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## Automatic Router Placement for Multipoint and Mesh in SignalPro v8.3.1



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### Overview

With the recent release of SignalPro v8.3.1, EDX Wireless enhanced the capabilities of the industry leading wireless network design, implementation and optimization software. With an emphasis on automated processes and improvements in calculation efficiency, these new features streamline the design of Mesh and Multipoint networks. This whitepaper discusses the features available in SignalPro v8.3.1 as well as offers best practices for their utilization.

### New Towers/Poles database dialog

The EDX Towers/Poles Database format is a simple comma-delimited ascii format that gives the locations, heights, and names of candidate tower locations to be used by either the Automatic Router Placement or Mesh Repeater Placement functions. If you do not have a list of pole candidates, the new Towers/Poles database dialog includes a number of functions to create candidate points on an even grid or along streets within a given polygon. Once you've created a filtered set of candidate poles, you can save them into the Towers/Poles format using the 'Export' button in the lower left of the dialog box.

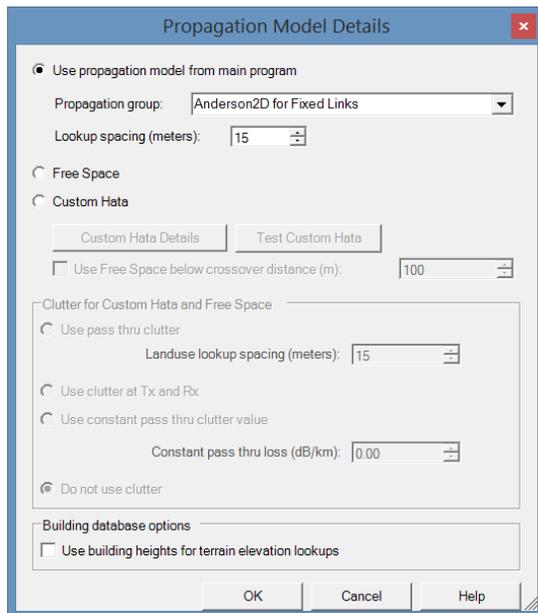
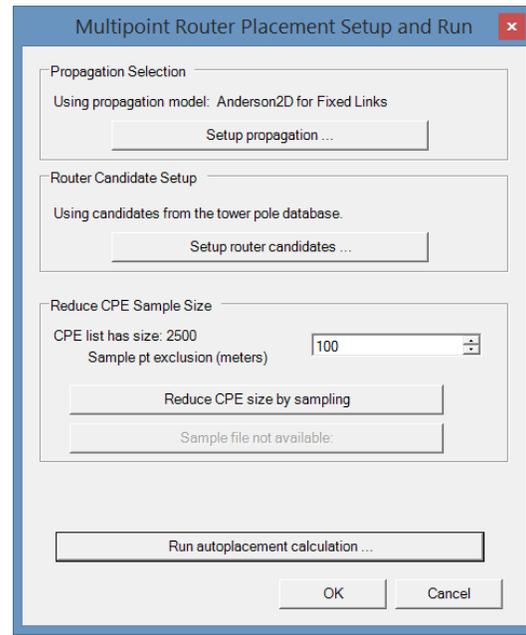
The screenshot shows the 'Create pole database' dialog box with the following fields and options:

- Pole Database file name:** C:\USERS\BPJ\_LAPTOP\DOCUMENTS\EDX\GEODATA\EUGENE-SPRINGFIELD\_500POLES.CSV
- Import/Create Points:**
  - Create Points:**
    - Create random points: number of points: 10000
    - Create Grid: grid spacing (km): 0.200
    - Create along streets
  - Default Mounting height (m): 5.000
  - Default Overall height (m): 5.000
  - Label prefix: jxx
- Filter Points by:**
  - Sample points based on min separation (meter): min separation for sampling (km): 0.200
  - Sample points based on min separation (Grid): grid size for sampling (km): 0.200
  - Filter poles by boundary file
- Bounding File:**
  - Browse for bounding file
  - polygon area (sq. km)
  - C:\USERS\BPJ\_LAPTOP\DOCUMENTS\EDX\GEODATA\EUGENE-SPRINGFIELD\_BOUNDARY.BNA
- Export:**
  - Export to CSV File
  - Number of Poles available to export: 0
- View:**
  - Show Statistics
  - Display
- Buttons: OK, Cancel, Help

The Towers/Poles file can also be added as a Map Layer by going into the Map Layers dialog and selecting Add Layer > Add Geographic File.

## Automatic Router placement for multipoint networks

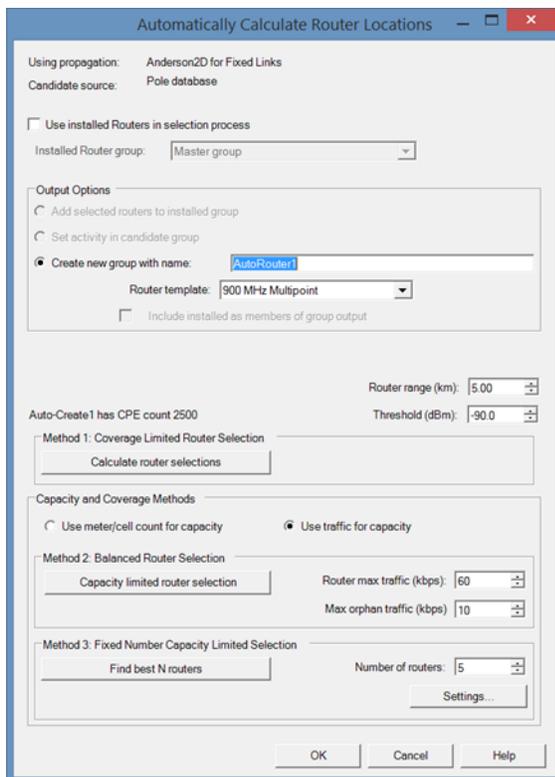
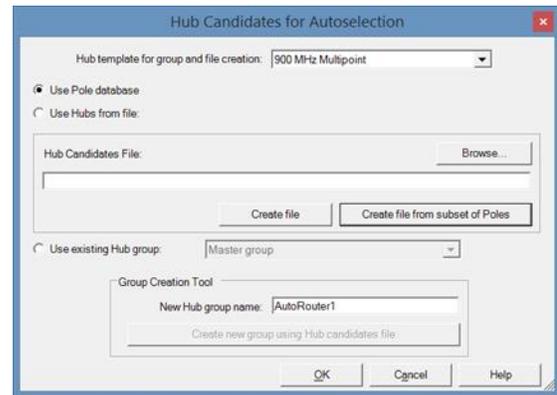
If you have a collection of fixed subscribers within an EDX project as CPEs, the Automatic Router Placement function can choose the candidate locations that will best serve those subscribers. To do this you'd first import or create the CPEs, then set up the Site Template for the sites which will eventually be created on the candidate locations. Go to Network Design/Analysis > Multipoint/Backhaul Networks > Create Hub/Transmitter Group. This dialog includes EDX's original cellular layout method; for the new methods select the CPE group to be used and click the 'Automated Router Selection' button.



You'll first need to click the Setup Propagation button and select whether the function should use the full propagation model from the main program or a faster Free-Space or HATA-type model. It can often be desirable to select a faster model for the router selection when the number of candidate locations and CPEs is very high and a full propagation analysis for every path is impractical.



Next, click Setup Router Candidates. In this dialog you select the Hub template for the sites that will be created. You can also choose whether to use the entire Pole Database file, an existing group of Hub sites, or a Hub Candidates file that contains a sub-sample of the pole database. If the pole database is too large, it may be desirable to use the ‘Create File from Subset of Poles’ option to select a smaller number of poles from the overall poles database and use them as the candidates.



The Reduce CPE Sample Size function can be used to reduce the number of subscribers used in router selection. This can be desirable when you have dense clusters of CPEs and want to speed the calculation.

Once the Propagation and Router Candidates have been set, click the Run Autoplacement Calculation button.

If you have existing sites that should be included in the router selection, you can switch on the ‘Use Installed Routers in selection process’ switch and select the Router group of existing sites. You can then choose to either Add selected routers to installed group or create a new group with a given name. Select the router template to be created and set the thresholds for received signal level and router range. Then choose one of the three Auto-Router methods.

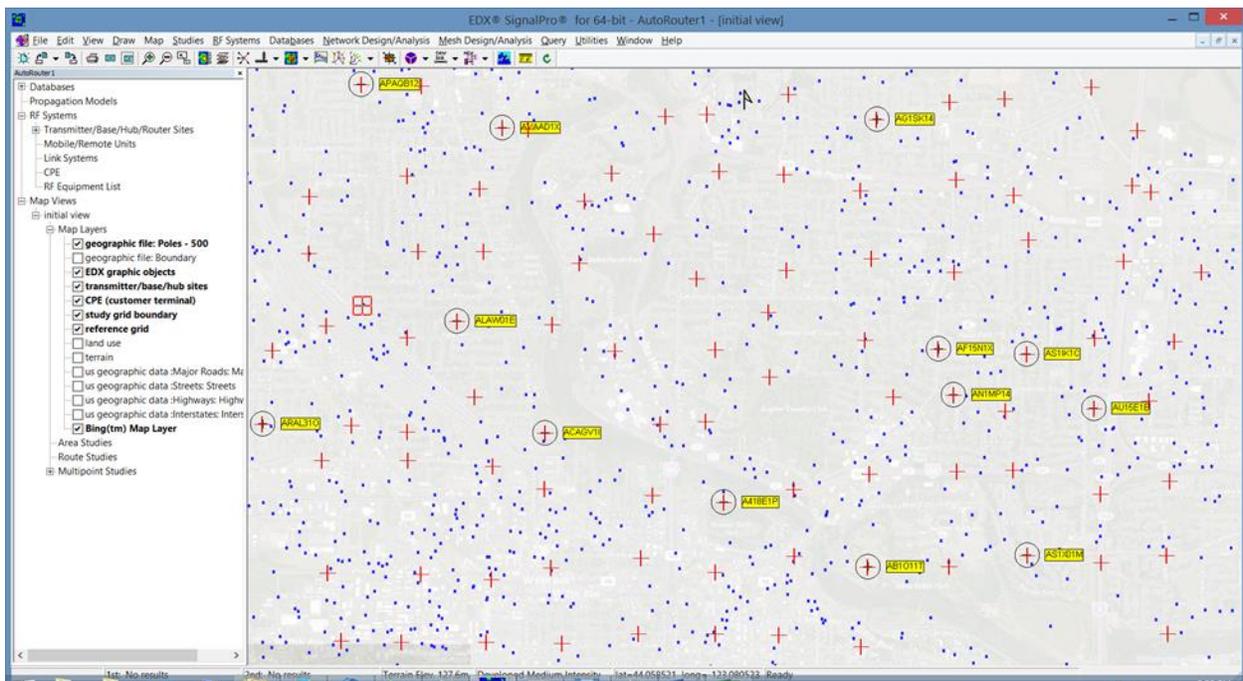


Method 1 is coverage based; it will select as many routers as necessary to provide coverage all the CPEs, if possible.

Method 2 also attempts to cover all CPEs, but allows for capacity constraints. Select whether to use the meter/cell count (CPE count) or traffic (kbps) and enter the maximum traffic per router as well as an allowable amount of orphan traffic.

Method 3 allows you to enter the number of routers to select and chooses those routers that will serve the greatest number of CPEs.

Once one of the three methods has been run the software will create the transmitters and place them into the new transmitter group. You can then run multipoint studies and or channel/server assignment functions on the new transmitters.



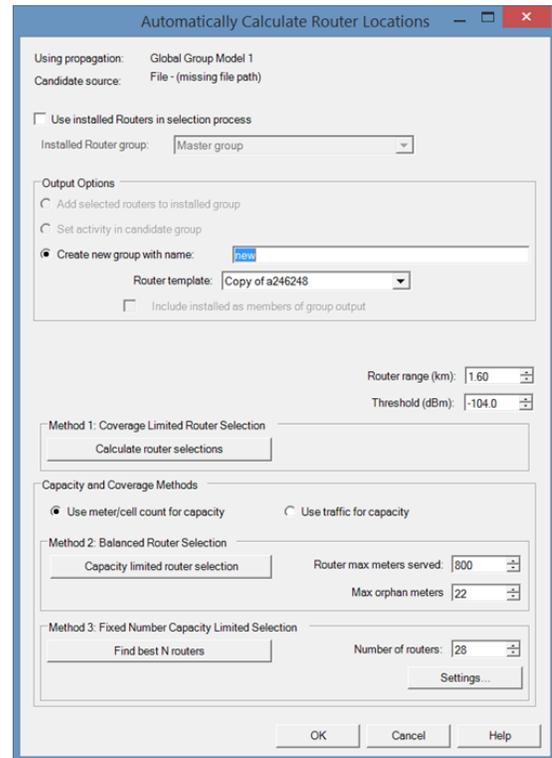


## Automatic Repeater Placement for Mesh Networks

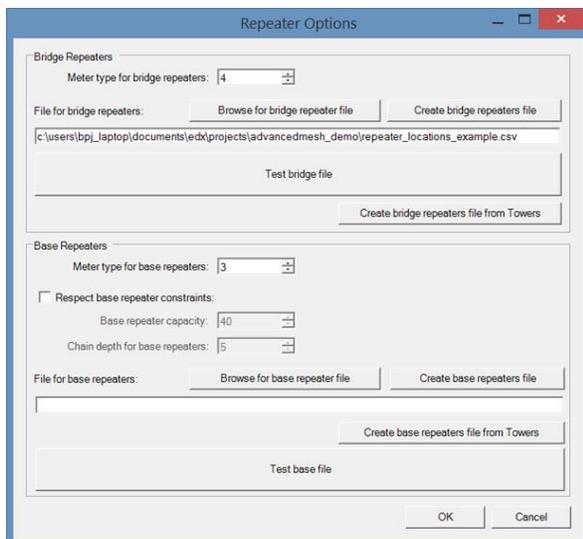
When working with the EDX MegaMesh tool the Tower/Pole candidate locations can be used both to automatically place routers and to automatically place repeaters for linking unconnected devices back to those routers.

Once you've imported a list of end devices (meters or small cells) into the Meters list and set up the Meter Types to reflect the different meters and repeaters you're using you can first use the 'Automatically Calculate Router Locations' option to select router locations to best serve the meters.

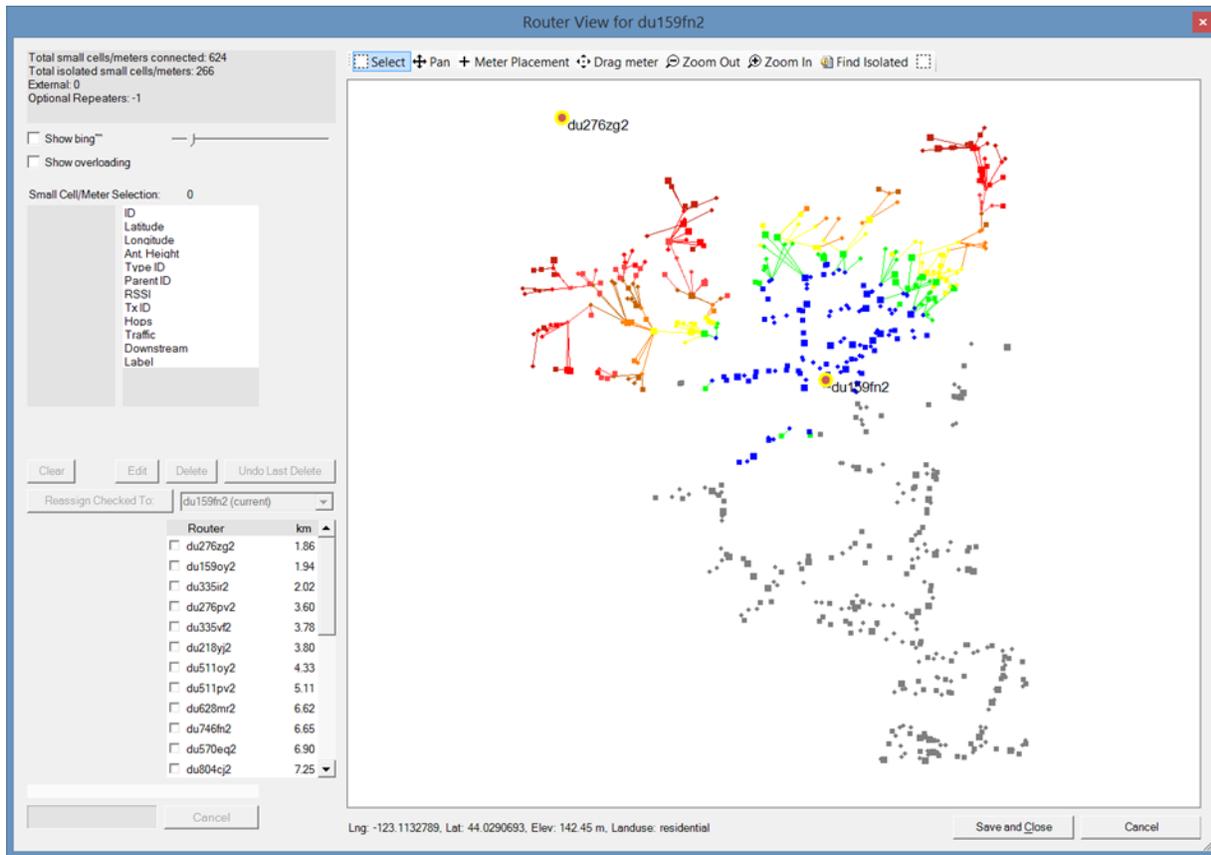
This placement dialog has same three auto-selection method choices as the multipoint; router locations may be chosen based on coverage alone, coverage and capacity, or finding a fixed number of routers to support as many devices as possible.



Once a collection of routers has been created to serve the meters you can run the initial MegaMesh study to determine how many meters may still be left unconnected, then use the automatic repeater functions to place bridge-type or base-type repeaters to the mesh.



The first step is to set up the Repeater Options, selecting a Meter Type for the bridge repeaters or base repeaters you want to add. You also set up a candidates file at this point. This can be your own spreadsheet or automatically created from the Towers/Poles database. Once that's done the full Mesh study can be run in order to find the number of unconnected devices per router. In the router view shown below are 266 meters (shown as grey squares) that couldn't connect to the router in the initial mesh study.



Selected Router: du159fn2

Include isolated points for router

Calculate and display selected router details...

Run selected      Display in spreadsheet

Add bridge reps      Add base reps

Router list:

```
All 28 routers, total unassigned 6646
1 du1039p2 # 949 un 278 o1 356 br 0 ba 0
2 du1098c2 # 240 un 125 o1 45 br 0 ba 0
3 du1156s2 # 692 un 2 o1 235 br 0 ba 0
4 du1274p2 # 192 un 33 o1 20 br 0 ba 0
5 du1274w2 # 212 un 23 o1 0 br 0 ba 0
6 du159fn2 # 624 un 266 o1 144 br 0 ba 0
7 du159oy2 # 1617 un 319 o1 715 br 0 ba 0
8 du218yj2 # 230 un 75 o1 61 br 0 ba 0
9 du276bv2 # 620 un 203 o1 174 br 0 ba 0
```

While it's possible to use the Meter Placement tool in this view and place repeaters on their candidate locations manually, the 'Add bridge reps' and 'Add base reps' buttons in the main Mesh Studies view will automatically attempt to place repeaters to link up as many unconnected devices as possible for that router.



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If you want to run the Automatic Repeater Placement for the entire mesh, the 'Add bridge reps' and 'Add base reps' functions in the upper section of the main mesh dialog will run the auto-placement function for every router. Care should be taken when setting up the candidate locations and propagation options for the auto-repeater placement as a very large number of candidate locations and end devices can cause the propagation calculations to take an impractically long time. In these situations you can either sub-sample the Tower/Pole candidates to use a smaller number of candidate locations or use a faster propagation model such as Hata, Cost-231, or even Free Space to do the initial placement, and then run the final mesh study using a more rigorous model.

## Conclusion

The release of SignalPro v8.3.1 marks improvements in calculation efficiency and contains new feature sets for the automated processes in designing large Multipoint and Mesh networks. Leveraging these features streamlines the design process and results in a new level of engineering productivity.