

Solving the Bandwidth and Performance Challenge in the LTE Core

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4G and the Connected World

The global market for LTE handsets is expected to grow from 50,000 units (2010) to 82 million by 2014. Similar growth is expected in other LTE consumer segments such as netbooks (ABI report on LTE – 2Q 2009)

“combined revenues from apps funded by pay-per-download, value-added services which includes freemium and subscription, and advertising is anticipated to show an increase from less than \$10 billion in 2009 to \$32 billion in 2015.” – (Juniper Research)



2009, global number of car production: Total ~60,986,985 = number of potential new devices on the network

total LTE market:macrocell = (eNBs + EPC) \$937.4 million in 2010 grow at a 2009–2014 annual growth rate (CAGR) of 167% to \$11.4 billion by 2014.

(Portio Research Mobile Factbook 2009) -estimated 5.8 billion mobile subscribers worldwide by 2013 -by 2020, the number of connections is expected to reach tens of billions

LTE technical requirements

- 100 Mbps, an uplink of at least 50 Mbps
- Up to 200 active users in a cell (5 MHz)
- Less than 5 ms user-plane latency
- Mobility
 - Optimized for 0 ~ 15 km/h.
 - 15 ~ 120 km/h supported with high performance.
 - Supported up to 350 km/h or even up to 500 km/h.
- Enhanced multimedia broadcast multicast service (E-MBMS)
- Spectrum flexibility: 1.25 ~ 20 MHz
- Enhanced support for end-to-end QoS

LTE Network Architecture

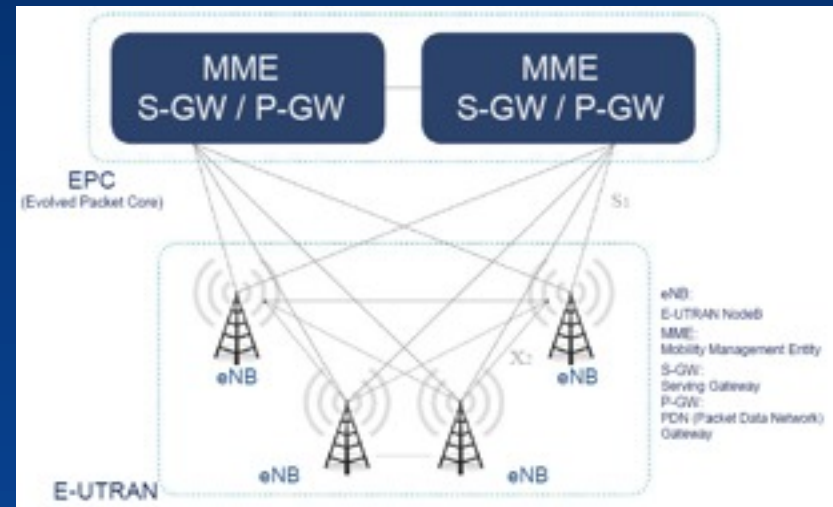
- ✓ **The eNB hosts these functions:**
 - ✓ Radio resource management
 - ✓ IP header compression and encryption
 - ✓ Selection of MME at UE attachment
 - ✓ Routing of user plane data towards S-GW
 - ✓ Scheduling and transmission of paging messages and broadcast information
 - ✓ Measurement and measurement reporting configuration for mobility and scheduling
 - ✓ Scheduling and transmission of ETWS messages

- ✓ **The MME hosts many functions including:**
 - ✓ Non-access stratum (NAS) signaling and NAS signaling security
 - ✓ Access stratum (AS) security control
 - ✓ Idle state mobility handling
 - ✓ EPS bearer control

- ✓ **The S-GW provides these functions:**
 - ✓ Mobility anchor point for inter eNB handovers
 - ✓ Termination of user-plane packets for paging reasons
 - ✓ Switching of user plane for UE mobility

The packet data network (PDN) gateway (P-GW) functions include:

UE IP address allocation

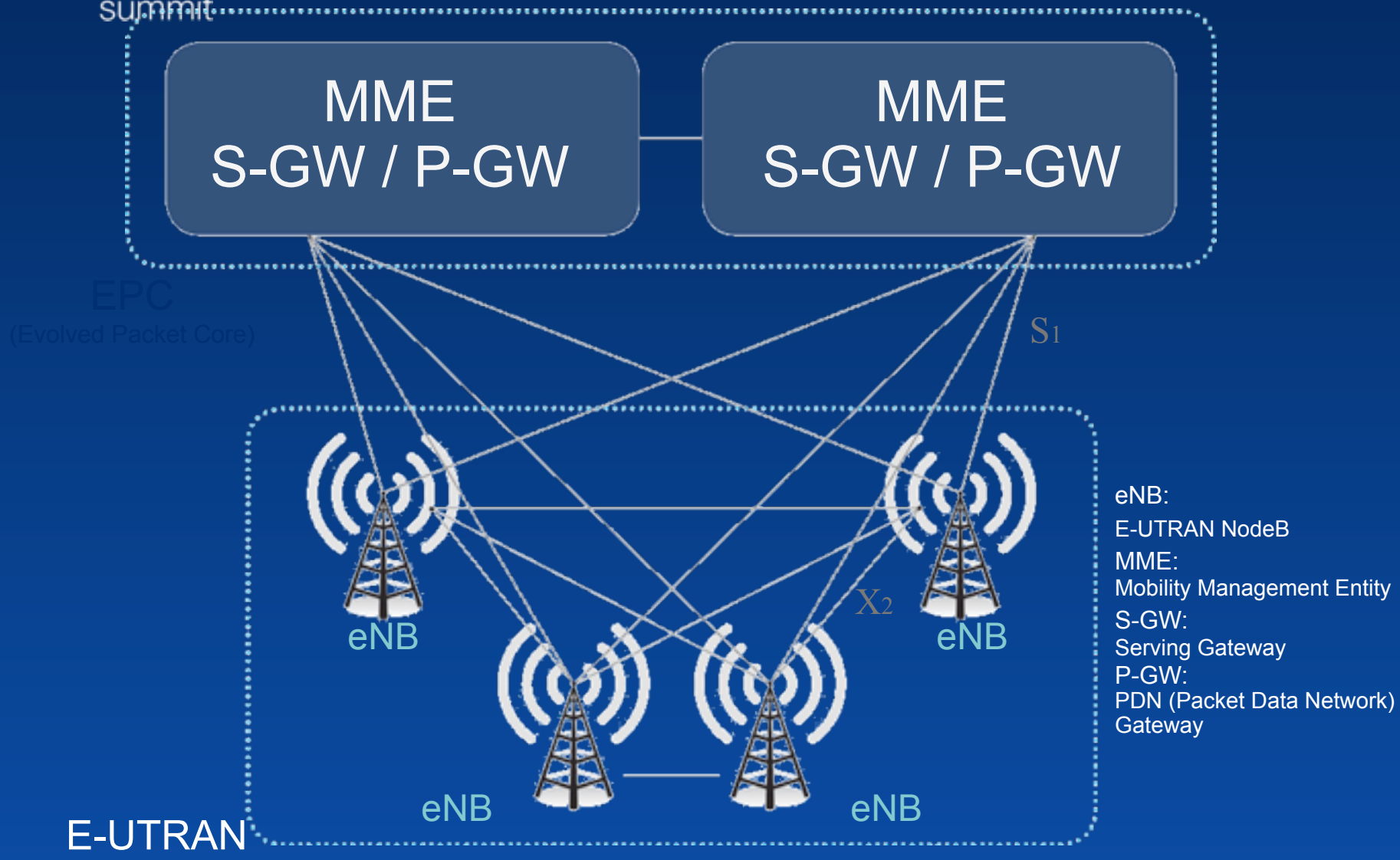


NE Functions

- ✓ Network Access Control Functions.
 - ✓ Network/Access network selection
 - ✓ Authentication and authorisation function
 - ✓ Admission control function
 - ✓ Policy and Charging Enforcement Function
 - ✓ Lawful Interception
- ✓ Packet Routing and Transfer Functions.
 - ✓ IP header compression function
 - ✓ Packet screening function
- ✓ Mobility Management Functions.
 - ✓ Reachability Management for UE in ECM-IDLE state
 - ✓ Tracking Area list management
 - ✓ Inter-eNodeB mobility anchor function
 - ✓ Inter-3GPP mobility anchor function
 - ✓ Idle mode signalling reduction function
 - ✓ Mobility Restrictions
 - ✓ IMS voice over PS Session Supported Indication



LTE Network Architecture

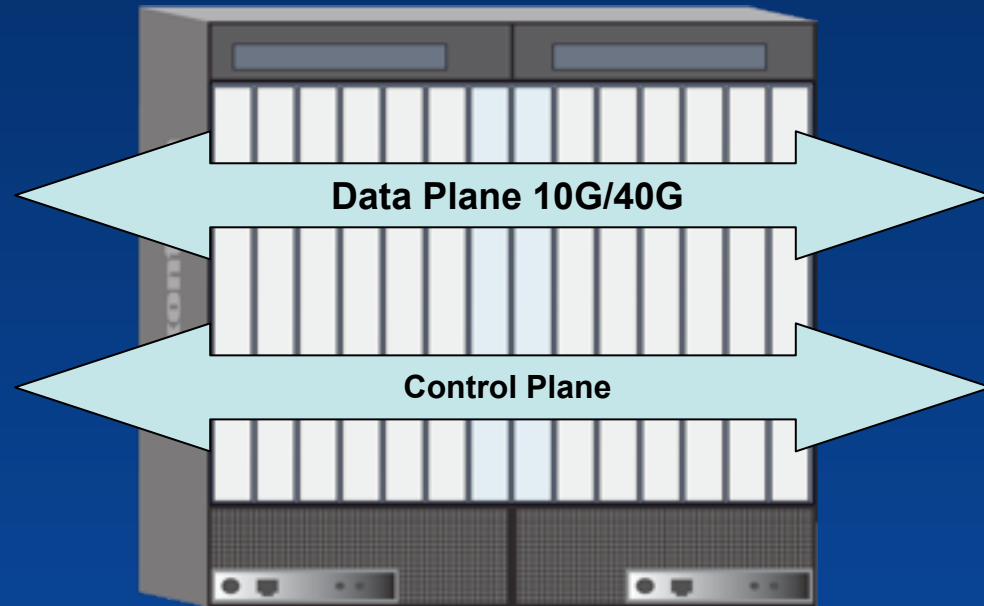


Three LTE Design Challenges

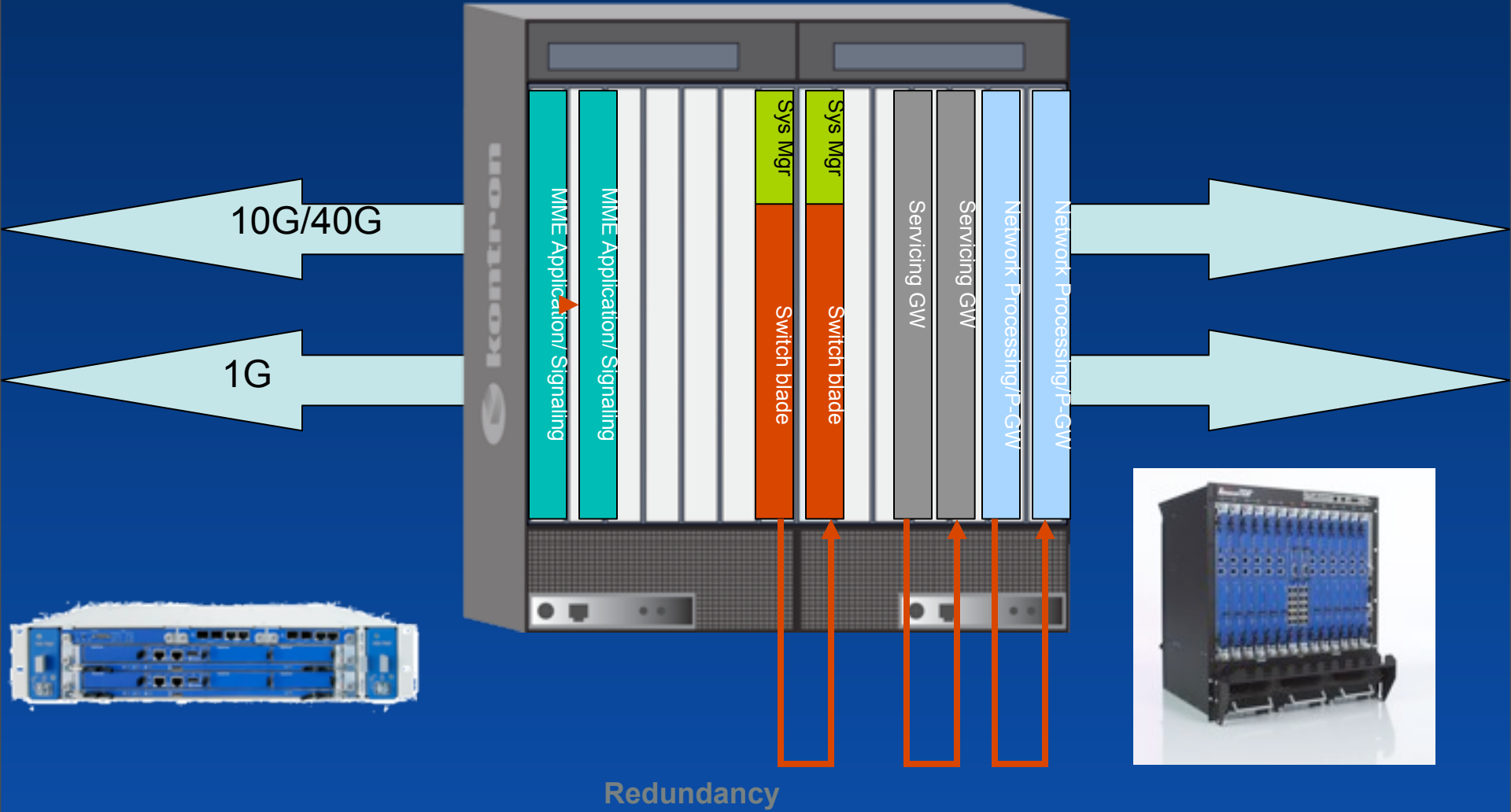
- ✓ Increasing Bandwidth Demand with Network processing to address
 - ✓ Network Access Control Functions
 - ✓ Packet Routing and Transfer Functions
 - ✓ Security Functions etc.
- ✓ IP v6 layer and all IP Network synchronisation (SyncE)
- ✓ Scalability and time to Deployment

LTE Hardware requirements

- **Standard Based for time to market advantage**
- **Scalable**
- **Packet Switching with low latency**
- **IPv6 support**
- **Beyond 10GbE backplane support to incorporate Network Processing**
- **IPsec protection of the control plane and the user plane with approximately 15 percent overhead on bandwidth due to IPsec headers**
- **MPLS support**
- **Sync. E and IEEE1588 support**
- **Dedicated or shared Protection for (1+1, 1:1, M:N)**



LTE Hardware requirements



ATCA 40G components

- Multi-Core, general compute blade architecture with Virtualization and 10GbE support provides ideal architecture for MME host and signaling function
- New MultiCore Network Processing architecture provides multiple native 10G and high speed Processor to Processor connectivity for P-GW function

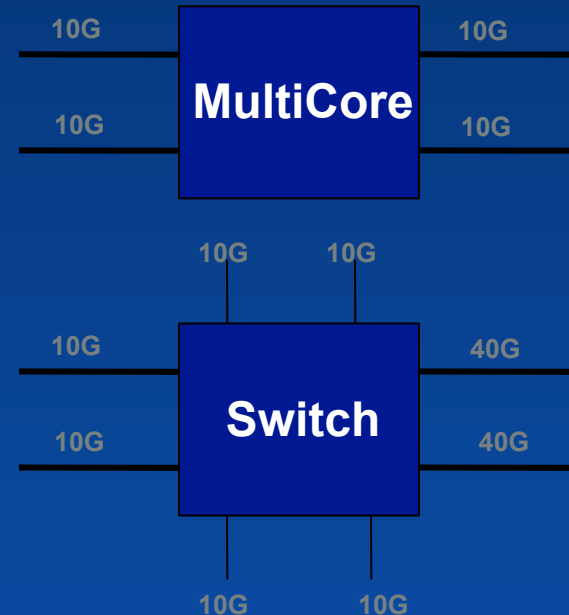
The Key Driver for 40G platform support

- Ethernet Switch Chip Vendors have proven stable 10GBaseKR implementation and 40G I/O

then



now



ATCA 40G components

- ATCA platform
 - New backplane with support for IEEE 802ap and IEEE 802.3BA
- Power beyond 200W per blade to accommodate higher performance Multicore processing and switch blades
- Extended manageability to provide e-keying etc. for 1G, 10G and 40G enabled ATCA components



New Generation of ATCA based platforms

- ATCA is the only Standard based HW platform what is suitable to meet LTE requirements including 40GbE
- LTE is going in deployments now and will increase the bandwidth demand
- Make vs. Buy
- 40G ready platforms are available now to plan ahead

