ATIS-1000001

NUMBER PORTABILITY OPERATOR SERVICES SWITCHING SYSTEMS

TECHNICAL REQUIREMENTS

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ATIS-1000001, *Number Portability Operator Services Switching Systems*

Is an ATIS Standard developed by the **PTSC.3 Subcommittee** under the **ATIS Packet Technologies and Systems Committee (PTSC)**.

ATIS-1000001

Technical Requirements for

NUMBER PORTABILITY OPERATOR SERVICES SWITCHING SYSTEMS

Secretariat

Alliance for Telecommunications Industry Solutions

Approved October, 2004

Abstract

This document defines the Operator Services Switching Systems technical requirements for number portability (NP) using the location routing number (LRN) method.

FOREWORD

This document defines the Operator Services Switching Systems technical requirements for number portability (NP) using the location routing number (LRN) method.

The Alliance for Telecommunication Industry Solutions (ATIS) serves the public through improved understanding between carriers, customers, and manufacturers. The Packet Technologies and Systems Committee (PTSC) -- formerly T1S1 -- develops and recommends standards and technical reports related to services, architectures, and signaling, in addition to related subjects under consideration in other North American and international standards bodies. PTSC coordinates and develops standards and technical reports relevant to telecommunications networks in the U.S., reviews and prepares contributions on such matters for submission to U.S. ITU-T and U.S. ITU-R Study Groups or other standards organizations, and reviews for acceptability or per contra the positions of other countries in related standards development and takes or recommends appropriate actions.

Number portability is a circuit switched network capability that allows an end user to move their North American Numbering Plan (NANP) number from one serving switch in a network to another switch in the same or different circuit switched network. Other users can connect to the portable subscriber without any changes to their dialing procedures. Requirements provided in this document address number portability using the LRN obtained from a centralized database to identify the recipient switch when numbers are ported. This document does not address number portability for subscribers with directory numbers that are also used for packet switched data.

This document provides the requirements for service provider portability, and location portability within a rate center. Number portability outside a rate center is beyond the scope of this document. This document does not address thousand block number pooling (see ATIS-1000004, *Thousand Block Number Pooling Using Number Portability)*, resale, or unbundling.

Normative annexes are considered a part of ATIS Technical Requirements. Informative annexes of ATIS Technical Requirements provide useful information, but do not contain requirements. Similarly, footnotes are informative.

This Technical Requirements (TRQ) document was developed by PTSC in accordance with ANSI and ATIS procedural guidelines and represents the consensus position of the formulating group. This document was processed and approved for submittal to ATIS. Committee approval of this specification does not necessarily imply that all committee members voted for its approval.

ATIS guidelines specify two categories of requirements: mandatory and recommendation. The mandatory requirements are designated by the word *shall* and recommendations by the word *should*. Where both a mandatory requirement and a recommendation are specified for the same criterion, the recommendation represents a goal currently identifiable as having distinct compatibility or performance advantages.

Suggestions for improvement of this document are welcome. They should be sent to the Alliance for Telecommunications Industry Solutions, ATIS Secretariat, 1200 G Street NW, Suite 500, Washington, DC 20005.

The PTSC.3 Subcommittee was responsible for the development of this document.

> Stuart Goldman PTSC.3 Chair & PTSC.3 Senior Technical Editor
> Wesley Downum, PTSC.3 Vice-Chair
> Brian Foster, PTSC.3 Editor

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1   SCOPE AND OVERVIEW

1.1   Scope

This document defines technical requirements for number portability as they apply to operator services switching systems. It describes the network capability for handling operator services involving portable numbers. The network capability functions in conjunction with the capability described in ATIS-1000002, and ATIS-1000003. The operator services call types (i.e., methods for reaching an operator) to which this document applies include Toll and Assistance (0-, 0+, 1+ screened, 00-, 1+ 800/888/etc., and international prefix equivalents), Listing Services (Directory Assistance - 411, (NPA) 555-1212), and Intercept Service (changed number, discontinued service).

This network capability, Operator Services with Portable Numbers (OSPN) as defined by the requirements in this document, is available for calls received with either Signaling System No. 7 (SS7) or Multi Frequency (MF) signaling. However, certain aspects of OSPN require SS7.

This network capability applies to service provider portability with location portability within a rate center, including portability between wireline service providers and the impacts on the functions performed in the wireline network. This document only addresses facility based service providers. This network capability encompasses operator services provided in the wireline network as part of the wireline network's operator service. Requirements in this document apply to operator services switching systems. Network capabilities pertaining to database architecture, internal switch call processing, and network operations and administration are beyond the scope of OSPN.

The terms Number Portability (NP) and Local Number Portability (LNP) are used interchangeably within this document.

1.2   Purpose

OSPN supports both routing and billing functions for portable numbers. The operator system may need to determine the network location of a called party number for routing and the network location of one or more of the calling party, called party, and billing numbers for billing. When it is available, service provider information may reduce the need for network location information for billing purposes.

1.3   Application

OSPN supports the implementation of NP for operator services in the competitive local service environment.

1.4   Background

This clause provides a brief reminder of some key elements of Operator Services and Number Portability (NP), and is intended to provide perspective on some of the elements to consider when

reading this document. Check the Acronyms and Definitions clauses in Clause 2.3 of this document for further assistance.

NP affects the way numbers are translated and signaled, and it creates a need for additional information when they are used in billing records. As a result, NP particularly affects Alternate Billing Services (ABS) and Busy Line Verification (BLV). ABS calls (e.g. Collect, Person-to-Person, Third Party Billed, Calling Card) are impacted because of the verifications required on the alternative billing information and the additional information required for billing (e.g. who is the service provider). BLV calls are impacted because of the special routing requirements of these calls.

Historically, all Directory Numbers (DNs) in one NPA-NXX belonged to a single telephone switch. With the introduction of NP, individual DNs in one NPA-NXX may be moved to a different telephone switch. This has tremendous implications for call routing, as the first six digits of a DN (i.e. the NPA-NXX) no longer uniquely identify the switch that serves that DN. Hence the concept of a Location Routing Number (LRN) was introduced. Each switch which hosts portable numbers has at least one ten-digit LRN assigned to it, which is used in routing a call to that switch. The actual dialed digits must also be signaled to allow the call to be completed.

For ABS calls, there can be up to three different Directory Numbers (DNs) of interest: Calling Party Number (CgPN), Called Party Number (CdPN), and Billing Number (BN). There are three functions of these calls to consider: routing, billing, and verification.

> The Called Party Number is used to route a call. For ported DNs, the LRN of the terminating switch is inserted into the CdPN parameter, with the dialed digits saved in the Generic Address Parameter (GAP).

> The LRNs of all three numbers (CgPN, CdPN, BN) may be included in AMA billing records.

> The requested alternate billing can be verified by querying a Line Information Database (LIDB) or other validation database for information using any of the three numbers (e.g. validating a calling card, or checking if third number billing is permitted for a DN). These LIDBs are typically geographically dispersed, and do not contain data for all regions or all service providers.

Each NP capable network element (switch, Signal Transfer Point (STP), Number Portability Database (NPDB), or Operator Services System (OSS)) will maintain a list of NPA-NXXs which are considered portable, at least for its own zone of portability. An NPDB provides the LRNs for ported DNs. The correct LIDB for a DN is determined by ten-digit Global Title Translation, performed by a GTT function, which may be implemented on the NPDB, STP, or STP adjunct.

2   INTRODUCTION

2.1   Network Prerequisites for Number Portability

The OSS requires the same network preparation for NP as required for other network switching nodes.

In networks where pseudo NPAs have been used to support routing of BLV traffic via tandems, translations and routing will have to be changed. If the trunk between the OSS and tandem is an MF trunk, the tandem will need the actual (dialable) ten-digit target number in order to look up the LRN. If the trunk between the OSS and tandem is an ISUP trunk, the tandem will need the actual 10-digit target number to signal forward to the end office and the LRN to select the appropriate outgoing trunk to the target office. As a consequence, it will be necessary to segregate BLV traffic onto separate trunk groups to allow the tandem to use a dedicated dialing plan to select a trunk that supports BLV to route to the target office.

2.2   Assumptions

1. This network capability must minimize the impact on networks outside zones of portability.

2. This document addresses the necessary requirements for service provider portability and location portability within a rate center.

3. An end office should have direct BLV trunks from only one OSS or access tandem. Any OSS, with BLV trunks to an end office participating in NP, must be NP capable.

4. Fourteen-digit non-proprietary line-based calling cards will move to a new service provider if the associated DN is ported.

5. Incoming SS7 NP signaling to an OSS is not fully addressed in this document.

6. No change is required to intra/interLATA carrier determination.

7. Interstate portability will not occur as part of service provider portability.

8. There must be entities (known as NP Global Title Translation (GTT) functions - see 4.5) that will route Billed Number Screening (BNS) or Calling Card Validation (CCV) queries to the appropriate LIDB. These entities must perform ten-digit global title translations for routing LIDB queries for BNS or CCV. If the SCCP Translation Type indicates this is a LIDB message and only six digits are sent by the OSS in the SCCP Called Party Address field, the GTT Server will obtain the ten digits from the Billed Number Parameter in the TCAP message.

9. It is assumed that local access competition will still allow ubiquitous 0+ dialing for non-proprietary line-based calling card calls, i.e., no matter what phone is used to make a 0+ call, the calling card validation will still be conducted.

10. Each switch has at least one NPA-NXX that is "homed" to the switch (assigned in the LERG) and this NPA-NXX can be used for the LRN. This may be an existing NPA-NXX or newly assigned NPA-NXX to the switch. Existing processes that apply to LERG-assigned NPA-NXXs will also apply to the NPA-NXX of the LRN, e.g., an NPA-TTC (Terminating Toll Center code) can be derived from the NPA-NXX of the LRN.

11. The Directory Number of a customer who selects not to have a non-proprietary line-based calling card (14-digit) with their local service provider cannot be re-used as the first ten digits of another customer's (local service provider or IXC) non-proprietary 14-digit calling card.

12. A national list of portable NPA-NXXs will be available to those service providers that wish to deploy NP capable OSSs.

13. Location portability within a rate center will not move a line to a different LATA.

2.3   Acronyms and Definitions

2.3.1   Acronyms

ABS	Alternate Billing Service
ACG	Automatic Code Gapping
AIN	Advanced Intelligent Network
ANSI	American National Standard Institute
BLV	Busy Line Verification
BN	Billing Number
BNS	Billed Number Screening
CAMA	Centralized Automatic Message Accounting

CCV	Calling Card Validation
CdPN	Called Party Number
CPE	Customer Premises Equipment
DN	Directory Number
FCI	Forward Call Indicator
GAP	Generic Address Parameter
GR	Generic Requirements
GTA	Global Title Address
GTT	Global Title Translation
IAM	Initial Address Message
IXC	Inter Exchange Carriers
ICLATA	Intra-LATA Carrier Selection
IN	Intelligent Network
ISUP	ISDN User Part
JIP	Jurisdiction Information Parameter
LATA	Local Access Transport Area
LEC	Local Exchange Carrier
LARG	LIDB Access Routing Guide
LERG	Local Exchange Routing Guide
LIDB	Line Information Data Base
LNP	Local Number Portability
LRN	Location Routing Number
MF	Multi Frequency
NANP	North American Numbering Plan
NP	Number Portability
NPAC	Number Portability Administration Center
NPDB	Number Portability Database
OAM	Operations, Administration and Maintenance
OLNS	Originating Line Number Screening
OSDC	Operator Special Dialed Code
OSS	Operator Services Switch
OSPN	Operator Services with Portable Numbers
PIC	Pre-subscribed Interexchange Carrier
PODP	3/6/10 Digit Public Office Dialing Plan Trigger
POTS	Plain Old Telephone Service
RAO	Revenue Accounting Office
RTP	Release To Pivot
SCCP	Signaling Connection Control Part
SCP	Service Control Point
SDS	Specific Digit String Trigger
SMS	Service Management System
SOAC	Service Order Analysis and Control

SS7	Signaling System No. 7
SSP	Service Switching Point
STP	Signal Transfer Point
TCAP	Transaction Capabilities Application Part
TTC	Terminating Toll Center

2.3.2   Definitions

2.3.2.1   Donor switch: The switch from which the DN was originally ported. More specifically, the switch that is considered the default destination for the NPA-NXX of the DN.

2.3.2.2   Default routing: The ability of the switch to continue the call based on the dialed number when the NPDB application cannot be accessed due to abnormal circumstances or when the NPDB response contains a protocol error.

2.3.2.3   End-User: A user of telecommunications services. Examples are business, residential, coin, hotel/motel, etc.

2.3.2.4   Exchange: Another term for switch.

2.3.2.5   Facility Based Service Provider: Identifies the owner of the switch. A reseller of switch services is not a facility based service provider.

2.3.2.6   GTT Server: The location in the SS7 signaling network where the NP Global Title Translation function described in ATIS-1000003, "Number Portability Database and Global Title Translations" is performed.

2.3.2.7   Local Access Transport Area (LATA): A defined geographic area where equal access switches or access tandem switches can provide carrier access to the local switch.

2.3.2.8   Line-Based Calling Card (Non-Proprietary versus Proprietary): "Line-Based" refers to a calling card using a 1-digit number consisting of a ten-digit NANP phone number and four-digit PIN.

A Non-Proprietary Line-Based Calling Card is administered in a LIDB database, and is typically issued by an LEC. Often business arrangements are made to allow the calling card to be used on a different network, validated on the original LIDB, and billed via the issuing LEC.

A Proprietary Line-Based Calling Card may use the same number format, but must access a proprietary database (typically by dialing a 1-800 number), and does not use a public LIDB for verification. Typically, these cannot be used for calls placed on other networks.

2.3.2.9   Line Served by Switch: Any Directory Number that is connected to the switch or subtends the switch. The DN may be a physical subscriber port or a virtual DN.

2.3.2.10   Location Portability: Allows the end-user to retain his/her DN after changing physical locations.

2.3.2.11   Location Routing Number (LRN): A 10-digit number, in the format NPA-NXX-XXXX. The first 6 digits of the LRN identify the switch.

2.3.2.12   Local Exchange Carrier (LEC) Routing: Routing for a call that does not involve an Interexchange carrier. For this case, an IXC is neither dialed nor presubscribed.

2.3.2.13   Non-NP Capable OSS: An OSS that does not have the capabilities described in this document.

2.3.2.14   Non-NP Capable Switch: A switch that does not have the capabilities as described in ATIS-1000002, "Number Portability Switching Systems".

2.3.2.15 NPA-NXX: The first six digits of a ten-digit North American telephone number, NPA-NXX-XXXX. The NPA is the Numbering Plan Area (or "Area Code"). The N in NXX means that the first digit cannot be a "0" or a "1". The Xs can be any digit, 0-9.

2.3.2.16 NPAC: Number Portability Administration Center. The NPAC is a regional Service Management Center that can be used as a central database for subscriber information and downloading NPDBs and GTT Servers.

2.3.2.17 NP Query: A request for call routing information sent from the switch to the NPDB when a call encounters an NP trigger.

2.3.2.18 Originating Switch: The switch serving the calling party.

2.3.2.19 Ported Number: A DN in a Portable NPA-NXX that resides on a switch other than the switch to which it is assigned in the LERG.

2.3.2.20 Portable Number: A DN which may be ported.

2.3.2.21 Rate Center: A geographic area used to distinguish rate boundaries. {Note: In this document "rate center" denotes the smallest geographic area used to distinguish rate boundaries. In other contexts, rate centers may contain even smaller geographic areas used for rating (e.g., rate districts, wire centers, rate areas)}.

2.3.2.22 Service Portability: Allows an end-user to retain the same DN after changing services.

2.3.2.23 Service Provider Portability: Allows an end-user to retain the same DN after changing service providers.

2.3.2.24 Signal Ported Number Option: Allows a trunk group to be provisioned to send the dialed number in the CdPN in lieu of sending the LRN in the CdPN and the Dialed Number in the GAP. In this case, the FCI is set to "number not translated".

2.3.2.25 Recipient Switch: The switch to which the DN is ported.

2.3.2.26 Zone of Portability: An area for which an OSS or switch performs NPDB queries.

2.4   References

2.4.1   Normative References

The following documents contain provisions which, through reference in this text, constitute provisions of this technical requirement. For non-ANSI documents, only specific clauses referenced in the body of this technical requirement are considered normative. The remaining clauses of those documents are considered informative. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

T1.113-2000, *Signaling System No. 7 (SS7) - Integrated Service Digital Network (ISDN) User Part.*[1]

ATIS-1000631.2005, *Signaling System No. 7 (SS7) – High Probability of Completion (HPC) Network Capability.*[1]

T1.660–1998, *Signaling System No. 7 (SS7) - Call Completion to a Portable Number - Integrated Text.*[1]

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[1] This document is available from the Alliance for Telecommunications Industry Solutions. < http://www.atis.org >

T1.667–1999, *Intelligent Network.* [1]

GR-1298-CORE, *Advanced Intelligent Networks Generic Requirements: Switching Systems (A Module of AINGR, FR-15)*, Issue 4, *Telcordia Technologies, September 1997.* [2]

GR-1299-CORE, *Advanced Intelligent Network Generic Requirements: Switch – Service Control Point (SCP)/Adjunct Interface (A Module of AINGR, FR-15), Issue 4, Telcordia Technologies, September 1997.* [2]

GR-1100-CORE, *Bellcore Automatic Message Accounting Format (BAF) Requirements, Issue 2, Telcordia Technologies, December 1997.* [2]

ATIS-1000002 October 2004, *Number Portability Switching Systems.* [1]

ATIS-1000003 October 2004, *Number Portability Database and Global Title Translations.* [1]

2.4.2   Informative References

Illinois Number Portability Workshop Generic Switching and Signaling Requirements for Number Portability, Issue 1.01, April 3, 1996. [3]

Illinois Number Portability Workshop Generic Operator Services Switching Requirements for Number Portability, Issue 1.1, June 20, 1996. [3]

3   CUSTOMER PERSPECTIVE

3.1   End User Perspective

End user perspective can be found in ATIS-1000002.

3.2   Service Provider Perspective

General service provider perspectives can be found in ATIS-1000002.

Business agreements need to be established with service providers and other networks to ensure that LIDB queries and responses route properly. If such agreements were not in place, Line Information Database (LIDB) queries would time out, resulting in service providers being susceptible to fraud.

Gateway and query destination node point code information needs to be exchanged. Pre-provisioning needs to occur for the Message Transfer Part (MTP) routing data, and the MTP and Signaling Connection Control Part (SCCP) gateway screening data. If a hub provider is used, agreement need to address performing 10-digit Global Title Translation (GTT) and modification of gateway screening in both the hub and destination networks. For queries originating from out of region networks, the hub provider may be the six-digit default LIDB Access Routing Guide (LARG) assignee.

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[2] This document is available from Telcordia Technologies, Inc. < http://www.telcordia.com >

[3] This document is available from the Federal Communications Commission <
http://www.fcc.gov/Bureaus/Common_Carrier >

3.3   Sample Call Flows

The following call flows are for illustrative purposes only and do not imply any specific functionality or ordering of functionality on OSSs. The intent is not to describe all possible calls in all possible scenarios, but merely to provide an introduction.

The Originating Switch refers to the switch to which the subscriber placing the call is connected, the Donor Switch refers to the switch FROM which the Called Party Number (CdPN) subscriber was ported, and the Recipient Switch refers to the switch TO which the CdPN subscriber was ported.

In each of the following examples, the Called Party Number has been ported (unless otherwise noted). The Billing Number (if present) and Calling Number may also have been ported. All OSSs are NP capable (unless otherwise noted).

In each of these examples, the NP Global Title Translation (GTT) function has been implemented at the NPDB. It could equally well have been implemented at another database or STP.

3.3.1   0-Call (Station Paid Billing)

This example involves a single zone of portability and assumes the OSS is capable of performing NP queries.
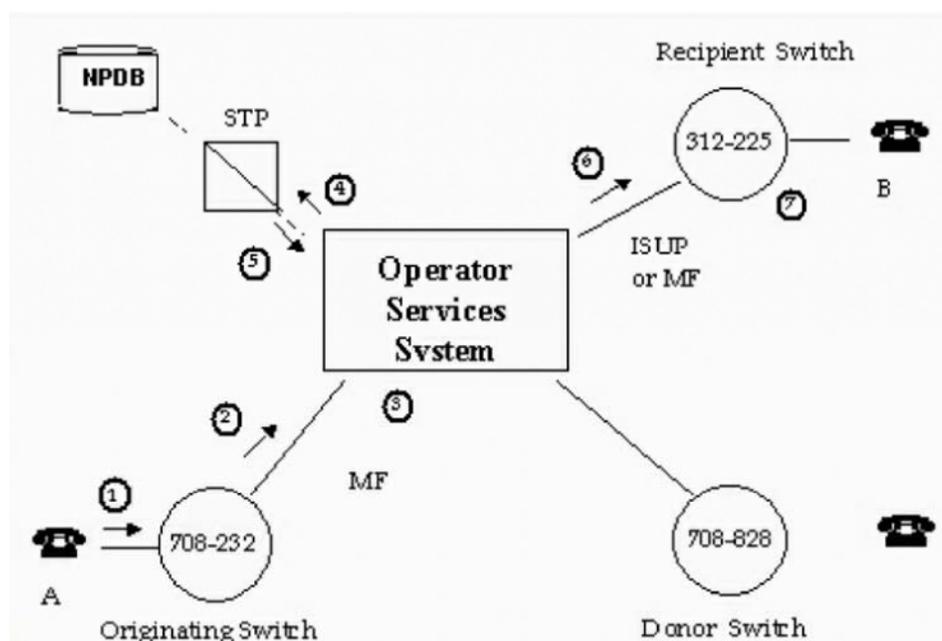
Figure 1: Call Completion Call Flow – 0-Call

1. Line A (708-232-1111) dials 0.
2. The Originating Switch performs digit analysis on the dialed digits to determine how to route the call. The originating switch determines the trunk to the OSS, seizes it and establishes a connection with the OSS.
3. The operator receives a verbal request from A to dial B at 708-828-2222 and to bill the call to A's line (station paid billing). The operator keys in 708-828-2222 and attempts to connect A with B.

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The OSS performs digit analysis to determine how to route the call. The OSS determines that B is in a portable NPA-NXX (from its internal list).

4. The OSS sends a NP query to an NPDB based on the called digits of 708-828-2222.

5. The NPDB sends a response with the LRN (312-225-0000) of the Recipient Switch.

6. The OSS receives the NPDB response and analyzes the data. The LRN of the calling number is obtained from the identity of the incoming trunk group. The Calling Number and Called Number will each have its own NP AMA module populated and appended to the AMA record since the called number has a portable NPA-NXX and the incoming trunk group has an associated LRN in office data. The LRN of the Called Number is translated to select an outgoing trunk.

   Outgoing ISUP Trunk: If the outgoing trunk is an ISUP route out of the switch (and not marked as "Signal Ported Number"), the LRN is stored in the CdPN parameter and the dialed digits are signaled in the GAP parameter of the ISUP IAM message. The FCI Ported Number Translation Indicator is set to indicate a query has been done (set to "translated number").

   Outgoing MF Trunk: If the outgoing trunk is an MF route out of the switch, the dialed digits are outpulsed in the Called Party Number field.

7. If the incoming trunk to the recipient switch is MF, the Called Party Number field is used to complete the call. If the incoming trunk to the recipient switch is ISUP then the contents of the IAM message are processed. Since the LRN identifies this switch, the switch uses the contents of the GAP rather than the Called Party Number parameter to identify the subscriber and complete the call.

3.3.2   Calling Card Call - LIDB Validation

This example transpires within a single zone of portability.

Figure 2: Calling Card Call LIDB Validation

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1. Line A (708-232-1111) dials 0-708-828-2222.

2. The Originating Switch performs digit analysis on the dialed digits to determine how to route the call. The originating switch determines the trunk to the OSS, seizes it and establishes a connection with the OSS.

3. The OSS sends a bong to the subscriber. The digits of a non-proprietary line-based calling card (312-228-1576-9999) are collected. The OSS sends a LIDB query with the first ten digits (NPA-NXX-XXXX) of the calling card digits in the Global Title of the SCCP Called Party Address and the fourteen digits of the calling card digits in the application (TCAP) layer of the LIDB query. The OSS routes this LIDB query to the STP.

4. The STP Global Title Translations are set to route portable NPA-NXXs in the SCCP layer to a GTT server (NPDB in this example).

5. The GTT server looks up the address (Point Code and Sub-System Number) for the correct LIDB using the 10 digits in the SCCP Called Party Address field (it does not need to extract data from the TCAP layer). The GTT server places the PC/SSN in the query and sends the LIDB query back to the STP.

6. The STP routes to the LIDB that contains the calling card number based on the point code address previously supplied by the GTT server.

7. The LIDB receives the query and validates the calling card number.

8. The LIDB routes its response by moving the incoming SCCP Calling Party Address into the outgoing SCCP Called Party Address.

9. The OSS receives positive validation to allow the call to complete.

10. The OSS launches an NP query with the first ten digits of the Billing Number (312-228-1576) placed in the CalledPartyNumber parameter if the Billing Number is in a portable NPA-NXX.

11. The NPDB sends a response with the LRN of the Billing Number.

12. The OSS stores this LRN that corresponds to the service provider issuing the line-based calling card for inclusion in the NP AMA module since the Billing Number has a portable NPA-NXX. The OSS performs digit analysis on the Called Number to determine how to route the call. The OSS determines that B is in a portable NPA-NXX.

13. The OSS sends an NP query to the NPDB based on the called digits of 708-828-2222.

14. The NPDB sends a response with the LRN (312-225-0000) of the Recipient Switch.

15. The OSS receives the NPDB response and analyzes the data. The LRN of the calling number is obtained from the identity of the incoming trunk group. The Calling Number, Called Number and Billed Number will each have its own NP AMA module populated and appended to the AMA record since the called number has a portable NPA-NXX and the incoming trunk group has an associated LRN in office data. The LRN of the Called Number is translated to select an outgoing trunk.

    Outgoing ISUP Trunk: If the outgoing trunk is an ISUP route out of the switch, the LRN is stored in the CdPN parameter and the dialed digits are signaled in the GAP parameter of the ISUP IAM message. The FCI Ported Number Translation Indicator is set to indicate a query has been done (set to "translated number").

    Outgoing MF Trunk: If the outgoing trunk is an MF route out of the switch, the dialed digits are outpulsed in the Called Party Number field.

16. If the incoming trunk to the recipient switch is MF, the Called Party Number field is used to complete the call. If the incoming trunk to the recipient switch is ISUP then the contents of the

IAM message are processed. Since the LRN identifies this switch, the switch uses the contents of the GAP rather than the Called Party Number parameter to identify the subscriber and complete the call.

3.3.3 Out of Region Calling Card - LIDB Validation

This scenario is the same as the preceding one, except that the calling card being used is from a different zone of portability than the rest of the example.

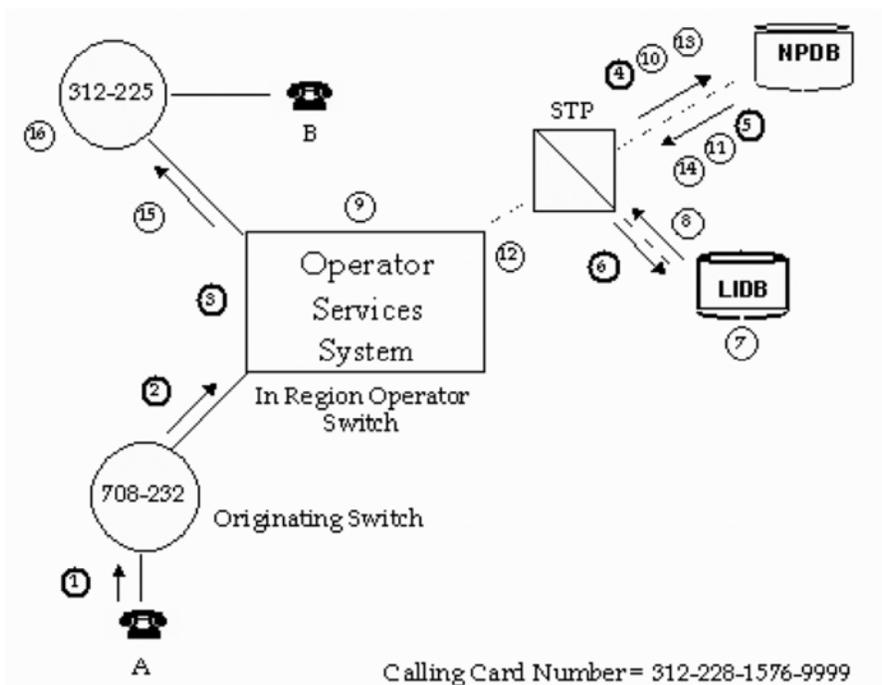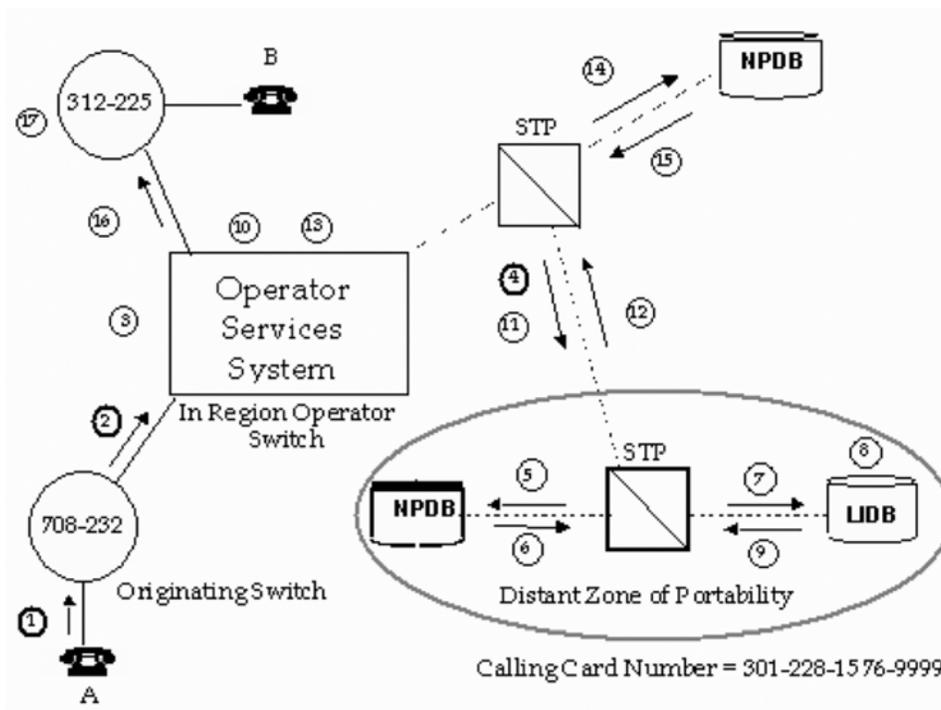**Figure 3: Out of Region Calling Card - LIDB Validation**

1. Line A (708-232-1111) dials 0-708-828-2222.

2. The Originating Switch performs digit analysis on the dialed digits to determine how to route the call. The originating switch determines the trunk to the OSS, seizes it and establishes a connection with the OSS.

3. The OSS sends a bong to the subscriber. The digits of a non-proprietary line-based calling card (301-228-1576-9999) are collected. The OSS sends a LIDB query with the first ten digits (NPA-NXX-XXXX) of the calling card digits in the SCCP Called Party Address Field and the fourteen digits of the calling card digits in the application (TCAP) layer of the LIDB query. The OSS routes this LIDB query to the STP.

4. In this example, the STP Global Title Translations are set to route portable NPA-NXXs belonging to a distant Zone of Portability to an STP in that zone.

5. The STP Global Title Translations in the distant zone of portability are set to route portable NPA-NXXs to a GTT server (NPDB in this example).

6. The GTT server performs a standard ten digit GTT by looking up the address (Point Code and Sub-System Number) for the correct LIDB using the 10 digits in the SCCP Called Party Address

field (it does not need to extract data from the TCAP layer). The GTT server places the PC/SSN in the query and sends the LIDB query back to the STP.

7. The STP routes to the LIDB that contains the calling card number based on the point code address supplied by the GTT server.

8. The LIDB receives the query and validates the calling card number.

9. The LIDB routes its response by moving the incoming SCCP Calling Party Address into the outgoing SCCP Called Party Address.

10. The OSS receives positive validation to allow the call to complete.

11. The OSS launches a NP query with the first ten digits of the Billing Number (301-228-1576) placed in the CalledPartyNumber parameter if the Billing Number is in a portable NPA-NXX.

12. The NPDB sends a response with the LRN of the Billing Number.

13. The OSS stores this LRN that corresponds to the service provider issuing the line-based calling card for inclusion in the NP AMA module since the Billing Number has a portable NPA-NXX. The OSS performs digit analysis on the Called Number to determine how to route the call. The OSS determines that B is in a portable NPA-NXX.

14. The OSS sends a NP query to the NPDB based on the called digits of 708-828-2222.

15. The NPDB sends a response with the LRN (312-225-0000) of the Recipient Switch.

16. The OSS receives the NPDB response and analyzes the data. The LRN of the calling number is obtained from the identity of the incoming trunk group. The Calling Number, Called Number and Billed Number will each have its own NP AMA module populated and appended to the AMA record since the called number has a portable NPA-NXX and the incoming trunk group has an associated LRN in office data. The LRN of the Called Number is translated to select an outgoing trunk.

    Outgoing ISUP Trunk: If the outgoing trunk is an ISUP route out of the switch, the LRN is stored in the CdPN parameter and the dialed digits are signaled in the GAP parameter of the ISUP IAM message. The FCI Ported Number Translation Indicator is set to indicate a query has been done (set to "translated number").

    Outgoing MF Trunk: If the outgoing trunk is an MF route out of the switch, the dialed digits are outpulsed in the Called Party Number field.

17. If the incoming trunk to the recipient switch is MF, the Called Party Number field is used to complete the call. If the incoming trunk to the recipient switch is ISUP then the contents of the IAM message are processed. Since the LRN identifies this switch, the switch uses the contents of the GAP rather than the Called Party Number parameter to identify the subscriber and complete the call.

3.3.4   Calling Card Call - LIDB Validation, Out of Region OSS

Here, the calling card is from a zone of portability, but the rest of the example does not take place in a portability zone (illustrates behavior of ABS calls from outside a zone of portability). The out of region OSS does not require NP functionality to validate calling cards from portable regions.
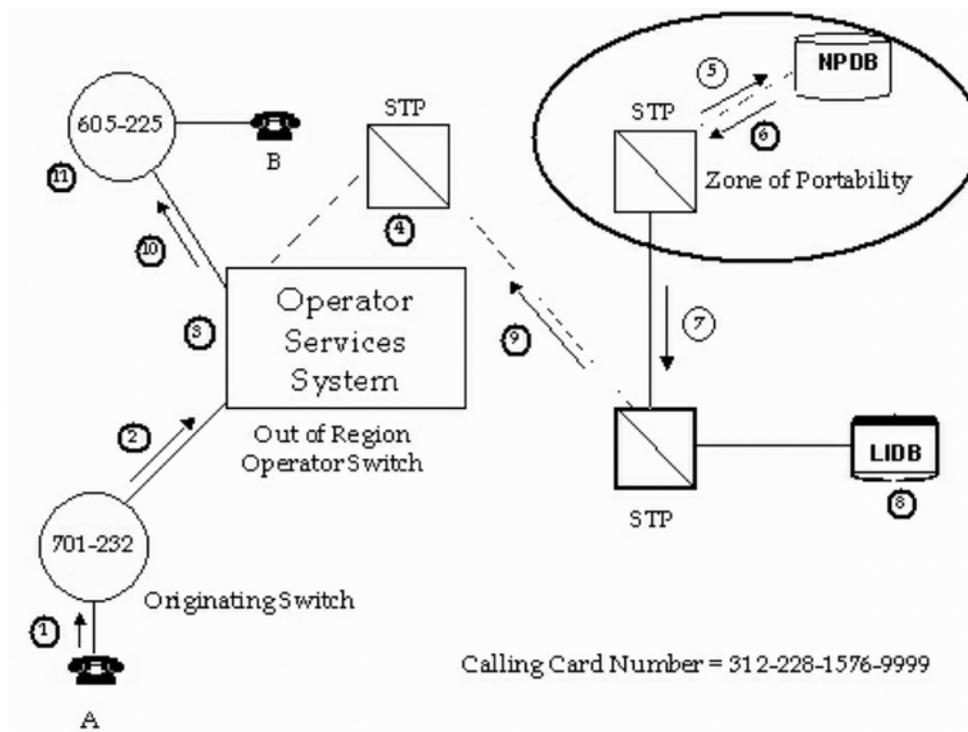
Figure 4: Calling Card Call LIDB Validation, Out of Region OSS

1. Line A (701-232-1331) dials 0-605-225-8787.

2. The Originating Switch performs digit analysis on the dialed digits to determine how to route the call. The originating switch determines the trunk to the OSS, seizes it and establishes a connection with the OSS.

3. The OSS sends a bong to the subscriber. The digits of a non-proprietary line-based calling card (312-228-1576-9999) are collected. The OSS sends a LIDB query with only the first six digits (NPA-NXX) of the calling card digits in the SCCP Called Party Address Field and the fourteen digits of the calling card digits in the application (TCAP) layer of the LIDB query. The OSS routes this LIDB query to the STP.

4. Out of region STPs' Global Title Translations route based on the NPA-NXX in the SCCP Called Party Address Field to the zone of portability.

5. Note: Out of region STPs do not need to change their current Global Title Translations. However, carriers with out of region STPs have the option of changing their translations to route portable NPA-NXX queries to a GTT server of their choosing.

6. The Global Title Translations in the STP in the zone of portability are set to route portable NPA-NXXs in the SCCP layer to a GTT server.

7. The GTT server extracts 10 digits of the billed number parameter (312-228-1576) from the application layer and uses it in place of the SCCP Called Party Address Field to obtain the point code and SSN address for the correct LIDB. The GTT server places the PC/SSN in the query and sends the LIDB query back to the STP.

8. The STP routes to the LIDB that contains the calling card number based on the point address previously supplied by the NPDB.

9. The LIDB receives the query and validates the calling card number.

10. The LIDB routes its response by moving the incoming SCCP Calling Party Address into the outgoing SCCP Called Party Address Field.

11. The OSS receives positive validation to allow the call to complete. The OSS performs digit analysis to determine how to route the call. A trunk is selected and a 605-225-8787 is placed in the Called Party Address field.

12. The terminating switch completes the call.

3.3.5 Third Party Number Billing - LIDB Validation

In this example, the OSS is NP capable and serves the zone of portability. Both the Third Party Number and the Called Party Number are ported within this zone.

Figure 5: Third Party Number Billing LIDB Validation

1. Line A (708-232-1111) dials B at 0-708-828-2222.

2. The Originating Switch performs digit analysis on the dialed digits to determine how to route the call. The originating switch determines the trunk to the OSS, seizes it and establishes a connection with the OSS.

3. The OSS sends a bong to the subscriber. The subscriber indicates that the call is third party and provides the billing number to the operator system (312-228-1576). The OSS sends a LIDB query with all ten digits of the Third Number in the SCCP Called Party Address Field and all ten digits of the Third Number in the application (TCAP) layer of the LIDB query. The operator system should send a LIDB query for each call. To accommodate number portability and number pooling, billing screening must be based on a LIDB query rather than any preliminary screening on the billing number NPA-NXX. The OSS routes this LIDB query to the STP.

4. The STP Global Title Translations route portable NPA-NXXs in the SCCP layer to a GTT server (NPDB in this example).

5. The GTT server looks up the address (Point Code and Sub-System Number) for the correct LIDB using the 10 digits in the SCCP Called Party Address field (it does not need to extract data from the TCAP layer). The GTT server places the PC/SSN in the query and sends the LIDB query back to the STP.

6. The STP routes to the LIDB that contains the Third Number based on the point code address supplied by the GTT server.

7. The LIDB receives the query and validates the Third Number.

8. The LIDB routes its response by moving the incoming SCCP Calling Party Address into the outgoing SCCP Called Party Address Field.

9. The OSS receives positive validation to allow the call to complete.

10. The OSS launches a NP query with the ten digits of the Third Number (312-228-1576) placed in the CalledPartyNumber parameter since it is based on a portable NPA-NXX.

11. The NPDB sends a response with the LRN of the Third Number (312-246-0000).

12. The OSS stores this LRN for inclusion in the NP AMA module. If billing acceptance is required, the OSS also translates the LRN to select an outgoing trunk. The OSS completes a call to the Third Number and receives billing acceptance.

13. The OSS performs digit analysis on the Called Number to determine how to route the call. The OSS determines that B is in a portable NPA-NXX. The OSS sends a NP query to the NPDB based on the called digits of 708-828-2222 to the NPDB.

14. The NPDB sends a response with the LRN (312-225-0000) of the Recipient Switch.

15. The OSS receives the NPDB response and analyzes the data. The LRN of the calling number is obtained from the identity of the incoming trunk group. The Calling Number, Called Number and Third Number will each have its own NP AMA module populated and appended to the AMA record since the called number has a portable NPA-NXX and the incoming trunk group has an associated LRN in office data. The LRN of the Called Number is translated to select an outgoing trunk.

    Outgoing ISUP Trunk: If the outgoing trunk is an ISUP route out of the switch, the LRN is stored in the CdPN parameter and the dialed digits are signaled in the GAP parameter of the ISUP IAM message. The FCI Ported Number Translation Indicator is set to indicate a query has been done (set to "translated number").

    Outgoing MF Trunk: If the outgoing trunk is an MF route out of the switch, the dialed digits are outpulsed in the Called Party Number field.

16. If the incoming trunk to the recipient switch is MF, the Called Party Number field is used to complete the call. If the incoming trunk to the recipient switch is ISUP then the contents of the IAM message are processed. Since the LRN identifies this switch, the switch uses the contents of the GAP rather than the Called Party Number parameter to identify the subscriber and complete the call.

3.3.6 Collect Call - LIDB Validation

This example illustrates a collect call where the OSS is NP capable, and serves the zone of portability. The Called Party Number is ported within this zone.

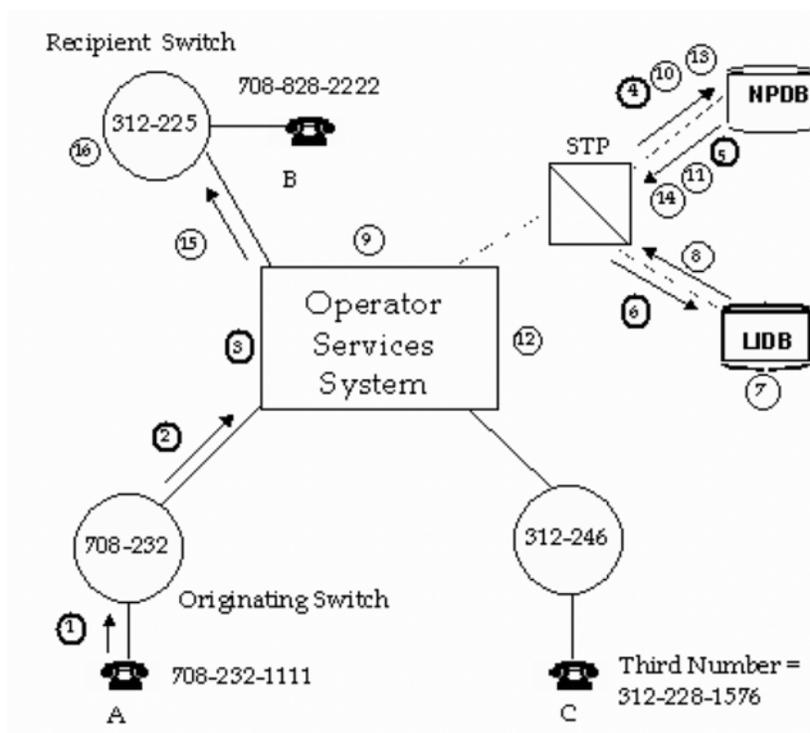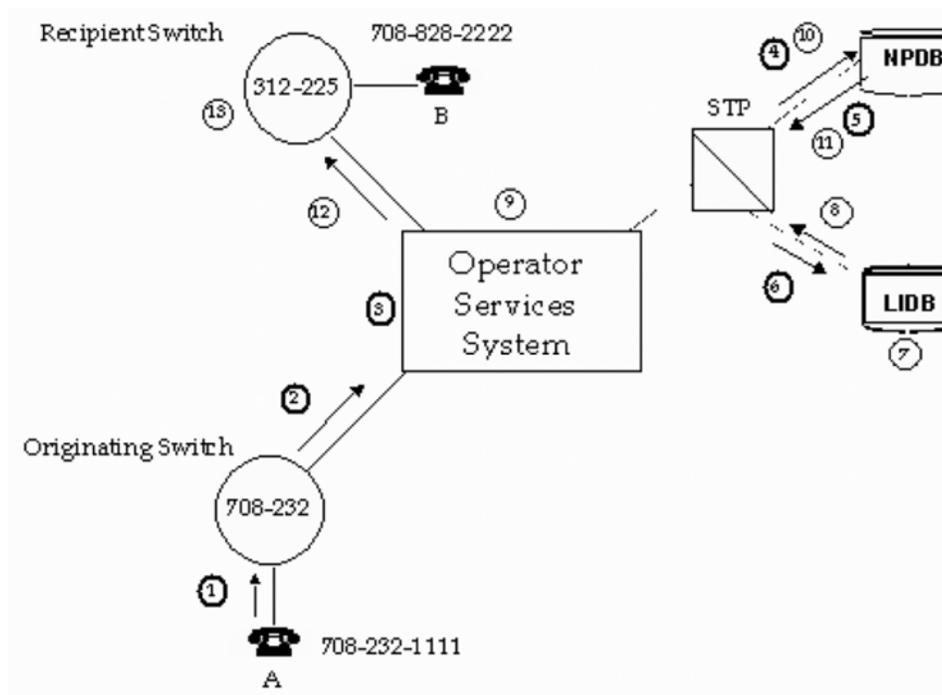**Figure 6: Collect Call LIDB Validation**

1. Line A (708-232-1111) dials B at 0-708-828-2222.

2. The Originating Switch performs digit analysis on the dialed digits to determine how to route the call. The originating switch determines the trunk to the OSS, seizes it and establishes a connection with the OSS.

3. The OSS sends a bong to the subscriber. The subscriber indicates that the call is collect. The call is marked collect (708-828-2222). The OSS sends a LIDB query with all ten digits (NPA-NXX-XXXX) of the Called Number in the SCCP Called Party Address Field and all ten digits of the Called Number in the application layer (TCAP) of the LIDB query. The operator system should send a LIDB query for each call. To accommodate number portability and number pooling, billing screening must be based on a LIDB query rather than any preliminary screening on the billing number NPA-NXX.The OSS routes this LIDB query to the STP.

4. The STP Global Title Translations are set to route portable NPA-NXXs in the SCCP layer to a GTT server (NPDB in this example).

5. The GTT server looks up the address (Point Code and Sub-System Number) for the correct LIDB using the 10 digits in the SCCP Called Party Address field (it does not need to extract data from the TCAP layer). The GTT server places the PC/SSN in the query and sends the LIDB query back to the STP.

6. The STP routes to the LIDB that contains the called number based on the point code address previously supplied by the GTT server.

7. The LIDB receives the query and validates the Called Number.

8. The LIDB routes its response by moving the incoming SCCP Calling Party Address into the outgoing SCCP Called Party Address Field.

9. The OSS receives positive validation to allow the call to complete.

10. The OSS launches a NP query with the ten digits of the Called Number (708-828-2222) placed in the CalledPartyNumber parameter.

11. The NPDB sends a response with the LRN of the Called Number (312-225-0000).

12. The OSS receives the NPDB response and analyzes the data. The LRN of the calling number is obtained from the identity of the incoming trunk group. The Calling Number and Called Number will each have its own NP AMA module populated and appended to the AMA record since the called number has a portable NPA-NXX and the incoming trunk group has an associated LRN in office data. The LRN of the Called Number is translated to select an outgoing trunk.

    Outgoing ISUP Trunk: If the outgoing trunk is an ISUP route out of the switch, the LRN is stored in the CdPN parameter and the dialed digits are signaled in the GAP parameter of the ISUP IAM message. The FCI Ported Number Translation Indicator is set to indicate a query has been done (set to "translated number").

    Outgoing MF Trunk: If the outgoing trunk is an MF route out of the switch, the dialed digits are outpulsed in the Called Party Number field.

13. If the incoming trunk to the recipient switch is MF, the Called Party Number field is used to complete the call. If the incoming trunk to the recipient switch is ISUP then the contents of the IAM message are processed. Since the LRN identifies this switch, the switch uses the contents of the GAP rather than the Called Party Number parameter to identify the subscriber and route the call. The subscriber accepts the charges for the call through interaction with the OSS, and then the call is completed to the subscriber.

3.3.7 Busy Line Verification, Voice-to-Voice Hand-off

The following example is an intraLATA call, where both OSSs are NP capable and inward connections can be established between LEC 1 and LEC 2.
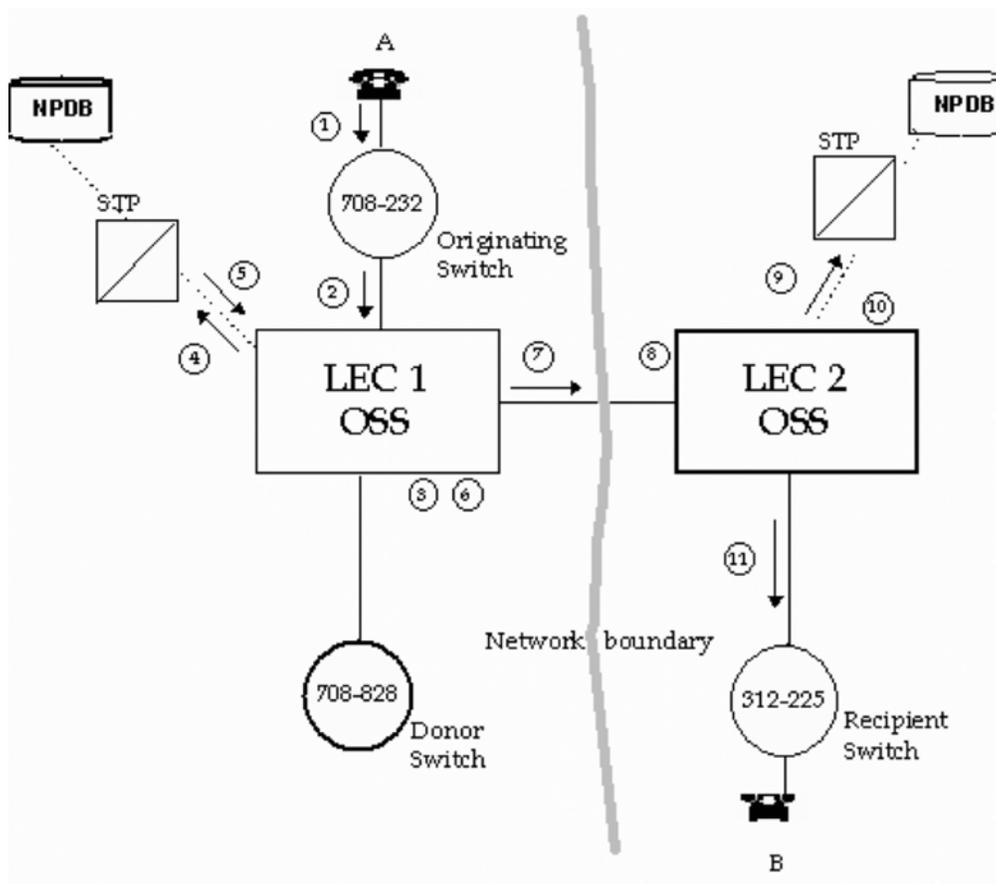
Figure 7: Busy Line Verification, Voice-to-Voice Hand-Off

1. Line A (708-232-1111) dials 0.

2. The Originating Switch performs digit analysis on the dialed digit to determine how to route the call. The originating switch determines the trunk to the OSS, seizes it and establishes a connection with LEC 1 OSS.

3. LEC 1 Operator receives a request from A to do a busy line verification on B at 708-828-2222. The operator keys in 708-828-2222 and initiates a BLV call. LEC 1 OSS performs digit analysis to determine how to route the call. LEC 1 OSS determines that B is in a portable NPA-NXX.

4. The LEC 1 OSS sends a NP query to the NPDB based on the BLV digits of 708-828-2222.

5. The NPDB sends a response with the LRN (312-225-0000) of the Recipient Switch.

6. LEC 1 OSS receives the NPDB response and analyzes the data. It determines that the LRN is not one that can be verified from this OSS. The operator is alerted to route the call to another OSS and the LRN is translated, either by the system or the operator, to a routing code of the form NPA-TTC, where TTC is the terminating toll center code for the LEC 2 OSS.

7. LEC 1 Operator routes the call to the LEC 2 OSS using NPA-TTC-OSDC, where OSDC is an appropriate operator special dial code for busy line verification.

8. Operator 2 at OSS 2 receives a request from LEC 1 Operator to do a busy line verification on B at 708-828-2222. The operator keys in 708-828-2222 and initiates a BLV call. The OSS 2 performs digit analysis to determine how to route the call. The OSS 2 determines that B is in a portable NPA-NXX.

9. The LEC 2 OSS sends a NP query to the NPDB based on the BLV digits of 708-828-2222.

10. OSS 2 receives the NPDB response and analyzes the data. It determines that the LRN can be verified from this OSS. The LRN is translated and used to choose a dedicated BLV trunk. OSS 2 routes the call on a BLV trunk and signals the 10-digit directory number, 708-828-2222. If the BLV trunk is an ISUP trunk, OSS 2 also signals the LRN (312-225-0000).

11. Operator 2 completes the BLV and reports the results back to LEC 1 Operator. LEC 1 Operator reports the results back to the subscriber.

Note - OSS-1 will generate an AMA record containing the LRN of the Called (Verified) Number in a NP AMA module. (A Calling Number NP AMA module would also be appended if the incoming trunk group has an associated LRN in office data or if the NPA-NXX of the Calling Number is portable and a NP query is performed. A Billing Number NP AMA module would be appended if the billing number is portable and a NP query is performed.)

3.3.8   Busy Line Verification - Non-NP capable OSS

In this example, the initial OSS is non-NP capable, and may belong to an IXC or a LEC.
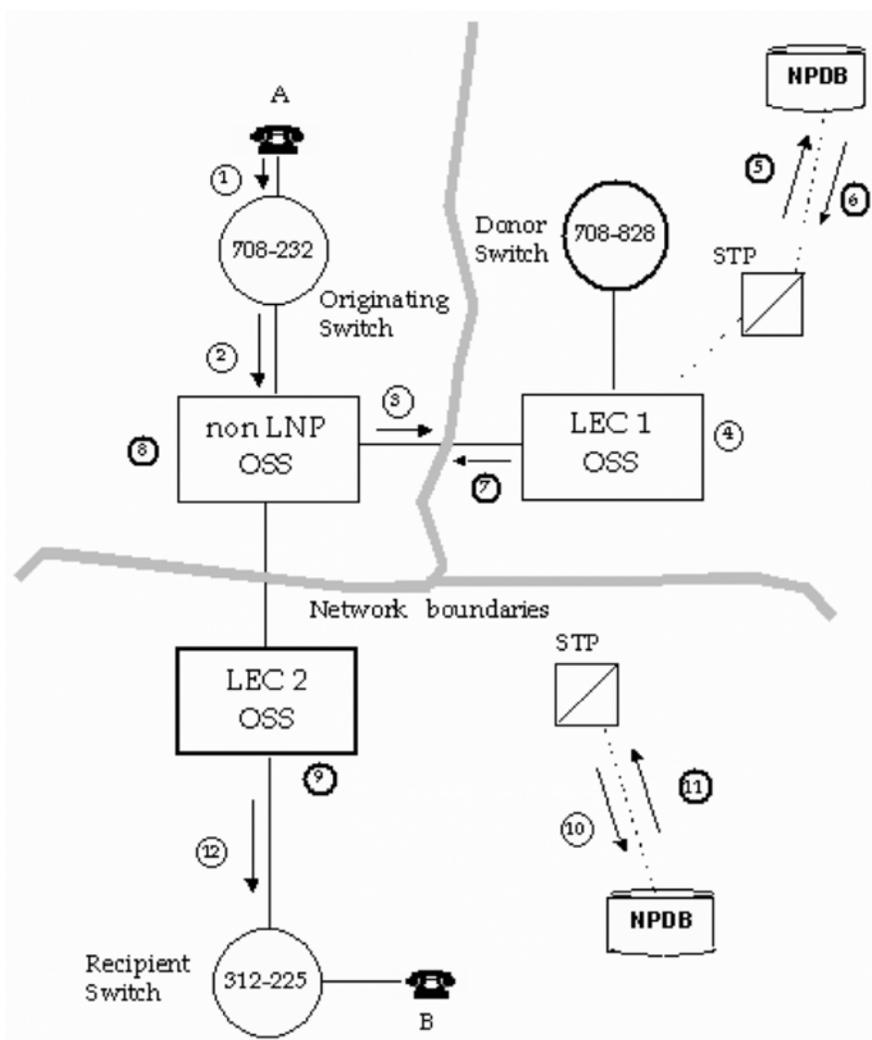
Figure 8: Busy Line Verification - Non-NP capable OSS

1. Line A (708-232-1111) dials 0 (or 00).

2. The Originating Switch performs digit analysis on the dialed digit to determine how to route the call. The originating switch determines the trunk to the OSS, seizes it and establishes a connection with the non-NP OSS.

3. Non-NP operator receives a request from A to do a busy line verification on B at 708-828-2222. The non-NP OSS determines that 708-828 is not an NPA-NXX that can be verified from this OSS. The operator is alerted to route the call to another OSS and the NPA-NXX is translated either by the system or the operator, to a routing code of the form NPA-TTC, where TTC is the terminating toll code for LEC 1 OSS. Non-NP operator routes the call to the LEC 1 OSS using NPA-TTC-OSDC, where OSDC is an appropriate operator special dial code for busy line verification.

4. LEC 1 OSS operator keys in 708-828-2222 and initiates a BLV call. The LEC 1 OSS performs digit analysis to determine how to route the call. LEC 1 OSS determines that B is in a portable NPA-NXX.

5. The LEC 1 OSS sends a NP query to the NPDB based on the BLV digits of 708-828-2222.

6. The NPDB sends a response with the LRN (312-225-0000) of the Recipient Switch.

7. The LEC 1 OSS receives the NPDB response and analyzes the data. It determines that the LRN is not one that can be verified from this OSS. The LEC 1 OSS alerts its operator, and displays either the LRN or the NPA-TTC (dependent on system implementation). The LEC 1 operator informs the non-NP operator of either the LRN or the NPA-TTC.

8. If the NPA-TTC is not directly provided, the non-NP operator or OSS determines the NPA-TTC by translating the LRN (312-225-0000) received from LEC 1 operator. The non-NP operator releases the connection to LEC 1 OSS. Non-NP operator routes the call to the LEC 2 OSS using NPA-TTC-OSDC, where OSDC is an appropriate operator special dial code for busy line verification.

9. The LEC 2 operator receives a request from the non-NP operator to do a busy line verification on B at 708-828-2222. The operator keys in 708-828-2222 and initiates a BLV call. The LEC 2 OSS performs digit analysis to determine how to route the call. The LEC 2 OSS determines that B is in a portable NPA-NXX.

10. The LEC 2 OSS sends a NP query to the NPDB based on the BLV digits of 708-828-2222.

11. LEC 2 OSS receives the NPDB response and analyzes the data. It determines that the LRN can be verified from this OSS. The LRN is translated and used to choose a dedicated BLV trunk. LEC 2 OSS routes the call on a BLV trunk and signals the 10-digit directory number. If the BLV trunk is an ISUP trunk, LEC 2 OSS also signals the LRN (312-225-0000).

12. LEC 2 operator completes the BLV and reports the results back to the non-NP operator. The non-NP operator reports the results back to the subscriber.

Note - The LRN of the verified number will not appear in billing records generated by a non-NP OSS.

Note - Some IXCs may choose to have NP capable OSSs. In these cases the IXC's NP capable OSS may do a query to determine the LRN of the requested number. This will allow the IXC OSS to route the BLV request directly to the LEC's OSS that hosts the requested line.

3.3.9 "Worst Case" example - NP capable OSS

This "worst case" example demonstrates a call flow with the maximum number of queries launched by an OSS.

In this example, a Bill to Third Number call (with authorization) is described. The Calling Number, the Called Number, and the Third Number have all been ported, and are all in different zones of portability.

The OSS is populated with the portable NPA-NXXs in its own zone, as well as those in zones B and C. Zone A is provisioned so that number portability information (LRNs) from zone A are looked up at the NPDB in zone A, whereas numbers from distant zones (B and C) are sent to the distant zone to be queried.

This example was chosen in an attempt to create a worst case scenario, involving all portable numbers, in different zones of portability. It is intended to illustrate technical requirements, and may not represent a realistic business model. This call flow illustrates a NP query within its own zone of portability (Calling Party number), a LIDB query, a NP query (for AMA and call routing) and a call completion to verify Third Party Billing in one distant zone of portability (zone B), and a NP query to a second distant zone of portability (zone C) where the OSS knows that a number is portable, but must obtain final routing and portability information from the distant zone of portability. Some of these queries may not be made by all service providers.

This example shows NPDB queries being made by the donor network. NPDB queries can be made from other networks (e.g., intermediate exchange carrier networks).

A Calling Card Validation would be very similar to this example, but would not require routing a call into zone B (authorization), and would include 14 digits in the TCAP portion of the LIDB query messages.
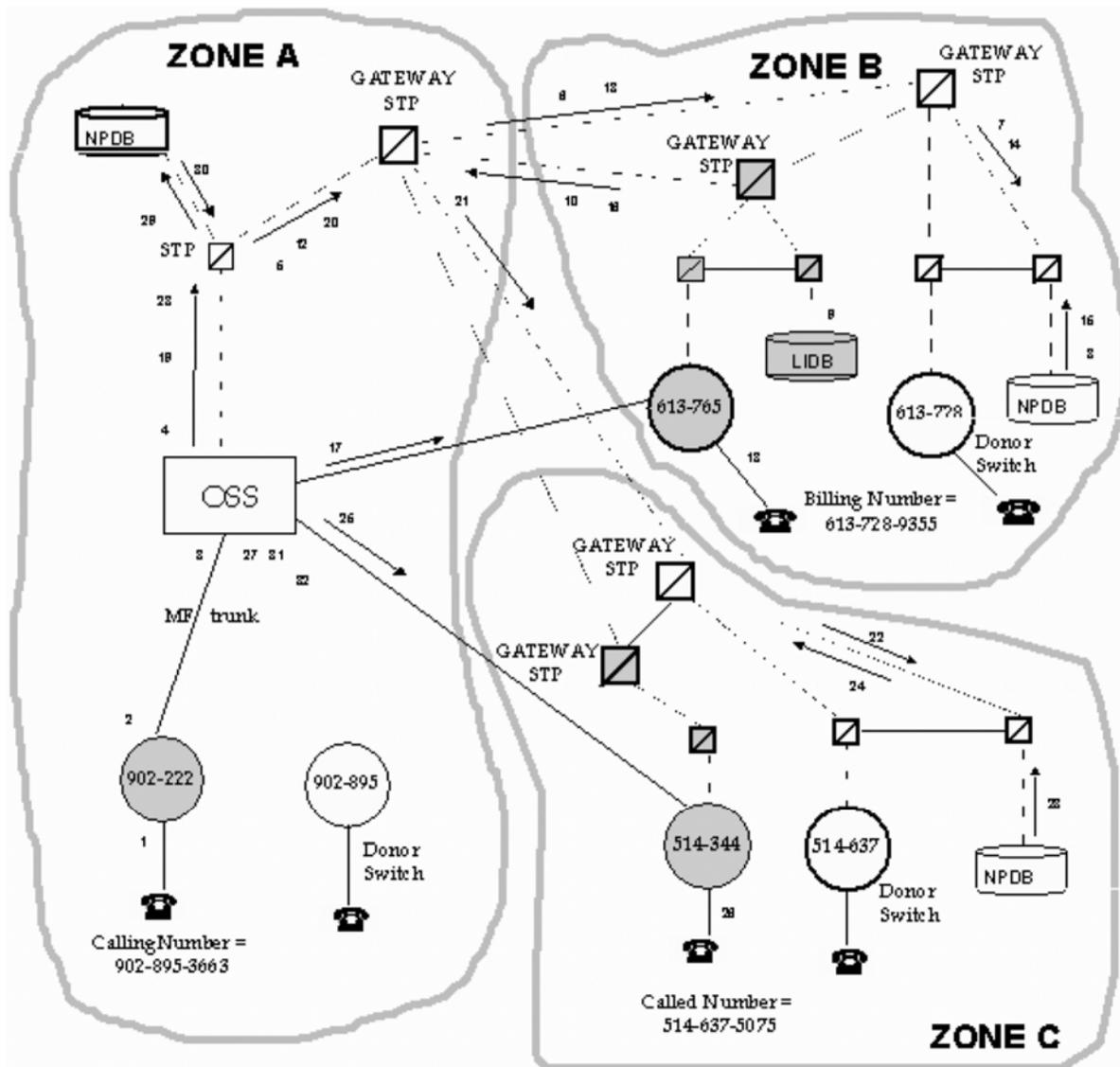
Figure 9: Worst Case Scenario - Third Party (Authorization required) - Three different zones of portability.

1. Line A (902-895-3663) dials 0-514-637-5075.

2. The Originating Switch performs digit analysis on the dialed digits to determine how to route the call. The originating switch determines the trunk to the OSS, seizes it and establishes a connection with the OSS.

3. The OSS sends a bong to the subscriber. The subscriber indicates that the call is Third Party and provides the Billing Number to the operator system (613-728-9355).

LIDB query

4. The OSS sends a LIDB query (for Billed Number Screening) with all ten digits (NPA-NXX-XXXX) of the Third Number in the SCCP Called Party Address Field and all ten digits of the Third Number in the TCAP (application layer) of the LIDB query. The OSS routes this LIDB query its local STP.

MTP	OPC: OSS	DPC: local STP
SCCP	CgPA: PC & SSN=OSS	CdPA: GTT (613-728-9355, TT=LIDB)
TCAP	BN: 613-728-9355	

5. The STP receives the query and looks up the GTA in its GTT table identified by the Translation Type. Since 613-728-9355 is outside this zone, the GTT table has been populated (in this example) to indicate that only a non-final translation should occur, with the message being forwarded to the Gateway STP.

MTP	OPC: local STP	DPC: Gateway STP - zone A
SCCP	CgPA: PC & SSN=OSS	CdPA: GTT (613-728-9355, TT=LIDB)
TCAP	BN: 613-728-9355	

6. The Gateway STP receives the query, looks up the GTA in its GTT table identified by the Translation Type. The GTT table has been populated to provide a non-final destination of a Gateway STP in zone B.

MTP	OPC: Gateway STP - zone A	DPC: Gateway STP - zone B
SCCP	CgPA: PC & SSN=OSS	CdPA: GTT (613-728-9355, TT=LIDB)
TCAP	BN: 613-728-9355	

7. The distant Gateway STP receives the query and looks up the GTA in its GTT table identified by the Translation Type. Since 613-728 has been designated as a portable NPA-NXX, the GTT table will have been populated to indicate that only a non-final translation should occur, with the message being forwarded to a GTT server (NPDB in this example) for final translation.

MTP	OPC: Gateway STP - zone B	DPC: NPDB - zone B
SCCP	CgPA: PC & SSN=OSS	CdPA: GTT (613-728-9355, TT=LIDB)
TCAP	BN: 613-728-9355	

8. The NPDB receives the query, and looks up the address (Point Code and Sub-System Number) for the correct LIDB using the 10 digits in the SCCP Called Party Address field (it does not need to extract data from the TCAP layer). The translation is set to final.

MTP	OPC: NPDB - zone B	DPC: distant STP
SCCP	CgPA: PC & SSN=OSS	CdPA: PC & SSN=LIDB
TCAP	BN: 613-728-9355	

9. The query is passed via the Gateway STPs to another network in zone B that contains the correct LIDB. The LIDB receives the query, and accesses the TCAP billing number to get the ten-digit DN for look up. It determines that a third party call is acceptable for this DN, but authorization is required. It then swaps the CgPA and CdPA to route the response back to the originating OSS.

MTP	OPC: LIBD - zone B	DPC: distant STP
SCCP	CgPA: PC & SSN=LIDB	CdPA: PC & SSN=OSS
TCAP	Reply: OK, but authorization required	

10. The response is routed back through the network to the OSS, which receives the response.

BN Routing

11. The OSS initiates a call to the Third Party Number to obtain authorization. It determines that the Third Number has a portable NPA-NXX, and launches a NP query to determine the LRN of the BN, placing the Third Number in the TCAP CdPID parameter.

MTP	OPC: OSS	DPC: local STP
SCCP	CgPA: PC & SSN=OSS	CdPA: GTT (613-728-9355, TT=LNP)
TCAP	CdPID: 613-728-9355	

12. The local STP looks up the SCCP CdPA in its GTT table using TT = LNP. It finds a match based on the first six digits (613-728) indicating a non-final translation pointing to its Gateway STP.

MTP	OPC: local STP	DPC: Gateway STP - zone A
SCCP	CgPA: PC & SSN=OSS	CdPA: GTT (613-728-9355, TT=LNP)
TCAP	CdPID: 613-728-9355	

13. The Gateway STP receives the query, and looks up the GTA in the six-digit GTT table identified by the Translation Type. The GTT table has been populated to provide a non-final destination of a Gateway STP in the home zone for the CdPN.

MTP	OPC: Gateway STP - zone A	DPC: Gateway STP - zone B
SCCP	CgPA: PC & SSN=OSS	CdPA: GTT (613-728-9355, TT=LNP)
TCAP	CdPID: 613-728-9355	

14. The distant Gateway STP receives the query and looks up the CdPA in the six-digit GTT table identified by the Translation Type. The message is forwarded to the NPDB via the intervening STP.

MTP	OPC: Gateway STP - zone B	DPC: distant NPDB
SCCP	CgPA: PC & SSN=OSS	CdPA: GTT (613-728-9355, TT=LNP)
TCAP	CdPID: 613-728-9355	

15. The NPDB receives the query. It looks into the TCAP CdPID to determine the ten-digit DN for translation, then uses the ten-digit NP translation table to determine the LRN of the correct switch for the CdPN. It puts the LRN into the CdPN field of the reply, and swaps the CgPA and the CdPA in the SCCP layer.

MTP	OPC: distant NPDB	DPC: distant STP
SCCP	CgPA: PC & SSN=NPDB	CdPA: PC & SSN=OSS
TCAP	CdPID: 613-765-0000	

16. The reply routes through the network back to the OSS.
17. The OSS receives the reply. It formulates an ISUP IAM including the third party number in the GAP, and the LRN in the CdPN parameter. It then routes the call to the Billing Number recipient switch.

MTP	OPC: OSS		DPC: recipient switch for BN	
ISUP	CgPN: 902-895-3663	CdPN: 613-765-0000	GAP: 613-728-9355	FCI: set

18. The Billing Number recipient switch receives the message, sees that the FCI is set, recognizes its own LRN, so it looks into the GAP to obtain the original CdPN digits, which it uses to complete the call. Assume that the third party authorizes the billing.

CdPN Routing (basically the same as the BN Routing above)

19. The OSS receives authorization for the call to proceed. It determines that the CdPN has a portable NPA-NXX, and launches a NP query.

MTP	OPC: OSS	DPC: local STP
SCCP	CgPA: PC & SSN=OSS	CdPA: GTT (514-637-5075, TT=LNP)
TCAP	CdPID: 514-637-5075	

20. The local STP looks up the SCCP CdPA in its GTT table using TT = LNP. Not finding a match, it then looks to its six-digit NP lookup table. Here it finds a non-final translation pointing to its Gateway STP.

MTP	OPC: local STP	DPC: Gateway STP - zone A
SCCP	CgPA: PC & SSN=OSS	CdPA: GTT (514-637-5075, TT=LNP)
TCAP	CdPID: 514-637-5075	

21. The Gateway STP receives the query, and looks up the GTA in the six-digit GTT table identified by the Translation Type. The GTT table has been populated to provide a non-final destination of the Gateway STP in the home zone for the CdPN.

MTP	OPC: Gateway STP - zone A	DPC: Gateway STP - zone C
SCCP	CgPA: PC & SSN=OSS	CdPA: GTT (514-637-5075, TT=LNP)
TCAP	CdPID: 514-637-5075	

22. The distant Gateway STP receives the query and looks up the CdPA in the six-digit GTT table identified by the Translation Type. The message is forwarded to the NPDB via the intervening STP.

MTP	OPC: Gateway STP - zone C	DPC: distant NPDB
SCCP	CgPA: PC & SSN=OSS	CdPA: GTT (514-637-5075, TT=LNP)
TCAP	CdPID: 514-637-5075	

23. The NPDB receives the query. It looks into the TCAP CdPN to determine the ten-digit DN for translation, then uses the ten-digit NP translation table to determine the LRN of the correct switch for the CdPN. It puts the LRN into the CdPN field of the reply, and moves the CgPA into the CdPA in the SCCP layer.

MTP	OPC: distant NPDB	DPC: distant STP
SCCP	CgPA: PC & SSN = NPDB	CdPA: PC & SSN=OSS
TCAP	CdPID: 514-344-0000	

24. The reply routes through the network to the OSS.
25. The OSS receives the reply. It formulates an ISUP IAM including the original CdPN digits in the GAP, and the LRN in the CdPN parameter. It then routes the call to the Called Party recipient switch.

MTP	OPC: donor switch for BN		DPC: recipient switch for BN	
ISUP	CgPN: 902-895-3663	CdPN: 514-344-0000	GAP: 514-637-5075	FCI: set

26. The Called Party recipient switch receives the message, sees that the FCI is set, recognizes its own LRN, so it looks into the GAP to obtain the original CdPN digits, which it uses to complete the call.

CgPN Query

27. The OSS looks the Calling Party DN up in its internal list of portable NPA-NXXs. Because it is portable, the OSS wants to determine its LRN. The LRN is determined from (a) the incoming trunk group, or (b) a query to the NPDB. The next three steps are only required in case (b).

28. The OSS launches a NP query based on the Calling Party DN of 902-895-3663, placing the Calling Party DN in the TCAP CdPID parameter.

MTP	OPC: OSS	DPC: local STP
SCCP	CgPA: PC & SSN=OSS	CdPA: GTT (902-895-3663, TT=LNP)
TCAP	CdPID: 902-895-3663	

29. The local STP looks up the SCCP CdPA in its GTT table using TT = LNP. It finds a final translation pointing to the local NPDB.

MTP	OPC: local STP	DPC: local NPDB
SCCP	CgPA: PC & SSN=OSS	CdPA: GTT (902-895-3663, TT=LNP)
TCAP	CdPID: 902-895-3663	

30. The NPDB receives the query. It looks into the TCAP CdPID to determine the ten-digit DN for translation, then uses the ten-digit NP translation table to determine the LRN of the correct switch for the CdPN. It puts the LRN into the CdPN field of the reply, and moves the CgPA into the CdPA in the SCCP layer.

MTP	OPC: distant NPDB	DPC: distant STP
SCCP	CgPA: PC & SSN = NPDB	CdPA: PC & SSN=OSS
TCAP	CdPID: 902-222-0000	

31. The OSS receives the NPDB response and analyzes the data.

AMA Record

32. An AMA record will be created for this call by the OSS. Three NP AMA modules - one for the Calling Party, one for the Called Party, and one for the Billing Number - will be appended to that record to contain the respective LRNs.

3.3.10 "Worst Case" example - Non-NP capable OSS

This example is the same as the preceding example, except that zone A is not a zone of portability. The non-NP capable OSS has not been populated with any portability information and only populates 6 digits in the SCCP layer of the LIDB query. The Called Number, and the Third Number are both ported (in different zones of portability). Some of the queries shown in this example may not be made by all service providers.

This example shows NPDB queries being made by the donor network. NPDB queries can be made from other networks (e.g., intermediate exchange carrier networks).
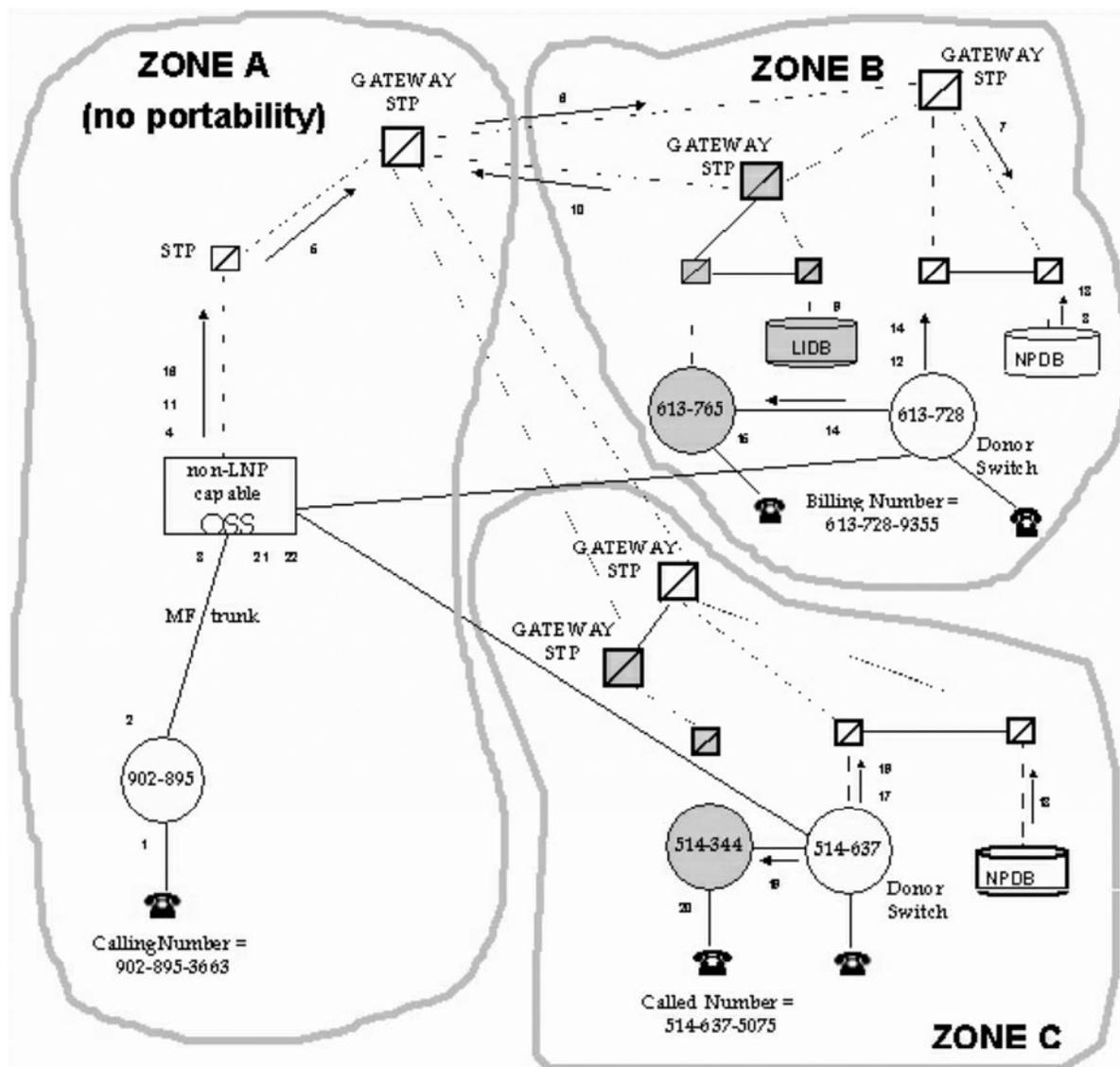
Figure 10: Worst Case scenario - Third Party (Authorization required) - Non-NP capable OSS

1. Line A (902-895-3663) dials 0-514-637-5075.
2. The Originating Switch performs digit analysis on the dialed digits to determine how to route the call. The originating switch determines the trunk to the OSS, seizes it and establishes a connection with the OSS.
3. The OSS sends a bong to the subscriber. The subscriber indicates that the call is Third Party and provides the Billing Number to the operator system (613-728-9355).

LIDB query (similar to preceding example but only six digits populated in the SCCP CdPA)

4. The OSS sends a LIDB query (for Billed Number Screening) with only the first six digits (NPA-NXX) of the Third Number in the SCCP Called Party Address Field and the ten digits of the Third Number in the TCAP (application layer) of the LIDB query. The OSS routes this LIDB query its local STP.

MTP	OPC: OSS	DPC: local STP
SCCP	CgPA: PC & SSN=OSS	CdPA: GTT (613-728, TT=LIDB)
TCAP	BN: 613-728-9355	

5. The STP receives the query and looks up the GTA of 613-728 in its GTT table identified by the Translation Type. Since 613-728 is outside this zone, the GTT table has been populated (in this example) to indicate that only a non-final translation should occur, with the message being forwarded to the Gateway STP.

MTP	OPC: local STP	DPC: Gateway STP - zone A
SCCP	CgPA: PC & SSN=OSS	CdPA: GTT (613-728, TT=LIDB)
TCAP	BN: 613-728-9355	

6. The Gateway STP receives the query, looks up the GTA in its GTT table identified by the Translation Type. The GTT table has been populated to provide a non-final destination of a Gateway STP in zone B.

MTP	OPC: Gateway STP - zone A	DPC: Gateway STP - zone B
SCCP	CgPA: PC & SSN=OSS	CdPA: GTT (613-728, TT=LIDB)
TCAP	BN: 613-728-9355	

7. The distant Gateway STP receives the query and looks up the GTA of 613-728 in the six-digit GTT table identified by the Translation Type. Since 613-728 has been designated as a portable NPA-NXX, the GTT table will have been populated to indicate that only a non-final translation should occur, with the message being forwarded to a GTT server (NPDB in this example) for final translation.

MTP	OPC: Gateway STP - zone B	DPC: distant NPDB
SCCP	CgPA: PC & SSN=OSS	CdPA: GTT (613-728, TT=LIDB)
TCAP	BN: 613-728-9355	

8. The NPDB receives the query. It looks into the TCAP BN to determine the ten-digit DN for translation, then uses the ten-digit LIDB translation table to determine the point code of the correct LIDB for the BN. The translation is set to final.

MTP	OPC: distant NPDB	DPC: distant STP
SCCP	CgPA: PC &SSN=OSS	CdPA: PC & SSN=LIDB
TCAP	BN: 613-728-9355	

9. The query is passed via the Gateway STPs to another network in zone B that contains the correct LIDB. The LIDB receives the query, and accesses the TCAP BN to get the ten-digit DN for translation. It determines that a third party call is acceptable for this DN, but authorization is required. It then swaps the CgPA and CdPA to route the response back to the originating OSS.

MTP	OPC: distant NPDB	DPC: distant STP
SCCP	CgPA: PC & SSN=LIDB	CdPA: PC & SSN=OSS
TCAP	Reply: OK, but authorization required	

10. The response is routed back through the network to the OSS, which receives the response.

BN Routing

11. The OSS initiates a call to the Third Party Number to obtain authorization. Having no portability information, it does not launch a NP query, instead it initiates an ISUP message in the general direction of the Donor Switch.

MTP	OPC: OSS		DPC: Donor switch for BN	
ISUP	CgPN: 902-895-3663	CdPN: 613-728-9355	GAP: none	FCI: N/A

12. The ISUP message is routed through the Gateway STPs in zones A and B to get to the Donor Switch in zone B. The Donor Switch recognizes that this number has been ported, and launches a NP query to determine the LRN of the Recipient Office.

Note that in many cases, this call would be first routed to an Access Tandem in the Donor network, which would perform the NP query and route the call to the Recipient network. This has been omitted from this example for the purposes of simplifying the diagram.

MTP	OPC: Donor switch for BN	DPC: Zone B NPDB
SCCP	CgPA: Donor switch for BN	CdPA: GTT (613-728-9355, TT=LNP)
TCAP	CdPID: 613-728-9355	

13. The NPDB receives the query. It looks into the TCAP CdPID to determine the ten-digit DN for translation, then uses the ten-digit NP translation table to determine the LRN of the correct switch for the CdPN. It puts the LRN into the CdPN field of the reply, and moves the CgPA into the CdPA in the SCCP layer.

MTP	OPC: Zone B NPDB		DPC: Donor switch for BN	
SCCP	CgPA: PC & SSN = NPDB		CdPA: Donor switch for BN	
TCAP	CdPID: 613-765-0000			

14. The Donor switch receives the reply. It saves the original CdPN digits in the GAP, and inserts the LRN in the CdPN field. It then routes the call to the Billing Number recipient switch, by sending an ISUP IAM.

MTP	OPC: Donor switch for BN		DPC: Recipient switch for BN	
ISUP	CgPN: 902-895-3663	CdPN: 613-765-0000	GAP: 613-728-9355	FCI: set

15. The Billing Number recipient switch receives the message, sees that the FCI is set, recognizes its own LRN, so it looks into the GAP to obtain the original CdPN digits, which it uses to complete the call. Assume that the third party authorizes the billing.

CdPN Routing (same as BN Routing)

16. Having no portability information, the OSS does not launch a NP query, instead it initiates an ISUP message in the general direction of the Donor Switch.

MTP	OPC: OSS		DPC: Donor switch for CdPN	
ISUP	CgPN: 902-895-3663	CdPN: 514-637-5075	GAP: none	FCI: N/A

17. The ISUP message is routed through the Gateway STPs in zones A and C to the Donor Switch in zone C. The Donor Switch recognizes that this number has been ported, and launches a NP query to determine the LRN of the Recipient Office.

   Note that in many cases, this call would be first routed to an Access Tandem in the Donor network, which would perform the NP query and route the call to the Recipient network. This has been omitted from this example for the purposes of simplifying the diagram.

MTP	OPC: Donor switch for CdPN	DPC: Zone C NPDB
SCCP	CgPA: Donor switch for CdPN	CdPA: GTT (514-637-5075, TT=LNP)
TCAP	CdPID: 514-637-5075	

18. The NPDB receives the query. It looks into the TCAP CdPID to determine the ten-digit DN for translation, then uses the ten-digit NP translation table to determine the LRN of the correct switch for the CdPN. It puts the LRN into the CdPN field of the reply, and moves the CgPA into the CdPA in the SCCP layer.

MTP	OPC: Zone C NPDB	DPC: Donor switch for CdPN
SCCP	CgPA: PC & SSN = NPDB	CdPA: Donor switch for CdPN
TCAP	CdPID: 514-344-0000	

19. The Donor switch receives the reply. It saves the original CdPN digits in the GAP, and inserts the LRN in the CdPN field. It then routes the call to the Called Number recipient switch, by sending an ISUP IAM.

MTP	OPC: Donor switch for CdPN		DPC: Recipient switch for CdPN	
ISUP	CgPN: 902-895-3663	CdPN: 514-344-0000	GAP: 514-637-5075	FCI: set

20. The Called Number recipient switch receives the message, sees that the FCI is set, recognizes its own LRN, so it looks into the GAP to obtain the original CdPN digits, which it uses to complete the call.

CgPN Query

21. The OSS is not NP capable, so no NP query is launched.

AMA Record

22. An AMA record will be created for this call by the OSS. As the OSS is not NP capable, it has received no LRN data, and no NP AMA modules will be appended to that record.

4   NETWORK IMPACTS

4.1   Security Issues

The NP Global Title Translation (GTT) function has the ability to obtain the Billed Number Parameter from the body of the TCAP message and therefore be able to "see" the Personal Identification Number (PIN) for a subscriber's calling card.

4.2   Signal Transfer Point (STP)

Existing six-digit GTT functionality in STPs will be used to route queries to the GTT Server. This will minimize provisioning in the STP and centralize subscriber changes in the GTT Server. There are no new STP functionality or protocol requirements.

Existing TCAP routing procedures apply between the OSS and the STP. A new translation type will be used for NP queries as per the LRN switch requirements.

4.3 Number Portability Database (NPDB)

The Number Portability Database (NPDB) is a type of Service Control Point (SCP) designed to support the database functions needed for number portability. The NPDB requirements are in the document ATIS-1000003, "Number Portability Database and Global Title Translations".

4.4 NP Global Title Translation (GTT) Function

With the introduction of NP, an OSS anywhere in North America must be able to validate billing to numbers from a zone of portability for collect, bill to third party or calling card calls. Service providers are not required to store their numbers in a common LIDB, so ten-digit translation is necessary to route BNS or CCV queries to the correct LIDB for numbers within a zone of portability.

Prior to NP, OSSs populated 6 digits in the SCCP CdPA (Called Party Address). An NP-compliant OSS will populate 10 digits in the CdPA (see Clause 5.2.2 of this document), but a non NP-compliant OSS outside a zone of portability must also be able to query a LIDB within a zone of portability in order to bill collect, bill to third party or calling card calls to numbers within that zone.NP for operator services requires one or both of the following functions:

♦ The ability to perform ten-digit GTT for LIDB (and some other) TCAP queries for portable numbers;

♦ The ability to extract the ten-digit number that is the subject of a query from the body of the TCAP message when the SCCP CdPA contains less than 10 digits of a portable number.

The NP GTT function can be implemented in an STP or in an SCP accessed by the STP. This document refers to the place where the ten-digit GTT function is performed as the GTT Server, and sometimes shows the GTT Server collocated with the NPDB for illustrative purposes. This is not meant to limit the choice of architecture for implementing the GTT function in any way.

Requirements for the NP GTT function are found in ATIS-1000003, "Number Portability Database and Global Title Translations".

4.5 Out of Region OSS

The maximum round trip delay time-out for a LIDB query may need to be advanced beyond the current setting. This is locally settable at each switch, and was usually set to two seconds prior to NP.

5 FEATURE REQUIREMENTS

The requirements are highlighted in "tags" to facilitate requirements traceability. Each tag in the document has a label containing a unique number (e.g. <REQ-OSS-00090>) where REQ-OSS is the type of requirement, 00090 is the number which identifies the specific requirement. Bold text within the tag identifies the specific requirement. Non-bold text provides supplementary explanation of the requirement. Non-bold text is not an additional requirement.

This document uses the following terminology:

♦ **Requirement** – Feature or function that is necessary to satisfy the needs of a typical service provider. Failure to meet a requirement may cause application restrictions, result in improper functioning of the product, or hinder operations. A requirement is flagged by the letters "**REQ-OSS**".

♦ **Conditional Requirements** - are needed by some but not all service providers and as such are left for the individual service providers to choose. A conditional requirement is flagged by the letters "**CR-OSS**".

5.1   NP Query Processing

The existing T1.667 Call Model does not specify any requirements for Operator Services Switches. This document proposes enhancing a subset of T1.667 requirements for NP and does not attempt to define T1.667 for OSS in general. T1.667 functionality not specifically mentioned in this document is assumed not to be part of OSS requirements for Number Portability.

The following requirements address the conditional nature of the NP query. Only one query option is supported: T1.667 SDS based.

5.1.1   Queries

<REQ-OSS-00100>

The OSS shall provide a means to mark individual NPA-NXXs as portable.

<End of REQ-OSS-00100>

The OSS will use the portable NPA-NXX data as one criterion to determine if a query should be launched for numbers handled by the OSS.

<REQ-OSS-00200>

A NP Query for the Called Number shall be sent when ALL the following apply:

1. **When the called number has a portable NPA-NXX.**
2. **When the LRN is not already known.**
3. **When the call is not transferred to an interexchange carrier, except for the specific designated set of IXCs provisioned by CR-OSS-04050.**
4. **When the call is not routed using the Release To Pivot (RTP) network capability.**

The OSS shall perform the NP query on behalf of an IXC only when business arrangements are in place that explicitly allow the LEC to perform the NP query.

For 0- operator handled calls (i.e. the calling party requested the operator to complete the call) for which the called number was outside the LATA, and for which the IXC is not designated to allow NP queries by the originating LEC, the call would be transferred to the interexchange carrier requested by the calling party without performing a query.

<End of REQ-OSS-00200>

<REQ-OSS-00250>

If the call is marked as High Probability of Completion (e.g., the IAM CPC is set to NS/EP), a NP Query for the Called Number shall be sent, even when it would not normally have been sent because of Automatic Code Gapping.

The analyzedInformation acgEncountered parameter is an optional parameter, and shall be sent as defined by T1.667 protocol. Detailed procedures can be found in GR-1298-CORE, Clause 14.2.5.

<End of <REQ-OSS-00250>

The following table shows the query and response messages to be utilized for NP queries from the OSS.

Trigger type	Query Message (OSS->NPDB)	Response Message (NPDB->OSS)
number portability	analyzedInformation	analyzeRoute

<REQ-OSS-00300>

The OSS shall implement the analyzedInformation message to launch a NP query to an NPDB.

<End of REQ-OSS-00300>

5.1.1.1 BLV Queries

<REQ-OSS-00400>

When the operator initiates the BLV function, the OSS shall query the NPDB for the LRN of the DN that is the object of the BLV test if its NPA-NXX is portable.

<End of REQ-OSS-00400>

The following requirement describes the query and response population rules for BLV. Please refer to Clause 5.2.2.1 TCAP Formats for further details on the messages.

<REQ-OSS-00500>

The OSS shall populate the CalledPartyID field of the analyzedInformation message with the DN that is the object of the BLV test when a query is needed to determine the BLV route.

<End of REQ-OSS-00500>

5.1.2 Response Processing (Normal)

If the DN that is the object of a NP query has not been ported, then the NPDB is expected to return the same DN in the response message as was sent in the query message.

<REQ-OSS-00600>

If a NP query is sent to the NPDB and an analyzeRoute message is received from the NPDB without error, digit analysis of the NP Response message can proceed.

For a call requiring routing to an interexchange carrier, the call shall be routed to that carrier.For a call not requiring routing to an interexchange carrier, the route shall be determined from digit analysis of the LRN of the Called Number if received, or the DN otherwise.

The Calling Number is determined by existing OSS functionality. The OSS shall ignore any requests to change the Calling Number from the NPDB.

As part of NP processing, the OSS will treat any T1.667 message other than these above as an error (subject to Clause 5.1.3, "Response Processing (Abnormal)" of this document).

<End of REQ-OSS-00600>

5.1.2.1 BLV Responses

<REQ-OSS-00700>

The NPDB will respond with an analyzeRoute message if the query launched was analyzedInformation.

The information needed to determine the BLV route for the object DN shall be found in the CalledPartyID parameter in the analyzeRoute response message.

<End of REQ-OSS-00700>

<REQ-OSS-00800>

Upon receipt of the NPDB response message, the OSS shall determine whether or not it provides BLV for the switch identified by the LRN or the DN as appropriate.

<End of REQ-OSS-00800>

<REQ-OSS-00900>

If upon analyzing the NPDB response message, the OSS determines that it provides BLV service for the target switch, a BLV test shall be initiated over a trunk determined from the information in the NPDB response.

As a consequence, the OSS will transmit the digits of the directory number toward the end office. If the BLV call is routed from the OSS to the end office via a tandem switch and the BLV trunk outgoing from the OSS is an ISUP trunk, the OSS will also signal the LRN.

<End of REQ-OSS-00900>

<REQ-OSS-01000>

If upon analyzing the NPDB response message, the OSS determines that it does not provide BLV service for the target switch, the operator shall be alerted. The current OSS or operator must translate the NPA-NXX returned from the NPDB into the NPA-TTC of the OSS that provides BLV service for the switch identified by the NPDB response. The OSS shall route the call and transmit the NPA-TTC-OSDC of the serving OSS.

<End of REQ-OSS-01000>

5.1.3   Response Processing (Abnormal)

This clause defines the minimum acceptable OSS processing in the event of the receipt of an abnormal response. It assumes a non- T1.667 capable OSS. These requirements should not be taken as precluding enhanced handling of abnormal conditions in accordance with T1.667 protocols.

5.1.3.1 Default Routing

When the NPDB is unavailable, or the NPDB response has a fatal error in it, the call will be routed as if no NPDB query were done. This behavior is called default routing.

<REQ-OSS-01100>

If no reply is received in response to an NPDB query, or if the NPDB response has a fatal error in it (i.e., the ten digit LRN cannot be extracted from the message), the call shall be routed using the Dialed Number.

In this case, if ISUP signaling is used, the FCI shall be populated to indicate "Number Not Translated" and no NP GAP shall be signaled.

<End of REQ-OSS-01100>

5.1.3.2 Unexpected Parameters

In general, if an OSS receives an unexpected parameter in a reply to a NP query, the OSS may ignore the unexpected parameter, process the message with the remaining parameters, and not send any message to the NPDB to indicate the unusual condition. Unexpected parameters are any parameters received that are not defined as required in Clause 5.2.2.1, "TCAP Formats" of this document.

<REQ-OSS-01200>

If the CalledPartyID parameter received in an analyzeRoute message does not contain a ten-digit NANP number, the OSS will generate a Unidirectional package containing an Invoke (last) component with a Report_Error message carrying an ApplicationErrorString parameter if the transaction was closed or an Application Error Message if the transaction remains open.

If the query was launched for routing purposes, default routing will be used. If launched for AMA purposes, a NP AMA module will be appended with a query failure indication being set.

<End of REQ-OSS-01200>

5.1.3.3 Unexpected Messages

In general, if an OSS receives an unexpected message in a reply to a NP query, the OSS will ignore the unexpected message, route the call as per default routing, and not send any message to the NPDB to indicate the unusual condition. Unexpected messages are any messages not listed in Clause 5.1.2, "Response Processing (Normal)", of this document.

The only exception occurs if a "sendToResource" message is received in a Conversation package. In this case, an Application_Error message carrying the sendToResource operation shall be sent to the NPDB to close the conversation. This exception is made because the sendToResource message typically has a long timeout period.

<REQ-OSS-01300>

If a "sendToResource" message is received by the OSS in a Conversation package, the OSS shall generate a Response package containing a Return_Error component with an Application_Error message carrying an ApplicationErrorString parameter invoking the sendToResource operation in its FailedMessage parameter.

The OSS shall process the response according to default routing guidelines.

<End of REQ-OSS-01300>

In general, if an OSS receives an unsolicited message from an NPDB, the OSS will ignore the unsolicited message, and not send any message to the NPDB to indicate the unusual condition. The only potential exception occurs if the OSS supports unsolicited Automatic Code Gapping (ACG).

<REQ-OSS-01400>

If any unrecognized parameters are received in the analyzeRoute message in a TCAP Response Package, the OSS shall ignore the unrecognized parameters and process the analyzeRoute message based on the recognized parameters.

<End of REQ-OSS-01400>

<REQ-OSS-01500>

If the TCAP response package includes an analyzeRoute message and one or more unrecognized messages, the OSS need not send any error messages to the NPDB and shall process the analyzeRoute message.

<End of REQ-OSS-01500>

<REQ-OSS-01600>

If the TCAP response package includes one or more unrecognized messages and does not contain an analyzeRoute message, the OSS need not send any error messages to the NPDB and shall route the call as per default routing.

<End of REQ-OSS-01600>

5.1.3.4 Automatic Code Gapping (ACG)

<REQ-OSS-01700>

If an ACG message is received from the NPDB, and ACG is supported by the OSS, then the OSS shall populate the ACGEncountered parameter of subsequent analyzedInformation messages directed at that NPDB as per T1.667, Clauses 7.3.1.3 and 7.4.6.1, for the duration of the gapping interval.

<End of REQ-OSS-01700>

Detailed procedures related to the use of this parameter can be found in GR-1298-CORE, Clause 14.2.5.

5.1.4 Generic Address Parameter (GAP) Generation and FCI Determinations

The use of an ISUP Generic Address Parameter (GAP) for ISUP signaling is required for preserving the dialed DN for interoffice calls following a successful NP query. The Forward Call Indicator (FCI) parameter in the ISUP Initial Address Message (IAM) will be used to indicate whether a NP query was performed. With respect to the GAP and FCI:

1. The GAP is created whenever the NP query returns an LRN for a called number.
2. The FCI is set to indicate "Number Translated" whenever a NP query is performed and a successful reply is received for a called number.

<REQ-OSS-01800>

GAP Creation - When the NP query is sent, and the NPDB returns an appropriate response (without fatal errors), then the OSS shall:

1. **Not create a "Ported Number" Generic Address Parameter if the received CalledPartyID parameter is the same as the CalledPartyID sent in the query to the NPDB. Any existing "Ported Number" GAP will be deleted from the SS7 message.**
2. **Not create a "Ported Number" Generic Address Parameter if the "Signal Ported Number" outgoing trunk group option specifies that the dialed number should be sent in the outgoing signaling (see <REQ-OSS-02700>). In addition, the "Ported Number" GAP shall not be sent for MF signaling.**
3. **Create a "Ported Number" Generic Address Parameter if the received CalledPartyID parameter is different from CalledPartyID parameter sent in the query to the NPDB and the Signaled Ported Number outgoing trunk group option does not specify that the dialed number should be sent in the outgoing signaling. Any existing "Ported Number" GAP shall be deleted from the SS7 message.**

<End of REQ-OSS-01800>

<REQ-OSS-01900>

FCI Creation - When the NP query is sent and the NPDB returns an analyzeRoute message containing a ten-digit NANP number, the OSS shall set the FCI indication to "Number Translated."

The FCI shall be set to "Number Translated" whether the NPDB-provided Called Party ID is the same or different (i.e., an LRN) from the Called Party ID initiating the NP query.

The FCI shall be set to "Number Not Translated" when the "Signal Ported Number" trunk group option is specified.

<End of REQ-OSS-01900>

5.2 Signaling and Protocol Requirements

5.2.1 Originating Switch to OSS Interfaces
<REQ-OSS-02000>

The MF signaling from the originating switch, including non-NP capable switches, is not modified by this feature.

From a signaling perspective, the signaling specified by trunk group data is the same for a call to a ported number as for a call to a non-ported number.

<End of REQ-OSS-02000>

<REQ-OSS-02010>

Operator Services Systems do not expect to receive NP query information in an IAM.

If an OSS receives an IAM with a Ported Number GAP, it shall replace the Called Party Number digits (where the LRN is stored) with the Dialed Number digits located in the Ported Number GAP, and the FCI shall be set to "Number Not Translated". For call processing and billing purposes, the call shall be treated as though NP called party information was not received.

<End of REQ-OSS-02010>

5.2.2 Signaling Formats

5.2.2.1 TCAP Formats
The following OSS/NPDB signaling changes are introduced to support NP using the NP query.

5.2.2.1.1 Query Messages (OSS to NPDB)
<REQ-OSS-02100>

The OSS shall use the analyzedInformation message for NP queries.

The analyzedInformation message shall be populated with the following parameters:

1. **UserID populated as defined by T1.667 protocol**
2. **Bearer Capability populated as defined by T1.667 protocol**
3. **CalledPartyID populated as defined by T1.667 protocol, but with the full 10 digits of the number that is the subject of the query (e.g. dialed number, third number or calling number)**

4. TriggerCriteriaType populated as 37 = numberPortability

<End of REQ-OSS-02100>

5.2.2.1.2   Response Messages (NPDB to OSS)

<REQ-OSS-02200>

When an OSS performs an NP query by sending an analyzedInformation message, the expected response from the NPDB is an analyzeRoute message.

The OSS shall only be required to process a CalledPartyID parameter in the analyzeRoute message. Other parameters in the analyzeRoute message need not be processed. Any other messages shall be handled as described in 5.1.3., "Response Processing (Abnormal)".

<End of REQ-OSS-02200>

5.2.2.1.3   LIDB Queries

NP capable OSSs will populate the full 10 digits of the DN for which LIDB information is being sought into the CalledPartyAddress field in the SCCP layer of a LIDB query when Global Title Translation is being used. This marks a change from the situation where a non-NP capable OSS populates only the six-digit NPA-NXX in that field. This is being done to reduce the need for GTT Servers to extract information from the TCAP layer to perform the translation.

<REQ-OSS-02300>

NP capable OSSs shall populate the full 10 digits of the DN for which LIDB information is being sought into the Called Party Address field in the SCCP layer of a LIDB query.

Global Title Translation is being used.

<End of REQ-OSS-02300>

5.2.2.2 ISUP Signaling Formats

Below are the ISUP signaling parameters affected by this feature.

The Called Party Number parameter follows the existing formats and procedures as specified in T1.113 regardless of whether the address digits specify an LRN or a subscriber's telephone number.

<REQ-OSS-02500>

The ISUP Generic Address Parameter (Parameter Name Code = 11000000) shall have the following format for this feature.

bit ->	8	7	6	5	4	3	2	1
Octet 1	Type of Address							
Octet 2	O/E	Nature of address Indicator						
Octet 3	Spare	Numbering Plan			Presentation		Reserved	
Octet 4	2nd address signal				1st address signal			
Octet n	Filler (if necessary)				nth address signal			

(1)	Type of Address	
	1 1 0 0 0 0 0 0	**Ported Dialed Number**

(2)	Odd/Even indicator	
	0	**Even Number of Address Digits**
	1	Odd Number of Address Digits

(3)	Nature of Address	
	0000001	subscriber number
	0000011	**national (significant) number**
	0000100	international number
	1110001	subscriber number, operator requested
	1110010	national number, operator requested
	1110011	international number, operator requested
	1110100	no number present, operator requested
	1110101	no number present, cut-through call to carrier
	1110110	950+ call from local exchange carrier public station hotel/motel, or non-exchange access end office
	1110111	test line code

(4)	Numbering Plan	
	000	unknown (no interpretation)
	001	**ISDN (Telephony) numbering plan**
	101	Private Numbering Plan

(5)	Address Presentation Restriction	
	00	**Not Applicable for Type "Ported Dialed Number"**

(6)	Rsvd	**Reserved field for future use**

(7)	Address Signal	**Coding the same as Called Party Number**

(8)	Filler (if necessary)	**not required**

Note - Only the code points in bold apply for this feature.

The format for the GAP follows the standard format specified by T1.113.

<End of REQ-OSS-02500>

<REQ-OSS-02600>

The format of the Forward Call Indicator parameter can be found in T1.113.

The Forward Call Indicator Parameter shall have the following assignment changes for this feature. Bit M is used for the Translated Called Number Indicator (TCNI), and is marked with an asterisk. The remaining indicators in the parameter are unaffected.

bit ->	8	7	6	5	4	3	2	1
Octet 1	H	G	F	E	D	C	B	A
Octet 2	P	O	N	M *	L	K	J	I

The Translated Called Number Indicator (TCNI) field (bit M) shall be encoded as follows:

♦ 0, number not translated

♦ 1, number translated

<End of REQ-OSS-02600>

5.2.2.3 OSS Signaling

This clause describes the signaling from an OSS. The table below gives a summary of the signaling from the OSS.

NP Response	Basis for Routing	Outgoing Signaling ("Signal Ported Number" TG option not specified)			
		Type	FCI	GAP	CdPN
LRN	LRN	ISUP	1	DN	LRN
DN	DN	ISUP	1	No GAP	DN
No Query	DN	ISUP	0	No GAP	DN
LRN	LRN	MF/DP	N/A	N/A	DN
DN	DN	MF/DP	N/A	N/A	DN
No Query	DN	MF/DP	N/A	N/A	DN
NPDB Failure	DN	ISUP	0	No GAP	DN
NPDB Failure	DN	MF/DP	N/A	N/A	DN
N/A = Not applicable DP = Dial Pulsing					

<REQ-OSS-02700>

An OSS shall support a per outgoing trunk group option for ISUP trunks for signaling the ported number instead of the LRN as the called party. The OSS shall choose the outgoing route using the LRN when it is available. If the selected trunk group is designated as "signal ported number", the Called Party Number parameter shall be populated with the dialed number (not the LRN) after proper digit editing, the FCI shall be set to "number not translated", and no Number Ported GAP shall be included.

This requirement allows the service provider to send the dialed number and must be coordinated with the connected switch. Without such coordination, this flexibility increases the chances of trunk looping since the dialed number could route back to the sending switch.

<End of REQ-OSS-02700>

<REQ-OSS-02800>

For ISUP calls, when a NP query is not made at the OSS, the Translated Called Number Indicator (bit M) in the FCI parameter in the IAM shall be set to 0 = "Number not translated".

Bit M of the Forward Call Indicators parameter should always be set to "0" for non-NP capable switches.

<End of REQ-OSS-02800>

<REQ-OSS-02900>

The OSS shall send the Initial Address Message with the following encodings when

♦ **The call is routed after a NP response which returned another switch's LRN**

♦ **An SS7 trunk group is selected**

♦ **The signal ported number trunk option is not specified, i.e., the LRN is to be signaled;**

    1. **The Called Party Number Parameter shall be populated with the LRN address and coded following existing ISUP requirements.**

    2. **The GAP shall be coded as follows:**

        ♦ **Type of Address: Ported Number (11000000).**

        ♦ **Odd/Even: Set for even number of address digits (0). For NP, ten address digits are included so this field has an even number of address digits.**

        ♦ **Nature of Address: National Number (0000011).**

        ♦ **Numbering Plan: ISDN (telephony) Numbering Plan (001).**

        ♦ **Presentation Restriction indicator: Not Applicable (00)**

        ♦ **Address Signals: The ten-digit ported number (dialed, derived, or signaled) shall be stored in the Address Signals in the GAP. The switch shall convert the dialed number into a 10-digit number for inclusion in the GAP by prepending the NPA or expanding the extension. The prefix (i.e., 1+) or access code (i.e., 101XXXX, 011) shall not be included in the GAP.**

    The NPA is derived based on the dialing plan for the originating subscriber (i.e., currently when a subscriber dials a 7 digit number, the NPA must be assumed) except for the cases where the NPA must be derived by taking into account protected NXX codes. (This occurs where 7 digit dialing can cross NPA boundaries. Since NXXs are not duplicated in the other NPA, 7 digit dialing is not ambiguous.)

    3. **The "Translated Called Number Indicator" in the Forward Call Indicators of the IAM shall be coded as 1 = "Number Translated."**

The remaining signaling parameters (CgPN, CHG, etc.) in the IAM will follow the existing ISUP requirements.

<End of REQ-OSS-02900>

<REQ-OSS-03000>

When the call is routed out of the OSS after a TCAP Response message with a Dialed Number is received and processed, if the trunk selected uses ISUP, the following modifications to the Initial Address Message shall be made:

    1. **The Called Party Number Parameter shall be coded using existing switch procedures with the dialed number.**

    2. **The IAM shall not include the "ported dialed number" GAP.**

    3. **The "Translated Called Number Indicator" in the Forward Call Indicators of the IAM shall be coded as "Number Translated."**

Even though the "Signal Ported Number" is not specified for this trunk group, there is no LRN to be signaled. See REQ-OSS-02700 in Clause 5.2.2 for requirements on this option.

The remaining signaling parameters (CgPN, CHG, etc.) in the IAM will follow the existing ISUP requirements.

<End of REQ-OSS-03000>

<REQ-OSS-03100>

When the call is routed out of the OSS after NP processing with an LRN and the trunk selected uses inband signaling (i.e., MF), the called party number sent inband to the other switch shall be the dialed number (after normal digit prefix or digit deletion or both) and not the LRN. Note that the call was routed based on the LRN from the NP response and not based on the dialed number.

The remaining signaling procedures are not modified. This requirement allows the service provider the ability to continue the call's progress for interworking situations.

<End of REQ-OSS-03100>

<REQ-OSS-03200>

When the call is routed out of the OSS after a TCAP Response message with a Dialed Number is received and processed, if the trunk selected uses inband signaling, the called party signaled shall be the dialed number.

The remaining signaling procedures are not modified. This requirement allows the service provider the ability to continue the call's progress for interworking situations.

<End of REQ-OSS-03200>

5.2.2.4 Multiple applications

It is possible that more than one application (subsystem) may send NP queries from a single point code.

5.2.3   Other Intra-Network Interfaces

The OSS will detect errors and send the NPDB error messages as defined in GR-1298-CORE (Clause 7, Fault Handling), except as specified in 5.1.3 of this document.

5.3   Hardware Interfaces Requirements

No unique hardware elements are needed.

5.4   Interactions and Transparencies with Other Features

5.4.1   Advanced Service Platform (T1.667) Services Interactions

It is assumed that the NPDB-based service operation will not send any messages other than those describes in Clause 5.1.2, "Response Processing (Normal)", to the OSS. If any other messages are received as part of a valid response, they may be ignored by the OSS, and the OSS should use the expected parts of the expected message (e.g. CalledPartyID). If unexpected messages are received on their own, they may be ignored. With one exception (noted in the next paragraph), the OSS does not need to send the NPDB any messages as a result of the invalid message

With respect to the T1.667 sendToResource operation (including sendToResource external), it is assumed that the NPDB-based service operation will not initiate a sendToResource session to collect

additional information from the user or play announcements to the user. If a sendToResource message is received in a Conversation package, the OSS will respond with an Application_Error message in order to close the transaction.

See Clause 5.1.3, "Response Processing (Abnormal)", for more information.

5.5 Operations, Administration and Provisioning Requirements

5.5.1 Service Changes

Office data will define when to launch NP queries in the OSS (e.g., when an NPA-NXX is portable).

5.5.1.1 OSS Provisioning Modifications - NP

In order to prevent the proliferation of multiple NPA-NXX tables for different purposes, thus becoming a burden on provisioning, the following requirement defines a single set of NPA-NXXs to be used by all functions within the OSS to determine whether a number is portable.

<REQ-OSS-03300>

The OSS provisioning shall support defining a set of portable NPA-NXXs. The same set of NPA-NXXs will be used as input criteria for determining if a query is needed for establishing BLV routes, Calling Number AMA information, Called Number routing or Billed Number AMA information e.g. different portable NPA-NXXs will not be used for query criteria for BLV route determination versus Called Number routing etc.

<End of REQ-OSS-03300>

The following requirement supports suppression of NP queries whose sole purpose is to obtain an LRN for service provider information in AMA records.

<REQ-OSS-03400>

The OSS shall provide an option to prohibit LRN queries intended exclusively for AMA purposes.

This requirement is invoked on a switch-wide basis, and does not consult the set of NPA-NXXs defined in the <REQ-OSS-03300>. On a combined OSS and end office switch, this requirement applies only to OSS functions.

<End of REQ-OSS-03400>

<REQ-OSS-03500>

The OSS shall provide office data to allow default routing for a call when a NP query is sent to determine routing information for the Called Number and the NPDB does not respond or the switch cannot interpret the response.

<End of REQ-OSS-03500>

<REQ-OSS-03600>

The OSS shall provide office data to identify the translation type to use for SCCP routing of NP queries.

<End of REQ-OSS-03600>

<REQ-OSS-03700>

The OSS shall allow a "Signal Ported Number" option for signaling the Dialed Number in the Called Party Number instead of the LRN. The option can be specified on an SS7 outgoing trunk

group basis and the default value is "Signal Ported Number" not specified (in other words, to send the "ported number" GAP and the LRN).

<End of REQ-OSS-03700>

<CR-OSS-03800>

The OSS shall provide a per-office option that permits LNP Module 719 to be recorded for all calls served by the switching office requiring the recording of an LNP module, instead of LNP Module 720.

<End of CR-OSS-03800>

<REQ-OSS-03900>

The NP capable OSS shall be able to provision on a per incoming trunk group basis one of the following options related to the AMA recording of the Calling Number:

1. **Do not record calling number LRN -- Default Indication (i.e. do not query and do not append the NP AMA module for Calling Number).**
2. **Record calling number LRN from trunk group data -- LRN of the end office switch connected at the other end of an incoming trunk group (i.e. do not query, but do append the NP AMA module for Calling Number populated with the LRN).**
3. **Record calling number LRN from NP query response -- Query Indication (i.e. query and append the NP AMA module for Calling Number populated with information found in the response message).**

<End of REQ-OSS-03900>

<CR-OSS-04000>

On an office wide basis, the OSS shall provide office data to allow specification to do exactly one of the following:

1. **Generate an AMA record with appropriate NP modules for all calls for which answer supervision is not received, an NP query is performed, and an AMA record would have been generated had the call completed.**
2. **Generate an AMA record with appropriate NP modules for all calls for which answer supervision is not received, an NP query is performed, an LRN is received from the NPDB, and an AMA record would have been generated had the call completed.**
3. **Not generate busy or unanswered call records based on NP criteria.**

As a default, the OSS shall not generate busy or unanswered call records based on NP criteria.

This requirement includes, but is not limited to, calls which are abandoned before routing, calls which receive busy, and calls which are not answered.

<End of CR-OSS-04000>

<CR-OSS-04050>

The OSS shall allow the service provider to designate the set of IXCs for which NP queries are performed. This specification will be on a per route basis for each of the designated carriers. As a default, a carrier is not designated for NP queries to be performed.

This is used in conjunction with REQ-OSS-00200. If the capability to designate IXCs for which NP queries are to be performed is not supported, the switch (as a default) does not perform the NP query when the call is to be routed to an IXC.

<End of CR-OSS-04050>

5.5.2 Measurements

<REQ-OSS-04100>

The OSS shall provide measurements for the following:

♦ **The number of NP queries initiated, and**

♦ **Either the number of successful NP queries initiated or the number of NP queries that failed.**

<End of REQ-OSS-04100>

5.5.3 Network Management

<REQ-OSS-04200>

The OSS shall support code gapping on six-digit NPA-NXXs in the Called Party ID field in query messages to NPDB.

<End of REQ-OSS-04200>

5.5.4 AMA Recording

It is a goal that the OSS identify the Service Provider for each number in a portable NPA-NXX in an operator services call:

♦ Calling number

♦ Called number

♦ Billing number

Initially LRNs will be used to identify a facilities-based Service Provider. A NP AMA module (i.e. either BAF Module 719 or BAF Module 720) will be appended for each number above if the number is in a portable NPA-NXX. A query will be launched as required to determine the LRN of the facilities-based Service Provider responsible for the number.

There are plans to enhance the service provider information contained in the Line Information Data Base (LIDB) through Telcordia Technologies proceedings. When these enhancements become available, it may be possible to eliminate NP queries done exclusively to obtain an LRN for AMA purposes for Calling/Called/Billed numbers that have queried at a LIDB (including ABS and OLNS queries). This document contains a requirement to selectively turn off these LRN queries.

NP AMA modules will be appended to existing Operator Services Structure Codes (e.g. 0751, 0752, 1200 and 1201). Existing call codes used for operator services will continue to be used.

In general, an AMA record must be created according to standard criteria - launching a NP query is not sufficient reason to create an AMA record except as described in REQ-OSS-04000.

<REQ-OSS-04300>

Number portability information shall be provided by a switch for AMA recording for Number Portability in an appended BAF Module 720, or if the option defined in <CR-OSS-03800> is on, an appended BAF Module 719. Number portability information consists of: the LRN of the switch serving the ported DN or an indication that the number is not ported; the party identifier (e.g. originating, terminating or billing) for which the information applies; and the source of the number portability information (NPDB, SS7 ISUP signaling, or switch data). The source of the number

portability information will vary depending upon the type of switch recording the information and upon the party for which the information is recorded (e.g. originating or terminating DN). When a BAF Module is appended to an AMA record, it shall be populated as specified in this document using the formatting specified in Telcordia Technologies GR-1100-CORE.

<End of REQ-OSS-04300>

<REQ-OSS-04400>

The appropriate NP Module shall be appended to an AMA record, if any is made for reasons other than recording the NP query, for the call involving a portable DN as described in subsequent requirements. If no AMA record is made for the call, then the NP Module data shall not be recorded.

<End of REQ-OSS-04400>

5.5.4.1 Calling Number

A "Calling Number" NP AMA module has the Party Identifier populated as "Originating Party".

If an AMA record is created for a call, a "Calling Number" NP AMA module will be appended if the call arrives on an incoming trunk that has an LRN in office data for the trunk group against it. In this case, no NP query will be required.

A "Calling Number" NP AMA module will also be appended if the trunk group LRN office data is not specified, but the Calling Number NPA-NXX is designated as portable, and a NP query is launched.

In the future, incoming ISUP signaling of the LRN and/or an OLNS query that returns enhanced service provider information could replace the NP query.

It is expected that for the majority of cases a query will not be required to determine the LRN of the Calling Number. The LRN can be determined from the identity of the incoming trunk group. An exception is the case where a separate tandem aggregates traffic to the OSS. In this case, a query on the Calling Number may be required to determine its LRN.

In the case where the NP-capable OSS hosts non-NP participating switches (i.e. switches that will not act as recipients to ported numbers and that do not have an assigned LRN), an indication on the incoming trunk group can be set to indicate that a query for the calling party number is not required and that a NP AMA module does not need to be appended. This will be the default setting for incoming trunk groups to the OSS.

<REQ-OSS-04500>

Based on incoming trunk group office data, the NP capable OSS shall provide one of the following options related to the AMA recording of the Calling Number:

a) **Default: This is an indication that a query is not required to determine AMA information for the Calling Number and that a NP AMA module does not need to be appended for the Calling Number.**
   This default would normally apply if the end office is non-NP capable.

b) **LRN Indication: The end office switch connected at the other end of this incoming trunk group shall have an LRN assigned to it. It is a dedicated trunk group to one facility based service provider that hosts ported numbers. The corresponding LRN will be specified in OSS incoming trunk group data. This indication means that a query is not required and the OSS will store an LRN that corresponds to the service provider originating the call for inclusion in the NP AMA module.**

c) **Query Indication: This is an indication that a query will be launched if the number is portable to determine the AMA information of the Calling Number. The NP capable OSS will populate the NP AMA Module for the Calling Number based on the response received from the NPDB.**

(see ATIS-1000002, Clause 5.5.4.2 for NP AMA population rules).

<End of REQ-OSS-04500>

The following two requirements describe the query and response population rules for the Calling Number. Please refer to Clause 5.2.2.1, "TCAP Formats" for further details on the messages.

<REQ-OSS-04600>

The OSS shall populate the CalledPartyID field of the analyzedInformation message with the Calling Number when a query is needed to determine the AMA information of the Calling Number.

<End of REQ-OSS-04600>

<REQ-OSS-04700>

The NPDB will respond with an analyzeRoute message if the query launched was analyzedInformation.

The OSS shall use the AMA information found in the CalledPartyID parameter in the analyzeRoute response message to populate the NP AMA module for the Calling Number .

(See ATIS-1000002, Clause 5.5.4.2 for NP AMA population rules)

<End of REQ-OSS-04700>

5.5.4.2 Called Number

A "Called Number" NP AMA module has the Party Identifier populated as "Terminating Party".

If an AMA record is created for a call, a "Called Number" NP AMA module will be appended if the Called Number NPA-NXX is designated as portable, and a NP query is launched. If the OSS is NP capable, it will launch a query for routing purposes. If an LRN is obtained, it will be used to populate the LRN information in the NP AMA record. Please refer to Clause 5.2.2.1 for information on the query to the NPDB for call completion.

<REQ-OSS-04800>

The NP Module containing terminating party information shall be appended to the AMA record whenever the NPA-NXX of the called party number is designated in OSS data as portable, resulting in a query to the NPDB. The NP Module shall be populated as follows depending on the contents of the response message from the NPDB:

When an LRN is received in the response message from the NPDB, it shall be included in the LRN field of the NP Module. The Party Identifier (BAF Table 730) shall be set to indicate the "terminating party" '002', and the Supporting Information (BAF Table 734) shall be set to indicate a LRN Source of "NPDB" '1' with a Query Status indicator of "Successful Query" '01'. Both the Service Provider Identity and Location field shall be populated with "Hexadecimal F" in accordance with BAF fill procedures.

When the switch receives a response message from the NPDB database containing the original Dialed Number, the LRN field of the NP Module shall be filled with "Hexadecimal F". The Party Identifier (BAF Table 730) should be set to indicate the "terminating party" '002', and the Supporting Information (BAF Table 734) shall be set to indicate a LRN Source of "NPDB" '1' with a

Query Status indicator of "Successful Query" '01'. Both the Service Provider Identity and Location field shall be populated with "Hexadecimal F" in accordance with BAF fill procedures.

If the NP Module does not contain a valid LRN, then downstream billing system processing may have to do additional work to identify the service provider of a terminating DN.

<End of REQ-OSS-04800>

<REQ-OSS-04900>

On a long duration call involving a portable DN(s), a NP Module(s) that is appended to the first call record shall also be appended to any subsequent long duration "continuation" records made for that particular call.

<End of REQ-OSS-04900>

5.5.4.3 Billed Number

There are three categories of alternate billed numbers that require consideration for operator services in a number portability environment: Collect, Third Number and Line based Calling Card. Note that only in cases of Bill to a Third Number or Line based Calling card is there a need to append a third NP module.

The Collect Number's LRN will be obtained from the LRN needed to route the call so a separate billed number query may not be required. Also if according to the LIDB validation a Called Party does not accept collect calls, a subsequent routing query may not be required and the NP AMA module need not be appended. In cases where the Called Number has a portable NPA-NXX, a NP query will be performed by the OSS to determine how to route the Called Number. If the LIDB response allows the collect call to proceed and a NP query is generated, the OSS will generate a NP AMA module for the Called Party and append it to the OSS AMA record generated for the call in accordance with the requirements of Clause 5.5.4.2 of ATIS-1000002, "Number Portability Switching Systems".

Often for "bill-to-third number" calls a verification call must be placed by the OSS or operator to verify acceptance of the charges. In these cases when the Third Number has a portable NPA-NXX, the response from the NPDB will be used by the OSS both for routing of the verification call and for AMA recording. The OSS will generate a NP AMA module for the third party (i.e. billing party) and append it to the OSS AMA record, if any, generated for the call in accordance with the requirements of Clause 5.5.4.2 of ATIS-1000002, "Number Portability Switching Systems". The "billing party" NP module will be in addition to any NP AMA modules generated for either the originating or terminating party of the call.

For both Third Numbers NOT requiring verification and Line-based Calling Card Numbers that have an NPA-NXX designated as portable, the OSS will provide an option to send a NP query to obtain an indication of the service provider serving that number for inclusion in the AMA record.

Initially, it is expected that the OSS will need to launch a query to the NPDB to determine the LRN, which will serve as service provider information. With anticipated upgrades to the LIDB system (providing enhanced service provider information) and to the OSS (receiving service provider information), this LRN query may not be necessary.

<REQ-OSS-05000>

If a NP-capable OSS handles a call involving a Third Number for which a third number verification call is required and if the third number NPA-NXX is designated as portable, it must send a NP query to determine routing for the third number and append a NP AMA module for the Billed

Number to any AMA record made for the call (see Clause 5.5.4.2 of ATIS-1000002, "Number Portability Switching Systems").

<End of REQ-OSS-05000>

<REQ-OSS-05100>

If a NP-capable OSS handles a call involving a Third Number not requiring third number verification or a Line based Calling Card, with the billed number's NPA-NXX designated as portable, and if the data option (see <REQ-OSS—03400>) indicates to send a NP query for billed numbers, the OSS must send a NP query and append a NP AMA module for the Billed Number to any AMA record made for the call.

<End of REQ-OSS-05100>

The following two requirements describe the query and response population rules for the Billed Number. Please refer to Clause 5.2.2.1, "TCAP Formats", for further details on the messages.

<REQ-OSS-05200>

The OSS shall populate the CalledPartyID field of the analyzedInformation message with the Billed Number when a query is needed to determine the AMA information of the Billed Number.

<End of REQ-OSS-05200>

<REQ-OSS-05300>

The NPDB will respond with an analyzeRoute message if the query launched was analyzedInformation.

The OSS shall use the CalledPartyID parameter in the analyzeRoute response message to populate the NP AMA module for the Billed Number.

(See Clause 5.5.4.2 of ATIS-1000002, for NP AMA population rules).

<End of REQ-OSS-05300>

5.5.4.4 Party Identifier Population

For a call requiring one or more NP AMA modules, the following table shows how the Party Identifier table is populated in each module for different class of charges. Note: BAF Table 730 is the Party Identifier Table as defined in Telcordia Technologies GR-1100-CORE.

Class of Charge	1st Module BAF Table 730	2nd Module BAF Table 730	3rd Module BAF Table 730
Paid	001 for Calling	002 for Called	
Hotel Room Number	001 for Calling	002 for Called	
Collect	001 for Calling	002 for Called	
Third Number	001 for Calling	002 for Called	003 for Third Number
Card	001 for Calling	002 for Called	003 for Card Number
Automatic Collect	001 for Calling	002 for Called	
No Charge	001 for Calling	002 for Called	

5.5.4.5 AMA Access Records

In the event that an AMA access record is created (e.g. call arriving by 0- dialing and then being transferred to another operator system), a NP AMA module will be added if the LRN of the originating switch is known at the time the access record is made. If the LRN is not known when the record is made, the NP module should not be included; a NP query is not required solely for access recording.

5.5.4.6 Operator Services CAMA

An Operator Services Switching System may provide the CAMA function for a network.

<REQ-OSS-05400>

When a NP query is made at a CAMA operator switch, if the switch records an originating AMA Structure Code for the call, the NP Module containing the NPDB- supplied number portability information for the terminating DN shall be appended to the AMA record.

<End of REQ-OSS-05400>

<REQ-OSS-05500>

For a given call, a CAMA operator switch shall be capable of appending up to two NP Modules to an originating AMA Structure Code; one NP Module for an originating DN, another for a terminating ported DN. The number portability information from the originating DN may be obtained from SS7 ISUP signaling (i.e. JIP), from data provisioned on the incoming CAMA trunk group (i.e. per-trunk group "LRN"), or from a response message from an NPDB database. The number portability information for a ported terminating DN will only be available when a NP query is performed at the CAMA operator switch.

<End of REQ-OSS-05500>

<CR-OSS-05600>

When number portability information for an originating party can not be obtained from either incoming SS7 ISUP signaling or from switch data, then the CAMA operator switch shall be capable of querying the NPDB database to obtain this information to be recorded in the NP AMA module.

If this optional capability to query for the number portability information of a ported originating DN is not available on the CAMA operator switch, then the CAMA operator switch owner will need to employ "off-line" means to determine the correct service provider of a ported DN.

<End of CR-OSS-05600>

5.5.4.7 NP AMA Module Code

A service provider may choose to use either BAF Module 719 or BAF Module 720 to record number portability information.

<REQ-OSS-05700>

If the option described in <CR-OSS-03800> to use BAF Module 719 to record number portability information is active, procedures in this document pertaining to population rules for Party Identifier (Table 730), Location Routing Number (Table 731) and Supporting Information (Table 734) shall be followed. In addition, when BAF Module 719 is used, the procedures in this document pertaining to population of Service Provider Identity (Table 732) and Location (Table 733) do not apply. BAF Module 719 shall be formatted as specified in Telcordia Technologies GR-1100-CORE (Division 5, BAF Modules).

<End of REQ-OSS-05700>

5.5.4.8 Rules for Busy and Unanswered Call Recording

<REQ-OSS-05800>

If the office data controls for NP busy or unanswered call recording described in <CR-OSS-04000> are active, the switch shall generate an AMA record for any call for which answer supervision was not received that meets the criteria for the option chosen. The call record generated shall use the same BAF Call Type Code, BAF Structure Code, and appended NP module(s) that would have been generated had the call completed.

<End of REQ-OSS-05800>

<REQ-OSS-05900>

When the switch can determine and record a unique indication of unanswered, busy, or other call conditions, the switch shall continue to do so when an AMA record is generated as described in <REQ-OSS-05800>. Otherwise, the switch shall record a marking of "unanswered".

Some record structures do not record a unique value for busy condition; in such cases the switch shall record an unanswered value in AMA records made for busy condition (e.g. BAF Table 9 "Called Party Off-hook Indicator" = Called Party Off-hook Not Detected (i.e. unanswered) in BAF Structure Codes 0751, 0752, or 12XX, where XX depends on billing type).

<End of REQ-OSS-05900>

5.6   Maintenance Requirements

No new maintenance requirements have been identified.

5.7   Initialization and Recovery Requirements

No new requirements have been identified.

5.8   Capacity, Performance and Reliability Requirements

No new requirements have been identified.