IP PBX for Service Oriented Architectures
Communications Web Services

Introduction

Enterprise communications have traditionally been provided by closed, stand-alone PBX systems. Installed in a separate phone room or wiring closet, operated over a different wiring infrastructure, known only by the telecom manager, these systems ran independently from every other aspect of the business.

Today's business-savvy CIOs are exploring ways in which information technology can be better leveraged to improve the efficiency and productivity of the enterprise. In practice, CIOs are embracing the concepts of Service Oriented Architectures and rethinking how the different business systems in use within the enterprise can be designed to allow each system to leverage the benefits of any other system.

The maturing of web service technology has provided a real framework for allowing one system to leverage the services of another according to the principles of a Service Oriented Architecture. Complex business systems can now work together to deliver solutions in highly customized ways to end users. Increasingly, applications are adapting to the specific needs of users rather than users being forced to adapt to the available functionality of applications.

Sphere Communications Inc. has developed the next generation of IP PBX (Sphericall) as a business software system that is able to deliver a rich set of communications services to a host of other business applications within the context of a Service Oriented Architecture. As such, the PBX moves out of the wiring closet, and is installed, managed and optimized in the same manner as any other business software system. Sphere's web services offer the CIO the opportunity to rethink how the enterprise is architected and to establish communications as the essential fabric of all business processes.

Web Services Overview

Web Service Technology

As the Internet grew from a forum for sharing information to a marketplace for doing business, a technology matured that allowed computers to easily transact with each other. Out of these Internet roots, web service technology was born.

The general goal of web services is to construct elements of business logic, services, which can be very easily used by other applications. The services themselves hide the complexity of their business logic from the consumers through simple interfaces that allow the services to be reused in many different applications. The service and the consumer are described as being loosely coupled, an approach that allows complex composite solutions to be developed through leveraging multiple web services.

There are a number of key elements to web service technology…

- *XML (eXtensible Markup Language)* is the core language of web service technology. It provides a platform neutral way to describe the data associated with any service transaction.

- *SOAP (Simple Object Access Protocol)* is the preferred means by which an application invokes a web service. The protocol itself is written in XML.

- *WSDL (Web Service Definition Language)* is the specification of the interface that a web service exposes to consumers. It describes the set of operations that the service makes available. The WSDL is also written in XML.

Advantages of Web Services

- *Loosely Coupled* – the high degree of abstraction that exists between the implementation and the consumption of the service frees the web service client and the web service provider from needing any knowledge of each other beyond inputs and outputs

- *Platform neutral* – web services can be provided by or invoked on most, if not all, platforms today, even legacy platforms

- *Development language neutral* – people are developing web services using C/C++, C#, Java, Visual Basic, Python and others

- *Standards are architecture neutral* - these do not enforce client-server, peer-to-peer or any other model, although practical implementation issues currently drive developers to client-server

- *Web services leverage existing standards* - standards that are already in place for conventional web server applications, including HTTP, secure sockets and authentication

- *Relatively lightweight* - so they can be easily deployed to small devices for example PDAs and SmartPhones.
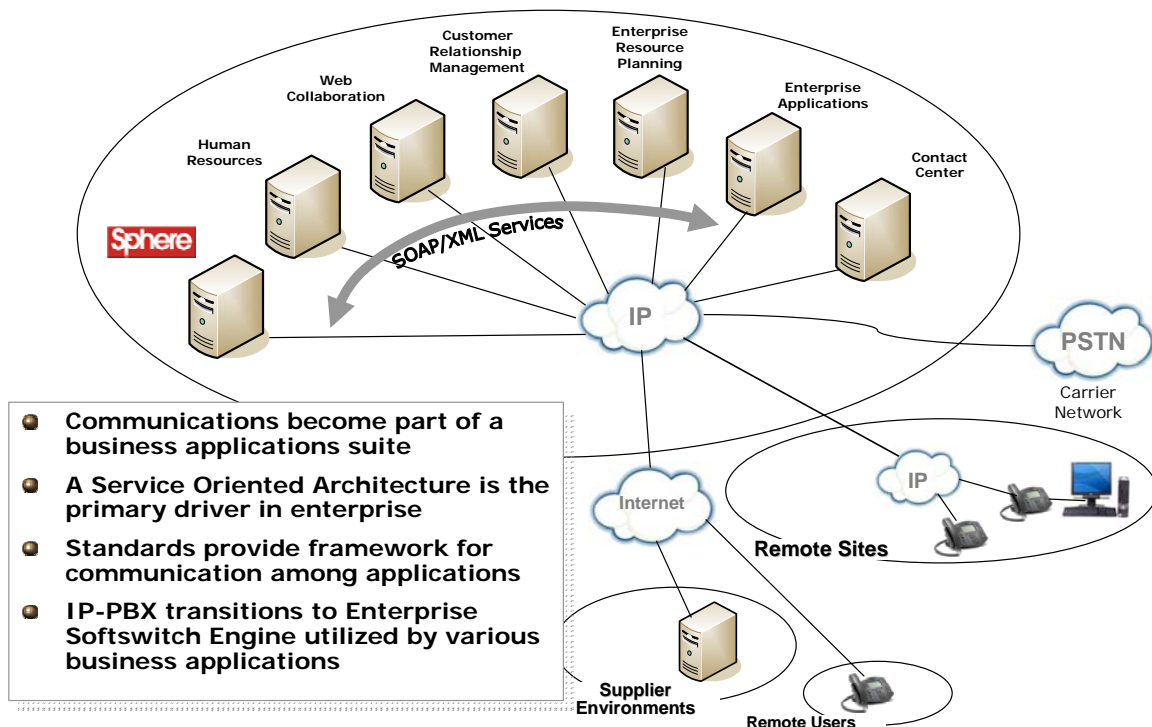
Sphere's Communications Web Services
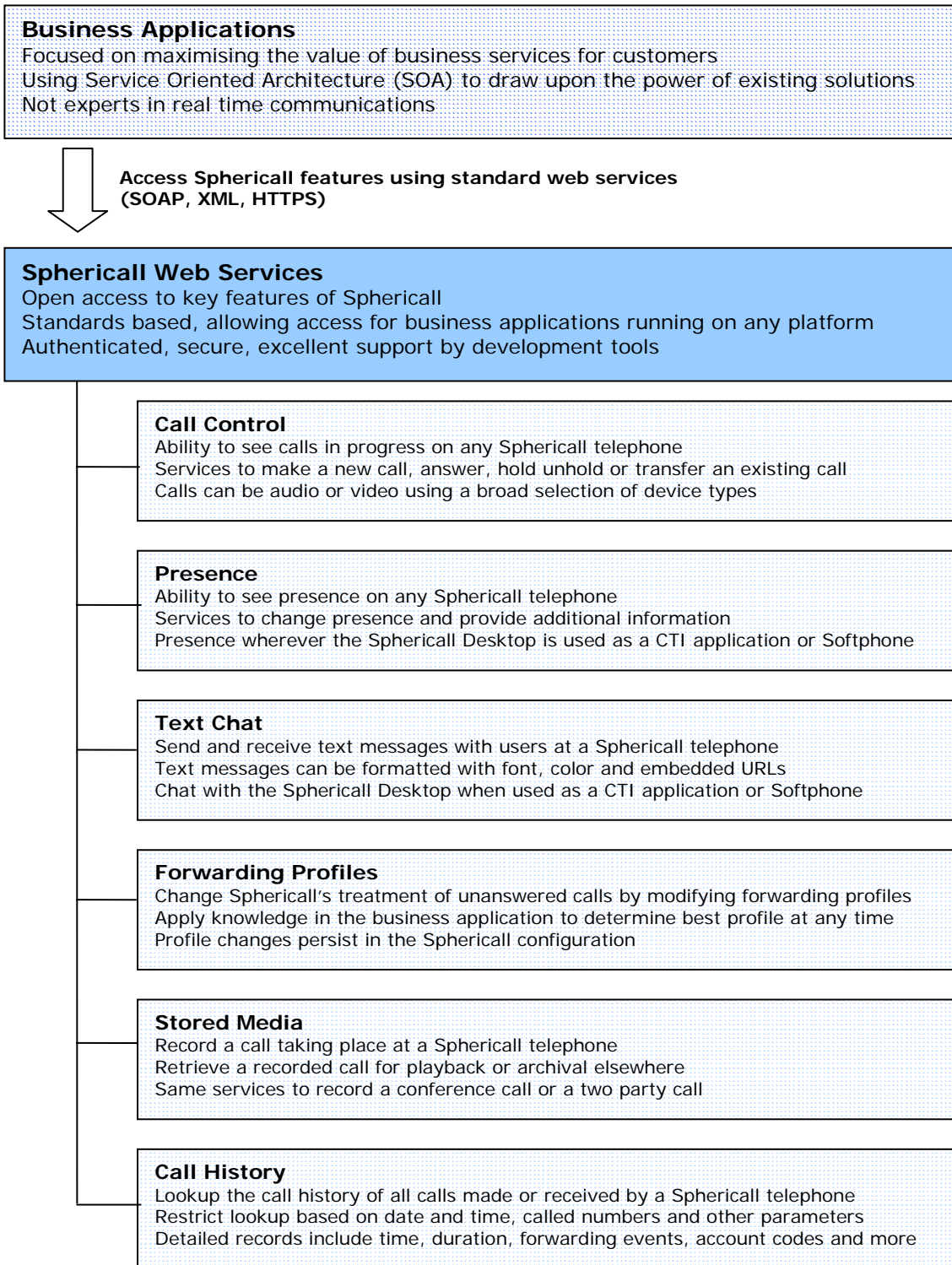
Sphere's IP PBX

Sphere has developed its next generation IP PBX (Sphericall) as a business software application that is abstracted away from the underlying network infrastructure and any telephones or gateways that it supports. As a software application it has been designed as an open mission critical communications infrastructure rather than as a closed standalone system. In this regard, it is a distributed application and able to operate on any number of networked servers. The servers can be centralized or setup over any wide geographic area, with no one server acting as a single point of failure. The IP PBX has been proven to support up to 30,000 lines.

As an IP PBX, Sphericall delivers a very rich feature set to its users going far beyond the traditional audio feature sets of legacy PBX systems. At the heart of the IP PBX is a presence engine that allows users to view the presence state (on the phone, in a meeting, out to lunch, etc) of colleagues so that an appropriate means of communication can be chosen; if a colleague is on the phone then a user might choose to send a text message to the colleague requesting a call back when they free up. Additionally, the IP PBX has the ability to "find" (or intelligently route calls to) a user based on a number of criteria including presence state, time of day and caller ID.

As a business software application, Sphericall is able to offer its rich set of capabilities as services to other applications. In essence, IP PBX communications can become part of the core fabric underlying all business processes. Most business applications do not want to know or need to know about the complexity of establishing audio, video or data communications between users. Web service technology provides an ideal integration approach, whereby the complexity of communications is shielded by the IP PBX from the business application, yet at the same time the technology provides a very simple approach for invoking the services.

- Communications become part of a business applications suite
- A Service Oriented Architecture is the primary driver in enterprise
- Standards provide framework for communication among applications
- IP-PBX transitions to Enterprise Softswitch Engine utilized by various business applications
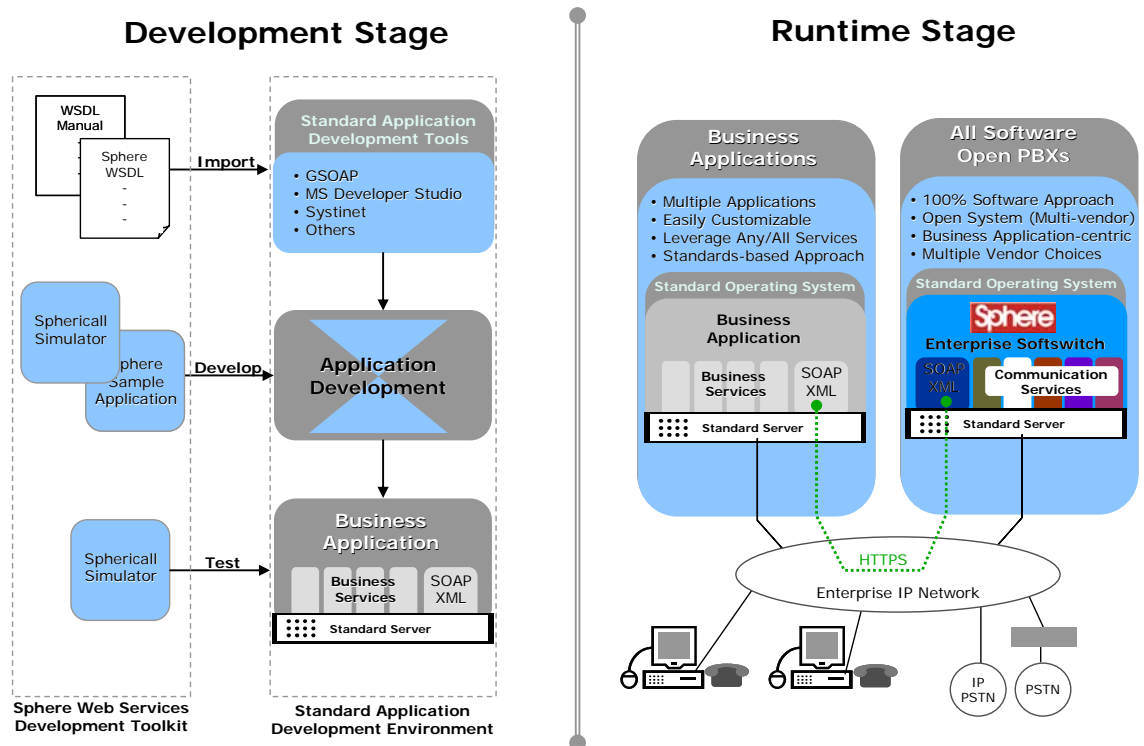
Communications Web Services

Leveraging the power and flexibility of web service technology, Sphere has opened up its rich feature set as a set of services to other business applications. The details of these services are described in the following chart…

Business Applications
Focused on maximising the value of business services for customers
Using Service Oriented Architecture (SOA) to draw upon the power of existing solutions
Not experts in real time communications

Access Sphericall features using standard web services (SOAP, XML, HTTPS)

Sphericall Web Services
Open access to key features of Sphericall
Standards based, allowing access for business applications running on any platform
Authenticated, secure, excellent support by development tools

Call Control
Ability to see calls in progress on any Sphericall telephone
Services to make a new call, answer, hold unhold or transfer an existing call
Calls can be audio or video using a broad selection of device types

Presence
Ability to see presence on any Sphericall telephone
Services to change presence and provide additional information
Presence wherever the Sphericall Desktop is used as a CTI application or Softphone

Text Chat
Send and receive text messages with users at a Sphericall telephone
Text messages can be formatted with font, color and embedded URLs
Chat with the Sphericall Desktop when used as a CTI application or Softphone

Forwarding Profiles
Change Sphericall's treatment of unanswered calls by modifying forwarding profiles
Apply knowledge in the business application to determine best profile at any time
Profile changes persist in the Sphericall configuration

Stored Media
Record a call taking place at a Sphericall telephone
Retrieve a recorded call for playback or archival elsewhere
Same services to record a conference call or a two party call

Call History
Lookup the call history of all calls made or received by a Sphericall telephone
Restrict lookup based on date and time, called numbers and other parameters
Detailed records include time, duration, forwarding events, account codes and more

Communications Web Services Software Development Kit

Sphere provides a Software Development Kit to facilitate the development of communications within new standalone applications or within existing business applications. The SDK consists of a number of components…

- *Sphere WSDL* – this is the XML contract between the IP PBX and the application that completely describes the set of services that Sphericall makes available.

- *WSDL Manual* – this document describes the WSDL explaining in detail (with appropriate code snippets) how an application is able to invoke the services.

- *Sample Applications* – Sphere has developed a number of sample applications, available in source code form, to better illustrate how an application developer might invoke the Sphericall communications web services.

- *Sphericall Simulator* - this standalone software application emulates the operation of the IP PBX. It allows the developer to easily start up this application without having to install the real Sphericall IP PBX and to configure telephones and gateways into the system. The emulator fully supports all services defined by the Sphericall WSDL.
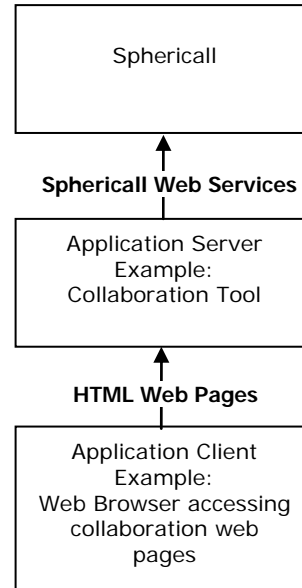
Development Stage

WSDL Manual

Sphere WSDL
-
-
-
-

Import →

Standard Application Development Tools
- GSOAP
- MS Developer Studio
- Systinet
- Others

Sphericall Simulator

phere Sample Application

Develop →

Application Development

Sphericall Simulator

Test →

Business Application

Business Services | SOAP XML

Standard Server

Sphere Web Services Development Toolkit

Standard Application Development Environment

Runtime Stage

Business Applications
- Multiple Applications
- Easily Customizable
- Leverage Any/All Services
- Standards-based Approach

Standard Operating System

Business Application

Business Services | SOAP XML

Standard Server

All Software Open PBXs
- 100% Software Approach
- Open System (Multi-vendor)
- Business Application-centric
- Multiple Vendor Choices

Standard Operating System

Sphere

Enterprise Softswitch

SOAP XML | **Communication Services**

Standard Server

HTTPS

Enterprise IP Network

IP PSTN

PSTN

Example Business Applications

Sphericall's web services can be used by many different types of applications because of the penetration of web service technology on all platforms. Some typical examples follow, although real world examples could be much more sophisticated...
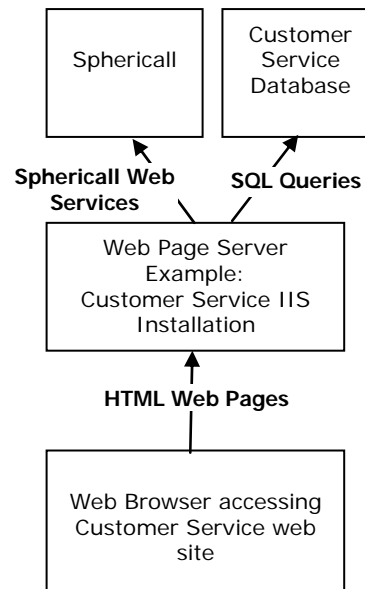
Example 1
A user interacts with a collaboration tool by using a web browser. The collaboration tool wants to allow the user to talk with another user in the collaboration session. By using Sphericall web services, the Collaboration tool can serve web pages that include behaviors like "call other user". When invoked on the web page, the collaboration tool server asks Sphericall to make the call. By using a Sphericall conference bridge, all the users in a collaboration session can talk together.

```
            Sphericall
               ↑
        Sphericall Web Services

       Application Server
           Example:
       Collaboration Tool
               ↑
         HTML Web Pages

       Application Client
           Example:
    Web Browser accessing
     collaboration web
           pages
```

Example 2
A company's customer service department logs support calls in a proprietary database. They are able to display these records in a web browser to their users.

By extending their web pages, they allow their users to view web pages when a support call first occurs, and to call back to customers who need further support. Once calls are established, the customer service agent can also transfer the call to a more experienced agent from the web page.

```
  Sphericall          Customer
                       Service
                      Database
        ↖               ↗
  Sphericall Web    SQL Queries
    Services

       Web Page Server
           Example:
    Customer Service IIS
        Installation
               ↑
         HTML Web Pages

    Web Browser accessing
    Customer Service web
           site
```

Example 3 is a screenshot from real web service integration with Microsoft CRM, one of the sample applications that Sphere provides as part of the SDK.
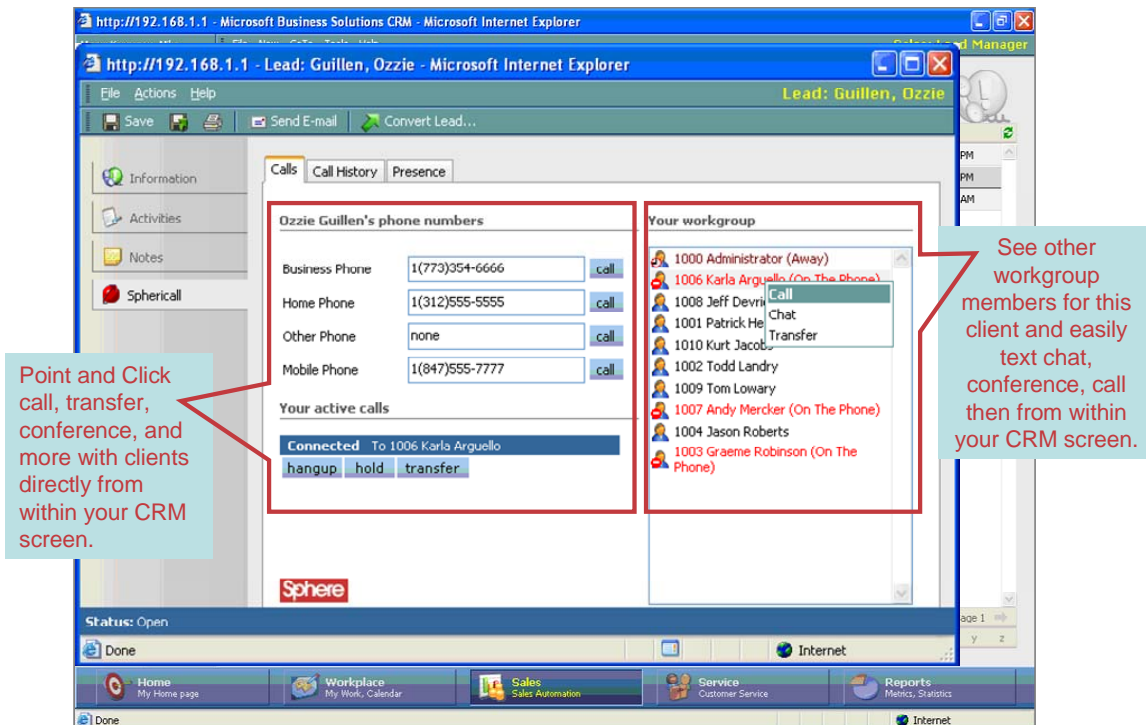
The screenshot shows how Microsoft CRM has been customized with a Sphericall menu option within the dialog showing details of a Lead. Within this menu are 3 options to manage Calls, Call History and Presence. The Calls option is currently selected and shows how the Lead, Jenny Anderson, was able to be called on her Business Phone directly from the dialog. Mouse clicking on the custom "call" button automatically invoked a communications web service controlled by Sphericall that takes care of the complexity of setting up a call from the user's desktop telephone through a PSTN trunk out to Jenny's phone. The CRM application had only to make a very simple service request to initiate the call.

Also shown on the screenshot is a list of PBX extensions corresponding to colleagues in the workgroup. The workgroup extensions display a dynamically changing presence status ("Online", "In a Meeting", "Away" etc.) so that the user can determine whether a colleague is reachable or not. If the user wished to consult a colleague about a discussion detail with Jenny Anderson, then the user can simply select the custom "hold" button associated with the call which invokes a web service of Sphericall putting the call on hold (Jenny hears music on hold), select a colleague from the workgroup extension list, right mouse click and select an option to dial the colleague—in the example, Anne Murray.

Conclusions

Sphere's vision of a Service Oriented Architecture providing a framework for next generation enterprise telecommunications services has become a reality through the maturing of web service technology.

Such communications services can now take their rightful place alongside collaborating business processes to allow enterprises to achieve the dream of a fully integrated Service Oriented Architecture, an architecture that can grow with the business and grow with technology.

Ultimately, Sphere's communications web services create a more integrated, optimized— and more competitive business.

Rethink how your business communicates!

Graeme Robinson
President
Sphere Communications Inc.

About Sphere Communications

Sphere Communications is the first to deliver IP PBX technology as a business application for Service Oriented Architectures. A software company, Sphere has the most robust IP-based software communications technology available in the marketplace. Developed around hundreds of enterprise installations, the Sphericall platform hosts an extremely rich PBX feature set and is proven in deployments that scale to more than 20,000 users. Sphere provides application developers with a Communications Web Services SDK, enabling communications to be integrated with a wide range of business applications. Founded in 1994, Sphere Communications is headquartered in Lincolnshire, Illinois and provides its products to a variety of enterprise customer networks. For more information please see the Sphere Communications web site at www.spherecom.com or contact us at 1-888-774-3732.

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