BAM Attachment 7 – Middle Mile Approach

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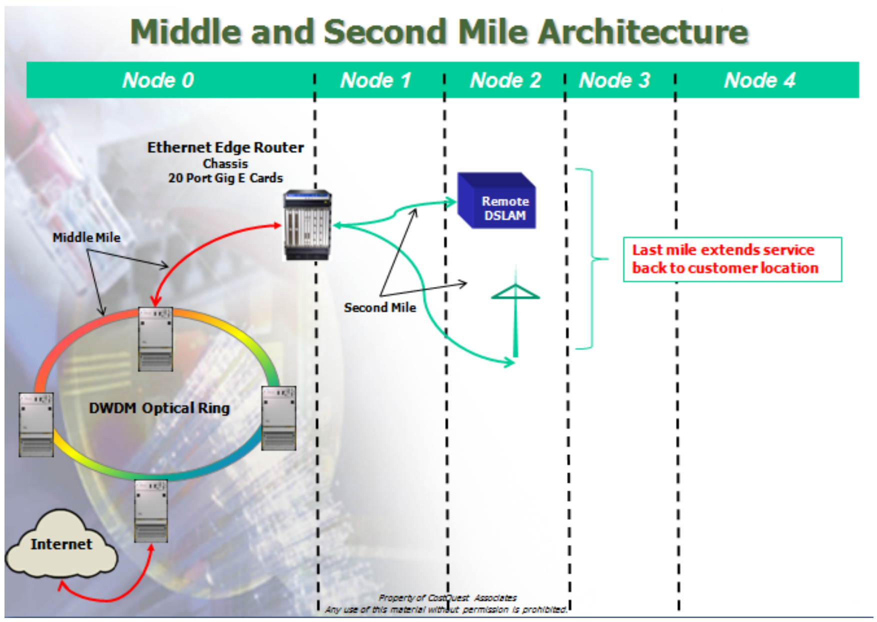
The middle mile methodology and approach uses components of the CostPro platform. As outlined in the full Broadband Assessment Model (BAM) Documentation and the related glossary, the *middle mile* is that portion of the network that provides a high capacity transport connection between a service provider's network core and its second and last mile network. More specifically, in the BAM the middle mile is assumed to extend between the service provider's point of interconnection with the internet and the service provider's point of interconnection (an existing fiber node) with the second and last mile network built for unserved areas. This relationship is illustrated in the schematic provided here.



The material that follows provides additional information on how middle mile costs are developed within the BAM.

The approach used to determine middle mile equipment required – and then to compute the related investment costs – is centered in the spatial relationship between the service provider's point of interconnection (POI) with the second and last mile network (designated as a telco central office or a cable headend) and the service provider's access to a Tier 3 internet gateway (a surrogate for such access is assumed to be on a regional access tandem ring).

Central Office Location: the location of each central office (also referred to as POIs, CLLIs and/or Node0s) is obtained from the FCC's TeleAtlas wire center boundaries database. In those situations where there was no central office identified in a wire center boundary, a NECA 4 location point is used. And in those cases where there was no NECA 4 point available, BAM uses the centroid of the wire center. The results of this approach align with the central office/Node0 locations used in the underlying CostPro model used to create the broadband network overall, including last and second mile related equipment and investments.

Regional Tandem Location: Regional tandem (RT) locations (and the relevant feature groups deployed) are obtained from the FCC's LERG database. Each tandem identified as providing Feature Group D access in LERG 9 is designated an RT. As with COs, a latitude and longitude is identified for each RT.

The underlying logic (and the process) of developing middle mile investment requirements is grounded in the assumption that the Tier 3 internet peering point is located on the RT ring – meaning that if the modeled design ensures each Node0 is connected to an RT ring, the corresponding Node0 customers all have access to the internet.

Given this baseline data on CO and RT locations and working under the assumption outlined above, the middle mile processing logic proceeds as follows:

- The Middle Mile process is run state by state. All CLLIs in a state are homed to an RT in that same state
- Within a state, each Node0 (CLLI or POI) is assigned to its nearest RT (Node00) to create the initial spatial relation of (read "parentage") Node0s to RTs.
- Node0 records are then routed to other Node0 records with the same Node00 parent using a spanning tree approach based on the shortest (most efficient) distance routing back to their proper Node00 record.
- The Node00 records within the same LATA are routed together in a ring. To ensure an efficient (and hence 'most likely') design the shortest ring distance is used. The shortest ring is chosen by starting at each Node00 point and storing the ring distances. After stepping through each potential ring route, the shortest ring distance is then used for further computations.

With that information in hand, the BAM develops middle mile costs thru the following steps:

1) The distance of the RT rings is attributed to each Node0 on the ring in proportion to the number of potential customers at each Node0 as compared to the total potential customers for all the Node0s attached to the RT Ring.
2) The distance on the Node0 tree back to the RT is attributed much in the same way as the routing to DSLAMS is attributed. That is, BAM attributes each route based on the cumulative potential customers that can use the route.
3) For electronics, BAM places a DWDM (fiber mux) at each RT and an Edge router at the Node0 location.
4) For the fiber placement, BAM assumes conduit and poles already exist and does not assign additional costs for conduit and pole attachments. However, BAM does compute a cost for fiber and related trenching for the portion that is assumed buried.
5) For the fiber, for trenching and for the DWDM, BAM captures 1/3 of the costs (2/3 of the costs are assumed to be absorbed by uses other than BAM broadband services, e.g., special access applications and legacy voice transport)
6) Finally, BAM allocates the middle mile cost out to each census block (the basic unit of geography in BAM) based on the proportion of potential customers in the census block (as compared to the total potential customers in the wire center/node0 serving area).

As with any modeling approach, embedded in the middle mile costing process are certain assumptions for which one might have an alternative view. The more significant debatable issues in the middle mile computations would include the following:

a) Fiber and related trenching costs are assigned on an equal basis across three broad product lines: voice, data and broadband. This “1/3 each” assumption can be seen as overly broad at the micro level – but within the scope of BAM is employed as a workable / reasonable approach.
b) The electronics used at RT sites (DWDM transport gateway) and Node0 locations (Ethernet switch) are assumed commercially available configurations and costs for multi-service support.
c) Within the BAM logic spanning trees are used to connect Node0s to RTs. To this point, one may argue that that these connections should be made via rings. The BAM includes a tree to route adjustment factor (that attempts to estimate the cost impact of converting from trees to rings). However, even with the adjustment factor, current BAM logic assigns costs in greater proportion to Node0s that are further away from the RT.
d) At a more fundamental level, an additional argument could be made that more or less reliance should be placed on legacy LEC hierarchical network routes in developing Node0 to RT paths. These arguments will of course tend to impact augmentation costs in both directions, depending on one’s view.
e) And in a related argument, one might argue that the incremental traffic associated with introducing broadband service to currently unserved areas is insufficient to cause additional costs (i.e., trigger additional investment) in the middle mile – other than the cost of providing an additional port on the existing transport network.