Application of Forward Looking Cost Models to Interconnection Pricing and Universal Service

William W. Sharkey

Federal Communications Commission

William.Sharkey@fcc.gov
http://www.fcc.gov/wcb/tapd/hcpm/

Overview

- Forward-looking economic cost (FLEC)
  - Alternative cost concepts
  - Methodologies for computing FLEC
- Universal service
- Access pricing and interconnection
- International Applications of HCPM

Forward-Looking Economic Cost

- Represents the cost of a competitive new entrant with newly constructed facilities if it:
  - Operates efficiently using modern technology employed in efficient network configurations
  - Serves the total demand for costed item
  - Serves customers located in their current positions connected by efficient network routing to efficient switching machines
  - Earns a “normal” return appropriately adjusted for risk

Definition of Efficient Network Model

- Most economically efficient technology capable of providing stated level of service
- Model should reflect substitution between technologies as relative prices change
- Model should be flexible enough to accurately describe local conditions

Implications of FLEC Assumption

- Embedded network is irrelevant
  - Except for scorched node wire center assumption
  - Assists consistency with record-keeping and geographical constraints
- Assumes use of only current best, least-cost technologies
- Costs must be those of a network that is efficient for the desired purpose
  - voice grade network for universal service
  - higher quality network design may be appropriate for interconnection and unbundled element pricing

Advantages of Proxy Model Approach

- Proxy modeling:
  - Minimizes data collection requirements and administrative burdens on companies
  - Is the only methodology reasonably capable of needed levels of disaggregation
  - Addresses consistently the costs of families of interrelated network elements
  - Provides transparency and rigor to the costing process

Universal Service Objectives

- Provide “affordable” service to customers in high cost areas
- Access to advanced telecommunications services for schools, health care and libraries
- Support for low income customers

Universal Service High Cost Mandates

- Make implicit subsidies explicit
- Base subsidies on forward-looking, not embedded cost
- Subsidies must be transferable between carriers; any company providing the service may collect the funds

Mechanisms for Achieving Universal Service Objectives

- High cost: rate averaging and explicit subsidies funded by a tax on all telecommunications carriers
- Schools and libraries: discounts on purchase of advanced services; subsidized internet access; both subject to a funding ceiling
- Health care: similar to schools and libraries
- Low income: existing lifeline and linkup programs

Current Issues in Universal Service Funding

- Reliability of proxy cost models
- Selection of inputs appropriate for universal service funding objectives
- State versus federal regulation
- Quality standards
- Size of high cost fund

Forward-Looking Universal Service Costs (U.S. Experience)

- High cost support is driven primarily by the cost of the local loop

	Local Exchange Cost by Network Element*				
	Loop	Port	EO Usage	Signaling	Transport
% of Total	77.4%	15.4%	3.6%	0.9%	2.7%
* Based on August 2003 run of Modified Synthesis Model in Virginia					

Forward-Looking Universal Service Costs (U.S. Experience)

- Loop costs are driven by the density of the subscriber base

Loop Cost per Month by Density Zone*		
	(# per square mile)	
	Monthly Cost	% of Total Lines
0-5	$164.24	0.29%
5-100	$52.10	7.50%
100-200	$23.30	3.93%
200-650	$17.24	13.67%
650-850	$15.06	4.79%
850-2550	$13.25	33.46%
2550-5000	$11.38	19.17%
5000-10000	$10.35	8.90%
10000+	$9.09	8.28%
* Based on outputs of HCPM model for large US companies		
using May 27, 1999 Input values		

Use of Forward-Looking Cost Models for Interconnection and Access Pricing

- Interconnection rates are currently set by negotiation
- Access is interconnection sold to IXCs and is currently priced based on fully distributed embedded cost methods
- Both interconnection and access prices can be flexibly and reliably estimated using proxy models of the underlying engineering and economic production processes

Interconnection Pricing Issues

- Potential for regulatory arbitrage and other problems due to:
  - Inefficient or inconsistent rate levels
    - Example 1 -- ISP reciprocal compensation
    - Example 2 -- Internet telephony
  - Inconsistent rate structures among different access regimes
    - Example 1 -- Incumbent offers flat-rate Internet access to its retail customers, but not wholesale customers -- Creates potential price squeeze problem

Pricing Issues

- Criteria for Competitive Neutrality
  - Cost recovery should not differentially affect a carrier's ability to win a customer
  - Cost recovery should not differentially affect a carrier's ability to earn a normal return (e.g., charging both the incumbent and a small entrant $1 million may drive the smaller carrier out of business)

Rate Structure Issues

- Setting efficient rate structures is as important as setting efficient rate levels
  - Inefficient rate structures cause inefficient use of the network -- e.g., recovering the non-traffic-sensitive (NTS) cost of a loop through per-minute charges leads to inefficient utilization
  - Inefficient wholesale rates tend to be translated into inefficient retail rates
  - Inefficient rate structures may lead to regulatory arbitrage.

Rate Structure Issues

- Alternative rate structures
  - Per-minute charges (most long-distance service and local service in some areas)
  - Per-call charges (for local calls in some areas)
  - Flat, monthly charges (most U.S. local service)
  - Capacity-based charges (certain transport and data services; wireless bucket of minutes plans)
  - Single, nonrecurring charges (e.g., cost of initiating service or or ordering an additional dedicated transport link)

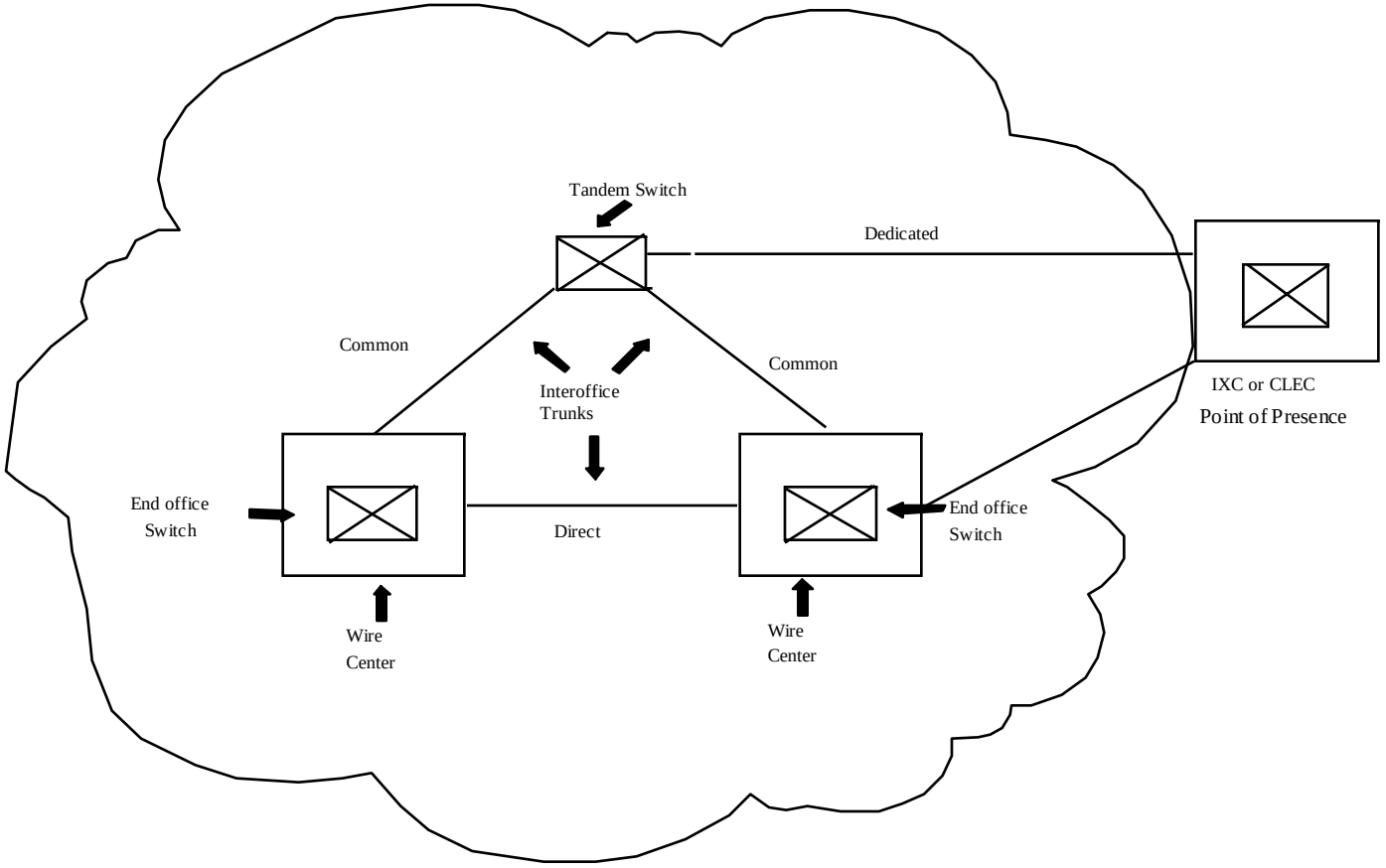
Examples of Rate Structure Rules

- Recurring Costs -- Should be recovered through recurring charges
- Non-recurring Costs -- General principle suggests that it be recovered through a non-recurring charge (NRC)
  - However, because NRCs represent a sunk investment, and thus constitute barriers to entry, a recurring charge is often employed
  - If a recurring charge is used, carriers should not be allowed to recover non-recurring costs more than once

Examples of Rate Structure Rules

- Dedicated Facilities -- Cost of dedicated facilities should be recovered through flat, monthly charges (e.g., unbundled loops, dedicated transport).
- Shared Facilities
  - If shared facilities are subject to congestion, peak-load pricing is most efficient.
  - Second-best solutions include: (1) per-minute rates; and (2) flat, capacity-based rates.
  - Flat rate for NTS costs (loops)

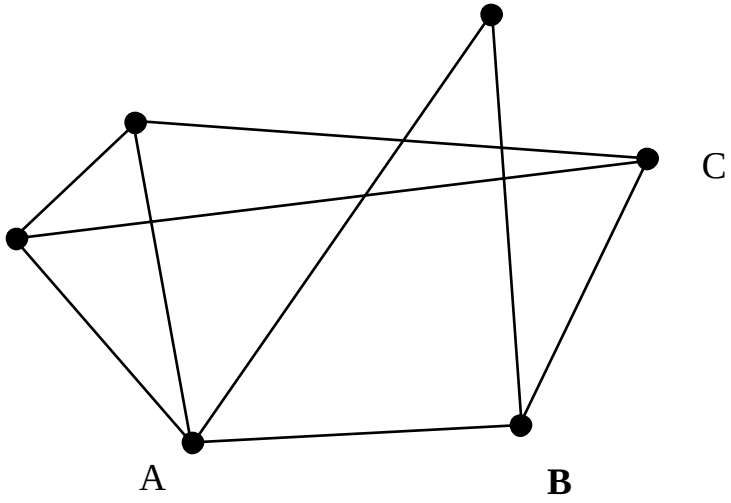
The Switching and Interoffice Network



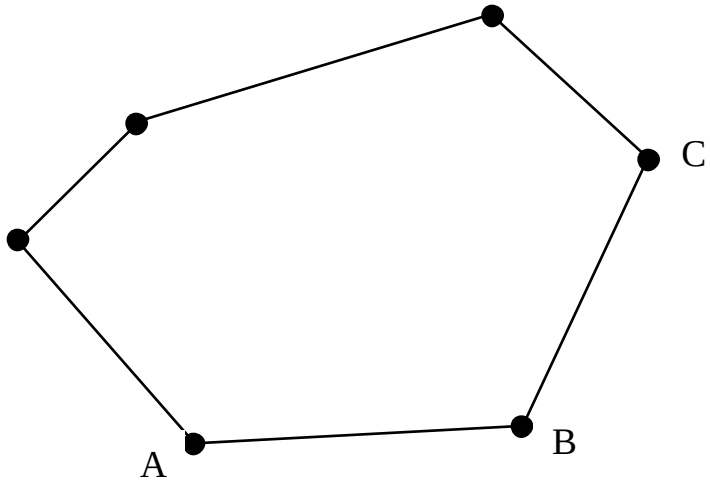
Switching Costs

- Line ports
- Trunk ports
- Common control call processing
- Signaling network costs

Interoffice Networks

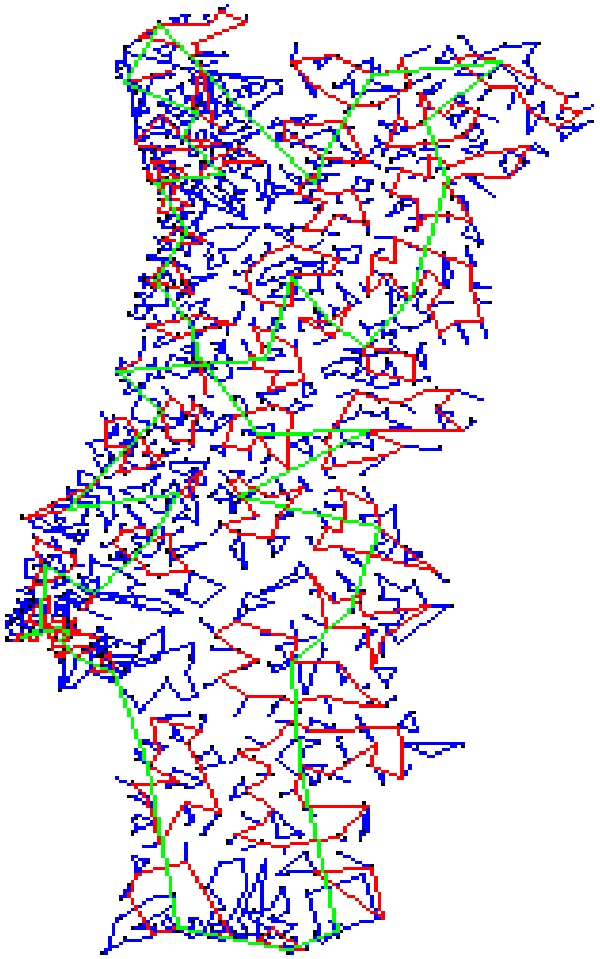


(a) Mesh-like Interoffice Network **b**



(b) Interoffice Ring Network

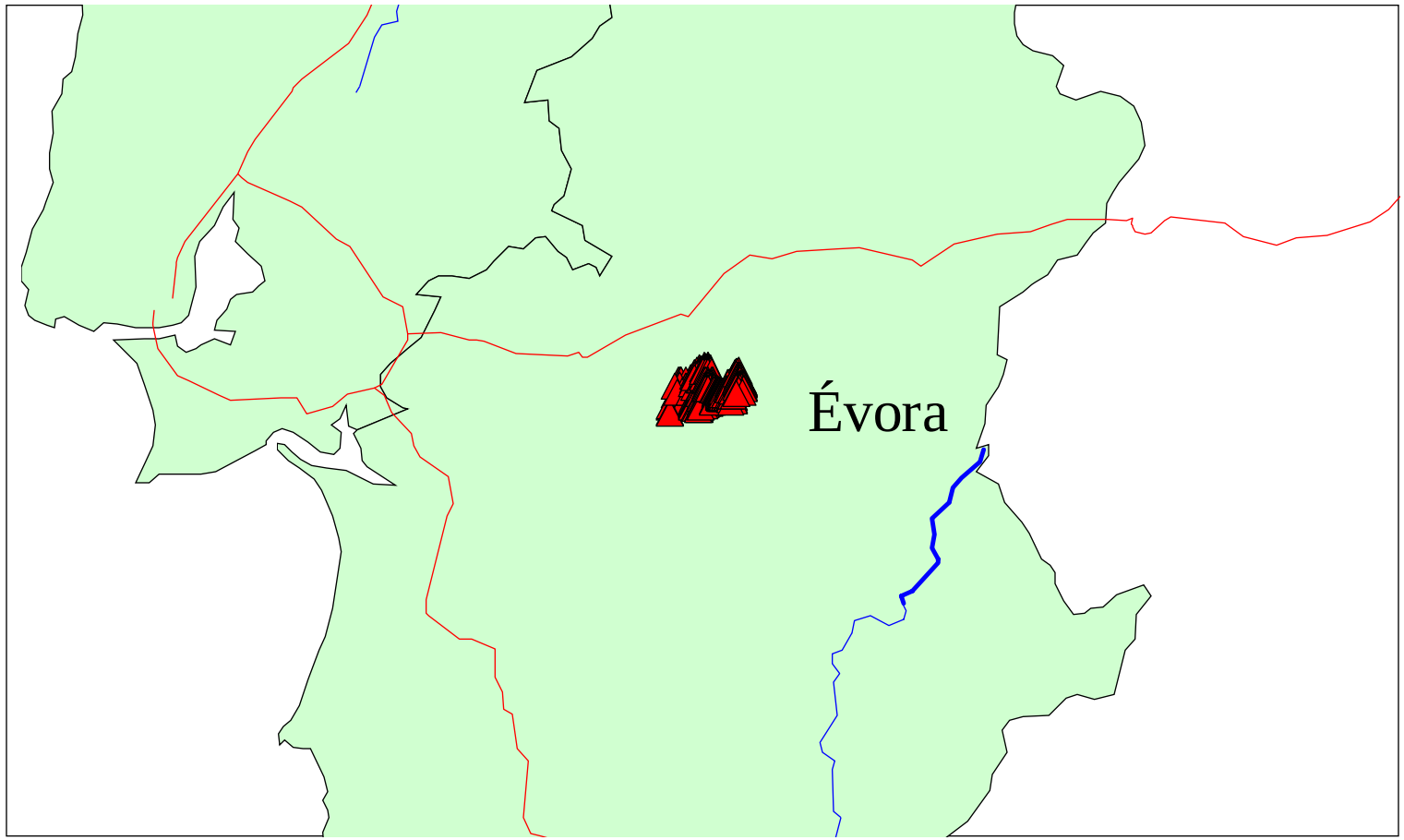
Model Generated SONET Rings for Portugal Telecom



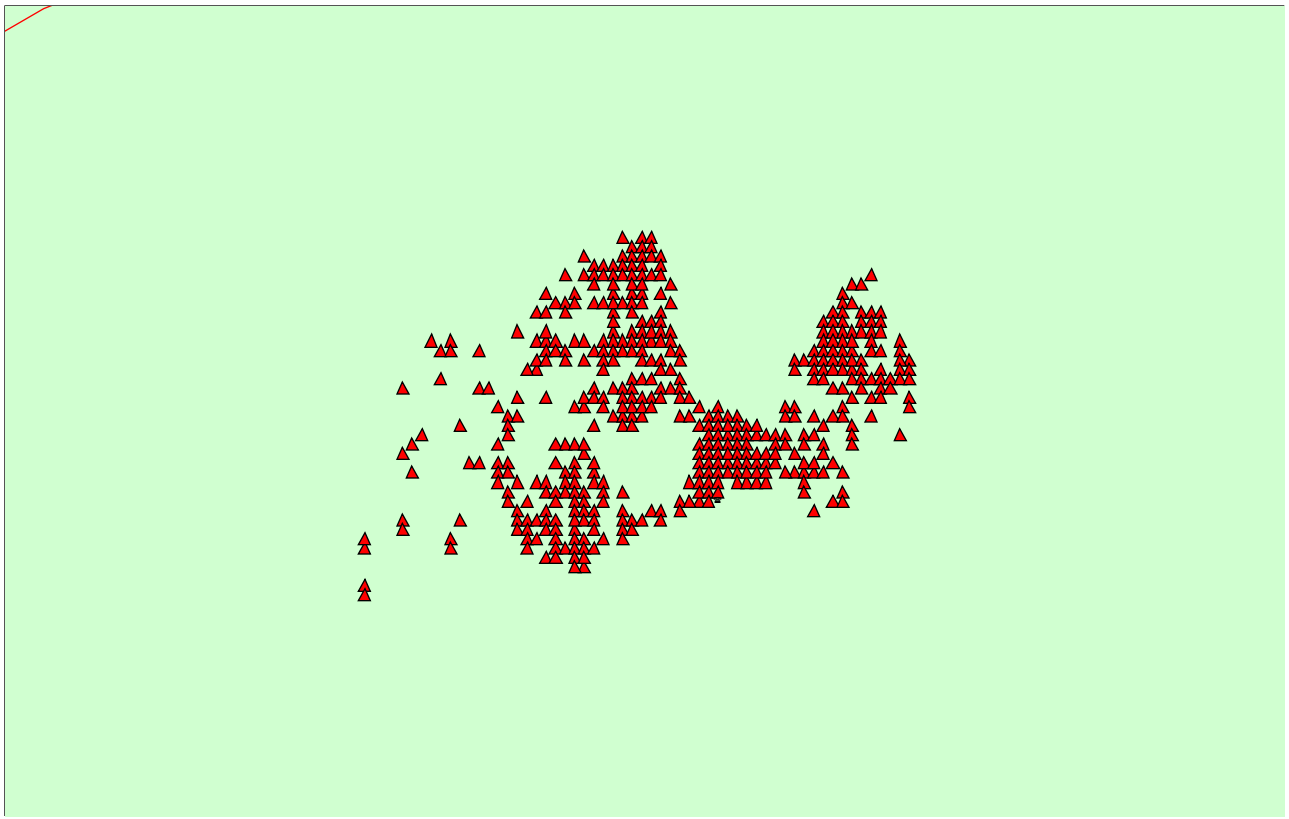
International Applications of HCPM

- Portugal
- Argentina
- New Zealand

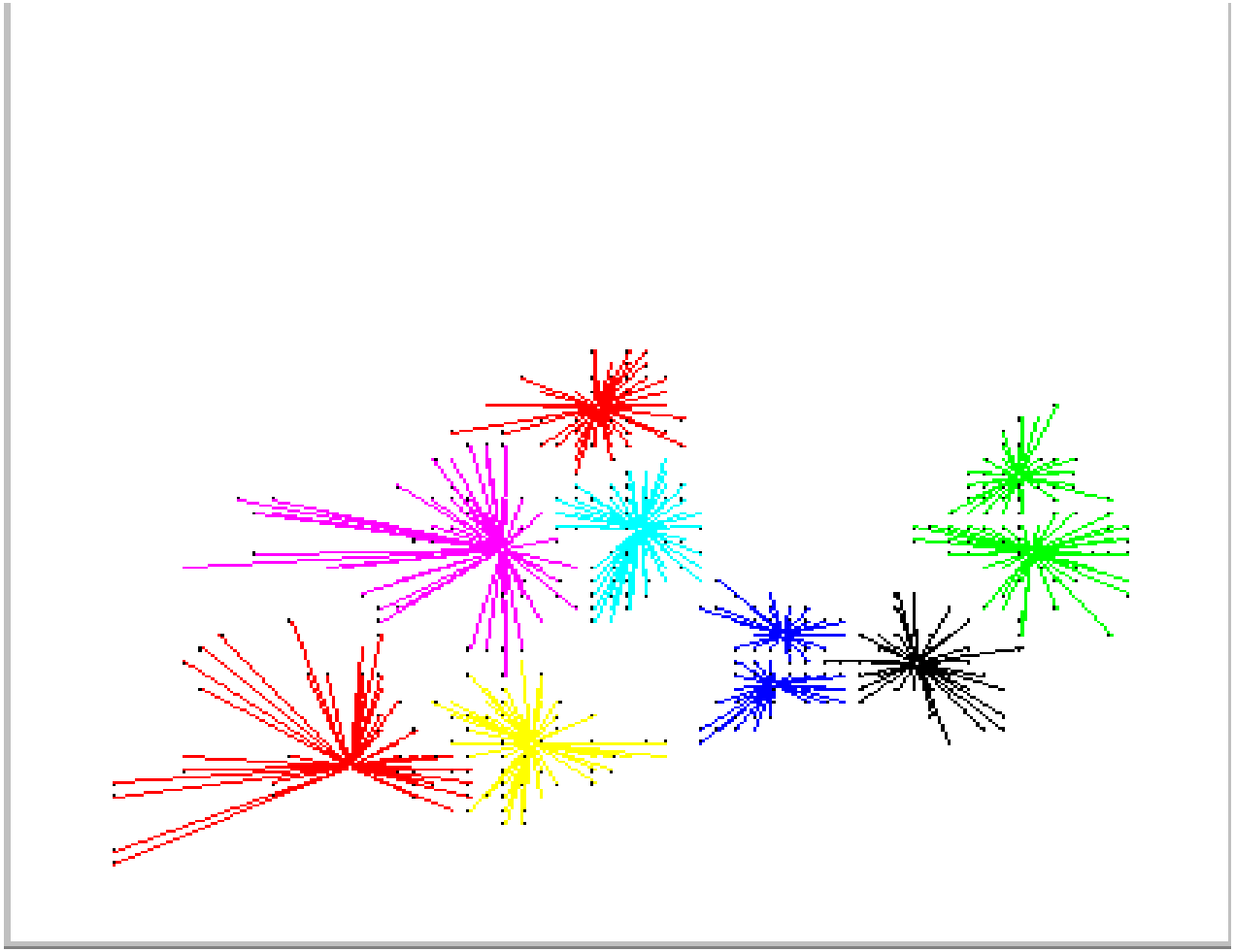
Geocode and Surrogate Locations, Évora service territory



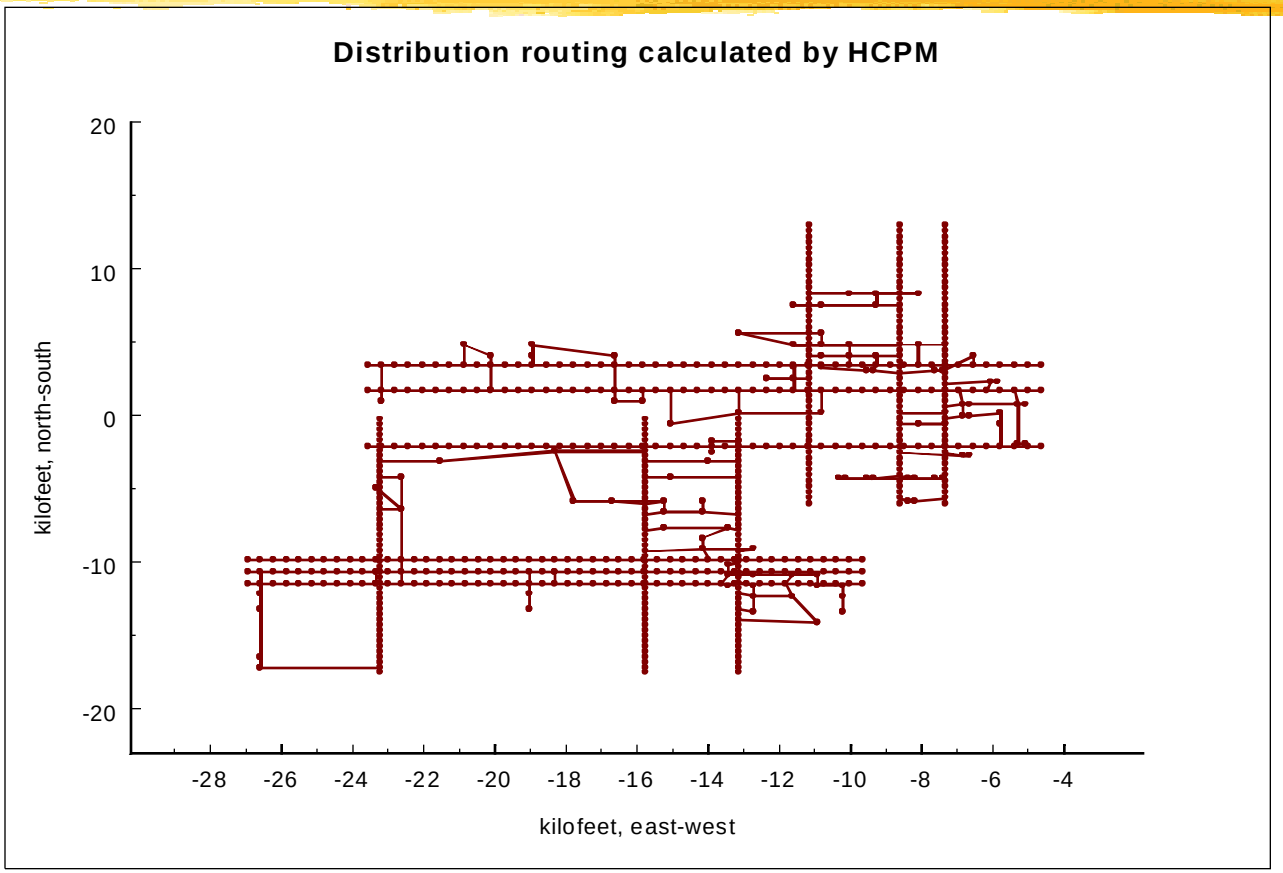
Closer view of Évora locations



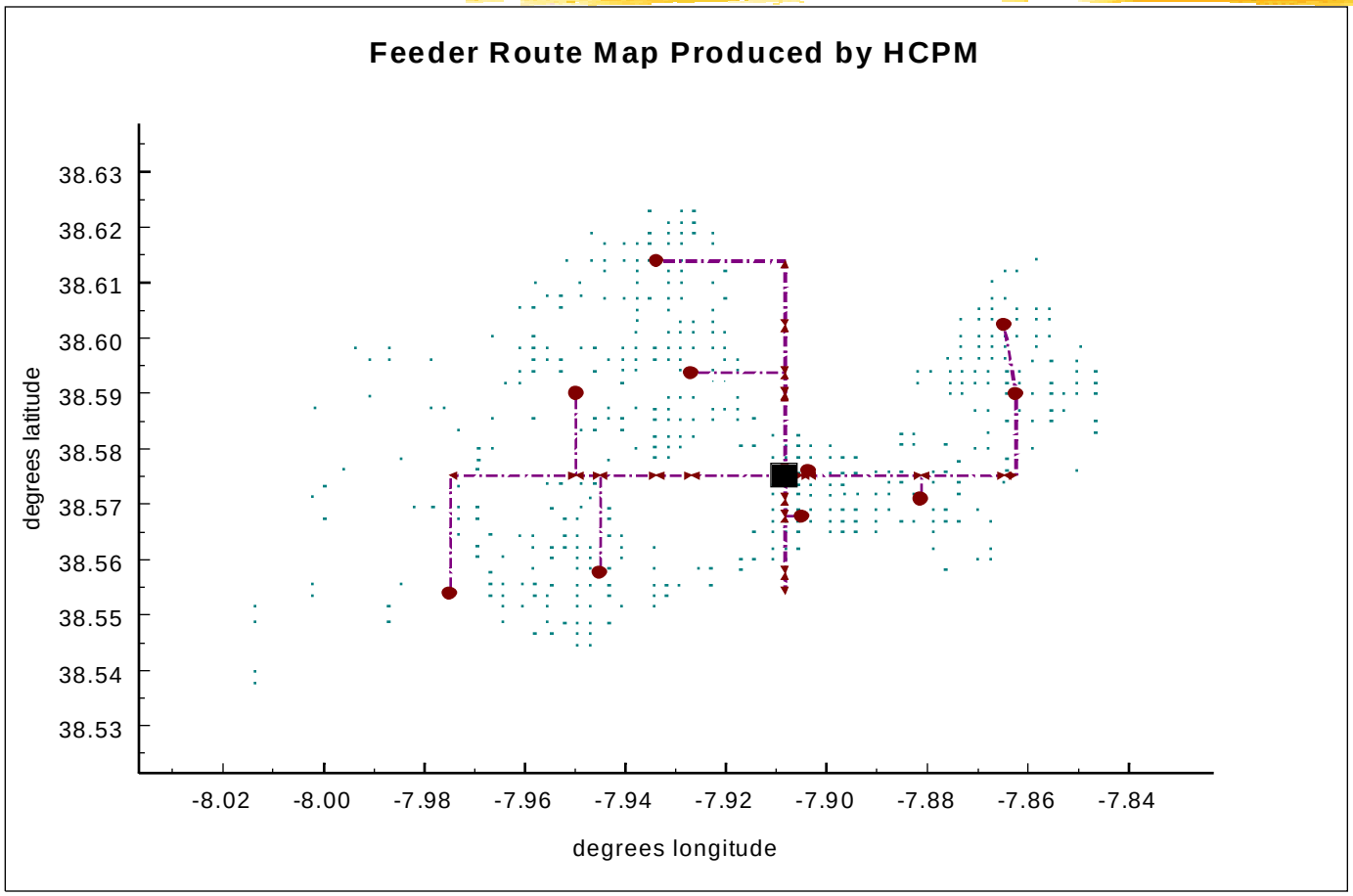
Clusters Created for Évora



Distribution Network for Évora



Feeder Network for Évora



Application of HCPM in Argentina

- Data collected and analyzed by independent team at Universidad Argentina de la Empressa (UADE) in collaboration with the World Bank
- Pilot study in two cities: Cordoba and Mendoza
  - customer location data created from Census data
  - see Gasmi et al. (2002), *Cost Proxy Models and Telecommunications Policy*, Appendix B

Application of HCPM in New Zealand

- NZ Post Office split in 1987 creating Telecom NZ
- Telecom privatized 1990
- Light handed regulation through 1990s allows Telecom to refuse to reach interconnection agreements
- Telecom Act of 2001 redefines TSO and implements industry specific regulation
- Interconnection prices set at NZ$0.013 per minute by Commerce Commission, based on international benchmarks in 2002

Definition of TSO Obligation

- The Act requires the Commerce Commission to estimate the cost to the TSP of providing service to “commercially non-viable customers”
  - cost refers to an efficient service provider
  - cost is measured as revenue minus “unavoidable incremental cost”
  - could be applied to groups of customers or to individual customers

Telecom's Cost Model

- Uses detailed cable records to estimate incremental costs of each customer
- Is not forward looking and does not necessarily represent the costs of an efficient provider
- Resulted in initial estimates of TSO obligation of $480 million (about 12% of total revenue)
- Entrant's share of this obligation is expected to be about 20%.
  - At $480 million, no entrant would be viable

Use of HCPM to Compute Incremental Cost of a Customer

- Run clustering procedure for set of all customers
- Compute IC of a cluster by editing the Cluster module outputs. Re-run model to redesign the feeder network and eliminate all distribution costs for the cluster
- For commercially viable clusters, delete individual residential customers, one by one, and compute IC to determine commercial viability
- Compute the IC of all residential customers in an exchange area by running the model for business customers only

Summary

- Forward looking economic cost (FLEC) is the appropriate cost concept for decision-making in dynamic, competitive markets
- FLEC can be flexibly and reliably estimated using proxy models of the underlying engineering and economic production processes
- FLEC provides a sound basis for universal service funding and interconnection pricing
- FLEC can be estimated using HCPM or other computer based cost proxy models