

Satellites to extend broadband's reach

By Robert Keenan, EE Times April 12, 2004

For most companies in the United States, gaining access to a broadband connection is a no-brainer. Simply contact your communication provider and have a T1, T3, optical or Ethernet link dropped at your office, and you're off and running. Even mom-and-pop businesses have the same luxury as any Fortune 500 behemoth in terms of bringing high-speed connectivity to their offices, assuming they are located in suburban or urban areas.

That scenario, however, doesn't exactly translate to enterprise customers in underserved areas-markets where broadband isn't even a thought for carriers-or those with offices in the boondocks, both in the United States and abroad. For those operations, T1 lines may be too expensive, and there's a good chance that digital subscriber line and cable modem services may not be available. A recent report from research firm Frost & Sullivan pointed out that DSL suppliers could provide 512-kbit/second service-a metric the report used to define broadband connectivity-to just 50 percent of the businesses in the United States. "This means that over 40 percent of businesses in the U.S. will not have access to useful broadband," wrote Frost & Sullivan analysts Gary Fong and Karim Nour in the report.

Filling the gap

The need for additional bridging of remote offices and for connecting up remote locations has not been lost on the satellite communications sector. While the overall broadband satellite market may represent only 20 percent of the total broadband market, large carriers like Hughes Network Systems and smaller players like iDirect and Aloha Networks all see broadband as a significant growth opportunity. They and other satellite companies are building equipment that's specifically designed to fill the gaps left by the DSL and cable modem sectors.

"There are still a ton of subscribers that don't have access to DSL or cable," said Christopher Baugh, president of analyst firm Northern Sky Research. "The broadband satellite service market won't have the same volumes as the DSL or cable sectors. But there's a healthy opportunity [there]."

"Enterprises want connectivity anywhere," said Warren Brown, vice president of marketing at satellite equipment provider iDirect. Through the coverage footprint provided by satellites, Brown said, they can get it.

In fact, the ubiquitous coverage that satellite offers even has traditional service providers looking to add satellite as one of their broadband service offerings. For example, MCI has eyed satellite as a service option for its business customers, said Pierre Francon, vice president of marketing at broadcast Internet Protocol (IP) specialist UDCast. France Telecom subsidiary Equant is also adding satellite capabilities to its service offerings.

"Carriers are seeing satellite as a way to add more coverage and service," Francon said.

Quality challenge

On paper, using satellite connections to link remote and underserved operations seems like an attractive option. But business-class broadband satellite service requires equipment vendors to take on some big challenges. One of the biggest is delivering strong quality-of-service capabilities in equipment designs.

"Customers are looking for systems that act like a terrestrial network," iDirect's Brown said. "Customers don't talk about Layer 1. All they care about is Layer 3 and up. What they ask is whether the satellite system will act and feel like another node on any network."

This need for a different way of looking at satellite connections led iDirect to build a deterministic TDMA-based broadband system optimized for business-class applications. "We built our systems from the ground up to support enterprise demands," Brown said.

Hughes is taking a similar approach with Spaceway, an upcoming Ka-band broadband satellite system aimed directly at enterprise-class applications. Mike Cook, a vice president and the Spaceway general manager, said that Hughes has been providing IP services to enterprises for eight years. But to take these efforts to the next level, its Spaceway system calls for the launch of two satellites that deliver on-board routing capabilities. The first satellite is scheduled for launch by the end of summer.

"The system will do fast packet routing in-band," Cook said. The router also allows the Spaceway system to provide full mesh connectivity to users, he said. "You can connect any dish to any dish."

Hughes and iDirect aren't alone in their quest to deliver enterprise-friendly broadband systems. Aloha Networks, UDcast and ViaSat are also building equipment specifically for this market.

To deliver an enterprise-class service, equipment vendors have to enable several basic IP capabilities. Two of the most important are also among the most challenging to implement: the handling of TCP/IP and virtual private network traffic.

Delivery of TCP/IP is a tricky venture in a satellite scenario. TCP/IP transmissions are heavily impacted by latency, and satellite connections by their nature are lossy links. To solve the TCP/IP dilemma, equipment vendors implement some flavor of an acceleration scheme, inserting a new header into the TCP/IP stream that will allow the stream to better flow over a satellite network. Additionally, many of the vendors, including UDcast, Hughes and iDirect, anticipate HTTP requests in order to accelerate TCP/IP operation.

Companies like iDirect and UDcast are taking this a step further by reworking the channel so that it is more TCP/IP-friendly. For example, iDirect uses turbo product-coding techniques to make sure that the channel is as clear as possible for handling transmissions. UDcast, on the other hand, implements congestion-recovery techniques that allow its system to fully use a channel's bandwidth in packet loss situations.

VPN developments

Handling TCP/IP is not necessarily a new problem for the satellite sector. Companies have been working on it for quite some time. The virtual private network (VPN), on the other hand, is a newer service that satellite vendors are now looking to address.

As with TCP/IP, equipment makers must accelerate VPN services for effective transmission over a satellite link. However, unlike TCP/IP, breaking in and making changes to VPN streams is not an option because enterprise customers do not want VPN streams exposed in the wide-area network after leaving the company's firewall. This factor eliminates the ability to do acceleration at the hub.

UDcast thinks it has found a way to solve the problem. The company has developed a networking box that sits within the corporate LAN to handle acceleration prior to traffic hitting the existing corporate VPN/firewall devices. Thus, it can accelerate traffic before the VPN tunnel is established, making traffic satellite-friendly before heading out to the WAN.

"Instead of placing VPN acceleration at the hub, UDcast is providing it at the customer office," said Simon Bull, senior consultant at analyst firm Comsys. "All other equipment vendors will follow that line."

Indeed, already ViaSat is working with Cisco, and Hughes with Nortel, to bring satellite-friendly acceleration techniques to the two communications equipment giants' popular corporate VPN platforms. "We're working with Nortel to incorporate acceleration into the VPN client," Hughes' Cook said.

Ka-boom

While it's easy to point to hardware challenges, like TCP/IP and VPN acceleration, as the main hurdles in the sector, such analysts as Comsys' Bull and Northern Sky Research's Baugh downplay the overall impact of those problems in the market. "At the end of the day, hardware is a minor issue," Bull said.

What both of those analysts, and most players in the sector, will not downplay is the importance of moving to Ka-band operation, which provides a significant bandwidth boost to broadband satellite links. "Ka band provides a 2x to 3x increase in bandwidth over existing Ku-band systems," Baugh said, allowing operators to pack more users onto links and thus cutting bandwidth costs.

Hughes is providing more aggressive bandwidth predictions for its Spaceway system launch. The company has designed Spaceway to deliver capacities up to 10 Gbits/s, almost a 10x increase over the 1- to 1.5-Mbit/s capacities delivered on current Ku-band systems. According to Cook, this increase allows Hughes to drop transmit costs and to offer various uplink configurations. "We can deliver asymmetric or symmetric operation," he said. "We have a whole range of options."

"Right now, bandwidth costs too much," said analyst Bull. "Ka band takes costs to a new level. The price per megahertz is one-eighth [that] of Ku band."

That decrease, Bull said, makes satellite service more affordable and thus a more attractive option for handling broadband IP services.