

Why and how Svalbard got the fibre¹⁾

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The Norwegian ground station for polar orbiting satellites at Svalbard, SvalSat, has the best location in the world for serving owners of such satellites. Satellite communication was a prerequisite for establishing the station in 1997. However, in 2002, the future of SvalSat was threatened due to the fact that it was not connected to the global fibre network. In record-breaking short time, and in cooperation with Telenor, the Norwegian Space Centre managed to finance and finalize the project connecting Svalbard to the mainland by fibre-optic cable for the benefit of SvalSat, scientific institutions, and the society at large in Longyearbyen.

Introduction

With all due respect to coal mining, tourism and all other activities at Svalbard, it was Svalbard's role in space activities that got Svalbard the fibre.

It is a simple geographical fact, supported by an airport and an enjoyable community with a mild climate that makes SvalSat the best location in the world for supporting polar orbiting satellites. SvalSat can see all the orbits.

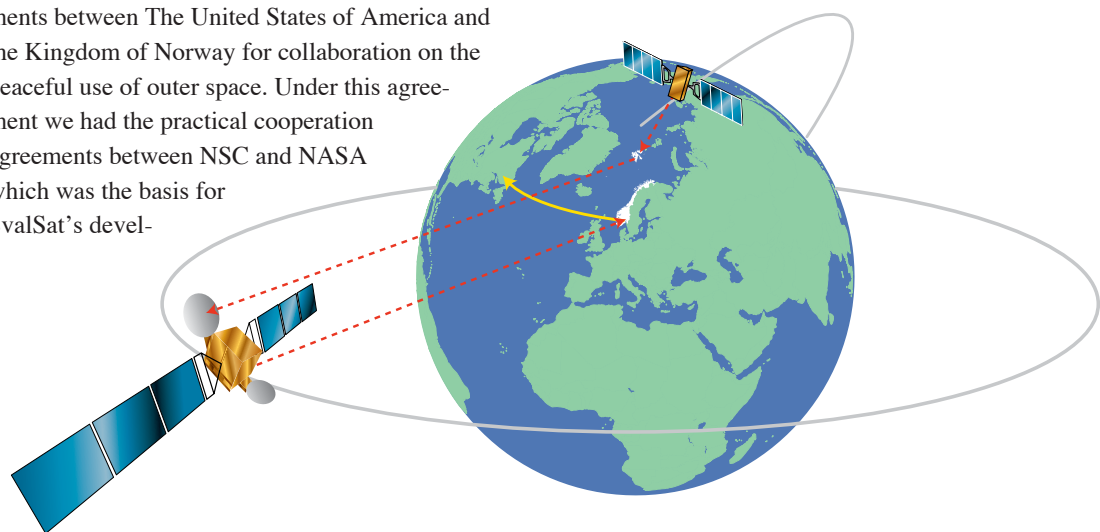
The short version of why Svalbard got the fibre is that the Norwegian Space Centre (NSC) felt that SvalSat's future was threatened when Northrup Grumman/Raytheon for NPOESS did not select Svalbard for its global network of 15 ground stations. They instead selected Helsinki because Helsinki was connected to the global fibre network. To put it mildly, we were not happy.

We were fortunate to have very high-level agreements between The United States of America and the Kingdom of Norway for collaboration on the peaceful use of outer space. Under this agreement we had the practical cooperation agreements between NSC and NASA which was the basis for SvalSat's devel-

Abbreviations used in the text

NSC	Norwegian Space Centre
NPP	NPOESS Preparatory Project
NPOESS	National Polar-orbiting Operational Environmental Satellite System
NASA	National Aeronautics and Space Administration
IPO	Integrated Programme Office
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
ESA	European Space Agency
UNIS	University Studies at Svalbard

opment, and 2002 saw the signing of the first agreement between ourselves and IPO/NOAA for SvalSat's role in the future next generation US polar orbiting weather satellites, the NPP and NPOESS.



Until 2004 the data from polar orbiting satellites were acquired by SvalSat, then sent via geostationary satellites directly from Svalbard to SvalSat customers on the East Coast of the US

¹⁾ This article is based on a speech given by Rolf Skår at the inauguration ceremony of the fibre cable in Longyearbyen on January 31, 2003.

Even more importantly, over many years the traditional good relations and friendship between USA and Norway had developed into a friendship and mutual trust between individuals who were in a position to shape the future.

I have been criticized for working against the interests of space, or specifically against satellite communication, by promoting fibre instead of communication via geostationary satellites. Let me simply say that it was because of satellite communication that SvalSat was developed; it was very reliable, we never lost a pass due to satellite communication problems, and it has served the Svalbard community very well since 1979.

Communication costs were high

However, SvalSat's future was in need of a more competitive solution, and I would simply like everybody to hear me say that I will promote and fight for space based solutions when they provide the best solution for the users, and only then.

The story of fibre to Svalbard began by both Telenor and NSC doing feasibility studies in early 2002. Both studies had the same conclusion: A sub sea fibre was feasible; the recommended route was from Tromsø via Bear Island to Spitzbergen.

Both studies concluded that a system would cost around 50 mill USD or 400–500 mill NOK for one cable with satellite communication as backup. This led to the formal process of Telenor Svalbard and NSC informing all parties with relevant space interests of this possibility and inviting them to a stakeholders' meeting in Longyearbyen 24–25 July 2002. Here the Telenor Group met with decision makers from NASA and IPO, plus EUMETSAT and ESA.

As a result of this meeting we had several telephone conferences with the stakeholders and another meeting was planned for November 1 at IPO in Washington DC.

Then the project collapsed, first NPOESS selected Helsinki and then the Telenor Group withdrew.

Was the game over?

No, this is when the real game started, and this is the more interesting story of how Svalbard not only got the fibre, but how it got 32 fibres in record time.

We went to America and during the three days from October 30 to November 1, we laid the groundwork. Based upon the interest from the feasibility studies

and stakeholders' meetings, we were approached by a very hungry telecom fibre sub sea cable industry.

On October 30 we visited one such company – it was not the one finally chosen – who convinced us that they could do a turnkey installation of one cable from Tromsø to Longyearbyen for 40 mill USD. Some other suppliers even indicated much lower prices, below 30 mill USD.

If there is one date to mark how Svalbard got the fibre it is October 31, 2002. At 10 a.m. we met with NASA's Bob Spearing at NASA Headquarters. He was the architect of the implemented solution. Bob told me that NASA could not invest in a fibre to Svalbard; however they could pay for a data transmission service from Svalbard to the US. Then I gave Bob an offer NASA could not refuse, and it truly reflects the mutual trust, the friendship and the common interests which had developed since 1995 when SvalSat was planned as a joint effort between NASA and NSC. I offered NASA that they should pay its current cost for satellite communication from SvalSat to the US, around 6 mill USD per year, for a few years until 20 mill USD in Net Present Value had been accumulated, and we would provide a 25 year transmission service with six times the current bandwidth. Among friends and partners you can be generous, therefore I offered 25 years – not 10 or 15, and six times the bandwidth – not double.

When the meeting was over, Bob arranged for me to meet Sean O'Keefe, the NASA administrator, and we talked about Svalbard and about Norway, and I invited him to come to Norway.

The same afternoon I met with John D. Cunningham from IPO, we met alone, and that was when Svalbard got the fibres. John was enthusiastic and eager to replace Helsinki with Svalbard. He promised to work with NASA and provide another 20 mill USD paid over a few more years than NASA because their bandwidth requirements were lower, but the value of Svalbard compared to Helsinki was worth the 20 mill USD he agreed to pay.

On November 1, the stakeholders' meeting did not develop as planned. First Telenor (the satcom people) announced that Telenor did not wish to invest in a Svalbard cable because of its negative economic impact for the Telenor Group.

Back in business

Then I announced that NSC would like to invest in a cable based upon an understanding between NASA, IPO and ourselves. We had some indications that

there was indeed a buyer's market for sub-sea fibre cables, which we wished to benefit from.

We then started to rush the project and went into a higher gear. On November 12, the Board of NSC gave me the go-ahead based on the NASA and IPO – NSC understanding. On November 15, I met with Jan Edvard Thygesen, Senior Vice President of Telenor and responsible for all Telenor networks.

A very important 'yes' to the project was his answer. And more than that, he was enthusiastic and promised full support from Telenor Networks and Telenor Svalbard. On November 18, the main terms of Telenor's role were agreed to.

Cable at low price

We rushed out the Invitation To Tender (ITT) on December 21. It had been prepared by us and a large group of Telenor experts and was for a turnkey end-to-end transmission system from Tromsø to Longyearbyen, with 40 mill USD available and vendor to choose route and technology, and an option was left whether 40 mill USD was sufficient for two independent cables forming a ring.

The vendors were asked to do the so-called Desk-Top-Study, select the route and then do the detailed survey of the selected route. The ITT deadline was February 3. Early January we discovered that to go from Tromsø to Longyearbyen was too risky due to the lack of protection from trawlers.

Another rush job: we extended the tender due date to February 25, and we did the Desk Top Survey with good help from the Harstad company Seaworks together with Telenor. We also decided to do the detailed survey for the new route going from Harstad over Andøya to Longyearbyen. The area outside Andøya is the only trawler free zone between Kirkenes and Trondheim and therefore the ideal place to get from land into deep water above 1600 m water depth.

When we opened the tenders on February 25 we had a huge surprise. We could get two completely independent cables forming a ring for around 40 mill USD.

However, there was also a major disappointment: None of the companies accepted payment from NASA and IPO over seven years. So we decided to re-compete with only the four vendors that we believed could do a turnkey solution, preferably a ring, for 40 mill USD.

The recompetition resulted in a clear winner, Tyco, and on March 7, we announced to all bidders that Tyco had been selected for contract negotiation, and we asked Tyco for their Best and Final Offer for a ring with two independent cables.

During contract negotiations early April we had some 25 telecom experts, including seven lawyers on our side, we worked very long hours to complete the very detailed turnkey contract to mirror our ITT and Tyco's Best and Final Offer.

We signed the contract on April 14; however, it would only come into force when financing was in place and we had all the necessary permissions.

We committed 300,000 USD to Tyco's early planning and ordered the detailed Survey, without which we could not get the permissions, and together with Tyco we set ourselves a deadline on May 15 to get financing in place and another deadline on July 1 to get all the permissions.

Financing was to become more difficult than anticipated and the week starting with my birthday, May 13, proved to be very dramatic. Tyco had proposed a specialist US financing company, Hannon Armstrong, to arrange the financing both for the construction period and also for them to purchase the yearly revenue stream from NASA and IPO as payment for their transmission service.

One challenge was that NRSE (Norsk Romsenter Eiendom), the legal customer, a 100 % owned subsidiary of Norwegian Space Centre, a foundation, did not have any meaningful equity, nor any cash left after paying for the Detailed Survey.

I used all my tricks; I invited the decision makers for the very best of the 'Huset' dinners; Huset being the famous restaurant at Longyearbyen. I invited them on the best of snowscooter safaris to Barentsburg and to Isfjord Radio. I did not succeed.

The most dramatic week

We left Svalbard on May 15 without an agreement, and Stan Kramer and myself signed an extension of the deadline until May 19, which we also missed.

Hannon Armstrong wanted a government guarantee. I told them that only the National Assembly could authorize such. Finally, by involving the Director of Public Prosecutions²⁾ and the Minister for Trade and Industry, a compromise was accepted. Mr. Ansgar

²⁾ In Norwegian: *Riksadvokaten*



Representatives from IPO, NASA and Raytheon (antenna provider) are leaving the foundation of the IPO antenna at SvalSat on June 24, 2003. They are clearly satisfied with what they have seen

Gabrielsen wrote a letter to Hannon Armstrong whose text they had agreed to beforehand. From then on the project was unstoppable. We only needed the final permissions.

Did we take too high risks? I believe I understood the risks involved, and certainly the rewards. The offer from Tyco depended upon doing the project during 2003. It was probably our only chance to get two cables instead of one. We had invested around 10 mill NOK; the majority of this was the Desk-Top-Study and the order for the Detailed Survey which started May 19.

I was so convinced that we would get the necessary permits that Tyco also believed this to be the case, even more so when on May 21 we committed 2 mill USD in a more serious downpayment to Tyco. So after May 21, the serious work started.

To give you a flair for Norwegian bureaucracy, I will give you two real examples of how fast it can be: At Andøya we needed a building of some 140 m² to house the power-feed equipment, a total investment of around 5 mill NOK. We contacted the owner of the land on May 7, on May 13 we agreed on the price and the same day we sent an application to the local authorities for permission to use farmland for our purpose and for building permits. We got all the approvals needed by May 22, construction work

started the next day and the building was ready to receive its first cable on July 25.

On June 17, Sean O'Keefe took Helle Hammer, the State Secretary of the Ministry of Trade and Industry, together with a few people from NSC on his NASA plane to Svalbard, accepting our invitation to visit Norway and Svalbard. During the visit I learned that the Detailed Survey necessary for our application for the main Government permit was ready. I signed the application for permit and personally handed it in to the Governor's office. Four days later we had the critical permissions and the following week we returned to Svalbard to celebrate and sign the final contract documents. The trust that Tyco, Telenor and ourselves had put into the project was truly rewarded.

The project was well under way to fully benefit from the Arctic summer with midnight sun and continual daylight. Look at these milestones: The complete wet plant, 2,700 km of cables and 40 repeaters were ploughed and laid at the bottom of the sea from July 21 until August 15; 25 days using two of the world's most advanced specialist ships and setting a world record for the deepest water depth for ploughing, 1671 meters.

The good planning was rewarded

The project team that completed this project in record time did a fantastic job. Torbjørn Dyb from Telenor



The final metres of the fibre are put in place by the cable ship on the sea floor reaching Spitzbergen in August 2003

was our Project Manager leading a team of Telenor engineers, and from Tyco were Debbi Brask and Dave Willoughby.

There were no surprises, no cost overruns. On April 14, we signed the conditions of turnkey contract with Tyco. The agreed price was the final price, not a cent in additional charges. And we got a little more than we asked for.

Our plan was one cable with two fibre pairs, four fibres, and 10 Gbit/s. Tyco offered one cable with eight pairs and one cable with two pairs in contract negotiations, and with some gentle arm twisting and some goodwill what is now installed are two fully independent cables, each with eight pairs fully repeatered with 40 repeaters, and with double initial capacity, 20 Gbit/s on each cable. The system may be expanded to 2500 Gbit/s on each cable. We believe this to be sufficient for any foreseen or even unforeseen future need.

I am convinced that it is the local community that will benefit most from having two cables instead of one with satellite communication as back-up. Satellite communication would be a very expensive solution to be paid for by Telenor Svalbard and thereby by its customers.

It was Telenor Svalbard through their agreement to cover the costs exceeding 40 mill USD that made it possible to get two cables. These additional costs will have to be paid by the local users, and we have agreed that this will be done over the first six years, so after 2009 there should be a significant decrease in the cost of using the fibre cables.



Two independent cables, each with very large capacity, now connect Svalbard with mainland Norway and the international fibre network

I am pleased that we have been able to find a new pricing model for selling really broad broadband. There is 20 Gbit/s in each cable, so by using the pricing model in mainland Norway, almost all this capacity would be unused. This new model will benefit the science community most. They will have a 1 Gbit Ethernet connection to the science community in the rest of the world, and Svalbard will have the best communication system of any higher learning or research establishment in Norway. I promised this as our gift to UNIS on its 10 year anniversary.

What we are really looking forward to at the Norwegian Space Centre is for all the data that will now be downloaded from Earth science and weather satellites at SvalSat to actually be used by the scientists at UNIS and in Norway.

There is a unique opportunity that with unlimited bandwidth, raw data at full sensor fidelity may be downloaded from the sensor with 400 Mbit/s or more, and through the fibre network made available to scientists.

Rolf Skår (63) is Director General at the Norwegian Space Centre (NSC) in Oslo. He holds an MSc in Cybernetics from the Norwegian University of Science and Technology (NTNU) in Trondheim from 1966. He has been engaged at the Norwegian Defence Research Establishment (NDRE) at Kjeller, and in 1967 he was one of the co-founders of the Norwegian Computer Company Norsk Data A.S in which he held several management positions and CEO from 1978 to 1989. From 1990 to 1992 he was General Director of the Norwegian Council for Scientific and Industrial Research (NTNF) after which he entered the position as President of the consulting company Norconsult International. From 1994, he has been engaged in space research. He is the Norwegian delegate to the European Space Agency (ESA) council and from 1998 he holds the position as Director General of NSC.

Rolf Skår has extensive experience in management of large and complex information technology projects, as well as from international sales and marketing management, including sales of large information technology systems. He is an active participant in various government policy studies, in particular related to space, science and technology policy.