Fixed-mobile convergence: new challenges for network operators

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Fixed-mobile convergence (FMC) is gaining considerable attention from wireless and fixed network operators, as well as manufacturers of mobile devices and network equipment.

For many operators, FMC appears to be the quickest way to roll out new applications and services that combine the advantages of wireless with the advantages of fixed networks. For others, FMC is merely a stepping-stone towards full network convergence using technologies such as IP multimedia systems (IMS). But for most, the major application for FMC is voice convergence – namely the ability to seamlessly roam on a cell phone or handheld between WiFi and cellular networks.

Convergence

Convergence occurs at many different levels within the communications industry. At the device level, new dual-mode handsets and devices are only now coming to market: e.g. WiFi/GSM, WiFi/CDMA, WiFi/W-CDMA and UMA handsets. At the network level, network operators continue to migrate their networks towards all-IP infrastructures that will eventually support triple-play services. And at the service level, new applications and services that leverage IP packetised video, voice and data for richer, more personalised services and applications are underway or near deployment.

Service providers that can capitalise on convergence and deliver the new personalised services will be well-positioned in a highly competitive market. The downside, or risk is that consumers have come to expect a high quality of service, independent of how the network is accessed. The customer who traditionally accessed applications via DSL or cable modem will now expect the same quality of service when accessing their application over wireless – like 3G or WiFi.

The bottom line is: how will service providers and network operators ensure that the quality of service they offer is adequate? Particularly given the fact that multiple networks may be involved. For many, the answer to this question is critical – considering what's at risk when you lose a paying customer to the competition. A false start in FMC will delay substantial adoption and revenue growth.

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FMC introduces yet another new definition of what “end-to-end” means for services. With FMC, part of the issue is that the definition of end-to-end depends on which networks are involved in delivering a particular service. If, for example, the customer accesses the service from a WiFi or cellular network, the operator will need to monitor and trouble-shoot at least three networks at any given time – where each network may be a different technology; e.g., WiFi, IP broadband access/core, or mobile. To add to the complexity, each of these network technologies is constantly in flux, undergoing constant change in an effort to keep up with customer and market demands. Some examples of this are the multiple WLAN standards, or the current state of a cellular network (UMTS release 4, 5 or 6, etc.).

Operators offering FMC services have to support a converged network environment, which physically translates to:
- New access methods
- New signalling protocols
- New network elements
- New supported multimedia services, and
- New OSS/BSS applications.
- Integrated user authentication and security.

FMC also introduces a new session model for a FMC service, which not only has more messages per call but also more variations of signalling flows, depending on the network. If more traffic is introduced as a result of these new service offerings, network operators may be forced to re-optimise the underlying networks involved in the delivery of these services. And finally, there are the issues related to roaming and automatic handovers between WiFi and cellular that will have a significant impact on the quality of experience for the end-user. Undoubtedly, all of this complexity must be managed by the network operators to ensure that the end-user’s experience is of high quality – and if not, problems must be quickly recognised and resolved.

Taking a look at the physical networks involved in an FMC service, operators will be required to manage and trouble-shoot multiple access technologies. For example, an operator offering...
an FMC service to its enterprise customers may use WLAN over a DSL broadband IP connection while a consumer subscriber may be using FMC services through a mobile access network such as GERAN or UTRAN. For each access method available, different network elements will be utilised. To ensure the seamless operations of FMC services for the end-user, the network operator must have end-to-end visibility of the service and be able to manage all of the network elements involved.

FMC is more than making sure the connection is established and maintained – it’s about offering more multi-media IP-based services. As more network operators migrate towards offering IMS-based applications for FMC customers (like gaming, instant messaging, streaming video, etc…), the ability to manage the migration to IP becomes critical in maintaining a high customer quality of experience. Some of the IP-related issues network operators are faced with are: interoperability between IP and legacy networks, QoS visibility and management, authentication/billing, security and network capacity planning.

While FMC requires operators to have a good strategy for managing the access networks, the complexities in migrating to an IP core network cannot be ignored.

In addition to network and technology considerations, network operators have to deal with the impact that convergence brings about in internal organisation support structures and business processes. Network operators must be able to quickly characterise a problem so that its resolution can be assigned to the appropriate technical group. FMC will also impart customer care, billing and sales and marketing groups.

Test, measurement and monitoring solutions

As with most major new technology initiatives, the challenge begins with the network equipment manufacturers. For equipment manufacturers, the major points of concern are:

• Do the network elements perform according to specifications?
• Do they perform accordingly under loaded real-world network conditions?
• Does the equipment interoperate with other equipment?

Many are looking towards telecoms and internet converged services and protocols for advanced networks (TISPAN) to provide guidance and standardisation for converged services and the associated protocols that come with it. The concept of TISPAN centres around subsystems co-operating with one another and the sharing of common components. Whether TISPAN is ready or not, equipment manufacturers designing FMC equipment will need to rely on equipment such as the Tektronix Spectra2 for converged, multi-protocol analysis to address these needs.

From a service assurance perspective, today’s advanced network monitoring systems combine the benefits of both passive and active monitoring. Passive network monitoring systems resides within the network and perform non-intrusive diagnostics of the network. With correct planning and probe layout, network operators have the ability to drill-down and isolate the individual network element that may be impacting end-to-end service quality. An example of this type of system is the Tektronix GeoProbe/Unified Assurance solution that gives network operators end-to-end visibility into service delivery performance in real time. In the example below, the quality of a voice call is measured using a high-level key performance indicator (KPI), which is based on a mean opinion score (MOS). When the quality of the call decreased below its minimum threshold, the operator was immediately notified. From here, the operator can then drill-down to the specific network elements and signalling involved to troubleshoot and resolve the situation.

In an active test system, end-to-end test calls are introduced into the network and analysed, as opposed to monitoring actual traffic (as with passive monitoring systems). With active test, network operators can isolate and troubleshoot individual links that may be suspect because active test calls have known reference media contents, deep comparative analysis at both the analogue and packet layers, leading to quick root cause determination and problem resolution. In addition, self-diagnostic tests calls can be initiated to test end-to-end service quality directly to the FMC handheld device.

By combining passive and active monitoring techniques, network operators are in a better position to not only maintain the end-to-end quality of service, but also be proactive in managing and allocating their network resources. In the case of fixed-mobile convergence, operators will need to anticipate what will happen at the network and service level and how these results will impact the end-user’s quality of experience.

Conclusion

Given the challenges that network and service operators will face to deploy fixed-mobile convergence successfully, there are a few key points to keep in mind:

• The physical implementation of fixed-mobile convergence is different for every network operator such that the “one-size-fits-all” approach cannot be adopted. No two networks or FMC deployment architectures are the same, with little consistency between operators. As a result, equipment manufacturers and service providers need to focus on the specific convergence needs for a given market – but be aware that any decision they make today may impact future capabilities. From a test and monitoring perspective, it is important that your solution not only meets your needs today, but is scalable and expandable.

• Fixed-mobile convergence involves different types of wired and wireless access technologies. It is important that your test and monitoring solutions cover both the breadth and depth of technologies and standards that are necessary to ensure end-to-end quality of service for your customers.

• Customers expect a high quality of service - independent of the network from which they accessed their application. From a business perspective, it is also important that customers are satisfied and that their contributions to ongoing profitability are maintained. Quality assurance may sound straightforward, but it’s not when you consider the complexity in managing an end-to-end session that involves fixed and mobile network elements, protocols and signalling.

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Fig. 2: Fixed-mobile convergence.