Use of Proprietary Models

- This is an input issue.

- HMS claim: BCPM relies upon proprietary SCIS/SCM models for switch partitioning. "HM 5.0's inputs for developing switching costs may be entered directly out of contract information on prices paid by LECs for switches."

Fact: SCIS/SCM represent most forward-looking data presently available.

Fact: HM 5.0 relies upon an arbitrary, unsupported allocation for partitioning.

Suggestions:

- Include ALSM sample data from more LECs (open invitation).
- Joint review of SCIS/SCM input data.
- Develop an engineering-based switch model to use as input.

Consistency of Input Values

- HMS claims: BCPM model is inconsistent because it combines SCIS and SCM outputs, while the HM 5.0 data are "internally consistent."

Fact: The BCPM sponsors carefully analyzed the functional investment categories to ensure consistency in the switch partitioning.

Fact: The HM 4.0/5.0 switch curve used data from several unrelated sources (access lines and associated investments are from unrelated sources and from at least one undisclosed source).

Validity of Modeled Cost Development

- HMS claim: The BCPM regression process does not differentiate the switch functional buckets reliably because the input variables are "colinear". HM 5.0 uses "documented engineering rules and traffic equations to convert cost inputs into output switching costs."

Fact: The HMS have mischaracterized the regression estimation process as performing the partitioning. The partitioning is done by the ALSM models. The BCPM performs an independent regression estimations upon each "bucket" to preserve the ALSM partitioning.

Fact: HM 5.0 makes no attempt to model the partitioning of the switch into meaningful functional categories such as line ports, usage, and processor traffic.

Cost Allocation Issues

- HMS claim: "BCPM3's assignment of all start up costs to the processor category appears to have as its purpose the inflation of vertical features costs."

Fact: "Vertical features" are not defined as supportable services. HM 5.0 by including their cost artificially inflates universal service costs.

- HMS claim: "BCPM3's line to trunk ratio is incorrect."

Fact: The HMS have confused the BCPM "line to trunk ratio" and Line Concentration Ratio (LCR). The LCR is not an input to BCPM. The BCPM line to trunk ratio is used to compute the number of trunks on each switch. The LCR is an engineering input for the ratio of line terminations to internal speech links.

- HMS claim: BCPM3 excludes certain remotes from allocation of host processor costs.

Fact: Host processor costs are allocated evenly across all switches in the complex based on call rates.

Interoffice Transport

Interoffice Transport

Assertion: The BCPM 3.0 transport calculations attempt to replicate the basic structure of the LEC's embedded interoffice network rather than a forward-looking network.

Fact: The design of the BCPM 3.0's transport module is consistent with the guidelines established by the FCC in their Sept. 3rd Public Notice.[3] The Bureau explicitly recommended that:
"the models' interoffice network modules be capable of accommodating a switching module, as discussed above, that identifies switches as host, remote, or stand-alone. The models' interoffice modules should therefore be capable of accommodating interoffice facilities that will successfully interconnect the switches as assigned by the switching module. As discussed above and in the FNPRM, the accurate computation of switching costs may require the separate identification of host, remote, and stand-alone switches.[4] As the model proponents have informed us,[5] this type of switch identification requires that the interoffice network be designed to account for individual switches' identity as a host, remote, or stand-

[3] See FCC's Public Notice, "Guidance to Proponents of Cost Models in Universal Service Proceeding: Switching, Interoffice Trunking, Signaling, and Local Tandem Investment" released September 3, 1997, CC Docket Nos. 96-45 and 97-160.

[4] See FCC's "Further Notice of Proposed Rulemaking" Released July 18, 1997, CC Docket No. 96-45 and CC Docket No. 97-160 at paragraphs 129-31.

[5] See letter from Glenn Brown, U S WEST, to William Caton, FCC, dated Aug. 7, 1997 and Letter from Chris Frentrup, MCI to William Caton, FCC, dated Aug 7, 1997.

alone switch. We therefore recommend that the model proponents ensure that their models possess this capability.

To this end, the models should accommodate an interoffice network that is capable of connecting switches designated as hosts and remotes in a way that is compatible with the capabilities of equipment and technology that is available today and current engineering practices. The model proponents should be able to demonstrate such compatibility."

The BCPM 3.0 developers use the Local Exchange Routing Guide (LERG) to determine the existing transport routes, consistent with the FCC guidelines that the interoffice network is compatible with current engineering practices. The LERG is not proprietary information. The LERG is copyrighted information in a database format owned by Bellcore. The BCPM 3.0 sponsors have made arrangements with Bellcore for the release of the relevant LERG at a nominal fee to BCPM 3.0 users. The Enhanced LERG Switch Data (ELSD) is extracted LERG data modified for input into BCPM 3.0. The BCPM 3.0 developers assume the ELSD to be default inputs to the BCPM which allow evaluation of the model. The ELSD provides the user with control over the Model's independent variables addressing tandem, host, remote physical locations and the connection of interoffice facilities. While BCPM 3.0 uses the present homing relationships and switch types, this does not imply that these relationships can not be changed, but validates that the modeling process is working correctly. The user can modify the output by adding, deleting, or modifying this input file. Since the LERG identifies and locates today's switching nodes as well as the

host/remote relationships, the BCPM sponsors believe that the ELSD based upon Bellcore's LERG database best meets this need for a national model, consistent with the FCC's guidelines suggesting that the proxy models should use as a starting point the existing LEC switch network.

Existing homing relationships are used because we know that viable transport media and routes exist and hence, are the logical starting point for any forward looking cost study. Modeling the existing transport routes is critical because it ensures that the routes chosen are feasible, given issues such as topography and rights of way and jurisdictional boundaries. The ELSD contains the collective wisdom of network planners and engineers who have first hand knowledge of the geographic areas served and ILEC network relationships.

Ironically, the Hatfield developers continue to advocate an interoffice network that is inconsistent with a forward-looking network design. In particular, Hatfield recommends the design of point to point transport routes. LECs are placing selfhealing rings wherever possible, as the first choice of network design, primarily for redundancy purposes. Indeed, the inclusion of penalty clauses for network failures in IXC contracts with LECs reflects the IXCs' expectation regarding network reliability. These IXC requests are inconsistent with Hatfield's embedded design approach with a single cable on a point to point route with a chance of network failure. BCPM 3 complies with the Sept 3 Public Notice "The Bureau recommends, to protect adequately against network failure, that the models ensure that the facilities interconnecting each office with the

rest of the interoffice network provide at least one level of redundancy."[6] Sprint LTD's network planners have indicated the number one cause of network failure is due to cable cuts supporting the Bureau's recommendation.

The transport module has three different size/bandwidth SONET terminals (OC3, OC12, OC48). The Model's algorithms select the appropriate terminal size/bandwidth based on traffic demands, making it an efficient model while building in redundancy to the network. All of these items are requirements of the FCC's Sept. 3rd Public Notice. Moreover, BCPM 3.0 uses today's equipment cost for SONET terminals, fiber and switching.

In summary, BCPM3's common sense decision to use the LERG accomplishes the following: 1)provides a solid foundation for the types and relationships of switches deployed today: remote, host, tandem; 2) ensures that there is a viable transport route between these locations today; and 3) uses the only data source publicly available, that reflects engineering practices and decisions for switching and transport. If the LERG is not used as a data source for universal service, we are ignoring widespread engineering practices and cumulative experience of the nation's engineers that have built the world's best telecommunications network.

Assertion: BCPM 3.0 does not model a forward-looking network because it uses manual digital cross connects rather than automated digital cross connects.

[6]See FCC's Public Notice, September 3, 1997 at Section II. A. Design of the Interoffice Network.

Fact: Automated digital cross connects are excluded from the BCPM 3.0 transport module. The LECs use predominately automated digital cross connect systems at their tandem locations where they have a large concentration of circuits. These automated digital cross connects are typically associated with the provisioning of dedicated special services, many of which are requested by the IXCs. In modeling basic service, BCPM 3.0 provides the cost of interoffice transport connections of umbilical switching trunks to a remote. Although most LECs monitor the traffic load on these umbilical links and interoffice trunks in DS1 bandwidth increments regularly, trunk/umbilicals quantities are typically resized no more frequently than semiannually, depending on traffic load. For universal service purposes, the BCPM 3.0 sponsors advocate the use of manual cross connect technology as a more cost effective solution since these switched umbilical and interoffice trunks are not rearranged frequently. The use of automated digital cross connect technology at every node location would cause a cost increase in the interoffice transport element for Universal Service that is not warranted.

Assertion: BCPM 3.0's transport module conflicts with accepted practices because it populates rings with wire centers operated by different operating companies.

Fact: There are thousands of cases were LECs have interconnecting rings between companies. Furthermore, recent FCC orders require LECs to negotiate with each other and develop contract rates for ILEC to ILEC interconnection agreements. Many of the independent

LECs depend on larger LECs for transport through meet point arrangements where they do not have contiguous service territories. Small independent telephone companies also rely on large LECs for tandem switching in support of host/tandem configurations. In addition, there are Coops in certain areas that handle tandem switching and transport for the independent LECs.

Assertion: BCPM 3.0 does not include investments for inter-tandem connections.

Fact: A cost proxy model designed for universal services should reflect the cost of providing/using interoffice facilities solely for the purpose of providing basic service. The FCC articulates this perspective in their July 18th FNPRM as follows: "We recognize two uses for interoffice trunking, signaling, and local tandem facilities: (1) the completion of local calls and (2) transport to an IXC point of presence (POP). Because transport for interexchange service is not a supported service, the selected mechanism will estimate only the cost of interoffice trunking, signaling, and local tandem facilities used for the completion of local calls."[7]

The Inter Tandem rings/connections that the Hatfield developers allude to are predominately used for toll services. BCPM 3.0 transport module provides a forward-looking design of interoffice transport that estimates the cost of interoffice trunking used for the completion of **local** calls.

[7] FNPRM, Ibid., paragraph 139.

Assertion: BCPM 3.0 is inconsistent in the assumptions used in the switching module, *vis a vis* the transport module, especially with respect to using a single ratio of lines to trunks for all switches.

Fact: The Hatfield developers are incorrect in their assertion that BCPM 3.0 uses a single line to trunk ratio. The BCPM 3.0 transport module utilizes two ratios of lines to trunks which are applied differently: 1) the line to trunk ratio for host/remote umbilical links (speech links); and 2) the line to trunk ratio for host/tandem trunks. These two inputs address the preponderance of HM proponents concerns. Remotes generally represent smaller switches and serve predominately residential areas.

Assertion: BCPM 3.0's transport module relies on a single ratio to determine the number of special access lines as a fraction of total lines in the wire center. Furthermore, BCPM 3.0's transport module uses the same input values, except for wire-center-specific lines counts (if available), for all LECs in a state.

Fact: This too, is an input issue and not a platform issue. The inputs can be modified as desired by the user.

Assertion: BCPM 3.0 does not utilize folded rings when an isolated wire center links to the tandem.

Fact: HM proponents criticism highlights their design flaw and inherent trend toward designing folded rings as a priority. Use of a

folded ring in BCPM 3.0 is a choice of last resort and rarely happens. BCPM 3.0's transport module has a more forward-looking design than the HM.

Assertion: BCPM 3.0 requires that the tandem be a node on every ring, resulting in a highly inefficient arrangement.

Fact: This assertion is incorrect. As described in the BCPM 3.0 Model Methodology, "The Model begins by creating a forward-looking ring, connecting all remotes to their hosts and hosts to their tandems. It assumes that all remote offices are connected to their respective host offices by SONET rings. If there is only one remote, a folded ring is assumed. All host offices are connected to their tandems by SONET rings."[8]

Note that none of the host remote rings have a tandem node as a part of the ring.

See the attachment labelled "BCPM Interoffice Transport Architecture" as a correct representation of the BCPM 3.0 transport design illustrating host-remote rings and host-tandem rings.

[8] See "Benchmark Cost Proxy Model Release 3.0 Model Methodology" December 11, 1997 Edition, Chapter 8, "Transport".

Fact: BCPM 3.0 Transport Design Is Forward Looking

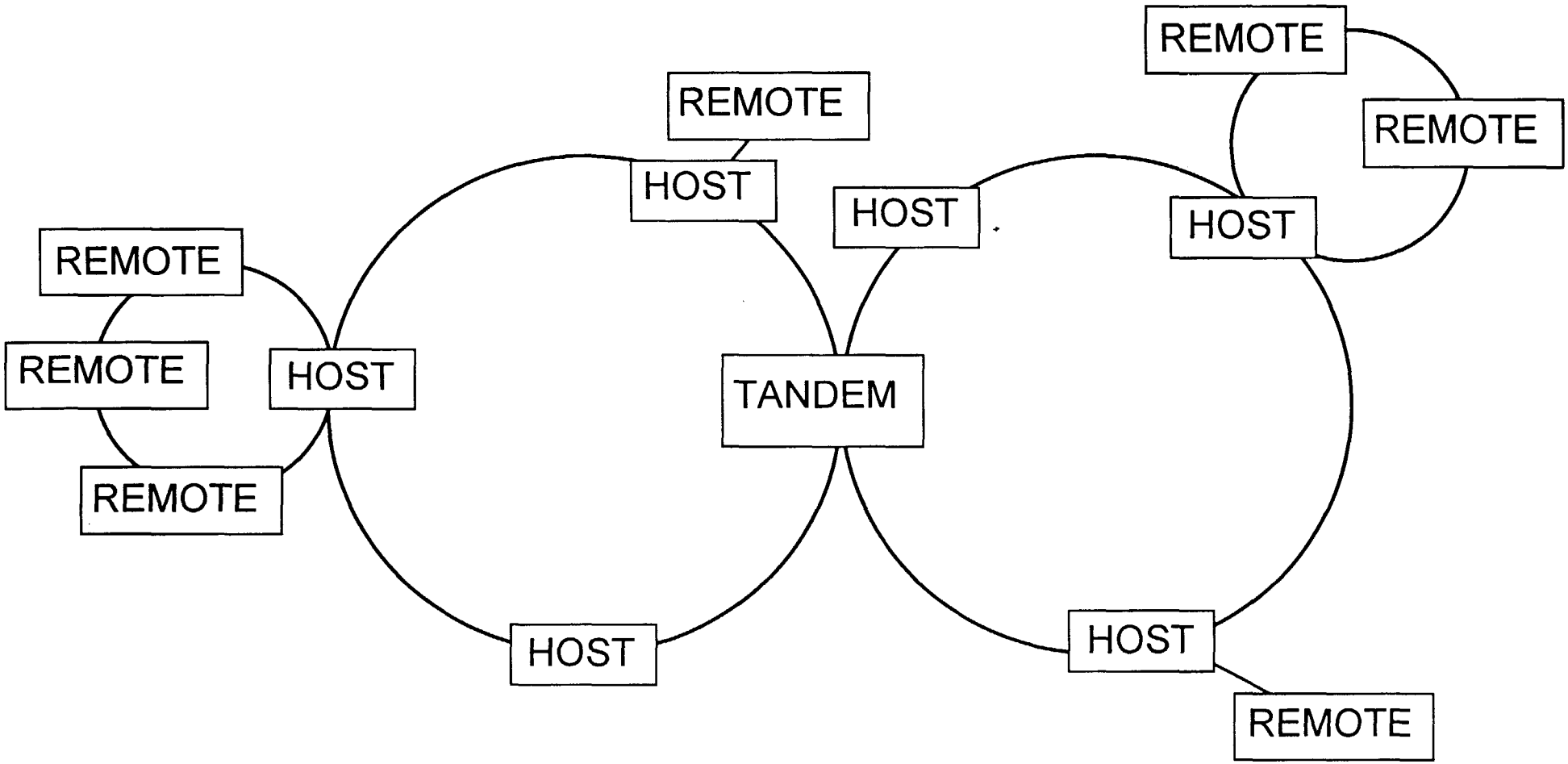
- Creates Forward Looking SONET Rings
- Connects All Remotes To Their Host Via SONET Rings
- Connects Hosts To Their Assigned Tandem Via SONET Rings
- Models Folded Rings Where Appropriate
- Builds In Redundancy (Reflecting Increased Reliability)
- Maintains Interdependency Between Transport And Switching
- Estimates Only The Cost Of Transport For The Completion Of Local Calls

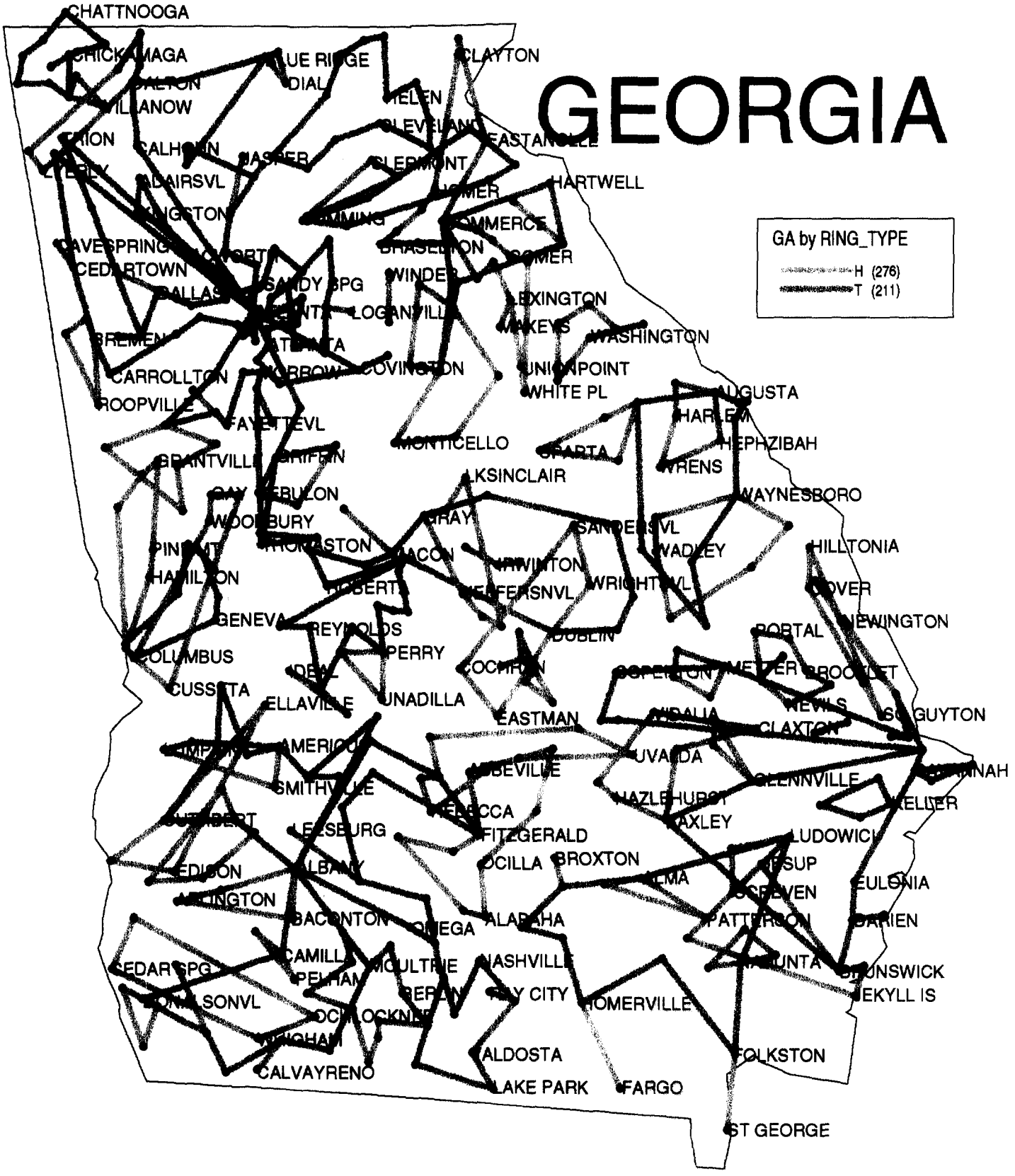
Assertion: BCPM 3.0 Replicates The LEC's Embedded Interoffice Network.

Fact: BCPM 3.0 Reflects Most Reasonable View Of A Forward Looking Design

- Most Current & Reasonable Data To Reflect Transport And Switch Interdependencies
- Publicly Available Data (LERG Is Copyrighted But Available For A Nominal Fee)
- Model Users Can Modify Host-Remote Relationships
- Reflects Meet Point Arrangement Of LEC's Today

BCPM Interoffice Transport Architecture

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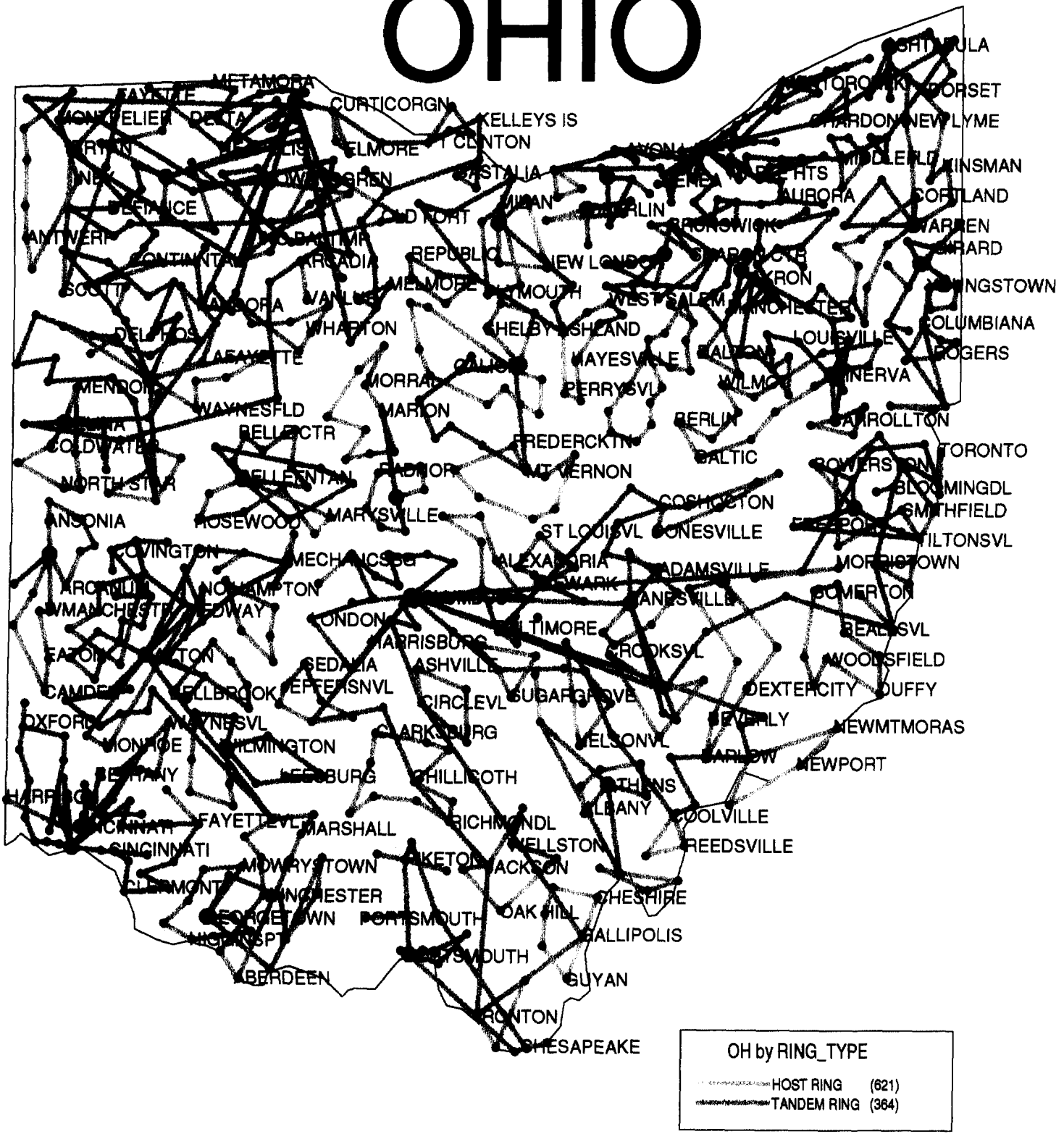
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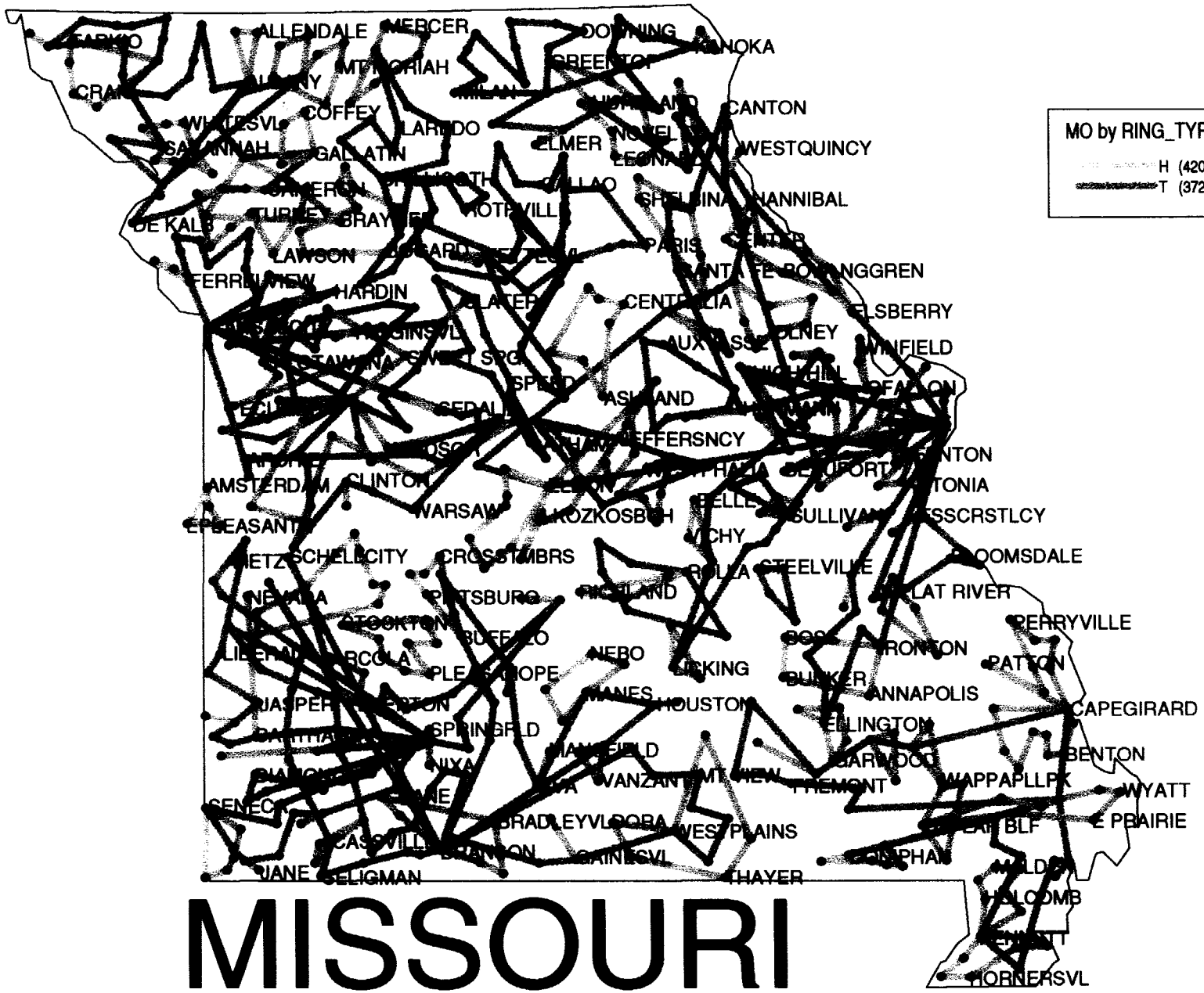
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BLOOMSDALE
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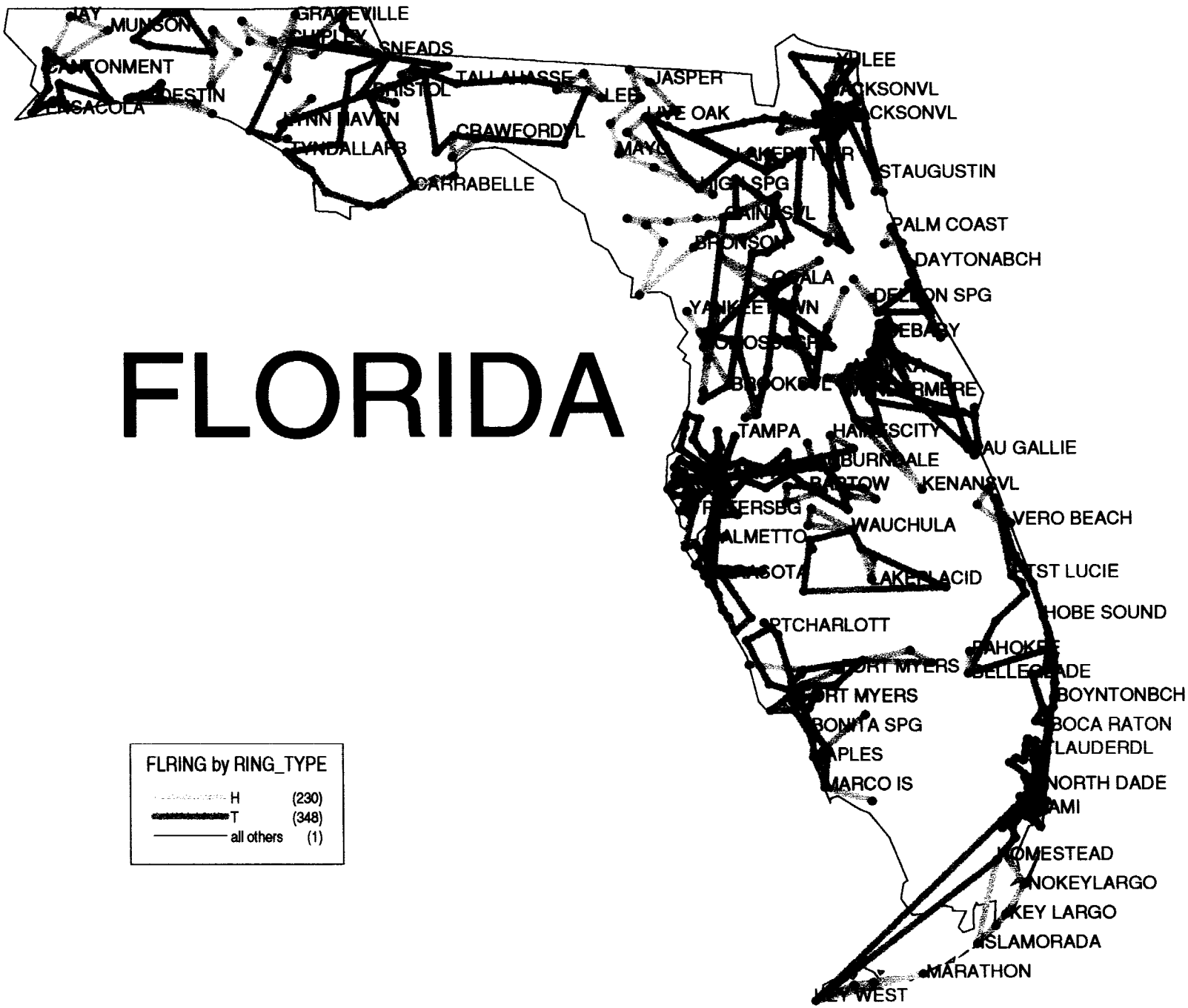
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KENANSVL
VERO BEACH
WAUCHULA
HOBE SOUND
PTCHARLOTT
BOYNTONBCH
BOCA RATON
NORTH DADE
MARCO IS
NOKEYLARGO
KEY LARGO
MARATHON
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H (230)
T (348)
all others (1)

Signaling

Signaling

Assertion: BCPM includes the cost of constructing a two-level network (i.e. the network consists of two levels of STPs). Two-level signaling networks are not needed for local service.

Fact: The BCPM 3.0 signaling module, SCPM, places at least one local STP pair per LATA, just as HM 5.0 does. V & H coordinates contained in the LERG are used to calculate the link distances from switching offices to the local STP within each LATA. Although the link distance calculations within HM 5.0 are concealed, HM 5.0 likely relies on the LERG data to perform this same function. At the user's discretion, an alternate set of data which contains the V & H coordinates of switching offices may be provided for the SCPM link distance calculations.

Both SCPM and HM 5.0 represent a cost for Local Number Portability (LNP) within the Universal Service support calculation. In order to provide LNP capability, an STP must query the LNP database(s), an SCP, to obtain the appropriate routing information. A signaling architecture which provides an LNP SCP in each LATA would yield a single tier signaling network capable of offering LNP. However, given that SCP investments are substantial, a significantly higher per line signaling cost would result. Since the cost of LNP within HM 5.0 is simply a user input with no supporting calculations evidence, HM 5.0's treatment of the LNP SCP investment cannot be analyzed. SCPM elects to consolidate LNP traffic at the Regional STP level,

a.k.a. the second tier, to more efficiently manage LNP signaling message handling and reduce the SCP requirement. In addition, SCPM is designed to accommodate unbundled network elements in addition to USF cost support. The second tier is used to manage all database query activity, such as 800 dialing and credit card verification, in a manner similar to LNP queries. The cost of handling this additional signaling traffic at the Regional STP is not reflected in the USF signaling investment per line in the model runs provided to the FCC on 12/11/97. When the costs of the second tier are included, only a portion of the second tier's costs, those costs related specifically to LNP activity, may be attributed to local service.

Other Items

BCPM Data Costs
HCPM Grid Maps
Metromail Address Counts
BCPM3 FCC National Run Summary Results

Data Used in BCPM Development
(Necessary for Administrator to Maintain)
Updated 1/14/98

It is important to recognize that the BCPM Sponsors have purchased all of the data for the model (with the exception of the LERG data needed for the Transport and Switching Modules) so that the model and any necessary data could be made public. The LERG data requires a minimal user fee along with the need to sign an agreement.

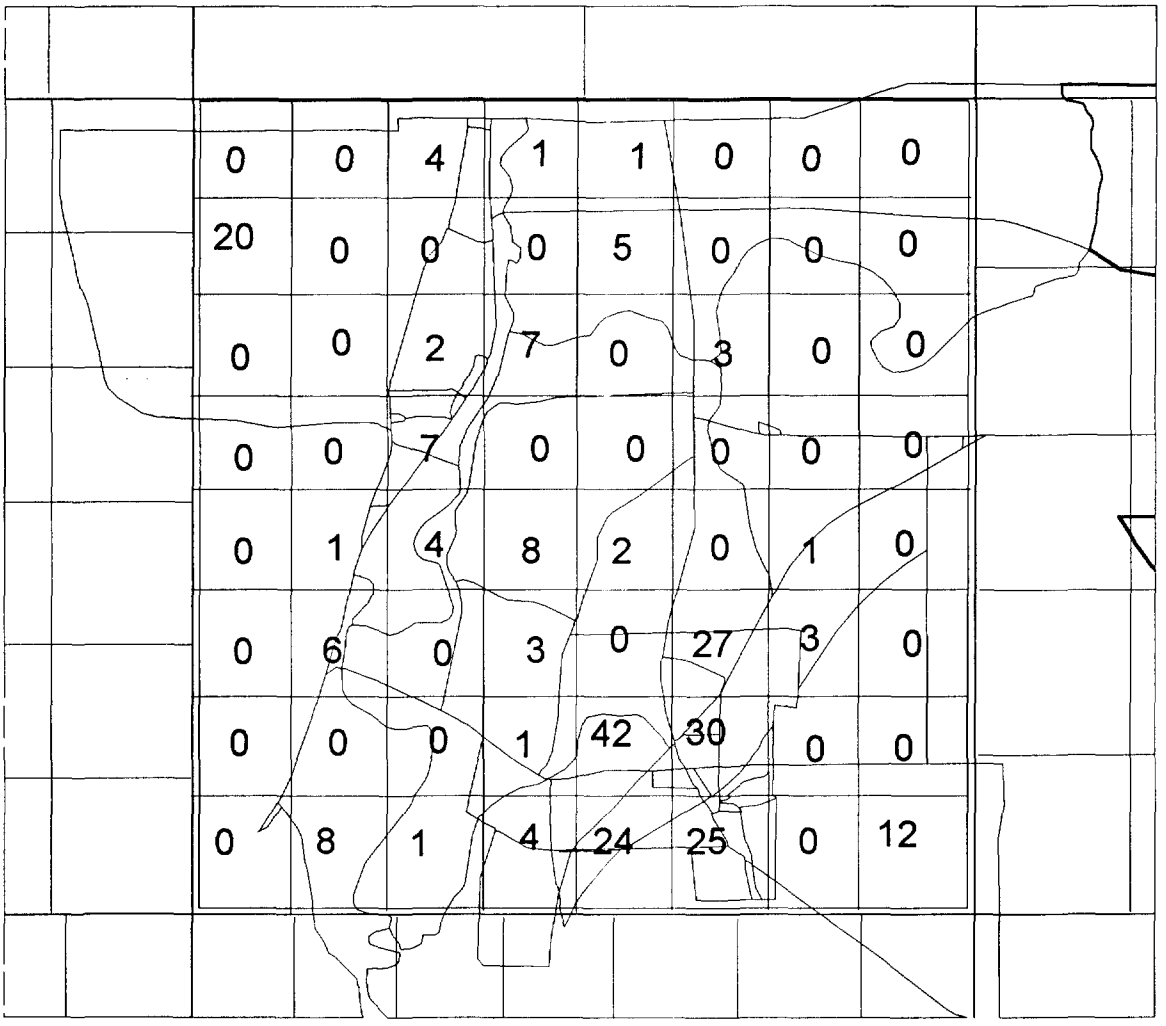
This data includes algorithms utilized in preprocessing, such as creation of ultimate grids and the allocation of lines to those grids. These have been provided to the FCC by the BCPM Sponsors.

When the Fund Administrator takes over the upkeep of the model, some data will need to be refreshed on a periodic basis. The items listed below are what will need to be maintained.

From BLR	
BLR Wire Center Premium Package (single user license)	**$14,500**
From Bellcore	
Bellcore LERG Updates	**< $1,000**
From PNR	
PNR Business Line/Firms by Census Block Purchased by Joint Sponsors as part of larger package of Sprint purchases for approximately $60,000. Stand alone price estimated at $100,000, but actual quote must come from PNR.	**Est. $100,000**
Acquired by Stopwatch Maps	
Road data from TIGER CD-ROMs	**$1,500**
Units-in-Structure Data from Claritas (single user license)	**$1,500**
Products of Stopwatch Maps	
Census Block Boundaries w/Basic Demo (single user license)	**$2,000**
Grid State Terrain Data (single user)	**$6,000**
Software	
MapInfo Professional 4.1	**$1,295**
MapBasic 4.1	**$795**
Visual C++	**About $600**
Stopwatch Maps utilities and library routines previously developed to deal with data in MapInfo form (single user)	**$6,000**
TOTAL	**$135,190**

Special Note: If Stopwatch Maps is retained to refresh data and provide additional services, charge is $50,000 for time, services, etc.. However, deduct $12,000 ($6,000 Utilities/libraries and $6,000 Grid State Terrain Data) from total.

Waterford, Pennsylvania Wirecenter
HCPM Census Blocks Contained within a Macrogrid



* Census Blocks whose centroid falls within the boundaries of the HCPM macrogrid have been identified by a slight shading. Notice that the area of those cbs is less than the area of the macrogird itself making the proper division of that unit into squares that are equal to the average area of the included census blocks impossible (macrogrid census blocks = 9.78 sq mi, macrogrid = 11.56 sq mi). The opposite occurance (i.e., the sum of the census blocks being greater than the area of the magrogrid) also frequently occurs. In fact, the possibility of the area of included census blocks equaling the area of the macrogrid is very unlikely.