



# ITU / BDT- COE workshop

Nairobi, Kenya,

7 – 11 October 2002

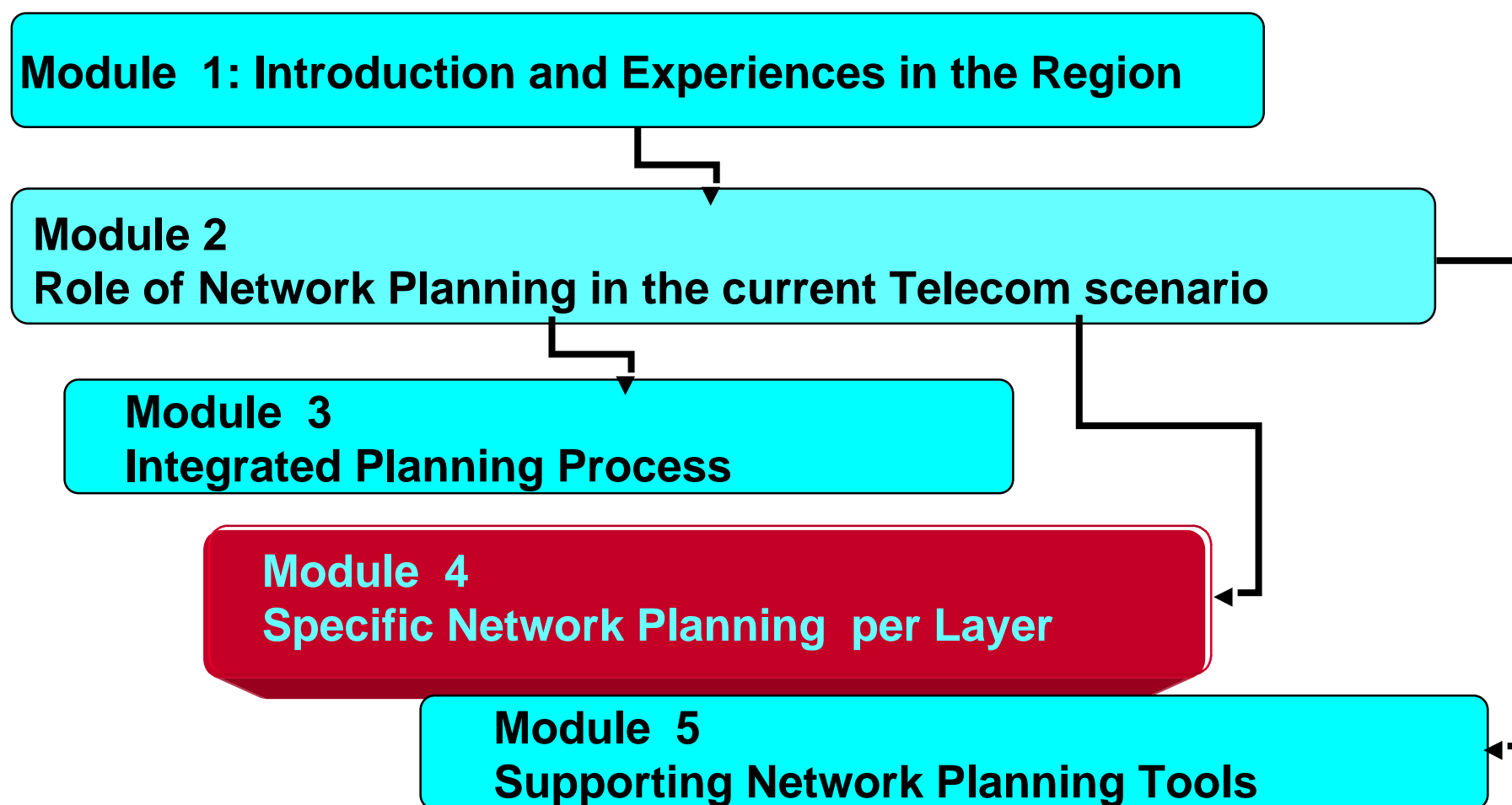
## Network Planning

Lecture NP- 4.3

## Specific Network Planning



# BDT - COE workshop on Network Planning



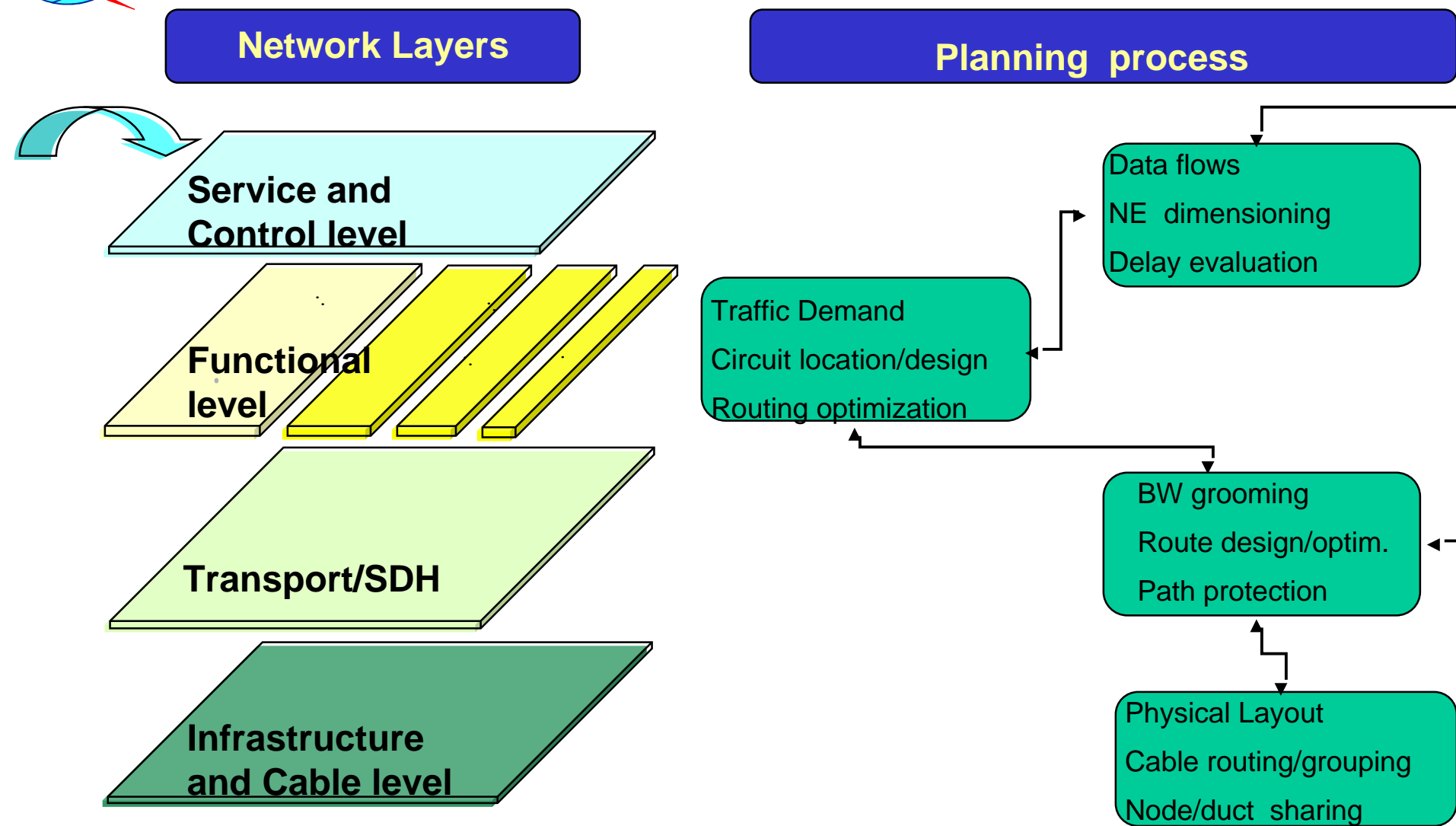


## Content Chapter 4.3

- **Requirements for NM, IN, signalling and/or Control network planning**
- **Planning and Design principles for management, signalling and control networks**

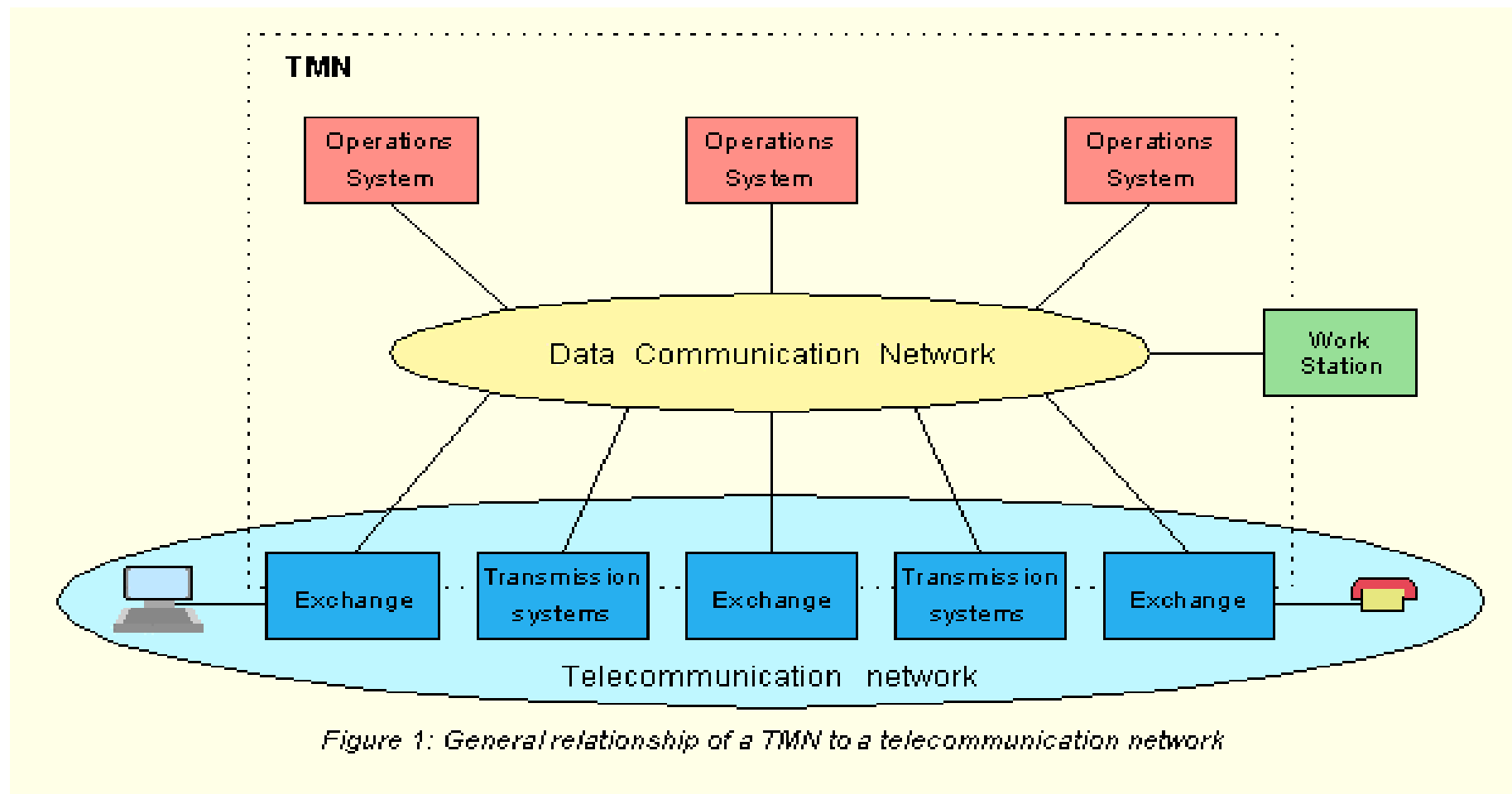


# Planning Methodology: Multilayer planning sequence



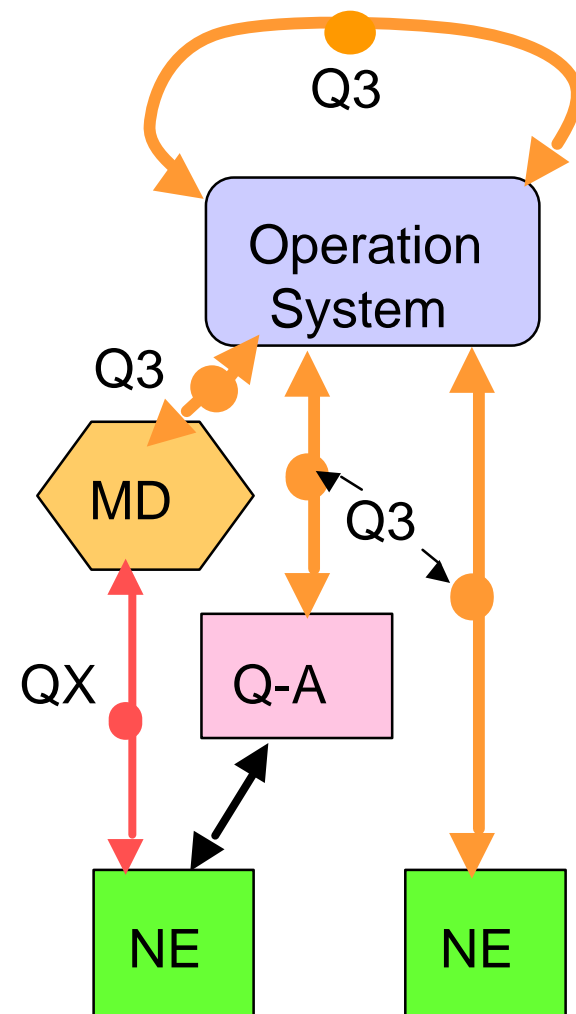


# Planning Control networks: NM configuration





## Planning Control networks: NM key NE



- Network Management System - NMS
  - HW&SW set embedded in the Operation System(s)
  - the Manager part of the TMN
  - NMS interacts with EMS through the DCN
- Element Management System - EMS
  - HW&SW set embedded in the Network Elements, Q-Adapters or Mediation Devices
  - the managed part of the TMN



## Planning Control networks: Issues and requirements

- Location and Dimensioning for NMC, IN, PSS & PTS ?
- Assignment for signaling associated services: O & M, IN, Control, Data ?
- Routing procedures ?
- Priority assignment per flow type ?
- Integrated versus specialised structures ?
- Impact due to massive traffics ?
- Protection level to failures ?
- Reserve Capacity for the service evolution ?
- Evolution capability ?



## Planning Control networks: Planning steps

- Definition and characterization of the traffic flows
- Location for the specialized service nodes
- Structure for the interconnection
- Dimensioning for the communication links and control nodes
- Quality evaluation and reserve capacity
- Plan for the service and network growth
- Evaluation for the equipment and operational costs



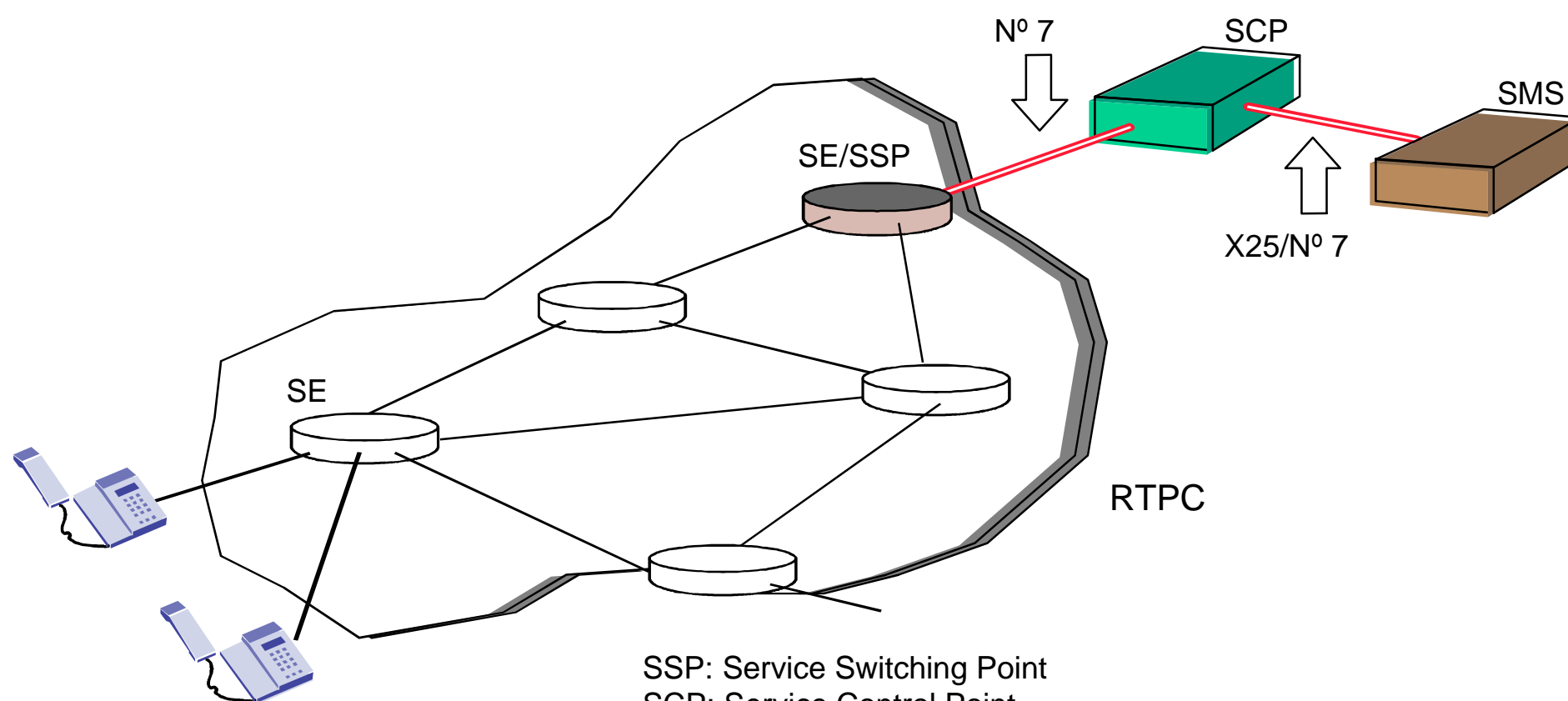


## Planning Control networks: Traffic characteristics

- **NM and OSS flow types**
  - Constant rates for periodic tasks
  - Multiple short messages
  - Random rates for failure events
  - Massive arrivals for generalized overloads
- **IN and CSS flow types**
  - Correlated to call arrival and call processing rates
  - Multiple short messages
  - Massive calls (voting ...)



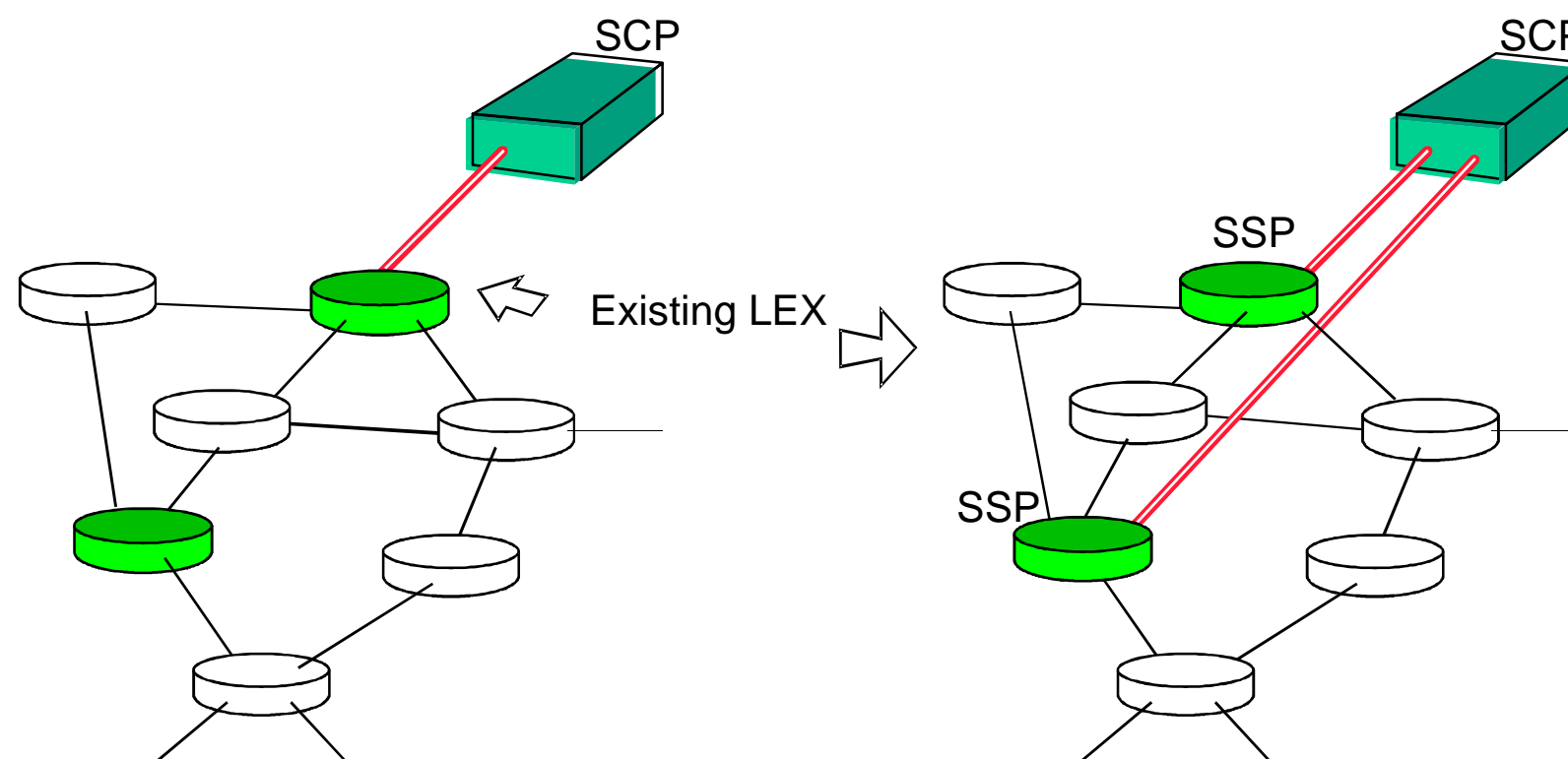
# Planning Control networks: IN configuration :



SSP: Service Switching Point  
SCP: Service Control Point  
SMS: Service Management System  
SE: Switching Exchange  
SE/SSP: Switching Exchange with SCP interface and SSP function

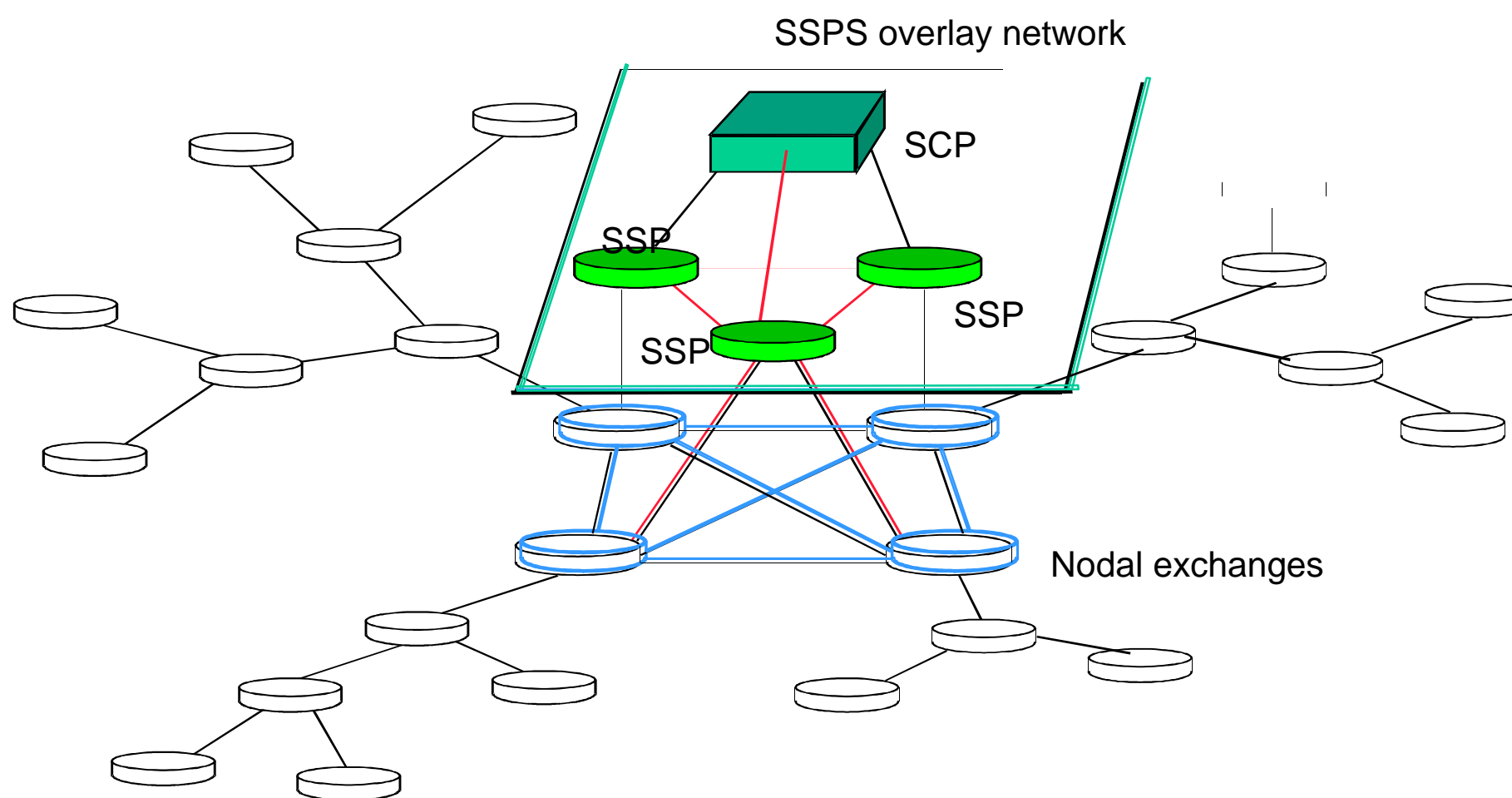


# Planning Control networks: IN Introduction in existing networks



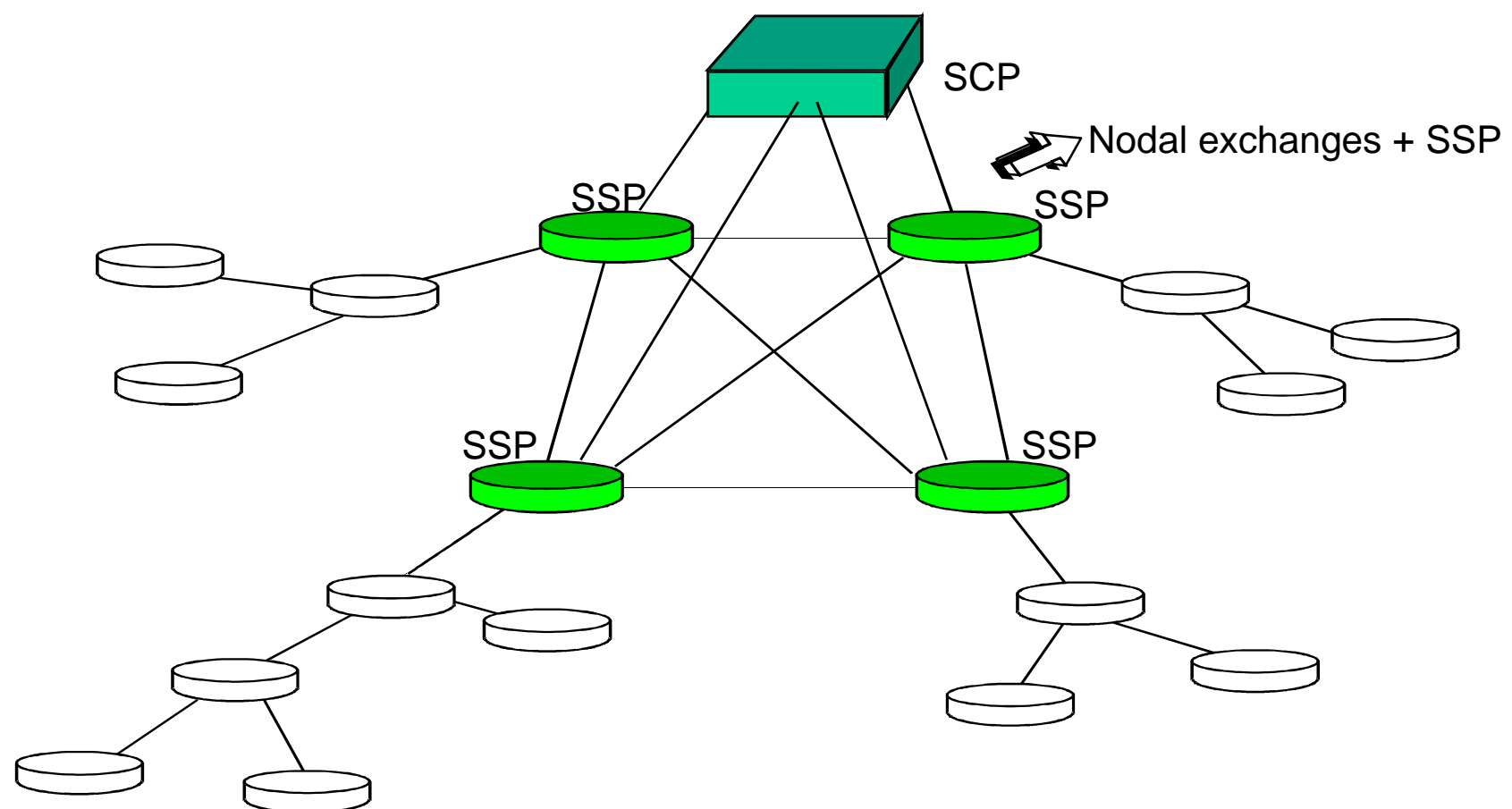


## Planning Control networks: SSP Location in overlay



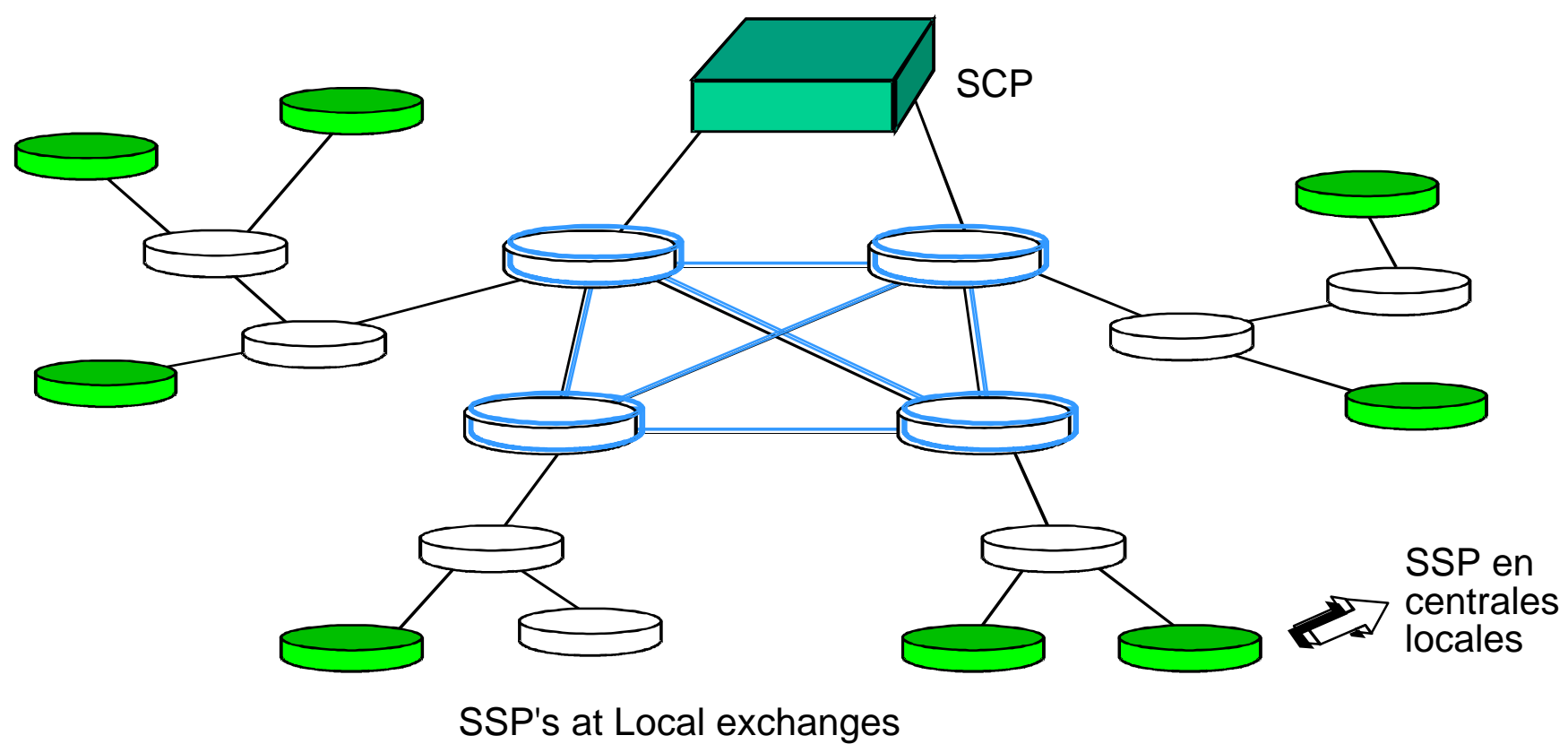


## Planning Control networks: SSP location in nodal exchanges



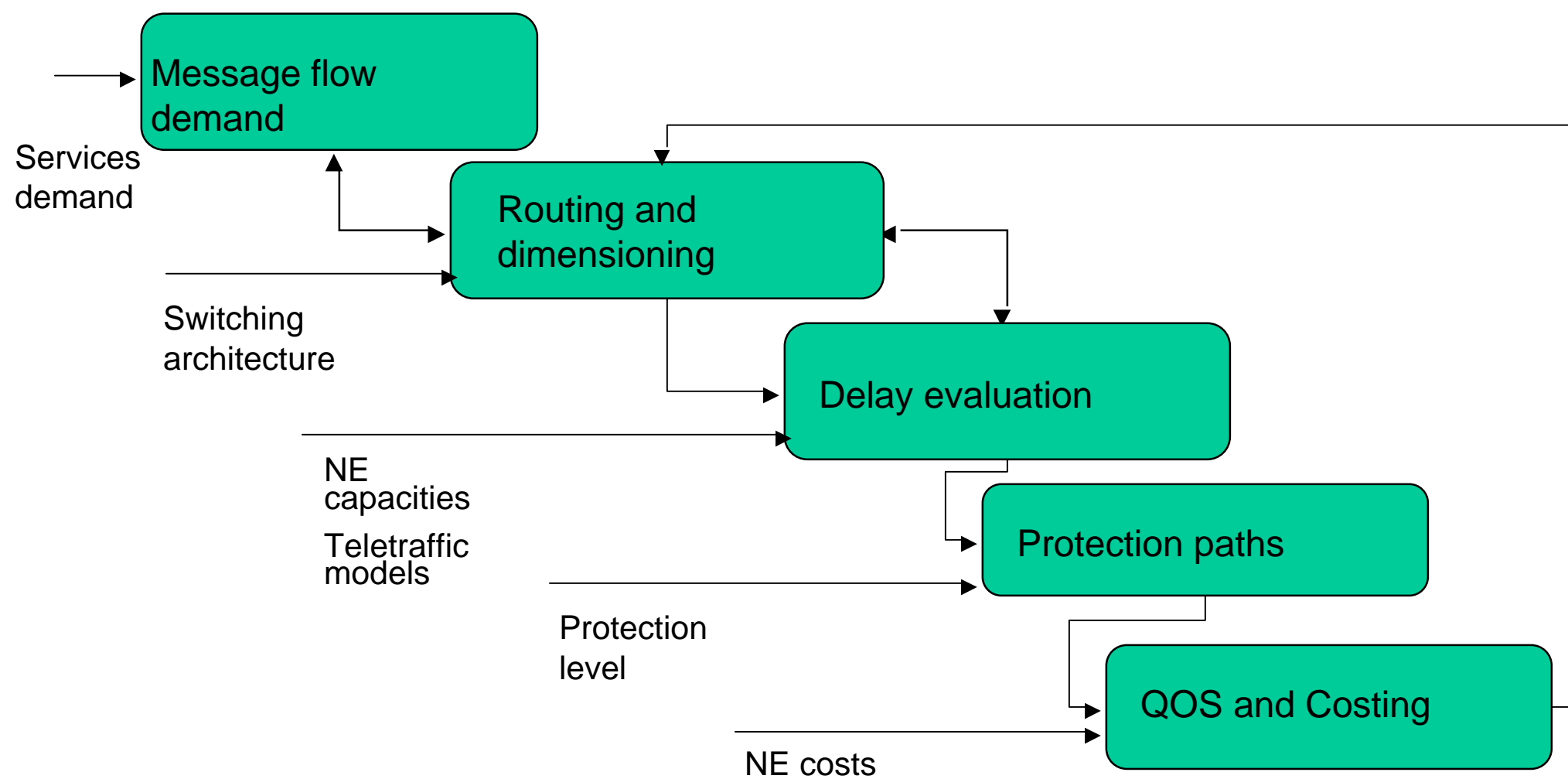


## Planning Control networks: SSP location in local exchanges





# Planning Control networks: The Network Design Process





## Planning Control networks: Network design and dimensioning

- Location/Association of service/control elements over the PSTN
- Evaluation of new matrices on the functional network by aggregation
- Redimensioning and reoptimization for the functional network
- Detailed dimensioning for the specific service/control NE
- Evaluation of critical performance parameters (transfer delays, end to end delays, etc.)
- Determination of reserve capacity and protection to overload





## Planning Control networks: Basic models:

- **Network dimensioning**
  - Message processing modeled by queueing network methods
  - Load value lower than nominal capacity minus reserve capacity
  - Transfer and end to end delays lower than specs
- **System and processor dimensioning**
  - Processors dimensioned based on load and delay
  - Memory based on customer number and service types
  - Resources dimensioned for specific (system dependent) rules

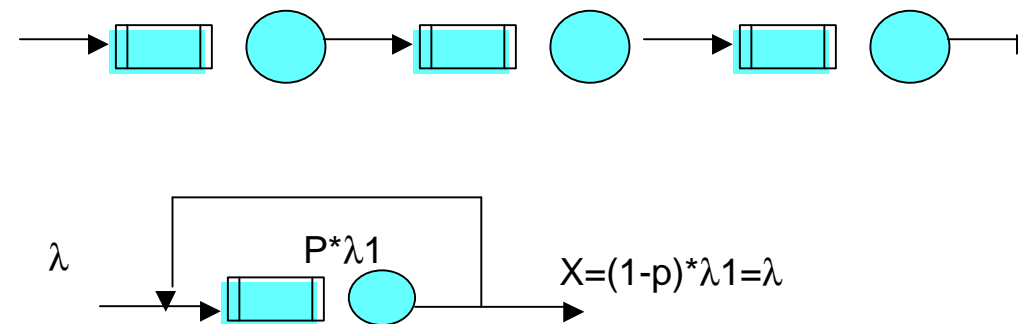


# Planning Control networks: Basic models:

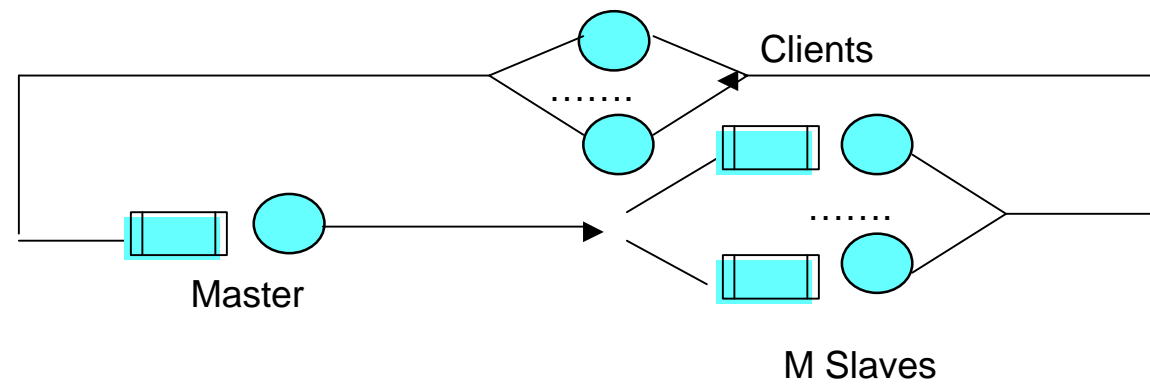
- **Network dimensioning**

- Open queues:

- Without feed-back:



- With feed-back:



- Closed queues

**Arrival laws with peakness factors and correlated**

**Holding times very short and heterogeneous**



## **Planning Control networks: Dimensioning Criteria**

- **High connectivity degree:**
  - **All node pairs with 3 or more end to end alternative paths**
- **High protection reserve capacity:**
  - **Occupancy level lower than nominal even after a single node/link failure**
- **High performance- Low transfer delays at system level and end to end network for quick reaction time**



## **Planning Control networks: Issues for the future**

- **Merging for all flow control types while maintaining high capacity and high security. Issues for OSI over IP and IP over OSI**
- **Incorporate new flows associated to new services and Application Service Provisioning with high demanding rates**
- **Protection systems for cases of overload, massive traffics and malicious interferences**