

## Network Forecasts for 2005

Net Forecasts – Peter J. Sevcik  
BCR Volume 30, Number 1  
January 2000

There's no headier time to be a forecaster than now, as history's big odometer flips. The millennium move has sparked plenty of glib predictions about a vague and distant future none of us will live to verify, one way or the other.

So, I'm taking a different tack -- extrapolating from today's realities along a relatively short timeline; say by 2005. I find this more useful, because if you accept that the following vignettes, it's possible to work backwards and deduce what had to happen to get us there. That, in turn, creates opportunities: We can use what we know, what we think we know and what we can envision, to set a course for the destinations described below, or others that are even more intriguing.

### **Bandwidth to Waste**

All optical networks interconnect the major markets and are growing to second-tier cities. If your building is on fiber, your enterprise can buy bandwidth end-to-end by the wavelength with an MPLS label. Bandwidth has evolved from being a scarce resource to a plentiful commodity. Enterprises terminate the fiber with WDM devices that can access many more wavelengths than they first order. True bandwidth-on-demand has arrived.

This means that an enterprise manager can order multi-Gbps pipes using a Web-based provisioning interface, and the bandwidth can be operational within seconds of the mouse click. It also means that the distance between the bandwidth-haves and have-nots of the world is now staggering. A major enterprise can buy more bandwidth with the click of a mouse than the total telecom infrastructure of many nations!

Prices have fallen but, despite the bandwidth glut, a price war did not materialize. Instead, bandwidth was packaged and sold much the same way that bottled water is sold -- through careful branding and marketing. Since additional wavelengths have a near-zero incremental cost, they really can be wasted.

Enterprises buy wavelengths for what they believe are must-have business reasons, but they can't fill up the pipes; more than 99 percent of the capacity is not used.

This bandwidth oversupply permits the emergence of novel applications and terminals that previously were considered almost science fiction -- e.g., high-definition TV, virtual reality and "immersion caves" (i.e., virtual reality rooms that take the "chat room" concept to an altogether new level, and which are described in some detail on the Electronic Visualization Laboratory home page --[www.evl.uic.edu](http://www.evl.uic.edu)).

Another by-product of plentiful bandwidth is that the pendulum starts to swing back to building private enterprise networks. Many of the enterprises that have been weaned off private data networks and onto the public Internet and VPNs, are no longer convinced that they are getting value for their expensive service bills. As network intelligence starts to move back into the enterprise, carriers are left with selling *BIG, FAT* pipes, which in turn means that CPE can become really simple.

The consumer took center stage, using the plentiful bandwidth to change the Internet from an information medium to an entertainment medium. Back in 1999, the personal television devices from Tivo and ReplayTV entered homes like Trojan horses. Missed your favorite drama? Just call it back from the hard drive. Then in 2001, these devices became equipped with DSL connections instead of a modem to access information about cable programming. Soon the actual programs were becoming available on the DSL circuit via the Internet. Want to see the first episode your favorite drama? Just call it up on the 'Net.

Video over IP and traditional video over cable are now indistinguishable to the consumer. Local and national programming are still delivered over the broadcast networks, but on-demand programming is delivered over the Internet. This started a major shift in how consumers view any video. Soon a few Internet

service providers became major buyers of bandwidth eclipsing all previous Internet traffic growth numbers.

### **Wireless is King**

Despite the apparent bandwidth dislocation of the masses that are not well wired, the world does not fall into conflicts over bandwidth disparity. Wireless communications spread over the emerging nations like a howling wind. Today, in 2005, the global markets for access to telephone or Internet service via wireline and wireless methods are equal – 1.3 billion each, with wireless the fastest growing communications market on the globe.

This is not lost on advertisers, who are very aware that applications have to be tailored to this huge, relatively narrowband audience. Many information services are available in broadband high-graphics and narrowband clipped form using WAP – the Wireless Applications Protocol. Much of the information browsing that dominated the Web in the late 1990s has migrated to this simple portable model. Indeed, user populations can be distinguished based on what they do with their wireless devices: Emerging markets are content with basic phone and news services, while advanced markets add electronic wallet features.

### **Bundled Net Services**

In much of the world, if you are connected, either via wireline or wireless networks, your communications services -- basic Internet, telephone and/or TV – is sold as a bundled service. However, services are stratified; better service with more features and premium services costs more. The combination of features, programs, promotions, rebates, co-branding deals and free trials is staggering. Enterprises and consumers continue to spread their share of the communications wallet among multiple suppliers.

### **Virtual Convergence**

Convergence was so over-hyped that people stopped using the term. Technology convergence did not pare down choices (one bill, one line, one phone), it escalated diversity. When two powerful forces collide they rarely fuse into one; instead they stay whole and

form offspring. Diversity is a natural evolutionary process that fuels markets, but businesses did want some simplification.

Enter *virtual convergence* or “synchronized diversity” – many parts working as a team. Take *Jeff's World*, the hot show based on the Hitchcock's classic *Rear Window*, that demonstrates how the Web and TV work together. The show can be viewed in three distinct ways. First, there is the traditional TV view: The audience sees a man obsessed with watching his neighbors in the apartments across the alley from his rear window. Based on what he sees, Jeff enlists friends and authorities to help solve crimes and fix injustice.

However, his apartment building has several security WebCams -- with picture and sound -- that produce different views of the same scenes. During the show, Jeff periodically checks the WebCams and weaves them into his story. However, audiences can connect to *all* of the WebCams and see much more than Jeff ever does. And the options are popular: One-fifth of the audience only watch the WebCam version, and real *aficionados* watch it on two screens, TV and Web.

In short, while the traditional view of convergence was too simplistic. Instead voice, video and data uniting within one “thing” – a computer, TV or telephone – the number of “things” actually increased but they work together more smoothly than was imagined back in the 1990s. Synchronized diversity – there's the show on regular TV, the one on the WebCams and a third show, which is the sum of the first two and requires two screens. It is a real-time ballet of TV and Web programming.

The union of the Web and TV had other implications as well. Advertisers, for example, took full control of the broadcast of Olympic Games. Worldwide viewers view specific venues on the Internet with live video from the floor of the arenas. Each “channel” is defined and recorded by independent teams working under the guidelines of their advertising sponsors – Coca-Cola-sponsored track and field on Yahoo, Pepsi sponsors swimming on Excite, Ford diving on Altavista and Microsoft

wrestling on MSN. But there was an upside: Virtual convergence led to more sponsors showing more programs to a larger audience, which generate more total revenue for the IOC.

### **What Network?**

While traditional enterprise and carrier networks still exist, there is much more interest in the hottest network properties on the planet: the car and the belt.

ExxonMobil put a BlueTooth wireless data transceiver on every gas pump to communicate with all the new cars as they fill up with gas. And there is a lot to communicate about. Ford has contracted with ExxonMobil to deliver car-wear statistics to Dearborn and maintenance bulletins to the consumer under new warranty plans. The car stays in warranty as long as the new Ford fills up at an ExxonMobil pump at least once per month, which in turn generates a rebate annuity (a rebate that pays out over time). In fact, if the owner has a SpeedPass account, then the Ford rebate annuity simply pays for the gas. Consumers love the program. Other automobile manufacturers are setting up similar alliances.

And while the car and the pump are linked during the fill-up, the gas station has a lot to tell the car as well -- local weather, restaurant, hotel and entertainment information, even local music for the car's entertainment system. All of these can be viewed or listened to for free after leaving the station. Advertisers pay to have the programming piped into the captive audience. In fact, programming is customized in real-time while the gas is pouring. The combination of customer, car and location turns out to be a good predictor of where the customer is going and what he/she will need for the trip. All the data is kept in a private owner's profile account on the Web that owners can customize.

The single does-everything-in-your-hand networking devices that were best exemplified in 1999 by MIT's Handy 21 were not popular with consumers. Instead, people own lots of different communicating gadgets, each tailored to individual functions -- an electronic golf caddy helps calculate swing and ball geometry, cell phones are everywhere, and communicate

with the Palm organizer and the health bracelet. The list goes on and on.

The belt is the unifying network for all these devices. Belts with personal intranet, sewn-in antenna and batteries are now the rage. (The buckle plugs into a charger at night.) Of course there are alternative personal intranets in purses and pendants. Also, the better cars and new refrigerators operate as family gadget intranets.

### **Disposable Networks**

Recently the number of networked devices outnumbered networked people. Just about everything is being built with an IP address and a communications jack or antenna. There are smart printers, smart stop signs, smart boxes of fruit and smart Nikes, and the real challenge is figuring out how to support all these communicating devices.

The answer in part is to have many small networks form organically as needed and then fade away. For example, a fruit cooperative ships fruit in a smart-box that measures temperature, humidity and even detects the emergence of fruit flies in the box. Each low-power radio box communicates with the other boxes in the truck. They all discover each other and appoint one to report to the truck's environmental system, which in turn keeps the driver and the cooperative fully informed.

Upon arrival at their ultimate destination, the boxes find themselves part of various grocery store networks where they reconstitute with other boxes of bananas and lettuce on the produce refrigerator. A box that is left by accident on the loading dock stays connected and can signal the warehouse foreman to get retrieved.

### **Telecommunications is Amazoned**

The network service providers multiplied and subdivided to the point where there were many specialized layers. That in turn produced the usual inefficiencies inherent with too many players in any system.

This was fixed by implementing "Collaborative Product Commerce" tools that transformed the telecommunications industry and other bricks-

and-mortar industries. Orders for service and trouble tickets are now seamlessly exchanged among retail, wholesale, local, distant and carrier's carriers. Of course, some players haven't been able to adopt quickly, and we've seen the passing of some once proud names. Others are still struggling.

### **Why Push the Envelope?**

Creating these and even cleverer applications of networking technology will test our ingenuity. But the real challenge in the years to come will be figuring out how to use our gray cells thoughtfully; not just to produce a marketable gadget that is faster, cheaper or does new tricks. Instead, the real achievement will be to develop technology that actually improves the health, safety, education and overall quality of life for the 6.5 billion souls who will soon inhabit this networked planet.

### **Are You Up for the Millenium Challenge?**

OK, we've proved we can make fantastic products that can make a lot of money. Fine.

But now I'd like to issue a challenge to the industry: To create systems that directly improve the lives and safety of humanity. Let's divert just some of the energy, talent, ingenuity that goes into funding the next billion-dollar deal, and apply it to some higher goals. Personally, I trust America's entrepreneurial engine more than government programs. If you're willing to take on a really big challenge, here are some ideas to get you going:

**Feed the Planet:** Create communication devices planted within the seeds to let farmers know it's getting too dry or too cold or a fungus is growing.

**Save the Kids:** Cheap, flexible communications devices that can be put inside a child's hat or

pinned inside a jacket - a homing device that works with your cell phone to make it much more difficult to lose a kid in a store or to a kidnapper.

**Wire the Abandoned Buildings:** Abandoned buildings should be wired for sound and infrared emissions, and the data sent into a city database - after all, bandwidth is cheap and because the buildings are abandoned, nobody's privacy rights are being infringed. Authorities can access the data quickly to find out if there is anyone in the building. Perhaps it would have saved those six firemen who died tragically in Worcester, MA, just days for Christmas and the turn of the millennium.

**Bring Babies Home:** Premies and sick infants might be better off at home if their vital signs and tests could be routinely communicated to physicians. Has to be cheaper than keeping them in the hospital, where Medicaid often pays the bill.

**Communicating Airplane Black Box:** Why wait for a crash to retrieve 30 minutes of aircraft data and cockpit dialogue? It should be transmitted continuously via satellite to the plane manufacturer. The records can be aggregated and searched to improve aircraft design. All incidents and crashes can be studied to improve public safety.

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