

The Status and Plans of the Silk Project

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Executive Summary

In this note, we outline the SILK Project, which is providing Internet connectivity on a regional basis to the NRNs of the eight countries in the Southern Caucasus and Central Asia plus Afghanistan. The project is mainly funded by the NATO Science Programme; but has additional contribution from Cisco Systems, DESY and the European Commission. The SILK Network is satellite-based. Details are given of the current status of the system, the forms of Governance and of the auxiliary activities being carried out under the project.

The project has recently been extended by a further two years. We discuss how the communications facilities may vary in the future, how we are moving towards a sustainable system, and what we expect to accomplish over the next couple of years.

1 Introduction

There have been several previous presentations of the Silk Virtual Highway Project, the Silk Project for short, to the Science Committee. The Silk Project is complementary to the Network Infrastructure Grants (NIGs). The NIGs help to provide National Research Networks (NRNs) in the relevant Newly Independent States (NISs); the Silk Project provides both international connectivity and other functions as described in this note.

Several decisions were taken three years ago by the Networking Panel and the Science Committee to implement the Silk Project.

- They provided \$2.5M over three years, 40% of the Panel budget, to build and operate the Silk Project up to July 2005
- We choose a VSAT satellite system, with a hub in DESY, Hamburg, and one earth station in each of the following areas: the Southern Caucasus (comprising Armenia, Azerbaijan and Georgia), and Central Asia (comprising Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan and Uzbekistan. Since then Afghanistan has been added.
- We put in as much capacity as we can afford, based on only the NATO budget and any additional funding pledged by the middle of 2001.
- Cisco agreed to donate equipment to link between the earth stations and NRNs, and to provide some IP phones.
- DESY agreed to manage the Silk network, house the hub, and provide connection into the European GEANT at no charge.
- We provide equal bandwidth for each NIS. This was expected to rise to around 1.5/0.5 Mbps of data in the received and transmitted direction.

We show in Fig. 1 the countries participating in the Silk Network.



Figure 1 The Countries participating in the SILK Project

2 The Current Status

2.1 The Technical Characteristics

As a result of a formal tender, Eurasiasat system finally chosen to provide the satellite bandwidth, and Kallitel to provide 2.5 or 3.8 m earth-stations. The different components are shown schematically in Fig. 2.

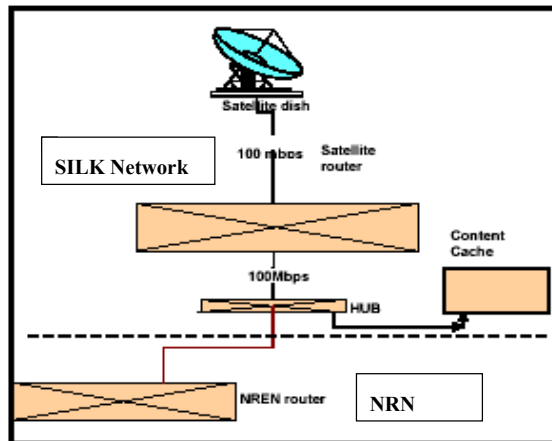


Figure 2 Schematic of the Configuration at each national SILK site

The last of the original eight sites became operational in September 2003. The Afghanistan site became operational early in October 2004. The portion of the equipment above the dotted line of Fig. 2 is operated by the Network Operating Centre (NOC) of DESY; that below is operated by the NRN.

The form of satellite transmission used allows received bandwidth not used by one site to be used by others. Thus we are able to honour our decision to provide equal resources, by providing equal Committed Information Rate (CIR) to each, without wasting bandwidth. In practice NATO is currently providing to each country an average of 1.8 Mbps CIR on the received beam, and 0.5 Mbps in the up-link.

2.2 Current Funding of the First Phase of the Silk Project

In addition to the original \$2.5M of NATO funding, there has been a further \$90K provided for expansion of Silk to Afghanistan.

The NATO funding for the Silk Project has followed the normal format of Networking Panel Projects. Thus the West co-Director comes from DESY, and there is a co-Director from each

Partner country. The money can be spent only on equipment, its installation and maintenance, and communications. This formula is acceptable for a NIG, but not for the carrying out of a major activity like the Silk Project.

The constraints on use of NATO money has been serious in several respects. First it has needed Western manpower to supervise the ordering and building of the network; secondly it has needed Western manpower to manage the whole project; third it is essential to organise regular meetings of the Silk Project participants. The first has been mainly accomplished by the kind offices of DESY, who have not charged either for the time of Hans Frese, nor for the costs of operating the NOC. The second has been covered by a 220 KE grant from the European Commission called the SPONGE Project, The third has been covered in an ad hoc way – mainly by various organisations including Eurasiasat and the Open Society Initiative (OSI). In addition some of the meetings were co-located with workshops, which allowed the workshop funding to meet some of the costs.

In addition to the above, there has been small purchases of extra bandwidth for Georgia and Uzbekistan from other sources. Also both the European Space Agency and the European Commission have funded for small amounts of additional bandwidth for specific experimentation in the context of the next generation Internet (IPv6). There has also been significant additional funding for education and training (see below).

2.3 The SPONGE and NOC Project

The EC agreed to fund, under the SPONGE project, 25% of the time of Robert Janz and Peter Kirstein, and their travel to Silk Board meetings (See below). The SPONGE funding has paid for the management of the project, the provision of information about the project both internally and externally, service measurements and the provision of IP telephony and conferencing (for project purposes).

DESY funds and runs a Network Operating Centre (NOC), which manages the Silk network, allocates frequency and bandwidth, provides IP addresses to some partners, and does network measurements.

2.4 Silk Project Governance

We felt it essential that there be a governing body for the Silk Project. For this reason, we have set up a Silk Board (SB), which includes the various people managing aspects of the project, representatives of the Networking Panel, the NATO Programme Director, anyone actively funding the network, and the area consultants to the Networking Panel. We have established official Terms of Reference, and meet three times a year – mainly in the Partner countries. Besides the formal members, we invite representatives from potential funding bodies to attend our meetings. It is encouraging that a significant proportion of the discussions are now in Russian, and the most important papers are translated into that language also. This reflects the increasingly active participation of the Silk Partner NRN representatives.

Clearly decisions have to be made between SB meetings. For this reason we have set up also an Executive Committee (ExCo) – with the managers, Programme Director and one representative from each Silk region. The ExCo operates partly by e-mail, but we also hold an audio-conference every couple of weeks or so. This uses the Cisco audio-conferencing system, with Voice/IP through the Silk network for the partner country representatives

2.5 The Silk Education Programme

As an integral part of the Silk Programme is education and training. We arrange, of course, that representatives from the Silk countries participate in the normal Advanced Network Workshops, which are supported by the regular activity of the Networking Panel. In addition, we have received a further grant of \$122K from the Internet Society (ISOC) and ~\$50K from the Network Start-up Resource Centre (NSRC). This has allowed us to hold 5 workshops (on Site Administration, Security, Distance Education, Next Generation Internet and Wireless) and to distribute both books and wireless cards to the Partner countries.

2.6 Regulatory Considerations

There have been some problems in the set-up and operation of the SILK Network from Government regulations in the Partner countries. We have requested “Acceptable Use Policies” (AUPs) which had to be agreed by ExCo. Most countries had reasonable ones; in one case they are so restrictive that we were hesitant to deliver the equipment. We decided to do so in the hope that conditions would improve; we are still waiting! In most cases there were little difficulties in getting permission to transmit. There are still very annoying customs constraints in some countries; these often impede our bringing back defective equipment for repair. This sometimes has serious impact.

3 Future Activity

3.1 Funding and Bandwidth

We are very grateful to the Science Committee that they have seen fit to provide a further E 800K to carry on the Silk project for a further two years. It has been made clear that during this period we should ensure that the funds spent on connectivity should be steadily reduced for two reasons. First, it is vital to NATO free funds for new initiatives in the Silk countries; secondly, it is very important for the Silk countries to realise that they must invest themselves if the system is to become self-sustaining. We have taken this to heart, and have formulated appropriate policies in the Silk Board. We will call the future activity following the original tranche of funding Silk-II.

So far the Silk Bandwidth has been allocated to each NRN on an equal basis, and has been provided at no charge to the NRNs. We have now agreed to provide bandwidth in the future according to a formula in which there will be an equal basic provision to each partner NRN, provided by NATO. The amount of this funding will be reduced to 50% in 2006 and 25% for the first half of 2007. There will be an additional tranche of bandwidth funded at 50% by NATO; the NRNs must find the remaining 50% from their own funds. If the NRNs find no additional funds, then the Silk bandwidth will decrease; we expect most countries to find additional funds to at least maintain their current bandwidth.

We will be investigating the provision of communications further during Silk-II. Providing, however, costs remained at the current levels, the impact of the above policies is shown in Figs 3 and 4.

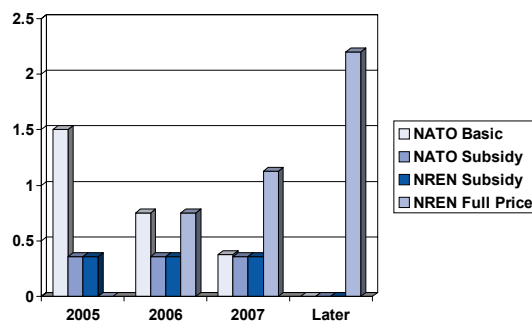


Figure 3 NRN bandwidth in Mbps per station

In each period, the first column would be an unconditional NATO expenditure. The second is conditional on the partner coming up with the third column, and the fourth is a partner country expenditure required to maintain the bandwidth at its 2005 level.

The expenditure implied by the above is shown in Fig. 4.

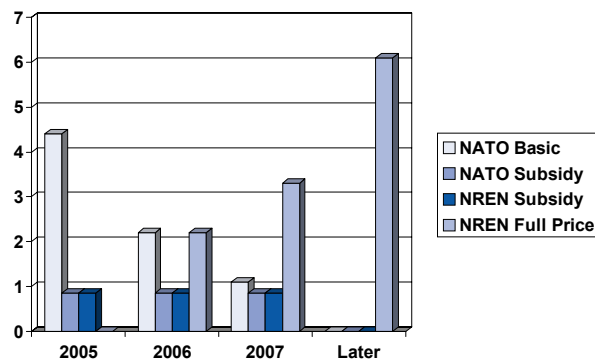


Figure 4 NRN costs per station in K\$/month

These costs should be quite affordable to most countries, but some may find themselves unable to afford these costs. What should be done in that case will have to be decided at the time.

3.2 Future Communications Media

In general, fibre-optic communications in the developed countries has become much more economic than satellite. In the Silk countries this will happen too – but not yet. In some countries this reflects their state of development; in others it is due to the mountainous nature of the terrain. We have investigated the cost and availability of fibre in the Silk countries. So far fibre is marginally more expensive in the Caucasus, and significantly so in Central Asia. We have therefore decided to continue with satellite communications for Silk-2.

The initial indications from Eurasiasat, our current Franco-Turkish supplier, are that the costs in Silk-II would be the same as in Silk-I. Early indications from other suppliers are that we could get satellite service in the Caucasus at half the rate of Eurasiasat, and in Central Asia at 80%. In both cases, it would require some capital expenditure to make the change. We are discussing with Eurasiasat whether they will match the competition. We would prefer this if possible for both political reasons and because it would be much less effort. Nevertheless, since we are asking the Silk countries to meet a significant percentage of the Silk-II costs of communications, we must point out to the Science Committee that it may be proposed that a change is made. In addition, there is a chance that we may have to choose different solutions for the two areas of the Caucasus and Central Asia. If this does not happen in Silk-II, it is quite likely to happen soon thereafter.

At present we are proposing to continue with satellite communications. When fibre becomes more economic, it is inevitable that much of the fibre will come through Russia and Kazakhstan. At present Russia is proposing very favourable terms for transiting to GEANT through the Russian NRNs.

3.3 Other Costs

During the extension period, we will not be able to restrict our expenditure to communications costs. There will be additional costs due to the maintenance of the Silk equipment. If we change Carrier, there may be some additional capital cost. We feel the maintenance of three meetings a year of the Silk Board is an essential expense; the reliance on external funding has been unsatisfactory, and we intend to underwrite Silk Board meeting costs from our budget. The SPONGE grant from the EC expires at around the same time as Sili-I; we intend to apply for an extension from the EC. Finally, we have started talking to ISOC, with the aim of getting new funds to maintain the training and workshop programme.

3.4 Extension of the Silk Network

The initial decision made by the Silk Task Force was to provide one earth station per partner country. This decision was based solely on the need to provide a presence in the whole area, while constrained by a limited budget. Nevertheless, all components of the system were architected so that the systems could be extended with additional local networks or earth stations. There have now been further proposals to the Panel involving additional earth stations – sometimes partially funded from other sources. One set of discussions in this area is for Kazakhstan; another involves the University of Central Asia (UCA). UCA is partially funded by the Aga Khan Foundation (AKF). Whether these initiatives will occur at all, and whether they become extensions of Silk, is not yet clear. We expect to explore these possibilities when the future communications infrastructure for Silk has been decided.

3.5 Collaboration with other Organisations

We invite to the Silk Board representatives of many organisations active in the Silk countries who might be interested in participating with Silk activities. OSI, UNDP, the European Central Bank and the World Bank are four such organisations. All have continued to express their interest in the Silk activity, and are helping already in their own ways – often by supporting the NRNs directly. We can expect, and they have so indicated, that they will provide some of the finance needed to support the Silk communications through their local activities. This will require, however, that such support is seen to be economic by the local organisations.

The European Commission has not, in the past, been a major player in this space. They are now planning, however, a Distance Learning initiative amounting to E3M over two years in the Caucasus. The full details of this initiative are not yet published; it is probable, however, that the international connectivity requirements for this activity will have strong relevance to the Silk network.

3.6 Technical Activities

The project has already undertaken some interesting technical activities such as videoconferencing, IPv6/satellite and caching experiments. The Silk Board members have reiterated their enthusiasm to continue this class of work, from their own resources. Relevant technical groups are being formed to progress this work under the aegis of the Silk Board.

We are exploring also various avenues to continue the training programme which has begun so successfully with the five workshops already held.

4 Conclusions

We have outlined the current status of the Silk Project, which includes a regional data network providing international connectivity for the NRNs of the Silk countries into world research network infrastructure. The network has been brought into operation, and is operating successfully, below budget. It has already shown that it can be expanded as required, and can carry a broad range of services including a limited amount of voice and multimedia for academic purposes.

We have started both training and collaborative technical activities under Silk auspices. Both are expected to continue and strengthen over the next two years. Moreover while this was initiated centrally, it has been developed into a participative structure, in which the participating NRNs themselves have a voice on future developments. We have now reached a critical phase where the further development will require also financial participation by the countries themselves. We are hopeful, but not certain of course, that most of the countries will take up the challenge.

We have shown that the Silk Project does considerably more than just provide international bandwidth. It is providing a basis for regional collaboration with other development agencies working in the area, and for the research communities there to collaborate with each other. We intend that the auxiliary functions, like distance education, conferencing and training be

expanded in future initiatives. Whether NATO can play a significant part in this future will depend, of course, on future plans and initiatives of the Science Committee and NATO itself.

Acknowledgements

This paper is not the work only of the author; it represents the dedicated efforts of the members of the SILK ExCo. We acknowledge the enthusiastic support of the NATO Science Committee, the generous contributions from Cisco, DESY, ISOC, OSI and the European Commission.

The project is completely dependent for its success on the activities by the SILK grantees. This has required many important contributions from representatives of the SILK countries and their NRNs both in the meetings that have taken place over the past three years and in their day-to-day activities.