

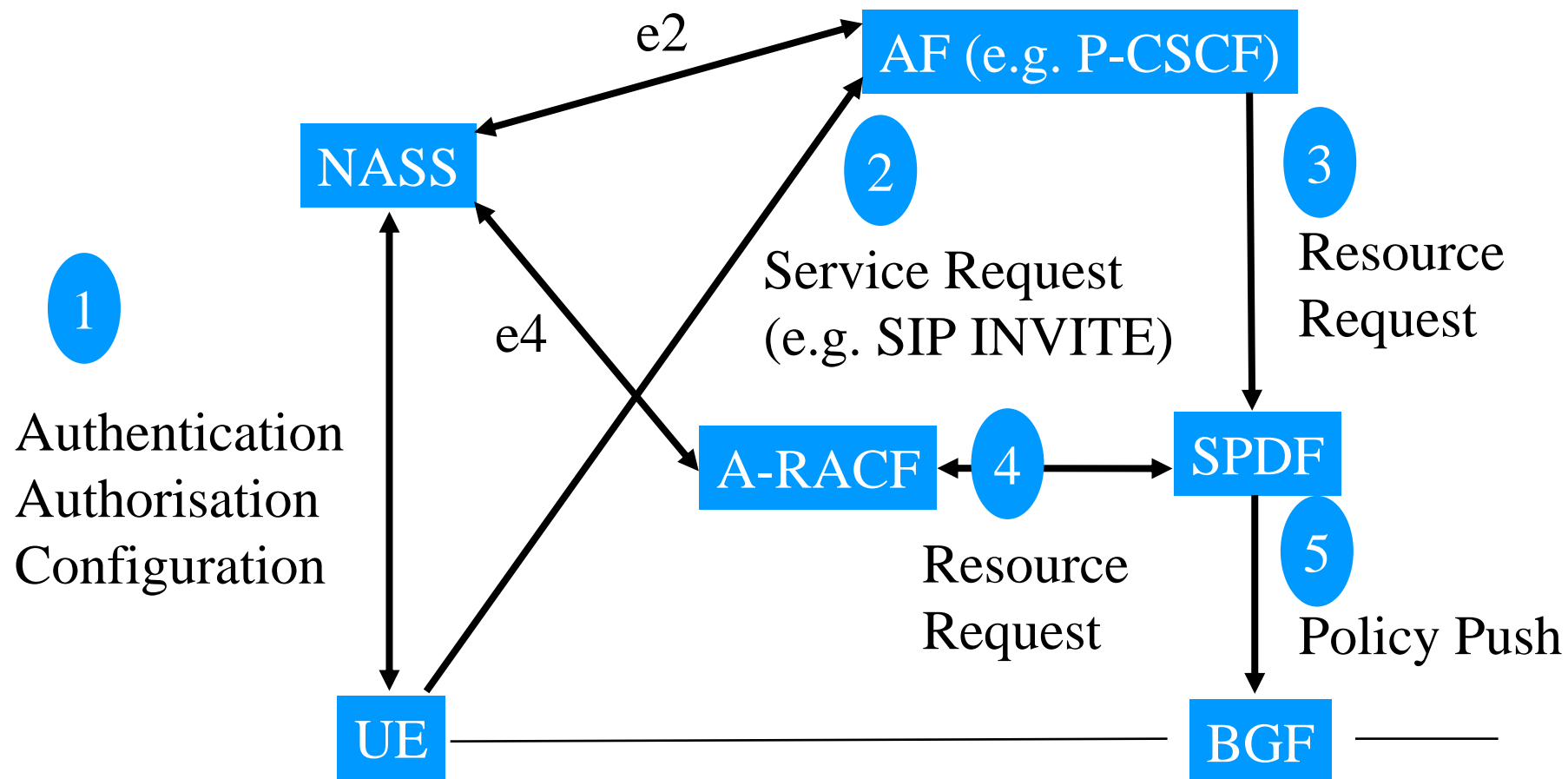


International Telecommunication Union

Next Generation Networks QoS Control Architectures and Protocols

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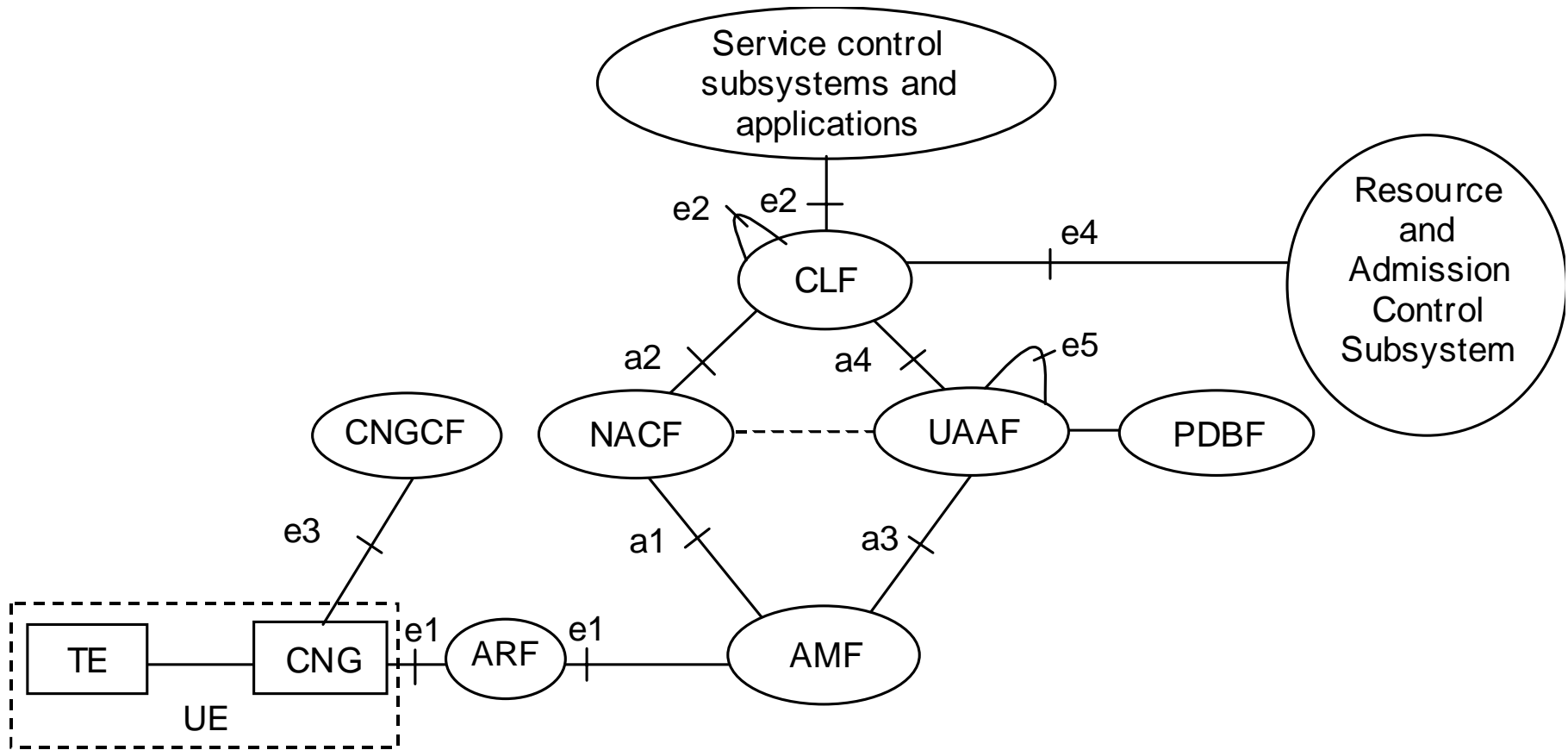
Outline of NGN QoS Control (ETSI terminology)





ETSI TISPAN NASS Architecture

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NASS Functions

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- CNGCF (Customer Network Gateway Configuration Function) - used during initialization and update of the UE to provide the UE with configuration information (e.g. configuration of a firewall internally in the UE and QoS marking of IP packets) additional to the network configuration data provided by the NACF.
- ARF (Access Relay Function) - relay between the CNG and the NASS that inserts local configuration information.
- AMF (Access Management Function) - translates the network access requests sent by the UE and forwards requests for allocation of an IP address and possibly additional network configuration parameters to/from the NACF and forwards requests to the User Access Authorisation Function (UAAF) to authenticate the user, authorize or deny the network access, and retrieve user-specific access configuration parameters. If PPP is used the AMF terminates the PPP connection and acts as a RADIUS client if the UAAF is implemented in a RADIUS server.
- NACF (Network Access Configuration Function) - responsible for the IP address allocation. Typically implemented as a DHCP or RADIUS server.
- UAAF (User Access Authorisation Function) - performs user authentication and authorisation checking, based on user profiles. Communication between UAAFs in different administrative domains is provided by the e5 interface allowing a UAAF-proxy to request the UAAF-server for user authentication and authorization and allowing the UAAF-proxy to forward accounting data for the particular user session to the UAAF-server.
- PDBF (Profile Database Function) - contains user authentication data (e.g. user identity, list of supported authentication methods, and authentication keys). It may be co-located with UAAF (the interface between them is not to be standardized).
- CLF (Connectivity Session Location and Repository Function) - registers the association between the IP address allocated to the UE and related network location information. The CLF has interfaces to the AF (e.g. P-CSCF) and to the RACS.

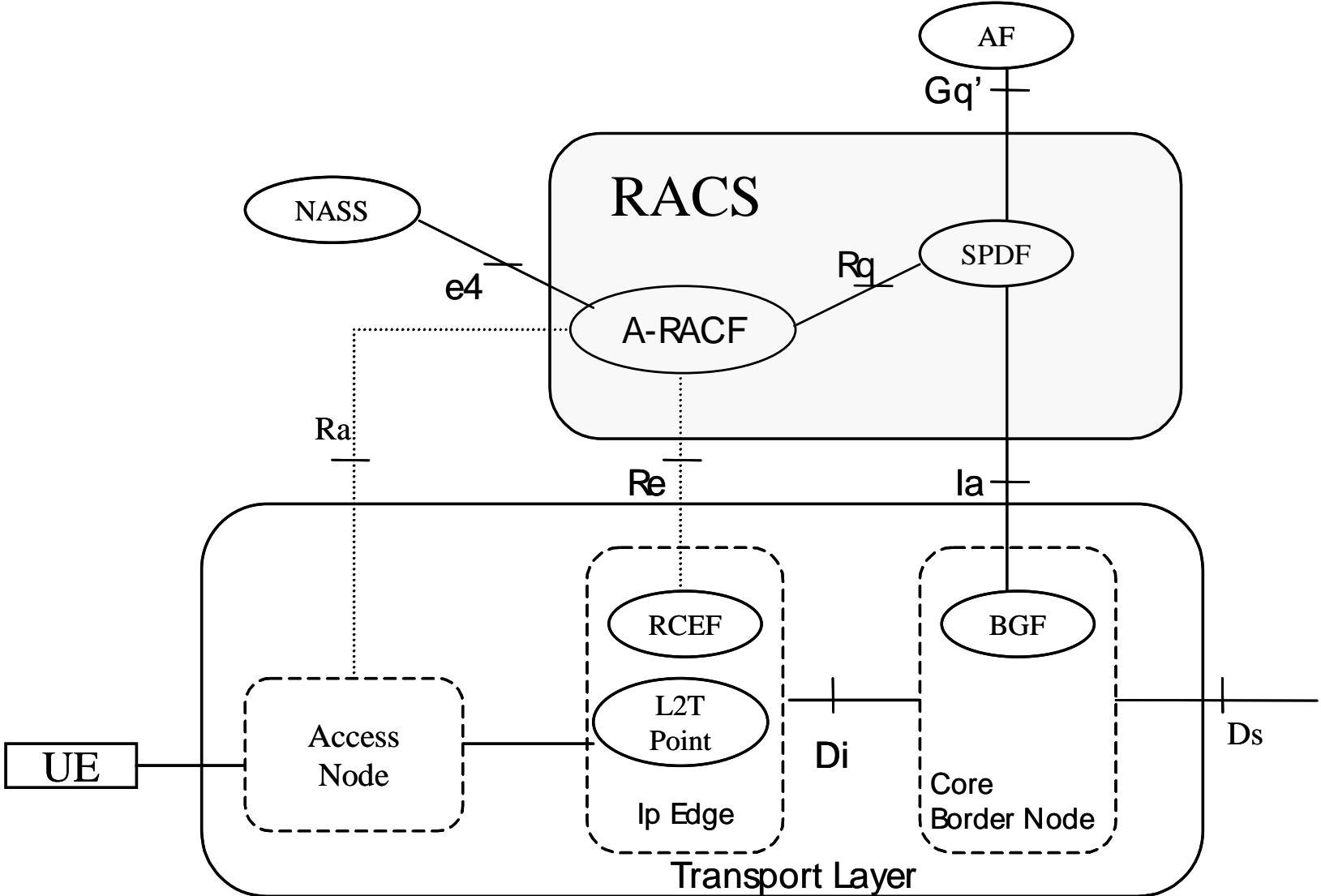


- Enables Application Functions (AF), such as an IMS P-CSCF or a Presence Network Agent (PNA) to retrieve IP-connectivity related session data from the NASS CLF
- The AF can request the following information for a specific subscriber (identified by a globally unique IP address or a subscriber identifier):
 - Subscriber-id;
 - Location information;
 - RACS contact point;
 - Access network type (ATM, Ethernet or Unknown); and
 - Terminal Type.
- The e2 interface may also be used between a CLF in a visited network and a CLF in a home network in the case in which the P-CSCF resides in the home network.



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ETSI TISPAN Resource & Admission Control





RACS Functions

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- Policy control, resource reservation and admission control in the access and aggregation sections of fixed access networks.
- Network Address Translation (NAT) at any place, or places, in the access, aggregation or core networks.
- Request and reservation of transport resources.
- RACS supports a “Push” model in which service requests are “pushed” to RACS from the Application Function using the Gq’ interface and then, if these requests are compliant with the policies established by the operator and the appropriate transport resources are available, RACS “pushes” requests to the transport layer to control the appropriate transport resources.
- The AF, SPDF and A-RACF may all be in different administrative domains. The AF is either configured with the address of the SPDF or obtains this information via the e2 interface to the NASS. The contact points for the A-RACFs and the BGFs are locally configured in the SPDF.



Service Policy Decision Function (SPDF)

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- checks if the request information received from the AF is consistent with the policy rules defined in the SPDF;
- authorizes the requested resources for the AF session based on the request information received from the AF ;
- locates the BGF and/or A-RACF in accordance with the transport capabilities required;
- requests resources from the A-RACF;
- requests one or more services from the BGF; and
- hides the details of the RACS and of the transport layer from the AF.



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- o e2, e4, Gq' and Rq
 - o Based on Diameter (RFC 3588)
 - o Diameter messages are transported using SCTP (RFC 2960) and use is made of the SCTP checksum method specified in RFC 3309.
 - o IPsec may be used for secure transport of Diameter messages.
 - o Accounting functionality is not used and Diameter sessions are implicitly terminated (i.e. the server does not maintain state information).
- o Ia
 - o Based on H.248.1 version 3.



- o ETSI AVPs
 - Binding-Information
 - Binding-Input-List
 - Binding-Output-List
 - V6-Transport-Address
 - V4-Transport-Address
 - Port-Number
 - Reservation-Class
 - Latching-Indication
 - Reservation-Priority



Rq interface – Resource reservation request

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- Application Function ID
- Subscriber ID
- Globally-unique IP Address
 - Assigned IP address (IPv4/IPv6)
 - Address realm
- Requestor name
- Service class
- Service priority
- Charging correlation information
- Media description
 - Media type
 - Media ID
 - Media priority
 - Traffic flow parameters
 - Direction
 - Flow ID
 - IP address
 - Ports
 - Protocol
 - Bandwidth
 - Reservation class
 - Transport service class
- Commit ID



e4 interface

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- Enables the exchange of IP-connectivity related session data between the NASS CLF and the Access -RACF in the RACS
- The following information can be transferred from the CLF to the A-RACF:
 - Initial Gate Setting
 - List of allowed destinations
 - Up-Link Subscribed Bandwidth
 - Down-Link Subscribed Bandwidth
 - QoS Profile Information
 - Transport service class
 - Media-Type
 - Up-Link Subscribed Bandwidth
 - Down-Link Subscribed Bandwidth
 - Maximum Priority
 - Requestor Name
- The Access Profile is “pushed” from the CLF to the A-RACF when an IP address has been allocated to a subscriber or in the case of a modification occurring on a profile that has already been pushed to the RACS and “pulled” by the A-RACF from the CLF after a restart or upon reception of a resource reservation request associated with an IP-Address for which no record is stored.
- The CLF can also report the loss of IP connectivity enabling the RACS to remove the access profile from its internal data base. This occurs when the allocated IP address is released (e.g. DHCP leased timer expiry) or due to the release of the underlying layer 2 resources.



Border gateway control

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RCEF	C-BGF	I-BGF
Open / close gates	Open / close gates	Open / close gates
Packet marking	Packet marking	Packet marking
	Resource allocation (per flow)	Resource allocation (per flow)
	NAT	NAT
	Hosted NAT traversal	
Policing of down/uplink traffic	Policing of down/uplink traffic	Policing of down/uplink traffic
	Usage metering	Usage metering



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I a protocol

- opening and closing gates (i.e. packets filtering depending on "IP address / port");
- allocation and translation of IP addresses and port numbers (NAPT);
- interworking between IPv4 and IPv6 networks (NAPT-PT);
- hosted NAT traversal;
- packet marking for outgoing traffic;
- resource allocation and bandwidth reservation;
- policing of incoming traffic; and
- usage metering.



Ia H.248 Packages

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- o Generic
- o Base root
- o Network
- o Diffserv
- o Gate management
- o Traffic management
- o IP NAPT traversal
- o MPLS (optional)
- o VLAN (optional)
- o MGC Information (optional)
- o Inactivity (optional)
- o Segmentation (optional)



RCEF intended to condition traffic on basis of:

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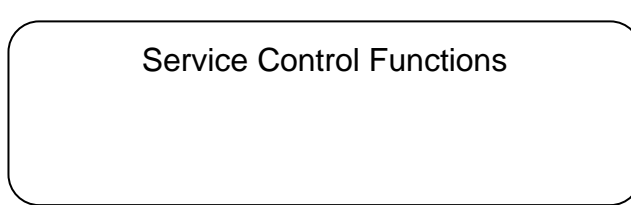
- pure L2 QoS mechanisms, e.g., VP/VC based for ATM networks, DLCI based for FR networks, or VLAN tag for Ethernet
- intermediate L2/L3 QoS mechanisms, e.g., MPLS
- pure L3 QoS mechanisms, e.g., DiffServ
- L3 over L2 QoS mechanisms, e.g., DiffServ over ATM or FR
- L3 over intermediate L2/L3, e.g., DiffServ and MPLS seamless integration.



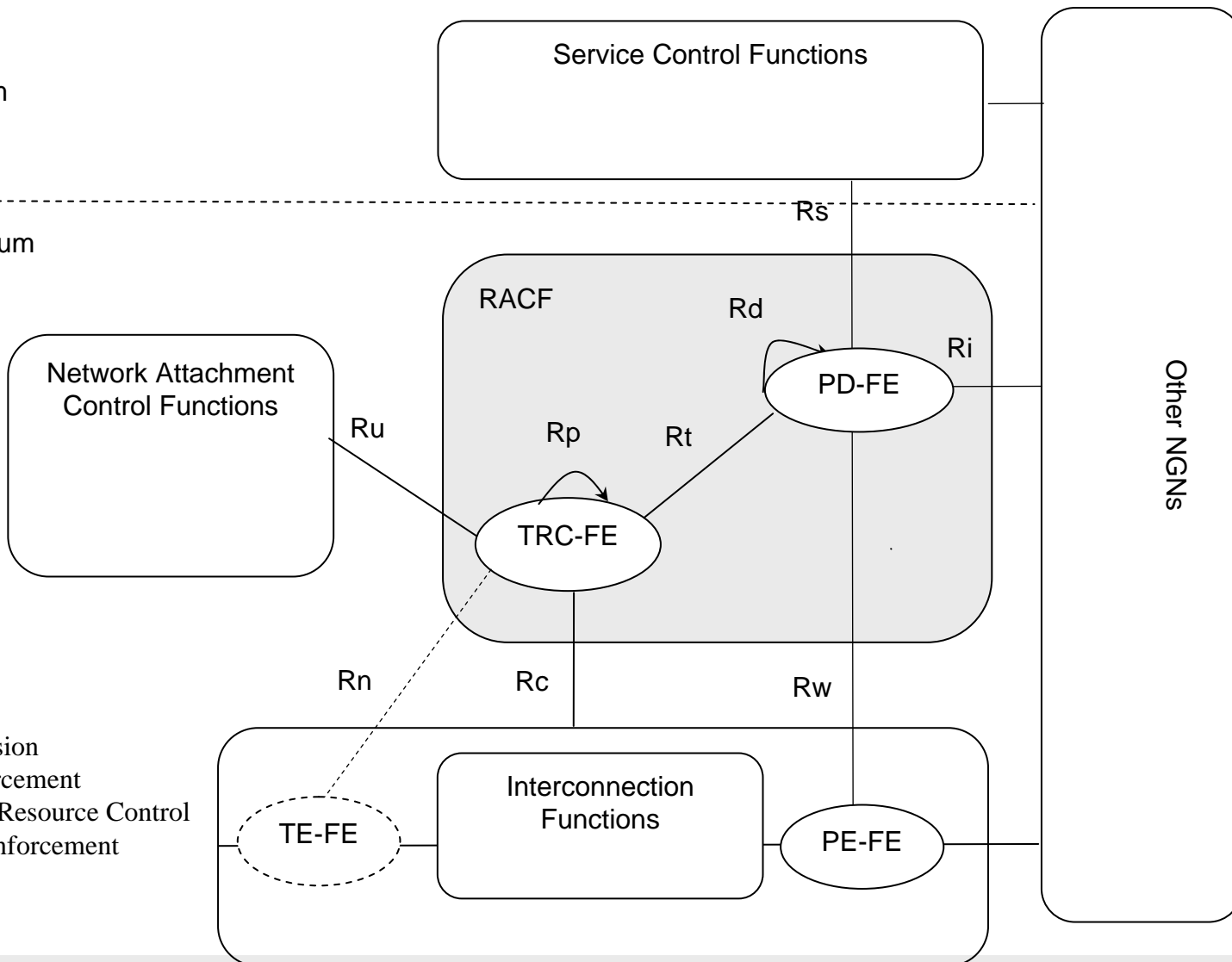
ITU-T Resource & Admission Control Architecture

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Service Stratum



Transport Stratum



Functional Entities

PD-FE: Policy Decision

PE-FE: Policy Enforcement

TRC-FE: Transport Resource Control

TE-FE: Transport Enforcement



ITU-T Resource Control Protocol Drafts

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R_s

- Q.rcp.1 - Protocol at the interface between Service Control Network Element and Resource and Admission Control Network Element.

Diameter

R_p

- Q.rcp.2 - Protocol at the interface between Resource and Admission Control Network Elements.

COPS

R_w/R_n

- Q.rcp.3 - Protocol at the interface between Resource and Admission Control Network Element and Edge Node Network Element.

COPS

R_c

- Q.rcp.4 - Protocol at the interface between Resource and Admission Control Network Element and Transport Network Element.

COPS

?

- Q.rcp.5 - Protocol at the interface between Policy Decision Network Element and Transport Resource Control Network Element in access network.



- o Completion of work on current architecture
- o Harmonisation of the work of various SDOs e.g. ITU-T & ETSI TISPAN
- o Support of enterprise network connection
- o Support of non-SIP applications e.g. web-browsing, IPTV
 - NAT/Firewall traversal (ICE, STUN, TURN)
 - Path-coupled QoS control mechanism