Resource and Admission Control for NGN

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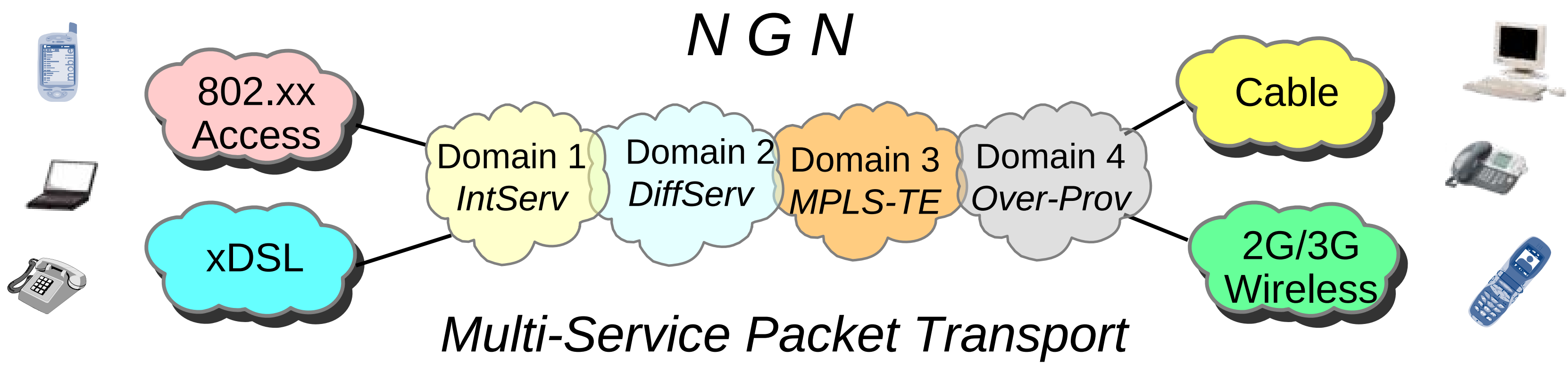
Why?



- Flawless support for a variety of applications (e.g., Web services, VoIP and IPTV) with very different performance needs
- Enabling providers to control end user experience in a heterogeneous environment while protecting the networks
- Allowing fast introduction of performance-demanding applications

Basic Network Requirements

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- Ensure that only legitimate requests are satisfied
- Allocate and de-allocate resources (e.g., IP addresses, port numbers, bandwidth) based on established *policy*
- Hide the network topology (e.g., IP addresses of all but a few entities) as necessary
- Be able to handle remote NAPT devices
- Mitigate relevant denial-of-service attacks

Real-time application-driven resource management that

- Preserves the separation of services and transport
- Provides the necessary coupling to *guarantee QoS* and *implement security measures dynamically*

Brief History + Building Blocks

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- 1997: IETF has completed the Resource Reservation Setup Protocol (RSVP)—a generally non-scalable per-flow end-to-end mechanism, which has found a 2nd life in Multi-Protocol Label Switching (MPLS)
- 2002-2005: IETF has developed the Differentiated Services (DiffServ) model, which supports traffic aggregation, and applied it to MPLS
- 2000-2005: IETF has developed the Common Open Policy Service (COPS) protocol to exchange policy information between a policy server (Policy Decision Point [PDP]) and its clients (Policy Enforcement Points [PEPs])
  - But other protocols (notably, RADIUS, DIAMETER, and H.248) have evolved to be used for the same purpose
- 2000-present: 3GPP has adopted the IETF building blocks for Service-Based Local Policy (SBLP), which is evolving into Policy and Charging Control. 3GPP2 has a similar effort on Service-Based Bearer Control.
- 2003-present: ETSI TISPAN has been developing the Resource and Admission Control SubSystem (RACS) based on SBLP
- 2004-present: ITU-T Q.4/13 has been developing RACF, with an end-to-end scope from the onset, based on SBLP

RACF and NGN Framework Architecture

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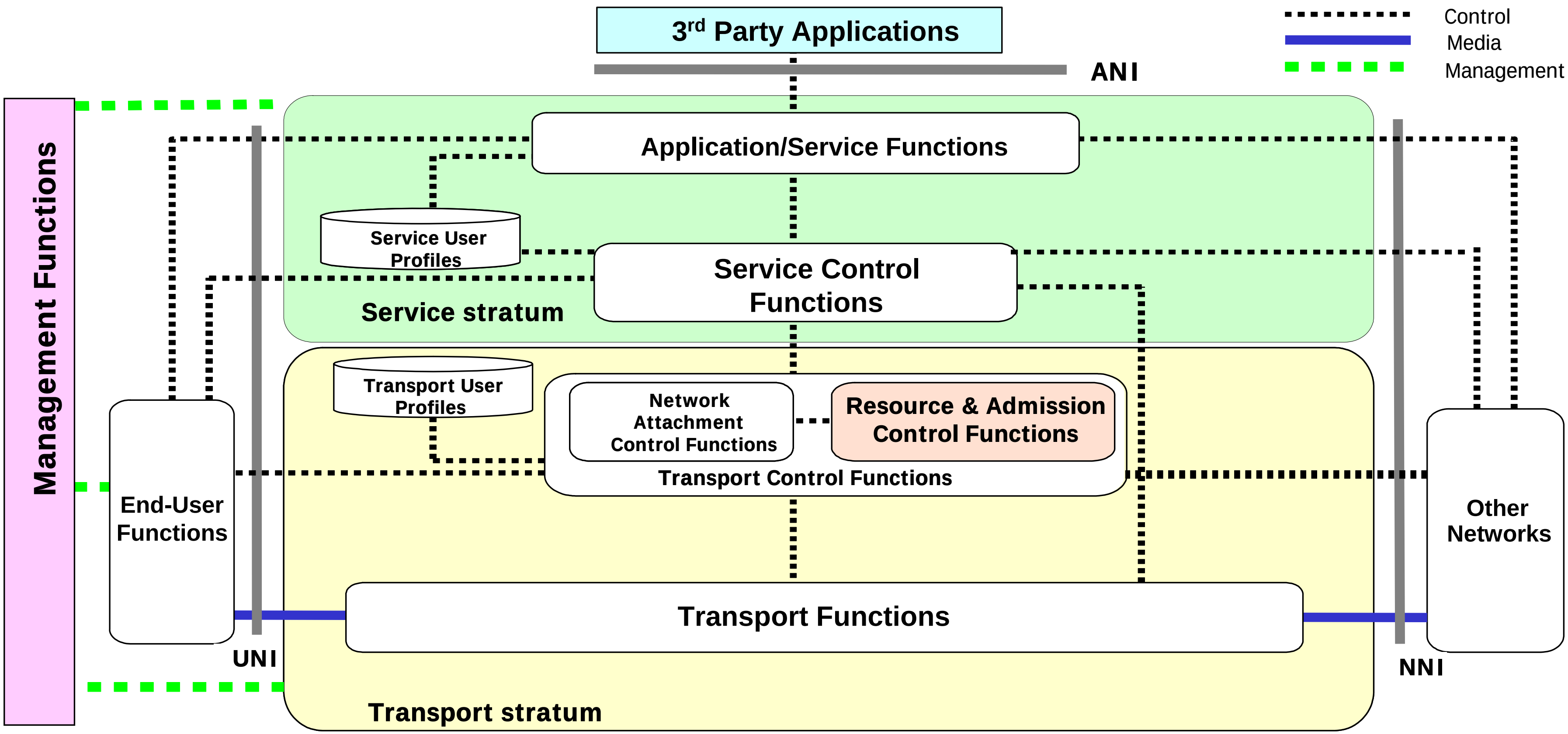

See ITU-T Y.NGN-FRA

ITU-T RACF Architecture

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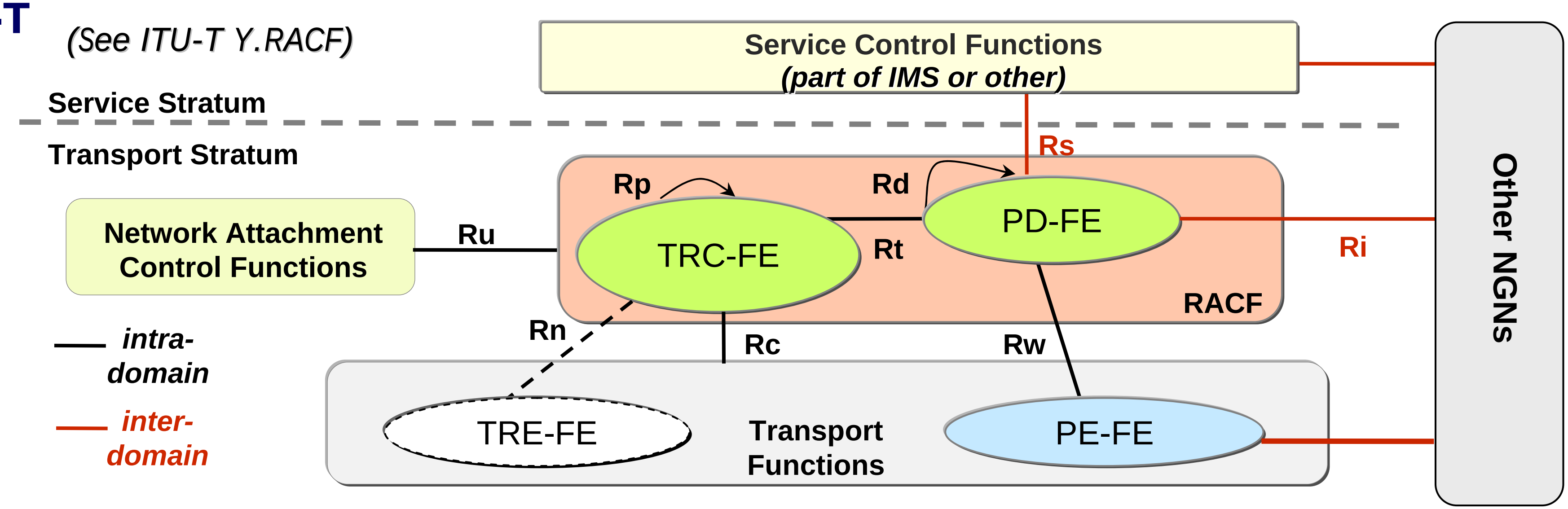
(See ITU-T Y.RACF)



Policy Decision Functional Entity (PD-FE)

- Authorizes resource requests
- Configures the transport to enforce policy

service facing, transport independent

Transport Resource Control Functional Entity

- Tracks resource usage & network topology
- Provides resource information to PD-FE

service independent, transport dependent, segment specific

Policy Enforcement Functional Entity (PE-FE)

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

typically part of border transport elements (e.g., S/BCs, edge router)

More RACF Specifics

Support for

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

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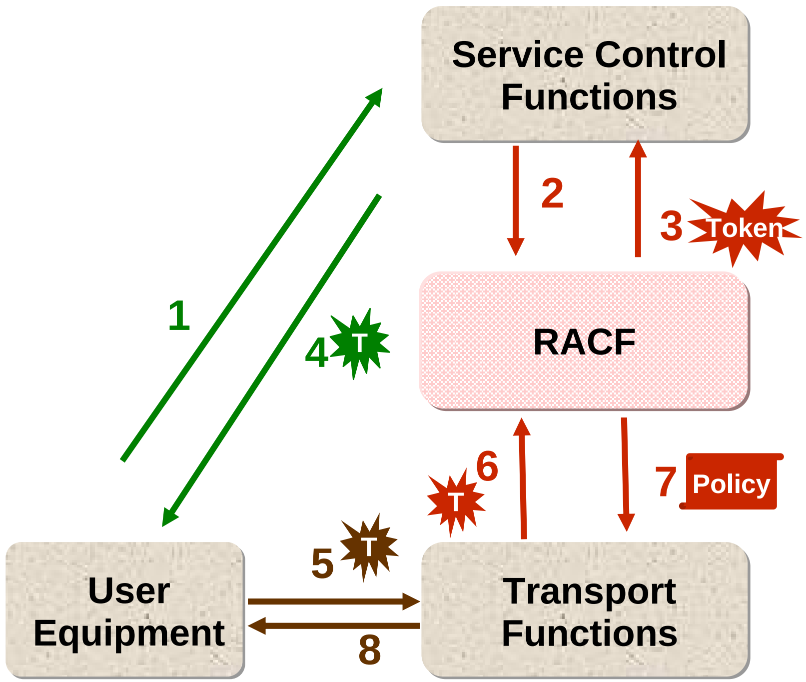
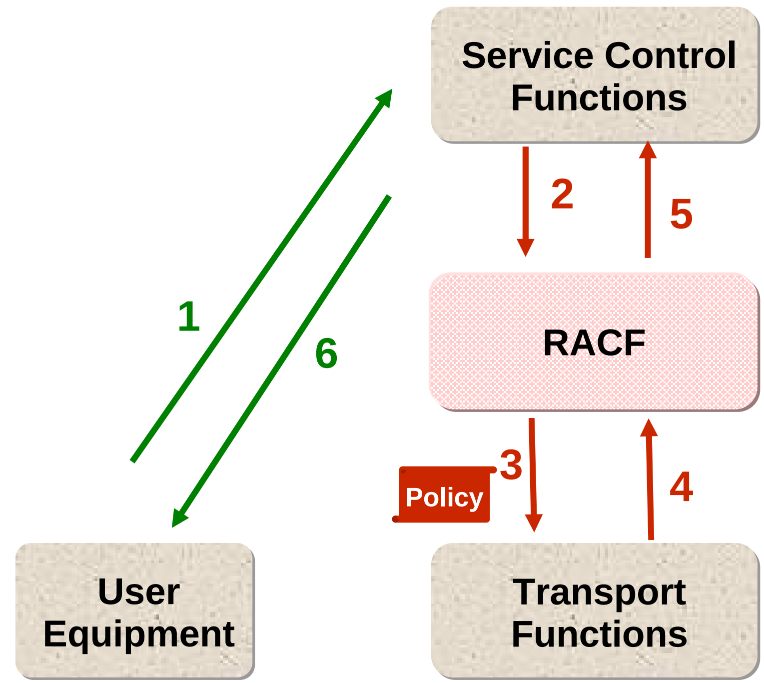
Push and Pull Models



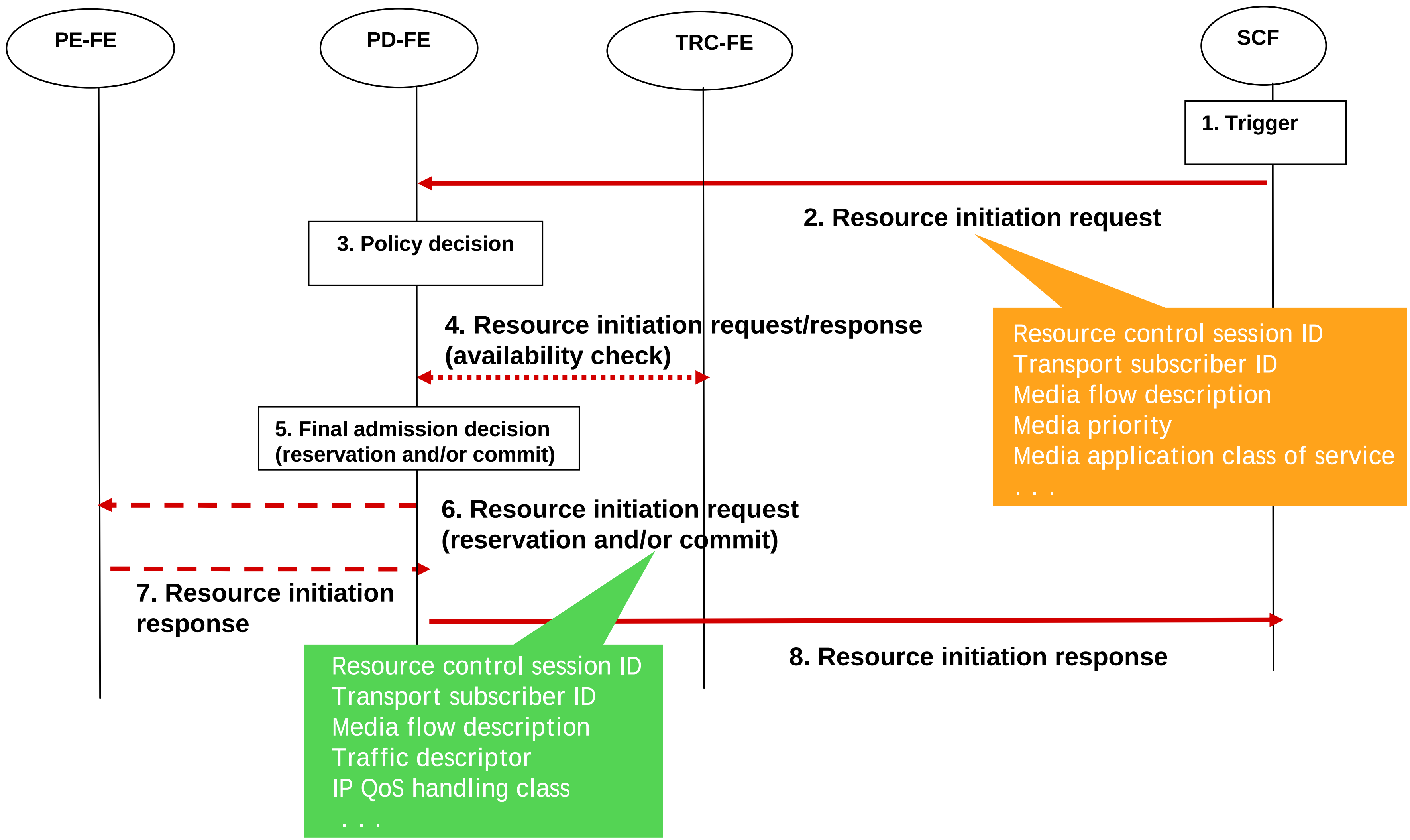
Pull Model



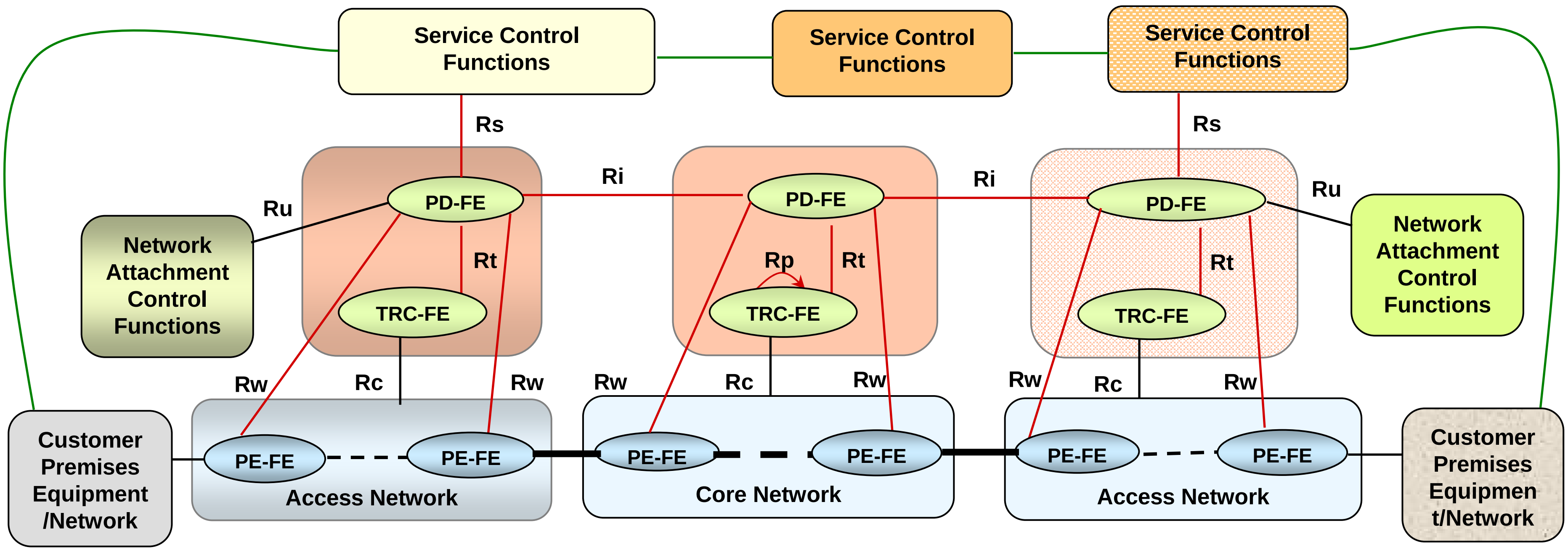
Push Model

Application Signaling — RACF Control — Transport QoS Signaling

Illustrative QoS Request Procedure



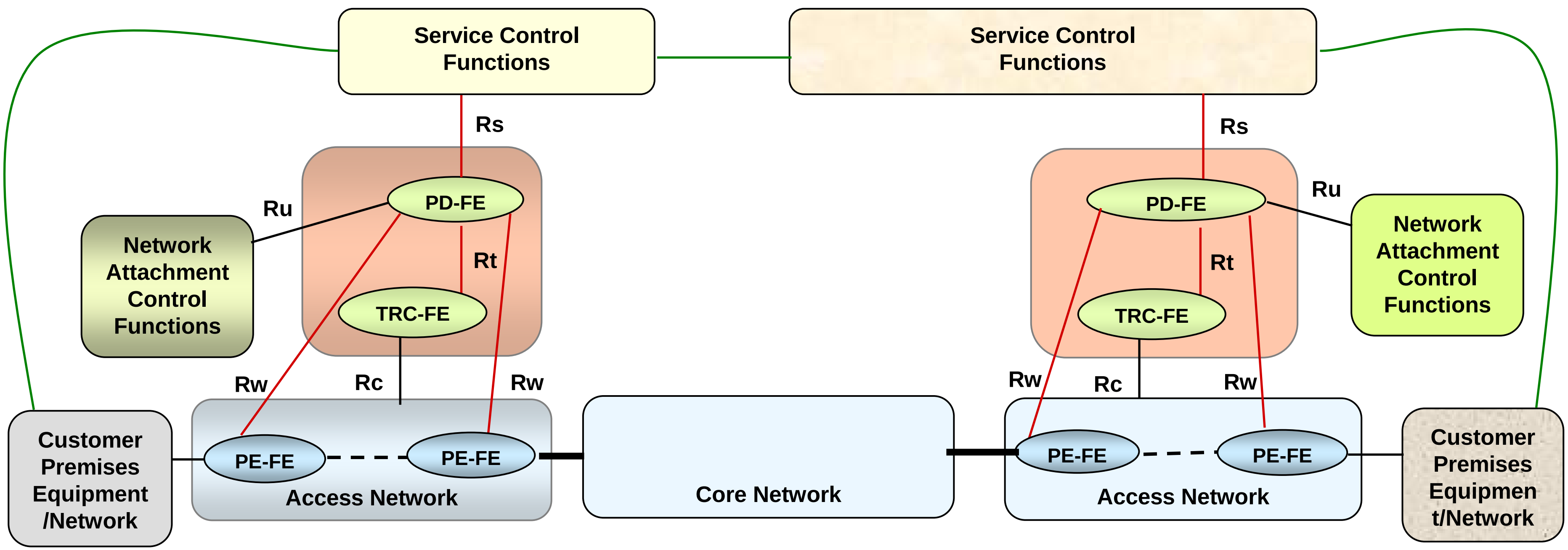
Configuration Example I



The PE-FE can reside in the

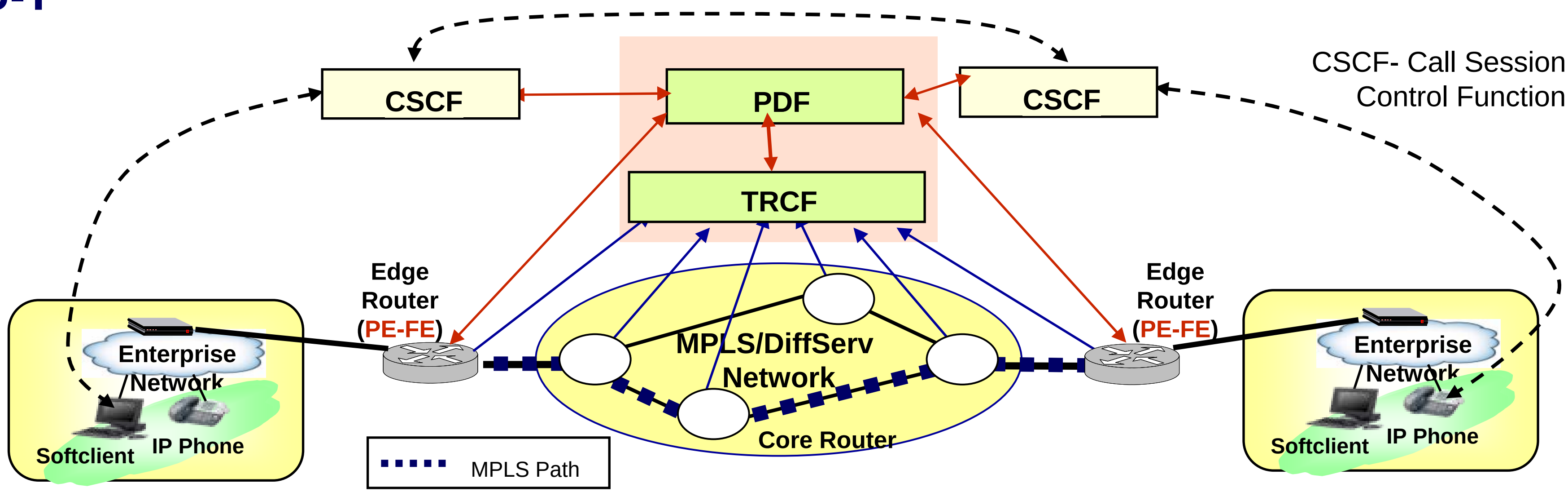
- Session Border Controller
- Access Node
- Border Gateway
- Cable Modem Termination System
- Gateway GPRS Support Node
- Packet Data Serving Node

Configuration Example II



- Core Network is over provisioned
- RACF is deployed per network segment as needed

Use Case: Link-Based Resource Management



- LSPs are set up a priori for routing the traffic of a specific application
- DiffServ is used for effecting the desired treatment of traffic
- RACF
  - ✓ Measures link utilization per service class periodically
  - ✓ Formulates blocking policy upon link congestion for affected paths
  - ✓ Makes admission decision per policy
  - ✓ Configures edge routers for the admitted traffic

Summary

- Bridging service control and transport, RACF enables dynamic application-driven resource management
  - Application admission decision taking into account resource availability
  - Preempting transport congestion from the service control layer
- Augmenting native transport QoS support, RACF can be applied edge-to-edge or end-to-end, and be realized in various ways
- All network-controlled applications can make use of RACF for performance assurance and network border control
- The initial Recommendation on RACF (*Y.RACF*) is targeted for consent in July
  - Selection and development of RACF protocols is ongoing
  - Next steps are to address open issues such as inter-PDF communication (intra- and inter-provider) and coordination of transactions end-to-end
  - Draft Recommendations *Y.123.qos* and *Y.enet* under development apply RACF to specific Ethernet environments
- Cooperation among related standards efforts across SDOs is essential for achieving a consistent approach

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List of Acronyms

- CSCF: Call Session Control Function
- GPRS: General Packet Radio Service
- IMS: IP Multimedia Subsystem
- LSP: Label Switched Path
- NAPT: Network Address and Port Translation
- NGN: Next Generation Networks
- PD-FE: Policy Decision Functional Entity
- PE-FE: Policy Enforcement Functional Entity
- RACF: Resource and Admission Control Functions
- RSVP: Resource ReserVation setup Protocol
- S/BC: Session Border Controller
- SDO: Standard Development Organization
- TRC-FE: Transport Resource Control Functional Entity
- TRE-FE: Transport Resource Enforcement Functional Entity