



# ITU / BDT- COE workshop

Nairobi, Kenya,

7 – 11 October 2002

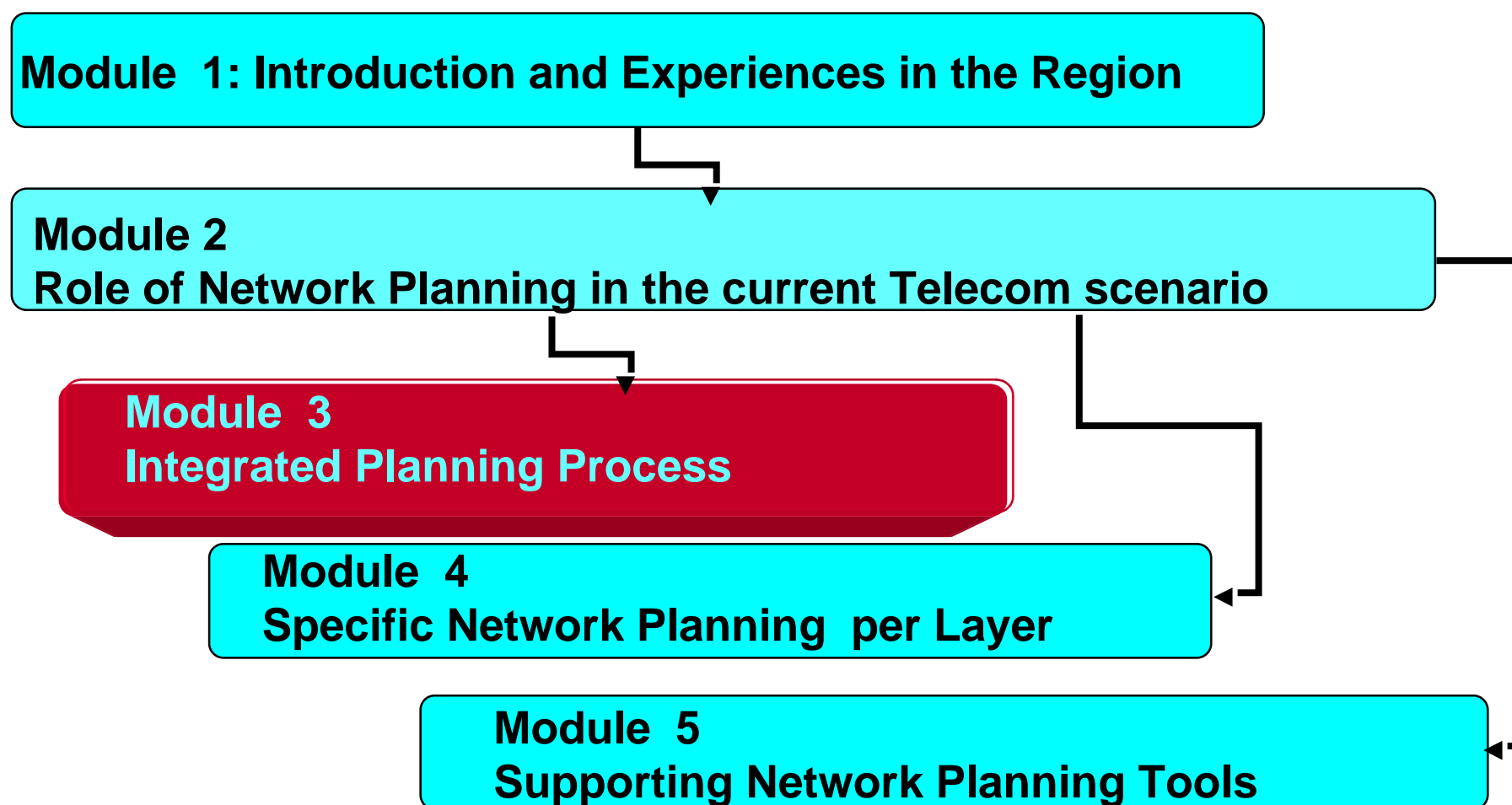
## Network Planning

Lecture NP- 3.1

## Integrated Planning Process



# BDT - COE workshop on Network Planning





## Content Module 3

*Define basic processes and methods to have an integrated and interactive view for the different planning activities*

- **Definition of processes for the different planning activities and corresponding interrelations and sequence**
- **Typical methods for services and traffic forecasting**
- **Technical functions for design, dimension, optimize and cost solutions**
- **Business related activities and documentation transfer to operations**



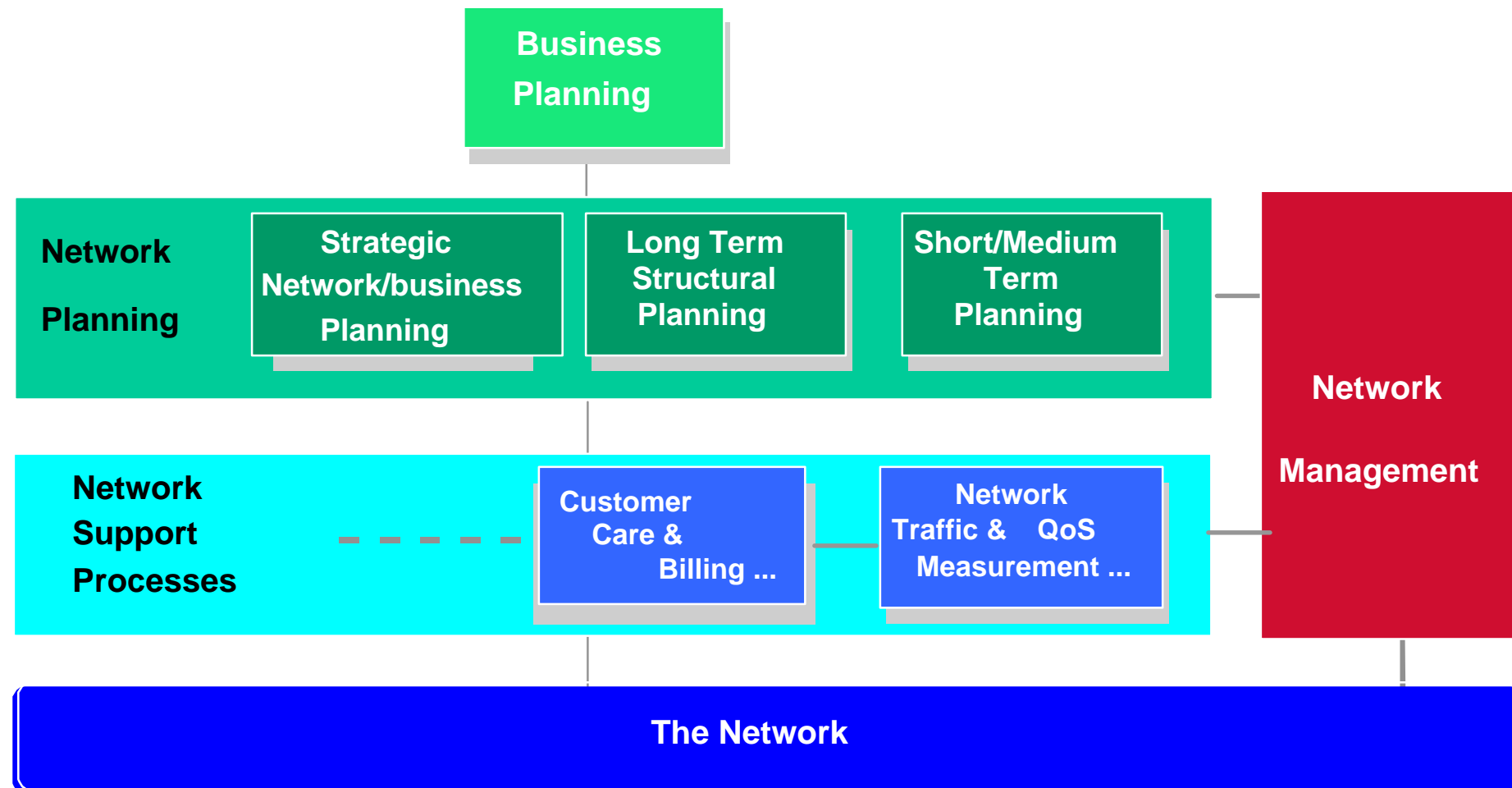
## Content Chapter 3.1

- **Definiton of processes and interrelations**
- **Network design tasks**
- **Parameters and Data to be used in the planning**



# Network Planning

## Scope: Related Processes



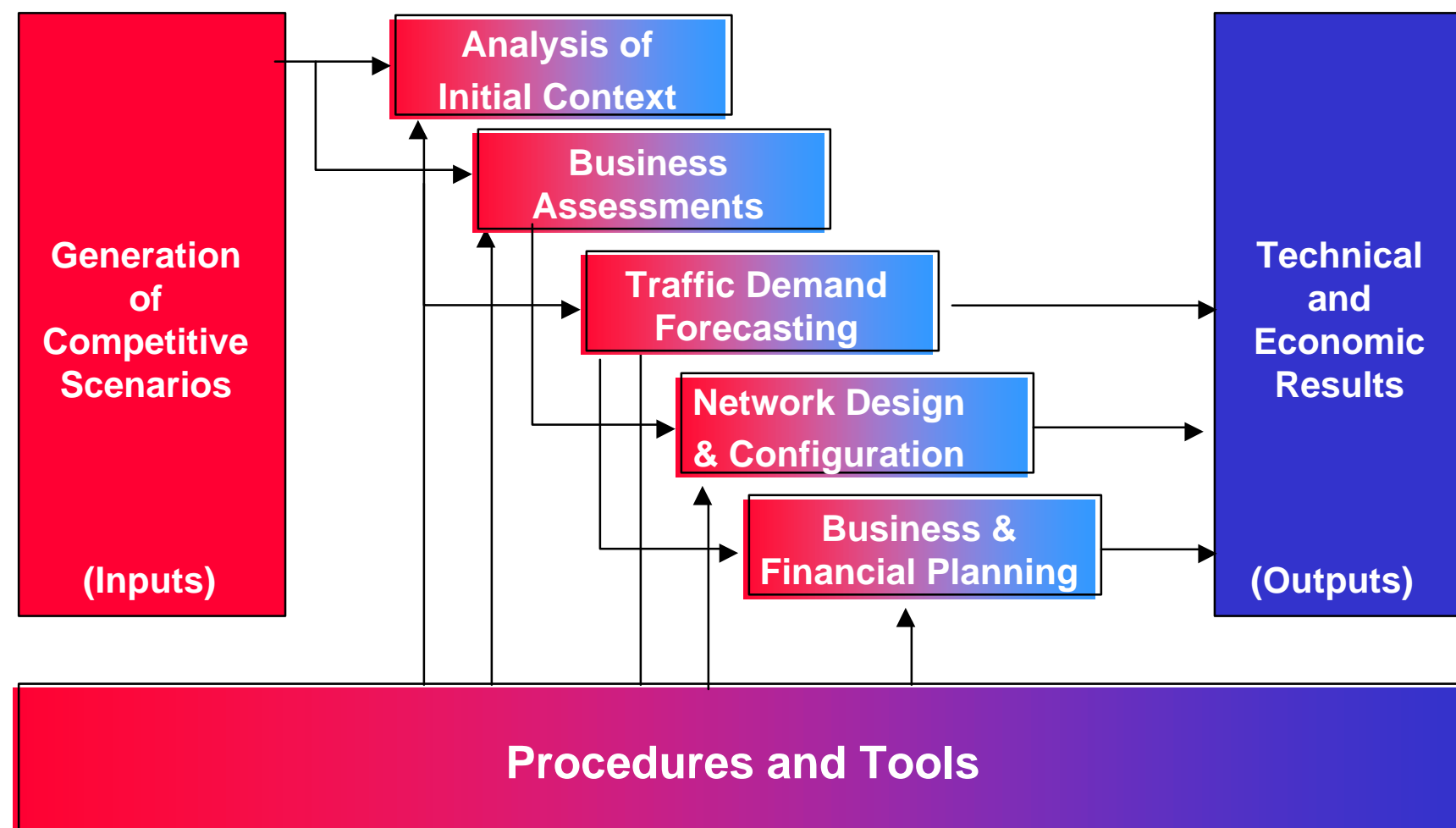


## Network Planning Flows among Processes

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

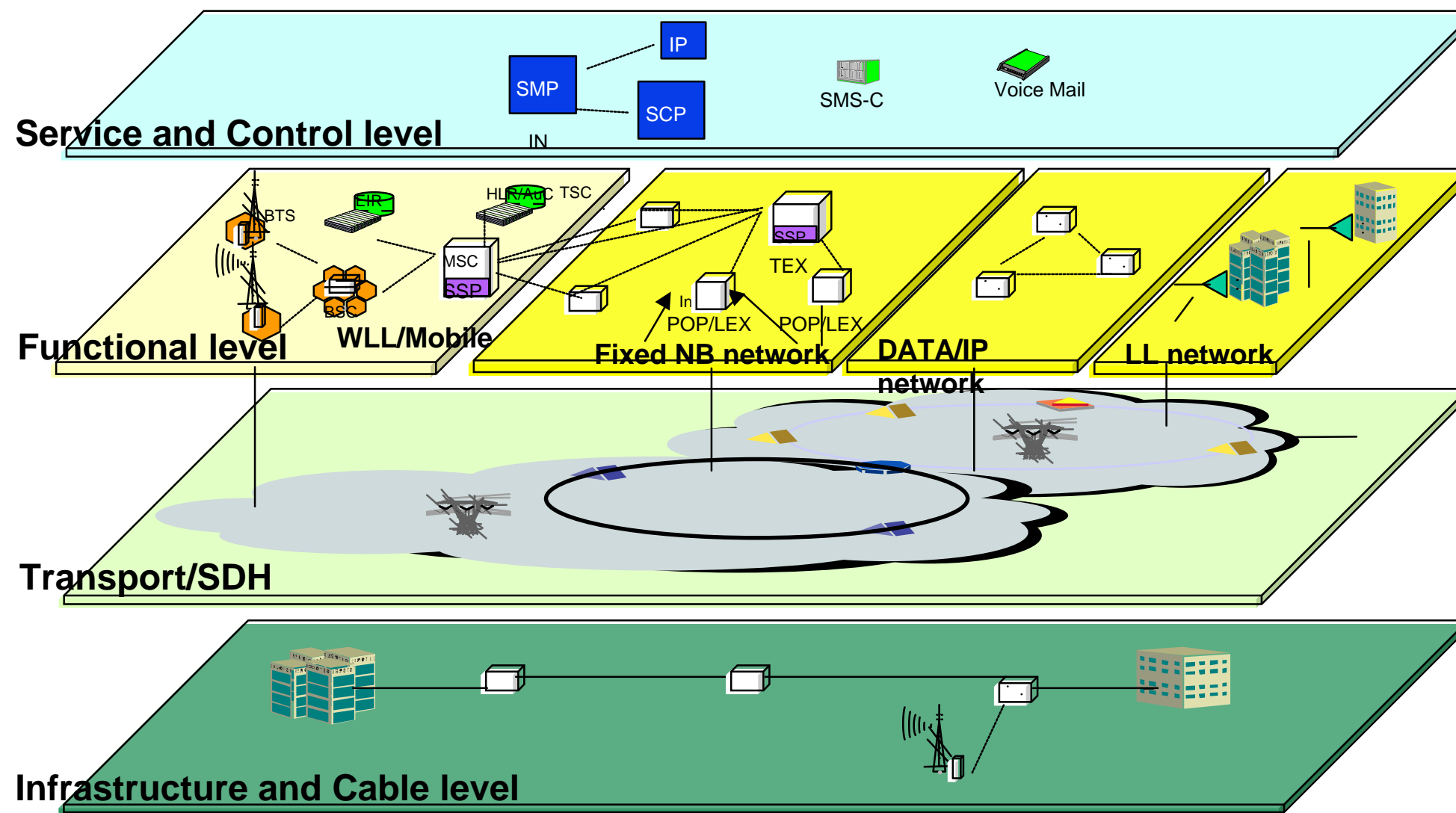
- **Telecom network scenarios are generated with the premises derived from realistic competitive situation**
- **Final objective is to have a quantified design fulfilling the strategy for the operator and the requirements of the society**
- **Defined processes and tasks are needed for all solutions and technologies. Internal data and algorithms 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 feasible solutions. More detailed business plan is obtained at the end**





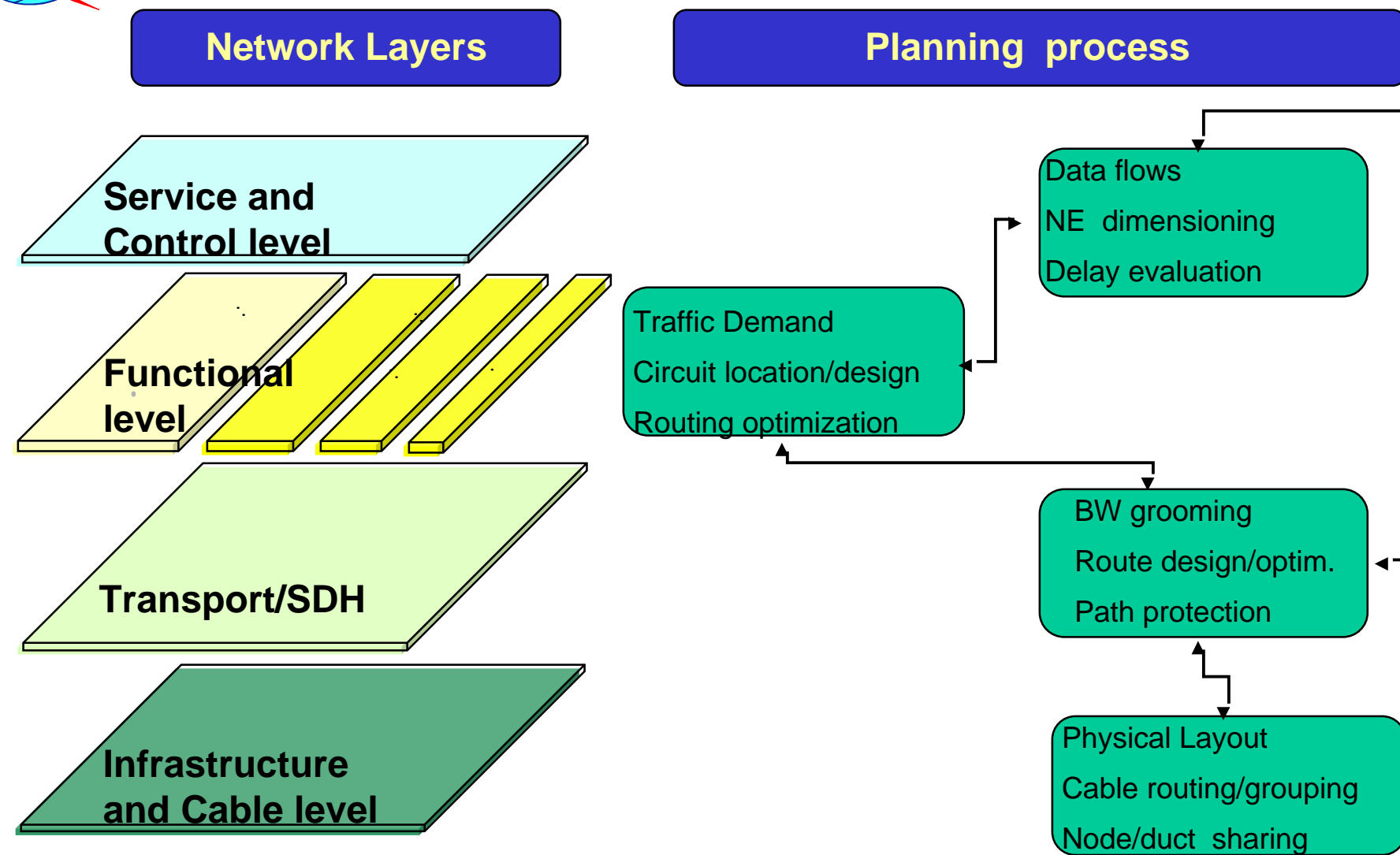
# Network Planning

## Strategic view: Network Layer Modeling





# Planning Methodology: Multilayer planning sequence



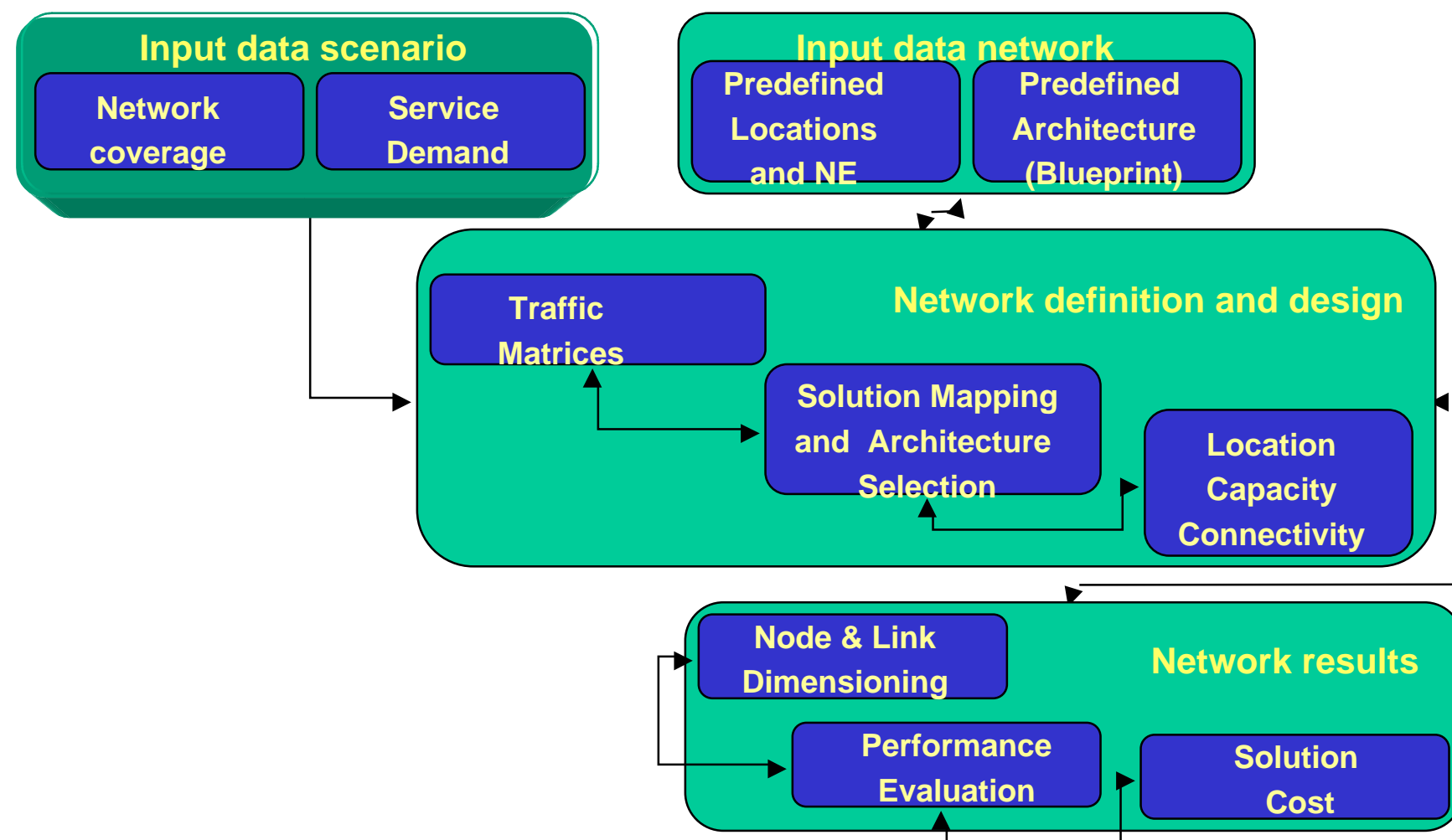


## **Network Planning Task sequence**

- **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





# 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



# 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)**
    - 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