

ITU-D Regional Development Forum for the Americas Region NGN and Broadband, Opportunities and Challenges

NGN Planning Process and Tools

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Agenda

- **NGN Planning issues and processes**
- **ITU-D activities on Planning**
- **Planning support Tools**
- **Example of strategic planning**

Questions for NGN Planning

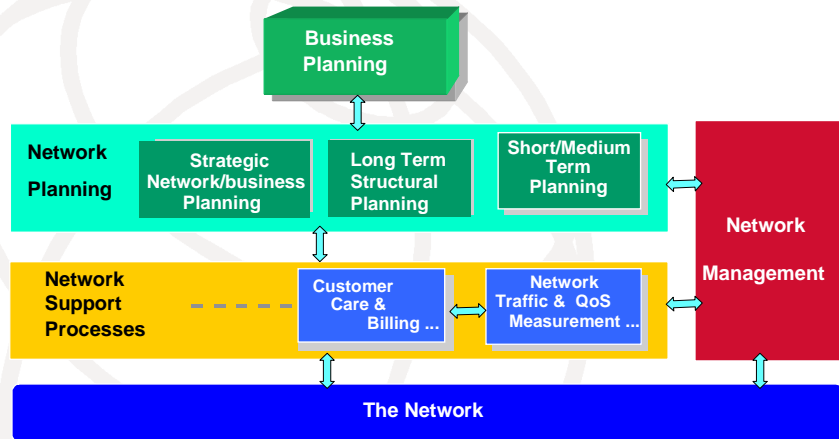
- **When to modernize the network?**
- **What new services to introduce and sequence?**
- **What cost and profitability may be expected?**
- **When to introduce IMS?**
- **How to reduce CAPEX and OPEX?**
- **Which technology to be used per segment?**
- **What timing for implementing network transition at each segment?**

- **Others**

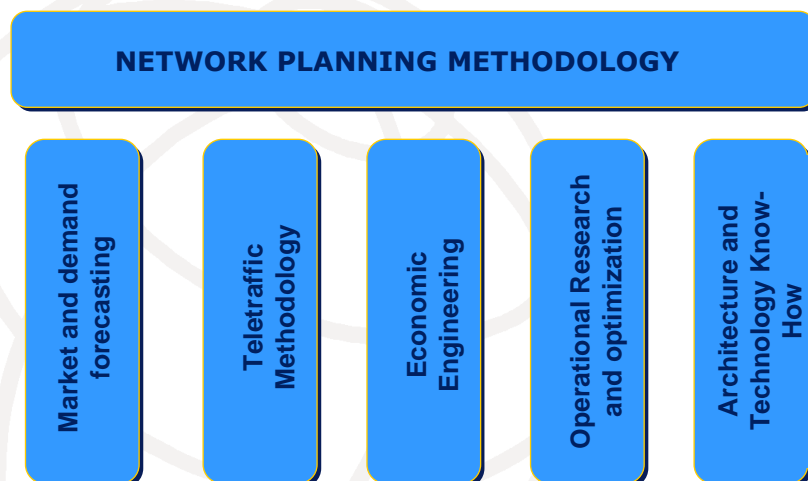
Specific Network Planning Issues for NGN

- **Technical and business evaluation for core migration rates to IP/MPLS mode**
- **T/E evaluation for Local/Edge migration to IP/MPLS mode with new functionalities**
- **T/E evaluation for Access migration at physical and functional levels**
- **T/E evaluation for IP protocols migration: IPv4 to IPv6**
- **T/E evaluation for Overall migration to full end to end NGN**

Overall Planning: Related Processes and interrelation

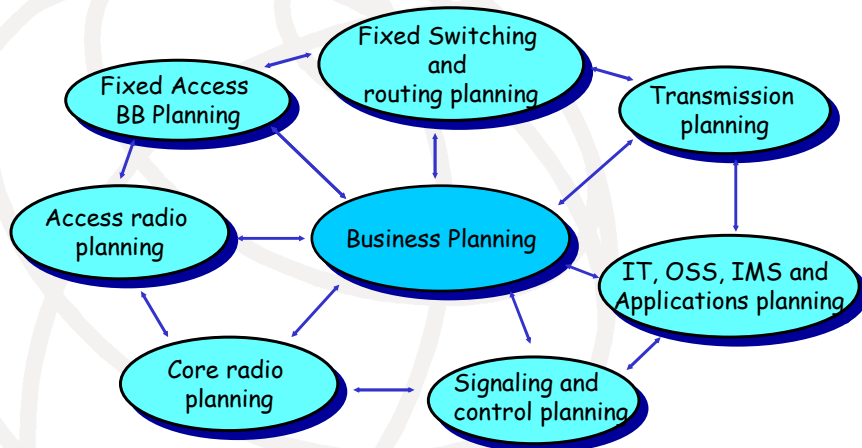


Main 5 planning supporting pillars



Network NGN Planning domains

Specific domains per network area in NGN



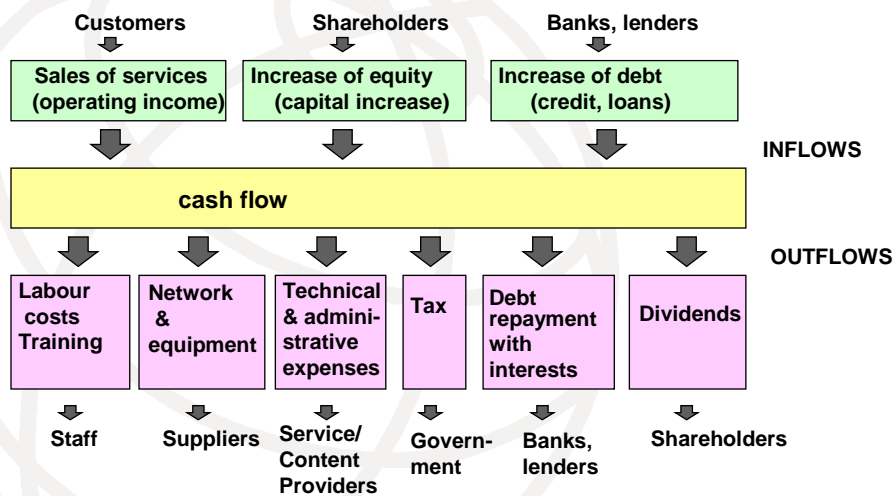
Role of Business Planning

- ◆ Forecast solutions, costs and revenues
- ◆ Evaluate future Cashflows, NPV, IRR, ROI, etc.
- ◆ Perform "What-if" analysis for optional alternatives on volume of customers, customer mixes and services domains
- ◆ Perform benchmarking with "best in class" operators
- ◆ **Decision making on strategy and actions in market competition based on quantified evaluations**
- ◆ Recommend solution alternatives to ensure business success

Business Planning frequent topics for NGN

- Business impact of introducing new NGN services, content and service bundles
- Market wholesale versus retail business evaluations
- What technology to use per geo-scenario
- NGN cost saving by infrastructure sharing
- NM/ OSS/BSS migration from multiple platforms to integrated platform

Overall business Inflows and Outflows



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Network Planning Activities Objectives

- **Context**
 - Today the high number of options for telecom solutions and services with the complexity of planning increases the needs for a systematic and reliable planning methodology
- **Objective**
 - Following ITU mandate and agreements, a series of support documents and activities on the field have been carried out as:
 - Reference Manual on Telecom Network Planning for evolving network Architectures
 - Network Planning Tool Specs for Developing Countries and Countries with economies in transition, (NPTS)
 - Assistance in the field to planning as requested by members on developing countries.

Network Planning Activities Users

- **Users of the NPTS**
 - The Reference Documents on MNP and NPTS is intended for use by network planning experts and managers from telecom operators, policy makers and regulators
- **Reference documents and web address**
 - *Reference Manual on Telecom Network Planning for Evolving Network Architectures*, ITU, Geneva, 2008
<http://www.itu.int/ITU-D/tech/network-infrastructure/Manual/Version5/indexManual5.html>
 - *Guidelines for Network Planning Tools for Developing Countries and Countries with economies in transition*, ITU, Geneva, 2005
http://www.itu.int/ITU-D/tech/network-infrastructure/GNPT_Final_17August2005.pdf

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Network Planning Tools Specs Need for multiple tools

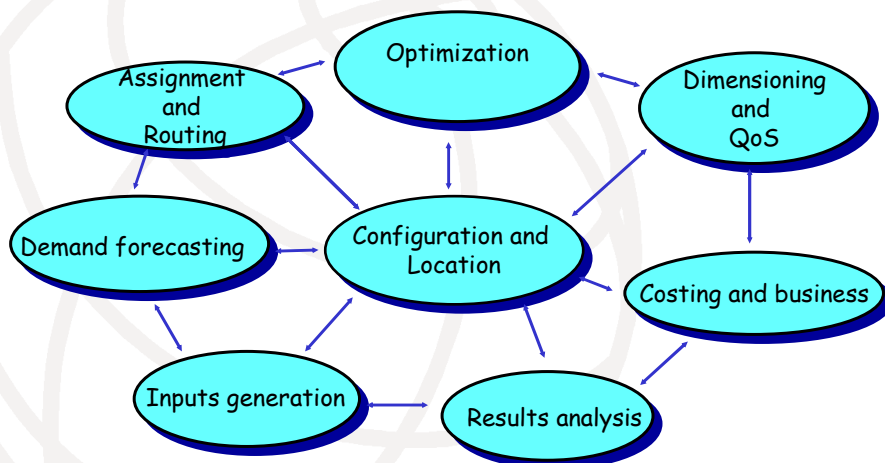


- **Multiple dimensions of the planning activities**
 - Due to timeframe for planning at short, medium or long term
 - Due to variety and complexity of network solutions
 - Due to new technologies
 - Due to different network layers
 - Due to planning type: strategic, tactical or operational
- **Need for combination of tools**
 - Tools should specialize to solve different problems
 - Interrelation is needed to combine evaluations and decisions
 - Assessment is required to select and combine most appropriate tools

Network Planning Tools Specs Type of requirements



A large variety of Planning activities needed per tool



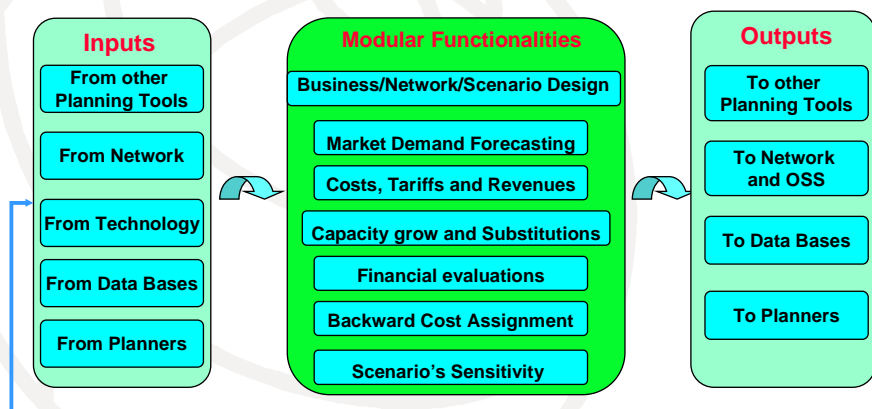
Network Planning Tools Requirements:

Requirements and criteria for the tool selection

- Capability to model modern technologies and technical requirements
- Commercial availability
- Capability to interrelate different planning tools
- Explicit documentation of models, inputs and results
- Commitment for periodical updates and maintenance
- Training program with reference cases
- Validation process for a range of cases
- Being well proven in the field

Network Planning Tools Requirements:

Illustration of functional requirements for the **business** planning domain



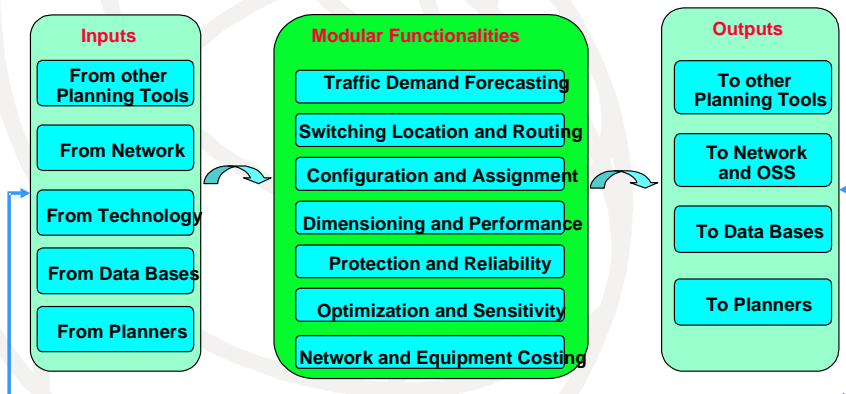
Network Planning Tools Requirements:

■ Required functionality for Business tools in NGN

- Service Demand Projection
- Dynamic modeling for technology substitution and migration rates
- Dimensioning multiple flows (circuit and packet modes)
- Evaluation of network resources and associated investment (CAPEX)
- Evaluation of revenues for services and service bundles
- Modeling multiple resource lifetimes
- Modeling of demand elasticity to tariffs
- Interrelation between network growth and operational cost (OPEX)
- Cost assignment as a function of utilization rates
- Generation of standard financial results like Cash Flow, Profit & Loss, Balance Sheet, NPV, IRR, etc.

Network Planning Tools Specs: Overview of modular requirements

Illustration of functional requirements for the switching and routing planning domain



Network Planning Tools Requirements:



Illustration of calculation procedures required for the **switching and routing** planning domain (I)

- Dimensioning methods for loss based systems including Erlang-B formula, overflow routing, and equivalent random method. Application of the methods to circuit-switched networks including hierarchical alternative routing and non-hierarchical routing. Multi-hour dimensioning methods.
- Dimensioning methods for delay based systems including Erlang-C, Erlang multi-rate, hyper-exponential models and processor sharing models. Application of the methods to packet-switched mode networks.
- Traffic evaluation models for equivalent sustained bit rate in multi-service environments. Capability for traffic evaluation and dimensioning based on additional given predefined rules. Annual traffic to busy hour and busy period traffic conversion.

Network Planning Tools Requirements:



Illustration of calculation procedures required for the **switching and routing** planning domain (II)

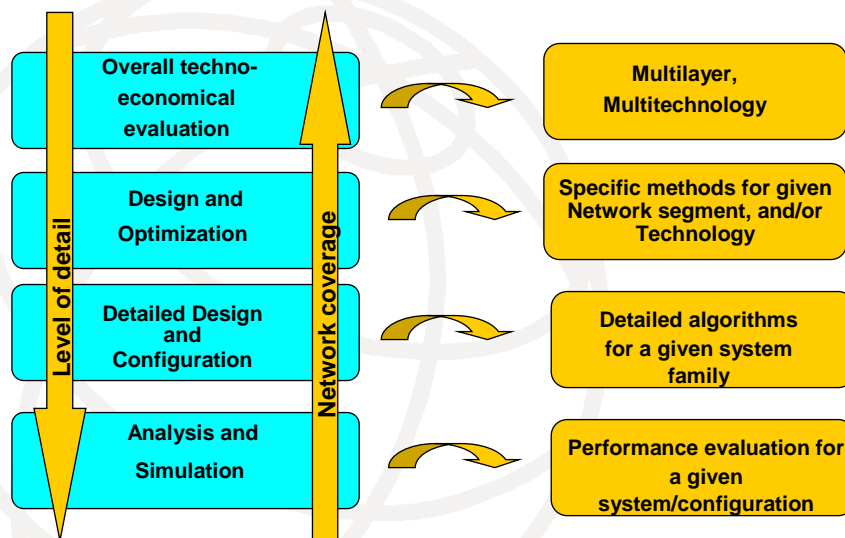
- Evaluation methods for calculating link, path and route GoS, at the designed network and utilisation factors at nodes and links.
- Evaluation methods for reliability of network, sub-networks and systems based on individual reliability parameters
- Calculation of protection levels for end-to-end routes and diversity paths with single node, single link and combined failure survivability.
- Evaluation of costs with polynomial models based on fixed and marginal costs per cost driver such as systems, cabinets, modules, racks, cards, ports, erlangs, Mbytes, Mbps, etc.

Network Planning Tools Requirements:

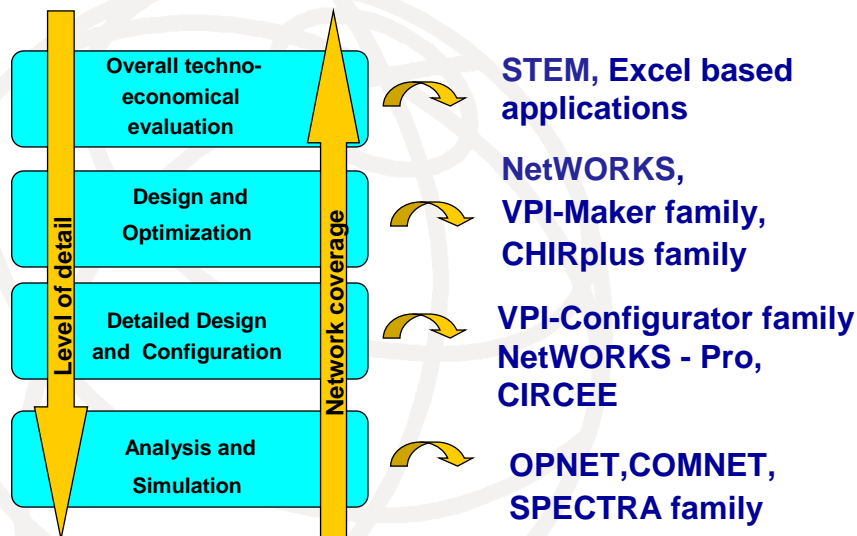
Illustration of calculation procedures required for the **switching and routing** planning domain (III)

- Optimisation algorithms for network topology and routing, including minimal connectivity, connectivity of level "n", flow optimisation, GoS objective functions, disjoint paths and protection. Associated dimensioning methods for resilient circuit-switched networks and packet-switched networks with single node, single link and combined failure survivability.
- Calculation models for circuit switching and packet switching mode are applicable in an NGN in which subnetworks and Network Elements need both type of models such as the Gateways and Application Servers. It is preferred to have all models available in the tools with an integrated view of NGN and have the planner to decide were to apply each, as many hybrid situations appear both in the networks and the systems.

Network Planning Tools: Tool categories by coverage



Network Planning Tools: Tool examples per category



Network Planning Tools: STEM

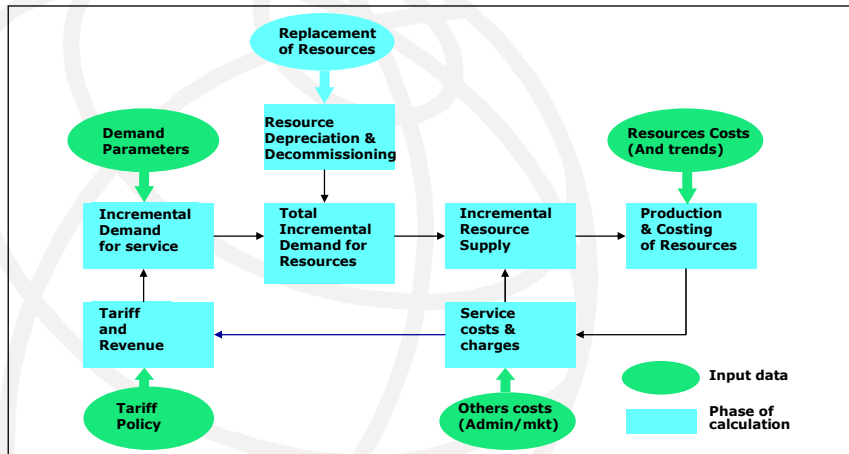
Business
Planning

Objective : STEM by "Analysys" (in Cambridge) is a business decision making support tool that enables the analysis of business models and cost assignment for Telecommunication Networks and services over a period of time.

The Analysys STEM network investment modelling tool is a product of Analysys Consulting Ltd, Cambridge, UK

see: www.analysys.com

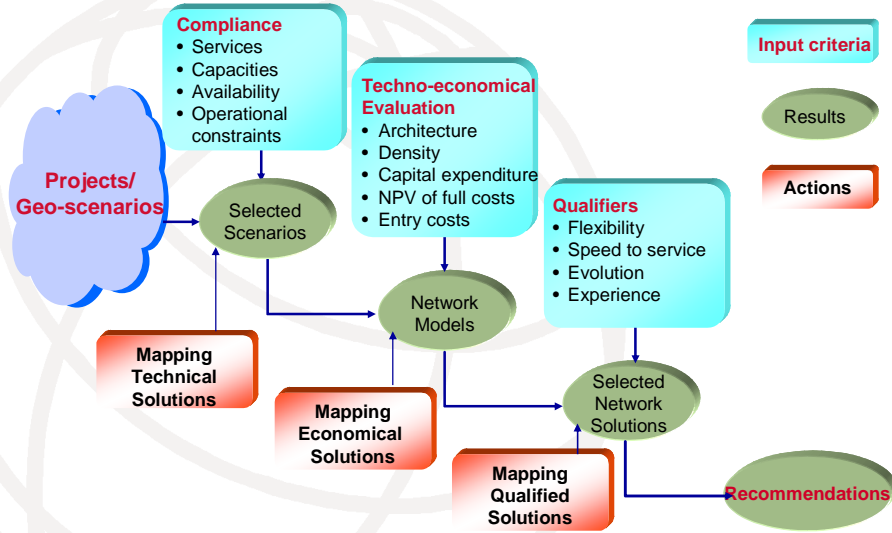
Dynamic modelling of network activity flows for migration



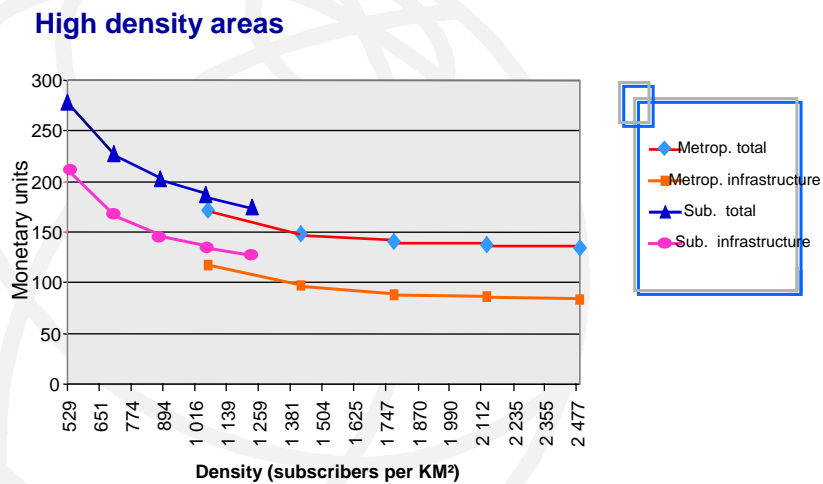
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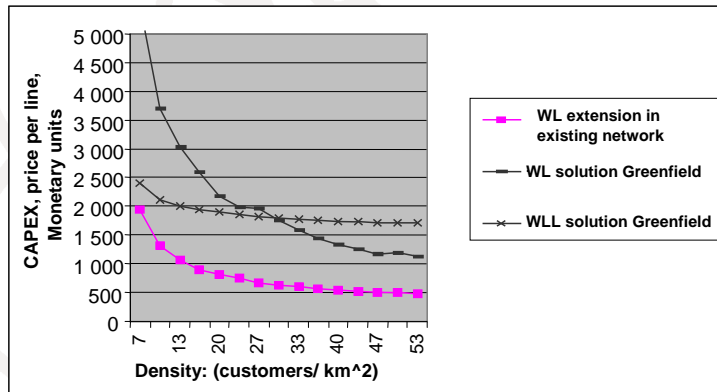
Solution Mapping: Methodology



Solution Mapping: Investment sensitivity to density in WL Access



Cost sensitivity to customer density per type of solution



- Clear cross-point between WL and WLL solutions as a density function
- Important impact of existing network reusability

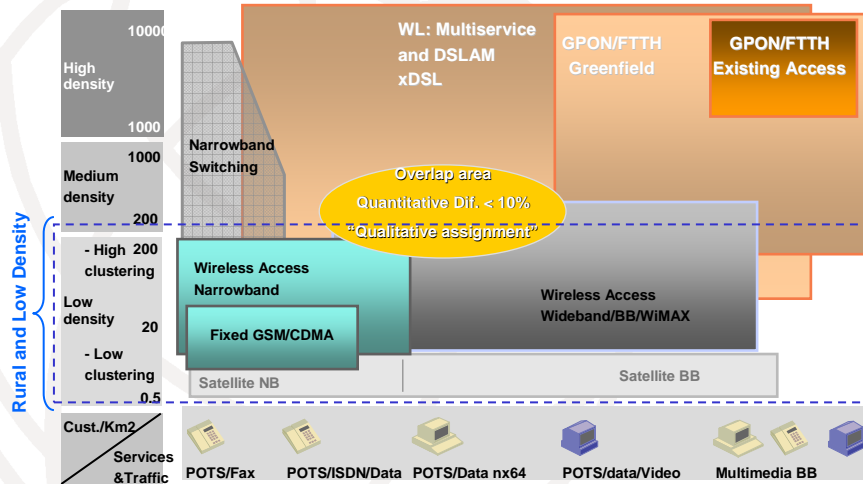
Frequent applicability mapping at access

Technology Solution	Scenario Type			
	LD Villages	LD resorts	Rural Clusters	Disperse settlement
WL-DLC/xDSL	✓✓	✓✓	(if OSP available) ✓	S
WL-PLC			✓	✓
FTTx	✓ FTTC	✓✓ FTTP		
WiMax	✓✓	✓✓	✓	✓
IMT 2000-WLL			✓✓	✓
Satellite			✓	✓✓
Mobile	✓✓	✓✓	✓✓	✓

Most frequent applicability is illustrated per solution category

Solution mapping by business evaluations

- Current positioning of access and FTTH solutions in service/density scenarios



Recommendations

- Identify **key factors** for network evolution and strategy definition
- Develop team with capability to perform **techno-economical evaluations** to decide best alternative. Collaborate with external experts when needed
- Investment in business evaluations **produce the higher returns** by a high multiplication factor