



# Welcome to Convergence

## Surviving the Next Platform Change

**H. Gilbert Miller, Henry D. Levine, and Sandra N. Bates**

*Voice, data, and Internet on one platform threaten chaos, but those who keep cool and keep moving will make it.*

**E**ach year, the federal government's largest buyer of telecommunications services—the U.S. General Services Administration's Federal Technology Service (FTS)—meets with its user base and industry partners to consider how best, as a group, to address upcoming challenges. For this year's *Tune into Technology Conference* keynote presentation, then FTS Commissioner Sandy Bates asked

the question, "What should telecommunications users and managers worry about in this new converged world?" Gil Miller, a recognized contributor to some of the largest federal government telecommunications procurements over the past two decades, and Hank Levine, a telecommunications lawyer known for representing large private- and public-sector

users in the negotiation of telecommunications contracts, tackled the tough answers to that question. The "Convergence Issues That Keep Us Up at Night" sidebar enumerates their top-10 answers. The rest of the article is based on excerpts from this interview, in which Miller and Levine address the basics of convergence and how it will affect the industry.

### CHALLENGE WITH OPPORTUNITY

**Bates:** What exactly is convergence, and is it a good thing?

**Miller:** In simple terms, convergence is moving voice into a data infrastructure, converging all the stovepipe data networks and applications inside a user organization into a single data infrastructure, and then extending that into the wireless

arena. So we're converging three components into an infrastructure based on the Internet Protocol—voice, data, and wireless. [See the "What Does Convergence Look Like?" sidebar.] As we do that, we're going to increase the functions and scope of both the infrastructure and the application base. Ultimately, users will have a unified network, increased performance, and increased functionality.

**Levine:** In the contest for the next-generation telecommunications standard, the combination of a single link running IP has emerged as the clear winner. So we're leaving the comfortable world of separate dedicated T1 access for voice, for the Internet, and for frame relay services, and entering a world in which a single T3 gets you to all three using the IP. Having all traffic come in and out over the same pipe promises both enormous economic efficiencies and flexibility. You can reroute traffic; redeploy resources; and add applications that combine video, data and voice in single meetings or single applications.

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## Convergence Issues That Keep Us Up at Night

10. Is convergence a framework for evolution or a straightjacket on innovation? Do we have the right balance in a converged world, particularly with respect to standards?
9. The potential for mischief—what is the regulatory and Internet governance agenda in the converged world?
8. Training and new expertise required—do we have the right people with the right skills in the converged world?
7. Legacy, legacy, legacy—how do we transition all our existing services and applications while still supporting the old ones?
6. Chaos in a converged world—will the marketplace sort things out?
5. The converged dashboard—how do we measure success (or even just performance and cost) in a converged world?
4. Performance—how do we specify performance in a converged world?
3. The scope and speed of change—can we pedal fast enough to keep up with change?
2. Continuous movement—do we understand what action is required?
1. The dark side of the Internet (our converged environment)—is our converged world secure and sustainable, or does it threaten to implode every day?

**Miller:** So for the user community, convergence means cost reduction, better productivity, and increased functionality. Let me share a simple example. Ten years ago, a business interacted with its customers, or a government agency with the citizens, by encouraging people to use 800 numbers to call into call centers. Employing convergence technology, *call* centers have evolved into *contact* centers – customers still interact with business or government through 800 numbers, but also through e-mail, chat sessions, and simultaneous viewing of web pages or electronic forms. The customer has greater latitude in the time, format, and substance of the interaction. Also, the contact center agent is more responsive as the convergence technology provides a wide variety of customer relationship management data simultaneously with the voice call or initiation of the chat session.

### CREATIVE-DESTRUCTIVE CHANGE

**Bates:** Exactly how will convergence affect the telecommunications industry?

**Levine:** We can expect total chaos. We do not realize real and significant progress and improvement by way of planned, controlled, incremental evolution, but rather by disruptive jumps to the next plateau. Convergence is that next telecommunications plateau, and that means there will be a major shift—and major discontinuity—to get there. The last wave of this magnitude was the move from private lines to frame relay for data, which occurred in the late 1990s. For the industry, this new platform represents a cheaper way to provide services that offer more functionality and flexibility.

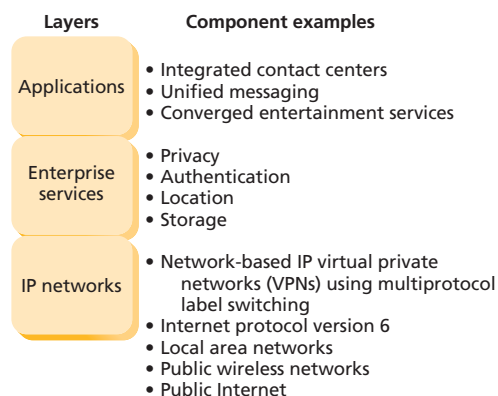
**Miller:** Exactly—convergence is a major enabling change. Companies that want to keep seeing the

## What Does Convergence Look Like?

In simple form, the converged Internet Protocol (IP) platform has the three layers in Figure A. At the bottom is the *IP networks* layer, which focuses on the secure, reliable, and efficient movement of bits using a variety of wireline and wireless networks residing in user and service provider (carrier) premises—networks that users and various service providers own and operate. The *enterprise services* layer uses the network and enables the applications.

The *applications* layer provides business functions to the user by combining the underlying layers. Third-party vendors and sometimes users typically develop and deliver the applications. (D. Garbin, “Private Internet Protocol Networks and Cyber Attacks,” *Sigma*, Winter 2004; [http://www.mitretek.org/publications/sigma\\_pubs\\_winter04/SigmaWinter2004.pdf](http://www.mitretek.org/publications/sigma_pubs_winter04/SigmaWinter2004.pdf) and G. Audin, “Roadmap to Convergence,” *Business Comm. Rev.*, supplement, Oct. 2004; [http://www.3com.com/other/pdfs/legacy/en\\_US/BCR\\_Audin\\_Roadmap.pdf](http://www.3com.com/other/pdfs/legacy/en_US/BCR_Audin_Roadmap.pdf)).

**Figure A. Three layers of convergence.**



kinds of price or cost reductions that we've enjoyed over the last two decades must adopt this platform change.

**Levine:** Gil and I refer to these price reductions as the hockey stick curve—the notion that as new technologies are deployed, a sudden price drop occurs [see “The Hockey Stick Curve” sidebar]. The standard number, historically, is 30 percent. When we went from private line to frame relay, prices went down pretty quickly by 30 percent, and then continued to decrease more slowly. We saw a similar sudden price reduction in the late 1980s with the shift from dedicated voice networks to software defined networks. Convergence will drive the next significant price drop, followed by further downward drift.

**Miller:** Users will indeed realize significant cost decreases, but of course everyone wants to know how much and when. The specific answers will depend on how the marketplace continues to evolve and the specific use situation. With so many implementation variables, generalization is impossible. There's the age of the legacy system, the state of the current data network, the operational staff's size and capabilities, not to mention the cost benefits of improved productivity and new services. The good news is that most vendors have case studies for users to consider, and early adopters have published some cost analyses.

**Bates:** As you noted, this plateau jump is likely to cause some shakeups. How will that look?

**Levine:** Convergence will provide new opportunities, which is likely to cause some established relationships to change. In the past, if you were replacing an existing PBX (private branch exchange) you typically turned to your current vendor. And, certainly, there was no need to switch out your voice service provider. But in a converged world, replacing your PBX creates an opportunity for new competitors—in both equipment and service—because a new technology platform is available. This platform change represents a creative-destructive technology, providing opportunities along with pain. As a result, there are essentially no incumbents—everyone has a more-or-less equal opportunity to bid the new contract. This is true for all the major players: the Regional Bell Operating Companies (RBOCs), the IXCs (Inter Exchange Carriers), the equipment vendors, and the system integrators.

### NO STANDING STILL

**Bates:** So leaving the benefits behind for a moment, you used the phrase “creative-destructive.” I imagine risk-averse readers just turned pale. With all the chaos and uncertainty already present, can companies stay the course and ride this wave? Is it better to sit this one out?

**Miller:** The marketplace, industry, and users are moving. Standing still isn't an option. It's not a question of *if*, but rather *when*, companies move to the new platform. Over time, fewer vendors will sell current circuit-switched products and services, and support will dry up. Even users who aren't adopting new technology will eventually get there through some critical event, maybe when their aging PBX is down one too many days. Who knows? But the need to move shouldn't be a drawback. Agile enterprises, the ones that thrive on complexity and change, will see it as an opportunity to improve products, service, and performance.

**Levine:** I agree that the users will have to move. When the PBX finally dies, there won't be another one like it. They'll have to get one that's IP-based. But let's be clear about the timeframe, which should be good news to the terrified. We aren't talking about months or even a few years. The transition to frame relay took five to ten years, and convergence of the kind we are talking about is apt to take at least a decade. But change *is* coming, and it's not necessarily a good idea to wait until the last possible moment to acknowledge that. Eighteen months ago, voice over IP (VoIP) was a toy. Twelve months ago it was a novelty. Now, at least in my world, which is doing procurements for very large corporations, everyone has at least some VoIP, along with many other IP-platform services, in their current major procurement.

**Bates:** We've seen something similar with the PC.

**Levine:** Right. Nobody just went out and bought a PC. They bought a PC to replace their typewriter. To these users, the PC was a word processor that happened to run on a little computer. And when they needed to replace their adding machines or calculators, they noticed that they already had the structure in place to do that, so they simply added to it, bought new software. The lesson is that you might move to the new platform for one purpose, but when new functions emerge and the budget allows, you migrate additional applications onto that platform.

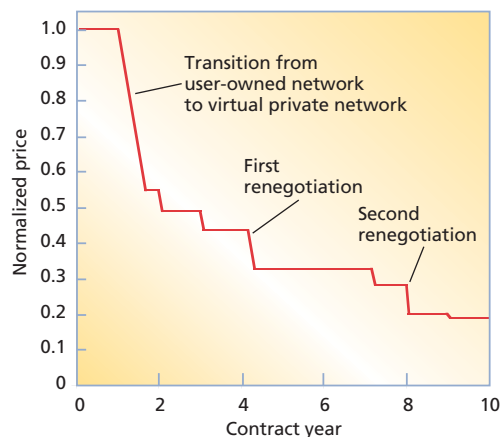
#### APPLICATION SPECULATION

**Miller:** That's a perfect example of why it's so difficult to predict where all this is going. Once we put a new platform in place, people will build applications with the aim of improving the way we do business, but we can only guess at what those will be. We can't predict how those new apps

## The Hockey Stick Curve

The telecommunications price curve in Figure B, dubbed the **hockey stick curve** for its shape, typically exhibits a significant price drop followed by continuing slower downward drifts. The deployment of new technology—a platform change—enables the initial price drop. Market factors, such as competition, then allow the later slower downward price drift. Figure A illustrates the normalized price of long-distance switched voice service for a 10-year contract that began in the early 1990s. The initial price reduction reflects a transition from a user-owned network to a virtual private network, a shift that telecommunications carriers deploying digital network technology enabled. As technology continued to evolve (larger transmission facilities based on the new digital network technology came into being, for example) and companies realized further economies of scale, subsequent contract renegotiations drive further price drops. The IP technology platform change has the potential for similar price reductions.

**Figure B. Telecommunications price curve.**



will compound future advances in technology and the marketplace, just as we couldn't predict in 1980 how applications would shape future PCs years from then.

**Levine:** But there are some reasonably good bets. It's pretty clear that over the next five years, and perhaps ten, we'll be building on an IP platform that is already partially in place in products, as well as service provider and user networks. We'll be using a variety of protocols such as Multiprotocol Label Switching (MPLS) signaling, Version 6 of IP, with, as Gil noted, enriched and additional applications, and certainly lots more bandwidth.

## IP CONVERGENCE

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**Miller:** The thrill of a creative-destructive technology change is the unexpected. Applications traditionally available from telephone carriers will be available via Web browsers and computers, and visa versa. New services will make user communications truly multimedia, so you can watch the broadcast of sports events on a wireless laptop and see statistics at the same time. It's not that the parts of the experience are new. It's that what is now scattered across media and devices will be integrated through one device. So in conferencing you get both audio and inexpensive video conferencing with integrated Web and data features. You'll be able to receive your voice call as e-mail or your instant messages as voice, all through one device.

**Levine:** And that device can also track your location, which is a huge improvement over current call forwarding.

**Miller:** The implications for entertainment are enormous. Gaming fans will have a whole new experience at home or on their cell phones. New video services, presented independent of the user's end device, will enable, for example, improved video conferencing capabilities with integrated data presented and maybe even the holographic sensory web everyone keeps predicting.

### NAVIGATING UNCERTAINTY

**Bates:** Given that there *is* a migration path, how can com-

panies avoid making terrible mistakes that will lead them into a dead end? And can they leapfrog over certain parts?

**Miller:** As always, the pace will be a function of a company's needs and risk tolerance. Some users require specific functionality that comes only with a converged IP platform, and their risk tolerance says that they prefer to be out front on the new platform. Of course, dead ends are inevitable, and early adopters will need to plan to back-track and reassess risk every now and then.

**Levine:** Actually, I think the dead ends won't cost much in terms of risk. It's not like companies are investing in a \$50 million machine and then saying, "Oops, that's not the direction the technology or market went, and we've lost it all." Rather, users will invest in an IP-based platform. It will require some tuning, and some applications will fail gloriously, but applications don't carry the price tag of reversing a huge investment. So a wrong path isn't going doom you. The CAT5 cable and the IP router choices aren't integral to the business. The IP platform will be a starting point, no matter what applications you have.

**Miller:** Exactly. Just take those first steps; the destination will more or less take care of itself. The point is to keep moving, and you'll get there eventually. There's no need

to wait until everything has been verified and time-tested.

## CONVERGENCE AND THE INTERNET

**Bates:** Does convergence mean we inherit the good and bad sides of the Internet? If so, how do companies deal with the Internet's dark side?

**Miller:** For many government and corporate users, convergence doesn't necessarily mean using *the* Internet. That said, even converged applications that run on dedicated or virtual private networks use the same underlying IP technologies and approaches, and even in dedicated environments they are susceptible to disruption and attacks. Remember the IP challenges of performance and security in the late 80s and early 90s when we moved from private voice networks to software-defined (virtual voice) networks?

**Levine:** And, of course, the underlying platform for the software defined networks was the public switched telephone network (PSTN), which immediately gave five nines.

**Miller:** Right. The PSTN gave us high reliability, high performance, and a rich set of standards—attributes that grew from a highly regulated environment and highly concentrated market. Now consider IP technology and the converged platform, which carries the Internet legacy of best-effort service delivery. To compensate, we overengineer and overprovision, hoping to boost component reliability and fill the gaps immature practices leave. And if that isn't nerve-racking enough, the IP infrastructure is constantly under attack.

Not that I don't see light. Equipment manufacturers are improving component reliability by increasingly adopting the design practices we saw in the PSTN. They're also including quality-of-service assurances, which are serving as the basis for engineering. Even so, users will have to appreciate and address performance and quality-of-service issues in building in-house networks, in integrating those networks and applications with carrier-provided networks, and in setting up the equipment.

**Levine:** They must also understand and take more responsibility for security. As everyone knows, it is much easier to hack the IP platform and applica-

## Regulatory Challenges

In addition to providing opportunities and pain to users, convergence is challenging well-established regulatory fundamentals, especially in the voice area. Consider this summary of regulatory issues that various federal and state regulators will need to address for the converged world (T. Rutkowski and T. Kershaw, "Implementing Telephone Numbers for VoIP," 15 Mar. 2005, [http://www.nanc-chair.org/docs/nowg/Mar05\\_VeriSign\\_VoIP\\_Presentation.ppt](http://www.nanc-chair.org/docs/nowg/Mar05_VeriSign_VoIP_Presentation.ppt)):

### National security and critical infrastructure protection

- Establish priorities for restoration after significant disasters; for example, ensure that telecommunications services are restored first for public safety and medical users after a hurricane.
- Set telecommunications priority access during or after disasters; for example, ensure that calls from public safety users get through.
- Implement legal requirements, such as the public safety emergency and law enforcement assistance that the Communications Assistance for Law Enforcement Act (CALEA) mandates.
- Mitigate the impact of network attacks or failures.

### Consumer requirements

- Implement 911 services to appropriately route and answer emergency calls.
- Continue the consumer protection and privacy provided in today's telephony world, such as the national Do Not Call List.
- Provide disability assistance such as the Telecommunications Relay Service to assist the deaf, hard of hearing, or speech-impaired.
- Provide universal service – telecommunications services regardless of geographic location.

### Competition and settlements requirements

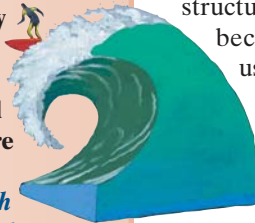
- Enable the number portability portions of the Telecommunications Act of 1996, which let users keep the same telephone number when they change service providers.
- Address intercarrier compensation—how to pay for a coast-to-coast call distributed between the various carriers that made the completed call possible.

### Operations requirements

- Determine who is responsible for fraud detection and management or for defining default service and routing options.

## A Prescription for Riding the Wave

- ▶ **Buy services (not technology).** This is a variant of the traditional risk-mitigation strategy to lease, not own. Let others take the risks associated with the new converged platform, especially as products, services, and standards sort out in the marketplace and are used in operational settings.
- ▶ **Specify performance requirements through service-level agreements, rather than technologies or products.** Stay focused on understanding your user, functional, and performance requirements. Do not overly constrain your service or product suppliers.
- ▶ **Encourage your service provider to update the underlying technologies.** Emphasize ways both of you can benefit from the cost savings or performance improvements. Insert contract clauses to allow and appropriately encourage your service providers to structure their upgrades after further standards and product development.
- ▶ **Never rely on single suppliers.** Instead structure your contracts to increase competition and your options. Build negotiations into your contract that bring the pressure of ongoing competition even to existing service providers. Use multiple, overlapping, staggered contacts to allow competition between your suppliers and even competition between technologies or market segments.
- ▶ **Allow winners and losers.** When you use multiple sources, ensure that you always have an eager, competitive source seeking your business. While this is sometimes difficult in a consolidating market, always seek to have an outside source of competition.
- ▶ **Identify, manage, and mitigate risk.** Develop technology and contractual approaches to mitigate identified risks. Use fixed rates to reduce user uncertainty and risks – but understand that the vendors' response to increased assigned risk is increased price. Give the vendors pricing flexibility (ability to price locations and services differently) to reduce *their* uncertainty and risks.
- ▶ **Require open systems and architecture from your vendors and users.** Proprietary approaches decrease flexibility and increase costs. Maximize the use of a vendor's standard services and avoid custom development. Leave no legacy or user behind, but recognize that users who do not update their applications will become nonstandard in an evolving architecture and increase your costs.



tions than the PSTN. Viruses, worms, and phishing are real problems. Firewalls, password administration, and patches help in the short term, and over time things will get better, but we could be dealing with these problems for the next decade. We can fine-tune the network infrastructure to perfection, but it won't solve the problem because the solution depends critically on what users and application developers do.

**Miller:** Convergence will change the user's internal support structure as well. Today's separate and distinct support organizations—one for voice and one for data—will become intertwined and interdependent. There's a great story about a guy who installed a VoIP phone and afterward, plagued with poor quality, called the telephony support technician. Of course, the telephony solution is typically to replace the hardware, so the technician changed out the phone—three times. Finally, he calls the data support technician, who recognizes that the software has not been configured to give the voice packets proper priority. That points to our need to develop best practices for the new converged platform, to address not only design and engineering, but also operations and management.

**Levine:** The same paths that move data also send signals between routers and move voice calls. Sending voice, data, and signaling traffic over the same paths introduces new vulnerabilities. We need to develop best practices that dictate how to set the priority of different packet types to ensure appropriate quality of service.

### MANAGED CHAOS AND LEGACY

**Bates:** I sense you both agree on the path to the converged promised land, but how do we deal with the current chaos in both the industry and user communities. Do we just let the marketplace sort it out?

**Levine:** In addition to the risks of dead ends, performance, and security we've already covered, users are faced with proprietary product concerns, as well as multiple and conflicting standards, that lead to difficulty in integrating applications and moving traffic across multiple networks.

Consequently, most large user organizations, certainly in the private sector, take a balanced approach that attempts to maintain flexibility as they move forward. They contract with a couple of providers. They manage their commitments and flow of work so that they're not dependent on a single supplier or component when its failure could harm the business. The focus on this kind of flexibility started with the industry's financial uncertainty (how to minimize cost in a market of decreasing

prices), but many are finding that it works equally well as a strategy for managing the technical uncertainties of a converged platform.

**Miller:** Again, it's about managing risk and understanding your risk tolerance and exposure. One risk-mitigation strategy is not to be on the cutting edge, but being on the trailing edge gives you a set of legacy issues.

**Levine:** We have all have legacy examples – X.25, Cellular Digital Packet Data (CDPD), teletype – some caused by the rapid advancement of technology or the marketplace, some caused by application providers and end users simply refusing to move ahead. Legacy costs—support, backward compatibility, and the like—are larger, more difficult and more awkward with a platform change. Again, maintain flexibility. You can have a couple of things side by side for a while, and you can move your applications over one by one, but eventually it's going to get too expensive and difficult to have legacy systems, equipment, and services as a part of your operations.

**Bates:** Won't standards help manage the chaos?

**Levine:** The PSTN was known for a very rich set of robust standards. In the IP world, we are now faced with the need to develop and accept critical standards. Rapid standards evolution is required to ensure the open systems and services that will let users maintain flexibility and make choices without excessive fear of dead end solutions and stranded investment.

**Miller:** But standards come with some tricky questions. Do we cut off innovation by adopting standards? What is the standards development cycle? How many options can we select without compromising compliance with a particular standard? Standards are a necessary condition for the total solution, but we want to be sure they don't strangle important innovative development.

### COMPETITION, COMPETITION, COMPETITION

**Bates:** Do you have any last advice for companies as they enter this brave new world?

**Miller:** Realtors say the three most important factors in moving are location, location, location. Here it's competition, competition, competition. Get positioned to take advantage of the competition between technologies, vendors, and market segments. [see the "Prescription for Riding the Wave" sidebar] Become an agile enterprise by adopting and using technology-procurement strategies that exploit changing market conditions. Adopting open platforms and architectures gives you flexibility as well as a competitive edge. This "agile principle" is hardly new. Successful government and private sector users have fol-

lowed it for over a decade, and it will continue to serve in a converged world.

**Levine:** My advice, ironic coming from a lawyer, is not to fret too much. The past few years have seen an enormous amount of work on security and applications. Industry continues to develop stable and functional platforms on which you will be thrilled to build your applications. Even though I'm paid to be nervous, I'm encouraged by what's happened over the last couple of years in the services that the corporate world is buying and how they have become stable, competitive, and flexible.

**Bates:** So the path to the converged world is accessible to everyone, and you both advise getting underway sooner than later. Plus, regardless of when they start adopting, users will need to appreciate their new responsibilities, stay flexible, and understand that standing still is not an option.

*H. Gilbert Miller is corporate vice president and chief technology officer at Mitretek Systems. Contact him at [hgmiller@mitretek.org](mailto:hgmiller@mitretek.org).*

*Henry D. Levine is a partner at Levine, Blaszak, Block & Boothby, LLP. Contact him at [hlevine@lb3law.com](mailto:hlevine@lb3law.com).*

*Sandra N. Bates, recently retired Commissioner of the General Service Administration's Federal Technology Service, is an experienced leader of government telecommunications programs. Contact her at [sandyspheline@aol.com](mailto:sandyspheline@aol.com).*

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