

Medium to Long Term Plan for the USPNet Enhancement

September 30, 2002

Katsumi Yamamoto, JICA Short Term Expert,
Planning of upgrade and design of USPNet
Keith Moala, Manager, USPNet, USP

1. Targets

This Medium to Long Term Plan aims at the targets below for the improvement of ICT environment at the USP.

- Provision of the Broader Band and Spectrum Efficient USPNet
- Interconnection of the USPNet with other Educational Communication Systems
- Expansion of USPNet Service beyond the Extension Centres

2. Suggestions to achieve Targets

In order to achieve the targets, the following tasks shall be carried out to find out the best solutions for targets.

- Spectrum Efficient Satellite Bandwidth Utilization

① Information gathering of Off-the-Shelf VSAT system

As of September 2002, only few candidate VSAT systems satisfy the USPNet requirements in Spectrum Efficient manner (full time data/tel/fax connection with the Hub in Star configuration and ad hoc video connection with any other station in mesh configuration). Possible candidate system may employ either one of multiple access schemes including TDM/FDMA, TDM/MF-TDMA or MF-TDMA. (See [figures 1-1 through 1-3](#))

By the starting time of this Plan, there may appear more candidate systems. Hence, it is necessary to gather the latest information on the possible candidate systems in the market. Further to that effort, the USP shall submit the Request For Information to short listed vendors for seeking detailed system information.

② Satellite System Upgrade Basic Design

According to the information gathered in the previous task, the Basic scheme of VSAT network shall be decided. Then the basic design of

Figure 1-1 Candidate Satellite Systems

Option 1 TDM/FDMA System

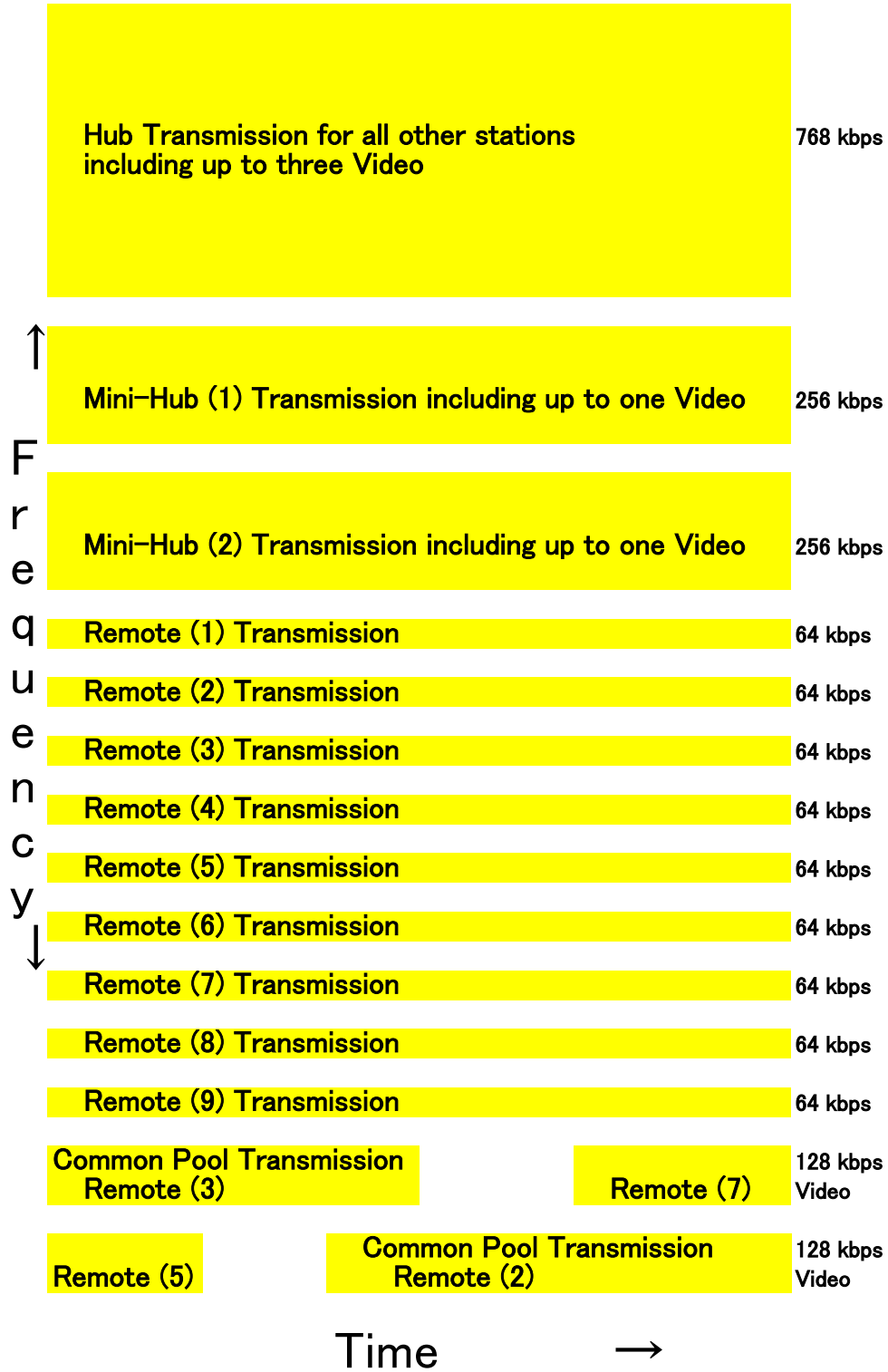
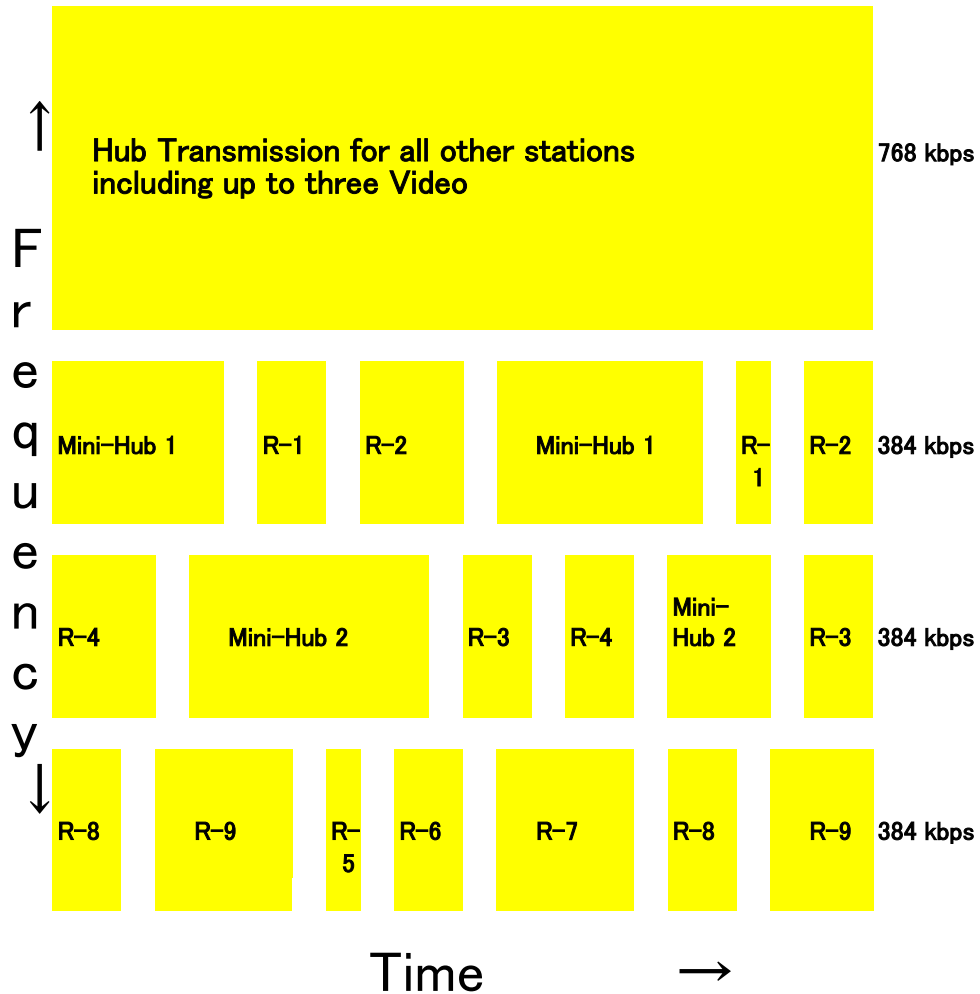


Figure 1-2 Candidate Satellite Systems

Option 2 TDM/MF-TDMA System



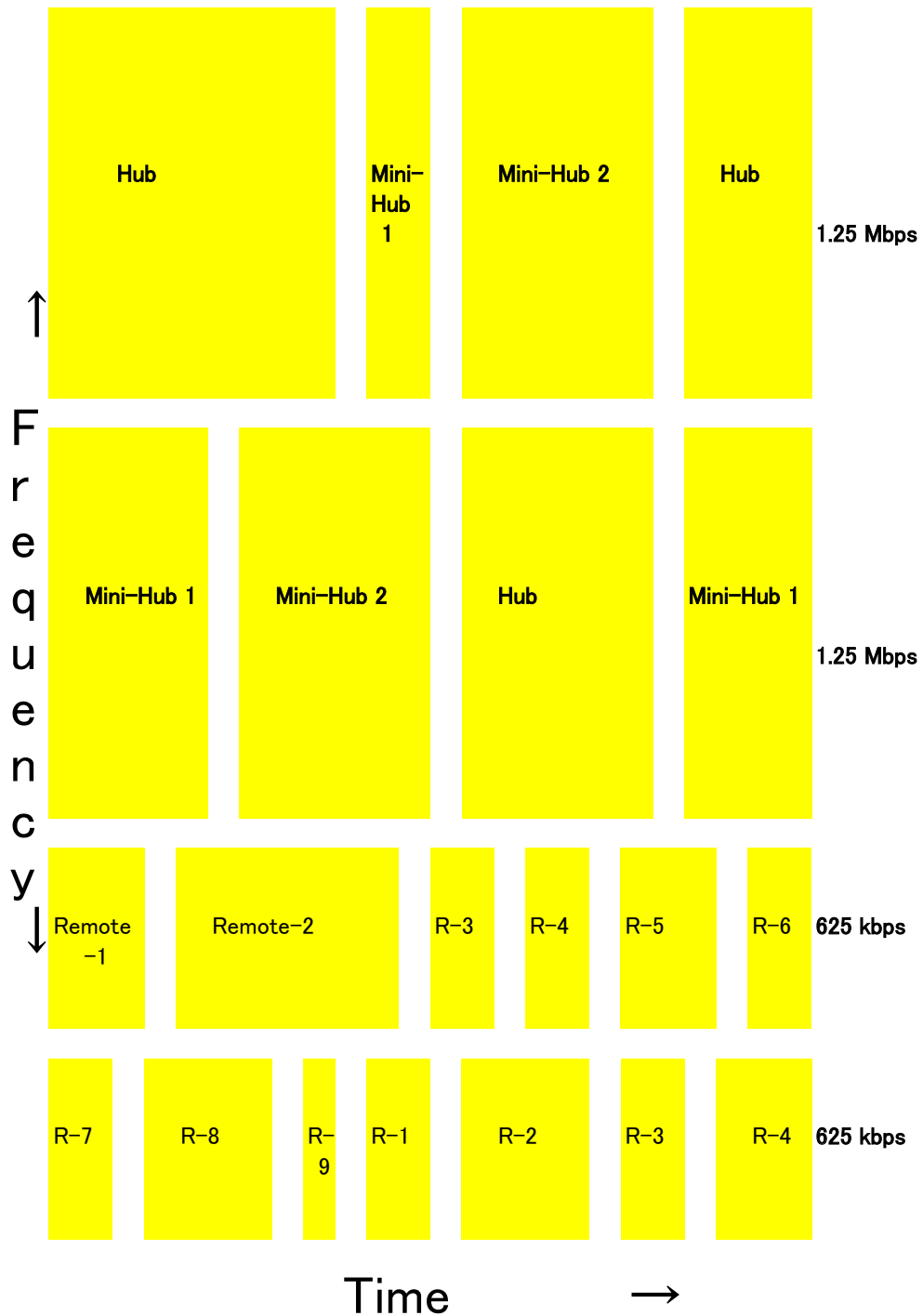
Mini-Hubs share the spectrum with small number of remote stations, so that they can have a capacity for Video transmission.

Remote station may also have a capacity for Video transmission time to time.

Each Mini-Hub and Remote station has pre-assigned minimum capacity and on top of that additional capacity can be allocated on demand basis, as far as the total system capacity allows.

Figure 1-3 Candidate Satellite Systems

Option 3 MF-TDMA System



A high capacity TDMA channels are shared by Hub and Mini-Hubs.

Lower Capacity TDMA channels are shared by Remotes.

Each station has pre-assigned minimum capacity and on top of that additional capacity can be allocated on demand basis, as far as the total system capacity allows.

upgraded VSAT network shall be carried out on the basis of traffic demands for at least the matters listed below.

- Required satellite resources (power and spectrum)
- Required modification of earth station transmission parameters
- Required modification and/or replacement of the existing earth station equipment
- Interface between the existing and new equipment

Once basic design is established, the USP shall submit the Request for Quotation for getting precise cost information for the satellite system upgrade and making firm ground towards the implementation of the upgrade.

③ Budget Planning and Implementation

On the decision to proceed in the previous task, the USP shall make budget available for the implementation of the satellite system upgrade. If the USP requires external funding, it shall also make appropriate arrangement with funding organization(s).

This task is the critical path to the implementation phase and decides the start time of actual implementation tasks and accordingly the completion date of the satellite system upgrade.

④ Procurement of Equipment

Based on the additional information gained in the RFQ process, the detailed specification of the upgraded satellite system shall be established. By this time, the transmission and control scheme of the target VSAT network should be clear and the detailed specification shall provide every necessary parameter required for actual installation and/or modification of the earth station equipment. The installation works may be carried out either by the successful bidder or the USP staffs depending on the expertise needed for the works.

With the detailed specification, the USP shall submit the Request for Proposal for the procurement of required equipment and installation works. The RFP shall be accompanied with the evaluation criteria of the proposals.

Through the RFP process, the USP shall award the contract to a successful bidder and the contractor shall deliver the required equipment and install them at the earth stations. The detailed installation schedule will be fixed through the design review process.

⑤ Arrangement of Satellite Resources and System Transition

The USP shall arrange the satellite resources required for the on-site test of the earth station equipment and the transition to the upgraded satellite network.

On successful transition to the upgraded satellite network and confirmation of the operational stability for a reasonable time period (for example, one month), the satellite resources for old satellite systems shall be surrendered and the contract for it shall be terminated

● Interconnection with other Educational Communication System

① There are a number of Educational Communication Systems in operational, experimental and planning stage, such as J-Net and GDLN. However, as of September 2002, there are still difficulties to interconnect the USPNet with these systems such as technical incompatibility, cost of communication link and lack of common application.

② The situation shall be reviewed for further consideration at the beginning of the Medium to Long Term Plan. Provided that a suitable communication measures are available at a reasonable cost and the technical compatibility can be coordinated with other party, the USP shall seriously consider the interconnection with other Educational Communication Systems.

③ In consideration of interconnection, the compatibility of application and educational program shall also be visited. A possible starting point is to mirror each other's Web Server for easier cross-referencing on both sides.

● Deployment of Satellite Receive Only (SRO) terminals

① Field Trial of SRO terminal

If a suitable SRO terminal is available off-the-shelf in a market, the USP can evaluate it through a field trial.

As of September 2002, no particular terminal is envisaged and a very rough idea of the trial terminal can be provided.

- Low cost satellite receive antenna for C-band (3 to 4 meter mesh reflector)
- Low cost satellite receiver (compatible with IP multi-cast)
- Low cost PC with appropriate software to decode and display the USPNet multi-cast data stream

② Establishment of Guidelines for Introduction of SRO

If the trial above is successful, the USP shall establish the Guidelines for Introduction of SRO. The Guideline shall provide the necessary information for purchase, installation and set-up of SRO terminal, so that a group of interested students can set-up a SRO terminal by themselves.

The USP may help these groups of students by making bulk purchase of SRO at a better price than for individual purchase.

3. Conditions

The solutions are based on the following conditions.

- Fluent data flow and data processing in Laucala LAN
- Utilization of off-the-shelf equipment
- Appearance of inter-connectable Educational Communication Systems
- Low cost and USPNet compatible Satellite Receive Only terminal is available

4. Restrictions

The following restrictions will apply to this Action Plan.

- Fund for procurement of required equipment
- Minimum affection to the existing services
- Budget for increased recurrent Satellite Resource cost
- Minimal outage of communication services during transition

5. Implementation Plan

The detailed Implementation Plan for the solutions and its summary are given in [Figure 2](#) and in the following table, respectively.

Target	Solution	Tasks	Responsibility	Completion Date
Satellite System Upgrade		Coordinate	Director, ITS	Feb. 5, 2007
	Information Gathering (Request for Information)	Coordinate	Manager USPNet	Jul. 9, 2004
	RFI process	Write & evaluate	Manager USPNet	May 28, 2004
	Review with existing system	Evaluate	Manager USPNet	Jun. 25, 2004
	Decision to proceed	Decide	DVC Director, ITS	Jul. 9, 2004
	Satellite System Basic Design	Coordinate	Manager USPNet	Jun. 17, 2005
	Basic Specification	Write	Manager USPNet	Sep. 3, 2004
	RFQ Process	Write & evaluate	Manager USPNet	Apr. 8, 2005
	Cost Benefit analysis	Analyze	Director, ITS Manager USPNet	Jun. 3, 2005
	Decision to proceed	Decide	DVC Director, ITS	Jun. 17, 2005
	Budget Planning	Coordinate	Director, ITS	Dec. 2, 2005
	Procurement of Equipment	Coordinate	Director, ITS	Sep. 1, 2006
	Detailed Specification	Write	Manager USPNet	Sep. 9, 2005
	RFP Process	Write & evaluate	Manager USPNet	Jun. 2, 2006
	Contract award	Contract	Director, ITS	Jun. 9, 2006
Manu- facturing & Delivery	Coordinate & accept	Manager USPNet	Sep. 1, 2006	

Figure 2-1 Candidate Satellite Systems

Option 1 TDM/FDMA System

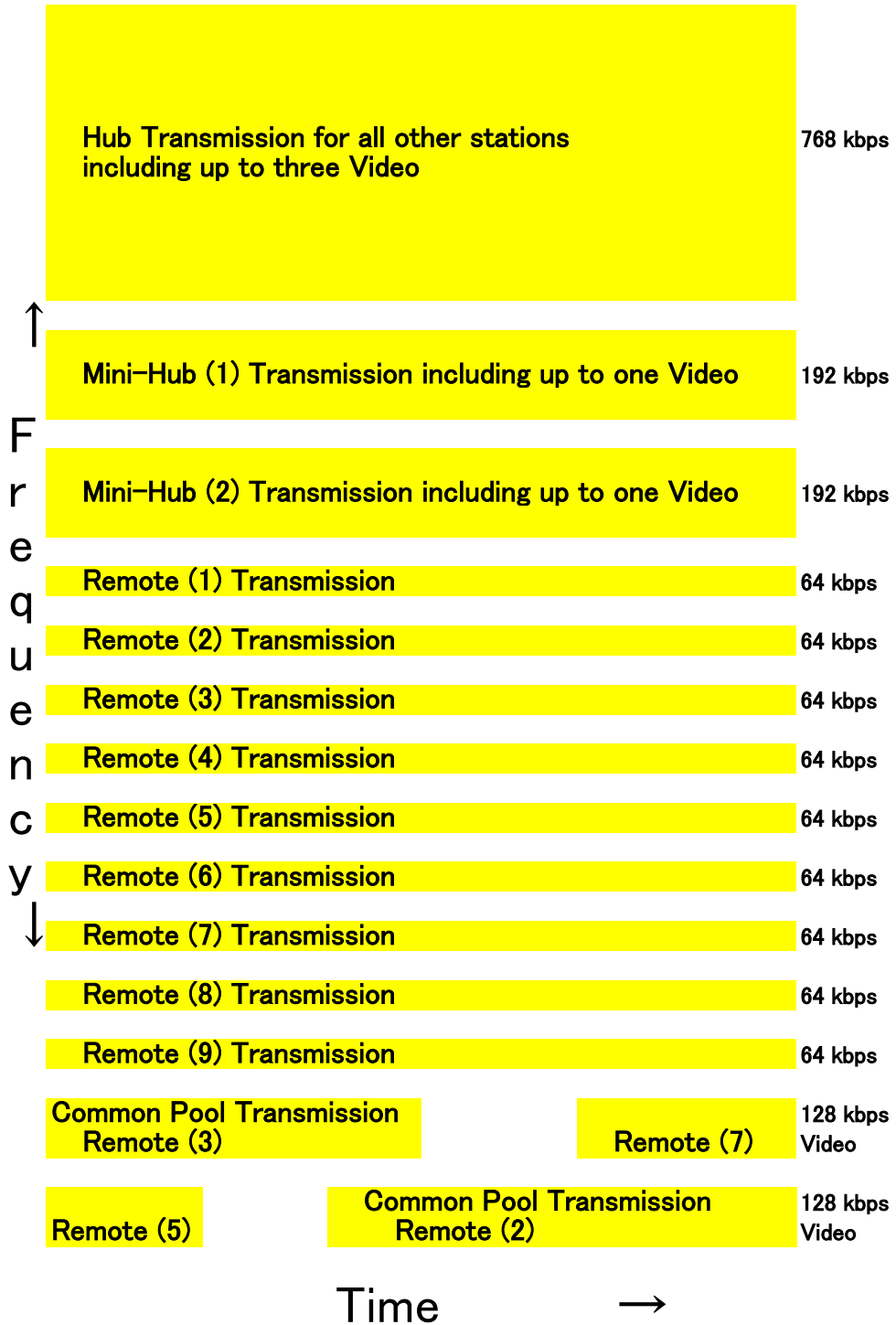
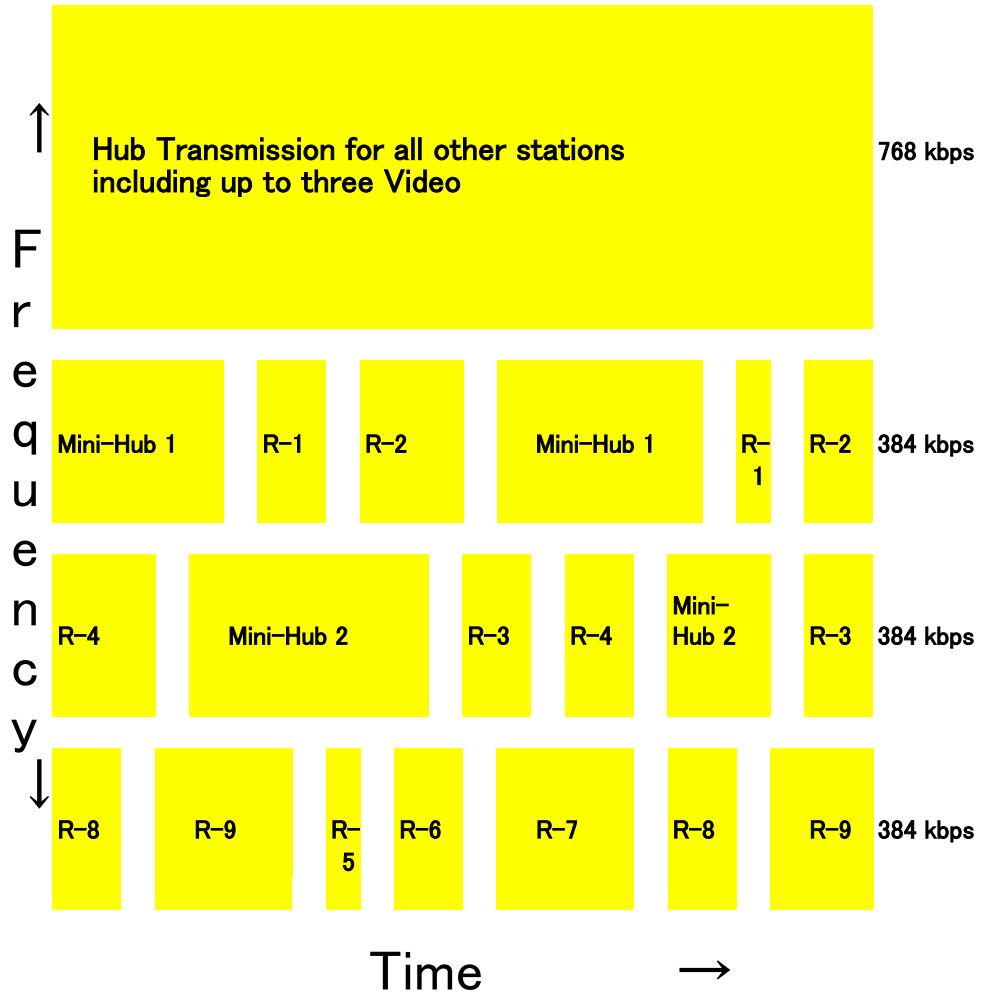


Figure 2-2 Candidate Satellite Systems

Option 2 TDM/MF-TDMA System



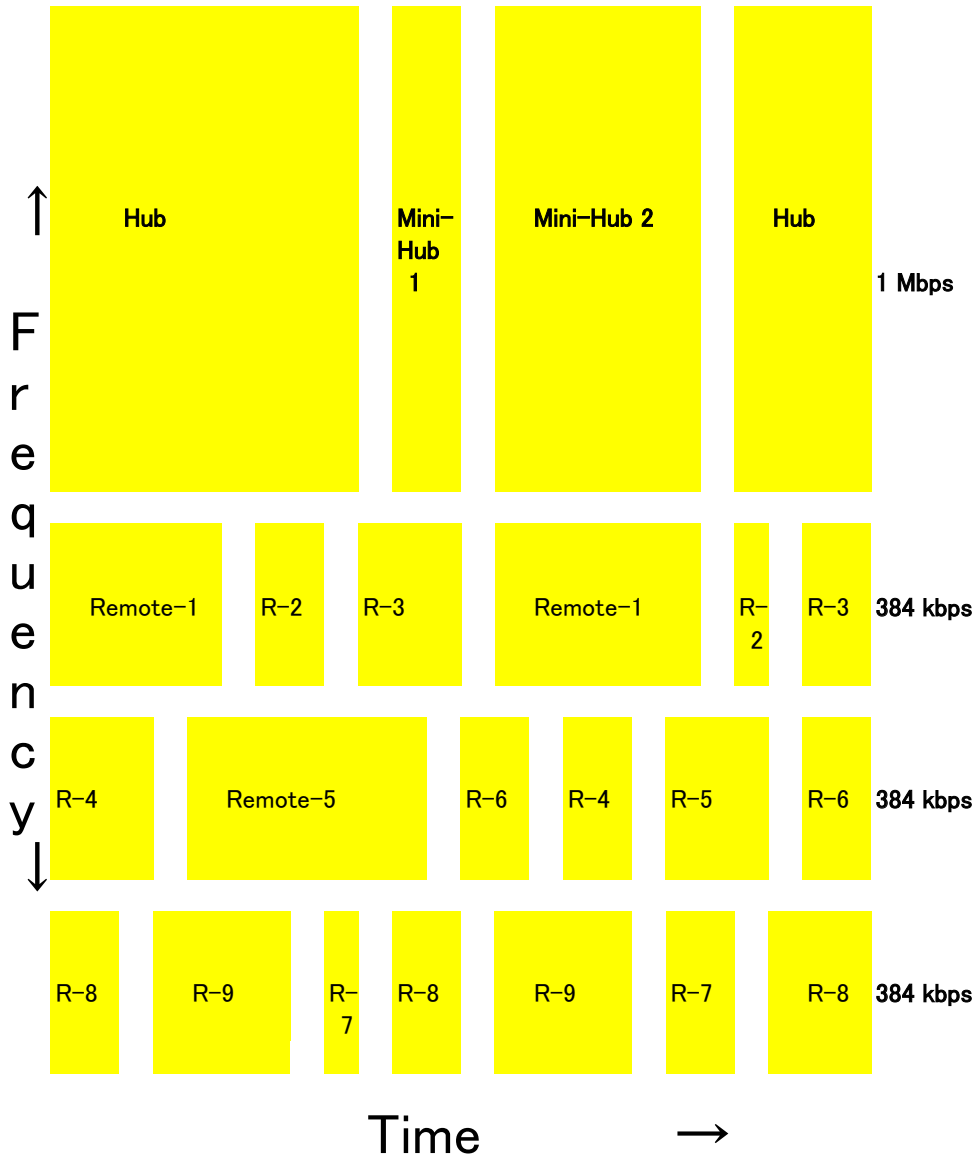
Mini-Hub shares the spectrum with small number of remote stations, so that they can have a capacity for Video transmission.

Remote station may also have a capacity for Video transmission time to time.

Each Mini-Hub and Remote station has pre-assigned minimum capacity and on top of that additional capacity can be allocated on demand basis, as far as the total system capacity allows.

Figure 2-3 Candidate Satellite Systems

Option 3 MF-TDMA System



A high capacity TDMA channel is shared by Hub and Mini-Hubs.

Lower Capacity TDMA channels are shared by Remotes.

Each station has pre-assigned minimum capacity and on top of that additional capacity can be allocated on demand basis, as far as the total system capacity allows.

	Arrangement of Satellite Resources	Coordinate	Manager USPNet	Feb. 5, 2007
	Satellite Resource for on-site test	Coordinate	Manager USPNet	Jul. 21, 2006
	Satellite Resource for Transition	Coordinate	Manager USPNet	Jul. 21, 2006
	Termination of Satellite Resource for old system	Coordinate	Manager USPNet	Feb. 5, 2007
	Equipment Installation at every Earth Station	Coordinate	Manager USPNet	Dec. 8, 2006
	Satellite System Transition	Coordinate	Manager USPNet	Jan. 29, 2007
	Preparation of Transition Procedures	Write	Manager USPNet	Nov. 10, 2006
	Transition	Coordinate & execute	Manager USPNet	Dec. 15, 2006
	System Shake Down	Monitor	Manager USPNet	Jan. 29, 2007
Inter-connection with other Educational Communication Systems	Review of other Educational Communication Systems	Survey and review	DVC	Feb. 27, 2004
	Coordination with other System operator	Coordinate	DVC	Jun. 30, 2004
	Trial connection with other System	Trial equipment installation	Manager USPNet	Aug. 31, 2004
	Coordination for Inter-connection agreement	Coordinate	DVC	Oct. 29, 2004
	Inter-connection	Cooperate	Manager USPNet	Dec. 17, 2004

Deployment of Satellite Receive Only Terminals		Coordinate	Manager, USPNet	Mar. 26, 2007
	Field Trial of SRO Terminal	Coordinate, execute & evaluate	Manager USPNet	Dec. 22, 2006
	Establish the Guideline for SRO Introduction	Write	Manager USPNet	Mar. 26, 2007

6. Cost Implications

This Medium to Long Term Plan demands following equipment costs and operational costs.

- Flexible Satellite Bandwidth Utilization (**Example for a MF-TDMA System with 1.25 Mbps x2 and 0.625 Mbps x2 channels. Installation by USP engineers and technicians. Total data rate around 2.24 Mbps.**)

It should be noted that the system capacity is only an example and the system design will depend on actual and forecasted traffic demands at the time of system design.

Item	Quantity	Unit Cost	Cost
Hub E/S redundant Modulators/ Demodulators	1	FJ\$55,000	FJ\$55,000
Hub E/S Network Control System	1	FJ\$250,000	FJ\$250,000
Mini-Hub E/S back-up Mini-Hub E/S back-up NCS	1	FJ\$250,000	FJ\$250,000
IDU for Mini-Hub and Remote Earth Stations	11	FJ\$55,000	FJ\$605,000
Total Equipment Cost			FJ\$1,160,000

Annual cost for leased satellite capacity	4.875 MHz	FJ\$252,000
---	-----------	-------------

This figure is based on a simple extrapolation of the current Intelsat cost.

- Interconnection with other Educational Communication Systems
 - Equipment for interconnection
 - Applications for interconnection
 - Communication link cost

- Deployment of Satellite Receive Only (SRO) terminals
 - SRO terminal
 - SRO antenna
 - SRO antenna foundation
 - Associated PC, display and speaker

7. Human Resources

This Action Plan demands following human resources for implementing the solutions.

- Flexible Satellite Bandwidth Utilization
 - ① USPNet Manager (29.3 months)
 - ② USPNet Earth Station Technician (24.8 months)
 - ③ IP Network Analyst (2 months)
 - ④ ITS Chief Engineer (4 months)
 - ⑤ ICT Technician at each Extension Centre (1 week)

- Interconnection with other Educational Communication Systems
 - ① Deputy Vice Chancellor (10% over 8.6 months)
 - ② Director, University Extension (10% over 10.8 months)
 - ③ USPNet Manager (20% over 12.5 months)

- Deployment of Satellite Receive Only (SRO) terminals
 - ① USPNet Manager (7.5 months)
 - ② USPNet Earth Station Technician (5.5 months)

8. Effect of Solution

The expected results of proposed solutions are as given below.

- Flexible Satellite Bandwidth Utilization
 - ① The benefit will be a better data flow throughout the USPNet due to more flexible bandwidth allocation to each Earth Station depending on their demand.
 - ② The beneficiaries of this solution are all Staffs and Students using satellite network at all Earth Stations. The number of beneficiaries is estimated around 1,500 considering the external students outside Fiji.

- Interconnection with other Educational Communication Systems
 - ① The benefit is the wider knowledge database for each other. The scale of benefit depends on the other party of interconnection. The USP can offer their unique database of the South Pacific culture and facilitate the people in other part of the world to understand the South Pacific and the USP.
 - ② In return, the USP can have an access to the knowledge database of the other party. This can facilitate the USP students to understand the activities and culture of the other world.

- Deployment of Satellite Receive Only (SRO) terminals
 - ① The deployment of SRO terminals with appropriate antenna can greatly expand the reach of USPNet. Although the number of beneficiaries will not increase so significantly, the increase of students in the future can be expected.