

The Silk Project – Recent Advances

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Abstract

The Silk Project has now reached the operational phase, with all eight of the initial remote VSATs deployed. We discuss some of the technical problems we have had, and the measures being taken to overcome them. The system is now figuring in the plans of many of the NGOs working in the region; the impact of this on the project is considered. There is an active training component, and even some technical novelties like use of VoIP and IPv6 over the satellite channel. The Governance and plans for the future will be mentioned.

Extended Abstract

The basic structure of the Silk Project [**Kirst**] [**Silk**], [**SPONGE**] has been described in previous Terena Network Conferences (TNC). It is funded mainly by NATO, with the management funded mainly under the SPONGE project by the European Commission, with several other sizable donations. It employs a VSAT system to connect the National Research Networks (NRENs) from the eight Newly Independent States (NIS) of the Southern Caucasus and Central Asia into the Internet. The equipment used, the Governance Structure and the bandwidth plans were presented at previous meetings. This note describes the progress since the last TNC.

The initial installation was completed in August 2003; there are now earth stations in all eight countries: Southern Caucasus (comprising Yerevan (Armenia), Baku (Azerbaijan) and Tbilisi (Georgia)), and Central Asia (comprising Almaty (Kazakhstan), Bishkek (Kyrgyz Republic), Dushanbe (Tajikistan), Ashgabad (Turkmenistan) and Tashkent (Uzbekistan)). It was recently decided to install two additional dishes: one at Khorug (Tajikistan) as part of the plans of the University of Central Asia, and Kabul (Afghanistan); it is hoped that these will be operational by the time of the TNC.

The system was supposed to be extendable to 1.5 Mbps Single Channel Per Carrier (SCPC) for each remote earth station, using a 2W transmitter, with a common DVB return channel able to operate with 40 Mbps of DVB data. There have been problems with some of the Block-Up-Converters (BUCs) from Paradise, which have prevented some of the earth stations to go up to the design speeds. Because the contract calls for repair of any defective components, the process of remedying this problem has proved very lengthy. First there was the problem of establishing the problem, and then there was the difficulty of returning defective parts while ensuring the system remains operational. The logistics of replacing equipment proved disastrously slow in some countries – owing to a mixture of time to establish the problem, organise the physical transport, and affect the actual repair. The one spare held, was enough only to replace the components in series – which looked like taking a

further 6 months. We adopted several measures to speed up the process: Buying several additional BUCs from a different supplier, thereby both getting more reliable and performant equipment and having additional spares so that 2-3 BUCs could be repaired at the same time. Eventually we will now have 2-3 spares of each type. The new equipment (from Advantech) has proved more reliable; moreover with a 4W transmitter, it is able to reach at least 3 Mbps with the current dishes. In some cases the replacement and repair of the BUCs is now affected by flying out a person with a new component; this has been shown to save many weeks – up to two months – in effecting a single replacement. The donated equipment from Cisco of 7200 router, Catalyst switch and Content Engine has proved very reliable. The single spare at Hamburg of each component has allowed very satisfactory service levels to be maintained.

The system is the only regional one in the area. Hence a number of organisations, e.g. OSI, ESA, the European Commission, the World Bank and the University of Central Asia, are looking to Silk to provide extra bandwidth for their purposes, additional to that which is being provided by NATO. So far the amount of bandwidth so provided is limited – but the interest is growing. This gives us strong hopes that a mechanism may be put in place to continue the whole project beyond its current termination in July 2005.

We have had to apply Quality of Service (QoS) on the links for two reasons. First Voice and Video/IP required a minimal guaranteed bandwidth; second we needed a specified Committed Information Rate (CIR) for each earth station. The former was essential for the provision of adequate quality. The second allowed us to guarantee a fair share of the remote receive bandwidth both for each partner, and for each organisation which wishes to increase their share. If neither VoIP nor the Receive links of the smaller users meet their allowed share, then any remaining DVB traffic is shared between the other users. This was particularly important as we are starting to have some NRENs purchasing additional bandwidth – but wanting to be sure that they were getting what they paid for.

We have a cache at each earth station as part of the Silk Project. These caches have been enabled, and already provide a saving of around 20% in (HTTP and FTP) bandwidth (which use approximately 50% of the total bandwidth) by a suitable choice of parameters. We had thought that each cache would be able to store any pages requested by other sites – since the data arrives at each earth station; unfortunately the caching standards do not call for this mode of caching. We have not decided yet whether to try to get the standards changed in the IETF, or just to make appropriate adjustments in the cache software.

There have been extensive VoIP and multimedia conferencing testing. These have been very successful – thanks to the QoS provision. We have now installed VoIP equipment at each site and softphones at some other sites (with a carefully controlled server to constrain the traffic), and are in a position to put in significant amounts of video conferencing; this was called for by one potential funding body (the World Bank) and will be used by others.

We have attracted significant support from the Network Start-Up Resource Center, who have provided books and wireless equipment to several of the NRENs. A workshop on training for earth station node operators has taken place from NATO funding. The Internet Society has provided an educational grant; the first tranche will allow us to give four training workshops. One on IPv6 is planned before the TNC, and three more on security, distance education and wireless are planned before the end of the summer. We have found that it is essential to hold all these in Russian. The first of such technical workshops was held in Tashkent in October 2003 with funds from NATO.

The NRENs have expressed interest in finding out more about IPv6 – provided it does not interfere with the IPv4 service. With this in mind, two initiatives are being undertaken. First,

we will run the Cisco routers dual stack; at the bandwidth we are using, there will be no performance problems. Second, we will experiment with new equipment being provided by ESA/IABG to run directly IPv6/DVB on the common channel. Without the ESA equipment, it would be necessary to run the IPv6 in tunnel mode. ESA and Eurasiasat expect to provide satellite bandwidth for testing their equipment. The EC is permitting 6NET to put in a limited amount of extra bandwidth to run an IPv6 service without interfering with the IPv4 service. This is being done under the training and dissemination part of the 6NET project. It is hoped that from this Spring, the IPv6 service will be available until the end of the current Silk Project.

The Governance of the project is now well established. The members of the Silk Board are the technical organisations providing and managing the service, the funding bodies and the NRENs. We hold a two-day meeting every four months – two per year in a partner country (so far Georgia and Azerbaijan) and one per year in Turkey (so far Istanbul and Antalya); the next two meetings will be in Turkmenistan and Tajikistan. We also arrange a further day of small meetings to discuss current problems with the earth station supplier, funders like World Bank and Open Society Initiative, and new participating organisations like the University of Central Asia and the European Commission. Face-face meetings of the Silk Executive Committee and the EC-funded SPONGE project are also held then, to supplement the teleconferences which are held frequently between the Silk Board meetings. The NRENs are now considering setting up their own Regional organisation, run fully by themselves and related to, but not part of, the Silk Network. This is to put in place a structure under their control for transition at the end of the current project. Both in the context of the Silk Board and of this new initiative, we have been exploring the regulatory environment in each Silk country. Most now have resolved the problems we had at the beginning; in very few do problems remain.

The information about the project is now quite voluminous. The web sites [Silk] and [SPONGE] contain a considerable amount of public information – in both English and Russian. This includes both publications and a regular publication in both languages.

We have started exploring the feasibility of supplementing the Silk system with other transmission media. Some NRENs are already supplementing the Silk bandwidth with that from other suppliers; in the Caucasus, for example, downlink capacity is somewhat cheaper than the Silk bandwidth, so a mixed economy is developing. The price of fibre is coming down in some of the Silk countries – particularly if links to Russia are considered. Some of the countries have a very considerable traffic to Russia, so that this form of link might be attractive; others would find it less attractive for political reasons. We expect to come to a plan for a continuation of the project after its current end of July 2005 within a few months. Clearly this will involve many potential funding agencies.

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[**Silk**] The Silk Web Site - <http://www.silkproject.org/>

[**SPONGE**] The SPONGE Web Site - <http://www.silkproject.org/spongeintro.htm>

Vitae

Peter Kirstein is Professor in the Department of Computer Science, University College London. He has led many research and piloting projects in computer communications - mostly in multimedia, active networks, network management, and security applications. He is currently Director of the Silk and SPONGE projects considered here, and leads the multimedia activities in the EC-sponsored 6NET project on IPv6 deployment and SEINIT on security. He is a Fellow of the UK Royal Academy of Engineering and many technical societies. He received a CBE, Postel award, SIGCOMM99 and IEE Senior award for his contributions to international development of the Internet.

Hans Frese is a physicist at Deutsches Elektronen-Synchrotron DESY in Hamburg. He has been engaged in computer communications since the eighties - running EARN in Germany, setting up TERENA, chairing the HEPnet Technical Committee, establishing satellite links to the scientists of the Former Soviet Union in various NATO projects, and coordinating DESY's telecommunication needs. He is currently Technical Director of the Silk project and acts as Programme Coordinator for Communications for the Preparatory Commission of the Comprehensive Nuclear Test Ban Treaty (CTBTO).

Robert Janz is technical director of the Computing Centre of the University of Groningen in The Netherlands. He has been engaged with support and management of academic IT since the beginning of the eighties – locally within the Computing Centre, nationally in the SURFnet context and internationally in various projects in Central Asia and Africa. He currently acts as Service Director of the Silk/SPONGE projects.

Zita Wenzel is Director, Center for Scholarly Technology, Information Sciences Institute, University of Southern California. She has been involved with developing country networking, education, and administration for many years. She was previously a lead consultant with the Network Startup Resource Center (<http://www.nsrc.org/>), which provides technical assistance and education for developing countries to connect to the Internet. She heads up networking activities for the Association of Pacific Rim Universities (<http://www.apru.org/>) and is lead author of RFC 2901 "Guide to Administrative Procedures of the Internet Infrastructure". She leads educational and training efforts, and domain names and numbers, in the Silk Project.