

The Myth of Internet Growth

Net Forecasts – Peter J. Sevcik

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The Internet and the Web are infiltrating all segments of our economy faster than any previous technology. Everyone is effected in some way, and so it's critical that we understand what's happening -- or not happening -- to the 'Net.

Getting a firm handle on what's real and what isn't can be plenty tough. That's because about the only thing that's growing faster than the Internet itself, is the hype about the 'Net. And nowhere is the gap between hype and reality more egregious than in the projections for Internet traffic growth.

The most vocal proponent of Internet growth is John Sidgmore, vice chairman and COO of Worldcom and president/CEO of UUnet. Sidgmore keeps telling anyone who'll listen that UUnet's backbone bandwidth doubles every 3.5 months. As a result, the life-cycle for the switches and circuits the company purchases are measured in months.

The bottom line on the Internet's growth according to Sidgmore is simple: "If you're not scared, you don't get it." But who is supposed to be scared? UUnet's competition? UUnet's suppliers? What if the claims of unbounded growth are themselves a scare tactic?

Now, if you believe that the Internet essentially doubles every 3.5 months, over the past two years, the Internet would have had a 1077 percent compound annual growth rate. Such claims should be treated with extreme caution since quick doubling is very volatile. For example, a shift of only 0.2 months (6 days) translates to a 100-percent change in compounded annual growth!

Even if true, nothing grows this fast forever; all technology adoption curves are "s-shaped": Adoption starts slowly, then a trigger enables fast growth that eventually trails off as saturation occurs. Since Internet traffic grows in three ways -- more users, longer connect times and more bandwidth-intensive applications -- how close to saturation is the current Internet phenomenon?

Number of Users

It's generally conceded that much of the Internet's recent growth has come from users who were using email for work, but not using the Internet for the email connections. That changed, however, when Web browsers were introduced; now, anyone could download free software and -- presto -- become full users of the Web. Since most everyone in corporate America already had a PC on their desk and it was relatively easy to get a circuit into the Internet, it didn't take long for corporate users to connect.

But now what? The "easy" converts to the Internet have already been made, and today it costs time and money to get new Internet users online. According to Jupiter Communications, the number of users in the U.S. who were connected to the Internet in 1998 was about 63 million, or 20 percent of US households (IDC/LINK). The user population is growing at 20-30 percent per year -- or doubling every 32-46 months.

However, they will level off when nearly all households are connected. If the number of users doubled every 3.5 months, then saturation would occur in about 8 months. An unlikely outcome.

Connect-Time

The second way traffic grows is measured in terms of time -- how long users stay connected. And, according to Jeanette Symons, CTO of Ascend, that number is growing -- from an average of 17 minutes per session two years, to 35 minutes today. That's a growth rate of 45 percent per year -- or a doubling every 23 months. Impressive, indeed, so impressive that it's not likely to continue.

However, If connect time were to double every 3.5 months, then within the next 19 months, every user would be online nonstop -- literally around the clock. No, I don't think so.

Application Profile

Finally, we can measure Internet growth by looking at the application traffic profile of the typical user. Two years ago, I published an Internet traffic-sizing model (see *BCR*, January 1997, pp. 34-35), which showed that the typical Web user generated traffic

at 1,000 bps. This is the total traffic transmitted divided by the average connect time.

The matrix presented in that article can still be used to see the level of traffic if the user population shifts to more active applications -- say, for example, to 2,500 bps or even 4,000 bps. Adjusting these traffic numbers for the additional connect-time shown above, this indicates modest application growth rate of 10-40 percent per year -- or doubling every 25-87 months.

However, if traffic were to double every 3.5 months, it would be about 24 months before every Internet users was seeing full-screen, full-motion video via the 'Net.

While that's highly unlikely as well, the growth of application profiles is the best argument for the Internet growth doubling every 3.5 months. In theory, this factor of growth should *never* saturate. As James Crowe, president and CEO of Level-3 Communications likes to put it: "We have learned how to build a network matched to the bandwidth of the human ear. But in the future we will build networks that support the bandwidth of the optic nerve." Sounds like a very big number.

Unfortunately, it'll be a long time before any of today's applications operate at such fidelity. In fact, while certainly some applications are consuming more and more bandwidth, other applications actually consume less. For example, many popular websites, such as search engines, provide users with a quick, "minimalist" response. As evidence of this trend, during the past two years, Yahoo has reduced the size of its home page by 60 percent.

The Internet is already the victim of its own success. New "high-end" applications, such as audio and video, that could operate at 100 to 400 Kbps are often limited at the source to 28 Kbps. Web sites must deliver programming that matches the lowest common denominator -- that means that even if you are connected at T1 or faster rates, you often can't tell the source to give you a higher quality session. High bandwidth applications will come, but slowly; the Internet's millions of slow-access-speed users act as an anchor.

Total Demand

The three factors discussed above -- number of users, connect time and application traffic profile -- combine to produce an overall annual compounded growth rate of 60-160 percent, depending on the use of low or high rates for each factor. A much more reasonable future growth scenario using a mid-point figure would translate into the Internet doubling every 11 months -- a very respectable showing and, ironically, the pace at which the Internet's predecessor -- NSFnet --grew from 1991 to 1995.

But doubling every 11 months is a far cry from Sidgmore's claim of doubling every 3.5 months, and there are at least three ways to justify the difference.

First, UUnet grew by acquisition; they've absorbed many other ISPs during the past two years. So, the effective rate of growth is both a reflection of the pie getting bigger, and of one player taking a bigger slice.

Are there enough acquisitions to be made that could sustain the growth? Probably not, and even if there were, it's not clear that M&A would occur: regulators in both Europe and the U.S. aren't likely to permit one company to own the whole pie.

Second, UUnet is not the Internet; many other ISPs have grown at a slower pace. Yet the analysts continue to use a single, albeit very successful player as a proxy for the industry. This is a risky over-simplification.

Third, UUnet participated in spectacular growth associated with the introduction and early, wildfire-like adoption of Web browser technology. But that was *not*, by any measure, a typical situation.

Internet Capacity

Looking at Internet capacity rather than demand provides a different view of growth. Data from the *Boardwatch Directory of Internet Service Providers* shows that total US Internet trunking doubled in capacity every 7 months from 1996 to 1998. However, when the UUnet numbers are removed, the growth of the rest of the US Internet has slowed from a 5-month doubling rate in 1997 to a 10-month doubling rate in 1998.

In summary, my best estimates are that the total US Internet was recently doubling demand every 8 months and capacity every 7 months. However,

soon the pace will slow to doubling demand every 11 months and capacity every 10 months. There will continue to be localized bandwidth shortages during such a dynamic period but any imbalances between supply and demand should quickly disappear.

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It is very important to understand the fundamental supply/demand balance of the Internet. The difference between continued 3.5-month and 10-month capacity doubling may seem small but it can translate into a very big problem. Many business plans are directly based on two assumptions about the Internet – growth and scarcity.

Think of all the businesses currently losing money with the promise that they will turn profitable as soon as growth catches up to their ability to lose money. Look at all the quality-of-service and traffic-shaping technologies that manage scarcity because demand is always expected to outstrip supply. Finally, there are huge investments in building supply in order to satisfy this extreme growth. All of these plans will be severely impacted if growth is found to be more modest and if supply does indeed get ahead of demand.

For example, Mike O'Dell, UUnet's CTO, has been telling people that UUnet will buy 2,000 OC-48s to connect each of its major city pairs by the year 2000. Every terabit-router company I've interviewed quotes that statement when I asked, "Who is going to buy your product?" The danger is that demand simply won't support the infrastructure being proposed by developers and investors chasing the brass ring of tens-of-thousands of OC-48s across the broader Internet by 2000.

The Internet, of course, will continue to grow, and if history is any guide, probably reflected by a series of "s-curves". It has experienced bursts of hyper-growth before, and they've come in six-year intervals: 1984 (DDN), 1990 (NSFnet) and 1996 (Web). So, things may stay relatively calm for a while, but look for the Internet to get even more crazy in 2002. The form of the next burst is just beginning to emerge. Stay tuned.

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