



7. QoS Provisioning

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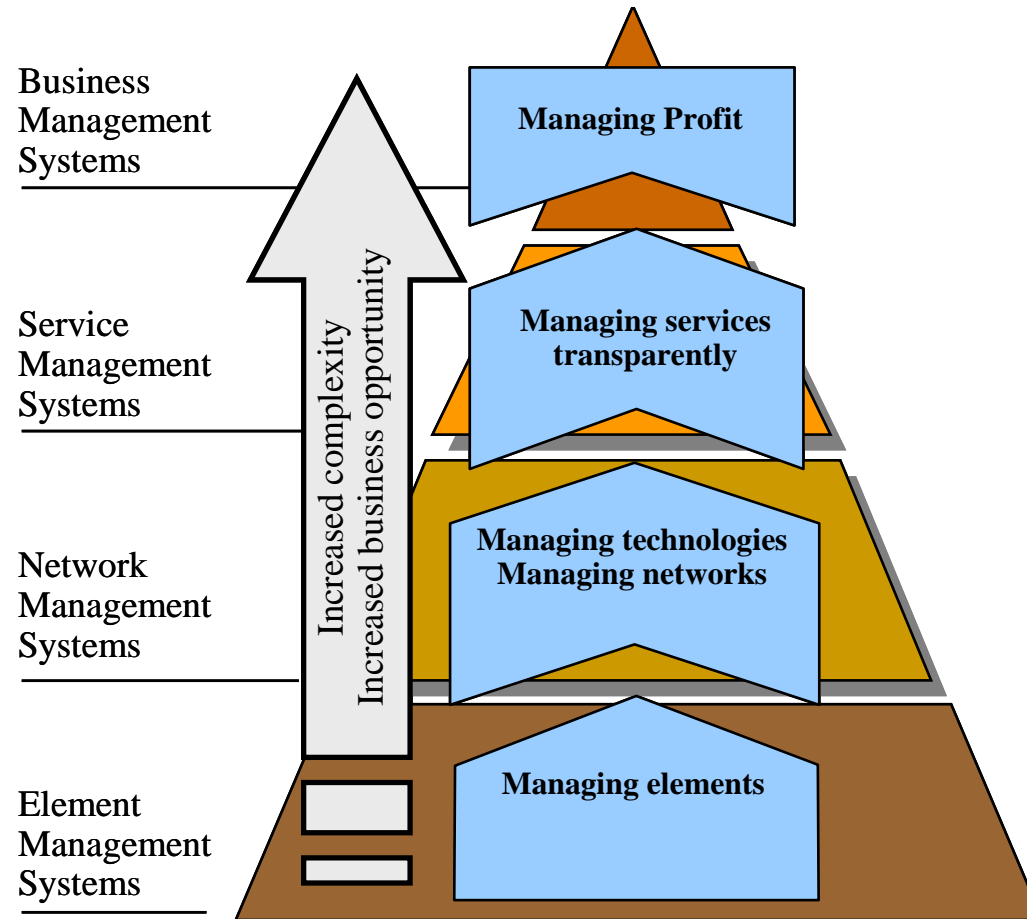
S-38.3215 Special Course on Networking Technology for Ph.D. students at TKK

Outline

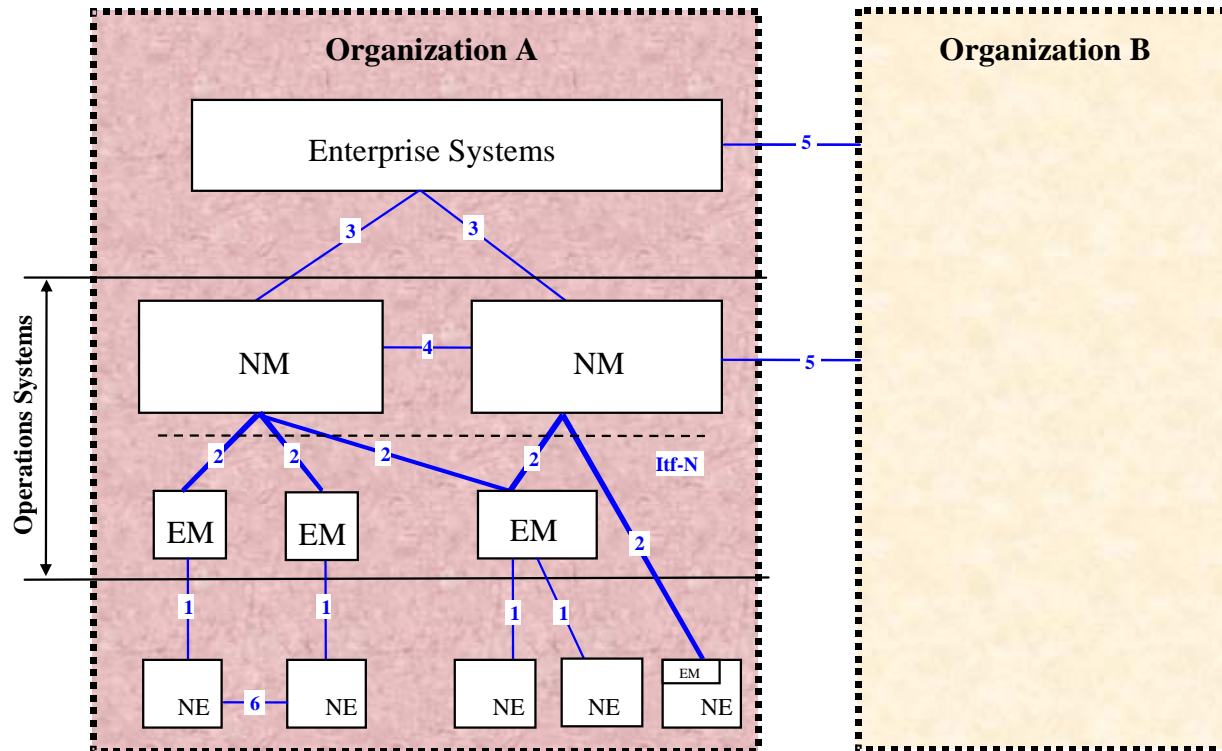
- Radio, core and transport QoS provisioning
- Service and mobile QoS provisioning
- QoS provisioning tools



TMN model for management hierarchy



TMF management hierarchy

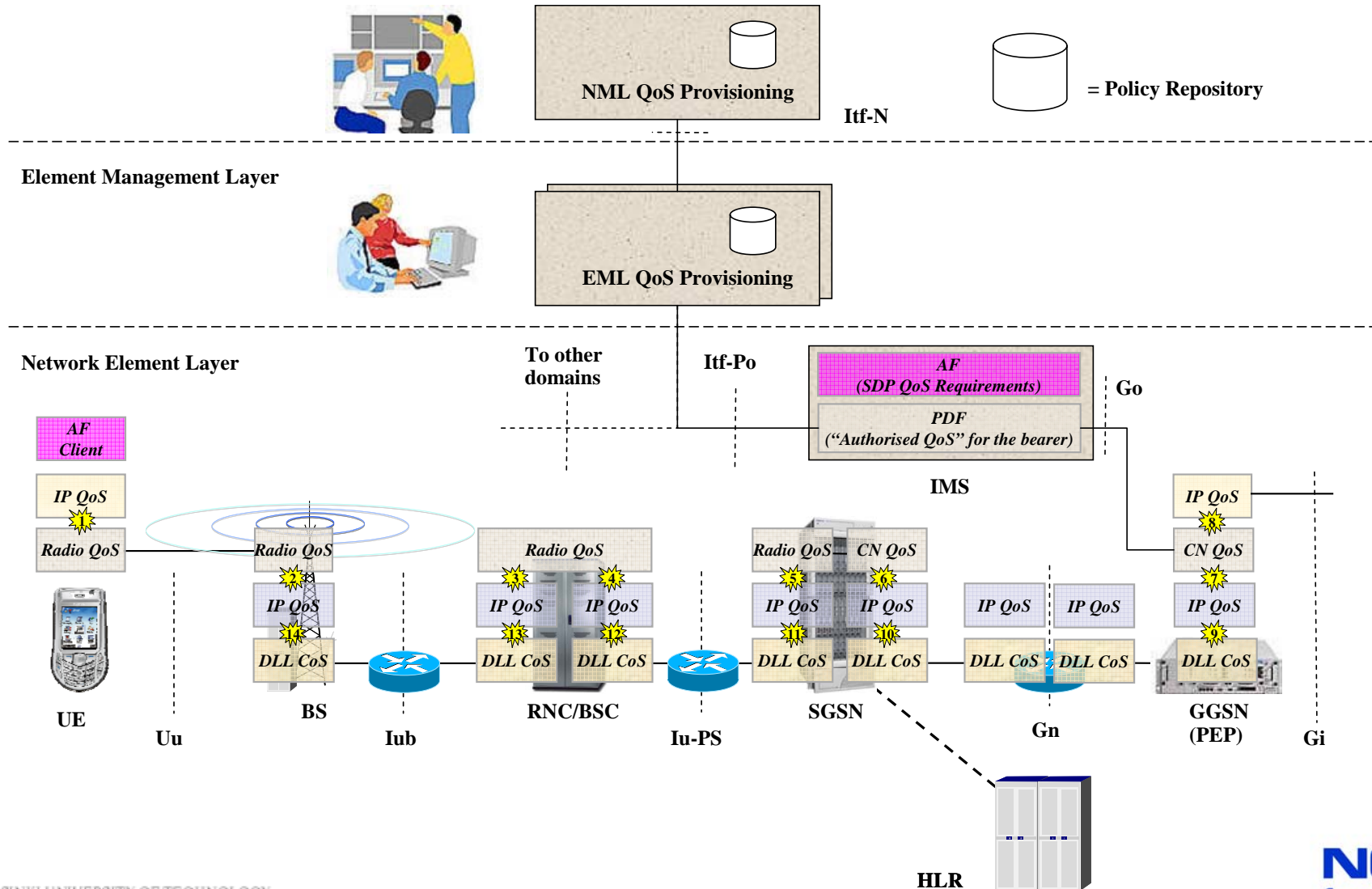


Possible interfaces:

- 1) Between Network Elements (NE) and Element Manager (EM) of a single PLMN organisation
- 2) Between EM and Network Manager (NM) of a single PLMN organisation
- 3) Between NM and Enterprise Systems (ES) of a single PLMN organisation
- 4) Between NMSs of a single PLMN organisation
- 5) Between ES and NM of different PLMN organisations
- 6) Between NEs



QoS mechanisms and management



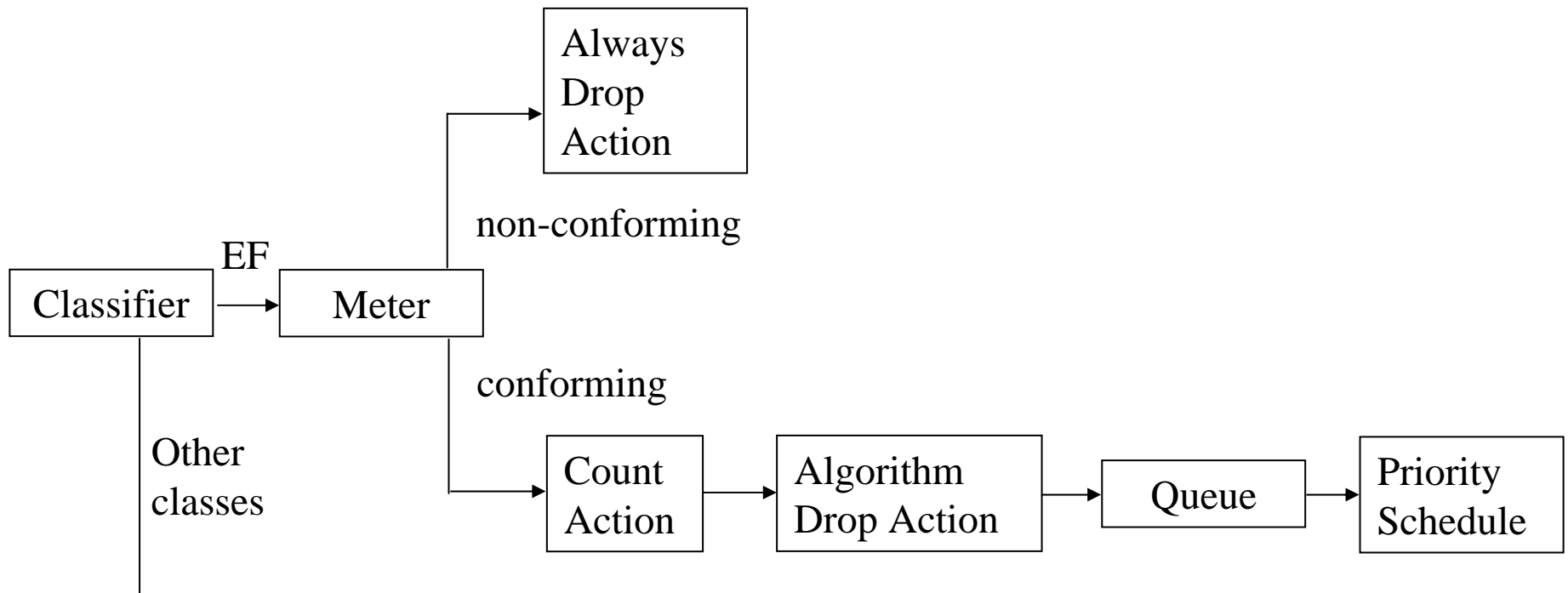
Radio, core and transport

- Provisioning of differentiation mechanisms
 - Radio QoS functions (UE, UTRAN/GERAN, SGSN)
 - CN QoS functions (SGSN, GGSN)
 - Policy Decision Function (IMS)
 - IP QoS functions
 - Data link layer functions
- Provisioning of QoS mapping functions
 - Service applications – 3GPP QoS parameters
 - 3GPP QoS parameters – IP QoS parameters (includes Edge function)
 - IP QoS parameters – Class of service parameters

(The mapping of 'Authorized QoS' onto UMTS QoS is specified in 3GPP)



Example of DiffServ EF policy

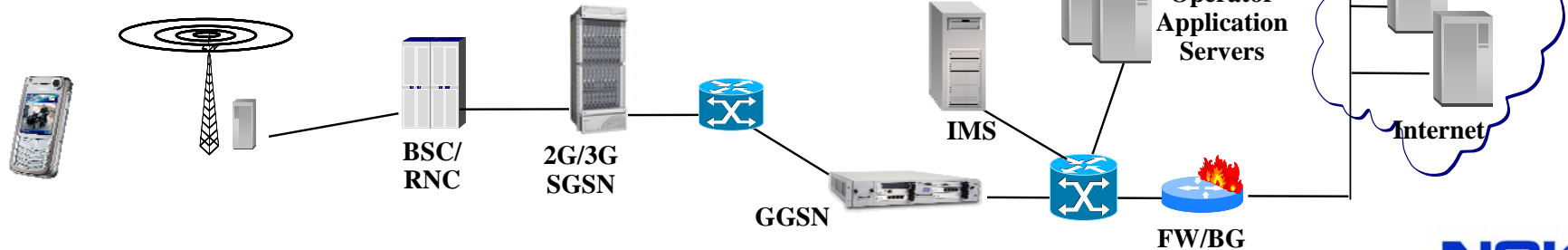
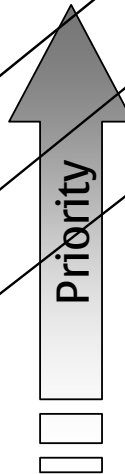


Service QoS provisioning

MMS Browsing Video streaming PoC Corporate VPN Video Call Content Sharing Gaming Instant Messaging Presence



Bearer 9 (guaranteed bit rate, priority 1, TC = Conversational, ARP = 1)
Bearer 8 (guaranteed bit rate, priority 2, TC = Conversational, ARP = 2)
Bearer 7 (guaranteed bit rate, priority 3, TC = Conversational, ARP = 3)
Bearer 6 (guaranteed bit rate, priority 4, TC = Streaming, ARP = 1)
Bearer 5 (guaranteed bit rate, priority 5, TC = Streaming, ARP = 2)
Bearer 4 (guaranteed bit rate, priority 6, TC = Streaming, ARP = 3)
Bearer 3 (non-guaranteed bit rate, priority 7, TC = Interactive, ARP = 1)
Bearer 2 (non-guaranteed bit rate, priority 8, TC = Interactive, ARP = 2)
Bearer 1 (non-guaranteed bit rate, priority 9, TC = Interactive, ARP = 3)
Bearer 0 (non-guaranteed bit rate, priority 10, TC = Background, ARP = 3)



Priority 'pipe' definition

- Subset of QoS attributes that allow an adequate number of priority 'pipes'
 - UMTS traffic class (TC)
 - Traffic handling priority (THP)
 - Allocation/retention priority (ARP)
 - Maximum bit rate
 - Guaranteed bit rate
- (Management concept!)



Service provisioning in (E)GPRS/WCDMA

- QoS differentiation can be provided
 - by placing applications with delay-critical QoS requirements behind **different APNs** and setting the different QoS parameters per subscriber and APN from the HLR; or
 - for QoS-aware applications, by terminal clients activating parallel primary or secondary PDP contexts (with different QoS parameters) using the **same APN**

(According to 3GPP R99, bit rate guarantees are possible only for QoS-aware clients and terminals.)



Mobile terminal QoS provisioning

- Mechanisms and protocols that make an application on a mobile device aware of which APN and hence associated QoS to use and, for an application on QoS-aware devices, what QoS to ask for



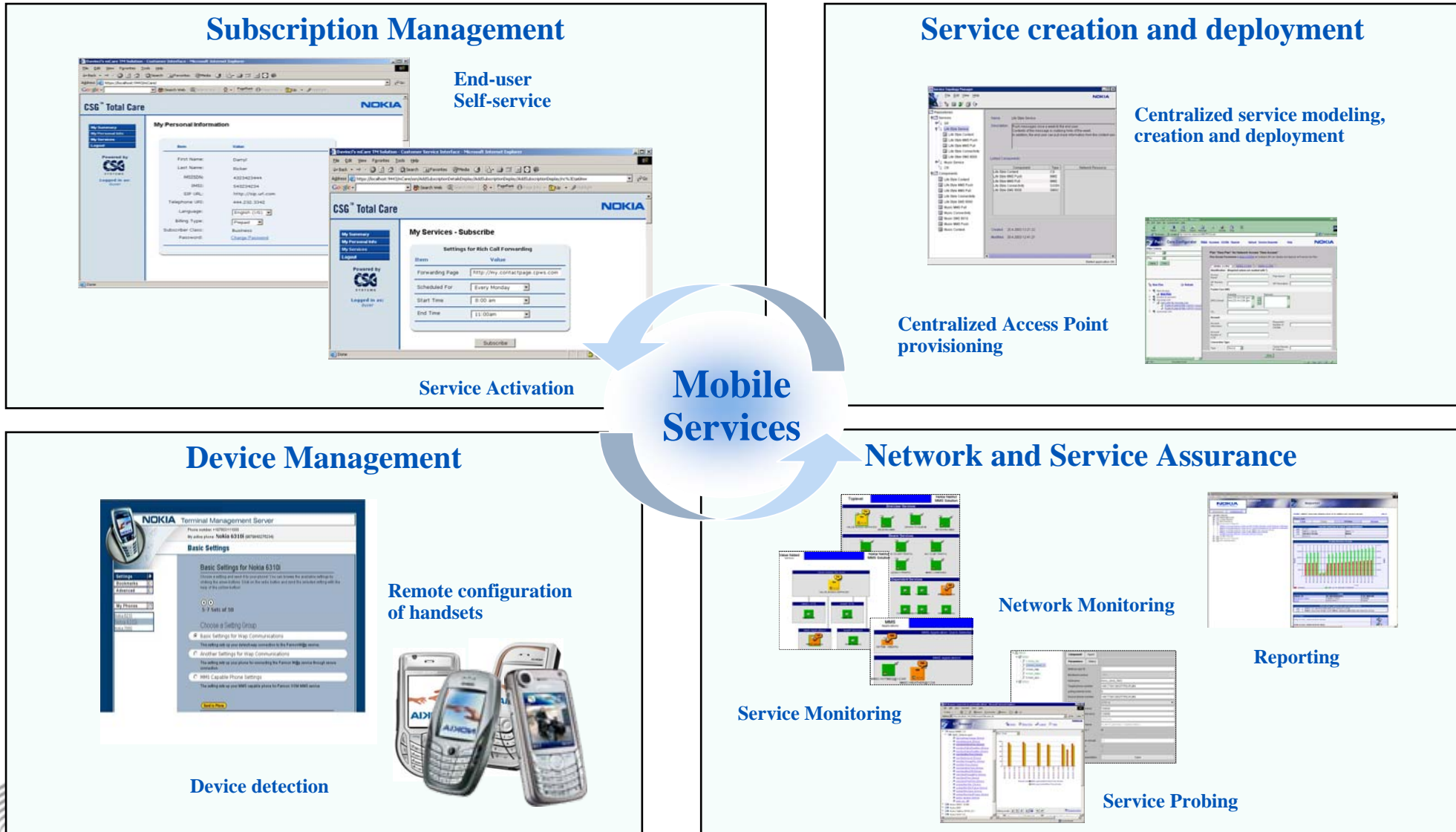
QoS provisioning tools

- Configuration management
- Policy based QoS management
 - Policy management tool
 - Policy decision point (PDP) or policy consumer
 - Policy enforcement point (PEP)

Policy = rule with *conditions* and *actions*
- Service configuration



Example of Nokia solution for IMS



References

- D. Soldani, M. Li and R. Cuny (eds.), **QoS and QoE Management in UMTS Cellular Systems**, John Wiley and Sons, June, 2006, 460 pp.
 - <http://eu.wiley.com/WileyCDA/WileyTitle/productCd-0470016396.html>
 - <http://www.connecting.nokia.com/NOKIA/nns.nsf/a/78786C61AB5A7C5AC225718F0026BAA3>

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See also:

- <http://lib.tkk.fi/Diss/2005/isbn9512278340/>

