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REPORT ON PCS N00 PORTABILITY

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INC Report on PCS N00 Portability

EXECUTIVE SUMMARY

The purpose of this INC report is to document the steps required for a potential implementation plan and guidelines for enabling the portability of the PCS N00 numbers among service providers.

A PCS portability architecture has been identified in Section 8. The portability architecture is based on the portability principles and criteria described in Sections 5 and 6. INC recommends this architecture along with a migration plan to provision a nationwide data base with sufficient capabilities to support multiple access arrangements and multiple PCS NPAs. The proposed architecture and associated call flows/routing in Section 8 would support both number portability and meet service provider requirements in a competitive PCS environment. This report includes recommendations for further work on this subject. It is understood that this report includes the most current information available at the time of publication. This report serves as a foundation for detailed implementation work.

The INC has concluded that if PCS number portability is to become a reality the following actions need to be taken by the appropriate regulatory bodies and by the industry.

A clear directive should be issued by the appropriate regulatory bodies to direct the industry to proceed with efforts for detailed implementation to achieve PCS number portability. The directive needs to include answers to the following questions:

- Who will be the owner/operator of the nationwide SMS/local SMS data base administration and how will they be selected?
- How will the costs for PCS portability be recovered?
- Taking into account that the industry needs resolutions of the above questions, when must the industry begin deployment of PCS portability?

When regulatory direction is provided to proceed with PCS portability, INC recommends that an industry group be identified to do the detailed planning for the development and implementation of the nationwide PCS data base. This industry group will address the items identified in Section 10.

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The implementation of personal communications service (PCS) N00 * number portability will impact many facets of the telecommunications infrastructure in World Zone 1 (WZ1). Different architectures and implementation strategies will result in varying levels of impact on the network and its operations.

The purpose of this INC report is to document the steps required for a potential implementation plan and guidelines for enabling the portability of the PCS N00 numbers among service providers.

Included in this work is the development of a migration plan to this portable environment from an assumed N00 NXX service provider implementation. This report addresses a high level target PCS N00 portability architecture and describes how to migrate from an NXX implementation. The portability architecture is based on the portability principles and criteria described in Sections 5 and 6. It includes recommendations for further work on this subject. It is understood that this report includes the most current information available at the time of publication. This report serves as a foundation for detailed implementation work.

This report has been developed via the industry forum consensus process by the PCS Portability Workshop of the INC (Industry Numbering Committee), a standing committee of the ICCF (Industry Carriers Capability Forum) which operates under the auspices of the CLC (Carriers Liaison Committee). The Workshop was formed to address the following issue statement associated with INC Issue # 007:

Issue Statement: The assignment of one non-geographic N00 code for PCS can lead to a shortage of numbers if only blocks of NXX codes are to be issued to PCS service providers. In addition, service provider number portability will not be possible under such an assignment procedure. This situation necessitates the development of a plan to share the available numbering space more efficiently and to provide number portability for PCS subscribers.

The PCS Portability Workshop's mission and scope statements are as follows:

Mission: To develop an implementation plan and guidelines for the establishment of the portability of the PCS N00 numbering resource for subscribers and service providers.

Scope: This work also requires the development of a migration plan to this portable numbering environment from the N00 NXX service provider environment. An analysis of the architecture alternatives will include but not be limited to technical

* A convention used throughout this document is "PCS N00" to refer to all PCS non-geographic NPAs regardless of format.

feasibilities, target technologies, end-user and service impacts (both positive and negative), timing complexities/benefits/costs for each. The architecture alternatives addressed will accommodate the needs of service providers offering technical and user mobility services. The output will consist of documentation of the above.

2.0 Definitions

The following terms are defined at the beginning of this report for the benefit of the reader since these terms will be used throughout the document.

Access Time - the period commencing when the caller completes dialing a PCS N00 call and ending when the call is delivered by the originating Access Provider to the PCS N00 Service Provider or to a Transport Provider for the PCS N00 Service Provider. (Note that Access Time is only one component of call set-up time.)

AIN (Advanced Intelligent Network) - a service-independent architecture which allows its service provider to create and/or modify telecommunications services.

ANI (Automatic Number Identifications) - the automatic identification of the calling station or billing number.

ANI (Automatic Number Identification) II Codes - ANI II digits are two digits that are sent with the originating telephone number identifying the type of originating station (for example: Plain Old Telephone Service (POTS)[00], Hotel/Motel [06], etc.). Use of the ANI II codes in an SS7 message is referred to as the Originating Line Information Parameter (OLIP). **Authorized Representative of Code Applicant/Holder** - the person from the applicant's/holder's organization or its agent that has the legal authority to take action on behalf of the applicant/holder.

CIC (Carrier Identification Code) - is a numeric code which is currently used to identify an entity which purchased Feature Group B and/or Feature Group D access services. This code is primarily used for routing from the local exchange network to the access purchaser and for billing between the Local Exchange Carrier and access purchaser. CICs are assigned by the North American Numbering Plan Administrator.

CIP (Carrier Identification Parameter) - is an SS7 ISUP (ISDN User Part) parameter carried in an Initial Address Message and provides the presubscribed CIC or is the 10XXX/10XXXX dialed by the calling party.

HLR- (Home Location Register) see SCP/HLR

ICCF (Industry Carriers Capability Forum) - provides an open forum under the auspices of the Carrier Liaison Committee to encourage telecommunication entities to discuss and resolve, on a voluntary basis, national technical issues associated with

telecommunications network interconnection, and the issues associated with the assignment and use of NANP/World Zone 1 numbering resources.

IN (Intelligent Network) - a telecommunications network architecture in which processing capabilities for call control and related functions are distributed among specialized network nodes rather than concentrated in a switching system.

NANP (North American Numbering Plan) - is a numbering architecture in which every station in World Zone 1 is identified by a unique ten-digit address consisting of a three digit NPA code, a three digit central office code of the form NNX/NXX, and a four-digit number of the form XXXX where N represents the digits 2-9 and X represents any digit 0-9.

NPA (Numbering Plan Area) - also called area code. An NPA is the 3-digit code which occupies the A, B, and C positions in the 10-digit NANP format which applies throughout World Zone 1. NPAs are of the form NXX, where N represents the digits 2-9 and X represents any digit 0-9. In the NANP, NPAs are classified as other geographic or non-geographic.

- a) Geographic NPAs are NPAs which correspond to discrete geographic areas within World Zone 1.
- b) Non-Geographic NPAs are NPAs which do not correspond to discrete geographic areas, but which are instead assigned for services with attributes, functionalities, or requirements that transcend specific geographic boundaries within WZ1. The common examples are NPAs in the N00 format; e.g., 800. N00 codes are commonly referred to as Service Access Codes (SACs).

Number Portability - number portability in the context of personal communications service implies that a PCS subscriber can change service providers while retaining their number assignment.

PIC (Presubscribed Inter LATA Carrier) - the carrier selected by the customer if they wish to be presubscribed to an IC (Interexchange Carrier) rather than selecting the IC on every interLATA call. The PIC is also frequently referred to as the presubscribed IC. In the context of this document PIC is also used as the Presubscribed IntraLATA Carrier.

PCS (Personal Communications Service) - for the purpose of this document personal communications service is a set of capabilities that allows some combination of personal mobility, terminal mobility, and service profile management. It enables each personal communications service user to participate in a user defined set of subscribed services, and to initiate and/or receive calls on the basis of some combination of a personal number, terminal number, and a service profile across multiple networks at any terminal, fixed or mobile, irrespective of geographic location. Service is limited only

by terminal and network capabilities and restrictions imposed by the personal communications service provider.

PCSNDB (Personal Communications Service Numbering Database) - a regional/local data base which contains PCS number assignments and routing information.

PCS Record Administrator - the responsible organization that assumes the duty of managing and administering the appropriate records in the PCS N00/SMS. These duties include data entry, record change, trouble acceptance, referral and/or clearance.

Personal Communications Service Subscriber - a person who, or entity which, obtains a personal communications service from a personal communications service provider on behalf of one or more personal communications service users.

Personal Communications Service User - a person who, or entity which, has access to personal communications services and has been assigned a personal number.

Personal Mobility - the ability of a user to access telecommunication services at any terminal on the basis of a personal identifier, and the capability of the network to provide those services according to the user's service profile. Personal mobility involves the network capability to locate the terminal associated with the user for the purpose of addressing, routing, and charging of the user's calls.

Personal Number - a number that uniquely identifies a PCS user and is used to place, or forward, a call to that user.

PC (Preferred Carrier) - the carrier (which may be selected by the customer to provision intraLATA or interLATA services).

PSTN (Public Switched Telephone Network) - the switched network that enables full and mutual access between public users via E.164 numbers. It is an integrated system of transmission and facilities, signaling processors, and associated operational support systems that are shared by customers.

SCP (Service Control Point) - a network data base containing information and/or logic used in call processing to provide services. A service switching point (SSP) contacts an SCP when the SSP recognizes the need for special call handling. Use of this term does not imply any specific technology platform.

SCP/HLR (Service Control Point/Home Location Register) for purposes of this document, an SCP/HLR is a data base that the PCSNDB may query in order to translate a dialed PCS N00 number into a geographic number.

SMS (Service Management System)- an Operations Support System used to facilitate the provisioning and administration of service data required by the SCP. Use of this term does not imply any specific technology platform.

SSP (Service Switching Point)- a network element that initiates a dialogue with an SCP in which the logic for the requested service resides. The SSP may communicate with more than one SCP. Use of this term does not imply any specific technology platform.

Service Profile - a record containing all the information related to a personal communications user in order to provide that user with personal communications service. Each service profile is associated with a single personal number.

Service Profile Management - the ability to access and manipulate the service profile. Service profile management can be performed by the personal communications service user, personal communications service subscriber, or personal communications service provider.

Service Provider - any entity that is authorized, as appropriate, by local government, state, federal, or World Zone 1 governmental authorities to provide personal communications service to the public.

STP (Signal Transfer Point)- a Common Channel Signaling (CCS) network element.

SS7 (Signaling System 7) - a standardized protocol for high speed communication between intelligent network nodes.

Terminal Mobility - the ability of a terminal to access telecommunication services from different locations and while in motion, and the capability of the network to identify and locate that terminal.

Working Numbers - the quantity of numbers within existing CO codes (NNX/NXX) which are assigned to working subscriber access lines or their equivalents, e.g. direct inward dialing trunks, paging numbers, special services, temporary local directory numbers (TLDNs), etc., within a switching entity/POI (Point Of Interconnection).

WZ1 (World Zone 1) - consists of the United States, Canada, Bermuda, and the NANP Caribbean administrations.

3.0 Reference Documents

1. ICCF 93-1130-011, PCS N00 NXX Code Assignment Guidelines (ICCF document)
2. TR-NWT-001284, Advanced Intelligent Network 0.1 Switching System Generic Requirements (Telcordia Technologies document) TR-NWT-001285, Advanced Intelligent Network 0.1 Switch Service Control Point/Adjunct Application Protocol Interface (API) Generic Requirements (Telcordia Technologies document)
3. CC Docket 86-10, Implementation Plan for 800 Data Base Access Service, 3m92 (FCC Docket)
4. SR-TSV-00227S, BOC Notes on the LEC Networks, Issue 2, 4194 (Telcordia Technologies document)
5. TR-NWT-000690, LSSGR Issue I, March, 1991 (Telcordia Technologies document)

To obtain Telcordia Technologies or ICCF documents please contact:

Telcordia Technologies Customer Relations (908) 699-5800
INC Secretary (202) 434-8846

4.0 Assumptions and Constraints

This report is based on the following assumptions and constraints resulting from Agreements Reached by the ICCF and INC.

- This document does not address the issue of who will administer the PCS N00 data base(s).
- This document describes an architecture intended to provide the greatest latitude to those providing personal communications service.
- Any new signaling messages required to implement PCS portability are recommended for implementation in SS7 only. Modifications to MF (Multi Frequency) signaling were not considered for PCS portability due to the additional call set up time required.
- International inbound routing from non-WZI areas to PCS N00-NXX is not addressed.

5.0 PCS N00 Portability-Principles

To allow entities the greatest possible latitude in providing services, the following principles apply to all aspects of PCS Portability:

- No PCS Service Provider should be advantaged or disadvantaged by the portability aspect of the architecture proposed.

-
- The terminology used within this document does not assume any particular equipment configurations, implementation or platform provider and is used for reference purposes only.

6.0 PCS N00 Portability Criteria

The following network, operational and user elements have been considered in assessing the various PCS N00 portability architecture options. This assessment is shown in the matrix in Appendix I.

6.1 Network

- Originating Switch (source of dial tone)
- Transport/tandem/interexchange/international switches
- Signaling (SS7, X.25)
- Data Base(s) (SSP, SCP, STP)
- PCS Number Portability Data Base(s)
 - ◆ Special capabilities - IN/AIN
 - ◆ Special capabilities - equal access
 - ◆ Capabilities - vertical services
- Intelligence/translations
- Load/traffic engineering/capacity
- Connectivity/interconnection/interworking
- Response times/grades of service
- New network elements/topology

6.2 Call Flows/Routing

- Call set-up procedures
- Link-by-link call flows
- Speech path vs. signaling paths
- Information flow/dependencies
- Response times/grade of service impacts
- Emergency call handling

6.3 Billing/Rating/Accounting/Settlement

- Methods of payment
- Billing/collection
- Billing records
- Settlement procedures
- Compensation

6.4 Traffic Performance: (portability portion only)

- Call set-up times (up to hand off to service provider)
- Network overhead/call processing

- Traffic load/engineering
- Reliability/survivability
- Load control/network management

6.5 Ubiquity/Universality

- Availability of service
- Ability/impact of accessing portable WZ1 PCS numbers (Domestic (USA)/WZ1/Outside WZ1)
- Assumptions
- Scheduling impacts
- Industry standards

6.6 Service Provider/Carrier Identification (ID)

- Service provider/carrier may be different entities
- ID embedded in PCS number
- ID embedded in address
- Calling party determinable - How?
- Network determinable - How?
- Carriage of ID information (Originating - transit terminating - billing)

6.7 Operational Support Systems (e.g., ordering, billing, maintenance, etc.)

- Support with no modifications
- Support with modifications
- New system/functionality required

6.8 Portable PCS Number Administration

- Security/data protection
- Number assignment procedures (request, selection, confirmation ,etc. .)
- Resource management
- Centralized vs. de-centralized
- Access/communications

6.9 Expandability

- Ability to support multiple PCS NPAs
- Ability to support multiple non-geographic NPA number portability
- Numbering resources required
- Open ended/closed
- Expediency vs. quality

6.10 Operator Services/Directory Assistance

- Requirements/assumptions
- Access arrangement(s)
- Information (number assignment, name of service provider, etc.) source .

6.11 Transparency Between Service Providers

(Portability should not add or subtract value across service provider spectrum)

- Advantage vs. no advantage
- Small service provider vs. large service provider
- National vs. international
- Intra-World Zone I (between countries) ;

6.12 Timing/Availability

- Critical assessment criteria
- Degree of difficulty and availability
- Relative estimates required (i.e., 2 years vs. 5 years)
- Trade-offs involved (features vs. bare bones)
- Establish minimum standard

6.13 Dependencies/Limitations

- Factors/actions which ease or complicate portability implementation (i.e., NXX plan implementation might complicate portability implantation/transition)

6.14 End User Impacts

- PCS users/subscribers
- PCS callers (casual callers to PCS numbers)
- Transition to PCS portability/number of changes
- Transparency
- Evolution path

6.15 Blocking Capability

- Screening and blocking of PCS calls at source
- Number of digits analyzed versus code blocking
- Calling customer control

6.16 Maintenance

- Trouble Reporting
- Testing/tracing/clearance
- Customer relations (PCS user, casual caller. etc.)
- Carrier/service provider identification

7.0 Evaluation of Portability Scenarios

Following review and discussion of potential PCS portability architecture contributions, the Workshop focused its evaluation efforts on three potential portability scenarios; an 800 Data Base Clone, an expanded 800 Data Base and an AIN based solution. Discussions of alternative architectures supporting PCS number portability have identified an overall architecture with two versions, one that uses CIC or CIC with Geographic Number to route calls and a second that provides a larger set of routing

instructions, including TGID (Trunk Group ID), signaling point code, PIC, etc. (Appendix 1 uses the Assessment Criteria described in Section 6.)

The matrix column identified as "800 Clone" assumes development of an architecture supporting PCS Number Portability that duplicates the functionality of the existing 800 Database service deployed today. No additional functions are assumed.

The matrix column identified as "Expanded 800" refers to a PCS Number Portability architecture derived from the current 800 Database architecture, but updated to provide the additional capabilities at the database of addressing other service providers' databases via a Signaling Routing Point Code, the use of calling party's PIC, and/or directed use of a Trunk Group ID for routing purposes. It is assumed that the development of such a database would accommodate at least the 500 SAC, and may support additional NPAs beyond 500. No additional capabilities are assumed in the "Expanded 800" architecture.

The matrix column identified as "AIN Based" describes an architecture supporting PCS Number Portability that is based on the capabilities described in AIN documentation, TR 1284 and TR1285 (see reference 2 in Section T).

The entries in the attached matrix are intended to be a high level assessment of the alternative architectures. More definitive data is not currently available for many of the entries.

7.1 800 Data Base Clone - An evaluation of the "800 Data Base Clone" architecture was conducted and is summarized in Appendix 1.

7.2 Expanded 800 Data Base - Evaluation results are included in Appendix 1.

7.3 AIN Based - Evaluation results are included in Appendix 1.

8.0 PCS N00 Target Architecture

The following PCS N00 portability architecture was developed based on the evaluation of portability scenarios in Appendix I as a potential PCS portability network architecture solution.

8.1 Network

This section describes the functionality of various network elements to provide PCS Number Portability (see Figure 1).

8.1.1 Nationwide SMS PCS Administrative Data Base - The nationwide PCS data base is a Service Management System (SMS) which contains information that will be downloaded to regional/local SMSs which will in turn download the information to the

PCS Numbering Data Bases (PCSNDBs). The information contained in the nationwide SMS may take the following forms:

- a) CIC
- b) CIC & geographic number
- c) geographic number
- d) SS7 Point Code

8.1.2 Regional/Local SMS - The regional/local SMS receives information from the nationwide SMS and passes this information to the regional/local PCSNDBs. The regional/local SMS is also used to indicate and implement local options such as the Trunk Group Identification (TGID) as per Section 8.2.

8.1.3 PCSNDB (PCS Numbering Data Base) - The regional/local PCSNDB responds to the queries from the switch/SSP which contain the N00-NXX-XXXX. The PCSNDB inspects the N00 NXX-XXXX and may return one of the following:

- a) CIC (Carrier Identification Code)
- b) CIC plus geographic number
- c) Geographic Number & "USE PIC" message
- d) CIC & Geographic Number (result of second SCP/HLR query)

8.1.4 PCS Service Provider SCP/HLR - The PCS Service Provider SCP/HLR is a data base provided by a particular PCS Service Provider which, as a business arrangement, the PCSNDB can query for call processing information. The query from the PCSNDB to the PCS Service Provider SCP/HLR is referred to as a second query.

8.1.5 Signaling - This document assumes that the signaling links to any PCSNDB are SS7 signaling links as part of an SS7 signaling network that includes Signal Transfer Points (STPs).

8.1.6 Switches/SSPs - if the originating switch has Service Switching Point (SSP) capability, it will recognize the PCS N00 code and launch a query to a regional/local PCS Number Data Base.

If the originating switch lacks SSP capability, it will pass the call to another switch that has SSP capability which in turn will launch a query to a regional/local PCSNDB.

8.2 CALL FLOWS/ROUTING

The following assumptions apply to all call flow diagrams:

- the nationwide SMS periodically updates the local SMS which then updates the PCSNDB, with appropriate routing information for each assigned PCS N00-NXX-XXXX.

-
- the dialed number is 1+N00-NE-XXXX. The dialed number, along with the calling party's preferred carrier ** and intraLATA carrier are sent to the PCSNDB as part of the database query. The dual PIC capability (capability to send both interLATA and intraLATA presubscribed carriers) may require development and standardization in most locations. The carrier information is P passed along for service applications that specify the calling party's presubscribed carrier to transport the call.
 - the original dialed number is passed to the indicated carrier, regardless of additional information also being passed (e.g., geographic number). The ANI plus ANI II of the calling party are also passed to the indicated carrier. The CIP, an optional SS7 parameter that indicates the original CIC or preferred carrier may also be passed to the indicated carrier. How the CIP interacts with service applications that specify the calling party's presubscribed carrier to transport the call is subject to further study.

In Figure (2), SW/SMS DATA RECORD: CIC, the information the PCSNDB contains related to the N00-NXX-XXXX is a CIC. The CIC along with the N00-NXX-XXXX were downloaded previously from the Nationwide SMS. The CIC is returned to the SSP. (The presubscribed carrier information is discarded.) Note that the SSP cannot distinguish from the returned information whether or not the carrier to which the call is to be routed was selected by the calling or called party (i.e., CIC and PIC use the same format). The SSP then routes the call to the indicated carrier.

In Figure (3), NW/SMS DATA RECORD: CIC & Geographic Number, the information the PCSNDB contains related to the N00-NXX-XXXX is a CIC and a geographic number (e.g., a geographic number associated with a switch or platform of the PCS Service Provider), which were previously downloaded from the Nationwide SMS. The CIC, N00 NXX - XXXX and NPA-NXX-XXXX are returned to the SSP. The SSP then routes the call to the indicated carrier.

In Figure (4), NW/SMS DATA RECORD: SS7 POINT CODE, the information the PCSNDB contains related to the N00-NXX-XXXX is an SS7 point code. The PCSNDB then routes a message to the database (PCS Service Provider SCP/HLR) identified by that SS7 point code to receive routing information on the subscriber's current location.

The capability for an SCP to launch a second query to another SCP/HLR may require a different application layer, which may entail development and standardization. Note also that when a second query is launched,- the response must always include a translated number (the response may also include carrier identification, billing information, and other relevant information).

** The carrier chosen to transport long distance calls. If the service provider provisions for equal access, then a calling party may choose which carrier(s) transport the long distance portion of the call. In instances where dual PICs are provisioned, the interLATA and intraLATA presubscribed carriers may be different.

In Figure (5), NW/SMS DATA RECORD; Geographic Number/"USE PIC", the information the PCSNDB contains related to the N00-NXX-XXXX is both a geographic number and a "Use PIC" routing instruction. When the PCSNDB receives the dialed N00-NXX-XXXX, the PCSNDB sends the preferred carrier's PIC(s) and the geographic number plus the original dialed number to the SSP. The SSP then routes the call to the indicated carrier. The calling party's preferred carrier may be selected for certain billing options (e.g. "Calling Party Determinable Routing").

The Local SMS is also used to indicate and implement local options. For example the use of a TGID) (Trunk Group Identification, or Route Index) is a local option in cases of direct interconnection of the Indicated Carrier to the EO/SSP which launched the PCS N00 query. A unique TGID is required for each trunk group for each switch served by that PCSNDB. The Nationwide SMS will need to download some form of null value for the routing instructions that indicates to the Local SMS that a local value needs to be entered, such as TGID. Or, alternatively, the Local SMS could override the CIC or "Use PIC!" indicator, which was downloaded from the Nationwide SMS, with the appropriate TGID.

Other routing instructions which could be downloaded from the Nationwide SMS to PCSNDBs include some form of "out of area coverage". These are error messages that indicate that the dialed PCS N00-NXX-XXXX is either not assigned to any PCS Service Provider, or that the location from which the calling party is attempting to place the call is not within the coverage area of the PCS Service Provider for that particular PCS N00-NXX-XXXX. These error messages may, for example, indicate to the SSP to route the call to a particular announcement.

Figure 6 displays potential interconnection configurations. These are the same configurations used in Reference (3).

In Figure 6.1 there are SS7 links between the EO/SSP and the Other Carrier. This configuration could support the call flows of Figures 2 - 5. Figures 6.2 and 6.3 also could support the call flows in Figures 2 - 5, being end-to-end SS7 between the originating EO and the Other Carrier. Note: It is assumed that the subscriber's intraLATA and interLATA PICs are available at the AT/AIN SSP, since the link from the EO is SS7 and development has occurred which supports the delivery of dual PIC information.

Figure 6.4 has an MF link between the EO and AT SSP. This configuration could not support passage of the "preferred carrier" (dual PIC). This configuration could support the call flows of Figures 2 - 4, but not the call flow of Figure 5.

Figure 6.5 has an MF link between the EO/SSP and the AT. This configuration could not support both the untranslated and translated PCS N00 number between the EO/SSP and the AT for passage on to the Other Carrier. Therefore, this configuration could only support the call flow of Figure 2.

Figure 6.6 has an SS7 link between the EO/SSP and the AT, with an MF link between the AT and the Other Carrier. This configuration could not support both the untranslated and translated PCS N00 number between the AT and the Other Carrier. Therefore, this configuration could only support the call flow of Figure 2.

Figures 6.7 - 6.10 could only support the call flow of Figure 2, for the same reason as Figure 6.5. In addition, Figure 6.9 could not support the "preferred carrier" (dual PIC) required for Figure 5.

PCS PORTABILITY ARCHITECTURE

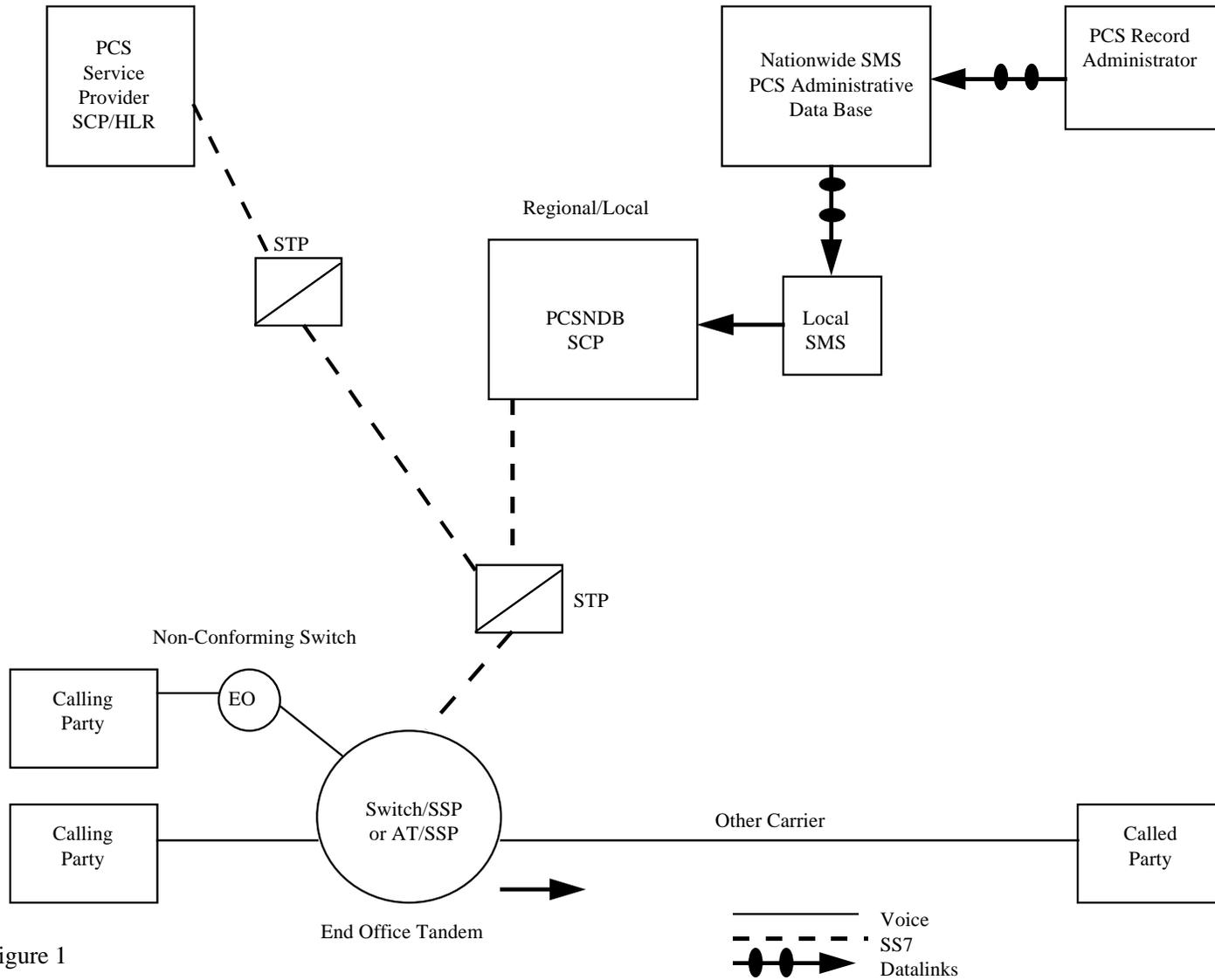
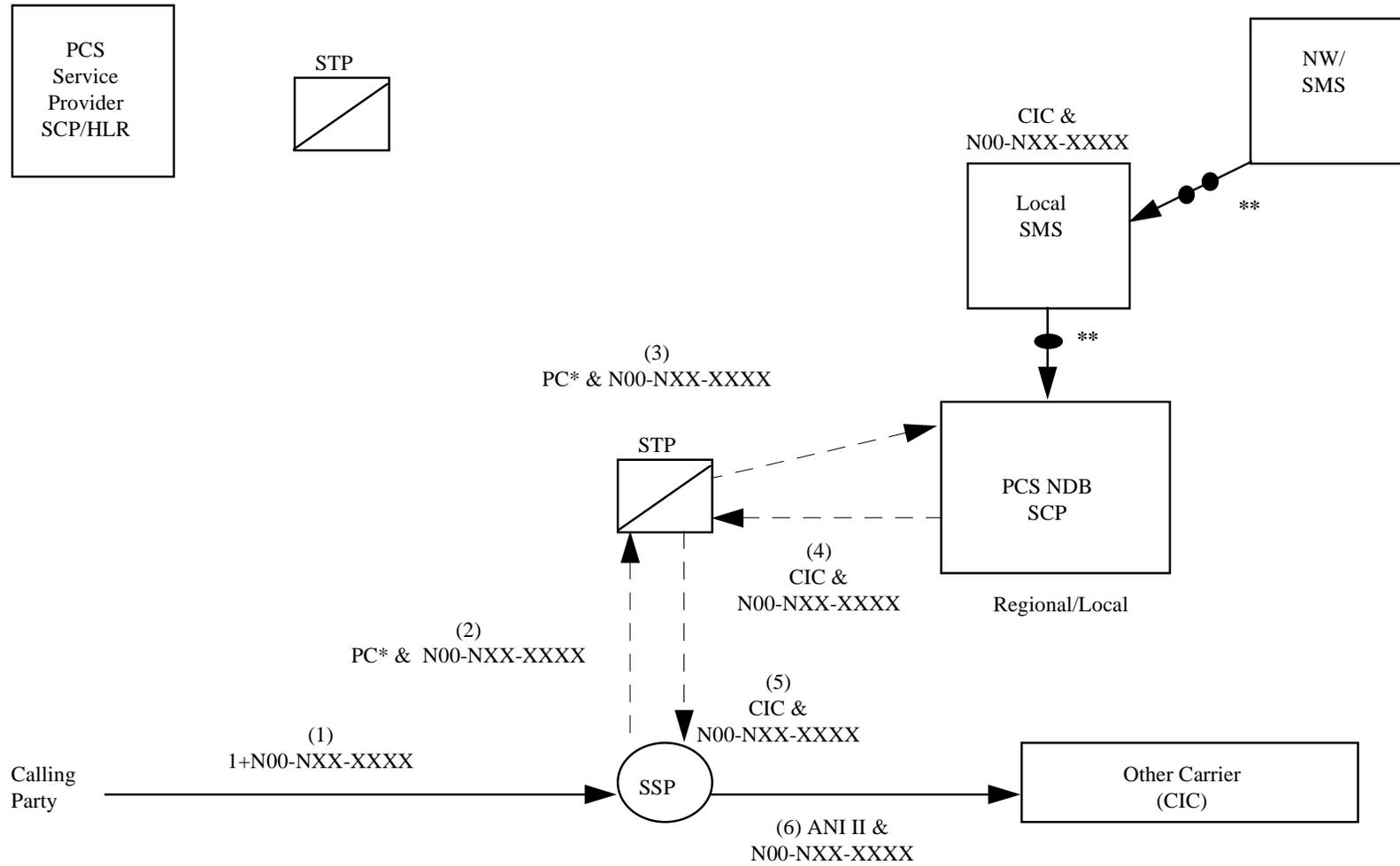


Figure 1

NW/SMS Data Record: CIC



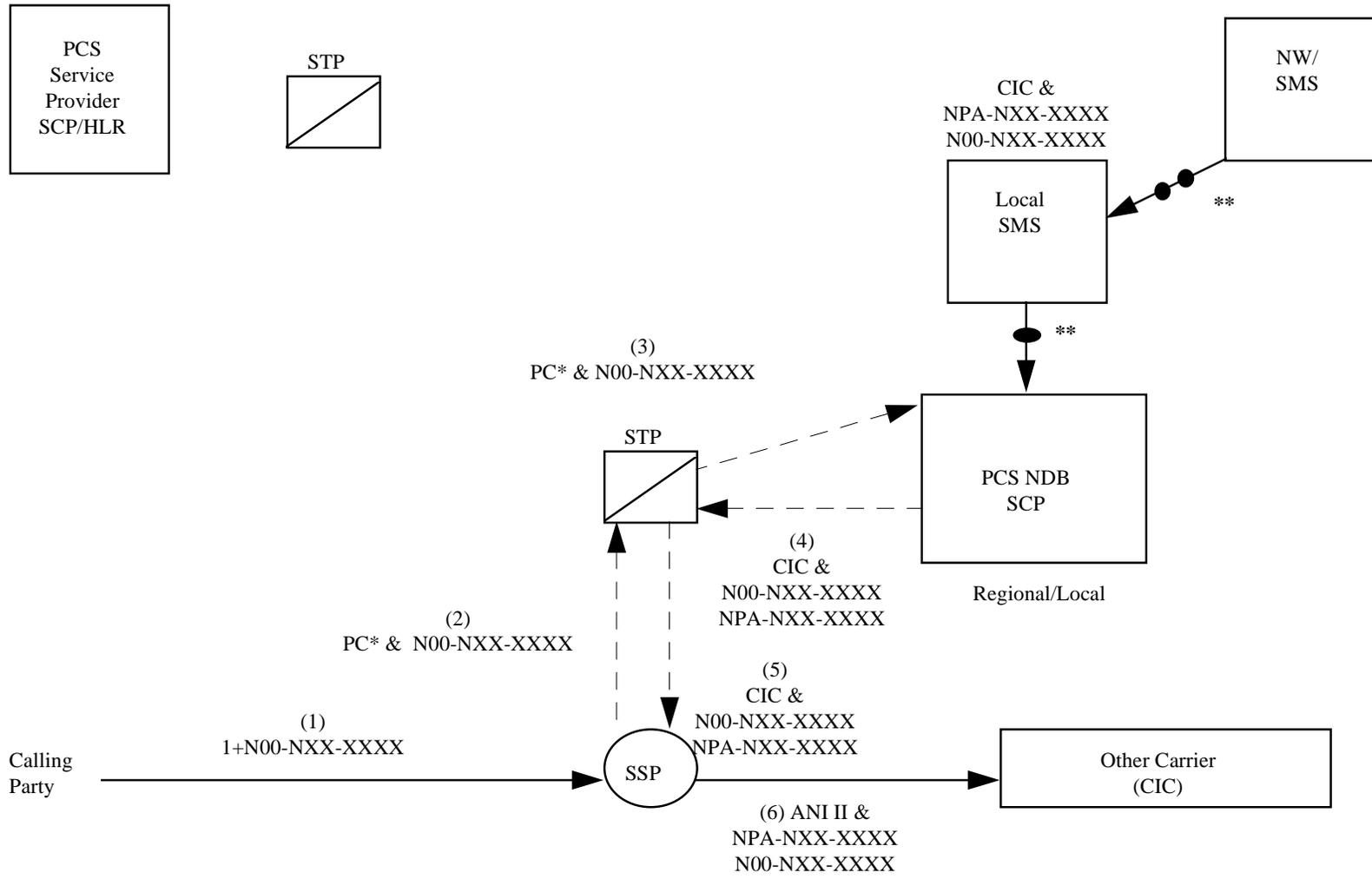
*PC = Preferred Carrier (s)

** = Periodic Download

NW = Nationwide

Figure 2

NW/SMS Data Record: CIC & Geographic Number



*PC = Preferred Carrier (s)

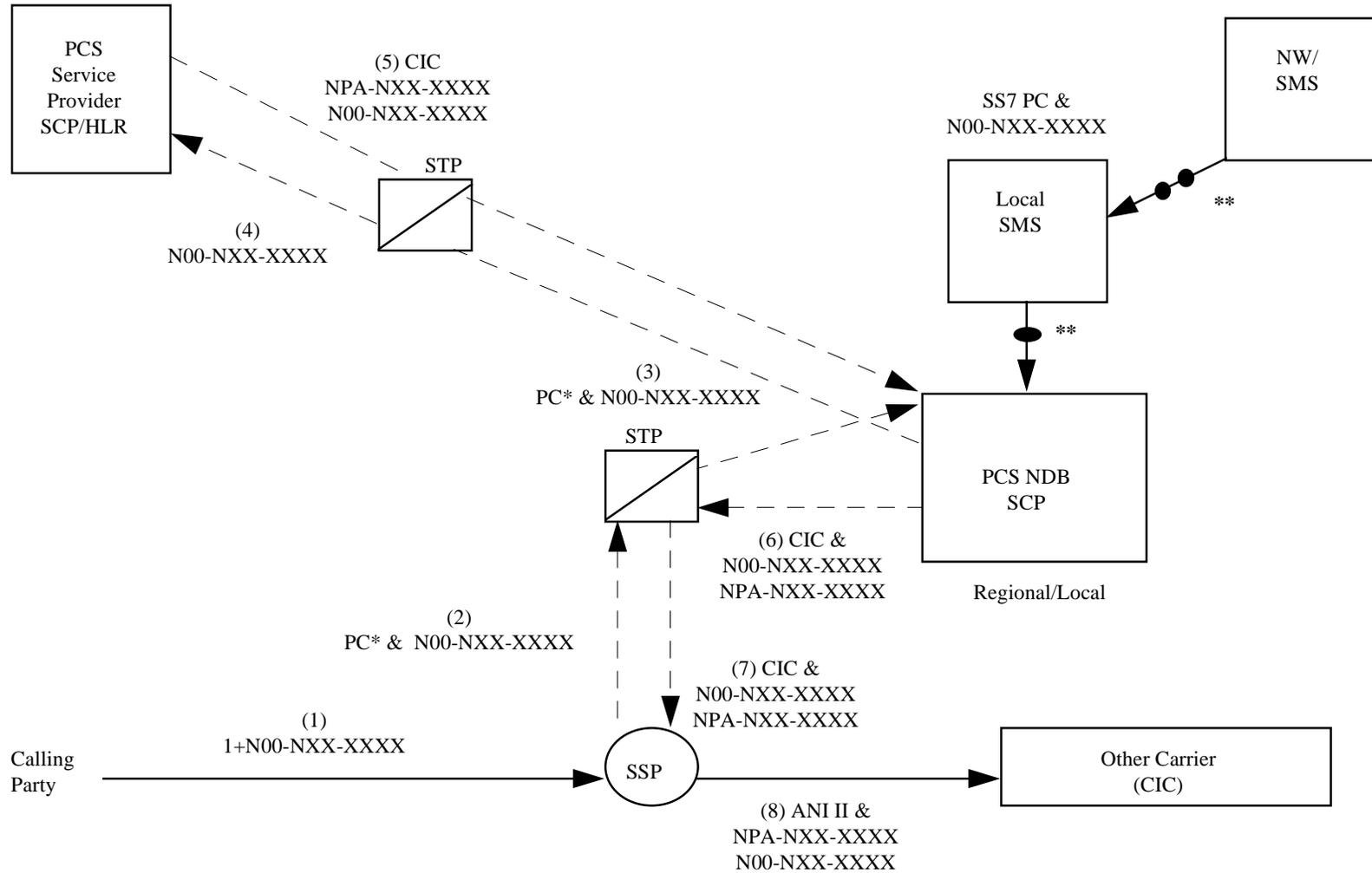
** = Periodic Download

NW = Nationwide

Figure 3



NW/SMS Data Record: SS7 Point Code



*PC = Preferred Carrier (s)

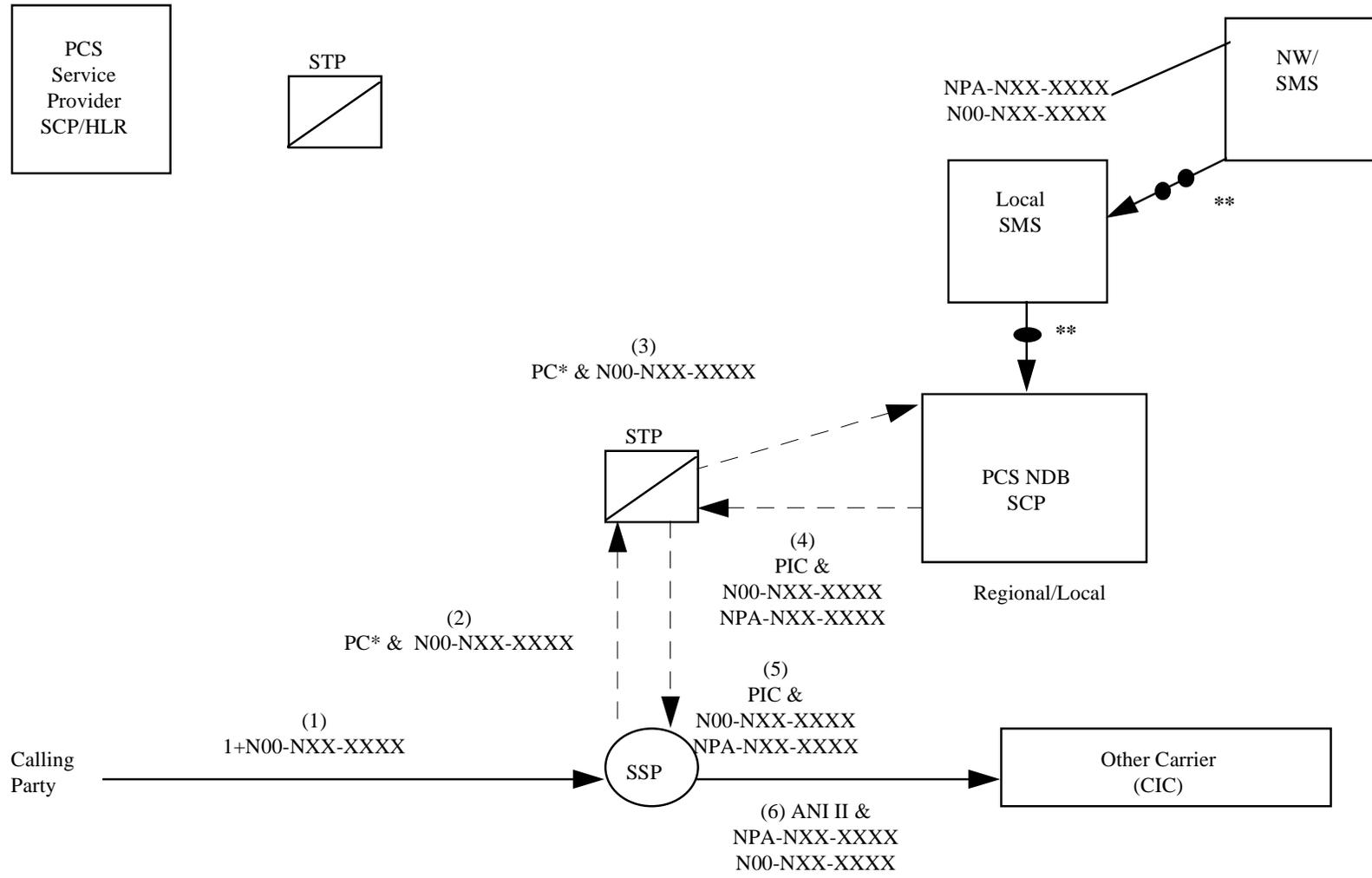
** = Periodic Download

NW = Nationwide

Figure 4



NW/SMS Data Record: Geographic Number/"USE PIC"



*PC = Preferred Carrier (s)

** = Periodic Download

NW = Nationwide

Figure 5

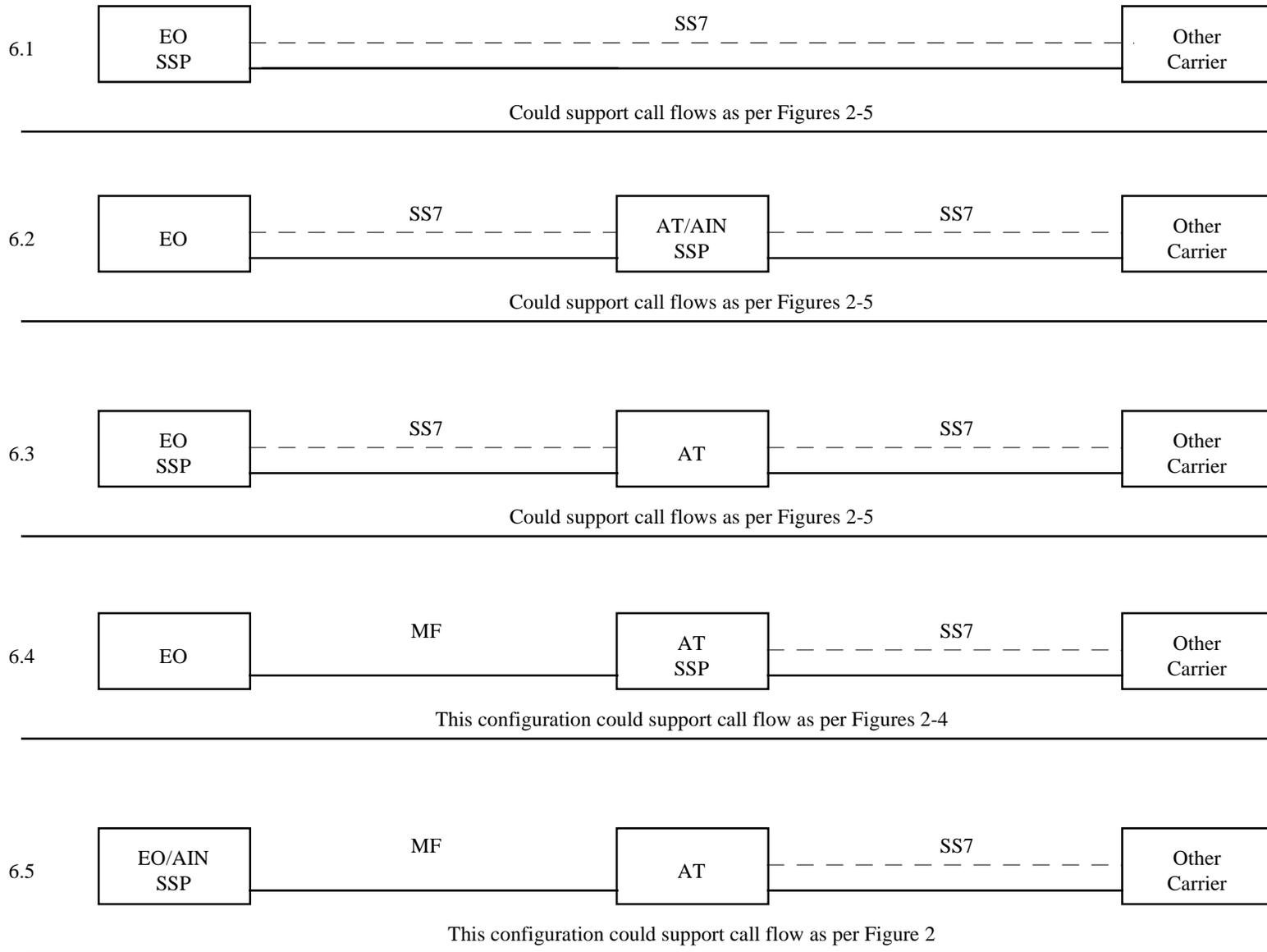


Figure 6: Potential Interconnection Configurations

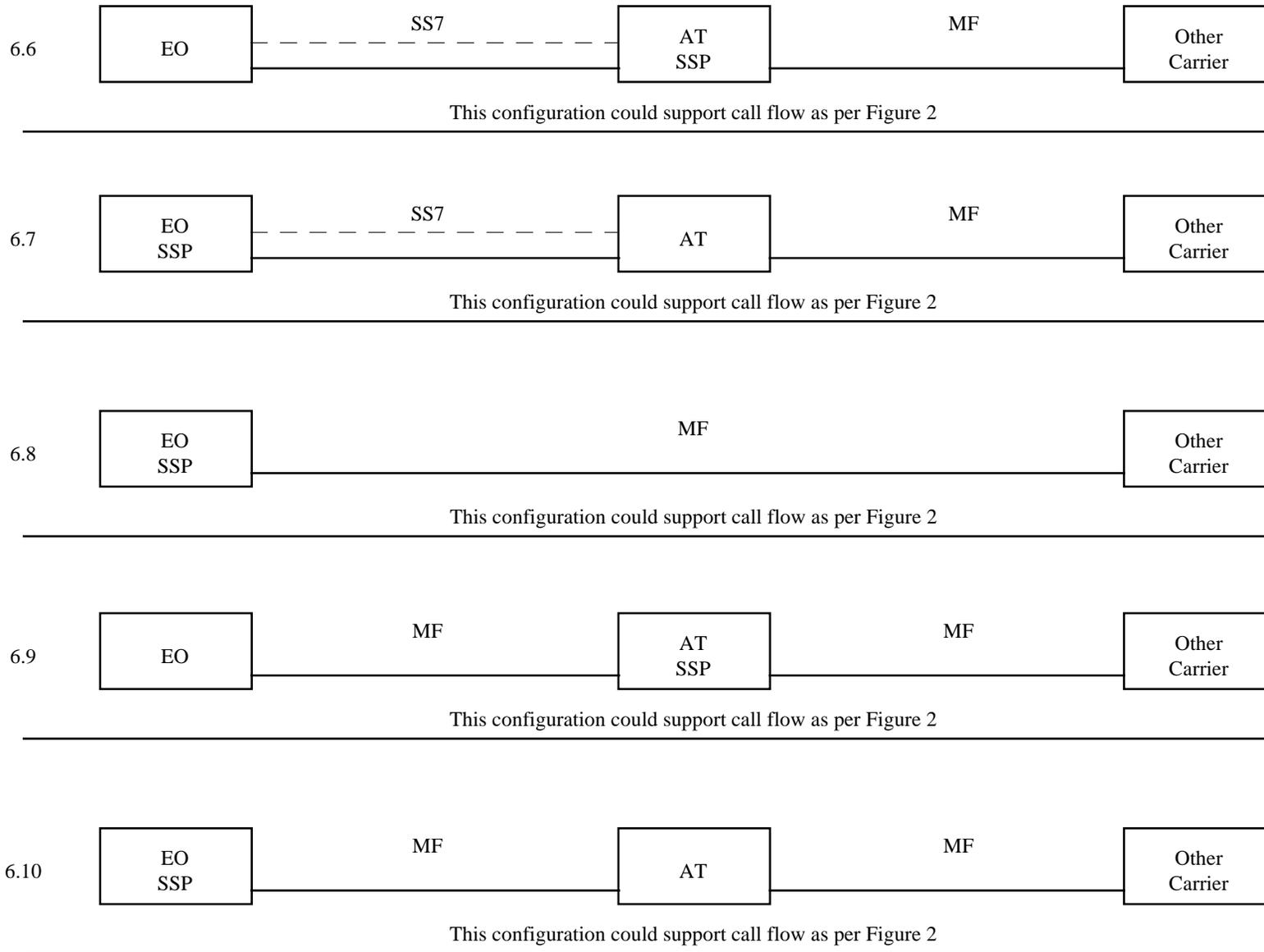


Figure 6: Potential Interconnection Configurations

8.3 Billing/Rating/Accounting/settlement - When a PCS call is dialed, a record for access charge billing and possibly end user billing should be made at the originating SSP.

A traffic count of queries per PCS service provider should be made at the PCSNDBs and should be used to assess query charges for PCSNDB queries. Additional or further queries, such as SCP to SCP/HLR queries, should also be counted so that additional charges may be assessed.

8.4 Traffic Performance - Access times for 800 service may be a useful guideline to begin determining access times for PCS Portability. The SCP-to-SCP/HLR query time must be taken into account. Common Channel Signaling (CCS) testing may be needed to determine performance standards.

It might be of use to provide a call processing announcement to calling parties if the end-to-end set-up time could be significant.

8.5 Ubiquity/Universality - No PCS Service Provider should be advantaged or disadvantaged by the portability aspect of the architecture proposed.

8.6 Service Provider/Carrier Identification - Service provider/carrier may be different entities - The originating SSP queries the PCSNDB and receives carrier identification/(PIC in the case of the optional Calling Party Pays). The originating SSP routes the call to the carrier. The carrier is responsible for disposition of the call including determining if another Service Provider is involved. A potential drawback of this solution is a possible increase in call set-up time.

ID derived from PCS number/Address - since the PCS N00 resources are to be portable among service providers, the Service Provider ID or Carrier ID can only be determined by the database translation of the 1 0-digit number.

Network determinable - on the originating side via query launched to PCSNDB. Response will contain carrier identification. When the call is routed to the indicated carrier, that carrier may have to perform additional translations/database queries (either to the PCSNDB or to the carrier's own database) to determine disposition of call. A drawback of this approach is a possible increase in call set-up time.

8.7 OSS Impacts - Most operations systems utilize the dialed telephone number as a geographically significant network terminating address. With non-geographic numbering services there is no relationship between the telephone number and the network terminating address. The proposed architecture in this contribution will require some work within the structure of operations support systems.

8.8 Portable PCS Number Administration - A nationwide PCS portability plan will require development of assignment guidelines. These guidelines may be similar to the "Industry Guidelines for 800 Number Administration". These guidelines are a subject for future development.

8.9 Expandability - These architectures which use the AIN platform should be expandable to other SACs (e.g., for other non geographic services). However, capacity of the AIN PCSNDBs may also be a factor in their expandability.

8.10 Operator Services/Directory Assistance - 0 + dialing to PCS numbers is not addressed in this document.

8.11 Transparency between Service Providers - No PCS Service Provider should be advantaged or disadvantaged by the portability aspect of the architecture proposed.

8.12 Timing/Availability - See Section 9.2.

8.13 Dependencies/Limitations - This architecture requires specifications and an implementation plan.

8.14 End User Impacts - PCS subscribers have portability in their assigned PCS N00-NXX-XXXX. that is, subscribers will be able to change service providers and maintain the same PCS N00-NXX-XXXX.

8.15 Blocking Capability - Blocking, if necessary will be done on a 1 0-digit basis.

8.16 Maintenance - The PCS portability architecture should have a network reliability, testing and performance monitoring plan similar in concept to that of the 800 Data Base Access Service. This plan should include but not be limited to, SS7 network reliability objectives, SS7 testing, compliance and interoperability testing, PCSNDB access service reliability objectives, SMS testing, and carrier/service provider identification.

9.0 Migration From NXX Environment

The DID recognizes that a mature PCS N00 NXX environment does not yet exist. However, it is assumed that the environment from which the Industry will migrate will include such functions as screening of the N00 NXX digits, which will provide routing information such as, CIC to enable the access provider to route the call to the appropriate service provider.

The initial PCS portability architecture must support any and all functionality provided in the pre-portability environment. Subsequent evolution will be - driven by market factors.

Furthermore, the architecture and methodology for routing PCS (N00-NXX-XXXX) traffic originating from non-WZI areas as well as all areas within WZ1 needs to be considered when selecting a portability implementation plan.

9.1 Regulatory Direction Requirements - INC has determined that the following questions need to be resolved by the appropriate regulatory bodies prior to the industry moving forward with PCS portability planning:

- Who will be the owner/operator of the nationwide SMS/local SMS data base administration and how will they be selected?
- How will the costs for PCS portability be recovered?
- Taking into account that the industry needs resolution of the above questions, when must the industry begin deployment of PCS portability?

9.2 Proposed Migration Steps - An industry group charged with the implementation of personal communications services number portability (i.e. migration from the NXX environment) would need to address the proposed list of project management and technical tasks appearing in Section 9.3. A broad range estimate of the time period to complete each task and an overall time period to cut-over is also provided. The estimated time line does not address the regulatory environment, e.g. the process and time period required for an FCC order to deploy PCS number portability and the local Public Utility Commission activity for access tariff approval for the new access capabilities. The time line assumes that there is an industry agreement in place for an appropriate industry group to perform the project management for PCS portability implementation. An initial task of the Industry Group would be to address the method(s) to support the development and deployment of the PCS nationwide data base, and its ongoing operation, administration and maintenance (OA&M).

9.3 Proposed Project Management/Technical Tasks and Estimated Time Line
(Note: List is not all inclusive.)

Task	Time Period**
OBTAIN REGULATORY GUIDANCE	TBD
I. Nationwide data base development	
• Review and document existing and planned NXX access arrangements	2 months
• Develop requirements *	12 months #
• Prepare & issue RFP	2 months #
• Vendor proposals preparation	2 months #
• Evaluate vendor responses	2 months #

- Select vendor * (including contract negotiations) 3 months #

II. Develop Implementation Time Line *

- Access providers implementation estimates

III. Industry Standards (if needed)

- Development of new call associate signaling parameters 9 months
- Development of new non-call signaling parameters 9 months

IV. Nationwide Database Implementation

- Database Development 9 months #
- Develop Implementation Test Plan* 3 months
- Implementation and Testing 3 months #
- Record loading and user data base training 9 months #

V. PCS Number Portability Implementation

- Access Arrangements Developed, Implemented and Tested for Participating Providers 18 months
- Access Arrangements Developed, implemented and Tested for Non-Participating Providers 9 months
- Provisioning and billing process changes (if needed) 9 months
- Develop Cut Over Test Plan 4 months
- Conduct Test Program 6 months #

VI. Implementation Time Line

Start Date	Cut Over
(1) _____	48 months (2) #

* Require Industry review and agreement

** Time periods for tasks are not sequential.

The cut over time period is based on the development and implementation of the nationwide PCS data base and administration system.

(1) Start Date: The START DATE of the implementation time line is the date agreed to by the recommended industry group as the beginning of the process of development, implementation on and OA&M for the nationwide data base and PCS portability. It is assumed that the start date will not occur before obtaining regulatory guidance.

(2) Cut Over: Successful completion of cut over testing program

10.0 Recommendations

The Industry Numbering Committee (INC) developed this report on PCS N00 Portability based on the CLC consensus process. r 10. 1 Migration to Portability - The migration plan presented is a high level view of the tasks involved and an estimate of the time periods involved for each task. Based on these tasks and time frames, it is estimated that from the START DATE it would take approximately 4 years to transition from an NXX environment to a number portability environment. However, under the regulatory issues, are defined and resolved, a firm plan for migration to portability including project management and technical tasks cannot be determined.

10.2 Architecture - PCS N00 service is presently offered in an NXX access environment and is in its infancy. Consequently, development of a detailed migration plan was not possible at this time. INC recommends a high level architecture, described in Section 8, which uses a nationwide data base with sufficient capabilities to support multiple access arrangements and multiple SAC NPAs. The proposed architecture and call flows would support both number portability and meet service provider requirements in a competitive PCS environment.

In order to implement an architecture which provides the greatest latitude for enabling portability among service providers, consideration should be given to various intelligent network platforms and network industry interface standards used to interconnect potential network providers.

10.3 Industry group - When regulatory direction is provided relative to the questions in Section 9.1 and if the regulatory directive is given to proceed with PCS portability, INC recommends that an industry group or committee be for need to do the detailed planning for the development and implementation of the nationwide PCS data base. INC makes no recommendation on how this industry group would be sponsored or supported, nor does it support that this industry group be formed within INC, since the implementation of portability is outside the mission and scope of INC. INC recognizes the need for such a industry group to facilitate the implementation of PCS N00 portability in an acceptable time frame. The industry group may address such issues as:

- development, operation and maintenance of the nationwide data base platform
- establishment of requirements for the nationwide data base and issuance of an RFP for the nationwide data base
- evaluation of RFP responses and vendor selection
- development of a time line for cut-over to portability
- monitoring the development, implementation and operation
- the analysis necessary to carry forward any standards for enhancements for the call flows
- determination of who owns the information in the SCPs in terms of property and privacy

- determination of how requests for modifications to the data base(s) will be approved and prioritized
- determination of performance measures, such as call setup time

APPENDIX 1

PERSONAL COMMUNICATIONS SERVICE-NUMBER PORTABILITY - ARCHITECTURE ASSESSMENT

<u>ASSESSMENT CRITERIA</u>	<u>CIC/CIC+NUMB. 800 CLONE</u>	<u>OTHER RESPONSES EXPANDED 800</u>	<u>OTHER RESPONSES AIN-BASED</u>	<u>NOTES</u>
NETWORK	Doesn't exist	Doesn't exist	Existing	
Orig. Switch (source of dial tone) Tandem (or Int'l) switch Signaling Databases	Slight additional devel. req. No impact No additional devel. req. Add. dev. req. for 500	Additional dev. req. May req. additional dev. No additional dev. req. Signif. modifications req.	Uses exist capability May req. additional dev.* No additional dev. req. Development of 500 database	*2nd data dip
PCS Database	Develop from 800 capacity	Develop from 800 capacity	Development of 500 database	
Capabilities Translations Capacity Interworking GOS/Res. time Net. Topology	Limited capabilities like 800 Basic translation to geo # Add'l capacity or new SCP req. Connectivity available Same as basic 800 Need new 500 SCP/SMC	Limited capabilities like 800 Basic translation to geo # New SCP req. with add'l Info Connectivity available Potential longer than 800* Need new 500 SCP/SMS	Additional svcs. available Additional translation avail. Add'l cap. or new SCP req. Connectivity potential Potential longer than 800* Add'l AIN SMC and Nat'l # Ad.	*2nd data dip
(Equal Access SSP Switch Req'd)				
500 DATABASE RESPONSE				
Carrier Identification Code (CIC) Carrier Identification Code (CIC)/Geo. Num. Geo Num (use PIC) SS7 Point Code	Provided Provided Provided Not Available	Provided Provided Provided Provided	Provided Provided Provided Provided	
CALL FLOWS				
Call set-up procedure call flows Speech/signaling	Same as basic 800 Same as 800 Same as 800	Like 800+SCP-SCP comm. Like 800+SCP-SCP comm. Like 800+SCP-SCP comm.	Like 800+SCP-SCP comm. Like 800+SCP-SCP comm. Like 800+SCP-SCP comm.	

Dependencies	Same as 800	Like 800+SCP-SCP comm.	Like 800+SCP-SCP comm.	
GOS/Res. time	Same as 800	Add'l delay for*	Add'l delay for*	*2nd data dip

BILLING/RATING/ACC.
TG/SETTLEMENT

Methods of Payment	Set-up for called party pays	Set-up for called party pays	Flexible billing	
**Billing Records	Record at orig. sw. & others	Sw. & SCP based records	Sw. & SCP based records	
**Settlement Process	Not req.	May be req.	May be req.	
**Compensation	Access Tariff based	Access + Transaction??	Access + Transaction??	

TRAFFIC

Set-up time	Same as 800	Pot. increased set-up time	Pot. increased set-up time	*2nd data dip
Net. Overhead	Same as 800	Increased messaging*	Increased messaging	*2nd data dip
Traffic load/engineering	Same as 800	Like 800 w/ add'l messages	New procedures req.	
Reliability	Same as 800	Need to handle*	Need to handle*	
Net. Mgmt.	Same as 800	Need to handle*	Need to handle*	*2nd data dip

UBIQUITY/UNIVERSITY

**Availability of service	Avail. to all Service Providers	Pot'ly avail. to all Svc. Prov.	Avail. to all Svc. Prov.	
**Ability/impact of access to port WZ1 #s	Same access assumpt. as 800	Same access assumpt. as 800	Same access assumpt. as 800	
Domestic (USA) WZ1/Outside WZ1 Scheduling	Req. dev. & deployment	Req. dev. & deployment	Req. deployment & svc. dev.	

SVC. PROV/CARRIER ID

Svc. Prov/Carrier not same ID embedded in PCS #	Not set up to handle	Not set up to handle	Can modify to handle	signal limit.
ID embedded in address	Based on number assign.	Based on number assign.	Based on number assign.	
Sel. by caller/how	Limited capabilities	Limited capabilities	Some flexibility	signal limit.
Sel. by net./how	Not sel. by caller	Pot. sel. by caller	Pot. sel. by caller	
Carriage of ID	Sel. by CIC in database	Sel. by CIC and/or TGID	Sel. by CIC and/or TGID	
	Not forwarded to Svc. Prov.	Pot. forwarded to Svc. Prov.	Pot. forwarded to Svc. Prov.	

OPS SUPPORT SYSTEMS

System/functionality Impacts	No additional systems req.	Some new systems req.	Some new systems req.	
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PORT. PCS # ADMINIST.

Security/data protection	Exist. structures limit acc.	New structures may be req.	New structures may be req.
Numb. assign. procedures	Clone exist. proc.	Clone exist. proc.	Clone exist. proc.
Resource mgmt.	Clone exist. proc.	Clone exist. proc.	Clone exist. proc.
Centralized vs. decentralized	Req. centralized admin.	Req. centralized admin.	Req. centralized admin.
Administrative access	Req. "real-time" access	Req. "real-time" access	Req. "real-time" access

EXPANDABILITY

Support Mult. non-geo PCS NPAs portability	Supports single non-geo SAC	Could support mult. PCS SACs	Supports mult. non-geo SACs
Numbering Resources required	single NPA-\$\$ cost	single NPA-\$\$\$ cost	mult. NPAs - \$\$ cost
Expandability, open ended/closed	Closed	Expand. w/development	Designed to be expanded
Expediency vs. quality	Expedient-limited features	Not expedient	Expedient-robust

OPERATOR SVS./DIRECTORY

Requirements/assumptions	Opr. access to database	Opr. access to database	Opr. access to database	not today?
Access arrangements	Like 800	New access req.	New access req.	
Information source	500 database/nat'l num. admin.	500 database/nat'l num. admin.	500 database/nat'l num. admin.	

TRANSPARENCY BTW Sps

Advantage vs. no advantage	No impact	No impact	No impact
Small vs. large service provider	No impact	No impact	No impact
National vs. International	Issues like 800	Issues like 800	Issues like 800
Between WZ1 Countries	Like 800		

TIMING/AVAILABILITY

Degree of difficulty and availability	Fast and simple	More complex and slower	Complex and not so fast	dev vs. deploy
Relative estimates required	1-2 year	2-3 year	1-2 year	

Trade-off involved (feature vs. bare bones)	Bare bones	Additional features	Additional features/expansion
Established minimum standard	Does not meet minimum req.	Meets minimum req.	Meets minimum req.
Ind. Stand. for Net Elements & Interfaces	SS7 only, GRs for SCP	SS7 only, GRs for SCP	GRs for Interface, SCP, SS7

DEPENDENCIES/LIMITATIONS

Factors/actions impacting implementation			
Local/Regional SMS	No specs. or dev. yet	No specs. or dev. yet	Specs. avail.; not wide deploy
National Admin. System	No specs. or dev. yet	No specs. or dev. yet	No specs. or dev. yet

END USER IMPACTS

PCS users/subscribers	Limited access to svc. prov.	No impact	No impact
PCS callers (to PCS #s)	No impact	No impact	No impact
Transition to portability/# of chgs.	Initial limited portability	Initial portability transparent	Transparent
Transparency	Limited transparency	Transparent	Transparent
Evolution Path	Limited evolution	Some flexibility	Flexible, easy evolution

BLOCKING CAPABILITY

Orig. EO per line blocking	3 & 6 digit analysis only (performed at SCP)	3 & 6 digit analysis only (performed at SCP)	All 10 digits available (performed at SCP)
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Maintenance

Trouble Reporting	Like 800 today	Req. more flexibility	Req. more flexibility
Testing/tracing/clearance	Like 800 today	Req. more flexibility	Req. more flexibility
Customer relations (PCS user, caller, etc.)	Transparent	Transparent	Transparent
Carriers/svc. prov. ID	Limited capabilities	Minimum capabilities	Minimum capabilities