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Ahead of the Curve: Top CTOs Discuss Where to Invest Next

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With satellite operators competing all over the world, getting the next set of technology investments right is key for any company. We look at how some of the industry's top CTOs see the landscape and where are they placing their technology bets.

From High Throughput Satellites (HTS) and all-electric propulsion satellites, to which launch service provider to use, operators are faced with a myriad of questions as they try and secure a profitable future.

For AsiaSat CTO Roger Tong, the main project right now is how to design a Ka-band HTS system that fits Asia-Pacific requirements. Tong believes this will be more of a multi-purpose Ka band practical system rather than the traditional forward and return link type. The operator expects to put a Request for Information (RFI) in this area out in the next two years.

"The implementation of HTS in Asia is only in its infant stage. The problems we see are that there are a lot of spots [and] the total aggregate of the satellite doesn't translate into where, when and how we want the high throughput. Therefore, we are looking at how we can design the HTS in a different way to meet market requirements," Tong says. "It will be evolving over the next few years, and will take years before we see HTS fully matured. We need to work out how HTS can meet market requirements and to look at areas like China. It is not just about multiple spot beams."

Tong says everyone is focused on HTS and building more powerful satellites right now, but this presents a number of challenges for technology providers. “You need more efficient solar arrays, better thermal designs, and more powerful RF systems; thus, more flexible filters,” he says. “The focus of the satellite industry right now is to make all these things better. As you build more hardware into the satellite, you have to look at its structure and to make your payload more effective and efficient.”

Yuichi Hayasaka, executive officer and deputy group president of the engineering and operations group at SKY Perfect JSAT Corporation, says the operator is still seeing strong demand for C-band services in the region. Hayasaka was a little non-committal on the the company’s HTS strategy saying that the choice between Ka-band HTS or conventional satellites will heavily depend on the application. He believes that certain applications, such as consumer broadband, are very much cost driven when a large pipe is required.

“We are confident that conventional satellite services will not fade into obscurity for this region. HTS is not limited to Ka band only, so we see potential in providing HTS-like performance using multiple high-power C- or Ku-band spot beams to cover targeted regions and still satisfy the rain resistance requirements. We certainly recognize the cost-performance benefits of HTS and its difference versus conventional satellites. Even for conventional satellites, we are constantly trying to bring the cost per bit down. Our part is to provide satellite capacity that meets the technical and commercial requirements of our customers in the region. The more likely scenario would be for HTS to coexist with conventional satellites, each occupying its unique place in the market.”

Ali Ebadi, senior vice president of regulatory and business affairs for space systems development at Measat Satellite Systems, says HTS platforms represent an important component of the satellite industry to serve the global communications market in the foreseeable future.

“Today’s HTS platforms are capable of delivering broadband speeds of up to 25 Mbps to the user making it comparable to terrestrial-based solutions both in terms of quality and affordability. Hence, HTS certainly has a strong value proposition in bridging the digital divide. In addition to consumer-based broadband, M2M type communication is also increasingly evolving adding to the number of devices that need to be connected,” Ebadi says. “At the moment, we are only scratching the surface of the potential of M2M with concepts such as smart grids, Internet of Things (IoT) and big data analytics, which are starting to become everyday norms.”

New Technologies

One of the key challenges facing any CTO of a satellite operator is where to invest in new technologies. David Bestwick, technical director at Avanti Communications, says a particular technology that could play a major part of Avanti’s future satellites is large Ka-band antennas. He says these larger antennas would enable the company to develop even smaller spot beams, increasing its capacity and ability to focus on even smaller areas. Avanti could even consider such a satellite being devoted to serving a single country, Bestwick says but also admits there are advantages for multimedia content delivery using wider coverage spot beams to enable efficient broadcast and multicast over national markets.

Tong said he believes that the satellite manufacturing community is moving “too slow” and that manufacturers have been “too conservative” in rolling out new technology.

“Technologies we were talking about years ago have still not been commercialized,” he says. “Things such as digital channelizers and flexible payloads are still not commercially affordable. Implementing these technologies would allow us to leverage satellites much better.”

Ebadi says new bent pipe payload technology will be gradually eclipsed with newer generation software-defined payloads that are spinoffs from the military domain.

“The technology is moving toward satellites that fully mesh with the global communication infrastructure, adaptable to varying business requirements and emergency situations,” he says. “Newer satellites carry more flexible payloads with improved traffic capacity, improved fill factor and lower operating cost with the introduction of digital processors, multipoint amplifiers, flexible TWTAs, digital beam forming antennas and flexible frequency plans.”

Marcus Vilaca, executive director of engineering and technology strategy at Yahsat, says the operator is very excited about new Robotic Refueling Technologies currently under testing by NASA.

“NASA has successfully concluded a remotely controlled test of new technologies that would empower future space robots to transfer propellant into the tanks of operational satellites. NASA is incorporating results from the tests and the Robotic Refueling Mission on the International Space Station to prepare for an upcoming ground-based test of a full-sized robotic servicer system that will perform tasks on a mock satellite client,” Vilaca says.

Innovation

One of the big questions at any recent satellite conference is the innovation of satellite manufacturers and whether they are able to keep pace with operator demands. Ebadi admits that even new HTS missions largely keep following basic designs.

“Innovation seems limited to some niche markets. The main example is the development of digital processors for mobile and military applications. Leading companies in the space business have been investing very large R&D for these units which open a range of new capabilities such as sub-channelization, beam forming, Galium Nitride (GaN) chips and GaN high power amplifiers, etc. Although these new capabilities are of interest to commercial satellite operators, they are not present on common telecommunications missions,” Ebadi says.

According to Hayasaka, even after decades of commercial history, satellites are still “very expensive tailor-made dresses” suitable for each satellite operator and its designated orbital location. He says the industry needs a “one satellite fits all” design.

“One standardized satellite design, which can cover every orbital slot with its flexibility in such frequency, beam forming and capacities will be able to elicit a drastic change in the way of satellite manufacturing and its costs structure, sustaining high reliability in qualities built up by experience in the past,” Hayasaka adds.

He also believes manufacturing cycles for new satellites are still too long. A satellite usually will be operational two or three years after the contract has been singed “while the clock of innovation and development ticks,” he says. By the time the satellite is operational, what was cutting-edge technology at the moment of signing, has now been replaced by newer upgrades and developments. This is one of his major concerns.

The Electric Revolution

When announced in 2012, Boeing’s deal with Asia Broadcast Satellite (ABS) and Satmex (now Eutelsat Americas) was a game-changer. However, while many have praised this deal, they have not exactly been a slew of contracts to follow based on all-electric propulsion. Ebadi attributes this mainly to the long orbit raising period these satellites inherently bring about.

“Satellite manufacturers should be improving the time to final orbit with higher Isp thrusters, or perhaps with the help of a small solid rocket engine like the traditional Apogee Kick Motor, as this would significantly improve the orbit raising period,” he says. “There is also a concern about no revenue generation during the orbit raising while the satellite operator may have to start paying back the financing obligation after the launch.”

Tong agrees and adds his concerns about the extended orbit raising environment and its effect on reliability. “Most satellite operators do not want to wait for these additional months for their satellites to get into orbit. The longer it stays there, the greater impact the radiation belt on its electronics,” Tong says, adding that the Boeing 702SP’s success will be key to define the industry’s perception of all-electric satellites. “I think people are watching and trying to understand how it may change the landscape. Electric satellites have the potential to reduce launch costs, but it adds to the project timeline.”

Ebadi adds another challenge with the Boeing 702SP is that it is being primarily marketed in a dual-launch configuration for SpaceX’s Falcon 9. This means any operator has to find a co-passenger compatible with its own satellite requirements in terms of antennas, weight, etc., as well as in terms of schedule.

Bestwick, however, sees many satellite operators as being quite conservative when it comes to new technologies. He does believes electric satellites will “undoubtedly become popular;” although he does not expect an overnight transition. Bestwick also admits that Avanti is studying the potential use of hybrid chemical-electric orbit raising and full electrical orbit raising for future satellites.

Trends & Opportunities

Whether looking at new HTS or all electric satellites, FSS operators in some ways have never had as many choices as they do now. While they would undoubtedly like shorter manufacturing cycles, the overall health of the industry is strong. While Tong agrees, he still believes the entire industry can do better when it comes to new technologies.

“[Satellite manufacturers] need to be a little bit more aggressive. We are happy to see Boeing returning with the electric satellites, and Lockheed moving back to the commercial space market — all these developments are positive. SpaceX offers an alternative launch vehicle solution and its recent successes of several satellite launches including our AsiaSat 6 and AsiaSat 8 have proved it, but I would like to see things moving a little faster; otherwise there is no way the satellite community can support the 4K broadcasts as well as the demand for 4G/5G backhaul,” Tong says.

Bestwick says he also believes the satellite industry is in good health and points to data connectivity as the largest part of unmet demand in the world. He says the satellite industry is now showing telecommunications companies around the world that HTS can provide the quality and return on investment needed to encourage them to make large-scale deployment.

Also, as Vilaca notes, there is a severe lack of infrastructure and technology solutions across many African and Asian markets in terms of connectivity. With no land-based broadband Internet and no 3G/4G in many parts of Africa and Asia, one of Yahsat’s objectives is to roll out solutions to these areas using new satellite technologies.

“HTS have the ability to provide significantly more throughput than a classic FSS satellite; these multiple spot beam satellites deliver reduced cost-per-bit, increased capacity and high-quality broadband Internet service,” Vilaca adds.

There are some challenges ahead for the industry, however. The constant need for spectrum is key and the satellite industry needs to ensure a good result at the World Radiocommunication Conference 2015 (WRC-15) to enable more innovation to take place.

“Recent sky rocketing rapid development of mobile network causes drain of frequency resource. Cellular companies try to take every opportunity to gain frequencies as impractically as possible, including those frequencies that have been assigned to satellite communications in every country,” Hayasaka says. “Especially in the Asia region, demands on C-band capacity are still firmly favored because of its rainy monsoon climate; some portions of C-band frequency have actually been requested to transfer [to cellular players].”

Besides the spectrum war, Ebadi notes that, while DTH and Ultra-HD are a big opportunity for a company like Measat, trends in broadcasting need to be watched carefully. “Internet/IP-based video broadcasting could probably be a threat to traditional DTH. In this light, IP based satellites would be a better move in certain markets for the satellite industry,” he adds. **VS**