Kratos and Kacific: Partnering to connect the unconnected in Asia Pacific

Delivering high-quality, accessible bandwidth to individuals living in remote locations with challenging terrain is a daunting proposition, particularly in the "Ring of Fire" which includes Indonesia and the Philippines. Fulfilling that need at the affordable price points defined by UNESCO and ITU presents even more of a challenge. Kacific Broadband Satellite Group and Kratos share the story of how they were able to accomplish those goals and potentially improve the lives of more than 600 million people across 25 countries in the Asia Pacific region.

Crispin Littlehales, Executive Editor, Satellite Evolution Group

On December 26, 2004, a tsunami devastated coastal communities in 14 countries in the Asia Pacific region killing 227,898 people. Christian Patouraux, then a consultant in the satellite sector, was caught in the midst of that disaster, and the memory of it informed the founding of his company, Kacific Broadband Satellite Group.

"I put together a humanitarian action with a couple of friends to rebuild the livelihood of some of the fishermen," Patouraux recalls. "We were helping fishermen rebuild boats, but I realized that there was more interest in the internet in my office."

That started Patouraux thinking about the massive need for internet access in the numerous rural and remote areas in many parts of the Pacific and Asia. Buoyed by the support of a small group of friends, a half million dollars in seed money, and 28 years of experience in the satellite industry, Patouraux began building relationships with operators, manufacturers, and potential customers. These efforts paid off, and eventually Patouraux partnered with Boeing to design and develop the company's first satellite, Kacific 1, which was launched into geostationary orbit atop a SpaceX Falcon 9 on December 16, 2019—fifteen years after the tsunami.

WIND, RAIN, AND FIRE

The Asia Pacific (APAC) region is characterized by mountainous terrain and expanses of water between the many island communities, which makes it impossible to serve using fiber or microwave. "The terrain is too difficult and the demand per activity center is not large enough,"

Christian Patouraux, CEO, Kacific ●●●

explains Patouraux. "What you have with broadband satellite is the ability to pinpoint a beam at these activity centers. You just put a small beam of high-power connectivity for a two-way communication exchange. By pinpointing those beams to match the various pockets of demand, satellite is able to compete with all the terrestrial systems."

According to Patouraux, Kacific 1, which has 56 spot beams, also complements the terrestrial systems located in major cities. "The internet is not very resilient, even in the middle of capital cities and we have about 15 percent of our customers using our services for backup," he notes.

"We live here in what is called the Ring of Fire. There are volcanic activities, earthquakes, landslides, and tsunamis. Now with global warming, we have typhoons and

John Loke, CTO, Kacific ●●●

Kacific Teleport at Broken Hill, Australia ●●●

tropical cyclones. Communities, cities, and regions here are vulnerable to such disasters and satellite provides an excellent response to that," says Patouraux. "The speed of deployment is a critical attribute of satellite in the aftermath of a disaster," he adds. "You have no connectivity, and you bring a terminal, install it in half an hour, and, in some cases, just push a button and the motorized system points at the satellite, and you have connectivity within two minutes."

THE RIGHT STUFF
Of course, putting together a robust cellular network from space that provides a high level of frequency reuse means having the right technologies in place. "You need to have a very large amount of bandwidth repeatedly pushed through a high throughput satellite in order to meet the price points that will be palatable to the market you're going after," Patouraux explains. "We also wanted to serve every area of a large country like Indonesia with the same quality of service, and that meant we needed to match the power of the satellite with an equivalent ground system.

"We had to make sure that the ground system would not give us problems and that the technology on the ground would match the technology of the satellite. We pushed the envelope a little bit further in order to try to scrape the bottom for whatever additional efficiency we could get," Patouraux remembers. "That was important for us because we wanted to push the prices down and have a higher volume."

The other goal was to de-risk the project as much as possible. "We wanted to work with world-class operators and world-class manufacturers to ensure the level of quality and resiliency that we needed as well as to establish the reputation required for the project to be seen as reputable," adds Patouraux.

Kacific's relationship with Kratos evolved early on in the company's history, growing sporadically during interactions at various industry gatherings and culminating in a contract whereby Kratos would build the end-to-end ground infrastructure for Kacific's new network. "I'd like to think that Kacific came to Kratos based on our experience and recommendations they had received from other

parties," notes Mark Lambert, President of Kratos Communications, Ltd. "We had installed many gateways in numerous countries around the world and we knew how to import products into the countries that were of interest to Kacific. Our approach to the project was to help all the way through the entire process. We were willing to discuss, to share ideas, and to compromise where necessary—to work together as a partner and deliver the optimum system."

TREAD CAREFULLY
The selection of the gateway location for Kacific included several important factors. Notes Patouraux, "You have to work with the locals and the culture of those communities. As you provide the internet, you're going to disturb the status quo so you must be prepared to work that out with members of each community.

"When you choose a teleport location, you need to make sure that for the next 15 years, this is going to be a home for these very expensive and delicate machines," he continues. "You want to put them in an environment where they are going to be well-connected, well looked after, and where they are going to be able to express their resiliency."

Kratos worked with the team to conduct site surveys of several different potential sites and helped Kacific work through their decision process as to which would be the premium locations. "Compliance with each country's regulatory requirements was a priority," states John Loke, CTO for Kacific. "For instance, in order to operate in Indonesia, we needed to establish a local telephone operation to meet the specific regulatory demands. Additionally, we sought to partner with hosts with existing infrastructure, such as diesel generators, uninterruptible power supply (UPS) systems, and incoming fiber connections."

In addition to five 9-meter antennas, Kratos supplied a complex suite of interconnected hardware and software components including:

- EPOCH® - the industry-leading C2 solution for real-time satellite command and control and payload status monitoring
- XR1 TT&C Modem – for RF signal processing of downlink data from the Kacific 1 satellite
- Monics® - for centralized RF monitoring and interference detection across the entire network
- Compass® - to manage, monitor, and control a wide range of devices on Kacific's network
- SpectralNet® - digitizers employed at each gateway location to convert RF signals into IP packets for transport over Kacific's IP network
- Skyminer – for real-time situational awareness tying performance data together to optimize operations over time

*Table 1. **The Advanced Satellite Ground System**. Source - Kratos* ●●●

Photo courtesy Kacific ●●●

The weather was also an issue. "Many people laughed at me when I tried to set up the first Ka-band system in Southeast Asia, which is notoriously rainy," recollects Patouraux. The solution was to strategically place teleports in the Philippines and Indonesia about 60 to 70 miles apart. The next challenge was to figure out a way to connect the locations by pushing the traffic through fiber between the teleports and switching between locations seamlessly when rain would hit one of the two places. "Kratos was able to deliver just that with the novel system they gave us in the early days," says Patouraux.

MAKING IT WORK
For each gateway, Kratos had to find a balance between performance, cost-effectiveness, and ease of maintenance to support the reliable and efficient operation of the satellite system. An on-site engineer was responsible for ensuring the installation process was carried out smoothly and efficiently.

"Operating a large antenna necessitates a reliable tracking system to ensure optimum performance. The ability to track and maintain alignment with the satellite is vital for consistent and high-quality signal reception," explains Loke. "Antennas that had easily replaceable parts and simple maintenance requirements were preferred so that any necessary repairs or replacements could be carried out swiftly, minimizing downtime and ensuring continuous operation."

Beyond the antenna hardware and digitizers, Kacific employed a suite of additional products to assure optimal operations and quality of service (see Table 1). According to Lambert, "These products provide advanced monitoring and control of the ground system and the satellite, supply information about signal quality and interference, as well as analytical on the entire system so that the Kacific team can operate their network with real-time information and in a constant state of operational improvement."

From when Kacific approached Kratos to when all five gateways were built and functional was about a year and a half. All the Ka-band gateways have been fully operational for five years and each works as anticipated. Lambert attributes this success in part to the fact that Kratos approached the project with extensive advance planning of logistics and work packages, including

extensive testing at Kratos' facilities before the equipment was taken to the gateway sites. He explains, "We like to involve the customer at all project stages with regular technical reviews, status meetings and a collaborative approach to overcoming any issues."

PASSION AND GRIT
Essentially, Patouraux started with a quest driven by what he knew was a desperate need. To get from that notion to a robust, reliable, and affordable broadband satellite network has been a remarkable journey. How, one might ask, did Patouraux manage to stay the course and deliver Kacific's service at such a low price?

"It's extremely difficult to actually make money through addressing the digital divide. You will need a lot of grit and tweaking of your business plan," stresses Patouraux. "There is a lot of back and forth, a lot of heartaches and headaches and you must be prepared for that. Eventually, it pays off because the grit gives you the competitive mode around your business. Once you've pushed through that and you have all the requirements in place, nobody competes with you."

Patouraux conducted some primary research where he talked to people. The result of these discussions resonated with what he believed—that there was a demand big enough to fill the satellite's capacity. "Once you believe in the demand and the market you go after, then you can set a much lower price," he emphasizes.

"It's volume times price. You need to be able to produce that volume on the satellite with your ground system," he continues. "We streamlined our entire business around that price and went as far down the value chain as possible. You need to find a business model where you can have customers that are a bit higher up the value chain, as well as another business model where you allow yourself to go down the value chain on the side of your more established customers, without competing with them. We managed to do this in order to push the volume."

According to Patouraux, there are now more than 3,000 connected education institutions, including elementary and primary schools as well as tertiary education in rural areas and on the outskirts of cities. "That fosters a better societal fiber with people receiving a better education where they live, and it also fosters gender equality since both boys and girls are receiving the same instruction," he notes.

Kacific's network also connects 1,000 healthcare institutions, dispensaries, clinics, and even large hospitals. "The estimation is that we must have saved in the order of several thousands of lives just by sometimes calling for medevac for critical cases, sometimes for a nurse to be able to call a doctor in the city, and sometimes simply via WhatsApp or Facebook Messenger," claims Patouraux.

Today, Kacific 1 connects up to 500,000 end users in 25 countries, and they have access to online education, healthcare, and the means to accelerate their economic development. External consultants who have reviewed exactly what Kacific provides confirm that by delivering affordable bandwidth—the per gigabit cost is less than 2 percent of Gross National Income per capita—Kacific is indeed changing peoples' lives dramatically. ●