Cost models
Essential facilities

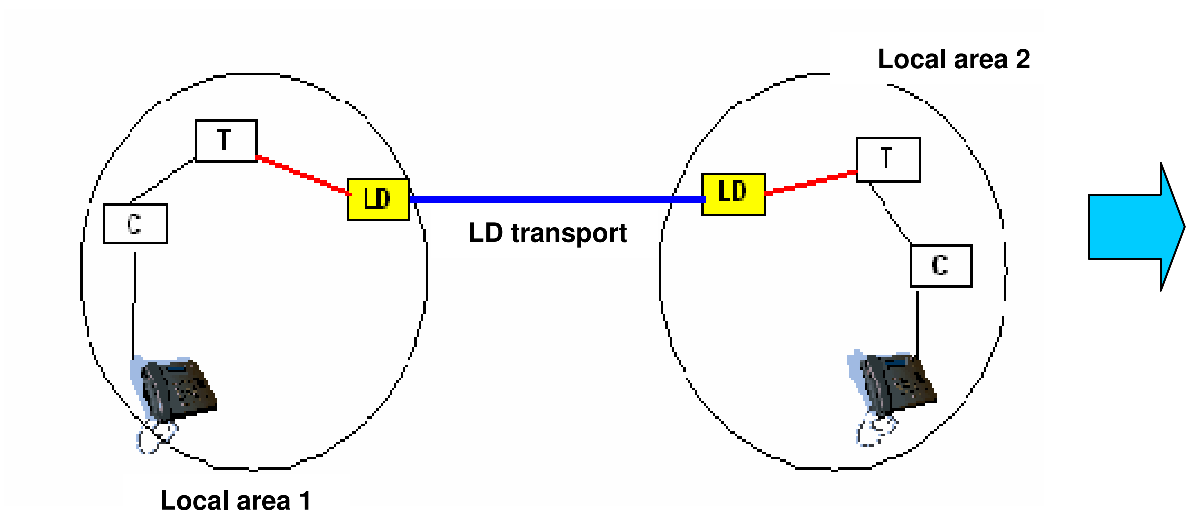
Peru's experience (OSIPTEL)
February 2007

CONTENTS

PURPOSE
Interconnection relations – One direction

- In a liberalized market, the entry of new operators in certain segments is expected to lead to the introduction of new and better services and to contribute to a regime in which competitive pressures have the effect of lowering tariffs and improving quality.

- For new entrants to supply their services, they have to use at least one of the functions of the network generally administered by the incumbent operator.



- Rapid interconnection
- Cost-oriented charges
- Efficient entry
- Promoting dynamic efficiency

POLICY OBJECTIVES
Regulatory instruments

Objectives → **Access** | **Competition**

Application of short- and medium-term policy instruments

Indirect competition (users not yet connected)

Direct competition (current users)

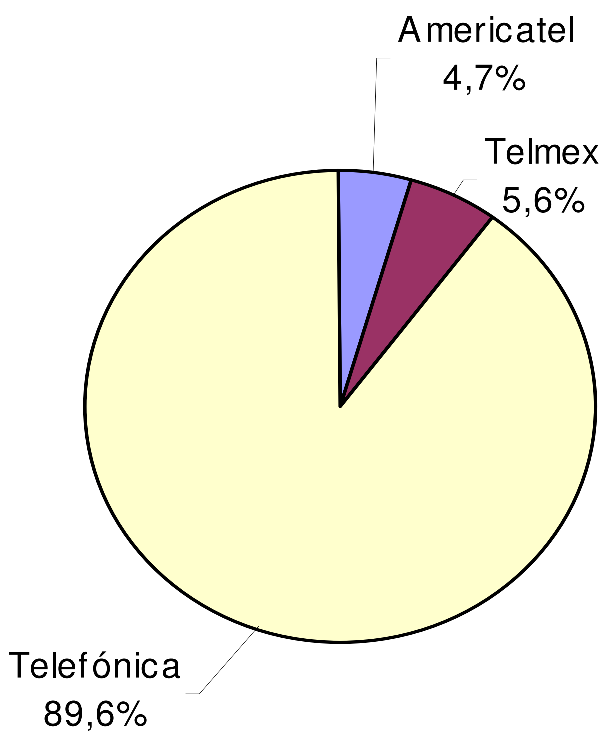
Interconnection:

Instruments →

- Administrative procedures
- Regulation of essential facilities (setting charges)

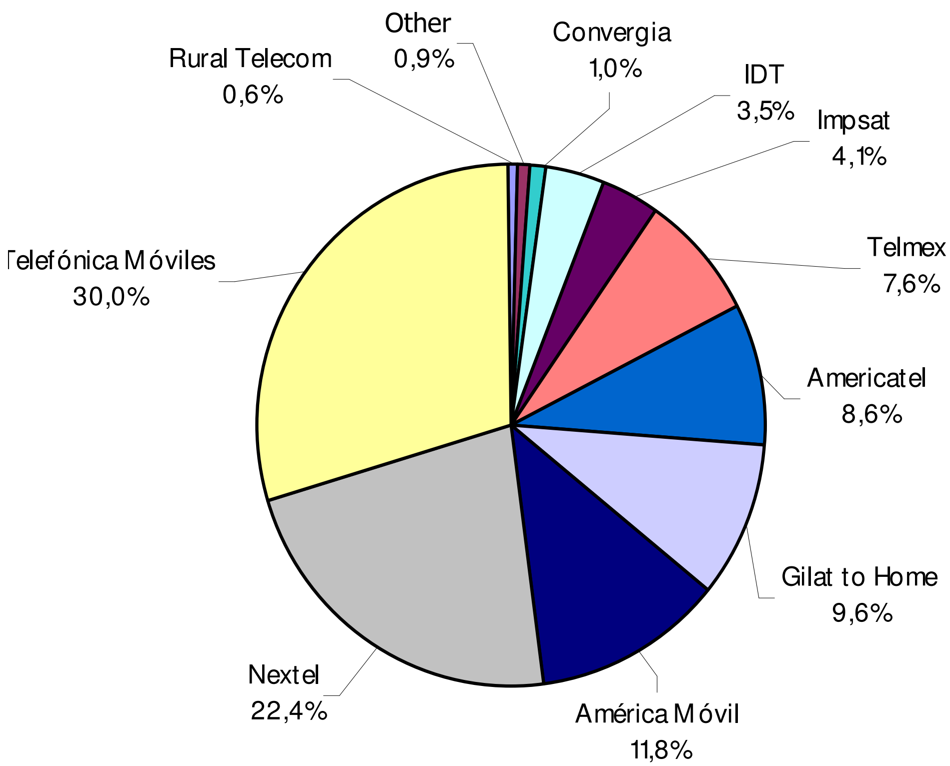
ESSENTIAL FACILITIES
Local switched transport

Supply – Local switched transport (2005)



A total of 338 million minutes were carried by local switched transport in 2005.

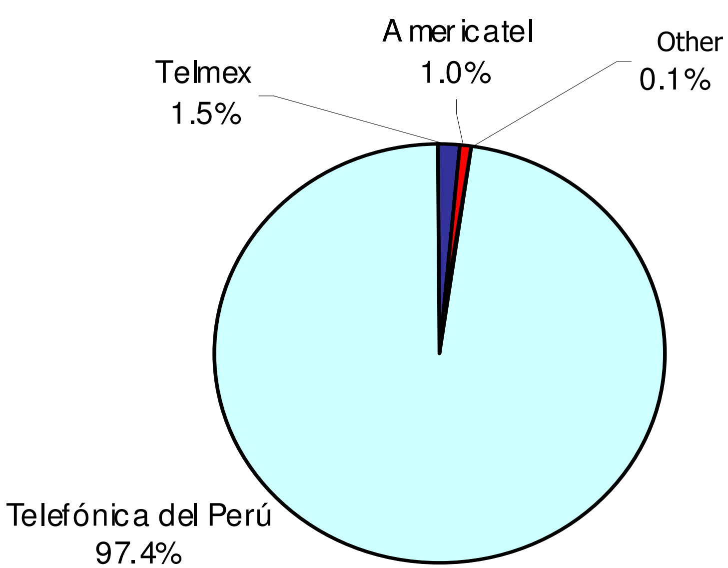
Demand – Local switched transport (Telefónica - 2005)



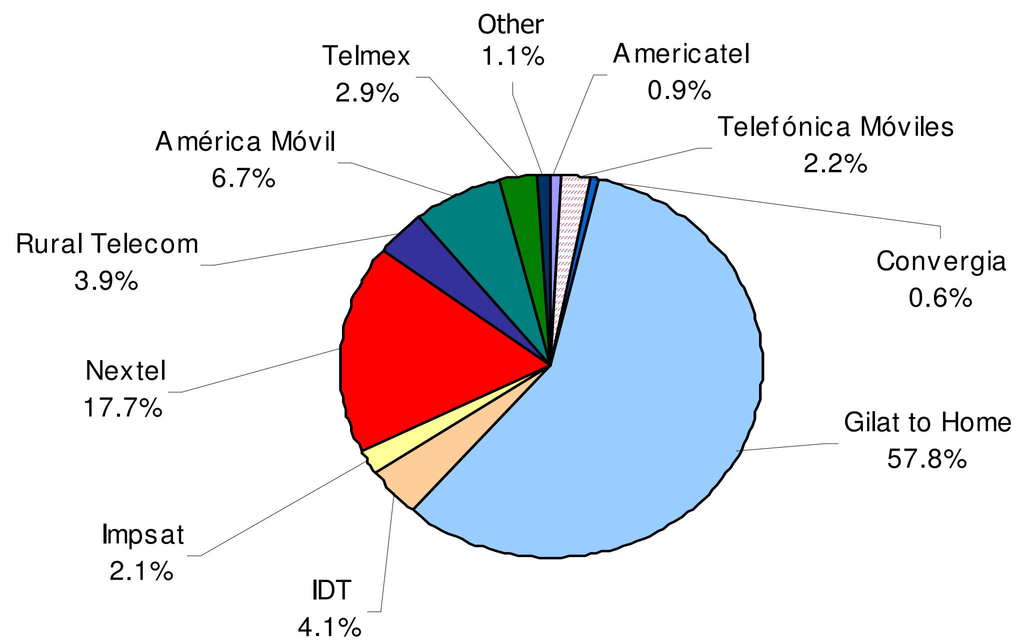
Of the total minutes supplied by Telefónica, the largest demand for service was from Telefónica Móviles.

ESSENTIAL FACILITIES
Long-distance switched transport

Supply – National LD switched transport (2005)



Demand – National LD switched transport (Telefónica - 2005)

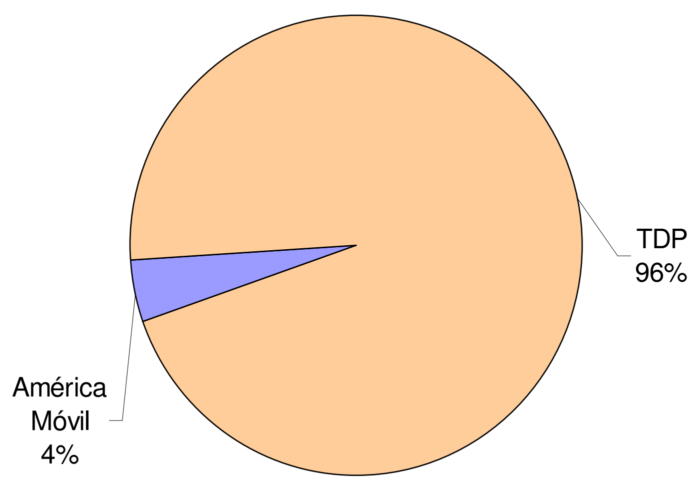


The lion's share of traffic supplied in 2005 was provided by Telefónica.

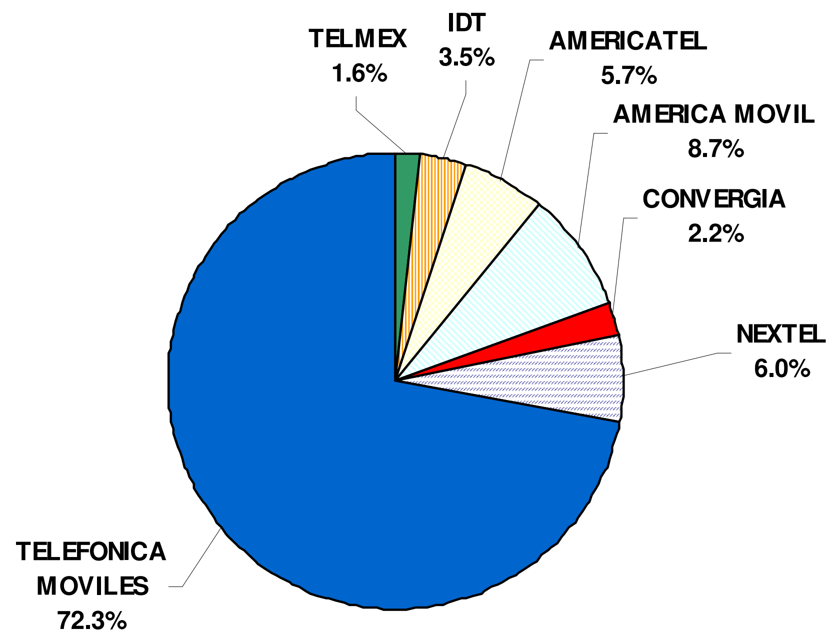
The largest demand for services was from Gilat To Home (rural operator).

ESSENTIAL FACILITIES
National long-distance leased circuits

Supply – Wholesale national LD circuits (2005)



Demand – Wholesale national LD circuits (Telefónica - 2005)

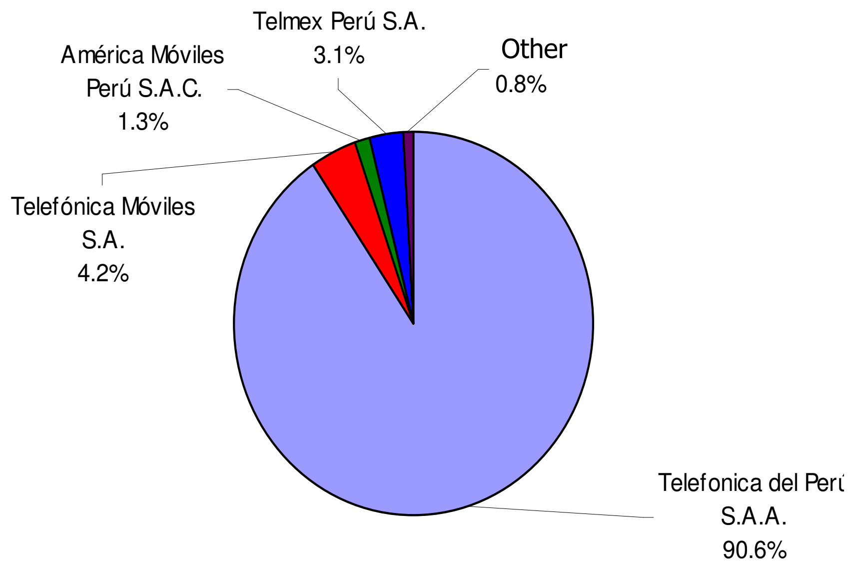


The lion's share of total circuits supplied in 2005 was provided by Telefónica.

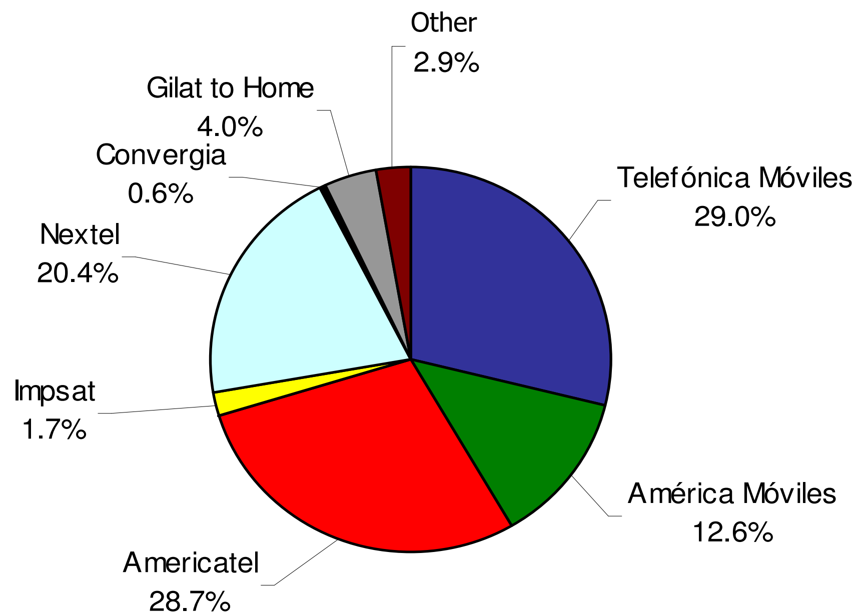
Of the total E1s supplied by Telefónica, the largest demand for service was from Telefónica Mobile.

ESSENTIAL FACILITIES
Interconnection links

Supply – Links (2005)



Demand – Links (Telefónica - 2005)

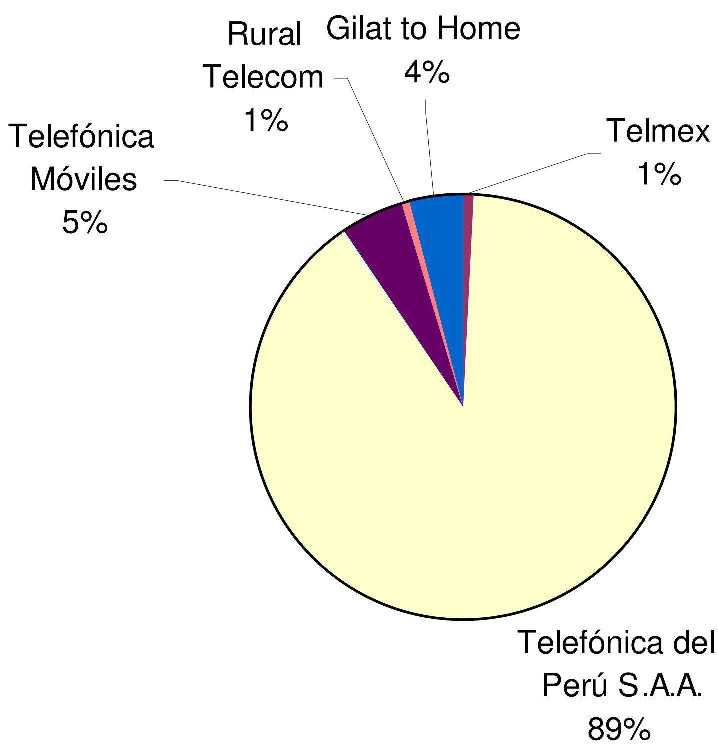


Of the total links supplied (384 E1s) in 2005, the lion's share was provided by Telefónica.

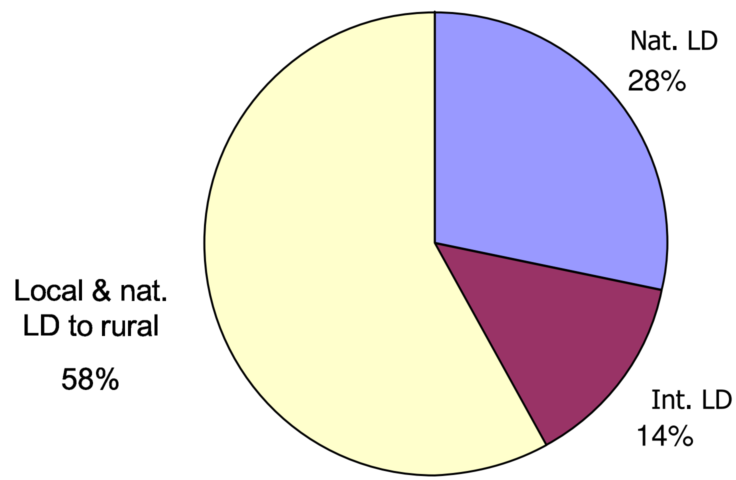
Of the total E1s supplied by Telefónica, the largest demand for service was from Telefónica Mobile.

ESSENTIAL FACILITIES
Public telephone access

Supply – Public telephones (2005)



Public telephone access charge by type of call



Of total public telephones (147 746 installed countrywide), the lion's share in 2005 was provided by Telefónica.

Local calls and national LD calls to rural areas account for the largest share of total access charges for public telephones.

ESSENTIAL FACILITIES
Regulatory framework

- Pursuant to the Consolidated Amended Text on Interconnection Regulations, interconnection charges:

  - Shall be equal to:
    - Interconnection costs
    - Contributions to total costs
    - Reasonable profit margin

  - Shall be based on the following:
    - Time duration of successfully completed calls
    - Periodic fixed charges
    - Other arrangements (where shown to be more efficient than the above)

CONCEPTUAL FRAMEWORK
Model

- Two services: Local calls, national long distance (NLD).
- Two NLD service operators (incumbent and new entrant)
- Consumer surplus functions:

$Vo(po)$ and $V(p_1, p_2)$ → $$\frac{\partial V_i}{\partial P_i} = -q_i$$

- Cost per local span and NLD span: (c_0, c_1, c_2)

- Incumbent operator profit function:

$$\Pi_1 = (p_o - c_o)q_o + (p_1 - c_1 - c_o)q_1 + (a - c_o)q_2 - F$$

→ $a =$ Termination charge

- New entrant sets competitive prices.

$$p_2 = a + c_2$$

FIRST BEST
Access deficit

- **Maximizing benefit (without restrictions)**

$$Max: \; W = V_o(p_o) + V(p_1, p_2) + \Pi_1(p_o, p_1, p_2)$$

$$p_0 = c_0$$

$$p_1 = c_0 + c_1$$

$$p_2 = c_0 + c_2 = a + c_2 \Rightarrow a = c_0$$

$$p_1 > p_2 \;\Rightarrow\; c_0 + c_1 > c_0 + c_2$$

$$\Rightarrow c_1 > c_2$$

Efficient entry

$$\Pi_1 = (c_o - c_o)q_o + (c_1 + c_o - c_1 - c_o)q_1 + (c_o - c_o)q_2 - F$$

$$\Pi_1 = -F$$ → **Access deficit**

$p_2 = a + c_2$

FULLY DISTRIBUTED COSTS
Additive margins

- **Implemented by including in each unit price a margin equivalent to the total average fixed cost.**

$$Q = q_0 + q_1 + q_2 \quad \Rightarrow \quad Margin = \frac{F}{Q}$$

$$p_0 = c_0 + \frac{F}{Q}$$

$$p_1 = c_0 + c_1 + \frac{F}{Q}$$

$$a = c_0 + \frac{F}{Q} \Rightarrow p_2 = c_o + c_2 + \frac{F}{Q}$$

$$\Pi_1 = \frac{F}{Q} q_o + \frac{F}{Q} q_1 + \frac{F}{Q} q_2 - F$$

$$\Pi_1 = \frac{F}{Q}(q_0 + q_1 + q_2) - F = F - F = 0$$

- **While the access deficit is eliminated, there are no incentives to minimize costs and the result is not necessarily optimal in terms of price structure (aggregate benefit).**

EFFICIENT COMPONENT PRICING RULE ECPR system (1)

- **Proposed by Baumol and Sidak (1994), this rule is also known as the parity or Baumol-Sidak rule.**

- **It states that, for homogeneous outputs and an enterable market, the access cost must consider (i) the actual cost of providing the access service, and (ii) the opportunity cost incurred by the incumbent operator.**

$$a = c_o + (p_1 - c_1 - c_o)$$

- **The incumbent operator's profits remain unchanged. The profits lost on service to the end user are recouped through interconnection costs, such that the operator can finance the access deficit.**

- **Output efficiency is guaranteed (efficient entry).**

$$p_2 = a + c_2$$

$$a = c_o + (p_1 - c_1 - c_o) = p_1 - c_1 \Rightarrow p_1 = a + c_1$$

$$p_2 \leq p_1$$

$$a + c_2 \leq a + c_1 \;\Rightarrow\; c_2 \leq c_1$$

EFFICIENT COMPONENT PRICING RULE
ECPR system (2)

- Since the incumbent operator's profits are not affected, the regulator may consider this to be healthy if it allows continued subsidies for priority areas, such as expansion.

- One may challenge the "validity" of the assumptions on which the theory of enterable markets is based, such as homogeneity and perfect sustainability of products, as well as the characteristics of the production functions.

- One of the major drawbacks of this tool is that possible monopoly rents of the incumbent operator are maintained.

- One might be assuming an opportunity cost that corresponds to inefficient supply (imperfections from market power). Applying this rule would result in an overestimation of the charge, which would be tantamount to a barrier to entry for efficient companies.

- There are incentives for the incumbent to under-declare its costs in the competitive segment (thus artificially increasing its opportunity cost).

ARMSTRONG, DOYLE AND VICKERS (1996) Model

- For simplicity, the provision of local call service is not taken into account.

$$Max: \; W(p_1,a) = V(p_1,a) + (p_1 - c_0 - c_1)q_1(p_1,a) + (a - c_0)q_2(p_1,a) - F$$

$$\Pi = 0$$

$$a = c_0 + \sigma[p_1 \text{-} c_0 \text{-} c_1] + \frac{\theta p_2}{n_2}$$

- Substitution parameter:

$$\sigma = \frac{\partial q_1 / \partial p_2}{-\partial q_2 / \partial p_2}$$

- Price elasticity:

$$n_2 = \frac{\partial q_2}{\partial p_2} \frac{p_2}{q_2}$$

$$a^{Ramsey} > a^{ECPR} > c_O$$

LAFFONT AND TIROLE (1994) Model

- **The model put forward by Laffont and Tirole estimates the access charge indirectly through optimal estimation of the price vector.**

$$W(p_1,p_2)=V_0(p_0)+V(p_1,p_2)+(p_0-c_0)q_0+(p_1-c_0-c_1)q_1(p_1,p_2)+(p_2-c_2-c_0)q_2(p_1,p_2)-F$$

$$\frac{[p_0-c_0]}{p_0}=\frac{\lambda}{1+\lambda}\frac{1}{n_0}$$

$$\begin{bmatrix}\frac{\partial q_1}{\partial p_1} & \frac{\partial q_2}{\partial p_1}\\ \frac{\partial q_1}{\partial p_2} & \frac{\partial q_2}{\partial p_2}\end{bmatrix}\begin{bmatrix}p_1-c_0-c_1\\ p_2-c_0-c_2\end{bmatrix}=-\frac{\lambda}{1+\lambda}\begin{bmatrix}q_1\\ q_2\end{bmatrix}$$

$$\left\{\begin{aligned}
&\frac{[p_1-c_0-c_1]}{p_1}=\frac{\lambda}{1+\lambda}*\left[\frac{n_2+\frac{p_2q_2}{p_1q_1}n_{21}}{n_1n_2-n_{12}n_{21}}\right]\\
&\frac{[p_2-c_0-c_2]}{p_2}=\frac{\lambda}{1+\lambda}*\left[\frac{n_1+\frac{p_1q_1}{p_2q_2}n_{12}}{n_1n_2-n_{12}n_{21}}\right]\\
&\tilde{n}_1=n_1\frac{n_1n_2-n_{12}n_{21}}{n_1n_2+\frac{p_2q_2}{p_1q_1}n_1n_{21}}\;;\;\tilde{n}_2=n_2\frac{n_1n_2-n_{12}n_{21}}{n_1n_2+\frac{p_1q_1}{p_2q_2}n_2n_{12}}
\end{aligned}\right.$$

LAFFONT AND TIROLE (1994) Model

$$[p_0 - c_0] = \frac{\lambda}{1+\lambda}\frac{p_0}{n_0} = \frac{\theta p_0}{n_0}$$

$$\frac{[p_1 - c_0 - c_1]}{p_1} = \frac{\lambda}{1+\lambda} * \frac{1}{\tilde{n}_1} \Rightarrow \frac{[p_1 - c_0 - c_1]}{p_1} = \frac{\theta}{\tilde{n}_1}$$

$$\frac{[p_2 - c_0 - c_2]}{p_2} = \frac{\lambda}{1+\lambda} * \frac{1}{\tilde{n}_2} \Rightarrow \frac{[p_2 - c_0 - c_2]}{p_2} = \frac{\theta}{\tilde{n}_2}$$

$$\frac{\partial}{\partial \lambda} : (p_0 - c_0)q_0 + (p_1 - c_0 - c_1)q_1 + (p_2 - c_2 - c_0)q_2 - F = 0$$

$$\theta = \frac{F}{\left[\frac{p_0 q_0}{n_0} + \frac{p_1 q_1}{\tilde{n}_1} + \frac{p_2 q_2}{\tilde{n}_2}\right]}$$

$$a = p_2 - c_2 \rightarrow a = c_0 + \frac{\theta p_2}{\tilde{n}_2} \rightarrow a = c_0 + \frac{p_2 / \tilde{n}_2}{\left[\frac{p_0 q_0}{n_0} + \frac{p_1 q_1}{\tilde{n}_1} + \frac{p_2 q_2}{\tilde{n}_2}\right]} F \rightarrow a_i = c_0 + \frac{p_i / \tilde{n}_i}{\sum_1^m \frac{p_i q_i}{\tilde{n}_i}} F$$

REGULATION IN PRACTICE
Accounting system vs. cost model

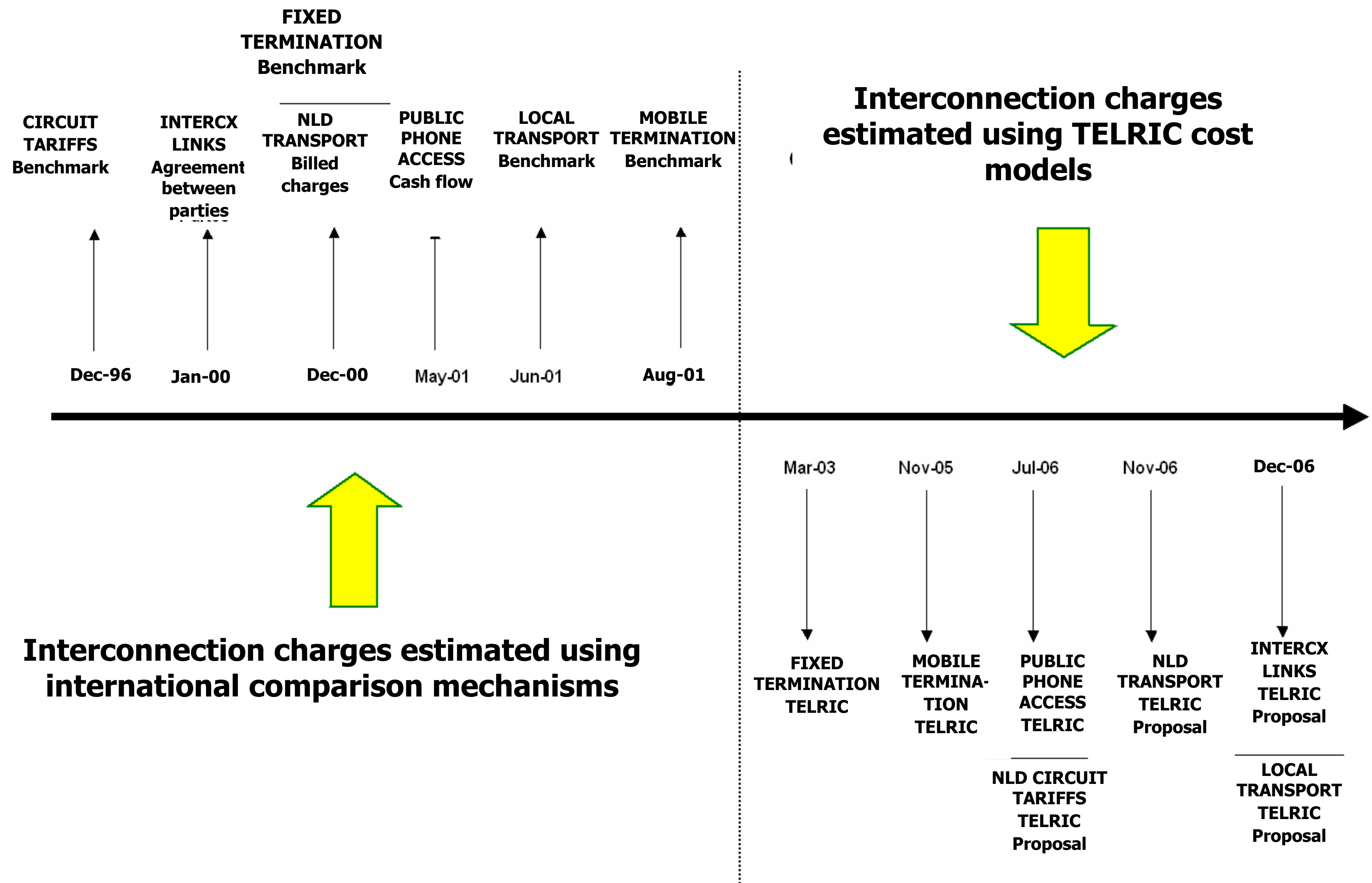
ACCOUNTING
(Top down)

- Reflects real costs of regulated operator.
- Does not necessarily encourage efficiency.
- Allocation criteria almost always arbitrary.
- Totally dependent on what information provided by the regulated operator.

COST MODEL
(Bottom up)

- A robust cost model effectively replicating the regulated operator's network can much more rigorously identify possible distortions not observed in the accounting system.
- Greater incentive for efficiency.
- Greater information and knowledge of the operator's network and service functioning.
- Technically more complex.

REGULATION IN PRACTICE
Peru's experience



REGULATION IN PRACTICE
LRIC : TSLRIC, TELRIC

- The system currently employed by regulatory agencies is so-called long-run incremental costs (LRIC), adopted by OFTEL in 1995 and FCC in the 1996 Telecommunications Act.

- US legislation, in order to meet the objectives set in the 1996 Telecommunications Act, draws a distinction between two incremental cost concepts: total service long-run incremental cost (TSLRIC) and total element long-run incremental cost (TELRIC).

- TSLRIC refers to the incremental cost of introducing a new service . It is equivalent to the change in total cost resulting from the addition of the new service to those currently supplied by the company, i.e. it measures the difference between producing the service and not producing it.

- TELRIC entails determining individually the cost of the main network components (unbundled network components), for example the local loop or local switching.

REGULATION IN PRACTICE
Asset valuation

- A key issue in the debate on strictly cost-based prices is the decision whether the incumbent's assets should be valued using the backward-looking cost rule or the forward-looking cost rule.

- The forward-looking approach must be duly interpreted as a forward-looking technology approach. The forward-looking cost estimate implies selecting the technology considered as the most efficient with a view to the long term.

- Supporters of the forward-looking access charge point out that competitors should not suffer from the incumbent company's past inefficiencies. Advocates of the backward-looking approach consider that incumbent operators should be compensated for the uncertainty risk they assume when making the investment.

REGULATION IN PRACTICE
"scorched node" or "scorched earth"

- **The scorched node approach entails accepting the operator's current network architecture and topology, thus retaining the number of nodes, their location and their position in the network hierarchy. The model only optimizes the capacity to be installed at each node. This approach may entail accepting some inefficiencies which the operator maintains in its network, stemming from the network's evolution over time: excessive number of nodes, excessive number of switching levels, etc.**

- **The scorched earth approach takes as a starting point only demand data, including geographic distribution, to calculate the optimum network in the given conditions. It allows the latest technology to be introduced in an optimum architecture, since it locates nodes without reference to their historical location and may modify the number of nodes and switching levels, as well as also optimizing the required capacity in each node.**

PERU's EXPERIENCE
Economic approach (1)

- **Public service telecommunication companies can be seen, from an economic standpoint, as multiproduct companies:**

$$f(\overline{X}) \rightarrow \begin{bmatrix} Y_1 \\ Y_2 \\ \vdots \\ Y_N \end{bmatrix}$$

- **An operator's cost function can be depicted by the following expression:**

$$C(Y_1, Y_2, \ldots, Y_N) = \sum_{j=1}^{m} (w_j x_j)$$

PERU's EXPERIENCE
Economic approach (2)

- **Step I – Calculation of incremental cost: Calculation of cost by service to be regulated.**

$$CI(Y_2) = C(Y_1, Y_2, ..., Y_N) - C(Y_1, 0, ..., Y_N)$$

- **Step II – Allocation of costs. Total investment is allocated to the various services, based on usage.**

$$\left[\alpha_{ij}\right]_{Nxm} * \left[w_j x_j\right]_{mx1} \rightarrow \begin{bmatrix} \sum_{j=1}^{m} \alpha_{1j} w_j x_j \\ \sum_{j=1}^{m} \alpha_{2j} w_j x_j \\ \sum_{j=1}^{m} \alpha_{3j} w_j x_j \\ \vdots \\ \sum_{j=1}^{m} \alpha_{Nj} w_j x_j \end{bmatrix}$$

$\sum_{j=1}^{m} \alpha_{1j} w_j x_j$ → Cost allocated to service 1

$\sum_{j=1}^{m} \alpha_{2j} w_j x_j$ → Cost allocated to service 2

$\sum_{j=1}^{m} \alpha_{3j} w_j x_j$ → Cost allocated to service 3

$\sum_{j=1}^{m} \alpha_{Nj} w_j x_j$ → Cost allocated to service N

PERU's EXPERIENCE
Economic approach (3)

- **Step III – Calculation of the maximum tariff: Obtained by dividing the cost attributable to the long-distance circuit-leasing service by the capacity in E1s corresponding to total long-distance circuits leased.**

$$\text{CPI} = \frac{\sum_{j=1}^{m} \alpha_{2j} w_j x_j}{(y_2)}$$

PERU's EXPERIENCE
Stages (1)

1. Estimate the expected level of demand for the different services considered or regulated (projections and/or estimate of maximum capacity, including time with no charging and a margin for down time). If there are network elements which are shared with other services or products and a system of cost allocation according to use is chosen, it will also be necessary to estimate the demand for those products.

2. Select a network architecture with the best available technology most suited to the demand and the country's specific features. Apply commonly accepted design or dimensioning rules.

3. With the identified demand and network architecture, dimension each of the network elements. Routing factors are taken into account to express the demand for a service for each type of network element (integral model).

4. On the basis of the dimensioning of each network element and market prices, estimate investment levels.

PERU's EXPERIENCE
Stages (2)

5. Having specified an annualization method, the rate of return on capital and the useful lifetime of each of the network elements, calculate the corresponding annualized cost (expenditure).

6. Identify operating and maintenance costs. To this end, specific estimation modules can be produced, or the costs can be estimated as a percentage of total investment levels in network elements.

7. Using the corresponding cost drivers and routing factors, assign the estimated costs to the different services, incorporating a sufficient level of common costs and other mark-ups deemed justified. Additional modules may be considered for estimating common costs.

8. Costs are deflated on the basis of traffic statistics to be expressed as per-minute costs. It is also possible to consider fixed charges or capacity-based charges (independent of usage time).

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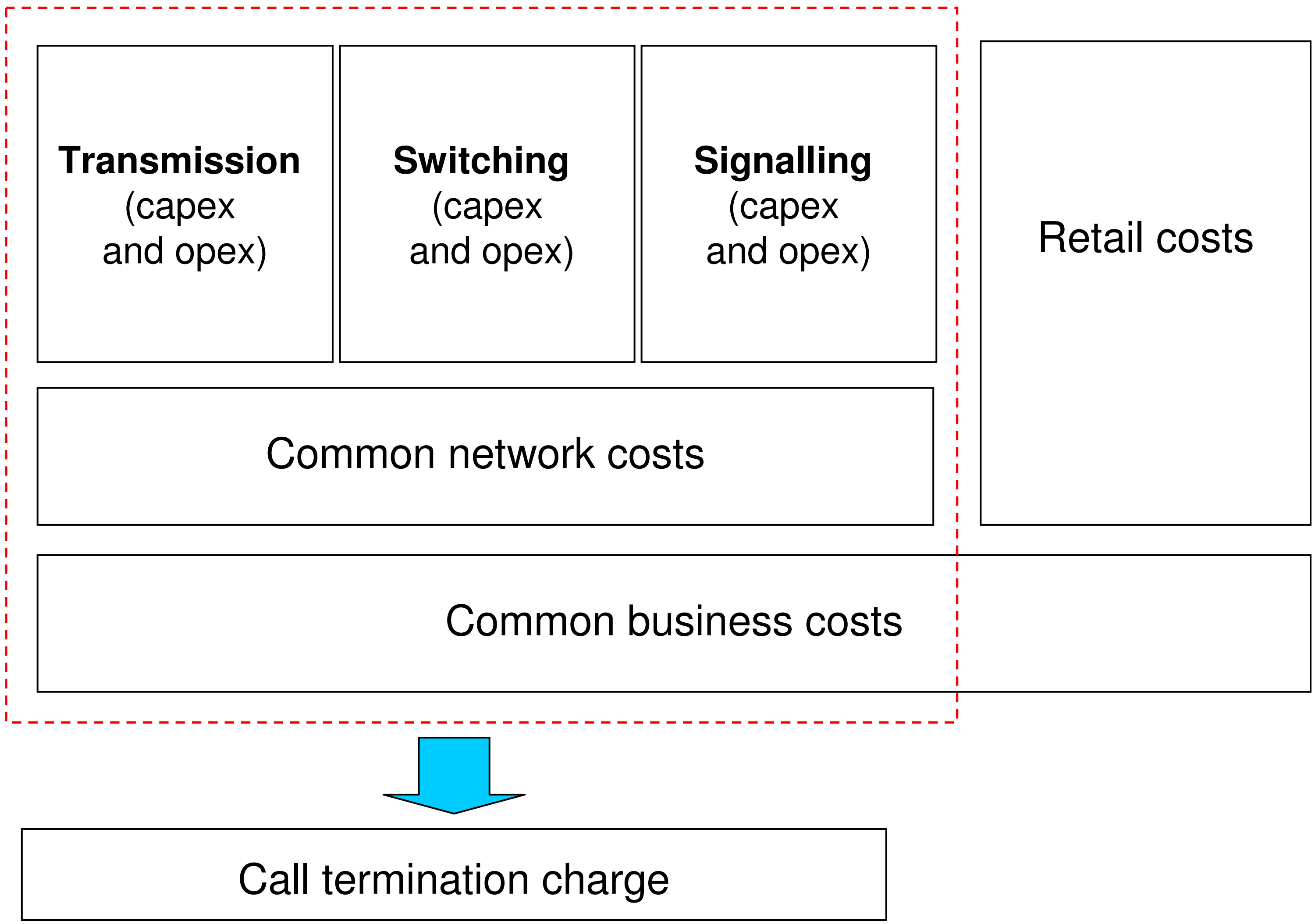
BOTTOM-UP MODEL
Scope of the model – Fixed network



Slide 29

A4 Administrador, 13/02/2007

BOTTOM-UP MODEL
Comprehensive model

Identify services

- Voice services
  . Incoming and outgoing local calls
  . NLD calls
  . ILD calls
  . F-M calls
  . Interconnection access
- Local leased circuits
- NLD leased circuits (ranges A, B and C)
- Interconnection links
- Broadband (ADSL)

Aggregate demand

- Quantity of E1s

Dimension network elements

- Exchanges
  . Tandem
  . Host
  . RSUs
- Transmission
  . Fibre
  . Radio

Estimate investment

- Total cost

Annualize investment

- Expenditure:
  . Transmission
  . Exchanges

Allocate total costs by use

- Voice services
  . Incoming and outgoing local calls
  . NLD calls
  . ILD calls
  . F-M calls
  . Interconnection access
- Local leased circuits
- NLD leased circuits (ranges A, B and C)
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DEMAND
Charged hour

- In order to respect to the maximum extent possible the principle of causality in the allocation of costs, the value that directly affects the size of the corresponding element should be selected as the cost driver.

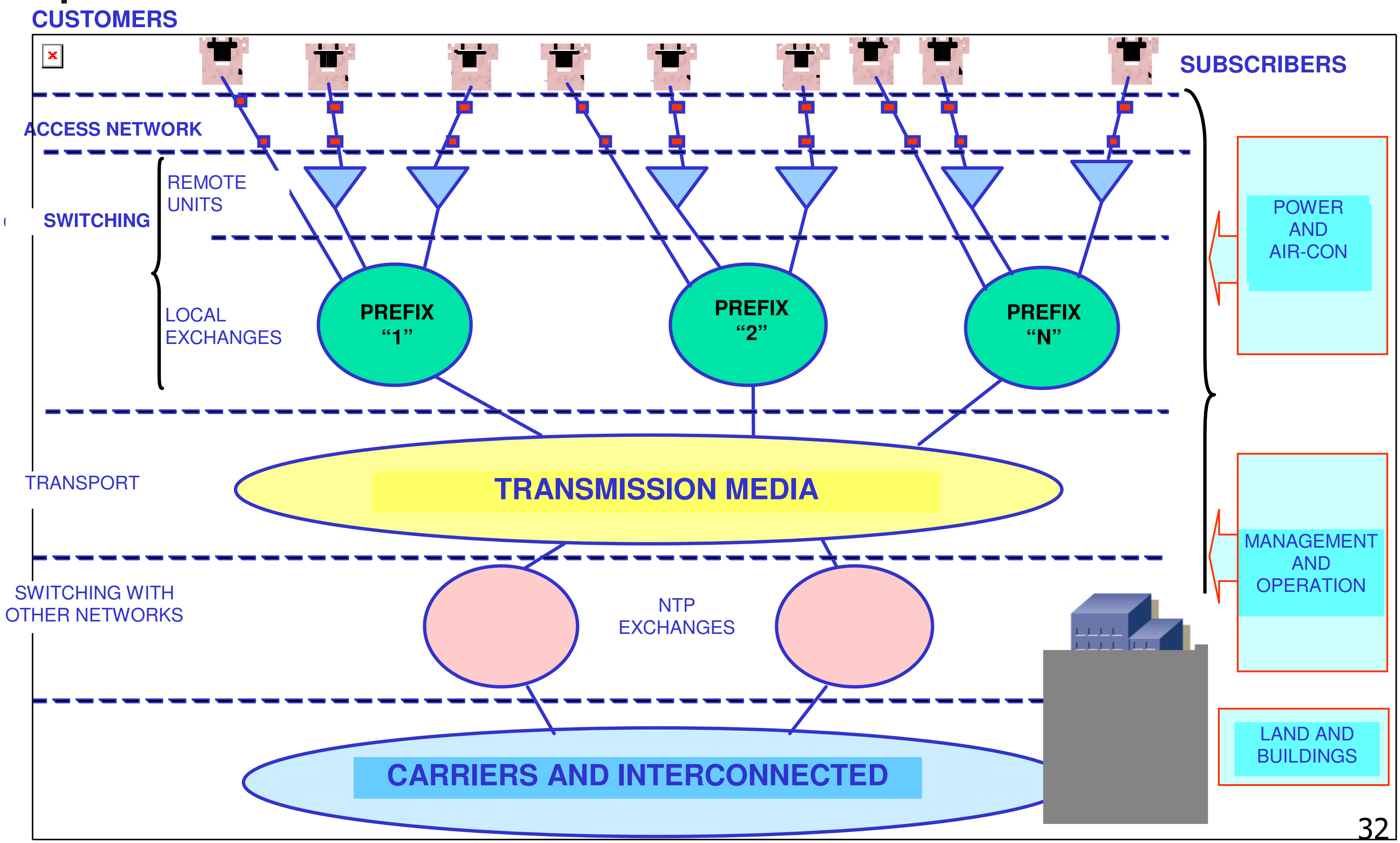
- According to the Erlang-B formula, the probability that a call cannot be handled by a network element with a capacity for n circuits and configured such that any call that does not find a free device is lost (blocking probability) is given by:

$$Prob = \frac{\frac{e^{-n*Tra}}{n!}}{1 + \frac{Tra}{1!} + \frac{Tra^2}{2!} + \frac{Tra^3}{3!} + \ldots + \frac{Tra^n}{n!}}$$

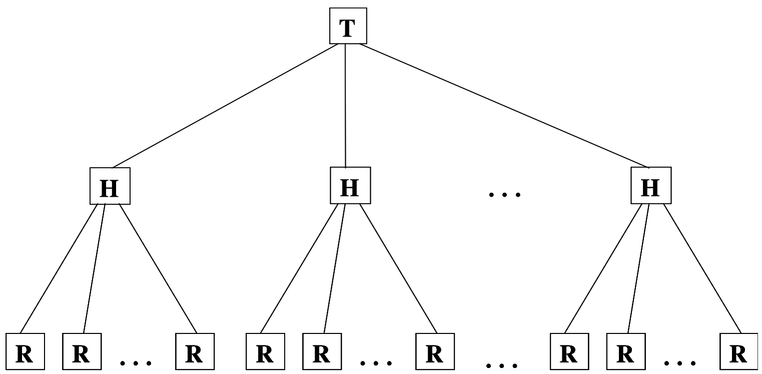
Given the blocking probability (1% fixed) and the flow in Erlangs, we obtain “n” (number of trunks and hence capacity in E1s).

- Where “Tra” is the flow in Erlangs. One Erlang represents continuous use of one circuit. In practice, one Erlang is equivalent to 60 minutes of uninterrupted call.

NETWORK ARCHITECTURE
Fixed-network components

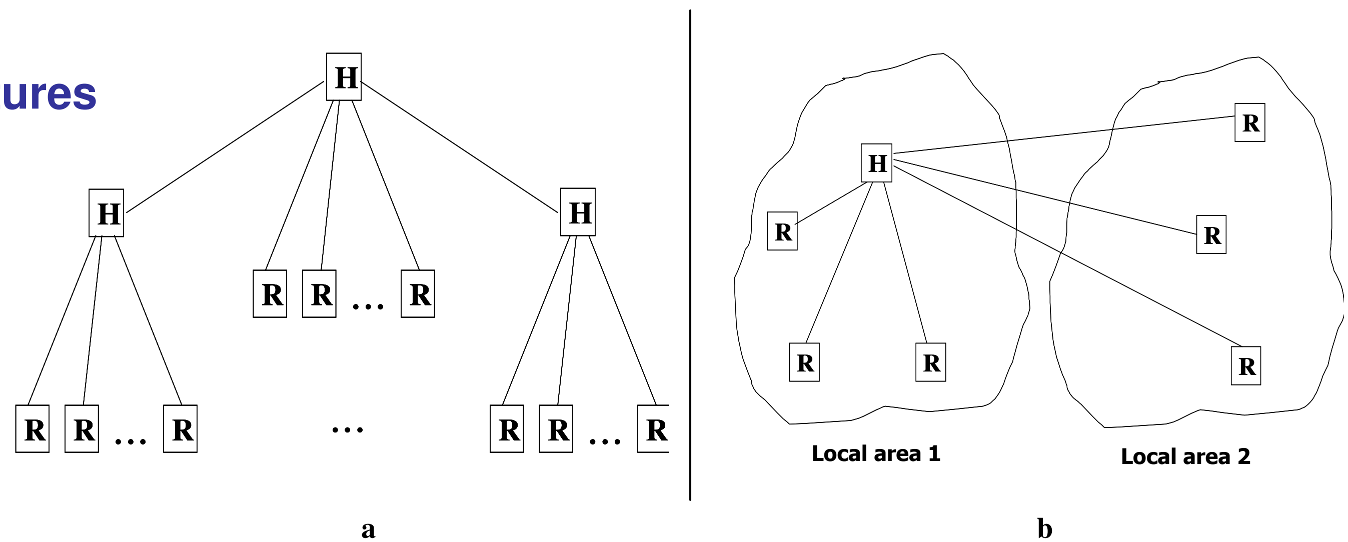


NETWORK ARCHITECTURE
Topologies



- **Traditional architecture**

- **Existing architectures**



Host acting as tandem

Localities without a host exchange

ELEMENTS
Switching – Criteria

- For the purpose of estimating the level of investment in switching, a two-layer switching hierarchy has been designed: tandem exchanges, host exchanges and remote switching units. For this purpose, it has been considered that one of the host exchanges in each department acts also as a tandem.

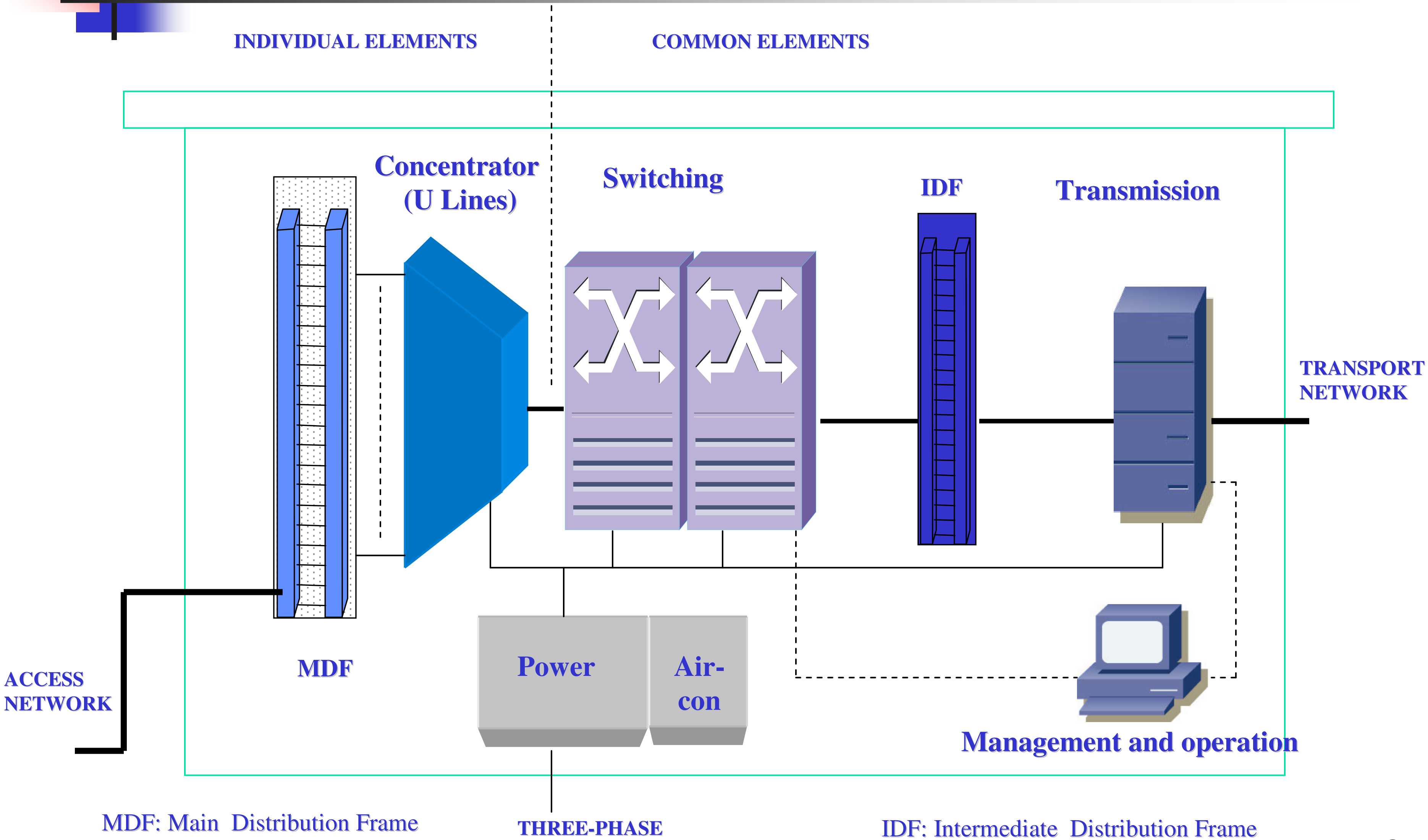
- This is the case everywhere except in Lima, a department which has an exchange fulfilling exclusively tandem functions. It is in the tandem exchange that interconnection is handled, as well as routing of long-distance calls.

- To dimension an exchange, one has to determine which and how many elements are necessary to meet specified requirements such as: number of subscribers, type of lines (analogue or ISDN), traffic per charged hour, and such like.

- For this, account is taken of classes of cards (for each type of line and capacity), warehouses, cabinets, multi-conference equipment, equipment for recorded announcements, central and regional processors, spatial and time switching modules, etc., in accordance with the specifications provided by the equipment suppliers.

- To ensure connectivity between the different levels of the hierarchy, each higher level exchange will have to have a number of additional trunks corresponding to the number of trunks arriving from exchanges at the level immediately below.

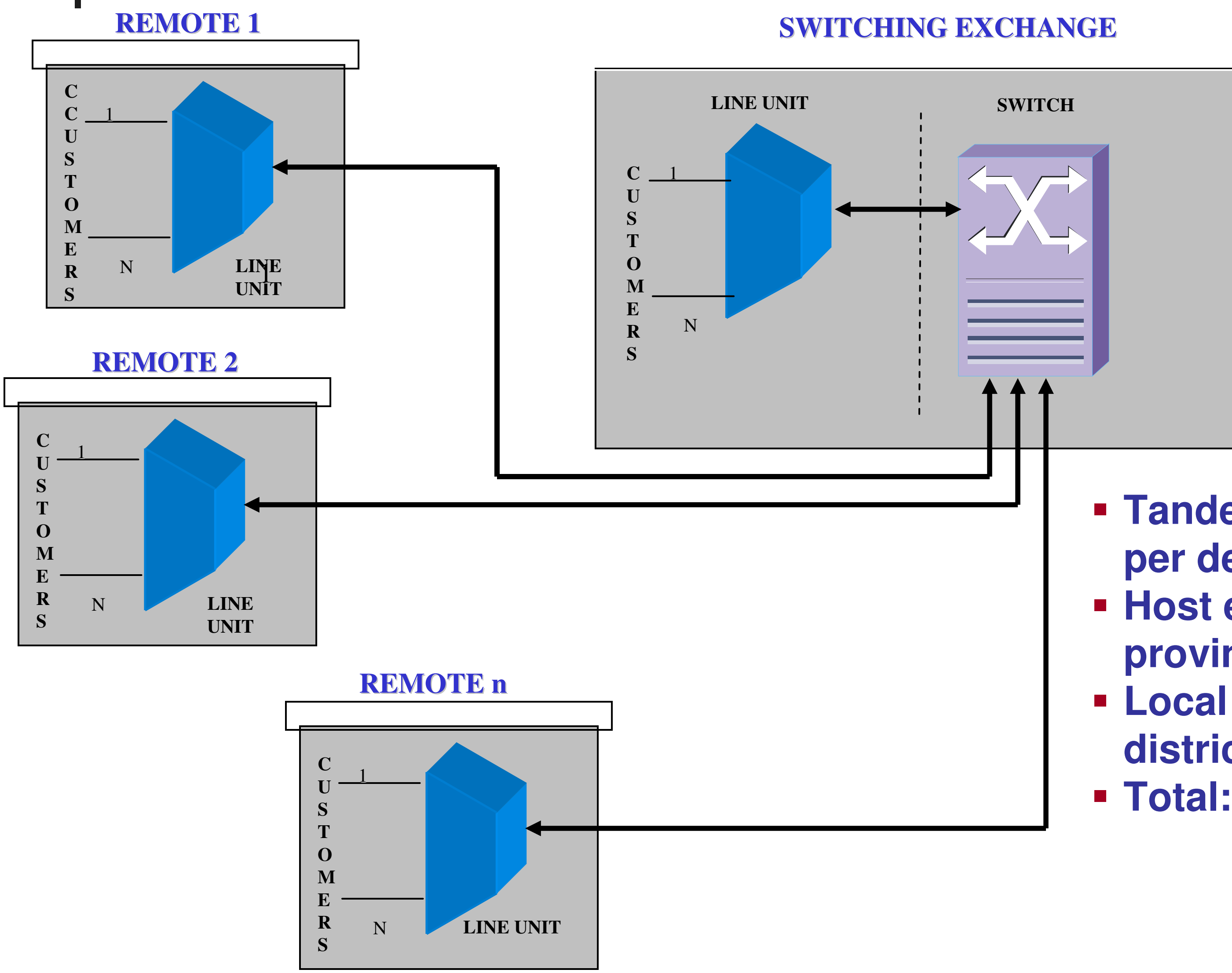
ELEMENTS
Switching



MDF: Main Distribution Frame

IDF: Intermediate Distribution Frame

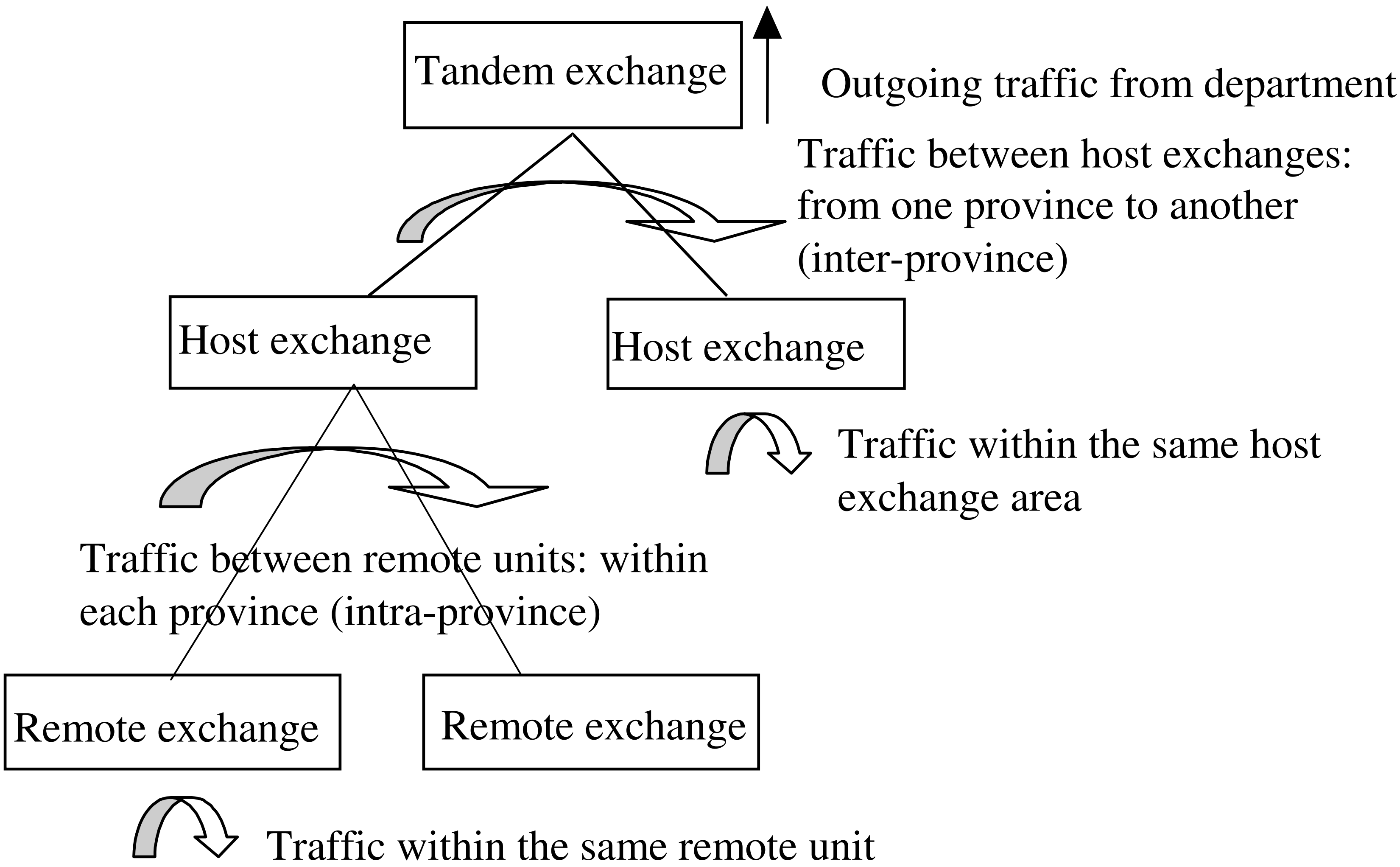
ELEMENTS
Exchange hierarchy



- Tandem exchange: one per department (24).
- Host exchange: one per province (95).
- Local exchange: in the districts (479).
- Total: 598 exchanges.

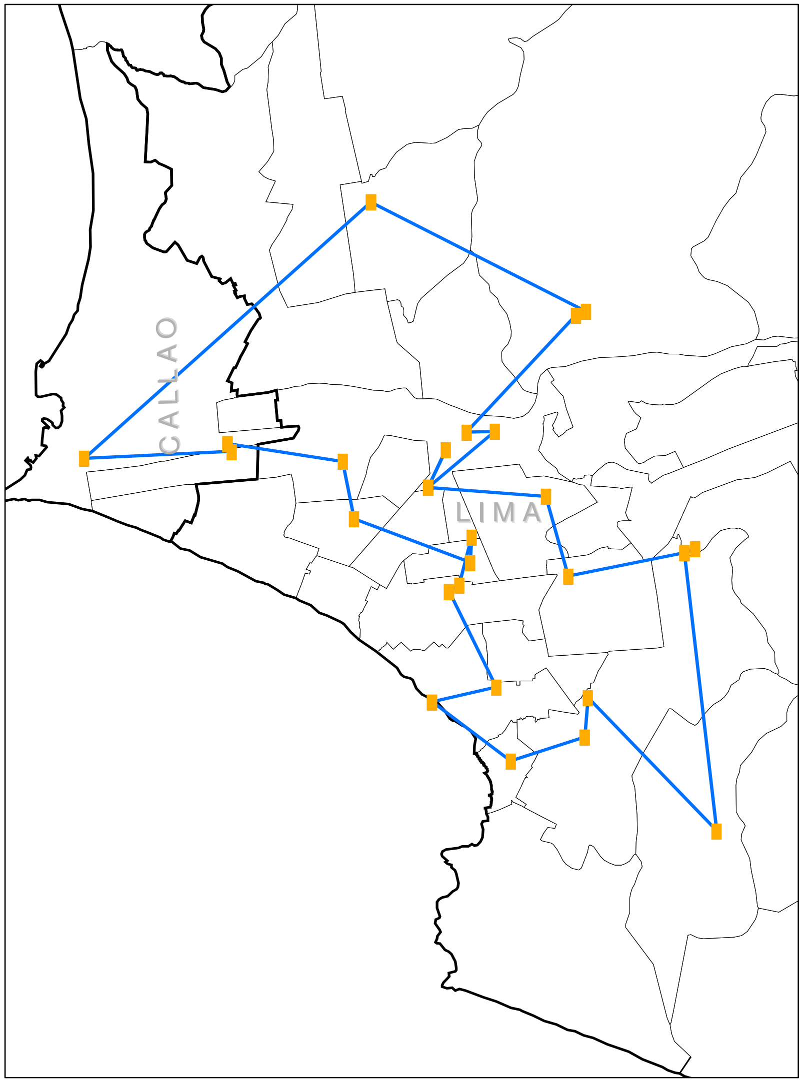
ELEMENTS
Transmission – steps

- **Local transmission network (within a department). Connection between host and remote exchanges. Interdepartmental transmission network. Connection between the country's different departments.**
- **Need to identify groups of exchanges.**
- **Need to specify the type of connection in each group (ring, mesh or star).**
- **Specify connections (Prim's algorithm for extended tree configurations, travelling salesman algorithm for ring connections.**
- **Specify technology (SDH, PDH system).**
- **Identify transmission medium for each span.**
- **Identify required transmission capacity per span.**

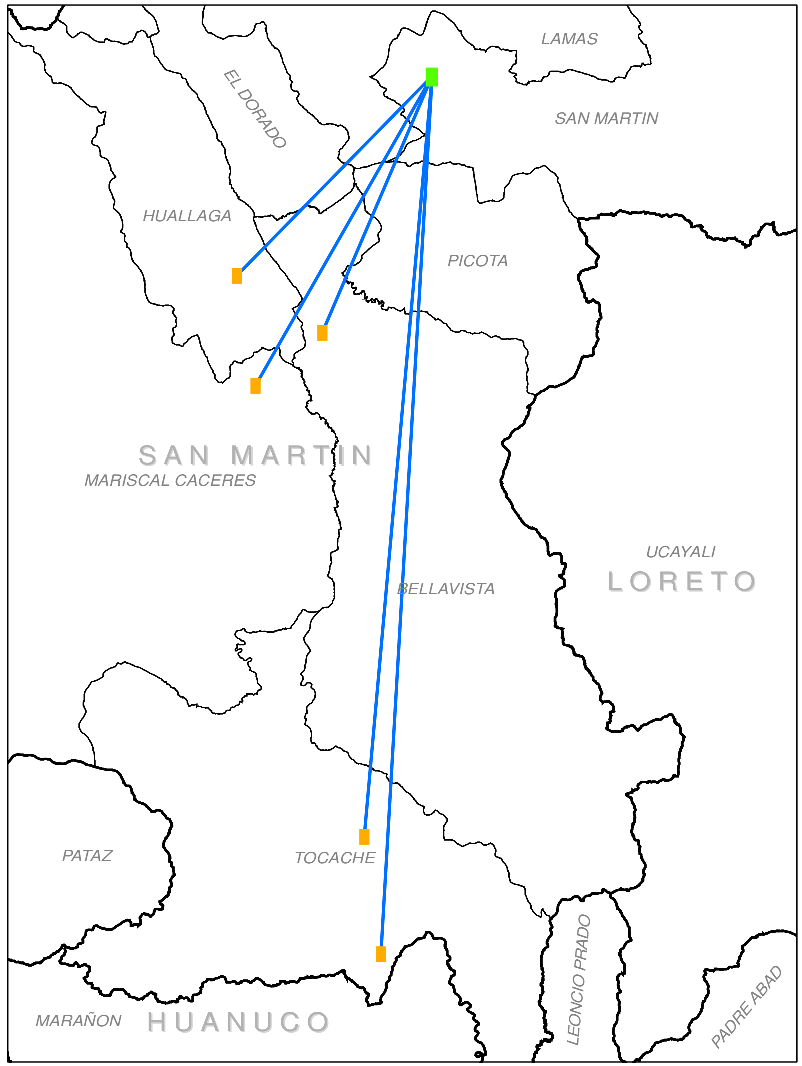

Tandem exchange
Outgoing traffic from department
Traffic between host exchanges: from one province to another (inter-province)
Host exchange
Host exchange
Traffic within the same host exchange area
Traffic between remote units: within each province (intra-province)
Remote exchange
Remote exchange
Traffic within the same remote unit

ELEMENTS
Local topology: ring – Lima and Callao

Travelling salesman algorithm

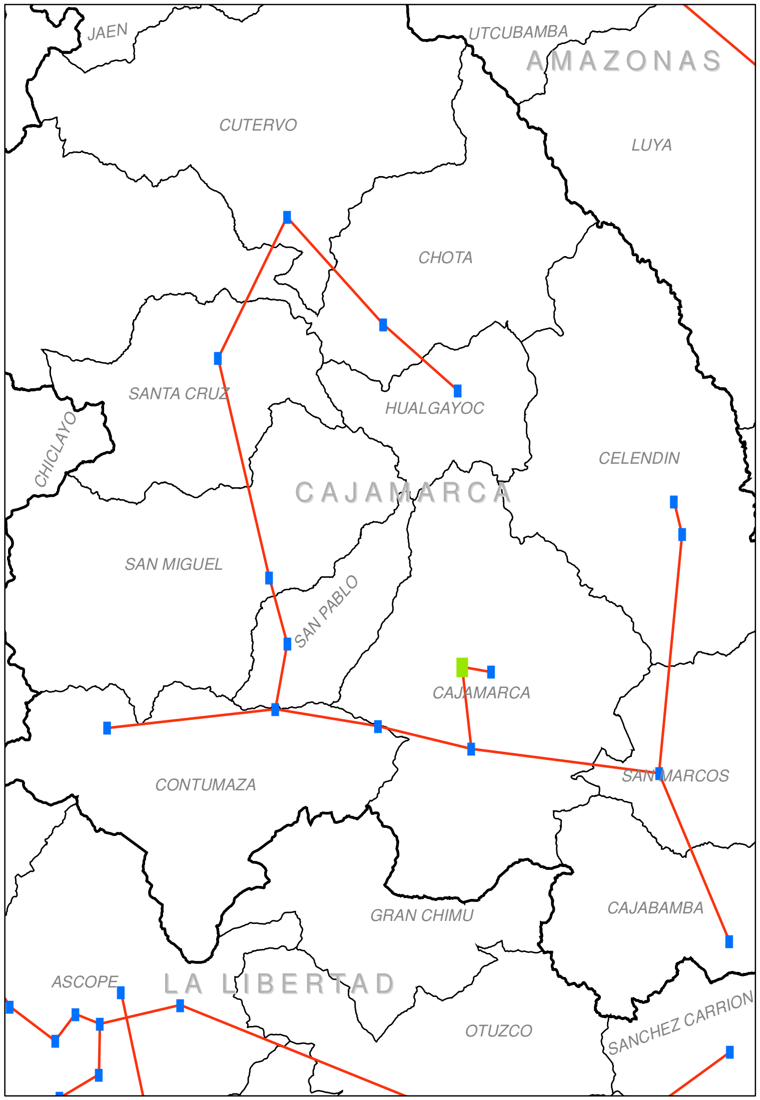


ELEMENTS
Local topology: star – Department of San Martín



ELEMENTS
Local topology: chain – Department of Cajamarca

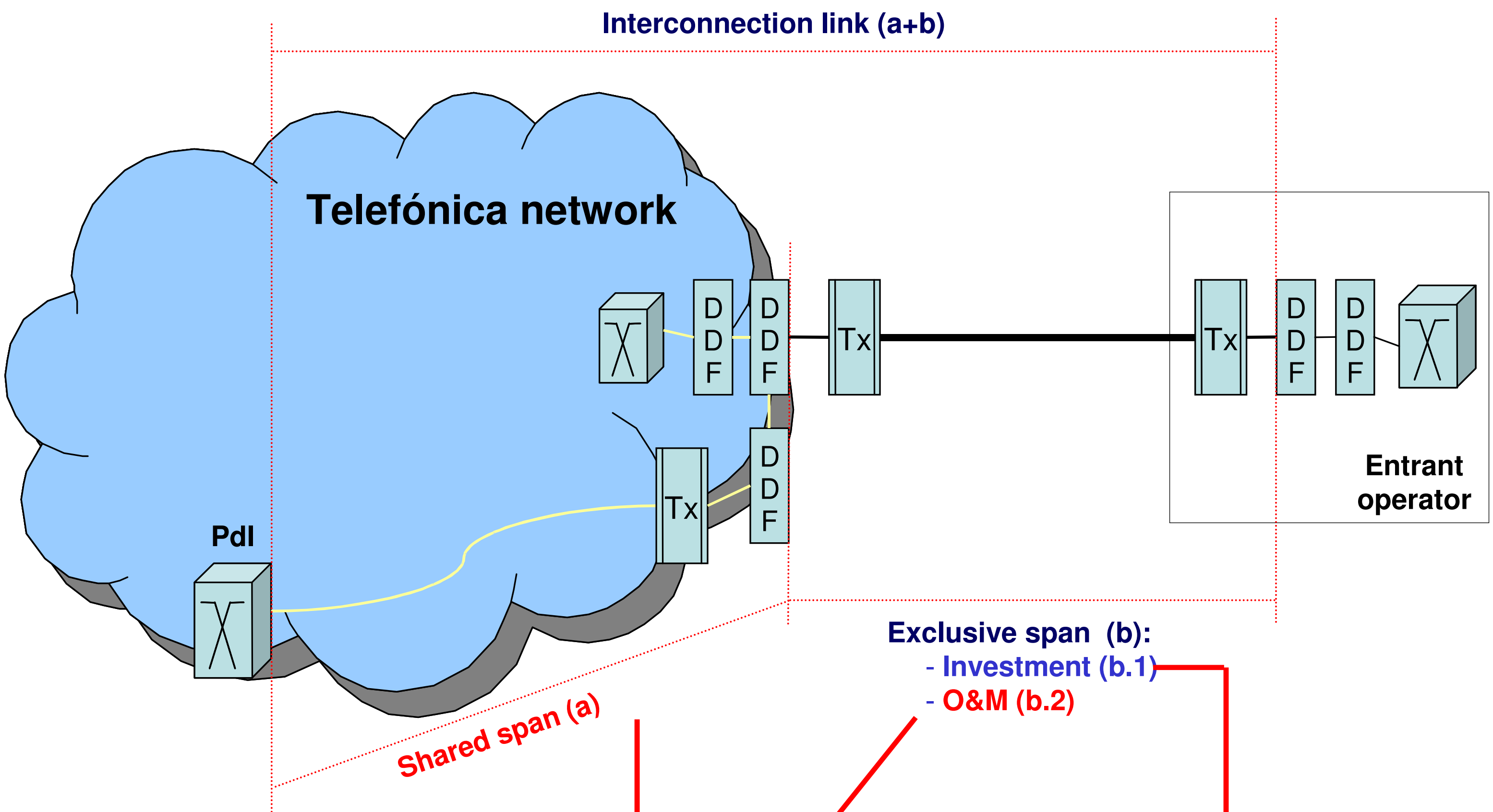
Prim's algorithm



ELEMENTS
Long-distance network topology

Routing matrix

ELEMENTS
Exclusive components – Example: links



Charge ➡ **Monthly charge** and **one-off charge**

Remunerates shared span (a) and O&M for exclusive span (b.2)

Remunerates investment for the exclusive span (b.1)

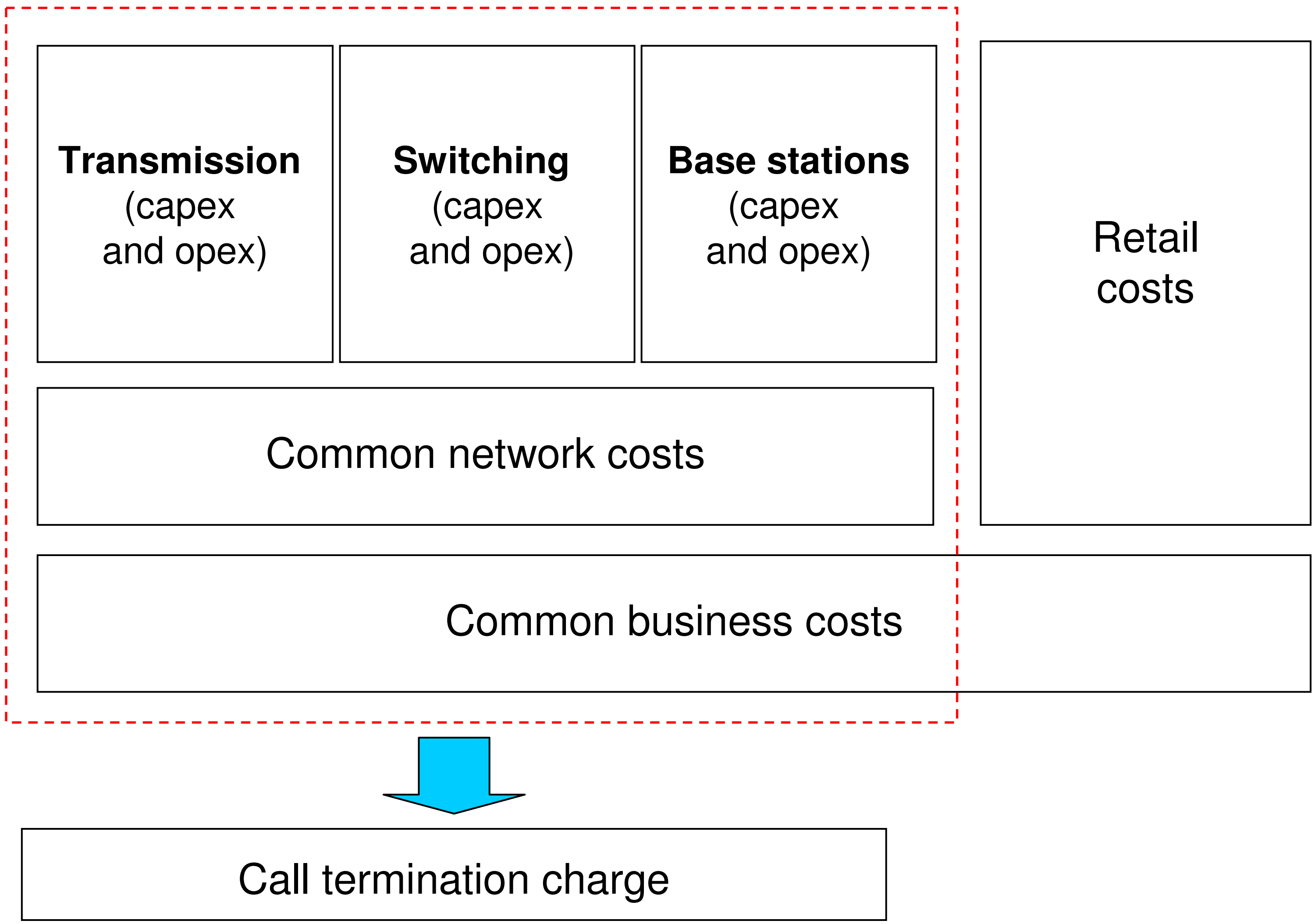
$$\text{Current asset value} = \sum_{i=1}^{n}\left[\frac{\text{Annuity}}{(1+cok)^{i}}\right] = (\text{Annuity})\left[\frac{1-(1+cok)^{-n}}{cok}\right]$$

$$\text{Annuity} = \left(\text{Current asset value}\right)\left[\frac{cok}{1-(1+cok)^{-n}}\right]$$

- **This formula only considers the annuity relating to the cost of investment and the cost of capital, and it is also necessary to incorporate operating costs. Such costs represent a percentage ("α" of initial investment over the equipment's useful lifetime, such that the annuity including that aspect is given by the following formula:**

$$\left(\text{Annuity including other costs}\right) = \left(\text{Current asset value}\right)\left[\alpha + \frac{cok}{1-(1+cok)^{-n}}\right]$$

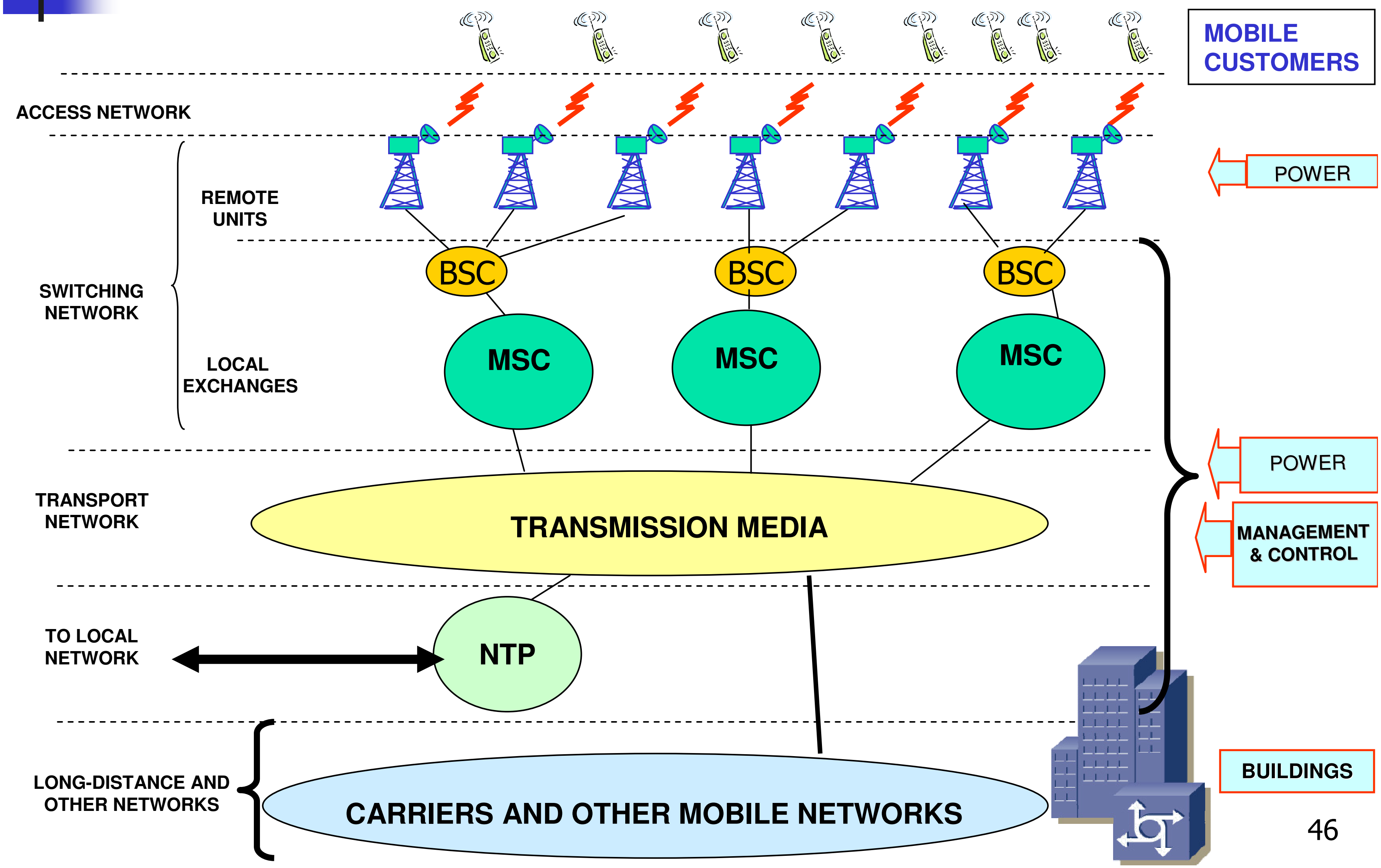
BOTTOM-UP MODEL
Scope of the model – Mobile network



Slide 45

A4 Administrador, 13/02/2007

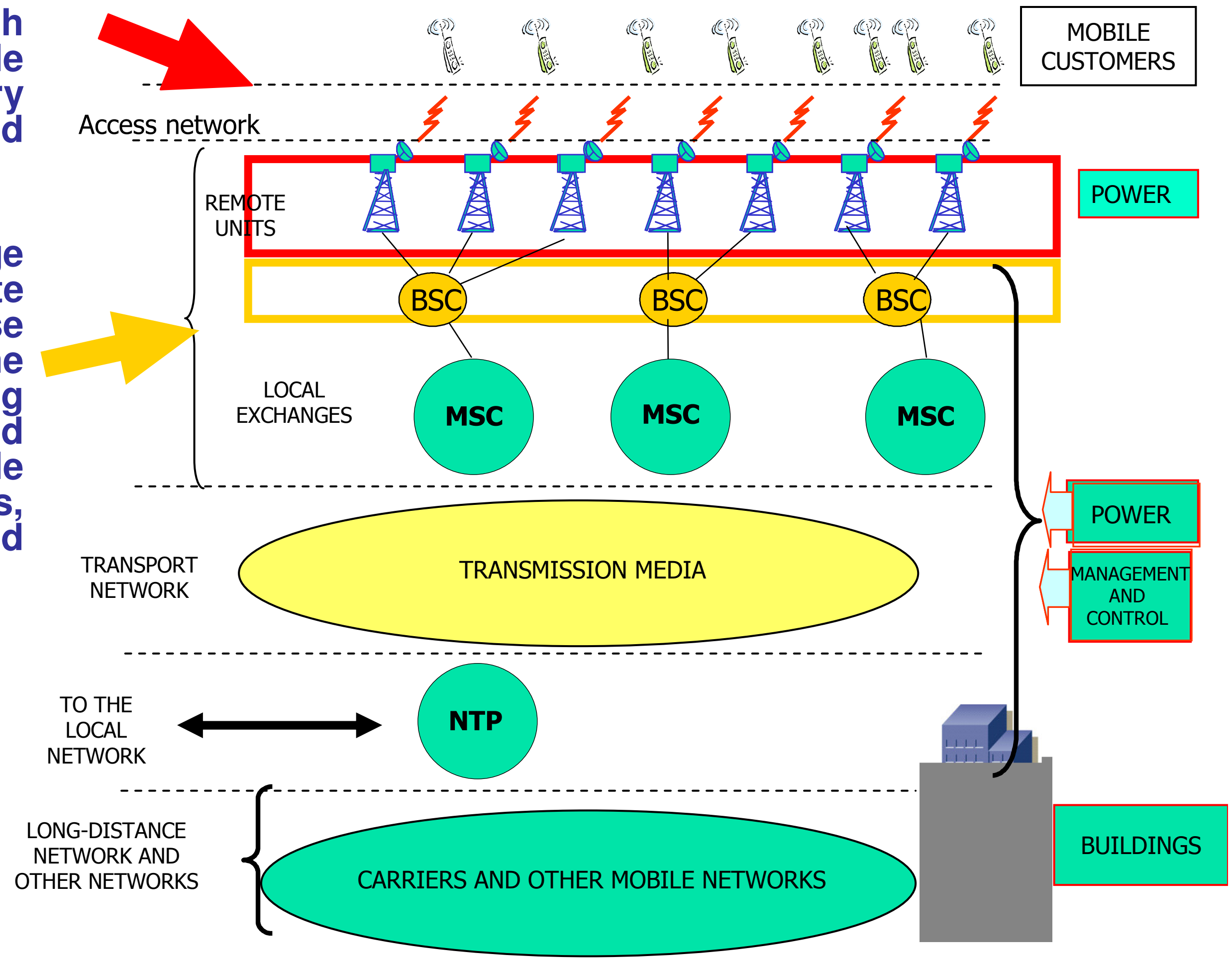
NETWORK ARCHITECTURE
Mobile network components



ELEMENTS
Base and control stations

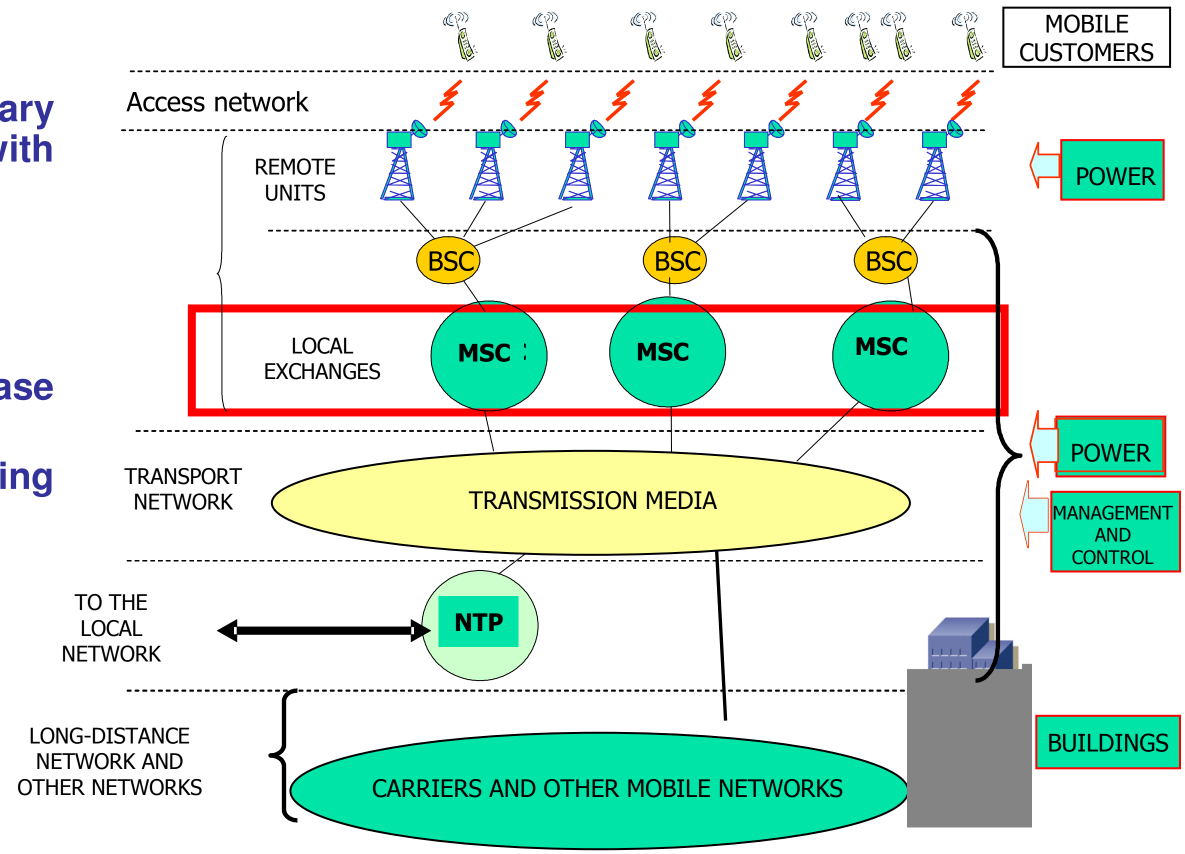
- **Base stations establish radiocommunication with mobile telephones. Their primary characteristics are coverage and capacity.**

- **Base station controllers manage radio resources and concentrate traffic in one or more base stations and direct traffic to the switching subsystem, comprising mobile switches and interconnections between mobile switches and other exchanges, whether mobile or in the fixed network.**

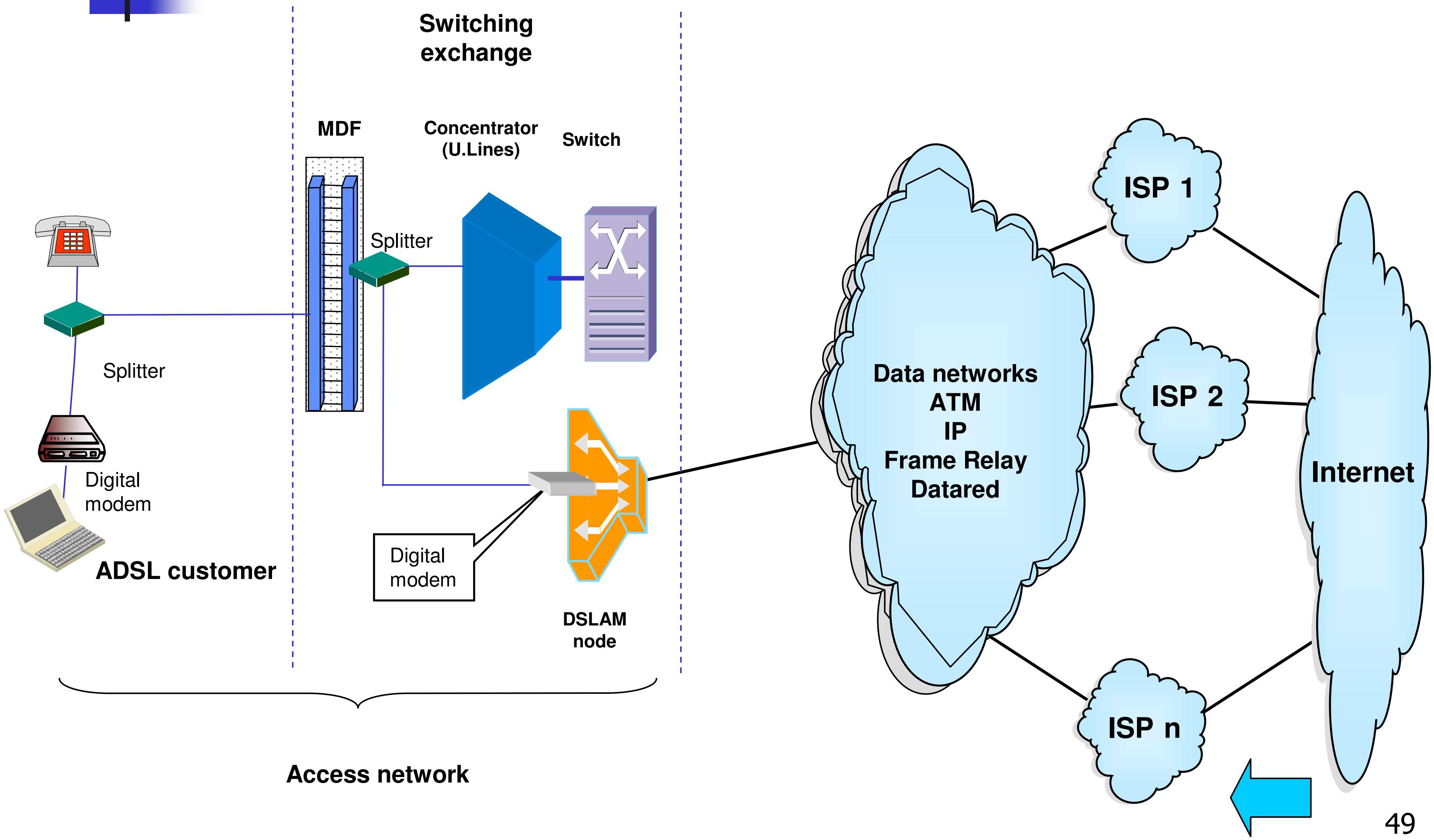


ELEMENTS
Switching

- **Provide the necessary functionality for operation with mobile telephones**
  - **Log in**
  - **Location update**
  - **Call handover between base stations**
  - **Routing of calls for roaming subscribers**



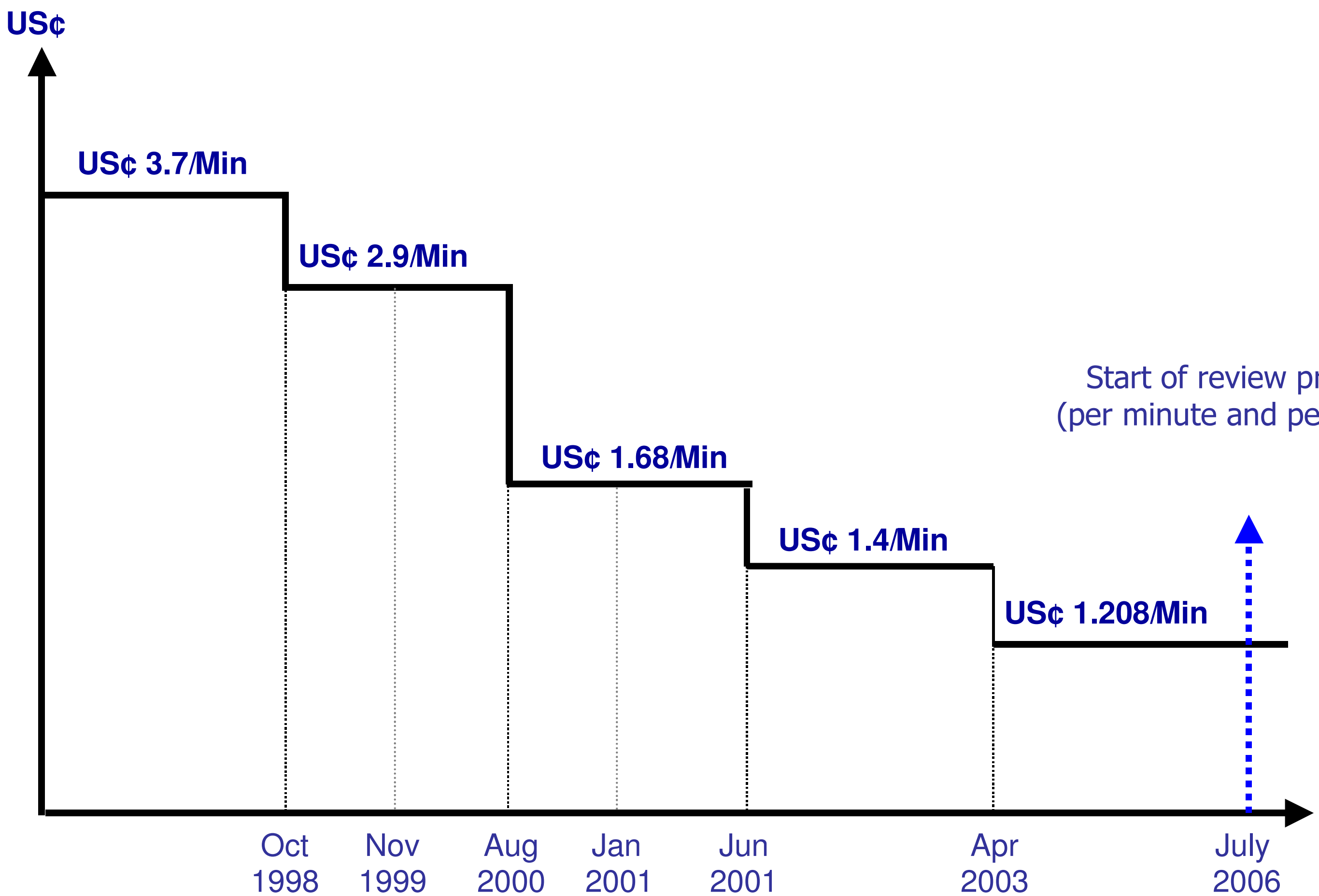
EXPERIENCE WITH DATA NETWORKS ADSL+ATM



CHARGING
Fixed termination

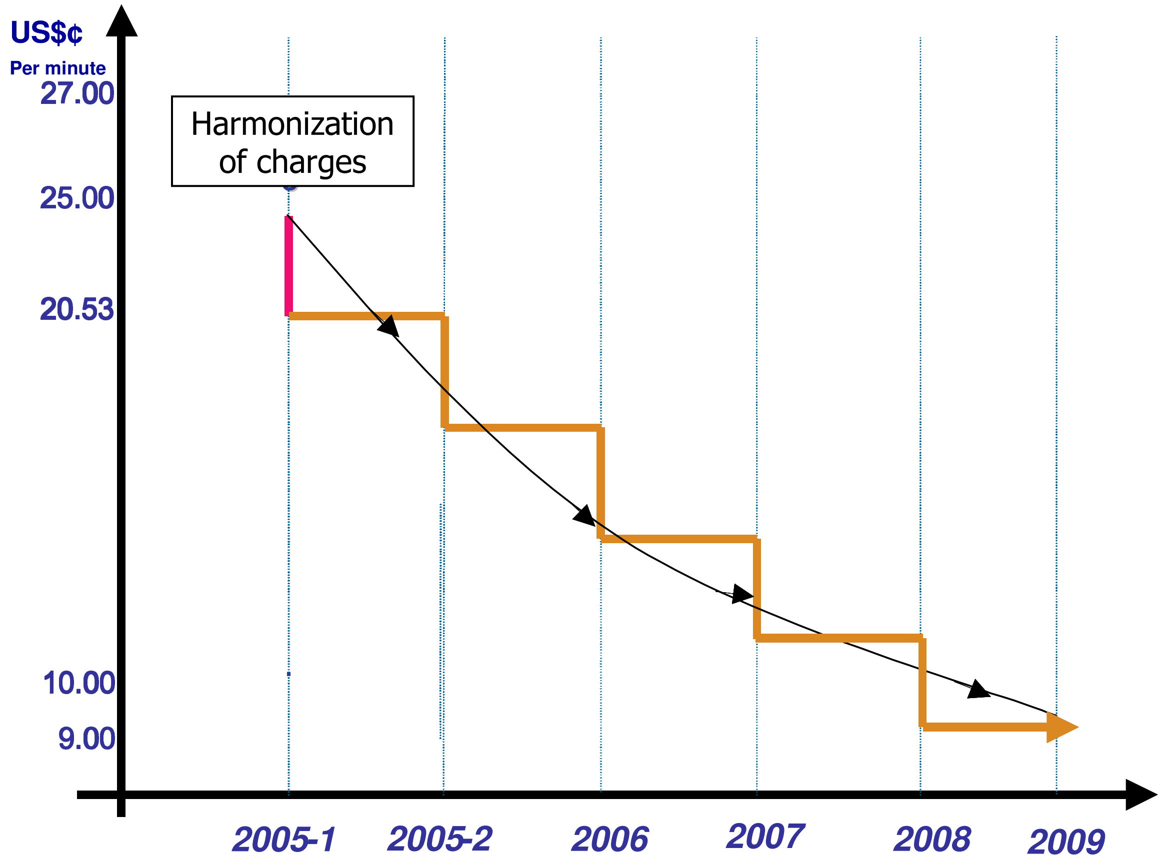
Department	Weighting	Charge per minute
AMAZONAS	0,22%	0,01932
ANCASH	1,88%	0,04311
APURIMAC	0,28%	0,01126
AREQUIPA	4,02%	0,05948
AYACUCHO	0,59%	0,01322
CAJAMARCA	1,11%	0,01653
CUSCO	2,13%	0,00691
HUANCAVELICA	0,14%	0,02388
HUANUCO	0,67%	0,00800
ICA	1,68%	0,06271
JUNIN	1,83%	0,01570
LA LIBERTAD	3,88%	0,02334
LAMBAYEQUE	2,48%	0,00764
LIMA	70,53%	0,00644
LORETO	1,20%	0,01602
MADRE DE DIOS	0,20%	0,00865
MOQUEGUA	0,48%	0,03585
PASCO	0,21%	0,02054
PIURA	2,49%	0,02412
PUNO	0,82%	0,06919
SAN MARTIN	0,95%	0,01420
TACNA	1,02%	0,01599
TUMBES	0,38%	0,03554
UCAYALI	0,82%	0,00732
Weighted average	100%	**0,01284**

CHARGING
Fixed termination



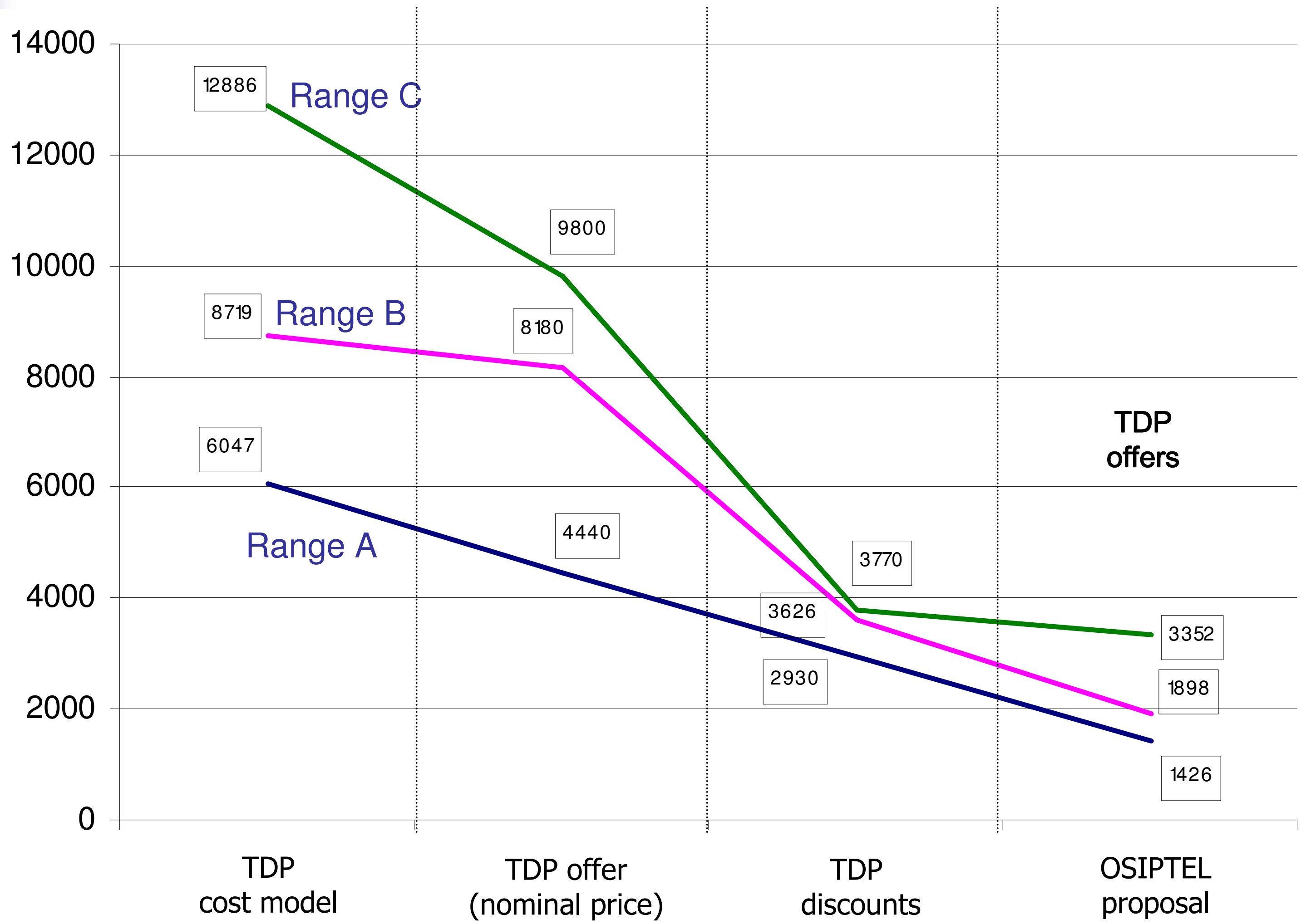
A further review was started in July 2006. The cost model will be revised in June 2007.

CHARGING
Mobile termination



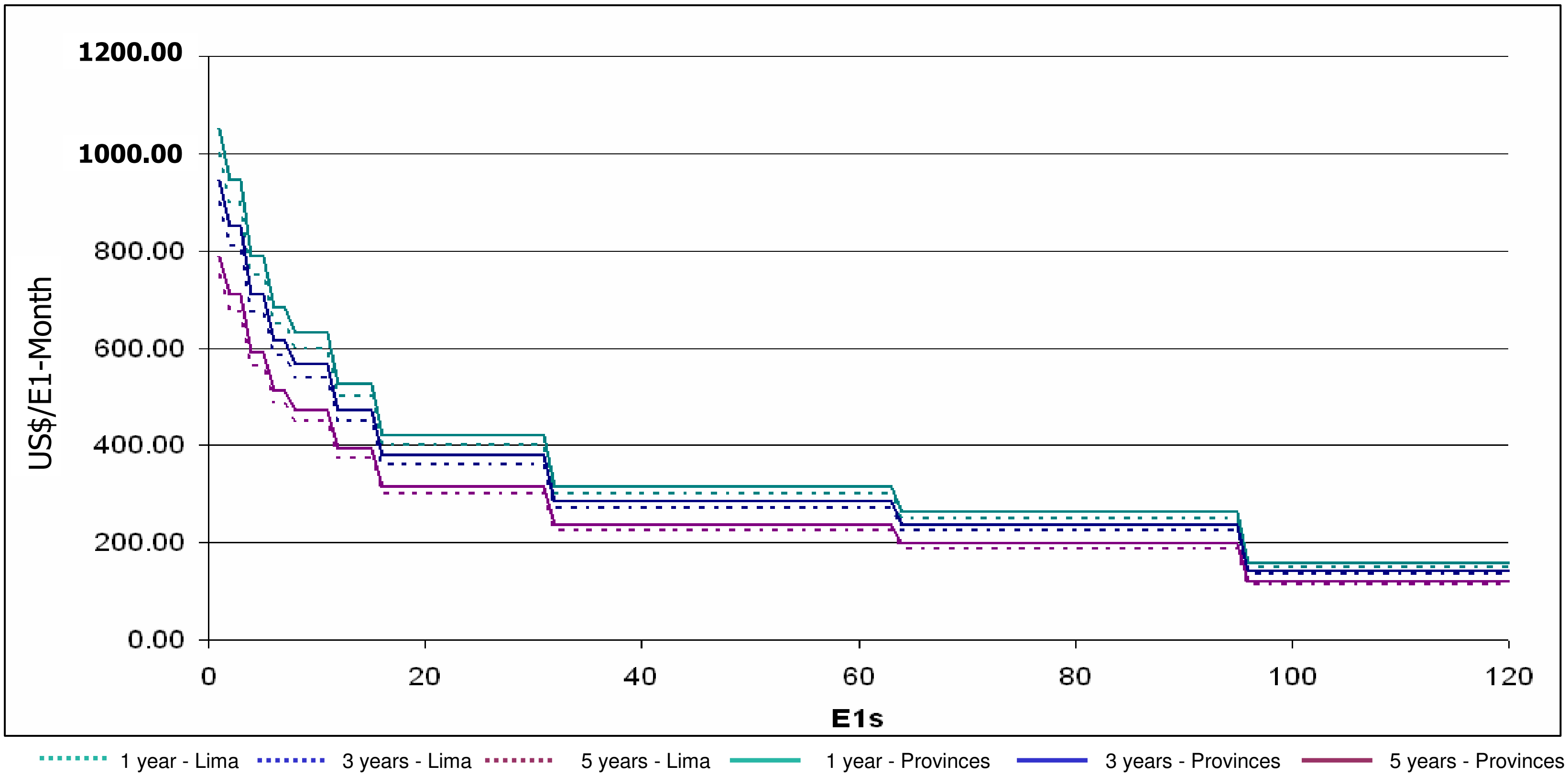
	Jan - Dec 2006	Jan - Dec 2007	Jan - Dec 2008	Jan - Dec 2009
América Móvil Perú S.A.C	0,1804	0,1555	0,1305	0,1056
Nextel del Perú S.A.	0,1772	0,1491	0,1210	0,0929
Telefónica Móviles S.A.	0,1770	0,1487	0,1204	0,0922

CHARGING
Lease of NLD circuits



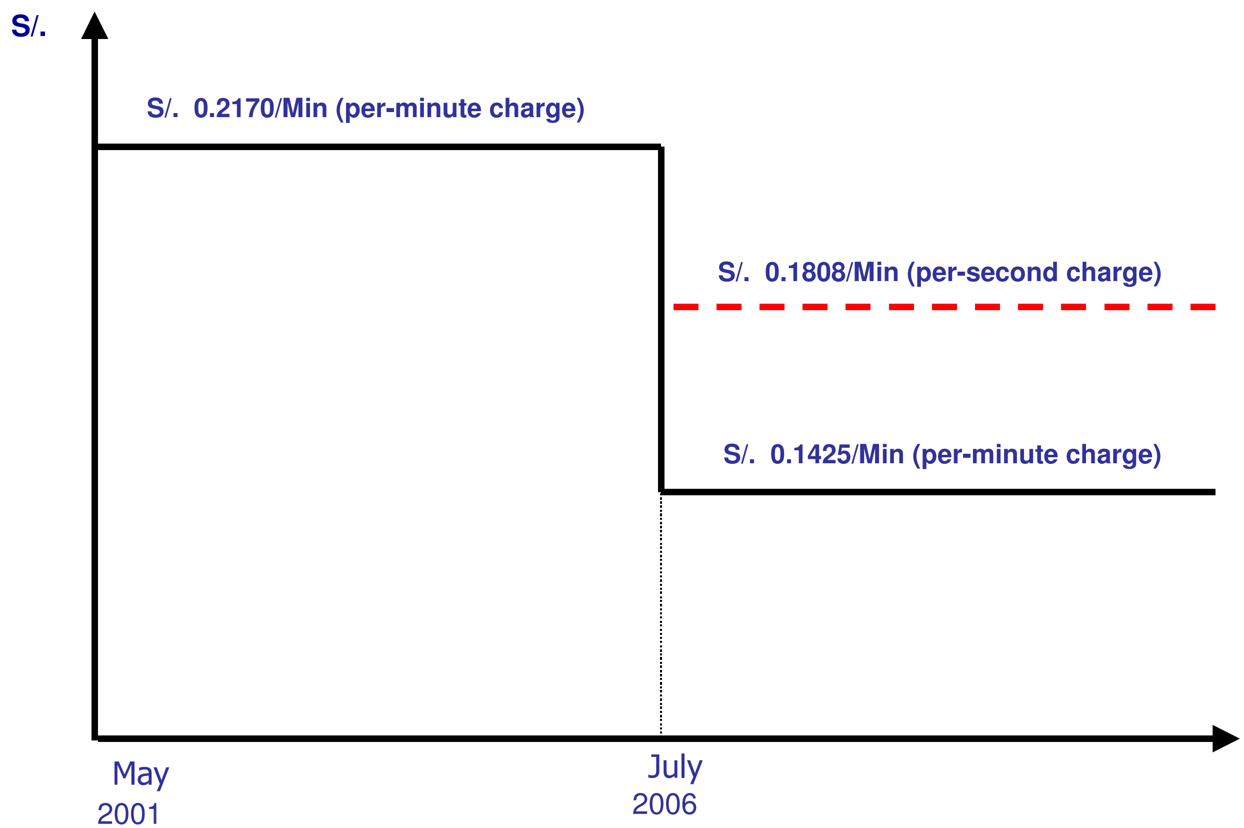
Range A: 0 km. - 100 km. / Range B: 100 km. - 450 km. / Range C: > 450 km.

CHARGING
Interconnection links



Telefónica is currently making voluntary offers according to the quantity of E1s

CHARGING
Public telephone access charge



In June 2006, a new public telephone access charge was established which has a direct impact on LD calls and calls to rural networks.

CHARGING IMPACT

Operators’ shares in savings generated by latest regulations

	Fixed and LD telephone operators	Mobile telephone operators	Rural operators
Lease of circuits*	44%	56%	Not leased
Public phone access charge	42%	N/A	58%
NLD switched transport	17%	31%	52%
Local switched transport	26%	64%	10%
Interconnection links	18%	78%	4%

* Includes circuits of at least one E1.

RELEVANT ASPECTS TOPICS

- The existence of interdependent demands means that economic models have to be developed (demand processing). Direct cost-based charges are not always the best policy.

- Alongside the development of cost models, there is a need for a clear orientation or management of regulatory tools at the levels of charges and tariffs, geared to the main aims of the policy (trade-off management).

- Handling of quality (economic theory supports the possibility of establishing minimum discrimination risk parameters).

- Analysis of instruments to avoid price-squeeze practices: allocation, retail-minus systems (possible entry).

- Formation of work teams.