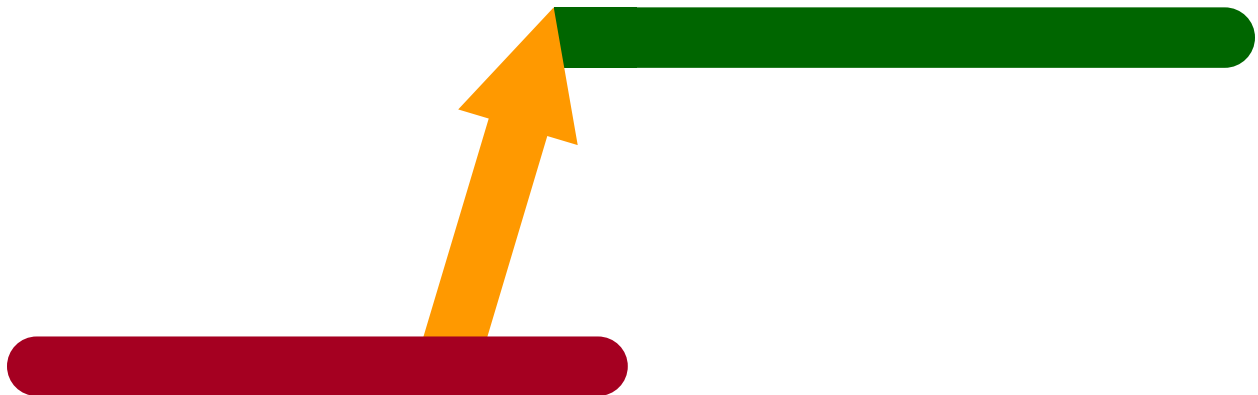


WHITE PAPER

THE COMMUNICATIONS/INFORMATION PRODUCTIVITY REVOLUTION



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INTRODUCTION

Business and individuals are looking for new ways to improve productivity, and they have complimentary goals. Businesses want to reduce operating costs by getting more productivity out of their employees, and employees want tools to help them be more productive and allow them to do more in less time (and maintain a life outside of the office). Individuals want solutions that will help reduce unwanted and unnecessary interruptions.

Fortunately, technologies are emerging to help businesses and individuals meet their goals. After evolving individually over the years, voice, data, video and wireless technologies and services are now starting to converge. This convergence is starting a revolution – the communication/information productivity revolution. It is a revolution that will deliver new products and services and change the way in which we communicate and collaborate. This revolution will be as profound as the invention of the telephone and the internet.

This white paper is intended to help vendors better understand what impact the communications/information productivity revolution will have on their business. It is also a wakeup call for the voice, data, video and wireless industries to start working together on products and standards.

Those companies that prepare for their battle(s) in this revolution will have a much better chance for not only survival, but success.

PRODUCTIVITY GAINS WILL FUEL THE REVOLUTION

Over the years, business practices have changed, and new technologies have been introduced that transform the way we communicate and share information. While these combined practices and technologies have helped improve productivity, they have also introduced new challenges which often make it more difficult to communicate with someone in real-time.

Before voice mail, automated attendants and interactive voice response (IVR), most businesses had practices and procedures on how to manage calls to unattended phones. Some simply let the phone ring, but most had someone answer the call. The person that answered would take a message or try to help the caller. They could answer questions, transfer calls (to the right party) and provide information that often eliminated the need for a call back or second call.

The personal or group administrative assistant (or secretary as they were referred to at the time) who answered the phone also screened calls. When voice mail came along, many people “hid” behind it and missed calls they would have taken. Caller ID has helped employees screen calls, but an assistant who can answer a simple question or make sure a call gets through, would increase productivity for both the caller and the person called.

Research and supporting technology is near a point where an electronic agent who could replace the human assistant of the past is viable. A push to make workers more efficient and productive will fuel this revolution. It is fortunate a number of technologies have evolved and will support new communications/information productivity products and services.

SOME OF THE DRIVERS

A revolution in the way people communicate and collaborate will occur as a number of individual components evolve and converge to create a new family of products and services.

In addition to a push for productivity improvements, there are five additional drivers contributing to this revolution:

- ◆ the explosive growth and innovation in wireless handheld devices;
- ◆ the advancements in real-time communications and collaboration – voice, data, video and web conferencing;
- ◆ a shift from centralized call/session control and intelligence with dumb endpoints to a peer-to-peer environment with intelligent endpoints;
- ◆ a migration from circuit to packet switching and transport; and
- ◆ the evolution of a channel that can sell, service and support voice, data and video solutions.

The components and technologies evolving that support the drivers above include:

- ◆ IP
- ◆ high-speed cell service
- ◆ display
- ◆ WiFi & WiMax
- ◆ Bluetooth
- ◆ peer-to-peer (including SIP)
- ◆ speech recognition
- ◆ handwriting recognition
- ◆ text to speech

These technologies are all important on their own, but when combined, they create an environment that will revolutionize the way both businesses and individuals communicate and collaborate.

TELECOMMUNICATIONS – A CONTINUAL EVOLUTION

The telegraph was a revolutionary invention and led to the evolution of the telephone, which some could argue was a revolution of its own. They both changed forever the way people communicate and do business. Before the introduction of these inventions, information had to be physically moved from one location to another. A simple question and reply could take months to complete. The only practical way to collaborate was face to face.

The history of telecommunications since Alexander Graham Bell's basic invention shows a continual evolution but nothing revolutionary:

- ◆ the first PBX in 1903
- ◆ the first key system in 1929
- ◆ the first ACD in 1973
- ◆ the first digital PBX in 1973
- ◆ the first IP PBX in 1998

The basic telecommunications architecture has remained the same – i.e.; centralized call control and call management with dumb endpoints (telephones).

Wireless voice technologies have had a similar evolution:

- ◆ the first car-based telephone in 1946
- ◆ the first cell phone call in 1973
- ◆ the first cell phone service in 1979
- ◆ the first cordless (residential) phones in 1980

Today the wireless and cordless phone markets significantly outpace sales of the wired telephone handset. There are more cordless phones in homes than wired; there are 10 times more cell phones sold per year than the combination of all business and consumer-oriented wired phones.

CELL PHONES ARE LEADING THE REVOLUTION

It is estimated that over 500 million cell phones will be sold this year. The cell phone industry is continually adding more features and capabilities to their products, and consumers appear eager to upgrade their phones to take advantage of these improvements.

Some people are using their cell phones as their primary mode of voice communications, preferring them over their office and home telephones. Ford Motor Company is replacing the office desk phone for over 8,000 employees with Sprint PCS wireless devices. In the business world, many people use wireless hand-held devices as their primary tool for sending and receiving email.

Cell phones and dumb PBX handsets are evolving into wireless tri-mode (GSM, WiFi and Bluetooth) hand-held devices that support voice, data, and video. These next generation endpoints are the major driving force behind the communications/information productivity revolution.

The other major component of the new revolution will be the evolving products and services that connect these various endpoints. The products are migrating from circuit switch to packet switch, and from centralized call/session control and management to distributed and peer-to-peer services.

DATA DEVICES AND CELL PHONES CONVERGE

Companies such as Motorola, Nokia, Samsung and Sony are well positioned to lead in the future endpoint market. Traditional PBX vendors such as NEC, Siemens (Siemens as part of Fujitsu Siemens Computers), and Toshiba are also well positioned based on their expertise in business and cellular phones plus desktop, notebook and tablet PCs.

Cell phones are adding more features and capabilities, including:

- ◆ larger and better displays;
- ◆ built-in cameras with video capabilities;
- ◆ improved text entry;
- ◆ high-speed data connectivity; and
- ◆ more connectivity options, including WiFi, WiMax and Bluetooth.

Over time, the addition of robust speech recognition capabilities will allow the size of cell phones to be based on the desired display size and other features supported.

PDAs, as well as tablet and notebook PCs, are continually being enhanced with more features, functions and connectivity. As these data-related products evolve and converge with evolving cell phone technologies, a new class of product will emerge. These products will come in many form factors, with appropriate features and functionality to meet the needs of every market segment. Even the simplest cell phone of the future will provide rich communications and collaboration capabilities.

iCID

The new converged products are best described as integrated communications/information devices (iCID) – pronounced (ī s ĩ d). They will integrate all modes of communications – voice, data and video – and provide local and remote access to all types of information and databases.

There will be many classes of iCIDs, including:

- ◆ mobile M-iCID
- ◆ desktop D-iCID
- ◆ tablet T-iCID
- ◆ notebook N-iCID
- ◆ personal P-iCID
- ◆ home H-iCID
- ◆ etc.

CENTRALIZED CALL MANAGERS MIGRATE TO DISTRIBUTED RESOURCE AGENTS

The technologies and services that connect these devices will also evolve. Just as mainframe computers with dumb terminals gave way to distributed computing with servers and intelligent terminals (PCs), centralized monolithic call control/management systems with dumb phones will migrate to resource agents, connection servers and integrated communications/information devices (iCID).

There will be an evolution of network services that will support the new call control model. Next generation speech-to-text, text-to-speech and voice recognition will insure rich and seamless communications and collaboration. Users at both ends of a connection will be able to communicate in their preferred mode – for example, one talking into their iCID while the other reads translated speech-to-text on their iCID.

PRODUCTIVITY WILL INCREASE AND YOU WILL HAVE MORE FREE TIME

Imagine walking into a meeting and the speaker phone in the room notifies your iCID that you have just entered a conference room where a meeting you are scheduled to attend is about to start. Your iCID displays a message that it has automatically sent your eBot “do not disturb” (DND) instructions, and gives you an opportunity to override or change your instructions. Your eBot knows that only selected family members and colleagues can get a message to you while you are in this mode.

A family member with privileges to interrupt you while in DND mode places a phone call to ask you to run an errand on your way home. They receive a message that you are on DND and are asked if they want to override DND. They indicate they do not and leave a voice message. Your eBot is instructed to convert all voice messages to text. When you leave the meeting, your iCID vibrates (your preference over an audible indication – ringing) and you see the message as text or can listen to it as a wav attachment.

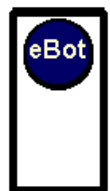
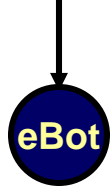
If you are looking at your iCID when the message arrives during the meeting you can respond by confirming that you will run the errand. You can even enter an instant messaging session to communicate with the message sender.

During the same meeting, a colleague who does not have automatic privileges to interrupt you while on DND tries to reach you. Their iCID receives a message that you are not available. They send a request to try and find you. Your eBot knows they are someone you have recently had frequent communications with and they are in your database as someone you automatically communicate with when not in DND. Your eBot sends your iCID a message to vibrate and displays a message asking if you will accept a call from the caller. You reply that you will accept the call but want all communications to be in text rather than voice.

Your colleague Bob is at his desk using his D-iCID (desktop PC) and you have a T-iCID (tablet PC). Bob wants to get your feed back on a contract he is working on. Reviewing the multi-page document in text form is not an issue since you both have large displays. You decide you want to conference in another colleague but she is traveling and only has an M-iCID (mobile phone/PDA) available with a very small display. Additionally, she is driving and can't read the display while behind the wheel, and needs all communications and information in voice. Her M-iCID starts to function as a combined cell phone and voice-controlled dictation machine. eBots for the three parties working with resource servers that provides speech recognition, text-to-speech and speech-to-text create a rich collaboration environment.

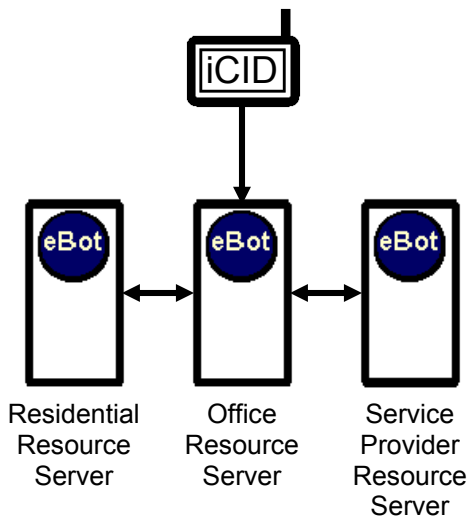
PRESENCE WILL PLAY A KEY ROLE

The communications/information productivity revolution will allow people to communicate and collaborate with anyone, anyplace, anytime. Presence (an individual's availability) will play a key role. The following depicts how the new products and services will work.

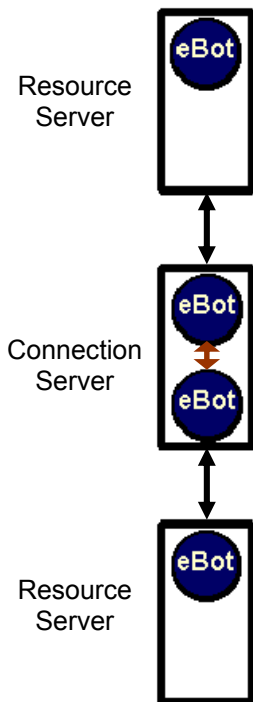


Resource
Server

- ◆ Each user will have a resource agent or electronic robot – called an eBot
 - The user will provide and update their eBot with a set of rules and filters that will ensure the user is available only:
 - to who they want
 - when they want
 - where they want
 - on the device they want
 - eBots will learn from the behavior of their user
- ◆ iCIDs will constantly update their eBot with:
 - presence
 - the resources on hand
 - display size
 - bandwidth available
 - processing resources (MHz)
 - memory
 - application software
 - updates to rules and filters
- ◆ Resource servers will host eBots
 - These servers will provide resources to deliver the richest communications based on resources available:
 - Text-to-speech;
 - Speech-to-text;
 - Speech recognition; and
 - Display size compensation.



- As a user travels, their iCID will communicate with one of several resource servers that hosts their eBot:
 - residential
 - office
 - service provider
- Resource servers will constantly communicate with each other and share information
 - Update an individuals':
 - * presence
 - * resources
 - * rules
 - Location and signal strength – similar to cell service. This will help provide seamless communications as a user travels between locations and access points



- ◆ Connection servers will connect and communicate with resource servers in order to:
 - provide a venue for eBots to negotiate on behalf of their user's
 - establish connections based on:
 - presence
 - resources
 - rules

The combination of these new communication devices and connection services will take communications to a new level where the called party – not the calling party – is in control. Personal productivity will improve for all (except outbound telemarketers).

CONNECTION MODEL

Users may have several iCIDs depending on where they are (in the office or on the road), the application and type of communications they desire (a voice call vs. a video call) and personal preference

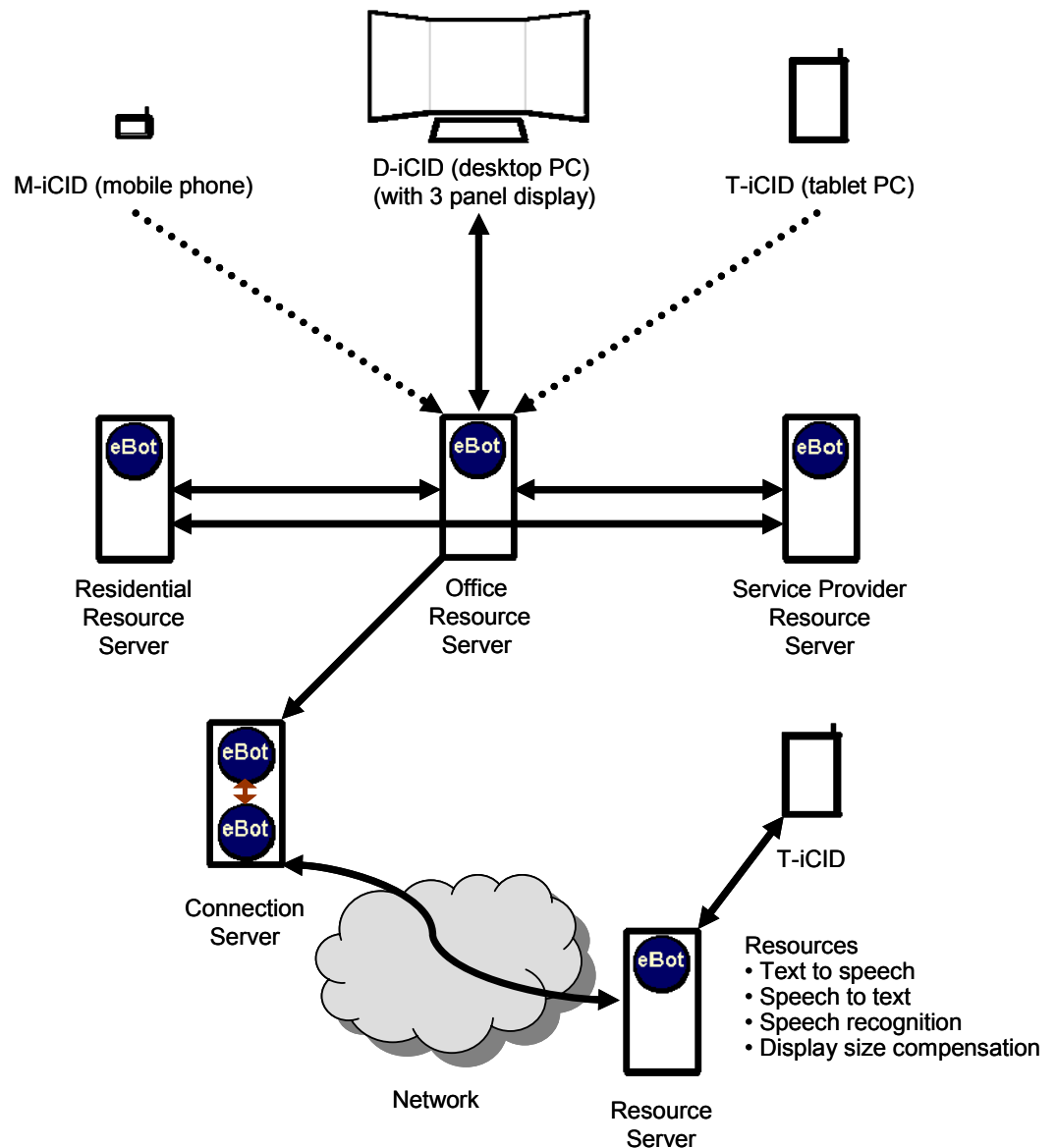
Integrated communications/information devices (iCID) send presence, resource information and updated rules to a personal eBot located in resource servers that support the user

Resource servers constantly communicate and update other resource servers that support and service that user

Connection servers provide a venue for eBots to negotiate connections for their users and provide resources to deliver rich communications based on available resources

In this example, a D-iCID and a T-iCID are connected. The connection server provides resources to compensate for the differences in display size and other device differences

Resource servers provide services that deliver rich communications based on rules and iCID resources available



EBOTS WILL BE EVERYWHERE

eBots will act as personal assistants for individuals and as software agents in customer service environments. As described above, personal eBots will screen calls and insure the user receives only the calls they want based on users defined rules.

eBots will also be self learning. If a personal eBot observes the user has recently accepted several communications from someone not in the user's database, it will ask the user if they would like to add that person.

If a user never responds to a communication between 9:00AM and 2:00PM on Wednesdays (weekly golf outing), the eBot will ask the user if they would like to automatically be placed in do-not-disturb mode during that time. The eBot will track presence and location and if the user is out of the area of the golf course on Wednesday between 9:00AM and 2:00PM it will treat all communications normally.

Personal eBots will help eliminate many steps required to access information or make a transaction. eBots will be used to automatically "log-in" and provide security (provide account number, password, etc.).

There will be other eBots or software agents to replace humans in customer interface roles of low-to-medium complexity, enabling enterprises to improve service and support functions at lower cost than human-staffed call centers. These customer service eBots will communicate verbally using natural language dialogs that are faster and more pleasant than traditional IVR systems.

SMALL BUSINESSES WILL BE THE EARLY ADOPTERS

Unlike most business-class solutions of the past that were initially viable only for large enterprises with big IT budgets and staff, iCID solutions will find their first adopters to be small businesses. Small businesses by their very size are more agile than large companies. They typically do not have to deal with legacy systems or require policies and practices to manage their voice and data services.

With the driving force being a shift from wired PBX/key system phones to next-generation hand-held devices – iCID – with multiple wireless capabilities, and the selection of that device often based on individual preference, large companies will be challenged as to how to manage and integrate the various devices into their existing voice and IT infrastructures.

IT organizations will start feeling pressure from their constituents (such as executives and employees), who will recognize the productivity benefits small businesses are enjoying from these new converged solutions. Similar to the adoption of instant messaging, some IT organizations will see unauthorized internal adoption of iCIDs as individuals use Bluetooth to connect SIP- (session initiated protocol) enabled next-generation devices to existing infrastructure.

THERE WILL BE A BATTLE THAT WILL DESTROY MANY VENDORS

Although this revolution is currently taking place, many vendors are still focused on evolving their piece of the puzzle and don't see the big picture. The puzzle is changing - what was once a black and white picture is turning to one with many shades of gray. The distinction between voice vendors and data vendors has already changed. Cisco and 3Com are now leading players in the voice market. The convergence of communications and collaboration technologies is re-cutting the puzzle into many new pieces. Microsoft, IBM and other companies who provide collaboration components are becoming important parts of the new puzzle.

Many companies may continue to fight for what was once their area of the puzzle. Traditional PBX vendors need to re-engineer their organizations as their traditional crown jewel – call control (as we know it today) – becomes obsolete and cell phone and PC vendors provide the new endpoints.

Traditional data and networking vendors will need to learn how to support real time voice and video. To date, many have viewed voice and video as “just data packets.” Some vendors have already learned the hard way and had to redesign their data network products to support real-time voice and video.

To survive, vendors will need to understand where they fit in the new puzzle and work to be the best in class. They will need to develop strategies on how to complement – not compete – with giants such as Cisco, IBM and Microsoft, as well as the new endpoint providers.

NEW OPPORTUNITIES

There will be many opportunities for start-up and existing companies. Capital (financial and human) will fuel this revolution. Due to the breadth of opportunities and a surplus of investment funds, venture capitalists will invest as if the dot-com era is back. Existing vendors that figure it out will spend whatever is necessary to survive and prosper. Industry consolidation is inevitable and will reward those that position their products and companies well.

Microsoft will continue to be the dominate OS supplier, but there is an opening for others to play at the low end – hand held devices – and at the high end – resource and connection servers.

CISCO WILL BE A LEADER - HISTORY WILL REPEAT

In 1997, Intecom formed an internal start-up – Selsius Systems. They developed IP phones and call manager software. In October of 1998, Cisco Systems acquired Selsius and overnight became the market leader in IP telephony - a position none of the traditional PBX vendors such as Alcatel, Avaya, NEC, Nortel and Siemens, have been able to overtake.

Many of the same people that started Selsius are involved in a new start-up – this time inside Cisco. They are determined to lead this revolution and are targeting the early adopters – small businesses. It is important to remember that this group had the vision to develop the components necessary to make a complete solution and will do it again. History will repeat and Cisco will likely be a leading player in this revolution.

MICROSOFT WILL BE AN IMPORTANT PLAYER

For years, PBX vendors have been concerned Microsoft would include call control in their server OS and seriously impact the PBX vendors' business. As centralized call/session control shifts to distributed peer-to-peer services, those PBX vendors' fears could become reality. Microsoft already has a SIP server that can be used to replace much of the functionality of traditional call control.

While PBX vendors have been downsizing, Microsoft has built a large and experienced organization focusing on its part of the revolution. The Real-Time Collaboration (RTC) Group is positioning Microsoft to own a number of pieces of the new puzzle including presence, web conferencing, instant messaging, softphone and screen/application sharing.

The Exchange Group at Microsoft is working on enhancements that will turn Exchange Server into a unified messaging server which will support email, voice mail and fax as well as calendar support.

Microsoft has a research/development project called "Information Agent." Part of this research could lead to key products/services required in this revolution – the rules and filters used by eBots.

The communications/information productivity revolution will create many opportunities for Microsoft to lead. The big question - will they? Microsoft could help shorten this revolution while insuring their domination in a number of areas. If history is any indicator, they will follow - then dominate.

CARRIERS COULD (AND SHOULD) LEAD!

Many carriers are seeing customers shift from wired to wireless phone service as cell phones replace residential and small business service. Industry consolidation has already begun based on this shift, with Sprint acquiring Nextel and Cingular Wireless acquiring AT&T Wireless.

Carriers have an opportunity to take leadership positions. They can provide wired and wireless network services, hosted applications and partner with the channel to deliver a complete solution. Historically, however, many of the carriers have been slow to change. It is not clear if they will be early participants in this revolution, giving entrepreneurs and their venture capitalist backers great opportunities. Entrepreneurs will start new application and service companies. Some will take on the big challenges (and opportunities), such as the development of resource and connection services. Others will find market niches.

If carriers don't lead, they will have to play catch up to survive. While many have the financial resources to help consolidate the industry as they play catch up, this could be a dangerous (terminal) strategy. Remember all the mid-range computer companies that did not make the transition to next generation computing – Wang, DEC, Prime and Data General?

APPLE – A LEADING ICID VENDOR?

Apple Computer could be a big winner. It has many of the elements needed for success, but will need to partner like it never has in the past in order to maximize this opportunity. It is easy to envision a family of revolutionary handheld devices with Apple design and usability. It would be interesting to see an Apple version of the Tablet PC with tri-mode communications capabilities.

NEW PROFITABLE OPPORTUNITIES FOR THE CHANNEL

The communication/information productivity revolution will require a channel that can sell, service and support voice, data and video solutions. The first step in channel convergence started in the early 1990s when computer telephony integration (CTI) applications were introduced. Traditional voice vendors (interconnects dealers) entered the data market and data vendors (VARs, VADs and system integrators) started to offer voice products and services.

The next step was the introduction of the first IP PBXs in the late 1990s. The converged channel will reach critical mass in 2005 when over 50% of PBX lines shipped in the US will be IP.

New products and services will provide the channel with new profit opportunities – especially those that already support converged voice and data solutions.

SIP NEEDS MULTI-INDUSRTY SUPPORT

Anyone who followed the ISDN battle in the early 1980s may be thinking that history could repeat itself with SIP. ISDN standards should have made the endpoint (i.e.; telephone) market more competitive and have reduced prices. Unfortunately, the competitive PBX market in the US required vendors to differentiate their products. They all based their handset strategy on proprietary digital telephones that delivered each vendor's version of advanced features. The only standards-based telephone was the basic touch-tone analog 2500 set.

Many of the voice vendors would like SIP to become the standard for what will replace the 2500 telephone set, with just the basic features, allowing them to charge premiums for their feature-rich proprietary phones. Unlike the ISDN battle in the 1980s where it was PBX vendors competing with each other, the battle for SIP is much broader. The voice, data, video and wireless industries are all interested in SIP.

Progress is being made on the extensions to SIP that will manage advanced call control features but the progress is slow and has the potential of falling short on what SIP could deliver. One risk is that only limited features are supported by the standard, requiring proprietary solutions for advanced features.

CONCLUSION

The revolution related to how we communicate and collaborate will take years and have many battle fronts. There is much to be done to make the new products and services work together seamlessly.

It is easy to forget the many years and challenges faced by the telecommunications industry to reach something most of us take for granted - a world-wide public switch telephone network (PSTN) that allows any telephone in the world to be connected and communicate with any other telephone in the world.

Similar challenges are now facing the many participants in this revolution – i.e.; the need for standards and vendor participation. Many companies will need to cooperate for the benefit of all while ensuring they will still have a piece of the puzzle.

This paper tries to predict the future, and while things may not evolve exactly as written, it should, at the very least, be thought provoking. The revolution will be profitable for some and lethal for others. The winners will be those companies that figure out where they fit in the new puzzle, plan an appropriate strategy and execute, execute, execute.

Some may find this paper stimulating, others threatening and still others may find it as some fantasy. Under any scenario, it is worth the effort to investigate how this revolution may affect your business.

ABOUT THE AUTHOR

Jim Burton is Founder and CEO of CT Link, LLC. Burton founded the consulting firm in 1989 to help clients in the converging voice, data and networking industries with strategic planning, mergers and acquisitions, strategic alliances and distribution issues.

In the early 1990s, Burton recognized the challenges vendors and the channel faced as they developed and installed integrated voice/data products. He became the leading authority in the voice/data integration industry and is credited with "coining" the term computer-telephone integration (CTI). Burton helped companies including Microsoft and Intel enter the voice market and helped AT&T (now Avaya), Mitel, NEC, Nortel, Siemens and Toshiba with their CTI strategies.

In the late 1990s, venture capitalists turned to Burton for help in evaluating potential investments in IP PBX start-ups. He went on to help these and other companies with strategic planning and partnering, including NBX (acquired by 3Com, Selsius (acquired by Cisco), ShoreTel and Sphere Communications.

In the early 2000s, Burton began focusing on what he believed were emerging technologies that would have an even more profound impact than IP on the converging voice and data industry.