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An Answer in the Stars: The Case for Satellite

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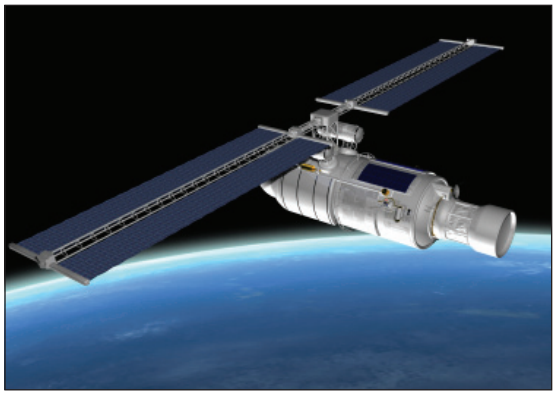

II lived in rural Indiana in the 1980s, and the coolest family in town had a giant dish trained at the sky in their backyard that beamed all the movies we could watch into their living room television. Nevermind the fact that these neighbors had sacrificed their backyard to the swimming-pool-size sky eye—they had cable, something unheard of in our zip code. This was my first introduction to satellite technology.

Just as mobile phones that can fit on a watch once required a car battery and a backpack to live up to their name, satellite technology has undergone extensive miniaturization and is now a mature technology that provides much more than cable TV to entertainment-starved farm kids. Advances like VSATs (Very Small Aperture Terminals), Ka-band spectrum, energy efficiency, signal optimization, and compression technologies have all culminated in a global satellite network that is widely used in disaster recovery and is increasingly attractive as a backhaul technology.

"If we learned anything from Hurricane Katrina, it is that we cannot rely solely on terrestrial Communications."

Everyone has seen the proliferation of satellite cable VSATs (DISH Network, etc.) and satellite phones, but what is the current state of commercial satellite technology, and is it a viable backhaul alternative?

Disaster Recovery Applications

"If we learned anything from Hurricane Katrina, it is that we cannot rely solely on terrestrial

Communications." FCC Chairman Kevin Martin.

Despite overlapping coverage and preventative

planning, terrestrial networks are still very vulnerable to natural or manmade disasters and terrorist attacks. Hurricanes Katina and Rita, and the recent disaster in Haiti saw massive outages in these regions that not only pulled the plug from businesses and consumers, but also made relief efforts much more difficult. Satellite technologies were used extensively in these regions to rapidly provision communication within the relief community and get mission-critical systems (healthcare, banking) back online until terrestrial solutions were functional.

A white paper prepared by the Space and Advanced Communications Research Institute on Emergency Communications outlined some of these disaster recovery efforts:

"Commercial satellite operators have generously made capacity as well as VSATs and hand-held units available in disaster areas, as was seen in the case of Hurricanes Katrina and Rita. Intelsat, SES-Americom, PanAmSat, and Loral Skynet each supported the restoration of communications services via satellite. In the mobile satellite Iridium, Globalstar, Mobile Satellite Ventures, and Inmarsat among others provided sector support."

VSAT Systems issued a press release during the Haitian disaster that detailed specific services enabled by their satellite technology. "Our satellite Internet disaster response solutions are currently being used by medical aid workers and relief agencies to coordinate logistics, and by humanitarian agencies to provide Internet and voice services to people in Haiti to let their loved ones know they're OK."

While corporate generosity fueled the rapid implementation of satellite communications, it can't be relied on exclusively. Global emergency management consortiums are calling for greater national satellite network solutions, which will likely evolve into actionable plans in the near future.

Commercial Applications

Satellite communications have been used for maritime connectivity for years, but now are being deployed by many vendors in an effort to extend internet access and communications to rural areas. Companies like WildBlue and HughesNet provide

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fast and affordable high-speed internet access to areas that aren't served by wireline carriers. For the enterprise customer, vendors such as CapRock and VSAT Systems also provide a variety of solutions to ensure mission-critical systems stay afloat when disaster strikes. Operating on a larger scale, Thuraya, which was founded and financially backed by a consortium of leading national telecommunications operators, provides cost-effective mobile satellite services in more than 140 countries in Asia, Africa, Europe, Australia and the Middle East.

Similarly, commercial airlines are employing satellite technology from vendors like AirCell to provide in-flight broadband. And VSAT Systems even offers a turnkey solution for VNOs looking to grow into the satellite communications space. (A good list of satellite internet service providers and their offerings can be seen here: http://www.satsig.net/ivsat.htm)

A look at the specifications and limitations of satellite connectivity is sobering, however. For consumer connectivity, data rates typically range from 56 Kbit/s to 4 Mbit/s, and bandwidth thresholds are dramatically lower than the ballyhooed caps imposed by Comcast or AT&T. The cheapest plan on WildBlue, for instance, costs $50 per month, offers 512 Kbit/s download speeds, and just 7.5 GB of bandwidth per month. That equates to less than four hours of HD video streamed by Netflix. Prices rapidly scale with speed and monthly throughput, and even the most expensive plans offer less than 20GB monthly usage before overage fees kick in.

Commercial offerings have significantly more headroom, but are also much more expensive. Data rates of 6.0 Mb/s are common, and some providers offer broadband speeds that meet high-speed wireline levels. In fact, the recently launched Eutelsat KA-SAT satellite promises to offer businesses up to 50Mb/s download speeds. According to Eutelsat's press release May 31, the new satellite offers a total

throughput of 70Gbps and "The combination of KA-SAT's exceptional capacity and SurfBeam 2 will make it possible to deliver Internet connectivity at speeds comparable to ADSL for more than one million homes in Europe and large parts of the Mediterranean Basin."

Backhaul and Large-Scale Deployment

While commercial applications are in play and servicing large customer bases, satellite backhaul and large-scale residential and commercial deployment is another story. Backhaul and multi-million subscruber customer networks require transmission of massive amounts of data, which is inherently one of the cost limitations facing satellite technology. Ryan Sher, COO, WIOCC (West Indian Ocean Cable Company) doesn't see satellite replacing large terrestrial networks anytime soon. "The issue with satellite is the cost is so high and the bandwidth is so small, that in the African market the satellite operators are trying to figure out what to do with these systems...They're only used where you can't get cable."

Still, that hasn't stopped global operators from trying.

Detecon Al Saudia launched a VSAT service at the end of May that promises to provide critical data communications backup for financial institutions, corporations, government agencies and military organizations. The satellites are geo redundant, and offer extremely fast resiliency in the event of a link outage. Detecon claims they "will be able to restore a customer link in as few as 120 seconds should it go down." And Network Nine in Australia and New Zealand turned to satellite to provide a resilient disaster recovery service to cover potential failure of redundant long-haul fiber services.

Justin R. Philips, VP of Marketing, Microstat Systems Canada, feels that the future is bright for satellite backhaul. Philips recently wrote a white paper advocating satellite backhaul, claiming "Backhaul via satellite has become a viable solution for the explosive demand being experienced worldwide. Backhaul is more cost effective and can be less expensive to implement and will, for now, have to meet demand until newer, more cost effective solutions emerge."

The Future

Satellite connectivity faces inherent limitations. First, the fact that a satellite signal must complete a 44,000-mile roundtrip means a significant amount of latency is to be expected. For real-time applications like videoconferencing, this latency can prove to be crippling. Second, weather conditions can interfere with satellite signals (so-called rain fade), and in particular, the higher bandwidth signals, like Ka band. Again, this is relative to the distance of the orbiting

satellites from their terrestrial counterparts. Several new strategies aim to overcome these problems by locating satellites—or clusters of satellites—closer to the earth.

Commstellation is likely the most interesting, since it has moved from concept to reality and will launch in 2014. The Commstellation strategy is to deploy a cluster of 78 microsatellites into a much nearer orbit—just 1,000 km from the surface of the earth. This will reduce effective latency to just 7ms (vs. current latency times of 500ms or more). And each microsatellite will offer 12Gb/s throughput, meaning the full constellation will offer some serious horsepower.

A more adventurous solution seeks to use solar-powered ultralight aircraft in place of geostationary satellites, flying under computer control at just 20,000 meters above the earth. This would reduce latency even further, to .25 ms. While there are studies being conducted into an ultra-low orbiting array, this is purely conceptual at this point.

Conclusion

Satellite technology has come a long way, and is increasingly part of the overall strategy for rural carriers, mission-critical enterprise backup, and emergency relief. It will continue to gain popularity with international governments (to wit: the U.S. National Broadband Plan has already begun subsidizing satellite internet in rural communities). Satellite is very effective for transmitting narrowband data at high speeds—transaction information—yet faces latency challenges and bandwidth limitations that make a true broadband data experience either expensive or annoying or both. It's the go-to solution for rural markets, and its ability to be deployed at a moment's notice makes it a default disaster relief solution. And in the future, it looks like many of the limitations facing satellite will be addressed and it could begin to compete with wireline networks.

But for now, terrestrial is the hands-down king for large-scale networks in terms of cost, speed, latency, and scale. The amount of data handled by a Tier 1 operator is just too mammoth for satellite. And as we've seen here, it's not the speed that's costly, it's the amount of data transmitted and received. For example, the monthly cost for a 200Gb of bandwidth, about what you'd get with a $35 cable internet plan, carries a massive pricetag in the sky: at least $1,500! And while we will continue to see satellite deployments in rural markets, it will probably be at least five years before satellite is used as a backhaul solution for even smaller carriers.