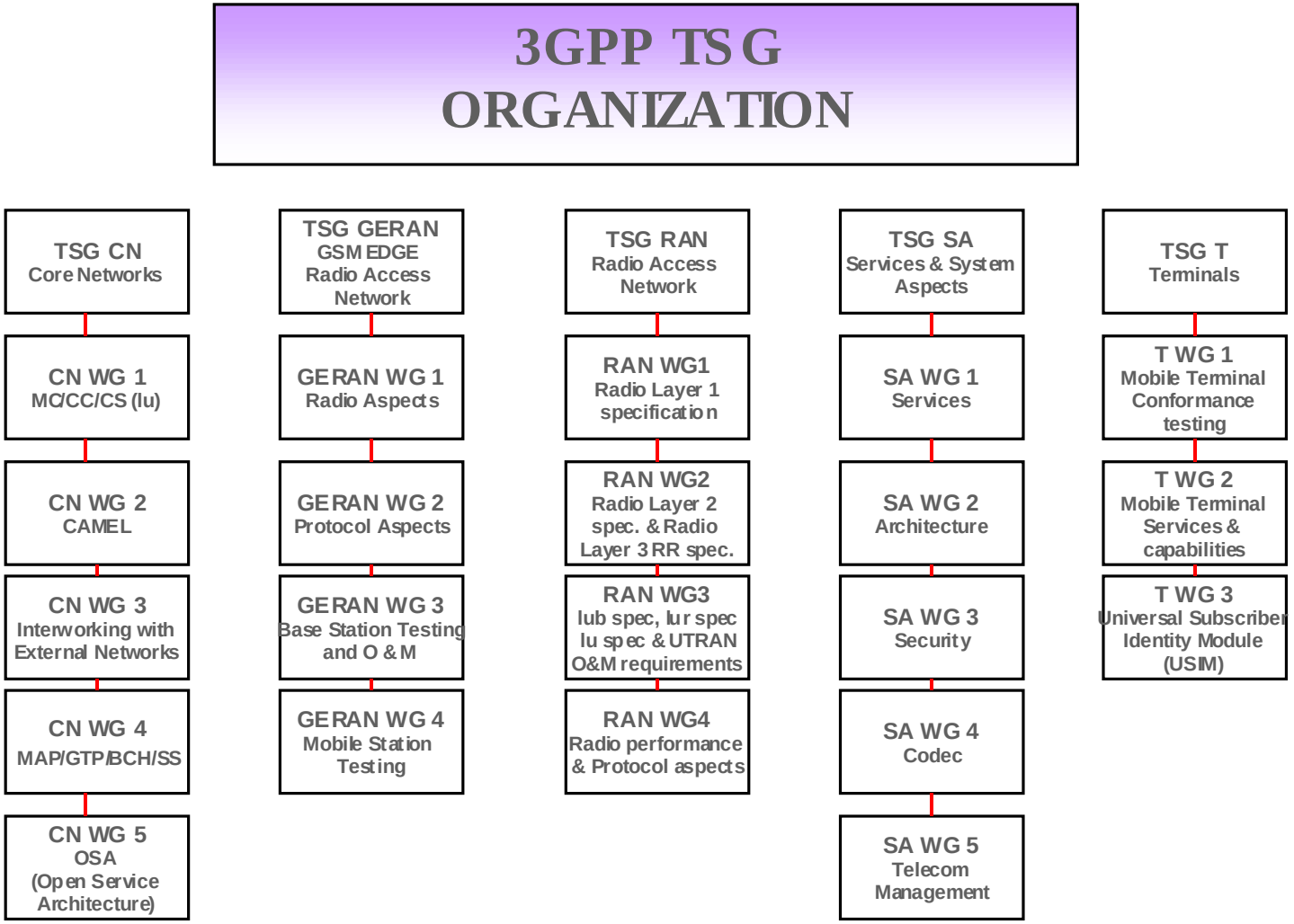
UMTS and IPv6

Presentation Outline

- Overview of 3GPP
- Introduction to 3GPP architecture
- Concepts of the UMTS packet domain
- IPv6 in UMTS
- Summary

Overview of 3GPP

Overview of 3GPP (1/2)

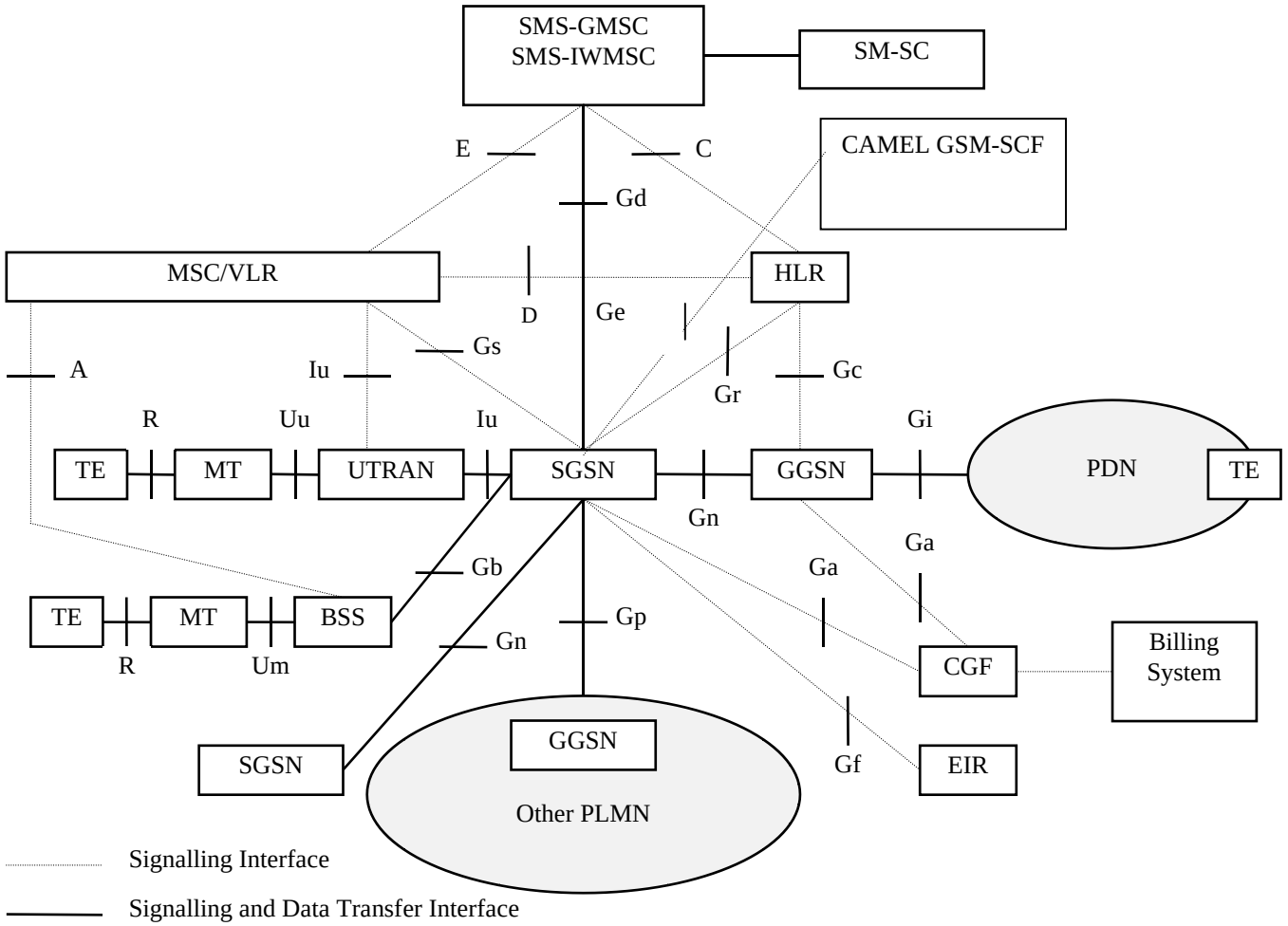


Overview of 3GPP (2/2)

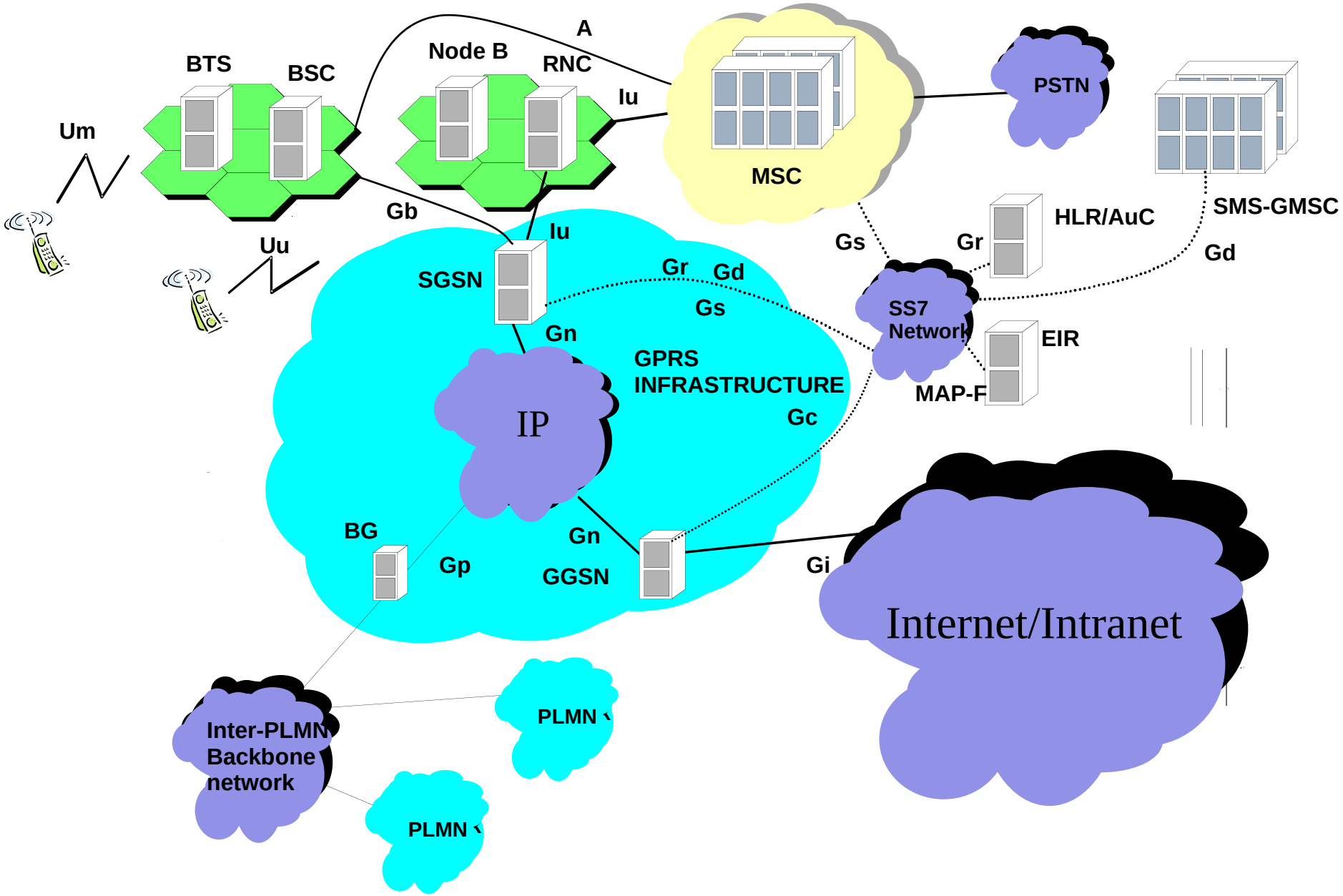
- Technical Work Done in WGs
- Meetings
  - As Necessary
  - Decision through Consensus or Voting
  - Most of the Work Done in Meetings
- Deliverables
  - Technical Reports/Technical Specifications
  - Approval by Consensus or Vote
  - Change Control When Sufficiently Stable
- Inter-WG Coordination
  - In TSGs
  - Information Exchange through Liaison Statements
- Standards
  - Releases

The UMTS Architecture

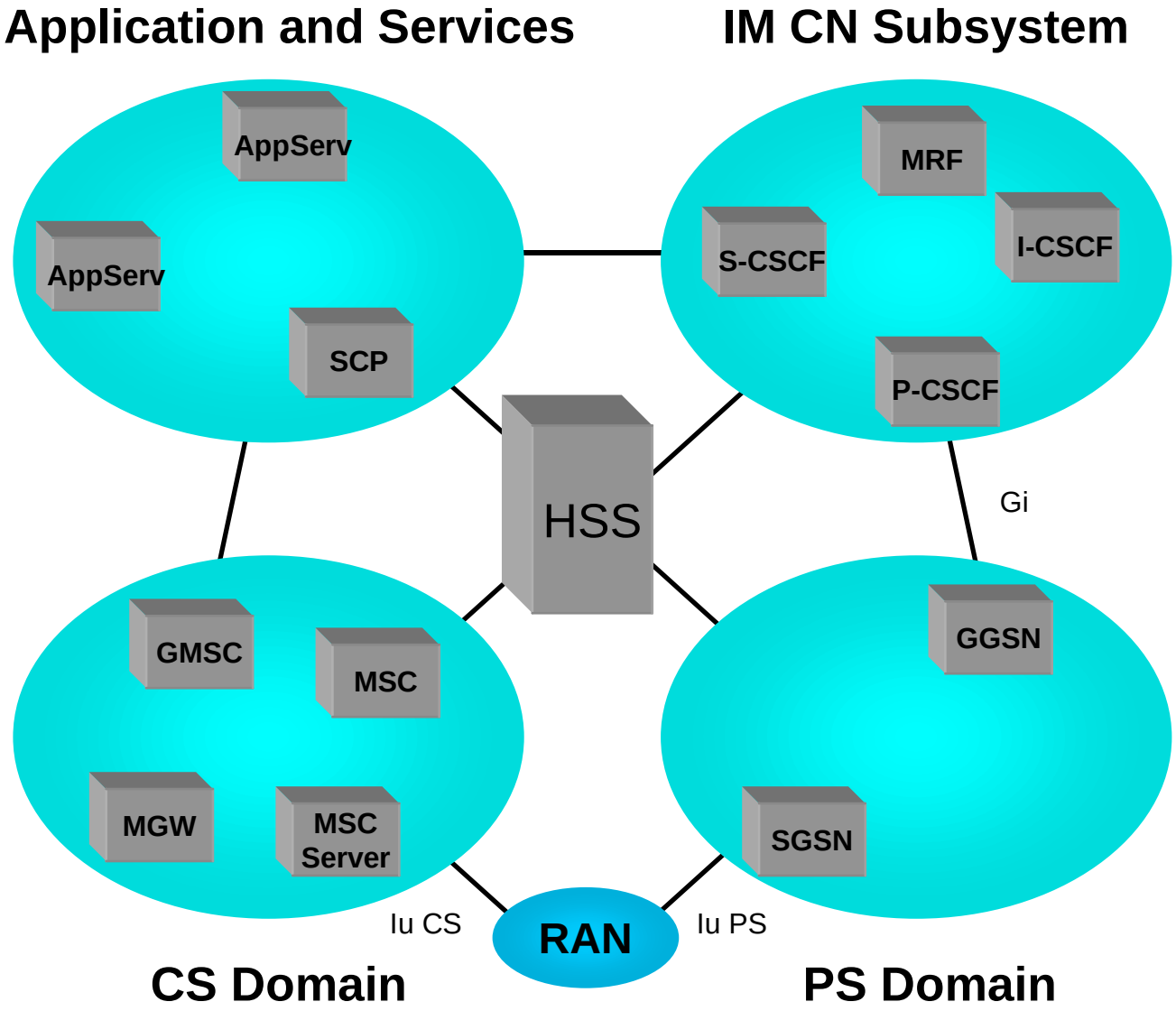
R’99 UMTS/GPRS Architecture



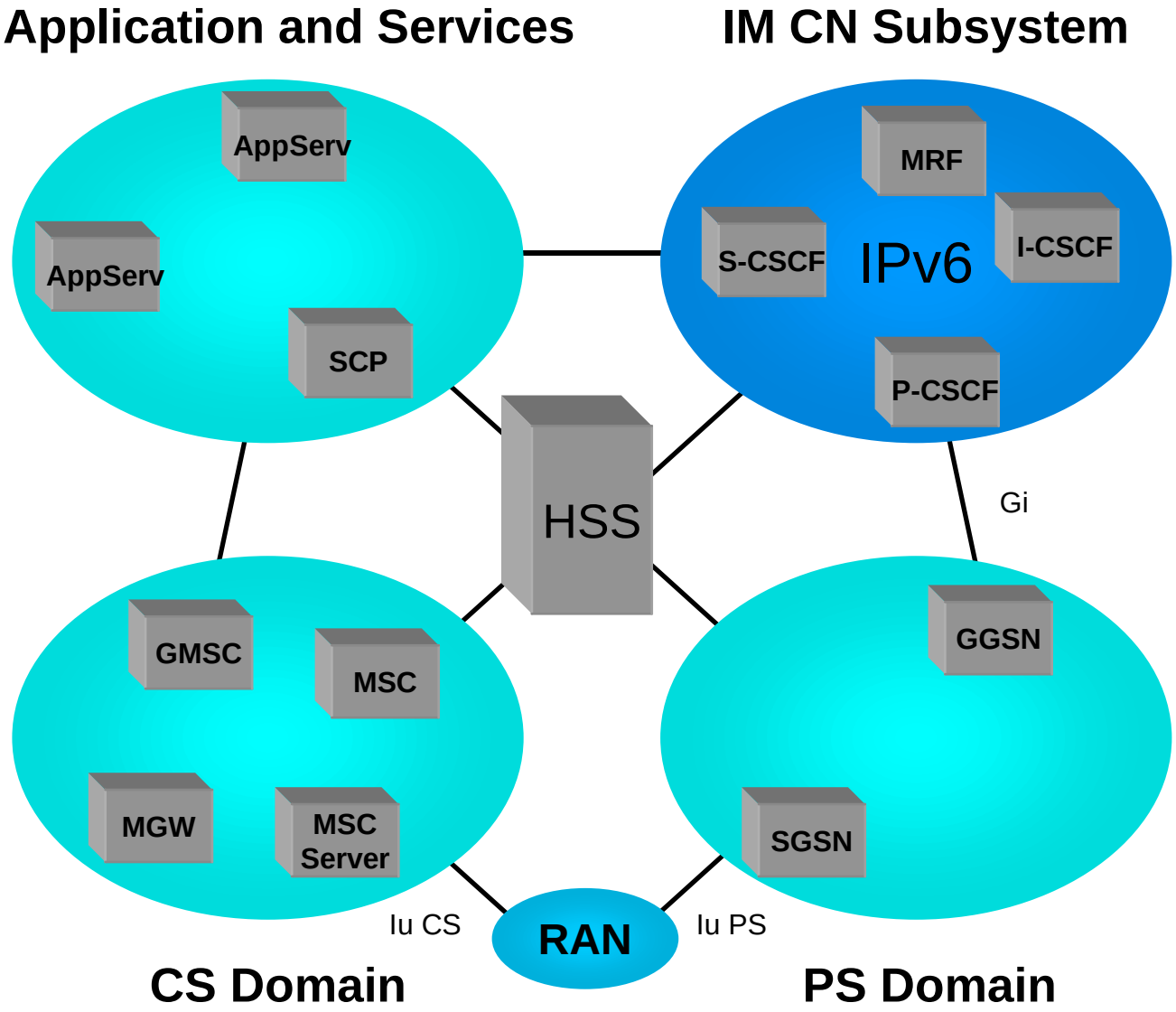
R’99 UMTS/GPRS Architecture



Release 4/5 Architecture

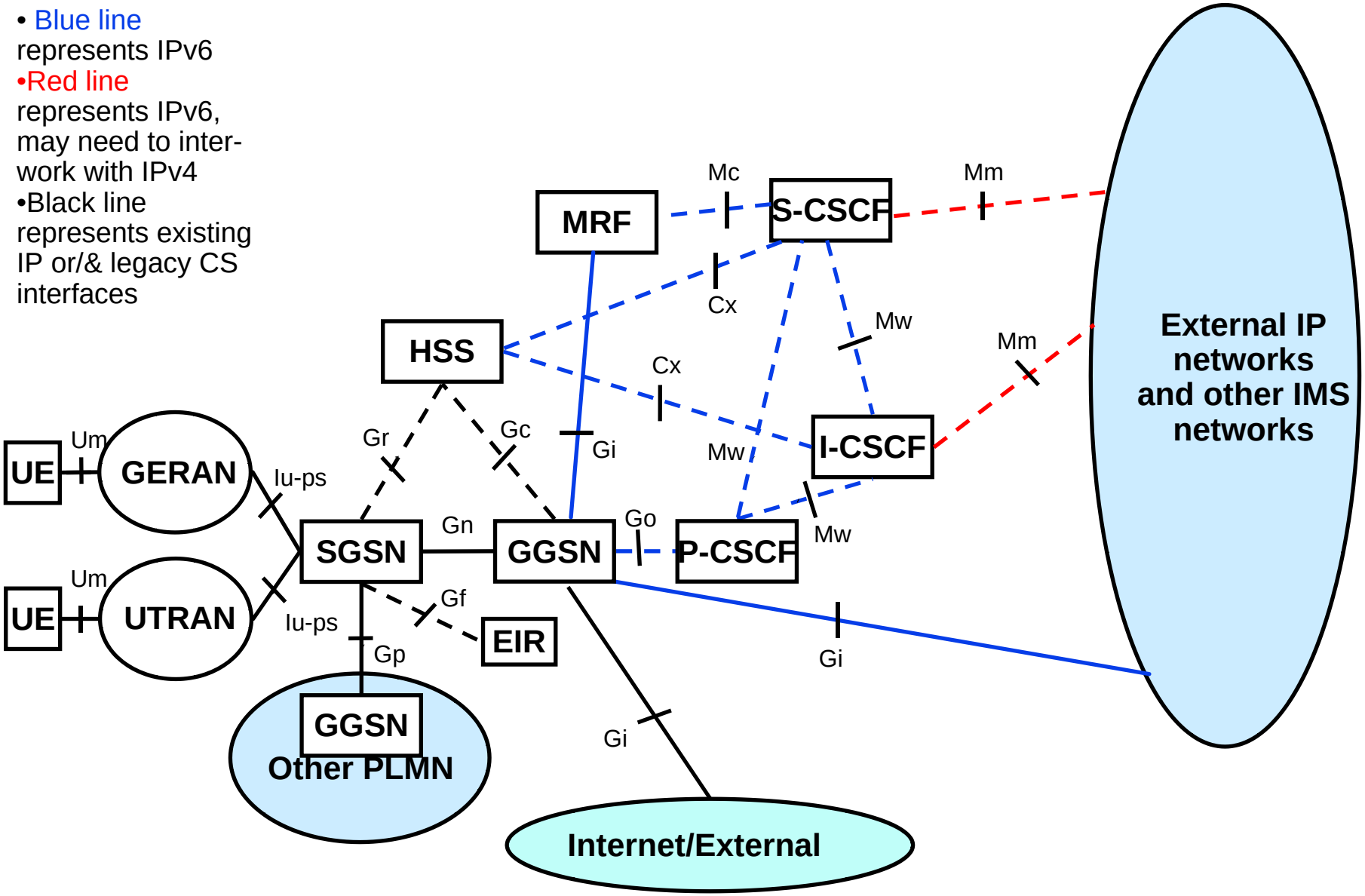


Release 4/5 Architecture

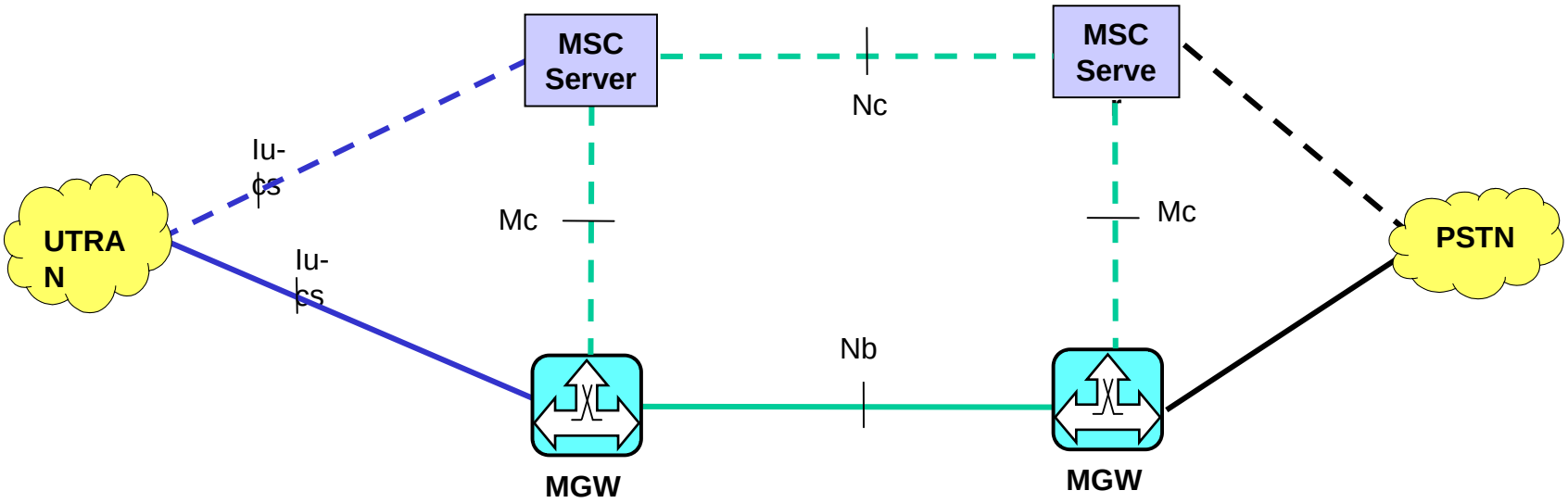


Simplified model for IP Multimedia

- Blue line represents IPv6
- Red line represents IPv6, may need to inter-work with IPv4
- Black line represents existing IP or/& legacy CS interfaces

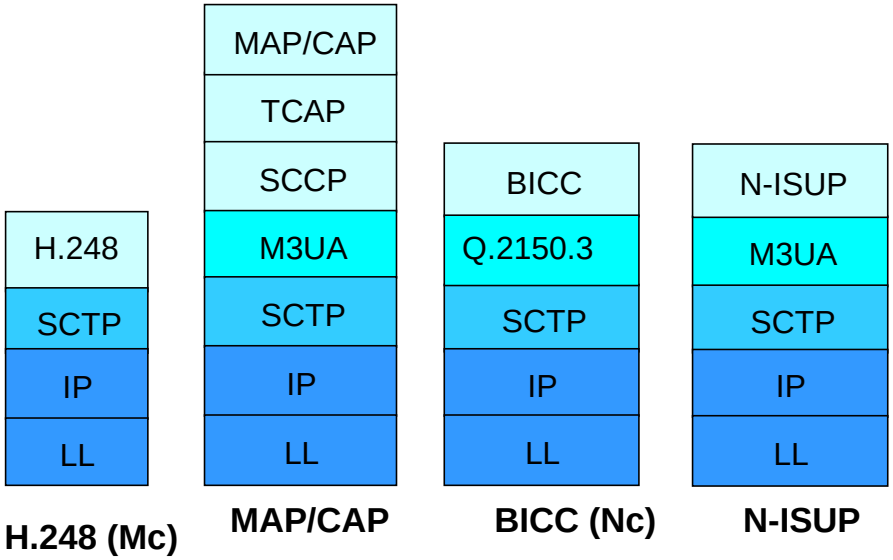


CS Domain: Signaling & User Plane

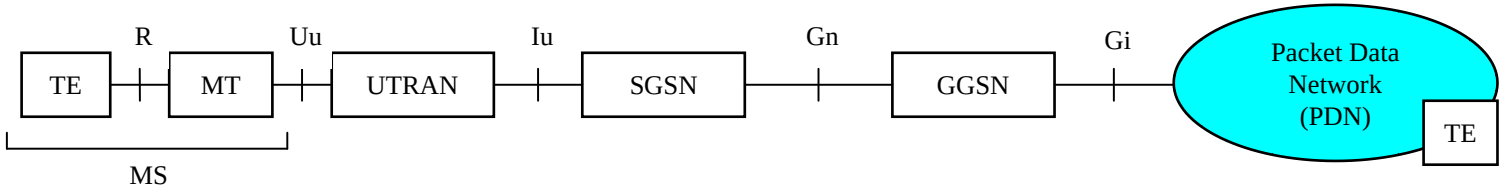


This bearer independent architecture makes possible to use IP transport

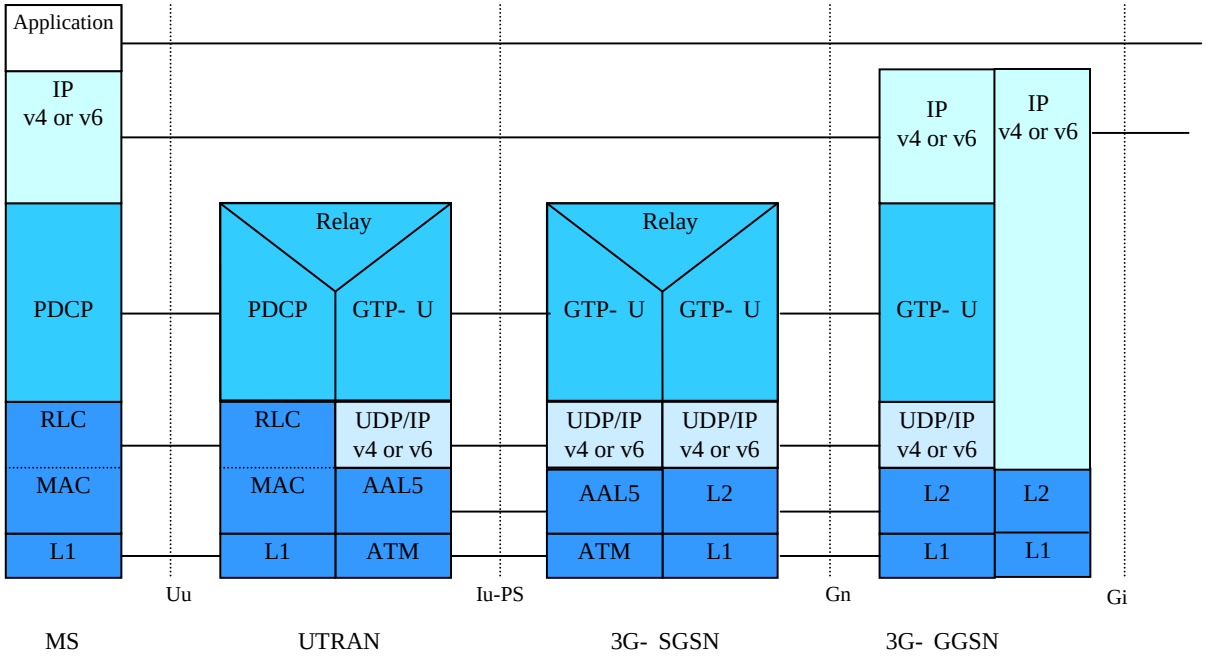
CS domain protocol stack using IP transport option



Simplified PS Domain Architecture

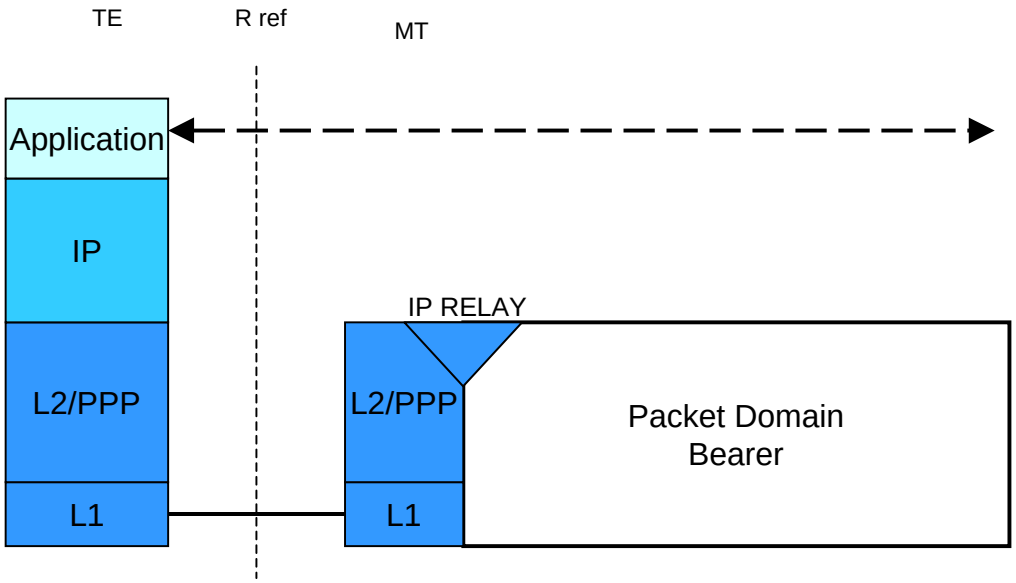


PS Domain User Plane protocol stack



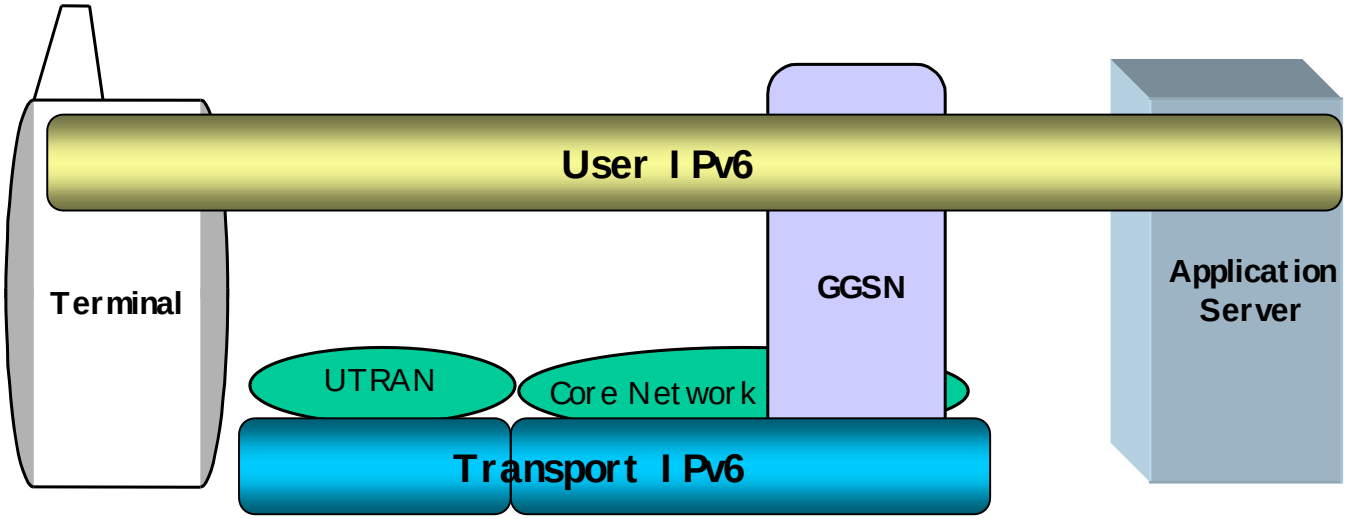
MT-TE Configuration

IP based services



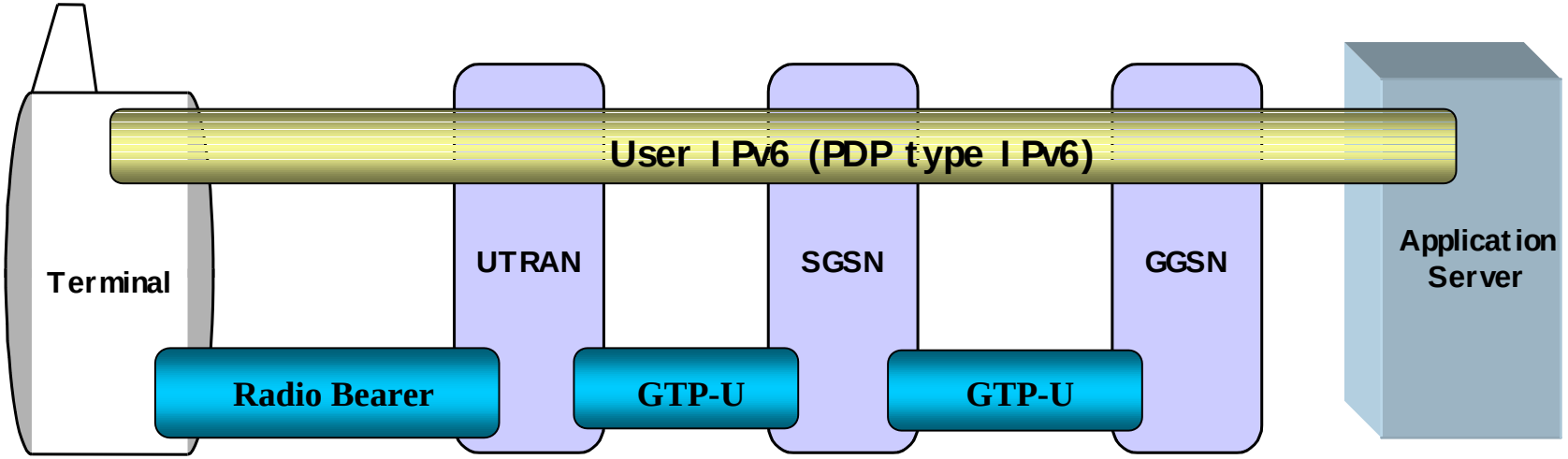
Note: MT and TE can be physically separated or physically co-located

User plane vs transport plane



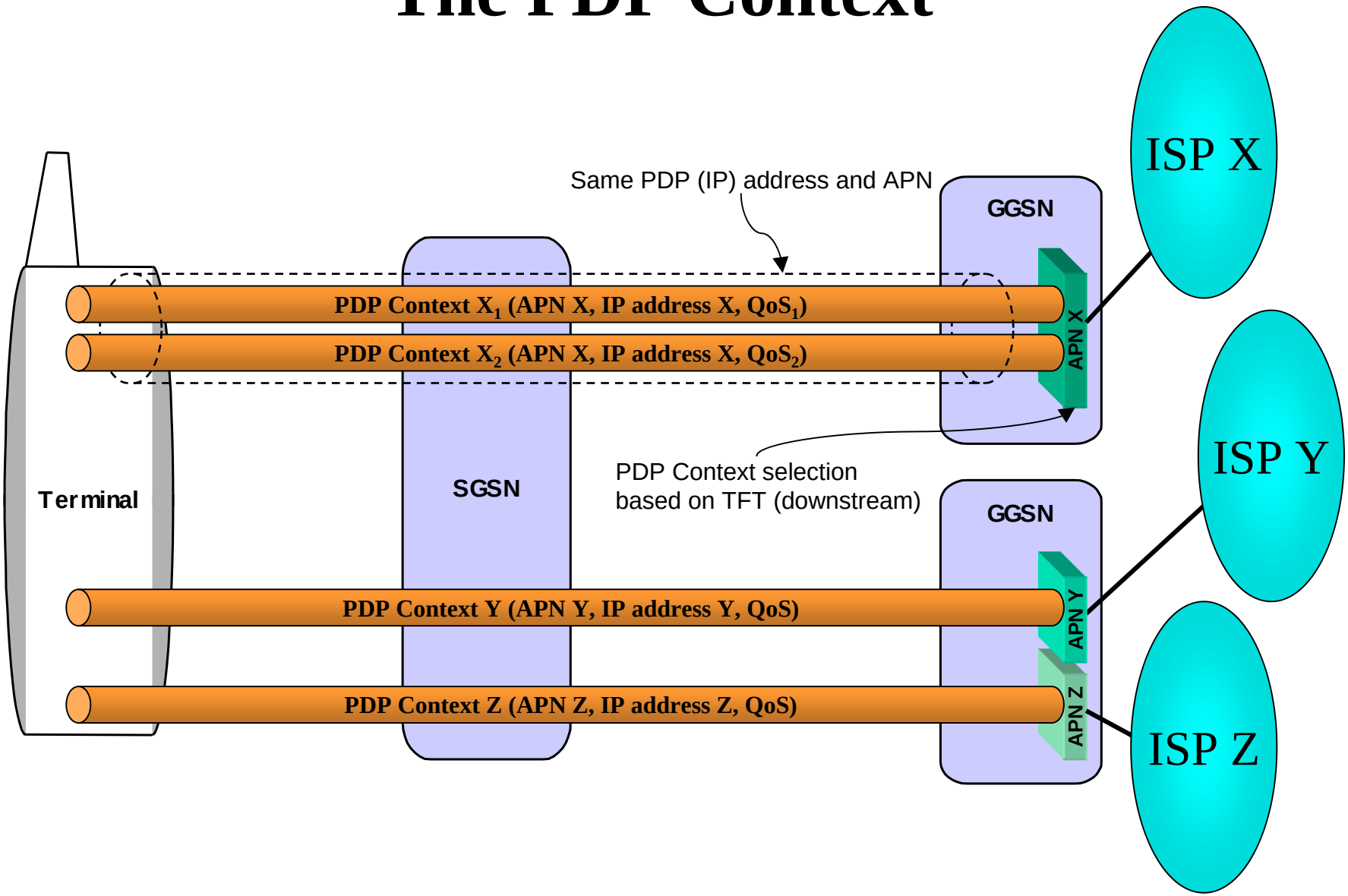
- User and transport planes are completely independent, i.e. the transport plane can run on a different IP version than the user plane
- UTRAN and Core Network transport can also run on different IP versions

Transport of user IP packets in UMTS



IP packets to/from the terminal are tunneled through the UMTS network, they are not routed directly at the IP level.

The PDP Context



The PDP CONTEXT

When an MS attaches to the Network, the SGSN creates a Mobility Management context containing information pertaining to e.g., mobility and security for the MS.

At PDP Context Activation (PDP - Packet Data Protocol), the SGSN and GGSN create a PDP context, containing information about the session (e.g. IP address, QoS, routing information , etc.),

Note: Each Subscriber may activate several PDP Contexts towards the same or different GGSNs. When activated towards the same GGSN, they can use the same or different IP addresses.

The Access Point Name - APN

The APN is a logical name referring to a GGSN. The APN also identifies an external network.

The syntax of the APN corresponds to a fully qualified name.

At PDP context activation, the SGSN performs a DNS query to find out the GGSN(s) serving the APN requested by the terminal.

The DNS response contains a list of GGSN addresses from which the SGSN selects one address in a round-robin fashion (for this APN).

Traffic Flow Template (TFT)

A TFT is a packet filter allowing the GGSN to classify packets received from the external network into the proper PDP context.

A TFT consists of a set of packet filters, each containing a combination of the following attributes:

- Source Address and Subnet Mask
- Destination Port Range
- Source Port Range
- IPsec Security Parameter Index (SPI)
- Type of Service (TOS) (IPv4) / Traffic Class (IPv6) and Mask
- Flow Label (IPv6)

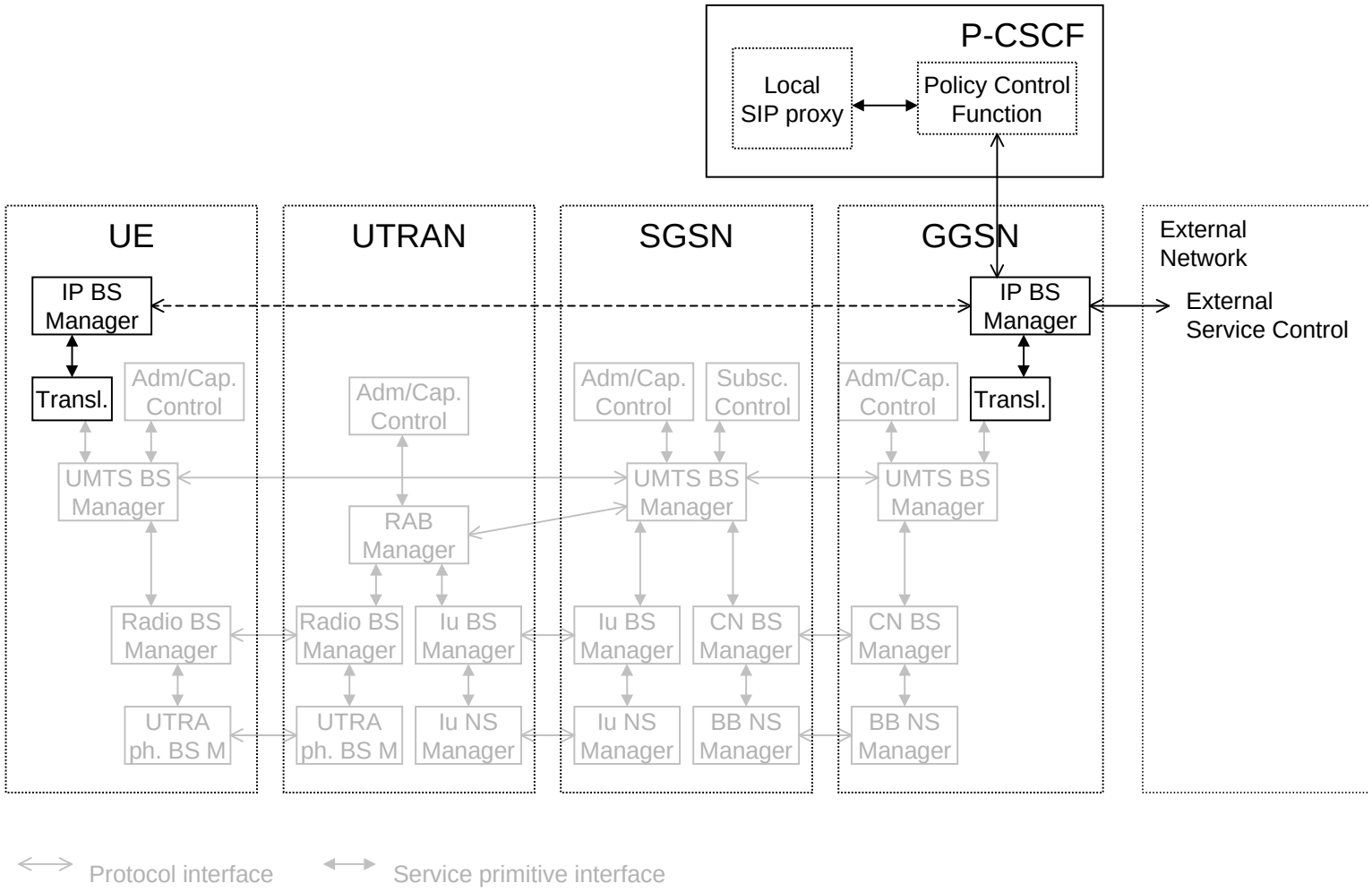
GPRS Tunneling Protocol

GTP is a simple tunneling protocol based on UDP/IP, used both in GSM/GPRS and UMTS.

A GTP tunnel is identified at each end by a Tunnel Endpoint Identifier (TEID)

For every MS, one GTP-C tunnel is established for signalling and a number of GTP-U tunnels, one per PDP context (i.e. session), are established for user traffic.

QoS Management Functions in UMTS



IP BS Manager

- is used to control the external IP bearer service to provide IP QoS end-to-end.
- communicates with the UMTS BS manager through the translation function.
- uses standard IP mechanisms to manage the IP bearer service.
- may exist both in the UE and the Gateway node, and it is possible that these IP BS Managers communicate directly with each other by using relevant signalling protocols, e.g., RSVP
- is the policy enforcement point for Service-based Local Policy control

Policy Control Function (PCF)

- is a logical entity that is co-located with the P-CSCF (the interface between the P-CSCF and PCF is not standardized in Release 5)
- is a logical policy decision element which uses standard IP mechanisms to implement Service-based Local Policy in the bearer level
- enables coordination between events in the SIP session level and resource management in the bearer level
- makes policy decisions based on information obtained from the P-CSCF
- has a protocol interface with GGSN (Go interface) which supports the transfer of information and policy decisions between the policy decision point and the IP BS Manager in the GGSN (following COPS framework)

IP BS Manager capability in the UE and GGSN

Table 1: IP BS Manager capability in the UE and GGSN

Capability	UE	GGSN
DiffServ Edge Function	Optional	Required
RSVP/Intserv	Optional	Optional
IP Policy Enforcement Point	Optional	Required (*)

(*) Although the capability of IP policy enforcement is required within the GGSN, the control of IP policy through the GGSN is a network operator choice.

IPv6 Details

IPv6 History in UMTS

- IPv6 in the 3GPP standards
  - User plane: PDP Type IPv6 introduced in GPRS R'97
  - Transport plane: IPv6 is optional
  - UTRAN: IP transport study is being conducted right now
  - IMS: The IP Multimedia Core Network Subsystem has been standardized to be based on the following IPv6 support:

    - The architecture shall make optimum use of IPv6.

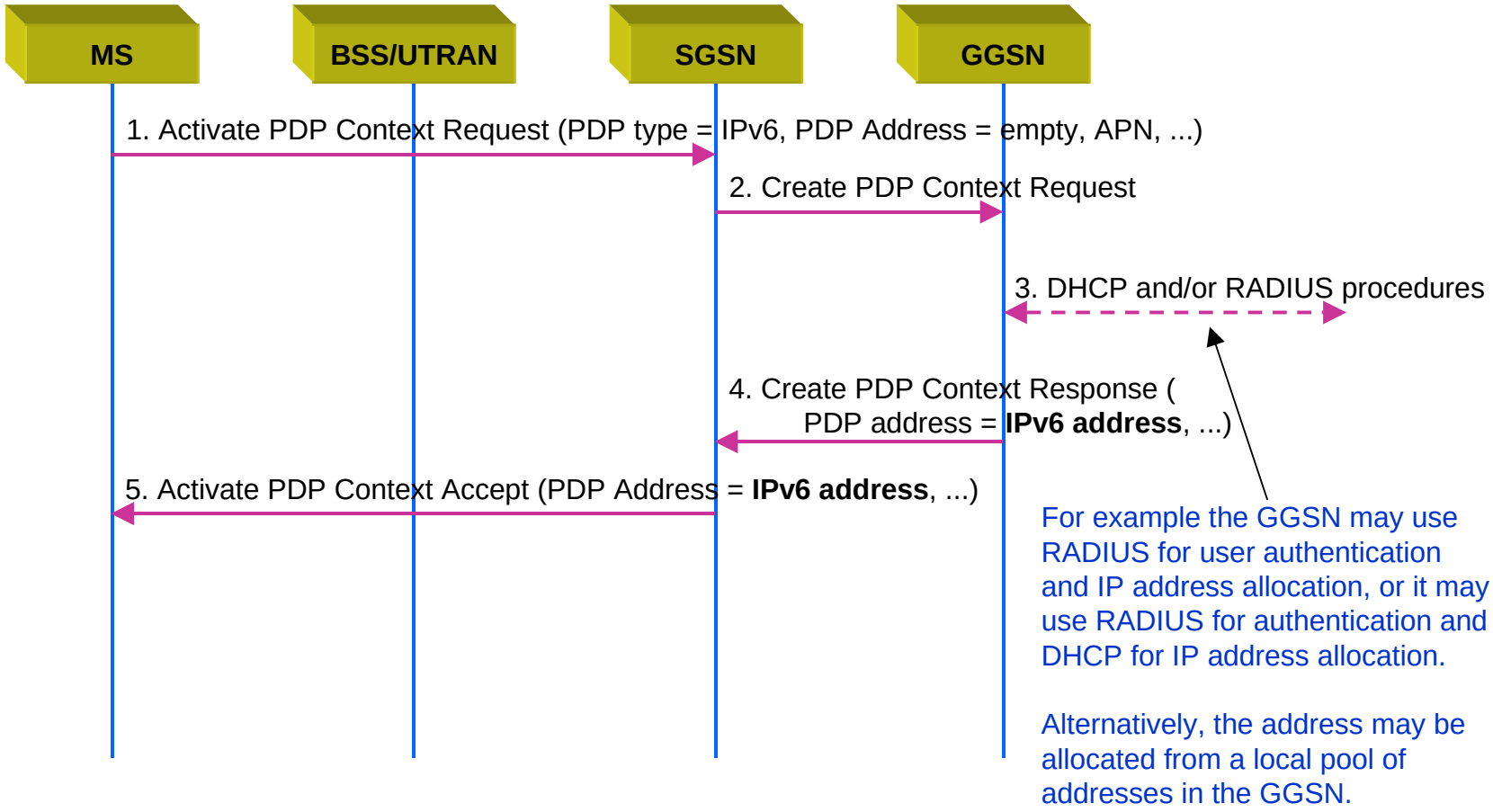
    - The IM CN subsystem shall exclusively support IPv6.

    - The UE shall exclusively support IPv6 for the connection to services provided by the IM CN subsystem.

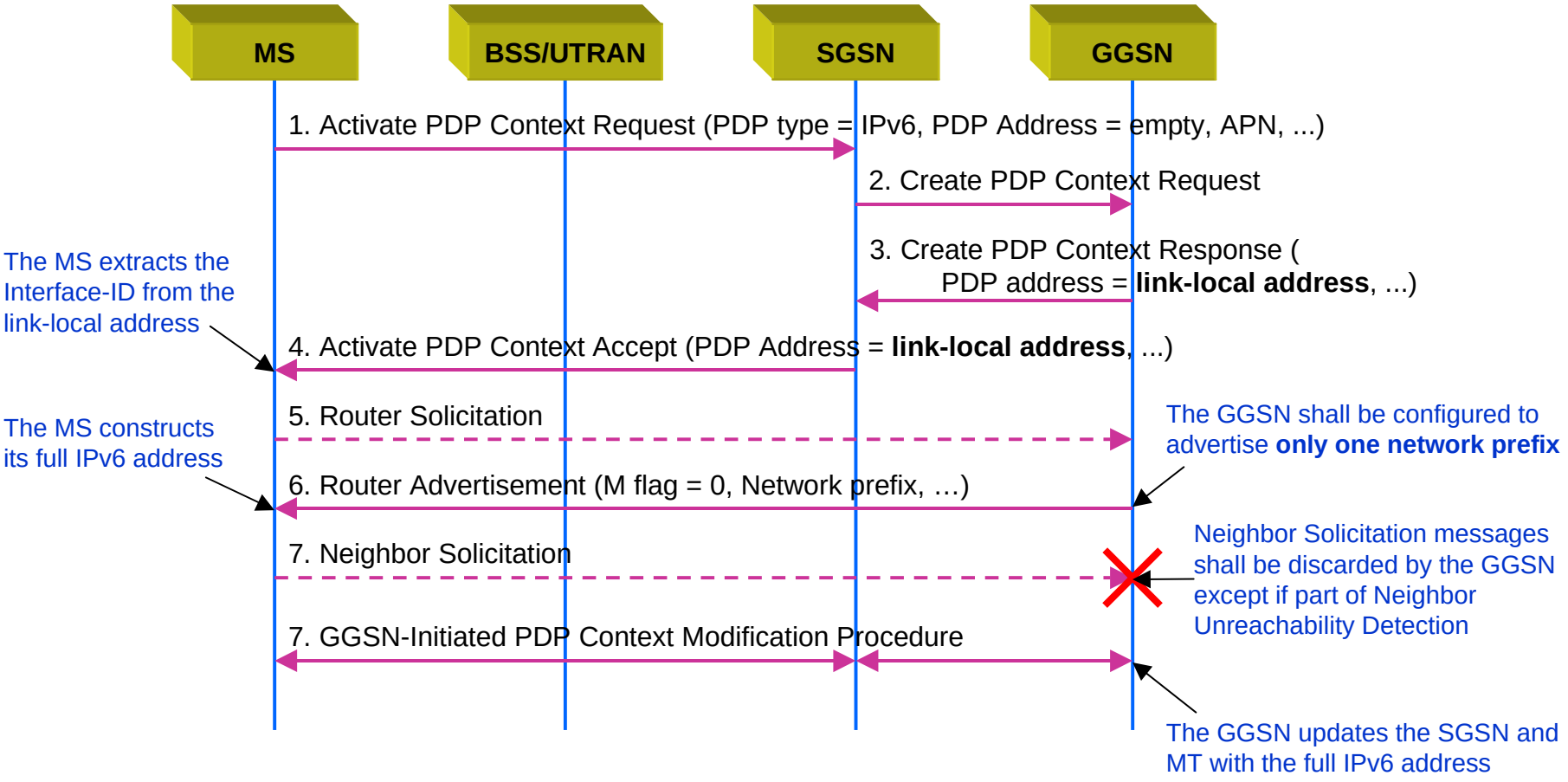
IPv6 Address Allocation Methods

- Stateless Address Autoconfiguration
  - Introduced in GPRS R’99
- Stateful Address Autoconfiguration
  - DHCPv6 client in the terminal
  - Requires DHCPv6 relay agent in the GGSN
- GPRS-specific Address Configuration
  - Static Address Configuration
    - The MS provides its statically configured IPv6 address at PDP context activation
  - Dynamic Address Allocation
    - The IPv6 address is provided by the GGSN at PDP context activation

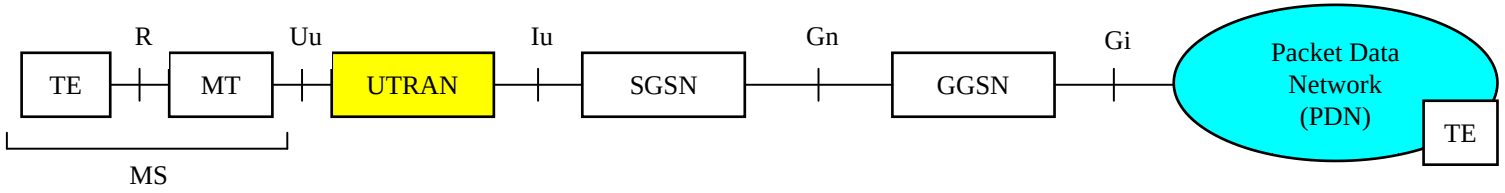
Dynamic Address Allocation in UMTS/GPRS



Stateless Address Autoconfiguration in UMTS/GPRS



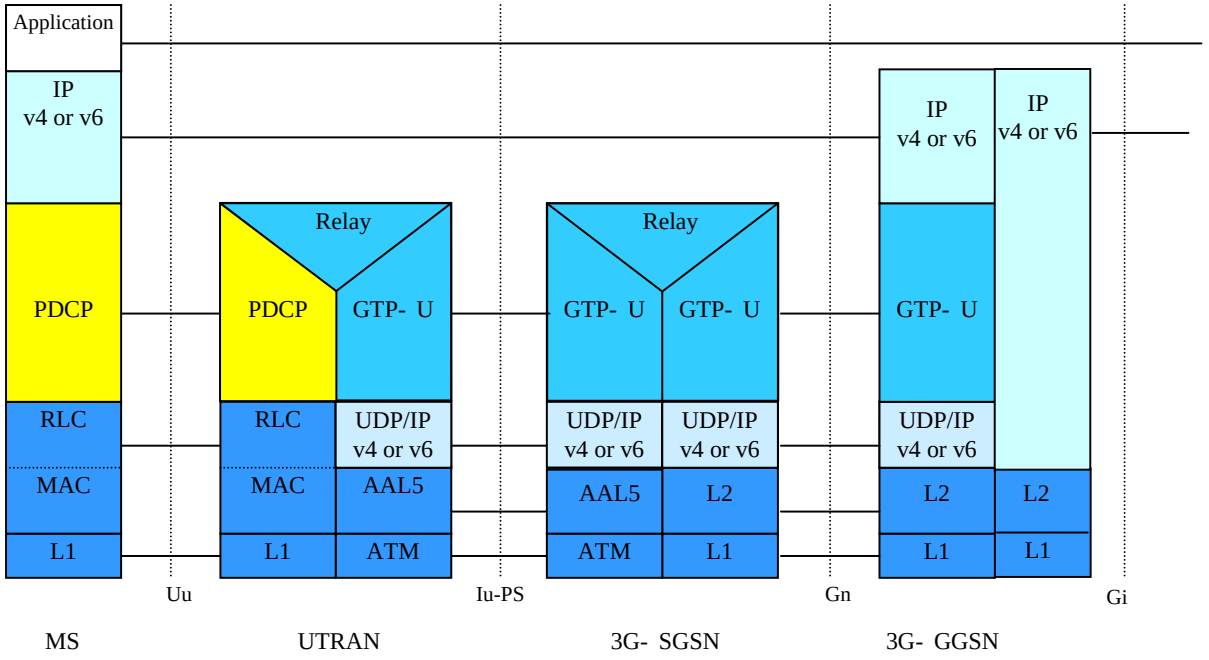
Header Compression



PS Domain User Plane protocol stack

Header Compression:

- RFC2507
- RFC…



IPv4/IPv6 Transition

Text in 23.221 shows examples of transition:

- Dual Stack
- NAT/PT
- Tunneling

These are only examples to show how transition could be done.

They are not mandatory to implement/deploy.

Contact

Juan-Antonio Ibanez

Ericsson

Juan-Antonio.Ibanez@eed.ericsson.se

Jonne Soininen

Nokia

jonne.soininen@nokia.com