



# ITU / BDT workshop

Warsaw, Poland,

6 – 10 October 2003

## Network Planning

Lecture NP-2.2

### Role of Network Planning in the current Telecom scenario

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## BDT workshop on Network Planning

Module 1: Introduction and Experiences in the Region

Module 2  
Role of Network Planning in the current Telecom scenario

Module 3  
Integrated Planning Process

Module 4  
Specific Network Planning per Layer

Module 5  
Supporting Network Planning Tools

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## Content Chapter 2.2

- **Requirements to the Network Planner**
- **Scope and activities within the network planning area**
- **Strategic Planning and new Technologies.**
- **Solution mapping per scenario**



## Network Planning Key requirements in competition

- **Business Oriented Needs**
  - **What are the best customer segments to address ?**
  - **Which services have to be introduced through time ?**
  - **What is the best service bundling per customer type ?**
  - **How to maximize revenues ?**
  - **How to reduce capital expenditure ?**
  - **How to reduce operational expenditure ?**



## **Network Planning**

### **Key requirements in competition**

- **Network Oriented Needs**

- How to forecast services and traffic demands?
- How many nodes to install ?
- What is best location for systems and related communication media ?
- What is the best network architecture and routing ?
- Best balance between built and lease ?
- How to plan capacity evolution and solutions migration ?
- How to ensure SLA and protection level ?



## **Network Planning**

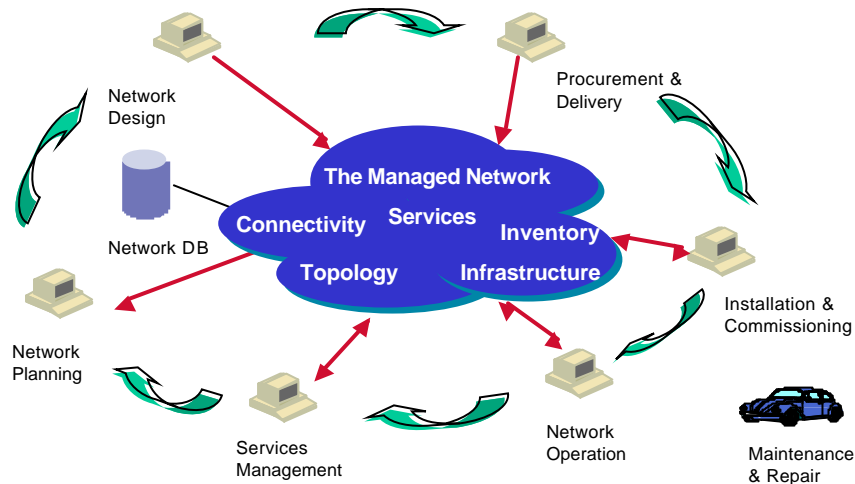
### **Key requirements in competition**

- **Operation Support Needs**

- How to evaluate alternatives for direct operation and outsourcing ?
- How to organize the operation processes ?
- Which IT applications ensure an efficient support to operation ?
- How to train labor force on the operational activities ?



## Network Planning Role within the network lifecycle



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## Network Planning Scope: Mission

“Decision making on the network deployment to Optimize Business based on quantitative evaluation”

- Considering geo-marketing scenarios and traffic demand
- Overall vision on the network layers
- Deciding network topology, interconnection and routing
- Optimizing balance between performance/SLA and cost (CAPEX + OPEX)
- Considering regulatory constraints
- Anticipating business evaluation and feasibility

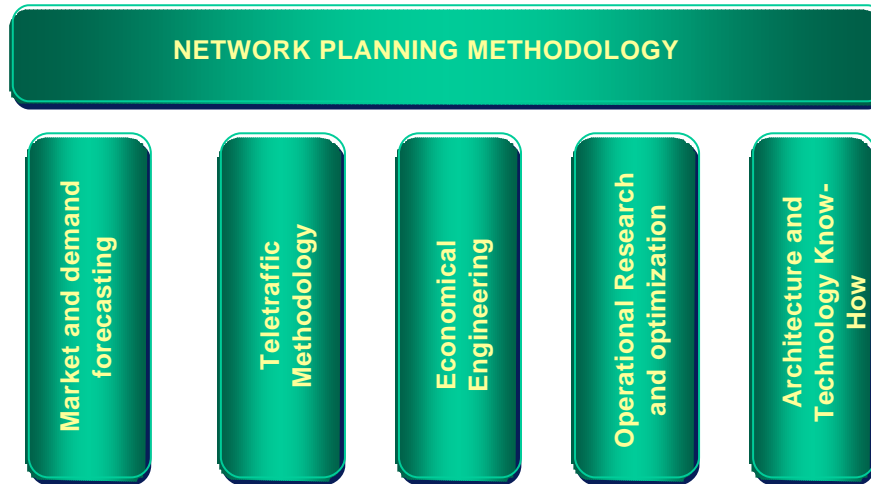
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## Network Planning Scope: Main supporting pillars



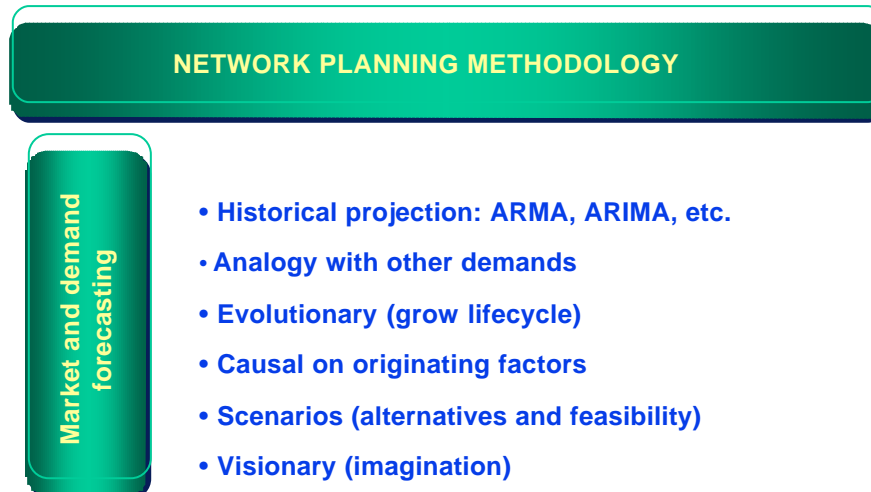
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## Network Planning Scope: Main supporting pillars



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## Network Planning Scope: Main supporting pillars

### NETWORK PLANNING METHODOLOGY

#### Teletraffic Methodology

- Statistical flow modeling for arrival rates and holding times
- Capacity models based on stochastic processes: Analytical and Simulation
- Dimensioning based on efficiency and QoS
- Good founding on the multiple contributions from the International community (ITC)



## Network Planning Scope: Main supporting pillars

### NETWORK PLANNING METHODOLOGY

#### Operational Research and optimization

- Linear programming → method of "simplex"
- Non linear modeling → procedures based on gradients
- Flow Optimization → critical path, maximum flow, etc.
- Combinatorial processes → "branch and bound"
- Iterative processes → decision by successive comparisons
- Heuristic procedures → hybrid with emphasis on constraints and equipment characteristics



## Network Planning Scope: Typical activities (1)

- 1) Problem and Network Partitioning to reduce complexity
- 2) Data Gathering to match real needs
  - Geo- scenarios
  - Existing Network & carried services
  - Current Performance and waiting lists
- 3) Demand Forecasting and traffic characterization
- 4) Definition of Solution Alternatives

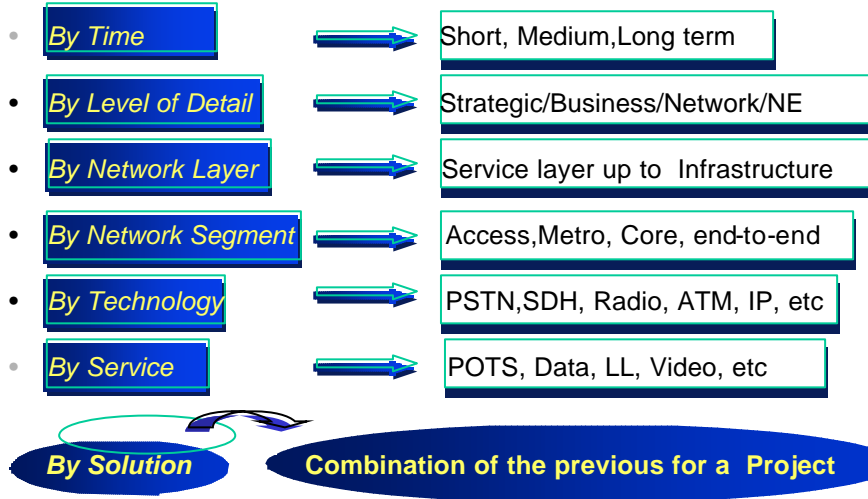


## Network Planning Scope: Typical activities (2)

- 5) Mapping best alternatives to requirements in coverage and technologies
- 6) Nodes/Links Design, Location and Dimensioning
- 7) Network Costing in CAPEX and OPEX
- 8) Optimization for routing and deployment
- 9) Sensitivity Analysis to demand level, QOS, etc.
- 10) Documentation of Network Plan and deployment



## Network Planning Scope: Dimensions



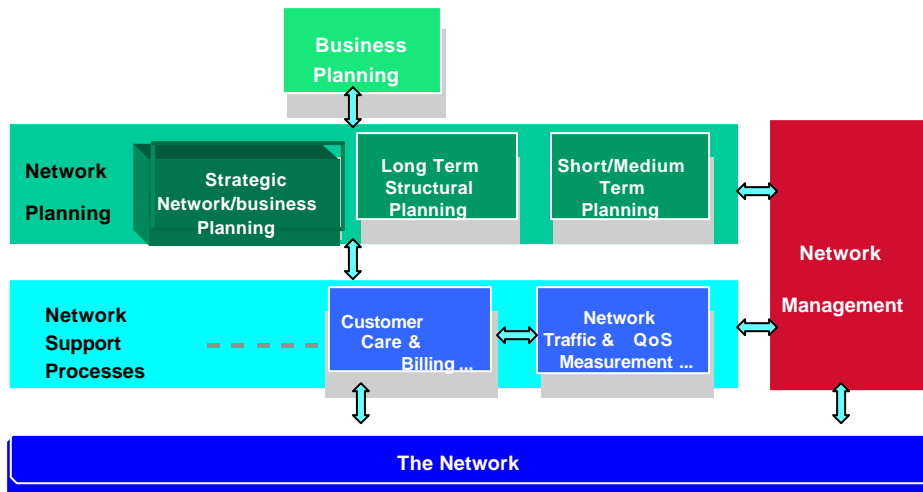
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## Network Planning Scope: Related Processes



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## Network Planning Strategic view

*Key decisions to guide the overall network structure, services and technologies:*

- **Role and market segments within competition**
- **Main evolution for technologies and architectures. NGN**
- **Solution mapping per scenario**



## Network Planning Strategic Planning: Role in competition

- **Selection of market segments: economy of scale**
- **Make versus outsource decision**
- **Policy on revenues and financing**
- **Partnership selection**
- **Priorities definition**



## Strategic Planning: Evolution on Technology and architecture

### Technological alternatives: Which, When and Where

- Architecture at core and access segments
- Operation support applications
- Planned evolution steps

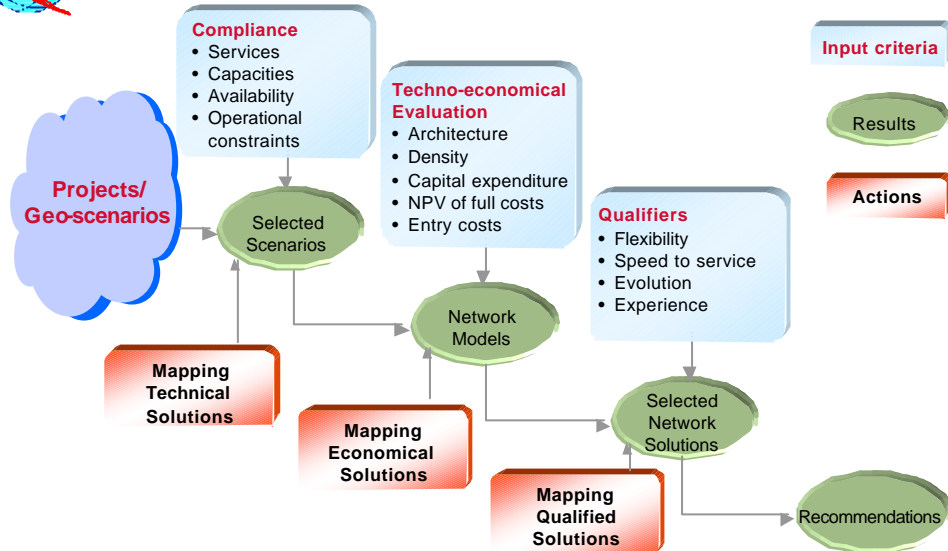


## Solution Mapping

- Variety of geo-scenarios within the country
- Characterize parameters for scenario and solutions
- Techno-economical evaluation to select best COOP



## Solution Mapping: Methodology



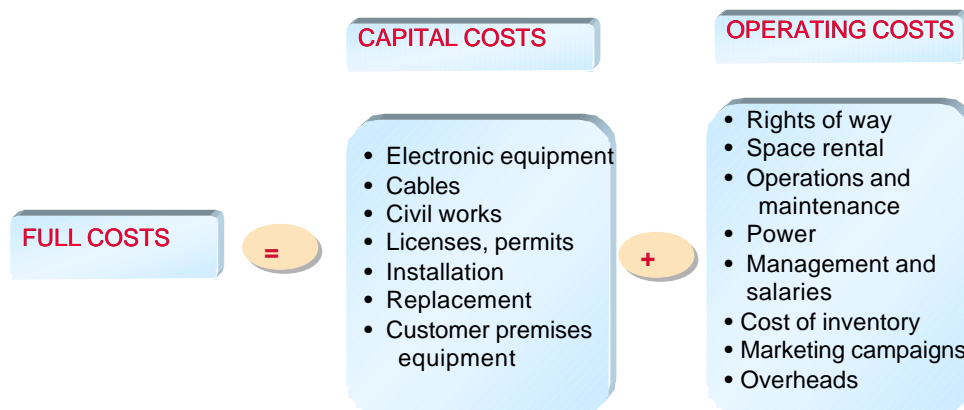
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## Solution Mapping: Cost Modeling



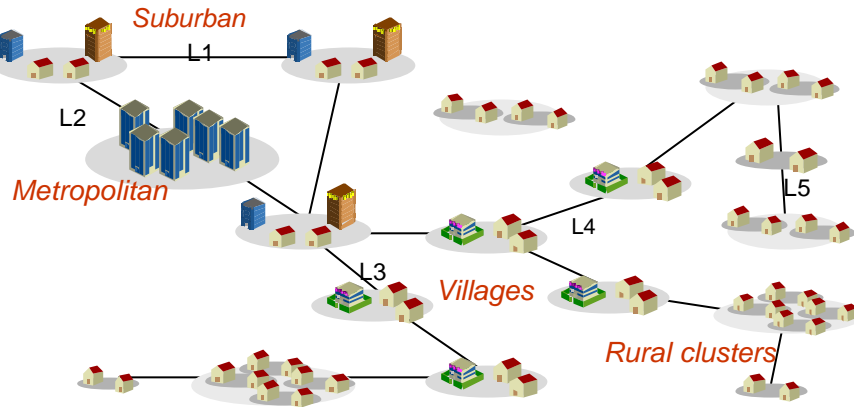
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## Solution Mapping: Example of Geo Scenarios

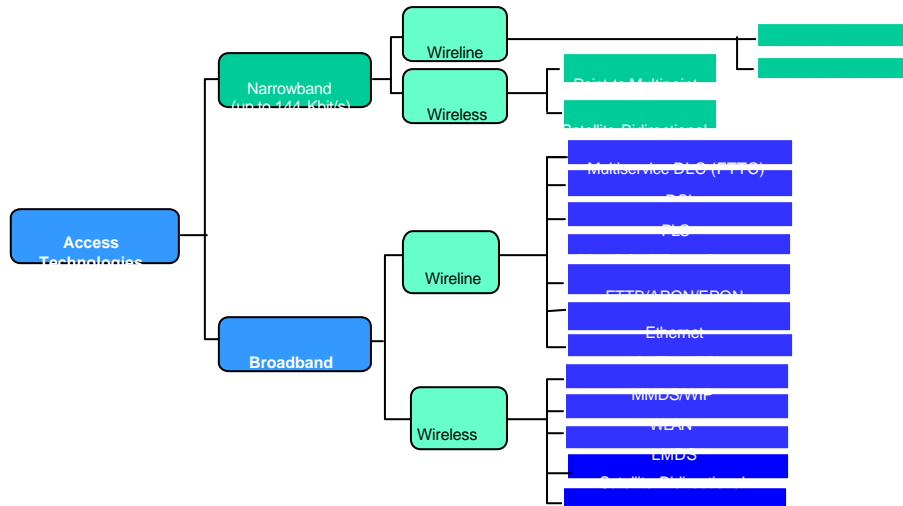


L1: Distance between suburban  
L2: Suburban - metropolitan distance  
L3: Suburban - village distance

L4: Distance between villages  
L5: Distance between rural

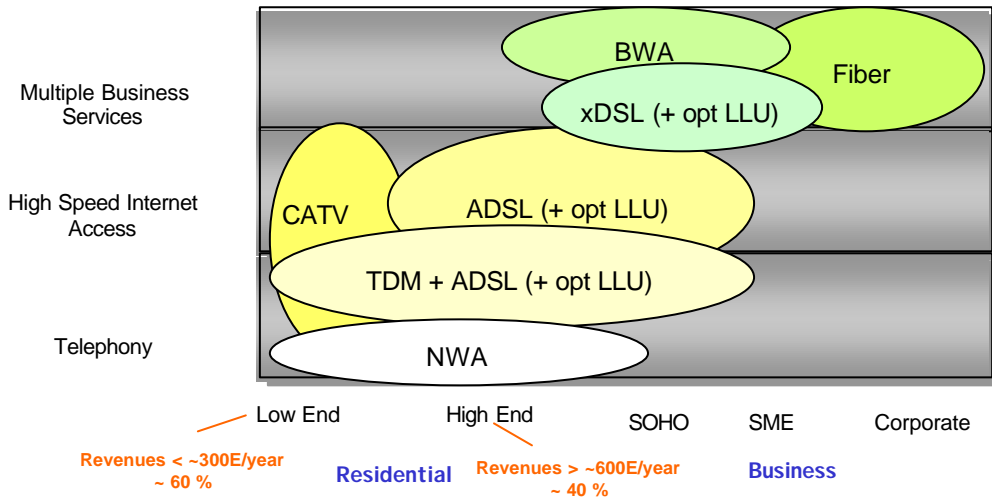


## Solution Mapping: Technological alternatives at access (Fixed)





## Solution Mapping: Technical Alternatives at access



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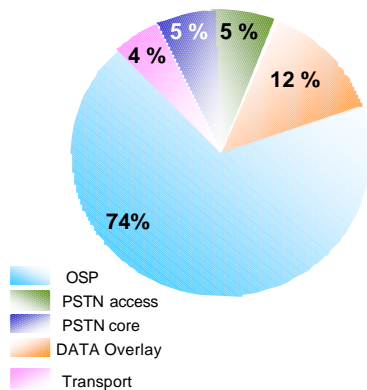
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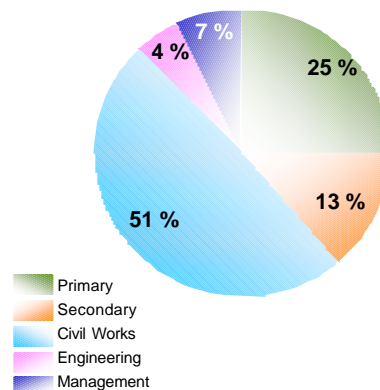


## Solution Mapping: Investment Splitting in Greenfield Access

**Network Cost Composition for overlay PSTN and Data**  
(Metropolitan 1 node Ducts+ Aerial)



**Infrastructure (OSP) Cost Composition**  
(Metropolitan 1 node Ducts+Aerial)



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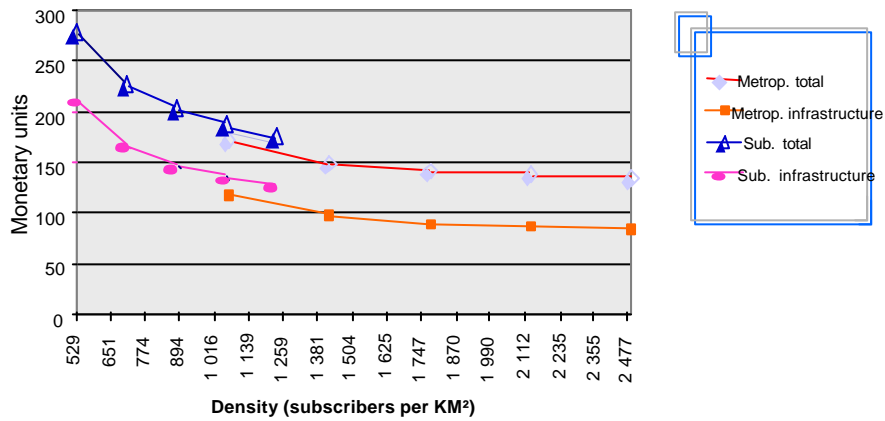
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## Solution Mapping: Investment sensitivity to density in WL Access

### High density areas



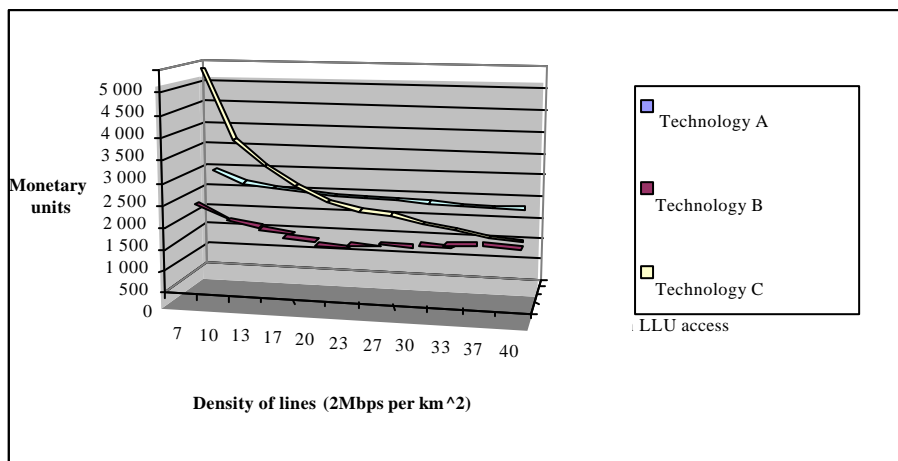
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## Solution Mapping: Solution selection per customer density



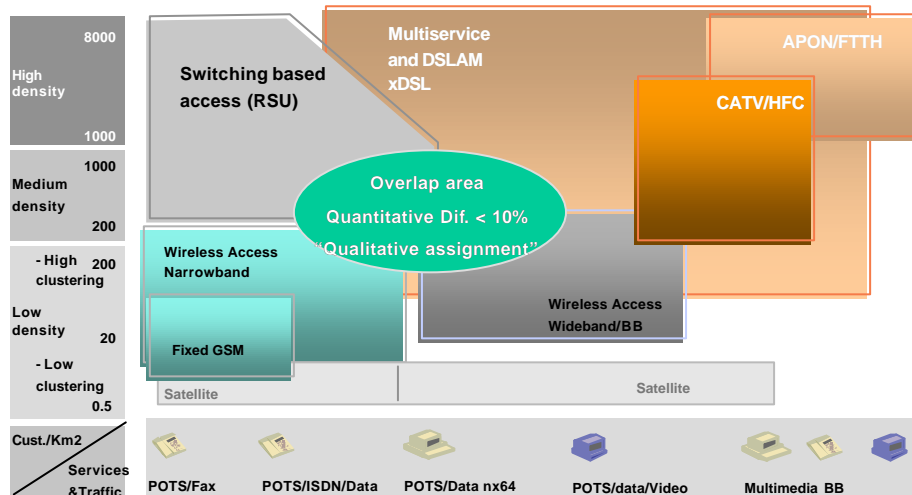
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## Solution Mapping: Techno-economical Recommendation



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## Network Planning Reference benefits

- Adequate definition of customer segments, services and business to ensure efficient operation in competition
- Anticipation of 2 to 3 years in the positive IRR
- Saving factors of 20 to 200 % by adequate solution/technology mapping in the access segment
- Additional gains between 20 to 40 % by topology/routing optimization

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