

**DEPLOYING COST-EFFECTIVE
NETWORK ELEMENTS FOR
NEXT-GENERATION NETWORKS:
THE CASE FOR APPLICATION
SESSION CONTROLLERS**



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TABLE OF CONTENTS

1.1	The Challenge of Declining Revenue per User	1
1.1.1	A New Approach: the ASC	1
2.1	The Challenges of Today’s Solutions	2
2.1.1	Approaches Presently Used for Adding New Applications	3
2.1.2	A Better Alternative: The ASC.....	5
3.1	The Advantages of ASC	7
3.1.1	Cost Savings: ASC vs. Traditional Models	7
3.1.2	Cost Savings: Easier Deployment of Large Scale Follow-On Applications.....	9
3.1.3	Cost Savings: ASC + IMS = Preserving Investment	11
4.1	ARPU: Service Convergence & Application Brokering.....	12
5.1	Conclusions	15
	Appendix: Applications and the Evolving Network: It’s Not a New Challenge	17
	Glossary.....	19

TABLE OF FIGURES

Figure 1	ASC Unites the Application Layer with the Network Layer.....	6
Figure 2	Single Application Deployment using ASC and a Traditional Model.....	7
Figure 3	Easier Deployment Using ASC	9
Figure 4	Comparing Cost Savings	11
Figure 5	Worldwide IP Services Market, 2006-2011 (\$Billions)	15

TABLE OF TABLES

Table 1	Comparing Capital Costs: ASC versus General-Purpose Elements for Single Application Deployment	8
Table 2	Adding Additional Applications: General Purpose versus ASC.....	10
Table 3	Comparing Operational Cost Savings: Adding Additional Application Deployments.....	10
Table 4	Comparing ROIs: Moving to IMS and Preserving Investment.....	12

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1.1 The Challenge of Declining Revenue per User

To remain competitive in the new telecom environment, all types of communication service providers are rapidly adopting Internet protocol technologies. The older public switched telephone network (PSTN) providers are incorporating IP into their networks to lower costs and deliver improved services. Wireless carriers are moving towards third-generation mobile system (3G) technologies to attract consumers with new multimedia services. The pure voice over IP (VoIP) carriers are competing against traditional carriers by providing low-cost long distance voice carried over the public Internet along with sophisticated Web applications. With increasing competition for voice in the wired world and slower acquisitions of new customers in wireless, carriers must contend with the problem of declining average revenue per user (ARPU) for their voice services. This challenge faces carriers of all kinds—new entrants as well as providers with deep roots in the PSTN.

While next-generation networks (NGNs) promise rich applications that will eventually offset the decline in voice revenue, today's carriers must support IP as well as their legacy networking technologies. Among service providers, business success is often tied to how fast market strategies can be changed to meet competitive pressures and take advantage of new opportunities. To capture markets and create critical mass, rapid creation and execution of new services has become a necessity. Given the way applications are currently deployed and the complexity of their interaction in continuously evolving networks, new services deployments are difficult, costly, and limit the service provider's ability to drive ARPU and reduce churn.

1.1.1 A New Approach: the ASC

Application Session Controllers (ASCs) are an important new approach to providing efficient and cost-effective application connectivity, application/session

call control and the ability to mediate application mash-ups in a mixed networking environment. Compared to the current application connectivity options, ASCs promote cost savings and introduce incremental revenue opportunities to a service provider's network. ASCs also preserve the investment in current revenue-producing IN (Intelligent Network) applications by enabling inter-working with next-generation network build-outs.

This white paper explores the cost benefits and revenue enhancing opportunities of utilizing an ASC network element to provide the call/session control and connectivity needed to manage application interaction in the evolving network.

2.1 The Challenges of Today's Solutions

Service providers are paying the price for the lack of cohesion between the application and network/control layer. It has limited their ability to profit financially from their data and voice network and to leverage an ecosystem of developers and innovators.

To move beyond the traditional single application to single network connectivity model, service providers are looking to the Internet model of application deployment as the key to future successes. With the Internet's communities of developers using standardized Web technologies to rapidly introduce new applications, the Internet is able to give consumers a continuing stream of sticky applications. Among them are social networking, on-demand video downloads, instant messaging, and traditional voice-centric services. Unfortunately, the service provider community faces a key limitation in creating new applications: it is the inherent limits of application connectivity. This limitation has an impact on applications and results in cost inefficiencies, time-to-market challenges, and lost revenue opportunities. Today's solutions are ad-hoc and unorganized, and they result in slow deployments cycles, unnecessary application stovepipes, and the inability to bundle and combine services to empower their subscribers and generate new revenue. Ultimately, fewer new applications mean lower revenue per subscriber.

The term *application* has sometimes been misapplied and used to describe underlying core technology, such as session initiation protocol (SIP), Voice over Internet Protocol (VoIP), eXtensible markup language (XML), and service-

oriented architecture (SOA). A better approach is to categorize the telecom marketplace applications as:

- **network applications** — including fraud detection, roaming, number portability;
- **enhanced services applications** — voice mail, interactive voice response (IVR), toll free, conferencing;
- **data applications** — service management system (SMS) and multimedia messaging system (MMS); and
- **multimedia applications** — such as streaming and audio.

Each of these types of applications depend on different networks that use different, yet inefficient deployment models. For example, the voice network's enhanced services represent an earlier software programming effort by the PSTN to increase ARPU. This extended services software was developed in the late 1980s through the mid-1990s. It was tightly tied to the underlying network elements (see Appendix), which resulted in IVR applications that worked for one vendor's network element but could not be easily or cost-effectively moved to another network.

2.1.1 Approaches Presently Used for Adding New Applications

To implement sophisticated revenue-generating applications and combine them with traditional services or other voice and data networks, service providers need a cohesive network element that manages interactions between the applications and the evolving network. By looking at how the application layer and the network is presently managed, INSIGHT Research identified four different approaches currently being used:

- **The Re-purposing of General-Purpose Products** — In order to deploy and connect applications across their underlying networks, service providers are forced to use general-purpose equipment that must be re-purposed to provide the required abstraction, connectivity, and

internetworking functionality for today's applications. Providing connectivity to multiple networks and call/session control requires three or more general-purpose distributed network elements: softswitch, media gateway, and signaling gateway, resulting in cost and network management inefficiencies.

- **Enhanced Service Platforms** — These solutions are generally closed development environments, supporting only a single vendor's solution or platform. They are hardwired directly into the network using either custom integration at the network layer or re-purposing general-purpose network elements. The enhanced service platform's inherent proprietary nature limits service convergence and innovation.
- **Service Delivery Platforms (SDPs)** — With an SDP in place, service providers can bring new applications from an ecosystem of developers to market quickly because the SDP itself provides the connectivity to the operation support system/business support system (OSS/BSS) infrastructure. Neither the service providers nor the application developers have to concern themselves with repeatedly integrating applications into these back office systems. Yet with regard to network connectivity, the SDP model requires multiple network elements for abstraction, connectivity, and inter-working. Basically the inefficiency of the stove pipe is simply pushed further down into the network. The stove pipe now takes the form of network-specific gateway requirements that lack scalability and limit functionality.
- **IP Multimedia Subsystems (IMS)** — Service providers are looking to IMS to build an open IP-based service infrastructure that supports both wireline and wireless networks. As envisioned, the IMS set of protocols were intended to streamline back-office systems, integrate multiple networks into one, and standardize network elements as well as the networks themselves, thus easing inter-operator connectivity. Once completed, IMS promises to provide interoperability, service brokering, and event integration from legacy systems. The challenge with the transition to IMS is that current revenue is generated not by IMS applications, but by legacy applications on legacy networks. Operators

must find a way to continue to leverage legacy applications and the associated ARPU, while moving onto IMS.

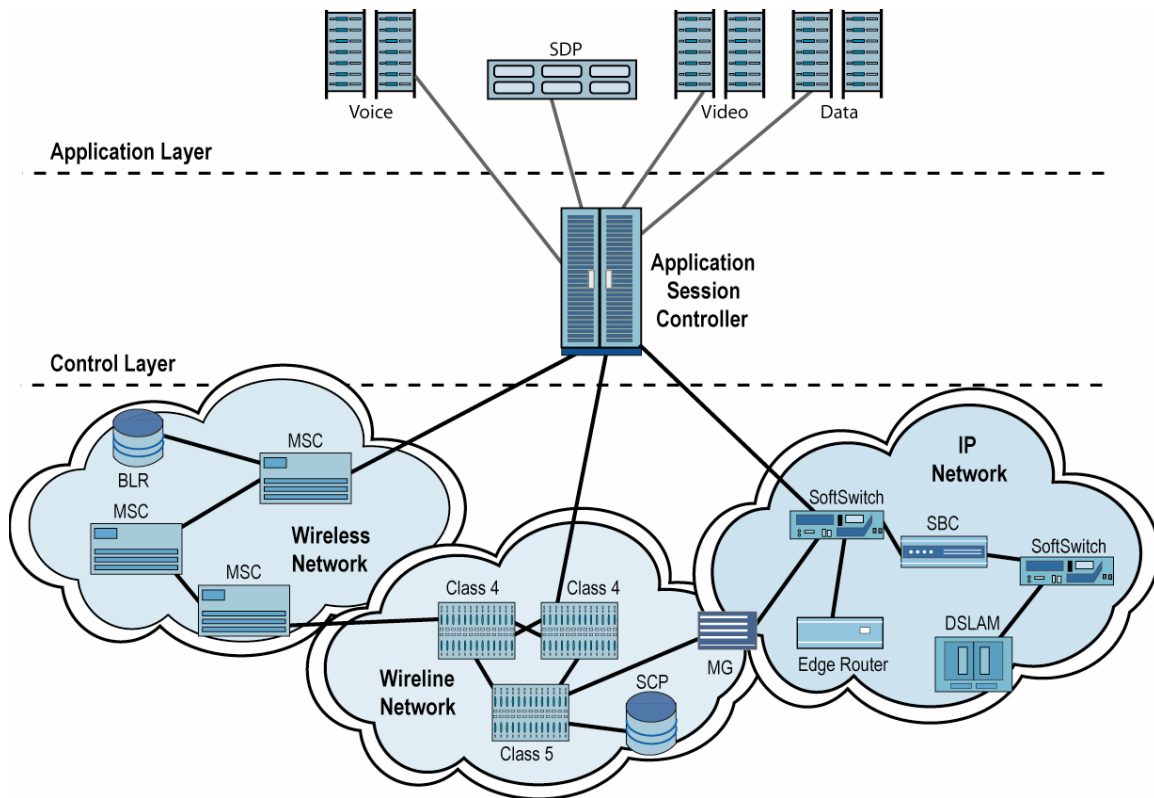
Service providers can follow different paths to achieving multi-network application deployment, connectivity, and application brokering. While each approach has advantages, they all fail to solve the challenges of a cost-effective and future proof solution for application connectivity and interaction with the evolving network.

2.1.2 A Better Alternative: The ASC

In today's network environment, application abstraction, connectivity, and inter-working solutions are a mixture of different ad-hoc solutions that have a negative effect on the service provider's focus on cost savings and ARPU. Service providers struggle because they have no overarching operational or architectural solution. Instead they rely on makeshift approaches, which results in a very disorganized model.

In contrast, the ASC allows service providers to maintain a competitive edge with a purpose-built application network connectivity architecture, as shown in Figure 1. In a single system, the ASC provides application-specific call/session control functions that are independent of each network. This call/session control provides intelligence for the application-to-network interaction. In addition, it is fully capable of supporting the necessary inter-working between disparate networks that converged and consolidated applications require. Without it, application interaction with the network is limited to such an extent that it curtails application sequencing, new combined service introductions, and end-user flexibility. The ASC supports open standard application programming interfaces (APIs) and Web services while providing all the signaling and media in a single network element.

Figure 1 ASC Unites the Application Layer with the Network Layer



As a purpose-built solution, the ASC supports multiple application platforms/servers and eliminates costly network connection stovepipes. By solving the problem between the application layer and control layer, the ASC accelerates the time to market for essential voice, video, and data applications, resulting in increased ARPU. Capital expenditure (CAPEX) reduction is achieved through eliminating unnecessary general-purpose network elements and removing the current ad-hoc approach used by service providers today.

Designed to support multiple simultaneous applications, the ASC resides at the application layer and sits between the application layer and the core network to provide and manage connectivity to the evolving network. The ASC also insulates the application server farm from the network below. It supports wireline, wireless, and IP protocols to ensure feature transparency and simplify the operational efficiencies by providing a single network layer management interface.

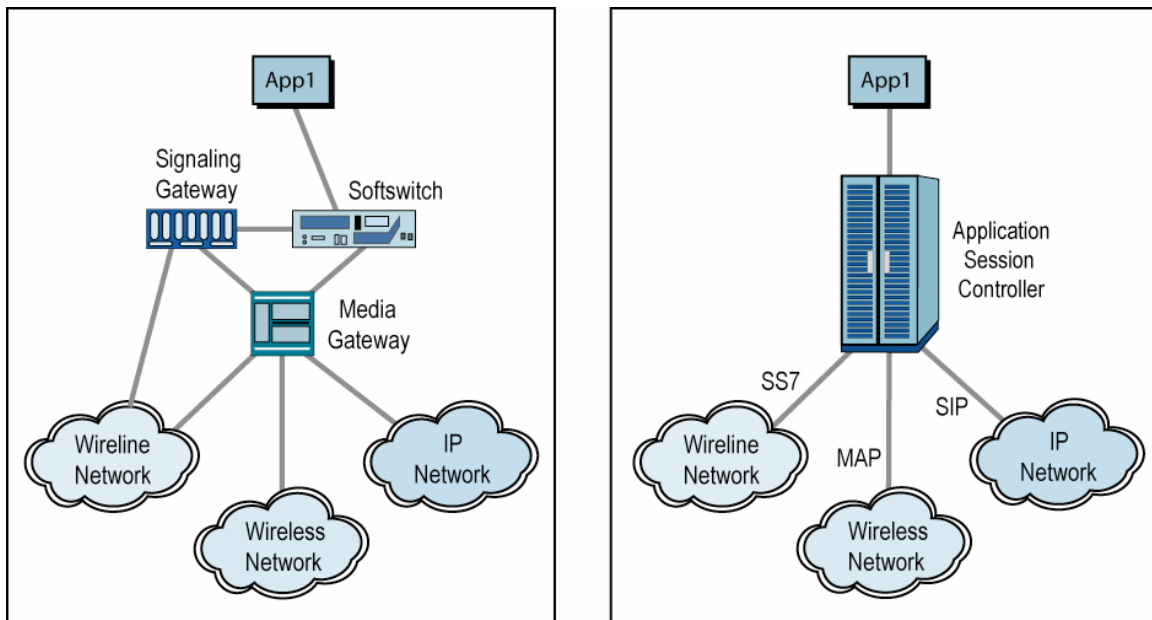
3.1 The Advantages of ASC

An ASC provides a purpose-built network element that combines the right mix of call control, signaling, switching, and media capabilities. In addition, it provides multi-application support for both new and legacy applications. The ASC can reduce costs through network, management, and operational efficiencies while enabling opportunities to increase ARPU, preserve investment, and provide application transparency for evolving networks.

3.1.1 Cost Savings: ASC vs. Traditional Models

Figure 2 contrasts the traditional single application deployment model with the ASC model.

Figure 2 Single Application Deployment using ASC and a Traditional Model



The traditional model used to deploy large-scale applications with more than five million subscribers is costly. Table 1 compares the initial CAPEX costs incurred using a general-purpose solution with the costs for an ASC. A purpose-built ASC provides media, call control, and signaling functionality all in one integrated solution. The ASC solution requires a capital outlay that is 57 percent of a

general-purpose solution, saving one million dollars. Because the network element is built for a single purpose, the ASC can be deployed more efficiently than three general-purpose network elements. Additional savings are possible since the ASC efficiently scales to meet increased load and additional application requirements, making the general-purpose approach inefficient from a cost management perspective.

Table 1 Comparing Capital Costs: ASC versus General-Purpose Elements for Single Application Deployment

	General-Purpose Cost Elements	ASC Cost
Media Gateway	\$1,200,000	NA
Softswitch	\$760,000	NA
Signaling Gateway	\$290,000	NA
ASC		\$1,300,000
Total Cost	\$2,250,000.00	\$1,300,000

Note: To create this table, the following assumptions were made:

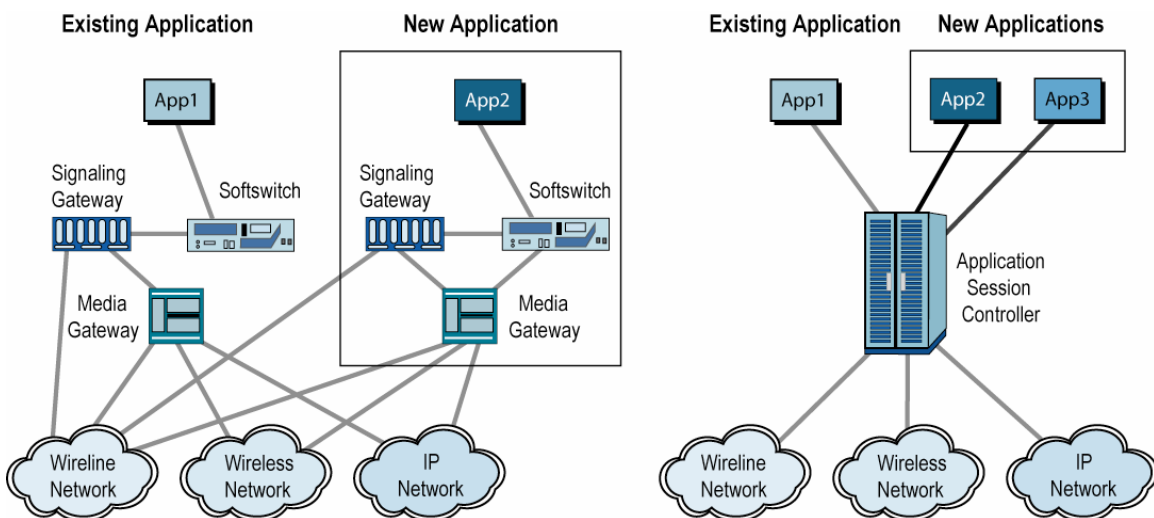
- 5 million subscriber network;
- 150 calls per second requirement
- 192 E1 spans;
- 22 SS7 signaling links;
- G.711 support; and
- redundant configuration.

The cost model above reflects only the CAPEX equipment costs because multiple general-purpose network elements require multiple points of management, maintenance, and upgrades which are not factored into the initial cost savings. The general-purpose model also increases the time it takes to introduce new applications. Each additional application must be retrofitted for each general-purpose element, thus affecting application return on investment (ROI) and associated ARPU gains. Today's competitive environment demands the ability to cost effectively test and launch new applications quickly and efficiently.

3.1.2 Cost Savings: Easier Deployment of Large Scale Follow-On Applications

Adding additional applications: A more significant and long-term cost benefit of the ASC deployment model comes from efficiencies realized from additional add-on applications, as illustrated in Figure 3. Once the service provider has deployed an ASC into their network, it is easier and more efficient to add, update, and migrate existing and new applications across underlying networks.

Figure 3 Easier Deployment Using ASC



The initial cost benefits of deploying the first application using an ASC are favorable compared to current models. The true cost benefit, however, becomes more evident in later application deployments that use the ASC, as shown in Table 2.

Table 2 Adding Additional Applications: General Purpose versus ASC

	General Purpose: Cost of 1st Application Network Layer	ASC: Cost of 1st Application Network Layer	General Purpose: Cost of Next Application Network Layer	ASC: Cost of Next Application Network Layer
Design	\$300,000	\$300,000	\$300,000	\$150,000
Testing	\$200,000	\$200,000	\$200,000	\$75,000
Equipment	\$2,000,000	\$1,000,000	\$2,000,000	\$300,000
Operator Training & Labor Costs	\$60,000	\$60,000	\$60,000	\$0.00
Installation	\$30,000	\$30,000	\$30,000	\$10,000
Maintenance	\$300,000	\$225,000	\$300,000	\$80,000
Total	\$2,890,000	\$1,815,000	\$2,890,000	\$615,000
Total cost				
General-Purpose Deployment Model			\$5,780,000	
ASC Deployment Model			\$2,430,000	
Total ASC Savings			\$3,350,000	

The benefits of using an ASC are clear from an operational expenditure (OPEX) perspective. Once the ASC has been introduced into the service provider’s network architecture, the design, testing, installation, and overall support costs for additional applications are reduced to a fraction of the costs compared to other approaches, as Table 3 shows.

Table 3 Comparing Operational Cost Savings: Adding Additional Application Deployments

	Current Model: Cost	ASC: Cost
Design	\$300,000	\$150,000
Testing	\$200,000	\$75,000
Operator Training & Labor Costs	\$60,000	\$0.00
Installation	\$30,000	\$10,000
Maintenance	\$300,000	\$80,000
Cost per Additional Application	\$890,000	\$315,000

Note: Operator training & labor costs are leveraged from initial deployment of an ASC, thus \$0 in each additional implementation.

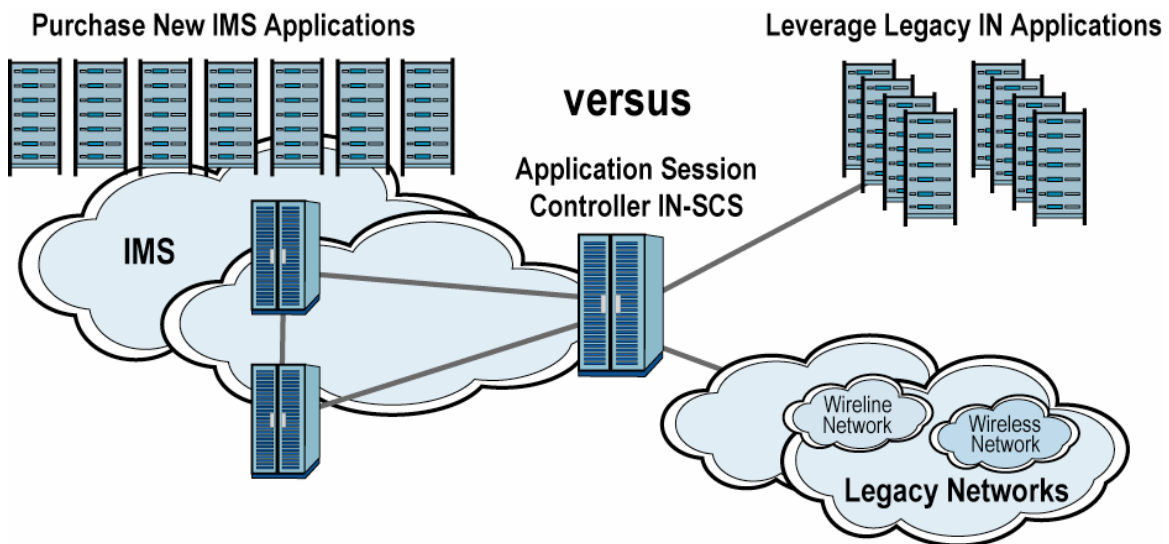
Ongoing operational concerns associated with general-purpose models, such as network connectivity testing and interoperability issues, contribute to lengthy

deployment schedules. These problems can last 18 to 24 months and cost between \$10 to \$15 million. Because ASCs leverage the initial application development effort, with every follow-on application added to the platform, the ongoing OPEX costs are significantly lower than the ongoing management of additional general-purpose elements.

3.1.3 Cost Savings: ASC + IMS = Preserving Investment

The cost of rewriting or redeploying large-scale applications across Tier 1 networks is estimated to be in excess of \$10 million for each new application. Service providers are struggling to find alternatives that leverage existing applications, thereby retaining their customer base and associated revenue streams. Replacing non-IMS applications today to comply with an IP structure makes little sense if no additional revenue will be generated. IMS makes little provision for allowing legacy applications access to IMS elements directly. The net effect is that major IMS roll outs are delayed pending development of positive business cases.

Figure 4 Comparing Cost Savings



INSIGHT’s research suggests that using an ASC costs only 24 percent of the price of buying a new application platform for IMS. In addition, the new IMS platform comes with none of the current revenue associated with the legacy applications supported by the ASC. By using the intelligent network-service capability server (IN-SCS) functionality of an ASC, service providers can cut the cost of application deployment to approximately \$3 million per application. With a potential cost savings of over \$7 million per application, the business case for moving to IMS becomes significantly more attractive when an ASC is used. Table 4 illustrates this savings.

Table 4 Comparing ROIs: Moving to IMS and Preserving Investment

	New IMS	Existing via ASC IN-SCS
Number of Applications	8	8
Cost Per Platform		
Replace/Re-Write Cost per Platform	\$12,500,000	
ASC IN-SCS Functionality Cost per Platform		\$3,000,000
Total Cost (8 x cost per platform)		
Total Re-Write/Re-Purchase Cost	\$100,000,000	
ASC IN-SCS Cost		\$24,000,000
Savings Opportunity		\$76,000,000

By deploying an ASC, the service provider will be able to continue moving forward with IMS network buildouts while still delivering revenue to the bottom line. An ASC provides a logical migration path to IMS by allowing new IMS applications and their subscribers to access the existing legacy applications. Migrating to IMS becomes a more attractive transition from an ROI perspective since the useful life and associated ARPU from existing applications can be transitioned to the new IMS environment.

4.1 ARPU: Service Convergence & Application Brokering

Carriers are adding next-generation capabilities to their network because IP services promise to boost revenue even as voice service margins decline. The drivers of IP services growth are tied to the growth in wireline and wireless

broadband infrastructure adoption. As service providers get a better grasp on profiting financially from their new services, excitement is growing about how to blend and converge services instead of simply bundling them.

With its CAPEX and OPEX cost saving advantages, higher reliability, and more rapid approach to multimedia application development and deployment, ASCs are being given serious consideration by all types of service providers. The ASCs represent a viable approach to achieving higher ARPU today because they provide the ability to route, broker, and deliver the requisite functionality to link application servers and legacy applications at the same time they provide all the necessary application connectivity.

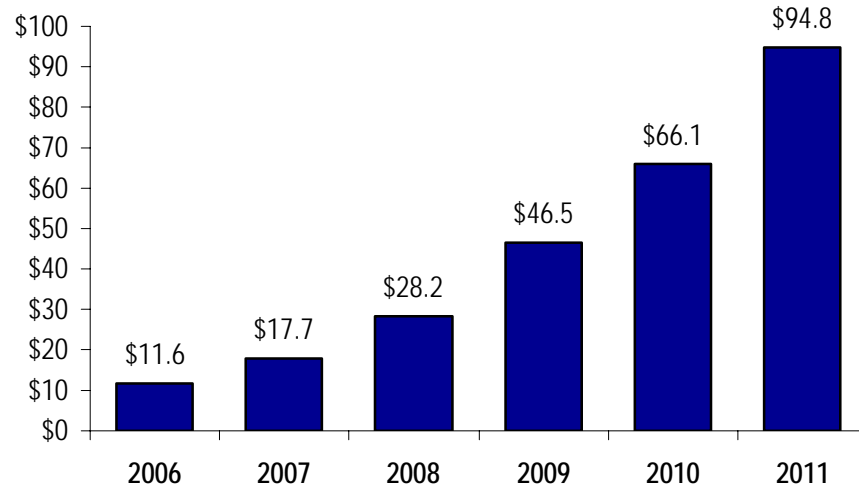
INSIGHT's analysis suggests that service providers globally will focus on applications in six IP service areas. In 2005-2006, most of these services were either newly available to consumers or had been in production and were beginning to produce revenues. Our six key IP services may be delivered either as an Internet-based service or as a mobile telephony service. They include:

- **Residential Video Telephony (RVT)** — Allows end-users to have video calls with each other and consists of simultaneous audio and video of the people communicating. The end-user equipment could be a PC, IP-based videophone, or a 3G-enabled mobile phone.
- **Fixed Mobile Convergence (FMC)** — Enables users to employ a single mobile device using licensed wireless public networks outside their homes and offices as well as unlicensed wireless private networks inside where the network coverage is poor. The forecast for consumer FMC service is focused on implementations where the consumer is a subscriber of voice over broadband service, primarily WiFi.
- **File Exchange/Downloading Service** — Refers to the exchange of audio and video files, messages, and downloads. The forecast focuses on the exchange of multimedia content from 2.5G or 3G mobile phones and purchased audio and video content downloaded to a mobile device or PC via a paid subscription service. The multimedia content includes ring tones and sending/receiving photo and audio files.

- **Streaming Service** — Provides live and on-demand transmission and simultaneous playing of audio and video files and broadcasts on end-user equipment in a real time fashion by simultaneously downloading, buffering, and playing the file on end-user equipment. This content includes digital TVs, PCs, PDAs or 3G-enabled mobile phones. IPTV is included in this group and is defined as streamed video services delivered over an IP data network and having the properties of basic broadcast television, as well as interactivity and personalization. IPTV goes well beyond broadcast cable TV.
- **Location-Based Service (LBS)** — Targets the physical location of a user through global positioning system (GPS) or wireless network-enabled mechanisms in order to keep the user apprised of specific services based on that location. The market forecast focuses on navigation/direction services and personal safety-related services, such as the location of children, delivered over 3G-enabled mobile devices.
- **Presence-Based Service (PBS)** — Ensures personalization of modes of communication preferred by the user by defining the availability and receptivity of contacts to engage in real-time text and voice communications. The market forecast focuses on mobile instant messaging (IM) and push to talk (PTT) services delivered over 2.5G and 3G-enabled mobile devices.

IP service is a growing market worldwide. As shown in Figure 5, the market for IP services will grow from \$11.6 billion in 2006 to approximately \$94.8 billion in 2011. The worldwide revenue will increase at a compound annual growth rate (CAGR) of 52.2 percent over the study period.

Figure 5 Worldwide IP Services Market, 2006-2011 (\$Billions)



Note: The revenues above include the following segments of the IP services market: residential video telephony, fixed mobile convergence, file sharing/downloading services, audio/video streaming services, location-based services, and presence-based services.

5.1 Conclusions

As a purpose-built network element that combines call control, signaling, switching, and media capabilities coupled with multi-application support for both new and legacy applications, the ASC is an important tool for service providers. It lowers costs, preserves existing investments, increases ARPU, and provides application transparency for evolving networks, including IMS.

The ASC advantages are apparent in savings in both capital and operational expenditures:

- On average, an ASC saves 40 percent on initial deployment when compared to the common general-purpose deployment models now being used.
- Once within the network, an ASC reduces operational costs by allowing the efficient management of one network element in place of three or four independent general-purpose elements.

- An ASC reduces dependency, time, and costs needed by the application vendor to re-write/re-connect as networks converge and evolve.
- An ASC can be turned up for an average of 24 percent of the cost of buying a new application platform for IMS even as the service provider continues to move in the direction of IMS.
- An ASC gives the service provider flexibility in dealing with vendors by making operational the application interaction with the network layer.
- An ASC can drive ARPU by enabling service convergence and application brokering.

On the revenue side, INSIGHT sees ASCs playing a significant role in six application areas that will make up a \$66 billion market by 2010. The six areas are: residential video telephone, fixed mobile convergence, file exchange, streaming service, location-based services, and presence-based services.

With revenues from voice declining, competitive differentiation for service providers will depend on delivering high value-added multi-media applications. ASCs will give service providers a reliable, cost-effective, multi-network platform on which it will be possible to rapidly develop and deploy a new generation of multi-media applications in conjunction with legacy applications to create unique service convergence.

Appendix:

Applications and the Evolving Network: It's Not a New Challenge

The phone network has previously faced the complexities of a changing network and competitive environment. After divestiture in the 1980s, competition threatened to lower AT&T's revenue in its long distance voice and data operations. Bellcore's network designers conceived of the Intelligent Network (IN). To realize additional revenue streams, they decided to break out the service control logic from the local central office switch by placing the IN in its own network element called a service control point (SCP). Both service switching points (SSPs) and SCPs were essentially digital computers programmed with the IN software. Special events — such as dialing 800 — would trigger a break in the call control sequence at the local switch (now renamed an SSP). In the IN call model, control flow would start in the SSP and then transfer to the SCP via the new Signaling System 7 (SS7) network. The SCP could map a called number into a different destination number by searching its routing database. In this way, it could transparently redirect a local number to a long distance number. An additional element, called the intelligent peripheral, gave the IN a structured interface to media resources for audio messages, text-to-speech, and interactive voice response.

AT&T had in effect implemented a rudimentary next-generation network, one characterized by distributed elements, programmability, and enhanced services that combined voice and data. When the IN was eventually rolled out in the early 90s by the Baby Bells, the intelligent network made new services and applications possible, including the now familiar toll-free 800 number, calling cards, third-party billing, tele-voting, and IVR menus. The design eventually became the model for intelligence in wireless networks. For example, GSM evolved equivalent network elements to SSPs and SCPs, called mobile switching centers (MSC) and service control function (SCF), along with a signaling protocol (CAMEL) that is heavily based on the PSTN's SS7.

One of the goals of the IN was to accelerate application development, and it succeeded to a degree. The NGN will be far more adaptable. While the exact form the NGN will take has not been decided, it too aims to foster rapid service creation and deployment. The NGN will support high-level applications and services, connect to a rich set of Web resources, and control new types of

information related to mobility and presence. Those developing and deploying converged services in the current transition stage toward a true NGN will have to be mindful of PSTN, VoIP networks, and mobile environments. Service providers as well as application service providers are actively looking at different approaches to shielding applications from low-level network dependencies. The goal is write once and deploy on any network.

GLOSSARY

3G	Third-generation mobile system
API	Application programming interface
ARPU	Average revenue per user
ASC	Application Session Controller
BSS	Business support system
CAMEL	Customized application of mobile enhanced logic
CAPEX	Capital expenditure
FMC	Fixed mobile convergence
GPS	Global positioning system
GSM	Global system for mobile communication (the European standard)
IM	Instant messaging
IMS	IP multimedia subsystem
IN	Intelligent network
IN-SCS	Intelligent network-service capability server
IP	Internet protocol
IPTV	IP television
IVR	Interactive voice response
LBS	Location-based service
MMS	Multimedia messaging system
MSC	Mobile switching center
NGN	Next-generation network
OPEX	Operational expenditure
OSS	Operation support system
PBS	Presence-based service
PDA	Personal digital assistant
PSTN	Public switched telephone network
PTT	Push to talk
ROI	Return on investment
RVT	Residential video telephony
SCF	Service control function
SCP	Service control point
SDP	Service delivery platforms
SIP	Session initiation protocol
SMS	Service management system
SOA	Service oriented architecture
SS7	Signal System #7

SSP	Service switching point
VoIP	Voice over IP
WiFi	Meeting IEEE 802.11 specifications for high-speed wireless LANs
XML	eXtensible markup language

The contents of this study represent our analysis of the information generally available to the public or released by responsible individuals in the companies mentioned. It does not contain information provided in confidence by our clients. Since much of the information in the study is based on a variety of sources that we deem to be reliable, including subjective estimates and analysts' opinions, The INSIGHT Research Corporation does not guarantee the accuracy of the contents and assumes no liability for inaccurate source materials supplied by manufacturers or end users.

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