The SSC communication experience-or-The Challenge in Building a global ground Communication network for satellite and space operations using the international telecommunication industry.

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Why build "your own" international communication network and what parameters and results are driving you and your company to pursue that vision? Analyses: Special demands for satellite and space missions, Price and quality issues, increasing demands of bandwidth, Creating knowledge for communication and specification towards our structure, **Project:** How go forward?, What is our goal?, What to do?**, Project lessons learned:** Huge price differences between International Telco's in different geographical markets, Concluding MPLS to be most effective platform to use internationally for space industry, International communication line structure (ICLS), Identifying SSC position in the international Telco's revenue and value chain, Important to Monitor communication quality 24/7/365, Today, Upside and Downside in actually kicking this project off into an operating structure, Afterword

Nomenclature

SSC	=	Swedish Space Corporation
EO	=	Earth Observation
ROM	=	Rough Order of Magnitude
SLA	=	Service Level Agreement
MPLS	=	Multiple Protocol Line Service
NREN	=	National Research Network
GS	=	Ground Station
PoP	=	Point of Presence
NNI	=	Network to Network Interface
VPN	=	Virtual Private Network
ICLS	=	International Communication Line Structure
B2B	=	Business to Business
SaMS	=	Satellite Management Services
GNS	=	Ground Network Services
SWOT	=	Strength, Weaknesses, Opportunities and Threats

I. Why build "your own" international communication network and what parameters and results are driving you and your company to pursue that vision?

AS SSC in 2007/2008 started its global expansion by investing in companies with mainly the same focus as SSCs SaMS Division, and thereby acquired a number of GS around the world, the focus on international communication increased. The division management asked me to look into what possibilities, if any, SSC had to actually "control" and "operate" fiber communication to/from these GS, and what risk and possibilities would be opened up for SSC.

As all Ground Station Services sold by SaMS need communication for their operation, it would have an impact on all services we sell if we decide to operate such a network. Security regarding communication is an increasingly important issue that SaMS are already looking into, as our GS network has been expanding and so far most of our clients have solved their own communication to/from our stations. Our clients with EO satellites are also expanding their communication interface volume towards our stations, and that indicates other issues for SSC and our GS. Last but not least, it would indicate an increased revenue stream possibility for SSC if we would pursue this new sales and operation area.

II. Analyses

Special demands for satellite and space missions

I got introduced to my co-author Mr. Thomas Niemi, who was newly employed in SSC as CIO, coming from Logica Sweden and with a good experience and knowledge of IT and communication. We started this analysis work immediately to try to understand where to actually start. There are very special demands for communication coming out from the space industry in general, and satellite operation and downloading in particular. So we started with the basic requests for any of our Ground Network Services just to understand the underlying demands for such services. Soon we understood that all ROM requests coming into SaMS are submitted approximately 3-5 years before operation. On top of that, customers expect this ROM to last for the same period. Another area was the time of operation, which can be between 5-15 years of operation. Fair pricing and very high quality demands are other areas that were covered in the space market's normal requests. These findings made Thomas and myself aware that we have a lot of ground to cover between us and the telecommunication industry, to even get close to a possibility to operate "our own network". A normal industry client in the telecommunication industry would have quite small communication needs connected to 1-15 geographical places and their request for ROM would be based on maximum 6-12 months prior to possible contract signing and maximum another 6-12 months prior to operation. Normal contract length is 3 years and then renegotiated.

Price and quality issues, increasing demands of bandwidth

What quality and price impact will it have on the communication that our stations are mainly located in rural and mostly non-populated areas? How to satisfy the space industry's need for low or fair price combined with high quality, low latency and high security in such a geographical context? Not to mention in comparison with their own chosen Telco? It becomes especially interesting to examine the possibility of building up a monitoring network and following fault handling.

Creating knowledge for communication and specification towards our structure

We need to understand on one hand what the space industry is accustomed to in regards to communication services and on the other hand what the telecommunication industry can deliver in regards to different technical platforms and structures, what is now, what is tomorrow, and what is best for us and our market? With above indications regarding capacity, SLA, price, latency and security, we didn't know which services we should focus on: Leased Line, MPLS, Internet VPN, or even NREN?

We thought that interfacing with one major telecommunication provider should give us a lot of answers regarding these services, their geographical coverage, strength, price and quality. But who shall we choose to interface with and is one really enough?

III. Project

How to go forward?

We started by contacting 5 major international Telcos. At the first meetings we tried to cover as much ground as we could in regards to the above. We concluded that the Telco's knowledge of our specific industry in general was quite limited, and our specific needs were not even "on the map" so to say. As we contacted their Nordic branches this was quite understandable. So we needed to start with an education in "space industry, what is that" and "satellite missions operating needs". After this quite extended education we asked them to recommend 2 different telecommunication services which became leased line and MPLS, and to quote us a ROM between 25 different geographically placed GS and 40 different client addresses globally. After several months of debating and polishing their ROM work before they were finished and actually quoted, we finally got our quotes.

This was followed by numerous meetings and discussions in regard to their findings, and all the anomalies we found in their quotes. We learned a new language in certain ways like on net/off net and NNI, their different ways of working with local partners, and their infrastructure and pricing. We started to understand that the local loop operation in each end of the ICLS was to be taken seriously. Exiting isn't it?

What is our goal?

We know that we need to guarantee our and our client's security, high quality, fair pricing, and general high standard if we shall utilize this possible opportunity window to actually "operate" our own network and sell that to our clients. We need to understand what service offering has the best delivery standard and price for our industry's need to SSC and PrioraNet locations. (PrioraNet is a group of ground stations around the world which are under this name cooperating regarding GNS).

Our main goal is to start and operate our "own" global fiber network which should also be sold to our clients.

What to do?

We need to put together a comprehensive business plan if this shall have any possibility to be approved by SSC management and to able to operate over time, including:
-Pitch
-What and how to deliver
-From/with whom
-Where in SSC/SaMS shall this group operate
-What personnel profile
-How to take care of the "local loop" issues
-Investments
-Structure
-Monitoring and fault handling
-SWOT analyses

IV. Project lessons learned

Huge price differences between International Telcos in different geographical markets

The first and most obvious area we found as we analyzed and started to work with the ROM quotes from the Telcos was the huge differences between the Telcos pricing for the same city and GS for leased line. In extended conversations with the Telcos we found that this was first due to that some of them were "on net" and others where "off net." Please note that "on net" means owned fiber over time and "off net" means operating in other Telcos fiber. The same was applicable when they quoted MPLS services where the price differences are due to an NNI connection in between 2 different MPLS clouds. We could conclude that some of the Telco's were really good in certain geographical markets and some were really good in other geographical markets. We didn't find that any of the 5 Telcos were able to cover all markets in an adequate technical or financial way.

We also discovered our most important information at this stage - that the international Telcos never negotiate the local loop part of the ICLS if it's not the Telcos "home" market or if you are not a "whale/Global client". To become a Whale/Global client most of the Telcos define that as yearly revenue volume, and one of the examples was >2 MUSD yearly in same account.

Concluding MPLS to be most effective platform to use internationally

Our conclusion is that the MPLS international service is the best for us and our clients to utilize since MPLS, as the name indicates, acts in multiple fiber structures within an MPLS cloud. You could say that this service always is multiple redundant in the international communication infrastructure with high SLA. This is in contrast to leased line where you need to buy 2 different services to get redundancy and Internet VPN where you have no actual SLA.

International communication line structure (ICLS)

The structure of an ICLS is: *Client HQ-PoP-*International connection-*PoP-GS*, which indicates that it is connected through Pop's at both inner ends. As we followed up on our Telco's quotes and drilled down we found that not only don't they normally negotiate the local loop but the price structure is approximately (there are off course variables in different markets and geographies) *40% - 20% - 40%. 80% of cost at client HQ and the local communication where we have our GS.* An initiated guess would be that the competition locally is not even close to the competition internationally. We identified the first clear "weak spot" in the international Telcos' coverage and we directly started to lay out plans how to use this to our and our clients benefit. This could really boost our strategy towards actually implementing this as a new service line in SSC.

Identifying SSC's position in the international Telco's revenue and value chain

A. Financial institutions-big client/high demand (Global account)
B. B2B/Partner Telcos
C. SSC level and probably most of the Space industry
D. Big client/small distributed need
E. Small client/small need and consumer

C, D and E levels major contributor to Telco's total margin

Looking at the above you could absolutely argue that it would be very difficult to compete with the "Royal Telco" that already our clients have chosen for their communication needs over time, and you would probably be correct in your argument if it weren't for the local loop connected to our GS. All owners of GS today shall take all types of cyber/IT/hacker threats seriously, not to mention interception and wiretapping - and SSC does take them seriously. Combine that with building an PoP infrastructure and put all efforts into creating an physical diversity between PoP and GS, with good relationship with your local operator and hard negotiation with the same and you actually start to have a good pitch towards your clients.

Important to monitor communication quality 24/7/365

Coming further and further into our business plan we start to actually believe that we have something to build on.
Another important issue regarding quality and control is monitoring of the communication lines. With multiple experiences from failing communications, we can conclude that it is not easy to actually get the full attention from an international operator, especially if the line structure is an ICLS with multiple subcontracted Telcos. Just to understand where on the line the fault appears, who shall be responsible to fix it and how much time will elapse before handled.
So a major question to answer would be to eliminate as many as possible of the above issues. The answers came from our technical staff: we need reliable monitoring software and we need to find out how to monitor each part of the link in a good way. We started to make the argument to the Telcos to at least have reading rights in their infrastructure, and on top of that we put in our own PoP close to where we had our GS, as well as put in routers at each end of the ICLS. All the aboves to be quicker in fault identification/handling, but we also could put hard pressure on the main Telco to act on the specific geographical fault. Another issue is to specify a really good escalation list and keep that up to date with your Telco.

Upside and downside in actually kicking this project off into an operating structure.

The downside in this work and analysis is that it will take at least 2-4 years for SSC to break even if we follow the business plan and actually start our "own" communications department and start to sell our services toour clients.

The upside is a strategic position for SSC towards our market as communication security and price become more important every day. SSC also would be able to participate early in our clients' decisions regarding choice of geographical GS, and to deliver high quality and good pricing. Last but not least, it would enable SSC to offer a one point of contract possibility for our clients.

Today SSC/SaMS Global operations

Afterword

As myself and Thomas closed the project and handed it over into an operating mode and structure we have been monitoring the Communication Department's ups and downs over the last years and all "new" issues that have a tendency to appear out of the blue. We can respectfully conclude that our effort in analyzing and structure of a project was a small part of what the communication group has achieved, implemented and operates today within SSC.

We are on the other hand very proud to have been a part of that effort and what that gives SSC and our clients today all over the world. There are still and will probably always be a lot of work, analysis, invention and implementation to be done just to make things work and progress within our communication network. But in time it can be a good platform for us and the rest of the space industry to utilize for future missions and operations.

We urge all other space-related industries to contact us and SSC to open up for communication operations where we together can make use of our combined experiences, investments and know-how.

As you probably have noticed, we haven't listed any sources or other references to above and the reason for this is that all analysis and conclusions are our own and shouldn't be pinned on anyone else.

Anders Gynning and Thomas Niemi