Constellations Podcast

Special Episode 2/3 – The New HTS Business Model, Importance of Automation and Leveraging Digital Payloads

Speaker: Stuart Daughtridge, VP of Advanced Technology for Kratos – 40 minutes

Stuart Daughtridge: Okay, well I hope everyone enjoyed the afternoon snack. I certainly did and had way more than I should have. I'm really excited to moderate this panel. Basically we're going to talk about HTS satellites and how is that different or is it different and what is its impact on your operations environments. I have a very distinguished panel and what I'm going to do is let each panelist introduce themselves and then do a quick introduction and then I'll get into the questions.

Steve Cooper: Steve Cooper from SES Networks, responsible for connectable payload within our product line management team.

Bob Potter: Bob Potter from Kratos, I'm responsible for introducing new technology into our satellites.

Tobias Nassif: Tobias Nassif from ViaSat responsible for the operation of the ViaSat fleet of satellites one day.

Tom Leisgang: I'm Tom Leisgang from SSL and my current position is I'm actually the mission systems engineer for RSGS but I previously was the technical director of ground systems and I did the NBN Co. high throughput satellite ground system.

John Loke: Hi I'm John Loke from MEASAT from Asia. Actually, it's three o'clock in the morning my time so if I'm speaking something out or the topic is off I'm sorry about that.

Stuart Daughtridge: Let's see. I realized I didn't introduce myself. I'm Stuart Daughtridge, VP of Advanced Technology for Kratos. Toby asked that I start with him.

Steve Cooper: The middle you don't start in the middle.

Stuart Daughtridge: The first question or where I want to start the panel and basically start off with how does an HTS satellite impact your operation environment and what is it about HTS satellites that are different or have an impact on your operations?

Tobias Nassif: I think from a bus operations perspective of flying the bus and keeping the satellite healthy there isn't too much of a difference from that respect. You're still going to do to how trending your telemetry, you're still going to send the commands but as we're finding the rate of commanding and the amounts of commands unless your payload has a separate command path, a separate

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command processing capability you are now time sharing what used to be in a traditional fixed FSS type satellite where you had Y beam you made a payload change once a month or so or twice a month depending on the services you're bringing up.

But with HTS satellites, channelizers et cetera you're constantly changing the configuration of payload and that is really now working out how to timeshare between your bus operations and your payload operations and really making sure that if you have to take 20 minutes to do a maneuver or do some sort of bus operation what is the impact on your business end and the payload side so as we're working through that now and coming up with the design and ViaSat-3 we're seeing that there is some traits and I'm sure the others that are flying the HTS satellites are seeing some of the same kind of things.

Steve Cooper: Yeah, absolutely. I think some of what we've seen particularly as we introduce our HTS fleet it's really obviously increase in scale were huge. Huge increase in scale anywhere from the number of customer interactions we have particularly with kind of key customers who are perhaps using HTS for the first time maybe for more challenging applications, for aero for example. The number of monitoring points that we've had to deploy recently to support the HTS satellites that we brought on stream so far has more has doubled our global ground monitoring and we're obviously expecting that to increase as we introduce SES-12 next year and SES-17 in a couple of years' time.

On the MEO side of the house we also have like another complexity because there literally are many, many moving parts but on the MEO side and handling all of that scheduling so in addition to what you were saying about having to schedule DTP and that kind of thing, needing to schedule antenna movements on the spacecraft, on the ground, the related hub systems and network systems that's a whole lot of moving parts that need to be kept in sync. That's one of the biggest challenges we're seeing and really looking at starting to introduce more and more automation to really get that as streamlined as possible because otherwise things just wouldn't scale.

Tom Leisgang: Got thoughts on it. I thoroughly agree with my colleagues here. Automation is probably going to be one of the key elements that you're going to want to look at on a high throughput satellite. That along with the necessary feedback that you would need to get from your monitoring system and the user terminals so that you can provide an optimization and actually optimize the spacecraft and try to reduce the amount of times that you have to adjust it because you can do a prediction.

I know that for example, on NBN Co when they were rolling out they sized it for 20 but they basically set it up for 20,000 user modems and didn't have to go readjust until they were at their 20,000 when they needed to deploy additional

modems. That was a good approach to use because it cut down on the amount of payload adjustments that had to be made.

Stuart Daughtridge: Bob.

Bob Potter: Sure. I think from a Kratos perspective to Steven's point we've had to lower the cost of our end point monitoring. You think "Oh yeah, everybody's going to buy more monitoring sites, whoop-dee-do" but it's not that. There's only so much money. I don't think there's any more revenues from an HTS satellite than there is from a traditional satellite and so we have costs that have to be kept under control. We've had to respond to that in what we have designed as product for our customer base in lowering the cost, making them smarter and to Tom's point, I think automation has to be there because if the money is the same and you have an order of magnitude increase in complexity the only way you can keep managing that and still make money is to automate and so we're seeing that in what we're doing and why we're putting emphasis on products like Skyminer for business analytics and prediction so that when we start automating all the services that we do.

Stuart Daughtridge: John was trying to let you get a little rest in there but you're ready.

John Loke: I think Bob should be the last one to mention this because what I have in mind was actually that today we're operating a HTS satellite and Thaicom 4 for IPSTAR 1. We've been operating since 2011 itself as a KU hybrid payload itself that key collects challenges that we actually have from operation because it's a smart beam. So we have about six spot beams here ourselves and actually monitoring other remote services to performances site and that's on the ground side. So today the traditional FSS that has served as a single transponder is easy to actually determine the health of the RF, but with HTS you have a circuit transponder for the forward in the region.

It means that you need to really deploy more spectrum and stuff at the remote side just to figure out what's really happening on the services itself. I think because we are operating from the tropics itself, the other challenges that we have on HTS is actually that we have to operate with a diversity side which is a two station operation. And we have studied that the range of the cloud is not more than 40 kilometers so we need to have cable the size itself our position not more than or more than 40 kilometers in terms of separation. That's additional equipment, additional side for us to actually manage and to monitor itself and to control.

So we moved to actually have a consolidated into a single platform. I guess most of the gentlemen here are saying that to automate it is easier for us to monitor the whole system with half the software. And I guess the other tricky

part is to make sure that when it switches from one side is leaning to the other side so it switches back and you do stuff yourself- it has be done seamlessly. Such that all traffic that is loaded on the satellite itself will be operational when you switch.

The third thing we from the ground segment saw with HTS is that the challenge for operation is probably from the remote terminal interference. I think that is something that we're trying to find ways to look around because you have multiple spot beams and just say for instance one spot is up here 10,000 to 12,000 sites that are operating from it. Just to catch one side is going to be the culprit. It's going to be a challenge.

Stuart Daughtridge: Thanks. A lot of you mention automation and so what I'm curious; I think about automation now. I'm wondering what features in the HTS satellites are having or going to impact the ground the most? Is it the number of spot beams? Is it the flexibility? Is it the fact that you can move the spot beams? Is it the fact that you can move power? What is it the feature set either in the current HTS satellite or in future HTS satellites that you see coming down the road that were the biggest impact into your operations?

Steve Cooper: I think it's certainly for us we're doing a lot of planning for introducing more services that will use the digital payloads so routing anywhere to anywhere that kind of thing. We have that on our SES-14 and SS-12, SS-17 launch in a couple of years will be completely digital and then ,more power or have a huge amount of flexibility but with that comes obviously complexity because a service that may have been served from one uplink might be served from a different uplink, might be served from a different network, might even be served from a different constellation so being able to keep that scheduled and I think it's going to be the introduction of those digital payloads. It's certainly going to have a huge impact on the ground operation.

Stuart Daughtridge: Anybody else want to add to that or?

Tom Leisgang: I'll affirm it. The complexity available from the digital payload which is actually flexibility to the customer translates into a really unique control situation where your customer may want to control the payload from multiple sites and coordinate bandwidth between those sites so that's turned out be a completely independent system in order to run the payload that's not even associated with running the bus and I know that in some of the cases that we're looking at SSL there is a separate payload command essentially system that's on board the spacecraft just for handling the digital payload and we've also developed a suite of ground software just for handling the digital payload because it just doesn't fit into any other model. It's so tightly coupled you have to design and implement it as a full set.

Stuart Daughtridge: Toby mentioned basically it sounded like he had inband commanding and you mentioned they have a separate command link. You think there's one way better than the other? The better to have a separate command link for the payload or is it inbound just as good or?

Tom Leisgang: I think having a separate command link would be fun. Again it will depend on the payload and how dynamic the payload plans to be but were they fully flexible payload where you can move power anywhere, you can create spot beams, take down spot beams and move it around. If it is truly that dynamic and it remains to be seen, a lot of systems have been touted as being dynamic and they're fairly static but if you're then having that kind dynamic action and trying to do your housekeeping commanding you run into those conflicts that could impact either health of the spacecraft or revenue. I think if you had a separate command path where you can decouple that and take away those the contention I think it is good but that's part of those people were designing. Need not have been thought through in some cases. Obviously some have but I would prefer that.

Steve Cooper: I think a detectable payload while it adds a lot of features for the customers it adds a lot of complexity at least on the monitoring side. There will be on board monitoring. How do you get access to that data? There will be more monitoring points through the payload as we're looking at it and how do we then bring that into a single point of glass that will actually make sense and that's one of the challenges. But it does actually give you the ability to manage interference the same on a traditional sub level pretty reactive. We were waiting for something to happen and then we have tools that go and find interference capture it and locate it and so on. But I think on the flexible payload we now have the ability to manage around interference or should have the ability to manage around interference and keep the services up essentially avoiding interference but essentially what the terrestrial guys already did with their satellite.

Stuart Daughtridge: Not allowed.

Steve Cooper: Yeah.

Stuart Daughtridge: Another topic that you guys have mentioned a lot is automation. So I'm curious basically how much automation and where do you see the automation impacting your operations. Where will you be investing? And the other thing is if one of their technologies do you think you're going to be bringing into your operations to help you deal with HTS satellites.

Tobias Nassif: I think the first part of automation will be just in creating those payloads configurations and changing it to how the concept of a network operations, virtual network operators that visibly can come in and create their own services

and take them down. Unless you have a system that can autonomously service a number of customers at the same time fulfilling their requests you have to have an automated system that will do that. You can't just have a manual staff sitting around taking in change requests and payload reconfigure request from potentially thousands of customers. Getting that system built, getting it deployed, keeping it up and going I think is obviously a major change and I see since I've only been at ViaSat for a year and a half now but there are more software engineers in the company than there probably anything else at this point and the software end of an HTS operation I think others can attest to is really in something that is critical and probably the most underestimated, like any software project is, underestimated effort in trying to bring the services online.

Steve Cooper: I think one of the areas that we've been investing recently but and certainly and a lot of discussions with a lot of our venders and partners is the automation of the entire service. A lot of our customers are looking at the ability to be able to turn up services on demand particularly when we start looking at things like mPower and that's great if we can crack that on satellite side but that's not the only part. They're really Interested in the entire process form where they may hand over at corporate headquarters or some data center all the way through to the remote modem and even possibly be on that so it's time all of those different systems in together rather than having one system for one part and one system for another part. That's really where we're trying to get to is to have a consolidated view of the whole service and be able to provision a service in one go.

Stuart Daughtridge: Right. So across all your platforms?

Steve Cooper: Yeah.

Stuart Daughtridge: Okay. We have a question from the audience. If you were to operate geo satellites and NGSO satellites would you recommend a unified control system or separate control systems?

Tobias Nassif: A unified. And I'll add why. Just a simplicity of your operation for those of knowing that Intelsat, PanAmSat where we had seven, eight control systems on the floor. When I was there, there was a concerted effort to try to reduce that. So from seven or eight I think we went to nine but it adds complexity and training of your operators train or engineers to learn all those different systems. If you're able to do a consolidated single system which shouldn't be difficult because LEO, MEO, Geo operations are essentially the same. You're doing the same functions it's just an issue of timing really when you have a pass for a LEO and again if you have interconnect satelinks you have always on telemetry it's really no difference. A unified system keeps your training simple, keeps an operation cost much lower maintaining one system than multiple.

Steve Cooper: I think that some of the discussions that we had yesterday about trying to move towards a single bus essentially for whether that's MEO or GEO or LEO is going to drive in that direction being able to have fewer and fewer control systems.

Stuart Daughtridge: Makes sense. Another question from the audience was how to automate an HTS payload reconfiguration with an extremely dynamic scenario. I'm assuming what they're meaning like a mobility case for your doing aircraft and thunderstorm over at New York reschedules 80 aircraft for an hour. How do you handle that in your automation and operations?

Tom Leisgang: Let's see. I had a comment for the previous thing. One of the technologies that SSL did with the digital payload was to, on the ground controller side, adopt a micro service architecture so that they could do it and within the micro service architecture that happens to be a resource manager whose purpose is just to do what exactly you're talking about and be able to schedule the resources of the digital payload so that they could beat the demand requirements. Then one of the other things there that's also really important especially for satellite operators was the ability to do a trace back audits and they could go through and do the billing that was necessary for this payload that's jumping around because as you move bandwidth around you have to be able to track it so that the customer that's demanding extra bandwidth can be built for it.

Stuart Daughtridge: That makes sense. Anybody else want to tackle the question or?

Tobias Nassif: Good software.

Stuart Daughtridge: Good software.

Tobias Nassif: Lots of it.

Stuart Daughtridge: What other technology do you see impacting operations? For example big data analytics, other software technologies, things like that that you see any of those things becoming more of a part of your operations.

Tom Leisgang: Certainly cloud services.

Tobias Nassif: I think big data analytics in a flexible dynamic payload will be pretty key to starting to be more predictive in what you're going to need and where you're going to need things. If you start analyzing where your traffic has been, where it seems to be trending to you can start reconfiguring that service maybe earlier. So I think the more you know the more you're able to understand what situation you're in the better you can be proactive rather than reactive.

Stuart Daughtridge: So Tom, you mentioned cloud services.

Tom Leisgang: Yeah, basically the cloud based architecture is actually pretty solid and pretty secure and pretty reliable and I don't know if you ever looked but Amazon Web Services is guaranteeing four nines for a very low price. It's difficult to beat that in your own data server environment. That's like eight hours of downtime a year.

Stuart Daughtridge: Yeah. I mentioned during my presentation that was actually another factor in our move of wanting to move our testing to there is because it's just hard keeping our own environment up into their level of service that they could offer. So I'm curious for the satellite operators on the panel which of you or would any of you consider moving to a public cloud part of your infrastructure or are you already thinking about it and if not are you implementing a private cloud approach?

Tom Leisgang: We're certainly doing a mixture.

Stuart Daughtridge: Are you already?

Tom Leisgang: I think I can say it's continuing that way certainly. A lot of the ground systems that we use the hubs, some of the modern systems that we're starting to see are moving more towards a- if you like private cloud kind of approach where you're centralizing a lot of functionality and that's going to be particularly key when we're looking at the more flexible payloads, more uplinks involves. Just cutting back on the vast amount of what needs to be deployed at each of those gateways. So centralizing that in some way private/public cloud I think that's certainly where we're seeing things happen.

Stuart Daughtridge: For that one case what are you willing to put in public cloud and what do you keep in the private cloud?

Tom Leisgang: I think it depends on the application. I mean obviously security is a big concern and reliability. I suspect a lot of it is going to be driven on service by service type basis and also really a capability clearly putting a modulator in the cloud is going to be pretty tricky. But all the back end processing systems associated with that absolutely. But whether it's private or public I think it really depends. I would say it's not necessarily so much handing over that responsibility to somebody else it's just where it makes sense to aggregate if it happens to be a public service I wouldn't say necessarily a public cloud but from some other partner then if it fits it's certainly something we consider but that's not something we actively do today in the cloud service path.

Stuart Daughtridge: Okay. Toby.

Tobias Nassif: I think it's as you were saying a mixture of public private cloud services I can't really speak to where we're putting our stuff but I know we're using a combination of three. I don't know what's going where but it does seems to be the more we work the more of a push towards a cloud of some sort is happening.

Stuart Daughtridge: John.

John Loke: I think it makes sense because nowadays you have too much data. It makes sense for you to actually have centralized way of monitoring it. We already are operating on a high big kind of concept- and so why? Because some of our end customers today so far- they want to know what's happening to their terminals, they want to know what's happening to their services. That kind of data itself is customer facing. We prefer to put in as an external cloud and where we actually find that the data is much more sensitive for us to look at and analyze it so we keep it in our premises. I think that's a way forward because it makes sense and it drives the cost down overall.

Stuart Daughtridge: Tom, from your guys perspective you guys do with your development environments and anything that you do much in the cloud? A public cloud I mean?

Tom Leisgang: We're moving almost everything there.

Stuart Daughtridge: Yeah. Just I noted funny when we first started looking at the cloud. We had a lot of concerns about security and all that and then we started looking at that and then realizing how much of our corporate infrastructure within the cloud for example if you have Salesforce as your CRM system well guess what? All your customer information, everything is in the cloud. A lot of the HR systems that a lot of companies use that are very popular. They're all in the cloud so all of your employees' private information is all kept in the cloud. All of a sudden we realized whether we wanted to or not we were already in the cloud and we just hadn't really realized it.

Tobias Nassif: No telemetry in the cloud.

Stuart Daughtridge: What's that?

Tobias Nassif: No telemetry in the cloud.

Stuart Daughtridge: Another question from the audience. With many beams on HTS is there other alternatives for monitoring besides putting monitoring equipment on each beam? Anything that can be done on the satellite level. Bob I know you know.

Bob Potter: Well, it already happens so some satellites have already got on board sampling and we have built what we call the single receivers which receives information coming up from the satellite and then we can analyze and then match it up with the plan which we'll be told about. We can get a complete view of all the uplinks, of all the beams. It costs money upfront as we thought upfront because as we designed into the satellite there is a way of managing the beams set from a central location. You get extra flexibility when you have that kind of capability because now with a digital payload then if you have interference in the beam then you can route it or make a copy of it and send it to where you have analysis tools. So you don't have to have monitoring in every beam. Would be nice because that's what we do, right? But you don't have to. We realized that we need to be smarter about the way we do things.

Stuart Daughtridge: Anyone else? Any other ideas on answer to that question or is that pretty much the primary way to deal with it?

Tom Leisgang: Depending on what modem you're using you may be able to pull information from the modem as well so that it would supplement your monitoring.

Stuart Daughtridge: Yeah. So the next question clearly for Toby. I don't know if you can read it Toby but.

Tobias Nassif: No, I can't.

Stuart Daughtridge: Okay. Through many conversation that we keeping brought to my attention ViaSat's a wonderful place to work. With that being said are you hiring?

Tobias Nassif: Yes we are.

Stuart Daughtridge: Who did you pay to put that up?

Tobias Nassif: Anonymous.

Stuart Daughtridge: Oh, that's what you're doing on your phone? For geo location on HTS beam it's even more challenging and finding a paired satellite et cetera. Any practical solution? Toss that one to Bob again.

Bob Potter: Well, we've actually done geolocation on HTS satellites so yes, there is a practical solution. The capability I mentioned just now which is the ability to then route a signal to a place where you have the right equipment and then you need a conventional satellite next door or adjacent to it but even if you had multiple HTSs with a flexible payloads you could then be have a cooperative payload to configure it to be suitable for two satellite geolocations. That being

said that's not necessarily always practical and we are actively pursuing and looking at single satellite location techniques which involved the data.

Stuart Daughtridge: Tom, I know there are some things you can do in designing a satellite payload to help in this area.

Tom Leisgang: Yeah, but I'm not sure what they are.

Stuart Daughtridge: Okay. I know there are so theoretically if you have a beam forming antenna on the satellite the satellite itself can do the geolocation based on the payload design. Let's see there's another question. Are any of your operations environment merging satellite bus operations and payload operations and if so what are the challenges to overcoming that merge.

Tom Leisgang: We are planning and doing that as we stand up the operations be much more involved with the payload side than previous saying the straight bus operator. And that's where we're going into how do you share the base of one command channel command link between the two sides? You still need a single point to deconflict those operations. We'll see how this cell rolls out as we're trying to put together the system and trying to still define different roles and responsibilities from where the human interaction is, where the automation is to ... Well, the system will check itself out and will take care of everything and this reminds me of Skynet, Terminator's coming one day. But the plan is to more integrate operations and would have been on a traditional sense.

Stuart Daughtridge: Okay. Steve what do you guys do?

Steve Cooper: We certainly bringing them lower closer together. I may think that the bus operations and payload they're still certainly separate today but they do work very, very closely together and I mean as we're bringing on the more digital payloads and particularly with mPower but getting more involved in a very close working between those two groups and the systems involved. You know very going to be tied together so I can see that happening at the time.

Stuart Daughtridge: Okay. John.

John Loke: Today it's separate. I think we're working towards unifying data so and looking for a single platform to actually match both the satellite operation as well as payload operation. I think that's something that's beneficial in the long term.

Stuart Daughtridge: Where are the polling question for the audience? Did any results on that? The question was basically how much automation people expected to implement over the next two year with one being basically little or no change, five being full automation and it look like everybody went the medium sized middle of the

road and basically says they're going to do some but clearly they want to use some automation but not go to a full automation. It's really interesting.

We're getting relatively close to the end of our time. One of the questions I wanted to ask or have you address is if you had one or two pieces of advice who was looking at buying an HTS satellite in the near future and wondering what they should consider particularly on a potential impacts on their operations or what they should think about as they buy it what would that be?

Steve Cooper: I'd say be really clear on what services you're going to be offering assuming you're going into that kind of route and what applications your customers' going to be using. Is it error? Is it COMS on a pause? Is it all going to be fixed and trunking? There's definitely some tradeoffs with each and more or less complexity with each of those so I think really understanding the end application's kind of key.

Stuart Daughtridge: Okay. Bob any?

Bob Potter: Yeah, I'd like to point out the flexibility of the payload. One thing you'll be certain is the plans will probably change by the time you design your satellite in the first place to the time it's launched it will have changed and then by the time after a couple of years operations it's probably changed again. Such is the nature of the world. You have to have flexibility to able to pull bandwidth where you need it as systems evolve.

Tobias Nassif: Well defined set of documentation on what you have to build.

John Loke: I think you should have a roadmap. A very clear roadmap also because I don't think any company will have all the money upfront for you to let you build infrastructure to cater to everything from day one. Build infrastructure that actually is scalable that allows you to ... You have a baseline foundation yourself and you build over time and so then you don't spend your money at one go. Look out for technology which is improving out there. Be open minded and actually look at it and perhaps speak to Kratos first. It will be the one stop shop for all these solutions.

Tom Leisgang: I have to agree with that. As well flexibility also carries with it complexity and I would recommend that If you look at the way that you want to operate your system and talk to your satellite vendor and see what they can do to help you optimize the satellite to fit the way you need to operate your business because that will help determine how difficult or easy it's going to be to operate a flexible payload to get that done upfront then everyone will understand how it's supposed to work with the business model, with the way it's going to adjust and

how and you need to have something that a solution in space needs to match the solution on the ground.

Stuart Daughtridge: Okay. One last question is flexibility on the pick and the payload a blessing or a curse? We'll start with John Loke.

John Loke: I think it's a blessing because I don't think anyone has a crystal ball to actually predict the future. 15 years for geo satellite. That's difficult so having the flexibility and the payload's definitely a must.

Tom Leisgang: I think it's a blessing that just starts out as a curse.

Tobias Nassif: I think for the business end it has to be a blessing but from the operation side it's probably the curse.

Bob Potter: Definitely a blessing and I think it's the job of Kratos to actually minimize the curse.

Steve Cooper: I think it's actually a blessing certainly witnessed a lot more flexibility for the kinds of services we want to offer going forward.

Stuart Daughtridge: Okay. Excellent. And we're at the end of our time. I want to thank our panel and appreciate the great answers. Thank you.