U S WEST Communications, Inc. Technical Publication

U S WEST Network Interface Specification Mediacc® Network Management Protocol Stacks

PUB 77306
Issue A
July 1993

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NOTICE

This technical publication describes the message-based interface with the corresponding hardware and physical interface requirements to allow U S WEST Communications, Inc. customers and network management system integrators Application Process-to-Application Process (AP-to-AP) access to network-based services through U S WEST Mediated Access (MEDIACC®) system. These network-based services are Feature Group B, C, and D switched circuits.

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1. Introduction

1.1 MEDIated ACCess (MEDIACC®)

Mediated Access (MEDIACC®) is the service offering of a gateway which customers use to conduct electronic dialogue with various U S WEST business services; i.e., Trouble Administration. The MEDIACC® Gateway supports a variety of software application functions which include the authentication of customers, verification of resources, translation of messages, and application-to-application communications with U S WEST business systems.

1.2 Purpose and Scope of Document

This document, as a Network Interface Specification, provides information which describes basic technical requirements for network connections with the MEDIACC® Gateway. Consistent with the document's title, the Simple Network Management Protocol (SNMP) and Common Management Information Protocol (CMIP) network management protocol stacks are specified as techniques for appropriate access to MEDIACC® Gateway Services. As such, this document is distinct from other U S WEST documents which describe the higher level network services and application functionality of various MEDIACC® Gateway Agent software modules and processes.

1.2.1 Acquisition of Documents

This document references many interrelated documents which describe both detailed protocol stack architecture, as well as higher level application services. These documents may be ordered as indicated in Section 6.6, Ordering Information. It is hereby noted that such explicit references are cited at the time of this publication and, hence, implicitly permit the evolution and future revision of the respective documents. Therefore, it is hereby requested that potential customers of U S WEST MEDIACC® Gateway Services contact their designated U S WEST Account Representative to ascertain the appropriate Gateway Service documentation list, prior to ordering and purchasing the extensive list of published documents which are referenced herein.

1.3 Document Summary

This document has been organized to indicate the necessary connectivity requirements that U S WEST customers must meet in order to electronically bond, via the MEDIACC® Gateway, with various services of U S WEST business systems. As a precursor to physical connectivity, the document indicates that customers must subscribe to the MEDIACC® Service and submit to an enrollment process which includes the exchange of network information and robust security procedures. Upon completion of the enrollment process, customers establish connectivity by jointly creating a physical link to U S WEST and commence an electronic dialogue by means of industry standard protocols which include X.25/X.75/X.32, SNMP, and CMIP.

1.4 Relationship to Other Documents

This particular document is one member of a collection of documents which provides a comprehensive guide to full service electronic bonding with U S WEST. The collection is organized in the following fashion:

1.4.1 Customer Enrollment

Customer requirements, account enrollment processes and security requirements are presented in:

U S WEST MEDIACC® Customer Enrollment Process Guide and Forms

This documentation is obtained by arrangement with the customer's designated U S WEST Account Representative.

1.4.2 Connectivity

Specifications for a network interface connection with the U S WEST MEDIACC® Gateway are provided in (this document):

U S WEST Network Interface Specification For MEDIACC® Network Management Protocol Stacks, Publication 77306, Issue A, March 1993.

1.4.3 Interoperability and Testing Verification

Specific details of the interoperability test suites, schedule, and verification requirements shall be disclosed and agreed upon as an adjunct of the official enrollment process and establishment of customer accounts.

In general, the customer will be assigned a U S WEST MEDIACC® Representative who will coordinate testing schedules and documentation. Test procedures will assure that robust interoperability and security are achieved at each layer of the protocol stack. The coordination of such procedures necessarily includes the disclosure of Object Definitions and Protocol Data Unit (PDU) exchange sequences which are described in U S WEST Management Information Base (MIB) modules and related documents.

This procedure documentation, obtained by arrangement with the customer's designated U S WEST Account Representative, is described in:

MEDIACC® Customer Interoperability Test System User Guide, Publication ITCAAMEDI00D0-38-01-00, February 1992, U S WEST Communications, Information Technologies, Customer Access Applications.

1.4.4 Application-To-Application Bonding

Features of particular services which include indigenous security mechanisms, message flow, and transaction processing are contained in documents which have been tailored to the specific capabilities and needs of individual service products, for example Trouble Administration. A list of currently available documents can be acquired by contacting the customer's designated U S WEST Account Representative.

Example documents include:

U S WEST Guide for the Development and Implementation of Trouble Administration Applications for Simple Network Management (SNMP) Protocol Stacks, Publication IT-CAA-MEDI00D0-95B-01-00, U S WEST Communications, Information Technologies, Customer Access Applications.

U S WEST Guide for the Development and Implementation of Trouble Administration Applications for Common Management Information Protocol (CMIP) Stacks, Publication IT-CAA-MEDI00D0-95A-01-00, U S WEST Communications, Information Technologies, Customer Access Applications.

2. Overview of U S WEST MEDIACC®

2.1 MEDIACC® Vision

The U S WEST MEDIated ACCess (MEDIACC®) Gateway has been architected as a multiprotocol gateway to a common set of mediated access services. The architecture traverses several important aspects of Open Systems technology while focusing upon the provision of superior customer service. MEDIACC® provides a seminal, enterprise-wide, network access architecture which has the promise of casting sprawling Operations Support Systems (OSSs) into a framework of efficient and transparent Open Systems networks. At the heart of the enterprise-wide network architecture lie salient features of the International Organization for Standards (ISO), the International Electrotechnical Commission (IEC), Operations, Administration, Maintenance, and Provisioning (OAM&P), NM Forum and InterNet Standards Organizations recommendations. These recommended standards form an operational basis upon which the MEDIACC® Gateway facilitates a mediated Open Systems representation of proprietary OSSs.

2.2 Customer Access to the U S WEST MEDIACC® Service

Customers subscribe to the MEDIACC® Service by:

- Successfully completing the Enrollment Process.
- Successfully establishing a connection to the U S WEST MEDIACC® Gateway Environment.
- Successfully completing the Interoperability and Test Verification Process.

Customers are designated as either a Primary Account Customer or an Agent Account Customer. Agents are customers who are able to act on behalf of other customers, as well as themselves. Agents can only be designated by a Primary Account Customer.

2.3 Security Overview

Pertinent details of the security paradigm and its administration are not revealed in this document. Such details will be disclosed between U S WEST and individual customers during the enrollment process and subsequently verified during the interoperability test suite procedures.

In general, basic security checkpoints are initiated at several junctures in the protocol stack. At the physical access level, customers are required to obtain unique interfaces with U S WEST DIGIPAC® network facilities. A variety of mechanisms are instituted to control access and ensure the authenticity of transactions.

2.4 MEDIACC® Network Management Protocol Access

2.4.1 Access Overview

In general, the MEDIACC® network management protocol access topology is predicated upon both Local Area Network (LAN) and Wide Area Network (WAN) fundamentals. Inherent in the Internet and ISO Layered Stack architecture is the capability to execute sophisticated and complex “higher level” protocol methods on top of a variety of robust “lower level” physical access and control methods. Such a milieu facilitates the alchemy of technological innovation and economic reasonableness over time.

2.4.2 Access Architecture

This section presents a logical illustration of the Network Management Protocol stack architecture. It is seen that the U S WEST MEDIACC“ Gateway is situated upon both the industry standard InterNet SNMP stack and the industry standard OSI CMIP stack. Customers may select either, or both, of these stacks. See FIGURE 2-1 for a diagram of the Access architecture.

Detailed descriptions of SNMP are found in:

RFC 1155: Structure and Identification of Management information for TCP/IP-based Internets, May 1990

RFC 1157: A Simple Network Management Protocol (SNMP), May 1990

RFC 1212: Concise MIB Definitions, March 1991

RFC 1213: Management Information Base for Network Management of TCP/IP-based internets: MIB-II, March 1991

RFC 1215: A Convention for defining Traps for use with the SNMP, March 1991

Detailed descriptions of CMIP are found in:

ISO/IEC 9595 - Information Technology- Open Systems Interconnect -Common Management Information Service Definition, 1991

ISO/IEC 9596-1 - Information Technology- Open Systems Interconnect -Common Management Information Protocol Specification - Part 1: Specification, Edition 2, 1991

Note: The Reference Section of this document, for expository purposes, contains a comprehensive list of relevant standards documents. The Ordering Information section of this document indicates how customers may obtain documentation.

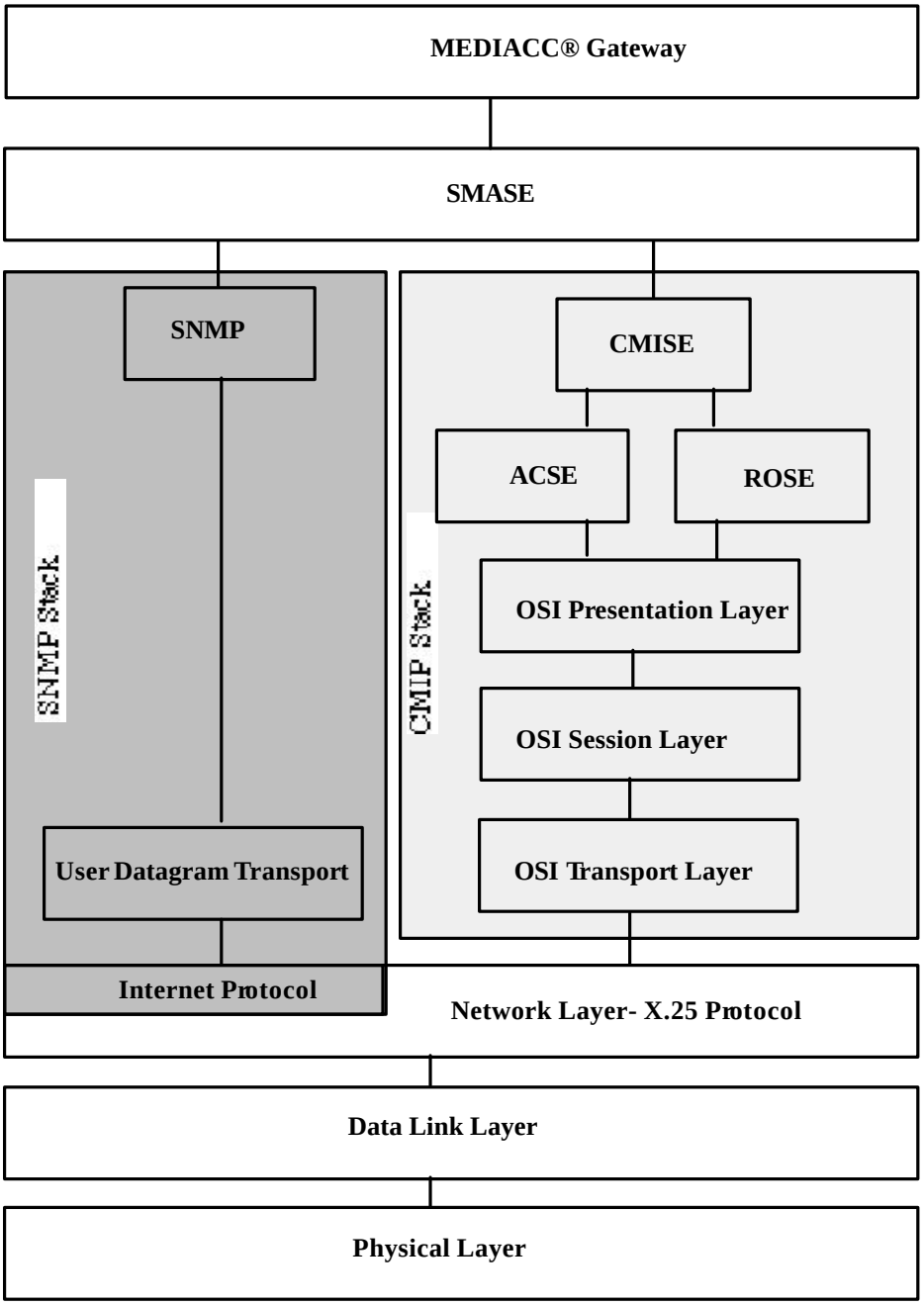

Figure 2-1: Access Architecture

2.4.3 Access Topology

U S WEST presently offers logical connectivity as illustrated in Figure 2-2. Descriptions of components and configurations are referenced throughout the remaining sections of this document.

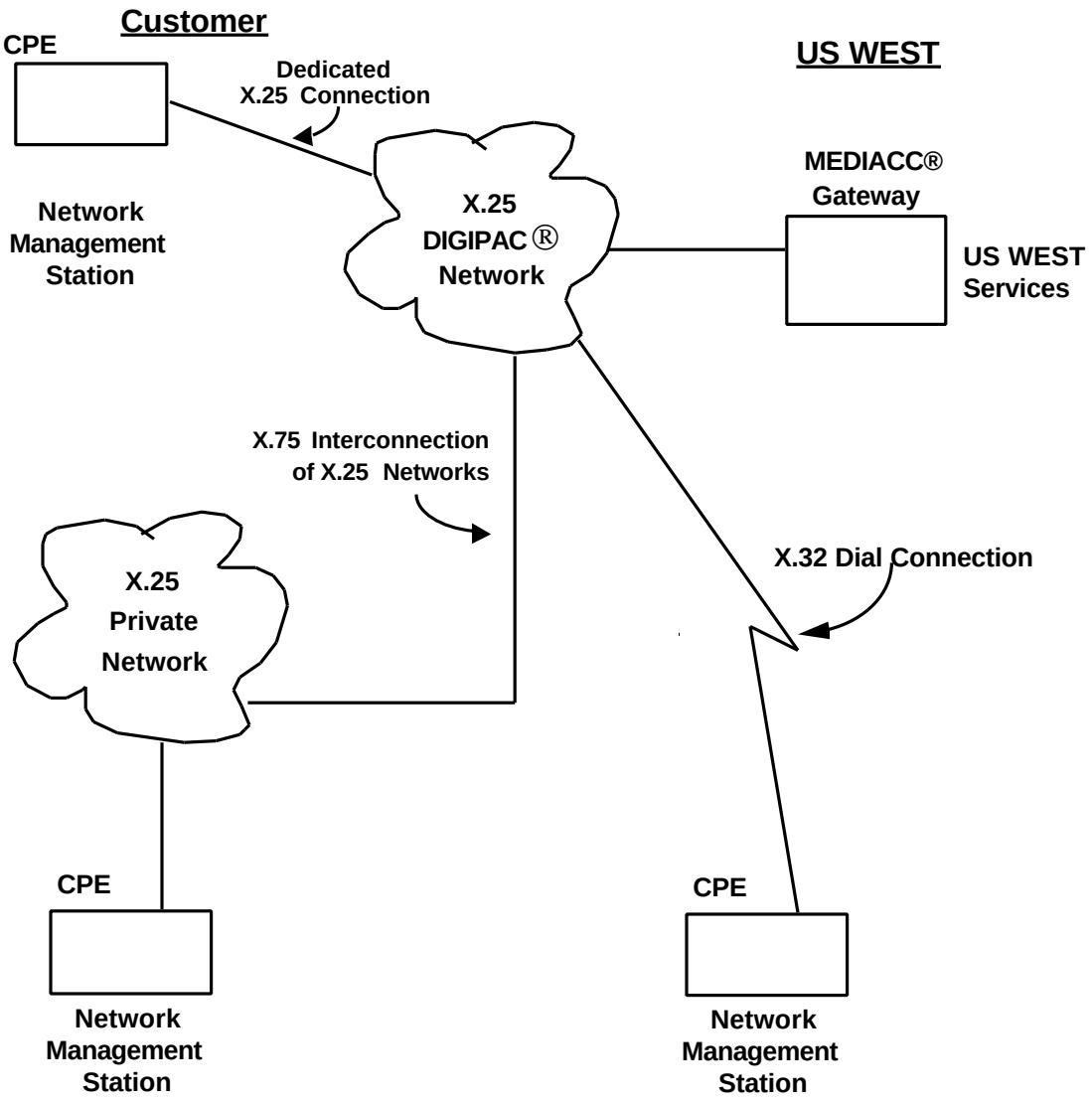

Figure 2-2: Connections To MEDIACC®

2.4.4 Making an X.25, X.75 or X.32 Connection

The use of the MEDIACC® gateway and associated services can only be gained through an X.25 packet switching network. Such access is established via U S WEST's DIGIPAC® X.25 packet switching network by:

- obtaining a dedicated digital or analog circuit facility, in conjunction with a U S WEST DIGIPAC® packet switching node, which provides synchronous system to system support of the protocol stacks defined in this document; or,

- obtaining dedicated digital or analog circuit facilities, in conjunction with a U S WEST DIGIPAC® packet switching node, which provides an X.75 interconnection of the customer's private X.25 packet switching network with the U S WEST DIGIPAC® X.25 packet switching network; or,
- obtaining X.32 dial access to a U S WEST DIGIPAC® packet switching node, which provides synchronous, system to system, support of the protocol stacks defined in this document.

Detailed specifications for making the necessary connections with DIGIPAC® are provided in the U S WEST DIGIPAC® Service Interface Specifications for Public Packet Switching Network, U S WEST Communications, Inc., Technical Publication 77359, Issue D, November 1992. This document, and subsequent issues, may be purchased from Faison, as indicated in Section 6.6.

In all situations, it must be recognized that it is incumbent upon the customer to provide Customer Premises Equipment (CPE) which provides connection to such circuits and implements the industry standard network management protocol stacks identified in this document. Additionally, it is necessary for customers to configure CPE in accordance with the U S WEST DIGIPAC® Service Interface Specifications document noted above. Customers are responsible for paying all charges necessary for connecting to the service and maintaining those connections.

3. SNMP Stack Functionality and Description

3.1 Overview of SNMP

The Simple Network Management Protocol (SNMP) is a well-known and widely used paradigm for the management and administration of TCP/IP internets, devices, and applications. A manageable network is composed of one or more management systems, many network elements or agent systems, and a network management protocol.

SNMP is the shared protocol which communicates information between a management system and an agent system. SNMP allows the management system to retrieve (get) or alter (set) management information on an agent system. SNMP also permits an agent system to notify management systems of important events (trap).

For a background on SNMP, the reader is encouraged to examine The Simple Book, by Marshall Rose, Prentice Hall, 1991, ISBN 0-13-812611-9.

3.1.1 SNMP Protocol Operation Summary

SNMP supports messages which are self-contained units of information. Such a unit, or data object, contains protocol control information, such as version and security data, as well as user data. For detailed information about SNMP, refer to the following series of documents:

RFC 1155: Structure and Identification of Management information for TCP/IP-based Internets, May 1990

RFC 1157: A Simple Network Management Protocol (SNMP), May 1990

RFC 1212: Concise MIB Definitions, March 1991

RFC 1213: Management Information Base for Network Management of TCP/IP-based internets: MIB-II, March 1991

RFC 1215: A Convention for defining Traps for use with the SNMP, March 1991

3.1.2 Structure of Management Information (SMI) and Management Information Base (MIB) Modules

The Structure of Management Information (SMI) contains the rules used to define objects that can be accessed by a network management protocol. For SNMP, the SMI is defined in:

RFC 1155: Structure and Identification of Management Information for TCP/IP-based Internets, May 1990

RFC 1212: Concise MIB Definitions, March 1991

Information available through the SNMP Agent is known as a Management Information Base, or MIB. The U S WEST MEDIACC® Management Information Base has been organized into MIB Modules which reflect the recommendations of standards organizations which include ISO/IEC, IOAM&P, T1M1, NM Forum and InterNet. MIB Module definitions will be provided to U S WEST MEDIACC® customers according to the particular service which a customer selects, for example Trouble Administration. Examples of U S WEST MIB Modules include Mediated Access, OSI Compatibility, Generic Network Model, and Trouble Administration.

3.2 MEDIACC® SNMP Stack Description

The MEDIACC® SNMP protocol stack follows industry standard definitions which support standard SNMP operations, as described in the preceding sections. In general, the lower three layers of the stack are an interface to an X.25 Packet Switching Network. The next two layers provide for industry standard Internet Routing and Datagram services. SNMP protocol messages are encoded and decoded, to facilitate hardware independence, by the conventions of an Abstract Syntax Notation (ASN version 1). Finally, SNMP provides an interface for the Network Manager and Agent to conduct application-to-application dialog. The entire protocol stack is depicted in Figure 3-1. Comprehensive explanations of the X.25, X.75 and X.32 configuration details may be found in the U S WEST DIGIPAC® Service Interface Specifications for Public Packet Switching Network, U S WEST Communications, Inc., Technical Publication 77359, Issue D, November 1992.

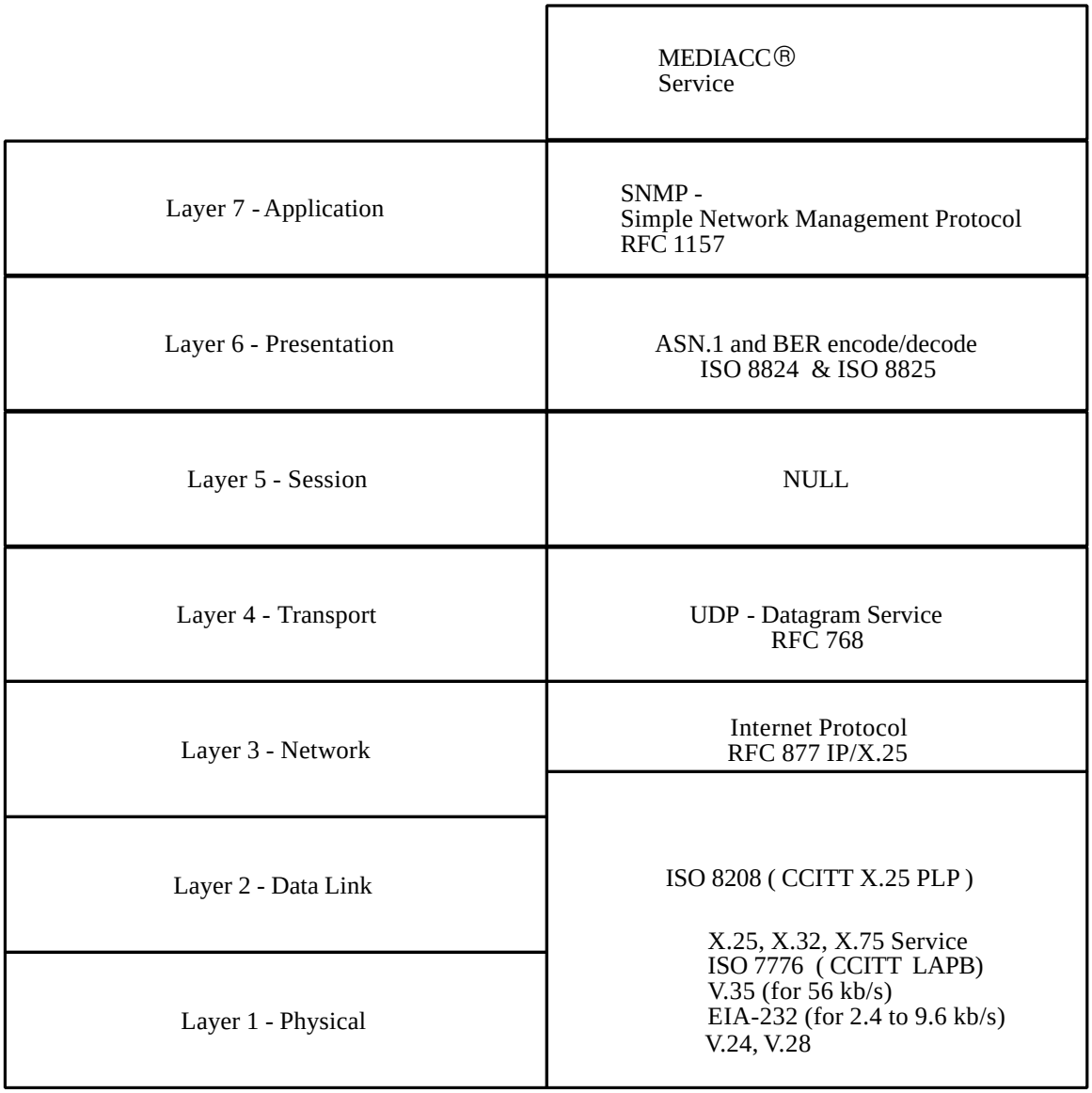

Figure 3-1: SNMP Protocol Stack

4. CMISE Functionality and Description

4.1 Overview of CMISE

The Common Management Information Service Element (CMISE) defines a set of basic management services for sending and receiving management related messages. The Common Management Information Protocol (CMIP) is a peer management protocol between manager and agent. These services allow manager and agent the ability to exchange operations on managed objects and notifications. Additional functionality is provided by other components of Service Management Application Service Element (SMASE), such as, Association Control Service Element (ACSE) for peer-to-peer association between two applications and Remote Operations Service Element (ROSE) for request/response message exchange. See Figure 4-1 for a diagram of the CMISE architecture.

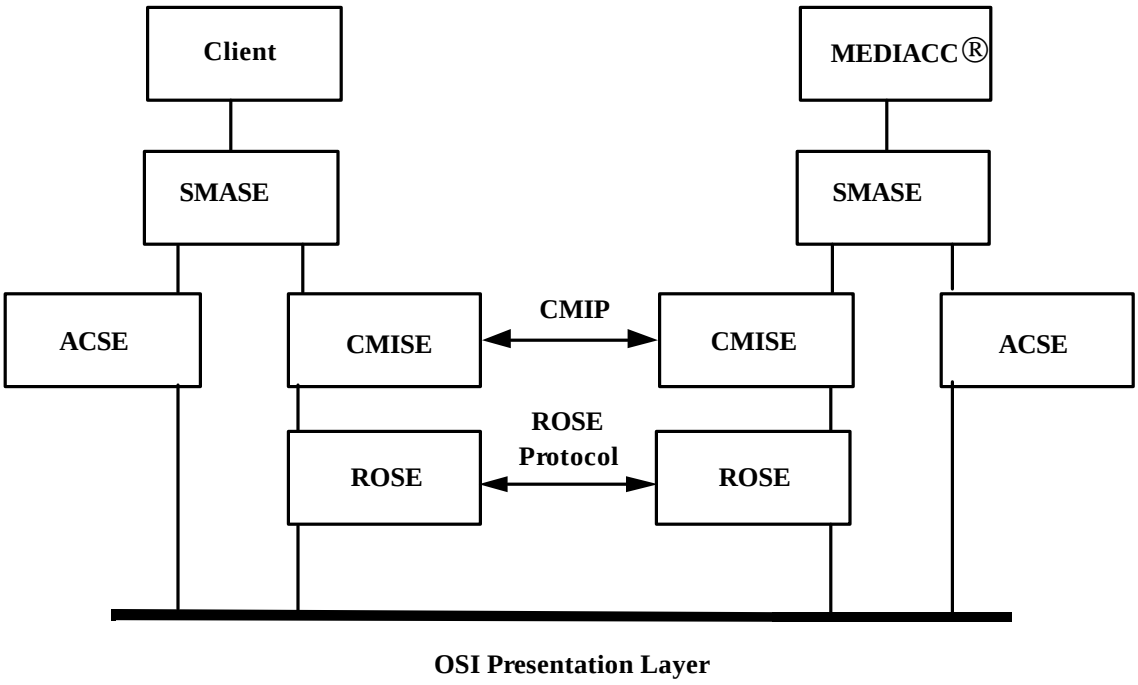

Figure 4-1: CMISE Architecture

For detailed information on CMISE and CMIP, refer to ISO/IEC 9595 and ISO/IEC 9596, respectively.

4.1.1 CMISE Architectural Description

CMISE defines a set of operations and data elements that define specific data exchange in the form of a request and response. These elements identify attributes of a managed object defined in the Management Information Base (MIB). CMISE provides two types of services, confirmed and non-confirmed. A confirmed request sent from a manager requires the agent to supply a response. A non-confirmed request does not require the agent to supply a response. See Figure 4-2 for the request/response flow in CMISE.

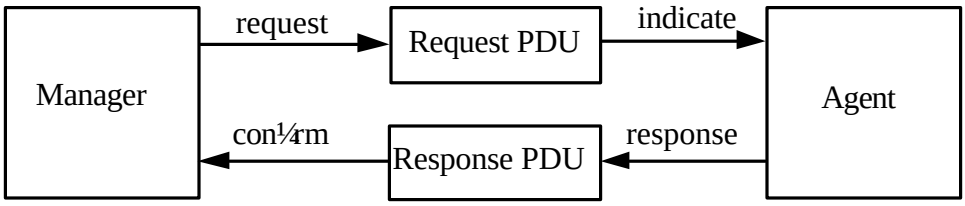

Figure 4-2: CMISE Request/Response Flow

4.1.2 CMISE Functional Units

CMISE has basic kernel and additional functional units. Functional units define capabilities of the manager and agent application. When an association between a manager and agent is established, the functional units are negotiated. The association fails if the responder does not support the functional units.

4.1.3 CMISE Services

CMISE services are used by network management processes to exchange management information. Each of the services include a set of attributes that contain application specific information i. e., access control, base object class, managed object instance, etc. The services provided by CMISE are exchanged between a manager and agent in the form of a Protocol Data Unit (PDU) as defined by CMIP. CMIP is a Remote Operations Service Element (ROSE) based protocol that maps CMISE services to a remote operation.

4.1.4 MEDIACC® CMIP Stack Description

The MEDIACC® CMIP protocol stack follows industry standard definitions which support standard CMISE operations, as described in the preceding sections. In general, the lower three layers of the stack are an interface to an X.25 Packet Switching Network. The functionality of the Transport to the Application layer conform to the OSI Network model. CMIP protocol messages are encoded and decoded, to facilitate hardware independence, by the conventions of an Abstract Syntax Notation (ASN version 1). Finally, CMIP provides an interface for the Network Manager and Agent to conduct application-to-application dialog. The entire protocol stack is depicted in Figure 4-3. Comprehensive explanations of the X.25, X.75 and X.32 configuration details may be found in the U S WEST DIGIPAC® Service Interface Specifications for Public Packet Switching Network, U S WEST Communications, Inc., Technical Publication 77359, Issue D, November 1992. This document, and subsequent issues, may be purchased from Faison, as indicated in Section 6.6.

4.1.5 Structure of Management Information (SMI) and Management Information Base (MIB) Modules

The Structure of Management Information (SMI) contains the rules used to define objects that can be accessed by a network management protocol. For CMISE, the SMI is defined in:

> *ISO/IEC 10165-4, Information Technology - Open Systems Interconnections - Structure of Management Information: Guidelines for the Definition of Managed Objects,* 1992.

Information available through the CMISE Agent is known as a Management Information Base, or MIB. The U S WEST MEDIACC® Management Information Base has been organized into MIB Modules which reflect the recommendations of standards organizations which include ISO/IEC, IOAM&P, T1M1, NM Forum and InterNet. MIB Module definitions will be provided to U S WEST MEDIACC® customers according to the particular service which a customer selects, for example Trouble Administration.

Note: The Reference Section of this document, for expository purposes, contains a comprehensive list of relevant standards documents. The Ordering Information section of this document indicates how customers may obtain documentation.

	MEDIACC® Service
Layer 7 - Application	ISO8649, ISO 9072-1, ISO 8650, ISO 9072-2 ISO 8649-1, ISO 8650-1, ISO 9595, ISO 9596 CCITT X.217, X.219, X.227, X.229 CCITT X.710, X.711
Layer 6 - Presentation	ISO 8824, ISO 8825, ISO 8822, ISO 8823 CCITT X.208, X.209, X.216, X.226
Layer 5 - Session	ISO 8326, ISO 8327 CCITT X.215, X.225
Layer 4 - Transport	ISO 8072, ISO 8073 CCITT X.214, X.224
Layer 3- Network	ISO 8348, ISO 8208, ISO 8878 CCITT X.223, X.213, X.25, X.244, X.32, X.75
Layer 2 - Data Link	ISO 7776 CCITT X.25 LAP-B
Layer 1 - Physical	CCITT V.35, V.28, V.24

Figure 4-3: CMISE Protocol Stack

5. Definitions

5.1 Acronyms

ACSE	Association Control Service Element
AD	Amendment; for example, IS0 8327 AD2
ANSI	American National Standards Institute
ASN.1	Abstract Syntax Notation One
BASE	Base document; for example, ISO 8327
BCC	Business Control Center
BER	Basic Encoding Rules for ASN.1
CCITT	Consultative Committee on International Telegraph and Telephone
CNM	Customer Network Management
CMIP	Common Management Information Protocol
CMISE	Common Management Information Service Element
CPE	Customer Premises Equipment
CSU/DSU	Channel Service Unit/Data Service Unit
DCE	Data Circuit Terminating Equipment
DTE	Data Terminal Equipment
EIA	Electronic Industries Association
FAST	Flexible Access Service Technology
GDMO	Guidelines for the Description of Managed Objects
GNM	Generic Network Model
IEC	International Electrotechnical Commission
IP	Internet Protocol
ISO	International Standards Organization
LAN	Local Area Network
LAP	Link Access Procedure
LATA	Local Access and Transport Area
MEDIACC®	Mediated Access
MIB	Management Information Base
NM	Network Management

NMS	Network Management System
OAM&P	Operations, Administration, Maintenance and Provisioning
OSI	Open Systems Interconnection
OSS	Operations Support System
PDN	Packet Data Network
PDU	Protocol Data Unit
PICS	Plug In Control System
PLTS	Private Line Transport Services (Special Access)
RFC	Request For Comments
RDN	Relative Distinguished Names
RMA	Request for Manual Assistance
ROSE	Remote Operations Service Element
RPC	Remote Procedure Call
SAP	Service Access Point
SMI	Structure of Management Information
SMASE	System Management Application Service Elements
SNMP	Simple Network Management Protocol
SVC	Switched Virtual Circuit
T1M1	(See Glossary)
TA	Trouble Administration
TCP	Terminal Control Protocol
TMN	Telecommunications Management Network
TMNA	Telecommunications Management Network Applications
UDP	User Datagram Protocol
WAN	Wide Area Network

5.2 Glossary

Abstract Syntax Notation One (ASN.1)

The OSI language for describing abstract syntax.

Basic Encoding Rules (BER)

The OSI language for describing transfer syntax.

Layer 1

Physical Layer. Provides the transparent transmission of bit streams between systems including relaying through different media.

Layer 2

Data Link Layer. Provides the transfer of software between directly connected systems and detects any errors in the transfer. Establishes, maintains and releases software data links; handles error and flow control.

Layer 3

Network Layer. Provides routing and relaying through intermediate systems. Also handles segmenting, blocking, error recovery, and flow control.

Layer 4

Transport Layer. Provides the transparent transfer of software between end systems. Handles end to end control, multiplexing, and mapping.

Layer 5

Session Layer. Provides administration and control sessions between application processes and manages their data.

Layer 6

Presentation Layer. Provides representation, interpretation, format and code transformation of information communicated between or referred to by application processes. MEDIACC uses standard ASN.1 representations for all messages and data communicated remotely. It uses standard presentation encoding, decoding, and transfer syntaxes.

Layer 7

Application Layer. Provides a window between application processes in order to exchange meaningful information. Performs management functions.

Protocol Data Unit (PDU)

A data object exchanged by protocol machines, usually containing both protocol control information and user data.

X.25

Packet level messaging protocol. Consists of five classes of optional facilities.

6. References

6.1 U S WEST Publications

PUB 77359 *U S WEST DIGIPAC®, Service Interface Specifications for Public Packet Switching Network,* Issue D, November 1992.

6.2 General Publications

ISBN 0-13-812611-9 Marshall Rose. *The Open Book: An Introduction to Management of TCP/IP-based Internets,* Prentice-Hall, Englewood Cliffs, NewJersey, 1991.

ISBN 0-13-351842-6 Adrian Tang. *Open Networking with OSI, Prentice-Hall, Englewood Cliffs,* New Jersey, 1992.

6.3 Consultative Committee International Telephone and Telegraph (CCITT) Publications

ASN.1 *Specification of Abstract Syntax Notation One (ASN-1),* CCITT Blue Book, Volume VIII, 1989, X.208.

6.4 Internet Request For Comments (RFCs) Publications

RFC 768 *User Datagram Protocol,* DDN Network Information Center, SRI International, August 1980.

RFC 791 *Internet Protocol*, DDN Network Information Center, SRI International, September, 1981.

RFC 792 *Internet Control Message Protocol,* (ICMP), DDN Network Information Center, SRI International, September, 1981.

RFC 877 *Public Data Networks,* DDN Network Information Center, SRI International, September 1983.

RFC 903 *Reverse Address Resolution Protocol,* DDN Network Information Center, SRI International, June 1984.

RFC 950 *Subnet Extension,* August, 1985, DDN Network Information Center, SRI International.

RFC 1009 Robert T. Braden and John B. Postel. *Requirements for Internet Gateways,* DDN Network Information Center, SRI International, June 1987.

RFC 1011 *Official Protocols,* DDN Network Information Center, SRI International, May 1987.

RFC 1034 *Domain Name System - Concepts and Facilities,* DDN Network Information Center, SRI International, November 1987.

RFC 1035 *Domain Name System - Implementation and Specification,* DDN Network Information Center, SRI International, November 1987.

RFC 1052 *IAB Recommendations for the Development of Internet Network Management Standards,* DDN Network Information Center, SRI International, April 1988.

RFC 1060 Joyce K. Reynolds and Jon B. Postel, *Assigned Numbers,* DDN Network Information Center, SRI International, March, 1990.

RFC 1066 *MIB Definitions,* DDN Network Information Center, SRI International, August 1988.

RFC 1109 *Report of the Second Ad Hoc Network Management Review Group,* DDN Network Information Center, SRI International, August 1989.

RFC 1123 *Host Requirements - Applications,* DDN Network Information Center, SRI International, October 1989.

RFC 1123 Robert T. Braden. *Requirements for Internet Host - Communication Layers,* DDN Network Information Center, SRI International, October 1989.

RFC 1140 *IAB. IAB Official Protocol Standards,* DDN Network Information Center, SRI International, May 1990. Internet Activities Board, May 1990.

RFC 1155 Marshall T. Rose and Keith McCloghrie. *Structure of Management Information for TCP/IP-based Internets,* DDN Network Information Center, SRI International, May 1990.

RFC 1156 Keith McCloghrie and Marshall T. Rose. *Management Information Base for Network Management of TCP/IP-based Intrnets,* DDN Network Information Center, SRI International, May 1990.

RFC 1157 *A Simple Network Management Protocol,* DDN Network Information Center, SRI International, May 1990.

RFC 1158 *Management Information Base for Network Management of TCP/IP-based Internets: MIB-II,* DDN Network Information Center, SRI International, May 1990.

RFC 1212 *Concise MIB Definitions,* DDN Network Information Center, SRI International, March 1991.

RFC 1213 *Management Information Base for Network Management of TCP/IP-based Intrnets: MIB-II,* DDN Network Information Center, SRI International, March 1991.

RFC 1236 *IP to X.121 Address Mapping for DDN* (June 1980), DDN Network Information Center, SRI International, June 1991.

Internet Draft *Definitions of Managed Objects for Administration of SNMP Parties,* SNMP Party MIB, January 12, 1992.

6.5 International Base Standards/Recommendations:

ISO/IEC 10165-4, Information Technology - Open Systems Interconnections - Structure Of Management Inforation: Guidelines For the Definition Of Managed Objects, 1992.

CCITT Recommendation X.217, Association Control Service Definition for Open Systems Interconnection for CCITT Applications, 1988.

ISO/IEC 8649 - Information Processing Systems- Open Systems Interconnect - Service Definition for the Assocation Control Service Element, 1990.

ISO/IEC 8649/AM1 - Information Processing Systems- Open Systems Interconnect - ACSE Service Amendment 1: Authentication During Association Establishment, 1990.

CCITT Recommendation X.227, Association Control Protocol Specification for Open Systems Interconnection for CCITT Applications, 1988.

ISO/IEC 8650 - Information Processing Systems- Open Systems Interconnect - Protocol Specification for the Assocation Control Service Element, 1990.

ISO/IEC 8650/AM1 - Information Processing Systems- Open Systems Interconnect - Protocol Specification for the Assocation Control Service Element -Amendment 1: Authentication During Association Establishment, 1990.

ISO/IEC 9595 - Information Technology- Open Systems Interconnect -Common Management Information Service Definition, 1991.

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