Controlling network costs and developing new revenue sources are key points in the profitability and even survival of network operators. A low TCO solution for operators to deploy value-added convergent fixed-mobile services, Huawei’s Mobile Extension (ME) provides the first step toward fully IMS-centric FMC network evolution.

As more and more operators are striving to reduce TCO, FMC for all access networks utilizing a common core network is a primary objective. The long-term FMC solution is always an IMS Centralized Services (ICS) solution that fully converges voice and advanced multimedia services across fixed broadband, 2G, 3G, 4G WiMAX and LTE networks.

Responding to this need Huawei has developed and launched the Mobile Extension solution. The solution allows operators to easily migrate their existing circuit-switched 2G and 3G mobile networks to the ICS architecture. It offers a low-cost path to reuse the current MSC by adding 3GPP-SIP signaling and media gateway controller function (MGCF) capabilities to the existing MSC hardware via software-only upgrade.

By adding these features, the MSC is able to inter-work with Huawei’s IMS platform to provide convergent SIP-based voice and multimedia features. The Huawei MSC and IMS are both ATCA-based and can easily be co-located in the same equipment rack. Mobile Extension offers operators a cost-effective and future-ready FMC solution based on the existing mobile softswitch and 3GPP R4 baseline network.

A simple entry point for fully IMS-centric networks

By David Randolph Hoelscher
Bringing FMC to your network now

Mobile Extension can be thought of as a cost-effective solution to converge existing fixed access networks with existing mobile access network infrastructure using MGCF and anchoring servers. It is a preliminary step to bring SIP-enabled convergent voice services to the mobile network, leading ultimately to the migration of voice to a unified ICS architecture as defined by 3GPP R8.

In Mobile Extension, the mobile softswitch communicates with the MGW, HLR, and other PLMNs just as in the traditional 3GPP R4 mobile network architecture.

With the Mobile Extension solution, the MGCF functionality is added to the MSC to support 3GPP-SIP inter-working with the IMS. Additionally, an anchoring server is introduced to the network where the server functions to allow call setup processing to be redirected to the Common Telephony Application Server (CTAS) in the IMS domain. The CTAS is the central call processing network element in the IMS fixed telephony network. By extending its call setup function to the mobile network, it makes FMC services available to mobile users.

Mobile accounts that are provisioned to support convergent services will have entries in the HLR that direct the MSC to transfer mobile origination and mobile termination call processing to another network element. The anchoring server handles the redirection routing, sending the call setup requests to the MGCF, which provides 3GPP-SIP inter-working, and finally to the CTAS, which then handles the call processing setup in the IMS domain.

This solution offers several advantages:
1) Call processing functionality can be gracefully migrated from circuit-switched MSC to SIP-based CTAS by modifying HLR database entries on a per-subscriber basis.
2) The entire solution is standards-based, so it can be applied to all MSCs and HLRs in the network.
3) For the Huawei MSC, the MCGF resides on the MSC hardware platform, and is enabled with a software-only upgrade. For other MSCs in the network, introduction of additional stand-alone MCGF network elements may be required.
4) By migrating call processing control from the MSC to the CTAS, convergent services such as Centrex can be enabled for both fixed and mobile users.
5) The CTAS handles calls.

The MSC still performs call control and setup for mobile devices in the 2G and 3G circuit-switched network that are not enabled for convergent services in the HLR. In this way, the existing fixed network can be gracefully extended to provide SIP-based voice and multimedia services to convergence mobile users, and open new business opportunities and economies of scale for unified convergent service deployment, while at the same time retaining the 3GPP R4-based network architecture, call processing, and operations methodologies for the bulk of existing 2G and 3G subscribers.

Mobile Extension: ICS

In the fully convergent ICS network,
all session control and voice services will be migrated from the circuit-switched MSC into the SIP-based IMS domain. The IMS will provide a central core for all access networks, including LTE. The CTAS is responsible for providing call setup and control services for all fixed and mobile voice. Other value-added services such as Telepresence and Centrex can be quickly rolled out to subscribers on any access network.

These key features of the ICS architecture have been standardized in 3GPP R8, 3GPP R9 and R10 are in work and focus on enhancements to VoLTE using the ICS network architecture.

As the IMS is responsible for SIP session control and the CTAS handles voice call setup for all access networks, the MSC is evolved into a mobile access gateway control function (mAGCF), whose main tasks are to manage mobility of the user in the radio network and to manage the CS network media gateways (MGW). The anchoring server is no longer needed, and signaling between MSC, anchoring server, MGCF, and TAS is greatly simplified, only involving the mAGCF and TAS. The mAGCF will still retain legacy MSC capability to handle call setup for roaming 2G and 3G subscribers whose home networks are still based on R4 or R99 circuit-switched architecture.

Evolving the network at your own pace

Every operator has a different set of requirements for value-added service adoption, fixed-mobile convergence urgency, and LTE evolution strategy. However, in the long term, the 3GPP standardized evolution path leads to ICS. The Huawei Mobile Extension solution allows a mobile operator to migrate to SIP and IMS at whatever pace best fits its unique business conditions. With Mobile Extension, hardware investments made today in the 3GPP R4 network MSC are able to be smoothly migrated with software-only upgrades to support initial voice and multimedia service FMC. The final upgrade path to ICS is also software-only change to evolve the MSC to add mAGCF capability. These network evolutions allow the operator to gracefully migrate subscribers from circuit-switched call processing to SIP-based call processing.

Since all Huawei core network control plane elements are based on a common ATCA hardware platform, hardware reuse and compatibility is guaranteed. The Huawei MSC and IMS work on this ATCA platform, and can easily be co-located in the same equipment rack. As network capacity transitions from MSC to IMS/CTAS, processor boards can be re-allocated from MSC to IMS with only software changes being required: 100% hardware compatibility and reuse is supported.

In addition to common hardware, the O&M system for both IMS and MSC are common, helping to ease the transition to ICS architecture, and reduce O&M costs.

The solution allows operators to easily migrate their existing circuit-switched 2G and 3G mobile networks to the ICS architecture. It offers a low-cost path to reuse the current MSC by adding 3GPP-SIP signaling and media gateway controller function (MGCF) capabilities to the existing MSC hardware via software-only upgrade.

Bottom-line benefits of Mobile Extension and ICS: TCO

The technical reasons for the migration to ICS are compelling, especially considering the long-term requirement for LTE support. The business reasons for migrating to Mobile Extension and ICS are significantly reduced TCO and new service revenue opportunities.

With Huawei’s Mobile Extension solution, a graceful evolution of the core network to ICS is assured. Common ATCA hardware, operating system, middleware, O&M, and provisioning systems ensure easy transition for the operational staff, and reduce workload in network support. The long lifecycle and software-centric approach of the ATCA platform ensure long-term security in the hardware investment. By extending current MSC capability to include MGCF; and evolving the network to gracefully migrate subscribers to the FMC services available via the IMS, the solution gives real flexibility to operators’ business needs and network transformation strategy.

Top-line benefits: new revenue streams

From a revenue standpoint, the ability to provide mobile users with advanced convergent services utilizing existing MSC equipment offers an immediate stream of revenue, and can increase customer loyalty by providing new advanced services and unified billing opportunities to individual and enterprise users. The graceful upgrade path to ICS architecture allows for new services that blend access networks and creates new ways to blend telecommunications and IT applications. For examples, Huawei can immediately provide operators with IP Centrex, One Key, eSpace, IPTV, amongst others.

In addition to these instantly available FMC multimedia services developed by Huawei, the IMS combined with the service delivery platform allows operators to develop their own in-house applications. Perhaps even more importantly, an IMS centralized network with SDP allows third-party software developers appropriate APIs to develop and integrate exciting new services. Leveraging the creativity, excitement, and ecosystem of the IT and software development industries to generate profitable applications for the operator is the ultimate revenue generation engine for telecom operators.

A fully IMS-centric future is beckoning. With Mobile Extension, Huawei and operators are walking hand in hand toward this infinitely promising future.