

WRDC-TR-90-8007
Volume VI
Part 1

AD-A248 905

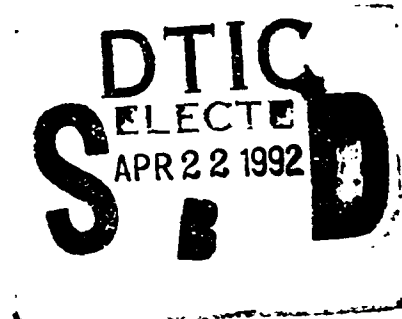


1

INTEGRATED INFORMATION SUPPORT SYSTEM (IISS)
Volume VI - Network Transaction Manager Subsystem
Part 1 - Network Transaction Manager (NTM) Development
Specification

S. Barker

Control Data Corporation
Integration Technology Services
2970 Presidential Drive
Fairborn, OH 45324-6209



September 1990

Final Report for Period 1 April 1987 - 31 December 1990

Approved for Public Release; Distribution is Unlimited

MANUFACTURING TECHNOLOGY DIRECTORATE
WRIGHT RESEARCH AND DEVELOPMENT CENTER
AIR FORCE SYSTEMS COMMAND
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433-6533

92-10287

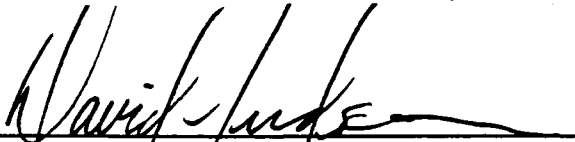
92 4 21 127

NOTICE

When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever, regardless whether or not the government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data. It should not, therefore, be construed or implied by any person, persons, or organization that the Government is licensing or conveying any rights or permission to manufacture, use, or market any patented invention that may in any way be related thereto.

This technical report has been reviewed and is approved for publication.

This report is releasable to the National Technical Information Service (NTIS). At NTIS, it will be available to the general public, including foreign nations



DAVID L. JUDSON, Project Manager
WRDC/MTI
Wright-Patterson AFB, OH 45433-6533

25 July 91
DATE

FOR THE COMMANDER:



BRUCE A. RASMUSSEN, Chief
WRDC/MTI
Wright-Patterson AFB, OH 45433-6533

25 July 91
DATE

If your address has changed, if you wish to be removed from our mailing list, or if the addressee is no longer employed by your organization please notify WRDC/MTI, Wright-Patterson Air Force Base, OH 45433-6533 to help us maintain a current mailing list.

Copies of this report should not be returned unless return is required by security considerations, contractual obligations, or notice on a specific document.

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION Unclassified			1b. RESTRICTIVE MARKINGS None		
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for Public Release; Distribution is Unlimited.		
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE					
4. PERFORMING ORGANIZATION REPORT NUMBER(S) DS 620342000			5. MONITORING ORGANIZATION REPORT NUMBER(S) WRDC-TR-90-8007 Vol. VI, Part 1		
6a. NAME OF PERFORMING ORGANIZATION Control Data Corporation; Integration Technology Services		6b. OFFICE SYMBOL (if applicable)	7a. NAME OF MONITORING ORGANIZATION WRDC/MTI		
6c. ADDRESS (City, State, and ZIP Code) 2970 Presidential Drive Fairborn, OH 45324-6209			7b. ADDRESS (City, State, and ZIP Code) WPAFB, OH 45433-6533		
8a. NAME OF FUNDING/SPONSORING ORGANIZATION Wright Research and Development Center, Air Force Systems Command, USAF		8b. OFFICE SYMBOL (if applicable) WRDC/MTI	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUM. F33600-87-C-0464		
8c. ADDRESS (City, State, and ZIP Code) Wright-Patterson AFB, Ohio 45433-6533			10. SOURCE OF FUNDING NOS.		
11. TITLE (Include Security Classification) See Block 19			PROGRAM ELEMENT NO. 78011F	PROJECT NO. 595600	TASK NO. F95600
					WORK UNIT NO. 20950607
12. PERSONAL AUTHOR(S) Structural Dynamics Research Corporation: Barker, S.					
13a. TYPE OF REPORT Final Report		13b. TIME COVERED 4/1/87-12/31/90	14. DATE OF REPORT (Yr., Mo., Day) 1990 September 30		15. PAGE COUNT 379
16. SUPPLEMENTARY NOTATION WRDC/MTI Project Priority 6203					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify block no.)		
FIELD	GROUP	SUB GR.			
1308	0905				
19. ABSTRACT (Continue on reverse if necessary and identify block number)					
This development specification establishes the development, test and qualification requirements of the Network Transaction Manager (NTM) subsystem. Block 11 (Cont) - INTEGRATED INFORMATION SUPPORT SYSTEM (IISS) Vol VI - Network Transaction Manager Subsystem Part 1 - Network Transaction Manager (NTM) Development Specification					
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT UNCLASSIFIED UNLIMITED x SAME AS RPT. DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION Unclassified		
22a. NAME OF RESPONSIBLE INDIVIDUAL David L. Judson			22b. TELEPHONE NO. (Include Area Code) (513) 255-7371	22c. OFFICE SYMBOL WRDC/MTI	

FOREWORD

This technical report covers work performed under Air Force Contract F33600-87-C-0464, DAPro Project. This contract is sponsored by the Manufacturing Technology Directorate, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio. It was administered under the technical direction of Mr. Bruce A. Rasmussen, Branch Chief, Integration Technology Division, Manufacturing Technology Directorate, through Mr. David L. Judson, Project Manager. The Prime Contractor was Integration Technology Services, Software Programs Division, of the Control Data Corporation, Dayton, Ohio, under the direction of Mr. W. A. Osborne. The DAPro Project Manager for Control Data Corporation was Mr. Jimmy P. Maxwell.

The DAPro project was created to continue the development, test, and demonstration of the Integrated Information Support System (IISS). The IISS technology work comprises enhancements to IISS software and the establishment and operation of IISS test bed hardware and communications for developers and users.

The following list names the Control Data Corporation subcontractors and their contributing activities:

<u>SUBCONTRACTOR</u>	<u>ROLE</u>
Control Data Corporation	Responsible for the overall Common Data Model design development and implementation, IISS integration and test, and technology transfer of IISS.
D. Appleton Company	Responsible for providing software information services for the Common Data Model and IDEF1X integration methodology.
ONTEK	Responsible for defining and testing a representative integrated system base in Artificial Intelligence techniques to establish fitness for use.
Simpact Corporation	Responsible for Communication development.
Structural Dynamics Research Corporation	Responsible for User Interfaces, Virtual Terminal Interface, and Network Transaction Manager design, development, implementation, and support.
Arizona State University	Responsible for test bed operations and support.

TABLE OF CONTENTS

	<u>Page</u>
SECTION 1.0 INTRODUCTION	1-1
SECTION 2.0 SCOPE	2-1
2.1 Identification	2-1
2.2 Functional Summary	2-1
SECTION 3.0 DOCUMENTS	3-1
3.1 Applicable Documents	3-1
3.1.1 Specifications	3-1
3.1.2 Standards	3-2
3.1.3 Other	3-2
SECTION 4.0 REQUIREMENTS	4-1
4.1 Computer Program Definition	4-1
4.1.1 System Capacities	4-1
4.1.2 Interface Requirements	4-2
4.1.3 Internal NTM Interfaces	4-19
4.2 Detailed Functional Requirements	4-43
4.2.1 Receive and Interpret Message Function ...	4-44
4.2.2 Authorize Message Function	4-46
4.2.3 Complete Message Header Function	4-48
4.2.4 Perform Special Message Handling Function	4-52
4.2.5 Log Message Function	4-54
4.2.6 Route and Send Message Function	4-57
4.2.7 Interpret Message Category Function	4-60
4.2.8 Initiate Application Process Function	4-61
4.2.9 Deliver Messages to Application Process	4-70
4.2.10 Accept Requests from Application Process	4-74
4.2.11 Terminate Application Process Function ...	4-83
4.2.12 Handle System Commands	4-92
4.2.13 Handle APC Message Queues	4-96
4.2.14 Handle Local APC Tables Function	4-98

TABLE OF CONTENTS (Continued)

	<u>Page</u>
4.3 Special Requirements	4-102
4.3.1 Programming Methods	4-102
4.3.2 Program Organization	4-102
4.3.3 Modification Consideration	4-102
4.3.4 Special Features	4-102
4.3.5 Expandability	4-102
4.3.6 Special Timing	4-102
4.4 Human Performance	4-102
4.5 Data Base Requirements	4-102
4.5.1 Sources and Types of Inputs	4-102
4.5.2 Destinations and Types of Output	4-102
4.5.3 Internal Tables and Parameters	4-103
4.6 Adaptation Requirements	4-128
4.7 Government Furnished Property List	4-128
SECTION 5.0 QUALITY ASSURANCE PROVISIONS	5-1
5.1 Introduction and Definition	5-1
5.2 Computer Programming Test and Evaluation	5-2
5.2.1 Test Approach	5-2
5.2.2 Test Plan	5-10
5.2.3 Test Description	5-16
5.2.4 Formal Qualification Tests	5-50
SECTION 6.0 PREPARATION FOR DELIVERY	6-1
APPENDIX A TERMS AND ABBREVIATIONS	A-1
APPENDIX B IDEFO MODEL OF THE NTM	B-1
APPENDIX C IDEF1 MODEL OF THE NTM	C-1
APPENDIX D DATA ITEM DESCRIPTIONS	D-1
APPENDIX E MESSAGE TYPES	E-1

Accession For	
NTIS GRA&I	☒
DTIC TAB	☐
Unannounced	☐
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	



LIST OF ILLUSTRATIONS

<u>Figure</u>	<u>Title</u>	<u>Page</u>
4-1	IISS System External Interfaces	4-3
4-2	IISS Architecture - Conceptual Model VAX	4-5
4-3	NTM/AP Interfaces	4-6
4-4	NTM Service Calls	4-7
4-5	The AP's Interface	4-8
4-6	IISS AP-COBOL Procedure Division Structure	4-10
4-7	The COMM AP/NTM Interface	4-12
4-8	COMM AP/NTM Protocol	4-13
4-9	NTM-UI Interface	4-15
4-10	IISS Operator's Interface	4-18
4-11	Header Format	4-19
4-12	Monitor AP Functions	4-26
4-13	IISS Messages Received by the Monitor AP	4-34
4-14	IISS System Commands and Responses	4-36
4-15	Processing of Messages Received by a Monitor AP	4-39
4-16	IISS Monitor Status Messages	4-41
4-17	NTM Functions	4-43
4-18	AP Initiation	4-67
4-19	A "RCV" (with wait) AP Scenario	4-73
4-20	NTM Service Call AP Interface Processing	4-76
4-21	NTM Abort AP Protocol	4-87
4-22	NTM - Normal AP Termination Protocol	4-90
4-23	APC Startup Protocol	4-95
4-24	NTM Tables - Overview	4-104
4-25	Message Category Table	4-108
5-1	Requirement to Test Matrix	5-3
5-2	TSPUIMPU Menu	5-10
5-3	TSNTMMPU Menu	5-11
5-4	TSSERMPU Menu	5-11
5-5	TST12MPU Menu	5-12
5-6	TSSIG Menu	5-13
5-7	TSSUIMPU Menu	5-13
5-8	TSGDMMPU Menu	5-14
5-8a	TSABTMPU	5-15
5-9	NTM Test Configuration	5-18

LIST OF SYMBOLS, ABBREVIATIONS, ACRONYMS

AP	Application Process
APC	Application Process Cluster
API	Application Process Interface
CDMRP	Common Data Model Request Processor
COMM	Communications Handler
CPCI	Computer Program Configuration Item
DBMS	Data Base Management System
DML	Data Manipulation Language
ICAM	Integrated Computer Aided Manufacturing
IDSS	Integrated Decision Support System
IISS	Integrated Information Support System
IPC	Inter Process Communication
LAN	Local Area Network
MCM	Manufacturing Control Material Management
MDL	Message Definition Language
MM	Message Manager
MO	Maintain Operability
MPU	Message Processing Unit
MRP	Materials Requirements Planning
MSG	Message
NTM	Network Transaction Manager
OS	Operating System
PM	Process Manager
QA	Quality Assurance
SS	System Specification
UI	User Interface
VAX	Trademark of Digital Equipment Corporation: 32 bit minicomputer
VMS	Trademark of Digital Equipment Corporation: The VAX OS

SECTION 1

INTRODUCTION

This Network Transaction Manager (NTM) Development Specification (DS) provides the design of the functions to be implemented by the NTM in the Integrated Information Support System (IISS) test bed. This specification supersedes in part the NTM System Design Specification. This specification views the NTM as a cohesive, testable (stand-alone) system with well defined external interfaces between the NTM and other test bed configuration items. This document further defines the operating environment, internal interfaces, and the database characteristics for the NTM. The major emphasis is the specification of the processing performed by the NTM.

The format and content of this specification is in conformance with the ICAM Documentation Standard (IDS 150120000A) for a Development Specification.

The NTM design presented in this document was derived from: (1) the NTM System Specification, System Design Specification, and Development Specification for project 6201 (2) technical review meetings and, (3) engineering judgement. The previous NTM Specifications provided detailed NTM requirements. Technical review meetings provided overall IISS system requirements, constraints, and functional interface definitions. Engineering judgement was used to derive the NTM design in consideration of these factors.

The NTM external and internal interfaces have been established at a functional level in Section 4.1. Interfaces are identified between NTM and the Common Data Model Request Processor, the User Interface, the Communications Handler, Integrated and Nonintegrated Application Processes, and Host Operating Systems. The internal interfaces section defines the NTM Message Header and the Monitor AP functionality.

The emphasis of this document is found in Section 4.2 where the NTM functions identified in the IDEF\0 Model (Appendix B) are described as to their inputs, outputs, and processing requirements.

The NTM data characteristics are detailed in Section 4.5. These are based on the data requirements established in the earlier NTM Specifications. The efforts in this area have resulted in an expanded IDEF\1 data model (see Appendix C).

The Appendix to this document provides, in addition to the IDEF models, the data dictionary for the NTM data (Appendix D), the definition of the message types used within the NTM (Appendix E), and a brief explanation of error message handling within the NTM.

SECTION 2

SCOPE

2.1 Identification

This specification establishes the performance, development, test, and qualification requirements of a computer program identified as the Network Transaction Manager, hereinafter referred to as the NTM. The NTM is one configuration item of the Integrated Information Support System (IISS).

Please refer to the Software Availability Bulletin, Volume III, Part 16, CI# SAB620326000, for current IISS software and documentation availability.

2.2 Functional Summary

The NTM Computer Program Configuration Item (CPCI) provides control and support services to application processes that are grouped together logically in clusters called Application Process Clusters (APCs*). The sum of these APCs is the IISS. The IISS is a system that incorporates heterogeneous host machines into a network to provide transaction processing services within a manufacturing environment. This environment is discussed in the IDEF\0 model (contained in Appendix B below).

The major functions of the NTM are:

- a. Manage Message: This function provides for the receipt and routing of messages both between application processes residing on a cluster and between clusters. The message manager also provides authorization checks, message and error logging, and message header completion.
- b. Manage Process: This function provides direct support to the application processes on the cluster in terms of initiating the process, communicating with the process, enabling abnormal termination or shutdown, and monitoring the process status.

*The term "Application Process Cluster" (APC) replaces the term "workstation" as used in all previous NTM documentation. In concept, the two terms are synonymous.

- c. Maintain Operability: This function provides the overall control capabilities of IISS system startup and restart, recovery, and monitoring. This function also collects and records status and statistics. This is a system-wide, host-wide and an APC local function.

SECTION 3

DOCUMENTS

3.1 Applicable Documents

The following documents were used in the definition of the NTM specification.

3.1.1 Specifications

- [1] Control Data Corporation and D. Appleton Co. Inc.; IISS Test Bed CDM Needs Analysis; June 7, 1982; IISS Test Bed CDM State of the Art; June 7, 1982; IISS Test Bed CDM Environment; June 7, 1982; IISS Test Bed CDM System Requirements; June 7, 1982.
- [2] General Electric Co.; Test Bed System Requirement Document (Draft); Revised 23 August 1982.
- [3] ICAM Computer-Based Information System (CBIS) System Requirements Document (Draft); September 10, 1981; CI #SRD3101400000.
- [4] SofTech, Inc.; IISS Test Bed: Network Transaction Manager System Specification; May 1982.
- [5] SofTech, Inc.; IISS Test Bed: Network Transaction Manager System Design Specification; July 1982.
- [6] General Electric Co.; Test Bed System Specification (Draft); 23 August 1982.
- [7] SofTech, Inc.; IISS Test Bed: Network Transaction Manager Development Specification (Milestone 7); October 1982.
- [8] SofTech, Inc.; IISS Test Bed Programmer's Guide (Draft); January 1983.
- [9] General Electric Co.; Interprocess Process Communication (IPC) Primitives; January 10, 1983.

3.1.2 Standards

- [10] American National Standards Committee X3; American National Dictionary for Information Processing; X3/TR-1-77; September 1977.
- [11] ICAM Documentation Standards; 15 October 1983; FTR150120000U.
- [12] SofTech, Inc.; ICAM Test Bed Interim Standards and Procedures"; February 1982; ISP620150000.
- [13] General Electric Co.; IISS Software Development Guideline/Conventions (Draft); August 23, 1982.

3.1.3 Other

- [14] ICAM Program Office; The Integrated Sheet Metal Center; 30 September 1981.
- [15] ICAM Program Office; The Role of the ICAM Test Bed and Integrated Information Support System (Draft); 18 May 1982.
- [16] SofTech, Inc.; IISS Response to CBIS Requirements and 'Threads': SofTech Reactions; March 18, 1982.
- [17] Digital; VAX-11 Architecture Handbook; Digital Equipment Corp., Maynard, MA, 1985.
- [18] IBM; System/370 Principles of Operation, SA22-7085-0.
- [19] Digital; VAX/VMS* System Services Reference Manual, AA-D018B-TE, "VAX-11 Information Directory and Index," AA-D016D-TE.
- [20] Users Manual: IDBMS (2.0) Users Manual, June 1980.

*VAX/VMS is a trademark of the Digital Equipment Corporation.

- [21] Systems Users Manual: IDBMS (2.0) System Users Manual, June 1980. IBM; MVS/Extended Architecture Supervisor Services and Macro Instructions, GC28-1154-0.

SECTION 4

REQUIREMENTS

This section includes functional and performance requirements for the NTM. In addition, it defines the NTM interfaces to other IISS CPCIs.

4.1 Computer Program Definition

The NTM interfaces with IISS CPCIs, integrated and non-integrated application programs (APs), and host operating systems. The NTM CPCI will interface with several IISS components. The identified ones are: the Communications Handler APs (COMM), the Common Data Model Request Processor (CDMRP), an Operator's Console, and the User Interface (UI).

4.1.1 System Capacities

The NTM system capacity requirements are the following:

- a. A VAX 11/780, that runs the VMS Operating System, and an IBM 4381 running MVS. The internal timing rates and computer storage capacities will be determined by the particular host's configurations supplied for the IISS Test Bed [14].
- b. One IISS Operator's Console on each computer system.
- c. Sufficient disc storage on all three hosts for an NTM module, its associated files, and a Message and Error Log. Requirements for log archiving have not yet been determined.

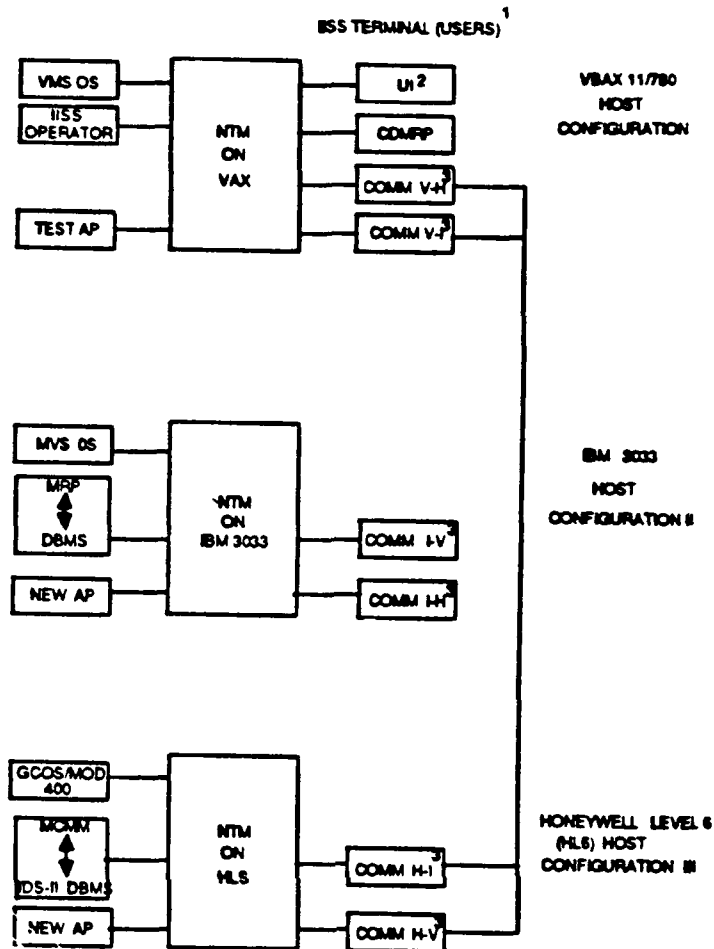
*VAX is a trademark of the Digital Equipment Corporation.

- e. There will be three types of inputs to the NTM. These are:
 - o inputs from an operator's console
 - o messages and service requests from other CPCIs and APs
 - o Host Operating System responses and messages.
- f. The volume of the particular types of inputs has not yet been determined.
- g. The testbed NTM will:
 - o operate on the VAX 11/780, and an IBM 4381 (Figure 4-1).
 - o support COMM, UI, MTR (the IISS Monitor and Operator's Console Cluster, Figure 4-2), CDMRP, and Test Application Clusters on the VAX.
 - o support COMM, Monitor, and application clusters on the IBM.

4.1.2 Interface Requirements

Requirements placed on the design of the NTM CPCI because of its relationship to other equipment/computer programs are as follows. The NTM CPCI design is constrained by the requirement to operate in two environments: a VAX 11/780, VMS environment; and the IBM 4381 environment. It must also provide message acceptance and delivery for the other CPCIs including the IISS operator. Figure 4-1 shows the relationships between the hosts and other CPCIs.

The requirement to support the NTM on multiple hosts imposes a need for portability in the NTM CPCI design. These portability considerations and existing vendor support for FORTRAN and COBOL effected a decision to use COBOL for the IISS CPCIs. There may be a need to use Assembly Language routines to implement host specific functions that are not available in COBOL. This will only be done where the COBOL compiler does not provide an interface for host specific functions.



Notes:

1. The IISS operator interface will be implemented as an IISS terminal or as a separate console interface. It is treated as a separate entity.
2. There will be one UI instance for each IISS terminal that is logged on.
3. The Communication components are named to indicate the link pair (i.e., COMM V-I indicates the component on the VAX that communicates with the IBM).

Figure 4-1. IISS System External Interfaces

The Application Process Cluster (APC) conceptual relationship to the other CPCIs is depicted in Figure 4-2. The NTM rectangles included inside the heavy black rectangle are the NTM's Message Processing Unit (MPU) components for the Application Process Clusters of the VAX host.

Figure 4-3 focuses on the interface between the MPU components of the NTM and the Application Processes (APs). The NTM provides an AP Interface (API) called the NTM I/F Routine to provide APs with the ability to send messages to other APs and to NTM components in the IISS. IISS messages are delivered in mailboxes that are managed by the NTM. The NTM uses IPC Primitives [9] for its interprocess communication functions. These Primitives provide the process to process functions of mailbox creation, mailbox writes, mailbox reads, waits, timers, and mailbox deletion.

The AP Interface provides a set of high level NTM calls for use by the AP that are, in concept, similar to traditional operating system calls. Figure 4-4 contains a list of these NTM Service Calls. A complete description of the NTM calls is contained in the IISS Programmer's Guide [8]. A set of NTM I/F routines is linked to each IISS AP to provide the integration of the AP into the IISS Test Bed. The NTM interface requirements for the NTM I/F routines for new APs, existing APs, COMM, and the UI are described in the following paragraphs. The Operator Interface to the NTM requires a different NTM interface, and is described in Section 4.1.2.5.

4.1.2.1 NTM Interface for New Applications

The NTM Interface for new IISS Applications is the set of NTM Services described in the IISS Programmer's Guide [8]. The AP uses the NTM service calls to send and receive messages from other IISS APs. The AP interfaces directly to the AP Interface component of the NTM (Figure 4-5). The interfaces will be implemented as a set of NTM I/F subroutines that will be bound (linked) to the AP to form the AP's runtime module.

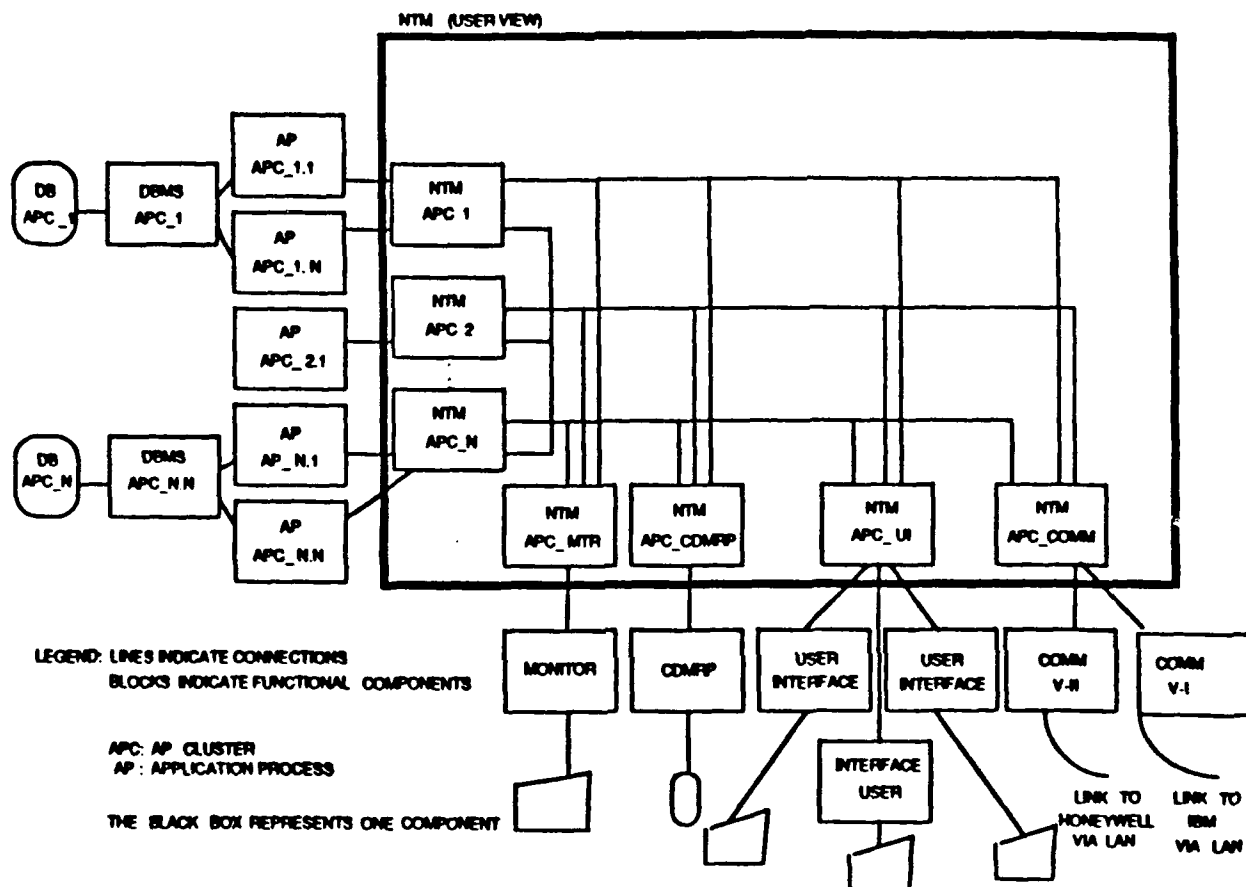


Figure 4-2. IISS Architecture - Conceptual Model on VAX

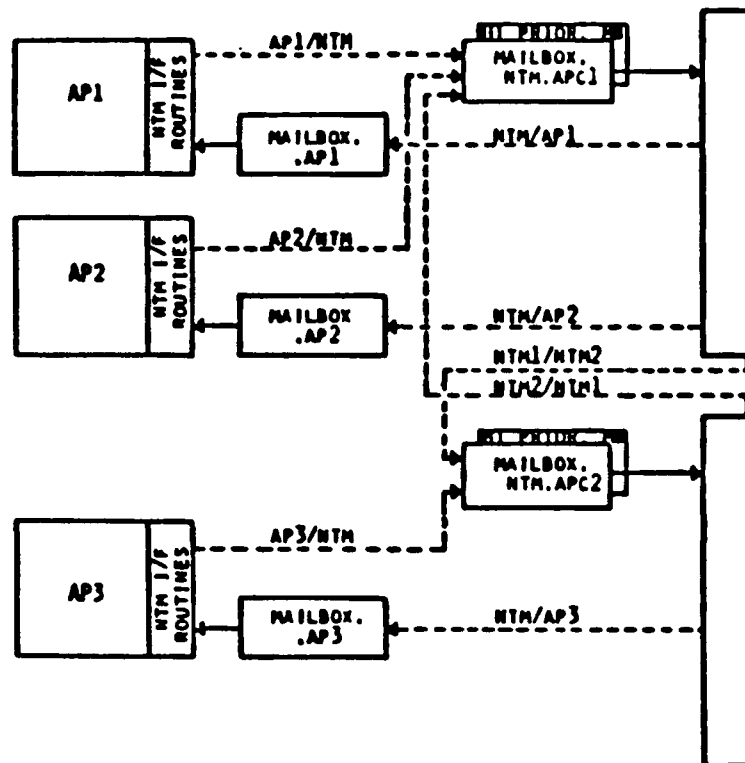


Figure 4-3. NTM/AP Interfaces

Connection Services

INITAL Provide initiation services for new APs
TRMNAT Signal AP termination status
ENDRCY Signal end of recovery processing

Communication Services

NSEND Send a message
GSEND Send a guaranteed delivery message
ISEND Send an initiation request
QSEND Send a Queue-Server's reply message
CHKMSG Check for any current messages (use RCV to retrieve messages)
SETDLY Specify delay condition for next message
SIGERR Notify the NTM of an AP (non-fatal) error
GDACK Acknowledge receipt of a guaranteed delivery message
MSGACK Acknowledge receipt of a message
RCV Receive a message
TSTMOD Switch IISS message test mode on or off

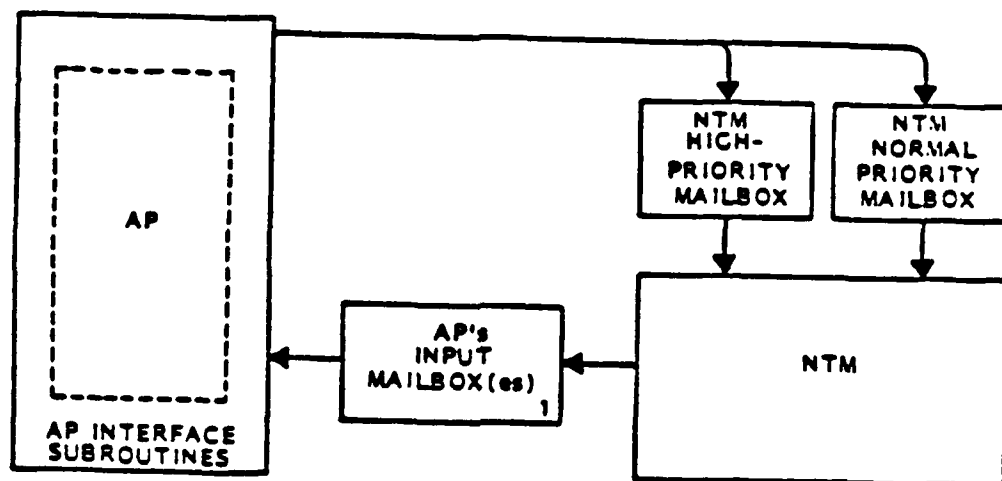
NTM Requests

APSTAT Get the status of a specified AP
HSTATS Get the status of a specified host
WHTHST Request the name of the current host
WHATAC Request the name of the current AP Cluster
WKONCA Request "wake-up" on specified AP Cluster availability
ACSTAT Get the status of a specified AP Cluster
SIGABT Signal to NTM to abort an AP
PRSTAT Get the status of one or more paired messages
GDSTAT Get the status of one or more guaranteed delivery messages
GETUSR Get the name of the original source of a given chain of AP's

Privileged Services

INICOM Provide initiation services for the COMM APs
INITEX Provide initiation services for UI AP
LOGON Send IISS user Logon information to NTM
LOGOFF Send IISS user Logoff information to NTM
TRMNAX Signal Comm AP Termination Status

Figure 4-4. NTM Service Calls



1. In implementation, APs that can process NTM commands (i.e., shutdown) will have three input mailboxes. The second input mailbox will be used to receive these high priority unsolicited messages from the NTM while the third is reserved for Message Acknowledgements from the NTM.

Figure 4-5. The AP's Interface

An AP that is to be integrated into the IISS and use the message services of the NTM must be written according to a format that includes NTM Initiation (INITAL) and termination (TRMNAT) calls at the beginning and the end of its Procedure Division (COBOL) as shown in Figure 4-6. The CALL "INITAL" and CALL "TRMNAT," respectively, provide the IISS connection and termination service. Communication between IISS APs is accomplished by using the NTM calls that are described in Section 6 of the IISS Programmer's Guide [8]. For example, the CALL "NSEND" USING ..., will cause a program's message to be delivered to the NTM for routing. The NTM routes the messages through the IISS to the destination AP. The destination AP receives its messages by using the NTM "RCV" call.

4.1.2.2 NTM Interface for Existing Applications

An NTM interface for existing applications may be designed to minimize any required changes to the APs for interfacing. Rules for the NTM interface for integrating existing Cobol APs are:

- a. The AP shall include an initiation routine 'INI---' that may be specific to each application. It will provide NTM connection logic for the AP.
- b. The AP will, in some manner, take I/O from the program's DISPLAY call and formulate an NTM message from the data and deliver it to a User Interface AP (UI) for display on a non-local terminal request.
- c. The AP will receive a message from a UI for the application and unpack the received data to return to the program in place of its ACCEPT statements.
- d. The AP shall include a termination routine "TRM---" that will disconnect the AP from the NTM.

Since the Rapid Application Generator is capable of quickly generating a fully integrated IISS AP, it would be a very unusual case that would benefit by this technique of integrating an existing application.

AP PROGRAM

PROCEDURE DIVISION.

CALL "INITAL" USING BUFFER,
BUFFER-SIZE,
SYSTEM-STATE,
RET-CODE.

...

AP CODE: can include NTM calls that are
described in the IISS Programmer's
guide [8] to communicate with the
IISS.

...

CALL "TRMNAT" USING TERMINATION-STATUS.*

*CALL "TRMNAT" is the last statement in the AP.

Figure 4-6. IISS AP-COBOL Procedure Division Structure

4.1.2.3 NTM Interface to the CDM AP's

The Communication (or COMM) AP cluster will support a COMM application process for each host connection. They are handled in a slightly different manner from other AP's. These differences are noted below. The COMM AP cluster on the VAX host is conceptually represented in Figure 4-7. These COMM AP's are not part of the NTM.

Because the COMM APs perform many of the AP Interface functions directly, they will have only a selected set of AP Interface routines bound to them.

The NTM Interface for the COMM APs is the following:

Services

- a. COMM will use the NTM initiation routine,
CALL "INICOM" USING event-block,
input-mailbox-name,
cluster-hot-mailbox name,
cluster-cold-mailbox name,
status.

INICOM will
 - o create the COMM's input mailbox
 - o establish an IISS exception handler for COMM
 - o return the names of the COMM AP's input mailbox and the names of the two cluster mailboxes.
- b. COMM-NTM Communication - The COMM AP's will use, directly, the IPC primitives, to send and receive messages from the NTM. On receiving a message from the NTM it will inspect the destination AP name in the header to determine whether the message is for it or to be sent to its remote host. Messages for COMM and the COMM-NTM protocol are given in Figure 4-8.
- c. COMM will use the NTM termination routine, "TRMNAT" [8], to end its execution. It calls "TRMNAT" on the receipt of a "TR" message from the NTMs MONITOR AP.

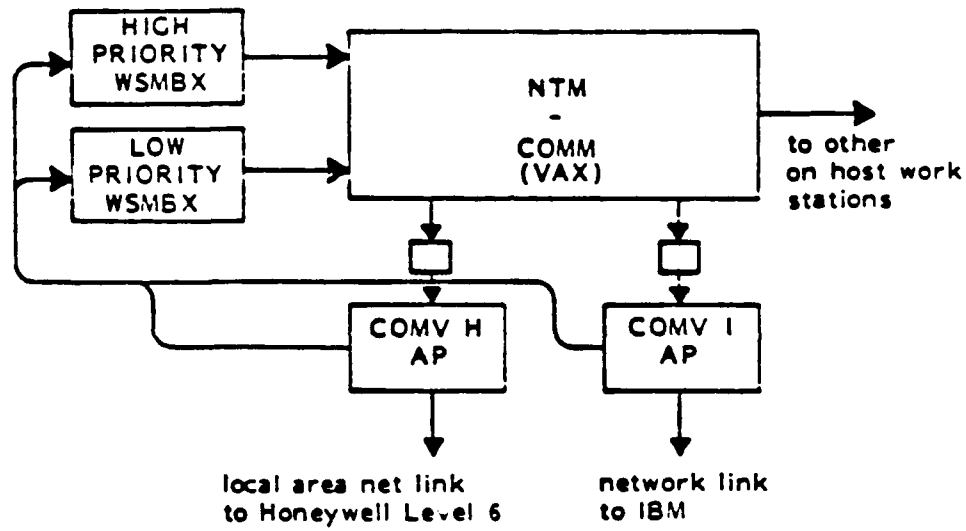


Figure 4-7. The COMM AP/NTM Interface

Message to a COMM AP
from the NTM's Monitor AP

Action by the COMM AP

Message Types

a) "SL" (start link)	COMM attempts to start the link to its remote host. Responds with "LA" - link active message or "LF" - link fail
b) "SD" (shutdown link)	COMM shuts down (stops listening to) remote host and responds with "LF"
c) "TR"	COMM calls the NTM termination routine "TRMNAT" to end execution
d)	A COMM may send the following unsolicited messages to the NTM's MONITOR AP. "RE", recoverable error with five character error code in the data field "LF", a link fail message

Figure 4-8. COMM AP/NTM Protocol

4.1.2.4 NTM Interface to the User Interface (UI)

The User Interface (UI) is the application process that interfaces to the IISS user terminals. Initially, there will be one UI per IISS terminal with a number of UIs associated with one work station. Conceptually, the NTM-UI Interface is depicted in Figure 4-9.

The connection protocol of these terminals causes this APC to be handled in a slightly different manner than other APCs. However, this difference is transparent to the UI APs. The UI (AP) Interface and the NTM protocols handle this special requirement by providing the necessary NTM connection logic on the UI's initiation call, CALL "INITEX" [8]. The services of INITEX are described below. This implementation is specific for the VAX under VMS.

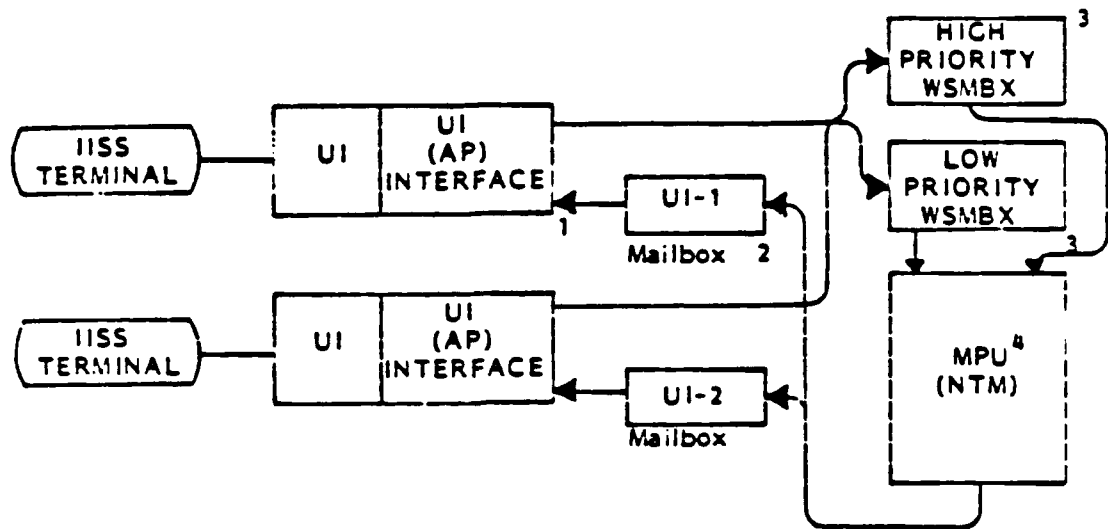
UI-NTM Initiation Service (INITEX)

The UI requires an "external" initiation connection service that is supplied by the routine "INITEX." This allows a user to logon to an IISS terminal and initiate a UI process from a logon command file. The UI must connect to the NTM, rather than the NTM initiating the UI as in the normal IISS process initiation procedure. External connection is required in light of the way that the UI will manage the terminals. INITEX performs the following initiation functions for the UI.

1. Sends an "I'm alive" message that contains the UI's operating system given process name to the UI's NTM.
2. Creates the UI's input mailboxes.
3. Establishes the IISS exception handler for the UI.
4. Saves the UI's buffer address and buffer size for later message services.
5. Returns to the UI with the status of the initiation.

The UI and Logical-Channels

A UI will manage communications between the NTM and any



1. UI represents the UI code.
UI (AP) Interface is the special AP Interface for the UI.
The UI code is bound with the UI (AP) Interface.
2. The UI-1 Mailbox is the Input mailbox for the first instance of the UI.
3. These represent the work stations high and low priority mailboxes.
4. The MPU is the Message Processing Unit of the NTM.

Figure 4-9. NTM-UI Interface

terminals connected to it. The logical channel specifier provides a mechanism for the UI to map messages to terminals, or to multiple screens on a given terminal. The UI can manage the mapping between messages and screens or terminals by maintaining a table that carries the current channel assignments for a terminal or screen and using the channel numbers as suggested in [8].

The requirement for an AP to be able to send an unsolicited form to a terminal can be supported by the use of a specified channel for UI unsolicited messages (channel 0 is being reserved for these unsolicited messages for single-terminal UIs).

Multiterminal UIs are queue servers and are supported by the NTM. The UI will assign blocks of channel specifiers to a terminal when the terminal logs on. The NTM will need to know the channel numbers associated with a logon, and will provide a message format for this data when multiterminal UIs are developed.

UI-NTM Interface Programming Conventions

The UI must use the following guidelines to communicate successfully in the IISS Test Bed.

1. It must be bound with the UI (AP) Interface supplied by the NTM.
2. It must initiate communications with the NTM with a 'CALL "INITEX" USING...
3. It must support asynchronously received (unsolicited) messages using CALL "RCV" or CALL "CHKMSG" and CALL "RCV" at regular intervals.
4. It must handle "shutdown" messages, including shutdown pending, cancel shutdown, and its own shutdown procedures.
5. If the IISS is in a recovery or down state, the UIs will get a "connection-failure-reason" status return on the CALL "INITEX." It should inform the terminal of the state of the IISS and provide a logoff or local mode capability to the user.
6. It must use the NTM Service Calls [8] to communicate with other IISS APs.
7. It should terminate with the NTM call, "TRMNAT".

4.1.2.5 NTM Interface to the IISS Operator

The NTM shall interface to an IISS Operator's Console. Initially, the interface will exist only on the VAX and will be implemented as a direct link from the operator's console to the NTM's Monitor AP (Figure 4-10). An early enhancement will be an IISS Operator's Interface through a UI to enable the use of forms and screen displays by the IISS Operator.

- a. The initial test bed shall support the following IISS Operator Commands during IISS operation.

1. Start IISS
2. Start APC
3. Start Link
4. Shutdown APC
5. Shutdown IISS
6. Cancel IISS Shutdown
7. Display Active APs
8. Display IISS Status
9. Enable SIGERR Messages
10. Disable SIGERR Messages

The MONITOR shall provide prompts to the operator to obtain the data required for each command. For example, the following is the START LINK scenario on the VAX.

> SL	Operator's Entry
Enter Link ID:	Monitor Prompt
> VI	Operator's Entry
(Terminal Locked out during command Execution)	
COMM LINK VI IS ACTIVE.	
> (a new command may now be entered)	

- b. NTM status information sent to the MONITOR AP from any of the MPU's that may require an operator's action shall be displayed on the operator's console.
- c. For the initial test bed, the IISS is started by a START IISS command entered by an operator on each IISS

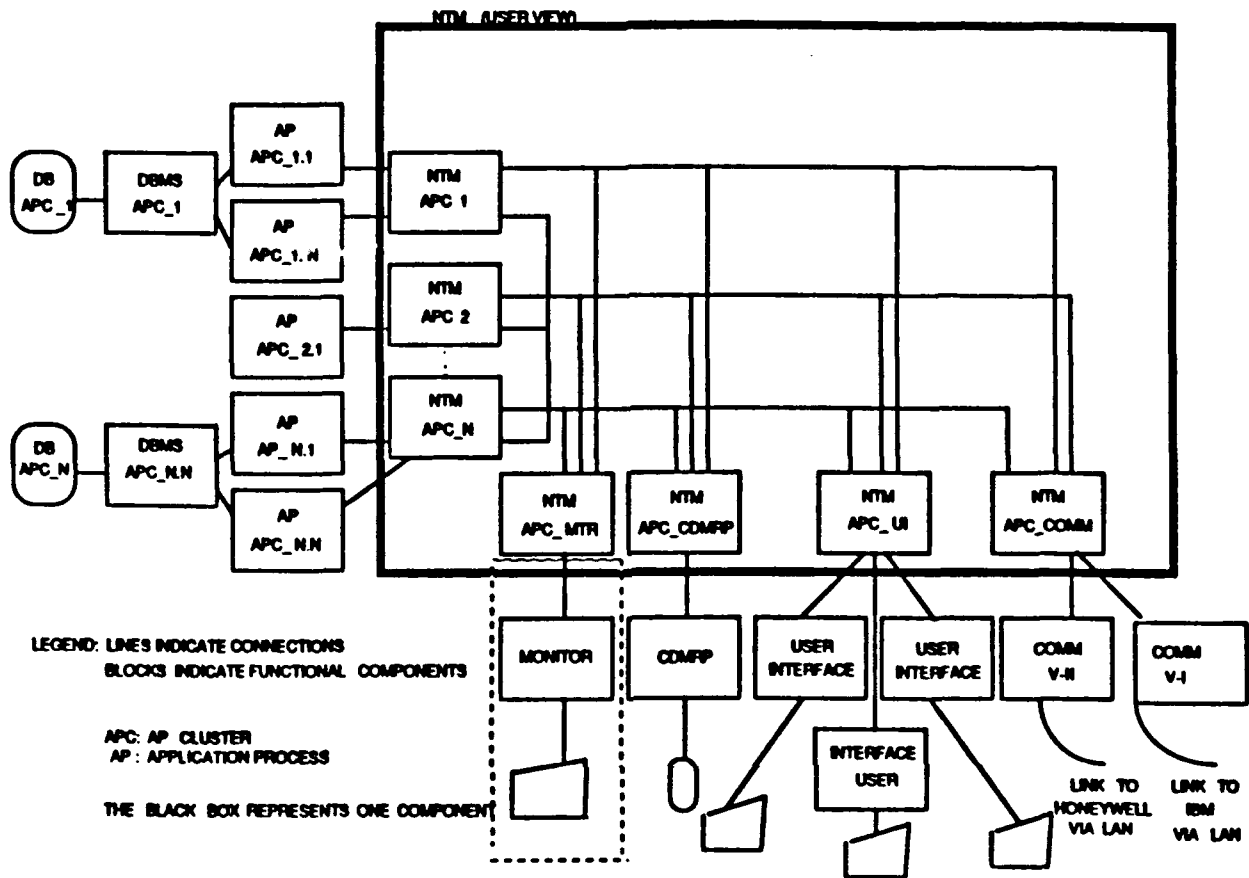


Figure 4-10. IISS Operator's Interface

host. The START IISS command will initiate a command file that starts the MONITOR AP on each host. The MONITOR APs then startup the other NTM modules and APCs on their hosts and cooperate to connect the other IISS hosts to complete the startup.

4.1.3 Internal NTM Interfaces

Three components (Monitor, MPU, and AP Interface) communicate among themselves through mailboxes via well defined messages. These messages have been defined by type and are thoroughly defined in Section 10.5. Each message carries a header and an optional data portion. The header provides the essential processing information needed by the destination component. The data portion is reserved for specific backup information pertinent to the relevant message type.

Field Name	Field Size	Field ID
Header Format Indicator	X	HDR-HDRFMT
Header Length	X(3)	HDR-HDRLEN
Data Length	X(4)	HDR-DATLEN
Binary/Native Flag	X	HDR-BINNAT
Message Priority	X	HDR-MSGPRY
Message Type	X(2)	HDR-MSGTYP
AP Name (Destination)	X(10)	MD-APNAME
Instance (Destination)	X(2)	MD-INSTNC
APC Name (Destination)	X(3)	MD-APCNME
AP Name (Source)	X(10)	MS-APNAME
Instance (Source)	X(2)	MS-INSTNC
APC Name (Source)	X(3)	MS-APCNME
Message Serial Number	X(7)	HDR-MSGSN
Processing Code	X	HDR-PROCDE
Message Category	X	HDR-MSGCAT
AP Priority	X	HDR-APPRTY
Integrity Check Flag	X	HDR-INTCHK
Log Requirement	X	HDR-LOGREQ
Statistics Collection Flag	X	HDR-STATCO
Test Flag	X	HDR-TSTFLG
Delay Trigger Flag	X	HDR-DELTRG
Delay Time Trigger	X(15)	HDR-TRGTIM
Delay Trigger Condition	X	HDR-TRGCON
Original Source	X(15)	HDR-ORGSRC
Logical Channel ID	X(3)	HDR-CHANID
Continuation Indicator	X	HDR-CONIND

Figure 4-11. Header Format

4.1.3.1 Message Header

The message header carries the relevant information about the message throughout the NTM. The header is formatted by the AP Interface at the message source AP. The MPU fills in the field values it is responsible for and performs the integrity checks on the other header fields. The completed header stays with the message until it reaches its destination. The Header Format is shown in Figure 4-11. Each field is defined below.

Field Name	Field Value Supplied By	Field Description
Header Format Indicator	AP Interface, MPU or Monitor AP (depending upon the source of the message)	Identifies the particular format of the given message header. For the test bed there is only one format although future enhancements may require other formats. The value contained in this field maps to its definition in the Data Division.
Header Length	AP Interface, MPU or Monitor AP (based on Header Format)	Identifies the length of the given header format. The value is given as number of bytes.
Data Length	Message Source AP (may be any AP on the IISS including Monitor)	Identifies the length of the data portion of the and an MPU) message. The value is given as number of bytes.
Binary/Native Flag	Message Source AP (or default)	Indicates whether the data portion of the of the message is

Field Name	Field Value Supplied By	Field Description
		encoded in binary or native mode. The default value on any message is always to native mode.
Message priority	Source MPU (based on Message Category)	Identifies the priority of the message. The value is obtained by the MPU from the Message Category Table.
Message Type	Message Source AP (Note: This value cannot be derived - it can only be provided by the source)	Identifies the nature of the message. See Section 10.5 for specific message types used by the NTM. The Source AP is free to choose it's own message types as defined by AP-AP protocol.
AP Name (Destination)	Message Source AP (Note: This value cannot be derived, it can only be provided by the message source.)	Identifies the Application Process to which the message is directed.
Instance (Destination)	AP Interface (Note: this field is optional, as a destination instance may not exist when message is sent.)	Identifies the specific occurrence of the Destination AP to which the message is the directed, when known.
APC Name (Destination)	Source MPU	Identifies the AP Cluster upon which the destination AP resides. This value is generally obtained

Field Name	Field Value Supplied By	Field Description
		from the AP Information Table. The exceptions are in the cases where: a. The Destination AP is an IISS Component (whose APC Names are known to all MPU's) b. The Destination AP is an MPU. c. The source AP has received a message from the destination and therefore knows the destination APC.
AP Name (Source)	AP Interface	The source of the given message.
Instance occurrence (Source)	AP Interface	The specific of the message source AP.
APC Name (Source)	AP Interface	The APC upon which the source AP resides.
Message Serial #	Source MPU	A number that, when concatenated with the source APC name, provides a unique message identifier for the given message through- out the IISS.

Field Name	Field Value Supplied By	Field Description
Processing Code	AP Interface or Default	Identifies whether the given header is "used" or new. If "used" it is assumed to be correct and does not require integrity checking. The default is always set to "0" (new).
Message Category	AP Interface (de- rived from Call 'SEND' Parameters)	Defines special processing to be performed by the MPU. See Sections 4.5.3.1 and Appendix E for details.
AP Priority	Source MPU	Identifies the relative priority of the source AP. Its value is obtained from the AP Characteristics Table.
Integrity Check Flag	Message Source AP or Default	Indicates whether an integrity check is to be performed on the data portion of the message. The default is always set to "0" (No).
Log Requirement	Source MPU	Indicates whether the message is to be logged at every MPU it arrives at. The value is obtained from the Message Category Table.
Statistics Collection Flag	Source MPU	Indicates whether statistics are to be collected on the

Field Name	Field Value Supplied By	Field Description
		message. The value is obtained from the Message Category Table.
Test Flag	Message Source AP	Indicates whether the source AP is operating in regular or test mode. If in test mode, this flag provides a warning to the destination AP to handle the message accordingly.
Delay Trigger Flag	Message Source AP or Default	Defines when the Flag message is to be delivered to its destination AP. The default is always set to "0" (No Delay).
Delay Trigger Time	Message Source AP or Default	Identifies the time constraint associated with the delay trigger. Where a time constraint is not applicable, this field will be filled with blanks (default).
Delay Trigger Condition	Message Source AP or Default	Identifies the conditional constraint associated with the delay trigger. Where this constraint is not applicable, the field will be filled with blanks (default).
Original Source	AP Interface	Identifies the Original Source (root AP) of the Message

Field Name	Field Value Supplied By	Field Description
		Source AP. This value is generally obtained from the AP Status Table. The exception is for messages conforming to Category F. In that case, the value is obtained from the corresponding field of the relevant Category B, D, or J message. See Appendix E for details on the use of Category.
Logical Channel ID	Original source AP AP or the AP Interface	On messages conforming to Category B, D, or J the logical channel ID identifies the channel upon which the reply message is to be returned. (Note: the channel will either be source specified or defaulted to the channel under which the source AP was initiated). On Category H messages, this field will contain the channel ID under which the target AP is to be initiated. On Category F messages, this field will contain the channel ID specified in the original B, D, or J message (i.e., the Field request message to which the reply is being made). For A, C, E or G

Field Name	Value Supplied By	Field Description
		messages, the channel ID value will be the one under which the message's source AP was initiated. The source AP's channel ID is obtained from the AP status table. See Appendix E for details on the use of Category.
Continuation Indicator	AP Interface	Identifies whether the message is continued or stand alone.

4.1.3.2 The Monitor AP

The Monitor AP (Figure 4-12) is a component of the NTM that resides on each IISS host on a cluster that is dedicated to this AP. It is an IISS Application Process whose functions are illustrated in the node tree in Figure 4-12.

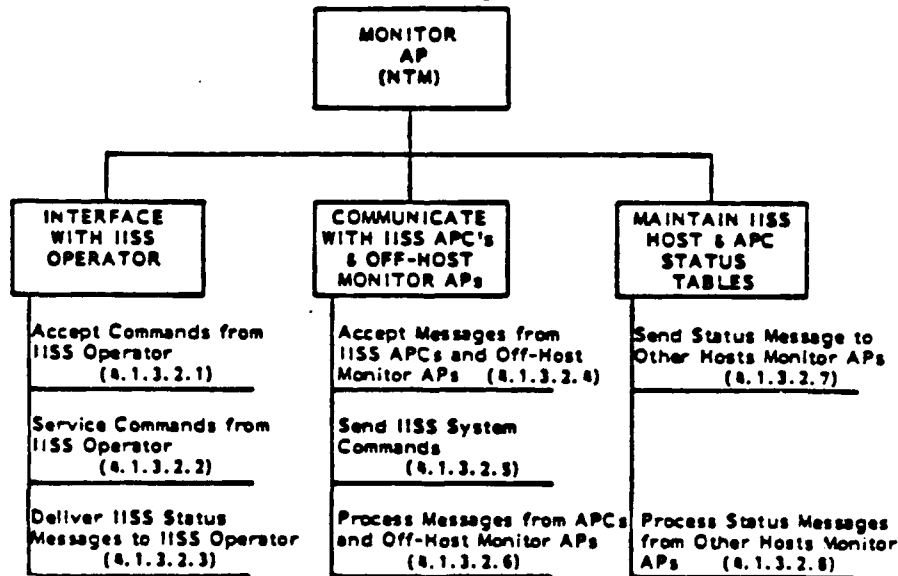


Figure 4-12. Monitor AP Functions

4.1.3.2.1 Accept Commands from the IISS Operator

The commands that will be accepted from the Operator's console in the initial Test Bed are listed in 4.1.2.5.

4.1.3.2.2 Service Commands from the IISS Operator

The processing that is provided on each of the supported IISS operator's commands is described below.

START IISS ON VAX:

1. Monitor AP is spawned as a result of the start IISS command from the operator.
2. Monitor reads its startup file to determine the current Sysgen Parameters. Among the parameters is the current table configuration. Monitor compares the current Operating configuration ID to its old value and sets a flag that indicates whether tables and local files are up-to-date.
3. Monitor creates its input mailbox.
4. It spawns it's APC's MPU.
5. It waits for a "Table Status Request" message from the spawned MPU.
6. On receipt of the "Table Status Request" message, the Monitor always sends a "Tables OK" message to its MPU and then waits for an "I'm Alive" message from the MPU. (The Monitor MPU's tables will be corrected after the CDM cluster is up, if necessary).
7. On receipt of the "I'm Alive" message, the Monitor updates the Monitor's APC status in the APC Status Table to "cluster-up".
8. Monitor sends the active APC a "Host Active" message to indicate that the APC's startup is complete and it's normal processing can begin.
9. The Monitor AP spawns the CDM cluster by sending a 'start APC' message to its MPU which will now spawn the CDM MPU. It now repeats steps 5-7 for the CDM cluster, except it will now send the correct table status to the CDM cluster (Tables OK or Tables Obsolete).
10. If the current table configuration ID is not equal to the old ID, the Monitor AP sends requests for new tables to the CDMRP and then sends a "Rebuild Table" message to its MPU so that the MPU can rebuild the tables.
11. If any of the above steps encounters an unrecoverable error, the Monitor AP will send a message to the operator and end execution.

12. The Monitor, now with correct tables, sends a 'START APC' message to its MPU to startup the UI cluster (then, does Steps 5-8 again, sending the correct table status). If this fails, the Monitor AP informs the operator and terminates the IISS.
13. Other clusters, indicated by the Monitor AP's tables, are started by a "start APC" message followed by Steps 5-8. This time, however, a failure only causes a status message to be sent to the operator and an update to the Monitor AP's Status Tables.
14. The Monitor AP next starts the Network Communications by sending Initiate COMM AP messages to the COMM cluster. These are followed by Start Link messages to the COMM APs. The link status message will be received and handled as part of Monitor's regular processing operations.
15. The Monitor AP updates its Host table entry to Active. "Host Available Messages" that include the host active APC names will be sent to any remote hosts once a link is established with the VAX.

START IISS ON NON-VAX HOSTS:

1. It is assumed that non-VAX startups will be initiated at the system operator's console.
2. Steps 1-6 of the VAX startup are performed.
3. The link to the VAX is started as in Step 14 with only one difference: the Monitor AP will always send a "Tables OK" message to the COMM MPU. If this is unsuccessful, the non-VAX startup has failed, a status message is sent to the non-VAX console, and the host startup is terminated.

4. If the link to the VAX is successful and the Non-VAX MONITOR receives the "VAX Host Available" message sent in step 15 above, the Non-VAX MONITOR AP rebuilds its tables and, if necessary, sends rebuild table messages to the MONITOR and COMM MPUs. (The MONITOR AP and the MPU's use of the off-host table rebuild protocol is TBD).
5. If host tables were rebuilt from the CDM, the MONITOR AP waits for "Table Rebuilt" Status messages from the COMM and MONITOR AP MPUs.

If table processing fails, the MONITOR AP informs the operator and terminates the IISS component on the non-VAX host.
6. When the non-VAX NTM tables are built, the local APCs to be initiated are started as they are on the VAX. An initiation error here is not a fatal IISS error.
7. The remaining network links are started and "Host Available" messages are sent as in Step 15 of the VAX Startup.

START APC (VAX only, while IISS is running):

1. Monitor prompts the Operator for the APC name.
2. The operator enters an APC selection.
3. If the selection is valid, the Monitor AP determines the host location of the APC.
4. If the APC is off-host and the destination host is running, the MONITOR AP sends a "START APC" command to the correct off-host Monitor AP MPU. If the host is not active, the Monitor AP sends a "APC's Host is not active" message to the operator.
5. If the APC is on-host, the Monitor AP sends a 'START APC' command to its MPU and performs the protocol of Steps 5-8 in the IISS Startup Procedure (p. 4-27).

START LINK (VAX only while IISS is running):

1. Monitor prompts the Operator for a link ID.
2. The operator enters a link ID.
3. If the selection is valid, the monitor AP checks to see if the COMM APC is available, if it is not:
 - 3a. It sends a "Start COMM APC" message to its MPU
 - 3b. The Monitor checks the status of the COMM AP.

- 3c. If the COMM AP is not active, the MONITOR then sends a "Start Comm AP" Message followed by a "Start Link" message to the COMM AP. If the COMM AP is active, only the "Start Link" message is sent.
- 3d. Upon receiving the link status from the COMM AP, the MONITOR AP displays the new link status to the operator.

If the COMM APC is available, Steps 3b, 3c, and 3d are performed.

SHUTDOWN APC (on VAX only):

- 1. The MONITOR prompts the Operator for the APC name.
- 2. The operator enters the APC name.
- 3. If the selection is valid, the operator sends a "SHUTDOWN APC" message to the APC.
- 4. On a Shutdown Status" message from a VAX APC or an "Update APC Table" message from a non-VAX Monitor AP if the APC was off host, the Monitor AP sends a status update message to the operator.

SHUTDOWN IISS (on VAX only):

- 1. The MONITOR AP requests the time until shutdown from the operator.
- 2. If the time until shutdown is not immediate, the MONITOR AP sends "Shutdown Pending" status message to the UIs at one minute intervals. If shutdown is immediate step 3 is ignored.
- 3. Before the time until shutdown expires, the MONITOR AP will accept only "CANCEL IISS SHUTDOWN," "DISPLAY IISS STATUS", "HELP", or "DISPLAY ACTIVE APs" commands from the operator.
- 4. When the time until shutdown has elapsed, the VAX MONITOR AP sends "SHUTDOWN IISS" messages to the non-VAX MONITOR APs, sets its status to "IISS Shutting Down", and sends "SHUTDOWN APC" messages to each active on-host non-component APC.
- 5. Each non-VAX Monitor AP on receiving the Shutdown Command sends "Shutdown APC" messages to its APCs (except COMM). When all of the APC's "APC Shutdown" messages have been received, the non-VAX Monitor AP sends a message to the VAX Monitor AP announcing the host shutdown, then shuts down COMM, its MPU and finally itself.

6. When the VAX Monitor AP has received all "IISS host shutdown" and local "APC Shutdown" messages, or has timed-out on any of these, it shuts down the VAX COMM AP's, the COMM APC, its MPU, sends a final status message to the operator, saves its tables, closes its files, and ends execution.
7. Throughout the shutdown IISS process, the Status Messages from off-host and local APC shutdowns are sent to the operator.

SHUTDOWN HOST (on VAX only):

1. The Monitor AP displays the active host names (not VAX*) to the operator.
2. The operator selects the desired host.
3. The VAX Monitor AP sends a "Shutdown Host" message to the off-VAX Monitor AP.

*To shutdown the VAX, a Shutdown IISS command must be issued.

4. Each non-VAX Monitor AP, on receiving the Shutdown Command sends Shutdown APC messages to its APCs (except COMM). When all of the APC's "APC Shutdown" messages have been received, the non-VAX Monitor AP sends a message to the VAX Monitor AP announcing the host shutdown, then shuts down COMM, its MPU and finally itself.
5. On receiving the "Host Shutdown" message, the VAX Monitor AP, shuts down the COMM AP for the link to the shutdown host, updates its status table to indicate the status of the shutdown host, sends a status message to the operator, and a "Host Status Update" message to all of the other active IISS hosts Monitor APS.

CANCEL IISS SHUTDOWN:

1. The Monitor accepts the command and sends a "Cancel Shutdown" message to the UIs, and then updates its status from IISS Shutting Down to IISS Active. This command only applies during the time that shutdown is pending. Once actual shutdown procedures begins, it cannot be cancelled.

ABORT AP (VAX only):

1. The operator enters AP name to be shutdown (the operator finds active AP names from the DISPLAY ACTIVE AP command).
2. If the AP Name is legal, the MONITOR AP sends the ABORT AP message to the correct APC.
3. On receipt of the AP abort status message, the MONITOR AP displays the status to the operator.

DISPLAY ACTIVE APS (VAX only):

1. On receipt of this command, the Monitor AP sends a message to the active APC entered by the operator requesting a list of the active APs on that APC.
2. On receiving the active list message from the APC, the list is displayed for the operator.

DISPLAY IISS STATUS (VAX only):

1. On receipt of this command, the Monitor AP displays its host and APC Status tables to the operator.

4.1.3.2.3 Deliver IISS Status Messages to the IISS Operator

This function is responsible for displaying IISS status and error messages to the IISS operator on the VAX. These are messages signalling events that might require some operator action. If the Monitor AP cannot write to the IISS operator's console from which it was started, it will attempt to write a message to the System Console.

4.1.3.2.4 Accept Messages from IISS APC's and Off-Host Monitor APs

This function is responsible for accepting messages from IISS APC's and off-host Monitor APs. The messages that can be received during the various IISS states are listed in Figure 4-13.

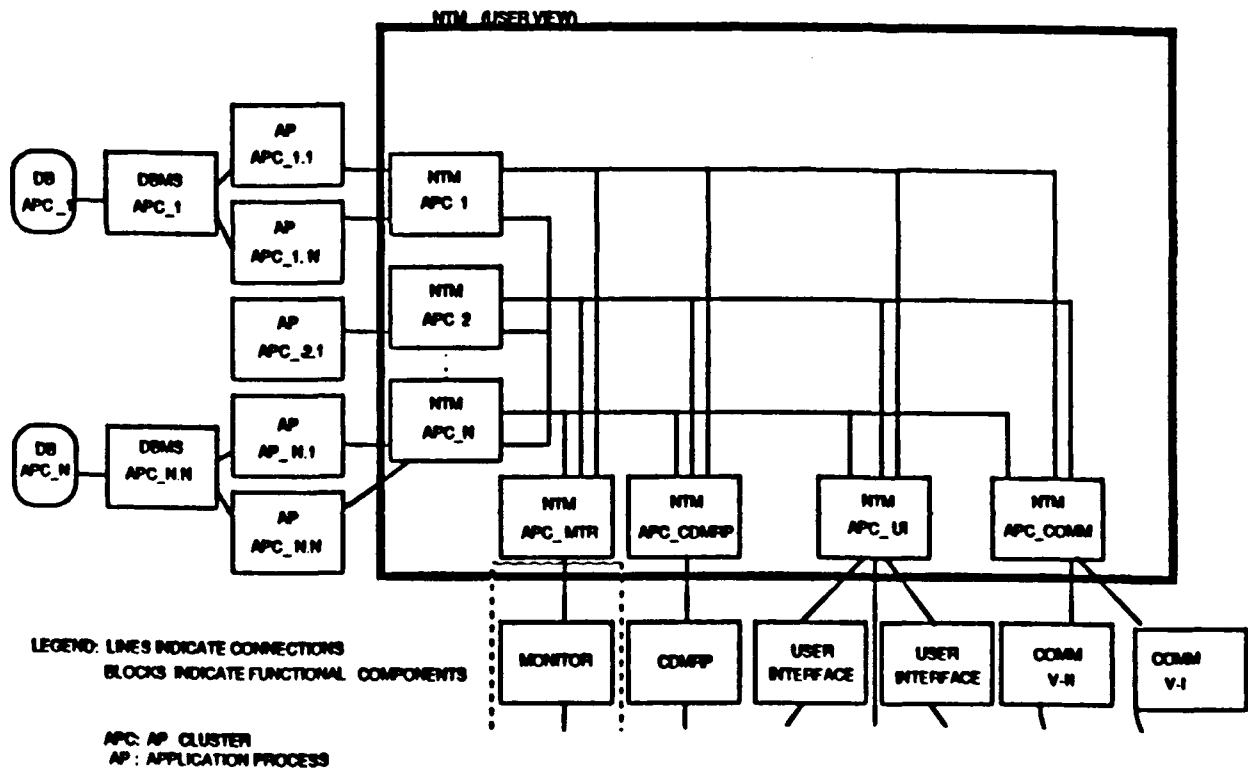


Figure 4-13. IISS Messages Received by the Monitor AP

4.1.3.2.5 Send IISS System Commands and Responses

This function is responsible for creating and sending the IISS system command messages from the VAX Monitor AP to the IISS APC's, APs, and off-host Monitor APs. These messages are created to effect an IISS Operator's command and are listed in Figure 4-14. See Appendix E for the specific format of these messages.

IISS System Command/Response -----	Message Type -----	Destination -----	When Sent -----
Operator Abort	OA	APC of Requested AP	IISS Running
Start Link	SL	COMM AP	IISS Startup IISS Running
Cancel Shutdown	CS	UI APs	IISS Running with IISS Shutdown Pending
Start MPU	SC	Monitor's MPU on requested MPU's Host	IISS Startup Host Shutdown IISS Running
List Request	LR	All APC's	IISS Running or IISS Shut- down Pending
Shutdown Link	SD	COMM APs	IISS Shutdown Host Shutdown IISS Running
Shutdown Pending	SP	UI APs	IISS Running with IISS Shutdown Pending
Shutdown APC	DC	Active APC	IISS Running IISS Shutdown
Shutdown Host	SH	Remote - Non-VAX Monitor AP	IISS Running IISS Shutdown
Rebuild Tables	RB	CDMRP & Monitor MPU on VAX	IISS Startup

Figure 4-14. IISS System Commands and Responses

IISS System Command/Response -----	Message Type -----	Destination -----	When Sent -----
		COMM & Monitor MPU on Non-VAX Hosts	IISS Startup
Display System Status	DS	Monitor AP	IISS Running

Figure 4-14. IISS System Commands and Responses
(Continued)

4.1.3.2.6 Process Messages from APC's and Off-Host Monitor APs

This function processes the messages received by the MONITOR AP. The message types received and the processing performed are in Figure 4-15.

<u>Message</u>	<u>Message Type</u>	<u>Source</u>	<u>When Sent</u>	<u>Processing</u>
Link Active	LA	COMM AP	IISS Startup	Update Table Inform Operator
Link Fail	LF	COMM AP	IISS Startup IISS Running IISS Shutdown	Update Tables Inform Operator
Processing Error	31	IISS APCs	IISS Startup IISS Running	Inform Operator
APC Terminated	CT	IISS APCs	IISS Startup IISS Running IISS Shutdown	Update Tables
Logon	LO	UI-AP	IISS Running	Update Logon Table
Logoff	OF	UI-AP	IISS Running or IISS Shutdown	Update Logon Table
Table Status Request	TS	All local APCs	IISS Startup or Running	Send Table Status Return (ST)
Shutdown Host	SH	Monitor AP	IISS Running or IISS Shutdown	Shutdown Host
APC Alive	LV	IISS APCs	IISS Startup or IISS Shutdown	Update Tables Inform Operator
Resource Unavailable	33	APCs	IISS Startup and IISS Running	Inform Operator
AP Interface Error	32	APCs	IISS Running	Inform Operator
Tables Rebuilt	RD	Monitor's MPU	IISS Startup	Send "Host Alive" Message to APC
Timeout Expired	TE	Monitor's MPU	Any IISS State	Take Timeout Action
Unstable Table	UT	Any MPU State	Any IISS	Inform Operator

Figure 4-15. Processing of Messages Received by a Monitor AP
(Host Status Messages in 4.1.3.8)

4.1.3.2.7 Send IISS Status Messages

This function is responsible for sending a Monitor AP's IISS status messages to remote Monitor APs and local APC's. The messages to the remote Monitor APs ensure that each IISS Monitor AP has up-to-date IISS status tables. The Status Messages to local APCs inform the APCs of IISS operating conditions and ensures that the APC will know when to perform cleanup functions. The status messages sent by a Monitor AP for this purpose are described in Figure 4-16.

Message -----	Message Type -----	Destination -----	When Sent -----
Update APC Tables	UA	Remote Monitor APs	IISS Startup IISS Running
Update Host Tables	UH	Remote Monitor APs	IISS Startup IISS Running
Host Available	HA	Remote Monitor APs	IISS Startup IISS Running
Host Active	HU	Local APC's	IISS Startup IISS Running
Off-Host Shutting	HS	Local APC's	IISS Running Host Shutdown

Figure 4-16. IISS Monitor Status Messages

4.1.3.2.8 Receive and Process Status Message from Other Hosts
Monitor APs

This function is responsible for receiving and processing status messages from other Monitor APs. The processing for the two identified messages of this category is described below.

Message -----	Message Type -----	Processing -----
Host Available	HA	Update Tables
Update APC Tables	UA	Update Tables
Update Host Tables	UH	Update Tables
Host Terminating	HT	Update Tables Inform Local APCs

4.2 Detailed Functional Requirements

The node tree shown in Figure 4-17 illustrates all NTM functions defined in the IDEF\0 Model (see Appendix B below). Each function name is followed by the subparagraph number where a description of the function may be found.

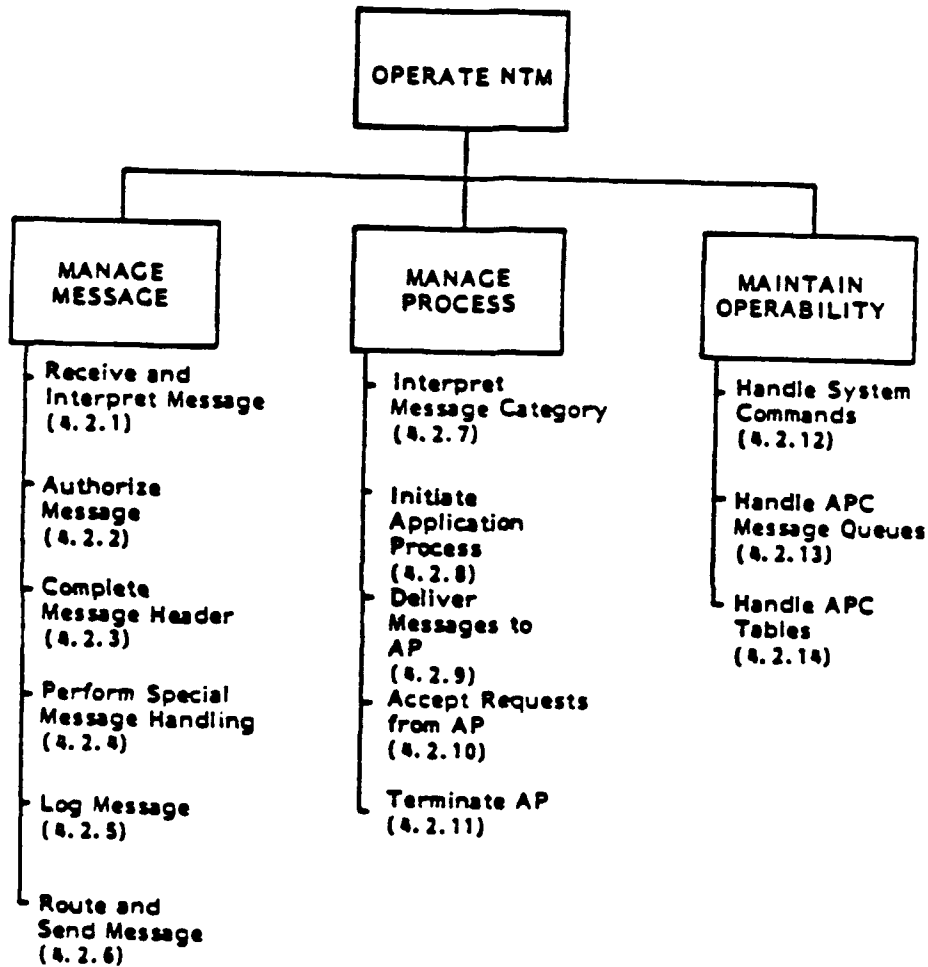


Figure 4-17. NTM Functions

4.2.1 Receive and Interpret Message Function

The Receive and Interpret Message function is responsible for receiving and interpreting all messages from off-cluster that are targeted for this cluster and all messages from on-cluster that must be routed.

4.2.1.1 Inputs

Inputs to this function are as follows:

Description -----	Source -----	Range -----
Message	on-cluster APs on-cluster MPU off-cluster MPUs	All categories
Message Category Table	Internal tables	

4.2.1.2 Processing

The processing of the Receive and Interpret Message function* is described below:

- a. Messages shall be received in the APC's input MPU mailboxes from on-cluster APs, from the on-cluster MPU, and from other off-cluster MPUs. If an error is detected in receiving messages from the mailboxes, Receive and Interpret Message shall generate a status message to be sent to the Monitor AP.
- b. A message that has been successfully received at an MPU from another MPU must have its destination field interpreted to determine whether the message has arrived at the correct cluster. The destination field of the message shall be checked for the APC's name or, if being routed through the Communication Handler APC, for a legitimate off-host APC designation. Valid messages from other APCs shall bypass the Authorize and Complete Message Header Functions and be sent directly to Log Message. An invalid message from off-cluster shall cause a status message to be sent to the Monitor AP.
- c. Messages from on-cluster APs shall indicate whether header checking is to be performed by the Manage Message Function. Header checking can be bypassed if a header that has already 'passed' Manage Message is reused by the AP Interface. These messages are sent directly to Complete Message Header to obtain a new serial number.

- d. A message, successfully received from on-cluster and requiring header checking, shall have its category field checked against a table of legal categories. Valid messages shall then be forwarded based on the processing requirements of the message category. Messages that require authorization shall be sent to Authorize Message and messages that do not require authorization shall be sent to Complete Message Header.
- e. Invalid messages shall be given an error code and shall be sent to Log Message.
- f. A message from an on-cluster AP with an invalid category shall cause the generation of a no-accept status return. The no-accept return shall be sent to Route and Send for delivery to the source AP.
- g. All messages from on-cluster (from an AP or from the MPU) with an invalid category shall cause a status message to be sent to the Monitor AP. Since the category field is supplied by the NTM software, a category error implies an NTM software failure.

4.2.1.3 Outputs

Outputs from this function are as follows:

Description -----	Destination -----	Range* -----
Received Messages	Authorize Message	Category

*All of the functions and their interfaces described in these sections are graphically portrayed in the IDEF\0 Model contained in Appendix B below.

Description -----	Destination -----	Range -----
Received Messages (Continued)	function	A,B,E,H and J messages
	Complete Message Header function	All Category C, D, F, and G messages from on-cluster to be routed.
	Log Message function	All accepted messages from off-cluster -and All rejected messages
Send Status on Message and Status Messages to the Monitor AP	Route & Send Message function	All status messages for the Monitor AP generated by Receive and Interpret function -and- Send status returns to on-cluster APs.

4.2.2 Authorize Message Function

The Authorize Message function is responsible for establishing the authority of an application process to issue the specified message type to the specified destination AP.

4.2.2.1 Inputs

Inputs to this function are as follows.

Description -----	Source -----	Range -----
Messages Possibly Requiring Authorization	Receive & Interpret Message Function	Category A,B,E, and H Msgs (Msgs Requiring Possible Authorizatio
Authority Check Table	Internal Table	N/A
Authority Table	Internal Table	N/A

4.2.2.2 Processing

The processing is described below:

- a. A message arriving at Authorize Message is first checked for an authorization requirement. The message destination is checked against the Authority Check Table to determine if the destination AP has any authorization requirements. If authorization is not indicated, the message is sent to Complete Message Header.
- b. A message that requires authorization shall have its message type, source AP and destination AP combination checked against the Authority Table that contains a list of message types that are valid between the specified source and destination APs. A valid message is sent to Complete Message Header.
- c. Invalid messages shall be given a status indicating an authorization error and be sent to Log Message.
- d. Authorize shall also generate a status return to be returned to the originator of the invalid message. This return shall be sent to Route and Send.
- e. Table access errors shall cause a status message to be sent to the Monitor AP.
- f. If the destination AP is not found in the tables, an invalid destination message will be sent to the source of the message.

4.2.2.3 Outputs

Outputs from this function are as follows:

<u>Description</u> -----	<u>Destination</u> -----	<u>Range</u> -----
Authorized Messages	Complete Message Header function	Authorized Category A, B, E, H, and J messages
Messages That Did Not Require Authorization	Complete Message Header function	Category A, B, E, H, and J messages with no authorization requirement
Send Status on Message and Status Messages to the Monitor AP	Route & Send Message function	"Authorization Denied" status return Table error to Monitor AP. Invalid Destination error to source AP
Messages rejected by MM	Log Message Function	Rejected messages

4.2.3 Complete Message Header Function

The Complete Message Header function is responsible for supplying message header information.

4.2.3.1 Inputs

Inputs from this function are as follows:

Description -----	Source -----	Range -----
Authorized Category A, B, E, H, and J Messages	Authorize Message Function	Authorized Messages
Category A, B, E, H, J Messages with No Authorization Requirement	Authorize Message	Category A, B, E, H, and J messages with no authority requirement
Category A-J Messages	Receive and Interpret Message	Category A, B, E, H, J mes- sages that do not require Header verification Category C, D, F, G messages
Message Category Table	Internal Table	N/A
AP Information Table	Internal Table	N/A
AP Characteristics Table	Internal Table	N/A
Message-Serial-Number	Internal Data Item	1-9,999,999

4.2.3.2 Processing

- a. For messages that require header verification (header processing flag = '0'), Complete Message Header checks the required header fields supplied by the AP Interface from APC tables and data from the AP's Service Call. If any required field is blank, the message is invalid. (Send status will indicate 'Header Processing Error'). Since this error may indicate an NTM failure, a status message will also be sent to the Monitor AP indicating an 'MPU Processing Error.'
- b. For messages requiring header verification, the Source MPU next supplies all of the remaining MPU header values except a message serial number to the message header. (See Section 4.1.3.1 for a description of the header values.) If the MPU cannot find any required field entry for the AP in its tables, the message is invalid. (Send status indicates 'Table Entry Not Found Error').

- c. The MPU, on messages requiring header verification, may supply default values for the following header fields: Binary/Native Flag, Integrity Check Flag, Test Flag, Delay Trigger Flag, Delay Trigger Conditions, and Logical Channel ID.
- d. A message serial number is supplied to the header of all messages processed by Complete Message Header. This serial number, with the APC name of this cluster, forms a unique IISS message identifier.
- e. Invalid messages shall be given a status indicating the type of error and are sent to Log Message. Valid messages shall be given a status code indicating their validity and are sent to Log Message.
- f. MPU file and table access errors during Complete Message Header shall cause a status message to be sent to the Monitor AP.
- g. Complete Message Header shall also generate a status return to be returned to the originator of the invalid message.
- h. Complete Message Header shall check the message category of all valid messages to determine if any special message processing is required. If neither, an "accepted" status message shall be generated to be returned to the originator.
- i. All messages, except status returns, status messages to the monitor AP, and messages requiring special message handling shall be sent to Log Message.

- j. Status returns and status messages to the Monitor AP shall be sent to Route and Send.
- k. Messages requiring special message handling (Category A, B, H, and J messages) are sent to Special Message Handling.

4.2.3.3 Outputs

Outputs from this function are as follows:

Description -----	Destination -----	Range -----
Accepted msgs from on-cluster with no special handling requirements	Log Message Function	Accepted Category C-G messages
Messages from on-cluster with a special requirement	Perform Special Message Handling function	Category A, B, H, handling and J messages
Messages rejected by MM	Log Message Function	Messages rejected by Complete Message Header
Send Status on Message	Route and Send Message Function	"Header Error" Status Return "Message Accepted" Status Return
Status Message to Monitor AP	Route and Send Message Function	"Table Access Error" msg to MONITOR AP "MPU Processing Error" message to the Monitor AP

4.2.4 Perform Special Message Handling Function

The Perform Special Message Handling function is responsible for updating the MPU's tables for guaranteed delivery, message pairing, or the sending APs Child Table for messages that require entries in any of these special message tables.

4.2.4.1 Inputs

Inputs to this function are as follows:

Description -----	Source -----	Range -----
Category A Messages from on-cluster	Complete Message Header	Guaranteed Delivery messages
Category B and D Messages from on-cluster	Complete Message Header	Message requiring a response
Category H and J Messages from on-cluster	Complete Message Header	Specific Initiation messages
Category E Messages having no Destination Instance	Complete Message Header	Message that may require the initiation of an AP
Message Pairing Table	Internal table	N/A
Guaranteed Delivery Table	Internal table	N/A
Child Table	Internal Table	N/A

4.2.4.2 Processing

- a. If the message received is a Category A message, an entry is made to the Guaranteed Delivery Table.
- b. If the message received is a Category B, D or J message, an entry, with a timeout value, is made to the Message Pairing Table. If the table entry is successfully made, a 'message accepted' status is returned to the sender.
- c. If the message received is a Category H or J message, an entry that indicates a status of 'initiation message sent' is made to the Child Status Table for the sending AP. If the table entry is successfully made, a 'message accepted' status is returned to the sender.

- d. If there is no destination instance and the category indicates that an AP may be initiated (i.e. category B or E) a child table entry will be created with a status of "reserved".
- e. If the attempt to make an entry into any of the tables is unsuccessful, a 'Resource Unavailable' send status is returned to the sender via the Route and Send message function. In addition, a 'Table Access Error' status message is sent to the Monitor AP to inform the IISS operator of the event.
- f. Messages that were not processed because of table access failures are sent to Log Message with a logging code that indicates 'Resource Unavailable'.

4.2.4.3 Outputs

Outputs from this function are as follows:

Description -----	Destination -----	Range -----
Processed Category A, B, D, and H messages from on-cluster	Log Message function	All Category A, B, D, H, and J messages that have been successfully processed in Special Message Handling.
Unaccepted Category A, B, D, and H messages from off-cluster	Log Message function	All messages B, (Category A, B, D, H and J)

Description -----	Destination -----	Range -----
Unaccepted Category A, B, D and H Messages from off-cluster (Continued)		that could not be processed by Special Message Handling due to a Table Access Error.
Send Status	Route & Send Message function	"Accepted Message" status returns on successfully processed Category B, D, H, and J messages. "Resource Unavailable" status returns on all Category A, B, H, and J messages that were not processed because of a Table Access error.
Status Message to Monitor AP	Route & Send Message function	"Table Access Error" status message to the Monitor AP on messages not successfully processed by the Special Message Handling function.

4.2.5 Log Message Function

The Log Message function is responsible for logging messages.

4.2.5.1 Inputs

Inputs to this function are as follows:

Description -----	Source -----	Range -----
Message Rejected by MM	Receive & Interpret Message function	Rejected messages from off-cluster due to routing failures Rejected messages from on-cluster due to unrecog- nized category
	Authorize Message function	Rejected messages from on-cluster due to an authorization failure
	Complete Message Header function	Rejected messages from on-cluster due to header errors
Message Rejected by MM (Continued)	Perform Special Message Handling	Rejected messages from on-cluster due to special message handling failure
Accepted Messages from On-cluster	Complete Message Header function	Accepted messages with completed header (all categories)
Accepted Messages from Off-Cluster	Receive & Interpret Message function	Accepted messages off-cluster (all categories)
Log Format	Internal Tables	N/A

4.2.5.2 Processing

The processing is described below.

- a. Log Message shall add an entry to the message log for each message received. The log entry will include: the message, an error code for rejected messages, and the host's clock-time stamp at the time of the log.
- b. Entries into a separate error log could be made for all error conditions encountered in the message processing. The format of this error log has not yet been determined but should include an error code, the error source, ID and the host's clock-time stamp. For the initial Test Bed, this will not be a separate log.
- c. Log Message shall check the message category to determine if guaranteed delivery is required. If so, a "logged" status message shall be generated to be returned to the originator.
- d. If an error occurs in logging, Log Message shall generate a status message to be sent to the Monitor AP via Route and Send Message. Error conditions may include file access errors, file space errors and file write errors.
- e. All accepted messages shall be sent to Route and Send Message.

4.2.5.3 Outputs

Outputs from this function are as follows:

Description -----	Destination -----	Range -----
Logged Messages	Route & Send Message function	All accepted and logged messages from off-cluster

<u>Description</u> -----	<u>Destination</u> -----	<u>Range</u> -----
		All accepted and logged messages from on-cluster
Send Status	Route & Send Message function	Message accept status on Guaranteed Delivery messages
Status Messages to Monitor AP	Route & Send Message function	Status Message to the Monitor AP "Error condition on log"
Message Log	Internal file	N/A

4.2.6 Route and Send Message Function

The Route and Send Message function is responsible for forwarding messages to their next destination.

4.2.6.1 Inputs

Inputs to this function are as follows:

<u>Description</u> -----	<u>Source</u> -----	<u>Range</u> -----
Logged Messages	Log Message function	All accepted and logged messages from on-cluster and off-cluster
Send Status and Status Messages	Receive & Interpret Message function	All status re- turns to the Source AP and status messages to the monitor AP
	Authorize Message function	

Description -----	Source -----	Range -----
	Complete Message Header function	
	Perform Special Message Handling function	
	Log Message function	
Host & APC Status Tables	Internal Tables	N/A

4.2.6.2 Processing

The processing is described below.

- a. Route and Send Message shall check the destination field of a message and access internal table information to determine routing.
- b. If the destination is for an on-cluster application, the message shall be sent to the Manage Process function of the NTM.
- c. If the message is a system command (Category C and D messages) for the on-cluster NTM, the message shall be sent to the Maintain Cluster Operability function (Handle System Commands, 4.2.12).
- d. If the destination is off-cluster, Route and Send Message shall check the host designation.
- e. If the destination is off-cluster, the status of the destination APC will be checked in the APC Status Table. If the destination APC is unavailable, a status message is sent to the monitor AP and the source to inform them that the destination resources are unavailable. If the message is a guaranteed delivery, it will be queued. Otherwise, the message is lost.
- f. If the destination cluster is on-host, the message shall be sent to the correct off-cluster mailbox (Receive and Interpret Message function of MM).
- g. If the destination is off-host, the message shall be sent to the correct on-host COMM APC mailbox (Receive and Interpret Message function).
- h. If a recoverable error (e.g., mailbox full) is detected on a send, Route and Send Message shall queue the message for later delivery.

- i. If an unrecoverable error (e.g., unrecoverable status returned), Route and Send Message shall generate a status message and attempt to send it to the Monitor AP.
- j. If an unrecoverable error occurs on sending a message to the Monitor's APC, ERRPRO will be called.

4.2.6.3 Outputs

Outputs from the function are as follows:

Description -----	Destination -----	Range -----
Messages to Off-cluster	Manage Message: via Off-Cluster MPU mail box Receive & Interpret function)	All messages with off-cluster destinations
On-cluster AP Messages, Send Status	Manage Process (Interpret Message Category function)	All messages with on-cluster AP destinations
	Manage Process	All status returns for on-cluster messages
Status Returns	Accept Requests from AP of the Manage Process function	All on-cluster status returns

Description	Destination	Range
Status Messages Monitor	Manage Message function of the Monitor AP's MPU	All status to messages to monitor AP

4.2.7 Interpret Message Category Function

The Interpret Message Category function is responsible for receiving a message from the Route and Send Message function and forwarding it to the appropriate Manage Process subfunction.

4.2.7.1 Inputs

Inputs to this function are as follows:

Description	Source	Range
-----	-----	-----
On-cluster AP Message, Send Status	Route & Send Message function of Manage Message	Shutdown AP request Abnormally terminate AP request Data messages for APs Status response
Message Category Table	Internal tables	N/A

4.2.7.2 Processing

The processing is described below.

- a. This function shall accept as input an on-cluster AP message or message for the NTM from Manage Message.
- b. This function shall interpret the message category based on the message category table and route the message to the appropriate function as follows:
 - o A message that explicitly requires initiation of an application process (Category H or J) shall be routed to Initiate Application.
 - o A shutdown AP request or abnormally terminate AP request message shall be routed to Terminate Application Process.

- o A Data Message shall be routed to deliver message to Application Process.

4.2.7.3 Outputs

Outputs from this function are as follows:

Description -----	Destination -----	Range -----
Interpreted Message	Initiate Application Process function	Category A, B, E, H and J messages
	Abnormally Terminate or Shutdown AP function	Shutdown AP request Abnormally Terminate AP request
	Deliver message to AP function	Data Message

4.2.8 Initiate Application Process Function

The Initiate Application Process function is responsible for initiating and establishing a connection with an application process.

4.2.8.1 Inputs

Inputs to this function are as follows:

Description -----	Source -----	Range -----
Category A, B, E,	Interpret Message	Message

Description -----	Source -----	Range -----
H, and J Messages	function	identified as an initia- tion message
AP Initiation Service Request	Initiated AP	N/A
Startup Status Messages from the Initiated AP's Interface	AP Interface	"I'm Alive" status message "Startup failed" status message
Initiate & Connect AP Status Response	Host Operating System or IPC Primitive	Status return indica- ting status of AP initiate and connect
AP Operating Infor- mation Table	Internal Tables	N/A
AP Characteristics Table	Internal Tables	N/A
AP Status Table	Internal Tables	N/A
I'm Alive Table	Internal Tables	N/A

4.2.8.2 Processing

- a. On an initiation request message, the AP Operating Information Table of the APC is referenced to determine the number of instances of the AP that are currently active and to determine the number of requests that are queued for the AP.
 - a.1 If there are no instances of the AP currently active, the MPU shall initiate the AP.
 - a.2 If there are one or more instances of the AP currently active, the MPU shall check the AP Characteristic Record to determine if the requested AP is a queue server and determine the maximum number of running instances of this AP allowed.

- a.2.1 If the AP is a queue server (number of parents per instance is greater than one), the MPU shall check the AP Characteristic Table to determine the maximum number of connections allowed for this AP against the number of current connections indicated in the AP Status Table.
 - a.2.1.1 If the number of current connections is less than the maximum number allowed, the message is sent to the AP's mailbox and the number of AP connections is updated in the AP Status table.
 - a.2.1.2 If the number of current connections is equal to the maximum allowed, the AP Characteristic Record is checked and the conditions are handled as in a.2.2 and a.2.3.
- a.2.2 If the number of active instances is less than the number allowed, the MPU shall initiate the AP.
- a.2.3 If the number of active instances is equal to the maximum number allowed, the AP's characteristic record is checked to determine the allowed number of queued requests for the AP.
 - a.2.3.1 If the maximum queue size is greater than the current queue size, the message is queued for the AP and the AP Operating Information Table is updated to indicate an addition to the queue for the AP.
 - a.2.3.2 If the maximum queue size equals the current size, a "Resource Unavailable" status message is formatted and sent to Manage Message for routing to the MPU where the initiation request was made.

- b. If initiation of an AP is indicated, Initiate AP requests the host Operating System to initiate the AP. The MPU supplies a process name for the AP in the initiation request.
- b.1 If a successful initiation is indicated by the Operating System Response, the following procedure is followed.
 - b.1.1 The AP Status Table is updated with a new record for this new instance of the AP. The status is indicated as initiated.
 - b.1.2 An entry into the I'm Alive Table is made to indicate that the MPU is awaiting a message from the initiated AP to indicate that it successfully started execution.
 - b.1.3 If the data portion of the initiation message is non-blank (data-length = 0), the data for the AP shall be queued to be delivered when the AP's "I'm Alive" message is received.
 - b.1.4 The AP Operating Information Table is updated to indicate the current number of instances active.
- b.2 If a non-successful initiation is indicated in the Operating System Response, the MPU will send an "Initiation Failure" message to the MPU where the initiation request originated. A status message will also be sent to the Monitor AP to indicate the initiation failure event.
- b.3 On receipt of an "I'm Alive" message from the initiated AP, the MPU changes the AP's process status state entry from "initiated" to "running", signals the Deliver Message function to send the IISS System State Status, and any AP data that was carried in the initiation message to the initiated AP.
- b.4 If instead of an "I'm alive" message, the MPU receives an "Initiation failure" message from the AP Interface, it updates the APC tables to indicate the failure event and sends the "Initiation failure" messages described above in b.2.

- c. when an IISS AP is initiated, it must call one of the NTM's Initiation Service Routines. New APs will call "INITAL" [8], the NTM Service module described below.
 - c.1 "INITAL" provides the mailbox connections of the AP to the NTM that will enable the AP to send and receive messages from other IISS APs.
 - c.1.1 "INITAL" creates the AP's low priority and ACK mailboxes.
 - c.1.2 "INITAL" uses the IPC Primitives [9], that in turn use operating system calls to create the required AP input mailboxes. The AP's MPU-given process name is used to form the AP's mailbox names; the process name is concatenated with A for an AP's ACK mailbox, and with C for the AP's normal- priority mailbox. "INITAL" determines the AP's process name by an operating system call on the VAX and from the initiation parameter list on the IBM.
 - c.2 If the mailbox connection requests are successful, "INITAL" establishes an IISS exception handler for the AP. (This Exception Handler will trap all Operating Systems and Machine Exceptions for the AP, formulate a status message for the MPU of the AP's parent (spawner), and then terminate the AP.)
 - c.3 If the initiation procedure, INITAL, is still successful at this point, an "I'm Alive" message that contains the AP's process name is sent to one of its MPU's mailboxes.
 - c.3.1 If a non-recoverable failure status is returned on this IPC SEND to the MPU's mailbox, "INITAL" calls ERRPRO, and returns an INITAL-NOT-SUCCESSFUL code to the calling AP.
 - c.3.2 If a "mailbox-full" status is returned on this IPC SEND, a timer is set by "INITAL" and on the timers completion, the SEND is repeated. This step is repeated until the call is successful or until the number of times tried surpasses the IISS set limit.

- c.4 If the "I'm Alive" message is successfully sent, "INITAL" reads (with a wait) the AP's input mailbox for a message from the MPU that contains the IISS System State (IISS Startup, IISS Recovery, or IISS Normal Operations) for special AP startup state information, such as, first run since IISS start. The system state message also carries information about the AP, such as the number of mailboxes it supports, and the original source AP. A timer is also set when the read is issued.
 - c.4.1 If a mailbox event occurs before the timer and the received message contains the IISS system-state information, "INITAL" checks the number of mailboxes the AP will support (None, if the AP receives no messages; one, if the AP can receive no high-priority shutdown messages from the NTM, and two, if the AP can receive high-priority messages.) If the AP supports no mailboxes, the low priority and ACK are deleted. If the AP supports two mailboxes, "INITAL" will create the AP's high priority mailbox. Upon successful handling of the mailboxes returns to the AP with the SYSTEM-STATE and a successful STARTUP-STATUS.
 - c.4.2 If the message received is not the system-state message, "INITAL" returns to the AP with an INITIAL-NOT-SUCCESSFUL status.
 - c.4.3 If a timer event occurs before a mailbox event, "INITAL" returns to the AP with an INITIAL-NOT-SUCCESSFUL status.
- d. Figure 4-18 depicts the roles of the AP, the AP Interface and the MPU in the successful initiation of an AP.

AP
--

AP Interface

MPU

1. OS call to initiate AP
2. Successful return from OS call - A C table updates to indicate the initiation of AP
3. Executing AP calls "INITAL" to initiate its connection to the NTM
4. "INITAL" creates the AP's Low Priority and ACK mailboxes
5. "INITAL" establishes the IISS exception handler for the AP
6. "INITAL" sends an "I'm Alive" message to the MPU
7. The MPU receives the "I'm Alive" message and updates its AP state tables accordingly.
8. The MPU sends the AP the IISS System State information and any AP initiation data that was carried in the initiation message

Figure 4-18. AP Initiation

9. INITAL receives the
system state message
from the MPU establishes
the correct number of
mailboxes and return
to the AP
10. The AP begins its
operating code
and issues a CALL
"RCV" if it expects
initiation data

Figure 4-18. AP Initiation (Continued)

4.2.8.3 Outputs

Description -----	Destination -----	Range -----
Initiate AP Request	Host Operating System	N/A
Create AP Mailbox Request	Host Operating System (via IPC Primitive)	N/A
Initiation Status Messages from AP Interface	Manage Message Function (MPU's input mailbox)	"I'm Alive" "Initiation Failed" msgs
Initiation Status Msg Arrival Notification	Deliver Message to AP	"I'm Alive"
Initiation Status Messages to the MONITOR AP and source MPU from the AP's MPU	Manage Message Function	"Initiation Failure" messages
AP Message Queue Update	Internal Table	Initiation Data for AP
APC "I'm Alive" Table Entry	Internal Table	"I'm Alive Waiting Entry" "I'm Alive" Arrived - Cancels Entry

4.2.9 Deliver Messages to Application Process

The Deliver message to Application Process function is responsible for delivering messages to the AP. This function includes the MPU's writing of the message to the AP's mailbox, and the AP Interface's reading of the message from the AP's mailbox, its stripping of the NTM message header, and its delivery of the message data to the destination AP.

4.2.9.1 Inputs

Inputs to the function are as follows.

Description -----	Source -----	Range -----
Messages for On-Cluster APs	Interpret Message Category	All messages for on-cluster APs
Operating System Response (IPC Response)	Host Operating System	Responses to "SNDMSG", "RCVMSG", "SETTIM", "WAIT", IPC Primitives
NTM Service: Call "RCV" Arguments	Source AP Requesting Message	N/A

4.2.9.2 Processing

- a. On receipt of a message for an on-cluster AP that has already been initiated by the message source, the Deliver Message to AP function sends the message to the correct mailbox of the AP.
 - a.1 If an unrecoverable error status is returned on the 'SNDMSG' call, a status message is sent to the monitor AP and to the MPU of the message source signifying the 'MAILBOX WRITE ERROR.'
 - a.2 If the AP's mailbox is full, the message is added to the on-cluster AP's message queue.
- b. On notification by the Initiate Message function an of an "I'm Alive" message from an initiated on-cluster AP, Deliver Message formulates and sends to the AP, a System-State Message that contains IISS State Information, and, if required, a message containing the AP's initiation data. On a send failure, the actions of a.1 or a.2 are taken.
- c. In response to an AP's RCV Service Request, the AP Interface first searches the AP's message buffer for the requested messages. If it is found then Step c.1 is performed. If it is not found the AP Interface reads the AP's mailbox(es). If a wait is implied, the AP Interface waits for a message and when one is received, checks whether the message header satisfies the AP's request. If no wait is signaled, a "GETMSG" IPC call is made after the "RCVMSG" call.

- c.1 If a message is in the buffer or in the mailbox and is of the type requested, the AP Interface removes the NTM header and delivers the data portion and required arguments to the AP.
- c.2. If the message is not of the type requested, the AP Interface buffers the message for a later AP request and either returns to the AP with a non-message status if the request signalled "no-wait," or rereads the AP's mailbox(es) for another message if the AP's request implied a "wait."
- d. If an unrecoverable error is detected on the "RCVMSG" or "GETMSG" IPC calls, the AP Interface generates and sends a status message to the Monitor AP, and returns a failure status to the AP.
- e. Figure 4-19 depicts the roles of the AP, the AP Interface and the MPU on a "RCV" (with wait) request from an AP. Note that events 1a and 1b occur asynchronously.

AP --	AP Interface -----	MPU ---
1a. The AP issues an NTM service request, CALL "RCV" with a the wait indicated		1b. As the MPU messages for the AP, it delivers the message to the AP's mailboxes. If the AP's mailbox(es) is full, the MPU queues the message for later delivery
	2. The AP interfaces responds to the AP's "RCV" request, by - o First searching the AP's buffer for a message of the type requested - o If the request message is not found, the AP Interface reads the AP's mailbox indicated by the "RCV" request until the mailbox is either empty or a message of the type requested is found. (The sequence of IPC calls is RCVMSG, WAIT; then on a mailbox event, GETMSG.)	
	3. On finding a message of the type requested, the AP Interface strips the NTM header from the message and returns the AP's data and required "RCV" return arguments to the AP.	
4. The AP receives back control, its data, and the "RCV" call arguments		

Figure 4-19. A "RCV" (with wait) AP Scenario

4.2.9.2 Outputs

Description -----	Destination -----	Range -----
OS Process Control Requests (via IPC Primitives)	Host Operating System	IPC Primitives: "SNDMSG" "RCVMSG" "GETMSG" "WAIT" "SETTIM"
Service Calls Return to the Requesting APs (Messages to the on- cluster AP)	AP	NTM service calls: Call "RCV" Call "CHKMSG" returns
APC Message Queue Updates	Internal Tables	Messages for APs whose mailboxes were full on a "SNDMSG" request - delivery to be retried at queue check time
Status Message to Monitor AP and and Source MPUs	Manage Message	Error messages: Unrecoverable errors on IPC Pimitives

4.2.10 Accept Requests from Application Process

The Accept Requests from Application Process function is responsible for accepting and servicing AP Service Requests. The Service Requests that an AP may use are described in the IISS Programmers Guide [8].

4.2.10.1 Inputs

Inputs to this function are as follows.

Description -----	Source -----	Range -----
NTM Service Request Arguments [8]	AP	[8]
OS Process Control Response	Host Operating System (possibly via an IPC Primitive)	Reponses on IPC Primitives
Send Status Responses	Manage Message	"Message Accept" or "Message Reject" responses from MM
APC Tables	Internal Tables	AP Status Table AP Characteristic Table

4.2.10.2 Processing

On an AP's NTM Service request ([8] and Figure 4-20) the called AP Interface routine begins execution, accepts the arguments of the Service call and begins the servicing of the requests. The connection and communication requests with the resulting AP Interfaces actions are described in Figure 4-19. For all of the Services, an unrecoverable error results in a "failure" status return to the AP and a message to the MONITOR AP that indicates the error condition. ERRPRO is called if the status message cannot be delivered to the MPU's mailbox(es).

The NTM Request Services can obtain status information from APC tables (WHATAC, PRSTAT, GDSTAT), cause request messages to be sent for IISS status (APSTAT, HSTATS, WHTHST, ACSTAT, GETUSR) and cause messages to be sent to effect the AP's request (SIGABT, WKONCA).

NTM AP Interface
Services

AP Interfaces Processing

INITIAL	- o Maps to the APC tables - o Determines the AP's NTM given process name - o Creates the AP's required input mailboxes using the AP's process name as the mailbox name - o Establishes the AP's message buffer area - o Establishes the IISS Exception Handler for the AP - o Sends an "I'm Alive" message to the local MPU - o Waits for the "System-State" Message from the MPU - o On receiving the System-State message, it completes mailbox processing and returns control, the System State, and the Startup Status to the AP
TRMNAT	- o Sends an "I'm Dying" message to the local MPU - o Disconnect the AP's input mailboxes - o Ends the execution of the AP
ENDRCY	- o Sends a "Recovery Complete" message to the Monitor AP - o Returns control to the AP
NSEND	- o Accepts the data and calling arguments from the AP - o Formulates NTM message(s) that includes the correct NTM header and the AP's data. The data may be packetized into several NTM messages if it is longer than the maximum NTM message data length. The packetizing of continuation messages is transparent to the AP. - o Sends the message, using the IPC primitive, "SNDMSG", to the correct MPU mailbox. If the MPU's mailbox is full, it resends the message until the send is successful.

Figure 4-20. NTM Service Call AP Interface Processing

- o If NTM header processing is required, it waits for the return status on message acceptance from Manage Message.
 - o On receipt of the message send status or if no header processing is required, returns control to the AP with the correct status returns.
- GDSEND
- o Same as NSEND, except that
 - o GDSEND causes the resulting message to be one of Category A
 - o On acceptance, returns control and the message serial number to the AP so that a future status inquiry on the GD message may be made
- ISEND
- o Same as NSEND, except that
 - o ISEND causes the resulting message to be a Category H or J message
- QSEND
- o Same as NSEND, except that
 - o QSEND is only used by Queue-Server APs
 - o QSEND sends the "reply" message to exactly the last instance of the Destination from which we had received from last. If we have not received from our destination AP, we cannot send this reply message.

Figure 4-2C. NTM Service Call AP Interface Processing
(Continued)

NTM AP Interface
Services

AP Interfaces Processing

CHKMSG	- o Checks the AP's buffer for a message of the requested type - o If not found, reads the AP's input mailbox(es) until empty or until the correct message type is found - o Returns the appropriate status to the AP either "message found" or "message not found"
SETDLY	- o Checks the validity of the call's message delay arguments - o If valid, saves the arguments for the header for the next "NSEND", "GDSEND", or "ISEND" call's message and returns to the AP - o If not valid, returns to the AP with a no-accept status
GDACK	- o Accepts the input arguments from the AP - o Formulates an NTM message of type GDACK for the MPU of the originating GD message - o Delivers the message to the local MPU's mailbox - o Returns control to the AP
MSGACK	o Same as GDACK, except that the message destination is the AP that sent the message requiring the ACK.
RCV	- o Accepts the input arguments of the RCV call - o Checks buffer and AP's mailbox for the message requested. (See [8] for the AP's request options.)

Figure 4-20. NTM Service Call AP Interface Processing
(Continued)

NTM AP Interface
Services

AP Interface Processing

RCV (Continued)

- o If found, the AP Interface strips the NTM header from the AP's message and returns that data and return arguments to the AP.
- o If the requested message is not found and a wait was requested by the AP the AP Interface waits until a mailbox event is signaled. It then performs the previous step.
- o If the requested message is not found and no wait was signaled, the API returns control to the AP with a "No Message" status

TSTMOD

- o Checks the TSTMOD argument
- o If it signals 'ON', all asynchronous error messages sent after will be passed to the AP.
- o If it signals 'OFF', all messages sent after will be discarded
- o The default TSTMOD setting is "Off" or "0"

SIGERR

- o Formats the Signal Error (SE) message using the given AP Name and AP Error Code, severity level, and error description.
- o Sends the SE message to the original source AP (typically the UI) and to the monitor AP.

APSTAT

- o Formats the AP Status Request (SR) message using the given AP Name.
- o Forwards the SR message to the NTM for processing (if AP is local - Read APS table, if AP is off-cluster - forward message to appropriate MPU).
- o Receives the AP Status Return (IS) from the NTM
- o Passes the AP Status data to the requesting AP.

Figure 4-20. NTM Service Call AP Interface Processing
(Continued)

NTM AP Interface
Services

AP Interface Processing

HSTATS	- o Formats the Host Status Request (HR) message using the given Host Name. - o Forwards the message to the local MPU for processing (read Host Status Table). - o Receives the Host Status Return (HO) message from the Local MPU. - o Passes the Host Status Data to the requesting AP.
WHTHST	- o Formats the Host Name Request (HN) message using either the given AP Name or the name of the AP to which the service is currently bound. - o Forwards the message to the NTM for processing (Read API and APC Tables). - o Receives the Host Name Return (NH) or processing error message from the Local MPU. - o Passes the Host Name to the requesting AP.
WHATAC	- o Formats the APC Name Request (AN) message using either the given AP Name or the name of the AP to which the service is currently bound. - o Forwards the message to the Local MPU for processing (read AP Information Table). - o Receives the APC Name Return (NA) message from the local MPU. - o Passes the APC Name to the requesting AP.
WKONCA	- o Formats the APC Availability Request (AV) message using the given APC Name. - o Forwards the message to the local MPU for processing. - o Receives the APC Available Return (VR) message from the MPU. - o Passes the relevant return status to the requesting AP.

Figure 4-20.

NTM Service Call AP Interface Processing
(Continued)

ACSTAT	- o Formats the APC Status Rquest (PS) using the given APC Name. - o Forwards the message to the Local MPU for processing (read APC Status Table). - o Receives the APC Status Return (PR) message from the MPU. - o Passes the APC status data to the requesting AP.
SIGABT	- o Formats the Abort AP (AB) message using the given AP Name and logical channel. - o Forwards the message to the Local MPU for processing (process message and send to given AP).

Figure 4-20. NTM Service Call AP Interface Processing
(Continued)

NTM AP Interface
Services

AP Interface Processing

- o Returns the sending status of the message to the requesting AP. Note: the API does not return the status of the Abort procedures in this call.
- PRSTAT
 - o Formats the Paired Message Status Request (MS) message using the given message destination and logical channel.
 - o Forwards the message to the Local MPU for processing (Read Message Pair Table).
 - o Receives the Paired Message Status Return (MR) message from the Local MPU.
 - o Passes the Paired Message Status to the requesting AP.
- GDSTAT
 - o Formats the GD Status Request (GS) message using the given Message Serial Number.
 - o Forwards the message to the local MPU for processing (Read GD Table).
 - o Receives the GD Status Return (GR) from the Local MPU
 - o Passes the GD message status to the requesting AP.
- GETUSR
 - o Locates the original source AP Name.
 - o If the original source AP is a user interface; accesses the Logon Table to determine the user logon data.
 - o Returns the original source data to the requesting AP.

Figure 4-20. NTM Service Call AP Interface Processing
(Continued)

4.2.10.3 Outputs

Description -----	Destination -----	Range -----
Messages to be Routed	Manage Message	All message types
OS Requests (IPC Primitives)	Host Operating System	IPC Primitive: "SNDMSG" "GETMSG" "RCVMSG" "WAIT" "SETTIM"
AP Initiation Requests	Initiate Application Process	NTM Service "INITIAL"
AP Termination	Terminate Application	NTM Service "TRMNAT"

4.2.11 Terminate Application Process Function

The Terminate Application Process function is responsible for terminating or signaling shutdown to an application process.

4.2.11.1 Inputs

Inputs to this function are as follows:

Description -----	Source -----	Range -----
AP Termination from "TRMNAT" Request	Accept AP	Requests
Messages for On-Cluster	Interpret Message Category	"I'm Dying" message from AP "Shutdown AP" message "Abort AP" message
Terminate AP Status Response	Host Operating System	Status msg indicating status of Abort

<u>Description</u>	<u>Source</u>	<u>Range</u>
		AP request
APC Tables	Internal Tables	AP Status Table AP Child Table AP Characteristic Table

4.2.11.2 Processing

Abnormally Terminate or Shutdown AP

Upon receipt of an "abort AP" or "shutdown AP" request the SIBABT service shall:

- a. Check the AP Information Table to determine if the targeted AP resides on the current MPU.

If the targeted AP resides on another MPU, the destination of the message is changed to the MPU the AP resides on, and the message is sent to that MPU.
- b. Check the AP Status Table to determine if the targeted AP has an entry.

If AP status table has an entry but the AP has already terminated, the NTM sends an "AP Terminated" message to the MPU which originated the request.

If the targeted AP has an entry in the AP Status Table but is in termination, an "Abort AP" message is sent to the MPU of each alive child of the target AP.

If the target AP has an entry and is initiation, the MPU will change the AP Status Table entry to "init cancelled". When the "I'm Alive" is received, the NTM terminates the target AP, and then sends an "AP dying"
- c. If the target AP has an entry in the AP Status Table executing, then the NTM will check the AP characteristic Record to determine the action to take.

If the AP characteristic table entry show the target AP expects a "request to abort message", then the NTM should send the message to the target application and take no further action.

If the AP characteristic table entry indicates an abort is required, the MPU will terminate the target AP. The MPU then will send itself an "AP Dying" message on behalf of the aborted AP. If the aborted AP message is sent to the MPU of each alive child to abort it.

If the AP characteristic table entry indicates the AP expects to run to completion, then no action is taken.

- d. On termination, the aborted AP's process status is updated to "aborted". A "child status" message is sent to the parent AP. If the abort request is from the operator, then an "ACK" should be sent to the MONITOR AP for the operator's console.
- e. On the receipt of a "child status AP aborted" message, the receiving NTM:

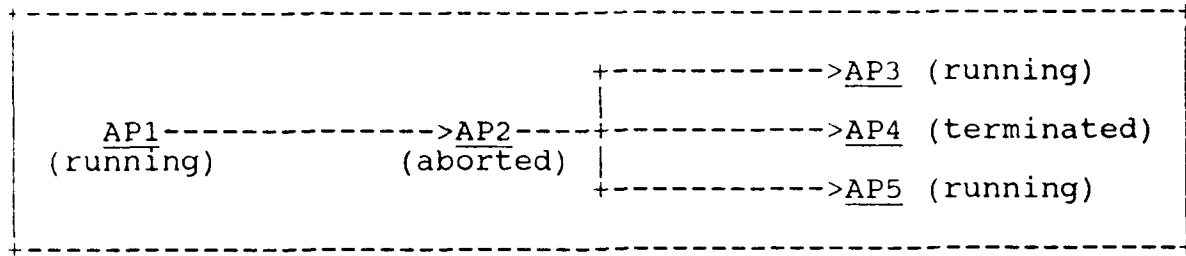
Checks the status of the parent AP and, if running, checks the parent's AP Characteristic Record to determine whether to

- o send an "aborted child" status message to the AP,
- o abort the parent AP,
- o let the parent AP continue and not send it a status message.

In addition, the NTM of the parent AP updates the child table of the parent AP to indicate the new status of the aborted AP.

On receipt of a child status message that indicates the completion of one branch of the APs child tree, the NTM checks to see if all children of a terminated AP are also terminated. The NTM of the AP sends a cleanup message to the NTM of each AP in its child tree and then removes the AP's entry from the Process Status Table and its Child Table entries.

- f. On the receipt of a "cleanup" message, the receiving NTM, removes the designated AP's entries in the Application Process Status Table and associated child table.
- g. Where the IISS state is "IISS shutdown," no acknowledgement or child abort processing is performed on the Abort AP or Shutdown AP message. It is assumed that each APC will do its own AP shutdown and cleanup.
- h. If the IISS state is "Host Shutdown" or "APC Shutdown", on the Abort AP or Shutdown AP message, acks and child abort notifications are sent, but shutdown proceeds without waiting for any child status or cleanup messages.
- i. No messages are sent to APC's or hosts in shutdown state.
- j. If the AP is of the type "Run to Completion," it is allowed to complete if the IISS is not in APC, HOST, or IISS Shutdown mode.



1. AP2 is aborted by its MPU
2. AP1's MPU sends a child status (abortack) to AP2's parent with the status of AP2's child tree (children running)
3. NTM sends ABORT messages to AP3's and AP5's MPUs
4. AP1's NTM updates child table to "child aborted with children active," on receiving the child status AP2
 - 4'. AP3 and AP1's AP5 are indicate aborted
 - 5'. Child status messages are sent to message AP2's MPU
6. AP2's NTM receives both child status msgs from AP2 & AP3 that indicates their terminations, updates its tables sends cleanup messages to AP2 and AP3's NTMs, and sends a "children terminated" message to AP1's MPU
5. AP1's characteristic record is checked to determine what action should be taken on the child status message from AP2
7. If AP1 is to be aborted: the NTM aborts AP1 and sees that its child tree in the process of terminating, so waits for child status messages that indicate completion of the tree
 - 7'. AP2 & AP3's NTMS remove the process status and is child table entries for AP2 & AP3

Figure 4-21. NTM Abort AP Protocol

8. On receiving the "children terminated" message from AP2's NTM, AP1's NTM removes AP1's table entries and sends a cleanup message to AP2's NTM
9. AP2's NTM receives the cleanup message from AP1's MPU and removes its table entries for AP2

Figure 4-21. NTM Abort AP Protocol (Continued)

Normal Termination

Upon receipt of an "I'm Dying" message from an AP, the NTM sends a child status message to the NTM of the parent (or spawner) of the terminated AP. Child table processing and cleanup continues as indicated in Figure 4-22.

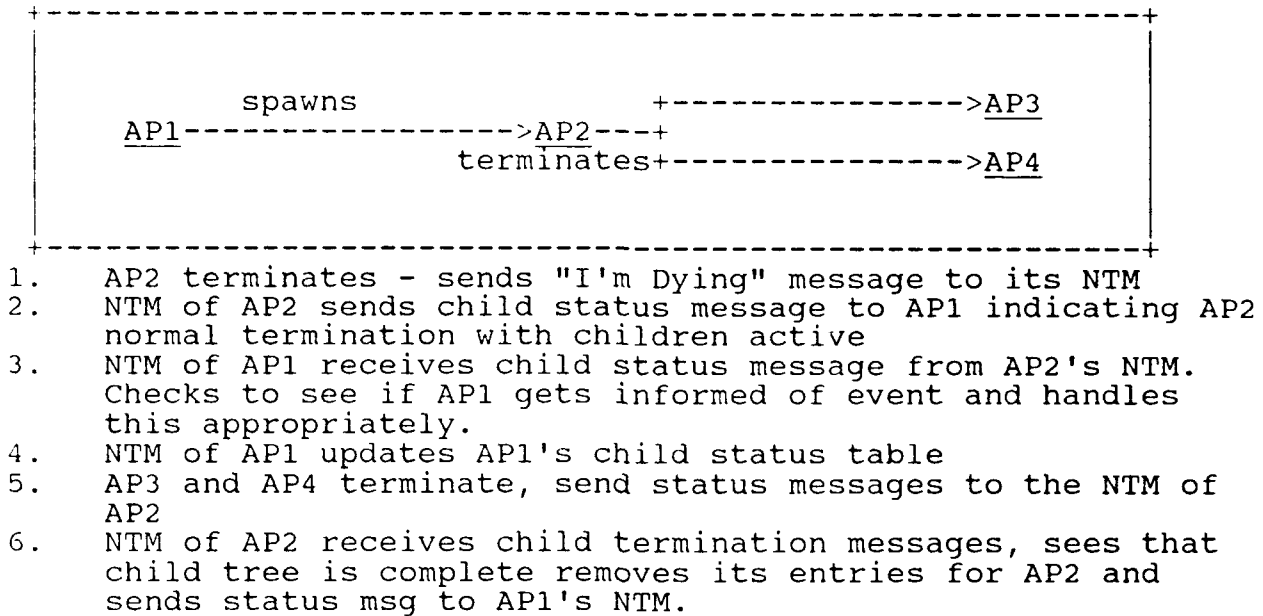


Figure 4-22. NTM - Normal AP Termination Protocol

7. NTM of AP1 receives the status message, and on termination of API and completion of all AP1's children, AP1's NTM sends a cleanup message to NTM
8. NTM of AP2 sends a cleanup message to AP3 and AP4's NTM's
9. AP3 and AP4's NTM remove all AP3 and AP4 table AP2's entries
10. NTM of AP2 receives & processes its cleanup message

Figure 4-22. NTM - Normal AP Termination Protocol (Continued)

4.2.11.3 Outputs

<u>Description</u> -----	<u>Destination</u> -----	<u>Range</u> -----
OS Requests to Abort APs	Host Operating System	Operating System dependent process termination requests
Messages to be Routed	Manage Message	"I'm Dying" message from terminating AP Child status messages to NTMs of terminating AP's parent Cleanup messages to NTM of child APs.
APC Table Updates	Internal Tables	AP Process Table Child Table

4.2.12 Handle System Commands

The Handle System Command function is responsible for processing commands from the Monitor AP for the APC.

4.2.12.1 Inputs

Inputs to this function are as follows:

<u>Description</u>	<u>Source</u>	<u>Range</u>
Messages for Maintain (APC) Operability (MO)	Manage Message	"Shutdown APC" "Shutdown AP" "Display Active APs" "Recover APC" (TBD)

<u>Description</u>	<u>Source</u>	<u>Range</u>
OS Responses	Host Operating System	APC Startup Responses to "Get APC name request" Response to "Map to Host Tables Request"
Host Tables	Internal Tables	Message Definition APC, Host Status Tables
APC Queues and Tables	Internal Tables	All APC Tables

4.2.12.2 Processing

The Handle System Command function processes the IISS System Commands from the Monitor AP according to the following procedures.

<u>System Command</u>	<u>NTM Processing</u>
START APC	1. Gets the MPU's process name. 2. The MPU, on startup, maps to the host tables that are maintained by the Monitor AP. 3. Creates the MPU's high and low priority input mailboxes using its process name concatenated with "H" and "C" for the mailbox names. 4. If steps 1-3 are successful, the MPU sends a "Table Configuration Status Request" to the Monitor AP. If steps 1-3 have failed, it sends a startup fail-status message to the Monitor AP. If it cannot send a message to the Monitor AP, it calls ERRPRO and terminates. 5. If processing is still successful, the MPU waits for a "Table Status" message from the Monitor AP. 6. The remaining startup protocol is described in Figure 4-23
Shutdown AP	See 4.2.11.2
Shutdown APC	1. Sets APC Shutdown flag.

2. Does abort/shutdown processing for each AP in AP Status Table (4.2.11.2.1)
3. Processing continues until the mailboxes are empty and all AP's are dead.
4. Saves queues
5. Saves initialization data.
6. Deletes mailboxes.
7. Sends "APC Terminating" message to the Monitor AP.
8. Terminates

MPU (after being initiated)

Monitor AP

1. Sends "Table Status Request" message and waits for return message.
 - 2a. On receipt of message, and if tables are OK sends "Tables OK" message to MPU
 - 2b. On receipt of message and tables not OK, sends "Tables Not OK" message to MPU
- 3a. On receipt of "Tables OK" message, reads local files to build tables.
 - o If table read is successful, sends "APC Alive" message to Monitor
 - o If table read fails, sends "Table Access Failure" message to monitor
 - o If return message times out, the APC will terminate.
- 3b. On receipt of "Tables NOT" message, requests CDM data and sends either success or failure message to the Monitor AP on completion
 - 4a. On "APC Alive" message, updates APC status to running, and sends 'Host Active' message to the APC
 - 4b. On "Table Access Failure" message, monitor updates APC status to "down" and notifies operator of condition.
- 5a. On receipt of the 'Host Active' message from the Monitor AP, it sets its status from 'startup' to 'running'. Normal processing can now begin.
- 5b. If the return message times out, the APC will terminate.

Figure 4-23. APC Startup Protocol

System Command

Display Active APs

NTM Processing

1. Creates a message with information about each active AP on its AP Cluster
2. Delivers the message to Monitor MPUs mailbox

4.2.12.3 Outputs

<u>Description</u>	<u>Destination</u>	<u>Range</u>
Response Messages to Monitor AP	Manage Messages	Messages: "Table Status Request" "APC terminating" "APC Alive" "Active APs" "Error Conditions" "Table Requests"
APC Tables & Queue Updates	Internal Table	All APC Tables
Queue Requests	Handle APC Message Queues	"Initiate"; Recover (TBD), Save Queues

4.2.13 Handle APC Message Queues

The Handle APC Message Queues function is responsible for maintaining the APC message queues.

4.2.13.1 Inputs

Inputs to this function are as follows.

Description -----	Source -----	Range -----
Queue Requests	Handle System Command Function	Initiate, Recover (TBD), Save Queues
OS Responses	Host Operating System (IPC Primitives)	Time out Event Responses on "SNDMSG" IPC
Host Tables	Internal Tables	APC Status Table, Host Status Table
APC Tables	Internal Tables	All APC Tables & Queues
Message Category Table	Internal Tables	A-J

4.2.13.2 Processing

There are two types of message queues within the IISS; off-cluster and on-cluster. Each queue is used to hold messages that cannot be sent due to a destination mailbox full condition. Guaranteed Delivery messages are the only messages queued if the destination is otherwise unavailable.

Both types of queues operate on a first-in-first-out basis (FIFO). Their entries are kept in index-sequential order with the local APC name as an integral part of the primary key. Unique processing for each queue type is described below.

1. Off-Cluster Queue: When the MPU has a message for another APC, it will check the AP Cluster Status table to determine the status of the destination APC. If the destination APC is not available, a status message is sent to the message source AP and to the Monitor AP. If the message is Guaranteed Delivery, it will be queued in the off-cluster queue. Otherwise, the message is lost.

If the destination APC is active, the MPU will attempt to place the message in the destination's mailbox. If the mailbox is full the message is queued. On the MPU's timer processing, the queue is checked for extent messages. If any are found, the send will again be attempted until the queue is empty or the mailbox is full.

2. On-Cluster Queue: When a message has been accepted for delivery to an on-cluster AP, the queue is checked for extent messages to the destination that have yet to be delivered. Any messages already in queue will be delivered first to ensure serial processing. Messages will be placed in the AP's mailbox until all messages are

delivered or the AP's mailbox is full. On a mailbox full or AP's initiating condition the messages will be queued. The on-cluster queue is periodically checked as part of the MPU's timer processing.

4.2.13.3 Outputs

Description -----	Destination -----	Range -----
Updated Queues	Internal Tables message	MM & MP Queues
Messages to On- cluster APs	Deliver Message to AP	All message categories for APs time-out messages
Messages for Off- cluster	Manage Message	All message categories Status messages to Monitor AP
OS Process Control Requests	Host Operating System	"SNDMSG" IPC Primitives OS file handling commands

4.2.14 Handle Local APC Tables Function

The Handle Local APC Table function is responsible for maintaining the APC tables.

4.2.14.1 Inputs

Inputs to this function are as follows:

Description -----	Source -----	Range -----
Table Requests	Handle System Command Function	Initiate, Recover (TBD), Terminate
OS Responses	Host Operating System (IPC Primitives)	Time-out Event Responses on "SNDMSG" IPC Response on "ABORT AP Requests
Message Category Table	Internal Tables	A-J
Host Tables	Internal Tables	APC Status Table Host Status Table
APC Local Tables	Internal Tables	All APC Tables

4.2.14.2 Processing

APC Tables are maintained by the following processing:

Event -----	Processing -----
APC Startup	All APC Local Tables are initialized and built from local files or from CDM data depending on Monitor's start table command (4.2.12.2)
Time-out	The following APC Dynamic Tables are processed on a time-out event.

Event

Processing

Time-out (Continued)

1. Message Pairing Tables - the pair table on the APC is checked for messages whose timeouts have expired. On expired messages, the AP characteristic record of the waiting AP is checked to determine whether the AP should receive a time-out message or be aborted. The appropriate action is taken by the MPU.
2. Guaranteed Delivery Table - the guaranteed delivery table entries are checked to see if an ACK from the next receiving MPU has been received. If the table indicates no response to the GD message, a status request is sent to the MPU from which a response is due.

If the table indicates an expired time with no response to a GD status request from an MPU that has been sent a status request, a status message is sent to the Monitor AP.

3. "I'm Alive" table - these table entries are checked for entries with elapsed time-outs. Those entries will cause an "Init failure" message to be sent to the Monitor AP and the MPU from which the AP initiation request was sent.

APC Shutdown

1. GD Tables are saved
2. APC Files are closed

4.2.14.3 Outputs

Description -----	Destination -----	Range -----
Status Messages	Manage Message messages	Status to MONITOR AP and to MPUs
Messages to On- cluster AP	Deliver Message to AP	Time-out messages
APC Tables	Internal Tables	All APC Tables

4.3 Special Requirements

4.3.1 Programming Methods

NTM programming methods shall conform to the standards set forth by General Electric in the IISS Software Development Guidelines/Conventions document [10].

4.3.2 Program Organization

This paragraph is not applicable to the NTM CPCI.

4.3.3 Modification Consideration

This paragraph is not applicable to the NTM CPCI.

4.3.4 Special Features

To facilitate the testing of the NTM CPCI, integrated application processes must be provided to act as test drivers.

4.3.5 Expandability

The NTM will be designed and implemented in a manner which provides for an expandable configuration and increasing functionality. Additional APs, clusters, hosts, and changes in hardware will be accommodated with minimal impact on the user and the system. The use of a High Order Language significantly enhances the portability of the code. Host dependent code will be used only when absolutely necessary. In these cases the code will be identified and isolated to facilitate transfer to a new host.

4.3.6 Special Timing

This paragraph is not applicable to the NTM CPCI.

4.4 Human Performance

This paragraph is not applicable to the NTM CPCI.

4.5 Data Base Requirements

4.5.1 Sources and Types of Inputs

The information identified as input to the NTM and its component functions is defined in Section 4.2 above. The identified data items are thoroughly defined in Appendix D below.

4.5.2 Destinations and Types of Output

The information identified as output from the NTM and its component functions is defined in Section 4.2 above. The identified data items are defined in Appendix D below.

4.5.3 Internal Tables and Parameters

The tables required by the NTM functions are discussed below. The structure of the data items used in the tables are identified in the IDEF1 model in Appendix C below. These items are defined in Appendix D as to name, ID, description, COBOL Picture, size, coding type, IDEF1 reference, stability (static vs. dynamic), legal values, source, and where used.

Figure 4-24 provides an overview of the tables used by the NTM.

Table Name -----	Table ID -----	Table Location -----	Entry Length -----	No. of Entries -----	Size -----
Message Category Table (4.5.3.1)	CAT	Global-IISS	X(7)	10	70 bytes
Authority Table (4.5.3.2)	AUT	Local to APC (Based on resident AP's authority to send)	X(22)	Variable per table instance	Vari- able
AP Informa- tion Table (4.5.3.3)	API	Local to APC	X(14)	One per AP known to IISS	TBD (fixed)
AP Status Table (4.5.3.4)	APS	Local to AP's AP Cluster	X(85)	One per initiated AP Instance	Vari- able
Child Table (4.5.3.5)	CLD	Local to Parent AP's AP Cluster	X(39)	One per spawned AP	Vari- able
AP Charac- istics Table (4.5.3.6)	APT	Local to AP's AP Cluster	X(24)	One per AP on APC	TBD (fixed)
APC Status Table (4.5.3.7)	APC	Global-IISS	X(7)	One per APC known to IISS	TBD (fixed)
Host Status Table (4.5.3.8)	HST	Global-IISS	X(7)	3	21 bytes
Message Pairing Table (4.5.3.9)	MPR	Local to sending APC	X(44)	One per msg. pair	Vari- able

Figure 4-24. NTM Tables - Overview

Table Name -----	Table ID -----	Table Location -----	Entry Length -----	No. of Entries -----	Size -----
Logon Table (4.5.3.10)	LOG	Local to Monitor AP	X(62)	One per logged-on user	Vari- able
Guaranteed Delivery Table (4.5.3.11)	GRD	Local to sending APC	X(66)	One per Guar. Del. Msg. sent from on-APC AP	Vari- able
AP Operating Information (4.5.3.12)	APO	Local to AP's AP Cluster	X(19)	One per AP on the APC	Vari- able
I'm Alive Table (4.5.3.13)	IAT	Local to AP's AP Cluster	X(18)	One per AP instance in Initiation Mode	Vari- able
Link Status Table (4.5.3.14)	LST	Local to Monitor AP	X(3)	One per link	9
Authority Check Table (4.5.3.15)	ACT	Local to APC	X(9)	One per destina- tion AP	Vari- able
Directory Table (4.5.3.16)	DIR	Global IISS	X(24)	One per directory known to the IISS	Vari- able
Connection Table (4.5.3.17)	CON	Local to APC	X()	One per Connection	Variable

Figure 4-24. NTM Tables - Overview (Continued)

4.5.3.1 Message Category Table

This table contains the information relative to the processing required of the MPU in order to move a message through the IISS. The categories are defined primarily in terms of these processing requirements. A second, smaller, consideration in the definition of the categories is the breakdown, to a limited extent, based on end processing requirements. This breakdown resulted in the separate categorization of System Commands and AP Status Messages.

The message categories defined for the initial Test Bed are:

A	Guaranteed Delivery
B	Response required
C	System Command - no response (to initiator)
D	System Command - response (to initiator) required
E	Unsolicited Message
F	Solicited Message
G	AP Status Message
H	Initiation Message (may or may not have data)
I	Message from COMM AP
J	Initiation Message - Response Required

The format and identified values of the message category table are shown in Figure 4-25. The individual fields are defined below.

Field Name	Field ID	Field Size	Field Description
-----	-----	----	-----
Message Category	CAT-MSGCAT	X	This field contains a legal value of a message category. The table is indexed on this field using the value contained in the message header.
Authorization Requirement	CAT-AUTREQ	X	This field identifies whether a message conforming to a given category requires authorization at it's source AP Cluster. Authorization is defined as the determination that the

Field Name -----	Field ID -----	Field Size ----	Field Description -----
			destination AP is in fact able to receive the given message type from the source AP.
Pairing Requirement	CAT-PREQMT	X	This field identifies whether a message conformed to a given message category requires pairing.
Guaranteed Delivery	CAT-GUARDL	X	This field identifies whether a message conforming to a given message category requires that an acknowledgment of delivery be sent to the source of the message.
Message Priority	CAT-MSGPRY	X	This field indicates the level of priority assigned to a message conforming to a given message category. The value of this field is added to the message header by the MPU.
Log Requirement	CAT-LOGREQ	X	This field indicates whether logging is required on a message conforming to the given category. The value is added to the message header by the MPU.
Statistics Collection Flag	CAT-STATCO	X	This field indicates whether statistics are to be collected on a message conforming to the given message category. The value is added to the message header by the MPU.

Message Category	Authori- zation Requirement	Pairing Require- ment	Guaranteed Delivery	Message Priority	Log Require- ment	Statistics Collection
A	Yes	No	Yes	Low	Yes	Yes
B	Yes	Yes	No	Low	Yes	Yes
C	No	No	No	High	Yes	Yes
D	No	Yes	No	High	Yes	Yes
E	Yes	No	No	Low	Yes	Yes
F	No	Yes	No	Low	Yes	Yes
G	No	No	No	Low	Yes	Yes
H	Yes	No	No	Low	Yes	Yes
I	No	Yes	No	Low	Yes	Yes
J	Yes	Yes	No	Low	Yes	Yes

Figure 4-25. Message Category Table

4.5.3.2 Authority Table

Authority is defined as the fact that a given destination is able to receive a given message type from a given source. In order for a message to be authorized, the message type, message source, and message destination values given in the message header must match with a legal combination given in the authority table.

The authority table is accessed where the Authority Check Table (Section 4.5.3.15) indicates that an authority check is required on the given message. The table is indexed by the Message Source although all three values (Source, Type, and

Destination) must exist in the same unique tuple in the table.

The fields of the Authority Table are briefly described below.

Field Name -----	Field ID -----	Field Size -----	Field Description -----
Authorized to Receive	AUT-ATOREC	X(10)	Identifies one instance of a legal destination that is allowed to receive a given message type from a given source. The value in this field will be replicated for each tuple in which the given destination is involved.
Message Type	AUT-MSGTYP	X(2)	Identifies one instance of a given message type. The value in this field will be replicated for each tuple in which the given message type is involved.
Authorized to Send	AUT-ATOSND	X(10)	Identifies one instance of a send legal source that is allowed to send a given message type. The value in this field will be replicated for each tuple in which the given source is involved.

4.5.3.3 Application Process Information Table

This table contains data relative to any given Application Process. This information is always available for routing purposes.

For this purpose, the table provides the name of the AP Cluster that a given destination AP resides on. (The physical location of any AP is deliberately invisible to any other AP in order to provide maximum flexibility in the assignment of AP's to AP Clusters). The destination AP name from the message header must be mapped to it's AP Cluster via a table lookup.

The destination AP's AP Cluster is added to the header when it is found in the table.

When the message is routed, the MPU checks the destination AP Cluster field. As each MPU knows who it is, the determination can easily be made as to whether the message is to be sent on or off AP Cluster. If the destination is off-AP Cluster, a lookup is made in the AP Cluster status table (Section 7) to determine the host the AP Cluster is currently residing on. Again, the MPU can recognize it's own host and can therefore determine whether the destination is on or off host. Where the destination is off-host, the message is routed to the destination host's COMM AP Cluster. Where the message destination is on-host, the message is routed directly to the destination AP Cluster.

The format and identified values of the AP Information Table are shown in Figure 4-26. Each field is described below.

Field Name -----	Field ID -----	Field Size -----	Field Description -----
AP Name	API-APNAME	X(10)	This field contains the name of a callable entity within the IISS. It is the key field of the table and is accessed by matching the AP name contained in the destination field of the message header.
AP Cluster Name	API-APCNME	X(3)	This field contains the name of the AP Cluster upon which the given AP name resides. The value in this field may serve as a key value should the need arise to access the AP Cluster status table.
Queue Server Type	API-QSTYPE	X	This field identifies the type of chaining support required by the AP. This support may be child

Field Name	Field ID	Size	Field Description
-----	-----	----	-----
			chaining, message chaining, or no chaining.

4.5.3.4 Application Process Status Table

This table contains dynamic data associated with an AP that has been initiated. An entry is created when an AP instance is initiated and is maintained until the AP instance's tree status indicates that the AP instance and all associated instances are terminated and cleaned up.

The table further provides the data needed to maintain the tree of AP's spawned by the given AP instance entry. This tree is kept to facilitate the logic needed to perform an Abort and to cleanup after any kind of termination.

The individual fields of the AP Status Table are described below.

Field Name	Field ID	Field Size	Field Description
-----	-----	----	-----
APC Name	APS-APCNME	X(3)	This field contains the name of the APC on which the AP resides.
AP Name	APS-APNAME	X(10)	This field contains the AP name of the initiated AP.
Instance	APS-INSTNC	X(2)	This field contains the identifier of the specific instance of the initiated AP.
Original Source	APS-ORGSRC	X(15)	This field contains the AP name Instance, and resident AP Cluster of the ultimate originator of the AP. In the case of a spawned AP, the originating source is the AP that sent the transaction that "fired off" the AP at the top of the tree.

Field Name	Field ID	Field Size	Field Description
-----	-----	-----	-----
Immediate Parent	APS-IMMPAR	X(15)	This field contains the AP name, Instance, and resident AP Cluster of the AP that sent the transaction that "fired off" the given AP instance. The value in this field may match the value of originating source.
Child Table	APS-CLDIND	9(4)	This field points to the AP's first Index Entry in the Child Table. (The Child Table is discussed in Section 4.5.3.5).
Message Queue Flag	APS-MSGQUF	X	This field indicates whether there are messages waiting for the AP in the message queue.

Field Name -----	Field ID -----	Field Size ----	Field Description -----
Pair Flag	APS-PRFLAG	X	This field indicates whether the given AP instance has one or more outstanding waits. If the AP does not have any paired msgs outstanding, the flag will be null. The Message Pairing Table is discussed in Section 9.
AP Status	APS-APSTAT	X	This field provides the current structure and operating status of the AP and its "tree" of AP's spawned by the given AP.
Message Serial Last Queued	APS-SERNLQ	X(10)	The Serial # and source AP Cluster of the last message placed in the AP instance's queue. This information will be used to recover the state of the AP.
Guaranteed Delivery Flag	APS-GDFLAG	X	This field indicates whether the given AP has one or more guaranteed delivery messages outstanding. The Guaranteed Delivery table is discussed in Section 11.
Number of Connections	APS-NOCONN	X(2)	This field indicates the current number of sources that are currently connected to an instance of a Queue Server. Where the given AP is not a Queue Server, this field will be null.
Logical Channel ID	APS-CHANID	X(3)	This field identifies the logical channel under which the given AP instance was initiated.

Field Name -----	Field ID -----	Field Size ----	Field Description -----
Children	APS-CHLDRN	X	This field indicates whether the given AP has any child AP's associated with it.
Message In Queue	APS-NMSA	X(4)	Identifies the Number of Messages in Queue for the AP.
Last Key Pointer	APS-LSTKEY	X(9)	Pointer to the last key value for the given AP in the AP Queue Table.
First Pseudo Instance	APS-FPINST	X	This field points to the first entry in the Connection Table for the given AP.
Last Pseudo Instance	APS-LPINST	X	This field contains the last Pseudo Instance number assigned to the AP.

4.5.3.5 Child Table

One instance of a child table is used to maintain one level of the tree of chained AP's. This table is in effect a linked list of AP's spawned by a common parent. This parent may also be a child AP itself. The table has an entry for every instance of an AP spawned by an on-WS AP.

The child table is accessed when the parent is abnormally terminated (aborted) in order to abnormally terminate any AP's that were spawned by the parent. As a child AP may also be a parent AP, its children would also be abnormally terminated. The table is also used to facilitate cleanup on any termination (normal or abnormal).

The fields of the Child Table are described below.

Field Name -----	Field ID --	Field Size ----	Field Description -----
Child AP Cluster	CLD-APCNME	X(3)	This field contains the name of the AP Cluster that the child AP resides on.
Child Parent	CLD-PARNME	X(12)	The Process Name of the child AP's parent.
Child Rank	CLD-RANK	9(4)	The ranking assigned to the child AP when the table entry is made.
Child AP Name	CLD-APNAME	X(10)	This field contains the AP Name of the spawned AP.
Child Status	CLD-CLDSTS	X	The child status indicates the operational status of the child AP.
Next Sibling Index	CLD-NXTSIB	9(4)	This field provides an index to the next child AP spawned by the common parent AP.
Logical Channel ID	CLD-CHANID	X(3)	This field identifies the logical channel under which the given Child AP was spawned.
Reserved Code	CLD-RESCDE	X	This field indicates whether the entry is confirmed or reserved.
Number Tries	CLD-CTRIES	X	This field indicates how long the entry has been reserved. At a given point, a reserved entry will be deleted.

4.5.3.6 AP Characteristics Table

This table provides the processing characteristics of a given AP in accordance with it's type. The table is used to determine how to handle a given AP on the occurrence of various events. As the characteristics of an AP are not directory

Field Name -----	Field ID -----	Size ----	Field Description -----
AP Name	APT-APNAME	X(8)	The AP Name of the given AP. This field serves as the key to the table.
Maximum Number Queued Messages	APT-NOAMSG	X(2)	The maximum number of of messages allowed in the AP's queue at any one time.
Maximum Instances	APT-MAXINS	X(2)	This field defines the maximum number of instances of the given AP that can be awake at any one time.
Number of Parents per Instance	APT-NOPINS	X(2)	The maximum number of parents allowed to one instance of the AP at any one time
Initiation Needs	APT-ININDS	X	This field identifies whether the AP requires a specific initiation message or can be started by any kind of message.
On Abort	APT-ONABT	X	This field indicates how the given AP is to be handled when an Abort message arrives for it.
Number of Mailboxes	APT-NUMMBX	X	This field indicates the number of mailboxes an AP will support.
On-Shutdown	APT-ONSTDN	X	This field indicates whether the given AP has the internal logic to handle shutdown.
On-Recovery	APT-ONREC	X	This field indicates whether the given AP has the internal logic to handle recovery.

Field Name -----	Field ID -----	Field Size ----	Field Description -----
On-Child Normal Termination	APT-ONCLDT	X	This field indicates how the given AP is to be treated upon the normal termination of a child AP.
On-Child Abnormal Termination	APT-ONCLDA	X	This field indicates how the given AP Abnormal is to be treated upon the Abnormal Termination of a child AP.
On-Child Shutdown	APT-ONCLDS	X	This field indicates how the given AP is to be treated upon the shutdown of a child AP.
Timeout Handling	APT-TMOHDL	X	This field contains a code which represents how the given AP is to be handled in the even of a timeout expiration.
AP Priority	APT-APPRTY	X	This field provides the priority level of the given AP.

specific, the directory prefix is not used in this table.

The fields of the AP Characteristics Table are briefly described below.

4.5.3.7 AP Cluster Status Table

This table serves to identify both the location of a AP Cluster within the IISS and its current operating status.

The table is accessed primarily for routing purposes in order to determine if the destination of a given message is on or off host. The table may also be used to check the status of a destination AP Cluster prior to sending a message.

Each field of the AP Cluster Status Table is defined below.

Field Name -----	Field ID -----	Field Size -----	Field Description -----
AP Cluster Name	APC-APCNME	X(3)	This field is the key to the table. It identifies an instance of a AP Cluster on the IISS.
AP Cluster Status	APC-APCSTS	X	This field identifies the current operational status of the given AP Cluster.
AP Cluster Logical Host	APC-HSTNAM	X(3)	This field identifies the logical host machine within the IISS that the given AP Cluster resides on.

4.5.3.8 Host Status Table

This table serves to provide the current operational status of a host machine on the IISS. It is called out as a separate table in order to provide the flexibility of adding more host specific data in the future.

The fields of the Host Status Table are described below.

Field Name -----	Field ID -----	Field Size -----	Field Description -----
Logical Host Name	HST-HSTNAM	X(3)	This field is the key to the table. It identifies an instance of a logical host machine on the IISS.
Host Status	HST-HSTSTS	X	This field identifies the current operational status of the given physical host.
Physical Host Name	HST-PHYHST	X(3)	This field maps the given logical host name to it's physical host name.

4.5.3.9 Message Pairing Table

The message pairing table serves to track a given dialog between APs on the IISS system. Messages conforming to categories requiring pairing services (category B, D, F, and J) will be tracked via this table.

When a message conforming to Category B, D, or J is generated on a AP Cluster, an entry will be made in the table for that AP Cluster. A timeout will be set on the pair, its duration to be either user defined or a system wide default value. Should a message conforming to Category F come into the AP Cluster before the timeout period expires, it will be matched to an existing entry in the table based on the original source and channel ID fields in the two messages. When a match is made, it will constitute a post thereby canceling the wait, the timeout, and the entry in the table. Should the timeout expire before a post is set, the wait will be canceled and should the Category F message arrive after the fact, it will be rejected.

The overall purpose of this table is to provide the status of paired messages to the originating source of the request upon the occurrence of three significant events; the setting of a post; the expiration of the timeout; or upon a paired message status request from the NTM system services.

The fields of the Message Pairing Table are described below.

Field Name -----	Field ID --	Field Size ----	Field Description -----
Paired Message APC Name	MPR-APCNME	X(3)	Identifies the source APC of the paired message.
Original Source AP	MPR-MSGSRC	X(15)	This field contains the source of the "request" end of the message pair.
Timeout Time	MPR-TMOUTM	X(23)	This field contains the system clock time when the timeout on the given message expires.
Logical Channel ID	MPR-CHANID	X(3)	Identifies the logical channel under which the paired message was sent.

4.5.3.10 Log-On Table

The Log-on Table will maintain information regarding the human users currently logged on to the IISS. The data will be supplied to the monitor AP by the User Interface upon successful Log-on. The NTM will have no awareness of an unsuccessful logon.

The fields of the Logon Table are described below.

Field Name -----	Field ID --	Field Size ----	Field Description -----
UI (AP) Name	LOG-APNAME	X(10)	This field contains the AP Name of the AP Cluster name of the UI where the given user is logged on.
APC Name	LOG-APCNME	X(3)	Identifies the AP Cluster that the given UI AP resides on.
Terminal ID	LOG-TERMID	X(2)	This field identifies the terminal where the given user is logged on. This is the instance of the UI(AP) Name.
User Name	LOG-USRNAM	X(8)	This field contains the User Name of the user logged on at the given AP instance.
Role Name	LOG-ROLENM	X(10)	This field identifies the role under which the given user is logged on.
Session Start Time	LOG-STRTME	X(23)	This field contains the system clock time when the given user's logon request was accepted.
Channel Range Start	LOG-CHANST	X(3)	The lowest Logical Channel ID in the range of ID's allocated to the user at logon.

Field Name -----	Field ID --	Field Size ----	Field Description -----
Channel Range End	LOG-CHANED	X(3)	The highest Logical Channel ID in the range of ID's allocated to the user at logon.

4.5.3.11 Guaranteed Delivery Table

This table is used to record all guaranteed delivery messages that originate on a given AP Cluster. The table is used to provide the age of a message to ensure that it does not remain on the system forever.

The fields of the Guaranteed Delivery Table are described below.

Field Name -----	Field ID -----	Field Size ----	Field Description -----
Message Source	GRD-MSGSRC	X(15)	This field contains the AP Name, instance identifier and work-station of the AP that sent the guaranteed delivery message.
Message Serial Number	GRD-MSGSN	X(7)	This field contains the serial number that was assigned to the message by the MPU.
Time Stamp When Accepted	GRD-TSTAMP	X(23)	This field contains the time when the given guaranteed delivery message was accepted by the source MPU as a valid IISS message. This time provides the base for determining the age of the message.
Message Destination	GRD-MSGDST	X(15)	This field contains the AP Name and AP Cluster of the destination AP as specified in the header of the

Field Name -----	Field ID -----	Field Size ----	Field Description -----
			guaranteed delivery message.
Pointer to Message File	GRD-MFNPTR	X(6)	This field points to the file in non-volatile memory where the given guaranteed delivery message has been journalized.

4.5.3.12 AP Operating Information Table

This table provides the current operational information about a generic AP (as opposed to a specific instance of it).

The fields of the AP Operating Information Table are defined below.

Field Name -----	Field ID -----	Size ----	Field Description -----
APC Name	APO-APCNME	X(3)	The name of the APC that the active AP resides on.
AP Name	APO-APNAME	X(8)	This field in combination with the APC name is the key to the table.
Instances Currently Running	APO-NUMINS	X(2)	This field provides the number of instances of the given AP that are currently in operation.
Last Instance Number Assigned	APO-LSTINS	9(4)	This field provides the last instance number assigned to an instance of the given AP.
Number of Messages	APO-NUMMSG	X(2)	This field indicates the number of messages in the message queue that are waiting for the given AP.

4.5.3.13 I'm Alive Table

This table is used to track AP's that have been initiated but are not yet running. As each entry will be maintained for a limited amount of time (# of tries) it also insures that an initiation problem is detected.

The fields are defined below.

Field Name -----	Field ID -----	Field Size ----	Field Description -----
APC Name	IAT-APCNME	X(3)	The APC of the AP being initiated.

Field Name -----	Field ID -----	Field Size ----	Field Description -----
AP Name	IAT-APNAME	X(10)	The name of the AP being initiated.
Instance	IAT-INSTNC	X(2)	The instance ID assigned to the given AP being initiated.
ACK to Source MPU	IAT-MPUACK	X	Identifies whether the message causing the initiation conforms to Category E thereby requiring an ACK to be sent to the source MPU upon AP initiation.
Data Code	IAT-DATACD	X	Indicates whether there is data waiting for the given AP.
Number of Tries	IAT-NTRIES	X	Tracks the number of times the entry has been checked against the AP Status Table.

4.5.3.14 Link Status Table

The Link Status Table provides the current operational status of the link between two given physical host machines.

The fields of the Link Status Table are defined below.

Field Name -----	Field ID -----	Field Size ----	Field Description -----
Link ID	LST-LINKID	X(2)	Identifies a specific link between two host machines on the IISS.
Link Status	LST-LKSTAT	X	The current status of the given link.

4.5.3.15 Authority Check Table

This table provides an authority precheck for messages conforming to categories requiring authorization. This is due to the situation where the message implies authorization but the destination AP has waived the requirement. This allows the AP developer the right to either restrict access to the AP (on those messages requiring authorization) or to open the AP to any and all sources. Where access is restricted, the AP developer will inform the CDM Administrator as to the sources allowed access and the message types accepted. This information will be contained in the authority table.

The Authority Check Table will be accessed by the MPU on all messages requiring authorization. Where the destination access is open, the MPU will continue message management processing. Where the destination access is restricted, the MPU will proceed to check the message against the Authority Table as described in Section 4.5.3.2. At present, the authority check is not concerned with the directory the AP is in.

The Authority Check Table fields are described below.

Field Name	Field ID	Field Size	Field Description
-----	-----	-----	-----
(Destination) AP Name	ACT-APNAME	X(8)	The key field in the table. The Destination AP Name from the header is matched to an entry in this field.
Access Flag	ACT-ACCFLG	X	Identifies whether the access to the destination AP (on messages requiring authorization) is restricted or open.

4.5.3.16 Directory Table

This table provides the link between a directory prefix and the directory name to which it refers. The use of the directory prefix allows an AP's executable module to be located in a directory other than the directory in which the IISS is run.

The directory prefix is used in all AP Interface service

calls as a given AP may exist as different versions in different directories (i.e., production version vs. test version). AP's having the same base (5 character) name must adhere to a common set of characteristics regardless of the number of versions in existence.

The individual fields of the directory table are defined below.

Field Name -----	Field ID -----	Field Size -----	Field Description -----
Directory Prefix	DIR-PREFIX	X(2)	The identifier assigned to a given directory. This ID is used as part of the AP's name when the AP's directory must be known.
Directory Name	DIR-DIRNME	X(20)	The name of the directory identified by the prefix. This field includes the brackets and period.
Directory Length	DIR-NMELEN	X(2)	The length in bytes of the directory name including the period but excluding the brackets.

4.5.3.17 Connection Table

The NTM supports AP's known as Queue servers. Within the type queue server are the sub-types of multiple-parent or single-source. As these AP's may serve a number of source AP's during a single run, they cannot be tracked by the current NTM child chaining mechanism. As a result, the genealogy of a given source AP will be broken when the path encounters a queue server. In order to maintain this genealogy, the NTM will, given the characteristic of an AP requiring Message chain support, track (chain) a message at the point at which it encounters a queue server.

In order to handle the tracking of messages at a queue server AP, an entry will be made in that AP's connection table. This entry establishes a "Pseudo" Instance or connection which is considered to be a separate instance of the AP. The connection table entry contains values pertinent to the particular connection as opposed to the AP instance itself. Therefore, in one AP instance there may be two connections, one of which has child AP's and one which may not. In this manner, the genealogy may be traced beyond a queue server.

As for the child table, the connection table is maintained as a linked list with a pointer from the AP's table to the first entry for the AP.

The individual fields of the connection Table are described below.

Field Name -----	Field ID -----	Field Size -----	Field Description -----
Pseudo Instance	CON-PINST	X	Identifies the Pseudo instance assigned to the given connection. This value may also be carried in the APs table to provide a pointer into the connection table.
Client Name	CON-CLNAME	X(10)	The name of the source AP of the given connection.
Client Pseudo Instance	CON-CLPINS	X	The pseudo instance of the source AP is included if the source AP is also a queue server. If the source is not a queue server this field will be blank.
Child Rank	CON-CLDRNK	9(4)	As in the APs table, this field points to the first child entry associated with the given connection.
Pair Flag	CON-PRFLG	X	Indicates whether the given connection has outstanding paired messages.
Children	CON-CHILD	X	Indicates whether the given connection has any child AP's associated with it.

Field Name	Field ID	Field Size	Field Description
-----	-----	-----	-----
Connection Channel	CON-CONCHN	X(3)	The channel ID from the message that established the given connection.
Next Connection	CON-NXTCON	X	Pointer to the next Pseudo instance associated with the Queue Server AP. The end of the chain is indicated where the last pseudo instance points to itself.

4.6 Adaptation Requirements

The NTM must be compiled, linked and installed on each host in the IISS Test Bed. The Test Bed consists of a VAX-11/780 (VMS operating system) and IBM 4381 (MUS/XA-750 operating system).

NTM modules that are machine specific must be included in the IISS system built on each host. As a goal it would be desirable to have the host specific statements conditionally compiled or assembled based on host type input. Adding a new host type requires writing these machine specific modules for that host.

4.7 Government Furnished Property List

This paragraph is not applicable to the NTM CPCI.

SECTION 5

QUALITY ASSURANCE PROVISIONS

5.1 Introduction and Definition

The NTM Quality Assurance will be coordinated with the IISS integration contractor, Boeing Military Airplane Company, to ensure that it supports the QA needs for the IISS.

The philosophy of Quality Assurance involves more than simply testing code. QA begins with Requirements Definition and continues throughout the System life Cycle. BCS supports this concept of QA via constant peer review. This review is facilitated through the device of the IDEF kit cycle. The kit cycle allows any member of the NTM team to circulate their work for the purpose of soliciting comments. These comments provide to the kit author insights as to holes, inconsistencies, potential bugs, and sometimes, kudos for work well done. It provides a view of the forest when the author is sometimes so mired in details that barely the trees are visible.

The NTM project has made the IDEF kit cycle an integral part of its Standard Operating Procedure. This has continued with the review of structure charts, module descriptions, PDL, and code.

Testing of NTM code will occur at three levels. First, unit level tests will be performed by BCS for each major portion of code to detect coding errors and errors resulting from the interaction of modules. Unit level testing will take place for each release of the NTM. Second, BCS will support BMAC in IISS Test Bed Integration Preliminary Qualification Testing (PQT) for each NTM release. Third, BCS will support BMAC in IISS Formal Qualification Testing (FQT) following integration testing of the last release of the NTM.

5.2 Computer Programming Test and Evaluation

5.2.1 Test Approach

Testing of code is driven by scenarios written to reflect the requirements stated in Section 4 of this document. Figure 5-1 provides a matrix of requirements to test cases. The specific tests are described in detail in Section 5.2.4. The implementation of these scenarios include small integrated test AP's having the characteristics noted in the scenarios. The scenarios include (but are not limited to):

- o Startup Host
- o Startup IISS
- o Accept Logon message from UI
- o Initiate an AP using CALL "ISEND"
- o Initiate an AP using CALL "NSEND"
- o Maintain the status of an AP from initiation through normal termination
- o Abort an AP from an Operator Command
- o Accept Logoff message from UI
- o Build NTM tables from file
- o Handle host to host communications between AP's
- o Shutdown Host
- o Shutdown IISS

<u>DS Ref.</u>	<u>NTM DS Requirement</u>	<u>Test Case</u>
4.1.2.1	Interface to New AP's (System Services) INITAL ISEND NSEND RCV TRMNAT GETUSR CHKMSG GDSEND SETDLY SIGERR GDACK TSTMOD APSTAT HSTATS WHTHST WHATAC WKONCA ACSTAT SIGABT PRSTAT GDSTAT	All Support Test AP's TSPUIMPU-Choice-3 TSPUIMPU-Choices-1,2 All Test AP's All Test AP's TSPUIMPU-Choice-3 TSPUIMPU-Choice-3 TSGDMMPU Logic Not Implemented TSSIGMPU TSGDRMPU TSSUIMPU Logic Not Implemented Logic Not Implemented TSNTMMPU Choice 8 Logic Not Implemented Logic Not Implemented Logic Not Implemented Logic Not Implemented Logic Not Implemented Logic Not Implemented
4.1.2.2	Interface to Existing AP's	TBD
4.1.2.3	Interface to COMM AP's (System Services) INICOM	Startup (Start COMVH)
4.1.2.4	Interface to UI (System Services) INITEX	Run TSPUIMPU, TSNTMMPU, TSSERMPU or TST12MPU LOGON Run TSPUIMPU, TSNTMMPU, TSSERMPU or TST12MPU LOGOFF Run TSPUIMPU, TSNTMMPU,

Figure 5-1. Requirement to Test Matrix

<u>DS Ref.</u>	<u>NTM DS Requirement</u>	<u>Test Case</u>
	CHGROL	TSSERMPU or TST12MPU TSTNTMMPU-Choice-1
4.1.2.5	Interface to IISS Operator (Operator Commands)	(at Operator Console)
	Start IISS	Run Monitor
	Start APC	Enter "ST" Command
	Start Link	Enter "SL" Command
	Shutdown Host	Logic Not Implemented
	Shutdown APC	Enter "SC" Command
	Shutdown IISS	Enter "SD" Command
	Cancel IISS Shutdown	Enter "CN" Command
	Abort AP	Logic Not Implemented
	Display Active AP's	Enter "DA" Command
	Display IISS Status	Enter "DS" Command
	Enable Sigerr Messages	Enter "SE" Command
	Disable Sigerr Messages	Enter "SO" Command
	Select Logging Features	Enter "LG" Command
	Start New Log File	Enter "SN" Command
4.1.3.1	Message Header	All
4.1.3.2	Monitor IISS	
4.1.3.2.1	Accept IISS Operator Commands	Enter Commands at Operator Console
4.1.3.2.2	Service Commands	
	Start IISS on VAX	Run Monitor (VAX)
	Start IISS on Non-Vax Hosts	Run Monitor (IBM)
	Start APC	Enter "ST" Command
	Start Link	Enter "SL" Command
	Shutdown APC	Enter "SC" Command
	Shutdown IISS	Enter "SD" Command
	Shutdown Host	Logic Not Implemented
	Cancel IISS Shutdown	Enter "CN" Command
	Abort AP	Logic Not Implemented
	Display Active AP's	Enter "DA" Command
	Display IISS Status	Enter "DS" Command

Figure 5-1. Requirement to Test Matrix (Continued)

<u>DS Ref.</u>	<u>NTM DS Requirement</u>	<u>Test Case</u>
4.1.3.2.3	Deliver IISS Status Messages to Operator	All Test AP's, Startup, Execute Operator Commands
4.1.3.2.4	Accept Messages From: IISS APC's IISS AP's Remote Monitor AP's	Startup IISS All test AP's Logic Not Implemented on Remote Host
4.1.3.2.5	Send IISS System Commands and Responses Operator Abort Start Link Cancel Shutdown Start MPU List Request Shutdown Link Shutdown Pending Table Status Return Shutdown Host Rebuild Tables	(at Operator's Console) Logic Not Implemented Startup, enter "SL" Command Startup, enter "CN" Command Startup, enter "ST" Command Enter "DA" Command Enter "LS" Command Enter "SD" Command with one or more minutes until shutdown Startup Logic Not Implemented Logic Not Implemented
4.1.3.2.6	Process Messages Link Active Link Fail Processing Error APC Terminated	(Error Message Displayed at Operator's Console) Startup, Result of "SL" Command Startup, Result of "LS" Command, Shutdown All Startup, Shutdown, Result of "SC" Command

Figure 5-1. Requirement to Test Matrix (Continued)

<u>DS Ref.</u>	<u>NTM DS Requirement</u>	<u>Test Case</u>
	Logon	TSPUIMPU, TSNTMMPU, TSSERMPU, TST12MPU
	Logoff	TSPUIMPU, TSNTMMPU, TSSERMPU, TST12MP
	Table Status Request	Startup IISS
	Shutdown Host	Logic Not Implemented
	APC Alive	Startup IISS, "ST" Command
	Resource Unavailable	Upon Receipt of "RU" Message from MPU

Figure 5-1. Requirement to Test Matrix (Continued)

<u>DS Ref.</u>	<u>NTM DS Requirement</u>	<u>Test Case</u>
4.1.3.2.6 (Cont.)	AP Interface Error Tables Rebuilt Timeout Expired	Upon Receipt of "AI" Message from MPU Logic Not Implemented Upon Receipt of "TE" Message from MPU
4.1.3.2.7	Send IISS Status Message Global Table Update Host Available Host Active OFF-Host Shutting Down APC Shutting Down	Logic Not Implemented Logic Not Implemented Startup, also Upon Receipt of "LA" Message Upon Receipt of "LF" Message Logic Not Implmented Directly- function handled via APC Status Table Update
4.1.3.2.8	Receive and Process Status Messages from Remote Monitor	
4.2.1	Receive and Interpret Message	Startup, Execute Operator Commands, All Test AP's
4.2.2	Authorize Message	Authority Check - All Test AP's Authority Table-Table not Populated
4.2.3	Complete Message Header Logoff	All Test APs TSPUIMPU, TSNTMMPU,
4.2.4	Perform Special Message Handling Paired Messages	TSPUIMPU-Choice-3,

Figure 5-1. Requirement to Test Matrix (Continued)

<u>DS Ref.</u>	<u>NTM DS Requirement</u>	<u>Test Case</u>
	GD Messages Specific Initiation Messages	TSNTMMPU-Choice-4, TSSERMPU-Choice 3 and 5, TST12MPU-choice-3 Logic Not Implemented TSPUIMPU-Choice-3, TSNTMMPU-Choice-5, TST12MPU-Choice-3 and 4
4.2.5	Log Message	Startup, Execute Operator Commands, All Test AP's
4.2.6	Route and Send Message	Startup, Shutdown, All Test AP's, Execute Operator Commands
4.2.7	Interpret Message Category	Startup, Shutdown, All Test AP's, Execute Operator Commands
4.2.8	Initiate AP	TSPUIMPU-Choices-1-5, TSNTMMPU-Choices-2-5
4.2.9	Deliver Messages to AP	All Test AP's
4.2.10	Accept Requests from AP (System Services) GETUSR	AP's Using Services) TSAP3MPU, TSAP4MPU, TSAP7MPU, TSAP8MPU, TSAP9MPU, TSAPDMPU All Test AP's on APC T1V
	INITAL	All Test AP's
	TRMNAT	Logic Not Implemented
	ENDRCY	All Test AP's
	NSEND	TSGDMMPU
	GDSEND	TSNTMMPU, TSPUIMPU, TSS ERMPU, TST12MPU
	ISEND	TSPUIMPU, TSNTMMPU, TSS ERMPU, TSAP8MPU, TST12M
	CHKMSG	

Figure 5-1. Requirement to Test Matrix (Continued)

<u>DS Ref.</u>	<u>NTM DS Requirement</u>	<u>Test Case</u>
	SETDLY GDACK MSGACK RCV TSTMOD CHGROL	TSAP5MPU, TSAP6MPU, PU Logic Not Implemented Logic Not Implemented Logic Not Implemented All Test AP's TSSUIMPU TSNTMMPU-Choice-1
4.2.11	Terminate AP Abort AP Shutdown AP with Logic AP without Logic Normal Termination	Logic Not Implemented TSPUIMPU, TSNTMMPU, TSSERMPU TSAP1MPU, TSAP9MPU All Test AP's (via TRMNAT)
4.2.12	Handle System Commands Start APC Shutdown AP Shutdown APC Display Active AP's	Upon Receipt of "ST" Command Direct Command Not Implemented (AP Shutdown only as the result of Shutdown APC or Shutdown IISS Command) Upon Receipt of "SC" Command Upon Receipt of "DA" Command
4.2.13	Handle APC Message Queues I'm Alive Queue Off-APC Queue Initiation Message Queue	TSPUIMPU-Choices-1-3 TSPUIMPU-Choice-1, TSSERMPU-Choice-2 TSNTMMPU-choice-2
4.2.14	Handle APC Tables	All Test AP's require table handling

Figure 5-1. Requirement to Test Matrix (Continued)

Each scenario includes specific input data (some of which will be intentionally wrong), the expected processing, and expected output. The results are verified by "canned" messages written into the test AP's. The NTM Message Log and IPC ERRPRO will be used to provide data on internal processing. A third verification tool is the Monitor AP's capability to display error messages to the IISS Operator.

5.2.2 Test Plan

The testing of the NTM is facilitated by a primary test driver, TSPUI. This driver was designed to simulate the User Interface, hence it's name - Pseudo UI. This allows user interaction, error and status displays, and testing of code specifically designed to support the UI.

TSPUI gets Logon information from the user and then presents the user with a menu of choices as shown in Figure 5-2.

```
$ RUN TSPUIMPU
ENTER USER NAME-MAXIMUM OF 8 CHARACTERS.
CROSS
ENTER ROLE NAME-MAXIMUM OF 10 CHARACTERS.
TESTER
(Date and Time of Logon)
      1          RUN AP1
      2          RUN AP2
      3          RUN AP3
      4          RUN TSPQS
      5          QUIT
      6          LOOP-3
      7          LOOP-1
ENTER CHOICE NUMBER
```

Figure 5-2. TSPUIMPU Menu

The user enters a choice thereby setting in motion a specific test.

TSPUIMPU has grown too large to incorporate all the test choices needed to exercise the NTM code. Five more test drivers have been created using the TSPUIMPU "shell" while offering new choices. These AP's are TSNTMMPU, TSSERMPU, TST12MPU, TSSUIMPU, TSGDMMPU, TSABTNPU. Their user menus are shown in Figures 5-3 through 5-8.

Nineteen additional test AP's have been written to support the choices offered in the test drivers. All of the choices are described in detail in the next section.

```
$ RUN TSNTMMPU
ENTER USER NAME-MAXIMUM OF 8 CHARACTERS.
CROSS
ENTER ROLE NAME-MAXIMUM OF 10 CHARACTERS.
TESTER
(Date and Time of Logon)
      1          CHG ROLE
      2          TEST INIQ
      3          TEST NI
      4          TEST TO
      5          BAD INIT
      6          FILL MBX
      7          WTHST
      8          QUIT
ENTER CHOICE NUMBER.
```

Figure 5-3. TSNTMMPU Menu

```
$RUN TSSERMPU
ENTER USER NAME-MAXIMUM OF 8 CHARACTERS.
CROSS
ENTER ROLE NAME-MAXIMUM OF 10 CHARACTERS.
TESTER
(Date and Time of Logon)
      1          INV DEST
      2          OFF APCQ
      3          CHECK HOT
      4          FILL LOG
      5          STUFF MBX
      6          HOT MBX
      7          QUIT
ENTER CHOICE NUMBER.
```

Figure 5-4. TSSERMPU Menu

```
$ RUN TST12MPU
ENTER USER NAME-MAXIMUM OF 8 CHARACTERS.
CROSS
ENTER ROLE NAME-MAXIMUM OF 10 CHARACTERS.
TESTER
(Date and Time of Logon)
      1          NO MAILBOX
      2          FILL CORE
      3          PAIR INIT
      4          LONG INIT
      5          RUN QUEUE
      6          QUIT
ENTER CHOICE NUMBER.
6
THE TEST APPLICATION PROCESSES PORTION OF THE DEMO
IS COMPLETE
```

Figure 5-5. TST12MPU Menu

```
$RUN TSSUIMPU
ENTER USER NAME-MAXIMUM OF 8 CHARACTERS.
CROSS
ENTER ROLE NAME-MAXIMUM OF 10 CHARACTERS.
TESTER
(Date and Time of Logon)
```

Figure 5-6. TSSIG Menu

This is a test of the Sigerr and TSTMOD services. This test invokes a test AP that will generate a requested number of messages. It will alternate between regular messages and error messages of different severity levels.

On Choice 1 you should receive the indicated number of regular messages with error messages of alternating severity level.

On Choice 2, you should receive the indicated number of regular messages. No error messages. Informatory (severity: I) messages will also be displayed.

On Choice 3, you should receive the regular messages and error messages of only F severity level and informatory (I) messages.

To check the messages that are being sent against those received, enable the Sigerr messages at the operator's console (SE). With Sigerr enabled, all SE messages will be displayed at the operator's console.

1. Set TESTMODE for all messages and test
2. Disable testmode for no error messages and test
3. Set testmode for fatal error only and test
4. Quit.

Figure 5-7. TSSUIMPU Menu

```
$Run TSGDMMPU
ENTER USER NAME-MAXIMUM OF 8 CHARACTERS.
CROSS
ENTER ROLE NAME-MAXIMUM OF 10 CHARACTERS.
TESTER.
```

This is a test of the guaranteed delivery service. This test invokes a test AP that will generate a guaranteed delivery request message for an AP that will process this request.

NOTE: No formal menu will appear. If the GDSEND test works, the test screen will display.

GD MESSAGE IS ON ITS WAY

GD AP HAS COMPLETED

The test application processes portion of the Demo is complete

Figure 5-8. TSGDMMPU Menu.

\$ RUN TSABTMPU

TSABTMPU: MAIN MENU

- 1. = INFORMATION ON THE SIBABT TEST SUITE
- 2. = EXECUTE COMPLETE SIGABT ACCEPTANCE TEST
- 3. = GO TO SPECIAL TEST MENU
- 4. = PERFORM CONFIGURATION CHECK TEST
- 5. = QUIT

ENTER CHOICE:

This is a test of the SIBABT function of the NTM. Choice 2 will execute the entire suite of SIGABT tests. Selection option 3 will display a menu from which individual test may be run. The option 2 menu is as follows:

TSABTMPU: SPECIAL TEST MENU

- 1 = TEST SOFT ABORT
- 2 = TEST HARD ABORT
- 3 = ABORT ONE OF SEVERAL CONNECTIONS
- 4 = CHILD RUNDOWN ON ABORT TEST
- 5 = RETURN TO MAIN MENU

ENTER CHOICE:

Selection Option 4 from the main menu produces a report of the test configuration showing which host each of the application programs in this test suite is on and reporting any problems in API and APC tables.

Figure 5-8a. TSABTMPU

5.2.3 Test Descriptions

The tests needed to exercise the NTM code are defined below as to name, configuration, description, purpose, and AP Interface services tested. The overall test configuration is shown in Figure 5-9.

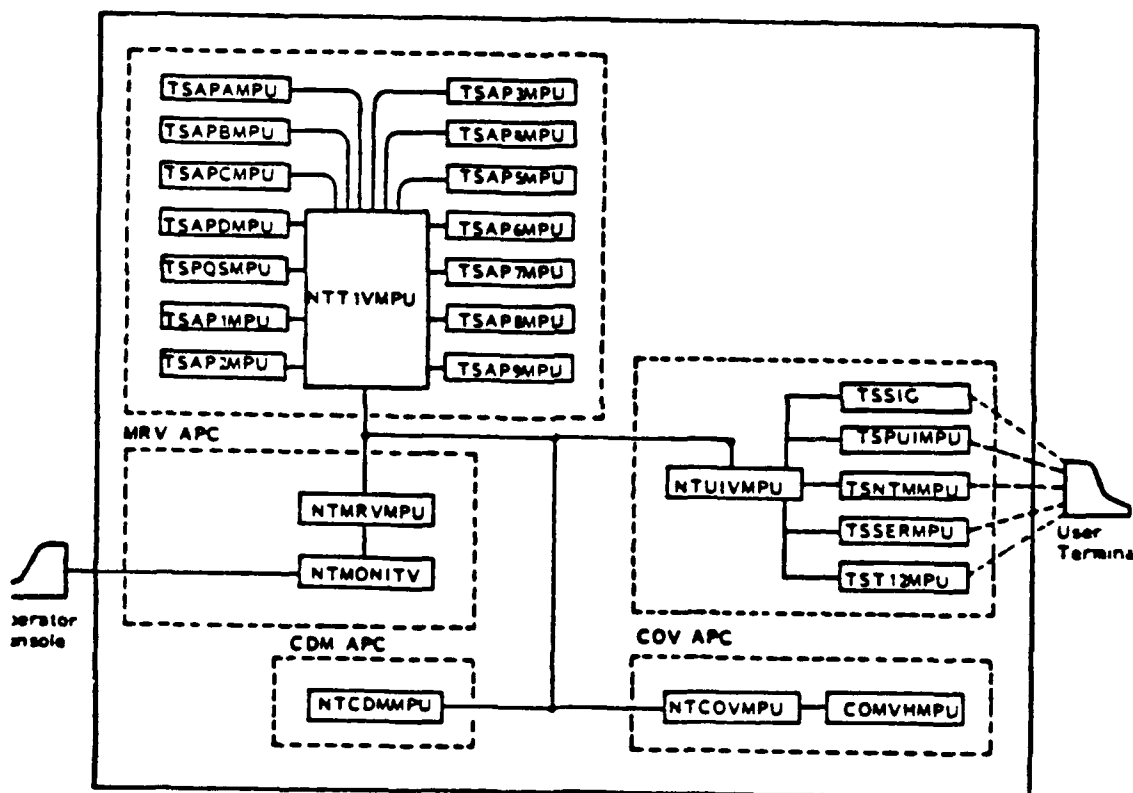
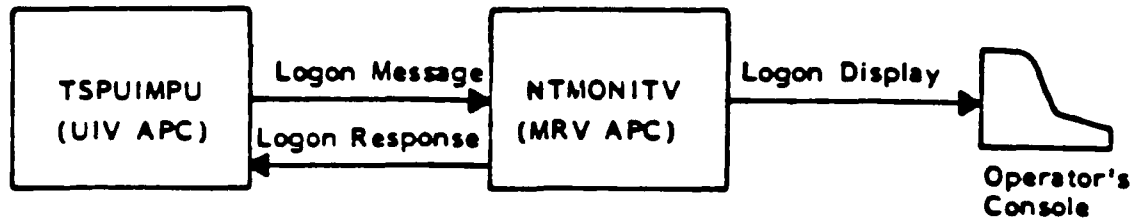


Figure 5-9. NTM Test Configuration

Test Name: Operator Commands

Test Configuration:



Test Description:

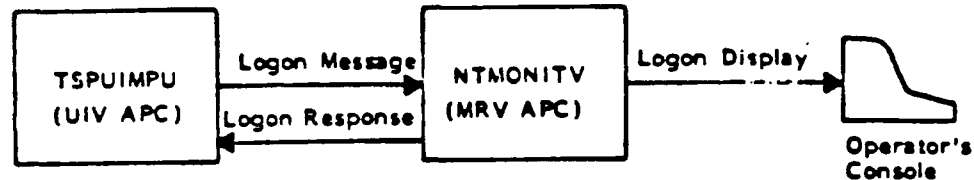
While there are no active AP's, the operator enters each available command in random order. After commands altering the system state (Shutdown APC and Shutdown Link) the display system status command is used to verify the results.

Test Purpose:

1. Monitor AP System Command Processing.
2. MPU System Command processing.

Test Name: Run TSPUIMPU

Test Configuration:



Test Description:

TSPUIMPU connects to the NTM from an external terminal. A logon message is sent to Monitor AP.

Test Purpose:

1. Connect to NTM from external terminal.
2. Send a message from an AP to the Monitor AP.
3. Display Logon data to the operator.
4. Logon table.

Services Tested:

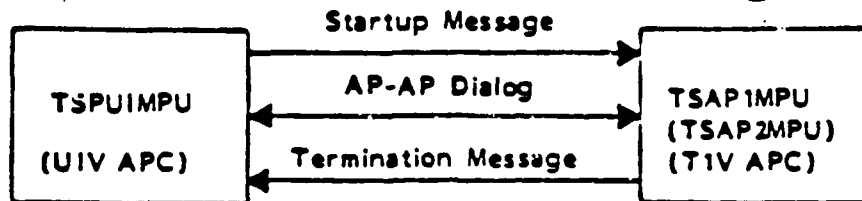
INITEX
LOGON

System Dependent Code Tested:

SYS\$ASCTIM

Test Name: TSPUIMPU - Choice 1 or 2 ("Run AP1" and "Run AP2")/TSPUIMPU-Choice-8(loop-1)

Test Configuration:



Test Description:

TSPUIMPU starts TSAP1MPU/TSAP2MPU with a category "B" message (reply required). TSAP1MPU/TSAP2MPU respond and engage in a limited dialog with TSPUIMPU. At the end of the dialog TSAP1MPU/TSAP2MPU terminate normally while TSPUIMPU waits for the message telling it that a child AP has ended execution. Choice-8 will run this test in a continuous loop 50 times.

Test Purpose:

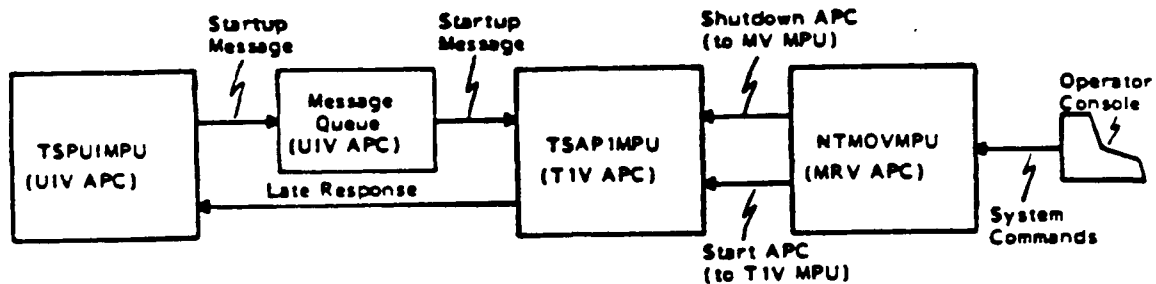
1. Child AP Initiation.
2. AP to AP communication.
3. Send message off-cluster.
4. Receive message from off-cluster.
5. Send Child Termination Message to Parent AP.
6. Cleanup upon Child Termination.
7. Send Unsolicited Initiation Accept.
8. Log Message.
9. Message Pair Table.
10. Choice-8 tests the NTM's endurance and table handling.

Services Tested:

INITAL
NSEND
RCV
TRMNAT

Test Name: Late Response on Message Pair (using TSPUIMPU
Choice-1)

Test Configuration:



Test Description:

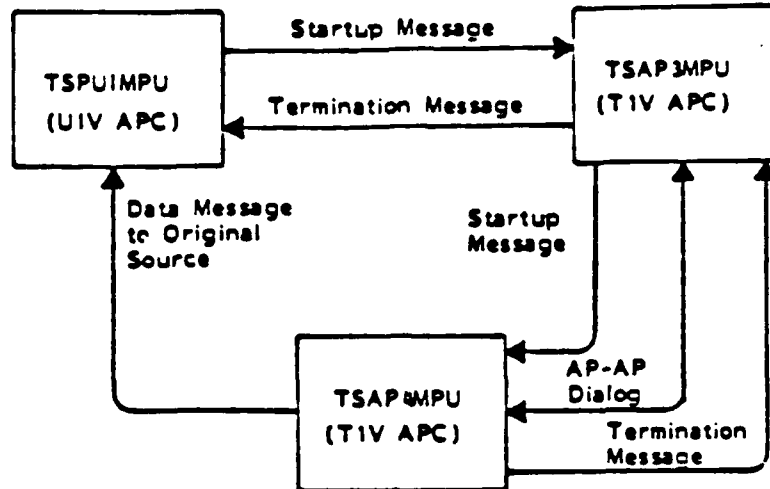
Before the user at TSPUIMPU enters a choice, T1V APC is shutdown. Then the user enters Choice 1. T1V APC is then started but, in the interim the message to TSAP1MPU has timed out. TSAP1MPU will respond anyway. When the response gets back to UIV it will not be delivered due to the timeout.

Test Purpose:

1. Message Pair Timeout.
2. Late response to a timed out message.

Test Name: TSPUIMPU - Choice 3 ("Run AP3")/TSPUIKMPU-Choice-7
(Loop-3)

Test Configuration:



Test Description:

TSPUIMPU starts TSAP3MPU with a specific initiation message. TSAP3MPU then starts TSAP4MPU. TSAP3MPU and TSAP4MPU engage in a limited dialog. At the end of the dialog TSAP3MPU terminates while TSAP4MPU continues execution. TSAP4MPU finds the original source AP (TSPUIMPU) and sends it a final status message. TSAP4MPU then terminates. Choice-7 will run this test in a continuous loop 50 times.

Test Purpose:

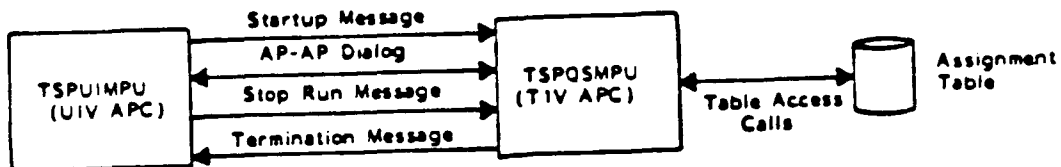
1. Send message on-cluster.
2. Immediate Parent dies before child.
3. Initiate AP on category "H" message.
4. Cleanup when all child (and grandchild) AP's are terminated.
5. Grandchild AP sends message to Original Source AP.
6. In choice-7 tests endurance of the NTM and Instance rollover after the 99th instance.

Services Tested:

ISEND
GETUSR
CHKMSG (Cold Mailbox - Any Match)

Test Name: TSPUIMPU - Choice 4 ("Run TSPQS")

Test Configuration:



Test Description:

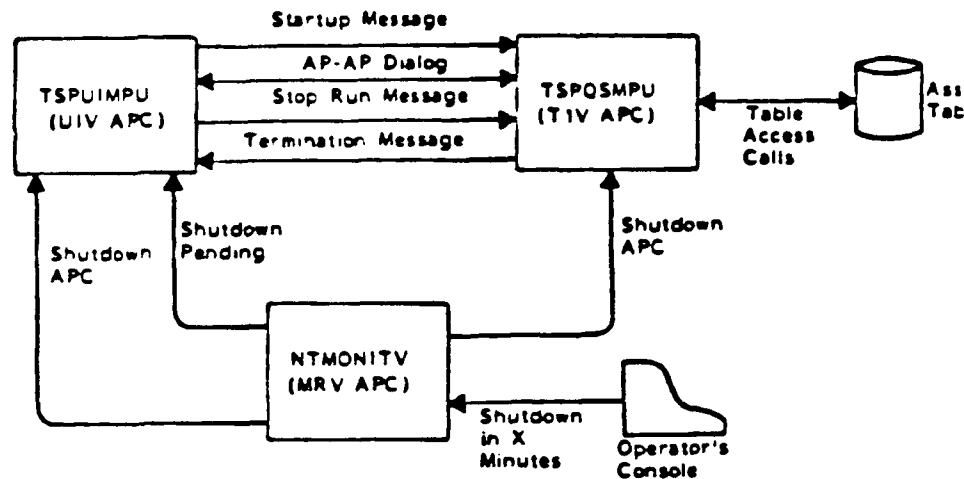
TSPUIMPU starts TSPQSMPU (Pseudo Queue-Server) and displays a menu of Machinist Numbers and Machinist Names to the user. The user enters one number at a time to get the group assignment of the machinist. The Queue-Server will check the Assignment Table and return the correct group assignment number. This test will run until the user enters "99" to specifically end the session.

Test Purpose:

1. Queue Server Logic

Test Name: Shutdown Pending/Shutdown IISS (using TSPUIMPU - Choice 4)

Test Configuration:



Test Description:

While running Choice 4, the operator enters the shutdown pending command. At the end of the allotted time, the shutdown IISS command will be sent to the active APC's. The user on TSPUIMPU will have sufficient time to end the session and exit gracefully. Or, the user can continue the session until TSPUIMPU shuts itself down.

Test Purpose:

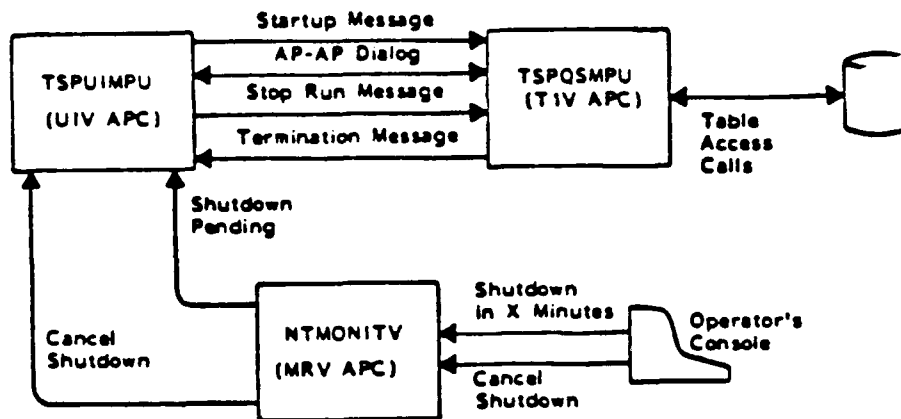
1. Monitor and MPU Shutdown Pending Logic.
2. Shutdown with Active AP's.
3. Soft shutdown of AP having shutdown logic.
4. Monitor and MPU shutdown IISS logic

Services Tested:

CHKMSG (Hot Mailbox - NTM Requests)

Test Name: Shutdown Pending/Cancel Shutdown (using TSPUIMPU - Choice 4)

Test Configuration:



Test Description:

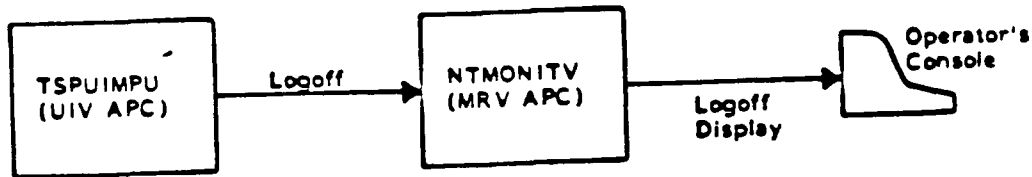
The same as Shutdown Pending/Shutdown IISS except that the operator enters the cancel shutdown command before IISS shutdown begins.

Test Purpose:

1. Monitor AP and MPU cancel shutdown logic.
2. Cancel shutdown message to the UI.

Test Name: TSPUIMPU - Choice 6 (Quit)

Test Configuration:



Test Description:

TSPUIMPU informs Monitor AP that the user has logged off.
It then disconnects from the NTM.

Test Purpose:

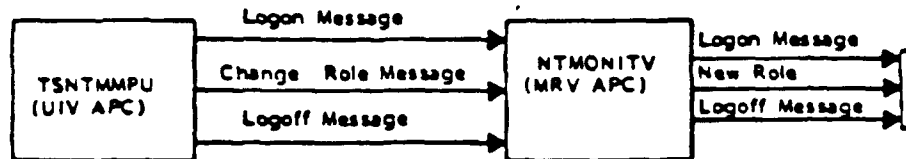
1. Disconnect from the NTM.
2. Logoff Message Logic.
3. Logon Table.
4. Display Logoff information to the Operator.

Services Tested:

TRMNAT
LOGOFF

Test Name: TSNTMMPU - Choice 1 (Change Role)

Test Configuration:



Test Description:

The user logged on at TSNTMMPU is allowed to change the role specified at Logon. The new role is entered and passed to the Monitor AP. The user then logs off using the new role.

Test Purpose:

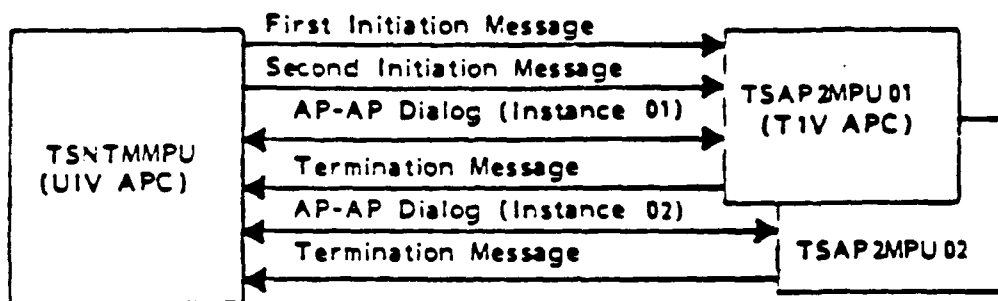
1. Monitor AP's Change Role Logic.
2. Logon Table updates.

Services Tested:

CHGROL

Test Name: TSNTMMPU - Choice 2 (Test Initiation Queues)

Test Configuration:



Test Description:

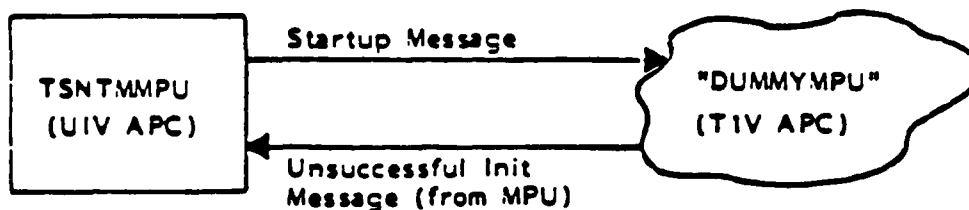
TSNTMMPU sends two specific initiation messages to TSAP2MPU. AS TSAP2MPU is allowed only one active instance at a time, the second initiation message is queued. When the first instance terminates, the second instance is started.

Test Purpose:

1. Initiation Message Queue.
2. AP Characteristic of single instance.
3. Start second instance.
4. MPU Time Check Logic

Test Name: TSNTMMPU - Choice 3 (Test Unsuccessful Initiation)

Test Configuration:



Test Description:

TSNTMMPU attempts to start "DUMMYMPU" on a specific initiation message. "DUMMYMPU" is listed in all the right tables but does not in fact exist. Upon the attempt to start it, the MPU will detect that it is not alive and return an Unsuccessful Initiation Message to the source AP.

Test Purpose:

1. Unsuccessful Initiation.
2. MPU I'm Alive Table Checker.
3. Child Table Logic.

Test Name: TSNTMMPU - Choice 4 (Test Timeout)

Test Configuration:



Test Description:

TSNTMMPU attempts to start "DUMMYMPU" on a paired message (non-specific initiation). The startup message will timeout and the UIV MPU will return a timeout expired message.

Test Purpose:

1. Message Pair Table
2. Pair Timeout Checker
3. Timeout Expired Message

Services Tested:

RCV (Timeout-Expired)

Test Name: TSNTMMPU - Choice 5 (Bad Initiation)

Test Configuration:



Test Description:

TSNTMMPU attempts to start TSAP3MPU on a non-specific initiation message (in this case, category "E"). TSAP3MPU, however, has the characteristic of requiring a specific initiation message. An error message will be displayed at the operator's console. The source AP will also be informed of the error condition.

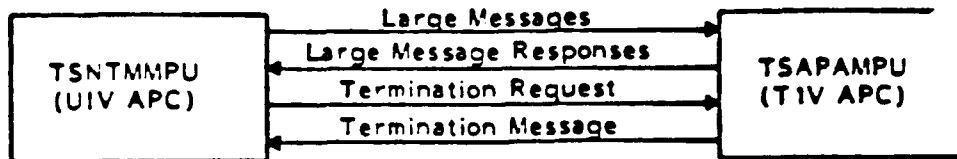
Test Purpose:

1. MPU Logic for "restricted" AP's.

Services Tested
TSTMOD
SIGERR

Test Name: TSNTMMPU - Choice 6 (Fill Mailbox)

Test Configuration:



Test Description:

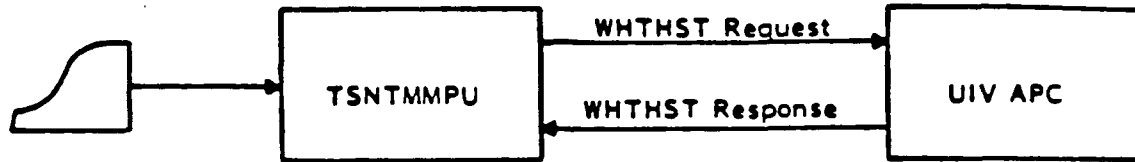
TSNTMMPU sends three messages that (a) contain the maximum number of bytes for a single message and (b) are sequentially numbered. TSAPAMPU will receive the messages and respond to each with a message containing the number of the received message. TSAPAMPU will terminate upon receipt of a termination request from TSNTMMPU.

Test Purpose:

1. Serial message queues.

Test Name: TSNTMMPU - Choice 7 (WTHST)

Test Configuration:



Test Description:

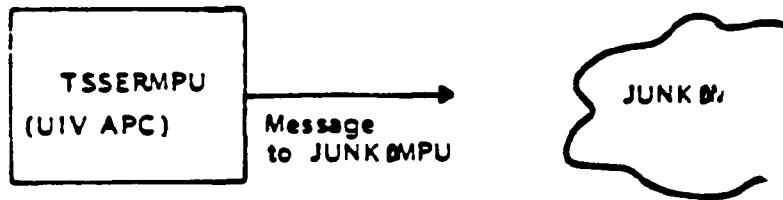
TSNTMMPU requests an AP name (with directory prefix) from the user. TSNTMMPU will then call "WTHST" with the given AP name. The WTHST return will be displayed to the user.

Test Purpose:

1. WTHST Service.

Test Name: TSSERMPU-Choice-1 (Invalid Destination)

Test Configuration:



Test Description:

TSSERMPU sends a message to "JUNKMPU" which has neither existence or records in the tables. The AP will receive the "SEND-INVALID-DESTINATION" return on the "NSEND" call. An error message will also be sent to the monitor AP. (The error message will be displayed on the operator's console as "31024-ACT" entry not found in Authority Check Table).

Test Purpose:

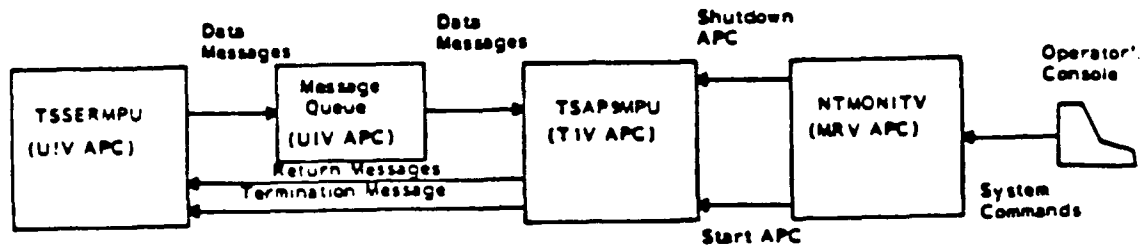
1. MPU message management logic.
2. Send returns.

Service Tested:

NSEND (SEND-INVALID-DESTINATION)

Test Name: TSSERMPU-Choice-2 (Off APC Queue)

Test Configuration:

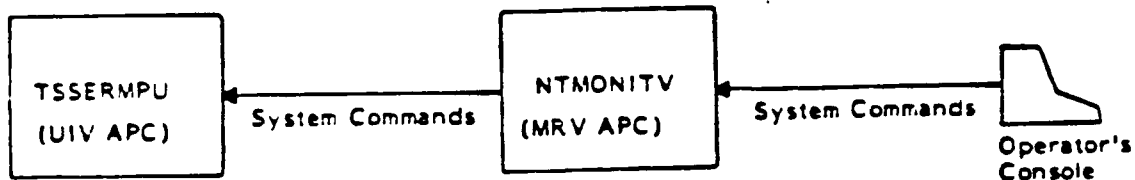


Test Description:

This is no longer a valid test because a change in the NTM logic in Rel. 1.1 now forces messages for an off-APC that is currently not available to be rejected rather than queued for later delivery (only guaranteed delivery messages will be queued for later APC delivery.) A "Resource Unavailable" message is sent to APs who are set to receive asynchronous status messages from the NTM on the event of an unavailable APC on a message delivery request. The test can be run without shutting TIV down but it does not test anything new. The test AP TSSERMPU, is not written to accept or display the Resource Unavailable message.

Test Name: TSSERMPU-Choice-3 (Check Hot Messages)

Test Configuration:



Test Description:

Choice-4 enters a loop that repeatedly checks the hot mailbox for a message. If a hot message is found, the type is interpreted and an appropriate display is shown. The test operator should enter an "SD" Command at the operator's console after starting this test and respond with a time greater than zero on the "minutes to shutdown?" request. The test AP TSSERMPU should receive the shutdown pending message and terminate. The IISS shutdown should proceed.

Test Purpose:

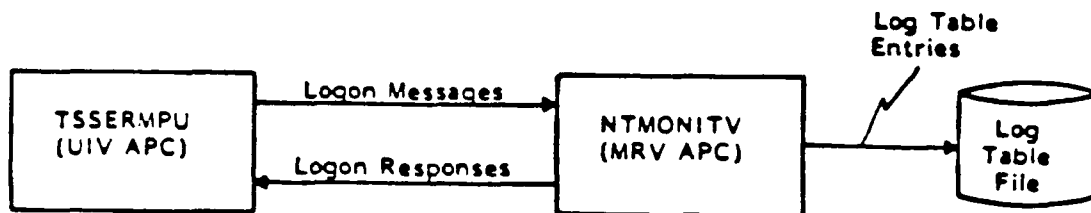
1. MPU Shutdown Pending Logic
2. MPU Shutdown where an AP has it's own Shutdown Logic.
3. Cancel Shutdown Logic.

Service Tested

CHKMSG
RCV

Test Name: TSSERMPU-Choice-4 (Fill Log)

Test Configuration:



Test Description:

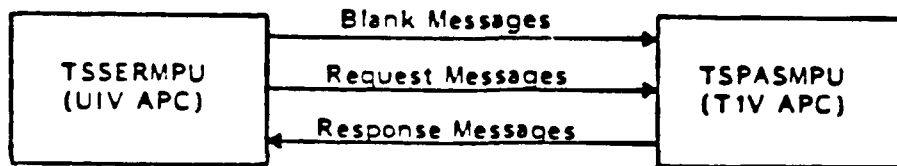
TSSERMPU calls "LOGON" 15 times. As the logon table has an occurs of 10, at least five of the entries will have to be written to a file. After the entries are written they will be deleted via 15 calls to "LOGOFF".

Test Purpose:

1. Table File Access on Write and Delete Functions.

Test Name: TSSERMPU-Choice-5 (Stuff Mailbox)

Test Configuration:



Test Description:

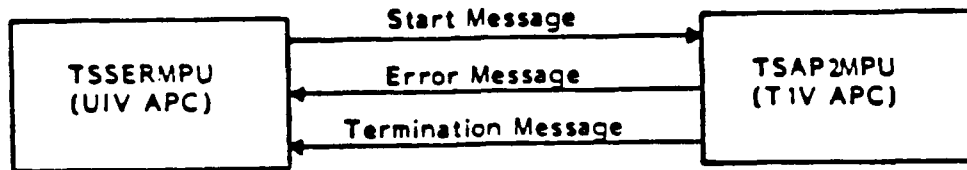
TSSERMPU sends 80 messages to TSPQSMPU (Queue Server) before calling RCV. As TSPQSMPU will be responding to the 40 request messages long before TSSERMPU calls RCV, the response messages will have to be queued at UIV APC. Noticeable delays in the display of the messages sent and received will occur during the processing of this test. This is because of the timer delays that occur before the queued messages are processed.

Test Purpose:

1. AP Queue Handling.
2. Buffer Capacity.

Test Name: TSSERMPU-Choice-6 (Hot Mailbox)

Test Configuration:



Test Description:

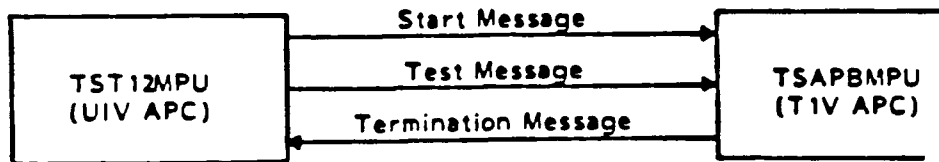
TSSERMPU sends a message to TSAP2MPU that will cause TSAP2MPU to call RCV for a "hot" message. As TSAP2MPU does not support a "hot" mailbox, it will receive an error return. This return will be sent to TSSERMPU in a message from TSAP2MPU. TSAP2MPU will then terminate itself.

Test Purpose:

1. AP Characteristic of Number of Mailboxes Supported.
2. RCV handling of an invalid call.

Test Name: TST12MPU-Choice-1 (No Mailbox)

Test Configuration:



Test Description:

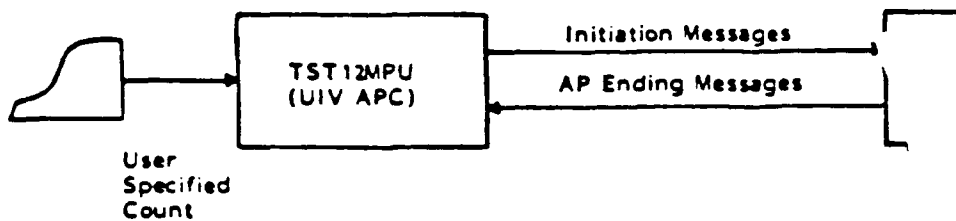
TST12MPU starts TSAPBMPU. TSAPBMPU has the characteristic of having no mailboxes. When TST12MPU sends a message to TSAPBMPU, an error message will come back. TSAPBMPU will terminate itself.

Test Purpose:

1. "No Mailbox" logic in INITIAL, RCV, and MPU.

Test Name: TST12MPU-Choice-2 (Fill Core)

Test Configuration:



Test Description:

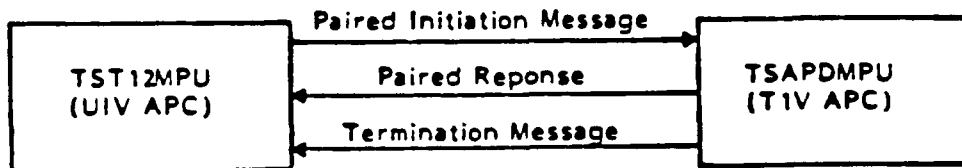
TST12MPU sends a series of specific initiation messages to TSAPCMPU in order to fill the in-core dynamic tables. TSAPCMPU will start, call RCV, and terminate. TST12MPU will receive AP Ending messages equal to the number of initiation messages sent.

Test Purpose:

1. Fill in-core tables in order to test table handling when writing to a file.

Test Name: TST12MPU-Choice-3 (Paired Initiation)

Test Configuration:



Test Description:

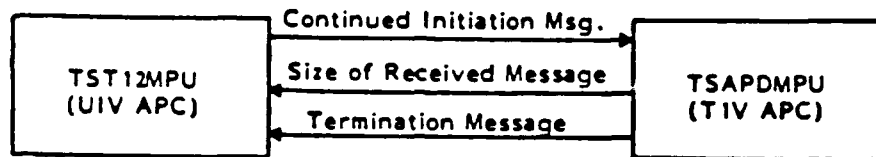
TST12MPU sends a paired initiation message to TSAPDMPU. A new instance of TSAPDMPU will be started and it will respond to the message. TSAPDMPU will then terminate itself.

Test Purpose:

1. ISEND logic for sending paired messages.
2. MPU logic to handle category "J" messages.

Test Name: TST12MPU-Choice-4 (Long Initiation)

Test Configuration:



Test Description:

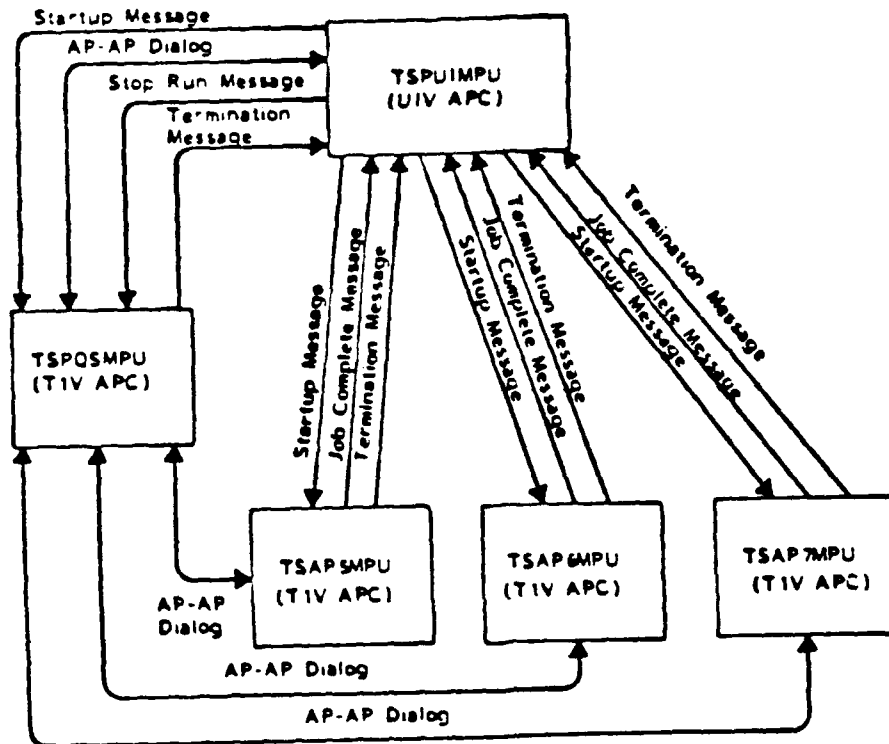
TST12MPU sends a continued initiation message to TSAPDMPU. A new instance of TSPDMPU will be started. It will call RCV and return the number of bytes of data received in a message to TST12MPU. TSAPDMPU will then terminate itself.

Test Purpose:

1. ISEND logic for sending continued messages.

Test Name: TST12MPU - Choice 5 (Run Queue)

Test Configuration:



Test Description:

TST12MPU starts TSAP5MPU, TSAP6MPU, and TSAP7MPU. Each AP begins sending a series of three messages to the Queue Server (TSPQSMPU). TST12MPU also sends a message, creating the situation where four AP's are communicating with the same instance of the queue server. At the end of the dialog, TSAP5MPU, TSAP6MPU, and TSAP7MPU inform TST12MPU that they are finished. When TST12MPU has heard from all the AP's it tells TSPQSMPU to shutdown.

This test was at one time driven by TSPUIMPU. Due to the handling of a Queue Server as a "child" of the NTM, the source AP has no way of knowing when a Queue server has terminated. The source will continue to send messages to a (possibly) dead AP. This test was moved to avoid this occurrence.

Test Purpose:

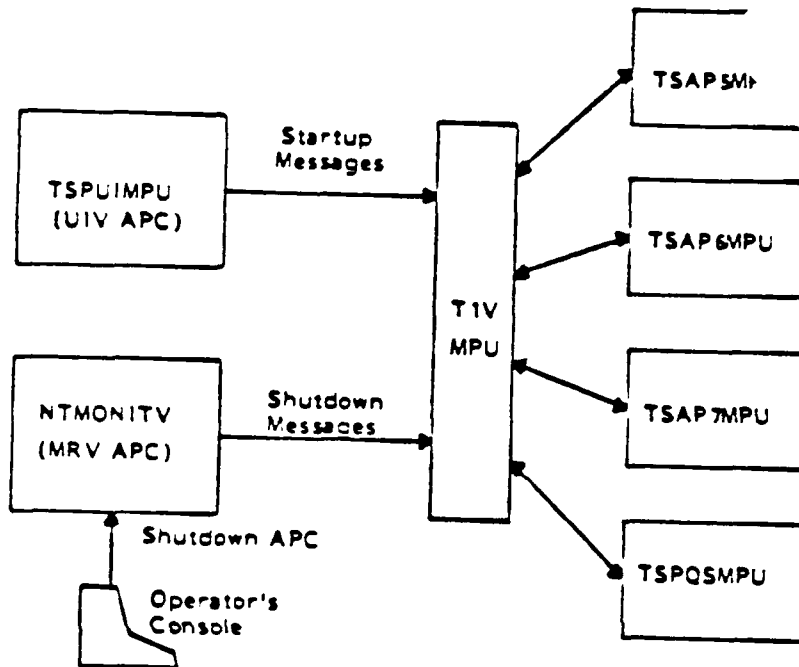
1. Multiple Parents per instance.
2. Message Queues.
3. Delivery of messages to a Queue Server Type AP.

Services Tested:

RCV (Message Buffer Logic)
NSEND
GETUSR

Test Name: Shutdown APC with Active AP's (using
TST12MPU-Choice-5)

Test Configuration:



Test Description:

There are two variations on this test.

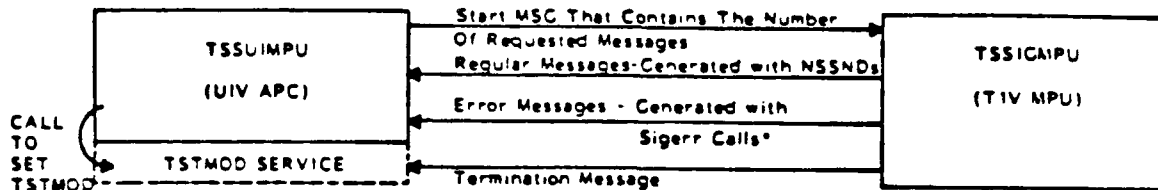
1. The user enters Choice 5 followed immediately by the Operator entering the Shutdown APC Command (T1V). In this case, some of the AP's on T1V will be in the initiation stage. A message is sent to Monitor to that effect.
2. The user enters Choice 5. The Operator waits until all the AP's are active and then enters the Shutdown APC Command. As none of the AP's have shutdown logic, they will be aborted and the APC terminated message is sent to Monitor.

Test Purpose:

1. APC Shutdown Logic with AP's still in initiation phase.
2. APC Shutdown Logic with active AP's on cluster.

Test Name: TSSUIMPU - Choice 1,2,3

Test Configuration:



*Sigerr generated messages are also directed to the monitor, and can be displayed by entering "SE" at the operator's console. The default at IISS startup is for no logging of Sigerr generated messages at the operator's console.

Test Description:

TSSUIMPU tests the three user testmodes that are setable by calls to TSTMOD in the three TSSUIMPU test choices. On Choice 1, TSTMOD is called to request the receipt of all messages by the test program. It also requests the tester to enter a number that will tell the test program, TSSIGMPU, the number of messages to generate in this test. On its startup, TSSIGMPU in all of the choices will loop through a series of regular messages sends, then Sigerr generated messages of severity levels (I, informatory; W, warning; F, fatal). On Choice-1, the test screen should display the received list of messages and their types. This list should contain a cycle of a regular message followed by error messages of Severity I, W, and F.

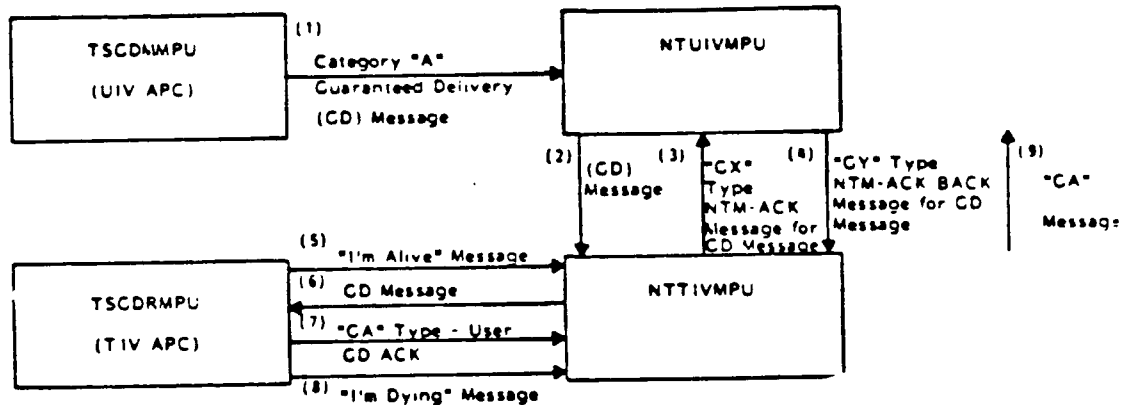
On Choice 2, TSTMOD is called to request that no error messages be sent to the user Screen. Again, the tester must supply the number of messages of each class that TSSIGMPU should generate. TSSIGMPU cycles through its message series in the same manner as in Choice-1, but in this test the only messages that are displayed are the regular messages and the I (Informatory) messages generated by TSSIGMPU calls to Sigerr. A verification that TSSIGMPU is generating all classes of Sigerr messages can be made by enabling SE at the operator's console and making sure that error messages of all types have been received at the operator's console during the test.

On Choice -3, TSTMOD is called to request that the only Sigerr generated error messages it should receive are the fatal

1. TSMOD Service Test.
2. Sigerr Service Test.
3. "SE" Operator's command test
4. New RCV logic to support filtering necessary with the TSTMOD flag.

Test Name: TSGDMMPU -Test Guaranteed Delivery Service.

Test Configuration:



Test Description:

TSGDMMPU tests the NTM's guaranteed delivery logic, and the two services, GDSSEND and GDACK. On the startup of TSGDMMPU, a guaranteed delivery (GD) message is requested with the service, GDSSEND. A message of category "A" (GD) is generated for TSGDRMPU. After it has been accepted (logged) by NTUIVMPU, a message "GD Message Accepted" should appear on the test screen. The rest of the test needs to be verified by checking the NTMLOG.

If the test worked correctly, after NTTIVMPU receives the "A" category message from TSGDMMPU, it should send an NTM-GD acknowledgment to NTUIVMPU (message type: "GX"). NTUIVMPU should then send an NTM-GD AckBack message (message type: "GI") to NTTIVMPU. On its receipt of the GD message, TSGDRMPU should send, via GDACK, a user GD acknowledgment, message type "GA", before terminating.

Test Purpose:

1. Test GDSSEND Service.
2. Test GDACK Service.
3. Test MPU handling of GD messages.

5.2.4 Formal Qualification Tests

Formal Qualification testing will be designed and performed

SECTION 6

PREPARATION FOR DELIVERY

The software associated with this NTM CPCI release will be delivered on a media which is compatible with the IISS Test Bed. The release will be clearly identified as to release, date, content, format and function and will include instructions on procedures to be followed for installation of the release.

APPENDIX A

A.1 Terms and Abbreviations

This paragraph contains definitions of IISS related terms and general computer terms that are used in this document. In addition, it contains definitions for selected terms used in the IDEF0 Model (Appendix B) and serves in lieu of a formal model glossary.

AP	See Application Process.
Abnormal	Stoppage of a process prior to its normal completion.
Termination	(Abort)
Alive AP	An application process that is capable of being initiated.
Application Process	Within the IISS Architecture; a cohesive unit of software that can be initiated as a unit to perform some function or functions. See also: Process.
Application Process Cluster	A logically related group of application processes that resides on a single host system. The application processes are collected at a single cluster because of their common need to access the same database. (In previous NTM documents this concept was referred to as "Workstation").
Authorization	A relationship between message type and legal paths of messages conforming to that type.
Awake AP	An application process that is currently executing.
Backlog	Messages waiting, in a queue, to be processed.
CDMRP	See Common Data Model Request Processor.
COMM	See Communications Handler.
CPCI	Computer Program Configuration Item. A cohesive testable (stand-alone) system with well-defined external interfaces.
Clean Point	A baseline of the entire system state at a given point in time so that recovery is possible from that point.
Cluster	See Application Process Cluster.

Common Data	Information that may be shared among users and is subject to policies and procedures of the IISS.
Common Data Model (CDM)	A description of the data, its structure, allowable operations, and integrity constraints for data of common interest within the IISS.
Common Data Model Request Processor	The implementation of the CDM within the IISS. The current design specifies the use of extremities.
Communications Handler	An IISS Configuration Item that services IISS network communications. It accepts messages from the NTM for off-host destinations. It provides NTM with messages from off-host sources.
DBMS	See Data Base Management System.
DML	See Data Manipulation Language.
Database	A collection of logically related data managed by a DBMS.
Data Base Management System	A computerized system consisting of numerous components, which have as their collective purpose the implementation, management, and protection of large-scale data bases.
Data Manipulation Language	A formal language for specifying data modification, and retrieval functions under a DBMS.
Destination	An application process (which may be user role) to which a message is sent.
Heterogeneous	Composed of parts of different kinds; having widely dissimilar elements or constituents.
Homogeneous	Composed of parts all of the same kind.
Host	See Host Machine.
Host Machine	A configuration of a processor(s) and associated peripherals.
IISS Component	Application Processes involved in IISS support activities. See: CDMRP, UI, COMM.
IISS Operation	Messages entered directly to the NTM by an operator.

Messages	These include: startup, shutdown, restart, and provide status and statistics.
IISS Shutdown	A signal or IISS operator command that initiates the orderly shutdown of the entire IISS system or an individual workstation.
IISS Startup	A signal or IISS operator command that initiates the IISS on a single host.
Integrated AP	An application process designed and written in accordance with the IISS Integration rules.
Initiation Message	A message that specifically requires the initiation of an application process. The message may also carry data for that process.
LAN	Local Area Network.
Load	To bring a bound (linked) set of computer instructions into a computer memory unit in preparation for its execution as a process.
MDL	Message Definition Language. Neutral syntax and semantics for formatting IISS messages.
MM	See Message Manager.
Maintain	The name given to that part of the NTM that will
Operability	Facilitate system wide services of restart, recovery, shutdown, and system status monitoring and recording.
Message	A structured unit of information.
Message and Error Log	The record of messages (legal and erroneous) that are processed by the message manager.
Message Category	A group of message types sharing common processing requirements.
Messages from Off-Cluster	Any message that has as its source an AP or NTM that is not resident on the cluster in question.
Message from On-Cluster	Any message sent by a local AP that is directed to another on APC AP or to another NTM (i.e., requiring the routing services of the Message Manager).

Message, Definition	The legal (recognized and allowed) values to which a message must conform to be accepted for processing at an AP on a given APC on a given host. The values are contained in tables which are defined in Section 3.5.3
Message Manager	The name given to the part of the NTM that will provide the service for the identified Manage Message functions (see DS/A1 Section 10.2).
Message to IISS Operator	Typically a response to an operation request. This message could also be a request for operator action.
Messages to Off-Cluster	Any message that has as its source an AP or NTM that is not resident on the cluster in question.
Message to On-Cluster	Messages directed to an AP (resident on the cluster) that contain information necessary for the process to perform.
Message to be Routed	A message that has another AP as its destination.
Message Type	The identification of the nature of a given message.
MO	See Maintain Operability.
MO Data and Status Messages	Any message directed to the maintain operability function.
Native Mode	Character code native to a particular machine, either ASCII or EBCDIC.
Network	Several computers and a communications facility connecting them.
Non-integrated AP	An Application Process designed without adherence to the IISS Integration rules.
NTM	Network Transaction Manager. That portion of the IISS that manages messages and application processes and maintains the operability of the IISS.
OS	See Operating System.
OS Process Control Response	Response from the host operating system to a request for services, (i.e., process ID assigned, process exists, process does not exist).

OS Process Control Request	Request for services to be provided by the host operating system.
On-APC AP Messages	Any message that has as its destination an AP that is resident on the workstation in question.
Operability Messages	Messages initiated by maintain operability to handle an IISS operation request and to monitor the IISS system.
Operating System	Software that controls the execution of computer programs and that may provide scheduling, debugging, input-output control, accounting, compilation, storage assignment, data management, and related overall system management.
Priority	The expectation of processing urgency assigned to a message type. The recognized transaction priorities are: standard, immediate and time-triggered.
Process	The basic unit of work from the standpoint of the computer's operating system.
Process Manager	The name given to the part of the NTM that will provide the service for the identified Manage Processes function. (See DS/A2, Section 10.2)
Process Name	The AP Name and instance identifier of an initiated AP.
Requirement	Stated functions for information processing and associated constraints.
Resources	People, hardware, software, and other components used to process information.
Source	An Application Process from which a message is sent.
Status and Statistics Log	Data regarding the AP status, resource utilization, message traffic provided in response to an operation request.
System	A collection of people, hardware, software and methods organized to accomplish a set of specific functions.
Task	See Process.

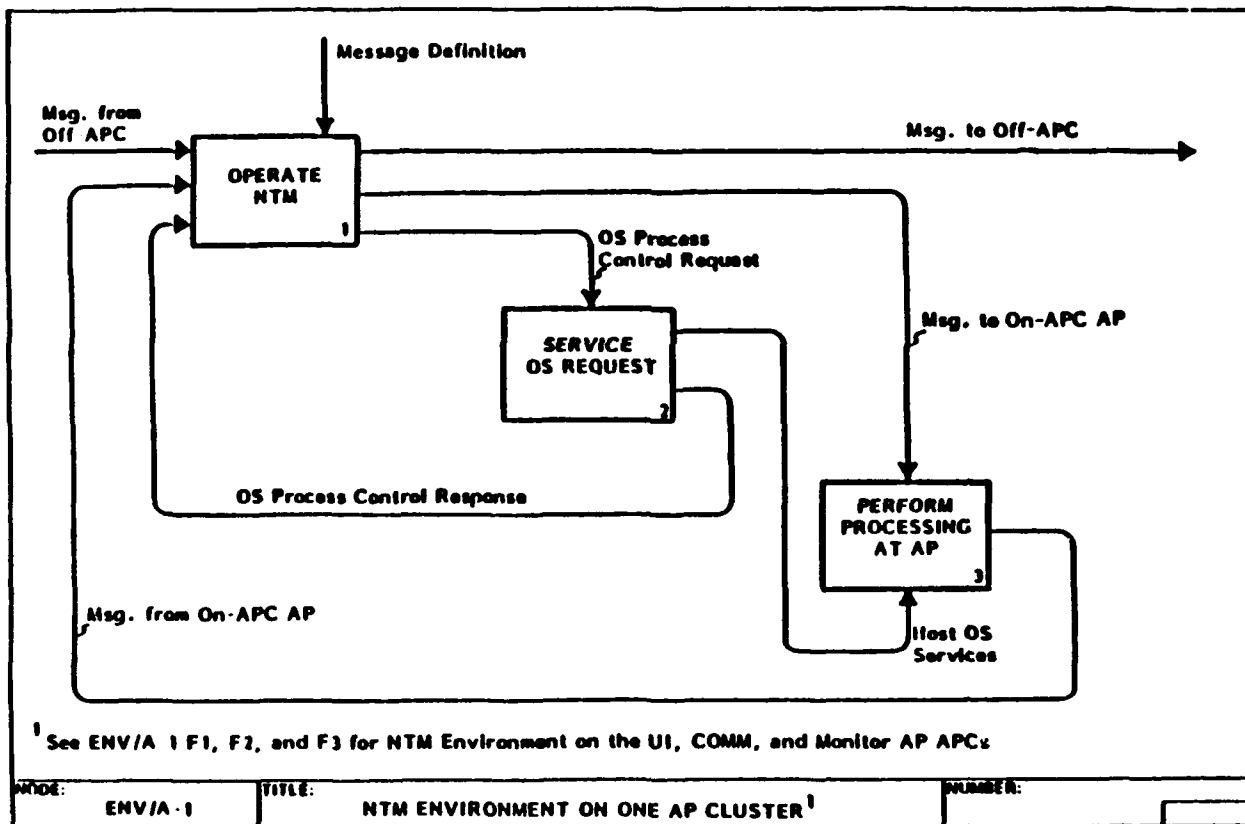
Test Bed	A collection of computer hardware, software, storage devices, and other peripherals used for testing application software and system concepts. Usually not the target operational system.
UI	See User Interface.
Update	The process of changing values in all or selected entries, groups, or data items stored in a database or adding or deleting data occurrences.
User	Human being who requests processing to be done. The person entering a transaction at a terminal. The user can also be a non-human that performs these functions but this term will not be used in this sense in this specification.
User Application Process	Any application process not involved in IISS support
User Interface	An application process that manages the user-terminal interface.
View	That which is within the range of vision. Also, that data which is of interest to a specific application process.
Workstation	See Application Process Cluster

APPENDIX B

B.1 IDEF0 Model of the NTM

The model presented here represents conceptual view of the IISS and the workstation environment in which the NTM will operate (ENV/A-1) along with the functional breakdown of the NTM components. The description of the functional processing shown in the model is found in Section 4.2 and serves in lieu of text.

ENV/A-1 - DIAGRAM



ENV/A-1T1

USED AT:	AUTHOR: SofTech PROJECT: NTM	DATE: 9/17/82 REV:	WORKING DRAFT X RECOMMENDED PUBLICATION	READER	DATE	CONTEXT:
NOTES: 1 2 3 4 5 6 7 8 9 10						

The basis of the IISS architecture is the concept of AP clusters. An AP cluster is defined as a highly cohesive group (one or more) of Application Processes that have either one or no Database Manager (and by extension, database) in common. This concept allows for the isolation of application functions based upon the data they need to access. The IISS components, the User Interface (UI), Communications Handler (CHM), and Common Data Model Request Processor (CDMP) are seen as Application Processes that each reside on a distinct AP cluster. Non-Integrated or "Existing" Applications (applications designed without adherence to IISS Integration rules) also reside on separate AP clusters in accordance with the rule that they access one database. Integrated or "New" Applications (applications designed and written in accordance with the IISS Integration Rules) will either reside on separate AP clusters or be added to existing AP clusters depending upon database(s) they need to access.

An Application Process (AP) within the IISS architecture is a cohesive unit of software that can be initiated as a unit to perform some function or functions. All APs within the IISS are treated in the same manner by the NTM.

Some examples of APs in the IISS are; User Application Processes such as an MCM component capable of processing a transaction; and IISS components such as the User Interface, Communication Handler, and Common Data Model Request Processor. The NTM's concern in all cases is to provide a transparent logical link from

MODE: ENV/A-1T1	TITLE: NTM ENVIRONMENT - TEXT	NUMBER:

EN

USED AT:	AUTHOR: SoftTech PROJECT: NTM	DATE: 9/17/82 REV:	WORKING DRAFT X RECOMMENDED PUBLICATION	READER	DATE	CONTEXT:
NOTES: 1 2 3 4 5 6 7 8 9 10						

any AP to any other AP in the IISS system. Each AP is seen by the NTM as a stand-alone unit that is fully capable of performing its own processing and normally terminating itself.

The NTM provides the common operating thread for each AP cluster. An NTM will be associated with each AP cluster to provide for message management, process management, and to maintain AP cluster and system operability. These functions are discussed in detail in the NTM DS Model below.

The NTM is an AP cluster's contact point with the rest of the IISS "world." Messages from outside the AP cluster (111) are received by the NTM (Box 1). The NTM determines whether the message belongs to the AP cluster based upon the Message Definition (1C1). Where the message does not belong to the AP cluster (for reasons discussed in NTMDS/A1) the message is sent off the AP cluster (101). Where the message does belong to the AP cluster, it is delivered to the appropriate Application Process (102). Where the message belongs to the AP cluster, the NTM will use the host OS services (103) to perform functions as needed. OS process control responses (113) are sent to the NTM.

The NTM (Box 1) uses the Host OS services (Box 2) to control the application process (Box 3). During the process or upon completion of processing when the need arises to send a message to a user or to access another Application, the processing AP will send a message to the NTM (301). The NTM receives the message (112), processes and routes it to the appropriate application either on (102) or off (101) the AP cluster.

MODE: ENW/A-112	TITLE: NTM ENVIRONMENT - TEXT	NUMBER:

V/A-1T2

USED AT:	AUTHOR: SoftTech PROJECT: NTM	DATE: 9/17/82 REV:	WORKING DRAFT ☒ RECOMMENDED PUBLICATION	READER	DATE	CONTEXT:
NOTES: 1 2 3 4 5 6 7 8 9 10						
In this environment, the functions that are performed by the Host OS (Box 2) and the application process (Box 3) are outside the jurisdiction of the NTM. The function of maintaining the AP cluster is also provided by the NTM. Messages regarding system operation (startup, shutdown, recover, restart) are sent to the NTM (IC1).						
MODE: EM/A-1T2	TITLE: NTM ENVIRONMENT - TEXT				NUMBER:	

ENV/A-1T3

USED AT:	AUTHOR: Softech PROJECT: NTM	DATE: 9/17/82 REV:	WORKING DRAFT X RECOMMENDED PUBLICATION	READER DATE	CONTEXT:
NOTES: 1 2 3 4 5 6 7 8 9 10					

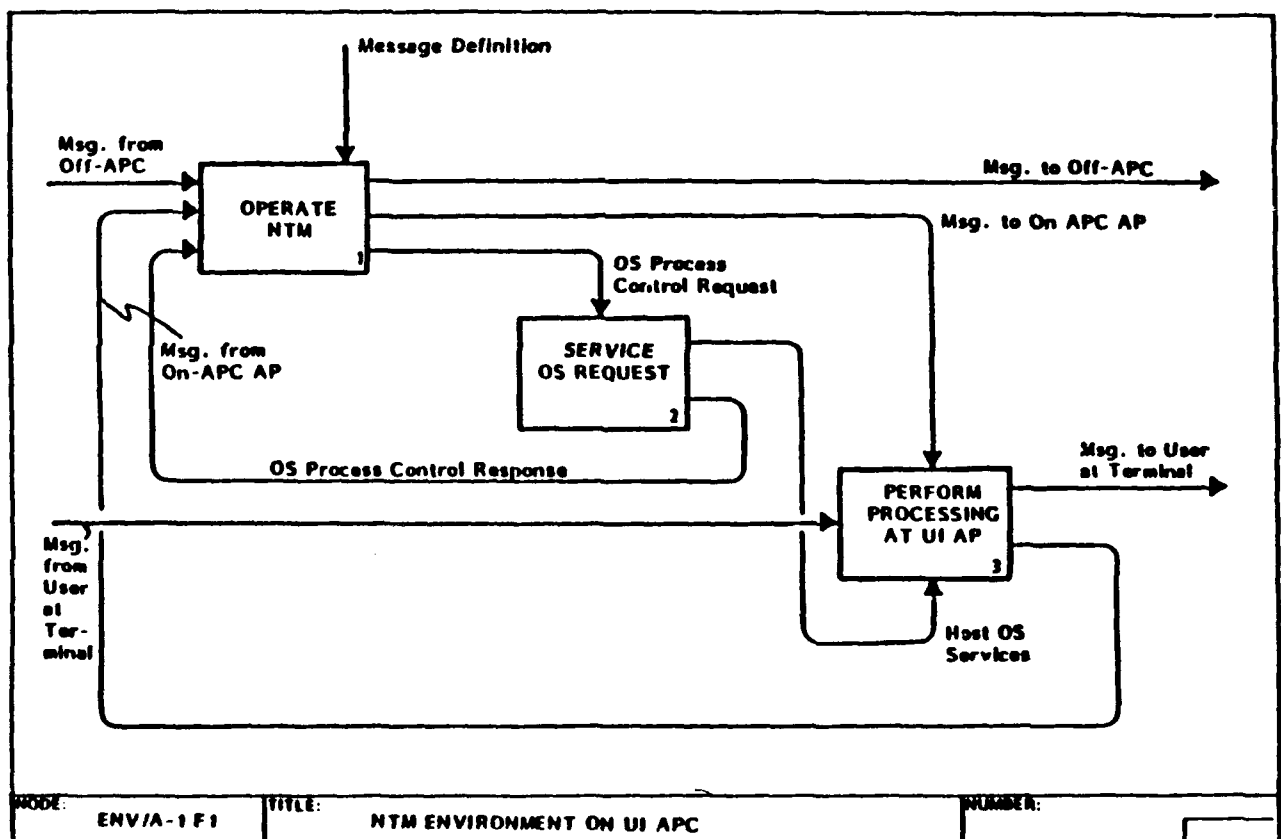
The scenario sequence described for ENV/A-1 deviates slightly for two AP clusters; the User Interface (UI) and the Communications Handler (COMM). This is due to the fact that a message can be received by the UI or COMM Application process prior to NTM processing. Note that the only difference implied in these FEDs is the order in which a message is passed among the functions on the AP cluster. The NTM functions and interfaces are exactly the same in all cases.

The User Interface AP (Box 3 on F1) receives a message from a user at an IISS terminal (311). The User Interface AP will interact with the user (301, 311) to gather the data needed to formulate a transaction which will then be sent (302) to the NTM for routing. Messages routed to the UI from another AP cluster will be received first by the NTM and handled in the manner described for ENV/A-1.

The UI AP cluster provides for the isolation (download) of the screens (menus) that facilitate the user's interaction with an application process. This isolation removes screens from an AP and places them closer to the terminal. Thus, the UI-User interaction allows the formulation of a transaction without the necessity of initiating the target application process. Further, all message traffic involved is kept within the AP cluster until the transaction is formed and routed thereby reducing the message traffic on the IISS.

MODE: ENV/A-1T3	TITLE: NTM ENVIRONMENT ON UI	NUMBER:

ENV/A-aF1T



ENV/A-1F1 - DIAGRAM

USED BY:	AUTHOR: SofTech PROJECT: NTM	DATE: 9/17/82 REV:	WORKING	READER	DATE	CONTEXT:
			DRAFT			
			RECOMMENDED			
			PUBLICATION			
NOTES: 1 2 3 4 5 6 7 8 9 10						

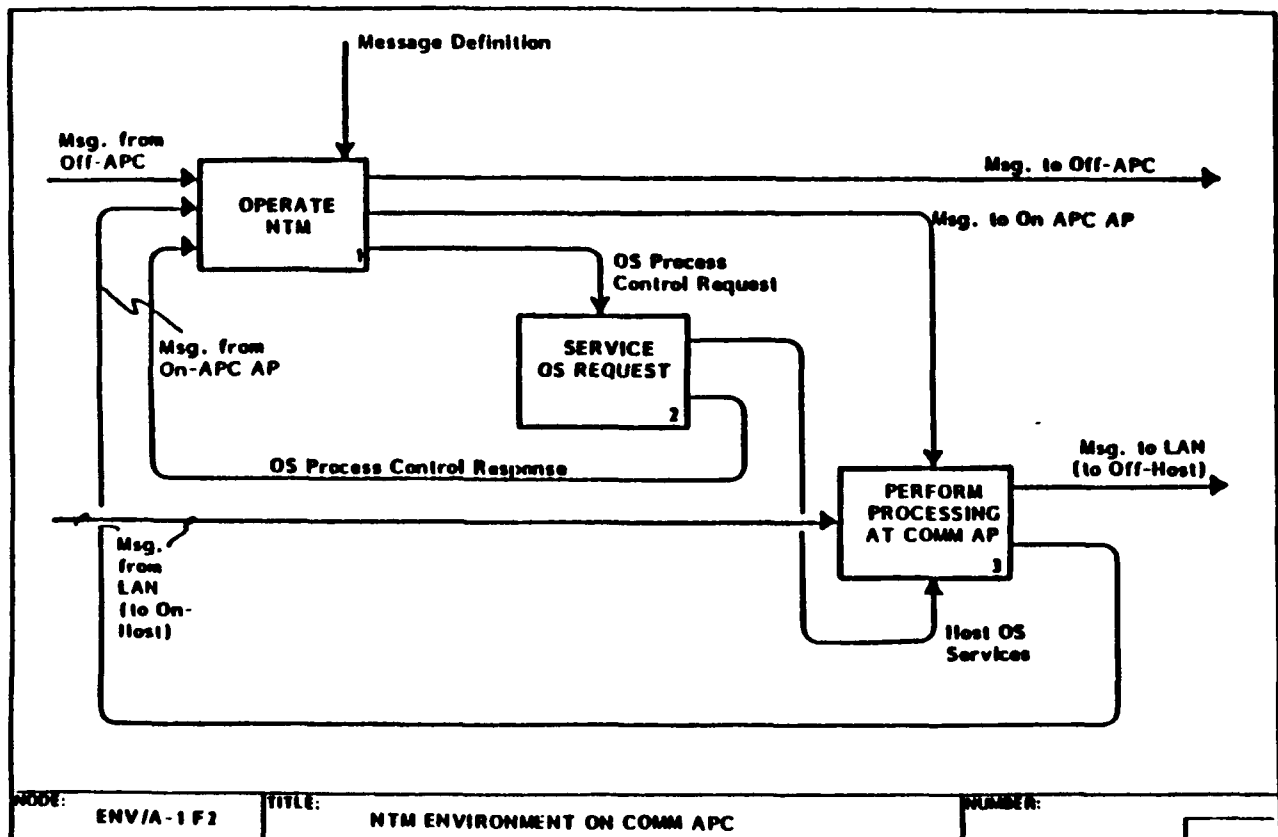
The COMM AP is (like the UI) capable of receiving a message prior to local host NTM processing of the message.

The COMM AP provides the host-to-host communication for the IISS. Where an NTM determines that a message belongs to a AP cluster other than its own, the destination is another AP cluster that is either on the same host or on another host in the IISS. Where the target AP cluster is on host, the message is sent to that AP cluster's NTM. Where the target AP cluster is off-host, the message is sent to the NTM for the host's COMM AP Cluster (111). The off-host messages are sent to the COMM AP (Box 3) from which they are sent to the LAN (301) as a single message stream.

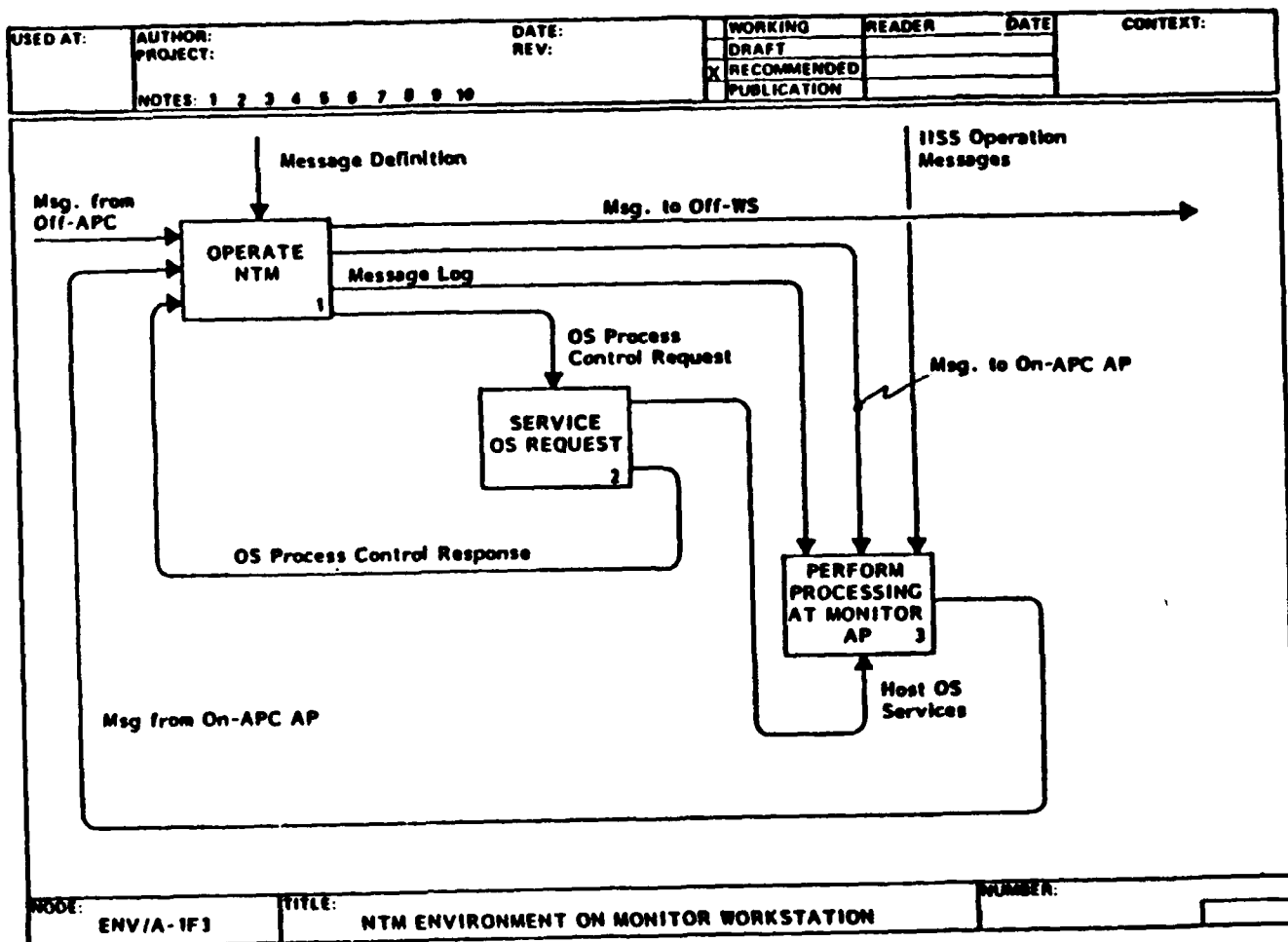
The deviation from the ENV/A-1 scenario when messages come into the COMM AP from the LAN (311). These messages are received by the COMM AP which then directs them to the COMM AP Cluster NTM (302) for further routing.

MODE: ENV/A-1F2T	TITLE: NTM ENVIRONMENT ON COMM IS	NUMBER:

ENV/A-1F2T



DS 620342000
30 September 1990



DS 620342000
30 September 1990

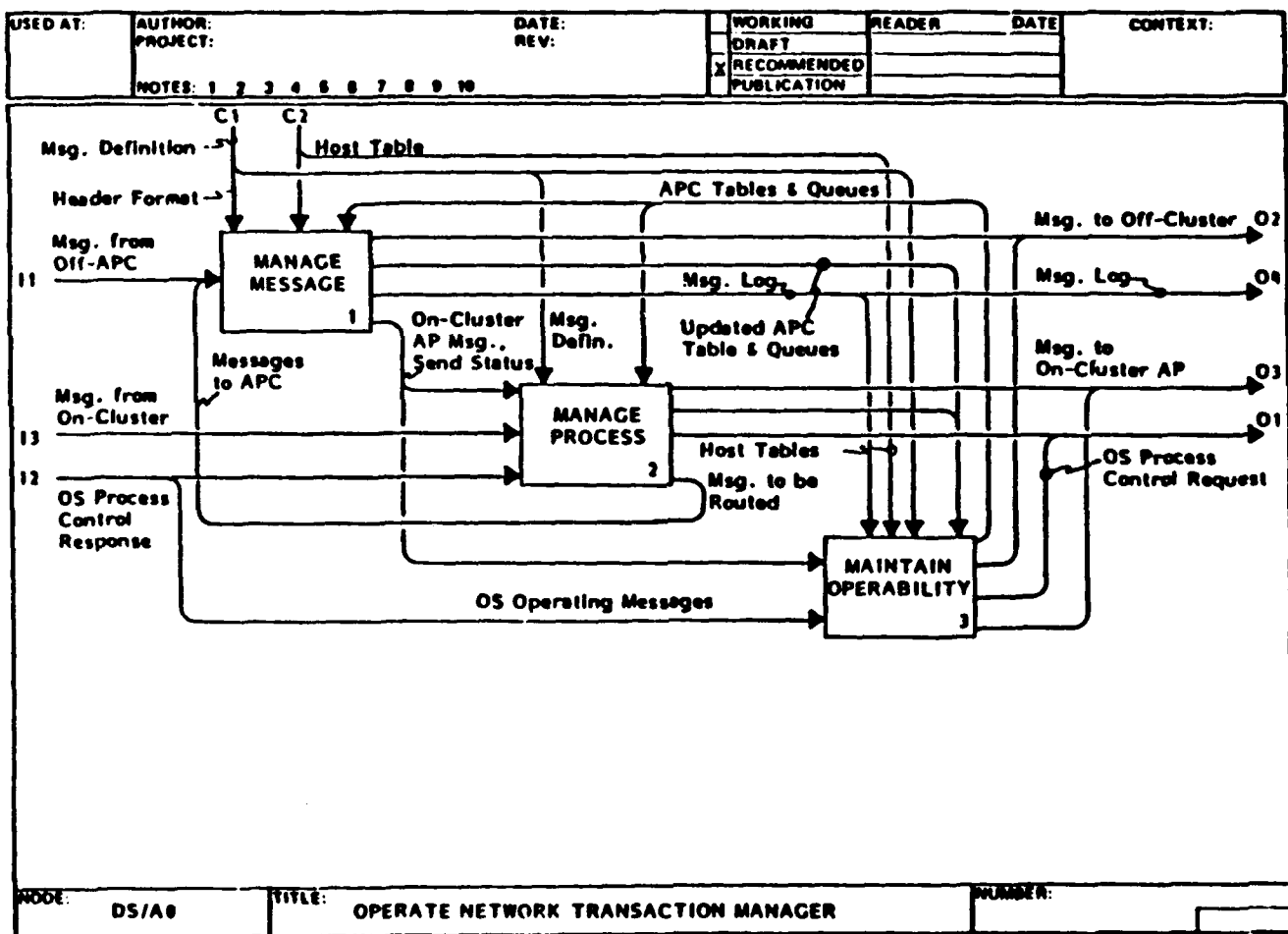
USED AT:	AUTHOR: PROJECT:	DATE: REV:	WORKING ☐ DRAFT ☒ RECOMMENDED ☐ PUBLICATION	READER	DATE	CONTEXT:
NOTES: 1 2 3 4 5 6 7 8 9 10						

Purpose: This model will be used to define the function of the NTM as they relate to a single APC for the NTM Development Specification.

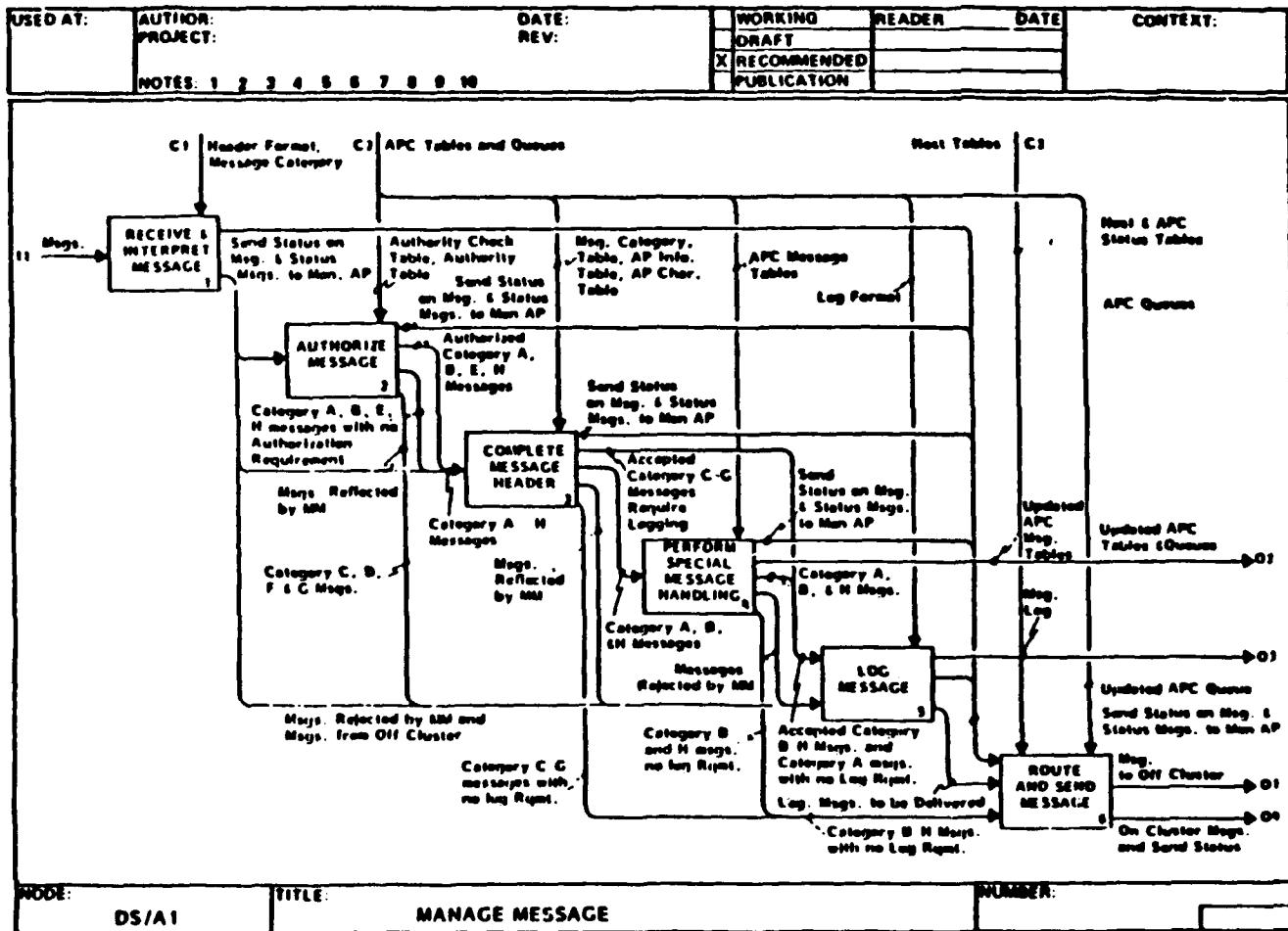
Viewpoint: An Individual Instance of an NTM's MPU and AP Interface Components as a stand alone system providing services to a Cluster of Application Processes (APC)

NODE: A-8	TITLE: OPERATE NTM	NUMBER:

DS 620342000
30 September 1990



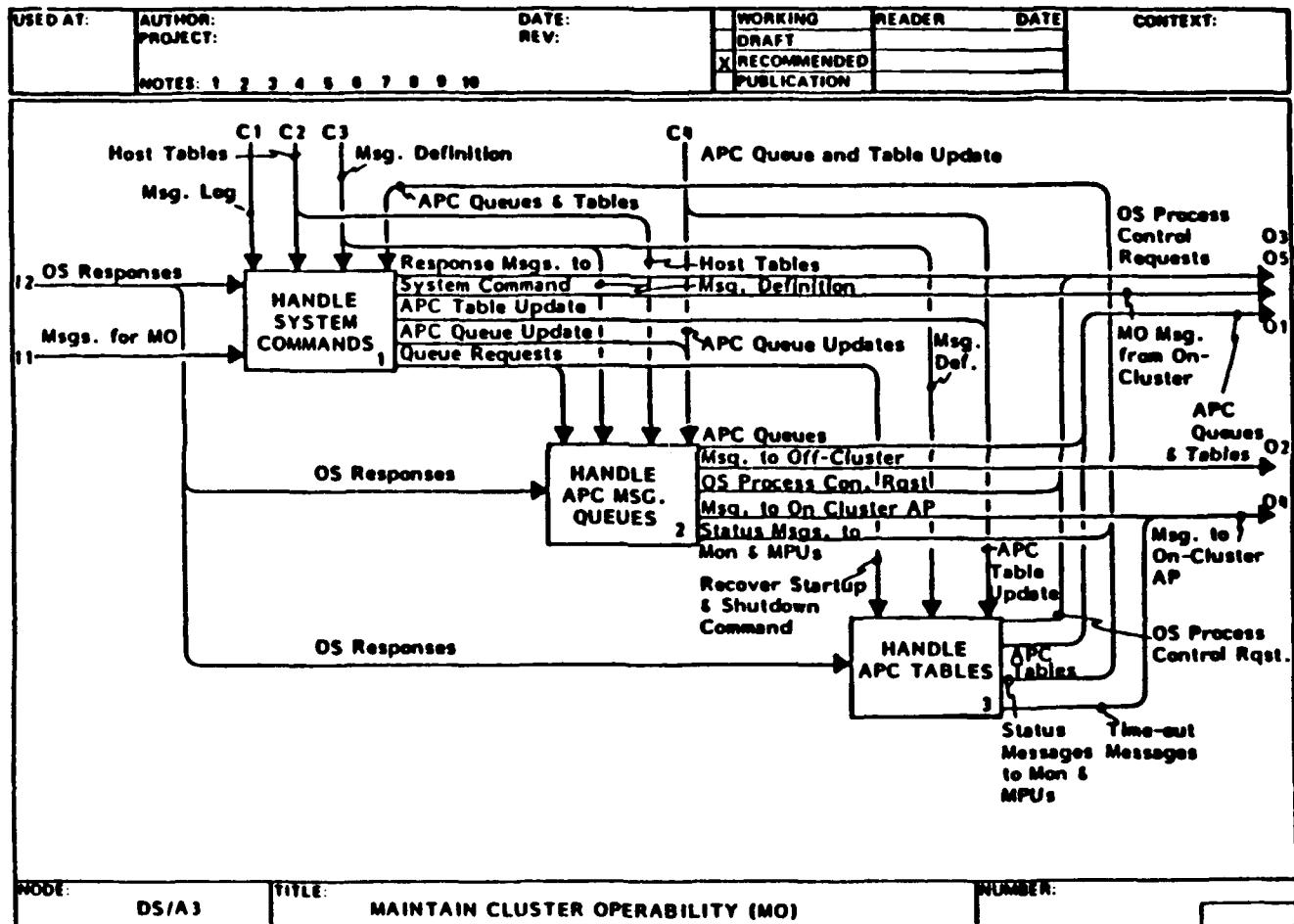
DS 620342000
30 September 1990



DS 620342000
30 September 1990

[illegible]

DS 620342000
30 September 1990



APPENDIX C

C.1 IDEF1 Model of the NTM

The Model presented here represents the structure of the data required to perform the NTM functions. The data items identified in the model are defined in Appendix D (in lieu of a formal glossary). The table usage and structure is defined in Section 4.5.3.

DS 620342000
30 September 1990

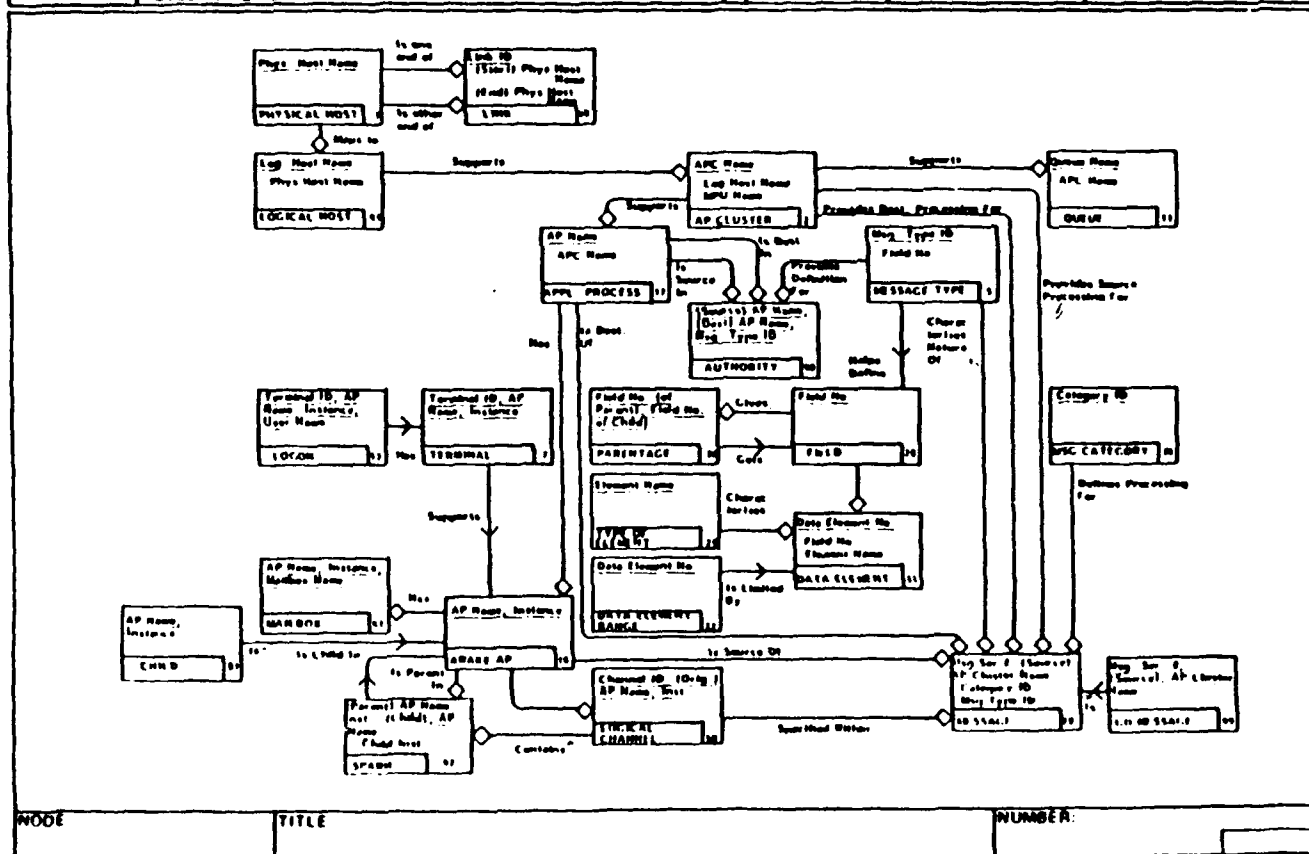
USED AT.	AUTHOR PROJECT	SoTech NTM	DATE REV.	4/20/82 5/4/82 10/7/82 2/2/83	WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT.
NOTES 1 2 3 4 5 6 7 8 9 10			3/2/84					

Entity Class		Entity Class	
Node No.	Name	Node No.	Name
E1	PHYSICAL HOST	E29	TYPE OF ELEMENT
E2	AP CLUSTER	E30	PARENTAGE
E5	MESSAGE TYPE	E31	DATA ELEMENT
E7	TERMINAL	E32	DATA ELEMENT RANGE
E11	QUEUE	E36	MESSAGE CATEGORY
E12	LOG ON	E40	AUTHORITY
E16	AWAKE APPLICATION PROCESS	E41	LOGICAL HOST
E17	APPLICATION PROCESS	E42	SPAWN
E19	MESSAGE	E47	MAILBOX
E20	POST	E48	LINK
E21	WAIT	E49	GD MESSAGE
E28	FIELD	E50	LOGICAL CHANNEL
		E51	CHILD
		E52	QUEUE SERVER
		E53	CONNECTION

NODE	TITLE	NUMBER:
	ENTITY CLASS POOL	

DS 620342000
30 September 1990

USED AT:	AUTHOR: SofTech	DATE: 2/6/81	WORKING	READER	DATE	CONTEXT:
	PROJECT: NTM	REV:	DRAFT			
			X RECOMMENDED			
			PUBLICATION			
NOTES 1 2 3 4 5 6 7 8 9 10						



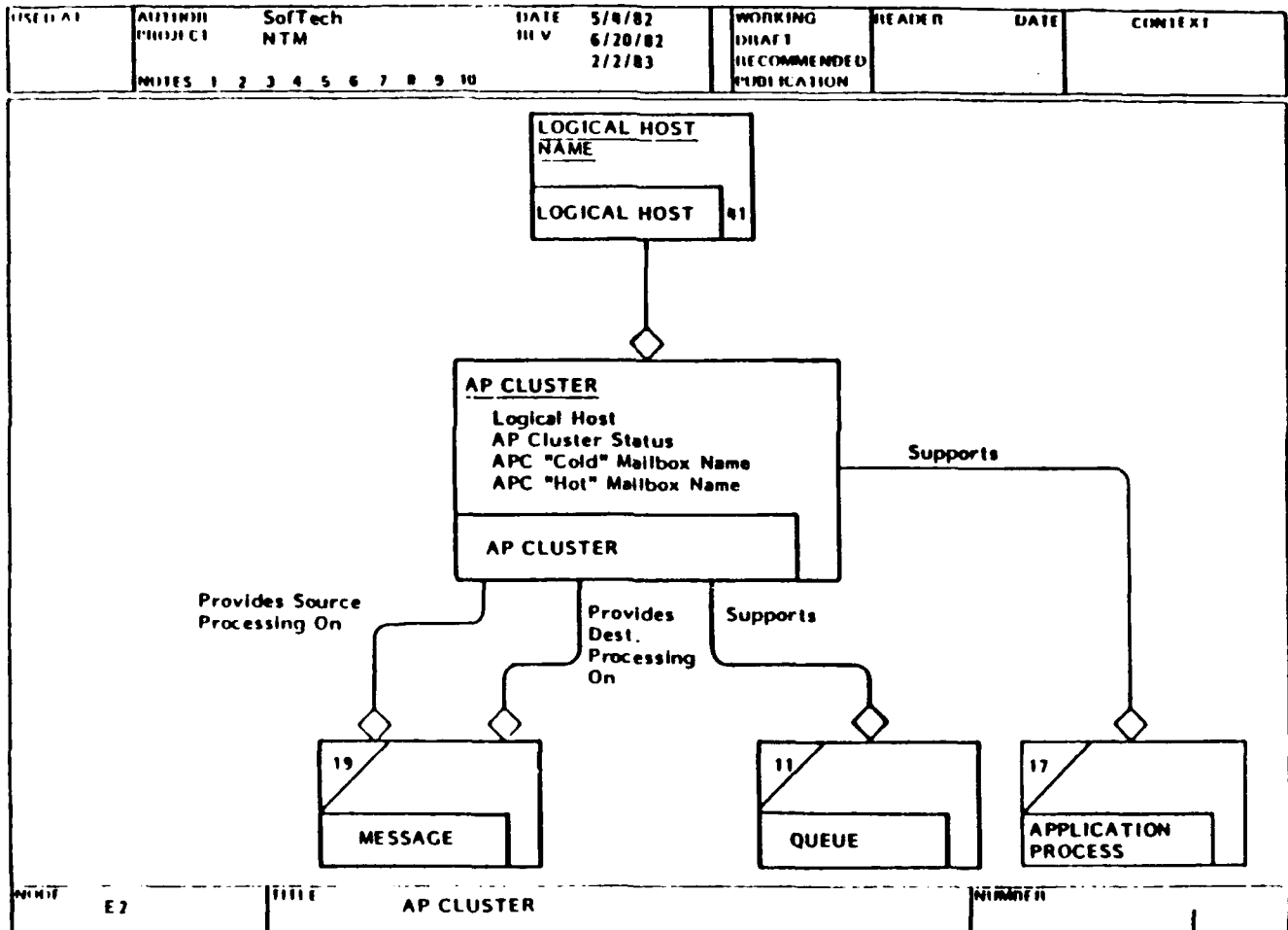
DS 620342000
30 September 1990

U D AT	AUTHOR: SofTech	DATE: 4/21/82	WORKING	READER	DATE	CONTEXT:
PROJECT: NTM	REV: 6/20/82	DRAFT				
	2/2/83	RECOMMENDED				
NOTES: 1 2 3 4 5 6 7 8 9 10		PUBLICATION				

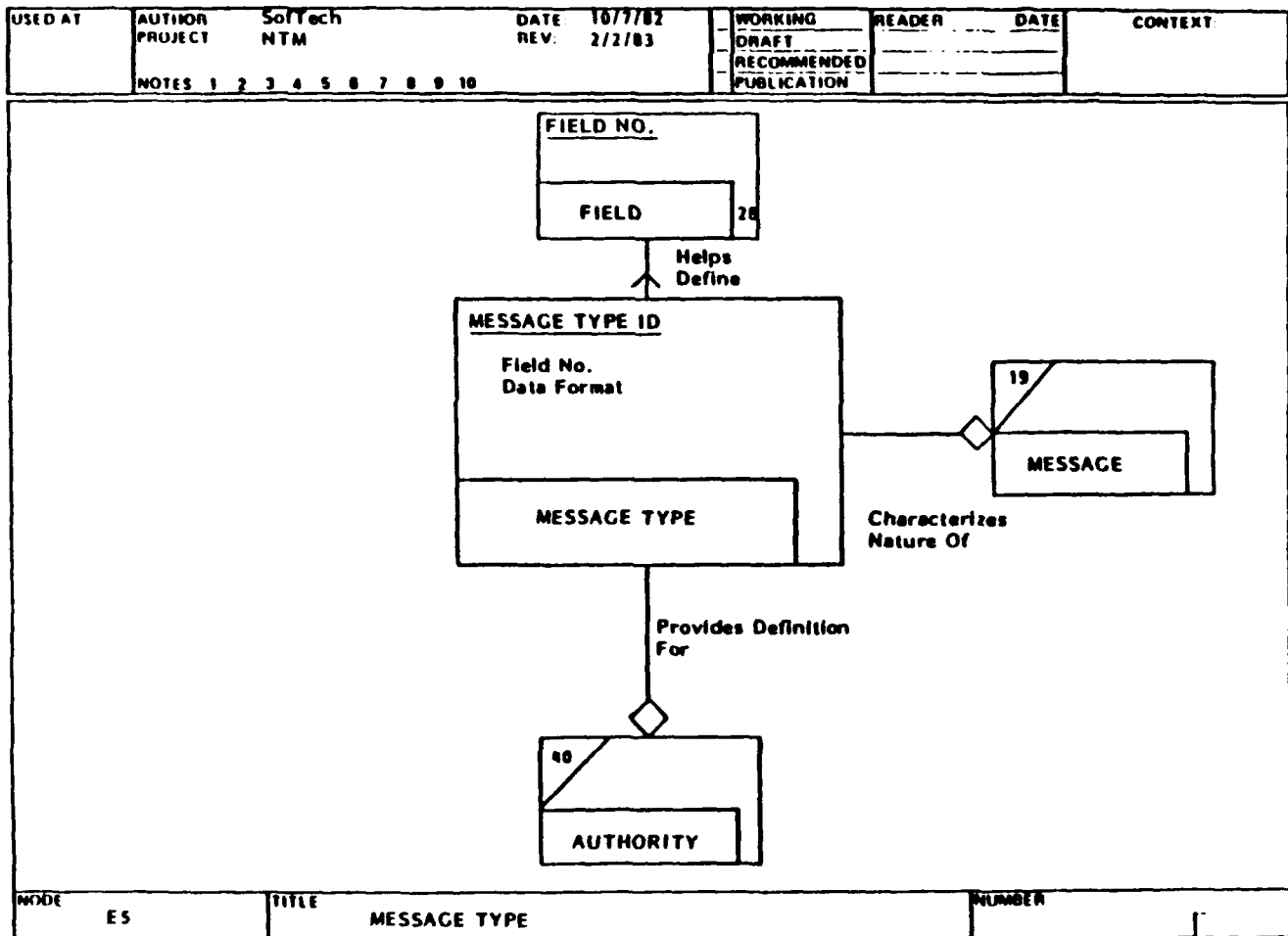

```

graph TD
    subgraph PH1 [PHYSICAL HOST]
        HS[Host Status]
        subgraph PH2 [PHYSICAL HOST]
        end
    end
    subgraph LH [LOGICAL HOST]
        direction TB
        L1[01]
        L2[LOGICAL HOST]
    end
    subgraph LK [LINK]
        direction TB
        L3[08]
        L4[LINK]
    end
    PH1 -- Maps To --> LH
    PH1 -- Is One End Of --> LK
    PH1 -- Is Other End Of --> LK
  
```

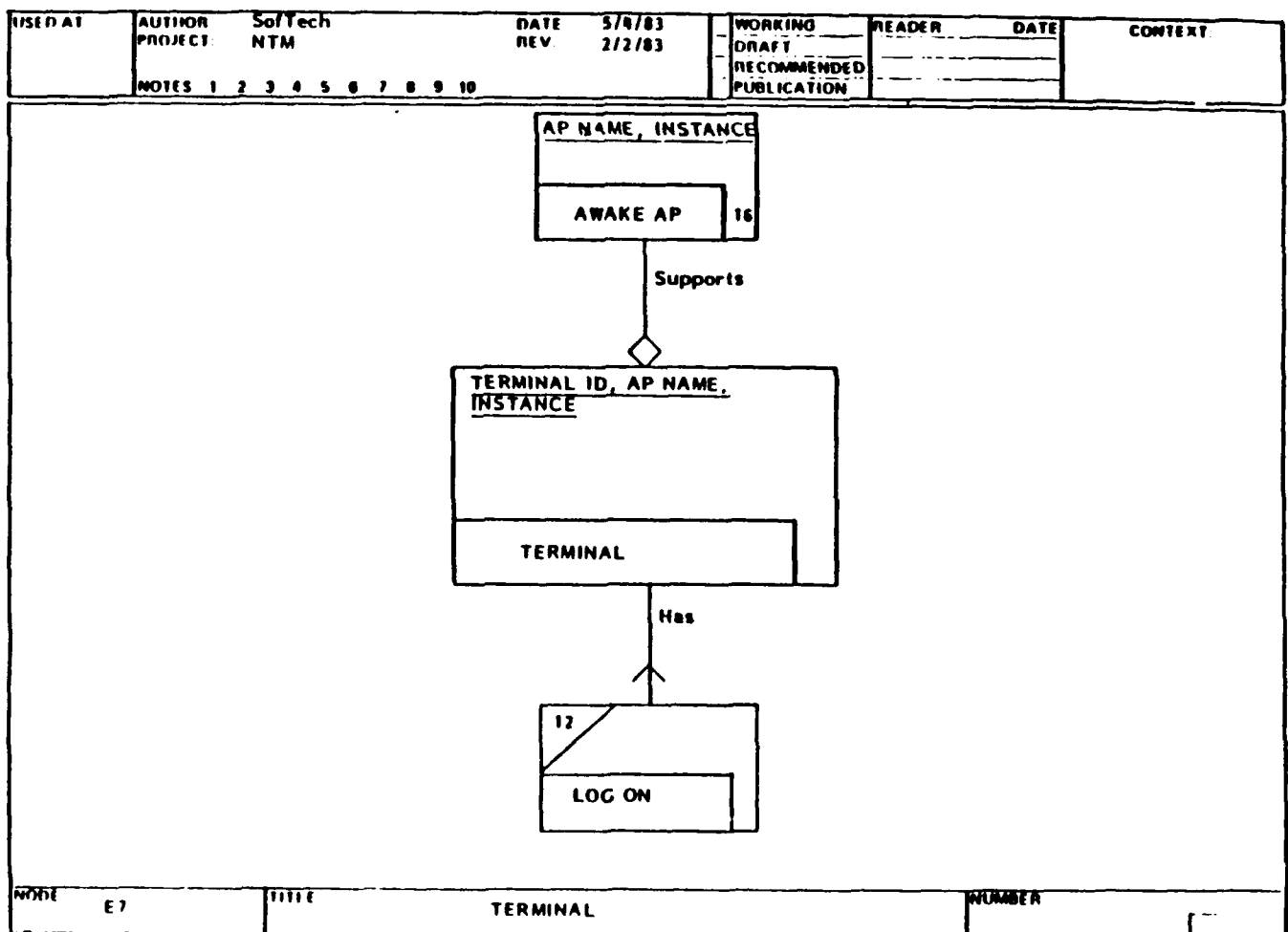
NOTE	TITLE	NUMBER
E1	HOST MACHINE	1



DS 620342000
30 September 1990



DS 620342000
30 September 1990



DS 620342000
30 September 1990

USED AT	AUTHOR PROJECT: SofTech NTM	DATE REV: 5/8/82 6/20/82 2/2/83	WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT
NOTES 1 2 3 4 5 6 7 8 9 10						

AP CLUSTER NAME

AP CLUSTER 2

Supports

QUEUE NAME
APC Name
Queue Status
Queue Length

QUEUE

NODE	E 11	TITLE	KIND OF BACKLOG	NUMBER

DS 620342000
30 September 1990

USED AT	AUTHOR PROJECT	SoftTech NTM	DATE REV	5/4/82 6/20/82	WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT
NOTES 1 2 3 4 5 6 7 8 9 10								

TERMINAL ID, AP NAME, INSTANCE
TERMINAL 7

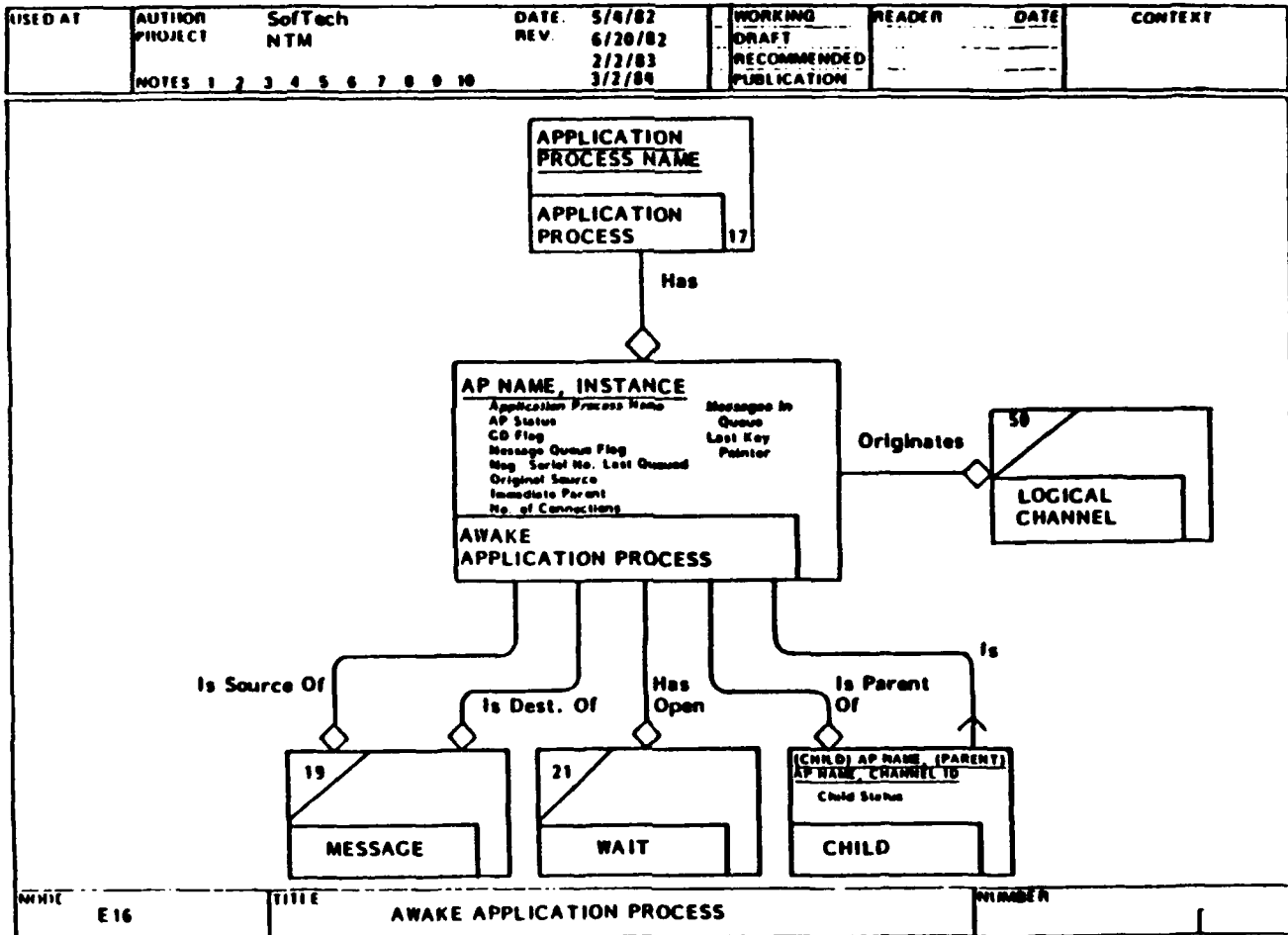
↑

TERMINAL NO., AP NAME, INSTANCE, USER NAME
Role Name
Session Start Time
Channel Range Start
Channel Range End

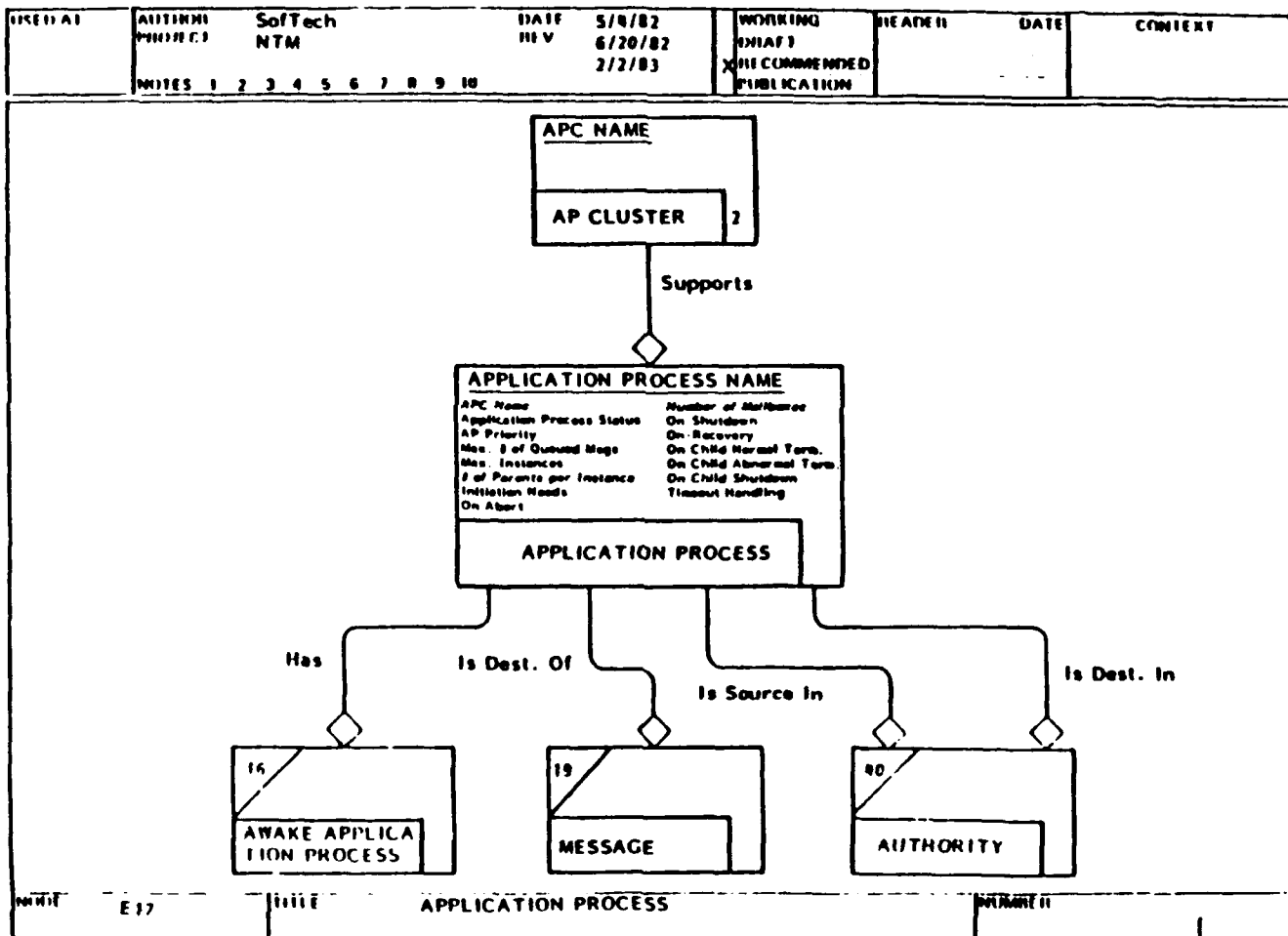
LOG ON

TITLE	E 12	LOG ON	NUMBER

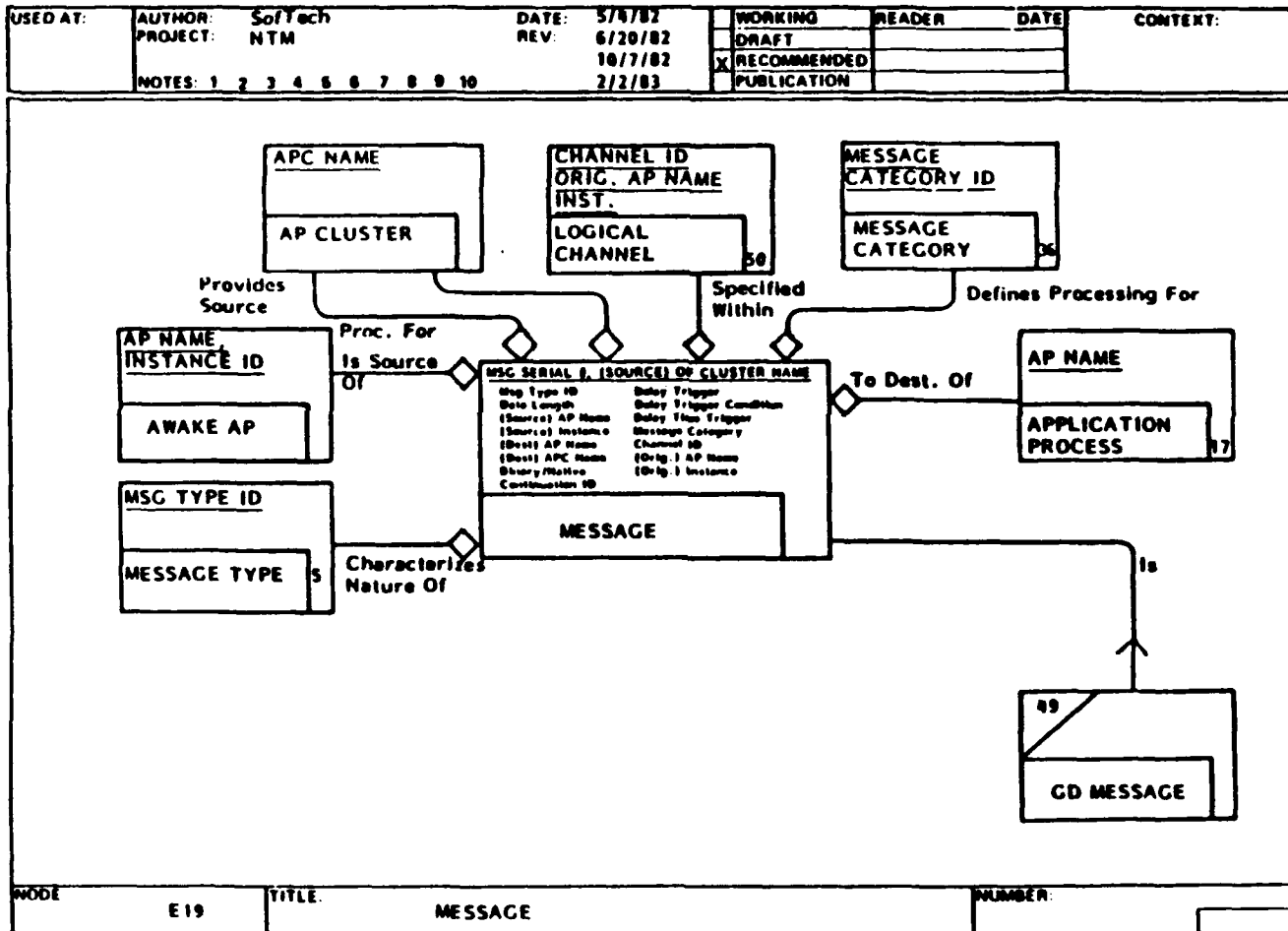
DS 620342000
30 September 1990



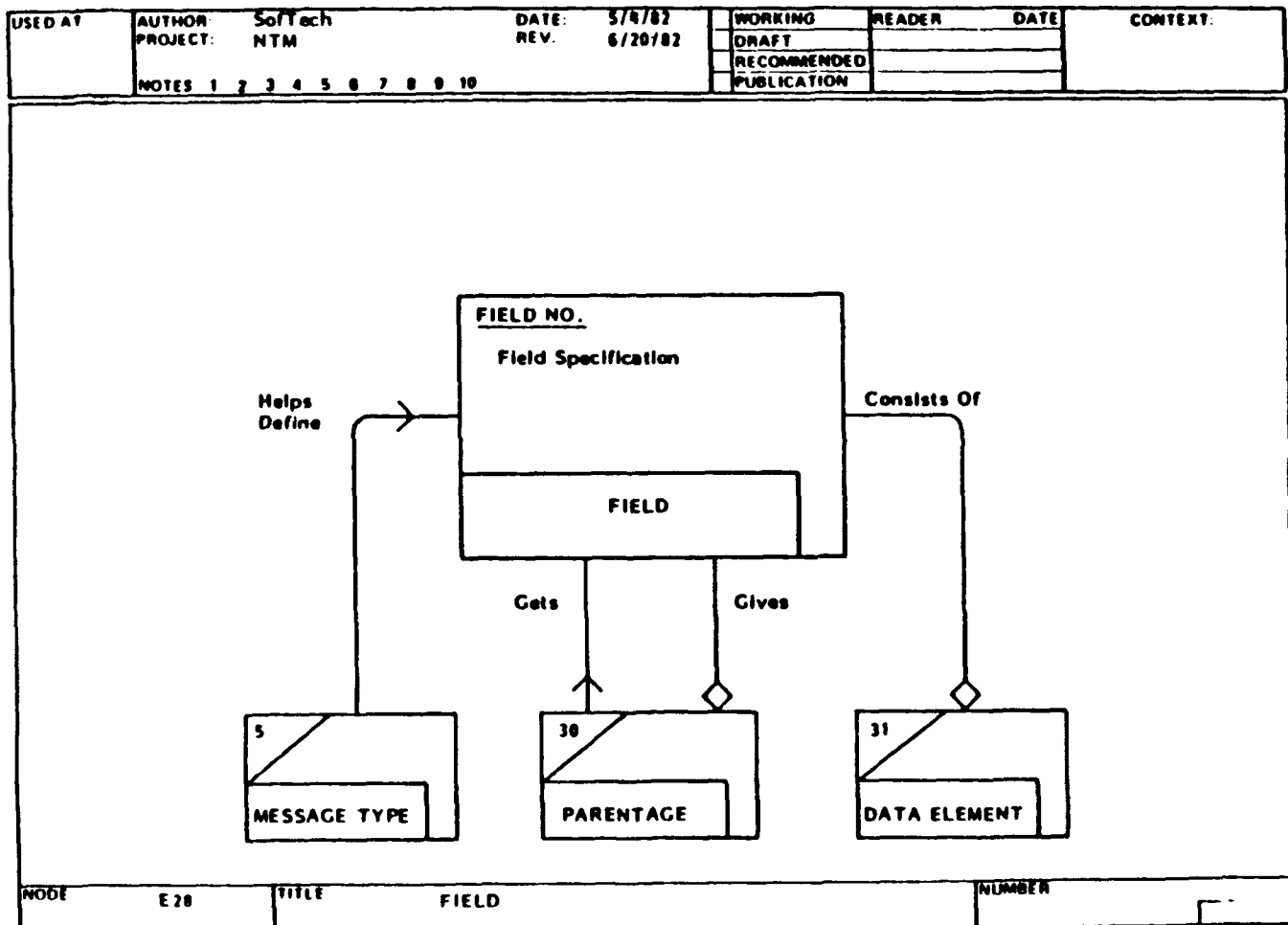
DS 620342000
30 September 1990



DS 620342000
30 September 1990



DS 620342000
30 September 1990



DS 620342000
30 September 1990

USED AT:	AUTHOR: SoftTech PROJECT: NTM	DATE: 5/8/82 REV:	WORKING ☒ DRAFT ☐ RECOMMENDED ☐ PUBLICATION	READER: _____ DATE: _____	CONTENT
NOTES: 1 2 3 4 5 6 7 8 9 10					

ELEMENT NAME

TYPE OF ELEMENT

Characterizes

31

DATA ELEMENT

MOD: E39	TITLE: TYPE OF ELEMENT	PAGE: 1

DS 620342000
30 September 1990

USED AT:	AUTHOR: SoTech PROJECT: NTM	DATE REV: 5/6/82	WORKING ☒ DRAFT ☐ RECOMMENDED ☐ PUBLICATION	READER	DATE	CONTEXT:
NOTES: 1 2 3 4 5 6 7 8 9 00						

FIELD NO.

FIELD 28

Gets
↑

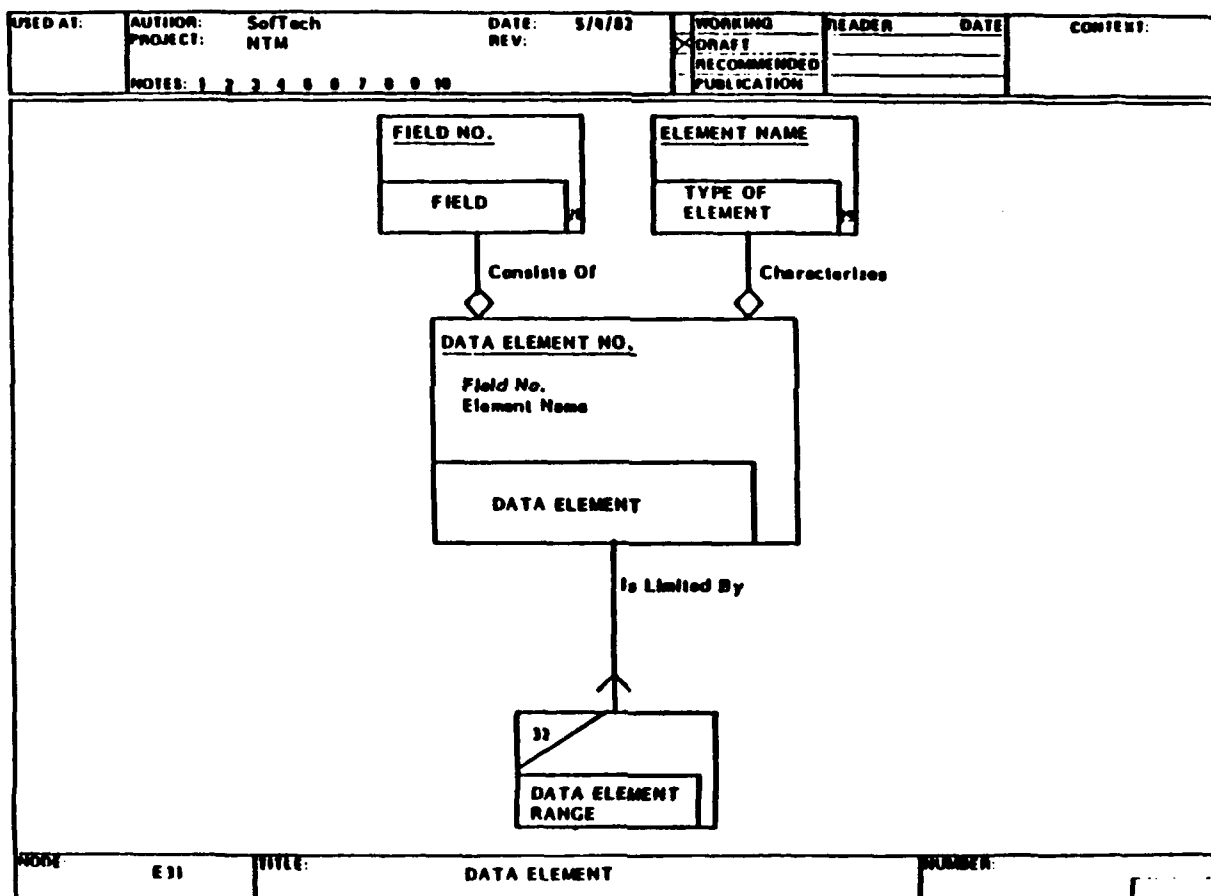
Gives
◇

FIELD NO. (of Parent)
FIELD NO. (of Child)

PARENTAGE

NAME: E 30	TITLE: PARENTAGE	NUMBER: 1

DS 620342000
30 September 1990



DS 620342000
30 September 1990

USED AT:	AUTHOR: SolTech	DATE: 5/8/82	WORKING	READER	DATE	CONTENT:
	PROJECT: NTM	REV:	☒ DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10		☐ RECOMMENDED			
			☐ PUBLICATION			

DATA ELEMENT NO.

DATA ELEMENT

Is Limited By

DATA ELEMENT NO.

DATA ELEMENT RANGE

PAGE	E 32	TITLE	DATA ELEMENT RANGE	NUMBER

DS 620342000
30 September 1990

USED AT:	AUTHOR: SolTech	DATE: 10/7/82	WORKING	READER	DATE	CONTEXT:
	PROJECT: NTM	REV	DRAFT			
			RECOMMENDED			
			PUBLICATION			
NOTES 1 2 3 4 5 6 7 8 9 10						

MESSAGE CATEGORY ID
 Authorization Requirement
 Pairing Requirement
 Guaranteed Delivery
 Statistics Collection Flag
 Message Priority
 Log Requirement

MESSAGE CATEGORY

Defines Processing For

19

MESSAGE

MODE E 36	TITLE MESSAGE CATEGORY	NUMBER:

DS 620342000
30 September 1990

USED AT	AUTHOR: SoFTech	DATE: 2/2/83	WORKING	READER	DATE	CONTEXT:
	PROJECT: NTM	REV:	DRAFT			
			RECOMMENDED			
	NOTES: 1 2 3 4 5 6 7 8 9 10		PUBLICATION			

```

graph TD
    A[AP NAME  
APPLICATION PROCESS 17] -- "Is Source In" --> C["(SOURCE) AP NAME, (DEST)  
AP NAME, MSG TYPE ID  
AUTHORITY"]
    B[MSG. TYPE ID  
MESSAGE TYPE 5] -- "Is Dest. In" --> C
    D[MSG. TYPE ID  
MESSAGE TYPE 5] -- "Provides Definition For" --> C
  
```

The diagram illustrates the following entities and relationships:

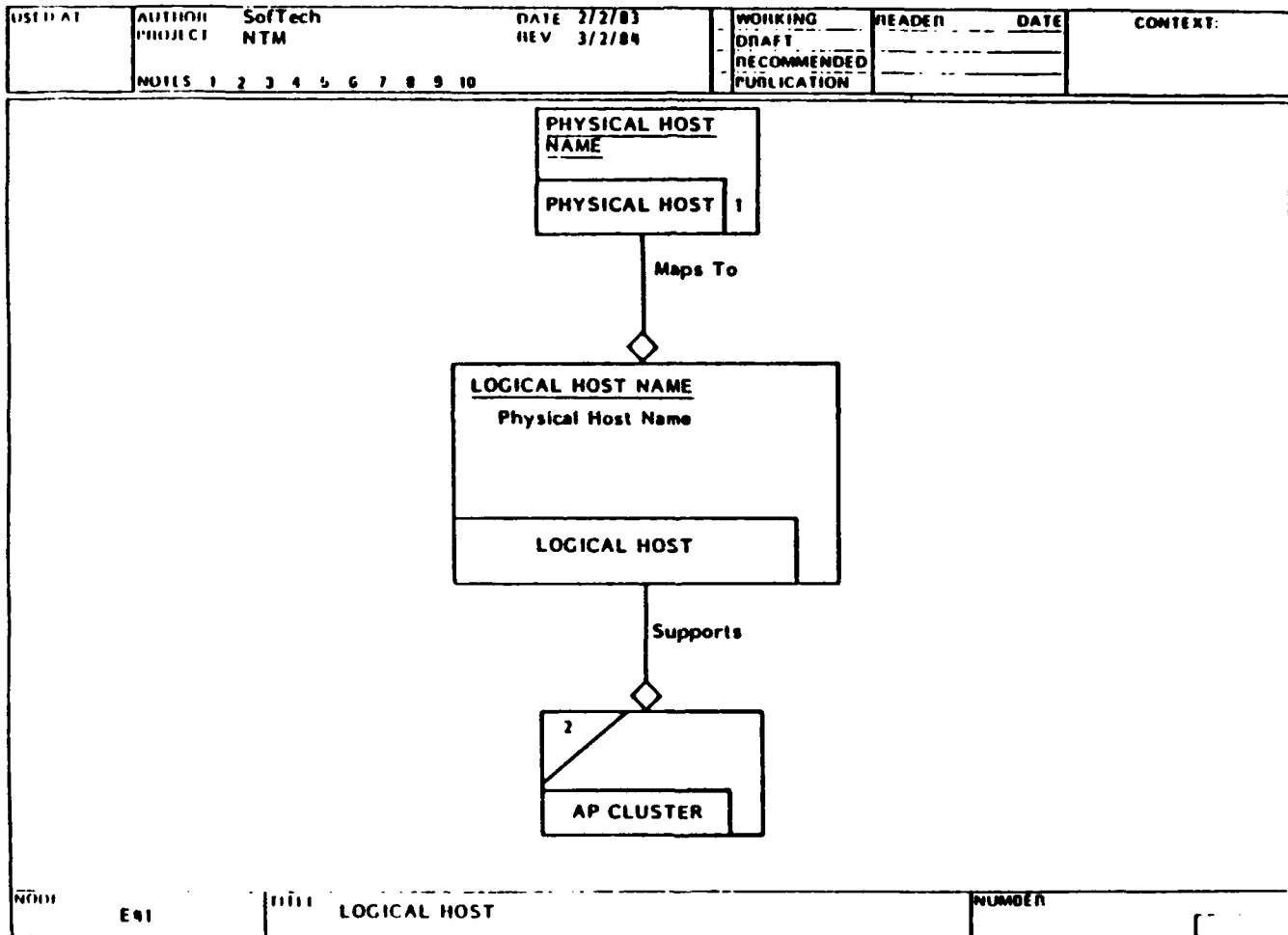
- Entity 1:** AP NAME (APPLICATION PROCESS) with cardinality 17.
- Entity 2:** MSG. TYPE ID (MESSAGE TYPE) with cardinality 5.
- Entity 3:** (SOURCE) AP NAME, (DEST) AP NAME, MSG TYPE ID. This entity includes an AUTHORITY field.

Relationships:

- Entity 1 is connected to Entity 3 via a relationship labeled "Is Source In".
- Entity 2 is connected to Entity 3 via a relationship labeled "Is Dest. In".
- Entity 2 is connected to Entity 3 via a relationship labeled "Provides Definition For".

MODE	TITLE	NUMBER
E 40	AUTHORITY	

DS 620342000
30 September 1990



DS 620342000
30 September 1990

USED AT:	AUTHOR: SofTech PROJECT: NTM	DATE: 2/2/83 REV: 3/2/84	WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT:
NOTES: 1 2 3 4 5 6 7 8 9 10						

```

classDiagram
    class AWAKE_AP {
        AP_NAME, INSTANCE
        AWAKE_AP
    }
    class CHANNEL_ID {
        CHANNEL_ID, (ORIG SOURCE) AP NAME, INSTANCE
        LOGICAL CHANNEL
    }
    class SPAWN {
        (PARENT) AP NAME, INSTANCE
        (CHILD) AP NAME, CHILD
        INSTANCE CHANNEL ID
        SPAWN
    }
    AWAKE_AP "16" --> SPAWN : Is Parent Of
    AWAKE_AP "16" --> SPAWN : Is
    CHANNEL_ID "50" --> SPAWN : Contains
  
```

NODE:	E42	TITLE: SPAWN	NUMBER:

DS 620342000
30 September 1990

USED AT	AUTHOR: SoftTech	DATE: 2/2/83	WORKING	READER	DATE	CONTEXT:
	PROJECT: NTM	REV:	DRAFT			
	NOTES 1 2 3 4 5 6 7 8 9 10		RECOMMENDED			
			PUBLICATION			

AP, NAME, INSTANCE

AWAKE AP 16

Has

AP NAME, INSTANCE, MAILBOX NAME

MAILBOX

NAME	E47	TITLE MAILBOX	NUMBER

DS 620342000
30 September 1990

USED AT	AUTHOR SolTech	DATE 2/27/83	WORKING	READER	DATE	CONTEXT:
	PROJECT: NTM	REV.	DRAFT			
	NOTES 1 2 3 4 5 6 7 8 9 10		RECOMMENDED			
			PUBLICATION			

PHYSICAL HOST
NAME

PHYSICAL HOST 1

Is One End Of
↓
◇

Is Other End Of
↓
◇

LINK ID
(Start) Physical Host Name
(End) Physical Host Name
Link Status

LINK

NAME	TYPE	NUMBER
E40	LINK	

DS 620342000
30 September 1990

USED AT	AUTHOR PROJECT	SoftTech NTM	DATE REV	2/2/83	WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT:			
NOTES		1	2	3	4	5	6	7	8	9	10

MSG. SERIAL #, (SOURCE) AP CLUSTER
MESSAGE

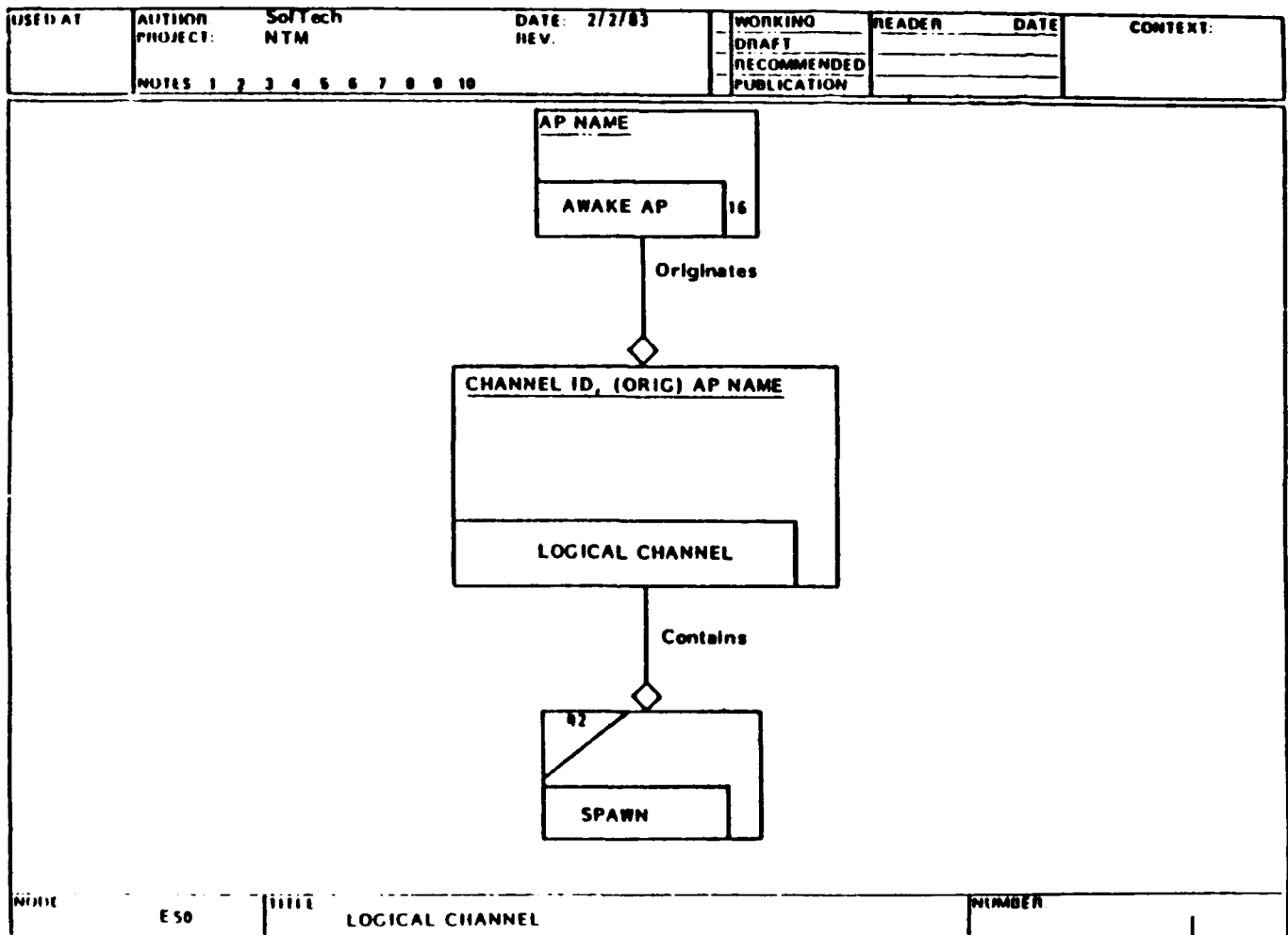
↑
Is

MSG SERIAL #, (SOURCE) AP CLUSTER
Time Stamp When Accepted

GD MESSAGE

NOTE	E49	TITLE	GD MESSAGE	NUMBER	1

DS 620342000
30 September 1990



DS 620342000
30 September 1990

USED AT	AUTHOR PROJECT	DATE: 2/2/83 REV:	WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT:
NOTES 1 2 3 4 5 6 7 8 9 10						

AP NAME, INSTANCE
AWAKE AP

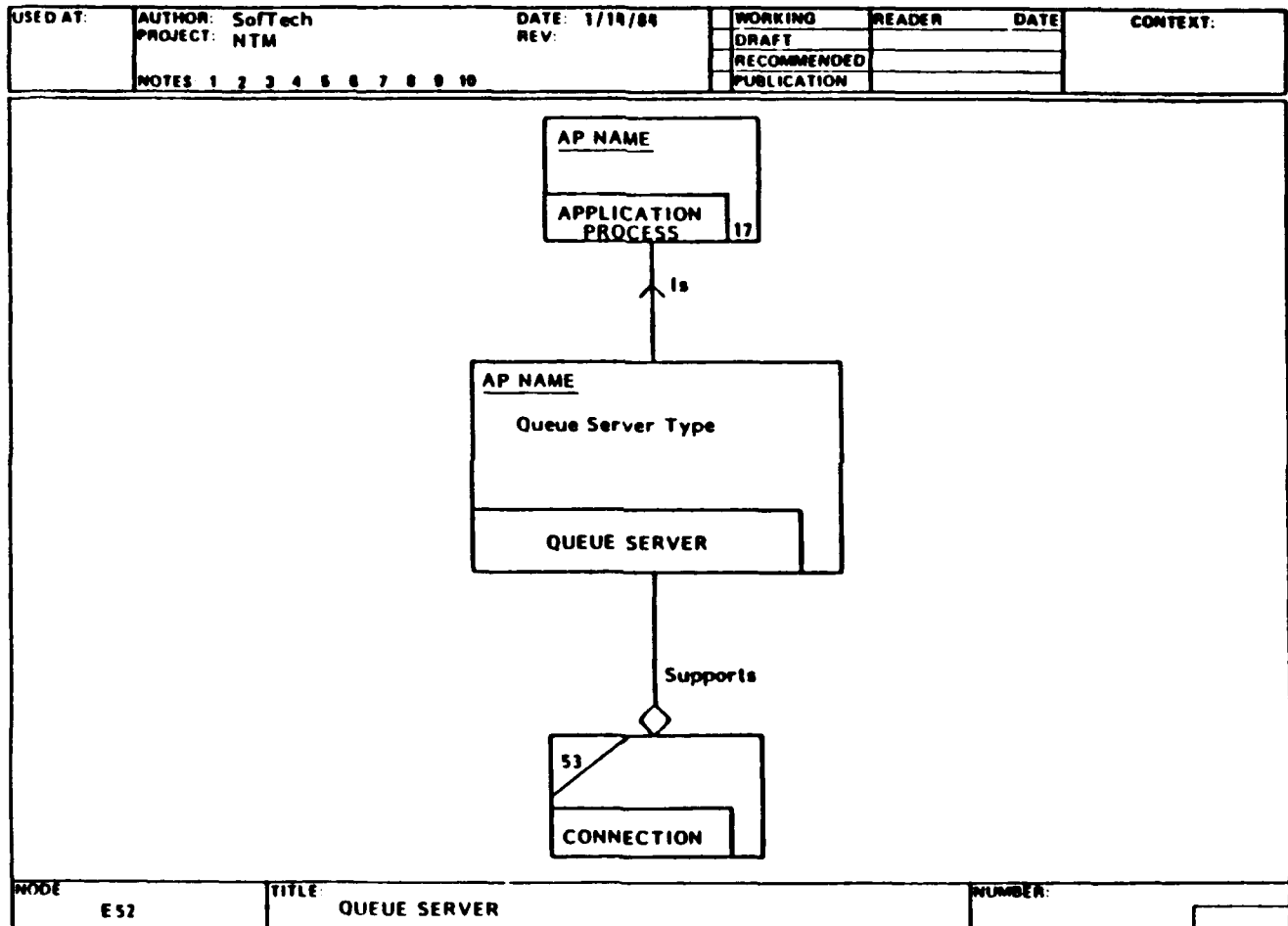
Is
↑

AP NAME, INSTANCE
Child Status
Child Rank

CHILD

NODE	SI	TITLE	CHILD	NUMBER

DS 620342000
30 September 1990



DS 620342000
30 September 1990

USED AT:	AUTHOR: SoTech	DATE: 2/27/84 REV.	WORKING	READER	DATE	CONTEXT:
	PROJECT: NTM		DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10		RECOMMENDED			
			PUBLICATION			

```
classDiagram
    class AP_NAME {
        QUEUE_SERVER 52
    }
    class AP_NAME_PSEUDO_INSTANCE {
        CONNECTION
    }
    AP_NAME "1" -- "1" AP_NAME_PSEUDO_INSTANCE : Supports
```

MODE: E3	TITLE: CONNECTION	NUMBER:

APPENDIX D

D.1 Data Item Descriptions

Each data item required by the NTM is defined below. The items are presented in alphabetical order for easy reference. The data items used by the AP interface services are described in the System Services Manual [8].

Data Item Name: Access Flag

Data Item ID: ACCFLG

Data Item Description:

Identifies whether the access to a given AP is restricted or open. This applies only to messages belonging to categories defined as requiring authorization.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 X Ref.: N/A

Data Item Stability: Static

Legal Value Set By:
AP Developer

Where Used: Authority Check Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Restricted	0	Ap has restricted Access - requires an authority check
Open	1	AP has open access - no authority required

Data Item Name: ACK to Source MPU

Data Item ID: MPUACK

Data Item Description:

Identifies whether the message causing the initiation of an AP conforms to category E (unsolicited message). Where the initiation message is category E, the destination MPU will return an unsolicited Initiation Accept (message type IA) to the source MPU.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 X Ref.: N/A

Data Item Stability: Dynamic

Legal Value Set By:
Message Category

Where Used: I'm Alive Table
Value

<u>Legal Values</u>	<u>Representation</u>	<u>Value Definition</u>
No Send ACK	0 initiation	No ACK required on
Send-ACK	1	ACK required on initiation

Data Item Name: AP Cluster "Cold" Mailbox Data Item ID: APCCMB

Data Item Description:

The name of the mailbox used for low priority messages coming into the AP Cluster. The messages may either be from a resident AP or from another cluster.

The priority level is determined by the message category and is relative to the NTM. The priority under consideration in this case has no bearing on the priority of an Application Process.

Data Item Picture: X(14)
Coding Type: Alpha/Numeric
Data Item Stability: Dynamic*

Size in Bytes: 14
IDEF1 XRef: EC 2
Legal Value Set By:
Derivation from APC
Name

Where Used: APC Startup

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Mon-VAX-C-MBX	MRVCbbbbbbbbbb**	VAX Monitor APC Cold Mailbox
Mon-IBM-C-MBX	MRICbbbbbbbbbb	IBM Monitor APC Cold Mailbox
User-Int-C-MBX	UIVCbbbbbbbbbb	User Interface Cold Mailbox
COMM-VAX-C-MBX	COVCbbbbbbbbbb	VAX COMM APC Cold Mailbox
COMM-IBM-C-MBX	COICbbbbbbbbbb	IBM COMM APC Cold Mailbox
CDM-C-MBX	CDMCbbbbbbbbbb	CDM APC Cold Mailbox

*In all cases, the distinction between static and dynamic data is based on whether the data is obtained from the CDM, or generated within the NTM. Therefore, data obtained from the CDM is static. All other items are dynamic.

**Note: the last byte in the mailbox name is reserved for non-NTM use.

Data Item Name: AP Cluster "Hot" Mailbox Data Item ID: APCHMB

Data Item Description:

The name of the mailbox used for high priority messages coming into the AP Cluster. The messages may either be from a resident AP or from another cluster.

Data Item Picture: X(14)

Size in Bytes: 14

Coding Type: Alpha/Numeric

IDEFl XRef: EC 2

Data Item Stability: Dynamic

Legal Value Set By:
Derived from APC Name

Where Used: APC Startup

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Mon-VAX-H-MBX	MRVHbbbbbbbbbbb*	VAX Monitor APC Hot Mailbox
Mon-IBM-H-MBX	MRIHbbbbbbbbbbb*	IBM Monitor APC Hot Mailbox
User-Int-H-MBX	UIVHbbbbbbbbbbb	User Interface APC Hot Mailbox
COMM-VAX-H-MBX	COVHbbbbbbbbbbb	VAX COMM APC Hot Mailbox
COMM-IBM-H-MBX	COIHbbbbbbbbbbb	IBM COMM APC Hot Mailbox
CDM-H-MBX	CDMHbbbbbbbbbbb	CDM APC Hot Mailbox

*Note: The last byte in the mailbox name is reserved for non-NTM use.

Data Item Name: AP Cluster Name

Data Item ID:
APCNME

Data Item Description:

The AP Cluster name identifies a given occurrence of an AP Cluster residing on the IISS. An AP Cluster is defined as a logically related group of application processes that reside on a single host machine. The processes are collected at a single AP Cluster because of their common need to access the same database. A cluster may not have any database but it will never have more than one.

Each cluster within the IISS is controlled by its own occurrence of an MPU. The control by the MPU extends to receiving messages, verifying messages, rejecting bad messages, routing messages to their appropriate destination, and servicing the resident application processes via the AP Interface.

The AP Cluster is always assigned to a single logical host but that assignment is allowed to change. The tracking of which logical host the AP cluster is currently assigned to is kept in the APC Status Table.

Data Item Picture: X(3) Size in Bytes: 3
Coding Type: Alpha IDEF1 XRef: EC 2
Data Item Stability: Static Legal Value Set By:
NTM Developers

Where Used: Message Header; APC Status Table; AP Information Table; Logon Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Mon-VAX	MRV	Monitor AP's APC on the VAX Supporting the Operator's Console

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Mon-IBM	MRI	Monitor AP's APC on the IBM
User-Int	UIV	User Interface APC on the VAX
Comm-Hdler-VAX	COV	VAX COM AP Cluster
Comm-Hdler-IBM	COI	IBM COM AP Cluster
CDM	CDM	CDM APC

Data Item Name: AP Cluster Status Data Item ID: APCSTS

Data Item Description:
The AP Cluster status identifies the current operational status of a given cluster.

Data Item Picture: X Size in Bytes: 1
Coding Type: Alpha/Numeric IDEF1 XRef: EC 2
Data Item Stability: Dynamic Legal Value Set By:
Monitor AP

Where Used: APC Status Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Clus-Up	1	Cluster is up
Clus-Unavail	2	Cluster is not active
Clus-Shutting-Down	3	Cluster is in Shutdown Mode
Clus-In-Startup	4	Cluster is in Startup Mode
Clus-Start-Flag	5	Cluster to be started on IISS startup

Data Item Name: Application Process Name Data Item ID: APNAME

Data Item Description:

This data item identifies a unique "generic" Application Process known to the IISS. An AP is defined as a cohesive unit of software within the IISS that can be initiated as a unit to perform some function or functions. Each application process name is considered to be a Legal System Address.

The naming convention for AP names is to reserve the first two characters for the name of the subsystem to which the AP belongs. The second three characters will identify the specific process within the subsystem.

The AP name is the key portion of the message header source, destination, and originating source fields. It cannot, by itself, provide all the information needed to route messages and is therefore concatenated with Instance (when known) and resident AP Cluster.

Data Item Picture: X(8)*

Size in Bytes: 8*

Coding Type: Alpha/Numeric

Owner IDEF1 XRef: EC 17

Data Item Stability: Static

Legal Value Set By:
Application Programme
in accordance with IISS
naming conventions*

Where Used: AP Information Table; Message Header; AP Status Table; Child Table; AP Characteristics Table; Logon Table; AP Operating Information Table; I'm Alive Table; Authority Check Table NTM System Services

*AP Naming conventions dictate an 8 Character base Name. To name a two character prefix to identify the directory where the AP's executable image is located is appended. This ten character name is the common reference to the AP throughout the NTM.

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Monitor AP NTMONTI	NTMONITV host machine	Monitor AP on the VAX Monitor AP on the IBM host machine
Communications Handler	COMVICOM	COMM linking the VAX to the IBM
	COMIVCOM	COMM linking the IBM to the VAX
MPU-Mon-VAX	NTMRVMPU	MPU serving the Monitor AP's APC on the VAX
MPU-Mon-IBM	NTMRIMPU	MPU serving the Monitor AP's APC on the IBM
MPU-User-Int	NTUIVMPU	MPU serving the User Interface APC
MPU-COMM-Hdlr-VAX	NTCOVMPU	MPU serving the COMM APC on the VAX
MPU-COMM-Hdlr-VAX	NTCOIMPU	MPU serving the COMM APC on the IBM
MPU-CDM	NTCDMMPU	MPU serving the CDM APC
<u>Data Item Name:</u> AP Cold Mailbox		<u>Data Item ID:</u> APCMBX

Data Item Description:

Identifies the low priority mailbox for a given instance of an application process.

Data Item Picture: X(14)

Size in Bytes: 14

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 47

Data Item Stability: Dynamic

Legal Value Set By:
AP Interface

Where Used: Message Processing Unit

Representation:

01	AP-Cold-Mailbox	
03	AP-Name	PIC X(10).
03	AP-Instance	PIC X(2).
03	Mailbox-Type	PIC X Value "C".
03	Filler	PICX

Data Item Name: AP ACK Mailbox

Data Item ID: APAMBX

Data Item Description:

Identifies the name of the mailbox to which acknowledgement messages are to be sent.

Data Item Picture: X(14)

Size in Bytes: 14

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 47

Data Item Stability: Dynamic

Legal Value Set By:
AP Interface

Where Used: Message Processing Unit

Representation:

01	AP-ACK-Mailbox	
03	AP-Name	PIC X(10).
03	AP-Instance	PIC X(2).
03	Mailbox-Type	PIC X Value "A".
03	Filler	PICX

Data Item Name: AP Hot Mailbox

Data Item ID: APHMBX

Data Item Description:

Identifies the low priority mailbox for a given instance of an application process.

Data Item Picture: X(14)

Size in Bytes: 14

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 47

Data Item Stability: Dynamic

Legal Value Set By:
AP Interface

Where Used: Message Processing Unit

Representation:

01	AP-Hot-Mailbox	
03	AP-Name	PIC X(10).
03	AP-Instance	PIC X(2).
03	Mailbox-Type	PIC X Value "H".
03	Filler	PICX

Data Item Name: AP Priority

Data Item ID: APPRC

Data Item Description:

The priority level assigned to a given Application Process.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 17

Data Item Stability: Static

Legal Value Set By:

Where Used: Message Header; AP Characteristics Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Default	0 for the Test Bed	Default AP Priority

Data Item Name: Application Process Status Data Item ID: APSTAT

Data Item Description:

This item defines the current operational status of a given initiated instance of an application process.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 16

Data Item Stability: Dynamic

Legal Value Set By:
AP's MPU

Note: All of these values are applied to an AP instance - Not to the "generic" AP

Where Used: AP Status Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
AP-Init	0	AP is in initiation mode ("I'm alive" msg has not yet arrived at MPU)
AP-Abort	1	AP has been aborted
AP-Dead-Act-Cld	2	AP has terminated but its child AP(s) are still active

AP-Dead	3	AP has normally terminated
Await-Init		AP is waiting for an initiation message
Init-Canc	5	AP's initiation was canceled
Shut-Down-Mode	6	AP is in the process of shutting down

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
In-Recovery	7	AP is in recovery mode
In-Wait	8	AP is waiting on a response to a paired message
Shut-Down	9	AP has completed shutdown and is dead
Recovered	A	AP has finished recovery and is available for initiation
AP-Executing	B	AP is executing

Data Item Name: Authorization Requirement

Data Item ID: AUTREQ

Data Item Description:

The authorization requirement identifies whether a message conforming to a given category needs to have the authority of its sender, Message Type, and receiver checked.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 36

Data Item Stability: Static

Legal Value Set By:
Message Category

Where Used: Message Category Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Aut-Yes	1	Authorize Message
Aut-No	0	Don't Authorize Message

Data Item Name: Authorized to Receive Data Item ID: ATOREC

Data Item Description:

This item is not a pure data item. It is the name of the field in the Authority Table that contains the AP Name that is authorized to receive a given message Type from an AP Name that is authorized to send the same given message type. The field name defines the function of the values that are contained in the field.

The values in the field are represented as the AP Name.

Data Item Name: Authorized to Send Data Item ID: ATOSND

Data Item Description:

This item (as Authorized to Receive) is a field name in the Authority Table which defines the function of the values that are contained in the field. The value in this field of the Authority Table is the AP Name that is authorized to send a given message type to another AP that is authorized to receive the same given message type.

The values in this field are AP Names and are represented as defined for the AP Name data item.

Data Item Name: Binary/Native Flag Data Item ID: BINNAT

Data Item Description:

Identifies the generic type of data contained in the data portion of a message. Binary indicates that the data is in the host machine's internal representation form whereas native indicates that the data is character data represented by the host machine's character code (ASCII, EBCDIC, etc.).

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 19

Data Item Stability: Dynamic

Legal Value Set By:
User (or default)

Where Used: Message Header

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Binary	B	Message is encoded in binary mode
Native	N	Message is encoded in native mode (default value)

Data Item Name: Channel Range End Data Item ID: CHANED

Data Item Description:
The highest Logical Channel ID in the range of ID's allocated to a user at logon. This item is represented as a logical channel ID. It's value is dynamic. It is used as a field in the Logon Table.

Data Item Name: Child Rank Data Item ID: RANK

Data Item Description:
A numeric ranking assigned to the child AP when its child table entry is created. The rank loosely correlates to the order in which the child AP's are spawned. The rank number is used in combination with the Parent AP Name as a link list pointer through the child Table.

Data Item Picture: 9(4) Size in Bytes: 4

Coding Type: Numeric IDEF1 XRef: EC 51

Data Item Stability: Dynamic Legal Value Set By:
User (or default)

Where Used: Child Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
	0001-9999	

Data Item Name: Channel Range Start Data Item ID: CHANST

Data Item Description:
The lowest Logical Channel ID in the range of ID's allocated to a user at Logon. This item is represented as a Logical Channel ID. It's value is dynamic. The item is used as a field in the Logon Table.

Data Item Name: Child Status Data Item ID: CLDSTS

Data Item Description:
This item defines the current operational status of a given child AP. The status values provided are only in terms of the child's relation to the Parent AP. The status of the child AP as an entity unto itself is provided in the AP Status Table.

Data Item Picture: X Size in Bytes: 1

Coding Type: Alpha/Numeric IDEF1 X Ref.: EC51

Data Item Stability: Dynamic Legal Value Set By:
Child AP's MPU

Where Used: Child Table

<u>Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Abort-ACK	1	Abort Message sent to child AP has been acknowledged
N-Term-No-Cld	2	Child AP has normally terminated leaving no active children of its own
SD-APC	3	Child AP has been shutdown in APC SD Mode
SD-AP	4	Child AP has been shutdown in AP SD mode
SD-Host	5	Child AP has been shutdown in Host SD mode
CLD-Initiated	6	Child AP has been initiated

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Normal-Term-With-Child	7	Child AP has normally terminated leaving active children

Data Item Name: Child Table Index Data Item ID: CLDIND

Data Item Description:

This item exists in the AP Status Table to serve as an index to the given AP Instance's first entry in the child status table. It is a dynamic item whose values are determined when the Child Table entry is written. It is represented in COBOL as PIC 9(4).

Data Item Name: Children Data Item ID: CHLDRN

Data Item Description:

Identifies whether a given AP has any child AP's associated with it.

Data Item Picture: X Size in Bytes: 1

Coding Type: Alpha/Numeric IDEF1 XRef: EC 51

Data Item Stability: Dynamic

Legal Value Set By:
Local MPU

Where Used: AP Status Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
No-Kids	0	AP has no associated child AP's
Kids	1	AP has associated child AP's

Data Item Name: Continuation Indicator Data Item ID: CONIND

Data Item Description:
This item identifies whether a given message is part of a larger group of messages.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 19

Data Item Stability: Dynamic
AP Interface

Legal Value Set By:

Where Used: Message Header

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
First Part	1	Message is the first part of a larger group and is continued
Not Continued	0	Message is complete within itself
Middle Part	2	Message is somewhere in the middle of a continued message.
Last Part	3	Message is the last part of a continued message.

Data Item Name: Data Code

Data Item ID: DATACD

Data Item Description:
This item is used in the I'M Alive Table to indicate whether there is data waiting to be delivered to the AP upon the MPU's receipt of the "I'm Alive" message. This item applies to messages that both cause an initiation to occur and carry data.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 X Ref.: N/A

Data Item "Stability": Dynamic

Legal Value Set By:
Destination MPU

Where Used: I'm Alive Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
No-Data	1	No data waiting
Data-Waiting	2	Data Waiting in buffer
Data-In-Next- Msg	3	Data Arguments are coming in another message

Data Item Name: Data Length

Data Item ID: DATLEN

Data Item Description:

This field exists in the message header to indicate the length of the actual data portion of the message.

Data Item Picture: X(4)

Size in Bytes: 4

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 19

Data Item Stability: Dynamic

Legal Value Set By:
Message Source AP

Where Used: Message Header

Value Range: 0000-9999

Data Item Name: Delay Time Trigger

Data Item ID: TRGTIM

Data Item Description:

The trigger time represents the time value to be used in conjunction with a specified delay trigger condition.

Data Item Picture: X(15)

Size in Bytes: 15

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 19

Data Item Stability: Dynamic

Legal Value Set By:
Source AP or System
Default

Where Used: Message Header

Representation: System Clock Time

Data Item Name: Delay Trigger

Data Item ID: DELTRG

Data Item Description:

The delay trigger indicates the condition under which the message is to be delivered.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 19

Data Item Stability: Dynamic

Legal Value Set By:
Source AP or System
Default

Where Used: Message Header

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Deferred Delay	1	Deliver any time after a specified time (see Delay Time Trigger)
Conditional	2	Deliver upon a specified condition or event (see Delay Trigger condition)
Time-Triggered	3	Deliver at a specified time (see Delay Time Trigger)
Immediate	0	Deliver right now (system default)

Data Item Name: Delay Trigger
Condition

Data Item ID: TRGCON

Data Item Description:

The trigger condition specifies the actual condition under which a message is required to be delivered.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 19

Data Item Stability: Dynamic

Legal Value Set By:
Source AP or System
Default

Where Used: Message Header

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>

TBD

Data Item Name: Guaranteed Delivery Data Item ID: GUARDL

Data Item Description:

This item indicates whether a message conforming to a given category requires guaranteed delivery services. These services involve a concerted effort to insure the delivery of the message to its destination AP.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 36

Data Item Stability: Static

Legal Value Set By:
Message Category

Where Used: Message Category Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>

GD	1	Message Delivery is Guaranteed

No-GD	0	Message Delivery is not Guaranteed

Data Item Name: Guaranteed Delivery Flag Data Item ID: GDFLAG

Data Item Description:

This flag is set when the AP instance is the source of one or more guaranteed delivery messages that have yet to be delivered. Further data on these outstanding guaranteed delivery messages is maintained in the guaranteed delivery table.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 16

Data Item Stability: Dynamic

Legal Value Set By:
AP's MPU

Where Used: AP Status Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>

GD-Out	1	The AP instance has guaranteed messages outstanding-Flag is set

No-GD 0 The AP instance has
no gauranteed
delivery messages -
Flag not set

Data Item Name: Header Format Indicator Data Item ID: HDRFMT

Data Item Description:
The header format ID identifies the particular format of the given message header. The value of this item has no relationship to the data portion of the message.

Data Item Picture: X Size in Bytes: 1

Coding Type: Alpha/Numeric IDEF1 XRef: EC 19

Data Item Stability: Static Legal Value Set By:
NTM Developers

Where Used: Message Header

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
A	A	Header Format A

Data Item Name: Header Length Data Item ID: HDRLEN

Data Item Description:
Specifies the length (in bytes) of the NTM header portion of the message.

Data Item Picture: X(3) Size in Bytes: 3

Coding Type: Alpha/Numeric IDEF1 XRef: EC 19

Data Item Stability: Static Legal Value Set By:
NTM Developers

Where Used: Message Header

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
A-092	092	The length of Header Format A

Value Range: 001-999

Data Item Name: Host Status Data Item ID: HSTSTS

Data Item Description:
The host status identifies the current operational status of a given physical host machine.

Data Item Picture: X Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 1

Data Item Stability: Dynamic

Legal Value Set By:
NTM

Where Used: Host Status Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Up	1	Machine is running
Down	0	Machine is dead
In-Start	2	Machine is being brought up
In-Shutdown	3	Machine is in the process of shutting down

Data Item Name: Initiation Needs

Data Item ID: ININDS

Data Item Description:

Defines whether a given AP requires a specific initiation message (Category H) in order to be started.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 X Ref.: EC17

Data Item Stability: Static

Legal Value Set By:
AP Developer

Where Used: AP Characteristics Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
No-Restric	0	AP can be initiated by any message
Needs-Init-Msg	1	AP requires specific initiation message
Start-From-Term	2	AP is initiated from a terminal-not started by the NTM

Data Item Name: Instance

Data Item ID: INSTNC

Data Item Description:

An identifier assigned to every instance (initiated occurrence) of a given AP. The instance serves to uniquely identify one initiated (awake) AP. In the case of the User

Interface AP, the instance will map to a specific terminal (or screen, in multiscreen mode). The instance identifier is associated with an AP from its initiation until the AP and its associated instances are cleaned up.

Data Item Picture: X(2) Size in Bytes: 2
Coding Type: Alpha/Numeric IDEF1 XRef: EC 16
Data Item Stability: Dynamic Legal Value Set By:
Local MPU

Where Used: AP Status Table; Message Header; I'm Alive Table

Value Range: 01-99

Data Item Name: Instances Currently Running Data Item ID: NUMINS

Data Item Description:
This data item identifies the number of instances of a given AP which are currently in some stage of operation.

Data Item Picture: X(2) Size in Bytes: 2
Coding Type: Alpha/Numeric IDEF1 XRef: EC 16
Data Item Stability: Dynamic Legal Value Set By:
Local MPU

Where Used: AP Operating Information Table

Value Range: 00-36

Data Item Name: Integrity Check Flag Data Item ID: INTCHK

Data Item Description:
Indicates whether the data portion of a given message should be validated against the data format specified in the message header.

Data Item Picture: X Size in Bytes: 1
Coding Type: Alpha/Numeric IDEF1 XRef: EC 19
Data Item Stability: Dynamic Legal Value Set By:
Source AP or System Default

Where Used: Message Header

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Check	1	Data portion is to be checked for data integrity

No-Check	0	Data portion is not to be checked
<u>Data Item Name:</u> Last Instance Number Assigned		<u>Data Item ID:</u> LSTINS
<u>Data Item Description:</u> This item provides the value of the last instance number assigned to an instance of a given AP.		
<u>Data Item Picture:</u> X(2)		<u>Size in Bytes:</u> 2
<u>Coding Type:</u> Alpha/Numeric		<u>IDEFl XRef:</u> EC 17
<u>Data Item Stability:</u> Dynamic		<u>Legal Value Set By:</u> MPU
<u>Where Used:</u> AP Operating Information Table		
<u>Value Range:</u> 01-99		
<u>Data Item Name:</u> Last Key Pointer		<u>Data Item ID:</u> LSTKEY
<u>Data Item Description:</u> Pointer to the last key value assigned for a given AP for messages queued in the AP queue.		
<u>Data Item Picture:</u> X(9)		<u>Size in Bytes:</u> 9
<u>Coding Type:</u> Alpha/Numeric		<u>IDEFl XRef:</u> EC 16
<u>Data Item Stability:</u> Dynamic		<u>Legal Value Set By:</u> MPU
<u>Where Used:</u> AP Status Table		
<u>Data Item Name:</u> Link ID		<u>Data Item ID:</u> LINKID
<u>Data Item Description:</u> The identification of a specific communications link between two physical host machines. The link is maintained by "sibling" COMM AP's.		
<u>Data Item Picture:</u> X(2)		<u>Size in Bytes:</u> 2
<u>Coding Type:</u> Alpha/Numeric		<u>IDEFl XRef:</u> EC 48
<u>Data Item Stability:</u> Static		<u>Legal Value Set By:</u> NTM Developers
<u>Where Used:</u> Link Status Table		
<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>

VAX-IBM

VI

Link between the VAX
11/780 and the IBM
4381

Data Item Name: Link Status

Data Item ID: LKLSTAT

Data Item Description:

The current operational status of a given link.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 X Ref.: EC48

Data Item Stability: Dynamic

Legal Value Set By:
VAX Monitor AP

Where Used: Link Status Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Active	1	Link is Active
Inactive	0	Link has failed
Started	2 has been sent-no return yet	Start Link message

Data Item Name: Log Requirement

Data Item ID: LOGREQ

Data Item Description:

The log requirement identifies whether a message is to be logged based upon the given message category. In the Test Bed all messages will be logged. For future releases, logging will be restricted to certain message categories in accordance with the requirements defined by the recovery function.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 36

Data Item Stability: Static

Legal Value Set By:
Message Category

Where Used: Message Category Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Yes	1	Log the Message
No	0 message	Don't log the

Data Item Name: Logical Channel ID Data Item ID: CHANID

Data Item Description:

This item identifies a logical connection between two or more awake APs. This connection is established in two cases. The first case involves the maintenance of a "family tree" of AP instances. The second case serves to identify a unique pair of messages.

Data Item Picture: X(3) Size in Bytes: 3

Coding Type: Alpha/Numeric IDEF1 XRef: EC 50

Data Item Stability: Dynamic Legal Value Set By:
Original Source AP
AP Interface (for
default)

Where Used: Message Header; Message Pairing Table; AP Status Table; Child Status Table.

Representation: Any combination of 3 Alpha or Numeric characters.

Data Item Name: Logical Host Name Data Item ID: HSTNAM

Data Item Description:

Host name identifies an instance of a logical host within a physical host machine on the IISS. The logical host has a number of AP Clusters assigned to it.

Data Item Picture: X(3) Size in Bytes: 3

Coding Type: Alpha/Numeric IDEF1 XRef: EC 41

Data Item Stability: Static Legal Value Set By:

Where Used: Host Status Table; AP Cluster Status Table

Data Item Name: Maximum Instances Data Item ID: MAXINS

Data Item Description:

This item defines the maximum number of instances of a given AP that can be initiated at any given time.

Data Item Picture: X(2) Size in Bytes: 2

Coding Type: Alpha/Numeric IDEF1 XRef: EC 17

Data Item Stability: Static Legal Value Set By:

Where Used: AP Characteristics Table

Data Item Name: Maximum Number of Data Item ID: NOAMSG
Queued Messages

Data Item Description:

This item identifies the maximum number of messages that are allowed to be in a given (generic) AP's queue at any one time.

Data Item Picture: X(2)

Size in Bytes: 2

Coding Type: Alpha/Numeric

IDEFl X Ref.: EC17

Data Item Stability: Static

Legal Value Set By:
AP Developer

Where Used: AP Characteristics Table

Value Range: 00-99

Data Item Name: Message Category

Data Item ID: MSGCAT

Data Item Description:

The message category defines processing required by the message. The category implies the level of processing needed to establish the overall acceptability of the message. It also specifies certain special services the NTM is required to provide.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha

IDEFl XRef: EC 36

Data Item Stability: Static
NTM Developers

Legal Value Set By:

Where Used: Message Header; Message Category Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Guar-Del	A	Message requires a Guaranteed Delivery Service
Resp-Reqd	B	Response Required
SysComd-No Resp	C	System Command - No Response Required
Syscomd-Resp	D	System Command - Response Required
Unsol-Msg	E	Unsolicited Message
Sol-Msg	F	Solicited Message
ApStatus-Msg	G	AP Status Message

Init-Msg-No-Response	H	Message specifically requires the initiation of an AP Instance

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>

Msg-From-COMM	I	Message having a COMM AP as its source

Init-Msg-Response-Required	J	Paired Specific initiation message

<u>Data Item Name:</u> Message Destination	<u>Data Item ID:</u> MSGDST

Data Item Description:

The Application Process that is the receiver of the given message. The destination is defined as the combination of the receiving AP name, instance (if known), and resident AP Cluster. It is represented in the message header as:

```
10 HDR MSGDST
  15 MD APNAME X(10)
  15 MD INSTNC X(2)
  15 MD APCNME X(3)
```

This item is used in the Guaranteed Delivery table to identify the destination of a given GD message.

<u>Data Item Name:</u> Message Log Time Stamp	<u>Data Item ID:</u> TSTAMP

Data Item Description:

The host system clock time at the occurrence of a particular event.

<u>Data Item Picture:</u> X(23)	<u>Size in Bytes:</u> 23

<u>Coding Type:</u> Alpha/Numeric	<u>IDEF1 XRef:</u> N/A

<u>Data Item Stability:</u> Dynamic	<u>Legal Value Set By:</u> Host OS

Where Used: Message and Error Log

<u>Data Item Name:</u> Message Priority	<u>Data Item ID:</u> MSGPRY

Data Item Description:

The priority code identifies the processing priority assigned to a message conforming to a given message category.

<u>Data Item Picture:</u> X	<u>Size in Bytes:</u> 1

<u>Coding Type:</u> Alpha/Numeric	<u>IDEF1 XRef:</u> EC 36

Data Item Stability: Static

Legal Value Set By:
Message Category

Where Used: Message Header; Message Category Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Hot	1	Message has high priority
Cold	0	Message has low priority

Data Item Name: Message Queue Flag Data Item ID: MSGQUF

Data Item Description:

This item is a flag that is set when there are messages in queue waiting for a specified AP Instance.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEFl XRef: EC 16

Data Item Stability: Dynamic

Legal Value Set By:
Local MPU

Where Used: AP Status Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Msg-In	1	There are messages in the queue for the AP Instance - Flag is set
No-Msg	0	There are no messages in the queue - No flag

Data Item Name: Message in Queue

Data Item ID: NMSG

Data Item Description:

Identifies the number of messages currently queued for a given AP instance.

Data Item Picture: X(4)

Size in Bytes: 4

Coding Type: Alpha/Numeric

IDEFl XRef: EC 16

Data Item Stability: Dynamic

Legal Value Set By:
Local MPU

Where Used: AP Status Table

Data Item Name: Message Serial Number

Data Item ID: MSGSN

Data Item Description:

A number that is assigned to each message by its source MPU AP Cluster. The number itself is unique only within an AP Cluster. In order for the message to be uniquely identifiable within the IISS, the serial number is concatenated with the source AP Cluster name.

Data Item Picture: X(7)

Size in Bytes: 7

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 19

Data Item Stability: Dynamic

Legal Value Set By:
Source MPU

Where Used: Message Header; Guaranteed Delivery Table

Data Item Name: Message Serial Number
Last Queued

Data Item ID: SERNLQ

Data Item Description:

The serial number and source AP Cluster of the last message written to the message queue for a given AP instance. The value representation is taken from the header of the message.

This data item is maintained for recovery processing purposes.

Data Item Picture: X(10)

Size in Bytes: 10

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 16

Data Item Stability: Dynamic

Legal Value Set By:
Local MPU

Where Used: AP Status Table

Data Item Name: Message Source

Data Item ID: MSGSRC

Data Item Description:

The Application Process that is the immediate sender of a given message. The source is defined as the combination of the sending AP's name, instance, and resident AP Cluster. It is represented in the message header as:

10 HDR MSGSRC
15 MS APNAME PIC X(10)
15 MS INSTNC PIC X(2)
15 MS APCNME PIC X(3)

This item is used in the Guaranteed Delivery table to identify the source of the given GD message.

Data Item Name: Message Type

Data Item ID: MSGTYP

Data Item Description:

The message type represents the nature of a given message. It is used for authorization purposes where the type is matched to a specified path (source to destination). The message type is also used to specify the format of the data portion of the message.

Data Item Picture: X(2)

Size in Bytes: 2

Coding Type: Alpha

IDEFl X Ref.: EC5

Data Item Stability: Static

Legal Value Set By:
Message Source AP

Where Used: Message Header; Authority Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>

See Appendix E for the definition of Message Types within the NTM.

Data Item Name: Next Sibling Index

Data Item ID: NXTSIB

Data Item Description:

This field is used in the child status table as a pointer between one child AP and it's next sibling (i.e., next child spawned by the same Parent AP). This is a dynamic item whose values are determined by the Child Table rank assignment protocols.

Data Item Name: Number of Connections

Data Item ID: NOCONN

Data Item Description:

Where the AP instance is of the Queue Server Type, this item provides the number of sources that are connected to it at any one time.

Data Item Picture: X(2)

Size in Bytes: 2

Coding Type: Alpha/Numeric

IDEFl XRef: EC 16

Data Item Stability: Dynamic

Legal Value Set By:
Local MPU

Where Used: AP Status Table

Value Range: 00-99

Data Item Name: Number of Mailboxes

Data Item ID: NUMMBX

Data Item Description:

Defines the number of mailboxes a given AP will support. An AP that needs no input will not support any mailboxes. AP's that accept input will support either one mailbox or two. The second mailbox is used by AP's having the capability of receiving unsolicited messages.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 X Ref.: EC17

Data Item Stability: Static

Legal Value Set By:
AP Developer

Where Used: AP Characteristics Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
No-MBX	0	AP has no mailboxes
One-MBX	1	AP supports one mailbox (and a small "ACK" mailbox)
Two-MBX	2	AP supports two mailboxes and is able to receive unsolicited messages (the AP also supports a small "ACK" mailbox)

Data Item Name: Number of Messages

Data Item ID: NUMMSG

Data Item Description:

This item value provides the number of messages in queue waiting for a given generic Application Process (not instance).

Data Item Picture: X(2)

Size in Bytes: 2

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 17

Data Item Stability: Dynamic

Legal Value Set By:
Local MPU

Where Used: AP Operating Information Table

Data Item Name: Number of Parents
Per Instance

Data Item ID: NOPINS

Data Item Description:

Defines the number of "Parents" a given AP instance may have at any one time. This item distinguishes between a single instance type of AP (one parent per instance) and a queue server type of AP (multiple parents per instance). In the case of a queue server this item also serves to define the maximum number of sources that can be connected to it at any one time.

Data Item Picture: X(2)

Size in Bytes: 2

Coding Type: Alpha/Numeric

IDEF1 X Ref.: EC17

Data Item Stability: Static

Legal Value Set By:
AP Developer

Where Used: AP Characteristics Table

Value Range: 01-99

Data Item Name: Number of Tries

Data Item ID: NTRIES

Data Item Description:

Identifies the number of times an entry in the I'm Alive table has been checked. After a given number of checks without receiving an I'm Alive message from the AP, it must be assumed that the AP is in trouble. The MPU will then take appropriate action.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 X Ref.: N/A

Data Item Stability: Dynamic

Legal Value Set By:
NTM Developers

Where Used: I'm Alive Table

Data Item Name: On Abort

Data Item ID: ONABT

Data Item Description:

This item defines how a given generic AP is to be handled when an abort message arrives for it.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 17

Data Item Stability: Static

Legal Value Set By:
AP Developer

Where Used: AP Characteristics Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Run-Comp	1	Run to completion
Send-Abort	2	Forward the abort message to the AP.
Ab-Term	3	Abnormally terminate the AP via an OS Call

Data Item Name: On-Child Abnormal Termination

Data Item ID:
ONCLDA

Data Item Description:

This item is used to indicate whether a given AP requires a status message upon the abnormal termination (abort) of one of its child AP's. It further indicates whether the given AP is to be abnormally terminated itself upon a child abort.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 17

Data Item Stability: Static

Legal Value Set By:
AP Developer

Where Used: AP Characteristics Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
No-Send-Msg	0	No message to AP-MPU status message only
Send-Msg	1	AP wants child abnormal termination message
Abort	2	Abort Parent on Child Abort

Data Item Name: On-Child Normal Termination

Data Item ID: ONCLDT

Data Item Description:

This item is used to indicate whether a given AP requires a status message upon the normal termination of one of its child AP's. It further indicates whether the given AP should be terminated itself upon its child normal termination.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 17

Data Item Stability: Static

Legal Value Set By:
AP Developer

Where Used: AP Characteristics Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
No-Msg only	0	No message to AP-MPU
Req Msg termination	1	AP wants child message

01 Original-Source
 03 Original-Source-AP PICX(10).
 03 Original-Source-Instance PICX(2).
 03 Original-Source-APC PICX(3).

Data Item Name: Pair Flag Data Item ID: PRFLAG

Data Item Description:

The pair flag is set when a given AP Instance has one or more outstanding waits on paired messages.

Data Item Picture: X Size in Bytes: 1

Coding Type: Alpha/Numeric IDEF1 XRef: EC 16

Data Item Stability: Dynamic Legal Value Set By:
Local MPU

Where Used: AP Status Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Pair-Set	1	AP Instance has one or more outstanding waits - Flag is set
No-Pair	0	AP Instance has no paired messages - Flag not set

Data Item Name: Pairing Requirement Data Item ID: PREQMT

Data Item Description:

The pairing requirement indicates whether the message conforming to a given category will require pairing services. These services involve creating an entry into the Message Pair Table, tracking timeouts on a pair, and matching the response message to its request.

Data Item Picture: X Size in Bytes: 1

Coding Type: Alpha/Numeric IDEF1 XRef: EC 36

Data Item Stability: Static Legal Value Set By:
Message Category

Where Used: Message Category Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Pair	1	Message requires pairing
No-Pair	0	Message does not require pairing

Data Item Name: Physical Host Name Data Item ID: PHYHST

Data Item Description:

A physical host machine is an actual instance of a computer. The physical host is referenced as one or more logical host(s) (see Logical Host Name).

Data Item Picture: X(3)

Size in Bytes: 3

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 1

Data Item Stability: Static

Legal Value Set By:
Host Vendor

Where Used: Host Status Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
VAX	VAX	VAX 11/780
IBM	IBM	IBM 4381

Data Item Name: Process Name

Data Item ID: PRONME

Data Item Description:

The name and instance identifier of an alive AP.

Data Item Picture: X(12)

Size in Bytes: 12

Coding Type: Alpha/Numeric

IDEF1 X Ref.: EC 16

Data Item Stability: Dynamic

Legal Value Set By:
AP Interface

Where Used: Message Header, AP Status Table, I'm Alive Table

Representation:

01	Process-Name	
03	AP-Name	PICX(10).
03	AP-Instance	PICX(2).

Data Item Name: Processing Code

Data Item ID: PROCDE

Data Item Description:

When a message is accepted by an MPU, an accept message. (Message Manager ACK-type MA) is sent to the message source AP. In the data portion of this message, the entire header of the accepted message is returned. The AP Interface may retain this header for use on future identical messages. Where the header is reused, the AP Interface sets the Processing Code field value in the header to "1" (used). The MPU can then bypass the normal data integrity checks on the message header.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 X Ref.: N/A

Data Item Stability: Dynamic
AP Interface

Legal Value Set By:

Where Used: Message Header

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Used	1	Message header has been used previously and is acceptable
New	0	Message header has never been checked by the MPU (default value)

Data Item Name: Pseudo Instance

Data Item ID: PINSTNC

Data Item Description:

An identifier assigned to each "connection" of a Queue Server AP requiring message chaining. In effect this item identifies an instance within an instance for those AP's that deal with multiple "Parents" concurrently.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 X Ref.: 53

Data Item Stability: Dynamic

Legal Value Set By:

Where Used: Connection Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
	0-2	

Data Item Name: Queue Server Type

Data Item ID: ASTYPE

Data Item Description:

Identifies the chaining support required by the AP.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 X Ref.: 17

Data Item Stability: Static

Legal Value Set By:
AP Developer

Where Used: AP Information Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>

No Chain

The AP requires no chaining support.

Child-Chain

The NTM will build a child AP chain of any AP's spawned.

Message-Chain

The NTM will build a message or "connection" chain for the AP.

Data Item Name: Role Name

Data Item ID: ROLENM

Data Item Description:

The role name identifies a generic class of human users within the IISS. Each user on the system may be assigned to one or more roles.

Data Item Picture: X(10)

Size in Bytes: 10

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 12

Data Item Stability: Static

Legal Value Set By:
Subsystem Developer

Where Used: Logon Table

Data Item Name: Session Start Time

Data Item ID: STRTME

Data Item Description:

The system clock time when an IISS user's logon request was accepted.

Data Item Picture: X(23)

Size in Bytes: 23

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 12

Data Item Stability: Dynamic

Legal Value Set By:
UI

Where Used: Logon Table

Data Item Name: Statistics Collection
Flag

Data Item ID: STATCO

Data Item Description:

The statistics collection flag indicates whether certain statistical data is to be collected on the given message.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 36

Data Item Stability: Static

Legal Value Set By:
Message Category

Where Used: Message Header; Message Category Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
Collect	1	Collect statistics on this message
No-Collect	0	Don't collect statistics on this message
<u>Data Item Name:</u> Terminal ID		<u>Data Item ID:</u> TERMID

Data Item Description:
A physical instance of a computer terminal on the IISS.

Data Item Picture: X(2) Size in Bytes: 2
Coding Type: Alpha/Numeric IDEF1 XRef: EC 7
Data Item Stability: Static Legal Value Set By:
UI

Where Used: Logon Table

Data Item Name: Test Flag Data Item ID: TSTFLG

Data Item Description:
This flag exists in the message header to indicate whether the source AP of the given message is operating in test mode. This flag serves as a warning to the destination AP to process the message accordingly (i.e., no update processing on a message with the test flag set to "1").

Data Item Picture: X Size in Bytes: 1
Coding Type: Alpha/Numeric IDEF1 XRef: EC 19
Data Item Stability: Dynamic Legal Value Set By:
Source AP or System Default

Where Used: Message Header

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
In-Test	1	Source AP is operating in test mode
No-Test	0	Source AP is operating in normal mode
<u>Data Item Name:</u> Timeout Handling		<u>Data Item ID:</u> TMOI.DL

Data Item Description:

Identifies how a given AP is to be handled in the event that a timeout on a paired message expires before the reply message arrives.

Data Item Picture: X

Size in Bytes: 1

Coding Type: Alpha/Numeric

IDEF1 X Ref.: EC17

Data Item Stability: Static

Legal Value Set By:
AP Developer

Where Used: AP Characteristics Table

<u>Legal Values</u>	<u>Value Representation</u>	<u>Value Definition</u>
No-Can-do-Pairs	0	AP does not send Paired Messages
Cancel-Pair	1	Delete entry in Pair Table
Abort-on-Timeout	2	Abort AP when timeout expires before reply arrives
No-Cancel-Pair	3	Set another timeout and maintain entry in pair table

Data Item Name: Timeout Time

Data Item ID: TMOUTM

Data Item Description:

This item represents the system clock time when the timeout on a given message pair is to expire.

Data Item Picture: X(23)

Size in Bytes: 23

Coding Type: Alpha/Numeric

IDEF1 XRef: N/A

Data Item Stability: Dynamic

Legal Value Set By:
Source MPU

Where Used: Message Pairing Table

Data Item Name: Time Stamp When Accepted

Data Item ID: TSMPA

Data Item Description:

This item is used in the Guaranteed Delivery Table to identify the time that a GD message was accepted by it's source MPU. The value of this item provides the base for determining the "age" of the message. The value is represented as system clock time, COBOL PIC X(23).

Data Item Name: User Name

Data Item ID: USRNAM

Data Item Description:

The name associated with a given human user of the IISS who is currently logged on to the system.

Data Item Picture: X(8)

Size in Bytes: 8

Coding Type: Alpha/Numeric

IDEF1 XRef: EC 12

Data Item Stability: Static

Legal Value Set By:
IISS System
Administrator

Where Used: Logon Table

APPENDIX E

E.1 Message Types

This section defines the various types of messages that the NTM will be handling in the IISS Test Bed. Each type is defined as to its nature and implied processing. In addition, the header values and data portion content for each type is provided.

Certain message types have been "canned" to facilitate their creation and delivery, particularly when an error condition occurs. These messages are indicated by an asterisk (*).

Table E-1 is an overview of all of the message types in terms of their name, code ID, category, path, and next immediate message (where applicable).

Table E-2 provides a review of the message categories along with relevant processing performed by the MPU when it receives a message conforming to the given type.

The message type description are provided in alphabetical order for ease of access.

TABLE E-1
MESSAGE TYPE OVERVIEW

	<u>Type</u>	<u>Category</u>	<u>Path</u>	<u>"Next Msg"</u>
1. Abort AP	AB	C	"Parent" MPU-Child MPU Parent AP - Child MPU	AP Dying
2. Active List	AA	F	MPU - Monitor	(Opt.) Operator Abort
3. AP Already Dead	AM	G	MPU - Monitor	N/A
4. AP Alive	AL	G	AP - Local MPU	System State
5. AP Dying	AD	G	AP - Local MPU	(Opt.) Abort AP
6. AP Ending	AE	E	MPU - AP	N/A
7. AP Init at SD NL		G	MPU - Monitor AP	N/A
8. AP Interface Error*	32	E	MPU - Monitor AP	N/A
9. AP Status Request	SR	B	Any AP - Any MPU	AP Status Return
10. AP Status Return	IS	F	MPU - Requesting AP	N/A
11. APC Alive*	LV	E	MPU - Monitor AP	Global Table Update
12. APC Availa- bility Request	AV	D	AP - Local MPU	APC Available Return
13. APC Available Return	VR	F	Local MPU - AP	N/A

TABLE E-1

MESSAGE TYPE OVERVIEW (Continued)

	<u>Type</u>	<u>Category</u>		<u>Path</u>	<u>"Next Msg"</u>
14. APC Name Request	AN	D		AP - MPU	APC Name Return
15. APC Name Return	NA	F		MPU - AP	
16. APC Status Request	PS	D		AP - Local MPU	APC Status Return
17. APC Status Return	PR	F		Local MPU - AP	N/A
18. APC Terminated	CT	E		MPU - Monitor AP	N/A
19. Cancel Shutdown	CS	C		Monitor AP - UI AP	N/A
20. Change Role					
21. Child AP Status	CD	E		Child APs MPU - Parent APs MPU Cleanup	(On Child Tree Completion)
22. Get User Request	UX	E		AP-Monitor Response	Get User
23. Get User Response	XU	E		Monitor - AP	N/A
24. Cleanup	CL	C		Parent APs MPU - Child APs MPU	N/A
25. GD ACK	GA	C		Dest. MPU - Source MPU	N/A
26. GD Status Request	GS	D		AP - Local MPU	GD Status Return
27. GD Status Return	GR	F		Local MPU - AP	N/A
28. Host Active	HU	C		Monitor AP - Local MPU's	N/A
29. Host Available	HA	E		Monitor AP - Monitor AP	N/A
30. Host Name Request	HN	C		AP - Local MPU	Host Name Return

TABLE E-1

MESSAGE TYPE OVERVIEW (Continued)

Type	Category	Path	"Next Msg"
31. Host Name Return	NH	E Local MPU - AP	N/A
32. Host HR Status Request	D	AP - Local MPU	Host Return
33. Host HO Status	F	Local MPU - AP	N/A
34. Host HT Terminating	F	Monitor AP - Monitor AP	Update Host Table
35. Initiate Comm	AP	CI Monitor AP - Comm AP	N/A
36. Link Active	LA	I Comm AP to	Host Alive
37. Link Fail	LF	Monitor AP I Comm AP - Monitor AP	(Opt.) Shutdown APCs
38. List LR Request	D	Monitor AP - MPU	Active List
39. Logoff	OF	E UI to Monitor AP	N/A
40. Logon LO Request	E	UI AP - Monitor AP	Logon Response
41. Logon LX Response	E	Monitor AP-UI AP	N/A
42. Message After Timeout	MT	E MPU - Monitor AP	N/A
43. Message Mgr. ACK*	MA	E Local MPU - Msg. Source AP	N/A

TABLE E-1

MESSAGE TYPE OVERVIEW (Continued)

	<u>Type</u>	<u>Category</u>		<u>Path</u>	<u>"Next Msg"</u>
44. Message No Accept*	34	E		Local MPU - Source AP	N/A
45. Message for Un- available APC*	MQ	E		MPU - Monitor	Queued Start APC (Operator Option)
46. Message Receive ACK	RA	F		AP - AP	N/A
47. Off-Host MPU Shutting N/A Down		HS		C	Monitor AP -
48. Operator Abort	OA	C		Monitor AP - MPU	AP Dying -Or-Proc. Name Not Found
49. Paired Message Status Request	MS	D		AP - Local MPU	Paired Message Status Return
50. Paired Message Status Return	MR	F		Local MPU - AP	N/A
51. Process Name Not Found	NP	E		MPU - Monitor AP	N/A
52. Proces-* sing Error*	31	E		MPU - Monitor AP	N/A
53. Rebuild Tables	RT	D		Monitor - MPU Rebuilt	Table Data Request Tables

TABLE E-1

MESSAGE TYPE OVERVIEW (Continued)

	<u>Type</u>	<u>Category</u>	<u>Path</u>	<u>"Next Msg"</u>
54. Recover- able Error	RE	E	AP - Monitor AP	N/A
55. Resource Unavailable*	33	E	MPU - Monitor	N/A
56. Shutdown AP	DA	C	Monitor AP - MPU	AP Dying
57. Shutdown AP DC Cluster		D	MPU - MPU Monitor AP - MPU Soft Shutdown	(opt.)
58. Shutdown Comm AP	TR	E	Monitor AP - Comm AP	AP Dying
59. Shutdown Host	SH	B	Monitor AP - Monitor AP Shutdown APC	
60. Shutdown Link	SD	B	Monitor AP - Comm AP	N/A
61. Shutdown Pending	SP	C	Monitor AP - UI AP	N/A
62. Signal Error	SE	E	MPU - AP	N/A
63. Soft Shutdown	SD C	Local MPU - AP	AP Dying	
64. Start Link	L	B	Monitor AP - Comm AP Link Active or Link Fail	
65. Start MPU	SC	C	Monitor AP - Monitor's MPU	N/A
66. System State		SS E	Local MPU - AP	N/A
67. Table Data Request	DR	B	MPU - CDMRP Table Data	Return

TABLE E-1
MESSAGE TYPE OVERVIEW (Continued)

	<u>Type</u>	<u>Category</u>		<u>Path</u>	<u>"Next Msg"</u>
68. Table	Data Return	DL	F	CDMRP - MPU	N/A
69. Table AP	Status Table Statu- Request*		TS	E	MPU - Monitor Return
70. Table MPU	Status N/A Return		ST	F	Monitor AP -
71. Tables	RB Rebuilt		F	MPU - Monitor	N/A
72. Timeout	TE Expired*		E	MPU - Local AP	N/A
73. Unsolicited	CE APC Termi- nation		F	MPU - Monitor	Update APC Table
74. Unsolicited	IA Initiation Accept		G	MPU - MPU	N/A
75. Unsuccessful MPU	N/A Initiation		NI	G	Child MPU - Parent
76. Unstable Table	UT		E	MPU - Monitor	N/A
77. Update APC Table	UA		E	Monitor AP - Monitor AP	N/A
78. Update Host Table	UA		E	Monitor AP - Monitor AP	N/A

TABLE E-2
MESSAGE CATEGORY REVIEW

Category ID	Category Definition	MPU Special Processing* (Beyond basic set of Message Management Functions)
A	Guaranteed Delivery	At Source 1. Checks Authority 2. Creates Entry in Guaranteed Delivery Table 3. Logs the Message 4. Sends Accept Status to AP 5. Routes and Sends the Message At Destination 1. Determines whether message requires AP initiation (and does so if required) 2. Delivers Message 3. Formats and Sends Guaranteed Delivery Accept message on receipt of CALL "GDACK" from AP At Source Again 1. On receipt of Guaranteed Delivery Accept Message - deletes entry in Guaranteed Delivery Table
B	Response Required	At Source 1. Checks Authority 2. Creates Entry in Pair Table 3. Logs Message 4. Routes and Sends Message At Destination 1. Determines whether message requires AP initiation (and does so if required) 2. Delivers Message

*MPU Special Processing is treated here in a rather general sense. Details of these functions are provided in Section 4.2.

TABLE E-2

MESSAGE CATEGORY REVIEW (Continued)

<u>Category ID</u>	<u>Category Definition</u>	MPU Special Processing (Beyond basic set of Message Category ID Category Definition Management Functions)
C	System Command - No Response	At Source A. Where MPU is the source 1. Formats Message 2. Logs Message 3. Routes and Sends Message B. Where Monitor AP is the Source 1. Logs Message 2. Routes and Sends Message At Destination 1. Performs processing in accordance with Message Type
D	System Command - Response Required	At Source 1. Formats Message 2. Creates Entry in Pair Table 3. Logs Message 4. Routes and Sends Message At Destination 1. Performs Processing in accordance with Message Type
E	Unsolicited Message	At Source A. Where MPU is the source 1. Formats Message 2. Logs Message 3. Routes and Sends Message B. Where local AP is the Source 1. Logs Message 2. Routes and Sends Message At Destination 1. Determines whether Message requires AP

DS 620342000
30 September 1990

- Initiation (and does
so, if required)
2. Delivers Message
 3. Sends Initiation ACK
(if required)

TABLE E-2

MESSAGE CATEGORY REVIEW (Continued)

Category ID	Category Definition	MPU Special Processing (Beyond basic set of Message Management functions)
F	Solicited Message	At Source A. Where MPU is the source 1. Formats Message 2. Logs Message 3. Routes and Sends Message B. Where local AP is the Source 1. Logs Message 2. Routes and Sends Message At Destination 1. Locates and deletes Entry in Pair Table (if entry is still in pair table - if entry is not found the message is discarded and an MT message is generated) 2. Delivers Message (if entry was in Pair Table)
G	AP Status Message (from Local AP to its MPU only)	At Source N/A At Destination 1. Updates AP Status Table 2. Performs any processing implied by AP's status (e.g., sending status messages to the AP's Parent, requesting clean-up, etc.)
H	Initiation Message	At Source 1. Checks Authority 2. Creates Child Table Entry 3. Logs Message 4. Routes and Sends Message

At Destination
1. Initiates AP
2. Creates entries in AP
Status Table and I'm
Alive Table

TABLE E-2

MESSAGE CATEGORY REVIEW (Continued)

<u>Category ID</u>	<u>Category Definition</u>	<u>MPU Special Processing (Beyond basic set of Message Management functions)</u>
I	Messages from COMM	At Source 1. Logs Message 2. Creates Entry in Pair Table 3. Routes and Sends Message At Destination 1. Determines whether message requires AP initiation (and does so if required) 2. Delivers Message
J	Paired Specific Initiation	At Source 1. Logs Message 2. Creates entries in Pair Table and child table 3. Routes and Sends Message At Destination 1. Initiates New AP Instance 2. Delivers Message

Message Type: Abort AP

Type ID: AB

Nature of Message:

Message to an MPU informing it that one of its resident AP's is to be abnormally terminated. The MPU will handle the actual abort via either an OS call or by sending this message to the APs that manage "Soft Aborts." The MPU's handling of this message is determined by the given AP's characteristics in regard to aborts.

Path: Parent MPU - Child MPU
Parent AP - Child MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	AP Name (AP	PIC X(10)
Header Length	092	to be aborted)	
Data Length	0013		
Binary/Native Flag	N (Default)		
Priority Flag	1	Channel ID	PIC X(3)
Message Type	AB	(of AP to	
AP Name (Dest.)	Child MPU	be aborted)	
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Child APC		
AP Name (Source)	Parent AP-or-Parent MPU		
Instance (Source)	Parent AP Inst - or - MPU		
	Instance		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	Given by Source AP Int.		
Message Category	C		
Priority of Source AP	from AP Char. Table		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag	0 (Default)		
Delivery Time Trigger	blank (Default)		
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Active List

Type ID: AA

Nature of Message:

List of all active APs on a given AP Cluster. Response to List Request Message.

Path: MPU - Monitor

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	For all Active APs on APC	
Header Length	092	AP Name	PIC X(10)
Data Length	Variable	Instance	PIC X(2)
Binary/Native Flag	N (Default)	On Abort Value	PIC X
Priority Flag	0	(from AP Charc.	
Message Type	AA	Table)	
AP Name (Dest.)	Monitor AP	Original Source	PIC X(15)
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	Providing the List		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	MPU's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	0		
Message Category	F		
Priority of Source AP	0		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag	0 (Default)		
Delivery Time Trigger	blank (Default)		
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	MPU's Channel		
Continuation Flag	0		

Message Type: AP Alive

Type ID: AL

Nature of Message:

Message from an initiated instance of an AP to its local MPU informing it that the AP is up and ready to run. Upon receipt, the MPU will delete the relevant entry in its "I'm alive table." Further, the MPU will update the AP Status Table entry for the given AP Instance.

Path: AP - Local MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	AP Process Name	PIC X(12)
Header Length	092		
Data Length	0012		
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	AL		
AP Name (Dest.)	Local MPU		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Local APC		
AP Name (Source)	Init. AP		
Instance (Source)	Assigned by MPU at Init		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	Given by AP Int		
Message Category	G		
Priority of Source AP	0		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: AP Already Dead*

Type ID: AM

Nature of Message:

Sent when an MPU attempts to deliver a message to an AP that has terminated.

Path: MPU - Monitor AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Status Code	PIC X(5)
Header Length	092	Name String	PIC X(7)
Data Length	0017	(Process name	
Binary/Native Flag	N (Default)	of Dead AP)	
Priority Flag	0	Filler	PIC X(5)
Message Type	AM		
AP Name (Dest.)	Monitor AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitors APC		
AP Name (Source)	Dead APs MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	G		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: AP Dying

Type ID: AD

Nature of Message:

AP Status information given to the AP's MPU when the AP is terminating. The MPU will use the data provided to update the local AP Status Table. The MPU will then send a child status message to the dying AP's Parent MPU.

Path: AP - MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Termination	PIC X
Header Length	092	Status	
Data Length	0001		88 Normal
Binary/Native Flag	N (Default)		Term.
Priority Flag	0		88 Shutdown
Message Type	AD		
Complete			
AP Name (Dest.)	Term. AP's MPU		88 Aborted
Instance (Dest.)	Det by SysGen Parameter		88 Exception
APC Name (Dest.)	Local APC		Condition
AP Name (Source)	Term. AP		
Instance (Source)	Assigned by MPU at Init		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	Given by AP Interface		
Message Category	G		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: AP Ending

Type ID: AE

Nature of Message:

Message sent when the AP's having the characteristic of requiring a message on a child AP's termination.

Path: MPU - AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Child Process	
Header Length	092	Name	PIC X(12)
Data Length	0016	Child Channel	
Binary/Native Flag	N (Default)	ID	PIC X(3)
Priority Flag	0	Child	PIC X
Message Type	AE	Termination	
AP Name (Dest.)	Parent AP	Status	
Instance (Dest.)	Assigned by MPU at Init		
APC Name (Dest.)	Local APC		
AP Name (Source)	Local MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	G		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag 0 (Default)			
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: AP Interface Error (to Monitor)* Type ID: 32

Nature of Message:

Message sent to the Monitor AP when the MPU discovers errors in the message header as formatted by the AP Interface. The MPU also sends an AI message to the Source AP (using a different format - See AP Interface Error - to Source AP).

Path: MPU - Monitor AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	AI Error Code	PIC X(5)
Header Length	092		
Data Length	0017	AP Name	PIC X(7)
Binary/Native Flag	N (Default - Native)		
Priority Flag	0	Processing code	PIC X(5)
Message Type	32		
AP Name (Dest.)	Monitor AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	MPU at Error Source		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP	0 (Default)		
Integrity Check Flag	0 (Default - No)		
Logging Flag	1 (Yes)		
Stat. Collection Flag	1 (Yes)		
Test Flag	0 (Default - No)		
Delivery Trigger Flag	0 (Default - Immed.)		
Delivery Time Trigger	blank (Default)		
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	APC Name		
Continuation Flag	0		

Message Type: AP Interface Error (to Source AP)* Type ID: 32

Nature of Message:

Sent to the Source AP when the MPU discover an error in the message header header as formatted by the AP Interface.

Path: MPU - Source AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Error Code	PIC X(5)
Header Length	092		
Data Length	0102	Bad Header	PIC X(92)
Binary/Native Flag	N (Default)		
Priority Flag	0	Processing code	PIC X(5)
Message Type	32		
AP Name (Dest.)	Error Source AP		
Instance (Dest.)	Error Source AP Instance		
APC Name (Dest.)	Local APC		
AP Name (Source)	Local MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Local MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag		1	
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	Monitor AP		
Channel ID	APC Name		
Continuation Flag	0		

Message Type: AP Initiating at Shutdown*

Type ID: NL

Nature of Message:

Message informing the operator that an AP is in the process of initiating. This message is sent (if the AP state exists) during shutdown procedures undertaken upon receipt of a shutdown AP or shutdown APC command.

Path: MPU - Monitor AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Status Code	PIC X(5)
Header Length	092	Name String	PIC X(7)
Data Length	0017	(AP in Init)	
Binary/Native Flag	N (Default)	Filler	PIC X(5)
Priority Flag	0		
Message Type	NL		
AP Name (Dest.)	Monitor AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	AP's MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	G		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: AP Status Request

Type ID: SR

Nature of Message:

Request for the current status of a given AP. The request will cause a table lookup of the given AP's APC AP Status Table.

Path: Any AP - Any MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	AP Name (for	PIC X(10)
Header Length	092	which status is	
Data Length	0010	required)	
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	SR		
AP Name (Dest.)	Given AP's MPU		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	MPU's APC		
AP Name (Source)	Calling AP		
Instance (Source)	Calling AP Inst.		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	Given by Source AP Int.		
Message Category	B		
Priority of Source AP	From AP Char. Table		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag	0 (Default)		
Delivery Time Trigger	blank (Default)		
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	Specified or Default		
Continuation Flag	0		

Message Type: AP Status Return

Type ID: IS

Nature of Message:

Return on an AP Status Request.

Path: MPU - Requesting AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	AP Name	PIC X(10)
Header Length	092	(specified in	
Data Length	0011	Status Request)	
Binary/Native Flag	N (Default)		
Priority Flag	0	AP Status	PIC X
Message Type	IS		
AP Name (Dest.)	Source of SR Message		
Instance (Dest.)	Source Inst of SR Message		
APC Name (Dest.)	Source APC of SR Message		
AP Name (Source)	Given AP's MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	0		
Message Category	F		
Priority of Source AP	0		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of SR Msg		
Channel ID	of SR Msg		
Continuation Flag	0		

Message Type: APC Alive*

Type ID: LV

Nature of Message:

Status message informing Monitor AP that the APC has completed its start-up processing and is ready to accept messages. Upon receipt, the Monitor AP will update it's own APC status table and send an "APC Table Update" message to its off-host siblings.

Path: MPU - Monitor AP

Header Fields	Header Values	Data Fields	Data Fields
Header Format	A	Status Code	PIC X(5)
Header Length	092		
Data Length	0017	Filler	PIC X(12)
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	LV		
AP Name (Dest.)	Monitor AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	APC's MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP		0 (Default)	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: APC Availability Request

Type ID: AV

Nature of Message:

Sent as a result of an AP invoking the "WKONCA" service.
The data portion contains the name of the APC of interest
to the calling APC.

Path: AP - Local MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	APC Name	PIC X(3)
Header Length	092		
Data Length	0003		
Binary/Native Flag	N (Default)		
Priority Flag	1		
Message Type	AV		
AP Name (Dest.)	Local MPU		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Local APC		
AP Name (Source)	Requesting AP		
Instance (Source)	Assigned by MPU at Init		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	Given by AP Interface		
Message Category	D		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: APC Available Return

Type ID: VR

Nature of Message:

Sent as the response to the APC Availability Request Message.

Path: Local MPU - AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	APC Status	PIC X(3)
Header Length	092		88 APC up
Data Length	0003		88 APC Not
Binary/Native Flag	N (Default)		Found
Priority Flag	0		88 Time
Message Type	VR		Out
AP Name (Dest.)	Source of AV Message		(if APC
Instance (Dest.)	Source Inst of AV Message		does not
APC Name (Dest.)	Local APC		come up
AP Name (Source)	Local MPU		within
Instance (Source)	Det by SysGen Parameter		reasonable
APC Name (Source)	Local APC		period of
Message Serial #	Filled in by Source MPU		time)
Processing Code	1		
Message Category	F		
Priority of Source AP	From AP Char. Table		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag	0 (Default)		
Delivery Time Trigger	blank (Default)		
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: APC Name Request

Type ID: AN

Nature of Message:

Sent as a result of an AP invoking the "WHATAC" service.
The MPU will read the AP Information Table to find the APC
upon which the given AP resides.

Path: AP - Local MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	AP Name	PIC X(10)
Header Length	092		
Data Length	0010		
Binary/Native Flag	N (Default)		
Priority Flag	1		
Message Type	AN		
AP Name (Dest.)	Local MPU		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Local APC		
AP Name (Source)	Requesting AP		
Instance (Source)	Assigned by MPU at Init		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	Given by AP Interface		
Message Category	D		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: APC Name Return

Type ID: NA

Nature of Message:

Sent in response to the APC Name Request message. The data portion contains the name of the APC on which the given AP resides. In the event that the given AP name was not found, the data portion will contain a three character error code.

Path: Local MPU - AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	APC Name	PIC X(3)
Header Length	092		
Data Length	0003		
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	NA		
AP Name (Dest.)	Source of AN Message		
Instance (Dest.)	Source Inst of AN Message		
APC Name (Dest.)	Local APC		
AP Name (Source)	Local MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	F		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: APC Status Request

Type ID: PS

Nature of Message:

Sent as a result of an AP invoking the "ACSTAT" service.
The data portion contains the name of the APC of interest
to the calling AP.

Path: AP - Local MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	APC Name	PIC X(3)
Header Length	092		
Data Length	0003		
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	PS		
AP Name (Dest.)	Local MPU		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Local APC		
AP Name (Source)	Requesting AP		
Instance (Source)	Assigned by MPU at Init		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	Given by AP Interface		
Message Category	D		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: APC Status Return

Type ID: PR

Nature of Message:

Sent in response to the APC status request message. The data portion contains the current status of the given APC.

Path: AP - Local MPU

Header Fields	Header Values	Data Fields	Data V
Header Format	A	APC Status	PIC X
Header Length	092		
Data Length	0001		
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	PR		
AP Name (Dest.)	Source of PS Message		
Instance (Dest.)	Source Inst of PS Message		
APC Name (Dest.)	Local APC		
AP Name (Source)	Local MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	F		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: APC Terminated*

Type ID: CT

Nature of Message:

Notification that an APC has completed the shutdown processing requested by the Monitor AP.

Path: MPU - Monitor AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Status Code	PIC X(5)
Header Length	092		
Data Length	0017	Filler	PIC X(12)
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	CT		
AP Name (Dest.)	Monitor AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	Shutdown APC's MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP	0		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Cancel Shutdown

Type ID: CS

Nature of Message:

Message overriding a shutdown in X minutes notice. This message is applicable only if the shutdown pending is still outstanding. Once shutdown procedures have begun, they cannot be stopped.

Path: Monitor AP - UI AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	N/A	
Header Length	092		
Data Length	0		
Binary/Native Flag	N (Default)		
Priority Flag	1		
Message Type	CS		
AP Name (Dest.)	UI AP		
Instance (Dest.)	Assigned by MPU at Init		
APC Name (Dest.)	UI APC		
AP Name (Source)	Monitor AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Monitor's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	C		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Change Role

Type ID: CR

Nature of Message:

Allows a user to change roles within a given session. The new role must be one that the user is authorized for.

Path: UI AP - Monitor AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Terminal ID	PIC X(2)
Header Length	092		
Data Length	0020	User Name	PIC X(8)
Binary/Native Flag	N (Default)	New Role	PIC X(10)
Priority Flag	0		
Message Type	CR		
AP Name (Dest.)	Monitor AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	UI AP		
Instance (Source)	Assigned by MPU at Init		
APC Name (Source)	UI's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	Given by AP Interface		
Message Category	E		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Child AP Status

Type ID: CA

Nature of Message:

Relevant status of a child AP. The data is sent to the Parent AP's MPU upon specified events. Upon receipt of the message, given the child's status, the Parent AP's MPU may send a cleanup message back to the child's MPU.

Path: Child AP's MPU - Parent AP's MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Process Name	PIC X(12)
Header Length	092	(of child)	
Data Length	0016		
Binary/Native Flag	N (Default)	Channel ID	PIC X(3)
Priority Flag	0	(of child)	
Message Type	CA		
AP Name (Dest.)	Parent MPU	Child AP	PIC X
Instance (Dest.)	Det by SysGen	Status	88 Abort
	Parameter		
APC Name (Dest.)	From Dest AP Name		Acknowl
AP Name (Source)	Child MPU		88 Child
Instance (Source)	Det by SysGen Parameter		Normally
APC Name (Source)	Local APC		Termin'd
Message Serial #	Filled in by Source MPU		No Active
Processing Code	0		Children
Message Category	E		88 Child
Priority of Source AP	0		Shutdown
Integrity Check Flag	0 (Default)		in APC SD
Logging Flag	1		88 Child
Stat. Collection Flag	1		Shutdown
Test Flag	0 (Default)		in AP SD
Delivery Trigger Flag		0 (Default)	88 Child
Delivery Time Trigger		blank	
(Default)		Shutdown	
Delivery Trig. Cond.	blank (Default)		in Host SD
Original Source	of Msg. Source AP		88 Child
Channel ID	of Msg. Source AP		Initiated
Continuation Flag	0		88 Normal
			Termi-
			nation
			Active
			Children

Message Type: Cleanup

Type ID: CL

Nature of Message:

Notification to clean up tables and messages for a given AP. Sent when all child AP's below a point have terminated with no active children of their own. The child AP's MPU can now delete the child's entry in the AP Status table.

Path: Parent AP's MPU - Child AP's MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Process Name	PIC X(12)
Header Length	092	(of child)	
Data Length	0015		
Binary/Native Flag	N (Default)	Channel ID	PIC X(3)
Priority Flag	1	(of child)	
Message Type	CL		
AP Name (Dest.)	Child AP MPU		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Child APC		
AP Name (Source)	Parent AP MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	0		
Message Category	C		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: GD ACK

Type ID: GA

Nature of Message:

Acknowledgment of the fact that a message requiring Guaranteed Delivery was received and processed by its destination AP. Upon receipt of this message, the source MPU will clean up its GD table and logs for the specified message.

Path: Destination MPU - Source MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	GD Source APC	PIC X(3)
Header Length	092	GD Message	PIC X(7)
Data Length	0010	Serial #	
Binary/Native Flag	N (Default)		
Priority Flag	1		
Message Type	GA		
AP Name (Dest.)	GD Source MPU		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	MPU's APC		
AP Name (Source)	Destination MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	0		
Message Category	C		
Priority of Source AP	0		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Get User Response

Type ID: UX

Nature of Message:

Sent in response to a Get User Request. The monitor AP will use the original source AP to access the Logon Table for the data values to be sent back to the requesting AP. The status field indicates success or failure of the table search.

Path: Monitor Requesting AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Status	PIC X
Header Length	092	User Name	PIC X(8)
Data Length	0021	Role Name	PIC X(10)
Binary/Native Flag	N (Default)	Terminal ID	PIC X(2)
Priority Flag	0		
Message Type	UX		
AP Name (Dest.)	Source of Request		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Request Source APC		
AP Name (Source)	VAX Monitor		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Monitor's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	XGU		
Continuation Flag	0		

Message Type: Get User Request

Type ID: XU

Nature of Message:

Request from AP (via GETUSR service) for the User Name, Role Name, and Terminal ID of the AP's original source where the original source is a User Interface AP.

Path: AP Monitor

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Original	PIC X(15)
Header Length	092	Source of	
Data Length	0015	Requesting AP	
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	XU		
AP Name (Dest.)	VAX Monitor		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	Requesting AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Requesting AP's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	XGU		
Continuation Flag	0		

Message Type: GD Status Request

Type ID: GS

Nature of Message:

Sent as a result of an AP invoking the "GDSTAT" service.
The data portion contains the source and serial number of
the Guaranteed Delivery Message of interest to the calling
AP.

Path: AP - Local MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	GD Message	
Header Length	092	Source AP Name	PIC X(10)
Data Length	0017	GD Message	
Binary/Native Flag	N (Default)	Serial Number	PIC X(7)
Priority Flag	1		
Message Type	GS		
AP Name (Dest.)	Local MPU		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Local APC		
AP Name (Source)	Requesting AP		
Instance (Source)	Assigned by MPU at Init		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	Given by AP Interface		
Message Category	D		
Priority of Source AP		From AP Char. Table.	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: GD Status Return

Type ID: GR

Nature of Message:

Sent in response to a GD Status Request. The data portion contains the current status of the Guaranteed Delivery messages specified in the request.

Path: Local MPU - AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Return Code	PIC X(3)
Header Length	092		88
			GD-Message
Data Length	0003		-in-system
Binary/Native Flag	N (Default)		88
			GD-Message
Priority Flag	0		-Not-Found
Message Type	GR		
AP Name (Dest.)	Source of GS Message		
Instance (Dest.)	Source Inst of GS Message		
APC Name (Dest.)	Local APC		
AP Name (Source)	Local MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	F		
Priority of Source AP		From AP Char. Table.	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Host Active

Type ID: HU

Nature of Message:

Message sent to all on-host APC's to inform them that the host has completed its startup processing.

Path: Monitor AP - MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	N/A	
Header Length	092		
Data Length	0000		
Binary/Native Flag	N (Default - Native)		
Priority Flag	1		
Message Type	HU		
AP Name (Dest.)	MPU Name		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	MPU's APC		
AP Name (Source)	Monitor AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Monitor's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	C		
Priority of Source AP		0 (Default)	
Integrity Check Flag	0 (Default)		
Logging Flag	1 (Yes)		
Stat. Collection Flag	1 (Yes)		
Test Flag	0 (Default - No)		
Delivery Trigger Flag		0 (Default - Immed)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Host Available

Type ID: HA

Nature of Message:

Message sent at startup to inform off-host Monitor APs that a given host has completed its startup processing and is now available to receive messages.

Path: Monitor AP - Monitor AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	For each on-host APC	
Header Length	092		
Data Length	Variable	APC Name	PIC X(3)
Binary/Native Flag	N (Default - Native)	APC Status	PIC X
Priority Flag	0		
Message Type	HA		
AP Name (Dest.)	Off-host Monitor AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	On-Host Monitor AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP		0 (Default)	
Integrity Check Flag	0 (Default - No)		
Logging Flag	1 (Yes)		
Stat. Collection Flag	1 (Yes)		
Test Flag	0 (Default - No)		
Delivery Trigger Flag		0 (Default - Immed)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Host Name Request

Type ID: HN

Nature of Message:

Sent as a result of an AP invoking the "WHTHST" Service.
The data portion contains the name of the AP whose host
name is being requested.

Path: AP - Local MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	AP Name	PIC X(10)
Header Length	092		
Data Length	0010		
Binary/Native Flag	N (Default)		
Priority Flag	1		
Message Type	HN		
AP Name (Dest.)	Local MPU		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Local APC		
AP Name (Source)	Requesting AP		
Instance (Source)	Assigned by MPU at Init		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	Given by AP Interface		
Message Category	C		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Host Name Return

Type ID: NH

Nature of Message:

Sent in response to a Host Name Request Message. The data portion contains the name of the Host associated with the given AP.

Path: Local MPU - AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Host Name	PIC X(3)
Header Length	092	AP Name	PIC X(10)
Data Length	0013		
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	NH		
AP Name (Dest.)	Source of HN Message		
Instance (Dest.)	Source Inst of HN Message		
APC Name (Dest.)	Local APC		
AP Name (Source)	Local MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Host Status Request

Type ID: HR

Nature of Message:

Sent as a result of an AP invoking the "HSTATS" service.
The data portion contains the name of the host whose
status is of interest to the calling AP.

Path: AP - Local MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Host Name	PIC X(3)
Header Length	092		
Data Length	0003		
Binary/Native Flag	N (Default)		
Priority Flag	1		
Message Type	HR		
AP Name (Dest.)	Local MPU		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Local APC		
AP Name (Source)	Requesting AP		
Instance (Source)	Assigned by MPU at Init		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	Given by AP Interface		
Message Category	D		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Host Status Return

Type ID: HO

Nature of Message:

Sent in response to a Host Status Request message. The data portion contains the current status of the Host named in the Host Status Request.

Path: Local MPU - AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Host Status	PIC X
Header Length	092	Host Name	PIC X(3)
Data Length	0004		
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	HO		
AP Name (Dest.)	Source of HR Message		
Instance (Dest.)	Source Inst of HR Message		
APC Name (Dest.)	Local APC		
AP Name (Source)	Local MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	F		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Host Terminating

Type ID: HT

Nature of Message:

Message sent when a Non-VAX host shuts down.

Path: Monitor AP - Monitor AP

<u>Header Fields</u>	<u>Header Values</u>	<u>Data Fields</u>	<u>Data Values</u>
Header Format	A	N/A	
Header Length	092		
Data Length	0		
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	HT		
AP Name (Dest.)	VAX Monitor AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	VAX Monitor APC		
AP Name (Source)	Non-VAX Monitor AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Non-VAX Monitor APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	F		
Priority of Source AP	From AP Char. Table		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag	0 (Default)		
Delivery Time Trigger	blank (Default)		
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	Monitor AP Channel		
Continuation Flag	0		

Message Type: Initiate COMM AP

Type ID: CI

Nature of Message:

Message requesting the initiation of a given COMM AP.

Path: Monitor AP - COMM AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	N/A	
Header Length	092		
Data Length	0		
Binary/Native Flag	N (Default - Native)		
Priority Flag	1		
Message Type	CI		
AP Name (Dest.)	COMM AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	COMM APC		
AP Name (Source)	Monitor AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Monitor's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	H		
Priority of Source AP		0 (Default)	
Integrity Check Flag	0 (Default - No)		
Logging Flag	1 (Yes)		
Stat. Collection Flag	1 (Yes)		
Test Flag	0 (Default - No)		
Delivery Trigger Flag		0 (Default - Immed)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	COMM AP Channel		
Continuation Flag	0		

Message Type: Link Active

Type ID: LA

Nature of Message:

Message from a COMM AP reporting the successful establishment of a link to its off-host sibling. Upon receipt, Monitor AP will update the link status table and send a "Host Available" message to the off-host monitor at the other end of the link.

Path: COMM AP to Monitor AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	N/A	
Header Length	092	Specific Link is	
Data Length	0	implied by	
Binary/Native Flag	N (Default)	COMM AP Name	
Priority Flag	0		
Message Type	LA		
Name (Dest.)	Monitor AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	COMM AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	COMM's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	I		
Priority of Source AP	0		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	Of Msg Source AP		
Channel ID	COMM AP Channel		
Continuation Flag	0		

Message Type: Link Fail

Type ID: LF

Nature of Message:

Message from COMM AP informing Monitor that a formerly active link has gone down. This message type is also used as a return on a "Start Link" message.

Path: COMM AP - Monitor AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	N/A - The Link	
Header Length	092	in question is	
Data Length	0	implied by the	
Binary/Native Flag	N (Default)	name of the	
Priority Flag	0	Source COMM AP	
Message Type	LF		
AP Name (Dest.)	Monitor AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	COMM AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	COMM's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	I		
Priority of Source AP	0		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	Of Msg Source AP		
Channel ID	COMM AP Channel		
Continuation Flag	0		

Message Type: List Request

Type ID: LR

Nature of Message:

Request from IISS Operator (via Monitor) for a list of all active APs on a specified AP Cluster.

Path: Monitor AP - MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	N/A	Header
Length	092		
Data Length	0		
Binary/Native Flag	N (Default)		
Priority Flag	1		
Message Type	LR		
AP Name (Dest.)	Specified APC MPU		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Specified APC		
AP Name (Source)	Monitor AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Monitor's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	D		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	APC's Channel		
Continuation Flag	0		

Message Type: Logoff

Type ID: OF

Nature of Message:

Notification from UI that a given user has logged off the IISS System. Upon receipt of this message, Monitor AP will delete the relevant entry in the Logon Table.

Path: UI to Monitor AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	UI (AP) Name	PIC X(10)
Header Length	092	UI APC Name	PIC X(3)
Data Length	0015	Terminal ID	PIC X(2)
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	OF		
AP Name (Dest.)	Monitor AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	UI AP		
Instance (Source)	Assigned by MPU at AP Init		
APC Name (Source)	UI's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	Given by AP Int		
Message Category	E		
Priority of Source AP	0		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Logon Request

Type ID: LO

Nature of Message:

Message from a UI AP informing Monitor AP of a successful Logon. Upon receipt of this message, Monitor will transfer the data portion to the Logon Table.

Path: UI AP - Monitor AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	UI (AP) Name	PIC X(10)
Header Length	092	UI APC Name	PIC X(3)
Data Length	0062	Terminal ID	PIC X(2)
Binary/Native Flag	N (Default)	User Name	PIC X(8)
Priority Flag	0	Role Name	PIC X(10)
Message Type	LO	Session Start	PIC X(23)
AP Name (Dest.)	Monitor AP	Time	
Instance (Dest.)	Det by SysGen	Channel Range	PIC X(3)
	Parameter	Start	
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	UI AP	Channel Range	PIC X(3)
Instance (Source)	Assigned by MPU at AP Init End		
APC Name (Source)	UI's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	Given by AP Int		
Message Category	E		
Priority of Source AP	0		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Message After Timeout

Type ID: MT

Nature of Message:

Message to Monitor that a reply message on a given message pair arrived after timeout had expired.

Path: MPU - Monitor AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Header of Tardy Message	PIC X(92)
Header Length	092		
Data Length	0092		
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	MT		
AP Name (Dest.)	Monitor AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	Pair Request Source MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	0		
Message Category	E		
Priority of Source AP	0		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Logon Response

Type ID: LX

Nature of Message:

Sent to inform the UI of the status of the LOGON Table upon completion of processing the Logon Message.

Path: Monitor AP - UI

Header Fields	Header Values	Data Fields	Data Values
Log			
Header Format	A	Table Status	PIC X
Header Length	092	88 Entry-Made	Value "1"
Data Length	0001	88 Table-Full	Value "0"
Binary/Native Flag	N (Default)		
Priority Flag	1		
Message Type	LX		
AP Name (Dest.)	Source of Logon Message		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Logon Source APC		
AP Name (Source)	VAX Monitor AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Monitor AP's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	UIV		
Continuation Flag	0		

Message Type: Message Manager ACK*

Type ID: MA

Nature of Message:

Acknowledgment from the MPU that the message from the source AP was found to be acceptable. The entire header from the accepted message is returned to be used later by the source AP.

Path: Local MPU - Msg. Source AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Entire header PIC X(92)	
Header Length	092	of Accepted	
Data Length	0092	Message	
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	MA		
AP Name (Dest.)	Source AP		
Instance (Dest.)	Assigned by MPU at AP Init		
APC Name (Dest.)	Source AP's APC		
AP Name (Source)	Local MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP	0		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Message No Accept*

Type ID: ME

Nature of Message:

Notification that a given message cannot be accepted. Message is logged and thrown away. The message source is informed of the problem via the error code parameter. In certain cases, the Monitor AP will also be informed of the problem.

Path: Local MPU - Source AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Message Error PIC X(5)	
Header Length	092	Code	
Data Length	0097		
Binary/Native Flag	N (Default)	Entire Original Header	PIC X (92)
Priority Flag	0		
Message Type	ME		
AP Name (Dest.)	Source AP of NACK's Msg		
Instance (Dest.)	Assigned by MPU at AP Init		
APC Name (Dest.)	Source AP's APC		
AP Name (Source)	Local MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Message Queued for
Unavailable APC*

Type ID: MQ

Nature of Message:

Message informing the Operator that a message is being
held for an AP residing on a currently unavailable APC.
The operator may choose to start the APC.

Path: MPU - Monitor AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Status Code	PIC X(5)
Header Length	092	Name String	PIC X(7)
Data Length	0017	Processing	PIC X(5)
Binary/Native Flag	N (Default)	Code	
Priority Flag	0		
Message Type	MQ		
AP Name (Dest.)	Monitor AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	Msg. Source MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Msg. Source APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Message Receive ACK

Type ID: RA

Nature of Message:

Sent to acknowledge the receipt of a message by the message's destination AP. Note: This message type may be used to acknowledge those requiring Guaranteed Delivery Services.

Path: AP - AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	APC Name (from	PIC X(3)
Header Length	092	Rec'd Msg)	
Data Length	0010		
Binary/Native Flag	N (Default)	Msg Serial #	PIC X(7)
Priority Flag	0	(from Rec'd Msg)	
Message Type	RA		
AP Name (Dest.)	Ack'd Msg Source AP		
Instance (Dest.)	Ack'd Msg Source Instance		
APC Name (Dest.)	Ack'd Msg Source APC		
AP Name (Source)	Receiving AP		
Instance (Source)	Assigned by MPU at AP Init		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	Given by AP Interface		
Message Category	F		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	from Rec'd Msg		
Channel ID	from Rec'd Msg		
Continuation Flag	0		

Message Type: Off-Host Shutting Down

Type ID: HS

Nature of Message:

Message from Monitor to its on-host APC's to inform them of an off-host shutdown. The APC MPU's can then take appropriate action as required (e.g., not trying to route and send a message to the shutdown host).

Path: Monitor AP - MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Host Name (of PIC X(3)	
Header Length	092	host shutting	
Data Length	0003	down)	
Binary/Native Flag	N (Default - Native)		
Priority Flag	1		
Message Type	HS		
AP Name (Dest.)	On-Host APC MPU		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Dest. MPU's APC		
AP Name (Source)	Monitor AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	C		
Priority of Source AP		0 (Default)	
Integrity Check Flag	0 (Default - No)		
Logging Flag	1 (Yes)		
Stat. Collection Flag	1 (Yes)		
Test Flag	0 (Default - No)		
Delivery Trigger Flag		0 (Default - Immed)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Operator Abort

Type ID: OA

Nature of Message:

Command from the Operator telling the MPU to abort a specific instance of an AP. The MPU will handle the abort in the manner specified for "Abort AP."

Path: Monitor AP - MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	AP Name (of AP to be aborted)	PIC X(10)
Header Length	092		
Data Length	0012		
Binary/Native Flag	N (Default)	Instance (known to Operator from Active List)	PIC X(2)
Priority Flag	1		
Message Type	OA		
AP Name (Dest.)	"Aborting" AP's MPU		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	MPU's APC		
AP Name (Source)	Monitor AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	C		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Paired Message Status Request Type ID: MS

Nature of Message:

Sent as a result of an AP invoking the "PRSTAT" Service.
The data portion contains the parameters given in the call.

Path: AP - Local MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Paired Message	PIC X(10)
Header Length	092	Destination	
Data Length	0013	AP Name	
Binary/Native Flag	N (Default)	Paired Message	PIC X(3)
Priority Flag	1	Logical	
Message Type	MS	Channel	
AP Name (Dest.)	Local MPU		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Local APC		
AP Name (Source)	Requesting AP		
Instance (Source)	Assigned by MPU at Init		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	Given by AP Interface		
Message Category	D		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Paired Message Status Return

Type ID: MR

Nature of Message:

Sent in response to a Paired Message Status Request. The data portion contains the current status of the Paired Message specified in the request.

Path: Local MPU - AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Return Code	PIC X(5)
Header Length	092		88 Message-
Data Length	0005		
in-system			
Binary/Native Flag	N (Default)		88 Message-
Priority Flag	0		
Not-Found			
Message Type	MR		
AP Name (Dest.)	Source of MS Message		
Instance (Dest.)	Source Inst of MS Message		
APC Name (Dest.)	Local APC		
AP Name (Source)	Local MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	F		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Process Name Not Found

Type ID: NP

Nature of Message:

Sent by an MPU when it cannot find an AP specified to be aborted in the AP Status Table. This is a possible response to an Operator Abort Message.

Path: MPU - Monitor AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	AP Name	PIC X(10)
Header Length	092	(specified in	
Data Length	0012	OA Msg)	
Binary/Native Flag	N (Default - Native)		
Priority Flag	0	Instance	PIC X(2)
Message Type	NP	(specified in	
AP Name (Dest.)	Monitor AP	OA Msg)	
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	Aborting AP's MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP		0 (Default)	
Integrity Check Flag	0 (Default - No)		
Logging Flag	1 (Yes)		
Stat. Collection Flag	1 (Yes)		
Test Flag	0 (Default - No)		
Delivery Trigger Flag		0 (Default - Immed)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Processing Error*

Type ID: 31

Nature of Message:

Message sent from an MPU when it encounters problems during its normal processing. The header portion is hard coded in the event that the problem encountered is within the MPU itself.

Path: MPU - Monitor AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Error Code	PIC X(5)
Header Length	092		
Data Length	0017	Name String	PIC X(7)
Binary/Native Flag	N (Default - Native)		
Priority Flag	0	Processing Code	PIC X(5)
Message Type	31		
AP Name (Dest.)	Monitor AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	Local MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP		0 (Default)	
Integrity Check Flag	0 (Default - No)		
Logging Flag	1 (Yes)		
Stat. Collection Flag	1 (Yes)		
Test Flag	0 (Default - No)		
Delivery Trigger Flag		0 (Default - Immed)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Rebuild Tables

Type ID: RT

Nature of Message:

Used on Startup by Monitor to inform an MPU that it must rebuild its tables from the CDM. This message applies only to those MPU's that must build their tables before the CDMRP comes up. It is used only where there is a table configuration change.

Path: Monitor - MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	N/A	
Header Length	092		
Data Length	0		
Binary/Native Flag	N (Default - Native)		
Priority Flag	1		
Message Type	RT		
AP Name (Dest.)	MPU		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	MPU's APC		
AP Name (Source)	Monitor AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Monitor's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	D		
Priority of Source AP		0 (Default)	
Integrity Check Flag	0 (Default - No)		
Logging Flag	1 (Yes)		
Stat. Collection Flag	1 (Yes)		
Test Flag	0 (Default - No)		
Delivery Trigger Flag		0 (Default - Immed)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	specified or default		
Continuation Flag	0		

Message Type: Recoverable Error

Type ID: RE

Nature of Message:

Notification that a given AP has encountered a recoverable error.

Path: AP - Monitor AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	AP Error Code	PIC X(5)
Header Length	092		
Data Length	0005		
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	RE		
AP Name (Dest.)	Monitor AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	AP where error occurred		
Instance (Source)	Assigned by MPU at AP Init		
APC Name (Source)	AP's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	Given by AP Interface		
Message Category	E		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Source AP		
Channel ID	of Source AP		
Continuation Flag	0		

Message Type: Resource Unavailable*

Type ID: 33

Nature of Message:

Informational message sent to Monitor AP when an MPU rejects any message due to the fact of a needed resource being unavailable.

Path: MPU - Monitor

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Error Code	PIC X(5)
Header Length	092		
Data Length	0017	Name String	PIC X(7)
Binary/Native Flag	N (Default - Native)		
Priority Flag	0	Processing Code	PIC X(5)
Message Type	33		
AP Name (Dest.)	Monitor AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	MPU's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP		0 (Default)	
Integrity Check Flag	0 (Default - No)		
Logging Flag	1 (Yes)		
Stat. Collection Flag	1 (Yes)		
Test Flag	0 (Default - No)		
Delivery Trigger Flag		0 (Default - Immed)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Shutdown AP

Type ID: DA

Nature of Message:

Command to an MPU telling it to shut down one of its resident APs. The MPU will handle the actual shutdown in accordance with the given AP's characteristics. Where the given AP has active child AP's, the MPU will also send shutdown AP messages to the child AP MPUs.

Path: Monitor AP - MPU; MPU - MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	AP Name (to be shut down)	PIC X(10)
Header Length	092	Instance	PIC X(2)
Data Length	0015	(where known)	
Binary/Native Flag	N (Default)	Channel ID	PIC X(3)
Priority Flag	1		
Message Type	DA		
AP Name (Dest.)	Shutting down AP's MPU		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	AP's APC		
AP Name (Source)	Monitor AP or Parent AP MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	C		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Shutdown AP Cluster

Type ID: DC

Nature of Message:

System Command to gracefully shut down a given cluster. Implies that the cluster's MPU will handle the shutdown of all resident AP's and will also shut itself down after all AP's and messages are cleared. Where resident AP's have child AP's and the shutdown type; host or APC, the MPU will also send shutdown AP messages to the child AP MPU's (where the child AP's are off-APC).

Path: Monitor AP - MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Shutdown Type	PIC X
Header Length	092		88 IISS
Data Length	0001		88 Host
Binary/Native Flag	N (Default)		88 APC
Priority Flag	1		
Message Type	DC		
AP Name (Dest.)	MPU		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	MPU's APC		
AP Name (Source)	Monitor AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Monitor's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	D		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	specified or default		
Continuation Flag	0		

Message Type: Shutdown COMM AP

Type ID: TR

Nature of Message:

Message to a given COMM AP telling it to shut itself down.

Path: Monitor AP - COMM AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	N/A	
Header Length	092		
Data Length	0		
Binary/Native Flag	N (Default - Native)		
Priority Flag	0		
Message Type	TR		
AP Name (Dest.)	COMM AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	COMM's APC		
AP Name (Source)	Monitor AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Monitor's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP		0 (Default)	
Integrity Check Flag	0 (Default - No)		
Logging Flag	1 (Yes)		
Stat. Collection Flag	1 (Yes)		
Test Flag	0 (Default - No)		
Delivery Trigger Flag		0 (Default - Immed)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	COMM AP's Channel		
Continuation Flag	0		

Message Type: Shutdown Host

Type ID: SH

Nature of Message:

System command from one Monitor AP to an off-host sibling telling the sibling to shutdown all IISS functionality on its host. The off-host Monitor AP will, upon receipt, send Shutdown APC messages to all of its on-host APC's.

Path: Monitor AP - Monitor AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	N/A - Host to	
Header Length	092	be shutdown is	
Data Length	0	implied by	
Binary/Native Flag	N (Default)	Dest. Monitor	
Priority Flag	0	AP Name	
Message Type	SH		
AP Name (Dest.)	Off-host Monitor AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Off-Host Monitor's APC		
AP Name (Source)	On-host Monitor AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Monitor's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	B		
Priority of Source AP	0		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Shutdown Link

Type ID: SD

Nature of Message:

Command to terminate an active link between a COMM AP and its off-host sibling.

Path: Monitor AP - COMM AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	N/A	
Header Length	092		
Data Length	0		
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	SD		
AP Name (Dest.)	COMM AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	COMM's APC		
AP Name (Source)	Monitor AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	B		
Priority of Source AP	0		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	COMM AP's Channel		
Continuation Flag	0		

Message Type: Signal Table Error

Type ID: SE

Nature of Message:

Sent to the message source AP on the occurrence of an entry-not-found in the NTM Tables. This message is sent only when the error creates a situation where the source AP's message cannot be processed. The message contains a brief description of the error and where it occurred.

Path: MPU AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Error Source	PIC X(10)
Header Length	092	NTM Error	
Data Length	0087	Return	PIC X(5)
Binary/Native Flag	N (Default)	Error	
Priority Flag	0	Description	PIC X(72)
Message Type	SE		
AP Name (Dest.)	Source of Message Causing Error		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Source Msg APC		
AP Name (Source)	MPU where error occurred		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	000		
Continuation Flag	0		

Message Type: Shutdown Pending

Type ID: SP

Nature of Message:

Notification that an IISS shutdown of a specified type will begin in X minutes. This notification may be overridden by a cancel shutdown (CS) Message.

Path: Monitor AP - UI AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Shutdown Data	PIC X(2)
Header Length	092	Time Until	PIC X(2)
Data Length	0004	Shutdown	
Binary/Native Flag	N (Default)	(in Minutes)	
Priority Flag	1		
Message Type	SP		
AP Name (Dest.)	UI MPU		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	UI's APC		
AP Name (Source)	Monitor AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Monitor's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	C		
Priority of Source AP	0		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Soft Shutdown

Type ID: SD

Nature of Message:

Message telling a specified AP to shut itself down. This message can only be sent to an AP that has the internal logic required to perform its own shutdown (as determined from the AP Characteristics Table). This message is sent as a result of receiving a Shutdown APC message.

Path: MPU - AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	N/A	
Header Length	092		
Data Length	0		
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	SD		
AP Name (Dest.)	AP to be shutdown		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Local APC		
AP Name (Source)	Local MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Serial #	Filled in by Source MPU		
Code	0		
Message Category	C		
Priority of Source AP	0		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Start Link

Type ID: SL

Nature of Message:

Message to a specified COMM AP telling it to establish the link between itself and its off-host sibling. The MPU will create an entry in the pair table to set a wait on the link status return.

Path: Monitor AP - COMM AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	N/A - the dest.	
Header Length	092	COMM AP can	
Data Length	0	only start	
Binary/Native Flag	N (Default)	one link	
Priority Flag	0		
Message Type	SL		
AP Name (Dest.)	COMM AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	COMM APC		
AP Name (Source)	Monitor AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Monitor's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	B		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	COMM AP's Channel		
Continuation Flag	0		

Message Type: Start MPU

Type ID: SC

Nature of Message:

Command to startup (spawn) a given MPU.

Path: Monitor AP - Monitor's MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Process Name	PIC X(12)
Header Length	092		(of MPU to be started)
Data Length	0012		
Binary/Native Flag	N (Default)		
Priority Flag	1		
Message Type	SC		
AP Name (Dest.)	Monitor's MPU		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	Monitor AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Monitor's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	C		
Priority of Source AP	0		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag	0 (Default)		
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: System State

Type ID: SS

Nature of Message:

Sent to an AP when the AP's "alive" status is known. This message serves to inform the AP of the current state of the IISS, along with certain characteristics of the AP.

Path: MPU AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	System State	PIC X
Header Length	092	Logical Channel	PIC X(3)
Data Length	0022	Original Source	PIC X(15)
Binary/Native Flag	N (Default)	MPU Instance	PIC X(2)
Priority Flag	0	Number of	PIC X
Message Type	SS	Mailboxes	
AP Name (Dest.)	"Alive" AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Alive AP's APC		
AP Name (Source)	Local MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	000		
Continuation Flag	0		

Message Type: Table Data Request

Type ID: DR

Nature of Message:

Message to the CDM requesting a download of the static table data values. This is done when the MPU is told of a CDM configuration change. This message is hard coded as part of the MPU's startup file.

Path: MPU - CDMRP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	N/A	
Header Length	092		
Data Length	0		
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	DR		
AP Name (Dest.)	CDMRP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	CDM's APC		
AP Name (Source)	Requesting MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Requesting MPU's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	0		
Message Category	B		
Priority of Source AP	0		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	specified		
Continuation Flag	0		

Message Type: Table Data Return

Type ID: DL

Nature of Message:

Indicates that the data following the header is to be used to update the MPU's local tables.

Path: CDMRP - MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Updated Static Up to	
Header Length	092	Table Data	PIC X(1908)
Data Length	up to 1908		
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	DL(Dest.)		
AP Name (Dest.)	Requesting MPU		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Requesting MPU's APC		
AP Name (Source)	CDMRP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	CDM's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	From AP Int		
Message Category	F		
Priority of Source AP	0		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	from DR Msg		
Channel ID	from DR Msg		
Continuation Flag	as req'd		

Message Type: Table Status Request*

Type ID: TS

Nature of Message:

Request from an MPU at its startup for the configuration status of its tables. This message is hard coded as part of the MPU's startup file.

Path: MPU - Monitor AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Status Code	PIC X(5)
Header Length	092	Filler	PIC X(12)
Data Length	0017		
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	TS		
AP Name (Dest.)	Monitor AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP	0		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag		1	
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	MPU's Channel		
Continuation Flag	0		

Message Type: Table Status Return

Type ID: ST

Nature of Message:

Current configuration status of the MPU's tables. Upon receipt of this message, the MPU will know whether it can build its tables completely from its existing files or if it has to request its static table data from the CDM.

Path: Monitor AP - MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Table Status	PIC X
Header Length	092		88 Local
Data Length	0001		Tables
Binary/Native Flag	N (Default)		0 K
Priority Flag	0		88 Get
Message Type	TR		Data
AP Name (Dest.)	Requesting MPU		from
Instance (Dest.)	Det by SysGen Parameter		CDM
APC Name (Dest.)	Requesting MPU's APC		
AP Name (Source)	Monitor AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Monitor's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	F		
Priority of Source AP	0		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg Source AP		
Channel ID	MPU's Channel		
Continuation Flag	0		

Message Type: Tables Rebuilt

Type ID: RB

Nature of Message:

Sent to Monitor upon successful (or unsuccessful)
completion of the task of rebuilding local tables using
updated CDM data.

Path: MPU - Monitor

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Table Status	PIC X
Header Length	092		88 Rebuilt
Data Length	0001		88 Unsuc-
Binary/Native Flag	N (Default - Native)		cessful
Priority Flag	0		
Message Type	RB		
AP Name (Dest.)	Monitor AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	0		
Message Category	F		
Priority of Source AP		0 (Default)	
Integrity Check Flag	0 (Default - No)		
Logging Flag	1 (Yes)		
Stat. Collection Flag	1 (Yes)		
Test Flag	0 (Default - No)		
Delivery Trigger Flag		0 (Default - Immed)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg Source AP		
Channel ID	MPU's Channel		
Continuation Flag	0		

Message Type: Timeout Expired*

Type ID: TE

Nature of Message:

Message informing an AP that the timeout on a paired message has expired before the response message arrived. This message can only be sent to AP's having the logic required to accept unsolicited messages (based on AP's On-Timeout characteristic).

Path: MPU - Local AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Error Code	PIC X(5)
Header Length	092	Message Header	PIC X(92)
Data Length	0097		
Binary/Native Flag	N (Default - Native)		
Priority Flag	0		
Message Type	TE		
AP Name (Dest.)	AP Requesting Pair		
Instance (Dest.)	Assigned by MPU at AP Init		
APC Name (Dest.)	AP's APC		
AP Name (Source)	Local MPU		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP		0 (Default)	
Integrity Check Flag	0 (Default - No)		
Logging Flag	1 (Yes)		
Stat. Collection Flag		1 (Yes)	
Test Flag	0 (Default - No)		
Delivery Trigger Flag		0 (Default - Immed)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Unsolicited APC Termination*

Type ID: CE

Nature of Message:

Message sent when an APC shuts down for internal reasons
(other than on operator command).

Path: MPU - Monitor AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Error Code	PIC X(5)
Header Length	092	Filler	PIC X(12)
Data Length	0017		
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	CE		
AP Name (Dest.)	Monitor AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	MPU of Terminating APC		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Terminating APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	F		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Unsolicited Initiation Accept Type ID: IA

Nature of Message:

Acknowledgment that an AP was initiated upon receipt of an unsolicited message. Upon receipt of this ACK, the MPU will modify the entry in the Child Status Table to indicate a confirmed child AP.

Path: MPU - MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A		
Header Length	092		
Data Length	0025		
Binary/Native Flag	N (Default)	Process Name (of PIC	
Priority Flag	0	Init Msg	X(12)
Message Type	IA	Source AP	
AP Name (Dest.)	Init Msg Source MPU		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Source APC	AP Name (of AP PIC X(10)	
AP Name (Source)	Init AP's MPU	Init by Unsol.	
Instance (Source)	Det by SysGen Parameter	Msg)	
APC Name (Source)	Init AP's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1	Channel ID	PIC X(3)
Message Category	G	(Child Init.	
Priority of Source AP	Table	From AP Char. Under from	
Integrity Check Flag	0 (Default)	Init Msg)	
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Unstable Table

Type ID: UT

Nature of Message:

Sent on the occurrence of an entry-not-found in the NTM Tables where the error occurs due to a problem within the NTM as opposed to bad input. The message carries information that pinpoints the error for the operator. In most cases, this message should result in the Operator shutting down the NTM.

Path: MPU AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Table Name	PIC X(3)
Header Length	092	Module Name	PIC X(6)
Data Length	0044	Error Field	PIC X(10)
Binary/Native Flag	N (Default)	Error Value	PIC X(20)
Priority Flag	0	Error Return	PIC X(5)
Message Type	UT		
AP Name (Dest.)	VAX Monitor		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Monitor's APC		
AP Name (Source)	MPU where error occurred		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP		From AP Char. Table	
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag		0 (Default)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	000		
Continuation Flag	0		

Message Type: Unsuccessful Initiation

Type ID: NI

Nature of Message:

Sent to the MPU of the source AP of a specific initiation message when the requested initiation is not successful. Upon receipt, the source (or Parent) MPU will delete the relevant child table entry.

Path: Child MPU - Parent MPU

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	AP Name (from	PIC X(10)
Header Length	092	Init Msg)	
Data Length	0022	Parent AP	PIC X(12)
Binary/Native Flag	N (Default - Native)	Process Name	
Priority Flag	0		
Message Type	NI		
AP Name (Dest.)	Source MPU of Init Msg		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Source MPU's APC		
AP Name (Source)	Dest MPU of Init Msg		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Dest MPU's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP		0 (Default)	
Integrity Check Flag	0 (Default - No)		
Logging Flag	1 (Yes)		
Stat. Collection Flag	1 (Yes)		
Test Flag	0 (Default - No)		
Delivery Trigger Flag		0 (Default - Immed)	
Delivery Time Trigger		blank (Default)	
Delivery Trig. Cond.	blank (Default)		
Original Source	from Init Msg		
Channel ID	from Init Msg		
Continuation Flag	0		

Message Type: Update APC Table

Type ID: UA

Nature of Message:

Message informing an off-host Monitor AP of APC Status table updates.

Path: Monitor AP - Monitor AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Status Update	PIC X
Header Length	092		
Data Length	0001		
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	UA		
AP Name (Dest.)	Off-Host Monitor AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Off-Host Monitor's APC		
AP Name (Source)	VAX Monitor AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	VAX Monitor's APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP	From AP Char. Table		
Integrity Check Flag	0		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag	0 (Default)		
Delivery Time Trigger	blank (Default)		
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		
Continuation Flag	0		

Message Type: Update Host Table

Type ID: UH

Nature of Message:

Message informing an off-host Monitor AP of Host table updates.

Path: Monitor AP - Monitor AP

Header Fields	Header Values	Data Fields	Data Values
Header Format	A	Host Name	PIC X(3)
Header Length	092	Status Update	PIC X
Data Length	0004		
Binary/Native Flag	N (Default)		
Priority Flag	0		
Message Type	UA		
AP Name (Dest.)	Off-Host Monitor AP		
Instance (Dest.)	Det by SysGen Parameter		
APC Name (Dest.)	Off-Host Monitor's APC		
AP Name (Source)	Local Monitor AP		
Instance (Source)	Det by SysGen Parameter		
APC Name (Source)	Local Monitor APC		
Message Serial #	Filled in by Source MPU		
Processing Code	1		
Message Category	E		
Priority of Source AP	From AP Char. Table		
Integrity Check Flag	0 (Default)		
Logging Flag	1		
Stat. Collection Flag	1		
Test Flag	0 (Default)		
Delivery Trigger Flag	0 (Default)		
Delivery Time Trigger	blank (Default)		
Delivery Trig. Cond.	blank (Default)		
Original Source	of Msg. Source AP		
Channel ID	of Msg. Source AP		

E.2 Eation Flag

E.2.1 Error Message Handling

When an error occurs within (or is detected by) the MPU, an error message is sent to either the Monitor AP, the source AP (where the error is related to a message), or both. However, sending an error message in the normal fashion (by writing to the MPU's own mailbox and performing all the message management functions) could easily result in an infinite loop. To avoid this, the MPU will have an error message formatting routine that formats and effects the send of the error messages to either Monitor AP, the Source AP, or both. In the event that the Monitor AP's mailbox is inaccessible, the fatal error processing routine (ERRPRO) will be called. The MPU's error formatting routine will have access to two "canned" headers and will be accessed by two MPU routines described below.

1. CALL "SNDMON" USING: Error-Code
 Name-String
 Processing-Code

Description: SNDMON will provide the error message formatting routine with the data needed to complete a "canned" header (in this case, one where the destination is the on-host Monitor AP). The formatting routine will move the data values to their proper fields and send the message. This call handles messages of Type 31, 32 and 33. (See Appendix E for formats).

Inputs: Error Code
 Name-String
 Processing-Code

2. CALL "SNDSAP" USING: Error-Code
 Entire Offending Message
 Header

Description: SNDSAP will provide the error message formatting routine with the data needed to complete a "canned" header (in this case, one where the destination is the source AP of the offending message). The formatting routine will move the data values to their proper fields and send the message. This call handles messages of type 32, 33, and 34. (See Appendix E for formats).

E.2.2 Error Message Description

Table E-3 lists the errors identified for the NTM. Each error is described along with the values for their calls to the error message

TABLE E-3
ERROR MESSAGES DESCRIPTIONS

<u>Error Description</u>	<u>Error Code</u>	<u>Parameters</u>
Can't write to Mailbox	31001	Data Length = 17 Name-String = Mailbox Name Processing-Code = IPC Code
Can't Create Mailbox	31002	Data Length = 17 Name-String = Mailbox Name Processing-Code = IPC Code
Can't Read Mailbox	31003	Data-Length = 17 Name-String = Mailbox Name Processing-Code = IPC Code
Mailbox Disconnect Error	31004	Data-Length = 17 Name-String = Mailbox Name Processing-Code = IPC Code
Call Wait Error	31005	Data-Length = 17 Name-String = NTM Module Name or AP Name if API error
Processing-Code = IPC Code		
Set Time Error	31006	Data-Length = 17 Name-String = NTM Module Name Processing-Code = IPC Code
Mapping Error	31007	Data-Length = 17 Name-String = NTM Module Name or AP Name if API error Processing-Code = OS Code
Job Process Information Error	31008	Data-Length = 17 Name-String = NTM Module Name or AP Name if API error Processing-Code = OS Code
Process Start Error	31009	Data-Length = 17 Name-String = Process Name Processing-Code = OS Code

TABLE E-3
ERROR MESSAGES DESCRIPTIONS (Continued)

<u>Error Description</u>	<u>Error Code</u>	<u>Parameters</u>
Process Abort Error	31010	Data-Length = 17 Name-String = Process Name Processing-Code = OS Code
Process Not Found	31011	Data Length = 17 Name-String = Process Name Processing-Code = OS Code
File Read Error	31012	Data Length = 17 Name-String = File Name Processing-Code = OS Code
File Write Error	31013	Data-Length = 17 Name-String = File Name Processing-Code = OS Code
File Close Error	31014	Data-Length = 17 Name-String = File Name Processing-Code = OS Code
File Open Error	31015	Data-Length = 17 Name-String = File Name Processing-Code = OS Code
Table Read Error	31016	Data-Length = 17 Name-String = Table Name Processing-Code = OS Code
Table Write Error	31017	Data-Length = 17 Name-String = Table Name Processing-Code = OS Code
CDM Data Access Errors	31018	Data-Length = 17 Name-String = MPU Name Processing-Code = Blank
Message Arrived at Wrong APC	31019	Data-Length = 17 Name-String = Sending MPU Processing-Code = Blank

TABLE E-3
ERROR MESSAGES DESCRIPTIONS (Continued)

<u>Error Description</u>	<u>Error Code</u>	<u>Parameters</u>
OS Call Error (for those not or covered specifically)	31020	Data-Length = 17 Name-String = MPU Module Name AP Name if AP Interface Processing-Code = OS Code
Time-out Error	31021	Data-Length = 17 Name-String = Processing-Code
COBOL Call Error	31022	Data-Length = 17 Name-String = Offending AP Processing-Code
Exception Condition	31023	Data-Length = 17 Name-String = AP Having Exception Condition Processing Code
Entry-Not-Found	31024	Data-Length = 17 Name-String = Table Name Processing-Code = Blanks
Entry-Not-Deleted	31025	Data-Length = 17 Name-String = Table Name Processing-Code = Blanks
Invalid Search Field	31026	Data-Length = 17 Name-String = Table Name Processing-Code = Blanks
Cancel Timeout Error	31027	Data-Length = 17 Name-String= Processing Code =
IPC Error	31028	Data-Length = 17 Name-String = Error Entity Processing-Code = IPC Code

TABLE E-3

ERROR MESSAGES DESCRIPTIONS (Continued)

<u>Error Description</u>	<u>Error Code</u>	<u>Parameters</u>
Invalid Category in Message Header	32001	On CALL "SNDMON" Data Length = 17 Name-String = Process Name Processing-Code = OS Code On CALL "SNDSAP" Offending Header
Invalid Header Format	32002	On CALL "SNDMON" Data Length = 17 Name-String = Source AP Processing-Code = Blank On CALL "SNDSAP" Offending Header
Invalid Header Length	32003	On CALL "SNDMON" Data-Length = 17 Name-String = Source AP Processing-Code = Blank On CALL "SNDSAP" Offending Header
Invalid Binary/Native	32004	On CALL "SNDMON" Flag Data-Length = 1 Name-String = Source AP Processing-Code = Blank On CALL "SNDSAP" Offending Header
Invalid Message Type	32005	On CALL "SNDMON" Data-Length = 17 Name-String = Source AP Processing-Code = Blank On CALL "SNDSAP" Offending Header

TABLE E-3

ERROR MESSAGES DESCRIPTIONS (Continued)

<u>Error Description</u>	<u>Error Code</u>	<u>Parameters</u>
Invalid Source AP	32006	On CALL "SNDMON" Data-Length = 0 Name-String = Blank Processing-Code = Blank On CALL "SNDSAP" N/A
Invalid Source Instance	32007	On CALL "SNDMON" Data Length = 17 Name-String = Source AP Processing-Code = Blank On CALL "SNDSAP" N/A
Invalid Source APC Name	32008	On CALL "SNDMON" Data Length = 17 Name-String = Source AP Name Processing-Code = Blank On CALL "SNDSAP" Offending Header
Invalid (Header) Processing Code	32009	On CALL "SNDMON" Data-Length = 17 Name-String = Source Processing-Code = Blank On CALL "SNDSAP" Offending Header
Invalid Continuation Flag	32010	On CALL "SNDMON" Data-Length = 1 Name-String = Source AP Processing-Code = Blank On CALL "SNDSAP" Offending Header
Invalid Data Length	32011	On CALL "SNDMON" Data-Length = 17 Name-String = Source AP Processing-Code = Blank On CALL "SNDSAP" Offending Header

TABLE E-3
ERROR MESSAGES DESCRIPTIONS (Continued)

<u>Error Description</u>	<u>Error Code</u>	<u>Parameters</u>
Invalid Message Priority	32012	On CALL "SNDMON" Data-Length = 17 Name String = Source AP Processing Code = Blank On CALL "SNDSAP" Offending Header
Resource Unavailable -or- Table Full	33001	On CALL "SNDMON" Data-Length = 17 Name-String = Table Name Processing-Code = Blank On CALL "SNDSAP" Entire Header
No Authorization	34001	Entire Header
Illegal Message Type	34002	Entire Header
Invalid Destination	34003	Entire Header