DIY Fiber Mapping

Sometimes a quick-and-dirty estimate is all you need to arrive at a go/no-go decision about a fiber extension. Here's how to do it.

By Jason Longenecker / *New Light Technologies*

Congratulations! You're now a local broadband provider, and you've got the fastest service and the best rates in town. Maybe you received some grant funding to build out the initial phase of your network. Now it's time to start growing. Whether the network serves municipal government, community anchor institutions, the commercial sector or local residents, each potential new service address has buildout costs that can make or break the deal. Regardless of how those costs are absorbed, passed on or written off, they factor in the decision to deliver or not deliver service to a particular location.

Most providers have that one customer who keeps calling to find out when gigabit service will come to her one-room, one-phone, one-Ethernet-jack guard shack at the top of a mountain. To calculate the return on investment for this build, you will need to establish its capital costs, including the costs of outside-plant fiber installation and construction.

Having the ability to provide a timely ballpark estimate for fiber installation allows a broadband operator to qualify leads faster and enables it to focus its limited resources on viable opportunities.

Few municipal or community broadband providers can hire full-time sales engineers who are on call to provide same-day estimates. Paying dedicated sales engineers is expensive, and pulling outside-plant engineers off billable projects is disruptive to the provisioning process. The DIY method proposed here is not a replacement for engineers' skills or knowledge but rather a companion tool that can be used to quickly qualify a sales lead by obtaining a rough estimate early in the process.

SELECT A MAPPING TOOL

The geographic information system (GIS) industry, like any other, offers a variety of commercial and open-source software packages, including desktop mapping tools, web-based mapping tools, map servers, spatial databases and mobile apps. Some operate as stand-alone products, and others are pieces of large enterprise GIS.

The detailed instructions in this article refer to Google My Maps, a free, web-based mapping tool. Why Google My Maps? It's simple to use. It has several data sharing options as well as a sister mobile app. It also provides batch geocoding and offers multidestination routing.

Most desktop and web-based mapping solutions allow users to add data to a map, find and zoom to places of interest, measure distances and areas, print maps and share data. Alternatives such as Google Earth Pro and Esri's ArcGIS Earth offer for free much of the functionality a small broadband provider would need to get started.

DEFINE AND MAP EXISTING ACCESS POINTS

Conventional wisdom says you don't know where you're going until you know where you've been. Accordingly, the first step is to map the existing network access points.

To avoid being overwhelmed by long lists of service addresses, start by organizing a list of critical infrastructure locations. These may

include distribution facilities, central offices, data centers, hub sites, cell towers and so forth.

Using a spreadsheet (such as Microsoft Excel), create a table that has a record for every location you wish to track. At minimum, each record needs address, city, state and ZIP columns so the GIS can convert the records to points on the map. Additional columns might include building name, building purpose (data center, cell tower, central office, and so forth), property owner and any other pertinent business data.

Use the spreadsheet to populate a map of the critical infrastructure locations, following the steps in Creating a Map in Google My Maps.

DEFINE AND MAP PROBLEM AREAS

To avoid expensive underground routes, lengthy historic zone permitting and areas with expensive permitting fees, find or create layers on the map to serve as warnings when you design a route. Reach out to the local, county or state GIS, transportation department, public works or planning office for map layers that may add value. Remember that not all the best data is published on GIS departments' websites.

Ask a senior outside-plant engineer with local knowledge to help identify these problem areas and then mark them with polygons in the new map layers. In 2011, I printed a poster-size map of city streets and asked a colleague who had 40-plus years of local experience to take a highlighter and color all the streets that had underground routes. It took him about an hour to highlight those areas from memory, and it took me about an hour to enter them onto the map. The other engineers on his team then used that layer throughout the following year to better design routes around the city.

Though our method was low-tech and low-data, that small effort saved far more time and money than it took to complete.

Avoiding problem routes that could derail your project is more than just a good idea for an organization with a narrow budget and no room for mistakes. That's why it's so important

CREATING A MAP IN GOOGLE MY MAPS

1) Create a Google account, or log in to your existing account. The same account you use for Gmail gives you access to Google My Maps.
2) Navigate to www.google.com/maps/d/, and create a new map.
3) Click on the "Untitled Map" text in the upper left to give the map a name.
4) Click on the "Untitled Layer" text to name the layer.
5) Click on the import link below the layer name to load the critical access point spreadsheet you created.
6) Check the address, city, state and ZIP columns to position the placemarks.
7) Select the name column to title the placemarks, and click "Finish." Google then geocodes the addresses – that is, converts them to points on a map. If Google is unable to geocode some records, it will prompt you to correct those records.
8) Click on "Individual Styles" below the layer name, choose "Uniform Style" and turn on labels by name.
9) Click on the base map layer, and choose a map style that best reflects your organization's needs. A base map that uses just a few colors emphasizes business data and frees up more colors for labeling, placemarks, lines and polygons.
10) Now you are ready to add points to the map. Two methods for this are available; both methods start by highlighting the layer to which the new point will be added.

Option 1: Search address and add point
To search and zoom to a point of interest, enter an address into the search bar. Click on "Add to Map" to incorporate the new address as a new marker. You'll see the same fields you defined earlier, such as address, city, state, ZIP and property owner. Click on the pen-shaped edit icon to make a change.
Option 2: Add marker
Click on the "Add Marker" icon under the search bar, and then zoom to the map location where you want to place your point. This is helpful for locations that might not have easy-to-locate addresses. Click to add the marker, and enter the fields as needed. Switching the base map to the satellite view while adding or moving markers may help improve the accuracy of data entry.

Option 1 works well in urban areas with small lots and in cities where address rules follow some sort of standard. Option 2 is useful for large properties, such as campuses, farms, military bases and recently developed areas, that are away from public roads. Option 2 might also come in handy for mapping pedestals, cabinets or telecom equipment huts without proper street addresses.

	A	B	C	D	E	F	G	H
1	Name	Address	Address2	City	State	ZIP	Purpose	Property Owner
2	White House	1600 Pennsylvania Avenue NW		Washington	DC	20500	Central Office	US Government
3	United States Capi	Capitol Hill		Washington	DC	20515	Hub Site	US Government
4	National Zoologica	3001 Connecticut Avenue NW		Washington	DC	20008	Hub Site	Smithsonian
5	George Washingto	101 Callahan Drive		Alexandria	VA	22301	Data Center	Private
6	FedExField	1600 Fedex Way		Greater Land	MD	20785	Data Center	Private

Start by creating a spreadsheet with information about critical infrastructure locations.
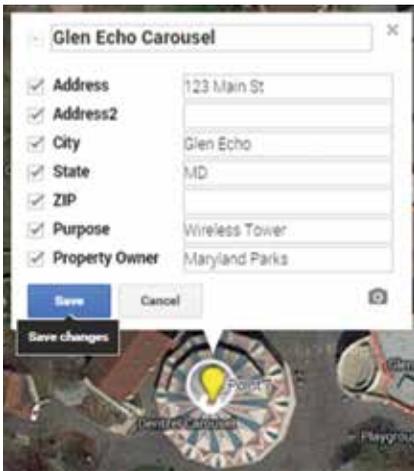
Adding a new marker to a map

to define and map high-cost areas or long-delay areas as early as possible. The details of adding these layers to a map are described in Mapping Problem Areas in Google My Maps.

DEFINE AND MAP STRATEGIC AREAS

What is strategic to one provider may be irrelevant to the next. That's why it's important to know which existing and future market segments your company targets. High-density commercial buildings, revitalization corridors and new construction projects are just a few types of areas to consider mapping as strategic.

The fundamental question to answer when seeking out this data is this: Where do potential customers work, live and play?

Using the steps provided to define and map problem areas, create a map layer for strategic areas.

MAP A ROUTE

When a potential customer (or group of customers) requests service, you can now design a route from an existing access point to the proposed service address. There are two methods to measure a proposed fiber route: using driving directions and manually mapping (or drawing) each segment of the route with the built-in shape tool.

Using driving directions with additional waypoints is fast and can yield a reasonable outcome. If, for example, a route must cross a river on a particular bridge or take a particular highway, the waypoint method allows some limited control and still maintains a speed advantage. On the other hand, a provider with adequate knowledge about its local utility infrastructure is more likely to benefit from using the manual drawing tool or measuring tools to manually carve out a route.

Routes that pass through predominantly underground zones generally have higher costs for installation and construction. Turning on a layer to mark these underground zones can greatly improve the accuracy of ballpark estimates.

See Mapping and Measuring a Route in Google My Maps for detailed instructions.

USING ROUTE DISTANCES

Use the measured route distances to populate a bill of materials (BOM),
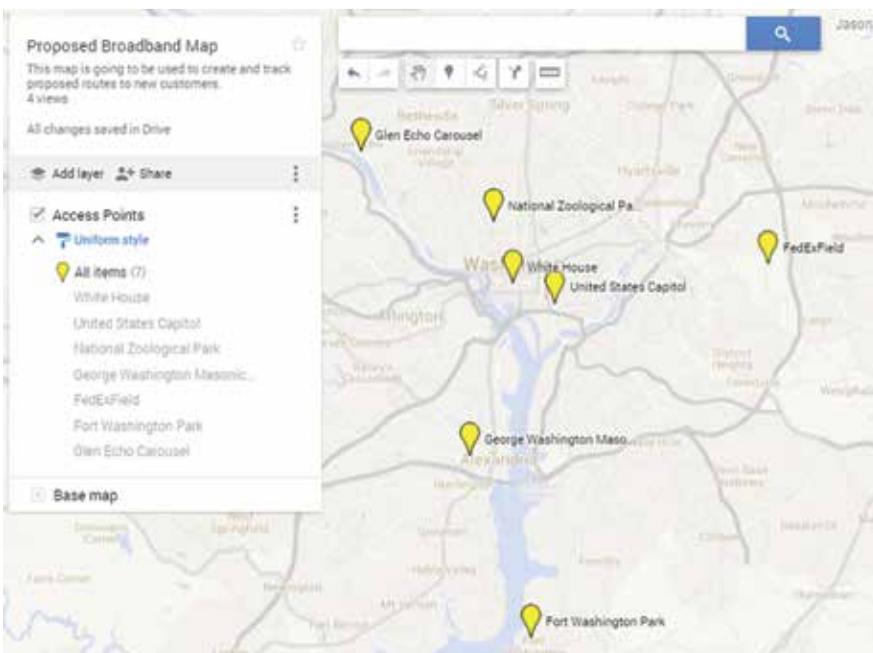
The map shows the imported critical access points and any new points added to it.

or simply multiply the distances by an average cost per foot. Regardless of how you calculate cost estimates, you've just taken the first steps toward qualifying leads faster and allowing your limited technical resources to focus on viable opportunities.

In a follow-up article later this year, I will describe how to use the measurements generated in this DIY mapping exercise to populate a BOM. ❖

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Additional illustrations are available in the digital edition of this article at **www.bbcmag.com**.

MAPPING AND MEASURING A ROUTE IN GOOGLE MY MAPS

Google My Maps' support for multidestination driving directions includes the ability to modify routes by dragging waypoints; avoid ferries and highways; add multiple destinations; and reorder destinations. Once generated, a route is saved as a layer in Google My Maps, and its waypoints can be modified at a later date.

Mapping Option 1: Use driving directions
Using the "Add Directions" button under the search bar, generate a new layer on the map. Enter the destination addresses as prompted, and a route will be created from the two addresses.

Clicking on the "Add Destination" button and adding yet another address will automatically create waypoints. Alternatively, select the route on the map and click and drag to change or add waypoints on the route.

Mapping Option 2: Manually draw a line
1) Click on the "Add Layer" button. Rename the newly created layer by clicking on "Untitled Layer" and changing the name in the text box.
2) Zoom to the area on the map where you want to draw your first route.
3) Activate the drawing tool by clicking on the "Add Line or Shape" button.
4) Choose a starting point on the map and click once to place the first vertex. Continue to place points mapping out the segments of the line you want to draw. Your last click should end at a location of interest.
5) A pop-up will launch, prompting you to name the shape. Enter a name, and click on "Save" to continue.
6) To alter the shape, click to activate the editing control points, and move the points to the desired locations.

Measuring the Route
For a route created using driving directions, click on the layer's step-by-step directions to get an itemized list of route distances. If you manually drew a line to represent your route, click on the line and read the route distance in the pop-up info window. Using the Google My Maps measuring tool (aka ruler) allows you to manually measure distances that might travel underground or have special attachment fees.