Crew Computer and LAN Integration, Team 5A.5
27 March - 4 April 2000
RSC-E, Moscow Russia
PROTOCOL

I. Attendees:

NASA	**RSC-Energia**
William Hartwell/OM (Boeing)	Dmitri Putan
Neil Woodbury/DL	Evgeni Lvov
James Reilly/CB	Sergey Bronnikov
John Michel/DL (USA)	Alexander Bereznoi
Timothy J. Creamer/CB	Elena Rozhkova
Don Schmalholz/MTLO	Gennadi Isaev
Nathan Moore/MTLO	Mikhail Shutikov
Julie Payette/CB	Igor Pustovoy
	Irina Beskrovnaya
	Alexander Languyev

I. Introduction:

The objective of this meeting was to develop a technical proposals for an integrated onboard network architecture based upon the operational requirements called out in the Crew Computer and LAN Integration, Team 5A.5 protocol of TIM 25, March 2000.

The following terms will be used to describe the major network architectures from Expedition 1 Crew Arrival to post Flight 5A:

a) Stage 1A – Crew arrival
b) Stage 1B – Flight 4A, move OCA to Node 1
c) Stage 2A – Smart Switch Router arrives
d) Stage 2B – The US Lab arrives

The priority of the meeting was to develop an integrated network architecture for Stage 1A and a list of actions (including actionees and due dates) required to provide a functioning network onboard ISS. Second priority was to develop preliminary network architectures for Stages 1B, 2A, and 2B.

This protocol will not modify the current Russian RS-1 and RS-2 Command and Control computer functions or locations.

With the limited time to complete this architecture to support Crew Arrival, the changes herein have been designed to minimize the impacts to the time schedule, work schedule, and existing configuration.

II. Agreements:

Based on discussions during this Mini-TIM and the operational requirements agreed-to in the Crew Computer and LAN Integration protocol from TIM 25, NASA and RSC-E agree on the following:

1) Beginning with Stage 1A:
   a) As a change to the Team 0 Protocol of 1 October 1999, the planned location for the SSC fileserver will be changed from the SM to the FGB.

   b) NASA and RSC-E agree that two of the RS computer worksites, the area of the Central Post and the Wiener Power worksite, will have fixed (non-portable) laptops. The Central Post has RS-1, SSC-1, and PCS. The Wiener Power worksite has the Wiener Power laptop.

      The SSC client mentioned above (SSC-1), must support crew operations for command and control for both the RS1 and PCS laptop computers. Within the constraints of the existing SM hardware, ~~I~~layout ~~must~~ will support ergonomically optimized, convenient operations with all three computers by one crewmember ~~simultaneously~~ from a single worksite.

   c) An SSC-based router will be developed and will be located in the FGB to provide connectivity between the SM network and the SSC Fileserver, OCA and portable laptop (SSC–3) in the FGB.

   d) Two worksites for portable laptop clients (for example, SSC-2, RS-3) will be developed to support IMS and other crew, payload or vehicle support functions on demand by the crew. One of the worksites will be located in the FGB. The laptop at this worksite will be connected via 10Base2 coaxial cable to the onboard LAN. The second worksite for portable laptop clients will be in the working compartment of the SM near the PrK. The laptop at this worksite will be connected to the network via coaxial cable, until the arrival of the Smart Switch Router, when it will change to 10BaseT. The coaxial backbones used in both the SM and FGB will include multiple T-connections along their length to provide additional connectivity as needed.

   e) For implementation of Stage 1A, the Wiener Power computer will be used to perform a router function and to convert from 10BaseT to 10Base2 coaxial cable.

   f) RSC-E and NASA agree that Stage 1A of the LAN integration effort will be accomplished with the network architecture as shown in Attachment 1. The table included in Attachment 2 shows the agreed-to computers and their locations. We expect the functions shown in Attachment 2 can be accomplished with this architecture.

2) The preliminary network architecture for Stage 1B, when the OCA must move to NODE 1, is shown in Attachment 3. (See Action 8 and Issues)

3) The two sides agree that Stages 2A and 2B of the network integration effort will be based on an architecture that employs a Smart Switch Router and a transition to 10BaseT in the SM.
   a) A preliminary network architecture diagram reflecting Stage 2A is shown in Attachment 4. There are problems with the connectivity between Node 1 and the FGB. The currently identified solutions and their associated issues are:
      i) Cables dragged through the hatch: Safety Issue
      ii) RF LAN connection: Certification Issue
      iii) External cables: to be investigated

   b) NASA has provided a preliminary network architecture diagram reflecting the USOS network integration at 2B (Attachment 5).

4) RSC-E and NASA agree to develop optimized computer worksites subject to jointly agreed ergonomic requirements (draft, Attachment 6).

5) RSC-E and NASA agree that RSC-E will establish a board member on the Station Portable Onboard Computer Control Board (S-POCCB). This meeting is usually held monthly.

III. Actions:

1) Identify the existing power and data connections in the FGB and their availability for computer equipment plug-in. [RSC-E, Due date: 14 April 00]

2) NASA will evaluate the physical locations for the potential worksites in the FGB, and NASA and RSC-E will coordinate implementation. [NASA and RSC-E, Due date: 14 April 00]

3) Hardware
   a) RSC-E and NASA will develop and evaluate the initial layout options for worksites and laptop connectivity with the Expedition 1 crew in the RS mockups at GCTC. RSC-E will provide a recommended layout from the available options. [RSC-E, Due date 14 April 00]

   b) Develop a list of minimum hardware required to implement the agreed-to architecture for Stage 1A: computers, cables, PCMCIA cards, terminators, T-connectors, barrel connectors, power connectors, equipment needed to satisfy ergonomic requirements of worksites, etc. Identify which items are already

onboard or already manifested. Identify which items need to be manufactured (for example, cables and connectors). [RSC-E and NASA, Due date: 14 April 00]

c) Make cargo manifest requests for the necessary items. [NASA and RSC-E, Due date: ~~as soon as possible~~28 April 00]

4) Hardware Certification
   a) RSC-E will identify any additional hardware certification issues that need to be addressed. (For example, the 3COM cable, called a "dongle," that connects the PCMCIA Ethernet card to the 10Base2 coaxial cable must be shown to meet certification requirements in the Russian Segment; cables and connectors.) [RSC-E, Due date: 14 April 00]
   b) NASA and RSC-E will exchange certification data for items not yet jointly certified. [NASA and RSC-E, Due date: 1 May 00]

5) Testing
   a) Develop a complete list of the testing required to implement the agreed-to architecture for the Stage 1A. Develop a schedule for testing and the division of responsibilities between the two parties. [RSC-E and NASA, Due date: 7 April]
   b) Develop test plans for each of these tests. [RSC-E and NASA, Due date: ~~TBD~~28 April 00]
   c) Begin tabletop testing of network configuration as soon as possible (do not wait for hardware layout decision to be complete). [RSC-E and NASA, Due date: ~~TBD~~31 May 00]

6) NASA and RSC-E will devise a joint plan describing possible failure scenarios of the joint network, and the possible responses, reconfigurations, and priorities. [RSC-E and NASA, Due date: 14 April 00]

7) RSC-E and NASA will develop a joint list of equipment and activities as required in the Forward Work Plan in the TIM 25 Protocol dated 9 March 00, and submit them to the Station Portable Onboard Computer Control Board (S-POCCB) [Due date: 20 April 00].

   RSC-E will develop and submit the required tasks and cost estimates to the Russian Aviation and Space Agency for authorization and funding. [Due date: 1 May 00]

   S-POCCB will develop and submit the required tasks and cost estimates to the ISS Program for authorization and funding. [Due date: 7 May 00]

8) NASA will investigate available connectivity options for implementing Stage 1B, 2A, and 2B when the OCA moves from the FGB to the Node. [NASA, Due date: 14 April 00]

9) NASA and RSC-E will define and document the concept of crew control of ISS, including the role of the SM Central Post. [NASA and RSC-E, Draft due: 28 April 00, Final due: 15 May 00]

IV. Issues

Connectivity of the integrated network is at risk beginning with Stage 1B, when the OCA must be moved to NODE1, and at Stage 2B when the File Server is moved to the Lab module. Any proposed solution that includes cables through hatches is subject to program level review. (See Attachment 3 and Action 8)

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