White Paper

Delivering SIP-Based Services in a Layered Network Infrastructure

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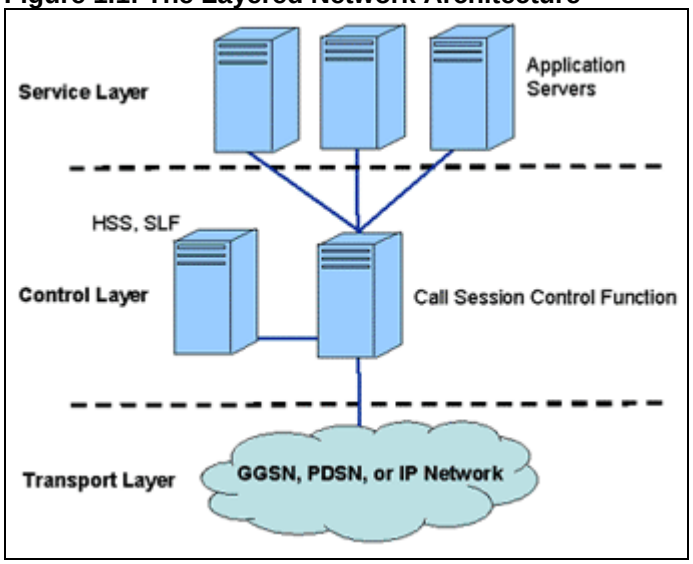
I. Executive Summary

With the standardization on IP as the common network protocol for services, the industry has been moving in the direction of standardizing the manner in which services are delivered, managed, and created. The 3GPP's IP Multimedia Subsystem (IMS) introduces a layered approach to mobile networking; ETSI Tispan has expanded upon this approach to support fixed-line networks, and CableLabs incorporated it into its PacketCable standard to support cable networks. With this layered approach, the functional elements associated with service delivery and management have been segmented into the transport, control, and application layers, with transport at the base, control in the middle, and the applications on top, as depicted in **Figure 1.1**.

Figure 1.1: The Layered Network Architecture



While the standards are clear on many transport and control layer functions, there is less clarity in the application environment. What is clear is that the intelligent networking and advanced features historically mixed within the control and network functions in traditional circuit-switched networks are provided at the application layer through feature servers in next-generation networks. The advantage of this approach is flexibility and speed in service creation and introduction.

How service providers create and introduce services at the application layer, however, is not yet standardized. To run their applications, SIP-based application developers have built service platforms that interface with VOIP and TDM networks based on standard protocols such as SIP and H.323, and SS7 and PRI signaling. Where necessary, interfaces are developed and tested to interconnect with other applications in the service provider's network. These platforms may contain a host of different capabilities and components, including but not limited to application servers, media servers, Web servers, database servers (containing data about subscribers, options, preferences, etc.), and the software applications and tools to facilitate service creation and operator interface. Collectively these elements are often referred to as the service delivery platform (SDP), but there is considerable variation in the use of the term and what vendors include in their SDPs.

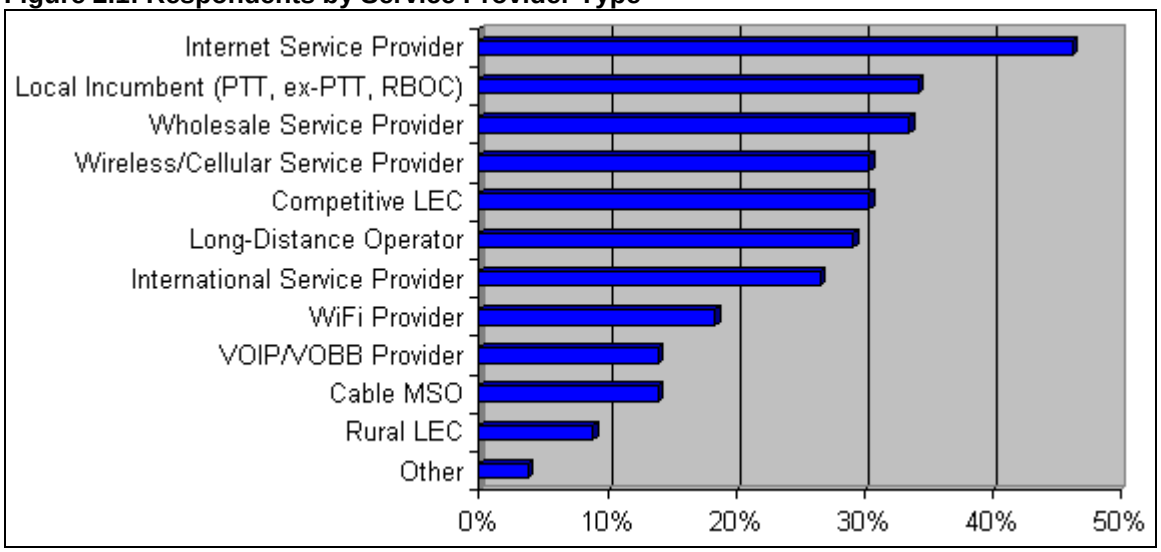
Service providers are challenged to determine the best way to implement services and advanced features in light of this shift to layered next-generation networks and the introduction of SDPs. This paper seeks to shed light on the industry trends in this direction by gathering data on the applications operators are running in their networks today and understanding how they expect to implement applications in the future. To assess these trends, *Heavy Reading* conducted an exclusive worldwide survey of 154 service provider professionals to get their input on applications, service creation, SDPs, and implementation expectations. This paper presents the results of that survey, along with analysis of overall industry trends based on other *Heavy Reading* research.

II. About the Survey Respondents

A total of 207 individuals responded to invitations to participate in the online survey. Of that total, 158 met *Heavy Reading*'s qualifications for participation, with the primary qualifiers being: direct affiliation with a telecommunications service provider as an employee or consultant; and familiarity with SIP-based applications and VOIP softswitches. The qualified respondents work for 129 different service providers.

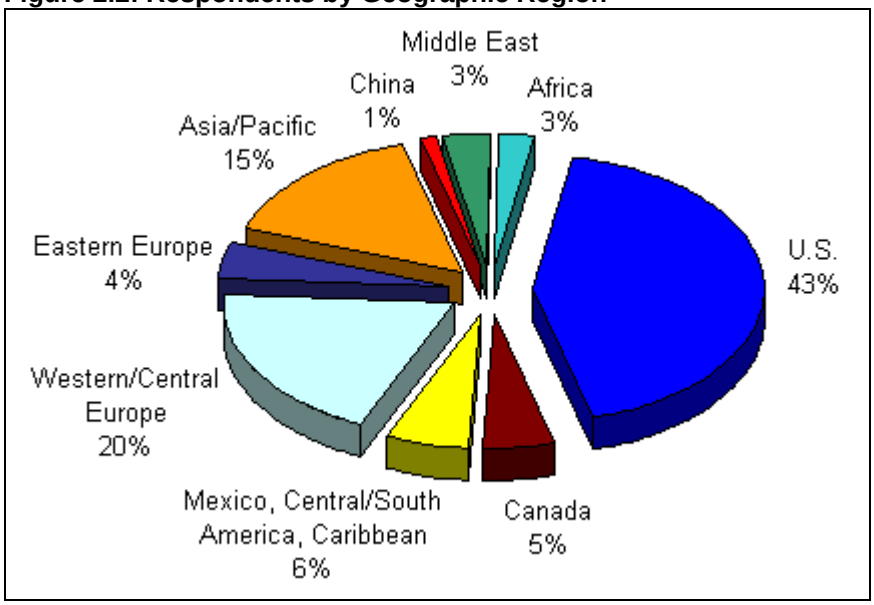
Figure 2.1 breaks out the respondent base by service provider type. Respondents were asked to indicate all categories that apply to the companies for which they work, so the total percentages exceed 100 percent. Almost 50 percent identified their company as an ISP; 34 percent identified their company as an incumbent operator.

Figure 2.1: Respondents by Service Provider Type



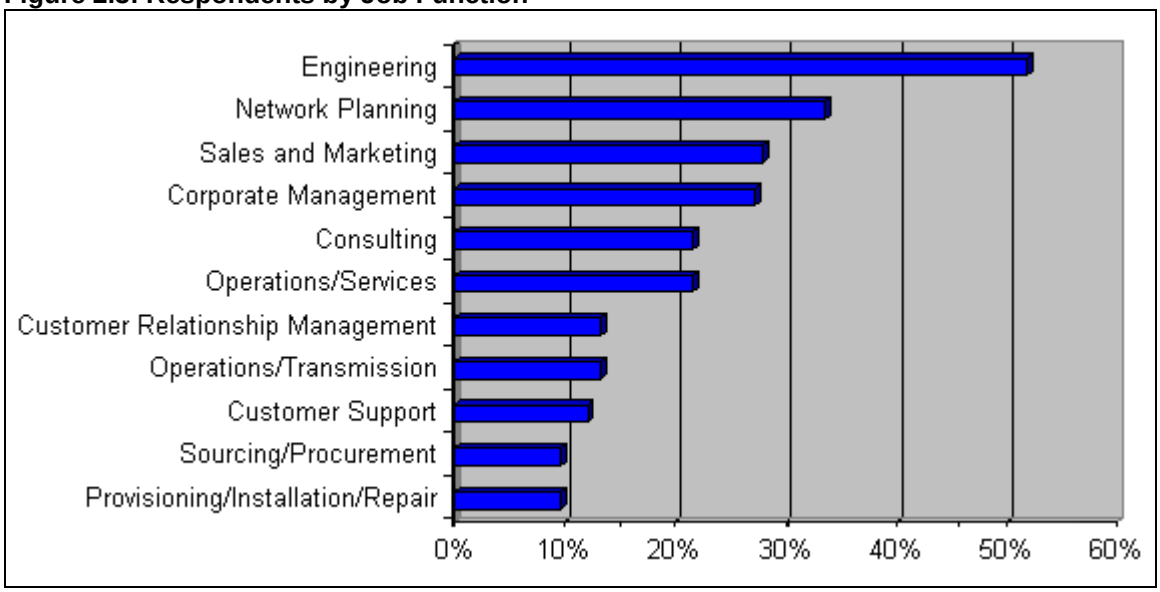
The 158 respondents represented all regions of the globe, with 43 percent in the U.S., 24 percent in Europe, and 15 percent in Asia/Pacific, as shown in **Figure 2.2**.

Figure 2.2: Respondents by Geographic Region



We asked respondents to identify the job functions for which they are responsible. As with the first question, they were asked to identify all job functions that apply to their position, so the total percentages exceed 100 percent. More than 50 percent of respondents identified their job function as engineering, and 34 percent identified it as network planning, as shown in **Figure 2.3**.

Figure 2.3: Respondents by Job Function

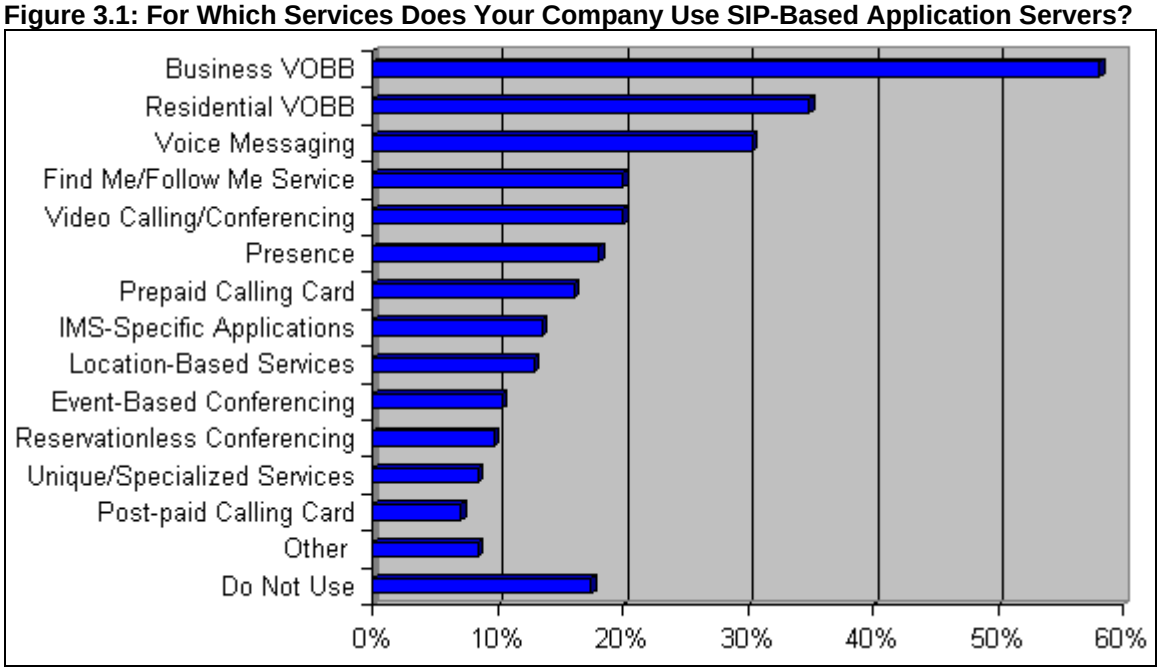


III. SIP-Based Applications

Service providers use SIP-based applications to provide a variety of services – such as residential and business voice over broadband (VOBB) services, calling card services, voice messaging, conferencing, video calling and videoconferencing, presence, and find me/follow me services. The survey participants were asked to identify the services for which their companies currently utilize SIP-based application servers in their networks. Since they were asked to identify all that apply, the total percentages exceed 100 percent.

As **Figure 3.1** shows, business VOBB is the application for which the most operators are using SIP-based application servers, with 58 percent of respondents identifying it. This was followed by residential VOBB at 35 percent and voice messaging at 30 percent; 17 percent of respondents said they do not currently use SIP-based application servers in their networks at all.

Figure 3.1: For Which Services Does Your Company Use SIP-Based Application Servers?



Of those selecting "other" as their option, the following additional applications were noted:

- Audiotext services
- Carrier VOIP peering and interconnection (2)
- Directory assistance
- Number portability
- Push-to-talk
- VOIP over cellular networks

Now that we have identified applications currently operating in service provider networks, another series of questions sought to identify trends toward future applications. Survey participants were asked to rate a list of applications with regard to timing of deployment (i.e., the highest-priority applications will likely be deployed first) on a scale of 1 to 5, with 5 being the HIGHEST PRIORITY and 1 being the LOWEST PRIORITY. **Figures 3.2** through **3.14** provide the details of those responses for each application.

Figure 3.2: Residential VOBB Service and/or Features – Future Priorities

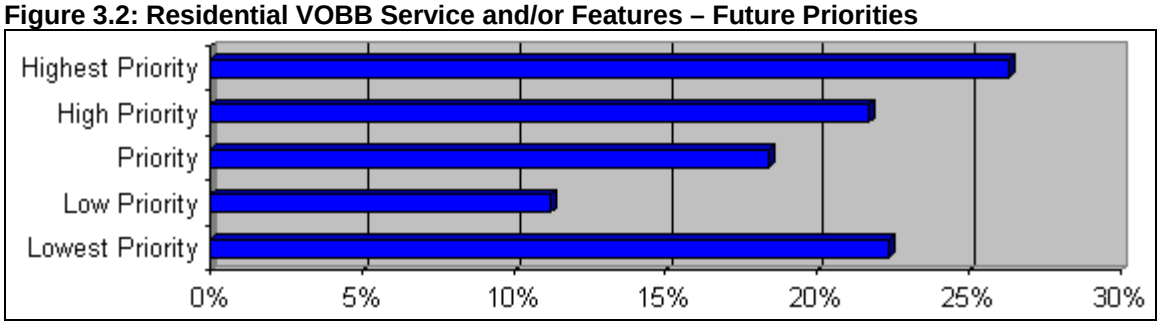


Figure 3.3: Business VOBB Service and/or Features – Future Priorities

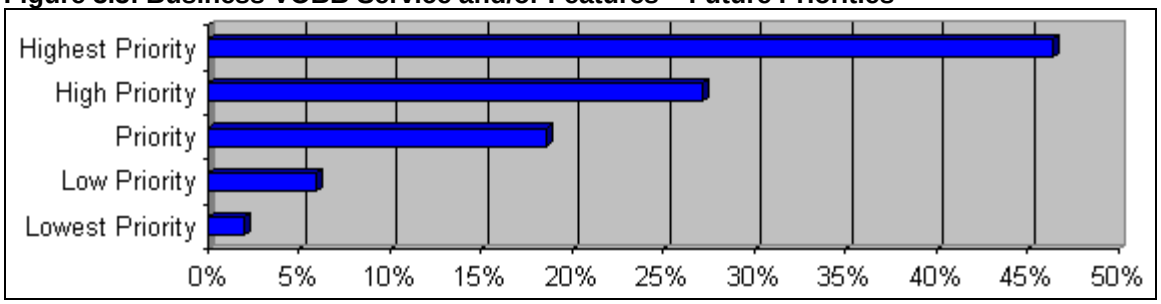


Figure 3.4: Prepaid Calling Card – Future Priorities

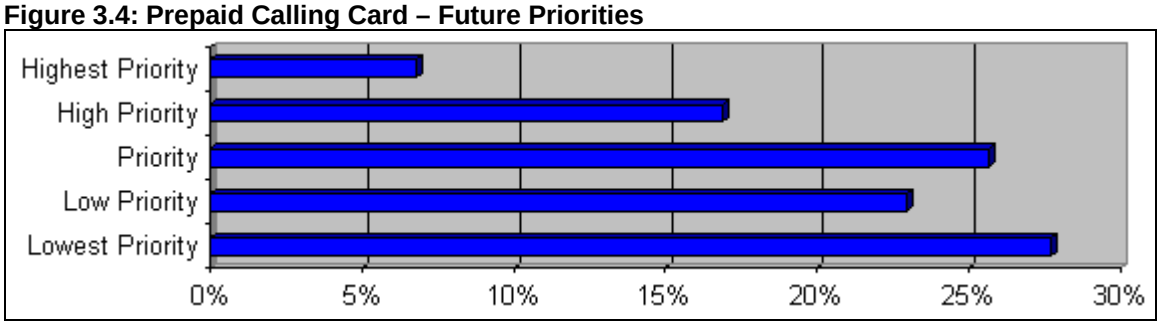


Figure 3.5: Post-paid Calling Card – Future Priorities

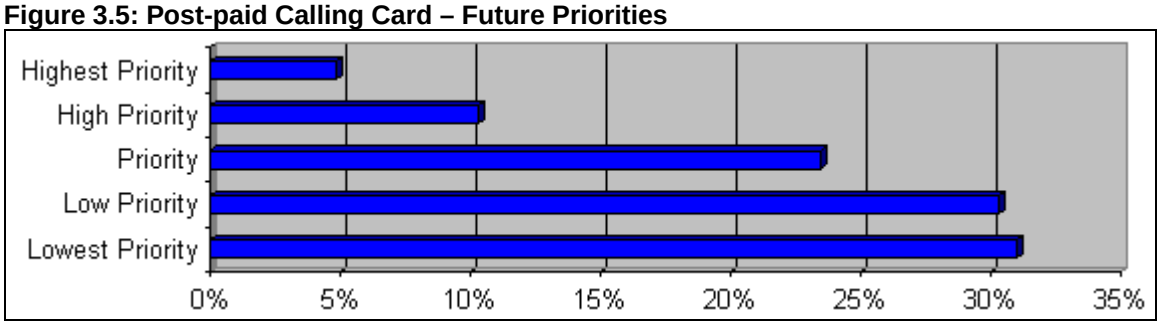


Figure 3.6: Reservationless Conferencing – Future Priorities

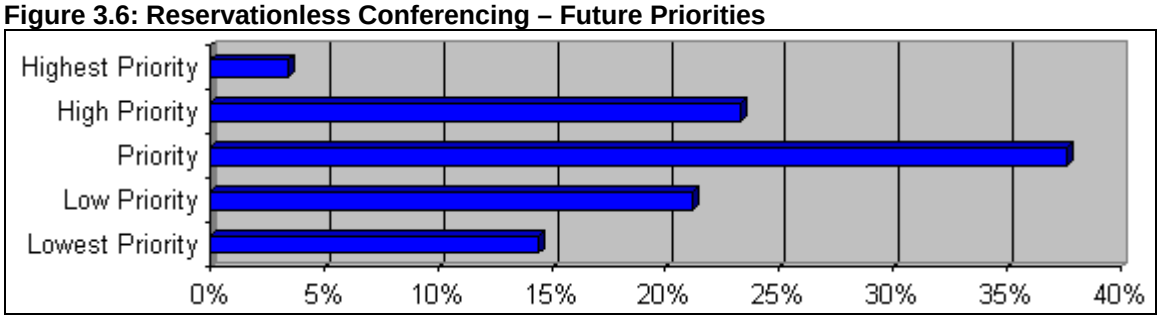


Figure 3.7: Event-Based Conferencing – Future Priorities

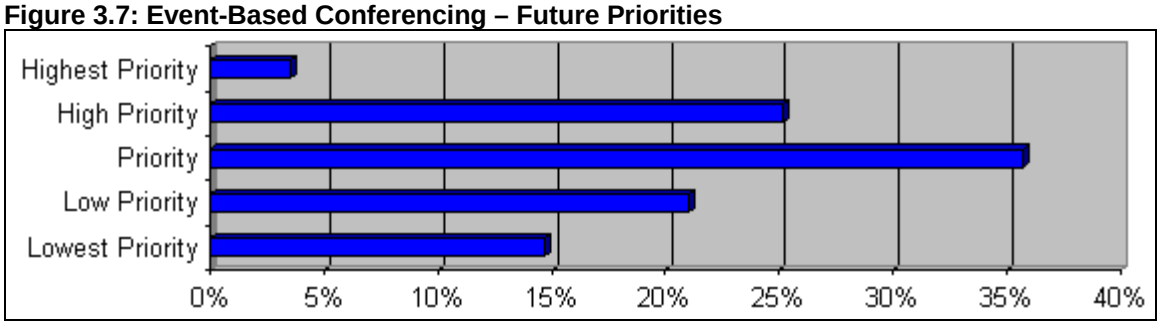


Figure 3.8: Voice Messaging – Future Priorities

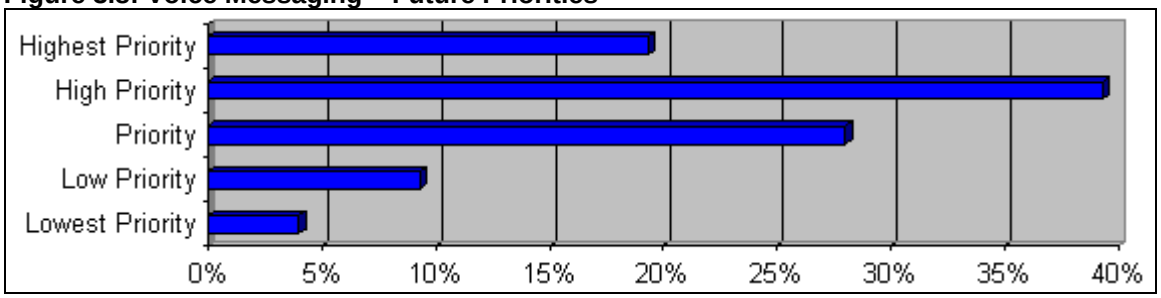


Figure 3.9: Video Calling/Conferencing – Future Priorities

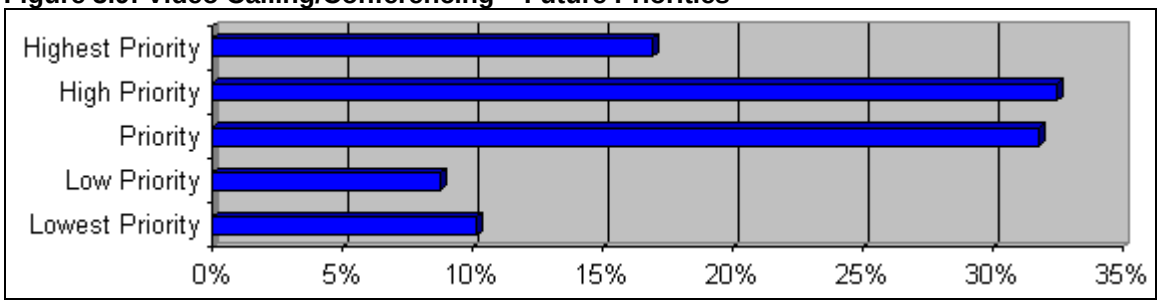


Figure 3.10: Presence – Future Priorities

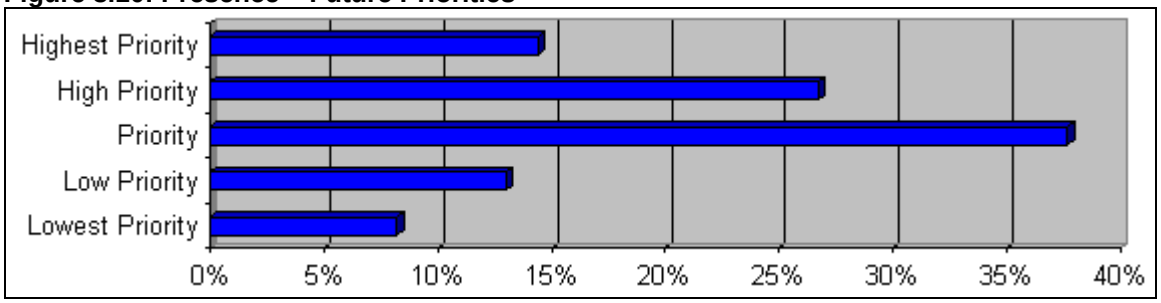


Figure 3.11: Find Me/Follow Me Service – Future Priorities

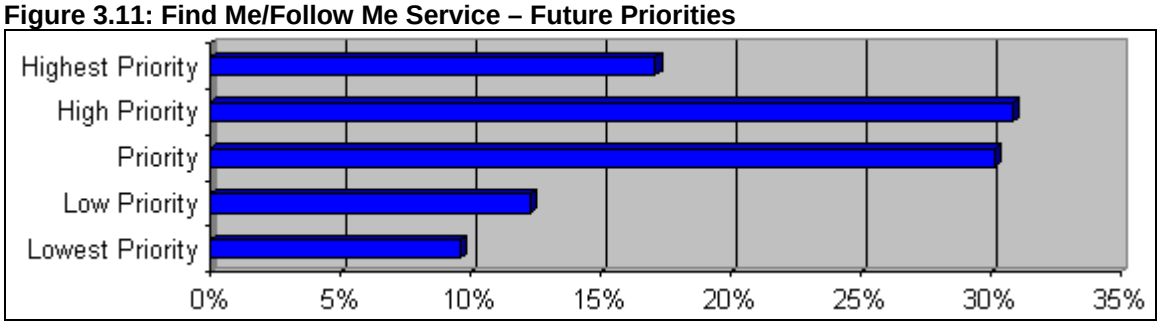


Figure 3.12: Location-Based Services – Future Priorities

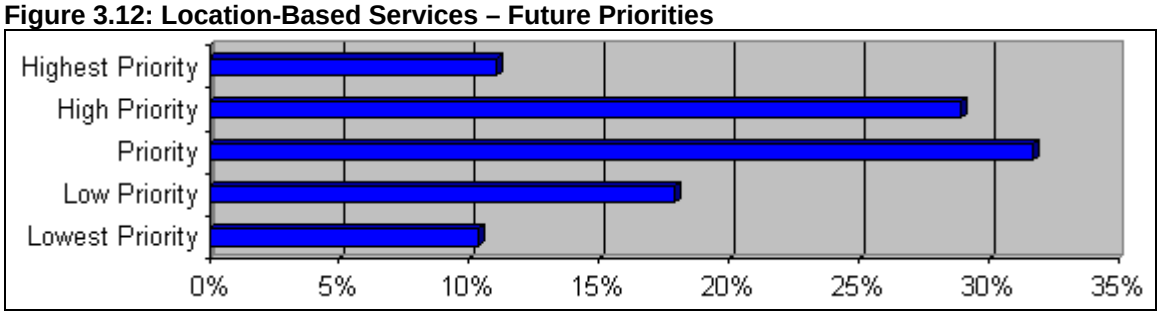


Figure 3.13: Unique and/or Specialized Services – Future Priorities

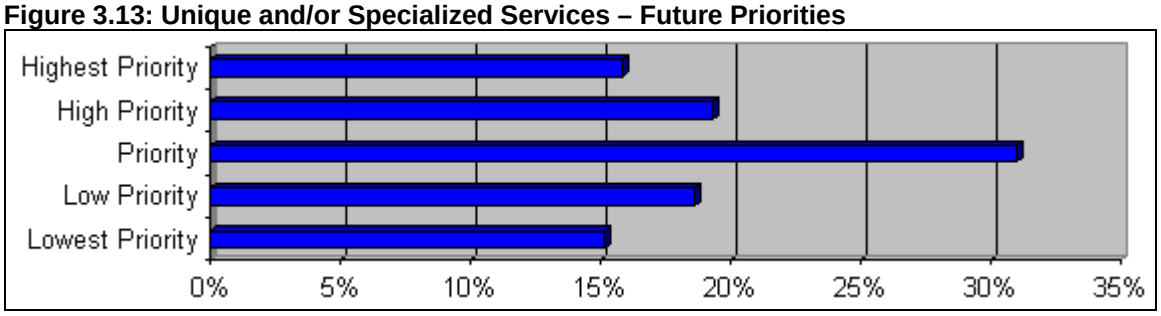
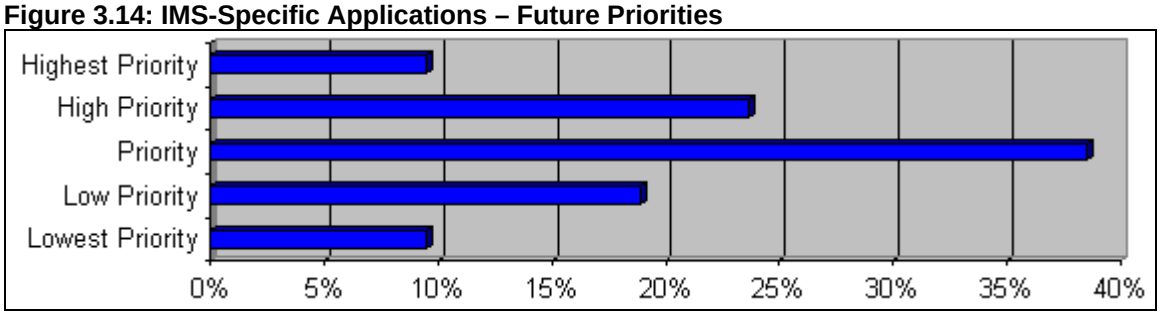
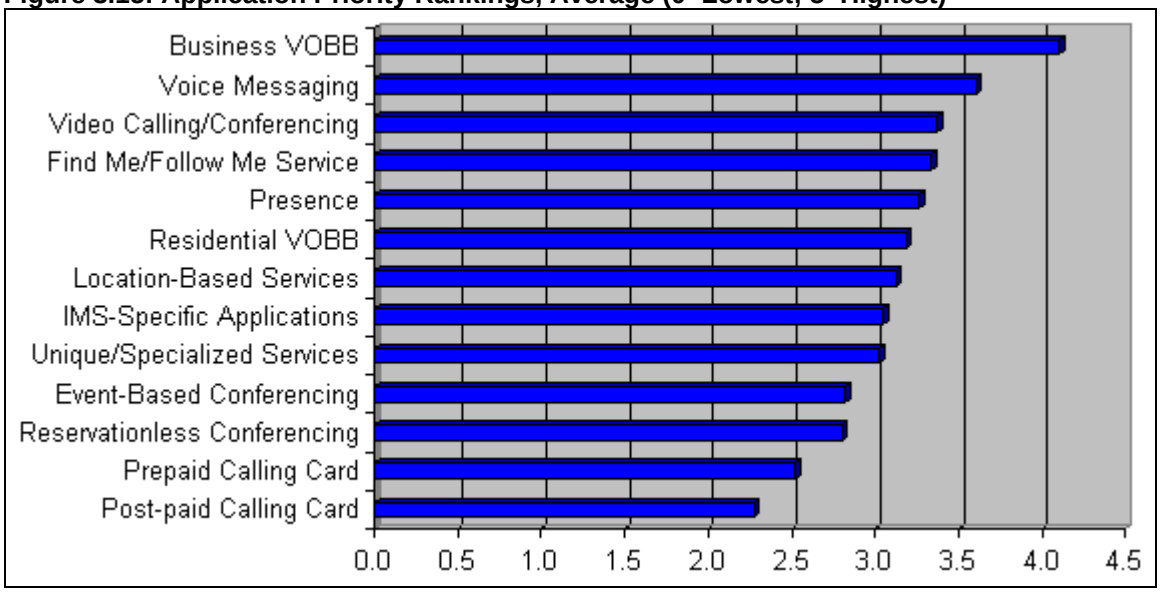


Figure 3.14: IMS-Specific Applications – Future Priorities



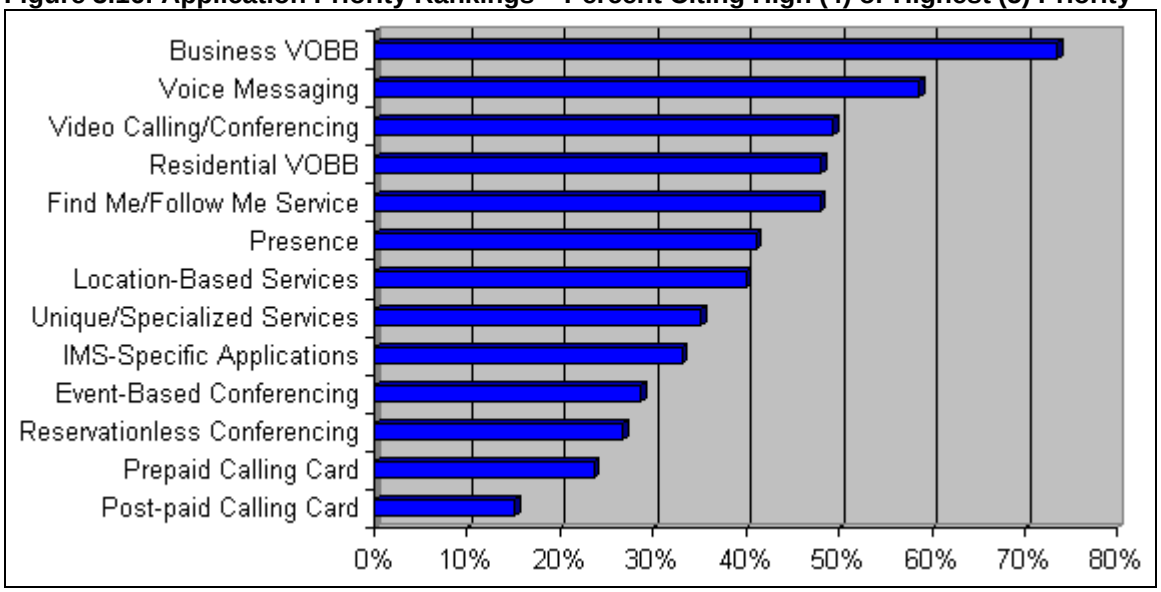
To summarize those results, we looked at them in two ways. To start, **Figure 3.15** depicts a simple average of the ratings for each application.

Figure 3.15: Application Priority Rankings, Average (0=Lowest; 5=Highest)



In contrast, **Figure 3.16** ranks these applications by the percentage of respondents who identified the application as their highest priority (5) or a high priority (4). While the ranking of the applications remains fairly consistent with both analytical approaches, the second highlights a greater degree of variation between applications with regard to importance.

Figure 3.16: Application Priority Rankings – Percent Citing High (4) or Highest (5) Priority



These results show that the industry is clearly moving to adopt SIP-based applications to provide a wide variety of services. While business and residential VOBB are the top applications today, video and voice messaging are becoming more important than residential service in the future. In addition, a host of new applications, such as find me/follow me, presence, and location-based services are taking on increasing importance.

Now that we have an elementary understanding of the applications service providers will implement in the future, the next area to explore is how those services will be created and delivered.

IV. Service Creation & Service Delivery Platforms

Companies implement their SIP-based applications in a variety of ways, from acquiring the complete turnkey application from equipment and application vendors to building it in-house on home-grown platforms. As noted earlier, the trends are toward standardization of service creation and service delivery. Many view the SDP as a way to standardize around a common platform to deliver applications within the network, but a standard definition of an SDP does not yet exist.

In the *Heavy Reading* report "The Future of SDP" (Vol. 3, No. 19, November 2005), analyst Caroline Chappell notes: "SDP vendors, and particularly systems integrators, have produced their own SDP architecture diagrams. Vendors have come up with their own terms for the component parts of an SDP and their own views on where in the SDP different functions sit. This means that their frameworks all differ in subtle ways: Some are relatively sparse, while others include a much richer set of functions – including, in some cases, even extending to OSS/BSS."

In the past, individual telecom services have typically been built as "stovepipes" – each tied to a particular equipment vendor's protocols in a particular type of network, with its own creation, provisioning, and control environment. SDPs are envisioned as the common platform that can offer a single set of capabilities to support anywhere from one to all of an operator's services, which is a major issue for large carriers that may have more than 100 stovepipe service platforms.

The basic principle of an SDP is reuse. It aims to provide a consistent, highly automated service-support environment that can be reused for multiple services. An SDP has three main functions:

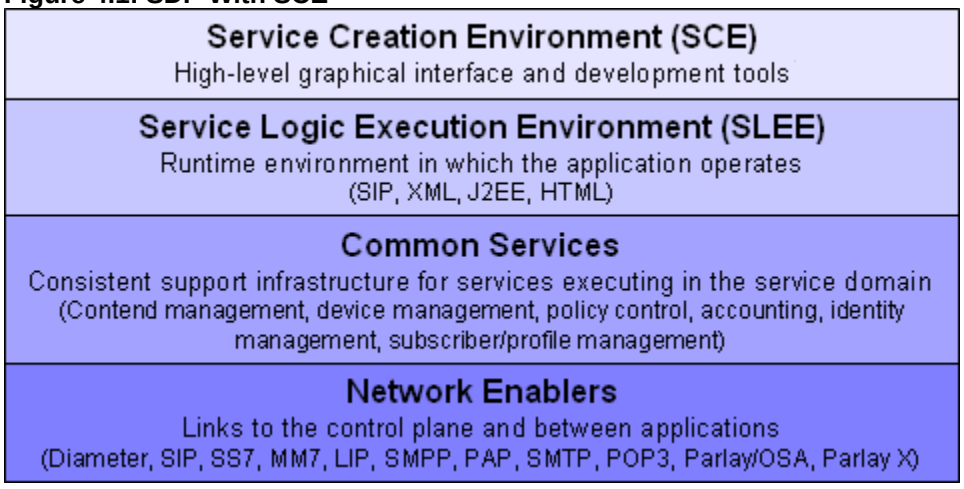
- To support the rapid creation of end-user services (applications) that run over networks
- To provision these services to end-users
- To control the execution of services so that they make money

And there are at least three categories of components typically found within SDPs:

- Service logic execution environment
- Common services
- Network enablers

For the purposes of this paper, we offer the simplified block diagram presented in **Figure 4.1** as a functional description of an SDP and its elements.

Figure 4.1: SDP With SCE



The **service logic execution environment (SLEE)** is a carrier-grade service runtime environment that takes care of issues such as scaleability, distribution, and deployment configuration of services. In practice, the SDP may contain multiple SLEEs, depending on the network functions to which service developers want to program. While business-oriented service logic will be executed in the IT environment, in a J2EE or .NET application server, real-time parts of services, such as logic handling call control or pre-paid charging, will execute close to the network in a carrier-grade SLEE embedded in a specialist telecom application server.

Common services provide a consistent support infrastructure for services executing in the service domain. Service developers can use the capabilities provided by the common services to provision and control their application-level services – they don't need to recreate "stovepipes" of function. Examples of common services are:

- Content management
- Device management
- Policy control
- Accounting
- Identity management
- Subscriber/profile management

The **network enablers** consist of middleware that provides developers with a high-level application programming interface (API) to an underlying network protocol. Depending on the situation, the network enabler either carries out the needed translation between the API command and the protocol or, if a legacy service has been developed that uses one protocol but needs to talk to a next-generation network function that speaks another protocol, the gateway will carry out the protocol conversion.

The **service creation environment (SCE)** is the developer toolset used to build application-level services that execute in the SDP and that call on network functions via the SDP. These applications are typically high-level graphical, point-and-click design tools that insulate the operator from the more detailed programming underlying their operation. While some players consider the SCE as part of the SDP, others do not.

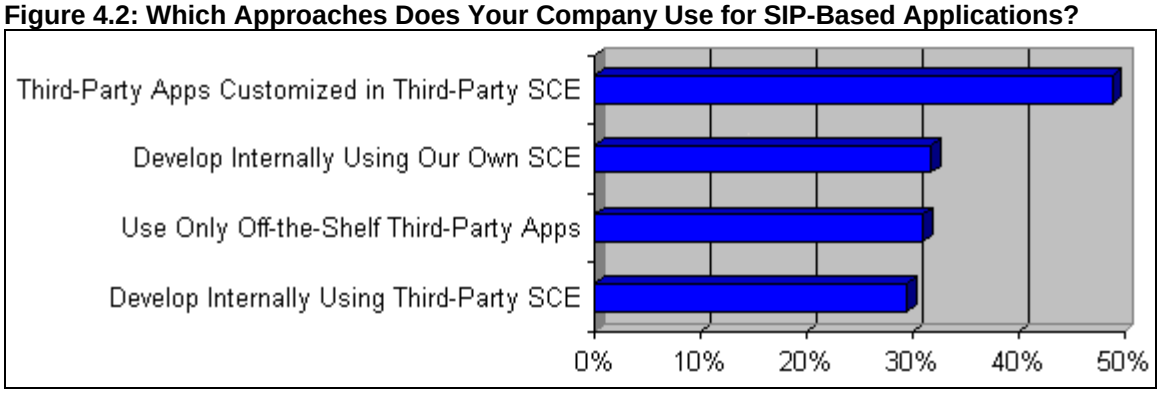
In addition to those functions outlined above, SDPs support service orchestration and service interaction to prevent possible conflict between different applications or parts of services trying to control network functions at the same time. They also provide self-service portals to facilitate automation of service development, provisioning, and control functions.

4.1 Survey Results

We next asked survey participants a series of questions regarding their current practices and future plans for service creation and SDPs. The first question in this series was: "Which of the following approaches does your company use for SIP-based applications?" Several options were listed, and respondents were asked to check all that apply.

Of the 129 participants who answered this question, as shown in **Figure 4.2**, the largest group (49 percent) said that their company uses third-party applications customized in a third-party SCE. While 31 percent noted that their company uses only off-the-shelf third-party applications, about equal numbers said they would develop applications internally on their own SCE (32 percent) or on third-party SCEs (29 percent). Overall, these results suggest that operators will use a combination of approaches to provide SIP-based applications, and all but one third of them will involve some level of customization.

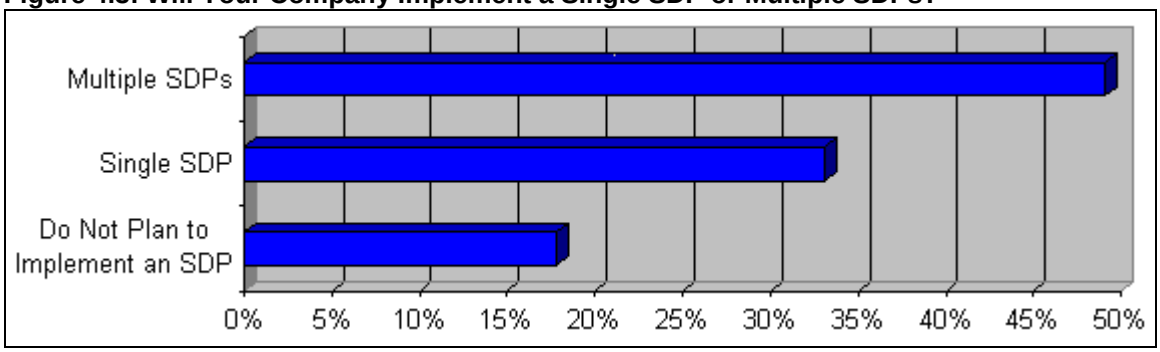
Figure 4.2: Which Approaches Does Your Company Use for SIP-Based Applications?



There is a lot of discussion in the industry about service providers implementing a single SDP infrastructure upon which they expect all their applications to operate. To assess the likelihood of this approach our survey asked: "Will your company implement a single SDP upon which all applications must operate, or multiple SDPs, each delivering different services and applications?"

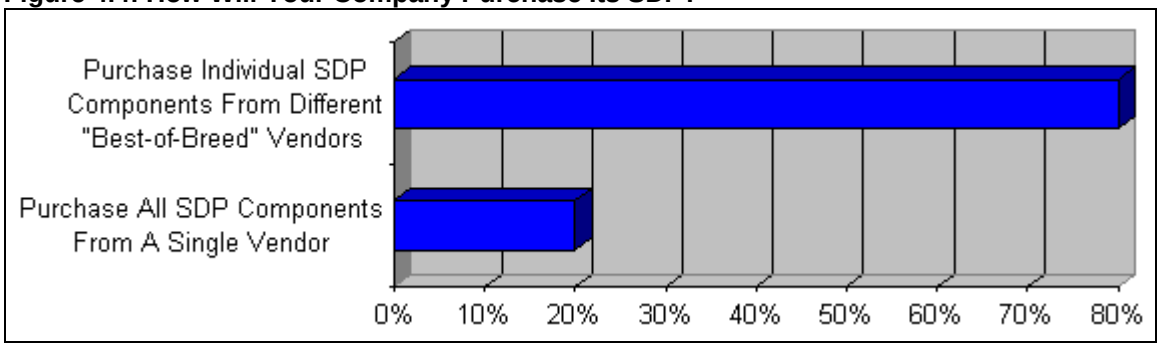
As **Figure 4.3** illustrates, virtually half of respondents (49 percent) said that their company would implement multiple SDPs. Since 18 percent stated that they do not plan to implement an SDP at all, we could also say that 60 percent of those planning to implement SDPs plan to do so with multiple SDPs (77 implementing multiple SDPs, 52 implementing single SDPs, for a total of 129).

Figure 4.3: Will Your Company Implement a Single SDP or Multiple SDPs?



As mentioned earlier, SDPs contain a variety of components, including but not limited to application servers, media servers, Web servers, database servers (containing data about subscribers, options, preferences, etc.), as well as the software applications and tools to facilitate service creation and operator interface. We asked survey participants how they would purchase these components; 80 percent of 117 respondents said they would purchase individual components from different "best-of-breed" vendors as shown in **Figure 4.4**.

Figure 4.4: How Will Your Company Purchase Its SDP?



We then asked a series of questions regarding respondents' SDP purchasing strategies, to determine how operators will purchase their applications. Participants were asked to identify how they expect their companies to purchase SIP-based applications by noting the likelihood for each approach on a scale of 1 to 5, with 5 being the MOST LIKELY STRATEGY and 1 being the LEAST LIKELY STRATEGY. **Figures 4.5** through **4.9** present the details of those results.

Figure 4.5: We Will Develop Our Own Applications

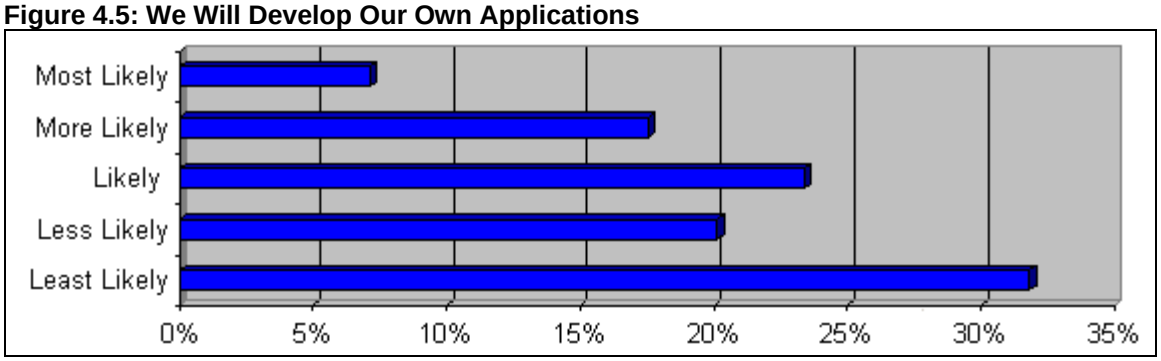


Figure 4.6: We Will Buy Applications From SDP-Independent Developers

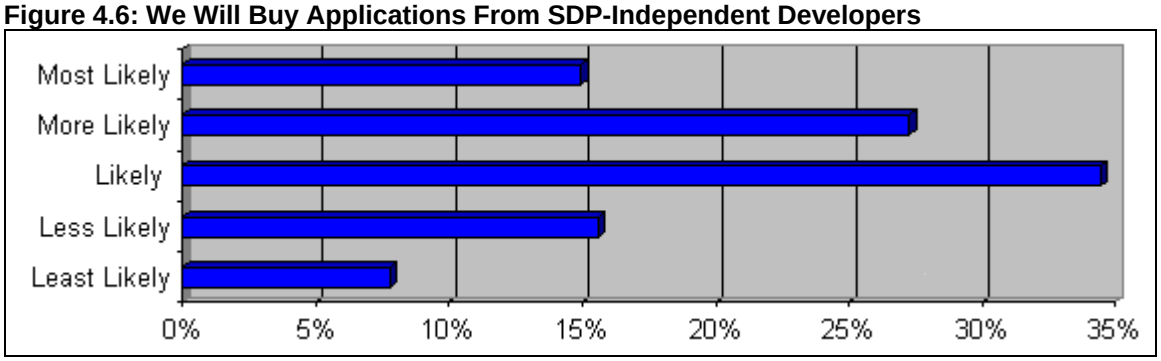


Figure 4.7: We Will Buy Applications From the SDP Vendor

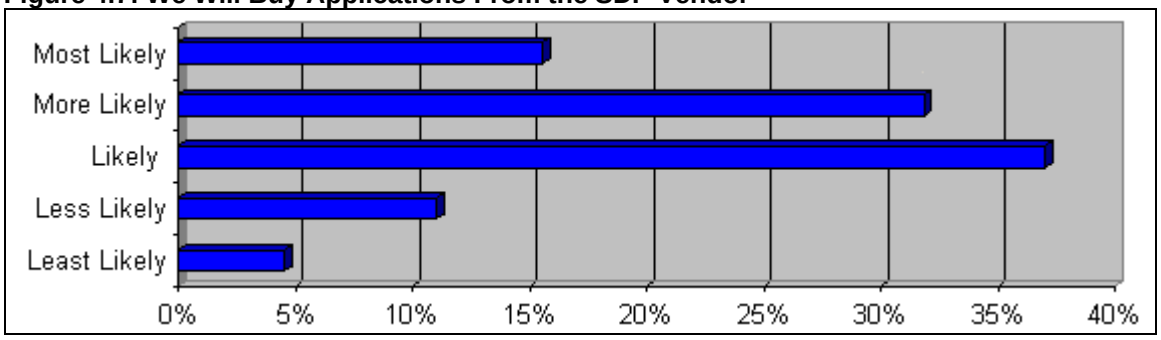


Figure 4.8: We Will Ask Our SDP Vendor to Recommend Applications

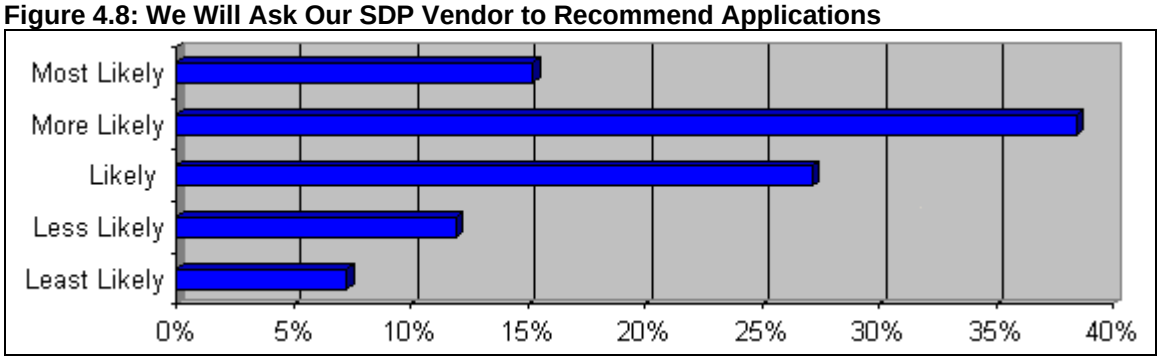
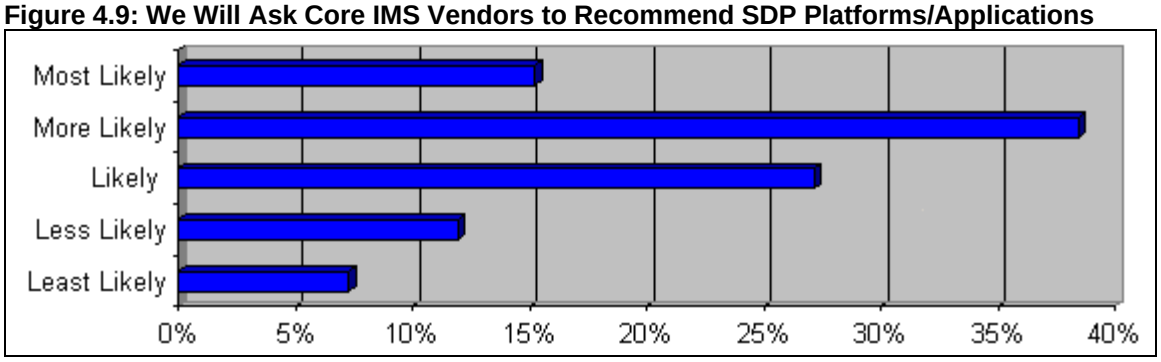


Figure 4.9: We Will Ask Core IMS Vendors to Recommend SDP Platforms/Applications



In order to summarize those results, we again looked at them in two ways. **Figure 4.10** shows a simple average of the ratings for each approach to application purchasing. **Figure 4.11** ranks each approach based on the number of respondents who identified the application as their most likely (5) or more likely (4) strategy.

The results don't show a wide variation. The responses are fairly evenly distributed among asking for SDP or IMS vendor recommendations, purchasing the applications from the SDP vendor, or purchasing them from SDP-independent application developers. The one distinction seems to be with regard to companies' plans to develop their own applications: As noted in the earlier question on service creation, a significant percentage of respondents anticipate developing their own applications, but this does not appear to be the dominant strategy. Instead, companies appear more likely to begin with some vendor's application and introduce a degree of customization.

Figure 4.10: SIP-Based Application Strategy, Average (0=Least Likely; 5=Most Likely)

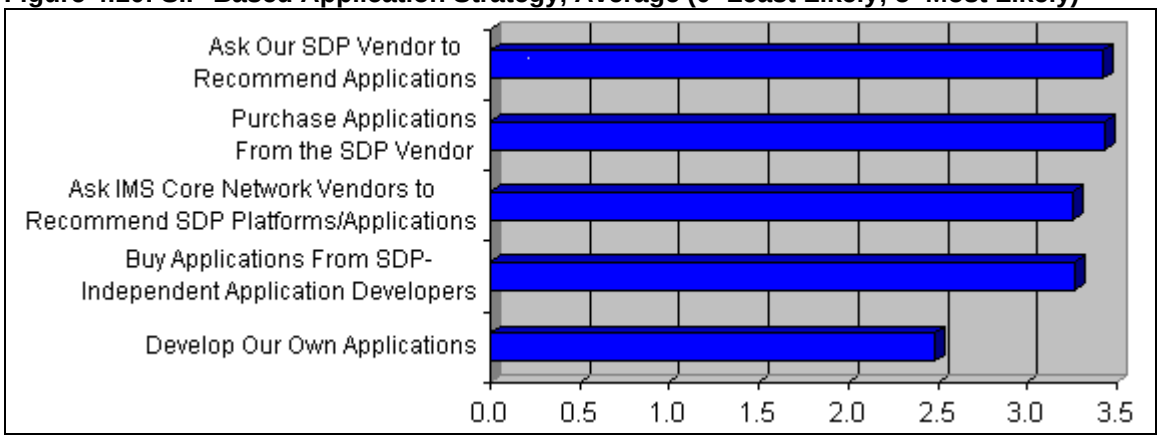
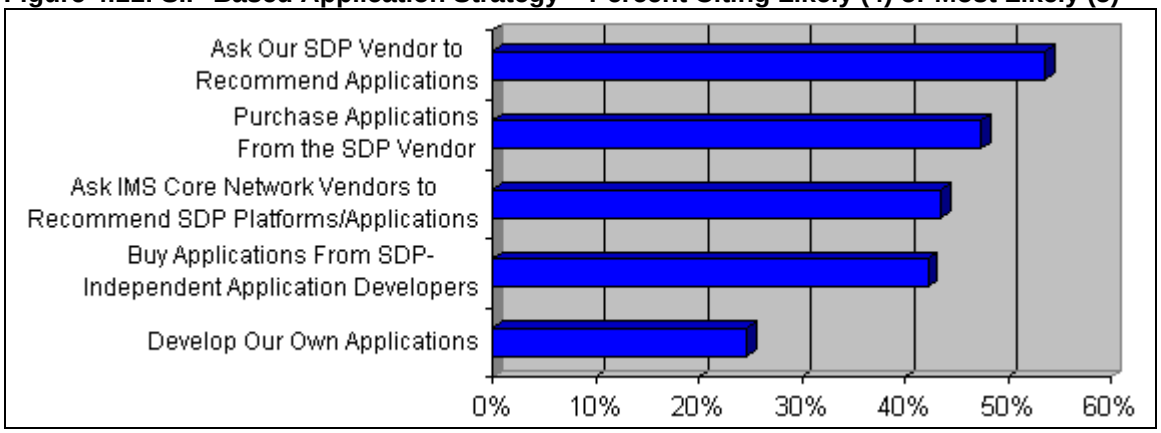


Figure 4.11: SIP-Based Application Strategy – Percent Citing Likely (4) or Most Likely (5)



We asked a similar series of questions to determine the importance of various attributes in selecting an application solution vendor. Participants were asked to rate how important they considered various vendor and platform attributes when selecting an application solution on a scale of 1 to 5, with 5 being MOST IMPORTANT and 1 being LEAST IMPORTANT. **Figures 4.12** and **4.13** summarize those results.

Figure 4.12: Factors Influencing Application Solution Choice, Average (0=Least Important; 5=Most Important)

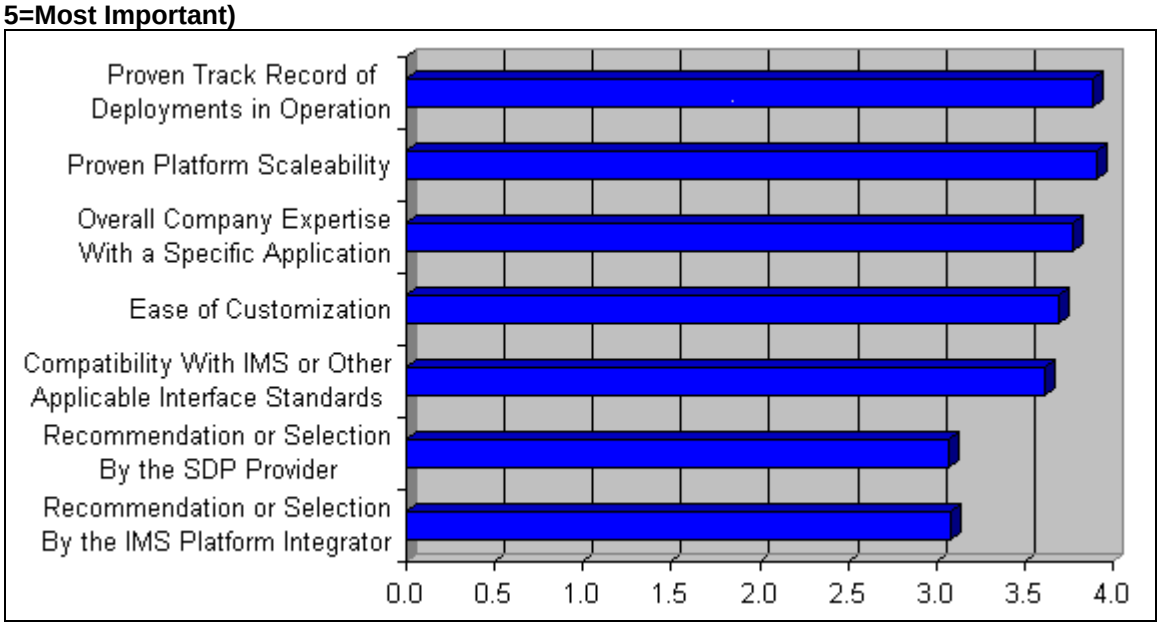
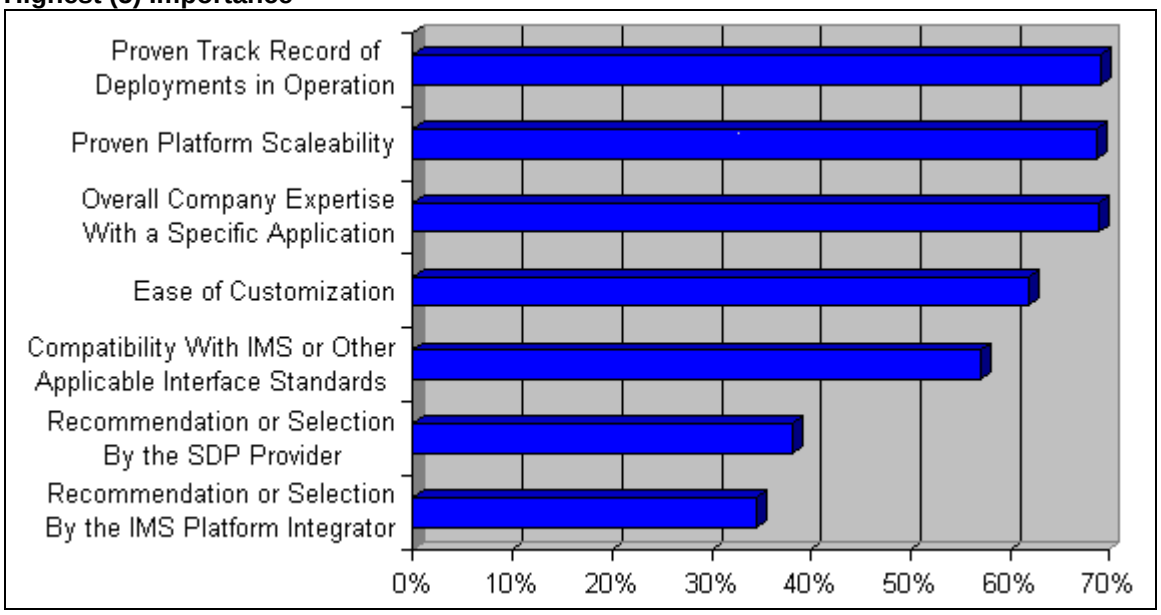


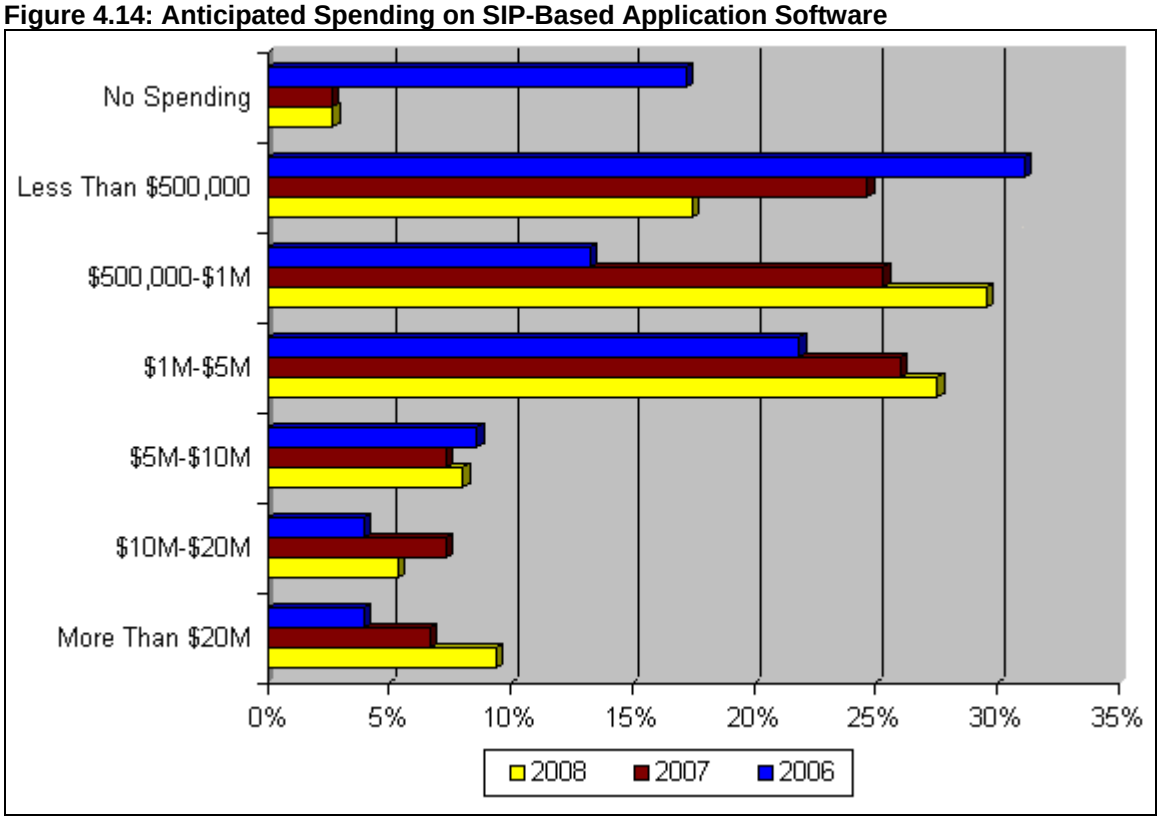
Figure 4.13: Factors Influencing Application Solution Choice – Percent Citing High (4) or Highest (5) Importance



Here we see that expertise, track record, and scaleability are the highest priorities, with results fairly evenly split among the three. The lowest priority, but still significant, is the recommendation of SDP and IMS vendors. This suggests that while operators value the input of their SDP and IMS vendors, they will ultimately make their purchasing decisions based on the performance of the application vendor's products.

Figure 4.14 presents a summary of survey participants' expectations for spending on SIP-based application software over the next several years. The majority of respondents expect their company to spend up to $5 million each year.

Figure 4.14: Anticipated Spending on SIP-Based Application Software



4.2 Survey Summary

The results of this survey clearly show that companies expect to use a variety of approaches to implement their SIP-based applications, with no single dominant approach. Customization is certainly a common theme, whether it is achieved by developing the application internally or beginning with a vendor's application and customizing it for the operator. Likewise, operators expect to implement multiple SDPs to run their applications, with some specific to the particular applications and others standardized for multiple applications. They also expect to use a variety of service creation approaches and SCEs to develop and customize their applications.

V. Conclusion: The Pactolus Approach

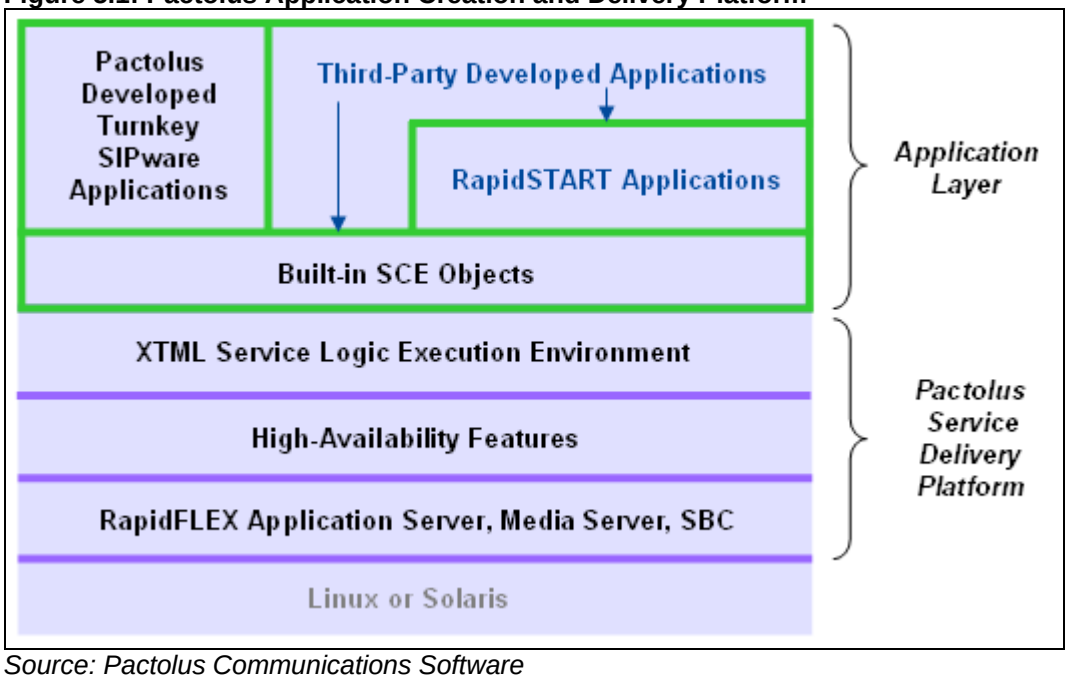
A wide variety of companies offer SIP-based applications and SDPs; some offer only applications, and others focus on the SDP. Still others provide a suite of applications as well as an SDP and SCE. Pactolus Communications Software is one such company. Pactolus offers a suite of turnkey SIPware™ applications that run on its RapidFLEX™ Service Delivery Platform. These applications include:

- Reservationless audio conferencing
- Event audio conferencing
- Residential and business VOBB
- Prepaid and post-paid calling card
- Voice messaging

The company is also known for offering a flexible, easy-to-use SCE within which its customers are able to customize Pactolus's turnkey applications or build their own.

Recently the company decided to take this level of flexibility one step further and lead the industry by organizing the SIP-based application development community www.SIPdev.org and opening up elements of its platform to third-party developers. To jump-start developers and enterprises, the company "open sourced" some of its application technology as RapidSTART™ applications, and it plans to expand the library with other applications in the near future. **Figure 5.1** depicts Pactolus's application creation environment and SDP.

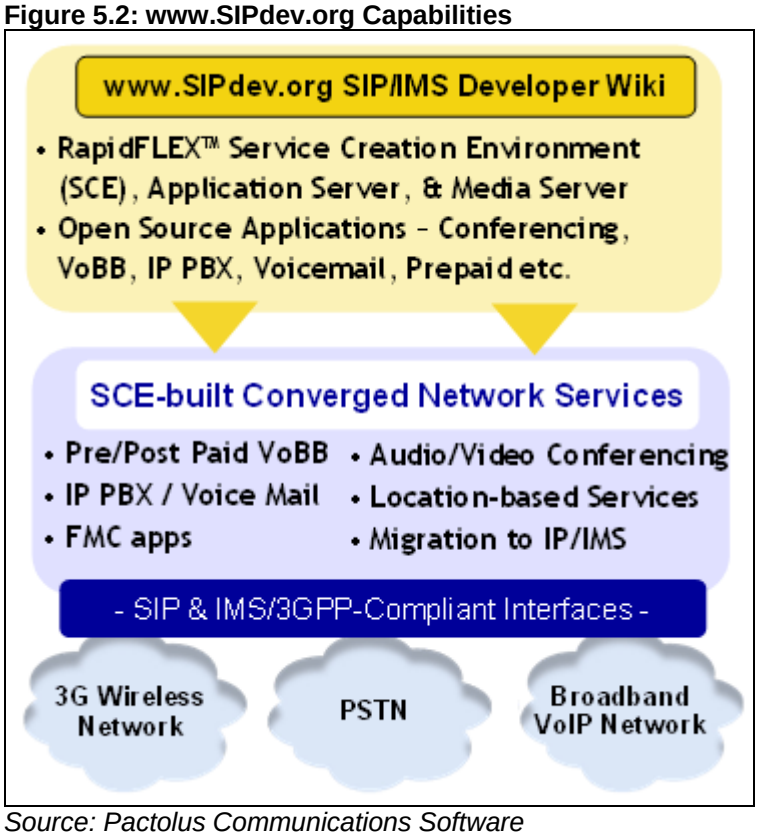
Figure 5.1: Pactolus Application Creation and Delivery Platform



Source: Pactolus Communications Software

This approach offers service providers the flexibility to purchase turnkey applications, customize packaged applications, and develop their own applications. It also opens the door to the much larger third-party developer community to greatly expand service provider application options. **Figure 5.2** depicts how developers utilizing www.SIPdev.org are able to leverage Pactolus's experience, SDP, and pre-built applications by reusing software objects to create customized applications with IMS-compliant interfaces to run in mobile, PSTN, or broadband environments.

Figure 5.2: www.SIPdev.org Capabilities



Source: Pactolus Communications Software

Companies such as Pactolus are driving the industry forward with leading-edge approaches to service creation and delivery and helping service providers come closer to recognizing the full benefits of a layered network environment.

For more information about Pactolus or this white paper, please contact:

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