SNS COLLEGE OF ENGINEERING

Kurumbapalayam(Po), Coimbatore – 641 107
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Department of Information Technology

Course Name – 19IT503 Internet of Things

III Year / V Semester

Unit 3 – EVOLVING IoT STANDARDS & PROTOCOLS

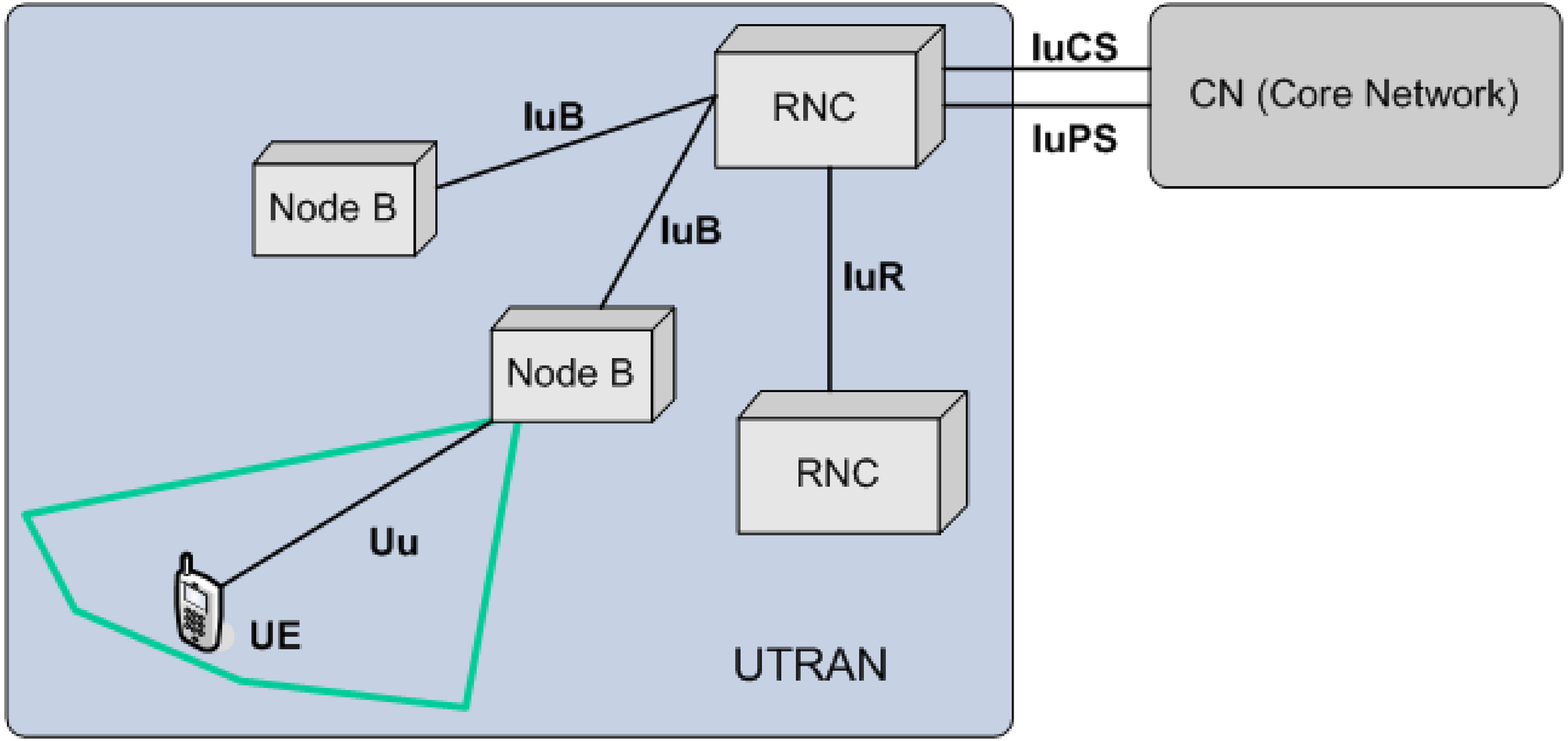
Topic 8 - Cellular and Mobile Network Technologies for IoT/M2M

Cellular and Mobile Network Technologies for IoT/M2M

Universal Mobile Telecommunications System (UMTS)

- UMTS is a 3G mobile cellular technology for networks supporting voice and data (IP) based on the GSM standard developed by the 3GPP (Third-Generation Partnership Project).
- UMTS is a component of the ITU IMT-2000 standard set and is functionally comparable with the CDMA2000 standard set for networks based on the competing cdmaOne technology.
- UMTS can carry many traffic types from real-time circuit switched to IP-based packet switched.
- Universal terrestrial radio access network (UTRAN) is a collective term for the NodeBs (base stations) and radio network controllers (RNC) that comprise the UMTS RAN.
- NodeB is the equivalent to the base transceiver station (BTS) concept used in GSM. The UTRAN allows connectivity between the UE and the CN

Cellular and Mobile Network Technologies for IoT/M2M



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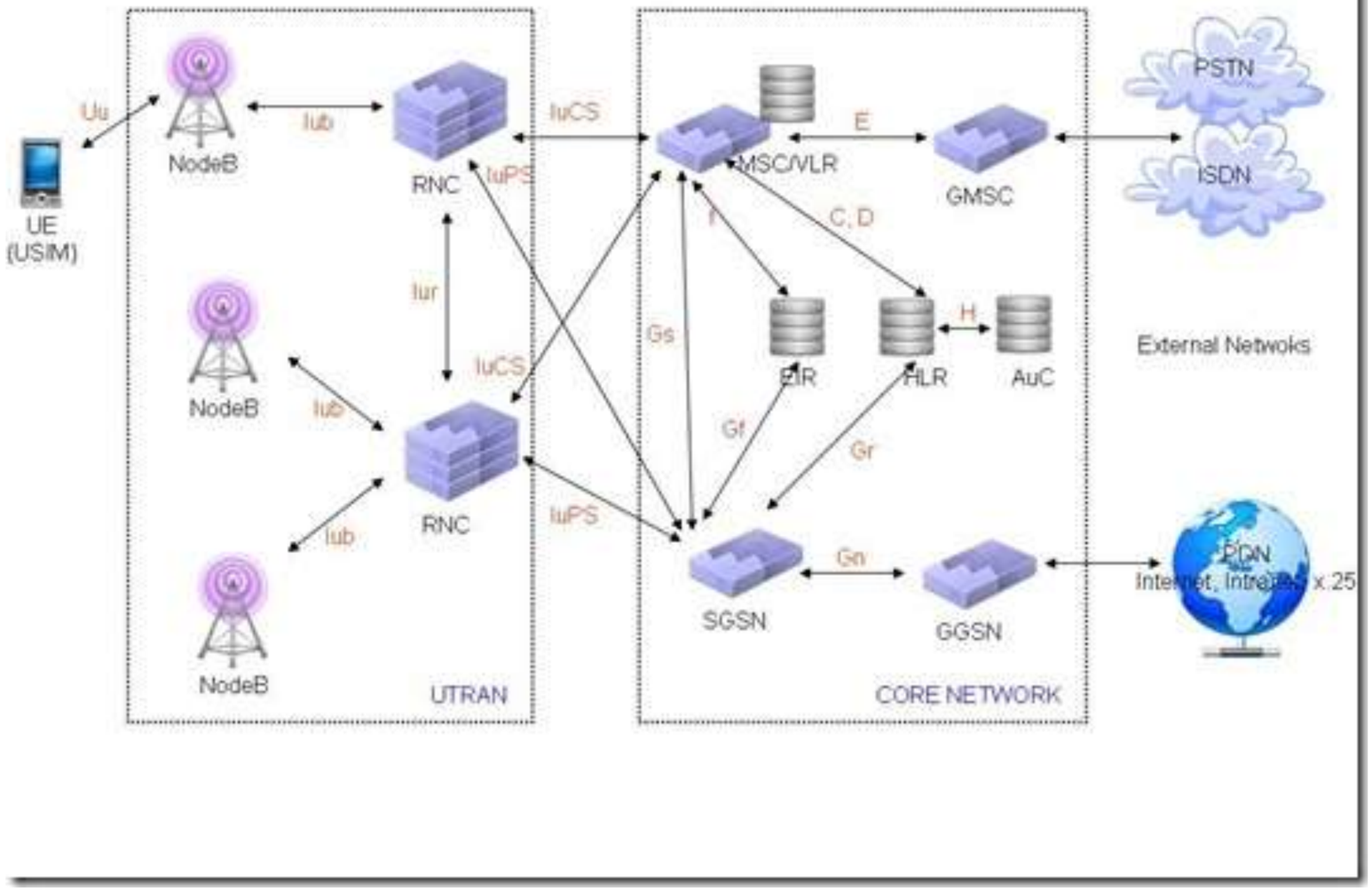

Cellular and Mobile Network Technologies for IoT/M2M

Long Term Evolution

- LTE is the 3GPP initiative to evolve the UMTS technology toward a 4G.
- LTE can be viewed as an architecture framework and a set of ancillary mechanisms that aims at providing seamless IP connectivity between UE and the packet (IPv4, IPv6) data network without any disruption to the end-users' applications during mobility.
- In contrast to the circuit-switched model of previous-generation cellular systems, LTE has been designed to support only packet-switched services.
- System architecture evolution (SAE) is the corresponding evolution of the GPRS/3G packet CN evolution.
- The key element provided by LTE/SAE is the EPS (evolved packet system), that is, together LTE and SAE comprise the EPS.
- EPS provides the user with IP connectivity to a packet data network for accessing the Internet, as well as for supporting services such as streaming video.

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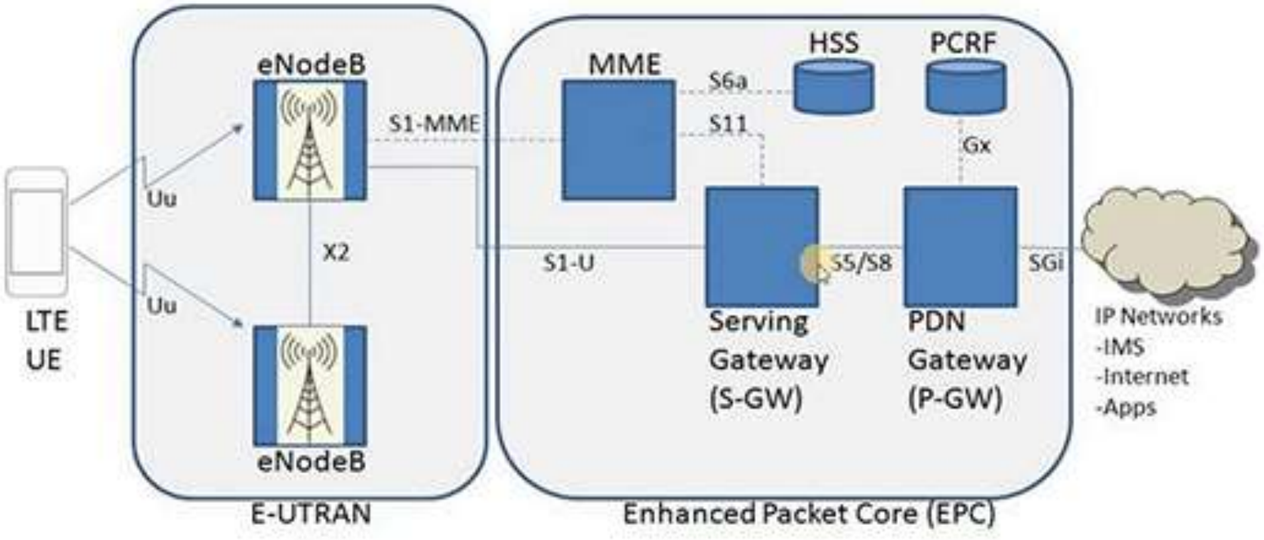
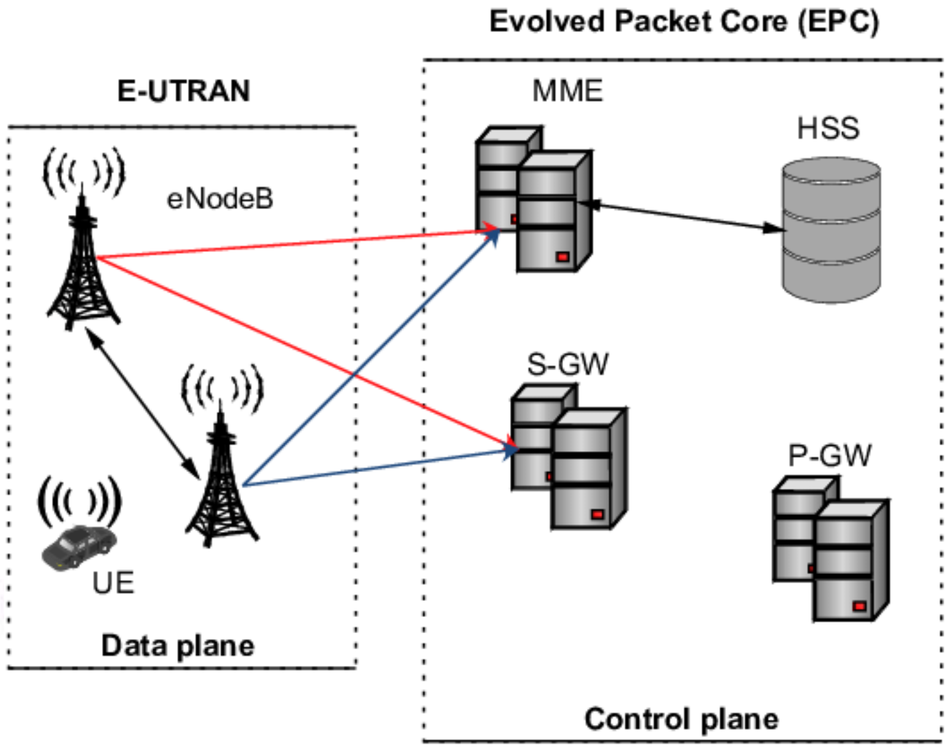
The EPS consists of the:

- New air interface E-UTRAN (evolved UTRAN) and
- The evolved packet core (EPC) network





eNodeB: Evolved Node B
E-UTRAN: Evolved Universal Terrestrial Radio Access
HSS: Home Subscriber Server
UE: User Equipment
MME: Mobility Management Entity
P-GW: Packet data network GateWay
S-GW: Serving GateWay

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- The EPS uses the concept of bearers to route IP traffic from a gateway in the packet data network to the UE.
- A bearer is an IP packet flow with a defined QoS between the gateway and the UE.
- The E-UTRAN and EPC together set up and release bearers as required by applications.
- Multiple bearers can be established for an end-user in order to provide different QoS streams or connectivity to different packet data networks or applications reachable via that network.

Access Network

- The access network of LTE, E-UTRAN, consists of a network of eNodeB.
- The eNodeBs are normally interconnected with each other by means of an interface known as “X2” and to the EPC by means of the S1 interface.
- More specifically, to the MME by means of the S1–MME interface and to the S-GW by means of the S1–U interface

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Core Network

- At a high level, the network is comprised of the CN (i.e., the EPC) and the access network E-UTRAN.

- While the CN consists of many logical nodes, the access network is comprised of essentially just one node, the evolvedNodeB (eNodeB), which connects to the UE.

- The CN is responsible for the overall control of the UE and establishment of the bearers.

The main logical nodes of the CN are:
(i) PDN gateway (P-GW);
(ii) serving gateway (S-GW); and
(iii) mobility management entity (MME).

- In addition to these nodes, the CN also includes other logical nodes and functions such as the Home Subscriber Server (HSS) and the Policy Control and Charging Rules Function

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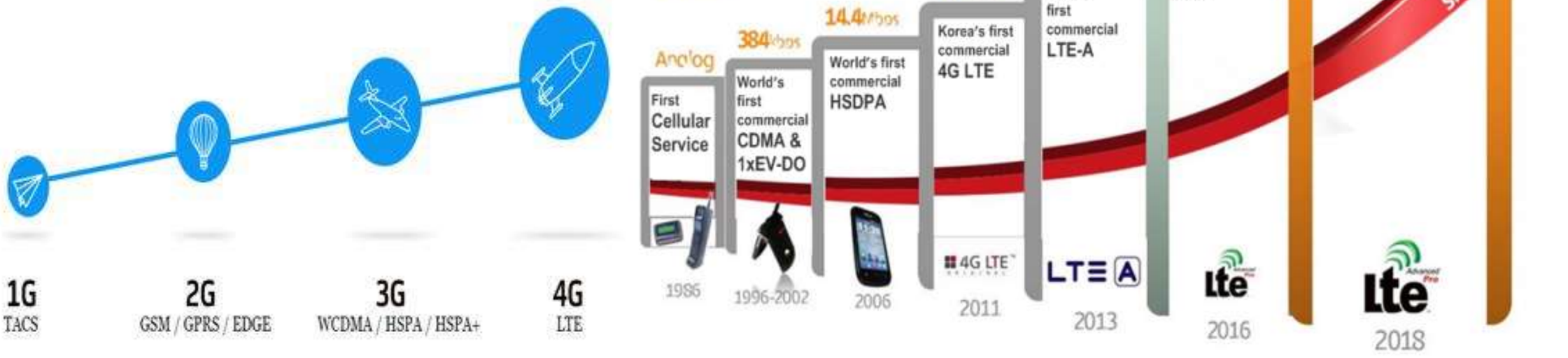
Evolution Paths to 4G/LTE
3GPP environments: GSM, GPRS, EDGE, WCDMA, HSPA

Network element evolution from 2G/3G to LTE includes the following upgrades in the provider network:
- GERAN and UTRAN -> E-UTRAN
- SGSN/PDSN-FA ->S-GW
- GGSN/PDSN-HA ->PDN-GW
- HLR/AAA ->HSS
- VLR ->MME



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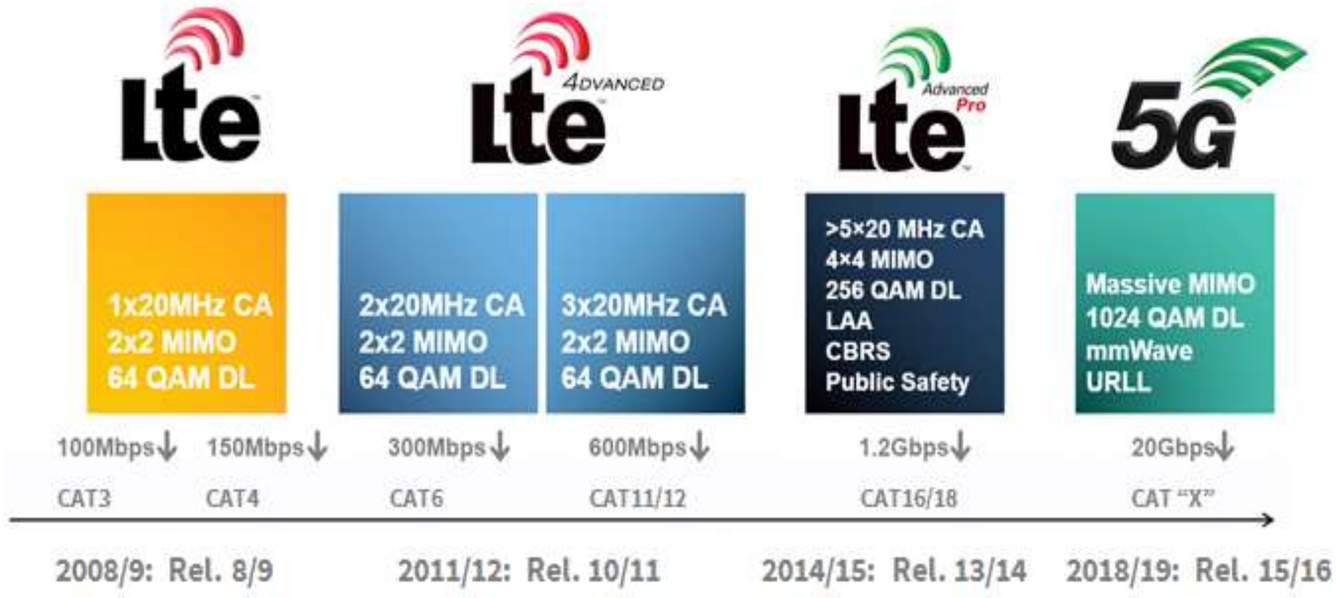
In principle, LTE promises the following benefits:

- Simplified network architecture (Flat IP based);
- Efficient interworking;
- Robust QoS framework;
- Common evolution for multiple technologies;
- Real-time, interactive, low-latency true broadband;
- Multisession data;
- End-to-end enhanced QoS management Policy control and management;
- High level of security.



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