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Interface Control Document (ICD)
For the ATM Service
Between NASDA and NASA

Version 1.0

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Earth Observation Research Center
National Space Development Agency of Japan

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APPROVED BY:

Yoshio Ishido
Senior Engineer
NASDA/EORC

Gene G. Knoble
Mission Systems Networks Manager
NASA/GSFC Code 423

Document Update History

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1.0	All	First signature version of this document.

Abstract

This Network Interface Control Document defines the interface agreements between the National Space Development Agency of Japan (NASDA) Earth Observation Center (EOC) Earth Observation data and Information System (EOIS) and the National Aeronautics and Space Administration (NASA) Earth observing satellite (EOS) Mission Support network (EMSn).

Keywords: Earth Observation Center (EOC), Earth Observation data and Information System (EOIS), EMSn, Interface Control Document (ICD)

Contents

Section 1. Introduction

1.1 Purpose

The purpose of this document is to provide a detailed definition of the network interface(s) between the NASDA/EOC/EOIS and NASA/EMSn.

1.2 Scope

This document defines and specifies the data transport interface(s) (i.e., protocols, standards applied, physical connections, and locations connected) between NASDA/EOC/EOIS and NASA/EMSn.

1.3 Document Maintenance Policy

NASDA has responsibility for maintenance of this document. If it is necessary to change this ICD, an updated document will be issued by NASDA.

If NASA or NASDA finds it necessary to change this ICD, the agency will communicate the items to be changed, the reasons for the change and specific language with which to make the change (actual new wording to be entered, and the old wording to be deleted or changed) by Operation Coordination Letter (OCL) to the other agency. The agency receiving the OCL will review the request and, if both agencies agree to the change, NASDA will issue a new version of the entire ICD (not just change pages) in an OCL which will contain the entire ICD and describe all of the changes that were made.

After a new version of the ICD is released, and until it is signed by both parties, it will be referred to as a "Preliminary Version". Before a Preliminary Version ICD is signed, the current signed version will remain in effect. However, if both parties agree (i.e. if the changes are urgent), the Preliminary Version can go into effect before it is signed.

Section 2. Related Documentation

2.1 Parent Documents

The following documents are the parents from which this document's scope and content are derived.

- ADEOS-II Mission Operations Implementation Plan (NASDA/NASA/NOAA) (AD2-EOC-96-055)
- AMSR-E Project Implementation Plan, Volume II (Draft 3.2, February 9, 2000)
- Tropical Rainfall Measuring Mission (TRMM) NASDA/NASA Implementation Plan (TRMM-490-009)
- Letter of Agreement between NASDA and NASA for cooperation on SeaWinds data aboard Quickscat

2.2 Applicable Documents

- Internet Protocol (IP): DARPA Internet Program Protocol Specification, Request for Comment (RFC) 791, September 1981
- Multiprotocol Encapsulation over ATM Adaption Layer 5 (AAL5), RFC, September 1999
- Internet Control Message Protocol, RFC 792, September 1981
- Routing Information Protocol (RIP), RFC 1058
- Structure of Management Information, RFC 1155
- Management Information Base - II, RFC 1213
- Transmission Control Protocol, RFC 793
- Telnet Protocol, RFCs 854 & 855
- File Transfer Protocol, RFC 959
- International Organization for Standardization (ISO) 9314-1, FDDI Physical Layer Protocol (PHY)

2.3 Reference Documents

The following documents, although not directly applicable, amplify or clarify the information presented in this document, but are not binding.

- ADEOS-II Mission Operations Interface Specification (MOIS) Common Part (AD2-EOC-96-054)
- Interface Control Document Between the Earth Observing System (EOS) Mission Systems and the National Space Development Agency (NASDA) Earth Observation Center (EOC) for the Aqua Advanced Microwave Scanning Radiometer (AMSR-E) Instrument (February 2000)
- Interface Control Document Between the Tropical Rainfall Measuring Mission (TRMM) Mission Operations Center (MOC) and the TRMM Instrument Facilities (TSDIS-1994-ICD-00196)
- Interface Control Document Between the SeaWinds On Quickscat Project at the Jet Propulsion Laboratory (JPL) of NASA and the Earth Observation Center at Hatoyama (HEOC) of NASDA
- Operations Agreement between the National Aeronautics and Space Administration of the United States (NASA) and the National Space Development Agency of Japan (NASDA) for the Management and Operations of the ATM service between the Jet Propulsion Laboratory (JPL) and the Earth Observation Center (EOC), January 2000

- EOS Ground System High-Level Architecture (423-10-61-001 R1)

Section 3. Systems Overview

3.1 NASDA/EOC/EOIS General System Description

The Earth Observation Center is located at Hatoyama, Japan. Instrument data are received using feeder-link stations and an X-band station at the NASDA EOC; are processed to near real-time data, Level 0 data and higher level products; and are distributed to related organizations.

Several major components of the Earth Observation data and Information System (EOIS), for example the Data Distribution and Management System (DDMS), are located at the NASDA EOC . Within the DDMS is the Data Distribution Subsystem (DDS). The DDS is an automated system that is responsible for sending and receiving mission operation information files, near real-time data files and catalogue data files between the NASDA EOC and domestic and foreign agencies. Data is exchanged with the DDS through a handshake procedure that utilizes SMTP mail and FTP/gets. The EOIS supports a local area network (LAN) at the NASDA EOC and also a wide area network (WAN) which connects the NASDA EOC to related agencies. The transPacific ATM service between the EOIS and EMSn is a NASDA WAN service which will support multi-mission data exchange.

3.2 NASA EMSn General System Description

3.2.1 EMSn Description

The EMSn provides wide-area communications circuits and facilities between and among various EOS Ground System (EGS) elements to support mission operations and to transport mission data between EOSDIS elements. The relationship of EMSn to other elements supporting EOS is presented in the *EOS Ground System High-Level Architecture* document.

The EMSn is responsible for transporting spacecraft command, control, and science data nationwide on a continuous basis, 24 hours a day, 7 days a week. The EMSn capability to transport these diverse types of data is implemented as two distinct subnetworks referred to as "real-time" and "science" networks. The real-time network transports mission-critical data related to the health and safety of on-orbit space systems and raw science telemetry as well as prelaunch testing and launch support. This highly redundant network provides an operational availability of 0.9995; a Mean Time to Restore Service (MTTRS) of 2 hours, 24x7 coverage, and 0.001% agreed packet loss ratio. The science network transports data collected from spacecraft instruments and various levels of processed science data including expedited data sets, production data sets, and rate-buffered science data. The science network provides an operational availability of 0.98 with an MTTRS of 4 hours.

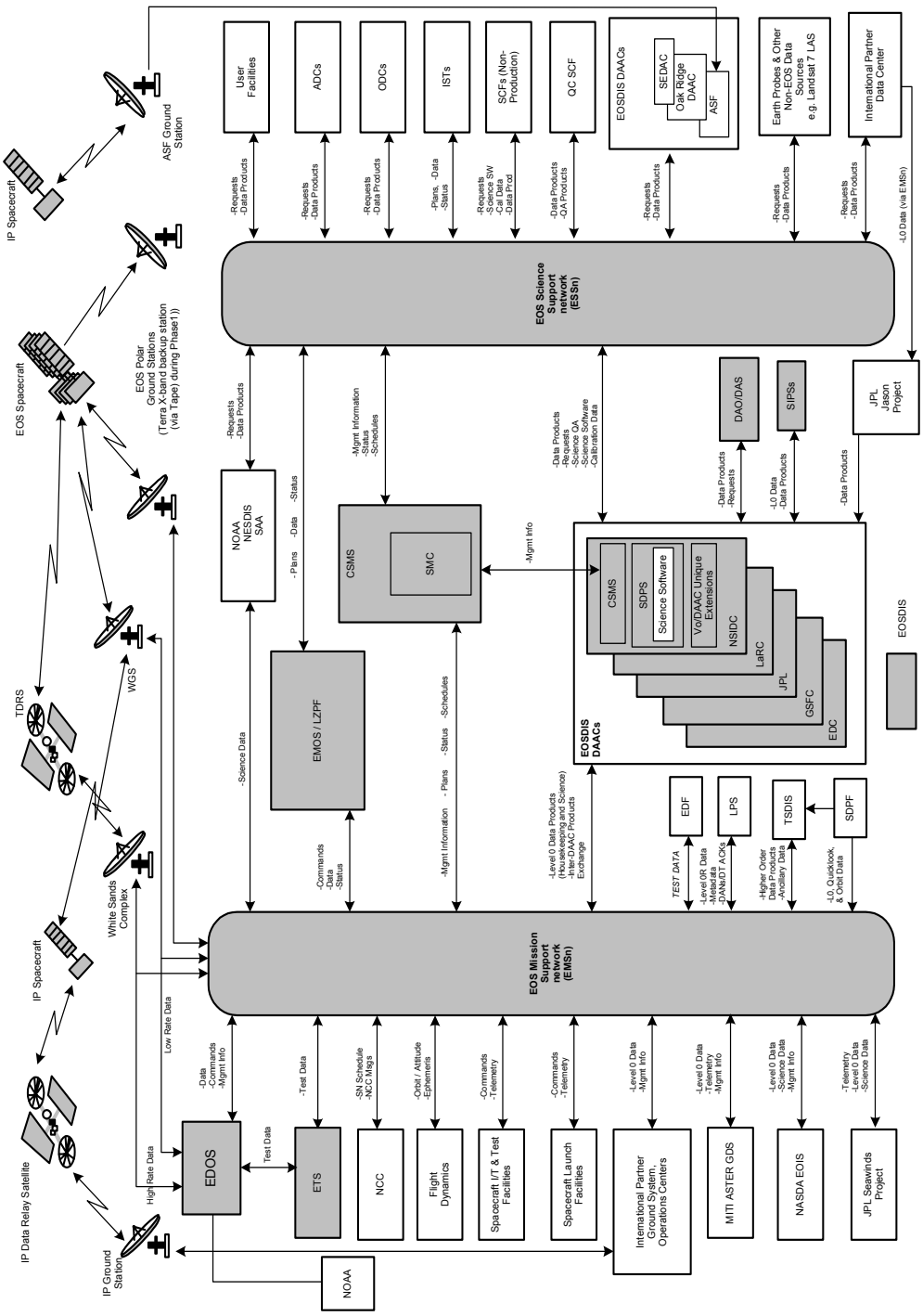

Figure 3-1. EOS Ground System

(Latest version at http://esdis-it.gsfc.nasa.gov/add/images/EOS-Ground-Arch-Pict.html)

3.2.2 EMSn Objectives and Services

The following sections provide an overview of EMSn objectives and services.

3.2.2.1 EMSn Objectives

The objectives of EMSn are to:

a. Implement an operational, integrated, transparent communications system that serves the data communications needs of projects supported by National Aeronautics and Space Administration (NASA) Goddard Space Flight Center (GSFC) and users within EOSDIS

b. Expand using industry standard system solutions while maintaining compatibility with the existing network and user interfaces

c. Minimize costs for implementation, operation, and maintenance of the network

d. Minimize life-cycle costs

e. Maintain high availability by designing with redundancy and without single points of failure in the Network Backbone where required

f. Utilize state-of-the-art technology, utilizing equipment with the best price performance available commercially

g. Allow for growth, adaptability to changing requirements, infusion of new technology, and upgraded interfaces throughout the life cycle.

3.2.2.2 EMSn Services

There are four options for accessing the Internet Protocol (IP)-based EMSn transport service: Local Area Network (LAN) Ethernet, Fast Ethernet, Gigabit Ethernet, and Wide Area Network (WAN) carrier service. Figure 3-2 shows an example of each of these types of interface/demarcation points to EMSn users. This ICD describes the EMSn-DAAC, EMSn-EOC, and EMSn-SMC interfaces, which use the WAN and/or LAN interface types.

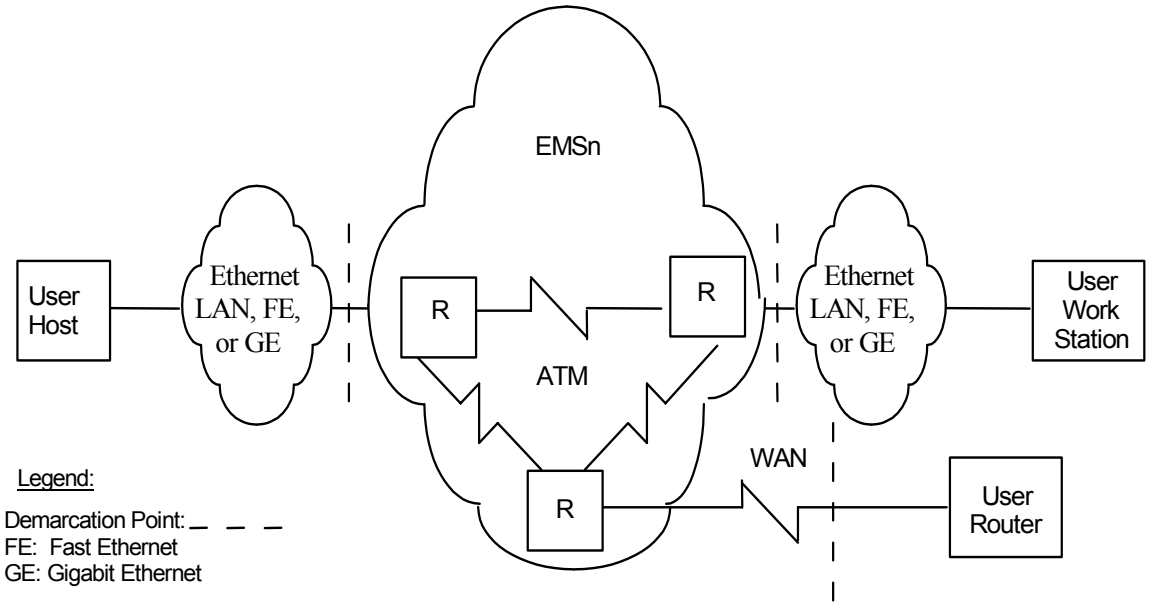

Figure 3-2. EMSn Demarcations

Sustaining engineering, preventive and remedial maintenance, and network monitoring services are provided for EMSn equipment to ensure that EMSn keeps pace with technology and standards and provides continuous service. The official point of contact for EMSn operational status is the NISN Communications Manager (COMMGR). Users who detect a network problem are urged to immediately report it to the COMMGR. The COMMGR may also provide users with limited information about maintenance and status actions. Refer to the *Nascom IP Operational Network (IOnet) User Guide* (541-225) for information regarding user connections, security guidelines, and maintenance information.

3.2.3 EMSn Security (Closed vs. Open)

EMSn consists of an 'open' side and a 'closed' side. The open side allows appropriate data (generally, science data) to be transmitted via the Internet to various end-users. The closed side is protected by firewalls and transports mission data to various EOSDIS subsystems and ground stations via a secure network. EMSn routers will provide filters to support security on an IP subnet basis. No service- or port-level filters will be supported on routers. Such services will be provided by NISN-operated firewalls for EMSn-Closed support or user-provided/operated firewalls on EMSn-Open. A diagram depicting the open and closed side connections is presented in Figure 3-3.

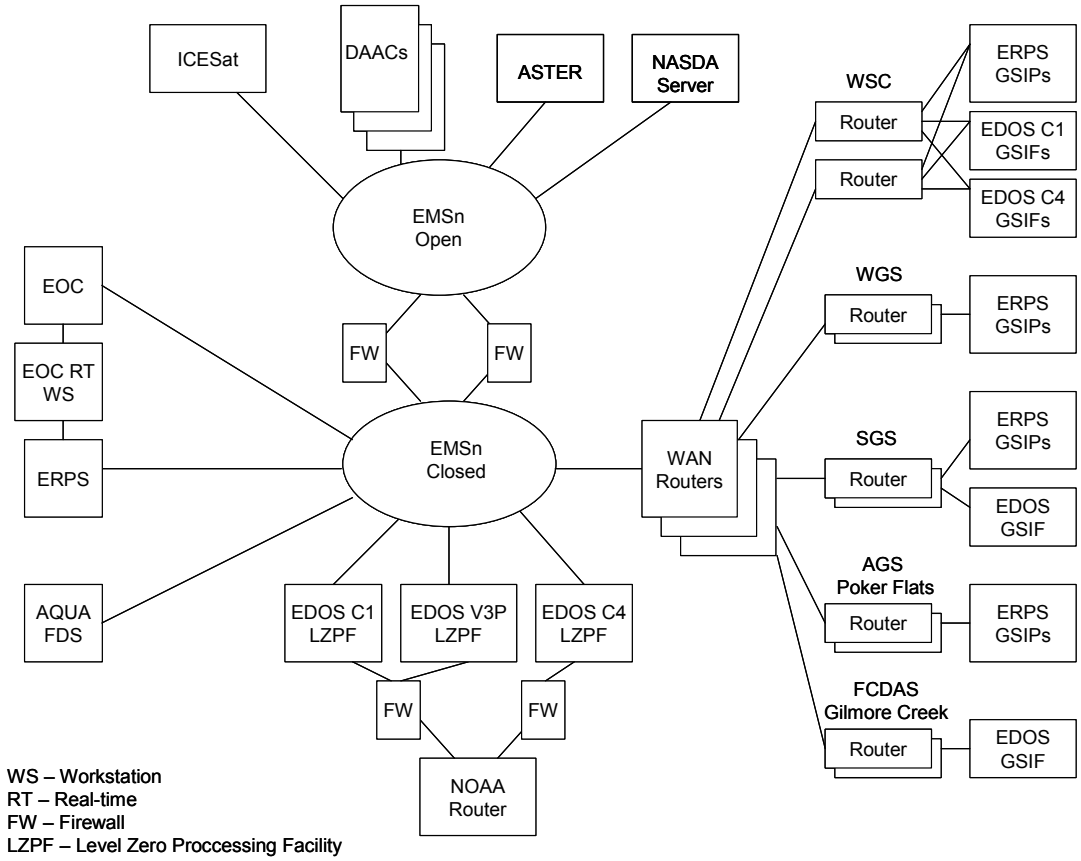

Figure 3-3. EMSn Open and Closed Network Connections

3.3 Relationship Between NASA/EMSn and NASDA/EOC/EOIS

The purpose of the ATM interface between JPL and the NASDA EOC is transport of mission and science flows between NASA and NASDA for the following missions: QuikSCAT, TRMM, ADEOS-II and EOS-Aqua/AMSR-E.

The interface at JPL is depicted in Figure 3-3. The EMSn will transport flows between the router at JPL and their end points within the United States.

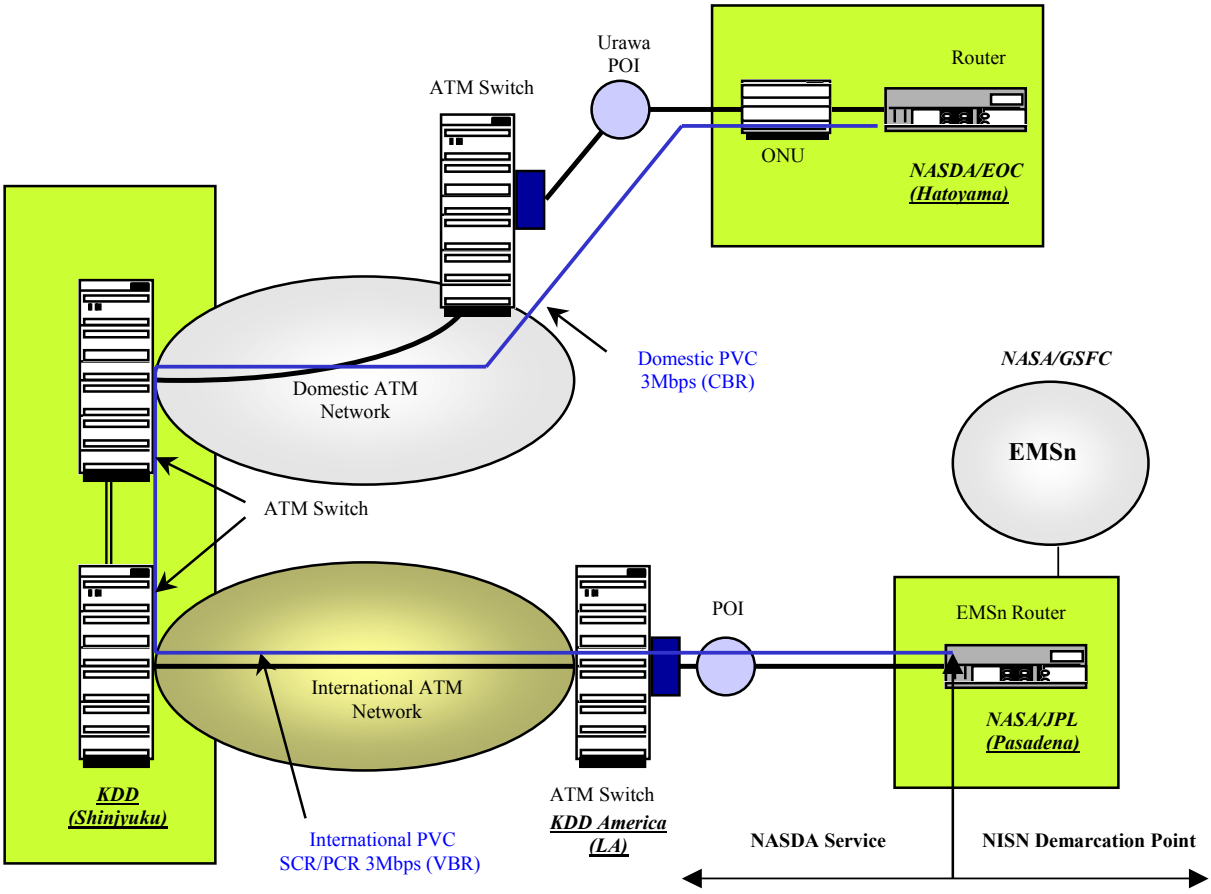

Figure 3-4. EMSn /ATM Service Interface

Section 4. Interface Detailed Design

4.1 Interface Design Overview

The NASDA/EOC/EOIS and NASA/EMSn interface design, as shown in Figure 3-3, consists of two routers for data transport over a trans-Pacific common carrier circuit. The physical demarcation point between NASDA/EOC/EOIS and NASA/EMSn is the NASA/JPL router port identified as the "NISN demarcation point" in Figure 3-3.

4.2 Design Description

WAN circuit bandwidth is as follows:

a. Between NASA/JPL and Carrier Tokyo PoP: VBR 3 Megabits per second (Mbps.) SCR and 3Megabits per second (Mbps) PCR.

b. Between Carrier Tokyo PoP and NASDA/EOC/EOIS: CBR 3 Megabits per second (Mbps).

4.3 Data Interface Design

4.3.1 Primary Communication, Router Interface

A router will provide the data communication interface for the primary service. Figure 4-1 shows the network, data link, and physical layers used by the router. The protocols for each layer are described in the following paragraphs.

network	IP
data link	ATM
physical	DS3 or OC3

Figure 4-1. Data Protocol Stack

4.3.1.1 Network Layer Protocols

The network layer shall support, at a minimum, the following protocols:

a. IP version 4.

b. Internet Control Message Protocol (ICMP).

c. Address Resolution Protocol (ARP).

d. Routing Protocol: Static.

4.3.1.2 Datalink Layer Protocols

The datalink layer shall support, at a minimum, the following protocols:

a. Multi-protocol Encapsulation over ATM adaptation layer 5 (AAL5).

4.3.1.3 Physical Layer Protocols

The physical layer interface between the router and the common carrier ATM switch is DS3 at JPL and OC3 at NASDA EOC .

4.3.1.4 Monitoring

NASDA will permit SNMP polling of the EOC ATM router for monitoring purposes.

4.4 Performance

The NASDA/EOC/EOIS-NASA/EMSn service shall meet the following performance specifications:

a. Data rate of 3 Mbps.

b. Availability of .995 with an MTTRS of 4 hours.

4.5 Equipment List

NASDA/EOC will provide the following equipment to support this interface:

Primary NASDA EOC Router: Cisco (Model 7507), interface modules and associated ATM Port Adapter.

EMSn will provide the following equipment to support this interface:

Primary JPL EMSn Router: Cisco (Model 7507), interface modules and associated ATM Port Adapter.

4.6 Network Parameters

Detailed parameters for this ATM circuit are shown in Table 4-1.

Table 4-1. Network Parameters

	NASDA/EOC	NASA/JPL
IP address	*1	*1
Netmask	*1	
VPI	10	
VCI	34	

*1 IP addresses and the netmask are not published in this document for security reasons. This information is communicated by fax.

4.7 Security

Because this network will support transfer of data for satellite missions between NASA and NASDA, it should be fully secured. Only authorized hosts and personnel should be allowed to access the network. Also, it must be isolated from the Internet and unauthorized access to this network must be prohibited. Both NASA and NASDA should monitor network security and protect against unauthorized access.

ADEOS-II ground network support facilities are supported by wide area and local network connections designed to support their own unique requirements. Because of the diversity in requirements the network equipment and supporting software vary from location to location. Enforcing network security associated with network routers, servers, hosts and other information systems will require coordination and cooperation among ADEOS-II network systems administrators and users. Local network administrators will be primarily responsible for ensuring network safety and preventing hostile attacks from unauthorized sources into their respective information systems. NASA ADEOS-II ground network elements, including wide area networks shall comply with NASA security policies defined in NPG-2810.1 (see http://nodis3.gsfc.nasa.gov/library/displayDir.cfm?Internal_ID=N_PD_2810_0001_&page_name=main for policy content). To the extent possible NASDA and NOAA facilities shall also comply with

NPG-2810.1 for those systems that interface directly to NASA provided networks and information systems.

Section 5. Facilities and Maintenance Demarcation

5.1 NASDA/EOC/EOIS Location

The NASDA/EOC/EOIS physical location is at NASDA/EOC Kanrihonkan 1F 1401 Numanoue, Oohashi, Hatoyama, Hiki, Saitama, Japan.

5.2 NASA/EMSn Location

The NASA/EMSn physical location is at NASA/JPL Building 230 room B3, 4800 Oak Grove Drive, Pasadena, California, USA.

Abbreviations and Acronyms

ARP	Address Resolution Protocol
COMMGR	Communication Manager
DDMS	Data Distribution Management System
DDS	Data Distribution Subsystem
EMSn	EOS Mission Support network
EGS	EOS Ground System
EOC	Earth Observation Center
EOIS	Earth Observation data and Information System
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
ESDIS	Earth Science Data Information System
FDDI	Fiber Distributed Data Interface
GSFC	Goddard Space Flight Center
ICD	Interface Control Document
ICMP	Internet Control Message Protocol
IONET	IP Operational Network
IP	Internet Protocol
IRD	Interface Requirements Document
ISO	International Organization for Standardization
JPL	Jet Propulsion Laboratory
LAN	Local Area Network
MTTRS	Mean Time to Restore Service
Mbps	Megabits per second
NASA	National Aeronautics and Space Administration
Nascom	NASA Communications
NASDA	National Space Development Agency of Japan
RFC	Request for Comment
RIP	Routing Information Protocol
CVCI	Virtual Channel Identifier
VPI	Virtual Path Identifier
WAN	Wide Area Network