

Transforming your voice, video and collaboration infrastructure

The IBM journey toward unified communications



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Executive summary

Many of today's innovations are driven by the consumer marketplace. This is particularly true in the voice, video and collaboration spaces. With new ways for people to find each other, keep in touch, share ideas and get information from any place, mobility is the new norm. As consumers, we are very familiar with the ease with which this can be done. As employees, we would like to apply these consumer capabilities to our work—seamlessly and on a global basis—to make us more effective with business colleagues, clients and business partners.

Organisations can expect to see several themes over the next few years relating to work and communication. These include:

- Employees spending the majority of the workday collaborating
- External partners becoming more integrated
- Tasks flowing seamlessly and fluidly across fully connected and visible processes
- The centre shifting from the organisation to a community of people

In the enterprise environment, we call these themes “unified communications.” The consumer market has seen an explosion of “social networking” tools, which are focused on building Web-based interactions among people who share common interests, activities or projects. In the Chief Information Officer (CIO) organisation within IBM, we seek to leverage the best of both as we move ahead to the next era to transform our business in the areas of communication and collaboration.

Despite the workplace challenges changes, one factor remains fundamental: People will continue to rely on audio and visual communication as the basis of work and collaboration. This reliance will bring unique challenges for CIOs around the world in terms of creating and maintaining a supporting infrastructure. These challenges include:

- Quality of service must be maintained over a broader scope. This is particularly challenging in the voice area, where people are accustomed to high levels of service in terms of fidelity and availability over a wide range of carriers, networks and endpoints.
- Stability of the environment must be maintained when resources from multiple places are required for business processes.
- Managing risk, data security and employee privacy are complicated within a more complex environment as well as varying local regulations.
- Always critical, the speed of execution is even more important to enable the enterprise to respond quickly to business and client requirements.

To address these challenges, we must provide the tools and capabilities in a high-quality, reliable and feature-rich manner to allow workers to collaborate with each other and with clients and business partners. Within the IBM CIO organisation, we are on an evolutionary path that is leading us to the next level of unified audio and video communications.

This paper shares IBM's internal story about our journey: where we are, where we are going and how we are benefiting.

Evaluating the state of the infrastructure: Challenges and opportunities

In the real world, every supplier, country and technology unfortunately tends to operate as its own "tower." In many cases, technology and business models, such as the traditional telephone carrier, are mature, so evolving to new ways of doing business can be challenging. To achieve true integration of voice and video technologies within collaboration and business processes across the globally integrated enterprise (its employees, clients and business partners), there must be significant interoperability among these towers.

Session Initiation Protocol (SIP) is emerging as the primary standard for control of real-time communication sessions (voice, video, instant messaging and so on), and most vendors are producing SIP products. SIP, therefore, is a good example of interoperability among towers. But globally, there is no common operating system for smartphones (Android, Apple OS, Symbian, Blackberry®). The marketing approach of smartphone manufacturers and carriers matches specific devices with specific carriers. Implementing and supporting a broad range of business smartphone applications is difficult. A new ecosystem of interlocked suppliers, applications, networks, applications and users is needed.

In the past, a typical telephony implementation consisted of site-based private branch exchange (PBX) equipment (usually based on the decades-old time division multiplexing technology connecting to the public decades-old circuit switched network). Technologies were generally vendor-proprietary, with limited capacity for innovation. IBM not only advocates but has moved to standards-based products and services. We now operate our voice systems on standard servers located centrally and usually running Linux®.

However, IBM recognises that infrastructure and solutions may provide valuable information that can enable tremendous opportunities to enrich business applications. For example, any SIP IP phone has the ability to report its status, or “presence,” to an application, allowing an application such as instant messaging to display whether or not a user is on the phone. In the case of a softphone running on a workstation, the workstation itself is the instrument that produces performance data used in a quality management application. High-end smartphones contain many additional sensors (GPS, accelerometer, compass, camera and microphone) that can be leveraged in business applications. IBM’s innovators are developing techniques to harvest the information from the network and integrate it with other sources of information to produce intelligent business process applications.

Moving toward unified communications

Implementing a high-quality, reliable infrastructure as a foundation is the first step toward more unified voice, video and collaboration tools. The infrastructure must be capable of rapid growth and support a common set of standards and interfaces. As employees increasingly collaborate with clients and business partners outside the organisation, building seamless border-traversal capabilities is and will continue to be an important infrastructure consideration. This foundation is basic and critical.

On top of this foundation, we must layer a set of globally consistent services and common tools, such as collaboration, conferencing and calendaring, that are available regardless of location, whether office, home or on the road. However, while global consistency is critical, the methods for regional access can and should be locally determined based on local economics and service availability. All of this must be achieved in a manner that allows the user to connect quickly, reliably and consistently.

Other capabilities should include:

- **The ability to store and change voice and video media.** Users should be able to record meetings, ideally indexing important sections of the meeting. Media can be converted between audio and text interchangeably today, and real-time language translation is expected in the near future. All these will be accomplished based on a user’s context and preferences.
- **Presence and awareness automatically accommodating the user’s preferences and situation.** For example, incoming calls could be automatically routed to another destination (such as voice mail) if the user is in a meeting—unless the inbound call is a key client or a C-level executive, in which case the voice stream of the caller might be converted to an instant messaging chat for the end user transparently and automatically.
- **A simple, intuitive user experience that hides complexity from the user.** Decisions regarding how best to route a call (based on both cost and quality) should be made automatically in the network. “Click to communicate” user interfaces can reduce the number of phone numbers people see and dial. Users are identified by a single ID (such as phone number or an e-mail style address) and not by multiple endpoints, which have a single voice-mail box, and role-based authentication credential for all services.

Getting started: A roadmap of IBM's journey

IBM started with hundreds of traditional site-based PBX's around the world and our scope was limited to voice calling through traditional public switched network connections and voice mail. Over time, we began moving to IP-based (standards-based) systems and expanding to video. As we did so, our thought process changed. Voice and video became data, and the convergence story emerged.

As you can see in Figure 1, the first stage in the journey is **network convergence: IP telephony and Voice over IP (VoIP)**. At this stage, an enterprise upgrades its infrastructure to combine its voice, video and data networks into a single IP network that can handle the quality-of-service, bandwidth, availability, call-control and traffic-handling capabilities needed to manage voice traffic. IP telephony and IP video can be deployed over this converged network. This stage is typically driven by the need to achieve cost savings.

The next stage is **convergence with applications**. At this stage, stand-alone voice, video and data communications applications are integrated into converged applications. This stage is typically driven by the need to increase employee productivity. In the convergence with applications phase, we introduced additional features for our users, including new ways to join audio conference calls as well as more information about who was on the call (including enterprise directory information) and who was speaking. The use of presence information allows us to display—through presence enabled applications, like instant messaging—whether contacts are on or off the phone. Users have a simple ability to route calls to other locations, and the workstation has become a voice endpoint with very simple operation.

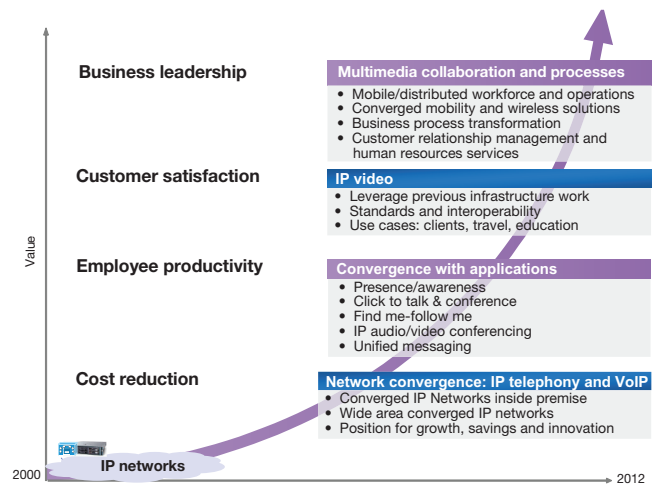


Figure 1: Roadmap to unified communications

The blue boxes within Figure 1 discuss the fundamental architectural design and implementation efforts to converge voice and video onto data networks. During these phases, the core infrastructure is established: signaling, call controllers, gateways, policies and so on. The fact that there are multiple blue phases highlights the need to work iteratively. The video market has matured dramatically since we started the journey, and can be easily added to the original infrastructure. However, the solid grounding we gained in the first convergence phase (voice) was simply reused and slightly enhanced to accommodate video.

The final stage includes **multimedia communications and collaboration**. At this stage, business processes and workflows are modified to take advantage of unified communications applications to create innovative business models, new methods of communication and new information flows to provide business leadership. As we move forward, we are working on more comprehensive ways to integrate voice and video with collaboration tools and business processes. For example, our unified communications and collaboration platform (IBM Lotus® Sametime®) offering allows users to promote a chat to a voice call, add screen sharing and, ultimately, promote the session again to video.

In this final stage of multimedia communications and collaboration, there are some subtle and critical technology issues as well. Significant changes include a growing number of collaborators from many different organisations who will be using many different networks. Requirements for bandwidth capacity are increasing dramatically as a result of increasing collaboration over distances, increasing use of video and increasing data sharing. Our infrastructure, therefore, must allow our employees to work seamlessly over multiple networks with increased capacity. Integration of mobile and IP networks of many types is required, as are new higher capacity networks such as WiMax and Long Term Evolution (LTE), or 4G.

Each stage in the journey to unified communications can help transform our business and enhance business value, as organisations move to capabilities that can provide a competitive business advantage.

Evaluating the results

The outcome of this work is a substantially new infrastructure that is well positioned for moving to the next level of unified audio and visual communication and collaboration. Figure 2 illustrates the breadth and depth of our transformation over our first decade.

Description	Installed (globally)
IP phones	Over 200,000
IBM site on corporate network traffic	Over 200
Audio conferencing minutes (IP-based)	Over 2 billion minutes per year
Telepresence or immersive video rooms	15
High-definition video rooms	100
Desktop video users	5,000
Mobile workforce	40-50 percent or over 200,000 people

Figure 2: Infrastructure transformation over our first decade

As a result of this work, we have implemented new user experiences within the IBM CIO organisation that allow people to more easily join conference calls and collaborate with team members. For example:

- IBM employees can use a single telephone number to join conference calls, reducing the calendar look-up effort. This is a great advantage for the mobile workforce.
- In a conference call, IBM employees have a visualisation of the conference that is linked to the corporate directory. Hence, participants’ understanding of who is on the call and what their roles are is enhanced.
- IBM employees can use their Lotus Sametime contact lists to initiate voice calls (and, eventually, video), simply by clicking on a name. With the addition of presence data, this feature is even more powerful.
- If two people are in a voice conversation and need to add a third, IBM employees no longer have to hang up and redial into a conference bridge. Instead, IBM Lotus Sametime Unified Telephony allows the user to drag a name from their contact list into the telephony window and automatically allow the third (or fourth or fifth) person to join the call.
- IBM has also implemented features that help people understand who is calling, with controls over how the inbound call is handled (send immediately to voice mail, send to another phone number, initiate an instant message or other custom options).

In addition to the user-facing features, we have instituted multiple behind-the-scenes capabilities. We are investigating methods to route calls, including mobile calls, over the optimum path (based on cost and, in the future, quality). Thus, decisions will be made by the network, not people wondering whether it is better to use a mobile phone, the hotel’s phone or a calling card. Technical integration between mobile networks and the enterprise network are needed to ensure mobile users have full access to the collaboration experiences they need.

Future voice and video applications will be able to recognise the user and present a context-based experience. For example, the ability to combine information from a person’s calendar with information from their workstation indicating they are in screen show mode and speaking on a softphone may allow us to infer that the person is presenting on a call. With this context, the handling of inbound calls might be different.

In addition, we now have more choices for voice endpoint provisioning: hard phones, mobile phones and softphones. Therefore, the sunset of the legacy voice infrastructure need not be a one-for-one replacement of old desk phones, but an efficient mix of various endpoints, each with its own benefits and price point. One size no longer fits all, and we can provision each person with the right device. While the fixed infrastructure will continue to exist, its size should be reduced, as Figure 3 illustrates.

Voice client	2009	2010 outlook	Beyond 2010
Mobile phone	➡	➡	⬇
Smartphone	⬆	⬆	⬆
Workstation voice-video	➡	⬆	⬆
IP hardphone	⬆	➡	➡
TDM phone	⬇	⬇	⬇
Video	➡	⬆	⬆

Figure 3 : Smart-sizing our portfolio: The changing face of our user

Breaking through the boundaries

Most importantly, we see the lines separating voice and video, collaboration and smartphones increasingly disappearing. Ideally, people should think about working with one another—not about phone numbers, costs or the complexity behind their communication methods. The next few sections discuss IBM’s priorities and goals in the areas of collaboration, video and smartphones to help make this vision a reality.

Collaboration

Collaboration is critical to IBM as a globally integrated enterprise. Global integration facilitates worldwide work operations, fosters collaboration among individuals and across teams and develops more fluid ways to manage and distribute resources.

To this end, we have defined four strategic priorities for 2010 and beyond:

- Transform IBM into a more collaborative organisation
- Establish a high-value IBM collaborative presence on the Internet
- Simplify and integrate collaborative tools and processes
- Improve employees’ and clients’ ability to identify and collaborate with IBM experts.

Our collaboration strategy framework can be visualised in Figure 4.

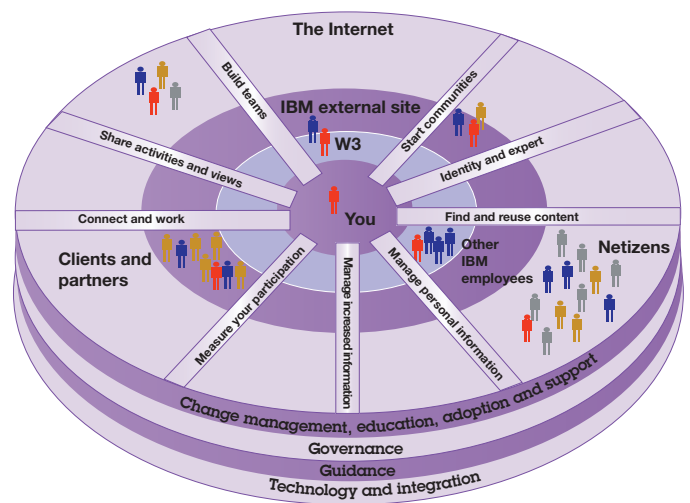


Figure 4: Collaboration strategy framework

Note that the framework illustrates multiple concentric levels in which people might reside. In a sense, there are boundaries between these layers that could be caused by multiple factors: geography, culture and organisation. The key elements of our collaboration strategy (represented by the spokes) traverse all of the layers and all of the boundaries. Thus, IBM workers collaborate with people around the world and with people from multiple organisations and the public sector for a full and rich experience as they live and work.

Critical to the voice and video space and the opportunities we have to support this vision are these realisations:

- We have opportunities to enrich each of the areas. For example, in “Connect and work” we can provide real-time audio and visual interaction over distances. To “Build teams” we can provide the visual experiences that help people develop trust and get to understand one other.
- Our services must traverse all the layers and boundaries to enable people to work collaboratively while maintaining personal and enterprise security and privacy.

Video

Video is increasingly important at IBM, particularly in situations where visual information is critical to a discussion. This visual information enriches the collaboration. The ability to view colleagues, both inside and outside our enterprise, and see their reactions to important discussions is invaluable, particularly for situations involving selling, negotiation and starting up a new team. To attain this, we are implementing video at multiple tiers, including telepresence, immersive/high-definition and desktop. Each has its role and is appropriate in different situations.

In addition, interoperability is extremely important to our users. We define interoperability in multiple ways:

- **Tier interoperability.** Users must be able to join a meeting regardless of which type of video endpoint they are using. For example, desktop users can participate in immersive meetings.
- **Vendor interoperability.** We cannot always depend on single vendor endpoints, especially if we wish to work with our clients and partners who are also using video equipment. Therefore, vendor interoperability is required where the joining experience and video quality are maintained at high levels and not compromised because of multiple vendor endpoints in a meeting.
- **Network interoperability.** Some IBM endpoints will be on an IBM network; other IBM endpoints will be on the Internet (depending on location and costs). We will connect with clients and partners using various networks, making secure multinetwork connectivity critical.
- **Calendar interoperability.** Many video suppliers have elegant calendaring interfaces. However, at IBM we are driving toward unifying the video calendaring experience with our existing IBM Lotus Notes® calendar. This way, IBM workers have one interface to invite people and reserve resources for video meetings.

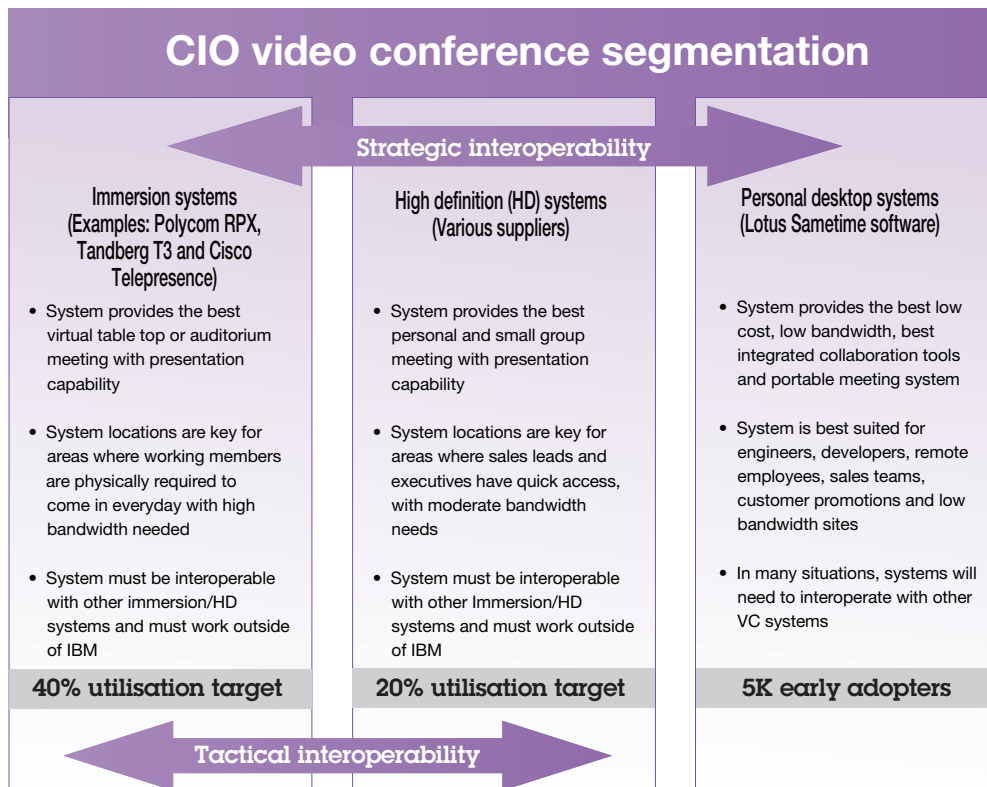


Figure 5: Multiple types of interoperability

Smartphones

The smartphone space is evolving rapidly and is extremely promising for the enterprise. Yet the market direction is still developing and is characterised by some particularly challenging aspects. For example, multiple operating systems

can add development and support costs for consistent user applications. Frequent upgrades, changes and new products can quickly outdate device models. In addition, the market model (whereby a device manufacturer sells a model to selected carriers only) hampers the enterprise goal of driving costs down.

At IBM, we are working hard to negate these challenges. We are working toward neutralising operating system differences for application development and support, developing security techniques required by our enterprise and developing new business applications. We believe that smartphones will soon play a significant role in our end point portfolio.

The IBM CIO is actively involved in this space and seeking to build the common standards and services required by our company in the following areas:

- Security – compliance with IBM corporate standards and protection of information, data and reputation
- Network connectivity – including WiFi and virtual private network (VPN). Use cases include connecting to the IBM wireless network while onsite or connecting offsite via a VPN through a home WiFi network.
- E-mail, calendar, contacts - pull as well as push solutions (for example, IBM Lotus iNotes® and IBM Lotus Traveler software)

Beyond these areas we are using and developing critical business applications to further enhance the value of these devices. These applications take collaboration among clients, business partners and employees into consideration, as building these capabilities up-front is a requirement to achieving full value. Applications include:

- Instant messaging and online meetings – for example, IBM Lotus Sametime instant messaging
- Collaboration – for example, IBM Lotus Quickr™ software for document sharing and collaboration
- Social networking – for example, IBM Lotus Connections software for business collaboration and networking
- Applications – line of business, Web, voice and VoIP services including both rich client applications as well as browser-based applications. In addition, hybrid applications are also emerging. These hybrid applications utilise the HTML 5.0 specification, which includes offline storage. Since each smartphone platform leverages a different application development toolkit, developing a standard framework is critical. IBM Research has developed a framework designed to solve this issue.
- Voice – includes voice over WiFi as well as traditional voice over cellular networks

Assessing the benefits of a voice and video infrastructure transformation

The role of the IBM CIO office is to leverage technology to drive business transformation and employee productivity. As a result of our move to a converged VoIP network, IBM has achieved benefits in several areas, including significant cost savings. We are also seeing the benefits of enabling people to work from anywhere, with a choice of devices. Among them are the following advantages:

- **Enhanced employee productivity.** Integrating communications channels such as e-mail, instant messaging and conferencing into a unified set of services and capabilities means more communications options at users' fingertips more of the time. This capability can enhance productivity with functions that are as simple and quick to use as an onscreen "Connect me" button that can automatically authenticate a user and connect to a conference in seconds with a double-click of the mouse. Technologies such as presence awareness, softphones and mobile phones promise to enable further integration and productivity. While traditional processes and systems may be slowed by their need for manual communication interactions, integrating them can significantly reduce manual functions. Presence awareness capabilities, for example, allow a user to quickly determine whether another person is available to accept a telephone call and help initiate that call.

- **Reduced costs.** Over the past decade, changes in its operations set IBM on the path to considerable cost savings. In the early 1990s, IBM maintained a large and dispersed IT infrastructure. Since 2005, IT earnings ratio has been reduced by 1.6 points, contributing to IBM's steady improvement in earnings per share.¹

In the video area, IBM CIO is evaluating a variety of potential benefits, including:

- More effective and frequent interaction with clients and partners
- Lower travel costs and increased resource effectiveness
- Improved user satisfaction through more exposure to clients and improved responsiveness to customer and sales requests
- Increased productivity through more effective communications, education and training

While individual business units may have business cases around any of these benefits, it is clear that the CIO must play a central role in maximising these benefits. So, when the CIO can bring the broader video community together, establish standards and interoperability and identify common pools of interest, investments can be shared and business benefits maximised.

Figure 6 below summarises some of the benefits of IBM’s voice and video infrastructure transformation.²

Hard savings			Soft savings	Intangibles
Category	Size	%	<p>Cost avoidance</p> <ul style="list-style-type: none"> Eliminate migrations to lower cost service or when contract ends for current provider <p>Productivity</p> <ul style="list-style-type: none"> Single number access to calls Visual eliminates the need for roll call Floor control: Who’s talking, persona info, who joined the call, noisy line problems Drag and drop to add new person to a call <p>Future</p> <ul style="list-style-type: none"> Integration into effective meetings 	<p>Customer satisfaction</p> <ul style="list-style-type: none"> Single number access to calls Eliminate migration to lower cost service for lower cost or contract ends <p>Security</p> <ul style="list-style-type: none"> Identify lurkers and disconnect them Moderator code more secure <p>Strategy</p> <ul style="list-style-type: none"> SIP Enablement Integration with IBM software offerings
Conferencing	\$\$\$	~75%		
Connectivity and toll	\$\$\$	~10%		
Maintenance and management	\$\$	~25%		
MACs	\$\$	~55%		
IP PBX facilities	\$	~50%		
<p>Future</p> <ul style="list-style-type: none"> Soft client integration – reduced transport 				

Figure 6: Summary value proposition

Conclusion

IT today is not only about implementing technology but is also about enabling business innovation. The same is true for communications. One of IT’s key roles is to provide a leading-edge communications system—a system that can deliver both functionality and benefits designed to help organisations achieve a competitive edge.

The advent of IP-based communications supporting voice, video, data and collaboration ushers in a broad range of enhanced communications based on the convergence and integration of devices and networks. This shift can profoundly affect the way people live and work. And it can enable improvements in communications, collaboration, productivity, customer service and more—creating integrated business communications that can foster business advantages that far outweigh lowering the cost of a phone call.

Such transformation to unified communications and collaboration is already happening inside IBM. In this paper we have told the story of how IBM is building one of the world's largest converged networks, and have discussed the resulting business and IT benefits—including increased employee productivity, reduced cost, enhanced workflow process, simpler and easier changes and improved business agility. Many of these advantages derive from the ability of mobile workforces to communicate using any method and device to quickly find the person or resources they need with presence awareness, and to freely collaborate with simplified audio conferencing. Together, these benefits can result in increased competitiveness.

IBM's experience in architecting and implementing a world-class and global-scale environment for integrated business communications for its own organisation, however, is more than just an example of implementing IP telephony, VoIP and video in a large organisation. IBM's leadership and experience enable new and improved services and solutions that can be leveraged for the benefit of IBM clients. Whether you are just beginning the journey to unified communications or are well on your way, IBM Converged Communication Services can help you transform your voice, video and collaboration infrastructure for the future.

IBM Converged Communications Services assists with strategy and assessment, architecture and design, and integration and deployment for a range of hardware and software solutions, including those that utilise Lotus Sametime and Lotus Notes software.

Our video communications services and solutions support an effective unified-communications environment that can foster innovation by allowing your employees to experience a new way of communicating with one another and with external individuals or teams. In addition to deep knowledge of IP networking and unified communications, IBM has the expertise necessary to successfully leverage and integrate multivendor video components with existing enterprise video communications infrastructure and new immersive video solutions.

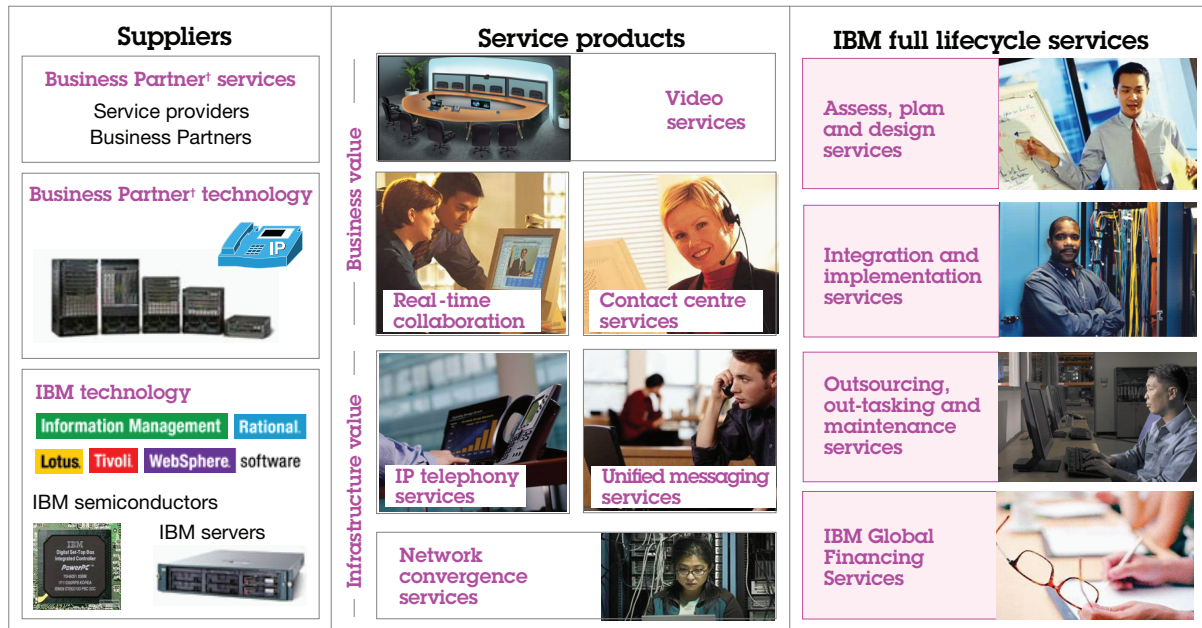


Figure 7: A suite of assessment, design, deployment, integration and managed services grouped into logical service products to deliver networking infrastructure and converged communications solutions for integrated business communications.

Figure 6: Summary value proposition

People will continue using telephones in the way they always have—if telephones are all they are offered. But broader changes in IP-based communications are enabling organisations to give their employees communications capabilities beyond telephones and receive significantly more business benefits in return. IBM Global Technology Services (GTS) can provide the networking and IP technology services,

as well as work effectively with Business Partners[†] who provide video conferencing technology, to provide the right desktop solution for a world that demands real-time collaboration and innovation at every organisational level.

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¹ IBM Transformation Journey case study, 2009.

² Based on IBM internal results gathered from 2001-2009.