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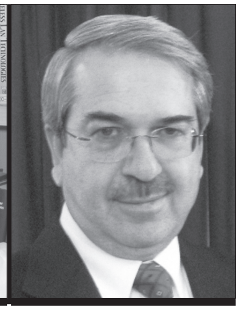

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# IP MULTIMEDIA SYSTEMS INFRASTRUCTURE AND SERVICES

IMS is the foundation for the next-generation IP-based networks, as specified by the Third Generation Partnership Project (3GPP/3GPP2) standards organizations and embraced by the European Telecommunication Standards Institute's Telecoms and Internet Converged Services and Protocols for Advanced Networks (ETSI TISPAN) group and International Telecommunication Union — Telecommunication Standardization Sector (ITU-T). The standards support multiple access technologies such as Global System for Mobile Communications (GSM), wideband code-division multiple access (WCDMA), CDMA2000, wireless local area networks (WLANs), wireline broadband, and cable.

The IP multimedia subsystem (IMS) defines a control layer — on top of IP-based fixed and mobile networks — that enables seamless provisioning of multimedia services riding over the control layer. This is realized by extending Internet Engineering Task Force (IETF) protocols such as the Session Initiation Protocol (SIP) and Diameter for multimedia session control and authentication, authorization, and accounting (AAA). Key IMS components are the call/session control function (CSCF), home subscriber server (HSS), media resource function (MRF), and application servers (ASs).

IMS offers a framework that both wireline and wireless operators can leverage to deliver new and revenue-generating services. This framework is called the *service factory* by some to amplify its faster service development and deployment capabilities, allowing service providers to react to the market quickly and be profitable.

IMS aims to make Internet technologies, such as instant messaging, presence, and voice and video conferencing, available to everyone from any location over any network. It is expected to allow service providers to control the network and, in return, provide better security, quality of service, and single sign-on for a combination of existing telecommunications services such as voice, short message service (SMS), and multimedia messaging service (MMS), and IP-based services such as IPTV, instant messaging, push to talk, and Web browsing. Switching between services will be seamless. Key benefits of IMS to service providers can be summarized as follows:

- A common access-agnostic core network supporting all applications instead of application specific networks, resulting in lower capital and operational expenditures
- Simplified creation of blended services such as combined presence, instant messaging, and telephony
- Delivery of applications across the fixed-mobile boundary
- Faster deployment of new applications based on standardized modules

As interest in fixed-mobile convergence continues to rise, IMS is emerging as the technology that enables service providers to move beyond the limitations of today's cellular mobile architectures. IMS is already being deployed in many trials and for a small number of commercial services, but it is expected to grow as service providers move from trials to full-scale deployment. Gaming, push-to-talk over cellular (PoC), and presence-based services are expected to drive IMS deployment in the mobile domain, while services such as VoIP, IPTV, and fixed/mobile convergence (FMC) are expected to drive deployment in the fixed network domain.

IMS was initially standardized by 3GPP as part of its Release 5 specifications in 2003 as a new service layer on top of IP-based 3G networks. Release 6 specifications in 2005 addressed IMS interworking with legacy circuit networks and other IP networks as well as harmonization with emerging PoC and related service enabler standards defined by the Open Mobile Alliance (OMA). In Release 7 specifications the IMS scope is extended to any IP networks, including fixed access networks. In addition, the Release 7 addresses decreasing latency and improvements to real-time applications such as VoIP. The ongoing Release 8 addresses 3GPP long-term evolution (LTE) and system architecture evolution (SAE), including IMS-based emergency services.

The IMS standardization effort focuses primarily on the IMS core network elements and protocols, including IMS application server options: Customized Applications for Mobile Network Enhanced Logic (CAMEL), Open Services Access (OSA)/Parlay, and SIP ASs, but excludes standardization of applications. OMA investigates the applications space by standardizing service enablers on top of IMS.

IMS architecture as defined in relevant standards is complex due to the number of interfaces and definitions of functional entities. This complexity results in various challenges in deploying IMS services:

- Simplification of the architecture
- End-to-end multivendor interoperability
- End-to-end network management
- Interaction of services layer with control and transport layers
- Policy management across various market verticals to effectively provide service offerings while guaranteeing service quality

- Coexistence and use of legacy technologies such as 3G, ATM, WLAN, Ethernet, WDM, and SONET
- Use of multiple access technologies in an agnostic fashion
- Simplified and flexible billing
- Delivery of more complex and blended applications
- Length of SIP control messages, which is extremely large for wireless control channels

These challenges in architecture, protocols, and operations are being worked in the industry. This feature topic intends to address challenges at the infrastructure and service levels. More specifically, the six articles we selected for this feature topic address the IMS architecture and interoperability issues, and provide real deployment examples.

The first article, "Service Delivery Platforms in Practice" by Christopher J. Pavlovski, presents the results of IT-based service delivery platform (SDP) deployments, outlines a large number of common and successful characteristics, and suggests incorporation of these characteristics into IMS by presenting a consolidated set of SDP capabilities.

The second article, "Experiences with Blending HTTP, RTSP and IMS" by Sohel Q. Khan, Robert Gaglianello, and Michael Luna, describes first a vision of a hybrid platform — exemplified by shared streaming video and multimedia proxy platforms — and presents solutions for how Real Time Streaming Protocol (RTSP), SIP-based IMS for voice and video telephony, and HTTP proxy networks can be integrated toward realizing the aforementioned vision.

The third article, "Towards an Innovation-Oriented IP Multimedia Subsystem" by Gonzalo Camarillo, Tero Kauppinen, Martti Kuparinen, and Ignacio Más Ivars, identifies shortcomings of the current IMS policy control and proposes a new modular and scalable approach to overcome these drawbacks, and offers operators a way to update policies without significant changes in the core network.

The fourth article, "IMS Interoperability and Conformance Aspects" by Mischa Schmidt, Andreas Wilde, Anett Schülke, and Henrique Costa, highlights the importance of interoperability and conformance testing of IMS products. It addresses a number of key interoperability aspects to be considered when using 3GPP IMS, ETSI TISPAN, and OMA standards-based network entities.

The fifth article, "Interworking of WiMAX and 3GPP networks Based on IMS" by Fangmin Xu, Luyong Zhang, and Zheng Zhou, presents an overall architecture for integrating IMS and WiMAX, providing solutions to support different levels of service interconnections, especially at the session negotiation level using SIP, Common Open Policy Service (COPS)/Go, and Diameter protocols.

The sixth article, "A Distributed IMS Enabled Conferencing Architecture on Top of a Standard Centralized Conferencing Framework" by A. Buono, S. Loreto, L. Miniero, and S. P. Romano, describes an IMS compliant distributed conferencing framework, and shares implementation and deployment experiences of the authors.

We hope that the readers find the articles informative, and this feature topic contributes to better understanding of the current issues and challenges in the IMS field. We would like to thank all the authors of all articles submitted to this special issue, and the reviewers who have given their time generously and provided valuable feedback and comments on the papers to make this feature topic a reality.

## BIOGRAPHIES

MEHMET TOY [SM] (mtoy@advaoptical.com) received his B.S. and M.S. in electronics and communications from Istanbul Technical University, Turkey, in 1976, and his Ph.D. in electrical and computer engineering from Stevens Institute of Technology, Hoboken, New Jersey, in 1982. He is currently a network consultant at ADVA Optical Networking, Inc., Mahwah, New Jerseey, for metro Ethernet products. Prior to his current position, he held managerial and technical positions in Intel Corp., Verizon Wireless, Axiowave Networks, Fujitsu Network Communications, AT&T Bell Labs, and Lucent Technologies. He led IMS software/hardware integration and architecture definition at Intel Corp., represented Verizon Wireless in 3GPP2 standards, and participated in the development of the Verizon Wireless IMS architecture. In Axiowave Networks, Inc., he led a software development program and was involved in the research and development of an IP/MPLS packet router and MEMS-based optical crossconnect. He led an architecture team for the research and development of ATM/IP/SONET access multiplexers at Fujitsu Network Communications. AT AT&T Bell Laboratories and Lucent Technologies, he was involved in various research and development projects in transmission and data networking, including the research and development of ATM switching systems. He served as an assistant professor at the University of North Carolina at Charlotte and taught at various universities including the Worcester Polytechnic Institute in Massachusetts and the New Jersey Institute of Technology. He has publications in the data networking and signal processing areas. He is the author of the IEEE video tutorial *ATM Switching System Management via Open Interfaces* and of the edited books *Optical Networking I: Architectures, Devices, Cross Connects and Switches*, *Optical Networking II: Signaling and Routing, QoS, and Network Management*, and *ATM Development and Applications* (IEEE). He served on the *IEEE Network* editorial board, and chaired the IEEE Communications Society IPAC and IEEE USA PACE Committees.

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