NORTH AMERICAN NUMBERING COUNCIL

ARCHITECTURE & ADMINISTRATIVE PLAN FOR LOCAL NUMBER PORTABILITY

NANC - LNP Architecture Task Force

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NORTH AMERICAN NUMBERING COUNCIL
LNP ARCHITECTURE & ADMINISTRATIVE PLAN

1. LOCAL NUMBER PORTABILITY OVERVIEW

On June 27, 1996, the FCC ordered the phased implementation of Local Number Portability (LNP). A subsequent First Memorandum Opinion And Order On Reconsideration was adopted on March 6, 1997 and released on March 11, 1997.

LNP is defined in the Telecommunications Act of 1996 as "the ability of users of telecommunications services to retain, at the same location, existing telecommunications numbers without impairment of quality, reliability, or convenience when switching from one telecommunications carrier to another." The primary elements of the order are as follows:

- All LECs are required to begin the implementation of a long term LNP solution in the 100 largest Metropolitan Statistical Areas (MSAs). Implementation of a LNP trial will begin in the Chicago, Illinois MSA, with the implementation in remaining MSAs beginning October 1, 1997. The FCC has mandated that implementation in the top 100 MSAs will be complete by December 31, 1998.
- After December 31, 1998, each LEC must make long term number portability available in smaller MSAs within six months after a bona fide request by another telecommunications carrier.
- All cellular, broadband PCS, and covered SMR (Specialized Mobile Radio) providers are required to have the capability of delivering calls to ported numbers anywhere in the country by December 31, 1998, and to offer number portability including support for roaming, throughout their networks by June 30, 1999.

2. SERVICE PROVIDER BUSINESS DOMAIN IMPACT

LNP touches every aspect of a Service Provider's business domain. Changes in business processes and their support systems are required to implement LNP. Also, major changes in call processing are required in the network. Figure 1 is a high level illustrative view of the business and network systems that are impacted.

This specification was developed primarily from a wireline number portability perspective. Unique wireless number portability requirements have not yet been considered in the development of this document. Modifications to this document may be required to support wireless number portability.

3. IXC BUSINESS DOMAIN IMPACT

The Interexchange Carriers (IXCs) will have many of the same change impacts that the Service Provider business entities have. Impacts to call processing, their business processes and their support systems are required to implement LNP.

4. HIGH LEVEL LNP PROCESS VIEW (*for Illustration)*

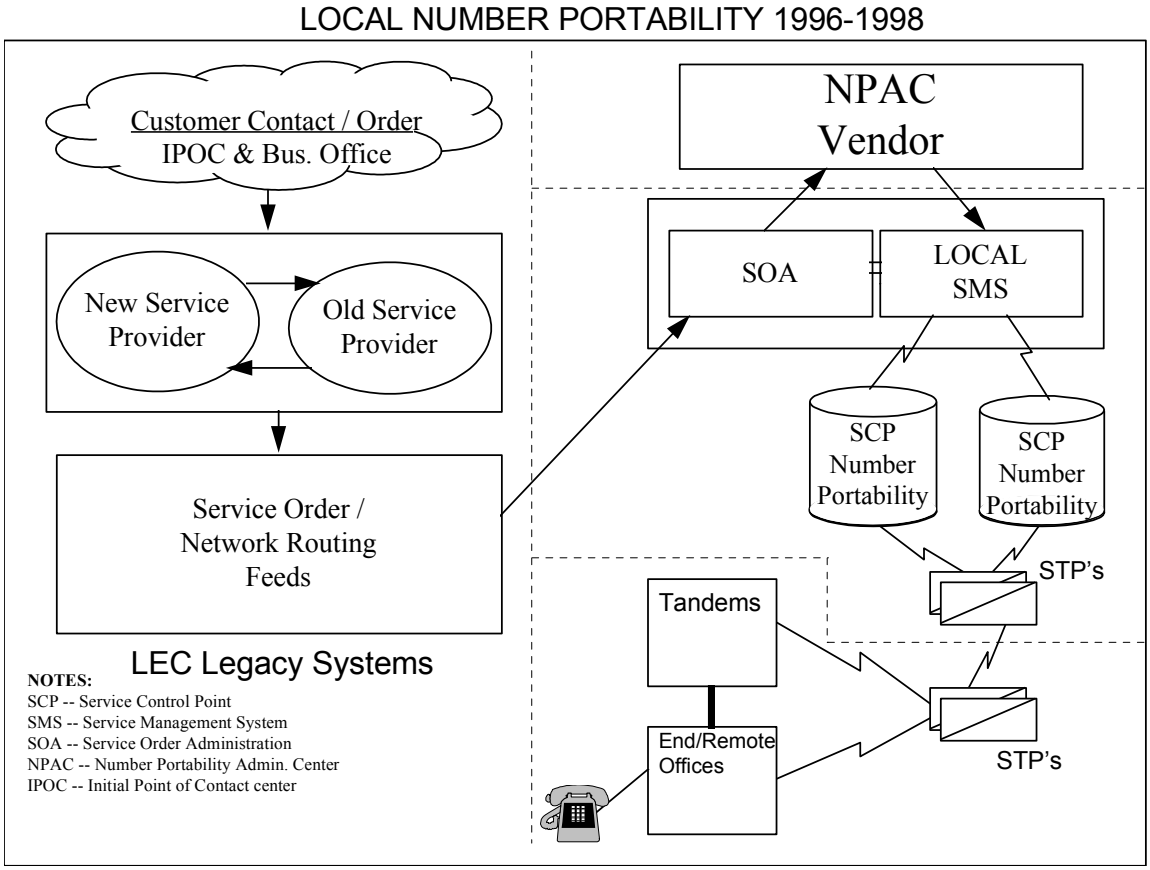


Figure 1

5. LNP HISTORY

The Illinois Commerce Commission (ICC) took the lead in July, 1995 as the first state to address LNP. Four different LNP architectures were being reviewed by the ICC LNP workshop. The workshop selected AT&T's LRN solution for LNP during September 1995.

In the main ICC LNP workshop on November 16, 1995, all switch vendors present indicated that they could provide LNP software capabilities based upon the Illinois specifications by 2Q97. The switch vendors present were AT&T Network Systems (now Lucent), Nortel, Siemens, and Ericsson. The issue of vendors being able to provide LNP was resolved and the planned date for LNP implementation in Chicago was established for 2Q97. This date was changed by the FCC Order which called for LNP testing during 3Q97 leading to full implementation in 4Q97.

6. LNP PERFORMANCE CRITERIA

The FCC adopted in its original order the following minimum performance criteria. Any long-term number portability method, including call processing scenarios or triggering, must:

(1) support existing networking services, features, and capabilities;
(2) efficiently use numbering resources;
(3) not require end users to change their telecommunications numbers;
(4) Deleted[1]
(5) not result in unreasonable degradation in service quality or network reliability when implemented;
(6) not result in any degradation of service quality or network reliability when customers switch carriers;
(7) not result in a carrier having a proprietary interest;
(8) be able to accommodate location and service portability in the future; and
(9) have no significant adverse impact outside the areas where number portability is deployed.

7. LNP ASSUMPTIONS (Wireline Only)

7.1 Service Provider Definition

In the context of LNP, a Service Provider is a facility (switched) based[2] local telecommunications provider certified by the appropriate regulatory body or bodies.

7.2 LRN -- Location Routing Number

LRNs are 10 digit numbers that are assigned to the network switching elements (Central Office - Host and Remotes as required) for routing of calls in the network. The first six digits of the LRN will be one of the assigned NPA NXX of the switching element. The purpose and functionality of the last four digits of the LRN have not yet been defined, but are passed across the network to the terminating switch.

7.3 LNP Portability Boundary

If location portability is ordered by a state commission in the context of Phase I implementation of LRN, location portability is technically limited to rate center/rate district boundaries of the incumbent LEC due to rating/routing concerns. Additional boundary limitations, such as the wire center boundaries of the incumbent LEC may be required due to E911 or NPA serving restrictions and/or regulatory decisions.

[1] Item (4) was deleted in the First memorandum Opinion And Order On Reconsideration adopted March 6, 1997 and released on March 11, 1997.
[2]The term facility based is used in this document to describe carriers who own or lease switching equipment.

7.4 NPAC LNP Databases Content

The NPAC LNP database contains only ported numbers and the associated routing and service provider information.

7.5 Line Information Data Base (LIDB) And Custom Local Access Signaling Services (CLASS)

The new service provider has the responsibility to populate the appropriate LIDB *and CLASS* information associated with the ported telephone number.

7.6 Line Based Calling Cards

When a telephone number is ported the nonproprietary line based calling card number will be deactivated by the old service provider and may be activated by the new service provider if the new service provider offers a line based calling card service. There are currently billing fraud and other technical concerns with nonproprietary line based credit cards which limit their provision to the new service provider. If the new service provider does not offer a nonproprietary line based calling card, the customer is not precluded from obtaining a proprietary line based calling card from another service provider.

7.7 Porting of Reserved & Unassigned Numbers[3]

7.7.1 Reserved Numbers

Telephone numbers that are reserved for a customer under a legally enforceable written agreement should be ported when the customer changes service providers.

1) Reserved numbers that have been ported must be treated as disconnected telephone numbers when the customer is disconnected or when the service is moved to another service provider and the reserved numbers are not ported to subsequent service providers;
2) Reserved numbers that are ported may not be used by another customer;
3) Implementation of the capability to port reserved numbers may require modifications to operation support systems and may not be available initially.

7.7.2 Unassigned number/Unreserved

Service Providers will not port unassigned numbers unless and until there is an explicit authorization for such porting from a regulator with appropriate jurisdiction.

[3] It will be the responsibility of the service provider receiving the ported reserved telephone numbers to provision their switches so that appropriate treatment by the recipient switch is provided which suppresses cause code 26 release messages for the ported reserved telephone numbers only.

7.8 N-1 Call Routing

Each designated N-1 carrier is responsible for ensuring queries are performed on an N-1 basis where "N" is the entity terminating the call to the end user, or a network provider contracted by the entity to provide tandem access. Examples of N-1 routing are found in **Attachment A**.

7.9 Disconnected Telephone Numbers (Snap-back)

When a ported number is disconnected, that telephone line number will be released (Snap-back), after appropriate aging, back to the original Service Provider assigned the NXX in the LERG.

7.10 Default Routing Overload and Failures

Unless specified in business arrangements, carriers may block default routed calls incoming to their network in order to protect against overload, congestion, or failure propagation that are caused by the defaulted calls.

7.11 Number Pooling

The FCC Order on LNP provided no explicit guidance on number pooling. Various industry activities are underway addressing this issue and Number Pooling is outside the scope of this Task Force.

7.12 NPAC to LSMS Architectural Restrictions

All networks will rely on the NPAC database as the ultimate source of porting data. Synchronization of networks to a single set of routing data is paramount to network operations. Therefore appropriate restrictions must be placed upon how these network elements may interconnect from an architectural perspective.

Specifically, the NPAC shall download relevant porting data required by participating carriers or their agents for the specific subset of network nodes. Consequently, the NPAC system shall be the source of all porting data for all carriers or agents of those carriers, thereby being the sole originator of all downloads.

As a result of these restrictions, the LSMS must operate as the intermediate database management system which receives downloads from the NPAC, and then further downloads directly to the appropriate SCP functionality in its associated network(s).

Through this architecture, it is intended that if a systems provider is performing a service management functionality, then this systems provider is responsible for contributing its appropriate share of the economic support (as determined via regulatory actions on cost allocation) to the NPAC. The local SMS architecture must not allow service providers to avoid their allocation of the shared NPAC costs. Such architecture does not preclude the implementation of the LSMS functionality in a distributed manner in an individual service provider's network.

7.13 High Volume Call In Numbers (Choke Network)(Further study req.)

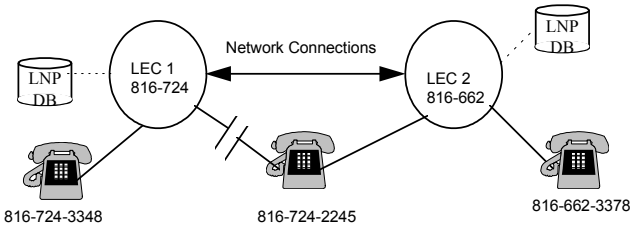
An area of concern regarding LNP is High Volume Call In (HVCI) networks. When a carrier determines that a customer regularly generates large volumes of terminating traffic, the customer may be moved over to an HVCI network. Examples of these types of customers could be radio stations that regularly hold contests that require many participants to call in a short period of time. An HVCI network allows all such customers to be assigned numbers in an NPA-NXX (e.g., 213-520) dedicated for HVCI. This HVCI number is the number that is announced for any high call in event. Switches in the area can be designed to segregate traffic for HVCI numbers and route it via trunk groups that are dedicated to the network and do not overflow to other trunk groups. The dedicated trunks are engineered to handle limited traffic and, in this way traffic is throttled and cannot congest the network. Such networks has proven to be effective in limiting the effects of large call in events.

However, with LNP before route selection takes place a database query is performed on calls to portable NPA-NXXs. If HVCI numbers are portable, they can generate large volumes of queries that can congest the signaling links and SCPs. Also if the HVCI number is ported and an LRN is returned in the database response, the call will not be routed via HVCI-dedicated trunks. This congestion can in turn effect other POTS type services which compromises the design of HVCI networks. One way to avoid this is to not perform queries on NPA-NXXs dedicated for HVCI networks. Further study is required in order to determine the proper network arrangements.

8. LNP Call Scenarios - Local to Local View

Example LNP call scenarios on Service Provider Portability are shown in Figure 2. See additional example scenarios in Attachment A for N-1 Call Routing.

Local Number Portability (LNP)
Service Provider Portability



All Scenarios -- 816-724-2245 changes service providers from LEC 1 to LEC2.
NXX's 724 and 662 are considered portable NXX's.

SCENARIO 1:
1. 724-3348 calls 724-2245
2. 724-2245 cannot be found on LEC 1's switch so, a query is launched to the LEC 1's LNP Database to determine the LRN for 724-2245. The LRN returned is 816-662-XXXX.
3. The call is routed to LRN 816-662-XXXX, LEC 2's switch.
4. LEC 2 terminates the call to 724-2245.

SCENARIO 2:
1. 662-3378 calls 724-2245
2. The number is found on the LEC 2 switch and the call is terminated. No query is required.

Scenario 3:
1. 724-3348 calls 662-3378.
2. The 662 NXX is identified as a portable NXX and a query is launched to LEC 1's LNP Database to determine the LRN for 662-3378. Because the number is not ported the DN (Dialed Number) is returned and the call is routed via normal network routing.
3. The call terminates to LEC 2's switch.
4. LEC 2's switch terminates the call to 662-3378.

lnpexinf.ppt

Figure 2

9. NPAC Regions

The following number of Number Portability Administration Center (NPAC) regions, their geographic coverage areas, and the NPAC assignment of Canada and the U.S. Caribbean are shown in Figure 3 and Chart 1:

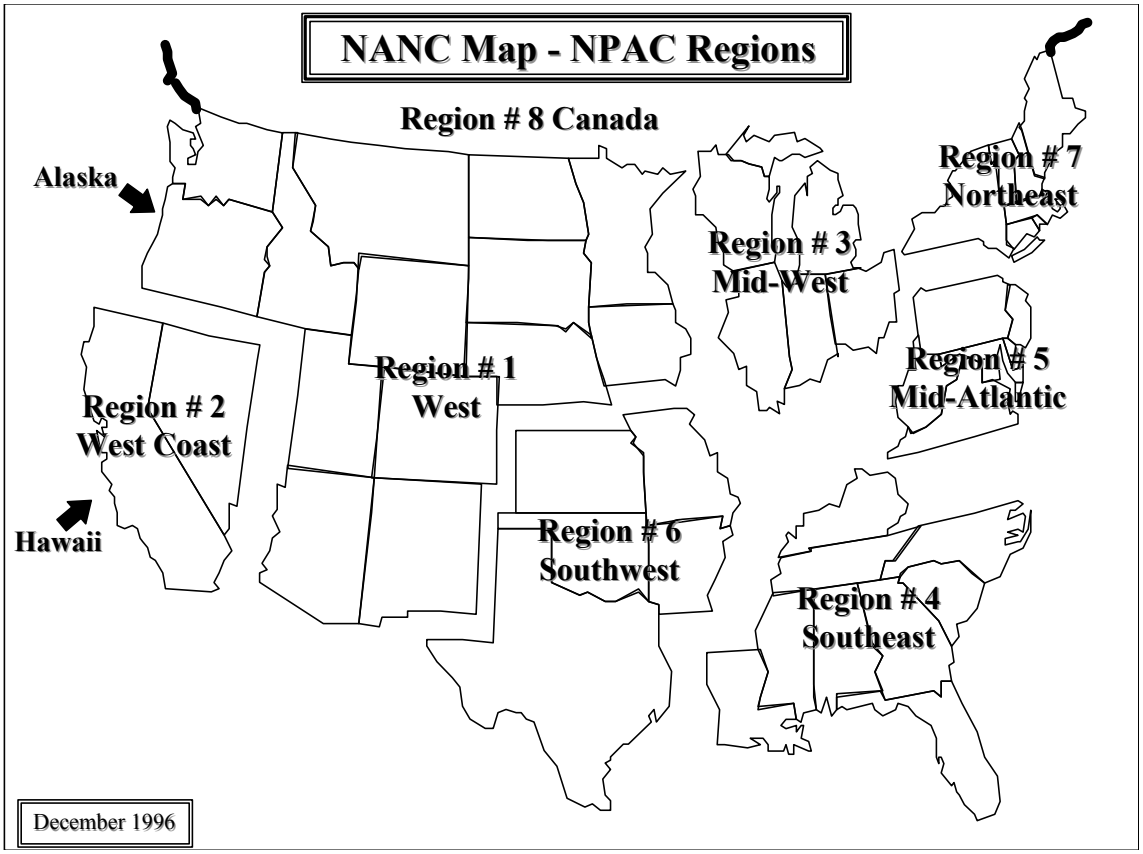


Figure 3

Factors considered in developing the NPAC regions were:

⇒ Economic efficiency and administrative simplicity -- On these factors, having multi-state NPACs is clearly superior to either an NPAC for each state or a single NPAC for the entire country.

⇒ Existing LLCs -- Each proposed region has an LLC which has chosen an NPAC vendor. The work at the state level should be built upon rather than re-invented.

⇒ Uniform sizes -- The number of access lines in the proposed regions are roughly comparable.

⇒ Existing regulatory structures -- State PUCs have formed regional associations that correspond to the proposed NPAC regions. These associations were formed to allow the PUCs to deal jointly with a Regional Bell Operating Company.

⇒ National responsibilities -- The NANC Architecture Task Force recognizes that Canada intends to create its own NPAC to serve all of Canada.

GEOGRAPHIC COVERAGE CHART

RECOMMENDED NPAC REGIONS	SPECIFIC STATES per NPAC REGION
Region # 1: WESTERN	Washington, Oregon, Montana, Wyoming, North Dakota, South Dakota, Minnesota, Iowa, Nebraska, Colorado, Utah, Arizona, New Mexico, Idaho, and Alaska
Region # 2: WEST COAST	California, Nevada, and Hawaii
Region # 3: MID-WEST	Illinois, Wisconsin, Indiana, Michigan, and Ohio
Region # 4: SOUTHEAST	Florida, Georgia, North Carolina, South Carolina, Tennessee, Kentucky, Alabama, Mississippi, and Louisiana
Region # 5: MID-ATLANTIC	New Jersey, Pennsylvania, Delaware, Maryland, West Virginia, Virginia, and Washington, D.C.
Region # 6: SOUTHWEST	Texas, Oklahoma, Kansas, Arkansas, and Missouri
Region # 7: NORTHEAST	Vermont, New Hampshire, Maine, New York, Connecticut, Rhode Island, and Massachusetts
Region # 8: CANADA	

Chart 1

1. The NANC Architecture Task Force recommends seven (7) NPACs to cover the 50 United States and the U.S. territories in the North American Numbering Plan Area (e.g. U.S. Virgin Islands and Puerto Rico). Refer to the Chart 1 for specifics.
2. The NANC Architecture Task Force recommends that the U.S. territories choose from one of the seven (7) U.S. NPACs.
3. The NANC Architecture Task Force recognizes that Canada intends to create its own NPAC to serve all of Canada.

10. NPA NXX Assignments - Ported Numbers

The NPA NXX XXXX's (Ten Digit Phone Numbers) for ported numbers are assigned to their respective NPAC regions. Uploads and downloads via the SOA and LSMS interfaces, respectively, are transmitted to and from their assigned NPAC platforms.

11. Virtual NPACs

Virtual NPACs are not precluded. If an NPAC vendor wins two or more regions, that vendor is not precluded from serving one or more of the regions on the same platform as long as the vendor meets all service requirements as specified in the contract or in End User Agreements.

11.1 NPAC SOA and LSMS Link(s)

Under the Virtual NPAC arrangement, Service Providers are not precluded from accessing the vendor's one NPAC platform for SOA and LSMS functionality via one or more physical links. Link capacity limitations such as reliability and performance requirements will determine the quantity of physical SOA and LSMS link(s).

The service provider is responsible for contributing its appropriate share of the economic support to the NPAC vendor for each region in which it operates.

11.2 Point of Presence (POP)

The NPAC vendor will provide the physical links (SOA/LSMS) from the NPAC platform to each respective POP (Physical Facility) as identified by each regional LLC. Each service provider or its agent that directly connects to the NPAC shall be required to provide SOA and/or LSMS connectivity to the POP.

12. NPAC CERTIFICATION PROCESS

12.1 TECHNICAL REQUIREMENTS

12.1.1 IIS

The NPAC vendor(s) and any entity directly connecting to the NPAC platform are required to use the current NPAC SMS Interoperable Interface Specification (IIS) as adopted by NANC.

12.1.2 FRS

The NPAC vendor(s) and any entity directly connecting to the NPAC platform are required to use the current NPAC SMS Functional Requirement Specification (FRS) as adopted by NANC.

12.2 BUSINESS & ARCHITECTURE REQUIREMENTS

12.2.1 LLC (Limited Liability Company)

Each NPAC vendor has to be established under the Regional LLC. At a minimum, each respective Regional LLC has to keep its respective vendor in compliance with the Architecture requirements identified by NANC.

The sole purpose of the formation of a Limited Liability Corporation (LLC) is to create an entity to select and manage a neutral third party number portability administrator. Example activities of the LLC are the negotiation of the third party contract, prioritization of platform/software upgrades and on going direction of the third party's activities as described in the master contract. Membership of the LLC is not required for service providers to receive services from the neutral third party.

12.2.2 Competitively Neutral Pricing

The NPAC vendors have to be competitively neutral in pricing. It is the responsibility of each respective Regional LLC to ensure that competitively neutral pricing is consistent with FCC and state regulatory mandates.

12.2.3 Competitive Neutral Service

The NPAC vendor shall provide non-discriminatory service to all users.

12.2.4 NPAC User Criteria

NPAC Users are required to be telecommunications Service Providers or facilities-based[4] interexchange carriers that have been certified by the FCC or a State Public Utility Commission or are under contract to a Service Provider or facilities-based interexchange carrier to provide billing, routing, and/or . for that respective Service Provider or interexchange carrier. The above criteria limits NPAC access to those with an operational need for NPAC service in order to provide local number portability. These limitations are necessary to protect security of information and to minimize NPAC costs.

12.3 NANC

12.3.1 Architectural Change Approval Process

All NPAC/SMS architecture changes will be approved by NANC. Implementation of these changes will be managed via each respective Regional LLC with its respective NPAC vendor. If NANC is dissolved, an oversight body should be identified or established to support/approve NPAC/SMS architecture changes.

12.3.2 Conflict Resolution

Any conflicts between Service Providers in relation to NANC architecture will be escalated to NANC for conflict resolution.

[4] The term facility based is used in this document to describe carriers who own or lease switching equipment.

12.4 LLC Merger Process

The merging of Regional LLC's is not precluded.

12.5 NPAC Business Roles and Responsibilities

12.5.1 Neutral Third Party

The NPAC will be staffed by a neutral third party vendor.

12.5.2 NPAC Role

The primary role of the NPAC will be to assist users in obtaining access to the NPAC SMS. To perform this duty, the NPAC must support the following functional areas: administration, user support, and system support.

12.5.3 NPAC Administrative Functions

1. The administrative functions of the NPAC will include all management tasks required to run the NPAC.
2. The NPAC will work with the users to update data tables required to route calls for ported local numbers or required for administration.
3. The NPAC will be responsible for NPAC SMS logon administration, user access, data security, user notifications, and management.
4. The NPAC will be the primary contact for users that encounter problems with NPAC system features.
5. The user support function should also provide the users with a central point of contact for reporting and resolution of NPAC problems.
6. The system support function will provide coordination/resolution of problems associated with system availability, communications and related capabilities.
7. The NPAC hours of operation will be 24 hours a day, seven days a week.
8. The NPACs must meet the service level requirements as established by their respective LLCs.
9. The NPAC will provide reports to regulatory bodies as required.

12.5.4 Transition Guidelines

1. The NPAC will provide the same level of quality service during the period of transition to a new NPAC.
2. Transition to a new NPAC will be transparent to users.
3. Sufficient time will need to be established to allow each user to operate in a dual mode during transition to allow for installation of new NPAC links, testing of new NPAC links, problem resolution, installation at disaster recovery site, and de-installation of access links from old NPAC.

13. REFERENCE DOCUMENTS

(1) Illinois Commerce Commission Order 96-0089 dated March 13, 1996.
(2) FCC First Report and Order and Further Notice of Proposed Rulemaking; FCC 96-286; CC Docket 95-116, RM 8535; Adopted: June 27, 1996; Released: July 2, 1996.
(3) FCC First Memorandum Opinion And Order On Reconsideration; CC Docket No. 95-116, RM-8935; Adopted: March 6, 1997; Released: March 11, 1997.

Attachment A

EXAMPLE N-1 CALL SCENARIOS

Refer to Paragraph 7.8 of the main document for the definition of N-1 carrier. Also refer to Section 8 of the main document for the local to local view of LNP call scenarios.

Refer to the figure on the last page of this attachment to help understand the call processing and routing described in the following call scenarios.

All Scenarios:

1. 816-724-2245 has changed service providers from LEC-1 to LEC-2.
2. NXX's 724 and 662 are considered ported NXX's.

WIRELINE LONG DISTANCE CALLS

SCENARIO A1 (Long Distance - LNP/LRN Capable IXC):

1. 507-863-2112 calls long distance to 816-724-2245 from outside the ported area.
2. LEC-3 routes the call to the caller's pre-subscribed carrier without any requirement to determine the LRN.
3. The pre-subscribed IXC (IXC-1) is the N-1 carrier, determines the LRN by performing a database dip, and routes the call to LEC-2. If IXC-1 does not have a direct connection to LEC-2, calls may be terminated through tandem agreement with LEC-1.

SCENARIO A2 (Long Distance - IXC without LNP/LRN capability):

1. 507-863-2112 calls long distance to 816-724-2245 from outside the ported area.
2. LEC-3 routes the call to the caller's pre-subscribed carrier without any requirement to determine the LRN.
3. The pre-subscribed IXC (IXC-2) is the N-1 carrier. Because IXC-2 does not have LNP/LRN capability, IXC-2 should have an agreement with LEC-1 (or LEC-2) to terminate default routed traffic, and LEC-1 (or LEC-2) becomes the carrier actually performing the LNP/LRN function to determine proper routing.

WIRELINE LOCAL CALLS FROM OUTSIDE THE PORTED AREA

SCENARIO A3 (Local call outside ported area - LNP/LRN Capable LEC):

1. 816-845-1221 makes a call within her local calling area, but from outside the ported area to 816-724-2245.
2. LEC-4 is the N-1 carrier and performs the database dip to determine the LRN and then routes the call to LEC-2. If no direct connection exists between LEC-4 and LEC-2, calls may be terminated through tandem agreement with LEC-1.

SCENARIO A4 (Local call outside ported area - LEC without LNP/LRN capability):

1. 816-845-1221 makes a call within her local calling area, but from outside the MSA and ported area to 816-724-2245.
2. LEC-4 is the N-1 carrier and at some time may be required to perform the database dip to determine the LRN to route the call to LEC-2. Until that time, LEC-4 should arrange with LEC-1 (or LEC-2) to terminate default routed calls.

Simplified Trunking and SS7 Diagram for Connections to Ported Area

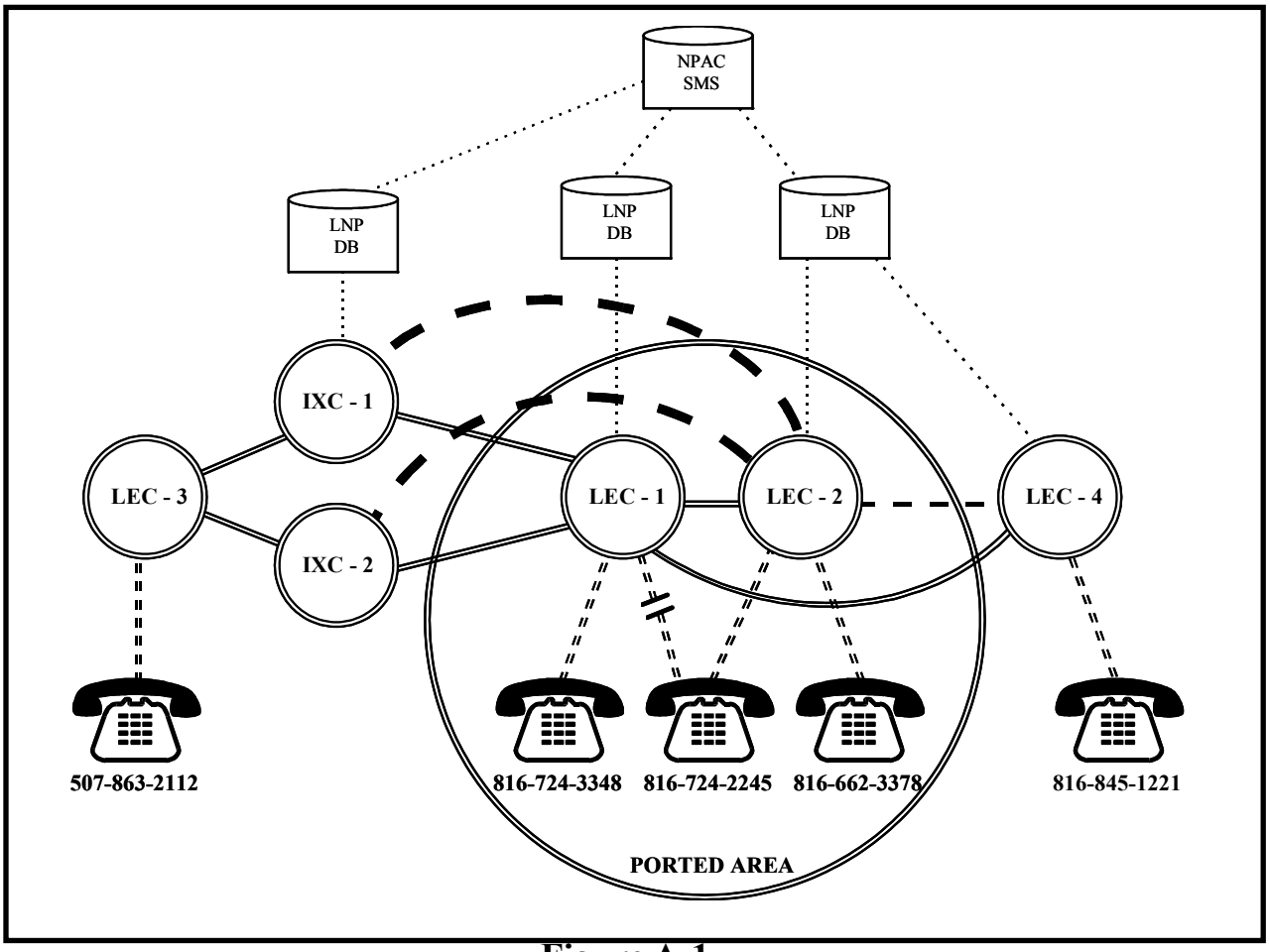


Figure A-1