



International Telecommunication Union

Quality of Service for Next Generation Networks

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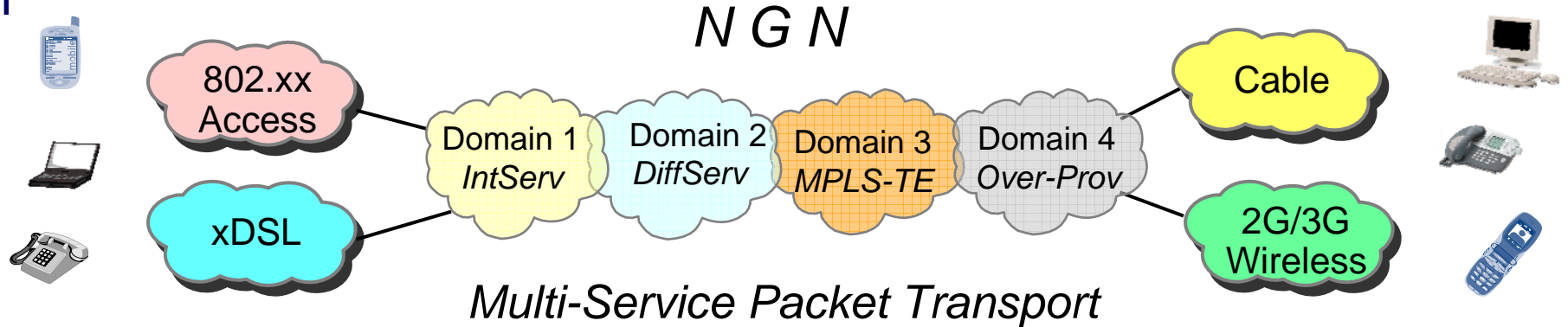


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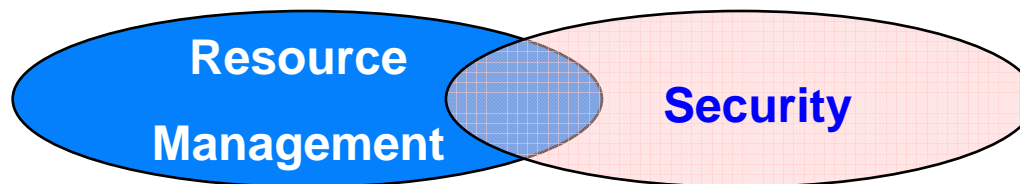
Outline

- o Drivers and basic requirements
- o NGN QoS standardization activities in ITU-T
- o Resource and Admission Control Functions (RACF)
- o Summary

Why?



- o Dynamic support for a variety of applications (e.g., Web services, VoIP, and IPTV) with very different performance needs
- o Enabling providers to control end user experience in a heterogeneous environment in a *consistent* and *secure* fashion
- o Allowing fast introduction of performance-demanding applications





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Key QoS Topics under Study in ITU

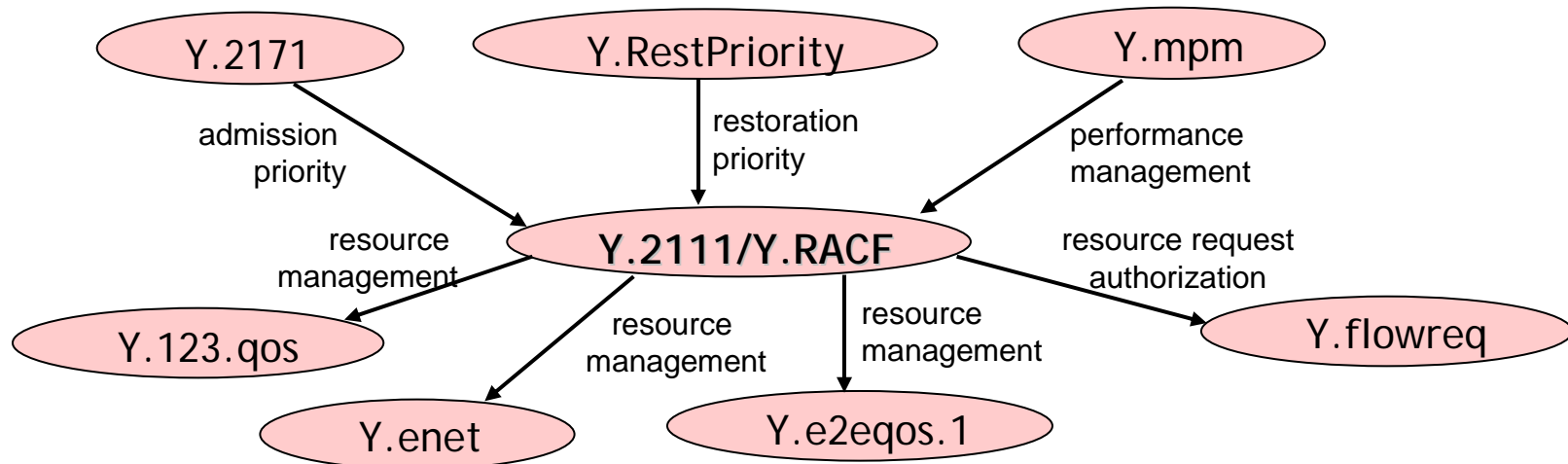
- Performance objectives, including
 - Network performance classification
 - Network performance allocation
- Dynamic QoS controls, including
 - Negotiation of QoS requirements
 - Resource and admission control
 - Interworking of QoS mechanisms
 - Inter-domain considerations
 - Frameworks and guidelines
- Performance measurement and management
- Performance prediction



Related efforts are underway in other SDOs

A major goal is to develop a comprehensive QoS solution that allows incremental deployment

NGN QoS Activities in Q.4/13



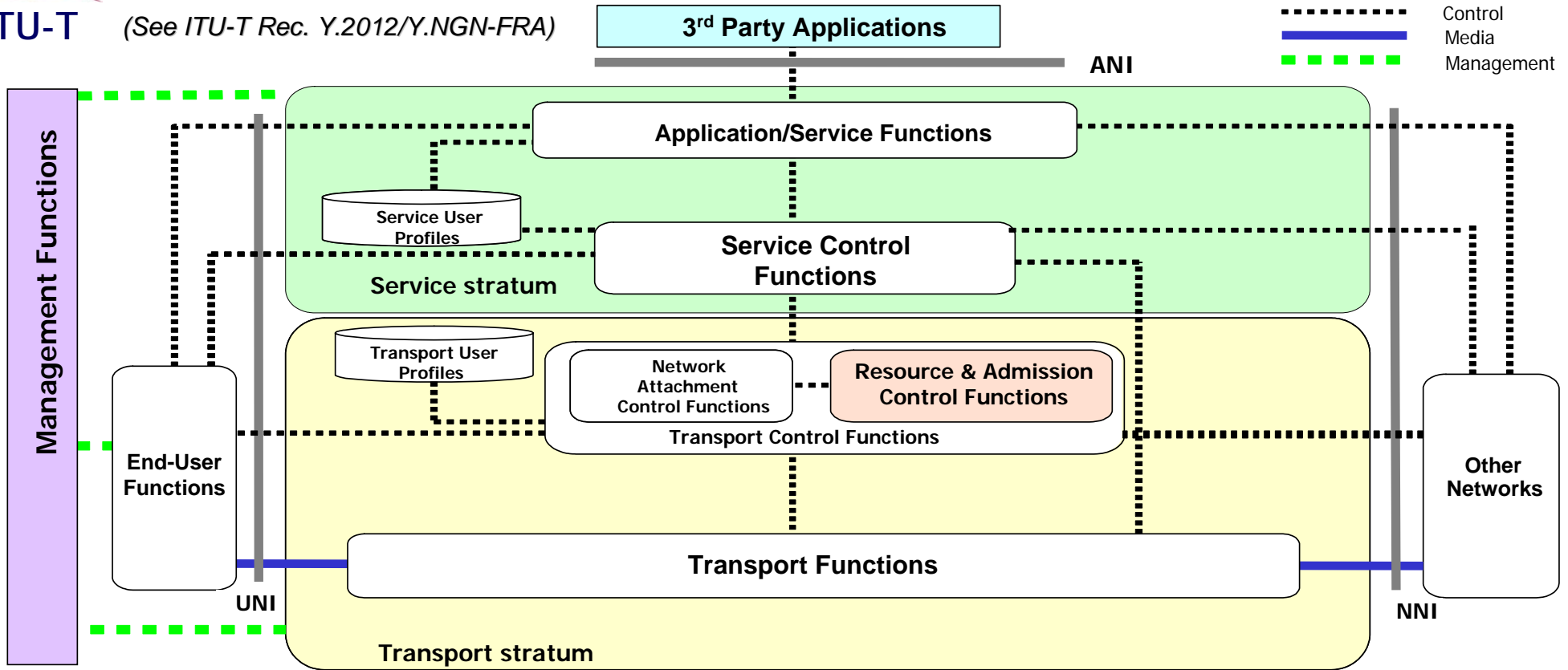
Recommendation	Title	Target for Consent
Y.2171	Admission control priority levels in NGN	07-2006
Y.2111	Resource and admission control functions in NGN	07-2006
Y.123.qos	A QoS control architecture for Ethernet-based IP access networks	04-2007
Y.enet	Ethernet QoS control for NGN	04-2007
Y.mpm	Management of performance measurement for NGN	04-2007
Y.e2eqos.1	Requirements and framework for end-to-end QoS in NGN	12-2007
Y.RestPriority	Restoration priority levels in NGN	04-2007
Y.flowreq	Requirements for the support of stateful flow-aware transport technology in NGN	04-2007



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(See ITU-T Rec. Y.2012/Y.NGN-FRA)

Resource and Admission Control Functions



Resource and Admission Control Functions (RACF)

- ❖ Provide application-driven, policy-based resource management
- ❖ Bridge service control and packet transport to dynamically guarantee QoS and enforce certain network security measures



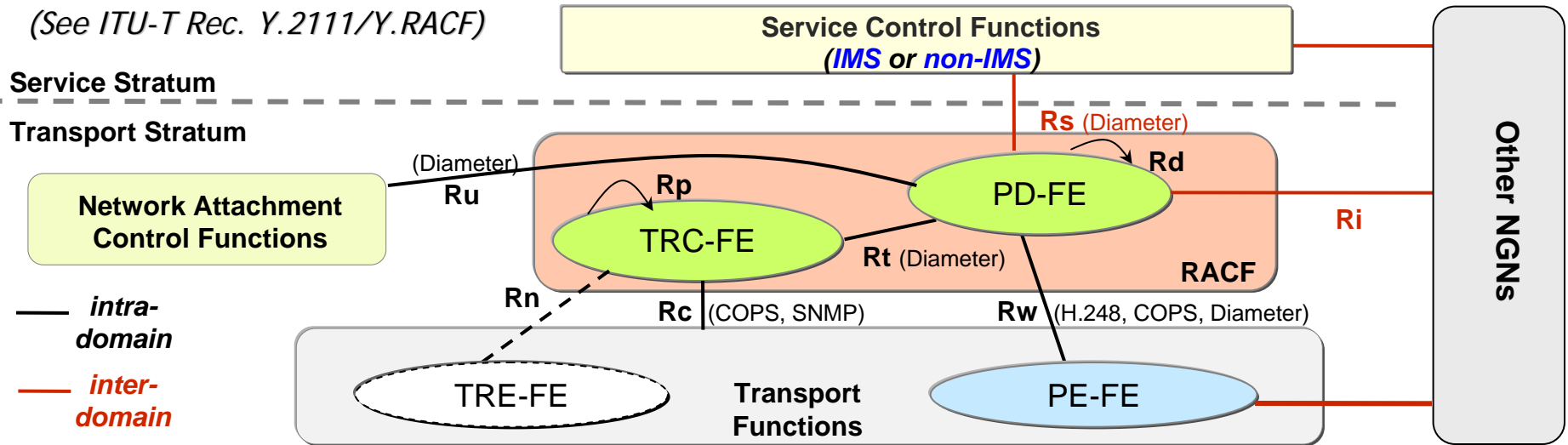
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ITU-T RACF Architecture

(See ITU-T Rec. Y.2111/Y.RACF)

Service Stratum

Transport Stratum



Policy Decision Functional Entity (PD-FE)

- o Authorizes resource requests based on policy
- o Configures the transport to enforce policy

*service-facing,
transport-independent*

Transport Resource Control Functional Entity (TRC-FE)

- o Tracks resource usage & network topology
- o Makes resource-based admission decision

*service-independent,
transport-dependent,
segment-specific*

Policy Enforcement Functional Entity (PE-FE)

- o Enforces policy for NAPT, gating, rate limiting, packet marking, etc.

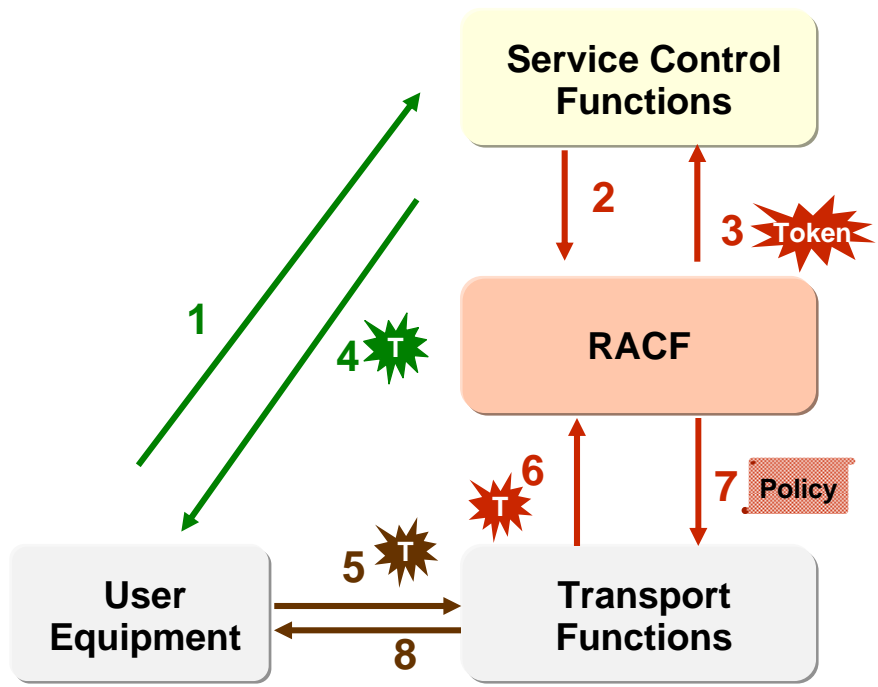
*typically part of border transport
elements (e.g. edge router and
border gateway)*

More RACF Specifics

Support for

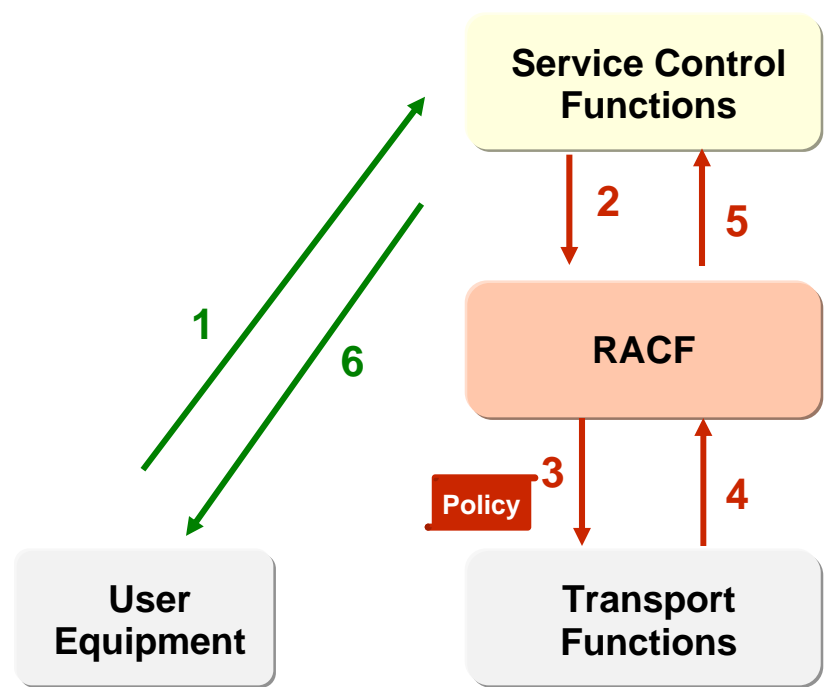
- Relative and absolute QoS, including priority
- Endpoints of varied QoS control capabilities
- *Push* and *pull* modes for policy control
- Various resource management methods based on accounting, measurement and reservation
- Existing and emerging transport QoS mechanisms

Push and Pull Modes



Pull Mode

(Token-free operations are also possible.)



Push Mode

— Application Signaling
 — RACF Control
 — Transport QoS Signaling



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Options for Admission Control in TRC-FE

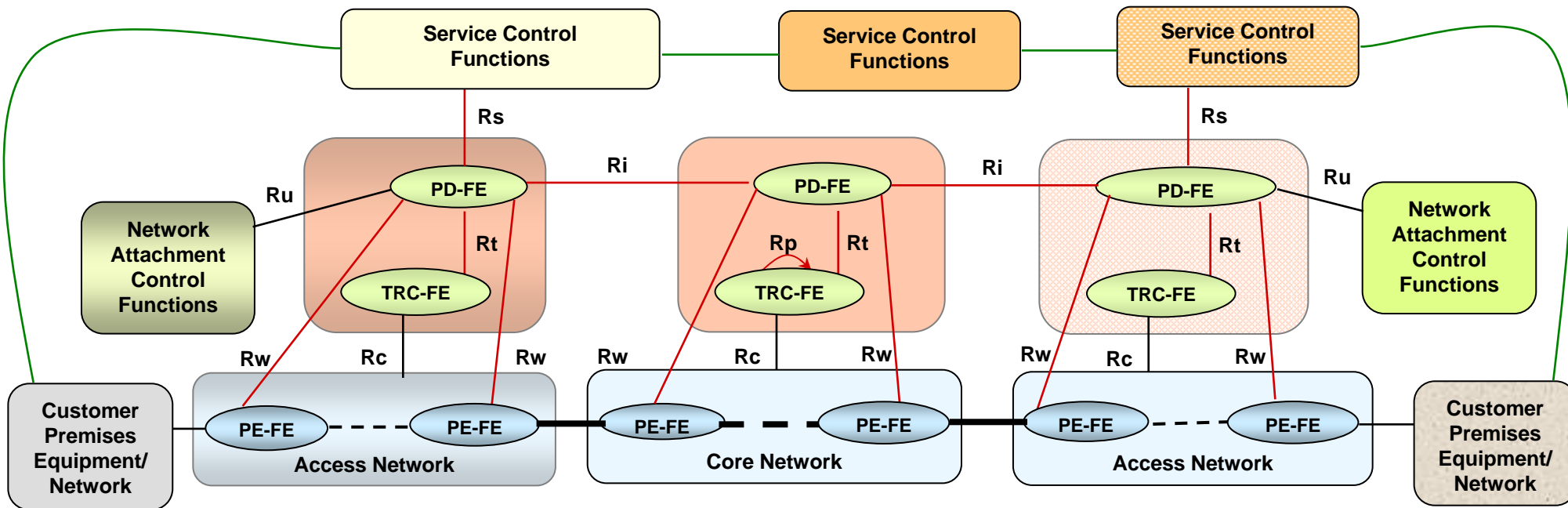
Depending on operator policy and network specifics:

- o NULL (such as in over-engineered core networks)
- o Accounting-based
 - Keep track of the consumed resources from a resource pool
- o Measurement-based (in-band or out-of-band)
 - Audit resource use in the transport periodically via SNMP, or
 - Measure directly network performance edge-to-edge(or end-to-end) via RTCP or active/passive probes
- o Part of native transport admission control
 - For example, MPLS routers/switches track resource use and LSP map
- o In conjunction with native transport resource reservation
 - Trigger native transport resource reservation and make admission decision based on the reservation result
- o A combination of the above
 - Different solutions according to services and/or network domains



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A Configuration Example



The PE-FE can reside in the

- Gateway GPRS Support Node
- Packet Data Serving Node
- Cable Modem Termination System
- Access Node
- Edge Node
- Border Gateway



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Summary

- NGN QoS is an active standardization area in the ITU-T
- RACF for dynamic, application-driven resource management plays a central role
 - *Y.2111/Y.RACF* (on the architecture and requirements for Release 1) and *Y.2171/Y.CACPriority* about to be approved
 - RACF protocols are under development in SG 11
 - Draft new Recommendations *Y.123.qos* and *Y.enet* address the application of RACF to Ethernet environments
- Other aspects are addressed by new draft Recommendations underway (*Y.mpm*, *Y.e2eqos.1*, *Y.flowreq*, *Y.RestPriority*, etc.)
- Close cooperation among relevant SDOs is essential to the development of consistent and interoperable standards
- Discussion of the impacts of Grids is in order