Pipeline
Technology for Service Providers.
www.pipelinepub.com Volume 10, Issue 5

Satellite Connectivity Comes of Age

By Jesse Cryderman

Like everything else in the realm of telecommunications, satellite technology has undergone a profound metamorphosis since its inception.

On July 10, 1962, the first telecommunications satellite, Telstar, was launched from Cape Canaveral; developed by AT&T and Bell Labs, it resembled a disco ball. Thirteen days later the first transatlantic broadcast in history—video of the Statue of Liberty—was viewed by millions of Europeans. Telstar, which earned the distinction of initiating the first commercial use of outer space, also introduced Europe to baseball that day with a live broadcast of a Chicago Cubs-Philadelphia Phillies game at Wrigley Field. The transmission window was a mere 20 minutes, but nevertheless, the satellite age of communications had begun.

In the 1980s the coolest families in rural townships had giant satellite dishes that beamed premium video content into their living rooms. Never mind the fact that these folks had sacrificed their backyards to a swimming-pool-sized sky eye—they were getting TV straight from the stars. A decade later, PrimeStar, DirecTV and then Dish Network brought affordable satellite TV to the masses with smaller dishes and better quality of experience (QoE).

Just as mobile-phone technology that once required a car battery and a backpack to truly be “mobile” can now fit on a watch, satellite technology has also undergone extensive miniaturization and can now provide much more than cable TV. Advances in Ka-band spectrum utilization, energy efficiency, signal optimization, compression technologies, satellite clustering, and nearer-to-earth orbiting have culminated in a global satellite network that’s robust and economical enough to function as 4G cellular backhaul.

It’s time to free satellite from the misconceptions of the past —namely, that it’s slow, expensive and suffers from high latency. Although there’s still room for improvement, the satellite networks of today can be leveraged for improved coverage, backhaul, disaster recovery, and new-service delivery.

Satellite-based 4G backhaul a reality

Generally speaking, capacity on legacy geosynchronous satellite networks reinforces those misconceptions of the past: it really is expensive, the speeds aren’t that good and latency is significant. But what if we could bring satellites closer to the earth’s surface?

In late June the satellite-based service provider O3b launched four medium Earth orbit (MEO) satellites. The company, which is partly funded by Google, says on its website that it “can offer broad coverage, high capacity and low latency at a lower cost than fiber for broad rural coverage areas.”

Even more impressive is O3b’s claim that this new satellite technology is robust enough to support 2G, 3G and 4G LTE mobile backhaul. As Pipeline reported in its July issue, Maju Nusa agreed to provide O3bCell service to rural Malaysia, with the Southeast Asian telco’s managing director, Shahruddin Salehuddin, explaining in an official announcement the impact that O3bCell would have on residents, not to mention his company’s business. “Utilizing the O3b network, Maju Nusa will be able to deliver 3G service to customers over satellite [starting in] 2014,” he

said. “For many, this will mean that they will go from zero connectivity to 3G for cellular services practically overnight.”

Salehuddin added, “Interactive services are not available today in these areas. Indeed, at present people commonly need to travel out of their village simply to make a phone call. As well as helping us improve our service, O3b helps to reduce CAPEX [capital expenditure] costs, aggregating our existing 111 sites over Peninsular Malaysia into only 20 customer-terminal locations.”

Intelsat is also providing 3G backhaul from the stars. Jay Yass, the company’s vice president of global accounts and strategic sales, talked about its satellite backhaul capabilities in a recent interview with Informa Telecoms & Media. “3G connectivity has yet to be deployed in much of the world, and Intelsat sees this as a tremendous opportunity in the years ahead. Contrary to the views expressed by others in the industry, current-generation FSS [fixed satellite service] satellites can and do support 3G cellular backhaul. We recently deployed several networks with mobile operators to support 3G connectivity.”

Live TV at 40,000 feet

Most in-flight video programming is either delivered by appointment or on demand from on-board hardware, but on July 2 Dish Network announced a partnership with Southwest Airlines to bring live television, not just on-demand options that become available after episodes have already aired, to Southwest passengers on more than 400 of its aircraft. This reporter can attest to its efficacy after watching Saturday Night Live on a flight from Fort Lauderdale to Chicago.

Satellite security

DirecTV took on pay-TV rivals Comcast and Time Warner Cable in June when it acquired LifeShield, allowing it to stake a claim in the burgeoning home-security services market. Forgetting for a second that the cell-phone market’s dance card is already full, so to speak, it’s not difficult to see why service providers of all shapes and sizes are looking to make headway in this new field: nearly 80 percent of US homes lack a home-security system.

Satellite phones get hip

The term “satellite phone” used to conjure up images of a bulky, brick-sized contraption with an antenna fit for a rooftop. But today, instead of resembling a toaster oven, satellite phones actually look like something from this decade. The Globalstar GSP-1700, for example, has the look and feel of a candy-bar feature phone; the slimmed-down sat phone takes advantage of a second-generation satellite constellation that Globalstar launched in February. The GSP-1700 has improved battery life, and QoE has improved as well: Globalstar claims its service delivers landline-quality voice transmission.

Special use-case satellite phones have evolved too. For off-grid wilderness explorers who require a device that’s both small and able to endure the rigors of dust, rain, extreme temperatures, and impact, Iridium offers the Iridium Extreme. This Rambo-approved sat phone sports a military-grade durability rating and GPS-enabled SOS button and utilizes Iridium’s global satellite network to ensure connectivity in the most demanding environments.

E.T. home phones?

Dish Network, DirecTV and O3b aren’t the only satellite-based service providers making headlines: ViaSat has become the first satellite-based internet company to furnish residential phone service in the US. Considering the satellite industry’s humble beginnings, sending an unlimited number of calls into outer space and back to Earth for less than $20 a month is quite an achievement. It’s also opened the door for ViaSat to offer triple-play service bundles (phone, internet and TV).

Lisa Scalpone, vice president of satellite services for ViaSat, outlined the news in a press release, saying, “We have long wanted to provide our customers with a cost-effective alternative to paying for an expensive landline through the telephone company. With the introduction of Exede Voice we can now offer a triple play, a first of its kind for the satellite industry and a great deal for consumers at a monthly price under $100.”

Strike up the band

Satellite communications use several spectral bands for transmission, including C, Ku and the aforementioned Ka. Each band represents a slice of available spectrum: C-band encompasses 4-8 GHz, Ku-band is 12-18 GHz and Ka-band covers 26.5-40 GHz. Of the three, Ka-band has the most buzz because it offers exceptional data-transmission rates, requires smaller antennae and delivers performance advantages in mobile use cases. Iridium's NEXT initiative and NewSat's Jabiru Satellite Program will both leverage Ka-band to transmit data at warp speeds compared to those of previous satellite services; when NEXT launches in 2015, Iridium says customers can expect speeds of up to 8 Mbit/s (megabits per second).

There's a catch, however: Ka-band suffers greater performance degradation than its lower-speed brethren in rainy conditions. It's simply a matter of physics, and not unlike the challenges that higher-spectrum LTE signals face in regard to in-building performance. Oddly enough, cars with overamped sound systems that rattle neighborhoods as they cruise past illustrate this point well: lower frequencies pass through mass much more effectively than high frequencies.

In his interview with Informa Telecoms & Media, Intelsat's Jay Yass talked about the challenges facing satellite operators and the advantages of Ku-band. "Frankly, we spend a lot of time combating misinformation and untruths spread by some of our competitors," he said.

"Intelsat has a premier assortment of spectral rights, and we are deploying C-, Ku- and Ka-band satellite capacity as our customers need it. But some of the claims we have heard about Ku-band are factually inaccurate. The truth is, Ku-band offers many advantages over Ka-band for industrial applications, including better rain attenuation, a large, installed base that reduces TCO [total cost of ownership] and far greater redundancy of capacity on orbit, which reduces risk for mission-critical applications."

Communications service providers (CSPs) must consider use-case, coverage and performance requirements as they investigate satellite strategies. For high-bandwidth applications like 3G and 4G backhaul, Ka-band is probably the best choice. "Aeronautical and maritime broadband services are a huge frontier for satellite operators," Yass said, and Ku-band fulfills the needs of those services.

Satellite comes of age

As the heterogeneous networks (HetNets) of the future move from research to reality, satellite connectivity will play an increasingly important role, especially in developing regions, hard-to-reach rural locales and areas where terrestrial backhaul is difficult to deploy. Satellite connectivity has evolved significantly over the past decade and can be leveraged for improved coverage, backhaul, disaster recovery, and new-service delivery.

As the technology continues to evolve, it will slowly supplant terrestrial offerings, just as cellular and Wi-Fi have. Someday in the distant future we may even transmit the bulk of our signaling to and from the stars instead of along wires. Perhaps 6G, or the sixth generation of wireless, will be the era of the satellite.