



ITU / BDT workshop

Bangkok, Thailand,

11 – 15 November 2002

Network Planning

Lecture NP- 4.3

Specific Network Planning

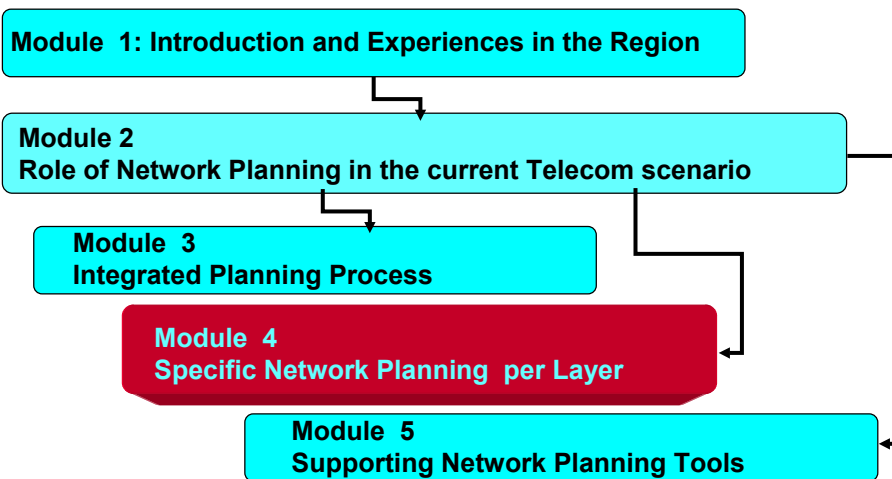
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BDT - COE workshop on Network Planning



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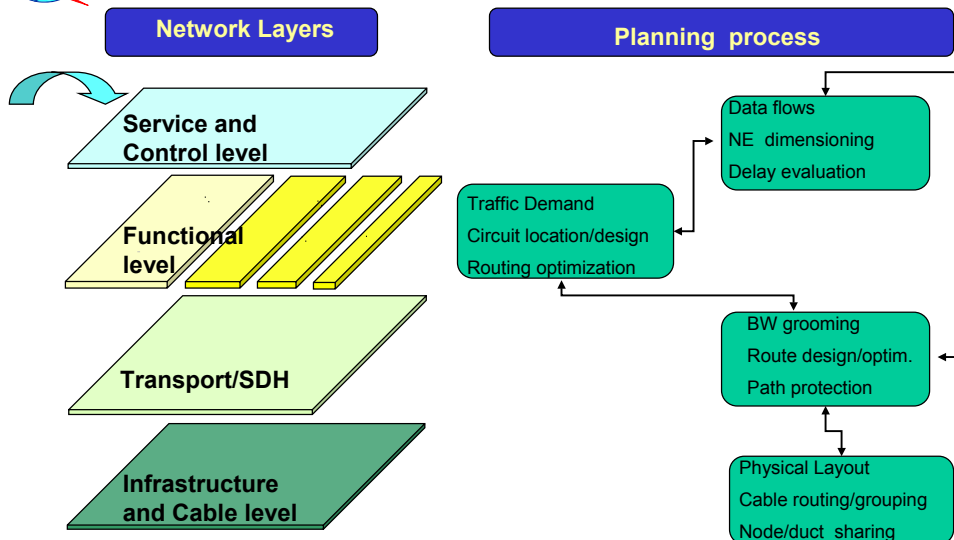


Content Chapter 4.3

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

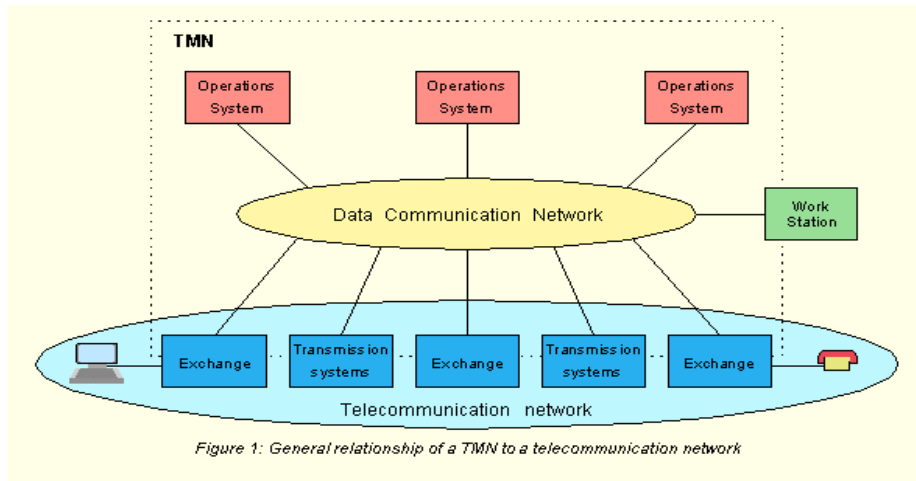


Planning Methodology: Multilayer planning sequence





Planning Control networks: NM configuration



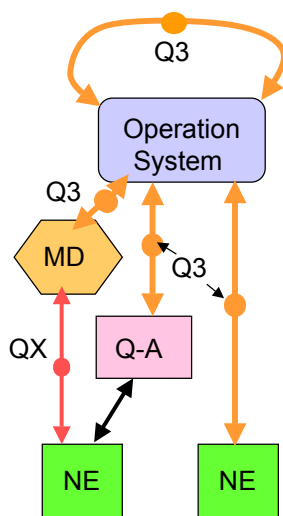
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Planning Control networks: NM key NE



- 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

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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 grow
- 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 ...)

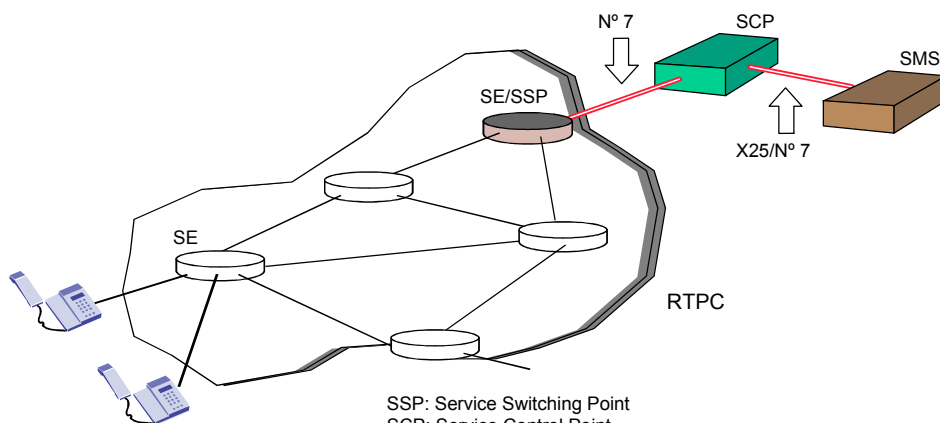
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Planning Control networks: IN configuration :



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

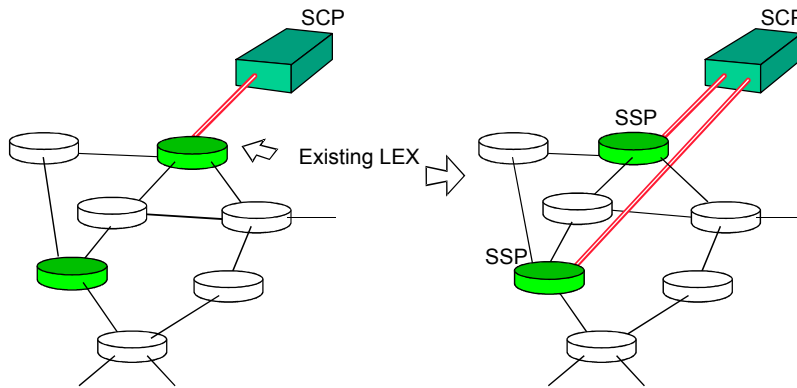
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Planning Control networks: IN Introduction in existing networks



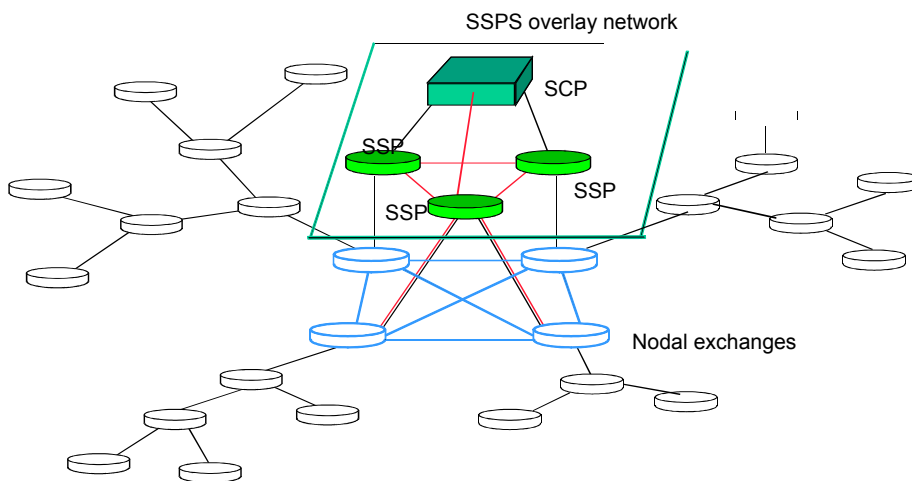
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Planning Control networks: SSP Location in overlay



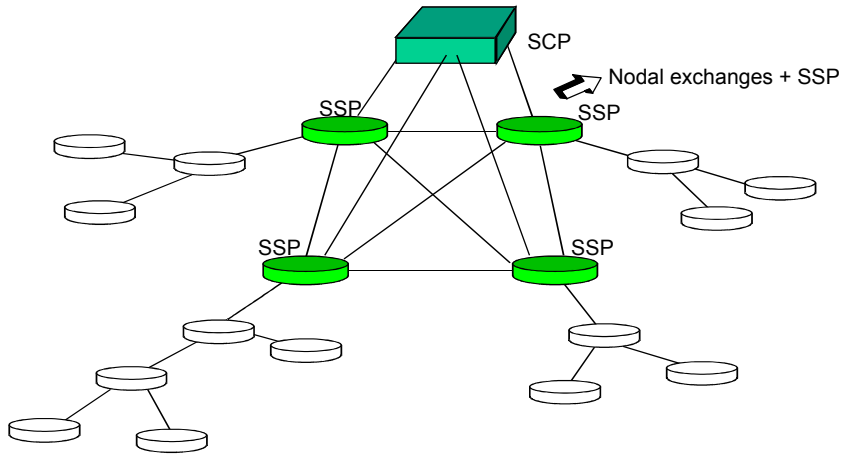
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Planning Control networks: SSP location in nodal exchanges



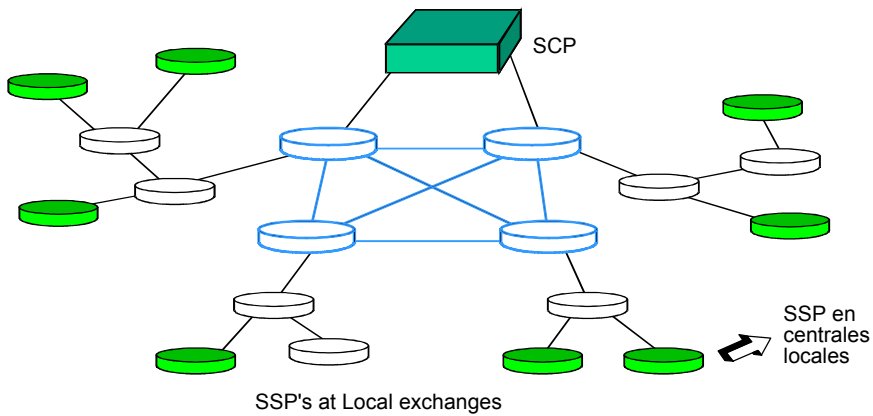
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Planning Control networks: SSP location in local exchanges



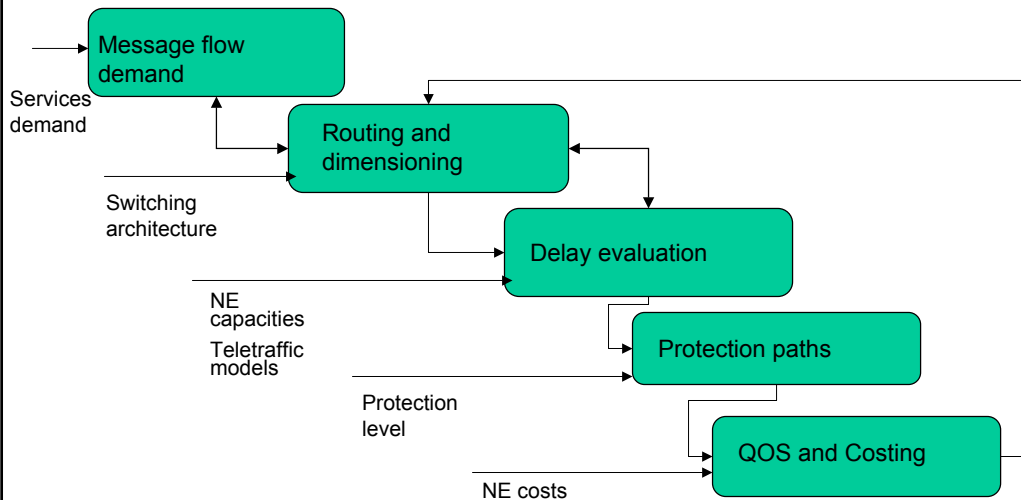
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Planning Control networks: The Network Design Process



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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

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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 within very stringent 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

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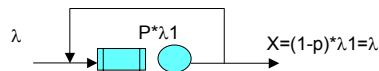
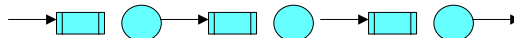
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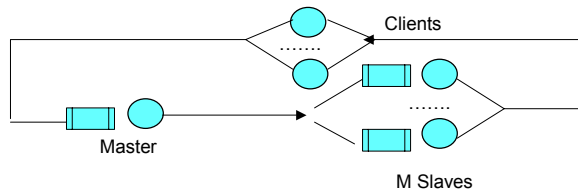
Planning Control networks: Basic models:

- **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**

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Planning Control networks: Dimensioning Criteria

- **High connectivity degree:**
 - All node pairs with 3 or more end to end alternative paths (ie: QUAD topology at upper level and double homing for low levels)
- **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**