Next Generation of Satellites:

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High Capacity, High Potential

High throughput platforms using spot beam technology and frequency re-use have the potential to become engines of growth for the satellite industry, but will require a change to a consumer-focus approach on the part of satellite operators.

BY GIOVANNI VERLINI

The growth in end-user applications like DTH, HD content, mobile satellite services and broadband access is fuelling demand for larger, more powerful satellites, but the increase in satellite power or size is not the whole picture. New technologies also are making inroads into the market, allowing for an increase in satellite capacity, which, in turn, is leading to remarkable changes in the satellite sector.

"We should distinguish between 'bigger and more powerful' satellites and 'higher capacity' satellites," says Mark Dankberg, ViaSat CEO. "While high capacity satellites are often 'big' and 'more powerful,' not all 'big' satellites also offer very high total bandwidth throughput or capacity," he says. These developments are no accident, of course. A quick look at broadband bandwidth consumption statistics shows that people want more and more bandwidth each year. Online, on-demand, streaming or downloadable video sites such as YouTube, Netflix and Hulu and others are among the biggest drivers of bandwidth demand. "To meet that demand requires a different type of satellite system than the one the industry has been building over the past few decades," he says.

A new breed of satellites is being developed to address the growth in demand for broadband connectivity. These satellites, known as high throughput satellites (HTS), as first defined by NSR, are true game changers. "In HTS platforms, there is a high level of frequency re-use thanks to the adoption of spotbeam technology, which ultimately makes it possible for operators to deliver services comparable to terrestrial services in terms of pricing," says Patrick French, senior analyst, NSR. He is not alone in this view. "HTSs will increase satellites' addressable market and lead to fiber-like offerings competitive with terrestrial broadband," says Arunas Slekys, Hughes' vice president of corporate marketing and general manager of the Russia/CIS region.

It is clear that the development of HTS platforms represents a remarkable opportunity for the satellite sector. These satellite platforms ultimately may serve only a small fraction of the overall broadband user market, currently estimated at more than 500 million users and climbing, but could still provide broadband service to millions of users during the next decade who would be otherwise unserved or underserved by terrestrial technologies. For these consumers this means the possibility of finally bridging the digital gap, while for the satellite industry this opportunity can hardly be overestimated.

"HTSs promise to enable the industry to address a portion of the broadband market, providing a growth opportunity for service providers, satellite operators and infrastructure providers alike," says Jim Simpson, vice president of business development at Boeing Space and Intelligence Systems. "HTSs are also catalyzing commercial use of Ka-band spectrum, continuing the satellite industry's evolution to higher frequency bands over time," he says.

Yet, as French is keen to stress, HTSs are not limited to Ka-band. "We came up with the term HTS out of frustration with the industry and the tendency to associate consumer types of services via satellite with Ka-band," he says. "This can be deceiving. The O3b constellation, for example, uses Ka-band but does not support consumer applications. Conversely, there is no doubt that Thaicom-4, which is a Ku-band satellite on the user side, is an HTS platform." The defining

traits of HTS platforms, French says, are the large amount of bandwidth capacity they offer and the fact that they mostly, but not solely, target the consumer market. High capacity in these satellites is achieved through a combination of greater spectrum availability — in the case of Ka-band and higher frequency bands — and the use of spot beams, which enables frequency re-use across multiple beams, much as in cellular networks. This contrasts with C-band and Ku-band systems which cover a large areas with fixed capacity.

High throughput satellites are not completely new to the industry but are the result of a relatively quick evolution in satellite manufacturing. The experience with the first generation of spot beam satellites, such as IPStar, Anik-F2 and WildBlue, proved the viability and potential of this technology. "HTSs are spotbeam satellites of a new generation in which frequency re-use is taken to a higher level," says Fabio Valle, head of strategic marketing for value-added services at Eutelsat. "In recent years, the growth in satellite bandwidth capacity has been remarkable. WildBlue, which was orbited in 2004, has a capacity of 10 gigabits per second. On the other hand, Eutelsat's Ka-Sat, which was launched in 2010 and is due to become operational later in 2011, will offer 70 gigabits per second, seven times WildBlue's capacity," he says. "Even so, the ceiling has yet to be reached," he says.

These satellites are designed for maximum throughput, so while there is some additional cost for HTS compared with a conventional satellite, the cost per bit is dramatically lower. The case of ViaSat-1, a Ka-band satellite due to be launched for ViaSat before the end of the third-quarter to address the broadband market in North America, clearly illustrates this point. "Ku-band FSS bandwidth can cost well over $100 million per gigabit per second in space, while ViaSat-1 will supply a gigabit of throughput in space for less than $3 million," says Dankberg. "Even compared with the best first-generation Ka-band satellites, the bandwidth supplied by ViaSat-1 will be only about one-tenth the cost. All that low-cost bandwidth can expand the markets operators serve and create a lot of new opportunities for our industry," he says.

Realm of Opportunities

While more capacity is a crucial feature, it should not be considered as a goal per se. The key is that these platforms open a realm of possibilities for the satellite sector. "By increasing capacity, i.e., the bandwidth available, HTS platforms give to point-to-point via satellite a strong competitive edge, as applications previously not convenient via satellites become cost-effective," Valle says. "This goes beyond being a factor of efficiency. It changes everything. It leads to a completely new idea of satellite, particularly effective for point-to-point services."

Any satellite pundit knows that the commercial satellite industry grew on the back of telecommunications point-to-point applications such as transatlantic voice services, but as fiber was laid across continents, the commercial viability of these types of applications became uneconomical. For years, the mainstay of the commercial satellite industry became television distribution and DTH services. With the development of HTS, however, the satellite sector has come the full circle: point-to-point applications have become commercially viable once again. These new applications, however, are very different in nature to those of the 1960s: while those were bulk services for telcos, these are consumer-centric applications aimed at the general public. "The kind of applications that are set to benefit from the deployment of HTSs are centred around consumer broadband access via satellite," says French. "This is going to be the anchor tenant for HTS and will be based on volume-type of business." Other key applications include terrestrial backhaul for mobile telephony as well as other types of terrestrial applications like WiMax and Wi-Fi and services for small and medium enterprises. Satellite newsgathering also represents an extremely interesting potential market, and in this sense, it is interesting to note how companies such as Newtec alreadyare looking at dual Ku-/Ka-band satellite newsgathering technology.

Mobile applications for the defense sector also are important prospects. "Our recent agreement to develop an in-flight broadband system for JetBlue using ViaSat-1 capacity demonstrates that," says Dankberg. "Governments don't have enough bandwidth to support existing defense requirements, while users need even higher speeds and more total bandwidth volume to obtain the benefits of advanced sensors. Fast tempo operations require lots of bandwidth to interconnect many different organizational elements. HTSs can apply to these markets."

But that is not the whole picture. Point-to-multipoint and even broadcast applications for these satellites also are feasible under some circumstances. For example, DTH distribution to a relatively small geographic area served by a single spot beam is a possibility, however, all seems to point to the fact that consumer broadband remains the anchor tenants for these platforms. "Demand for satellite broadband services in all market sectors is driving the need for more capacity, with the highest growth from consumers for high-speed Internet access," says Slekys. In North America for example, our HughesNet service now has over 558,000 consumer subscribers (at the close of the 2010 third quarter) and is growing at 15 percent to 20 percent annually, despite the recession. Studies estimate this addressable market in North America to be approximately 10 million to 15 million households that are either unserved or underserved by terrestrial broadband, so we have just scratched the surface. In Europe, its closer to 30 million."

Engines of Growth

While HTS' ability to increase bandwidth capacity is not in doubt, questions have been raised about what has been described as the Achilles' heel for these satellites — their lack of flexibility. An example of this is provided by of WildBlue, a subsidiary

of ViaSat. While successful in the West Coast of the United States, WildBlue has not been able to reach the same level of success on the East Coast. Yet, because of the payload configuration, excess capacity in the East Coast beam cannot be re-allocated. Similarly, focusing on a single type of customer, such as broadband consumers, might lead to taking too much risk.

"At Eutelsat, our approach is to optimize the use of resources by offering a mix of services," says Valle. "Ka-Sat will offer at least four categories of services: broadband to consumers, professional data network, professional video services and regional broadcasting. Ka-Sat will change the game."

As deliverers of a new family of services for users, HTS satellites represent a great opportunity for satellite operators. Some experts even believe HTS platforms are expected to rapidly become the dominant growth engine for satellite operators globally, though this is an opportunity that can only be fully grasped if Ka-band is deployed. "Traditional Ku-band services will continue alongside Ka-band for the foreseeable future but will be increasingly disadvantaged by lower cost-per-bit profiles of new Ka-band HTS platforms," says Slekys. "Consider that the cost of several hundred million is the same to launch a 100+ Gbps Ka-band platform like Jupiter as it is to launch a conventional Ku-band satellite with 100 times less capacity, and it is obvious which business case wins."

Questions remain, however, about the impact HTS platforms will have on the satellite sector at large. For example, how will they interact with the existing fleet of geostationary satellites operating in C- and Ku-band. "HTSs are optimized for two-way broadband user access and are likely to be operated independently from more traditional broadcast satellites/payloads," says Simpson. "Some enterprise or VSAT applications currently served by traditional payloads will likely migrate to HTSs as terminal capacity usage increases," he says.

This could turn out to be a deciding factor for satellite operators: the deployment of HTS could help them maximize returns on traditional applications, increasing the overall value of their business. "Deploying capacity in Ka-band on a HTS platform in support of applications such as [satellite newsgathering] could mean that some operators will be able to relocate their existing Ku-band customers from traditional platforms," says French. "This means that the freed Ku-band capacity could be dedicated to more remunerative applications such as DTH, for example." In other words, not only can traditional and HTS platforms co-exist with traditional platforms, they can have a positive effect on the business as a whole.

Yet, the most pressing question remains whether HTS platforms will be successful in their own right. The answer to this question hinges around the fact that HTS platforms are a volume type of business. "Capacity is only cheap if you manage to sell a lot of it," says French. The key to the success of HTS platforms is whether they will achieve these volumes. For satellite operators, this challenge goes beyond the technical features of an HTS. It involves the way they present themselves on the market and reach their customers. Without such a shift to a consumer-focused approach, the future of HTS will remain uncertain.

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