Netwatcher

ISSN 0890-5800

November, 2001
Volume 19.11
Internet Edition



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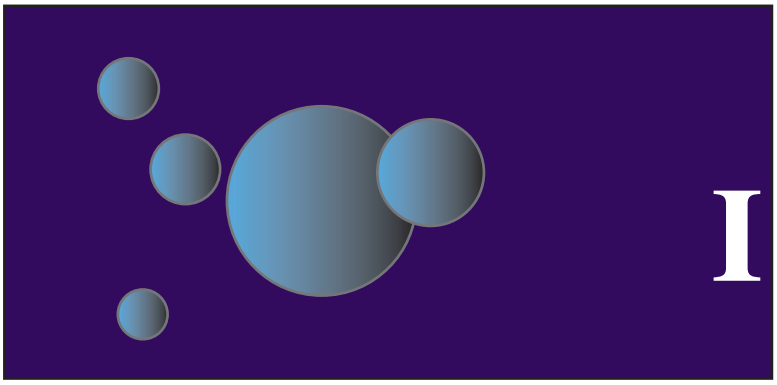
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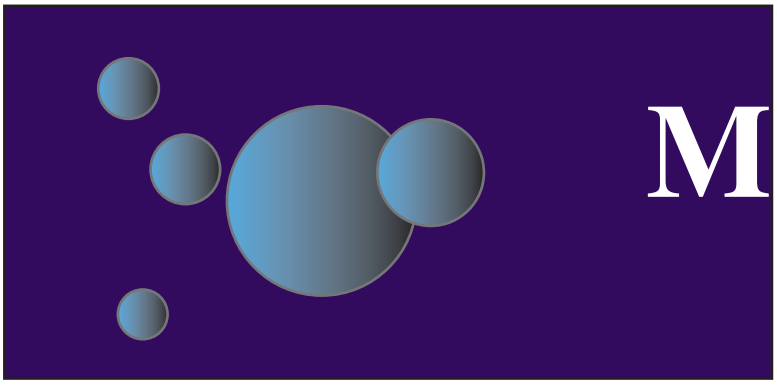
Market Area Focus reviews the key issues for the service provider and enterprise networking markets, in preparation for our annual forecast next month. **Sorry, this is for subscribers only!**

Management Briefing provides an update on the progress of regulatory reform and the possible inclusion of broadband stimulation in the economic recovery package.

In the Know looks at a new kind of multi-player gaming that might end up being the major stimulation of residential broadband in the near term.

Strategies asks how capital can return to the networking market, and where in the equipment space that return might happen.

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Management Briefing

Despite the need to develop a good economic and regulatory framework for our industry, and for the whole technology sector, the main players in the drama of telecom were seemingly paralyzed in the last month. Nothing new is emerging from the FCC, and congress is still at a stalemate in the economic stimulus area. Despite this, there's still hope, and there are some actions brewing behind the scenes. There are even a few overt signs to be considered.

Overt sign number one is the inclusion of specific broadband stimulation in at least some versions of House and Senate stimulus legislation. The stimulation, applied in the form of an investment tax credit, would seemingly apply to any form of residential broadband and would also possibly encourage services above the 1 Mbps level.

In the House version of the bill, carriers would receive one level of ITC (10%) for "current generation" broadband services offering 1 Mbps service or so, and another ITC level (20%) for deployment of "next-generation" service capabilities in the 20 Mbps range. In practical terms of DSL deployment, the first generation would apply to ADSL and the second to VDSL. The Senate bill of November 13th appears to have this same provision.

We're of two minds on this legislation. On the positive side, any ITC is a good thing for deployment, and the fact that there's a larger credit for the "next-generation" capabilities may induce carriers to speed deployment of VDSL-ready devices. On the negative side, however, there are a number of issues:

- The question of what level of actual support for the services would have to be installed in order to qualify for the credit seems murky. We'd like to see a new-gen credit applied to any device that **could** be made to support VDSL based on currently available vendor technology, even if that technology is not yet installed and even if no such service is currently offered.

- The service classification is made entirely on data rate and not based on any form of QoS. Thus, we could have "new-gen" broadband that would have no capability to support streaming video. QoS issues have to be handled to make this credit meaningful, and if the legislation doesn't address it we need specific FCC guidance. In any event, setting a 22 Mbps threshold for "next-generation" service seems to virtually disqualify any practical alternatives to DSL, and thus any players but the RBOCs.

- There is still no indication of what the regulatory status of the new infrastructure would be, relative to Telecom Act wholesaling and unbundling. This again is left to the FCC, whose statutory framework for making an absolute ruling has been questioned both by the FCC itself and by the courts.

We think this portion of the package will probably receive some tuning in the final discussions and debates, but it's not completely clear how much tuning can be accomplished without raising so many partisan issues that the whole bill gets derailed or the broadband section gets cut out of frustration.

An interesting sidelight on this is the fact that there is a rumor that the House will actually vote on the Tauzin bill some time late this year or in early 2002. It would be heartening to think this was an indication that the legislative compromise we reported on in August might hold, and that congressional and thus effective reform of the Telecom Act was in the offing. We don't think so, unfortunately. It seems more likely that the backers of the bill are simply paying off a political debt to the RBOC, since the Senate seems to have no intention of taking up the matter. There's also a chance that the bill might have elements extracted from it for inclusion in the economic stimulus package. That might alleviate some of our concerns over the broadband tax credit approach—see above.

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On the broader regulatory front, it's still not completely clear where the FCC might be taking the industry with its forthcoming advanced services rulemaking. Everything seems to hinge on the term "regulatory forbearance" as used in section 706 of the Act and in the FCC's NOI on the matter. If the dictionary definition is to be trusted, "forbearance" is "refraining from something". In the context of indebtedness, it means "forgiving" the debt. Doing that in connection with regulation would seem to mean "forgiving" a regulatory mandate. Does this give the FCC the right to waive wholesaling or unbundling of data networks or advanced services infrastructure? If it doesn't, just what did congress mean in the section?

What seems to be emerging isn't too different from what Verizon proposed back in August or so. Competitors and other players would acquire customer access via wholesaling a service connection—an ATM VC, for example. Deeper interconnect and unbundling would be off the table. Data service infrastructure outside the access space (like Internet infrastructure) would be exempt from wholesaling and unbundling. Customers would be allowed equal access to the Internet provider of their choice, and all legitimate providers would have access to customers via the wholesale connection and a kind of NNI to the RBOC network.

It's also clear that at least some of the RBOCs are still looking at service beyond the Internet. Last year, Blockbuster and Enron were in a deal with Verizon, SBC, and Covad to deliver video. That deal has died, but there is still a lot of interest in Verizon in reviving it, and both BellSouth and SBC are also working through their own plans. But video deals are the hardest to do, as we pointed out in our Content Network Market Focus this time last year. It might be smarter to look at what could happen with the Microsoft Xbox as a proprietary content terminal. There are some really interesting variations on the common themes of multi-player gaming in the works, some of which are said to combine video-like concepts with more traditional gaming to create virtual realities. One question is whether these new deals are part of the Internet or simply other public service networks. Technologically that may be a minor point, but it could loom large in the regulatory space.

That regulatory issues may be the key to the future might be reflected in SBC's choice of William Daley (a former Commerce Secretary under Clinton) as their new president. Daley will also be charged with specific responsibility for regulatory affairs. A Washington insider, he's expected to help SBC navigate the possibly complex set of issues that will develop over the next year. He's particularly savvy in the international space, having played a major role in NAFTA. This might mean that SBC is going to take a broader world view in its future planning, dodging some of the quirks of the near-term market here in the US.

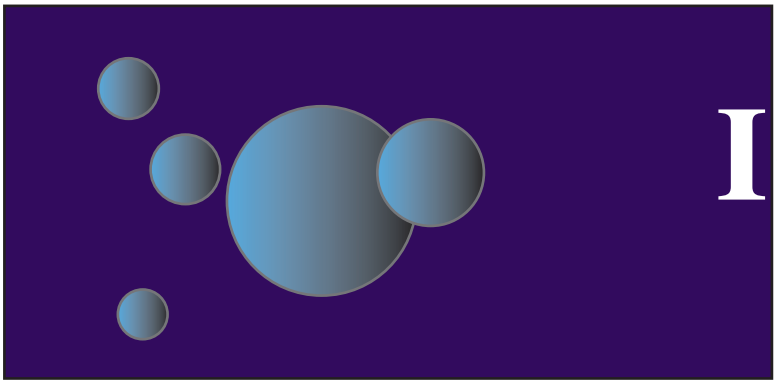
The FCC might also be getting up to full size, having been short after the administration change. Sen. Daschle is recommending an aid, Jonathan Adelstein, to Bush for consideration. Interestingly, Tom Tauke of Verizon gave the new appointment a vote of confidence. A sign perhaps that the pro-RBOC camp is packing the FCC? Not with Daschle's recommendation, we'd think. A sign that Washington insiders are converging on a course of action supported by both parties? Dare we hope! Politicking on Tauke's part, in gaining favor with a powerful Senator when the Senate is a key factor in future regulatory change? As if that would be surprising. Ah, maybe we're just getting too cynical—as if that were possible in this market. No word from the Bush people on the idea at this point.

Recap time. We expect a stimulus package to pass, but it may not happen until congress comes back in January. The longer it is delayed, the more likely it would be to contain something specific on broadband. This is providing, of course, that nothing major happens over the holidays in terms of new terrorism. Should there be anything that would presage a general economic downturn, congress will move quickly on stimulation and drop any specific industry plans. We expect the FCC to be more aggressive than not in its upcoming rule-making. We expect that to result in more broadband deployment in 2002.

Verizon and BellSouth are the two to watch in the first quarter. Verizon has a 271 application in New Jersey to hear on, and Verizon's DSL plans are less impacted by the fine points of the FCC order, since it's not dependent as much on fiber remotes (remember Verizon Avenues, the basement-remote strategy?) BellSouth needs to be watched just because it **is** so dependent on fiber remotes. BellSouth deploys a greater portion of its new lines on remotes than any other RBOC. Should we suddenly find BellSouth building out according to a new residential broadband plan, it would signal that the RBOCs are more certain that residential broadband is going forward in the near term.

There will be no management briefing in the next issue, since it's our technology forecast. We'll resume these briefings in January.

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In The Know

Let's play a game. In fact, let's do it in two dimensions. This section of *Netwatcher* is a purely hypothetical exercise—a game. And games are what it's about. Games, that is, and how they might control the future of networking.

We've said many times that consumer broadband was the catalytic factor in determining where our infrastructure and services go in the next decade. In the past, many have simply assumed that "consumer broadband" meant "broadband Internet". Today, few are confident that the Internet can pay the freight of an infrastructure upgrade. Those who are confident are really betting not on the Internet as we know it, but on something that the Internet might evolve to. Those who aren't confident, it turns out, are making the same bet but in different terms—they're assuming that this utopia beyond the Internet will prove to be an independent application. We're in the latter camp, but for now lets' focus on the application.

It's "content", but it turns out that defining just what "content" means is complex, and defining what kind of "content" might drive networking is more so.

Redeeming the Sins of Content

Everybody thinks content means video. Other than pornography, though, there is little indication that video represents a significant near-term opportunity. Subscribers might want to refer to our *Market Area Focus* on content networking, published in the November 2000 issue. Suffice it to say here that the largest problem with video is continued availability of suitable material. If "video" means "movies", then there are perhaps 50 films released per year that would satisfy premium viewing needs for an average household. Most video planners admit that consumers would have to triple that consumption or more to create a viable video content market.

Some of the problem with video can be alleviated by moving from movies to live performances, and from national to regional or local events. Still, it's clear that the video content market doesn't have proven legs. To make matters worse, streaming video is the absolute worst application for a network from a technical and business perspective, because it demands essentially constant-bit-rate bandwidth and because that bandwidth would be readily resold to compete with other applications—if the provider (like an RBOC) were subject to wholesale requirements.

So what's the answer? We'd like to have "content" available that commands a price of five to ten bucks an hour, and available in quantities that would create a multi-billion-dollar market. As it happens, the answer may lie in an application that we (and others) have long promoted—multi-player real-time gaming. But there's a new twist that may make this as close to a killer application for broadband as we're going to get.

Multi-player gaming synchronized by a common network connection has been around for a while. The mechanics of the games vary, but the overall principles are similar—players have a software disk that contains a game scenario in which interaction is with other players can occur, then synchronize with others to support that interaction. Often the "interaction" is nothing more than player-to-player combat, a simple personified substitute for the normal "player-against-the-software" combat of adventure and war games. This type of interaction requires fairly contained network delays to support real-time behavior, but since trigger messages to synchronize action are relatively small (the graphics are locally generated) no broadband service is really required.

Let's imagine a twist on this approach, though. Let's suppose that somebody develops a gaming architecture based on what might be called a "shared virtual reality". In this system, a central server stores the game environment, made up of "sprites" or "deltas" that are something like A/V building-blocks, as a series of linked descriptor lists. Each player's disk contains software and the templates

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for playing or viewing each of these sprite/delta elements. When the player is to "see" or "hear" something, the server downloads the list of sprites/deltas that make up the immediate environment, and the local software builds the audio-visual experience by looking up each element on the local disk and displaying or playing what it finds. For example, a "room" might be created by sending a linked command set "wall-wall-wall(door)-wall" with coordinates for each.

What makes this system different is that the players of this type of game would really share a virtual reality. In most interactive multi-player games, players can interact with each other and with the game environment in only limited ways. In this new system, players would actually share a common view, which means that if several happened to be in the same place they'd "see" each other. Using our example above, the command set sent to each would include "player(x)" icons. Each player would develop a character image, for example, and that character would be displayed to any who could "see" it from their current location in the virtual reality.

What makes **this** different from a networking perspective is that more bandwidth is required to make this work, since "instructions" to create each view of the game must be delivered to each player. It's not as stringent as full-motion streaming video, but it's considerably more than a simple data message application. A simple shared virtual reality probably requires on the order of 256 kbps to coordinate, and a complex three-dimensional audio-visual one would require a megabyte per second or more.

Another difference, perhaps the critical one, is that this new system is a form of **self-authored content**. The game system can be created so as to permit the players collective control over environmental elements. They could build things, tear them down, move them, paint them, etc. The dynamism that is lacking with standard video features (how many times can you watch a movie—or more significantly, how many times would you pay to watch it) is created by the experience itself! A game architect (a "dungeonmaster" in adventure game terms) would create a basic framework, and players would then proceed to drive the virtual reality as they chose. The architect could intervene at any point, either by creating rules that were invoked under specified conditions and which altered the framework of the game, or at the human level to toss in a few quirks.

This whole scenario opens a number of very interesting business model issues. It should be remembered that the proximate cause of the Internet crash of the last couple of years wasn't that IP is bad, but that the Internet business model didn't lend itself to creating a financially stable framework of content and service. If shared virtual reality (SVR from here on) solves that, then it means something really significant could happen.

Looking at the Business of SVR

It's pretty easy to see the business model for SVR from the perspective of the "gaming company". A game is established and advertised in some way to attract players. The players register, pay a fee, and establish their character. They receive a disk or download with the sprites/deltas that will be used to construct the virtual reality, and a key to access the game server. For each "play" they pay a usage fee.

This simple structure has a lot of flexibility, though. For example, the "game" could be a whole series of related "games" with a limited number of players per game instantiation. Players could have to qualify through prior experience to join a particular game, or a particular instantiation. They could get discounts for playing in multiple instantiations or multiple characters in the same one. Games could be done in a successor/series sense, with players growing along the series. Games could require scheduled interactions of the players at fixed times, random play against/with whoever happened to be online at the moment, or a combination of both. You could promote tournaments and special events within a game or outside it. There could be merchandise associated with a game. The list is endless, and it's all profitable.

In the network space, there are also options. While it's almost certain that games would be made available via "the Internet" and some might even be made to support dial-up access, it's likely that the premium games would be delivered on a customized connection. That connection would include broadband access and a link to a gaming network, the fee for which would be included in the charge for the game. This is where the experience starts to look like content in a network sense.

How does a parallel gaming network look or work? First, it's theoretically possible that the network would not support a standard IP protocol, but we don't think that will happen. It's more likely that a parallel gaming network would simply look like a facility-separated VPN, an IP network built like AT&T's IPFR but designed to "touch" the consumer edge via DSL. This network might employ a different IP address (one of the RFC 1918 addresses), it might be reached via a tunnel of some sort, and it might use a different IP stack than the standard Internet connection.

Separating the gaming network from the Internet would accomplish a number of useful purposes. First, it would make it possible to

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fund the gaming network for an ROI yielded from gaming alone, with no fixed-price best-efforts Internet contamination. Second, it would dodge the one-price-with-no-usage model that might otherwise create backpressure against the per-play-hour charging paradigm of the game. Finally, it would eliminate a possible equal-access regulatory requirement applied for ISP services. An incumbent might be able to promote a "gaming network" and offer it with his service. How this would be treated by the public, press, and regulators is anyone's guess, of course.

The promotion of the games would take place on the Internet, of course. Players would register, pick (or be assigned to) a game instantiation, obtain their play/access key, and then connect to the game network to download the software and sprite/delta mixture to be used. Popular game frameworks could be sold in stores to form the basis of joining a game/instantiation, or downloaded as paid-for software.

Hosting games now becomes a network business as well. Some "hosts" might be centralized (for key, high-level games with a national or worldwide player base) and some might be associated with regions or metro areas (for games with so many players that subdivision is needed to keep the interactions reasonable). It's also perfectly possible that game hosting companies would elect to serve only one metro area, eliminating the cost of creating a broader game network and equalizing the performance levels among players.

This new paradigm would make a tremendous difference in the revenue levels that a gaming content thrust could generate. The upper limit of pure gaming, in network revenue terms, is probably on the order of $1.5 billion per year. Adding SVR raises that to over $90 billion. By anyone's measure, that's good money. In fact, it's not far off the pace of IXC revenue generation today.

Technology Issues

What has to be there to make this work? In a software sense, the technology's already there. Many of the current action games are created using locally stored descriptor lists and a combination of sprites/deltas referenced in those lists. In the hardware sense, a lot of the stuff is there, too. It's just a matter of linking the pieces.

One link may be the Microsoft Xbox concept. A proprietary game system is a safer platform to author a gaming network around than an open platform like a PC, which might be reverse-engineered by somebody. We called such a system a "trusted content agent" in the past, because the system could be trusted to secure delivery of the material in accordance with the copyright of the owner. Could it be that Microsoft intends to do something in this area? We'd never hazard an opinion, of course.

Game servers are needed, perhaps. There are two models of distribution of the synchronizing list of sprites/deltas that make up a given view. One model says that each player sends changes in a multicast to every other one, and the other that a central server maintains a common experience that it then multicasts to all the players. We think the former model not only doesn't scale, it doesn't deal with the likelihood that in a given instantiation, all players aren't in the same place at the same time and thus can't cooperate to create a view.

A collective game server is a pretty powerful box. It has to collect "transactions" from each player that represent the player's actions, movements, etc. From this, it creates an altered "map" of what each part of the SVR gamespace might look like, and distributes a piece of that map to any player who moves into a new area, or who's existing area is altered by behavior of the player or others.

The server, in fact, would look pretty much like a big OLTP box. Distributed transaction processing principles might be applied if the game were to be supported by linked metro/regional servers to create adequate scaling. There are any number of technical or gaming measures that could be taken to insure that no player experienced a glitch due to a DTP update. IBM Websphere, take note!

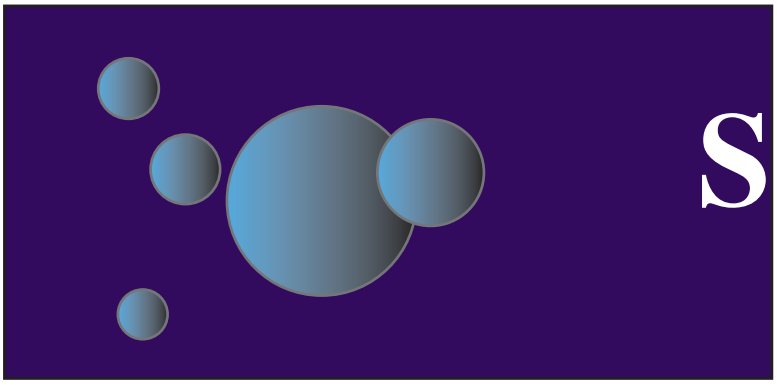
Inside the network, what would be needed? Not much, necessarily. In fact, nothing at all unless you really wanted to dodge the Internet business model. The technology to build a gaming network is pretty much what's already used to build public data networks. The only special requirement is generated by the need to split gaming network traffic off the overall DSL or cable modem access stream. That could be accomplished at Level 2 or Level 3, using either a traditional LAN switch or router, or a service switch optimized for the mission.

If it's so simple, why hasn't it been done already? We think that the concept is already in the works, frankly. We think some experiences of this type will be available to at least a select few by the end of 2002, and that the concept will become a broadband opportunity driver by late 2003. The inhibitors remain the same; regulatory issues on the ILECs (hopefully to be addressed in the upcoming FCC ruling) and lack of convincing sponsorship in the content development area. For that, we really will have to look to Microsoft, whose software skills and Xbox introduction combine to make it the logical guy to watch.

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Other content applications will develop, and it's even likely that we'll eventually get video distribution via broadband. What SVR could do, though, is accelerate the whole broadband program by creating a revenue stream that's more compatible with current DSL and cable technology. We'll keep a close eye on this, folks, and report as needed.

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Strategies

The most critical question our industry may be facing is that of continued capital access. Over the last five years, networking has benefited from an influx of cash from VC and other sources that was literally the envy of the modern world. The cash spigot got turned off in 2000, and the question now is how capital can be made to flow again.

People invest in expectation of a return whose magnitude offsets the perceived level of risk. The return is achieved by liquidating the original investment in some way—selling the company, going public, etc. This, in turn, is usually linked to an event or events that greatly expand the perception of value. To put it in simple terms, capital is invested when the company is a low-profile, higher-risk, proposition. The investment's value is realized when the company gains status, creating a buyer for the interest the original investor developed.

Gaining status, or gaining credibility, can happen in a number of ways. One is for the company to do something wonderful. Another is for a large number of people to **believe** it will. Wall Street has always been known for a "buy-on-the-rumor-sell-on-the-news" attitude. A bargain isn't obtained by waiting for the market to strike a fair price, but by anticipating what that price might be. Thus, expectation enters into the return equation, and hype is a way of driving the expectations.

We don't want to make this a(nother) diatribe against hype; we've said it all. We just want to point out that a part of the process of capital acquisition is the promotion of the industry. Whether that promotion becomes **over**-promotion depends on a bunch of factors that we've also covered before. Whatever happens, though, we must have promotion—credibility—to attract investment. That leads to the question "How can that credibility be re-created?"

The challenge of rebuilding confidence in networking as a worthy target for capital investment was created in large part by the failure to discipline our marketplace over that five-year golden period starting in 1995. The Internet craze, the CLEC hype, the concept of "convergence" all combined to promise extravagant profits from networking. Again, we'll leave aside the bad karma of the period to focus on the key issue—extravagant profit expectations. Invest for a high return, is the moral. How and where does that high return come back?

The biggest strategic issue for both service providers and equipment vendors is the conservatism of the market. It's clear that "emerging" players are the dynamism of the industry, since incumbents are by their very incumbent status discouraged from offering real innovation. Can "emergents" be created?

Sort of, we think. That will involve a multi-step program, however, and we'll need to get started quickly.

Step One: Equipment Innovators

The first step in creating capital market confidence is the creation of, or recognition of, emerging equipment players that offer products better suited to the market directions that are now becoming visible and viable. In short, we must offer alternative technology to carriers. Initially, those "carriers" will be largely incumbent players, and that frames the nature of our first phase of recapitalization of networking: **Equipment Startups Promoted For Acquisition**.

If we look at the past, even the period immediately preceding our latest boom-bust cycle, we can see that in the early phases of a market capital influx, companies were started not with the expectation that they'd go public, but with the expectation they'd be sold to an established player. Liquidating investment through selling the company to an incumbent is in many ways better than the IPO route, since it usually doesn't involve putting stock under restriction. That means employees and investors can get out quicker.

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But it's also true that there are only so many incumbents to sell to, and that's what usually brings about the shift to the IPO-exit approach. We can define perhaps 10 incumbent equipment vendors in the networking space for the service provider part of the market, and another 10 for enterprise. If we assume a product that would be targeted to one space or the other, and assume a historical average that half the incumbents will acquire somebody, that gives us only five product exits. Moral: **In the early days of our first phase of recapitalization, the number of players will have to contract to accommodate the size of the exit "door"**.

We believe that an "exit space" of five would create a maximum opportunity for 15 players. Keep that number in mind, because it will have great significance for the current market space.

Of course, incumbents can't be induced to just buy five arbitrary startups to create exit strategies. Where the acquisition is most likely is where **market condition changes expose a weakness of the incumbent equipment base**. Today, that's most likely to happen in the service switch space and the ATM/MPLS core space.

We've covered service switches in some depth in past issues. The product category is based on the presumption that future carrier service revenues will depend on traffic screening and forwarding based on criteria not now being applied at the network edge, and/or will depend on carriers being able to offer service combinations of great flexibility from a relatively stable (and profitable) single equipment platform. There are already RFIs or RFPs out on the street for service switch products, and these expose significant limitations of incumbent devices, in terms of interfaces and features.

The big problem carriers face is the fact that revenue today is almost purely "non-IP", but that within five years IP services are likely to become revenue-dominant. We have a fairly rigorous segregation of level 2 and level 3 services in today's access devices, and this segregation works against incumbent vendors. In addition, most of today's access devices are inflexible in terms of core technology—they support routed IP cores, ATM cores, but not both. Flexibility here is needed to accommodate the expected shift in revenue and traffic balance.

Unfortunately, many of the service switch startups have made the same mistake the incumbents made, and developed a product that's highly inflexible. Few service switches can do both level 2 and level 3 service creation, and fewer can hybridize both layers into composite services. We estimate that there are about a dozen service switch startups already, and only two or three could claim to have something like the correct product. That means that there is room for nearly a dozen newly funded service switch product companies.

MPLS creates a similar situation. For all the hype about MPLS, few realize that there are really a number of MPLS "flavors" that are quite different from one another, and that MPLS requirements are sharply segregated into "IP traffic management" and "virtual circuit core" categories. In the near term, the latter group of products will be in great demand and the former will tend to languish. In any case, the former requirement set is largely met by incumbent products. Today, there are three or four startups that have good MPLS strategies for the virtual circuit core application. There's thus room for a dozen or so here as well.

The third area is fiber remotes. Yes, we know that this is an unglamorous space that has been historically dominated by the big telecom players. But the requirements for this space are determined by a combination of regulatory policy and overall societal economic trends, and both these sets of trends have created a considerable turmoil in the market. In addition, as elements of the access network, fiber remotes are linked to the satisfaction of growing "anti-terrorist" protective measures like decentralization.

A fiber remote, to be truly valuable, would have to offer the following:

1. The ability to deploy to a population not yet DSL-committed, at a first cost not exceptionally higher than that presented by conventional DLC technology.

2. The ability to support field upgrades to offer incremental DSL service in support of today's residential and small business application set. In technology terms, that means ADSL and a form of SDSL. This incremental upgrade must be cost-efficient at both the capital and craft level.

3. The ability to support field upgrades to offer forms of DSL (like VDSL) not yet linked to a viable service set, but associated with credible (if unproven) future revenue opportunities. This is critical to insure the cost of the remote is not "stranded" by industry evolution.

4. Viability in low- and high-density customer environments, to insure the product supports both urban and rural empower-

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ment.

We do not believe that there are any products that can claim to have these capabilities today, so the market has the potential of supporting the full 15 incremental players here.

OK, we have an opportunity to fund between 35 and 40 new companies, each of which would have the chance (one in three, statistically) of being sold to an incumbent vendor. That's our first step, and our first milestone.

The Carrier Explosion and the Return of the IPO

What will really galvanize the market, though, is the return of IPO credibility. To get that, we need to have not only incumbent carrier sales but also the additional dynamism of emerging carriers. That doesn't mean funding competitors in spaces where no competition is logical or viable. It means finding a niche where the opportunity will support a large number of players, and where incumbency doesn't matter as much.

We think that content networking, in the context of our November 2000 *Market Area Focus* is that opportunity area. Consumer services like those included in the "content" category have few barriers to entry of new players. The total consumer/content carrier market opportunity will reach nearly $6 billion in 2003, which is more than enough to justify funding some new blood. We believe that by 2004, a dozen "content competitors" will have been established.

The existence of a large number of viable non-incumbent carriers will reopen the equipment market to IPOs, because it will be possible to create profitable companies by sale to these easier-to-sell-to emerging players. An incumbent carrier buys from an incumbent equipment vendor, which limits the number of equipment players who can be validated (to the fifteen we cited above, per market area). With an IPO exit, we'll triple the number of equipment startups that can legitimately be supported per market area.

By the time this happens, it's likely that a lot of the glitz will have fallen from our original market sectors, but there may still be opportunities in all three areas for the careful to address. Other areas are likely to open up as well, including:

- Content network delivery architectures, to deal with the special network topology and traffic issues associated with content networks.
- Evolution of existing level 2 business services to level 3 and content services. We think that IP VPNs will be coming into their own during that period.
- New-generation voice and integrated multimedia communications services. Convergence or other cost-containment strategies are ineffective as infrastructure drivers when the network is largely capitalized for the existing service set. Instead, carriers will be focusing on how to develop new services out of existing patterns of consumption. Those issues have yet to be addressed in the product space.
- New enterprise infrastructure to support the new traffic and protocols. This will include both business networking and home networking.
- Wireless technology to extend elements of the new applications into the portable space. Historically, validation of applications occurs first with wireline infrastructure then moves to wireless, so we can expect that here as well.

The risk, of course, is that the expanding opportunity will create another wave of greed and hype like the last one, leaving us with a new set of casualties in the investor space. We can only hope that the regulators (the SEC, in particular) will be more effective this time. We've given up hope that our industry can police itself.

Conclusion

We can expect to see the capital-funded part of our industry expand cautiously in the next year, and we can expect that expansion to accelerate over the next five years. The risk of its becoming derailed by excess is greatest in the near term (when so much money has been poured into VC pools and so many VCs are still running ponze schemes at heart) and at the end of the period when the IPO climate will again be favorable. The public, after all, is the dumb buyer of last resort.

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A lot of companies are going to sink in the next year. Many are already being bridged by their existing capital sources in the hope a better day (meaning a more gullible one) is coming. It is, but not quickly enough to save the dross of the current crop. Unfortunately, that's two-thirds of the players. Thus, despite the fact that the buying cycle will have bottomed this year, the excitement of the market that we've come to expect will continue to wane for a while, and good people will suffer.

It would be nice if we could avoid all this the next time.

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