ITU / BDT- COE workshop

Bangkog, Thailand,

11 –15 October 2002

Network Planning

Lecture NP- 3.1

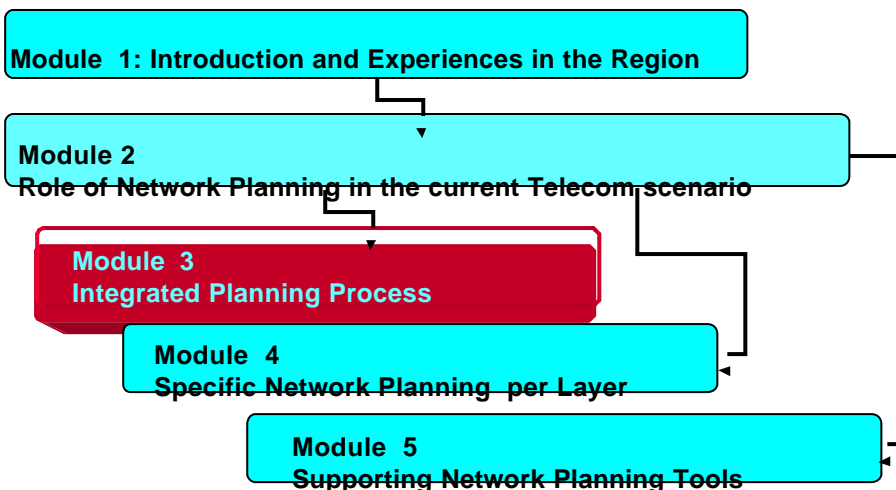# Integrated Planning Process

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BDT - COE 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
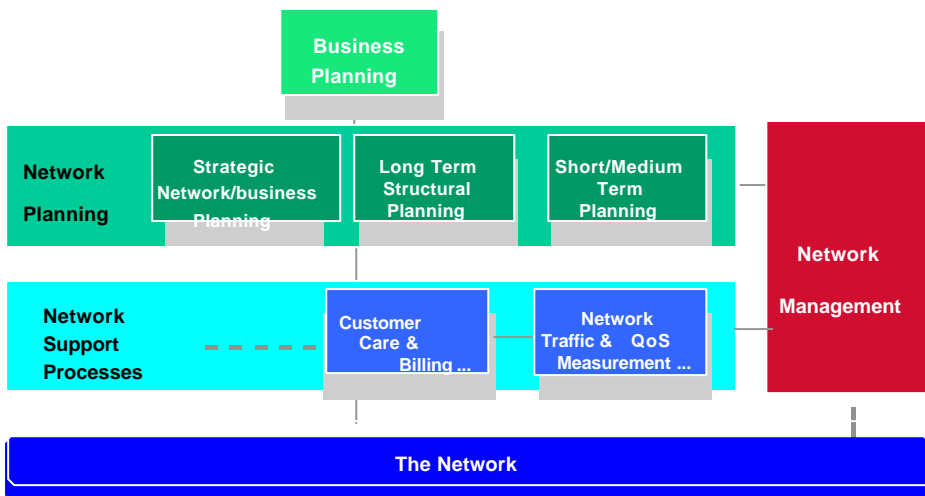**Supporting Network Planning Tools**

Content Chapter 3.1

- Definiton of processes and interrelations

- Network design tasks

- Parameters and Data to be used in the planning

Network Planning
Scope: Related Processes

Business Planning

Network Planning
- Strategic Network/business Planning
- Long Term Structural Planning
- Short/Medium Term Planning

Network Management

Network Support Processes
- Customer Care & Billing ...
- Network Traffic & QoS Measurement ...

The Network

Network Planning
Flows among Processes

- **Data on topologies, architectures, location, routing, etc from long term planning are transfered to the medium term and iteratively to short term activities**

- **Planning results are transfered to NM applications and viceversa, NM measurements and status are provided as inputs to the planning activities**

- **Operating System Processes also provide data to the short/medium term planning activities on the traffic demand, performance and Origin/destination flows**

Planning Methodology:
Integrated Iterative Planning Process
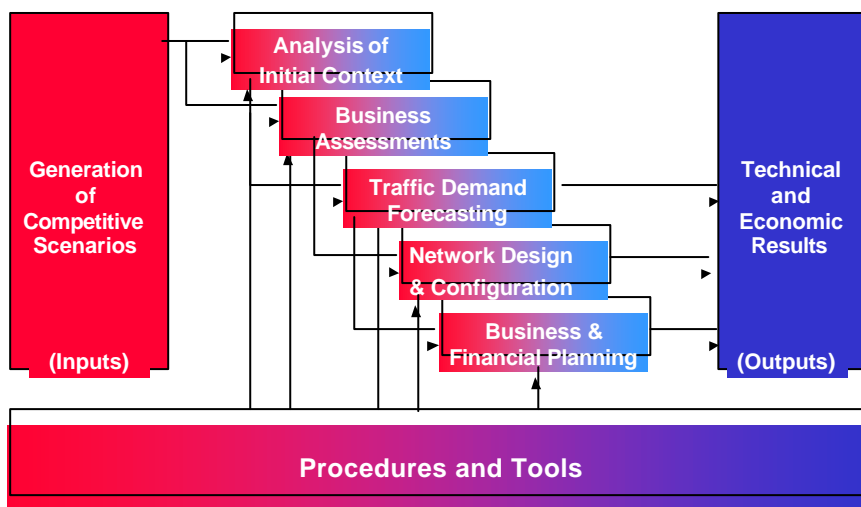
Network Planning
Iterative sub-processes

- **Telecom network scenarios are generated with the premises derived from realistic competitive sitiation**

- **Final objective is to have a quantified design fullfiling the strategy for the operator and the requirements of the society**

- **Defined processes and tasks are needed for all solutions and technologies. Internal data and alghoritms vary for each case**

- **Feedback among activities is needed to incorporate results of the optimization on the inputs and assumptions**

- **Business assesment is made at the process start to select feasi ble solutions. More detailed business plan is obtained at the end**
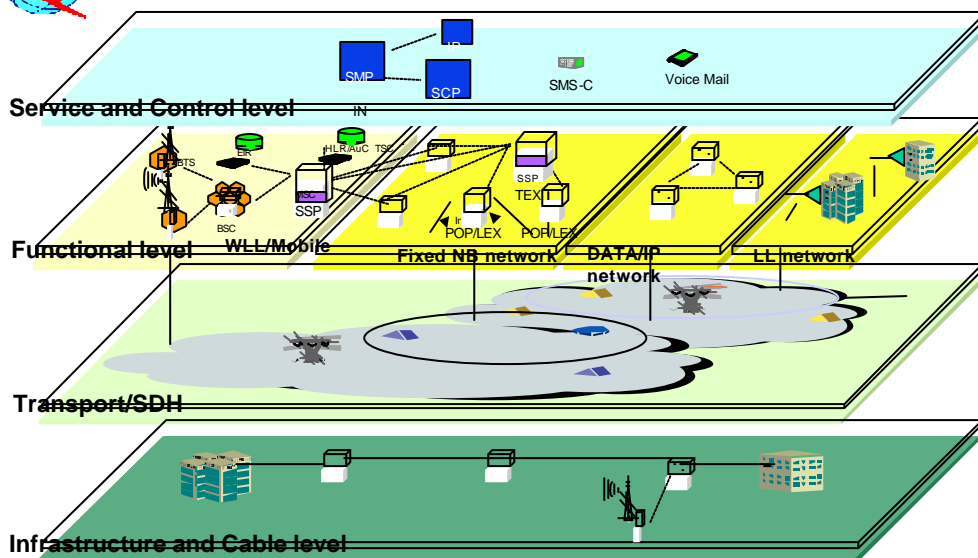
Network Planning
Strategic view: Network Layer Modeling

Planning Methodology:
Multilayer planning sequence
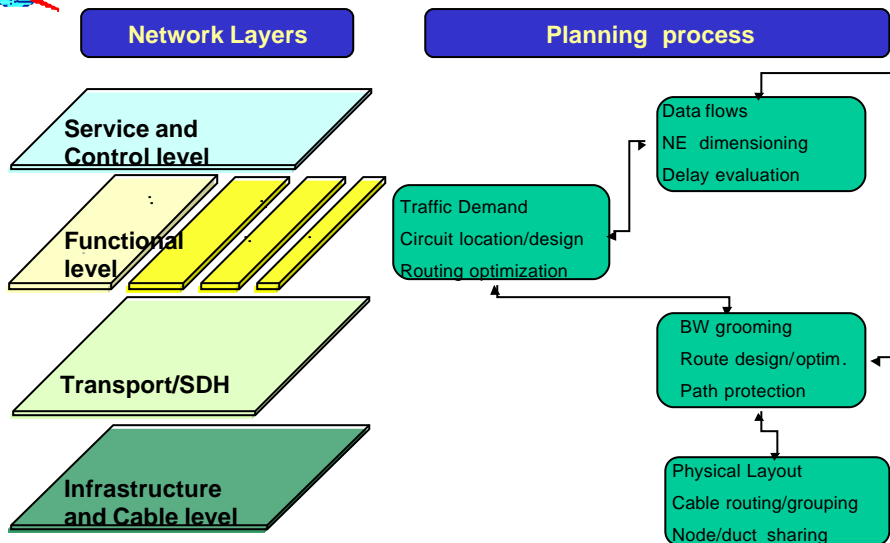
Network Layers	Planning process

Service and Control level

Functional level

Transport/SDH

Infrastructure and Cable level

Traffic Demand
Circuit location/design
Routing optimization

Data flows
NE dimensioning
Delay evaluation

BW grooming
Route design/optim.
Path protection

Physical Layout
Cable routing/grouping
Node/duct sharing

Network Planning
Task sequence

- **Starts with services and traffic demand projection**

- **First design is made for the functional level: switching, routing, mobile, data, etc.**

- **Intermediate results are given as inputs for Transmission and control layers**

- **Transmission results are provided as inputs to the Physical layer**

- **Iteration is made among layers and basically to the functional for consolidation**
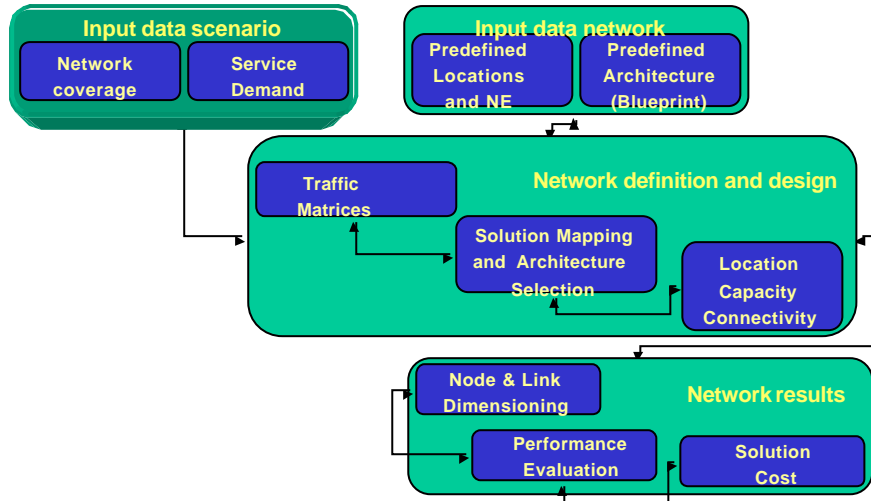
Planning Methodology:
The Functional Network Design Tasks

Input data scenario

Network coverage	Service Demand

Input data network

Predefined Locations and NE	Predefined Architecture (Blueprint)

Network definition and design

Traffic Matrices

Solution Mapping and Architecture Selection

Location Capacity Connectivity

Network results

Node & Link Dimensioning

Performance Evaluation

Solution Cost

Network Planning
Input Data

- **Input categories**

  - **Geo-scenario**

  - **Customers, Services and traffic**

  - **Existing network**

  - **Technology characteristics and capacities**

  - **Performance**

  - **Economical**

Network Planning
Input data

- **Geo scenario**
    - Number of differentiated service areas:
      (Metropolitan,Suburban,Villages, Rural)
    - Surface for each area
    - Distance to the core service area
    - Population per area (volume and density)
    - Number and distribution of households
    - Customer density and clustering
    - Digitalised maps (scales 1:5000 to 1:1000)
    - Regulatory rules
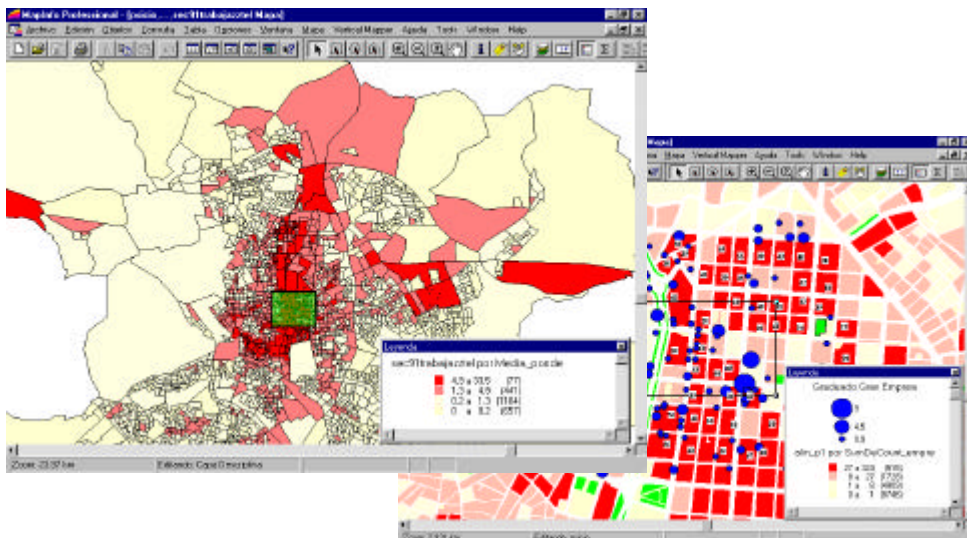   - Interconnection locations and constraints

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Network Planning
Input data : Geo maps

Network Planning
Input data

- **Customers, services and traffic (1)**
  - Customer segments
    - Residential (Low and High end)
    - SOHO
    - SME
    - Large institutions and corporations
  - Services
    - POTS, 64kb/s data, ISDN Basic/primary access
    - Leased Lines (64, n x 64, 2 Mb/s)
    - ADSL (high speed internet), HDSL, SDSL
    - IP mode
    - Video
    - FO, SDH, Managed bandwidth

Network Planning
Input data

- **Customers, services and traffic (2)**

  - Traffic (per customer class and service type)

    - Customer calling rate
    - Erlangs per customer
    - IN messages per call
    - IP sessions per customer
    - Average Packet and Bit rates per IP mode flow and/or
      customer (PCR and SCR)
    - NM and control messages/packet rate

Network Planning
Input data

- **Technology related:**

  - Physical elements sizes (cabinets, racks, boards, etc.)
  - Capacity per main NE:
    - Switches, routers, ADM, CxC and RSU
    - Processors (Packet Rate, Message Rate, etc.)
    - Memory
    - Channels (max bandwidth and guaranteed)
  - Routing types
  - Load sharing rules
  - Performance parameters (Availability, QoS, etc.)

Network Planning
Input data

- **Existing network:**

  - Existing node locations, sizes and service areas
  - Existing link locations and capacities
  - Existing cable maps, capacities and spares
  - Existing NE locations, capacity and filling degree
  - Building locations, capacities and conditioning
  - % reusability of civil infrastructure in primary over all area
  - % reusability of civil infrastructure in secondary over all area

Network Planning
Input data

- **Performance**

    - Waiting lists per customer type

    - Call completion rates (overall, per type and per O/D)

    - QOS (Loss probability, Node and End to end Delays, etc.)

    - Availability (MTBF, MTTR, etc.) in overall and per cause: power,

       HW, SW, etc.

    - Bit error rate

Network Planning
Input data

- **Economical**
    - **Generic (for all technologies)**
    - Macroeconomic data(GDP, etc.)
    - Interest rates
    - Change rates
    - Amortization periods

    - **Reference costs (per solution)**
    - NE costs for typical economy of scale (minimum configuration
       and incremental per modularity)
     - Civil works and labor-force
     - Engineering, installation, testing and commissioning
     - Operational and Maintenance resources
     - Interconnection
     - Marketing and overheads