ITU/BDT Regional Seminar on Costs and Tariffs for Member Countries of the Tariff Group for Africa (TAF)

Midrand, South Africa,

28 June-1 July 2005

Migration towards NGN

Oscar González Soto
ITU Consultant Expert
Strategic Planning and Assessment

Migration towards NGN
Content

- **Key factors for the evolution towards NGN**
  - **Services and revenue motivations.**
- **Network architecture consolidation at transit, local and access levels**
  - **Topology and migration**
- **Network optimization based on planning methods and tools**
  - **Support to Network Design**

Network Architecture towards NGN
Key Factors: Motivation

- **New services and revenue** increase with multimedia services:
  - Compensate voice revenue reduction and increase BB related business
- **Cost reductions** by sharing network infrastructure and systems
  - Savings are a function of network scenario, equipment modernization status and customers grow speed
- **Simplification of O&M**, thus lowering OPEX
  - Integrated operation platforms, maintenance and training

Network Architecture towards NGN
Key Factors: Issues to care

- Ensure service and business continuity for existing customers.
- Introduction of new services based on profitability
- Interworking with existing PSTN and other operator's networks
- QoS for guaranteed services and critical business customers
- Tariff principles as a function of market demand and consumption of network resources (Backward Cost Assignment)
- Universal Service Obligations for basic services and internet

Network Architecture towards NGN
Key Factors: Questions

- When to start network migration ?
  - Short term versus long term versus combined per network segment
- Where to start ?
  - Access versus local versus transit versus applications
- How to perform migration ?
  - Overlay versus substitution versus new sub-networks at growing areas

Network Architecture towards NGN
Key Factors: Country Status

- Diversity of Geo-scenarios in customers density and development level: homogeneous versus heterogeneous
- Development level for accessibility, fixed services, mobile services and video
- Aging of installed equipment for Outside Plant, Transmission and Switching
- Competition level for fixed and mobile services
- Regulatory status

Network Architecture towards NGN Content

- Key factors for the evolution towards NGN
  - Services and revenue motivations
- Network architecture consolidation at transit, local and access levels
  - Topology and migration
- Network optimization based on planning methods and tools
  - Support to Network Design

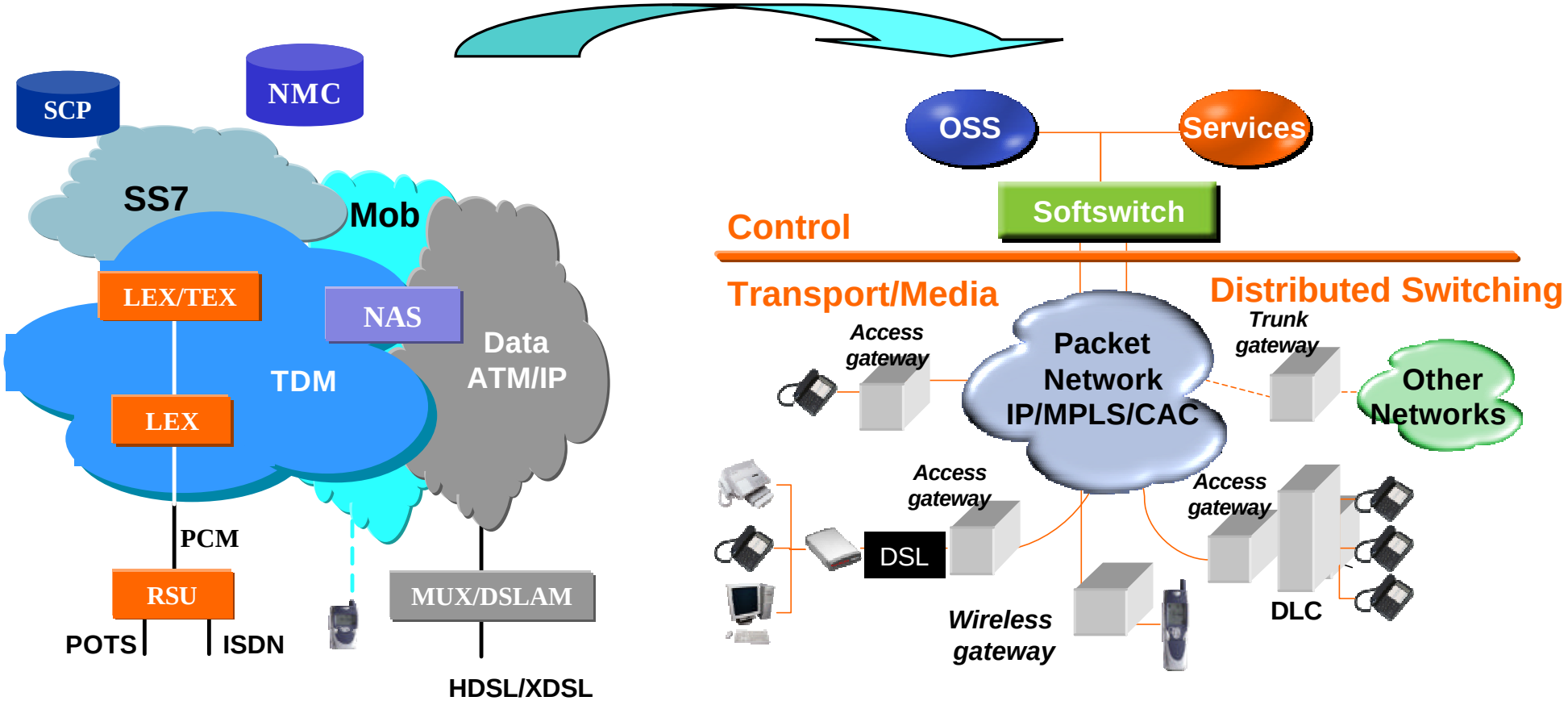
Network Architecture towards NGN
Architecture Consolidation: Topology

Topological changes impact on infrastructure and are slower to implement than technology substitution

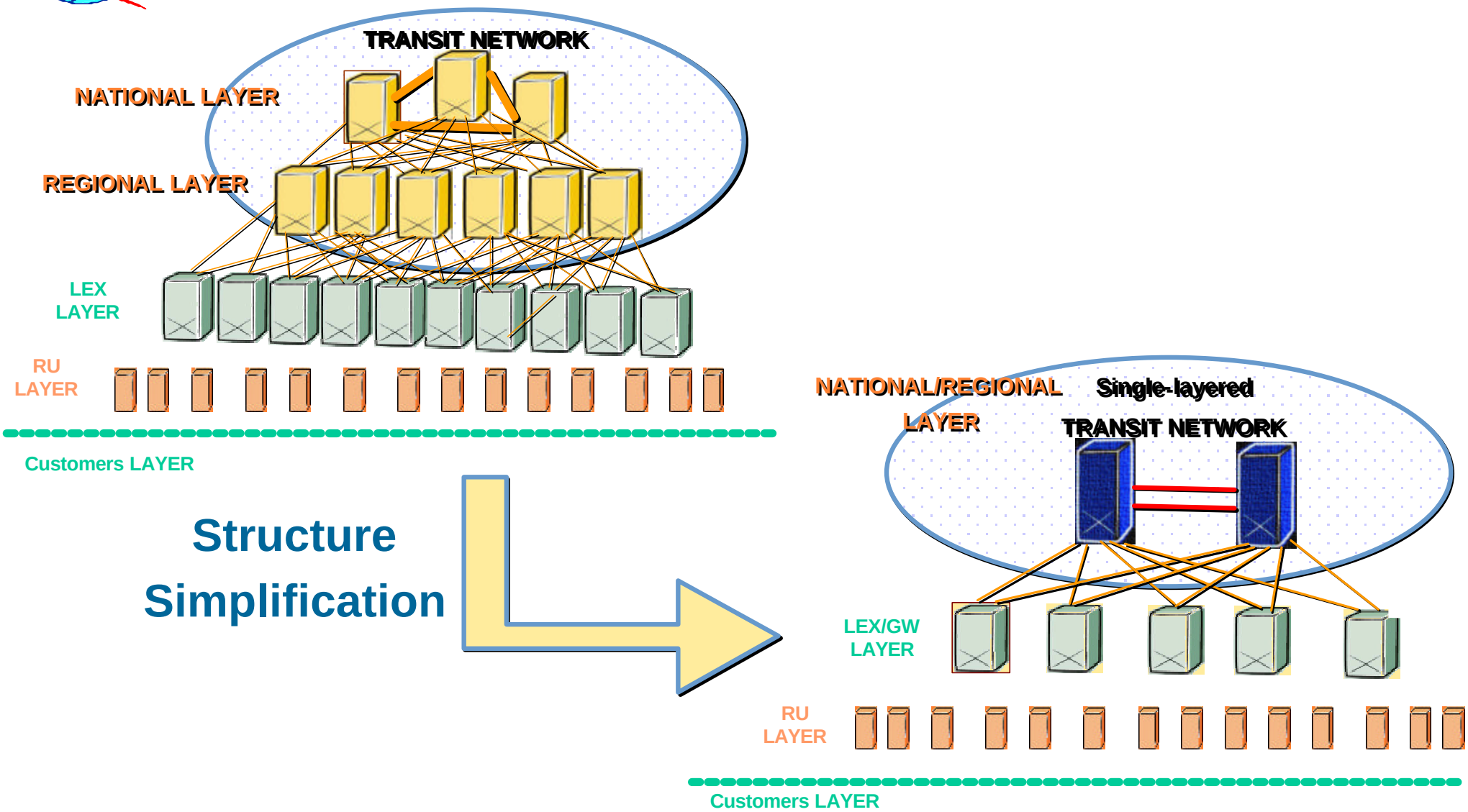
- **Less network nodes and links** due to the higher capacity of systems (one order of magnitude).
- **Same capilarity** at access level due to identical customer location
- Topological **connectivity higher** for high capacity nodes and paths for security
- **High protection** level and diversity paths/sources in all high capacity systems, both at functional and physical levels

Network Architecture towards NGN
Architecture Consolidation: Topology

What changes from current scenario towards target network ?



Network Architecture towards NGN
Architecture Consolidation: Topology



Network Architecture towards NGN
Architecture Consolidation: Access

Access dominated by physical infrastructure cost and deployment time

- Quick deployment of DSL and Multimedia Services

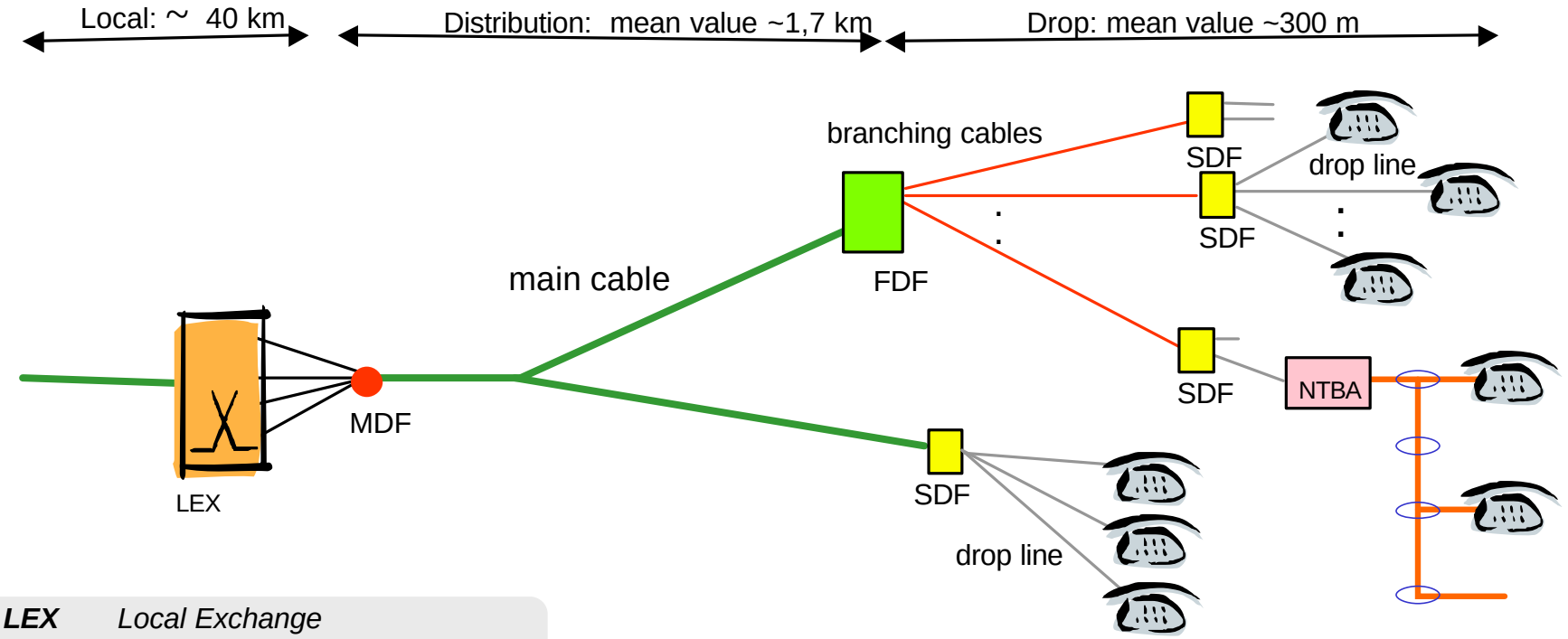
- FO closer to customer when implementing new outside plant or renovating existing one

- New Wireless technologies for low density customer scenarios

- Shorter LL length than classical network to be prepared for high bandwidth Multimedia services

Network Architecture towards NGN
Architecture Consolidation: Wireline Access

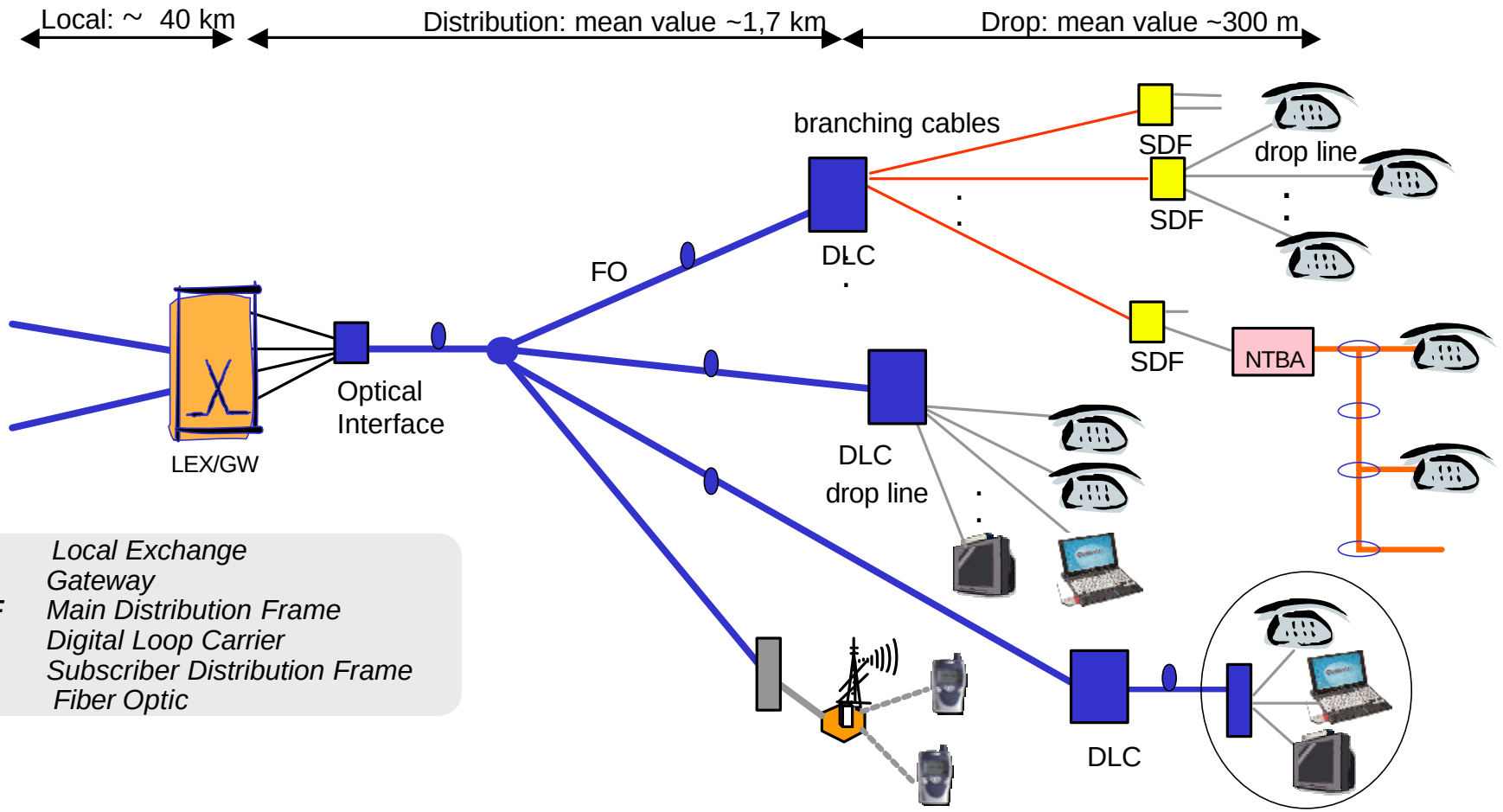
Typical historical Access Network structure



LEX	*Local Exchange*
MDF	*Main Distribution Frame*
FDF	*Feeder Distribution Frame*
SDF	*Subscriber Distribution Frame*

Network Architecture towards NGN
Architecture Consolidation: Access evolution

Typical Access Network evolution



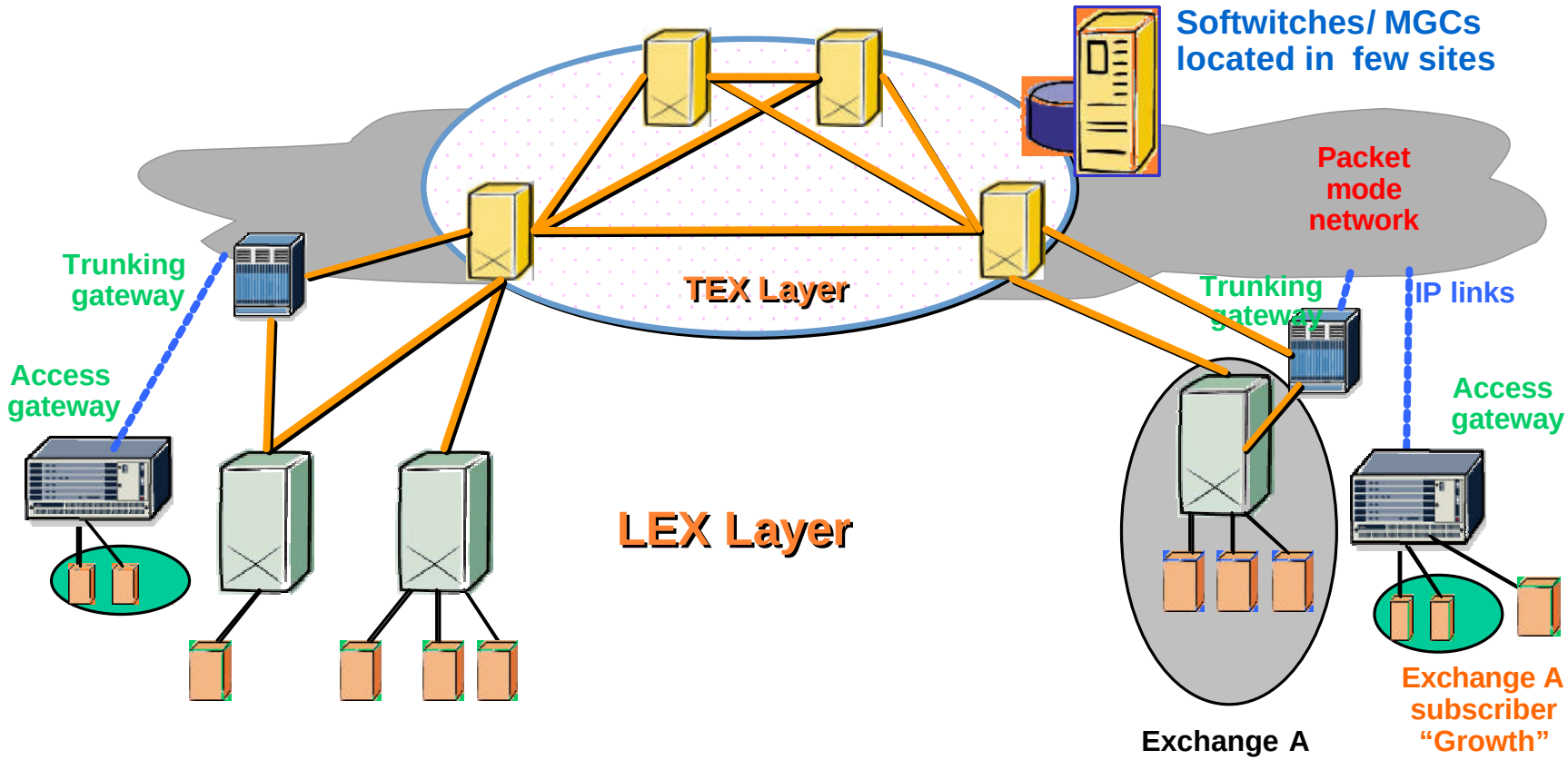
LEX	*Local Exchange*
GW	*Gateway*
MDF	*Main Distribution Frame*
DLC	*Digital Loop Carrier*
SDF	*Subscriber Distribution Frame*
FO	*Fiber Optic*

Network Architecture towards NGN
Architecture Consolidation: Local

Dominated by functions migration investment and interoperability

- Move from joint switching and control to separated control and media GW
- Introduce Multimedia Services at all areas
- Optimize number, location of nodes and interfaces among existing and new network
- Requires longer time and higher investments due to variety of geo-scenarios and geographical distribution

Network Architecture towards NGN Architecture Consolidation: Local

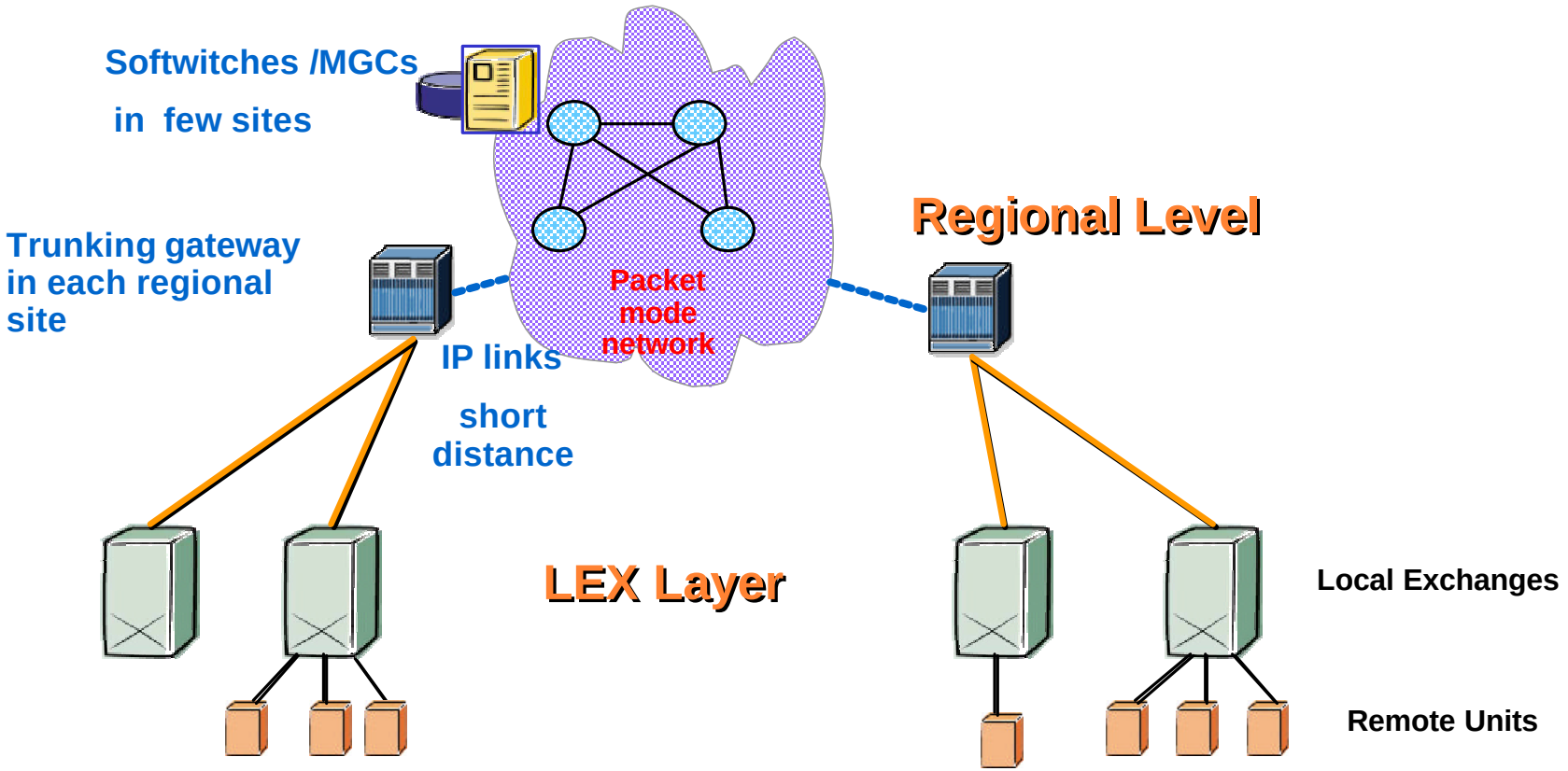


Network Architecture towards NGN
Architecture Consolidation: Core

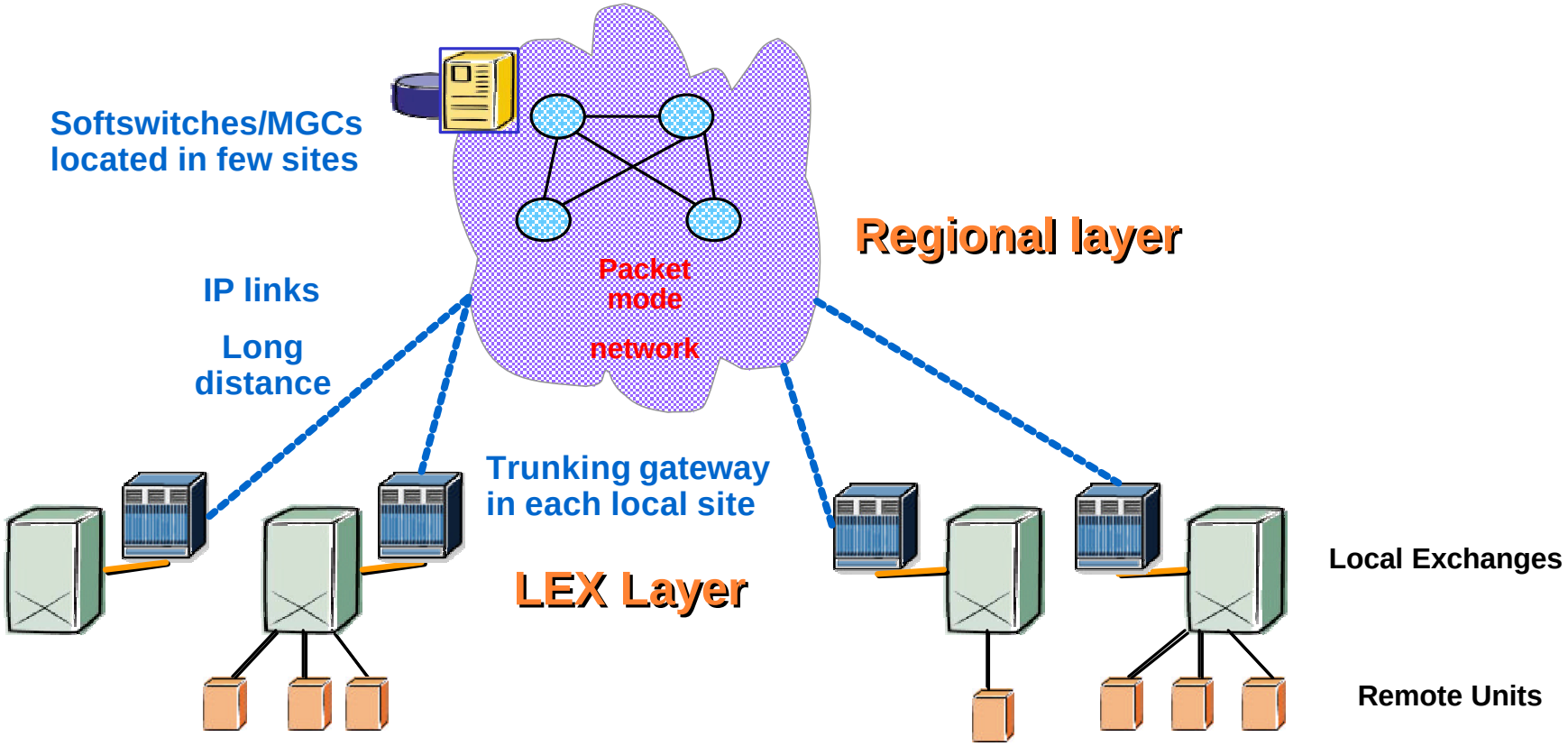
Dominated by high capacity and protection level

- Overlay deployment for full coverage in all regions
- Quick deployment needed for homogeneous end to end connections
- Strong requirements for high quality, protection, diversity paths and survivability
- Importance of the optimization for location and interconnection

Network Architecture towards NGN
Architecture Consolidation: Core



Network Architecture towards NGN
Architecture Consolidation: Core



Network Architecture towards NGN
Architecture Consolidation: Combined Segments

Where to start and how to co-ordinate migration?

Network "consolidation"

Cost Optimisation of the network

- Reducing nodes and increase their capacity
- Deployment of ADSL and multiservice access

Network expansion

NGN solution :

- Cap and Grow; this means keeping the existing PSTN network as it is, and grow demand with NGN equipment

Network replacement

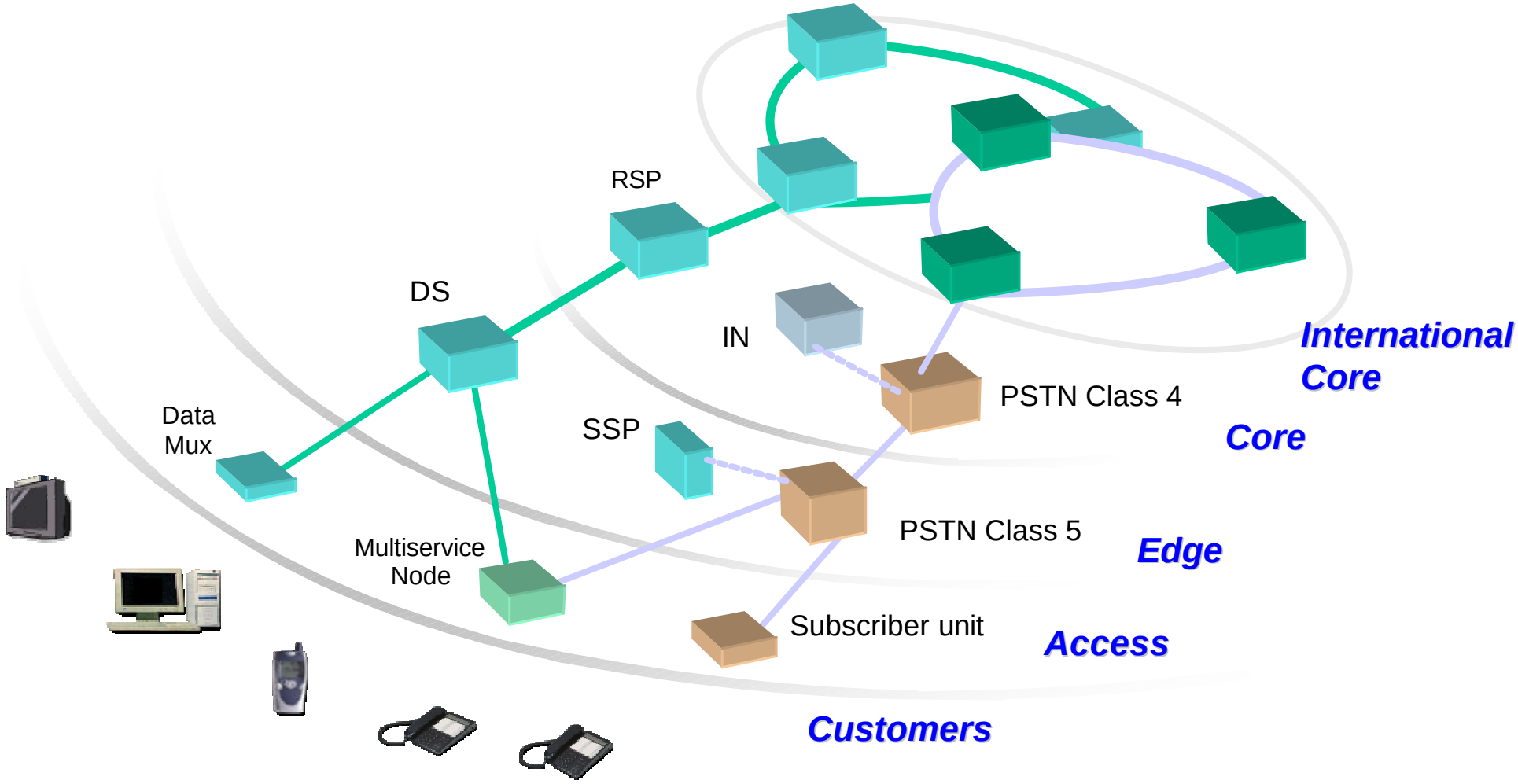
Replacement of out-phased (end of life) TDM equipment

- gradual replacement : this means coexistence of the two technologies
- full accelerated replacement with a short transition period

Need to optimize overall network evolution: technically and economically

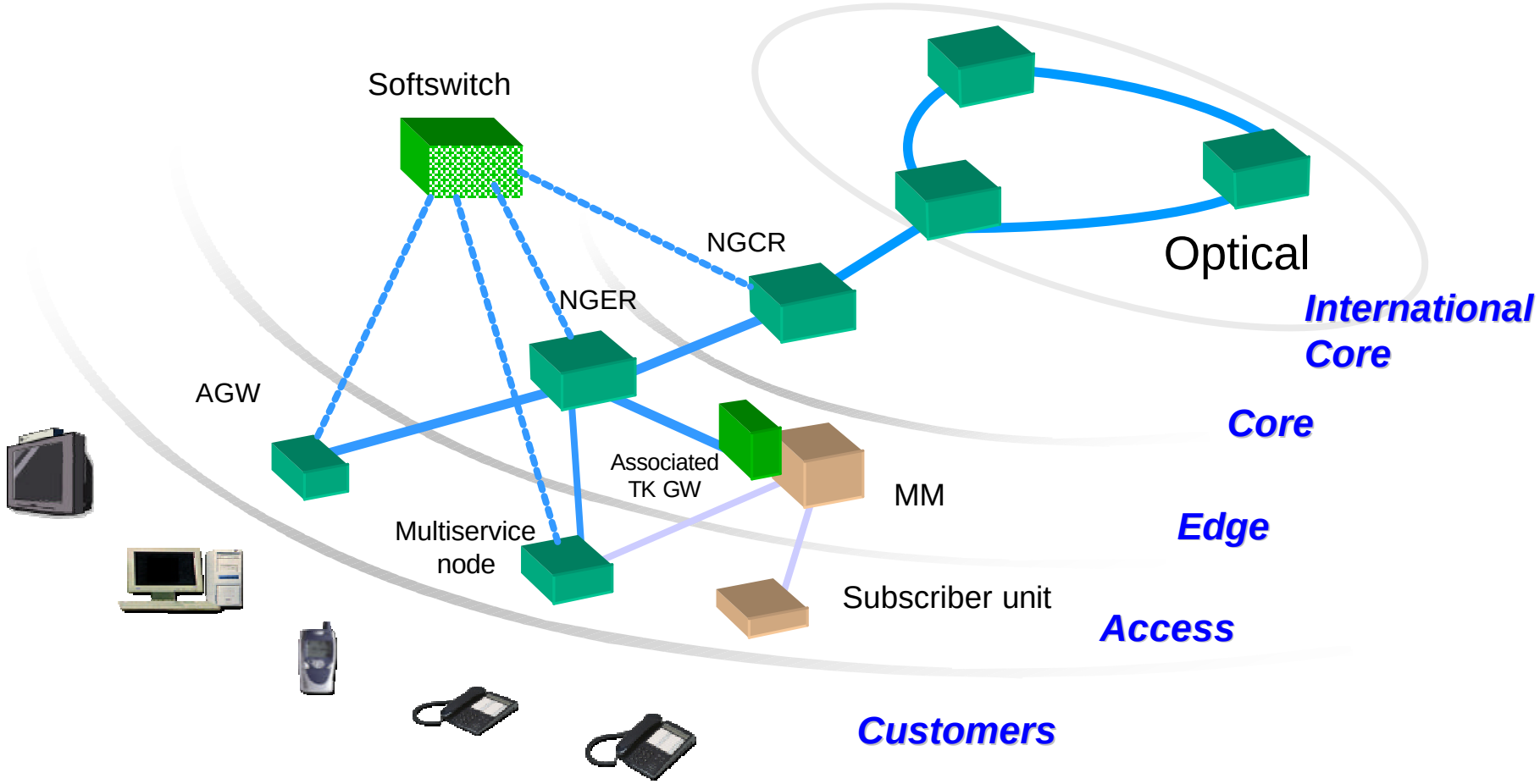
Network Architecture towards NGN

Architecture Consolidation: Combined Segments (I)



Network Architecture towards NGN

Architecture Consolidation: Combined Segments (II)



Network Architecture towards NGN
Architecture Consolidation: Combined Segments

Overall impact of evolution on network CAPEX and OPEX

CAPEX

- TDM and NGN CAPEX are close
- NGN CAPEX in the first years driven by geographic coverage
- Access systems represent a large part of CAPEX
  - similar values in TDM and NGN

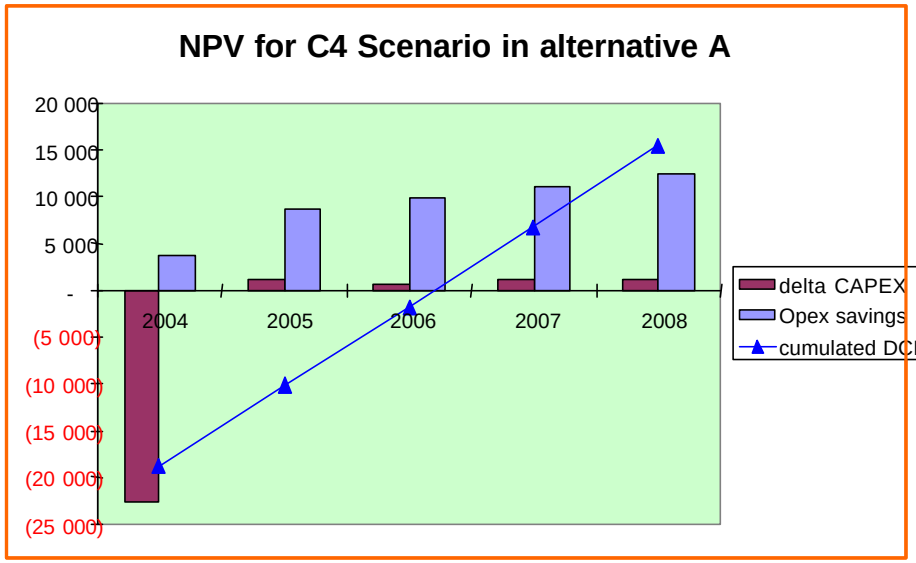
OPEX

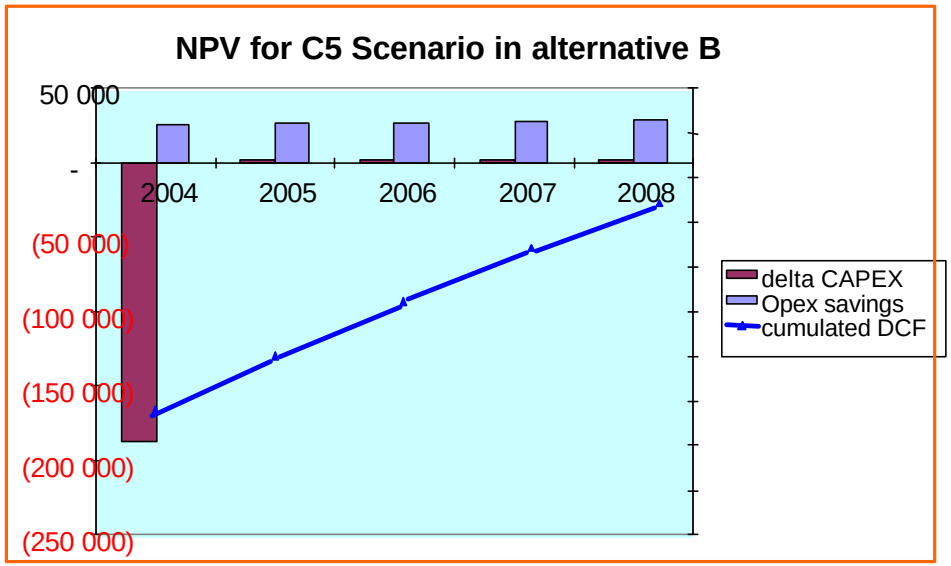
- OPEX in NGN trends to be lower
- Migration scenarios will have a mix of TDM OPEX (installed base) and NGN OPEX (substitution and growth)
- Significant impact of manpower cost due to convergence in operations

Key factors for the evaluation: Geo-scenarios, Network grow rates, Aging of equipment, New services

Network Architecture towards NGN
Architecture Consolidation: Scenario evaluation

- **Net Present Value (NPV)** for the overall migration project is the best global evaluator





A large variety of country scenarios and transition strategies generate major differences in the economical results ➡ Planning to be performed per country and operator

Network Architecture towards NGN Content

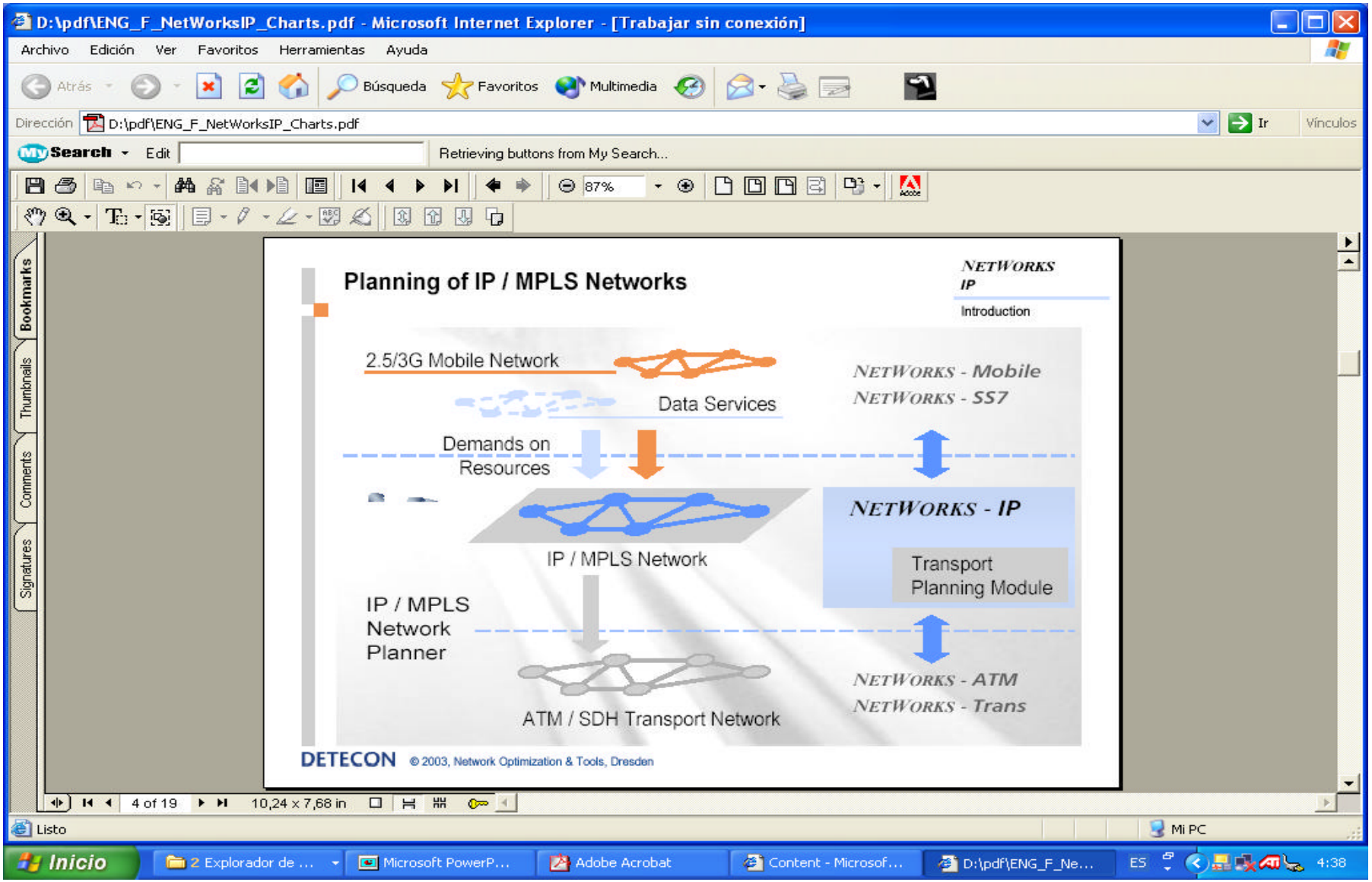
- Key factors for the evolution towards NGN
  - Services and revenue motivations
- Network architecture consolidation at transit, local and access levels
  - Topology and migration
- Network optimization based on planning methods and tools
  - Support to Network Design

Network Architecture towards NGN
Support tools: Design and Optimization

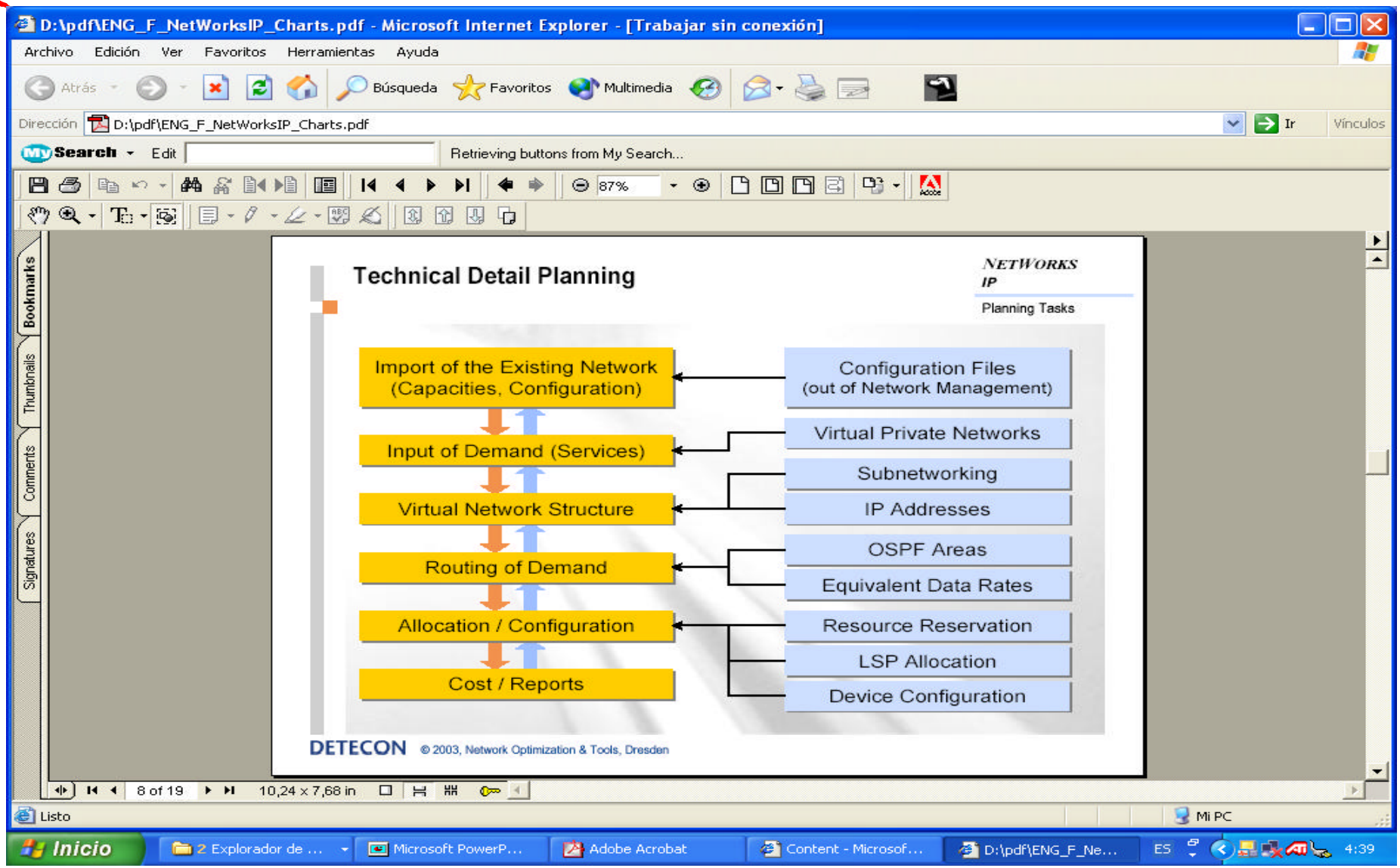
Required functionality for Technical design tools

- Service demands characterisation and traffics for VoIP and NGN multiservice flows
- Conceptual Network Design and Capacity Planning
- Comparison of different network structures
- Routing flows for most typical cases including OSPF, shortest path, widest path and weighted cost functions.
- Optimizing locations and connections of network gateways
- Cost, Performance and Reliability Analysis
- Estimation of investment costs for the rollout and the extension of the investigated multi-service network
- Estimation of end-to-end delays
- Technical Site and System Planning
- Allocation of the IP or MPLS links
- Formation of virtual networks
- Routing over ATM links or PDH/SDH systems or tunneling via other IP links
- Sub-networking and addressing

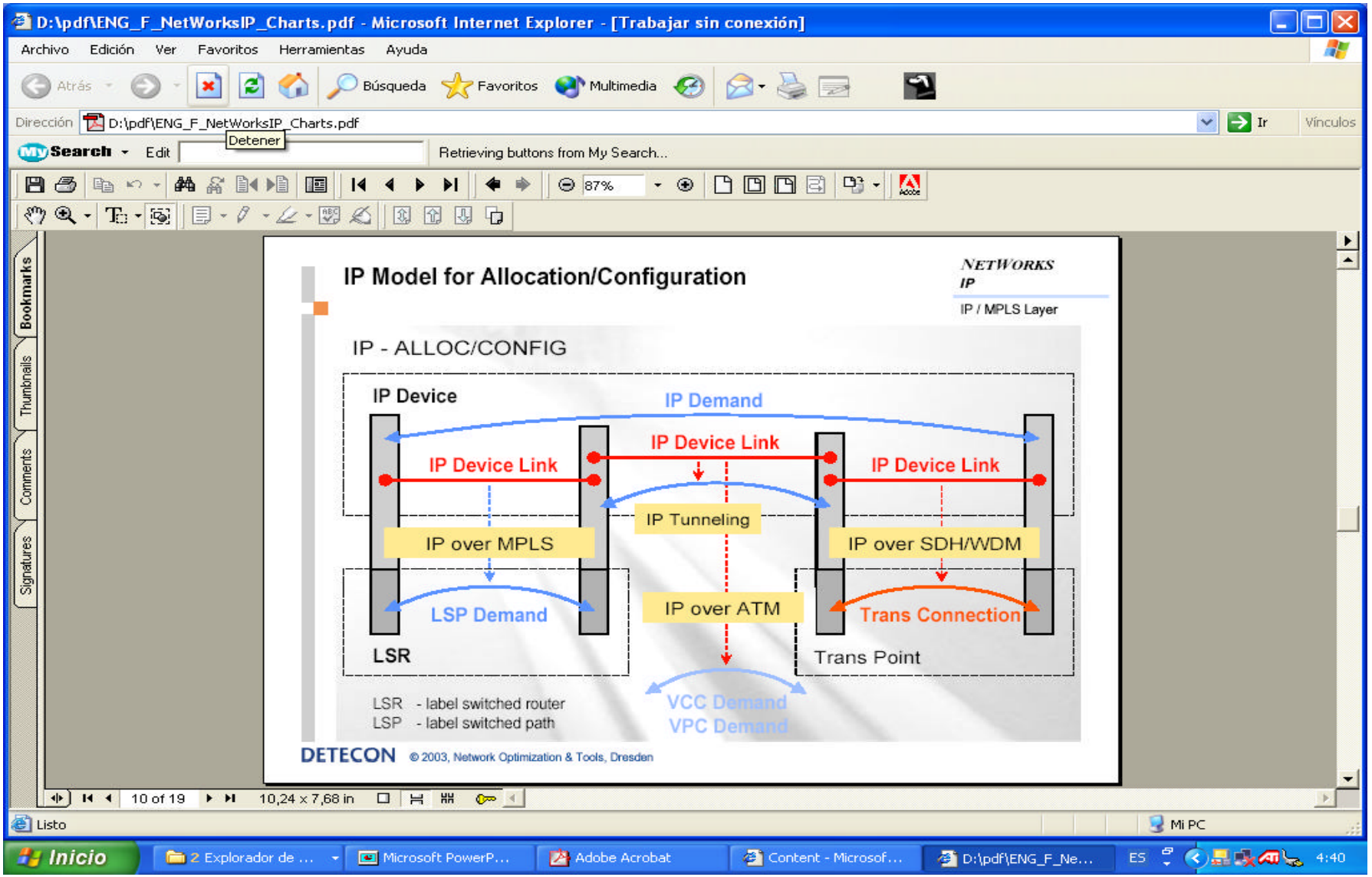
Network Architecture towards NGN
Example of Design Supporting tools



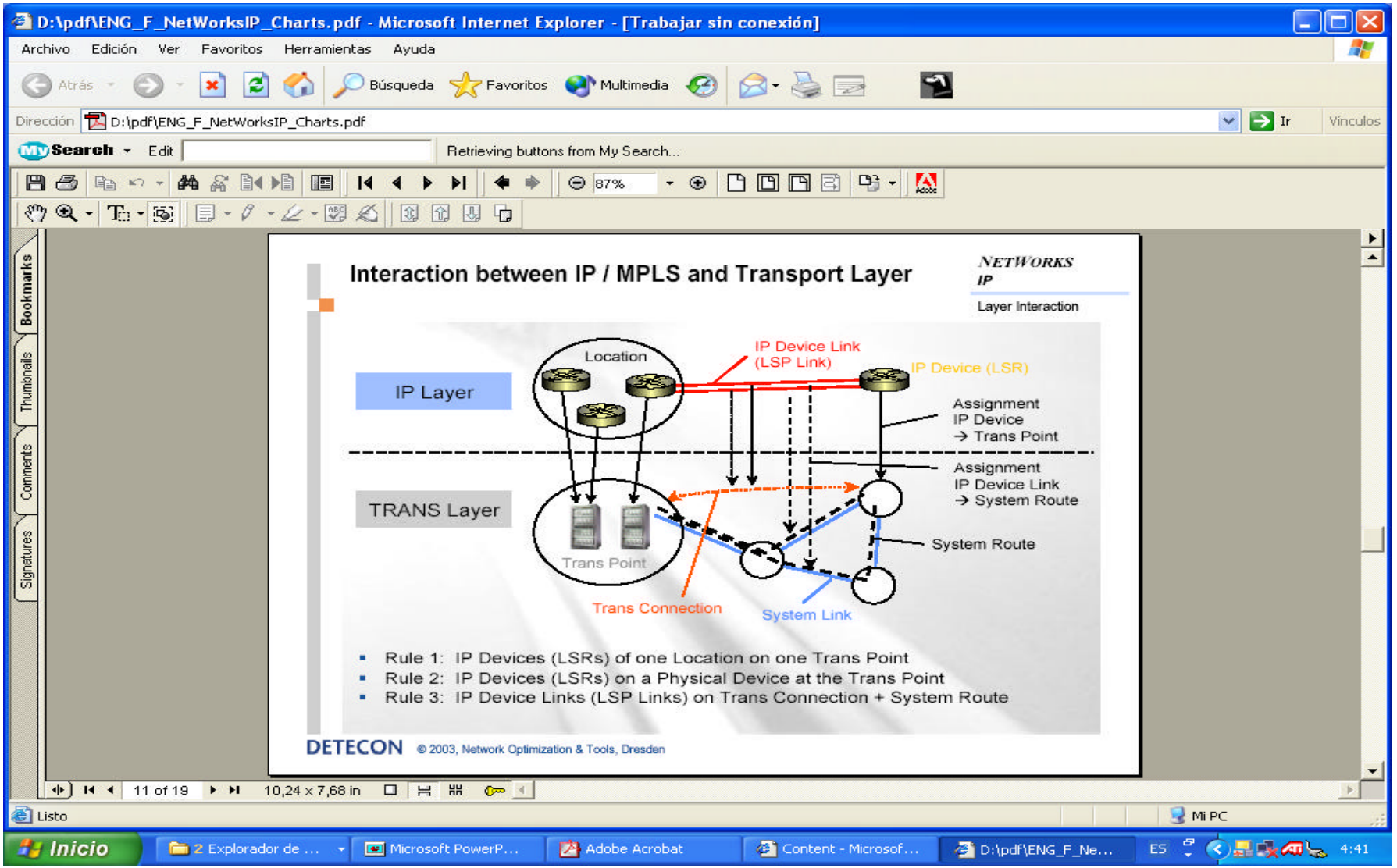
Network Architecture towards NGN
Example of Design Supporting tools



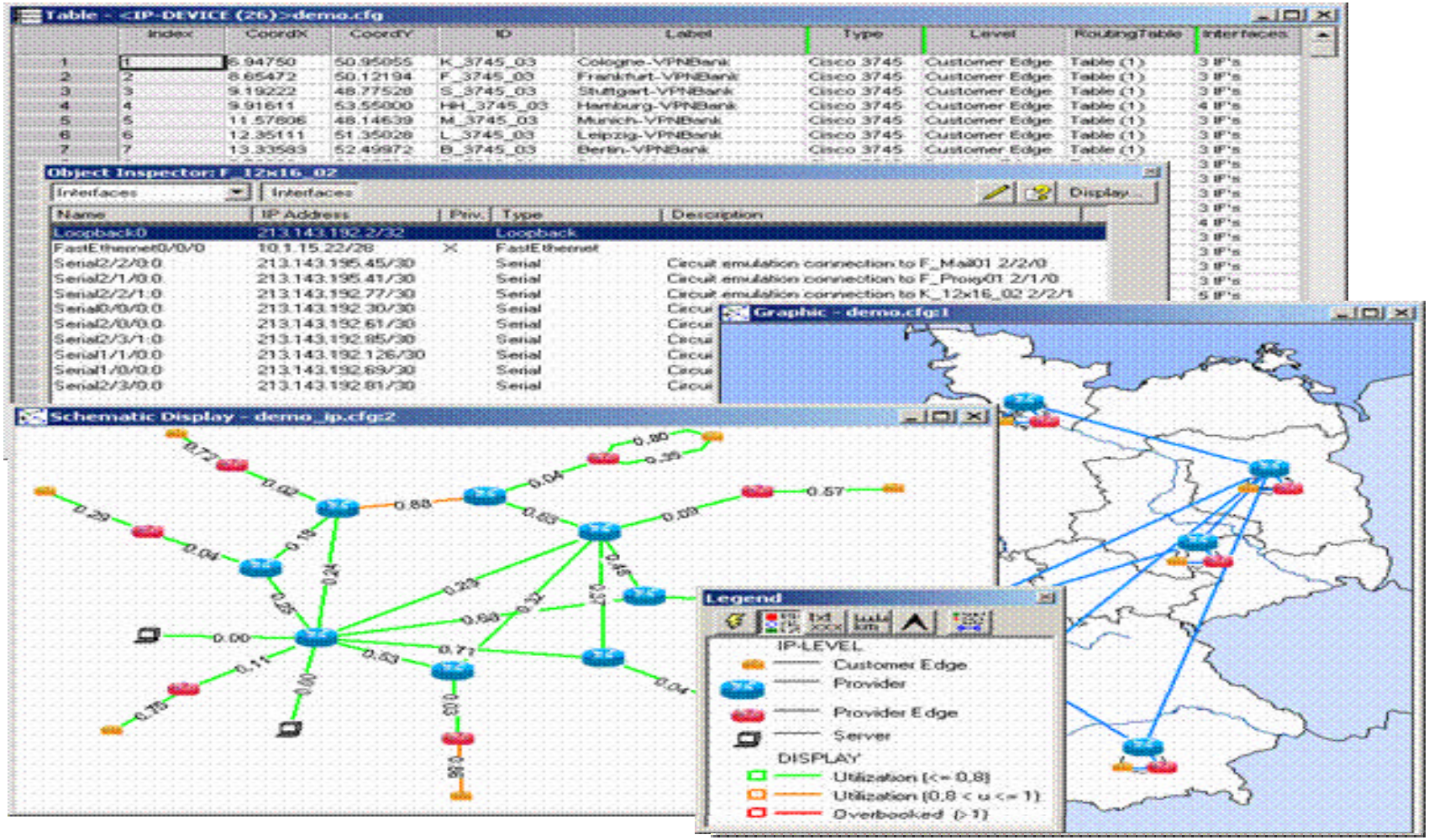
Network Architecture towards NGN
Example of Design Supporting tools



Network Architecture towards NGN
Example of Design Supporting tools



Network Architecture towards NGN
Example of Design Supporting tools



Network Architecture towards NGN
Summary of Evolution Factors

- Ensure service **continuity**
- Plan **business and services first**, later the network with proven solutions.
- Implement **pilot cases** before network migration
- **Differentiation** to competitors on new services and quality