APSCC 20th Anniversary
Asia-Pacific Satellite Communications Council

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APSCC
Asia-Pacific Satellite Communications Council

GROUND SYSTEMS

INTERVIEW

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FOCUS ASIA

Small Satellites, Big Window of Opportunities

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MESSAGE FROM THE PRESIDENT

When commercial satellite communications service was introduced back in 1960's, as large as 30m diameter antennas were used at ground stations to send and receive signals to and from satellites. That is because the communication performance on satellite side at that time was very limited. Therefore we had to have enormous capabilities on ground in terms of transmitting high power signal using kilowatt level klystron power amplifiers and receiving very small level signal using cryogenic low noise amplifiers together with large size antennas to establish meaningful communications link. Of course, modulation technique used was all analogues. Even with such a huge and complicated ground system we could handle very limited number of voice and video channels. In short, satellite system at that time was very costly and inefficient.

Looking at today's satellite system, it has been changed so much during 50+ years of satellite communications history, thanks to technical innovations in the several technological areas like satellite manufacturing, satellite launching vehicle, digital communications and semiconductor devices. The common sense regarding satellite systems back in 60's and 70's written in the textbook has become obsolete and just a history today. Nowadays, less than 10m (5~7m) diameter antennas are commonly used even for big hub stations and less than 1m antennas are widely used for VSAT systems including mobile terminals on ships and airplanes. Regarding transmitting and receiving system of earth station, it became much simpler using several hundred watt TWTAs or lower power semiconductor (GaAs) power amplifiers for transmit, and semiconductor (GaAs/HEMT) low noise amplifiers for receive, thanks to new device technologies and higher performance of communications payload on satellites. So-called HTS satellite today can handle 100 Gbps to 200 Gbps capacity with a single satellite. This kind of high capacity satellite was realized not only by satellite technologies but also by digital technologies. Nowadays, digital technologies are used at everywhere. Analogue signals are converted to digital signals by high speed data sampling and then converted to any desirable form by digital computational power (DSP : Digital Signal Processing). Even those functions used to be done by analogue circuit like modulation, demodulation and filtering can be done digitally using numerical computational power. Multi-level modulation like 16/32 APSK is now widely used in satellite link which was inconceivable 10-15 years ago, because of the non-linear characteristics and lower power margin of satellite link.

As stated above, technical innovations during past 50+ years have enabled satellite systems to be significantly more economical and easier to use. This could drive the development of satellite industry so far. I hope that new innovations of ground system technologies together with other satellite related technologies will bring further development to the satellite industries in coming years.

Yutaka Nagai
President, APSCC

An Incremental Approach to Using Open Control System Architecture for Satellite Fleet Modernization and Expansion

John Edwin Byrne, Director, Engineering, Kratos Integral Systems International
Ricky Kusnandar, Satellite Ground System Senior Engineer,
PT. Telekomunikasi Indonesia, Tbk

Figure 1: TELKOM Master Control Station (MCS) in Cibinong

Indonesia has a long heritage in satellite communications as one of the first countries in the world to operate its own satellite with the launch of Palapa-A1 in 1976. Since then, satellite communications has been utilized extensively and has remained a critical technology in building and enhancing the communications infrastructure for the world's largest archipelago country with more than 13,466 islands.

PT Telekomunikasi Indonesia, Tbk (TELKOM), is the leading telecommunications operator in Indonesia and has been a part of the long history of satellite operations within the country. TELKOM currently operates the Telkom-1 and Telkom-2 satellites at orbital positions 108 deg E and 118 deg E respectively. Satellite operations are conducted from TELKOM's Master Control Station (MCS) located in Cibinong, the capital of the Bogor Regency of West Java, Indonesia, 30 km south of Jakarta.

Plans and Specifications

In 2012, TELKOM started planning for the establishment of a Backup Control Station (BCS) for satellite operations, designated to be located in Banjarmasin, the capital of South Kalimantan, Indonesia. The BCS was designed to use 5m fixed antennas allocated to each satellite that could provide the uplink and downlink under nominal conditions for each of the TELKOM satellites. A shared 9m Turning Head Antenna with 2 kW HPA was specified as a shared asset that could be pointed to any one of the satellites and provide the uplink power and downlink gain necessary to support any of the satellites in an anomaly situation. This allocation of antenna and RF assets was a cost-effective solution to backup-up operations.

For the satellite control system, TELKOM specified the use of a common open architecture that could control all its satellites with the same system. The aim was also to have a minimum cost system without duplication of hardware and software resources while also allowing operations staff to be trained on a single system platform.

A Flexible Control Infrastructure

The BCS specifications were released for competitive bidding and, at the end of an e-auction process, Kratos Integral Systems International (Kratos ISI) was selected as the winner. After signing the contract in early 2013, Kratos ISI proceeded with the installation of the antenna and RF equipment and installation of the satellite control system. Kratos ISI's EPOCH Integrated Product Suite (EPOCH IPS) formed the basis for the fleet control solution, consisting of the EPOCH command and control system, OASYS flight dynamics software. In addition, Kratos ISI began development of operational procedures and display pages, as well as commissioning and testing of the integrated solution.

During 2013, the work proceeded in parallel at multiple sites with a multinational team. The antenna and RF systems engineering was performed at Kratos Integral Systems Europe facilities at Newcastle in the UK, with components from the UK, US, Canada, France and China. After factory integration, the RF components were shipped to Banjarmasin for on-site assembly, installation and integration and ultimately validation testing with the Telkom-1 and Telkom-2 satellites.

The satellite control system engineering work was split between Kratos ISI engineers in Washington, D.C., and engineers working for Integral Systems Japan (ISJ) in Tokyo. Secured VPN links were set up to allow the Kratos ISI engineers to develop and test the operational data products with the Dynamic Satellite Simulators (DSS) installed at the MCS in Cibinong.

Set Up and Launch

Starting in October, as the RF engineering group arrived at the BCS in Banjarmasin to perform the antenna/RF installation, systems engineers from Washington and Tokyo at the MCS in Cibinong worked with the TELKOM team of satellite engineers to validate the operational data products with the DSS and live telemetry from the satellites.

The system was completed in February of 2014, and was marked by a Board of Directors Message from the Network & Infrastructure Service Director with the message: "Less Cost, More Opportunity." TELKOM was able to perform commissioning tests and operations using the BCS to conduct North-South Maneuvers, East-West Maneuvers and other standard operations on the two satellites from the BCS in Banjarmasin. While the MCS in Cibinong is the primary operations hub, the BCS performs automatic ranging that augments the ranging and track data that is collected at Cibinong and serves as a backup operations facility to the MCS.

Figure 2: TELKOM Directors Open the Facility

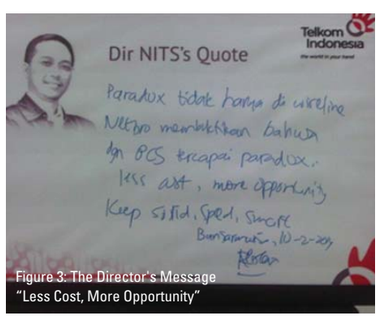


Figure 3: The Director's Message "Less Cost, More Opportunity"

Figure 4: 9m Antenna at the Banjarmasin Backup Control Station (BCS)
The main antenna at the BCS is sized to support all satellites during an anomaly condition

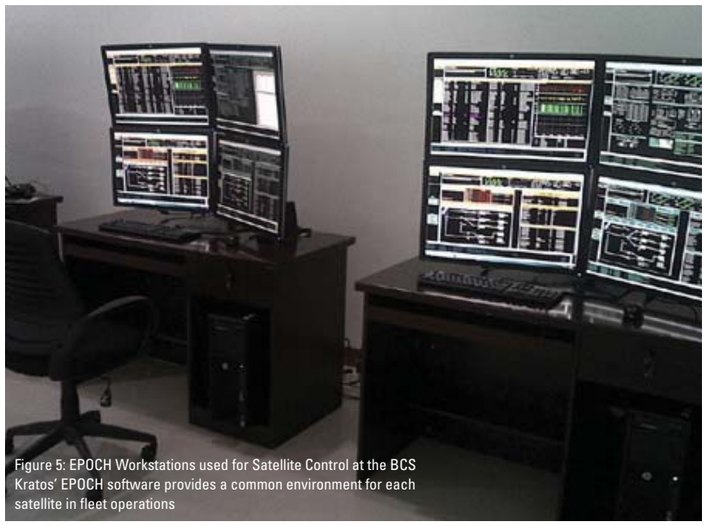


Figure 5: EPOCH Workstations used for Satellite Control at the BCS
Kratos' EPOCH software provides a common environment for each satellite in fleet operations

Scalability for Growth

The EPOCH-based BCS met the initial requirements for backup operations, and it was also designed from the very beginning as a system that could be easily expanded to meet the growing needs of TELKOM as new satellites are added to the fleet in the future.

A key design feature of the BCS that provides the ability to cost-effectively expand the system is the use of Virtual Machines (VM) for hosting software functions as well as the ability of EPOCH to support all the different commercial satellite types. The addition of a new satellite within the BCS command and control system can be supported without the addition of new hardware. All it requires is cloning an existing VM, reconfigure the VM for the new satellite and activate the VM. The main additional work for any new satellite is simply the verification and qualification of the satellite database, operational procedures and display pages. Provided these already exist for a specific manufacturer bus type, the operational data can be quickly customized to manage the change in payload and any change in bus components (e.g. star trackers vs. earth sensors). Since EPOCH IPS supports satellites from every commercial satellite manufacturer in the world, TELKOM is positioned to capitalize on this flexibility and scalability to minimize their risk and expense for system expansion.

Planning for the Future

The BCS is now able to support several expansion objectives.

First, the common control system can be expanded at the MCS to support primary operations of the Telkom-1 and Telkom-2 satellites. Already, as part of the initial BCS expansion, there is a small system installed at the MCS that supports testing and validation with the DSS and remote monitoring of the BCS using a single workstation with embedded VMs. Originally intended solely as a simple training and validation system, it has evolved into an emergency backup at the primary site connecting to the basebands and RF equipment at the MCS and performing operations that cannot be performed using the legacy equip-

ment, such as turn-around ranging interleaved with direct ranging. It is fairly common for legacy control systems provided by the satellite manufacturer to remain static after initial installation and delivery at the time of satellite launch. As such, these legacy systems can be prone to software obsolescence. The new system provided by Kratos ISI runs on the latest virtual environments and software updates with new features are available with each new release. An MCS upgrade plan will therefore expand on the single workstation at the MCS to provide a full VM server system with associated clients to support Telkom-1 and Telkom-2 primary operations at the MCS.

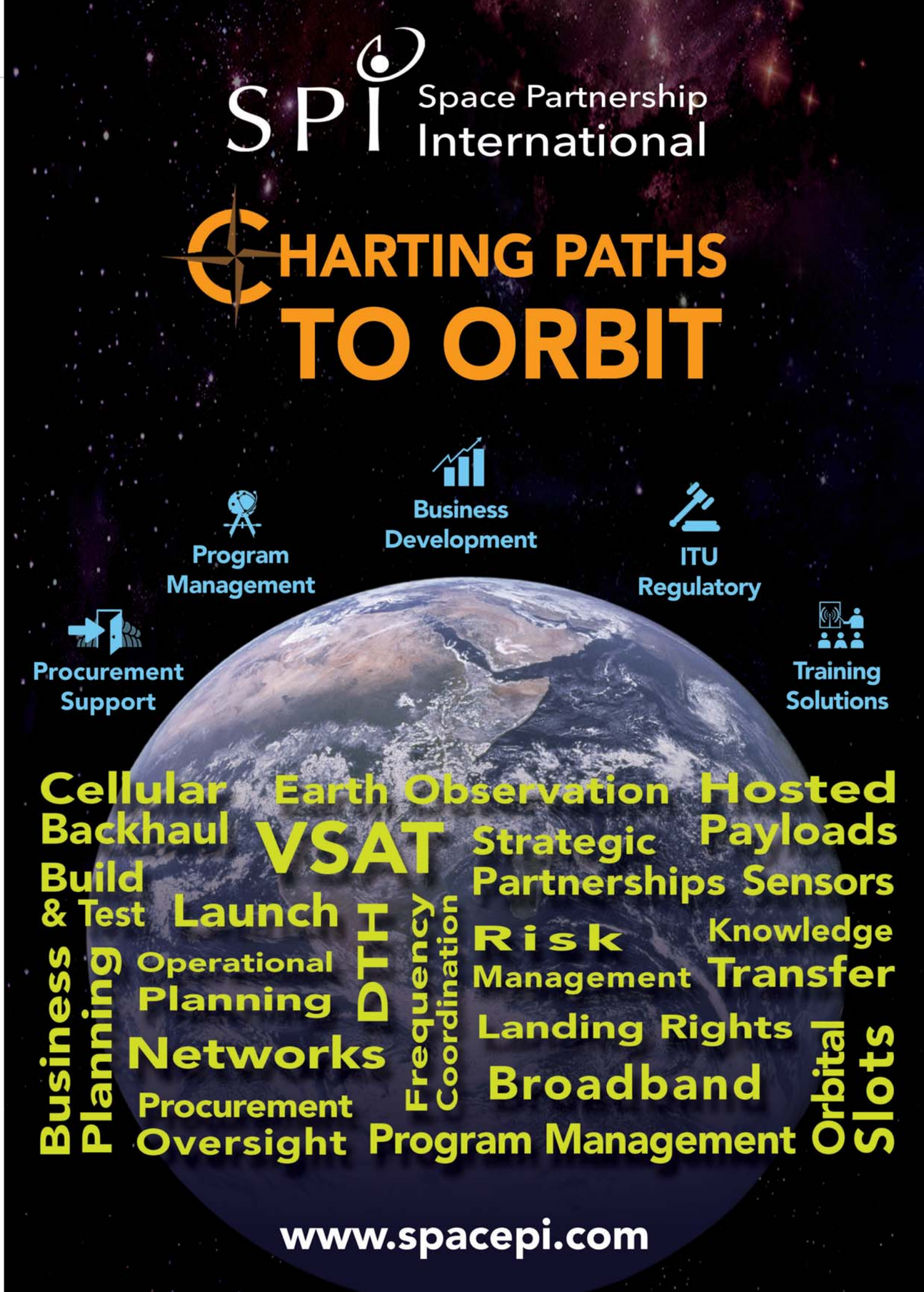
Second, and equally significant from a business perspective, an open satellite control system is well suited for contracted operations for satellites owned by other companies. Regardless of what type of satellite a partner company may have, TELKOM will be in a position to cost-effectively expand the control system at both the MCS and BCS to support operations for the additional third-party satellite. This is a win-win situation for both TELKOM and the potential partner companies. The partner company can save money on satellite operations by having TELKOM operate the satellite instead of setting up a complete independent operations center for only one satellite. Similarly, TELKOM can offset cost of their own satellite operations with revenue from the third-party satellite operations contracts with minimum expansion to hardware/software infrastructure or operating staff. Providing third-party satellite operations would simply not be possible using proprietary systems from the spacecraft manufacturer, unless the third-party satellite was of exactly the same bus type.

Procuring an open satellite control system capable of operating all the various commercial satellites enhances TELKOM's ability to offer these services for third-party satellite. It is no coincidence that the majority of outsourced satellite operations services are conducted on the Kratos EPOCH IPS system. The control system will also be expanded to support TELKOM's own fleet expansion. The contract between TELKOM and Thales Alenia Space (TAS) has recently been announced for the supply of Telkom-3S which will be launched in 2016. The control system at the MCS and BCS will be expanded to support this new satellite. As Telkom-1 gets closer to its end-of-life, plans are being made for a replacement, Telkom-4, which will be launched in 2017. The Kratos ISI EPOCH IPS open control system will be expanded to support that satellite as well.

Another benefit that TELKOM will realize with the new system is that— as the number of satellites supported expands— the EPOCH IPS-based control system offers automation features including scheduled procedures and procedure execution triggered by events. Increased use of automation avoids increasing workload on the operational staff so that more satellites can be operated without the need to increase staff.

Less Cost, More Opportunity

In summary, while the contract to establish a Backup Control Station in Banjarmasin was a cost-effective means to meet the immediate TELKOM requirement for backup satellite operations, the selection of an open and expandable control system provided a framework to allow TELKOM to effectively expand operations at both the MCS and BCS to cover not only its own fleet expansion but opportunities to support operations for other satellite owners.



This approach may also be beneficial for other operators in the region. Consolidating operations on a common open control system not only reduces operations costs for the operators own fleet, it also has advantages in joint ventures or condosats where the different partners in the satellite must ensure ground system compatibility across the various partners. As evidenced by this program, consolidation of satellite operations can be done effectively with older satellites and in some cases the consolidation can be driven by factors such as obsolescence of original manufacturer systems. However, in order to fully capitalize on the investment, operators would be well served to consider the extensibility of the system to support the expansion of their satellite fleet. TELKOM was able to accomplish all of these objectives with their procurement of their BCS system in Banjarmasin, and there is no reason why other operators cannot do the same.

In future years, TELKOM sees the potential for its facilities at the MCS and BCS to develop as a center of excellence in the region for satellite operations. This growth in the satellite business then supports strategic partnerships with other regional telecom operators and reinforces TELKOM strategic goals of expansion in the international marketplace.

John Edwin Byrne is a graduate of the University of Toronto Institute for Aerospace Studies with a Master of Applied Science from 1983. Since graduating Byrne has over 30 years' experience in the aerospace industry working for DSMA International and Aastra Aerospace in Toronto, Canada and CRI in the Netherlands. Byrne has worked for Kratos Integral Systems since 1998 during which time he has participated in satellite ground control projects for more than 50 satellites. Currently Byrne is the Director of Engineering based in Washington DC.

Ricky Kusnandar has 17 years of experience on various roles covering Satellite Ground System Engineering, Satellite product Sales & Marketing, Leading and Managing Ground System Support Team, and Bid Tendering for Ground Satellite Product in TELKOM Indonesia. Involved in integration and developing of ground system architecture, have designed, integrate and launched of TELKOM-2 and TELKOM-3 Satellite project. He also played a role in several major satellite service deployments in Indonesia for private and government institutions. Previously, Project Manager for Backup Control Station Project in Indonesia and held Coordinator of Ground System position in TELKOM-3S project.

The Challenges of Capacity Management in the Evolving World of Satellite Communications

Ahsun H. Murad, President and CEO, Optimal Satcom, Inc.

Satellite operators and satellite service providers are facing unique challenges in their business. Over the past 25 years since the wider commercialization of the SATCOM industries and the transition of satellite ownership from government telecommunications agencies to private commercial enterprises, satellite companies have generally followed well-established business models and practices that are fairly consistent throughout the industry. Shifts in demand, advances in technology, evolution of satellite design, competition from competing technologies, changing lifestyles, and tumultuous world events are forcing satellite companies to evolve in an effort to remain viable in a rapidly changing business environment.

The Changing Business of Commercial Satellite Communications

Satellite operators face stiff competition from the the encroachment of fiber, WIMAX and other terrestrial technologies into areas previously unserved or underserved by terrestrial services, which were traditionally sustained by satellites. Improvements in modem technologies have reduced the per-channel bandwidth requirement for direct-to-home (DTH) video services. There is a significant temporal reduction in the demand for satellite capacity in the Middle East, North Africa, and Afghanistan led by the pull-out of the American forces and further exacerbated by the continuing turmoil throughout much of the region which has discouraged development of infrastructure and depressed demand for satellite communications. Asia continues to pose challenges to satellite operators due to heavy price pressures and reduced margins resulting from the socio-economic conditions of the region, and heavy competition between international and regional satellite operators many of them operating with substantial government subsidies and protections.

In the satellite TV market, the continued strong demand from new satellite TV channels and conversions from SD to HD (and the further growth potential with the adaptation of 4K) is generating strong revenues and cash flow for the major operators in the DTH business with established hot-spot orbital locations; however consumer trends that are shifting viewing habits (especially within the Millennial Generation)

from traditional television to streaming Internet content on mobile devices is providing strong competition and making the business case for new DTH satellite operators particularly weak.

Changes in lifestyle and the increasing reliance on always-connectedness is resulting in significant growth in areas such as mobility, with higher throughput services for commercial airlines, oil rigs, marine vessels, cruise ships, and luxury vessels. Innovative systems such as O3b with its constellation of high-throughput low-latency MEO satellites (and Google's conceptual new venture to provide a world-wide satellite system for internet) are opening new markets to satellites.

One of the ways in which satellite operators have responded to the competitive market pressures is through innovative high-throughput satellite (HTS) systems that use a combination of technologies to bring much greater volume of capacity to market at lower price points – technologies such as multiple high-power focused beams with greater frequency reuse, use of Ka-Band, onboard digital switching and channelization; as well as advanced modem techniques such as DVB-S2, ACM, low-roll-off spectral shaping, Turbo and LDPC codes, etc.

Government Involvement in the Commercial SATCOM Market

The role of governmental agencies in this changing satellite industry cannot be underestimated. Export credit agencies (ECAs) like the U.S. Export-Import (Ex-Im) Bank, France's Coface, the Chinese Government, and Export Development Canada have all been instrumental in the financing of satellite projects promoting their respective countries' satellite industries and exports by facilitating below-market-rate government backed financing, credit risk protection, and guarantees.

The Ex-Im Bank has financed AsiaSat 6 from SSL with launch by SpaceX; ABS-2 one of the largest commercial satellites, and two electric propulsion satellites by ABS from Boeing to be launched by SpaceX; Amazonas 3 from Orbital Sciences by Hispasat (with an Arianespace launch financed by Coface); VinaSat-2 from Lockheed Martin; two satellites from Boeing and one from Orbital Sciences by MexSat; a satellite from Lockheed Martin by Jabiru Satellite Ltd. of Australia also with an Arianespace launch financed by Coface; and three Boeing Ka-band 702HP satellites for the Inmarsat-5 Global Xpress system. Coface has been instrumental in the financial backing of major projects such as GlobalStar, Iridium's next generation network of 81 satellites, Hughes Jupiter HTS satellite, and O3b's constellation of MEO satellites.

The Australian government backed National Broadband Network (NBN) initiative to provide broadband connectivity to all its citizens has a significant satellite component with two advanced Ka-band multi-beam high throughput satellites being built by SSL, and a host of satellite equipment and service companies involved in building the supporting ground infrastructure for this massive project. The Chinese state-owned China Great Wall Industry Corporation, has also entered into this arena – targeting emerging countries with aspirational national satellite programs, but which often face financial constraints or other political challenges. Its heavily government subsidized space program offers construction and launch services often at half the price of US and European manufacturers and come bundled with other services, trade deals, and financing through China's Development Bank. It has built satellites based on its DFH-4 5,200 kg, 10.5 kW (EOL) platform for Nigeria (NigcomSat-1 and NigcomSat-1R), Bolivia (TKSAT-1), Venezuela (VeneSat-1), and Pakistan (PakSat-1R), and has signed construction deals with Laos, Belarus, and APSTAR (Hong-Kong); as well as several launch contracts for its Long March 3 (LM-3) vehicle.

Role of Technical Innovations

Borrowing a page from the now retired US Space Shuttle Program's playbook, California-based SpaceX is revolutionizing the space industry with its development of reusable rockets that are significantly cheaper than competing launch options with the goal of ultimately bringing down launch cost to 10% of their present levels. Placing extreme focus on high reliability, SpaceX launches on the Falcon 9 two-stage rocket are already seeing preferential rates from the insurance industry. The Falcon 9 with its 4,850 kg payload delivery capability to geosynchronous transfer orbit (GTO) has completed 11 consecutive successful missions with its last one being delivery of the AsiaSat-8 satellite to GTO. Its larger launch vehicle, the Falcon Heavy, currently under testing, and expected to commence operations in 2015, is designed to lift more than twice the payload of the next closest operational vehicle, the Delta IV Heavy, at one-third the cost, with a 21,200kg payload delivery capability to GTO.

Another advancement that has the potential to revolutionize the SATCOM industry, is the meta-materials-based electronic beam-forming antennas being developed by Kymeta that are flat, thin, light, and dynamically steer antenna beams with no moving parts, and open satellite communications possibilities for a whole range of mobile and highly-flexible portable and fixed services.

Spun out of Intellectual Ventures, Nathan Myhrvold's patent holding company, with credentialed investment from Bill Gates, Kymeta has received a recent contract with Inmarsat to accelerate the development of its Ka-band aeronautical antenna which will enable business jets (with fuselages smaller than commercial airliners which cannot support conventional antennas due to their curvature) to access high-speed broadband connectivity through Inmarsat's Global Xpress (GX) service. O3b and Kymeta have also teamed together to develop satellite tracking antennas for use with the O3b's high-throughput satellite system.

How HTS Is Changing the Traditional Business Relationships within the Satellite Industry

While the cost of financing, building, insuring, and launching new satellites remains the major cost of satellite systems; adaptability to the market, effectiveness of marketing and sales processes, and operational efficiency are major contributors to the viability and profitability of any satellite venture.

To effectively use high-throughput satellite systems requires substantial dedicated ground infrastructure. For example, providing services on multi-beam Ka-band satellites with the kinds of availability traditionally expected in satellite systems (99.5%/year or higher) requires use of large gateway antennas with site diversity, automatic uplink power control, and specialized remote terminal equipment.

In the traditional SATCOM business, satellite operators lease the satellite resources (bandwidth and power) to satellite service providers, and it has been these value-added satellite service providers (VARs) who build the ground infrastructure, and manage the provisioning and deployment of services provided to end customers. However, with the new HTS systems, the required ground infrastructure is a substantial

expenditure which cannot be cost-effectively borne by any one service provider alone. Satellite operators find themselves needing to adopt this role, or forming partnerships where they take substantial ownership of the cost and responsibility for the building and operation of the gateways that serve as the primary access points for services, and developing the supply chain of manufacturers of compatible antenna, modem, and user terminal equipment, with a service business infrastructure to deploy, maintain, and service this ground network. In this expanded role, the satellite operators often find themselves in direct competition with the service providers, who are otherwise their largest customers for conventional satellite capacity, changing the relationship between traditional allies. With the satellite operator in the role of service provider, there is also a fundamental shift in the way capacity is marketed – instead of leasing capacity in terms of raw bandwidth and power, satellite operators are operating managed services platforms and offering products which bundle bandwidth with aggregation, uplinking, performance monitoring, IP and routing, terrestrial fiber connectivity, equipment rental or leasing, and other services.

The Case for Efficiency

Given that satellite capacity is such a valuable resource with a limited shelf-life (satellites are typically built with a 12-15 year design life), the efficient use of satellite bandwidth is extremely important to the financial viability and success of any satellite company. This means that business processes need to be streamlined such that any factors that hinder bringing satellite capacity to a revenue-bearing status are minimized.

A major mistake often made by satellite operators is often one that is made early, especially by newer satellite operators. Faced with the daunting task of building a satellite and the infrastructure to fly it, satellite operators often do not place adequate emphasis on preparing to manage the business that was the reason for launching the satellite in the first place. Tasks such as marketing of the capacity, building of operational systems for satellite capacity management, and hiring and training support staff are often a last-minute scramble as the satellite nears launch. The resulting slow ramp-up of revenue-bearing customers and contracts, and inefficiency of operational processes often means irrecoverable loss of revenue in the first two-three years, excessive issuance of service credits to retain goodwill lost as a result of poor support infrastructure, and often being locked into long-term contracts on unfavorable or below-market rates. Satellite operators that build their operational capacity management infrastructure at the onset, position their upcoming satellites early in the commercial market; undertake a robust effort to build partnerships with major service providers; and target large end-users such as the US Government, enjoy increased revenue not only in the early phase, but also higher quality contracts in the long-term.

Once business operations commence, a continued focus on efficiency is equally important. When satellite capacity is expected to be released as a result of the movement of services, or termination of a service, that capacity needs to be brought back to market as quickly as possible. Metrics need to be monitored that allow the satellite operator to track fill-rates and identify and eliminate fragmentation that results in unusable capacity. Metrics that track the profitability of leases and services (such as normalized revenue per unit bandwidth – ratio of revenue per MHz for the lease to average revenue per MHz for satellite, beam, or region, etc.) should be constantly monitored, and contracts and services that are unprofitable or hampering a more financially lucrative contract should be identified and culled. Better policing of capacity is needed to identify customers that may be over-utilizing their capacity without paying for it. Auditing is

Figure 1: Executive dashboard and key reports from Optimal Satcom's Enterprise Capacity Manager® (ECM™) Product provide business metrics and key performance indicators (KPIs) that help companies better understand their business.

important to ensure that processes are not being bypassed that would restrict a customer from making changes to their services without both proper technical and business authorization.

With satellite capacity being such a valuable resource, it would be logical to think that satellite companies would operate with a singular focus towards its efficient management – it is therefore surprising that this is often far from the truth. Historically, many satellite companies have originated within the umbrella of the telecommunications division of their host countries, and adopt a very bureaucratic, compartmentalized, and conservative approach that has vast hidden inefficiencies – many that remain systematically hidden from management through the very practices that management reinforces.

For example, it is often the case that there exists a somewhat adversarial relationship between sales managers (who often have no knowledge of satellite communications engineering), and the technical sales support staff who perform link budget computations that support them. In an effort to make sales, the sales manager often exerts pressure on the technical staff to make the numbers add up to support a deal, but then in the event of a problem, come back to blame their technical staff. As a result, the technical staff find themselves increasingly more conservative in each step of their capacity assessments to protect their own back and often end up with layers upon layers of fudge factors buried within technical computations – it is not unusual for these factors to contribute several dB to a link budget (keeping in mind that a 3 dB increase represents a doubling of capacity), and make the satellite operator's capacity commercially un-competitive – without the sales manager or upper management ever realizing it. To discourage the resulting customer complaints, it is often easier to withhold the technical information that would allow a customer to perform their own assessment.

By contrast, a system where sales and technical staff can work collaboratively, fosters an environment

with much higher transparency and operational efficiency. Providing the customer with information and tools to collaborate in the capacity engineering process gives them a sense of shared responsibility for the outcome, while off-loading much of the capacity assessment work from the technical staff to the customer. Metrics such as bandwidth efficiency (bit per Hz) track the resulting process improvements, and ultimately have a business advantage, allowing the satellite operator to charge a higher rate for their capacity (while keeping the all-important cost per bit number constant from the perspective of their satellite service provider or end-user customers).

Integrated Approach to Enterprise Satellite Capacity Management

The evolving nature of the SATCOM business, the new types of satellites, and technologies being deployed, the political and financial instabilities of world regions, and the pressing need to remain competitive in an increasingly complex business environment require that satellite companies adopt an approach to capacity management that integrates the technical, business, operational, and financial functions of their business. An integrated system provides a wealth of insight into a business that is just not practicable with traditional approaches. Information on key business parameters, performance metrics, and trends are readily available, and management reports can be generated instantaneously rather than being an unloved mid-management task requiring days or weeks of laborious work. Many of the metrics that are discussed in this article as indicators of efficiency are quite difficult to compute because they involve financial, technical, operational, and customer information – with an integrated capacity management system, they can be computed and updated in near-real-time.

Companies that have traditionally operated with a hierarchical, and compartmentalized system often find it hard to adopt such a radically different approach and often encounter a measure of internal resistance.

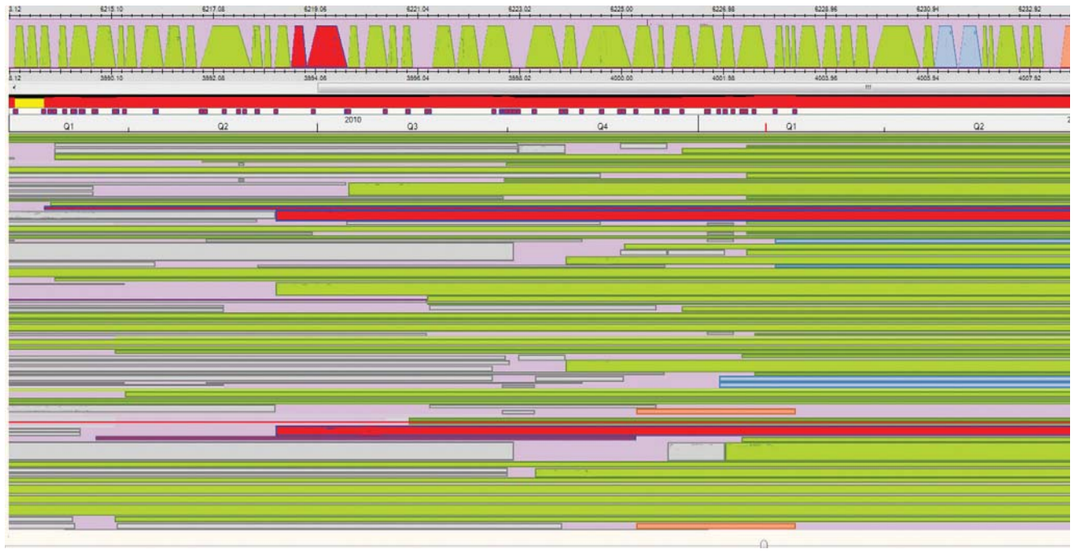


Figure 2: Higher bandwidth efficiency achieved through better capacity management. This screenshot from Optimal Satcom's Enterprise Capacity Management System® (ECM™) product shows capacity allocation on a transponder, with an improvement in fill rate of about 20% over a 17-month period from left to right. Increases of 8%-15% after one year of use are typical.

Personnel that have operated with their individual domains of control are often not used to having their work exposed for others to see (and potentially critique), and are used to working through established hierarchical channels of communication. A system that allows a much more free flow of information can appear daunting at first. It is therefore important that such a change be undertaken with buy-in from key personnel at all levels and from all departments, taking into account their concerns, and putting in place safeguards, and protections necessary to make sure that knowledgeable people remain in control, and not feel that the system is taking over.

Successful adoption of a system is possible, if the system eases, rather than complicates people's daily work – not just as an eventual goal, but in the short-term as well. A lengthy and complex transition period where people are performing double-duty, working with both the legacy system, and the new system, is likely to cause the project to lose support from its potential users even before it has been put into serious use, and that first impression may be exceedingly hard to change. In Optimal Satcom's experience, efficient transitioning is one of the most important contributors to the success of a project, and at each stage of transition, it is important that the system provide a real benefit to the people involved, so that there is an incentive to keep the data in the new system current during the transition phase.

Deploying such an integrated enterprise satellite capacity management system is a transformational event within a company, and can bring multi-fold improvements in operational efficiency, eliminating redundancy of functions. So, what does the day-to-day operation of such a satellite operator look like? Customers work collaboratively with their account team in the pre-sales stage to analyze their requirements and assess service parameters using self-help tools and extranet services that can submit requests electronically or integrate with the company's internal systems. The sales manager and the technical sales support staff work collaboratively with each other to determine the technical resource requirements, and identify available capacity. When capacity is not directly available, functions are available to perform grooming, evaluate preemption options for satellite operators, and for service providers, to quickly evaluate which satellites and beams can support the service request through sophisticated capacity search options.

In parallel, the Contracts personnel update customer records, enter billing information, perform credit checks, provide credit approvals, and issue service agreements. When a customer signs off on a service contract, the corresponding records are transitioned from pre-sales to provisioning, services planned, and information made available to the provisioning team and the NOC, and line-up notifications emailed to the customer. When the customer calls the NOC to activate their services, and then to periodically make changes to, or request information about a service, information about the service has already been pushed to the NOC's systems, and is readily available to the operator. Service related notes entered by the operator are logged into the system, and made available to other personnel managing the service. Ultimately, when the service is decommissioned with the NOC's supervision, the customer, account manager, contracts, and accounting department are automatically notified. In parallel, invoices are automatically generated as needed (monthly, bi-monthly, etc.) and sent to the customer. Payments, service credits, and other adjustments are recorded.

These day-to-day operations of the business, feed into the management functions where key performance metrics are computed, management reports generated, and information displayed on executive dashboards – all updated in near-real-time with no additional effort. With the passage of time, the accumulation of historical data provides rich insight into the evolving nature of the business, and charts and graphs display trends in key performance indicators.

This type of rich data mining of the satellite operator or service provider's business data allows it to understand how the dynamics in the satellite industry are affecting its business, relate world events to regional changes in demand in capacity, relate technological trends to changes in satellite traffic, monitor efficiency across the system, and adjust pricing policies to reflect the value they provide to their customers. Adapting quickly and effectively to the changes in the satellite industry will be key in determining the business success of satellite companies in today's evolving market.

Ahsun Murad is the President and CEO of Optimal Satcom, which he co-founded as a spin-off from Lockheed Martin Corporation in 2002. Since creating the company, Murad has focused Optimal Satcom on developing tools, applications, and fully-integrated, enterprise management system that cater to the requirements of satellite operators, satellite service providers, and satellite-centric MILSATCOM initiatives. Murad has worked for over 20 years in various positions across the satellite communications industry. Before founding Optimal Satcom, he worked at Lockheed Martin and COMSAT Laboratories where he headed the development of products for transmission planning and satellite capacity management and was the lead system architect for a number of commercial SATCOM projects and major MILSATCOM projects for the US and UK governments.

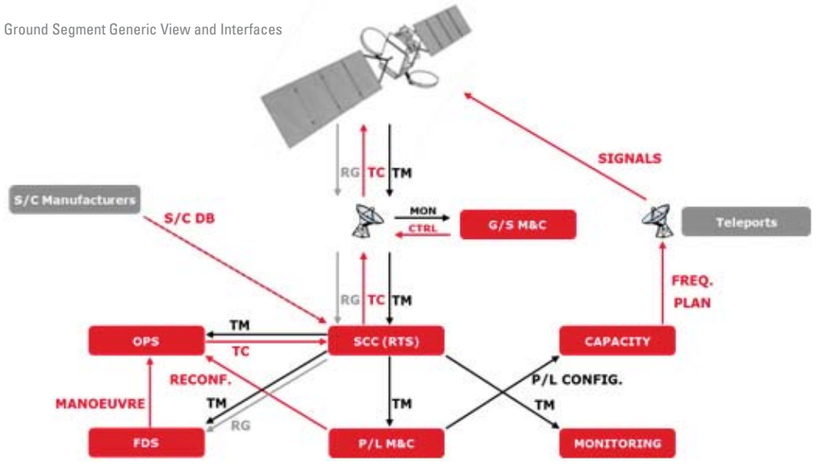
Ground Segment Drivers for Telecom Satellites Operations

Miguel Molina, Business Development Director and Deputy General Manager, GMV Aerospace

Satellites, particularly Telecommunications satellites, require robust and reliable ground systems enabling tracking and control to get the most out of their performance and ensure data and service continuity and integrity. GMV is a global leader in supplying ground systems to institutional customers, and independent complete Ground Segment supplier to commercial telecommunications operators in the following areas:

- Ground segment design and integration
- Ground control systems
- Payload management systems
- Ground Stations Monitoring and Control Systems
- Flight Dynamics Systems
- Mission Planning Systems

Ground Segment Generic View and Interfaces



The procurement of the different Ground Segment components is today driven by the capability and availability of real COTS, allowing a reliable and fast implementation of a new system through the adaptation

of these products. The generic guidelines for these COTS should be:

- Multi-mission and multi-platform ready
- Modern SW technologies
- Advance HMI
- Open architecture (expandable and scalable)
- 3rd party SW and HW free
- Extensive support of standards (CCSDS, XTCE, SLE,…)
- Automation
- Operations consolidation
- ITAR free
- Compatibility with existing satellite platforms

It is relevant to consider the experience and knowledge of the different satellite platforms acquired through previous missions in order to allow the tailoring of the systems to the needs of the final customer, with a minimum risk and providing optimum solutions to satellite operators, while ensuring data confidentiality for satellite manufacturers.

In recent years, satellite operators worldwide have identified the need to address their control systems infrastructure as a whole in order to optimize the investments in the mid and long-terms. The approach is different from what has been a common practice in the industry, where satellite operators dealt with each new spacecraft independently, thus procuring a different control system infrastructure for each mission.

In Satellite operations there is no margin for errors. In order to support the compliance with the required levels of safety and efficiency, the routine operations must be simplified to a maximum extent while the user retains full control over the procedures and verifies and validates the results. The satellite operations must be carried-out with the support of software specifically adapted to the operational needs and control philosophy, such us:

- highest safety and efficiency
- powerful and stable facilities
- multi-platform
- concurrent operations for different satellites and by different users
- multi-user environment
- powerful graphical applications
- long-term analysis capabilities
- advanced HMIs
- high interaction between all software components and with external subsystems
- electronic data storage and dissemination
- high level of automation

It is clear that the target must be to reduce the complexity associated to the satellite operations. In this sense, it is of interest to describe the most relevant factors:

1. Fleet Management

Homogeneous fleet management is essential for a cost-effective support of a satellite fleet based of different satellite platforms.

Cost savings are significant when compared to the deployment of satellite dedicated control systems. This is achieved thanks to an integrated system that permits to re-use the core functionalities and know how, requiring just incremental upgrades for future satellites. These savings are specially identified in the following areas:

- Operations
  - Single Operations Concept
  - Consistent approach to satellite platform specifics, being all core functionalities common to all platforms
- Training
  - Single system to learn – then only s/c specifics makes the difference
  - Single set of test / training support tools
- Software
  - Single system to maintain
  - Enhanced problem resolution capability
- Fully integrated compatible products
- Expandable
  - Add new spacecraft types easily and efficiently
- Low through-life cost

2. Configuration:

In addition to that the control system must cope with a highly configurable, adaptable and scalable system in terms of:

- Easy to include new satellites in servers and client workstations.
- Distributed system (workload distributed & flexible allocation of processing load to target HW resources)
- Designed for smooth integration and deployment into a target Spacecraft Control Center infrastructure.
- The configuration can be split into three groups: common (system wide), satellite specific and site specific.

A particular deployment can be setup by allocating server and client positions to satellites in different ways, depending on the needs, available resources or other constraints.

3. Migration of legacy systems and operational data

An important element in upgrading target spacecraft control centers is the capability to ingest the TM/TC database and valuable operational mission data into the new infrastructure.

When migrating from an existing system, a very detailed and thorough development, validation and implementation plan shall be defined. The upgrade of a legacy control system could be simplified considering that all the operational data is stored based on well-defined specifications:

- native representation of the TM/TC database must be an open representation that is fully formalized in the corresponding ICD, with data available in a relational database, and also available as plain ASCII files.
- Telemetry displays are defined in open and standard formats (XML format) and stored as files
- Derived or synthetic parameters are specified and stored in the operational database as expressions written in a high level language (called OL).

Converting/Loading a target system's spacecraft database is a key step that is further complemented with a strategy for the loading of historical data from the legacy system and for the conversion of the existing operational procedures.

It is a hard requirement to secure the migration of the existing satellite control system to the new system, with a stringent and thorough v alidation program that incorporates an intensive verification of the core and satellite specific features. The migration process could be generically based on the five steps described in the table below.

Migration phases

PHASE 1: SYSTEM CONFIGURATION	New system is configured based on legacy data
PHASE 2: DATA MIGRATION	Operational data is migrated (converted) to format supported by the new system
PHASE 3: SYSTEM INSTALLATION AND ACCEPTANCE	The new system performances are checked during the Factory Acceptance Tests. The new system (fully configured to support operations) is installed at Prime and Back-up sites. Site Acceptance Tests are performed
PHASE 4: SHADOW OPERATIONS	Satellite operations are performed by: - Legacy system with the new one in shadow - The new system with the legacy one in shadow
PHASE 5: OPERATIONAL DEPLOYMENT	Operations are performed by the new system.

4. Wide support for operational modes:

Core processing chains incorporate comprehensive support for different operational modes. Each operational mode fulfils different needs across the ground segment (prime and backup sites) as follows:

- Online: supports real-time telemetry processing and telecommanding for operational satellites. This is the nominal mode for operations in the prime site.
- Standby: provides functionality in standby mode ready for taking over processing after failure of the online instances
- Training: supports a training mode that only enables connectivity to satellite simulators (as opposed to operational satellites)
- Offline: support satellite analysts in the health monitoring and trending

5. Open solution

Exporting the core functionality in the form of fully-formalized interfaces, provides an open interface having a huge degree of vendor independence in the deployment of additional functionality and incorporation of external systems. The API allows external components to perform any command and control operation.

This open interface is further complemented by simplified TCP based interfaces and even simpler file interfaces (for example, files with temporary Out-Of-Limits definitions, files with list of telecommands, file interface with external systems, operational data dump files, including telemetry, telecommand and event dumps, etc). API exports all the core functionality, allowing external components to perform any command and control operation.

6. Compliance with international standards

Adherence to standards (CCSDS, XTCE) allows to reduce maintenance and development costs, since these standards are often widely followed by many spacecraft manufacturers and space agencies around the world.

7. Automation

A high number of satellites and the heterogeneous origin and characteristics of the different satellites is a major issue to be assessed by the existing satellite operators for routine/contingency operations definition. Under these conditions, the capability for automation of routine operations is a major requirement in order to minimize the risk and assure a safe, efficient and flexible implementation of these operations. This automation capability can be extended also to ground segment activities automation, considering a high level layer where the different activities associated to the ground segment operations are managed and dynamically controlled and verified.

8. Efficient and compatible Flight Dynamics systems

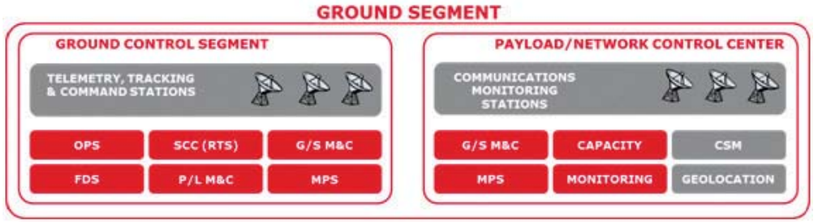
Flight dynamics systems provide the necessary means to determine both the position and the orientation of satellites and space systems and also enable the planning and execution of required manoeuvres, for routine and contingency operations, including the analysis of collocation scenarios and collision risk assessment. As a result, these systems are essential to ensure the perfect reception of satellite communications or the attainment of goals in any mission, whether scientific, exploration or of any other nature.

9. Homogeneous ground stations monitoring and control

Traditionally the management of the ground stations and the associated equipment have been applied through separated control systems. Integration with the satellite control system will facilitate the execution of the operations and the homogeneity of the activities in the control station. At the end the ground station can be managed as an additional satellite, and using all the satellite monitoring and control facilities conveniently adapted to the ground station interface.

In parallel to the satellite platform operations it is also relevant to remember the support to the operations associated to the payload.

Payload engineers need to cope with complex planning problems. They need to optimize the use of onboard resources and minimize the impact on customer services of any payload reconfiguration. To help



Ground Segment Components

them it is interesting to consider specialized system covering the following aspects:

- When a payload reconfiguration is needed either because of a change in the transmission plan or due to a failure in a payload component, the optimal new payload configuration (on all possible new configurations) shall be generated, including the command list required for this configuration, based on a number of figures of merit thanks to the built-in search algorithm. It is a valuable tool for "what if" analysis, training and to automate payload reconfigurations during In-Orbit-Testing.
- For satellites featuring steerable antennas, a module providing support for re-pointing operations, including visualization of new coverage areas and generation of the telecommands for antenna re-pointing.
- The optimization of the frequency plans and carrier power levels. It should require accurate models for the computation of link budgets and impairments analysis of all the relevant effects, including accurate models of the non-linear behavior of transponder amplifiers.
- The management and optimization the on-board amplifiers operating configuration and satellite total power consumption.

Finally, space industry manufacturers, operators and organizations, as well as companies in other industries need tools and solutions for managing their businesses and processes. The solutions must be oriented to the following areas which are not in the core activity of the satellite operations, but they are complementary services required for a complete efficient and secure process.

- Security Systems and Information Network Engineering, Solutions and Services.
- E-Mail, Agenda and Mobile Device Synchronization Corporate Solutions.
- Content Management Platforms.
- Intranet, Portal and Document Management Platforms.
- E-Learning Platforms.
- Mobility Solutions.
- Infrastructure and Systems Architecture.
- Process and Technology Consulting.

Miguel Molina is the Business Development Director and Deputy General Manager of GMV Aerospace, a global company that provides, engineering and systems integration for satellite space and ground segments. He has devoted his entire career to space programs and applications with more than 25 years' experience in the space sector. Throughout his career he has been involved in different space missions ranging from Space exploration, Earth observation, Navigation, Science and Telecommunications.

Interview with Suphajee Suthumpun

Chairman of the Executive Committee & Chief Executive Officer, Thaicom Public Company Limited

In August 2011, Suphajee Suthumpun was appointed as Chairman of Executive Committee and CEO of Thaicom, Asia's leading satellite operator. Despite the company's strong pioneering history, Thaicom had been operating at a loss for several years and Suthumpun was given the task of turning its fortunes around.

Suthumpun wasted no time, changing the way the operator did business to bring about the transformation required. Today, Thaicom is reaping the benefits – announcing a consolidated net profit of 1.1 billion Baht for the year 2013, an increase of 548 percent on the previous year.

Q. Can you tell us a little bit about Thaicom, its vision and its main achievements?

A. As an Asian satellite operator, Thaicom aims to create innovative technology and business solutions to contribute to the industry and society at a global level, while maintaining profitable and sustainable growth.

We like to define a theme for every business year. For example, in 2012 "In Pursuit of Growth" and "Sustainable & Profitable Growth" last year. We want to continue our pioneering history and, as part of that, our theme for this year is "New Frontiers". This includes a shift of focus to concentrate on end-to-end solutions and will see Thaicom moving into new territories, namely Africa. We also have three new satellites, Thaicom-6, which was launched in January 2014, Thaicom-7, which will launch this year, and Thaicom-8, which will launch by the first half of 2016. In addition, we have increased the number of satellite television channels from 641 in 2013 to 677 now. The number of HD channels has grown from 74 in 2013 to 116 in the 1st half 2014 — an increase of 54%.


Asia's first Ku-band satellite service for In-flight broadband.


Thaicom 7 provides media & data services for Asia's and Australasia's entertainment and telecom industries.

Q. What kinds of customers and potential clients do you focus on?

A. Market segmentation is a key success factor. For broadcasting, we will continue to focus on the broadcasting and media industries, content providers and government customers to support the launch of digital television in the region. In regards to the broadband segments, again, we split this into three different areas, namely telecom industry and enterprise, government segments and mobility. In Japan, for example, we work with SoftBank Mobile and other operators to develop solutions for backhaul for 3G and soon 4G to add to their coverage in a very cost-effective way. Targeting this segment is a re-positioning for us, as instead of trying to compete with terrestrial or mobile operators, we are now working to complement them with our solutions.

Another focus area for broadband satellite is the Government segment. In the Asia Pacific region, many administrations pursue Universal Service Obligation (USO) funds. Each country's regulator asks operators for a percentage of their revenue to be used to extend broadband coverage in rural or underpenetrated areas. We work with the Government to utilize this fund. Customers we work with include TOT in Thailand to provide Internet for schools outside of cities and, in Australia, we work with the National Broadband Network (NBN) to provide broadband throughout the country. We are the only Asian operator working with them and our wholly owned subsidiary, IPSTAR Australia (IPA), has just been selected for a new initiative with NBN to boost the number of broadband connections for Australians who cannot access an existing commercial broadband service. Since 2005 we have connected nearly 100,000 premises in Australia with satellite broadband.

In addition, we have started to focus on verticals, such as the airline industry in Asia. We have just become the first in the Asia Pacific region to introduce In-Flight Connectivity services to provide broadband on commercial planes using Ku-band. This service will soon be operational on many planes flown by carrier Nok Air, which last year transported nearly six million passengers.

Q. What is behind the financial turnaround Thaicom has seen in the last few years?

A. When I joined Thaicom in 2011, we'd made losses for the past five or six years and now we are consistently delivering a positive financial result for each quarter. Such a solid performance has required a lot of change and transformation in a number of areas. Firstly, we reorganized ourselves to ensure we were focused on our customers and their needs. Internally, we reorganized our teams from product-based to function-based in order to better respond to the growing convergence of broadband and broadcast. Secondly, we have also done a lot on operational efficiency to make sure we have the right people with the right skills in the right place to best serve the customer. This has improved the process within teams and ensures we are working as efficiently as possible.

In my first year, we were able to finalize significant bandwidth sales with Measat and NBN in Australia. We also kicked off the Thaicom-6 project and introduced HDTV broadcast on Thaicom-5. In 2012 we sold all IPSTAR capacity in Japan, entered the African market and launched Africom by Thaicom late that year.

Moving forward, in 2013, we focused on sustaining our growth and sold all of the China capacity to Synertone and Thailand capacity to TOT. In the same year we introduced value-added services on an end-to-end basis and integrated solutions for verticals, which required new strategic partnerships, such as with Gilat and Row 44. In addition, we have started to further strengthen our video channel neighbourhood at 78.5 degrees East. This now has nearly 700 channels out of which 116 are broadcast in HD.

As a result our current portfolio is solid — we do not aim to have a huge fleet of satellites but instead focus on leveraging our experiences and on strengthening our unique value propositions.

Q. How do you see Thaicom changing as the satellite market continues to evolve?

A. The satellite industry is currently marked by two major changes. Firstly, Ultra HD has seen 4K and even 8K coverage of the 2014 FIFA World Cup, and by 2016 it is estimated there will be 10 mil-


Thaicom Earth Station and Satellite Control Centre

lion Ultra HDTVs. The other shift is in consumer behaviour. They want anywhere, anytime connectivity and have the devices to facilitate that, mobility applications on land, at sea or in the air are widely available, data consumption is rising and broadband and broadcast is converging.

To deal with these changes, satellite operators have to ensure not only capacity but also solutions to address customers' needs. At Thaicom we have already set Ultra HD as key in our strategic direction, even though the Ultra HD broadcast market is still a few years from gaining traction, especially in Thailand and neighbouring countries. We have also launched a 4K event with partners on Thaicom-6 and had positive feedback from our customers. We will continue to work with partners to promote 4K services.

As I mentioned, away from Ultra HD and back to consumers, we have just become the first in the Asia Pacific region to introduce In-Flight Connectivity services to provide broadband on commercial planes using Ku-band.

I foresee satellite will continue to play a significant role in complementing other technology platforms due to the increasing consumption of data and the proliferation of UHD as growth drivers.

Small Satellites, Big Window of Opportunities

Carolyn Belle, Analyst, NSR

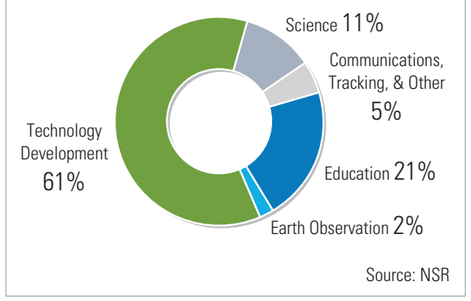
Nano and micro satellites have attracted attention from both developed and nascent space economies in Asia over the past 5 years. Asian universities, national space programs, and commercial entities have contributed to projects involving 1-50 kg satellites, and these small platforms are increasingly considered as capable of addressing diverse missions and market objectives. Yet while global launch rates of these satellites tripled between 2012 and 2013, launch rates from Asian operators have remained steady since 2009.

However, given that this market is still emerging, it is not yet dominated by incumbent players – particularly in light of prospective novel applications and a diverse potential customer base. With the total number of these satellites expected to exceed 2000 launched between 2014 and 2024, the nano and microsatellite market is an opportunity ready to be grasped. Asia, with a mix of developed and emerging space economies coupled to growing educational institutions and a cluster of high tech industries, is a prime region to take advantage of a window of opportunities opening up thanks to the growth of this sector.

State of the Market

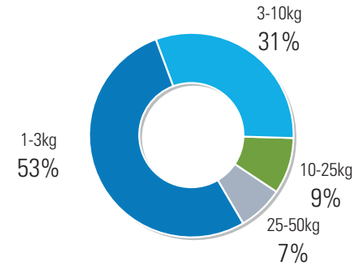
Nano (1-10 kg) and micro (10-100 kg) satellites have been launched in greater numbers over the last decade due to their suitability for hands-on university training and cheap technology development missions. Within the smaller 1-50 kg market, the majority (82%) launched from 2009-2013 had one of these two applications as their primary mission.

1-50 kg Satellite Launches by Application, 2009-2013



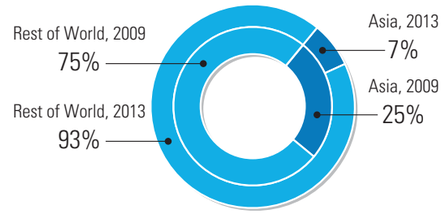
Source: NSR

1-50 kg Satellite Launches by Mass, 2009-2013



Source: NSR

Asian Market Share of 1-50 kg Satellite Launches, 2009 and 2013



Source: NSR

This trend is reflected in the mass distribution of satellites launched: 84% of 1-50 kg satellites had a mass of less than 10 kg, generally the most affordable and rapidly built platforms with the least customization in this segment. Nearly 50% of all missions were undertaken by universities.

There were 89 satellites in the 1-50 kg. category launched in 2013 compared to only 30 the year before and 21 in 2009. Nearly 200 satellites in this mass category are expected to be launched in 2014, more than the total number of satellites launched over the previous 5 years. Based on current trends, this could increase further by 2024.

Notwithstanding overall global growth, Asian markets' share has fallen from 25% of 1-50 kg satellites launched in 2009 to only 7% in 2013. This is attributable to a fairly stable launch rate in Asia while North America and Europe saw an increase in their launch rates for this segment. Less activity in Asia compounded by low levels of military and commercial activity drove this decrease; these two operator groups commanded only 10% of the Asian market compared to 36% of the global market.

It is NSR's view that this situation is poised for a reversal: alongside North America and Central/Eastern Europe, Asia is the region expected to have the most growth in nano and micro satellite launches in the near term. However, North America has already launched more than 100 of these satellites compared to Asia's 29. While pre-2014 launches were only the first leg of the race, Asia must now play catch up to North America's higher launch rate and more developed industry.

Asia's Opportunities

How can Asian companies and governments effectively pursue this growing market? Asia's division between established space players looking to enhance and expand their local industry, and countries endeavoring to establish their own space industry, provides opportunities to benefit from this new market on several levels.

Development of a skilled workforce

It is not surprising that the smaller scope and cost of nano and microsatellite projects is well suited to

less established space economies and programs. Vietnam, Singapore, and Taiwan used these platforms as their first locally-designed and built satellite, and Indonesia and the Philippines are planning similar efforts. This is largely accomplished through support for university projects and the associated development of a skilled and experienced workforce that can form the basis for local industry. Essentially, nano and microsatellites can be a low cost, low risk, and rapid avenue towards a healthy local space industry through skills and expertise development.

Sample List of Locally-Built and Designed Nano/Micro Satellites in Asia

Country	Designation	Mass(kg)	Year Launched
Vietnam	F-1	1	2012
Indonesia	LAPAN-A2	78	2015 (est)
Indonesia	IiNUSAT	30	2014/5 (est)
Singapore	X-sat	105	2011
Philippines	*Unnamed	~10-100	2016 (est)
Taiwan	YamSat	1	2002 (launch cancelled)
Japan	Prism (Hitomi)	5	2009
India	Anusat	38	2009
China	Zheda Pixing	3	2010
South Korea	OSSI-1	1	2013

Source: NSR

In these cases, the process of building and operating the satellite is more valuable than any services the satellite provides; the project is simply a hands-on learning opportunity that is applicable to a wide variety of situations.

Manufacturing

Asia already houses satellite manufacturers serving international markets; while entities in India, China, and Japan build large satellites, companies in South Korea and most recently Singapore are active in producing smaller satellites. Despite the current trend to manufacture nano and micro satellites in-house, demand for turnkey satellites is expected to create a new, albeit small, satellite manufacturing niche in the coming years.

Even as demand for these satellites gradually emerges, NSR has observed demand for components from in-house manufacturers increasing at a greater pace. Specialization into the manufacturing of one or multiple subsystems could draw customers across international markets to Asia, especially if these are proposed at attractive price points.

Efficiencies gained through 1-50 kg satellites hinge in part on the availability of suitable and affordable consumer electronics components. Leveraging the existing local expertise – 5 consumer electronics companies consistently ranked in the top 10 are headquartered in Asia – in developing these components and adapting them to use in satellites could give Asian commercial ventures an advantage.

Earth Observation

Earth Observation is forecasted to represent 40% of total missions by 2014 for nano and microsatellites . Much of this growth is tied to constellations, which enable operators to leverage high revisit rates despite lower spatial resolution. Several American start-up companies have already begun establishing these constellations and obtained significant venture capital, with plans also announced by players in Russia and Argentina.

Asia already stands out in this segment: between 2009 and 2013, Asia was the only region to launch dedicated Earth Observation satellites (in contrast to technology development satellites testing Earth Observation capabilities). This early adoption of 1-50 kg platforms for Earth Observation positions Asia to further refine and expand expertise at a faster pace than other regions.

Novel Applications

Over the long term, NSR expects to see a shift towards greater diversity of applications in this market; satellites in the 1-10 kg mass category that began as a tool for universities are only now being considered for commercial and government missions that provide a service or perform a research objective. This means that the vast potential of these satellites to provide real services has yet to be explored, leaving ample room for innovation and the penetration of completely novel applications and markets.

For instance, Asia's widespread need for improved communications during natural disaster response and recovery could elicit a microsatellite based solution, opening the door to further communications applications that have been insignificant to date.

Bottom Line

Nano and microsatellites are an unknown entity, as yet unproven in a commercial market. But with all indications that these platforms are on the brink of a significant jump in exploitation, there is a big window of opportunities opening up for governments and commercial operators to push development of capabilities that capitalize on such growth. **This emerging market is an opportunity for Asia to expand its footprint on the global space industry.** However, with design and manufacturing times on the scale of months and satellite lifetimes only a few years, it is a fast paced market that demands an equally quick response to raise the odds for success.

Carolyn Belle comes to NSR from the Research and Analysis team at the Space Foundation, where she contributed to the creation of the publication The Space Report 2014. Her research efforts primarily addressed new and emerging space products and services. This position was preceded by an internship with the Space Foundation during which Belle explored the policy considerations and efficacy of international space endeavours such as the International Space Station. Belle received a Master's degree in Space Management from the International Space University in 2013. Prior to attending ISU, she coordinated programs for a science outreach non-profit in Colorado. Her Bachelor's degree was awarded from The Colorado College in 2010 with a focus in Biology and Chemistry.

Extending Multiband / Multimode Military Radio Communication Range over L-Band Satellite System

Lee Foh Cheong, Chief Engineer, Director of Engineering and Customer Solutions, SingTel Satellite

The military in general and troops in the land environment in particular, rely on robust, portable radio terminals to provide all-informed communications for command, control and coordination of dispersed teams. However, when operational distances extend beyond line of sight, the normal workhorse VHF terminals face range limitations and are unable to meet the capability requirement without the use of rebroadcast (or relay) stations. This can often lead to teams being isolated which can compromise the safety and lives of personnel.

To work around this, the alternative is Communications on the Pause (COTP) using tactical satellite (TACSAT), conventionally provided in the UHF band on military owned satellites. The demand for these channels exceeds supply, meaning that nations are often unable to lease or gain access to channels. In addition, governments that use VHF radios cannot use this system. Therefore, radio interoperability cannot be achieved in a single radio net.

Radio Characteristics and Limitation

Most military radios require a small narrow bandwidth of 25 kHz to establish voice communications. However, radio frequency transmission ranges are often prohibited by environmental obstacles, electrical power and the performance of radio wave propagation due to ground reflection characteristics.

BLOS Communication using Radio

Existing solutions to overcome radio transmission range limitation are often evolved around developing an Internet Protocol (IP) radio gateway with a Very Small Aperture Terminal (VSAT) solution to overcome Beyond Line Of Sight (BLOS) communications by backhauling IP traffic. However, such complex integration design involves large financial investment that can incur high maintenance costs in the long run and logistic challenges that could hinder fast response deployment.

Extending Range & Security

A new, highly innovative solution which converts radio frequencies has been designed to convert existing VHF/UHF radio signals to L-band to access a global satellite network. This would directly cut back the required radio frequency power amplifier needed in VHF/UHF to operate a narrowband channel of 25 kHz in the L band frequency range. Existing sovereign encryption can be used and is transparent over the L-band network which covers the globe, in a secure broadcast mode over the satellite.

Interferences & Anti-Jamming

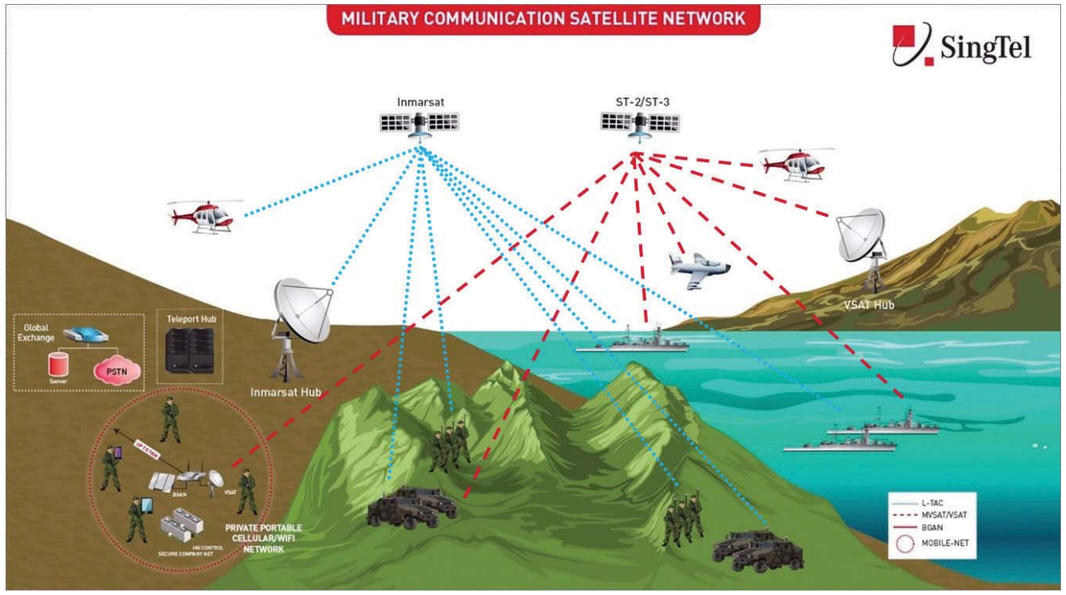
The risk of direct terrestrial UHF radio frequency interferences can be liberated when the military UHF signal is up convert to commercial L band. This will indirectly reduce the probability exposure to intruder using military jammers to discrete mission critical rescue covert operations.

Multiband Radio Interoperability

In addition, any combination of UHF and VHF radios can share a single channel making it ideal for rapidly establishing a single interoperable network for multiple agencies or even multiple nations.

Mobility and Response

Owing to the small form factor of the frequency converter and antenna, operational deployment time is improved significantly without the need to integrate to VSAT system. The system is designed to run on low power consumption and can operate using existing battery and power sources. This would directly advance the flexibility to install the system on a completely mobile man portable system and fast moving platforms such as Communications on the Move (COTM) on land and speed boat for coastal patrolling



operation, for example. Because there is no requirement for additional infrastructure, cost is kept to a minimum. So, instead of investing in a high radio tower to extend radio coverage, the cost of owning the ground space, electricity and high power radio towers are eliminated. With no repeaters, relays or cells, there are fewer targets for hostile forces attempting to disable command and control. Extending existing military radio communication range can be enabled today without investing in an expensive GEO Satellite UHF payload.

Service Provider

With this innovation, SingTel and Inmarsat are able to provide government and military with the capability to rapidly deploy a cost effective, simple and secure communications system.

Lee Foh Cheong is the Chief Engineer, Director of Engineering and Customer Solutions of SingTel Satellite. He is a brainchild behind the World First 1.5m C-Band stabilized antenna that was innovated in 2007. This antenna is successfully deployed by various Navy operations, Offshore Supply Vessels (OSV) and Rigs platforms. He won Seatrade Asia Technical Innovation Awards in 2008. Before joining SingTel, Foh Cheong worked for Ministry of Defence in Singapore.

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Thailand

VTI Vietnam

Regular Member

ACeS ASIA Cellular Satellite

AETHERIC ENGINEERING

APSI Asia Pacific Satellite Industries Co., Ltd.

AsiaSat

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APSCC Welcomes a New Regular Member

Optimal Satcom

Optimal Satcom is the leading provider of enterprise satellite capacity management systems for satellite operators, satellite service providers, and Government civilian and MILSATCOM programs.

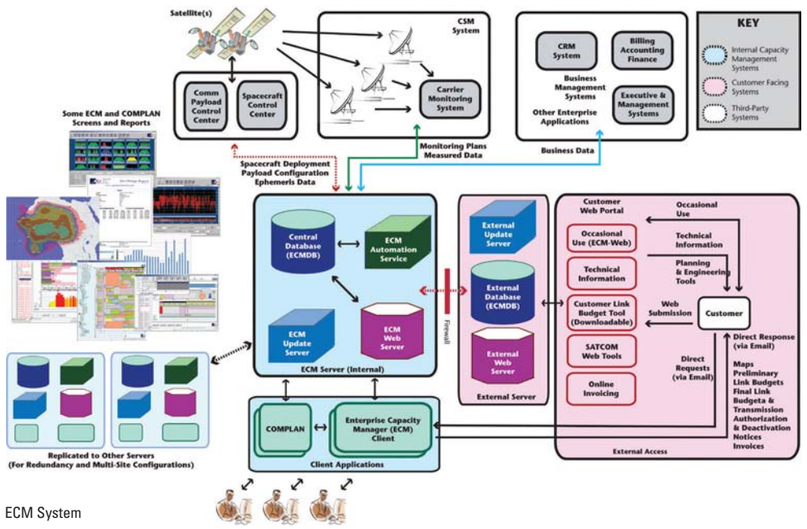
Optimal Satcom offices in Reston, VA, USA

Optimal Satcom's products include industry leaders such as Enterprise Capacity Manager (ECM), COMPLAN, and Customer Link Budget Tool (CLBT). Systems based on Optimal Satcom's off-the-shelf commercial products and customized software are used to manage a significant portion of the world's commercial and military satellite capacity.

Optimal Satcom specializes in systems that integrate all aspects of capacity management – capacity engineering, mapping and visualization, technical operations, customer and lease management, ground asset management, reporting, web services, occasional use services, cost and revenue tracking, and invoicing – into a single system that is easy to use, flexible and extensible, and easily integrated with other third-party systems such as carrier monitoring, CRM, accounting and finance, etc.

Sophisticated planning and modeling techniques incorporated into COMPLAN and ECM allow users to model complex interference scenarios to visualize and mitigate the effect of different types of jamming and interference, and detailed mapping and visualization of simultaneous ASI from multiple satellites.

Visit us at www.optimalsatcom.com for more information.



ECM System

Satcomm 2014 at CommunicAsia2014 Summit

CommunicAsia2014 Summit

The Asia-Pacific region has the focused attention of global satellite industry with a robust market outlook. This year Satcomm 2014 at the CommunicAsia Summit has been designed to meet the most critical needs of the satellite industry, in close consultation and research with more than 50 key satellite stakeholders and the end-users. Satcomm 2014 this year brought two new tracks focusing on competitions in Asia, High Throughput Satellite (HTS) and VSAT mobility markets – land, aero and maritime jointly by the Asia-Pacific Satellite Communications Council (APSCC), talk Satellite, and Singapore Exhibition Services for two days on June 18 and 19.

In a recent report by Euroconsult, the FSS sector is transitioning into a new environment with increased competition between satellite operators and greater uncertainty on demand usage and associated pricing conditions. This increased competition results from investments by both leading operators and established regional operators, and from the emergence of new national systems in emerging regions. The market value of HTS capacity is expected to triple within the next two years to reach US$1.6 billion by 2014 but the belief that HTS will struggle to open up new markets, leading to the overall negative outlook – The first day Summit track discussed on strategies to tackle competitions in Asia and panelists debated on whether HTS platforms will be successful in Asia.

Tackling Competitions in Asia

After the welcome speech by Mr. Yutaka Nagai, the President of APSCC and Kevin French, Publisher of talk Satellite, the Satcomm 2014 started with a keynote presentation by Deepak Mathur (Senior Vice President, Commercial, SES) on the market opportunities and upcoming trends for satellite growth in Asia. Moderated by Kevin French, the satellite operators' power panel threw questions to the panelists of what can be done for intensifying competition from satellite operators and terrestrial networks affecting the customers and competitors. Mohamed Youssif (COO, ABS), Pierre Benoist d'Anthenay (Deputy CEO, Eutelsat Asia), David Ball (CTO, Newsat), Patompob (Nile) Suwansiri (CMO, Thaicom), Philip Balaam (VP, Business Development, AsiaSat) and Ng Guan Soon (Head of APAC, Thuraya Telecommunications) joined this session to share their own unique strategy and proposition to the market help.

HTS:
Another example of evolution in the satellite industry, or a game-changing revolution?

Erez Antebi (CEO, Gilat Satellite Networks) started the afternoon session with a presentation to examine the current state of HTS and its status in Asia and to identify the key hurdles that must be overcome to achieve its potential. With a question regarding the future of HTS platforms in Asia Markets, Pierre-Jean Beylier (CEO, SpeedCast), Imran Malik (Vice President APAC, O3b Networks), David Ball (CTO, Newsat), Terry Bleakley (Regional Vice President for Asia Pacific Sales, Intelsat), Lim Kian Soon (Head of Satellite, SingTel) and Robin Salem (VP of Business Development, Broadband Group, ViaSat) also discussed on the possibility of HTS's success in developing markets, especially in rural regions of Asia. Blaine Curcio (Analyst, NSR) also shared his overview on HTS affection to the future VSAT business models.

Daniel Enns (Senior Vice President Marketing & Business Development, Comtech EF Data) in his presentation, identified the market drivers and challenges for HTS adoption in the cellular backhaul market in Asia. His presentation included new technologies that enable affordable 3G/4G backhaul solutions over HTS satellite and key success factors for mobile backhaul for moving to 3G-4G/HTS.

VSAT Mobility Markets – Land, Aero and Maritime

In the connected world we live today, all the three VSAT mobility markets, oil & gas, aero and maritime are growing at an exponential rate. Satellite operators are still facing the challenge to keep up with the demand in providing high quality and reliable capacity. The satcom track on June 19 examined the priorities and forecasts for VSAT services and growth opportunities in Asia. The session also addressed the challenges faced by satellite operators to meet today's communication needs and how it can support changing future requirements of the VSAT mobility markets.

After the VSAT market overview presentation by NSR, there was a panel on the satellite mobility applications joined by Tom Cheong (VP and General Manager, iDirect Asia), Vaibhav Magow (Regional Director, Asia-Pacific, Hughes), Stefan Jucken (Director, Strategic Development, Viasat), James Collett (Director, Mobility Services, Intelsat), Mohd Faizal Zainal Amri (General Manager, Hermes Datacomms) and Todd McDonell (Vice President - Global Government Solutions, Inmarsat). The panel discussed on the cost effective solutions for VSAT service providers and the services to meet the customers' communication needs for presence and the future.

The growing demand of mobility requirements, especially in the aeronautical space was also of considerable interest and highlight during the second day summit. David Bruner (Vice President, GCS Business, Panasonic Avionics) delivered the Company's strategy to build HTS to meet the elevated demand from the aviation world with the innovation in technology.

Sandeep Kumar (Head of Satellite, Telstra Global) explained the growth of satellite services in the face of terrestrial high bandwidth fiber. He also pointed out the satellite services as a complement to terrestrial infrastructure and identified the benefits of VSAT satellite networks and its growth in the Asia-Pacific region.

The panel discussion on the changing business of teleports provided the introduction of new delivery platforms, successful cases of introduction of new services using different platforms, and factors that lead to the successful implementation. Panelists from ATCi Communications, Satlink Communications, Telstra Global, Gateway Teleport Ltd., and NewSat discussed on the key trends in the multiplatform space and how teleports can take advantage of the opportunities in this segment.

The two day summit of the Satcomm 2014 presented a great opportunity to meet and discuss the Asia-Pacific satellite industry today as well as what the future holds for the satellite industry. Clearly the Asia-Pacific region is positioned for an exciting phase of opportunity and prosperity.

SATELLITE INDUSTRY NEWS

PGNL Chooses MEASAT for International Distribution

August 1, 2014 - MEASAT Satellite Systems Sdn. Bhd. announced an agreement with Pilipinas Global Network Limited (PGN Limited) for capacity on MEASAT-3. Under the terms of the agreement, PGN Limited will use MEASAT-3's global beam to distribute the Aksyon TV International and Kapatid TV5 channels to over 120 countries across Asia Pacific, Australia, the Middle East and Eastern Africa. Kapatid TV5 is a 24-hour general entertainment Tagalog language channel and prides itself in its ability to capture the pulse of the Filipino people. AksyonTV International is a 24-hour Tagalog language channel dedicated to bringing the latest in News and Philippine Sports.

SSL Selected to Provide Intelsat 36 Satellite

August 4, 2014 - Space Systems/Loral (SSL) was selected to provide a communications satellite to Intelsat. Intelsat 36 is designed to provide media and content distribution services in Africa and South Asia. The satellite will be located over the Indian Ocean to provide both Ku- and C-band services, with MultiChoice, Africa's leading pay TV provider, utilizing the Ku-band payload. The C-band payload will provide video services to other customers who distribute content to South Asian cable communities. The satellite design is based on the highly reliable SSL 1300 satellite platform that provides the flexibility for a broad range of applications and technology advances. It is scheduled for launch in 2016. With Intelsat 36, SSL will have a total of four Intelsat spacecraft under construction in its manufacturing facility.

SpaceX to Build Launch Site at Boca Chica Beach

August 4, 2014 - The vertical rocket launch site will be at Boca Chica Beach, on the edge of the Gulf of Mexico and saddling the Rio Grande. Space Exploration Technologies' founder Elon Musk announced the strategic decision to build a site in the outskirts of Brownsville, Texas, where the company plans to launch its signature Falcon 9 rocket. SpaceX already has launch sites at Vandenburg, California and Cape Canaveral, Florida. The much anticipated decision finally came, after more than 3 years of analyzing sites in Georgia, California, Virginia, Alaska, Puerto Rico and Florida. Within Texas, SpaceX was originally considering about a dozen locations from Cameron County to about 90 miles north, in the King Ranch area, but ultimately, Brownsville became the lone Texas finalist. Earlier this month, the project was given the green light by the Federal Aviation Administration, as part of the federal environmental process.

AsiaSat 8 Successfully Lifts Off

August 5, 2014 - AsiaSat 8 aboard a SpaceX Falcon 9 launch vehicle successfully lifted off from the Cape Canaveral Air Force Station in Florida, U.S.A. AsiaSat 8 is a Space Systems/Loral 1300 series satellite, and has a design life of 15 years. With 24 Ku-band transponders and a Ka-band payload, AsiaSat 8 will co-locate with AsiaSat 7, where AsiaSat has established networks for service since 1990. AsiaSat 8's powerful Ku-band beams cover China, India, the Middle East and South East Asia, with inter-beam switching capability to provide flexibility to address market requirements.

Orange Niger Expands Reach of its Cellular Network in Rural Niger with Intelsat

August 6, 2014 - Intelsat announced that Orange Niger, part of the Orange Group, is utilizing Intelsat capacity to expand its cellular network to the rural regions of Niger. Under the new, multi-year agreement, Intelsat will provide C-band broadband capacity to Orange Niger on Intelsat 903 at 325.5 degrees East to support its deployment of cellular backhaul services in Niger. Orange Niger plans to use its expanded network reach to offer

high-quality, reliable broadband services to corporate enterprises and provide mobile telecommunications services to customers within Niger. When the Intelsat 35e satellite enters service, scheduled for 2017, Orange Niger will be able to seamlessly transition to the new satellite.

Inmarsat Expands Operations in China

August 6, 2014 - Inmarsat marks another important milestone in China with the opening of its first office in the capital city of Beijing. Located at the Kong Gang Industrial Park in Shun Yi District, the new office demonstrates Inmarsat's commitment to the Chinese market and cements more than three decades of partnership with the world's second largest economy. Inmarsat works through partners in China, primarily Beijing Marine Communication and Navigation Co. (MCN), to provide mission critical communications services to some of China's biggest multinational enterprises including Air China, China COSCO, China Shipping Container Lines, China National Petroleum Corporation, China Central Television, and Xinhua News Agency.

SingTel Satellite Drives Campaign to Improve Seafarer Welfare

August 7, 2014 - SingTel Satellite has joined forces with three of the world's main maritime charities to help seafarers use onboard technology to keep in touch with loved ones at home. At the heart of the cooperation is a new seafarer Facebook campaign where seafarers are encouraged to use SingTel's CrewXchange@SingTel portal to communicate with family and friends while at sea. SingTel has pledged to donate S$1 for every 'Here's One From Me' unique post placed by a crew member on the CrewXchange wall to the three charities – Apostleship of the Sea, Seafarers UK and Sailors' Society. These charities provide vital support and funding to seafarers and their families. The campaign will potentially help play a part in improving the communication and educational needs of the seafarers and their families. SingTel Satellite is a satellite solutions provider and also an advocate for crew welfare. It not only creates solutions to aid operational efficiency and improve remote monitoring and control for shipping companies, but also creates solutions which improve the life of seafarers on board vessels.

Orbital Selected by Avanti to Build Hylas 4 High-Throughput Commercial Satellite

August 12, 2014 - Orbital Sciences Corporation announced that Avanti Communications has awarded the company a firm contract to build the Hylas 4 broadband communications satellite. Based on Orbital's GEOStar-3 satellite platform, the Hylas 4 satellite will be designed, manufactured and tested at Orbital's satellite manufacturing facility in Dulles, VA. The satellite will deliver up to 28 GHz of capacity in 66 fixed beams positioned over Africa and Europe. A portion of the Hylas 4 capacity will provide growth for Avanti's existing markets with the remainder available for initiating service to new coverage areas. Hylas 4 is designed with four steerable beams that also could serve markets in Latin America or Africa. It is planned for launch by Arianespace in early 2017. Hylas 4 will be the 27th Orbital-built satellite launched into orbit aboard an Ariane rocket.

Cobham Receives Brazil STC Approval for AVIATOR 200 for King Air Operators

August 12, 2014 - Cobham SATCOM has announced that its AVIATOR 200 SwiftBroadband solution has received Administración Nacional de Aviación Civil (ANAC) Brazil Supplemental Type Certificate (STC) approval for installation by King Air operators. The new certification was developed in cooperation with Cobham SATCOM partner Pro Star Aviation and includes the activation of the AVIATOR 200's built-in Wi-Fi option, offering access to an extensive range of communication capabilities aboard King Air models B200, B200C and B300 (Super King Air 350). The approval of the STC for use of the innovative Cobham system on Brazilian-registered aircraft adds to the FAA (Federal Aviation Authority) and EASA (European Aviation Safety Agency) STCs already confirmed for King Air aircraft, which were also developed with Pro Star.

Kratos ISI Selected by ABS to Expand Its Ground System to Support ABS-3A and ABS-2A Satellites

August 13, 2014 - Kratos Integral Systems International (Kratos ISI) business unit has been selected by ABS to extend its EPOCH® IPS Fleet Management System to support the new ABS-3A and ABS-2A programs.Earlier this year, ABS launched its high-powered ABS-2, an SSL 1300 satellite, implementing EPOCH IPS for Command and Control (C2). Kratos ISI will now expand and upgrade the primary and backup satellite C2 system to support the ABS-3A and 2A satellites as well. Both are new Boeing 702SP satellites and will be the first all-electric types in the world to enter service. The ABS-3A will have 24 C-band and 24 Ku-band transponders, and the ABS-2A will have 40 Ku-band transponders.

Kacific Inks Five Year Satellite Broadband Agreement with Solomon Telekom Company

August 13, 2014 - Kacific Broadband Satellites has signed a five year Framework Services Agreement with Solomon Telekom Company to provide high speed bandwidth to the people of the Solomon Islands. The multi-million dollar agreement almost doubles the bandwidth available to Solomon Telekom and will provide high speed internet coverage to even the most remote locations in the island group. Five high capacity beams directed from Kacific's Ka-band High Throughput Satellite (HTS) will provide coverage to every one of the many islands that comprise the group. Despite approximately 1,500 kilometres separating the westernmost and easternmost islands, the high power Kacific coverage will provide all with equally outstanding service quality through inexpensive terminals. Coverage will extend from Choiseul and the Shortland Islands in the far west and north-west, all the way to the most northern atoll, Ontong Java, to the most eastern remote atolls of Tikopia and the Duff Islands and to the Rennell Bellona Islands in the south.

Optus Expands Satellite Services to ITC Global

August 15, 2014 - Optus announced a new two-year agreement with global satellite network services provider, ITC Global. Under the agreement Optus will provide ITC Global with expanded satellite capacity, equipment hosting, up-linking and downloading services via its major satellite facility, located in the northern Perth suburb of Lockridge, Western Australia. Optus' Lockridge facility is both a domestic and international gateway for satellite services across Australia and regions to the west, around the Indian Ocean and into Europe.

SES Leases Two Brazilian Orbital Slots

August 18, 2014 - SES DTH do Brasil has signed with Anatel (the Brazilian National Telecommunications Agency) the Satellite Exploitation rights terms for two Brazilian orbital positions (48 degrees West and 64 degrees West). The Anatel auction took place in May of this year and the execution plan documents were under review and were the driver for the time being the auction and the signature. As of the publication of extracts of the rights terms, SES will have four years to make definitive capacity available at 48 degrees West and six years to make definitive capacity available at 64 degrees. At the 48 degrees West orbital position, SES will focus on multiple uses (FSS model - Fixed Satellite Services) and will operate in C-, Ku- and Ka-bands. The 64 degrees West orbital position will be exclusive for direct-to-home use (BSS - Broadcasting Satellite Services). The exploitation rights are valid for 15 years, renewable once for the same period. SES invested a total of R$ 59.8 million (approximately EUR 19.65 million) for the positions.

SES to Deliver DTH Broadcast Services in West Africa

August 18, 2014 - SES will be delivering direct-to-home (DTH) broadcast television across French-speaking countries in Sub-

SATELLITE INDUSTRY NEWS

Saharan Africa for the Lomé-based consortium of West African broadcasters led by Africable and Media Plus. The multi-year contract for two transponders will allow the new platform to deliver direct-to-home (DTH) television from its Bamako Teleport to member countries of the West African Economic and Monetary Union (also known by its French acronym UEMOA). The roll-out begins on 1 October 2014 across Mali, Burkina Faso, Ivory Coast and Niger. SES will provide the satellite capacity on its SES-4 satellite located at 22 degrees West, the company's prime orbital slot for Francophone sub-Saharan Africa, providing 100% audience reach from urban to non-urban areas.

China Launches HD Earth Observation Satellite

August 19, 2014 - China successfully launched its most advanced earth observation satellite, the Gaofen-2. The Gaofen-2, the country's second high-definition satellite in orbit, was launched from the Taiyuan Satellite Launch Center in north China's Shanxi Province by a Long March-4B carrier rocket. It is China's most advanced high-definition Earth observation satellite, and is able to see a one-meter-long object from space in full color. It will be used for geographic and resources surveillance, environment and climate change monitoring, precision agriculture, disaster relief and city planning. The primary users of the satellite will be the Ministry of Land and Resources, the Ministry of Housing and Urban-Rural Development, the Ministry of Transport, and the State Forestry Administration. The Gaofen-2 is the second of seven satellites to be launched for China's indigenous high-definition observation project Gaofen before 2020. The project was initiated in May 2010.

Number of Ka-Band Satellite Internet Subscribers in Russia Exceeded Five Thousand

August 19, 2014 - The satellite network set up and running to provide high potential Ka-Band Internet access has enlisted the five thousandth active subscriber. Currently services are available in European part of Russia using the KA-SAT satellite (9 degrees East). Commencing from the first quarter of 2015, the service will be extended to residents in the Far East and Siberia and from the second half of 2015 the Ka-band Internet access will be provided in the Central and South Ural Regions of Russia. The network operation will be supported by the Russian two spacecraft, Express-AM5 that is already operating in the orbit at 140 degrees East and future Express-AM6 due to be launched in autumn 2014. This project is giving rise to a new market for Ka-band services to satisfy the growing demand for affordable satellite Internet services from individuals and businesses. The average speed of user access to information resources is 6 Mbit/s. The monthly average internet traffic per terminal is more than 8 GB with the total monthly traffic exceeding 40 Tb. Services will be provided by the partners (distributors) of RSCC.

Arianespace to Launch Three Batches of Galileo Satellites on Ariane 5 ES

August 20, 2014 - Arianespace and the European Space Agency (ESA), acting on behalf of the European Commission sign a contract for three launch services with Ariane 5 ES in order to step up the deployment of the European navigation system Galileo, the European Union's flagship program. With this new launch contract and thanks to the performance of Ariane 5 ES, a total of 12 Galileo FOC (Full Operational Capability) satellites will be launched using three dedicated Ariane 5 ES launch-vehicles, each carrying four satellites. The Ariane 5 ES launches will take place from 2015 onwards. Arianespace will be responsible for ensuring all of the 22 FOC satellites manufactured by the German group OHB System alongside the British company Surrey Satellite Technology Ltd are taken into circular orbit at an altitude of 23,522 km using a combination of five Soyuz launch-vehicles (two satellites per launch) and three Ariane 5 ES launch-vehicles (four satellites per launch). The 22 operational satellites will join the four IOV satellites (IOV 1&2 and IOV 3&4) launched successfully by Arianespace from the Guiana Space Center back in 2011 and 2012.

2014

01	02	03	04	05	06	
07	08	**09**	**10**	**11**	**12**	

CALENDAR OF EVENTS

SEPTEMBER

08-12	**World Satellite Business Week** - Paris, France www.satellite-business.com
11-16	**IBC 2014** - Amsterdam, the Netherlands www.ibc.org
17-19	**VSAT 2014** - London, U.K. http://vsatevent.com/
18-19	**International Satellite Symposium 2014** - Bangkok, Thailand www.satellitesymposium2014.org
22	**APSCC 2014 Satellite RF Interference Mitigation Meeting** - Phuket, Thailand www.apscc.or.kr
23-25	**APSCC 2014 Satellite Conference & Exhibition** - Phuket, Thailand www.apscc.or.kr
25	**SDA & IRG Workshop** - Phuket, Thailand www.apscc.or.kr
29-30	**Telecoms World Middle East 2014** - Dubai, UAE www.terrapinn.com/conference/telecoms-world-middle-east/

OCTOBER

09	**2014 Hosted Payload Summit** - Washington DC, USA www.hostedpayloadsummit.com
15-17	**Broadcast India 2014** - Mumbai, India www.broadcastindiashow.com
23-24	**2014 Joint Conference on Satellite Communications(JC-SAT 2014)** - Busan, Korea www.kosst.or.kr/JC-SAT/2014
27-30	**CASBAA Convention 2014** - Hong Kong www.casbaaconvention.com
28-30	**China Satellite 2014** - Beijing, China www.china-satellite.org

NOVEMBER

04-06	**Global MilSatCom 2014** - London, U.K. www.globalmilsatcom.com
19-20	**Oil & Gas Communications South East Asia 2014** - Kuala Lumpur, Malaysia www.uk-emp.co.uk/current-events/o-gsea-2014/
19	**Myanmar Satellite Forum 2014** - Yangon, Myanmar www.communicastmyanmar.com

DECEMBER

02-05	**Asia-Pacific Regional Space Agency Forum (APRSAF-21)** - Tokyo, Japan www.aprsaf.org/annual_meetings/aprsaf21/meeting_details.php
07-10	**ITU Telecom World 2014** - Doha, Qatar http://world2013.itu.int/

ADVERTISERS' INDEX

3rd Quarter 2014

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APSCC 20th Anniversary

APSCC is a non-profit, international regional association representing all sectors of satellite and space related industries. APSCC membership is open to any government body, public and private organization, association, or corporation that is involved in satellite services, broadcasting, manufacturing, launch services, risk management or associate fields such as datacasting, informatics, multi-media, telecommunications, and other outer space-related activities with interests in the Asia-Pacific region.

APSCC aims to exchange views and ideas on technologies, systems, policies and outer space activities in general along with satellite communications including broadcasting for the betterment of the Asia-Pacific region. Conferences, forums, workshops, summits, symposiums, and exhibitions are organized through regional coordination in order to discuss issues that affect the industries and to promote and accelerate the efficient introduction of outer space activities, new services and businesses via satellites.

In order to disseminate industry related information, APSCC publishes a quarterly satellite magazine as well as a monthly e-newsletter, which are distributed worldwide to members and others. The quarterly magazine and other publications are available on the Web at www.apscc.or.kr.

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