IMS Integrated IPTV with Multi-screen Foundation
Delivering content with enriched communication across different end user devices

IPTV solutions are optimized to deliver video entertainment over IP networks. IMS is an architecture designed to deliver converged multimedia services in a mobile IP core network. Although standards groups for IPTV and IMS have not delivered a ratified standard to support the effective coupling of IPTV with IMS, Alcatel-Lucent believes an NGN Integrated IPTV (IMS-integrated IPTV) approach is the best option. To validate the benefits of IMS-integrated IPTV, Alcatel-Lucent has developed a solution that leverages the common functions used by both IMS and IPTV and offers all the components required for the successful deployment of IPTV services in an IP network.
<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Integrating IMS and IPTV</td>
</tr>
<tr>
<td>2</td>
<td>Key Considerations for Blending IMS and IPTV</td>
</tr>
<tr>
<td>3</td>
<td>User profile</td>
</tr>
<tr>
<td>4</td>
<td>User authentication</td>
</tr>
<tr>
<td>4</td>
<td>Resource and admission control</td>
</tr>
<tr>
<td>4</td>
<td>Session management</td>
</tr>
<tr>
<td>4</td>
<td>Real-time rating and charging</td>
</tr>
<tr>
<td>5</td>
<td>Context enablers</td>
</tr>
<tr>
<td>5</td>
<td>Alcatel-Lucent IMS Integrated IPTV Solution</td>
</tr>
<tr>
<td>6</td>
<td>Standards Compliance</td>
</tr>
<tr>
<td>6</td>
<td>Use Cases</td>
</tr>
<tr>
<td>12</td>
<td>Evolving the solution to support multi-screen</td>
</tr>
<tr>
<td>14</td>
<td>Conclusion</td>
</tr>
<tr>
<td>14</td>
<td>Acronyms</td>
</tr>
<tr>
<td>15</td>
<td>References</td>
</tr>
</tbody>
</table>
Integrating IMS and IPTV

Internet Protocol TV (IPTV) is the next frontier for multimedia information and entertainment over service provider networks. IPTV solutions are optimized to deliver video entertainment (multicast broadcast TV and unicast video-on-demand (VoD)) over IP networks. As service providers worldwide consider introducing IPTV in their next-generation networks (NGN), the question of how best to integrate IPTV with an IP Multimedia Subsystem (IMS) has become a key topic of discussion.

IMS is an architecture designed to deliver converged multimedia services in a mobile IP core network. It is a key component of a NGN architecture that supports delivery of multimedia services to NGN terminals in the wireline world based on Session Initiation Protocol. Conversational services such as voice and video telephony, push-to-talk/show/share, short message service (SMS) and multimedia messaging services (MMS) are examples of services well suited to IMS.

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 service delivery platforms (SDPs) and optimal protocols already exist for delivery of voice, video, and messaging services. But industry standards groups have identified two key approaches that can be used to integrate IPTV and IMS:

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

Service providers must consider a number of factors to determine the best approach for a migration to IPTV (Figure 1). Carefully weighing the pros and cons of each option will ensure that the approach chosen meets each service provider’s unique business objectives.

Figure 1. Pros and cons associated with two approaches to integration of IPTV and IMS

<table>
<thead>
<tr>
<th></th>
<th>IPTV Integrated with IMS</th>
<th>IMS-Based IPTV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Common Aspects</strong></td>
<td></td>
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<tr>
<td>Support for event, communication and notification services</td>
<td>Yes caller ID on TV, click to dial, presence</td>
<td>Yes caller ID on TV, click to dial, presence</td>
</tr>
<tr>
<td>Communications and IP video services integration</td>
<td>Yes through IWF or through client interworking</td>
<td>Yes through IMS core or via UE</td>
</tr>
<tr>
<td>Access and resource management</td>
<td>RACS/PCC</td>
<td>RACS/PCC</td>
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<tr>
<td>OTT video via IPTV</td>
<td>Well-suited, IPTV natively supports web-based interfaces</td>
<td>Via interworking</td>
</tr>
<tr>
<td><strong>Differences</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Web-based services</td>
<td>Yes well-suited, IPTV natively supports web-based interfaces</td>
<td>Via interworking IMS interworks with non-SIP based services via applications or web gateway</td>
</tr>
<tr>
<td>Communication services with single sign-on, authentication, roaming, multi-screen</td>
<td>Via interworking level of integration driven by IWF functionality and web services capabilities (e.g. for authentication/single sign-on)</td>
<td>Yes IMS natively supports single sign-on, authentication, roaming, multi-screen (but does not extend to OTT)</td>
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</tbody>
</table>

From implementation prospective, IMS-based increases complexity, latency, IPTV cost

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1 For a complete review of the issue of IPTV and IMS integration, see the Alcatel-Lucent white paper “IPTV and IMS in Next-generation Networks: Choosing the right approach for IPTV integration”
Based on current trends and its experience as the global leader in deploying and supporting IPTV solutions, Alcatel-Lucent favors an NGN Integrated IPTV (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 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
- 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. Alcatel-Lucent believes that IMS-integrated IPTV provides many more options at a lower unit cost for a service provider than the alternative.²

**Key Considerations for Blending IMS and IPTV**

The European Telecommunications Standards Institute (ETSI), Telecoms & Internet Converged Services & Protocols for Advanced Networks (TISPAN), Alliance for Telecommunications Industry Solutions IPTV Interoperability Forum (ATIS IIF), International Telecommunication Union (ITU-T), and 3rd Generation Partnership Project (3GPP) identify the following as common functions used by both IMS and IPTV (Figure 2):

- User profile
- User authentication
- Resource and admission control
- Real-time rating and charging
- Session management
- Context enablers

² For a complete explanation of the benefits of IMS-integrated IPTV versus IMS-based IPTV, see the Alcatel-Lucent white paper “IPTV and IMS in Next-generation Networks: Choosing the right approach for IPTV integration.”
These functions are considered to be Service Delivery Environment (SDE) common service enablers for IMS and IPTV. As such, they make it more efficient to migrate to IMS-integrated IPTV rather than IMS-based IPTV.

**User profile**

Knowledge about users and their services is considered to be one of the key assets and competitive advantages today’s service providers have over Internet-based application providers. As service providers move to an all-IP infrastructure, they are looking at how to best provision, store and exploit this data to deliver new services and compete more effectively in a Web 2.0 world.

To do this, service providers must ensure that user data can be efficiently accessed by a variety of applications. They must control how their own applications and those of selected third party partners access or modify this data. They must determine how applications such as advertising and service operations tools, such as business intelligence applications, use subscriber data to target end users with new service offerings. And they must ensure end users can access and manage their own data, identity, preferences and privacy.

With a data federation strategy in an IMS-integrated IPTV environment, service providers can leverage the user profile function that is common to IMS and IPTV and create a flexible, high-speed approach to data management. This strategy can be based on usage of a common data model, on data federation capabilities, and on a set of applications that access the data in the most efficient way. A data federation tool can map (statically and dynamically) the various parts of a user's data (or identity) into a common view, and allow each application that needs access to the data to use its preferred user identifier and its best-fit protocol (for example, Sh for IMS).

This standards-based approach to user data management offers a number of functional benefits:

- It exposes a common interface and data model for user profiles towards operations support systems (OSS), and takes care of the location of the data.
- It exposes a set of standardized interfaces within the SDE based on Web Services technology and use of a data federation mechanism.
- It provides high-speed, transparent access to the user data elements and enables access to data by third party applications, as well as support for high-volume self-management and privacy settings enforcement on access by end users.
- Data federation provides the knowledge required to aggregate the various types of user data into a common data model view, and identifies where the individual data elements are located in the service provider’s environment. In the case of an IMS and IPTV SDP, user data will be located in the IMS home subscriber service (HSS) databases, in the User Profiles Service Function (UPSF) and in IPTV databases.
- It can be used by network-based applications to access information from applications on other SDPs, which can be useful for blended services across SDPs. In this case, the data location is transparent to the blended application.
- In parallel, applications on individual SDPs can use their optimized protocols, such as Diameter (for example, 3GPP Sh interface for IMS), Lightweight Directory Access Protocol (LDAP) or MySQL, for local/direct data access and caching.
- Data federation technology can be used to achieve cross-SDP identity management.

Finally, a data federation strategy sets the stage for data exposure capabilities that can be used for internal or external marketing, and for targeted advertising, which may create new sources of revenue for the service provider.
User authentication
To provide end users with access to the services they have subscribed to, service provider networks must first authenticate each user through a unique user identifier and profile. If this process is not successful, most applications have a client authentication scheme, which in the case of IPTV is embedded into a set-top box (STB) and IPTV middleware. This authentication process may indirectly rely on Generic Bootstrapping Architecture (GBA) mechanisms, which relay the process to an external SDP authentication function (GBA-based) and then ensure uniformity of the user authentication mechanisms.

Because users may be profiled differently in each SDP and have different identifiers, the use of identity federation enables mapping of profiles and identities between each user's IPTV and IMS profiles.

Resource and admission control
IPTV places significant quality of service (QoS) requirements on a network. Not only is a VoD stream high bandwidth, but it must be delivered with low jitter and loss. Some IMS applications also have high demands on quality. To ensure the network can support each session, Resource Admission Control (RACS) can be used to reserve resources and to ensure each application does not exceed its quality quota. By using the common RACS, the system can ensure that IMS and IPTV applications do not interfere with each other and they have the resources they need, when they need them.

Session management
Session Initiation Protocol (SIP) is used by IMS to deal with session control for any kind of service launched from any kind of device and connected to the service provider network from various types of access networks. Its use has started to become widespread, thereby standardizing the delivery of services related to voice, messaging, and video regardless of the access technology over which the services are activated. It is useful to negotiate common capabilities when establishing sessions between different types of end user equipment.

Real-time rating and charging
A competitive service delivery environment requires flexible billing, payment and content management enablers. For example, business-to-business and business-to-consumer services may need to support instant payment for items or content, while telecommunications services often require pre-paid and post-paid approaches. Online, real-time rating may apply to both types of services and content delivery must be tracked to assure payment to content providers.

With IMS-integrated IPTV, a SDE should provide service enhancement and service operations components that enable payment and content management of services common to one or multiple application platforms. The SDE should supports the 3GPP/TISPAN standard on-line and off-line charging architecture and protocols that address fixed/mobile broadband service billing requirements, and it should achieve a convergent fixed/mobile billing architecture as part of the SDE.

In particular, the ideal SDE components should include support for:
- Prepaid-postpaid applications
- Convergent rating engine services that enable real-time rating according to a set of service provider-determined constraints or billing policies
- Instant payment
- Call detail record (CDR) collection and aggregation functions that collect data offline, generate CDRs or billing events, and interface with OSS applications that provide fraud analysis, billing and other applications
- Digital media asset management applications that can manage commercial and content delivery relationships with content providers and advertisers
- Integration of legacy charging and billing systems
Together the SDE components for payment and content management should provide service providers with the flexibility to meet their convergent billing and revenue sharing requirements.

**Context enablers**
Context enablers like location, presence or address book, which have been primarily defined by the Open Mobile Alliance (OMA), are today generally associated with IMS. Consequently, IMS SDE blending capabilities apply to those services/enablers inherited from OMA. They enable features such as showing a buddy list on a TV.

In addition to this list of standardized common functions, an IMS-integrated IPTV environment should enable optimal service blending across SDPs via:

- Service creation environment
- Content management
- Multi-screen purchasing synchronization
- Device management
- Service abstraction
- Service exposure

**Alcatel-Lucent IMS Integrated IPTV Solution**
To validate the benefits of IMS-integrated IPTV, Alcatel-Lucent has developed a solution that leverages the common functions used by both IMS and IPTV and offers all the components required for the successful deployment of IPTV services in an IP network (Figure 3). More components can be added to provide additional services that meet the specific needs of each individual service provider.

*Figure 3. Alcatel-Lucent IMS-integrated IPTV Solution enables deployment of IPTV services as broadcast TV and VoD*
The Alcatel-Lucent IMS Integrated IPTV Solution is comprised of the Alcatel-Lucent IPTV solution, a communications gateway and an IMS environment. This solution allows end users to enjoy multimedia content and communicate with other end users online. It supports the smallest to the largest IPTV/IMS networks, and offers different personalized and blended services. Integration of the communications gateway with IPTV is based on the usage of Simple Object Access Protocol (SOAP) Extensible Markup Language (XML)/Hypertext Transfer Protocol (HTTP) or SIP for notifications and SOAP/XML for control handling.

With the Alcatel-Lucent approach, service providers can deploy IPTV services in the form of broadcast and VoD delivered to a TV screen in the home of an end user. In addition, the Alcatel-Lucent 5905 Communications Gateway network element can work in an IMS environment by extending communications services to the TV set of the end user.

**Standards Compliance**

The Alcatel-Lucent 5905 Communications Gateway is built upon the Alcatel-Lucent 5400 IMS Application Server platform, which is used in many IMS, messaging, and mobile networks. This platform is compliant with the 3GPP and TISPAN standards for functions and interfaces.

The communications gateway is located in the applications layer of the TISPAN model. It is an element of the TISPAN ETSI TS 182 028 architecture within the boundary of the applications layer and it acts as an application server for blended services. As such, it delivers IMS and other communication-based applications into the IPTV space. In addition, because the gateway is based on the Alcatel-Lucent 5400 IMS Application Server platform, it supports all the same interfaces (ISC, Sh, Dh, Rf/Ro and Ut).³

**Use Cases**

The Alcatel-Lucent IMS Integrated IPTV Solution has been field tested and proven to be an effective approach to IMS and IPTV integration through customer deployments and trials. Based on these deployments, several key capabilities of the IMS-integrated IPTV approach have been demonstrated to be attractive features to customers in key markets around the world.

**Calling line Identification**

With this solution, calling line identification (CLID) is displayed on an end user’s television via an IPTV endpoint when there is an incoming call to the end user’s phone (Public Switched Telephone Network (PSTN)/Public Land Mobile Network (PLMN) or voice over IP (VoIP)/IMS). The actual call is handled on the user’s telephone, but the CLID notification on the TV shows the calling directory number, name assigned to the number or, if the caller’s number is unknown, as anonymous (Figure 4). The calling name is displaced by the contact list name when applicable.

In the CLID notification display the end user can select one of the following options:
- Dismiss
- Reject
- Forward to phone
- Forward to voice mail

³ For more detailed information about the specifications of the Alcatel-Lucent 5905 Communications Gateway, and the Alcatel-Lucent 5400 IMS Application Server platform, including standards compliance and interfaces, see the product links in the reference section.
**Voice mail notification**

With IMS-integrated IPTV voice mail notification, a voice mail waiting in the IPTV end user's phone voice mail system appears on the TV screen if the notification appears, the end user can choose to listen or dismiss the call (Figure 5). If the end user chooses to listen to the call, a connection is established between the end user's phone and the voice mail system.

**E-mail notification**

The e-mail notification feature displays alerts when an e-mail is received in the inbox of the end user's e-mail account. It shows the sender's name and subject line of the e-mail, and indicates the number of new e-mails waiting to be read (Figure 6). The sender's information is replaced by the contact list name if applicable. As with voice mail notifications, the end user can choose to dismiss or read the e-mail while the notification is displayed. The read option brings the end user into the e-mail access web portal offered by the communications gateway.

**E-mail access web portal**

The e-mail access web portal allows the IPTV end user to access the Inbox of an e-mail account. Once the account is accessed, the end user has the ability to read, delete, reply, reply all, and compose e-mails. If multiple e-mail addresses are linked to the end user's account, the end user will be presented with a choice of e-mail addresses to access (Figure 7).

After selecting the desired e-mail account, the end user is presented with the login screen to identify the owner of the e-mail address. The end user can then input the password to access the account (Figure 8).
**Video conference**

Video calls can also be made by the IPTV end user using a device that supports video call capabilities. With this feature, the end user can choose availability settings as “Available”, “Only Contact List” or “Do Not Disturb” (Figure 9).

**Note:** The video conference capability is only possible when the IPTV STB supports a SIP client that handles the session setup control and video stream.

**Location-based services**

The Alcatel-Lucent IMS Integrated IPTV Solution also supports a location-based multimedia sharing service that allows end users to tag a place with interest and publish comments to a specific place or person (Figure 10). With presence, time and other context information, notifications/alerts can be pushed to other end users, as required.

**Enhanced messaging with SMS and MMS**

The IPTV end user can also receive and send SMS and MMS messages from a TV screen. A message icon appears on the TV screen from which the end user is able to read and reply to messages (Figure 11).

**Presence and instant messaging**

A messaging IPTV client is also available for buddy list management and instant messaging capability through the communications gateway (Figure 12). With this client, IPTV end users can communicate with other IMS-integrated IPTV users.
Network address book
A network address book feature provides end users with one address book that contains the contacts of the end user (Figure 13). This address book supports presence, messaging, emotions sharing, and other features. The end user is able to access this address book from any device and still get the same look-and-feel.

Home messaging
The IPTV end user also has the opportunity to receive and send short messages (pre-defined or written as required) from the TV or remote high-speed Internet access PC or cell phone to another TV screen within the end user’s IPTV home environment (Figure 14). The short message appears as a notification on the TV screen.
When the end user receives the notification, options appear to reply or dismiss the message. All messages in home messaging are logged. The home messaging feature is accessible through the end user's web portal. It offers an interface that allows the user to write messages or see logged messages (Figure 15).

Sending messages is based on selecting the home-defined profile to which the message is destined (Figure 16).

The end-user can also opt out of the service provider’s pre-defined messages (Figure 17), or write a message using the onscreen keyboard or the triple tap function of the STB remote control (Figure 18).

Visual voice mail
The visual voice mail feature offers the IPTV end user the ability to access visual voice mail from an IPTV endpoint and manage visual voice mail entries and settings. The end user is able to play visual voice mail entries as voice, text, video or pictures (Figure 19). The same functionality is provided inline with the abilities offered to a PC or mobile handset.

End user profile management
The IPTV end user can also access and manage features from an IPTV menu option or an IPTV inline channel on the TV screen. This is made possible by the IPTV end user interface portal offered by the communications gateway.

End user profile management offers the end user the ability to maintain a list of customized profile data. This includes different phone numbers, e-mail addresses, and feature settings for the preferred IPTV endpoints (STB). In addition, the end user can provide a profile name to the allocated IPTV endpoint. This profile data management is supported from the TV screen via high-speed Internet access from a PC (Figure 20).
CLID notification

A CLID notification logging feature allows the IPTV end user to keep track and view more detailed information on all incoming or missed calls. The end user can maintain the log history list by deleting entries. Sorting date, time and state are also available (Figure 21).

Contact list

A contact list feature offers a more personalized user experience. It allows end users to associate a nickname, a pre-formatted picture, and an optional “who’s it for” name with a contact. When a CLID, voice mail or e-mail notification is received the personalized contact information is displayed on the TV screen. The IPTV end user can create as many contacts as the service provider allows and can manage the contact list by adding, modifying, and removing contacts.

Notification control feature

With the notification control feature the end user can activate and deactivate the CLID, voice mail, e-mail, and home messaging notification display (Figure 22). The notification display can be suspended for a defined length of time. These changes will only take effect for the IPTV endpoint from which the action was performed.
Click to dial/click to connect
Click to dial and click to connect offers the IPTV end user the ability to select a phone number via a web portal and remote control access (Figure 23). It automatically establishes a conversation call between the end user’s defined telephone (fixed or mobile) and the selected telephone number. This option is available via consultation with a:

- Call log list
- Buddy/contact/address list
- Voice mail (as option during voice mail consultation)
- Other applications (like directory service)

Figure 23. Click to dial/click to connect with IMS-integrated IPTV

Evolving the solution to support multi-screen
The Alcatel-Lucent IMS Integrated IPTV solution allows service providers to offer blended services that extend communication to a variety of endpoints and any access device, while still providing end users with a high quality end user experience. It enriches communication and takes the service provider a step closer to offering the connected home with convergent user-centric communication supported by connected service platforms.

To further enable the connected home strategy, Alcatel-Lucent offers an open platform that allows service providers to consolidate their media operations and efficiently deliver multimedia services over different screens, including mobile devices, PCs, and STBs. That platform is the Alcatel-Lucent Multi-screen Foundation.

Multi-screen enablement
The Alcatel-Lucent MSF is the result of the Alcatel-Lucent vision for multi-screen enablement, which is the delivery and monetization of a seamless multimedia experience across multiple screens. Alcatel-Lucent believes that service providers have an opportunity to capture and monetize the end user span of attention by leveraging the growing demand for a multi-screen experience to extend
fixed or triple play offerings. This not only lays the foundation for tapping into new revenue streams, but also provides a way to establish competitive differentiation vis-à-vis other service providers, device vendors, and application service providers (ASPs).

Multi-screen enablement ultimately offers service providers:
- Revenue acceleration and competitiveness by decreasing the time-to-market for new solutions
- Cost savings by maximizing operational efficiency
- Monetization through new business models

To execute on this vision, Alcatel-Lucent has investigated the technical design of several high-volume video solutions including web multimedia services, mobile multimedia services and IPTV services, and has identified a set of common components that are essential for the creation of compelling multi-screen end user services: content, identity messaging and communications, and payment and billing. With these enablers, service providers can orchestrate the delivery of services and content according to an individual’s preferences, regardless of the screen.

The Alcatel-Lucent Multi-screen Foundation provides a modular and scalable platform that leverages these enablers and allows for incremental deployment and continuous launch of new multimedia services to any screen. It allows service providers to reap the benefits of faster time-to-market and operational cost savings associated with the consolidation of infrastructure elements into a common platform. This not only helps service providers improve their competitive positioning in the marketplace and attract and retain new subscribers, but also increase revenues through new business models thanks to selective exposure of capabilities and high-value advertising.4

Deploying and evolving IMS with MSF

Multimedia services are currently experiencing dramatic growth, and service providers have plans to evolve their current services and roll out new ones. Many of the existing services are going through various stages of disruption or technology upgrade and new services often require huge investments that have negative impact on profitability.

When a new multimedia service is launched on top of the Alcatel-Lucent MSF, its design and open interfaces enable easy and quick integration in an existing infrastructure. Moreover, the foundation is built on technology components that scale. This enables service providers to minimize investments when launching new services, while ensuring services will scale as they are enriched with new content and applications and as the number of subscribers increases.

As service providers deploy new multimedia solutions, they can reuse the existing components of the multi-screen content enabler: content, content management, storage, encoders, and transcoders. The specific delivery solutions can easily access the existing content management through the MSF open web service interface. The central delivery servers of the new solutions get content access by simply mounting the central storage as external storage for on-demand content or picking up live content from the MSF at the respective access point.

In addition, the foundation’s content management supports multiple formats for each content asset and eliminates the need for yet another content management silo. If additional content formats for different devices and screens are required they can be enabled by a simple software upgrade and a one-time configuration inside the MSF. This allows new content or content that is currently in the system to be repurposed into new formats.

4 For more information about the Alcatel-Lucent Multi-screen Foundation, see the Alcatel-Lucent white paper “The Multi-screen Foundation: The foundation for delivering and monetizing multimedia services across multiple screens”
The new solutions to be deployed can also benefit from authentication services provided by the multi-screen identity enabler, which offers unified cross-screen and cross-solution identity. For example, if a new solution is targeting the TV screen, federated identity associates the user with its household. In cases where the new solution has an existing user base that is different from the existing one, the MSF provides a simple federation of the new user base into the system and eliminates the need to rebuild an entirely new user database. And when the new solution provides access to content, integration with the MSF content usage database via standard-compliant formats federates the content usage from this new solution to enable a better profiling of the end users and ensure higher value for advertising.

Conclusion

End users worldwide are now using multiple devices to access multimedia content in the most convenient way. To stay competitive in the fast-paced media environment service providers must have the ability to launch content-based services faster than in the past and make this content available on multiple platforms.

As a first step towards a true integrated multimedia experience, service providers must find the optimal approach for integrating IPTV and IMS over NGN networks. Although industry standards groups have identified two key approaches that can be used to integrate IPTV and IMS, Alcatel-Lucent believes an NGN Integrated IPTV (IMS-integrated IPTV) approach offers the best solution. With this approach, web-based and communication-based architectures and technologies can each evolve as best-in-class within their respective domains. And integrating these domains allows a service provider to take 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.

The Alcatel-Lucent IMS Integrated IPTV solution together with the Alcatel-Lucent Multi-Screen Foundation enables service providers to extend multimedia services to end users’ TV, PC and mobile devices. They allow service providers to reap the benefits of faster time-to-market by deploying new blended services that meet the demands of end users. In addition, they provide operational cost savings associated with the consolidation of infrastructure elements into a common platform. Most importantly, they enable the delivery of blended services that enrich the communication experience today.

Acronyms

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<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
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<tbody>
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<td>3GPP</td>
<td>3rd Generation Partnership Project</td>
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<td>ASP</td>
<td>application service provider</td>
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<tr>
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<td>Alliance for Telecommunications Industry Solutions IPTV Interoperability Forum</td>
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<td>HTTP</td>
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<td>IPTV</td>
<td>Internet Protocol Television</td>
</tr>
<tr>
<td>ITU</td>
<td>International Telecommunication Union</td>
</tr>
<tr>
<td>LDAP</td>
<td>Lightweight Directory Access Protocol</td>
</tr>
<tr>
<td>NGN</td>
<td>next-generation network</td>
</tr>
<tr>
<td>OMA</td>
<td>Open Mobile Alliance</td>
</tr>
<tr>
<td>OSS</td>
<td>operations support systems</td>
</tr>
<tr>
<td>MMS</td>
<td>multimedia messaging service</td>
</tr>
<tr>
<td>PLMN</td>
<td>Public Land Mobile Network</td>
</tr>
<tr>
<td>PSTN</td>
<td>Public Switched Telephone Network</td>
</tr>
<tr>
<td>QoE</td>
<td>quality of experience</td>
</tr>
<tr>
<td>QoS</td>
<td>quality of service</td>
</tr>
<tr>
<td>RACS</td>
<td>Resource and Admission Control Subsystem</td>
</tr>
<tr>
<td>SDE</td>
<td>service delivery environment</td>
</tr>
<tr>
<td>SDP</td>
<td>service delivery platform</td>
</tr>
<tr>
<td>SIP</td>
<td>Session Initiation Protocol</td>
</tr>
<tr>
<td>SMS</td>
<td>short message service</td>
</tr>
<tr>
<td>SOAP</td>
<td>Simple Object Access Protocol</td>
</tr>
<tr>
<td>STB</td>
<td>set-top box</td>
</tr>
<tr>
<td>TISPAN</td>
<td>Telecoms &amp; Internet Converged Services &amp; Protocols for Advanced Networks</td>
</tr>
<tr>
<td>UPSF</td>
<td>User Profiles Service Function</td>
</tr>
<tr>
<td>VoD</td>
<td>video on demand</td>
</tr>
<tr>
<td>VoIP</td>
<td>voice over IP</td>
</tr>
<tr>
<td>XML</td>
<td>Extensible Markup Language</td>
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