Nokia Siemens Networks

Signaling is growing 50% faster than data traffic

To enable future-proof mobile broadband networks, Nokia Siemens Networks has designed its Evolved Packet Core to handle high signaling load.

A signaling storm is gathering

With the mass market rollout of LTE, operators face a blizzard of signaling that threatens to overwhelm conventional core networks. As subscribers become increasingly active on social networks and run a growing number of applications at the same time, their smartphones can produce huge volumes of signaling as they interact with the network.

Mobile broadband penetration is set to increase at the same time and as a result, the growth in signaling traffic will significantly outpace the corresponding rise in data traffic. Nokia Siemens Networks estimates that the growth in signaling traffic will be up to 50% faster than the growth in data traffic over the next few years. Yet the increase in smartphone use is just one of the factors behind the explosion in signaling traffic.

Multiple drivers of signaling growth

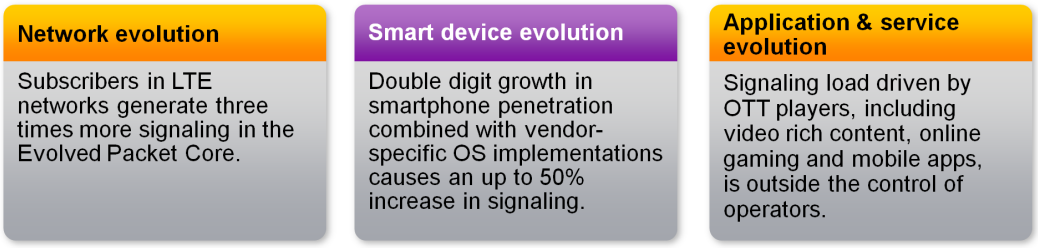

Figure 1: There are multiple drivers of signaling traffic in the fast-changing mobile broadband ecosystem.

Multiple drivers of signaling traffic

- Operators are increasingly relying on service awareness to deliver a better experience for smartphone users. When combined with differentiated charging, the result is an up to 30% (see Figure 2) increase in signaling

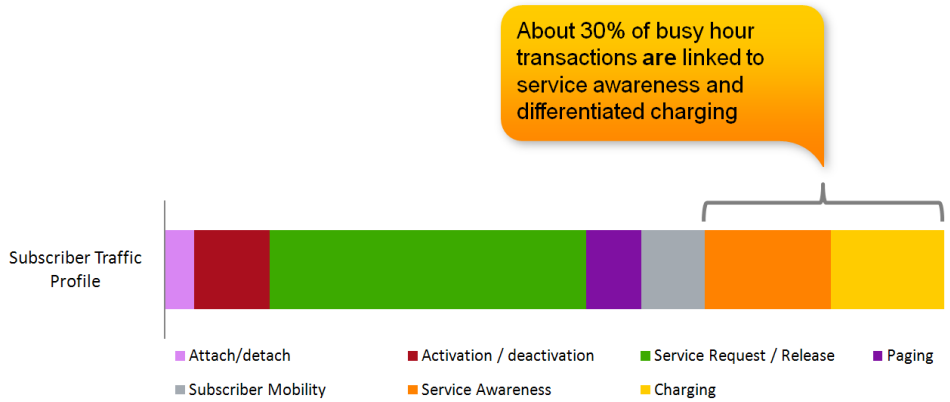

Figure 2: Service awareness and charging differentiation can add a further 30% to the overall signaling load on networks.

- The growing number of Internet-connected mobile machine-to-machine devices and applications with high mobility demands will result in heavy signaling
- Voice over LTE requires scalable signaling capacity and differentiated real-time service experience
- Emerging trends and new business models require scalability of the user and control plane
  - Growing use of online marketing, cloud storage, content business and apps
  - Increasing number of customers who have multiple personal devices
  - Convergence of industries such as media, social networking, healthcare, energy and ecological services, etc.

LTE exposes core networks to signaling load

In 3G networks, the Radio Network Controller (RNC) resides between the base station and core network elements, effectively shielding the core network from the mass of signaling generated by the radio access network for mobility management. In contrast, LTE uses a flat architecture that eliminates the RNC. As the core network is connected directly to the LTE base stations, it must handle all signaling traffic (see Figure 3).

The average signaling requirement per subscriber is up to 42% higher with LTE than with HSPA. It's clear that signaling has become a critical consideration when dimensioning packet core networks.

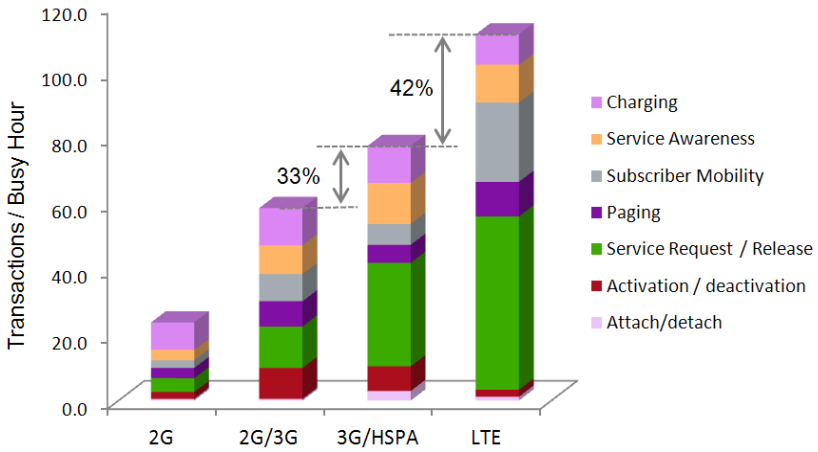

Figure 3: Average signaling requirement per subscriber.

Figure 4 shows the regional variation in transaction requirements based on the network technology, subscriber behavior, regional/local services, etc.

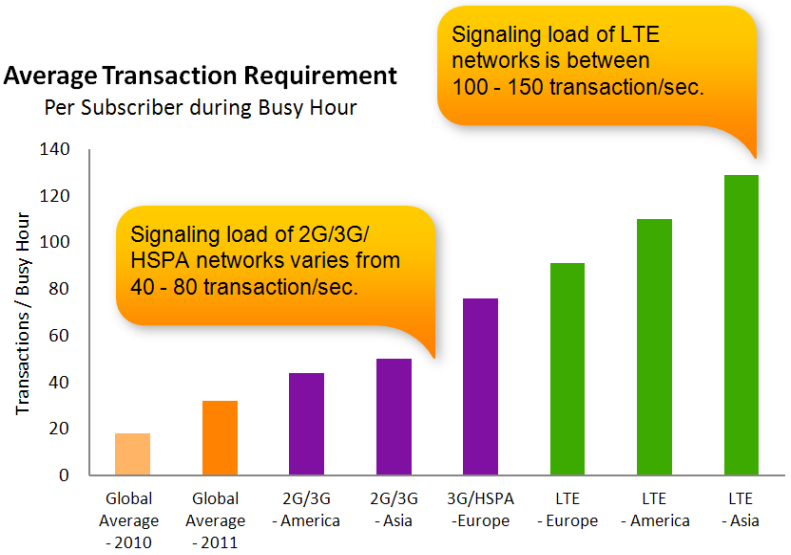

Figure 4: In LTE networks the average signaling requirements are between 100-150 transactions per second.

As Figure 5 shows, the transaction requirements for Evolved Packet Core are growing dramatically and by 2015 will generate 250% more signaling, which the core network must be ready to handle.

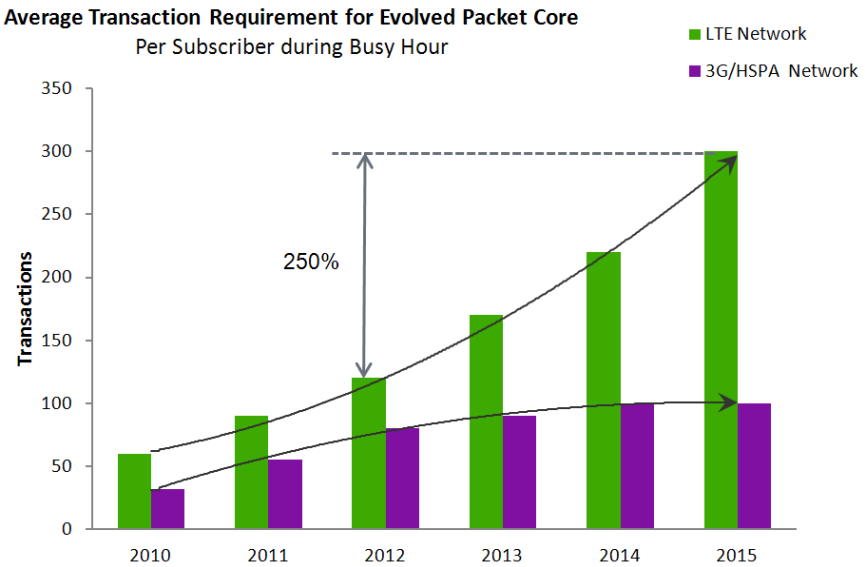

Figure 5: By 2015 the average number of signaling transactions in the core network will increase by 250%.

Signaling places new demands on Evolved Packet Core networks

Evolved Packet Core networks have traditionally been dimensioned for subscriber, session and throughput capacity. Looking ahead, they will also need to be dimensioned for CPU-intensive signaling capacity. For example, the network controlled fast dormancy feature, which improves the battery life of mobile devices, has resulted in highly CPU-intensive mobility management operations.

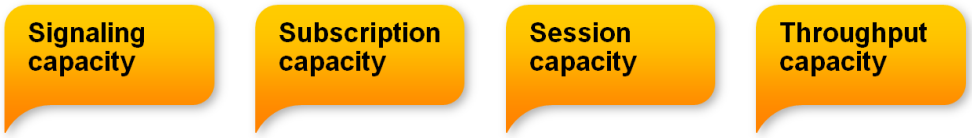

Figure 6: Signaling capacity has become one of the four key elements for dimensioning efficient Evolved Packet Core networks.

The Serving Gateway (SGW), which acts as a user plane anchor for mobility between the 2G/3G access system and LTE access system, is exposed to far more messages than the PDN Gateway (PGW). The PGW is a mobility anchor for all access methods and a gateway to the Internet, corporate intranets and operator services.

In an LTE network, the Mobility Management Entity (MME) is more exposed to signaling.

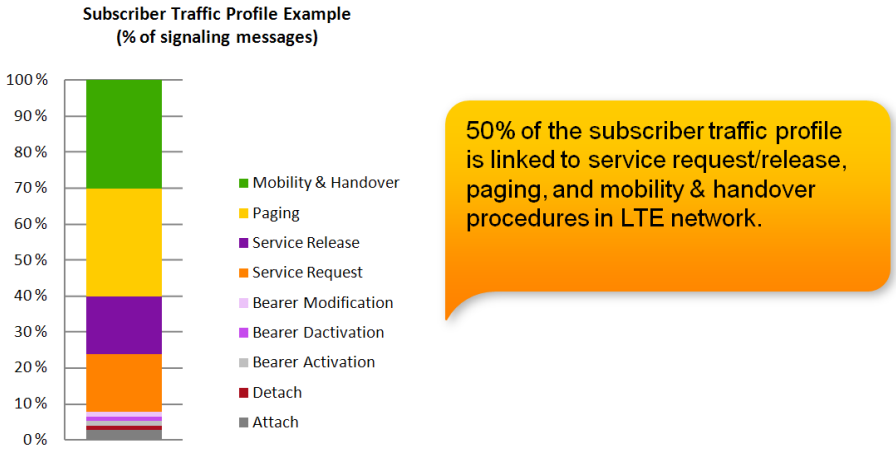

Figure 7: Service requests, paging, and handover control account for 50% of the subscriber traffic profile.

As part of its core network deliveries, Nokia Siemens Network provides recommendations for traffic profiles and key considerations for handling signaling effectively.

Signaling traffic is commonly measured by the number of transactions and messages between network elements, with each transaction comprising one or several messages. This is an important distinction to bear in mind when comparing the specifications of network elements from different vendors.

In an LTE network, operators can expect one million smartphone users to generate 31,000 transactions per second during busy hours. For every subscriber transaction on LTE, the Mobility Management Entity (MME) needs to handle an average of ten messages and 31,000 transactions per second, totaling around 290,000 messages per second in the MME.

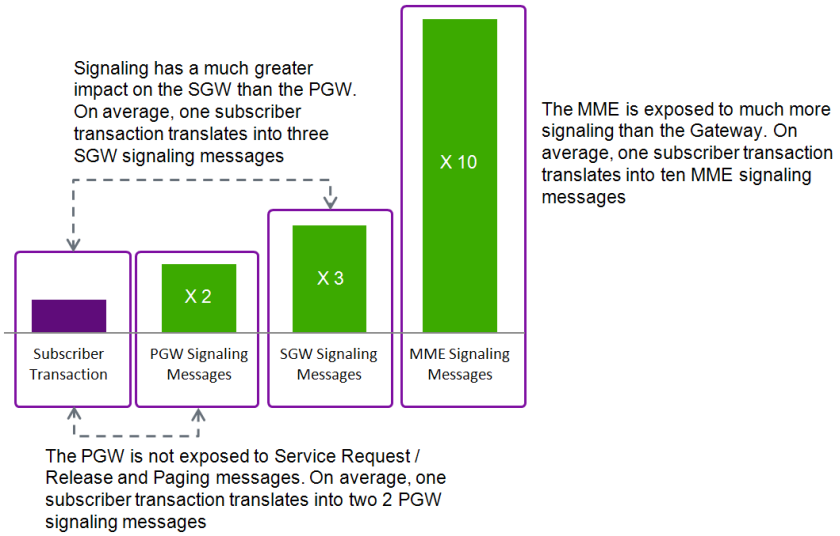

Figure 8: Transactions comprise a different number of messages depending on the network element. For example, one transaction is comparable to 10 messages in the MME, but only 3 messages in the SGW.

Similarly, 31,000 transactions per second will create about 63,000 messages per second in the PGW, but some 94,000 messages per second in the SGW. This is because the PGW is not exposed to service request, service release and paging messages.

Unlike subscriber and session capacity there is no common definition for signaling capacity for packet core products. In practice, this means that vendors can define the signaling capacity as transaction or message capacity. In addition, many packet core network elements available today have evolved from router technology that is fundamentally unable to handle the combination of data and signaling traffic that mobile networks generate.

Nokia Siemens Network packet core is designed to handle high signaling load

Building on its long background in mobile communications, Nokia Siemens Networks has designed its Evolved Packet Core to handle high signaling load.

The Nokia Siemens Networks Evolved Packet Core is built on Advanced Telecommunications Computing Architecture (ATCA®), which is designed to handle high signaling loads, as well as the traditional dimensioning requirements of throughput, sessions and subscribers.

The multi-core packet processor technology used in our Evolved Packet Core makes it possible to handle both high signaling load and high volumes of data traffic. Multi-core processors also enable high flexibility for adapting to variable traffic profiles.

Nokia Siemens Networks
P.O. Box 1
FI-02022 NOKIA SIEMENS NETWORKS
Finland
Visiting address:
Karaportti 3, ESPOO, Finland

Switchboard +358 71 400 4000 (Finland)
Switchboard +49 89 5159 01 (Germany)

Product code: C401-00780-WP-201212-1-EN