Mobile Networks Migration to NGN

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Why a Next Generation Network for Mobile Networks?

> **Same drivers** as for fixed access networks
  - Technological evolution
  - Demand for new services

> **Same constraints** apply as for the fixed networks
  - Continuity of services offered to end-users
  - Inter-working between new and old technologies
  - Cost control of the migration process - even more critical!

> **Mobile networks specific issues**
  - Migration driven by **3G** mobile radio access technology (UMTS)
  - Heavy **standardization** effort for mobile migration (3GPP)
  - Focus on **openness** towards 3rd party providers for new services
GSM based networks evolution

- **2G**: GSM is the leading technology
  - 777.6 Million subscribers by end Nov.02 (GSM Association)
    - 70% of installed base world-wide
  - Growth opportunities in many countries

- **2.5G**: GPRS is a key transition technology
  - Mass market launch already began in 2002
  - Upgrade with existing GSM (2G) radio access or enhanced GSM (EDGE technology) access

- **3G**: UMTS
  - Enhanced capability radio access but...
  - Essentially new services
    - Multimedia Communication, Enhanced Messaging, Location based Services, Online gaming...
    - Optimised voice services over packet transport
Introduction of GPRS Packet Services

Solution to offer **Always-on** data services for mobile subscribers

GPRS specific equipment **Added** to existing legacy GSM radio

GPRS core part **re-usable** in future UMTS steps

Mobile Radio

Mobile Core Circuit Switching

Access to Internet/Intranet, service portals and SMS Gateways

Mobile Core Packet Switching

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Introduction of GPRS Packet Services

- **General Packet Radio Service (GPRS)** introduced as a solution for offering an *always-on* access mode to data services for mobiles
  - *Optimized use* of the *scarce* radio resource
    - *Share the bandwidth* for data services between users of a given radio coverage zone (cell)
    - Radio resources are not monopolized during **idle periods**

- **No modification of the existing radio and core infrastructure for voice services**
  - GPRS adaptation equipment *added* to existing radio infrastructure
  - GPRS specific core infrastructure *re-usable* in further evolution steps

- **GPRS service platform**
  - **Offers access to Internet/Intranet data networks** and to service **portals** (first step towards future UMTS services)
  - **Optimize** provision of 2G data services like Short Messages (SMS)
Introduction of UMTS Radio Access Networks

- Initial **coverage Islands** in UMTS radio technology
- Mixed 2G/3G core equipment (**smooth evolution**)
- QoS-enabled IP backbone
- New Service Capabilities (**location based features**)
- QoS Enabled core data network

- GSM RAN
- UMTS RAN
- Core Router
- Edge Router
- SCF
- HLR
- SGSN
- MSC
- GGSN
- Internet
- PSTN
Introduction of UMTS Radio Access Networks

> Initial introduction of 3G UMTS radio access network (UTRAN) as coverage islands
  • Rest of the network coverage kept with legacy GSM 2G/2.5G radio

> Combined 2G/3G HLR, MSC, SGSN and GGSN network equipment support both types of access (Alcatel’s approach)
  • Smooth upgrade of early 2G equipment

> Backbone data network introduced with QoS features
  • Edge router concentrates ATM streams coming from UTRAN
    - Front-end for both packet and circuit streams
    - Evolves into an access gateway in future evolution steps
  • Core router switches IP traffic with MPLS/DiffServ support

> New service capabilities with location based service support
  • Enhanced intelligent network interfaces for mobiles towards SCP
NGN in Circuit Switching Domain

**Generalization** of UMTS Radio Access Networks

**Evolution** of 2/3G MSCs onto MSC servers

Gateways controlled by MSC servers through **standard** interfaces

Leverage on QoS Enabled data network to support **Voice services**

- **QoS-enabled IP backbone**
- **Optical Core**
- **Core Router**
- **AMR/AAL2 Connectivity Layer**
- **Control Layer**
- **MSC server**
- **BICC**
- **GMSC server**
- **HLR**
- **SCP**
- **Internet**
- **PSTN**
- **GGSN**
- **SGSN**
- **GSM RAN**
- **UMTS RAN**
NGN in Circuit Switching Domain

> **Generalization of UTRAN access**
  
  • Voice coming in *packet mode* (ATM/AAL2) from the access network

> **Leverage on the QoS-enabled IP backbone to support voice services in NGN way**
  
  • Keep voice in original packet mode for mobile-mobile calls
    - Avoid unnecessary and quality decreasing encoding/decoding
  
  • **Evolution** of 2G/3G integrated MSCs into MSC servers (Alcatel’s approach)
  
  • Use of the **H.248** open interface to control Media gateways

> **Media gateways for Access and Trunking functionality**
  
  • Based on the *same platform* as the Edge Router
  
  • Mediation device for voice applications over ATM/AAL2
Introduction of IP Multimedia Service (IMS) architecture

**Multimedia Softswitch** with new services over IP backbone

- **Service Co-ordination layer**
- **Session layer**
- **Application layer**

**Transport & connectivity layer**

- **UMTS RAN**
- **SIP Terminals**

- **Optical Core**

- **QoS-enabled IP backbone**

**Access to Portal and 3rd Party applications through open interfaces**

**Re-Use** of the GPRS equipment to access to the new Multimedia services

**Interworking** with PSTN and legacy PLMN voice Services

**Integrated Management**
Introduction of IP Multimedia Services (IMS)

> IMS is the operator solution to differentiate from commodity-priced best-effort data services
  - Offering end-to-end Quality of service
  - Network operator as the broker of added-value services
    - Services can be offered by 3rd party service providers
  - New business model unlocking new revenue sources

> Multimedia Softswitch providing new services
  - Re-use of the currently deployed packet switched IP backbone and network equipment (SGSN and GGSN)
  - New NGN signaling with new type of end-user terminals
    - SIP protocol with proper extensions to ensure end-to-end QoS per service invocation
  - Open interfaces towards 3rd party service provider
  - Inter-working with voice services through interface with MSC Server
Target All-IP Multimedia Architecture

**Multimedia Softswitch** handling all services including legacy and enhanced voice

**Interworking** with PSTN and voice services

- **UMTS RAN**
- **SIP Terminals**
- **Transport & connectivity layer**
- **QoS-enabled IP backbone**
- **Optical Core**
- **HSS**
- **HLR**
- **Portal**
- **Multimedia Softswitch**
- **3rd party Application**
- **Media server**
- **T-MGW**
- **Multimedia Softswitch** handling all services including legacy and enhanced voice
- **Interworking** with PSTN and voice services


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Target All-IP Multimedia Architecture

> Real growth phase of IP Multimedia Services
  • Technology matures and legacy networks begin to die out
  • Widespread user acceptance of enriched and innovative services

> Migration of the traffic from the circuit switched domain into the packet switched domain
  • Leverage on the capabilities of a unified data transport network
  • Partial re-use of media gateways previously introduced to support IP Multimedia trunking functionality

> Possible advantages
  • Unified services around multimedia (e.g., premium Voice over Packet with 16Khz and higher sampling)
  • Rationalization of investment and maintenance effort
  • Network wide solution providing on demand, guaranteed QoS
Conclusions

> Migration of mobile networks to NGN will likely be driven by the enhanced capability of 3G UMTS access networks
  • Standardization process more elaborated as for fixed networks case

> Speed of this migration will depend on widespread acceptance and appropriation of new services by end-users
  • But also on the maturity of the newly introduced technologies

> Challenges to all actors
  • Network equipment vendors: provide cost-effective solutions based on a smooth network migration
  • Network operators: master the roll-out of new technologies in a controlled and cost effective way
  • Service designers: develop attractive services needed by the largest end-user community (not technophile gadgets)
Thank You!
Questions?