

## IPTV and IMS in Next-generation Networks

### Choosing the right approach for IPTV integration

IPTV is the next frontier for multimedia information and entertainment over service provider networks. As service providers worldwide consider introducing IPTV in their next-generation networks (NGN), industry standards groups have identified two key approaches to IPTV integration. This paper examines IMS-Integrated and IMS-based IPTV, beginning with a review of work underway within the various standards bodies and concluding with an assessment of key functional aspects of each approach, as well as its impact on IPTV network performance and end user quality of experience (QoE).

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## Service Delivery in Today's Networks

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In today's networks, services are created and delivered using many technologies and architectures, all of which have been implemented at different times to enable the delivery of specific types of services. Each has unique requirements for service creation, session control, resource allocation, and service delivery enabling mechanisms, such as authentication, policy control, subscriber management and billing.

For example, IP Multimedia Subsystem (IMS) application servers use Session Initiation Protocol/IP Multimedia Service Control Interfaces (SIP/ISC) for session control of conversational services. However, IPTV platforms use real time streaming protocol/hypertext transfer protocol (RTSP/HTTP) for interactive content, and Internet group management protocol (IGMP) for broadcast services.

Each implementation enables the optimal delivery of specific services. The system designed to support that delivery can be collectively referred to as a "service-optimized" service delivery platform (SDP). In this respect, IMS and IPTV can be viewed as discrete, service-optimized SDPs that can be effectively integrated to create unique, cross-domain, blended services.

Service blending may be as simple as displaying notifications of incoming calls, e-mail or text messages on a TV, or as complex as combining location, presence and calendar information with video delivery and mapping applications to direct an individual to a scheduled destination (for example, directions to a customer meeting, or a walking tour of Paris). This service blending between an IMS SDP and an IPTV SDP is the foundation of IMS-integrated IPTV. By contrast, IMS-based IPTV uses IMS as a control mechanism to manage IPTV sessions and deliver IPTV services.

Both approaches (IMS-integrated and IMS-based IPTV) are the result of extensive work within various standards bodies. Each offers benefits that impact IPTV network performance and end user quality of experience (QoE). As a result, there is no one solution that will fit the needs of all service providers who want to launch IPTV services. Therefore, each service provider must consider the alternatives and select the solution that best meets market objectives.

## Understanding IMS and IPTV

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IMS is the architecture developed by the 3rd Generation Partnership Project (3GPP), a consortium of global standards organizations, to deliver converged multimedia services in a mobile IP core network. It has been adopted by several international standards bodies, including Telecoms & Internet Converged Services & Protocols for Advanced Networks (TISPAN), the International Telecommunication Union (ITU) and the Alliance for Telecommunications Industry Solutions (ATIS). IMS is a core component of a next-generation network (NGN) architecture that supports delivery of SIP-based multimedia services to NGN terminals in the wireline world. Conversational services such as voice and video telephony, push-to-talk/show/share, short message service (SMS) and multimedia messaging service (MMS) are examples of services well suited to IMS.

IPTV solutions are optimized to deliver video entertainment (multicast broadcast TV and unicast video on demand (VoD)) over IP networks. Standards groups for IPTV and IMS have not delivered a ratified standard to support the effective coupling of IPTV with IMS. In fact, there is still a question in the industry about the need to select only one ratified approach, since IMS and IPTV can both be considered service-optimized SDPs and optimal protocols already exist for delivery of voice, video, and messaging services.

For all standards bodies, the challenge isn't so much a matter of whether to use one or two protocols for everything, but how to enable a standards-based environment in which efficient blending between service-optimized platforms can occur to support creation and delivery of blended services.

## IMS and IPTV in NGN

A NGN has been defined by several standards bodies, including the ATIS IPTV Interoperability Forum (ATIS IIF), the ITU, the European Telecommunications Standards Institute (ETSI) and TISPAN. In the definitions developed by all these organizations, NGN architectures and functional elements are similar and usually grouped into two layers:

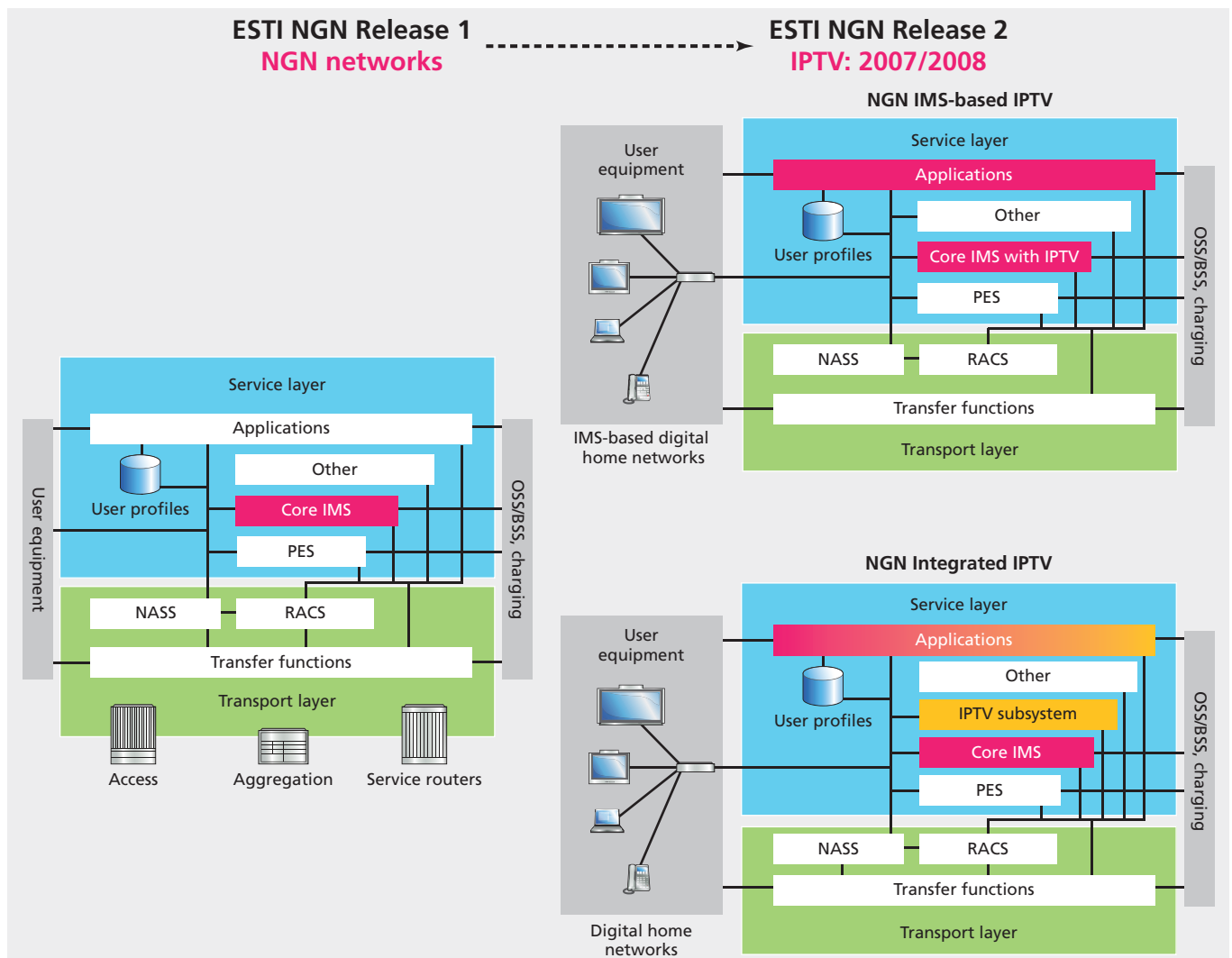
- *NGN transport layer*, which contains transport processing functions that may include different access, a common Network Attachment Subsystem (NASS) and a common Resource and Admission Control Subsystem (RACS)
- *NGN service layer*, which contains IMS, PSTN/ISDN Emulation Subsystem (PES) and common elements such as a User Profiles Service Function (UPSF).

The NGN Release 1 specification includes some communication standards (for example, PES, IMS) but does not consider IPTV. Two approaches have been suggested to accommodate the addition of IPTV:

- IMS-based IPTV: extend IMS to support basic IPTV services
- NGN Integrated IPTV (IMS-integrated IPTV): integrate IPTV alongside IMS

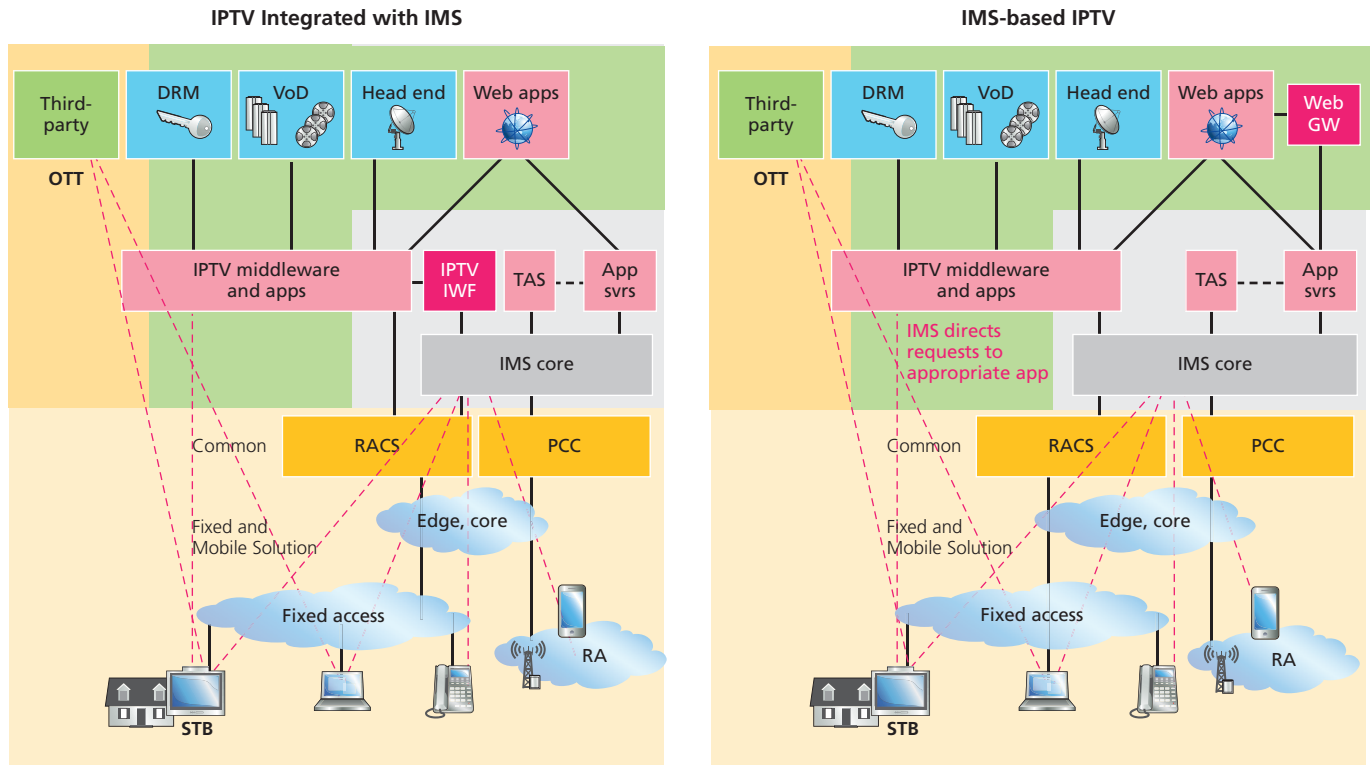
The development path for NGN under the ETSI TISPAN standard is illustrated in Figure. 1. ATIS IIF and ITU architecture paths are similar to ETSI TISPAN.

Figure 1. NGN development in ETSI TISPAN



Both IMS-based and IMS-integrated approaches in ETSI TISPAN, ATIS IIF and ITU share aggregation and core networks across multiple services, including IPTV, voice over IP (VoIP), and data (illustrated at the transport layer as transfer functions). In addition, both leverage common network management infrastructure (RACS/Policy and Charging Control (PCC) and NASS), but differ on the degree of integration of IMS-based communication services and web services. These differences are illustrated in Figure 2.

Figure 2. IPTV architectures



IPTV and IMS services integration is available through both approaches. In addition, from a standards perspective, both approaches offer a similar set of standardized services. However, the approaches differ in the level of integration with communication and web-based services. Solutions based on the IMS-integrated (NGN Integrated IPTV) approach are well-suited for integration with web-based services (such as HTTP delivered content, Internet TV, adaptive streaming) because they have native support for web-based interfaces. IMS-based IPTV requires interworking between services not based on SIP via applications or a web gateway as shown in Figure 2.

NGN Integrated IPTV has been developed to offer migration for existing IPTV solutions into NGN without changing client side protocol stacks. Conversely, migration into NGN via an IMS-based approach requires new client devices to access SIP-based network and service control.

## Selecting the Right IPTV Approach

Service providers must consider a number of factors to determine the best approach for a migration to IPTV. Carefully weighing the pros and cons of each will ensure that the approach chosen meets each service provider's unique business objectives.

### Efficiency

The volume of control messages required to support access and management of IPTV services, such as broadcast TV, VoD, targeted advertising, time-shift TV, restart TV and others, is an important consideration.

An IMS-based IPTV approach requires extra SIP messages to access and control services, as well as ‘native’ IPTV protocols, such as RTSP, IGMP, and HTTP. NGN Integrated IPTV requires three to four times fewer control messages for unicast services (VoD, restart TV, nPVR) and over eight times fewer messages for linear TV services (broadcast TV). The increased messaging associated with an IMS-based IPTV approach is sometimes referred to as a “SIP messaging tax”. The SIP messaging tax increases channel zapping time. This makes fast channel changes, which have proven to be popular with IPTV users, inefficient.

An IMS-based IPTV signaling analysis study performed by Alcatel-Lucent Bell Labs has also identified the following:

- An IMS-based centralized resource control mechanism generates 50 percent more signaling messages compared to non-IMS based centralized mechanisms. This is in addition to the three to four times increase for IMS service control for on-demand services and the seven to eight times increase for linear services.
- The potential for flooding the network with messages in support of consumer device-based PVR activities is significant. Consumer PVR sessions will likely start almost simultaneously in a very small window during peak viewing times. The signaling message count required to support this activity in an IMS-based architecture may be as high as 15 times more during the PVR “tuning window” relative to a “manual tuning window” for the same resource control mechanism.
- Resource control messages may contribute as much as 66 percent of the signaling load during peak times. By contrast, an access node-based resource admission control mechanism can result in as much as 85 percent fewer signaling messages being exchanged compared to IMS-based centralized resource control.

SIP messages generate billable revenues for communication services (for example, VoIP, SMS) because users are billed per service (per call, per SMS). However, with IPTV, extra SIP messages do not generate additional revenues because users are typically billed per broadcast packages or per VoD purchased.

Network scalability must be evaluated to determine the ability to support more near real-time SIP messages for channel access, channel zapping and VoD access. Unlike communication services, these investments are not directly tied to revenue and, therefore, the service provider will have to bear the cost.

### **QoS for linear services**

IMS is designed as an end-to-end call management infrastructure that provides quality of service (QoS) between two call endpoints.

Linear IPTV services are delivered using IP multicast. With IP multicast, the second IP endpoint is not known to IMS service control. Each multicast replication tree may end either at a multicast replicator in an access node or in network elements in the core network. Therefore, central-based admission control used by IMS cannot provide end-to-end QoS for linear services if the multicast tree is not available in the local access node.

NGN Integrated IPTV resolves this problem by using an alternative approach based on local admission control.

### **Integration with Internet and premium over-the-top video services**

IPTV solution providers can benefit from joint business models that include on-boarding select third party content owners who can provide the content services end users want. Therefore, IPTV networks should have the flexibility to support business models that do not lend themselves to the IMS SIP-based “fixed” network bandwidth reservation approach.

To deliver new content services, providers can use HTTP adaptive streaming, which varies video bandwidth dynamically based on network state and is emerging as the de-facto protocol for premium video delivery over the Internet. By providing QoS via content distribution network (CDN) caching and adaptive HTTP streaming, service providers can offer a differentiated IPTV end user experience.

### **Leveraging consumer electronic trends**

Market research predicts significant growth of “Net TV” and connected home devices sales worldwide with 225 million Net TV units sold by 2012 and 450 million by 2014.<sup>1</sup> Net TVs are TVs with an integrated web browser and HTTP player. IPTV solution providers with networks relying only on IMS SIP service management would require residential HTTP-to-SIP gateways to reach consumers with Net TVs or connected home devices. NGN Integrated IPTV supports simple integration with Net TVs or connected home devices.

The Alcatel-Lucent IPTV solution supports a web interface compatible with the most common Net TV browsers. Therefore, it allows service providers to reach Net TV users directly. With the Alcatel-Lucent solution, service providers get open interfaces for fast integration and trial of multiple service bundles that blend IMS, IPTV and web services (including Internet video and third party content).

The Alcatel-Lucent offering is based on the NGN Integrated IPTV approach and provides a number of key differentiating features, such as local admission control for multicast, network-based fast channel change, CDNs, assured per-flow quality control, and network-based application assurance.

## **Conclusion**

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Active participation in open standards creation is a responsibility that Alcatel-Lucent takes seriously. We believe open standards for core functions is a requirement for a cost-effective deployment of IPTV. We also believe that the entire industry benefits when standards are adopted and adhered to. Most importantly, we believe differentiation through innovation and exceptional delivery will maintain the health of the industries in which we participate.

To this end, Alcatel-Lucent maintains active membership in a number of initiatives that promote open standards for IPTV, including ATIS IIF, Digital Video Broadcast (DVB) and ETSI/TISPAN. Alcatel-Lucent is also an active member of the Open IPTV Forum (OIPF) and serves on its board. We see the OIPF as an important standards body that is enriched by the presence of major players from the consumer electronics industry who will play an active role in fostering the interoperability of IPTV solutions.

The variety of activity focused on IPTV within all these standards bodies is a testament to the fact that there is no one solution that will fit the needs of all service providers. Each service provider must carefully consider the alternatives and select the solution that best meets specific and unique market objectives. But the common denominator required by all service providers is flexibility. This is key because end user expectations will continue to evolve and become even more demanding with respect to content access.

Based on current trends and its experience as the global leader in deploying and supporting IPTV solutions, Alcatel-Lucent favors an NGN IMS-Integrated IPTV approach. With this approach, web-based and communication-based architectures and technologies can each evolve as best-in-class within their respective domains. Integrating these domains allows a service provider to take

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<sup>1</sup> “Open IPTV Forum White Paper”, Open IPTV Forum, January 2009, [http://www.oipf.org/docs/OIPF-T2-Whitepaper\\_V2\\_0.pdf](http://www.oipf.org/docs/OIPF-T2-Whitepaper_V2_0.pdf)

better advantage of advancements in technologies and leverage existing assets, as opposed to force-fitting IPTV and existing assets into an IMS-based IPTV approach. And a NGN Integrated IPTV approach enables:

- A smooth migration for existing video distribution platforms
- Efficient service control (without a SIP messaging tax)
- Fast channel change
- Efficient multicast control
- Open interfaces for integration with web services
- Support for service blending (service brokering)

Most importantly, all of these benefits support delivery of IMS-based communication services (call session management, presence, instant messaging, location, and more) to IPTV platforms in a cost-effective and efficient manner.<sup>2</sup>

## Acronyms

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3GPP	3rd Generation Partnership Project
ATIS	Alliance for Telecommunications Industry Solutions
ATIS IIF	Alliance for Telecommunications Industry Solutions IPTV Interoperability Forum
CDN	content distribution network
DVB	Digital Video Broadcast
ETSI	European Telecommunications Standards Institute
HTTP	Hypertext Transfer Protocol
IGMP	Internet Group Management Protocol
IMS	IP Multimedia Subsystem
IPTV	Internet Protocol Television
ISC	IP Multimedia Service Control Interfaces
ISDN	Integrated Services Digital Network
ITU	International Telecommunication Union
NASS	Network Attachment Subsystem
NGN	next-generation network
OIPF	Open IPTV Forum
MMS	multimedia messaging service
PCC	Policy and Charging Control
PES	PSTN/ISDN Emulation Subsystem
PSDN	Public Switched Data Network
PSTN	Public Switched Telephone Network
QoE	quality of experience
QoS	quality of service
RACS	Resource and Admission Control Subsystem
RTSP	Real Time Streaming Protocol
SDP	service delivery platform
SIP	Session Initiation Protocol
SMS	short message service
TISPAN	Telecoms & Internet Converged Services & Protocols for Advanced Networks
UPSF	User Profiles Service Function
VoD	video on demand
VoIP	voice over IP

<sup>2</sup> For more information about the Alcatel-Lucent approach to IPTV and IMS integration, see the Alcatel-Lucent white paper "IMS Integrated IPTV with Multi-Screen screen Foundation: Delivering content with enriched communication across different end user devices"



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