



# What's New in Planet 6.0

Orchestrating Network Performance

# Content

- Mentum Planet Roadmap
- User-friendliness
- LTE
- Call Traces
- Propagation Modeling
- Data Management
- Additional Features
- Windows Operating System Compatibility

The image features a city skyline, likely New York City, with the Empire State Building as a prominent landmark. Overlaid on this background are several large, colorful, curved lines in orange, yellow, green, and blue that sweep across the frame. A semi-transparent dark grey rectangle is centered over the image, containing the text "Planet Roadmap" in white. At the bottom of the image, there is a horizontal bar composed of four colored segments: orange, yellow, green, and blue, which correspond to the colors of the arcs above.

# Planet Roadmap



# Planet Roadmap

2016				2017
March	June	September	December	H1
<p><b>Mentum Planet 6.0 – GA</b></p> <ul style="list-style-type: none"> <li>➤ 64-bit software (with MapInfo 15.2.2)</li> <li>➤ User-friendliness</li> <li>➤ LTE Relay Nodes</li> <li>➤ Unified Planning &amp; Optimization               <ul style="list-style-type: none"> <li>• Interface with VistaNEO (OSS based algorithms)</li> <li>• Call end types</li> <li>• Support for IMSI for LTE</li> <li>• Performance and scalability enhancements</li> </ul> </li> <li>➤ User Permissions               <ul style="list-style-type: none"> <li>• Granularity of object permissions in Data Manager</li> <li>• User Permissions for local Planet projects</li> </ul> </li> <li>➤ Propagation               <ul style="list-style-type: none"> <li>• Prediction Previewer tool</li> <li>• Universal Model v. 440</li> <li>• ITU-R P.1546-5</li> </ul> </li> </ul>	<p><b>Planet 6.0.1</b></p> <ul style="list-style-type: none"> <li>➤ Indoor/Outdoor Planning &amp; Optimization               <ul style="list-style-type: none"> <li>• Identification of buildings for which indoor systems are needed</li> </ul> </li> <li>➤ 3D Geolocation               <ul style="list-style-type: none"> <li>• Computation of subscriber height for call traces</li> <li>• Call trace based network analyses in 3D</li> <li>• Merged predictions in 3D</li> <li>• Traffic Maps from call traces in 3D</li> </ul> </li> <li>➤ Support for masked Universal Model in Automatic Cell Planning</li> <li>➤ Miscellaneous Features</li> </ul>	<p><b>Planet 6.0.2</b></p> <ul style="list-style-type: none"> <li>➤ Indoor/Outdoor Planning &amp; Optimization               <ul style="list-style-type: none"> <li>• Estimation of required number of indoor cells – without floor plans</li> </ul> </li> <li>➤ Miscellaneous Features</li> </ul>	<p><b>Planet 6.1</b></p> <ul style="list-style-type: none"> <li>➤ Unified Planning &amp; Optimization               <ul style="list-style-type: none"> <li>• Planet as a thick client of VistaNEO</li> <li>• Visualization of call trace KPIs from within Planet</li> <li>• Call search &amp; visualization of call records</li> <li>• Synchronization of additional parameters from Live Network</li> <li>• Integration of Configuration Management parsers in Planet and Data Manager</li> <li>• Live planning and optimization for GSM</li> <li>• Simplified optimization workflows</li> <li>• Automatic triggering of some optimization processes based on call trace file issue detection</li> </ul> </li> <li>➤ IoT</li> <li>➤ Mesh Networks</li> <li>➤ 5G – Propagation using mm waves</li> <li>➤ LTE Advanced               <ul style="list-style-type: none"> <li>• CoMP</li> <li>• Combined Cells</li> <li>• TDD/FDD carrier aggregation</li> </ul> </li> <li>➤ New raster format - .mrr format</li> <li>➤ Automation &amp; Scheduling in Planet               <ul style="list-style-type: none"> <li>• Automation Cell Planning</li> <li>• Traffic Map</li> <li>• Concept of macros/workflows</li> </ul> </li> <li>➤ User-friendliness               <ul style="list-style-type: none"> <li>• Integration of Metro Designer in Planet</li> <li>• Layer Statistics tool redesign</li> <li>• Traffic Map Generator redesign</li> </ul> </li> </ul>	<p><b>Planet 6.2</b></p> <ul style="list-style-type: none"> <li>➤ Indoor/Outdoor Planning &amp; Optimization               <ul style="list-style-type: none"> <li>• Estimation of required number of indoor cells – with floor plans</li> <li>• Network analyses accounting for both outdoor and indoor cells</li> </ul> </li> <li>➤ Unified network planning, optimization, and troubleshooting               <ul style="list-style-type: none"> <li>• Single desktop tool for planning, optimization, and troubleshooting</li> <li>• Geolocation Engine improvements</li> </ul> </li> <li>➤ 5G               <ul style="list-style-type: none"> <li>• Massive MIMO</li> <li>• Lean Carriers</li> </ul> </li> <li>➤ LTE Advanced               <ul style="list-style-type: none"> <li>• LTE-U / LTE-LAA</li> <li>• LTE Relay Node enhancements</li> </ul> </li> <li>➤ 3D               <ul style="list-style-type: none"> <li>• Automatic Cell Planning</li> <li>• Interference Matrix, Neighbor List, PCI, Scrambling Code, etc.</li> <li>• Statistics</li> </ul> </li> <li>➤ Data Manager               <ul style="list-style-type: none"> <li>• History of changes</li> <li>• Data Manager client user interface enhancement</li> </ul> </li> </ul>





# User-Friendliness

# General

- Full 64-bit software – with integration of MapInfo 15.2.2 – 64 bit
- New, ribbon based, graphical user interface
  - Logical grouping of ribbons/functionalities for optimal efficiency



# User Interface Terminology

The screenshot displays the InfoVista software interface with several key components highlighted by orange callout boxes:

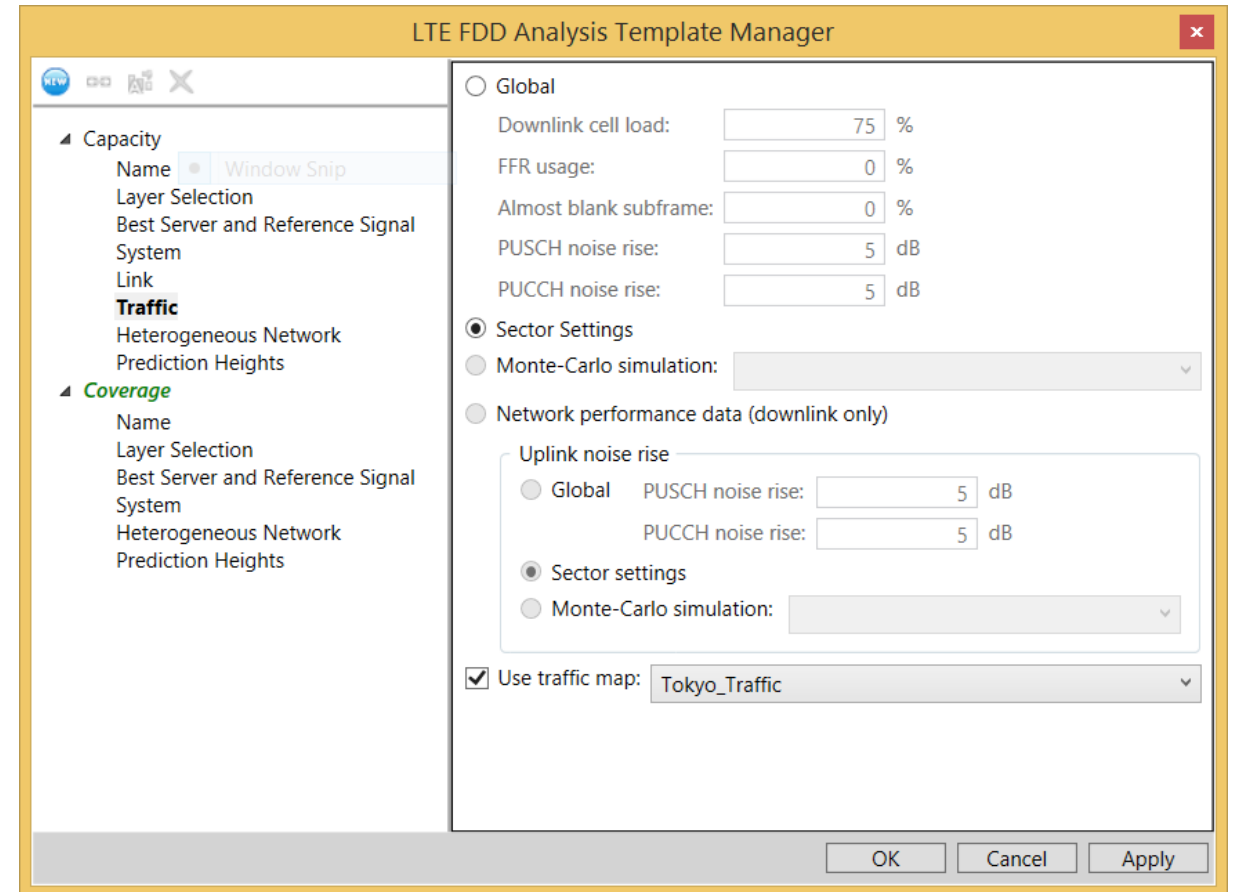
- Quick A**: Points to the 'Tools' ribbon category.
- Ribbon Gallery**: Points to the 'Tools' ribbon category.
- Ribbon Categories (Tabs)**: Points to the 'Tools' ribbon category.
- Contextual Tab/Ribbons**: Points to the 'Tools' ribbon category.
- Ribbon Group**: Points to the 'Tools' ribbon category.
- Ribbon Floaty (Mini-toolbar)**: Points to the 'Tools' ribbon category.
- Windows**: Points to the 'Sites' and 'Live' windows.

The interface includes a main ribbon with categories like HOME, PLAN, ANALYZE, OPTIMIZE, and VIEW. The 'Tools' ribbon is currently active, showing options for LTE FDD, Wi-Fi, Compliance, Raster, GIS, Spatial, Layout, and Map. A 'Sites' window on the left shows a tree view of site templates and data. A 'Live' window on the right shows a tree view of network data and call trace data. The main workspace displays a map of Tokyo - Shibuya Station with a signal strength heatmap and several antenna icons. A 'Point-To-Point Profile' window is open, showing a profile graph of elevation and signal strength over distance. A context menu is visible over the map, offering options like Edit, Tabular Edit..., Add Relay, Generate Predictions..., View Predictions..., Network Analysis, Export..., and Delete... The status bar at the bottom provides technical details such as Azimuth: 313.16°, Inclination: -9.28°, Transmitter: open land at 33.15m AMSL + 51.54m, Receiver: minor roads at 29.17m AMSL + 1.60m, Distance: 0.34km, and UTM Zone 54, Northern Hemisphere (WGS 84).



# Network Analyses

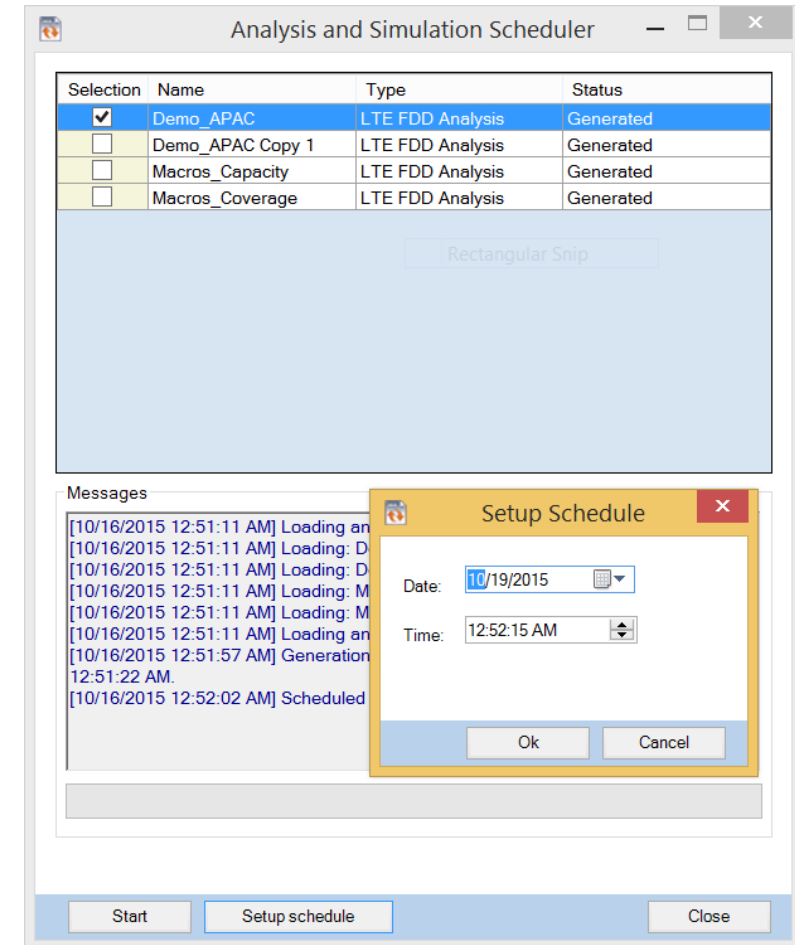
- Introduction of the notion of analysis templates
  - Relevant settings displayed depending on layer selection
- Ability to edit the settings of existing network analyses
- Ability to copy network analysis
- Fast analysis setup based on
  - Active cell selection
  - Active analysis template
  - Active analysis area
- Check boxes to view/close analysis layers



*LTE Analysis Template Manager*

# Network Analysis and Monte Carlo Simulation Scheduling

- Ability to “queue” network analyses and Monte Carlo Simulations
- Ability to schedule when analyses and simulations should start
  - E.g., outside of working hours
- Available for all Radio Access Technologies



LTE Analysis Scheduler

## User-Friendliness (1)

- Ability to drag and drop sites/sectors/antennas
- Double-click from map window to open site editor
- Project Windows/Categories organized in tabs
- Introduction of contextual ribbons
- Ability to “easily” generate pdf/cdf curves from layer statistics tool
- Easy creation and update of Planet projects from third-party csv/Excel sheets in “flat” (generic tabular) format
- “Flat view” of the data Tabular Editor



## User-Friendliness (2)

- Ability to have Planet projects without Geodata
- Ability to view antenna patterns within site editor
- Notion of active cells, active area, and active analysis template
- Ability to edit color profiles in color profile editor dialog
- Faster zoom in/out and panning
- Right-click menu items on the map based on selected items
- Ability to group drive test files

The image features a city skyline, likely New York City, with the Empire State Building as a prominent landmark. Overlaid on this background are several large, colorful, curved lines in shades of orange, yellow, green, and light blue. These lines intersect and form a network-like pattern. In the center of the image, the letters "LTE" are displayed in a white, sans-serif font. The text is positioned within a dark, semi-transparent rectangular area that also contains the colorful lines. The overall aesthetic is modern and technological, suggesting a focus on telecommunications or network infrastructure.

LTE

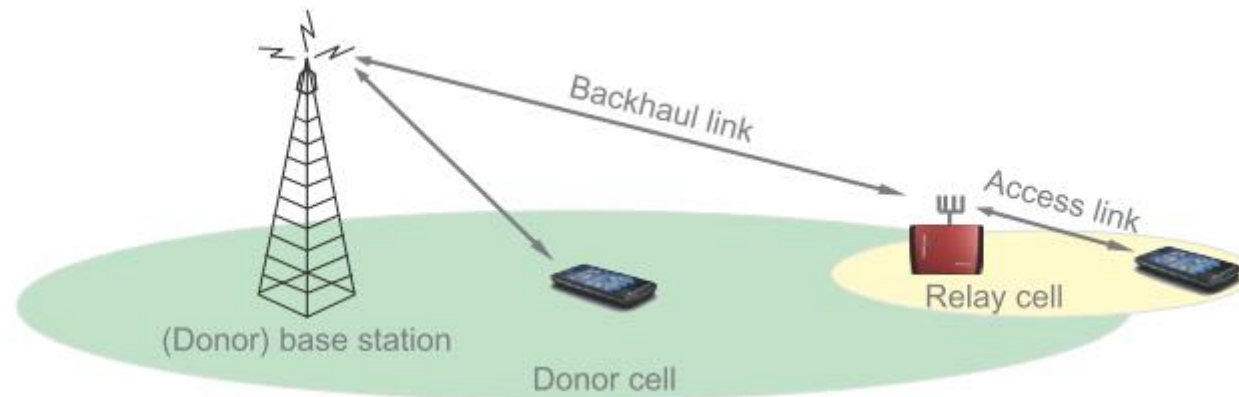
# LTE

- Support of LTE Relay Nodes
- PCI plan analyses
- Support for static mode in Interactive Analysis tool
- New “power recycling” option to recycle power on PDSCH Resource Elements
- Nth RSRP layers instead of Nth Reference Signal Strength analysis layers



# Background

- A Relay is a low-power LTE wireless access point connected to the core network through another LTE cell (Donor cell).
- Repeaters operate as “amplify-and-forward” devices, Relays operate as “decode-and-forward” devices,
  - i.e. the output power is independent of received power from the donor
- LTE Relays were introduced by 3GPP Release 10

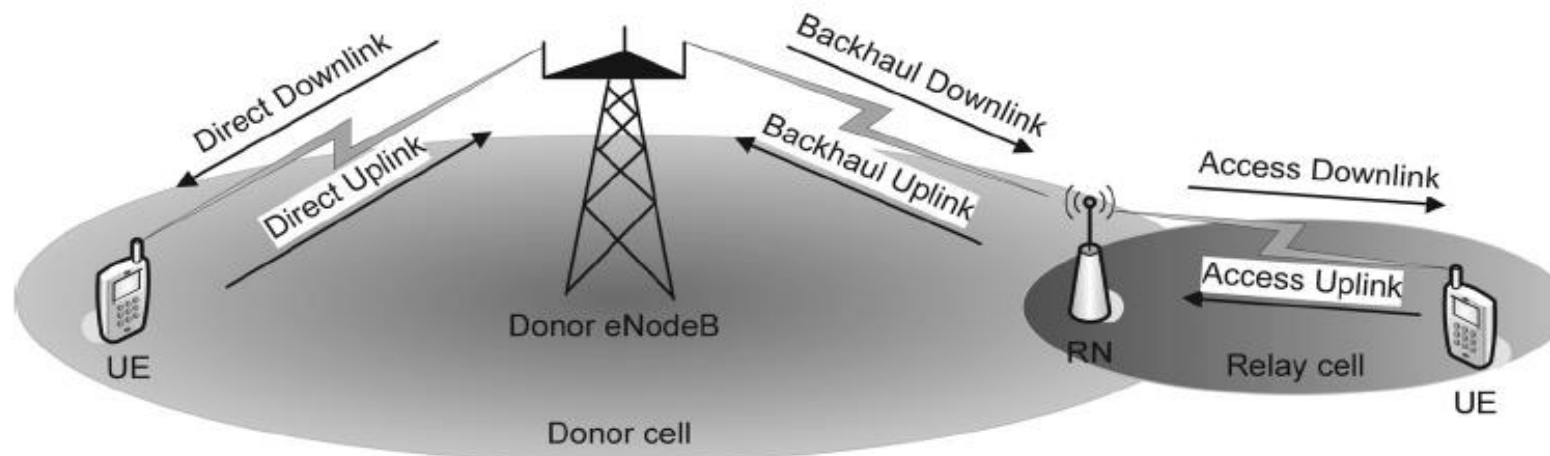


# Relay Benefits

- Relays are seen by User Equipments as separate cells with their own PCID
- Virtually a small cell with full frequency reuse
  - Added capacity
- Upon adding Relays at hotspots, link quality is improved by reducing pathloss (higher probability of line-of-sight)
- For an operator, Relays offer the same benefits as small cells with less worries on backhaul planning

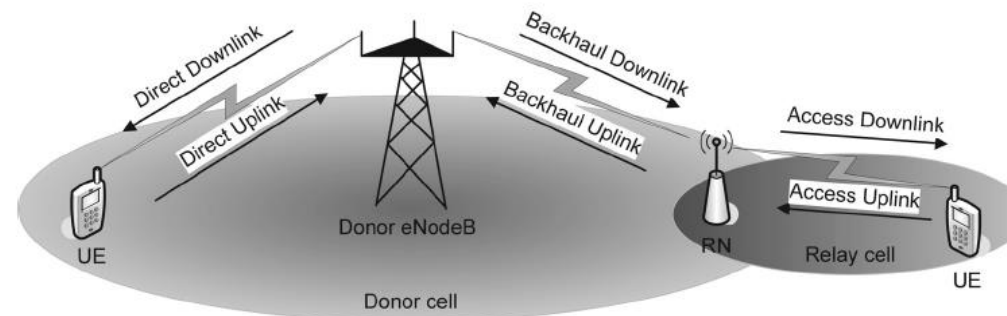
# Relay Node Terminology

- Direct link:  
Link between the Donor eNB (DeNB) and UEs.
- Backhaul (BH) link:  
Link between DeNB and the Relay.
- Access link:  
Link between the Relay and the UE.



# Relay Types

- Relays are classified as:
  - Inband
    - Backhaul and access links operate on same carrier  
Interference between links avoided by time-division
  - Outband:
    - Backhaul and access links operate on separate frequency bands  
No need to manage interference
    - Both links operate at the same time (Full duplex)



# Relay Backhaul Link

- From the donor cell's perspective, a Relay is an LTE subscriber with a higher data rate demand.
- Relay backhauls consume resources from the same carriers activated by their donor cell.  
→ They compete with direct link subscribers
- Relay backhauls usually have directive antennas towards donor cells, increasing backhaul spectral efficiency  
→ reduce interference and resource consumption.
- The Relay's backhaul capacity acts as an upper limit to the amount of throughput a Relay could provide.

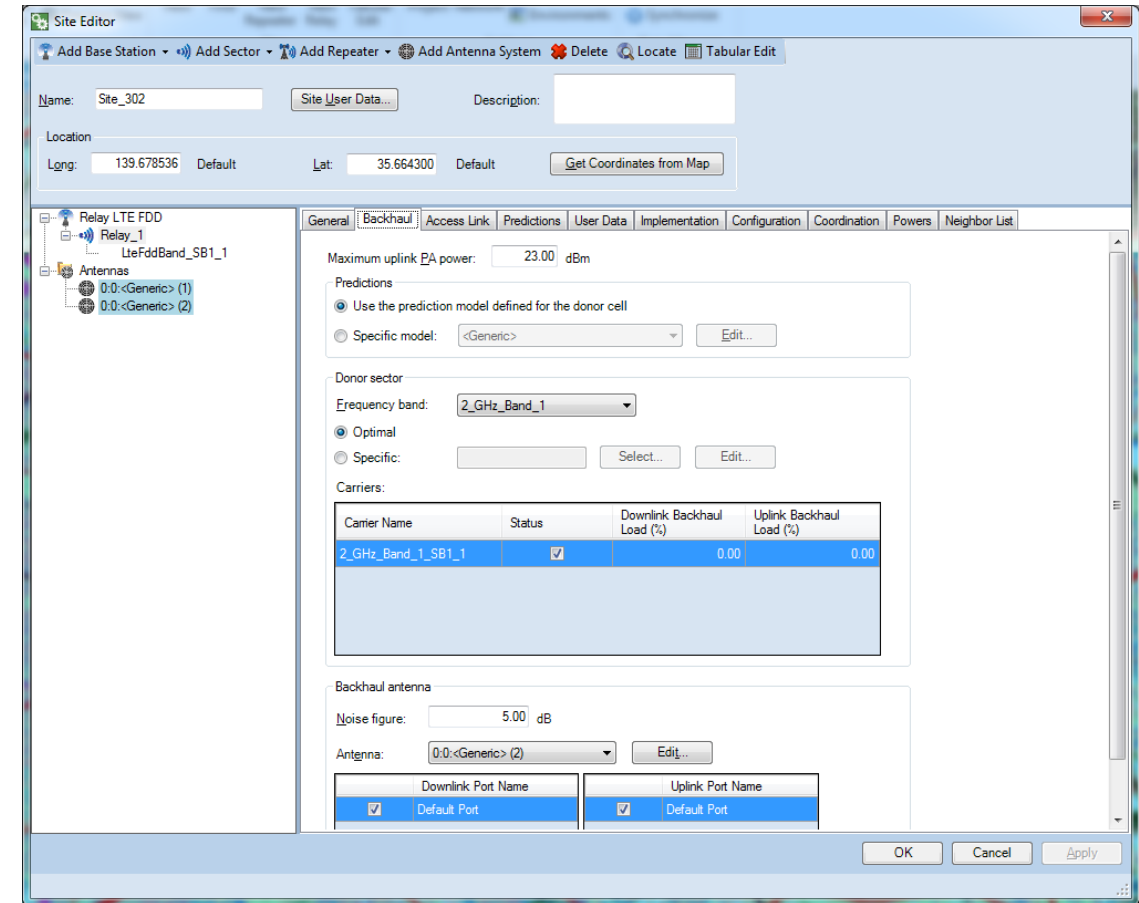


# Relay Nodes in Planet 6.0 – General

- Support of out-band Relay Nodes.
  - The backhaul link and the direct link use the same carriers
  - The backhaul link and the access links cannot use the same carriers
- From the DeNB's perspective, a Relay backhaul operates as a fixed terminal, using the LTE radio interface
- Relays have the same sector settings as LTE cells and an additional tab for backhaul parameters
- Network Analyses and Monte Carlo Simulations compute backhaul quality KPIs
  - Computation of backhaul and access links
- ACP and ASCP support Relay Nodes
  - Filter Relay candidates of poor backhaul quality upon candidate selection.

# Relay Nodes – Backhaul Link

- Backhaul Donor Cell can be
  - Automatically computed as part of analyses/simulations
  - Or set to a specific cell if known already
- Definition of resource loads from donor cell to be used for backhaul
- Separate antenna definition for backhaul and access links



Relay Node – Backhaul Link Tab

# Relay Nodes in Network Analyses

- There are two analysis components for Relays:
  - Backhaul Link analysis
  - Access Link analysis
- Analysis of the Relays' backhaul links is performed as part of regular LTE network analyses.
- If the Relay's donor cell is set to "Optimal", the analysis first computes the optimal donor cell based on RSRP or PDSCH  $C/(N+I)$

# Backhaul Quality Report

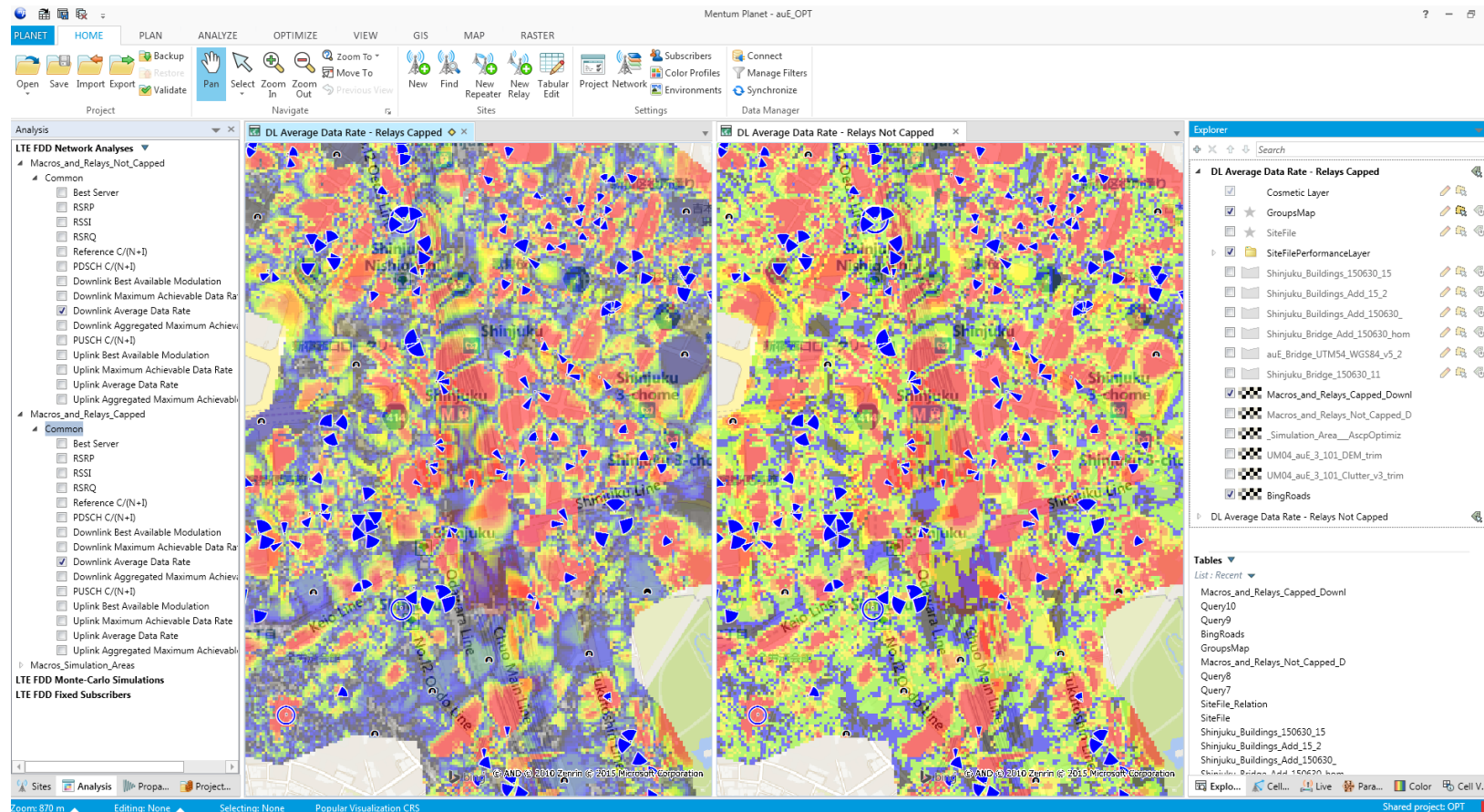
The screenshot displays the Mentum Planet software interface with a 'Report Preview' window open. The report table lists the following data:

Relay Site ID	Relay Sector ID	Backhaul Camer	Donor Site ID	Donor Sector ID	Distance to Donor (meters)	Azimuth (degrees)	Downtilt (degrees)	RSRP (dBm)	PDSCH CNI (dB)	M P <sub>i</sub> (d)
C1_6.Relay_Node_Template	Relay_1	2125_1	T80220	1	200.84354920639771	257.47055166779245	-11.961682214237069	-57.6562385559082	7.1728854179382324	10
C1_22.Relay_Node_Template	Relay_1	2125_1	T8FT34	2	149.94178752191436	317.86025342257085	-18.832059811618794	-57.399185180664062	24.627151489257813	12
C1_38.Relay_Node_Template	Relay_1	2125_1	T8B815	2	261.37659325198615	46.7088315128603	-10.801220079035669	-72.154861450195313	3.0253784656524658	12
C2_108.Relay_Node_Template	Relay_1	2125_1	T81503	1	180.3849885389423	155.59579707304087	-15.12958268945059	-43.880077362060547	14.959202766418457	93
C2_122.Relay_Node_Template	Relay_1	2125_1	T8JY25	2	70.4219706126182	311.693532052034	-26.090885579081217	-62.849227905273438	4.6017999649047852	11

The 'Graph' window shows a bar chart titled 'Downlink Max Achievable Data Rate (Mbit/s)'. The x-axis lists relay site IDs from C1\_6 to C4\_1407. The y-axis ranges from 0 to 35 Mbit/s. The chart shows varying data rates across the sites, with a peak around 30 Mbit/s for C2\_314.

# Data Rate Layers Capped with Backhaul Link

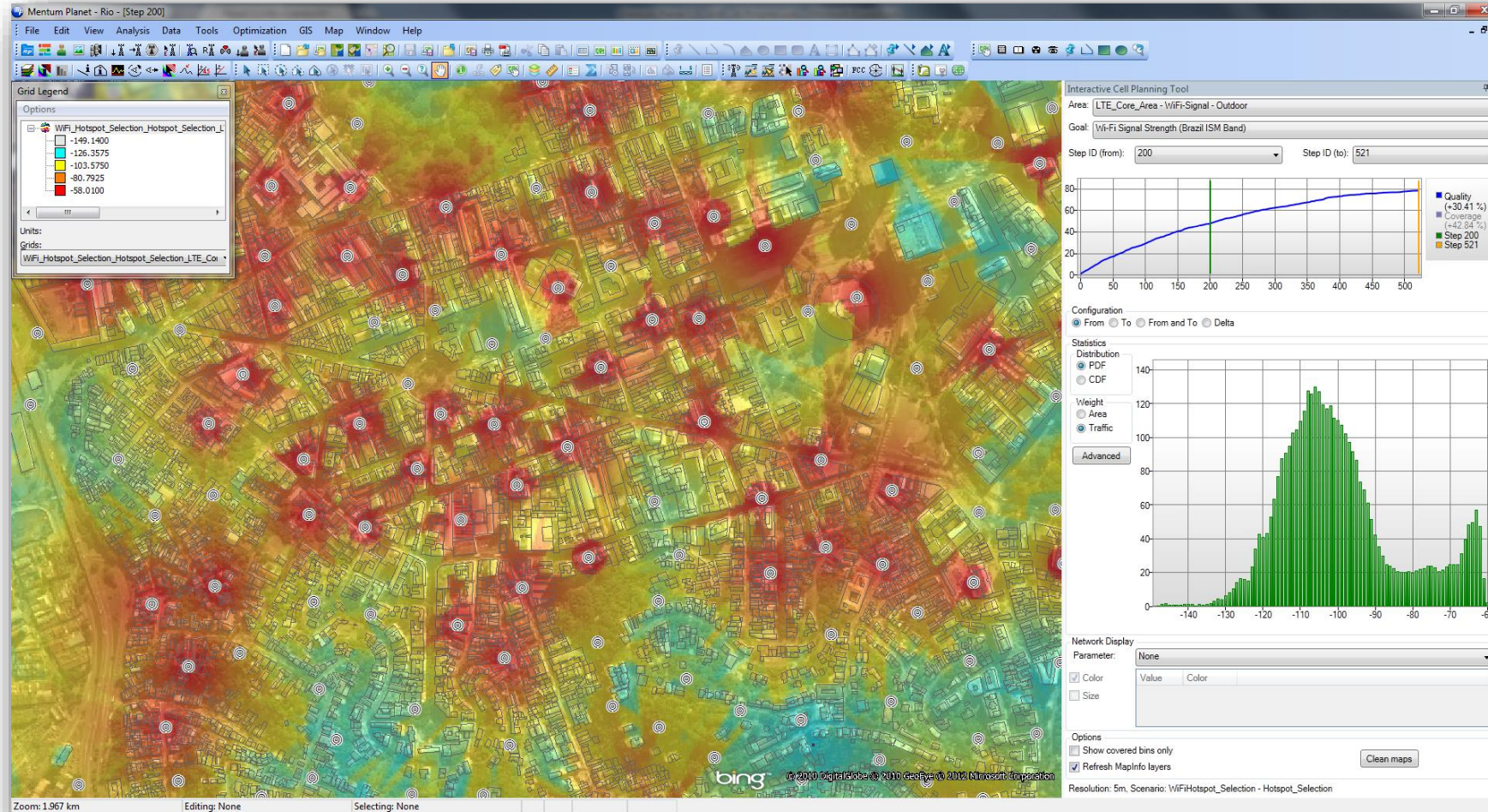
- Option to cap data rate layers based on backhaul link resources



LTE Downlink Average Data Capped (left) and Not Capped (right) by backhaul resources



# Relay Node Addition – Interactive Cell Planning



Relay Selection – 200 Hotspots

# PCI Plan Analyses

- Ability to analysis existing PCI plans
  - To check (for instance) the quality of the PCI plan implemented in the network
- Ability to compare PCI plans
- Analysis of
  - PCI collision (direct neighbours with the same PCI)
  - PCI confusion (2<sup>nd</sup> order neighbours with the same PCI)
  - Downlink Reference Signal collisions
  - Uplink Reference Signal collisions
  - Secondary Synchronization Signal Sequences with high correlation

# PCI Plan Analysis Reports

The screenshot displays three overlapping windows from the PCI Plan Analysis Reports application. The background window is titled "PCID Analysis: Within\_Geodata\_2\_GHz" and shows a list of properties on the left, including "Total number of D" (highlighted in blue). The middle window is titled "Graph" and shows a bar chart of "Interference Traffic (%)" with a y-axis from 0 to 1000 and an x-axis from 0 to 20. The foreground window is titled "PCID Analysis: Within\_Geodata\_2\_GHz" and displays a table with the following data:

PCID	Server Site	Server Sector	Indirect Neighbor Site	Indirect Neighbor Sector
16	TBV359	1	TBJZ14	3
9	TB1460	1	TBHZ62	1
9	TBFK09	1	TBHZ62	1

Below the table, there are tabs for "Summary", "PCID Duplication", "PCID Confusion", "DL RS Collisions", "UL RS Collisions", and "SSS". A "Close" button is located at the bottom right of the foreground window.





# Call Traces

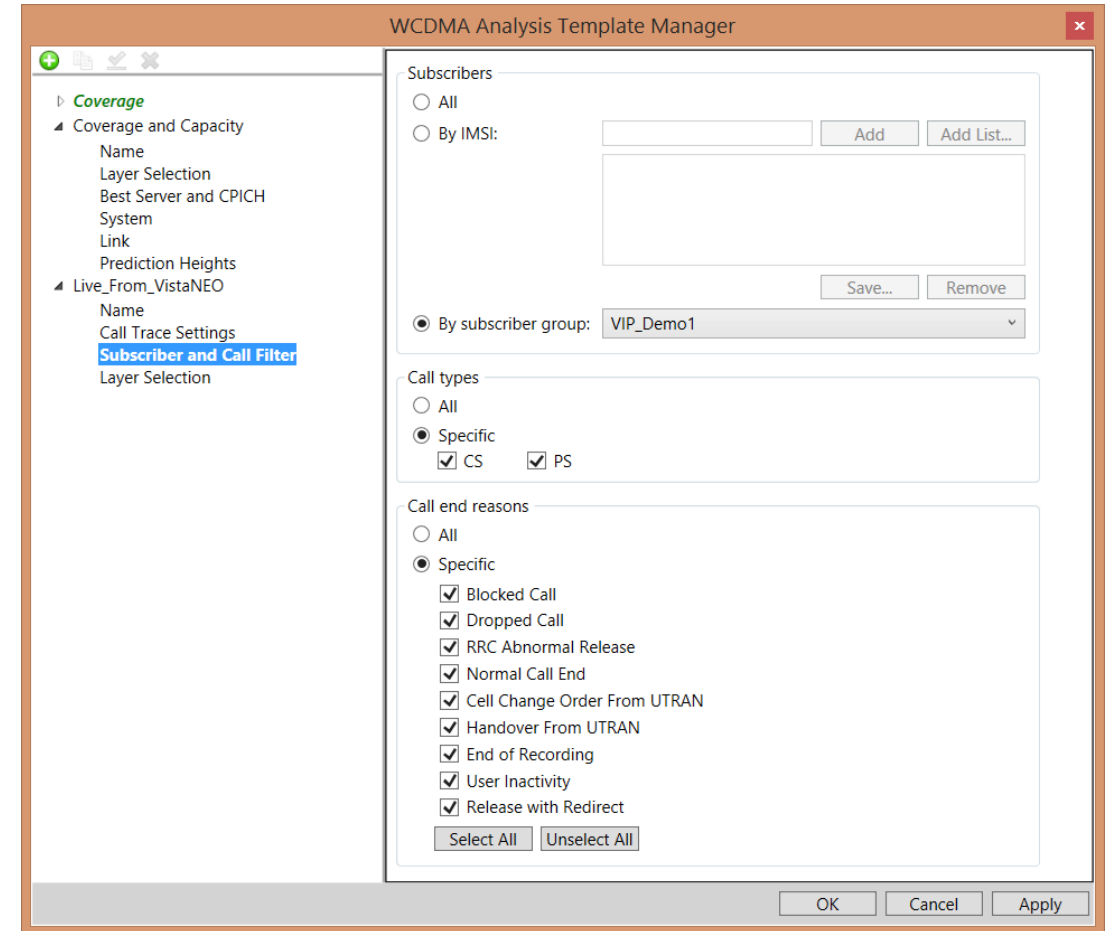
# Interface with VistaNEO

- Connection to VistaNEO for the ability to:
  - Generate network analyses
  - Generate Interference Matrices
  - Generate/optimize Neighbor Lists
  - Create Traffic Maps
  - Create surveys
- Data Filters
  - Time, call end type, call type, IMSIs, serving cells



# Call Trace Based Network Analyses

- Ability to generate network analyses based on call trace data stored in VistaNEO
- Selection of Call End Reason
  - E.g., dropped call, handover
- Time Selection
- IMSI selection
  - Including subscriber groups defined in VistaNEO
- Selection of Call Types



WCDMA Analysis Template Manager

# Network Analysis from VistaNEO – Example

Mentum Planet - MWC

PLANET HOME PLAN ANALYZE OPTIMIZE VIEW GIS MAP RASTER

Schedule Analysis  
 Multipoint-to-Multipoint  
 Create Analyze Table  
 Fixed Subscribers  
 Network Analyses

Schedule Simulation  
 Monte Carlo Simulations  
 Metro Designer  
 View 3D

Google Earth Export  
 Network Performance  
 Social Media  
 Import Call Trace  
 Live

Color

Color Tool Snp

Input File

Classified Raster

Class Id	Class	Color
1	EndOfRecording	[Color]

Color Transformation Options

Apply Automatic  
 Apply Settings Close Help

Color  
 Sites  
 Explorer

CPICH RSCP

Blocked and Dropped Calls

Analysis

- CPICH RSCP
- CPICH Ec/No
- Downlink Data Rate
- Uplink Data Rate
- Blocked Call
- Dropped Call
- RRC Abnormal Release
- Normal Call End
- Cell Change Order From
- Handover From UTRAN
- End of Recording
- User Inactivity
- Release with Redirect

Live\_Downtown\_AllDay\_50m  
 LTE FDD  
 Heterogeneous  
 Monte Carlo Simulations

Analysis Parameter Optimization

Shared project: MWC

Zoom: 3.459 km Editing: None Selecting: None Popular Visualization CRS



# Call Trace Based Traffic Maps

- Generation of Traffic Maps based on call traces stored in VistaNEO
- Selection of Call End Reason
  - E.g., dropped call, handover
- Time Selection
- IMSI selection
- Including subscriber groups defined in VistaNEO
- Selection of Call Types

The screenshot shows the 'Traffic Map Generator Wizard' dialog box, specifically the 'VistaNEO Subscriber and Call Filters' step. The window title is 'Traffic Map Generator Wizard' and the subtitle is 'VistaNEO Subscriber and Call Filters'. The main instruction is 'Specify the subscribers and calls you want included.' The dialog is divided into several sections:

- Subscribers:** Includes radio buttons for 'All' and 'By IMSI:'. Below 'By IMSI' is an empty text box and 'Add' and 'Add List...' buttons. A larger empty list box is below that, with 'Save...' and 'Remove' buttons. At the bottom, there is a radio button for 'By subscriber group:' and a dropdown menu currently showing 'VIP\_Demo1'.
- Call end reasons:** Includes radio buttons for 'All' and 'Specific'. Under 'Specific', there is a list of call end reasons with checkboxes: Handover, User Inactivity, Blocked Call, Dropped Call, Normal Call End, Release with Redirect WCDMA, Release with Redirect GERAN, Release with Redirect Cdma2000, Release with Redirect TD-SCDMA, Registration Failure, Registration Success, Handover Success (GSM), and Handover Success (WCDMA). At the bottom of this section are 'Select All' and 'Unselect All' buttons.
- Call types:** Includes radio buttons for 'All' and 'Specific'. Under 'Specific', there are checkboxes for 'VoLTE' (checked) and 'Non VoLTE'.

At the bottom of the dialog are navigation buttons: '< Back', 'Next >', and 'Cancel'.

Traffic Map Generator – VistaNEO Filters

# Traffic Maps from VistaNEO – Examples (VoLTE vs. non VoLTE)

Mentum Planet - MWC

PLANET HOME PLAN ANALYZE OPTIMIZE VIEW GIS MAP RASTER

Schedule Analysis Multipoint-to-Multipoint Create Analyze Table New Simulation Metro Designer Google Earth Export Network Performance Social Media Import Call Trace

Color

Color Tool

Input File: LiveDowntown\_PS

Display Mode: Pseudo Color

Color table

Color Transformation Options

Histogram

>=Value	<Value	Count	Color
64.80396270	0	0	Blue
0	15.2000875	0	Cyan
15.2000875	500	10700728	Yellow
500	2500	591797	Orange
2500	7500	201864	Red
7500	50000	178203	Dark Red

VoLTE Traffic

Non VoLTE Traffic

Live

- Traffic Maps
  - Live\_Downtown
  - LiveDowntown\_5m
  - LiveDowntown\_CS
  - LiveDowntown\_PS
- Network Data
- Drive Tests
- Call Traces
- Social Media

Analysis

- Network Analyses
  - WCDMA
  - LTE FDD
  - Heterogeneous
- Monte Carlo Simulations
  - WCDMA
  - LTE FDD
- Fixed Subscribers
  - LTE FDD

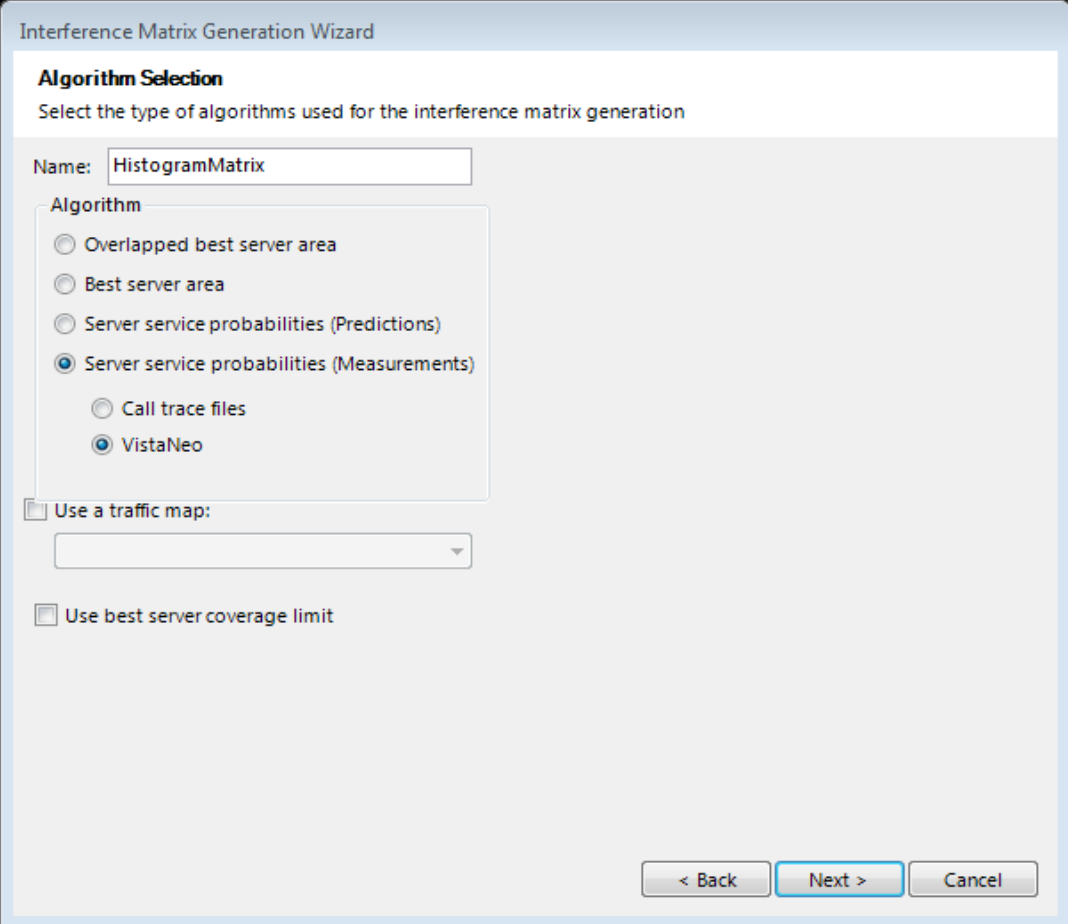
Zoom: 3.842 km | Editing: None | Selecting: None | Popular Visualization CRS | Shared project: MWC





# Call Trace Based Neighbor Lists and Interference Matrices

- Ability to generate Neighbor Lists and Interference Matrices based on call trace data stored in VistaNEO
- Ability to generate PCID, Scrambling Code (etc.) plans based on call trace data stored in VistaNEO
- Time Period Selection



The screenshot shows a software dialog box titled "Interference Matrix Generation Wizard". The main heading is "Algorithm Selection" with the instruction "Select the type of algorithms used for the interference matrix generation". A text input field labeled "Name:" contains the text "HistogramMatrix". Below this is a section titled "Algorithm" containing four radio button options: "Overlapped best server area", "Best server area", "Server service probabilities (Predictions)", and "Server service probabilities (Measurements)". The "Server service probabilities (Measurements)" option is selected. Underneath this option are two sub-radio buttons: "Call trace files" and "VistaNeo", with "VistaNeo" being selected. Below the algorithm section are two checkboxes: "Use a traffic map:" (unchecked) and "Use best server coverage limit" (unchecked). The "Use a traffic map:" checkbox has a dropdown menu below it. At the bottom right of the dialog are three buttons: "< Back", "Next >", and "Cancel".

*Interference Matrix Generator*



# Interference Matrix – Example

### Histogram Interference Matrix - Live\_Downtown\_WCDMA\_966

Servers Served traffic: 18401.0000

Interference display:  Co-channel  Adjacent channel

Servers	Site ID	Sector ID	Affected Traffic	Affected Traffic (%)	Display Curve
HRP0290					
HRP0321					
HRP0348					
HRP0385	HRP0169	3	18024.9047	97.9561	...
HRP0392	HRP0472	1	17991.92	97.7769	...
HRP0420	HRP0083	3	17569.6062	95.4818	...
HRP0436	HRP0169	1	17292.3236	93.9749	...
HRP0443	HRP0443	3	17212.7299	93.5424	...
1	HRP0443	1	16815.5018	91.3836	...
2	HRP0509	1	16525.7981	89.8092	...
3	HRP0392	1	16284.4439	88.4976	...
HRP0445					
HRP0447					

Mentum Planet - MWC

MAP RASTER

Subscribers Connect Manage Filters Synchronize

Color Profiles Environments

Settings Data Manager

### Curve Editor - HRP0443\_2 : HRP0059\_1

#### Interferer Histogram

Probability Density Function

Server-Interferer signal strength difference (dB)

#### Curves

HRP0059\_1

#### Points

	Server-Interferer signal strength	Probability Density Function
1	-20.00	0.00
2	-19.00	0.00
3	-18.00	0.00
4	-17.00	0.00
5	-16.00	0.00
6	-15.00	0.01
7	-14.00	0.01
8	-13.00	0.04
9	-12.00	0.04
10	-11.00	0.09

Live

- Traffic Maps
- Network Data
- Drive Tests
- Call Traces
- Social Media

Parameter Optimization

Interference Matrices

- HistogramMatrix
- Live\_Downtown\_WCDMA\_966
- Live\_IM\_Downtown

Neighbor Lists

- Live\_Downtown\_WCDMA
- Live\_Downtown\_WCDMA\_966
- Frequency and Parameter Plans
- LTE FDD Frequency and PCID
- LTE FDD PRACH Root Sequence
- WCDMA Scrambling Code
- LTE FDD Tracking Area

Analysis Parameter Optimization

Shared project: MWC

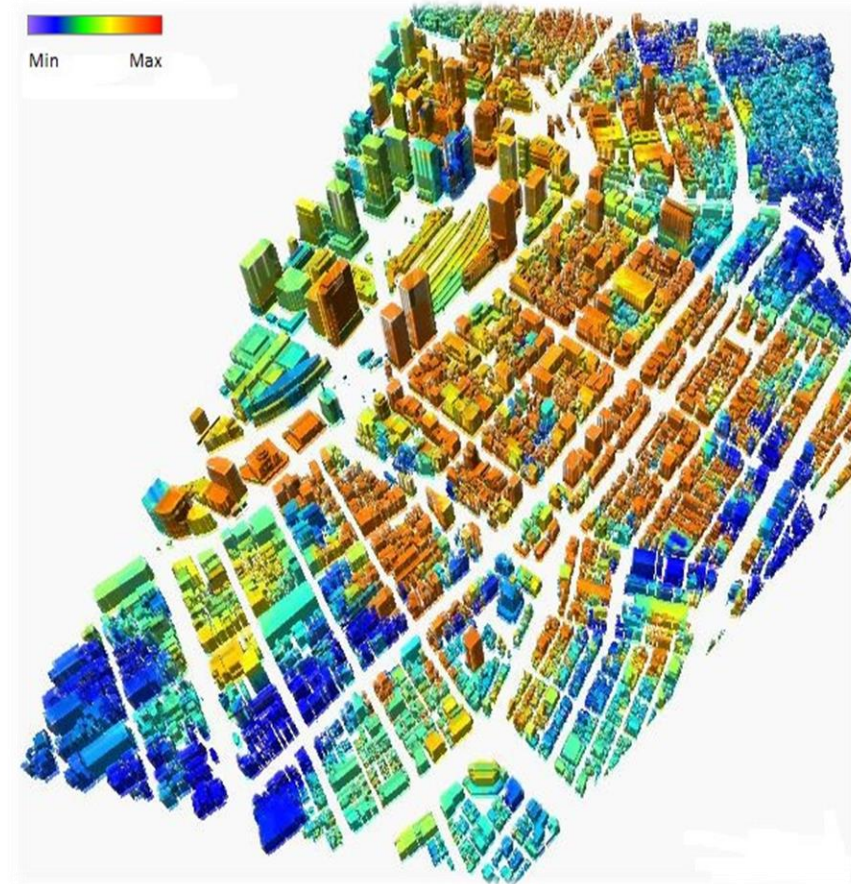


# Call Traces

- 3D geolocation
- Call End types
- Support for IMSI for LTE call traces
- Ability to import and geolocate call trace files in one user operation
- Improved methodology to leverage Timing Advance reports
- Improved reporting of CQI and data rate
- Addition of traffic volume (Erlangs and MB)

# 3D Geolocation

- Computation of probability density grid for different receiver heights
  - One grid per prediction height
- Computation of subscriber height
- Timing Advance / Propagation Delay filter in 3D
  - Distance from cell to location/height computed in 3D
- Fingerprinting algorithm in 3D



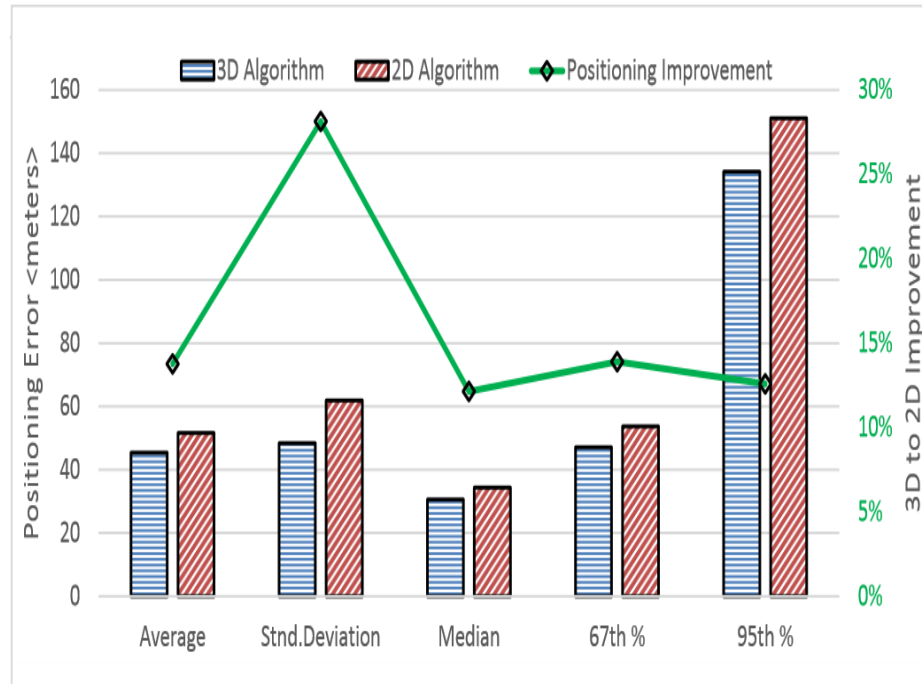
*Traffic Geolocated in 3D*

# 3D Geolocation – Example

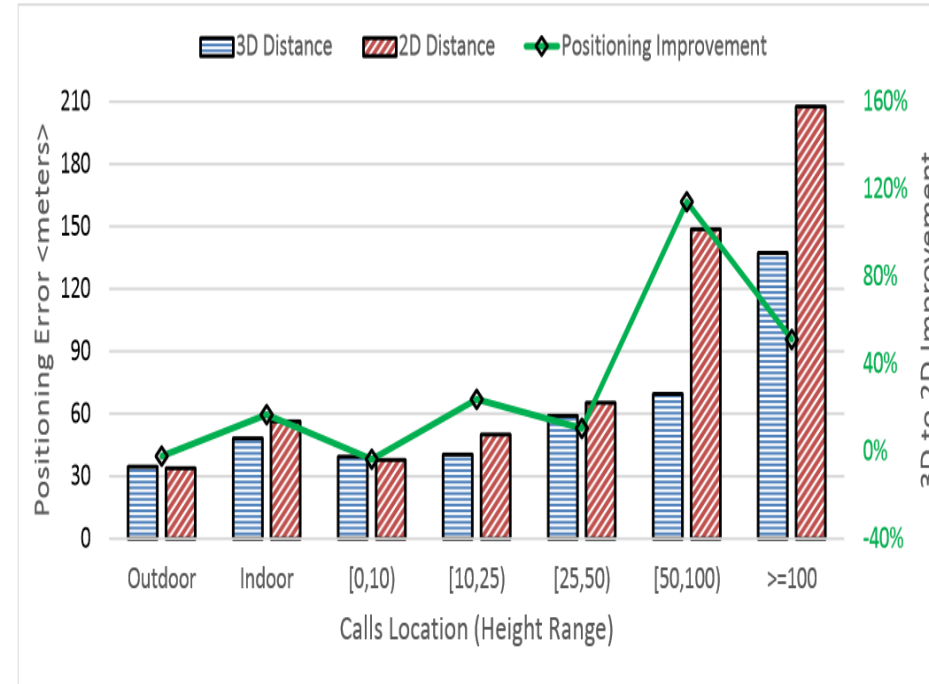
The screenshot displays the Mentum Planet software interface for a project titled "Metro Designer - Project". The main window is split into two views: a 3D view and a 2D map view. The 3D view shows a detailed model of buildings in Tokyo, with a color gradient from blue to red indicating signal strength or coverage. The 2D map view shows a top-down view of the same area, with a color-coded overlay representing the same data. The interface includes a menu bar (PLANET, HOME, PLAN, ANALYZE, OPTIMIZE, VIEW, GIS, MAP, RASTER), an Explorer panel on the left with a search bar and a list of layers (e.g., Tokyo\_Buildings\_ver2, Cosmetic Layer, GroupsMap, SiteFile, SiteFilePerformancel, Tokyo\_CallDensity, BingRoads, tokyo5m\_heights5, tokyo5m\_clutter5), and a Tables panel with a list of recent queries. On the right side, there are panels for "Live" (Traffic Maps, Network Data, Drive Tests, Call Traces) and "Analysis" (LTE FDD Network Analyses, LTE FDD Monte Carlo Simulations, LTE FDD Fixed Subscribers). The bottom status bar shows "Zoom: 1.896 km", "Editing: None", "Selecting: None", "Popular Visualization CRS", and "Local project". The Windows taskbar at the bottom shows various application icons and the system clock (18:01, 2016-03-04).



# 3D Geolocation Accuracy Improvements



(a) Aggregated 3D vs. 2D Geolocation Performance



(b) Per Height Range 3D vs. 2D Geolocation Performance

Geolocation Accuracy Improved by 20 % for Indoor



# Call End Types

- “Call End Reason” in Planet call trace format
  - E.g., Handover, blocked call, dropped call
- Call trace based network analyses
  - Ability to generate call end type density grids
  - Ability to limit analyses to specific call end types
  - Ability to limit analyses to specific call types (e.g., VoLTE)



*Dropped Call Density Grid*



# Geolocated Call Traces – Example – Subscribers “In Motion”

The screenshot displays the Mentum Planet software interface, titled "Mentum Planet - Tokyo". The main map area shows a street-level view of a city, likely Tokyo, with numerous green circular markers representing geolocated call traces. The markers are densely packed in certain areas, such as near the "Chuo Main" station and the "Nishi-Shinjuku" area. The interface includes a top menu bar with tabs for PLANET, HOME, PLAN, ANALYZE, OPTIMIZE, VIEW, GIS, TABLE, MAP, RASTER, STYLE, and LABELS. Below the menu bar is a toolbar with various tools like Map, Open, Explorer, Add Layers, Clear Cosmetic Layer, Select, SQL Select, Find, Zoom In, Zoom To, Zoom Out, Move To, Pan, Previous View, Label Tool, Priority, Info, Hotlink, Redistricter, Ruler, Statistics, Map Options, Scalebar, Lock Scale, Sync, Instant Sync, Clone, Rectangle, Ellipse, Polyline, Symbol, and Rename. On the left side, there is an Explorer panel showing a list of layers and tables. The "In\_Motion,....tokyo5m\_clutter5 Map" is selected. The "Tables" section lists recent tables including "In\_Motion", "Indoor\_Users", "Query14", "Query12", "Tokyo\_CTR\_Planet6", "\_10th\_Feb\_2016\_Last4Months", "Query6", and "Query3". On the right side, there is a Live panel with sections for Traffic Maps, Network Data, Drive Tests, Call Traces, and Social Media. The "Call Traces" section is expanded, showing "LTE" with "Tokyo" and "Tokyo\_CTR\_Planet6" selected. Below that, there is an Analysis panel with sections for LTE FDD Network Analyses, LTE FDD Monte Carlo Simulations, and LTE FDD Fixed Subscribers. The bottom status bar shows "Zoom: 1.134 km", "Editing: None", "Selecting: None", "Popular Visualization CRS", and "Local project". The Windows taskbar at the very bottom shows various application icons and the system clock indicating "18:29 2016-03-04".





# Propagation

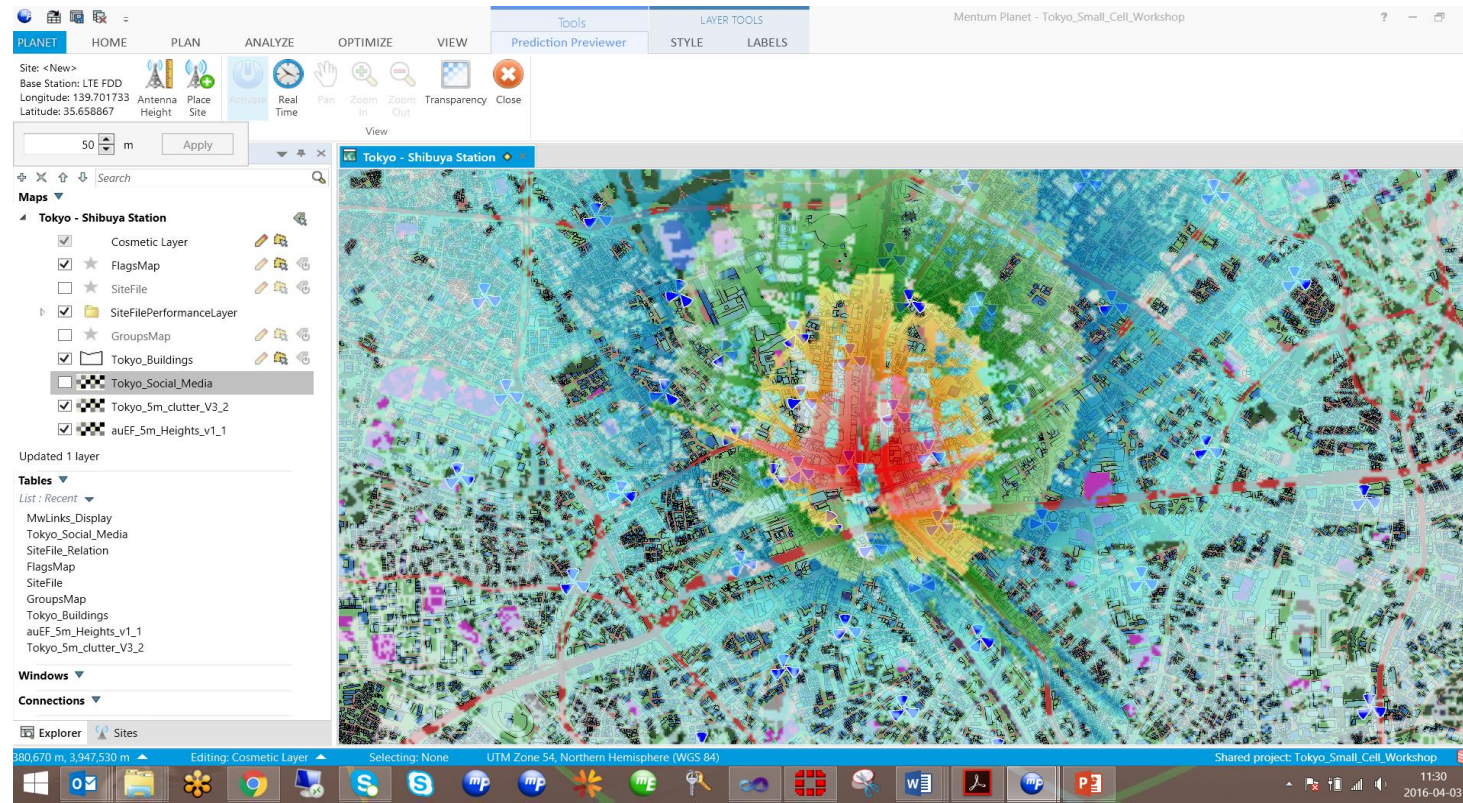
# Propagation

- Prediction previewer tool
- Introduction of ITU-R P.1546-5 propagation model
- Point to Point profile tool update
  - Ability to have Earth curvature with straight LOS
- Computation of recommended propagation distance
- “Generic” propagation model and antenna
- Introduction of Multipoint to Multipoint analyses
- New version of Universal Model



# Prediction Previewer

- Quick computation/visualization of predictions
  - For existing sites or new sites
- Fast re-computation of predictions when moving sites or adjusting antenna height



# “Generic” Propagation Model

- The goal is to allow Mentum Planet users to be able to generate “decent” predictions out of the box
- Use cases related to users who want decent predictions out of the box
  - Brand new user who creates a Planet project
  - Migrated project from other radio planning/optimization software
  - Creation of a Planet project from file (e.g., Excel, csv)
  - No access to drive tests / measurements
- The back end is based on “Planet 3D Model”
  - Tuned for different frequencies
  - Tuned for different environments
  - Tuned for different cell types (e.g., macro vs. micro/pico)
- No need for Planet 3D Model license

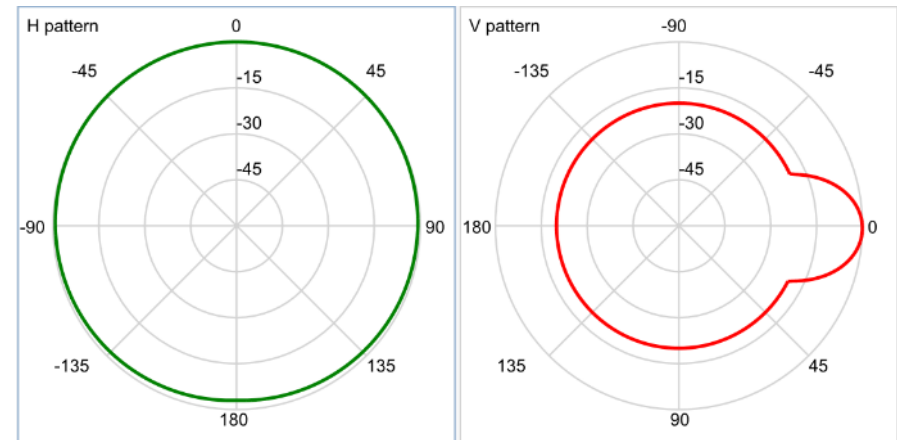
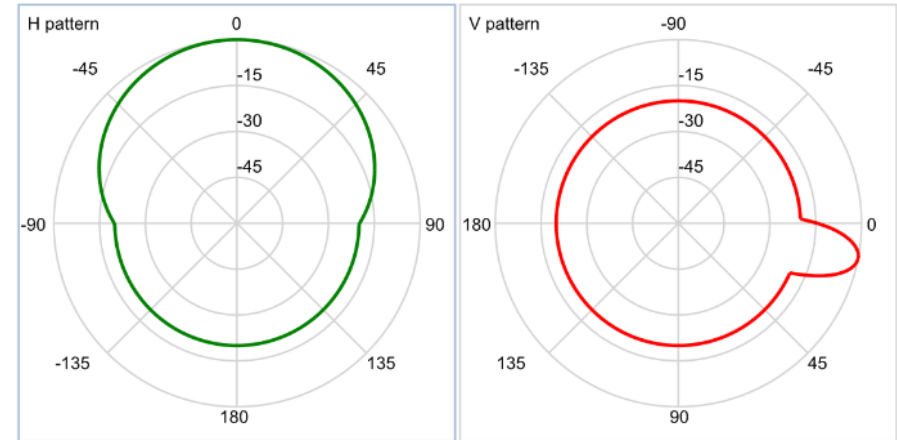


## “Generic” Antenna – General

- The goal is to allow Mentum Planet users to be able to use a “standard/generic” antenna pattern when users do not have access to antenna patterns
- Use cases
  - Brand new user who creates a Planet project
  - Migrated project from other radio planning/optimization software
  - Creation of a Planet project from file (e.g., Excel, csv)
- Default pattern based on 3GPP standard

# “Generic” Antenna – Details

- Single antenna port
- E-beamwidth can be used to select the antenna’s beamwidth
  - Automatic computation/suggestion of e-beamwidth when selecting “Generic” antenna model
    - E-beamwidth = 360 if antenna is used by a single sector
    - E-beamwidth = 70 if antenna is used by multiple sectors
- Ability to define e-tilt and e-azimuth values



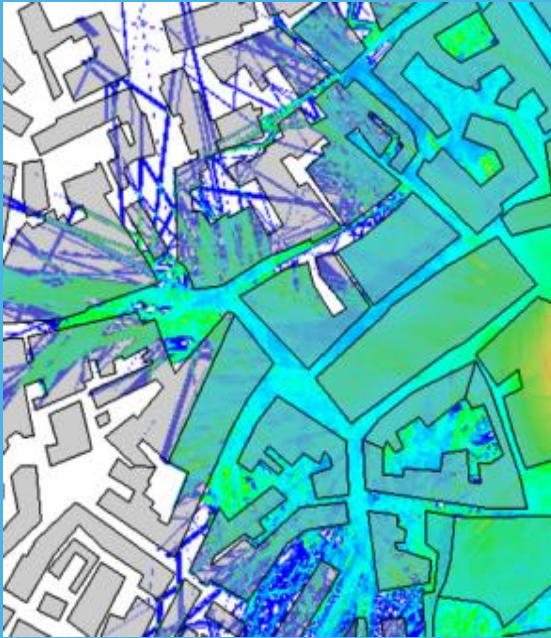
# Computation of Recommended Propagation Distance

- Planet users typically set the same propagation distances for all the sites or for all the sites that belong to a given cluster
- The issue that:
  - If the distance is too large, then waste of time
  - If the distance is too small, then under-estimation of interference
- The goal is to recommend appropriate propagation distance values on a per site basis

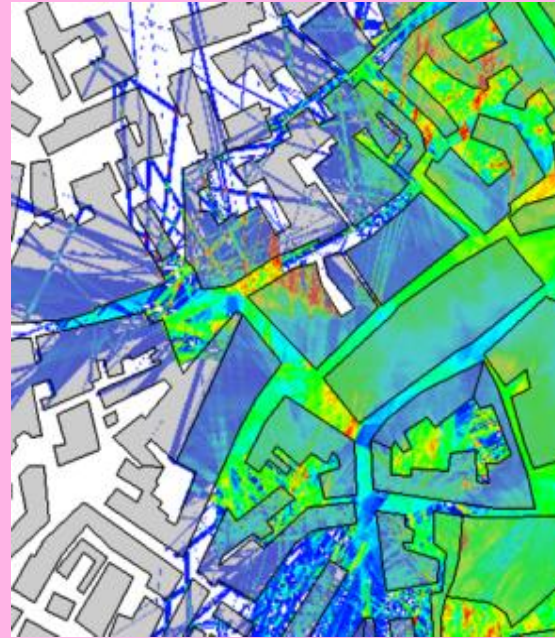
# Universal Model Multipath Component

- Generation of optional grids with Universal Model
- The **Rice Factor** is the ratio of the power from the direct path over the sum of the powers of all the paths
  - It indicates how close a receiver is to be in Line of Sight conditions
- The **Delay Spread** shows the time span during which most of the power arrives at a receiver
  - Receivers with values lower than the cyclic prefix may expect improvements when spatial diversity/multiplexing are used
- The **Angle Spread** shows the dispersion of the paths as they leave the transmitter to the receiver
  - It can allow fine tuning the antenna design

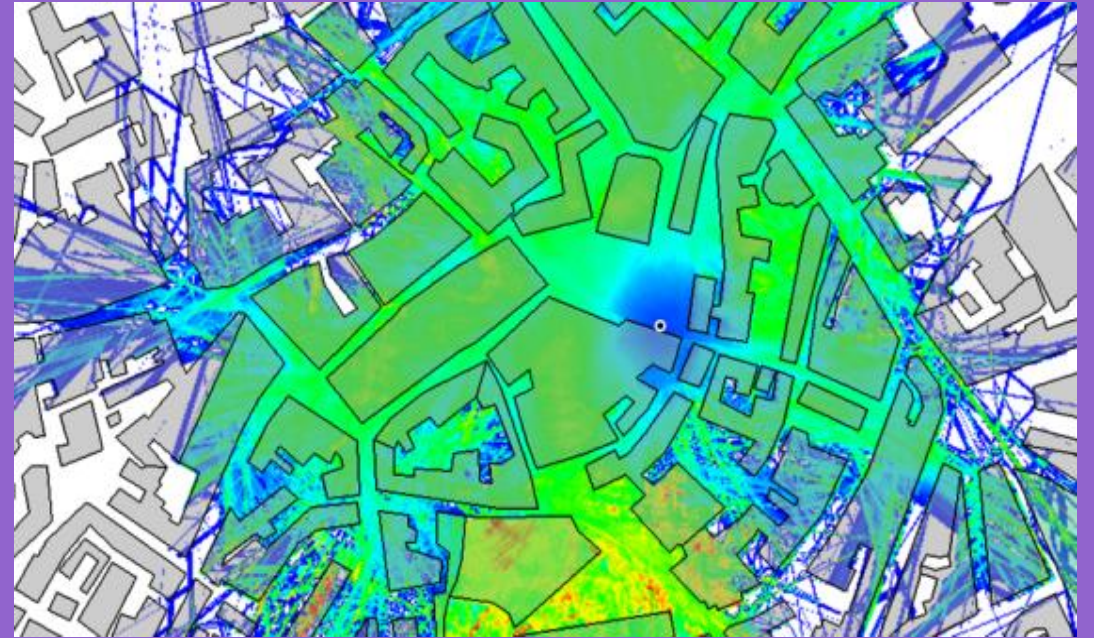
# Universal Model Multipath Component



Rice fading



Angle-spread



Delay-spread





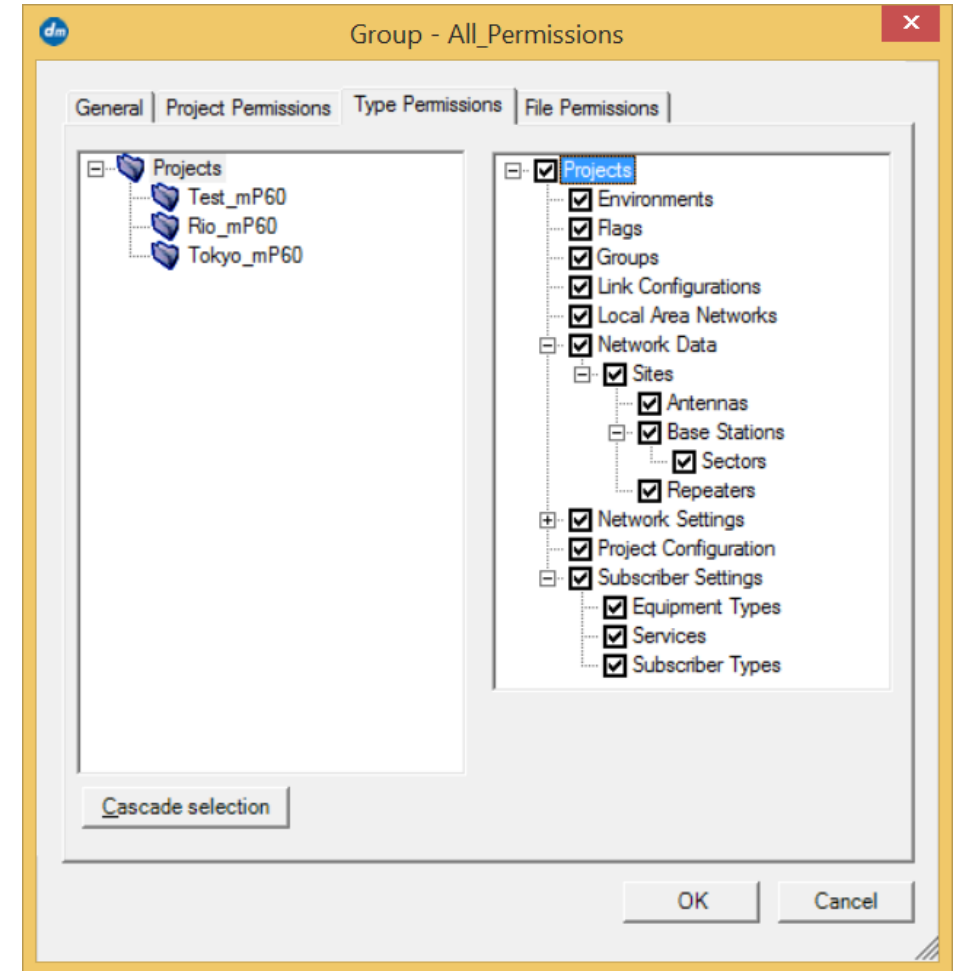
# Data Management

# Data Management

- Support for site/sector/antenna attachments
  - Including pictures
  - Ability to “push/upload” attachments to Data Manager without Planet
- User Permissions
  - Granularity of object permissions in Data Manager
  - User Permissions for local Planet projects
- Data Manager status button

# Data Manager Permissions – New Features

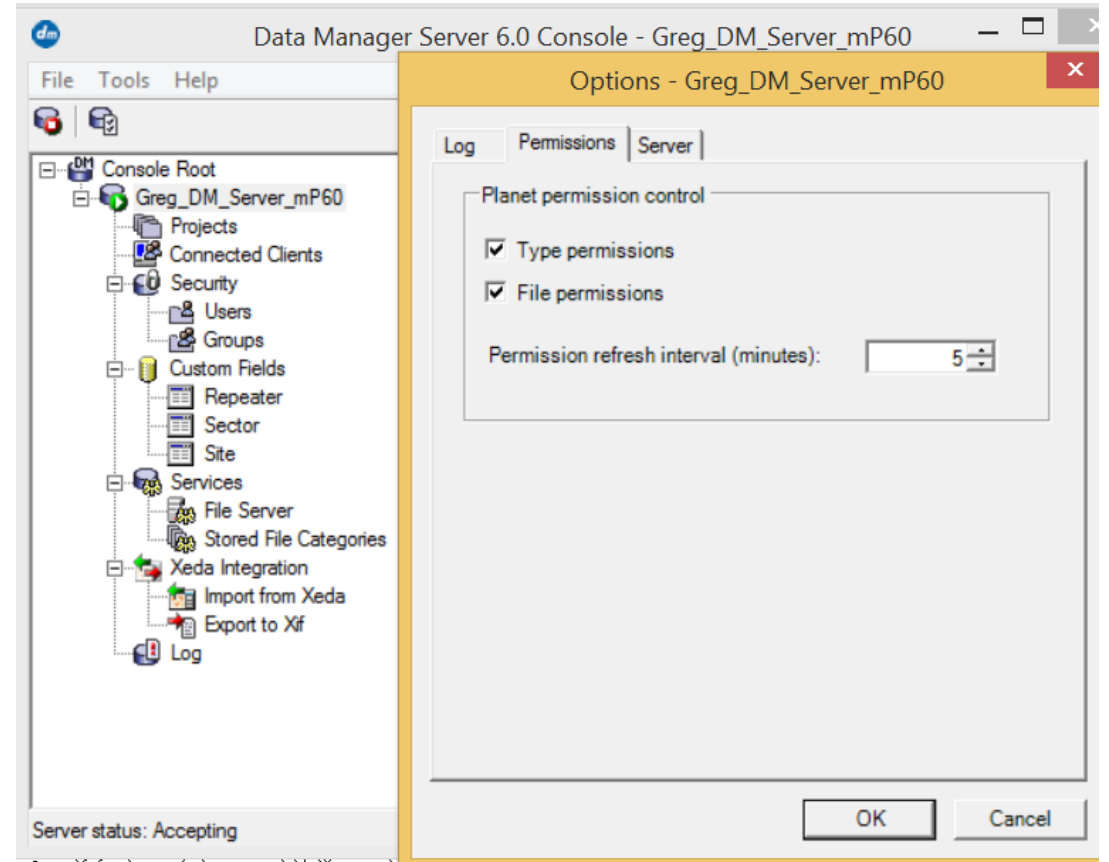
- Ability to control permissions for each project separately
- Addition of new file type permissions
  - E.g., antennas, link configurations, Base Stations
- Addition of new file permissions
  - E.g., antenna patterns, propagation models



Data Manager Console – Permissions

# User Permissions – Local Planet Projects

- Option to apply user permissions to local Planet projects
  - Type permissions
    - All types
  - File permissions
    - Antennas and propagation models only



*Data Manager Console – Permissions – Local Projects*





# Additional Features

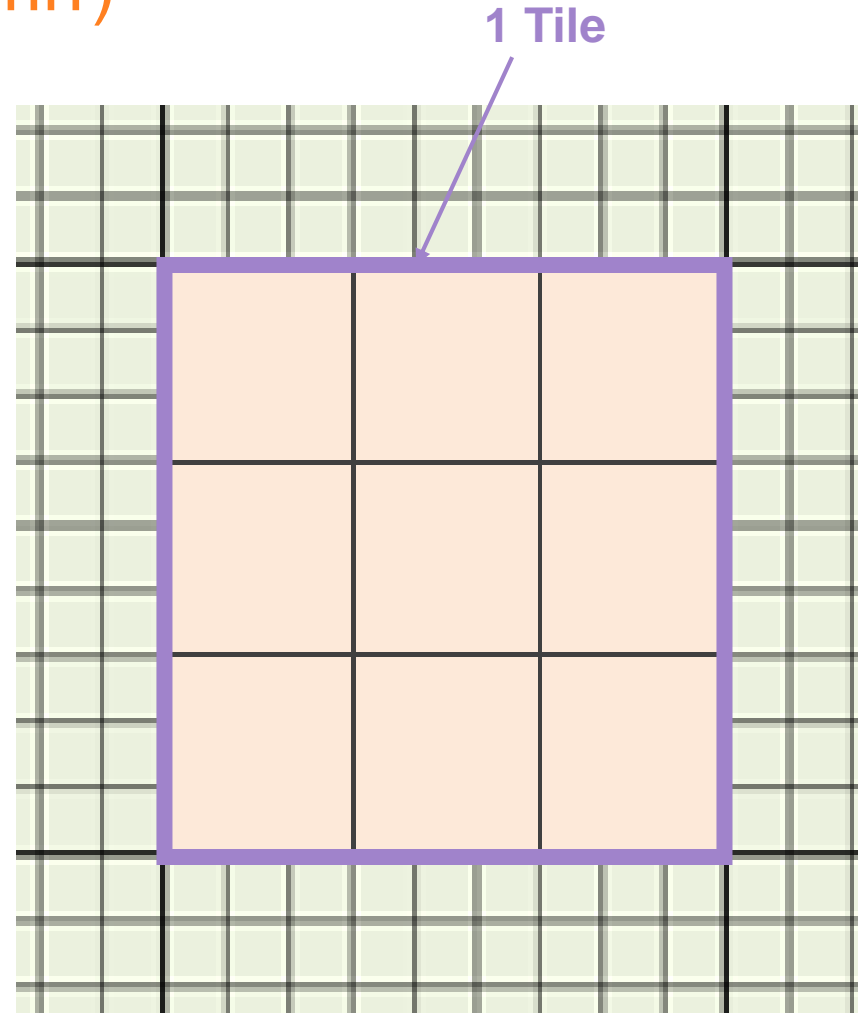


# Additional Features

- Interactive Analysis tool
  - Support for WCDMA/Cdma2000
    - Replacement of CPICH/Pilot pollution inspector and pixel info tool
- GSM network analyses
  - Now account for penetration losses defined in Environments table
  - Now account for slow/fast fading values defined in Environments table
- Automatic Cell Planning
  - Improvement in automatic creation of optimization area

# Multi-Resolution Raster Format (.mrr)

- “mrr” stands for “multi-resolution raster”
- Tile-based raster format
- Multi-resolution format
  - Each tile has its own resolution
- Support for Unicode characters
- No limit on file size
- Ability to use 32-bits for values for each Bin
  - Increased resolution when needed (e.g., Traffic Maps)
- File size smaller than Vertical Mapper grids



# Multi-Resolution Raster Format – “Fields” and “Bands”

- A given .mrr file may contain multiple “fields”
  - And each field contains one or more “Bands” (also called “Data Bands”)
- A field can contain the following data types
  - **Image:** An Image field contains a single band of color data
  - **Image Palette:** An Image Palette field uses a restricted color palette
  - **Classified:** A classified field has an integer index band that stores the class index for each cell
  - **Numeric (discrete):** Contains bit (1/2/4) or numeric (integer, float, complex, date time) data bands
  - **Numeric (continuous):** A continuous field contains one or more data bands of any supported data type



# Windows Operating System Compatibility

# Windows Workstation Compatibility

Platform	Planet 5.7	Planet 5.8	Planet 6.0
Windows XP Pro 32 bits	✓		
Windows Vista 32 bits	✓	✓	
Windows XP Pro 64 bits	✓		
Windows Vista 64 bits	✓	✓	✓
Windows 7 Pro 32 bits	✓	✓	
Windows 7 Pro 64 bits	✓	✓	✓
Windows 8 / 8.1 Pro 32	✓	✓	
Windows 8 / 8.1 Pro 64 bits	✓	✓	✓
Windows 10			✓



# Windows Server Compatibility

Platform	Planet 5.7	Planet 5.8	Planet 6.0
Windows Server 2003 32 bits	✓	✓	
Windows Server 2003 & 2003 R2 64 bits	✓	✓	✓
Windows Server 2008 & 2003 R2 32 bits	✓	✓	
Windows Server 2008 64 bits	✓	✓	✓
Windows Server 2008 R2 64 bits	✓	✓	✓
Windows Server 2012 64 bits	✓	✓	✓
Windows Server 2012 R2 64 bits			✓

# Sentinel™ RMS Versions

Sentinel RMS	Planet 5.7	Planet 5.8	Planet 6.0
Sentinel 8.5.1	✓		
Sentinel 8.5.5		✓	✓

# MapInfo Professional™ Versions

MapInfo Professional	Planet 5.7	Planet 5.8	Planet 6.0
MapInfo Professional 12.0	✓		
MapInfo Professional 12.5 32 bit		✓	
MapInfo Professional 15.2.2 64 bit			✓

Thank you!

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