Progress in The Silk Project

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Chair, Silk Board

Credits to Co-authors

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Overview

- The Background of the Project
- The equipment being delivered
- Current status
- The conditions for delivery of equipment
- Operations
- User and Technical Groups
- SPONGE technical activities

NATO Science Com. Netw. Panel NIGs

- **Improve National Research Net Infrastructure**
  - Not that of isolated groups or institutes
- **Encourage national collaboration**
  - Preferably to set up National Research and Education Networks (NRENs)
- **Encourage international collaboration**
  - Ever more important at the current time

Networking Panel NIG Support

- The NATO Networking Panel has supported Network Infrastructure Grants (NIGs) for many years
  - Was initially for Russia and Eastern Europe
  - Southern Caucasus and Central Asia are current principal areas for our larger grants
- Internet Connectivity has been a large part of each NIG
- Current bandwidths much too small
  - but all that could be afforded from budget

Status at End 2001

- Bandwidth from NATO sources 64 – 512 Kbps
  - Wanted to go up by an order of magnitude
- Cost unaffordable in pre-Silk model ($100k per year for 1 Mbps)
- National Research and Education Networks (NRENs) existed in most of the countries

Silk Project

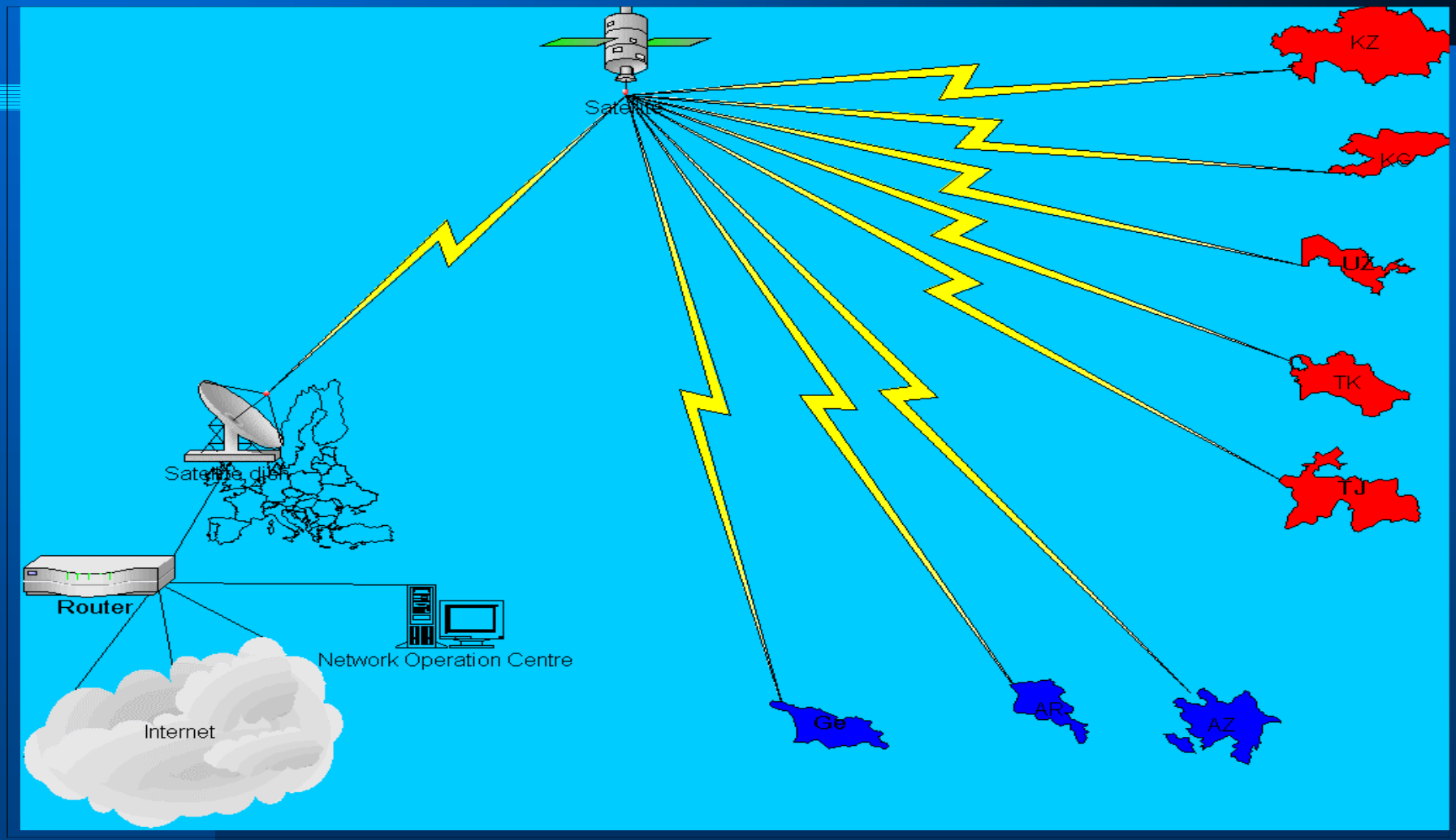
- Decided to address whole Region of Southern Caucasus and Central Asia
- Wanted to build on the existing NRENs
- Put in regional network connecting NRENs
  - Connected also to European NRENs (GEANT)
- Start with own resources
- Allow to be extensible by others

Possible Technologies

- Mainly Fibre in Developed World
  - No affordable fibre yet in Caucasus or Central Asia (> 5 times satellite cost)
- Satellite attractive in these areas
  - Satellite Bandwidth driving force
  - Broadcast capability can be useful
- Proposed Silk Project in 2000
  - Based on VSAT technology
  - Much cheaper than earlier 64 – 256 Kbps links

The Silk Countries

Schematic of the Silk System



Fiscal Constraints

- Assumed that not more than $2.5M was available from NATO 01-04 Panel Budget
- Feasibility study demonstrated that this suffices to provide a minimum of 500 Mbps*months to 8 countries
- Other financial or *in kind* contributions additional to this budget

Additional Resources to Date

- Cisco -~ Equipment & maintenance donation
  - Worth $500K
- DESY ~ VSAT Hub housing, Network Operations and GEANT access
  - Worth $400K
- EC SPONGE project for Project Management, dissemination, measurements & conference
  - $230K

Who gets connected?

- Funded by NATO/Cisco
  - NRENs
- Co-funded by NGOs and others
  - More bandwidth for NRENs
  - Libraries, schools, etc.
- Staged implementation
  - Installing equipment only when NRENs ready
- Staged upgrades
  - Minimum, equal facilities from NATO for each NREN

Architectural Overview

- Hub Earth Station at DESY with access to the European NRENs and the Internet via GEANT
  - Providing International Internet access directly
- National Earth Station at each Partner site
  - Operated by DESY, providing international access
  - Additional earth stations from other sources – none yet
  - SCPC up-link, common down-link, using DVB
- Routers for each Partner site
  - Linked on one side to the Satellite Channel
  - On the other side to the NREN

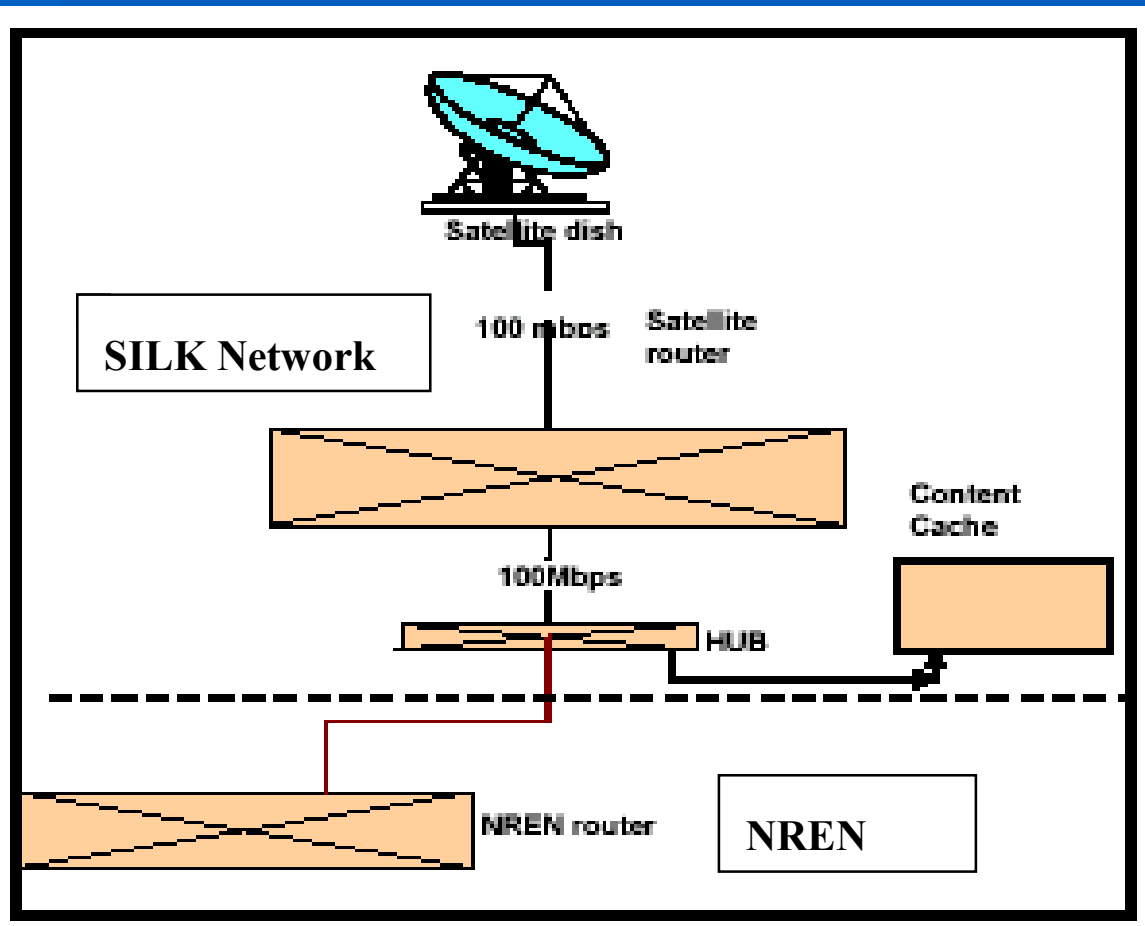
Equipment at Each Site

- Kalitel-supplied, NATO financed, central hub and VSATs
  - 5.6 m dish for hub
  - 2.4 or 3.8 m dishes for VSATs (the 3.8m dishes are needed for Almaty and Bishkek)
- Cisco-supplied and financed LAN items
  - A 7204 Router, and a 3524 Switch with 24 interfaces
  - A CE 560 Content Engine with 155 GB of disc as a Web Cache
  - 2 IP telephones

Equipment Status at May 14, 2003

- Stations operational in Armenia, Azerbaijan, Georgia, Kyrgyz Republic, Tajikistan, Uzbekistan
- Equipment ready for shipping to Kazakhstan and Turkmenistan
  - Were waiting for a transmitter, now repaired
- National Research and Education Networks (NRENs) exist in most of the countries

Schematic of Equipment at each site



Bandwidth Plan – as of 3/03

From	To	MHz	DVB Mbps	SCPC Mbps	$K
08/02	11/02	2.9	3.1	0.77	20
12/02	05/03	5.4	6.9	2.40	92
06/03	11/03	7.5	9.5	3.32	136
12/03	05/04	9.4	12	4.10	175
06/04	11/04	12	16	4.90	220
12/04	07/05	15	19	6.50	379
					1022

Pre-conditions for Eq Delivery

- NREN Existing
- AUP Agreed
- Licence Approvals
- Suitable site
- Suitable Personnel

Current Problems

- Siting of the Earth Station - Uzbekistan
- AUPs – Armenia
- Licence - Armenia
- Existence of NREN – Turkmenistan
- Shortage of Bandwidth – Georgia
- Number of Earth Stations – Kazakhstan
- Marginal transmitters – putting in amplifiers

Silk Board and Exco

- Silk Board formal constitution
  - Managers (Technical, Service, Project, NOC, External)
  - One from each Silk NREN/Country
  - Programme Director and Panel Chair
  - Funders
- Silk Task Force (STF) initially appointed by Panel
  - Now replaced by Silk Board ExCo, agreed by SB
- Silk Exco membership agreed in SB, ratified by Panel
  - Managers, Cisco, Programme Director, 1 representative each region (Caucasus & Central Asia), regional consultants

The Silk Board Exco

- Sergey Berezhnev, MSU, RU, NOC Manager
- Jane Butler, Cisco, UK
- Hans Frese, DESY, DE – Technical Manager
- Robert Janz, RUG, NL - Service Manager, SPONGE, Consultant Central Asia
- Walter Kaffenberger, NATO, BE – NATO Programme Director
- Peter Kirstein, UCL, UK – Chair, Project Director, SPONGE
- Ramaz Kvatadze, GRENA, Georgia – Caucasus, SPONGE
- Askar Kutanov, AKNET, Kyrgyz Republic – Central Asia
- Zita Wenzel, ISI, US – Consultant Caucasus

Theoretical Rules

- Funded by NATO/Cisco
  - Minimum equal facilities for each NREN
- Co-funded by NGOs and others
  - More bandwidth for NRENs
  - More earth stations
  - Libraries, schools, etc.
  - Advanced Facilities
- Staged implementation
  - Installing equipment only when NRENs ready
- Staged upgrades

External Discussions

- World Bank – Most advanced
- Soros Foundation
- US State Department
- Aga Khan Foundation
- EC - INTAS

World Bank

- Want Central Asia Distance Learning Centres
- Multi-way H.323 Video Conferencing
- Normally ISDN, need convincing IP gives QoS
- Want about 784 Kbps full duplex to/from one centre in each Central Asian site
- Hope to use up to 8hrs/day – otherwise free
- **Have been doing tests, would double SCPC for Central Asian sites**

Extending the System

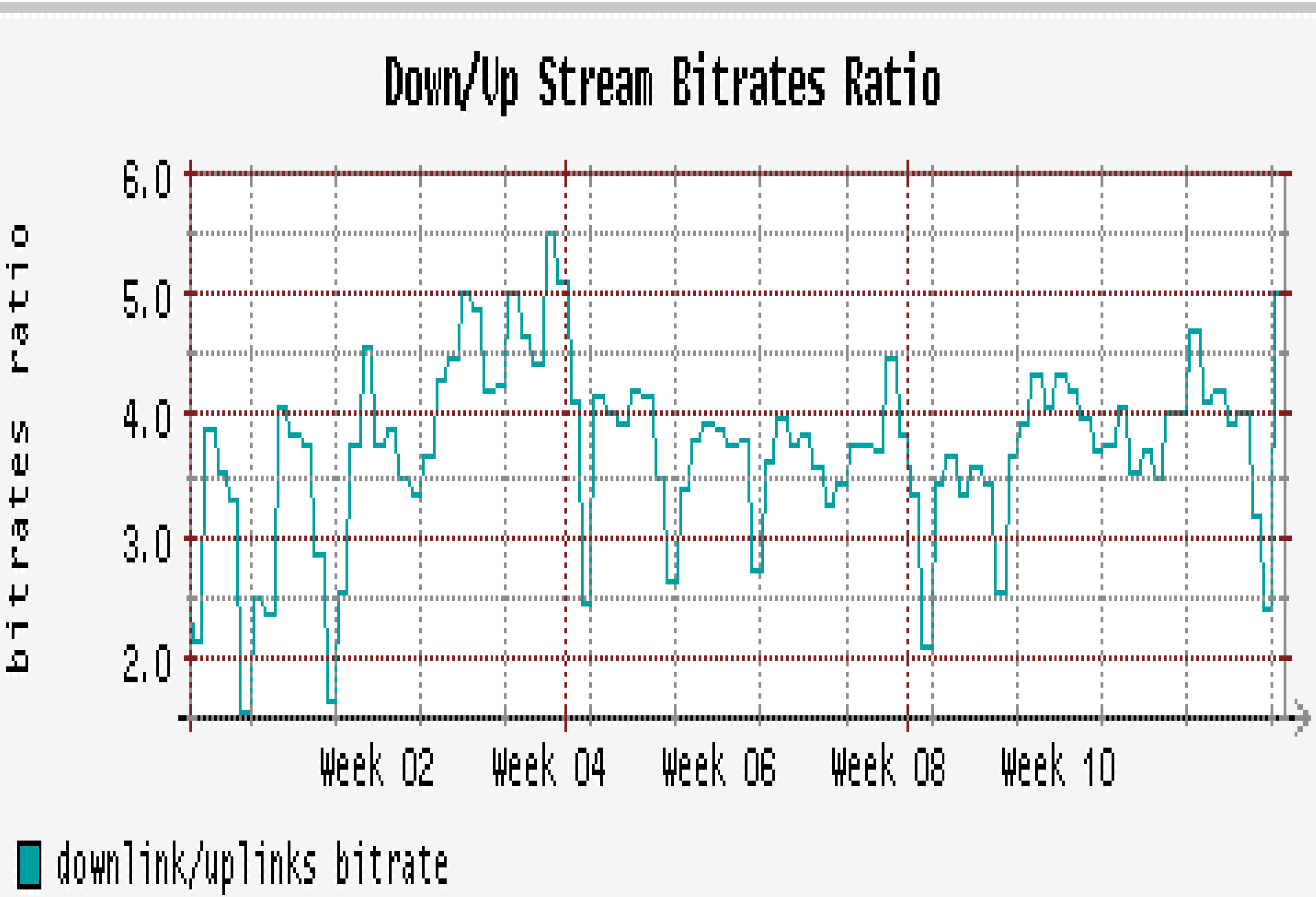
- Have started talking to Kalitel and Eurasiasat on further extensions
- Current plans with World Bank would have 24 Mbps DVB, 10 Mbps SCPC, Central Asian stations 1.4 Mbps SCPC each
- Current transponder limited to 42 Mbps
- Current SCPC limited to 1.5 Mbps each

Preliminary Solutions

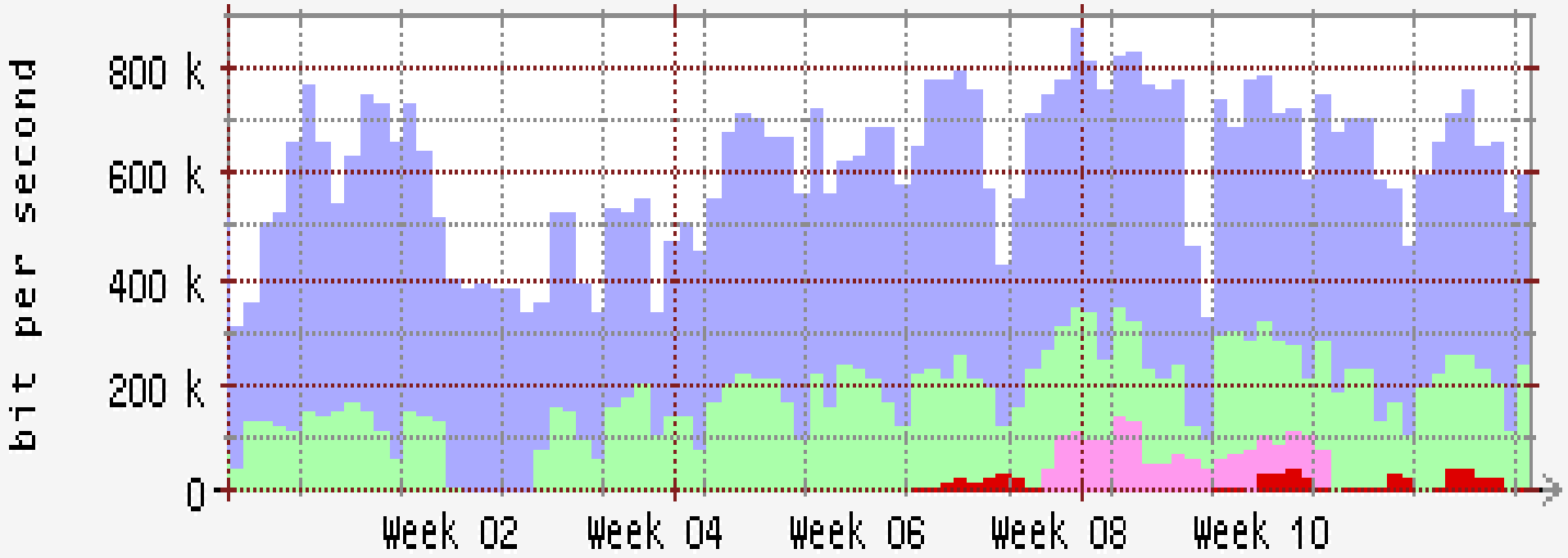
- First limit SCPC per remote station
  - Could move to 8PSK from current QPSK
  - Could increase transmit power – very expensive
  - Could increase dish size – about $17K/ station
  - Favoured solution, re-deploy existing stations, put in larger new stations, where needed
- Second limit cost of Broadcast Channel
  - Could go back to 16QAM , had gone to 8PSK for stability
- Third limit transponder
  - – Might be able to use additional transponder

The SPONGE Project

- 10/02- 3/05, E220K
- Partners ARENA, GRENA, Groningen U, UCL
- Objectives
  - Project management
  - Dissemination
  - Measurement
  - Personal communications
- Have got measurements for Q1 - 2003

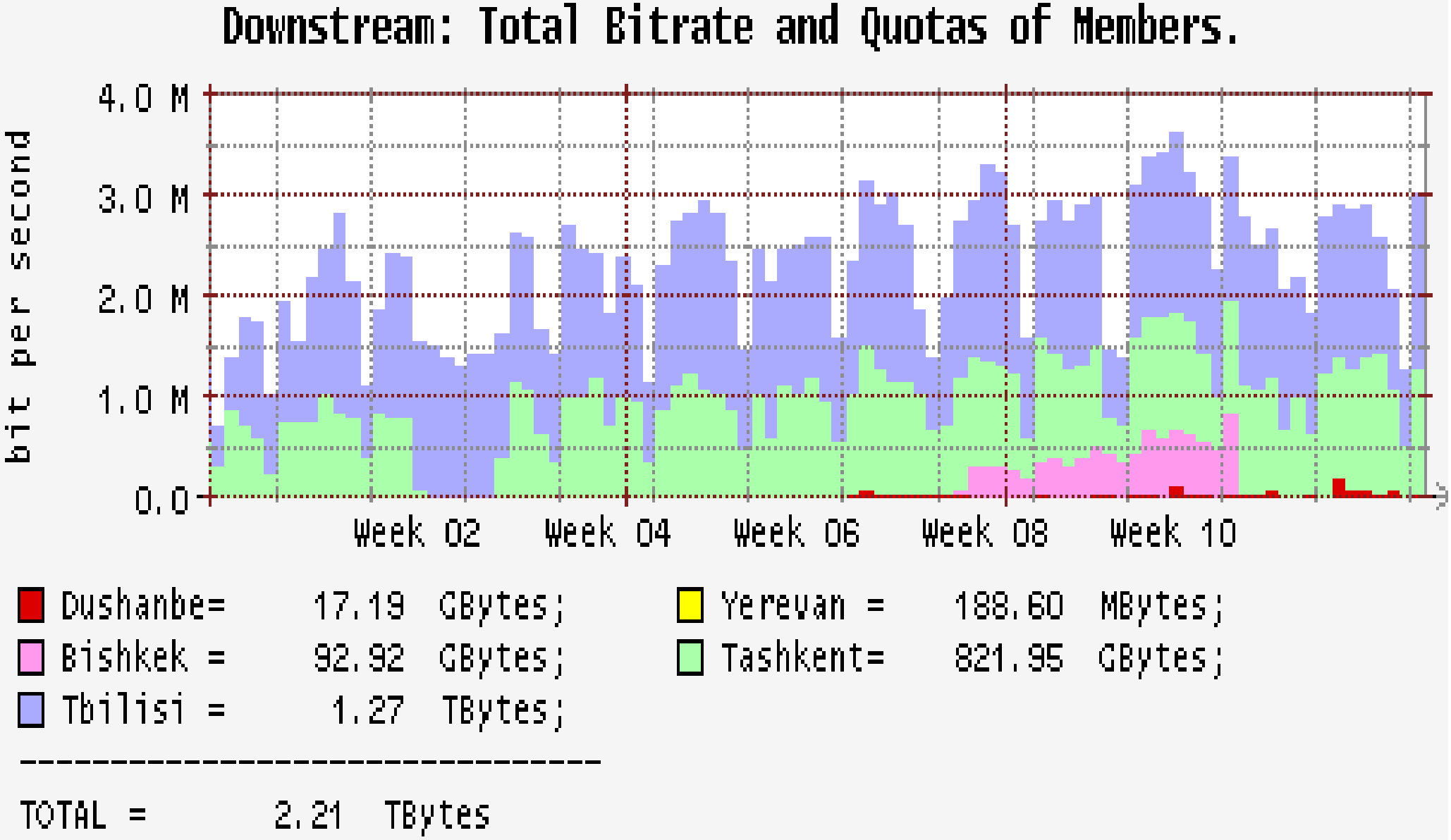

Down/Up Stream Bitrates Ratio
bitrates ratio
6.0
5.0
4.0
3.0
2.0
Week 02
Week 04
Week 06
Week 08
Week 10
downlink/uplinks bitrate

Upstream: Total Bitrate and Quotas of Members.



Dushanbe=	6.63 GBytes;	Yerevan =	123.03 MBytes;
Bishkek =	16.65 GBytes;	Tashkent=	151.58 GBytes;
Tbilisi =	416.90 GBytes;		

TOTAL = 591.88 GBytes


Downstream: Total Bitrate and Quotas of Members.
bit per second
4.0 M
3.0 M
2.0 M
1.0 M
0.0
Week 02
Week 04
Week 06
Week 08
Week 10
Dushanbe= 17.19 GBytes;
Bishkek = 92.92 GBytes;
Tbilisi = 1.27 TBytes;
Yerevan = 188.60 MBytes;
Tashkent= 821.95 GBytes;
TOTAL = 2.21 TBytes

Measurement Uses

- Can look at any period
  - Bits, packets, receive, transmit, ratio
- Shows need to upgrade countries
- Ratio shows how much need to increase shared BW if increase of SCPC
  - Normal 1:4
  - Video conferencing 1:1
- Only just starting to adjust and measure cache

SPONGE Video Conferencing

- Regular Audio Conferencing VoIP
  - Use for ExCo meetings
  - Dial out from UCL Server into Cisco global system
- Some early work on H.323 conferencing
  - For World Bank, expect they will provide equipment
  - DESY, UCL and RUG have equipment
  - All have 3-way multiplexors, UCL has 12-way
  - Will provide simple equipment for SPONGE partners
- Will do some work with Mbone tools

Service Issues

- Fault reporting
  - Now NOC has 24 x 7 cover, is working better
  - Has tracking and history system
  - Will provide access to Silk Board members and EC
- Will provide training in Russian
- Must provide for Cisco system support
  - First year part of Cisco donation
  - Discussing putting all installations in Silk countries including NRENs under one contract

Communication

- WebPages www.silkproject.org
  - document store – minutes, publications, manuals, papers
  - Operations – current status, historical status
  - Soon performance, resource usage, caching statistics
- Distribution lists
  - Silk taskforce, Silk board, Working groups, funders
- Regular News letter
- Future Interactive facilities support
  - IP telephony (with advice on document store)
  - Video conferencing (with advice on document store)

Training

- NATO workshops
- OSI support for NRENs and workshops
- Cisco Academy
  - On-site training
  - distance education
  - Can provide specialised courses

Silk Groups

- Starting Technical and User Groups under project auspices
- Providing usual Web, distribution list support etc
- Plan to increase Russian Language information

Summary

- Silk System 6 sites by end of Q1 03
  - 8 sites should be operational by 06-03
- Need to consider provision of ongoing support
- Discussions with funders looking very promising
- From NATO getting to 800Kbps transmit/site
  - 20 Mbps shared receive at all sites
  - If World Bank OK, Central Asia sites 1.5 Mbps transmit

Summary Continued

- If other bodies' support comes through, will need to upgrade total system
  - At least a further factor of three is achievable
- Technical activities starting on measurements, caching, conferencing etc
- Training activities need further planning
- Technical and User Groups need starting