LTE EPC: Addressing the Mobile Broadband Tidal Wave

What You Will Learn

The mobile Internet has changed the way people communicate, stay informed, and are entertained. With more compelling services and mobile multimedia computing devices, users are increasingly entering the network and creating an enormous surge in mobile traffic.

To address this new normal, operators must deploy a core network that combines performance with intelligence to meet different traffic demands with an elastic architecture. An intelligent core network allows them to create a robust multimedia environment, enhance and manage the subscriber experience, and monetize network traffic.

Long-Term Evolution (LTE) is the next-generation mobile wireless technology designed to deliver ultrahigh-speed mobile broadband. The primary goals of LTE are increasing bandwidth, improving spectral efficiency, reducing latency, lowering the cost per byte, and enabling improved mobility. This combination aims to enhance a subscriber's interaction with the network and further accelerate the adoption of mobile multimedia services, such as online television, streaming video, video on demand (VoD), social networking, and interactive gaming.

Radio access solutions are a primary consideration of the LTE deployment strategy, because LTE affects the mobile operators' most valued asset: spectrum. However, equally important is the multimedia core network.

The Evolved Packet Core: The Next-Generation Packet Core for All Networks

LTE calls for a transition to a “flat”, all-IP core network with open interfaces, called the Evolved Packet Core (EPC). The goal of the EPC is higher throughput, lower latency, simplified mobility between Third-Generation Partnership Project (3GPP) and non-3GPP networks, enhanced service control and provisioning, and efficient use of network resources. Although the EPC has been defined in conjunction with LTE, it is an open next-generation packet core for all networks, including 2.5G, 3G, 4G, non-3GPP, and even fixed networks. In addition, although the EPC represents one of the smallest percentages of overall wireless infrastructure spending, it provides the greatest potential effect on overall network profitability through enablement of new services combined with cost savings from operational efficiencies.

As a result, mobile operators are looking for the best multimedia core solutions to deliver an optimum user experience and migrate to an efficient, intelligent EPC.

Important considerations for the multimedia core network include:

- Support for multiple access network types, including 2.5G, 3G, and 4G; deployment flexibility and network optimization including backhaul
- Smooth and flexible evolution from 2.5G and 3G to 4G
- Massive increase in signaling
- Increased user-plane performance
- Session-state and subscriber management
- Integration of intelligence and policy control at the mobility anchor point
- Security

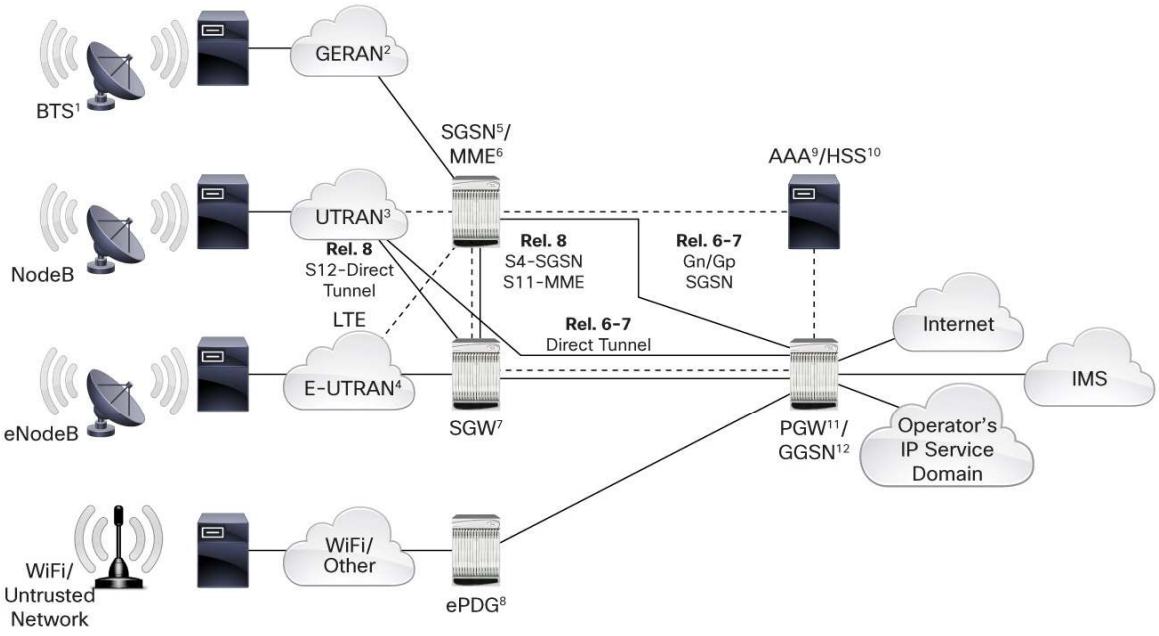
- Voice-grade reliability
- Reporting, monitoring, accounting, and charging
- Roaming
- Support for multimedia services over the packet switched infrastructure

Cisco is exceptionally well positioned to address these challenges and assist in the migration to an LTE EPC, bringing the products and expertise needed for this evolution.

Cisco ASR 5000 Series Platform

The Cisco® ASR 5000 Series extended by the Cisco ASR 5500 is elastic; it combines high capacity, high availability, and powerful performance with unparalleled subscriber and network intelligence. Designed for the evolution from 3G to 4G, the Cisco ASR 5000 Series platform is the benchmark for today's and tomorrow's multimedia-enabled core network. The platform uses a simple, flexible distributed architecture that supports multiple access technologies, subscriber mobility management, and call-control capabilities, as well as inline services (Figure 1). With its leading-edge throughput, signaling, and capacity, the Cisco ASR 5000 Series can readily support all EPC network functions.

Figure 1. The Cisco ASR 5000 Series in a Multiaccess Multiservice Environment



[1] BTS: Base Transceiver Station
[2] GERAN: GSM EDGE Radio Access Network
[3] UTRAN: UMTS Terrestrial Radio Access Network
[4] E-UTRAN: Evolved UTRAN
[5] SGSN: Serving GPRS Support Node
[6] MME: Mobility Management Entity
[7] SGW: Serving Gateway
[8] ePDG: Evolved Packet Data Gateway
[9] AAA: Authentication, Authorization, and Accounting
[10] HSS: Home Subscriber Server
[11] PGW: Packet Data Network Gateway
[12] GGSN: Gateway GPRS Support Node

EPC Network Functions

The LTE EPC performs a series of network functions that flatten the architecture by minimizing the number of nodes in the network. As a result capital and operational expenditures decrease, thereby trimming the overall cost per megabyte of traffic while improving network performance. Cisco provides the functions defined for the LTE EPC, including the following:

- The **Mobility Management Entity (MME)** resides in the control plane and manages states (attach, detach, idle, and Radio Access Network [RAN] mobility), authentication, paging, mobility with 3GPP 2.5G and 3G nodes (Serving GPRS Support Node [SGSN]), roaming, and other bearer management functions.
- The **Serving Gateway (SGW)** sits in the user plane, where it forwards and routes packets to and from the eNodeB and Packet Data Network Gateway (PGW). It also serves as the local mobility anchor for inter-eNodeB handover and roaming between 3GPP systems, including 2.5G and 3G networks.
- The **Packet Data Network Gateway (PGW)** acts as the interface between the LTE network and packet data networks, such as the Internet or IP Multimedia Subsystem (IMS) networks. It is the mobility anchor point for intra-3GPP and non-3GPP access systems. It also acts as the Policy and Charging Enforcement Function (PCEF) that manages quality of service (QoS), online and offline flow-based charging data generation, deep packet inspection, and lawful intercept.
- The **Evolved Packet Data Gateway (ePDG)** is the element responsible for interworking between the EPC and untrusted non-3GPP networks, such as a wireless LAN.
- **Release 8 Serving GPRS Support Node (SGSN)**, also known as the S4 SGSN, provides control, mobility, and user-plane support between the existing 2.5G and 3G core and the EPC. It provides the S4 interface that is equivalent to the Gn interface used between the SGSN and the Gateway GPRS Support Node (GGSN).

The Cisco Difference

Cisco multimedia core platforms are built to address the needs of the mobile multimedia core market.

Cisco brings a history of innovative solutions that already meet many of the requirements of the EPC, such as integrated intelligence, simplified network architecture, high-bandwidth performance capabilities, and enhanced mobility.

Therefore, Cisco solutions can support 2.5G and 3G today and, through in-service software upgrades (ISSUs), will support mobile broadband functions as LTE networks are deployed. These platforms can support multiple functions in a single node, allowing a single platform to concurrently act as an MME, Release 8 SGSN and SGW, SGW and PGW, or even as a 2.5G and 3G and LTE EPC node. Mobile operators who want a smooth network migration can maximize the return on their investments and offer an exceptional experience to their customers.

Specific key features include:

Network Flexibility:

- Common platform for all network functions
- Integration and colocation of multiple core functions
- Software architecture that enables service reconfiguration and online upgrades
- Evolution from 3G to LTE
- Single operations, administration, and management (OA&M), policy, and charging integration

Superior Overall Performance:

- High performance across all parameters - signaling, throughput, density, and latency
- Linear scaling of network functions and services
- Support for 2.5G and 3G LTE service on any card running anywhere in the system
- Resources distributed across the entire system

Integrated Intelligence with Policy Enforcement:

- Integrated deep packet inspection, service control, and steering
- Value-added inline services
- Integrated policy enforcement with tightly coupled policy and charging
- Support for integrated Session Initiation Protocol (SIP) and IMS functions
- Consolidated accounting and billing

Outstanding Reliability

- No sessions lost because of any single hardware or software failure
- Automatic recovery of fully established subscriber sessions
- Interchassis session recovery or geographic redundancy
- Network Equipment Building Standards (NEBS) Level 3 certification

Conclusion

Although the deployment of LTE RANs receives considerable attention, the EPC has emerged as critical for delivering next-generation mobile broadband services. As such, mobile operators must look for solutions that can address today's requirements while positioning them for future technologies.

Cisco is focused on the elastic multimedia core network and the challenges it presents to the mobile operator. We have led the industry with intelligent, high-performance solutions that have changed the packet core environment to a true multimedia core network. We will continue to harness this proven experience and expertise to become your trusted advisor and deliver best-in-class solutions that evolve the mobile operator's network and help deliver on the promise of true mobile broadband.

For more information, please visit http://www.cisco.com/go/mobile.

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