



# netTerrain 10.1

## End-User Guide



# Contents

<b>1 About this Guide</b>	<b>14</b>
1.1 Who should use it	14
1.2 Assumptions	14
<b>2 Introduction to netTerrain</b>	<b>15</b>
2.1 netTerrain in a nutshell	15
2.1.1 Description of the problem	15
2.1.2 The netTerrain solution	15
2.1.3 Key features and visualization	16
2.1.3.1 Network documentation	16
2.1.3.2 Application, system, and miscellaneous views	17
2.1.3.3 Data Center Infrastructure Management (DCIM)	18
2.1.3.4 Link (cable and circuit) management	19
2.1.3.5 Outside Plant (OSP)	20
2.1.3.6 Dashboards and reports	21
2.1.3.7 Import mechanisms	22
2.1.3.8 Security	23
2.2 System organization and architecture	23
2.3 What's new in 10.1	26
2.3.1 Release notes	26
2.4 Help and support	27
2.4.1 Live support	27
2.4.2 Getting help from your netTerrain tool	27
<b>3 Navigating the System</b>	<b>29</b>
3.1 User level permissions	30
3.2 Logging in	30
3.2.1 Animated tutorials for beginners	32
3.2.2 Bypassing the login	33
3.2.3 Seeing who's online	34
3.2.4 Structure of netTerrain URLs	34
3.3 Getting started with diagrams	35
3.4 The netTerrain GUI	37
3.4.1 Diagram	38
3.4.1.1 Help notifications	39
3.4.2 Menus and ribbons	40
3.4.2.1 Page menu	42

3.4.2.2 Insert menu	51
3.4.2.3 Edit menu	54
3.4.2.4 Arrange menu	55
3.4.2.5 Tools	56
3.4.2.6 Discovery	57
3.4.2.7 Import and export	57
3.4.2.8 IP Address Management (IPAM)	59
3.4.2.9 Maps	59
3.4.2.10 Help	60
3.4.3 Quick access bar	62
3.4.3.1 Project link	63
3.4.3.2 netTerrain Reports and Dashboards	63
3.4.3.3 Event console	64
3.4.3.4 Work order management	65
3.4.3.5 Catalog link	65
3.4.3.6 Admin console	66
3.4.3.7 Last diagram link	66
3.4.4 Zooming and panning	66
3.4.4.1 Zoom options	67
3.4.4.2 Zoom in	68
3.4.4.3 Zoom out	69
3.4.4.4 Pan	69
3.4.4.5 Fit to window	70
3.4.4.6 Hiding the zoom toolset from the diagram	71
3.4.5 Hierarchy browser	71
3.4.5.1 Expanding a hierarchy browser subtree	72
3.4.5.2 Opening a new diagram from the hierarchy browser	74
3.4.6 Searching	74
3.4.6.1 Using search parameters	76
3.4.6.2 Feeling lucky searches	78
3.4.7 Properties and settings	79
3.4.8 Catalog	80
3.4.8.1 Accessing the catalog for a node type	82
3.4.9 Layers	82
3.4.10 Breadcrumbs	83
3.4.11 Notifications, user and help menus	84
3.4.11.1 User settings menu	84
3.4.12 Context menus	89
3.4.12.1 Diagram context menu	90
3.4.12.2 Node Context menu	92

3.4.12.3 Link context menu	93
3.4.12.4 Displayed field and text context menu	95
3.4.12.5 Bend point context menu	98
<b>4 Working with Diagrams and Objects</b>	<b>99</b>
<b>4.1 Basic operations on diagrams and objects</b>	<b>99</b>
4.1.1 Properties and settings	100
4.1.1.1 Locking objects on a diagram	103
4.1.1.2 Page sizes	104
4.1.1.3 Node and link settings tab	107
4.1.2 Selecting and copying objects	108
4.1.2.1 Select all and select of all type	110
4.1.2.2 Copying objects	111
4.1.3 Moving, cutting and rotating objects	112
4.1.3.1 Moving objects between diagrams by cutting	112
4.1.3.2 Rotating	112
4.1.3.3 Rotating nodes with fixed 30 degree increments	115
4.1.3.4 Moving objects to front and back	115
4.1.4 Resizing objects	117
4.1.4.1 Resizing objects in bulk	119
4.1.5 Aligning and arranging objects in bulk	120
4.1.5.1 Row and column arranging	121
4.1.5.2 Tile arranging	122
4.1.5.3 Ellipse arranging	122
4.1.5.4 Force-directed layout	124
4.1.5.5 Centric Layout	126
4.1.5.6 Left, top, right, bottom alignments	128
4.1.5.7 Centering objects	130
4.1.6 Diagram backgrounds and grid	132
4.1.6.1 Uploading background images	132
4.1.6.2 Clearing a background image	134
4.1.6.3 Hiding a background image	135
4.1.6.4 Changing the diagram background color	135
4.1.6.5 Downloading a background image	136
4.1.6.6 Defining a diagram grid	137
<b>4.2 Working with nodes</b>	<b>139</b>
4.2.1 Understanding the netTerrain catalog	140
4.2.1.1 Viewing the catalog	140
4.2.1.2 Catalog structure	143
4.2.1.3 'Dia' and 'Fav' checkboxes: objects on the diagram and favorites	144

4.2.1.4 Categories drop down box	145
4.2.1.5 Catalog search box	147
4.2.2 Adding and deleting nodes	147
4.2.2.1 Adding nodes by using the node menu	148
4.2.2.2 Adding nodes by using the right-click diagram context menu	151
4.2.2.3 Adding nodes by dragging and dropping from the catalog	152
4.2.2.4 Adding nodes by dragging and dropping an image from a browser or folder	153
4.2.2.5 Line Nodes	155
4.2.2.6 Deleting nodes	156
4.2.2.7 Creating node aliases	157
4.2.2.8 Changing the icon for an alias	161
<b>4.3 Editing Data</b>	<b>162</b>
4.3.1 Editing objects	162
4.3.1.1 Editing a single object instance by clicking	162
4.3.1.2 Combo Box values	163
4.3.1.3 Setting the value to NULL or to a value not in a combo box	164
4.3.1.4 Field editor	164
4.3.1.5 Inserting expressions	165
4.3.2 Displayed fields	166
4.3.3 Hyperlinks	170
4.3.4 Double-click Behaviour	171
<b>4.4 Working with links</b>	<b>174</b>
4.4.1 Link basics	175
4.4.1.1 Link catalog	175
4.4.2 Creating links	176
4.4.2.1 Method 1: select the two endpoints	177
4.4.2.2 Method 2: Dragging and dropping a link from the catalog	177
4.4.2.3 Method 3: using the clipboard	178
4.4.2.4 Method 4: using the 'l' key	179
4.4.3 Inter diagram links	180
4.4.3.1 Bringing in a reference node to the local diagram	181
4.4.4 Link aesthetics: snapping points, styles and bend points	182
4.4.4.1 Snapping points	182
4.4.4.2 Link styles	183
4.4.5 Bend points	184
4.4.5.1 Creating multiple bend points quickly using the 'b' shortcut	185
4.4.5.2 Creating right-angled routes for links quickly	185
4.4.6 Separating links	186
4.4.7 Creating multiple links at once	188
4.4.8 Easy cable management using the cable mapper	192

<b>4.5 Free text, palette objects, drawings, and pictures</b>	<b>196</b>
4.5.1 Free text	196
4.5.2 Rich text	198
4.5.3 Palette objects	200
4.5.3.1 Comments and stamps	201
4.5.3.2 Documents	202
4.5.3.3 Shapes	203
4.5.4 Drawings	206
4.5.4.1 Lines	207
4.5.4.2 Paths	207
4.5.4.3 Polygons	207
4.5.5 Pictures	208
4.5.5.1 Adding a picture by dragging and dropping	208
<b>5 Advanced Features</b>	<b>210</b>
<b>5.1 Hiding and filtering information</b>	<b>210</b>
5.1.1 Hiding individual nodes	210
5.1.2 Temporary filters: hiding unconnected objects	211
5.1.2.1 Using filters with links	213
5.1.3 Viewing hidden objects in outline mode	215
<b>5.2 Layers</b>	<b>215</b>
5.2.1 Node layers	217
5.2.2 Link layers	219
5.2.3 Field layers	221
5.2.4 Field tags	223
5.2.5 Misc layers	224
<b>5.3 Table views</b>	<b>225</b>
5.3.1 Hybrid vs type-specific table views	227
5.3.2 Editing data from a table view	228
5.3.3 Navigating from a table view to a diagram	229
5.3.4 Other table view features	231
5.3.4.1 Column sorting	231
5.3.4.2 Hiding and showing the id field	232
5.3.4.3 Pagination and counters	232
5.3.4.4 Exporting table views to csv	233
<b>5.4 Queries</b>	<b>234</b>
5.4.1 Loading an existing query	240
<b>5.5 Diagram templates</b>	<b>241</b>
5.5.1 Removing the template for a diagram	244
5.5.2 Prebuilt diagram templates	244

<b>5.6 Advanced link features</b>	<b>244</b>
5.6.1 Circuit Layout Records	244
5.6.1.1 Running a CLR by type	246
5.6.2 Main (or shortest) paths	246
5.6.3 Link bundles	249
5.6.4 Link measurements	254
<b>5.7 Embedding coordinates in a diagram</b>	<b>254</b>
5.7.1.1 Measurements with embedded coordinates	257
5.7.1.2 Using static latitude and longitude in maps	261
<b>5.8 IP toolset</b>	<b>263</b>
<b>5.9 Triggers</b>	<b>264</b>
<b>5.10 IP Address Management (IPAM)</b>	<b>267</b>
5.10.1 Accessing IPAM	267
5.10.2 Hierarchy and structure	268
5.10.2.1 Folders	268
5.10.2.2 Subnets	269
5.10.2.3 IP Address behavior within subnets	270
5.10.2.4 Inspector panel	273
5.10.3 Reports	274
5.10.3.1 Status reports	275
5.10.3.2 Exception reports	276
5.10.4 Exception handling and maintenance workflow	278
5.10.4.1 Reviewing exceptions	278
5.10.4.2 Acknowledging (clearing) exceptions	278
5.10.4.3 Viewing cleared exceptions	278
5.10.4.4 Correcting exceptions	279
5.10.4.5 Exporting for review or audit	279
5.10.5 IP address assignation	279
5.10.5.1 From netTerrain	279
5.10.5.2 From IPAM	282
5.11 Viewing device and port performance data	284
5.11.1 Viewing time-series data for devices	284
5.11.2 Viewing port traffic	286
<b>6 DCIM Objects</b>	<b>287</b>
<b>6.1 Regular nodes vs. 'Smart objects'</b>	<b>288</b>
6.1.1 Can I use nodes to represent devices or racks?	288
6.1.2 The netTerrain hardware model hierarchy	289
<b>6.2 Racks</b>	<b>290</b>

6.2.1 Adding a new rack to the project	291
6.2.1.1 Method 1: using the rack menu option	291
6.2.1.2 Method 2: using the right-click diagram context menu	293
6.2.1.3 Method 3: dragging and dropping from the catalog	294
6.2.1.4 Method 4: dragging and dropping an image from a browser or folder	295
6.2.2 Working with racks on a floor plan	297
6.2.3 Rack aggregate properties and visual overrides	299
6.2.4 Working with dual racks	301
6.2.5 Rack composite views (multiple racks in one view)	302
<b>6.3 Devices</b>	<b>305</b>
6.3.1 Adding a new device to the project	305
6.3.1.1 Method 1: using the device button in the menu	306
6.3.1.2 Method 2: using the right-click diagram context menu	309
6.3.1.3 Method 3: dragging and dropping from the catalog	309
6.3.1.4 Method 4: dragging and dropping an image from a browser or folder	310
6.3.2 Working with devices	312
6.3.2.1 Changing the type of a device	314
6.3.2.2 Predefined device properties	316
6.3.2.3 Mounting a device on a rack	317
6.3.2.4 Rack mounting using increments of 1/3 of a rack unit	317
<b>6.4 Device subcomponents: slots, cards and ports</b>	<b>318</b>
6.4.1 Slots and Cards	318
6.4.1.1 Predefined card properties	320
6.4.1.2 Changing slot positions for a card	320
6.4.2 Ports	320
6.4.2.1 Port fields	321
6.4.2.2 Reference ports	322
6.4.2.3 Port overrides	324
<b>7 Imports and Exports</b>	<b>324</b>
7.1 Importing netViz projects into netTerrain	325
7.1.1 Preparing the netViz file for the import process	325
7.1.2 Manual process for netViz imports	327
7.1.3 Importing netViz automatically	331
7.1.4 Importing several netViz projects in bulk	331
7.1.5 Post import checkup	332
7.2 Importing a Visio project	334
7.2.1 Static vs full project imports	334
7.2.2 Using Visio stencils in the netTerrain catalog	335
7.3 Exporting diagrams to Visio	335

7.3.1 Server vs client-side exports	335
7.3.2 Visio export options	336
7.3.3 Exporting and fetching the files	337
<b>7.4 Static exports: HTML and PNG</b>	<b>338</b>
7.4.1 Exporting to static HTML	339
7.4.1.1 HTML export options	339
7.4.2 Exporting to PNG	340
7.4.2.1 PNG export options	340
<b>7.5 Importing data from Excel</b>	<b>341</b>
7.5.1 Obtaining the Excel import sheet	341
7.5.2 Excel import worksheets	343
7.5.3 Objects	343
7.5.3.1 Assigning cards to a device slot	344
7.5.3.2 Mounting devices on racks	345
7.5.4 Links	345
7.5.4.1 Creating links between ports	346
7.5.4.2 Bundling Links	347
7.5.4.3 Assigning Fiber Strands	347
7.5.5 Updating values	348
7.5.5.1 Using curly brackets to insert and update values	348
7.5.5.2 Changing the Name of objects	349
7.5.6 Positioning Objects and reparenting	349
7.5.6.1 Changing x/y coordinates	349
7.5.6.2 Lat & Long Coordinates	349
7.5.6.3 Moving Objects to Different Diagrams	349
7.5.7 Troubleshooting and Tips	350
7.5.7.1 Input string not in correct format issue	350
7.5.7.2 Type image ignored	350
7.5.7.3 Parent node missing	351
7.5.8 Proceeding to import from Excel	351
7.5.8.1 Importing single files	351
7.5.8.2 Default Node Size	352
7.5.8.3 Importing a package	353
<b>7.6 PDF export</b>	<b>355</b>
<b>8 Outside Plant</b>	<b>356</b>
<b>8.1 Advantages of using georeferenced diagrams</b>	<b>357</b>
8.1.1 Large diagrams and deep zooming	357
8.1.2 Embedded coordinates	357
8.1.3 Node identification (halos and clusters)	358

8.1.3.1 Disabling clusters and halos	360
8.1.4 Cable, strand and circuit management	361
<b>8.2 Working with map sources</b>	<b>361</b>
<b>8.3 OpenStreetMap (OSM) maps</b>	<b>363</b>
8.3.1 Map layers	364
8.3.1.1 Standard layer	364
<b>8.4 Adding georeferenced maps to your diagram</b>	<b>373</b>
8.4.1 Use of maps covering large geographical areas	375
<b>8.5 Working with georeferenced diagrams</b>	<b>376</b>
8.5.1 Placing nodes on georeferenced diagrams	376
8.5.1.1 Placing nodes based on location or GIS coordinates	377
8.5.1.2 Measurements in georeferenced diagrams	379
8.5.2 Creating links and bend points	382
8.5.2.1 Creating multiple bend points quickly using the 'b' shortcut	383
8.5.3 Location searches	384
<b>8.6 Typical Outside Plant (OSP) elements</b>	<b>386</b>
8.6.1 OSP Node Types	387
8.6.2 OSP Link Types	388
8.6.2.1 Circuits and strands	389
8.6.3 OSP Device Types	389
<b>8.7 Working with KML / KMZ maps</b>	<b>390</b>
8.7.1 Prerequisites for importing KML / KMZ files	391
8.7.2 Importing a KMZ/KML file	391
8.7.3 Exporting a diagram to KMZ	393
<b>8.8 Working with cables and strands</b>	<b>393</b>
8.8.1 Fiber cable and strand types	393
8.8.2 Managing strands	396
8.8.2.1 Connecting strands	400
8.8.2.2 Disconnecting strands	405
8.8.2.3 Strand table view	405
8.8.2.4 Strand colors on ports	406
8.8.2.5 Strand custom fields	410
8.8.2.6 Resplicing	413
8.8.3 Ribbon cables	415
8.8.4 Air blown fiber (ABF) cables	415
8.8.4.1 Creating an ABF link	416
8.8.4.2 Assigning a fiber to an ABF tube	416
8.8.4.3 Modifying or removing fiber assignments	417
8.8.4.4 Bundling fiber cables to non-ABF ducts	418
8.8.4.5 Reviewing tube occupancy	418

8.8.4.6 Inspecting subtube occupancy	419
8.8.4.7 Capacity rules and limitations and container views	420
8.8.4.8 Managing and Validating ABF Data	421
<b>8.9 Circuits</b>	<b>422</b>
8.9.1 Components of a circuit	422
8.9.2 Anatomy of a circuit path	423
8.9.2.1 Hops	424
8.9.3 Creating a new circuit	424
8.9.3.1 Rules for a valid circuit path to exist	424
8.9.3.2 Step 1: Launching the ACRA	426
8.9.3.3 Step 2: Selecting the end devices	437
8.9.3.4 Final step: end ports, parameters and patching the circuit up	440
8.9.3.5 Creating a circuit from a manual path selection	443
8.9.3.6 Creating a circuit from a CLR	444
8.9.4 OSP circuit layout records	444
8.9.4.1 Why a CLR?	445
8.9.4.2 The block CLR	445
8.9.4.3 Swimlane CLR	451
8.9.5 Diverse and redundant paths for existing circuits	452
8.9.6 Circuit Lists	454
8.9.6.1 Full circuit list	454
8.9.6.2 Opening a list of affected circuits per node or link	457
<b>9 Dashboards</b>	<b>457</b>
<b>9.1 Predefined dashboards</b>	<b>458</b>
9.1.1 Summary dashboard	459
9.1.2 Data Center Capacity (for netTerrain DCIM only)	460
9.1.3 Rack Capacity Planning Dashboard (for netTerrain DCIM only)	461
9.1.4 Asset Dashboard	462
9.1.5 Connectivity Dashboard	463
9.1.6 Admin Dashboard	463
9.1.7 Work order Dashboard	464
<b>9.2 Dashboard drill down</b>	<b>465</b>
<b>10 Change Management</b>	<b>467</b>
10.1 Document management (attachments)	467
10.1.1 Uploading a document	467
10.1.1.1 Deleting a document	471
10.1.2 Document extensions	471
10.1.3 Downloading, checking out and checking in documents	471

10.1.4 Unlocking 'dormant' documents	473
10.1.5 Document history	473
10.2 Work order management	474
10.2.1 Introduction to tasks	475
10.2.1.1 Categories of tasks	475
10.2.2 Creating tasks	475
10.2.2.1 Default task name	478
10.2.2.2 Task work order	479
10.2.2.3 Task owner	479
10.2.2.4 Task category	480
10.2.2.5 Task due date	480
10.2.2.6 Completing the task	481
10.2.2.7 Adding multiple tasks to the same object	482
10.2.2.8 Copying tasks for links	483
10.2.3 Task status and stages	486
10.2.4 Editing a task	487
10.2.5 Task visual overrides	488
10.2.6 Closing a task	489
10.2.7 Cascading task dependencies	489
10.2.7.1 Creating an add task for a node with objects underneath	489
10.2.7.2 Closing a task with objects underneath	490
10.2.8 My work order tasks	491
10.2.9 Task notifications	492
10.2.10 Work orders	494
10.2.10.1 Editing work orders	494
10.2.10.2 Accessing a work order from an object	495
10.2.10.3 Archiving work orders	496
10.2.10.4 Viewing archived work orders	496

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Image: **John Bardeen, Walter Brattain, and William Shockley.**

They invented the transistor at Bell Laboratories, for which they shared the 1956 Nobel Prize in Physics. This invention made modern electronics possible by replacing bulky vacuum tubes.



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# 1 About this Guide

This document is divided into the following mind-blowing chapters:

- Chapter 1, "About this Guide".
- Chapter 2, "Introduction to netTerrain"
- Chapter 3, "Navigating the System"
- Chapter 4, "Working with Diagrams and Objects"
- Chapter 5, "Advanced Features"
- Chapter 6, "DCIM Objects"
- Chapter 7, "Bulk Imports and Exports"
- Chapter 8, "Outside Plant"
- Chapter 9, "Dashboards"
- Chapter 10, "Change Management"

## 1.1 Who should use it

This guide is for you, oh great keeper of network documentation Zen, also known as the netTerrain end-user!

End users in netTerrain are typically associated with the following roles:

- Diagram Read-Only: read-only users who can only see diagrams and the information displayed within a diagram but have no access to the object properties window.
- Read-only users: read-only viewers and consumers of diagrams and data.
- Annotators: read-only viewers with permission to add and edit annotations of their own.
- Updater: users who can update properties for objects but cannot add new objects or remove objects from a diagram.
- Editors: network administrators, IT documentation personnel or any other individual tasked with entering and editing data in netTerrain.

## 1.2 Assumptions

This guide assumes that users have basic knowledge of browser navigation and general computer and networking knowledge. Let's just say that if we are talking about mouse-clicks and you don't picture rats running around the kitchen, that's a start.

## 2 Introduction to netTerrain

### 2.1 netTerrain in a nutshell



#### 2.1.1 Description of the problem

IT inventory information is typically maintained in unconnected files and other data sources scattered around the enterprise, such as spreadsheets, legacy databases, service Desk, network, and asset management systems, even notes or plain employee knowledge.

Lack of a usable, centralized repository of asset information has a devastating effect on the bottom line:

- Difficulty in troubleshooting leads to excessive MTTR.
- Provisioning decisions and implementation take too long.
- Assets are scattered and unaccounted for, resulting in unnecessary purchases.
- Zombie servers and cables abound.
- Space and environmental variables are not optimized.
- And much more...

In short, total cost of ownership soars because you can't manage a system you don't understand!

#### 2.1.2 The netTerrain solution

netTerrain is a multi-user IT visualization solution used in many different scenarios:

- Network inventory and documentation
- Inside and outside plant documentation
- Data center infrastructure management (DCIM)
- Cable management
- Outside plant fiber, copper, and wireless documentation

It enables organizations to automate and simplify the management and visualization of IT components, links and their relationships within networks and data centers.

netTerrain comes in three flavors: netTerrain Logical, netTerrain DCIM and netTerrain Outside Plant. We refer to these as products, although technically netTerrain is just one product with the base one being netTerrain Logical and it can be extended to DCIM by adding reporting, work orders and the capability of documenting smart devices and racks and netTerrain OSP by adding dynamic map, strand, and circuit management support. This guide will cover all three products.

netTerrain Logical lets users create any type of IT or non-IT views, modeling each object in detailed fashion, using custom properties and hierarchies.

netTerrain DCIM is a Data Center Infrastructure Management solution that can track assets, document racks, devices and cables and monitor and report on the state of the Data Center. All three solutions offer discovery and integration options as well (covered in the Integration Toolkit Guide).

netTerrain OSP is an outside plant solution that helps in documenting the campus fiber, copper and wireless networks traversing geographically dispersed areas laid out on GIS maps.

The netTerrain catalog includes many predefined vendor specific configuration items. Users no longer must worry about how many ports a router has, or what icon must be used on a network diagram since netTerrain manages such things as vendor specific images or subcomponents automatically. These subcomponents are also automatically generated in the netTerrain visualization.

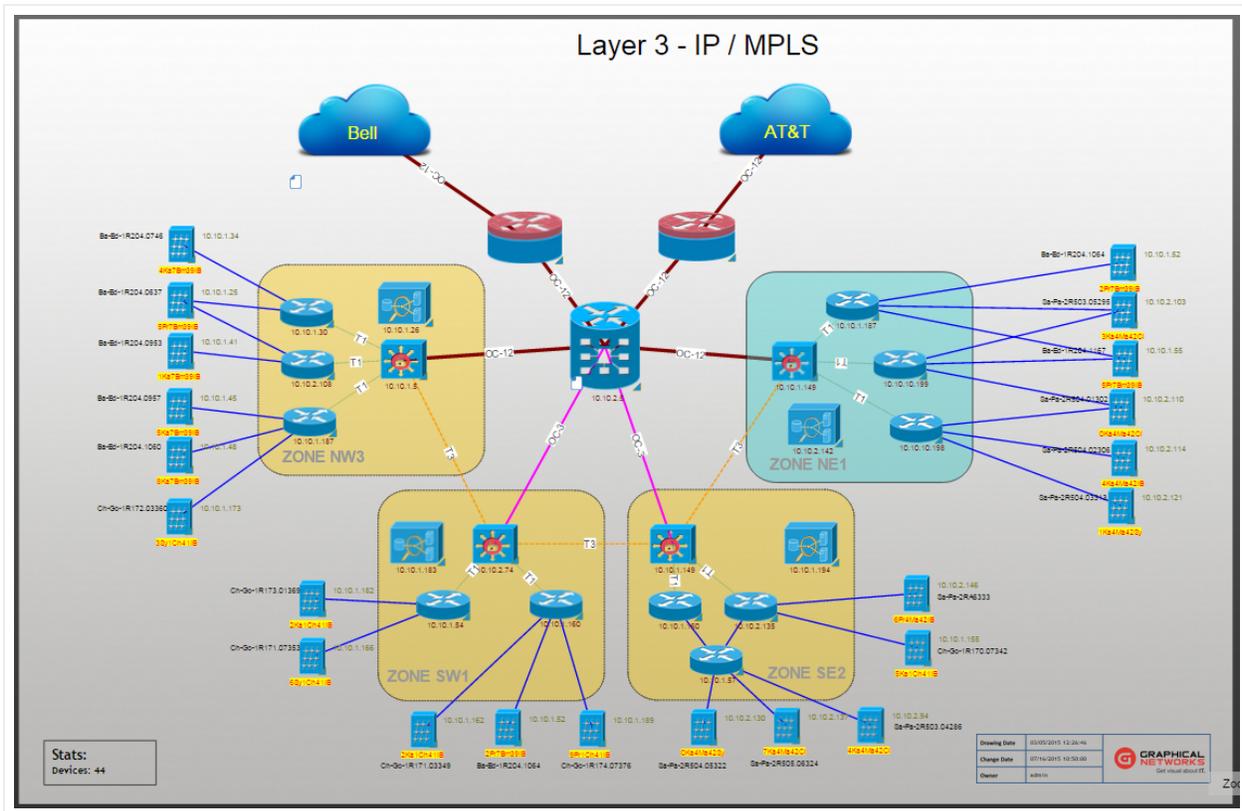
## 2.1.3 Key features and visualization

### 2.1.3.1 Network documentation

netTerrain is a full-fledged IT inventory management and network documentation system with advanced automation features.

netTerrain can produce topology views for assets such as network devices, servers, and power devices. Users can create any type of network with a few clicks. This is a useful feature for network managers. Once networks are created in netTerrain and devices mapped to them, users can:

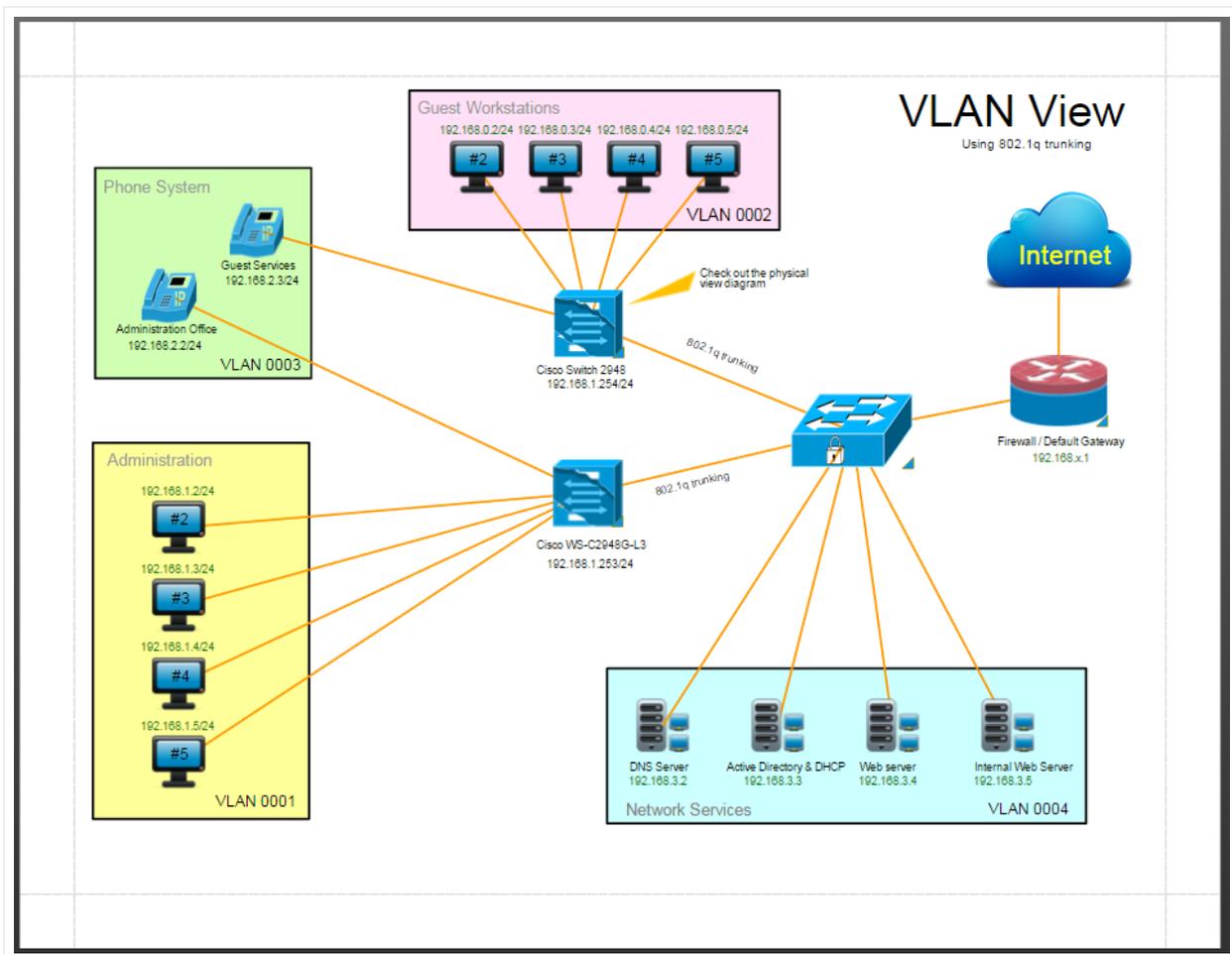
- Track all necessary device and link attributes by users, technology, protocol or any other attribute.
- Get real-time statistics for network topologies and its components.
- View networks by type and change icons, colors, link thickness or any other visual cue by any attribute value.
- Using the Integration Toolkit users can discover the network using SNMP and other protocols or from third-party systems and view real-time alarms on netTerrain diagrams.



Layer 3 network view example

### 2.1.3.2 Application, system, and miscellaneous views

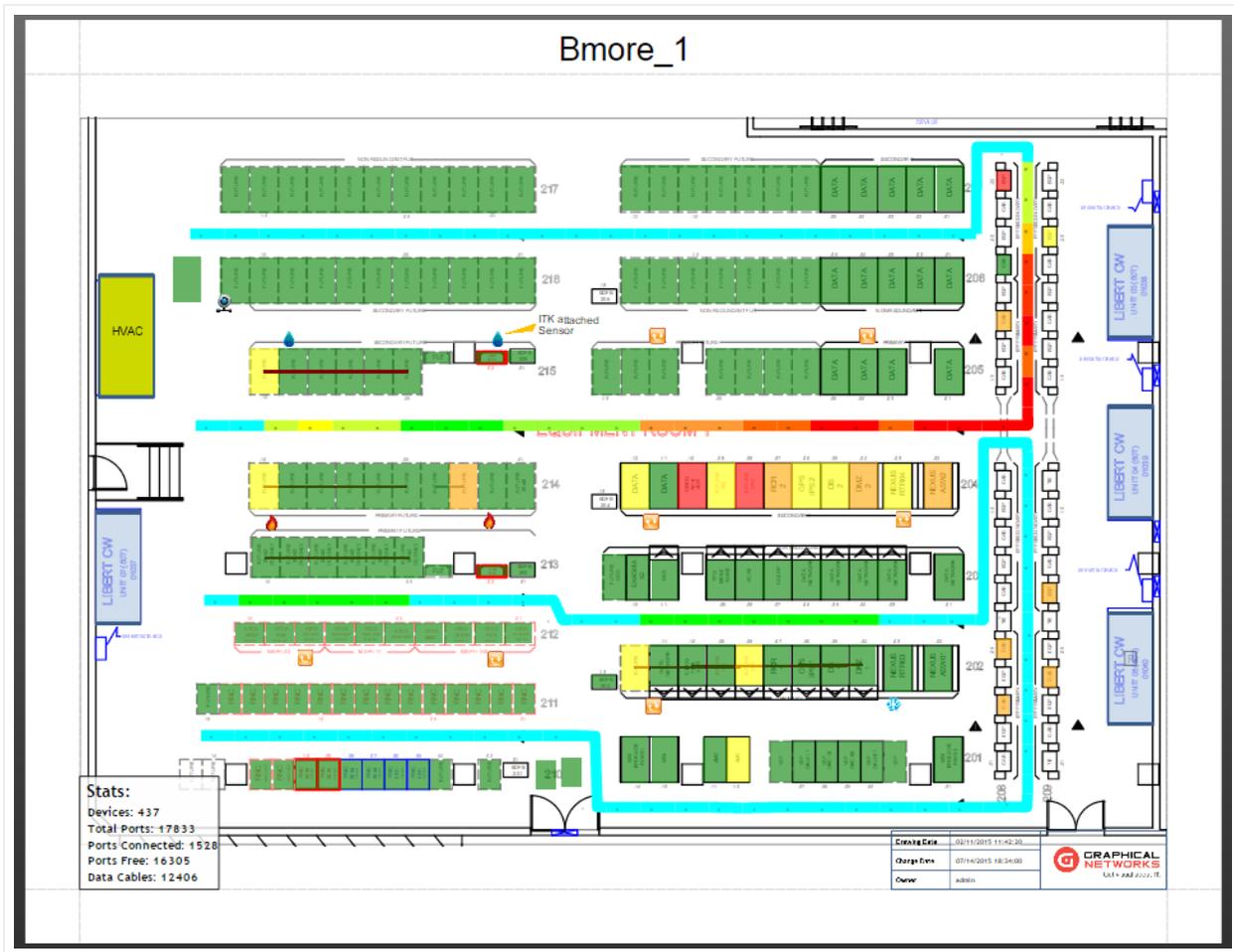
With netTerrain users can create a myriad of diagram types that represent different aspects of the organization. Thanks to a fully flexible catalog of nodes and links, users can create topology, system and application views displaying a variety of IT and non-IT objects.



Application View example

### 2.1.3.3 Data Center Infrastructure Management (DCIM)

Along with regular node and link types that can model any type of entity, netTerrain includes smart devices, cards, ports, and racks. These so-called smart objects have built-in business rules geared towards the documentation and inventory of your data center, such as rack occupancy, power and weight tracking, slot availability, port connectivity, DCIM reporting and much more. netTerrain DCIM includes a sophisticated network, infrastructure and environmental monitoring module that is outside the scope of this guide.



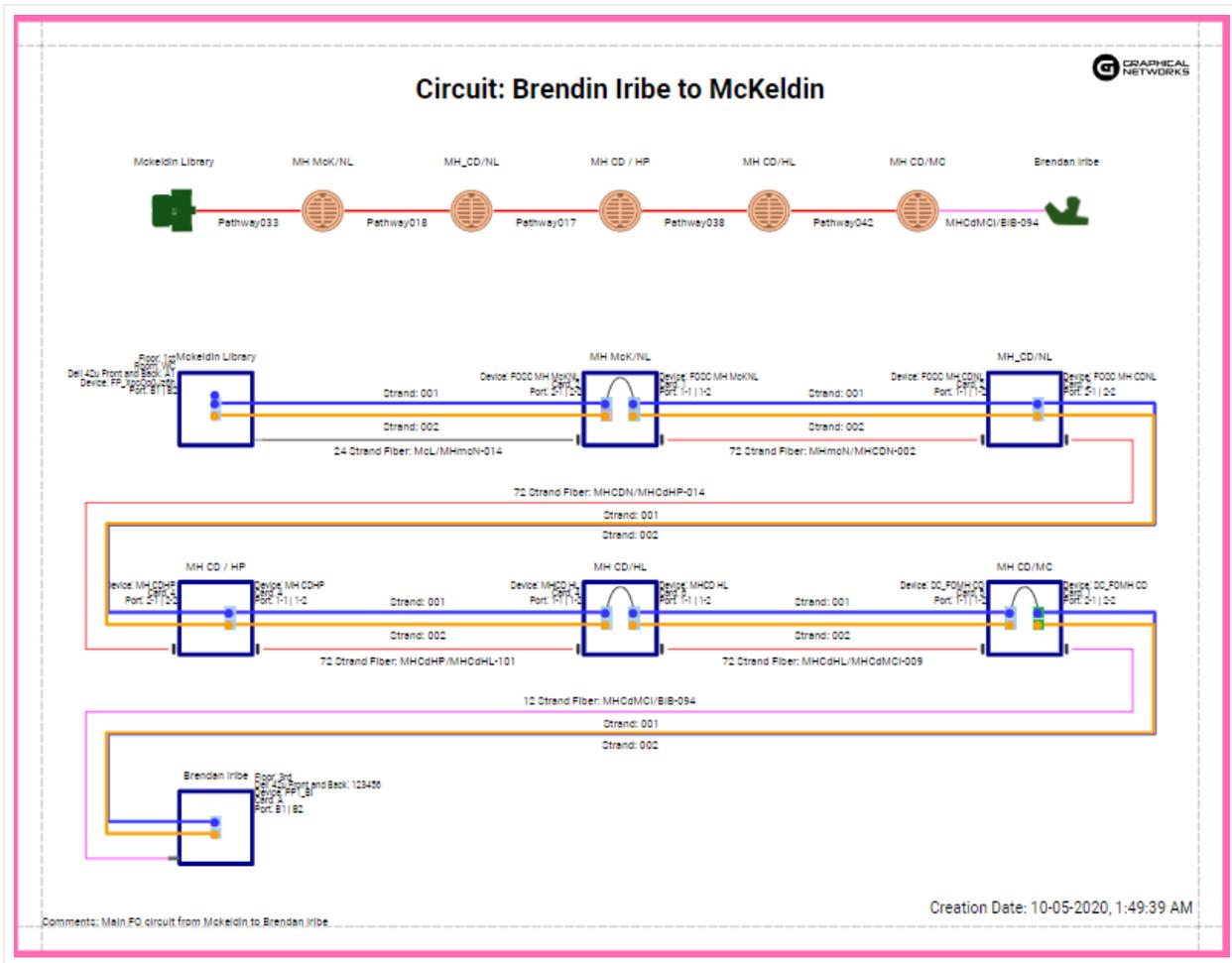
Floor plan view example

### 2.1.3.4 Link (cable and circuit) management

Links in netTerrain support an unlimited number of custom fields and can store any type of attribute (list fields). Using visual overrides, links can dynamically change their color, thickness, and style if a certain value matches a user predefined rule.

netTerrain includes a rules engine to specify which link types can be connected to which node types if a cable needs to have matching port connectors and much more.

netTerrain also has the ability to create Circuit Layout Records (CLRs) to see end-to-end connectivity as well as multiple tools to create multi-connections at once.

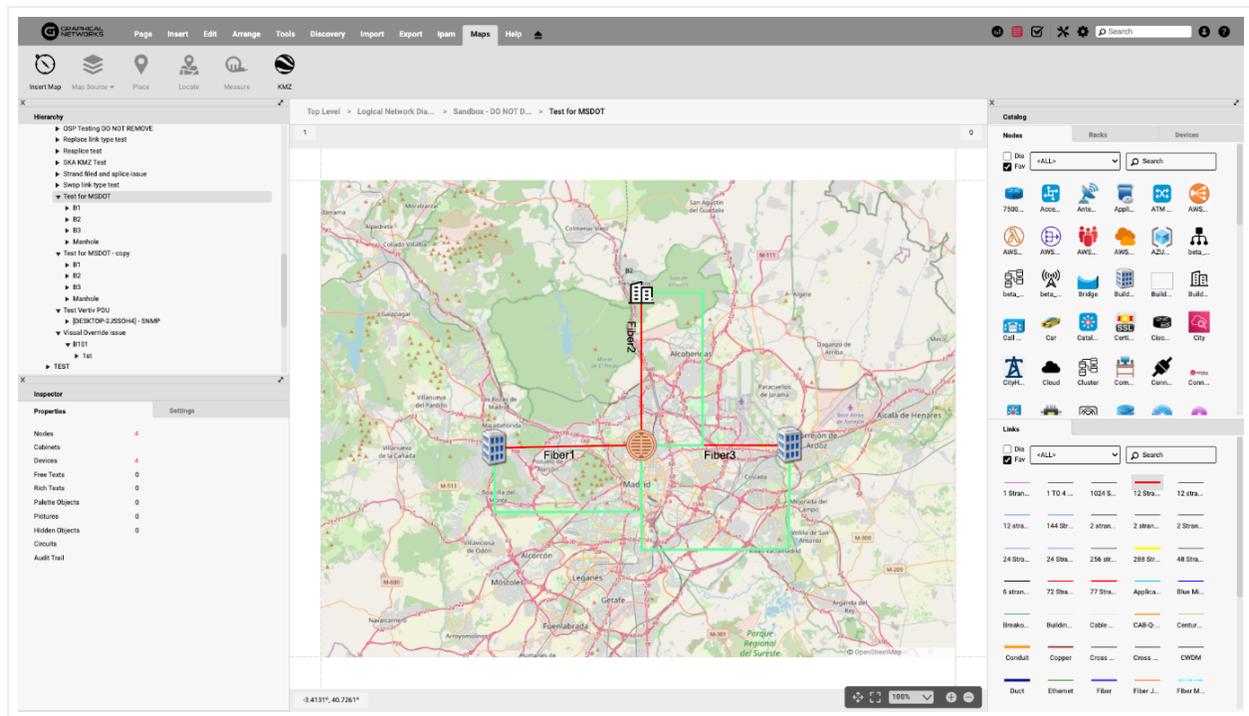


Block CLR view

### 2.1.3.5 Outside Plant (OSP)

With netTerrain OSP you can visually manage your copper, fiber, wireless or transmission networks and GIS based outside plant views.

You can use fully GIS-enabled maps, manage any type of outside plant element, and combine them with inside plant cable and asset management.

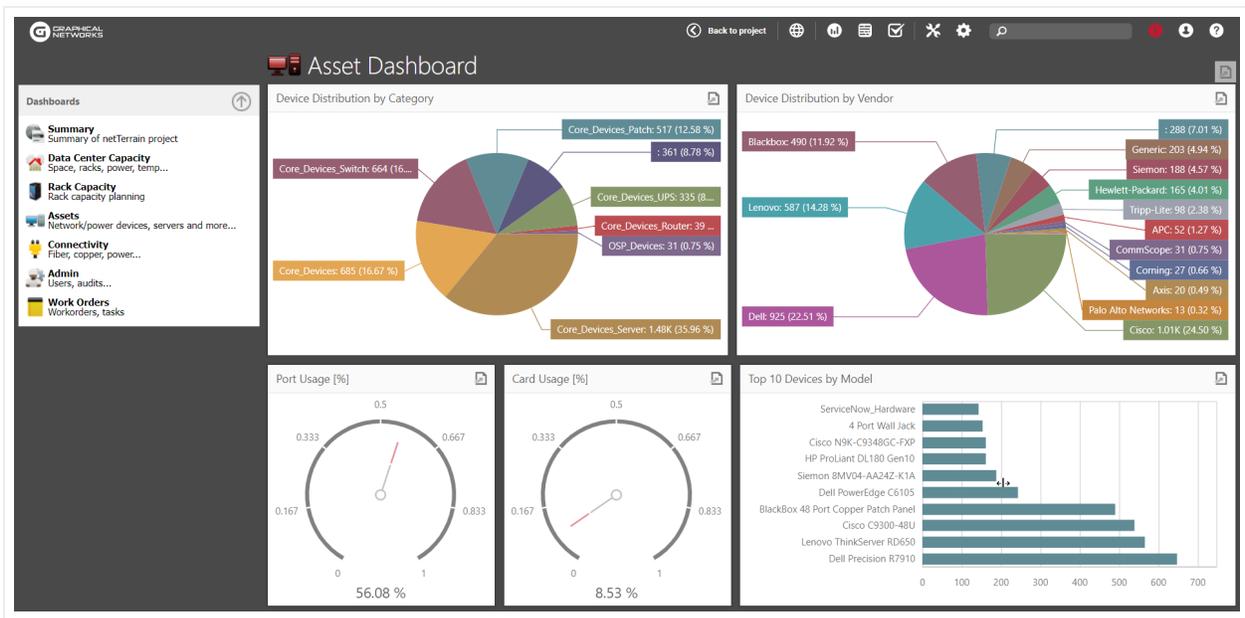


Outside plant dynamic map view

## 2.1.3.6 Dashboards and reports

netTerrain includes a full-fledged business intelligence engine for the creation of slick reports and dashboards. These reports are accessed from any part of the project and display different dashboard tabs that can be discriminated based on default role access.

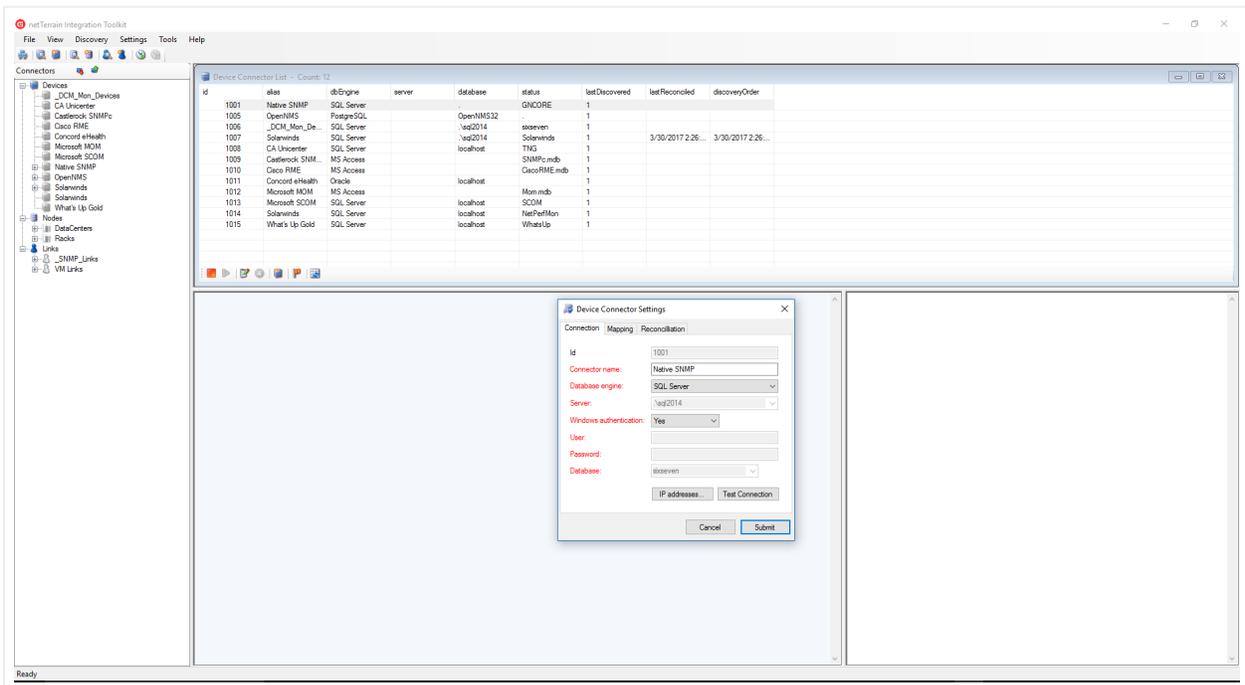
netTerrain ships with a series of built-in reports such as dashboards for Data Center summary views, device aggregate reports, connectivity reports, admin reports and much more.



Dashboard view

### 2.1.3.7 Import mechanisms

netTerrain provides several bulk import methods, including Microsoft Excel, Visio and netViz import buttons as well the Collector and Integration Toolkit (ITK) to capture data from the network or other systems and other third-party or homegrown repositories.



## 2.1.3.8 Security

netTerrain has a security model based on 8 roles: These roles comprise the following permission levels, and each one inherits the permission level from the previous one:

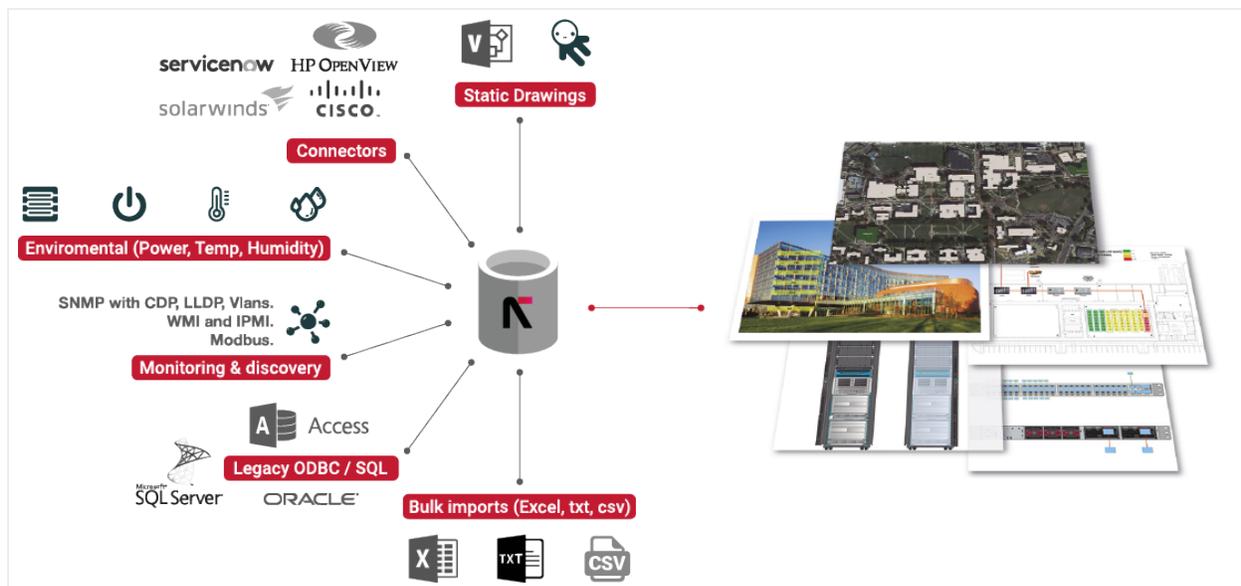
- 1) No access: users are prevented from accessing certain parts of the project.
- 2) Diagram read only: users may view data that is displayed within a diagram but can't view the data fields associated with objects.
- 3) Read-only: users may view data and diagrams, but lack the permission levels to modify, add or remove data from the database or diagrams.
- 4) Annotator: users can add, edit, and delete their own comments and palette objects.
- 5) Updater: users can edit data fields for objects but cannot add or delete existing objects in a diagram.
- 6) Editor: these are the users that can add, edit, and remove IT related records from the database. They can also modify diagrams.
- 7) Power-User (or catalog managers): In addition to data-entry functionality, power users can also manage the catalog and lookup tables.
- 8) Admin: administrators have full access to the system via the web browser and can create new users and groups as well as run the audit trail reports and change settings.

netTerrain supports Active Directory (AD) so that groups defined in AD can be synchronized with groups in netTerrain.

## 2.2 System organization and architecture

Below is a view of the system, as understood from the user's perspective. This view aims to show the typical data flow into and out of the netTerrain database, which serves as the de-facto information repository.

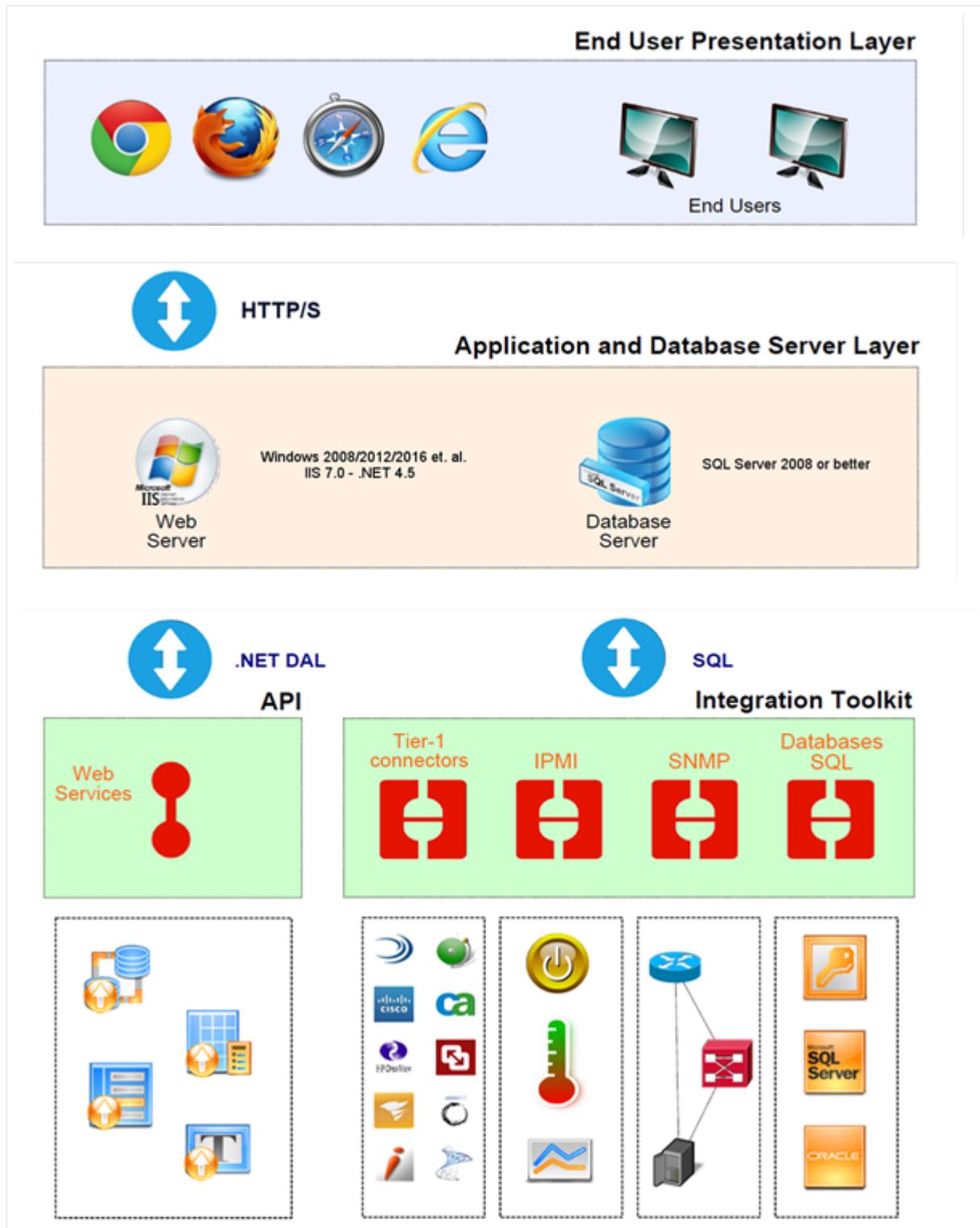
The following functional view shows the data flow in netTerrain:



### Functional view

Bulk imports and legacy asset data are typically imported during initial deployment or for field personnel with no access to the system, and 'steady state' daily asset tracking is accomplished by means of the data entry process using the netTerrain browser or automatically through the netTerrain Integration Toolkit and Collector.

The diagram below shows the architecture of netTerrain, with each component and how it interacts with the system:



netTerrain architecture diagram

## 2.3 What's new in 10.1



What's New in 10.0

Welcome to netTerrain 10.1, the next evolution in the 10.x series. Building on the major architectural foundations introduced in 10.0, this release expands netTerrain's modeling capabilities while strengthening enterprise-grade authentication and security support.

Version 10.1 introduces powerful new OSP functionality with air-blown fiber modeling and enhances secure access with CAC-based authentication – making netTerrain even more suitable for highly regulated and government environments.

Below are the highlights of this release.

### 2.3.1 Release notes

#### Major netTerrain enhancements

- Air-blown fiber (ABF) modeling and visualization: introducing native ABF modeling workflows and visual representation, enabling more accurate fiber infrastructure documentation and management.
- CAC (Common Access Card) login and client certificate authentication: support for CAC-based authentication and SSL client certificates, ensuring compatibility with strict IIS security requirements and government-grade environments.

#### Minor netTerrain enhancements

##### OSP & Circuit Improvements

- Enhanced CLR and Swimlane usability and stability
- Support for complex and mixed parallel circuit connections
- Improved strand-level modeling and visibility
- Additional circuit rendering and interaction refinements

##### Usability

- Ability to disable trackpad zooming
- New prebuilt diagram templates included with the master database
- Sortable table views for improved data navigation

## IP Address Management (IPAM)

- Support for larger CIDR blocks (e.g., /22, /16)
- Improved reserved IP handling and device association logic

## Security & Platform Stability

- Authentication and Active Directory error handling refinements
- Improved logout privacy behavior
- Front-end dependency and SDK updates to strengthen long-term platform stability

### Attention!

This section describes changes that affect any one of our netTerrain licenses. Some features may only apply to users with a netTerrain DCIM or netTerrain OSP license.

This section only describes improvements since version 10.0.

## 2.4 Help and support

There are several ways to get support for your netTerrain tool. As you might expect, support is only available for customers with a valid maintenance contract.

### 2.4.1 Live support

Live support is available through the following channels:

- Customer support portal (preferred method): <https://graphicalnetworks.zendesk.com/hc/en-us/>.
- You need your customer portal user and password, if you don't have one, you can request it at [support@graphicalnetworks.com](mailto:support@graphicalnetworks.com)
- Email: [support@graphicalnetworks.com](mailto:support@graphicalnetworks.com)
- Live chat (not always available): live chat link on our website ([www.graphicalnetworks.com](http://www.graphicalnetworks.com))
- Phone support: 1-240-912-6223

### 2.4.2 Getting help from your netTerrain tool

You can also get help straight from your netTerrain software by clicking on the help menu. The help menu can be accessed from the main help bar, as well as from the top right corner.

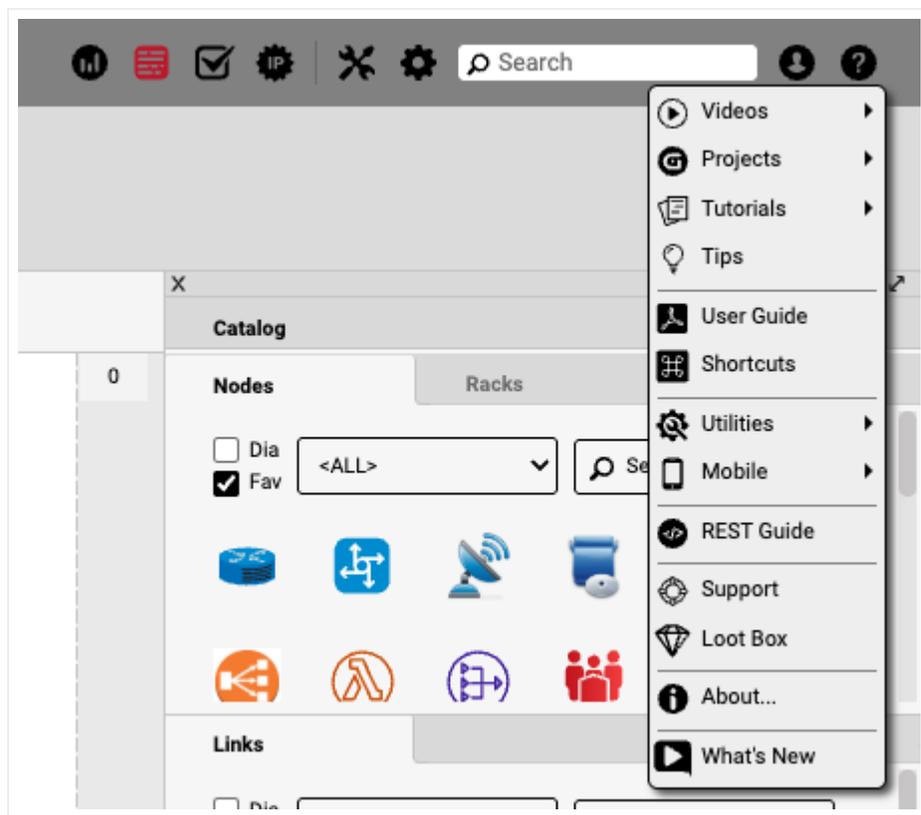


### *Help menu in netTerrain*

The help menu includes:

- Videos to help you get started.
- Sample projects online
- The “dragonfly” tutorial that can be relaunched as many times as you want.
- Animated gifs on how to get started and carry on with basic tasks.
- PDF guide
- The shortcut (hotkey) list in PDF format
- Useful utilities (IP toolset, exporter tool, Excel import sheet, Collector)
- Mobile app download
- The REST API guide
- Customer portal support link
- About dialog

It is important to note that the PDF guides are context specific. If you are in the “project” (end-user part of netTerrain) you will see the end-user PDF guide. If you navigate to the catalog, the help menu provides the catalog guide. If you are an administrator and you navigate to the admin console, you see whole set of extra guides not available for regular end-users.



*Help menu in the admin console*

These extra guides only available from the admin console include:

- Programming guide: this is the SOAP API guide.
- Database and Scripting guide: this provides information about the database structure and how to write scripts against it.
- Import/Export guide: this guide explains how to set up the import/export mechanisms on the client and/or server and how to use them.
- Installation guide
- REST Guide: this is the REST API interface link, which opens swagger.

## 3 Navigating the System

netTerrain is at its core a collection of diagrams of your data center, fiber plant or network topologies. You can create any number of user-friendly pictorial representations of your IT landscape, such as physical, logical and application views. In addition, as we briefly showed in the previous chapter, netTerrain also displays table views, dashboards, and reports.

End users of the system require no special software to navigate netTerrain diagrams. By simply opening a browser and accessing the login page, a viewer can start navigating the diagrams depicted in netTerrain.

### 3.1 User level permissions

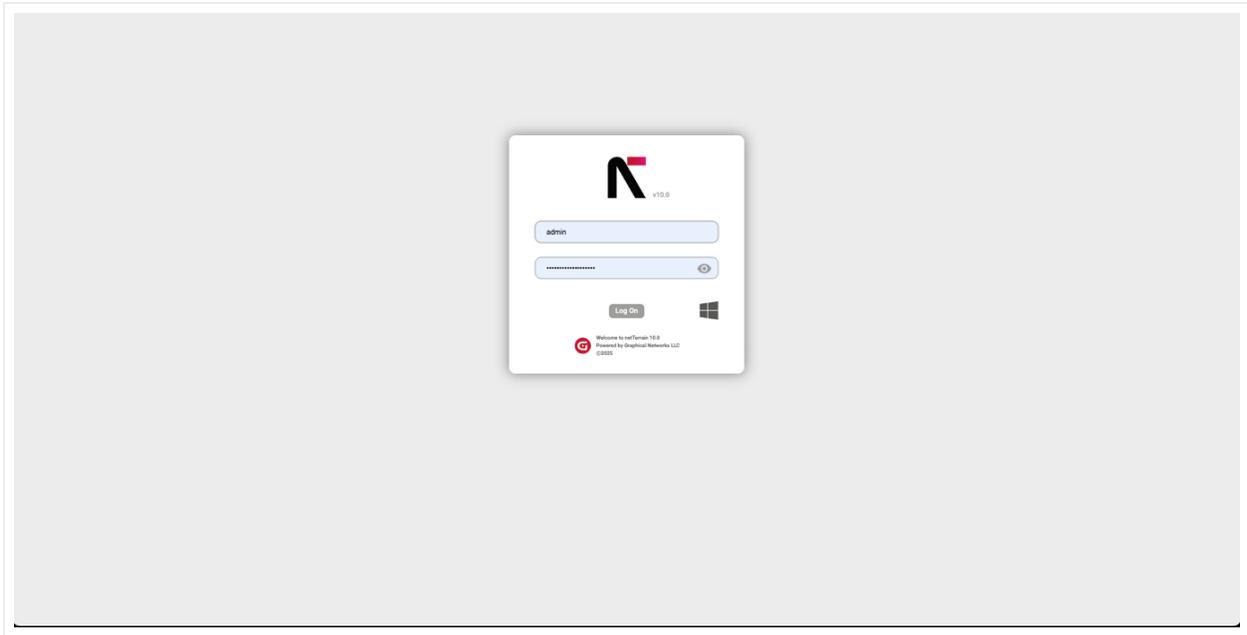
Before we dive into diagram navigation features, we will review the netTerrain user permission structure. This is important since not all buttons and menus are visible to all users. Depending on the permission level, some options can be enabled, disabled or not visible at all.

netTerrain has a security model based on 8 roles:

- 1) No access: this role is mostly used to 'park' users that may not have access to the project but should not be deleted from the database. This role can also be assigned on a per diagram basis, so that users may have no access to certain parts of the project.
- 2) Diagram Read-Only: users may view data and diagrams, but lack the permission levels to modify, add or remove data from the database or diagrams. Users will not be able to view the object properties or settings.
- 3) Read-only: users may view data and diagrams, as well as the property values associated with objects, but lack the permission levels to modify, add or remove data from the database or diagrams.
- 4) Annotator: users can add, edit, and delete their own comments and palette objects. The rest of the data can only be accessed in read-only mode.
- 5) Updater: users can modify object properties but cannot add new objects, move them on a diagram or delete them from the database.
- 6) Editor: users that have full permission to make any modifications in the project, including any so-called "CRUD" operations (create, read, update, delete).
- 7) Power-User (or catalog managers): in addition to data-entry functionality in the project, power users can manage the catalog.
- 8) Admin: these users have the highest permission level and full access to the system. They can create new users and groups as well as run audit trail reports and change global settings.

### 3.2 Logging in

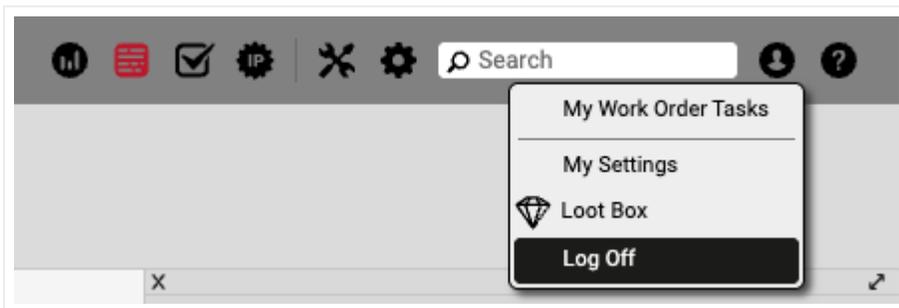
To access the netTerrain web interface, the user needs the URL that points to the web server, usually something like `http://<server>/<virtualDirectory>`, where `<virtualDirectory>` is the name of the web server directory assigned to netTerrain.



### *Login dialog*

Users can click on the show password button. Also note that your system admin may set up login to work with Active Directory or Azure AD, so the screen may vary a bit.

To log off the system, simply click on the Log Off link (top right corner). All session data will be cleared after you logged off. To view or edit a specific diagram the user needs to log back in.

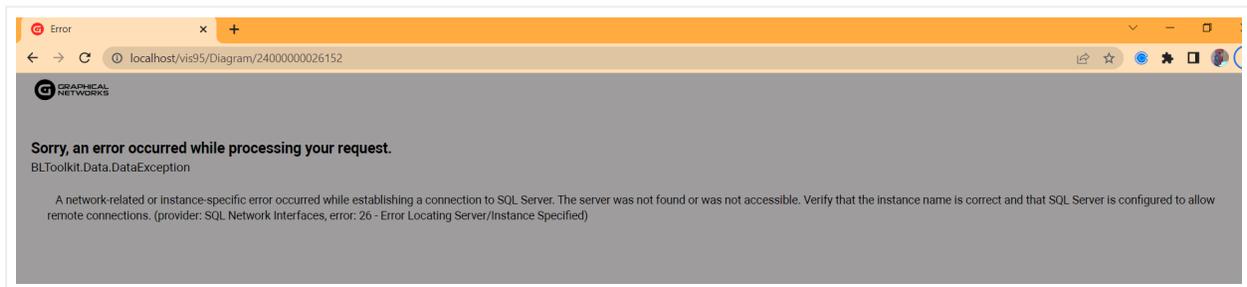


### *Logging off*

If you provide incorrect netTerrain (or AD) credentials, netTerrain will throw an error. Other log-in errors are possible if your server is not correctly configured (see netTerrain Admin Guide).

### Attention!

If you get an error like the one depicted below, the application server is not properly connecting to the database. Consult with your system administrator to trouble shoot the problem (also see the Installation Guide).



### Application connectivity problem

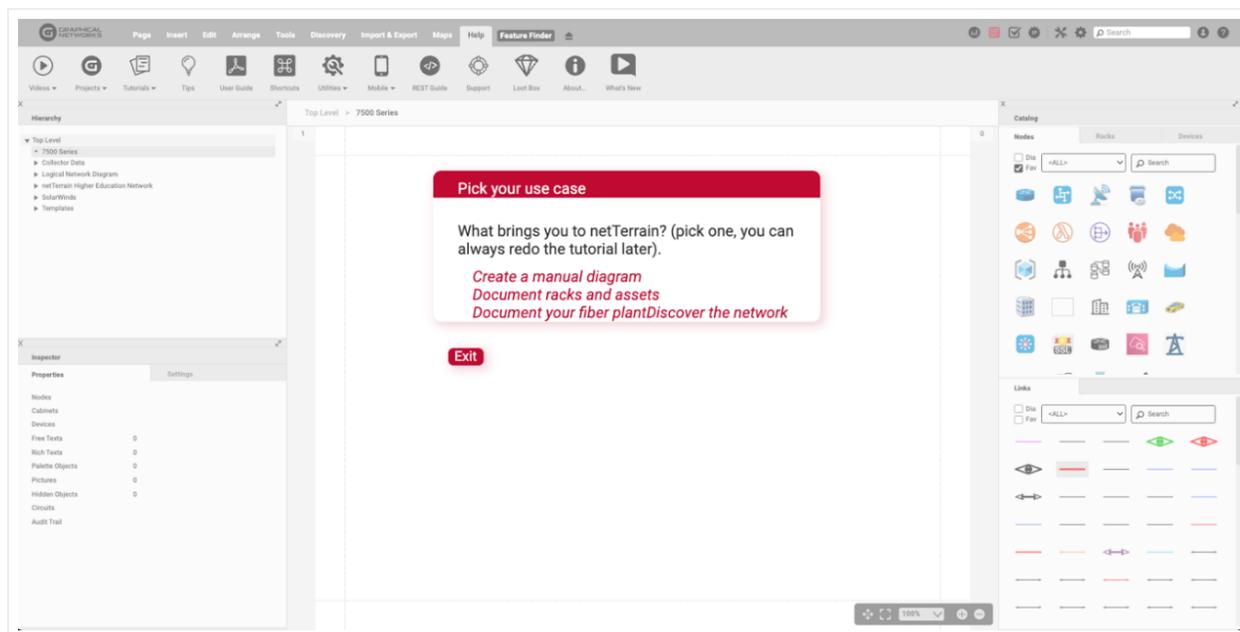
As mentioned above, the login process can be integrated with Active Directory, in which case the user may choose to enter the windows credentials or use a native netTerrain login (if it exists). If the 'Support Active Directory accounts' checkbox is checked in the admin console (see Installation Guide or Admin Guide for Active Directory settings), no credentials need to be specified for logging into netTerrain.

If two-factor authentication is enabled, then the user needs to also provide a Google 6-digit code from the Google authenticator app on their phones.

netTerrain also supports PIV (Personal Identity Verification) / CAC (Common Access Card) authentication using SSL client certificates. This advanced authentication method allows users to log in using smart cards or digital certificates instead of traditional username/password credentials. The system validates certificates against configurable trust policies and maps them to user accounts through identity attributes.

## 3.2.1 Animated tutorials for beginners

For novice users netTerrain now starts up with an animated tutorial to show you how to get started with the tool. This tutorial teaches you the very basics: how to add a node, how to double click and add some links. It only launches automatically when a newly created user logs in for the first time.



### Animated tutorial

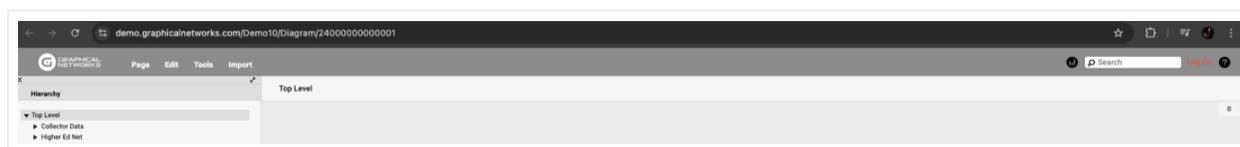
The novice user will be prompted to perform basic tasks assigned by our friendly dragonfly, while being shown around.

## 3.2.2 Bypassing the login

netTerrain does have a feature to bypass the login process and provide a read-only mode interface of netTerrain (see Installation Guide). When netTerrain is set up to 'Bypass login mode' any valid netTerrain URL that is entered in your browser (or clicked on), will render a netTerrain diagram without the need to authenticate against the server.

This is useful in cases where you want to see a netTerrain diagram inside another web application for example.

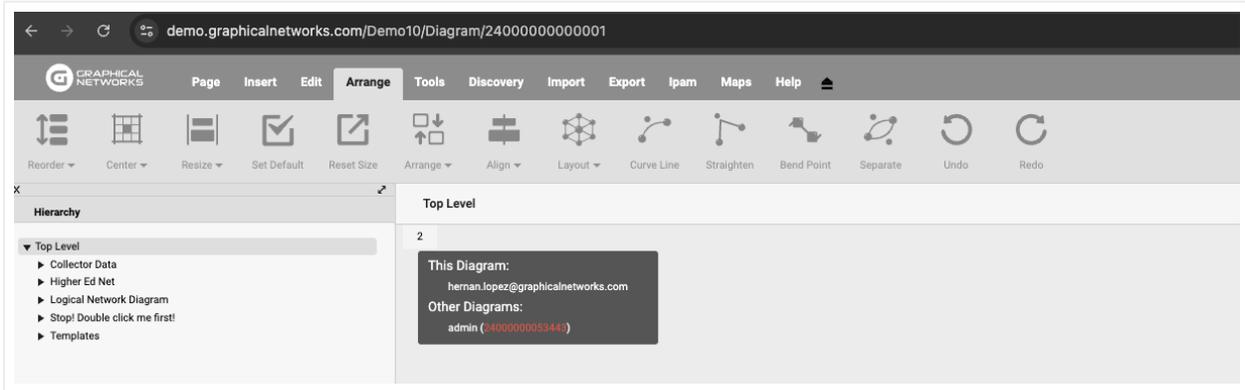
As mentioned above, in such cases you will be navigating diagrams in read-only mode. You can, however, login after the fact, by clicking on the 'logon' link on the upper right corner of the page, as depicted below.



### Logging into netTerrain during a bypass login session

### 3.2.3 Seeing who's online

Once you logged in, you can see if there are other users currently online and where, by hovering over the online indicator on the top left corner of the diagram.



#### Seeing who's online

When another user is on the same diagram, the indicator has a pink fill color, if everybody else is on a different diagram the indicator is grey. You can access the diagrams that other users are currently navigating by simply clicking on the diagramId link.

### 3.2.4 Structure of netTerrain URLs

netTerrain diagrams all use “deterministic URLs”, with a regular structure, or pattern:

```
http://<server>/<virtualDirectory>/Diagram/<diagramId>
```

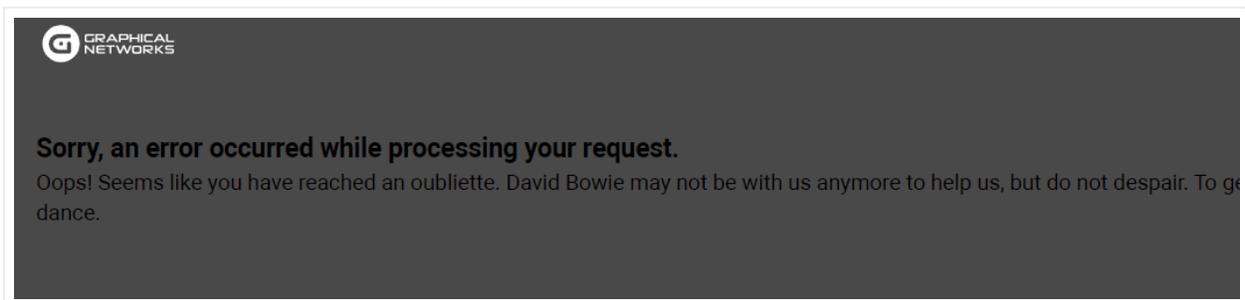
The diagramId is the unique id assigned by netTerrain to any node that can contain a diagram. An example of the top-level diagram is the following:

```
http://localhost/vis/Diagram/240000000000001
```

#### Attention!

Just like with any other web application, an incorrect URL will redirect you to an error page (or 404 page). Some of the reasons why you are reaching a 404 page may be the following:

- You provided an incorrect URL (maybe a typo? lack of coffee?).
- a redirect to a diagram that no longer exists.
- An incorrectly constructed URL in a custom report or hyperlinked field.

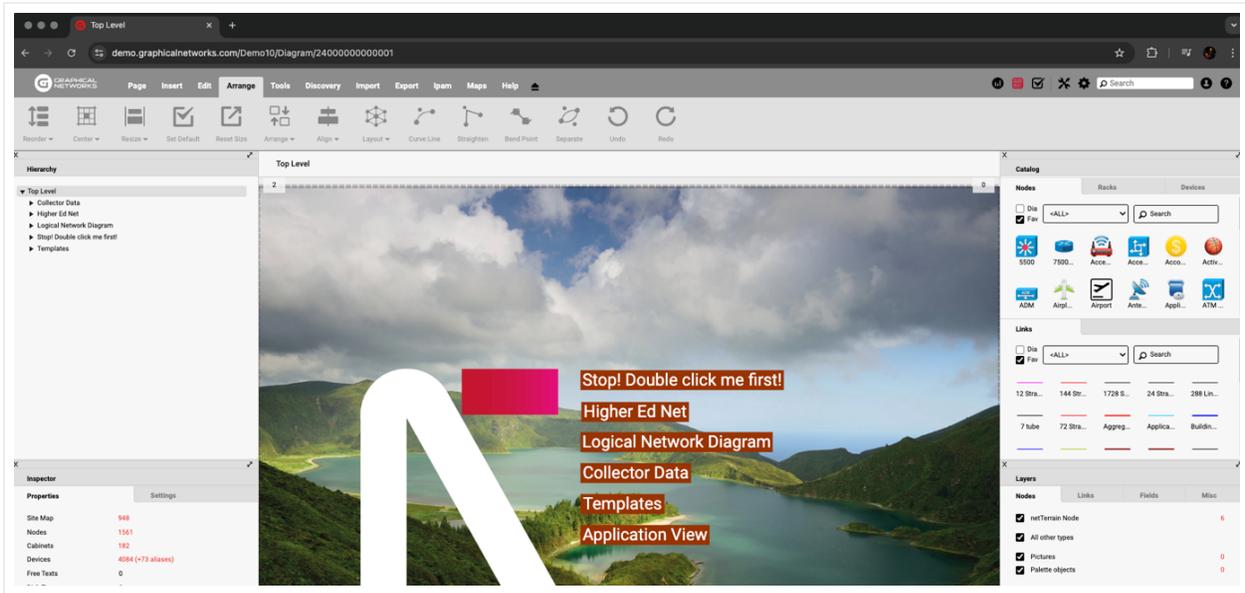


*Oh noes! A 404!!*

### 3.3 Getting started with diagrams

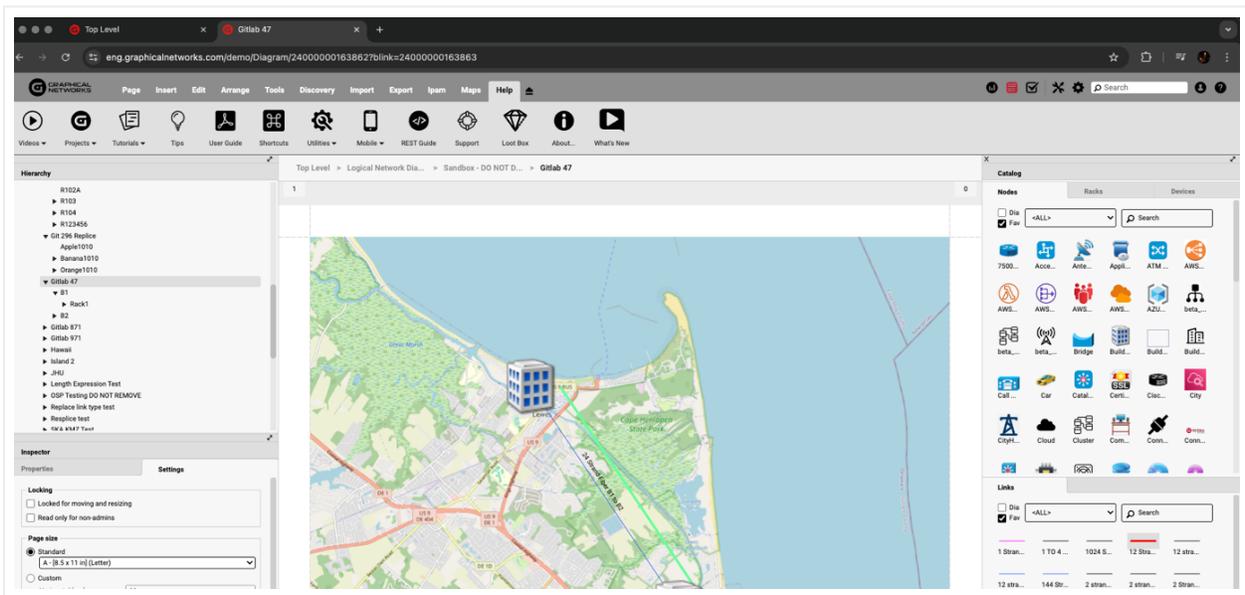
Once logged into the system for the first time, users find themselves on the so called 'project' side, where they can start navigating the different diagrams that comprise a netTerrain project. After a period of inactivity (15 minutes by default), the user will be logged off the system.

The inactivity period can be modified in the netTerrain application by editing the web.config file (see Installation Guide).



Sample Top Level diagram

To drill down into other levels of the project, simply double-click on a node or click on any leaf on the hierarchy browser, as depicted in the image below.



Accessing a sub diagram by double-clicking or selecting a leaf object

Besides the project, netTerrain also contains a catalog, a reporting dashboard, a work order section, and an administrative console. We will review the different parts of the GUI later but note that not all parts are

accessible by everyone. For example, the catalog, which is the placeholder for all the types and metadata that are used in the project, can only be accessed by power users or administrators.

#### **Attention!**

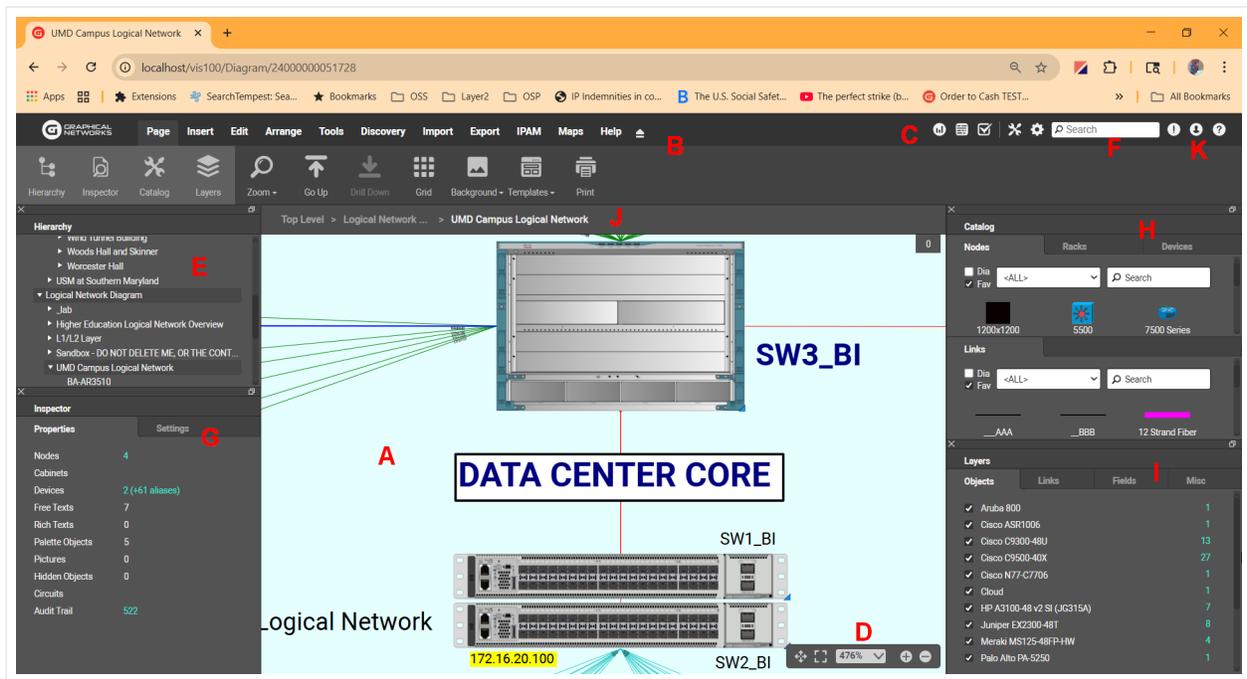
The administrative console is the gateway for managing users, groups, global settings, and audit trails. This can only be accessed by users with Admin role privileges.

### **3.4 The netTerrain GUI**

The netTerrain graphical user interface (GUI) is designed to simplify the process of managing your diagrams and information. In this section we simply walk you through these elements, and later through the guide (as we will regurgitate repeatedly) you can dive deeper into each feature.

Below we review the different parts that comprise the netTerrain user interface, which include:

- A) Diagram
- B) Menus & ribbons
- C) Feature finder
- D) Quick access bar
- E) Zoom & panning
- F) Hierarchy browser
- G) Search dialog
- H) Properties and settings tabs
- I) Catalog
- J) Layers
- K) Breadcrumbs

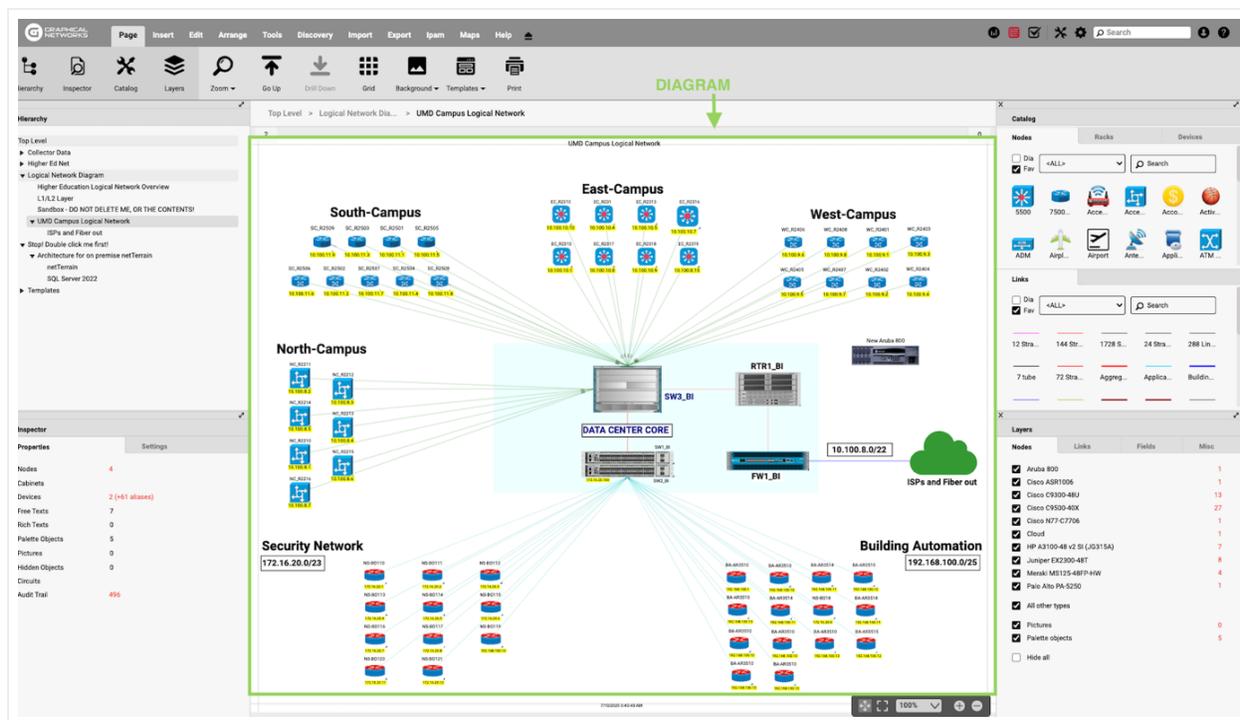


Basic netTerrain GUI components

### 3.4.1 Diagram

Diagrams in netTerrain are the main actors, and hard to miss; it's where you place all your objects. There are tons of interesting things that you can do with diagrams, such as adding nodes, links, text, images, palette objects, maps, backgrounds a grid and more.

Every node in netTerrain is also a diagram. You access the node diagram simply by double clicking on it.

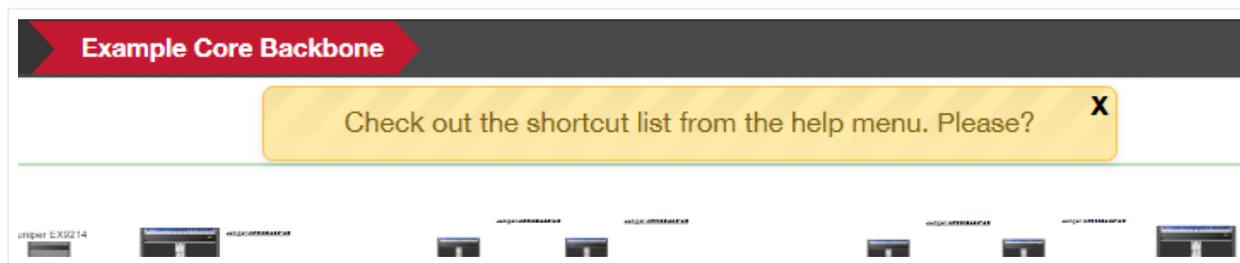


*netTerrain diagram, right there in the thick of things!*

### 3.4.1.1 Help notifications

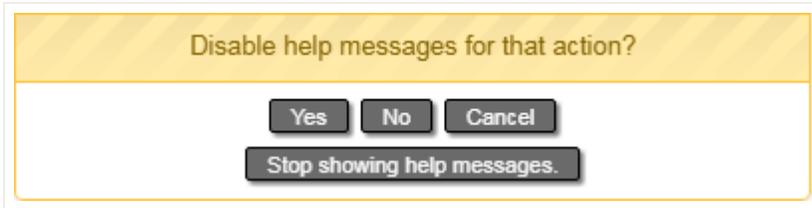
As a new user to the system (and if the sys admin enabled them), netTerrain will provide some basic help notifications when you perform certain actions.

For example, if you click on the zoom in button, a notification prompting you to try out a zoom shortcut will appear.



*An example notification*

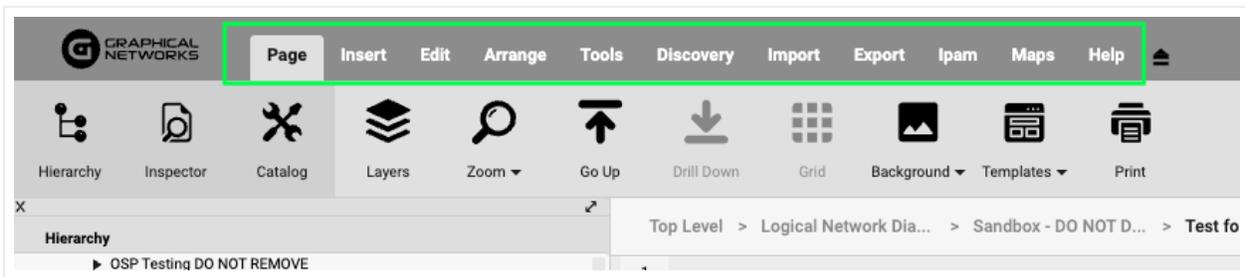
Notifications will only show up a few times per action until they stop appearing. However, if you find them annoying (or are a master ninja netTerrain user) you can disable a notification for a specific action or just disable them all, by simply clicking on the 'x' after a notification appears, and then disabling them as shown below:



Dialog to disable notifications

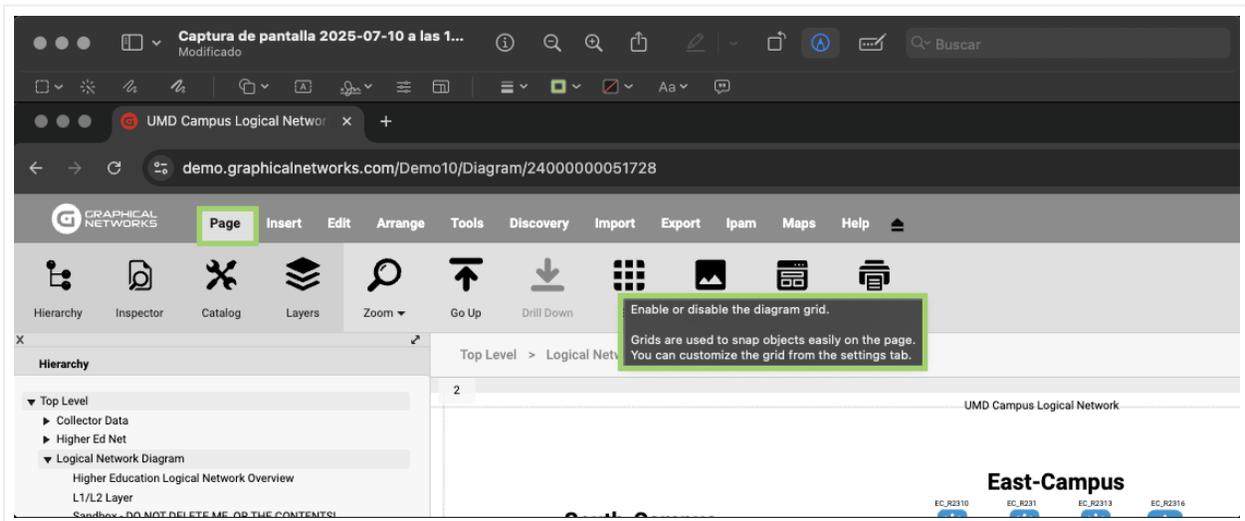
### 3.4.2 Menus and ribbons

The top of the netTerrain project page contains an array of menus, as you may recall from other desktop or web applications.



netTerrain menu bar showing the page ribbon

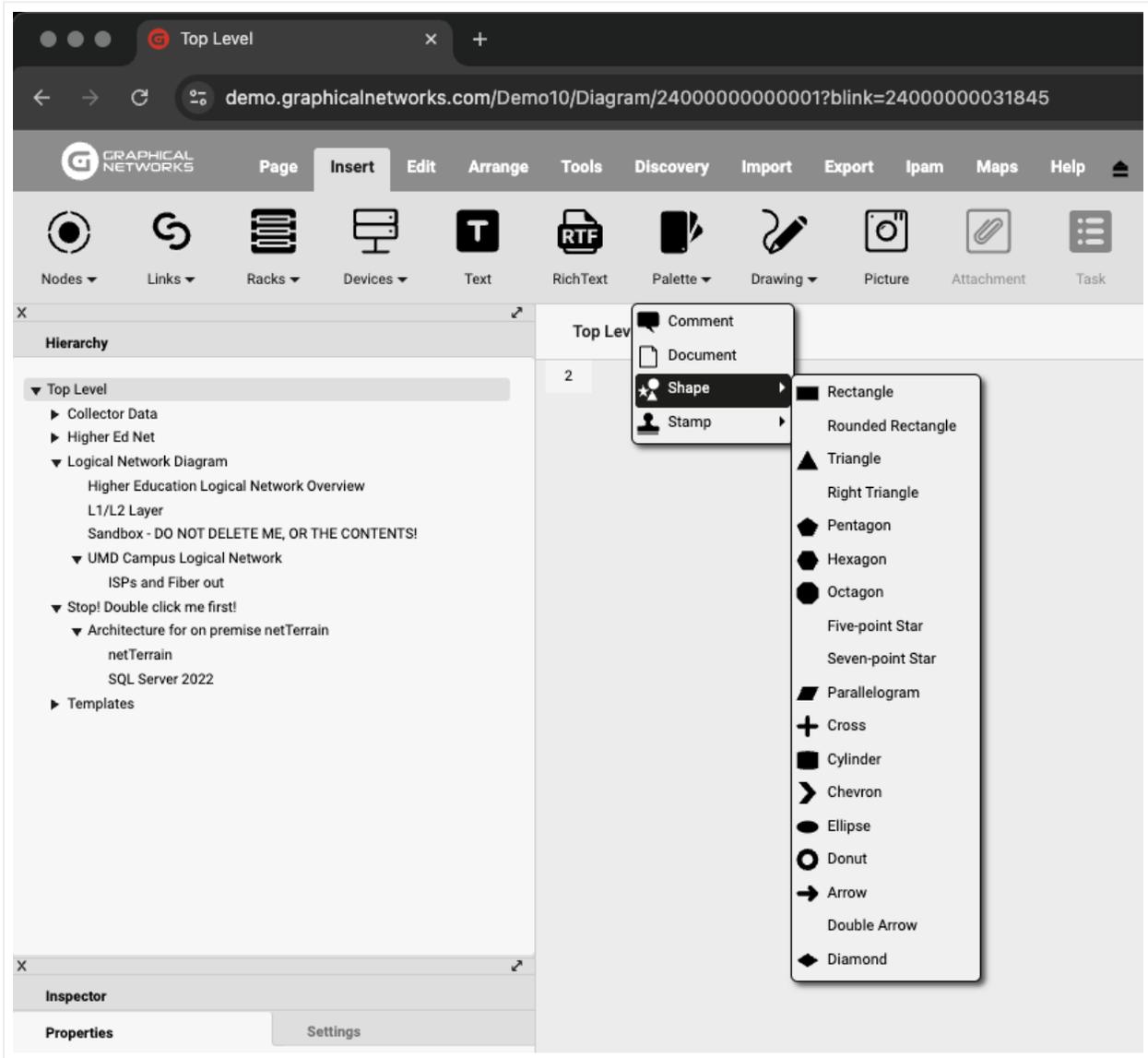
Each menu now expands into a ribbon with buttons, where each button has a simple subtext and a detailed tooltip explaining what the button does. You can collapse the ribbon using our ribbon arrow displayed in the screenshot below.



Page menu, ribbon, button and tooltip description

Buttons are context specific, meaning that depending on where and who you are, certain buttons may not be enabled or even displayed.

Note that some of the buttons include submenus, which in turn contain other buttons or icons.



Example of an expandable menu with submenu buttons

Below we will go over each menu and its corresponding buttons.

**Tip:**

Many buttons can be activated with a keyboard 'hotkey' or a combination of keyboard actions. When you hover the mouse over a button, you can see the description of that button and whenever applicable, the hotkey shortcut will be displayed between brackets.

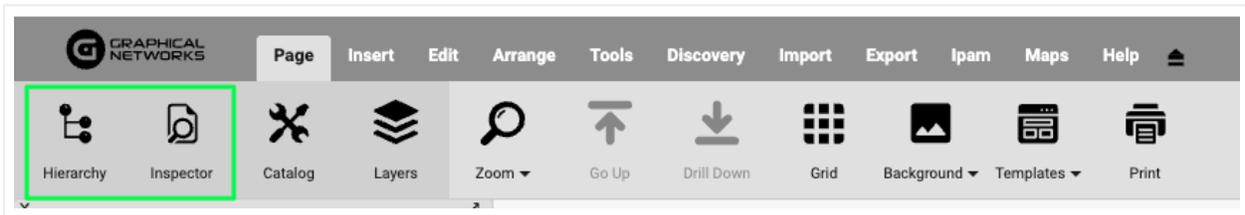
### 3.4.2.1 Page menu

The page menu deals with operations that affect your overall diagram and page settings.

#### 3.4.2.1.1 Toggle left panel

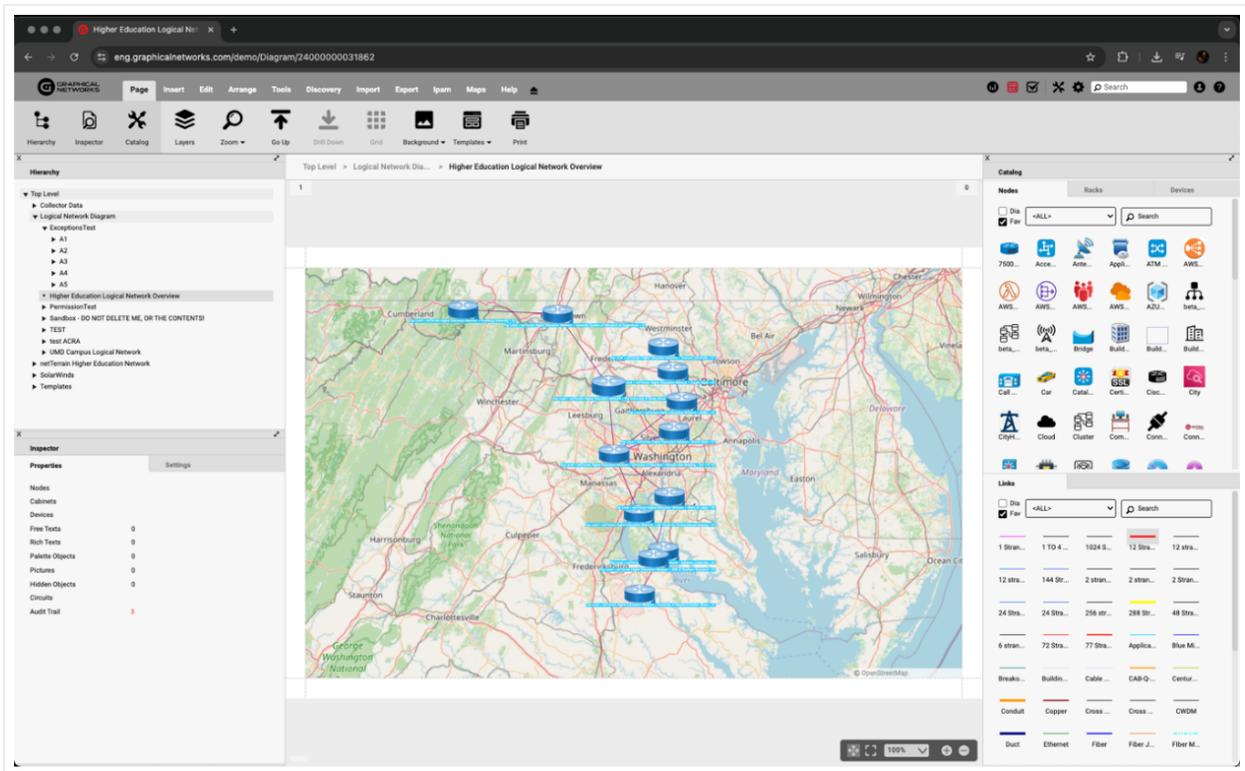
The toggle left panel hides or displays the hierarchy browser and the properties window. Most users leave this untouched for regular navigation since you want to see the hierarchy browser and the properties window when you click on an object.

However, in some cases this button comes in handy to provide a full screen view of just the diagram or printing purposes.



*Toggle left panel button*

By default, the left panel is displayed. This setting applies to the entire project and is user and session dependent.



*netTerrain view, with left panel hidden*

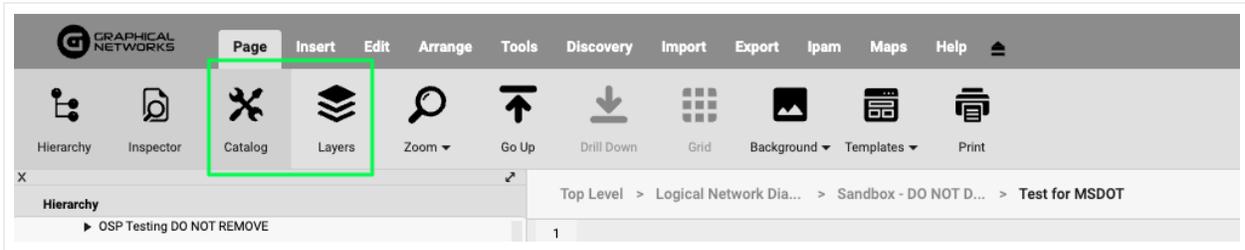
Below we will see how you can also hide the panels on the right side and provide a complete full screen view for your diagram.

### 3.4.2.1.2 Catalog and Layers

Next to the Left Panel button you can find two more buttons that also hide or show dialogs. This time, it's the dialogs that you may see on the right side. We will learn more about the catalog and layers panes later, but in short, the catalog and layers panes come in handy for easy drag and drop of objects onto the page and quick filtering of nodes, links, or fields.

Now if you want to hide them, that's what the two buttons displayed below do. For a quick operation you can use the hotkey! F3 (a nod to our netViz users) will operate on the catalog dialog and F4 on the layers.

Notice that the catalog button is not available for updater users (or lower) since they cannot drag and drop objects onto a diagram.

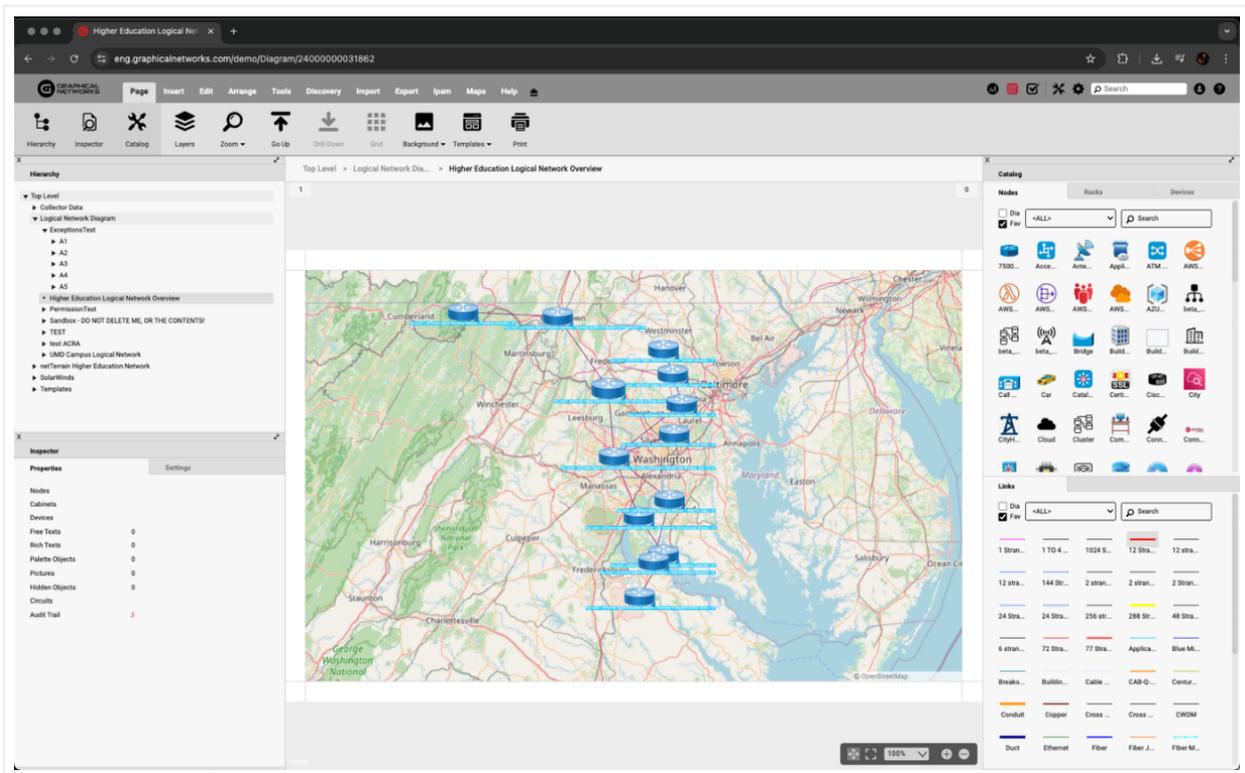


### Catalog and layer display button

When the catalog and layer panes are docked, they are stacked on top of each other on the right side of the page, as shown below:

Now that we know how to hide all dialogs on the page (left panel, catalog, and layers), here is a nice trick, if you want to see a full-page view of a netTerrain diagram:

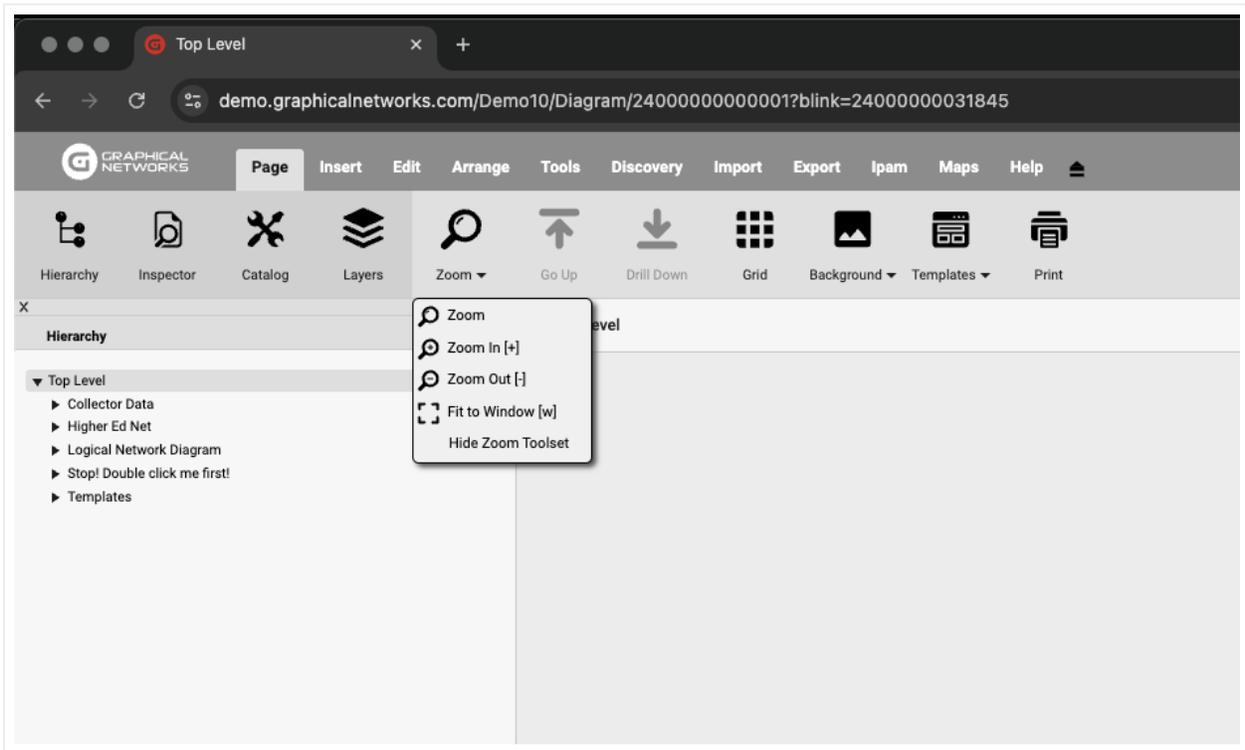
- a) Hide the catalog and layers (use F3 and F4).
- b) Hide the left panel and the ribbon! (Using the ribbon arrow).
- c) Hit F11 for a full browser view and ta-da!



### Full screen view using toggle left panel and F11

### 3.4.2.1.3 Zoom

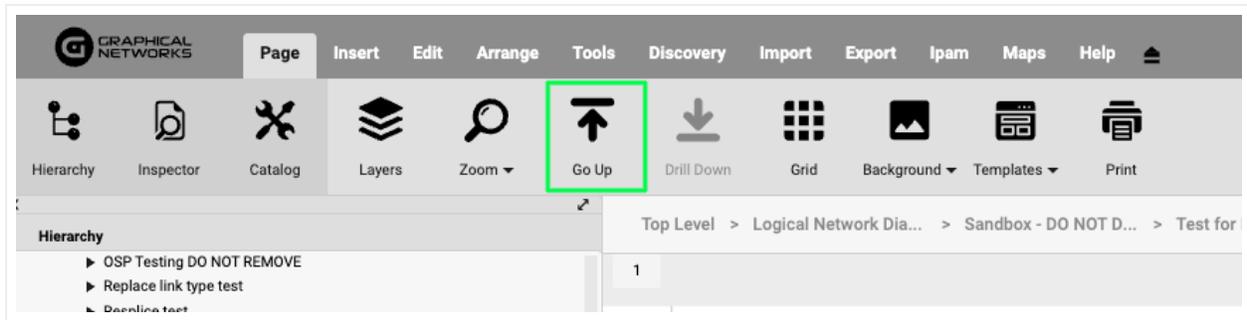
Zooming is very easy in netTerrain, so much so, that we don't recommend using these buttons as there are other easier ways of doing that, which we will review later. However, mostly for consistency and compatibility purposes we still have several zoom related buttons available from the page menu.



#### *Zoom options*

### 3.4.2.1.4 Go up

By pressing on the 'Go up' button, users can go up one level in the diagram hierarchy. Note that by going up, the icon that represents the parent object of the previous sub diagram has an indicator (a surrounding red box by default) showing the container object the user came from. The indicator will blink a certain number of times before disappearing. An administrator can configure how many times the blinking should occur. The type of indicator can also be changed by an administrator.



*Go up button*

**Tip:**

Use the 'u' hotkey for this button! You will get very used to this convenient shortcut for going up.

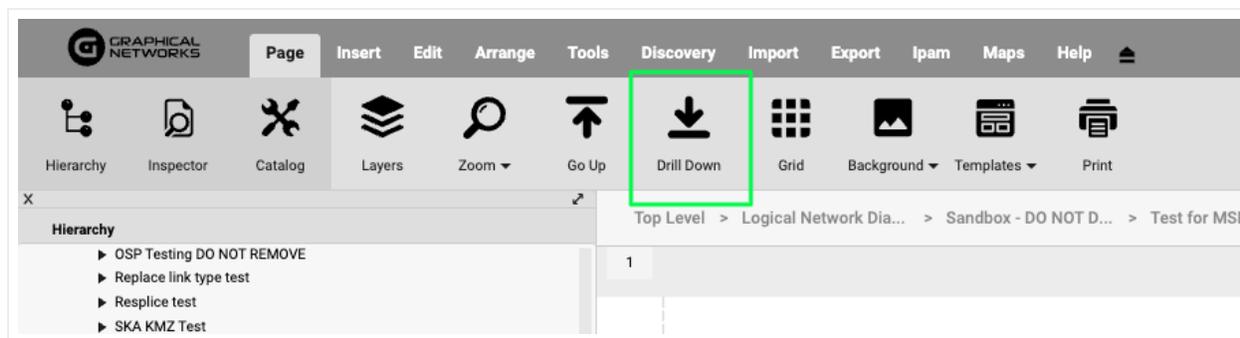
**Attention!**

If the 'u' hotkey seems not to react is because maybe you do not have the focus on the diagram. Click anywhere on the diagram and you will gain focus back. Also consider that the 'Go up' function does nothing when you are at the top level.

### 3.4.2.1.5 Drill Down

The drill-down function lets users drill into a specific node, which we normally refer to as its sub diagram.

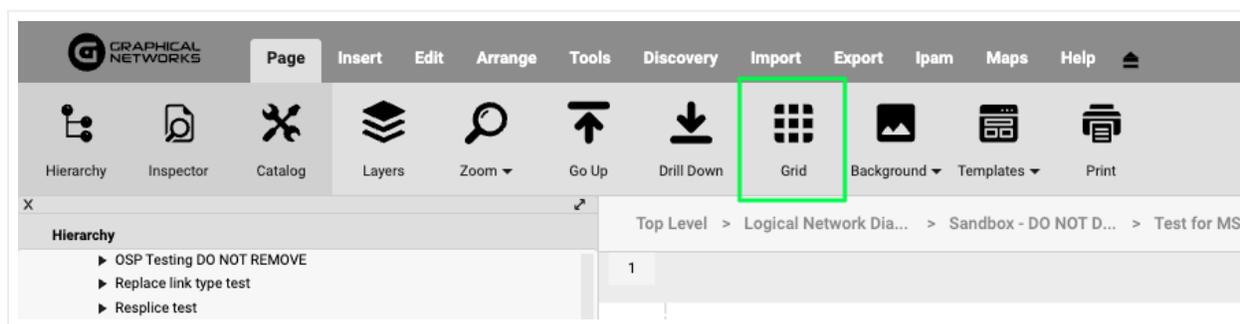
Now you may know that this is also possible by simply double-clicking on the node itself, in which case you are wondering why this button even exists. For starters, some users may not initially know about the convenient double-click option, but even after you were enlightened about this, you may still use the button in case the node double-click function was overridden. In other words: sometimes double-clicking on a node does not take you into the node sub diagram.



*Drill down button to access a node sub diagram*

### 3.4.2.1.6 Grid

As the name suggests, this button enables the grid on a page. To hide or show the grid on a page simply, click on the button. We will review more details about grid settings later.

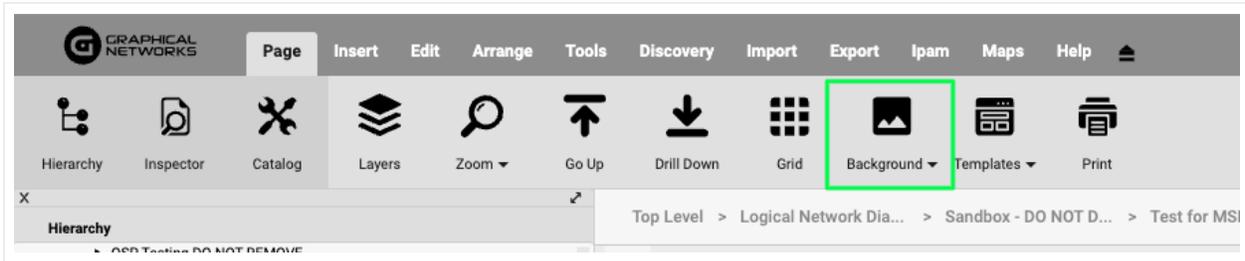


*Grid button*

### 3.4.2.1.7 Backgrounds

To upload a background image simply click on the upload background button and select an image file from any local or network drive. As the tooltip explains, backgrounds can be used to set up static images on the background of your diagram, such as floor plans, pictures, static maps and more.

The entire process is reviewed in more detail later, including how to clear a background and image format options.



Upload background button

### 3.4.2.1.8 Templates

In some cases, users may want to apply a standard layout to several diagrams without having to create the objects that comprise each diagram manually every time. To do that, users can set up any given network diagram as a template and then apply that template to any other network diagram.

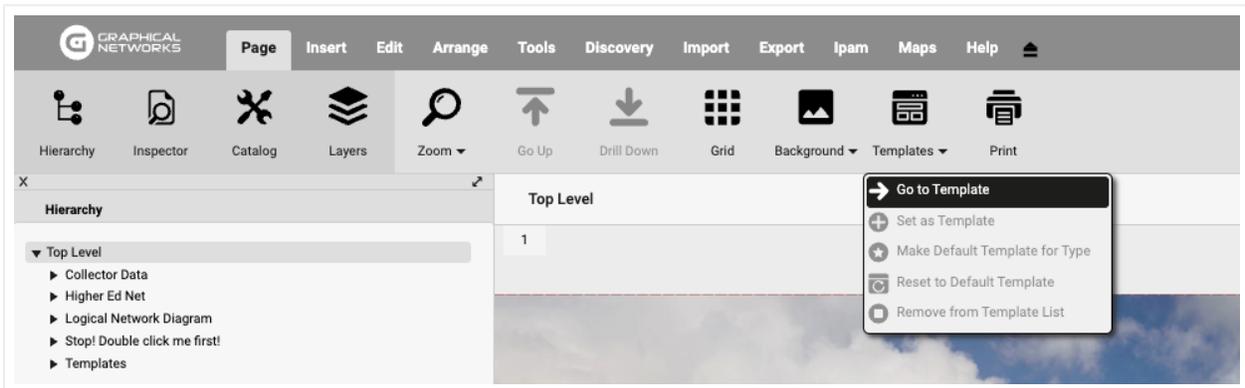
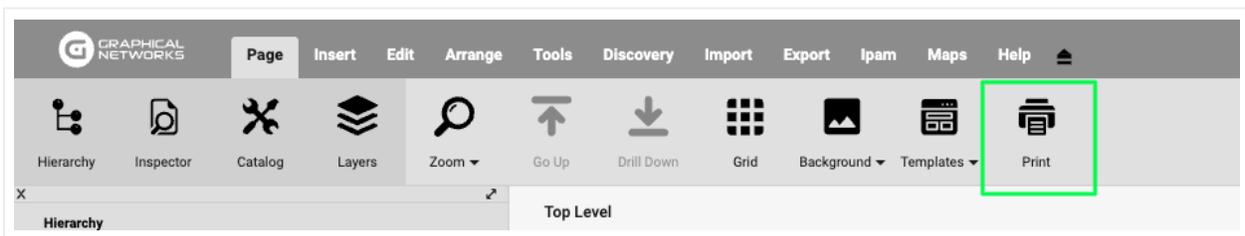


Diagram template options

### 3.4.2.1.9 Printing

This one should be a bit obvious; we hope. The print button opens a dialog for printing the current diagram.

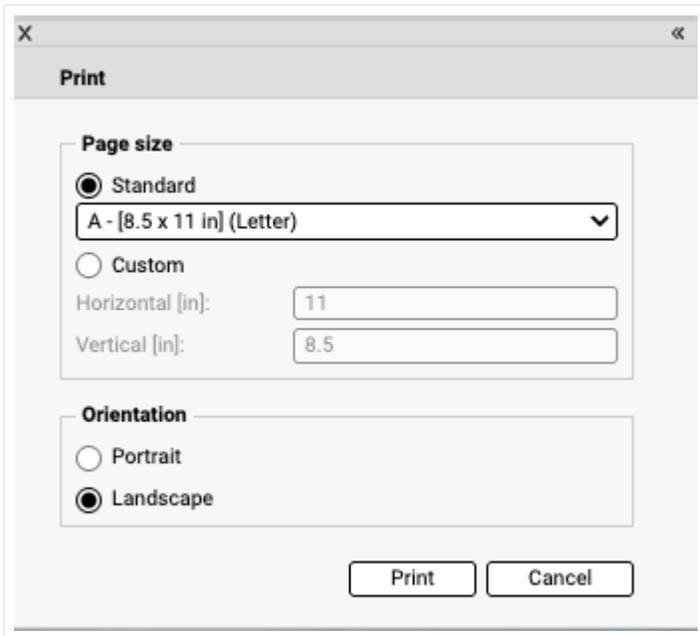


Print button

The netTerrain print dialog provides the user with a few options to send the diagram to the printer. These options include the orientation mode and page size. Since every netTerrain diagram has its own page size,

usually you would match up that size with the printer page size, but this is not mandatory. In some cases, you need a large page size in netTerrain to accommodate many nodes without messing with their default sizes, yet you still want to send that diagram to a letter-sized printer page.

The page size options include many standard European and American page sizes but notice that you can also select your own custom sizes.

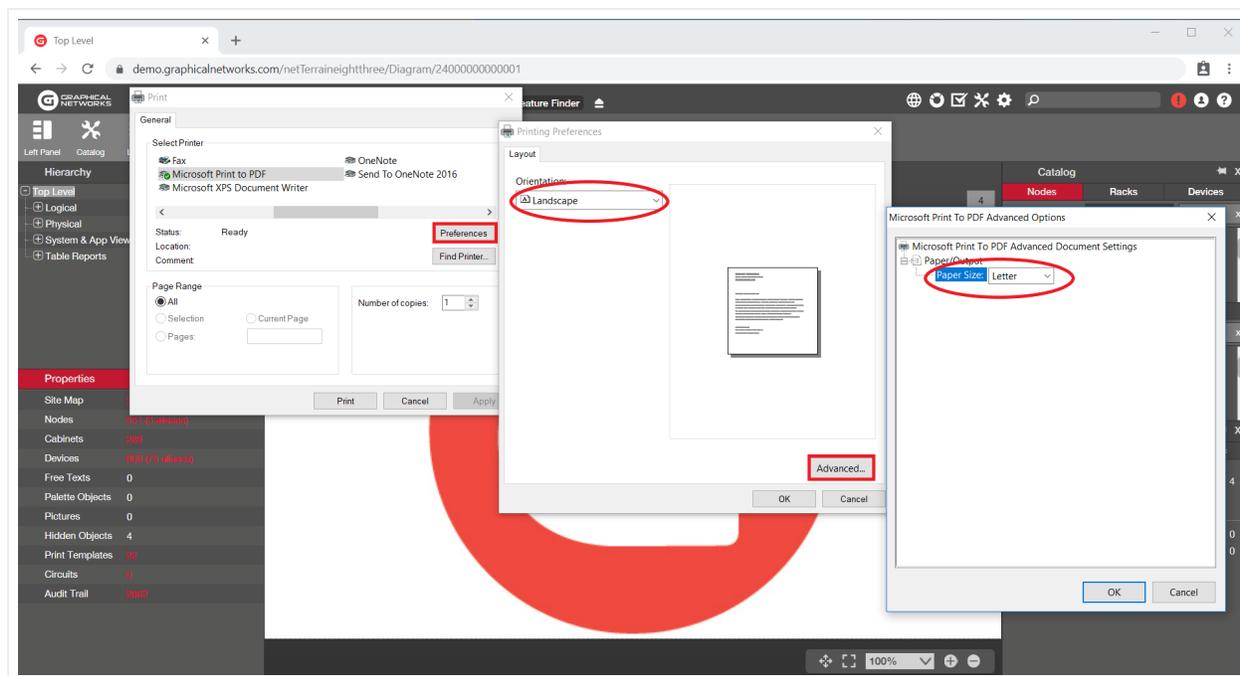


*Print dialog options*

#### Attention!

Once you click on the print button on the netTerrain print dialog you can also set printer-specific page, orientation and other settings, which are outside of the netTerrain domain. These settings will really depend on the printer driver.

In some cases, it may be necessary to explicitly match up the printer specific settings with the netTerrain print settings. The screenshot below shows the printer settings for a PDF printer driver. Notice how the orientation and the page size may be selected and even differ from the netTerrain print settings. For optimal resolution we recommend trying different dpi size and page sizes, since raster-based objects may be very pixelated for low resolution outputs.



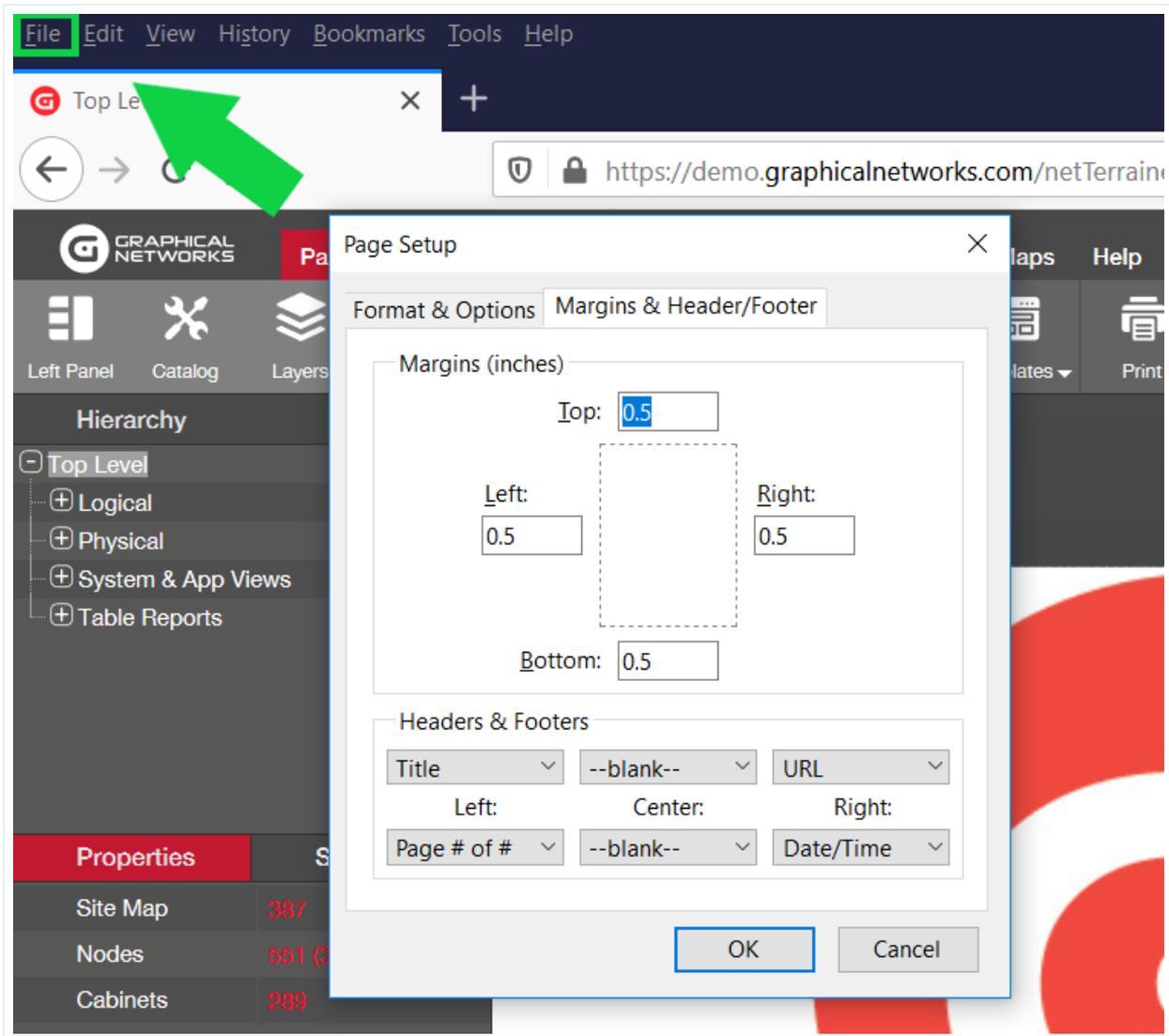
Example of a PDF printer and its settings

### 3.4.2.1.9.1 Removing headers and footers from the print outs

Sometimes a printout shows headers and footers that are not part of the original netTerrain diagram.

Also, some printouts introduce an extra room for margins, which are at odds with the preexisting margins in netTerrain and add extra blank real estate to your printed diagram.

These are elements introduced by the printer driver and the process of removing them will depend on what browser or printer you are using. Typically, the browser has a page setup option, which you can customize. The screenshot below shows the Firefox page setup dialog, with header and footer options. Notice how the margins are set to zero and the headers and footers are set to "blank".



Browser page setup dialog

### 3.4.2.2 Insert menu

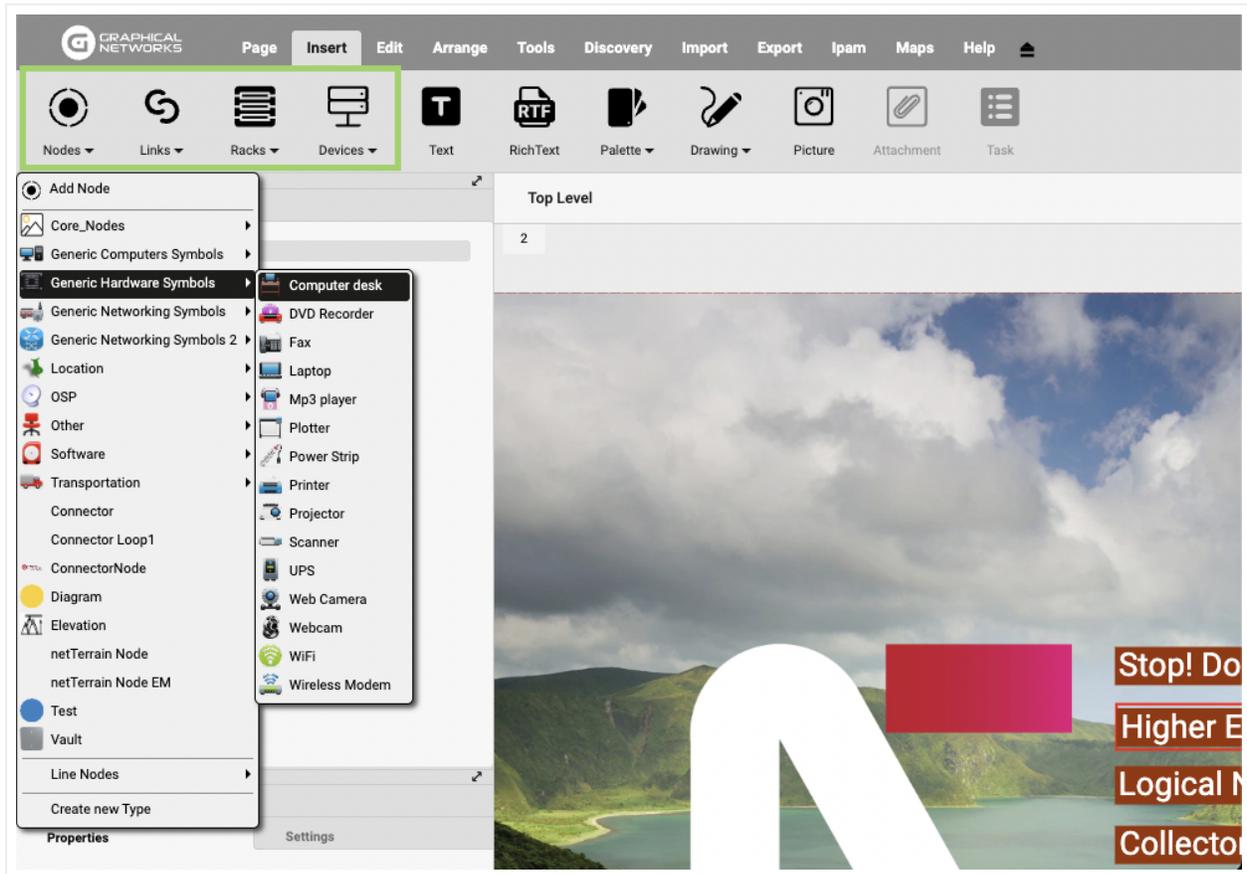
The insert menu provides functions to add and remove nodes, links, and other objects in netTerrain.

#### Attention!

Most of the insert menu buttons are only available to users with editing rights. Users with annotator rights will be able to use the text and palette object menus, but not the menus for inserting actual inventory items such as nodes, devices, or racks.

### 3.4.2.2.1 Inserting nodes, links, devices and racks

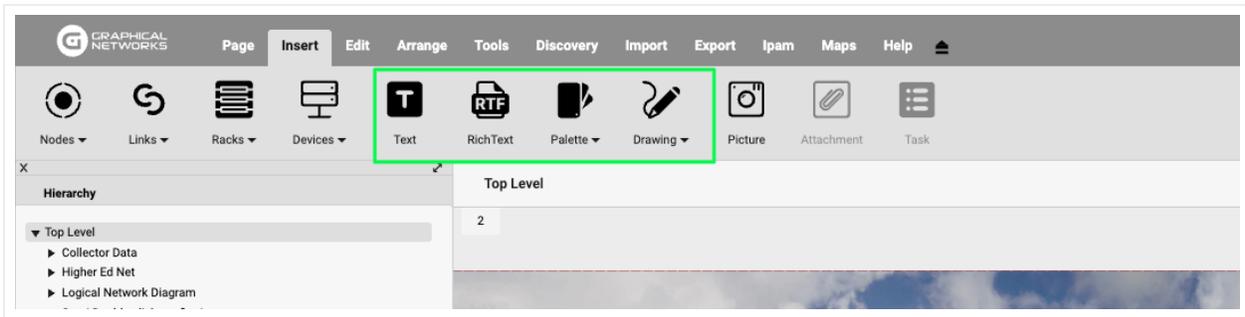
We will be reviewing in more detail the different mechanisms for inserting your inventory items, such as nodes, links, devices, and racks, but suffice it to say that netTerrain provides several different ways for doing this, including selecting the items from the ribbon drop down menus, as depicted below.



*Different insert menu options*

### 3.4.2.2.2 Inserting text, palette objects and pictures

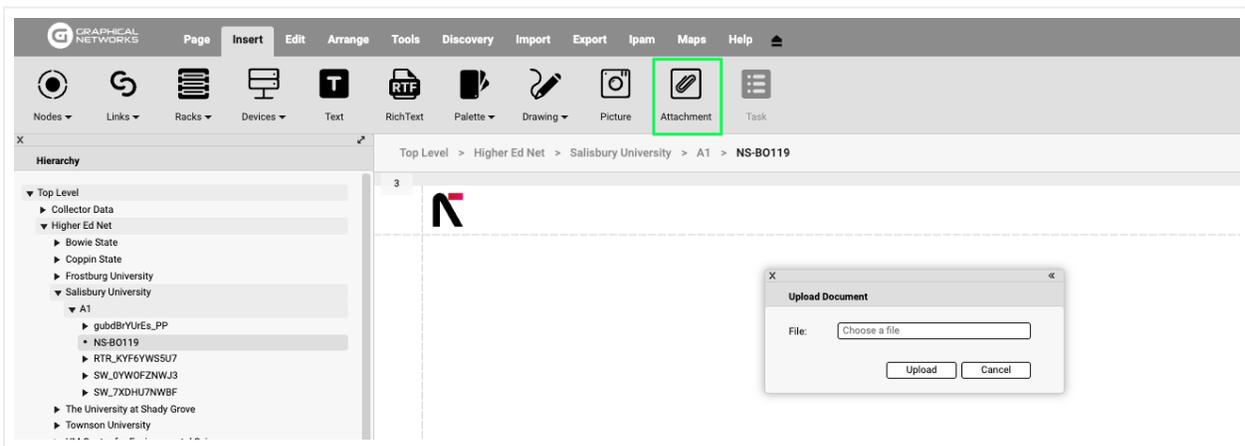
Users with annotation rights (or better) can insert a series of elements that although are not part of what you would consider the project inventory (nodes, links, devices, etc.) can come in handy to decorate a diagram or provide information related to the project. These elements include free text, palette objects and pictures. We will review these in more detail later throughout the guide.



*Inserting free text, palette objects and pictures*

### 3.4.2.2.3 Attachments

In the chapter about change management, we will analyze in more detail how netTerrain allows you to upload and manage documents as part of your change management process. The attachments button (only enabled when clicking on a node) is used for that purpose.



*Attachments*

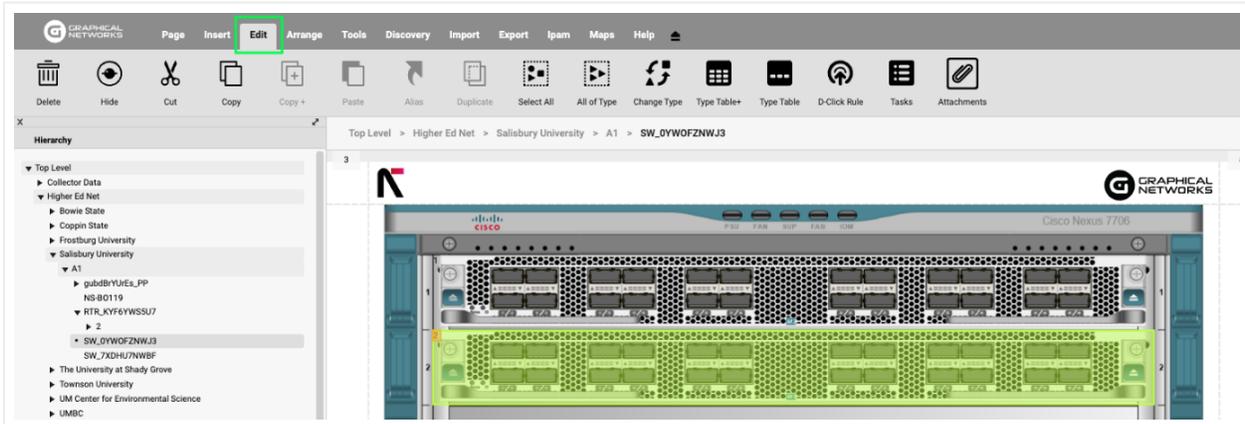
### 3.4.2.2.4 Tasks

Users with sufficient permissions can create and manage tasks associated with nodes to better control the inventory process. The task button (only enabled when clicking on a node) is used for that purpose. To learn more about this change management feature, check out the chapter about change management that goes over more details of the work order and task management process.

### 3.4.2.3 Edit menu

The edit ribbon contains several functions that help you manage the contents of your diagrams efficiently, including the following features:

- Delete: ability to remove objects from the diagram.
- Hide: ability to hide objects on a diagram.
- Cut: button to cut an object so that it can be pasted on a different diagram.
- Copy
- Copy+: button to copy a node including all its children underneath.
- Paste
- Alias: ability to create an alias (mirror image) of a node.
- Duplicate: ability to duplicate a link with the same endpoints.
- Select All
- Select Type: ability to select all objects of the same catalog type.
- Type Table+: ability to open a table view of all the objects of the selected type.
- Type Table: ability to open a table view of all the objects of the selected type on that diagram.
- D-click rule: ability to edit the double click rule associated with a node.
- Attachments: button to edit the attachments associated with a node.



#### *Edit menu*

Each of these buttons and features is reviewed in more detail later throughout this guide.

### 3.4.2.4 Arrange menu

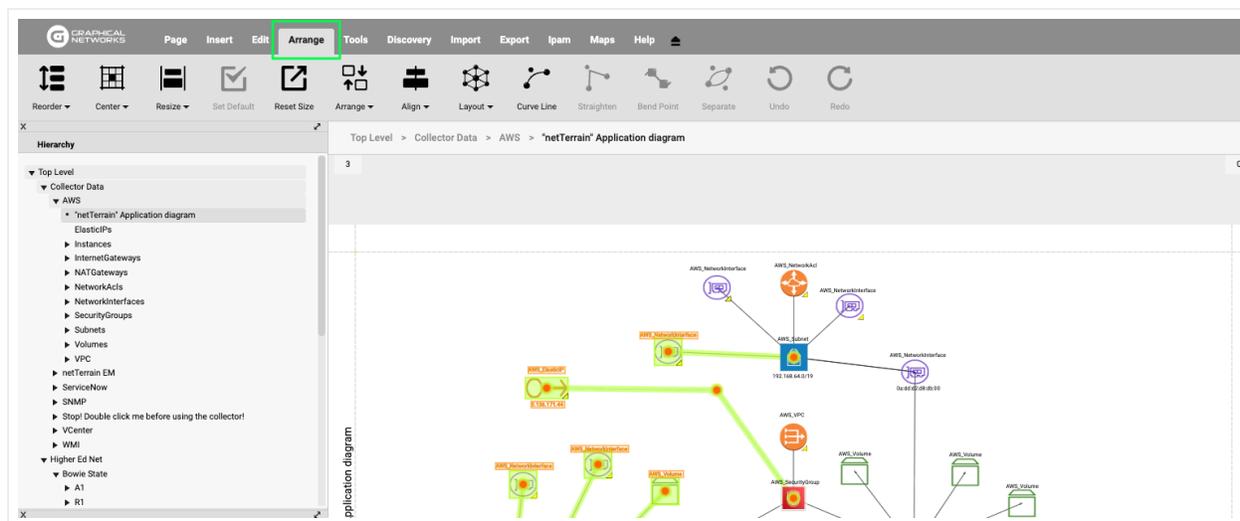
The arrange ribbon contains several functions that help you quickly lay out objects on your diagrams in a myriad of configurations. These functions include the following features:

- Reorder: change the z-order of an object with respect to other overlapping objects.
- Center: ability to center objects horizontally, vertically, or both.
- Resize: bulk resizing operations.
- Set Default
- Reset Size
- Arrange: bulk row, column, tile, and ellipse arranging features.
- Align: left, top, right, and bottom alignments for bulk operations.
- Layout: Force-directed layout function.
- Curve Line
- Straighten Line
- Bend Point: add bend point to a line.
- Separate: separate multiple lines sharing the same endpoints.
- Undo
- Redo

Most of these buttons and features are reviewed in more detail later throughout this guide.

#### **Attention!**

Note that data entry operations are not subject to undo or redo. In other words, the undo and redo only apply to operations of aesthetical nature, such as moving and resizing nodes or adding bend points. Also, the undo and redo work within a given user and session. If you refresh a page, you are also refreshing your browsing session and any previous steps are flushed in the undo / redo cache.



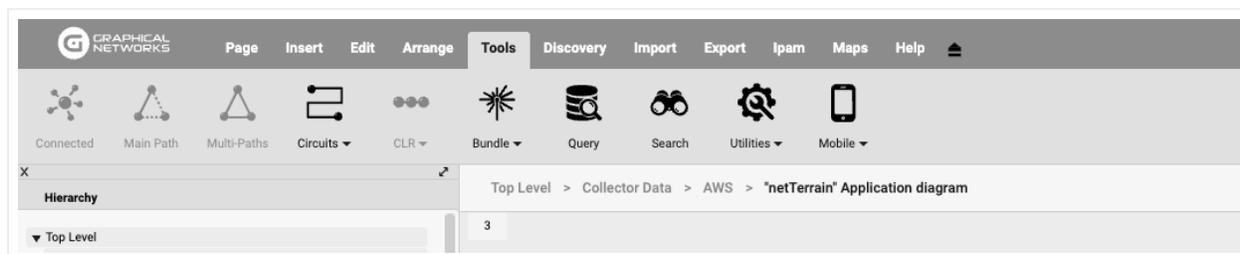
Arrange menu

### 3.4.2.5 Tools

The tools ribbon contains several miscellaneous functions including:

- Connected: show all objects directly connected to the selected object.
- Main Path: show main shortest path between two selected nodes.
- Multi-Paths: show main and backup path between two selected nodes.
- Circuits: options to run and create circuits (with OSP module).
- CLR: manage Circuit Layout Record diagrams.
- Bundle: function to associate links with other links.
- Query: tool to create and save custom queries.
- Search
- Utilities: download links for the IP toolset, Exporter tool, Excel import sheet and Collector
- Mobile: links to download the netTerrain mobile app for Android or Apple

Each of these buttons and features is reviewed in more detail later throughout this and other guides.



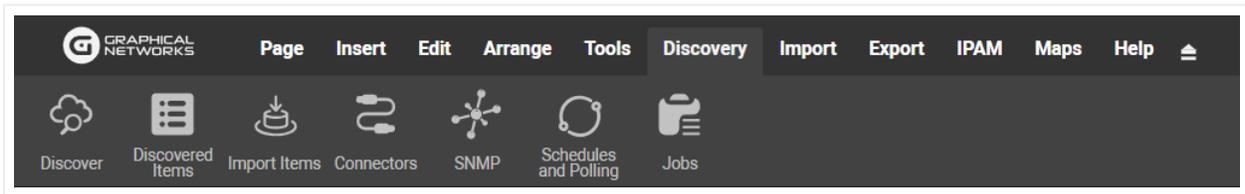
Tools menu

### 3.4.2.6 Discovery

netTerrain has the capability of discovering your network using discovery protocols and importing data from other system via so-called connectors. It can also monitor your network. The discovery menu provides the tools to configure the discovery and monitoring functions and to manage the discovered items.

The main functions of the discovery and monitoring can be accessed from this ribbon, including:

- Launching the discovery
- Showing discovered items
- Importing items into netTerrain
- Configuring connectors and SNMP
- Setting up schedules for discovery and polling
- Viewing discovery jobs



#### Discovery menu

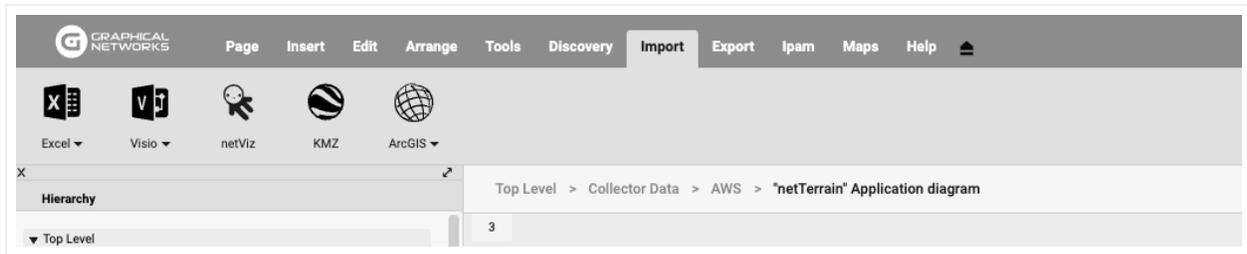
##### Attention!

netTerrain also includes the collector, a thick-client application for discovery and data import. This discovery ribbon supports many of the collector discovery functions, however, there are certain features for which the collector is still necessary. The collector is reviewed in detail in the collector guide, which is a separate guide from this one.

### 3.4.2.7 Import and export

netTerrain includes several options to import and export data. For imports netTerrain supports:

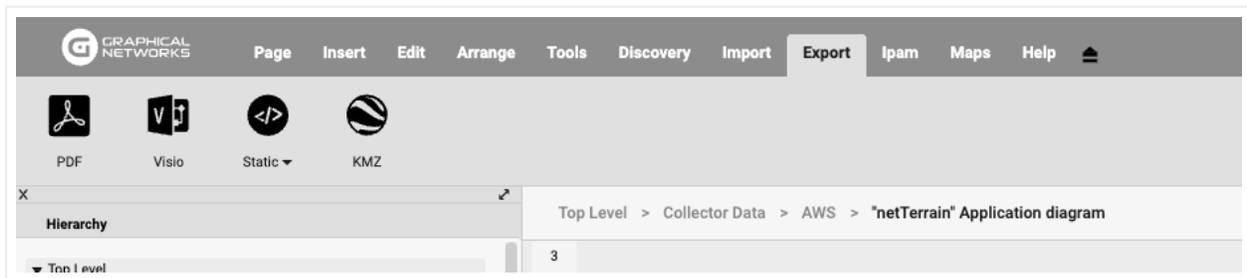
- Excel bulk imports
- Microsoft Visio
- netViz projects
- KMZ
- ArcGIS



### Import menu

For exports it supports the following formats:

- PDF
- Visio
- Static: HTML packages, PNG
- PNG
- KMZ



### Export menu

These features are reviewed in more detail later.

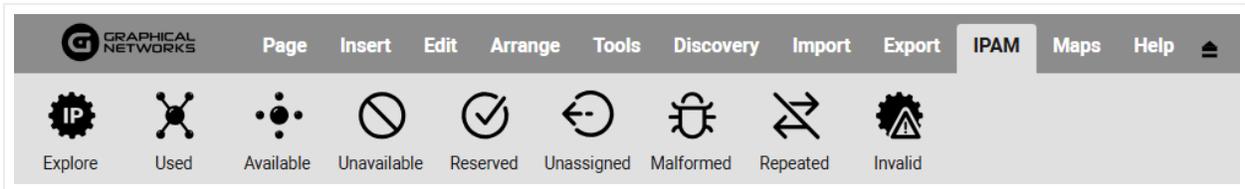
#### Attention!

netTerrain supports many other import and export functions besides these. These buttons only deal with imports and exports within a given diagram or project. Search results, table views and dashboards support other export formats and netTerrain can also import from databases, discovery processes and much more.

### 3.4.2.8 IP Address Management (IPAM)

The IPAM module enables centralized and efficient management of an organization's IP address space. It facilitates documenting, organizing, and managing IP addresses and subnets, optimizing resources, and preventing conflicts.

The IPAM ribbon provides the tools to set up and manage the IP address space and view exception reports.

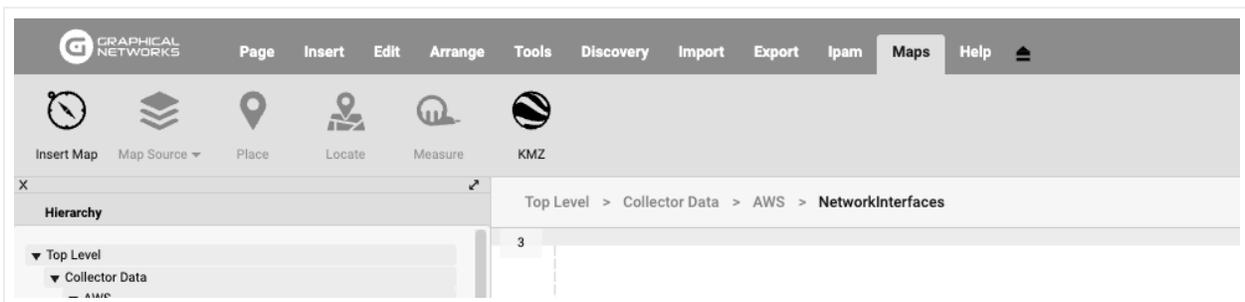


*IPAM menu*

### 3.4.2.9 Maps

netTerrain includes several features used for outside plant purposes. Some of these functions are accessed from the Maps menu shown below:

- Insert Map: upload and modify the diagram map.
- Map Source: change the source for rendered OSP maps.
- Place: place a node on the map.
- Locate: locate a place on a map.
- Measure: measure distances and lengths.
- KMZ: import KMZ file.



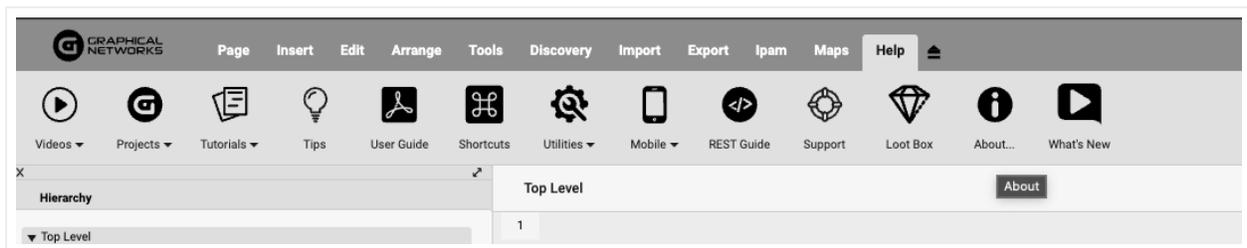
*Map menu*

The outside plant features are reviewed in more detail later throughout the guide.

### 3.4.2.10 Help

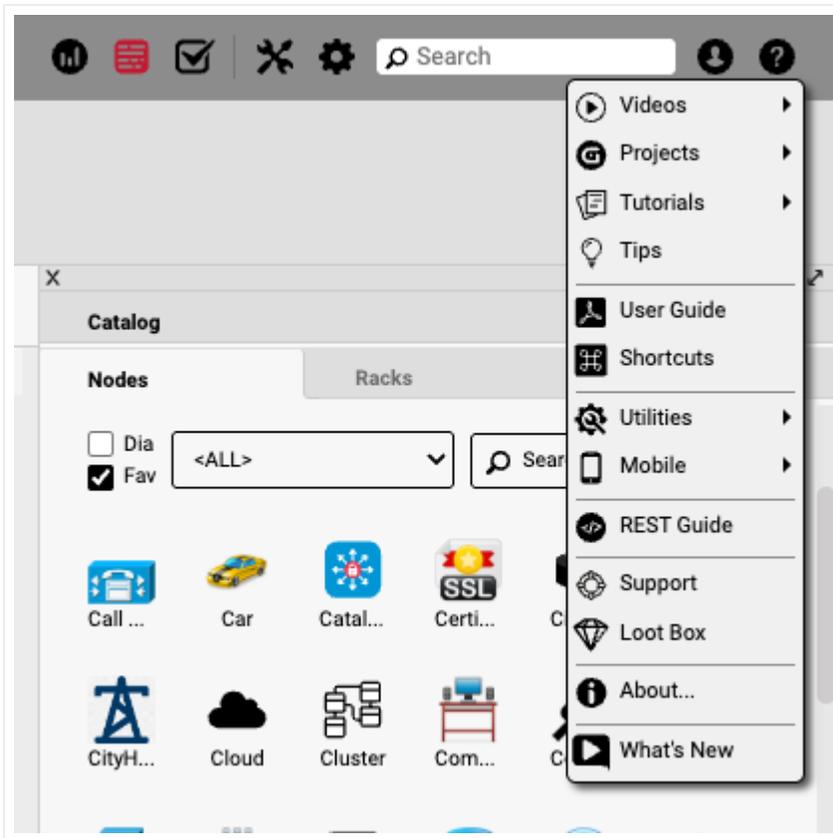
The help menu includes several buttons to provide support in a variety of areas:

- Videos to help you get started
- Sample projects online
- The “dragonfly” tutorial that can be relaunched
- Animated gifs on how to get started
- PDF guide
- The shortcut (hotkey) list in PDF format
- Utilities: download links for the IP toolset, Exporter tool, Excel import sheet and Collector
- Mobile app download utility
- The REST API guide
- Customer portal support link
- Loot box
- About and what’s new links’
- What’s new video link



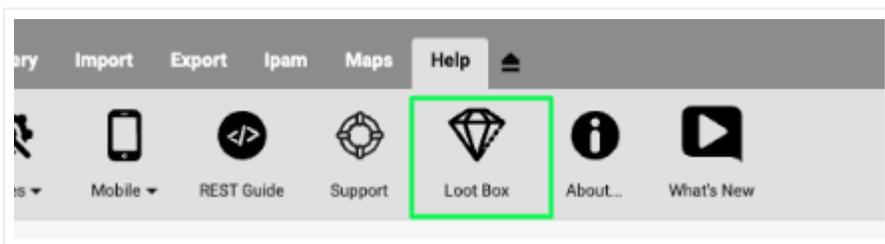
*Help menu in netTerrain*

The help menu can also be accessed from the traditional top right corner.

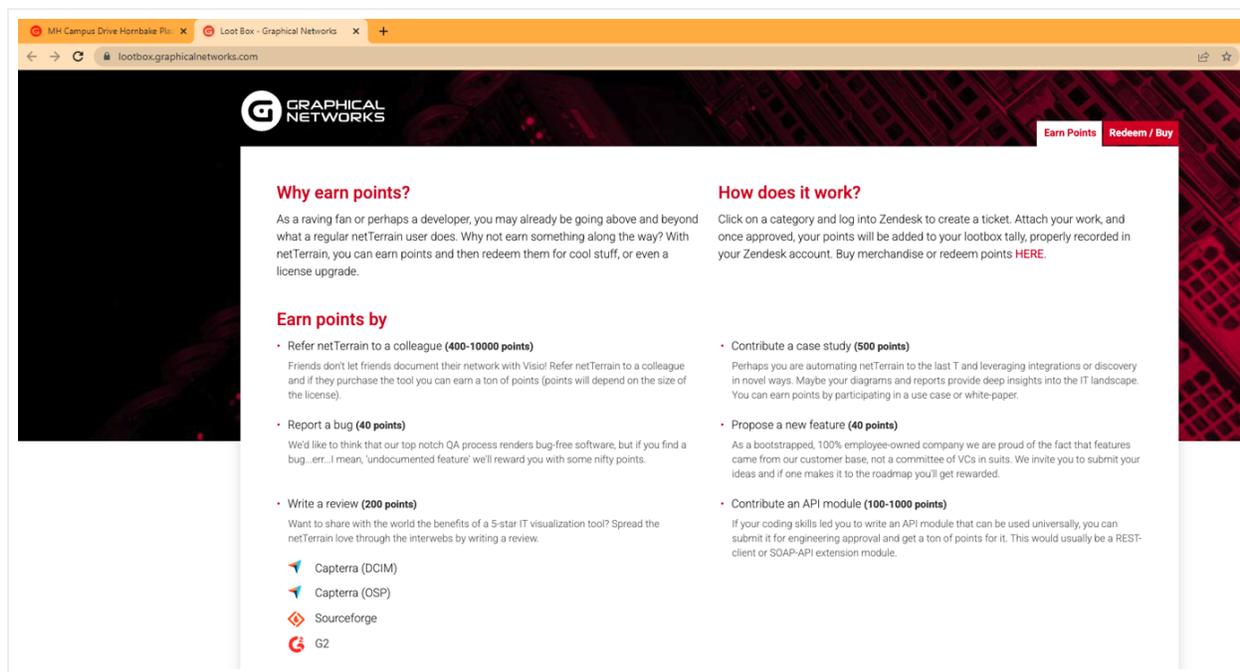


*But wait, there's more: you can access the help menu from the top right corner...*

The loot box link allows users to access the Graphical Networks loot box page directly:



Simply click on the loot box button and magic happens:



### Loot box page

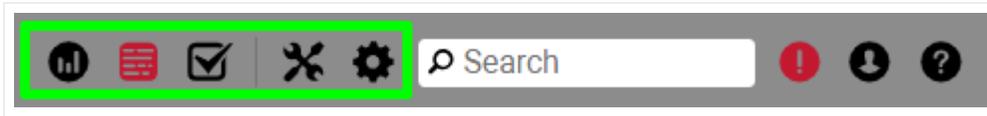
As a raving fan or perhaps a developer, you may already be going above and beyond what a regular netTerrain user does. Why not earn something along the way? With netTerrain, you can earn points and then redeem them for cool stuff, or even a license upgrade.

If you have work that you think you can submit for points, simply click on a category and log into Zendesk to create a ticket. Attach your work, and once approved, your points will be added to your loot box tally, properly recorded in your Zendesk account.

## 3.4.3 Quick access bar

The quick access bar provides users with a quick way to access different work areas in netTerrain. Currently netTerrain has the following work areas:

- Reports: repository of graphical dashboards and reports. All users have access to this area.
- Event Console: the section that displays and manages events.
- Work Orders: area to manage work orders and tasks. Editors (or better) can access this area.
- Catalog: the library of devices, node and link types and other categories of objects. Only power users and administrators can access this area.
- Admin Console: the place to manage users, groups, settings and other admin tasks. Only administrators can access the admin console.



*The quick access bar near the upper right corner (in green)*

The quick access bar is always present in every netTerrain area. Users can quickly jump from one area to another if they have the permission level to do so.

### 3.4.3.1 Project link

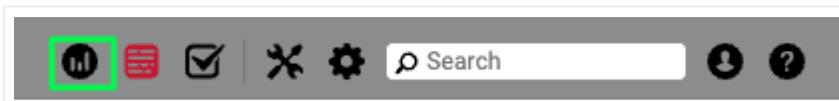
The top left logo image (by default it is the Graphical Networks log) takes users back to the Top Level in the project. This button is the equivalent of pressing the top-Level link on the breadcrumbs.



*Top level link*

### 3.4.3.2 netTerrain Reports and Dashboards

The reports link takes you to another area in netTerrain displaying several dashboards and reports.



*Reports link*

Each dashboard presents information graphically using so-called gadgets, which are dashboard items that organize data using visual arrangements, such as:

- Charts
- Pies
- Gauges
- Cards
- Other (maps, pivots, grids, etc.)

netTerrain ships with a series of default dashboards, which can be customized. Users can also create new ones using the netTerrain dashboard editor (see netTerrain Dashboard Designer Guide).

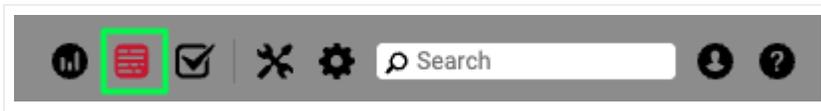
### Attention!

Some of the default dashboards provided with netTerrain are geared towards DCIM-type data. If you are a user of netTerrain Logical, those dashboards are not available.

We will review reports and dashboards in more detail towards the end of this guide.

## 3.4.3.3 Event console

The event console shows several types of events such as alarms, overrides and incoming traps from your network.



*Event console link*

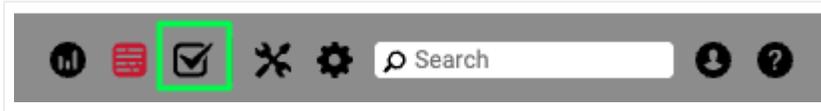
By clicking on the event console link you access a list of events sorted by timestamp (newest first), including the event type, severity, time received, object affected, description, acknowledged status cleared/resolved status and notes.

A screenshot of the netTerrain Event Console interface. The interface shows a table of events with columns for #, Event Type, Severity, Time Received, Object, Description, Acknowledged, Cleared / Resolved, and Notes. The table contains 8 rows of event data. The first row is highlighted in red. The interface also includes a filter section at the top with options for Default, Date Range, Severity, Object, and Event Type. The search bar at the top right contains the text 'Search'. The bottom right of the interface shows 'Records on page: 100' and 'Records in table: 33751'.

*Event console*

### 3.4.3.4 Work order management

The work order management area is only accessible by administrators since it displays the work orders and tasks created or managed by any user.



Work order link

By clicking on this link administrators access a list of all the work orders that exist in netTerrain.

Work Order List

Archived Workorders To csv To Excel Add New

Records on page: 16 Records in table: 16

Filter: Apply Clear

Records per page: 100 Show Id Field Default sorting

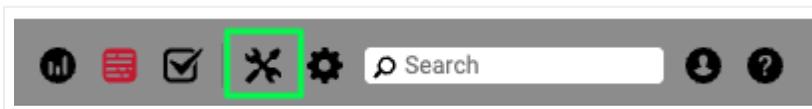
#	Name	Due Date	Status	Owner	Comments	All Tasks	All Overdue Tasks	All Closed Tasks	My Tasks	My Overdue Tasks
1	+++9999	05-21-2021	Overdue	power		10	10	0	0	0
2	+++kk	05-21-2021	Empty	admin		0	0	0	0	0
3	586.1	01-27-2022	Empty	admin		0	0	0	0	0
4	Har_Test	01-20-2025	Empty	herman.hopz@graphicalnetworks	TEST TEST TEST	0	0	0	0	0
5	herman	05-21-2021	Empty	admin	PRUEBA	0	0	0	0	0
6	Herian TEST	04-13-2023	Empty	admin		0	0	0	0	0
7	hermantest	05-21-2021	Empty	admin		0	0	0	0	0
8	Henry	05-21-2021	Empty	admin	Fairt	0	0	0	0	0

Work order list

From this list, the administrator can drill down into tasks, check overdue tasks, reassign tasks and work orders, manage due dates and much more. We will view the work orders in more detail later in this guide.

### 3.4.3.5 Catalog link

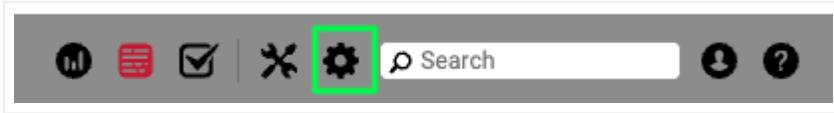
Next to the work orders link we have the catalog link, accessible for power users and administrators. As explained above, the catalog is the place where power users can manage the library. For more information about the catalog please check the power user guide.



Catalog link

### 3.4.3.6 Admin console

As the name suggests, the admin console gives administrators access to a console to manage users, groups, settings, and other administrative tasks. This link is not visible to any users other than administrators. For more information about the admin console please check the administrator guide.



*Admin console link*

### 3.4.3.7 Last diagram link

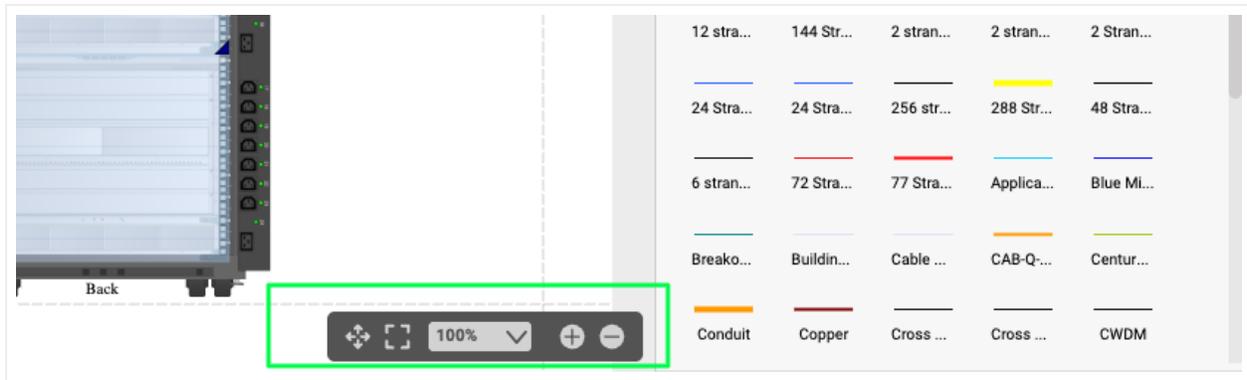
When you find yourself in an area other than the main project you can always return to the project by pressing the go back button on the browser (remember, netTerrain is a browser-based app). However, it may take several clicks until you get to the last diagram you were in before leaving the project side. To the left of the top-Level link, you can find the 'Back to project' link which serves as a convenient shortcut that takes you back to the last diagram you visited before you decided to venture outside the netTerrain project area.



*Last diagram link*

### 3.4.4 Zooming and panning

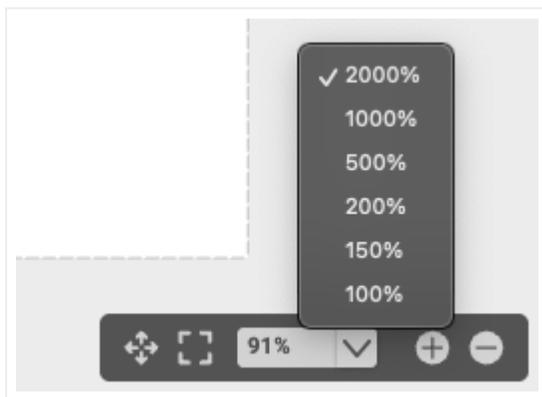
netTerrain diagrams can be quite large arrangements of nodes and links, so zooming and panning are common operations. Zooming and panning are operations that only apply to the project area. All the zooming and panning functions are grouped together in a compact toolset that you can find on the lower right corner of a diagram.



*Zooming and panning toolset*

### 3.4.4.1 Zoom options

To zoom, you can use the '+' and '-' buttons, as well as the keyboard or the mouse-wheel. You can zoom into a specific percentage level by choosing one of the fixed options on the zoom drop-down box. You can also fine-tune your zoom level by typing any value. We'll review each option below.



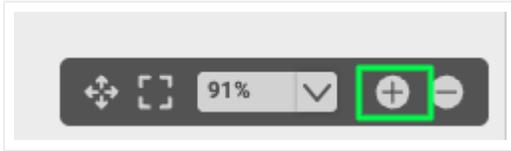
*Zoom options*

**Tip:**

A quick way to zoom into any desired area is to 'paint' a zoom rectangle by holding the right mouse button and creating a selection area with your mouse (see below).

### 3.4.4.2 Zoom in

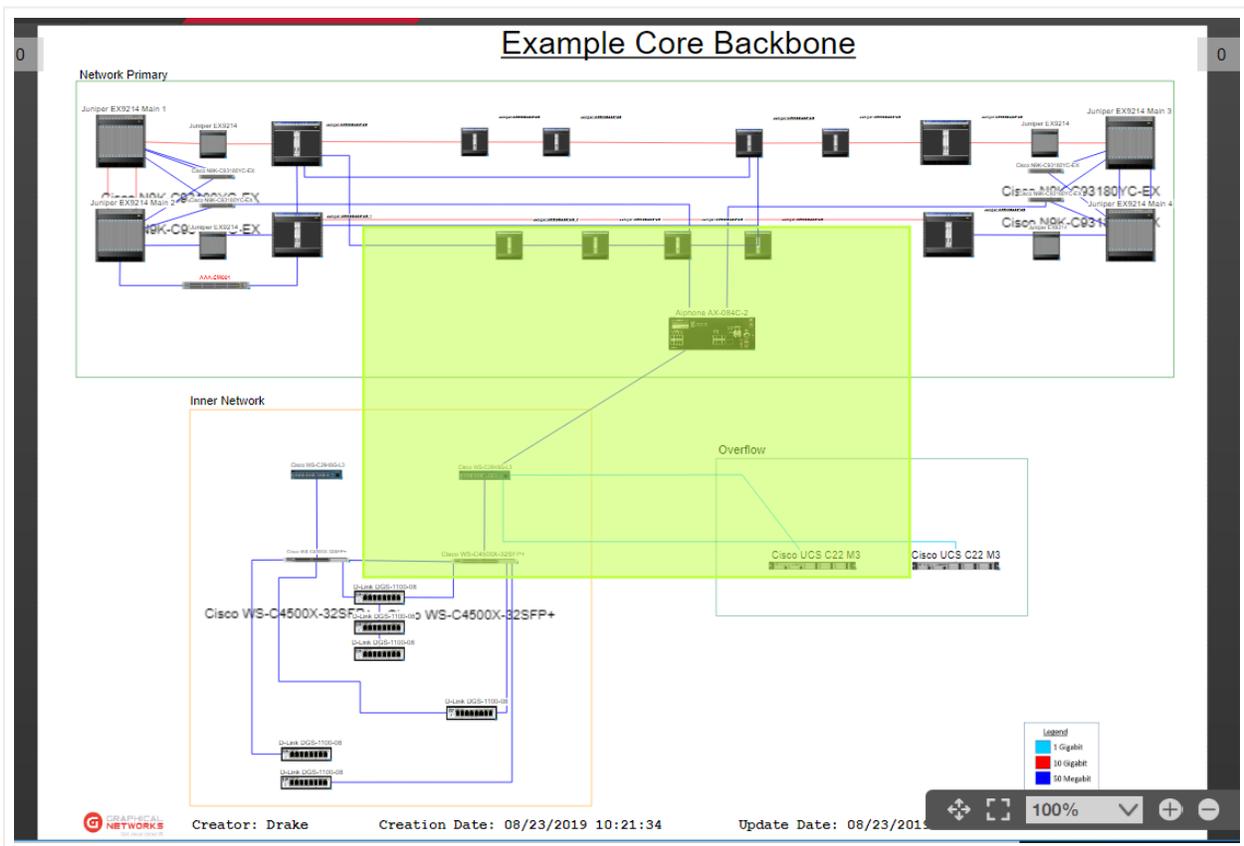
This button lets the user gradually zoom into the diagram by repeated clicking. The hotkey for this operation is the key that contains the '+' sign.



#### Zoom in button

Besides zooming in using the button, users can also zoom in using the mouse wheel and the right mouse button. With the mouse wheel a user can move the pointer to the part of the diagram that should be centered during the zoom process and then move the mouse wheel to zoom in or out.

To zoom in with the right mouse button, simply press and hold it and then move the mouse to create a zoom in rectangle area. Once the button is released, the diagram is zoomed in.

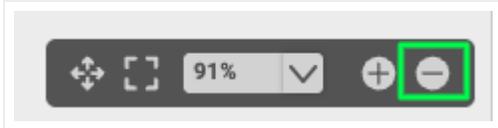


A zoom in rectangle generated with the right mouse button

The same zoom in function as the button, is also available from a submenu when right-clicking on the diagram.

### 3.4.4.3 Zoom out

This button lets the user gradually zoom out by repeated clicking. The hotkey for this operation is the key that contains the '-' sign.

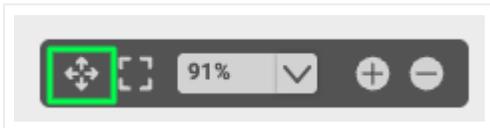


*Zoom out button*

Users can also zoom out by using the mouse wheel or selecting the zoom out option from the diagram right-click -> zoom menu.

### 3.4.4.4 Pan

Panning is quite easy using the zoom and pan toolset. Simply press the pan button, which is the left-most button with the four arrows. Once pressed, the cursor changes into pan mode. As soon as you release the mouse button, the pan is again disabled. If you want to pan multiple times in succession you must click on the pan button each time. Instead, keep it simple: use one of the pan shortcuts (see tip).



*Pan button*

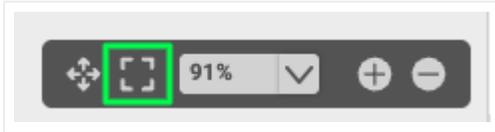
**Tip:**

For continuous panning we highly recommend using one of the shortcuts or hotkeys:

- 1) Press the shift key while you hold the left mouse button and then move the mouse
- 2) Press and hold the mouse wheel!

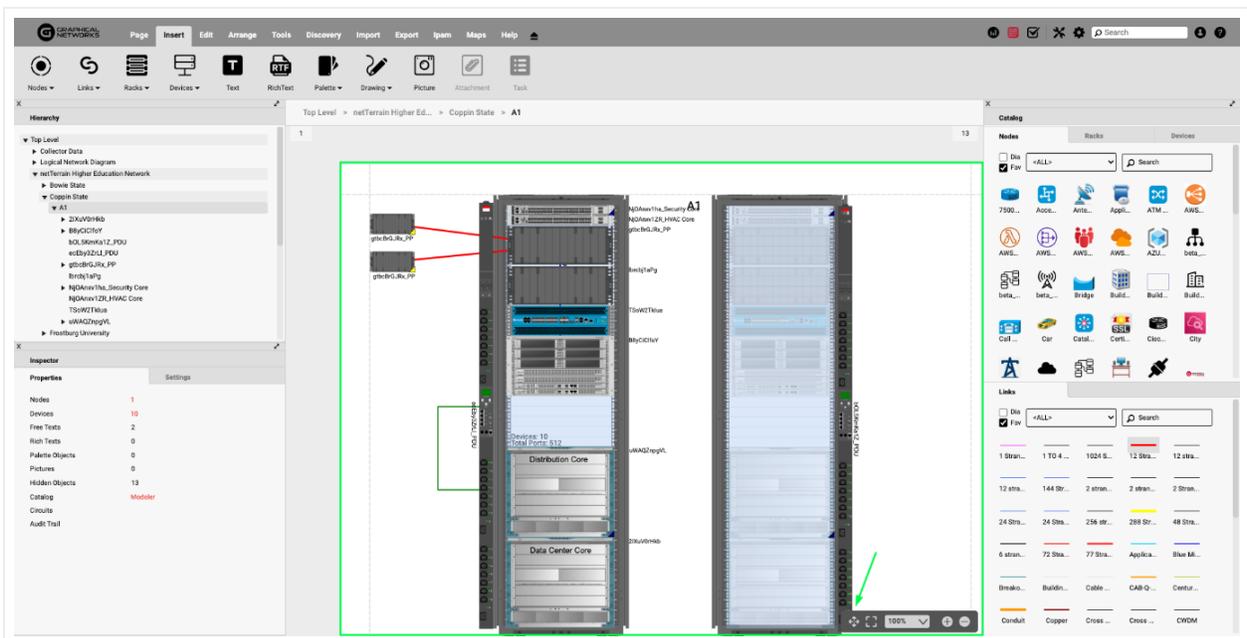
### 3.4.4.5 Fit to window

This button is used to restore the diagram to a size that fits the entire screen. Typically, this operation is performed after a zoom-in operation.



*Fit to window button*

When you fit the diagram to the window size you may notice that the zoom level indicator (bottom right corner) is at 100%.



*Diagram that was fit to window, with a 100% zoom level*

**Tip:**

Use the 'w' hotkey for this button or double-click on the mouse wheel. You will get very used to these convenient shortcuts and save a lot of time on unnecessary mouse trips.

**Attention!**

If the 'w' hotkey seems not to react you may not have the focus on the diagram. Click anywhere on the diagram and try again.

### 3.4.4.6 Hiding the zoom toolset from the diagram

As you zoom in and out and perform pan operations, the zoom bar can sometimes be a bit intrusive as it is sitting on top of the diagram and cannot be moved. Since all basic zoom operations can be achieved via shortcuts or other menus, some users prefer to hide the zoom bar.

To hide the zoom bar simply right click anywhere on the diagram (or go to the zoom menu) and then click on 'Hide Zoom Toolset'.

### 3.4.5 Hierarchy browser

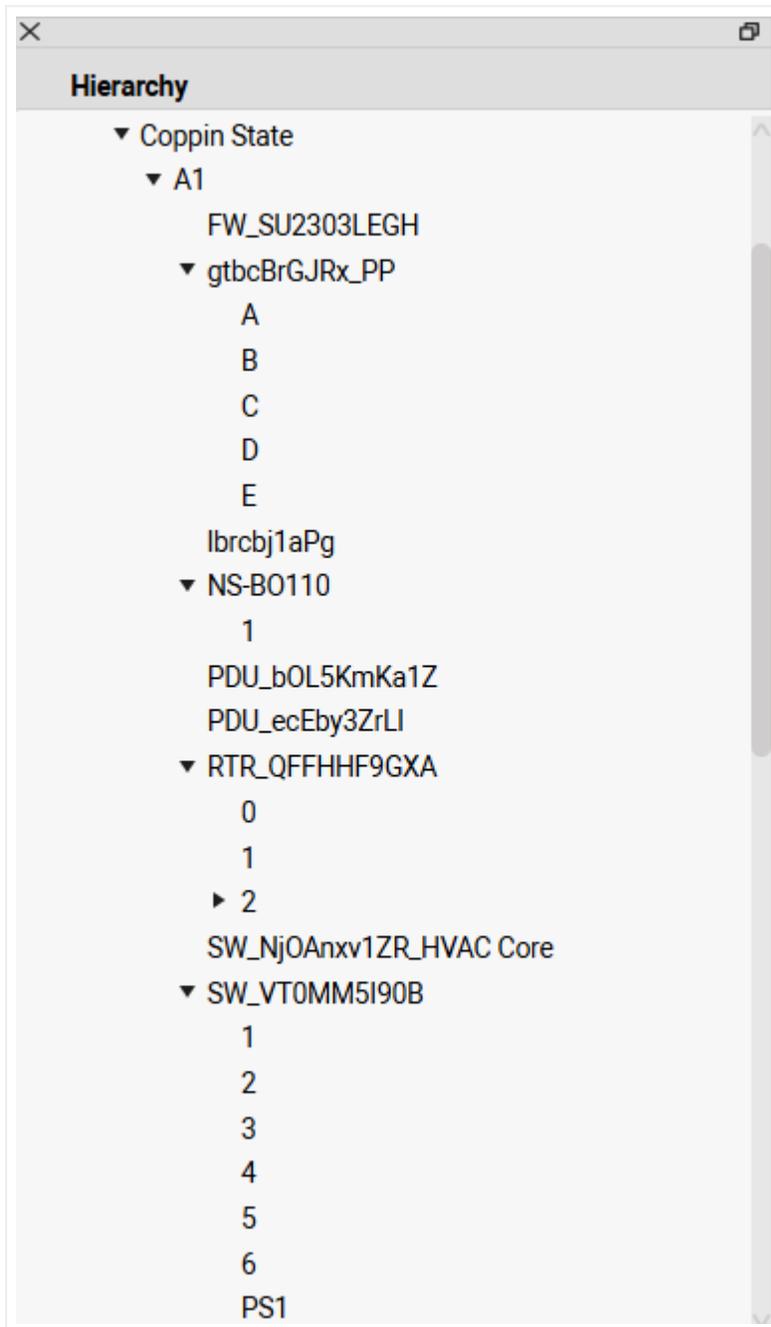
The hierarchy browser in netTerrain provides a quick way to access any sub diagram in the netTerrain project. Items in the browser can be clicked or expanded. When clicking on an item, netTerrain takes the user directly to the diagram corresponding to that item.

The objects that appear in the hierarchy browser include:

- 1) Nodes that contain other nodes (the definition of a diagram)
- 2) The current diagram (regardless of whether it contains nodes or not)
- 3) Devices, assuming the option 'Display devices in hierarchy browser' is enabled in the admin console (see Admin Guide)

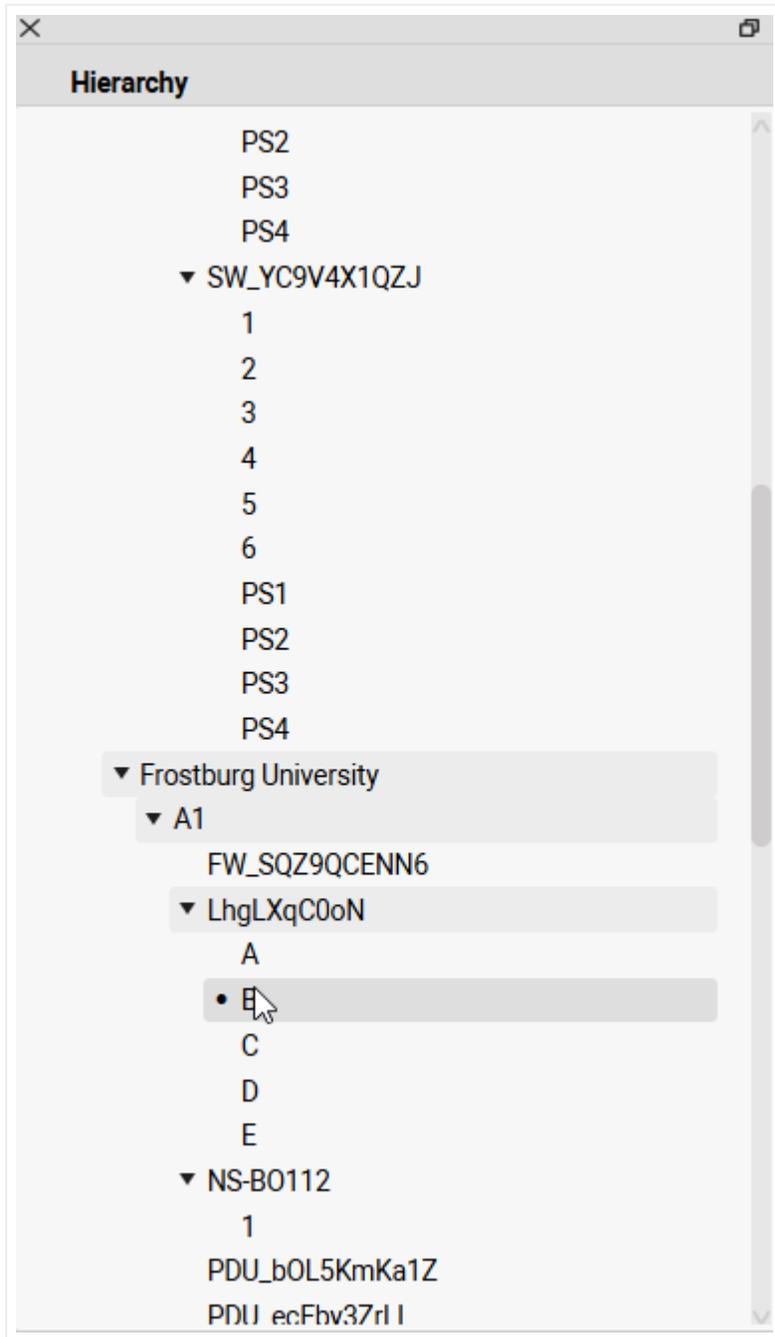
### 3.4.5.1 Expanding a hierarchy browser subtree

In some cases, it can be useful to expand all diagrams of a subtree in the hierarchy browser (or maybe the entire hierarchy browser). To do that, hold the control key and click on the parent leaf that you want to expand in its entirety.



*Fully expanded subtree*

You can expand different parts of the hierarchy tree independently, so that you can visually the corresponding subtrees simultaneously. The subtrees remain expanded even if you click on a particular subtree leaf.



Multiple expanded subtrees even when a leaf is selected

### 3.4.5.2 Opening a new diagram from the hierarchy browser

Users can open a new diagram from the hierarchy browser by interacting with a specific item (or leaf). The following are the available options when interacting with any item on the hierarchy browser:

- Left-mouse button click + key: opens the HB item as a new diagram in a new tab
- Left-mouse button click + lowercase t: opens the HB item as a new diagram in a new tab (focused)
- Left-mouse button click + uppercase T: opens the HB item as a new diagram in a new window

Note that the diagram that opens is the parent object that contains the leaf that was clicked on. The item itself will be blinking.

### 3.4.6 Searching

The netTerrain search engine is fast and simple to use and is based on direct pattern matching.

To start a search, locate the search box and enter the text you want to use for searching.

This could be a partial string representing the target object or a full string. Then press enter.



*Searching for a string in netTerrain*

The search engine will find any records that have a total or partial match with the supplied string (the string is highlighted in yellow within the result set). It then retrieves a list of instances that match the search criteria, with the ability to click on a link to take the user directly to the diagram containing that instance.

The search can also be rerun with a different search pattern straight from the previous search result list. A convenient filter text box lets users filter the search results using any other additional string.

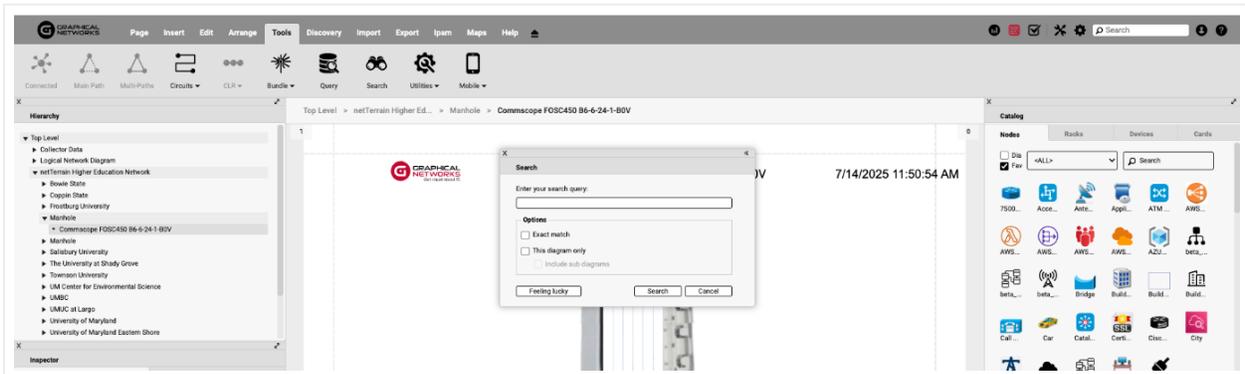
Other features of the search results table include the ability to show or hide the id field, sort by any column, reset to default sorting, refresh the page and jump to other pages in case of pagination.

#	Link	Name	Type	Property Name	Property Value
1	Show on diagram	Szz_Node_ParentName[d]	Cisco WS-X6K8UP1A-25E	Type	Cisco WS-X6K8UP1A-25E
2	Show on diagram	0	Cisco SPA-1X10GE-LV2 (N)	Type	Cisco SPA-1X10GE-LV2 (N)
3	Show on diagram	0	Cisco SPA-1X10GE-LV2 (N)	Type	Cisco SPA-1X10GE-LV2 (N)
4	Show on diagram	0	Cisco SPA-1X10GE-LV2 (N)	Type	Cisco SPA-1X10GE-LV2 (N)
5	Show on diagram	0	Cisco SPA-1X10GE-LV2 (N)	Type	Cisco SPA-1X10GE-LV2 (N)
6	Show on diagram	0	Cisco SPA-1X10GE-LV2 (N)	Type	Cisco SPA-1X10GE-LV2 (N)
7	Show on diagram	0	Cisco SPA-1X10GE-LV2 (N)	Type	Cisco SPA-1X10GE-LV2 (N)
8	Show on diagram	0	Cisco SPA-1X10GE-LV2 (N)	Type	Cisco SPA-1X10GE-LV2 (N)
9	Show on diagram	0	Cisco SPA-1X10GE-LV2 (N)	Type	Cisco SPA-1X10GE-LV2 (N)
10	Show on diagram	0	Cisco SPA-1X10GE-LV2 (N)	Type	Cisco SPA-1X10GE-LV2 (N)
11	Show on diagram	0	Cisco SPA-1X10GE-LV2 (N)	Type	Cisco SPA-1X10GE-LV2 (N)
12	Show on diagram	0	Cisco SPA-1X10GE-LV2 (N)	Type	Cisco SPA-1X10GE-LV2 (N)
13	Show on diagram	0	Cisco SPA-1X10GE-LV2 (N)	Type	Cisco SPA-1X10GE-LV2 (N)
14	Show on diagram	0	China 98L-1X10GE-LV2 (N)	Type	China 98L-1X10GE-LV2 (N)

### Search result table view example

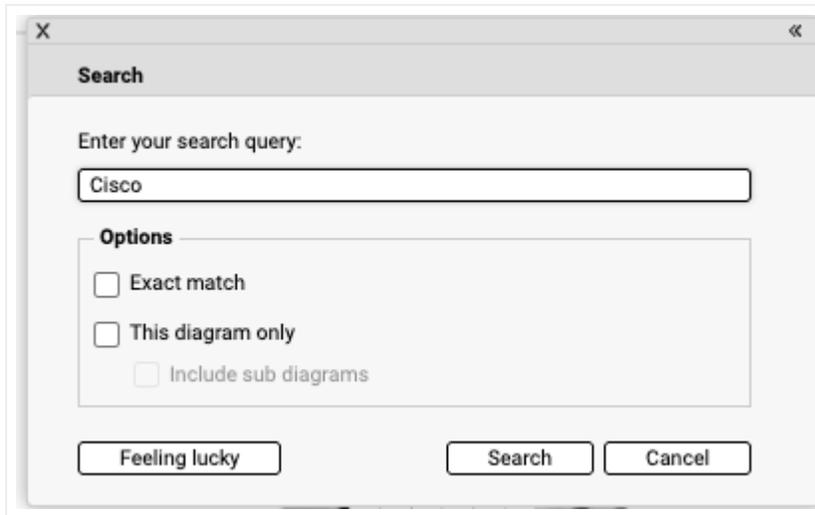
The user can also click on any link (Show on diagram) and it will retrieve the diagram where the object is contained, along with a blinking rectangle that highlights that object.

In addition to the quick search described above, the tools menu includes a button to open a more powerful search functionality (you can also press “s” on your keyboard) which brings up the search dialog.



### A more advanced search

The dialog lets you search within the current diagram only or the current diagram and below. It also lets you force an exact match on your search, use parameters and utilize the feeling lucky function (more on that later).



*Full floating search dialog with suggestions*

#### Attention!

If the 's' hotkey seems not to react you may not have the focus on the diagram. Click anywhere on the diagram and retry.

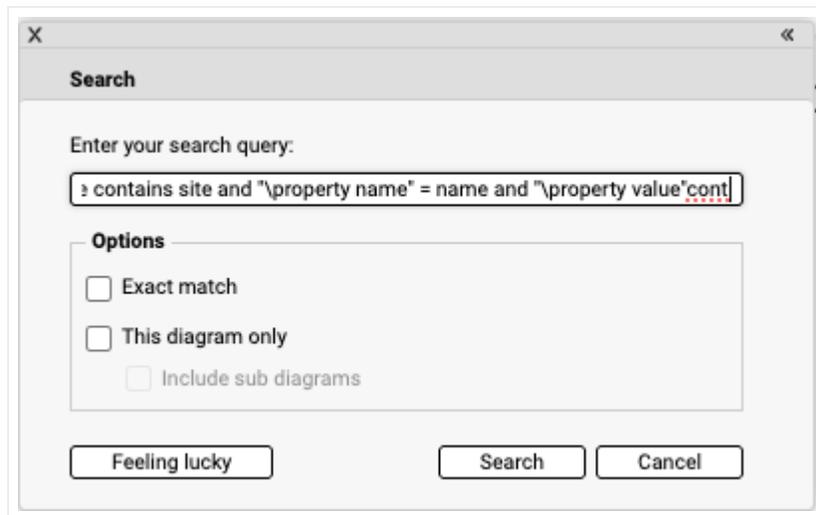
### 3.4.6.1 Using search parameters

In addition to partial string matches, netTerrain also allows searches using parameters to limit the results based on different criteria. The character used as an indicator for the parameter is the backslash '\'. If any of the supplied parameters (such as a type or property name) contains a space, enclose that parameter in double quotes (including the backslash).

Here is an example of a search using parameters:

```
\type contains site and "\property name" = latitude and "\property value" contains 4
```

This search would retrieve all objects in netTerrain of a type that contains the string 'site', that have a property called 'latitude' where the value contains the character '4'.



*Advanced search using parameters*

### 3.4.6.1.1 Search operators

The following are valid logical operators when running advanced searches in netTerrain:

- AND
- OR
- NOT
- CONTAINS
- "(" and ")"
- "<" and ">"

### 3.4.6.1.2 Finding objects of a specific type

To find all instances of a specific type, the following syntax is valid:

- \type =
- \type contains
- \type not

The following search will retrieve all instances of types for which the type name contains the string '500'.

```
\type contains 7500 and "\property name" = name
```

### 3.4.6.1.3 Finding objects by property name

If you need to find objects of any type, but only those instances for which there is a specific property, the following syntax (and combinations) is possible.

- “\property name” =
- “\property name” contains
- “\property name” not

### 3.4.6.1.4 Finding objects by property value

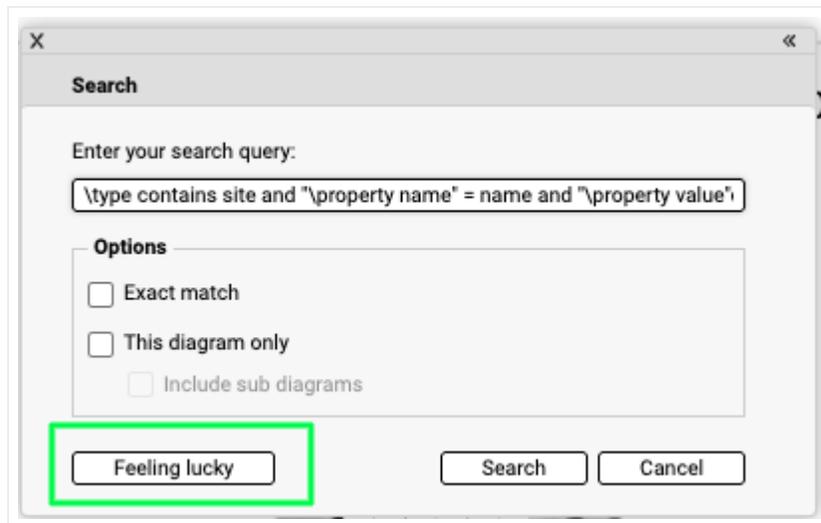
If you need to find objects of any type, but only those instances for which there is a specific property, the following syntax (and combinations) is possible.

- “\property value” =
- “\property value” contains
- “\property name” not

## 3.4.6.2 Feeling lucky searches

Are you feeling lucky today? You can save yourself a couple of clicks if you think your search criteria will retrieve the desired result at the top of the result list. If you think your search criteria will retrieve just one match, then by definition that would also be the first result!

Typically, you then want to navigate to the diagram containing that record, which requires you to get to the search result list and then click on the ‘Show on diagram’ link. The “feeling lucky” search saves you that extra step. Simply bring up the floating box, type the search string and then press the feeling lucky button.



*Feeling lucky button*

### 3.4.7 Properties and settings

Every netTerrain diagram includes a properties and a settings dialog underneath the hierarchy browser on the bottom left. The properties tab works in two modes:

- 1) Diagram mode
- 2) Object mode

The settings tab lets you adjust some of the object and diagram metadata, including size, position and more.

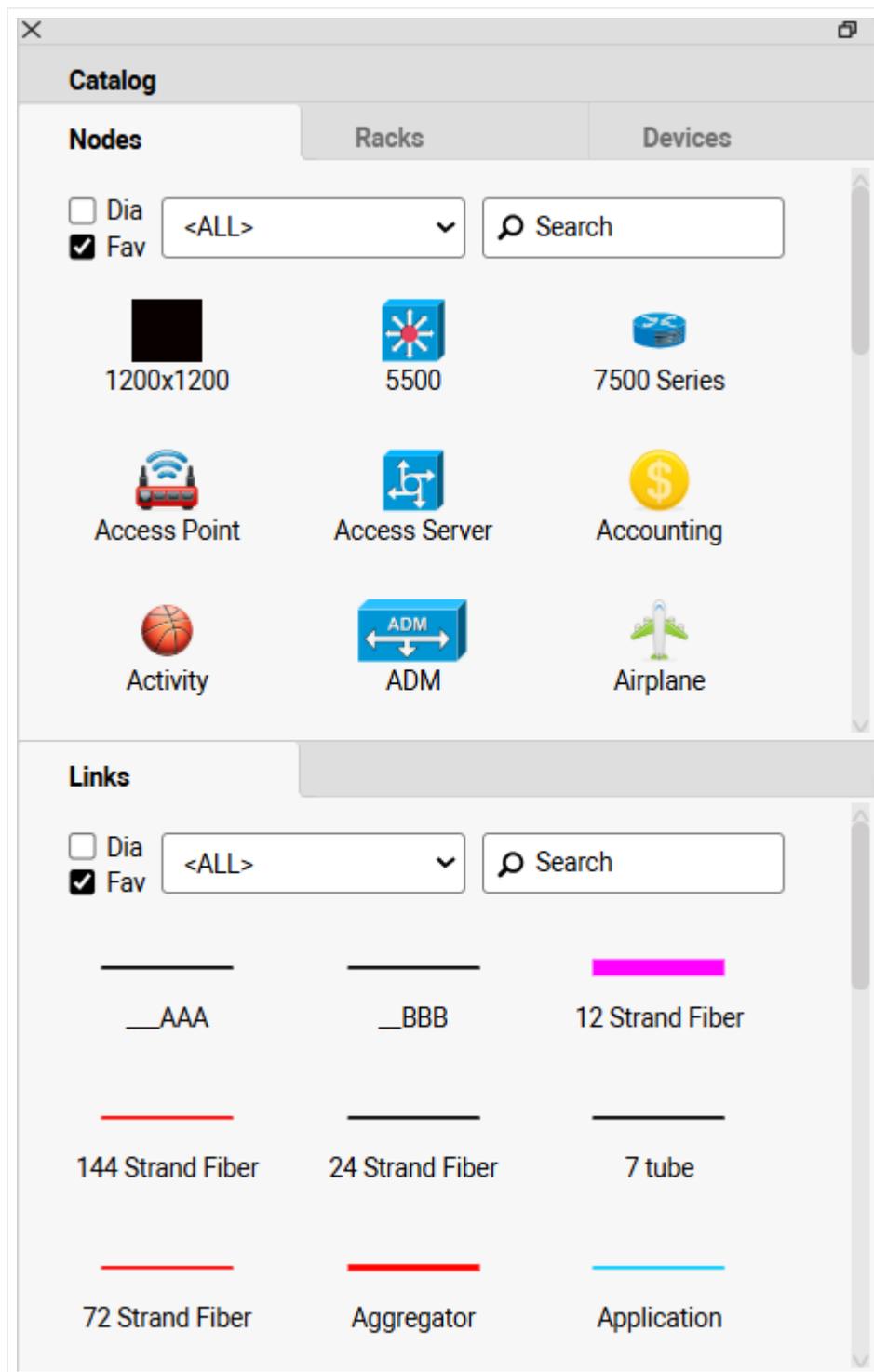
We will review these tabs in more detail throughout the next chapter.

Inspector		
Properties	Settings	
Id	24000000051746	
Type	Cisco N77-C7706	... <input type="checkbox"/>
Name	SW3_BI	... <input checked="" type="checkbox"/>
Peak Power [W]	3000	... <input type="checkbox"/>
Weight [lb]	325	... <input type="checkbox"/>
Status		... <input type="checkbox"/>
Visual Override		... <input type="checkbox"/>
Parent	Top Level > Higher Ed Net > U	... <input type="checkbox"/>
IP_Address	10.100.8.99	... <input type="checkbox"/>
MaintenanceE...	10/1/2026	... <input type="checkbox"/>
SerialNumber	qppTSogPQaZg	... <input type="checkbox"/>
Warranty Expir...	02/01/2026	... <input type="checkbox"/>
Cost	\$9876.00	... <input type="checkbox"/>
Catalog	Fields	
Audit Trail	11	

*Properties and settings*

### 3.4.8 Catalog

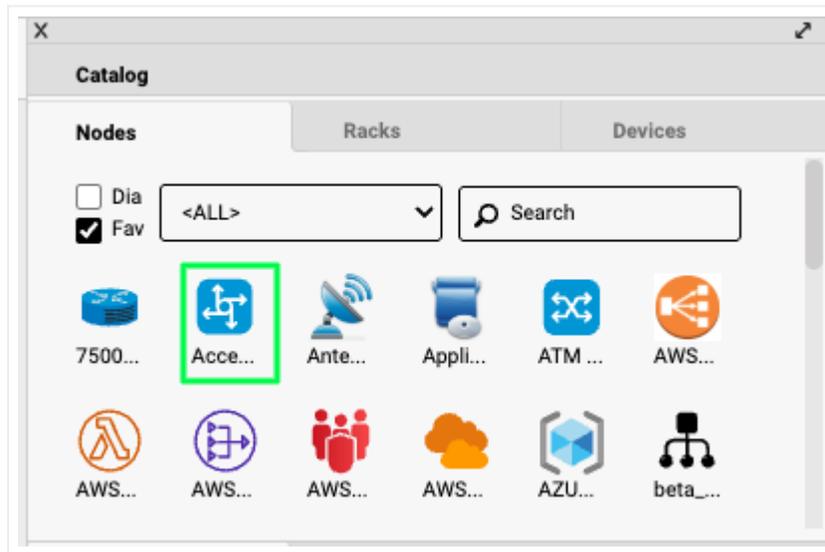
From the catalog window users can pick objects of different types and drag and drop them into the project. netTerrain has two separate dialogs for the nodes (including devices and racks) and links catalog, as shown in the screenshot below. Users can undock, close, hide or show the catalog window, which will be explained in more detail throughout the guide.



Nodes and links catalog

### 3.4.8.1 Accessing the catalog for a node type

netTerrain has a nice shortcut to access a node type in the catalog directly from this pane. Simply double click on the node in the catalog pane (here on the project), and netTerrain takes you straight to the catalog, displaying the type in the node type list view.

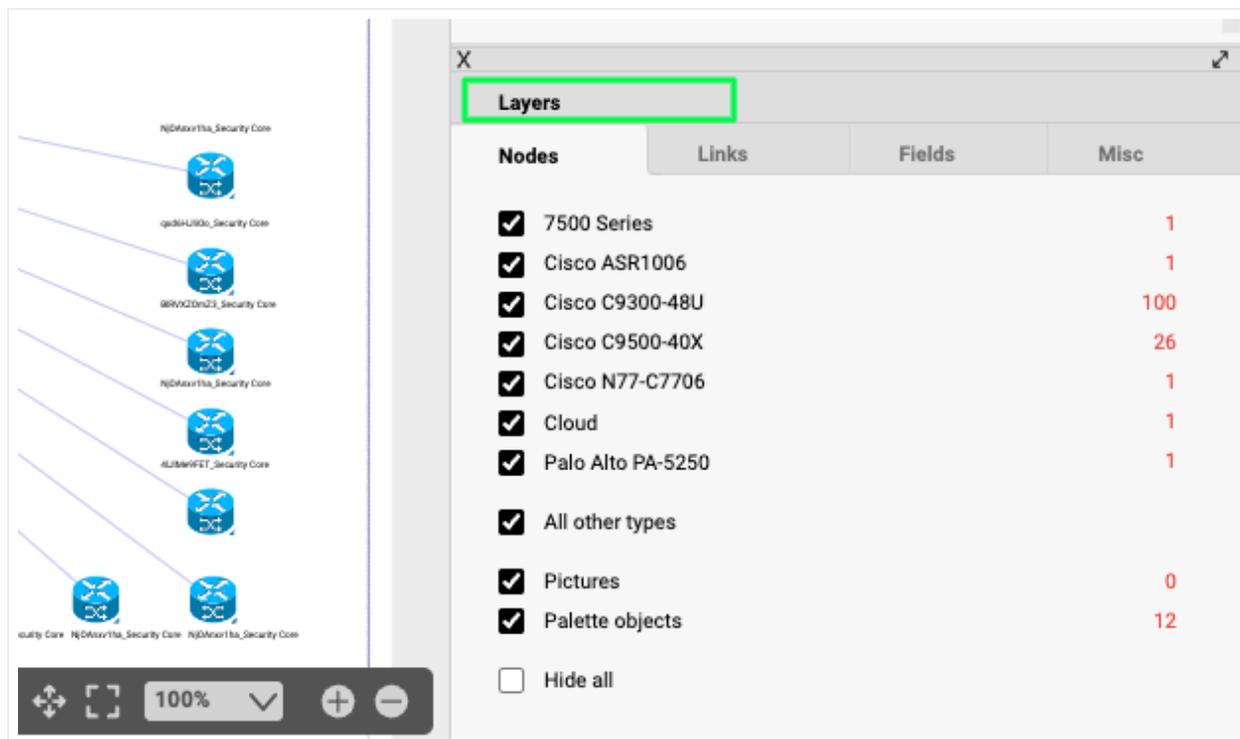


Double-clicking on node item in catalog pane

This shortcut comes in handy to get directly to a catalog definition of a node without having to click through several pages. Notice that you still must be a power user or administrator to take advantage of this feature.

### 3.4.9 Layers

From the catalog layers users can hide or show objects on a given diagram based on their type. Users can undock, close, hide or show the layers window, which will be explained in more detail throughout the guide.

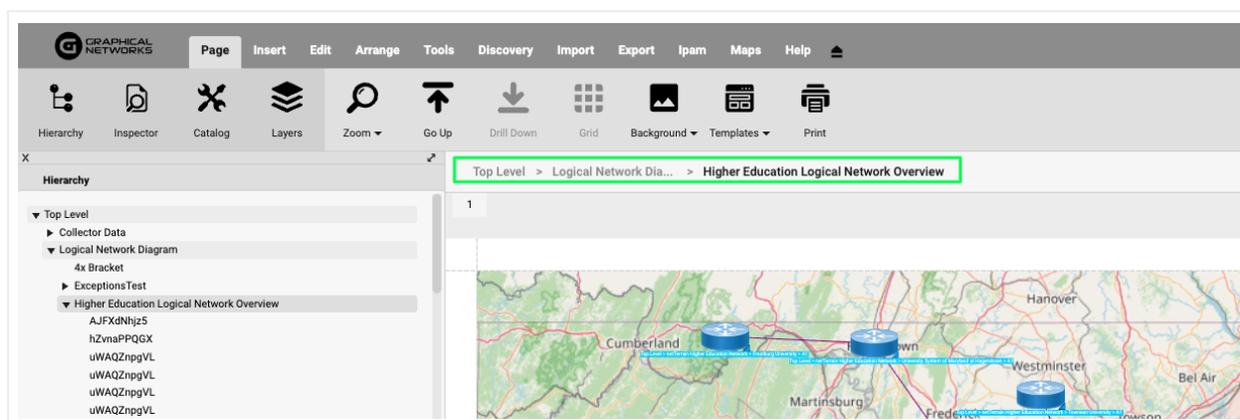


Layers

### 3.4.10 Breadcrumbs

As the name suggests, breadcrumbs denote the path the user took to reach the current diagram. Or put another way, the node names that form the breadcrumb correspond to each leaf in the hierarchy the user had to access to reach that diagram.

Breadcrumbs are displayed on top of the diagram itself, as shown in the image below:



Breadcrumbs, yummy...

### 3.4.11 Notifications, user and help menus

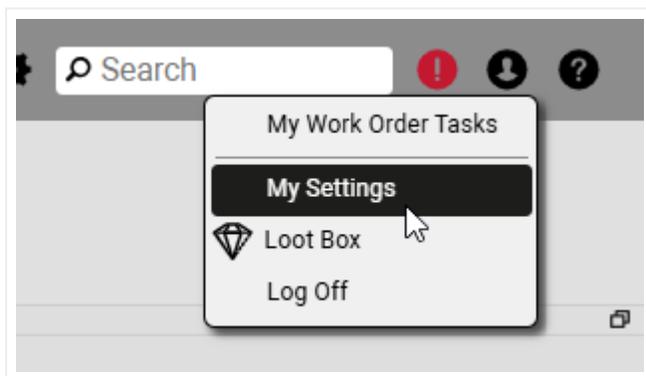
On the top right corner of the page, you can find the user and help menus, and if any work order notifications exist for the current user, these are shown to the left of the user menu, as pictured below:



*Notifications, user and help menu*

The help menu on the right provides the same set of help options that you find in the help ribbon. The following additional functions can be accessed from here:

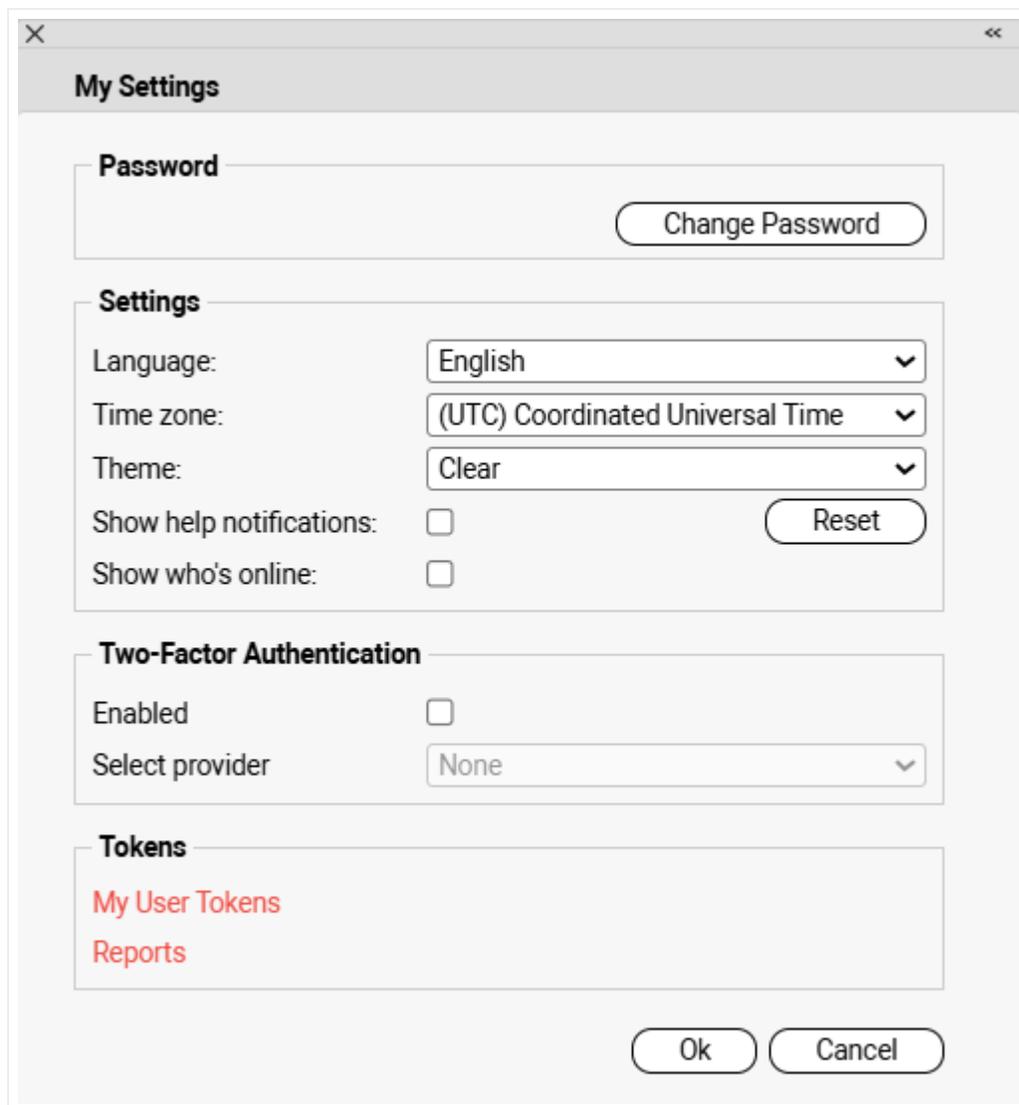
- My work order tasks: opens the list of work orders for the current user, as explained later in the guide
- User settings
- Lootbox link



*User menu options*

#### 3.4.11.1 User settings menu

The user settings menu is your own space that lets you personalize netTerrain. You can access this menu by clicking on the user icon and then selecting the 'My Settings' sub menu.



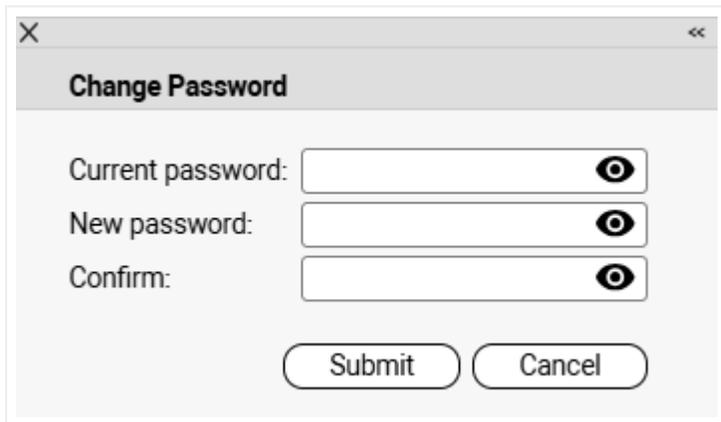
*User settings dialog*

In here, you can manage security settings including changing your password, setting up two-factor authentication and user tokens. The user settings dialog also lets you manage the following user-level settings:

- Language
- Time zone
- Themes
- Help notifications
- Show who is online

### 3.4.11.1.1 Changing your password

To change your password, simply click on the 'Change Password' menu and fill out the form accordingly. You must provide your current password to change it to a new password successfully. When all else fails, you can always request a password change from the sys admin.



The image shows a 'Change Password' dialog box. It has a title bar with a close button (X) and a back button (<<). The title is 'Change Password'. Below the title, there are three input fields: 'Current password:', 'New password:', and 'Confirm:'. Each field has a toggle icon to its right. At the bottom, there are two buttons: 'Submit' and 'Cancel'.

*Changing your password*

### 3.4.11.1.2 Language settings

Users can change their own language settings. For example, if you live in sunny Mexico, Spanish is one of the languages we currently support. The languages that are currently supported include:

- English
- Spanish
- French
- German (beta)
- Finnish (beta)
- Hungarian (beta)
- Simplified Chinese

### 3.4.11.1.3 Other settings

Users can now adjust netTerrain elements that utilize datetime formats to reflect their current time zones. This is useful for getting local times featured in UI elements like datetime fields such as for instance the log reports.

Themes allow users to change the netTerrain skin from a few different options.

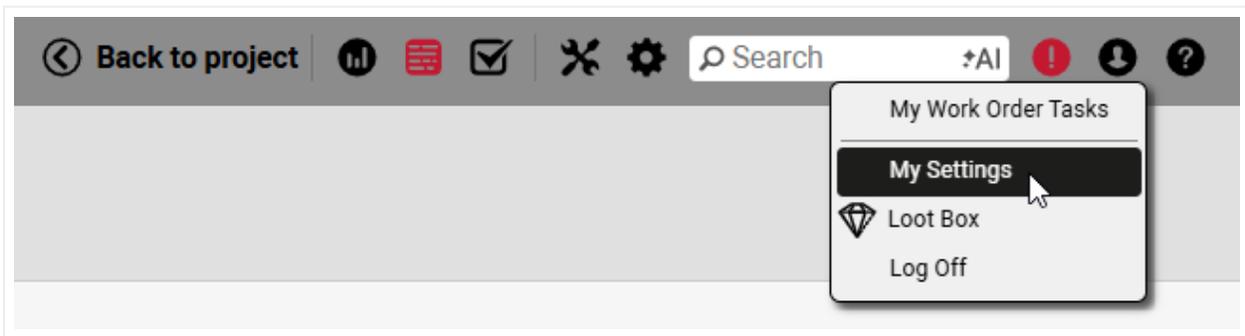
The 'Show help notifications' option lets you turn these notifications on or off. And if you'd like to get help notifications as if you just started using netTerrain, simply click on the reset button.

When the 'Show who's online' checkbox is checked, you will see the users that are currently on netTerrain or the same diagram you are navigating.

#### 3.4.11.1.4 Using two-factor authentication (2FA)

If you would like to harden the security settings for accessing netTerrain, you can implement a two-factor authentication (2FA or MFA) mechanism for your netTerrain login. To do this follow these steps:

- Open your user settings (My Settings) dialog



- Check the Enabled box in the Two-Factor Authentication section and choose the 'One-Time-Password' option under 'Select provider'

**My Settings**

**Password**

Change Password

**Settings**

Language: English

Time zone: (UTC) Coordinated Universal Time

Theme: Clear

Show help notifications:

Show who's online:

Reset

**Two-Factor Authentication**

Enabled

Select provider: One Time Password

TOTP Auth status: NOT SET

Set

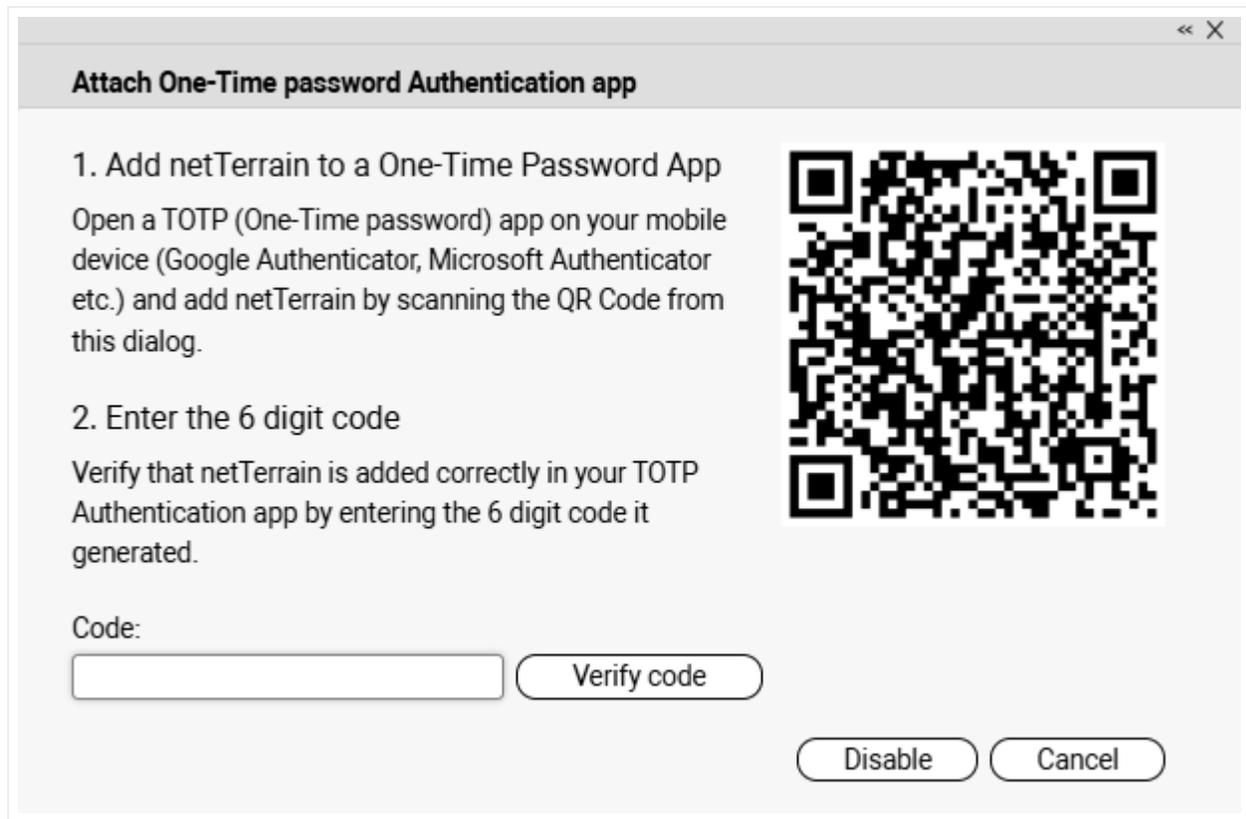
**Tokens**

My User Tokens

Reports

Ok Cancel

- Check the 'Set' button
- Add netTerrain to a One-Time Password app by following the instructions shown on the pop-up dialog



### 3.4.12 Context menus

Context menus are essentially menus that pop up when a user right clicks on a diagram or an object. They are a convenient way to find out what can be done in a certain context, so, as we like to say, when in doubt, right-click!

For better usability and easier handling of objects, netTerrain has five categories of context menus, which are triggered by a mouse right-click:

- Diagram context menu
- Node/object context menu
- Link context menu
- Displayed Field context menu
- Free text context menu
- Bend point context menu

If a user wants to open the diagram context menu, for example, a simple mouse right-click on any part of the diagram that is empty will do. The context menu that pops up will then provide a series of sub menu

options to perform certain actions specific for a diagram. Note that in many cases certain sub menus are grayed out.

**Tip:**

Use the shortcuts! You can open any context menu by pressing [alt-c]. For instance, if you select a link and press [alt-c], the link context menu pops up.

This is a very useful shortcut when right-clicking on an object is tricky (such as a very thin link).

### 3.4.12.1 Diagram context menu

The diagram context menu includes most of the functions related to the diagram itself. So, for example if you want to upload a background, select all objects or insert an object, simply right-click on the diagram and click on the desired sub menu.

Make sure that when you right-click, it is on the diagram itself and not some other object, because this would bring up a different context menu. Also remember to use the [alt-c] shortcut!

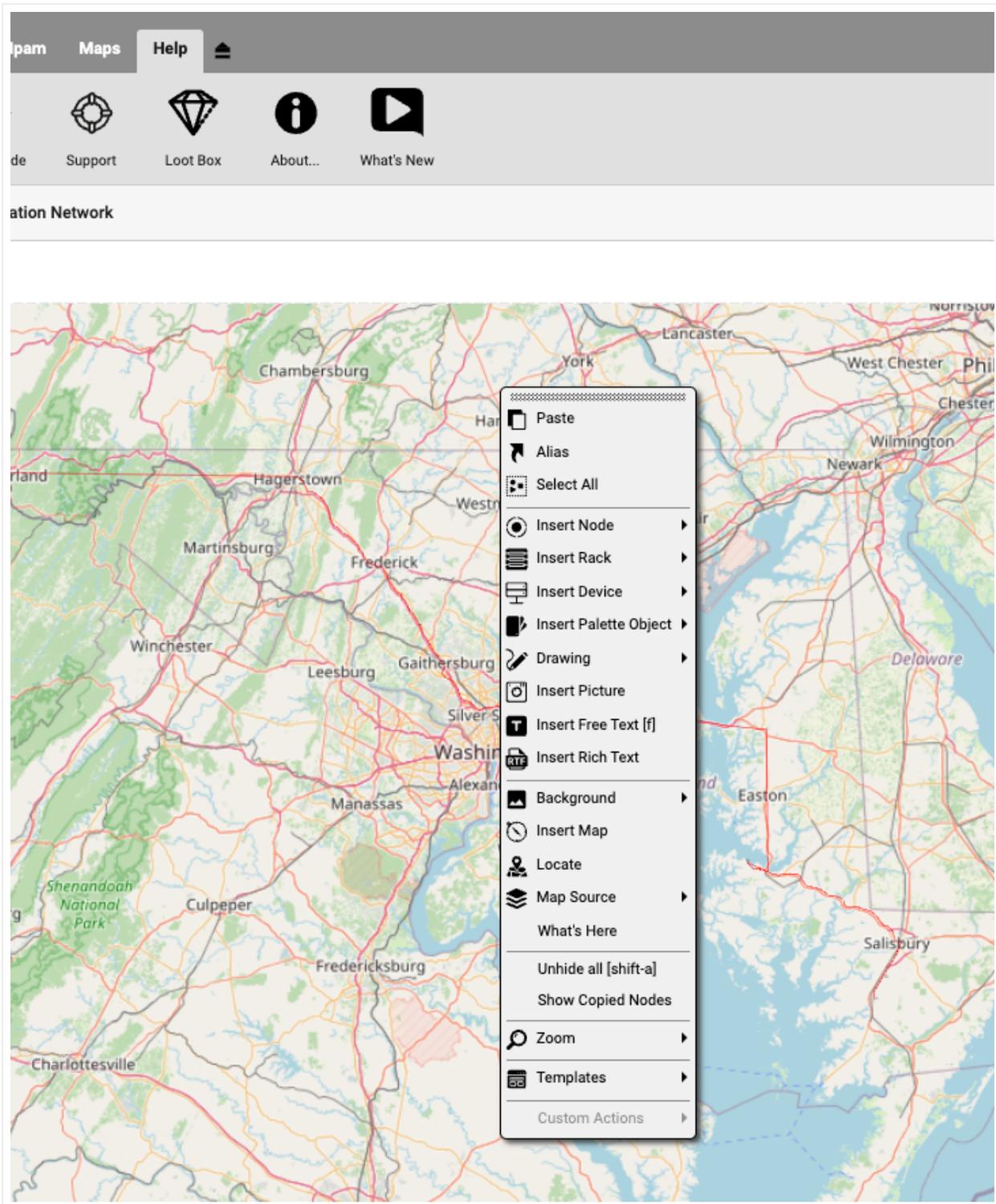
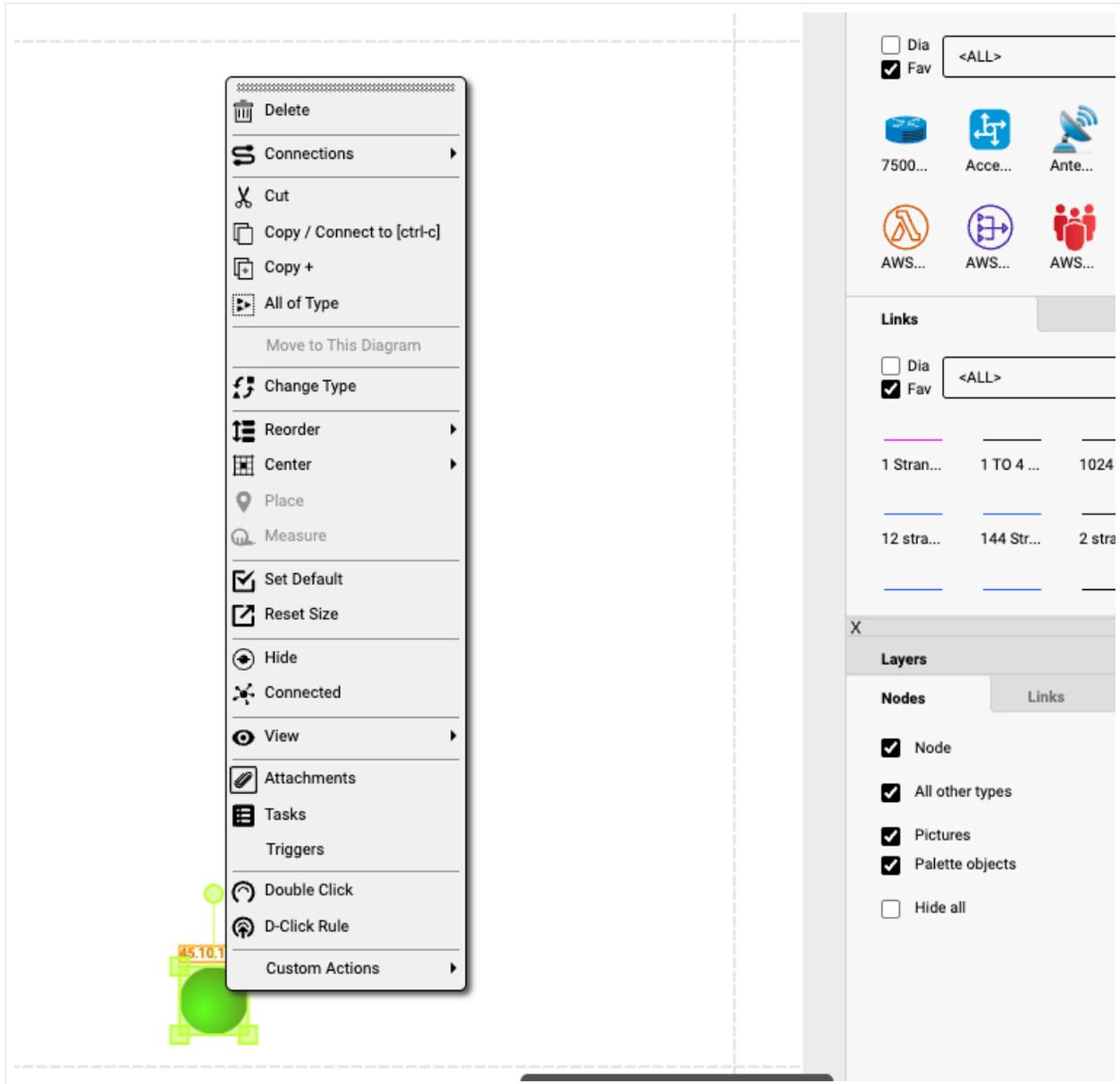


Diagram context menu

We will review the details of each operation throughout the rest of the guide.

### 3.4.12.2 Node Context menu

The node context menu shows several node related operations such as deleting, connecting, cutting, copying and more.



Node context menu

We will review the details of each operation for nodes throughout the rest of the guide.

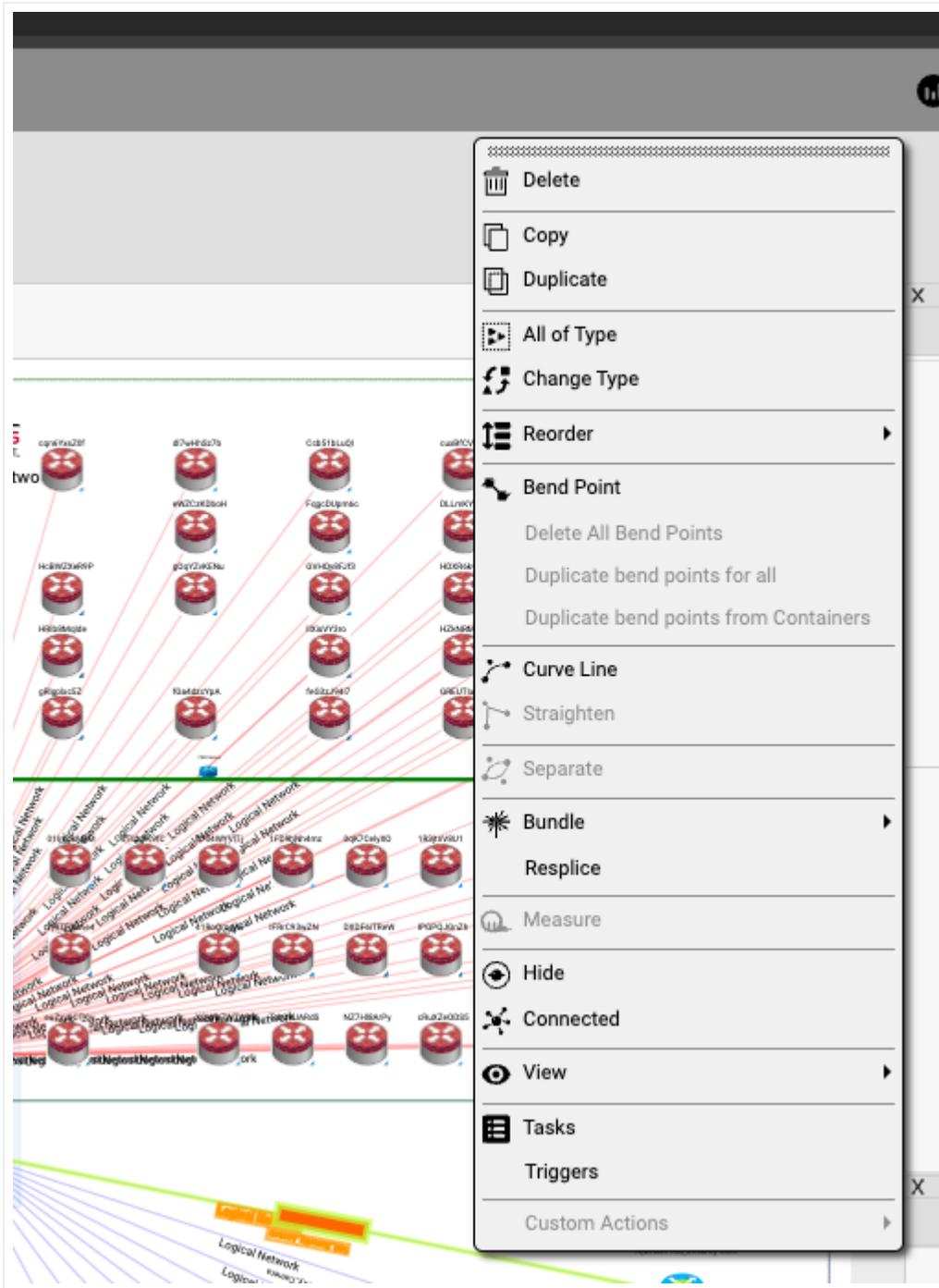
#### **Attention!**

Be careful when selecting objects: the menus that are enabled differ when you have multiple objects selected as opposed to just one.

### **3.4.12.3 Link context menu**

The link context menu shows several link related operations such as deleting, copying, reordering and much more.

An easy way to bring the link context menu is to simply “touch” a link with a selection rectangle by holding down the left mouse button and dragging the mouse towards the link (no need to carefully right-click on it, as that may require good pulse if the link is too thin) and then pressing [alt-c], which, as you now know, is the shortcut for the context menu.



Link context menu

We will review the details of each operation for links throughout the rest of the guide.

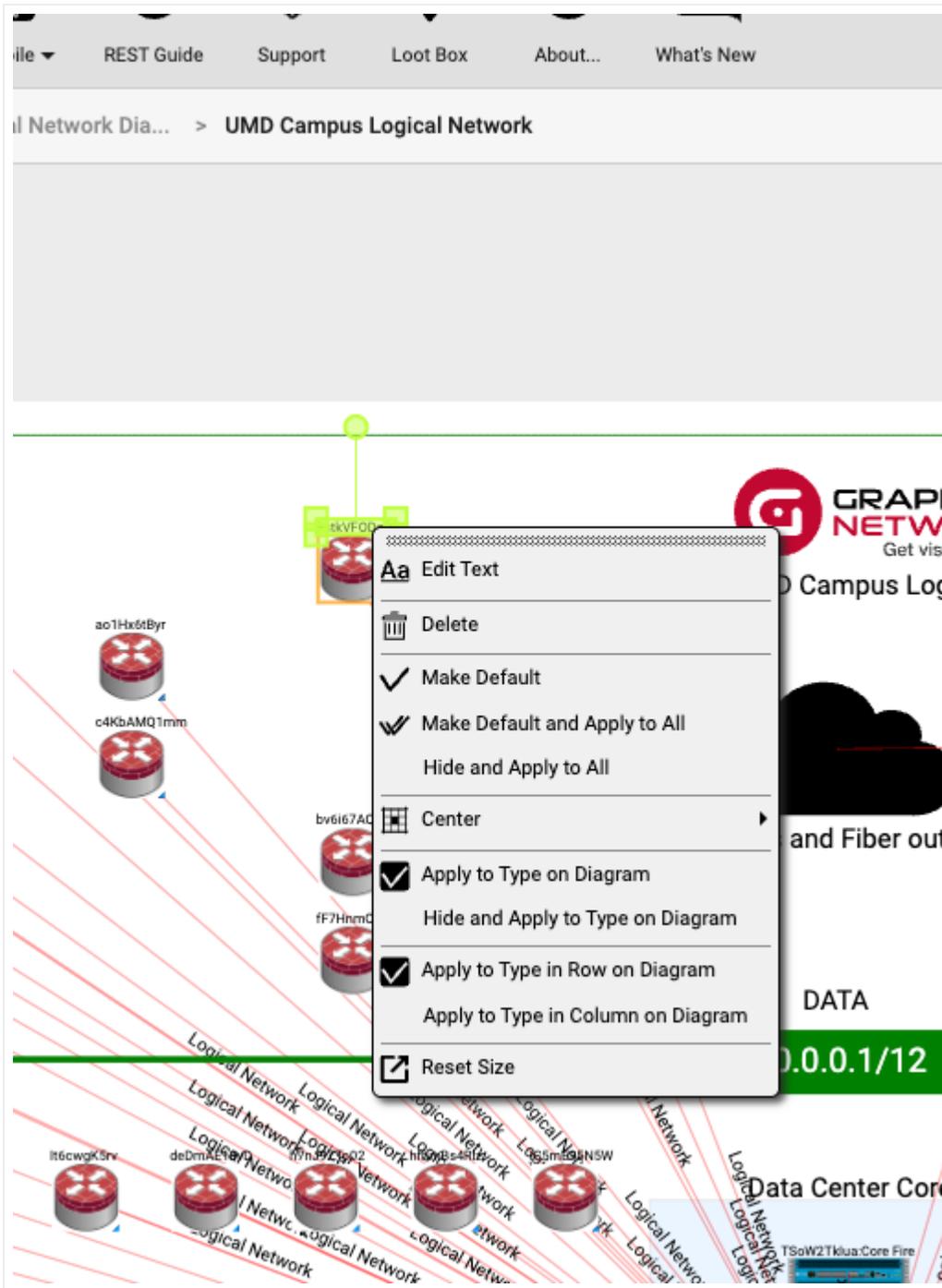
#### **Attention!**

When you want to bring in the link context menu make sure you are not just clicking on one of the bend points. Bend points have their own special context menu.

### **3.4.12.4 Displayed field and text context menu**

They may look similar but displayed fields and texts are not quite the same category of entity: displayed fields are associated with a node or link whereas text is untied (free floating in a diagram and not associated with any object in particular). As such, their context menus vary quite a bit.

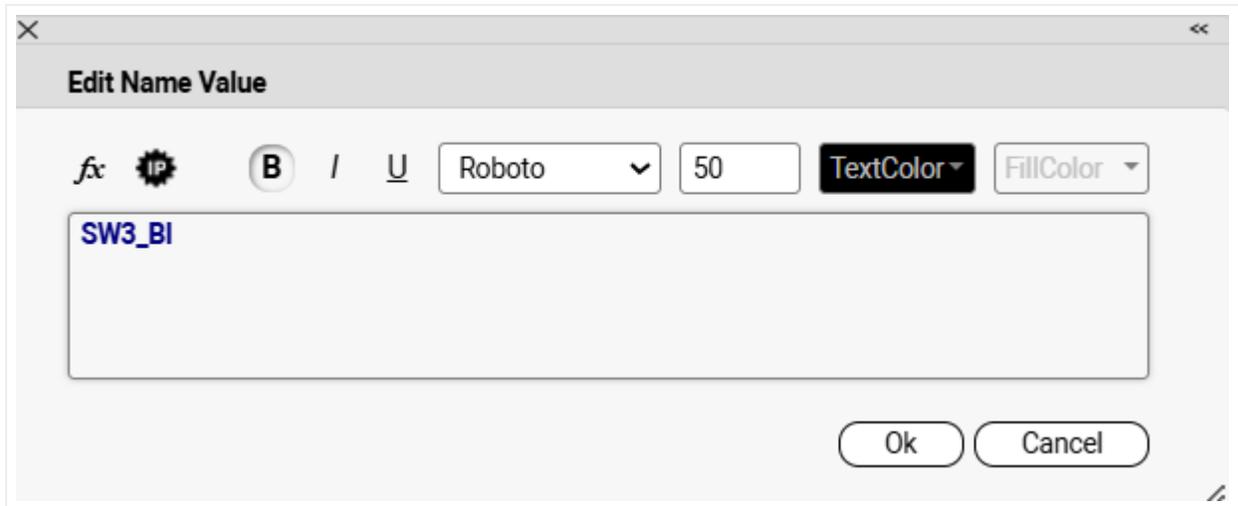
Displayed fields have an array of options around default settings for the type and applying settings across all occurrences of that displayed field in a diagram:



Displayed field context menu

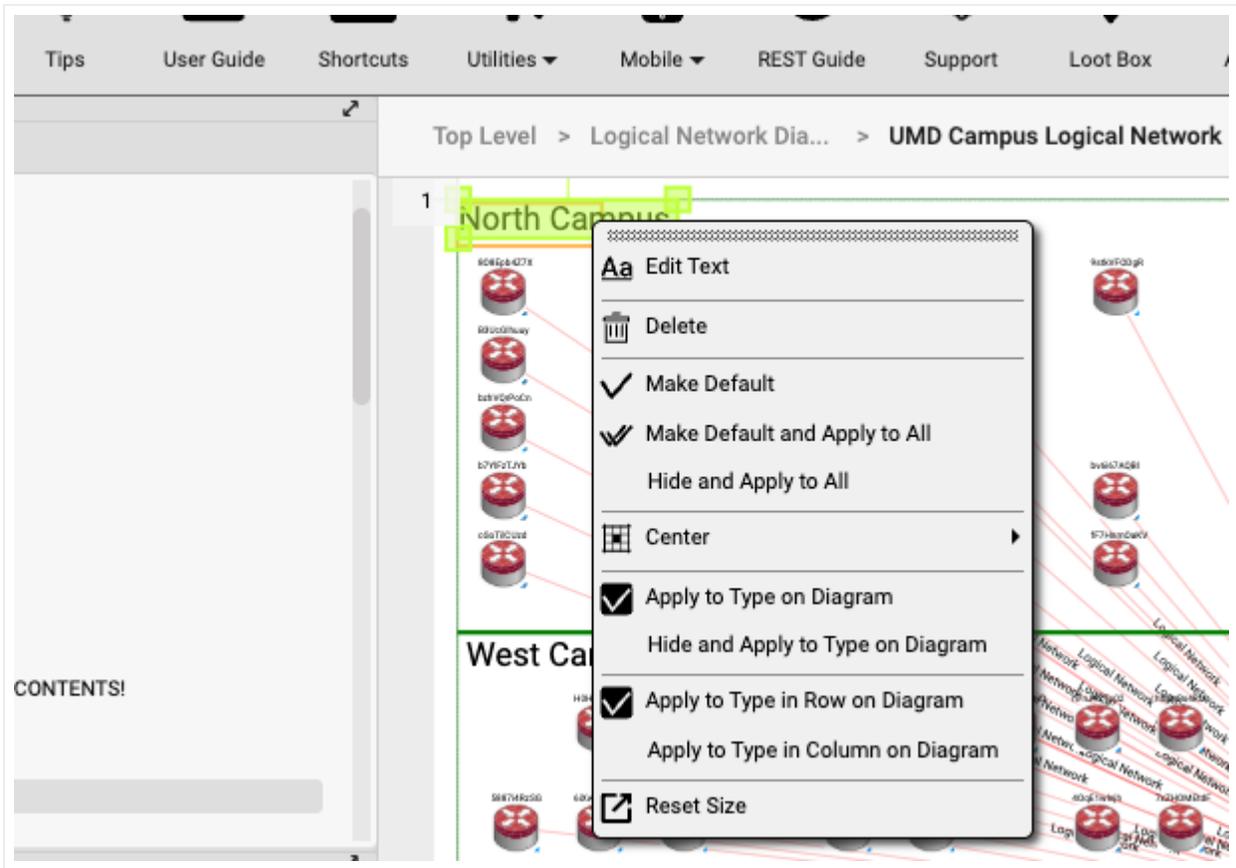
Below we review each sub menu:

- Edit Text opens the standard text editor for that displayed field. Here, users can edit the displayed field text just like any other free text with plenty of formatting options and the ability to set up expressions (more on that later).



- Make Default: this option makes the current displayed format the default for that field and type, without affecting existing instances.
- Make Default and Apply to all: this option makes the current displayed format the default for that field and type and applies that format to all occurrences of that field and type currently in the project.
- Hide and apply to all: clicking on this option is the equivalent to deleting the displayed field for every occurrence (of that field and type) in the project.
- Center: centers the text with respect to the object horizontally, vertically, or both.
- Apply to Type on Diagram: applies the current format to all objects of the type on the current diagram.
- Hide and Apply to Type on Diagram: hides that field for that type for every instance on that diagram only.
- Apply to Type in Row on Diagram: applies that displayed field format for that field and type for every occurrence on that same row on that diagram.
- Apply to Type in Column on Diagram: applies that displayed field format for that field and type for every occurrence on that same column on that diagram.
- Reset Size: quite self-explanatory, this option resets the size of the text to the default in the catalog.

Free text has several options related to copying, cutting, reordering and more. As shown in the image below.



### Free text context menu

We will review the details of each operation for displayed fields and text throughout the rest of the guide.

### 3.4.12.5 Bend point context menu

To activate the bend point context menu, just right-click on a bend point:



*Bend point context menu*

We will review the details of each operation for bend points throughout the rest of the guide.

## 4 Working with Diagrams and Objects

This chapter will show you how to work with diagrams and objects and performing data entry operations on nodes and links. If you have a very large list of objects that need to be added (100+), you may want to consider using the Integration Toolkit (ITK) to automate and speed up the data entry process.

Data entry operations in netTerrain include the insertion of new objects, updating existing objects and deleting existing objects from their diagrams.

### **Attention!**

Full data entry functions are only available to users with editor rights, or higher. Users with an 'updater' role may only change data for existing objects.

### 4.1 Basic operations on diagrams and objects

At its core, netTerrain consists of diagrams that contain two types of objects that represent the diversity of systems that can be created in the tool: nodes and links. Like other familiar tools such as Visio, users have

an array of features to make objects aesthetically pleasing and accurate. These features can control things such as properties, size, rotation, and settings.

## 4.1.1 Properties and settings

Every netTerrain diagram includes a properties dialog underneath the hierarchy browser on the bottom left. The properties dialog works in two modes:

3) Diagram mode

4) Object mode

When no object is currently selected, the properties window is in diagram mode and shows a context specific set of properties related to the diagram. For example, if a user drills down into a network diagram, the information displayed initially contains aggregated data counts for underlying nodes and links. This information is diagram, not object specific.

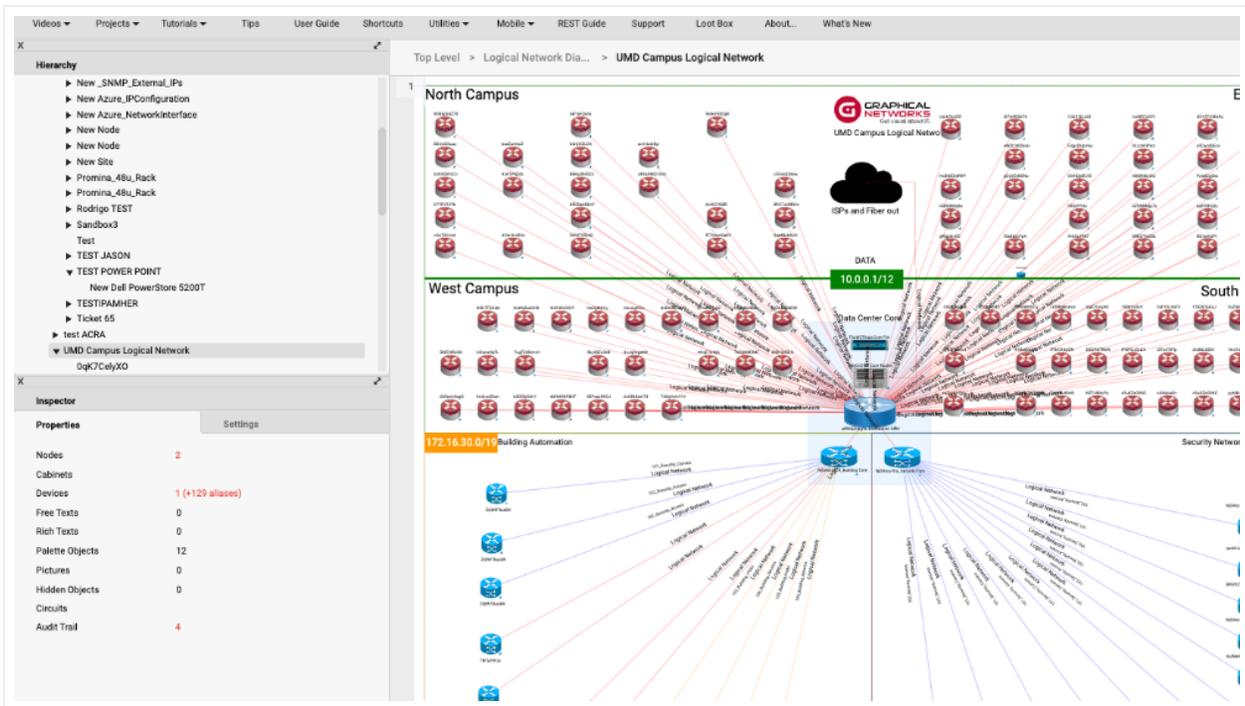
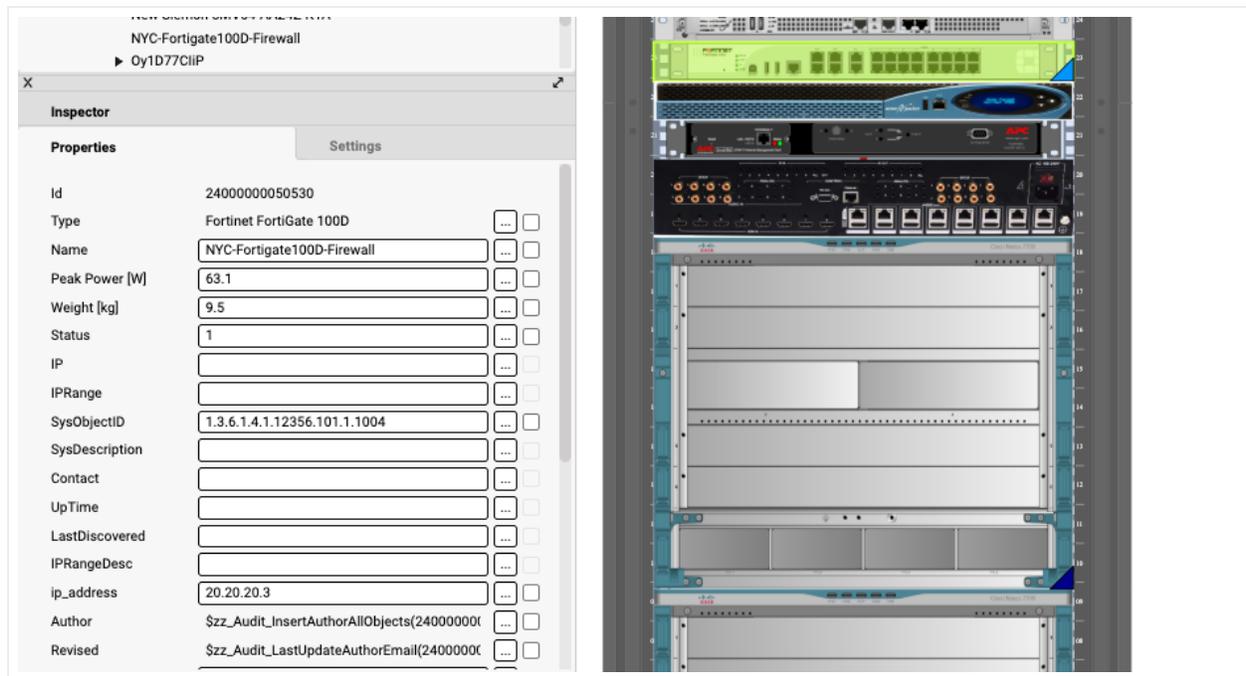


Diagram properties on the top left properties window

A user can click on a specific object (node or link) and view the object specific properties for that object. In this case, the properties window is in object mode and the fields and values displayed will vary based on the type of selected object.

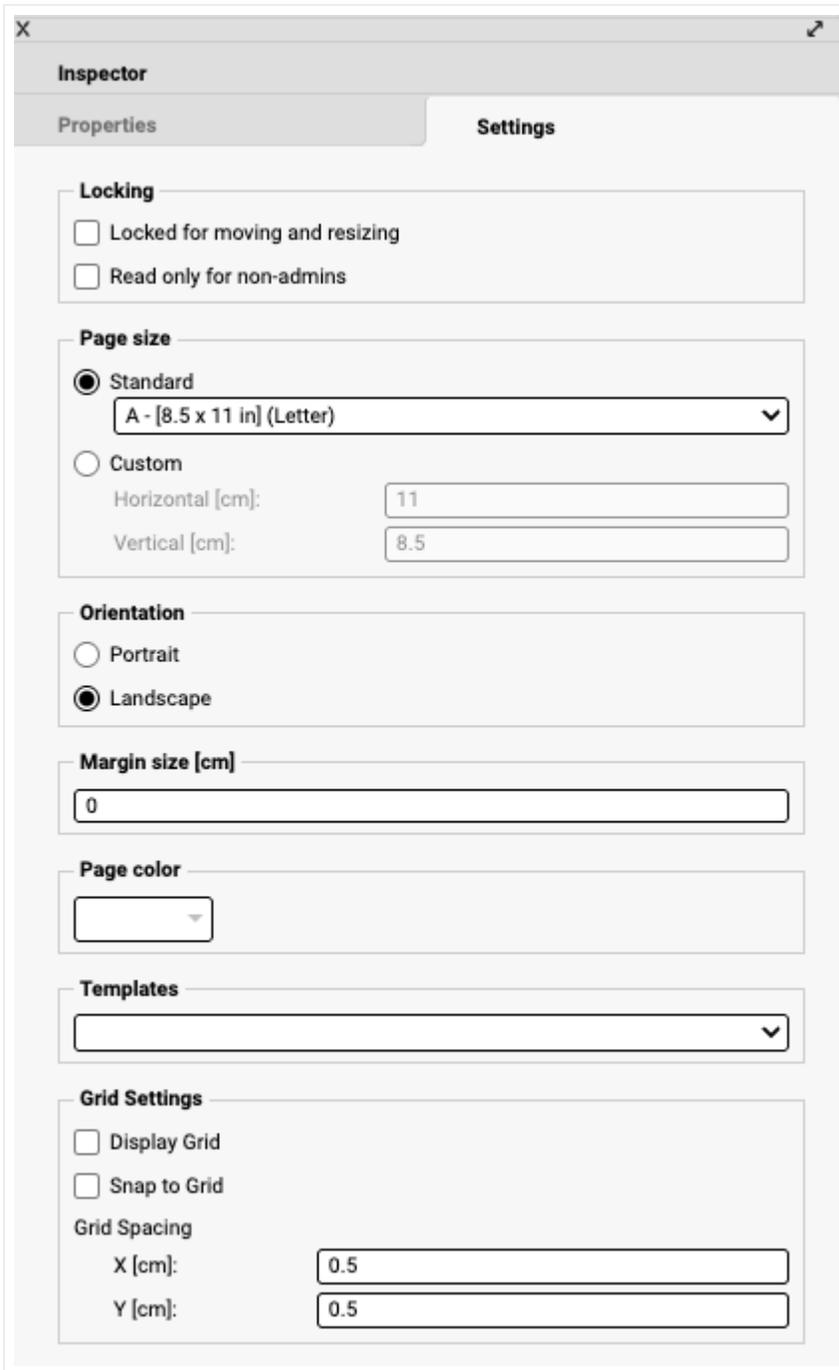


### Node properties

Note that the values for a given instance are being retrieved in real-time from the netTerrain database.

Next to the properties tab, netTerrain has a context specific settings tab. Just as with the properties, when no object is clicked, the settings tab shows settings for the current diagram. When a node or link is selected, the settings for that object are displayed.

The diagram settings tab contains a locking option, page size, orientation, margin, template section and a grid settings section. The templates section is discussed later in the guide.

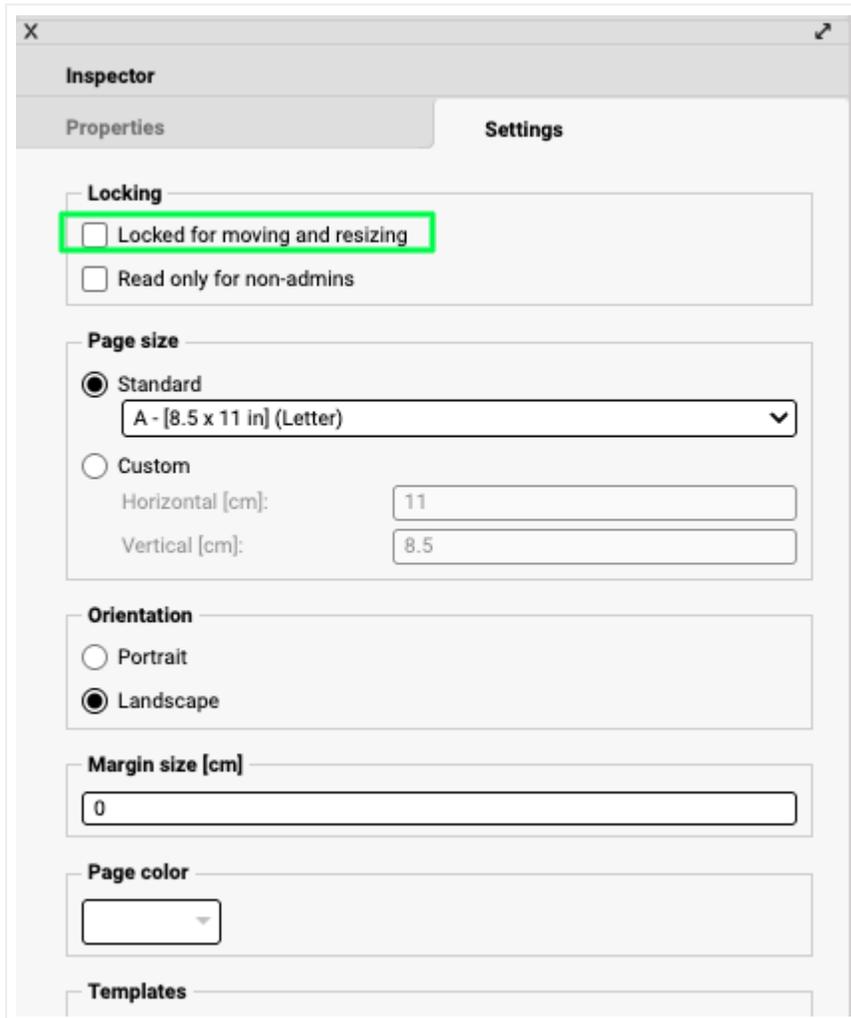


*Display section for diagram settings*

We will review the diagram display filters in more detail later.

### 4.1.1.1 Locking objects on a diagram

As an editor, when you zoom in or pan around a project it is easy to accidentally bump an object out of its original position when the diagram has many objects in it. To prevent this from happening, the locking section has an option called 'Locked for moving and resizing', which, when checked, disables any moving or resizing for all objects on the diagram.



*Lock option*

#### Attention!

If some objects are locked within the diagram, as opposed to the whole diagram being locked, whenever the lock option for the diagram is enabled and then turned off, all objects in the diagram will be unlocked.

An additional locking option that controls the level of permissions users have on a specific diagram is the “Read-only for non-admins” option.

This option is useful when you want a root diagram to be blocked from editing, even is users of edit permissions on the rest of the project. This is typically used in conjunction with diagram permission exceptions. For example, you may use the top level as the root access for different groups across the organization, who need editing permissions in their specific sub trees, but you want to make sure they cannot add new nodes to the top level. That’s when this feature comes in handy.

#### 4.1.1.2 Page sizes

In many cases a user may want to change the size of the area that is used to render objects on a diagram. For that purpose, netTerrain has a series of page setup features in the settings tab, to control the look and feel of the page for that diagram. When a diagram is resized, objects on a diagram are also resized to adjust to the new diagram scale.

To change the page setup for a diagram, go to the settings tab and choose from the following options to control the page setup:

- Standard page size
- Custom page size
- Orientation
- Margin size (margins can also be filtered out)

X
↶

**Inspector**

Properties
Settings

**Locking**

- Locked for moving and resizing
- Read only for non-admins

**Page size**

- Standard
 

A - [8.5 x 11 in] (Letter) ▼
- Custom
 

Horizontal [cm]:

Vertical [cm]:

**Orientation**

- Portrait
- Landscape

**Margin size [cm]**

0

**Page color**

▼

**Templates**

▼

**Grid Settings**

- Display Grid
- Snap to Grid

Grid Spacing

X [cm]:

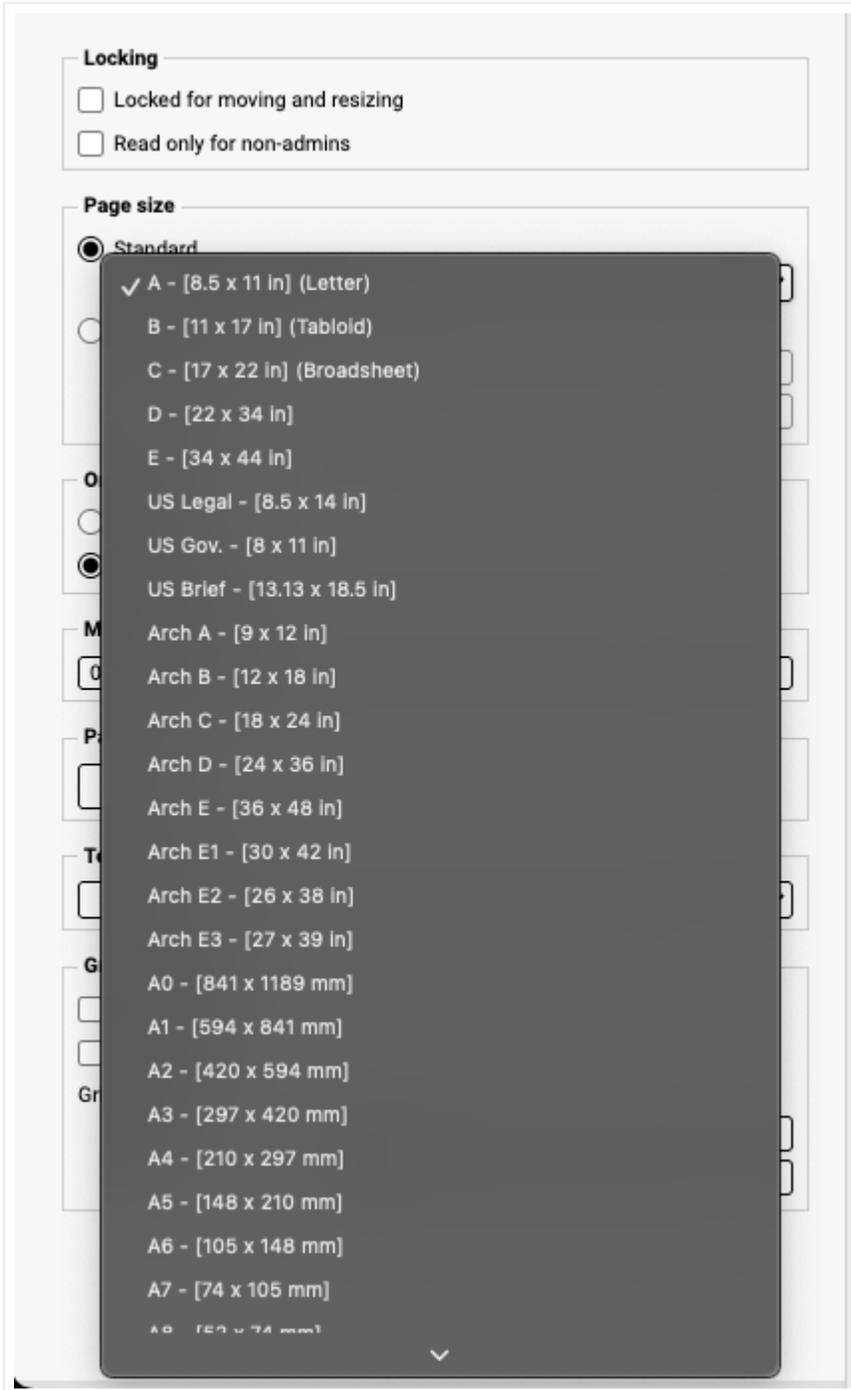
Y [cm]:

*Page setup features*

Any changes to the page setup affect all users of the system and can only be set by users with edit rights or better.

Standard page sizes in netTerrain include most North American and European page sizes, such as European A0 to A10, Arch A to Arch E3, and A to E sizes.

When resizing a page, netTerrain will keep the absolute size of the objects. This means that when changing to a larger page size, objects will look smaller on the screen. Conversely, when changing to a smaller page size, objects will look larger on the screen.

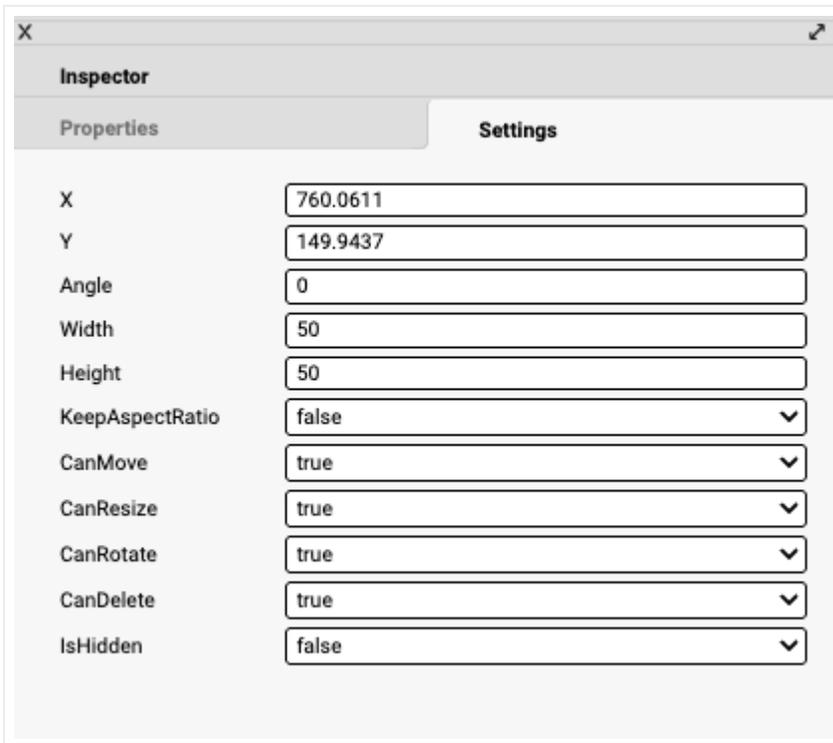


**Attention!**

Be careful when switching to a smaller page size: netTerrain does not allow objects to be out of bounds, in which case nodes and links may end up cobbled together on the bottom right corner. Also, a page resize cannot be undone, so be careful when changing page sizes and make sure the size is really the one you need!

### 4.1.1.3 Node and link settings tab

When a node is selected, the settings tab exposes certain node (meta) properties related to its appearance and behavior on a diagram. Of interest are the properties that control whether the node can be deleted, moved, resized and so on, as depicted below.



*Node settings tab*

The settings tab for a selected link has a similar set of properties, which control the appearance and behavior of the link on the diagram, as depicted below.

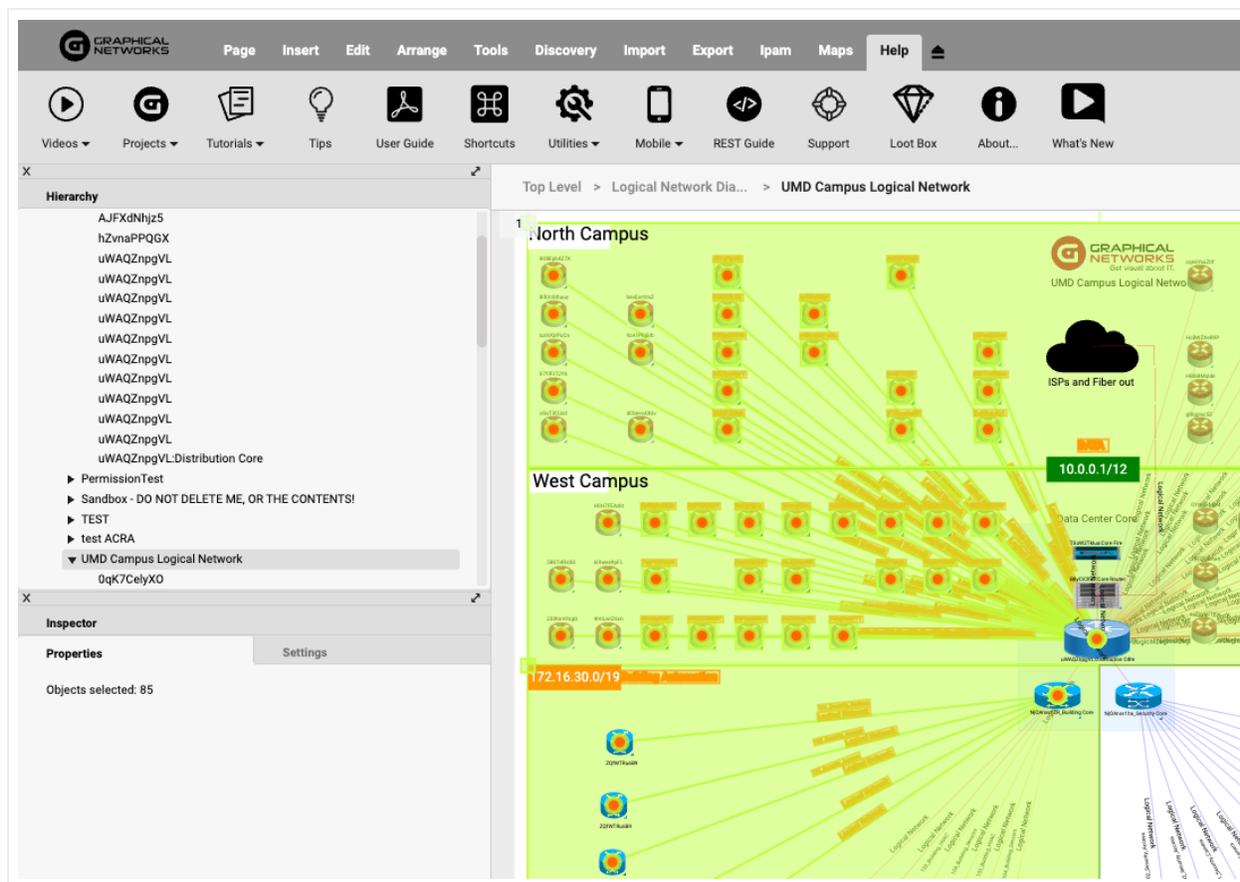


*Object settings for links*

## 4.1.2 Selecting and copying objects

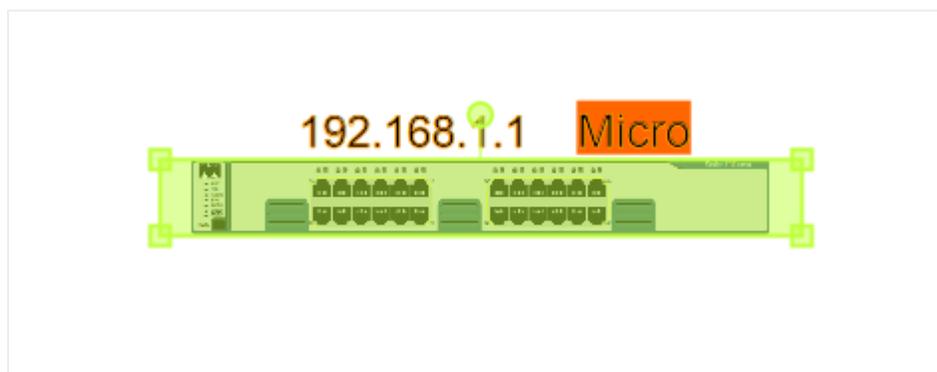
To select an object or set of objects (nodes, links, etc.), users can either click on the object itself or touch it with a selection rectangle. In most cases a simple selection consisting of a click of the left mouse button will do. Note that in the process of selecting an object, the mouse pointer changes from a selection pointer to a hand. This indicates that the object itself is now selectable.

Users may also multi select by holding the 'ctrl' key and clicking the left mouse button, but sometimes the user may want to choose multiple objects that are close together or on top of each other, in which case a selection rectangle is the better choice. This can be constructed by holding the left mouse button and dragging the mouse until any part of the object or group of objects is "touched", as displayed below.



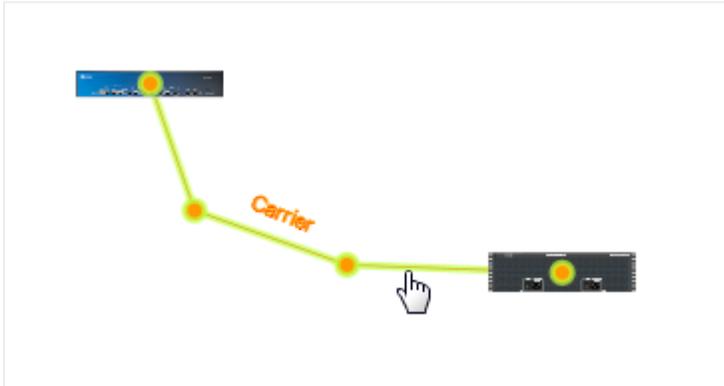
### Selecting multiple objects

Once an object is selected it will display a green selection rectangle, which may include four small selection handles on each corner defined by the enclosing object rectangle, and a rotation handle. If these handles are missing is because the object may have the resizing and/or the rotation properties disabled. These settings are reviewed later in the chapter. Note that when an object is selected, any associated displayed fields will present an orange shadowing. This is for the users convenience to quickly identify which displayed fields are tied to that object. This comes in handy when the displayed field is far from the object or it is not obvious that it is linked to it. This feature is also available for links.



*Selected node with highlighted displayed fields and handles*

Selected links will display an orange overlaid line on top of the link, including augmented endpoints and corresponding bend points.

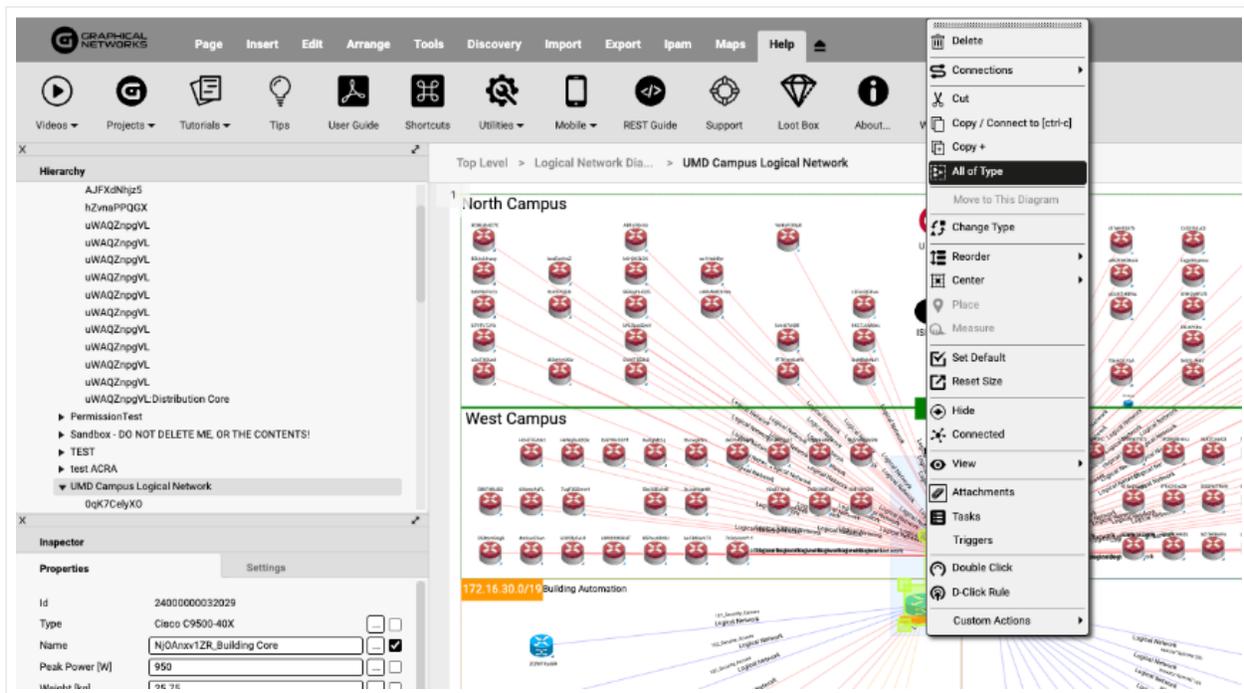


*Selected links with highlighted endpoints and bend points*

#### 4.1.2.1 Select all and select of all type

Besides using the 'ctrl' key or a selection box, netTerrain offers other ways to conveniently select multiple objects at once.

Users can select all objects on a diagram by right-clicking on the diagram and selecting all objects (ctrl-a). If all objects of a certain type need to be selected, a user can also right-click on any object of that type and clicking on 'select all of type'. This will select all instances of that type on that particular diagram.



Selecting all of type

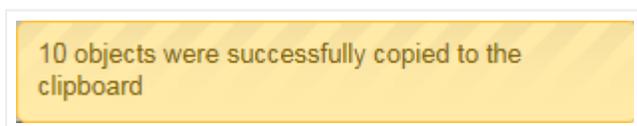
#### 4.1.2.2 Copying objects

An easy way to copy objects is to use the standard windows-style clipboard functions and shortcuts. A big advantage of copying objects is that not only do you create an instance of the same type, but also the pasted object preserves the property field values of the copied object. To copy an object to the clipboard simply right-click on the object and then click on the 'copy' button. An even easier way is to select the object and press the Ctrl-c shortcut.

Once the object has been copied, simply press ctrl-v, to paste the object.

If notifications were turned on by the administrator, once the object or objects you will see a yellow notification indicating the number of objects copied to the clipboard.

If notifications were turned on by the administrator, once the object or objects you will see a yellow notification indicating the number of objects copied to the clipboard.



Copy to clipboard notification

A simple way to place a copied object is to use the right-click context menu and paste option. Simply position the mouse cursor where you want the copied object to be placed. Then select the paste option from the right-click menu.

#### **Attention!**

Note that reference nodes cannot be copied to the clipboard. netTerrain automatically disables the copy button for any selected objects that cannot be used with the clipboard.

### **4.1.3 Moving, cutting and rotating objects**

Moving objects is a trivial task. Select one (or more of them), hold the left mouse button and then move the mouse to the target area on the diagram. Note that the x and y coordinates of an object can also be controlled from the object settings tab.

For fine tuning, the left, right, up and down arrows can also be used to move objects one pixel at a time.

#### **4.1.3.1 Moving objects between diagrams by cutting**

We saw before that you can use the clipboard in netTerrain, just like you do in other software packages. One of the most common clipboard operations in netTerrain is to cut an object. This is commonly used to move that object to another diagram, since you cannot move it to your target diagram by dragging and dropping.

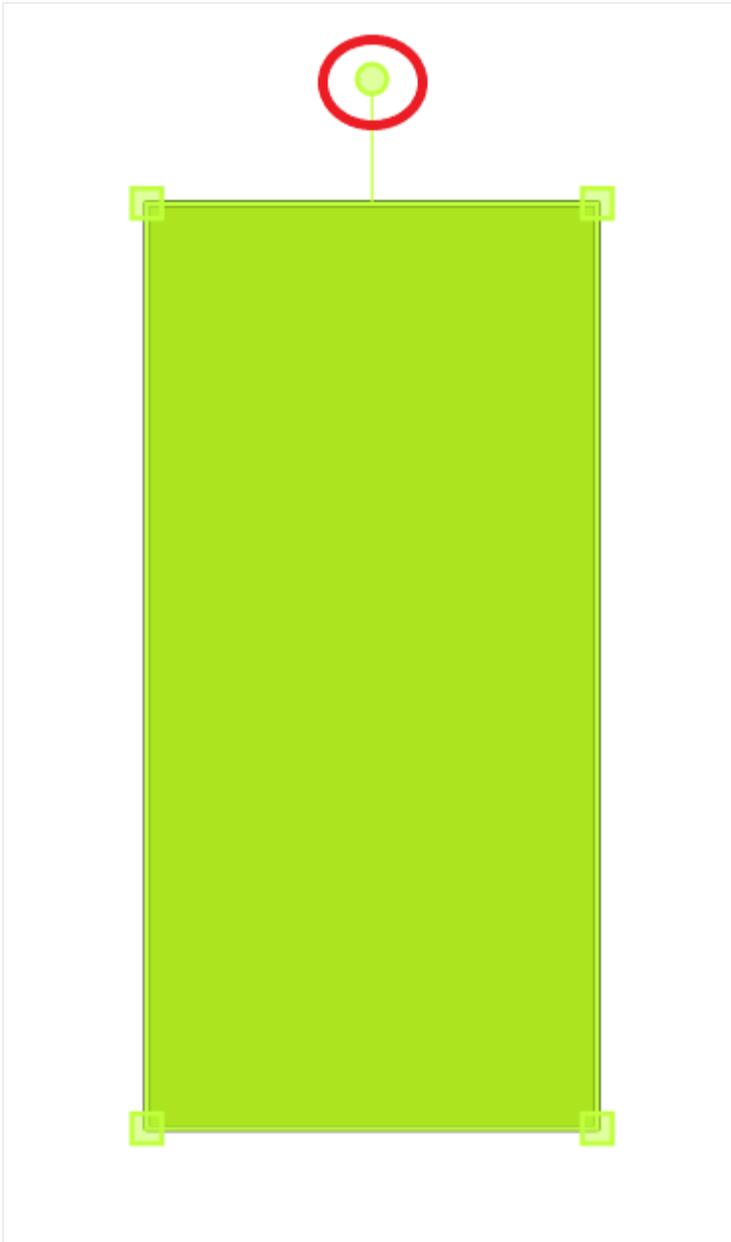
Cut an object to the clipboard, by using the 'cut' button (Ctrl-x). Once it's in the clipboard, simply navigate to the target diagram, then right click, and paste (or simply press ).

#### **Attention!**

When moving objects from one diagram to another, netTerrain automatically rearranges any connections and reference nodes to reflect the hierarchy changes correctly.

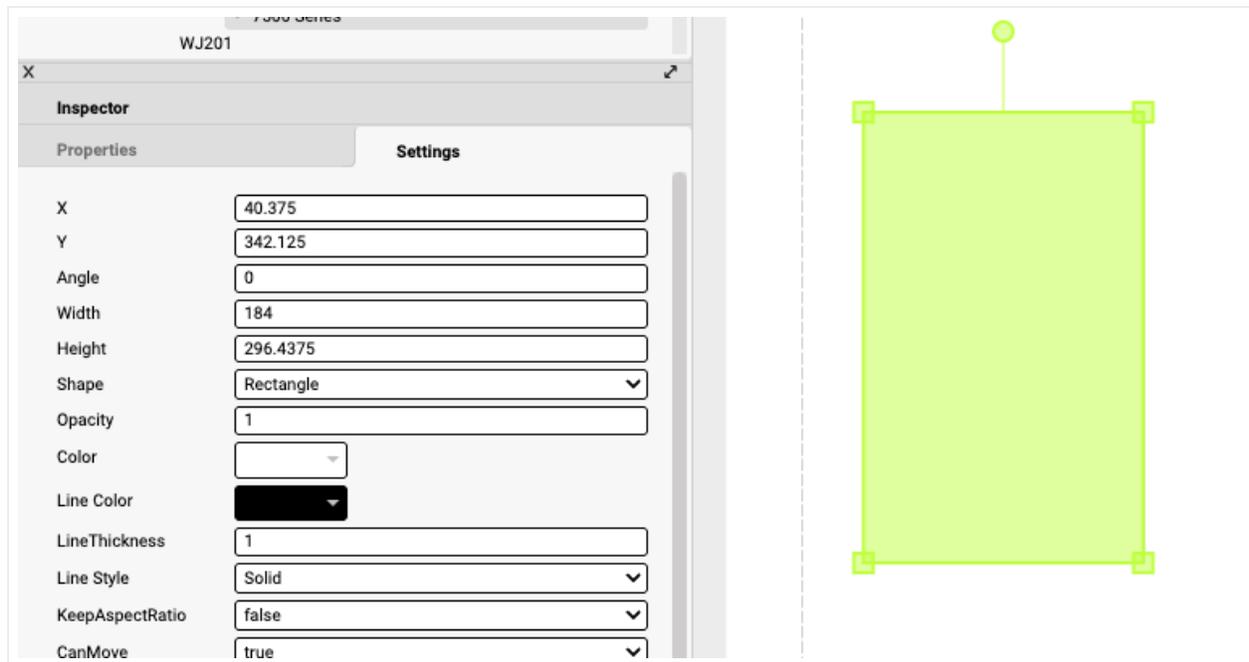
#### **4.1.3.2 Rotating**

To rotate an object, select it first and then hover the mouse over the rotation handle. Notice how the mouse cursor changes to a rotation cursor. Proceed to click on the handle and hold the left mouse button as you move the mouse. Note that for better control it is ok to move the mouse 'away' from the handle.



*Rotation handle*

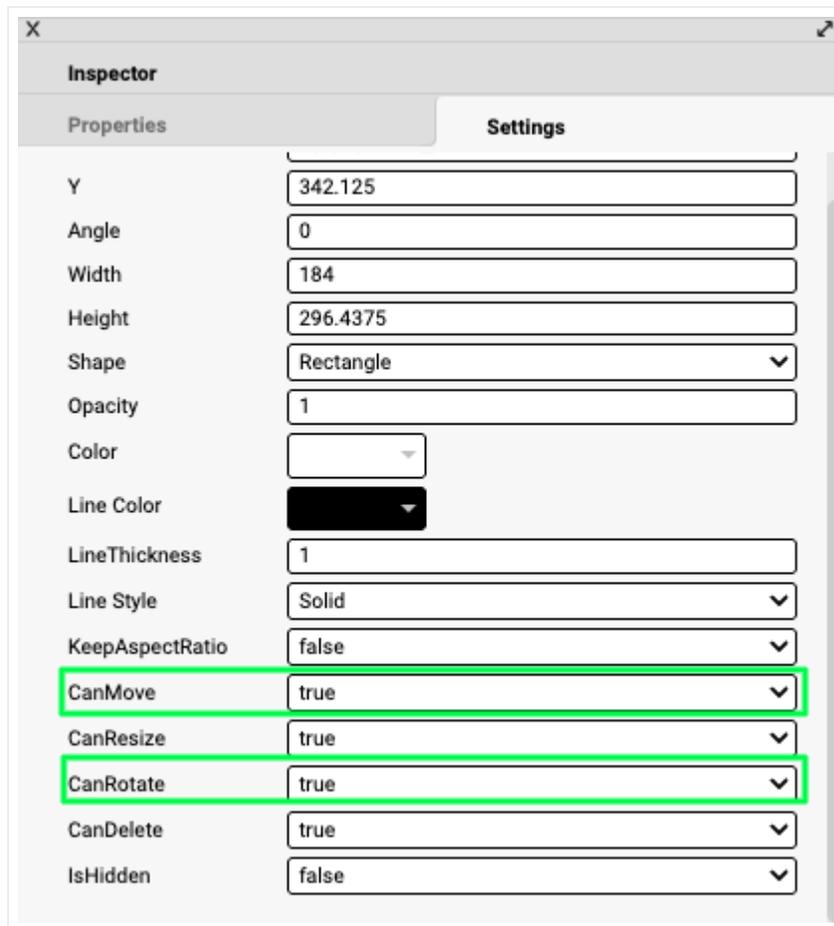
Also, the object angle can be controlled from its settings tab:



*Angle setting for rotation fine tuning*

### Attention!

If the move or rotation object handle is missing, it means that the object is locked for that operation. If you need to move or rotate an object, click on the object and then from the settings tab, make sure the 'CanMove' and/or 'CanRotate' options are set to true.



*CanMove and CanRotate options*

### 4.1.3.3 Rotating nodes with fixed 30 degree increments

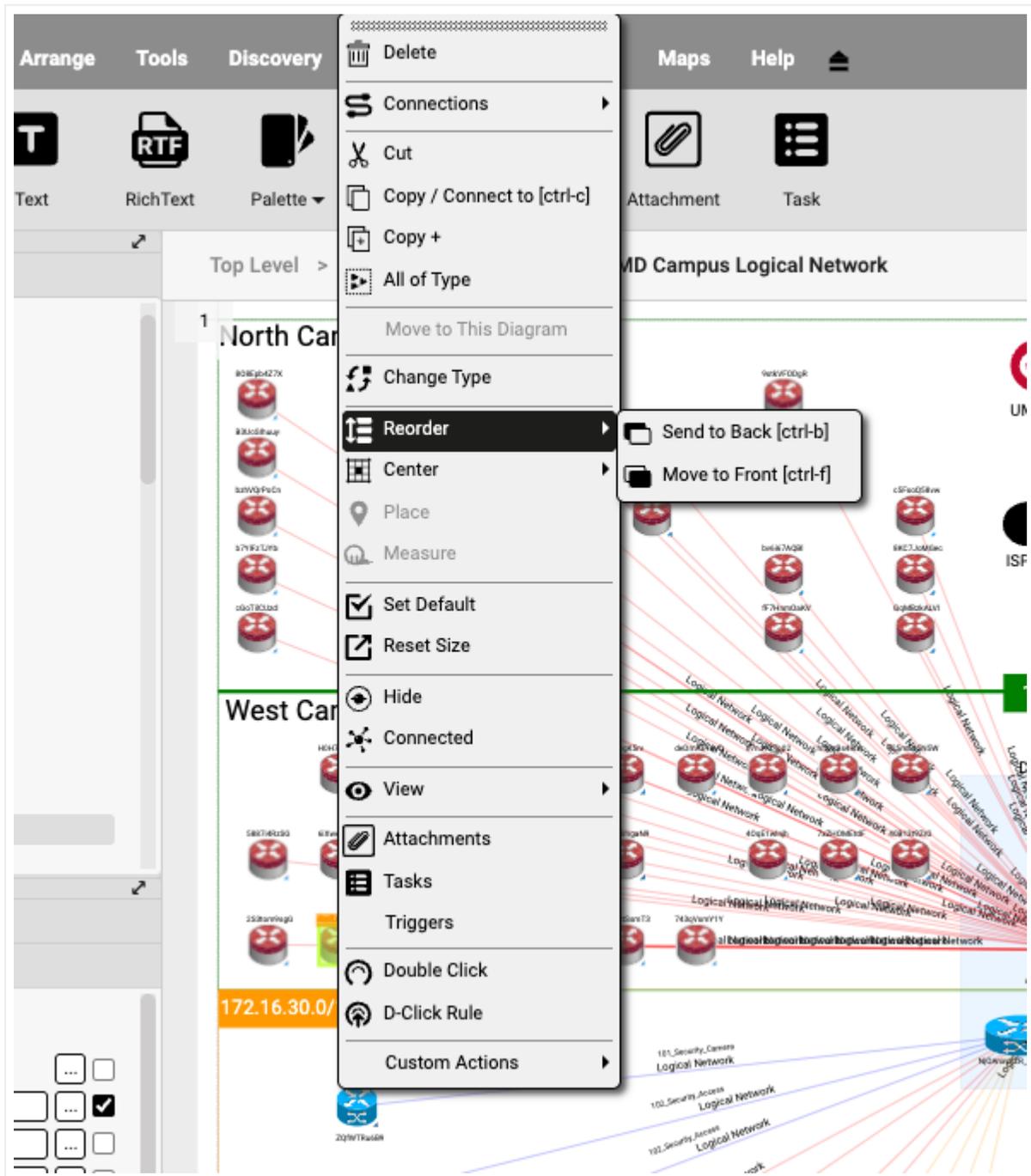
In many instances you want a node to be rotated by a nice multiple or round number. A nice trick in netTerrain is to rotate a node by holding the key, which rotates the node in fixed increments of 30 degrees.

This comes especially handy when you want the object to be horizontal, rotated by 90 degrees or by 180 degrees. Without this trick it could take a few steps of trial and error to get the object to be perfectly level, whereas with the key pressed, it is much easier to obtain a perfect result!

### 4.1.3.4 Moving objects to front and back

In many cases when objects overlap, users want to control the so called z-order of some of these objects. Objects can be sent to the back of the z-order or brought to the front, with respect to other objects on the diagram.

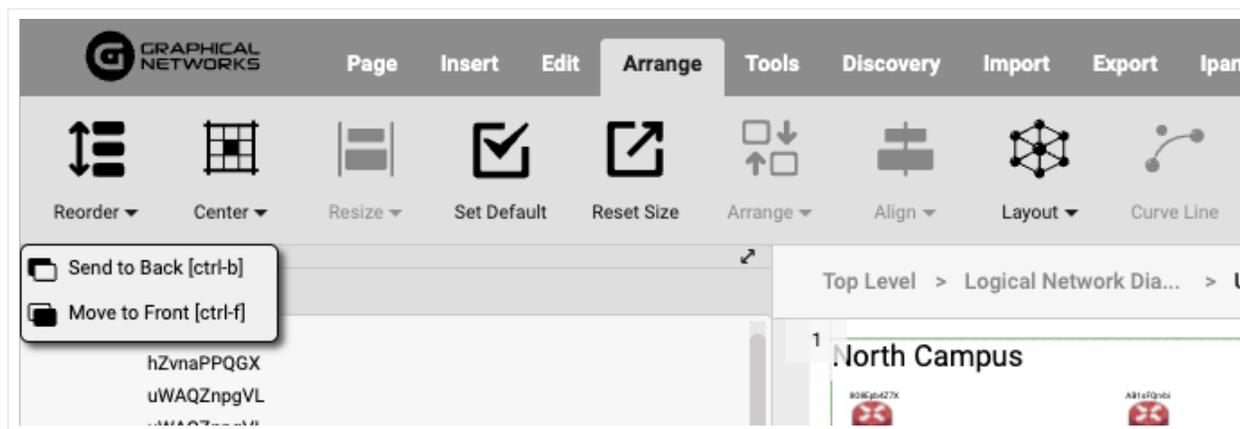
To do this, simply right-click on the object and select one of the 'reorder' options, as shown below.



### Changing the z-order of a node

Reordering in the z coordinate is also available for link. For example a link may be shown in front of its connected node or behind it.

You can also change the z-order of objects using the reorder button that you can find in the Arrange ribbon.



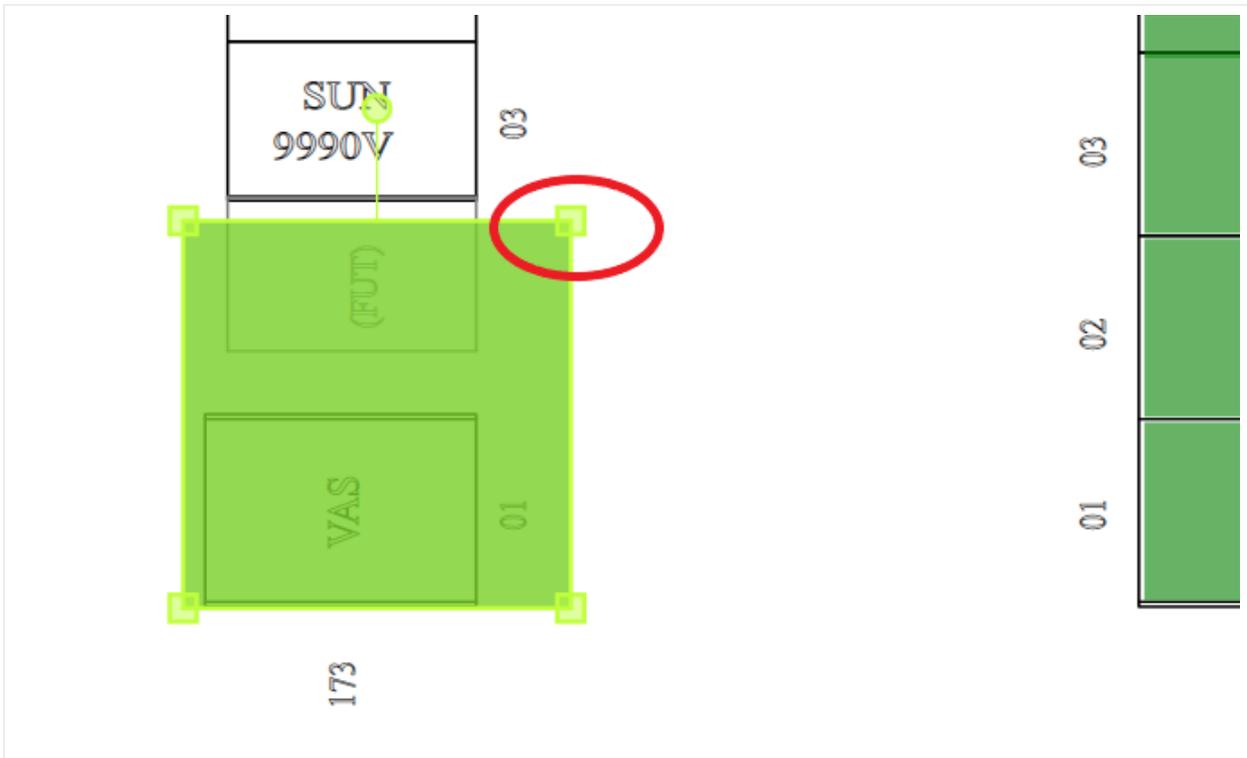
*Reorder button in the arrange ribbon*

**Tip:**

Use the shortcuts! For the 'Move to front' and 'Send to back' options you can use [ctrl-b] and [ctrl-f].

#### 4.1.4 Resizing objects

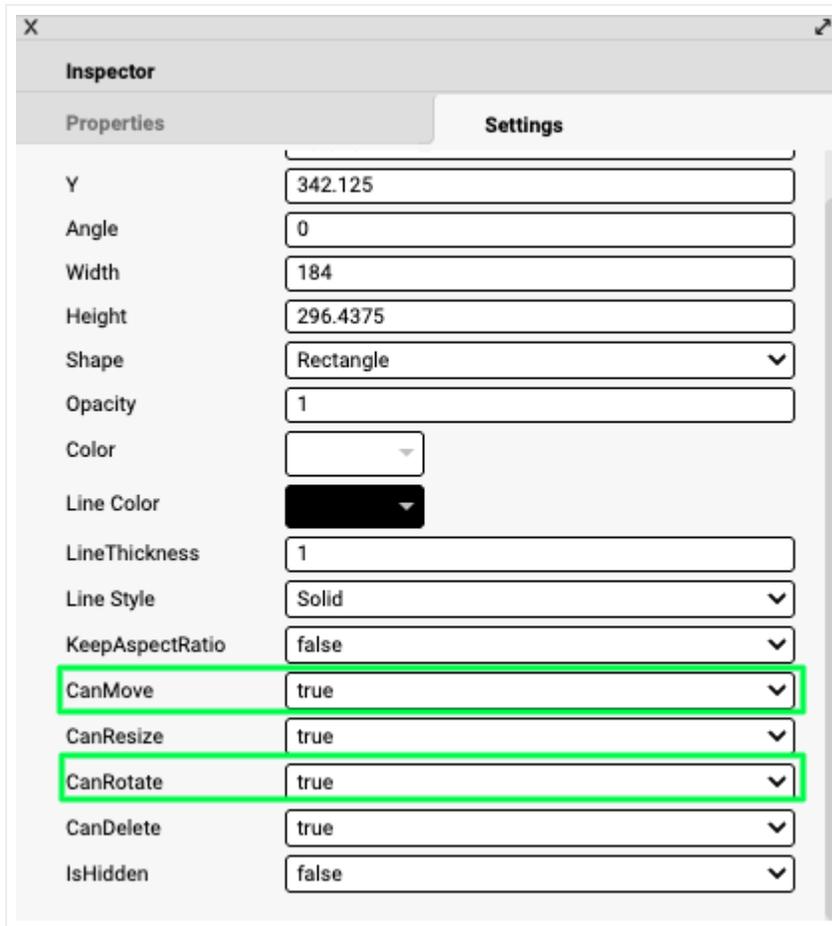
Resizing an object in netTerrain is a very simple task. Simply select the object and then drag one of the resize handles to change the size.



*Resizing handle*

**Attention!**

If an object retains its aspect ratio, this is because the `KeepAspectRatio` option in the object settings tab is set to true. Also, if the resize object handle is missing, it means that the object is locked for that operation. Change the `CanResize` option as needed.



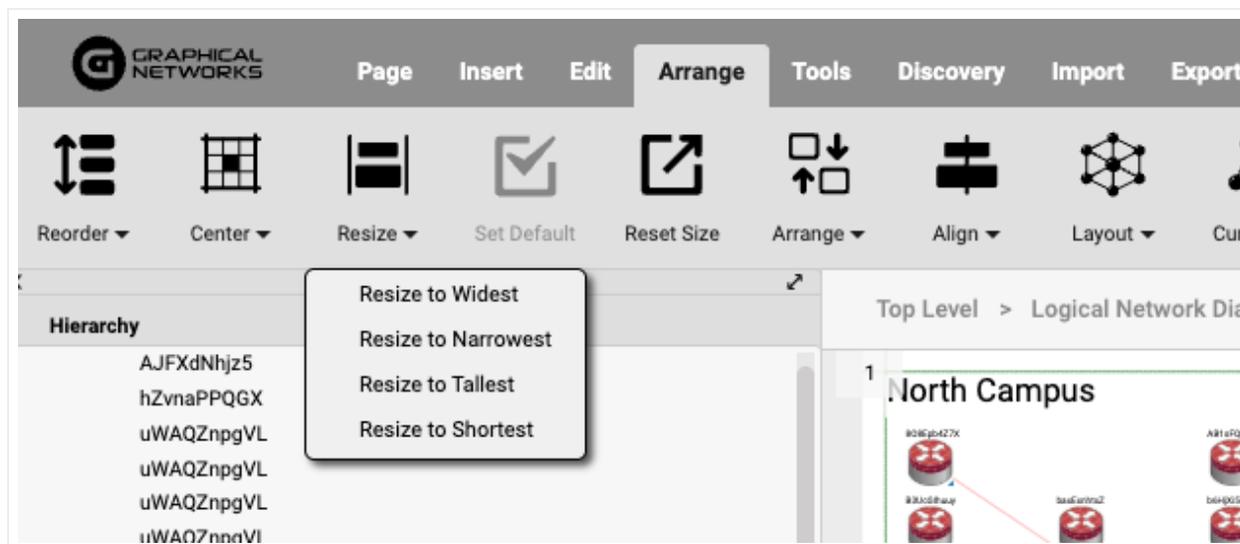
*CanMove and CanRotate options*

#### 4.1.4.1 Resizing objects in bulk

The resize options work on any type of object in netTerrain, including nodes, palette objects, images, and free text. netTerrain provides a menu for the main bulk resizing operations, which include:

- resizing to shortest
- resizing to widest
- resizing to narrowest
- resizing to tallest

Any of these operations work over the current set of objects selected by the user. Note that if the diagram forces objects to keep the aspect ratio, then the smallest dimension will be utilized as a reference for resizing.

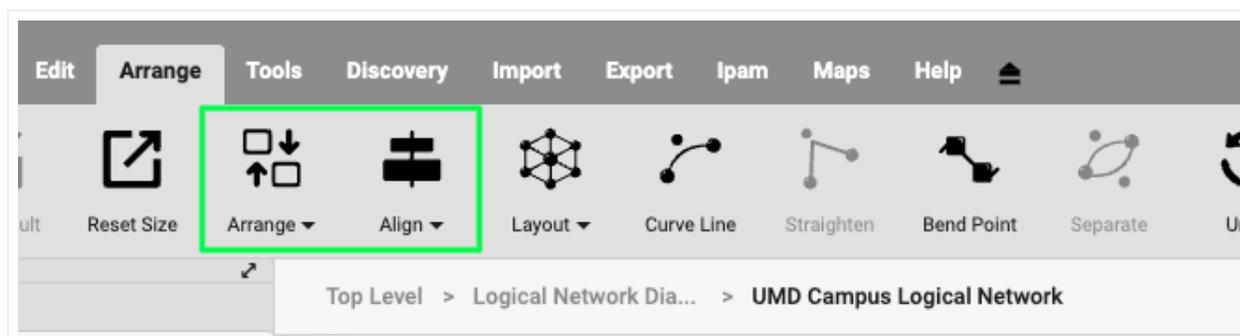


*Resizing a set of objects*

### 4.1.5 Aligning and arranging objects in bulk

In many cases users need to align, arrange, or center multiple objects on a diagram, in which case it is convenient to use bulk operations, instead of working with single objects at a time.

As a faster alternative to individual arranging and resizing, netTerrain offers two convenient menu options.



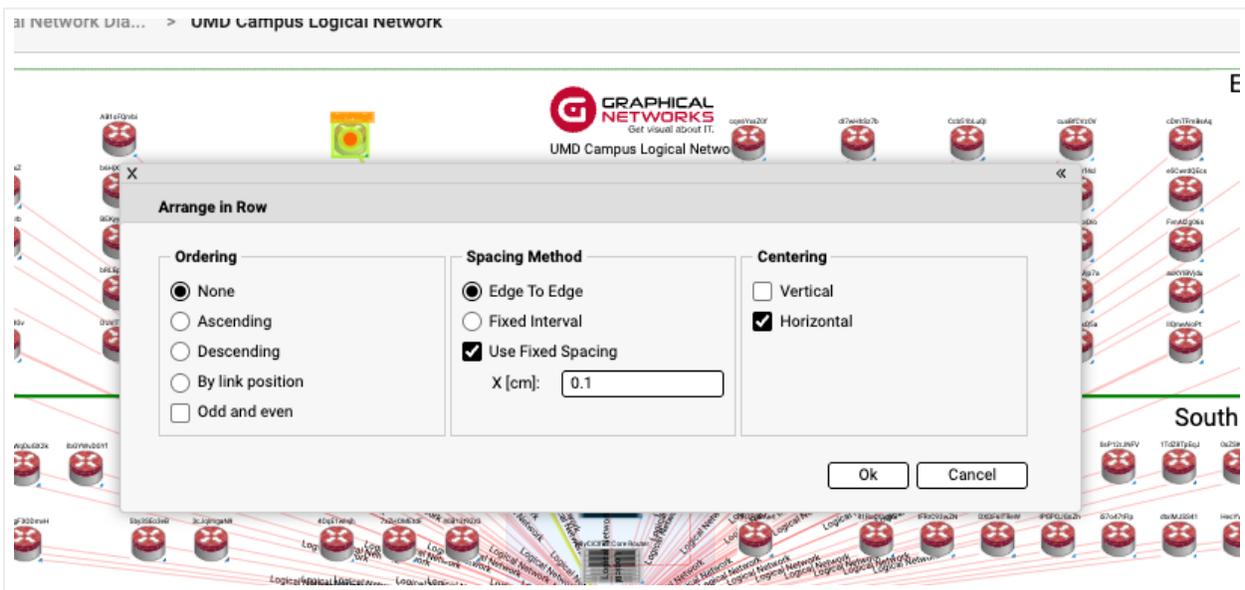
*Arrange and resize button*

The arrange button lets users arrange a set of objects in a row, column, tile, or ellipse as well as left, right, top and bottom alignment. An additional graph layout algorithm called 'Force directed layout' helps a user spread out connected nodes to minimize crossings. Users select the objects that need to be arranged using the selection button and then proceed to select the best suitable arrange option.

## 4.1.5.1 Row and column arranging

Options for row and column arranging include the ability to sort objects in ascending or descending order. First select a set of objects and click on the 'arrange' button and select the arrangement type (for example row). The following options are available:

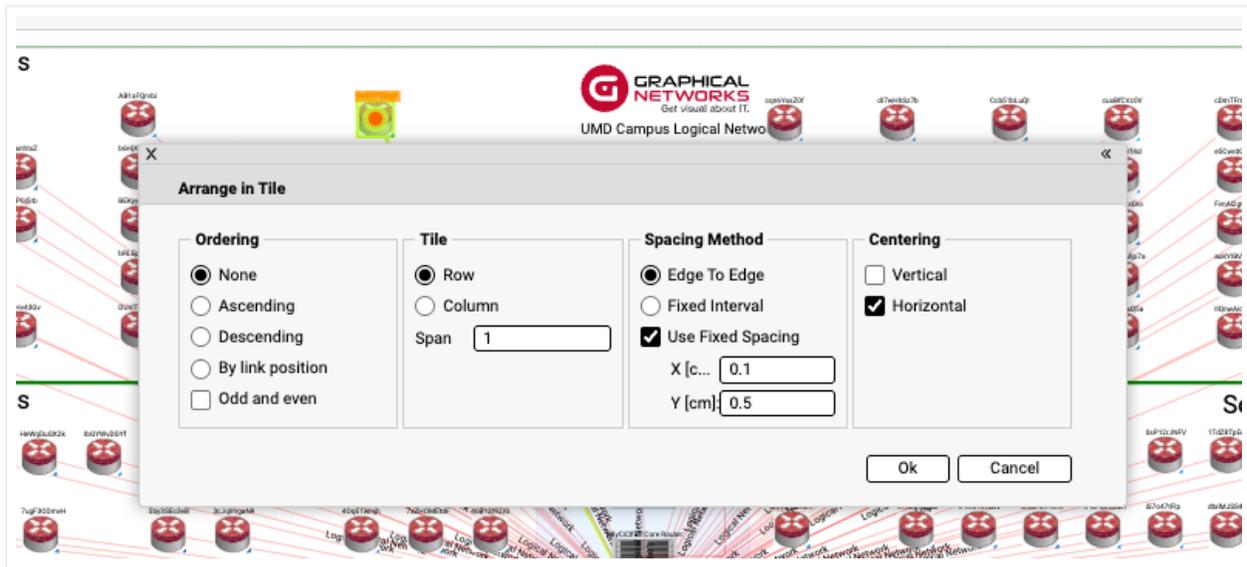
- Ordering:
  - None: keeps the current relative position of objects (by x coordinate for row arrangement and y coordinate for column arrangement).
  - Ascending: orders objects in ascending order by name.
  - Descending: orders objects in descending order by name.
  - Odd and Even: sorts the objects into odd and even groups.
- Spacing method:
  - Edge to Edge: the spacing is determined by the distance between object edges.
  - Fixed interval: the spacing is determined by the distance between the object centers.
  - Fixed spacing: when checked, provides the spacing distance, when unchecked the row boundary is determined by the x coordinates of the left and right most-objects before the arrangement took place.
- Centering:
  - Vertical: the ensuing ordered row will be vertically centered with respect to the page.
  - Horizontal: the ensuing ordered row will be horizontally centered with respect to the page.



*Arranging a set of objects in a row*

### 4.1.5.2 Tile arranging

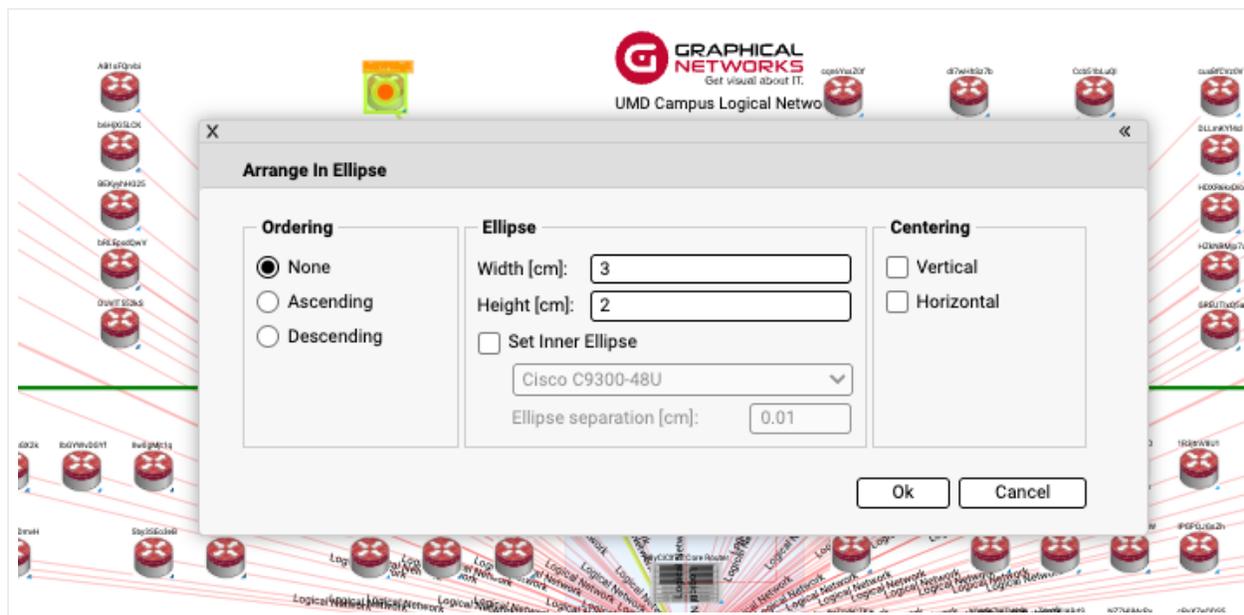
Users can create “object matrixes” with predefined row and column dimensions, using the tile arrange feature. In addition to the options above, tile arrangement also provides the option of selecting the number of rows or columns for the object matrix.



*Arranging a set of objects in tile*

### 4.1.5.3 Ellipse arranging

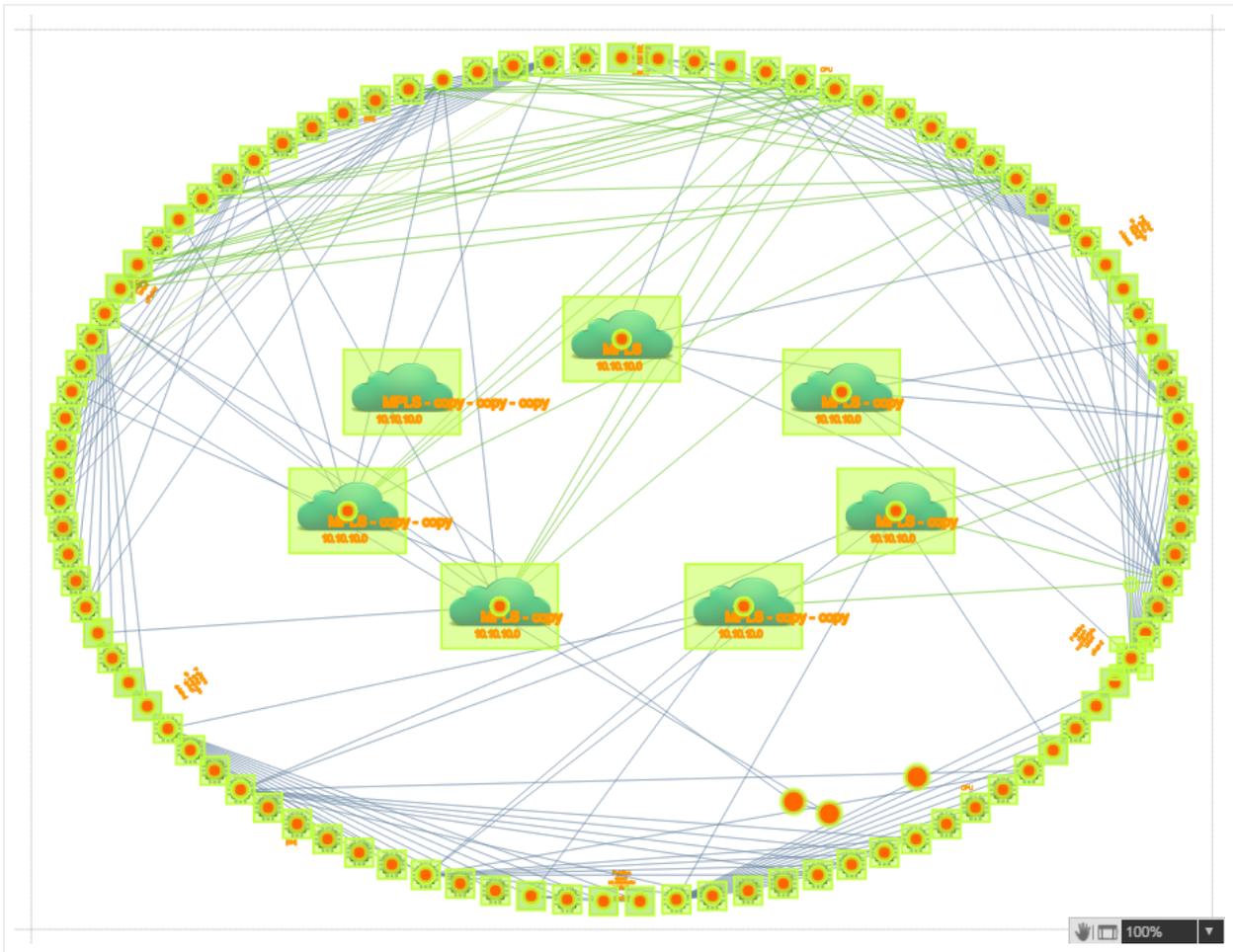
Besides row, column, and tile arrangements, netTerrain provides a convenient way to arrange objects in an ellipse, as shown in the diagram below.



### *Ellipse layout*

The ellipse layout can arrange objects in two ellipse “layers”, where the internal layer is comprised of a set of objects of a certain type and the external ellipse of all the other objects connected to the first layer. Ordering of objects, separation between ellipses and the height and width of the internal ellipse, as well as the centering of the resulting ellipse with respect to the page are the other options for this algorithm.

Note that if the size of the ellipse triggers some objects out of bounds, they are squeezed inside the drawing area determined by the page margins. netTerrain does not like to put objects out of bounds!



*Object distribution after applying ellipse layout*

#### 4.1.5.4 Force-directed layout

This feature works in conjunction with connections, so it only applies to nodes.

In some cases, you may want to have a large set of nodes and links automatically dispersed within a diagram. For instance, when you perform a discovery operation and a large set of devices and links are automatically added within a diagram, they are usually cobbled together in a bundle of nodes and links on the top left corner of the diagram. It can be very time consuming to try and place these nodes and links manually. With the 'Force-directed layout' algorithm we can spread out nodes and links and minimize link crossings for improved diagram readability.

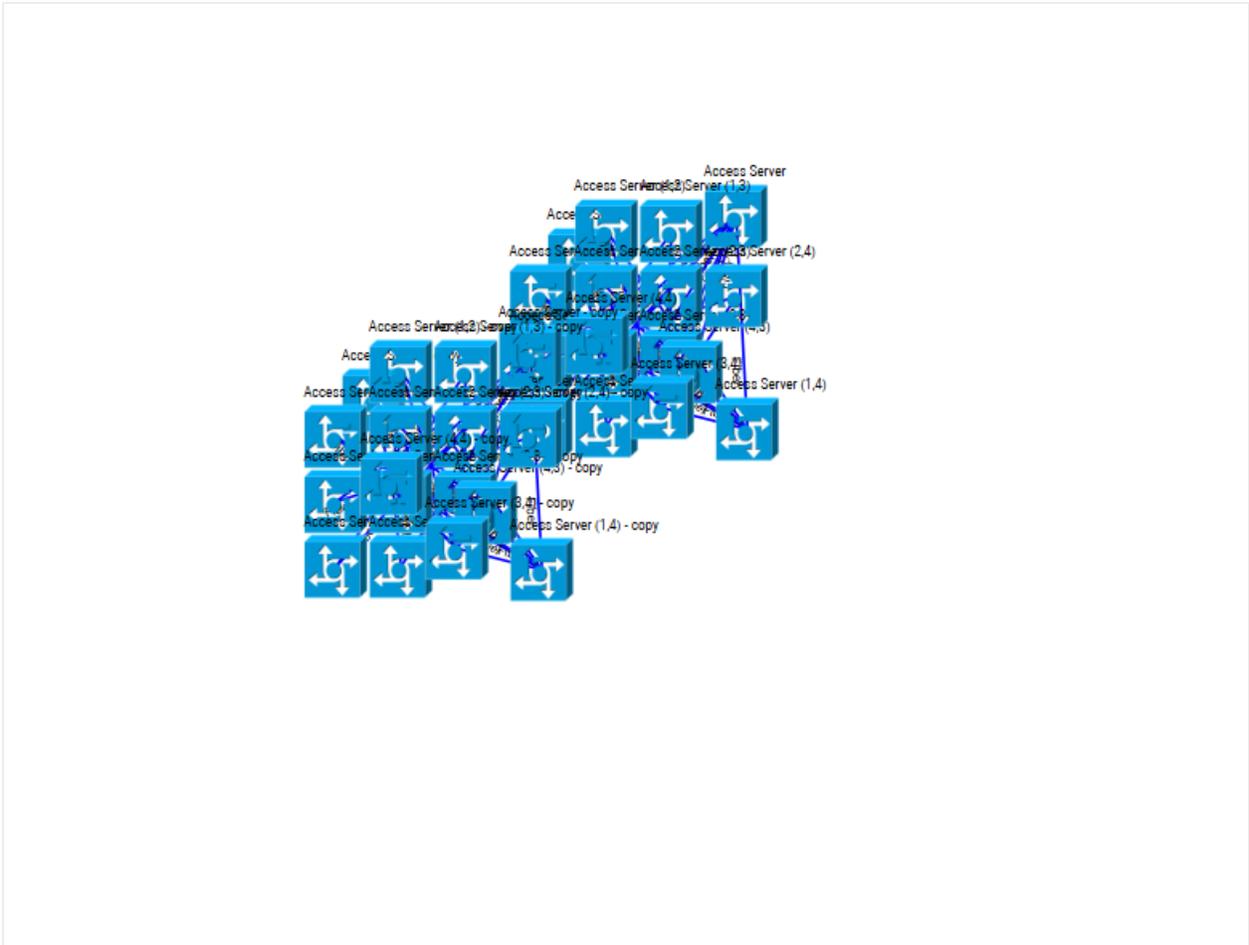
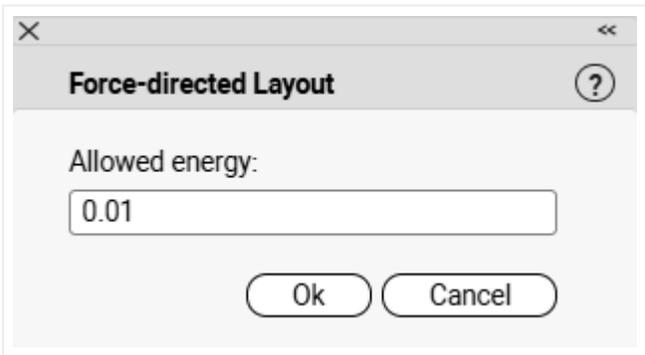


Diagram with nodes and links before applying a force-directed layout algorithm

The algorithm includes a setting referred to as the “energy level”. Low energy level values translate into less link crossings but also higher processing times for running the algorithm. The energy level value can be set between .01 and 1.



Energy level setting

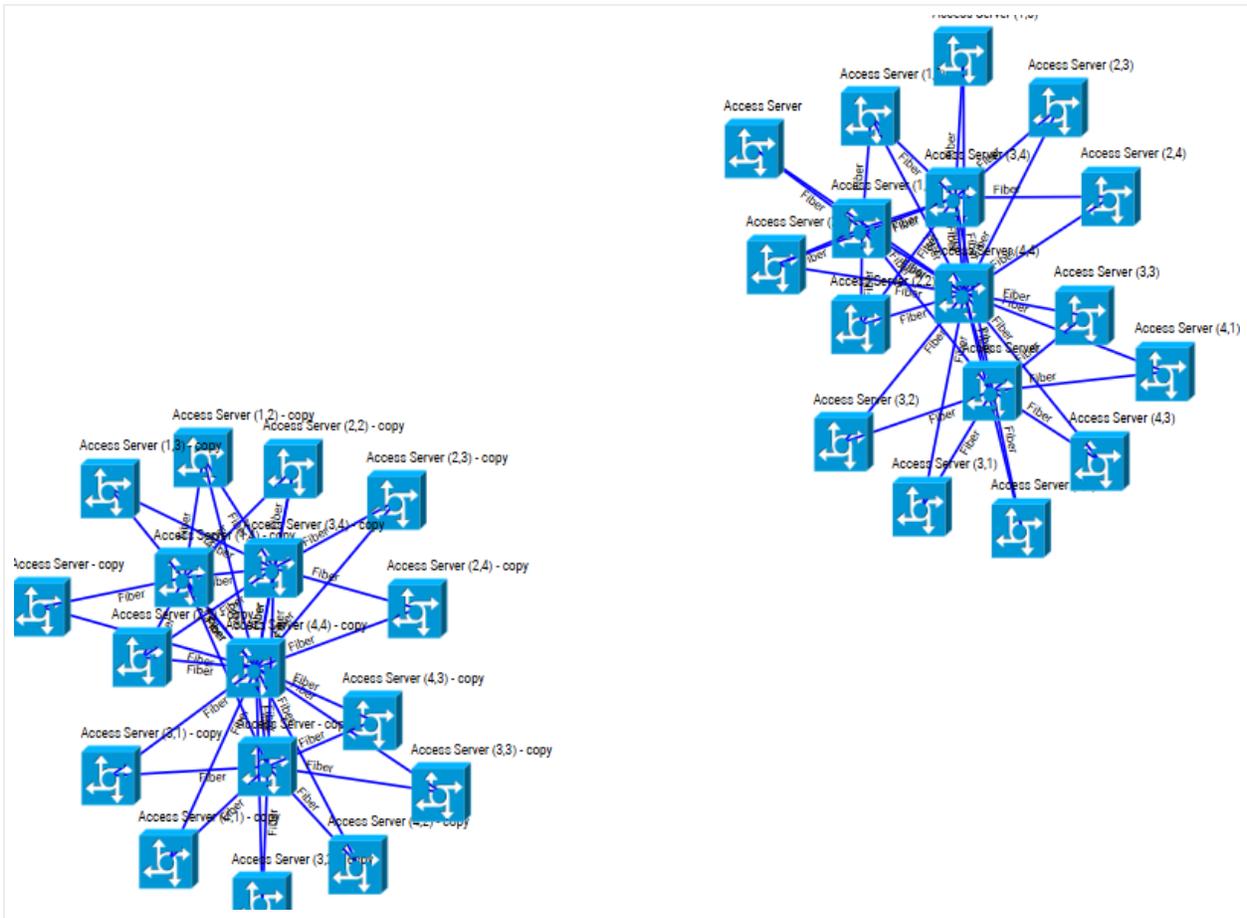


Diagram after the Force directed layout was applied

### 4.1.5.5 Centric Layout

The centric layout is a hierarchical-type layout that places a selected node at the center of the diagram and distributes all other connected nodes around the center node in a somewhat symmetrical fashion.

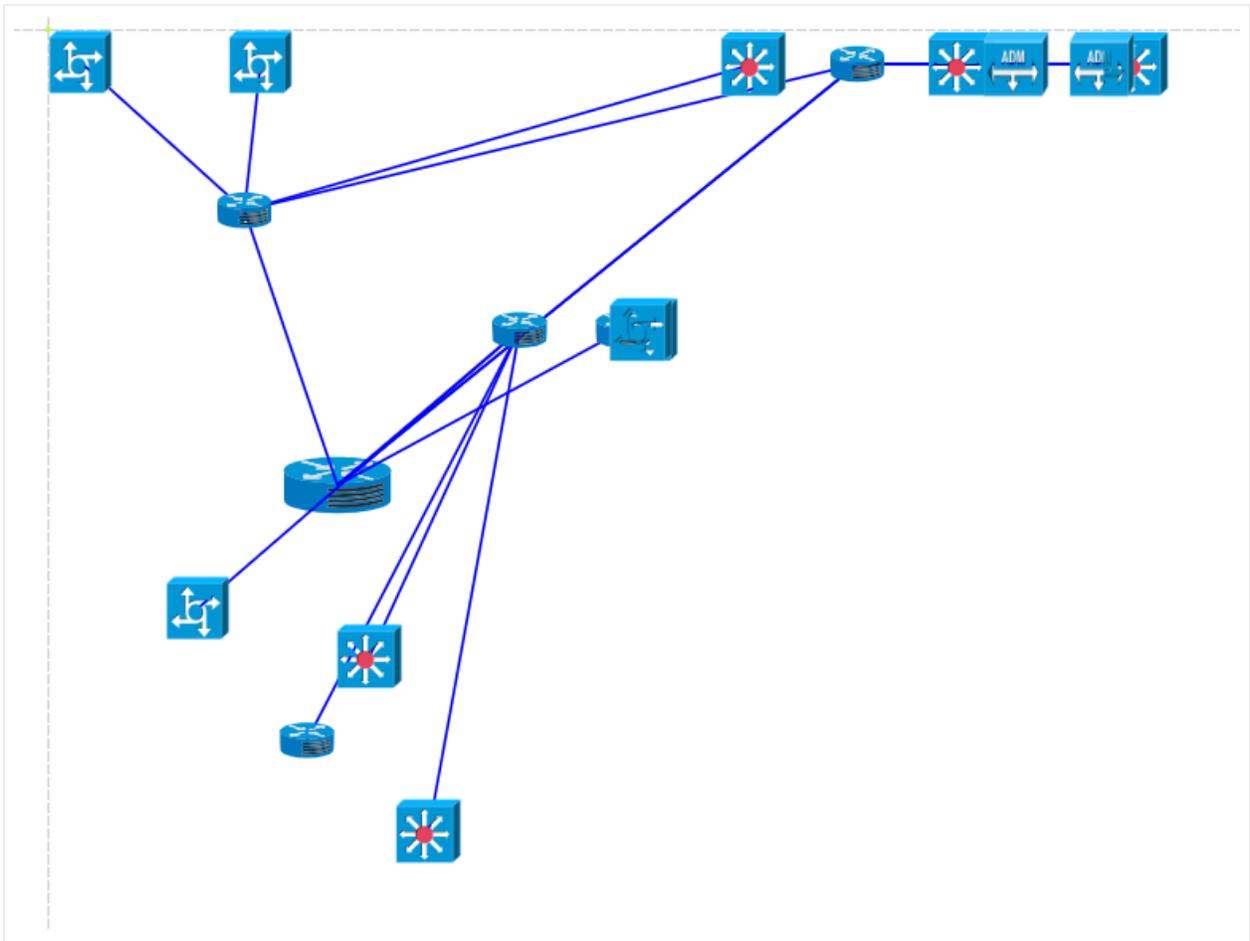


Diagram before applying the centric layout

To use the centric layout first select the node that you would like to be placed in the middle of the diagram and then click on the 'Centric Layout' button menu option. Only nodes that are directly, or indirectly connected to the selected (centric) node, will be affected by the algorithm.

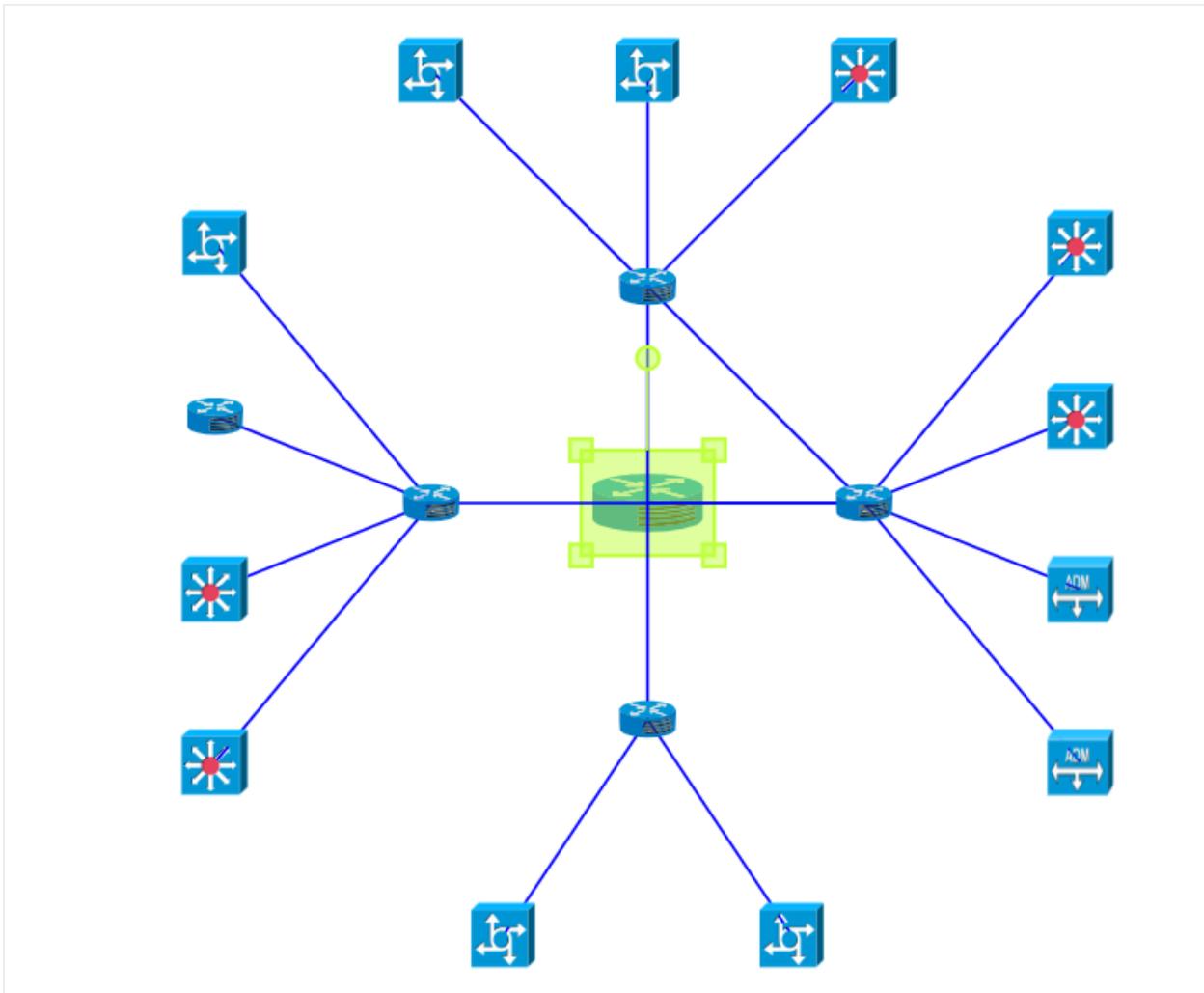
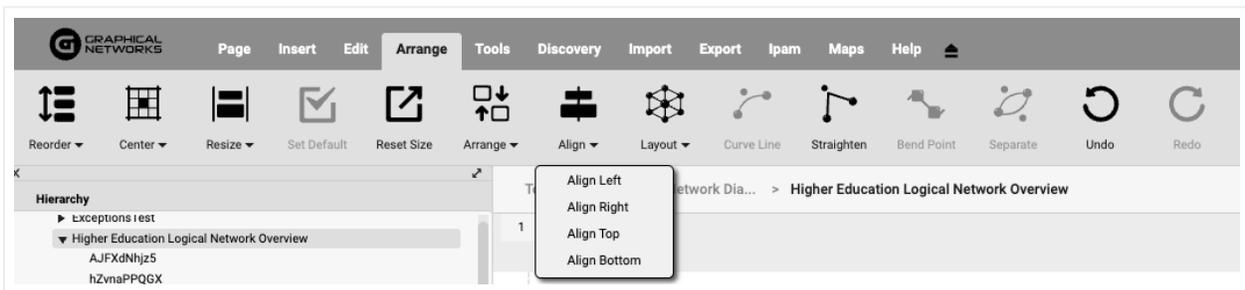


Diagram after applying the centric layout

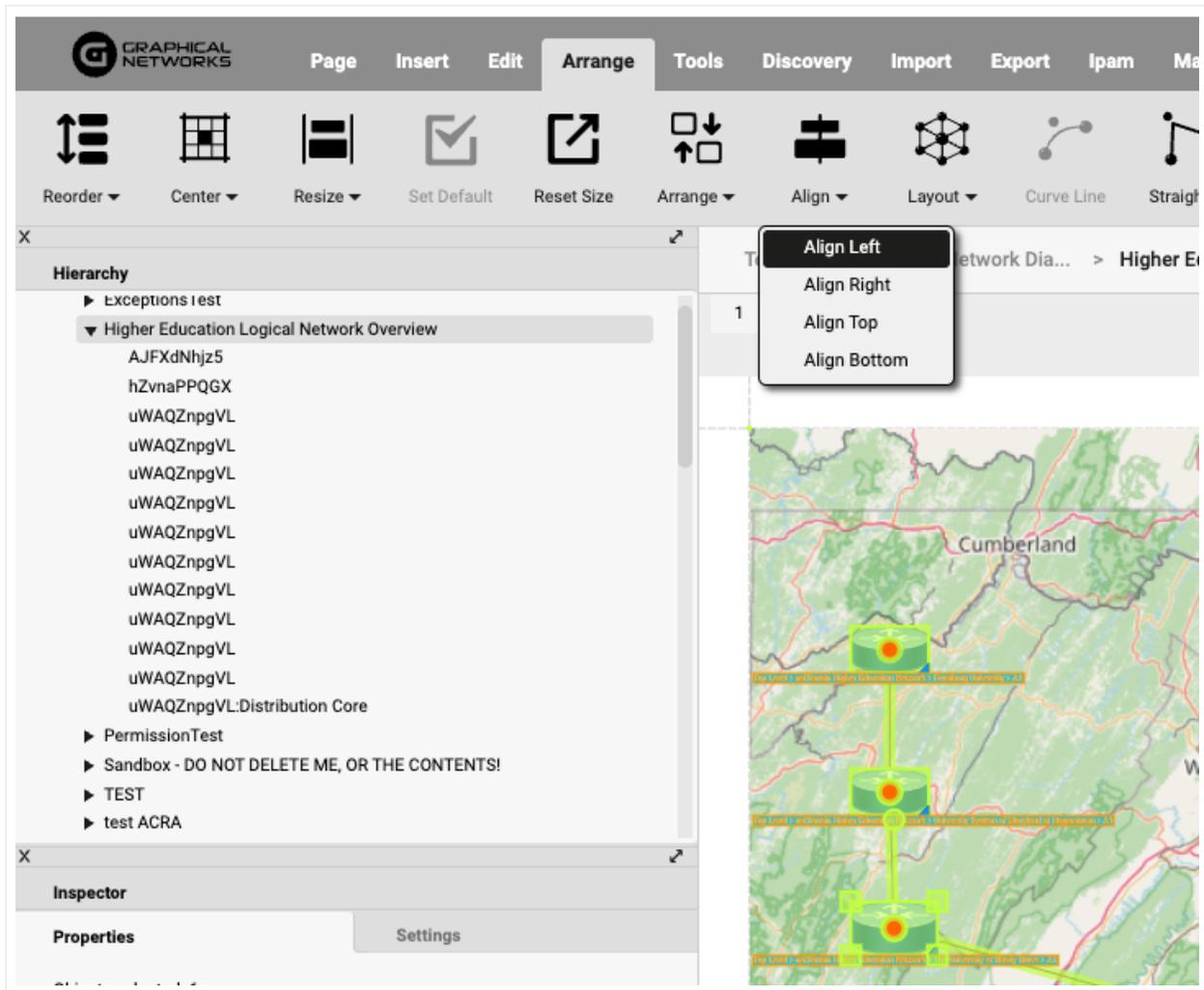
#### 4.1.5.6 Left, top, right, bottom alignments

In many cases users want objects on a diagram to be aligned in one dimension, while maintaining the same relative position in the other dimension. For that purpose, netTerrain has the option to align objects based on the left-most, right-most, top-most or bottom-most object in the selection.

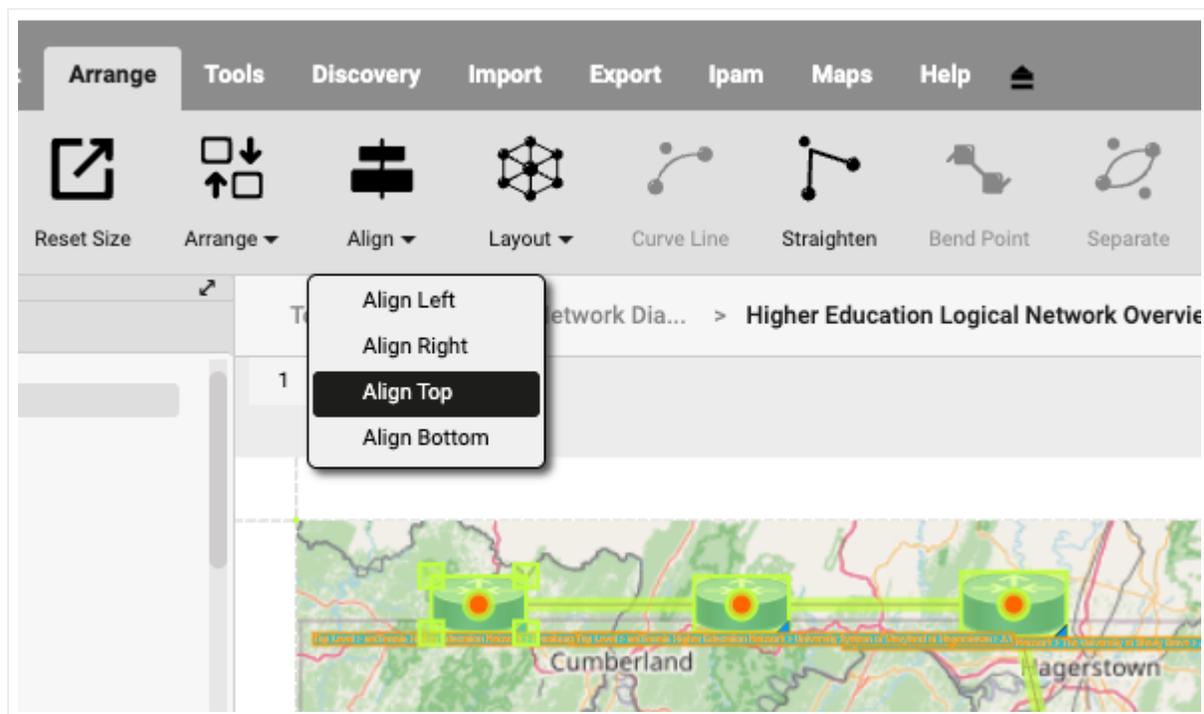


Left, top, right and bottom object alignment options

Below, we show some screenshots after a left and a top alignment operation.



Objects after a left alignment operation

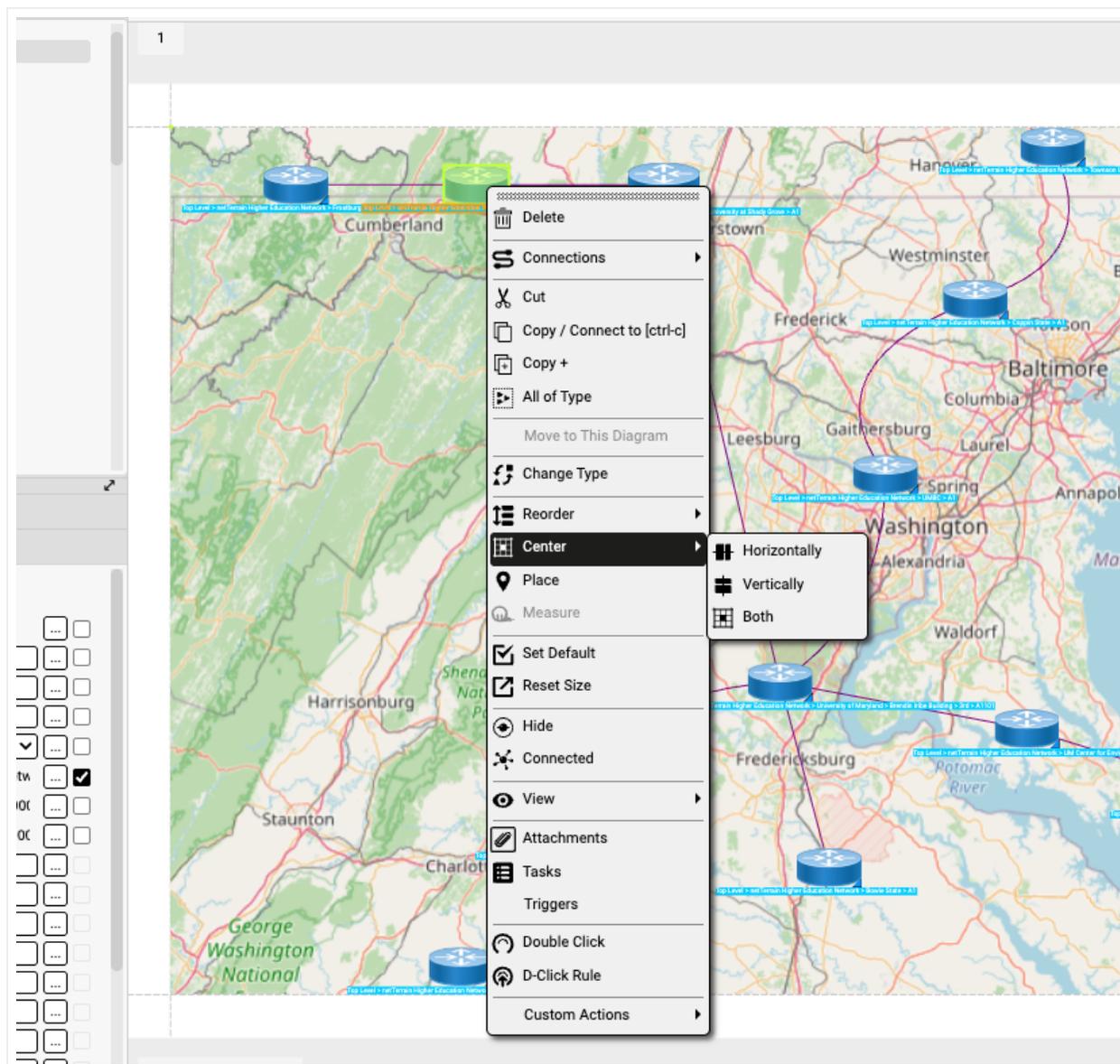


*Objects after a top alignment operation*

### 4.1.5.7 Centering objects

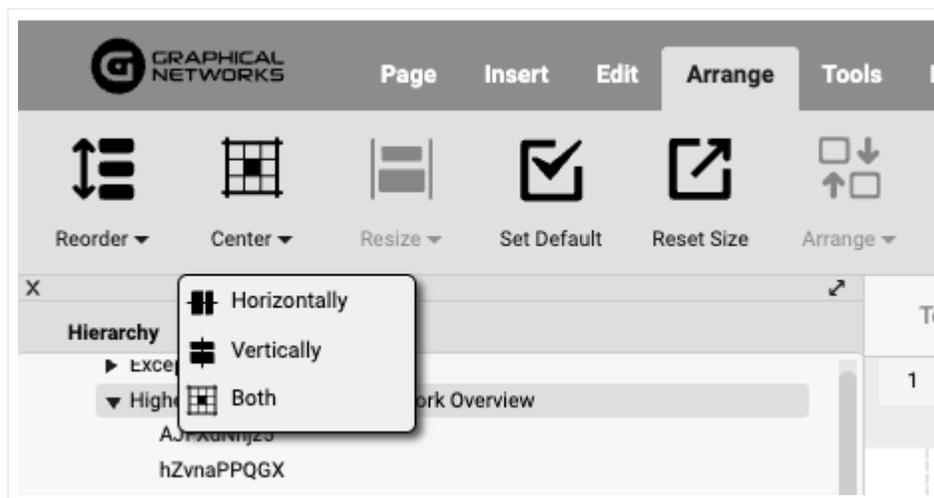
Users can automatically center objects horizontally, vertically, or both by right-clicking on the object and clicking on one of the three centering options available.

For example, to center a node horizontally, select the node and then click on the 'center horizontally' submenu.



### Object centering

You can also change the centering of objects using the Center button that you can find in the Arrange ribbon.



Center button in the arrange ribbon

## 4.1.6 Diagram backgrounds and grid

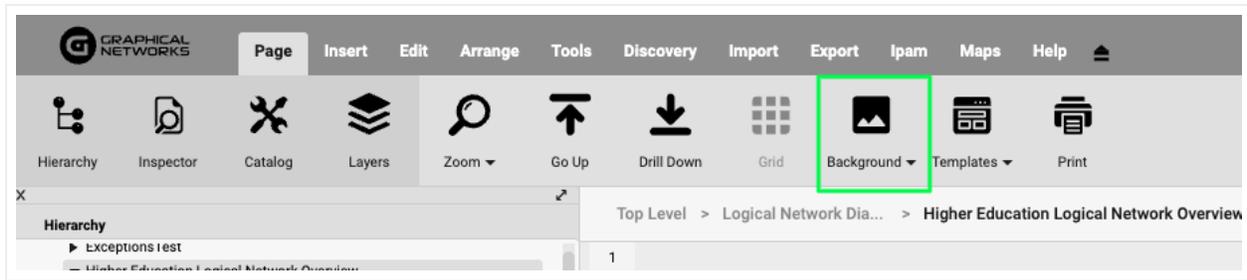
Node diagrams can contain background images, which are used to enhance the navigation and look and feel of the project. If you don't want to upload a background image yet want to provide a bit of sizzle to your diagram, you can change the background color.

### 4.1.6.1 Uploading background images

netTerrain supports the following formats for background images:

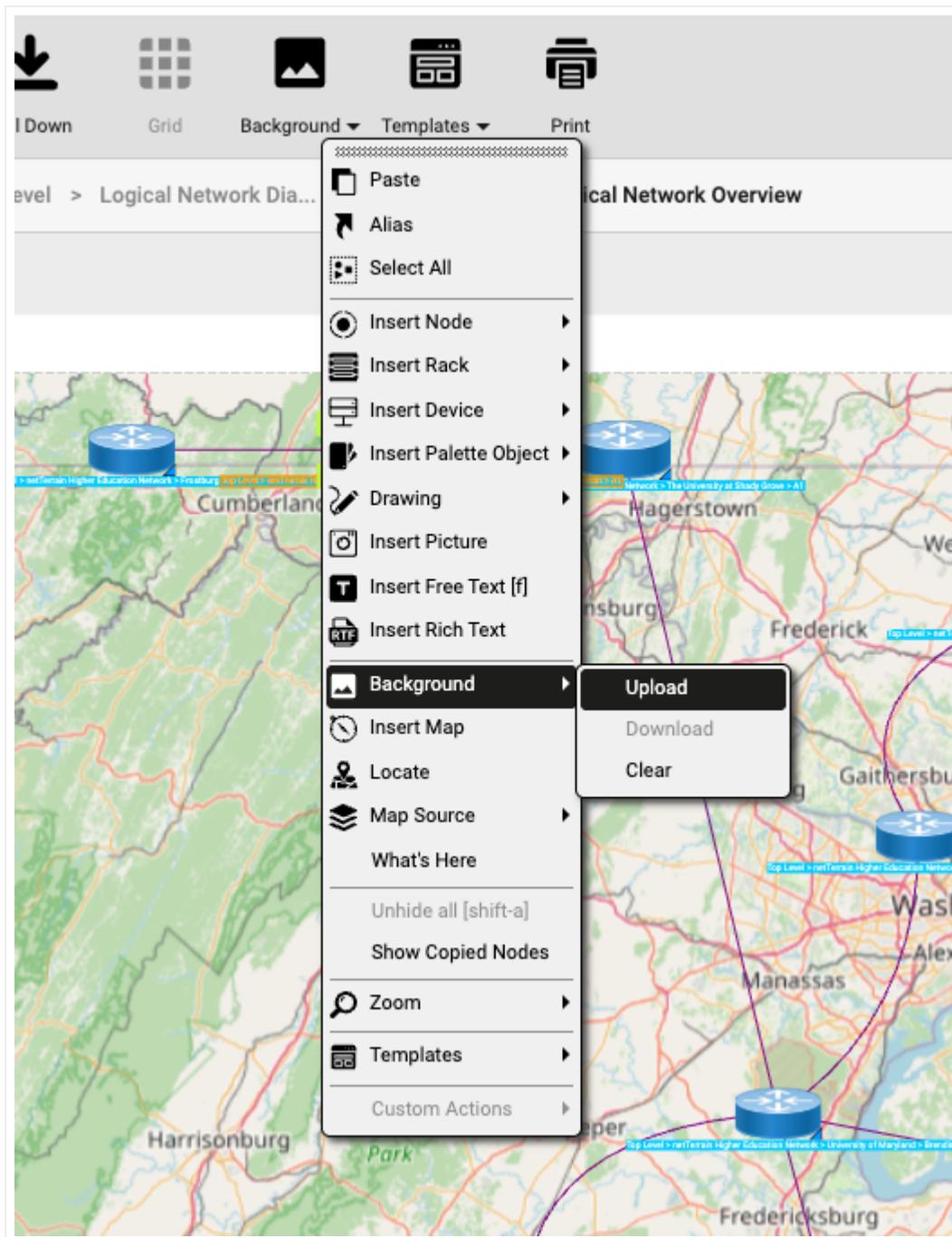
- Raster formats:
  - jpg
  - png
  - gif
  - bmp
- Vector format:
  - svg

Background images stretch to the whole page size and cannot be selected or resized. To upload a background image simply click on the upload background button found under the Page menu and select an image file from any local or network drive.



### *Background upload button*

Once selected, the image will be uploaded to the server and rendered on the diagram. You can also use the diagram right-click context menu to accomplish the task.



Uploading a background image using the context menu

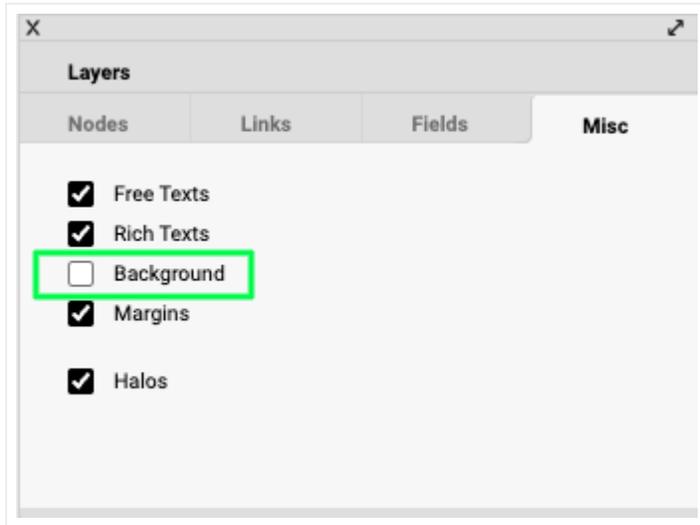
#### 4.1.6.2 Clearing a background image

A background image can be cleared from the diagram by right-clicking and selecting 'Clear background'.

Note that the 'clear background' option removes the background completely.

### 4.1.6.3 Hiding a background image

If you just need to hide the background, you can simply filter it out by using the background checkbox in the diagram “Layers” Misc settings.



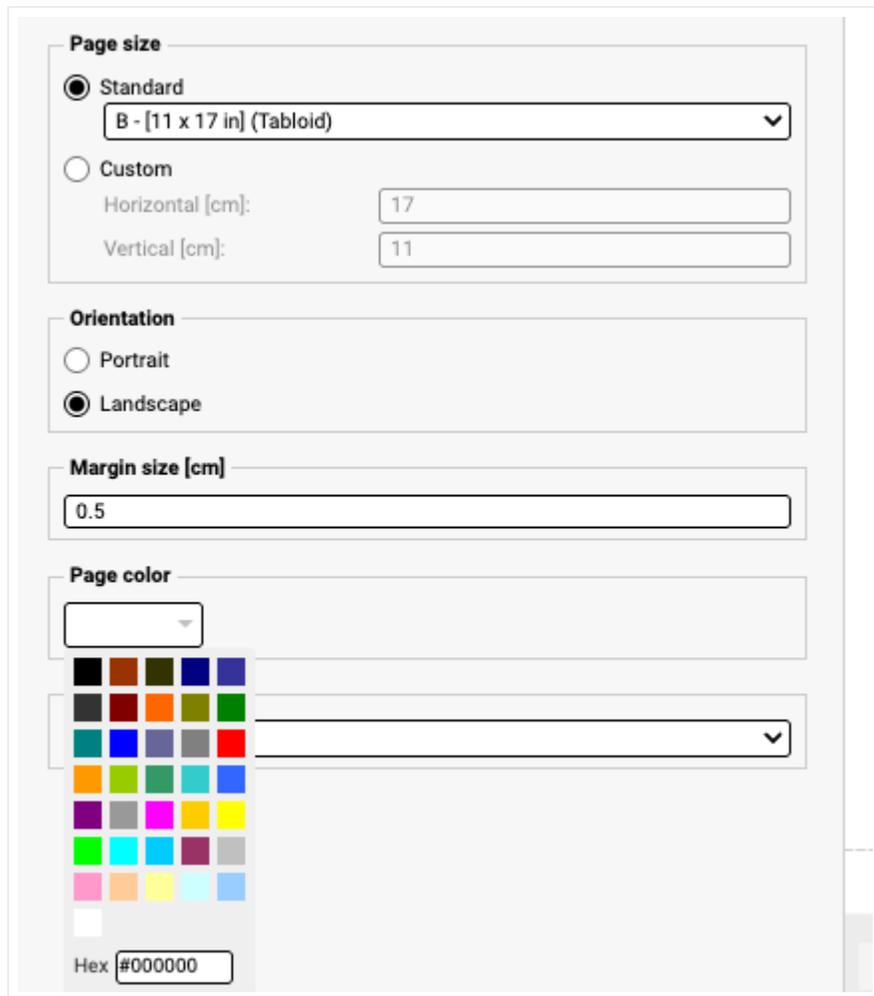
*Background filtering*

#### Attention!

If a background does not show up after being uploaded it may be because the Background option in the diagram settings page is unchecked.

### 4.1.6.4 Changing the diagram background color

An administrator can set up the default background color of a diagram (usually white) but users can override that color on a per diagram basis. To change the background color of a diagram, click on the settings tab (in diagram mode) and select a color from the ‘Page color’ groupbox, as shown below:

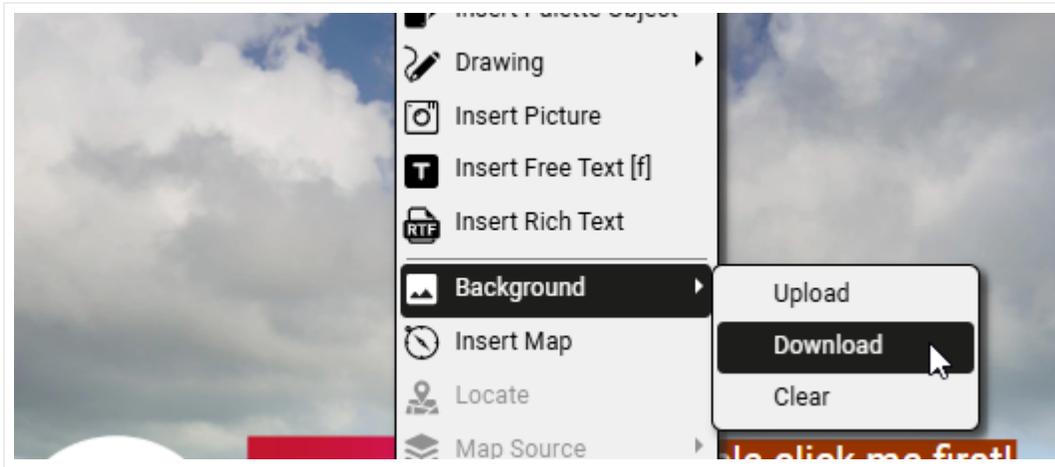


*Changing the default page color of a diagram*

#### 4.1.6.5 Downloading a background image

Users can also download background images that have been uploaded and associated with a diagram.

To download a diagram, you can use the diagram context menu or the background button in the Page ribbon. Simply click on the 'Download' button and fetch the image from the default download folder used by your browser.



*Downloading a background using the diagram context menu*

#### 4.1.6.6 Defining a diagram grid

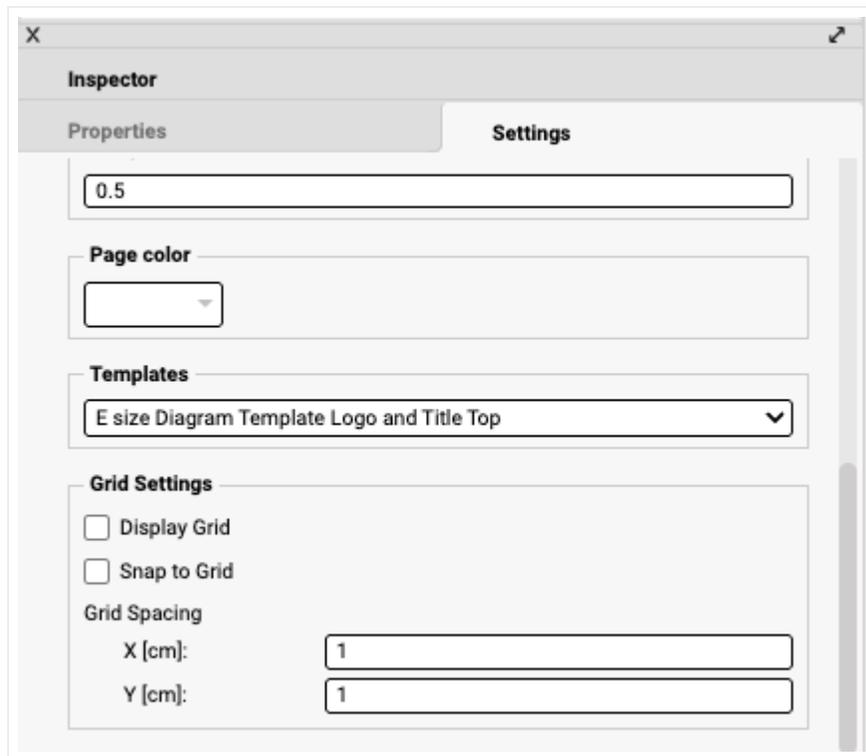
For any node diagram (that is, a diagram that is not inside a rack, device, or card) you can visualize a grid and define the grid spacing.

To enable the grid on a diagram simply click on the grid button on the Page menu:



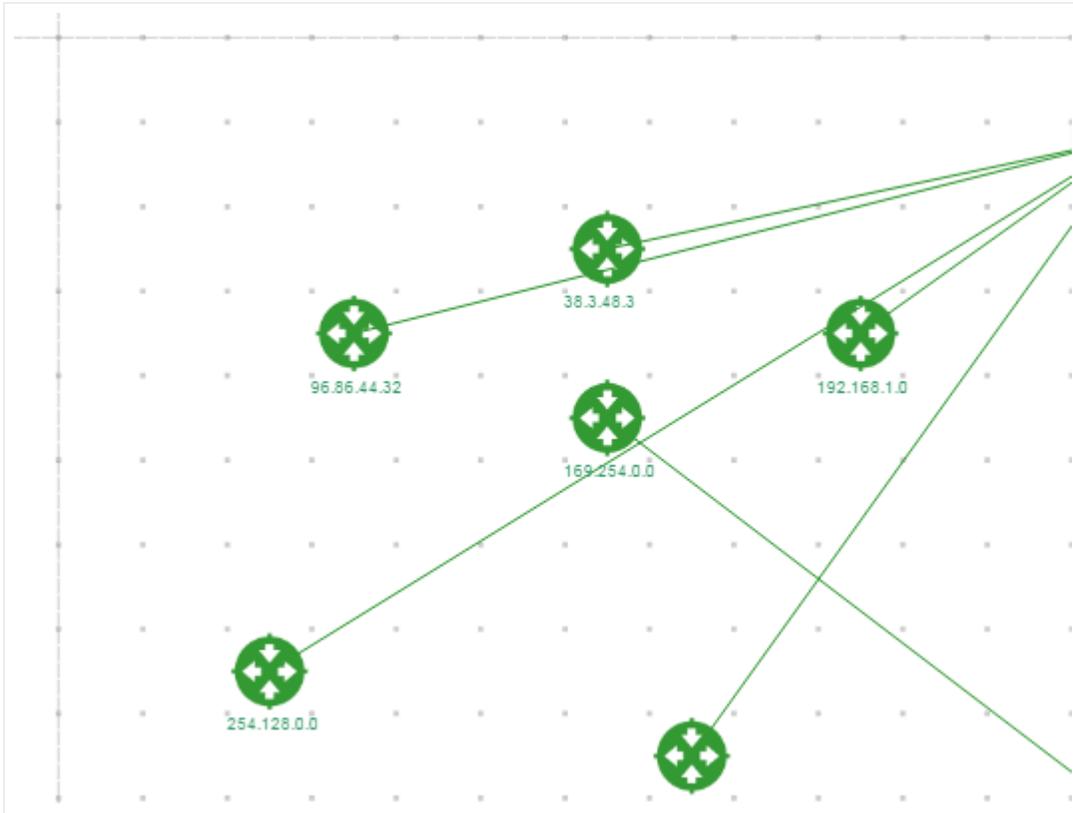
*Grid button*

Alternatively, you can check the grid checkbox on the diagram settings tab:



### *Grid settings*

When you enable the grid for a diagram, the default spacing of 0.5 inches is shown, and objects will automatically be snapped to the grid. When enabling the grid through the setting, the snap to grid options is enabled through an additional checkbox, as displayed in the image above. In short, any objects dropped onto the diagram or moved will snap to the grid.



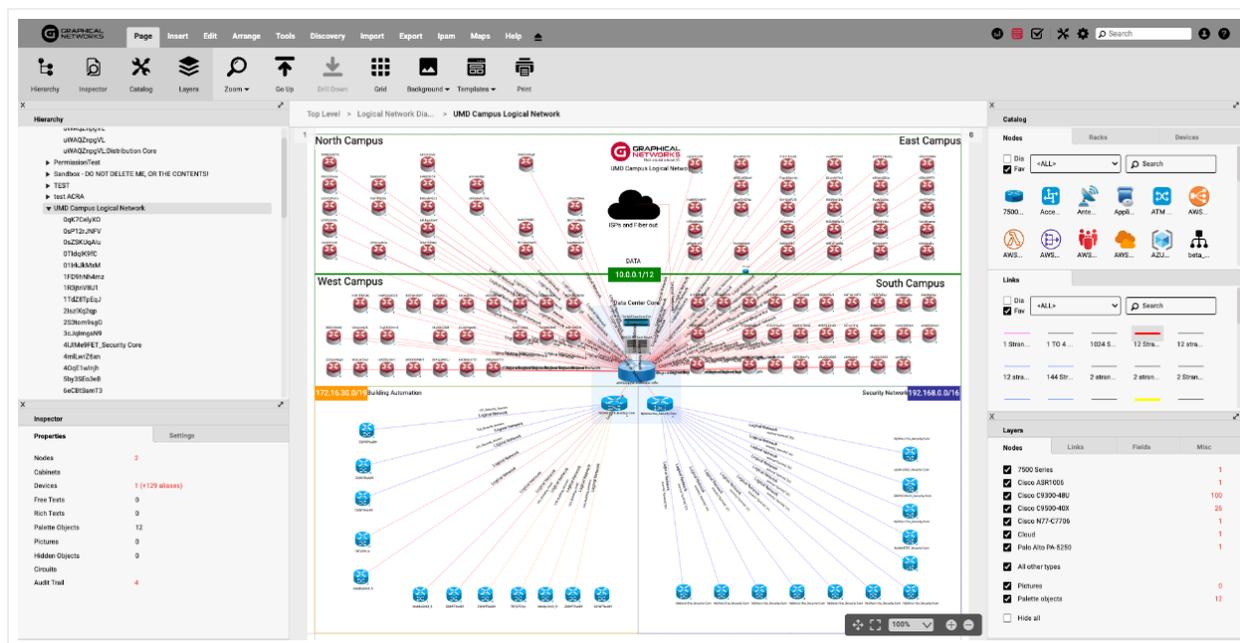
*Diagram grid with snapped objects and a 0.5-inch separation*

From the diagram settings tab you can change the snap to grid setting, as well as the x and y coordinate grid spacing.

## 4.2 Working with nodes

netTerrain diagrams are hierarchical in nature; hence you start by adding the highest-level nodes at the top level. For instance, if you want to document your network based on regions, then you would place nodes of type 'region' at the top level (perhaps on top of a world map). Because netTerrain lets you model any type of object in the catalog the options are infinite. Customers have also segmented their network views based on department, end-user type, technology, or geographical location.

Before we dive into data entry aspects, we will devote a few sections to the drag and drop catalog.



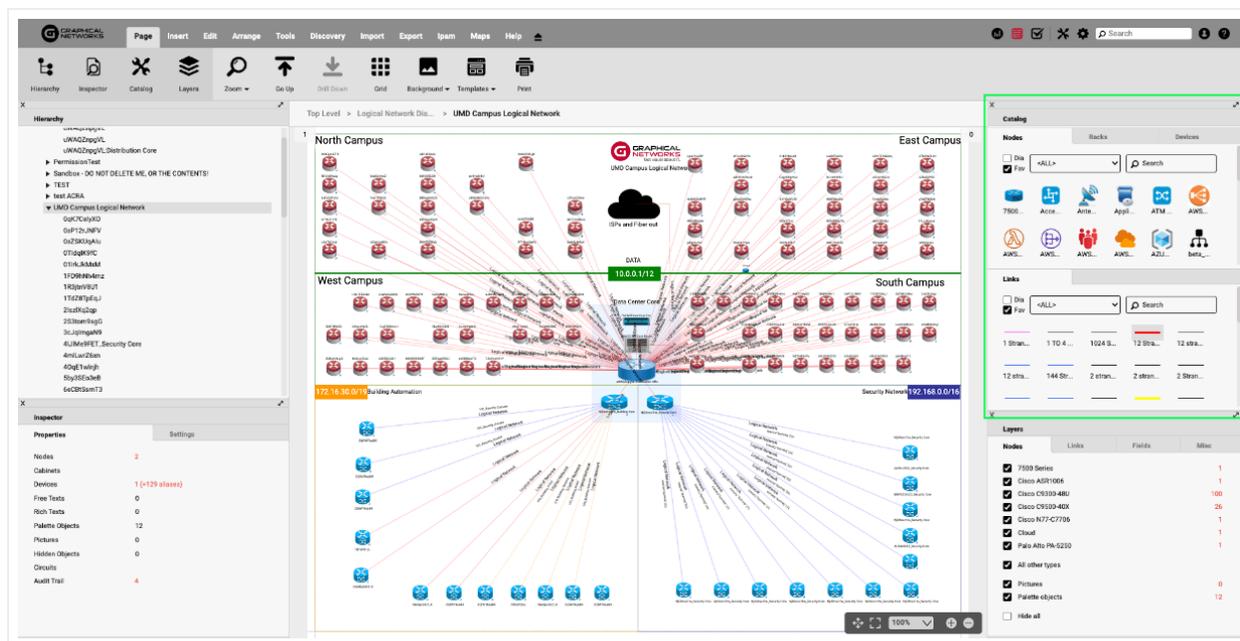
Example of a network view

## 4.2.1 Understanding the netTerrain catalog

The netTerrain catalog is the repository of all types that exist in netTerrain, and it provides an easy way to work with standardized objects. These standardized objects (nodes, links, racks, cards and so on), have a predefined and customizable set of images, properties, and behaviors, which makes it easy for an organization to agree on how entities should be represented.

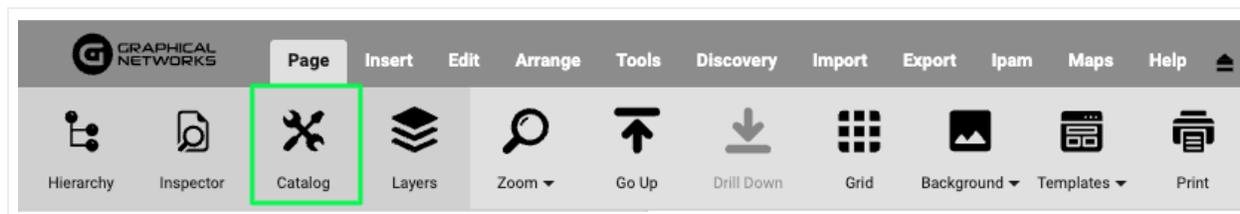
### 4.2.1.1 Viewing the catalog

By default, the catalog is displayed and docked on the right-hand side of the page:



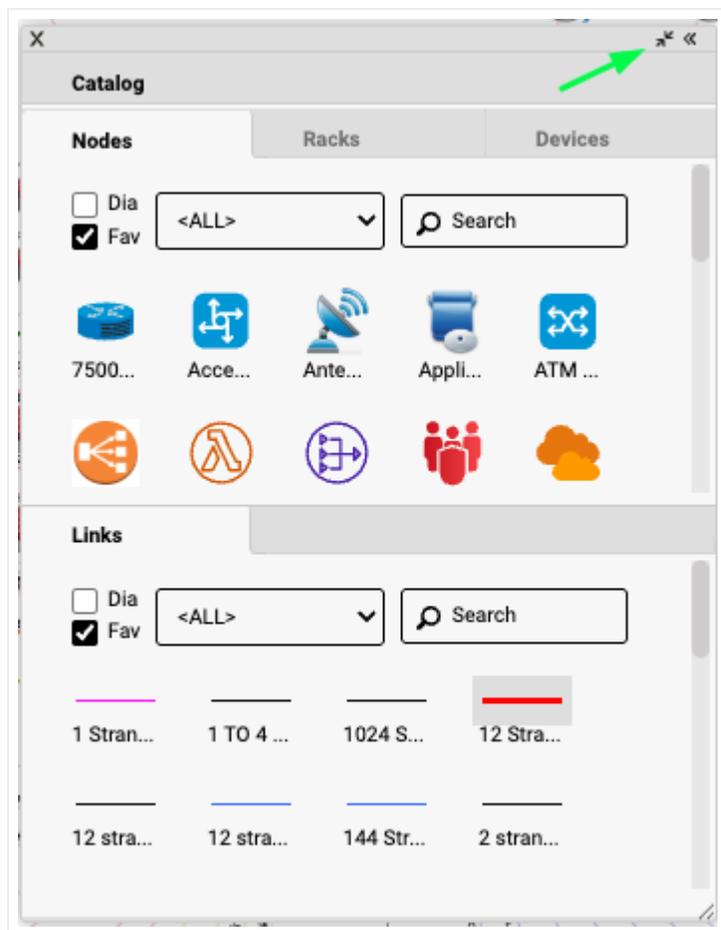
### netTerrain node and link catalog

If you can't see it, just go to the Tools menu, and click on catalog. Alternatively, you can click on 'F3' (netViz says hi!):



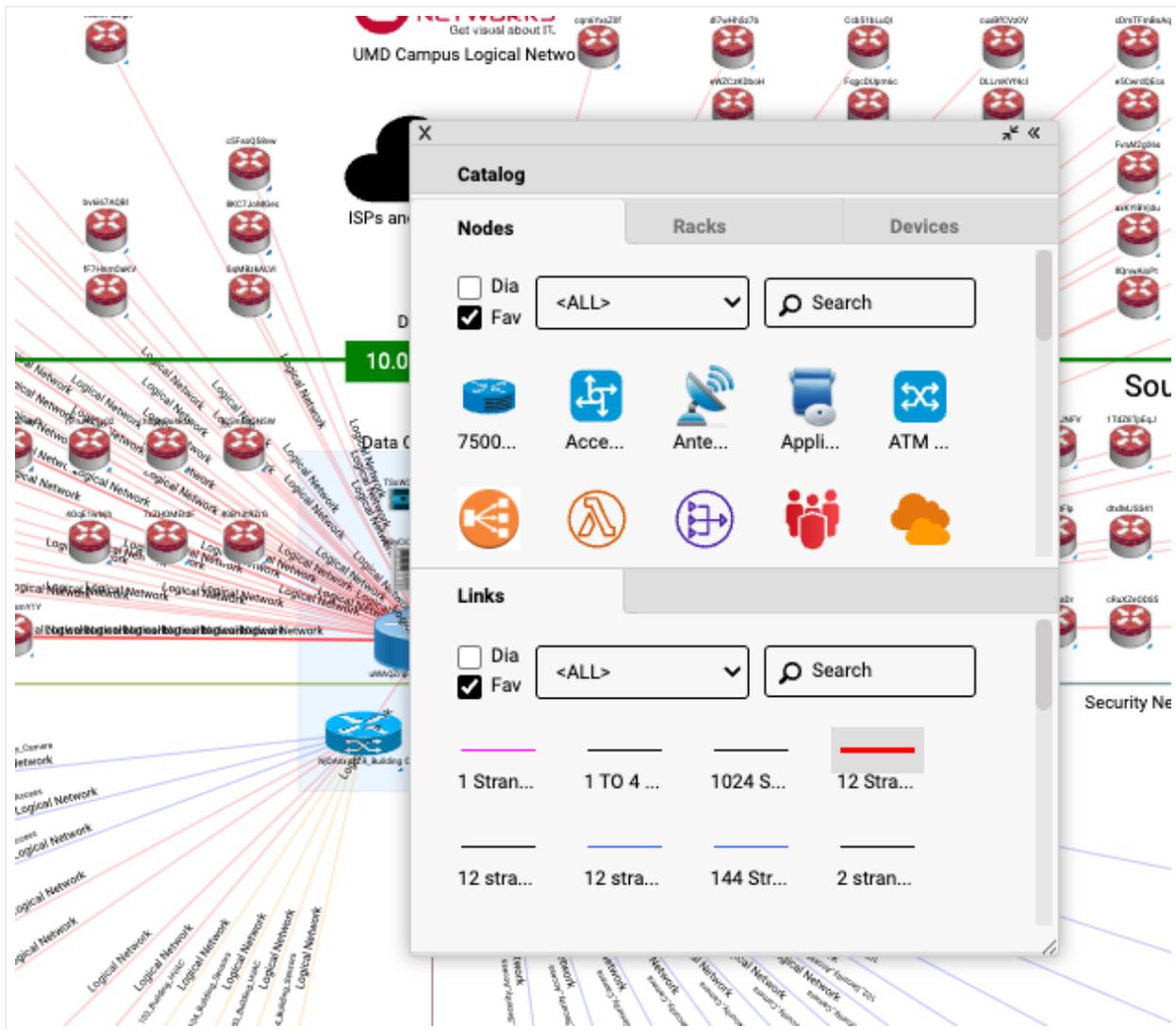
### Showing the catalog

Now the catalog should be displayed. You can work with the catalog in docked mode, or you can make it "float" on the diagram and display it anywhere you want. To do that simply click on the "Undock/Dock" handle on the top right corner of catalog, as displayed below:



### *Undocking the catalog*

When the catalog is undocked, or floating, you can move it around freely on the diagram by dragging it from the top bar (notice the move mouse cursor). You can also resize it by dragging the bottom corners.



Floating catalog

### 4.2.1.2 Catalog structure

The catalog is divided into two main categories: nodes and links. The nodes catalog has, in turn, three tabs: one for all the nodes, another one for all the devices and a third one for racks. In total, the catalog has four sections (three for nodes and one for links).

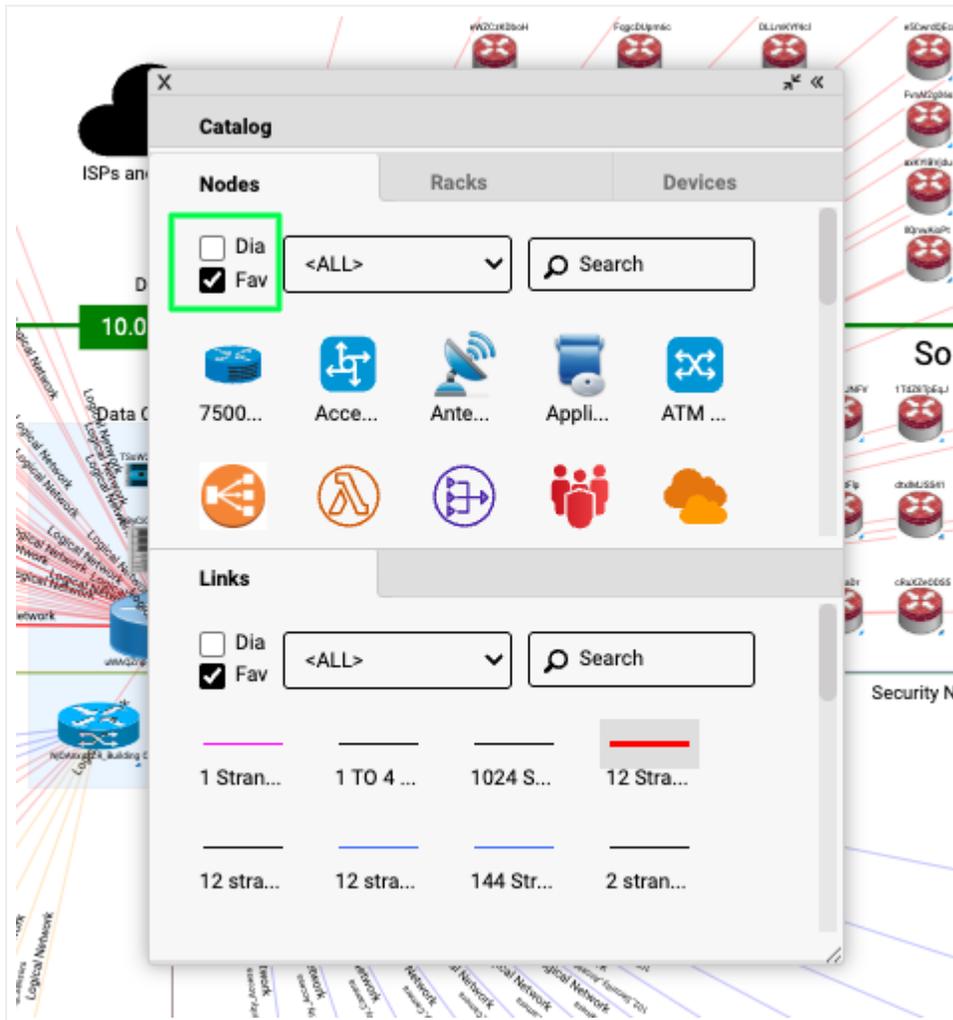
#### Attention!

Devices and racks are only available for customers that have a valid DCIM license. netTerrain Logical customers will only see the nodes tab.

Each of these sections has four convenient utilities that help you find your objects faster, a 'Dia' and a 'Fav' checkbox, a 'categories' drop down box and a search tool. Whatever settings you pick for these utilities, they are remembered on a per user and per tab basis, even after you finish a session.

### 4.2.1.3 'Dia' and 'Fav' checkboxes: objects on the diagram and favorites

If you hover the mouse over the 'Dia' checkbox it reads "Only on the diagram". As that tooltip suggests, when the 'Dia' checkbox is checked, the objects you see in the catalog will only include types that already exist in that diagram.

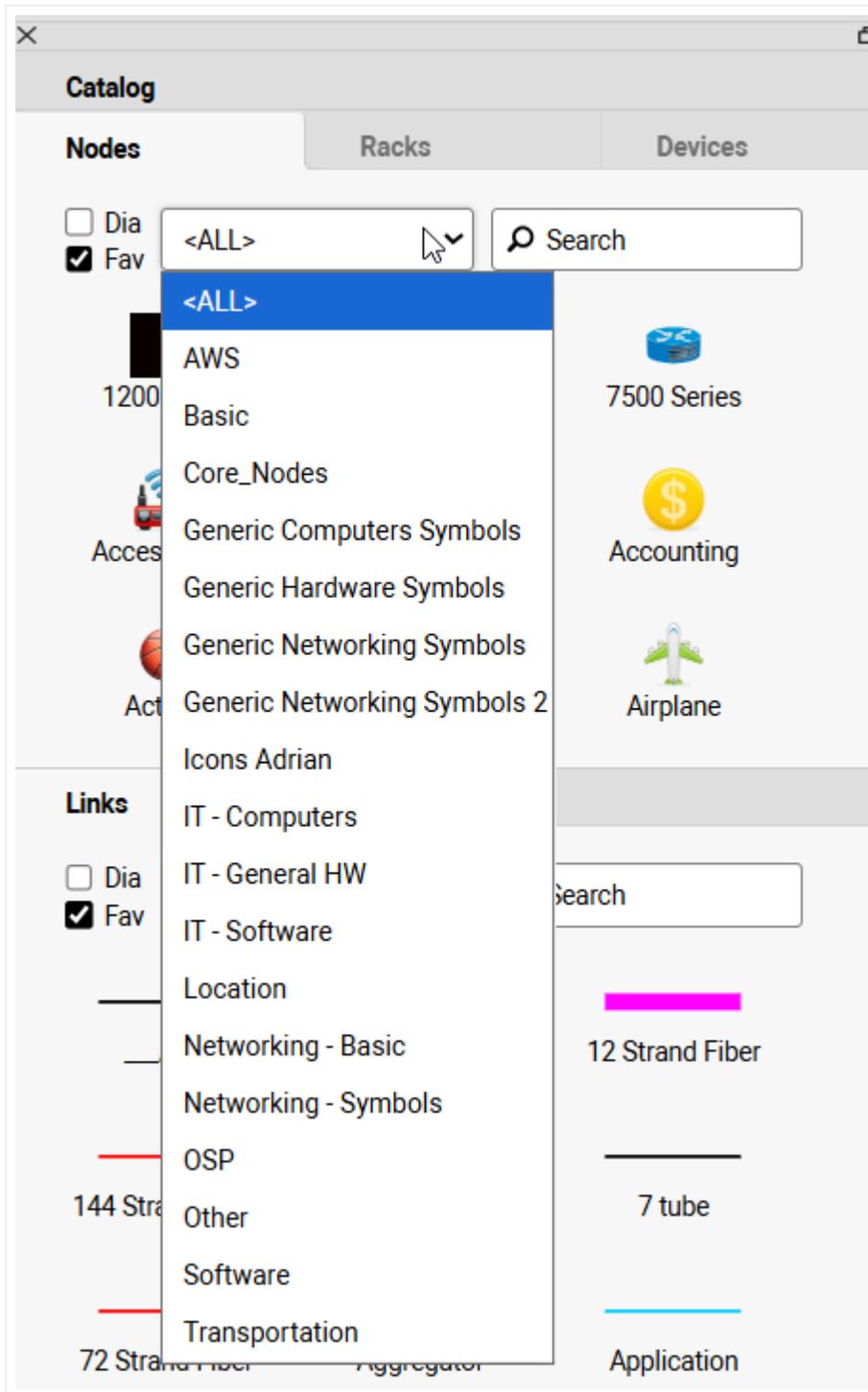


*Working with the Dia and Fav checkboxes*

By checking the 'Fav' checkbox, the catalog only displays objects that were marked as favorite.

#### 4.2.1.4 Categories drop down box

netTerrain categories are akin to Visio stencils. The default netTerrain installation already includes several categories for nodes.

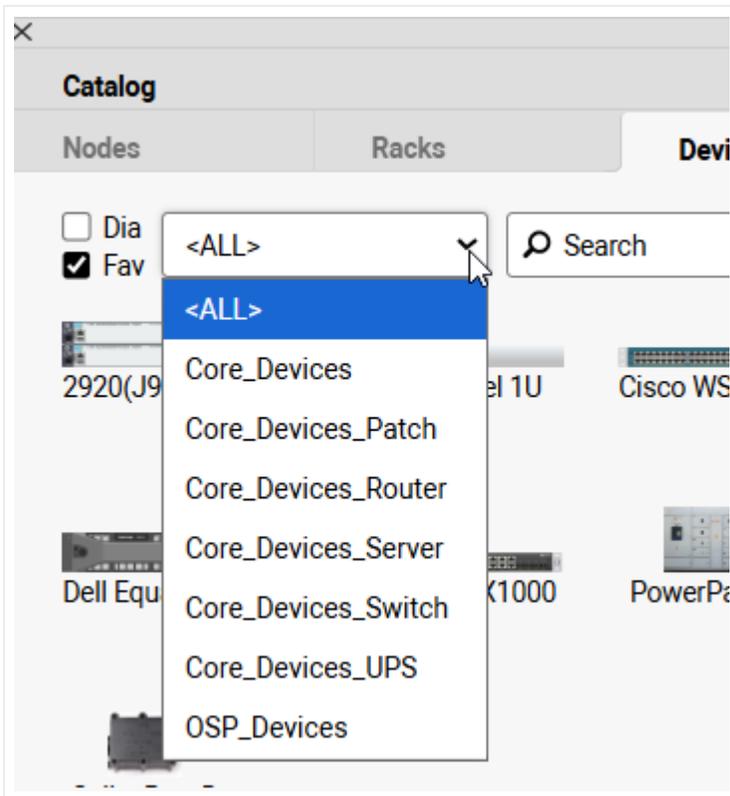


### Node catalog categories

Power users can add more categories, remove existing ones, mark or unmark them as favorites and assign individual objects to those categories. The `<ALL>` category is always present and, as its label suggests, displays all nodes from all categories (assuming, of course, that the 'Dia' and 'Fav' options are not checked, and the search string is empty).

We suggest organizing the catalog in a way that is easy to search for different objects based on categories and then utilizing the drop-down option to narrow down your searches.

For devices, netTerrain will display the set of vendors that exist in the catalog as the categories for you to filter the devices in the catalog. For instance, if you choose the 3Com category, only 3Com devices will show up.

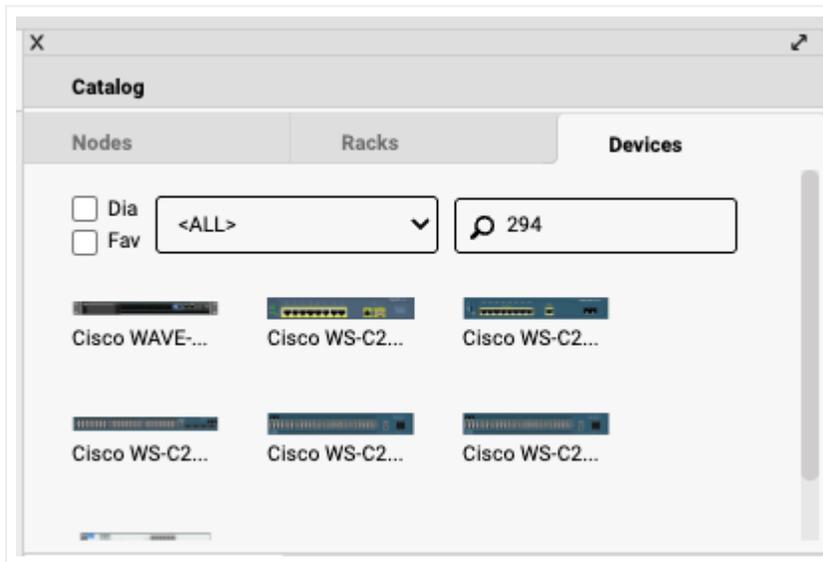


### Using the vendor category filters

You can create custom categories for devices, so in case you prefer to use yours, instead of the system-generated vendor categories, contact your netTerrain administrator who can disable them from the admin console (see Admin Guide).

### 4.2.1.5 Catalog search box

The catalog search box provides the ultimate tool for quickly finding the desired object from the catalog. This is a dynamic, partial string-matching search tool. As you start typing, the set of objects narrows down so that, on average, you probably find your object by just typing 3 or 4 letters.



*Catalog search*

#### Attention!

We should not confuse this catalog search with the internal catalog search shortcut 'c'. The former searches for objects in the catalog panes on the project side, the latter searches for types in the internal catalog accessible to power users or admins on the catalog side.

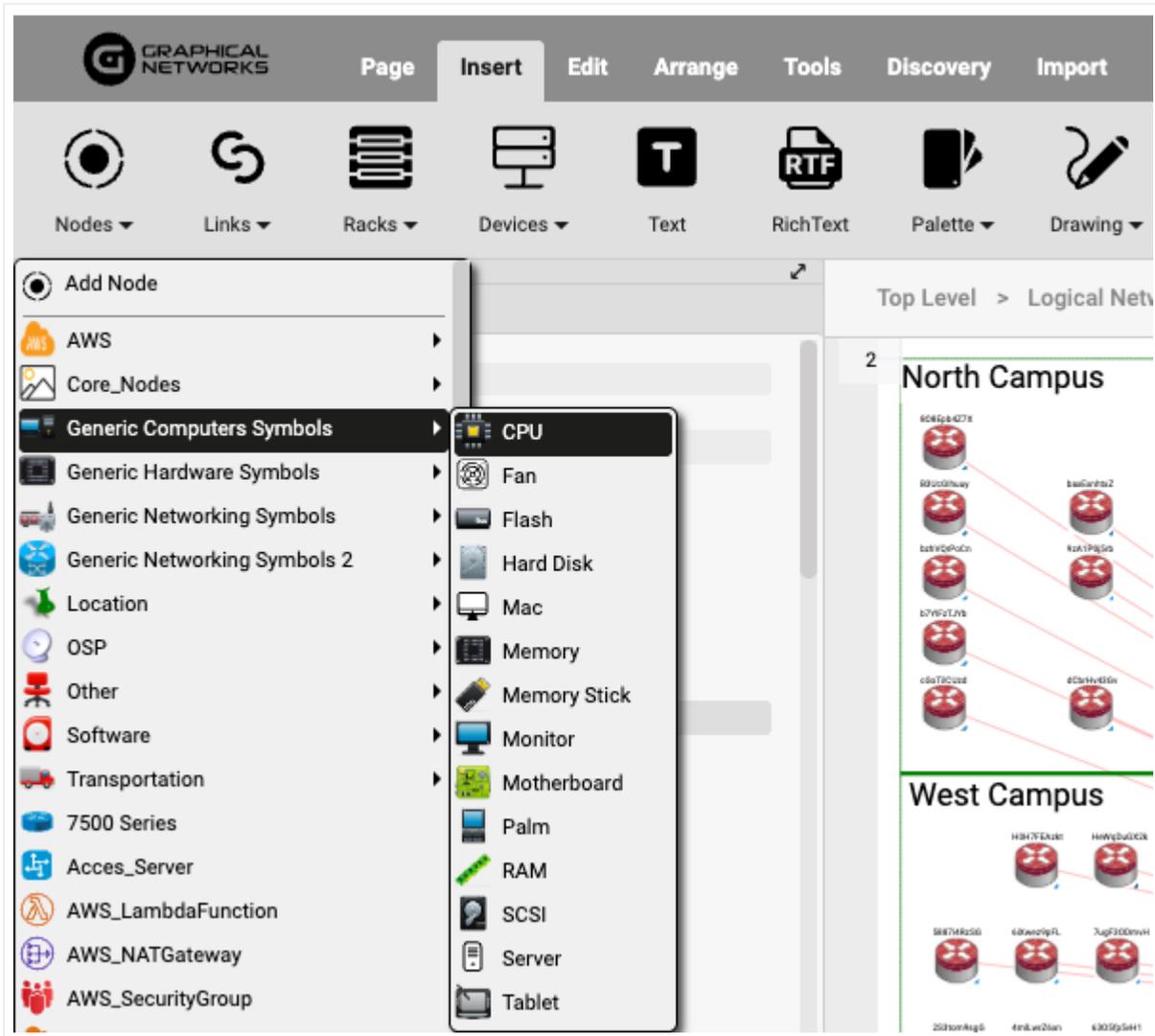
### 4.2.2 Adding and deleting nodes

Nodes in netTerrain have many behaviors. They can be selected, resized, moved and they can contain an unlimited number of properties. A node is represented by a default image, which can be overridden if any visual overrides are created for that node. Nodes can in turn be the parent diagram of other objects, contained in a sub diagram.

There are several ways of adding a node to your project, including bulk, database, network discovery and API imports. However, in this guide we only review manual data entry techniques. You can review the import/export, ITK and programming guides to explore other methods.

### 4.2.2.1 Adding nodes by using the node menu

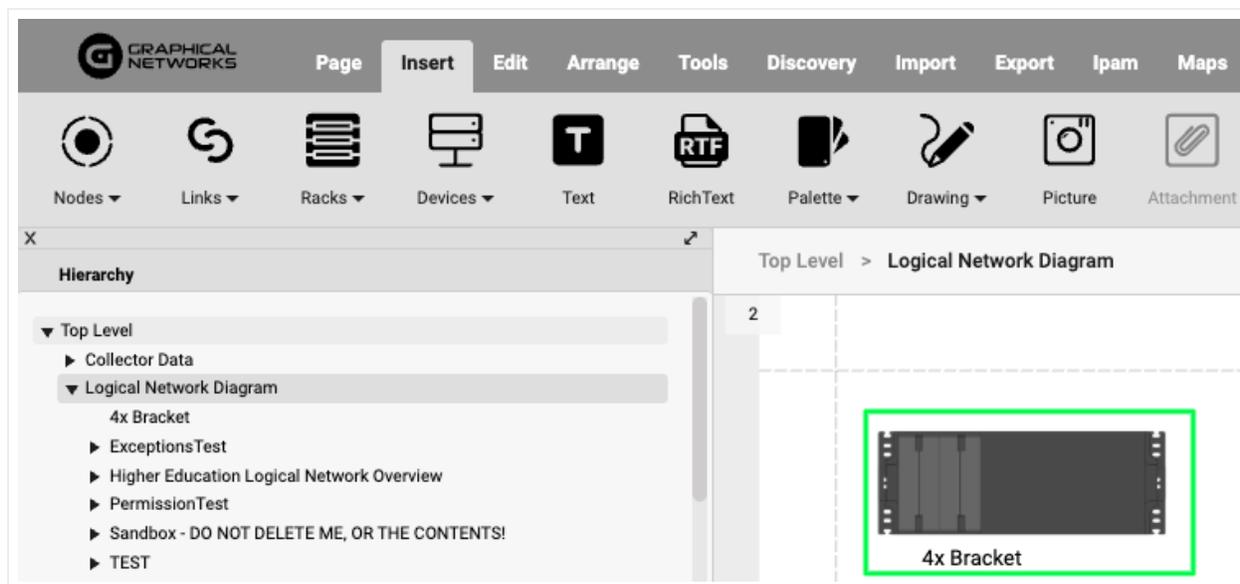
The traditional way of adding a node is from the insert menu. Just click on the left most orange node menu button and several options become available. You can add a generic node, as depicted below, and then change its type to something else, or simply click on one of the categories and find the node type you need.



*Adding a node using the menu button*

The categories and nodes you see here by no means represent the entire catalog. They are just the categories and node types defined as favorites. Categories you see in this menu are user defined and can be modified at will by any power user.

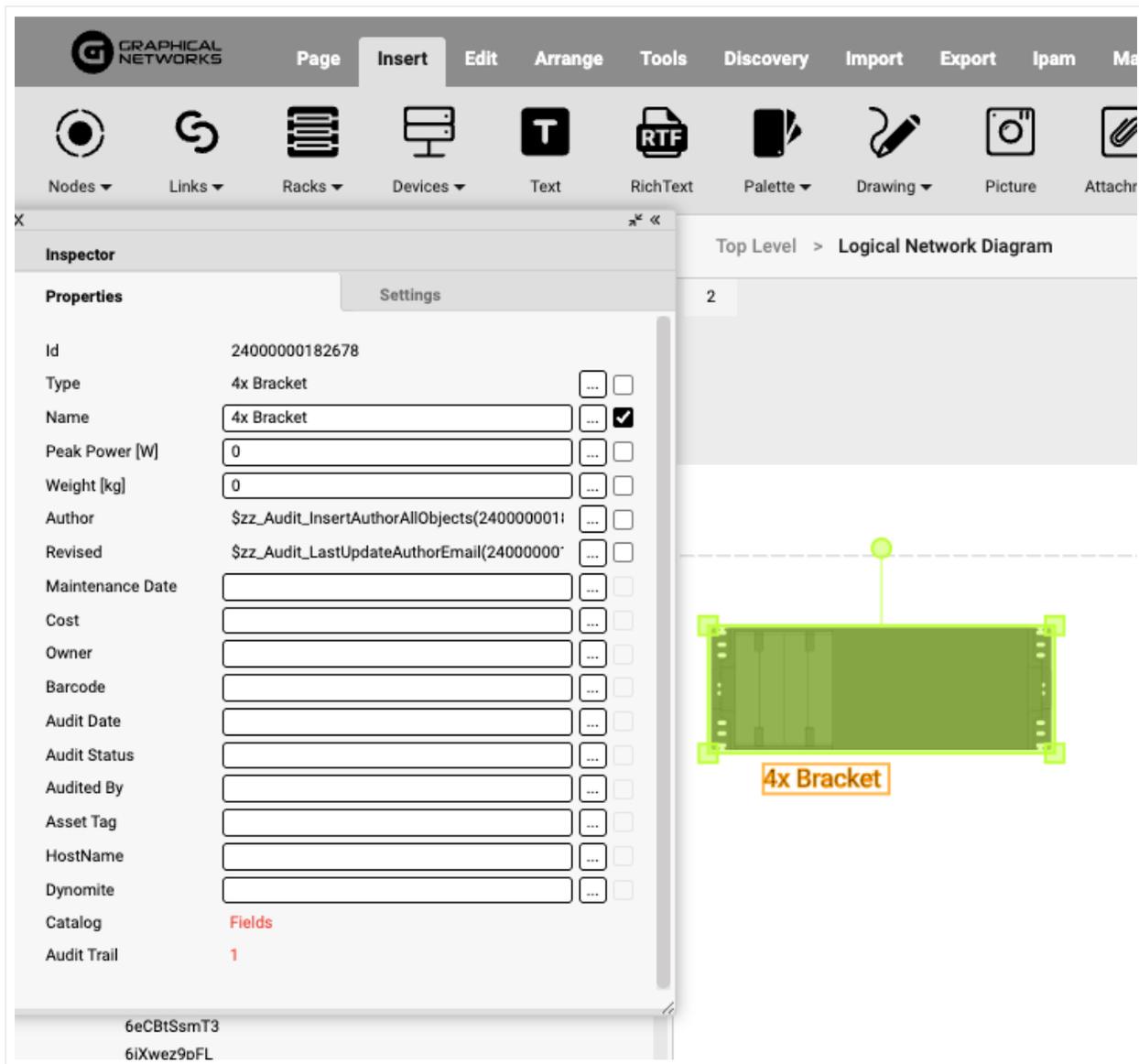
Once you identify the node type you need, you click on it and it will be added to the top left corner of your diagram. This is what we call an instance of a node type, by the way.



### *Newly added node instance*

Each instance of a node type will reflect the custom properties that were defined in the catalog for that type. In other words, all instances of a certain type share the same specific set of properties.

When you click on that instance, the properties will be displayed on the properties window on your left. Any user with updater permissions or better can modify the values for any of the custom properties.

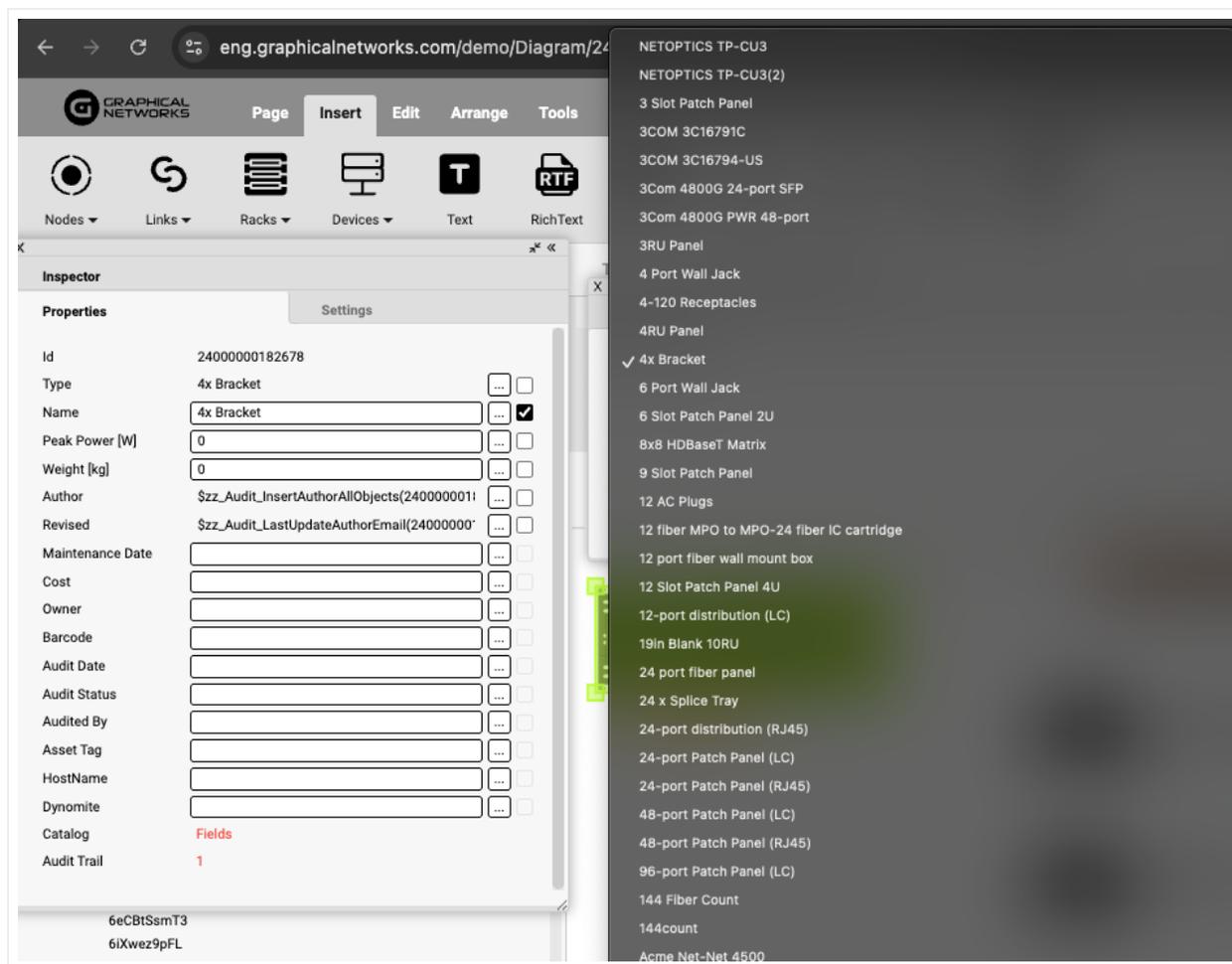


*All instances of a certain type share the same properties*

As mentioned earlier, if a generic node is added, a user can later change to some other type, by selecting it from the type menu, as shown below.

### Attention!

When you change the type of a node, all the properties will change as well. Any data that was filled out for the old node type will be lost, since those properties don't apply anymore.

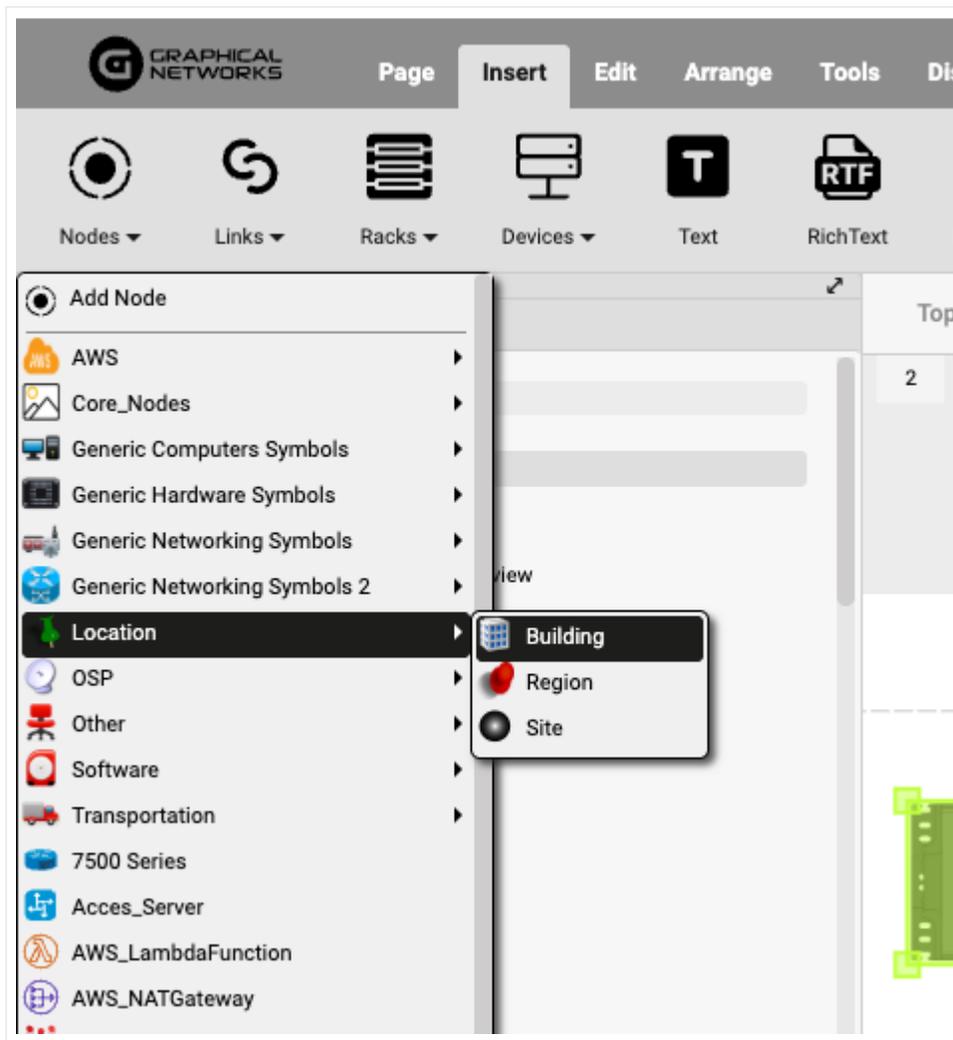


*Changing the type for a node*

#### 4.2.2.2 Adding nodes by using the right-click diagram context menu

As an alternative method for adding nodes, you can do the following:

- 1) Right-click anywhere on the diagram.
- 2) Click on Insert Node -> desired category or node.



*Inserting a node using right-click context menus*

The newly inserted node will be placed on the spot where the right-click action occurred.

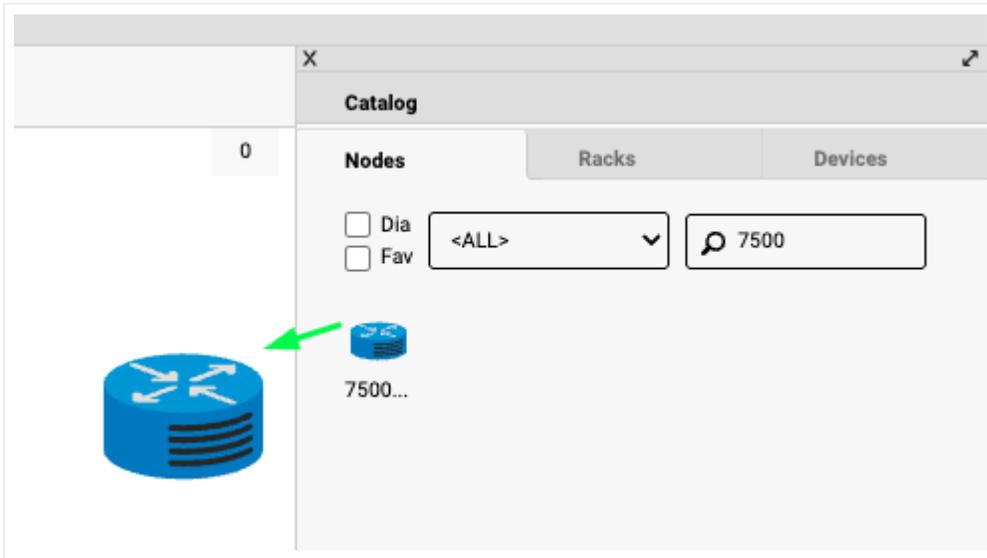
### 4.2.2.3 Adding nodes by dragging and dropping from the catalog

The simplest and most powerful method for adding nodes is to just drag and drop them from the catalog pane. To do that, the catalog needs to be displayed. If it is not displayed, just press 'F3'.

Once the catalog is visible, you can use any of the tools you want to find the desired object:

- 'Dia' and 'Fav' checkboxes
- category drop down box
- catalog search

Once you find your object, just drag and drop it on the diagram. That's it!

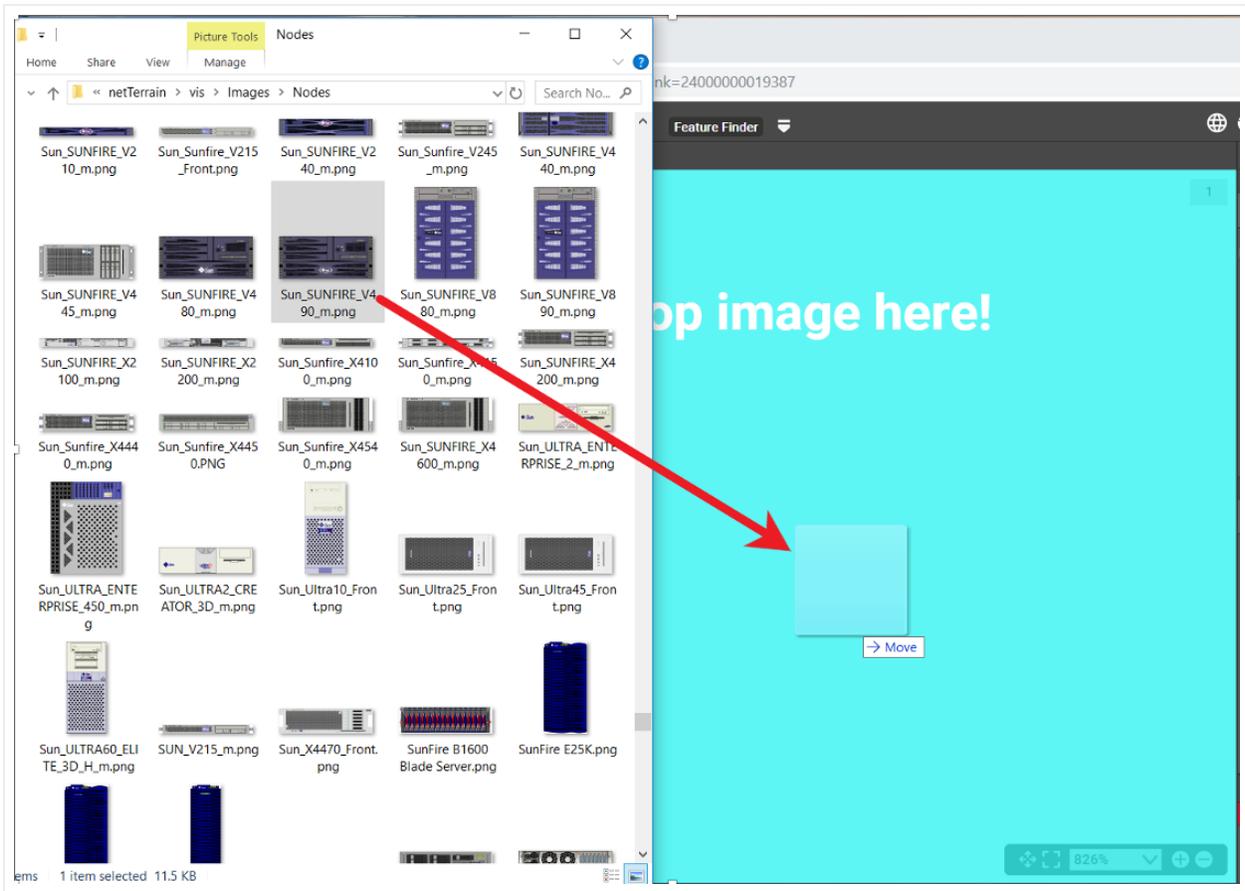


*Dragging and dropping a router onto a diagram*

#### 4.2.2.4 Adding nodes by dragging and dropping an image from a browser or folder

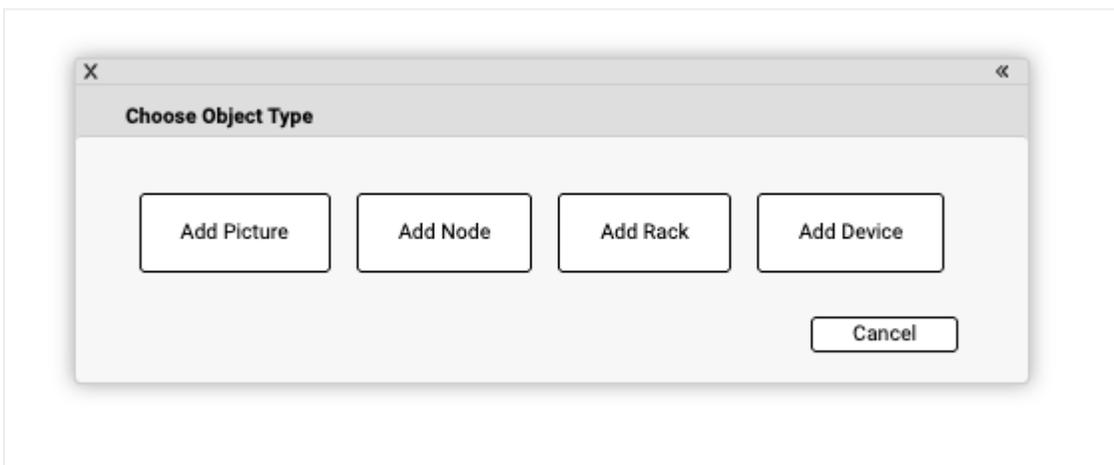
There is a nice trick to adding a node into the project quickly: by dragging and dropping an image from a folder or browser!

The best way to use this trick is to have both the netTerrain browser and the folder or website with the image side-by-side. Then, just drag and drop the desired image to the netTerrain diagram, as shown below:



Create a picture by dragging and dropping an image

After you drop the image on the diagram, netTerrain gives you the option to create it as a floating image (picture), a node type, a device type, or a rack type. Choose the 'node' option:



Choosing the 'Node' option to create a new node

This process creates a node type in the catalog using that image. The node type is called something like 'Node #1' and has no custom properties. You can later (as a power user) edit the node type properties, change the node type name, add new custom fields and overrides and much more. The nice thing about this trick is that it gets you started quickly.

**Tip:**

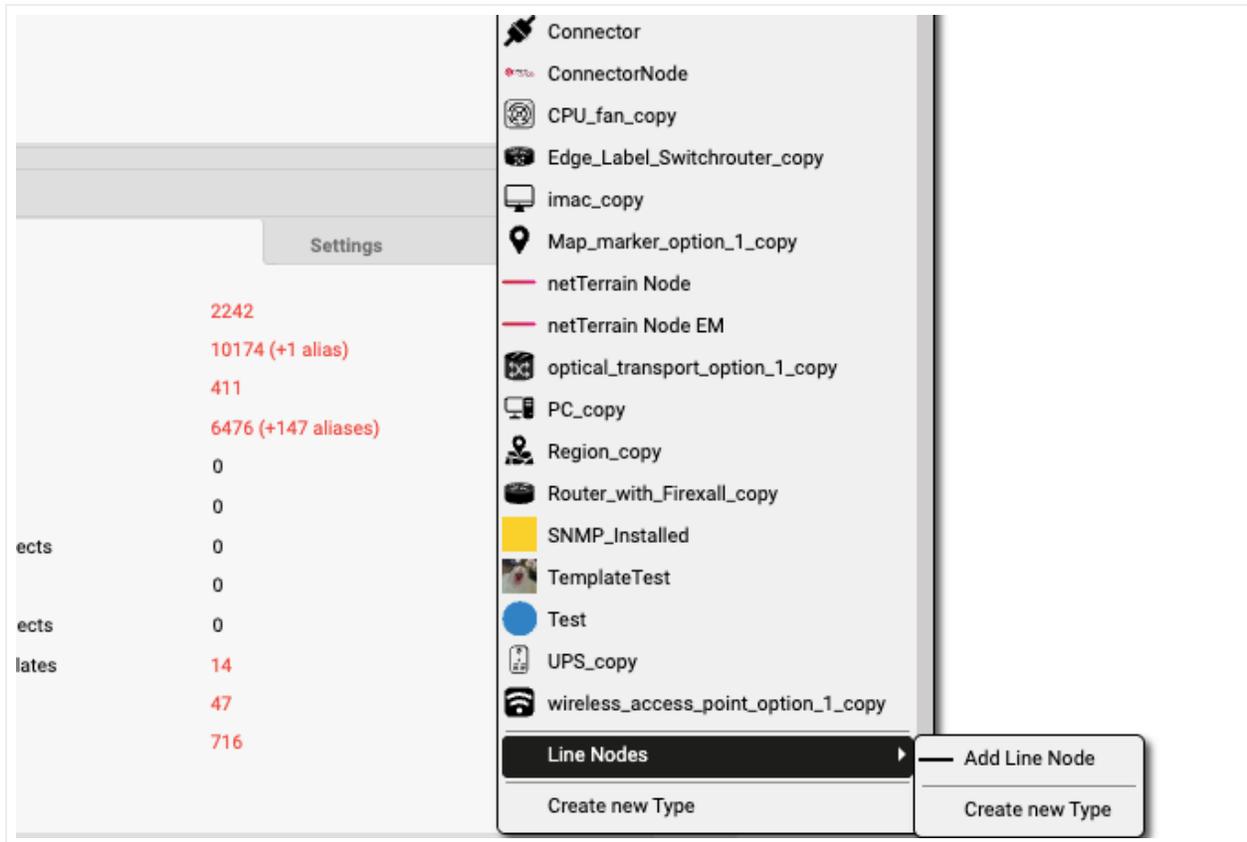
You can also perform the same operation by simply copying a picture from your computer with ctrl-c and then pasting it on the netTerrain diagram.

## 4.2.2.5 Line Nodes

Line nodes constitute a special system defined node type in the catalog that behaves like a node but looks like a link. Line nodes can be connected to other nodes, contain custom properties as well as be pasted as aliases.

There is a system line node in the catalog, but you can also create your own line node types, with custom properties, behaviors, and appearances.

Line nodes can be added to a diagram using methods 1 and 2 as explained above. Notice that when you are adding a line node through the context menu (method 2), towards the bottom of the menu you'll find the line nodes submenu with all the line node types defined in the catalog.

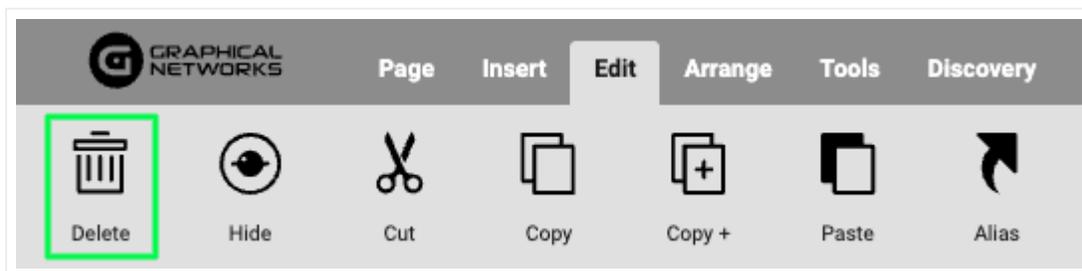


Line nodes

#### 4.2.2.6 Deleting nodes

To delete a node, you can:

- use the delete button in the edit menu



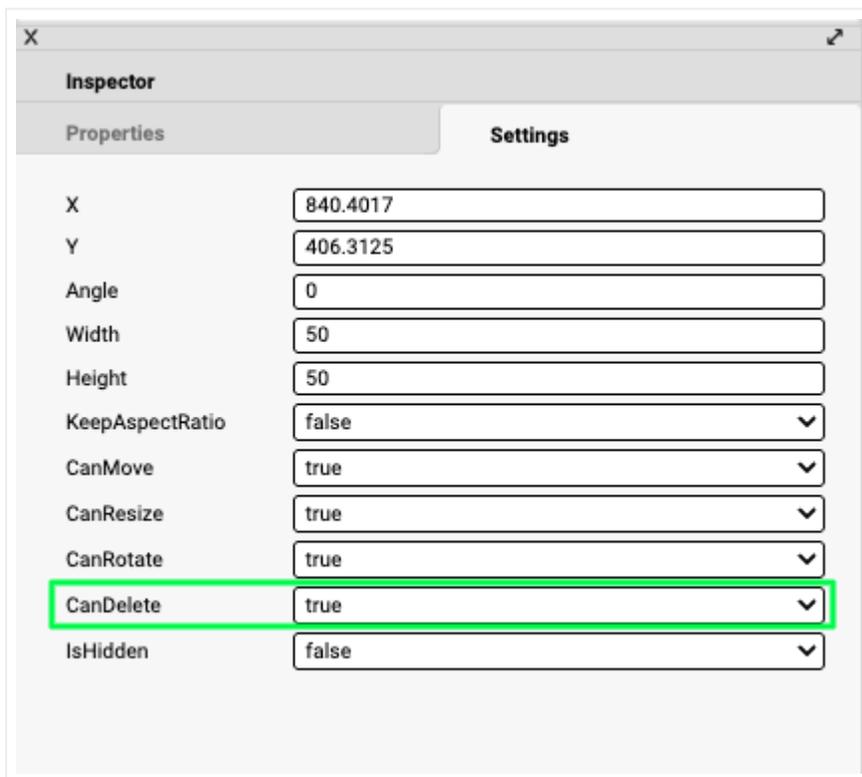
- right-click on the node and click on the 'delete' option or
- simply press the 'del' key

Note that if objects exist under a node, they will be deleted too, along with any links that either start or end on that node or a child object of that node.

### Attention!

If a node has the delete button disabled when selected, it may be because the CanDelete option in the node settings tab is set to false.

Also note that reference nodes cannot be deleted. You need to double-click on one, and go to the diagram that has the original node in order to delete it.



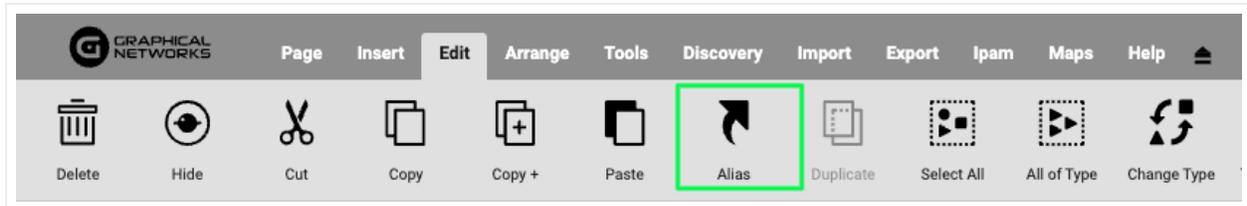
*CanDelete option*

## 4.2.2.7 Creating node aliases

A netTerrain project can contain multiple copies of the same node (referred to as an alias). This is useful when a representation of the same object needs to be displayed in different contexts.

The aliasing of a node works in three simple steps:

- 1) Copy the node (master) that needs to be aliased to the clipboard.
- 2) Go to the diagram that needs to contain the aliased object.
- 3) Click on the 'Alias' button in the edit menu or the diagram context menu.



### *Pasting an object as alias*

As a result, an alias of the master will now be placed on the new diagram.

Aliased objects have the following characteristics:

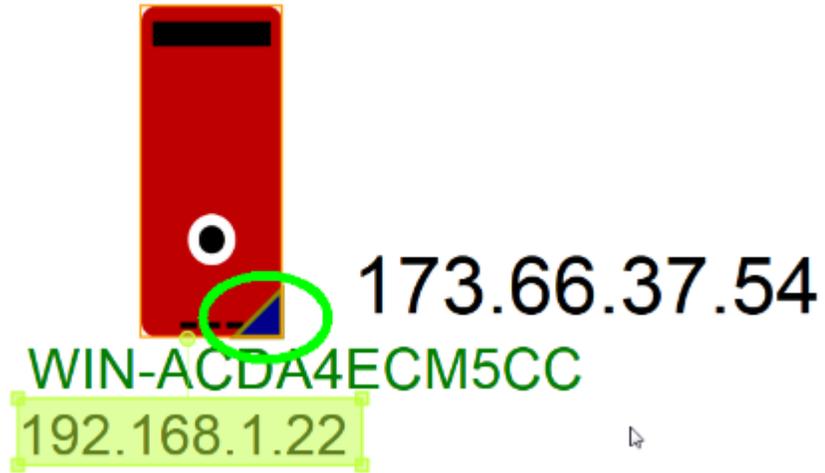
- 1) The icons for the master and all its aliases are the same.
- 2) Aliased nodes have a small blue triangle indicator on the bottom right corner.



- 3) All properties of the master and aliased node are the same and are always in synch (this means that when changing the value of an attribute for an alias, it will change it for every other instance and the master).
- 4) Deleting any aliased instance will not delete any of the other instances.
- 5) Deleting the master instance will delete all the aliased instances.

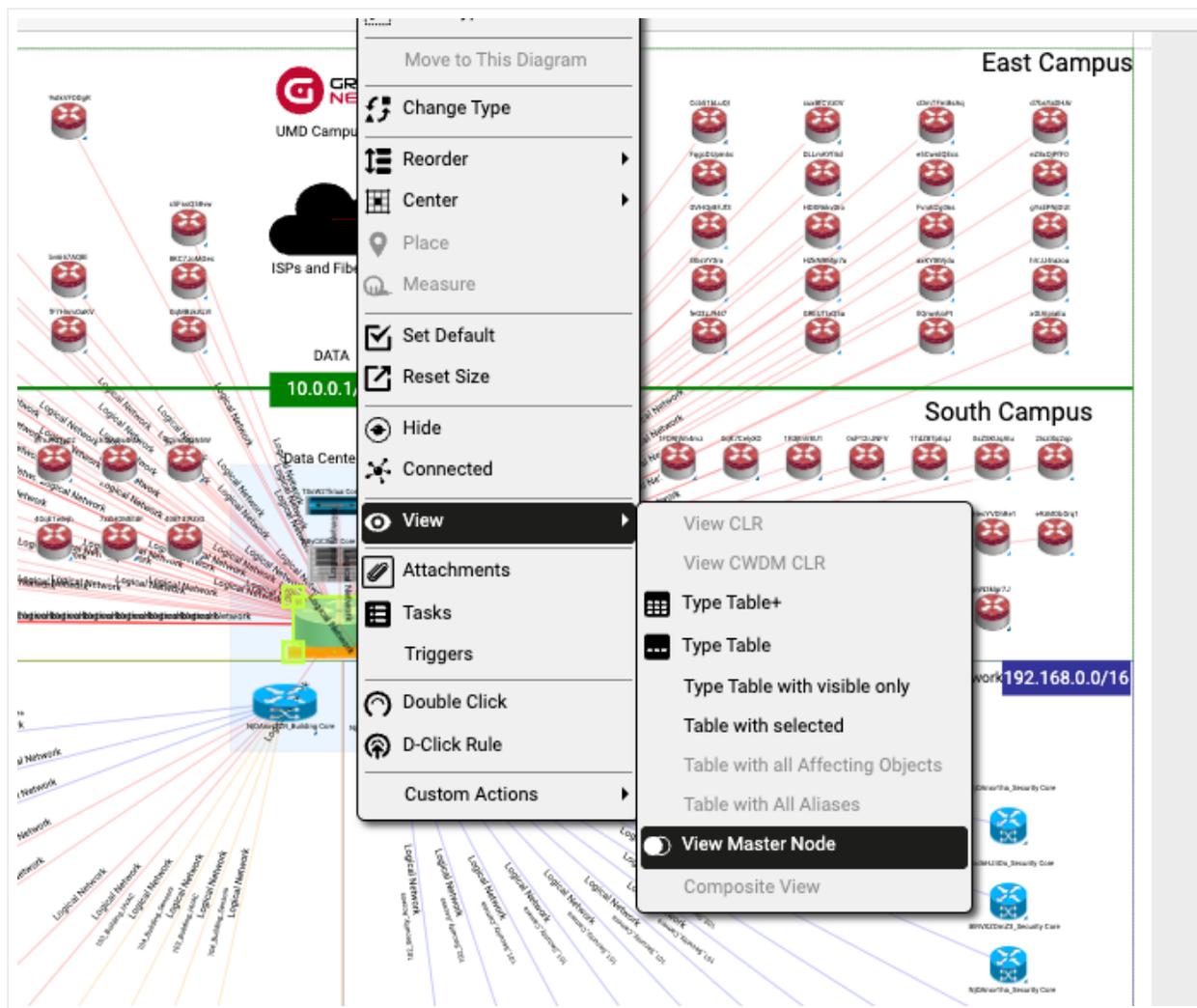
The master object on the other hand has a darker alias indicator as shown below.

## New Demo and Test Drive Server



### *Master node alias indicator*

Users can right-click on an alias, and go to the master node, or also right-click on the master node and see a table view of all the aliases associated with that master node, as depicted below.

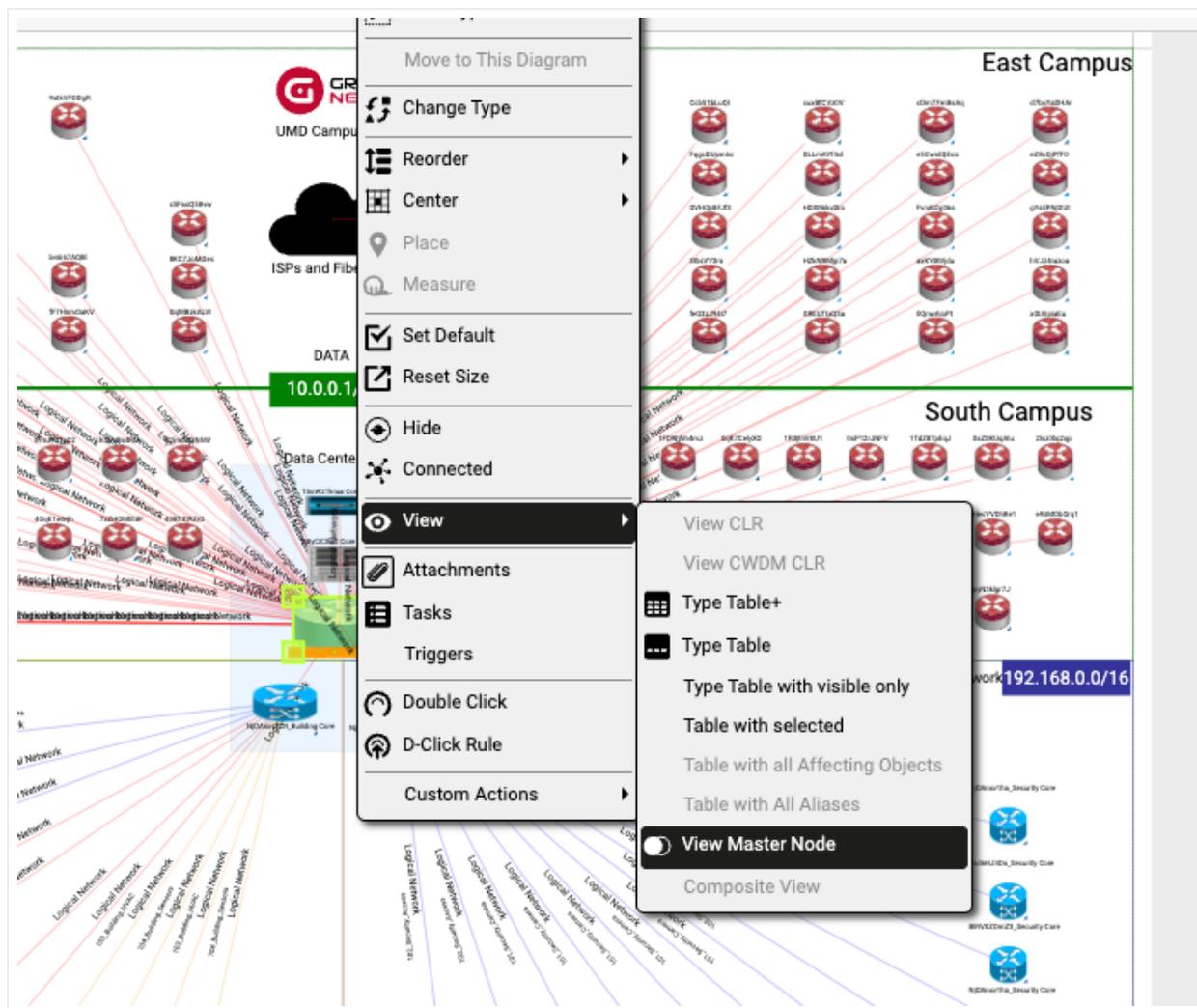


Getting the list of all aliases for a master node

### Attention!

Note that whereas aliases can be edited just like any other node in diagram view, they are not editable in table view.

Given an alias, you can also find its corresponding master node by right-clicking on the alias and selecting the 'View Master Node' option, as depicted below:



Getting from an alias to its master node

#### 4.2.2.8 Changing the icon for an alias

Aliases share every feature of its master node including properties, property values and icon, since it is a mirror of the master object. An alias doesn't even have a separate set of property records in the database, and it does not increase the license count either.

There is, however, a way for an alias to show a different value of a field than its master, and it's with the use of an expression. It consists of creating a field that uses an expression to determine its parent node (or node type), and then creating a visual override that changes the icon based on the result. The creation of expressions is outside the scope of this guide (for that, see the Database and Scripting guide) and built-in expressions and visual overrides are reviewed later in this guide and in the power user guide.

## 4.3 Editing Data

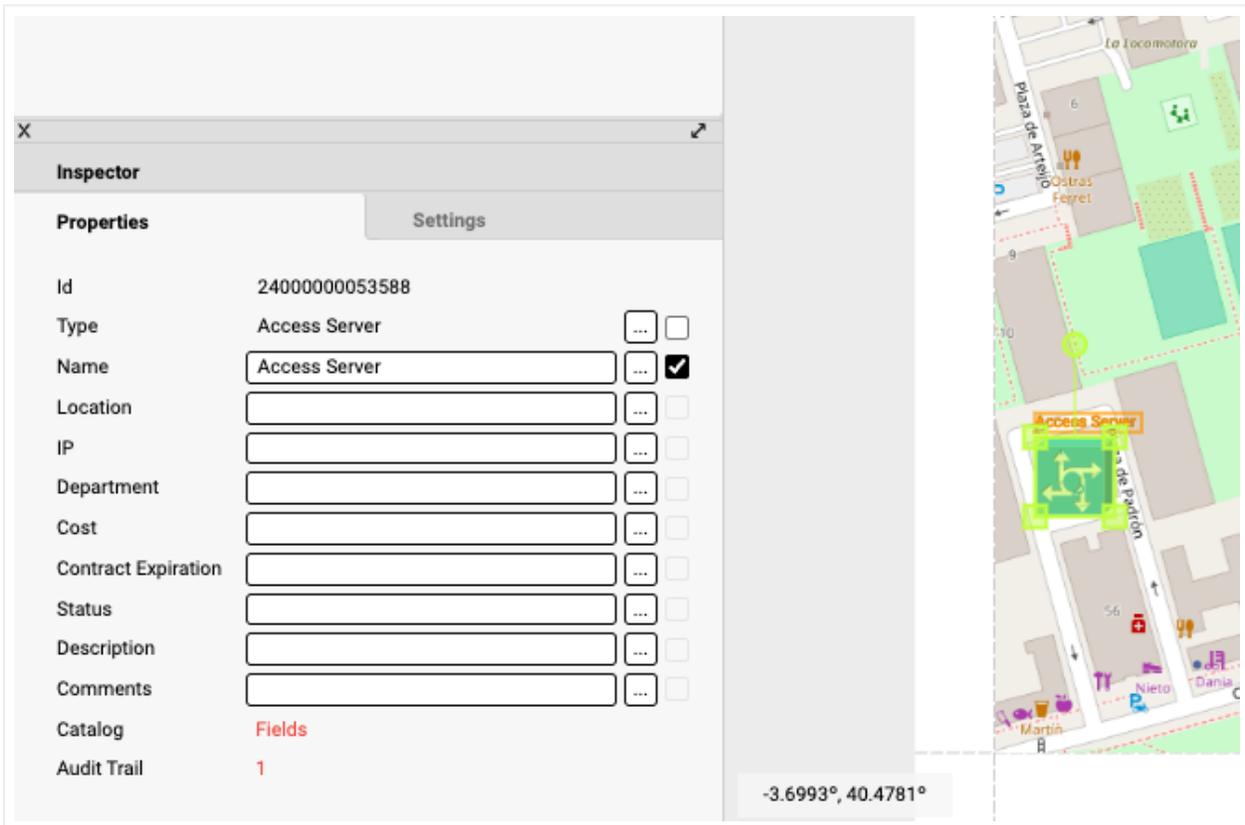
Naturally, as objects are added to the inventory, a user will want to edit the node, device, and link data. netTerrain provides instance editing capabilities for users with updater (or better) permission levels.

### 4.3.1 Editing objects

netTerrain is known for its easy and straightforward object property editing. Unlike other tools, where object properties are almost an afterthought, in netTerrain users can edit property values of nodes and links straight from the properties window after a single click.

#### 4.3.1.1 Editing a single object instance by clicking

By simply selecting an object, such as a node or a link, the properties window will display the field values for that object and make them available for editing.



*Instance editing*

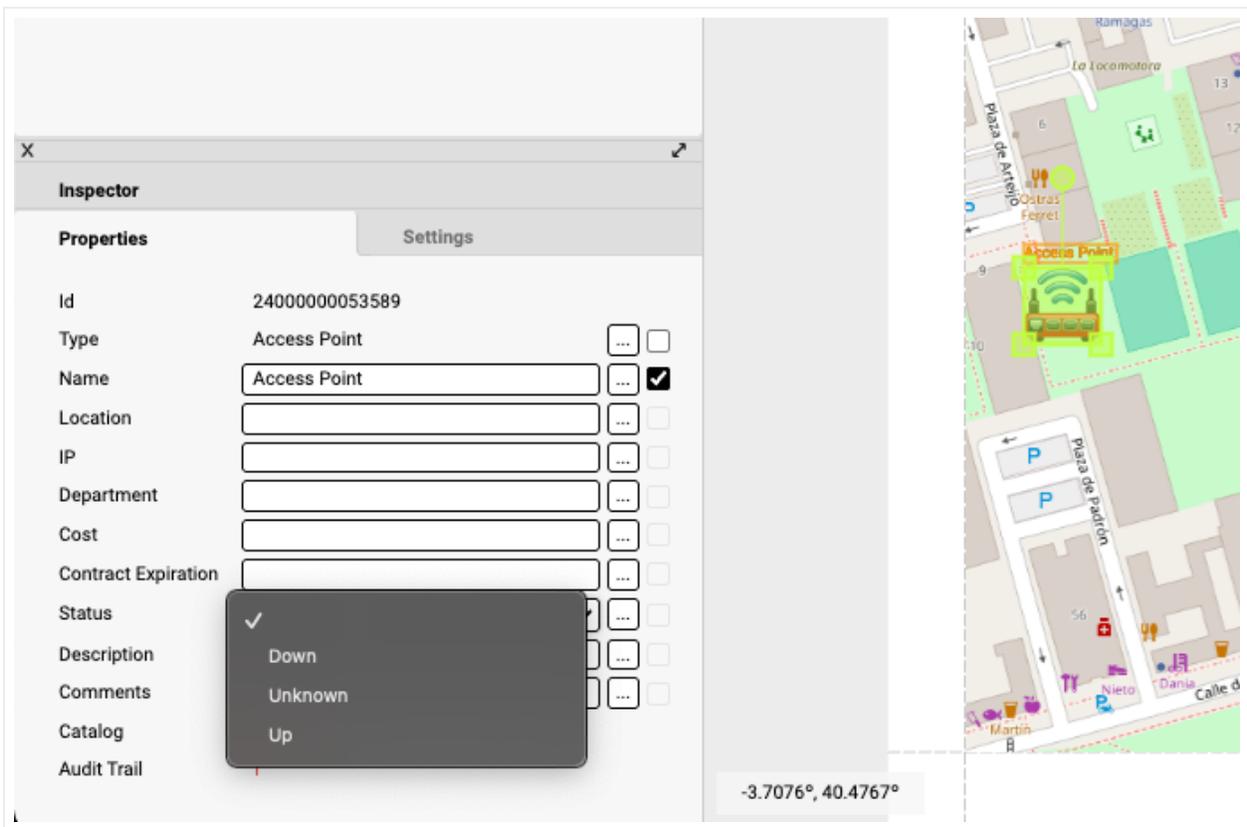
Note that every object has a non-editable Id, which uniquely identifies the record in the database. This Id is internally generated and can come in handy to run searches and easily find unique matches.

### 4.3.1.2 Combo Box values

Combo boxes (drop-down boxes) allow the selection of values that already exist in a lookup or catalog table in netTerrain. All values for drop down boxes are managed in the catalog.

For faster data entry, users may quickly type the first few letters of the combo box entry when that field is currently selected.

Combo boxes exist for predefined fields (such as type) and can also be created for custom fields (see catalog management).



#### *Combo box field*

It is important to note that the values in a combo box will only consist of the list values defined in the catalog for that field (and the current value if it is not in the list).

### 4.3.1.3 Setting the value to NULL or to a value not in a combo box

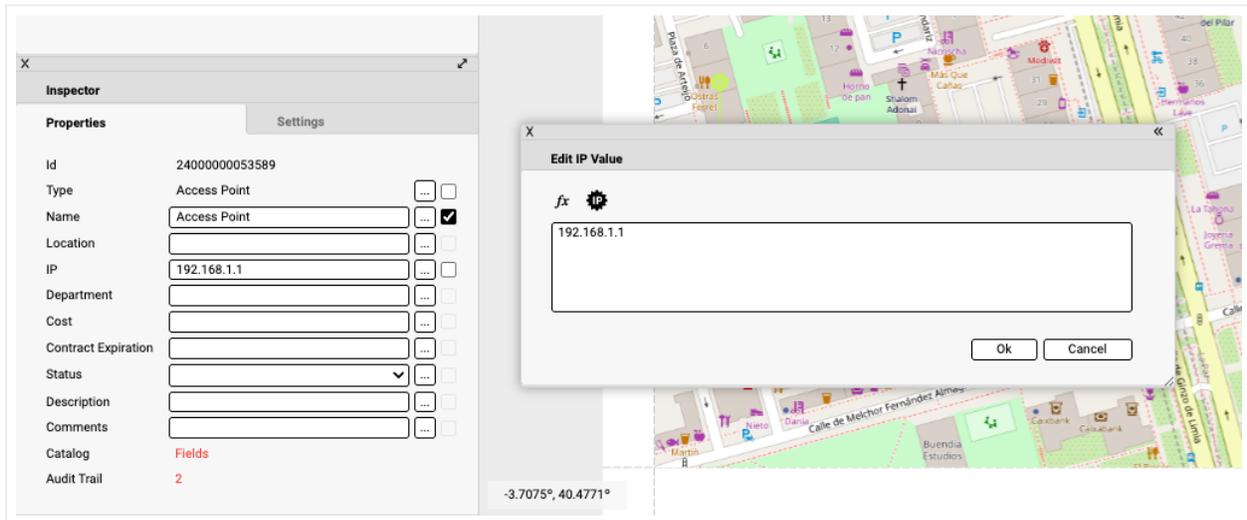
It is possible to add values in a combo box field that do not exist in the drop-down list. To do that, simply click on the ellipsis button for the field editor and enter your value there (see 'Field Editor' section below). This is also the proper method to set a combo box value back to nothing (NULL).

#### Attention!

A combo box field may have been restricted in the catalog in such a way that it doesn't accept manual editing of data.

### 4.3.1.4 Field editor

In certain cases, a user may prefer to insert long texts by opening the field editor window. This editor can be moved within the main window area and resized. Line breaks can be easily inserted here, by simply pressing the enter key.



#### Field editor window

In the field editor you can also add expressions, which are described below. If a property has been checked for diagram display (meaning that it is a displayed field that also shows on the diagram), then the field editor provides additional options to modify the font,

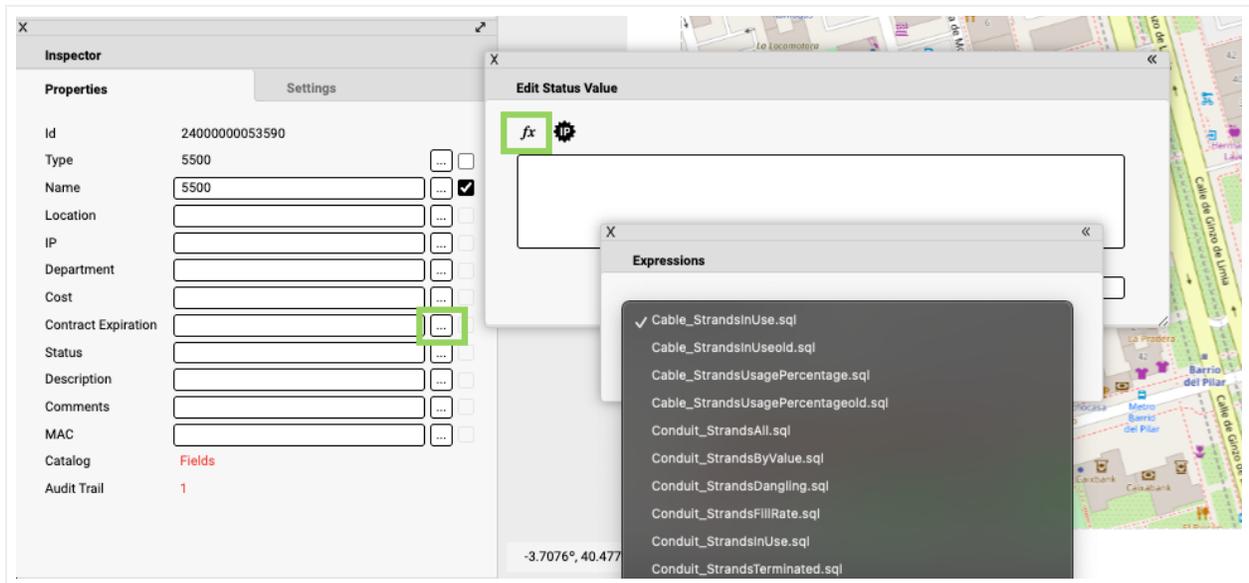
### 4.3.1.5 Inserting expressions

Expressions in netTerrain are aggregate SQL functions that exist in the application server. These functions retrieve a scalar value based on the expression query, for example the number of nodes in the project.

netTerrain ships with several predefined functions, and advanced users can also create their own expressions and put them in the SQLexpressions folder on the server (see Database and Scripting guide).

These expressions will then be available to the client and can be displayed in the properties window or on the diagram as a displayed field.

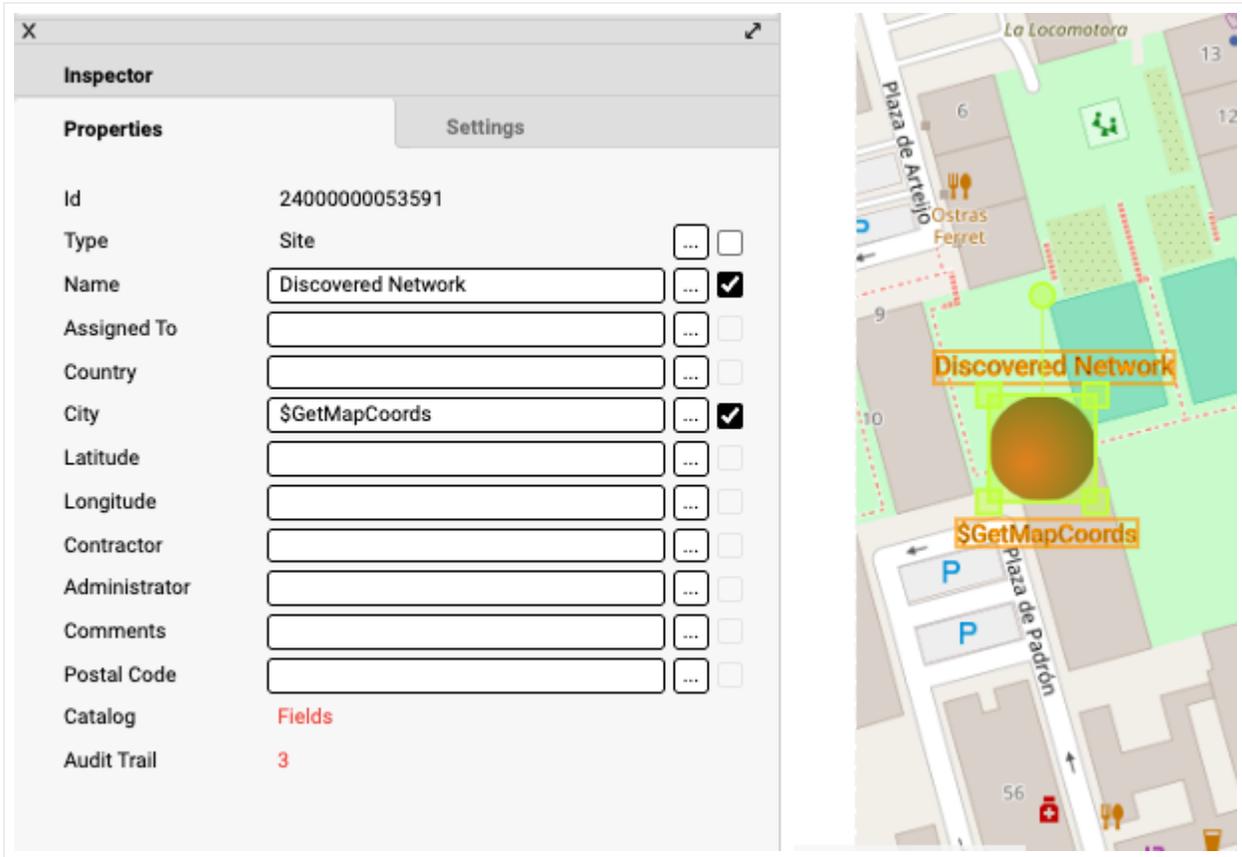
To use an expression, type it on the properties field directly if you know the syntax, or retrieve it from the field editor by clicking on the 'Exp' button as shown below.



#### *Adding an expression to a field*

The example above shows a node, for which the field 'AggregateValue' displays an expression consisting of the total number of nodes in the project. The property field uses the following syntax: 'Total nodes: \$zz\_Project\_GenericNodeCount'

A sample calculated result is shown in the screenshot below.

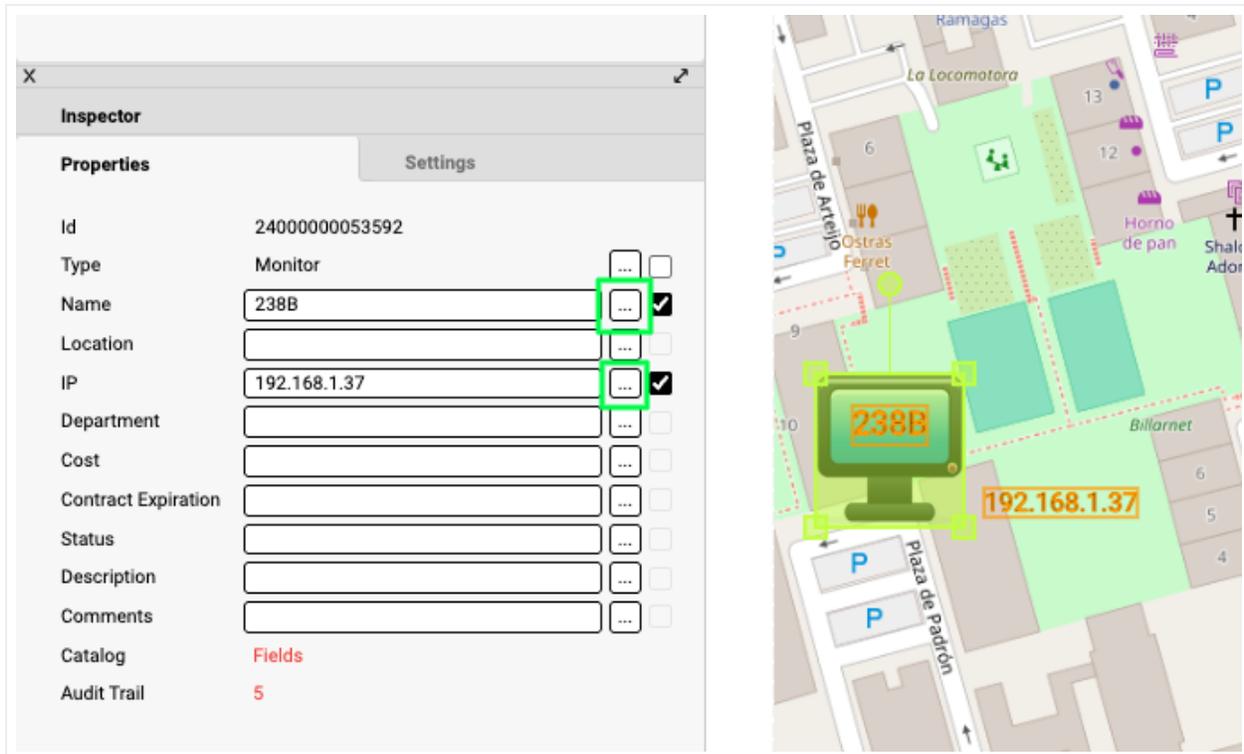


*Result of the expression*

### 4.3.2 Displayed fields

Objects shown on the diagram can also include a displayed field for any of the fields associated with that object. The displayed fields will 'float' next to the object in any position chosen by the user, and as the object moves, so do the displayed fields.

Each object will have a default set of displayed fields corresponding to its type, but users can override these defaults by selecting the displayed fields on an instance by instance basis, as depicted below



*Fields checked as displayed*

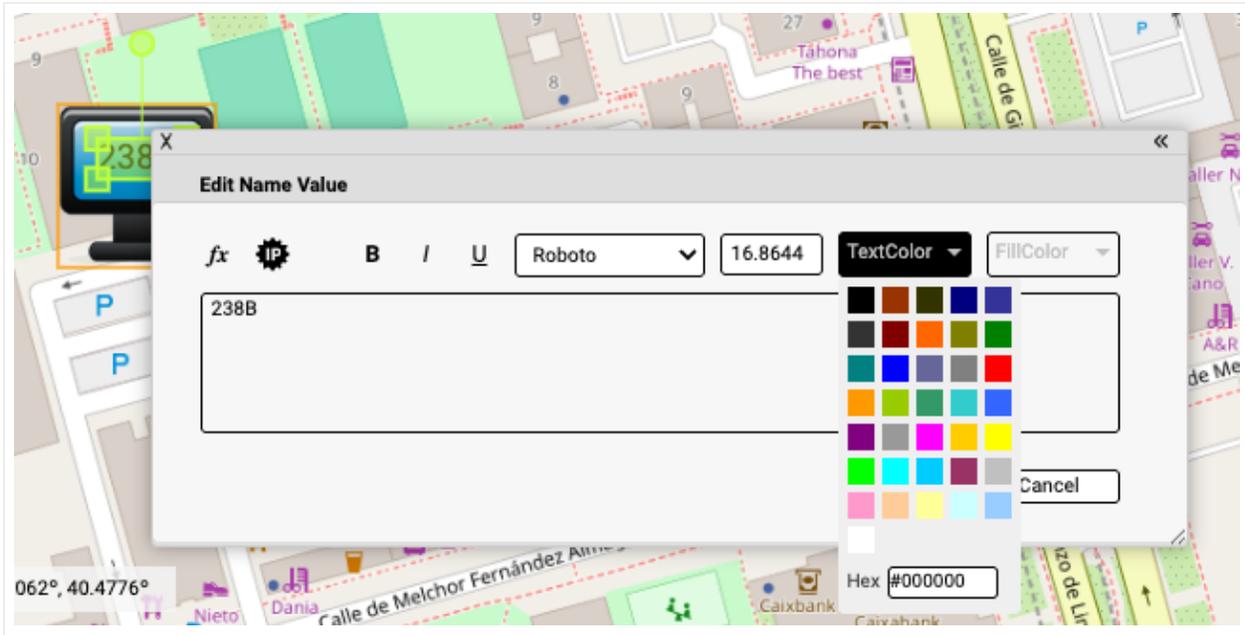
**Tip:**

Displayed fields can also be edited directly by double-clicking on them. This is only true if the display field is not directly above the object. If it is above the object double-clicking will drill down into the object. In this case you would need to right-click the text in order to edit the text.

**Attention!**

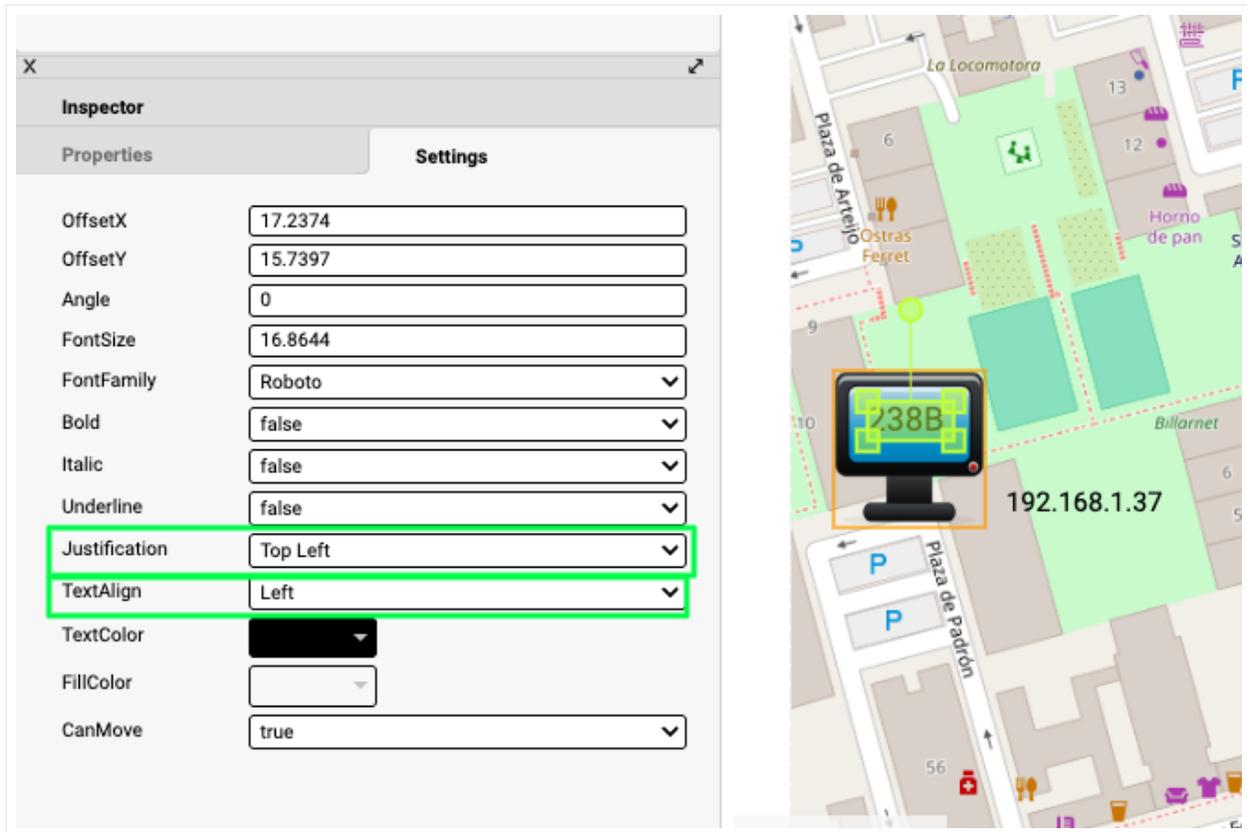
For a displayed field checkbox to be enabled, the field cannot have an empty value.

Users can also resize each displayed field, as well as change the font type and color. Displayed fields can be italicized and set as bold, as well as underlined. Each displayed field can be restored to its default setting, or set as a default for that type by simply right-clicking on it and clicking on the corresponding context menu option



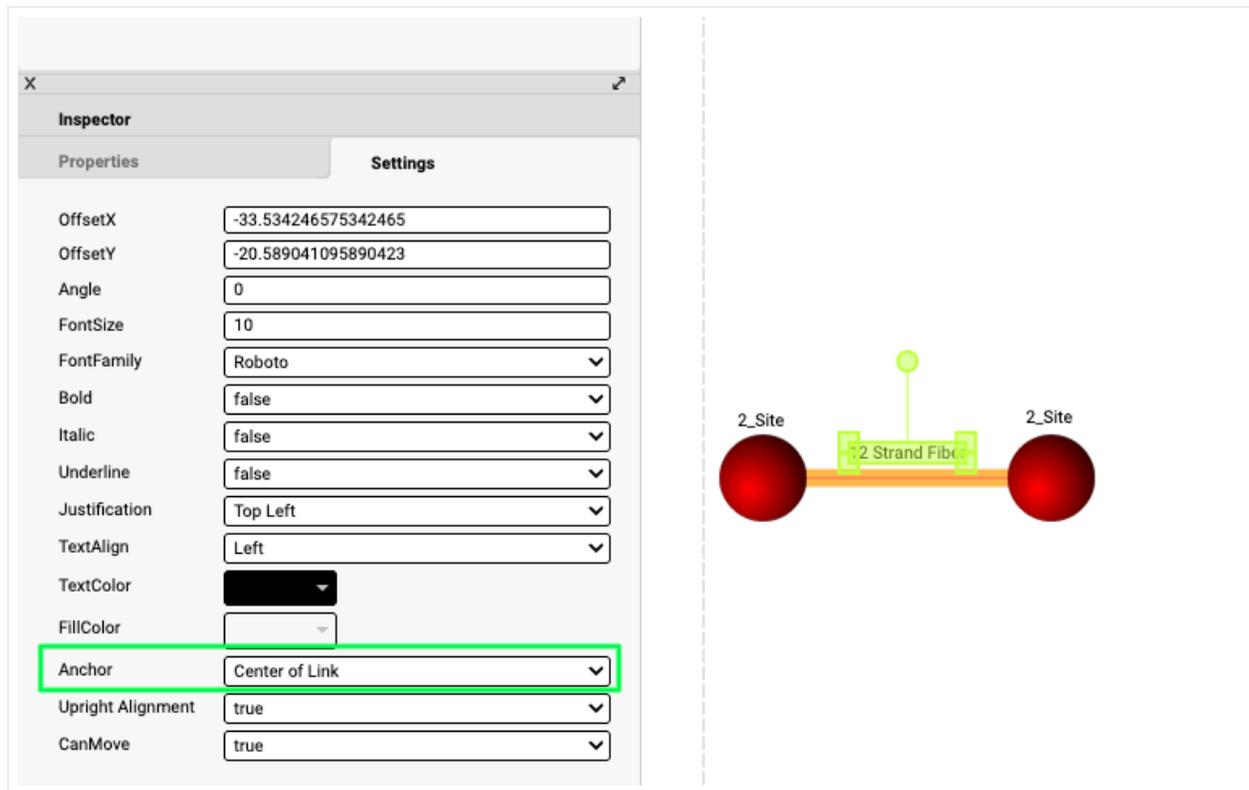
### *Changing the displayed field appearance*

Displayed fields and free text can also be aligned. You can left, center or right align displayed fields or free text, by clicking on it, and selecting the proper justification from the TextAlign feature in the settings tab. You can also choose the justification of top left or center from the settings tab.



*Justification and alignment options for a displayed field*

For links, displayed fields can also have a default anchor position. The options are “from node”, “center of link” and “to node”. The “from node” and “to node” position the displayed field near the starting or ending node. The “center of link” will position the displayed field on the center of the link.



*Anchor option for links*

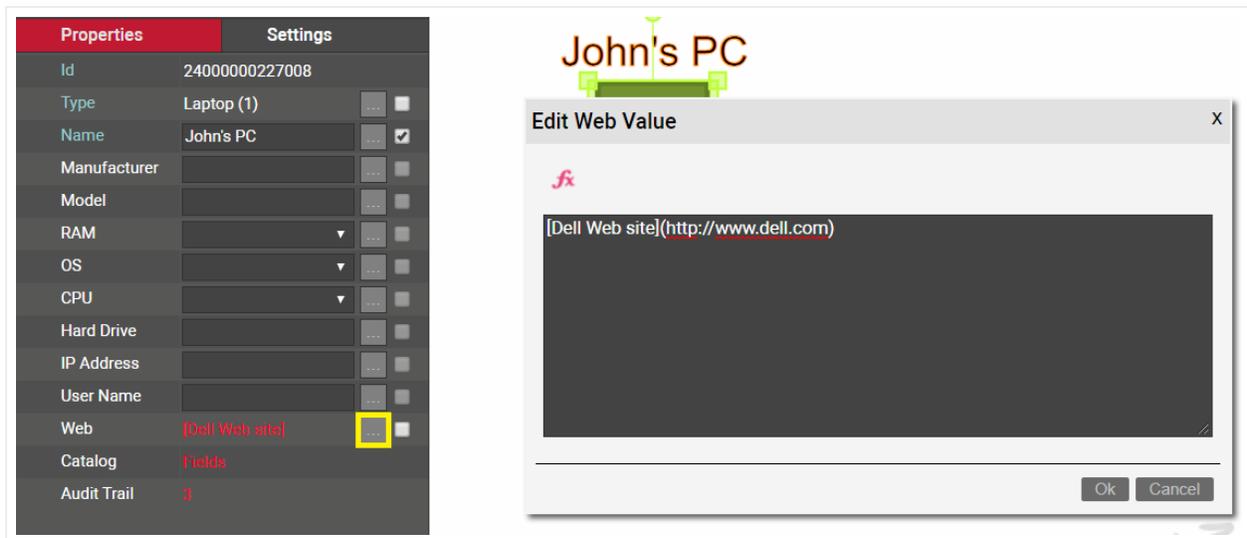
### 4.3.3 Hyperlinks

Any editable field in netTerrain can serve as a hyperlink, which in turn can either open a web page or a document. In that sense, hyperlinks in netTerrain behave like any link in a web browser.

Hyperlinks can be useful for redirecting the user to another web page, for opening a document (the application that reads the document format needs to be installed on the local machine) or even for taking the user to a different diagram within netTerrain (internal link). For internal links, use relative paths that do not include the server name, IP address or application path.

Hyperlinks can be defined for both the field in the editor, as well as the displayed field.

To create a hyperlink simply open the field editor and type in the displayed field between square brackets and the actual URL between round brackets, just as depicted in the image below. If the field is also a displayed field, double-clicking on it will open a new browser tab with the corresponding URL.



### Formatting a field as a URL

#### Tip:

You can open any hyperlink in a new tab by simply holding the ctrl key while clicking!

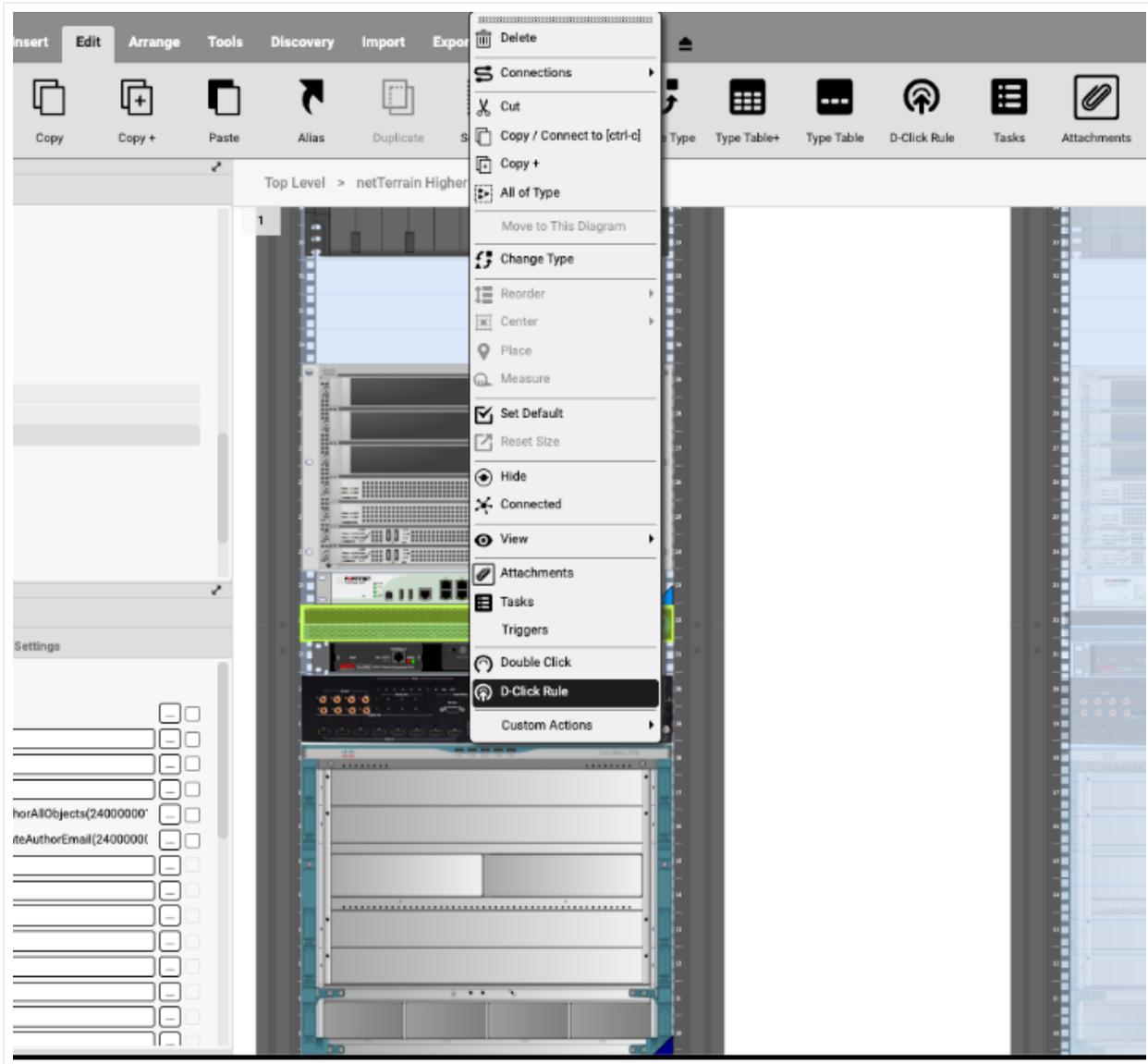
#### Attention!

Note that for the hyperlink to work correctly you need to prefix it with an 'http://' or 'https://'.

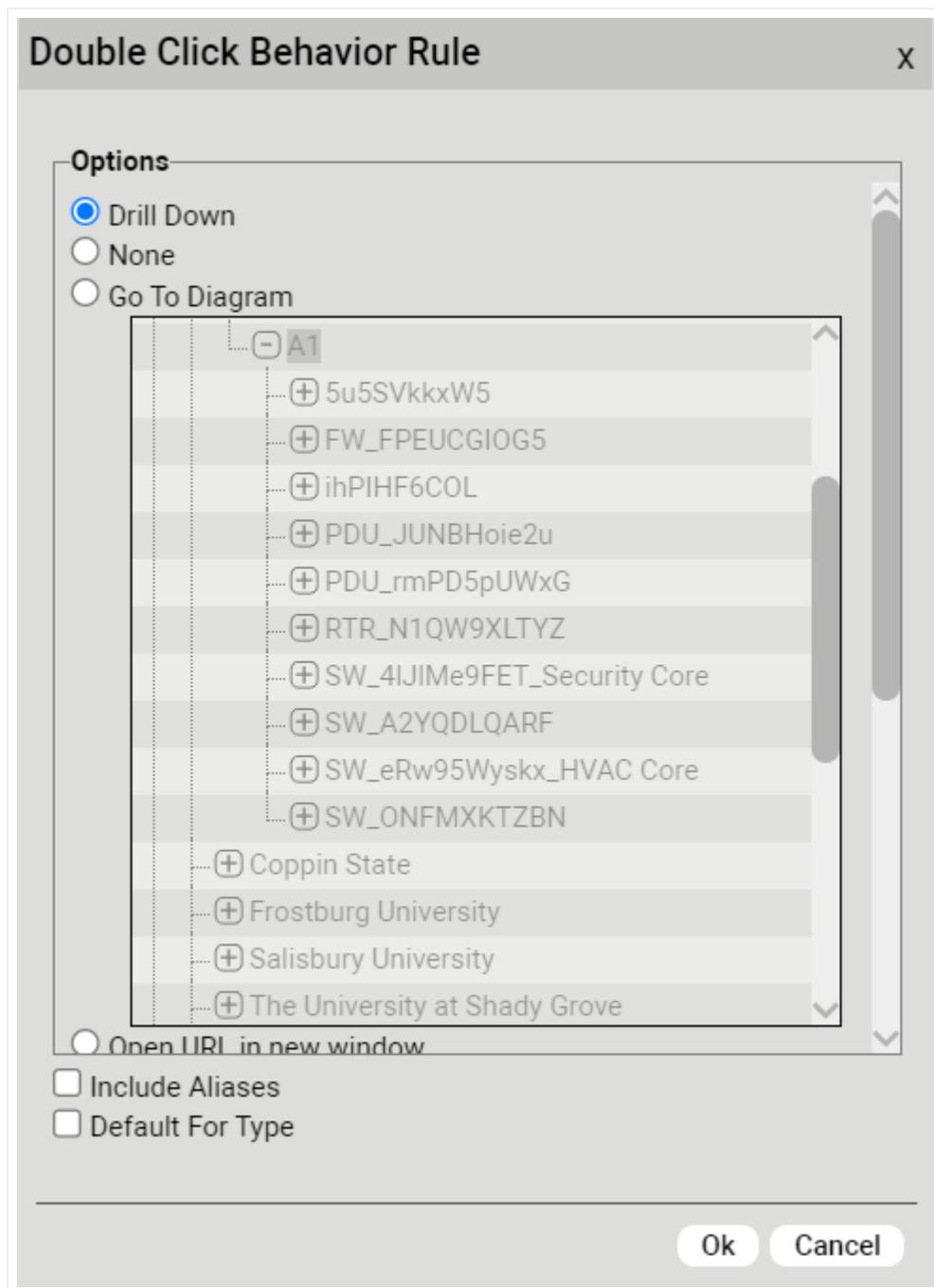
## 4.3.4 Double-click Behaviour

The default behavior for a node double-click action is to drill down into its sub diagram. netTerrain also lets you overwrite this behavior with some other event. To use this feature, follow these steps:

- 1) Right-click on the object where you want to overwrite the double-click behavior.
- 2) Choose the 'D-click rule' option.



3) Then choose from one of the available options:



Below we list all the options to override a double-click behavior. The user chooses one of the following ten radio buttons:

- a. The 'Drill down' option is the default behavior. This opens a sub diagram for a node object or a backplane for a device.
- b. Selecting "None" will prevent any double-click behavior for the object.

c. The 'Go To Diagram' option allows you to re-direct the double-click behavior to another diagram. The Open URL option allows you to specify a hyperlink as the double-click behavior.

d. The 'Open URL in new window' will open a new browser window pointing to the URL provided in the text box.

e. The 'Run Web API module' option lets you select a module and method to be executed upon double-clicking. Please see the netTerrain API guide for more information on custom modules and methods.

f. The 'Open document list' option will open the document embedding dialog with a list of all the documents associated with the node.

g. The 'Open task list' option will open the list of tasks and work orders associated with the node.

h. The 'Show custom SQL report' will open the specified custom report upon double-clicking. Notice that currently this option does not take input parameters. This means that table reports that require input parameters will not execute correctly.

i. The 'Open sub diagram in new tab' will drill down into the instance by opening the sub diagram in a new tab.

j. The 'Open sub diagram in new window' will drill down into the instance by opening the sub diagram in a new window.

In addition, the dialog includes two check boxes:

k. Include Aliases: when checked, the double click rule also applies to all aliases of that instance.

l. Default for type: when checked, any new instances of that type will automatically exhibit the double-click rule set here.

Once you pick a double-click rule for the selected node, any user that double clicks on the node will trigger that specific rule for said node.

## 4.4 Working with links

Links in netTerrain are what the name implies: connections between nodes. A link can only exist between two nodes (or devices, which in this context are considered nodes). Palette objects, free images, text and other decorative items cannot serve as end points for links.

## 4.4.1 Link basics

In netTerrain users can easily create links between two nodes on the same diagram. These are sometimes called "direct links".

We use this term to distinguish these links from their cousins: the inter-diagram links. Inter-diagram links are links between two nodes that are in different diagrams. This is a unique feature not found in other drawing tools.

When a user creates an inter diagram link, netTerrain will also automatically create reference nodes as needed.

Links can be created between any combination of two node objects of the following classes:

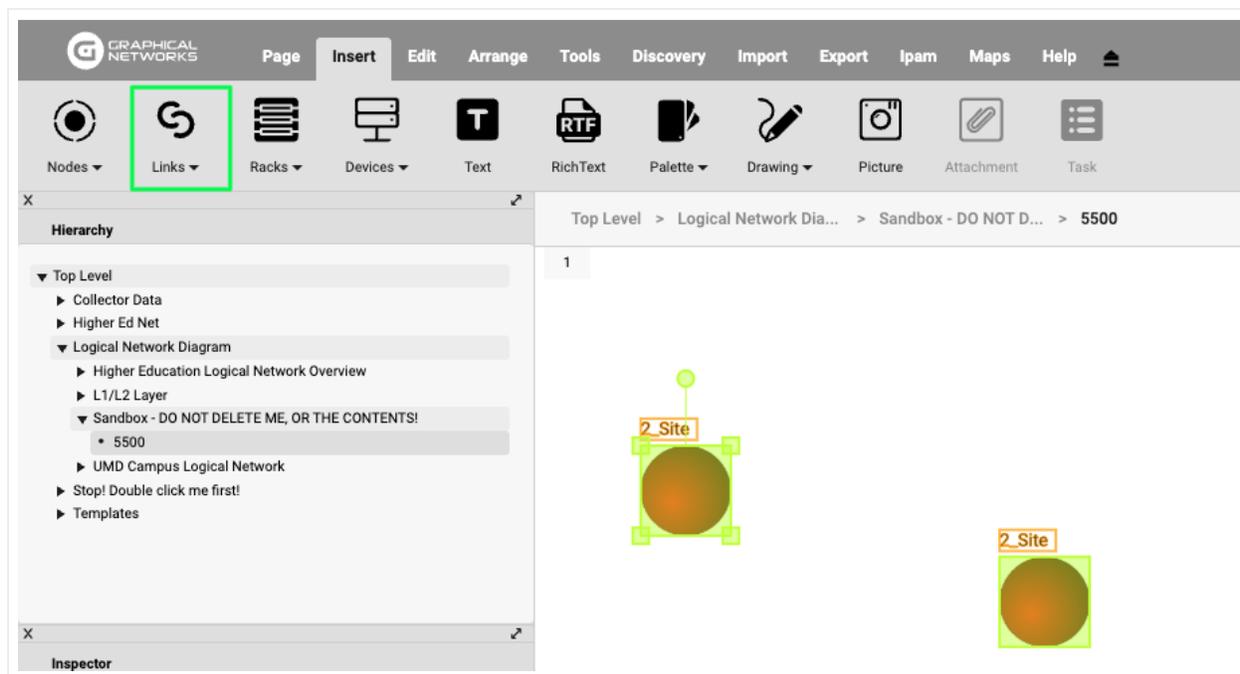
- Nodes
- Devices
- Ports
- Racks

It is valid to create a link between, say, a node and a port, or a rack and a device. It is also valid to create more than one link against a single object. As such, a node can serve as a termination point for multiple links.

A link must always have two and only two endpoints. If you want to create a "dangling" link, that is, a link with no endpoints, then you should use the line tool available from the palette menu.

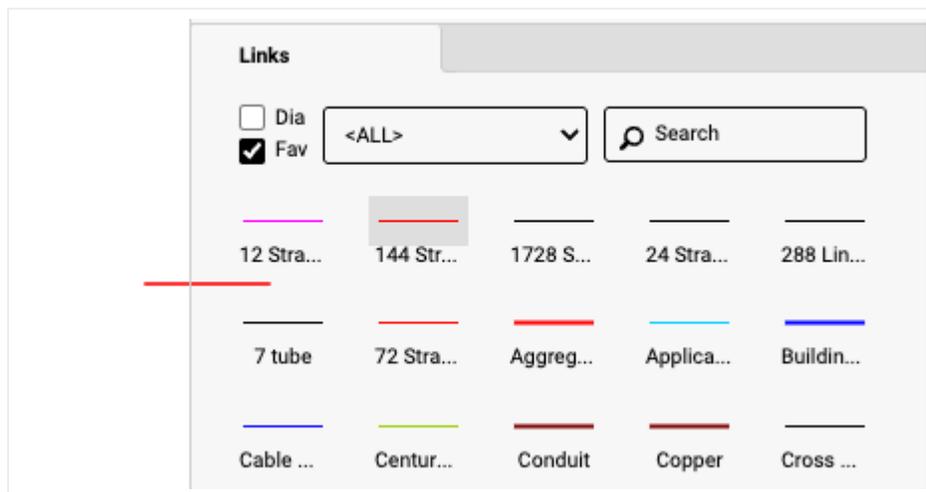
### 4.4.1.1 Link catalog

Links can be created in the project using several different methods. The link catalog can be used to add links via dragging and dropping. You can also add links from the insert menu, as shown below.



Link button

For the link button to be enabled you must have two and only two valid endpoints selected (see list above). If you have, say, 2 nodes selected and a link, it will be disabled.



Link catalog pane

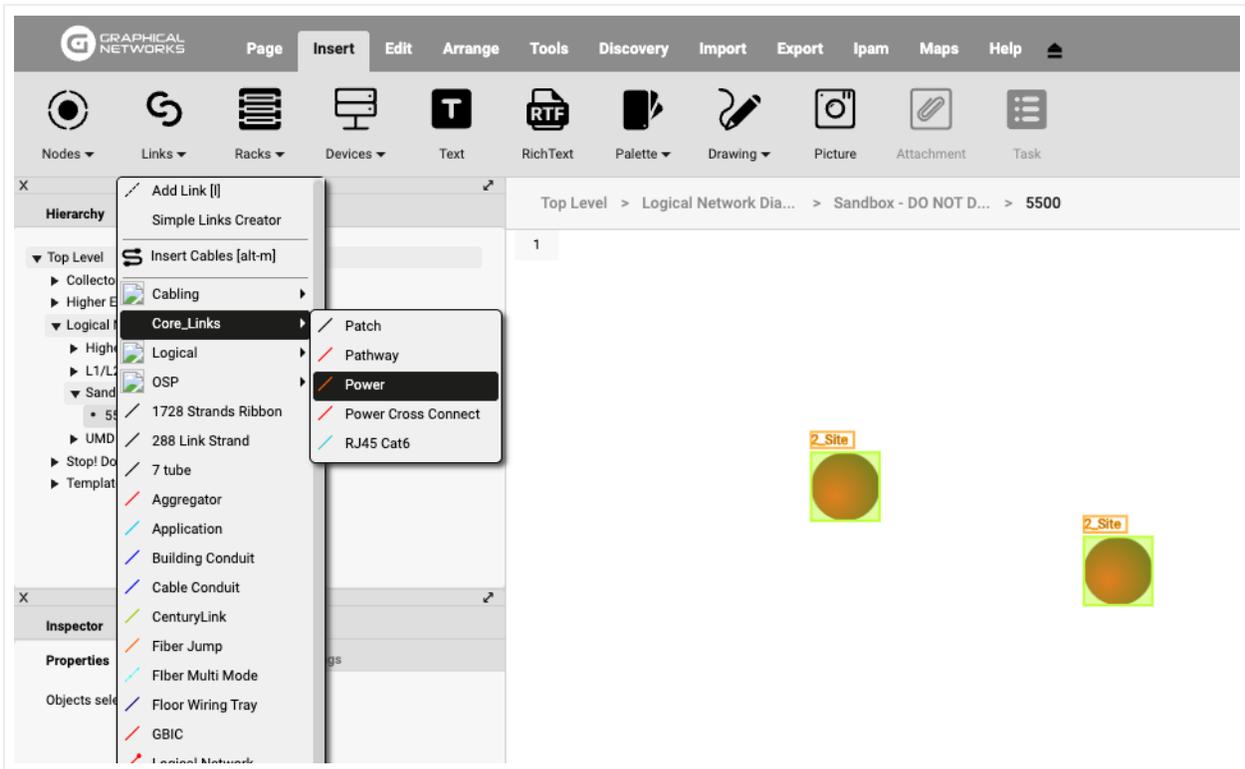
## 4.4.2 Creating links

When the endpoints of a link coexist in the same diagram, the link is called 'direct'. There are several ways to create direct links between objects.

### 4.4.2.1 Method 1: select the two endpoints

The first method to create a direct link is to simply select the two endpoints on the diagram and pick a link type from the links sub menu.

The screenshot below shows two nodes selected, and the expanded link menu with several link type options. Upon clicking of the desired link type, an instance of that type is created between the two selected nodes. Just as with nodes, this link type instance will have a set of properties that correspond to the selected type from the link button.



*Creating a link between two devices*

### 4.4.2.2 Method 2: Dragging and dropping a link from the catalog

Probably the most straightforward method for creating a link between two objects is to just drag and drop it from the link catalog pane. To do this, follow these steps:

- 1) Move the mouse to the link catalog pane and select a link type by clicking on the left mouse button.
- 2) Drag the mouse cursor to the starting node on the diagram.

- 3) As you hover the mouse over the starting node, the node should display 9 snapping points (more on that later).
- 4) Once you identify the desired connection point on the starting node, release the left mouse button and drag the mouse cursor to the endpoint.
- 5) Once you hover the mouse over the ending node, the node should also display 9 snapping points.
- 6) Once you identify the desired connection point on the ending node, press the left mouse button and the link is created!

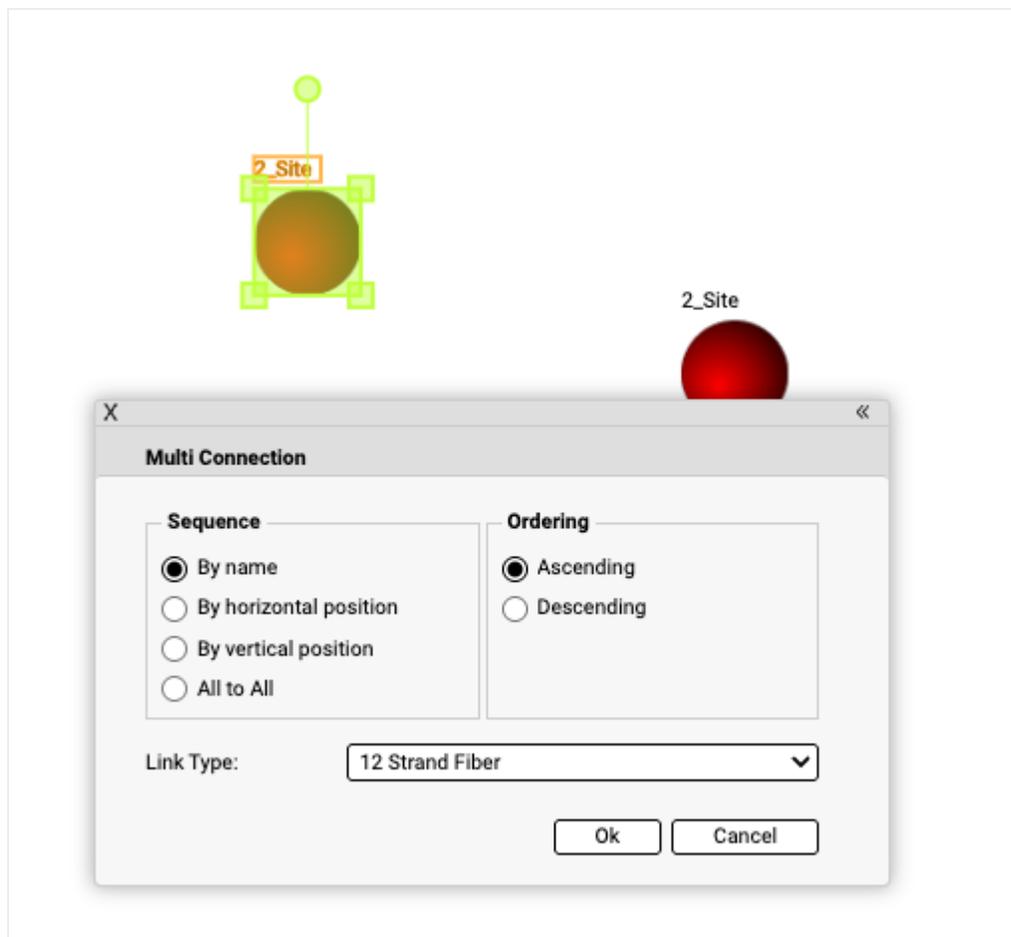
### 4.4.2.3 Method 3: using the clipboard

Another way of creating a link is to use the clipboard and multi connection option dialog (more on that later). You can do this, as follows:

- 1) From the link section of the catalog, select the link type you want to use
- 2) Select the starting node and copy it to the clipboard (ctrl-c)
- 3) Click on the end node and then click ctrl-l. Done!

If you want to choose which type of link type you use, during the creation process, an alternative method is the following:

- 1) Select the starting node and copy it to the clipboard (ctrl-c)
- 2) Right-click on the end node
- 3) Select 'create connection' (you can use ctrl-l for the shortcut and the last selection for the Multi connection dialog will be remembered, as explained below).
- 4) The 'Multi connection' dialog will open, which lets you choose the link Type you want use. This option is most useful when creating multiple options at once, so for single connections simply pick the link type to use and then next time that setting will be remembered.
- 5) Click 'Ok'.



*Creating a link using the clipboard and multi connection option*

This option is also the one that will be used for creating inter diagram links, as explained later in this guide.

After you used this method for the first time, all the settings above are remembered, in which case the process gets a lot simpler with two easy steps (if you stick with these settings, including the link type):

- 1) Select the starting node and copy it to the clipboard (ctrl-c)
- 2) Select the ending node and press [ctrl-l]

#### 4.4.2.4 Method 4: using the 'l' key

A very quick way of creating a direct link is by using the 'l' key shortcut method, as explained below:

- 1) With the 'l' key pressed move the mouse to the starting node and click on the desired snapping point
- 2) With the left mouse button pressed (and the 'l' key still pressed) move the mouse to the endpoint

3) With the mouse hovering over the endpoint, release the left mouse button when you are over the desired endpoint snapping point and you are done!

### 4.4.3 Inter diagram links

Links that start and end on different diagrams are called 'Inter Diagram Links' and represent a useful way of showing connectivity and relationships between objects residing on different parts of the hierarchy.

Creating an inter diagram link is as easy as creating a direct link using the method 3 described above.

- 1) From the link section of the catalog, select the link type you want to use
- 2) Select the starting node and copy it to the clipboard (ctrl-c)
- 3) Navigate to the diagram where the end node is
- 4) Select it and then click ctrl-l.

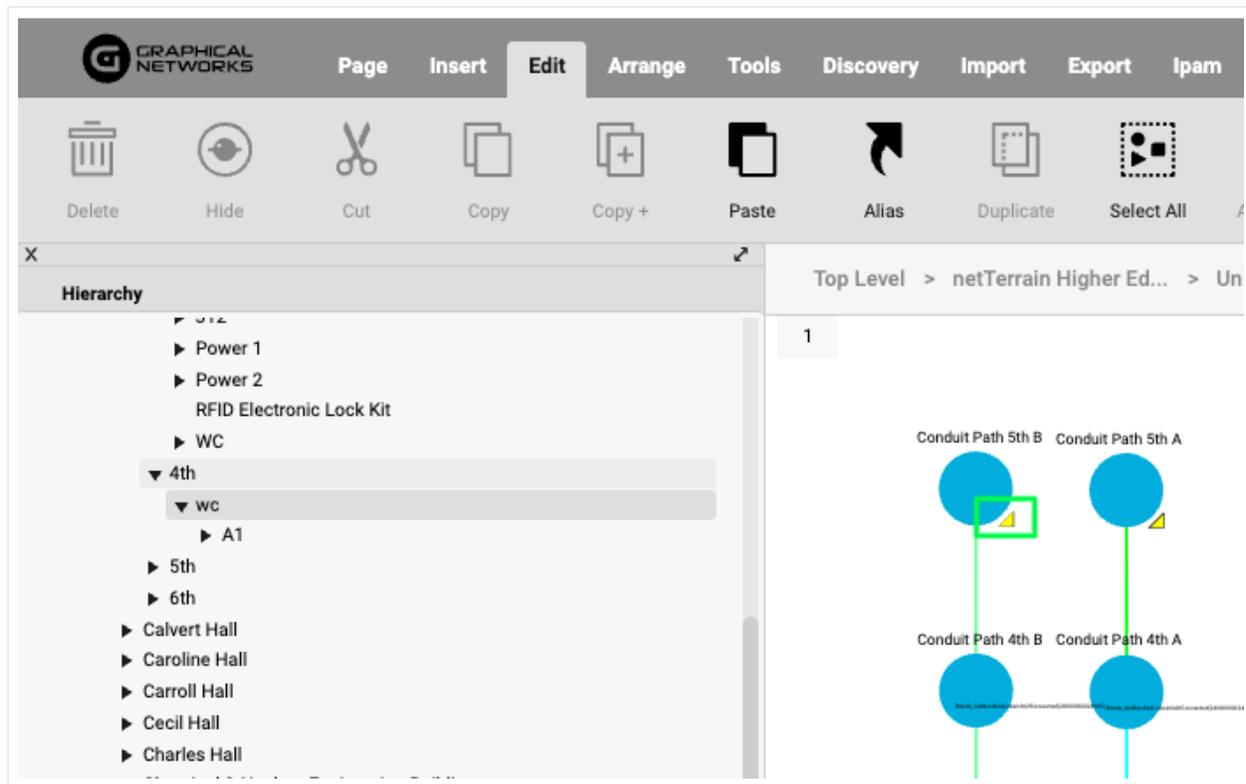
Note that netTerrain will automatically add the corresponding reference nodes to each diagram. These reference nodes will specify on each local diagram what the corresponding end node on the other diagram is.

The new inter diagram is not only represented on the diagram where it was created. A link representing it, will appear in the following places:

- 1) On the diagram where each end node exists along with the reference node representing the opposite node. These are also the lowest-level diagrams in the hierarchy where that inter diagram link is represented.
- 2) On the highest-level diagram where the containing nodes of both end points coexist. In this case the link is a direct link between those two containers.
- 3) On any intermediate diagram where only one of the containers of one of the end points exists

A user can differentiate a reference node from a regular node by the yellow triangle on the bottom right corner of the node.

Users can also create links by selecting reference nodes. Inter diagram links can be deleted from anywhere in the hierarchy they appear.

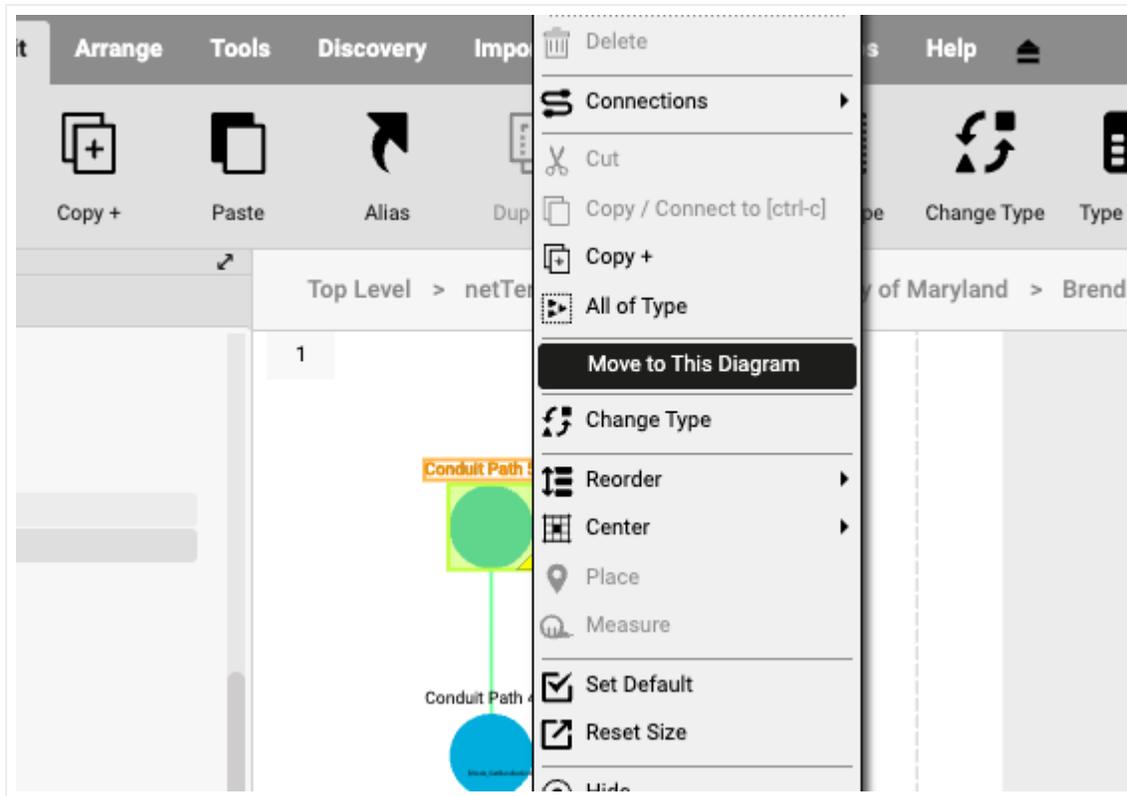


*Reference node indicator*

#### 4.4.3.1 Bringing in a reference node to the local diagram

If you'd like to bring in a reference node from the remote diagram to the local diagram you are currently in, you could, of course, navigate to the remote diagram, then do some nice cutting and pasting after navigating back to the local diagram. Here's a nice hack instead:

On the local diagram simply right click on the reference node and click on the 'Move to this diagram' option.



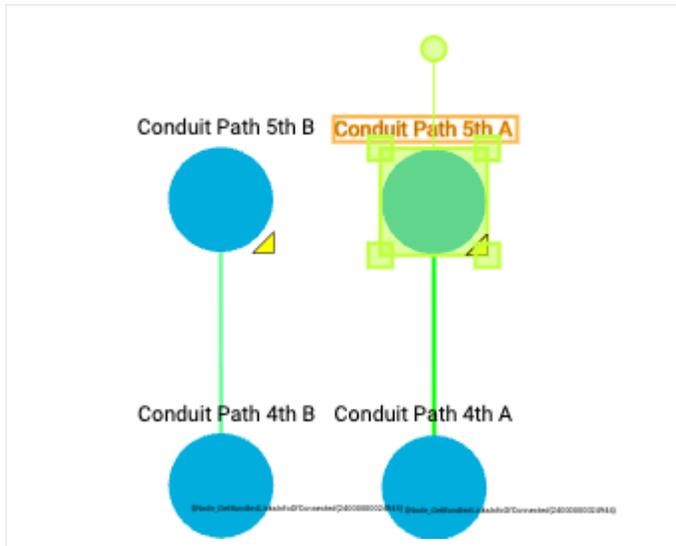
*Moving a reference node to the local diagram*

#### 4.4.4 Link aesthetics: snapping points, styles and bend points

To help you make your network diagrams look precise, netTerrain supports several aesthetical elements to help you with the task of making your links sing.

##### 4.4.4.1 Snapping points

By default, each link endpoint is connected to the center of the nodes. To provide users with a more granular control on the exact position of link endpoints, nodes in netTerrain have 9 snapping points on a 3x3 grid. They become visible when a user moves the endpoint of a link inside the rectangle that defines the node boundaries.



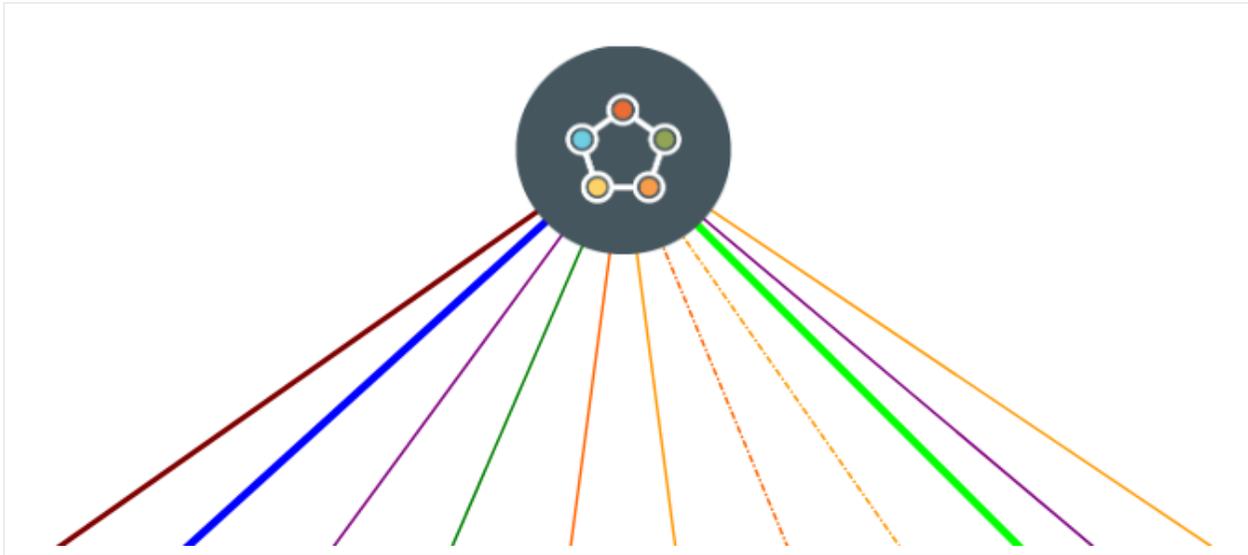
### Node snapping points

To make the snapping points visible simply fetch the link endpoint on the node and move it inside the node rectangle by holding the left mouse button. Every time the mouse hovers over a snapping point, it is highlighted so that upon mouse button release, the link is locked to that snapping point. Snapping points are there for convenience only, since a link can be connected to any part of the node, not just the specific snapping points.

### 4.4.4.2 Link styles

Links can include different line styles, colors, and thicknesses, depending on the link type that was defined when creating the instance. These styles are applied for all instances of a given link type, but can be overridden on a per instance basis, using visual overrides. The netTerrain catalog supports the following line styles:

- Solid
- Dash
- Dot
- Dash-dot
- Dash-dash-dot

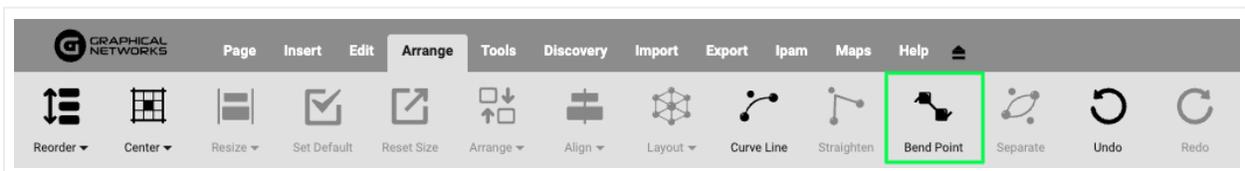


*Links displaying different line styles and colors*

## 4.4.5 Bend points

Bend points in netTerrain provide the ability to reroute links within a given diagram. A bend point will partition a link into multiple segments, but they all represent the same original link. By clicking on any segment, the properties for the link will be displayed.

To create a new bend point, select the link and click on the 'Add Bend point' button ('b' hotkey). Alternatively, you can create a bend point using the bend point button from the Arrange menu.



### *Adding a bend point*

To create right-angled bend points, select the bend point and click on the 'Set right angle' button (or alt-b). Once the right-angle button has been pressed, the bend point will be positioned at a right angle with respect to its adjacent nodes. The engine automatically determines what the best right-angle option is, based on the relative position of the bend point with respect to its adjacent nodes.

The general rule for this operation is that if the x coordinate of the bend point is closer to the right-most adjacent node, it will be located on the upper right corner of an imaginary right-angled triangle defined by the bend point and its two adjacent nodes.

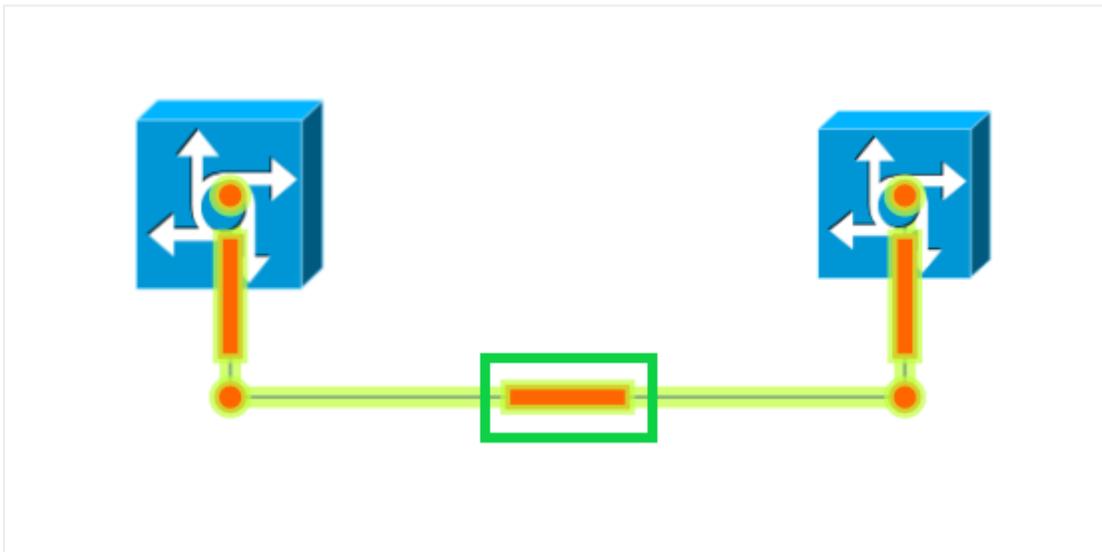
To delete a bend point, simply select it and click on the delete button or key. If you arrange the bend points or nodes in such a way that an existing bend point no longer “bends” the link, it automatically disappears as it serves no purpose anymore.

#### 4.4.5.1 Creating multiple bend points quickly using the ‘b’ shortcut

A very quick way of adding multiple bend points and directing the path of the link is to use the ‘b’ shortcut. Select the link of interest first and then press and hold ‘b’. Move your mouse to the position of where you want to add a bend point and press the left mouse button. This will add the bend point where you click on the screen. You can perform this operation as many times as you want in succession.

#### 4.4.5.2 Creating right-angled routes for links quickly

Often you may find yourself wanting to create right angled paths for a link between two nodes. For example, you may want to lay out a link so that it looks like a right-angled U. Doing it all manually would require creating two bend points, then moving them appropriately to create a right angle. A much easier way to accomplish this is by using the link ‘right angle’ handle, as shown below.



*Using the right-angle handle*

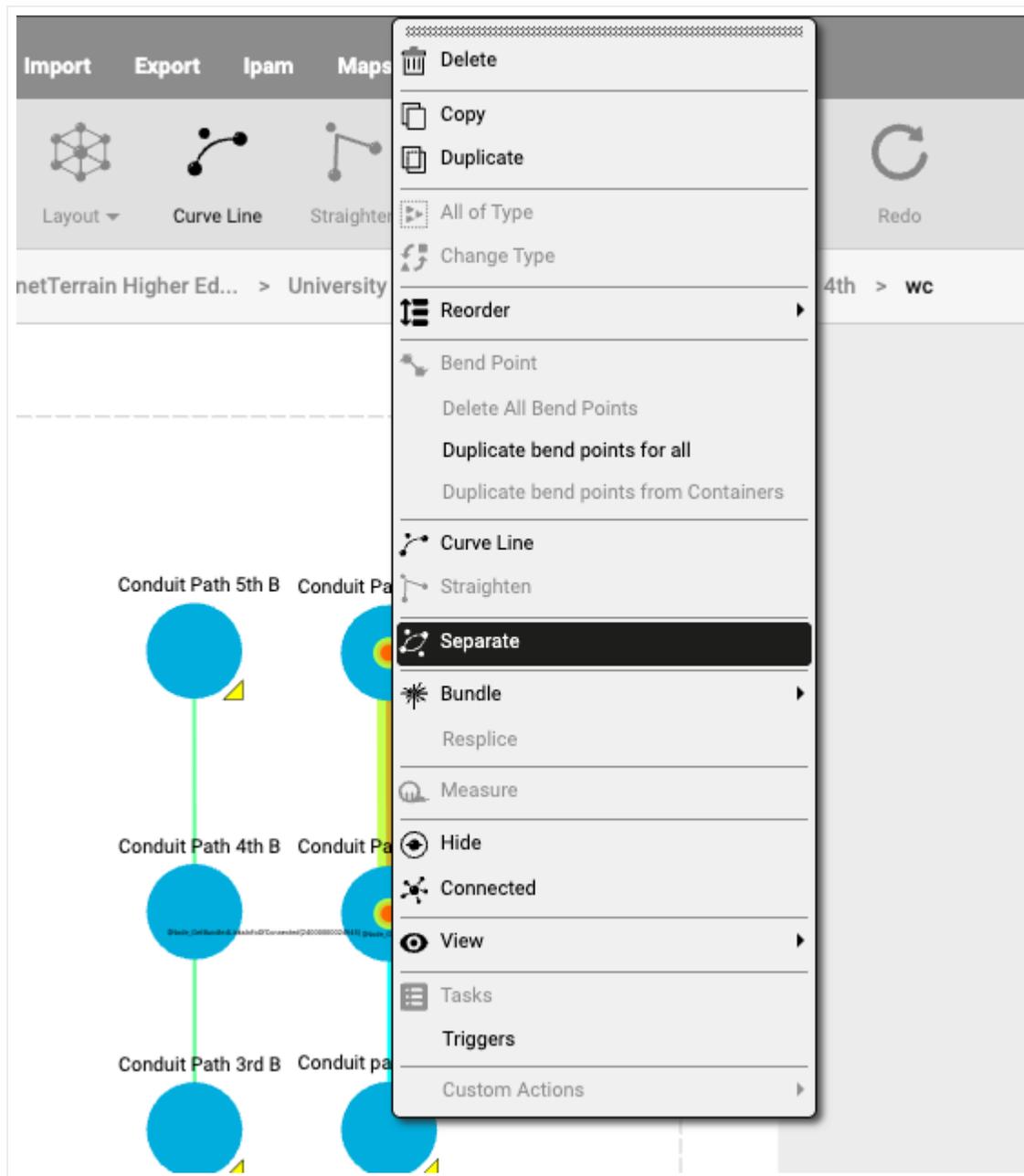
Just click on the link and then drag that handle until you create the desired U-shape. This feature can be used as many times as needed on any segment of the same link.

## 4.4.6 Separating links

In many instances two nodes can be connected by several links, which by default would be displayed on top of each other. For each link to be clearly visible, users can quickly accomplish the task of separating the links by selecting them and applying a link separation algorithm.

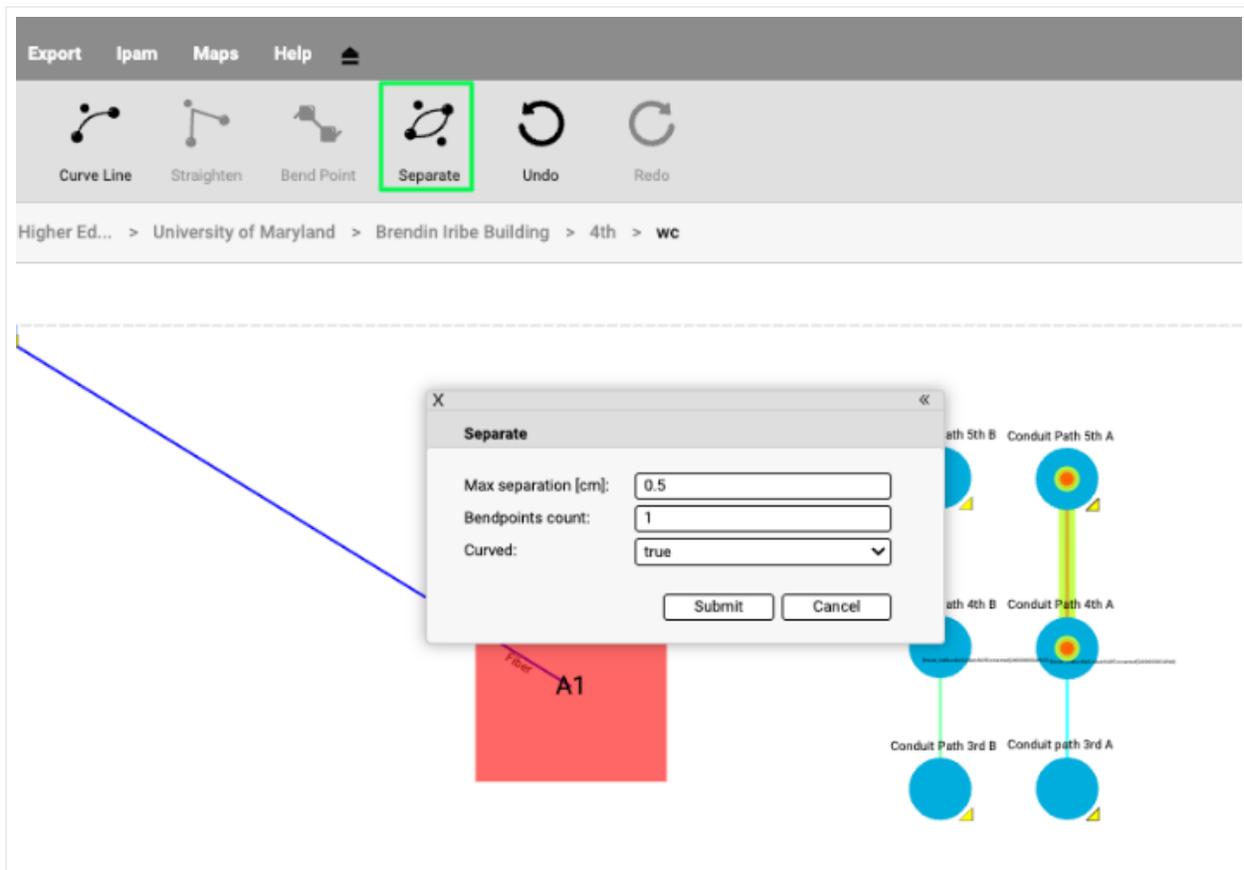
The process works as follows:

- 1) Select the links considering that they must start and end on the same pair of nodes. Also note that since most likely the links will be on top of each other, you may have to select them using a selection box that crosses them at some point.
- 2) Once the links are highlighted, right-click on any of them and click on 'separate links' or click on the 'Separate' button in the Arrange menu. Note that if that option is not enabled, you may have only selected one link. Make sure you have more than one link selected, and the endpoints are the same.



3) With the 'Separate Links' dialog open, you can now choose from the following parameters:

- a. Separation distance between links (in inches)
- b. Number of bend points you want to apply to each link
- c. Line curving



Note that this separation algorithm can be applied to any set of links sharing endpoints, regardless of bend point count, distance between links or curving state.

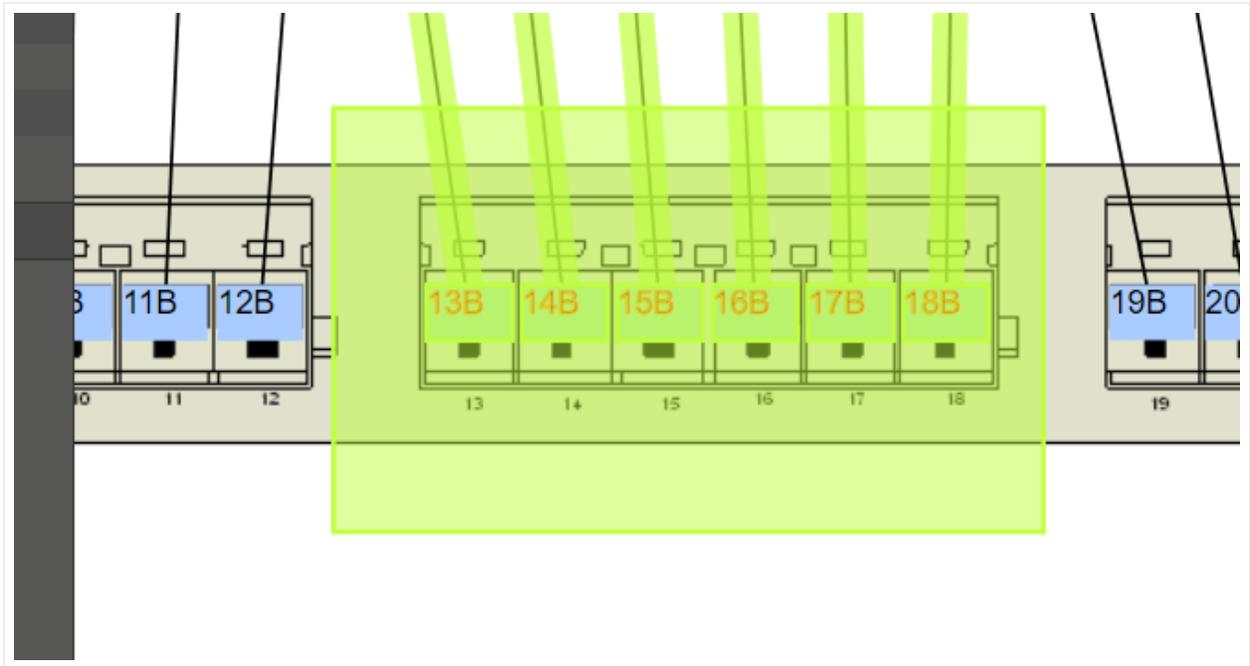
#### 4.4.7 Creating multiple links at once

netTerrain has several convenient ways for creating multiple links at once. These methods work for any type of link and node.

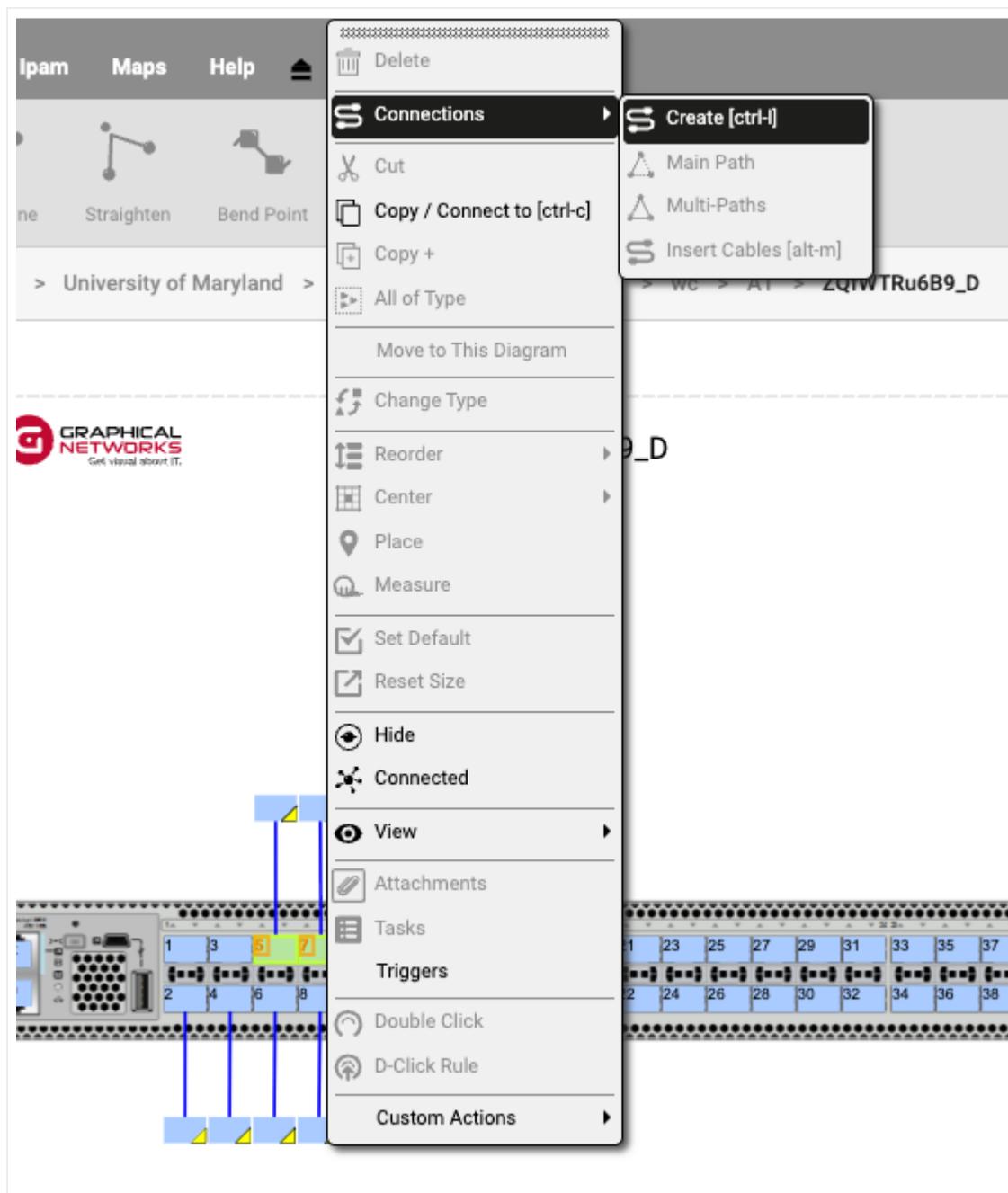
Where these methods are most helpful is in the creation of multiple connections between ports. For example, let's connect two 'patch panel' devices with links of type 'Copper'. In case you are not familiar with these types of devices, just imagine them as nodes with an ordered set of sub nodes underneath.

Let's say we wanted to create 6 cable connections between ports 1 to 6 on patch panel A and ports 1 to 6 on patch panel B. These are the typical steps to accomplish that task:

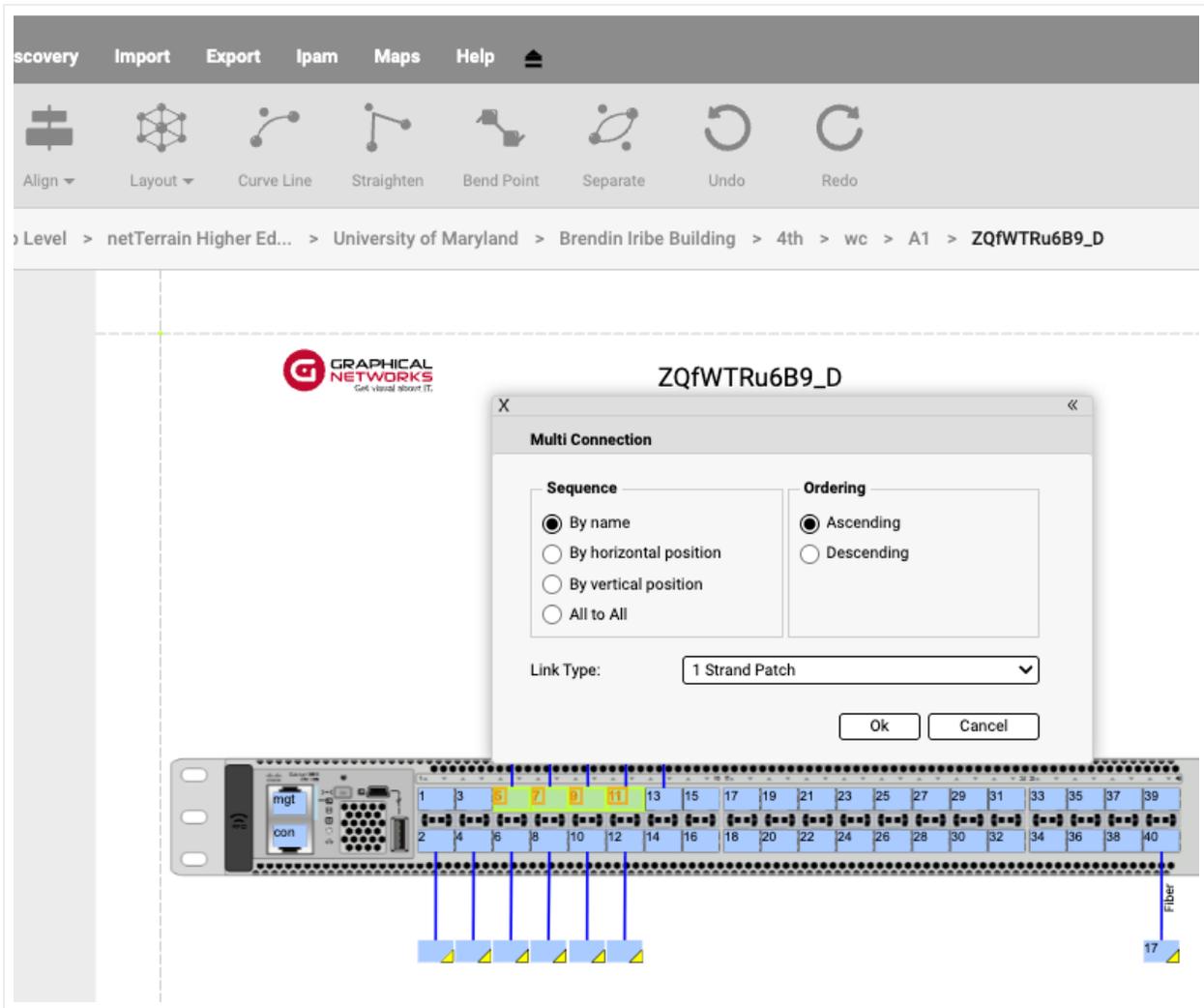
- 1) Go into the patch panel A diagram and select the 6 starting ports.



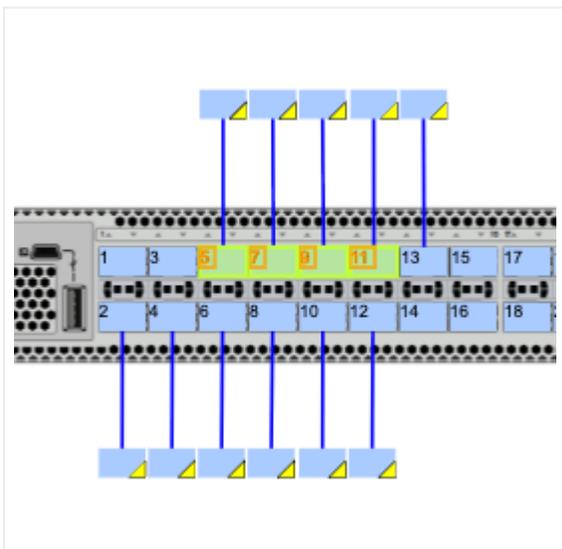
- 2) Copy all ports to the clipboard (ctrl-c).
- 3) Go into the patch panel B diagram and select the 6 ending ports.
- 4) With those ports selected, right-click and select 'Connections' -> 'Create'.



5) A 'Multi connection' dialog pops up, where you can select the type of sequence, ordering and catalog link type and click 'OK'.



After clicking ok, 6 cables are created, with their corresponding reference nodes and interdiagram links.



*6 cables added via the multi connection option*

The sequence options provide a great degree of control for choosing which starting nodes are connected to which ending nodes.

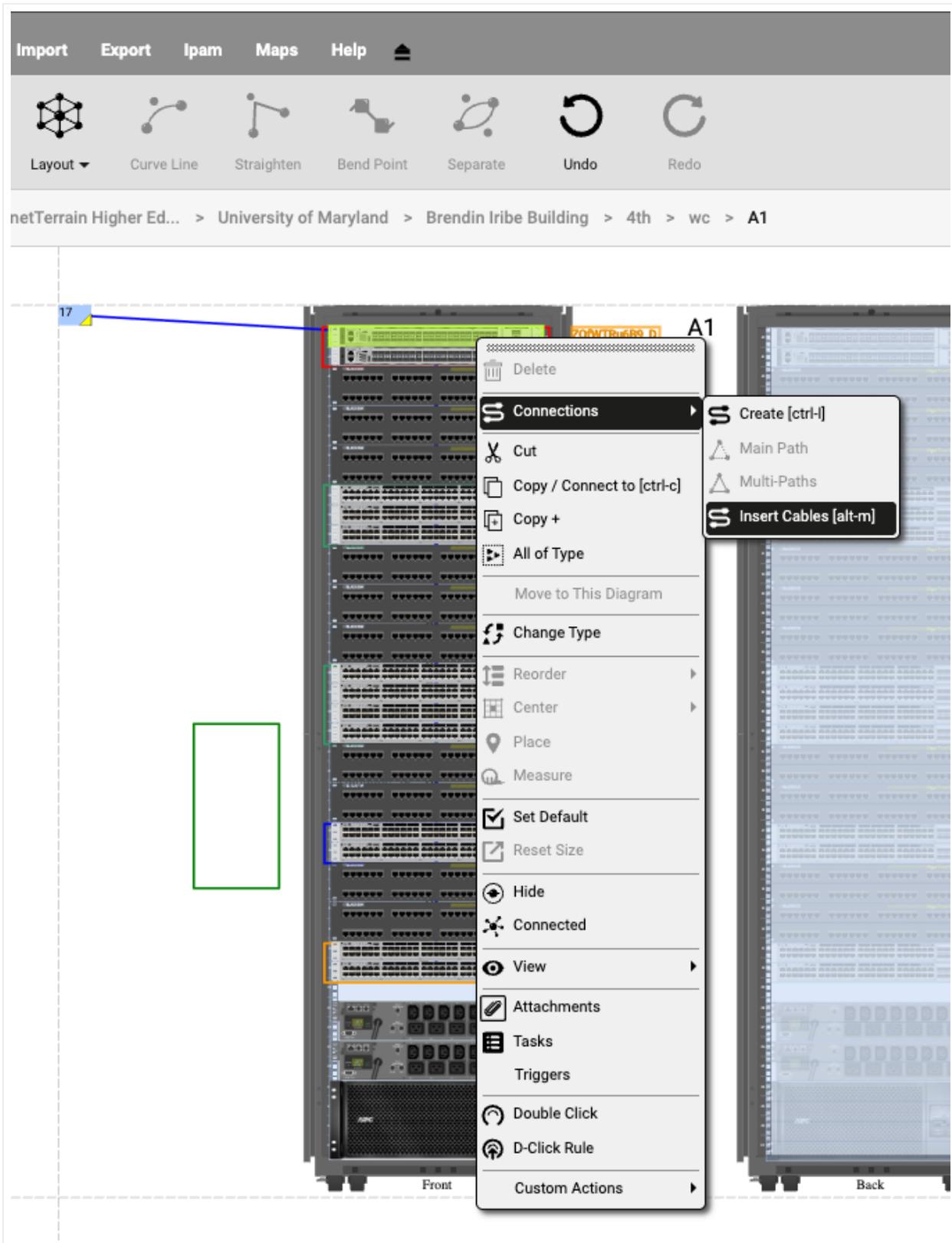
## 4.4.8 Easy cable management using the cable mapper

Cable management can be a daunting task, especially if you need to create many cables between different ports in your inventory. You can use shortcuts and other methods to create single cables between different ports. You can also create multiple cables between sequences of ports using shortcuts, however this only works when there is some sort of uniform pattern for the connections. In addition, for these techniques you always need to go to the actual ports to start the connection process. Enter the “cable mapper”.

The cable mapper is an informal name that we use for a utility launched from a context menu, which already existed in the Integration Toolkit (ITK) in an unofficial capacity to speed up the process of creating cables. We ported this utility to the web-based interface, improved it and made it official. It can be used for any kind of link connection, but we refer to it as the cable mapper because the endpoints are always ports and the way you create the cables is by mapping these port endpoints, as we will see below.

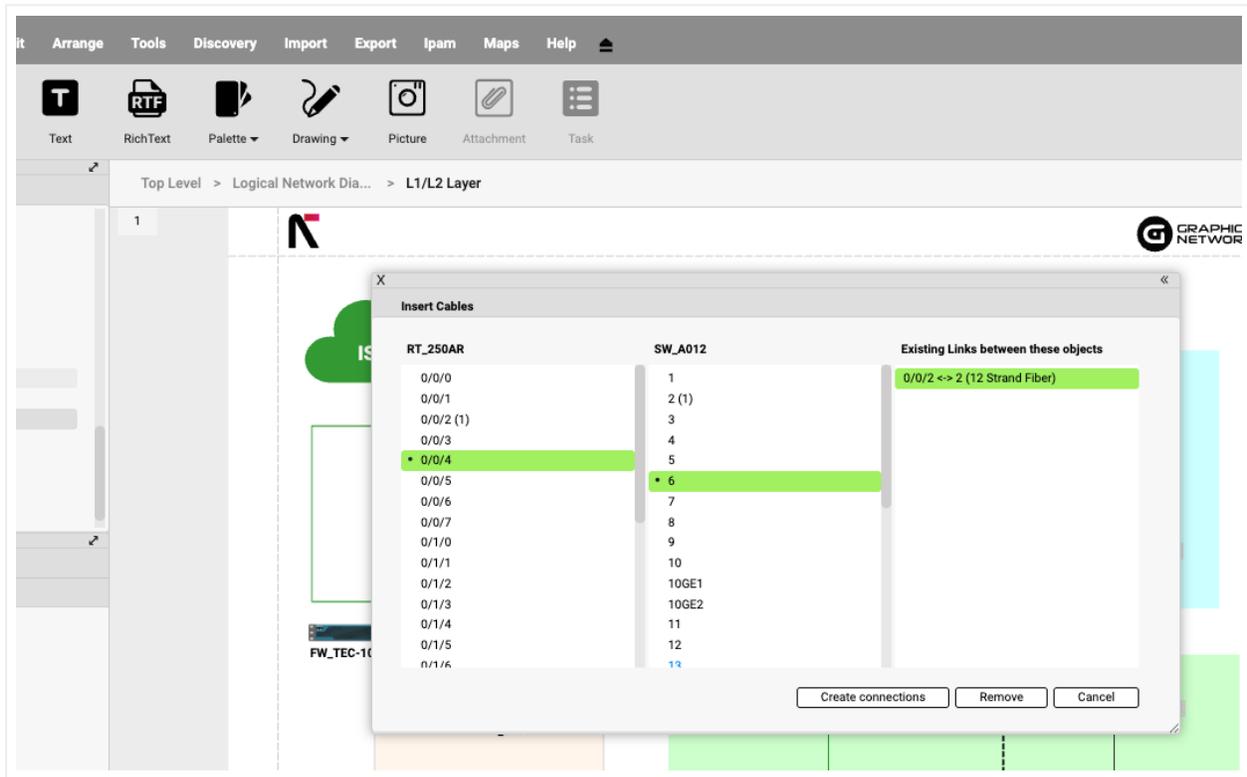
The cable mapper simplifies the process of creating cables in two ways: you can launch it from anywhere in the project by selecting two nodes and it doesn't require a specific connectivity pattern for cables to be created.

You launch the cable mapper utility by selecting two nodes from a diagram. As mentioned above, they don't have to be the actual ports or even the devices that you want to connect. It can be the two buildings where the end devices are. This is quite convenient because right there it already simplifies the process by not having to navigate to the endpoints back and forth. After selecting the two objects bring up the context menu (alt-c) and click on the “Insert Cables” menu. Or just click on alt-m, which is the hotkey for the utility.



*Insert Cables utility launched for two buildings*

The cable mapper shows you the two endpoints, and their entire hierarchy, as well as a list of already existing cables between these two endpoints in the far-right window. You can navigate both hierarchies until you find the devices you want to connect. You can expand the devices to show the ports. If the devices have cards, you can expand those as well.



*The cable mapper interface*

At this point you can start clicking on the ports you want to connect to on each side. You can use the ctrl or shift keys to multi-select ports. Two sort buttons let you sort the ports in ascending or descending order on each side.

Once you are done selecting the ports you want to connect, you press the 'Create connection' button. This opens a dialog that lets you choose the sequence in which you want to connect these ports and the ordering.

**Sequence:**

- By name: connects port 1 with 1, 2 with 2, etc.
- By horizontal position: connects the left most port with the left most, and so on.
- By vertical position: connects the top most port with the top most, and so on.
- All to All: connects every port on the left with every port on the right.

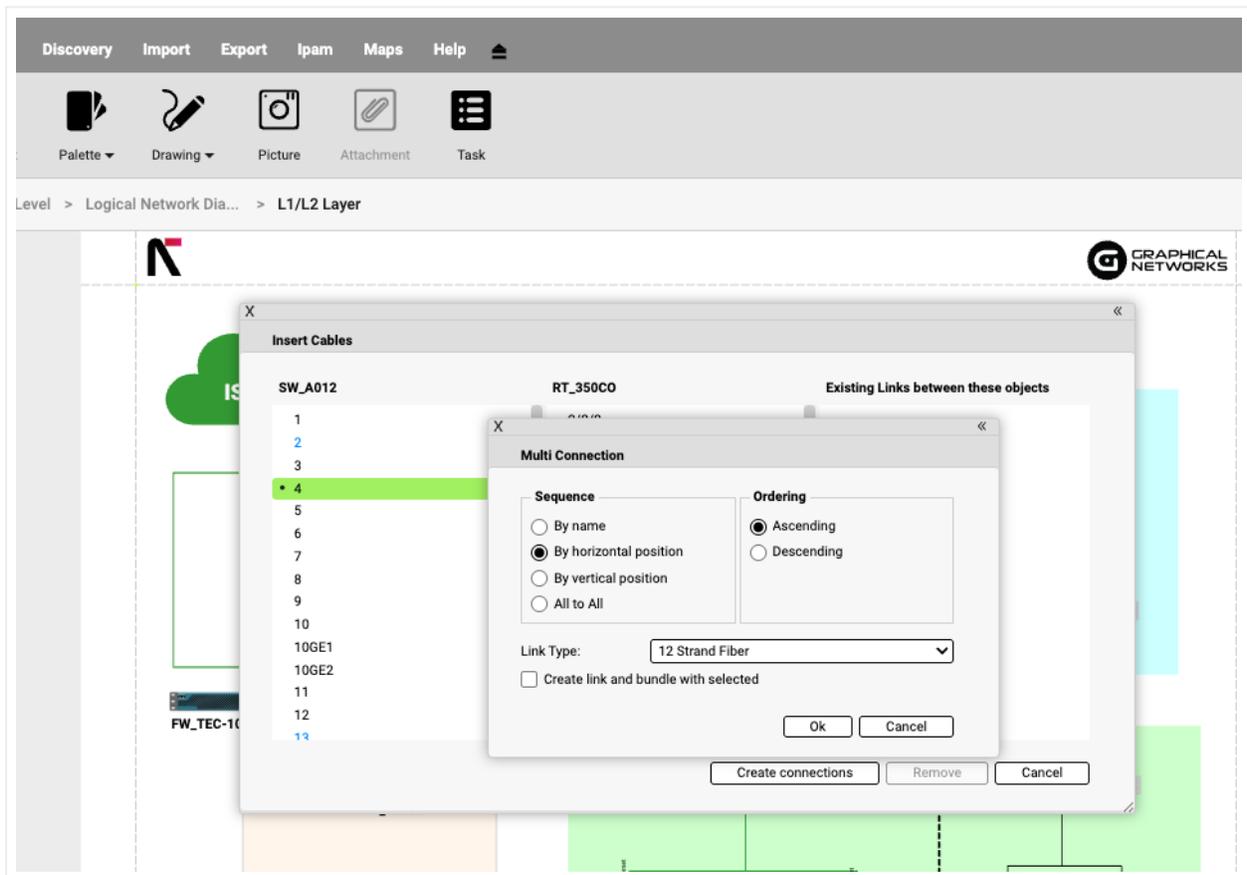
## Ordering:

· Ascending: connects ports in ascending order (such as if, for example, you choose the 'By name' option above, you are now connecting the ports front-to-back).

· Descending.

Link Type: lets you choose which catalog type you want to use for these cables.

Once you click 'Ok' the connections are created.



### *Creating cables with the cable mapper*

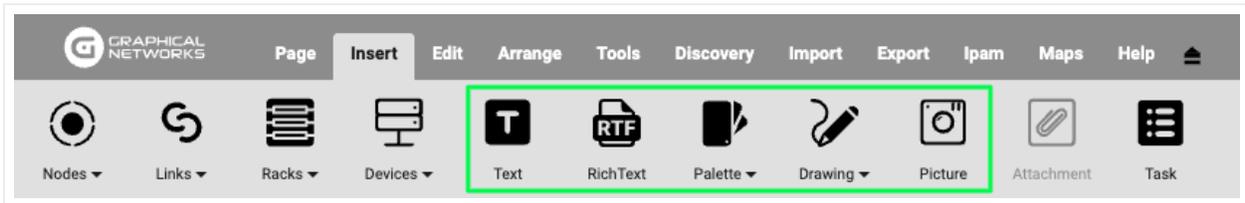
The cable mapper will remember the settings for the multi-connection dialog above, so that next time you use the same preferences, you can just click through it.

By being able to click through this dialog, you are also making it easy to quickly create connections between ports in no discernible pattern. Just select any pair of ports from the cable mapper, create the connection, and click through the dialog.

Because the cable mapper shows you existing connections between the selected endpoints, it can also be used to quickly remove existing connections. Just select any connections from the right panel and click on the remove button.

## 4.5 Free text, palette objects, drawings, and pictures

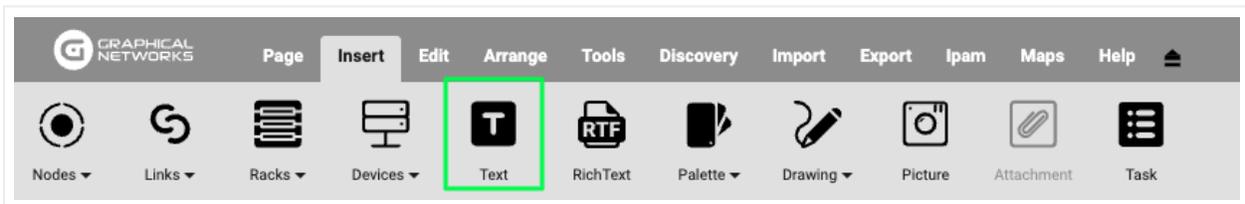
As we saw briefly in the chapter reviewing the GUI, users with annotation rights (or better) can insert a series of elements that although are not part of what you would consider the project inventory (nodes, links, devices, etc.) can come in handy to decorate a diagram or provide information related to the project. These elements include free text, palette objects, drawings, and pictures.



*Free text, palette object, drawing and picture menus*

### 4.5.1 Free text

Users with annotation rights (or better) can insert free text in any netTerrain diagram by clicking on the text button under the Insert ribbon, as depicted below.



*Inserting free text*

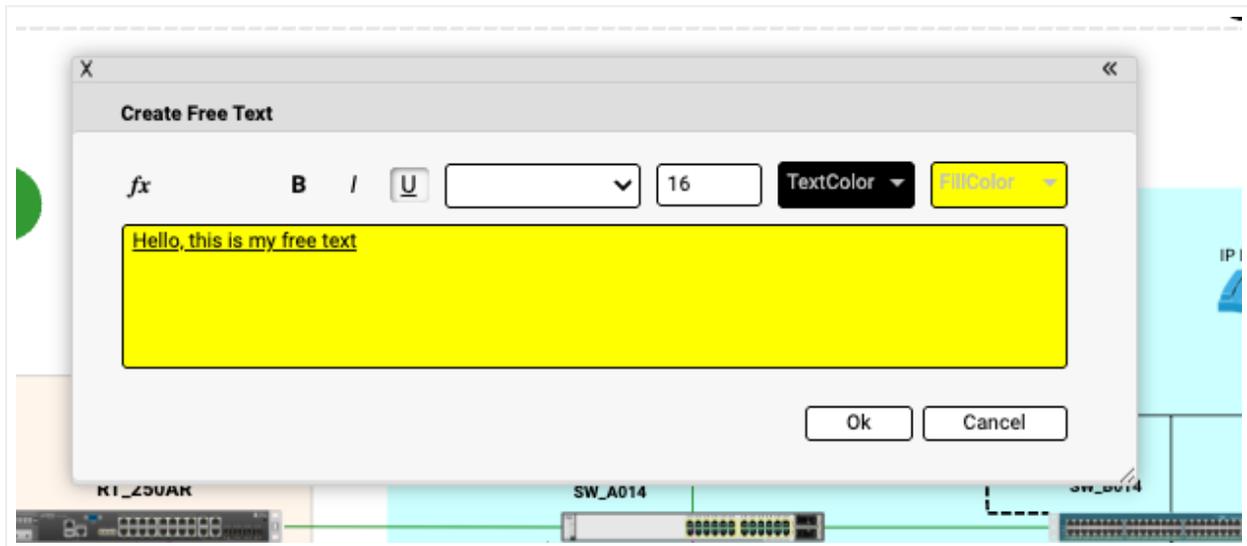
Once you press the Text button, a free text dialog pops up, which includes many options to format your text appropriately. Formatting options include:

- Bold text
- Italics
- Underline
- Font type
- Font size
- Font color
- Fill color
- Expression insertion

We will cover expressions in more detail later in this guide.

#### Attention!

In addition to free text, netTerrain also supports the display of property values on a diagram (called displayed fields). As opposed to displayed fields, free text is not associated to any node or link on a diagram. We will cover displayed fields later throughout the guide.



*Free text dialog*

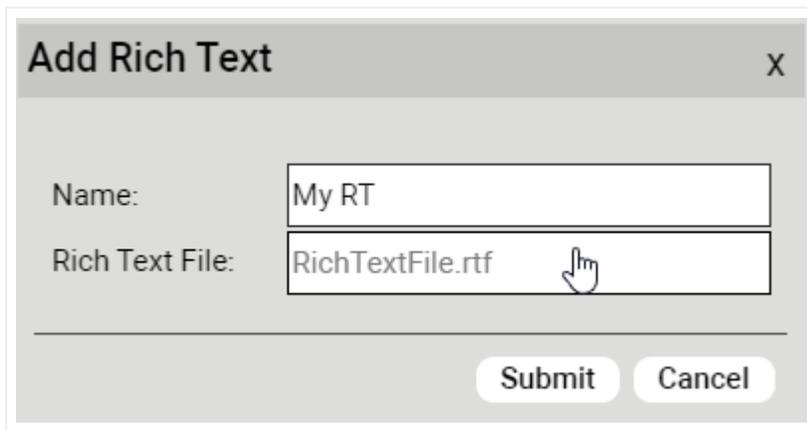
## 4.5.2 Rich text

Rich text is text that is formatted with common formatting options, such as bold and italics, that are unavailable with plain text. netTerrain Free text supports some of these options, but they are applied to the entire text. Rich text, in turn, also supports different fonts, font sizes, and colored text for different parts of the text, as opposed to normal text where the entire text must have the same style.

Rich text documents can also include page formatting options, such as custom page margins, line spacing, and tab widths. netTerrain supports inserting rich text into diagrams as objects that can be edited with the default client rich text editor.

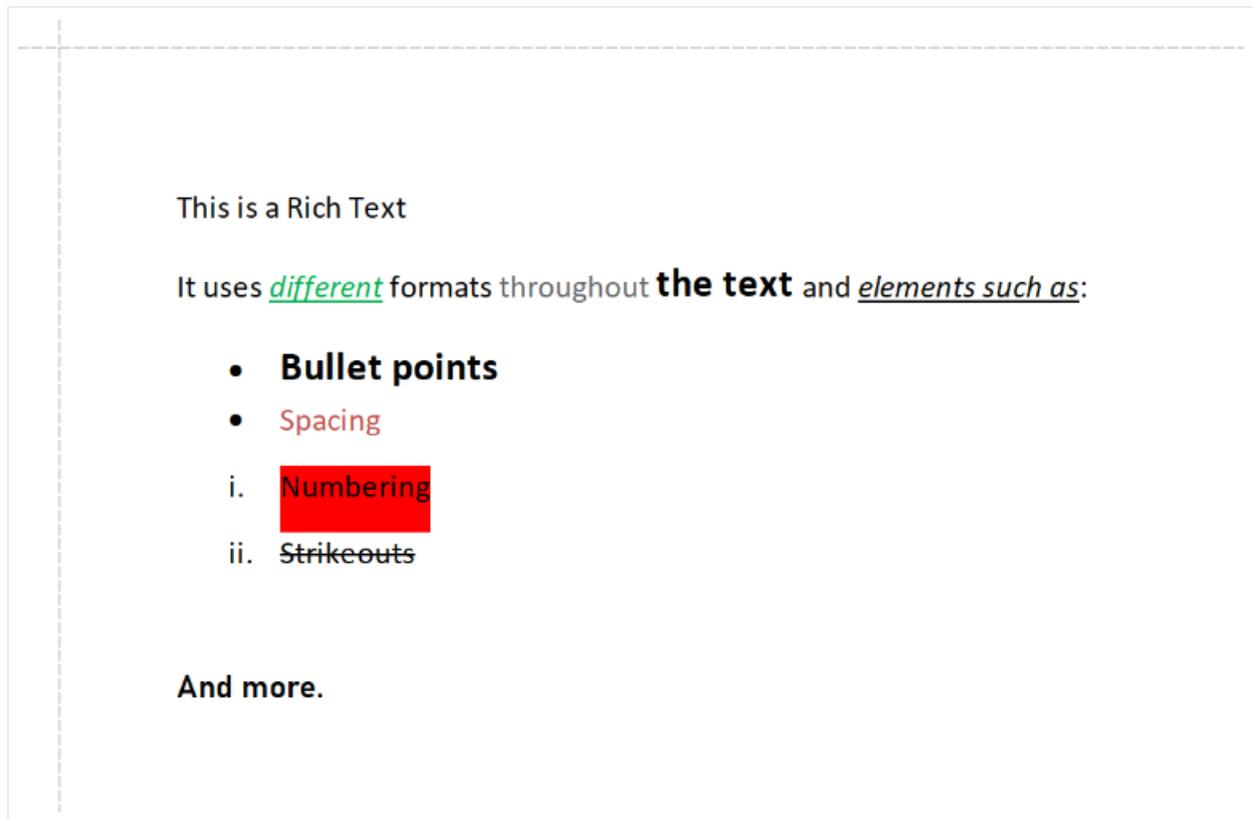
To insert a new rich text, you must first edit your Rich text object using an editor such as Wordpad. Once you saved your Rich text object, follow these steps:

- Anywhere on the diagram right click and select Rich text or click on the Insert->Rich text button on the ribbon.
- Using the Rich text dialog, pick a name for the Rich text object and browse for the Rich text file.



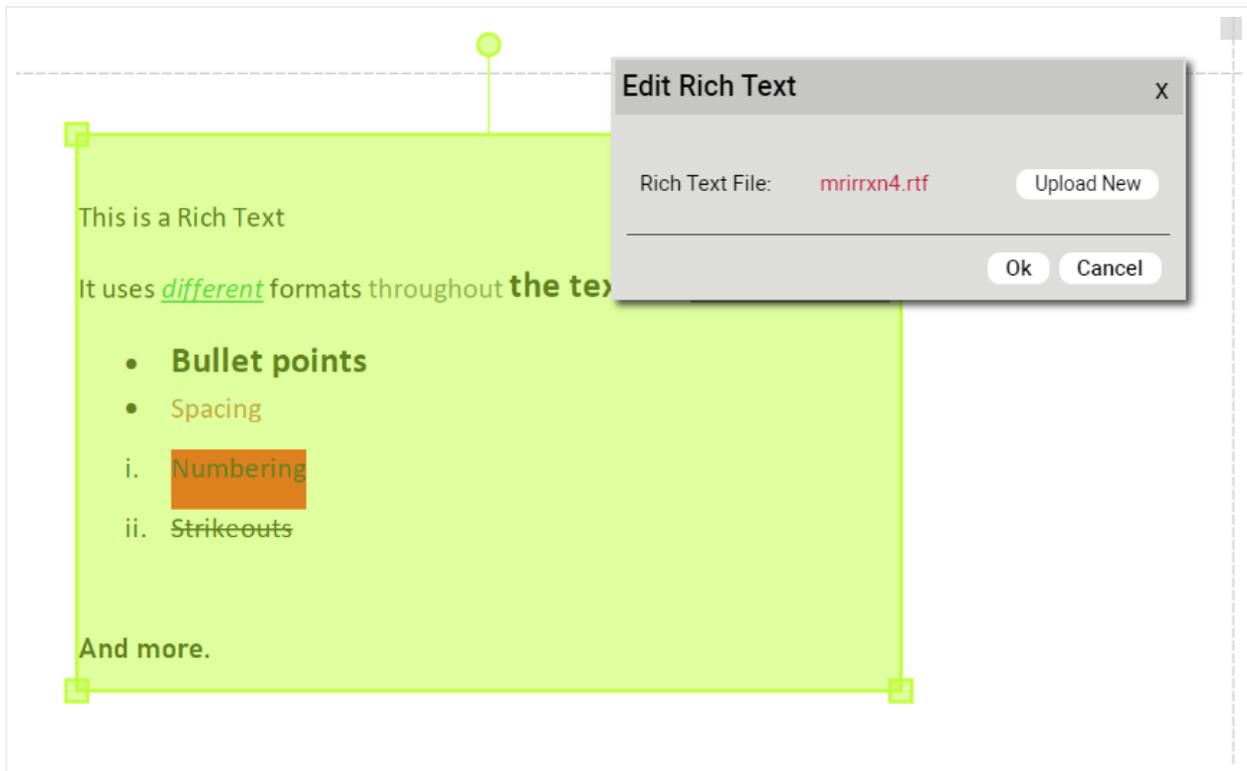
The image shows a dialog box titled "Add Rich Text" with a close button (X) in the top right corner. The dialog contains two input fields. The first field is labeled "Name:" and contains the text "My RT". The second field is labeled "Rich Text File:" and contains the text "RichTextFile.rtf". A mouse cursor is positioned over the "Rich Text File" field. At the bottom of the dialog, there are two buttons: "Submit" and "Cancel".

- Hit submit and you are done.



*Rich text example in netTerrain*

To edit the Rich text simply double click on it and the Rich text edit dialog will pop up. This dialog itself won't let you edit the file. Any modifications you need to do on the Rich text you can click on the Rich text link, which will download the file, or you can go back to the original file, edit the file with Wordpad (or your Rich text editor of choice) and then upload a new file.



*Editing or modifying Rich text*

### 4.5.3 Palette objects

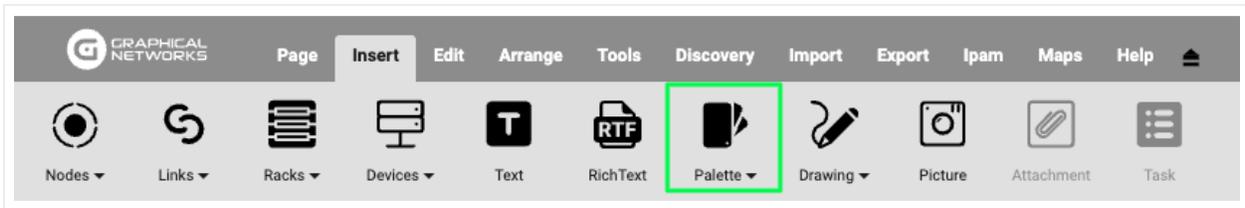
Users with annotation rights, or higher, can also add and remove palette objects. These objects represent an additional layer of information on top of the netTerrain network schema. Annotators can only insert new palette objects or update and delete their own. Editors or higher, can edit or delete annotations that were created by any user.

Palette objects come in 4 types:

- Comments
- Documents
- Shapes
- Stamps

All palette objects support custom fields, and all attributes are searchable within the netTerrain database.

To add a palette object node, a user can click on the palette button, or simply right-click on the diagram and click on the appropriate palette option. Once added, palette objects can be edited just like regular nodes.



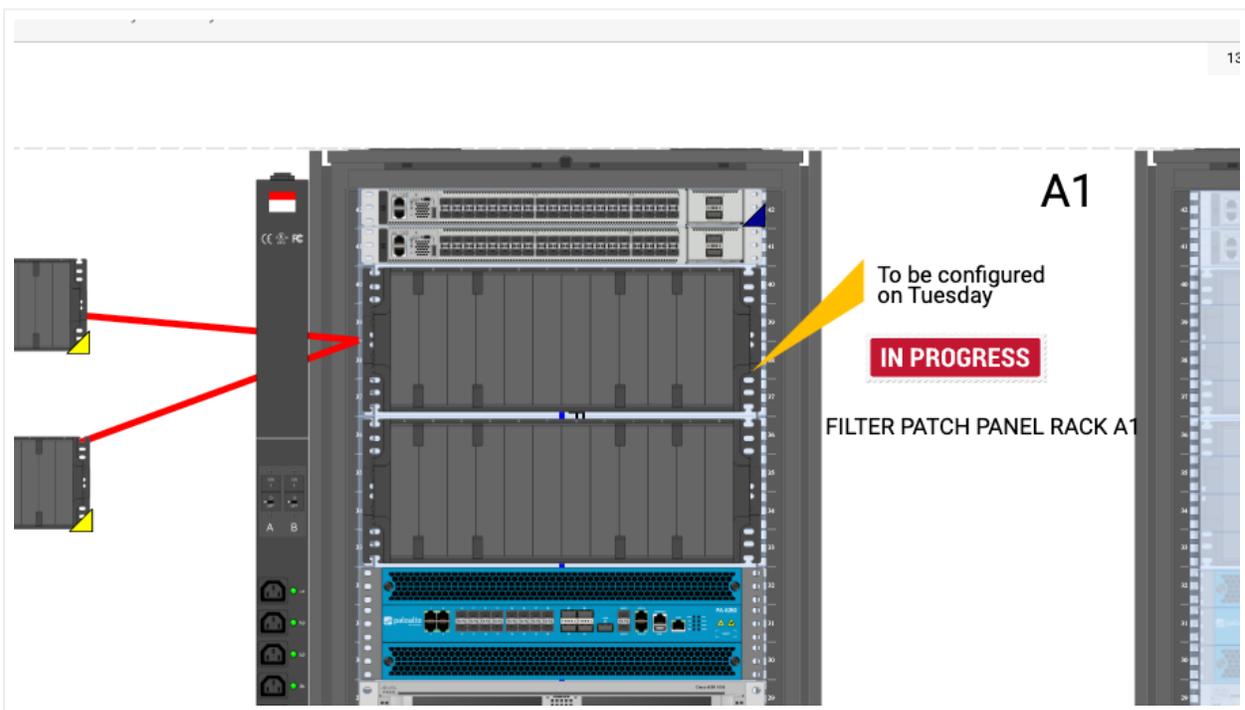
### *Palette object menu*

To remove a palette object simply select it and then click on the 'Delete Object' button (or 'del' key).

## 4.5.3.1 Comments and stamps

Comments are generally used to decorate a diagram with pertinent information about pending changes or edits needed to improve it. Comments already have a comment field and use an image based on an orange pointy geometric figure, as displayed below.

Stamps offer users a limited set of predefined labels, usually reserved for marking the status of the current diagram. The image above shows the submenu with the available stamps.



*A comment and a stamp on a diagram*

### 4.5.3.2 Documents

A document node in netTerrain can be useful for serving as a pointer to an actual document by assigning a hyperlink to the Document 'path' field. This behavior is not exclusive to documents, since, as is explained above, any node in netTerrain can have a field value with a hyperlink embedded in it. The convenience lies in the fact that document nodes already use an icon that looks like a document and already include a predefined field called 'path'.

For a document node to be able to open the actual document, the following is required:

- The document must be accessible via a URL, and the server needs to reach that address.
- The application that opens the document needs to be installed on the client machine.
- The URL must be preceded by `http://` or `https://`.

The path for the document object conforms to the same construction rules for hyperlinks as any other fields. An example of a valid hyperlink path is the following:

```
[datasheet] (http://myFileserver/datasheet.txt) .
```

Once the document has been added with the hyperlink, the node and path fields will look as follows:

Properties	Settings
Id	24000000227040
Type	Document
Name	null <input type="text"/> <input checked="" type="checkbox"/>
Path	[datasheet] <input type="text"/> <input type="checkbox"/>
Catalog	Fields
Audit Trail	8



#### **Attention!**

Notice that starting with version 5.4, netTerrain included a document embedding feature (akin to SharePoint), which is usually better suited for the task of sharing documents and files (see chapter on change management). If you need to control the flow of documentation or you want to use netTerrain as a document repository, we recommend using that feature instead. We do keep these document nodes mainly for backwards compatibility reasons.

### **4.5.3.3 Shapes**

Shapes are special palette objects that support vector background colors and line styles, as well as transparency levels. Shapes can be used for several purposes:

- to delimit boundaries between inventory objects
- to create grouping objects to place inventory items inside
- as placeholders for actual object that need not be inventoried
- to enhance a diagram with indicators using geometrical figures

Shapes are vector objects that include four special features in the settings tab, by which the user can choose a color, transparency level, a shape type and a line style and thickness.

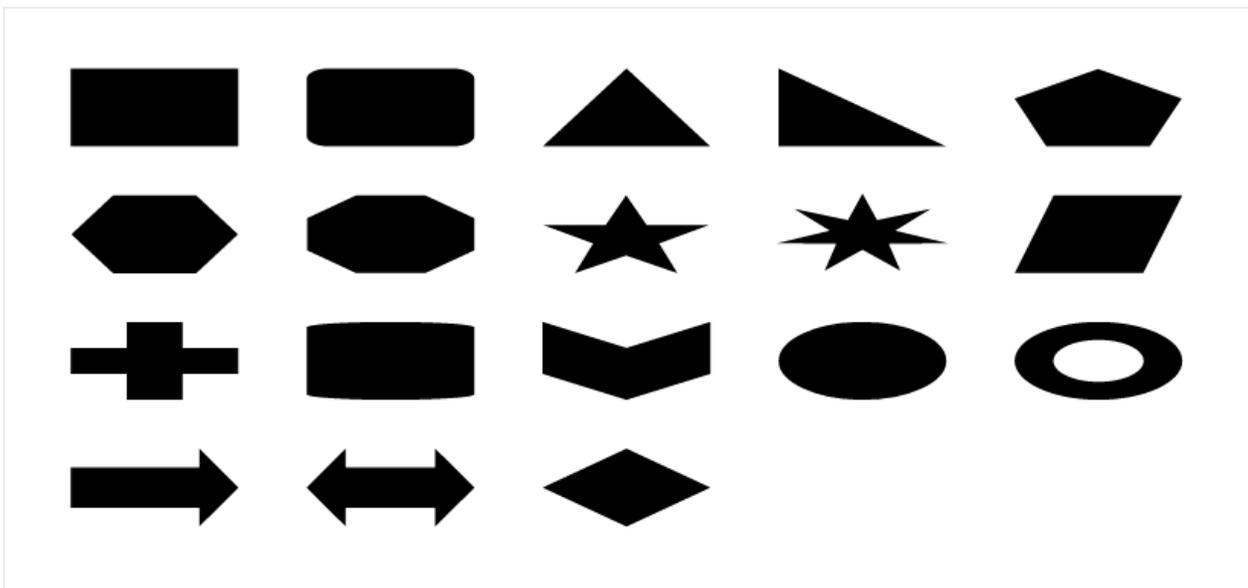
The image shows a software interface with two main parts. On the left is an 'Inspector' panel with a 'Settings' tab. It lists various properties for a selected object, each with a corresponding input field or dropdown menu. On the right is a 3D visualization of a light green rectangular prism, which is a 3D representation of the settings shown in the inspector. The prism has small square handles at its corners and a small circle on top connected to the top edge by a thin line.

Property	Value
X	24.4521
Y	370.274
Angle	0
Width	154.6575
Height	166.7397
Shape	Rectangle
Opacity	1
Color	[Color Picker]
Line Color	[Color Picker]
LineThickness	1
Line Style	Solid
KeepAspectRatio	false
CanMove	true
CanResize	true
CanRotate	true
CanDelete	true
IsHidden	false

*Shape settings*

The following shape types are currently supported in netTerrain:

- Rectangle
- Rounded rectangle
- Triangle
- Right triangle
- Pentagon
- Hexagon
- Octagon
- Five-point star
- Seven-point star
- Parallelogram
- Cross
- Cylinder
- Chevron
- Ellipse
- Donut
- Arrow
- Double arrow
- Diamond

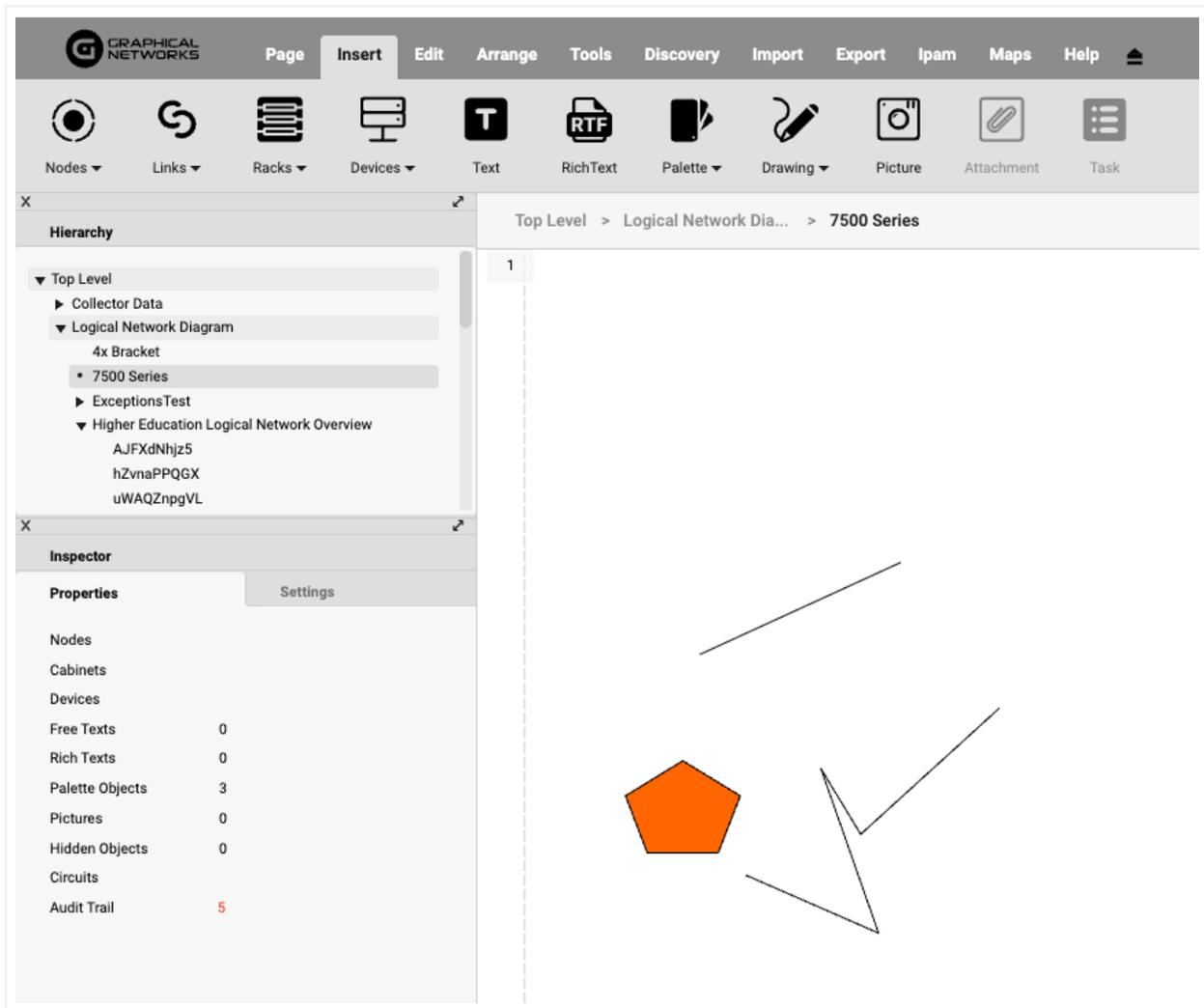


*netTerrain Shapes*

## 4.5.4 Drawings

netTerrain lets you create three types of free drawings to enhance the look and feel of your diagrams. These include:

- Lines: single lines that do not require two nodes as end points
- Paths: a collection of consecutive segments
- Polygons



*Lines, paths and polygons*

### 4.5.4.1 Lines

To create a line, follow these steps:

- Click on the line sub menu.
- Hold the left mouse button where you want to start the line.
- Drag the mouse to where you want the line to end.
- Release the left mouse button.

By holding the ctrl key, the line will snap at 15-degree angle increments. This is especially useful when you need the line to be exactly at, say zero or 90 degrees without having to control your pulse that hard.

### 4.5.4.2 Paths

To create a path, follow these steps:

- Click on the path sub menu.
- Hold the left mouse button where you want to start the path.
- Drag the mouse to where you want the next segment to start.
- Release the mouse to start the second segment.
- Keep dragging and clicking on the left-mouse button as many times as segments you want.
- Double-click to finish the path.

By holding the ctrl key, the path segments will snap at 15-degree angle increments.

### 4.5.4.3 Polygons

To create a polygon, follow these steps:

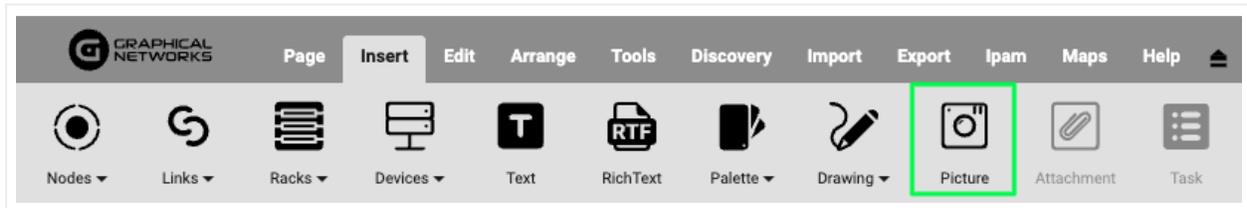
- Click on the polygon sub menu.
- Hold the left mouse button where you want to start the polygon.
- Drag the mouse to where you want the next side to start.
- Release the mouse to start the second side.
- Keep dragging and clicking on the left-mouse button as many times as sides you want for the polygon.
- Double-click to finish the polygon.

By holding the ctrl key, the polygon sides will snap at 15-degree angle increments.

## 4.5.5 Pictures

In addition to background images (which are fixed to the diagram), users can upload pictures as well. Pictures can have custom fields and are searchable, but just as other palette objects, it is not possible to link them or double-click on them.

To upload a picture, open the 'Insert' menu ribbon and click on the button that looks like a camera, or right-click on the diagram and select 'Insert picture'.

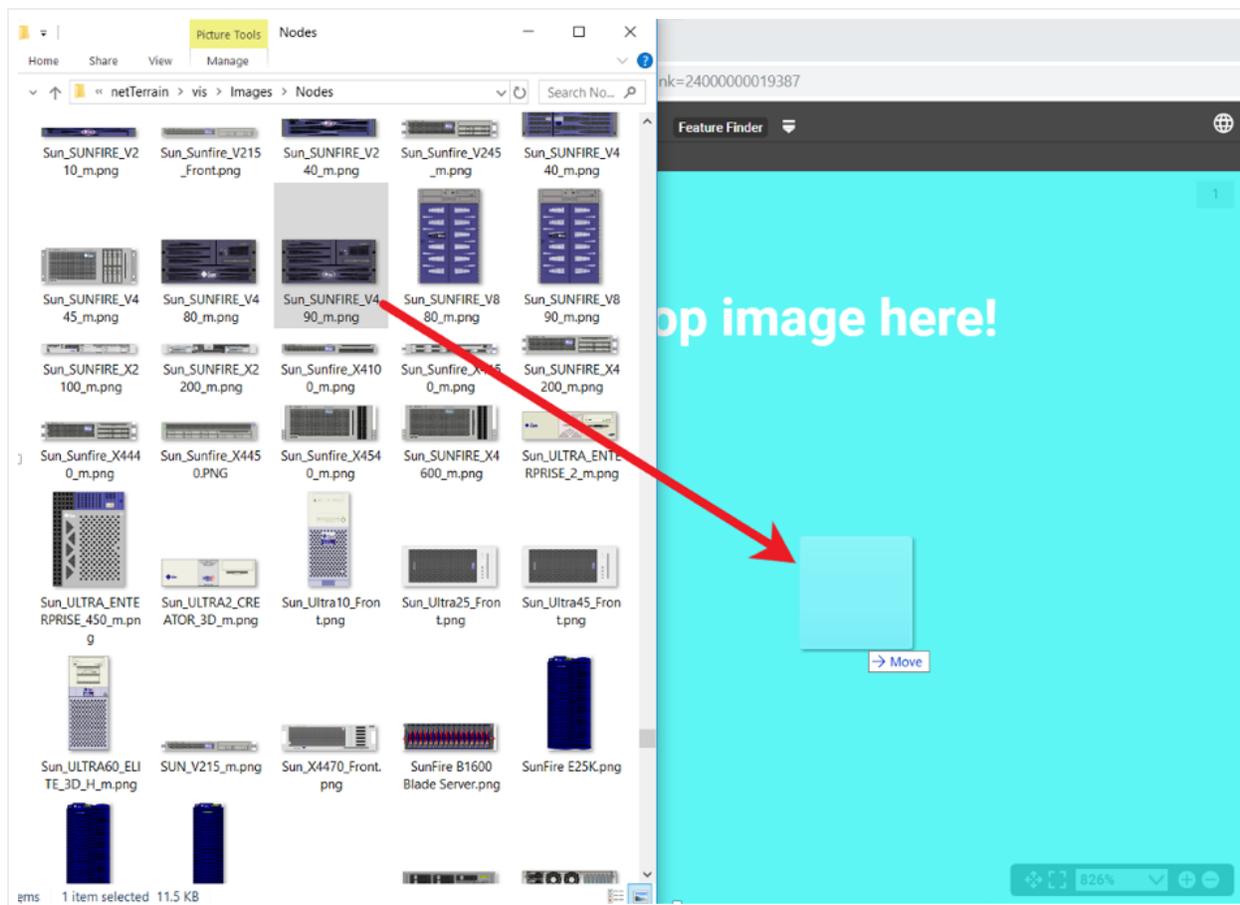


*Uploading a picture*

### 4.5.5.1 Adding a picture by dragging and dropping

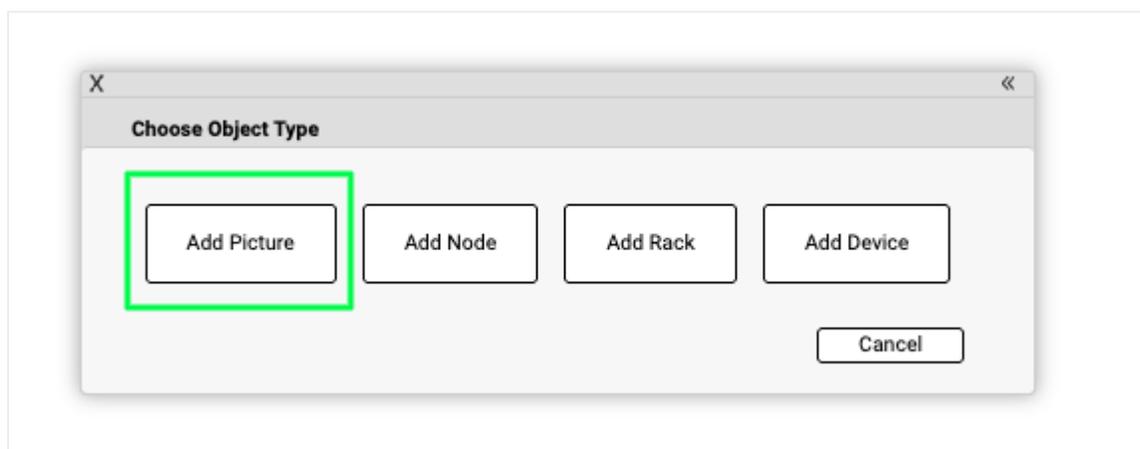
Just as with nodes, there is a nice trick to add a picture into the project quickly: by dragging and dropping an image from a folder or browser!

The best way to use this trick is to have both the netTerrain browser and the folder or website with the image side-by-side. Then, just drag and drop the desired image to the netTerrain diagram, as shown below:



Create a picture by dragging and dropping an image

After you drop the image on the diagram, netTerrain gives you the option to create it as a floating image (picture), a node type, a device type, or a rack type. Choose the 'Picture' option:



Choosing the Picture option to create a floating image

This completes the process!

**Tip:**

You can also perform the same operation by simply copying a picture from your computer with ctrl-c and then pasting it on the netTerrain diagram.

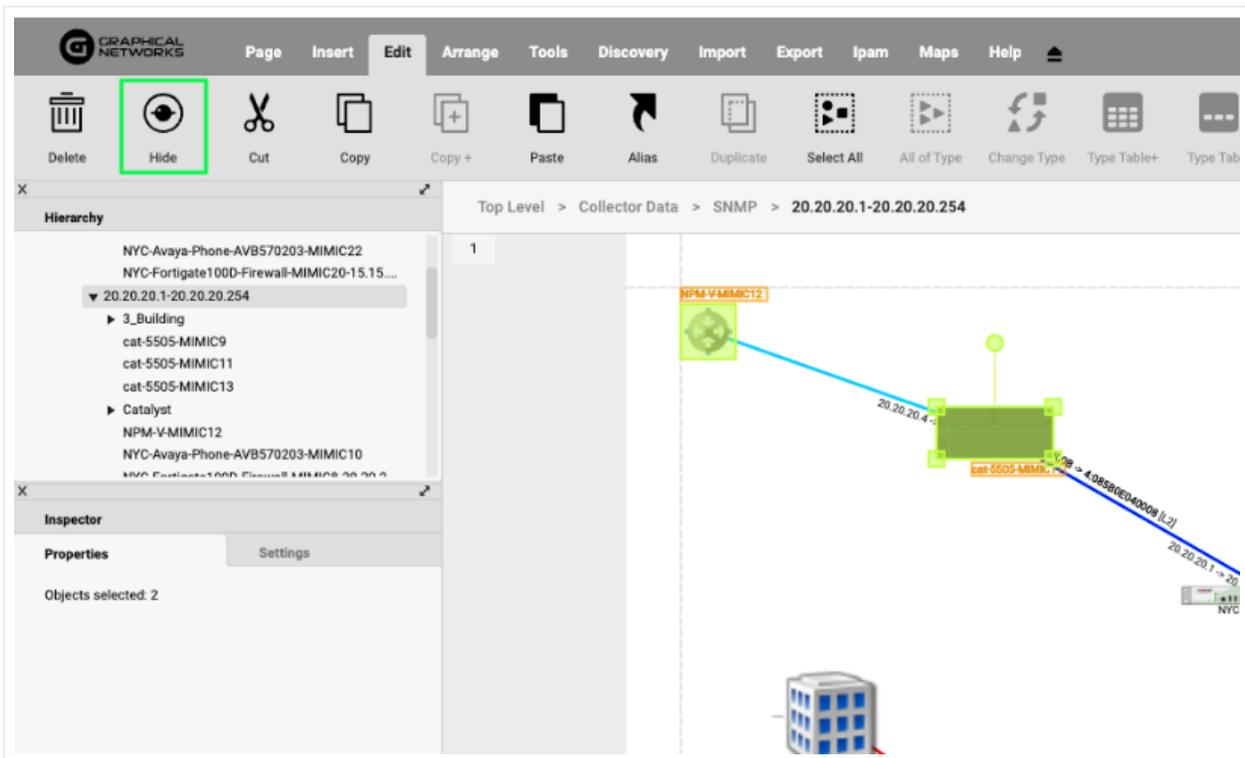
## 5 Advanced Features

### 5.1 Hiding and filtering information

Users can filter out objects in a diagram, either by hiding individual nodes or by applying diagram filters. Except for the 'Show connected' option, these filters are persistent, meaning that the changes will stay after the session has ended, and will be visible to all users.

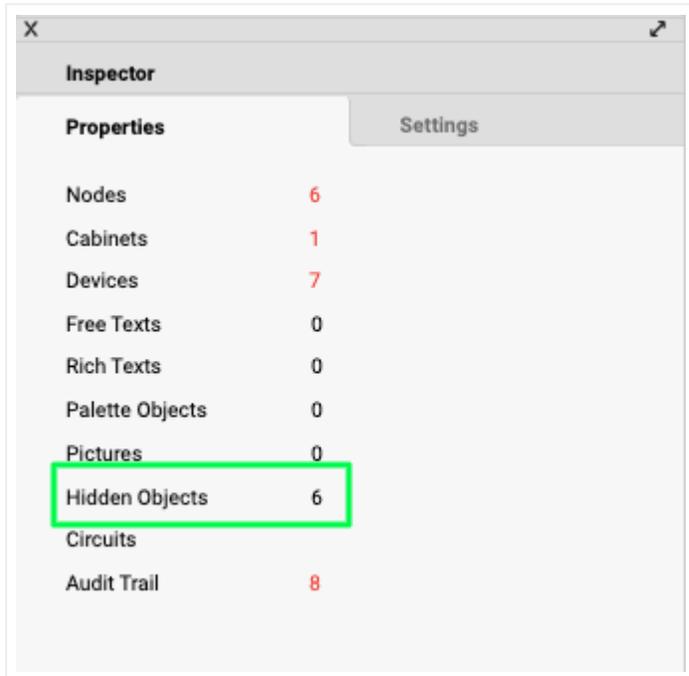
#### 5.1.1 Hiding individual nodes

To hide a node or group of nodes, simply right-click on them and click on the 'Hide' sub menu.



## Hiding nodes

Any hidden node will also hide any connecting link, and if a diagram has hidden nodes, the diagram properties will show a 'Hidden nodes' counter.



## Hidden nodes counter

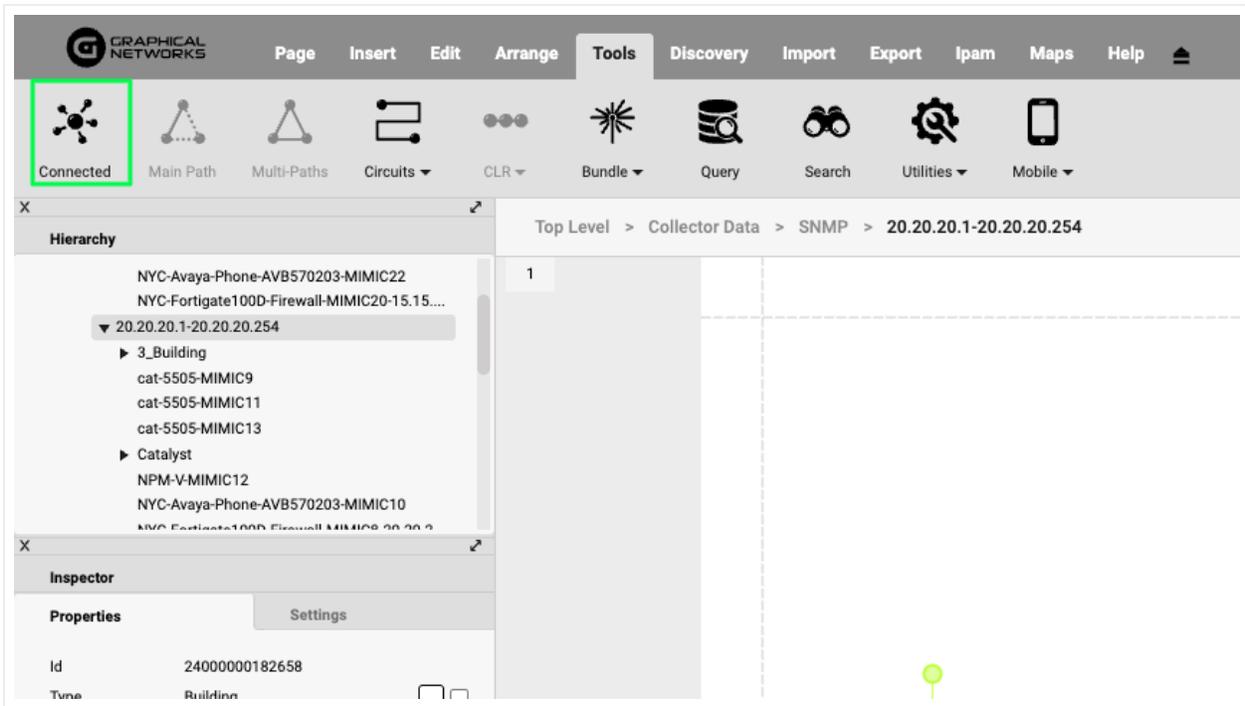
To show all hidden nodes, simply right-click on the diagram and select 'Show hidden nodes' (or the hotkey shift-a).

## 5.1.2 Temporary filters: hiding unconnected objects

In many cases it is useful to see what's connected to a specific node or group of nodes. netTerrain includes a convenient temporary filter (per user) that shows "what's connected".

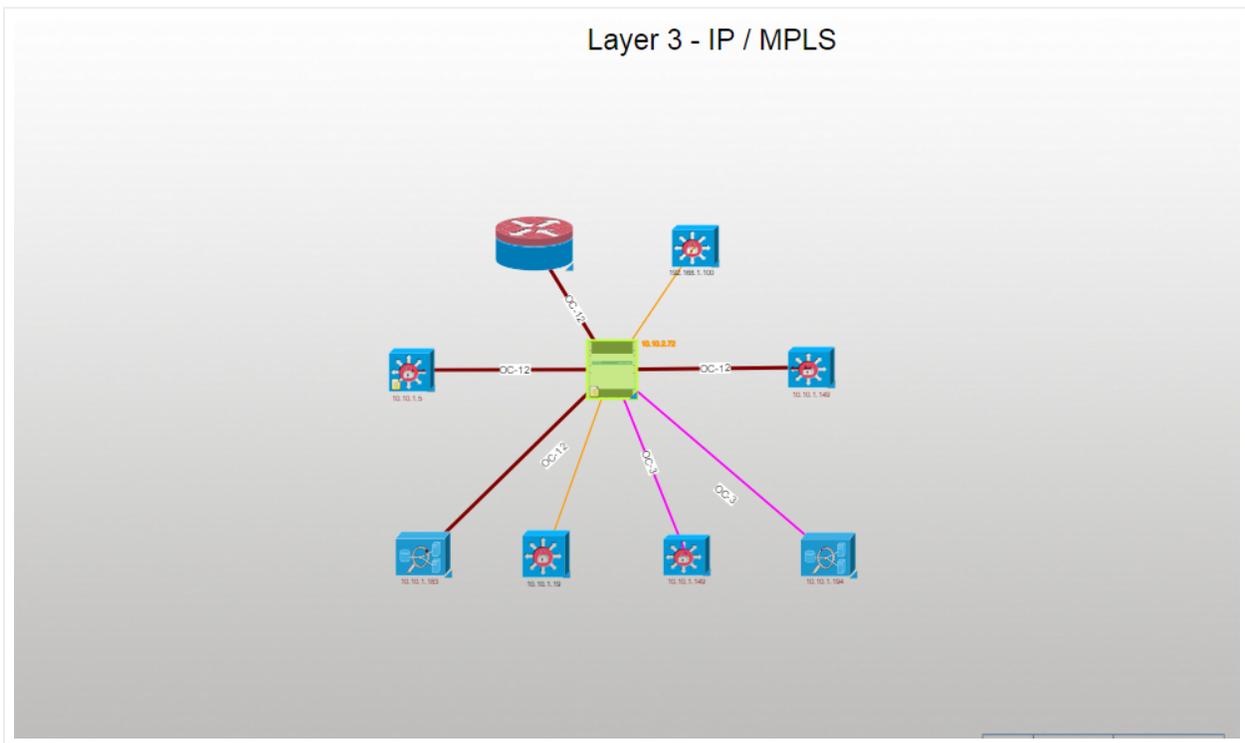
To hide everything that is not connected to a node or group of nodes, select the set of nodes you want to isolate and then do one of the following:

- 1) Click on the 'Connected' button in the Tools menu
- 2) Right click on the selection and press 'Connected'.
- 3) Or our favorite: press the 'Shift-h' hotkey!



Using the Show connected option

After you hide all unconnected objects, the hidden objects counter (see below) will be increased by the number of objects that are now hidden.



### *Result of a Show connected action*

To see all unconnected objects again, you can bring up the diagram context menu and click on the 'Unhide all' option (or [shift-a]).

#### **Attention!**

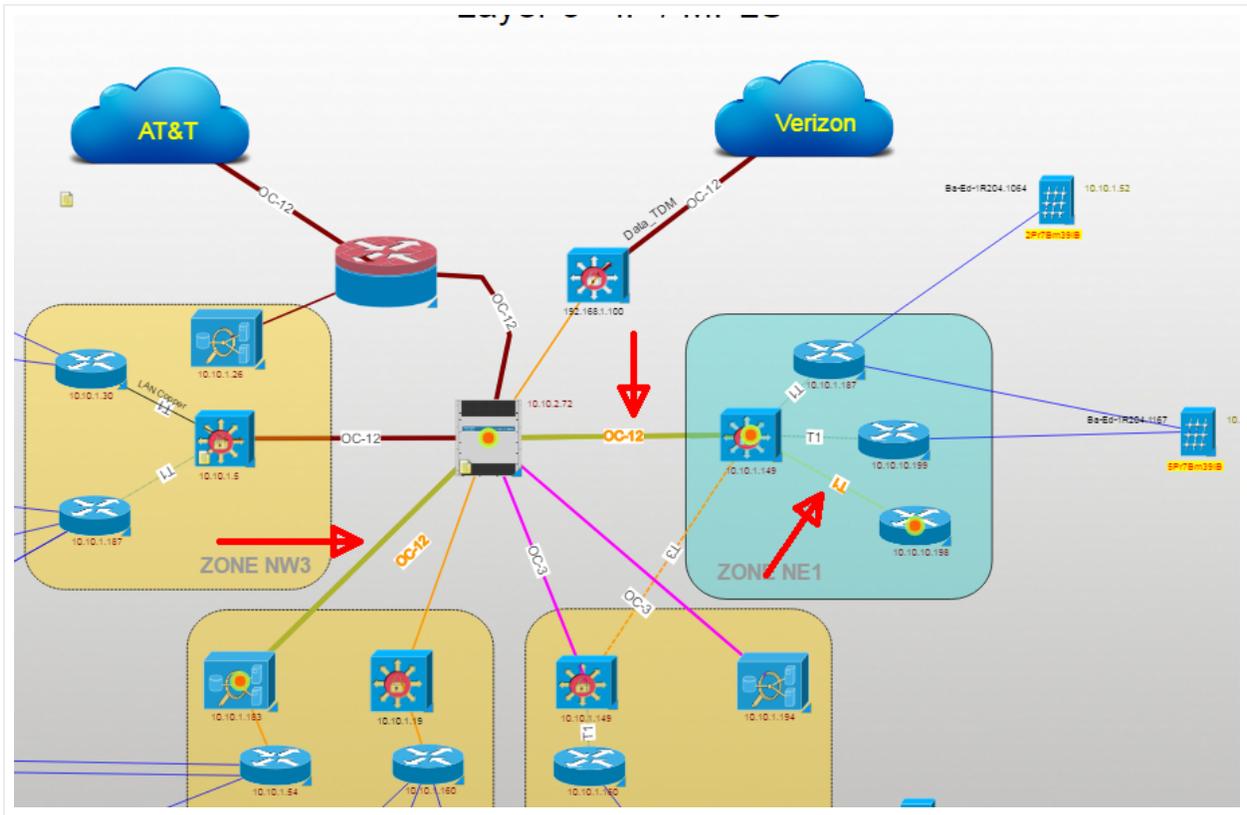
Be careful using this option though, because this will indeed unhide all objects, even previously hidden ones. A better option for reverting the 'Show connected' option is to use the 'Esc' key. Not only is this faster to do, but it will also preserve the hidden state of any objects previously hidden. This is also why we refer to this filter as a temporary filter since it is client-side and not persistent.

#### **Tip:**

Use your shortcuts! Press [shift-c] to apply the filter, it is much faster than right-clicking and selecting the menu option.

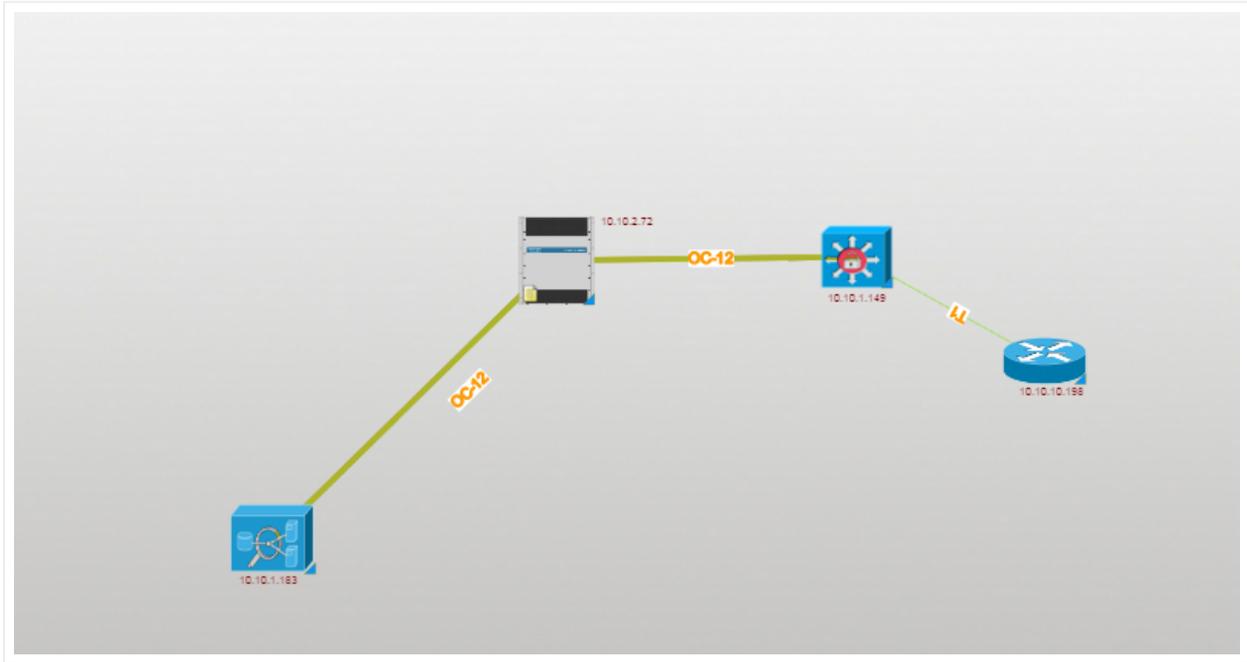
## 5.1.2.1 Using filters with links

You can also use these filters with links. For example, you may select a link, set of links or a full path, as shown below.



A path with three selected links before applying the filter

After pressing [shift-c] all objects on the diagram except the ones that serve as endpoints for any of the selected links will be hidden.



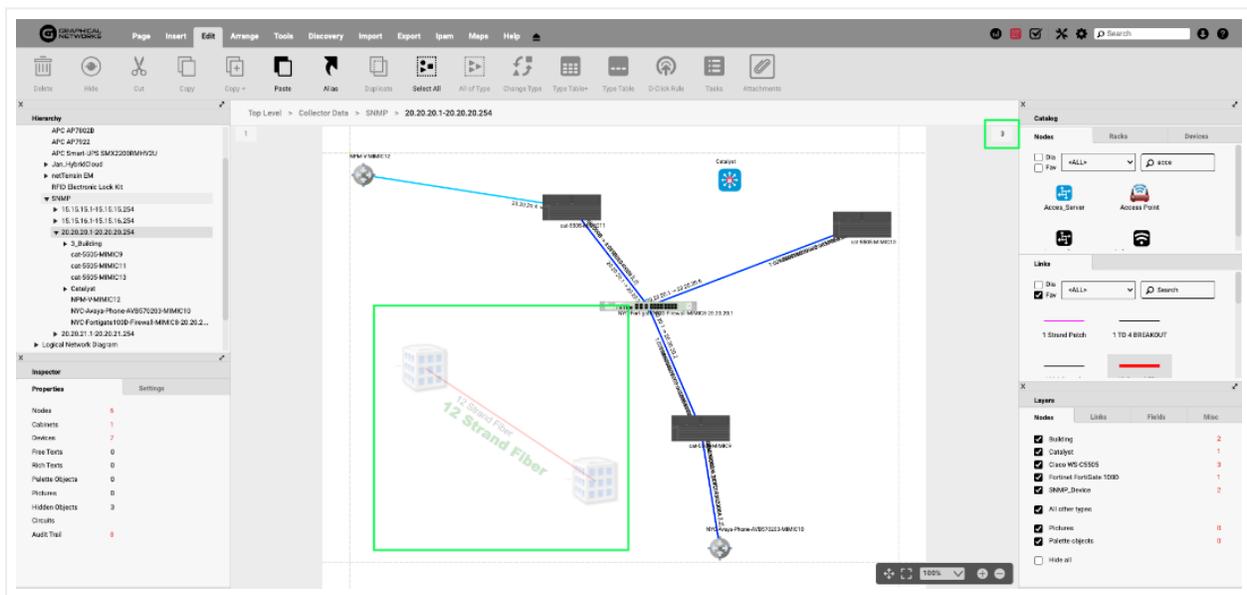
The selected path after applying the filter

### Tip:

If you want to select a path, you can click on one link and use the shortcuts [shift-q] and [shift-w] to auto select links upstream or downstream along the path.

## 5.1.3 Viewing hidden objects in outline mode

In addition to the 'Hidden Objects' indicator in the properties window, netTerrain also displays a hidden objects counter on the top right corner of your diagram. When hovering the mouse over this counter, netTerrain briefly displays objects in grayed out (or outline) mode. The objects will immediately disappear once you move the mouse pointer away from the counter.



Hidden objects in outline mode

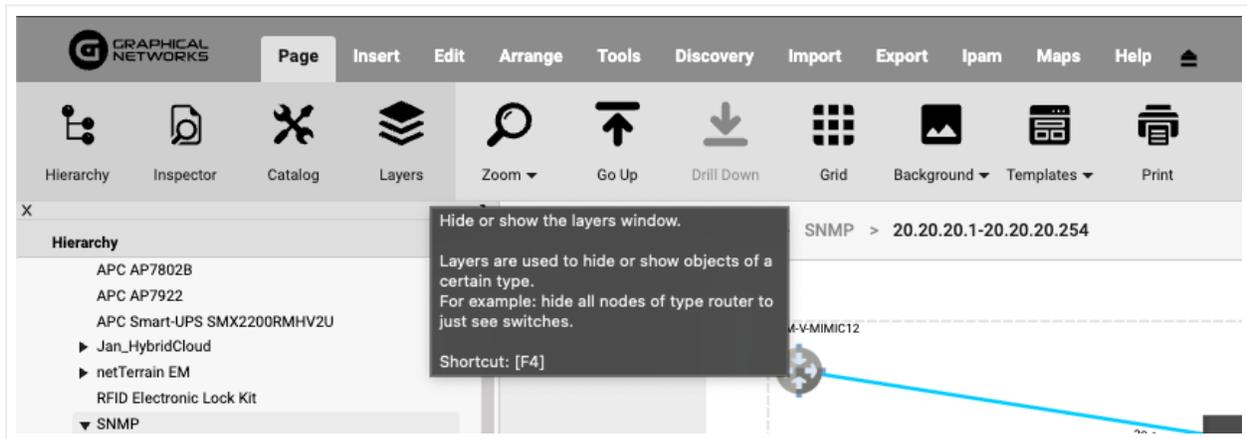
## 5.2 Layers

Layers in netTerrain are per-diagram filters that operate over an entire type or category of objects whereas the process of hiding or filtering, as reviewed in the previous section, operates on individual instances.

Layers come in four flavors:

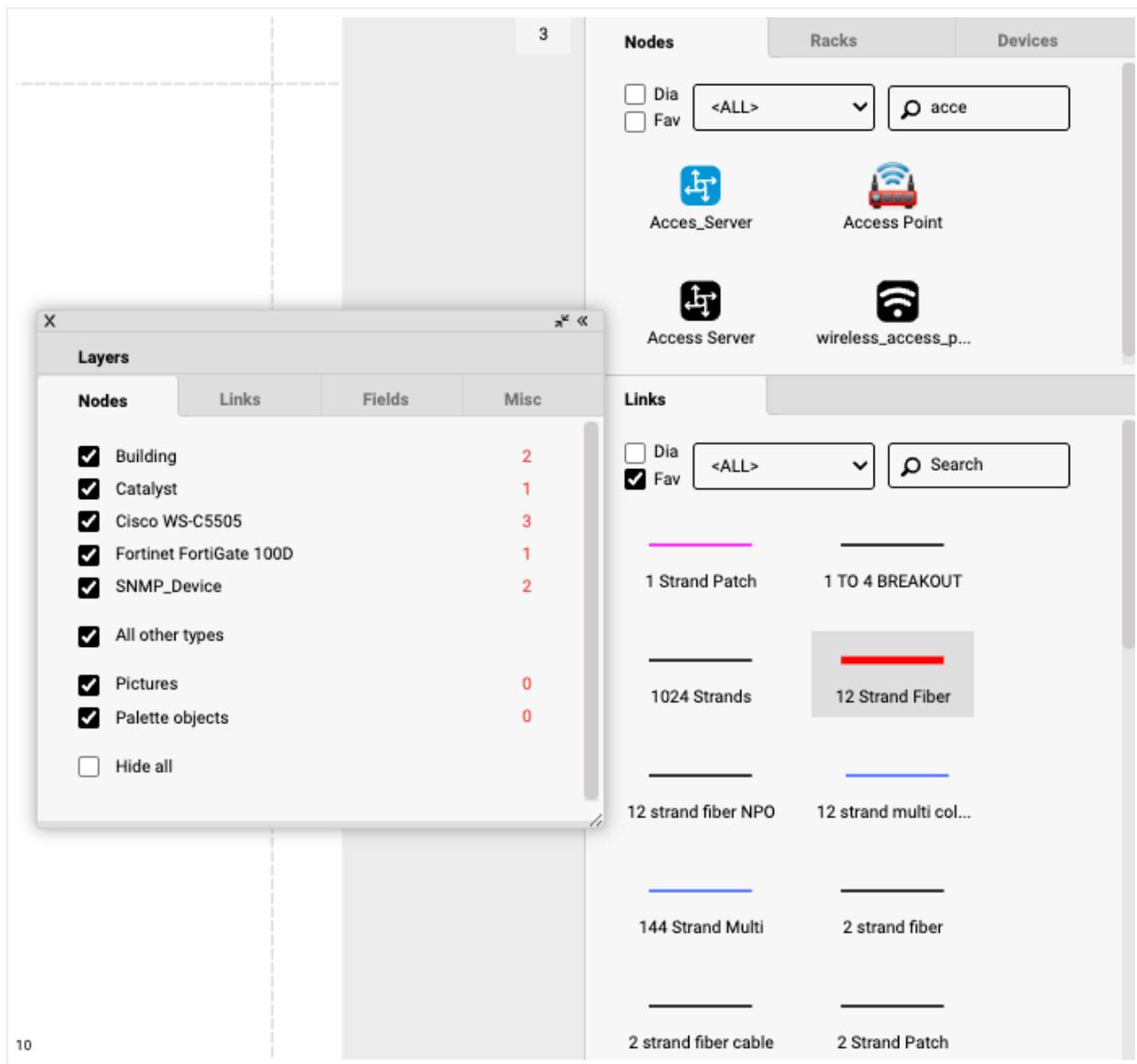
- Node layers
- Link layers
- Field layers
- Miscellaneous layers

The layers pane can be enabled from the page menu or by simply pressing 'F4'.



*Showing the Layers pane*

Just like with the catalog pane, the layers can be docked on the bottom right part of the page or can be floating.

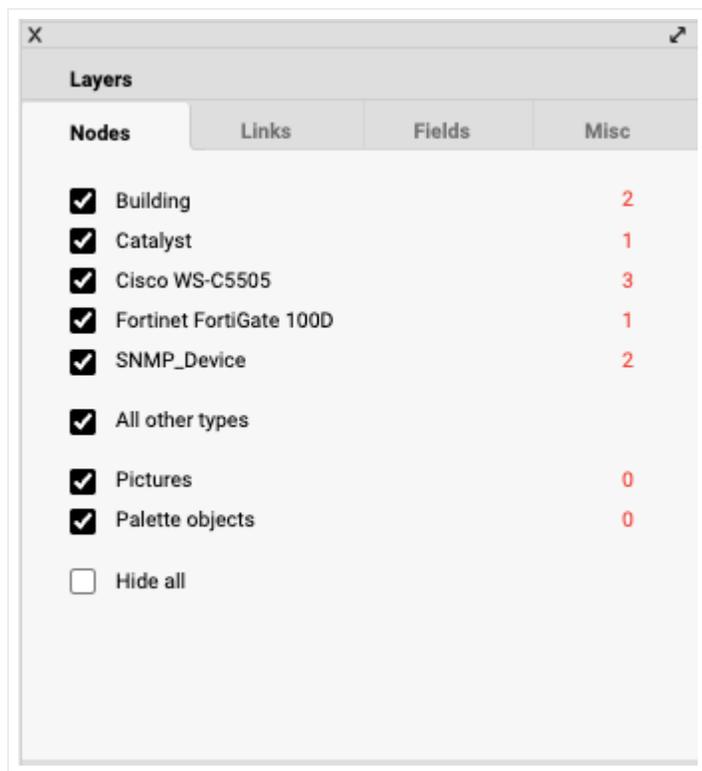


Floating layers pane

## 5.2.1 Node layers

Node layers are per-diagram filters for nodes that let you quickly hide or show instances on a per node type basis.

The node layers feature automatically lists all distinct node types that exist on the diagram. A checkbox displayed in the layers 'Nodes' tab, in front of each type, lets you hide or show all instances on that diagram for that specific type.

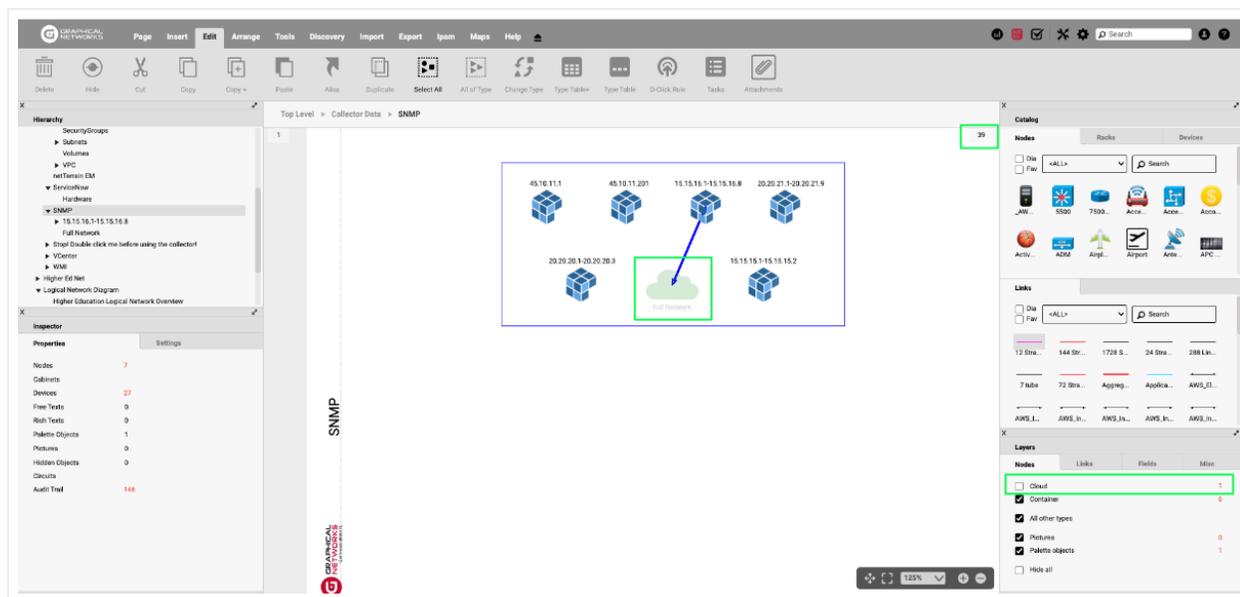


#### Node layers tab

A counter next to each type tells you how many instances of that type you have on the diagram. This counter includes reference objects. Reference objects will not show up in the table view when the qty in red is pressed.

If you uncheck any of the types, these objects are hidden from the rest of the objects on that diagram. This setting applies to all users and is persistent throughout browsing sessions.

The screenshot below shows the cloud object type being hidden from the rest of the diagram. When hovering the mouse over the hidden counter, those clouds are displayed in outline mode.



### Using the node layering feature

Notice the option 'All other types' how below the discovered types you find an. When this option is checked, if an instance of a new type is added, it will be shown by default, otherwise it will be hidden.

Also notice the last option, 'Hide All', which when checked, unchecks every other type from the filter and essentially hides all objects from the diagram.

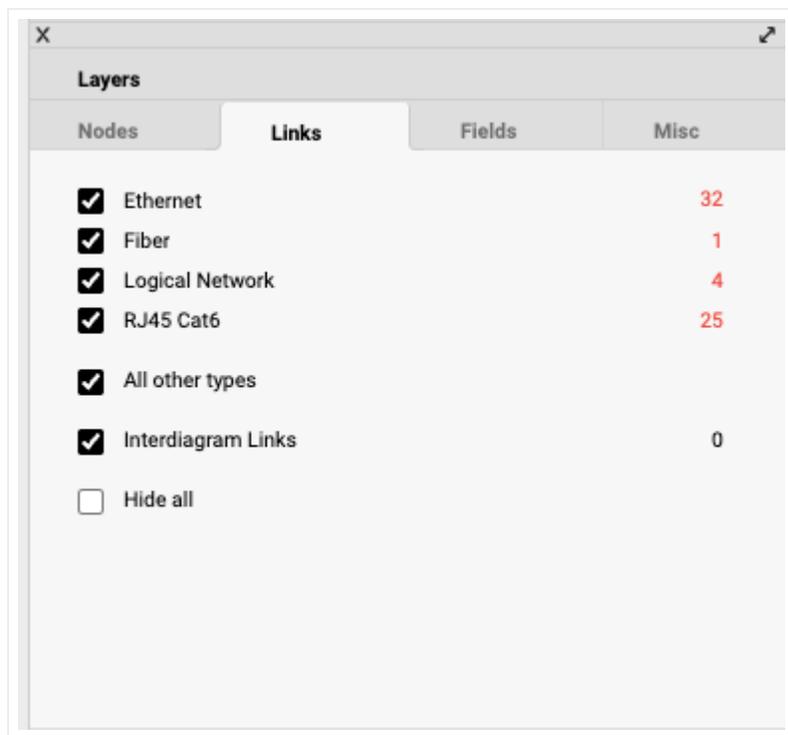
#### Attention!

The Node Layers pane also features two system object classes that can be turned on or off on the diagram: the pictures and the palette objects.

## 5.2.2 Link layers

Link layers are per-diagram filters for links that let you quickly hide or show instances on a per link type basis.

The link layers feature automatically lists all distinct link types that exist on the diagram. A checkbox displayed in the layers 'Links' tab, in front of each type, lets you hide or show all instances on that diagram for that specific type.



### Link layers tab

A counter next to each type tells you how many instances of that type you have on the diagram.

If you uncheck any of the types, these objects are hidden from the rest of the objects on that diagram. This setting applies to all users and is persistent throughout browsing sessions.

Notice the option 'All other types' how below the discovered types you find an. When this option is checked, if an instance of a new type is added, it will be shown by default, otherwise it will be hidden.

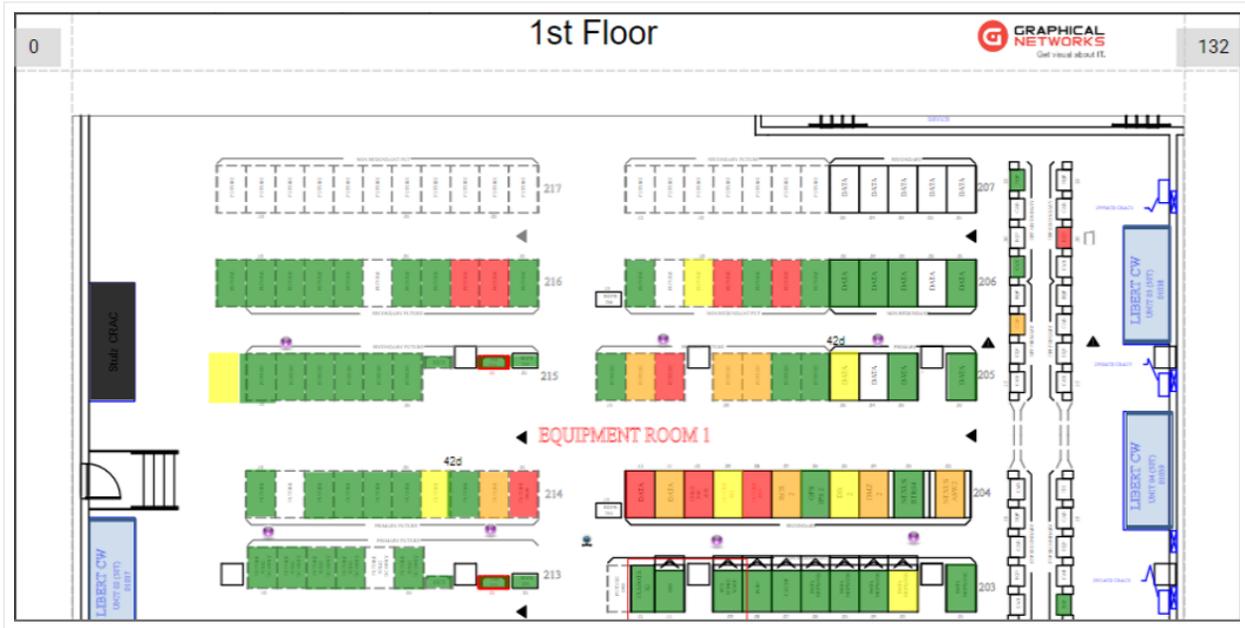
Finally, you can choose to hide all links on the diagram by checking the 'Hide all' checkbox at the very bottom of the tab.

#### Attention!

The Link Layers pane also features the inter diagram links as a separate class of links that can be turned on or off on the diagram.

A good use case for link layers is in a floor plan view. For instance, you may want to see trays (modeled as links), but not each individual cable. The example below shows a floorplan view with tray section running in the middle of the diagram. These trays are modeled as links and fiber and copper cables are associated with

those trays. The display filter prevents any new copper or fiber strands to be displayed when they are added to the diagram, or any object underneath.



*Floor plan view with trays modeled as links and other connections filtered out in layers*

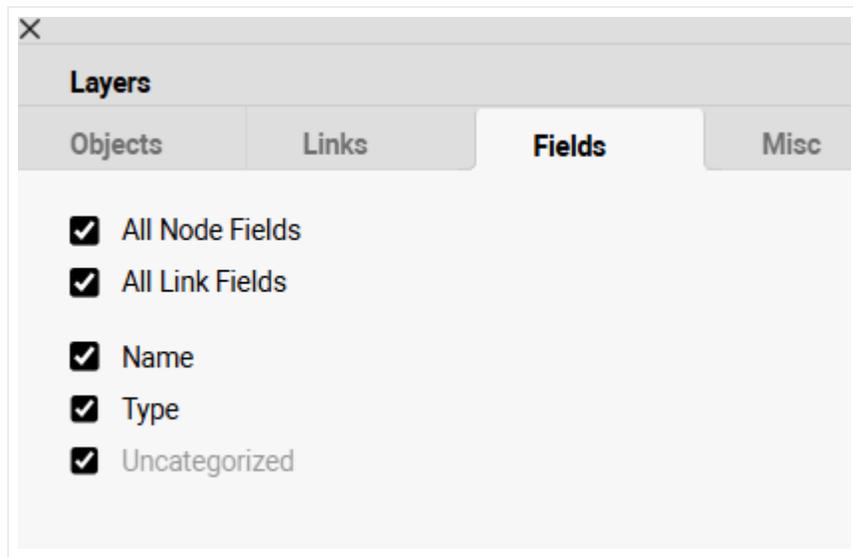
In addition to working with diagram displays, users can still hide individual objects (reviewed later in this guide). Any objects that were explicitly hidden will not be affected by the diagram displays. This means that if a specific link is hidden, and later the 'Links display' option is utilized by hiding all links of the same type as the hidden one, the original link will remain hidden even after you disable the filter.

### 5.2.3 Field layers

The field layers pane lets you turn all node and link displayed fields on or off. Notice that when you turn off node fields, it also turns off any palette object displayed fields.

Below we show you two screenshots, one with all node (and palette object) displayed fields turned on and the second screenshot showing them off.





*Field layers pane*

## 5.2.4 Field tags

Field (or property) tags allow you to associate fields to a “tag” (i.e., layer). All existing tags appear in the fields tab in the layers pane. Fields associated with a tag label can be turned on and off within a diagram. So, you could assign a field like IP Address to an “IP address fields” tag. If you happen to be on a diagram that has objects containing that field, you could then turn all IP Address fields on or off without having to individually uncheck them from the properties window for each instance.

Tags are set up and mapped to properties by a power user (see Power User Guide).

The screenshot below shows different layers that were defined in the catalog. A simple click on the checkbox next to the ‘IP’ layer will hide all IP addresses (green displayed fields on the diagram).

12 Stra... 144 Str... 1728 S... 24 Stra... 288 Lin...

X

**West-Campus**

WC\_R2406 WC\_R2408 WC\_R2401 WC\_R2403

10.100.9.6 10.100.9.8 10.100.9.1 10.100.9.3

WC\_R2405 WC\_R2407 WC\_R2402 WC\_R2404

10.100.9.5 10.100.9.7 10.100.9.2 10.100.9.4

**Layers**

Nodes Links **Fields** Misc

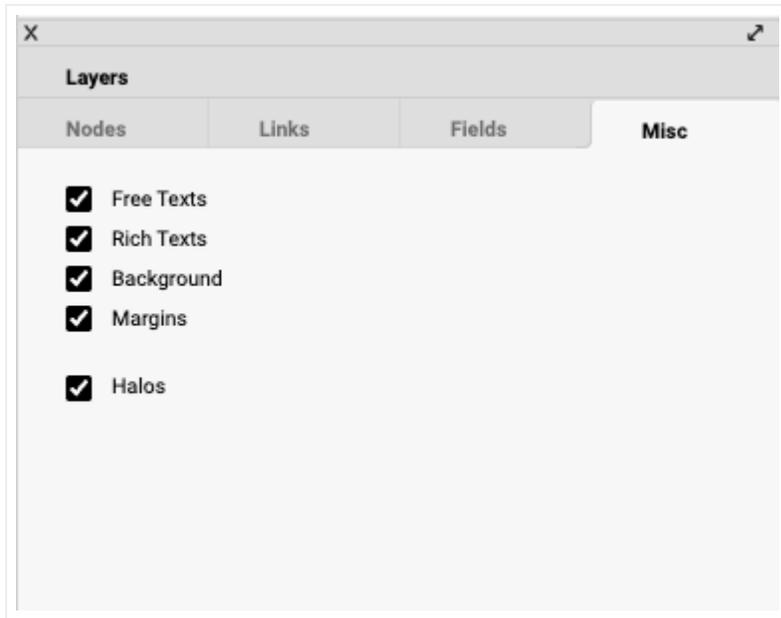
- All Node Fields
- All Link Fields
- Tag0
- Tag1
- Tag2
- Tag3
- Name
- Type
- Uncategorized

*Field layering feature*

## 5.2.5 Misc layers

The Miscellaneous (Misc) layer groups other layers or classes of entities that can be turned on or off. These include:

- Free text
- Rich text
- Background
- Margins
- Rack lines
- Halos



*'Misc' layer*

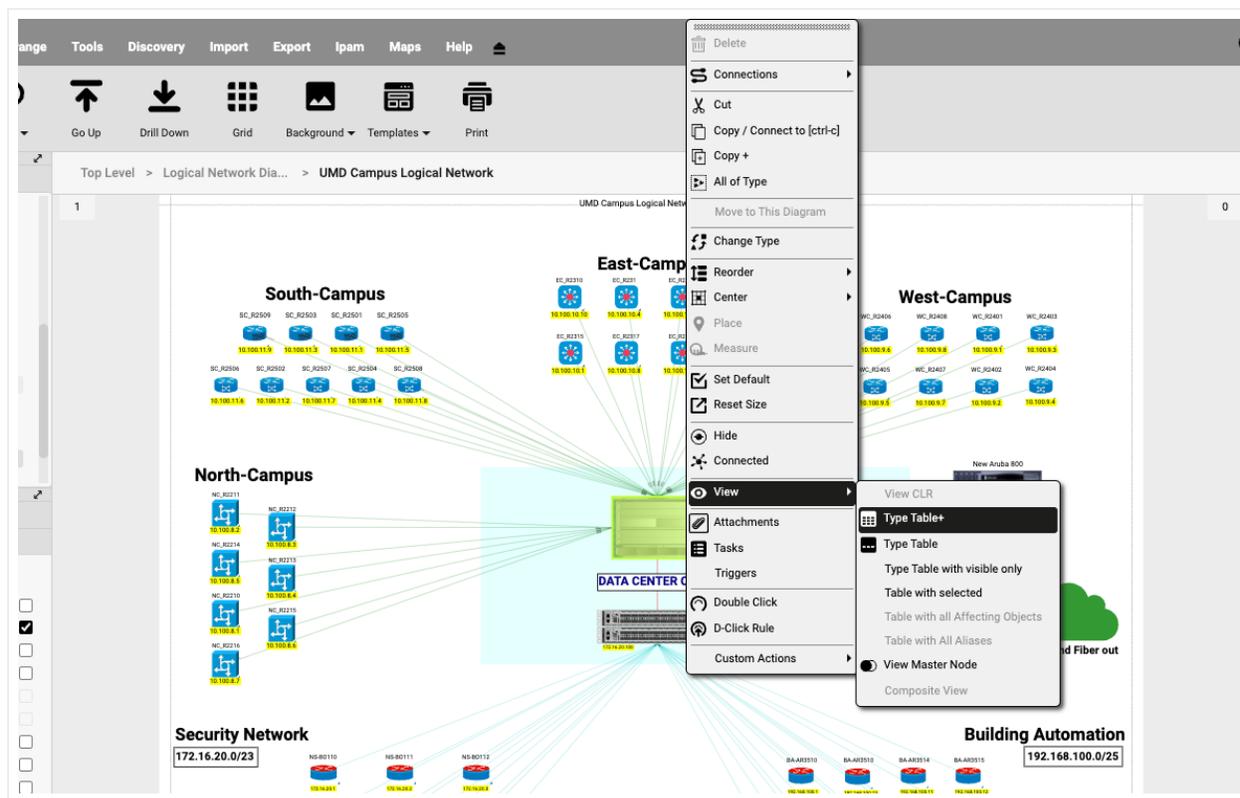
When you may suspect, uncheck one of these options, any instances of objects of that group will be hidden on the diagram. The 'Rack lineslines' checkbox only apply to appears when you are currently inside a rack diagrams diagram.

## 5.3 Table views

An alternative view to diagrams in netTerrain is the table view. A table view is a display of data in a column and row representation. netTerrain includes a predefined set of table views that can be accessed from different parts of the hierarchy. Customers can also create their own table views (see Database and scripting guide).

Table views are typically accessed from the properties window, in the form of a URL link that summarizes the underlying data. There are other ways to access table views, though. The view menu lets you choose from several options to display objects in table:

- Type Table+: view all instances of a certain type for the whole project.
- Type Table: view all instances of a certain type for the current diagram.
- Type Table with visible only: view all instances of a certain type that are visible on the current diagram.
- Table with Selected: view a table of the selected objects (only valid if the selected objects are of the same type).



Viewing instances of a type in table view

Diagrams also contain built-in table view that can be accessed from the properties tab. The top-level network view, for example, has a summary of its contents, such as the site map, nodes, devices, and links that are contained in the project.

Inspector	
Properties	Settings
Site Map	<a href="#">950</a>
Nodes	<a href="#">1565</a>
Cabinets	<a href="#">182</a>
Devices	<a href="#">4084 (+73 aliases)</a>
Free Texts	0
Rich Texts	0
Palette Objects	0
Pictures	0
Hidden Objects	0
Print Templates	<a href="#">24</a>
Circuits	<a href="#">15</a>
Audit Trail	<a href="#">353</a>

*Properties window displaying hyperlinks to underlying table views*

Clicking on any of the links that summarize data will take the user to the corresponding table view.

### 5.3.1 Hybrid vs type-specific table views

Table views come in two flavors: hybrid and type-specific.

Whether a table is one or the other is determined automatically by netTerrain based on context.

When a user invokes a table from the properties window, as explained above, then the data can contain instances from different types. Because every type has a different set of properties, netTerrain cannot show custom properties in that table. Instead, it shows common fields for all types, such as the Id, name, type, and ancestry.

#	Link	Type	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6	Layer 7	Layer 8	Layer 9	Layer 10
1	Show on diagram	netTerrain Node	Higher Ed Net									
2	Show on diagram	University		UMBC								
3	Show on diagram	netTerrain Node	Templates									
4	Show on diagram	Application			netTerrain Application diagram							
5	Show on diagram	University		UoM								
6	Show on diagram	Building_University			Mekelin Library							
7	Show on diagram	Building_University			H. J. Patterson							
8	Show on diagram	Building_University			Jimenez Hall							
9	Show on diagram	Building_University			Health Center							
10	Show on diagram	Building_University			St. John Center							
11	Show on diagram	Building_University			Symons Hall							
12	Show on diagram	Building_University			St. Marys Hall							
13	Show on diagram	Building_University			Dorchester Hall							
14	Show on diagram	Building_University			Anne Arundel Hall							
15	Show on diagram	Building_University			Queen Annes Hall							
16	Show on diagram	Building_University			Somerset Hall							
17	Show on diagram	Building_University			Worcester Hall							
18	Show on diagram	Building_University			Chocotague Hall							
19	Show on diagram	Building_University			Tydings Hall							

A hybrid table view showing the site map

When a user launches a table from the right-click context menu using one of the 'Table with all of Type...' variants, then all instances are of the same type, in which case the table view will show all custom fields for those instances.

### 5.3.2 Editing data from a table view

Using the same reasoning explained above, it is easy to see that a hybrid table cannot be edited directly from the table, since custom fields are not represented. In that case, table views show an 'Edit' link for each record, which opens the record editor:

#	Link	Type	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6	Layer 7	Layer 8	Layer 9	Layer 10
1	Show on diagram	netTerrain Node	Higher Ed Net									
2	Show on diagram	University		UMBC								
3	Show on diagram	netTerrain Node	Templates									
4	Show on diagram	Application			netTerrain Application diagram							
5	Show on diagram	University		UoM								
6	Show on diagram	Building_University			Mekelin Library							
7	Show on diagram	Building_University			H. J. Patterson							
8	Show on diagram	Building_University			Jimenez Hall							
9	Show on diagram	Building_University			Health Center							
10	Show on diagram	Building_University			St. John Center							
11	Show on diagram	Building_University			Symons Hall							
12	Show on diagram	Building_University			St. Marys Hall							
13	Show on diagram	Building_University			Dorchester Hall							
14	Show on diagram	Building_University			Anne Arundel Hall							
15	Show on diagram	Building_University			Queen Annes Hall							
16	Show on diagram	Building_University			Somerset Hall							
17	Show on diagram	Building_University			Worcester Hall							

Editing a record from the table view

A type-specific table, on the other hand, has no edit field link since the data can be edited directly on the table.

#	Link	Master ID	Parent	Name	Peak Power [W]	Weight [lb]	Status	Visual Override	Parent
1	<a href="#">Show on diagram</a>		A1	SW_7dZlWJZwT9	1100	17.03		<input type="text" value="\$zz_Node_ParentName([diagramid]]"/>	<input type="text" value="\$zz_Node_AllParents"/>
2	<a href="#">Show on diagram</a>		A1	SW_M4exD7ppPy	1100	17.03		<input type="text" value="\$zz_Node_ParentName([diagramid]]"/>	<input type="text" value="\$zz_Node_AllParents"/>
3	<a href="#">Show on diagram</a>		A1	SW_GeZWNozo5d	1100	17.03		<input type="text" value="\$zz_Node_ParentName([diagramid]]"/>	<input type="text" value="\$zz_Node_AllParents"/>
4	<a href="#">Show on diagram</a>		A1	SW_vDwJyq9cux	1100	17.03		<input type="text" value="\$zz_Node_ParentName([diagramid]]"/>	<input type="text" value="\$zz_Node_AllParents"/>
5	<a href="#">Show on diagram</a>		A1	SW_yfUEt3KD6w	1100	17.03		<input type="text" value="\$zz_Node_ParentName([diagramid]]"/>	<input type="text" value="\$zz_Node_AllParents"/>
6	<a href="#">Show on diagram</a>		A1	SW_2yo4sEzJVl	1100	17.03		<input type="text" value="\$zz_Node_ParentName([diagramid]]"/>	<input type="text" value="\$zz_Node_AllParents"/>
7	<a href="#">Show on diagram</a>		A1	SW_NRC28SxbSm	1100	17.03		<input type="text" value="\$zz_Node_ParentName([diagramid]]"/>	<input type="text" value="\$zz_Node_AllParents"/>
8	<a href="#">Show on diagram</a>	2400000016024	A1	SW_TtbQkUARdS	1100	17.03		<input type="text" value="\$zz_Node_ParentName([diagramid]]"/>	<input type="text" value="\$zz_Node_AllParents"/>
9	<a href="#">Show on diagram</a>		A1	SW_PTHUllHuT	1100	17.03		<input type="text" value="\$zz_Node_ParentName([diagramid]]"/>	<input type="text" value="\$zz_Node_AllParents"/>

Type-specific table view showing editable textboxes for each record

Each record in this table view has an editable textbox (or combo box) for each custom property. This has the added convenience of being able to quickly navigate through cells using the arrow keys.

Notice that both variants of tables support the delete features. Deleting records from a table view is essentially the same as deleting them from a diagram.

#### Attention!

Calculated or system fields are not editable, and aliases have no editable fields at all. To change the values for an alias you must go to the master instance and edit custom properties there.

### 5.3.3 Navigating from a table view to a diagram

In most cases, a link to the diagram that contains the object will also be displayed next to the edit and delete buttons.

Site Map    To csv    To Excel

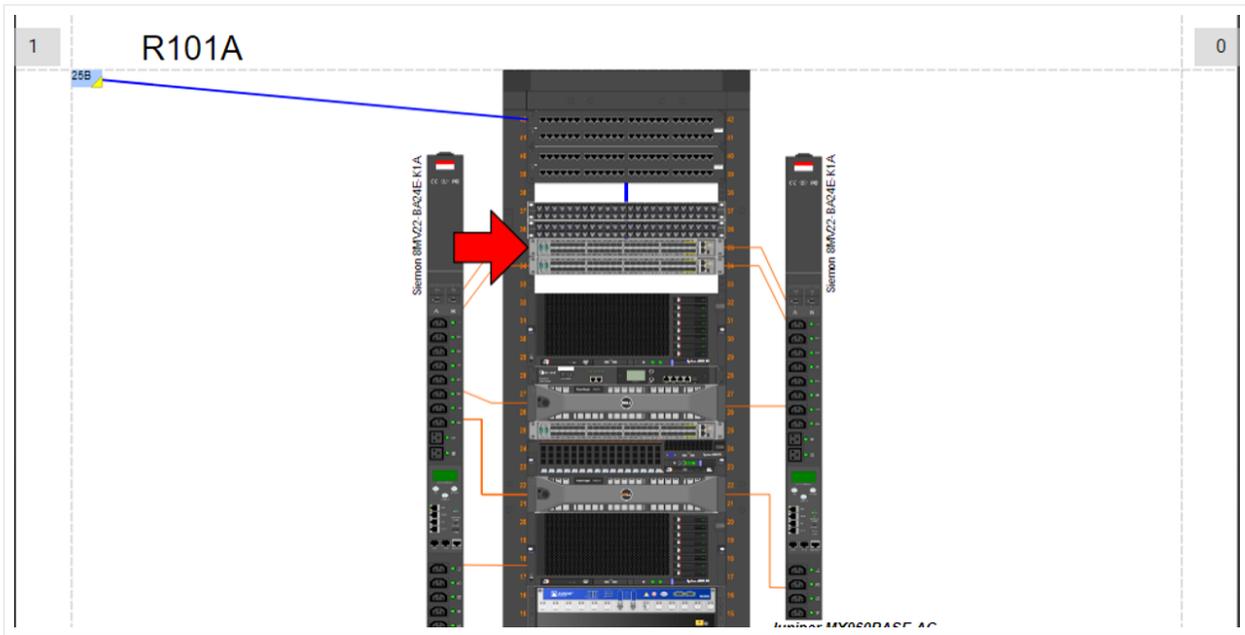
Filter \_\_\_\_\_    Apply    Clear

#	Link	Type	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6	Layer 7
1	<a href="#">Show on diagram</a>	netTerrain Node	Higher Ed Net						
2	<a href="#">Show on diagram</a>	University		UMBC					
3	<a href="#">Show on diagram</a>	netTerrain Node	Templates						
4	<a href="#">Show on diagram</a>	Application			'netTerrain' Application diagram				
5	<a href="#">Show on diagram</a>	University		UofM					
6	<a href="#">Show on diagram</a>	Building_University			Mckeldin Library				
7	<a href="#">Show on diagram</a>	Building_University			H. J. Patterson				
8	<a href="#">Show on diagram</a>	Building_University			Jimenez Hall				
9	<a href="#">Show on diagram</a>	Building_University			Health Center				
10	<a href="#">Show on diagram</a>	Building_University			St. John Center				
11	<a href="#">Show on diagram</a>	Building_University			Symons Hall				
12	<a href="#">Show on diagram</a>	Building_University			St. Marys Hall				
13	<a href="#">Show on diagram</a>	Building_University			Dorchester Hall				
14	<a href="#">Show on diagram</a>	Building_University			Anne Arundal Hall				
15	<a href="#">Show on diagram</a>	Building_University			Queen Annes Hall				
16	<a href="#">Show on diagram</a>	Building_University			Somerset Hall				
17	<a href="#">Show on diagram</a>	Building_University			Worcester Hall				
18	<a href="#">Show on diagram</a>	Building_University			Chincoteague Hall				
19	<a href="#">Show on diagram</a>	Building_University			Tydings Hall				

1 out of 10    <    >    1    Go

*Show on diagram link*

By pressing this link, users are taken to the diagram that contains the object and the object will blink.



*Navigating from a table view to the diagram*

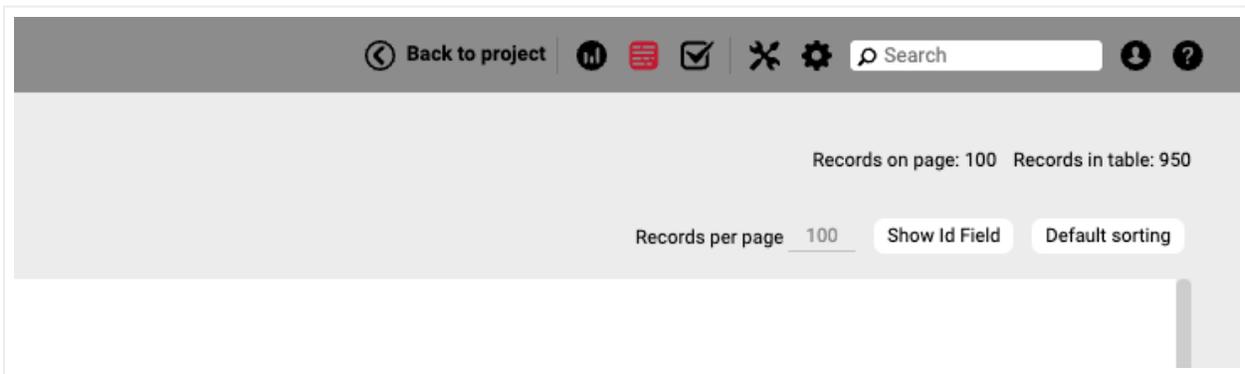
### 5.3.4 Other table view features

Table views include several additional standard features, which are mostly self-explanatory:

#### 5.3.4.1 Column sorting

All name and custom fields are sortable in a table view. Press on the column header once for ascending order sorting and press again for descending order sorting.

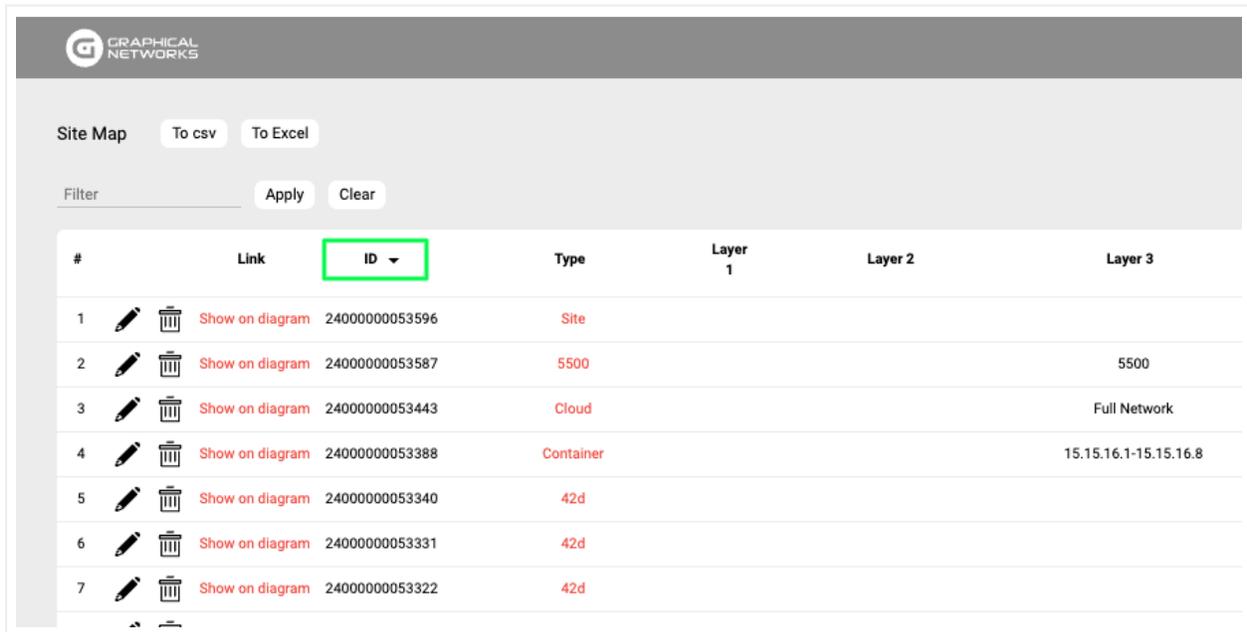
To go back to the default sorting, click on the 'default sorting' button:



*Default sorting*

### 5.3.4.2 Hiding and showing the id field

By default, table views will not show the instance id column, which can be shown by pressing the 'Show id field' button on the top right corner. The id column can be a useful feature to find out which records were added most recently. Since every record has a unique id and ids are issued sequentially in ascending order and never reused, to find out which records are newer click on 'Show Id field' then press on the Id column header (and make sure the arrow next to the header is pointing down) and voila! Your records are sorted by most recent in descending order.



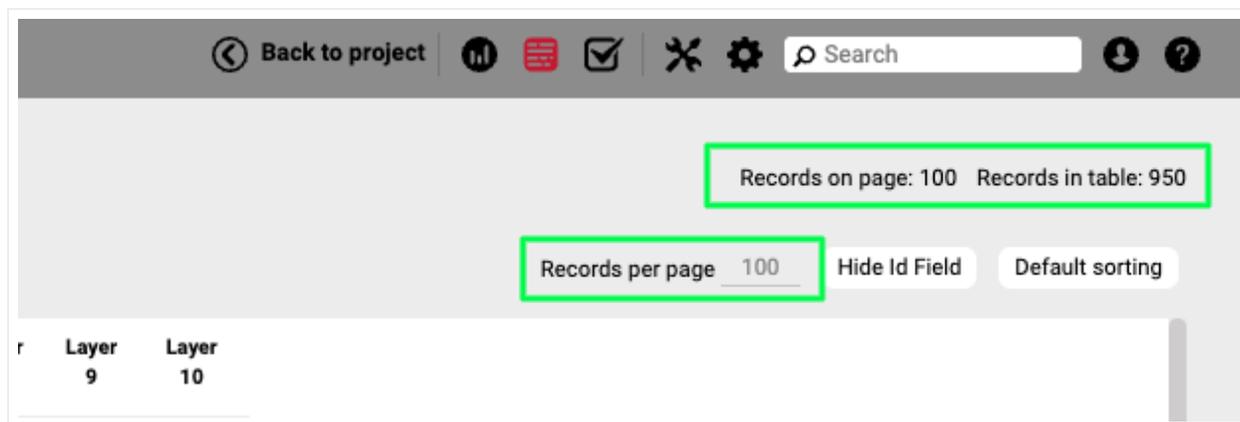
The screenshot shows the Graphical Networks interface. At the top, there is a header with the logo and the text 'GRAPHICAL NETWORKS'. Below the header, there are buttons for 'Site Map', 'To csv', and 'To Excel'. A filter section contains a 'Filter' input field, 'Apply', and 'Clear' buttons. The main content is a table with the following columns: '#', 'Link', 'ID', 'Type', 'Layer 1', 'Layer 2', and 'Layer 3'. The 'ID' column header is highlighted with a green box and has a downward arrow. The table contains 7 rows of data, sorted by ID in descending order.

#	Link	ID	Type	Layer 1	Layer 2	Layer 3
1	  <a href="#">Show on diagram</a>	2400000053596	Site			
2	  <a href="#">Show on diagram</a>	2400000053587	5500			5500
3	  <a href="#">Show on diagram</a>	2400000053443	Cloud			Full Network
4	  <a href="#">Show on diagram</a>	2400000053388	Container			15.15.16.1-15.15.16.8
5	  <a href="#">Show on diagram</a>	2400000053340	42d			
6	  <a href="#">Show on diagram</a>	2400000053331	42d			
7	  <a href="#">Show on diagram</a>	2400000053322	42d			

*Sorting records by most recent in descending order*

### 5.3.4.3 Pagination and counters

The top right corner of the table view will display how many records are displayed per page and how many records exist in total. The records per page counter is editable on the table view and the default records per page is a setting that can be changed in the admin console by an administrator (see Admin guide).



### Record counters

As you would expect from a table view, pagination is supported and available at the bottom of the page. The pagination features are self explanatory, methinks!

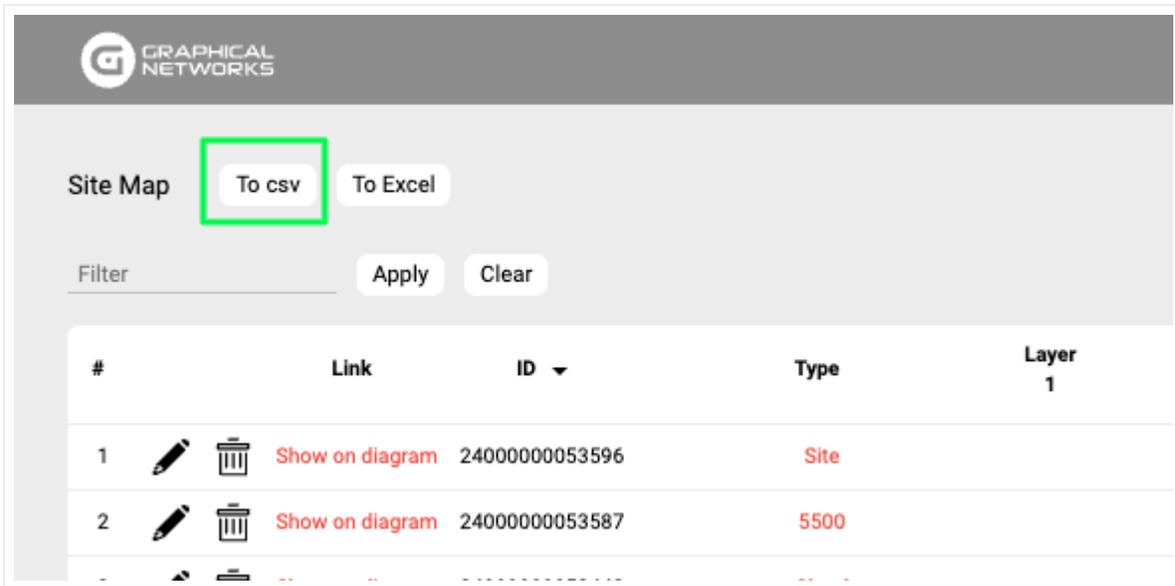


### Pagination in table views

#### 5.3.4.4 Exporting table views to csv

All table views can be exported to csv. The export will include all the columns that are displayed in the table view. To export, simply click on the 'Export to csv' button on top. Once clicked, the user will be prompted to open or save the file to disk.

The method to retrieve the generated csv will depend on the browser used. The screenshot below shows the place to fetch the csv when launched from a Chrome browser.



Exporting to csv

Tip:

Csv formats can be opened with spreadsheet software like Microsoft Excel. You can then take advantage of the features in those tools to further manipulate the information or create reports.

## 5.4 Queries

Besides running a search, which retrieves results as a table, or running a pre-defined table view report, an end-user can also design a simple query, run it and store it, all through a simple-to-use GUI.

To create queries dynamically, follow these steps:

1) From the Tools menu click on the 'query' button, which opens a 'Create Query' dialog. We recommend you name the query so you can retrieve it later.

**Create Query**

Name:  ...

**Source table**

Nodes  
 Links

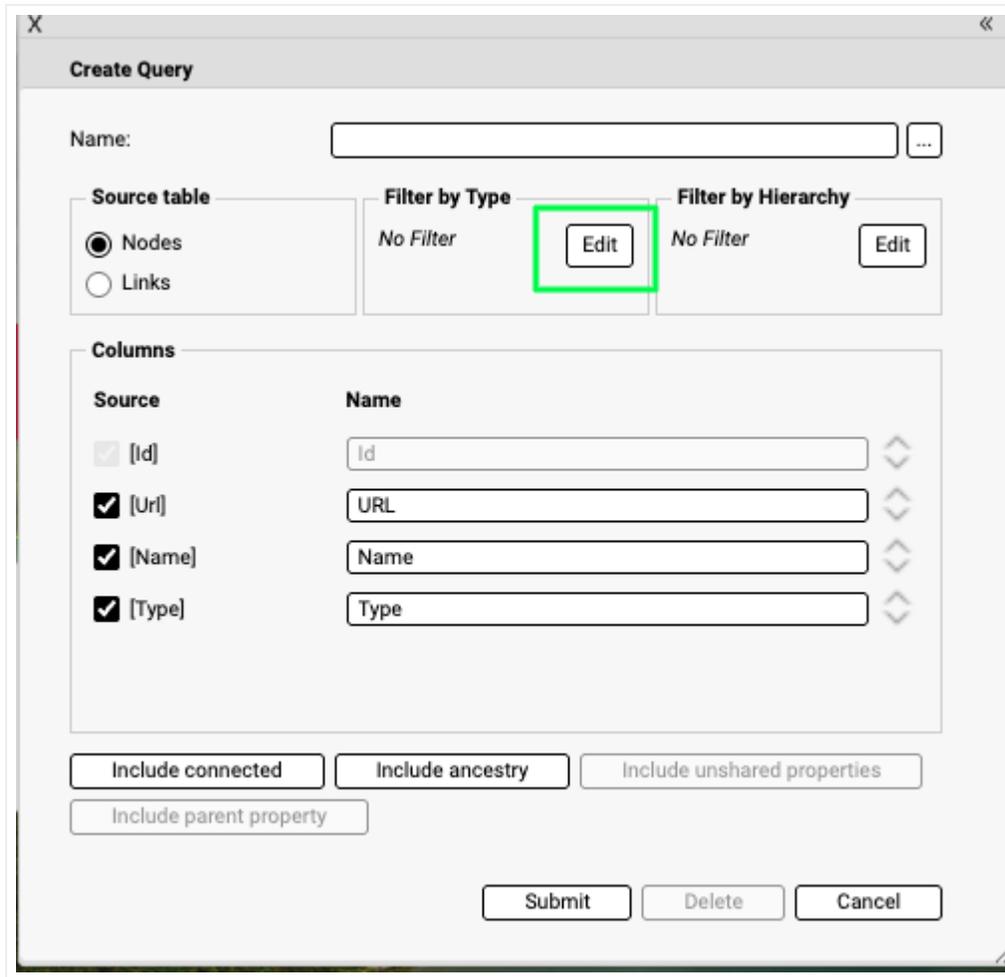
**Filter by Type**  
No Filter

**Filter by Hierarchy**  
No Filter

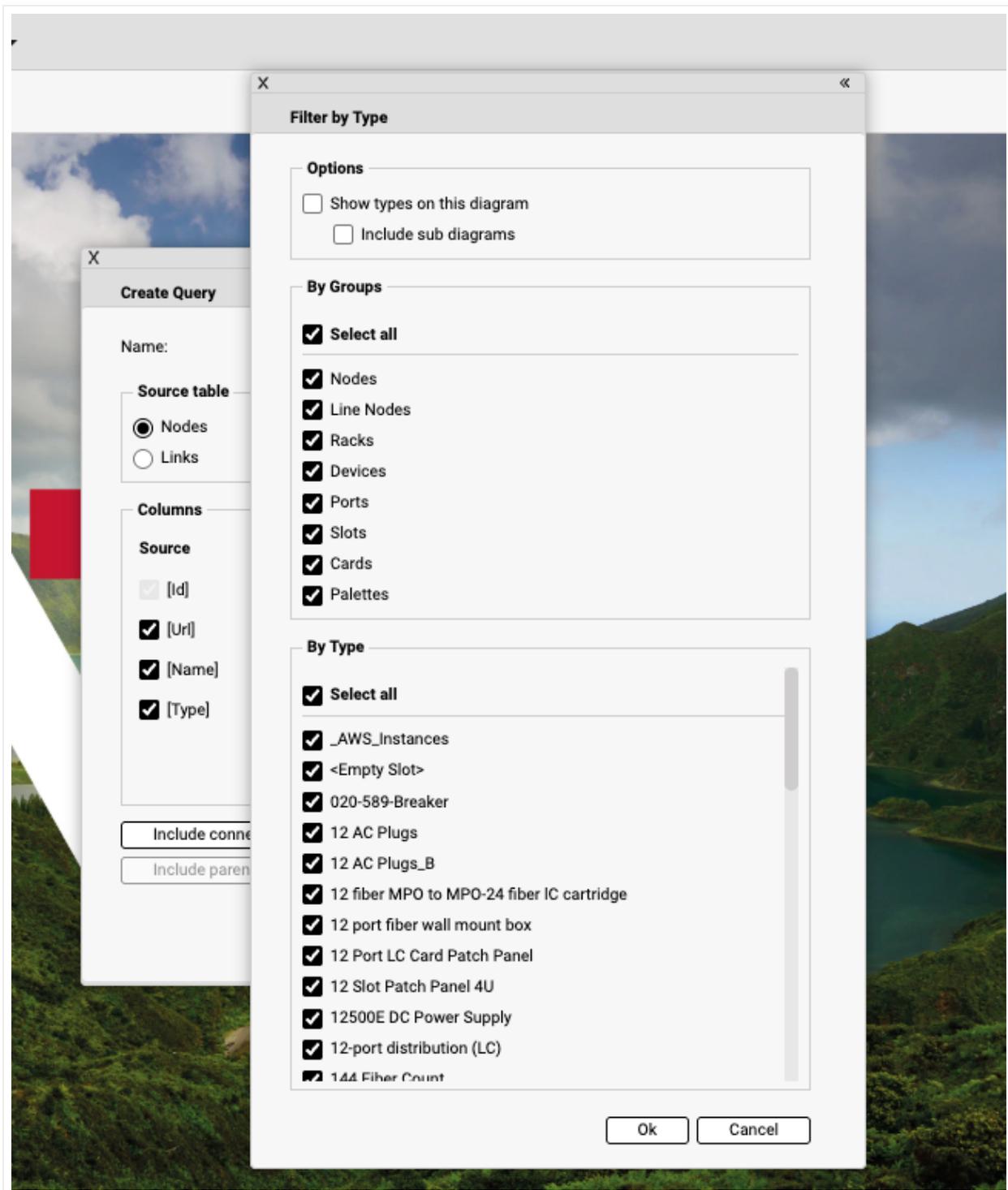
**Columns**

Source	Name
<input type="checkbox"/> [Id]	<input type="text" value="Id"/> <input type="button" value="↑"/>
<input checked="" type="checkbox"/> [Url]	<input type="text" value="URL"/> <input type="button" value="↑"/>
<input checked="" type="checkbox"/> [Name]	<input type="text" value="Name"/> <input type="button" value="↑"/>
<input checked="" type="checkbox"/> [Type]	<input type="text" value="Type"/> <input type="button" value="↑"/>

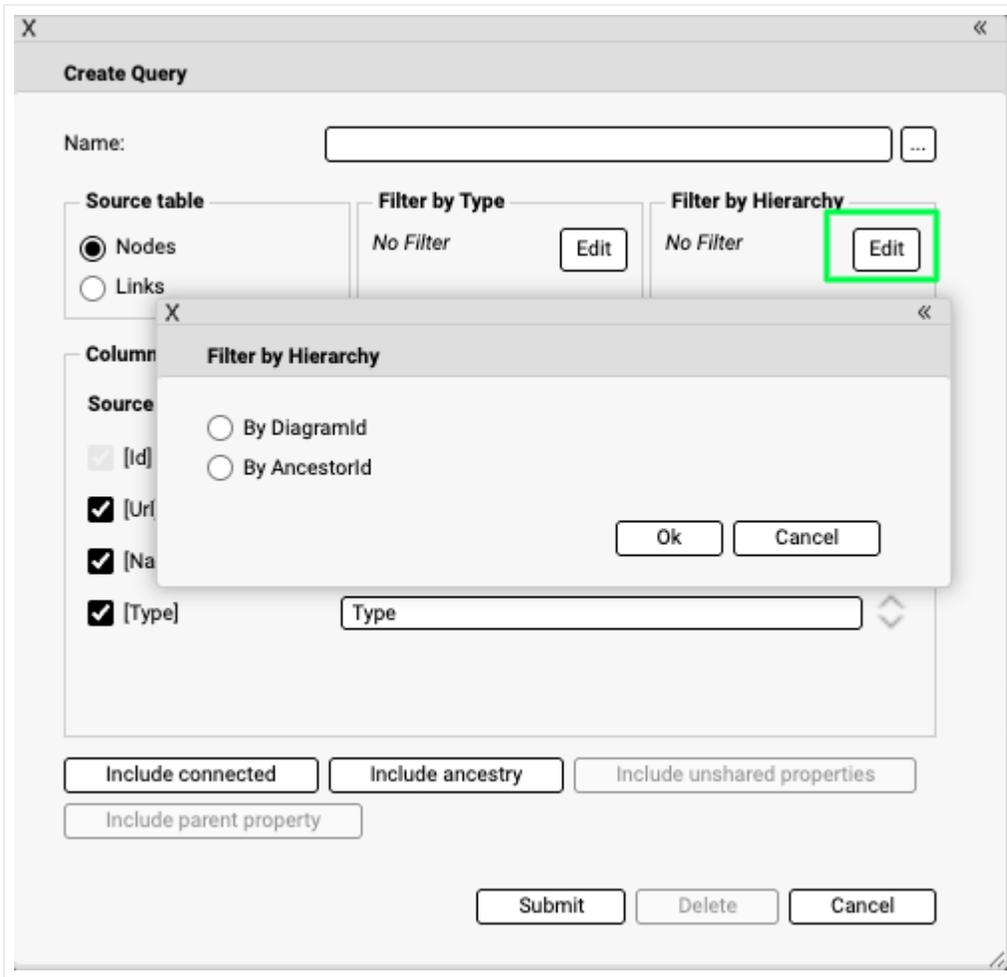
- 2) In the create query dialog pick the source table (nodes or links).
- 3) If you want to filter by type click on the 'Edit' link in the Filter by Type section.



4) The filter by type option let's you browse types by current diagram and/or below (which limits the types a lot and makes them easier to find), and also let's you pick one or more groups, or choose one or more types from a specific group.



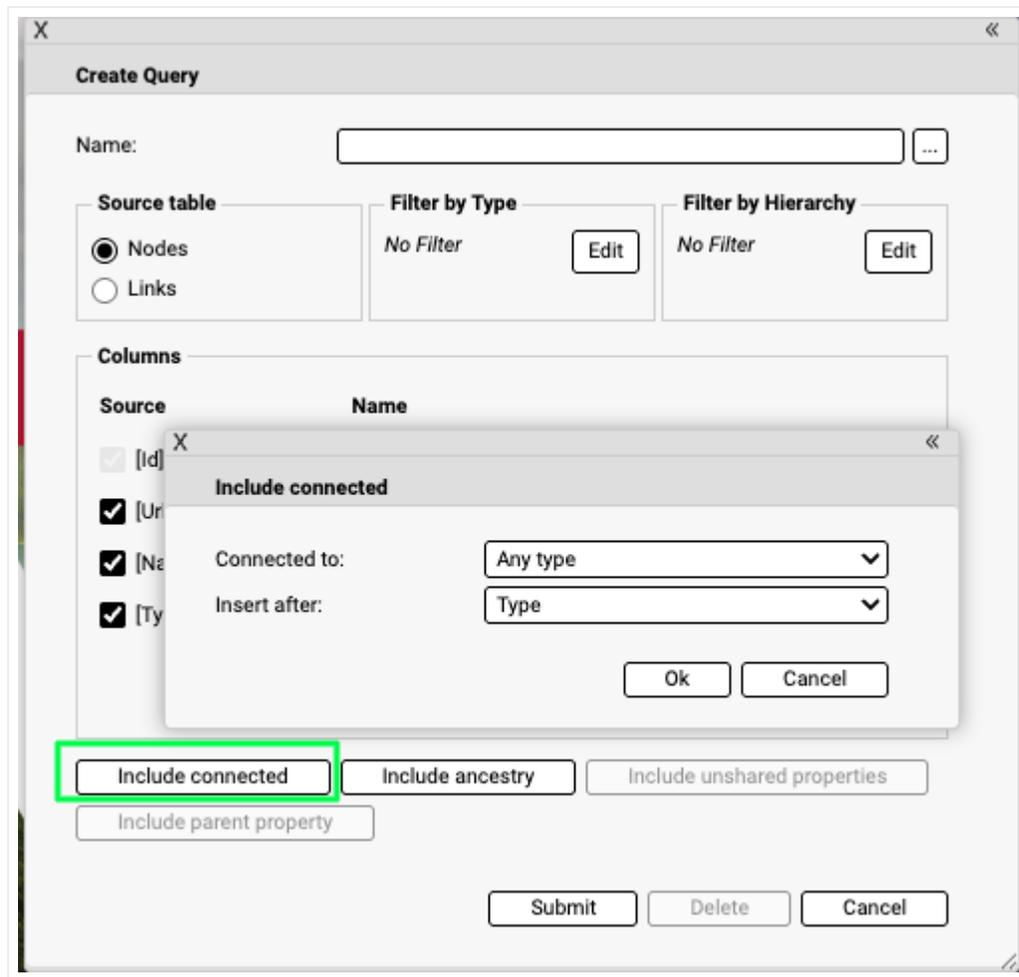
5) The filter by hierarchy option let's you limit the table results by the current diagram or the whole ancestry.



6) In the columns section you can pick which fields should be included in the table view results. In the case of multiple types, the default is that only common fields to all types are included. You can include specific fields not shared by all types by clicking on the 'Include unshared properties'. You can also check or uncheck any specific fields from the columns section to modify the result set.

7) Finally, you can also include nodes connected to the nodes in the result set, as well as the ancestry for each node:

a. The include connected option let's you pick which group types of objects should be displayed for the connected recordset and specify where that information should be inserted in the report.



b. The Include ancestry option let's you pick if you are displaying ancestors by level, in which case you can also choose how many levels of ancestors should be included in the report as well as the ordering, or by type, in which case you pick one type to act as the query clause. You can also specify where in the column order this information should be inserted. Notice that if the include connected option was enabled, the include ancestry feature also gives you the option to append the ancestry information for the connected objects.

8) After you selected all your options and click on the 'submit' button of the query dialog a table view is launched in a separate browser tab. This is your table view!

building university To csv To Excel

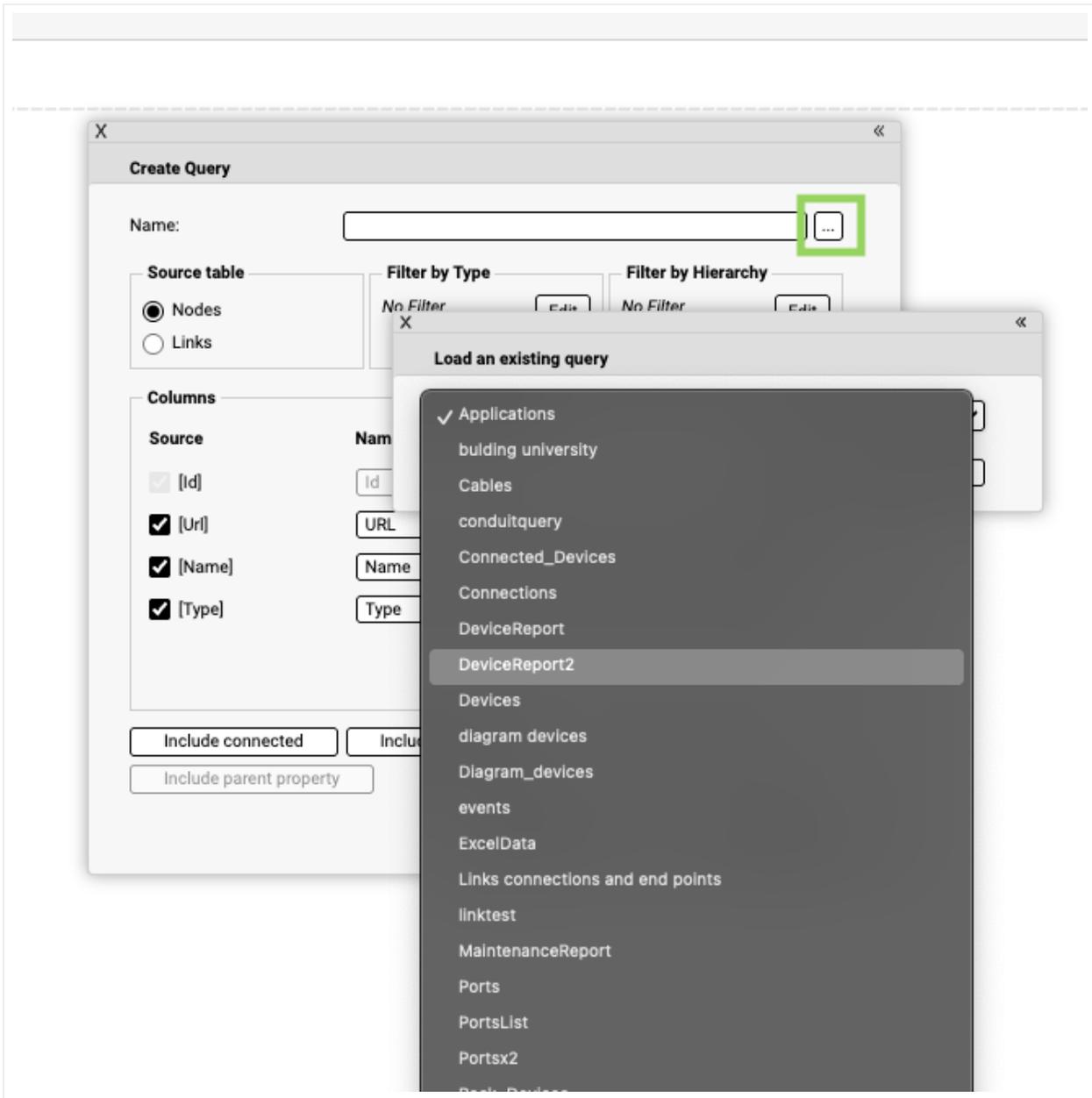
Filter Apply Clear

#	URL	Name	Type	Parent
1	Show on diagram	F1	Port	WJ 101
2	Show on diagram	F2	Port	WJ 101
3	Show on diagram	F3	Port	WJ 101
4	Show on diagram	F4	Port	WJ 101
5	Show on diagram	B2	Port	WJ 101
6	Show on diagram	B1	Port	WJ 101
7	Show on diagram	B4	Port	WJ 101
8	Show on diagram	B3	Port	WJ 101
9	Show on diagram	con	Port	AP1
10	Show on diagram	Ethernet	Port	AP1
11	Show on diagram	P1	Port	AP1
12	Show on diagram	---	Port	AP1

Retrieved table view

### 5.4.1 Loading an existing query

Of course, you don't want to have to go through all these options every time you run the same table view. Thankfully, netTerrain saves your queries automatically, after you named them during your original query design process. To retrieve a query, simply open the create query dialog, and load up your query using the 'Load an existing query' option (ellipsis button).



*Loading an existing query*

After you loaded the query, you can then edit it, or simply run it again.

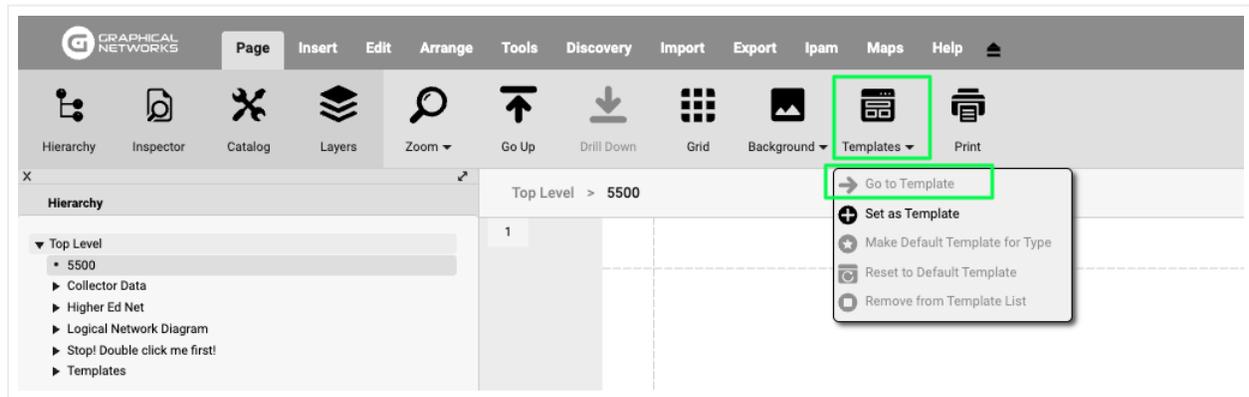
## 5.5 Diagram templates

In some cases, users may want to apply a standard layout to several diagrams without having to create the static objects (free drawings, background, text, etc.) that comprise each diagram manually every time. To do

that, users can set up any given network diagram as a template and then apply that template to any other network diagram.

If a diagram has been defined as a template and then another diagram applies that template, the template background image and all its shapes and shape displayed fields will also appear on the template consumer (that diagram).

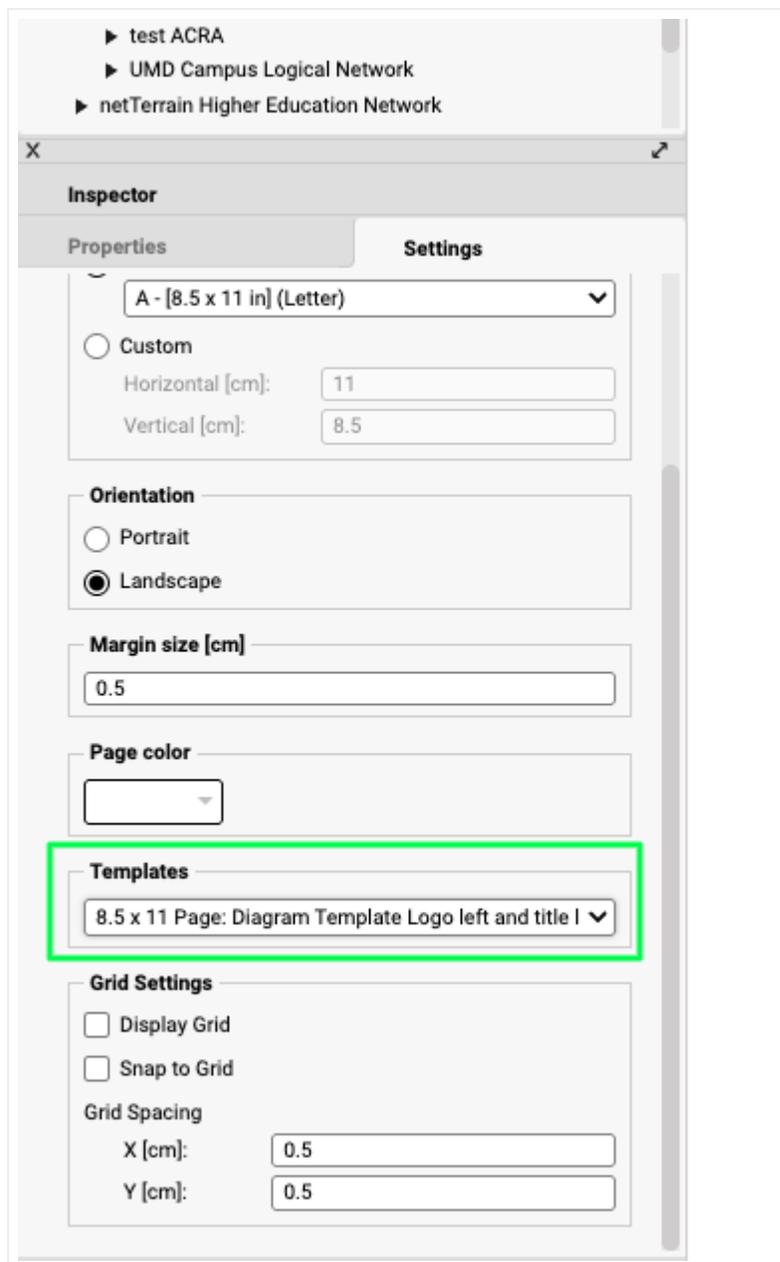
To set up a diagram as a template, simply go to the diagram, right-click on the empty space of the diagram and use the 'Set as Template' submenu or use the 'Template' button from the Page menu.



### Setting a diagram as template

If the set as template option is not enabled it could be because the diagram itself is using a template. A diagram cannot serve as a template and at the same time use another diagram as a template.

To apply a template to a diagram, simply go to the diagram, click on the settings tab and select from the list of available templates.



### *Applying a template to a diagram*

The drop down list that you see for the templates lists all diagrams in the project (by name) that have been set as a template.

#### **Attention!**

You cannot set a diagram as a template if it is currently using another template. You must first remove the template from the diagram, as explained below.

## 5.5.1 Removing the template for a diagram

To remove the template from a diagram, follow the same steps as if you were applying a template to the diagram and select the empty record (as shown above).

## 5.5.2 Prebuilt diagram templates

netTerrain includes several prebuilt diagram templates shipped with the master database. These templates provide standardized layouts and functions that users can take advantage of or modify as needed.

## 5.6 Advanced link features

### 5.6.1 Circuit Layout Records

Circuit Layout Records (CLRs) are end-to-end views of a path between two nodes represented in one single diagram. For example, I may have a desktop computer connected to the internet router via a wall jack, patch panels and a switch. A CLR displays that entire path in one diagram.

The rules for CLR generation are the following:

- 1) The starting node must have a connection to some other intermediate node (hop) or end node.
- 2) Each hop needs to have one connection to the next hop.
- 3) The CLR stops until a node has no more connections to a next hop, or more than one outgoing connection. In other words, the CLR is generated for paths that are unique.

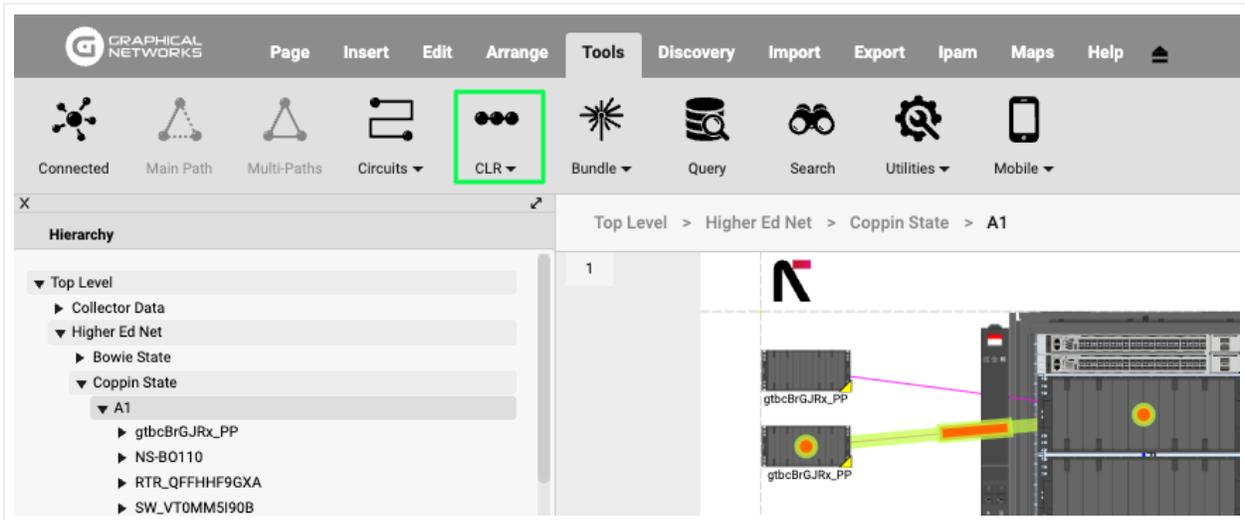
#### **Attention!**

If you double-click on any link along the path netTerrain will redirect you to the diagram containing that link and make it blink.

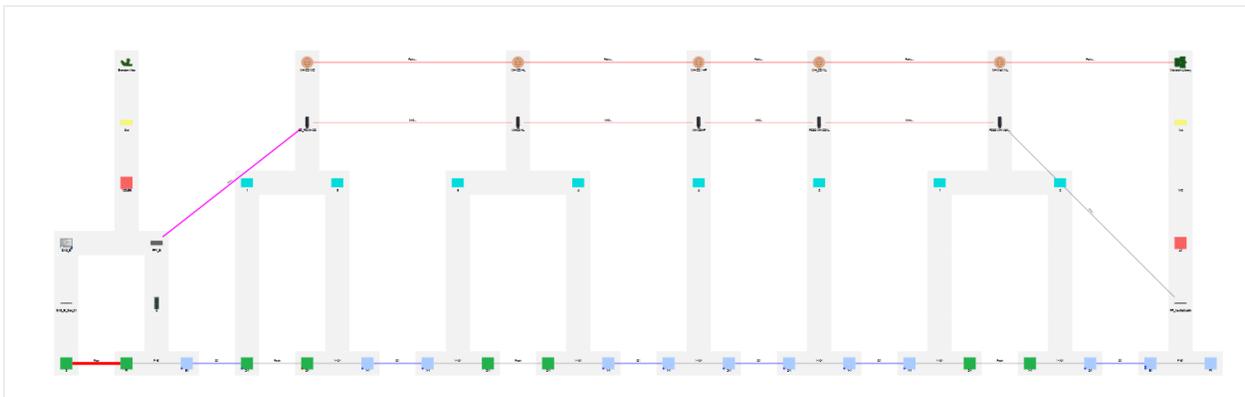
CLRs are not explicitly constructed. They are automatically generated by virtue of nodes being connected with each other. To visualize a CLR do one of the following:

- 1) Double-click on the link for which you want to see the CLR
- 2) right-click on a node along the potential CLR path and select the View-> View CLR option.
- 3) Right-click on a link and select the CLR option

4) Click on the CLR button under the 'Tools' menu



Visualizing a CLR



CLR view

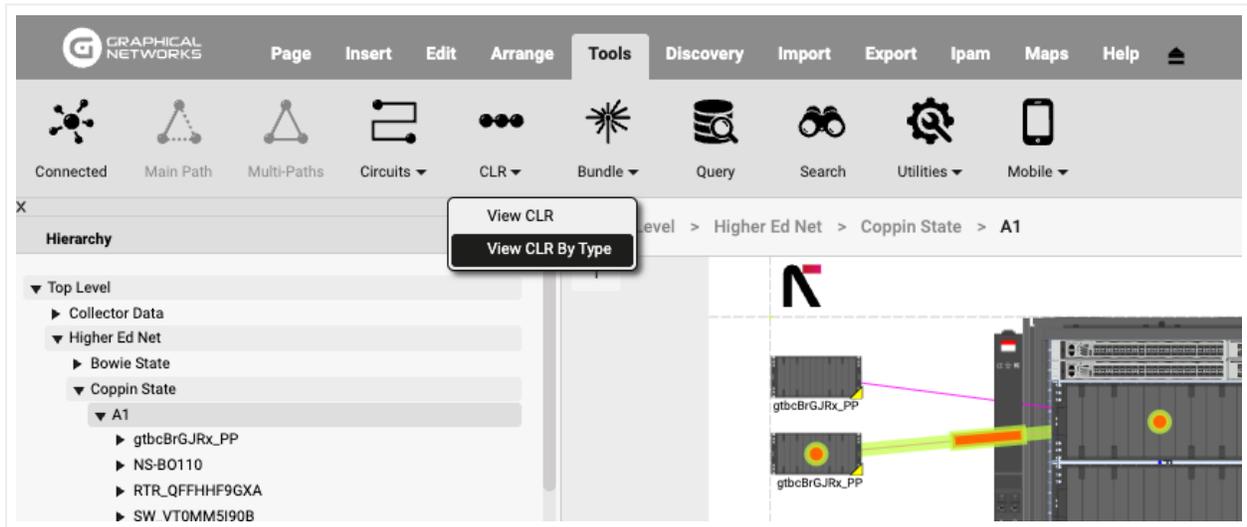
The image above shows a CLR for an antenna (a cable starting on the left) a switch connected to another antenna (on the right), with all the fiber panel through multiple hops in between. Users can double-click on any node on the CLR and jump to the diagram that contains that node.

Tip:

If you double-click on any link along the path netTerrain will redirect you to the diagram containing that link and make it blink.

### 5.6.1.1 Running a CLR by type

In some cases, you are interested in the CLR for a given link type only. netTerrain can launch a CLR by type with the extra advantage that it ignores any other connections that are not of the same type as the connection type that triggers the CLR. If multiple paths exist, but all the alternative paths are of a different type, those will be ignored. This is the only case where rule 3 (above) does not apply.



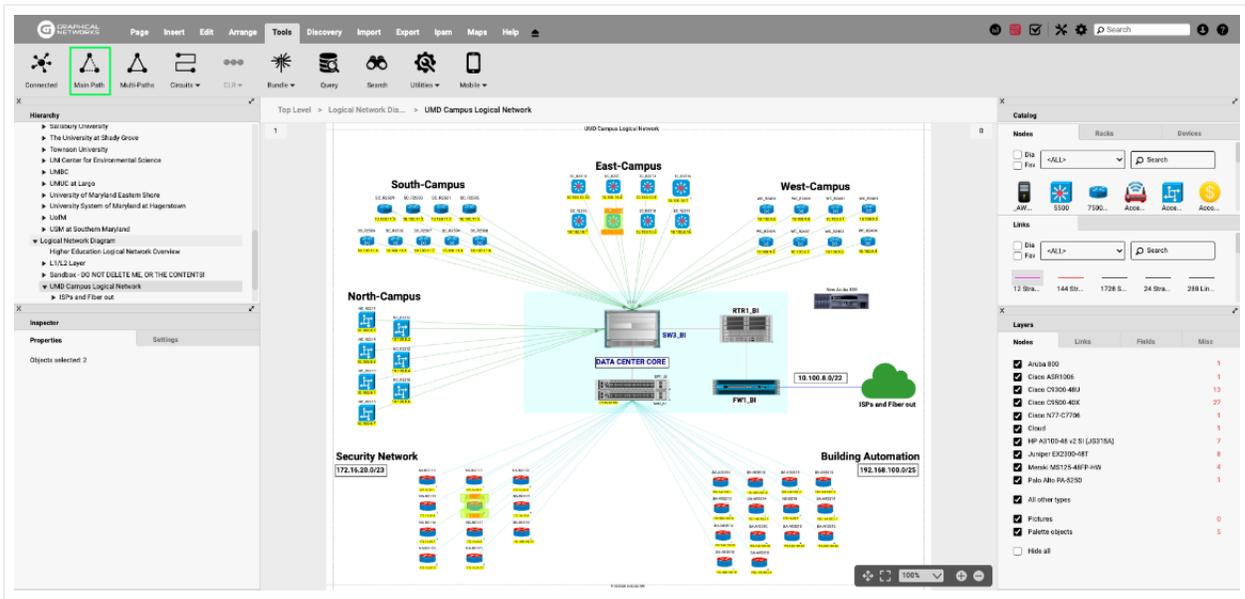
*CLR by type option*

### 5.6.2 Main (or shortest) paths

netTerrain can find the shortest main and secondary paths between two nodes on the same diagram. This feature has two limitations:

- Only works for two nodes on the same diagram.
- The connections must be at the diagram level (and not bubbled up from diagrams underneath).

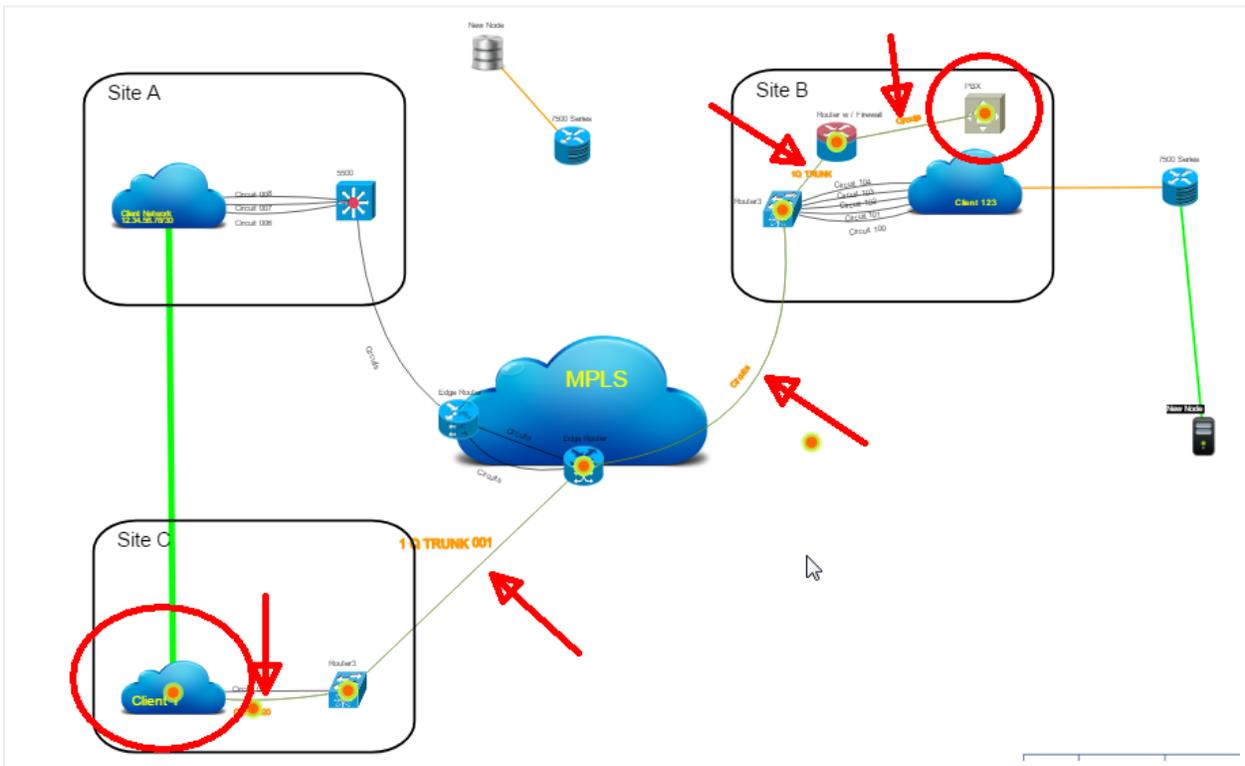
To find the main path between two nodes, select two (and only two) nodes and right-click on one of them (or press alt-c). You can also click on the 'Main path' button under the tools menu, as shown below:



Shortest path option

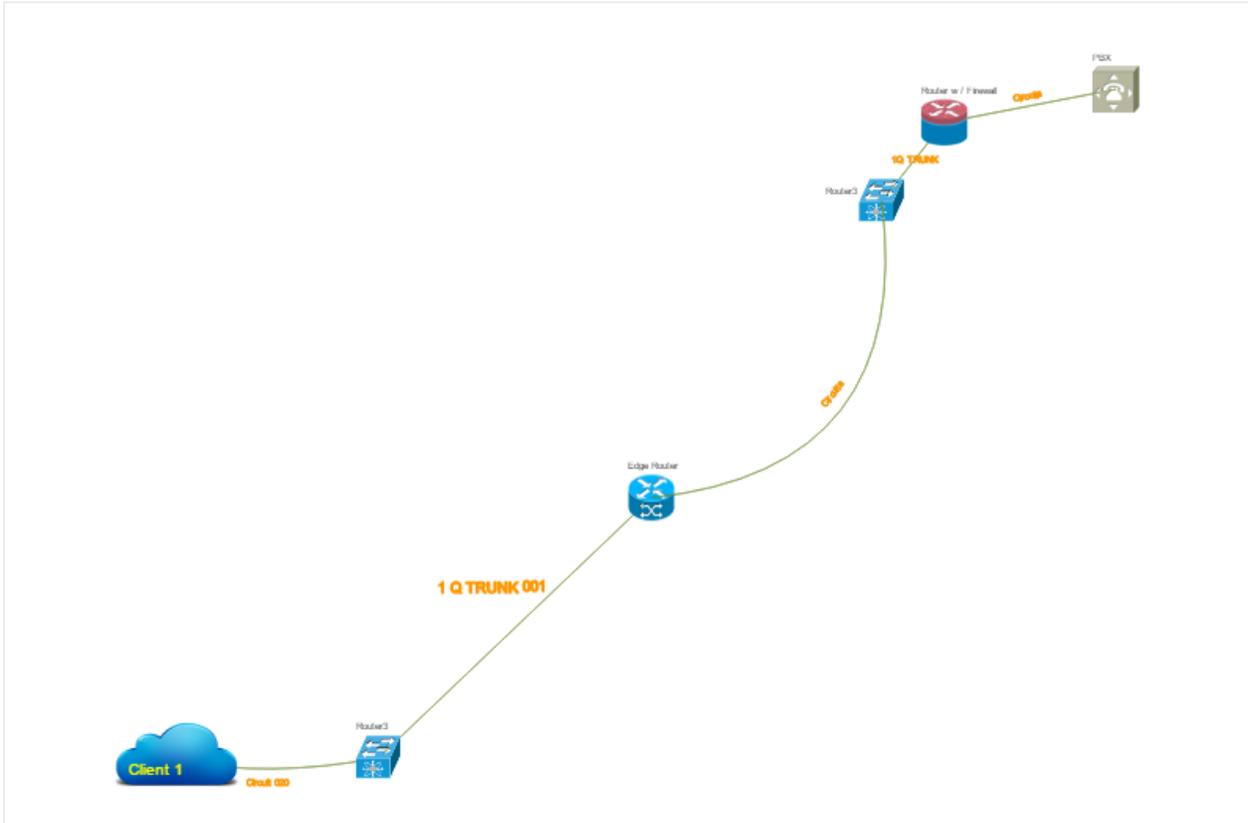
Alternatively, you can select both nodes and press [shift-p] for the shortcut.

netTerrain, after finding the shortest path, will highlight that path:



Shortest path between two nodes

The ensuing path can be easily isolated from the rest of the diagram by simply pressing [shift-c], which only shows the node endpoints for each segment of the path:

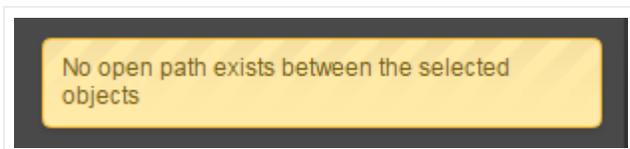


*Isolated shortest path between two nodes*

When requesting the main and secondary paths netTerrain will find the shortest path first, remember all the intermediate nodes on that path and look for the shortest alternative path that does not pass through any of those remembered nodes.

If a main and secondary path exists, then they will be highlighted as well, and can be isolated just as described above.

If no main path exists, or, in the case of requesting the main and secondary paths, no two paths exist, netTerrain throws an error:



*No open paths found*

### 5.6.3 Link bundles

netTerrain can represent parent to child relationships with nodes in a natural way by double-clicking on the parent node and accessing the child nodes on the sub diagram. With links a somewhat similar representation is also possible: the ability to associate several links with a “higher order” link. Moreover, this association can be done across an infinite number of layers and hierarchies.

This feature is called link bundling and some of the ways you can take advantage of this feature include:

- bundling copper and fiber cables to trays (where the tray is the higher level ‘link’)
- bundling fiber strands to fiber trunks and fiber trunks
- bundling SONET or SDH circuits with their higher-level containers

There is no restriction on which types of links can be bundled and bundling is also possible in a “many-to-many” relationship fashion. Multiple lower-level links can be associated with one or more higher level links.

To create a link bundle, follow these easy steps:

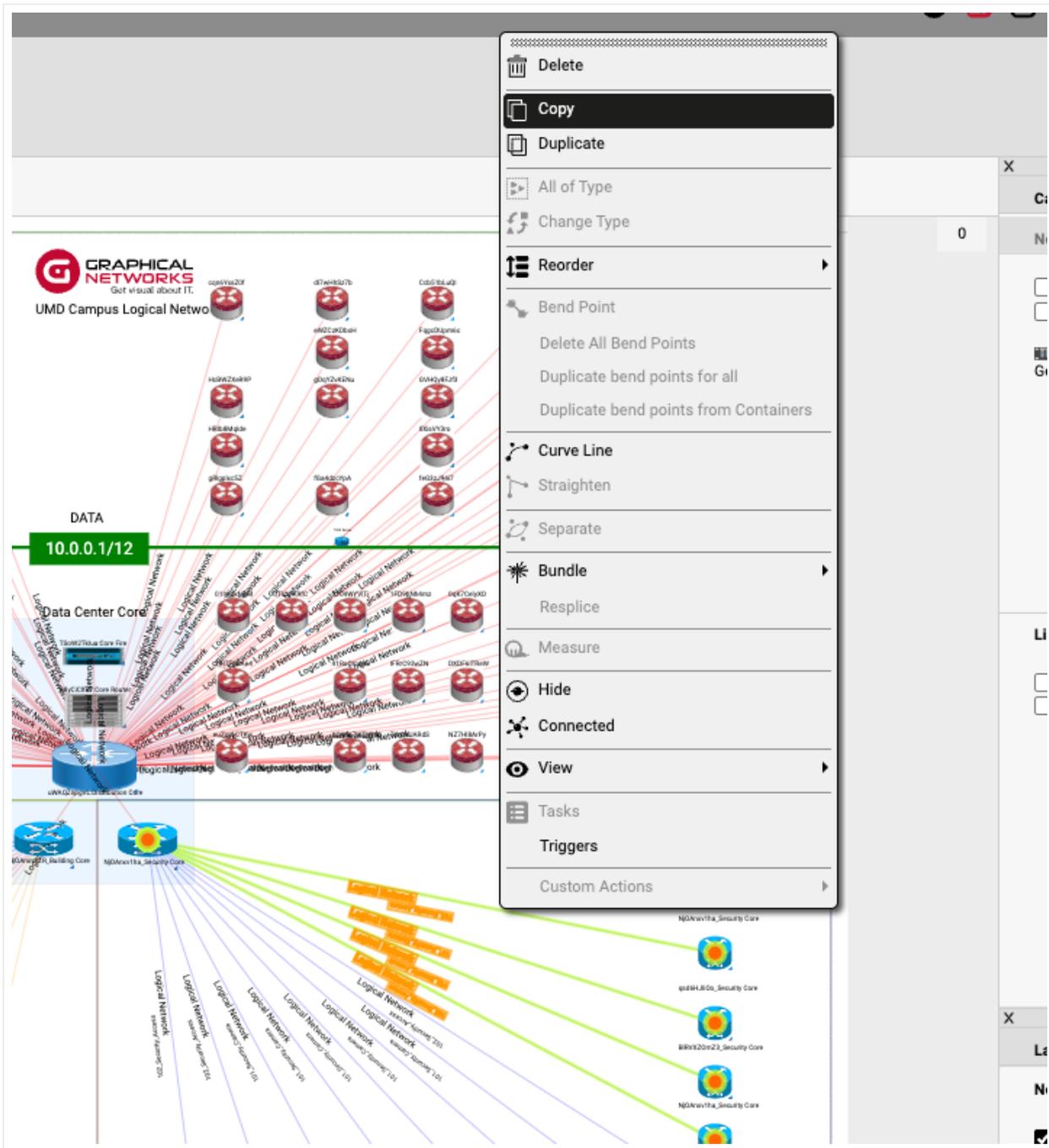
- 1) Select the lower-level links.
- 2) Copy them to the clipboard (ctrl-c).
- 3) Select the higher-level links.
- 4) Right-click on any of them (making sure they all stay selected).
- 5) Click on the option ‘bundle’ or click on the ‘Bundle’ button under the tools menu.
- 6) Select the ‘Bundle with copied links’ option.

As an example, we can select multiple copper cables in a data center, copy them to the clipboard and then select several tray sections, and bundle the copper to the trays.

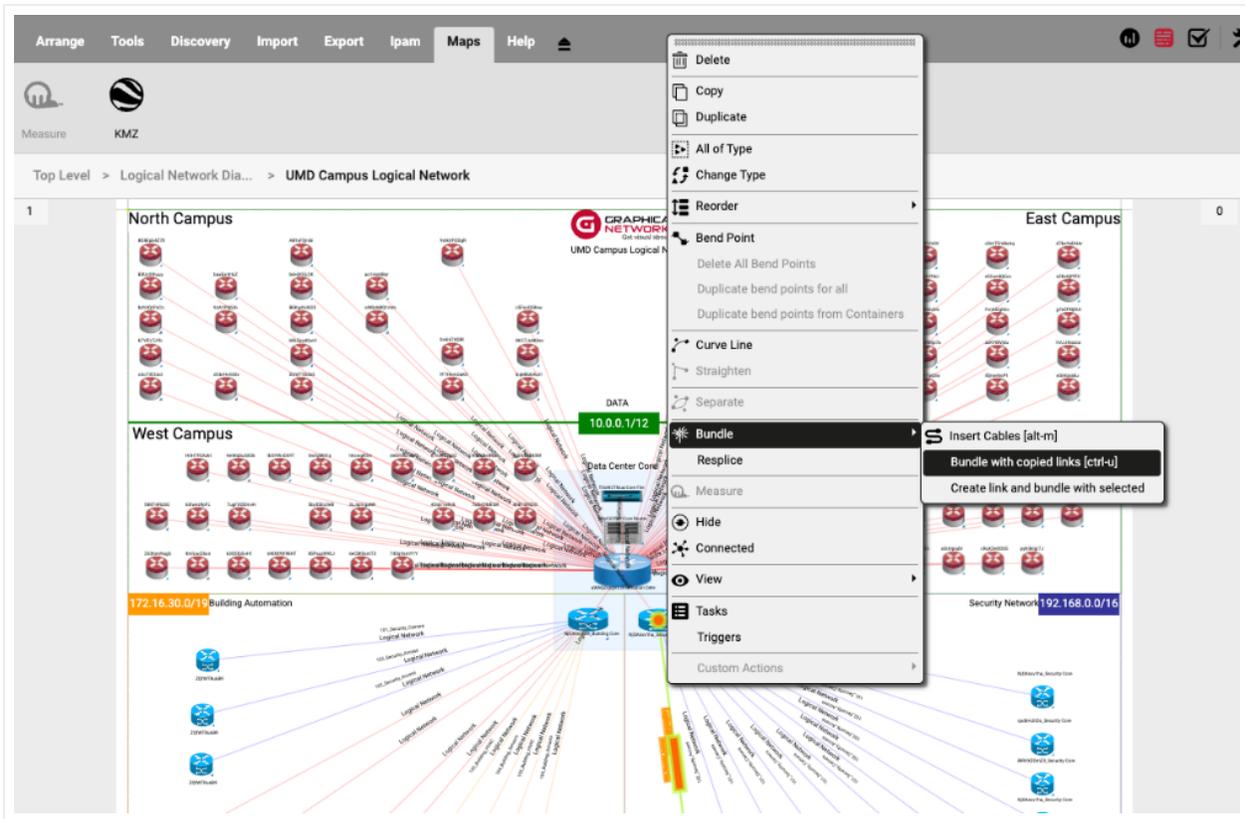
A particularly useful case for link bundling is the representation of fiber strands at high level maps. You wouldn’t want to have all fiber strands displayed on a map, instead you just want to see the fiber trunks or conduits, but you may still want to click on a trunk or conduit to get a report of all the bundled strands.

To do this:

- 1) select, say, 4 fiber strands from a diagram and copy them to the clipboard.



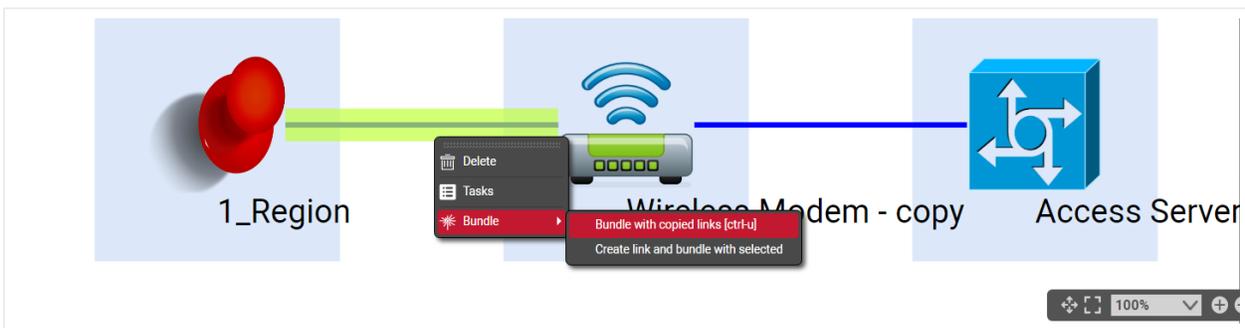
2) Select the fiber trunk path, as depicted below



3) Click on 'Bundle' -> 'Bundle with copied links'.

4) As a final step you can then hide the 4 fiber strands from the diagram, which will improve the visibility of the diagram while still providing a way to see which strands are associated with which trunks.

You can also bundle a link with another one directly from a CLR view, by right-clicking on any link in your CLR view:



*Bundling from a CLR view*

Once we created our bundle, users can later on see which lower level links are associated with the higher level links and viceversa.

To find all the links bundled with another link, simply click on the link, and click on the bundled links hyperlink in the properties window.

Properties	Settings
Id	25000000294947
Type	Conduit <input type="checkbox"/>
From	1_Region <input type="checkbox"/>
To	Wireless Modem <input type="checkbox"/>
Name	Conduit <input type="checkbox"/>
Fill %	\$zz_Link_Fill_Pe <input type="checkbox"/>
Length	<input type="checkbox"/>
Depth	<input type="checkbox"/>
Location	<input type="checkbox"/>
CableCapacity	<input type="checkbox"/>
St_Total	\$Conduit_StrandsAll... <input type="checkbox"/>
ST_Terminated	\$Conduit_StrandsTer... <input type="checkbox"/>
St_CircFillRate	\$Conduit_StrandsFill... <input type="checkbox"/>
St_Bad	\$Conduit_StrandsBy... <input type="checkbox"/>
St_Dangling	\$Conduit_StrandsDa... <input type="checkbox"/>
<b>Bundled Links</b>	<b>5</b>
Catalog	Fields
Audit Trail	1

### Getting a report of bundled links

This hyperlink will open a table report of all the links bundled within the higher level link. This report includes the link names, types, ids as well as ancestry (2 levels).

From that report a user can remove individual links from the bundle by clicking on the 'unbundle' button or click on the 'show on diagram' option for any particular link and go to the starting point of that link (usually in a lower level diagram, such as a device backplane).

Bundled Links (Container: Building Conduit A) To csv

Filter Apply Clear

#	Link	Exclude from ACRA	Starting Parent 2	Starting Parent 1	Starting Node	Ending Parent 2	Ending Parent 1
1	Show on diagram	<input type="checkbox"/>	A1	SW_ZQfWTRu6B9_D	40	SW_C7NH1LFXID	1
2	Show on diagram	<input type="checkbox"/>	A1	SW_ZQfWTRu6B9_S	40	SW_C7NH1LFXID	1

### Bundled links report

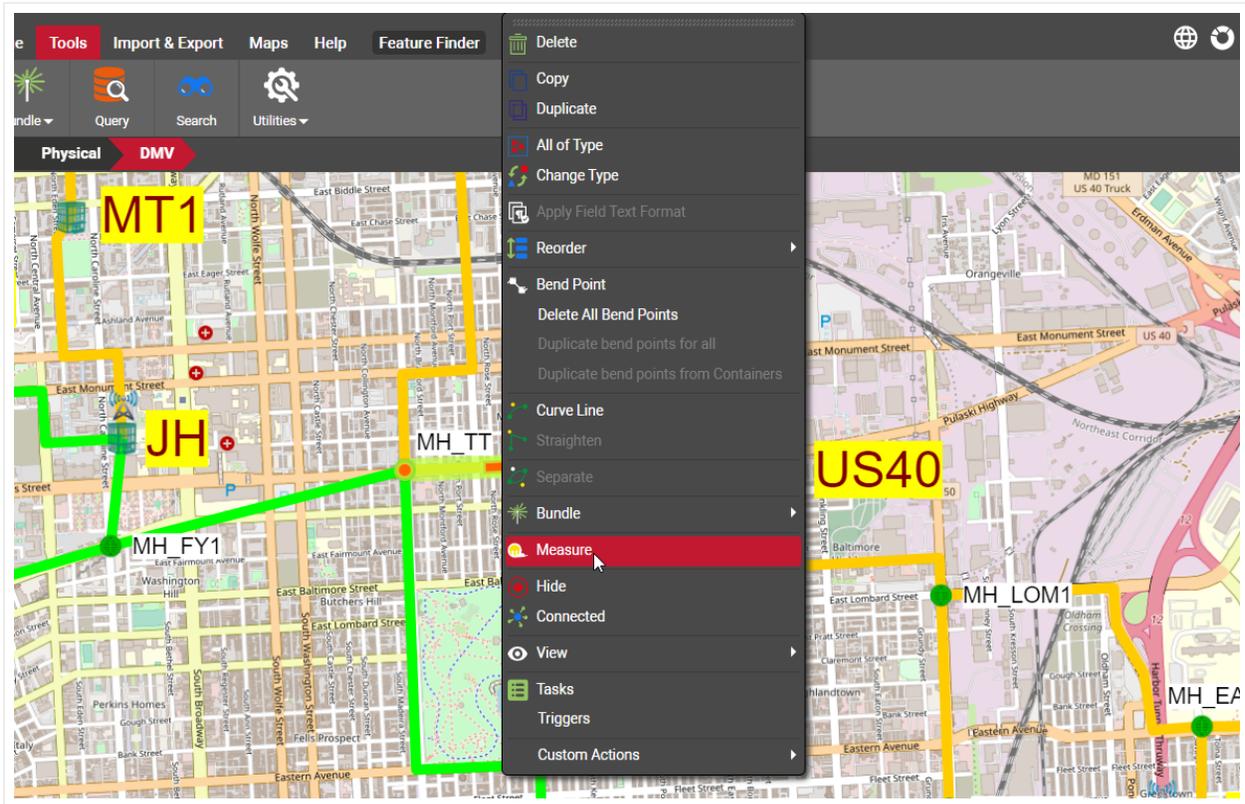
Given a link that has been bundled inside higher-level links, it is also possible to get a report of those 'parent links' by simply clicking on the link and then clicking on the 'Containers' hyperlink.

Properties	Settings
lag	<input type="checkbox"/>
Bundled_Link_Report	<input type="checkbox"/>
Length	<input type="checkbox"/>
Colors	<input type="checkbox"/>
Bandwidth	<input type="checkbox"/>
Provider	<input type="checkbox"/>
Loss [dB]	<input type="checkbox"/>
Description	<input type="checkbox"/>
Comments	<input type="checkbox"/>
Status	<input type="checkbox"/>
Fill Rate	<input type="checkbox"/>
VRfid	<input type="checkbox"/>
Vlan	<input type="checkbox"/>
Vlan2	<input type="checkbox"/>
NewField999	<input type="checkbox"/>
OTDR	<input type="checkbox"/>
Network Owner	<input type="checkbox"/>
Wavelength1	<input type="checkbox"/>
Wavelength2	<input type="checkbox"/>
Ticket#	<input type="checkbox"/>
Containers	1
Catalog	Fields
Audit Trail	4

Obtaining the container links for a lower level link

## 5.6.4 Link measurements

Diagrams with embedded coordinates can be used to measure link lengths. Simply right-click on a link to open the context menu and select the option 'Measure'. Alternatively, you can click on the 'Measure' button available in the Maps menu.



Link Measurements

## 5.7 Embedding coordinates in a diagram

This feature explains the process of embedding coordinates in static background images. For the GIS (georeferenced) maps please refer to the Outside Plant module chapter.

Backgrounds in netTerrain can contain coordinates, which can be useful in several scenarios. Some of the uses for embedded coordinates include:

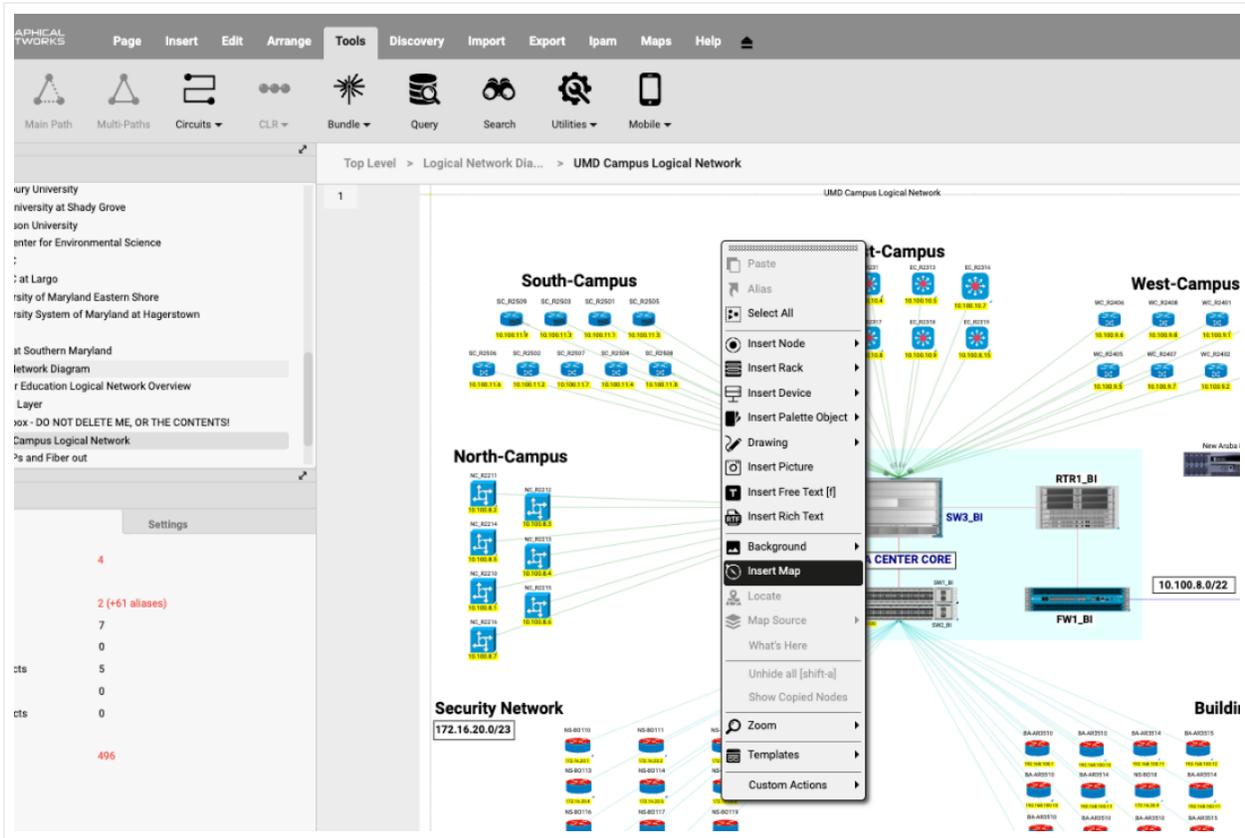
- GIS awareness of a map using latitude and longitude coordinates
- Creation of custom coordinates for measurement purposes using a variety of coordinate systems
- Automatic positioning of objects using the Integration Toolkit

Strictly speaking, the coordinates are embedded in the diagram, so a background is not even needed for this operation.

Currently, the following units are available:

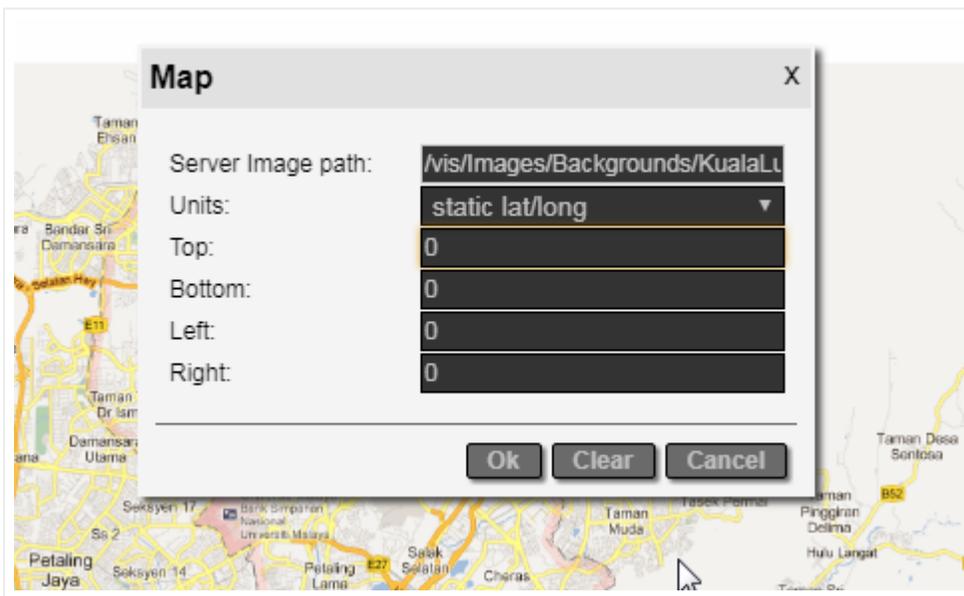
- Latitude / Longitude (static or dynamic using GIS maps)
- Millimeters
- Centimeters
- Meters
- Kilometers
- Inches
- Yards
- Miles

To embed coordinates to a diagram simply right-click on an empty area of the project diagram to open the diagram context menu and select the 'Map' option. You can also click on the 'Map' button on the Maps menu instead.



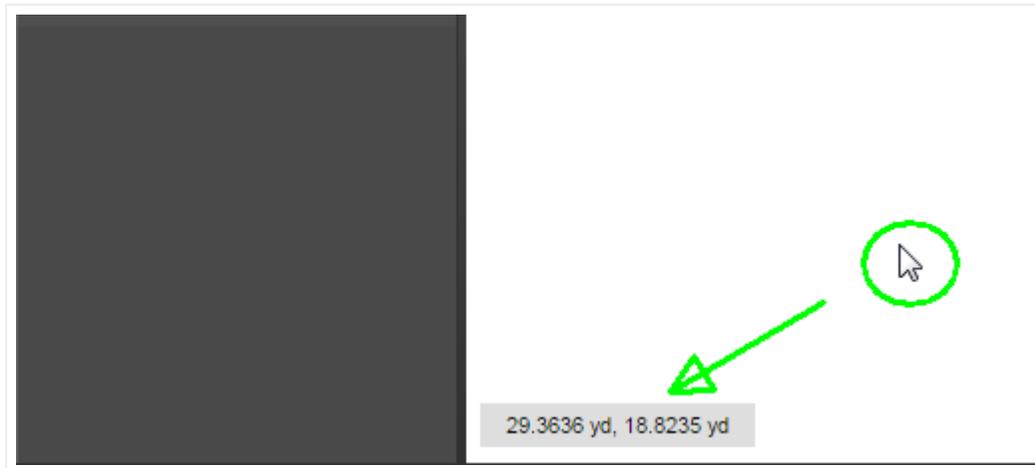
### Map Specifications

Proceed to enter the extremal values for the map chosen as the background image. For that, you may want to use some reference points of your map and compare them to the same points on some other mapping engine (like Google maps) and write down the corresponding latitude and longitude values.



### *Embedding the coordinates*

Once the coordinates have been embedded in the diagram, the user hovers the mouse over the diagram, an indicator on the bottom left corner of the diagram area will show the current position of the mouse cursor in the assigned coordinate system.



### *Diagram Coordinate indicator*

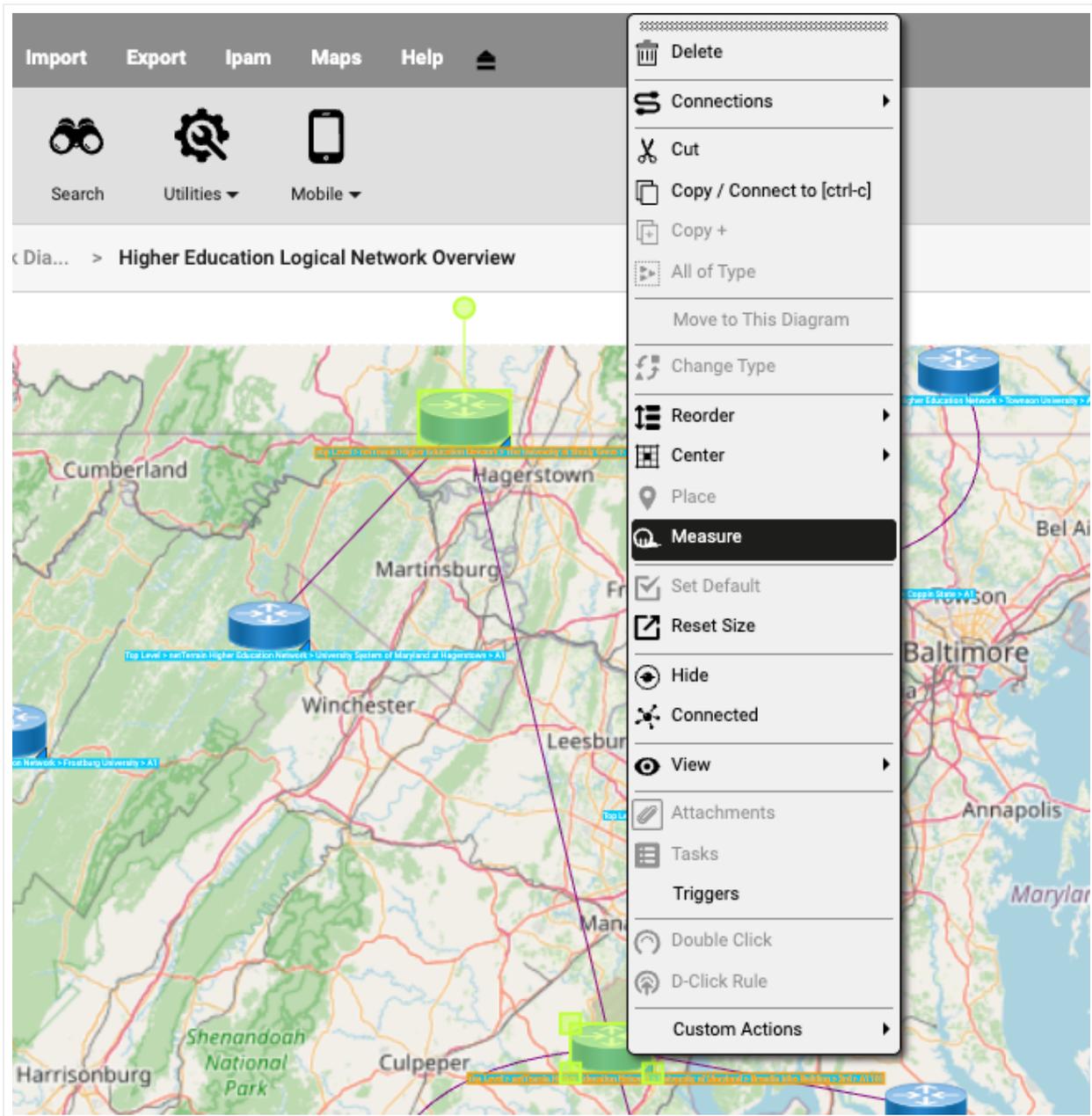
This feature of embedding coordinates is only recommended when you need very simple mapping features, and you don't have the netTerrain OSP module. For real outside plant functionality, we recommend using our OSP module, which includes support for real dynamic mapping and number of improved rendering features better suited for outside plant documentation.

## 5.7.1.1 Measurements with embedded coordinates

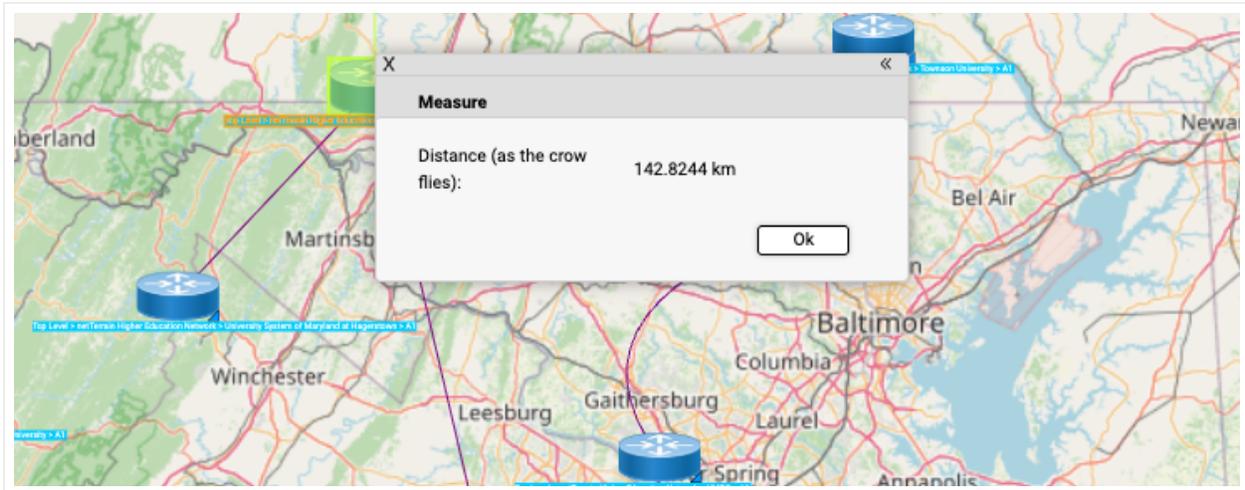
Once coordinates have been embedded on a diagram, users can measure the distance between two nodes or measure the length of a link.

To measure the distance between two nodes, do the following:

- 1) Select the two nodes.
- 2) Right-click on one of them and select the menu 'Measure' (or use the Measure button in the Maps menu).

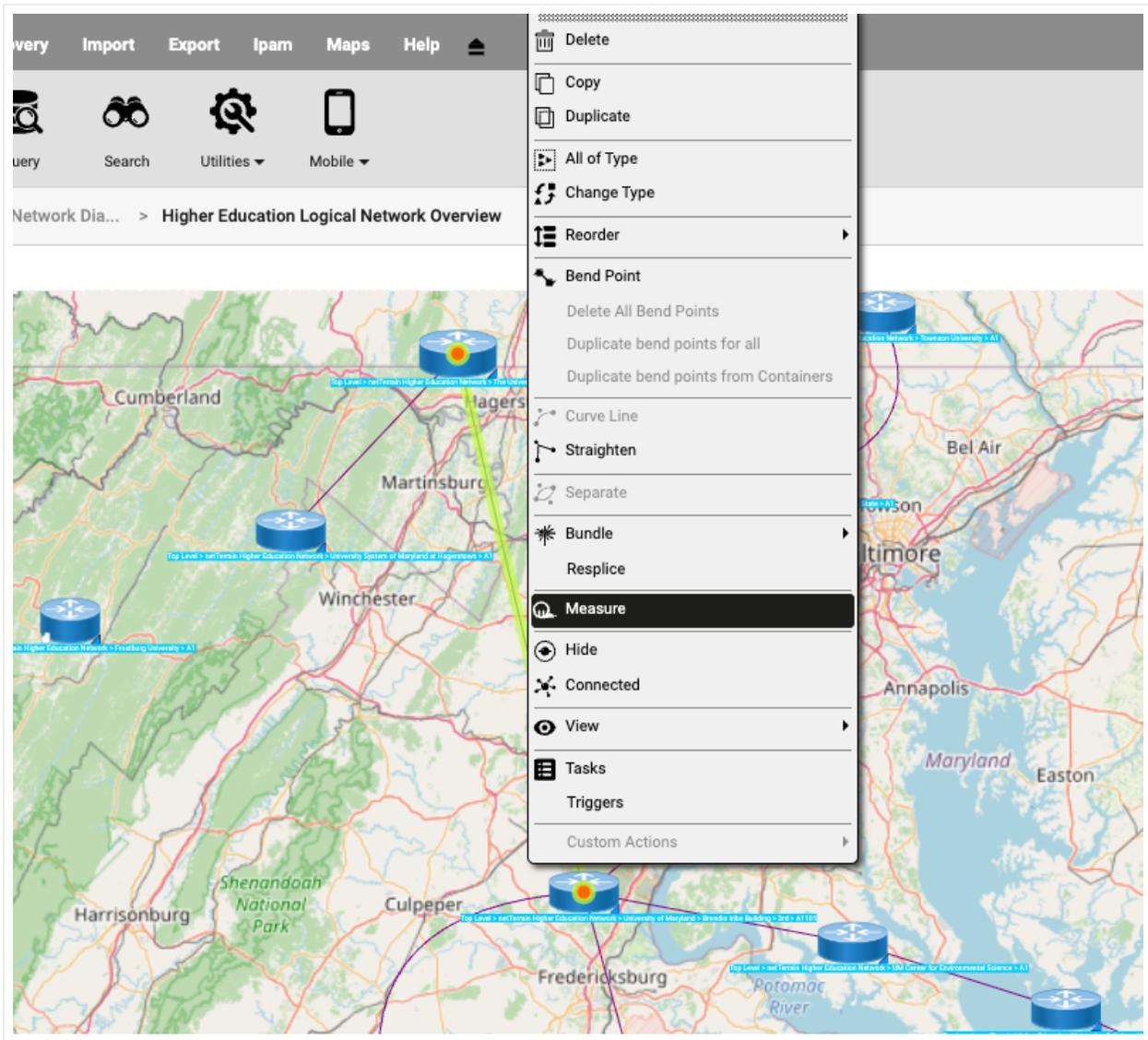


3) This will bring a pop-up dialog showing the distance (as the crow flies).

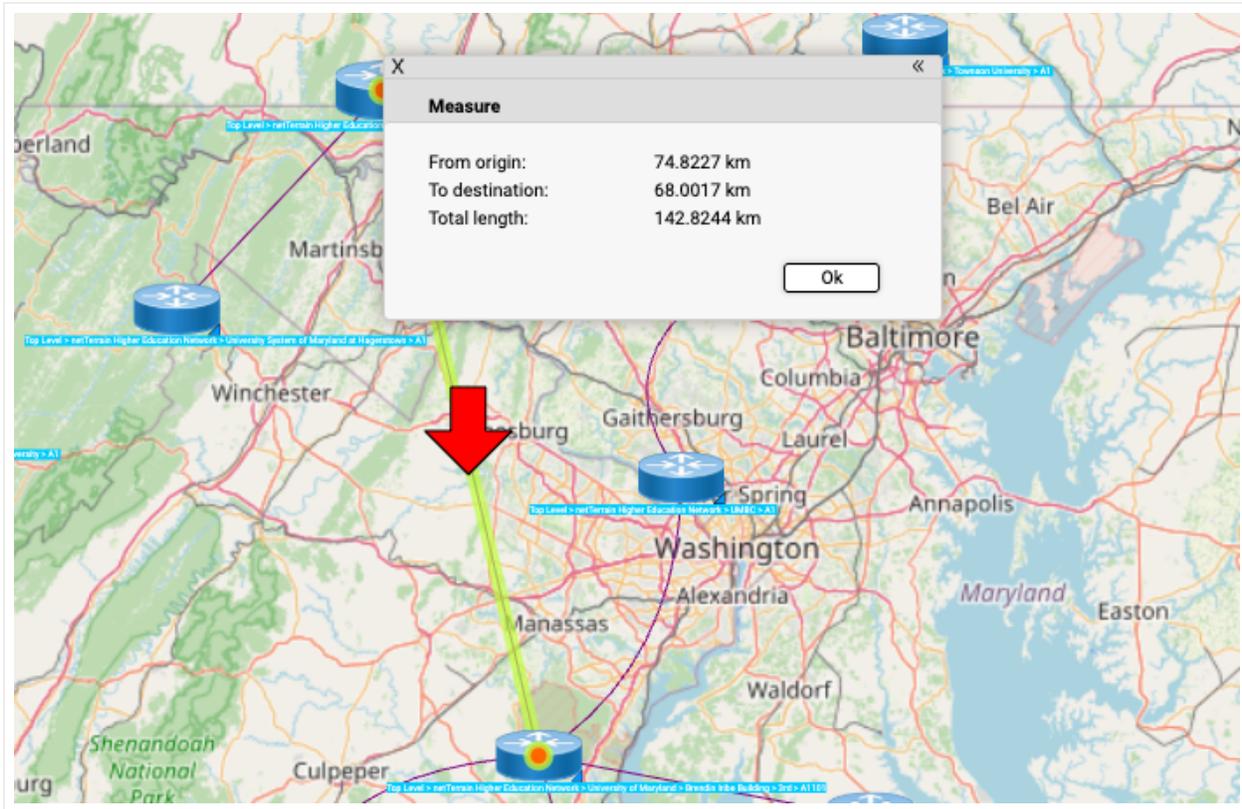


To measure the length of a link, do the following:

- 1) Right-click on one of them and select the menu 'Measure' (or use the Measure button in the Maps menu).



2) The pop-up dialog will now show the length, as well as the distance to the origin and destination.



For link measurements, the distance to the origin and destination are taken from the exact point the mouse-click happened.

Link measurements also consider the bend points! This is especially useful for outside plant purposes when measuring total lengths of (straight) links with several bend points.

#### Attention!

When measuring lengths of links with bend points, the actual position of the bend point is what matters. For straight links this provides an exact measurement, but for curved links the actual path of the link will not coincide with the measured number since the bend points in Bezier curves lie outside of the line.

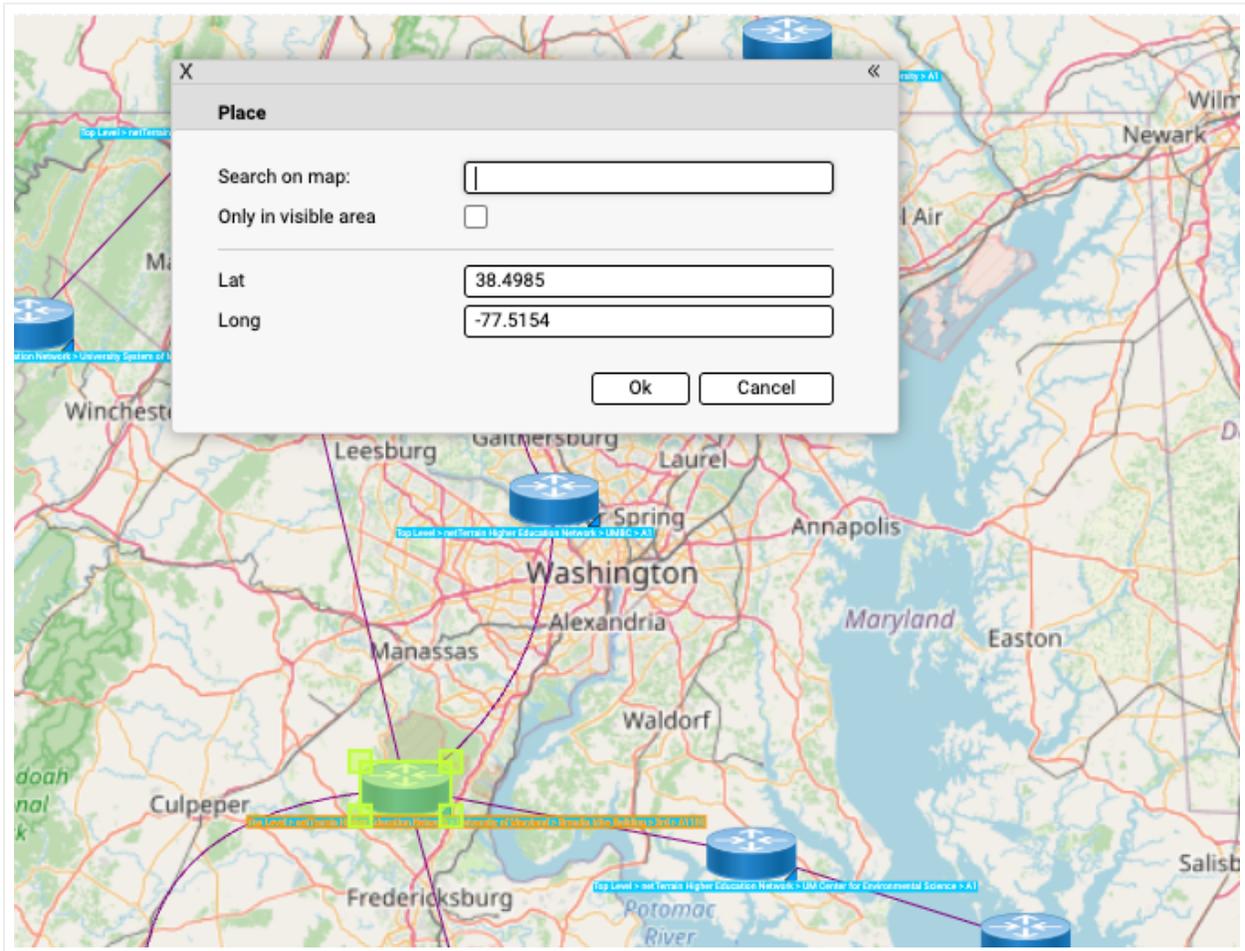
### 5.7.1.2 Using static latitude and longitude in maps

Latitude and longitude coordinates come in two flavors: static and dynamic. Static lat / long coordinates refer to coordinates set manually by the user. Dynamic coordinates make use of georeferenced maps (we devote a separate chapter for this feature). When using static latitude and longitude coordinates, netTerrain

automatically computes cities that lie within the latitude/longitude coordinate boundaries. This can be used to place nodes automatically on a specific city and to find the nearest city to a specific point.

To place a node on a city, do the following:

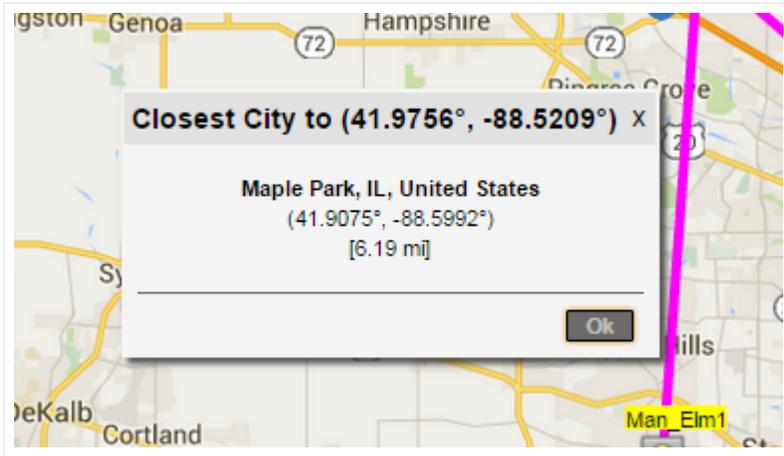
- 1) Right-click on the node and select 'Place'.
- 2) A pop-up window with a list of cities will appear. Select the desired city and the node will move to the correct latitude / longitude position.



### *Automatically placing nodes on a city*

The list of cities is pulled from a large table (in the netTerrain database), that contains over 100,000 cities worldwide.

Users can also right-click anywhere on the map and find the nearest city to the point where the click occurred by selecting the option 'What's here'. A pop-up window will appear showing the closest city to the corresponding latitude and longitude of the point that was clicked.



What's here feature

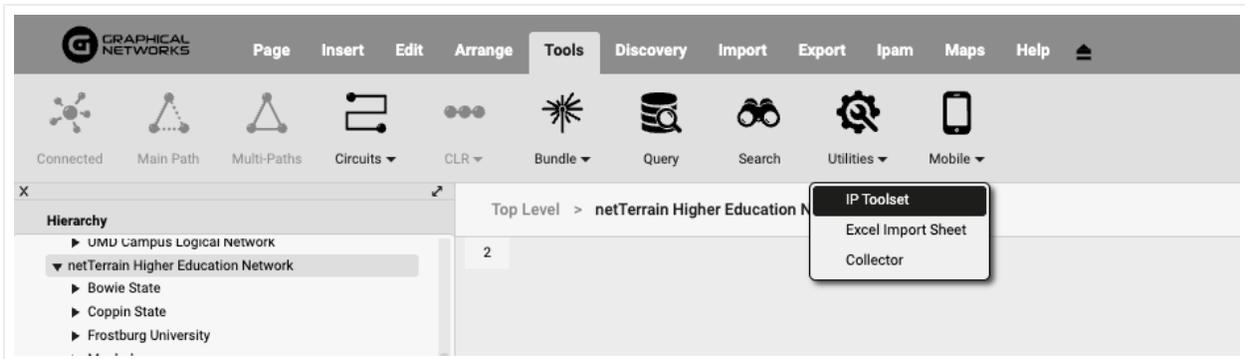
## 5.8 IP toolset

The IP toolset is a little utility that lets users run useful commands or programs, such as ping, telnet, or remote desktop, directly from the browser.

These programs work when the following conditions are met:

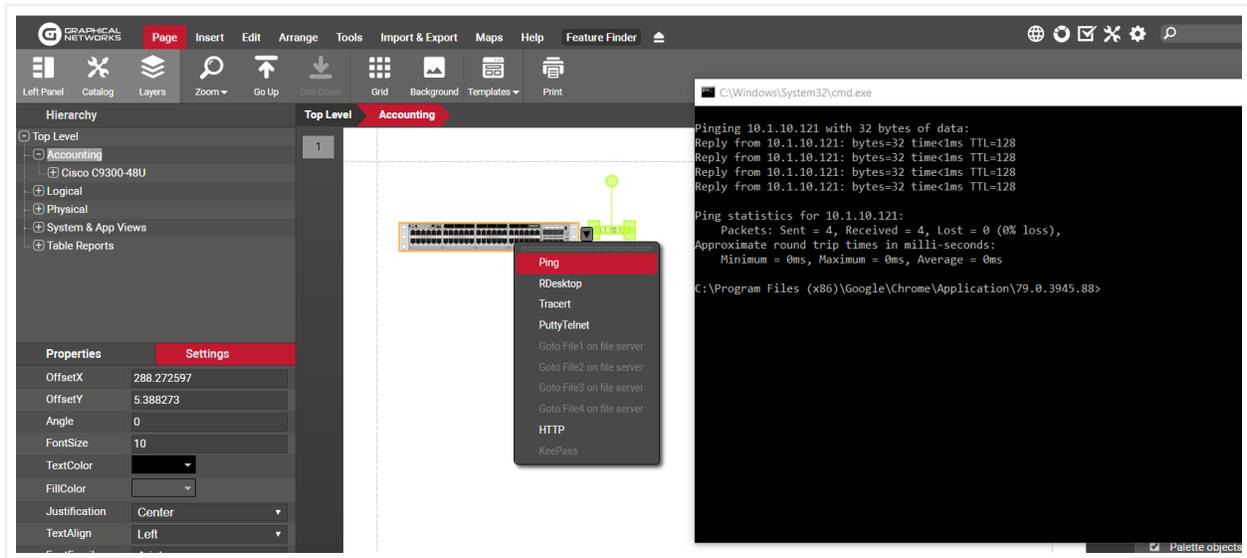
- The IP toolset has been enabled by an administrator (see admin guide).
- One or more commands or programs have been configured by the administrator (see admin guide).
- The IP toolset application has been installed on that machine.
- The programs a user wants to run exist on that user's client machine (the activation is client based because browser cannot allow the execution of client programs on their own for obvious security reasons).

Any clients that need to utilize this feature must run the IP toolset installer on their machine. To get the toolset installer, the user can download it from the Tools->Utilities menu:



Downloading the IP toolset

The IP toolset feature manifests itself as a little drop-down arrow that pops up next to a property or displayed field that is formatted as IP addresses. The image below shows the execution of the ping command directly by clicking on the drop down arrow next to the IP address.



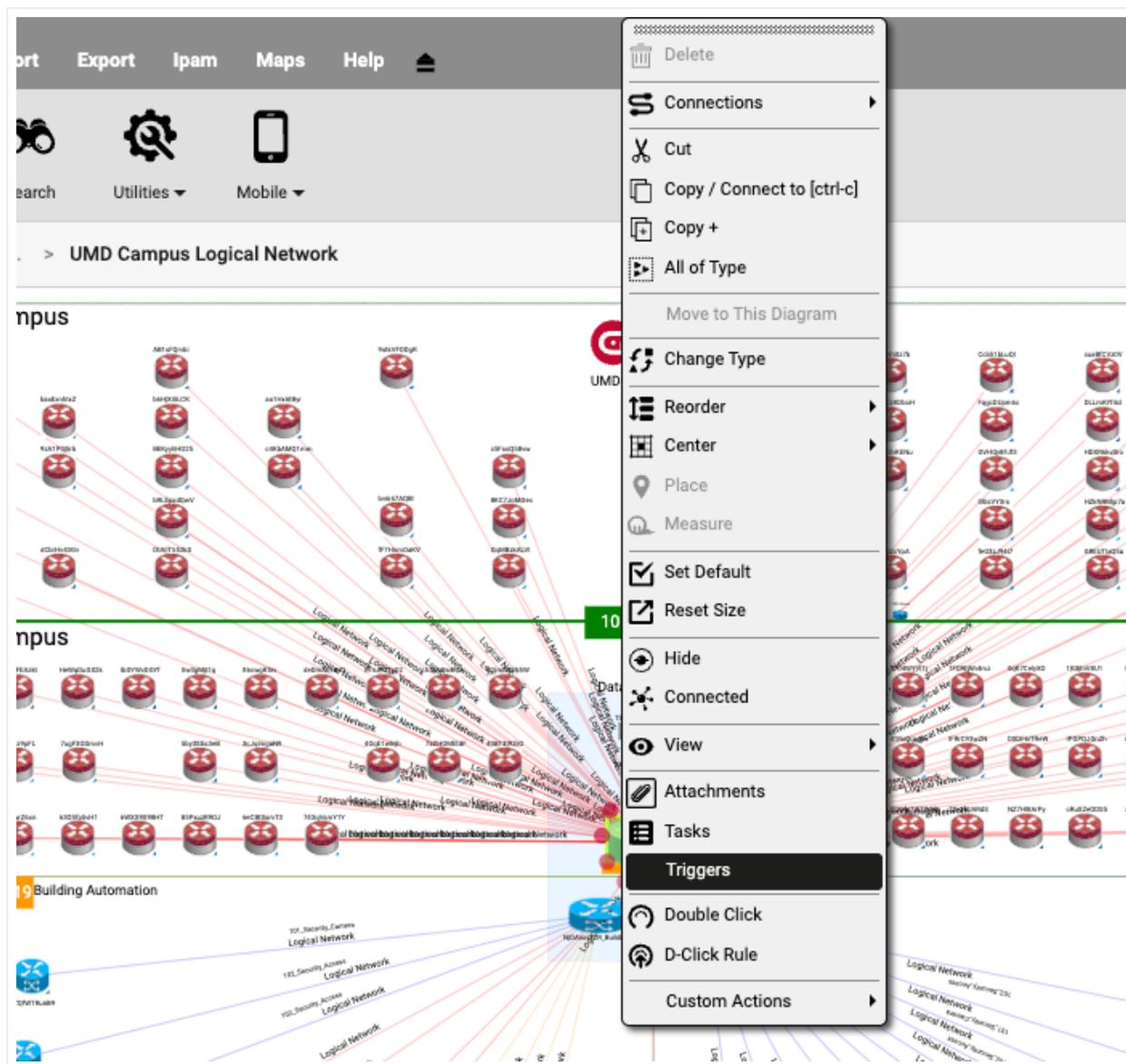
IP Toolset execution example

## 5.9 Triggers

netTerrain lets you create triggers, which are programmable actions that can be launched when an event occurs. This is done through the netTerrain SOAP API and the so-called event-handler. Currently the event-handler supports one event only, which is the on-property change event.

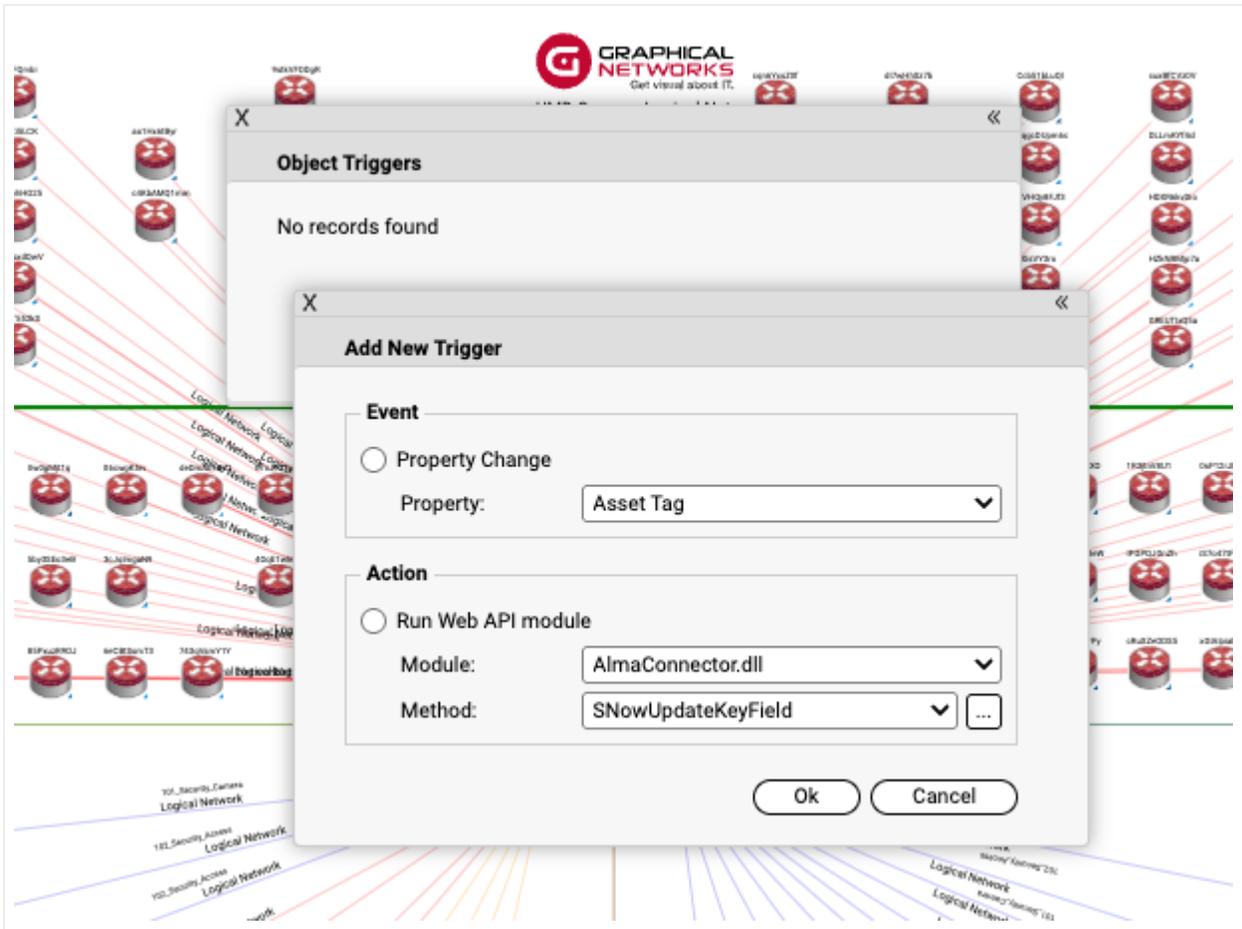
The netTerrain Programming guide explains how to create custom modules, which is outside the scope of this guide, so here we will just focus on how to use an existing custom module for a trigger.

Since triggers apply to property change events for an object like a node, link, or text, first you need to right-click on that object and click on 'triggers'.



This will open a dialog that looks a bit like the dialog used for attachments or tasks. Next do the following:

- Click on the 'Add new' button.
- Choose the object property for which the trigger needs to run.
- Pick the dll module that will be executed upon the property value changing.
- Pick the module method, essentially the function that will run upon the property changing.



Trigger dialog

It is important to understand that on-property change event triggers do not behave like a visual override. For the trigger method to run, the selected property for the object simply needs to record any change in value, not a specific value which is what visual overrides expect.

Triggers also work with links and text objects.

#### Attention!

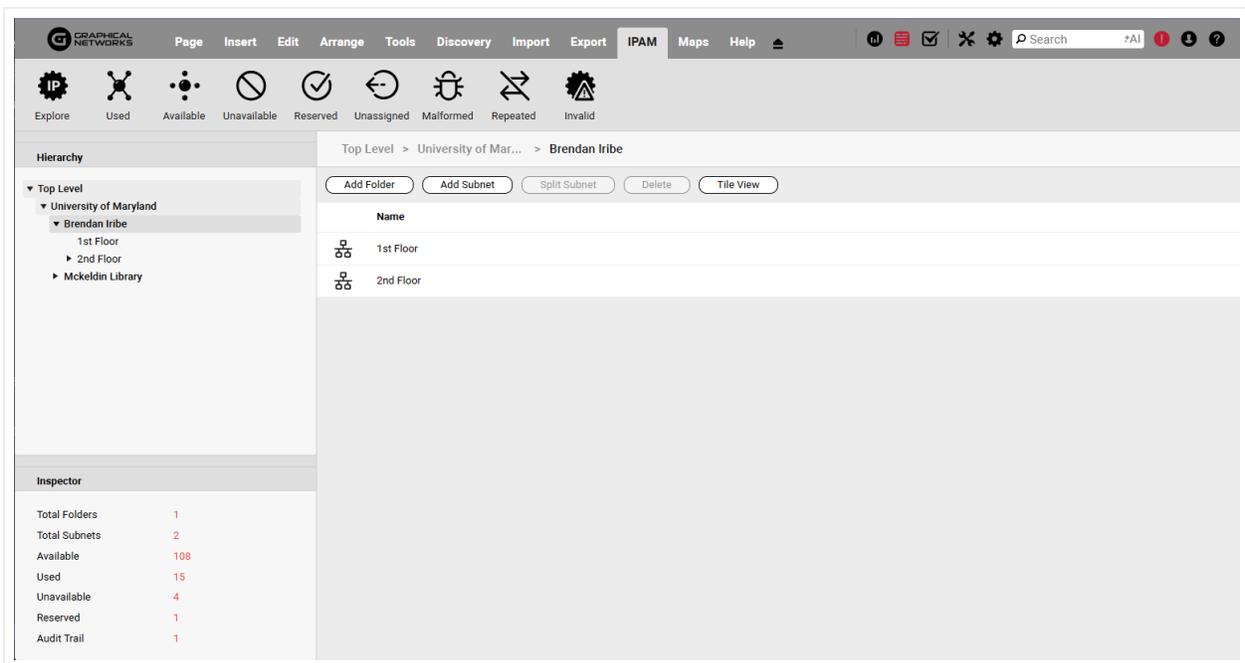
Custom modules can execute code that make changes in the database, such as object updates, inserts and deletes. As such, custom modules require an editor-level user to execute them.

## 5.10 IP Address Management (IPAM)

The IP Address Management (IPAM) module in netTerrain provides a centralized system for organizing, tracking, and analyzing IP address usage across your network. It allows administrators to define subnets, allocate and reserve addresses, detect duplicates, and identify inconsistencies across discovered or manually entered IP data.

### Attention!

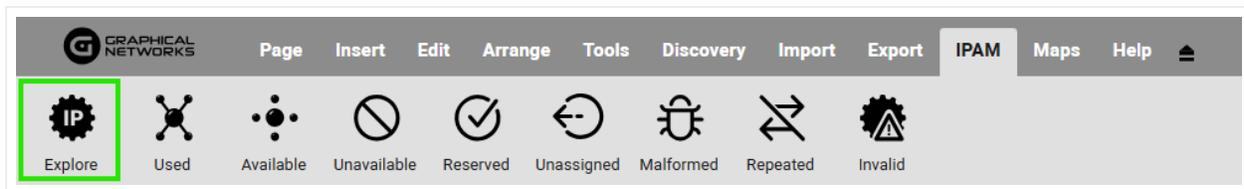
IP addresses inside the IPAM system are independent entities – they exist only within the defined IPAM subnets. Even though objects in netTerrain can have properties containing IP values, those values are not automatically linked to IPAM unless they have been explicitly associated. This ensures that IPAM remains a consistent and authoritative source for all network address management operations.



IPAM main view

### 5.10.1 Accessing IPAM

To access the IPAM module click on 'Explore' in the IPAM section of the main ribbon in netTerrain.

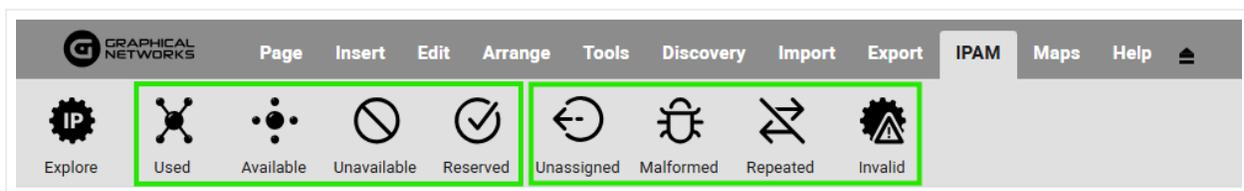


This opens the main IPAM workspace, where you can view, manage, and analyze all subnets and IP addresses.

The IPAM module includes:

- A main workspace for browsing folders, subnets, and IPs.
- Eight dedicated reports, divided into two categories:
  - Address State Reports: Used, Available, Unavailable, and Reserved.
  - Exception Reports: Unassigned, Malformed, Repeated, and Invalid.

Each report provides an organized table of IPs that match the selected condition, allowing for quick verification, filtering, and corrective actions.



*Address State Reports and Exception Reports*

## 5.10.2 Hierarchy and structure

The IPAM module is organized in a hierarchical structure that allows administrators to represent network organization logically through folders, subnets, and IP addresses. This hierarchy not only simplifies navigation but also provides control over address allocation and subnet segmentation.

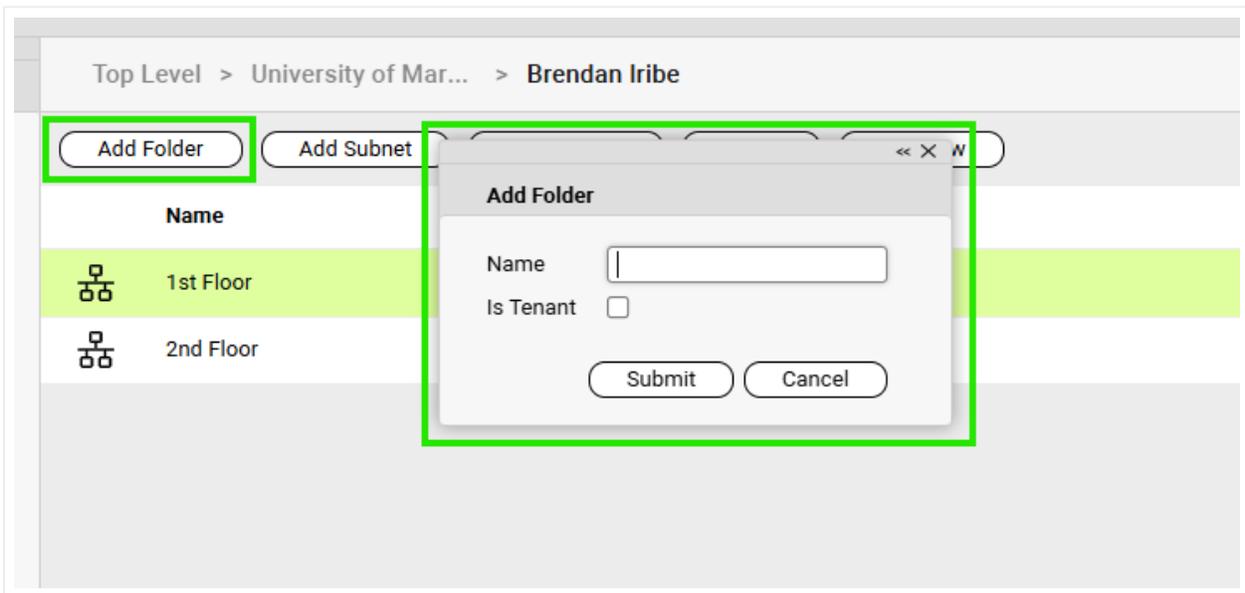
### 5.10.2.1 Folders

Folders serve as logical containers that group subnets or other folders. They are typically used to organize IP space by geographical region, department, or environment (for example University of Maryland -> Brendan Iribe -> 1st Floor).

To create a new folder, click Add Folder in the toolbar. A dialog will appear where you can specify the following fields:

- Name - The display name of the folder.
- Is Tenant - If checked, the folder is marked as a Tenant.

Tenant folders allow overlapping subnets within their own scope. Normally, IPAM prevents the creation of subnets that overlap with existing ones. However, if a folder is defined as a Tenant, overlapping subnets can exist within that tenant only, without conflict with the rest of the project.



*Creating a Tenant Folder - allows overlapping subnets within the same tenant scope.*

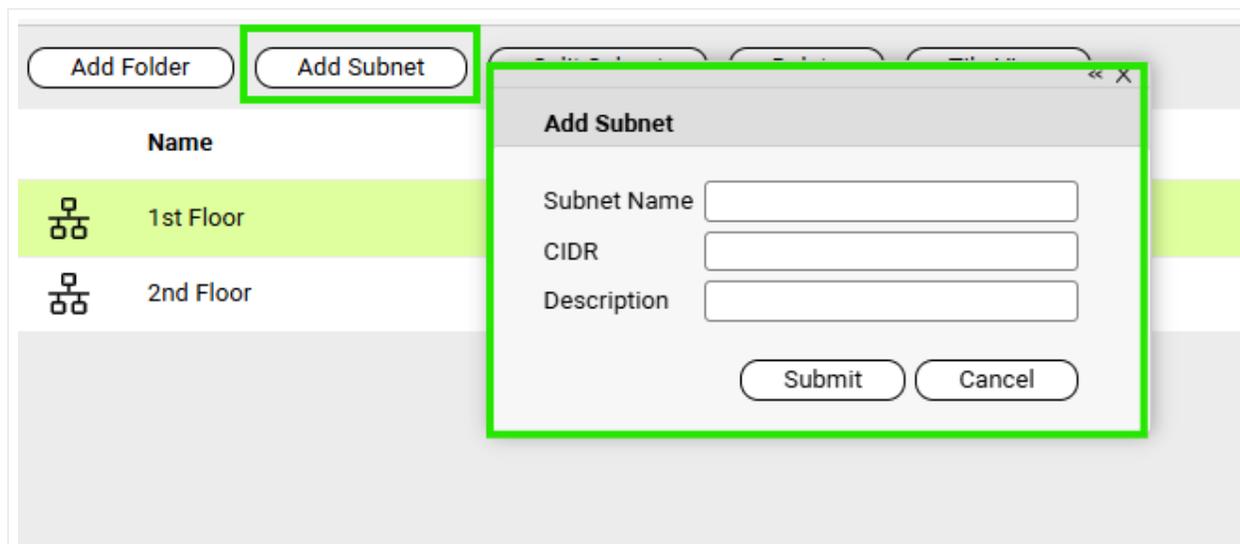
## 5.10.2.2 Subnets

Subnets are the fundamental units of the IPAM system. Each subnet defines a block of IP addresses using CIDR notation (e.g., 10.10.0.0/24) and automatically generates all addresses within that range.

To create a new subnet, click Add Subnet. In the dialog, complete the following fields:

- Subnet Name - A label for easy identification.
- CIDR - The subnet definition in Classless Inter-Domain Routing format (e.g., 192.168.1.0/24).
- Description - (Optional) a short note describing the purpose or location of the subnet.

Once submitted, IPAM automatically calculates the number of IPs for that subnet. By default, network and broadcast addresses are marked as 'Unavailable', but this behavior can be customized through advanced settings.



*Creating a subnet*

### 5.10.2.3 IP Address behavior within subnets

Each IP inside a subnet can exist in one of four main states:

- Used - Assigned to a device or property.
- Available - Free for allocation.
- Reserved - Set aside for future use.
- Unavailable - System-reserved (network and broadcast addresses by default).

IPAM automatically manages these states when addresses are created, assigned, or released. Addresses marked unavailable cannot be used unless manually reconfigured.

Top Level > University of Mar... > Brendan Iribe > 1st Floor

Tile View

IP Address	Description	Device Path	Action
192.168.100.0			
192.168.100.1	Distribution	Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > BA-AR3515	<a href="#">Go To Device</a>
192.168.100.2	Distribution	Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > SW_YHIK2i4EW6	<a href="#">Go To Device</a>
192.168.100.3	Data Stack 1	Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > SW_bBnd3TQjcy	<a href="#">Go To Device</a>
192.168.100.4	Data Stack 1	Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > SW_wmtVwFbUUh	<a href="#">Go To Device</a>
192.168.100.5	Data Stack 1	Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > SW_Gh4IhNRHm	<a href="#">Go To Device</a>
192.168.100.6	Data Stack 1	Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > SW_LEXrACaZt2	<a href="#">Go To Device</a>
192.168.100.7	Data Stack 2	Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > SW_1vbpWy7cx6	<a href="#">Go To Device</a>
192.168.100.8	Data Stack 2	Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > SW_oY8nSN76S4	<a href="#">Go To Device</a>
192.168.100.9	Security	Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > SW_yz1yDG54rd	<a href="#">Go To Device</a>
192.168.100.10	Security	Higher Ed Net > UofM > Mckeldin Library > 1st > WC > A1 > BA-AR3510	<a href="#">Go To Device</a>
192.168.100.11			
192.168.100.12		Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > SC_R2506	<a href="#">Go To Device</a>
192.168.100.13		Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > SW_MhEvcQGwGv	<a href="#">Go To Device</a>
192.168.100.14			
192.168.100.15			
192.168.100.16		Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > PDU_DKBQea4fIL	<a href="#">Go To Device</a>
192.168.100.17		Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > PDU_CtRfillszJ	<a href="#">Go To Device</a>

Subnet view of IP addresses

### 5.10.2.3.1 Table view

In the Table view we can see the following columns:

1. IP Address: Lists each address contained in the selected subnet. Each IP is displayed with a color-coded indicator representing its status:
  - Red: Unavailable (e.g., network or broadcast address)
  - Green: Available
  - Blue: Used (assigned to a device or port)
  - Yellow: Reserved
2. Description: provides additional information or labels assigned to the IP address, such as device role or network function (e.g., "Distribution," "Security," "Data Stack 1").
3. Device Path: shows the full hierarchical path of the device or port associated with that IP address, following the netTerrain hierarchy (e.g., *Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > BA-AR3515*). This helps identify exactly where that address is being used in the system.
4. Action: contains a link labeled "Go To Device", which navigates directly to the diagram or object representing the device associated with that IP. This provides a quick way to locate and verify device-level details from within IPAM.

### 5.10.2.3.2 Tile view

Tile View is especially useful when working with large subnets that contain a high number of IP addresses, allowing you to visually analyze the state of all IPs at a glance.

The screenshot shows the netTerrain interface for a specific subnet. On the left, the 'Hierarchy' sidebar shows a tree structure: Top Level > University of Maryland > Brendan Iribe > 1st Floor. Below it, the 'Inspector' panel displays details for the selected IP address: Id (62000000000024), IP Address (192.168.100.3), Description (Data Stack 1), Device Path (Higher Ed Net > UofM > ...), Status (Used), and Audit Trail (2). The main area is titled 'Top Level > University of Mar... > Brendan Iribe > 1st Floor' and contains a 'Table View' button. Below the button is a grid of 64 numbered tiles (0-63) representing IP addresses. The tiles are color-coded: 0 and 63 are red, 3 is green, 11 is yellow, and all other tiles (1-2, 4-10, 12-17, 18-62) are blue.

#### Tile view

Each rectangle on the screen represents a single IP address within the selected subnet. The color of each tile indicates the status of that IP address. This visual layout enables quick identification of address utilization patterns and simplifies spotting gaps in IP allocation.

When you click on a specific tile (IP address), its details appear (and can be edited from) in the Inspector panel. The Inspector displays:

- Id - Unique identifier of the IP object in the system.
- IP Address - The full address represented by the selected tile.
- Description - Optional label or note associated with the address.
- Device Path - The hierarchical path of the device or port linked to that IP.
- Status - The current state of the address (Used, Available, Reserved, or Unavailable).
- Audit Trail - A history record showing the number of tracked changes or assignments related to this IP.

### 5.10.2.4 Inspector panel

The Inspector panel, located on the lower left of the interface, provides real-time summary statistics of the selected IPAM level (top-level, folder, or subnet). It displays the following information:

- Total Folders
- Total Subnets
- Available IPs
- Used IPs
- Unavailable IPs
- Reserved Ips

Additionally, it includes quick-access links to exception reports:

- Unassigned IPs
- Malformed IPs
- Repeated IPs
- Invalid Ips

Clicking any of these links opens the corresponding report.

Inspector	
Total Folders	4
Total Subnets	2
Available	108
Used	15
Unavailable	4
Reserved	1
Unassigned IP	<a href="#">Link</a>
Malformed IP	<a href="#">Link</a>
Repeated IP	<a href="#">Link</a>
Invalid IP	<a href="#">Link</a>
Audit Trail	

*Inspector*

### 5.10.3 Reports

The IPAM module provides two main categories of reports:

- Status Reports, which summarize IPs based on their current assignment state.
- Exception Reports, which identify inconsistencies or anomalies between IPAM and the network model.

Each report presents IPs in a tabular format with standard columns and interactive tools for management.

### 5.10.3.1 Status reports

These reports display IP addresses according to their state within a subnet. All of them share a similar table layout, differing only by the filter applied to the Status field. Common Columns:

- Links - The  icon redirects to the IP inside IPAM. The  icon opens the device or object associated with that IP in the main project view.
- IP Address - The full address of the entry.
- Status - The address state (Used, Free, Reserved, or Unavailable).
- Description - Optional note describing the IP's purpose or assigned role.
- Device Path - The full hierarchical location of the linked object in the project.
- Subnet Name - The subnet this address belongs to.

#### 5.10.3.1.1 Used

Displays all IPs currently assigned to devices, ports, or interfaces in the project. Used IPs typically include the Device Path column populated, linking back to the connected element.

#### 5.10.3.1.2 Available

Lists all IPs that are free within their subnet - available for assignment or reservation. These IPs have no active associations and are safe to allocate.

#### 5.10.3.1.3 Unavailable

Shows addresses that are system-reserved, typically the network and broadcast addresses in each subnet. Unavailable IPs cannot be manually assigned unless their state is changed.

#### 5.10.3.1.4 Reserved

Displays IPs marked as Reserved for specific use cases or future allocation. They are intentionally excluded from automatic assignments.

Since all Status Reports share the same structure, a single screenshot (e.g., the "Used" report) can serve as a visual example in this section.

Ip Addresses [Used] [To csv](#) [To Excel](#)

Filter [Apply](#) [Clear](#)

#	Links	IP Address ▲	Status	Description	Device Path	Subnet Name
1		192.168.100.1	Used	Distribution	Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > BA-AR3515	1st Floor
2		192.168.100.10	Used	Security	Higher Ed Net > UofM > Mckeldin Library > 1st > WC > A1 > BA-AR3510	1st Floor
3		192.168.100.12	Used		Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > SC-R2506	1st Floor
4		192.168.100.13	Used		Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > SW_MhEvcQGwGv	1st Floor
5		192.168.100.16	Used		Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > PDU_DKBQea4fIL	1st Floor
6		192.168.100.17	Used		Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > PDU_CtrfillSzJ	1st Floor
7		192.168.100.2	Used	Distribution	Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > SW_YHiK2i4EW6	1st Floor
8		192.168.100.3	Used	Data Stack 1	Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > SW_bBnd3TQjcy	1st Floor
9		192.168.100.4	Used	Data Stack 1	Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > SW_wmtVvfBrUh	1st Floor
10		192.168.100.5	Used	Data Stack 1	Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > SW_Gh4lhNRHrm	1st Floor
11		192.168.100.6	Used	Data Stack 1	Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > SW_LEXrACaZt2	1st Floor
12		192.168.100.62	Used		Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > PP_chuBUjAwuy	1st Floor
13		192.168.100.7	Used	Data Stack 2	Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > SW_1vbpWy7cx6	1st Floor
14		192.168.100.8	Used	Data Stack 2	Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > SW_oY8nSN76S4	1st Floor
15		192.168.100.9	Used	Security	Higher Ed Net > UofM > Brendan Iribe > 1st > WC > A1 > SW_yz1yDG54rd	1st Floor

1 out of 1 < > 1 Go

*Used addresses report*

### 5.10.3.2 Exception reports

Exception reports highlight discrepancies between IPs stored in IPAM and IP values present in properties across the netTerrain project. Each table includes a Clear action, which acts as an acknowledgment of the exception. When an exception is cleared, it is hidden from the active list but remains accessible through the Active Exceptions filter, where it can be restored (Unclear) if needed. Common Columns:

- Links - 'Show on diagram' opens the location of the object in the project.
- IP Address - The address involved in the exception.
- Property Name - The name of the property where the IP is found.
- Object Name - The name of the object containing the property.
- Object Type - The type of element (e.g., Device, Connector).
- Parent Name - The parent element in the hierarchy.
- Action - Specific operations such as Assign (for Unassigned) or Clear (to acknowledge the exception).
- Cleared - Acknowledge the exception.

### 5.10.3.2.1 Unassigned

Lists IPs that exist within a property in the project but are not currently linked to IPAM. This often happens when new data is imported from a connector. From this report, you can assign the IP directly to IPAM, creating the proper association.

### 5.10.3.2.2 Malformed

Shows IPs found in object properties that do not conform to valid IP syntax (e.g., wrong format, letters in octets, or exceeding values). These entries help identify and correct typing errors or invalid values.

### 5.10.3.2.3 Repeated

Displays IPs that appear multiple times across different devices or properties, causing duplicates. The Show on diagram link helps locate each instance visually, so conflicts can be resolved efficiently.

### 5.10.3.2.4 Invalid

Lists IPs that exist in IPAM but are marked as 'Unavailable' (for example, a broadcast or network address) yet are still being referenced by a device property. These indicate improper assignments that should be corrected or cleared. Exception reports can be exported using the 'To CSV' or 'To Excel' buttons for offline review or audit documentation.

Unassigned    Active Exceptions    To csv    To Excel

Filter \_\_\_\_\_    Apply    Clear

#	Links	IP Address ▲	Property Name	Object Name	Object Type	Parent Name	Action	Cleared
1	<a href="#">Show on diagram</a>	192.168.100.11	IP_Address	SW_D9h4zYpF4e	Cisco C9300-48U	A1	<a href="#">Assign</a>	<a href="#">Clear</a>
2	<a href="#">Show on diagram</a>	192.168.100.11	IP_Address	BA-AR3514	Cisco C9500-40X	A1	<a href="#">Assign</a>	<a href="#">Clear</a>

1 out of 1    <    >    1    Go

*Unassigned report*

## 5.10.4 Exception handling and maintenance workflow

The exception reports in IPAM are designed not only to detect inconsistencies between the IPAM database and network object properties, but also to provide tools for managing and resolving them efficiently.

This section describes the workflow to review, acknowledge, and reprocess exceptions.

### 5.10.4.1 Reviewing exceptions

When new data is imported (for example, from an external connector or network discovery), IPAM automatically validates all IP values found across the system. Any inconsistency generates an entry in one of the exception reports (Unassigned, Malformed, Repeated, or Invalid).

Administrators can access these reports to review detected anomalies, using the active exceptions view to focus only on unresolved issues. Each entry includes:

- The exact IP Address involved
- The object and property where it was found
- The type of exception
- A direct link to show on diagram for visual verification

### 5.10.4.2 Acknowledging (clearing) exceptions

When an exception is identified but intentionally accepted (for example, a duplicate IP that is known and tolerated), it can be cleared using the 'Clear' action. Clearing an exception works like an acknowledgment: you confirm awareness of the issue, and IPAM hides it from the default list to keep the reports focused on unresolved items.

Cleared exceptions are not deleted - they remain stored for audit and can be restored later. You can use the clear option when the inconsistency is valid in your environment but does not require correction (for example, virtual IPs shared between clustered devices).

### 5.10.4.3 Viewing cleared exceptions

Cleared exceptions can be displayed again at any time by enabling the Active Exceptions toggle and switching to the Cleared view. From here, the 'Unclear' action can be applied to restore the item back to the active list if further review is needed. This mechanism provides full visibility and traceability of every identified and acknowledged exception.

#### 5.10.4.4 Correcting exceptions

In cases where the problem must be fixed (for example, malformed or invalid IPs), you can:

- Edit the IP value directly in the corresponding device property within the project.
- Re-assign the IP from the unassigned report, linking it correctly to its subnet in IPAM.
- Re-run synchronization or import to automatically refresh validation results.

After corrections, reloading the exception report will remove or update the affected entries automatically.

#### 5.10.4.5 Exporting for review or audit

All exception reports can be exported through 'To CSV' or 'To Excel' buttons. This allows network administrators to maintain audit records, share exception lists with other teams, or perform batch review processes outside the application.

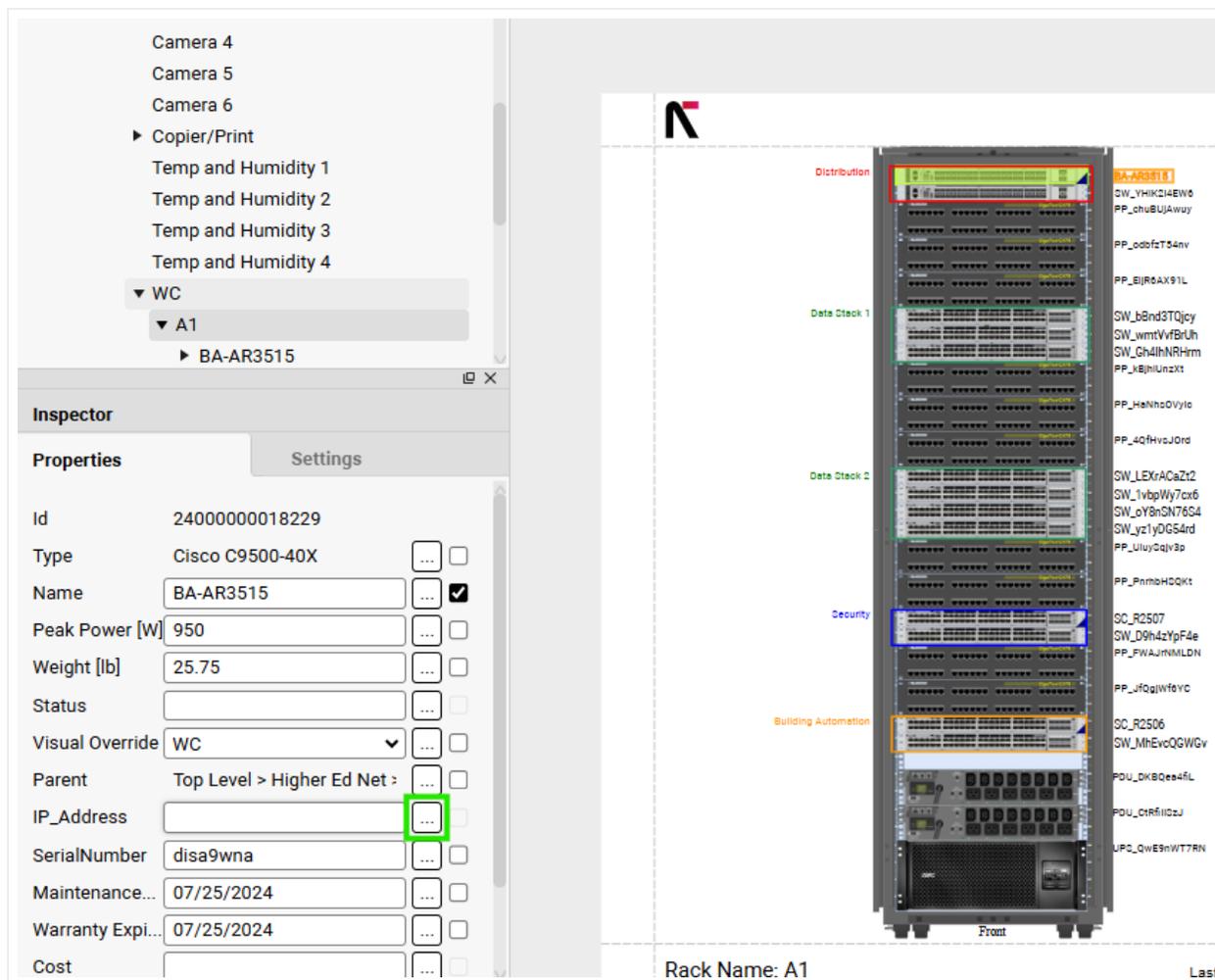
### 5.10.5 IP address assignation

IP addresses in IPAM can be assigned from a netTerrain object that exists in a diagram or from the IPAM console itself.

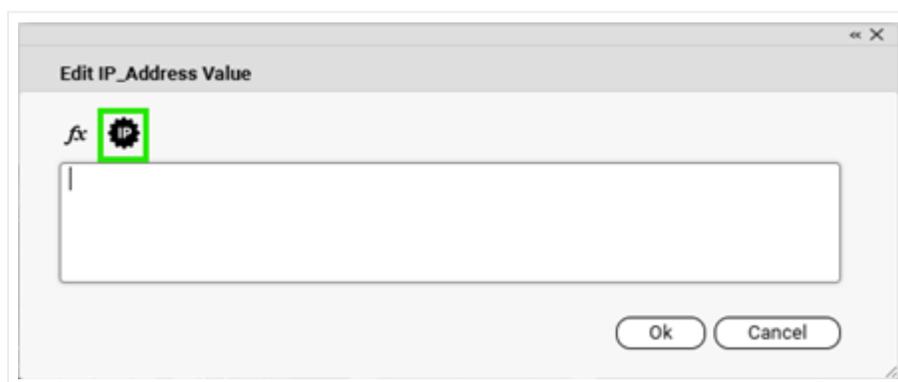
#### 5.10.5.1 From netTerrain

NetTerrain allows IP assignment from any device or node. This provides a seamless way to link a property value to the centralized IPAM database without leaving the main diagram interface. To assign an IP address in IPAM from netTerrain do the following:

1. Open the property editor: from the inspector panel, select the device or port whose IP address you want to assign. Each object property includes a small ellipsis button (...) that opens the value editor.



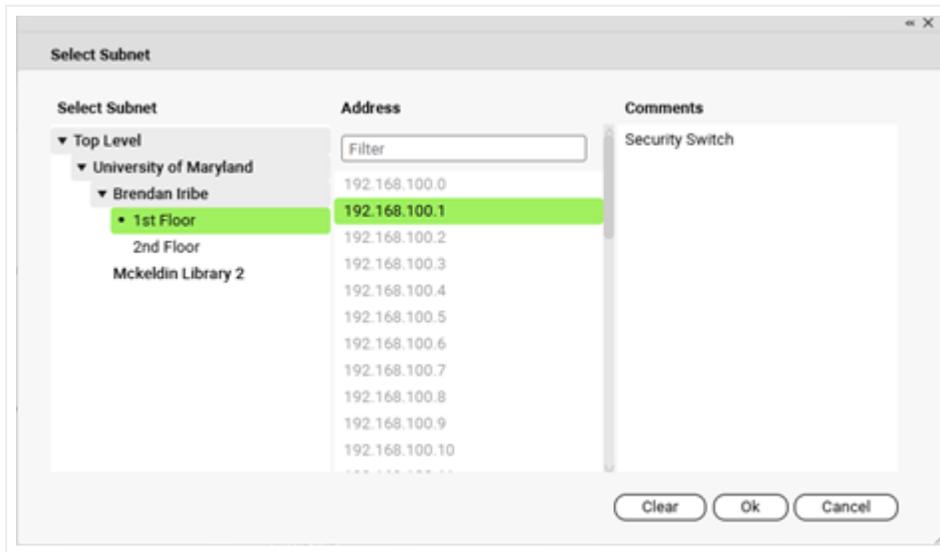
2. Launch the IPAM selector: inside the property editor, you will find an IPAM icon next to the fx icon. Clicking on this icon opens the 'Select Subnet' dialog.



3. Select a subnet and IP address: the select subnet dialog is divided into three columns:

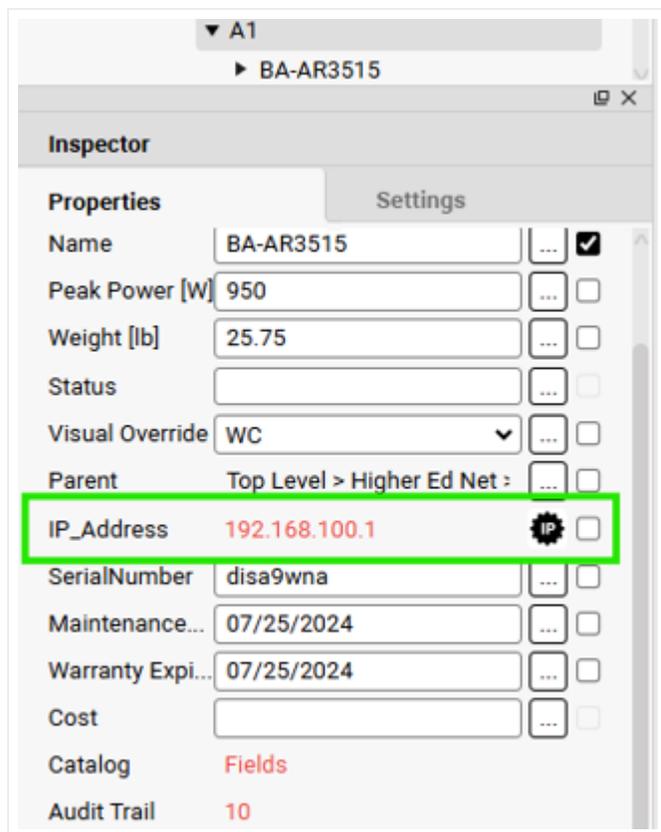
- Left Panel - subnet hierarchy: displays all folders and subnets defined in IPAM. You can navigate the hierarchy to locate the subnet from which you wish to assign an IP.

- Center Panel - address list: shows all IP addresses within the selected subnet.
- Available IPs appear active and selectable.
- Used or reserved addresses appear grayed out and cannot be selected. You can filter the list by typing in the search bar above the column.
- Right Panel - comments: allows adding an optional comment or description for the selected address.
- Once an available IP is selected, click OK to assign it.



#### 5.10.5.1.1 Property update and IP link

After confirming the assignment, the property value is automatically updated with the selected IP address. The field becomes a clickable link that directs to the IP entry inside IPAM. The previous (...) button is replaced by the IPAM icon, indicating that this value is now managed through IPAM.



#### 5.10.5.1.2 Clearing an assigned IP

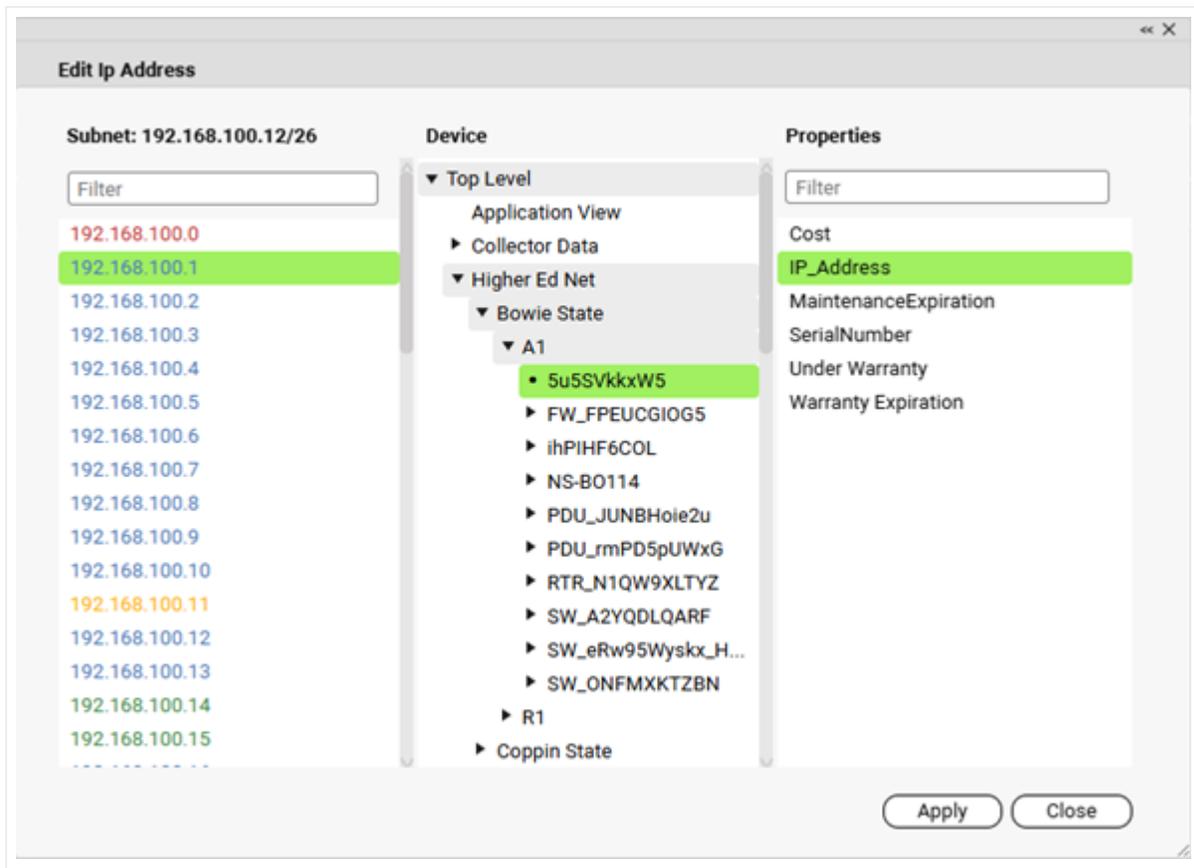
If the assigned IP needs to be removed, open the same dialog again using the IPAM icon and select 'Clear'. This action unlinks the IP from the property, returning it to the 'Available' state in IPAM.

### 5.10.5.2 From IPAM

IP addresses can be assigned directly from within the IPAM interface to any device or port in the project. This process creates a link between the IP entry stored in IPAM and a property field of the selected network element in netTerrain.

#### 5.10.5.2.1 The edit IP address dialog

When you double-click on an IP address from a subnet view, the 'Edit IP Address' dialog opens. This interface is divided into three panels, each serving a specific purpose for the assignment process.



The left panel displays all IP addresses contained within the currently selected subnet. The IP that was double-clicked appears highlighted, but you can select any other IP in the same list to perform multiple assignments without reopening the dialog. Each address is color-coded according to its status for quick identification of address states while assigning.

The middle panel shows the entire project hierarchy, including all diagrams, devices, and ports. You can expand folders and nodes to locate the exact object or port that should receive the selected IP. An IP can be assigned either to:

- a device, or
- a specific port of that device.

This flexibility allows detailed mapping of IP addresses across physical and logical network elements.

Once a node or port is selected in the middle panel, the properties panel on the right displays all available properties for that object. You must select the property (for example, IP\_Address, ManagementIP, etc.) where the IP will be stored.

This ensures that the IPAM entry is properly associated with the correct property within the object.

### 5.10.5.2.2 Applying the assignment

After selecting the target IP address, device or port, and property, click 'Apply' to complete the assignment. The IP will immediately appear as used in IPAM and will be linked to the corresponding object in the project. If multiple IPs need to be assigned, you can continue selecting new addresses from the left panel without closing the dialog.

## 5.11 Viewing device and port performance data

With the advent of time series and monitoring capabilities within netTerrain, users can now see performance data for devices and ports over time using embedded time-series reports for those objects that are being monitored.

The process of monitoring a device or a port is set up in the polling configuration explained in the Power User Guide. End users can view monitored data over time for devices that are part of the monitored set of objects.

### 5.11.1 Viewing time-series data for devices

Devices that are part of the monitored set of objects collect data for custom properties, visible as time-series reports through the device inspector. To open a time-series report for a specific property, locate the report icon:

**Inspector**

**Properties** **Settings**

Id	24000000001163	
Type	ServersCheck SensorG	<input type="checkbox"/>
Name	Modbus_Sens_Gtwy	<input checked="" type="checkbox"/>
Peak Power...	0	<input type="checkbox"/>
Weight [lb]	0	<input type="checkbox"/>
Status	Online	<input type="checkbox"/>
Int. Temp1	75.78	<input checked="" type="checkbox"/>
Ext. Temp1	0.00	<input type="checkbox"/>
Dew Point	-	<input type="checkbox"/>
IP	172.16.10.204	<input type="checkbox"/>
IPRange	172.16.10.204	<input type="checkbox"/>
SysObjectId	1.3.6.1.4.1.17095	<input type="checkbox"/>

Report icon for time-series reports

When you click on the report icon, a modal time-series report pops up:

The screenshot shows the netTerrain 10.1 interface. On the left, the 'Inspector' panel is visible, showing the properties of the 'Modbus\_Sens\_Gtwy' device. The 'Int. Temp1' property is highlighted with a green box, and its report icon (a small bar chart) is also highlighted. A modal window titled 'Modbus\_Sens\_Gtwy(ServersCheck SensorGateway) - Time Series' is open in the center, displaying a line graph of the internal temperature (Int. Temp1 (AVG)) in degrees Fahrenheit from October 21st to October 27th. The graph shows a fluctuating temperature around 75°F. The background shows a network diagram with a green box highlighting the sensor gateway device.

### *Time-series report*

These reports display polled data (typically at 30 second polling intervals) for any device MIB and show values for the following time spans:

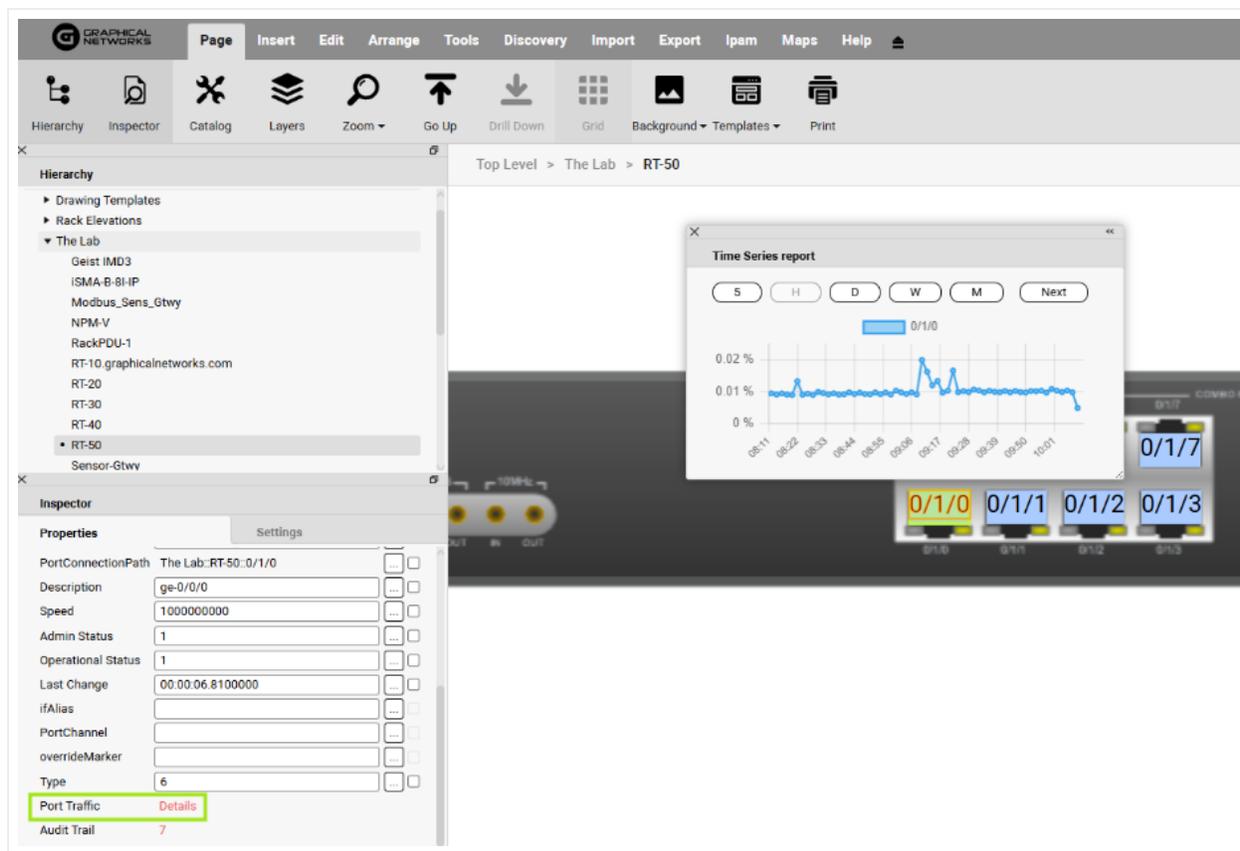
- 5 minutes
- 1 hour
- 1 day
- 1 week
- 1 month

Users can switch from one span to another by clicking on the time span buttons and can also advance to the next property report by clicking on the 'Next' button.

## **5.11.2 Viewing port traffic**

A special type of time-series report consists of bandwidth data that can be collected for ports. To set up bandwidth polling check out the Power User Guide.

To open a time-series report for port traffic drill down to the port that needs to be viewed and locate the 'Details' link for the 'Port Traffic' property (usually at the very end). This will open the port traffic time-series report, which behaves just like any device report.



Port bandwidth usage visualization

## 6 DCIM Objects

In previous chapters we learned how to work with nodes and links in netTerrain. A node is a very unassuming yet flexible object in netTerrain: it can represent anything from a building to transportation equipment, a data center object, location or even a chair or person. Nodes can, of course, relate to each other or to a smart object. Yet nodes are rather modest compared to their cousins, the DCIM objects (or “smart” as we sometimes like to call them). Nodes, as opposed to smart objects are not aware of subcomponents they may contain, their physical dimensions, let alone more sophisticated properties like weight or power usage.

This guide will show the process of adding one device or rack at a time. If you have a very large list of devices and racks that need to be added (100+), you may want to consider using the Integration Toolkit (ITK) to automate and speed up the data entry process.

## 6.1 Regular nodes vs. 'Smart objects'

If you are a user of netTerrain DCIM you probably want to use smart objects in case you need to document entities like routers, switches, cards, or cabinets, so that you can take advantage of some of the business rules and automation that netTerrain offers. These business rules and features include:

For devices and cards:

- An extensive predefined library of makes and models.
- Automatic creation of subcomponents (ports and slot).
- Automatic creation of a background image.
- Awareness of physical size and weight.
- Easy "snap in" for rack mounting.
- Awareness of power consumption.
- Ability to receive automatic alarms from the Integration Toolkit (ITK).
- More comprehensive modeling capabilities such as the ability to specify reference node location.
- Ability to restrict which card types can be positioned under which slot.
- Pre-defined reports in the dashboard.

For racks:

- Rack unit count and awareness of rack unit occupancy.
- Automatic creation of a background image.
- Smart aggregation of dependent devices for rack occupancy, power, and weight consumption.
- Pre-defined visual overrides on floor plans for rack occupancy, power, and weight thresholds.
- Pre-defined reports in the dashboard.

Generic nodes (or simply nodes) have none of these capabilities. They are simply modeled as objects that have an image, a set of fields, and visual overrides.

### 6.1.1 Can I use nodes to represent devices or racks?

None of the features for smart devices described above prevents a user from utilizing generic nodes to represent devices. In those cases, netTerrain really doesn't see a difference between your "nodes as devices" and any other node. You can certainly add a node that looks like a router and later connect it to another instance of a generic node that looks like a switch. The caveat is that netTerrain will treat these objects as any other generic node. What this means, is that if you want to document the ports of a router or switch, you

will need to create them manually, and if you want to rack mount it, you will have to resize it and fit it inside a rack diagram manually.

If you have a license of netTerrain Logical, generic nodes must be used in place of smart devices, since this product does not have smart devices as a feature. Otherwise, we only recommend using generic nodes in place of smart devices if you have little use for tracking things like physical rack locations, devices subcomponents, port occupancy, power, and weight consumption, among other features.

The creation and maintenance of devices, racks, and other so-called smart objects in netTerrain is only available with a netTerrain DCIM license. In this chapter we will be working with racks and devices, then subsequently the assignment of cards to devices and devices to racks. The section also covers ports and their connectivity.

## 6.1.2 The netTerrain hardware model hierarchy

The modeling of racks, devices and cards is covered in the Power User guide, but from the standpoint of an end user in netTerrain it is important to know how the netTerrain hardware model works.

netTerrain provides a very flexible, n-layered, object-oriented hardware model, where the users have complete control over what a rack, a device and a card constitute. We already know that each object type can have unlimited properties and behaviors, but from a hardware model point of view, netTerrain supports the following hierarchy:

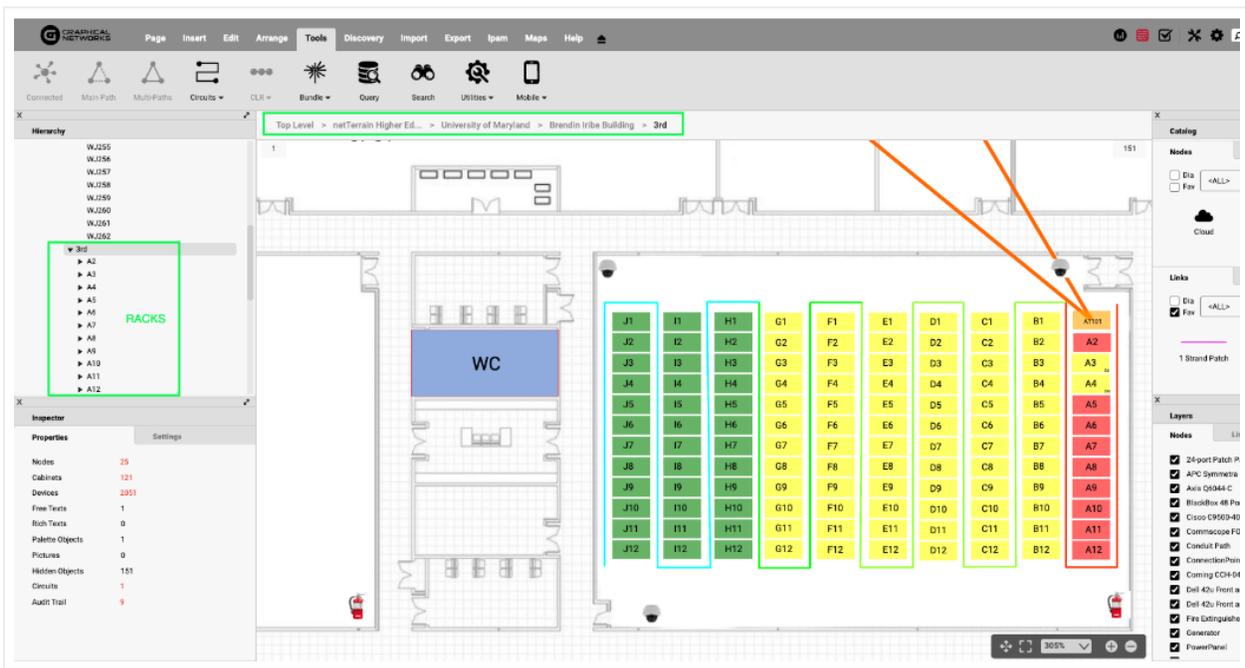
- Rack or Node (User-defined: region, site, room, bazinga object, Planet Mu...)
  - Node
  - Device
    - Node
      - ...ad infinitum
    - Port/s
    - Card/s
      - Node
        - ...ad infinitum
      - Port/s
      - Daughtercards
        - Node
          - ... ad infinitum
        - Port/s
        - Daughtercard/s
          - ... ad infinitum

As we can see, this hierarchical model allows for any possible hardware scenario, real-world or imagined. Even the definition of a rack is very broad: it doesn't really have to be an actual rack.

## 6.2 Racks

Racks are containers of other objects, specifically devices that allow a rack mounting process. For rack mounting, racks require a certain width (specified in inches) and a certain height (specified in inches as well). In addition, racks have a certain number of rack units (typically one rack unit equals 1.75 inches). All these properties are defined during the rack modeling process and are reviewed in the Power User Guide. Finally, racks may also have a certain power availability and weight capacity.

We assume that before adding a rack or device, you already have some sort of hierarchy in place. This is not strictly needed, as you can place smart objects anywhere in the netTerrain hierarchy, but it usually makes sense to have higher level objects representing sites, buildings, floors or rooms, which provide context for the device locations.



Typical Data Center hierarchy with a room section view and racks

Also, prior to adding devices to netTerrain make sure you already have the appropriate rack types modeled in the catalog. If a rack type you are trying to add is not available from the rack menu button, it will have to be modeled in the catalog. These tasks are covered in the Power User Guide.

## 6.2.1 Adding a new rack to the project

Racks are added in netTerrain through the rack button in the insert menu, the diagram right-click context menu or through a simple drag and drop process from the catalog.

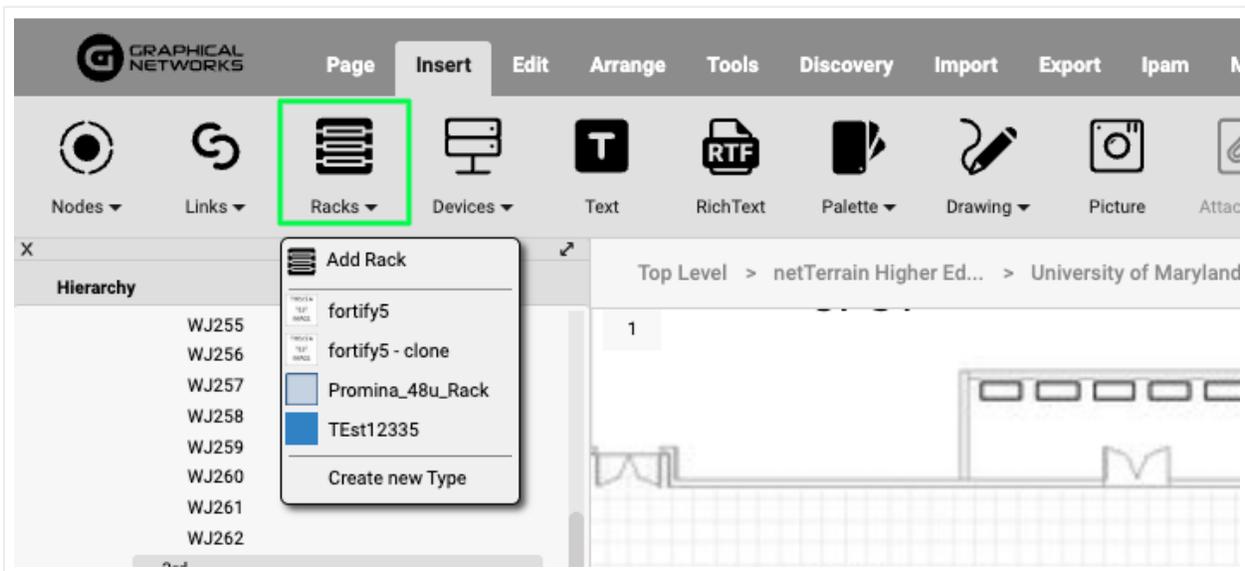
### 6.2.1.1 Method 1: using the rack menu option

The traditional way of adding a rack is from the insert menu. Just click on the rack button and several options become available. You can add a generic rack (this is the green rack at the top of the menu) and then change its type to something else, or simply click on one of the racks below, or categories (if there are any) and find the rack type you need.

If the rack type you are looking for is not on the drop-down list, it may have to be modeled in the catalog or it just isn't part of the favorites list. In the latter case, the catalog administrator simply needs to make sure that rack type is checked as a favorite (see Power User Guide).

The categories and nodes you see here by no means represent the entire catalog. They are just the categories and node types defined as favorites. By default, netTerrain does not ship with rack categories as typically, you will only have a handful of different rack types in your data center. If you do have categories, these are, of course, all user-defined and can be modified at will by a power user. They contain the racks associated with that category that were also marked as favorite in the catalog.

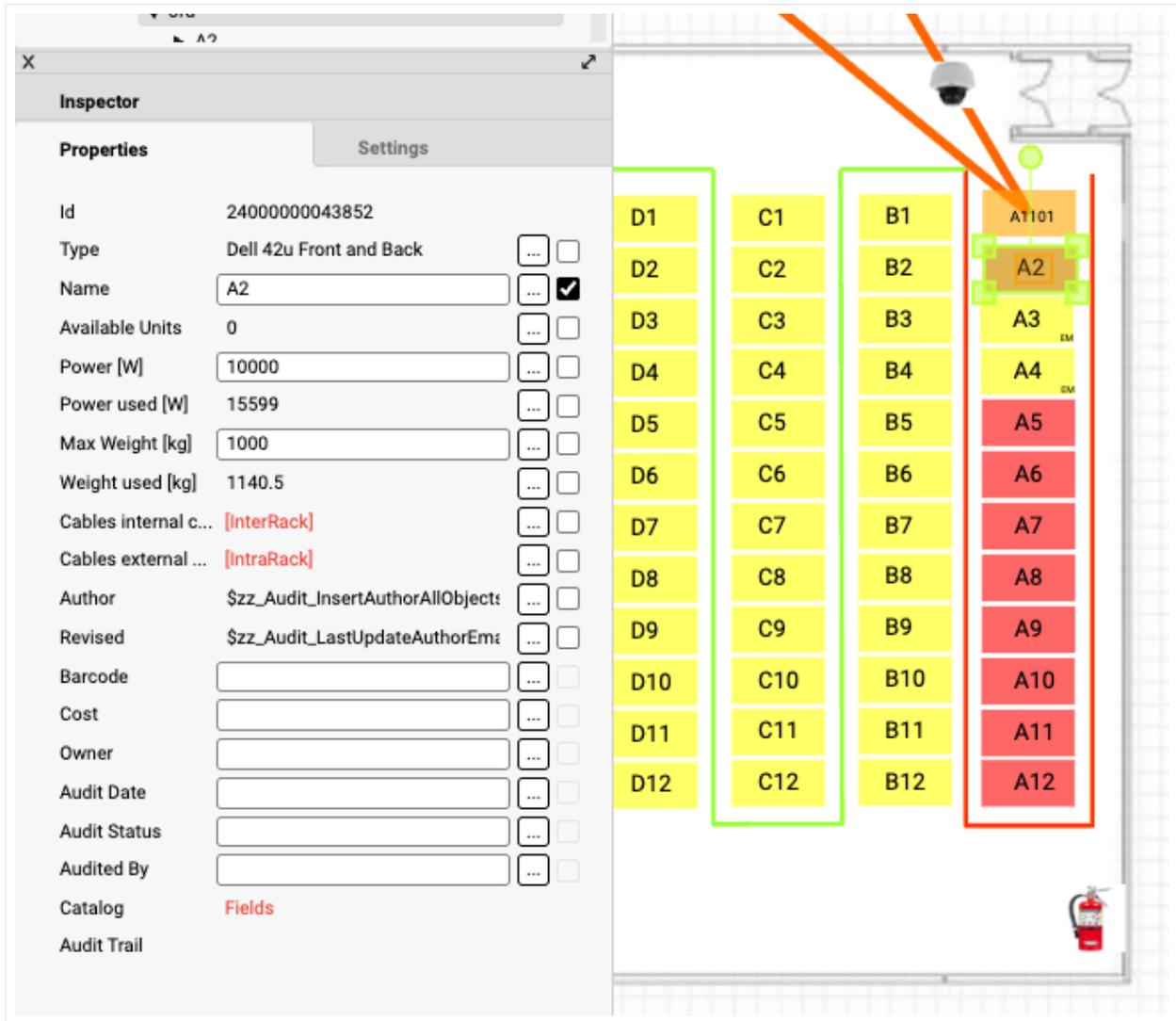
Once you identified the rack type you need, you click on it and it will be added to the top left corner of your diagram. You just created what we call an instance of that rack type.



*Rack menu button*

Each instance of a rack type will reflect the custom properties that were defined in the catalog for that type. In other words, all instances of a certain rack type share the same specific set of properties.

When you click on that instance, the properties will be displayed in the properties window on your left. Any user with updater permissions or better can modify the values for any of the custom properties.

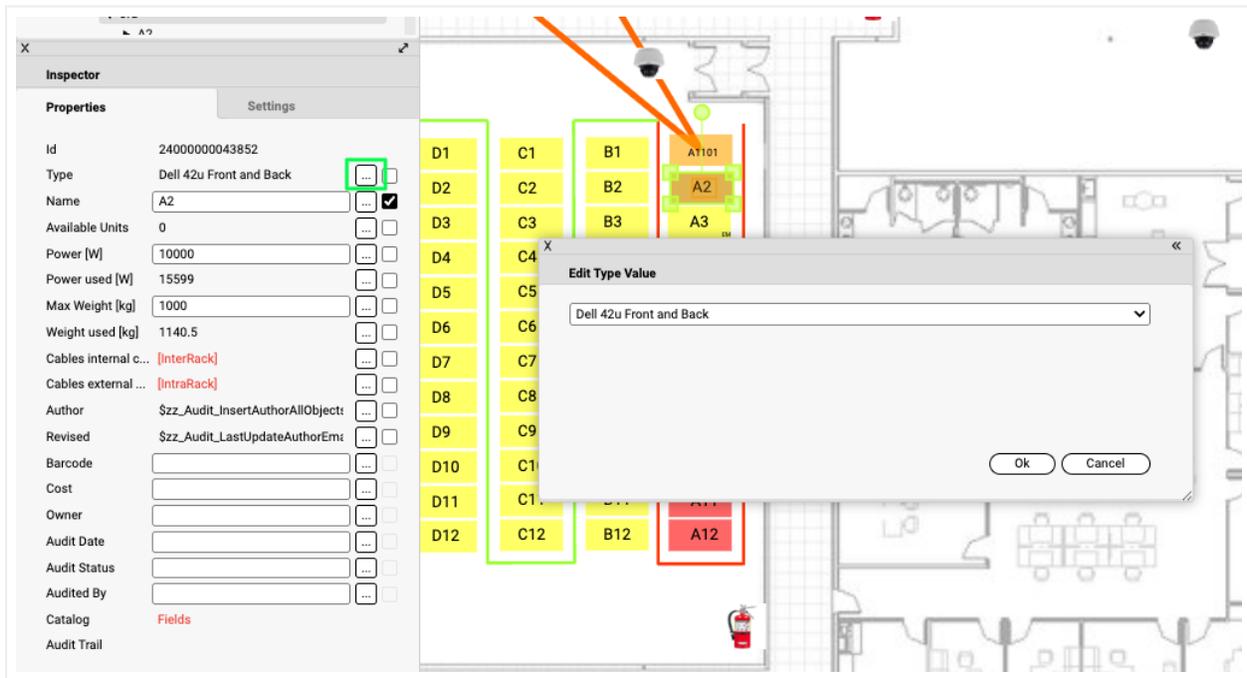


Properties for the rack. All racks of this type share the same properties

You can change the type of a rack later but consider that if you change the type after devices were rack mounted on the rack, they will be unmounted if the new type differs in dimensions.

### Attention!

When you change the type of rack, all the properties will change as well. Any data that was filled out for the old rack type will be lost, since those properties may not apply anymore.

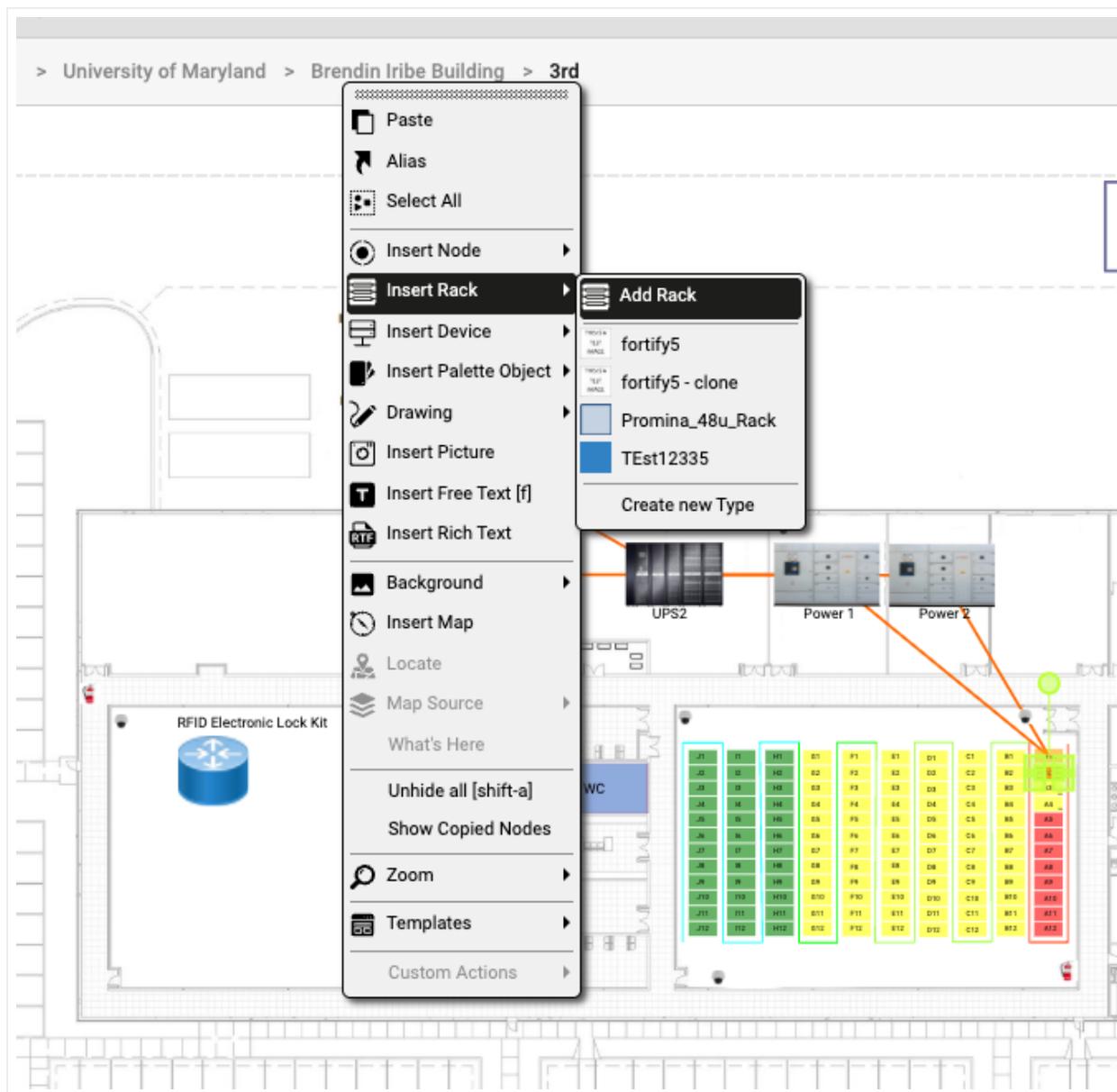


*Changing the type for a rack*

## 6.2.1.2 Method 2: using the right-click diagram context menu

As an alternative method for adding racks, you can do the following:

- 1) Open the diagram context menu by right-clicking anywhere on the diagram
- 2) Click on Insert Rack -> desired category or rack



*Inserting a rack using right-click context menus*

The newly inserted rack will be placed on the spot where the right-click action occurred.

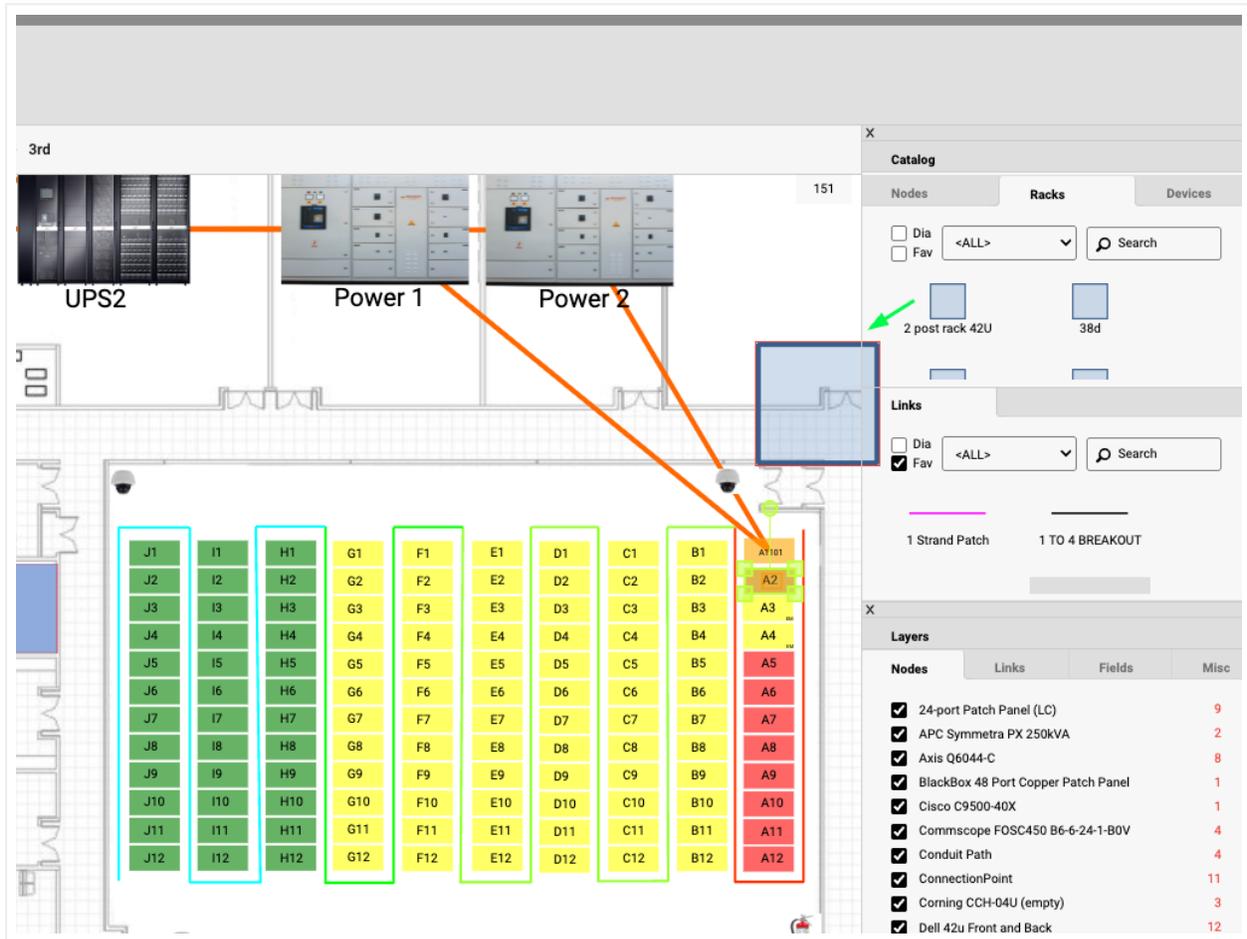
### 6.2.1.3 Method 3: dragging and dropping from the catalog

The easiest way to add devices in netTerrain is to just drag and drop them from the catalog. To do that, the catalog needs to be displayed (see above). If it is not displayed, just press 'F3'.

Once the catalog is visible, you can use any of the tools you want to find the desired object (see catalog structure section):

- 'Dia' and 'Fav' checkboxes
- category drop down box
- catalog search

Once you find your rack, just drag and drop it on the diagram. That's it!

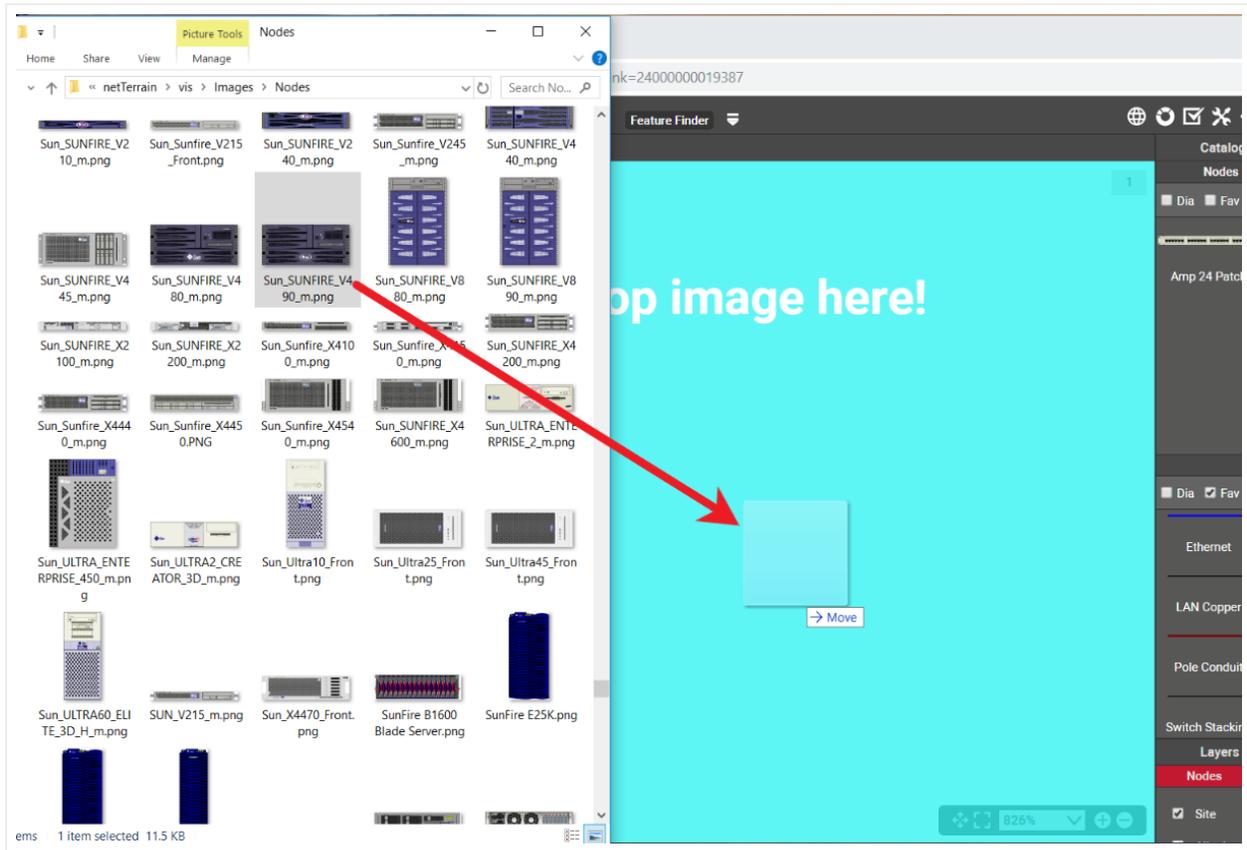


*Dragging and dropping a rack onto a diagram*

#### 6.2.1.4 Method 4: dragging and dropping an image from a browser or folder

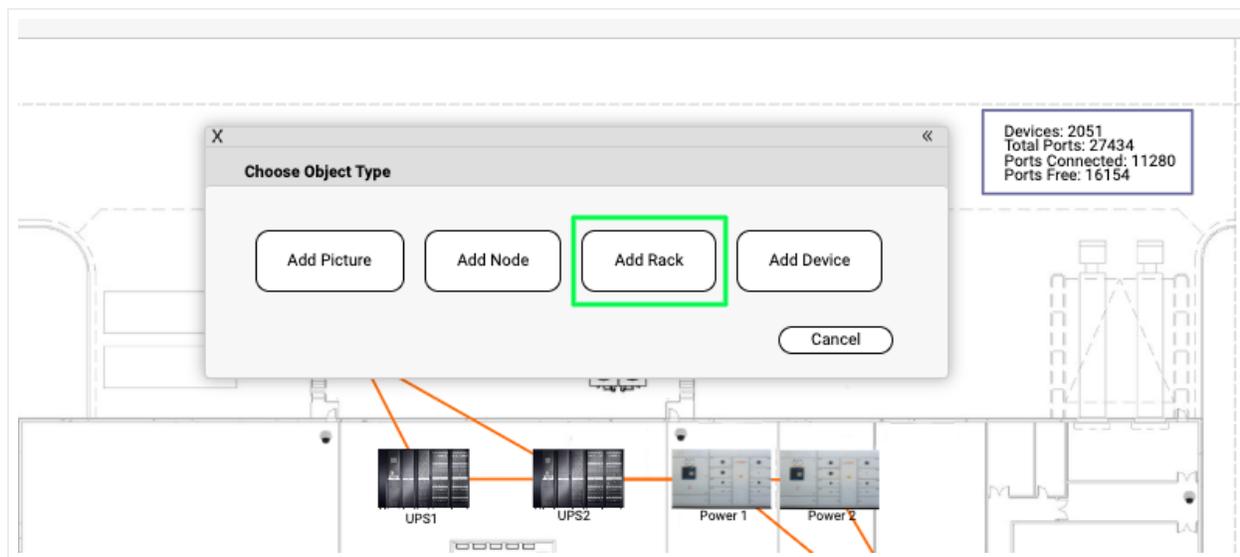
Just as you do with nodes, there is a nice trick to adding a rack into the project quickly: by dragging and dropping an image from a folder or browser.

The best way to use this trick is to have both the netTerrain browser and the folder or website with the image side-by-side. Then, just drag and drop the desired image to the netTerrain diagram, as shown below:



*Create a picture by dragging and dropping an image*

After you drop the image on the diagram, netTerrain gives you the option to create it as a floating image (picture), a node type, a device type, or a rack type. Choose the 'rack' option:



*Choosing the Rack' option to create a new rack*

This process creates a rack type in the catalog using that image. The type is called something like 'Rack #1' and has no custom properties. You can later on (as a power user) edit the rack type properties, model it, change the type name, add new custom fields and overrides and much more. The nice thing about this trick is that it gets you started quickly.

**Tip:**

You can also perform the same operation by simply copying a picture from your computer with ctrl-c and then pasting it on the netTerrain diagram.

## 6.2.2 Working with racks on a floor plan

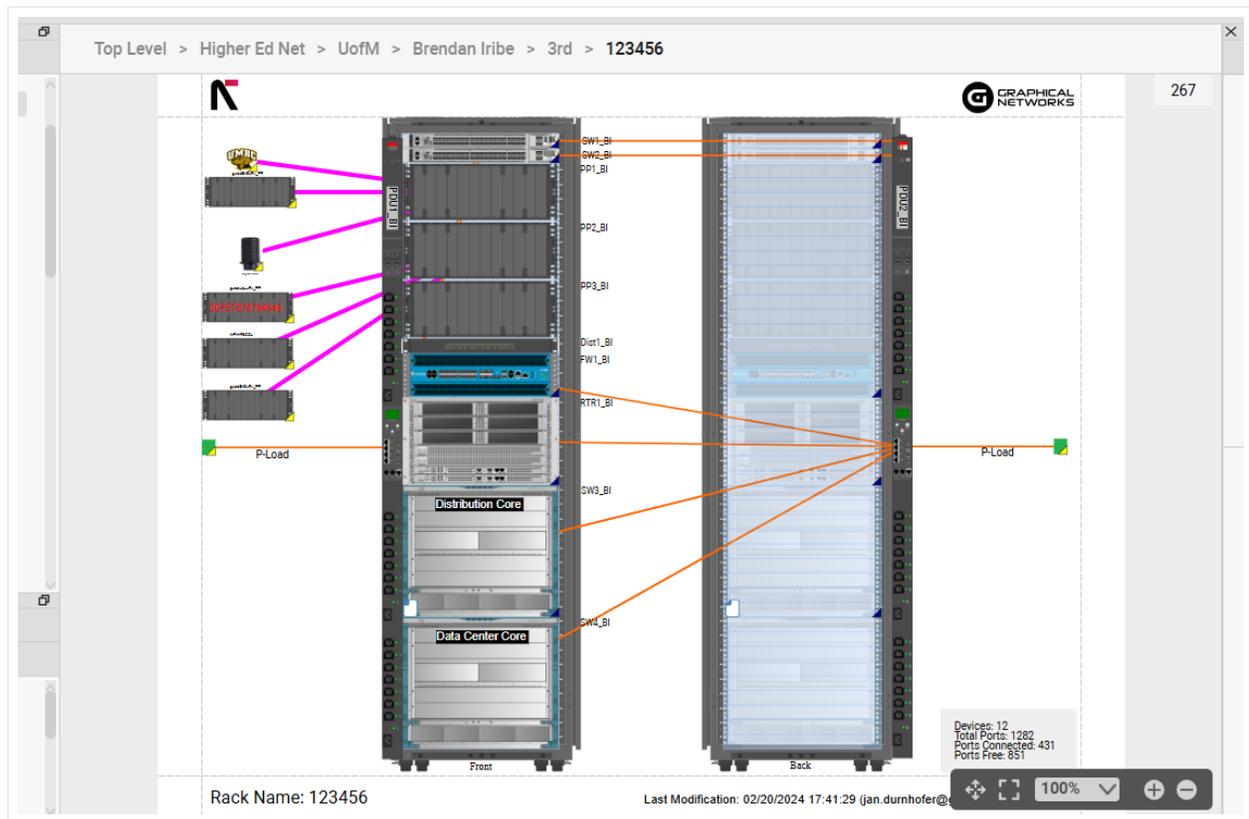
Once your rack is on the floor plan you can also resize the rack icon and place it correctly on top of the floor plan view or room section (if applicable).

When a rack is created, two images are associated with it. The rack icon represents the top view of the rack on the floor plan or room section and is typically a square (as depicted in the image below).



*Rack icons on a room section*

The second image used for racks is the rack front and/or back image, representing the rack mountable area, accessible by double-clicking on the rack icon.



### Rack front and back image with rack mounted devices

The rack front and back images are background images that cannot be resized or moved on the diagram, as they represent the rack mountable area. If the rack mountable area needs to be changed, this is done in the rack modeler (see Power user Guide).

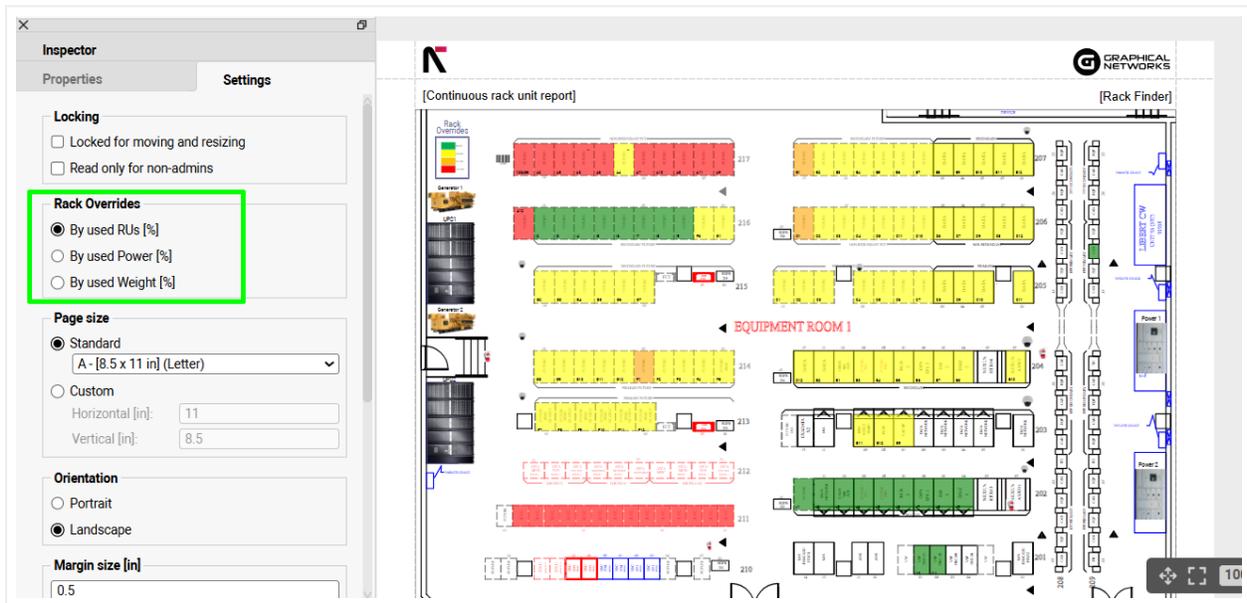
## 6.2.3 Rack aggregate properties and visual overrides

As you start rack mounting devices inside a rack, the rack (being a smart object) aggregates relevant data and stores it as part of its properties. These aggregate values are used in conjunction with editable environmental properties that inherit a default value from the type. While the latter can be edited on a per

instance basis, the aggregated values cannot be edited, as they are calculated. These special rack properties are the following:

- Available Units (aggregated): this is the number of rack units that are still available for the rack.
- Power [W] (inherited from type – editable): this is the predefined static power value assigned in the rack modeler. The existence of this property does not prevent you from creating other power figures as custom properties.
- Power Used [W] (aggregated): this is the sum of all nameplate power figures for devices rack mounted on that rack. These device nameplate power figures are also created during the device modeling process and are static numbers. netTerrain can also aggregate other power figures into custom fields. For example, dynamic power values could be discovered and automatically populated into a device custom field, and later aggregated as an expression in a rack custom field.
- Max Weight [lb.] (inherited from type – editable): this is the predefined static weight capacity value assigned in the rack modeler. The existence of this property does not prevent you from creating other custom properties related to weight.
- Weight Used [lb.] (aggregated): the sum of the device weight rack mounted on that rack. The device weight values are also created during the device modeling process.

Because of aggregate properties being automatically computed for racks, netTerrain can dynamically change the colors of racks based on three core properties: rack unit occupancy, used power and weight. These visual overrides can be overridden with custom overrides as well, but the main difference between these predefined overrides and custom ones is that the former overrides are included as radio buttons in a Rack Override feature that allow users to switch from one override criteria to another, as depicted below.



*Predefined rack overrides*

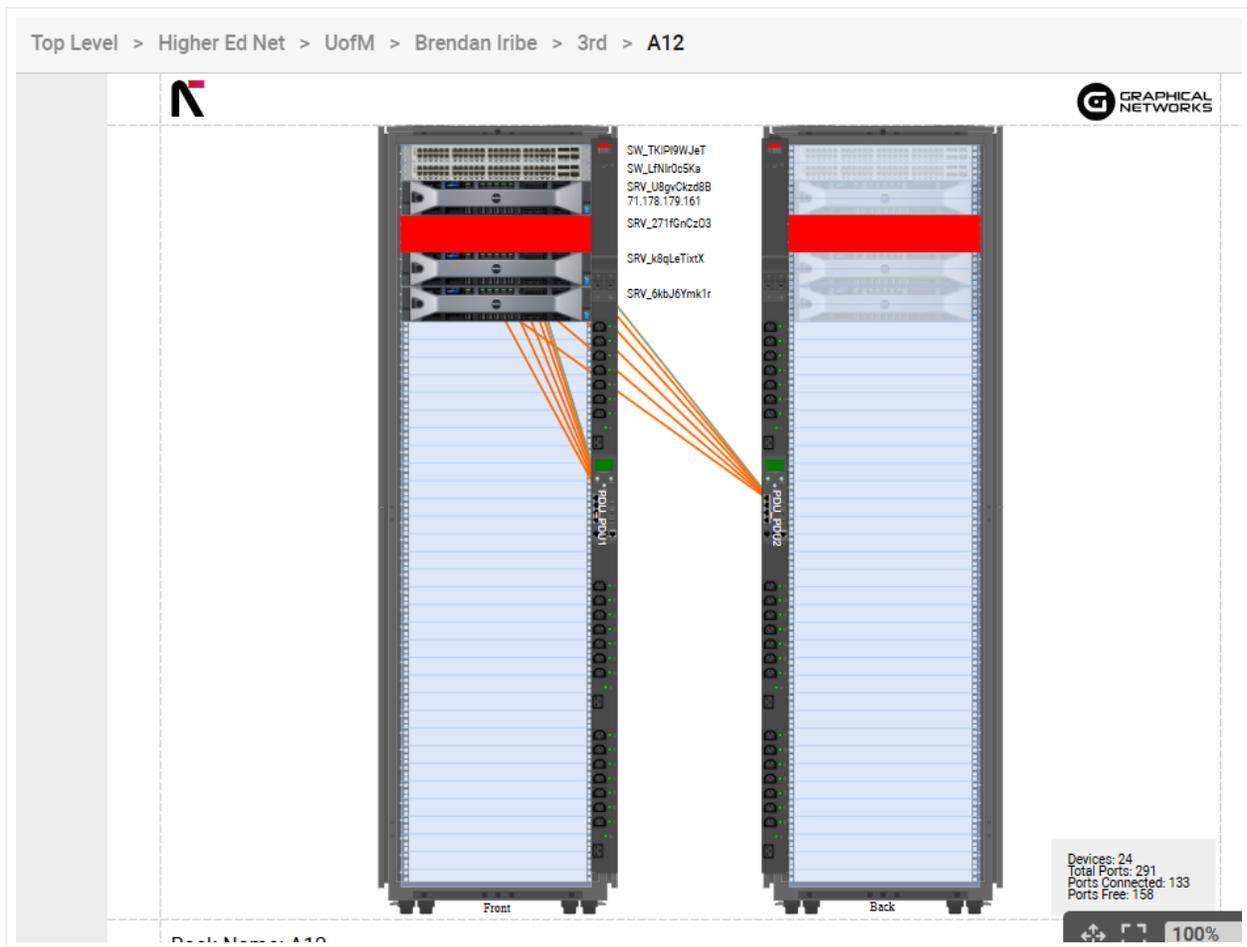
With this feature, a user can switch from one override criteria to another, and the rack colors will change accordingly. These predefined overrides to have a fixed range of colors based on the following rules:

- 0 to 25% is represented in green.
- 25% to 50% is represented in yellow.
- 50% to 75% is represented in orange.
- 75% and higher is represented in red.

## 6.2.4 Working with dual racks

The netTerrain catalog supports rack views with multiple containers, which lends itself to using front and back views. For that to work, the rack itself must be modeled as a dual rack, which is covered in the Power User guide.

To rack mount devices on dual racks, make sure you are indeed using a rack properly modeled as dual. This can be configured in the catalog as 'Coupled Front / Back mounting' (CFBM). See the netTerrain Power User Guide on how to do that.



### *A dual rack view with CFBM*

With CFBM when you rack mount a device on the front, netTerrain will show a faint image of the device on the back and vice versa. That way, users already see from a graphical standpoint that those units are unavailable on either side of the rack. The image above shows a dual rack with CFBM enabled, with two devices mounted on the front and a patch panel on the back.

Also, it is interesting to note that if you try to mount a device overlapping with any of the “faint” icons, the device will not snap inside the rack. This is expected since the rack units are already taken.

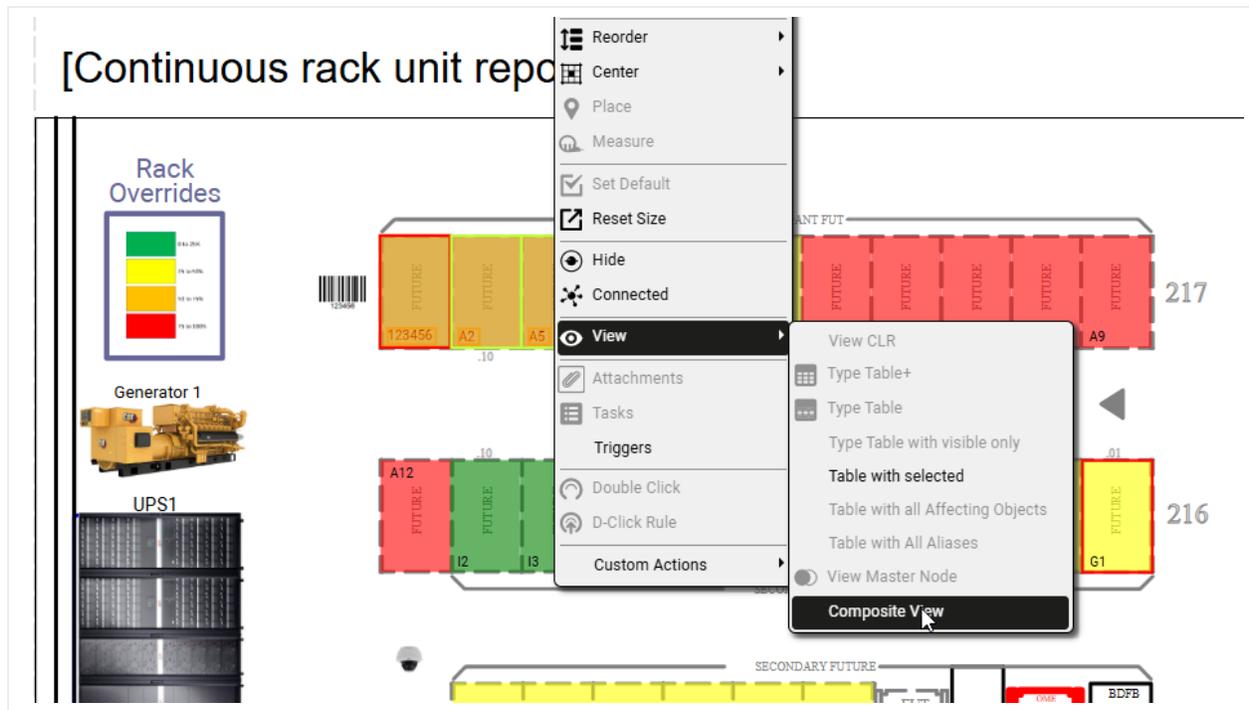
## **6.2.5 Rack composite views (multiple racks in one view)**

In many cases users want to see multiple racks side by side, showing all the rack mounted devices in one view. This is possible using the rack composite view feature. These are some of the capabilities of the feature:

- You can combine up to 8 racks in one view.
- You can pick any set of racks (between 2 and 8) from a given floorplan; they don't need to be contiguous.
- The created view is a dynamic view, meaning that the diagram is only in memory and will not be permanently stored.
- Composite views let you create cables between devices on different racks, all from one diagram.

To launch this feature, do the following:

- First select the racks from the floorplan
- Right click (or alt-c) and click on 'composite'

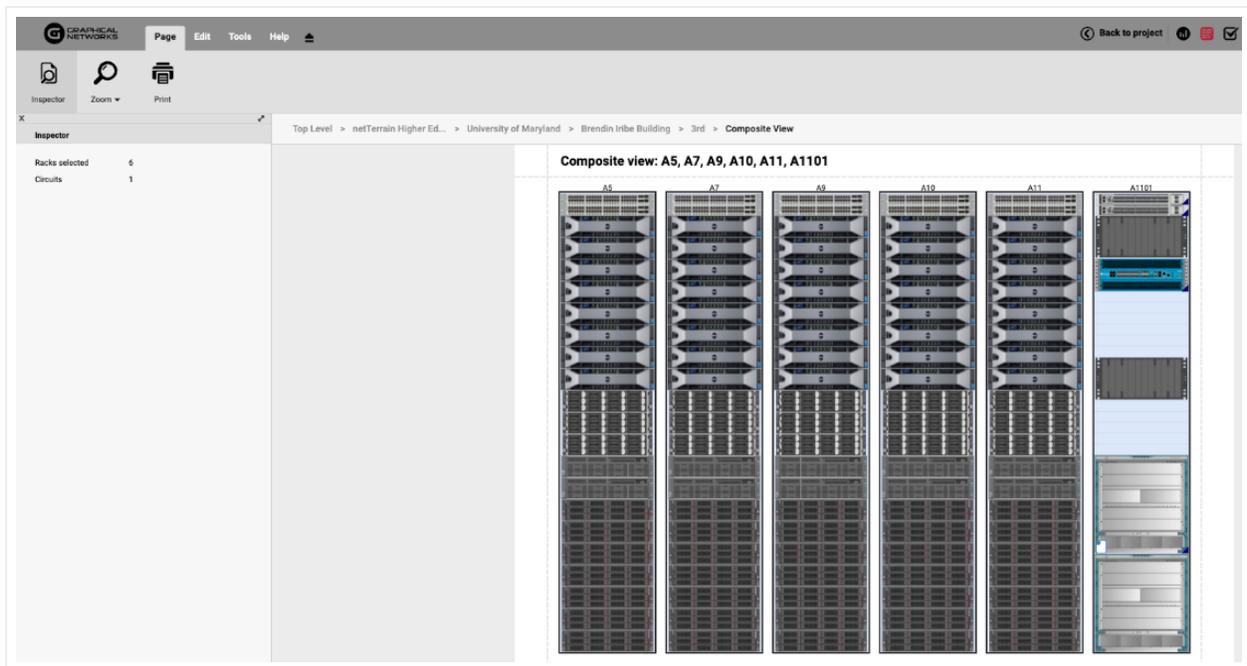


### Launching the rack composite view

Once the composite view is launched, netTerrain will create a dynamic view of all the selected racks, rendered side by side stretching the whole page.

The names of all the racks are displayed on the header, separated by commas and each rack will have its name on top of the container. Notice that the racks may look a bit different in this view than in the normal view, since we only display the rackmountable area (container).

From this view you can create cables between devices using the multicable feature: select two devices and hit [alt-m].



*Rack composite view*

### Attention!

Composite views for racks will not work with racks that have more than 2 containers and racks that are not coupled if they are using 2 containers.

## 6.3 Devices

If you are a user of netTerrain DCIM you probably want to use smart objects in case you need to document entities like routers, switches, cards, or cabinets, so that you can take advantage of some of the business rules and automation that netTerrain offers. These business rules and features include:

- An extensive predefined library of makes and models
- automatic creation of subcomponents (ports and slot)
- automatic creation of a background image
- awareness of physical size and weight
- easy “snap in” for rack mounting
- awareness of power consumption
- ability to receive automatic alarms from the ITK
- more comprehensive modeling capabilities such as the ability to specify reference node location
- ability to restrict which card types can be positioned under which slot
- pre-defined reports in the dashboard

Strictly speaking, a device is an instance of a type that was created in the catalog using the category ‘Device’ during the creation process. Of course, this definition is recursive, but it is up to the user to define what exactly constitutes a device. Because of the flexible nature of netTerrain, you could in theory model anything as a device, but in general it is any box (router, server, UPS, switch, patch panel, etc.) that contains subcomponents (such as ports and slots) and has certain default physical and environmental parameters such as size, power and weight.

During the modeling process, devices are built or “modeled” with specific properties, for instance rack unit size, power and weight capacities. In addition, subcomponents such as ports and slots can be added to a device. As mentioned before, this provides a high degree of automation, since every time an instance of a specific device type is added in the project, all the type properties are inherited, and all the subcomponents are automatically created.

A default installation of netTerrain DCIM contains a few thousand common types, but as you will learn later, adding new ones is not complicated. Moreover, if your netTerrain maintenance contract is current, you can request new models from us at no extra charge.

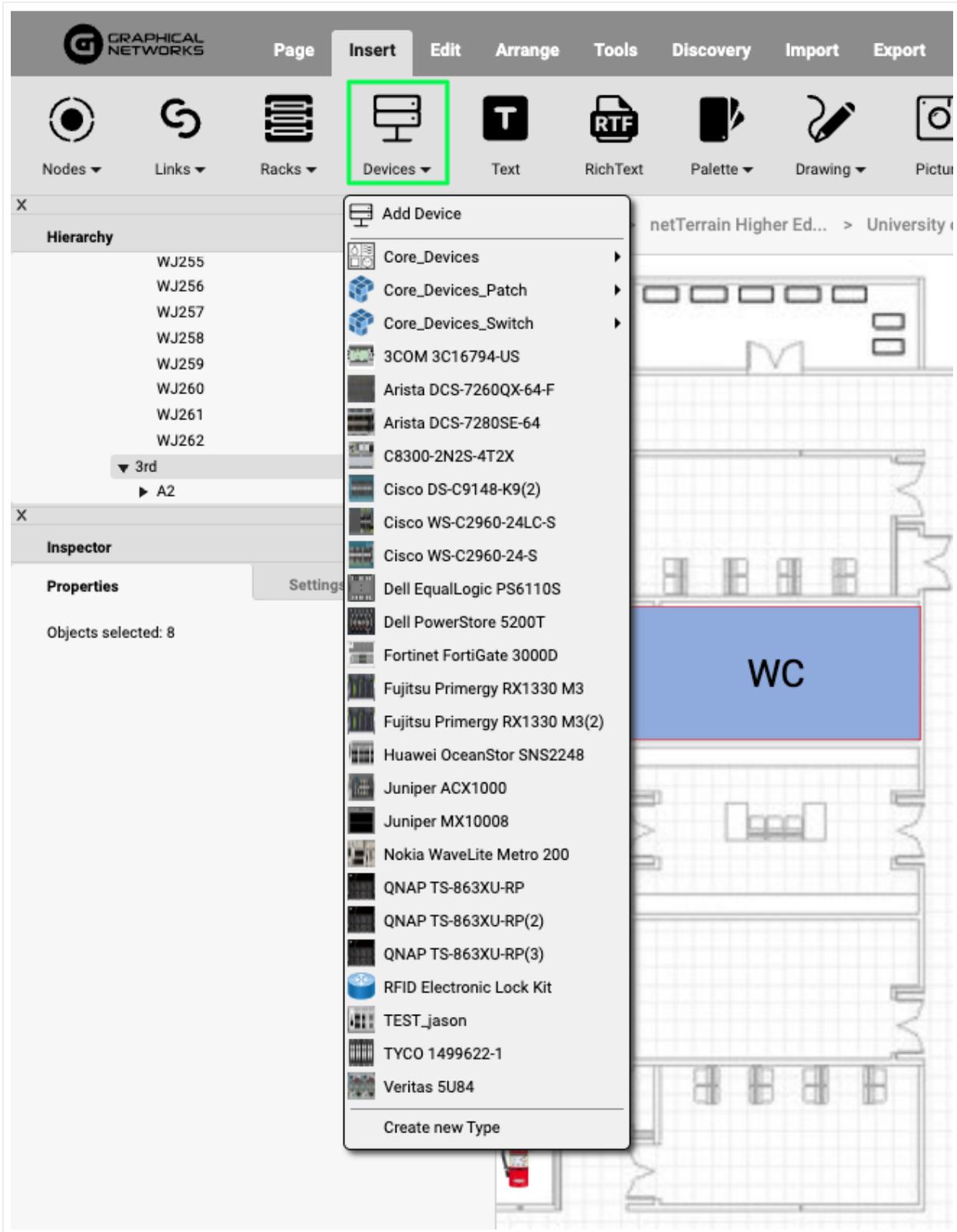
### 6.3.1 Adding a new device to the project

There are several ways of adding a device to your project, including bulk, database, network discovery and API imports. However, in this guide we only review manual data entry techniques. You can review the import/export, ITK and programming guides to explore other methods.

### 6.3.1.1 Method 1: using the device button in the menu

The traditional way of adding a device is from the insert menu. Just click on the device menu button and several options become available. You can add a generic device (this is the blue node on top of the menu) and then change its type to something else, or simply click on one of the categories and find the device type you need. The categories and devices you see here by no means represent the entire catalog. They are just the categories and device types defined as favorites. Categories you see in this menu are user defined, can be modified at will by a power user and they contain the devices associated with that category that were also marked as favorite in the catalog.

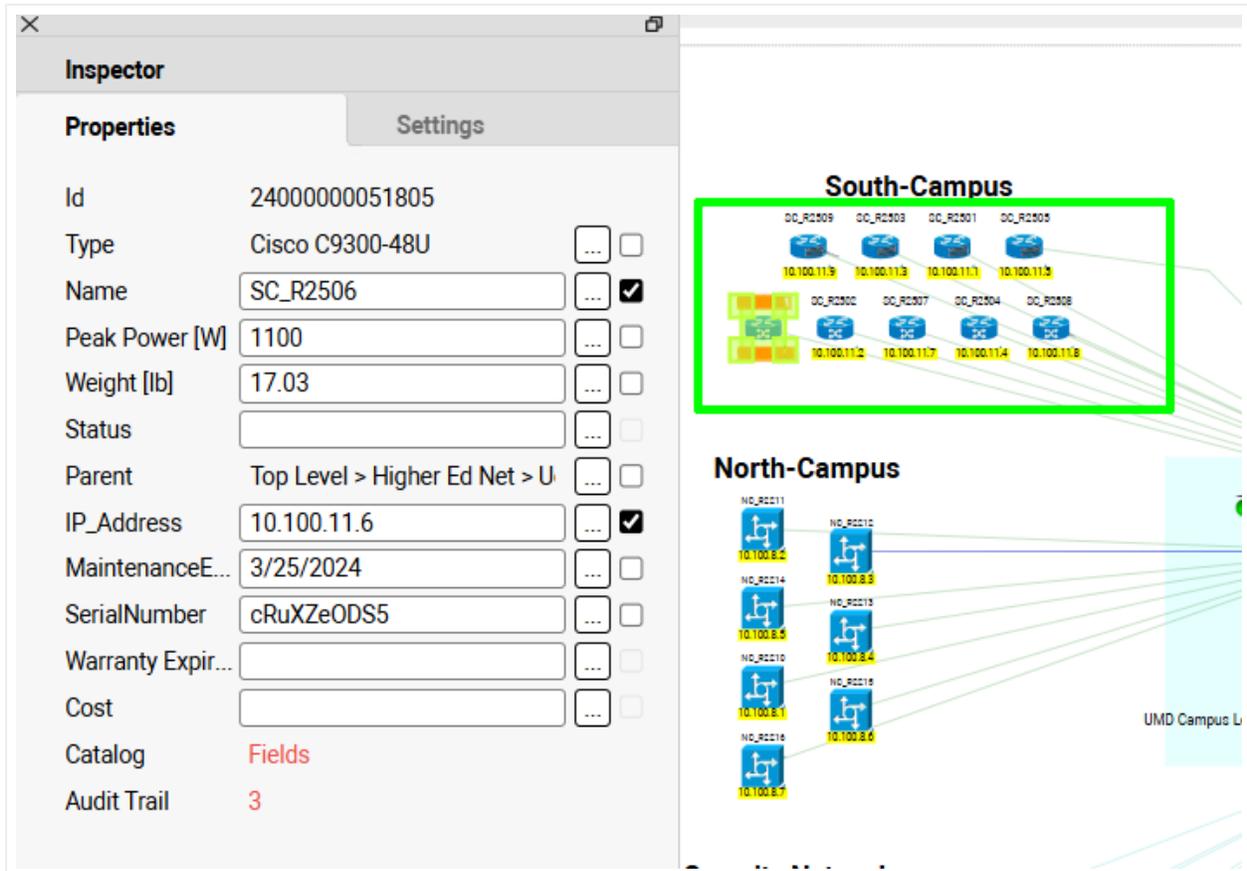
Once you identify the device type you need, you click on it, and it will be added to the top left corner of your diagram. You just created what we call an instance of that device type.



Device menu button

Each instance of a device type will reflect the custom properties that were defined in the catalog for that type. In other words, all instances of a certain type share the same specific set of properties.

When you click on that instance, the properties will be displayed in the properties window on your left. Any user with updater permissions or better can modify the values for any of the custom properties.



*Properties for the router device. All routers of this type share the same properties*

If a generic device is added, a user can later change to some other type, by selecting it from the type menu, as shown below.

#### Attention!

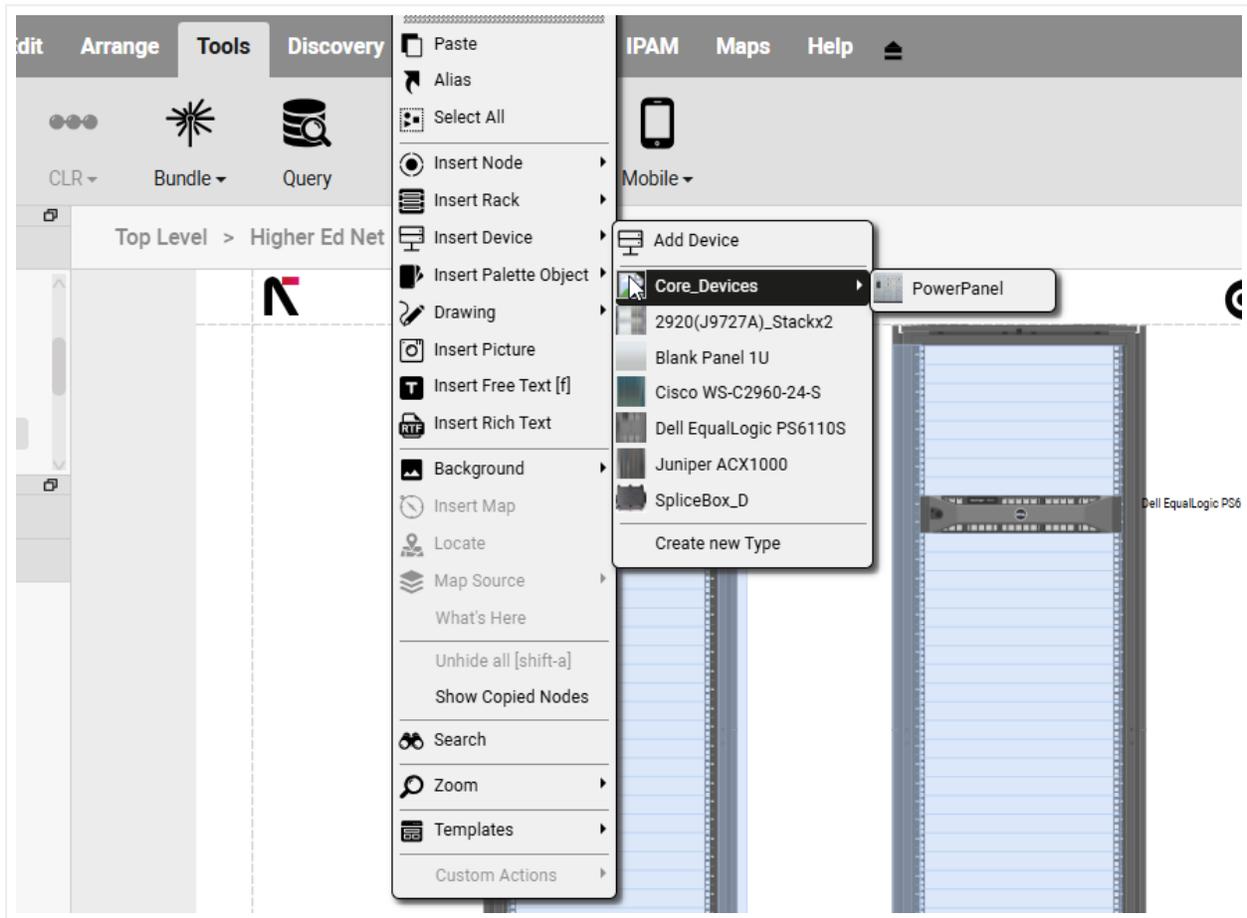
When you change the type of a device, all the properties will change as well. Any data that was filled out for the old device type will be lost, since those properties may not apply anymore.

More importantly though, when you change a device type, its subcomponents like ports and slots change. This triggers a series of events discussed below.

### 6.3.1.2 Method 2: using the right-click diagram context menu

As an alternative method for adding devices, you can do the following:

- 1) Right-click anywhere on the diagram to open the diagram context menu
- 2) Click on Insert Device -> desired category or device



*Inserting a device using right-click context menus*

The newly inserted device will be placed on the spot where the right-click action occurred.

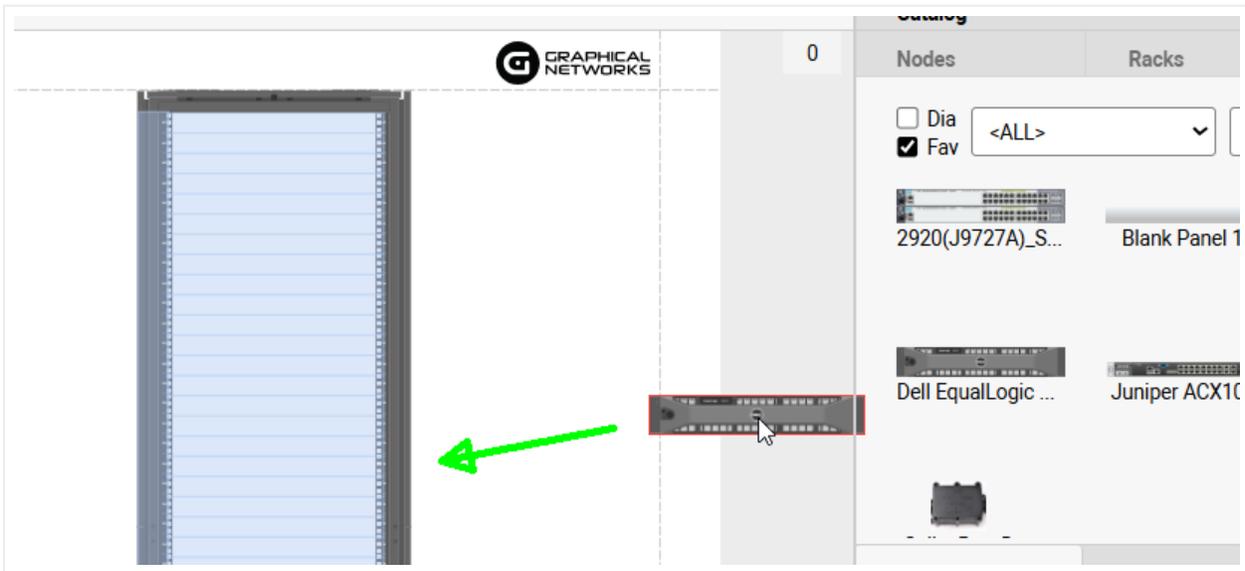
### 6.3.1.3 Method 3: dragging and dropping from the catalog

The easiest way to add devices in netTerrain is to just drag and drop them from the catalog panes. In order to do that, the catalog needs to be displayed (see above). If it is not displayed, just press 'F3'.

Once the catalog is visible, you can use any of the tools you want to find the desired device:

- 'Dia' and 'Fav' checkboxes
- category drop down box
- catalog search

Once you find your device, just drag and drop it on the diagram. That's it!

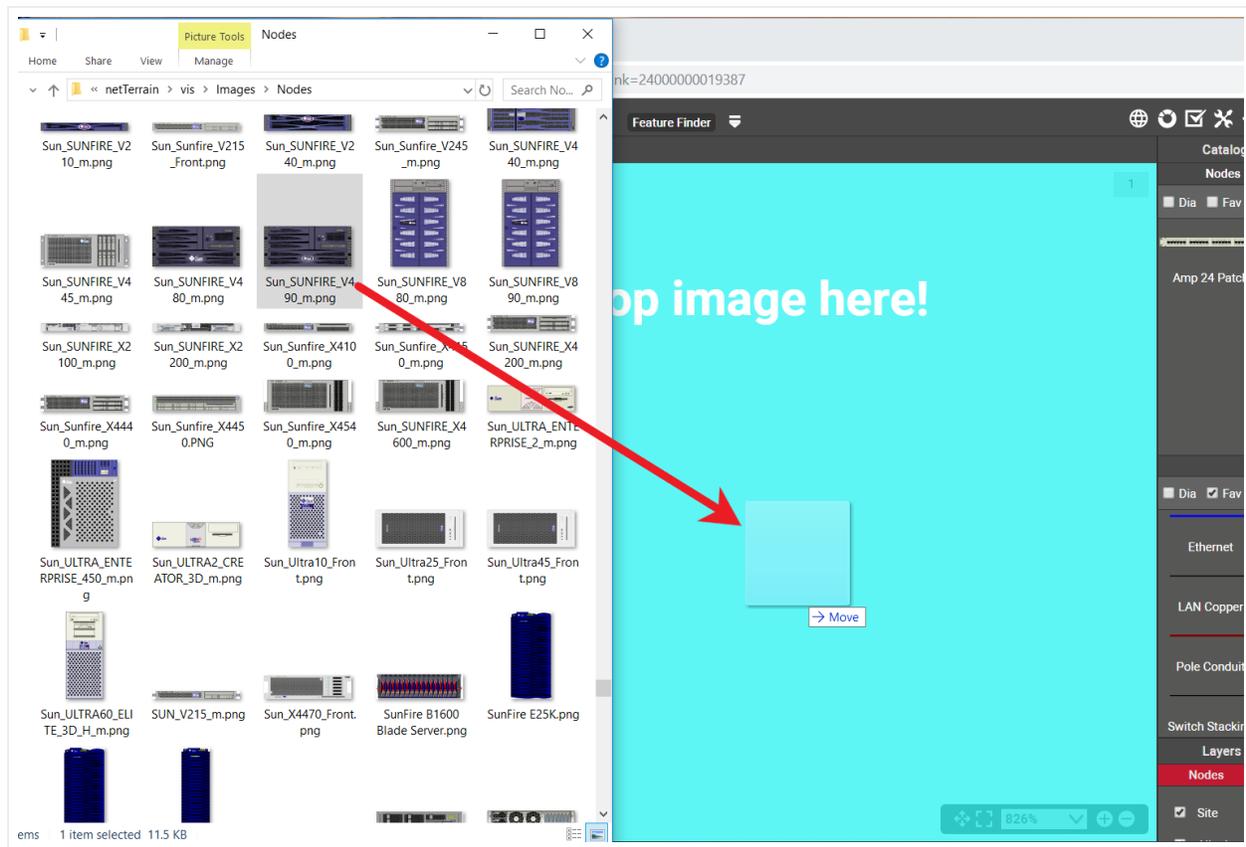


*Dragging and dropping a router onto a diagram*

#### 6.3.1.4 Method 4: dragging and dropping an image from a browser or folder

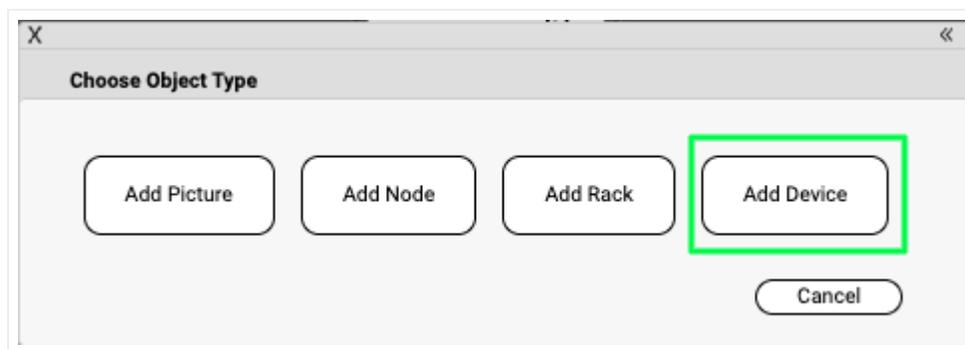
Just as you do with nodes, there is a nice trick to add a device into the project quickly: by dragging and dropping an image from a folder or browser.

The best way to use this trick is to have both the netTerrain browser and the folder or website with the image side-by-side. Then, just drag and drop the desired image to the netTerrain diagram, as shown below:



Create a picture by dragging and dropping an image

After you drop the image on the diagram, netTerrain gives you the option to create it as a floating image (picture), a node type, a device type, or a rack type. Choose the 'device' option:



Choosing the 'Device' option to create a new rack

This process creates a device type in the catalog using that image. The type is called something like 'Device #1' and has no custom properties. You can later on (as a power user) edit the device type properties, model

it, change the type name, add new custom fields and overrides and much more. The nice thing about this trick is that it gets you started quickly.

**Tip:**

You can also perform the same operation by simply copying a picture from your computer with ctrl-c and then pasting it on the netTerrain diagram.

## 6.3.2 Working with devices

Devices inherit a series of properties defined in the catalog:

- device icon
- a backplane image
- subcomponents (if applicable)
- predefined properties

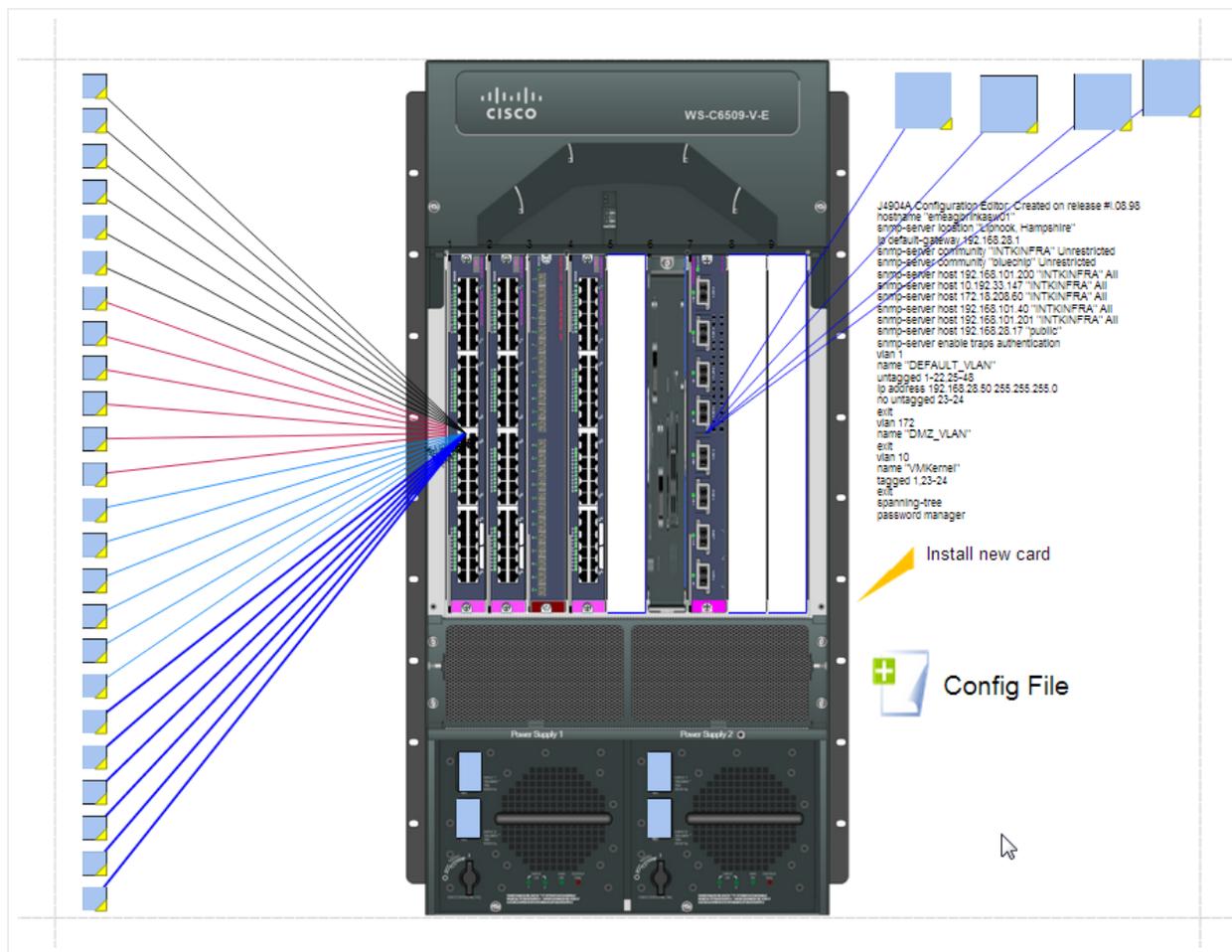
To access the backplane of the device and its subcomponents, simply double-click on it.

When a device is created, two images are associated with it. The device icon represents the front view of the device and is typically a vendor specific picture.



### *Device icons in a rack diagram*

The second image used for devices is the backplane image, representing the back of the device where ports, slots and cards reside, accessible by double-clicking on the device icon. This image, along with the subcomponents is also referred as the subcomponent view.



Device subcomponent view with the backplane image

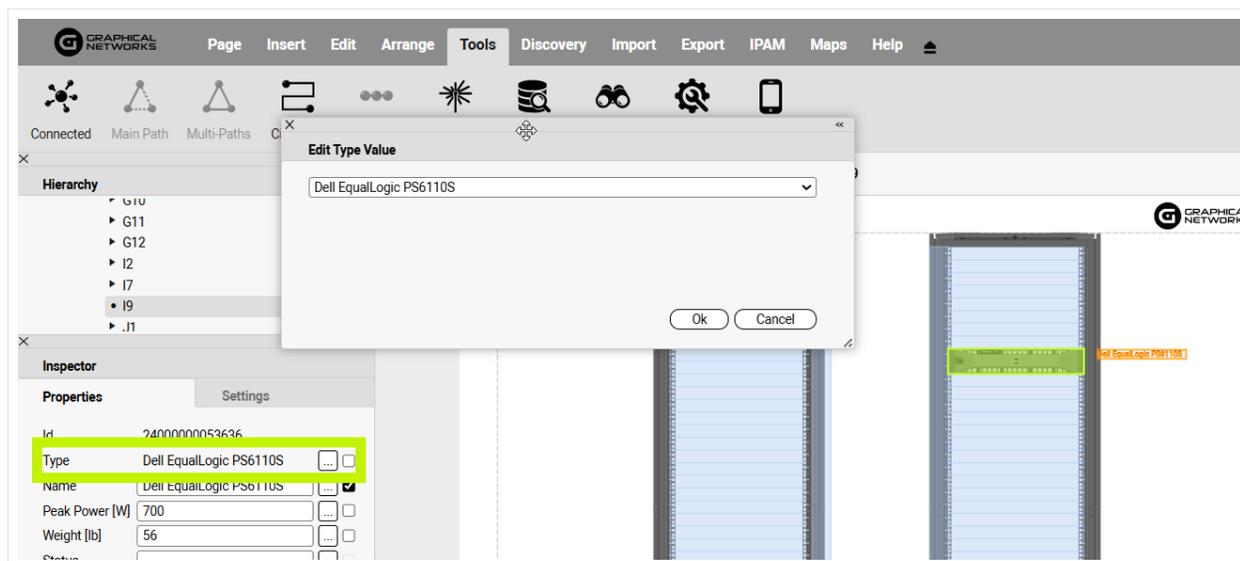
The device backplane image cannot be resized or moved on the diagram, as it represents the physical view of where ports, slots and cards are placed. If that image needs to be changed, this is done in the device modeler (see Power user Guide).

**Tip:**

If you need to show the front and the back view of a device in the device subcomponent view simply use a composite image in your catalog.

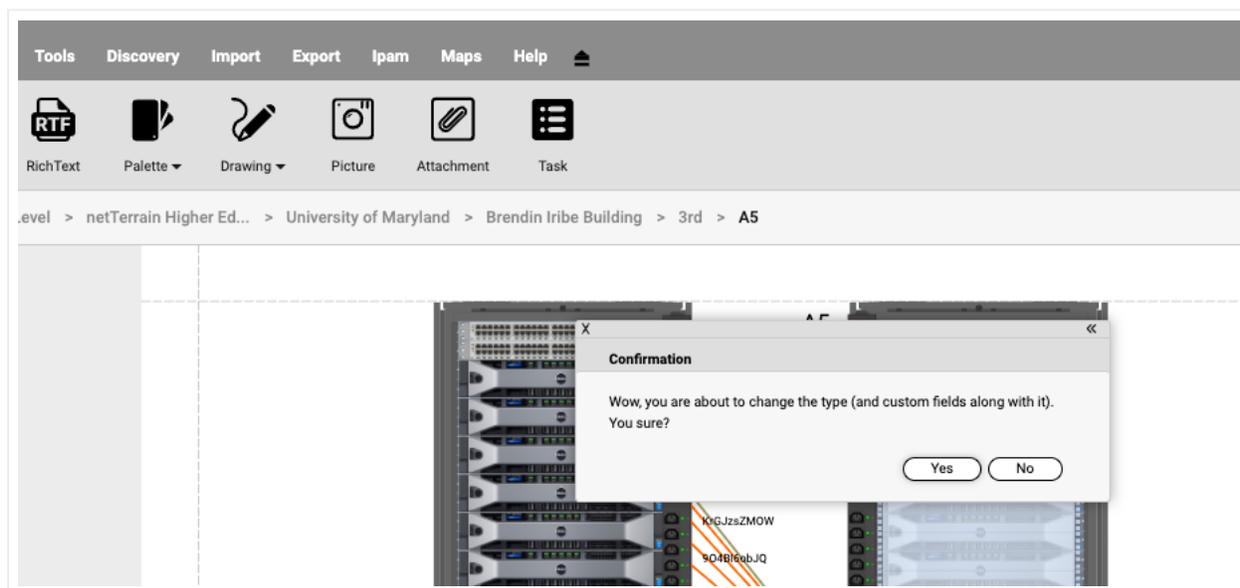
### 6.3.2.1 Changing the type of a device

To change the type of device (make and model) of an existing instance, select the device and change the type from the properties window.



*Changing a device type using the drop down list of device types.*

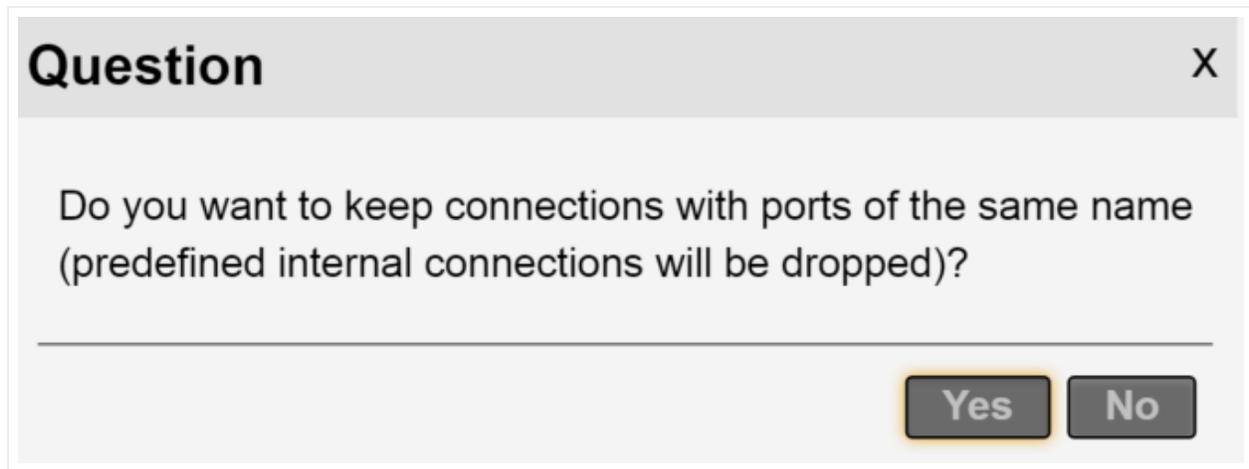
When a device type is changed and has connections you will be presented with a message asking to verify the change (since it may affect several connections).



*Changing a device type*

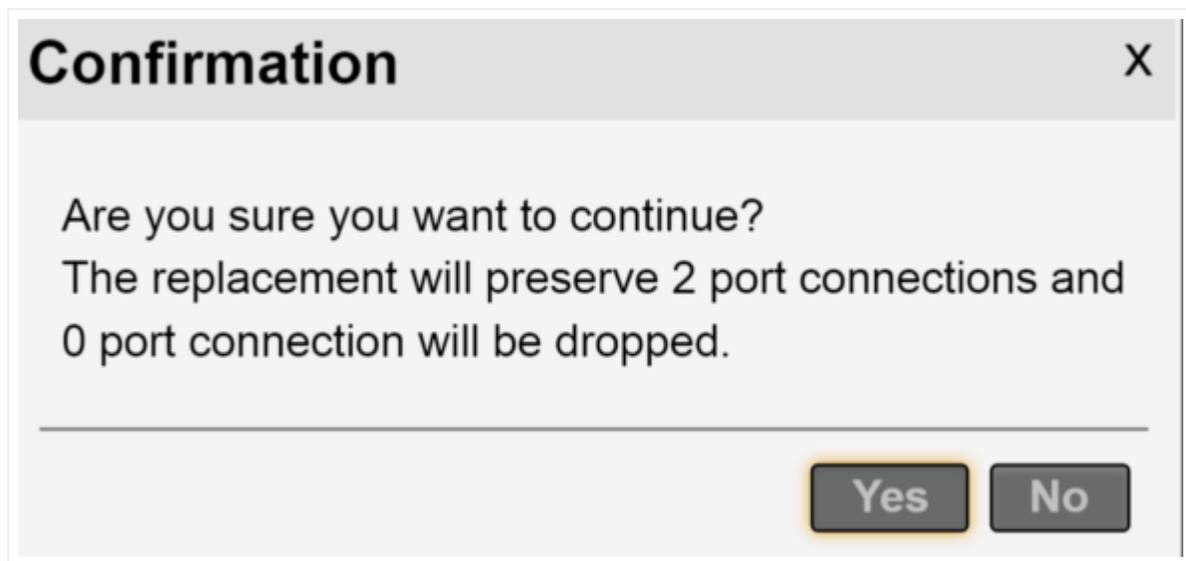
As the make and model changes, so do the underlying slots, and ports. netTerrain does provides some logic to try to preserve the connections, using port names as a reference. If no matching port names exist for a given connection you will be notified of the number connections to be dropped.

Also, as mentioned before, if the data fields are different between the old device type and new device type then those property values will be removed as well.



*Connection preservation dialog box*

If you decide to keep the existing connection(s) then you will see a message box describing how many connections will be preserved.



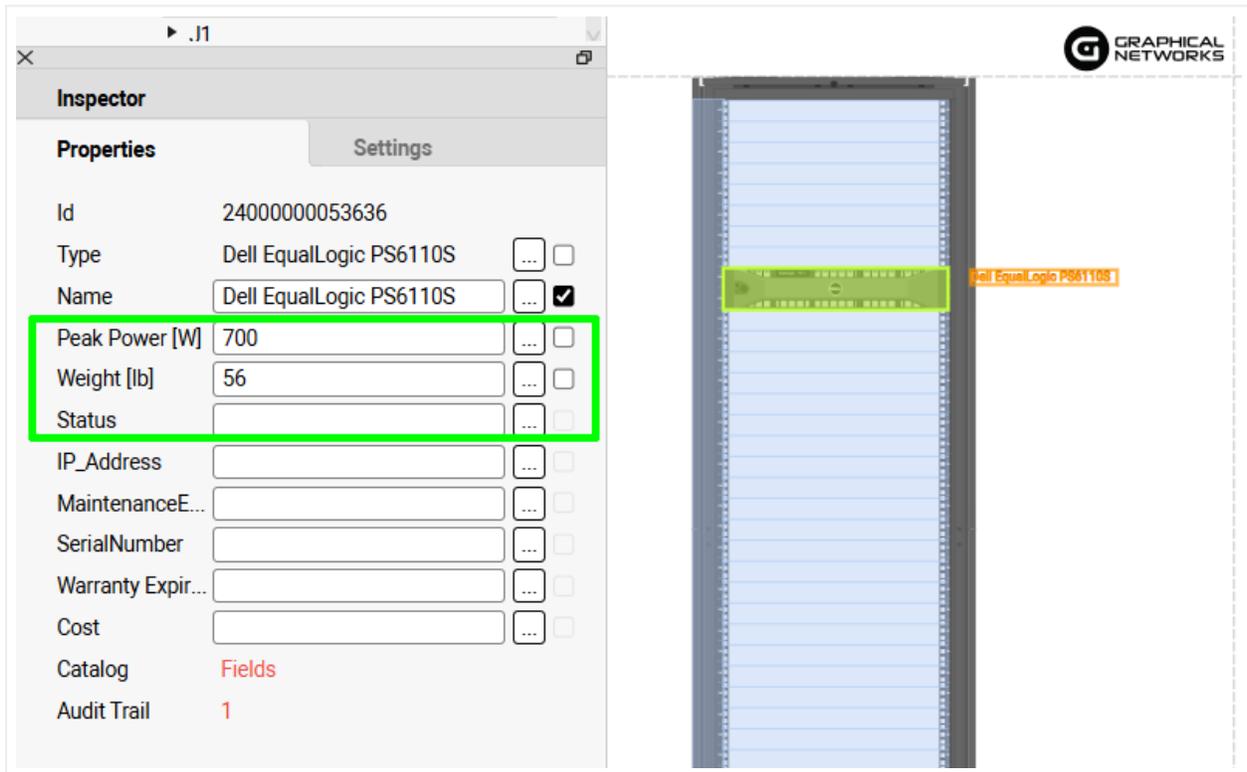
*Connection preservation details*

### 6.3.2.2 Predefined device properties

Devices have three predefined properties (besides the Id, Name and Type) that are inherited from the catalog:

- Peak Power [W]: this is the predefined nameplate power assigned in the device modeler.
- Weight [lb]: this is the predefined static weight capacity assigned in the device modeler.

· Status: this field can be used for monitoring purposes to provide real-time status values.



#### Predefined device fields

As opposed to aggregate functions for racks, these properties can be overridden on an instance-by-instance basis. Also, users can create additional custom fields representing power readings, which can in turn be the result of a discovery or some other importing mechanism.

### 6.3.2.3 Mounting a device on a rack

To mount a device on a rack, drag it to the rack mountable area. You will notice that netTerrain tries to snap the device on the nearest rack unit (provided there is enough space to fit the device).

Once a device is rack mounted, netTerrain flags those units as occupied and aggregates them for proper rack visual override processing.

### 6.3.2.4 Rack mounting using increments of 1/3 of a rack unit

Racks usually allow mounting in increments of 1/3 of rack units. To do that, simply select the device and move it up or down using the arrow keys on your keyboard instead of the mouse.

## 6.4 Device subcomponents: slots, cards and ports

Devices can have three types of subcomponents, which can be viewed by double-clicking on the device icon:

- Slots
- Cards
- Ports

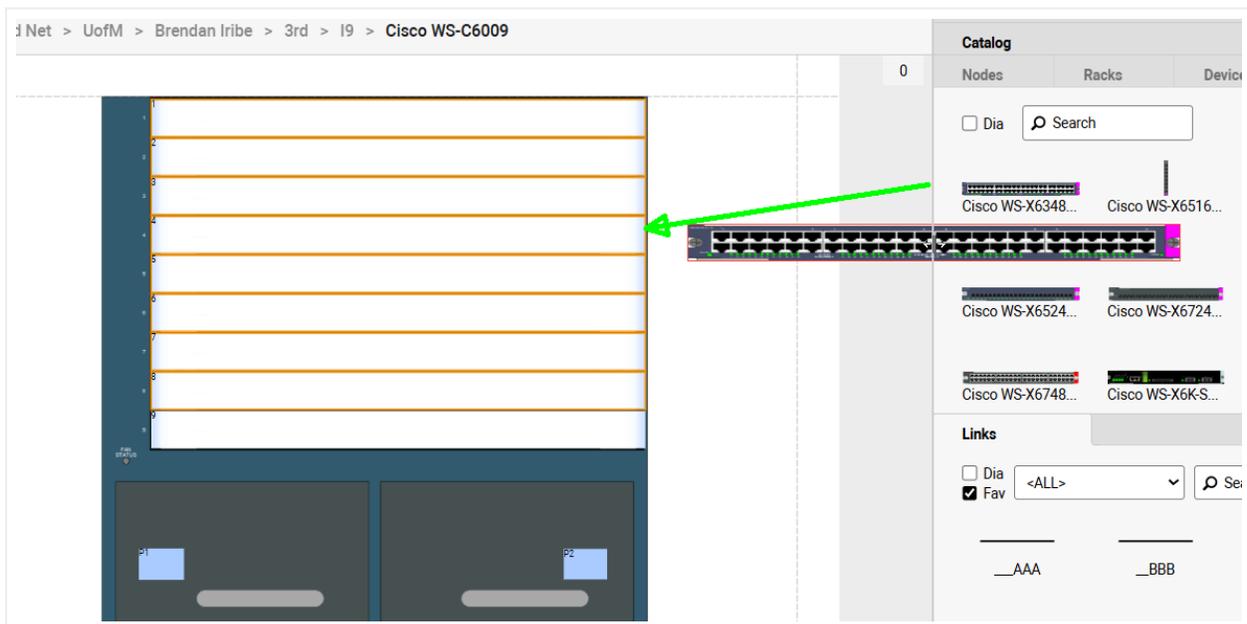
Devices can, of course, contain other nodes which can have anything underneath. Ports can also appear underneath a card or a daughter card, as we saw in the netTerrain hardware model at the beginning of the chapter.

### 6.4.1 Slots and Cards

Slots are placeholders for cards, and they are defined in the catalog, typically on top of the device backplane image. Devices that contain slots are sometimes referred to as modular. Slots cannot be moved or resized for an instance (it wouldn't make much sense to do so, when was the last time you could stretch a card on a router!). Slots that have been mapped to card types in the catalog can be populated with cards. The card types that are available will depend on the catalog setup (see Power User guide).

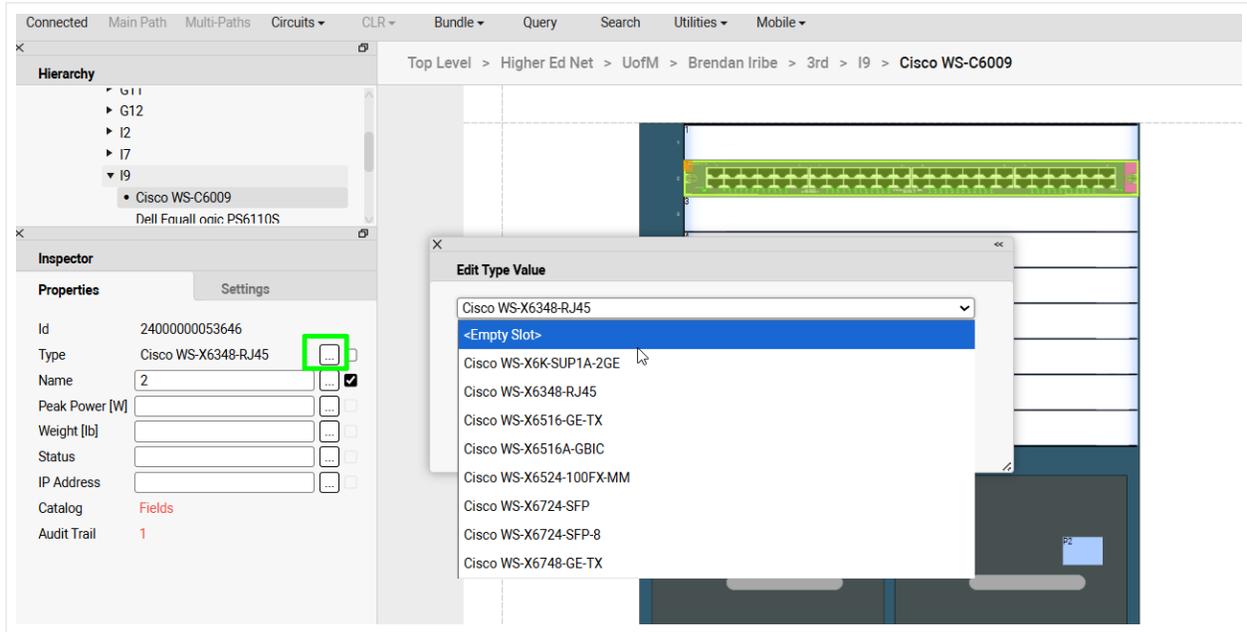
To assign a card to a slot first make sure you go to the device backplane, which is where you find the slots. Notice that now the catalog includes a cards tab. Click on it, and all the cards that have been mapped to the current device type will be populated inside the tab.

Now just drag and drop the desired card type to the slot you want to populate and that's it!



## Populating a slot with a card

To remove a card from a device, you basically just turn it back into a slot, as shown in the image below, using the type `<Empty Slot>`:



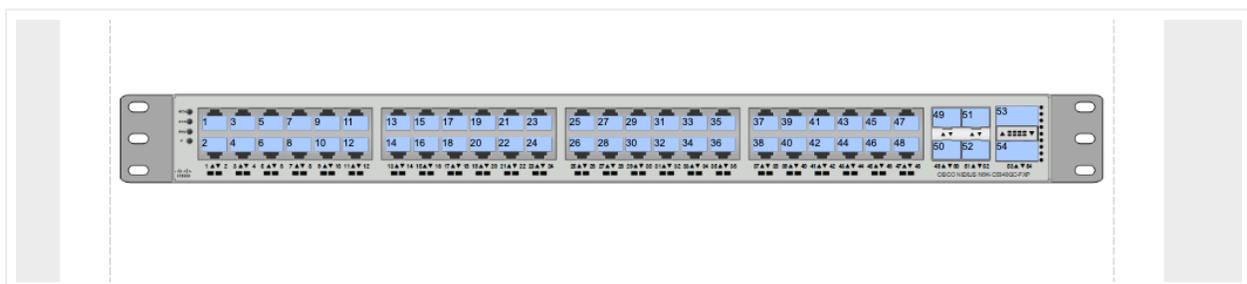
## Turning a card back into an empty slot

Another way to remove the card from the slot is to simply select it, and then press the 'del' key. How easy is that?!

A card is modeled in the catalog pretty much like a device (see power User guide). A card can contain:

- Ports
- A background image
- Other cards (or daughter cards)
- Other nodes

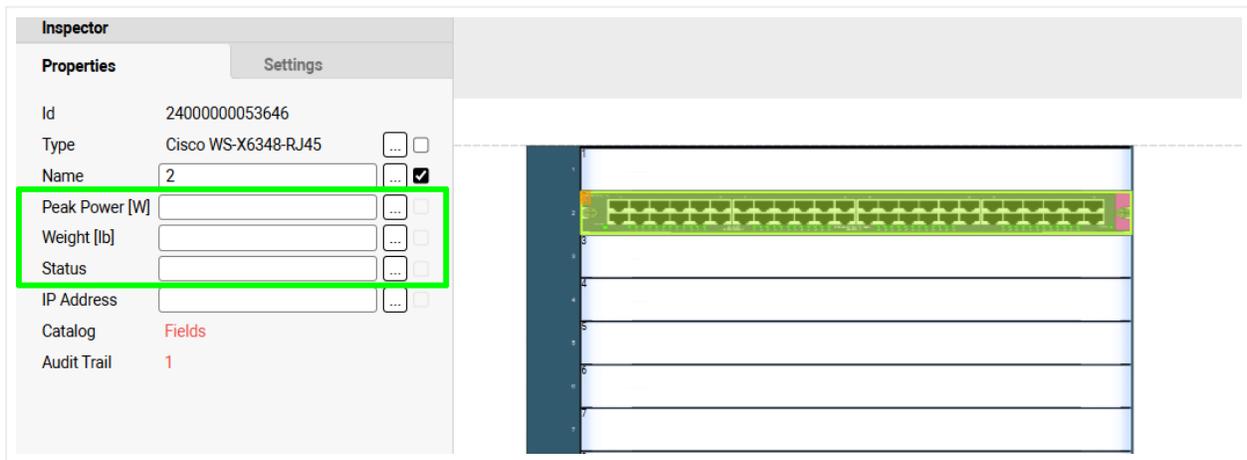
Once a card has been created, its ports are also created automatically, just like with a device. To see the ports and other subcomponents inside a card just double-click on it.



### 6.4.1.1 Predefined card properties

Cards, just like devices, have the same three predefined properties that are inherited from the catalog:

- Peak Power [W]: this is the predefined nameplate power assigned in the card modeler.
- Weight [lb]: this is the predefined static weight capacity assigned in the card modeler.
- Status: property to track real-time status values when using the monitoring capabilities.



#### Predefined card fields

These properties can be overridden on an instance-by-instance basis. Also, users can create additional custom fields representing power readings, which can in turn be the result of a discovery or some other importing mechanism.

### 6.4.1.2 Changing slot positions for a card

Sometimes you need to change the slot position on a card, without losing any connections on it. To do that simply cut and paste the card: select the card and press ctrl-x and then select the destination slot and press ctrl-v (notice how we are not bothering to provide the right-click context options anymore, you are becoming the shortcut guru!).

## 6.4.2 Ports

Ah, the famous ports!

Ports are... well, we know what they are, but from a netTerrain perspective, ports are subcomponents of devices or cards, and they are the last link in the hardware hierarchy since you cannot drill further down.

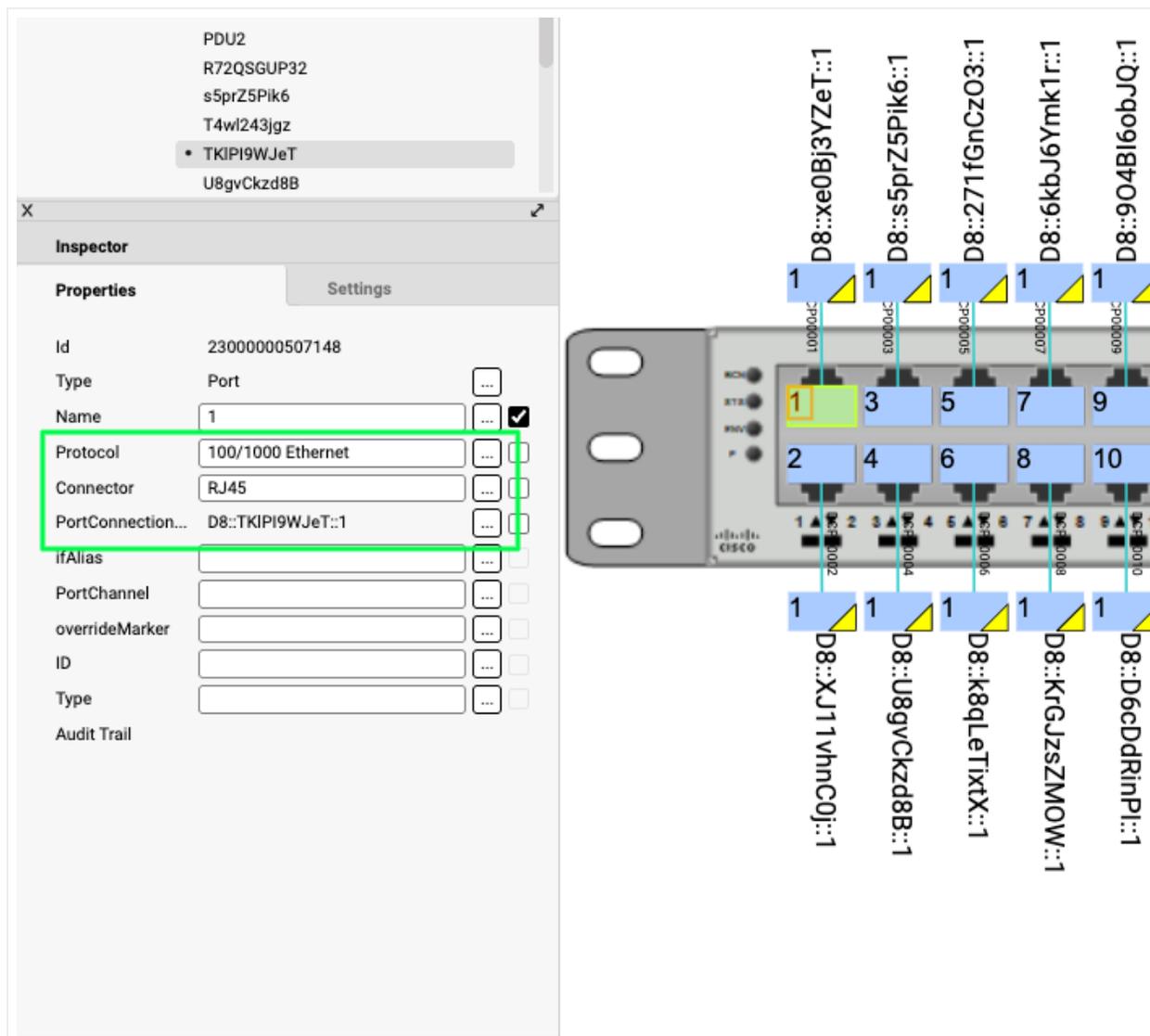
As opposed to devices and cards, ports do not have different types. All ports share the same set of properties and the only thing that can differentiate one from another is some value in some field.

### 6.4.2.1 Port fields

Besides the name itself, ports have the following predefined fields:

- Protocol: this would typically be the layer 1 standard, which is a user defined list (such as Ethernet, RS-232, etc.)
- Connector: the physical connector, which is a user-defined list (RJ45, SC, Power, etc.)
- Status: user-defined list of values (up, down, etc.)
- Slot Name: calculated field which simply reflects the slot position of the containing card. If the port is directly in a device backplane this value is empty

None of the fields are mandatory (Slot Name is not even editable as it is calculated).

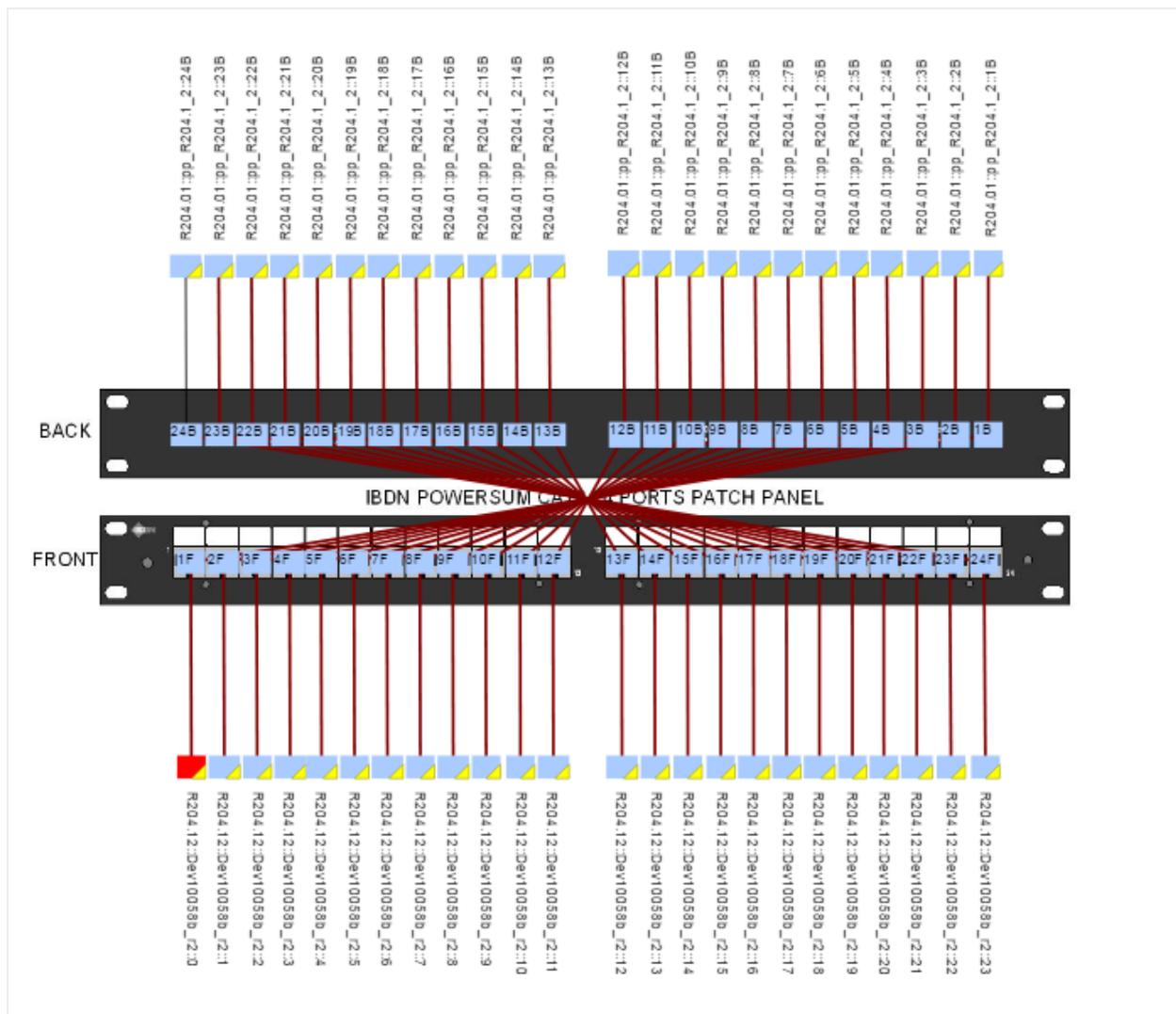


Port fields

## 6.4.2.2 Reference ports

Just as with other objects, any inter diagram link that connects to a port will display the reference port on the other end.

The netTerrain device / card modelers let the power user predefine the position of reference ports on the device and card backplane. This saves the users a lot of time in moving reference ports around to make the diagram look tidy. The image below shows a patch panel that is fully connected where all the reference ports were nicely aligned automatically by virtue of their positions being predefined for that patch panel type in the modeler.



A patch panel with properly arranged reference ports

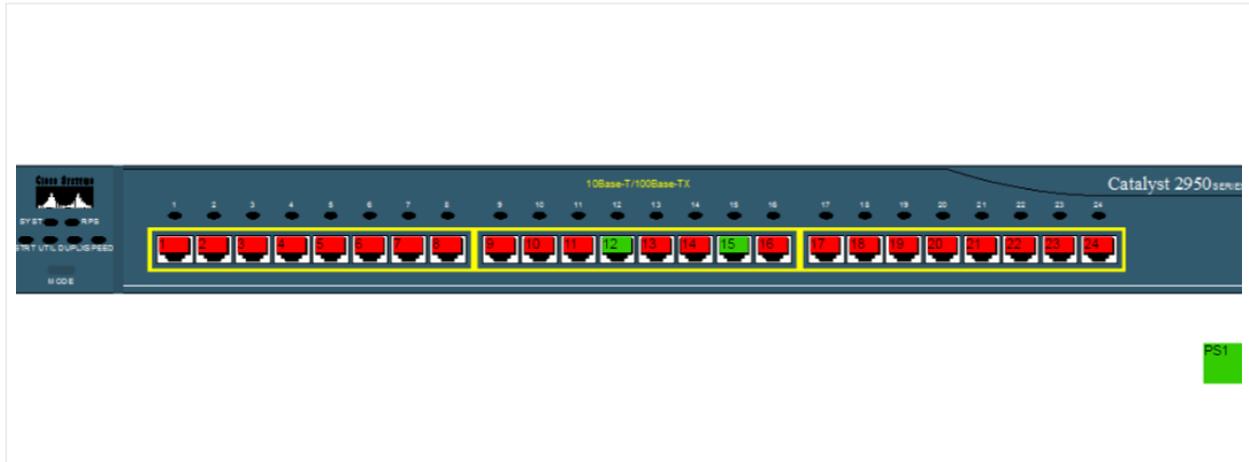
Also notice the displayed fields for the reference ports: they show a full ancestry path specifying the location of the port on the other end of each local port. This can also be automated using an expression in netTerrain that captured the location data for each reference port.

By setting the expression as a default for any custom field, and making that field displayed, every time a connection is made, the full path displayed field shows up automatically. In the example above, we used the expression `$zz_Port_RackDevicePortPath([id])`, which is a predefined expression that ships with netTerrain.

### 6.4.2.3 Port overrides

Just as with any other node type, ports allow overrides simply by setting up a rule for any of its fields. Port overrides are set up by the Power User in the catalog (see Power User guide).

The image below shows a port with overrides based on a field called ifOperStatus.

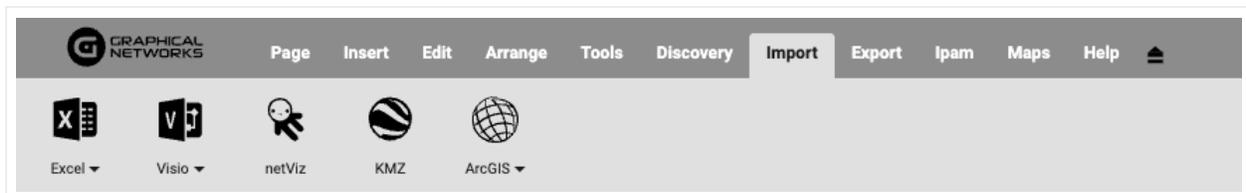


*Port overrides based on operational status*

## 7 Imports and Exports

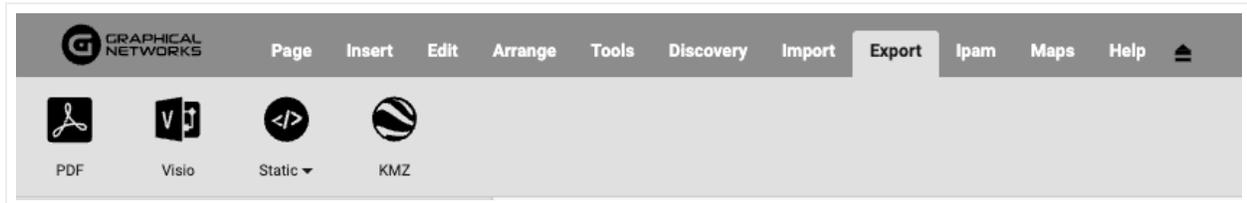
As mentioned earlier in the guide when reviewing the menus, netTerrain includes several bulk import and export features, including:

- and export
- Excel import
- Microsoft Visio import
- netViz import
- KMZ import
- ArcGIS import



### Bulk import menu

- PDF export
- Microsoft Visio import
- Static exports (HTML and PNG)
- KMZ export



### Bulk export menu

For the netViz and Visio imports to work correctly, Visio and netViz need to be installed on the netTerrain application server and properly configured (see Import / Export Guide). KML / KMZ imports will be reviewed in the Outside plant chapter.

## 7.1 Importing netViz projects into netTerrain

Once the netViz importer is set up, end users can import netViz projects into netTerrain.

Considering that netTerrain and netViz differ in many ways, which means that for an optimal import process to work, it is recommended that you first prepare the netViz project and catalog for proper importing.

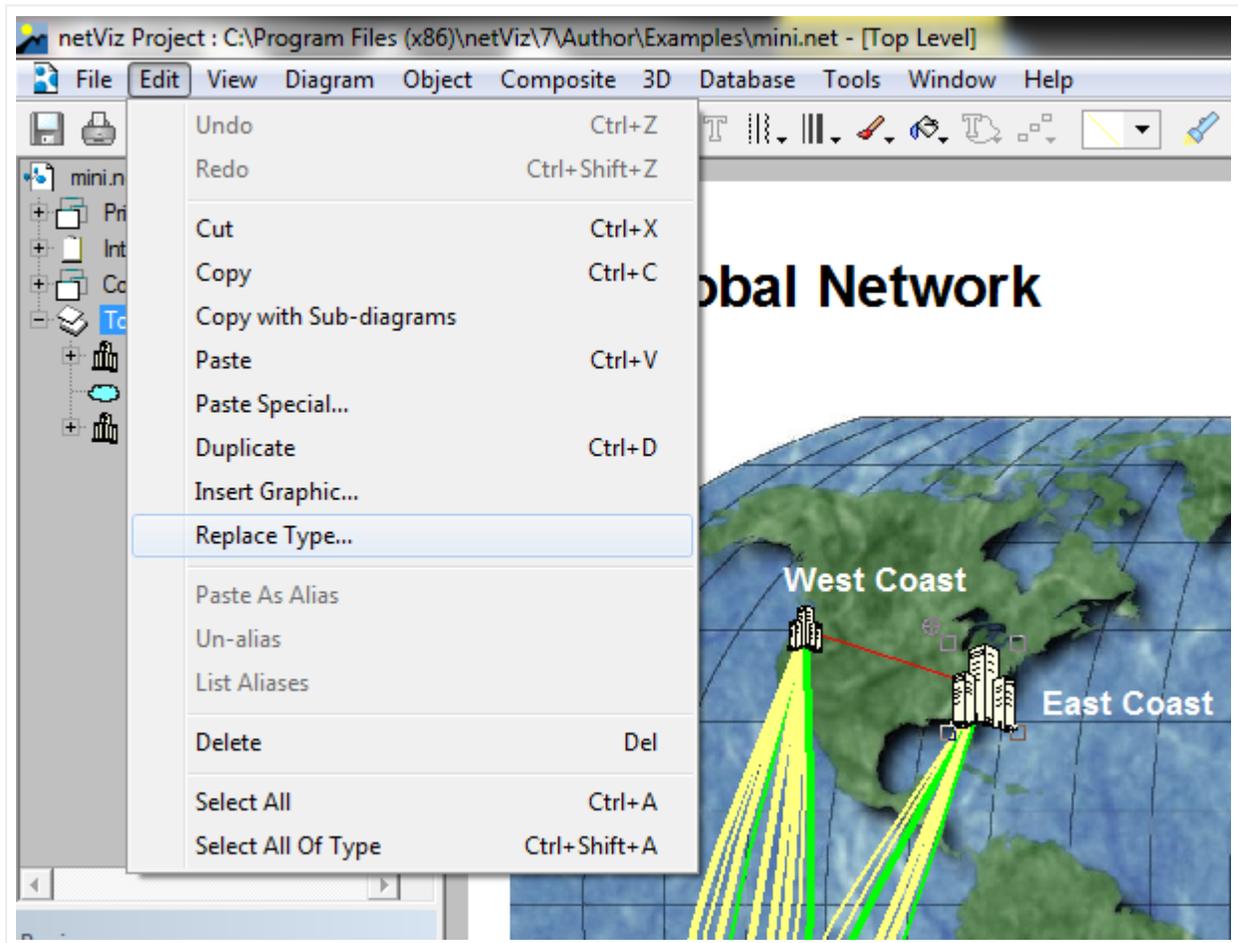
### 7.1.1 Preparing the netViz file for the import process

As mentioned above, because of differences in functionality and business rules it is recommended to properly set up a netViz project before the import process is launched. Follow the steps below to get the most out of your netViz migration.

- 1) Save and compact the netViz project. It is recommended that you use a different name for the project, so you always keep the original.
- 2) Remove print templates and composite views. We cannot import these due to netViz export limitations.
- 3) Check the project for unconnected links (in netViz tools/unconnected links). netTerrain does not allow dangling (unconnected) links. If you find some then they need to be linked or they will not be imported. Create a dummy connection point in the netViz catalog and use this if you need a connection point.

4) Delete any catalog types that are not used unless you want to import the unused catalog objects. To do this in netViz, go to file/catalog/delete types. Then choose the option to delete all unused types. Do this for nodes and links.

5) Combine any nodes or links that have the same name or change the name of these nodes (if you do not change redundant names then some of the nodes and links will be dropped). You can use replace type if needed.



6) Perform a save and compact on the project.

7) F3 to edit the internal catalog. Check all node and link fields. All field names must be unique for each node or link type. Also, if any node or link field is called 'name', 'id' or 'Type' then it should be renamed since these are netTerrain reserved field names.

8) The field that has the name information (blue field in netViz) should be set to be the first field for a node or circuit within the netViz catalog before performing an import. This will ensure a proper name is displayed after import.

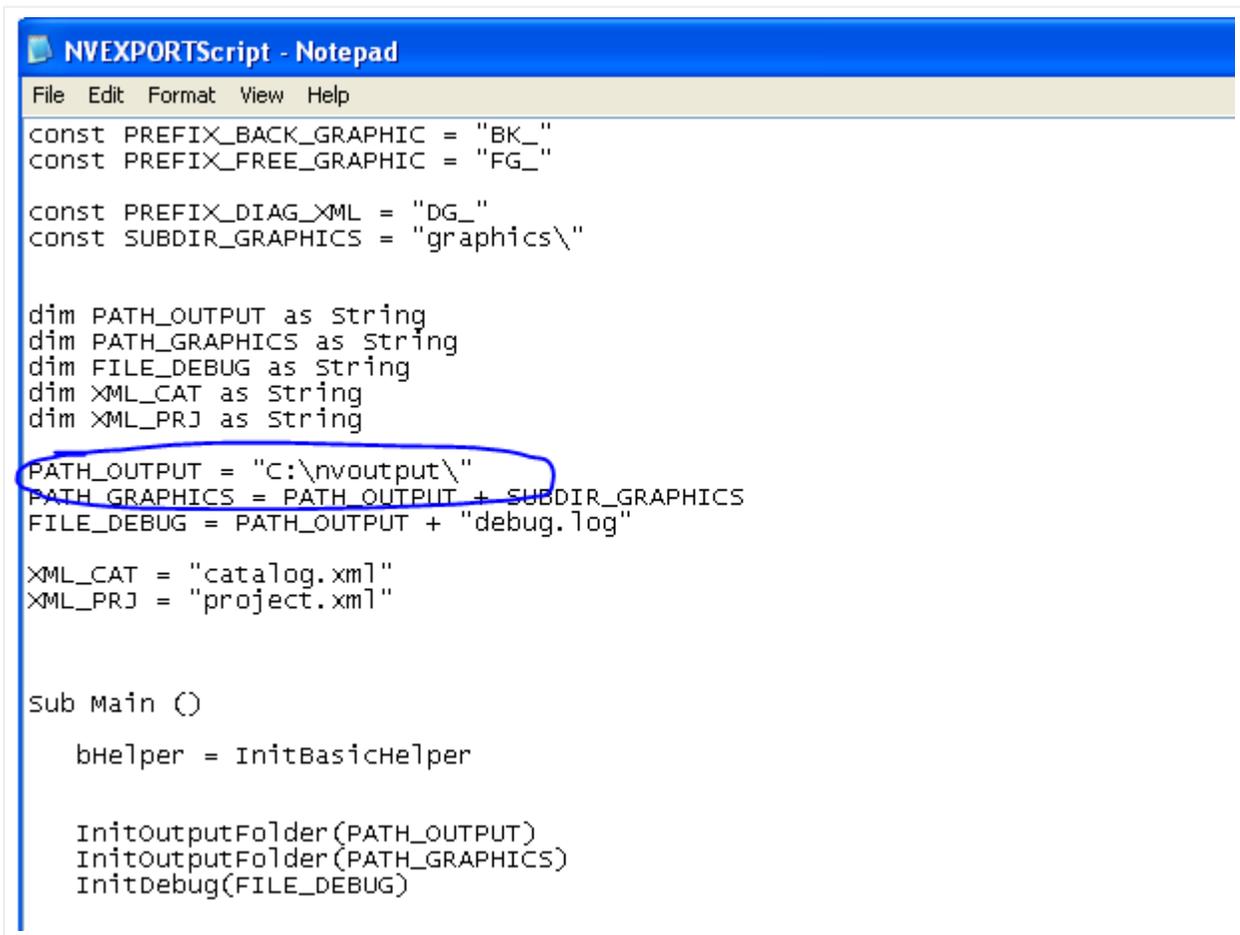
9) Proceed with the netViz import as described below.

## 7.1.2 Manual process for netViz imports

In some cases, when netTerrain cannot launch netViz automatically, a netViz project can be imported in manual fashion. Consider that the following steps require access to the netTerrain application server, in which case you may need to contact the system administrator.

If you have netViz properly set up on the application server, you may skip this section and import netViz projects simply by using the netViz import button.

1) Open the basic script called "NVEXPORTScript.bas" located in the C:\Program Files (x86)\Graphical Networks\netTerrain\Utilities folder with notepad and change the output folder path.



```
Const PREFIX_BACK_GRAPHIC = "BK_"
Const PREFIX_FREE_GRAPHIC = "FG_"

Const PREFIX_DIAG_XML = "DG_"
Const SUBDIR_GRAPHICS = "graphics\"

Dim PATH_OUTPUT as String
Dim PATH_GRAPHICS as String
Dim FILE_DEBUG as String
Dim XML_CAT as String
Dim XML_PRJ as String

PATH_OUTPUT = "C:\nvoutput\"
PATH_GRAPHICS = PATH_OUTPUT + SUBDIR_GRAPHICS
FILE_DEBUG = PATH_OUTPUT + "debug.log"

XML_CAT = "catalog.xml"
XML_PRJ = "project.xml"

Sub Main ()

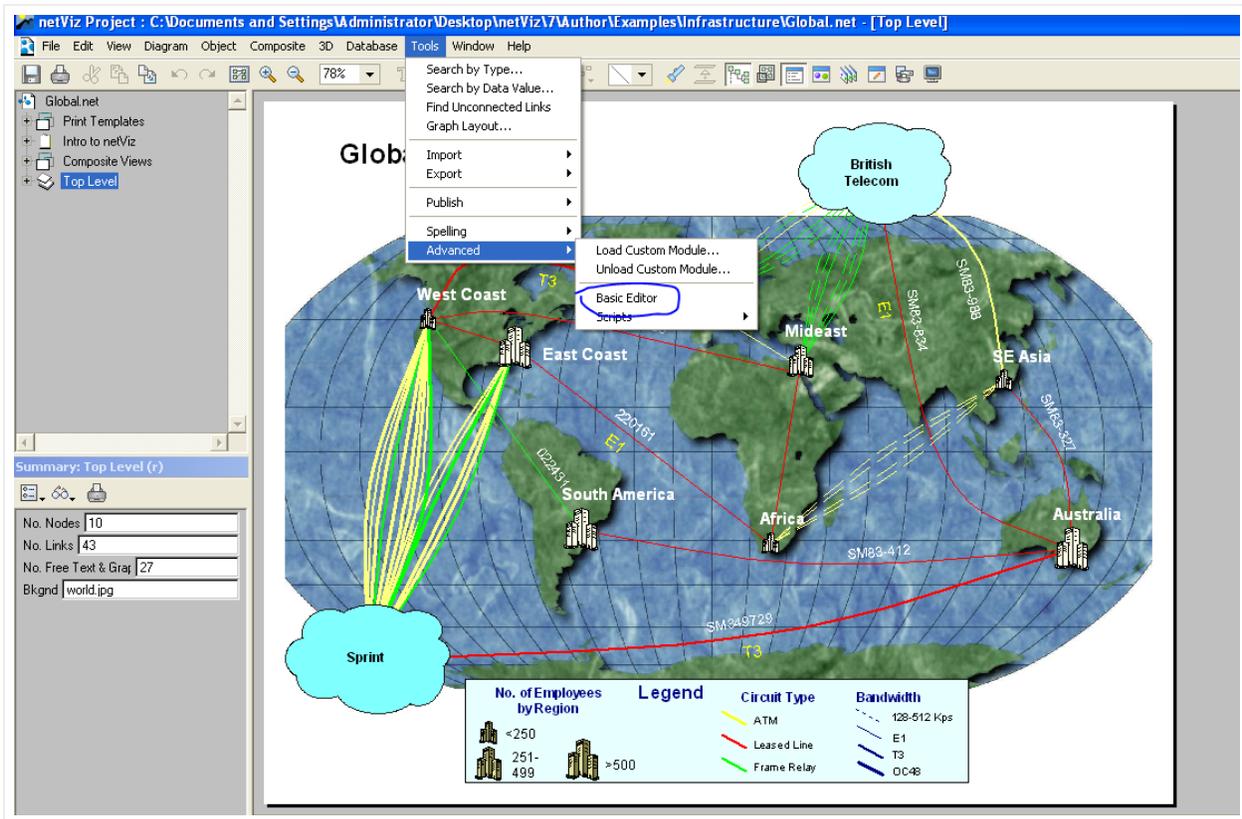
    bHelper = InitBasicHelper

    InitoutputFolder(PATH_OUTPUT)
    InitoutputFolder(PATH_GRAPHICS)
    InitDebug(FILE_DEBUG)
```

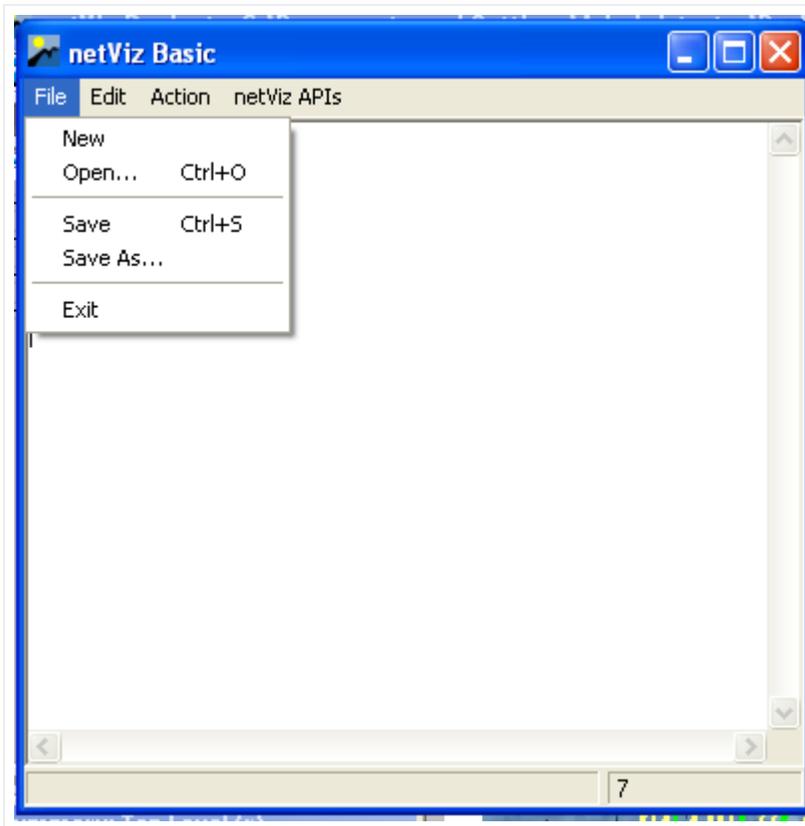
2) Create the output path folder in this instance (called C:\nvoutput).

3) Start netViz and open the project that will be converted.

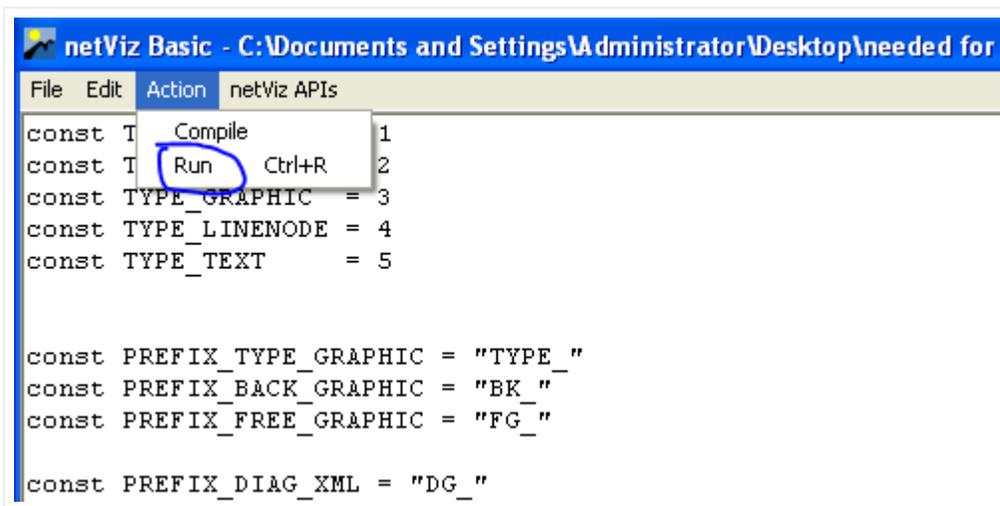
4) Open the Basic Editor feature in netViz.



5) Load the "NVEXPORTscript.bas" module



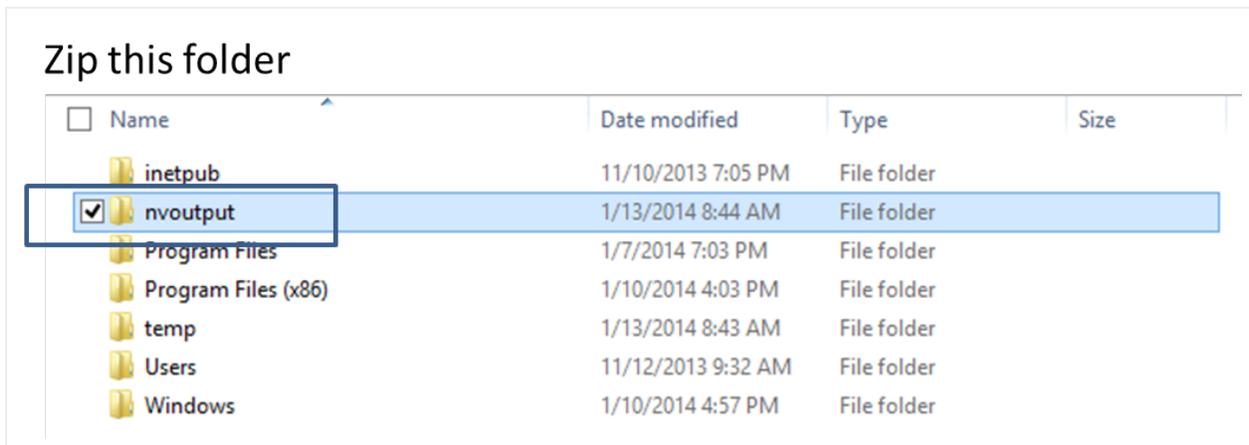
6) Press run



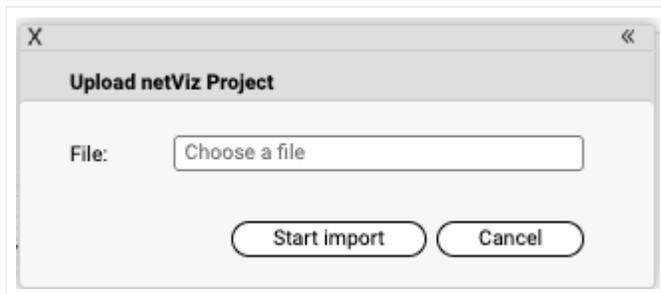
7) After the process is completed, you should see the following message:



8) ZIP up the folder called "nvoutput" (the folder you created on the C drive).

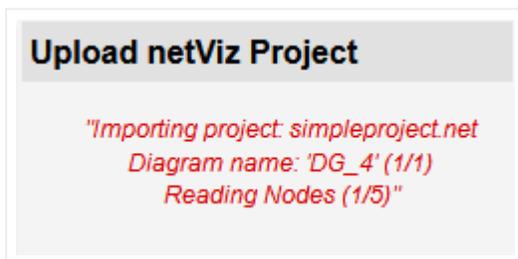


9) Log into the netTerrain server and then press the netViz import button.



10) Proceed to upload the ZIP file.

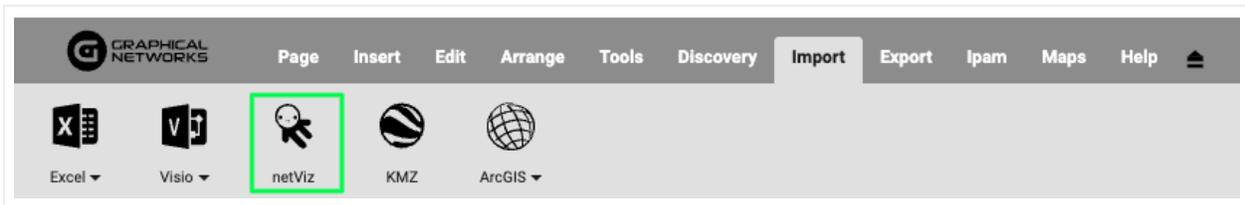
Once you complete these steps, the import process will begin. This process usually imports a few objects per second, so for large projects the import may take several minutes or even hours.



After the import is completed, a green generic node will be placed on the diagram where the import was launched. The node will have the name of the netViz project, and the entire contents of the project will be placed underneath that node.

### 7.1.3 Importing netViz automatically

Log into netTerrain and press the “netViz import” button from the Import & Export menu. Upload a netViz project and wait for the project import to complete. Yeah, that’s it. The tricky part is to get IIS to work in concert with netViz access permissions, as described earlier in the chapter.



*netViz import button*

After the import is completed, a green generic node will be placed on the diagram where the import was launched. The node will have the name of the netViz project and the entire contents of the project will be placed underneath that node.

### 7.1.4 Importing several netViz projects in bulk

This task requires the help of a netTerrain system administrator and assumes the netViz importer is ready for automated imports and was properly set up on the server (see Import / Export guide).

When having to import numerous netViz projects, using the import button method may be inefficient and tedious. netTerrain allows for bulk imports of netViz projects but requires server file access to the webserver to upload netViz projects.

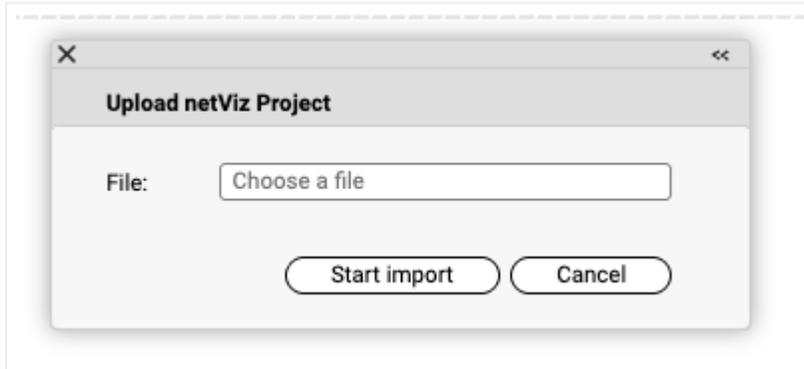
1) Ensure the following setting is present in the web.config file above `</appSettings>`

```
<!-- NetViz import queue.-->  
  
<add key="NetVizImportQueuePath" value="App_Data/netvizque " ></add>
```

2) Add the netViz projects to the folder (or the custom installation folder):

```
_C:\ProgramData\Graphical Networks\netTerrain\vis\App_Data\netvizque_
```

3) From the netTerrain project click on `<ctrl> + <alt> + <q>` to access the netViz queue. Make sure the number of netViz projects matches the number of projects uploaded. Click 'Import' to begin the process.



*netViz import queue*

## 7.1.5 Post import checkup

It is recommended to perform a basic sanity check in netTerrain to check that the netViz projects have been imported in a satisfactory manner.

Perform a catalog node and link comparison between the netViz catalog and the imported netTerrain catalog.

One way to do this is to print the catalog from netViz (`files/summary/catalog/print`). Use this printout to check off each field and verify all fields have been imported. Make sure all visual overrides are available and check the drop-down lists. Currently, drop down lists need to be recreated in netTerrain. If any fields are missing, it is usually because the fields in netViz are repeated.

As a second step, you can check the counters for both netViz and netTerrain. In netTerrain, the counter for nodes and links will be displayed in the diagram properties of the netViz import node sub diagram.

The screenshot shows the 'Inspector' window with two tabs: 'Properties' and 'Settings'. The 'Properties' tab is active and displays a list of object counts. The 'Nodes' entry is highlighted with a green box and has a red value of 25. Other entries include Cabinets (121), Devices (2048), Free Texts (1), Rich Texts (0), Palette Objects (1), Pictures (0), Hidden Objects (151), Circuits (1), and Audit Trail (9).

Object Type	Count
Nodes	25
Cabinets	121
Devices	2048
Free Texts	1
Rich Texts	0
Palette Objects	1
Pictures	0
Hidden Objects	151
Circuits	1
Audit Trail	9

#### *netTerrain node and link counters*

The netViz counters can be obtained by opening the netViz project and then going to Project->Summary. Compare both counters and if they are close enough then the import was successful. It is not uncommon to miss some nodes and links. This is usually due to extra system nodes added in netTerrain and/or dangling links not being imported.

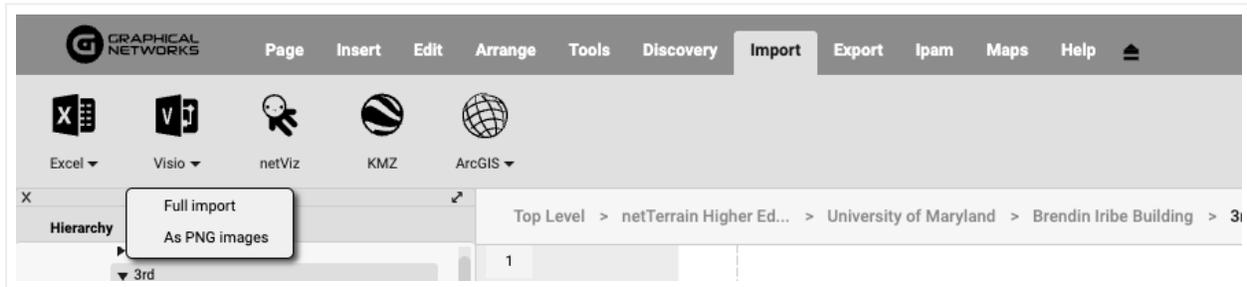
You can also:

Recreate any node and link field drop down lists that were not imported. Drop downs are not imported unless they are visual overrides in netViz.

- 1) Check visual overrides, to be sure they look correct.
- 2) Check link settings to be sure they have the appropriate color.
- 3) Check the nodes to see if any images need to be replaced.
- 4) Check background images for diagrams to see if any need to be replaced.
- 5) Clean up font sizes and positions for nodes and links. "Shape" object displayed fields should be set to the "center".

## 7.2 Importing a Visio project

For Visio imports to work, the import process first needs to be set enabled and configured on the server (see Import / Export guide if you are an administrator). Once the Visio importer has been configured you can import a project from netTerrain directly.



*Visio import button*

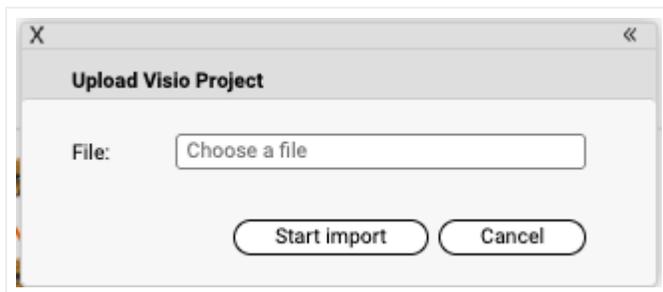
### 7.2.1 Static vs full project imports

There are two ways to import a Visio file: as a static searchable image or as a full project.

Static Visio imports simply convert the contents of each Visio sheet into a static image (no selectable nodes and links). As a bonus, all the attributes for each Visio object are indexed in netTerrain so that you can search for them. However, netTerrain will not pinpoint to the object that matches a search, since it is simply part of a static image, but at least it will take you to the image that contains it.

Full project imports are a lot more elaborate since they do convert the Visio objects into netTerrain nodes and links.

To start an import simply click the on the corresponding Visio import option and you should get a popup prompting you to upload a drawing.



*Uploading a Visio file*

The drawings will be uploaded into the diagram you were in when you pressed the import button, under a top-level Visio icon that bears the name of the Visio project.

Because Visio drawings will not generate smart devices or racks in netTerrain (that concept does not exist in Visio), it is probably better to upload Visio diagrams onto a netTerrain diagram that holds (or will hold) logical data. Better yet, don't use Visio; it's not good for your health.

netTerrain currently only supports .vsd Visio file formats. If the file is larger than 10MB, then IIS may conspire on you and time out. Make sure you configure the settings in the web.config file to allow for large file uploads.

## 7.2.2 Using Visio stencils in the netTerrain catalog

Users can also import Visio stencils using the netTerrain web interface. After logging into the project, you should see a "Visio" icon under the Import & Export menu. Simply click the icon and you should get a popup to upload a stencil file in .vss format.

After the upload completes the stencils will be turned into netTerrain objects in the catalog "nodes" section. Any fields associated with the stencils will also be converted into netTerrain fields.

## 7.3 Exporting diagrams to Visio

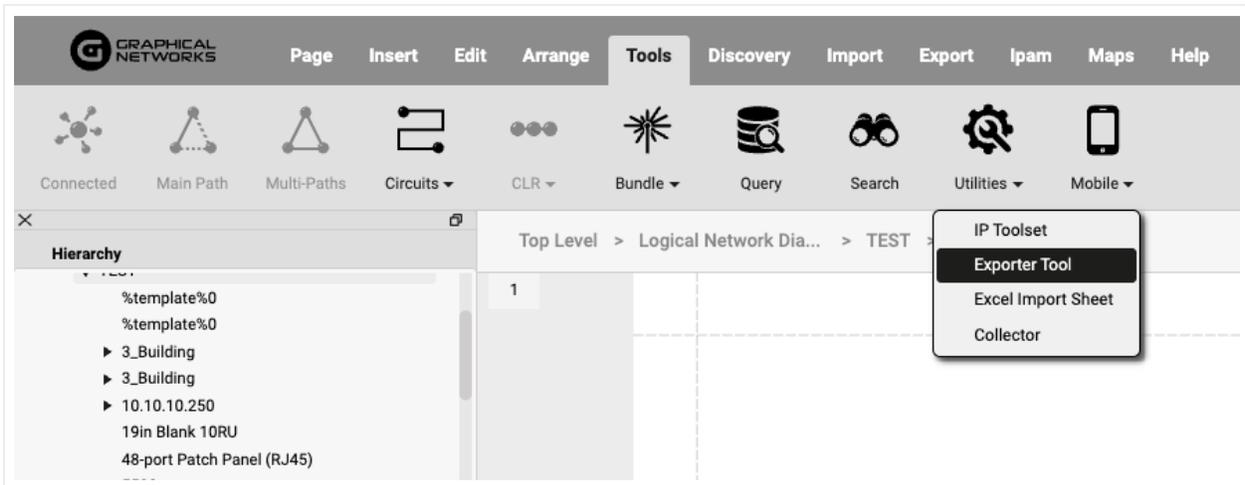
netTerrain gives users the ability to export diagrams to Visio, for the office masochist that also likes to reheat three day old salmon in the office microwave.

### 7.3.1 Server vs client-side exports

Visio export rendering from the application server requires the application to be installed on the server. Often installing the application on the application server is not possible. netTerrain provides an alternative export mechanism where the client renders the Visio export, instead of the server.

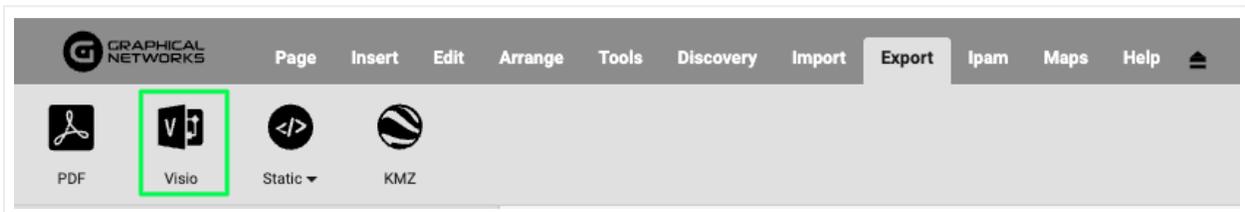
To enable server-side exports, the administrator can enable that setting from the admin console. However, when the server-side exports are disabled, users must download the export utility to take advantage of Visio exports.

To download the Exporter tool, simply go to Tools->Utilities and click on 'Exporter Tool'.



Exporter tool to export to Visio and PowerPoint client-side

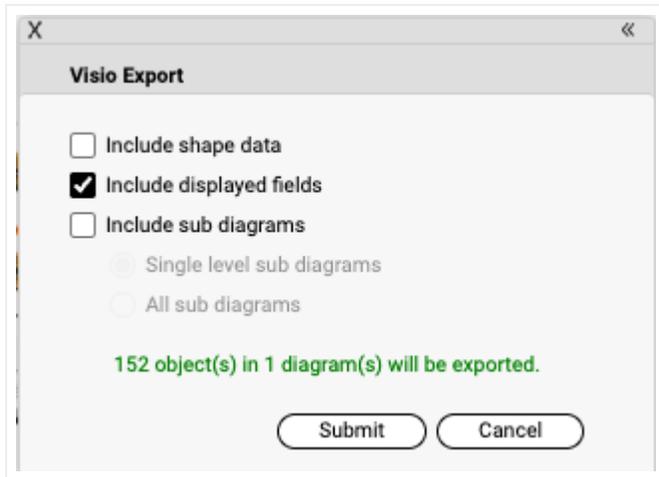
To start the export process to PowerPoint or Visio click on one of the export buttons from the Import & Export menu.



Visio option

### 7.3.2 Visio export options

After clicking on the Visio export button, a dialog showing export options will be displayed, as shown below in the Visio export example:



### *Visio export options*

The following options are available when exporting Visio files:

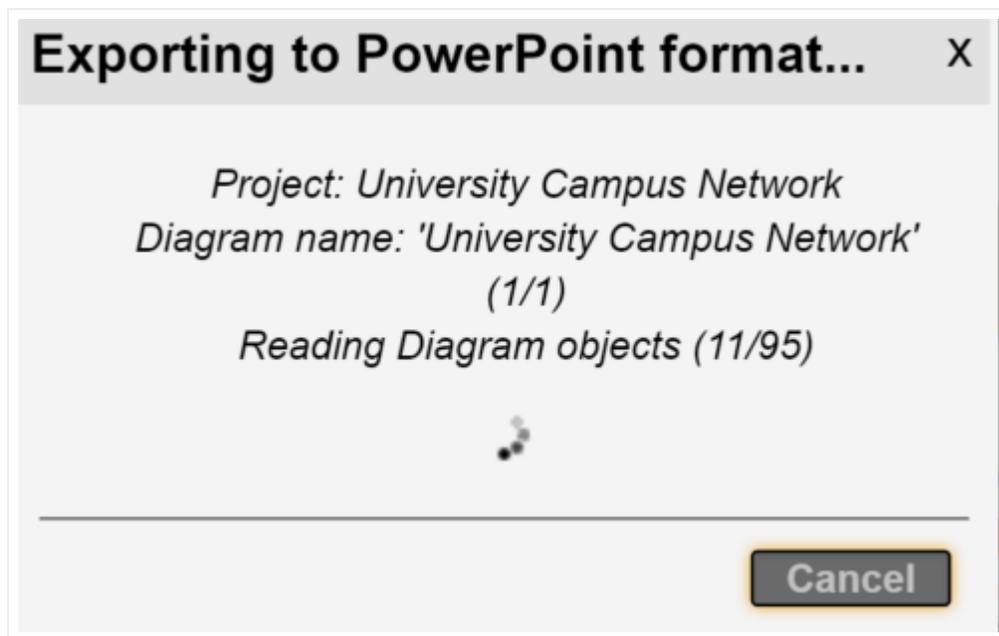
- Include Shape Data: exported objects from diagrams will include all field data in the exported Visio diagrams.
- Include displayed fields, which means that any displayed data in the diagram will also be Visio export.
- Include sub diagrams, which will export child diagrams to individual Visio sheets depending on the sub diagram options that are checked. These are:
  - Single level sub diagram, which exports the immediate level below.
  - All sub diagrams exports, which, well, you guessed it, exports everything.

Note that the “all sub diagrams” option can take a very long time to process and is not recommended for large sets of diagrams. If your boss really must see the entire collection of diagrams then get ready for a really long coffee break (or better yet, give him access to netTerrain, it’s a much better app anyways).

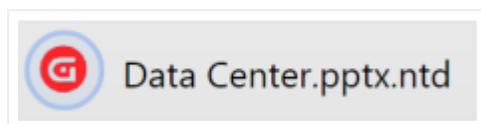
If the file is rendered on the server the file will be made available for download by a server process.

## 7.3.3 Exporting and fetching the files

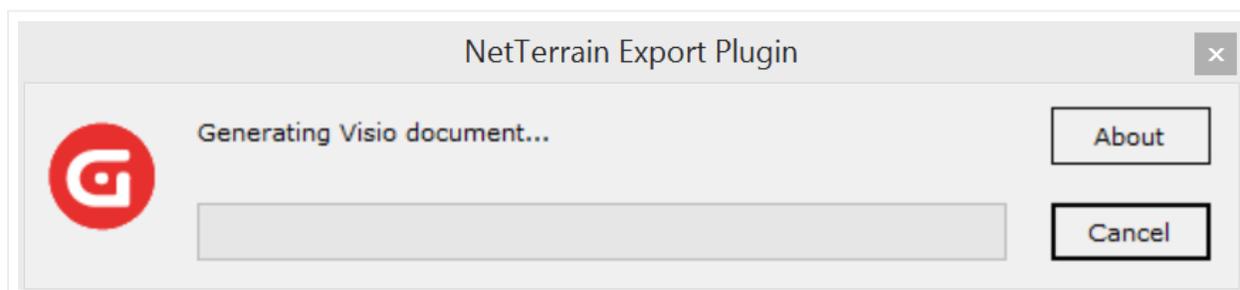
After clicking on ‘Submit’, the Visio or PowerPoint export process commences.



If the export is enabled on the client side, an .ntd extension file indicates that the process is ready for local rendering.



After you double click on the .ntd file extension netTerrain starts the rendering process.



When the process is complete the file should automatically open.

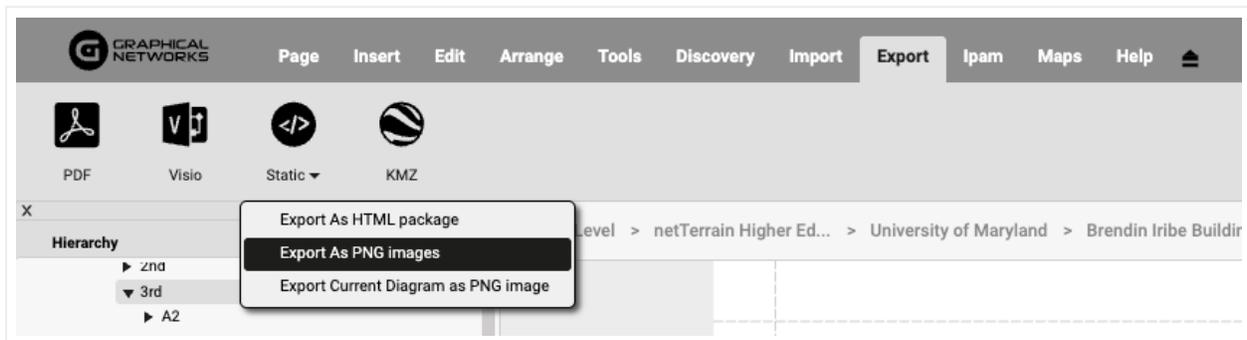
## 7.4 Static exports: HTML and PNG

Sometimes you may need to create a static output for a netTerrain diagram that does not require any specific application to run. For that purpose, we introduced HTML and PNG exports as a mechanism to one or multi diagrams to a format that can be opened with a browser or an image viewer. An additional advantage of these methods is that it does not require any specific set up on the netTerrain server.

## 7.4.1 Exporting to static HTML

netTerrain diagrams are already in HTML5 format, so why this export option? Native netTerrain diagrams may be HTML, but you need to be connected to the netTerrain server to view them. Sometimes you may have a user that needs to look at a diagram without being connected to netTerrain. This is what this export feature is for.

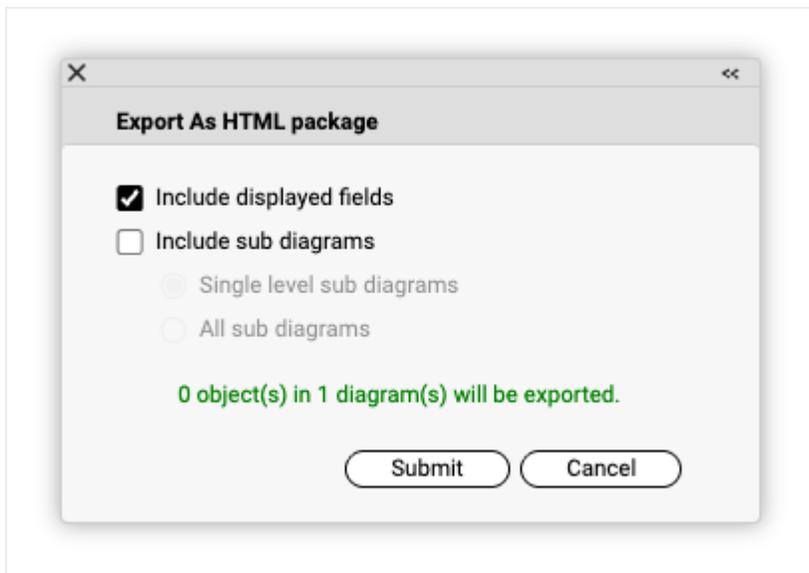
To start the export process to HTML, click on the 'Static' button on the Import & Export toolbar and select the 'Export as HTML package' option.



*HTML package export*

### 7.4.1.1 HTML export options

After clicking on the HTML export sub menu, a dialog showing export options will be displayed, as shown below:



## HTML export options

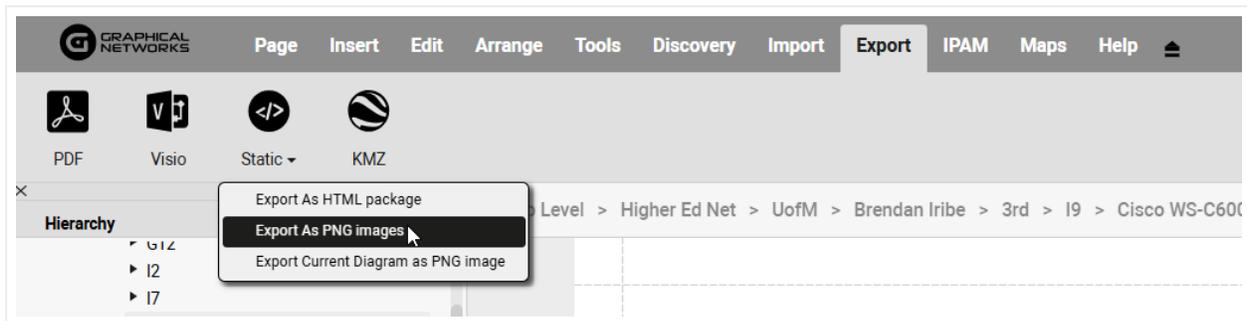
The following options are available when exporting to an HTML package:

- Include displayed fields, which means that any displayed data in the diagram will also be in the exported HTML diagrams.
- Include sub diagrams, which will export child diagrams to individual HTML pages (hence the name HTML package) depending on the sub diagram options that are checked. These are:
  - Single level sub diagram, which exports the immediate level below.
  - All sub diagrams exports, which, well, you guessed it, exports everything.

Note that the “all sub diagrams” option can take a very long time to process and is not recommended for large sets of diagrams. If your boss really must see the entire collection of diagrams, then get ready for a long coffee break.

## 7.4.2 Exporting to PNG

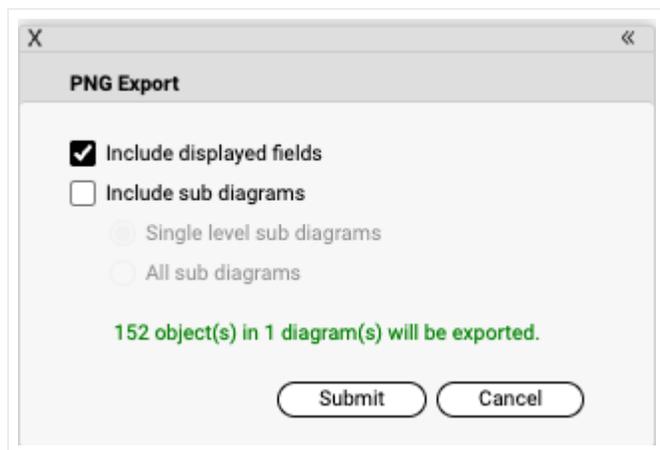
To start the export process to PNG, click on the ‘Static’ button on the Import & Export toolbar and select one of the PNG export options.



### HTML package export

#### 7.4.2.1 PNG export options

The first option of the highlighted sub menu above can export multiple diagrams in PNG format:



### *PNG package export options*

The following options are available when exporting to a PNG package:

- Include displayed fields, which means that any displayed data in the diagram will also be in the exported PNG diagrams.
- Include sub diagrams, which will export child diagrams to individual PNG files. These are:
  - Single level sub diagram, which exports the immediate level below.
  - All sub diagrams exports, which, well, you guessed it, exports everything.

The second option of the highlighted sub menus in the Static export button exports the current diagram only.

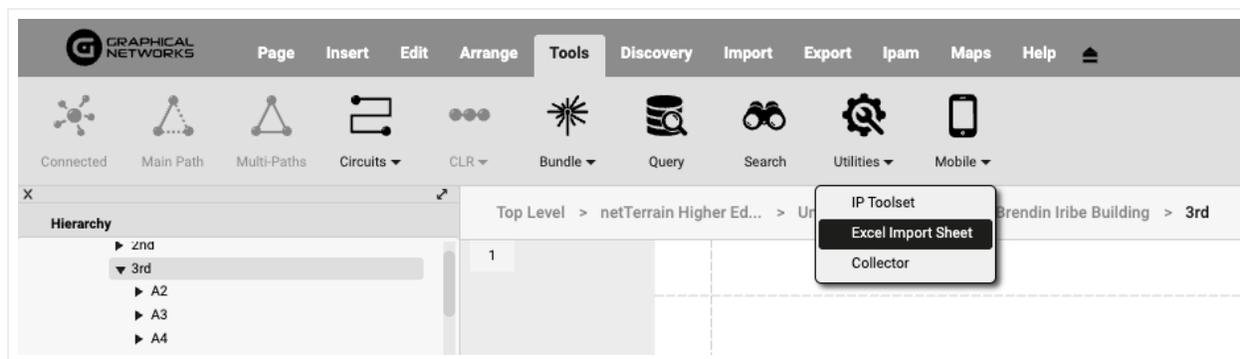
## 7.5 Importing data from Excel

This section covers the process and techniques required for importing devices, nodes and other objects into the netTerrain project using the Excel bulk import spreadsheet. The Excel bulk import can be used for inserting new objects as well as updating existing nodes.

### 7.5.1 Obtaining the Excel import sheet

The Excel import sheet can be downloaded directly from netTerrain if the administrator has enabled downloads from the netTerrain page.

Simply log into netTerrain, go to the Tools ribbon, and click on the Tools menu option. You can also go to the 'Import' ribbon and click on the Excel Package Import button. If the Excel import sheet download has been enabled by the admin, then you should be able to download the template excel import sheet directly.



### *Excel import sheet download*

If the administrator disabled the direct download of the Excel template, you must request from the administrator directly.

If you are the administrator, the spreadsheet can be found in the web installation directory of netTerrain. The default directory is: C:\ProgramData\Graphical Networks\netTerrain\vis. There should be a BulkImport.xls file in the base folder. This file must be used for the Excel import and should be copied and then modified. The file may be renamed.

#### **Attention!**

It is important that you maintain the existing format of the BulkImport.xls file and preserve its compatibility level; otherwise, the Excel importer may not be able to process its contents.

## 7.5.2 Excel import worksheets

The bulk import spreadsheet contains four worksheets:

- Objects: creates new node or updates existing ones in the netTerrain project. Devices and cards are also allowed.
- Links: creates new links in the netTerrain project
- Subnets: creates subnets in bulk for the IPAM functionality

### Attention!

You cannot generate catalog devices using the Excel spreadsheet. However, we support a large catalog of pre-modeled devices. If there are devices you would like to see modeled, please contact us at [support@graphicalnetworks.com](mailto:support@graphicalnetworks.com). As part of maintenance we can model any types for you. Of course, our training and certifications also teach you how to do this in our device type modeler.

## 7.5.3 Objects

This worksheet is used for creating and updating nodes, devices and cards in the netTerrain project.

	A	B	C	
1	<b>Name</b>	<b>Type</b>	<b>ParentNode</b>	
2	Alpha	Building	Excel Import	{Latitude}4
3	1st	Floor	Alpha	{Comment:
4	101	Room	Alpha>1st	
5	R1	42d	Alpha>1st>101	
6	PP1	Corning CCH-04U (empty)	Alpha>1st>101>R1>Back{20}	
7	A	Generic Vertical 12 port card (LC Ports)	Alpha>1st>101>R1>PP1>A	
8	B	Generic Vertical 12 port card (LC Ports)	Alpha>1st>101>R1>PP1>B	
9	C	Generic Vertical 12 port card (LC Ports)	Alpha>1st>101>R1>PP1>C	
10	R10987655	Juniper MX80-48T-AC	Alpha>1st>101>R1>Front{10}	{IP_Addres
11	Bentley	Building	Excel Import	{Latitude}3
12	1st	Floor	Bentley	
13	101	Room	Bentley>1st	

*Objects worksheet*

The columns include:

- Name: mandatory field that represents the name of the object
- Type: mandatory field that identifies the type associated with the object. Once a type is defined, the custom fields in the spreadsheet will correspond to the custom fields associated with that object type in the netTerrain catalog
- ParentNode: the name of the parent node containing this object. If this field is blank, the new object will be placed on the 'Top Level' diagram.
- Fields: the custom fields associated with the type of the object. The import process does not require you to put specific custom values in specific fields in the spreadsheet, instead, you simply need to add the netTerrain custom field name as a prefix in brackets. In the example below, the nodes 'Alpha' and '1st' have custom fields 'Latitude', 'Longitude' and 'Comments' which can be populated by specifying the netTerrain custom field names in brackets:

A	B	C	D	E
<b>Name</b>	<b>Type</b>	<b>ParentNode</b>		
Alpha	Building	Excel Import	{Latitude} 40.4851	{Longitude} -78.7247
1st	Floor	Alpha	{Comments} 1500 Sq Feet	
	101 Room	Alpha>1st		
R1	42d	Alpha>1st>101		

*Pointing to the proper netTerrain custom fields using brackets*

### 7.5.3.1 Assigning cards to a device slot

Before assigning cards to devices through the bulk import process make sure the card types that you will use have been modeled and mapped to the device type and device's modeled slots in the netTerrain catalog.

Let's assume we have a device type called 'deviceTypeName' which has been modeled with slots named 'S1', 'S2', and 'S3'. We now want to assign the card types 'Card101', 'Card202' and 'Card303' to 'S1', 'S2', and 'S3' respectively. We can accomplish this type of import by using angle brackets '>'.

The format for 'ParentNode' is as follows:

'Project Object Name>Slot Name'

	A	B	C	D
1	<b>Name</b>	<b>Type</b>	<b>ParentNode</b>	
2	Alpha	Building	Excel Import	{Latitude}40.4851
3	1st	Floor	Alpha	{Comments} 1500
4	101	Room	Alpha>1st	
5	R1	42d	Alpha>1st>101	
6	PP1	Corning CCH-04U (empty)	Alpha>1st>101>R1>Back{20}	
7	A	Generic Vertical 12 port card (LC Ports)	Alpha>1st>101>R1>PP1>A	
8	B	Generic Vertical 12 port card (LC Ports)	Alpha>1st>101>R1>PP1>B	
9	C	Generic Vertical 12 port card (LC Ports)	Alpha>1st>101>R1>PP1>C	
10	R10987655	Juniper MX80-48T-AC	Alpha>1st>101>R1>Front{10}	{IP_Address}10.0.1
11	Bentley	Building	Excel Import	{Latitude}39.2813
12	1st	Floor	Bentley	
13	101	Room	Bentley>1st	

Example of card assigned to parent device

#### Attention!

Make sure the order of appearance of records in the spreadsheet follows the natural hierarchy associated with the objects. For example, if a card is associated to a specific device, make sure the device was created first. A common mistake is referring to a parent node which has not yet been created.

### 7.5.3.2 Mounting devices on racks

To mount a device on a rack, you must provide the rack unit number at the end of the hierarchy path of each device to be rack mounted. In the example below, a Corning CCH-04U device is mounted in position 20 in a rack that has front and back views. If you want to mount the device on the back of the rack, simply prepend the name of the back container (usually named 'back') to the rack position, such as 'Back{20}'.

PP1	Corning CCH-04U (empty)	Alpha>1st>101>R1>Back{20}
-----	-------------------------	---------------------------

### 7.5.4 Links

This worksheet is used for creating links in the netTerrain project.

	A	B	C	D	E
1	Name	Type	Node1	Node2	
17	Fast Ethernet 6	Ethernet	Alpha>1st>101>R1>R10987655>6	Franklin>1st>101>R1>8934jue8>6	
18	Fast Ethernet 7	Ethernet	Alpha>1st>101>R1>R10987655>7	Franklin>1st>101>R1>8934jue8>7	
19	Fast Ethernet 8	Ethernet	Alpha>1st>101>R1>R10987655>8	Franklin>1st>101>R1>8934jue8>8	
20	Fast Ethernet 9	Ethernet	Alpha>1st>101>R1>R10987655>9	Franklin>1st>101>R1>8934jue8>9	
21	Fast Ethernet 10	Ethernet	Alpha>1st>101>R1>R10987655>10	Franklin>1st>101>R1>8934jue8>10	
22	Fast Ethernet 11	Ethernet	Alpha>1st>101>R1>R10987655>11	Franklin>1st>101>R1>8934jue8>11	
23	Fast Ethernet 12	Ethernet	Alpha>1st>101>R1>R10987655>12	Franklin>1st>101>R1>8934jue8>12	
24	Fast Ethernet 13	Ethernet	Alpha>1st>101>R1>R10987655>13	Franklin>1st>101>R1>8934jue8>13	
25	Fast Ethernet 14	Ethernet	Alpha>1st>101>R1>R10987655>14	Franklin>1st>101>R1>8934jue8>14	
26	Fast Ethernet 15	Ethernet	Alpha>1st>101>R1>R10987655>15	Franklin>1st>101>R1>8934jue8>15	
27	Fast Ethernet 16	Ethernet	Alpha>1st>101>R1>R10987655>16	Franklin>1st>101>R1>8934jue8>16	
28	Fast Ethernet 17	Ethernet	Alpha>1st>101>R1>R10987655>17	Franklin>1st>101>R1>8934jue8>17	
29	Fast Ethernet 18	Ethernet	Alpha>1st>101>R1>R10987655>18	Franklin>1st>101>R1>8934jue8>18	
30	Fast Ethernet 19	Ethernet	Alpha>1st>101>R1>R10987655>19	Franklin>1st>101>R1>8934jue8>19	
31	Fast Ethernet 20	Ethernet	Alpha>1st>101>R1>R10987655>20	Franklin>1st>101>R1>8934jue8>20	
32	Fast Ethernet 21	Ethernet	Alpha>1st>101>R1>R10987655>21	Franklin>1st>101>R1>8934jue8>21	
33	Fast Ethernet 22	Ethernet	Alpha>1st>101>R1>R10987655>22	Franklin>1st>101>R1>8934jue8>22	

### Links worksheet

The columns include:

- Name: mandatory field that represents the name of the link
- Type: mandatory field that identifies the type associated with the link. Once a type is defined, the custom fields in the spreadsheet will correspond to the custom fields associated with that node type in the netTerrain catalog
- Node1: mandatory field identifying the name of the starting node or device.
- Node2: mandatory field identifying the name of the ending node or device
- Fields: the custom fields associated with the type of the link, which work just like the case with objects specified above.

## 7.5.4.1 Creating links between ports

Sometimes you need to create links between ports. This creates an additional naming convention challenge because ports are usually just named based on their sequential port number. Naturally, in such a case just using the port name to identify endpoints would be a problem since many ports with the same number might exist in the project.

To overcome this, you can identify ports by appending the device ancestry information in both the Node1 and the Node2 columns:

```
Device Name>Port Name
```

For instance, let's say we have a device called 'myDeviceName' with two ports 'P1' and 'P2' and another one called 'myOtherDevice' also with two ports 'P1' and 'P2'

To link both 'P1' ports together and the 'P2' ports together we could format the Node1 and Node2 columns like indicated below:

	A	B	C	D
1	<b>Name</b>	<b>Type</b>	<b>Node1</b>	<b>Node2</b>
2	MyFirstLink	LinkTypeNameHere	myDeviceName>P1	myOtherDevice>P1
3	MySecondLink	Logical	myDeviceName>P2	myOtherDevice>P2

#### Creating links between ports

In a similar fashion we can embed and concatenate card information in our endpoint columns, such as the example below:

	A	B	C	D
1	<b>Name</b>	<b>Type</b>	<b>Node1</b>	<b>Node2</b>
2	MyFirstLink	LinkTypeNameHere	myDeviceName>Card1>P1	myOtherDevice>P1
3	MySecondLink	Logical	myDeviceName>Card1>P2	myOtherDevice>P2

#### Creating links between ports residing in cards

### 7.5.4.2 Bundling Links

The Excel import sheet can be used to bundle links as well. As we can see in the image below for cell 'E3', you can bundle links by using the "bundle" label inside curly braces ({}).

Outside the curly braces, enter the name of the link you want to bundle. Repeat this process for each link you wish to bundle. In the following example the fiber link "24SF1" will be linked to the conduit link "C100":

1	Name	Type	Node1	Node2	
2	C100	Conduit	Alpha	Bentley	{Length}75 Miles
3	24SF1	24 Strand Fiber	Alpha>1st>101>R1>PP1	Bentley>1st>101>R1>PP1	{bundle}C100

### 7.5.4.3 Assigning Fiber Strands

Users can assign fiber strands with the Excel Import sheet. For each fiber link, follow these steps:

- 1) Enter the name of the fiber link in column A, followed by the ">" symbol.
- 2) Append the strand number to the fiber link using a three-digit format (e.g., 001, 002, 003, etc.).
- 3) Example: If the fiber link name is "FiberLink1" and the strand number is 001, enter "FiberLink1>001".

Leave column B (Type) blank. It will not be used in the case of fiber strand assignments.

Like other links, columns C and D are used for providing the full hierarchy path.

Name	Type	Node1	Node2
FiberLink1	24 Strand Fiber	Alpha>1st>101>R1>PP1	Bentley>1st>101>R1>PP1
FiberLink1>001		Alpha>1st>101>R1>PP1>C>B1	Bentley>1st>101>R1>PP1>A>B1
FiberLink1>002		Alpha>1st>101>R1>PP1>C>B2	Bentley>1st>101>R1>PP1>A>B2
FiberLink1>003		Alpha>1st>101>R1>PP1>C>B3	Bentley>1st>101>R1>PP1>A>B3
FiberLink1>004		Alpha>1st>101>R1>PP1>C>B4	Bentley>1st>101>R1>PP1>A>B4
FiberLink1>005		Alpha>1st>101>R1>PP1>C>B5	Bentley>1st>101>R1>PP1>A>B5
FiberLink1>006		Alpha>1st>101>R1>PP1>C>B6	Bentley>1st>101>R1>PP1>A>B6
FiberLink1>007		Alpha>1st>101>R1>PP1>C>B7	Bentley>1st>101>R1>PP1>A>B7
FiberLink1>008		Alpha>1st>101>R1>PP1>C>B8	Bentley>1st>101>R1>PP1>A>B8

## 7.5.5 Updating values

The Excel import sheet can be used to update values of objects in netTerrain. This is quite trivial: simply add the objects to be updated to the spreadsheet along with the fields to be updated. If netTerrain can uniquely identify the objects from the spreadsheet (whether due to the unique name of the object or the combination of the name and path) it will not create a new object, but simply update the fields specified in the spreadsheet.

### 7.5.5.1 Using curly brackets to insert and update values

In the examples above, values for fields are inserted or updated in netTerrain by virtue of the name of the column in the spreadsheet matching a field in netTerrain. However, you can also update values without worrying about the name of the column by prepending the value to be updated with the name of the field to be updated using curly brackets like this:

	A	B	C	D	E
1	<b>Name</b>	<b>Type</b>	<b>ParentNode</b>		
2	Alpha	Building	Excel Import	{Latitude}40.4851	{Longitude} -78.7247
3	1st	Floor	Alpha	{Comments} 1500 Sq Feet	

In the example above, the latitude and longitude fields for the first record and the comments field for the second record are updated using curly brackets. The advantage of that, as can be seen, is that you don't need to worry about the order or sequence of fields between one record and the next.

## 7.5.5.2 Changing the Name of objects

Since the name of an object is also a common data field you can also change the name of an object the same way you would insert data into other fields.

## 7.5.6 Positioning Objects and reparenting

The Excel import spreadsheet can be used to automatically position nodes on netTerrain diagrams. Options include x/y positioning, lat/long positioning and reparenting.

### 7.5.6.1 Changing x/y coordinates

The x/y coordinates of a node can be applied from the Excel import spreadsheet to place objects on a diagram. This is the default method if the diagram does not have a map.

The format for specifying x/y coordinates is the same as with any field, using curly brackets:

```
{x}Coordinate
```

```
{y}Coordinate
```

For the standard 8.5 by 11 inch diagram, the x coordinate ranges from 0 to 950 units and the y coordinate ranges from 0 to 700 units.

### 7.5.6.2 Lat & Long Coordinates

A node can be placed on a diagram containing a georeferenced map using latitude and longitude coordinates. The format for lat/long coordinates, as expected, uses curly brackets:

```
{Latitude}Coordinate
```

```
{Longitude}Coordinate
```

### 7.5.6.3 Moving Objects to Different Diagrams

Using the 'reparent' label, you can move a node from one diagram to another with the Excel import sheet. To reparent a node, place the {reparent} label followed by the new path in a custom field for the given record. The example below shows the 101 room being moved from the 1st floor to the 2nd floor.

101 Room	Charles>1st	{reparent}Charles>2nd
----------	-------------	-----------------------

## 7.5.7 Troubleshooting and Tips

As you build your import spreadsheet, we recommend testing the import in phases to catch input mistakes early.

When errors occur on input, please refer to the 'App\_data' in the netTerrain web directory folder. The log files are named as follows: `[date time] EI [name of uploaded spreadsheet]`.

Here are some common mistakes and their resolution:

### 7.5.7.1 Input string not in correct format issue

Below is a typical logged error related to input string problems:

```
Input string was not in a correct format.

    at System.Number.StringToNumber(String str, NumberStyles options,
NumberBuffer& number, NumberFormatInfo info, Boolean parseDecimal)

    at System.Number.ParseInt32(String s, NumberStyles style,
NumberFormatInfo info)

    at System.Convert.ToInt32(String value)

    at NetTerrain.Importers.ExcelImporter.ExcelTypeToImportFormat(DataRow
nodeTypeRow, String nodeName)...
```

Usually this error stems from two possible data entry mistakes:

- 1) The Excel import spreadsheet had its structure (the columns) modified. You should make a new copy of the original bulk import spreadsheet and copy over the information.
- 2) Not all mandatory fields were filled out

### 7.5.7.2 Type image ignored

You may get the following error in the log:

Type image ignored. File does not exist.

Make sure that when you are importing node types, you zip together the spreadsheet with a folder called 'graphics', which contains all the referenced icons.

### 7.5.7.3 Parent node missing

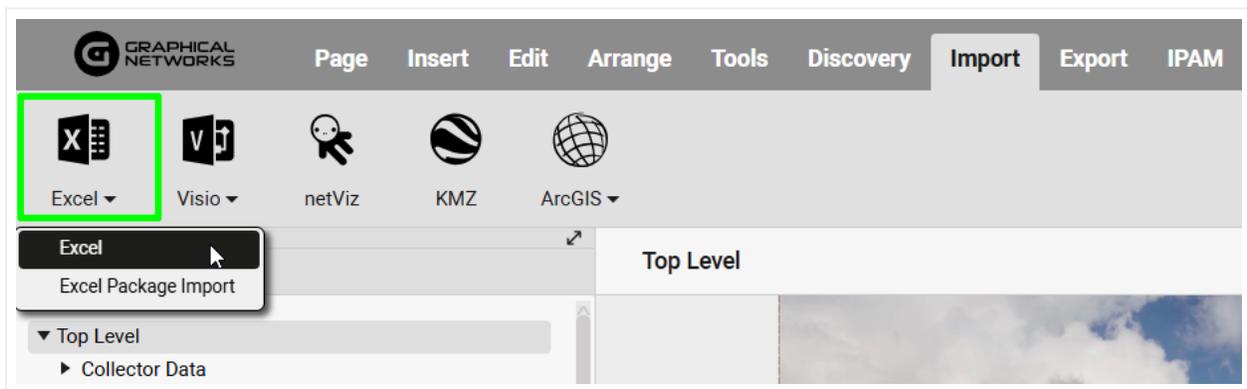
You may get the following error in the log:

```
Cannot import node xyz as its parent node xyz cannot be found.
```

This one is self-explanatory and usually the resolution is simple. Make sure that the parent node exists or, if it is supposed to be imported during the same process, that it is higher up in the row sequence than the nodes that produce the error.

### 7.5.8 Proceeding to import from Excel

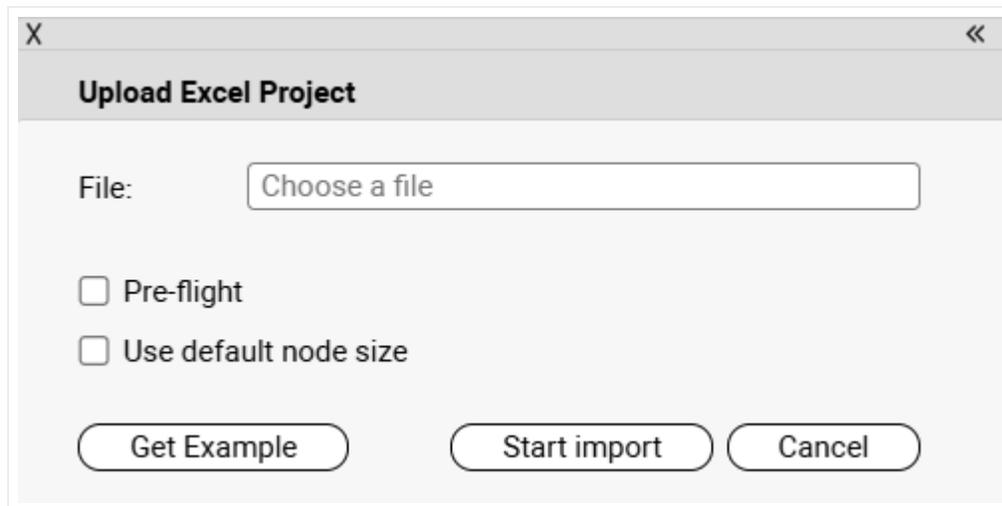
It is not uncommon for organizations to have more than one user to fill out data in Excel that should be imported into netTerrain. In many cases you could end up with several Import files waiting to be queued for netTerrain import. For that reason, netTerrain can import one file at a time or import a whole batch.



*Excel bulk import options*

#### 7.5.8.1 Importing single files

Once you have completed your bulk import spreadsheet, you can proceed to import the data into netTerrain one file at a time by pressing on the 'Excel Import' sub menu under the Excel Import menu option, as shown above.



#### *Single file import option*

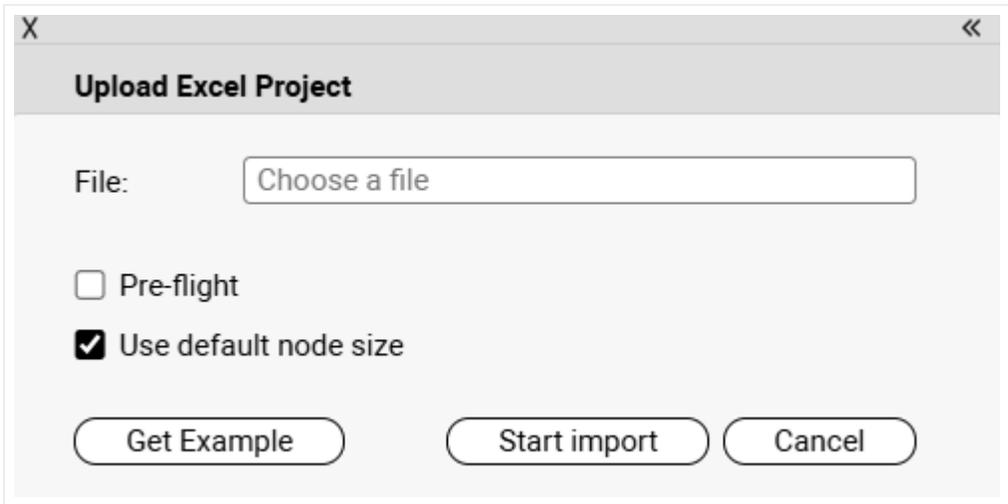
After prompted to choose a bulk import file from your local machine or connected network folders, you can fine-tune the import process with the 'pre-flight' and 'Use default node size' options.

The Pre-flight option previews the import before it actually happens. This gives you the ability to review and fix any issues with the data being imported, before it is committed. Additionally, if you want to override any node sizes with the default node size defined in the catalog, make sure you check the 'Use default node size' checkbox.

Once you are ready, click on the 'Start import' button to start the process.

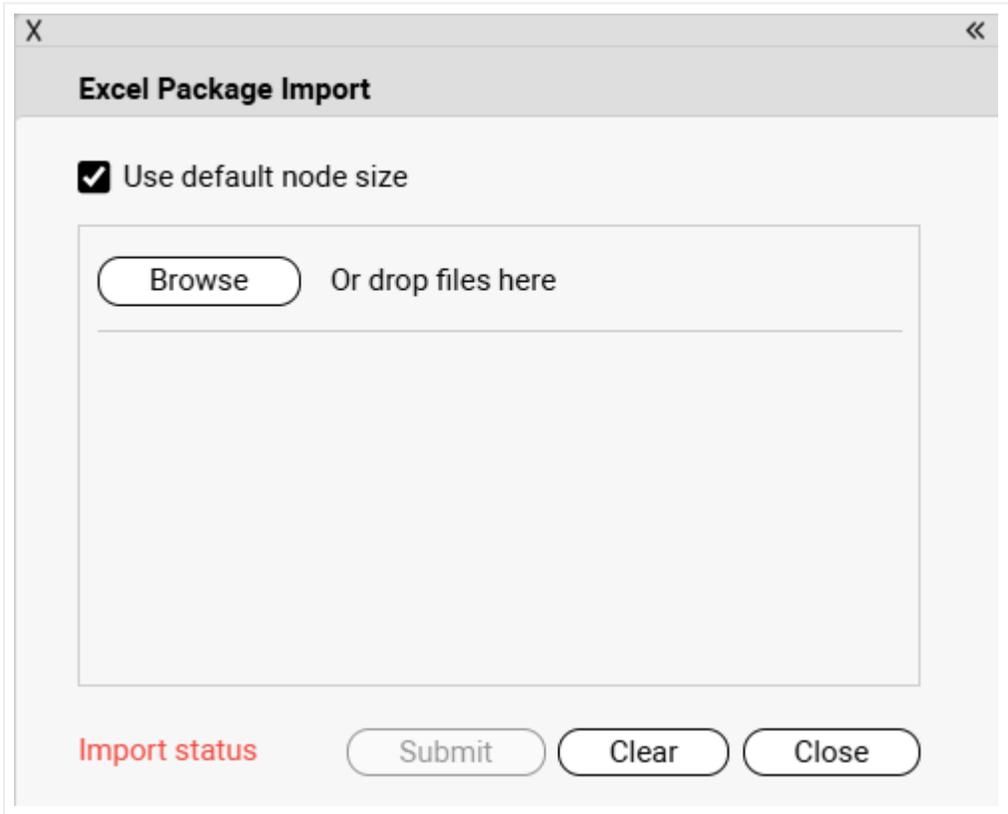
### 7.5.8.2 Default Node Size

When importing from excel, the sizing of objects will use dynamic sizing based on the diagram page size. To use the default node size regardless of the diagram page size, check the "Use default node size" option.



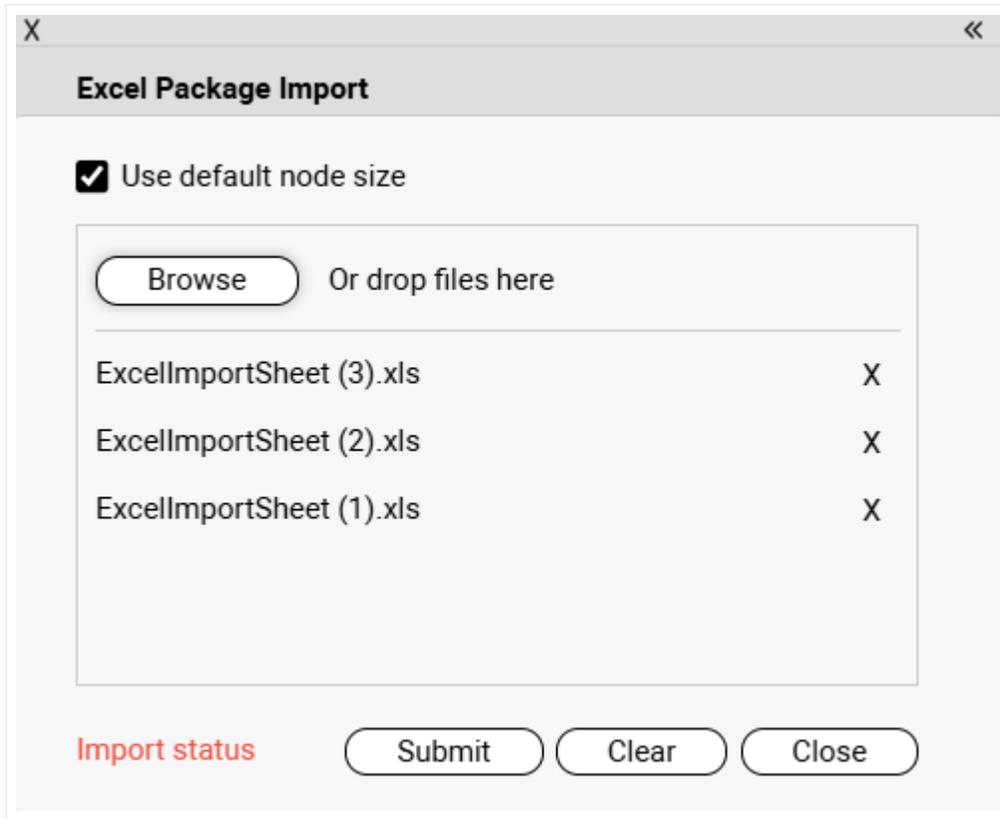
### 7.5.8.3 Importing a package

The 'Import package' option is quite self-explanatory and prompts the user to choose multiple Excel files and import them as a package.



*Package file import option*

Remember that these files need to be formatted based on the base ExcellImport file standard. After selecting the list of files, a dialog showing each individual file, with the status 'Ready for upload' will be displayed.



*File upload dialog*

This list can be cleared if you want to start over. Once you are ready, press the 'Submit' button to get the process started. And get yourself a big cup of coffee, as this can take a while.

It is also recommended to do this type of process involving large files during the night, or when users are not actively on netTerrain because it can slow the server down considerably.

Users can access the Import status list, by clicking on the Import status link as shown above. This will display a list of the files in the queue. The status column will show files that are still queued up as 'New', files currently processed as 'In process', the ones that are completed as 'Done' and any files that errored with the label 'Error'.

Logs for individual files already processed can also be accessed by clicking on the 'Show log' link.

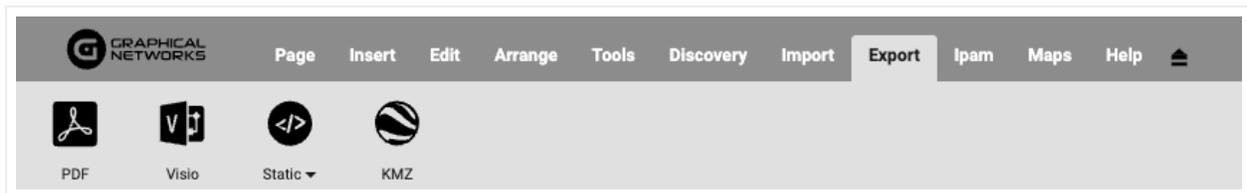
An administrator can remove any pending files from the queue. A non-admin user can remove their own files from the queue.

## 7.6 PDF export

One of the easiest ways to export diagrams from netTerrain is by using the PDF export option. The PDF option is available from the Import & Export menu in netTerrain. If the PDF icon is not present, then it was not enabled by the administrator (see netTerrain admin guide on how to enable the feature). There is no additional software that needs to be installed for the PDF export option to work.

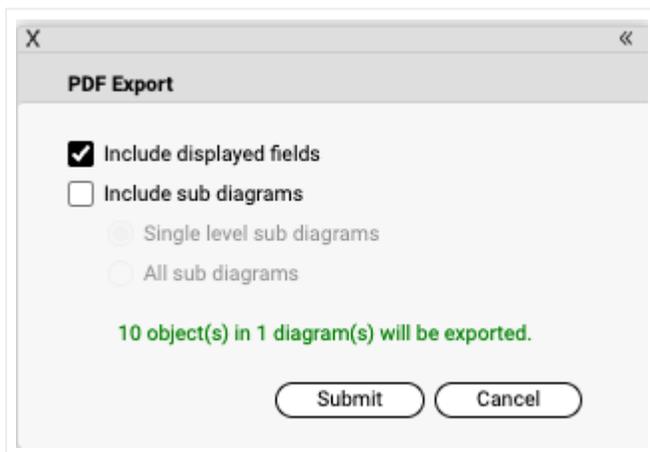
To use the PDF export, follow these steps:

1) Press the PDF Export button:



*PDF export button*

2) A PDF Export options dialog appears



*PDF export options*

The Include displayed field option will preserve any displayed fields present in the diagrams when exported. The include sub diagrams provides two options:

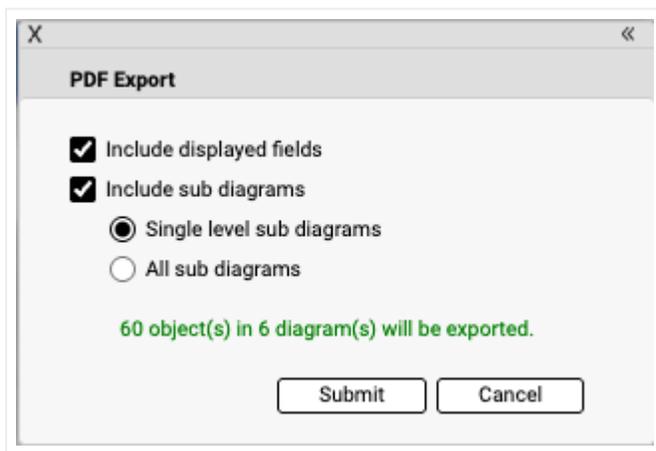
- a. Single Level sub diagrams : will export the current diagram and one level below
- b. All sub diagrams: will export the current diagram and all diagrams below

3) Press 'Submit'

### Attention!

This can be a time-consuming process when several diagrams are part of the export. When performing a large export, it may be best to do this during a time of the day when there is less user activity. For instance, when they are all sleeping or at the water cooler chatting non-stop.

Notice that before hitting submit, netTerrain will provide you with a count of nodes to be exported so that you can decide whether a reduction in the number of diagrams to export is in order.



*Message indicating the number of nodes and diagrams to export*

## 8 Outside Plant

netTerrain OSP is an additional module that turns your netTerrain software into an outside plant (OSP) documentation tool. This requires a separate product license.

netTerrain OSP includes the ability to create dynamic (or georeferenced) maps within a diagram. It also changes the behavior of a diagram in situations like zooming, copying and object placing, compared to diagrams that contain static backgrounds. netTerrain OSP also has some additional features for cable, strand, and circuit management not available with regular netTerrain licenses.

netTerrain georeferenced maps use a variety of mapping sources. The default map source includes the OpenStreetMap® repository for cartographic representation of data (from now on OpenStreetMaps or OSM) and Google maps. OSM maps do not require any paid license or service, but certain map views may require an OSM API key.

netTerrain OSP also supports ESRI and other sources which you can set up in the settings.xml file located on the netTerrain server. Our default installation includes paths to 3 OSM layers, Google standard and satellite views.

All these services require a connection to the internet by default; however, you can set up your internal map servers for services such as OSM.

#### **Attention!**

The netTerrain OSP module is a licensed product and is not included with netTerrain. For this to work you would need to purchase the OSP module. Also, for the georeferenced maps to be properly generated, the client machine needs to have a connection to the internet. If this is a problem in your environment, you can create your own internal OSM server. For certain map sources you may need an API key or paid royalty license which may depend on map usage. Contact support for more details.

## **8.1 Advantages of using georeferenced diagrams**

In terms of keeping an inventory of your network, static maps may be all you need, but once you need to document your outside plant, dynamic (or GIS or georeferenced) maps become critical, specifically around the features of zooming and location-based placement.

### **8.1.1 Large diagrams and deep zooming**

As opposed to static maps, which lose resolution and get pixelated as you zoom in, with georeferenced maps you can work with relatively large geographical areas and zoom in until you reach the street or block level without losing precision.

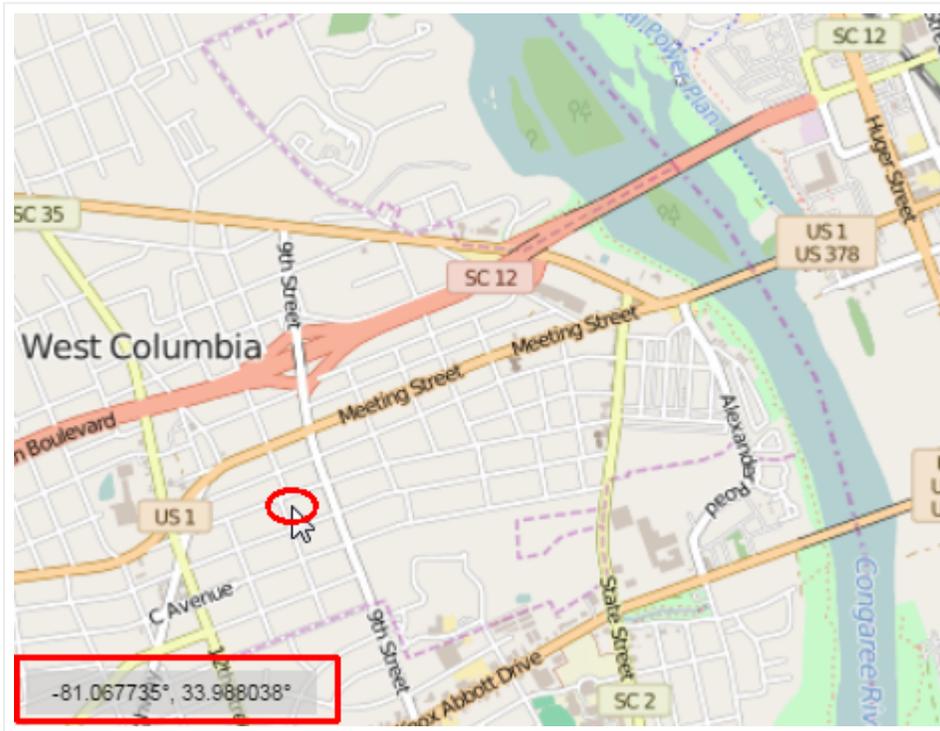
This lets you add a large number of small objects in an extensive map area without losing precision on the geographical details at deep zoom levels

### **8.1.2 Embedded coordinates**

Another benefit of using georeferenced diagrams is the fact that when the map is created, its lat /long coordinates are automatically embedded. As such, users do not have to manually find and enter the appropriate coordinates for a specific map.

Also, coordinates in georeferenced diagrams support 6 decimals of precision, which provides accurate placement of objects down to the street / block level.

Coordinates in georeferenced diagrams are automatically displayed when you load a map. Coordinates are displayed on the lower left corner of the map and change automatically as you move the cursor over the map.

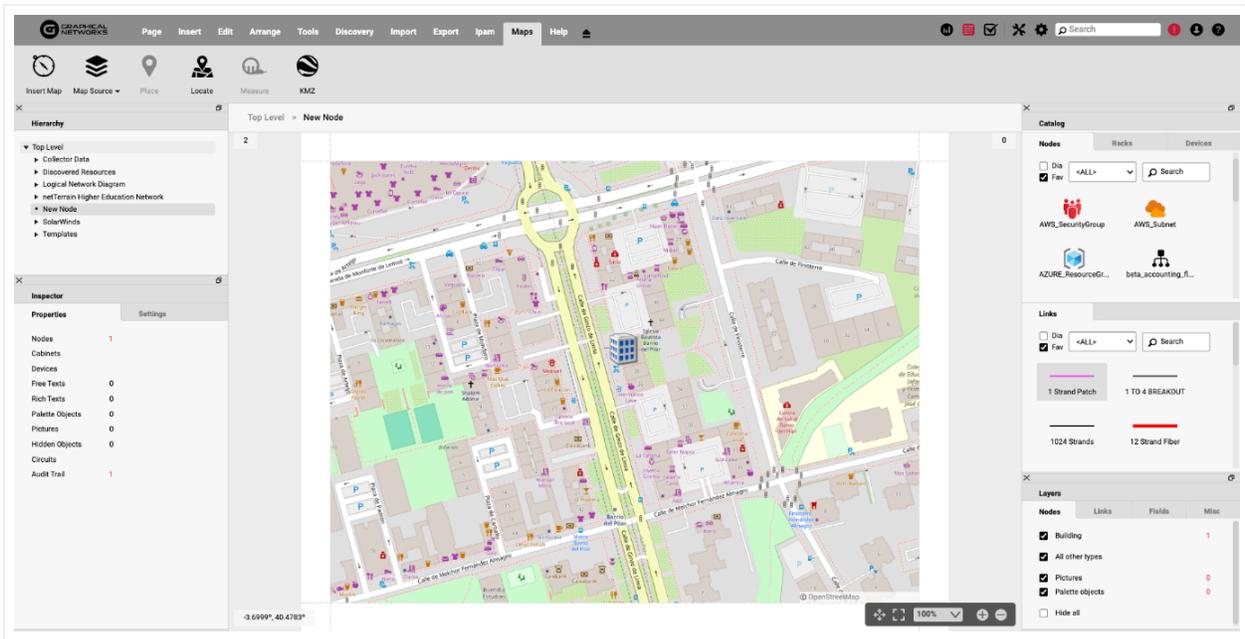


*Coordinate display on georeferenced diagrams*

### 8.1.3 Node identification (halos and clusters)

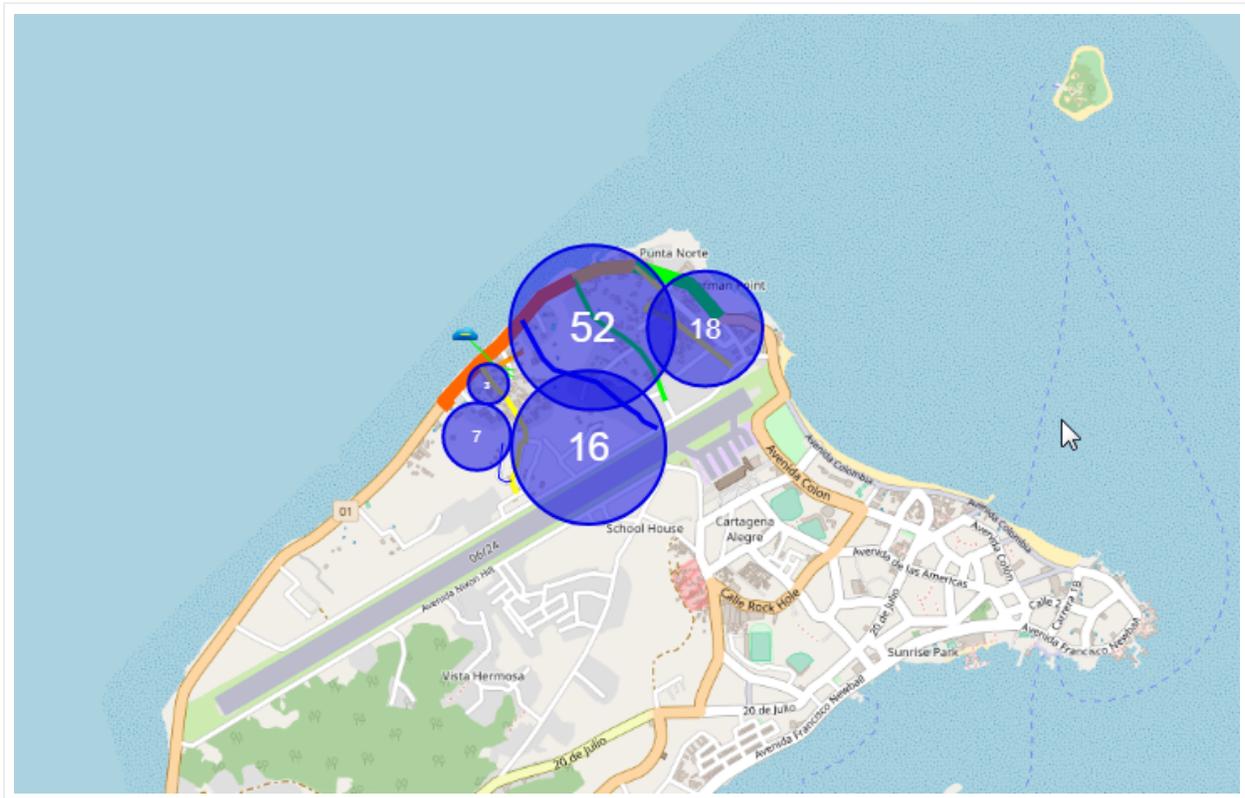
Another nice feature of georeferenced diagrams is the ability to identify the location of any nodes even if you are zoomed too far out to see the actual node icon.

For instance, say we have a georeferenced diagram that covers a large geographical area (such as the state of Maryland) and we want to show buildings at street level. Those buildings may be drawn to scale at the street level but once we zoom out, they would be very small and essentially disappear.



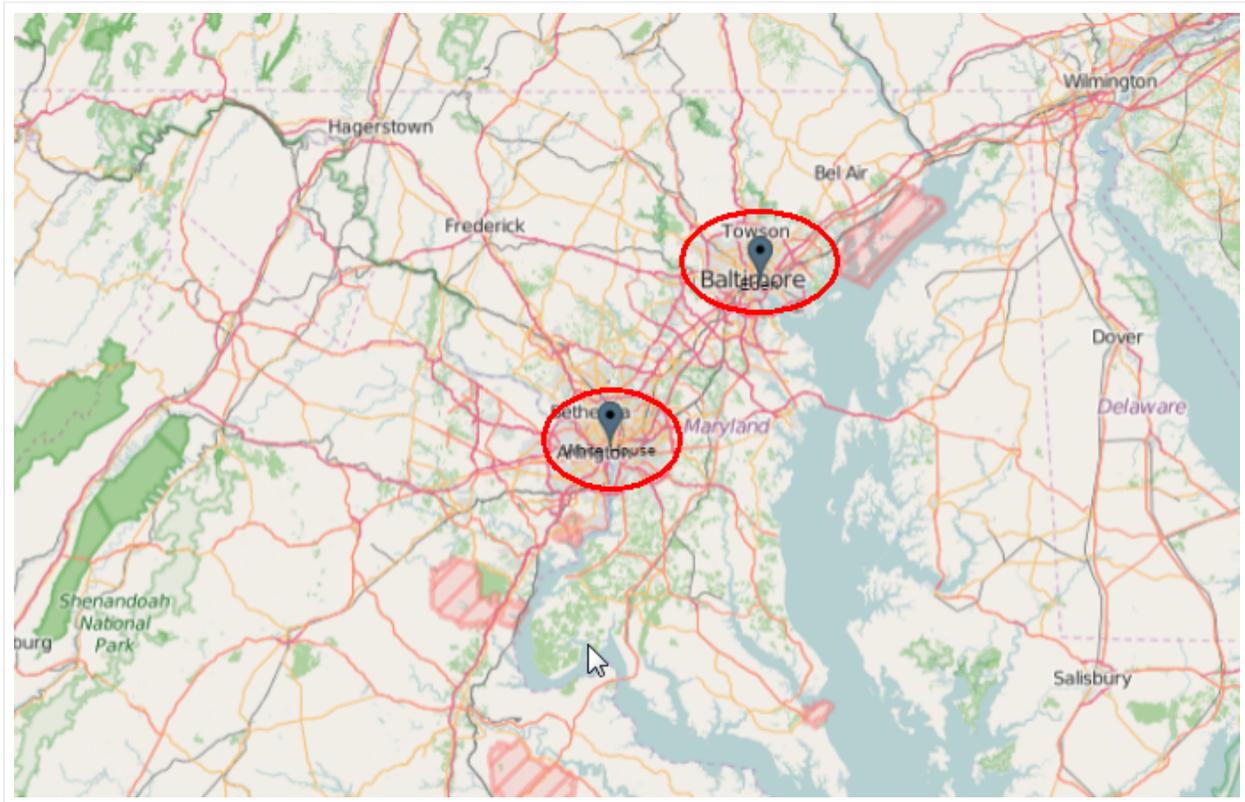
*Building on the center is shown at street level*

At a certain point, in a static map we would not be able to see them anymore, but within a georeferenced diagram these small objects are aggregated using clusters.



### *Nodes grouped in clusters*

Icons not grouped in a cluster are identified by a marker (a.k.a. halo) that is always displayed with the same size relative to the diagram.



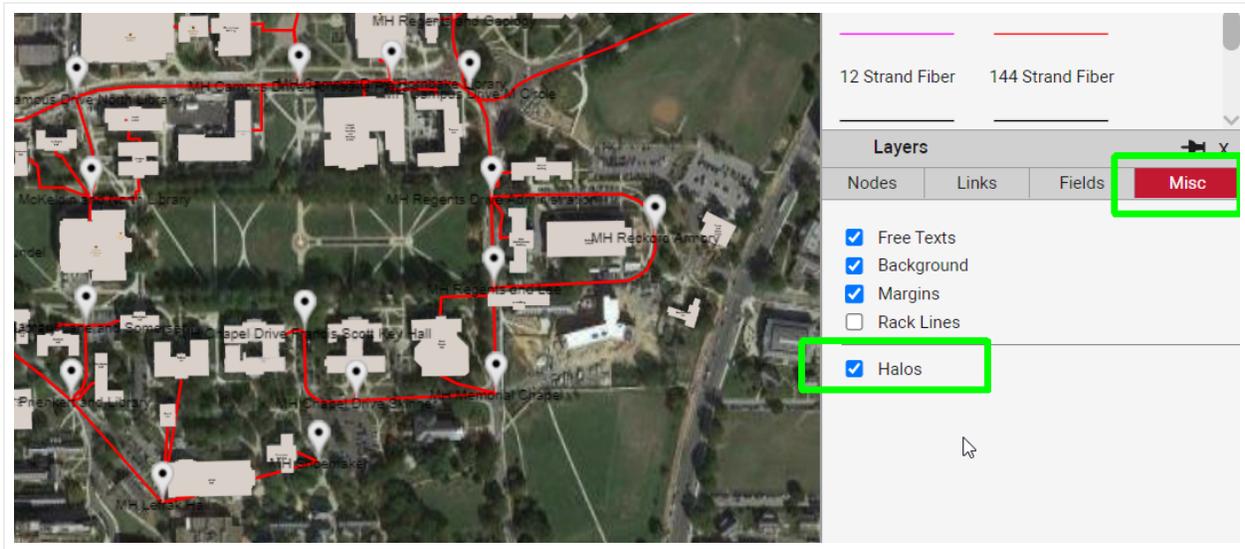
*Individual zoomed out buildings represented by markers (halos)*

### 8.1.3.1 Disabling clusters and halos

There are instances where clustering may become a liability. For example, in linear layouts of fiber traversing vast geographical regions the clustering can look weird. There can be other situations where you wish netTerrain didn't render a set of objects in a cluster or maybe didn't render halos.

You can disable the clustering, halos, or both. To disable them globally, you need to do it from the settings.xml file, so you may have to ask a netTerrain admin to disable this for you.

You can disable halos on a per-diagram basis from the layers tab->miscellaneous.



*Disabling halos from the layers tab*

## 8.1.4 Cable, strand and circuit management

In netTerrain DCIM or netTerrain logical you can model cables, strands and circuits, but you are essentially doing everything by hand modeling links in the catalog accordingly. There are no specific business rules associated with strand counts in a cable, circuit management and so on. Fiber plant users, however, have a consistent way of managing these, so in netTerrain OSP you have a whole array of extra features to simplify the process of adding, deleting, and managing circuits, cables and strands.

Also, circuits in OSP have their own special CLR views, map displays, list reports and more, as we will see later in this chapter.

## 8.2 Working with map sources

As mentioned earlier, netTerrain georeferenced maps use a variety of mapping sources. The default map source includes the OpenStreetMap® repository for cartographic representation of data (from now on OpenStreetMaps or OSM) and Google maps. OSM maps do not require any paid license or service, but certain map views may require an OSM API key.

netTerrain OSP also supports ESRI and other sources which you can set up in the settings.xml file located on the netTerrain server. Our default installation includes paths to 3 OSM layers, Google standard and satellite views.

All these services require a connection to the internet by default; however, you can set up your internal map servers for services such as OSM.

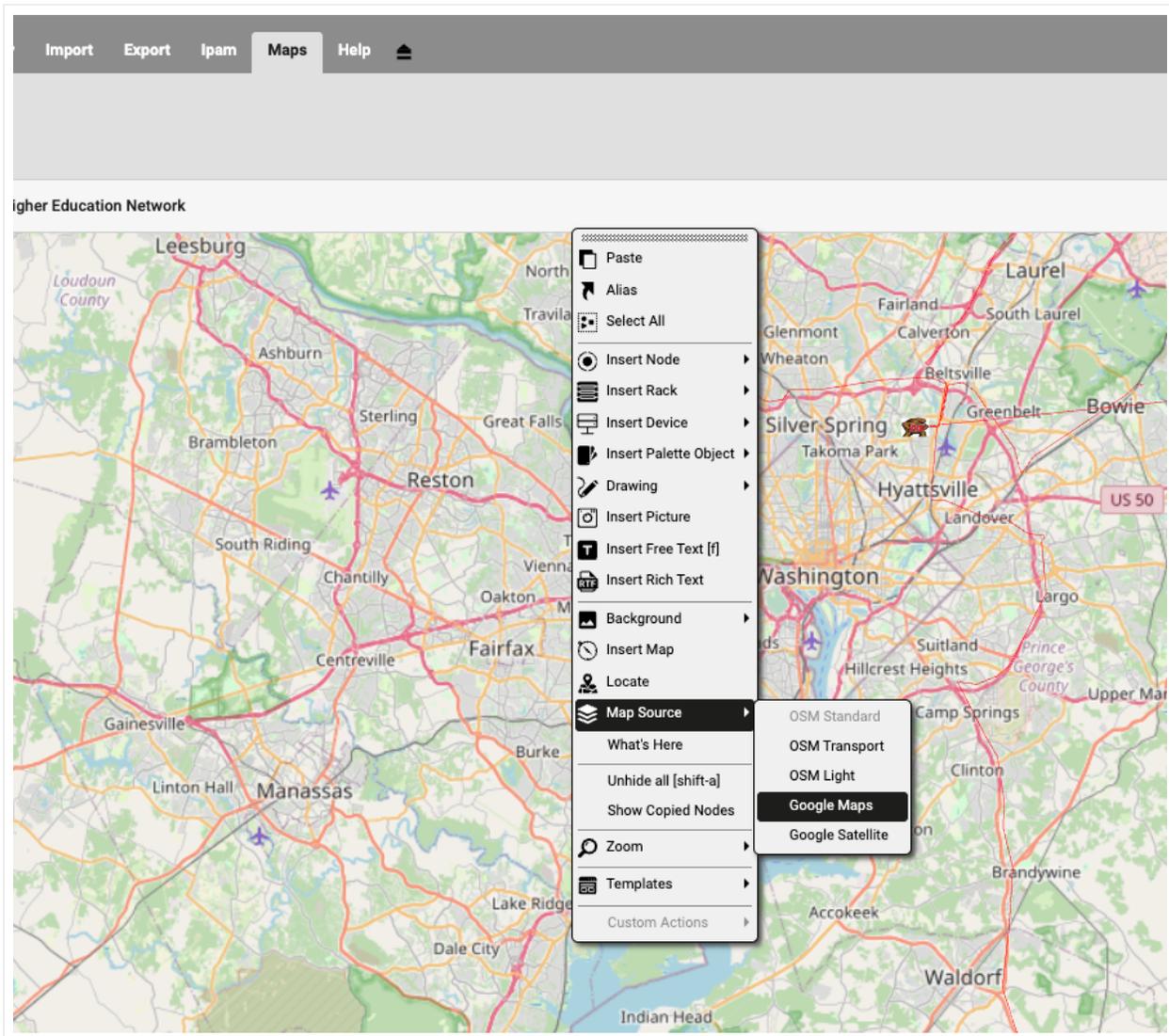
To set up a new map source or modify an existing one you need access to the netTerrain app server, find the settings.xml file on the root directory, open said file with a text editor, locate the

`<!-- Sources of map tiles -->` tag and carefully edit the information. Consult with your netTerrain administrator or Graphical Networks tech support and how to add other sources or modify these tags.

```
<!-- Sources of map tiles -->
<add key="MapSource1" value="https://a.tile.openstreetmap.org/{z}/{x}/
{y}.png" />
<add key="MapSource2" value="https://a.tile.thunderforest.com/
transport/{z}/{x}/{y}.png" />
<add key="MapSource3" value="https://tile-a.openstreetmap.fr/hot/{z}/
{x}/{y}.png" />
<add key="MapSource4" value="https://mt.google.com/vt/lyrs=m&x={x}
&y={y}&z={z}" />
<add key="MapSource5" value="https://mt.google.com/vt/lyrs=s&x={x}
&y={y}&z={z}" />
<add key="MapSource6" value="" />
```

*Map sources in the settings.xml file*

From the project, you can switch from, say, an OSM view to a Google maps view for any given diagram by simply right-clicking on the diagram and choosing the source.



*Additional OSP sources*

### 8.3 OpenStreetMap (OSM) maps

netTerrain can use the OpenStreetMap cartography for its GIS maps. The OpenStreetMap Foundation is a non-profit foundation whose aim is to support and enable the development of freely reusable geospatial data maps. It is a collaborative project to create a free editable set of maps of the world.

OSM maps can be used in any diagram to overlay any netTerrain objects on top of it. These maps are royalty-free and users can render as many maps as needed in netTerrain.

## 8.3.1 Map layers

The OSM integration with netTerrain includes 3 different map layers, which can be switched at any time. Layers provide the user with the ability to change the background look and feel of maps. For example, in certain instances it may be desirable to use a less cluttered map layer to improve the visibility of the netTerrain objects on top of it.

### 8.3.1.1 Standard layer

The standard layer is the default tile layer. It is also the layer that provides most of the map level symbols. Single symbols denote several kinds of points of interest or describe a larger area. If the map feature in question has a name, it is written below the symbol most of the time, in the same color of the symbol.

For more information about the standard please visit the following web page: [https://wiki.openstreetmap.org/wiki/Standard\\_tile\\_layer](https://wiki.openstreetmap.org/wiki/Standard_tile_layer)

#### 8.3.1.1.1 Standard layer symbols

The following table shows example of symbols used in the standard layer tiles:

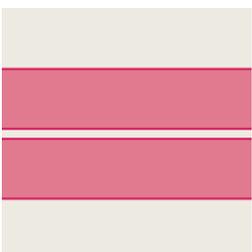
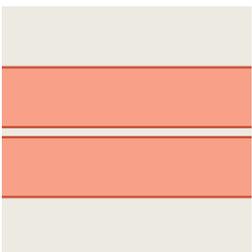
Symbol	Description	Category
	Bar	Sustenance
	Cafe	Sustenance
	Restaurant or food court	Sustenance
	Library	Culture/ entertainment
	Museum	Culture/ entertainment
	Playground	Leisure
	Water park	Leisure
	Campsite, campground	Outdoor
	Point of information, such as a tourist information office, informational board, map board, etc.	Tourism

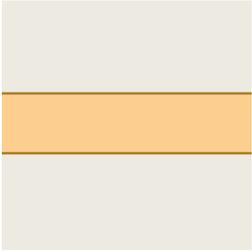
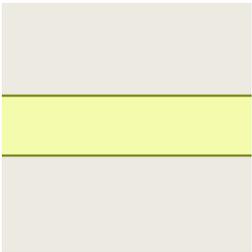
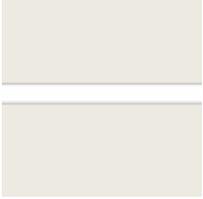
Symbol	Description	Category
	Hotel	Tourism
	ATM or cash point	Financial
	Bank	Financial
	Hospital	Healthcare
	Pharmacy	Healthcare
	Electricity pylon	Electricity
	Small electricity pole	Electricity
	Post box	Communication
	Post office	Communication
	Fire station	Fire station
	Rent a car	Transportation
	Car parking lot or other facility to park cars	Transportation
	Gas station or petrol station or similar	Transportation
	Bus stop	Transportation
	Railway station, railway stop point or tram stop point	Transportation
	Airport	Transportation
	Traffic lights	Road features
	Railway crossing	Road features
	Peak, summit, etc.	Nature
	Tree	Nature
	Town hall	Governmental institutions
	Police station	Governmental institutions

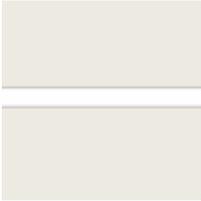
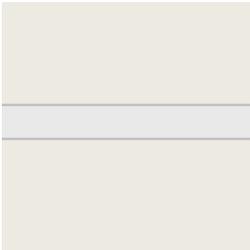
Symbol	Description	Category
	Embassy	Governmental institutions
	Christian	Religious place
	Jewish	Religious place
	Muslim	Religious place
	Hindu	Religious place
	Bakery	Shop
	Supermarket	Shop
	Book store	Shop

### 8.3.1.1.2 Standard layer lines

In OpenStreetMap, the major roads of a road network are sorted on by importance, from motorway to quaternary road. The following table shows example of lines used in the standard layer tiles:

Symbol	Description	Category
	Motorway, the most important roads in a road network. Equivalent to freeway, Autobahn (Germany), etc.	Major road
	Trunks, the most important roads in a road network that aren't motorways.	Major road
	Primary road	Major road

Symbol	Description	Category
		
	Secondary road	Major road
	Tertiary road	Major road
	Quaternary road	Major road
	Residential road	City road
	Access road (may be also outside of a city)	City road

Symbol	Description	Category
		
	Living street	City road
	Pedestrian street	City road
	Bridleway	Non-motorized
	Cycleway	Non-motorized
	Footway	Non-motorized
	Non-specific path (footway, cycleway or bridleway)	Non-motorized

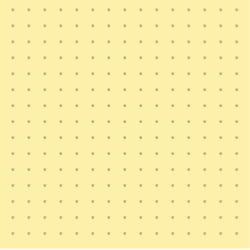
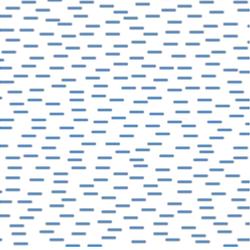
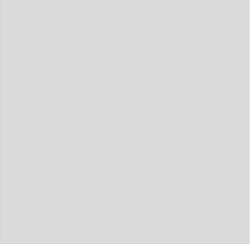
Symbol	Description	Category
	Steps	Non-motorized

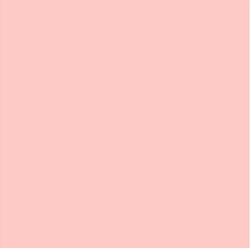
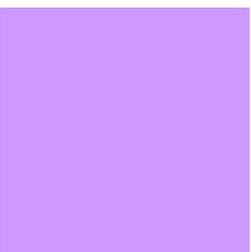
### 8.3.1.1.3 Standard layer areas

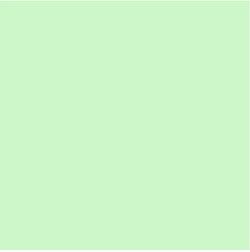
Areas in the Standard tile layer denote various things, from land usage to buildings to restricted access zones.

The following table shows example of areas used in the standard layer tiles:

Area	Description	Category
	Land (This is only shown when no more specific information is available)	Nature
	Body of water (ocean, sea, pond, river, swimming pool, etc.)	Nature
	Natural grassland	Nature
	Bushes and small trees	Nature

Area	Description	Category
		
	Beach	Nature
	Wetland	Nature
	Residential area	City planning
	Commercial area or business park (predominantly offices)	City planning
	Retail area (predominantly shops)	City planning

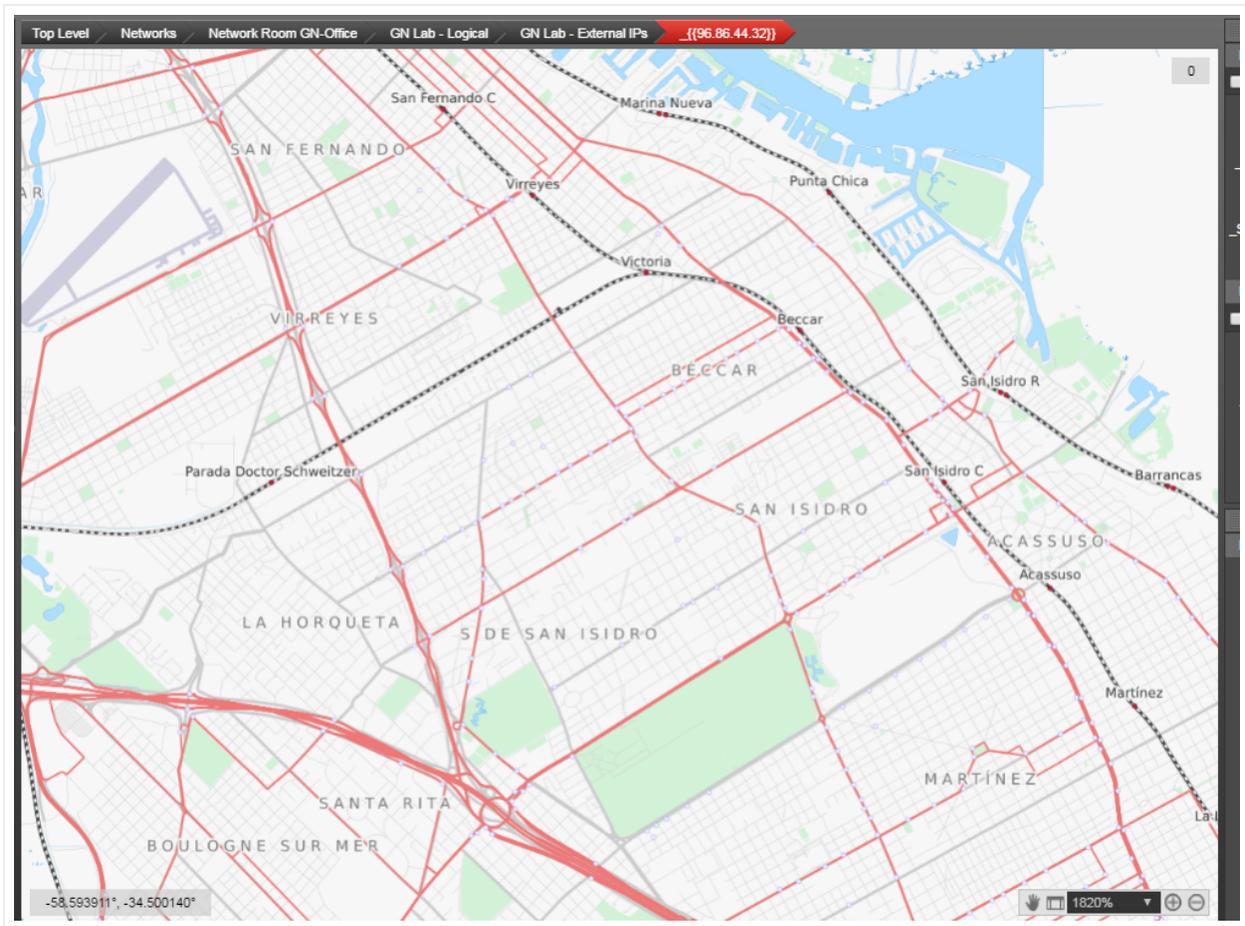
Area	Description	Category
		
	Industrial area or area for railway usage	City planning
	Non-specific building	Buildings
	Airport terminal	Buildings
	Farmland	Agriculture and industry
	Park	Leisure

Area	Description	Category
		
	Tourist attraction	Leisure
	Land used by the military.	Military

#### 8.3.1.1.4 Other layers

In addition to the standard layer, netTerrain can render OSM diagrams in 2 other styles:

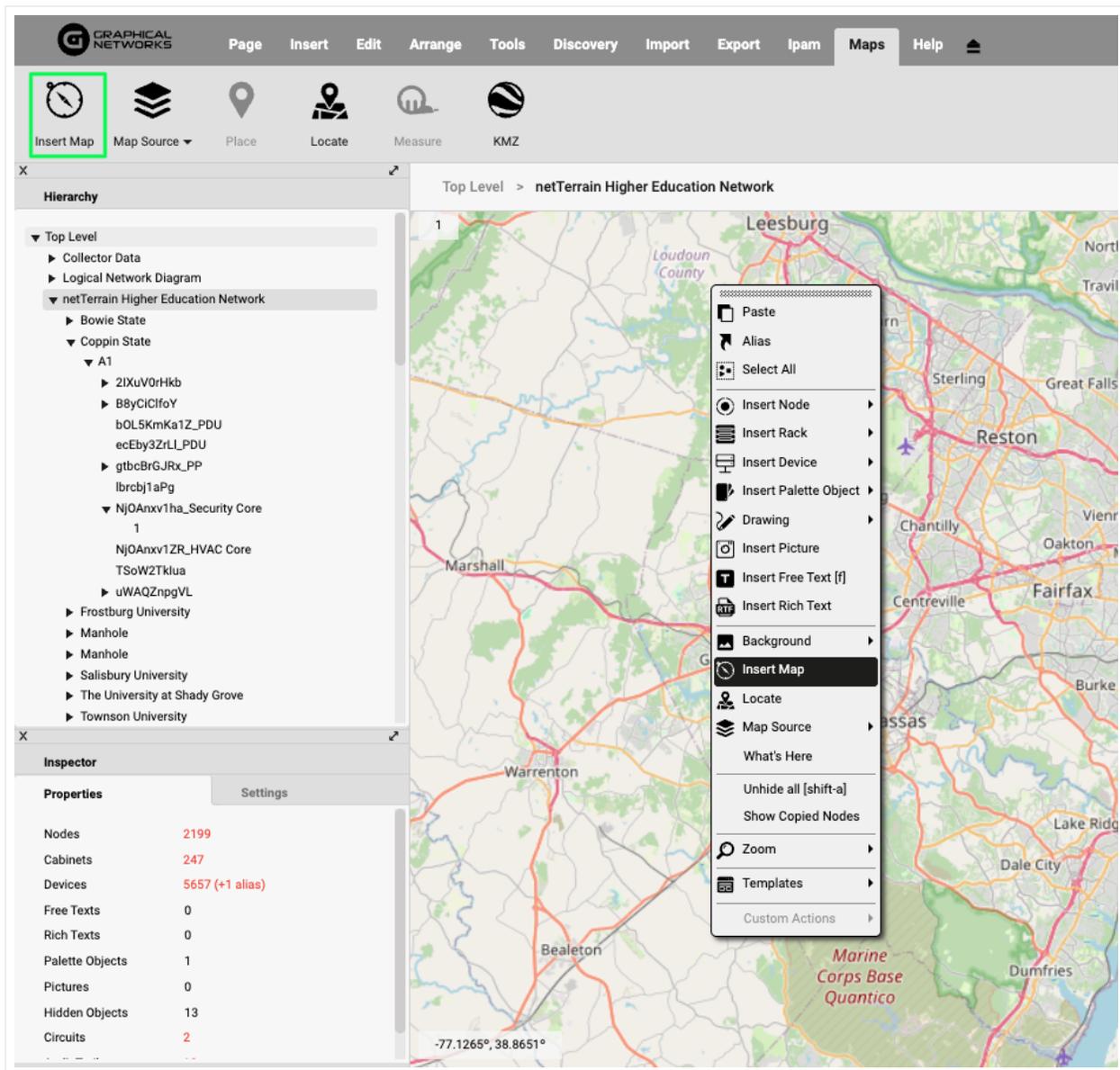
- Transport: these maps mainly show railways, streets, highways, and other routes without much regard for other map details. This is a great layer where you want less cluttered maps. The only drawback with this layer is that it shows a watermark unless you get a license key for its use (some licenses for the transport layer can be obtained for free).
- Light: maps where the colors are light to make it easier to see objects placed in the map.



*Transport layer map*

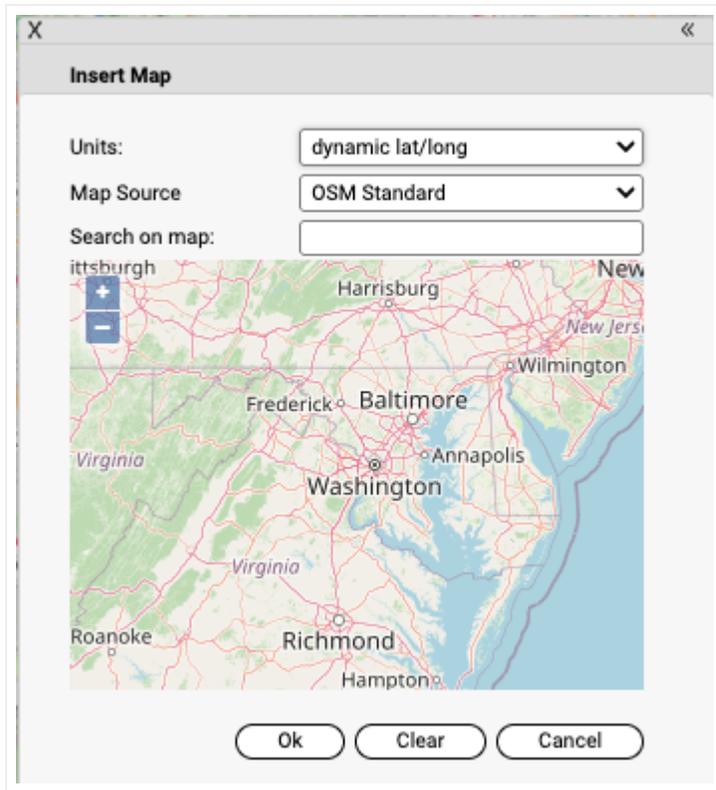
## 8.4 Adding georeferenced maps to your diagram

To add a georeferenced map right-click on the diagram and choose 'Map' (or alternatively click on the Map button in the Maps menu):



### Inserting a map

A dialog with a map previewer allows you to easily zoom in on a location to use. You can utilize a very large geographical area, or even the whole world in a single netTerrain diagram but try to choose as small an area as possible that is relevant to the diagram you are working with to maximize performance and take advantage of hierarchical diagrams in netTerrain.



### Map previewer

The options for the Map Specifications are as follows:

- Server Image Path: If there is a background image in use it will provide the image path details.
- Units: Change this to dynamic lat/long to use the dynamic maps.
- Map Layers: these layers are discussed in the previous section
- Search on Map: Type in the street, city or other location information to find a specific map location.

Once you find the desired map with its appropriate zoom level, simply click 'Ok' and the map will be rendered on the page accordingly.

## 8.4.1 Use of maps covering large geographical areas

As mentioned above, you can utilize a very large geographical area, or even the whole world in a single netTerrain diagram, but if you use a large geographical area instead of taking advantage of parent-to-child diagrams you may tend to place many objects in one diagram, which decreases performance.

You should not use georeferenced diagrams as a replacement for drill down capabilities. As such, whenever applicable, it is recommended to structure your project in collections of parent-to-child diagrams.

## 8.5 Working with georeferenced diagrams

Georeferenced diagrams allow the placement of any netTerrain objects, and these behave pretty much like objects on standard static backgrounds except for a few differences, which arise all due to the fact that it is highly likely that in georeferenced diagrams users will resize nodes to very small size so that they are properly represented to scale:

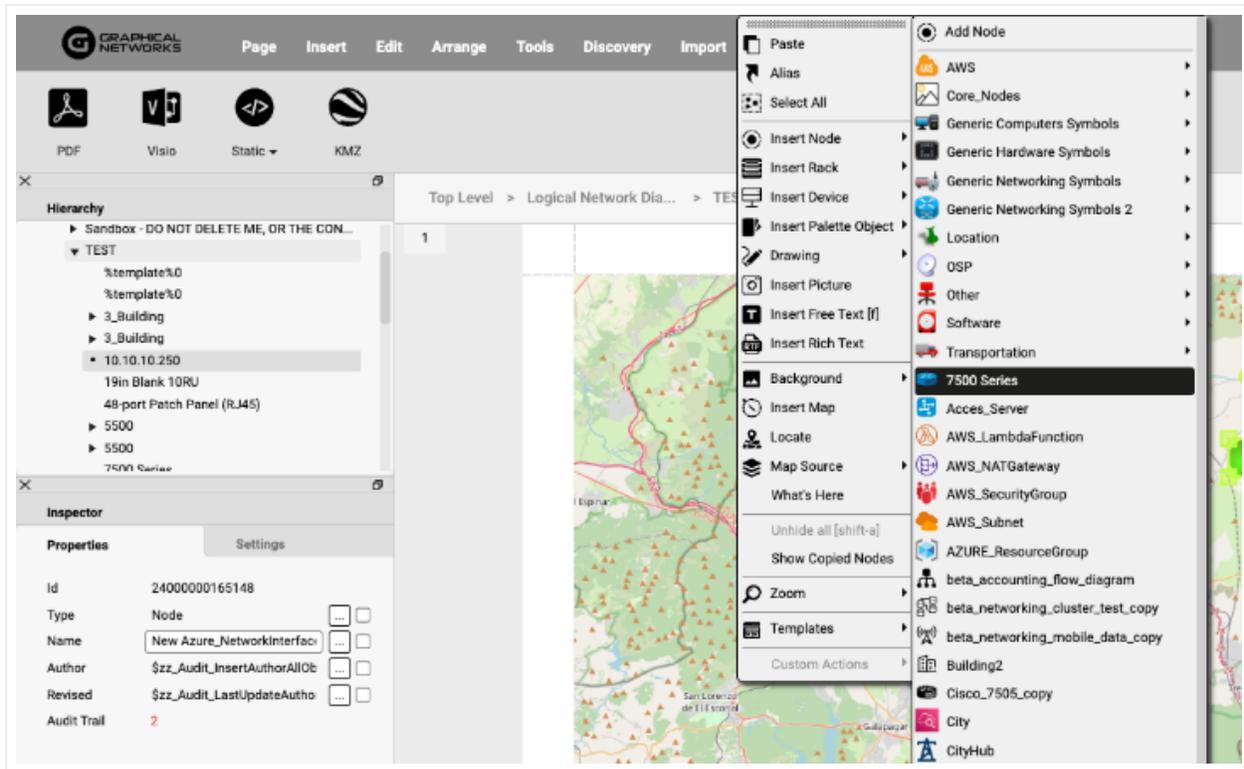
- zoomed out nodes that are too small to see may be aggregated in clusters or display markers or halos, as discussed previously in this chapter
- When adding a node in a georeferenced diagram, the default size is relative to the zoom level
- Link thickness does not increase as you zoom in. The thickness is relative to the zoom level

### 8.5.1 Placing nodes on georeferenced diagrams

The placement of nodes in georeferenced diagrams is similar to placing them on any regular netTerrain diagram. There are still a few details that need to be considered.

For example, if you are using a map covering a wide geographical area and you want the nodes to be drawn to scale (for example at the street level) it becomes very impractical to add the node when you are zoomed out and then resize it because you may need several processes of resizing, zooming and panning in order to accomplish the task.

Instead use the following approach: zoom in to the desired level first, then drag and drop the object from the catalog to the diagram or right-click on the location (for instance the exact street corner) where you want the node placed, and then insert the node. As mentioned earlier, you will notice that the default size of the node is relative to the zoom level (in a static map, if you zoom in heavily, the default size of the node may be such that the rendering in the zoom out state ends up drawing a huge node).

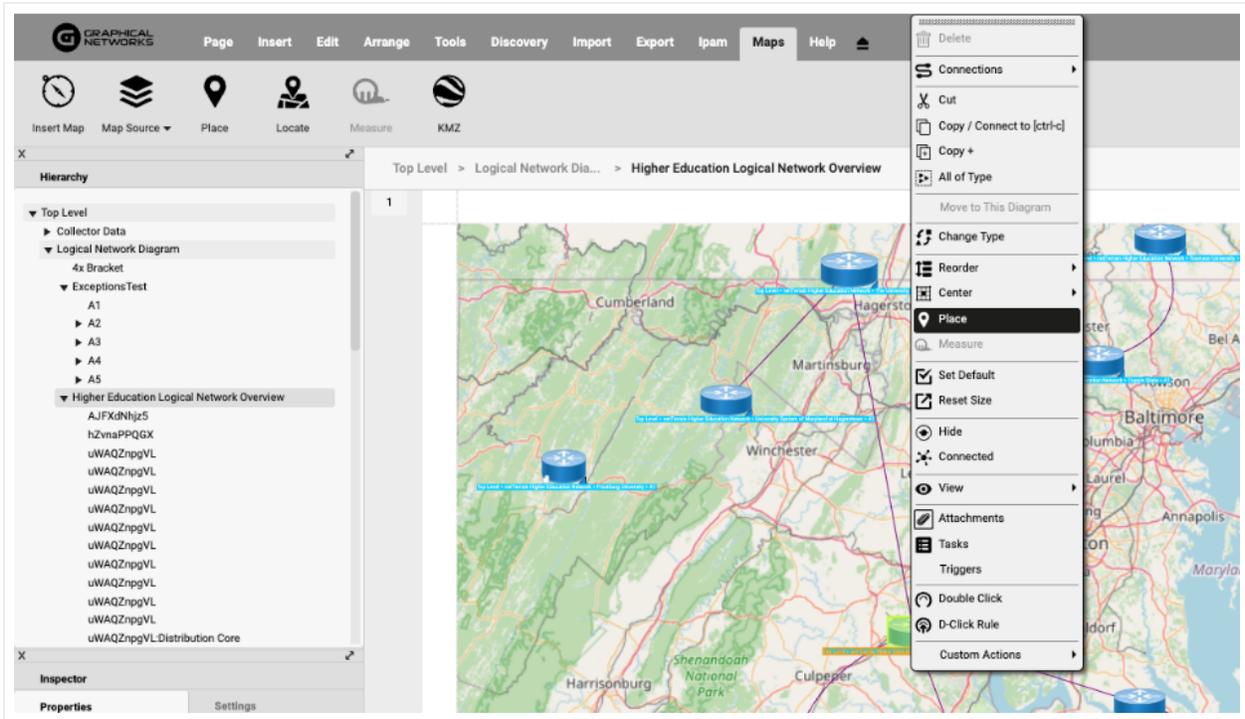


*Inserting a node on a zoomed-in area*

If you are copying and pasting a node, it is also convenient to paste the copied node by right-clicking on the zoomed in area and on the exact place, using the diagram context menu in order to minimize any additional resizing and panning actions.

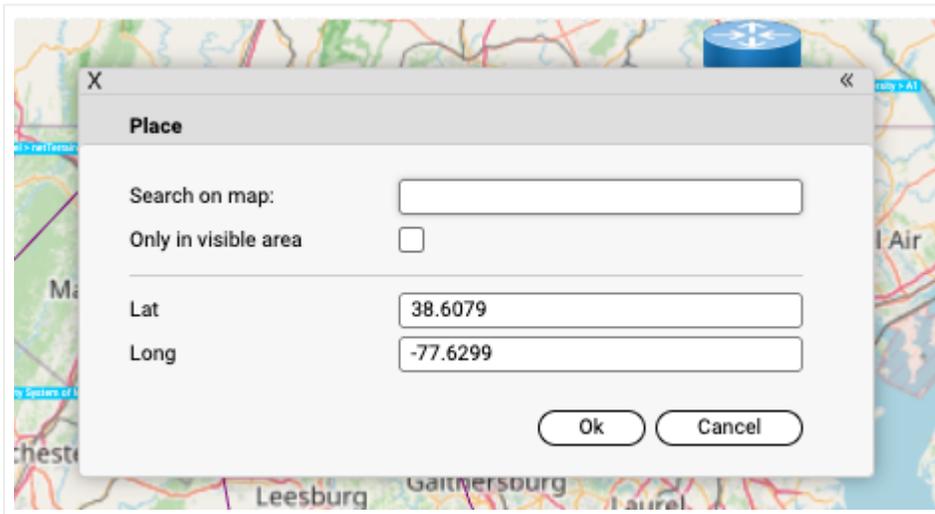
### 8.5.1.1 Placing nodes based on location or GIS coordinates

It is also possible to place nodes in georeferenced diagrams based on GIS coordinates or location. Click on the node and then on the 'Place' button (Maps menu) or right-click on the node and press 'Place'.



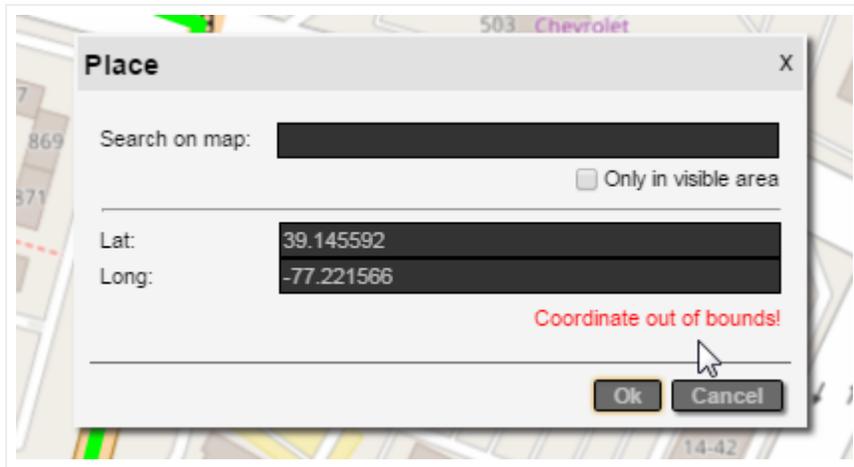
*Placing a node by location or lat/long*

This will open a dialog box where you can either search for a location and even limit that search to the zoomed in area or you can also type in the lat and long coordinates.



*GIS and location-based placement*

If the lat/long values are malformed or outside the boundaries of the map on the diagram, you will see a notification prompting you to fix that mistake, such as the 'coordinate out of bounds' message seen below:



*Coordinate out of bounds*

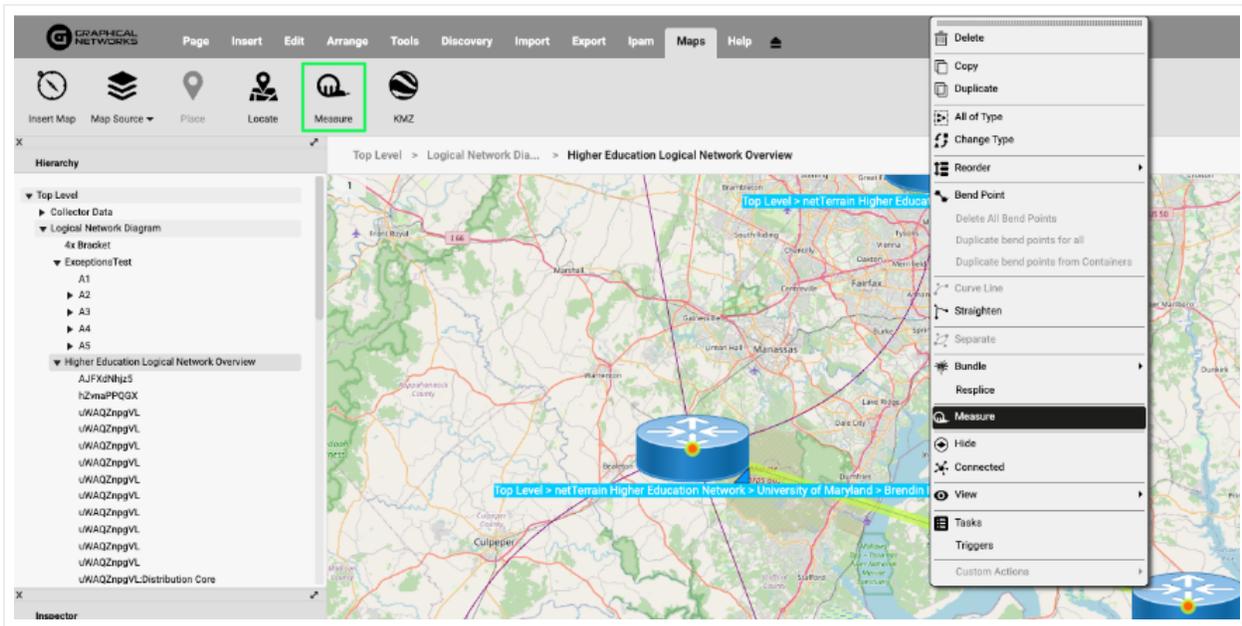
Once you click 'Ok' netTerrain places the node and pans/zooms to the appropriate area on the map.

### 8.5.1.2 Measurements in georeferenced diagrams

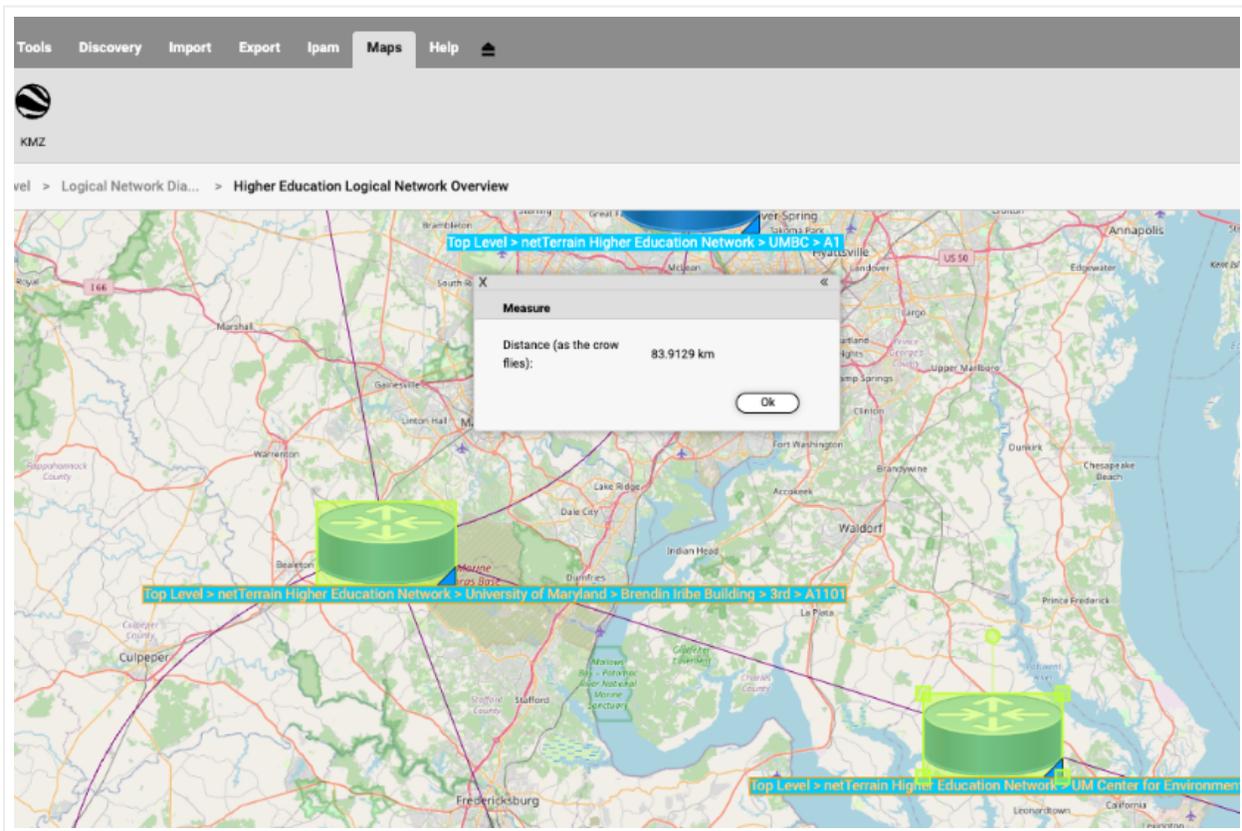
Measurements in georeferenced diagrams are essentially the same as in static maps with embedded coordinates. Since coordinates are automatically associated with georeferenced diagrams, users can always measure the distance between two nodes or measure the length of a link in miles, based on the auto embedded coordinates. We'll review the measurement process here again.

To measure the distance between two nodes, do the following:

- 1) Select the two nodes.
- 2) Right-click on one of them and select the menu 'Measure' option (or click on the Measure button in the Maps menu).



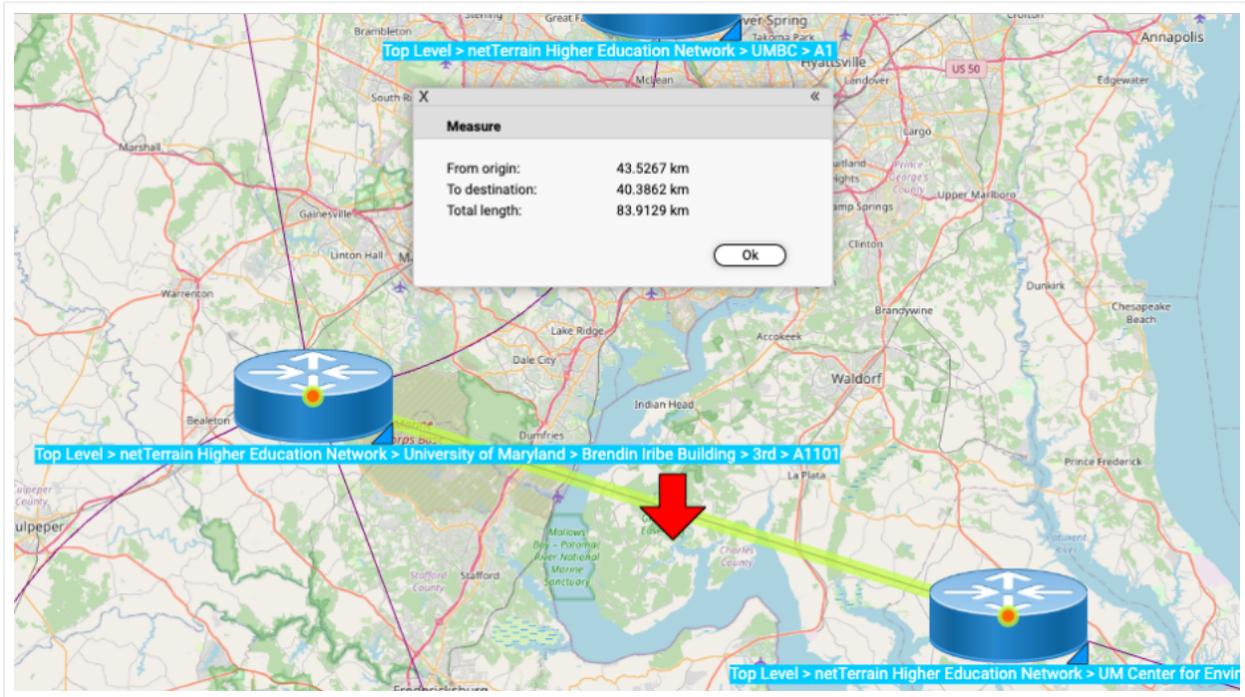
3) This will bring a pop-up dialog showing the distance (as the crow flies).



*Example of measuring distance between two nodes in miles*

To measure the length of a link, do the following:

- 1) Right-click on one of them and select the menu 'Measure' option (or click on the Measure button in the Maps menu).
- 2) The pop-up dialog will now show the length.



### Example of measuring the length of a link in OSM diagrams

Notice the red arrow pointing to the link. This is the location where you right-clicked, and the distance to the origin and destination are taken from that exact point where the mouse-click happened. Of course, this only applies if you used the right click method to measure the length. This feature could be useful in fiber measurement situations to find out the distance of a fiber cut to the nearest manhole or location of a certain connection point to the destination.

Also notice how link measurements consider the bend points! This is especially useful for outside plant purposes when measuring total lengths of links with several bend points.

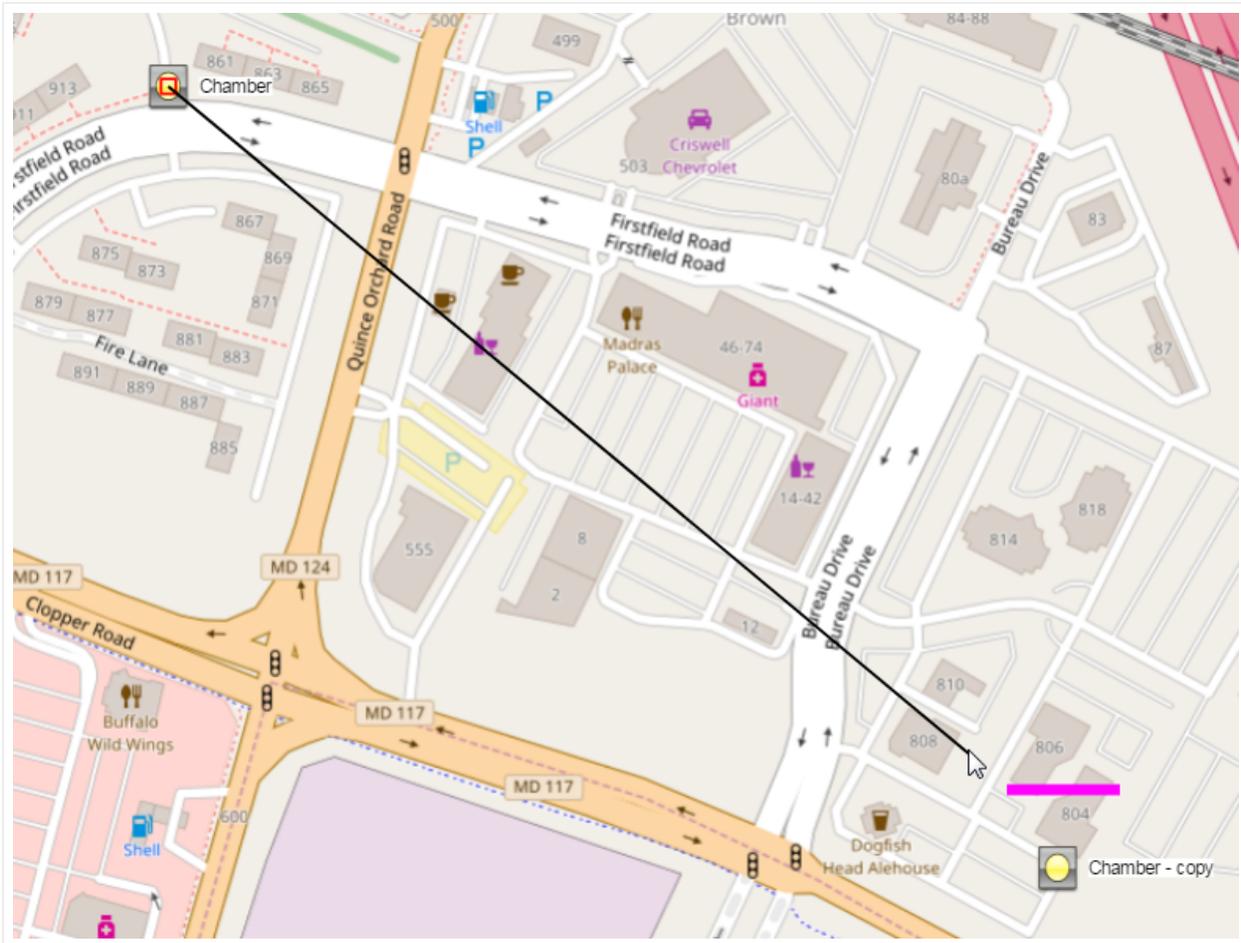
#### Attention!

When measuring lengths of links with bend points, the actual position of the bend point is what matters. For straight links this provides an exact measurement, but for curved links the actual path of the link will not coincide with the measured number since the bend points in Bezier curves lie outside of the line.

## 8.5.2 Creating links and bend points

The process of creating links and bend points in georeferenced diagrams is not different than in other diagrams, except for how the links look when zooming in or out. We will only review the drag and drop method for creating links:

- 1) Move the mouse to the link catalog pane and select a link type by clicking on the left mouse button.
- 2) Drag the mouse cursor to the starting node and the diagram.
- 3) As you hover the mouse over the starting node, the node should display 9 red snapping points (more on that later).
- 4) Once you identify the desired connection point on the starting node, release the left mouse button and drag the mouse cursor to the endpoint.
- 5) Once you hover the mouse over the ending node, the node should also display 8 red snapping points.
- 6) Once you identify the desired connection point on the ending node, press the left mouse button and the link is created!



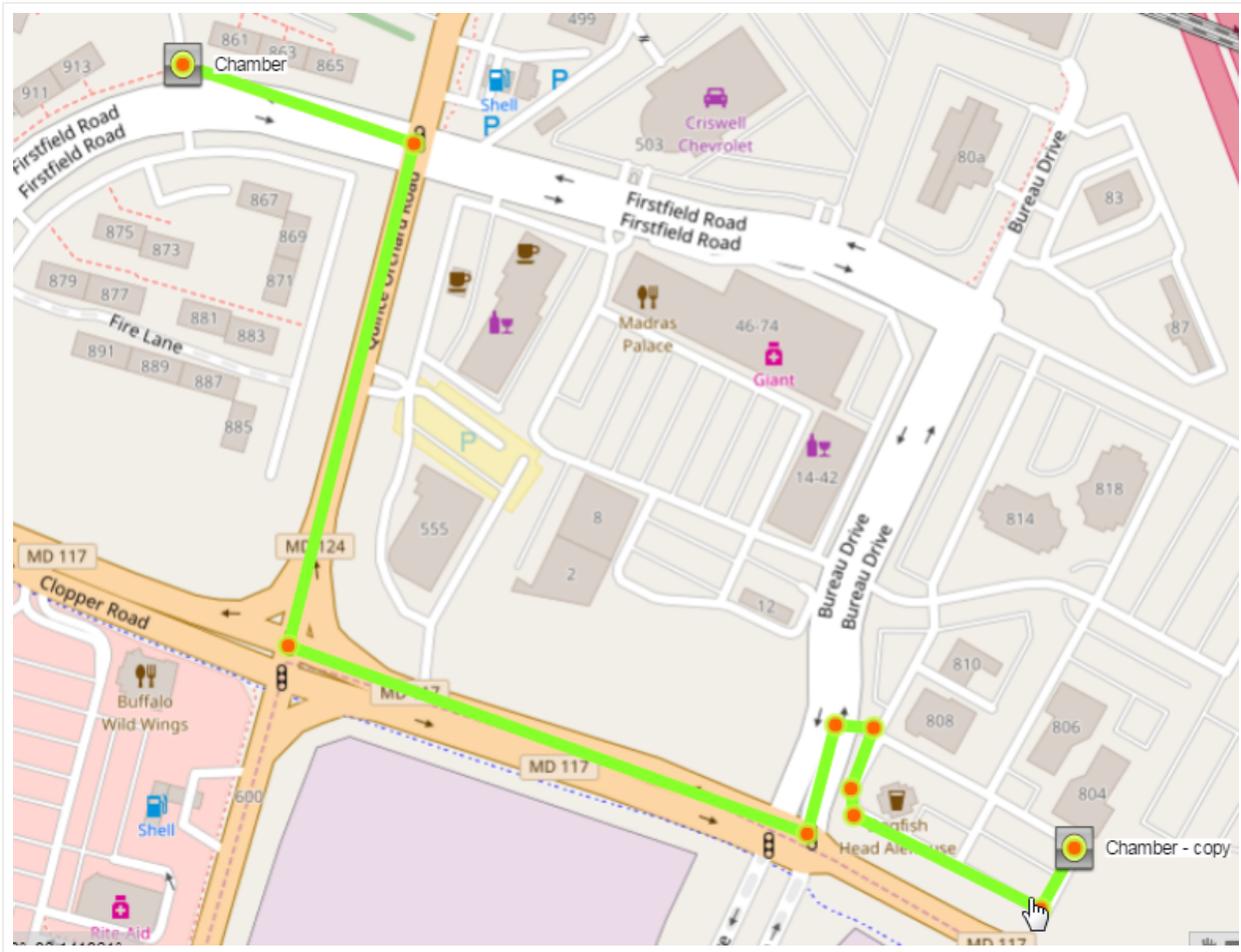
*Creating a link using the drag and drop method*

After the link is created, notice that when you zoom in or out of the map, the link thickness always remains the same regardless of zoom level. This is in contrast with diagrams not using dynamic maps, where the thickness of the link is absolute.

### 8.5.2.1 Creating multiple bend points quickly using the 'b' shortcut

As we saw before, a very quick way of adding multiple bend points and directing the path of the link is to use the 'b' shortcut. Select the link of interest first and then press and hold 'b'. Move your mouse to the position where you want to add a bend point and press the left mouse button. This will add the bend point where you click on the screen.

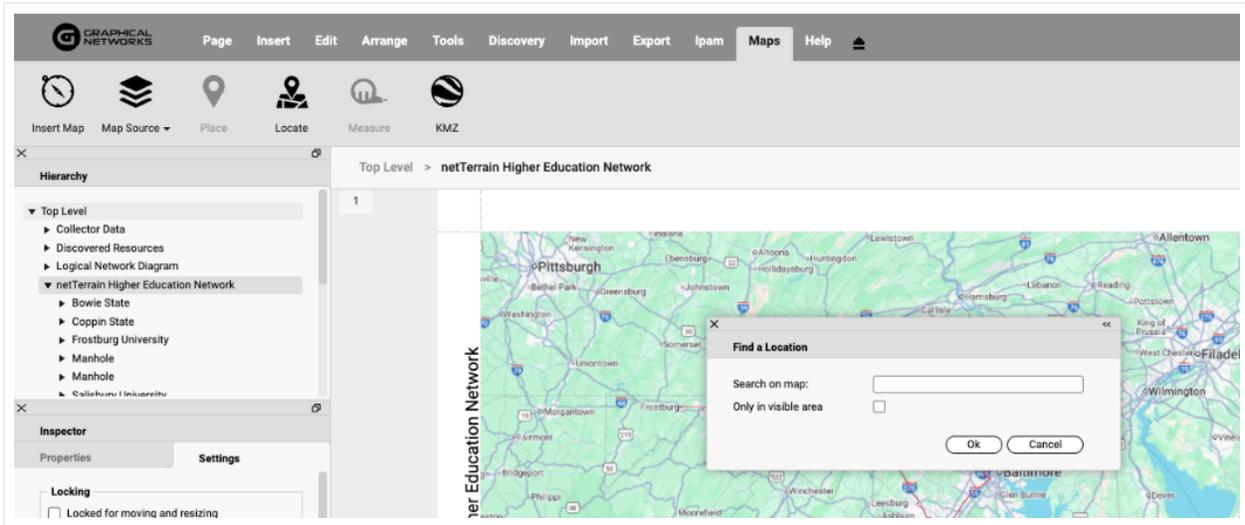
You can perform this operation as many times as you want in succession.



*Conduit following a complex path using bend points*

### 8.5.3 Location searches

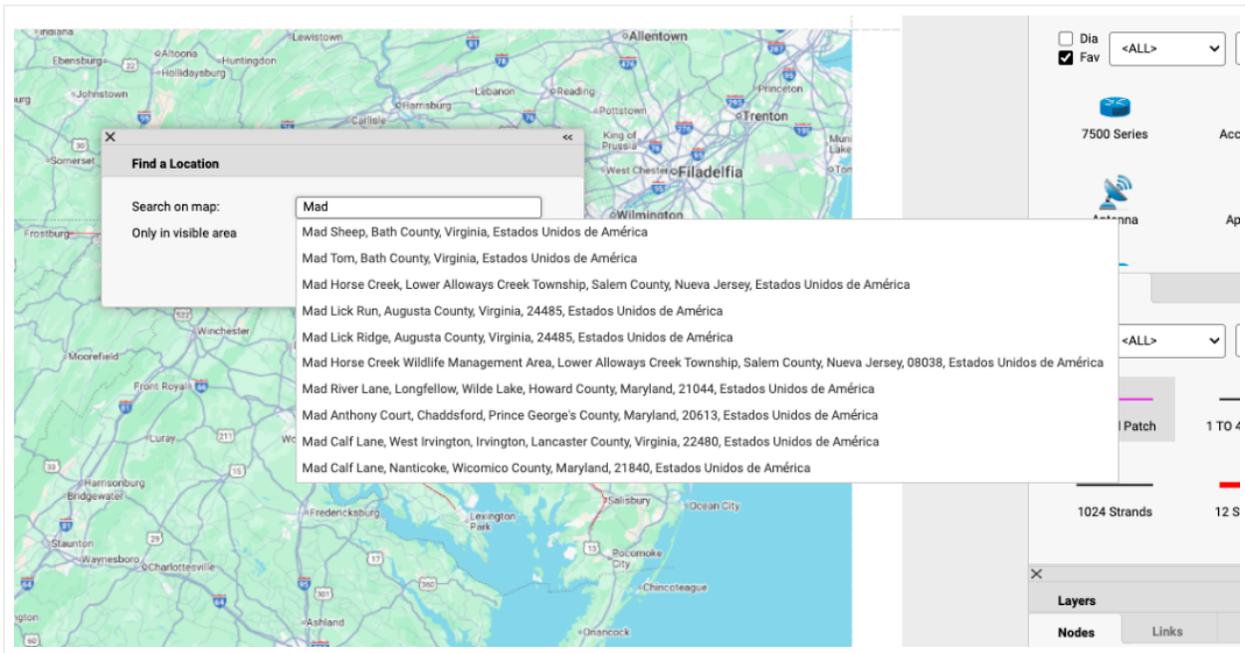
Georeferenced diagrams in netTerrain allow for location-based searches. For instance, you can enter a street number and find the precise location on a map. To do that simply right-click on the diagram (or press the 'o' key):



### Finding a location in a georeferenced diagram

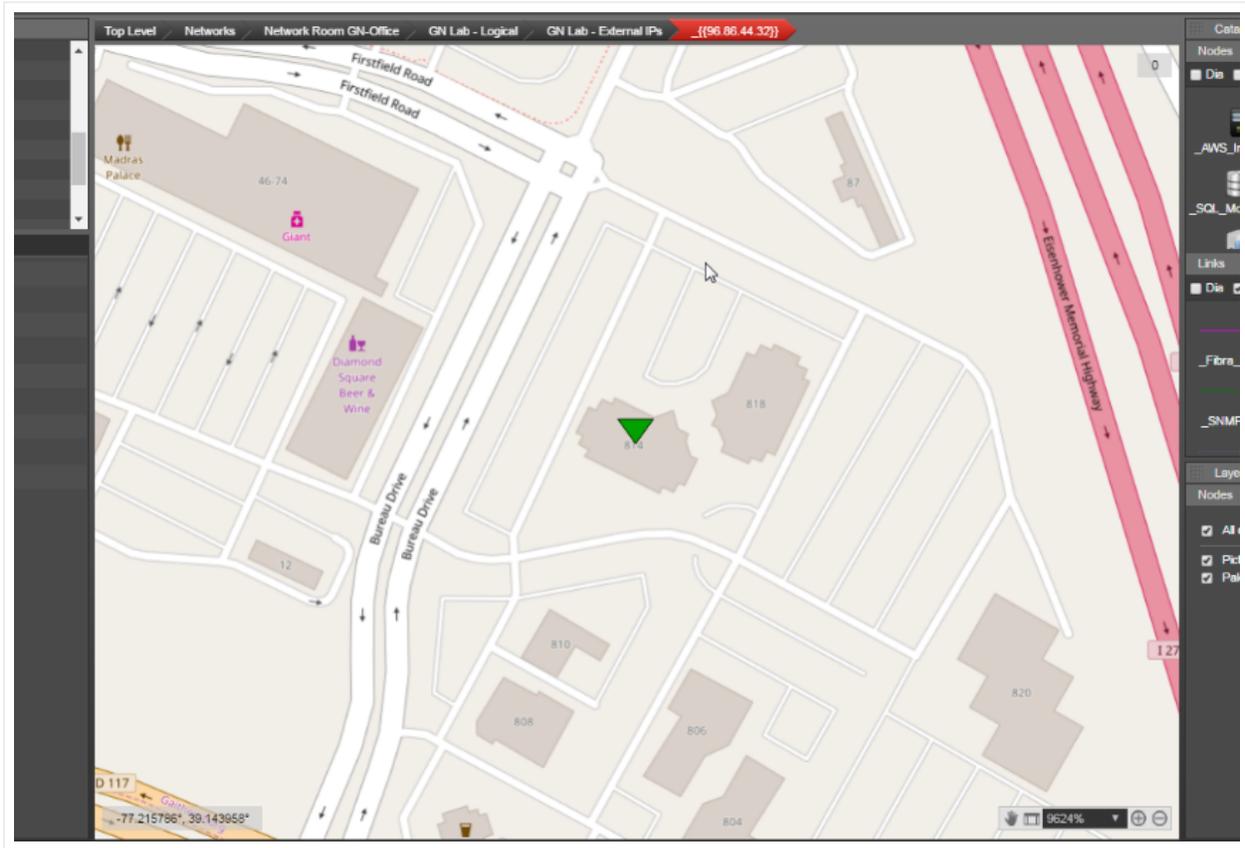
The search is smart in many ways:

- 1) It only looks for locations within the map displayed on the diagram, not the whole world.
- 2) It shows any matches as you type.
- 3) It can restrict the search for places that are inside the visible zoomed-in area, by clicking on the 'Only in visible area' option.



### Finding a match

Once one or more matches are found, you can click on the appropriate entry and netTerrain will auto pan and zoom to the resulting location. netTerrain will also add a green marker to the corresponding location.



*Found location*

## 8.6 Typical Outside Plant (OSP) elements

The netTerrain catalog is the place where power users or administrators can create and manage netTerrain types, including nodes, devices, racks, cards, links as well as Outside Plant objects.

The netTerrain catalog already includes several prepopulated OSP elements. As we know, any user with Power User rights can easily extend the catalog to include more custom types, in minutes. The details about catalog management are covered at length in the Power User guide, so it may seem a bit redundant to talk about types already included in the catalog when it is so easy to add new ones. However, it is worth highlighting some of the existing types and use cases that specifically apply to OSP.

## 8.6.1 OSP Node Types

netTerrain version 7 includes several OSP node types that can be used for outside plant functions such as containers of OSP devices or connection points for OSP links.

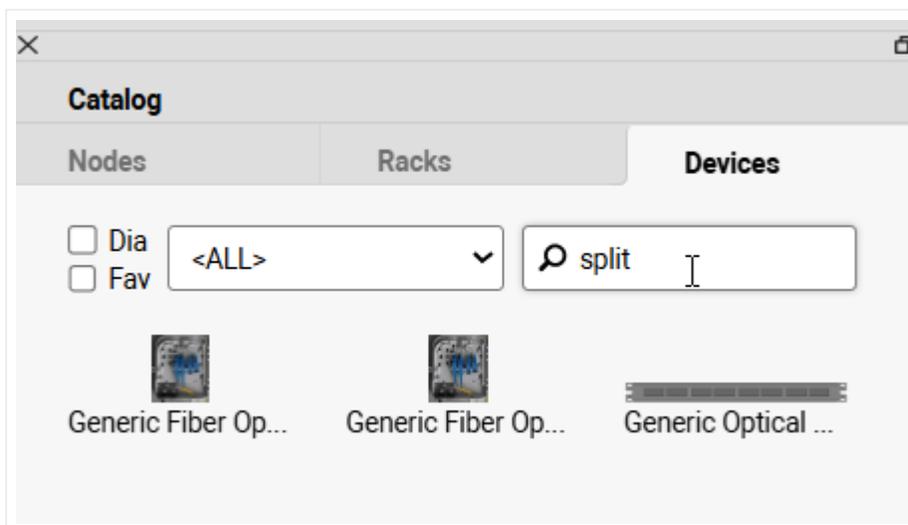
To view the built-in node types included in a new installation of netTerrain, click on the OSP category in the node catalog.

The current list of predefined types in the node catalog includes the following objects:

- Manhole
- Handhole
- Slack
- Tower
- Antenna
- Pole
- Mast
- Satellite

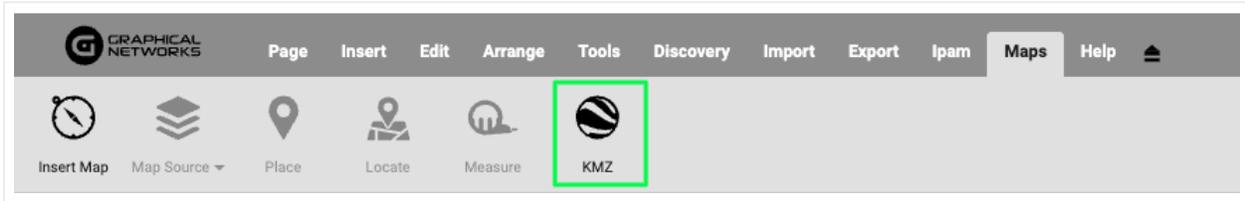
Not included in this list are elements such as buildings, sites, regions, generic connection points, networks, and other containers that, while part of many OSP projects, are also used in other contexts, and, as such, aren't specifically categorized in the OSP catalog folder.

The following is the expanded list of some of the OSP objects, as seen in the node catalog:



*OSP node catalog sample view*

The custom fields included for each predefined object vary from node type to node type. As an example, we show the list of fields for the object "manhole":



*List of fields for the "Manhole" type*

As mentioned above, we expect your specific Outside Plant project to have other types in the catalog, which, as you can see from the power user guide, is trivially simple to expand. It takes maybe a couple of minutes to add a brand new object type, including its properties and behaviors.

## 8.6.2 OSP Link Types

netTerrain version 7 includes several OSP link types that can be used for outside plant functions such as trenches, conduits, ducts and more.

To view the built-in link types included in a new installation of netTerrain, click on the OSP category in the link catalog.

The current list of predefined types in the node catalog includes the following objects:

- Conduit
- Duct
- Overhead Line
- Trench
- Wireless Link

The following is the expanded list of OSP objects, as seen in the link catalog:

Link Types (Category: OSP) To csv To Excel Add New

Filter Apply Clear

#	Name ^	Category	Fields	Overrides	Instances	Is Favorite	Is Enabled	Preview	Thickness	Link Style	Color	Start
1	12 Strand Fiber	OSP	4	0	24	<input checked="" type="checkbox"/>	<input type="checkbox"/>		5	Solid		Nc
2	144 Strand Fiber	OSP	2	0	58	<input checked="" type="checkbox"/>	<input type="checkbox"/>		1	Solid		Nc
3	24 Strand Fiber	OSP	4	0	69	<input checked="" type="checkbox"/>	<input type="checkbox"/>		1	Solid		Nc
4	72 Strand Fiber	OSP	5	0	7	<input checked="" type="checkbox"/>	<input type="checkbox"/>		1	Solid		Nc
5	Conduit	OSP	4	12	153	<input checked="" type="checkbox"/>	<input type="checkbox"/>		5	Solid		Nc
6	Duct	OSP	6	12	0	<input checked="" type="checkbox"/>	<input type="checkbox"/>		4	Solid		Nc
7	Overhead Line	OSP	5	0	0	<input checked="" type="checkbox"/>	<input type="checkbox"/>		3	Solid		Nc
8	Trench	OSP	6	0	0	<input checked="" type="checkbox"/>	<input type="checkbox"/>		8	Solid		Nc
9	Tube	OSP	2	0	0	<input checked="" type="checkbox"/>	<input type="checkbox"/>		1	Solid		Nc
10	Wireless link	OSP	8	0	0	<input checked="" type="checkbox"/>	<input type="checkbox"/>		2	Solid		Nc

### OSP link catalog sample

The custom fields included for each predefined object vary from link type to link type.

As mentioned above, we expect your specific Outside Plant project to have other types in the catalog, which, as you can see from the power user guide, is trivially simple to expand. It takes maybe a couple of minutes to add a brand new object type, including its properties and behaviors.

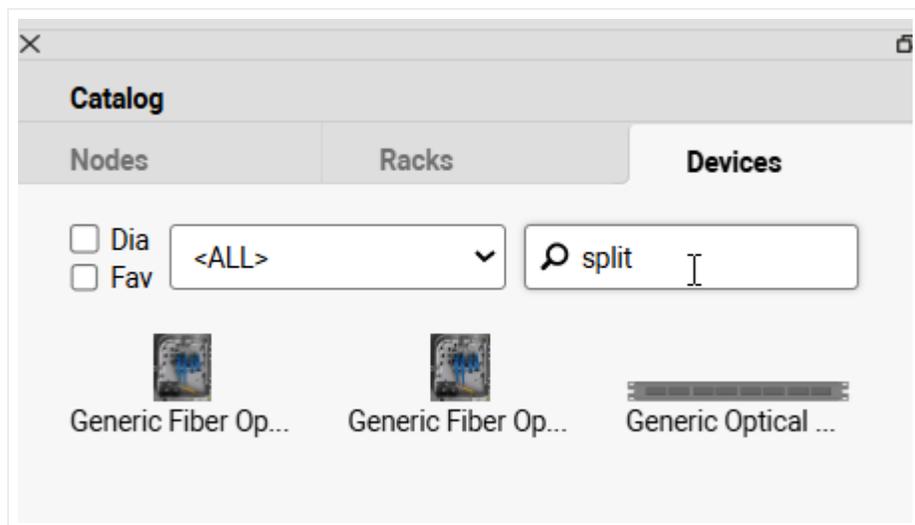
## 8.6.2.1 Circuits and strands

Circuits and strands can be modeled as regular links in the catalog, but as we will see later in this chapter, it is more convenient to use the built-in entities that already exist in netTerrain for this purpose.

## 8.6.3 OSP Device Types

netTerrain also includes several OSP device types that can be used for outside plant functions, mainly related to fiber strand management and splicing involving outside plant equipment. As opposed to node and link types, which lend themselves to having their own special OSP category, the OSP device types are spread across the catalog by vendor, so there isn't an OSP category per-se.

To find a specific OSP device type you would typically search it by value. For example, you may want to look for a splitter in the catalog and type the string "split" and get the following result:



### *Splitter devices*

In addition to splitters, you can find a variety of other device types in the catalog, including splices, enclosures, fiber panels, distribution panels and much more.

Just as with node and link types, the custom fields for each OSP device type vary from case to case and can be easily customized by a power user.

Notice that OSP device types behave like other (inside plant or DCIM) types: they can contain slots, ports, and default environmental and physical parameters. In particular, when working with fiber strands that need to be tracked on a strand by strand basis down to the connection point level we recommend modeling the equipment as netTerrain devices and model each connection point as a port.

Also, as mentioned before, we expect your specific Outside Plant project to have other types in the catalog, which, as you can see from the power user guide, is simple to expand. You can model new OSP device types yourself or request from us at no extra charge when you are under maintenance.

## **8.7 Working with KML / KMZ maps**

If you already have outside plant data in Google earth or another tool that supports exports to KML or KMZ formats, you can leverage that data by bringing it into netTerrain with a few clicks. You can also do the opposite: take a netTerrain georeferenced diagram and export it to KML.

KML and it's a cousin, KMZ (zipped KML) are typical formats used by mapping or GIS applications, such as Google Earth, and they can be easily imported into netTerrain. KML/KMZ imports and exports are mostly used in the context of a netTerrain OSP project, specifically to import data that exists in another OSP type application and minimize manual data entry or to export the netTerrain data and consume it inside an application that supports KML.

Nothing needs to be set up on the netTerrain server or on the client side to make this work but note that the KML import and exports buttons only work for netTerrain diagrams containing a dynamic map. Dynamic maps are only available with a valid netTerrain OSP license.

### 8.7.1 Prerequisites for importing KML / KMZ files

As stated, a KMZ file is basically a compressed version of a KML file, but there is, however, an important distinction to make: KMZ files can contain images, typically located under a “files” folder. These images would not be present in the KML file since the latter is essentially a text file with a special XML style format.

netTerrain can use images contained in the KMZ file and associate them with the corresponding nodes that are imported. If you want to preserve the same icons used in your application that exported the data, you may want to utilize the raw KMZ format instead of the unzipped KML file and make sure that those images are indeed included. From now on, we will mostly just refer to KMZ files, when explaining this feature.

Before importing a KMZ file into netTerrain, make sure that you are on a diagram in netTerrain that already has a dynamic map in it.

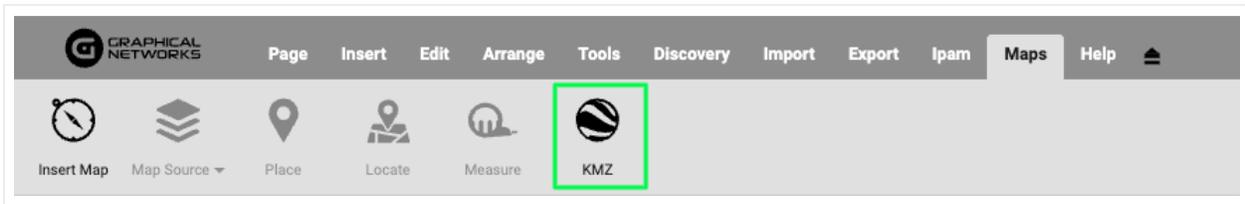
This map should ideally be large enough to correctly place all nodes that exist in the KMZ file. This means that every latitude and longitude coordinate associated with a node in the file should be contained within the boundaries of your netTerrain map, otherwise, any nodes falling outside of the boundaries will be discarded. Since importing the data is easy, if your original map is not correct, you can delete the imported data, change the map, and retry. Also, it is better to err on the side of a larger than needed map. You can change it to a smaller map later, and netTerrain will preserve the coordinates (if they are still within the boundaries of the smaller map).

#### Note

Since KMZ data is flat in nature, netTerrain will not produce any hierarchy of any kind. As such, all the data will be placed in one diagram, which in some cases may produce a very large diagram that takes a long time to load. You can take advantage of netTerrain's hierarchical nature by using different maps or diagrams, even in a parent to child relationship. To do that, it is better if the source is somehow partitioned so that you can already bring in the data as different KMZ files.

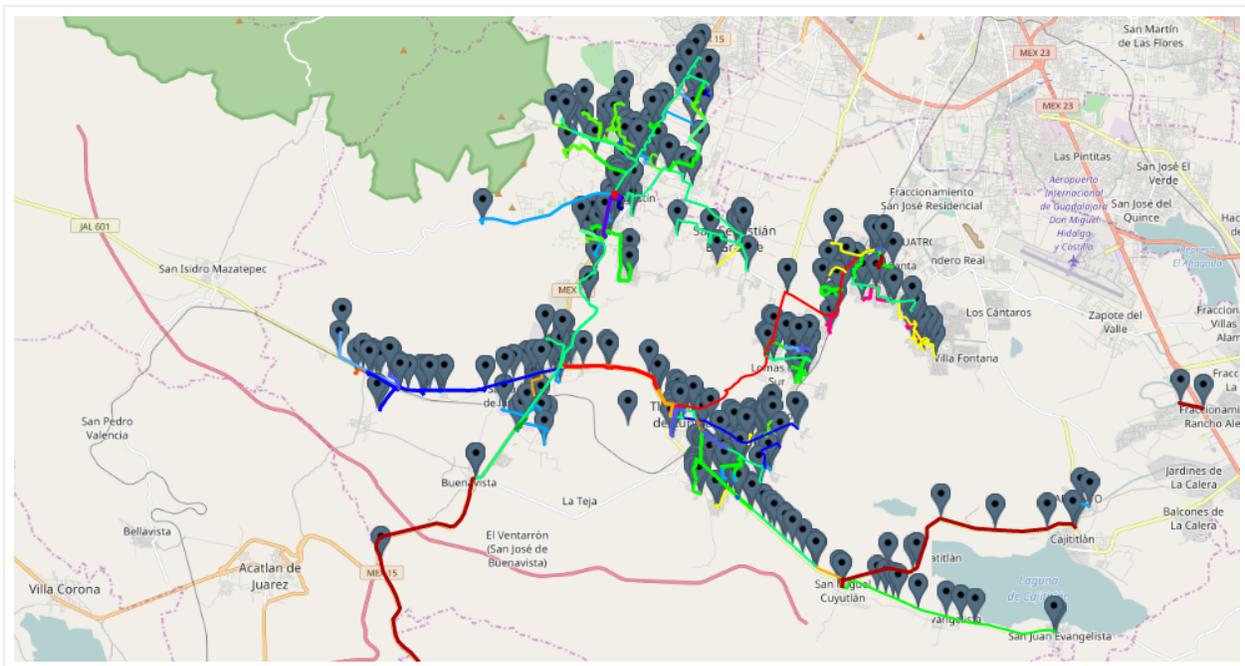
### 8.7.2 Importing a KMZ/KML file

To import a KMZ file navigate to the diagram that contains the map that will hold the KMZ data and click on the import from KMZ button found under the Import & Export ribbon.



### KMZ import button

In the upload KML / KMZ file dialog navigate to the folder that has the KMZ file and click on 'Start Upload'. Once the import finished, an "Import completed" dialog appears. After you click on 'OK' the map is refreshed, containing the KMZ data.



### Sample KMZ import into netTerrain

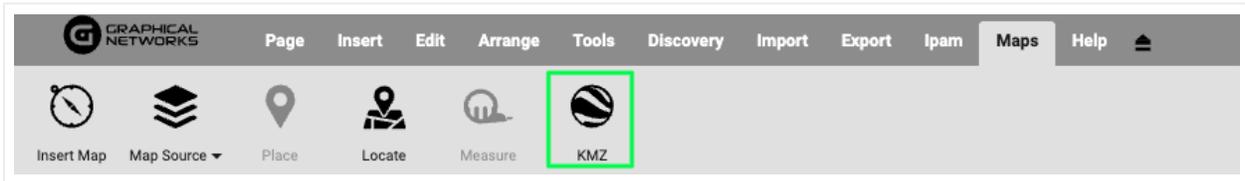
A few things to note about the results you see after the import:

- Nodes are automatically assigned a type.
- The same icon you used in Google Earth (or your original tool) should be seen in netTerrain.
- Lat long positioning is, as expected, automated.
- Lines should include bend points to follow the same path you used in the source.
- Line colors should be preserved.
- "Dangling" links are not supported, as such, netTerrain creates fictitious, transparent endpoints to represent these lines.

## 8.7.3 Exporting a diagram to KMZ

To export a diagram to KMZ navigate to the netTerrain diagram that contains the data to export. Remember, it must be a diagram that contains a GIS map.

Then click on the Import & Export ribbon and click on the KMZ Export button on the right.



*KMZ export button*

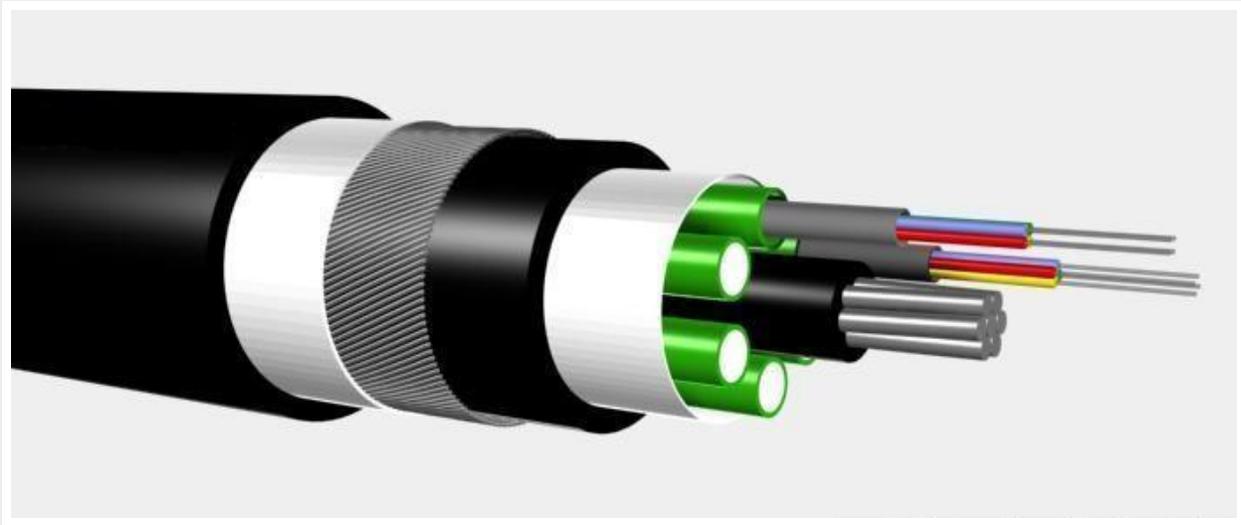
## 8.8 Working with cables and strands

Links in netTerrain so far have been quite simplistic in terms of how they are modeled: choose a look and feel for the link, assign some properties and, if needed, apply some rules (visual overrides) to some of those properties. This works well for virtually all network mapping and most Data Center Infrastructure Management (DCIM) scenarios. In outside plant (OSP) applications, however, a lot of the work with links deals with fiber cables, which contain so-called strands. Due to the high number of strands that can exist in a fiber plant project, and the fact that the strands count, as we will see later, is predetermined based on the type of cable, a different approach is needed.

In the following paragraphs we will see how you can model cables and strands in more efficient ways. We will also be referring to cables as containers of fiber strands even though a cable in netTerrain is still essentially a link. In that sense, link and cable are used interchangeably.

### 8.8.1 Fiber cable and strand types

Before we dig deeper into how netTerrain models cables let's review some of the basics of fiber optic cabling. An optical fiber cable is an assembly containing one or more small optical fiber strands that transmit information by means of light signals with certain wavelengths.



### Multi-fiber cable representation

A fiber cable usually has a series of layers for protection and improved performance, with the strands being inside the cable, sometimes also organized in ribbons. There are myriad of different strand counts available in the market, from a couple of strands per cable to up to an 864-count, consisting of 36 ribbons containing 24 strands of fiber each. Some of the most common strand counts are 12, 24, 72 or 144.

In netTerrain a user would ideally want to have these strands created automatically when adding a cable in a fiber plant project. You see this type of automatic creation of subcomponents already, when it comes to hardware: in netTerrain, a device may already have a predefined number of slots and a card, a predefined number of ports. Likewise, a power user can create a link type in the netTerrain that is configured as containing strands, as depicted in the image below.

#	Name	Category	Fields	Overrides	Instances	Is Favorite	Is Enabled	Preview	Thickness	Link Style	Color	Start Arrow	End Arrow	Snapped to Edge	Restrictions	Matching Port Connectors	Strands	Use For ACRIA Patch
1	_Native_SNMP_Links	Logical	29	0	0	<input type="checkbox"/>	<input type="checkbox"/>		1	Solid	Green	None	None	<input type="checkbox"/>	0	<input type="checkbox"/>		<input type="checkbox"/>
2	_Native_SNMP_Links_Lis	Logical	24	0	0	<input type="checkbox"/>	<input type="checkbox"/>		1	Solid	Blue	None	None	<input type="checkbox"/>	0	<input type="checkbox"/>		<input type="checkbox"/>
3	1 Strand Patch		18	0	11	<input checked="" type="checkbox"/>	<input type="checkbox"/>		1	Solid	Purple	None	None	<input type="checkbox"/>	0	<input type="checkbox"/>	1	<input type="checkbox"/>
4	1 TO 4 BREAKOUT		18	0	5	<input checked="" type="checkbox"/>	<input type="checkbox"/>		1	Solid	Black	None	None	<input type="checkbox"/>	0	<input type="checkbox"/>		<input type="checkbox"/>
5	1024 Strands		18	0	23	<input checked="" type="checkbox"/>	<input type="checkbox"/>		1	Solid	Black	None	None	<input type="checkbox"/>	0	<input type="checkbox"/>	1024	<input type="checkbox"/>
6	10G Opt - 1 Strands		24	0	0	<input checked="" type="checkbox"/>	<input type="checkbox"/>		5	Solid	Green	Plain	Plain	<input type="checkbox"/>	0	<input type="checkbox"/>		<input type="checkbox"/>
7	10G optika		29	0	0	<input checked="" type="checkbox"/>	<input type="checkbox"/>		5	Solid	Red	Plain	Plain	<input type="checkbox"/>	0	<input type="checkbox"/>		<input type="checkbox"/>
8	10G BASE-CX		20	0	0	<input checked="" type="checkbox"/>	<input type="checkbox"/>		5	Solid	Black	Plain	Plain	<input type="checkbox"/>	0	<input type="checkbox"/>		<input type="checkbox"/>
9	12 Strand Fiber		20	0	109	<input checked="" type="checkbox"/>	<input type="checkbox"/>		3	Solid	Red	None	None	<input type="checkbox"/>	0	<input type="checkbox"/>	12	<input type="checkbox"/>
10	12 strand fiber NPO		18	0	55	<input checked="" type="checkbox"/>	<input type="checkbox"/>		1	Solid	Black	None	None	<input type="checkbox"/>	0	<input type="checkbox"/>	12	<input type="checkbox"/>

### List of cables and their number of predefined strands as seen in the catalog

As an end-user, you can take one of these cables that are defined in the catalog as containing strands, apply them to your project, and they will automatically then create these strands.

For high strand counts or cables with bundles (or buffers) of 12 strands it is common to identify each strand with a color code standard adopted from the early TIA telephone standards for copper wire, as shown in the table below.

Fiber Number	Color
1	Blue
2	Orange
3	Green
4	Brown
5	Slate
6	White
7	Red
8	Black
9	Yellow
10	Violet
11	Rose
12	Aqua

The netTerrain catalog supports the TIA standard for the creation of strands in cables by automatically creating sets of 12 strands with the color code shown above. These colors can be overwritten on a strand-by-strand basis.

For cables with less than 145 strands, you typically organize the cable by strands and buffers. Each buffer normally contains 12 strands, and the buffer color (in the TIA standard) follows the same pattern as each strand and changes color every 12 strands.

For very high strand counts netTerrain also supports so-called "stripes", an extra color-coded category. Usually, stripes make sense with cables that have more than 144 strands, since after that, the buffer colors repeat. The idea behind the stripes is to make sure that each strand has a unique color identifier (which, in a 12-color pattern, would see repetitions after 144 strands). With the extra stripe layer, the number of unique color-coded strands would be 12-cubed (1728).

You can set up stripe colors for your cables in the catalog the same way you do it with buffers. By default, netTerrain follows the TIA standard and assigns stripe colors only for cables with a count higher than 144

strands and the color pattern is the same one used for strands and buffers. These patterns and colors can be overwritten on a per strand basis.

While cables are just like in the netTerrain catalog with some extra sizzle, strands in netTerrain are not really links. You don't see them graphically, and they are not individually modeled in the catalog. Just like we do with ports where there is only one system type called port, in the netTerrain catalog there is a system type called 'strand'. As with ports, a power user can assign custom fields to the strand system type.

## 8.8.2 Managing strands

Adding a cable with strands to your fiber plant diagram is like adding any regular link. For example, you can drag and drop it from the catalog into the project by connecting it to the endpoints. Once created, the cable will list all its strands in the properties window as a clickable hyperlink:

**GRAPHICAL NETWORKS** Page Insert Edit Arrange Tools Discovery Import Export

Insert Map Map Source Place Locate Measure KMZ

Inspector

Top Level > Logical Network Dia... > Higher Educ

1

**Properties** Settings

Id 25000000241859

Type 256 strands test

From uWAQZnpgVL

To uWAQZnpgVL

Name 256 strands test

Cable Length

Change

Color

Connector 1

Connector 2

Cost

Description

Fiber Mode

Fiber Type

Manufacturer

Manufacturer Eq...

Product Descript...

Product Line

Product Number

V\_Type

Viasat Part Num...

Strands 256 (256 dangling)

Catalog Fields

Audit Trail 1

The map displays a geographical area with various locations including Savage River State Forest, Cumberland, Green Ridge State Forest, Oakland, Keyser, Romney, Moorefield, Petersburg, Woodstock, Franklin, Shenandoah Wildlife Management Area, New Market, Luray, Harrisonburg, Bridgewater, and Elkton. A fiber optic link is shown connecting two routers. The top router is labeled 'Top Level > netTerrain Higher Education Network > The University at Study Grove > A1'. The bottom router is labeled 'Top Level > netTerrain Higher Education Network > University System of Maryland at Hagerstown > A1'. The link is labeled '256 strands test'.

GRAPHICAL NETWORKS Page Insert Edit Arrange Tools Discovery Import Export

Insert Map Map Source Place Locate Measure KMZ

Inspector

Top Level > Logical Network Dia... > Higher Edu

1

**Properties** Settings

Id 25000000241859

Type 256 strands test ...

From uWAQZnpgVL

To uWAQZnpgVL

Name 256 strands test ...

Cable Length ...

Change ...

Color ...

Connector 1 ...

Connector 2 ...

Cost ...

Description ...

Fiber Mode ...

Fiber Type ...

Manufacturer ...

Manufacturer Eq...

Product Descript...

Product Line ...

Product Number ...

V\_Type ...

Viasat Part Num...

**Strands 256 (256 dangling)**

Catalog Fields

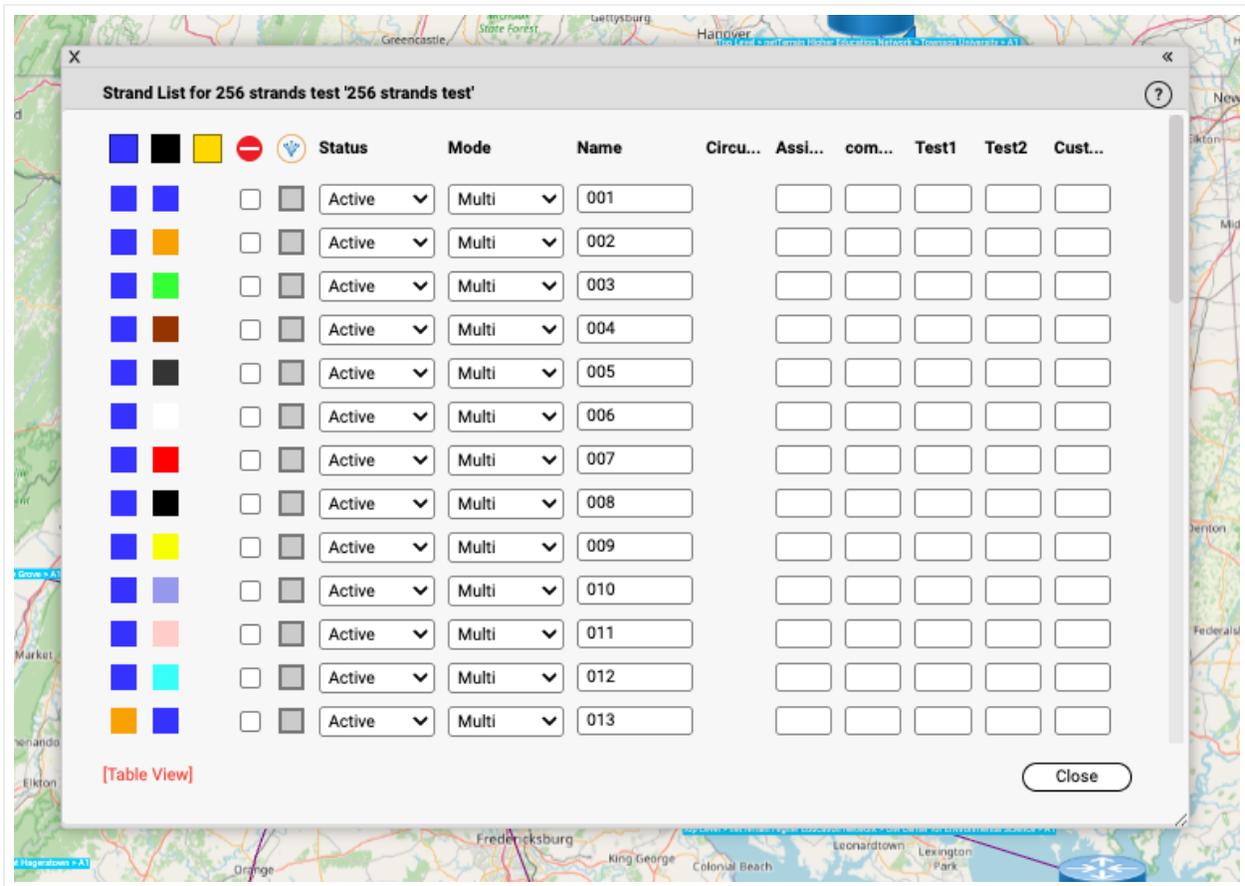
Audit Trail 1

Strands displayed in the cable properties window

The clickable Strands hyperlink opens a new list view that lets you manage the strands. This list view includes several properties and actions to help you manage strand usage, attributes, and capacity:

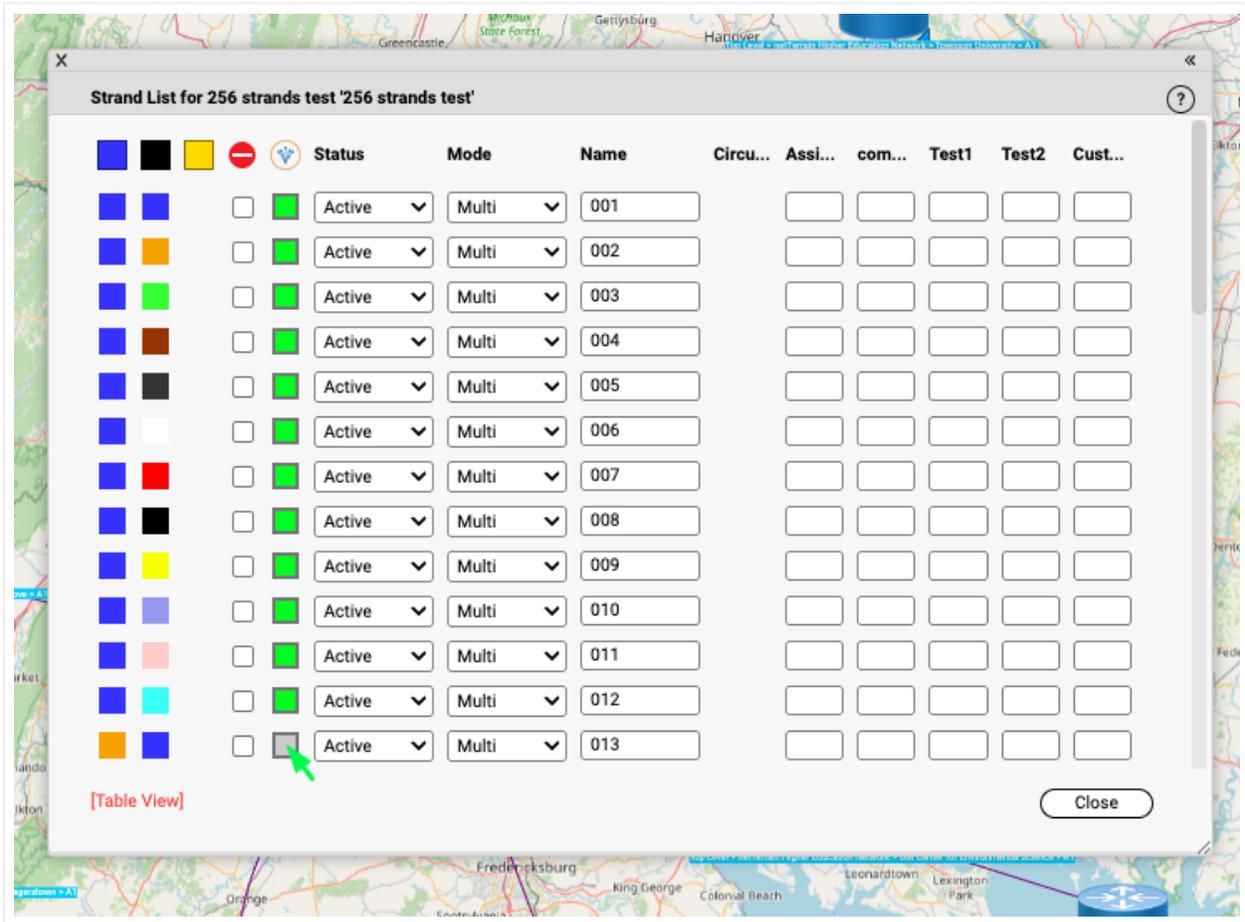
- Buffer color: this is the first square on the left and represents the color of the buffer that contains the strand.
- Strand color
- Stripe color
- Checkbox to exclude the strand from an ACRA process (more on that later).
- Strand connection utility (see below).
- Strand status
- Strand mode
- Strand name
- Circuit associated to the strand.
- Custom fields

Each strand name inherits the predefined name for the strand assigned for that cable type in the catalog.



Strand list dialog

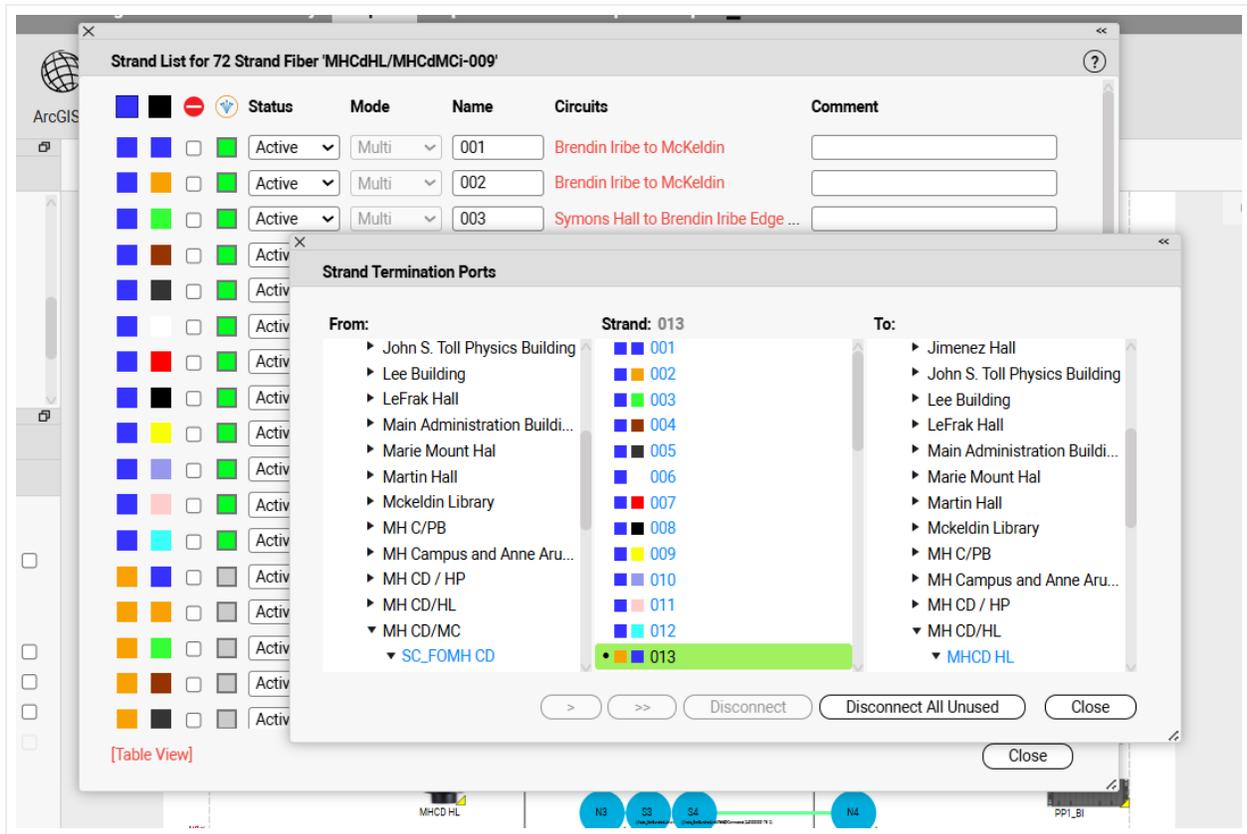
Right after the cable is created in netTerrain, all the strands that are contained, are disconnected (or dangling), which means that each individual strand will not be connected to any port. Once you start connecting strands to ports, the connected ones will have a lime-colored square to the left of the status field. Any disconnected ones will show a grey-colored square.



*A disconnected strand*

### 8.8.2.1 Connecting strands

To connect a strand to an endpoint or switch the current endpoints, simply click on the grey button, which opens another dialog to manage these endpoints:

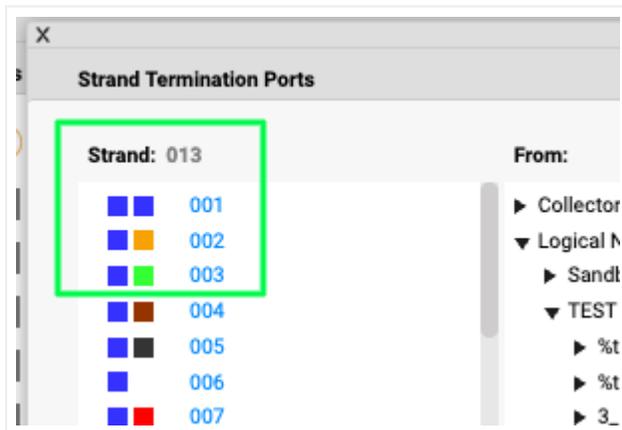


### Strand endpoint management

The Strand Termination Ports dialog has three main sections:

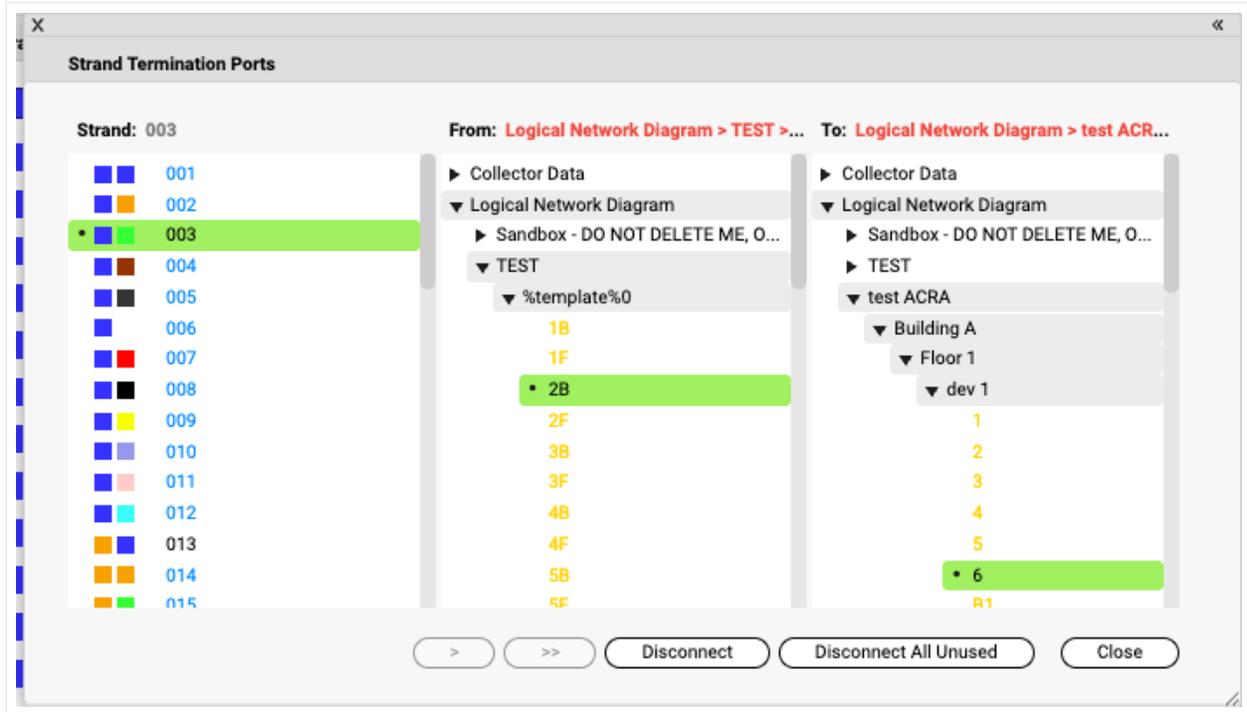
- From termination port
- Strand list: includes the strand number with its buffer and strand color.
- To termination port

Any connected strands will be displayed in light blue. Disconnected strands will be shown in grey.



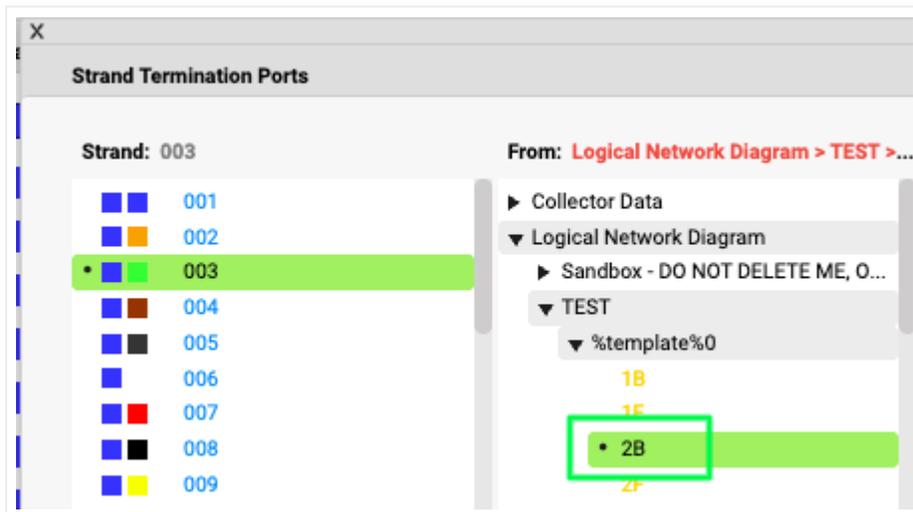
Two connected strands and two disconnected strands

To know how a strand is connected, simply click on it. If it is connected to any ports, these will be highlighted in green:



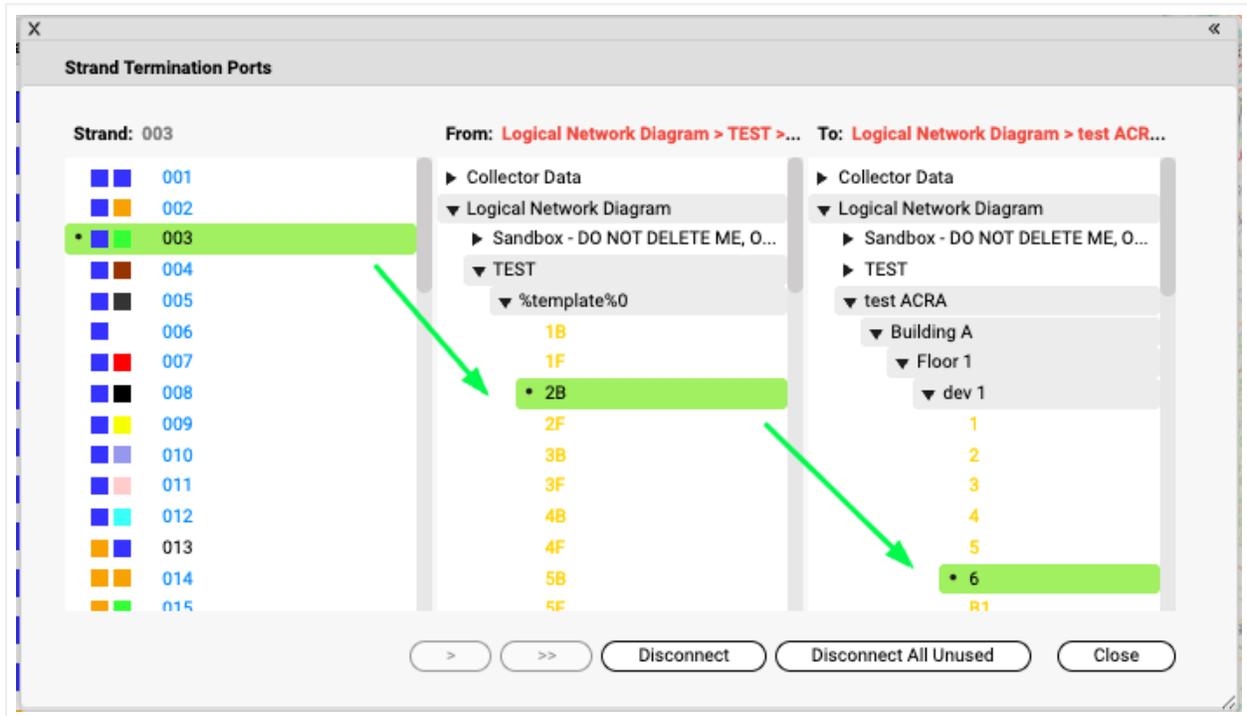
*A connected strand*

Before connecting a strand to a port, you can inspect any of the ports on the 2nd and 3rd columns by clicking on the port name. This will open a new tab and navigate to the netTerrain project and highlight the port.



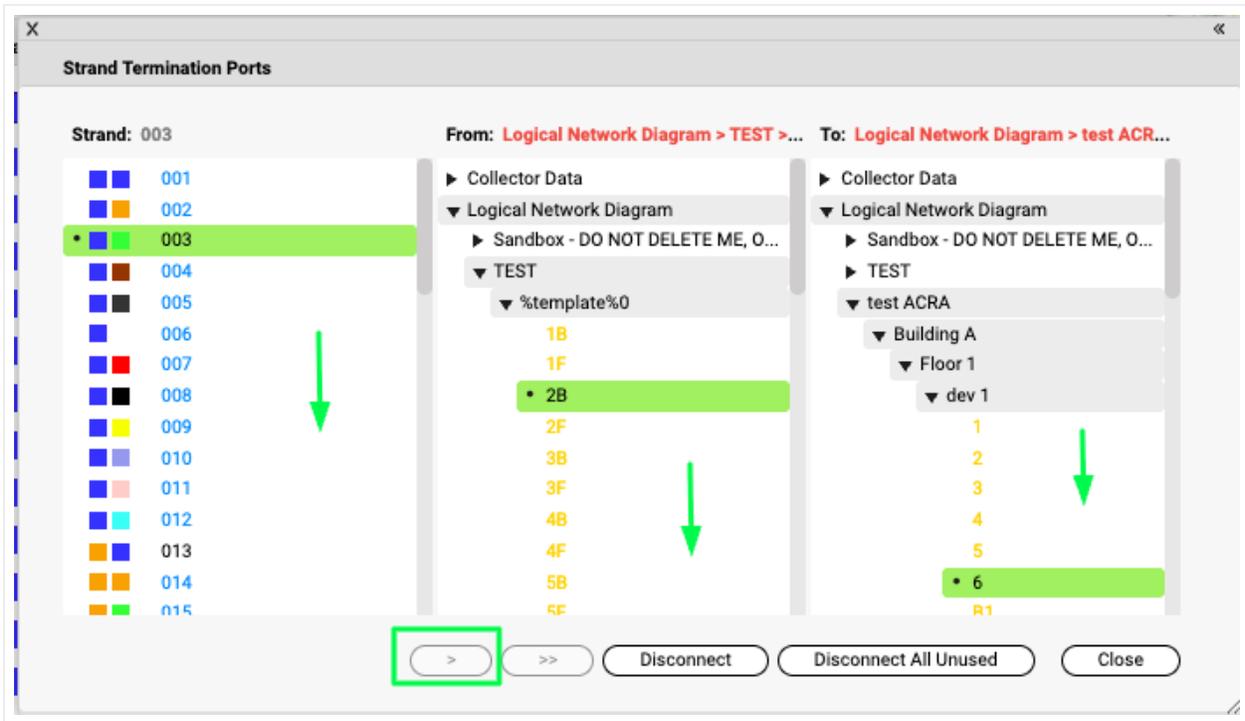
### Navigating to a port

If you want to connect a strand, you can do that individually by clicking on the strand and simply selecting the ports on the 2nd and 3rd column. Notice that these columns display the full netTerrain hierarchy.



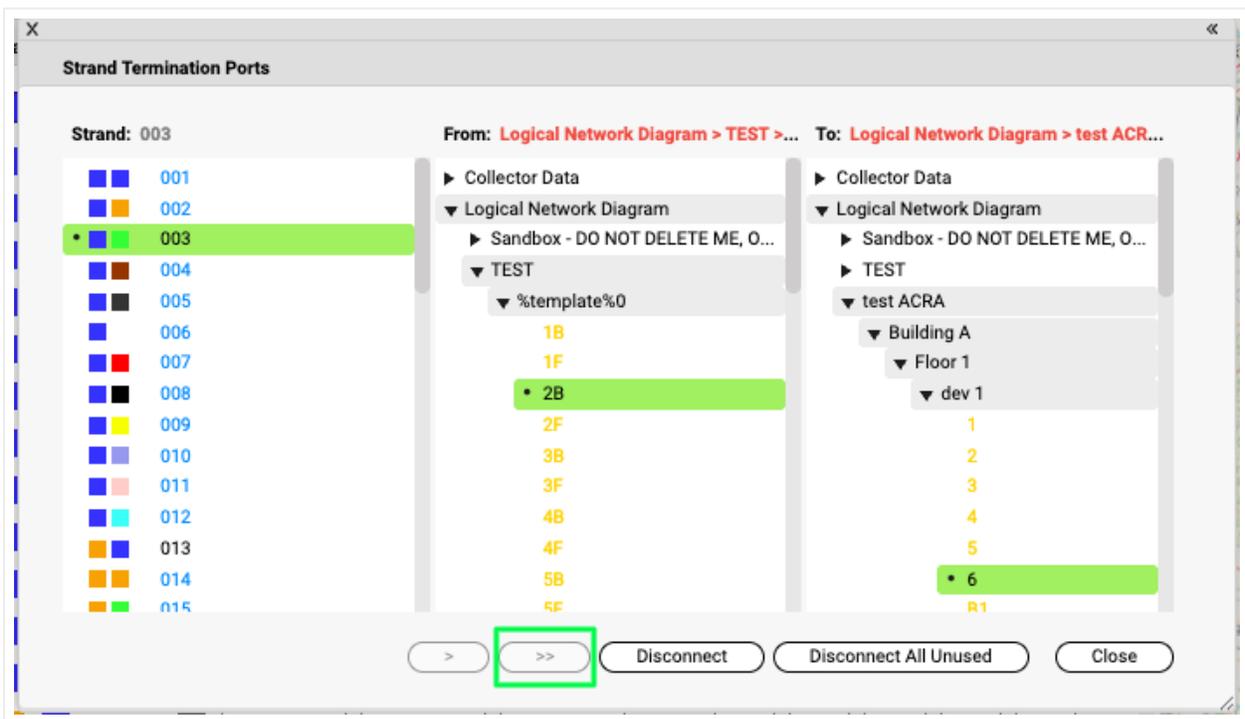
### Connecting a strand individually

You can automatically connect the next strand in the sequence, by clicking on the '>' button. This will connect the next strand to the next available ports sequentially.



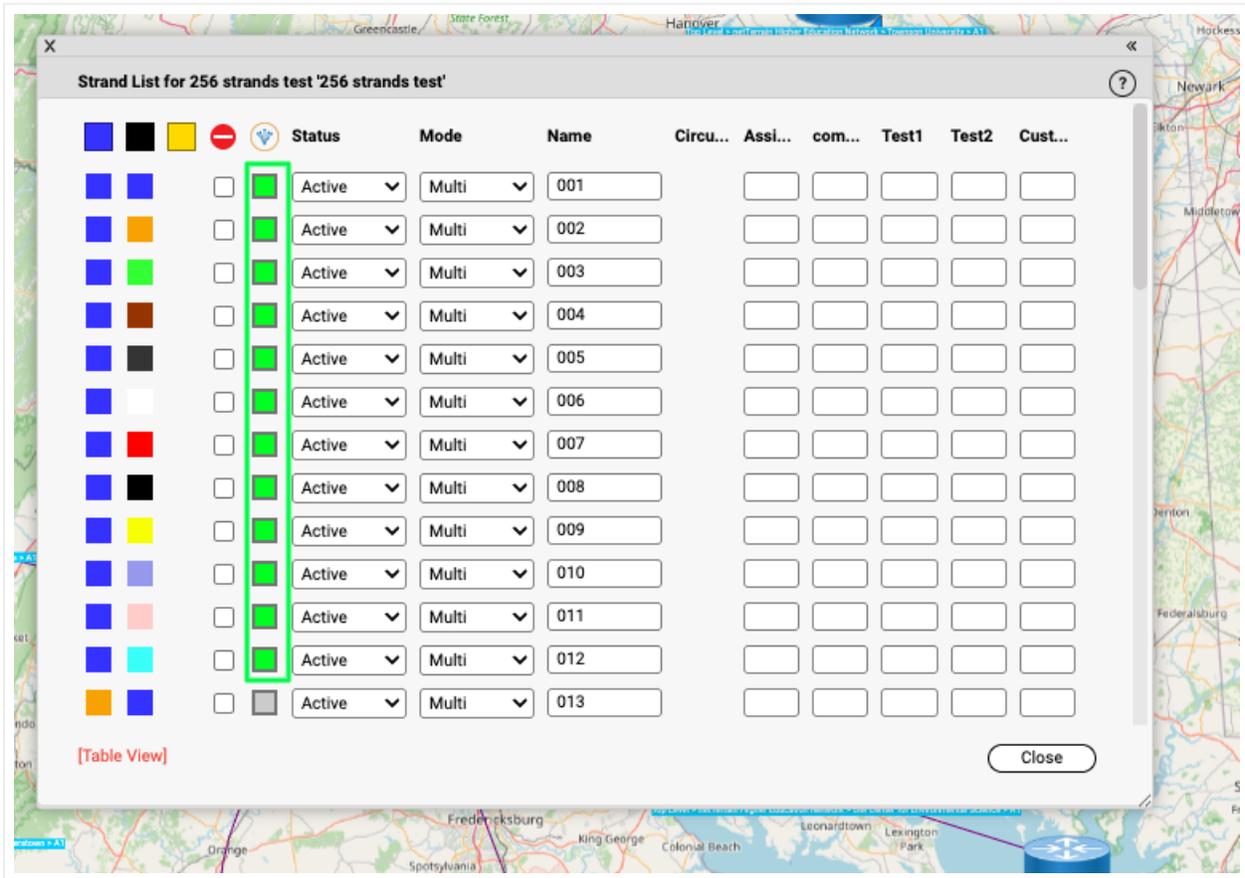
Sequentially connecting strands with the single arrow button

You can also connect the entire batch of unconnected strands following the selected one, by clicking on the '>>' button. This will connect strands if the corresponding consecutive ports are also available.



Connecting a batch of strands with the '>>' button

Once the strands are connected to endpoints, the endpoint indicator in the strand list is shown in green.



### Terminated strands

It is important to have your strands terminated, otherwise they cannot be used for circuits (more on that later).

## 8.8.2.2 Disconnecting strands

If you wish to disconnect a strand, select it and then click on the disconnect button. You can also disconnect all strands that are not currently in use by a circuit if you click on the 'Disconnect All Unused' button.

## 8.8.2.3 Strand table view

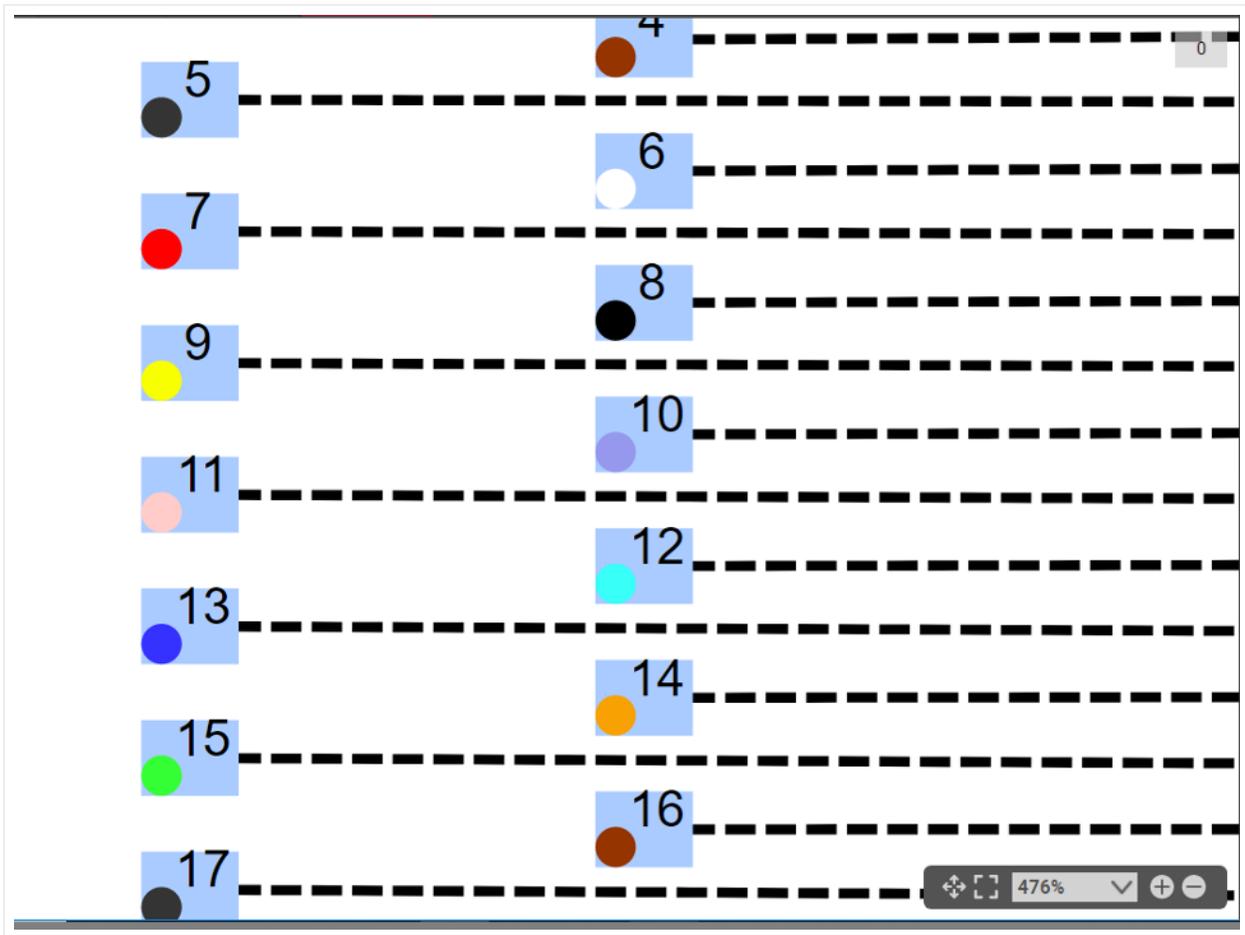
You can open a table view of all the strands on a cable by clicking on the 'Table View' hyperlink located on the bottom right corner of the strand list dialog.

#	Buffer Color	Strand Color	Stripe Color	Exclude from ACRA	From Port	To Port	Status	Mode	Name	Circuits	Assignment	comments	Test1	Test2	Customer
1	Blue	Blue	White	<input type="checkbox"/>	1B	4	Active	Multi	001						
2	Blue	Orange	White	<input type="checkbox"/>	1F	5	Active	Multi	002						
3	Blue	Green	White	<input type="checkbox"/>	2B	6	Active	Multi	003						
4	Blue	Brown	White	<input type="checkbox"/>	2F	B1	Active	Multi	004						
5	Blue	Black	White	<input type="checkbox"/>	3B	B2	Active	Multi	005						
6	Blue	White	White	<input type="checkbox"/>	3F	B3	Active	Multi	006						
7	Blue	Red	White	<input type="checkbox"/>	4B	B4	Active	Multi	007						
8	Blue	Black	White	<input type="checkbox"/>	4F	B5	Active	Multi	008						

Strand table view

### 8.8.2.4 Strand colors on ports

As soon as a port is used for a strand, you can visually see that the ports is already “taken” by means of a strand indicator. This indicator consists of a small circle rendered inside the port icon showing the strand color. The circle can be configured by an administrator (in the web.config file) to be displayed on the bottom, center or bottom right of the port icon.



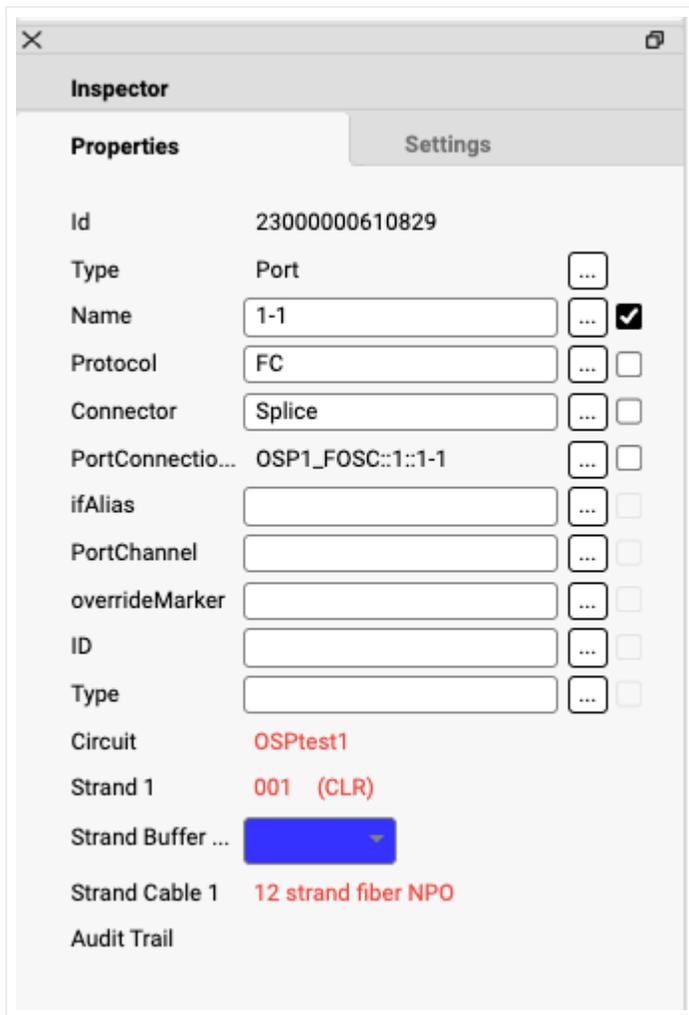
### Strand indicators

You can double click on any port with a strand to get to the other end of the strand. netTerrain will then automatically navigate to the diagram that contains the port where the other strand endpoint is connected and highlight it.



*Highlighted port of opposite endpoint of a strand*

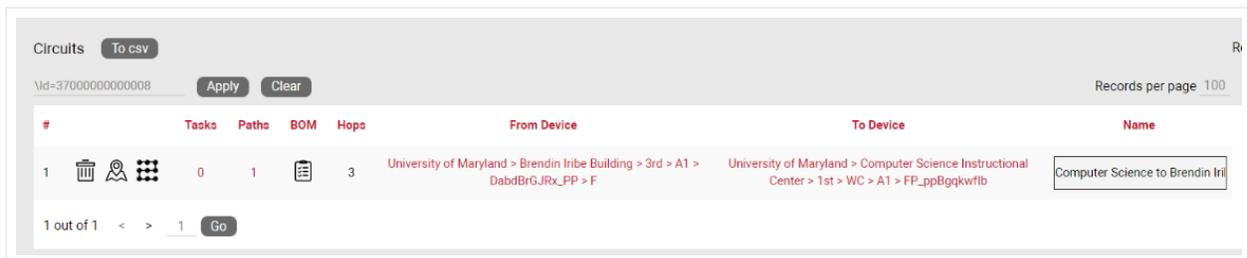
When clicking on a port that has a strand connected to it, that port will include some basic information about that strand, as shown below:



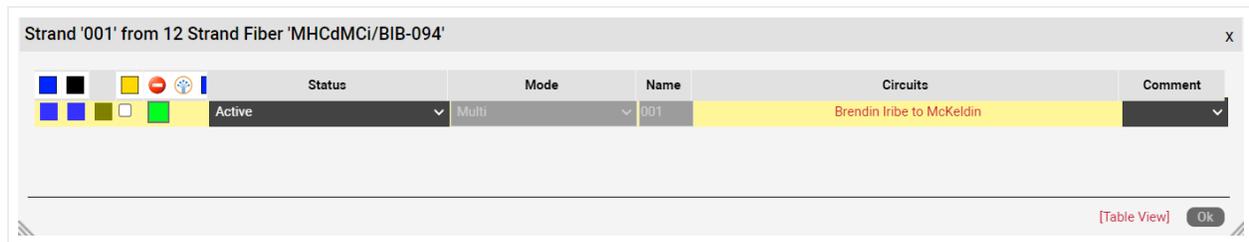
Strand information for port

The strand information includes:

- Circuit link: opens the circuits table with that particular circuit filtered out.

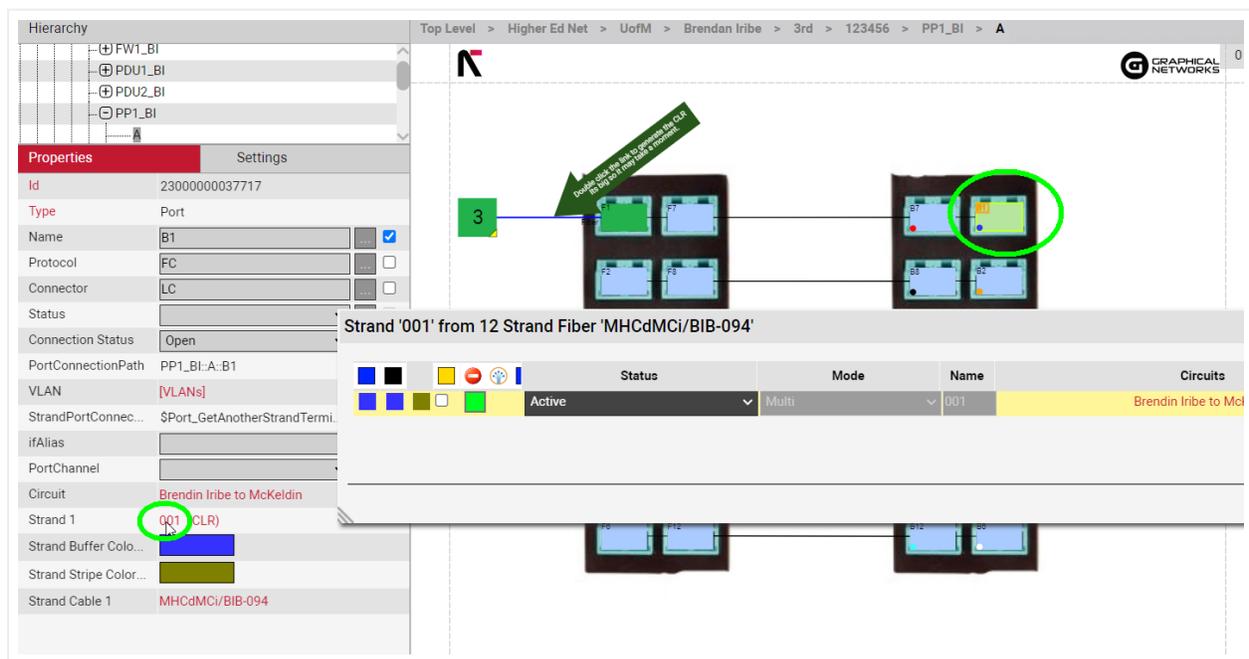


- Strand number link: opens the strand list showing that particular strand.



- Strand buffer color: color of the buffer containing the strand.
- Strand cable link: takes you to the diagram that contains the cable containing the strand.

You can open the strand dialog from a port as well by clicking on the port and then clicking on the Strand number hyperlink:



### 8.8.2.5 Strand custom fields

Strands can also have custom fields, which are defined in the catalog (see Power-User Guide). Users can edit strand property values for each strand from the strand list as well. Custom fields appear after the circuit list and can use text fields as well as combo boxes.

**Strand List for 48 strand SM '48 strand SM'** ? x

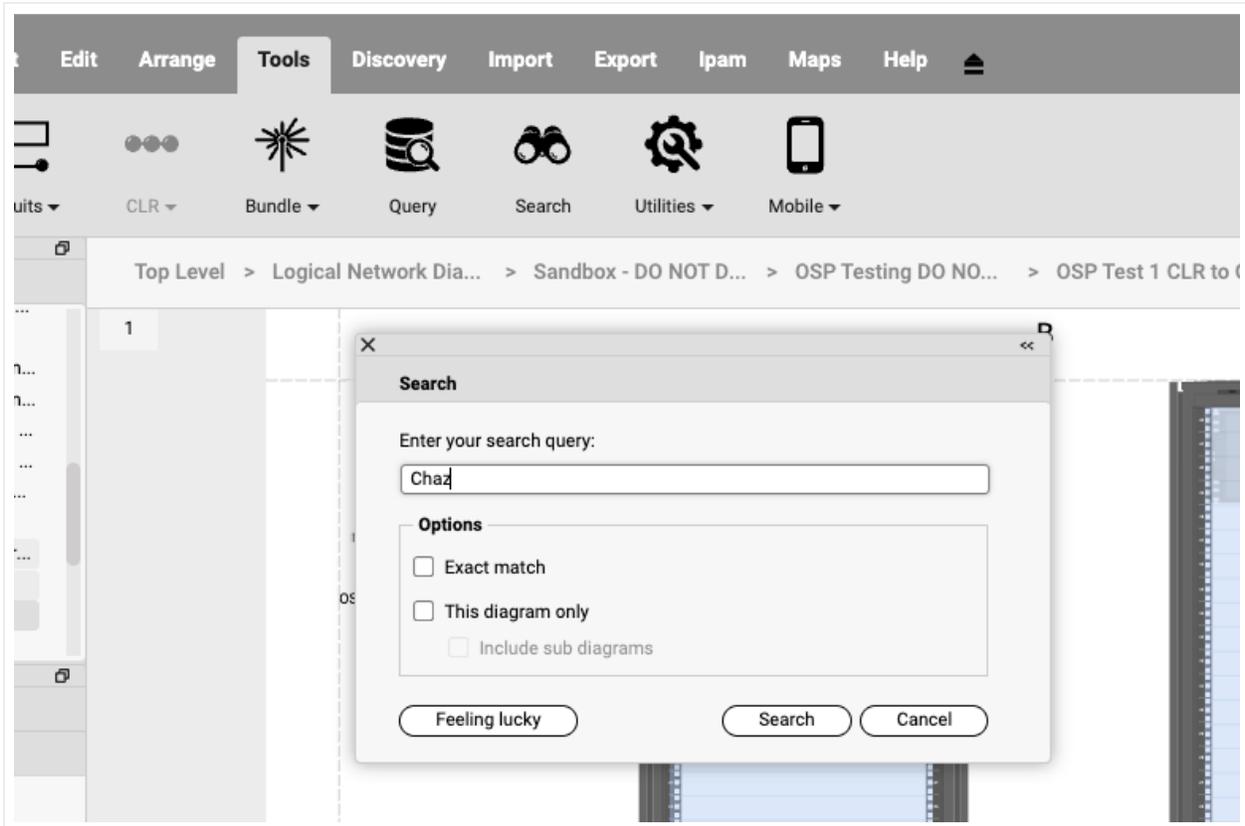
				Status	Mode	Name	Circuit	User
				Active	Single	001	crc-my88-PPOLT	
				Active	Single	002	crc-my88-PPOLT	
				Active	Single	003		
				Active	Single	004		
				Active	Single	005		Brad
				Active	Single	006		Chaz
				Active	Single	007		Pepe
				Active	Single	008		Toto
				Active	Single	009		
				Active	Single	010		
				Active	Single	011		
				Active	Single	012		
				Active	Single	013		
				Active	Single	014		
				Active	Single	015		
				Active	Single	016		
				Active	Single	017		

[Table View]

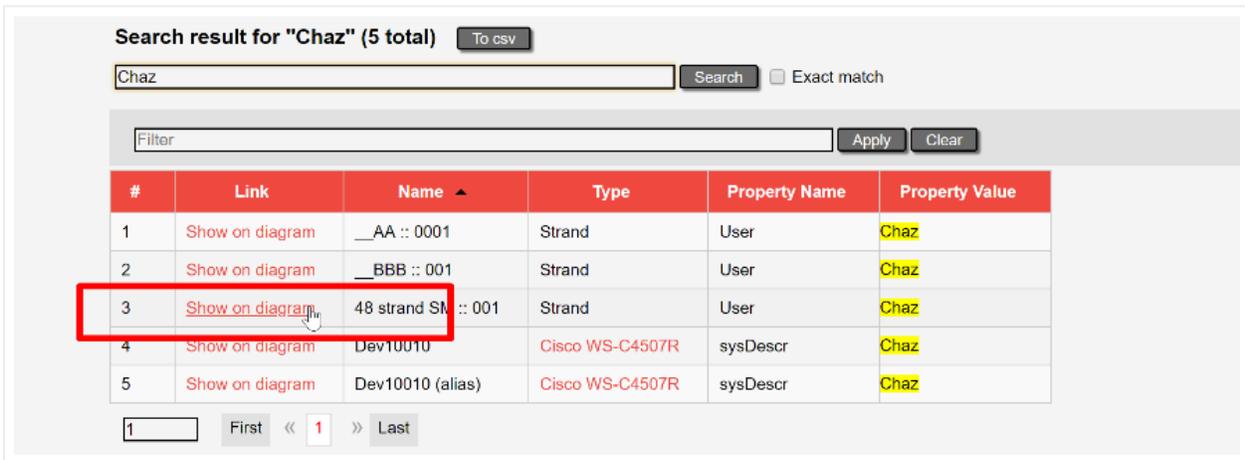
Strand custom properties displayed in the strand list

Strand custom fields are searchable just like any other property in netTerrain:

- 1) Follow the usual process for searching by typing in a string in any of the netTerrain search boxes.



2) From the search results, click on the entry that you are interested in (let's assume it corresponds to a strand custom field value).



3) The strand that contains the custom field value will be highlighted in the newly opened strand list dialog.

Top Level **3\_Building**

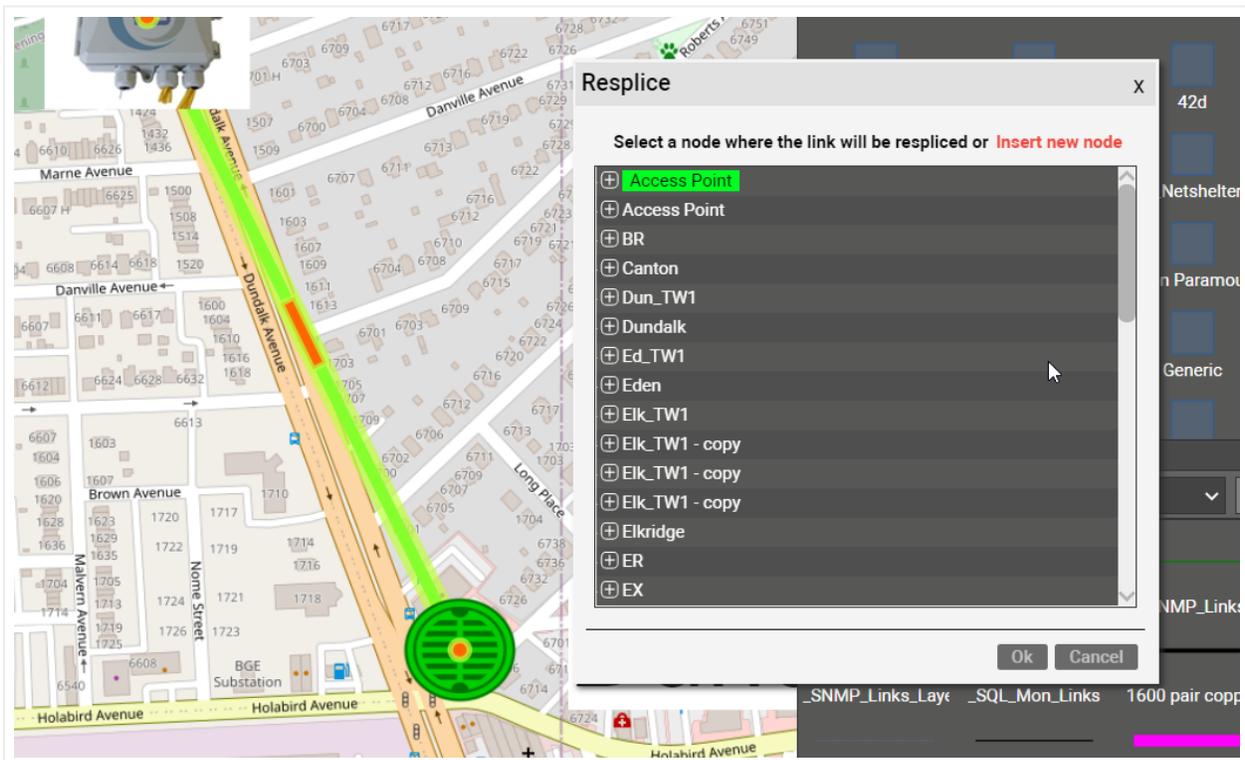
Strand List for 24 Strand Fiber '24 Strand Fiber'

	Status	Mode	Name	Circuit	CustomerName	Comment
	Active	Dual	001		Chaz	
	Active	Dual	002			
	Active	Dual	003			
	Active	Dual	004			
	Active	Dual	005			
	Active	Dual	006			

### 8.8.2.6 Resplicing

In some cases, users may need to insert a new splicing object in between an existing cable with strands or container of cables with strands. Normally this would mean reconnecting all the existing strands and more. This could be a bit of a nightmare. An easier way is to use the resplicing feature.

This feature can be used in two ways: selecting a node to resplice the link or adding a new node in between.

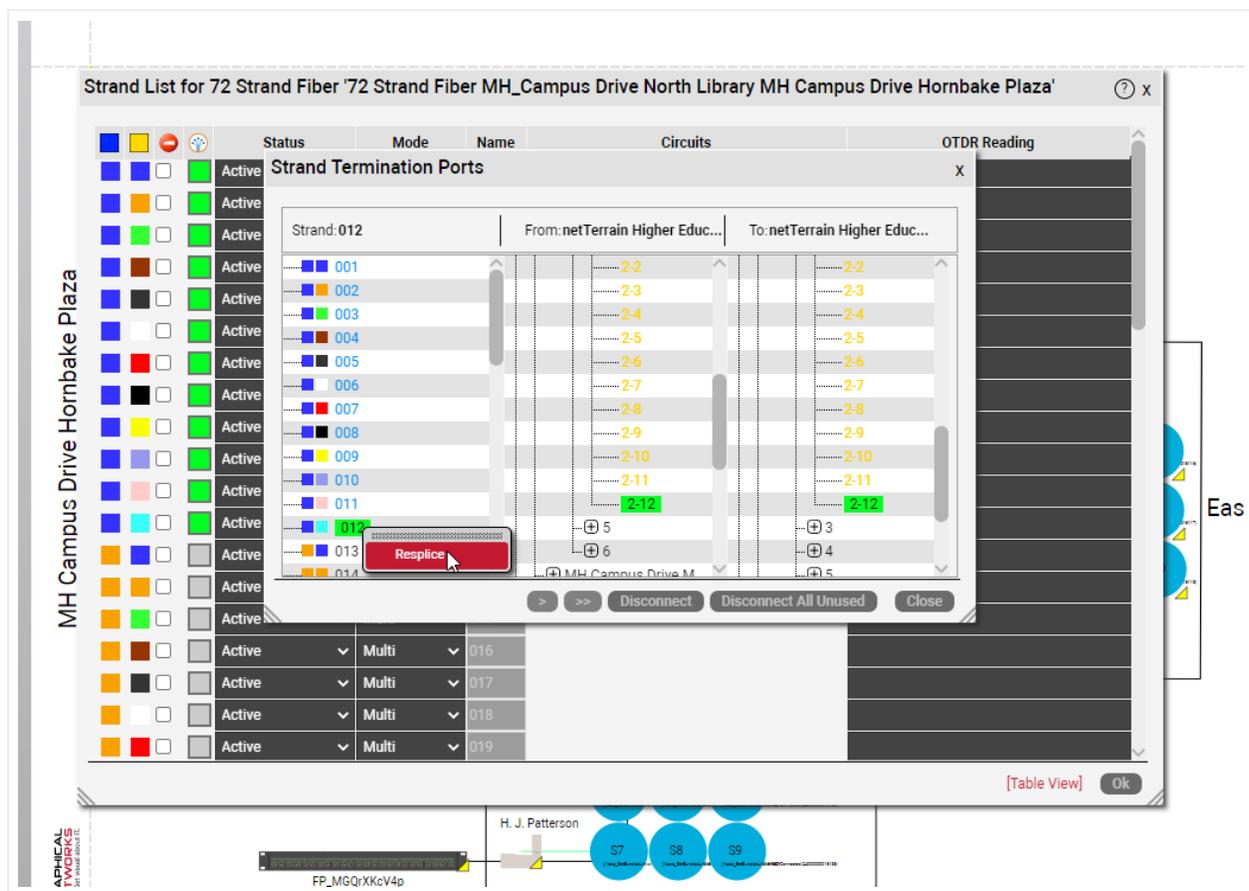


## Resplicing a link

If you click on the 'Insert new node' option on the top right, you can then choose a splicing node that will be inserted between the endpoints of the selected link and all strands will be reconnected (terminated) automatically.

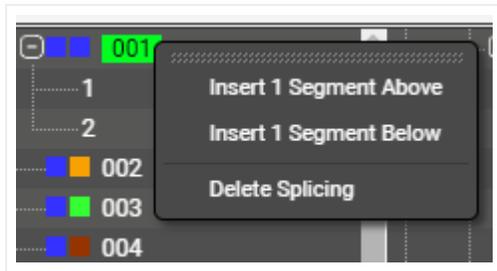
You can also splice out individual strands. A fiber cable with strands can be spliced without cutting and splicing the entire cable. Individual strands can be divided and spliced to their own end points. This allows for one strand to be turned into two strands within an existing fiber cable and for the entire fiber cable to traverse a large pathway while providing one or more strands for splicing out.

To resplice a strand, go to the strand termination port dialog and right click on the strand you want to resplice:



## Resplicing a strand

A strand can also be respliced multiple times. If you select a strand that has already been respliced, a further resplicing action lets you choose if you want to insert a segment above or below:



### 8.8.3 Ribbon cables

A ribbon cable (also known as a fiber ribbon or ribbon fiber cable) is a type of fiber optic cable where multiple optical fibers are arranged side-by-side in a flat, ribbon-like structure. Unlike traditional loose-tube or tight-buffered cables where fibers are bundled loosely, ribbon cables bond fibers together in a precise linear arrangement.

Ribbon cables offer higher density (up to 3,456 fibers in a single cable), faster splicing with mass fusion splicing allowing 12 fibers to be spliced simultaneously and an overall organized structure ideal for hyperscale data centers.

In the Power User guide, we explain how ribbon cables are created in the catalog. End users can instantiate any such ribbon cable types and then properly manage higher density fiber cables based on broad and flexible color coding.

Each strand within a Ribbon Cable has four color properties for identification:

- **Strand color:** the primary identification color of the individual fiber strand
- **Buffer color:** color of the buffer tube containing the strand
- **Subunit color:** color identifying which subunit (ribbon) the strand belongs to
- **Stripe color:** optional marking stripe for high-density cable differentiation

A subunit represents one physical ribbon within the cable. Each subunit typically contains 12 fibers (though this is configurable), and each fiber within a subunit is color-coded using the (customizable) TIA/EIA-598 standard.

### 8.8.4 Air blown fiber (ABF) cables

Air blown fiber (ABF) in netTerrain represents a hierarchical fiber infrastructure where fibers are installed inside tubes instead of being directly placed in a conduit. This model reflects real-world deployments where fibers are blown through tubes previously deployed in a network. ABF allows you to visualize, manage, and track capacity at each tube level. By modeling tubes and fibers separately, netTerrain helps you understand

how physical space is consumed over time. This approach provides a more accurate representation of modern fiber networks.

ABF is commonly used in different scenarios where flexibility and future expansion are required. It is especially useful when fibers are installed incrementally rather than all at once. ABF helps track which tubes are occupied and which remain available for future growth. It is also valuable for planning upgrades, auditing capacity, and avoiding over-allocation. Network designers and operators use ABF to keep long-term control of physical infrastructure usage.

With ABF, you can model tube structures, create links that include those tubes, and assign fibers to specific tubes. You can visualize how fibers are distributed across the tube hierarchy and monitor available capacity at each level. ABF allows you to move fibers between tubes as the network evolves. Overall, ABF helps you design, operate, and maintain fiber networks more efficiently.

In the Power User guide, we explain how ABF cables are created in the catalog. End users can instantiate any such ABF cable types and then properly manage them in the project.

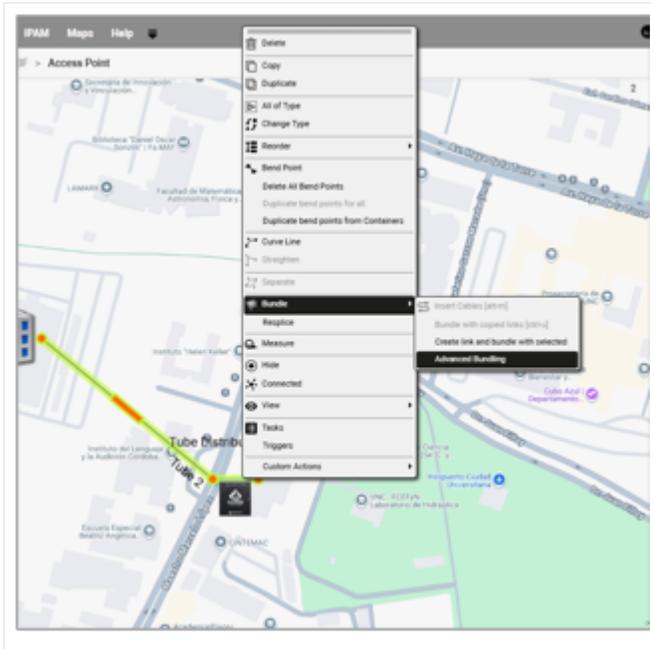
#### **8.8.4.1 Creating an ABF link**

ABF links are created in the same way as any other link in netTerrain, using the standard tools and shortcuts. From the catalog, you select the link type that was previously defined with an ABF tube structure. Once selected, the link is placed between devices as usual. Creating the link automatically generates the full logical structure of main tubes and subtubes. At this stage, no fibers are assigned yet, only the tube structure is created.

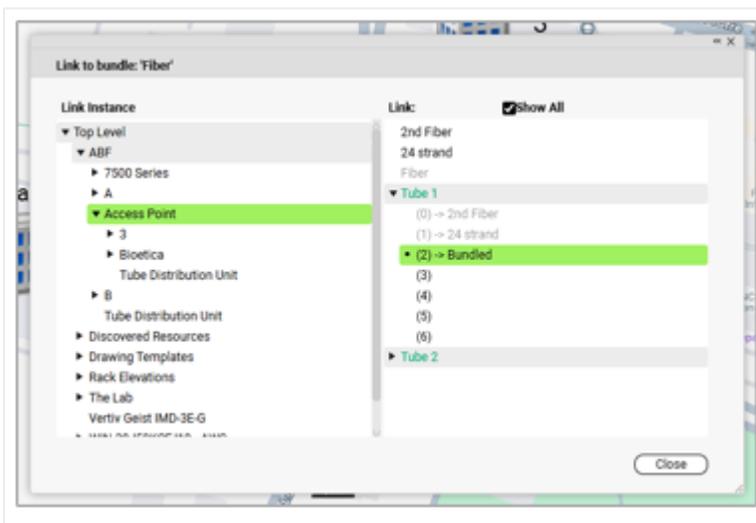
Strand cables (as reviewed previously) are created using the normal netTerrain workflow. They are independent from the ABF tubes at creation time. This separation allows fibers to be created first and assigned to tubes later. Once the fiber exists in the diagram, it becomes available for bundling. Fiber creation does not require any ABF-specific configuration.

#### **8.8.4.2 Assigning a fiber to an ABF tube**

To assign a fiber cable to a tube, you right-click on the fiber link and open the 'Bundling' menu. Inside this menu, an option called 'Advanced Bundling' is available. This opens a dedicated interface for managing fiber inside ABF cables. Selecting a tube and a subtube number immediately creates the bundling relationship. The assignment is reflected visually as soon as it is applied.



In the 'Advanced Bundling' interface, the left side shows all diagrams in the project, allowing navigation across different diagram levels. The right side displays all links that are eligible for bundling with the selected fiber. ABF-capable links are clearly marked and can be expanded. Inside each ABF link, sub tubes are shown as a numbered list. Available sub tubes display only the number, while occupied ones show the number along with the name of the fiber using them.



### 8.8.4.3 Modifying or removing fiber assignments

To remove an existing bundling, you simply click again on the currently selected sub tube. The relationship is immediately removed. To change the assignment, you select a different available sub tube number. The

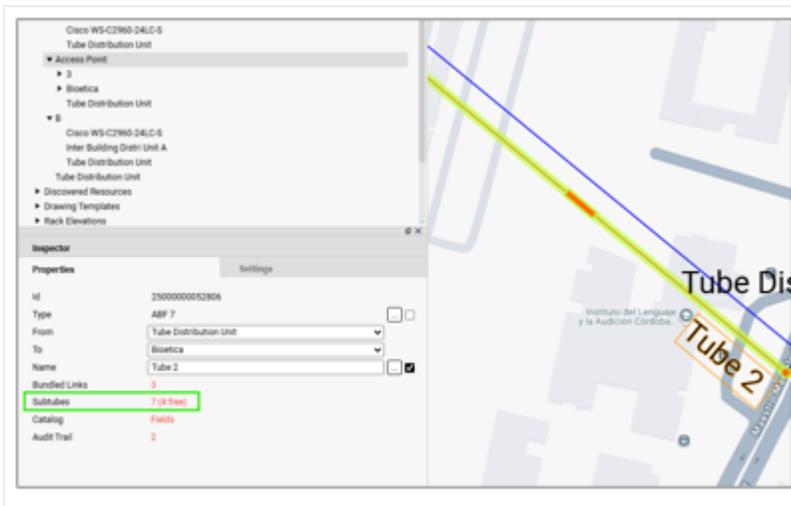
interface updates automatically to reflect the new assignment. This makes it easy to review which sub tubes are occupied, which fibers are using them, and which capacity remains available.

#### 8.8.4.4 Bundling fiber cables to non-ABF ducts

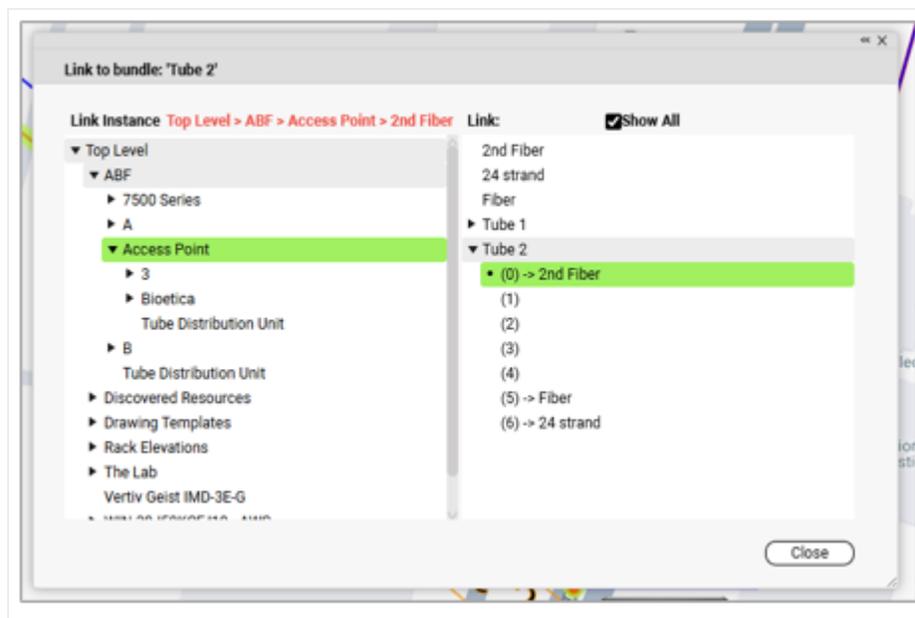
The 'Advanced Bundling' interface is shared across all bundling scenarios. This means a fiber cable can also be bundled directly to a standard duct, even if it is not an ABF tube. The same interface is used for both cases, providing a unified bundling experience. You can navigate across different diagrams in the project and perform bundling at multiple diagram levels for the same fiber. This allows consistent fiber management across the entire network.

#### 8.8.4.5 Reviewing tube occupancy

To review tube occupancy, select an ABF tube link in the diagram. In the Inspector, below the list of properties, you will find a field called 'Subtubes'. This field shows the total number of subtubes and how many of them are still available. The values are displayed numerically, providing a quick overview of capacity usage. This is the fastest way to check whether a tube still has available space. No navigation is required at this stage.



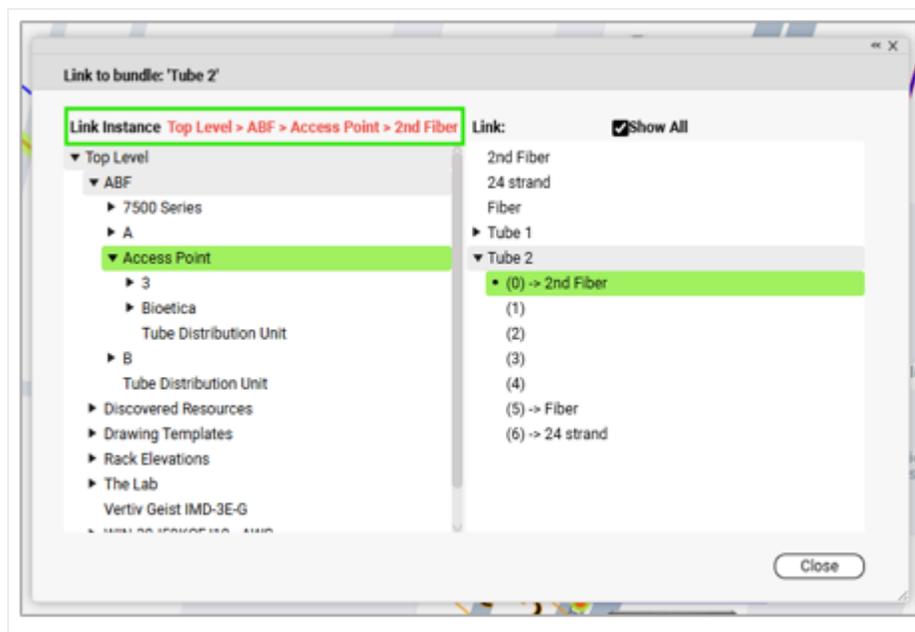
Clicking on the subtubes field opens a dedicated occupation interface. This interface is similar to the advanced bundling view, with a few contextual changes. The selected tube is automatically loaded and focus set on it. On the left side, you can navigate through all diagrams in the project. On the right side, the selected tube can be expanded to show all its subtubes and their current occupancy state.



### 8.8.4.6 Inspecting subtube occupancy

Each subtube is displayed as a numbered entry. Available subtubes are shown with only their number, while occupied subtubes display the number along with the name of the fiber assigned to them. This makes it easy to identify which capacity is in use and by which fiber. The view reflects the current state of the network and updates automatically when changes are made. This allows users to audit tube usage without modifying any data.

When selecting an occupied sub-tube, the top-left area of the interface displays the fiber name along with breadcrumb navigation. These breadcrumbs indicate where the fiber is located within the project hierarchy. By clicking on the breadcrumbs, you can directly navigate to the diagram that contains the associated fiber link. This makes it easy to move from capacity review to detailed inspection of the network layout.

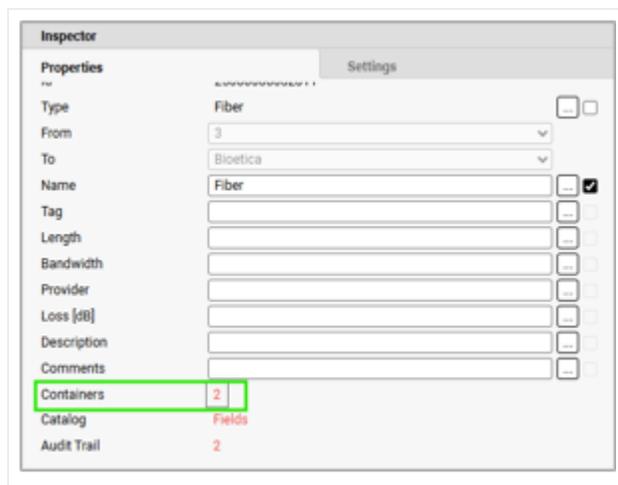


### 8.8.4.7 Capacity rules and limitations and container views

Each subtube can contain only one fiber. Because of this rule, subtubes cannot be over-allocated. An overallocation scenario is technically impossible. What can occur, however, is that a tube becomes fully occupied when all its subtubes are assigned. In that case, no additional fibers can be routed through that tube until capacity is freed.

Clicking on the 'containers' link on the properties dialog for a fiber cable opens a detailed table view listing all the containers that the selected fiber traverses (as reviewed previously).

When the container is an ABF tube, the table also shows the subtube number through which the fiber passes. This makes it easy to understand exactly how the fiber is routed inside complex ABF structures. The information is presented in the order in which the fiber traverses the network.



This view allows users to quickly verify routing decisions and confirm correct fiber placement. It is especially useful for troubleshooting, audits, and documentation purposes. By reviewing the list of containers, users can detect unexpected routing or confirm that fibers are using the intended tubes. This helps maintain clarity and consistency across large projects.

### 8.8.4.8 Managing and Validating ABF Data

Users can verify that fibers are assigned to the correct tubes and that tube capacity is being used as expected. By combining the tube occupancy view and the fiber container view, users can cross-check assignments from both perspectives. This helps identify inconsistencies without making changes. Regular reviews are recommended for active projects.

As network designs evolve, fibers may need to be reassigned to different subtubes. This is done through the advanced bundling interface. Selecting a different available subtube immediately updates the assignment. No additional steps are required. This allows users to reorganize fiber usage while keeping the underlying tube structure intact.

ABF enforces capacity rules at the subtube level. Since only one fiber can occupy a subtube, over-allocation is not possible. Validation is therefore focused on identifying tubes that are fully occupied. Reviewing tube utilization helps determine when expansion or redesign is needed. This makes capacity planning straightforward and reliable.

Typical operational scenarios include auditing tube usage, verifying fiber routing, and preparing for network expansion. Users may review fully occupied tubes to determine where new ABF links are required. Fiber path reviews are commonly used to confirm correct routing during troubleshooting. These actions are read-only unless a reassignment is explicitly performed.

A typical review workflow starts by checking tube utilization from the Inspector. Next, users review occupied subtubes and navigate to associated fibers if needed. Finally, fiber container views can be used to confirm

the full routing path. This workflow helps ensure ABF data remains accurate and easy to understand over time.

## 8.9 Circuits

In an OSP project a circuit can be many things: a service between two points A and Z on a map, an MPLS connection going over fiber or really any logical relationship between points that uses physical resources of the network. One thing is quite consistent in fiber plant layouts though: circuits traverse from A to Z over strands that are inside cables (probably in some conduit) through several hops. And there can be thousands of them.

In past versions of netTerrain users created circuits as simple links between two nodes. This is possible to do in OSP projects as well, but not very practical. Traditional netTerrain links are not always well suited for this type of behavior. Therefore, in version 8 we have created a specific entity called circuits, perfectly optimized for fiber plant projects.

Some of the advantages of using this type of entity to represent your OSP circuits over a traditional link are the following:

- Easy mapping of circuit to strand without having to individually bundle each hop.
- Smart algorithm to find the optimal path between two endpoints.
- Automatic patching of circuits along its path.
- Automatic reservation of resources.
- Convenient menu options to create diverse and redundant circuits from an existing one.
- Dedicated circuit views and searches.
- Better performance

### 8.9.1 Components of a circuit

A netTerrain circuit consists of the following:

- A name
- Properties
- One or more paths
- Physical infrastructure to support it

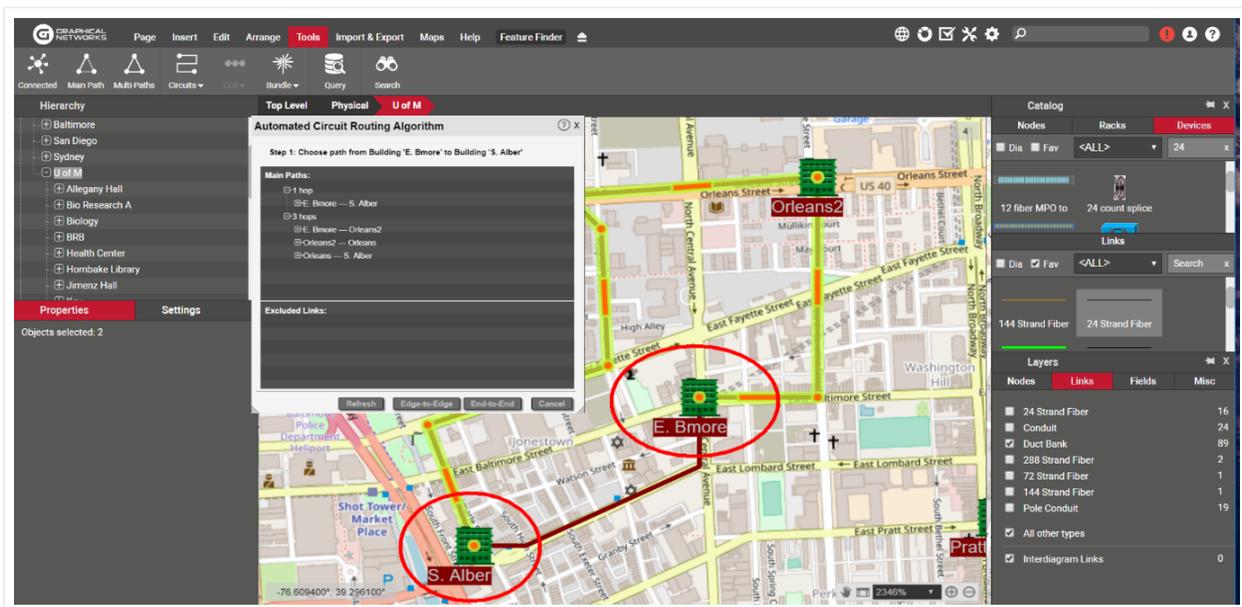
The name and the properties are obvious: we have dealt with this for every other object category in netTerrain: the name is whatever you want it to be, and the properties are whatever custom fields were defined in the catalog. A power-user can define as many custom properties for circuits as needed.

The paths are the different routes that a circuit can take. And as the wording suggests, you can have more than one path for a circuit. We allow this because you may want to have a main and a secondary (possibly diverse or redundant) route. If a circuit has more than path, the endpoints always coincide. We will review paths in more detail later.

The physical infrastructure needed for the circuit is the strand (or pair of strands) used for each path and the circuit end ports.

## 8.9.2 Anatomy of a circuit path

Before digging deeper into the process of creating a circuit, we'll spend a few lines talking about paths. As we mentioned above paths are the different routes that a circuit can take, but what exactly are these paths? For starters, a path must already exist before we use it to construct a circuit. Second, paths manifest themselves as routes on a map, which implies that for a path to exist, it needs to be associated as routes throughout nodes laid out on a map. Like what is shown below.



Two paths to get from point A to point Z

When discussing paths, consider the following concepts:

- Main path: this typically refers to the first path created for a circuit, usually the shortest route between the endpoints.
- Secondary path: usually refers to a path created for a circuit that already has a main path, which is typically diverse or redundant.
- Diverse path: a secondary path that has no common elements between the main path, except, of course, for the endpoints.
- Redundant path: a secondary path that traverses the same hops on the map as the main path.

### 8.9.2.1 Hops

In the picture above notice that the highlighted top path to get from building A. Alber to E. Bmore traverses through Orleans and Orleans2. These are intermediate hops. The top path has 3 hops to get from A to Z, the bottom path only 1, as it is a direct path.

In short, hops are the all the number of jumps on a map going from node to node, to make the trip from A to Z. When choosing an optimum path between A and Z netTerrain tries to minimize the number of hops.

In the following section we will review all the different ways of creating a circuit, now that we know the different types of paths that can comprise it.

### 8.9.3 Creating a new circuit

When creating a new circuit who decides which path it should take and how is that accomplished? There are basically three ways to define a path for a circuit, with decreasing levels of automation:

- By having netTerrain choose the shortest path
- By having netTerrain choose the shortest path and then modifying it
- By selecting the path on the map manually

Before we drill down into each method, we should review some basic rules required for a circuit to even be created.

#### 8.9.3.1 Rules for a valid circuit path to exist

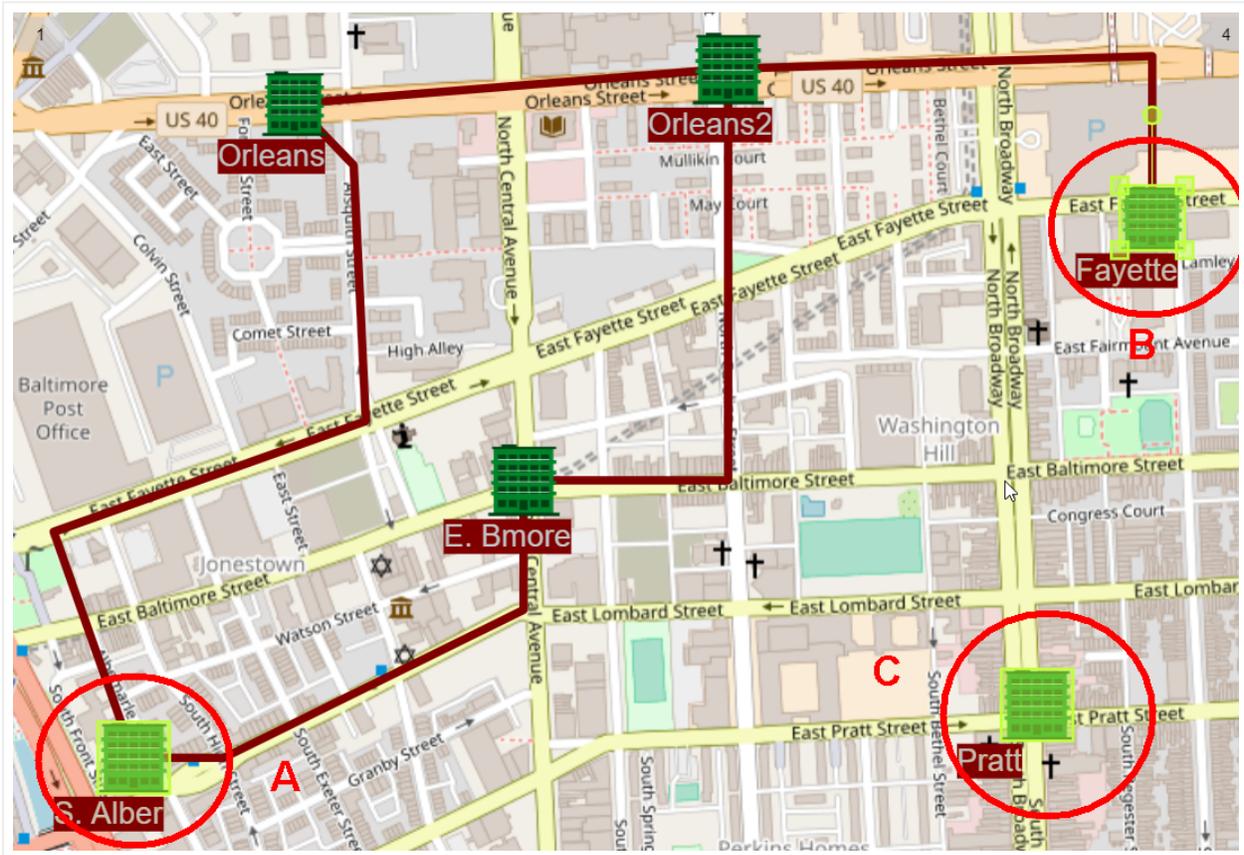
Circuits require at least one path, so when you are looking for a valid path during the circuit creation process there are certain rules you need to abide by.

##### **Rule 1:**

A circuit is initially defined at the map level, so it requires two distinct endpoints on the map.

**Rule 2:**

You must have connectivity from A to Z at the map-level. A typical example of map-level connectivity for a fiber plant infrastructure is conduits connecting buildings and manholes.



Valid map-level connectivity between A and B, but not between A and C.

**Rule 3:**

The map level connections (for instance, conduits) need to contain cables. In netTerrain parlance, a conduit containing a cable means that the cable is bundled to that conduit (please review the section on link bundling to learn how to do that). It's important to note that you must have at least one level of bundling (such as cable to conduit), but you can have multiple bundling levels as well. For example, if your cable is bundled to a micro duct bundled to a conduit bundled to a duct bank bundled to a trench, that is a legal configuration for ACRA to work. You can have unlimited bundling levels provided the cable eventually leads to the container map-level connection.

**Rule 4:**

Every cable along the path must have at least one available strand. An available strand is one that is connected to a port on both ends and is not already assigned to a circuit. We will review later what it means for a strand to be used by a circuit.

There is an additional addendum to these rules regarding the strands and it's that if you are using a pair of strands for a path, both need to terminate on ports that are on the same device.

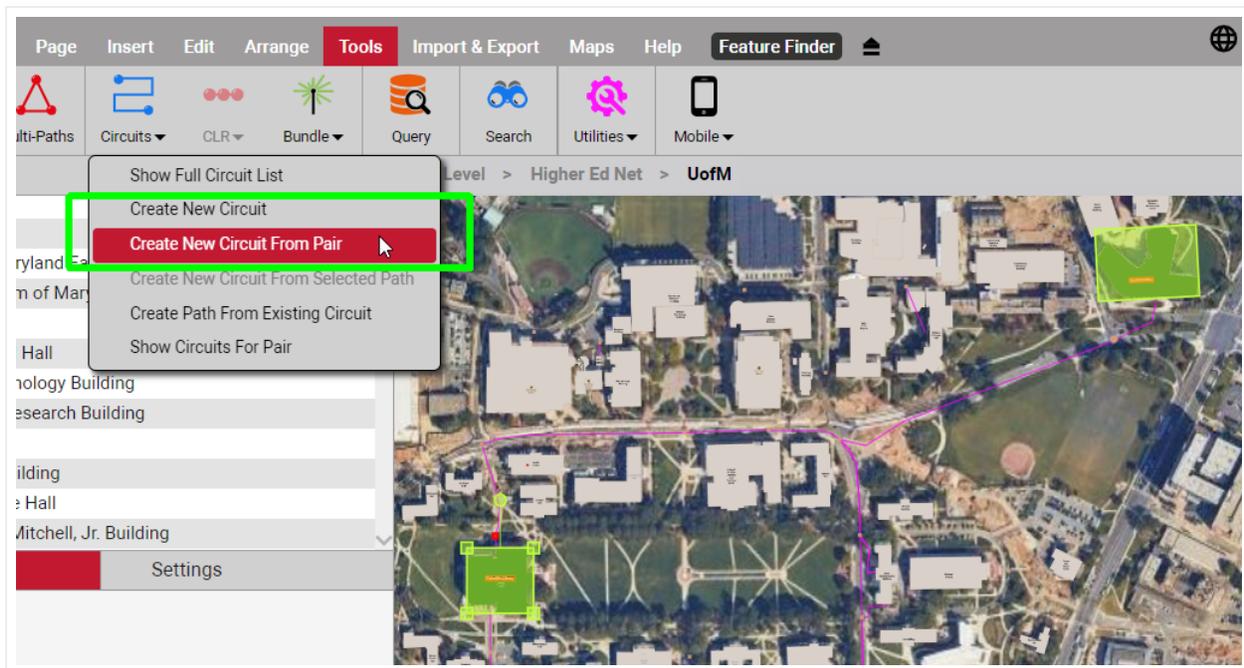
Why all these rules, you may ask? Because that's how most fiber plant environments are laid out: circuits go through strands, that are part of a fiber cable, that are bundled inside a cable container such as a micro duct and so on, so netTerrain mimics real-life situations for a more intuitive and realistic user experience.

### 8.9.3.2 Step 1: Launching the ACRA

If you want to create an apple pie from scratch, first you must create the universe. And if you want to create a circuit from scratch, one that doesn't even really exist in your environment, you use the ACRA.

Not the prettiest acronym in the world, ACRA stands for Automated Circuit Routing Algorithm dialog. ACRA is an algorithm that netTerrain uses to determine optimal routes between two points on a map following the four rules stated above. The algorithm is based on a method devised by Edsger Dijkstra's to find the shortest path between two nodes in a graph. No, Dijkstra is not a Graphical Networks employee.

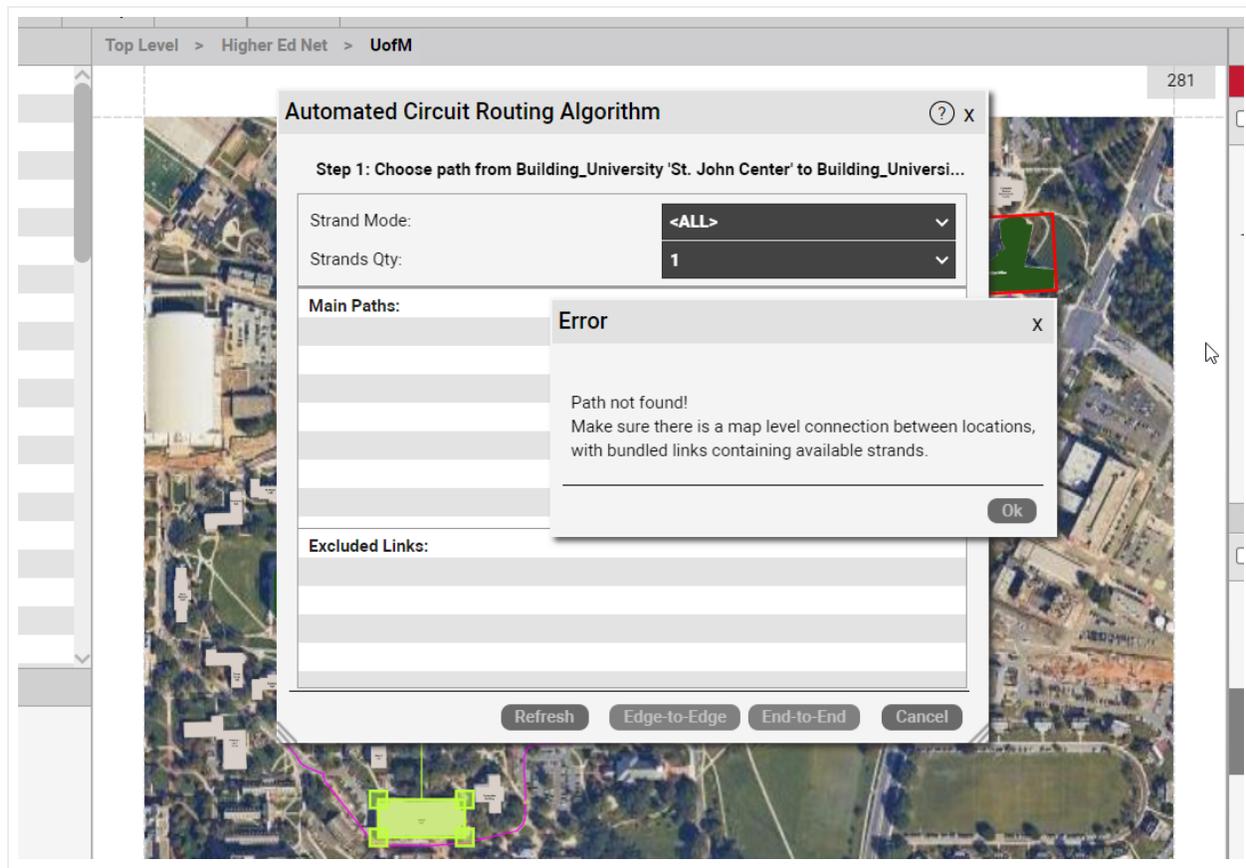
To launch the ACRA utility, the endpoints are your basic known input parameters to start the circuit creation process. The ACRA can be launched by picking a pair of endpoints on a map and choosing the 'Create Circuit From Pair' option, or the inverse, by clicking on the 'Create Circuit' menu and then picking the endpoints from the dialog that pops up.



*Creating a new circuit with two selected buildings*

### 8.9.3.2.1 Choosing the paths

After the ACRA dialog pops up anywhere from zero to multiple paths can be available for the pair of selected objects. The ACRA process will try to find two optimum paths: the shortest and a diverse secondary path. This may or may not be possible. If there are no routes available, netTerrain will let you know loud and clear, invoking the circuit rules mentioned earlier.

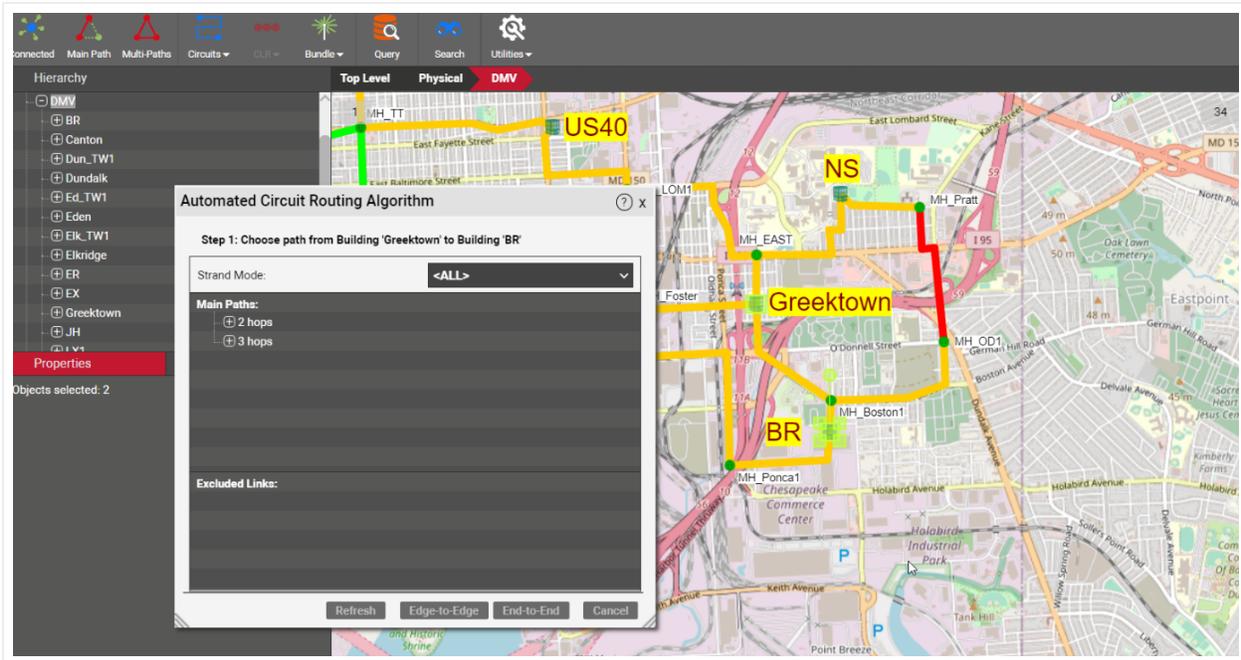


### *Path not found error*

To recap, a path may not be found if:

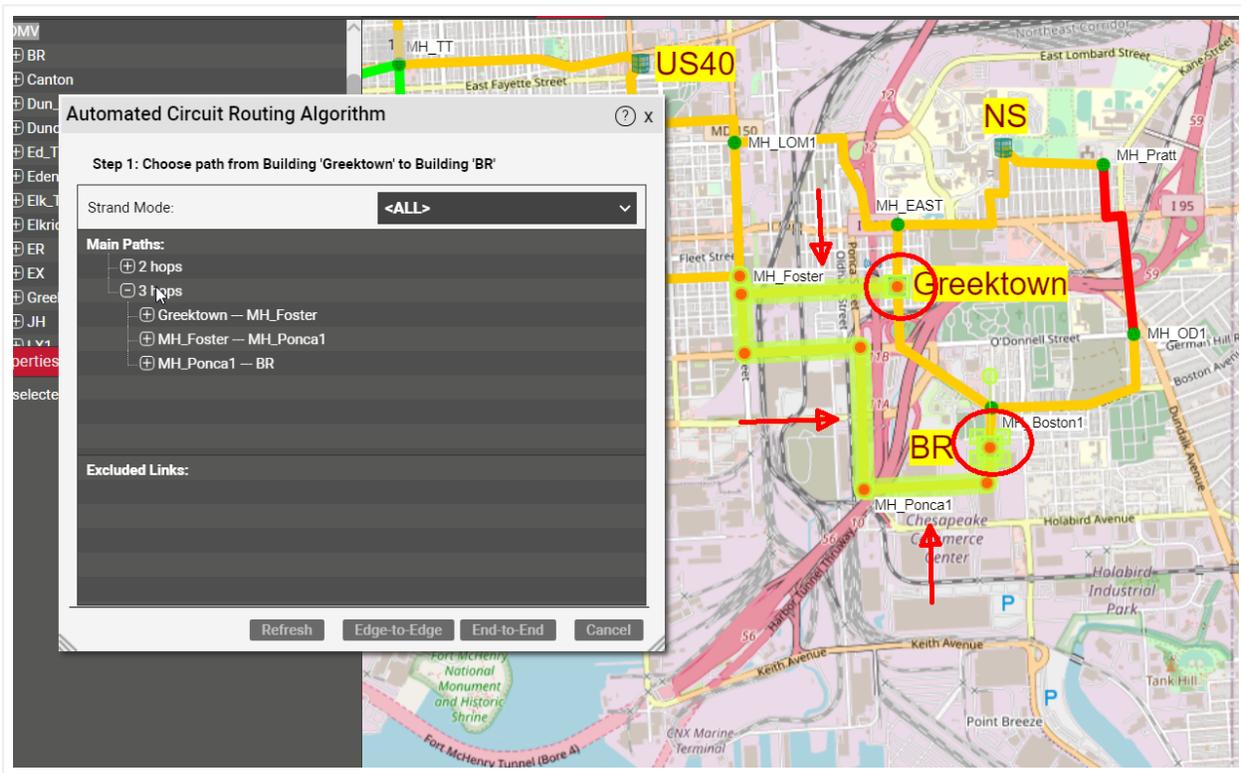
- You are not choosing two distinct endpoints at the map level (in this case you won't even be able to launch the dialog itself)
- No conduits connect the endpoints directly or through other nodes.
- One or more conduits along the path have no bundled cables.
- One or more bundled cables along the path have no available strands.

If the two optimum paths (main and diverse) are found, they are displayed in the dialog.



ACRA dialog showing two optimum paths (main and diverse)

You can click on any one of the paths shown and netTerrain will highlight them on the map, and expand it to show the hops, as shown below:



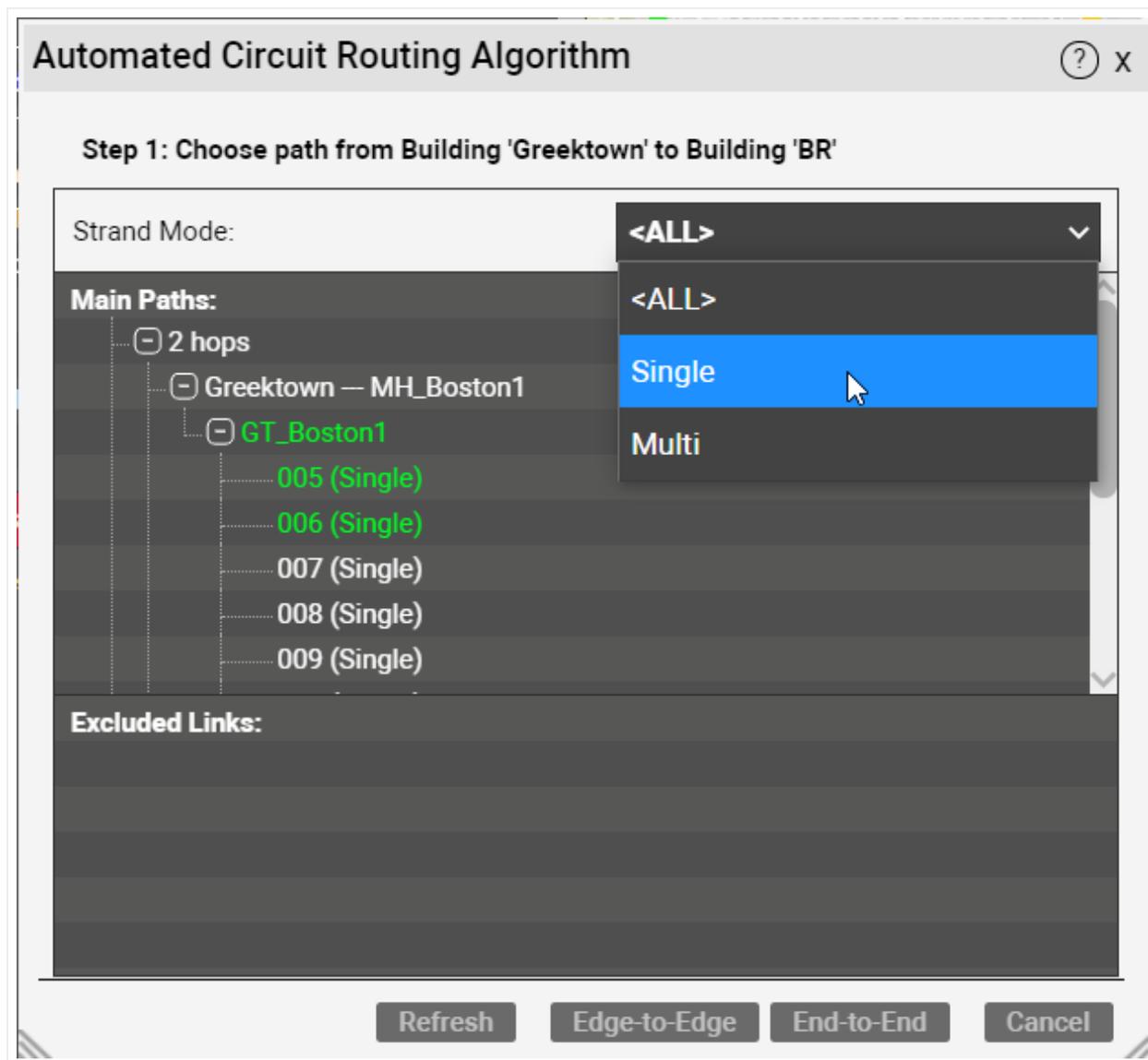
*Secondary path highlighted with expanded hops*

You can click on the other path and netTerrain will automatically zoom-in or out to make the entire path visible for you to review.

### 8.9.3.2.2 Selecting the cable mode

As part of the circuit design process sometimes you must make sure that all strands throughout the path are of the same mode. To prevent hybrid scenarios of single and multi-mode strands affecting the same circuit you can set the cable mode to any of the options available in the cable mode drop-down, as displayed below.

The mode of a specific cable type is defined in the catalog (see Power User guide), and the different mode options can be set in the settings.xml file (see Admin Guide).

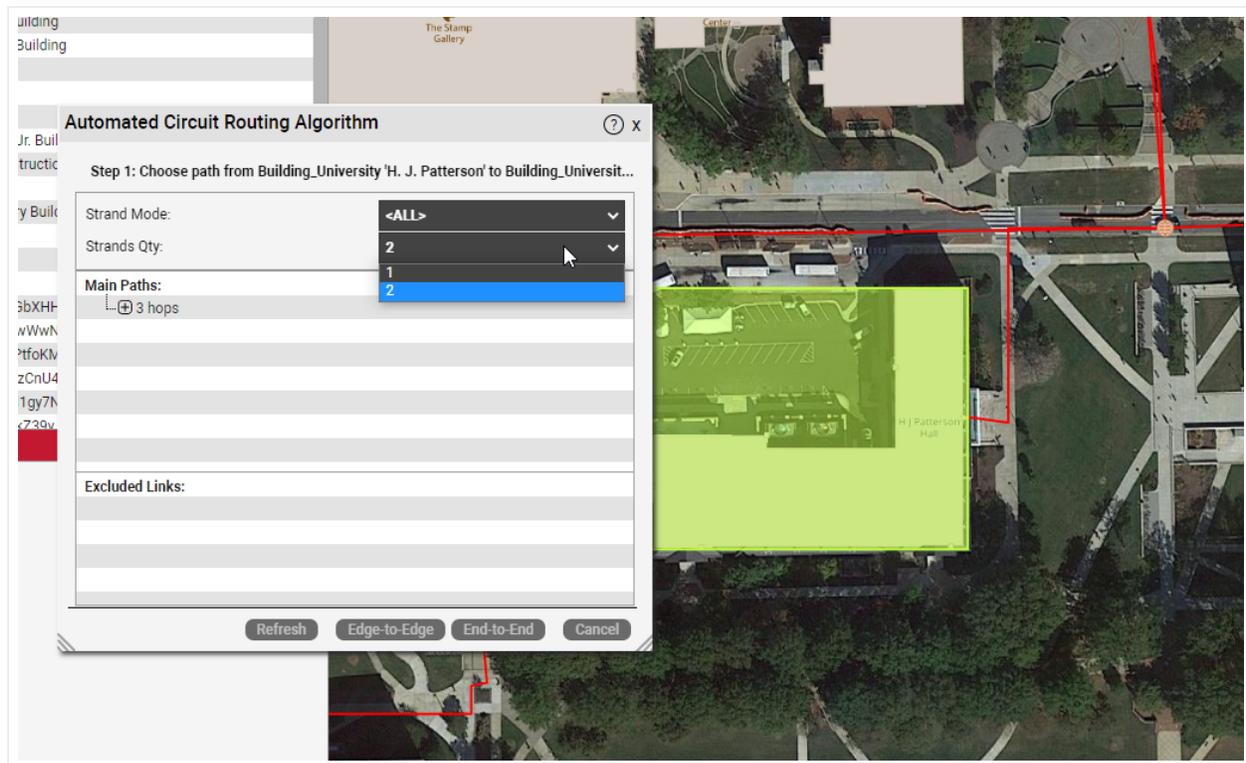


*Selecting the cable mode*

Once a mode is selected (other than All), then the ACRA process will limit all options (cables, hops, etc.) to ones that indeed use (or have) that mode.

### 8.9.3.2.3 Strand quantity

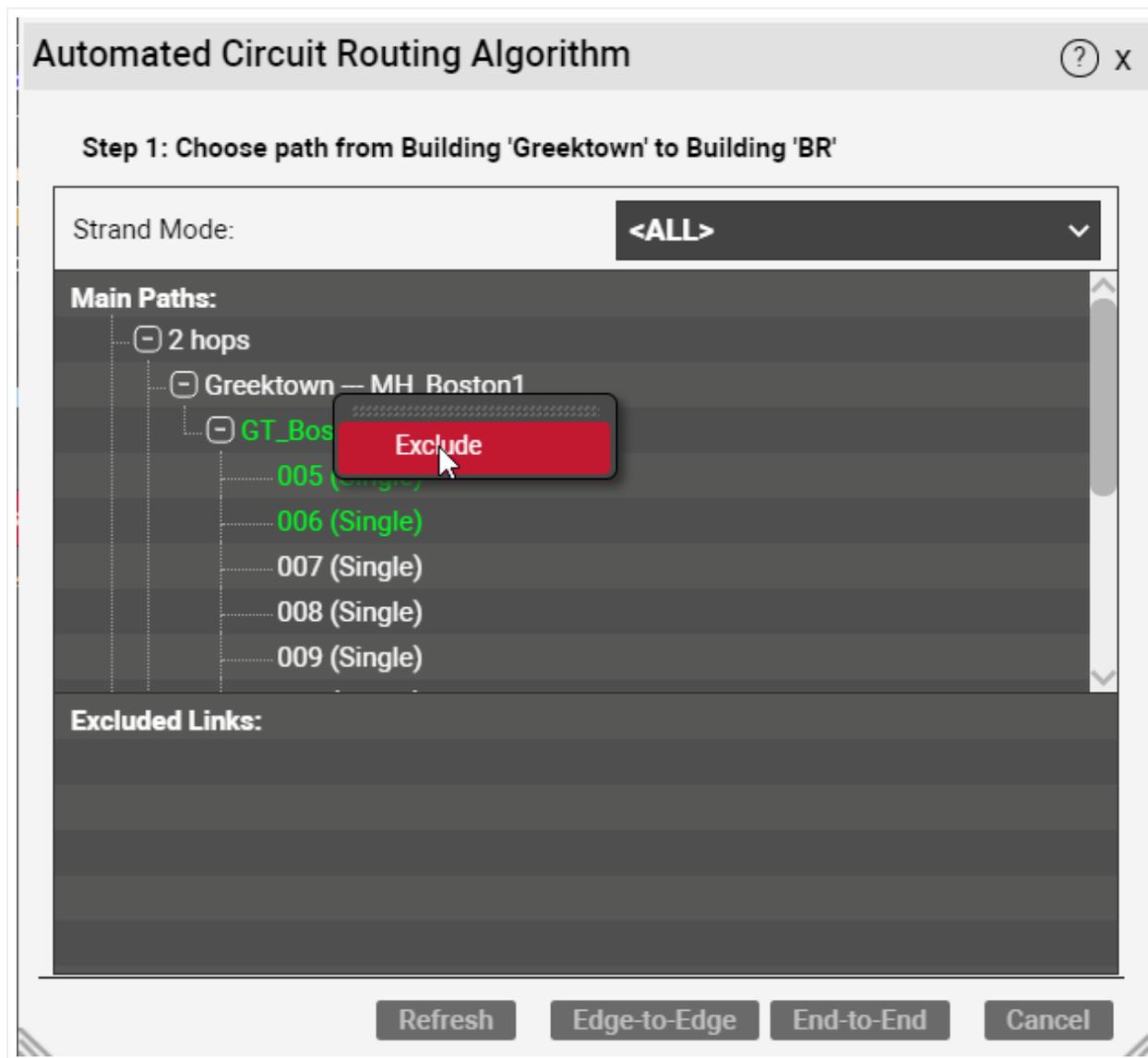
Users can create circuits that use one or two strands. To pick the required number select a value from the strands Qty drop down box:



#### 8.9.3.2.4 Changing a hop

We mentioned that you can have netTerrain choose the shortest path and then modify it. This is done by excluding certain hops from the path and is useful in cases where you know a certain hop may be available in the system but should not be used for whatever reason.

To exclude a hop from the path right click on it and then click on the 'Exclude' option on the context menu:



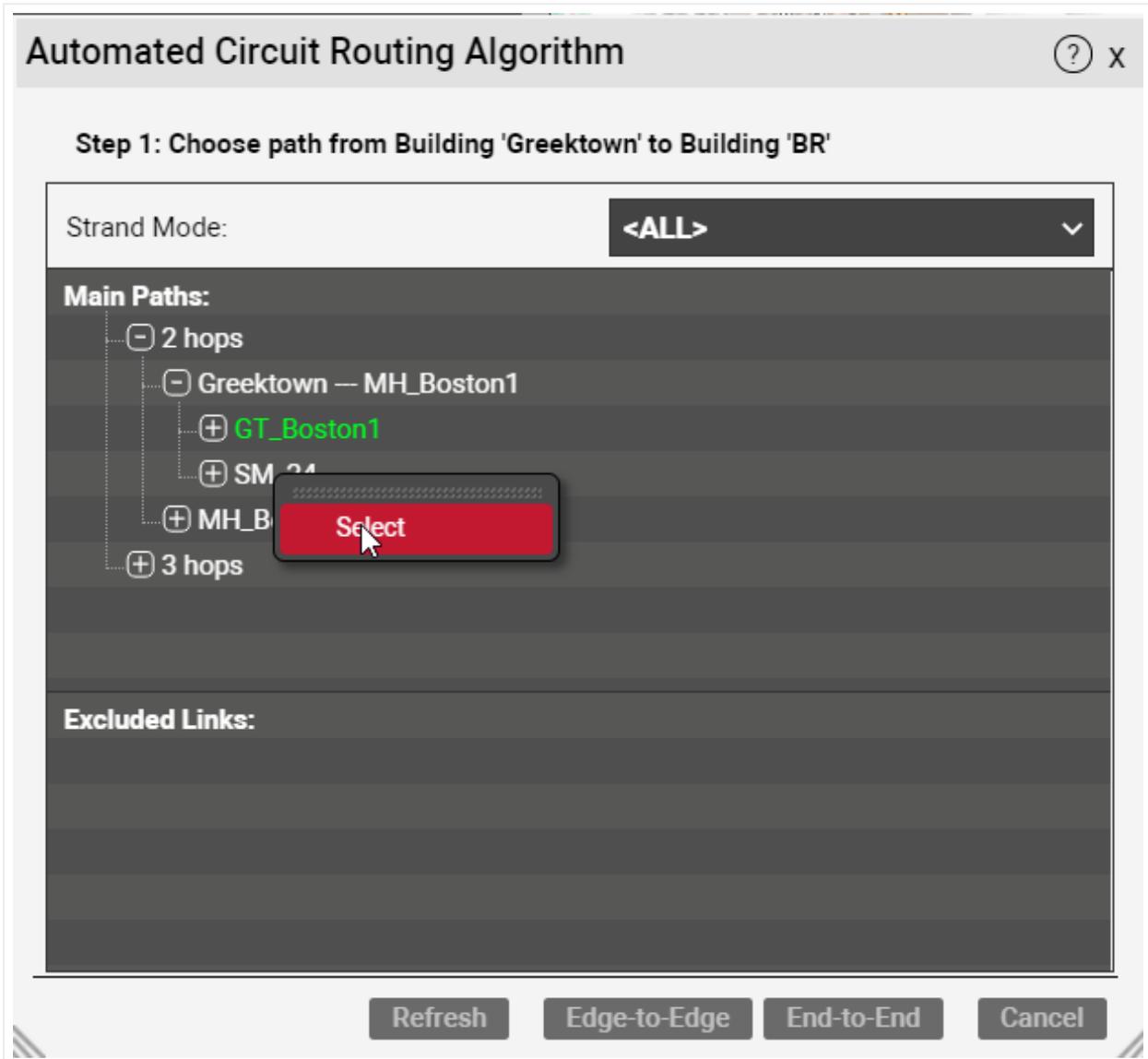
#### *Excluding a hop from the path*

Once the hop is excluded, it shows up in the 'Excluded Links' list and ACRA automatically refreshes the paths. To include the hop, you just right click on that hop in the Excluded Links list and include it again. It's important to note that when a hop is excluded or included, it may not only affect the path that hop belongs to, but also the other path.

#### 8.9.3.2.5 Changing the cables and strands

What about the cables and strands? How does netTerrain know which ones to use for each hop? It doesn't, aside from the fact the cable must have available strands. netTerrain just selects the first cable and first pair of available strands based on name in ascending order. If you don't like the cable that netTerrain chose for a

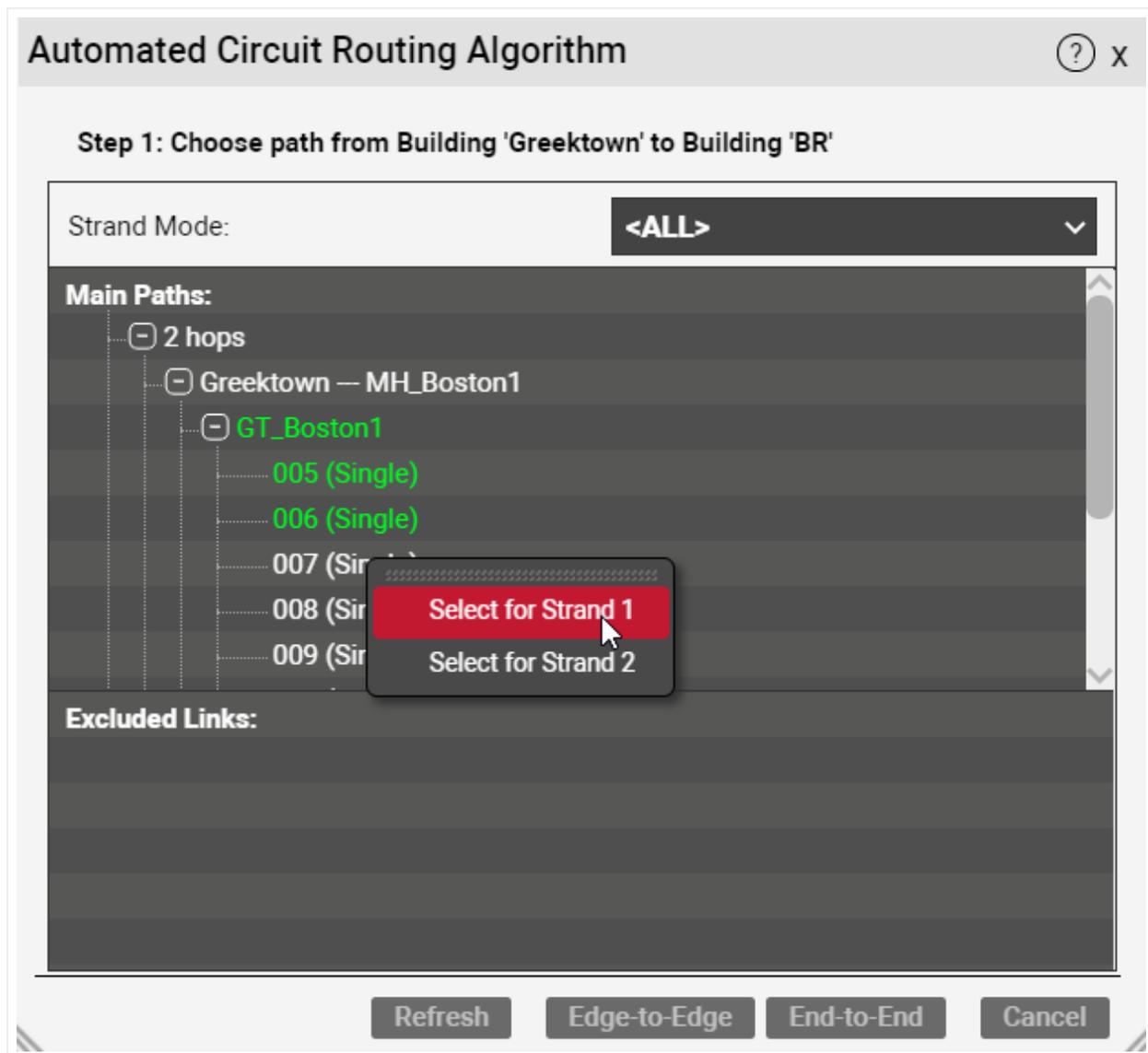
hop and there are more, you can change the selection by expanding the hop and right-clicking on your preferred cable:



*Selecting a different cable for a hop*

The selected cable is displayed in green. You can also expand a cable and change the selected strands, one at a time. Remember that obscure additional rule for circuit creation, where a strand pair used for a path need to terminate on ports on the same equipment? Well, netTerrain does check that in this case. As a visual aid, any ports associated with a different device use a grey font.

This means that if you switch one strand to another that terminates on a different device, then netTerrain will automatically switch the other.



### *Changing the selected strands*

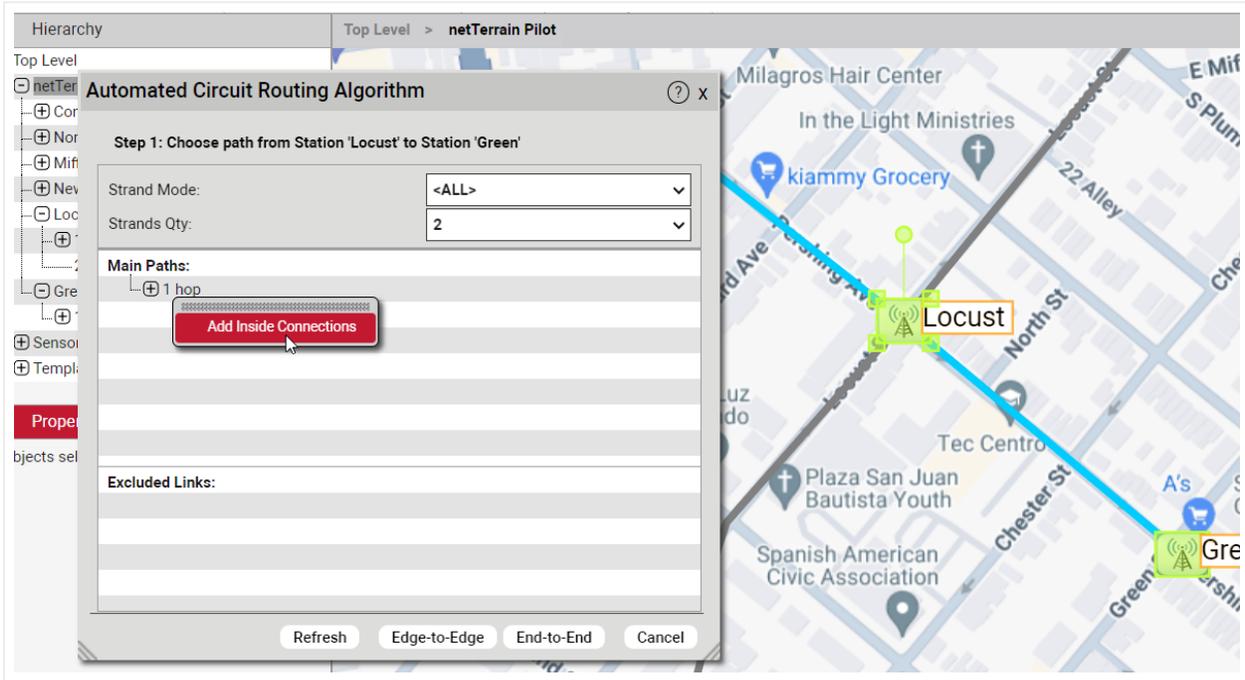
Once you have your paths with the correct hops, cables and strands you go to step 2 of the circuit creation process picking one of two circuit types: edge-to-edge or end-to-end.

### 8.9.3.2.6 Selecting an 'Intra-building' cable (or inside connection)

In some cases, the cable that contains a strand section of your circuit path may flow between two floors, or two rooms in the same building or node at the map level.

Since ACRA in theory treats hops as nodes at the map level, how can a user specify a section of the path that is inside the same node? Enter the so-called inside connections.

To choose an inside connection for your path, you do it on a hop-by-hop basis. Right-click on the hop that needs an inside connection and click on the 'Inside connection' context menu.

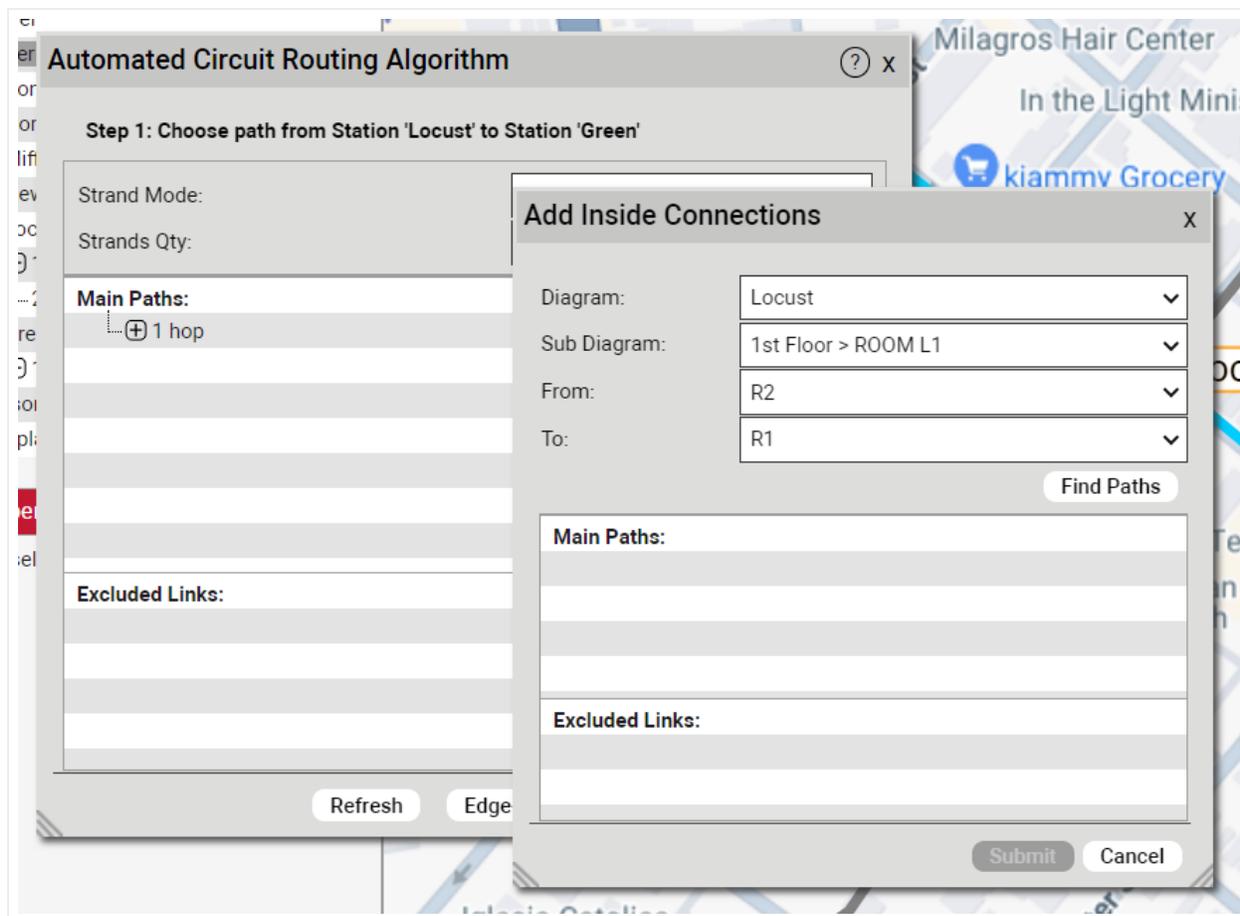


*Choosing an inside connection for your circuit path*

After clicking on the context menu do the following:

- 1) Selecting the diagram (and sub diagram) where the connection node for the from and to endpoints can be found
- 2) Select the proper connection points in the 'From' and 'To' combo boxes

If no cables or nodes exist inside the map-level node, then one or both combo boxes will be empty. Also notice that a map level connection with bundled strand cables must exist between locations.



*Adding an inside connection*

Main paths and excluded links are selected in a similar fashion as with inter-building hops.

### 8.9.3.3 Step 2: Selecting the end devices

Since circuit paths utilize strands and patches (more on that later) to traverse the fiber network between points A and Z on the map, it is ultimately devices and a pair of ports on them that provide the physical infrastructure for a circuit path to exist.

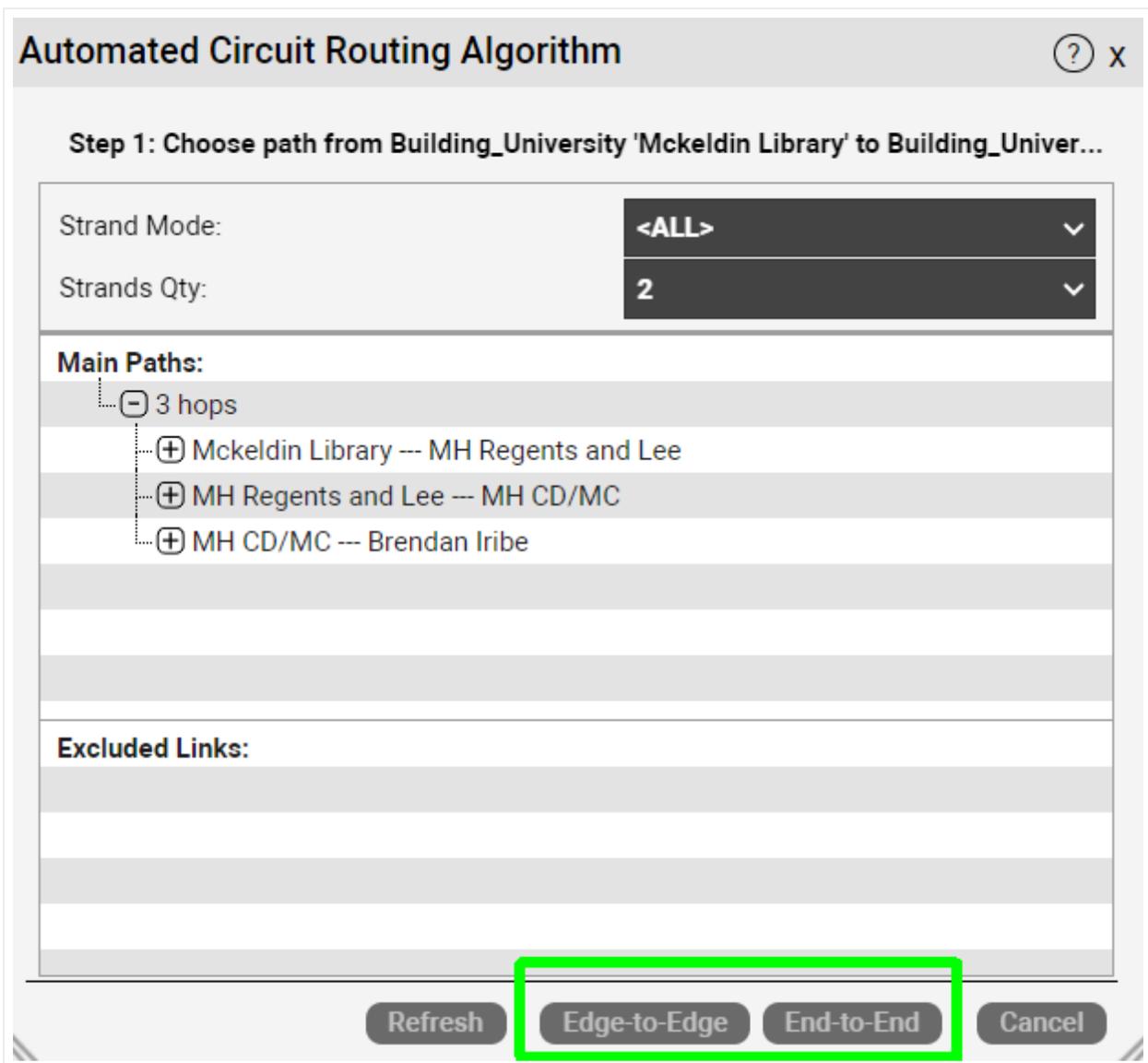
In step 2 of the ACRA you get to choose those devices, unless you create a so-called edge-to-edge circuit, which we'll review below.

#### 8.9.3.3.1 Edge-to-edge versus end-to-end circuits

For the intermediate nodes, we sometimes refer to the “fiber equipment” as the hardware infrastructure that supports the paths. The purpose of the fiber equipment is to simply serve as transport for these circuits. This will become clear when we launch a circuit layout record.

We usually terminate the circuits in the A and Z locations on a network equipment, not on fiber equipment. After all, the circuit should serve an actual purpose for some network end user. In these cases, we refer to the circuit as “end-to-end”. More precisely, the circuit path is patched through fiber equipment in the intermediate nodes, and on the A and Z locations, there is an extra patch between the terminating fiber equipment (edge) and the final end-user or network equipment “end”. For end-to-end circuits, the user also must choose which network equipment the circuit should terminate on for both locations.

In some cases, however, you may not know which end equipment the circuit will serve. If you still want to create the circuit (perhaps to make sure nobody else takes up those resources), you can still do it by creating an “edge-to-edge” circuit. The next step in the ACRA process then is for you decide which circuit type you want.

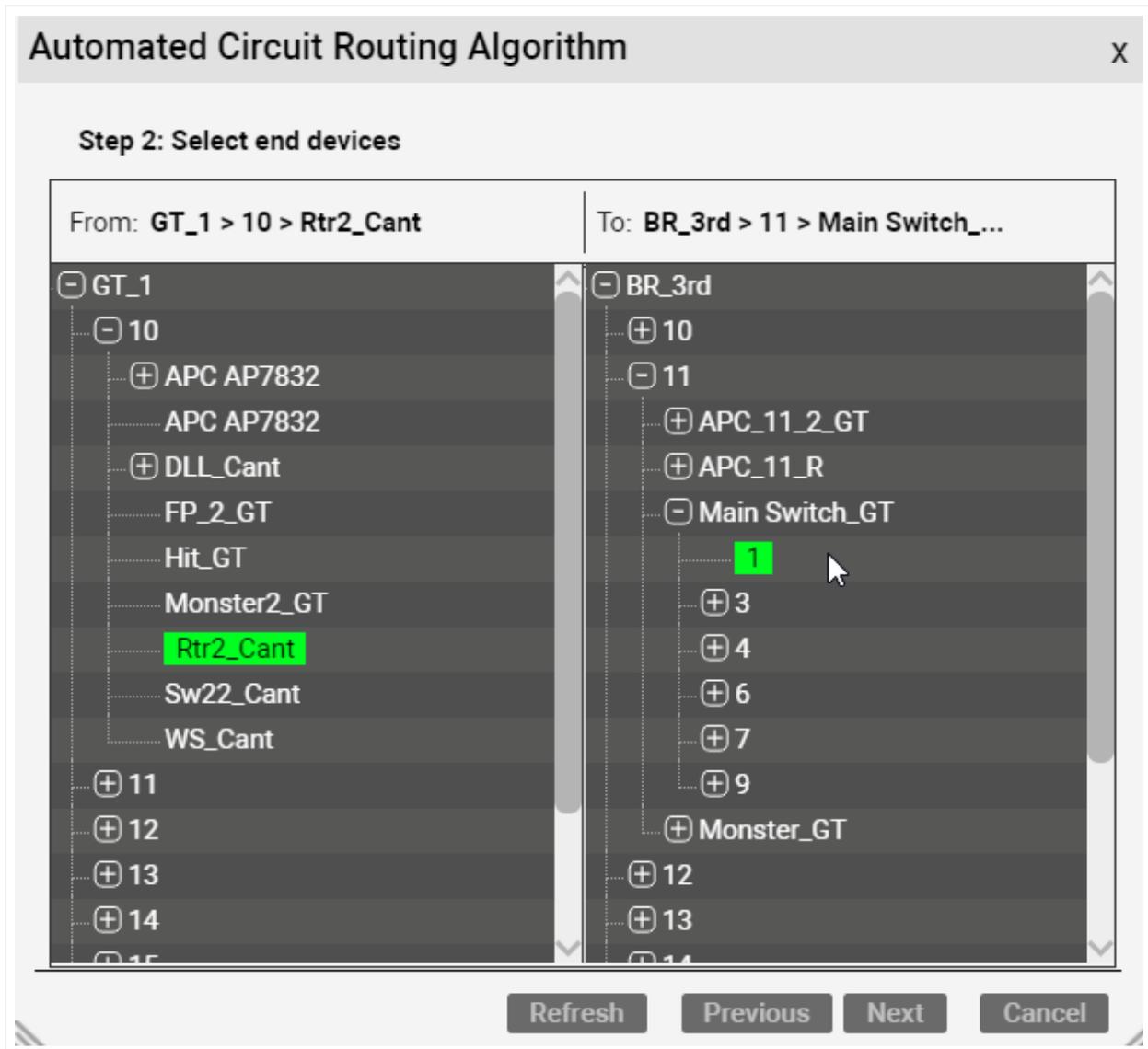


Selecting between an edge-to-edge and end-to-end circuit

### 8.9.3.3.2 Selecting an end-to-end circuit

If you choose an edge-to-edge circuit, netTerrain determines the endpoint fiber devices automatically. In that case there is no step 2 (well, the next step becomes step 2).

For an end-to-end circuit, netTerrain still selects the fiber devices on the A and Z locations, but you get to choose the end network equipment.



#### Selecting the end devices for an end-to-end circuit

Choosing the end devices is a simple process: in step 2 the ACRA shows you all the equipment (fiber or not) that exists in locations A and Z. They are displayed as a hierarchy browser on each side. The devices you pick are highlighted in green and all you need to do to confirm them is click on 'Next'. If you are not sure

about anything during the ACRA process you can always go to the previous step. There is also a refresh button to make sure you see the latest data. You know, in case you went for a long coffee break and you suspect somebody else may be lurking around creating circuits between the same end locations.

### 8.9.3.4 Final step: end ports, parameters and patching the circuit up

The final step of the ACRA consists of selecting the end ports of the devices picked for the A and Z locations, entering the parameters for the circuit and selecting the patch type.

**Automated Circuit Routing Algorithm** [X]

**Step 3: Set parameters for patching**

From: **GT\_1 > 10 > Rtr2\_Cant** | To: **BR\_3rd > 11 > Main Switch\_GT > 1**

**Circuit Name:** [Redacted]

**Patch Type:** **Fiber\_patch** [v]

[More circuit parameters]

**Path 1**

Individual port per strand

From Port 1: **AUX** [v] To Port 1: **1** [v]

**Path 2**

Individual port per strand

From Port 1: **CON** [v] To Port 1: **2** [v]

Create Work Order task after completing circuit

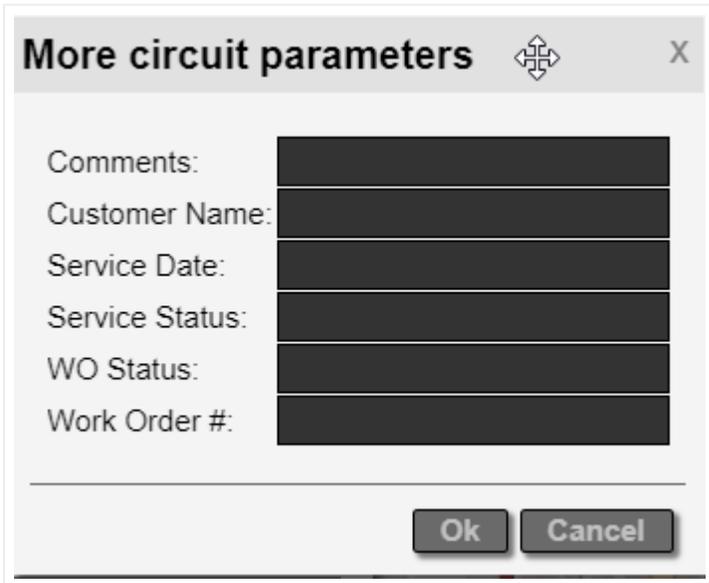
Use Existing Links as Patches

Use Cross Connected Ports

[Refresh] [Previous] [Patch me up!] [Cancel]

*Step 3 of the ACRA process*

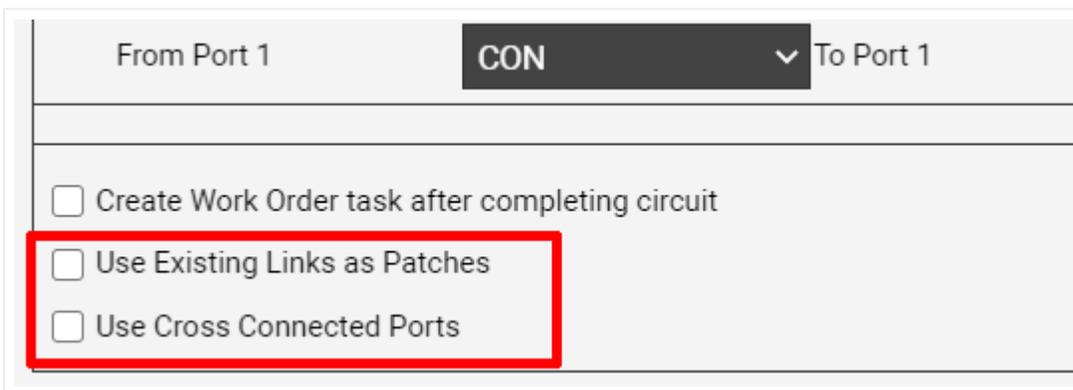
Let's start with the circuit name: this can be anything you want and is a mandatory field (hence the red color). Circuits can have any number of custom fields, so if you want to enter values for these custom properties, click on the 'More circuit parameters' button:



*Adding additional property values for the circuit*

For each intermediate node along each path, we have a device where the strands for the entering hop connect to, and a device where the strands for the departing hop exit. netTerrain will patch these up automatically for your circuit, so it has fiber continuity.

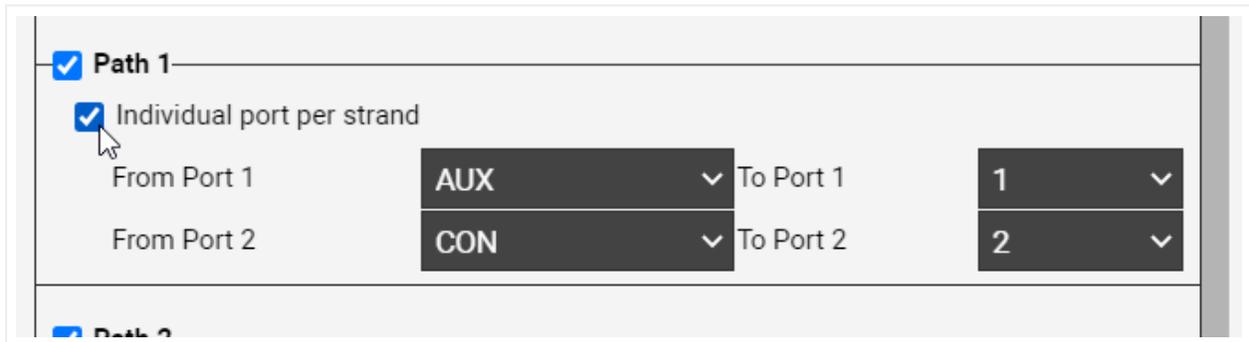
If you know you already have continuity and would like to use existing links as patches and existing cross connections, make sure you check the last two options in the dialog.



*Using existing patches for the circuit creation*

You can pick which type of patch netTerrain should use for this. This is done in the “Patch Type” field. This field is a drop-down box and it only shows types that have been enabled as valid for patching in the catalog (see Power-User Guide).

Each path can use individual ports per strands, or the default, which is two strands connecting to one port on the end equipment. Make sure to check the ‘Individual port per strand’ option if you want each strand to occupy an individual port on your end devices.

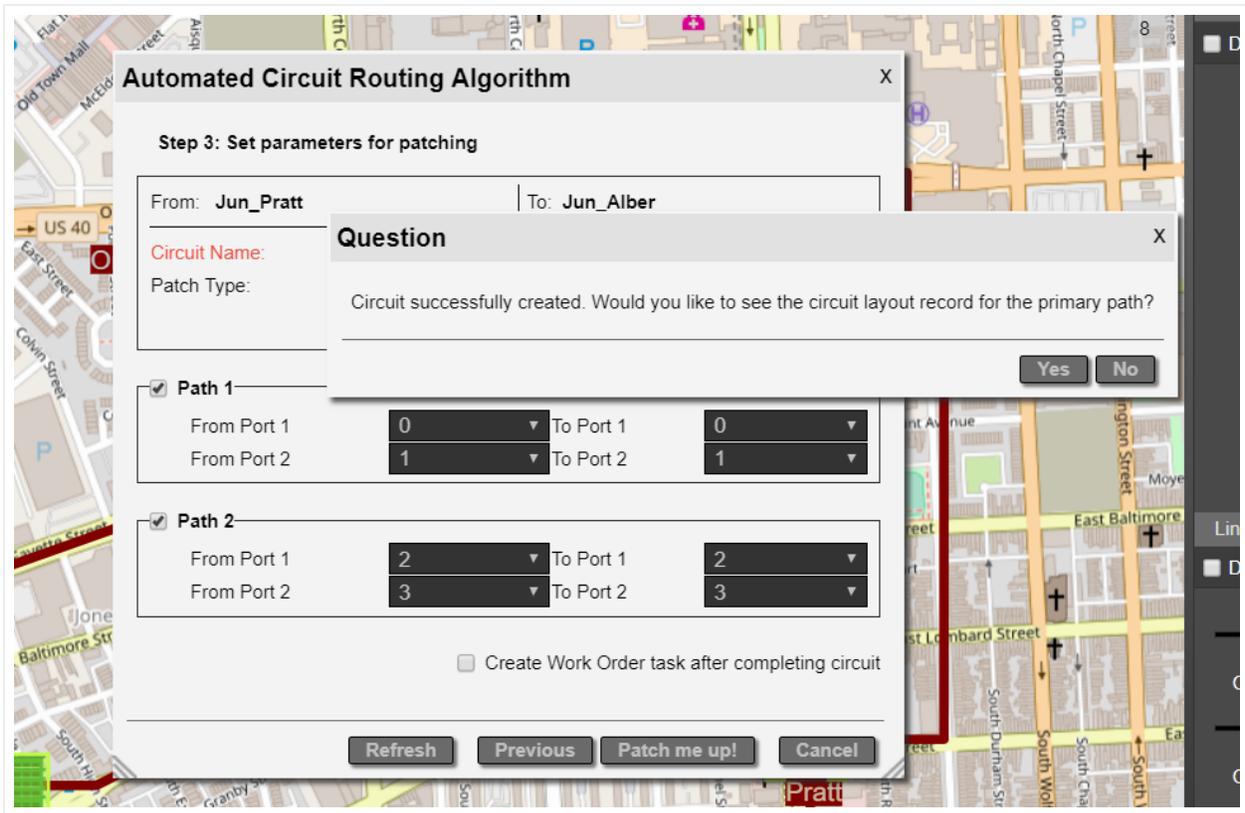


#### *Using an individual port per strand*

If you don't want a secondary path for your circuit, you can uncheck it in this dialog. For any of these paths you can also choose the end ports they should terminate on the edge or end equipment.

As a final bonus, if you also want netTerrain to create a work order task for your circuit, make sure to check the ‘Create Work Order task after completing circuit’ checkbox.

Once you are done, click on the ‘Patch me up!’ button and this will complete the process. After some thinking, netTerrain will throw a message saying the circuit was created and prompt you to launch the CLR, which we will review later.



*Circuit complete!*

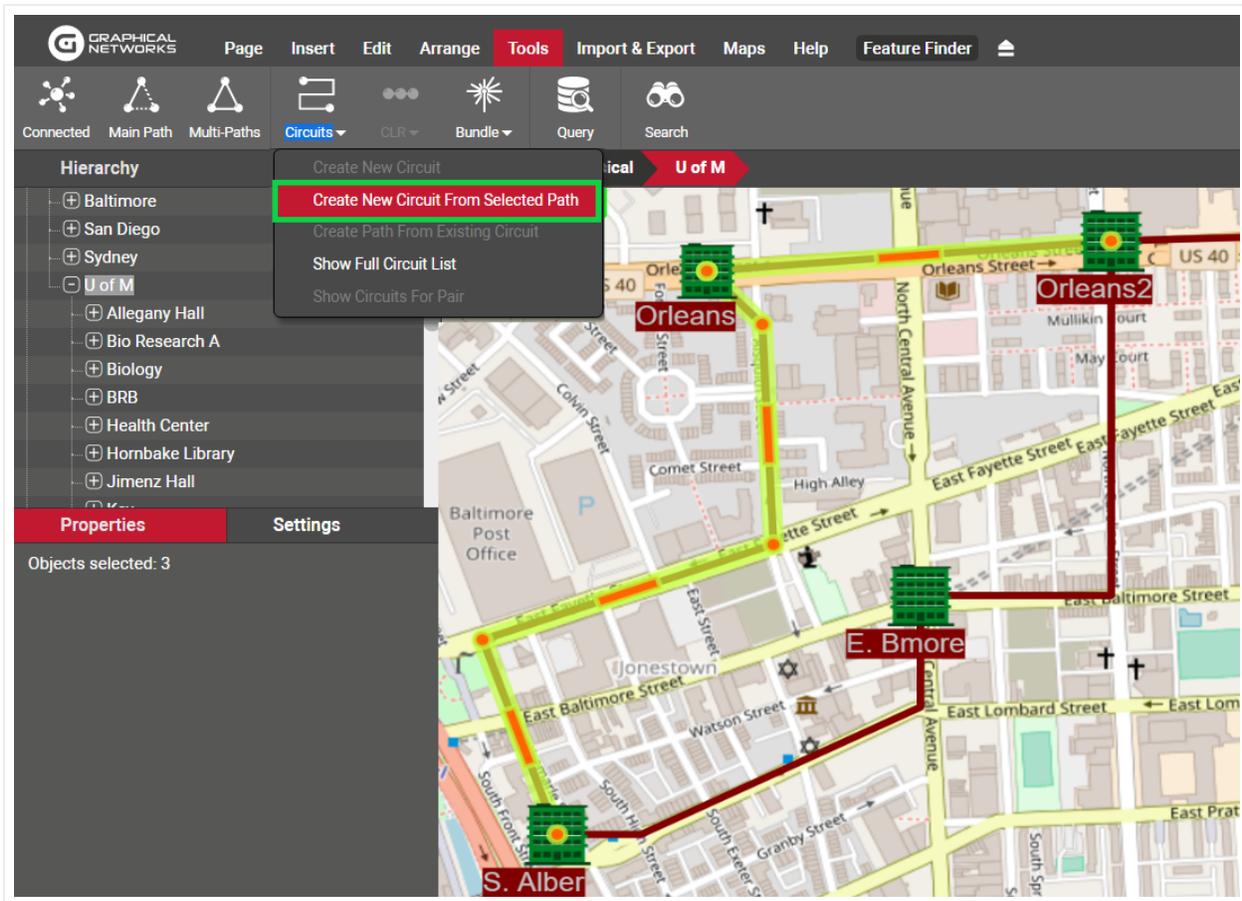
Interesting to note is that while this whole process seemed quite elaborate, it is still very automated: netTerrain picks the optimal paths for you, selects default cables and strands and even patches up the circuit along the way. Most of the explanations around this process deal with the details of how to override some of the decisions the software makes for you.

Being as automated as it is this process is prone to more automation through the API: you can have an external program send API calls to netTerrain via REST or SOAP and have the same circuit created 100% automatically without any human intervention.

### 8.9.3.5 Creating a circuit from a manual path selection

When you create a new circuit in netTerrain you may already know which path the circuit takes or maybe the circuit itself already exists in production. In that case you want to choose the path yourself and then “assign it to the circuit”.

This process is quite simple: select the conduits between the hops on the route and then click on the ‘Create New Circuit from Selected Path’ under Tools->Circuits:



*Creating a new circuit from an existing path*

What follows next is the Automated Circuit Routing Algorithm dialog (or ACRA), which we already saw previously.

### 8.9.3.6 Creating a circuit from a CLR

When you create a new circuit in netTerrain you may already know which path the circuit takes from an existing cable circuit layout record. netTerrain lets you create a circuit from said CLR by simply launching the CLR and clicking on the Circuit button on the top left corner.

### 8.9.4 OSP circuit layout records

A circuit layout records (CLR) is an end-to-end view of a linear connection between two endpoints, in one page. We have seen these before, when we launched a CLR for a cable or a port: netTerrain tries to follow the path as far out as possible until it encounters no more connections or too many (a split).

With circuits however, we have a more granular definition of a CLR: a one-page view of one of the edge-to-edge or end-to-end paths a circuit takes. We even provide two flavors of that CLR: a block CLR and the traditional swimlane CLR.

### 8.9.4.1 Why a CLR?

Circuits in your fiber plant, as we have seen already, traverse from locations A to Z through intermediate nodes on a map. The underlying circuit infrastructure, however, is connected through strands and patches terminating on ports inside a card or device, mounted on a rack in a room, etc. As we can see there is a whole hierarchy of sub diagrams associated with each node. If we were to visualize the whole path of a circuit, we would have to start navigating netTerrain, clicking and double-clicking on objects and by the time we are done, we forgot where we started. Also, if you were to provide the information to a technician to configure the circuit in production, you would have to print a ton of diagrams and explain to that technician how netTerrain works. This is where the CLR comes in handy.

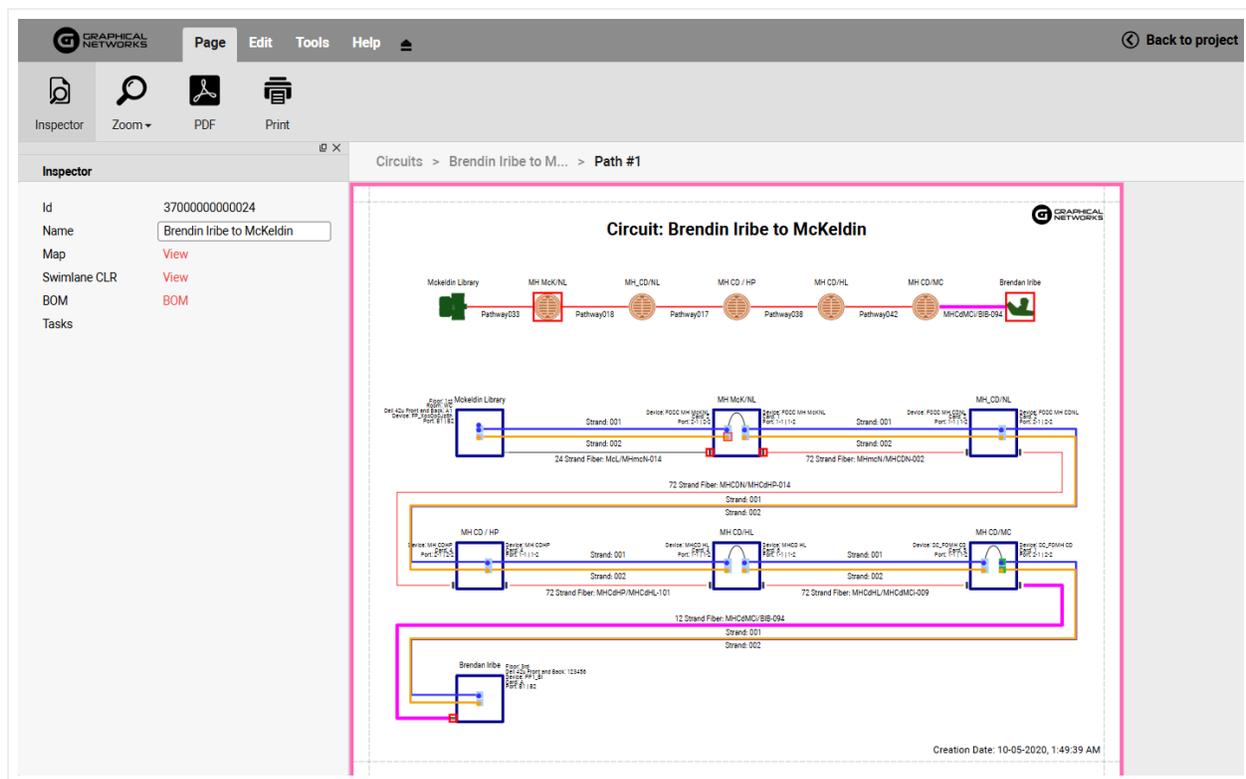
A CLR shows you all the information you need to know for the circuit, in one printable page without the need to navigate an array of different diagrams.

### 8.9.4.2 The block CLR

For both the block and the swimlane CLR views we show you each hop and each node, along with some properties. The difference between the two is in how we display these on the page. In the block CLR, each node down to the port is displayed as one simple block (hence the name).

Important to note is that a CLR shows you one path at a time.

Below is an example of a block CLR:

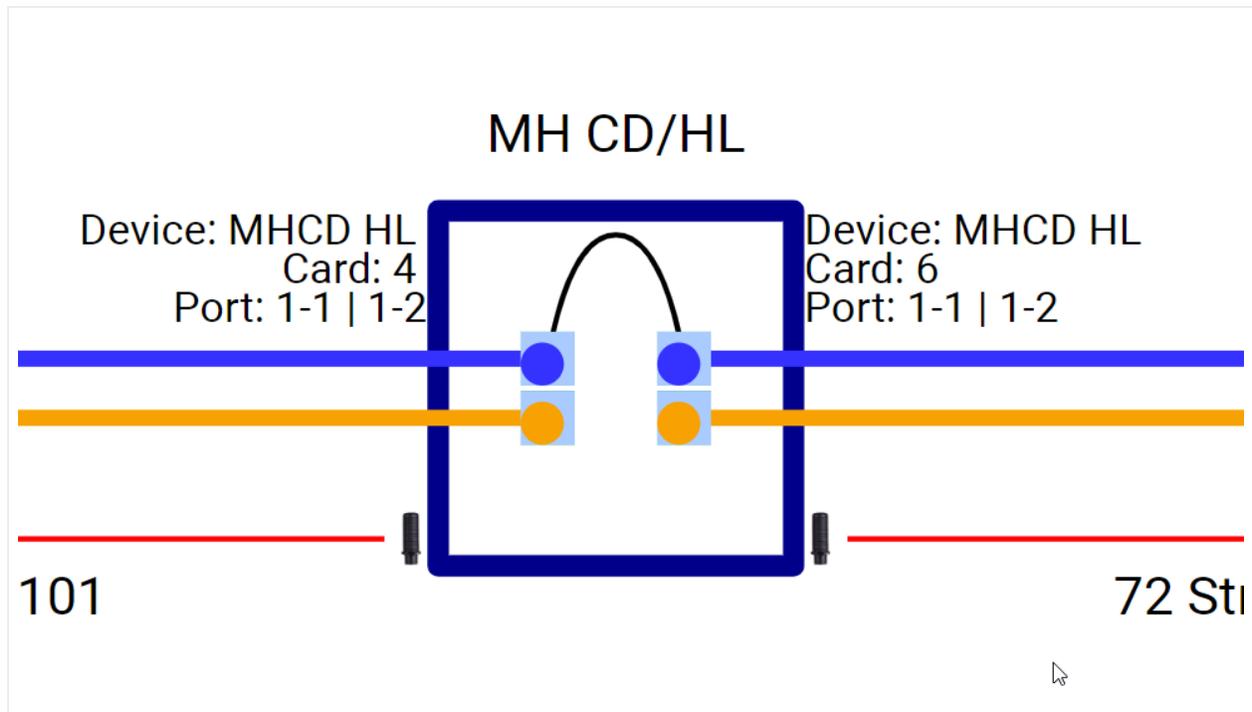


## Block CLR

The block CLR shows two graphics: a top graphic representing the map-level path the circuit path takes and a bottom graphic showing the entire hierarchy for each node as text displayed next to the block representing that node hierarchy. It's easy to see why a block CLR is convenient: by looping around the page, it can accommodate many hops and it also provides more details around the strand and cable configuration for a given circuit.

Just as with a swimlane CLR, you can jump to the diagram containing any component in the block CLR by double clicking on it. If you ctrl-click, it'll do the same, but in a new tab.

Here is a detail of one of the nodes:



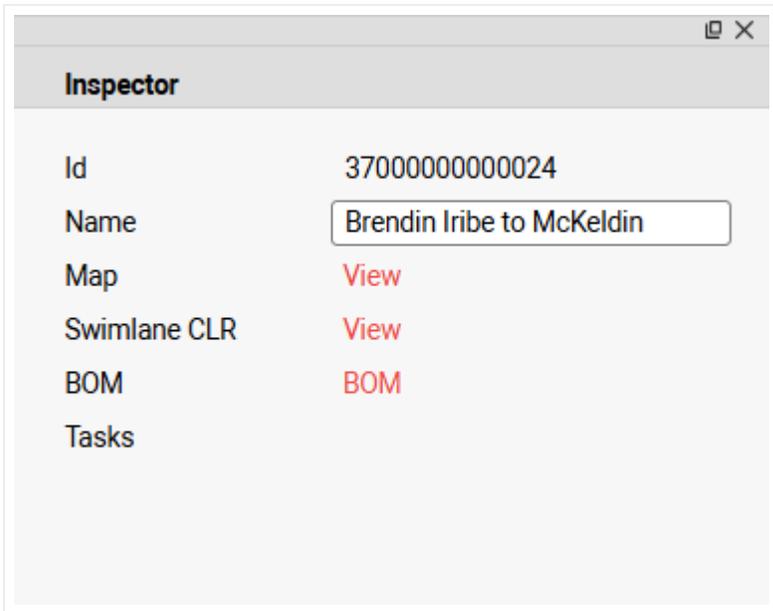
#### *Node detail on the block CLR*

The block includes a representation of the port where the strands and patches are connected and the cable that contains the strands. It also shows both port and strand numbers for each of the strands on the pair. For a pair of strands, two strands with their corresponding colors are shown.

The block CLR properties window shows the name and custom fields of the circuit, along with a link to see the main or secondary path (if it exists), a link to show you the circuit path on the map, and a link to open the swimlane view of the path:

The inspector on this CLR view gives users the following features:

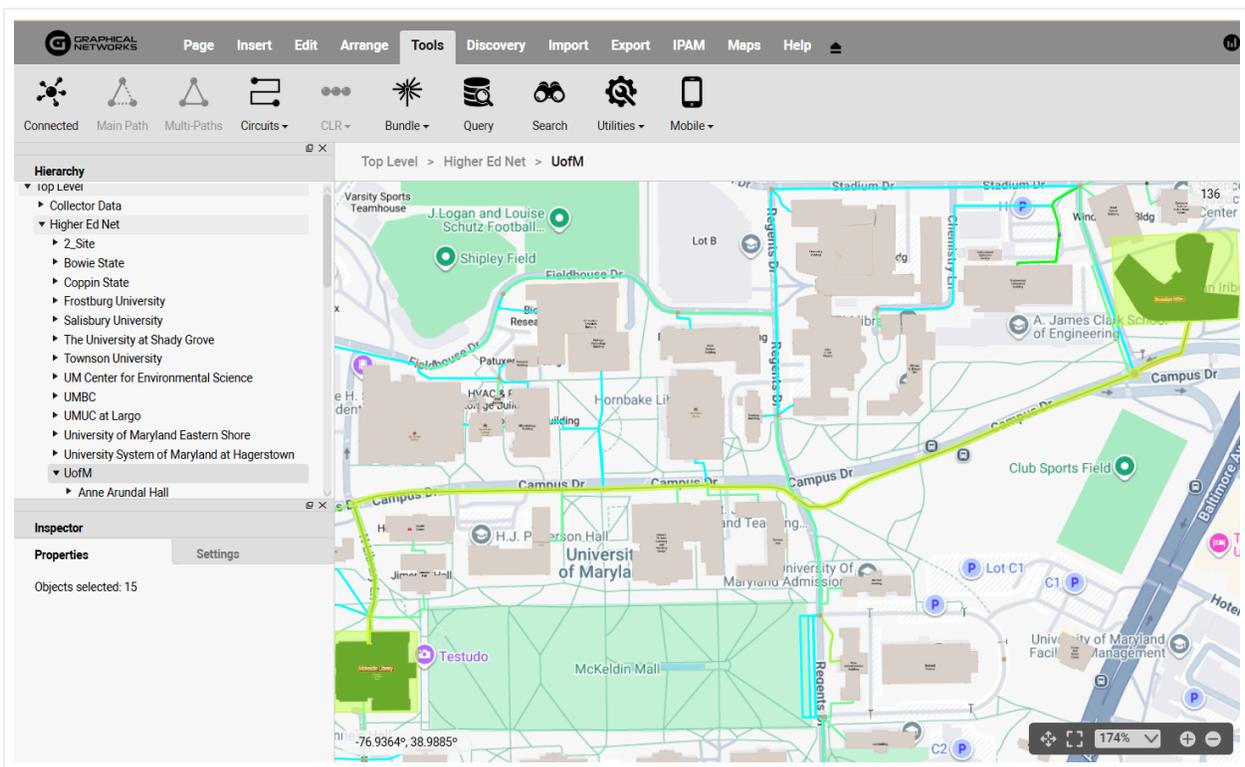
- View the circuit on the map
- Switch to the swimlane CLR view
- Create a Bill of Materials (BOM)



Circuit CLR inspector

### 8.9.4.2.1 Viewing a CLR on the map

By clicking on the Map link users can navigate from the CLR view to the map view of the circuit. netTerrain will highlight the entire route of containers and hops that comprise the circuit.



CLR shown on map

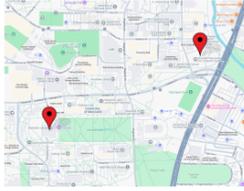
Creating

Properties	
Id	37000000010551
Name	<input type="text" value="JAN_aaa543"/>
Customer Name	<input type="text" value="GN"/>
Work Order #	<input type="text" value="123-rrt"/>
WO Status	<input type="text" value="Pending"/>
Service Date	<input type="text" value="10/10/2018"/>
Service Status	<input type="text" value="Pending"/>
Comments	<input type="text" value=""/> <input type="button" value="..."/>
Path #1	1 hop
Map	<a href="#">View</a>
Swimlane CLR	<a href="#">View</a>
Tasks	0

CLR properties window

#### 8.9.4.2.2 Creating a CLR Bill of Materials (BOM)

netTerrain includes a simple BOM feature for circuit CLR's which can be launched from the inspector BOM link. This link launches a BOM export dialog that dynamically creates a BOM PDF file that can be fetched from the default download folder of your browser.



## Circuit: Brendin Iribe to McKeldin Path 1 (Primary)



[Custom comments section]  
 Set path to custom comments file in this web.config key:  
 <add key="BOMReportCustomTextFilePath" value="Reports/bomReportCustomText.txt" />  
 Leave the key empty if you don't need custom comments:  
 <add key="BOMReportCustomTextFilePath" value="" />  
 If you don't see your text check report creating log for possible errors.  
 Use empty lines at the top to shift the text down.  
 Up to 8 lines of text fit this area.

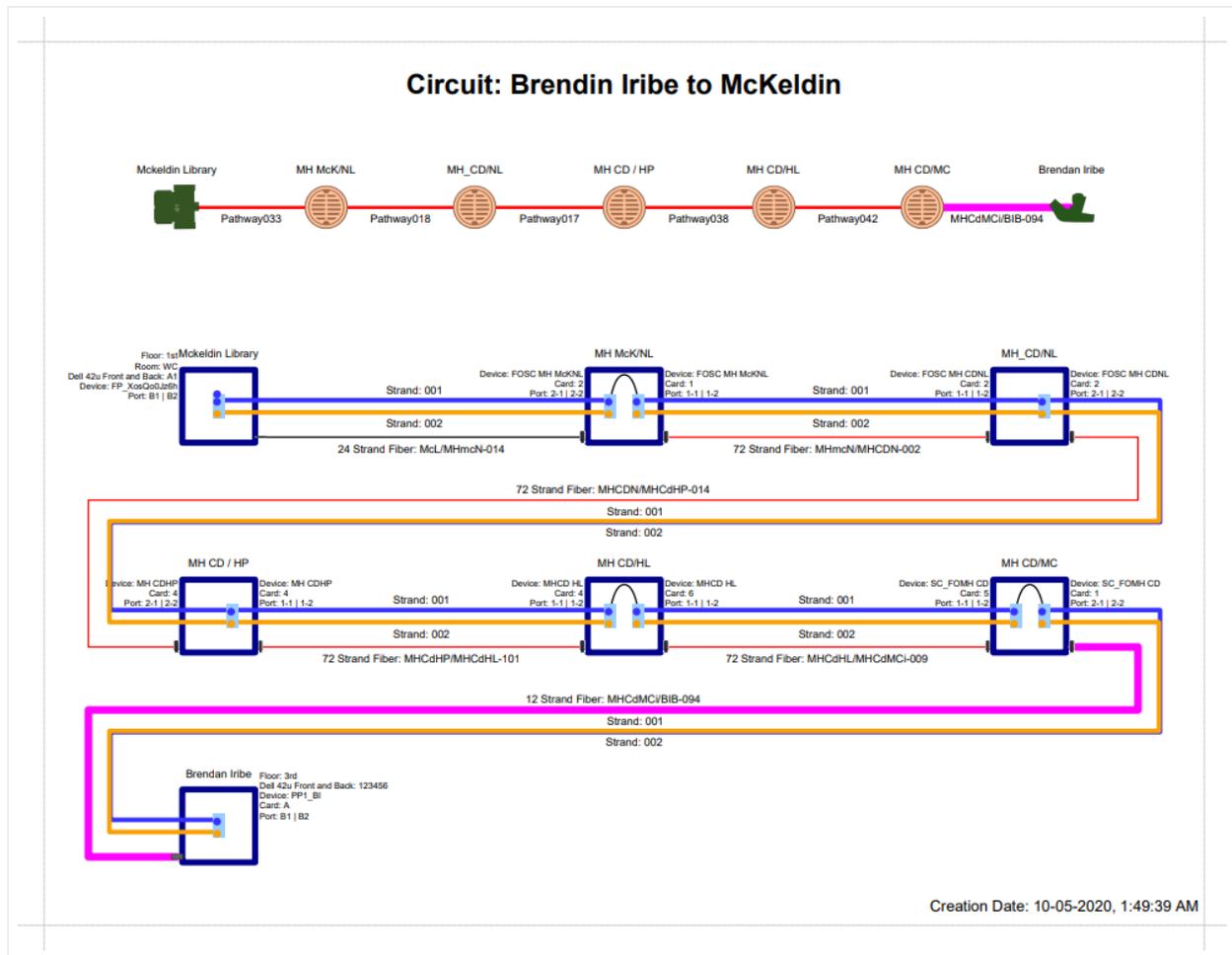
#	Link name	Link type	Start connection	End connection	Length
1	001	Strand	UofM > Brendan Iribe > 3rd > 123456 > PP1_BI > A > B1:LC	UofM > MH CD/MC > SC_FOMH CD > 1 > 2-1:Splice	
2	001	Strand	UofM > McKeldin Library > 1st > WC > A1 > FP_XosQo0Jz6h > B1:LC	UofM > MH McK/NL > FOSC MH McKNL > 2 > 2-1:Splice	
3	001	Strand	UofM > MH CD / HP > MH CDHP > 4 > 1-1:Splice	UofM > MH CD/HL > MHCD HL > 4 > 1-1:Splice	
4	001	Strand	UofM > MH CD / HP > MH CDHP > 4 > 2-1:Splice	UofM > MH_CD/NL > FOSC MH CDNL > 2 > 2-1:Splice	
5	001	Strand	UofM > MH CD/MC > SC_FOMH CD > 5 > 1-1:Splice	UofM > MH CD/HL > MHCD HL > 6 > 1-1:Splice	
6	001	Strand	UofM > MH_CD/NL > FOSC MH CDNL > 2 > 1-1:Splice	UofM > MH McK/NL > FOSC MH McKNL > 1 > 1-1:Splice	

Test Results

### CLR Bill of Materials (BOM)

#### 8.9.4.2.3 Exporting a CLR to PDF

Users can also export the CLR view to PDF by clicking on the PDF button on the ribbon, which launches the PDF export utility and creates a file that can be fetched from the default download folder of your browser.

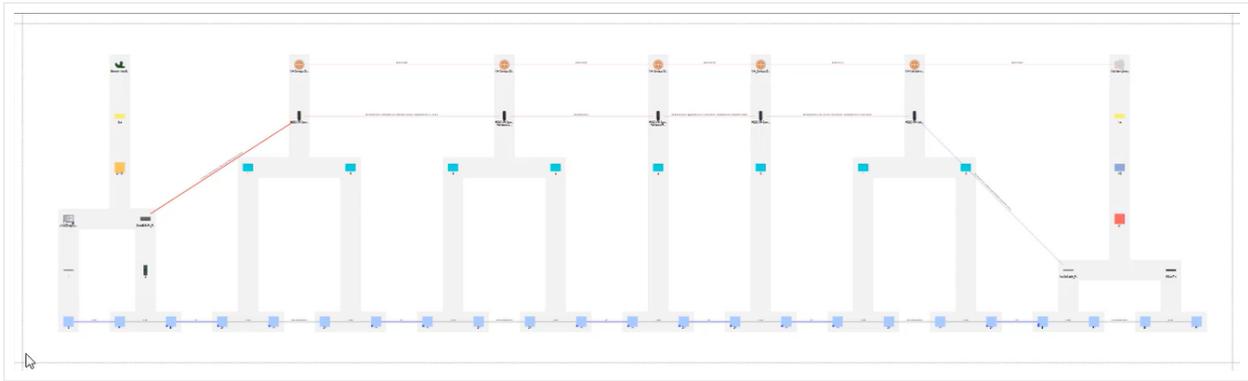


#### CLR PDF export

For CLR with multiple paths, netTerrain includes a REST API method to launch said export. The export of multiple paths sends the results to a single PDF file. Also, when multiple paths are exported, a "List View" is added to the Table of Contents in the PDF indicating the Path #s (Path 1, Path 2, etc.) that match the Path #s shown on the Circuit CLR page in the web client.

### 8.9.4.3 Swimlane CLR

The swimlane CLR is somewhat similar except that it shows the entire hierarchy for each node and it does not loop around the diagram in the presence of many nodes, it just keeps drawing the path horizontally. This makes it less convenient for printing if the paths are long.



### Swimlane CLR

From the swimlane CLR properties you can also access the alternate CLR paths, the map representation of the path and the block CLR view.

## 8.9.5 Diverse and redundant paths for existing circuits

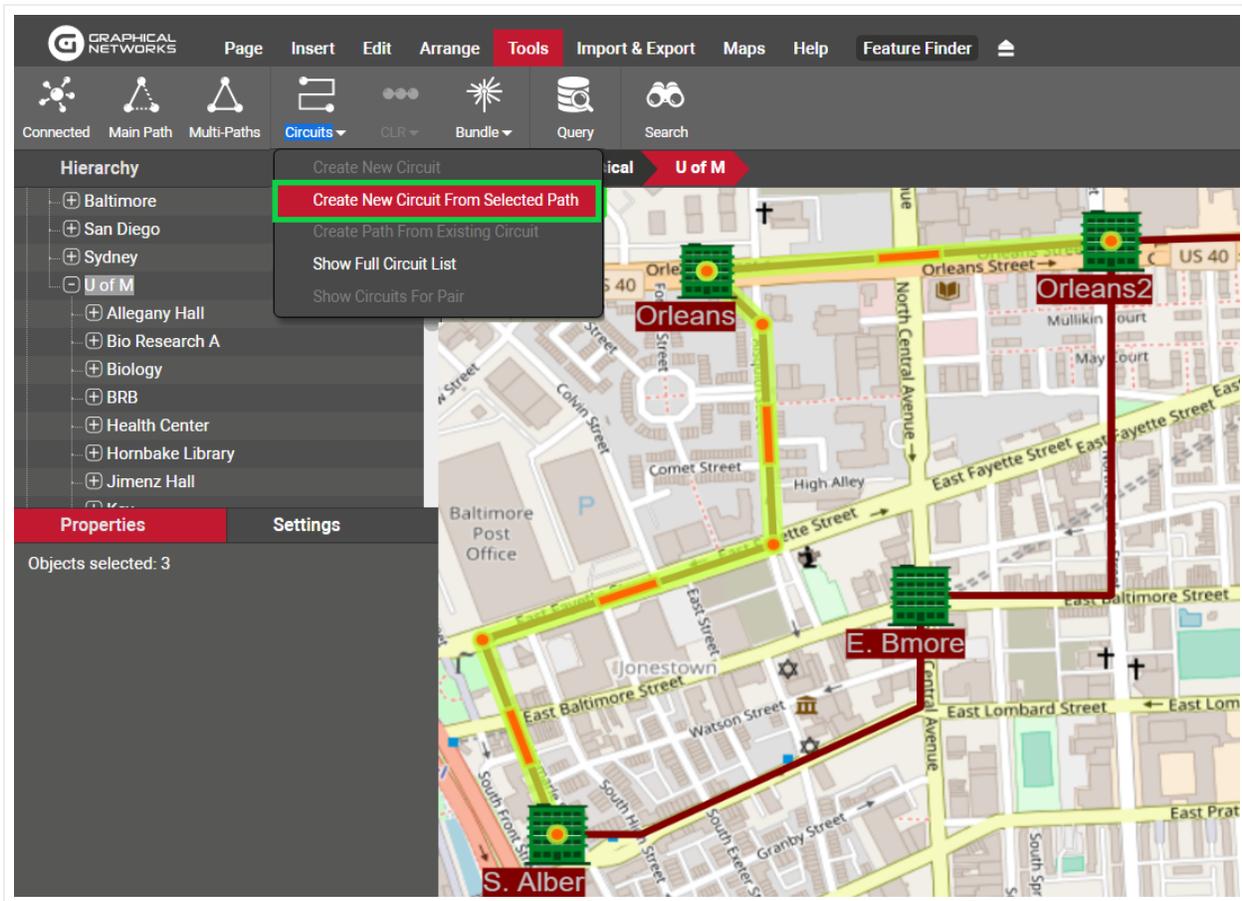
Something quite important in fiber plant circuit design is the ability to create redundant and diverse paths for an existing circuit.

We already saw in the circuit creation process above that when designing a new circuit netTerrain finds an optimal (shortest) path and the optimal diverse path. As we also saw above, a diverse path is a secondary, or alternative path that has no common elements with the main path, except, of course, for the endpoints. And we already know that a redundant path is a secondary path that traverses the same hops on the map as the main path.

Fiber circuits usually serve as a transport mechanism for some service to internal or external end customers. The purpose of diverse and redundant circuits is to add some robustness to that service. Usually, diversity in a circuit gives us safeguards against physical damage to one of the paths. For example, a construction company may be digging on some street and cutting a fiber cable. All the circuits that traverse that cable would be affected, but the ones without a diverse path would suffer a complete outage.

To view which circuits could be affected by such a fiber cut, you can click on the cable, or the conduit or any of the containers of circuits and get a list of the circuits going through that.

So, let's suppose we have a circuit in netTerrain, and we would like to provide some robustness by creating a secondary route that is diverse. We start by selecting the circuit, which can be done directly from the map by choosing the end points for that circuit, then clicking on the circuits button->create path from existing circuit:



*Creating a path from an existing circuit*

This menu will bring up a report with all the circuits that exist between these two endpoints:

**Circuits for Selected Pair** Pratt -- S. Alber

View	Tasks	From Device	To Device	Name	Customer Name	Work Order #	WO Status	Service Date	Service Status	Comments	Paths
[View Map]	Table CLR	0	Sample > Pratt > Ju...	Sample > S. Alber > ... JAN_aaa543	GN	123-rrt	Pending	10/10/2018	Pending		2

Buttons: Add Diverse, Add Redundant, Create New, Close

*Circuit list for those two endpoints*

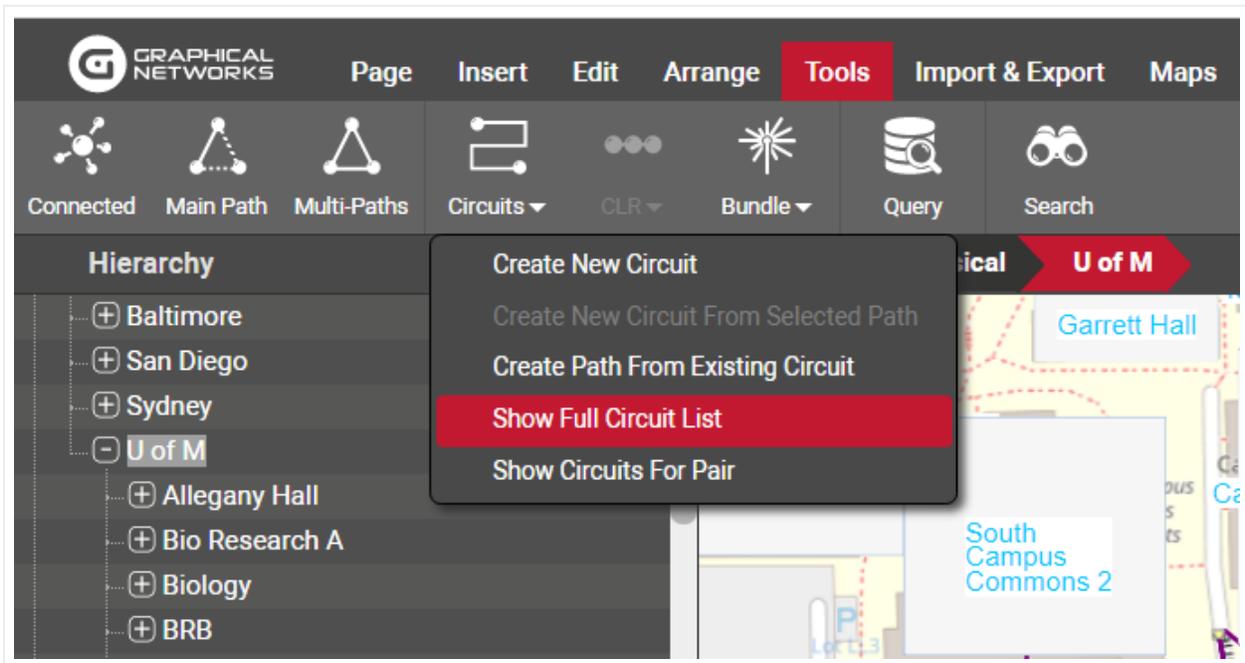
From here you must select the circuit for which you want to create another diverse or redundant path (in the example above, it is the only one that exists) and either click on the 'Add Diverse' or 'Add Redundant' button. You are not guaranteed to have a path available, in which case netTerrain will show you an error. If there is a path, the ACRA dialog reviewed above is presented and you simply need to complete that same process.

## 8.9.6 Circuit Lists

To simplify the management of your circuits, netTerrain includes a variety of circuit lists that can be launched from different contexts.

### 8.9.6.1 Full circuit list

You can launch the full circuit list from the toolbar menu, as shown below:



#### *Full Circuit List menu item*

There's no mystery here: this button will open a list view with all the circuits that exist in your project. The list uses the well-known list view format we have already seen countless other times throughout the tool. A reduced list is the one that can be opened just for a pair of selected nodes by clicking on the menu below (Show Circuits For Pair). Important to note is that these lists provide a few convenient links and tools:

- Link to delete the circuit.
- Link to view the circuit on the map.
- Link to launch the CLR.
- Link to launch a Bill of Materials (BOM).
- Link to show any Work order tasks.
- Link to open a sublist of each path for that circuit.

Circuits To csv Records in table: 17 Records on page: 17

Filter Apply Clear Records per page 100 Show Id Field Default sorting

#	Tasks	Paths	BOM	Hops	From Device	To Device	Name			
1				0	1		3	University of Maryland > Brendin Irbe Building > 3rd > A1 > DabdBrgJRx_PP > C	University of Maryland > HVAC & PM Storage Building > 1st > WC > A1 > SW_JhbMjvGACf_R	HVAC to Brendin Irbe
2				0	1		3	University of Maryland > Brendin Irbe Building > 3rd > A1 > DabdBrgJRx_PP > C	University of Maryland > HVAC & PM Storage Building > 1st > WC > A1 > SW_JhbMjvGACf_R	HVAC to Brendin Irbe_2
3				0	1		3	University of Maryland > Brendin Irbe Building > 3rd > A1 > DabdBrgJRx_PP > C	University of Maryland > HVAC & PM Storage Building > 1st > WC > A1 > SW_JhbMjvGACf_R	HVAC to Brendin Irbe_3
4				0	1		3	University of Maryland > Wind Tunnel Building > 1st > WC > A1 > FP_6hj0QwZRYm	University of Maryland > Brendin Irbe Building > 3rd > A1 > DabdBrgJRx_PP > F	Brendan Irbe to Wind Tunnel
5				0	1		3	University of Maryland > Brendin Irbe Building > 3rd > A1 > DabdBrgJRx_PP > F	University of Maryland > Computer Science Instructional Center > 1st > WC > A1 > FP_ppBgakwflb	Computer Science to Brendin Ir
6				0	1		1	University of Maryland > Brendin Irbe Building > 3rd > A1 > SW_C7NH1LFXID > 1	University of Maryland > Shoemaker Building > 1st > WC > A1 > SW_G7cRjpsMfj_D	Brendin Irbe Shoemaker Data
7				0	1		1	University of Maryland > Brendin Irbe Building > 3rd > A1 > SW_Nj0Anxv1ZR_Building Core	University of Maryland > Shoemaker Building > 1st > WC > A1 > SW_womrMZMC13_B	Brendin Irbe Shoemaker Buildin
8				0	1		1	University of Maryland > Brendin Irbe Building > 3rd > A1 > SW_Nj0Anxv1ha_Security Core	University of Maryland > Shoemaker Building > 1st > WC > A1 > SW_v8zpl0GPwS_S	Brendin Irbe Shoemaker Secur
9				0	1		1	University of Maryland > Brendin Irbe Building > 3rd > A1 > SW_C7NH1LFXID > 1	University of Maryland > LeFrak Hall > 1st > WC > A1 > SW_G7cRjpsMfj_D	Brendin Irbe LeFrak Data
10				0	1		1	University of Maryland > Brendin Irbe Building > 3rd > A1 > SW_Nj0Anxv1ZR_Building Core	University of Maryland > LeFrak Hall > 1st > WC > A1 > SW_womrMZMC13_B	Brendin Irbe LeFrak Building Au

List view detail, showing shortcut links

### 8.9.6.1.1 Deleting a circuit

From the Delete button you can remove a circuit from the inventory permanently. Note that if you remove a circuit, you will also remove its paths and you will make any used strands available again. You will also be prompted to remove any existing patches currently used for that circuit.

### 8.9.6.1.2 Viewing circuit paths

Paths can also be viewed in simple list form. This is available on a per circuit basis by clicking on the Paths button available for each circuit:

Circuit Paths (Circuit: HVAC to Brendin Iribe) To csv

Filter Apply Clear

#	Link	#Hops
1	  	3

1 out of 1 < >  Go

### Circuit paths list

From this list you can also delete a path for a circuit, view it on the map or launch its CLR.

### 8.9.6.1.3 Launching a Bill of Materials (BOM)

A special type of report is the Bill of Materials (BOM), which you can launch by clicking on the BOM button available on the circuit list view. A BOM is a PDF report that is generated on the fly for the circuit showing a list of the patches that comprise it, along with a snippet of the affected map area (endpoints).



### Circuit: Brendin Iribe to McKeldin Path 1 (Primary)

[Custom comments section]  
Set path to custom comments file in this web.config key:  
<add key="BOMReportCustomTextFilePath" value="Reports/bomReportCustomText.txt" />  
Leave the key empty if you don't need custom comments:  
<add key="BOMReportCustomTextFilePath" value="" />  
If you don't see your text check report creating log for possible errors.  
Use empty lines at the top to shift the text down.  
Up to 8 lines of text fit this area.



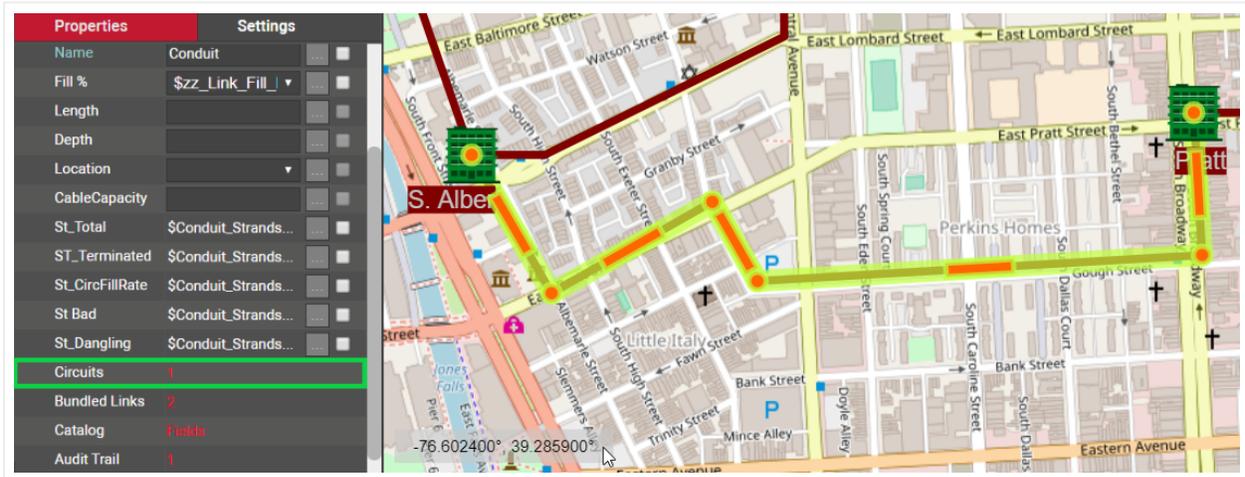
#	Link name	Link type	Start connection	End connection	Length
1	001	Strand	UofM > Brendan Iribe > 3rd > 123456 > PP1_BI > A > B1.LC	UofM > MH CD/MC > SC_FOMH CD > 1 > 2-1:Splice	
2	001	Strand	UofM > McKeldin Library > 1st > WC > A1 > FP_XosQc0Jz6h > B1.LC	UofM > MH McKNL > FOSC MH McKNL > 2 > 2-1:Splice	
3	001	Strand	UofM > MH CD / HP > MH CDHP > 4 > 1-1:Splice	UofM > MH CD/HL > MHCD HL > 4 > 1-1:Splice	
4	001	Strand	UofM > MH CD / HP > MH CDHP > 4 > 2-1:Splice	UofM > MH_CD/NL > FOSC MH CDNL > 2 > 2-1:Splice	
5	001	Strand	UofM > MH CD/MC > SC_FOMH CD > 5 > 1-1:Splice	UofM > MH CD/HL > MHCD HL > 6 > 1-1:Splice	
6	001	Strand	UofM > MH_CD/NL > FOSC MH CDNL > 2 > 1-1:Splice	UofM > MH McKNL > FOSC MH McKNL > 1 > 1-1:Splice	

Test Results

### BOM report

## 8.9.6.2 Opening a list of affected circuits per node or link

You can click on any node, port or link and get a list of the circuits that go through that object. This is a convenient way for launching a list of “affected circuits”. The usefulness of this feature is obvious: if you need to relocate a building, or decommission a device, you can easily find out all the affected circuits by simply clicking on that object, as shown below:

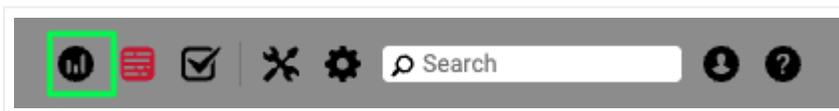


[Link to access circuit list for a conduit](#)

## 9 Dashboards

Dashboards (also called reports) are collections of gadgets showing aggregated data from the netTerrain database (customized dashboards may include data from other data sources).

The reports button opens a special reporting view, including several predefined dashboard views and reports.



[Reports link](#)

These gadgets present information in several different arrangements, such as:

- Charts
- Pies
- Gauges
- Cards
- Other gadgets (maps, pivots, grids, etc.)

## 9.1 Predefined dashboards

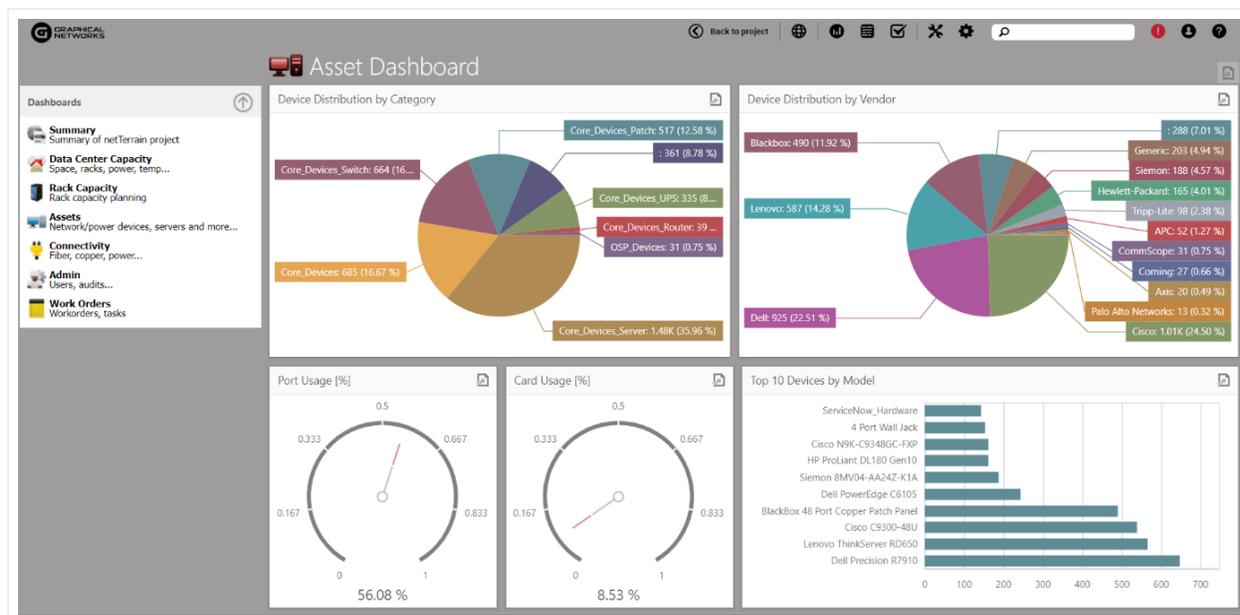
netTerrain ships with a series of default dashboards, which can later be overridden by changing the existing dashboards or creating new ones using the netTerrain dashboard editor (see netTerrain Dashboard Designer Guide).

### Attention!

Some of the default dashboards provided with netTerrain are geared towards DCIM-type data. If you are a user of netTerrain Logical, those dashboards may be hidden (see predefined dashboards below).

Dashboards can be designed so that only users with a certain permission level can view a specific dashboard. For example, the default dashboards include an administrator dashboard that can only be accessed by users with an admin role.

Users that access the dashboards will initially be presented with the default dashboard, which provides a summary of the project.



netTerrain summary (default) Dashboard

As mentioned above, netTerrain includes a series of predefined dashboards. In total, netTerrain ships with 6 dashboards, which are detailed below.

### 9.1.1 Summary dashboard

An example of the summary dashboard in netTerrain is shown above. This dashboard includes a basic summary of the components of the project including:

- A pie chart of the node counts and percentages by category, where the categories refer to the built-in categories such as nodes, devices, racks, etc (some of these categories may not be available for netTerrain Logical users).
- A pie chart of the node counts and percentages by type.
- A series of cards including scalar values (counts) for the following entities:
- Diagrams (nodes containing other nodes)
- Nodes
- Cabinets
- Devices
- Links
- Cards
- Ports
- Palette Objects

## 9.1.2 Data Center Capacity (for netTerrain DCIM only)

The Data Center Capacity dashboard provides a summary of capacity statistics as well as four exception charts for rooms based on different criteria:

- A chart for the top 5 rooms by rack count.
- A chart for the top 5 rooms by rack unit utilization [%].
- A chart for the top 5 rooms by rack weight utilization [%].
- A chart for the top 5 rooms by nameplate power utilization [%].
- 4 cards with the following capacity stats:
  - Room count.
  - Cabinet count.
  - Rack unit (RU) usage (percentage), including :
    - Total rack units used.
    - The differential to reach the total RU capacity in the entire project.
    - The percentage of RUs used.
  - Power usage (percentage) in kW, including:
    - Total power used.
    - The differential to reach the total power capacity for the entire project.
    - The percentage of power used.



### Attention!

A room is defined as any diagram (node) that contains at least one rack. Because netTerrain is so flexible, it lets users place racks at any level, so you may have 'rooms' that in the project appear at any level of depth.

Also notice that the power usage report here is based on nameplate power definitions for the devices in the netTerrain catalog. This is not instantaneous power and relies on the nameplate power figures being entered correctly in the catalog. Using the netTerrain environmental monitoring module users can obtain real-time, derated and other instantaneous power values.

## 9.1.3 Rack Capacity Planning Dashboard (for netTerrain DCIM only)

The Rack Capacity Planning dashboard provides a series of widgets depicting Rack Unit (RU), power and temperature aggregate data per room, including the following:

- Horizontal gauges depicting Rack RU capacity for each room.
- Horizontal gauges depicting average rack temperature for each room.
- Circular gauges depicting average rack nameplate power for each room.



## Rack capacity planning dashboard

### Attention!

Rack power usage here is based on nameplate power definitions for the devices in the netTerrain catalog. This is not instantaneous power and relies in the nameplate power figures being entered correctly in the catalog. Using the netTerrain environmental monitoring module users can obtain real-time, derated and other instantaneous power values. Temperature values are based on any values depicted in some field called 'temperature'. This can be added manually, collected via SNMP or aggregated using our environmental monitoring module.

## 9.1.4 Asset Dashboard

The Asset dashboard provides a series of widgets depicting device distribution per category, per vendor as well as port and card usage percentages:

- Device distribution by vendor is shown as a pie chart assuming devices were placed in different categories (see Power User Guide).
- Device distribution by vendor also assumes devices in the catalog are associated with the correct vendor.
- Port and card usages are represented in two circular gauges as percentage values.



## Asset dashboard

## 9.1.5 Connectivity Dashboard

The Connectivity dashboard provides a series of widgets depicting link counts by type, connectors and so, including:

- A full-stacked bar chart depicting endpoint counts by node and link type: for each different endpoint type in the project that has links (either as a starting point or an ending point) the corresponding bar shows the counts for each link type.
- A pie chart showing the distribution of links by type.
- A pie chart showing the distribution of cables by connector type (this only applies to DCIM).
- A pie chart showing the distribution of cables by type.

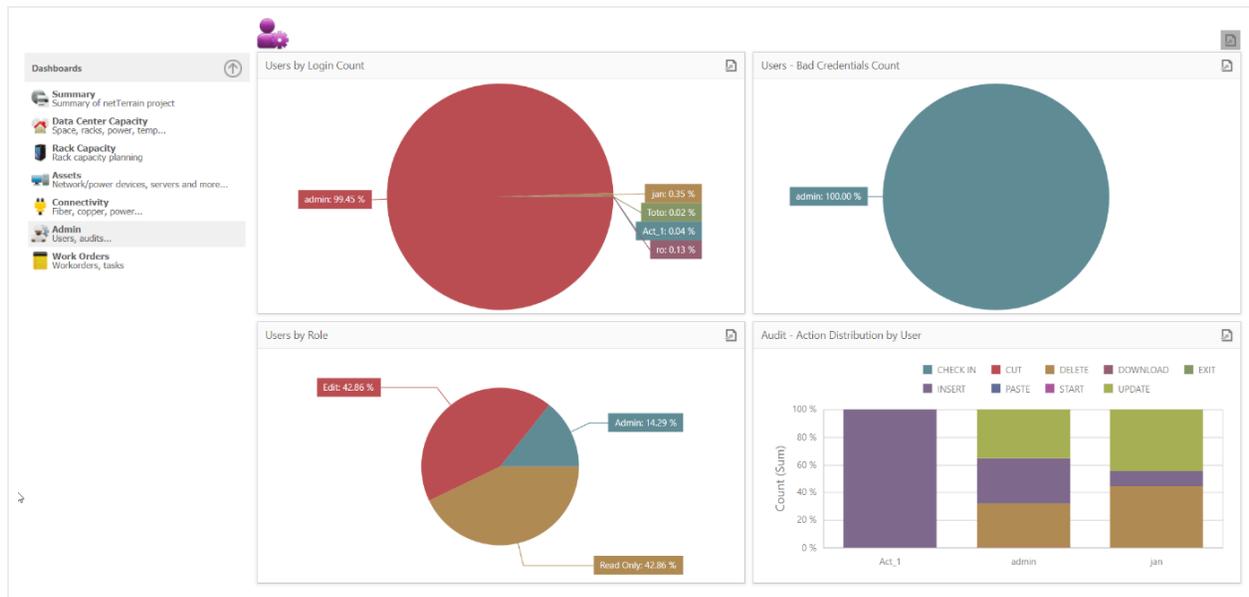
### Attention!

netTerrain does not discriminate between a link and a cable per-se, but cables in this context refer to any links that terminate on two ports.

## 9.1.6 Admin Dashboard

The Admin dashboard is, of course, only accessible for administrators and provides a series of widgets depicting user and audit trail related data, including:

- A pie chart of login counts, by user.
- A pie chart of login attempts using bad credentials, by user.
- A pie chart of distribution of users by role.
- A stacked bar chart of audit trail events by action.



## Admin dashboard

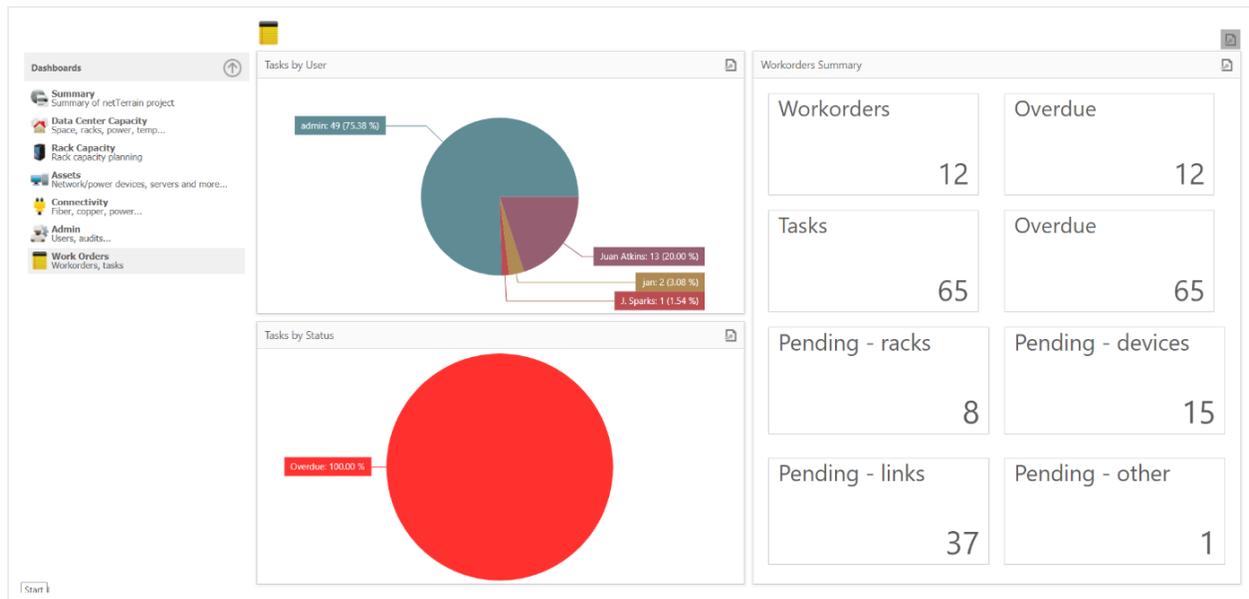
### Attention!

This dashboard is only accessible by users with administrator credentials.

## 9.1.7 Work order Dashboard

The work order dashboard is only for administrators and provides a series of widgets depicting work order and task related data, including:

- A pie chart of tasks, by user.
- A pie chart of tasks, by status.
- A series of counters providing summarized task and work order information.



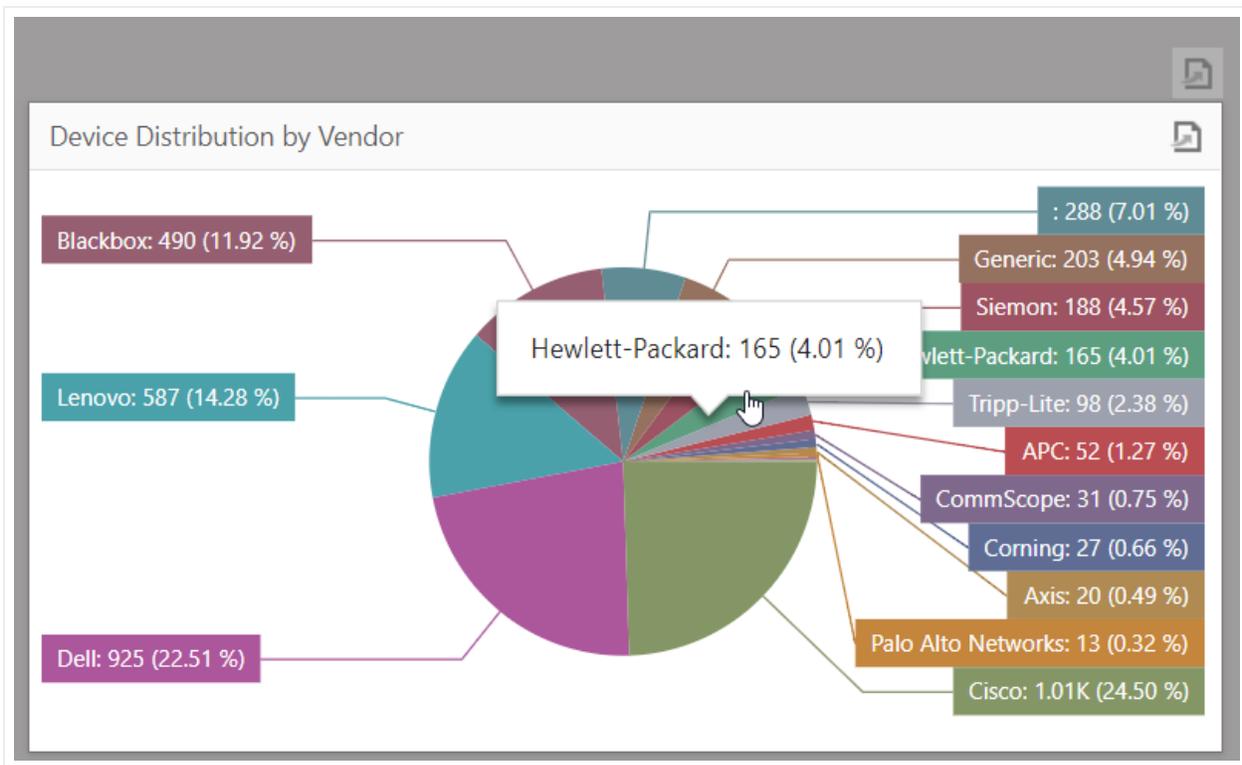
Work order dashboard

**Attention!**

This dashboard is only accessible by users with administrator credentials.

## 9.2 Dashboard drill down

Where applicable, dashboards allow drilling down from a specific widget into further levels of detail. To know which widget allows drilling down simply hover the mouse over it and when the mouse pointer shows the “hand” icon it means you can drill down into it.



Dashboard allowing drill downs into a table view

For example, the devices by vendor widget that you can find in the assets dashboard (shown above) lets you drill down into a specific slice of the pie chart to open a table view of that particular slice. Since these tables are completely customizable as well, you can choose which columns to display in those table views.

zy\_Dash\_Assets\_pieDashboardItem1 To csv Records in table: 165 Records on page: 100

Filter Apply Clear Records per page: 100 Show Id Field Default sorting

#	url	ParentId	TypeName	Vendor	Name	Parent	Peak Power (W)	Weight (lb)	Width (in)	Height (in)	Slots	SlotsFree	SlotsFreePerc
1	Show on diagram	24000000003620	HP LaserJet M404n	Hewlett-Packard	HP LaserJet M404n	Node: Copier/Print	495	18.12	15	8.5	0	0	N/A
2	Show on diagram	24000000003620	HP LaserJet M553n	Hewlett-Packard	HP LaserJet M553n	Node: Copier/Print	617	59.5	18.8999996185303	18	0	0	N/A
3	Show on diagram	24000000003620	HP LaserJet M9050	Hewlett-Packard	HP LaserJet M9050	Node: Copier/Print	1160	315.26	52.5	48	0	0	N/A
4	Show on diagram	24000000003811	HP ProLiant DL180 Gen10	Hewlett-Packard	SRV_rxc10uqs2	Rack: B1	500	58	19	3.5	3	3	100%
5	Show on diagram	24000000003811	HP ProLiant DL180 Gen10	Hewlett-Packard	SRV_v1s8wb3jz	Rack: B1	500	58	19	3.5	3	3	100%
6	Show on diagram	240000000033509	HP ProLiant DL180 Gen10	Hewlett-Packard	SRV_vyz8wsdz2l	Rack: B2	500	58	19	3.5	3	3	100%
7	Show on diagram	240000000033509	HP ProLiant DL180 Gen10	Hewlett-Packard	SRV_stj9xr35di	Rack: B2	500	58	19	3.5	3	3	100%
8	Show on diagram	240000000033652	HP ProLiant DL180 Gen10	Hewlett-Packard	SRV_lwdit9xt06	Rack: B3	500	58	19	3.5	3	3	100%
9	Show on diagram	240000000033652	HP ProLiant DL180 Gen10	Hewlett-Packard	SRV_jaz2lpyo51	Rack: B3	500	58	19	3.5	3	3	100%
10	Show on diagram	240000000033795	HP ProLiant DL180 Gen10	Hewlett-Packard	SRV_vg6m5pliv9	Rack: B4	500	58	19	3.5	3	3	100%
11	Show on diagram	240000000033795	HP ProLiant DL180 Gen10	Hewlett-Packard	SRV_vdc7ewe812	Rack: B4	500	58	19	3.5	3	3	100%
12	Show on diagram	240000000033938	HP ProLiant DL180 Gen10	Hewlett-Packard	SRV_1k0zsz3vda	Rack: B5	500	58	19	3.5	3	3	100%
13	Show on diagram	240000000033938	HP ProLiant DL180 Gen10	Hewlett-Packard	SRV_hlirg19hv	Rack: B5	500	58	19	3.5	3	3	100%
14	Show on diagram	240000000034081	HP ProLiant DL180 Gen10	Hewlett-Packard	SRV_gufxhc9e4	Rack: B6	500	58	19	3.5	3	3	100%
15	Show on diagram	240000000034081	HP ProLiant DL180 Gen10	Hewlett-Packard	SRV_rrmtw7nww4	Rack: B6	500	58	19	3.5	3	3	100%
16	Show on diagram	240000000034224	HP ProLiant DL180 Gen10	Hewlett-Packard	SRV_jtfa2yh0d0	Rack: B7	500	58	19	3.5	3	3	100%
17	Show on diagram	240000000034224	HP ProLiant DL180 Gen10	Hewlett-Packard	SRV_dSeq0lncet	Rack: B7	500	58	19	3.5	3	3	100%
18	Show on diagram	240000000034367	HP ProLiant DL180 Gen10	Hewlett-Packard	SRV_1de80sghtg	Rack: B8	500	58	19	3.5	3	3	100%
19	Show on diagram	240000000034367	HP ProLiant DL180 Gen10	Hewlett-Packard	SRV_jo5unsncwz	Rack: B8	500	58	19	3.5	3	3	100%

1 out of 2 < > 1 Go

Table view for one of the slices of the dashboard shown above

# 10 Change Management

netTerrain can be used as an advanced tool for change management. Two features stand out: document management and work order management, which we will explore in this chapter.

## 10.1 Document management (attachments)

netTerrain can be used to store documents and files, embedded with any node in the project. Users associate a document to a node by uploading the document from a local or network drive to the netTerrain server. When documents are uploaded to netTerrain, they reside in a netTerrain folder called 'EmbeddedDocs', which is on the application server.

The management of stored documents is akin to a SharePoint-Style document repository, and it includes features such as check-in, check-out, versioning, downloads, locking and history of files.

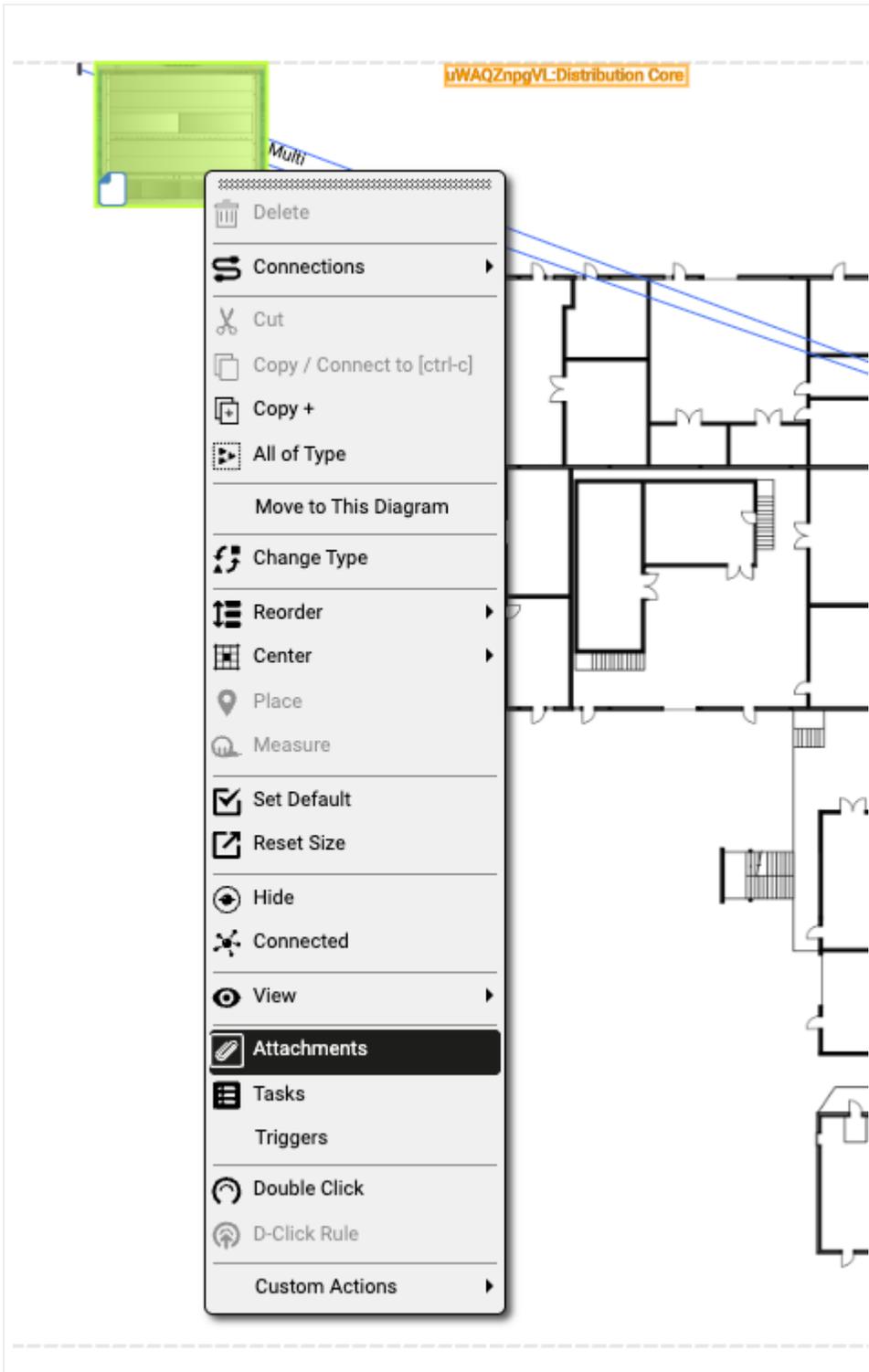
To manage documents, you must be a user with the annotator role or higher.

The ability to use netTerrain for document storage means that users can control the change and flow of documentation within the organization. Users can take advantage of this feature for the storage of user guides, processes, configuration files, diagrams designed with other tools, and much more.

### 10.1.1 Uploading a document

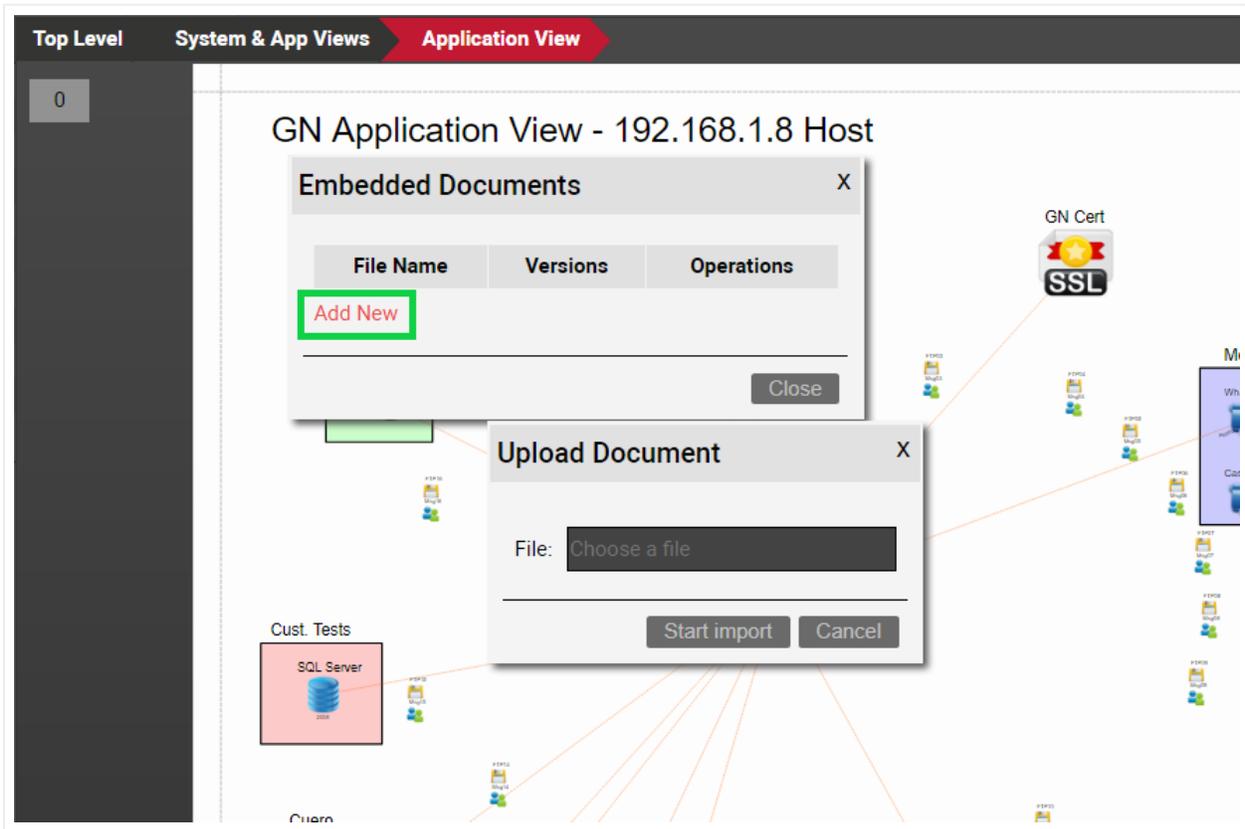
To upload a document first pick a node that will have these associated documents. You can associate as many documents as you want, and you can use as many nodes to embed documents as you want.

Start by right-clicking on the node and choosing the 'Attachments' menu, as depicted in the screenshot below. You can also click on the 'Attachments' button in the Insert menu.



*Accessing the document embedding feature for a node using attachments*

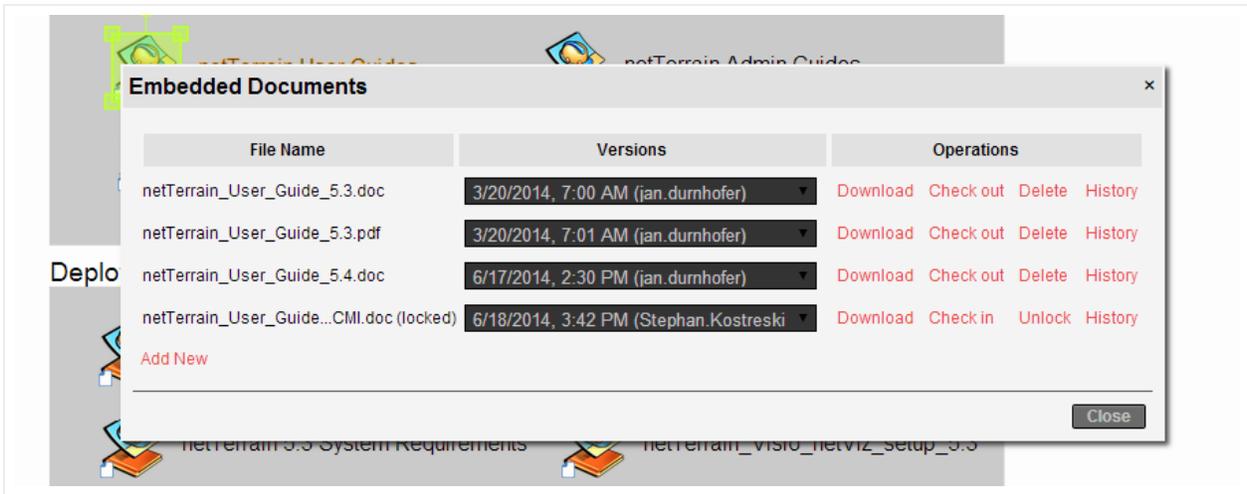
After you click on the 'attachments' menu, a dialog box called 'Embedded documents' is displayed. A node without any embedded document initially looks like the dialog below. By clicking on the 'Add new' button, a dialog to upload a document is displayed.



#### *Document upload dialog*

Click on the text box to browse for a document. If the document extension is valid (more on that later), then it can be uploaded by clicking on the 'Start Upload' button.

The uploaded document is then stored on the netTerrain server and displayed in the Embedded document dialog. As mentioned before, multiple documents can be embedded with a node, in which case the dialog looks as depicted below.

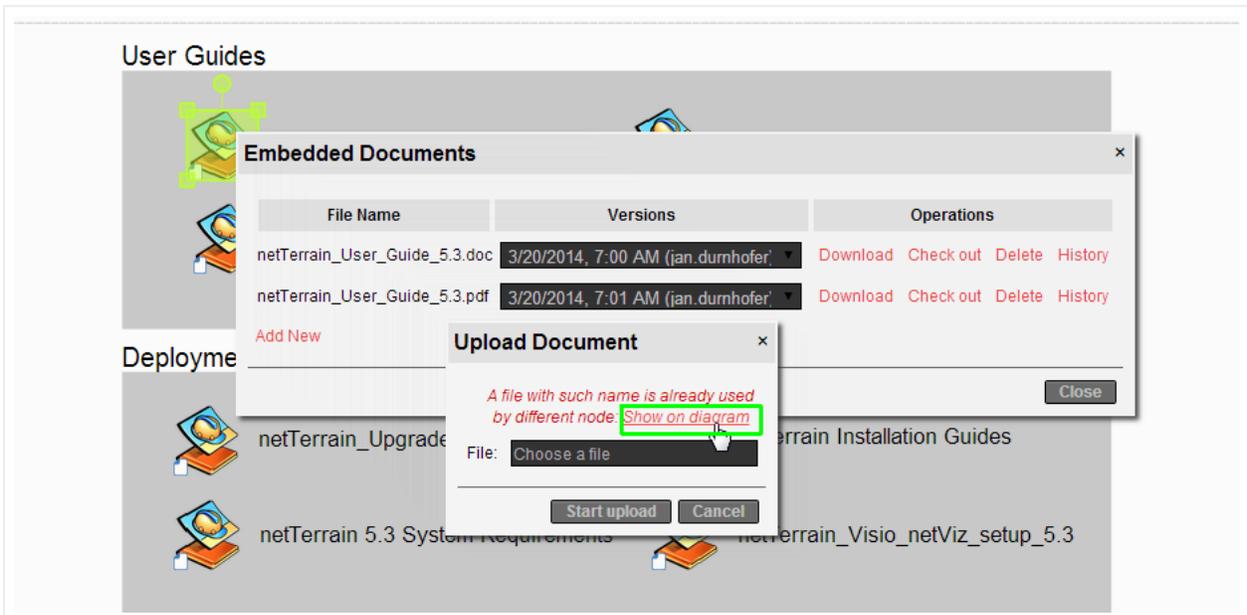


Embedded documents dialog

Embedded documents will be assigned a version and author, where the version is the date and time of the creation (or check in, see below) and the author is the user who originally uploaded it to the server.

### Attention!

Uploaded documents must be unique across netTerrain. If you try to upload a document with the same name as another one associated with another node, netTerrain will display an error message and offer a link to show the containing node on the diagram.



*Repeated document name error*

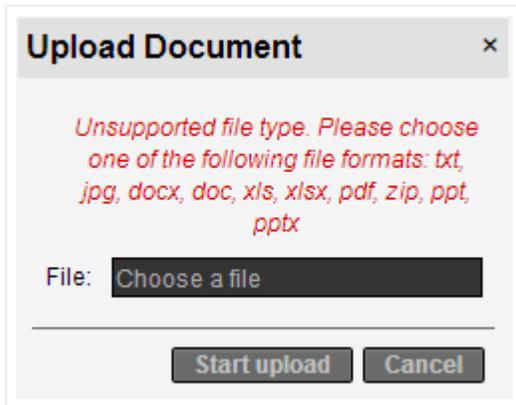
### 10.1.1.1 Deleting a document

To delete a document simply click on the delete button. This will remove the document from the netTerrain repository (although it still exists in the netTerrain folder).

### 10.1.2 Document extensions

In theory, any type of file can be uploaded to netTerrain, but administrators can control which extensions are accepted by listing them in the web.config file (see the netTerrain Installation guide).

If the extension of the selected document does not match any extension set up in the web.config file, then the following error will be displayed:



*Unsupported file type error*

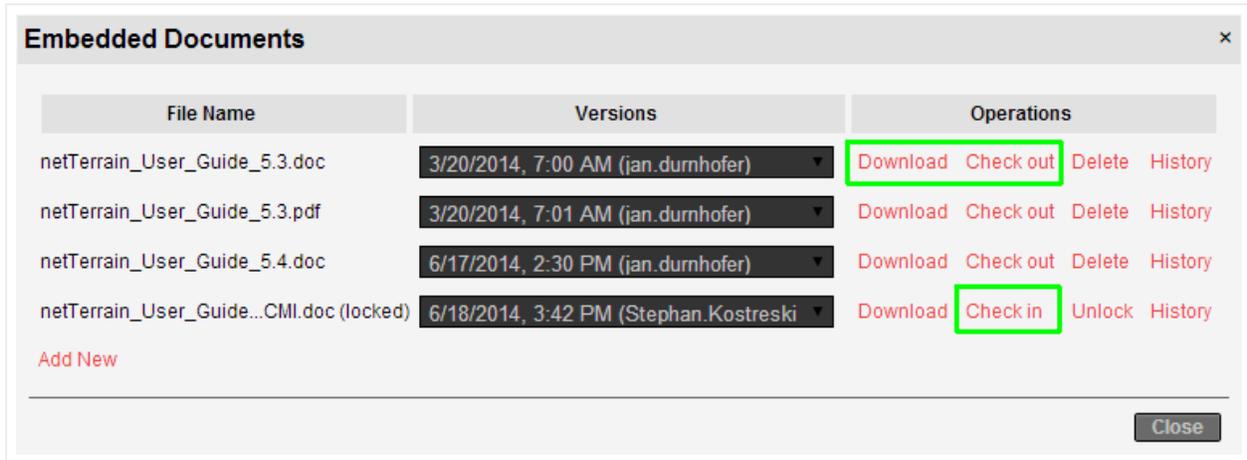
### 10.1.3 Downloading, checking out and checking in documents

Let's say we have a node with embedded documents, and a user wants to get a copy of a document. We have two options to do that: we can download it or check it out.

When we download a document from the server, we can store a copy of it on our local machine and work with as pleased, but that is pretty much all we can do with it. netTerrain will not allow a user to check a document back to the server when it was downloaded. What this means is that any changes the user makes to the document cannot be sent back to the server.

To store any new changes made to a document back to the server the user needs to do a 'check out' process. By checking out a document, the user in essence 'locks it' in netTerrain. After the document has

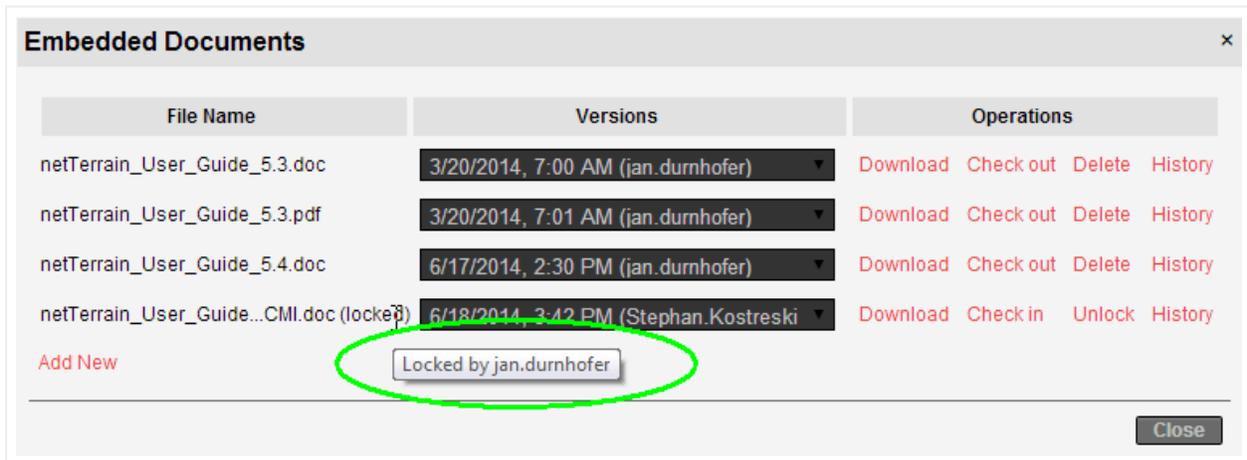
been checked out, netTerrain remembers the user that has document locked and prevents any other user from checking it out. This user can then modify the document locally and check it back in.



*Download, check out and check in options*

Naturally, many users can download a document and make changes locally, but only one user can check out a document at any given time. That way, we have in effect established a mechanism for document change control and prevent conflicting changes from occurring on the server.

To know who locked a document, hover the mouse over the locked document label, as depicted below.



*Locked document showing the user that is currently working with the checked-out document*

Once the modified document is ready to be checked back in make sure it still has the same name as when it was checked out originally, otherwise an error occurs when attempting to check it in.

As soon as the document is checked back in, a new version is assigned to the checked in document, which is, as expected, determined by the date and time of the check in process.

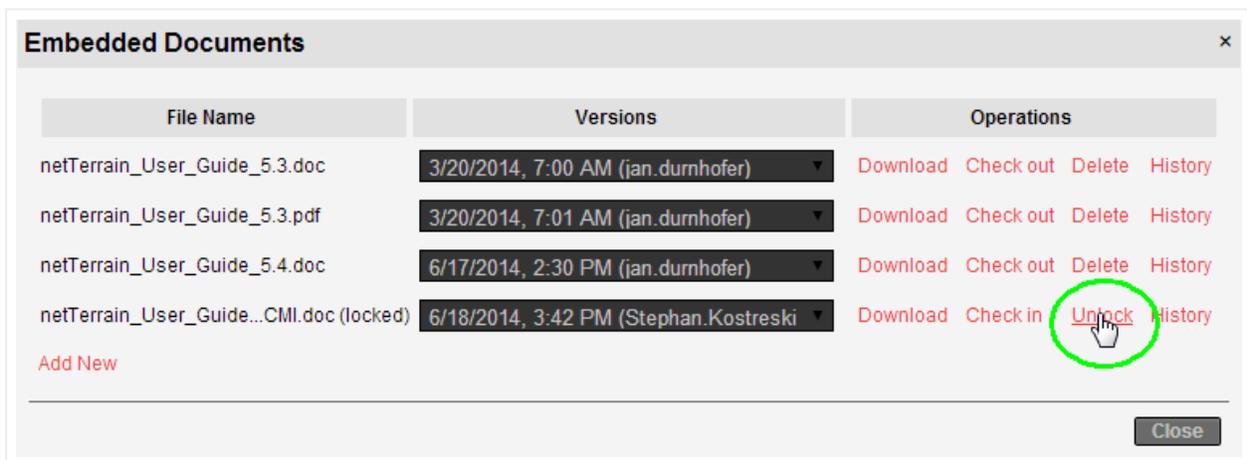
All versions of the document are stored on the server and displayed in the corresponding drop-down box.

### Attention!

Any version of the document can be downloaded, but only the latest can be checked out. That way we avoid any mistakes when editing the document and we ensure that we are always checking back in a version based on the latest changes.

## 10.1.4 Unlocking 'dormant' documents

There may be cases where a user checks out a document and then never checks it back in (or takes too long to do so). This could produce a bottleneck and prevent other users from making necessary modifications. In those cases, an administrator always has the power to 'unlock' the document. By unlocking a document, we are allowing other users to check it out. The administrator is bringing back the document to its previous state, and any changes that the 'dormant' user made will not be accepted.



File Name	Versions	Operations
netTerrain_User_Guide_5.3.doc	3/20/2014, 7:00 AM (jan.durnhofer)	Download Check out Delete History
netTerrain_User_Guide_5.3.pdf	3/20/2014, 7:01 AM (jan.durnhofer)	Download Check out Delete History
netTerrain_User_Guide_5.4.doc	6/17/2014, 2:30 PM (jan.durnhofer)	Download Check out Delete History
netTerrain_User_Guide...CMI.doc (locked)	6/18/2014, 3:42 PM (Stephan.Kostreski)	Download Check in <b>Unlock</b> History

[Add New](#)

[Close](#)

*Unlocking a document*

## 10.1.5 Document history

The entire sequence of events associated with a document is kept in an audit trail, which can be accessed by clicking on the 'History' button. This history is displayed in table views, like the audit trails available for nodes and links. In fact, the list view uses the same format as the audit trail list views.

Audit Trail for Instance [Complete Audit Trail] [To csv](#)

Filter  [Apply](#) [Clear](#)

#	Link	ID	Parent ID	FieldAffected	Field Value Affected	Old Value	Action	User	On
1		40000000000040	24000000032026	Revision	8/11/2022 8:35:32 AM		CHECK IN	admin	08-11-2022, 8:35:32 AM
2		40000000000040	24000000032026	Revision	8/11/2022 8:34:46 AM		CHECK OUT	admin	08-11-2022, 8:35:24 AM
3		40000000000040	24000000032026		Danny.txt		INSERT	admin	08-11-2022, 8:34:46 AM

1 out of 1 < > 1 [Go](#)

### Document history

#### Attention!

When you delete a document, its history is also deleted as there is no user interface to access it any longer.

## 10.2 Work order management

Network configuration changes, data center installations, or outside plant resource commissioning are all activities that typically need some level of change control. Many organizations have dedicated software for the management of work orders and tasks associated with these activities.

netTerrain can integrate with third-party work order management (WOM) systems via the Integration Toolkit, APIs, or some other method. However, organizations that either have no existing WOM system and need to start tracking work orders and tasks or have one but want to replace it, netTerrain also includes a module for that very purpose.

The advantage of the netTerrain WOM module over a standalone or separate WOM tool is that since it is part of the core netTerrain software it automatically reflects changes in tasks in the objects and diagrams visually represented in the system. In other words: no integration is needed!

The WOM module consists of two types of items: work orders and tasks, where a work order can have a collection of several tasks. Both work orders and tasks can be assigned to netTerrain users who get notified when a new item has been assigned to them.

## 10.2.1 Introduction to tasks

Tasks in the WOM module are essentially tags assigned to a netTerrain object. We will see that these are no ordinary tags, since there are several things you can do with tasks.

The objects in netTerrain that can have tasks assigned to them include:

- Any node
- Any link
- Racks
- Devices
- Cards
- Slots
- Line nodes

### 10.2.1.1 Categories of tasks

There are three main categories of tasks in a netTerrain WOM:

- Add (or New) task
- Delete task
- 'Other' task

Add tasks are probably the most important item in the netTerrain WOM, since they are used to mark an object as new. Generally, you want to create a new task for objects that are not in production, and when you use this type of task, as we will see, it triggers several useful features that ultimately let the user visually see the planned network in a netTerrain project.

As we will see throughout this chapter, in some cases you can pick the category of task you are adding, but this is not always the case. Sometimes due to the context and business rules of the WOM you are prevented from creating certain categories of tasks.

## 10.2.2 Creating tasks

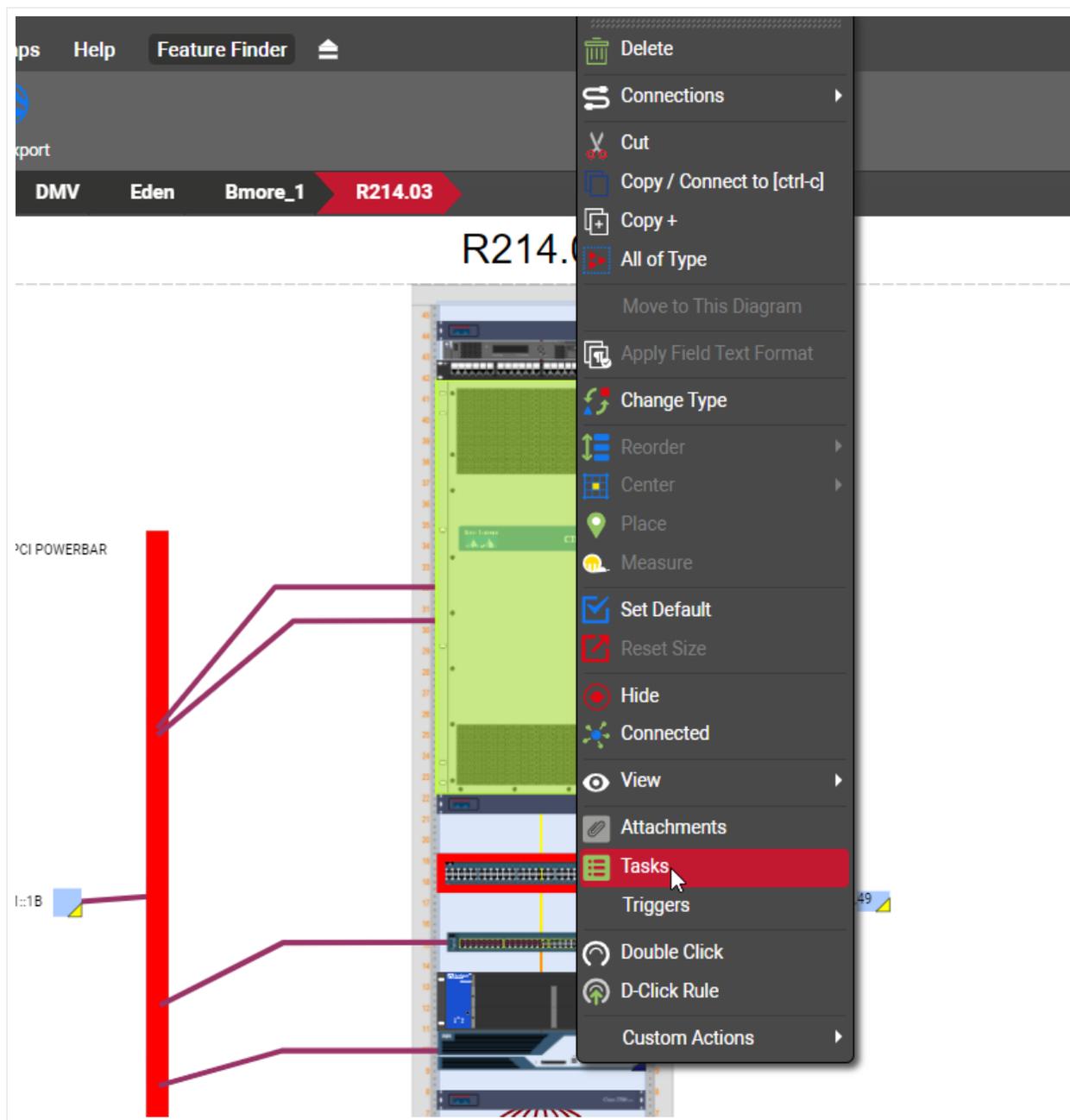
As mentioned before, tasks are associated to objects, so to create the task, you must first have an object to associate it too. At first, this may seem odd, especially if you have worked with other systems that use a different logic. You may wonder about two things:

a) What if the task I want to create is related to an object that does not exist? This seems like a problem with netTerrain's approach, but it is one of its strengths: by first creating the object and then assigning the add

task you are essentially creating a “planned” object. Later we will see how this can also be visualized properly.

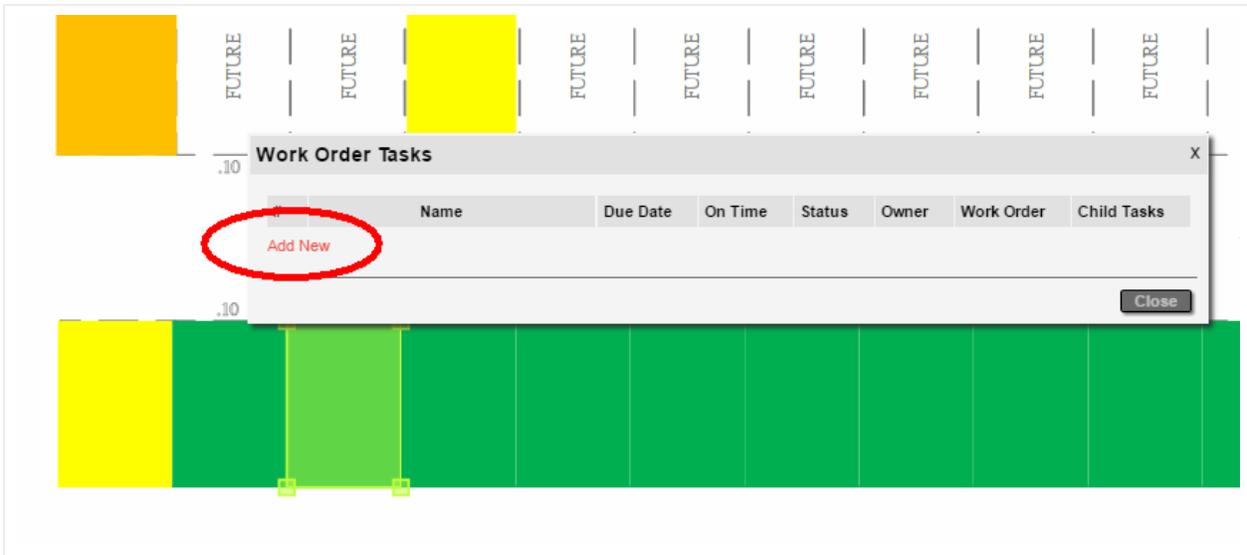
b) What if the task is not related to any network object, why do I still have to create one? Remember that the netTerrain catalog is extremely flexible, you could have a special object type in the catalog just devoted to general purpose tasks (or anything you imagine) and not have to rely on actual, physical objects to create your tasks, so this is not a problem.

Once you have an object to assign the task to, simply right-click on it and select ‘Tasks’ (or alternatively click on the ‘Task’ button in the Insert menu).



### Work order task menu

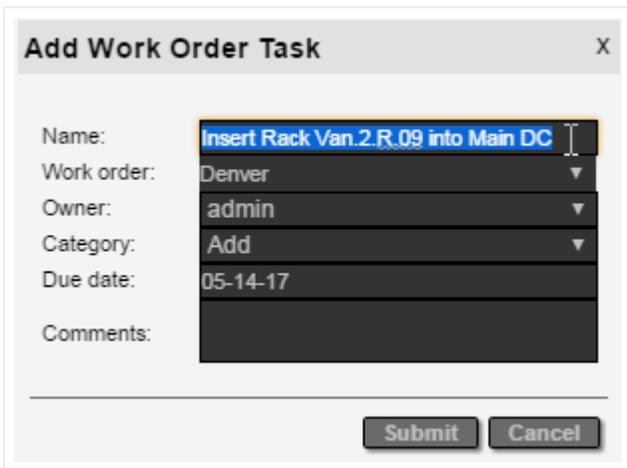
If no tasks have been previously assigned to that object, an empty 'Work Order Tasks' list prompts you to add a new task. Click on the 'Add new' link to create your new task.



*Creating a task*

### 10.2.2.1 Default task name

When the 'Add Work Order Task' dialog pops up, a generic name for the task is displayed.



*New task with default name*

The task name is constructed as follows:

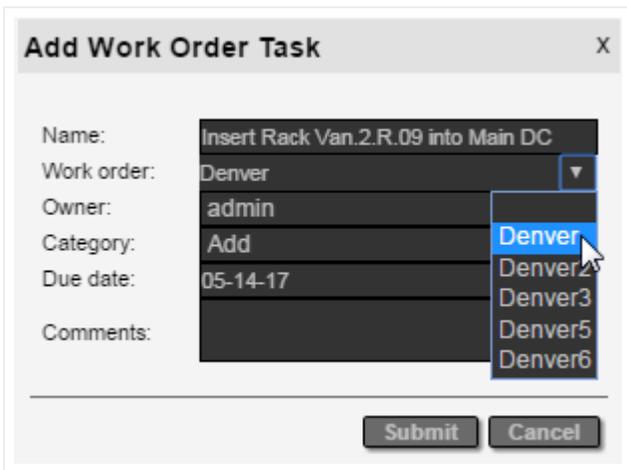
- The prefix 'Insert' is appended when the task category is 'Add'.
- The object type (in the example above, 'Rack') is appended next.
- The object name (in the example above 'Van.2.R.09') is appended next.
- 'into' is appended for an Add task.
- The parent name is added last.

Of course, you can change the name of the task to anything you want.

### 10.2.2.2 Task work order

A task must have a parent work order. The second field in the 'Add Work Order Task' dialog lets you select an existing work order from the list of all existing work orders, or you can just type a new work order in the text box.

When you type a new work order in the text box it is created in the system as soon as the task itself is created.



*Choosing a parent work order for the task*

### 10.2.2.3 Task owner

Next, you must choose an owner or stakeholder for the task. The owner is always a netTerrain user with editor rights or better. Updaters (or lower) cannot manage tasks; thus, they cannot be assigned any!

If the user doesn't exist, it must be added first in the system (sorry, in that case you must cancel the dialog and request the new user from the netTerrain sys admin).

When the task is created, the user will get a notification in the notification area that a task has been assigned to them (more on that later).

*Choosing an owner for the task*

### 10.2.2.4 Task category

As mentioned before, tasks come in three categories:

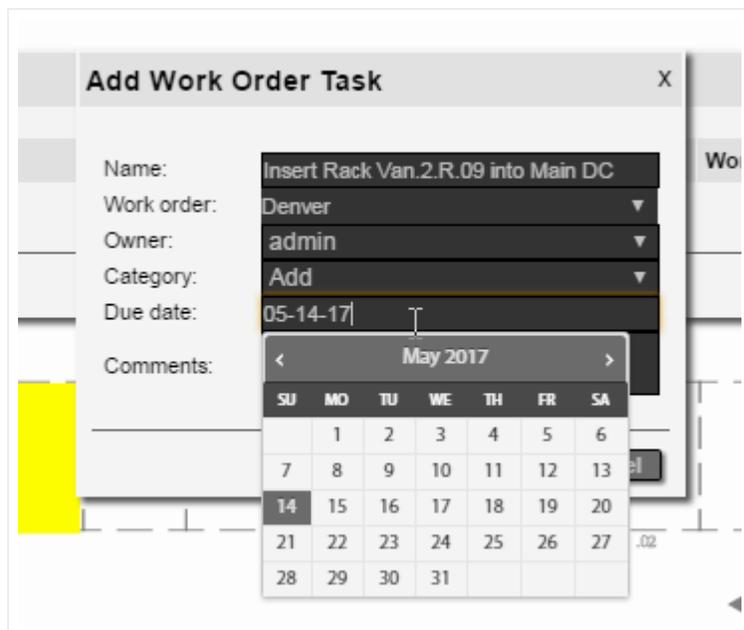
- Add (or New) task: here you are essentially creating a “planned” object, which means that the object will be in production only after the task is closed. Later we will see how this can also be visualized properly, so that we identify objects that are still pending an add task as opposed to the ones already in production.
- Delete task: this is the reverse of the add task, meaning that once the delete task is closed, then the associated object will be deleted as well.
- ‘Other’ task: this is a general-purpose bucket for tasks that are not adds or deletes.

When you create the first task for an object, if the object is a rack, device, node, link or card, then the default category is ‘Add’. You can pick any of the three categories, except for the object type slot, where the only available category is ‘Other’.

### 10.2.2.5 Task due date

Next you must pick a due date for the task. Note that later, after the task has been added, as soon as the task is due, the stakeholder will get a notification.

Also note that the date field is a calendar control that lets you choose a date in the past. This is ok, since sometimes tasks and work orders need to be recorded in the system, even if they have been completed already. Or maybe everybody was lazy, and the task simply might be due for real!

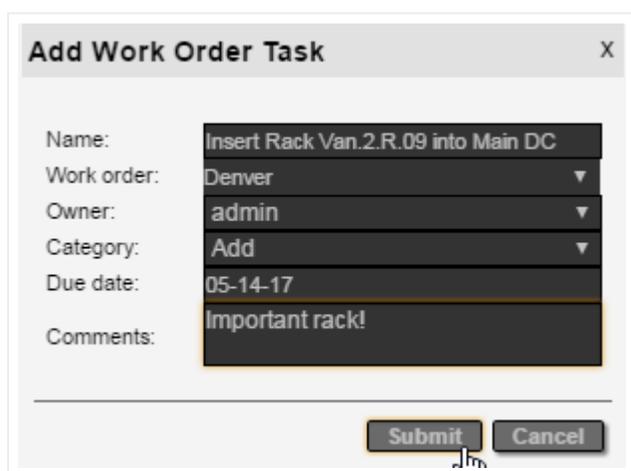


Choosing a due date for the task

### 10.2.2.6 Completing the task

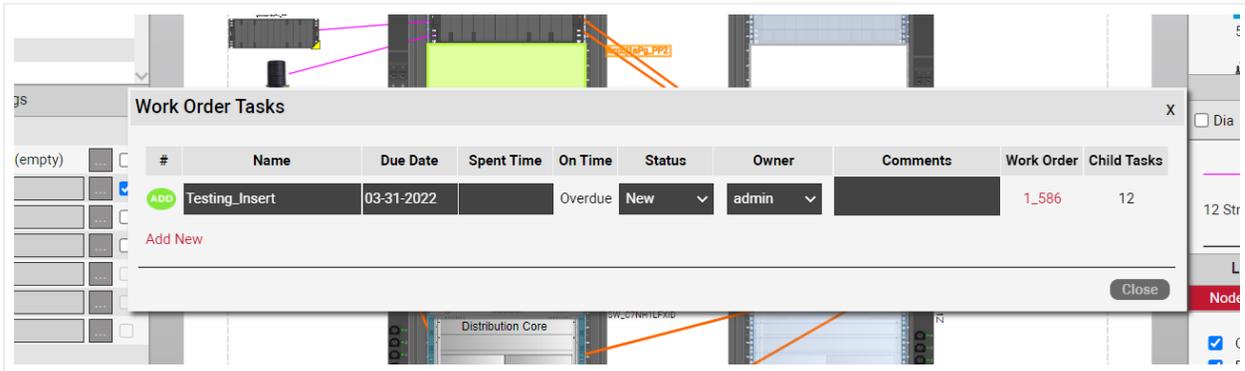
The final field lets you add some comments for your work order task. Once you click 'Submit' the following actions are triggered:

- The task is added to a task list associated with its parent work order.
- The stakeholder will get a notification for a new task added.
- If the due date is already in the past, the stakeholder will get a notification as well.



Completing the task

Upon submitting, the task list will now show our first task.



*Work order task list for an object*

Notice that if this was an 'Add' task, the '#' column in our task list will have a green 'Add' icon. If the task is a delete task, the icon is red.

Also notice the extra columns that exist for the tasks:

- On Time - this column has two possible system generated values: On Time or Overdue.
- Status - an indicator of the status or stage of the task. We will review more of this later.
- Owner – person that owns the task
- Comments
- Work Order
- Child Tasks – this column indicates whether the object that has the task automatically created child tasks for objects that exist underneath. We will review more of this later in this chapter.

#### Attention!

Once you add a task, you cannot delete it from the task list. You must go to the work order list and delete it from there.

### 10.2.2.7 Adding multiple tasks to the same object

You can add an unlimited number of tasks to an object, but take note of the following WOM rules:

- You can only have a maximum of one add task per object
- You can only have a maximum of one delete task per object
- You can not have an object containing both an add and a delete task

The task list orders tasks alphabetically and currently there is no mandatory sequence for completing the tasks on a work order or object.

### Attention!

The list of tasks for an object is not correlated with a list of tasks for a work order (more on that later). An object can have tasks from multiple work orders and a work order can have tasks from multiple objects.

## 10.2.2.8 Copying tasks for links

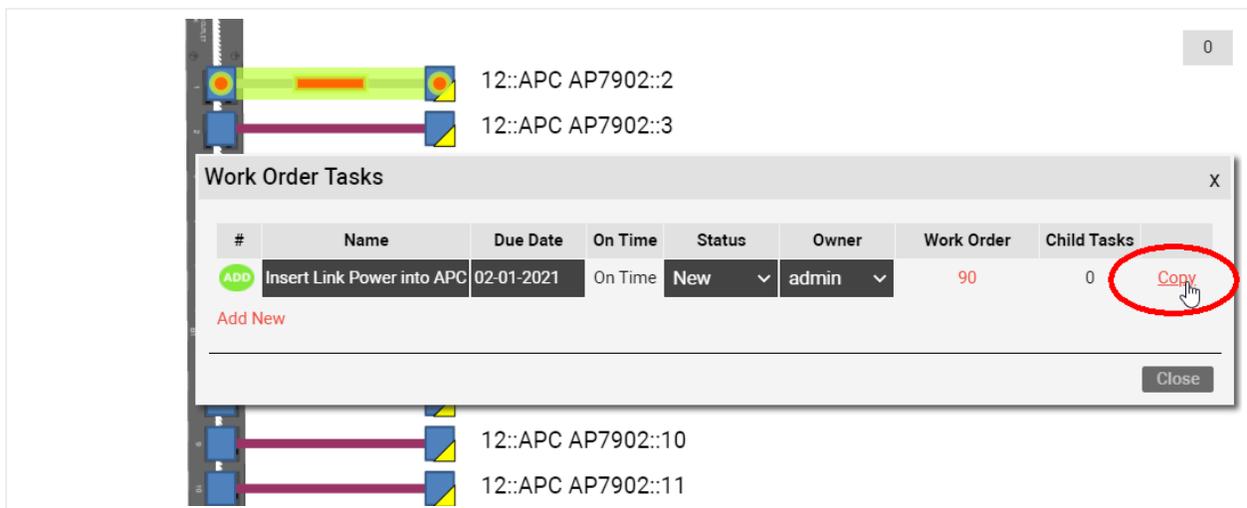
You can copy a task from a link and then replicate that task throughout a selection of links. As we will see later, when you create an 'add task' for a device that already has links, netTerrain creates add tasks for underlying links in cascading fashion.

However, in some cases you may create a task for the device before any cables are created in netTerrain itself. That is one case where the copy feature comes in handy: it lets you quickly create tasks that you duplicate from an original task.

This feature is only available for links.

To copy and duplicate a link task do the following:

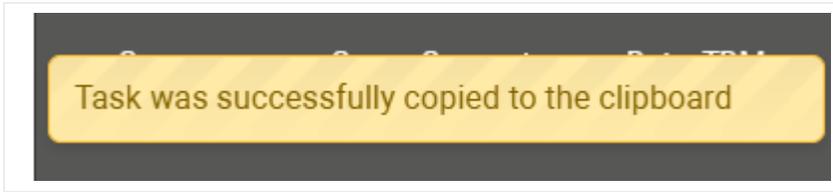
- Go to the task list for the link that contains the task you want to copy.



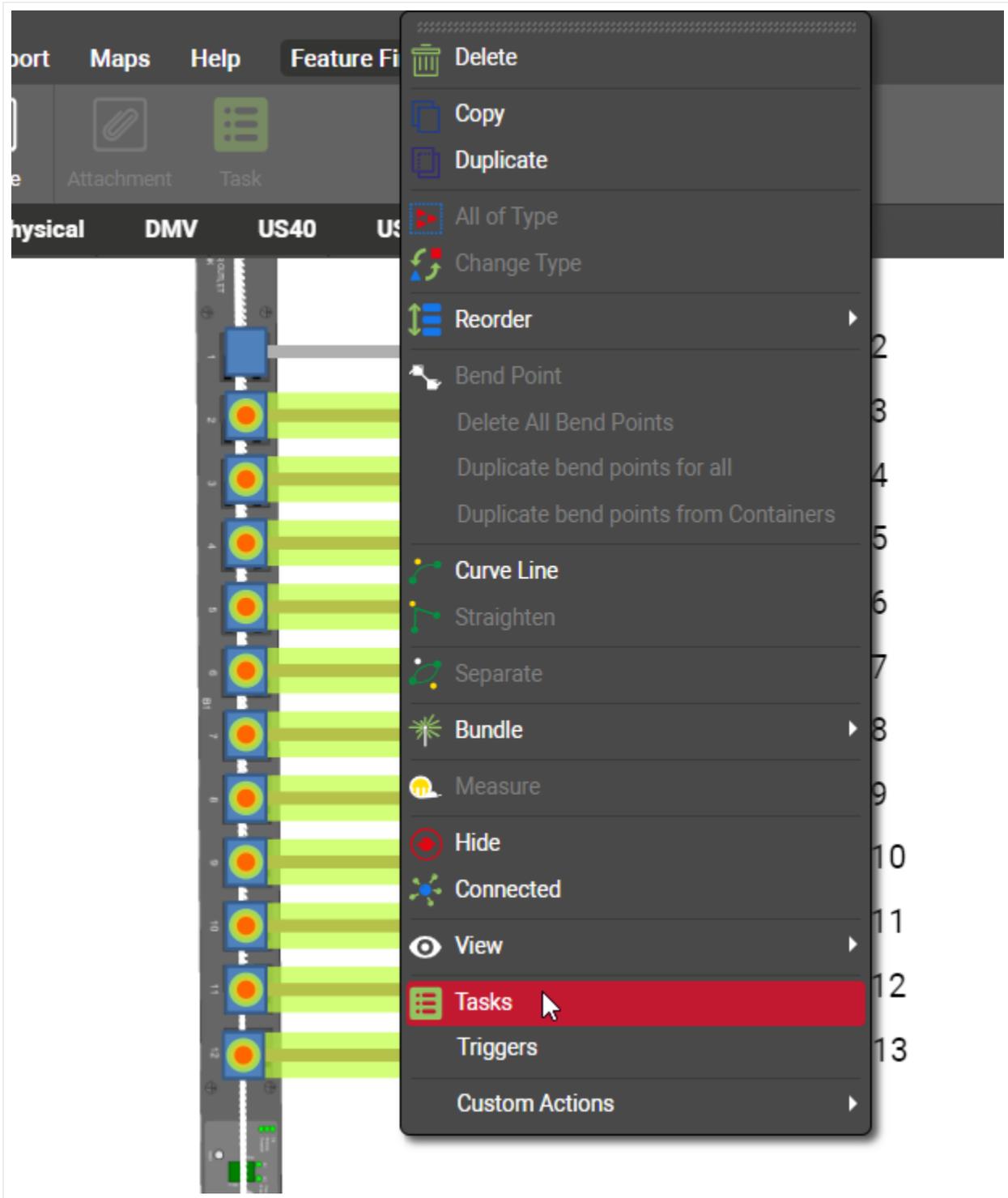
The screenshot displays a network diagram with several links and devices. A modal window titled "Work Order Tasks" is open, showing a table of tasks. The table has the following columns: #, Name, Due Date, On Time, Status, Owner, Work Order, and Child Tasks. A task is listed with the name "Insert Link Power into APC", due date "02-01-2021", status "New", and owner "admin". The "Copy" link in the "Child Tasks" column is circled in red. The modal also includes an "Add New" link and a "Close" button.

#	Name	Due Date	On Time	Status	Owner	Work Order	Child Tasks
ADD	Insert Link Power into APC	02-01-2021	On Time	New	admin	90	0 <a href="#">Copy</a>

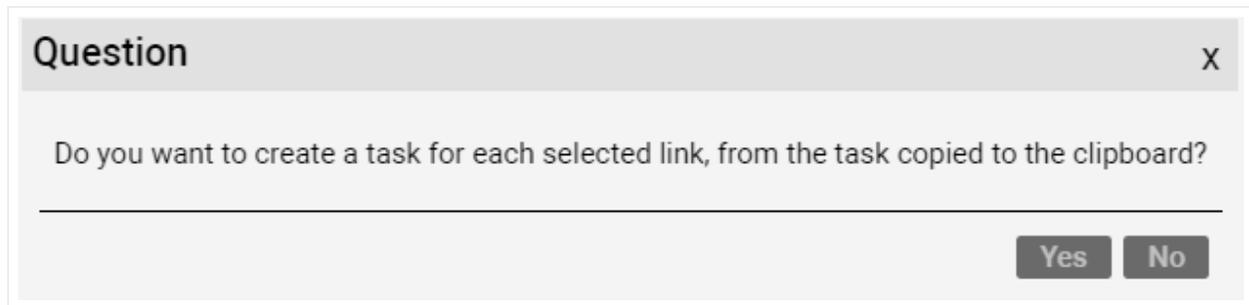
- Find the task you want to copy and click on the copy link.



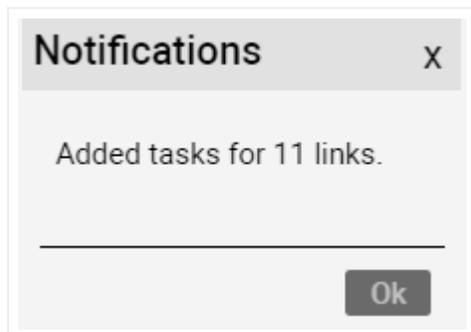
- Close the dialog and select the links for which you want to duplicate the copied task.
- Open the context menu for the selected set and click on 'Tasks'.



- Click 'Yes' on the dialog that pops up asking if you want to duplicate the copied task.



- The tasks are now pasted for each selected links

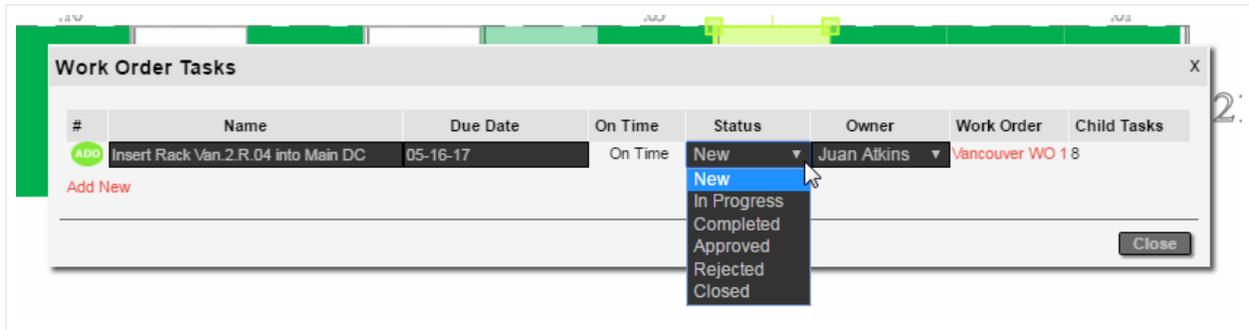


If the copied task was an add or delete task, any links that already had one such task type will be excluded from the process since you can only have one add or delete task for a given object.

### 10.2.3 Task status and stages

Currently tasks have several possible system-defined status values. The flow of status changes and how the owner is reassigned is up to the users of the WOM, but in general the flow goes from new to closed through several stages described below:

- New: this is the default status value a task has when created.
- In Progress: this is an optional value to mark a task as being worked on by the stakeholder.
- Completed: this is an optional value to mark a task as being completed by the stakeholder.
- Approved: once a task is completed the stakeholder may reassign it to a task owner (or approver), who can mark it as approved.
- Rejected: a task previously marked as completed, may also be marked as rejected by the task owner (or approver).
- Closed: once the task is completed and approved it can be closed. We will go over the things that this status value triggers later in this chapter.



*Task status values*

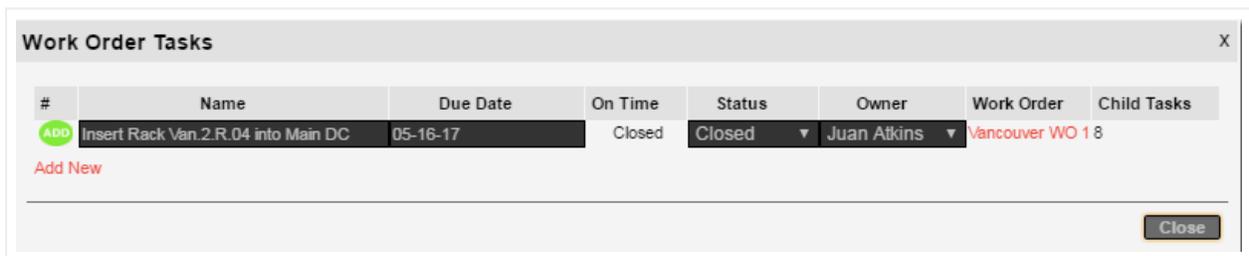
A work order task that does not have the status value set to 'closed' is usually referred to as a pending task.

## 10.2.4 Editing a task

Once a task is created, it can later be edited. The fields that can be edited include:

- Name
- Due date
- Status
- Owner

You edit a task directly from a task list or from the work order task dialog, when clicking on the work order tasks menu:



*Editing a task*

### Attention!

The task category is not displayed in the work order task list because it cannot be edited after the task has been created.

## 10.2.5 Task visual overrides

One of the interesting features of the WOM is that objects with tasks can be viewed in netTerrain in such a way that they can be visually differentiated from the rest of the project. The main goal of this is to be able to see the network as planned versus the network as-is.

An object without a task is viewed in what may be called 'normal' mode. However, when an object has a task, we can differentiate it from the normal objects. Moreover, we can differentiate objects that have an add tasks and objects that have a delete tasks from the normal objects.

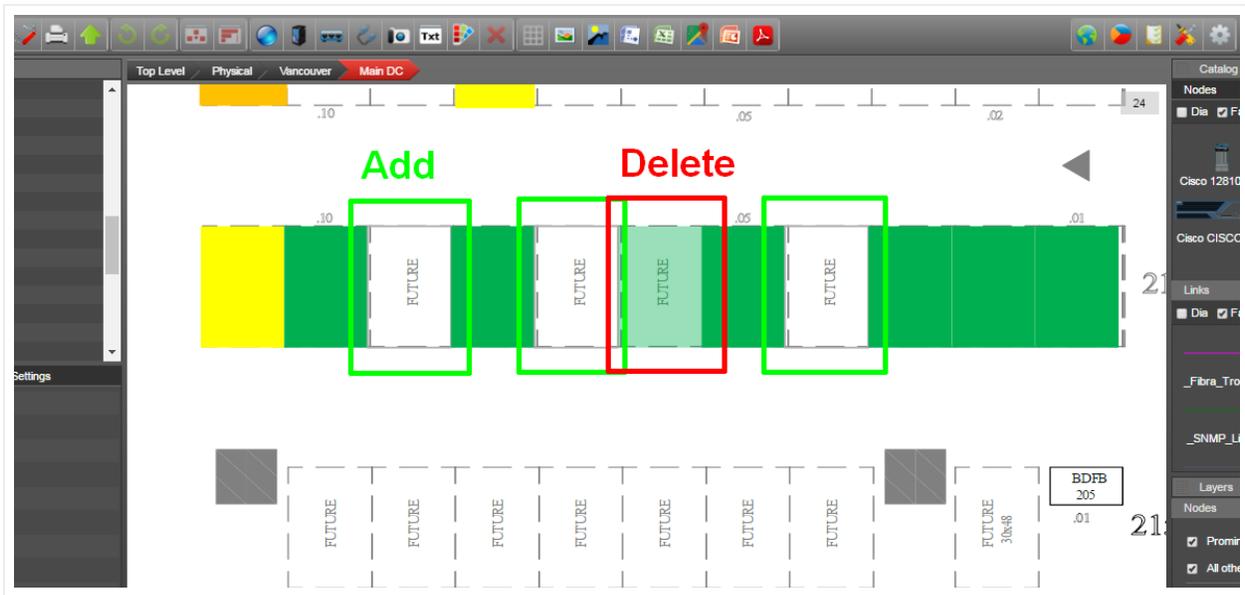
A netTerrain administrator can easily configure the system so that an object with an add task has a certain view mode and an object with a delete task has another.

These view modes make it easy for users to identify which objects may be pending an insert into production and which ones are about to be removed.

The possible visual overrides or view modes are the following:

- Outline mode: object only shows a grayish rectangle of the size of the rectangle that encompasses the normal icon. Links show a grey line.
- Normal mode: this mode shows the object just like normal ones without a task. in this mode we would not be able to distinguish objects with pending work order tasks.
- Faint mode: object is displayed in a faint variant using the same icon as the object would have without a pending task.
- Hidden mode: object is simply hidden.

We typically recommend having the administrator set the viewing modes in such a way that we can differentiate objects with add tasks from objects with delete tasks and in turn, have those being displayed in a different way than normal objects. Below we show an example of racks with add and delete tasks:



7 normal racks, 3 racks with pending add tasks and 1 rack with a pending delete task

## 10.2.6 Closing a task

As mentioned before, a task typically goes through several stages from the time it is created until it is closed. These stages may include changes in status from 'new' to 'in progress' to 'completed' to 'approved' or 'rejected' until it changes to its final status as 'closed'.

When a task is closed, the object returns to normal mode in terms of its visual override. To close a task simply change its status to 'Closed'.

## 10.2.7 Cascading task dependencies

An add task is the real-world equivalent of an object that does not exist in production yet. So, what happens to the objects underneath?

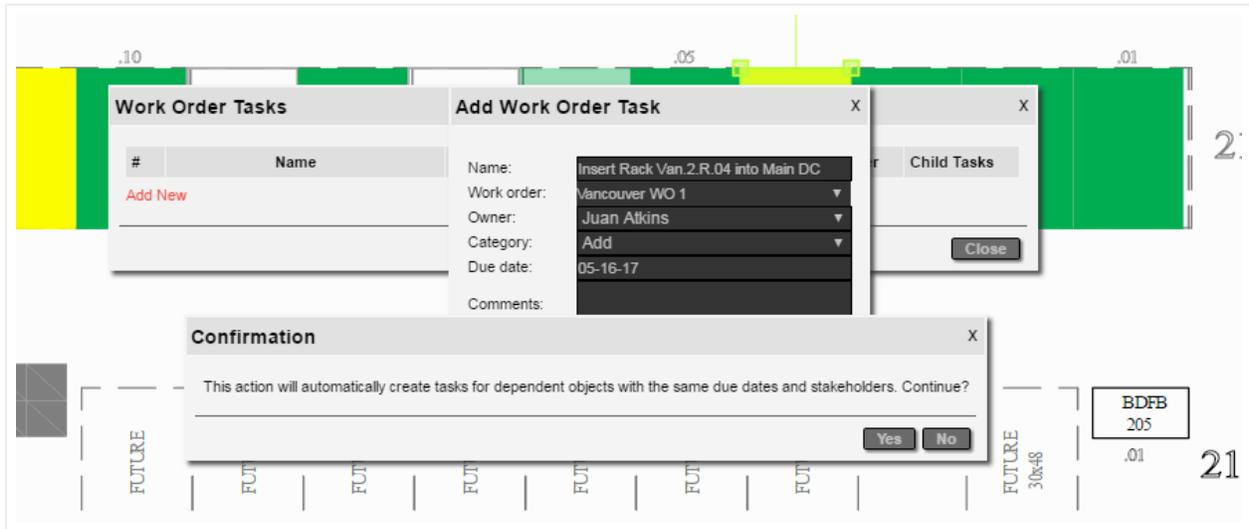
To preserve data consistency certain business rules apply when working with tasks across hierarchies in netTerrain. We will review these next.

### 10.2.7.1 Creating an add task for a node with objects underneath

When you create an add task for a node with objects underneath, netTerrain will notify you of impending add tasks that will be added to all these (WOM applicable) objects that exist underneath. This is a necessity that

derives from context: if the parent object is not in production yet, the dependent objects cannot be either. Don't worry, netTerrain manages most of these business rules automatically.

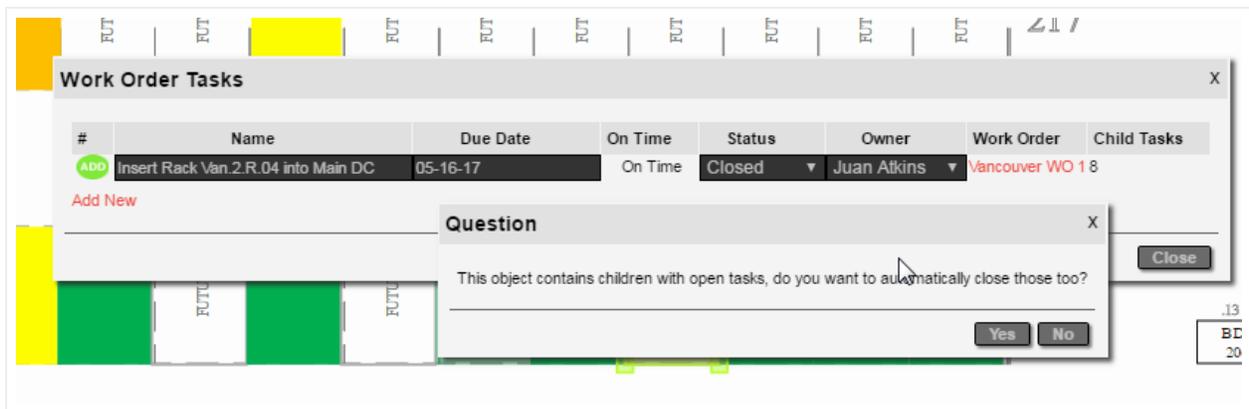
For example, if I create an add task for a rack that has devices underneath, netTerrain will notify me of an impending cascading trigger: all devices will now have their corresponding add task added automatically.



*Cascading task creation for dependent objects*

## 10.2.7.2 Closing a task with objects underneath

When I close a task for a node that has other objects underneath, then netTerrain will ask me if I want to close those related tasks too.



*Automatically closing related tasks*

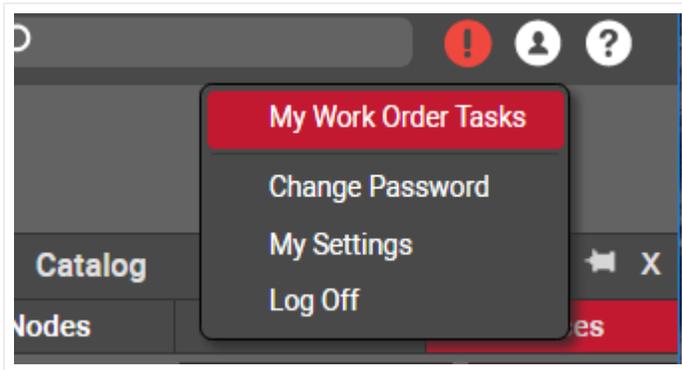
Be careful though, you may have interdependent tasks that can prevent you from closing the tasks underneath altogether. For example, picture a rack that has pending tasks for devices underneath with

pending tasks for cables that have endpoints to devices on a different rack that are also pending completion, closing all tasks from the original rack will not be possible.

The sure way to close all tasks without running into business rules contradictions is to work your way from the top down. So, for instance, first close the task for a rack, then for the device underneath and finally for the cables.

## 10.2.8 My work order tasks

As tasks are assigned to me, I can access them all from the 'My work order tasks' menu in the user menu:



*My work order tasks*

When I click on the menu, I get a list of all the tasks assigned to me:

#	Link	Name	Due Date	On Time	Status	Owner	Comments	Work Order	Ch
1	<a href="#">Show on diagram</a>	Delete Device 2SApPQH3pp f	03-17-2022	Overdue	New	admin		Insert Fiber Cable	
2	<a href="#">Show on diagram</a> <a href="#">Show parent task</a>	Insert Card A into lbrcbj1aPg	03-31-2022	Overdue	New	admin		1,586	
3	<a href="#">Show on diagram</a> <a href="#">Show parent task</a>	Insert Card B into lbrcbj1aPg	03-31-2022	Overdue	New	admin		1,586	
4	<a href="#">Show on diagram</a> <a href="#">Show parent task</a>	Insert Card C into lbrcbj1aPg	03-31-2022	Overdue	New	admin		1,586	
5	<a href="#">Show on diagram</a> <a href="#">Show parent task</a>	Insert Card D into lbrcbj1aPg	03-31-2022	Overdue	New	admin		1,586	
6	<a href="#">Show on diagram</a> <a href="#">Show parent task</a>	Insert Card E into lbrcbj1aPg	03-31-2022	Overdue	New	admin		1,586	
7	<a href="#">Show on diagram</a> <a href="#">Show parent task</a>	Insert Card F into lbrcbj1aPg	03-31-2022	Overdue	New	admin		1,586	
8	<a href="#">Show on diagram</a> <a href="#">Show parent task</a>	Insert Card G into lbrcbj1aPg	03-31-2022	Overdue	New	admin		1,586	
9	<a href="#">Show on diagram</a> <a href="#">Show parent task</a>	Insert Card H into lbrcbj1aPg	03-31-2022	Overdue	New	admin		1,586	

*My work order tasks*

From the list I can easily edit tasks, reassign them to other users, and change due dates and more.

This list also includes a link on the right to access the parent work order.

## 10.2.9 Task notifications

When a new task gets assigned to me or one of my tasks is past due, I get a notification in the top right notification section:



### *My notifications*

The notification list first shows all my work orders and then all my tasks below.

From the notifications list I can click 'Ok' on a notification, which will mark it as read and make it disappear from the list or mark all of them as read.

## Notifications

---

### Orders

Name:	1_586	Ok
Due date:	03-31-2022	
Name:	PahoNXT-APC	Ok
Due date:	06-30-2022	

---

### Tasks

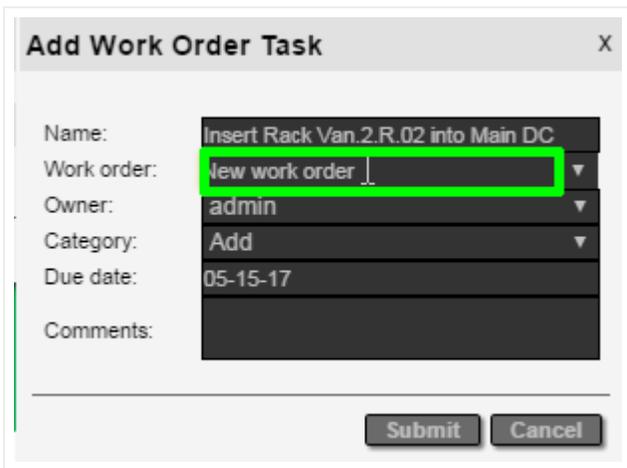
<b>DEL</b>	Name: Delete Device 2SApPQh3pp from A3	Ok
	Due date: 03-17-2022	
<b>ADD</b>	Name: Testing_Insert	Ok
	Due date: 03-31-2022	
<b>ADD</b>	Name: Insert Card A into lbrcbj1aPg_PP2	Ok
	Due date: 03-31-2022	
<b>ADD</b>	Name: Insert Card B into lbrcbj1aPg_PP2	Ok
	Due date: 03-31-2022	
<b>ADD</b>	Name: Insert Card C into lbrcbj1aPg_PP2	Ok
	Due date: 03-31-2022	
<b>ADD</b>	Name: Insert Card D into lbrcbj1aPg_PP2	Ok
	Due date: 03-31-2022	
<b>ADD</b>	Name: Insert Card E into lbrcbj1aPg_PP2	Ok
	Due date: 03-31-2022	
<b>ADD</b>	Name: Insert Card F into lbrcbj1aPg_PP2	Ok
	Due date: 03-31-2022	

**Mark all as read**

## 10.2.10 Work orders

Work orders are the root WOM item, and mainly act as repositories of tasks. Work orders are not only useful to consolidate many tasks into one group, however. They can also serve to assign a responsible or stakeholder to this collection of tasks and hence simplify the tracking of progress.

To create a work order you just create it from the task itself, as we saw in the example above when creating a task. Just type it in the work order text box upon creation of the task.

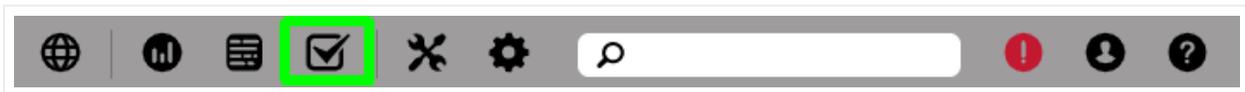


The screenshot shows a dialog box titled "Add Work Order Task" with a close button (X) in the top right corner. The dialog contains several fields: "Name:" with the value "Insert Rack Van 2.R.02 into Main DC"; "Work order:" with a dropdown menu showing "Jew work order" (highlighted with a green box); "Owner:" with a dropdown menu showing "admin"; "Category:" with a dropdown menu showing "Add"; "Due date:" with the value "05-15-17"; and "Comments:" with an empty text area. At the bottom of the dialog are two buttons: "Submit" and "Cancel".

*Creating a new work order by just typing it upon the task creation*

### 10.2.10.1 Editing work orders

As an administrator you can manage and edit all work orders by clicking on the work order button on the quick access bar:



*Accessing all work orders as an admin*

If you are not an administrator, you can edit your work orders by accessing them from the 'My work order tasks' menu.

The work order list shows all the work orders along with editable text boxes for each, as well as some key links that let you access all tasks for a given order, all overdue tasks for a given order, all closed tasks, the user's tasks, and the user's overdue tasks:

Work Order List Archived Workorders To csv Add new Records in table: 5 Records on page: 5

Filter Apply Clear Records per page 100 Show Id Field Default sorting

#	Name	Due Date	Status	Owner	Comments	All Tasks	All Overdue Tasks	All Closed Tasks	My Tasks	My Overdue Tasks
1	1_586	03-31-2022	Overdue	admin		17	17	0	17	17
2	Insert Fiber Cable	07-29-2021	Overdue	Jason		1	1	0	1	1
3	Install Rack into Row 1	06-10-2021	Empty	fred.koh@graphicalnetworks.com		0	0	0	0	0
4	PahoNXT-APC	06-30-2022	Completed	admin		5	0	5	0	0
5	Rack Installation	09-03-2021	Overdue	Jason		1	1	0	1	1

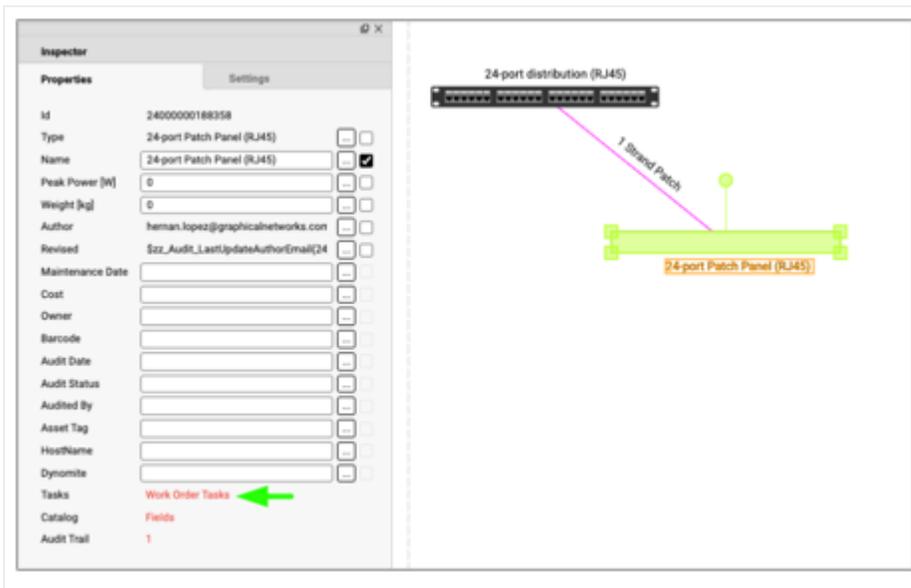
1 out of 1 < > 1 Go

### Work order list

The work order list, just like any list, can be sorted, filtered, and exported to csv.

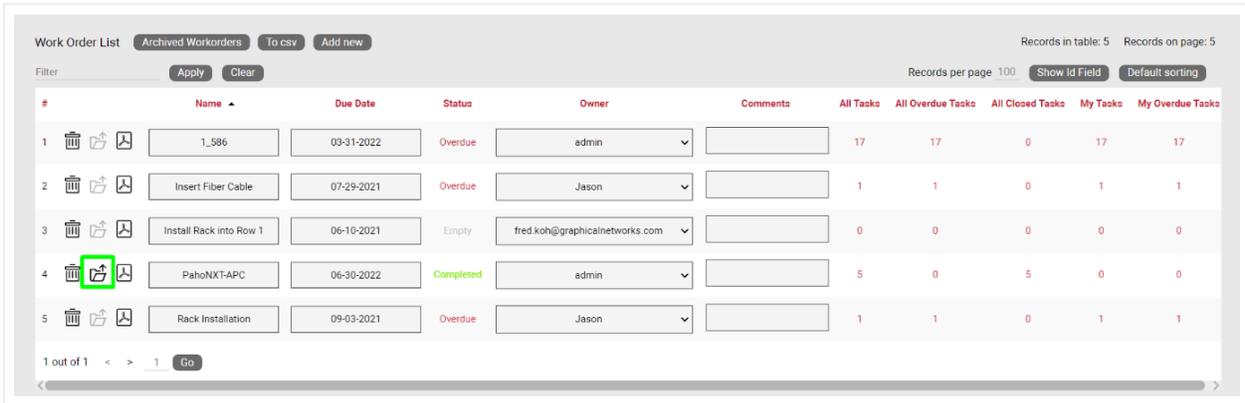
## 10.2.10.2 Accessing a work order from an object

When a work order is generated for an object, it can be accessed by selecting the object. In the Properties window, a direct link to 'Work Order Task' is displayed, allowing you to view and manage the associated work order.



### 10.2.10.3 Archiving work orders

Work orders can be archived once all the dependent tasks have been closed. To archive a work order, go to the work order list and first make sure that the Status is marked in green as 'completed'. You should also see the 'Archive' link enabled.



Work Order List Archived Workorders To csv Add new Records in table: 5 Records on page: 5

Filter Apply Clear Records per page: 100 Show Id Field Default sorting

#	Name	Due Date	Status	Owner	Comments	All Tasks	All Overdue Tasks	All Closed Tasks	My Tasks	My Overdue Tasks
1	1_596	03-31-2022	Overdue	admin		17	17	0	17	17
2	Insert Fiber Cable	07-29-2021	Overdue	Jason		1	1	0	1	1
3	Install Rack into Row 1	06-10-2021	Empty	fred.koh@graphicalnetworks.com		0	0	0	0	0
4	PahoNXT-APC	06-30-2022	Completed	admin		5	0	5	0	0
5	Rack Installation	09-03-2021	Overdue	Jason		1	1	0	1	1

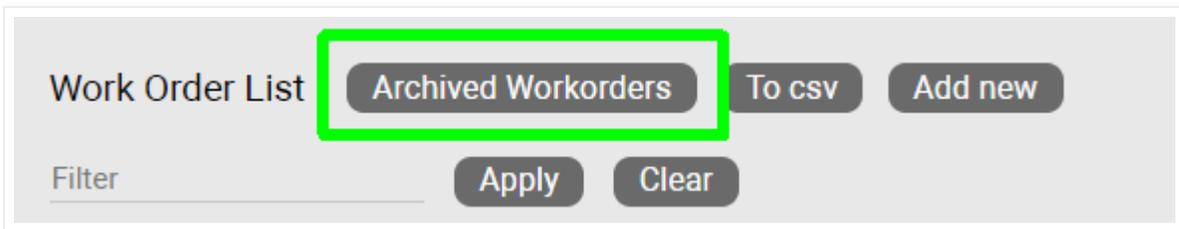
1 out of 1 < > 1 Go

#### Archiving a work order

After you click on the 'Archive' link the work order will only be accessible from the archived list.

### 10.2.10.4 Viewing archived work orders

To view all the archived work orders, go to the work order list and then click on the 'Archived Workorders' button.



#### Accessing the archived work orders

Remember that to access the work order list you must be an admin.

Work Order List Active Workorders To csv

Filter Apply Clear

#	Name ▲	Due Date	Status	Owner	Comments	All Tasks	All Overdue Tasks	All Closed Tasks	My Tasks	My Overdue Tasks
1	 PahoNXT-APC	06-30-2022	Archived	admin		5	0	5	0	0

1 out of 1 < >  Go

*Archived work orders*



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