The Evolved Packet Core, Status and future plans

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Technical areas

1G
Analog technology.
Deployed in the 1980s.
Primary technologies include NMT, TACS and AMPS.

2G
Digital Technology.
First digital systems.
Deployed in the 1990s.
New services such as SMS and low-rate data.
Primary technologies include GSM/GPRS, CDMA and IS-95.

3G ITU's IMT-2000 required 144 kbps mobile, 384 kbps pedestrian, 2 Mbps indoors
Primary technologies include UMTS-HSPA, WiMAX and CDMA2000 1X/EVDO.

4G ITU's IMT-Advanced requirements include ability to operate in up to 40 MHz radio channels and with very high spectral efficiency.
No technology meets requirements today.
LTE Advanced and IEEE 802.16m designed to meet requirements.

Radio Technology

- Spectrum availability, efficiency, flexibility
- Higher Data Throughput, Lower Latency
- Improved CAPEX and OPEX

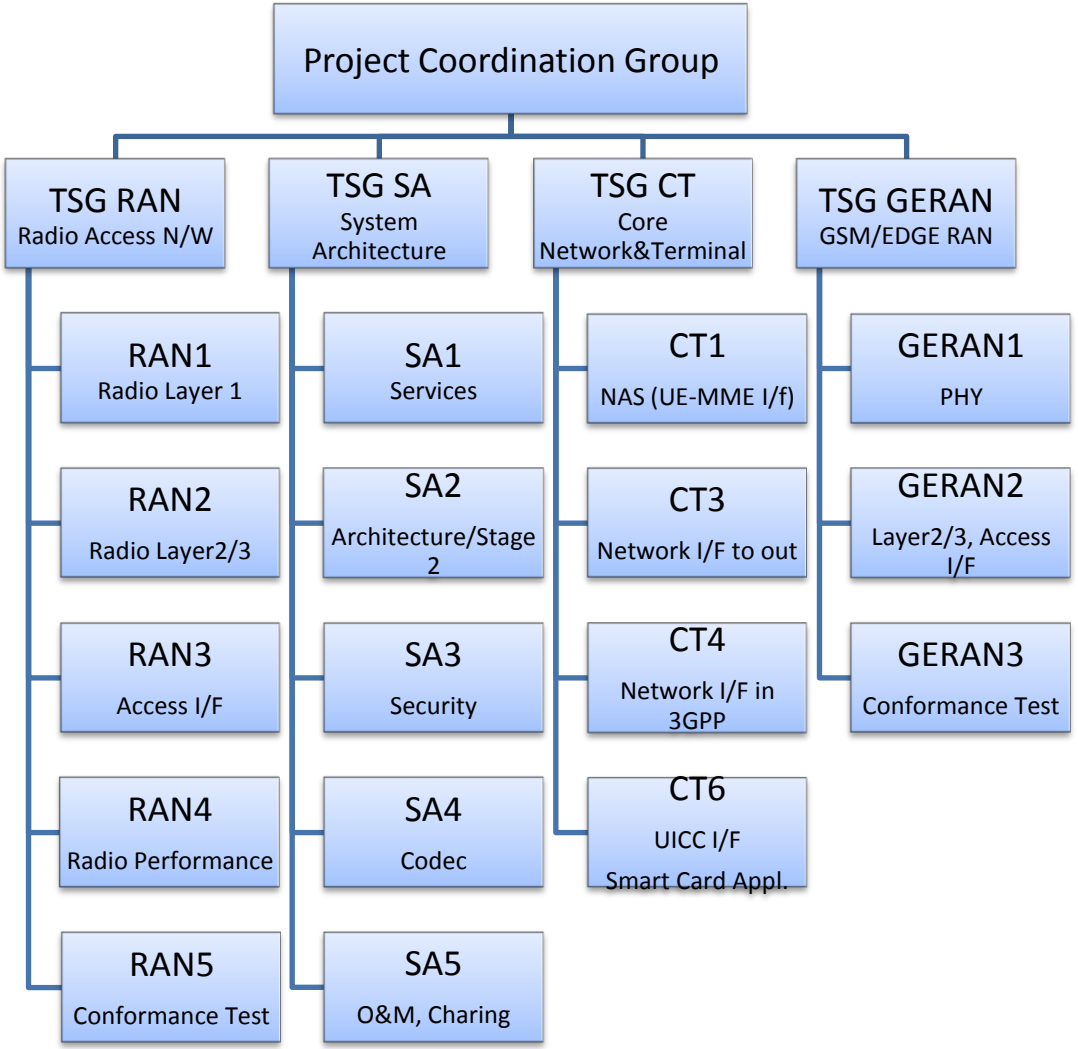
IP Core Network

- Support of 3GPP and non-3GPP Accesses (e.g. WiFi)
- Optimized Packet Only Support
- Enhanced QoS and Policy
- Support for M2M
- Greater Device Diversity

Service Layer

- IMS and Applications
- Session continuity
- Codecs and streaming

3GPP organization structure



Scope of 3GPP CT

- Generally 3GPP CT has responsibility for stage 3 (detailed protocol realisation) for the 3GPP core network, but does some stage 2 work aswell

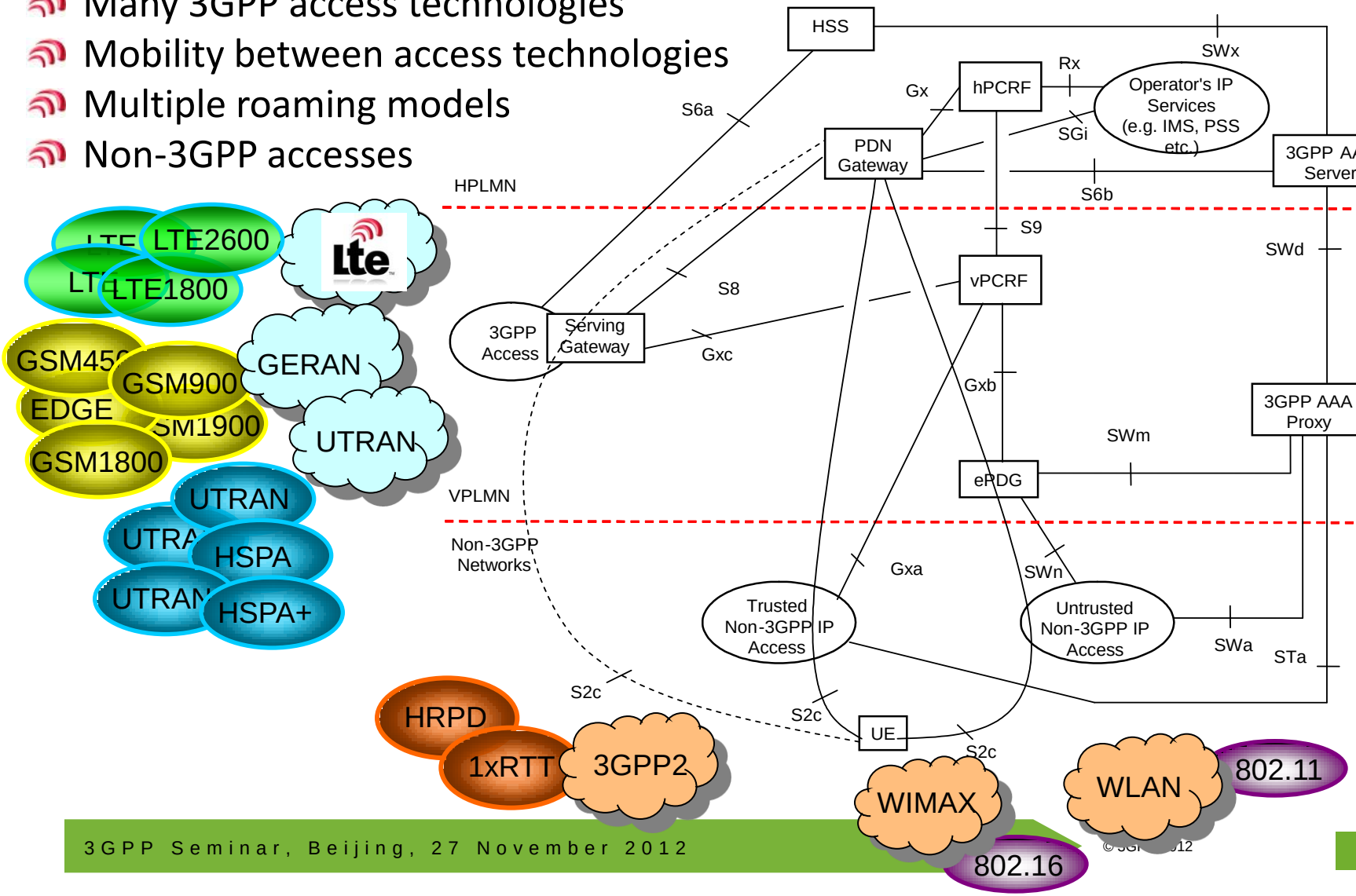
- CT1 - layer 3 protocol aspects between terminal and the 3GPP core network for CS, PS and IMS
- CT3 - interworking aspects between the 3GPP core network and external networks
- CT4 - layer 3 protocol aspects within the 3GPP core network
- CT6 - smart card aspects

Cooperation with IETF

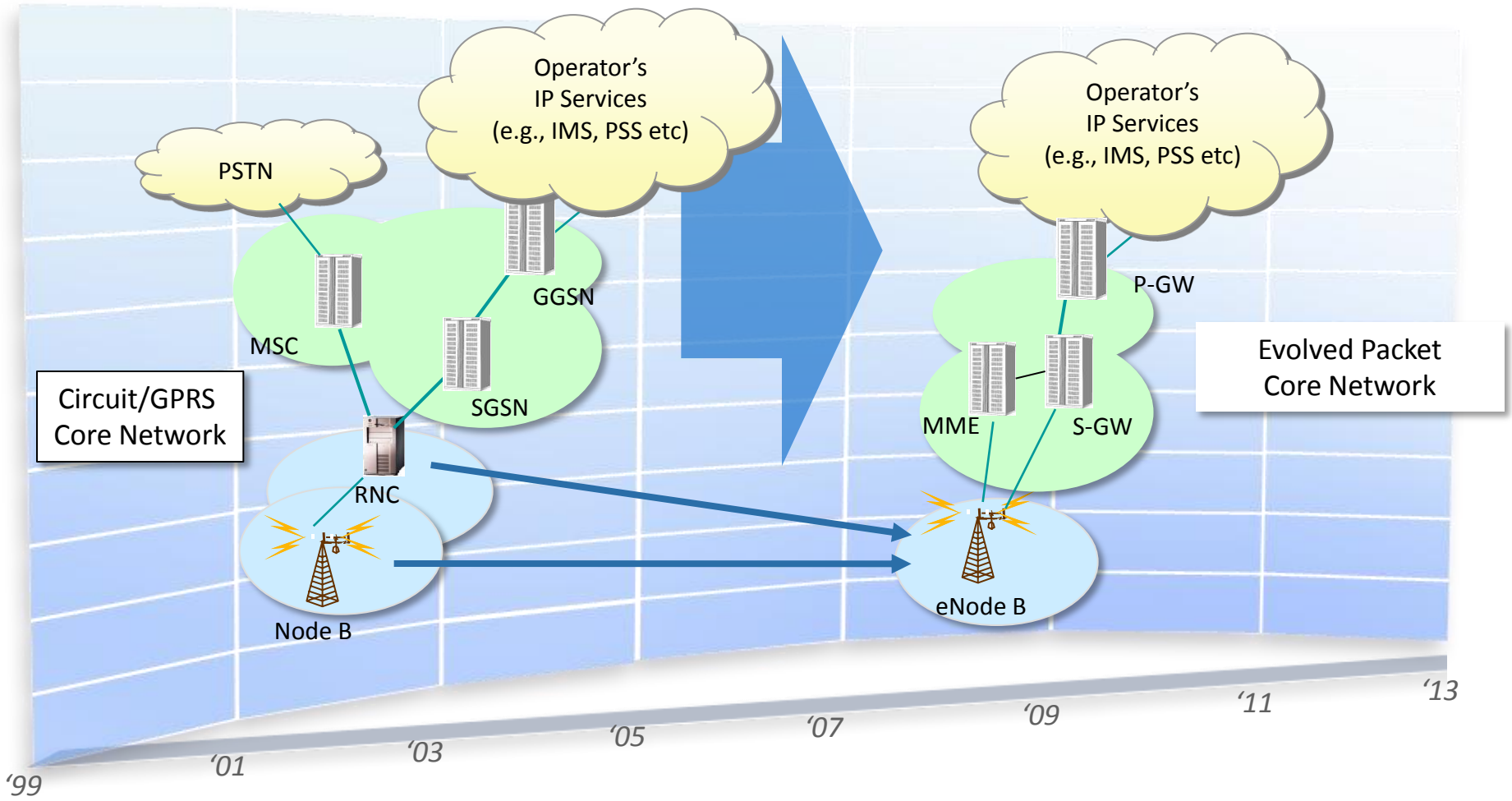
- All-IP has created a need for strong cooperation between 3GPP and IETF
- 3GPP incorporates a number of IP-based protocols fully or partly (e.g. SIP, DIAMETER, IPv4/v6, PMIP, IPsec & IKE)
- 3GPP works with IETF on requirements as well as protocol realisation
- 3GPP profiles RFCs to meet specific requirements
- TSC CT is key contact point between 3GPP and IETF

Simplified EPS architecture

- Many 3GPP access technologies
- Mobility between access technologies
- Multiple roaming models
- Non-3GPP accesses



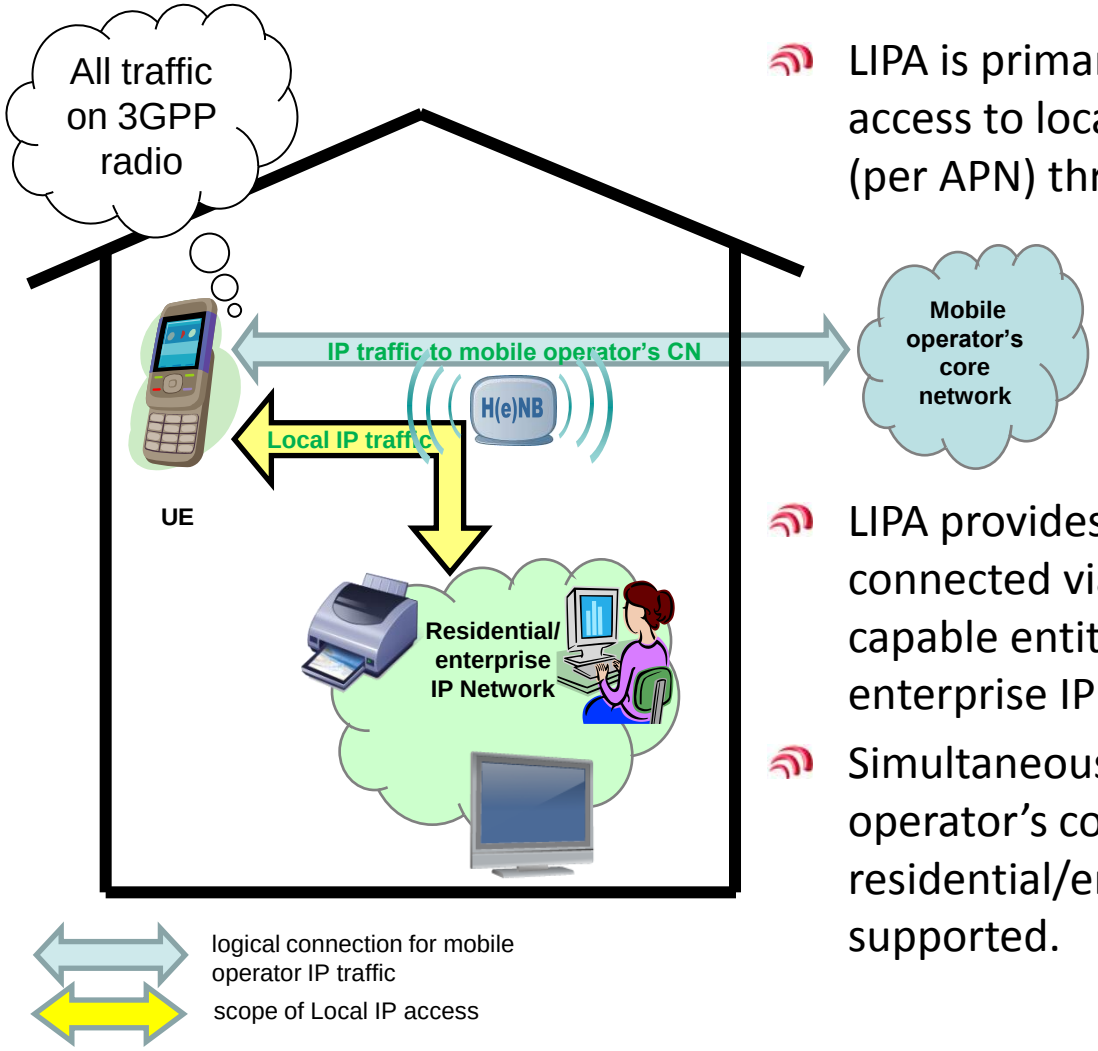
3GPP access & core network evolution



Core Network optimised for IP traffic and services

- Multi-access, operators can influence the selection
- Dual-stack IPv4/v6 connectivity
- Network initiated QoS, PCC
- Various ways to combine or split traffic off inside the network
  - Local IP Access (LIPA)
  - Selective IP Traffic Offloading (SIPTO)
  - WLAN offloading
- IP Multimedia Subsystem
- Single Radio Voice Call Continuity (SRVCC)
- Network sharing

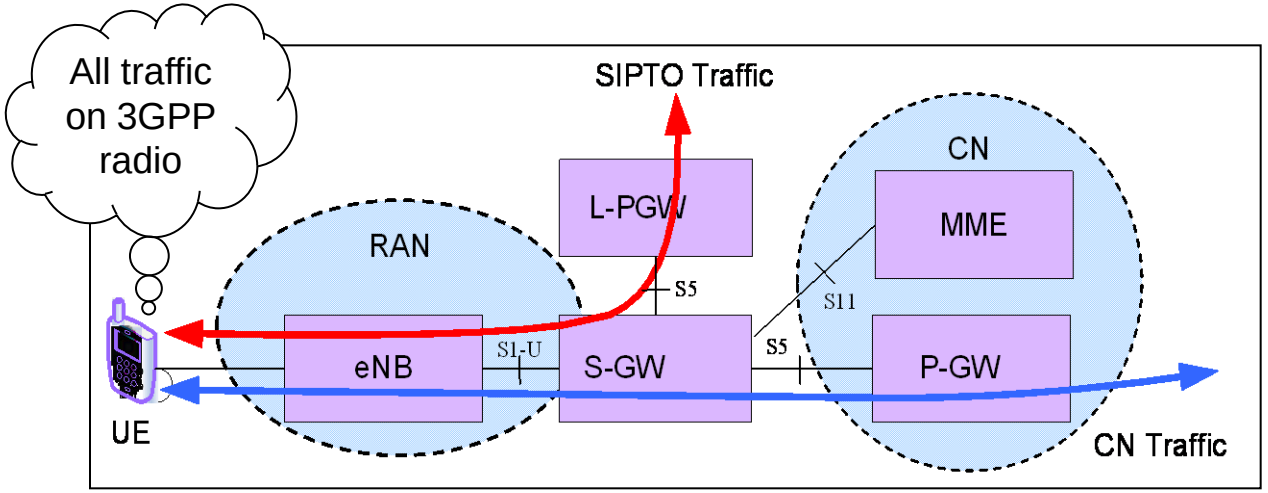
Local IP Access (LIPA)



- LIPA is primarily for end user's benefit, to allow access to local residential or corporate network (per APN) through a 3GPP device
- LIPA provides access for IP capable UEs that are connected via a H(e)NB subsystem to other IP capable entities in the same residential/ enterprise IP network.
- Simultaneous access from a UE to the mobile operator's core network and Local IP Access to a residential/enterprise IP network will be supported.

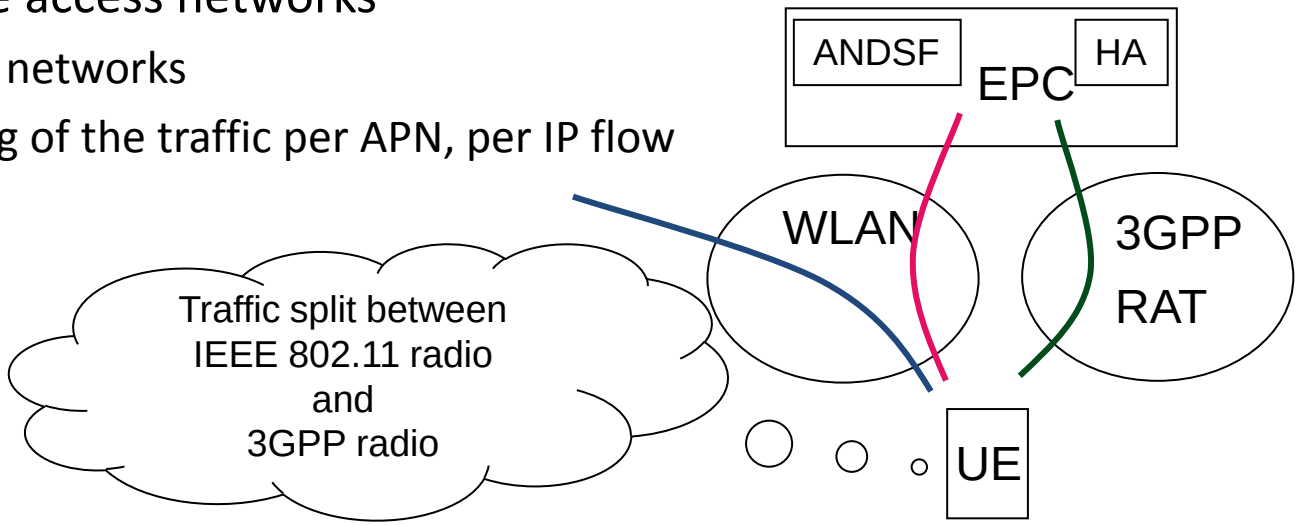
Selective IP Traffic Offloading (SIPTO)

- Optimizing “cost per bit” is becoming essential in the “flat rate” era
- SIPTO is a specific routing scenario within the operator’s network, allowing *selective* offloading (per APN) of the traffic away from the Evolved Packet Core network
- SIPTO benefits the cellular operator and it is transparent for the end user
- SIPTO is intended for allowing cost optimized handling of the internet traffic that is not intended for the operator’s core network
- Local GW is selected for the traffic to be offloaded

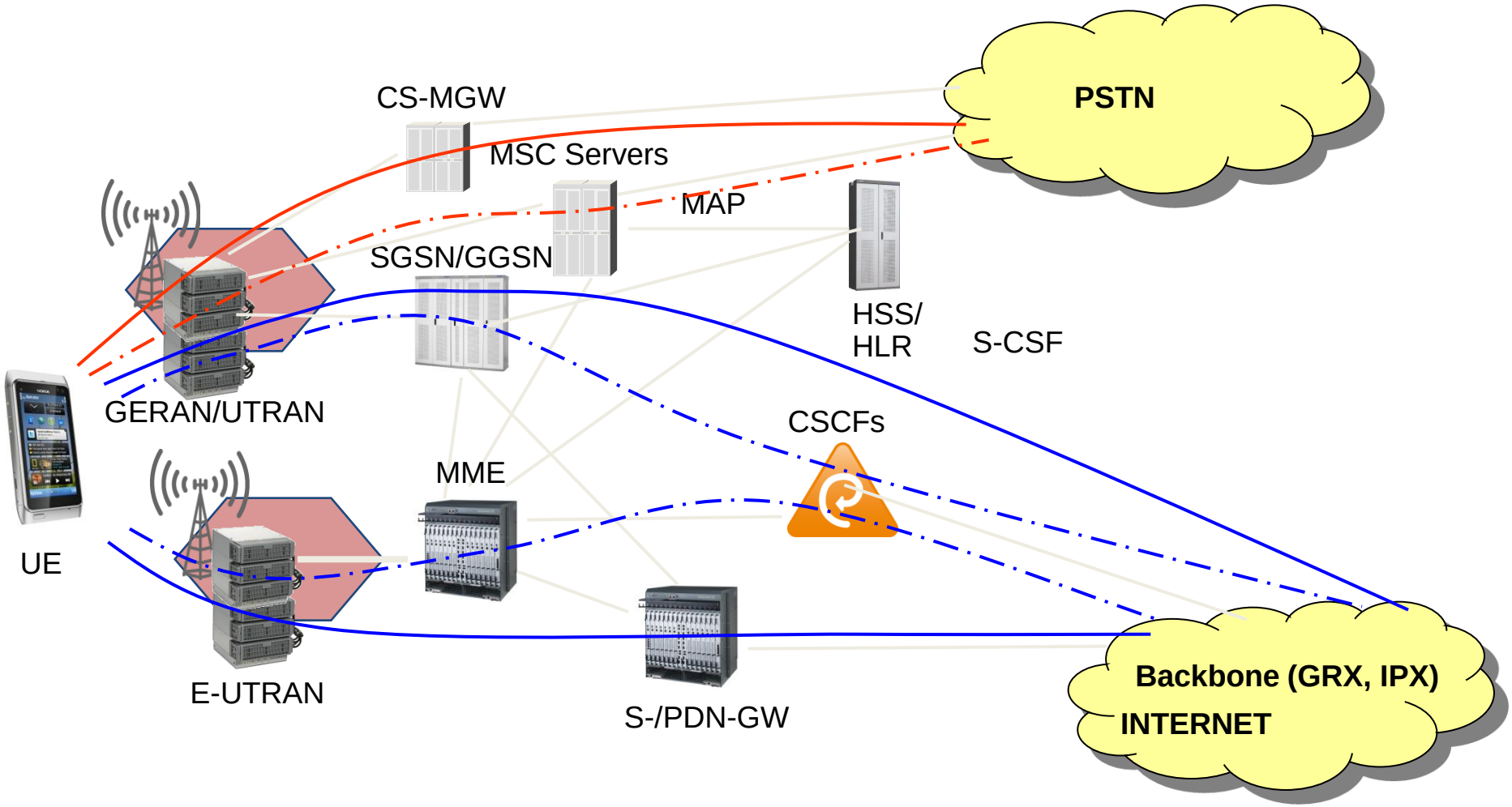


WLAN Offloading

- WLAN offloading refers to the dual radio scenario where part of the traffic is routed via WLAN access and part via 3GPP access
- WLAN offloading covers both the scenario where the traffic via WLAN radio is anchored in the EPC (i.e., seamless offloading) and the scenario where it is not anchored (i.e., non-seamless offloading)
- Access Network Discovery and Selection Function (ANDSF) is there to provide the UE with the access network discovery information and the policies on how to use the available access networks
  - Available access networks
  - Preferred routing of the traffic per APN, per IP flow

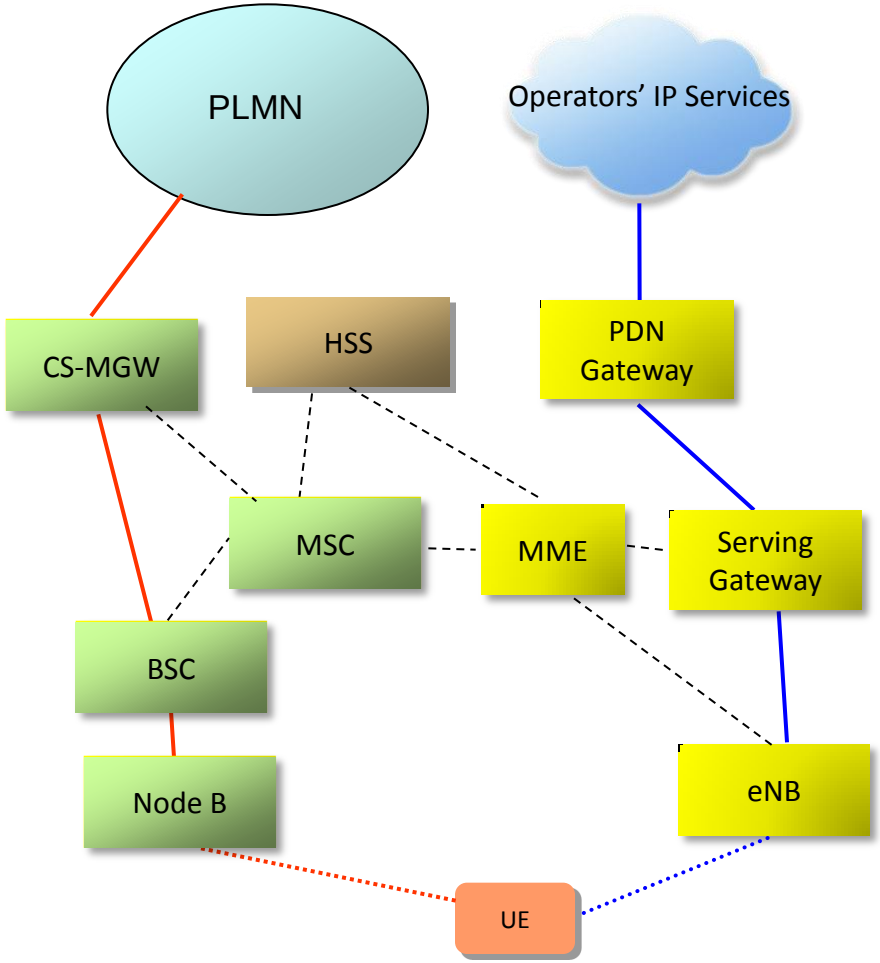


CS and PS voice service architecture



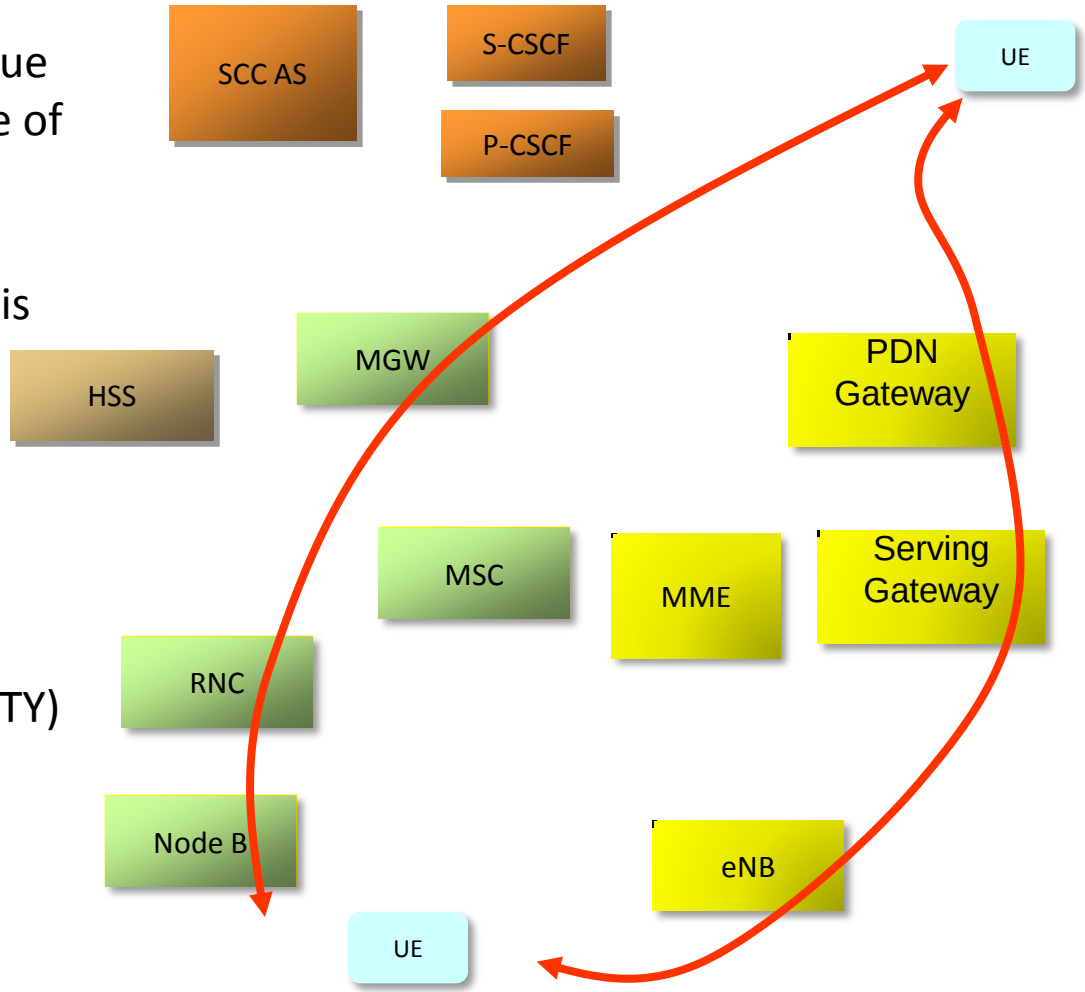
CS Fallback in EPS

- Application of CSFB:
  - CS capable device camping on LTE cell can establish/receive CS services
  - Reuse of existing CS infrastructure for voice service until IMS VoIP is deployed
  - Provide voice roaming support with LTE
  - Can support emergency calls using existing CS infrastructure
- After CS service the UE returns to LTE, depending on coverage and policy



Single Radio Voice Call Continuity

- SRVCC use case:
  - IMS call initiated in LTE can continue in CS domain after moving outside of LTE coverage area
  - SRVCC is invoked if no other VoIP capable PS system (HSPA/eHRPD) is available for VoIP PS-PS HO
  - Requires overlapping with GSM/WCDMA/1xRTT coverage
- SRVCC improvements:
  - Mid-call services (like HOLD & MPTY)
  - emergency calls
  - video calls



Machine-to-Machine (M2M)

- M2M is recognized as a key segment in future packet networks
- Initial 3GPP efforts have focused on the ability to differentiate machine-type devices
  - This allows the operator to selectively handle such devices in overload situations
    - Low priority indicator has been added to the relevant UE-network procedures
    - Overload and Congestion control is done on both core network and radio access network based on this indicator
- Functions for device triggering and small data transmission are added
- Improved overload and congestion management to improve performance and increased amount of devices
- Support for SMS in MME included (without need for SGs)

Proximity Services and Public Safety

- Proximity-based applications and services represent a recent and enormous social-technological trend
  - These applications and these services are based on the awareness that two devices or two users are close to each other
  - Awareness of proximity carries value, and generates demand for an exchange of traffic between them

- Direct device-to-device communication is also essential for **Public Safety services**
  - Necessary LTE enhancements to support Public Safety functions are expected to be added in Rel-12/Rel-13
  - Regional regulators need to progress the spectrum band aspects

Regulatory features – disaster response

- Recent events have brought the different disaster response functions of the 3G/4G networks to the forefront
  - Public Warning System (PWS) provides a secure framework for delivering Warning Messages to the devices
    - The Japanese version of this system saved thousands of lives in last year's earthquake/tsunami disaster
  - Priority Services
    - Mechanisms have been standardized to allow priority access to the network services (voice calls, Internet, multimedia calls, etc…) for e.g. government officials in the event of a mass disaster
  - Emergency Access support on PS domain
    - IMS based emergency voice, video, messaging, etc …

Key messages

- 3GPP is fully focused on:
  - addressing the smartphone challenge with innovative features across radio and core
  - optimizing the network for machine-to-machine support
  - providing the industry with timely evolution
  - Improving network performance
  - securing backwards compatibility over the 3GPP accesses

Thank You !

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