NPAC SMS
INTEROPERABLE INTERFACE SPECIFICATION

NANC Version 1.05.1

Prepared for:
~~Prepared for:~~
~~The Illinois Commerce Commission SMS Subcommittee~~The North American Numbering Council (NANC)

~~By:~~
~~Lockheed Martin IMS and Evolving Systems, Inc. (ESI)~~

April 7, 1997~~March 14, 1997~~

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Table Of Contents

1. Introduction

1.1. Document Overview

1.2. How To Use This Document

1.3. Document Version History

1.4. References

1.4.1. Standards

1.4.2. Related Publications

1.5. Abbreviations/Definitions

2. Interface Overview

2.1. Overview

2.2. OSI Protocol Support

2.3. SOA to NPAC SMS Interface

2.3.1. Subscription Administration

2.3.2. Audit Requests

2.3.3. Notifications

2.3.4. Service Provider Data Administration

2.4. NPAC SMS to Local SMS Interface

2.4.1. Subscription Version and Network Data Download

2.4.2. Service Provider Data Administration

2.4.3. Notifications

3. Hierarchy Diagrams

3.1. Overview

3.1.1. Managed Object Model Inheritance Hierarchy

3.1.2. Log Record Managed Object Hierarchy

3.1.3. NPAC SMS to Local SMS Naming Hierarchy for the NPAC SMS

3.1.4. NPAC SMS to Local SMS Naming Hierarchy for the Local SMS

3.1.5.SOA to NPAC SMS Naming Hierarchy for the NPAC SMS

4. Interface Functionality to CMIP Definition Mapping

4.1. Overview

4.1.1. Primary NPAC Mechanized Interface Operations

4.1.2. Managed Object Interface Functionality

4.1.3. Attribute Interface Functionality

4.1.4. Action Interface Functionality

4.1.5. Notification Interface Functionality

4.2. Scoping and Filtering Support

4.2.1. Scoping

4.2.2. Filtering

4.3. lnpLocal-SMS-Name and lnpNPAC-SMS-Name Values

5. Secure Association Establishment

5.1. Overview

5.2. Security

5.2.1. Authentication and Access Control Information

5.2.1.1. System Id
5.2.1.2. System Type
5.2.1.3. User Id
5.2.1.4. List Id
5.2.1.5. Key Id
5.2.1.6. CMIP Departure Time
5.2.1.7. Sequence Number
5.2.1.8. Association Functions
5.2.1.9. Recovery Mode
5.2.1.10. Signature
5.2.2. Association Establishment
5.2.3. Data Origination Authentication
5.2.4. Audit Trail

5.3. Association Management and Recovery
5.3.1. Establishing Associations
5.3.1.1. NpacAssociationUserInfo
5.3.1.2. Unbind Requests and Responses
5.3.1.3. Aborts
5.3.1.4. NPAC SMS Behavior
5.3.1.5. Service Provider SOA and Local SMS Procedures
5.3.2. Releasing or Aborting Associations
5.3.3. Error Handling
5.3.3.1. NPAC SMS Error Handling
5.3.3.2. Processing Failure Error
5.3.4. Resynchronization
5.3.4.1. Local SMS Resynchronization
5.3.4.2. SOA Resynchronization

6. Message Flow Diagrams

6.1. Overview

6.2. Audit Scenarios
6.2.1. SOA Initiated Audit
6.2.2. SOA Initiated Audit Cancellation by the SOA
6.2.3. SOA Initiated Audit Cancellation by the NPAC
6.2.4. NPAC Initiated Audit
6.2.5. NPAC Initiated Audit Cancellation by the NPAC
6.2.6. Audit Query on the NPAC

6.3. Service Provider Scenarios
6.3.1. Service Provider Creation by the NPAC
6.3.2. Service Provider Deletion by the NPAC
6.3.3. Service Provider Modification by the NPAC
6.3.4. Service Provider Modification by the Local SMS
6.3.5. Service Provider Modification by the SOA
6.3.6. Service Provider Query by the Local SMS
6.3.7. Service Provider Query by the SOA

6.4. Service Provider Network Data Scenarios
6.4.1. NPA-NXX Scenarios
6.4.1.1. NPA-NXX Creation by the NPAC
6.4.1.2. NPA-NXX Deletion by the NPAC
6.4.1.3. NPA-NXX Creation by the Local SMS
6.4.1.4. NPA-NXX Creation by the SOA
6.4.1.5. NPA-NXX Deletion by the Local SMS
6.4.1.6. NPA-NXX Deletion by the SOA
6.4.1.7. NPA-NXX Query by the Local SMS
6.4.1.8. NPA-NXX Query by the SOA

6.4.2. LRN Scenarios
6.4.2.1. LRN Creation by the NPAC
6.4.2.2. LRN Creation by the SOA
6.4.2.3. LRN Deletion by the SOA
6.4.2.4. LRN Query by the SOA
6.4.2.5. LRN Deletion by the NPAC
6.4.2.6. LRN Creation by the Local SMS
6.4.2.7. LRN Deletion by the Local SMS
6.4.2.8. LRN Query by the Local SMS
6.4.2.9. Network Data Download
6.4.2.10. Scoped/Filtered GET of Network Data
6.4.2.11. Scoped/Filtered GET of Network Data from SOA

6.5. SubscriptionVersion Flow Scenarios
6.5.1. SubscriptionVersion Create Scenarios
6.5.1.1. SubscriptionVersion Create by the Initial SOA (Old Service Provider)
6.5.1.2. SubscriptionVersion Create by the Initial SOA (New Service Provider)
6.5.1.3. SubscriptionVersion Create by Second SOA (New Service Provider)
6.5.1.4. SubscriptionVersion Create by Second SOA (Old Service Provider)
6.5.1.5.SubscriptionVersion Activated by New Service Provider SOA
6.5.1.6. Active SubscriptionVersion Create on Local SMS
6.5.1.7. SubscriptionVersionCreate M-CREATE Failure to Local SMS
6.5.1.8. SubscriptionVersion M-CREATE: Partial Failure to Local SMS
6.5.1.9. Create Subscription Version: Resend Successful to Local SMS Action
6.5.1.10. Subscription Version: Resend Failure to Local SMS
6.5.1.11. SubscriptionVersion Create for Intra-Service Provider Port
6.5.2. Modify Scenarios
6.5.2.1. SubscriptionVersion Modify Active Version Using M-ACTION by a Service Provider SOA
6.5.2.2. SubscriptionVersion Modify Active: Failure to Local SMS
6.5.2.3. SubscriptionVersion Modify Prior to Activate Using M-ACTION
6.5.2.4. SubscriptionVersion Modify Prior to Activate Using M-SET
6.5.2.5. Subscription Version Modify Active: Resend Successful to Local SMS
6.5.2.6. Subscription Version Modify Active: Resend Failure to Local SMS
6.5.3. Cancel Scenarios
6.5.3.1. SubscriptionVersion Cancel by Service Provider SOA After Both Service Provider SOAs Have Concurred
6.5.3.2. SubscriptionVersionCancel: No Acknowledgment from a SOA
6.5.3.3. Subscription Version Cancels With Only One Create Action Received
6.5.4. Disconnect Scenarios
6.5.4.1. SubscriptionVersion Immediate Disconnect
6.5.4.2. SubscriptionVersion Disconnect With Effective Release Date
6.5.4.3. SubscriptionVersion Disconnect: Failure to Local SMS
6.5.4.4. SubscriptionVersion Disconnect: Partial Failure to Local SMS
6.5.4.5. Subscription Version Disconnect: Resend Successful to Local SMS
6.5.4.6. Subscription Version Disconnect: Resend Failure to Local SMS
6.5.5. Conflict Scenarios
6.5.5.1. SubscriptionVersion Conflict and Conflict Resolution by the NPAC SMS
6.5.5.2. Subscription Version Conflict Removal by the New Service Provider SOA
6.5.5.3. SubscriptionVersion Conflict: No Conflict Resolution
6.5.5.4. Subscription Version Conflict by Old Service Provider Explicitly Not Authorizing (First Create)
6.5.6. SubscriptionVersion Query
6.5.6.1. Subscription Data Download

6.6. LSMS Filter NPA-NXX Scenarios
6.6.1. lsmsFilterNPA-NXX Creation by the Local SMS
6.6.2. lsmsFilterNPA-NXX Deletion by the Local SMS
6.6.3. lsmsFilterNPA-NXX Query by the Local SMS
6.6.4. lsmsFilterNPA-NXX Creation by the SOA

6.6.5. lsmsFilterNPA-NXX Deletion by the SOA
6.6.6. lsmsFilterNPA-NXX Query by the SOA

6.7. Miscellaneous
6.7.1. Sequencing of Events on Initialization/Resynchronization of Local SMS
6.7.2. SOA/Local SMS Notification of Scheduled NPAC Downtime
6.7.3. NPA-NXX Split
6.7.4. Mass Update

7. GDMO Definitions

7.1. Overview

7.2. -- Object Definitions

7.3. -- Name Binding Definitions

7.4. -- Attribute Definitions

7.5. -- Package Definitions

7.6. -- Parameter Definitions

7.7. -- Action Definitions

7.8. -- Notification Definitions

8. General ASN.1 Definitions

8.1. Overview

8.2. LNP ASN.1 Object Identifier Definitions

8.3. LNP General ASN.1 Definitions

9. Managed Object Conformance Statements

9.1. Overview

9.2. lnpAudits Tables
9.2.1. lnpAudits Packages
9.2.2. lnpAudits Name Bindings
9.2.3. lnpAudits Attributes
9.2.4. lnpAudits Actions
9.2.5. lnpAudits Notifications

9.3. lnpLocalSMS Tables
9.3.1. lnpLocalSMS Packages
9.3.2. lnpLocalSMS Name Bindings
9.3.3. lnpLocalSMS Attributes
9.3.4. lnpLocalSMS Actions
9.3.5. lnpLocalSMS Notifications

9.4. lnpLogAudit-DiscrepancyRptRecord Tables
9.4.1. lnpLogAudit-DiscrepancyRptRecord Packages
9.4.2. lnpLogAudit-DiscrepancyRptRecord Name Bindings
9.4.3. lnpLogAudit-DiscrepancyRptRecord Attributes
9.4.4. lnpLogAudit-DiscrepancyRptRecord Actions
9.4.5. lnpLogAudit-DiscrepancyRptRecord Notifications

9.5. lnpLogAuditResultsRecord Tables
9.5.1. lnpLogAuditResultsRecord Packages
9.5.2. lnpLogAuditResultsRecord Name Bindings
9.5.3. lnpLogAuditResultsRecord Attributes
9.5.4. lnpLogAuditResultsRecord Actions

9.5.5. lnpLogAuditResultsRecord Notifications....

9.6. lnpLogCancellationAcknowledgeRequestRecord....
9.6.1. lnpLogCancellationAcknowledgeRequest Packages....
9.6.2. lnpLogCancellationAcknowledgeRequest Name Bindings....
9.6.3. lnpLogCancellationAcknowledgeRequest Attributes....

9.7. lnpLogNewSP-CreateRequestRecord Tables....
9.7.1. lnpLogNewSP-CreateRequestRecord Packages....
9.7.2. lnpLogNewSP-CreateRequestRecord Name Bindings....
9.7.3. lnpLogNewSP-CreateRequestRecord Attributes....
9.7.4. lnpLogNewSP-CreateRequestRecord Actions....
9.7.5. lnpLogNewSP-CreateRequestRecord Notifications....

9.8. lnpLogOldSP-ConcurrenceRequestRecord Tables....
9.8.1. lnpLogOldSP-ConcurrenceRequestRecord Packages....
9.8.2. lnpLogOldSP-ConcurrenceRequestRecord Name Bindings....
9.8.3. lnpLogOldSP-ConcurrenceRequestRecord Attributes....
9.8.4. lnpLogOldSP-ConcurrenceRequestRecord Actions....
9.8.5. lnpLogOldSP-ConcurrenceRequestRecord Notifications....

9.9. lnpLogOperational-InformationRecord Tables....
9.9.1. lnpLogOperational-InformationRecord Packages....
9.9.2. lnpLogOperational-InformationRecord Name Bindings....
9.9.3. lnpLogOperational-InformationRecord Attributes....
9.9.4. lnpLogOperational-InformationRecord Actions....
9.9.5. lnpLogOperational-InformationRecord Notifications....

9.10. lnpLogStatusAttributeValueChangeRecord Tables....
9.10.1. lnpLogStatusAttributeValueChangeRecord Packages....
9.10.2. lnpLogStatusAttributeValueChangeRecord Name Bindings....
9.10.3. lnpLogStatusAttributeValueChangeRecord Attributes....
9.10.4. lnpLogStatusAttributeValueChangeRecord Actions....
9.10.5. lnpLogStatusAttributeValueChangeRecord Notifications....
9.10.6. lnpNetwork Packages....
9.10.7. lnpNetwork Name Bindings....
9.10.8. lnpNetwork Attributes....
9.10.9. lnpNetwork Actions....
9.10.10. lnpNetwork Notifications....

9.11. lnpNPAC-SMS Tables....
9.11.1. lnpNPAC-SMS Packages....
9.11.2. lnpNPAC-SMS Name Bindings....
9.11.3. lnpNPAC-SMS Attributes....
9.11.4. lnpNPAC-SMS Actions....
9.11.5. lnpNPAC-SMS Notifications....

9.12. lnpServiceProvs Tables....
9.12.1. lnpServiceProvs Packages....
9.12.2. lnpServiceProvs Name Bindings....
9.12.3. lnpServiceProvs Attributes....
9.12.4. lnpServiceProvs Actions....
9.12.5. lnpServiceProvs Notifications....

9.13. lnpSubscriptions Tables....
9.13.1. lnpSubscriptions Packages....
9.13.2. lnpSubscriptions Name Bindings....
9.13.3. lnpSubscriptions Attributes....
9.13.4. lnpSubscriptions Actions....
9.13.5. lnpSubscriptions Notifications....

9.14. serviceProv Tables
9.14.1. serviceProv Packages
9.14.2. serviceProv Name Bindings
9.14.3. serviceProv Attributes
9.14.4. serviceProv Actions
9.14.5. serviceProv Notifications

9.15. serviceProvLRN Tables
9.15.1. serviceProvLRN Packages
9.15.2. serviceProvLRN Name Bindings
9.15.3. serviceProvLRN Attributes
9.15.4. serviceProvLRN Actions
9.15.5. serviceProvLRN Notifications

9.16. serviceProvNetwork Tables
9.16.1. serviceProvNetwork Packages
9.16.2. serviceProvNetwork Name Bindings
9.16.3. serviceProvNetwork Attributes
9.16.4. serviceProvNetwork Actions
9.16.5. serviceProvNetwork Notifications

9.17. serviceProvNPA-NXX Tables
9.17.1. serviceProvNPA-NXX Packages
9.17.2. serviceProvNPA-NXX Name Bindings
9.17.3. serviceProvNPA-NXX Attributes
9.17.4. serviceProvNPA-NXX Actions
9.17.5. serviceProvNPA-NXX Notifications

9.18. subscriptionAudit Tables
9.18.1. subscriptionAudit Packages
9.18.2. subscriptionAudit Name Bindings
9.18.3. subscriptionAudit Attributes
9.18.4. subscriptionAudit Actions
9.18.5. subscriptionAudit Notifications

9.19. subscriptionVersion Tables
9.19.1. subscriptionVersion Packages
9.19.2. subscriptionVersion Name Bindings
9.19.3. subscriptionVersion Attributes
9.19.4. subscriptionVersion Actions
9.19.5. subscriptionVersion Notifications

9.20. subscriptionVersionNPAC Tables
9.20.1. subscriptionVersionNPAC Packages
9.20.2. subscriptionVersionNPAC Name Bindings
9.20.3. subscriptionVersionNPAC Attributes
9.20.4. subscriptionVersionNPAC Actions
9.20.5. subscriptionVersionNPAC Notifications

9.21. lnpLogDonorSP-CustomerDisconnectDateRecord Tables
9.21.1. lnpLogDonorSP-CustomerDisconnectDateRecord Packages
9.21.2. lnpLogDonorSP-CustomerDisconnectDateRecord Name Bindings
9.21.3. lnpLogDonorSP-CustomerDisconnectDateRecord Attributes
9.21.4. lnpLogDonorSP-CustomerDisconnectDateRecord Actions
9.21.5. lnpLogDonorSP-CustomerDisconnectDateRecord Notifications

9.22. lnpLogLocalSMS-ActionResultsRecord Tables
9.22.1. lnpLogLocalSMS-ActionResultsRecord Packages
9.22.2. lnpLogLocalSMS-ActionResultsRecord Name Bindings
9.22.3. lnpLogLocalSMS-ActionResultsRecord Attributes
9.22.4. lnpLogLocalSMS-ActionResultsRecord Actions

9.22.5. lnpLogLocalSMS-ActionResultsRecord Notifications.....

9.23. lnpLogNewNPA-NXXRecord Tables.....
9.23.1. lnpLogNewNPA-NXXRecord Packages.....
9.23.2. lnpLogNewNPA-NXXRecord Name Bindings.....
9.23.3. lnpLogNewNPA-NXXRecord Attributes.....
9.23.4. lnpLogNewNPA-NXXRecord Actions.....
9.23.5. lnpLogNewNPA-NXXRecord Notifications.....

9.24. lsmsFilterNPA-NXX Tables.....
9.24.1. lsmsFilterNPA-NXX Packages.....
9.24.2. lsmsFilterNPA-NXX Name Bindings.....
9.24.3. lsmsFilterNPA-NXX Attributes.....
9.24.4. serviceProvNPA-NXX Actions.....
9.24.5. serviceProvNPA-NXX Notifications.....

10. Subscription Version Status.....

Appendix A: Errors.....292

1

1 Introduction

1.1 Document Overview

The NPAC SMS Interoperable Interface Specification contains the information model for the Number Portability Administration Center and Service Management System (NPAC SMS) mechanized interfaces. Both Service Order Activation (SOA) and Local Service Management System (LSMS or Local SMS) interfaces to the NPAC SMS are described in this document.

1.2 How To Use This Document

The NPAC SMS Interoperable Interface Specification contains the following chapters:

Chapter 1 Introduction -- This chapter describes the conventions and organization of this document. It also lists related documentation.

Chapter 2 Interface Overview -- This chapter contains an overview of protocol requirements and a brief description of the functionality provided in each interface.

Chapter 3 Hierarchy Diagrams -- This chapter contains the class hierarchy diagrams for all managed objects defined in the interoperable interface.

Chapter 4 Error: Reference source not found -- This chapter contains the mapping of the interface functionality to the managed objects, attributes, actions, and notifications.

Chapter 5 Error: Reference source not found-- This chapter contains information on secure association establishment.

Chapter 6 Error: Reference source not found -- This chapter contains the message flow diagrams.

Chapter 7 Error: Reference source not found -- This chapter contains the GDMO interface definitions supporting the SOA to NPAC SMS interface and the NPAC SMS to Local SMS interface

Chapter 8 Error: Reference source not found -- This chapter contains the ASN.1 definitions that support the GDMO definitions in Chapter 7.

Chapter 9 Error: Reference source not found -- This chapter contains the Managed Object Conformance tables.

Chapter 10 Error: Reference source not found -- This chapter contains a Subscription Version Status diagram, which illustrates the transition from one subscription version state to another.

Appendix A ***Errors*** -- This appendix contains the valid errors associated with CMISE confirmed primitives used in the interoperable interface definitions.

1.3 Document Version History

~~**Version 1.0 Draft 2, released on 8/15/96.**~~

~~**Version 1.0 Draft 3, released on 9/17/96.**~~

~~**Version 1.0 FINAL, released on 10/01/96.**~~

~~**Version 1.1, released on 11/18/96.**~~

~~**Version 1.2, released on 11/18/96.**~~

~~**Version 1.3, released on 01/01/97.**~~

~~**Version 1.4, released on 02/01/97.**~~

NANC Version 1.05, released on 043/07/97, contains the following changes from the ICC SMS Subcommittee IIS Version 1.5.1:

Change Order 181 - Additional key information added to section 5.2.1.5.

Change Order NANC 13 - Notification of T2 expiration to Old SP added to section 3, section 4 and flow 6.5.1.6.3.

~~**Change Order 103** - Clarify title of cancellation acknowledgment.~~

~~GDMO updated.~~

~~**Change Order 114** - Miscellaneous notification corrections.~~

~~GDMO updated.~~

~~ASN.1 updated.~~

~~**Change Order 121** - Add attachment information of access control for ObjectCreate, ObjectDelete and AttributeValueChange notifications.~~

~~In Section 5.2.3, added text explanation.~~

~~**Change Order 122** - failedTN-List errorId ASN.1 modification.~~

~~ASN.1 updated.~~

~~**Change Order 127** - Create default values (not OPTIONAL attributes) for subscriptionEndUserLocationValue, subscriptionEndUserLocationType and subscriptionBillingId.~~

~~ASN.1 updated.~~

~~**Change Order 136** - Remove auto-instance naming support in the serviceProv and serviceProvNetwork objects in the MOCS.~~

~~MOCS updated.~~

~~**Change Order 137** - Add LNPType attribute to OldSP-CreateData.~~

~~ASN.1 updated.~~

~~MOCS updated.~~

~~**Change Order 138** - Update message flows to portray the NPA-NXX first usage notification going to the accepting Local SMSs after subscription version creation.~~

~~Chapter 6, flows 6.5.1.1 and 6.5.1.2, step k, updated to state "accepting Local SMSs".~~

~~**Change Order 139** - In the ASN.1, remove customer-disconnect-date field from MismatchAttributes (SEQ3) and SubscriptionData.~~

~~Updated ASN.1 and MOCS for removed fields.~~

Change Order 140 - Need to change the invalid-data fields of the OldSP-CreateReply, NewSP-CreateReply and ModifyReply to be a CHOICE of the fields submitted in the action request.

Updated ASN.1 and MOCS for new fields.

Change Order 141 - Change the subscriptionAuditStatus attribute to be GET not GET-REPLACE in the subscriptionAudit object.

Updated GDMO.

Change Order 143 - Add default value for LRN and make attributes optional.

ASN.1 updated.

Change Order 144 - Add the status attribute value change to the deferred disconnect flow after the status goes to disconnect-pending on the NPAC-SMS.

Updated flow 6.5.4.2, Subscription Version Disconnect With Effective Release Date.

Change Order 145 - Flow corrections.

Flows updated.

Change Order 146 - Update the behavior of all LRN and DPC fields to indicate the type of data being stored.

Behaviors updated.

Change Order 147 - Flow corrections.

Flows updated.

GDMO updated.

Change Order 148 - Update the behavior of the subscriptionAudit object to change the reference to the Process Audit Association Function to SOA Management Function.

Behaviors updated.

Change Order 149 - Make DPC and SSN data optional on SubscriptionModifyData.

ASN.1 updated.

Change Order 150 - Change time-of-completion field to a GeneralizedTime field in the LocalSMS-ActionResults structure.

Verified change made.

Change Order 151 - In the subscriptionVersionDonorSP-CustomerdisconnectDate make the effectiveReleaseDate an optional field.

Updated ASN.1 structure, VersionCustomerDisconnectDate to make service-prov-effective-release-date OPTIONAL.

Change Order 152 - Flow corrections.

Flows updated.

Change Order 153 - Add filter support criteria for Local SMSs.

Criteria added to the end of Chapter 4.

Change Order 154 - Update behavior for the lnpLocal-SMS-Name and lnpNPAC-SMS-name.

Behaviors updated.

Change Order 156 - Change the EndUserLocationValue definition from NumberString(SIZE(12)) to NumberString(SIZE(1..12)).

ASN.1 field updated.

Change Order 158 - In the ASN.1, change the AddressInformation zip code field to GraphicString9.

ASN.1 updated.

Change Order 159 - Change the subscriptionVersionNPAC behavior regarding subscriptionVersion0 DonorSP-CustomerdiseonnectDate.

GDMO updated.

Change Order 160 - Add subscriptionStatusChangeCauseCode.

MOCs updated.

Chapter 4 attribute table updated.

Change Order 161 - Implement NANC solutions.

GDMO updated.

ASN.1 updated.

Change Order 163 - Update the behavior for subscriptionVersionStatusAttributeValueChange.

GDMO updated.

Change Order 184 - Scoping and Filtering Clarification.

Chapter 5 updated.

Change Order 182 - CMIP bind/unbind information.

Chapter 5 updated.

Change Order 185 - Flow corrections.

Flows updated.

Change Order 189 - Add security address package.

GDMO updated.

Change Order 190 - Add 'downloaddata' before the CHOICE in DownloadReply.

ASN.1 updated.

MOCS updated.

Change Order 190 - Add CCITT reference when deriving from top.

GDMO updated on all objects derived from top.

Change Order 190 - Change serviceProviderDownloadReasonBehavior to serviceProvDownloadReasonBehavior.

~~GDMO updated.~~

~~**Change Order 190** - Remove reference to DSET in section 2.2 of the IIS.~~

~~Reference removed.~~

~~**Change Order ESI011** - Remove all special references to "Illinois" and integrate in accordance with the NANC flows.~~

Change Order NANC 16 - Retry clarification is sections 5.2.3 and 5.3.3.1.

Change Order NANC 19 - M-CANCEL-GET ~~Document updated.~~clarification in section 2.1.

Change Order NANC 21 - Clarification of note in section 6.1.

Change Order NANC 22 - Modification of flow 6.5.6.

Change Order NANC 23 - Modification of flow 6.2.1.

Change Order NANC 24 - Modification of flows 6.5.1.2 and 6.5.1.3.

Change Order NANC 25 - Modification of flows 6.5.4.1 and 6.5.4.2.

Change Order NANC 26 - Modification of flows 6.5.5.2.

Change Order NANC 37 - Primitive error list modifications in Appendix A.

Change Order NANC 38 - Clarification of flow 6.4.1.6.

Change Order NANC 39 - Correction to section 4.2.2.

Change Order NANC 40 - Addition of flows 6.6.4, 6.6.5, and 6.6.6.

Change Order NANC 42 - Addition of section 4.3.

Change Order NANC 50 - Clarification of flow 6.5.1.6.2.

Change Order NANC 52 - Modification of flows 6.5.2.1, 6.5.2.3, and 6.5.3.1.

Change Order NANC 53 - Modifications to Canceled state in section 10.

Change Order NANC 56 - Modifications of flows 6.5.2.3 and 6.5.2.4.

Change Order NANC 57 - Clarification of section 5.2.1.10.

~~**Version 1.5.1, released on 03/14/97, contains the following changes:**~~

- ~~V 1.5 Change History updated to reflect completion of Change Orders 182 and 189.~~
- ~~Conflict resolution acknowledgment request record removed from Log Record diagram in Chapter 3.~~
- ~~VersionConflictResolutionAcknowledgmentRequest removed from Exhibit 7 in Chapter 4.~~
- ~~NewSPConflictResolutionPending replaced with subscriptionVersionRemoveFromConflict in Exhibit 10, Chapter 4.~~
- ~~Descriptive text for Flow 6.5.1 in Chapter 6 modified.~~
- ~~Imported current GMDO and ASN.1 chapters.~~

1.4 References

1.4.1 Standards

ANSI T1.224-1992, *Operations, Administration, Maintenance, and Provisioning (OAM&P) - Protocols for Interfaces between Operations Systems in Different Jurisdictions.*

ANSI T1.243-1995, *Telecommunications, Operations, Administration, Maintenance and Provisioning (OAM&P) - Baseline Security Requirements for the Telecommunications Management Network (TMN).*

ANSI T1.246, *Operations, Administration, Maintenance and Provisioning (OAM&P) - Information Model and Services for Interfaces between Operations Systems across Jurisdictional Boundaries to Support Configuration Management - Customer Account Record Exchange (CARE).*

Belcore TA- 1253, *Generic Requirements for Operations Interfaces Using OSI Tools: Network Element Security Administration.*

Committee T1 Technical Report No, 40, *Security Requirements for Electronic Bonding Between Two TMNs*.

ISO/IEC 11183-1:1992, *Information Technology - International Standardized Profiles AOM ln OSI Management - Management Communications - Part 1 Specification of ACSE, Presentation and Session Protocols for the use by ROSE and CMISE.*

ISO/IEC 11183-2:1992, *Information Technology - International Standardized Profiles AOM ln OSI Management - Management Communications - Part 2: CMISE/ROSE for AOM12 - Enhanced Management Communications.*

ISO/IEC 11183-3:1992, *Information Technology - International Standardized Profiles AOM ln OSI Management - Management Communications - Part 3: CMISE/ROSE for AOM12 - Basic Management Communications.*

ITU X.509, *Information Technology - Open Systems Interconnection - The Directory Authentication Framework.*

ITU X.690/ISO IS 8825-1 Annex D*, ASNI/BER Encoding of Digital Signatures and Encrypted Cyphertext.*

ITU X.741, *OSI Systems Management, Objects and Attributes for Access Control*

ITU X.803, Upper Layers Security Model.

NMF Forum 016, Issue 1.0, 1992, *OMNIPoint 1 Specifications and Technical Reports, Application Services Security of Management.*

OIW Stable Implementation Agreement, Part 12, 1995.

Rec. M.3100:1992 & 1995 draft, *Generic Network Information Model.*

Rec. X.701 | ISO/IEC 10040:1992, *Information Technology - Open System Interconnection - Common Management Overview.*

Rec. X.710 | ISO/IEC 9595:1990, *Information Technology - Open System Interconnection - Common Management Information Service Definitions.*

Rec. X.711 | ISO/IEC 9596-1:1991, *Information Technology - Open System Interconnection - Common Management Information Protocol - Part 1: Specification.*

Rec. X.720 | ISO/IEC 10165-1:1991, *Information Technology - Open System Interconnection - Structure of Management Information - Part 1 Management Information Model.*

Rec. X.721 | ISO/IEC 10165-2:1992, *Information Technology - Open System Interconnection - Structure of Management Information: Guidelines for the Definition of Managed Objects.*

Rec. X.722 | ISO/IEC 10165-4:1992, *Information Technology - Open System Interconnection - Structure of Management Information: Guidelines for the Definition of Managed Objects*.

Rec. X.730 | ISO/10164-1:1992, *Information Technology - Open System Interconnection - System Management - Part 1: Object Management Function.*

Rec. X.734 | ISO/10164-5:1992, *Information Technology - Open System Interconnection - System Management - Part 5: Event Report Management Function.*

Rec. X.735 | ISO/10164-6:1992, *Information Technology - Open System Interconnection - System Management - Part 6: Log Control Function*.

Rec. X.209: 1988, *Specification for Basic Encoding Rules for Abstract Syntax Notation One (ANS.1).*

Rec. X.690: 1994, *ASN.1 Encoding Rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER), and Distinguished Encoding Rules (DER).*

Rec. X.208: 1988, *Specification of Abstract Syntax Notation One (ASN.1).*

Rec. X.680 | ISO/IEC 8824-1: 1994, *Information Technology - Abstract Syntax Notation One (ASN.1) - Specification of Basic Notation.*

Rec. X.680 Amd.1 | ISO/IEC 8824-1 Amd.1, *Information Technology - Abstract Syntax Notation One (ASN.1) - Specification of Basic Notation 1 Amendment 1: Rules of Extensibility.*

ITU-T Recommendations are available from the US Department of Commerce, National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. ISO standard are available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.

1.4.2 Related Publications

Illinois Commerce Commission Number Portability Administration Center and Service Management System Request for Proposal (ICC NPAC/SMS RFP), February 6, 1996.

Lockheed Martin Team Response to the Illinois Commerce Commission Number Portability Administration Center and Management System Request for Proposal, March 18, 1996.

Scoggins, Sophia and Tang, Adrian 1992. *Open networking with OSI.* Englewood Cliffs, NJ, Prentice-Hall.

Stallings, William 1993. *SNMP, SNMPv2, and CMIP, The Practical Guide to Network-Management Standards*, Reading Massachusetts, Addison-Wesley.

1.5 Abbreviations/Definitions

A-PDU	Application Protocol Data Unit
ASN.1	Abstract Syntax Notation 1
BER	Basic Encoding Rules
CARE	Customer Account Record Exchange
CER	Canonical Encoding Rules
CLASS	Custom Local Area Signaling Services
CME	Conformance Management Entity
CMIP	Common Management Information Protocol
CMISE	Common Management Information Service Element
CNAM	Caller Id with Name
GDMO	Generalized Definitions of Managed Objects
DER	Distinguished Encoding Rules
DES	Data Encryption Standard
FR	Frame Relay
IEC	International Electrotechnical Commission
ISO	International Organization of Standardization
ISVM	Inter-Switch Voice Mail
LIDB	Line Information Database
LNP	Local Number Portability
LRN	Location Routing Number
LSMS	Local Service Management System
LSPP	Local Service Provider Portability
MAC	Media Access Control
MD5	Message Digest (Version 5)
NE	Network Element
NMF	Network Management Forum
NPAC SMS	Number Portability Administration Center and Service Management System
NPA	Numbering Plan Area
NXX	Exchange
OCN	Operating Company Number
OSI	Open Systems Interconnect
PPP	Point-To-Point Protocol
RFP	Request for Proposal
RSA	Encryption Scheme
SOA	Service Order Activation
TMN	Telecommunications Management Network
SMS	Service Management System
TN	Telephone Number

2

2 Interface Overview

2.1 Overview

This specification defines the interfaces between the NPAC SMS and the service providers' Service Order Entry System and Local SMS. The interfaces, defined using the CMIP protocol, are referred to as the SOA to NPAC SMS interface and the NPAC SMS to Local SMS interface respectively. CMISE M-CREATE, M-DELETE, M-SET, M-GET, M-EVENT-REPORT, and M-ACTION primitives are fully supported in a confirmed mode. The relationship from the SOA to the NPAC SMS is a manager to agent relationship. The relationship between the Local SMS to NPAC SMS is a manager to agent or an agent to manager relationship depending on the function being performed. The SOA and Local SMS interfaces are defined by Association Functions. These functions allow each association to define the services it supports. Association establishment from the SOAs and Local SMSs to the NPAC SMS, Association Function and security for each of these interfaces is discussed in Chapter 5***, Error: Reference source not found***.

Note: The M-CANCEL-GET primitive may~~will~~ not be supported in some NPAC SMS implementations due to the fact that ~~access control information cannot be associated with this PDU and support for~~ this functionality was~~is~~ not determined necessary for the interface~~s~~ defined.

The sections that follow provide an overview of protocol requirements and a brief description of the functionality provided in each interface. Complete functional descriptions for the interfaces are provided in the process flow diagrams in Chapter 6, Error: Reference source not found, as well as the behavior for the managed objects.

2.2 OSI Protocol Support

The SOA to NPAC SMS and NPAC SMS to Local SMS interfaces must be implemented over the protocol stack shown in Exhibit 1.

Exhibit 1. NPAC/SMS Primary Network Protocol Stacks

Layer	Mechanized Interface	Function
	CMIP Agent Server	User
7	CMISE, ACSE, ROSE	Application
6	ANSI T1.224	Presentation
5	ANSI T1.224	Session
4	TCP, RFC1006, TPO	Transport
3	IP	Network
2	PPP, MAC, FRAME Relay, ATM (IEEE 802.3)	Link
1	DS-1, DS-0 x n, ISDN, V.34	Physical

Multiple associations per service provider to the NPAC SMS can be supported. The secure association establishment is described in *Chapter Error: Reference source not found*.

2.3 SOA to NPAC SMS Interface

The SOA to NPAC SMS interface, which allows communication between a service provider's Service Provisioning Operating Systems and/or Gateway systems and the NPAC SMS, supports the retrieval and update of subscription, service provider, and network information. The following transactions occur to support local number portability functionality:

- SOA requests for subscription administration to the NPAC SMS and responses from the NPAC SMS to the SOA.
- Audit requests from the SOA to the NPAC SMS and responses from the NPAC SMS to the SOA.
- Notifications from the NPAC SMS to the SOA of subscription version data changes, need for concurrence or authorization for number porting, conflict-resolution, cancellation, outage information, or customer disconnect dates.
- Service provider data administration from the SOA to the NPAC SMS.

Mapping of this functionality into the CMIP Definitions is provided in *Chapter Error: Reference source not found (see Exhibit 7.)*

2.3.1 Subscription Administration

Service provider subscription administration functionality includes the capability to:

- Create a subscription version
- Cancel a subscription version
- Acknowledge cancellation of a subscription version
- Modify a subscription version or range of versions
- Retrieve a specific subscription version or range of versions
- Activate a version or range of versions
- Disconnect a subscription version or range of versions
- Remove a subscription version from conflict

2.3.2 Audit Requests

Audit functionality allows the SOAs to request audits for a subscription version or group of subscription versions based on a Telephone Number (TN) for a specified service provider or all service provider networks. The action SOA receives discrepancy reports as they are found in the network. Upon audit completion it receives a notification of the success or failure of the audit and the total number of discrepancies found.

2.3.3 Notifications

SOAs are sent notifications to ensure that they are fully informed of relevant events for their subscriptions. Notification of creation, deletion, or data value changes for subscription versions will be sent to the SOA as they occur. Notification will be sent to the SOA if the service provider has not authorized transfer of service for a TN in the amount of time specified in the "Service Provider Concurrence Interval" defined on the NPAC. This notification will indicate to the service provider that authorization is needed for the pending subscription version. If the service provider has not acknowledged version cancellation within a timeframe specified by the NPAC SMS, notifications will be sent requesting cancellation acknowledgment. The donor service provider SOA is

notified of the customer's disconnect date. SOA systems are also sent notifications to insure they are aware of planned down time in the NPAC SMS.

2.3.4 Service Provider Data Administration

Service providers can use, read, and update their own service provider information on the NPAC SMS using the SOA to NPAC SMS interface. Service providers can update information in their service provider profile as well as add and delete their own network data. Changes to network data that result in mass updates are prevented by the NPAC SMS to SOA interface. Mass changes must be initiated by the service provider contacting the NPAC personnel directly.

2.4 NPAC SMS to Local SMS Interface

The NPAC SMS to Local SMS interface is used for communications between a service provider's Local SMS and the NPAC SMS for support of LNP network element provisioning. The following transactions occur to support Local Number Portability:

- Subscription version and network data download from the NPAC SMS to the Local SMS.
- Service provider data administration from the Local SMS to the NPAC SMS.
- Notifications from the NPAC SMS to the Local SMS of planned NPAC SMS outages and the first use of a new NPA-NXX.

Mapping of this functionality into the CMIP Definitions is provided in *Chapter Error: Reference source not found (see Exhibit 7.)*

2.4.1 Subscription Version and Network Data Download

When new network (new switches, NPA-NXX, or LRN data for service providers) or subscription data is created or existing network or subscription data is modified on the NPAC SMS, the data is automatically downloaded from the NPAC SMS to the Local SMS. The Local SMS may request that data be downloaded using a download request that is sent from the Local SMS to the NPAC SMS. The Local SMS then receives the data to be downloaded in the request response. Subscriber data to be downloaded can be requested based on time range, a TN, or a TN range and an optional local number portability type. Network data to be downloaded can be requested based on a time range, service provider or all service providers, an NPA-NXX range or all NPA-NXX data, an LRN range or all LRN data, or all network data can be requested.

Service providers can also directly read data they wish to download from the NPAC SMS MIB.

2.4.2 Service Provider Data Administration

Service providers can use, read, and update their own service provider information on the NPAC SMS using the Local SMS to NPAC SMS interface. Service providers can update information in their service provider profile as well as add and delete their own network data. Changes to network data that result in mass updates are prevented by the NPAC SMS to Local SMS interface. Mass changes must be initiated by the service provider contacting the NPAC personnel directly.

2.4.3 Notifications

Local SMS are sent notifications to insure they are aware of planned down time in the NPAC SMS. Local SMS are also sent notifications when a new NPA-NXX is to be used for the first time in a subscription version.

3 Hierarchy Diagrams

3.1 Overview

The following five exhibits show the class hierarchy diagram for all managed objects (*Exhibit 2*), Log Record Objects (*Exhibit 3*), the Local SMS (*Exhibit 4*), the NPAC SMS naming hierarchies for the Local SMS (*Exhibit 5*) and the SOA (*Exhibit 6.*) These exhibits will help the user gain a better understanding of the structure of the interface definitions provided.

3.1.1 Managed Object Model Inheritance Hierarchy

The Managed Object Model Inheritance Hierarchy shows the inheritance hierarchy used for object definitions in the NPAC SMS to Local SMS and the SOA to NPAC SMS interfaces.