LOCAL NUMBER PORTABILITY ADMINISTRATION WORKING GROUP (LNPA WG) INTERPRETATION OF N-1 CARRIER ARCHITECTURE

NOTE: The yellow highlighting throughout this document is meant to provide focus on text from the various cites and industry documentation that is directly relevant to the specific LNPA interpretation it addresses.

NOTE: Throughout the discussions in the LNPA WG of the N-1 LNP Architecture and the responsibilities of carriers in ensuring calls are routed properly to the called party, carriers expressed concerns over the network impacts and costs to perform LNP queries on default routed calls. The LNPA WG would like to stress that if all carriers complied with the following interpretation of the N-1 architecture, based on research of FCC mandates, and performed the necessary LNP query when they were designated as the N-1 carrier on a call to a portable NXX code, a carrier rarely would be forced to perform the query on a default-routed basis.

FCC NOTICE OF APPARENT LIABILITY FOR FORFEITURE, DA 04-1304, RELEASED MAY 13, 2004, ¶¶ 5 (Quoted from the Notice):
5. Furthermore, in adopting, with some modification, recommendations of the North American Numbering Council ("NANC") as set forth in a [LNPA] Working Group Report, the Commission clearly imposed requirements on the carrier immediately preceding the terminating carrier, designated the "N-1 carrier," to ensure that number portability databases are queried and thus that calls are properly routed. Currently, call routing is accomplished by use of Location Routing Numbers ("LRNs"). Under the LRN method, a unique ten-digit number is assigned to each central office switch. The routing information for end users who have ported their telephone numbers to another carrier is stored in a database, with the LRNs of the switches that serve the ported subscribers. Carriers routing calls to customers with ported numbers query this database to obtain the LRN that corresponds to the dialed number. This query is performed for all calls to switches from which at least one number has been ported. In adopting the [LNPA] Working Group Report, the Commission noted that if the N-1 carrier does not perform the database query, but instead relies on another entity to perform the query, the other entity may charge the N-1 carrier in accordance with long-term number portability cost allocation and recovery guidelines.

❑ LOCAL CALL:

INTERPRETATION:
- The originating carrier is the N-1 carrier and is responsible for performing the query in its network or entering into an agreement with another entity to perform the queries on its behalf.

CITE:
➢ **Third Report and Order, FCC 98-82, ¶¶ 15-16, (1998) (Quoted from the Order):**

15. For a carrier to route an interswitch telephone call to a location where number portability is available, the carrier must determine the LRN for the switch that serves the terminating telephone number of the call. Once number portability is available for an NXX, carriers must "query" all interswitch calls to that NXX to determine whether the terminating customer has ported the telephone number. Carriers will accomplish this by sending a signal over the SS7 network to retrieve from an SCP or STP the LRN associated with the called telephone number. The industry has proposed, and the Commission has endorsed, an "N minus one" (N-1) querying protocol. Under this protocol, the N-1 carrier will be responsible for the query, "where 'N' is the entity terminating the call to the end user, or a network provider contracted by the entity to provide tandem access." Thus the N-1 carrier (*i.e.* the last carrier before the terminating carrier) for a local call will usually be the calling customer's local service provider; the N-1 carrier for an interexchange call will usually be the calling customer's interexchange carrier (IXC). An N-1 carrier may perform its own querying, or it may arrange for other carriers or third parties to provide querying services on its behalf.

16. To route a local call under this system, the originating local service provider will examine the seven-digit number that its customer dialed, for example "456-7890." If the called telephone number is on the originating switch (*i.e.* an intraswitch call), the originating local service provider will simply complete the call. If the call is interswitch, the originating local service provider will compare the NXX, "456," with its table of NXXs for which number portability is available. If "456" is not such an NXX, the originating local service provider will treat the call the same as it did before the existence of long-term number portability. If it is an NXX for which portability is available, the originating local service provider will add the NPA, for instance "123," to the dialed number and query "(123) 456-7890" to an SCP containing the LRNs downloaded from the relevant regional database. The SCP will return the LRN for "(123) 456-7890" (which would be "(123) 456-XXXX" if the customer has not changed carriers, or something like "(123) 789-XXXX" if the customer has changed carriers), and use the LRN to route the call to the appropriate switch with an SS7 message indicating that it has performed the query. The terminating carrier will then complete the call. To route an interexchange call, the originating local service provider will hand the call off to the IXC and the IXC will undertake the same procedure.

➤ **FCC Consent Decree Order, DA 04-2065, Released July 12, 2004, ¶¶ 9(d):**
9(d). Upon execution of this Consent Decree, company-wide on all 398 of its host switches and whenever (Carrier X - name deleted) is the N-1 carrier, (Carrier X - name deleted) will perform or will have performed on its behalf, a database query to obtain the Location Routing Number ("LRN") that corresponds to any dialed number. Whenever it is the N-1 carrier, (Carrier X - name deleted) will ensure that any call placed by a (Carrier X – name deleted)

customer to a ported telephone number is properly routed to the network of the current carrier serving that telephone number, based on the LRN.

❑ TOLL CALL:

INTERPRETATION:
• For an interLATA Toll call, the IXC is the N-1 carrier and is responsible for performing the query in its network or entering into an agreement with another entity to perform the queries on its behalf.

CITE:
➢ **Third Report and Order, FCC 98-82, ¶¶ 15-16, (1998) (Quoted from the Order):**
15. For a carrier to route an interswitch telephone call to a location where number portability is available, the carrier must determine the LRN for the switch that serves the terminating telephone number of the call. Once number portability is available for an NXX, carriers must "query" all interswitch calls to that NXX to determine whether the terminating customer has ported the telephone number. Carriers will accomplish this by sending a signal over the SS7 network to retrieve from an SCP or STP the LRN associated with the called telephone number. The industry has proposed, and the Commission has endorsed, an "N minus one" (N-1) querying protocol. Under this protocol, the N-1 carrier will be responsible for the query, "where 'N' is the entity terminating the call to the end user, or a network provider contracted by the entity to provide tandem access." Thus the N-1 carrier (*i.e.* the last carrier before the terminating carrier) for a local call will usually be the calling customer's local service provider; the N-1 carrier for an interexchange call will usually be the calling customer's interexchange carrier (IXC). An N-1 carrier may perform its own querying, or it may arrange for other carriers or third parties to provide querying services on its behalf.

16. To route a local call under this system, the originating local service provider will examine the seven-digit number that its customer dialed, for example "456-7890." If the called telephone number is on the originating switch (*i.e.* an intraswitch call), the originating local service provider will simply complete the call. If the call is interswitch, the originating local service provider will compare the NXX, "456," with its table of NXXs for which number portability is available. If "456" is not such an NXX, the originating local service provider will treat the call the same as it did before the existence of long-term number portability. If it is an NXX for which portability is available, the originating local service provider will add the NPA, for instance "123," to the dialed number and query "(123) 456-7890" to an SCP containing the LRNs downloaded from the relevant regional database. The SCP will return the LRN for "(123) 456-7890" (which would be "(123) 456-XXXX" if the customer has not changed carriers, or something like "(123) 789-XXXX" if the customer has changed carriers), and use the LRN to

route the call to the appropriate switch with an SS7 message indicating that it has performed the query. The terminating carrier will then complete the call. To route an interexchange call, the originating local service provider will hand the call off to the IXC and the IXC will undertake the same procedure.

INTERPRETATION:
- For an intraLATA Toll call where the originating carrier is the Pre-subscribed IntraLATA Carrier for the calling party, the originating carrier is the N-1 carrier and is responsible for performing the query in its network or entering into an agreement with another entity to perform the queries on its behalf.

CITE:
➢ **Technical Requirement T1.TRQ.2-2001, Technical Requirement on Number Portability Switching Systems, Prepared by T1S1.6 (quoted directly):**

<REQ-00500>
An NP Query shall only be sent when:
- **an NP trigger has been encountered, and**
- **the FCI indicates "number not translated".**

However, the query will not be performed if,
- **the called number is served by this switch and the transition mechanism (as specified in <REQ-08600>) does not apply to the called number, or**
- **the call is identifiable as destined for an operator, or**
- **the call is to an interexchange carrier, as indicated by presubscription or dialed digits (101XXXX) (for exceptions see <CR-00950>).**

<REQ-00900>
If an NP trigger is encountered and IXC routing (not LEC routing) is assured prior to launching the NP query, the NP query shall be bypassed, and the call routed to the predialed carrier, or presubscribed carrier (PIC), or group carrier, or lastly to the Office provisioned interLATA carrier (for exceptions see CR-00950).

<CR-00950>
If an NP trigger is encountered and IXC routing (not LEC routing) is assured prior to launching the NP query, the switch shall launch the NP query if the call is to be routed to any of the specific designated set of IXCs provisioned by <CR-08550>. This specification shall be on a per route basis for each of the designated carriers. The switch shall not perform the NP query for calls to be routed to any other IXC.

The default behavior shall be as described in REQ-00900.

This requirement shall not apply to operator-destined calls.

When the NP query is performed, the call shall be routed to the predetermined carrier and route.

The originating LEC 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.

Some tandem switches can not perform this capability.

➢ Based on current end office switch functionality, if the originating switch has the 6-digit LNP trigger set on an intraLATA Toll NXX code, and the originating carrier is the intraLATA Toll PIC for the calling party, the originating switch will launch a query to the LNP database and route the call based on the response from the database. Based on this established switch functionality, the LNPA WG believes the originating carrier is the N-1 carrier in this call scenario.

INTERPRETATION:
• For an intraLATA Toll call where the originating carrier is NOT the Pre-subscribed IntraLATA Carrier for the calling party, the Pre-subscribed IntraLATA Carrier is the N-1 carrier and is responsible for performing the query in its network or entering into an agreement with another entity to perform the queries on its behalf.

CITE:
➢ **Refer to cites above from Technical Requirement T1.TRQ.2-2001, Technical Requirement on Number Portability Switching Systems, Prepared by T1S1.6**

➢ Based on current end office switch functionality, if the originating switch has the 6-digit LNP trigger set on an intraLATA Toll NXX code, and the originating carrier is NOT the intraLATA Toll PIC for the calling party, the originating switch will NOT launch a query to the LNP database and will route the call unqueried to the calling party's intraLATA Toll PIC. Based on this established switch functionality, the LNPA WG believes the calling party's intraLATA Toll PIC is the N-1 carrier in this call scenario, similar to the IXC scenario.

❑ DEFAULT QUERIES (A.K.A. QUERY OF LAST RESORT OR DONOR SWITCH QUERIES)

PLEASE REFER TO NOTE AT THE BEGINNING OF THIS DOCUMENT.

INTERPRETATION:

- If an LNP query is not performed previously in the call path, the call will continue to route on the dialed digits until it could eventually reach the LERG-assigned switch for the dialed NPA-NXX. This will put that LERG-assignee in the position of performing a default LNP query if the dialed digits are within a portable NPA-NXX.

CITE:
- ➢ **Third Report and Order, FCC 98-82, ¶¶ 21, (1998) (Quoted from the Order):**
  21. In the *Second Report and Order*, the Commission determined that if an N-1 carrier arranges with another entity to perform queries on the carrier's behalf, that other entity may charge the N-1 carrier in accordance with requirements to be established in this *Third Report and Order*. The Commission also noted that when an N-1 carrier fails to ensure that a call is queried, the call might inadvertently be routed by default to the LEC that originally served the telephone number. If the number was ported, the LEC incurs costs in redirecting the call. This could happen, for example, if there is a technical failure in the N-1 carrier's ability to query, or if the N-1 carrier fails to ensure that its calls are queried, either through its own query capability or through an arrangement with another carrier or third-party. The Commission determined in the *Second Report and Order* that if a LEC performs queries on default-routed calls, the LEC may charge the N-1 carrier in accordance with requirements to be established in this *Third Report and Order*. The Commission determined further that it would "allow LECs to block default-routed calls, but only in specific circumstances when failure to do so is likely to impair network reliability." The Commission also said that it would "require LECs to apply this blocking standard to calls from all carriers on a nondiscriminatory basis."

INTERPRETATION:
- A carrier may bill the N-1 carrier for performing the default query when the N-1 carrier default routes a call unqueried.

CITE:
- ➢ **First Memorandum Opinion and Order, FCC 97-74, ¶¶ 125-126 (1997) (Quoted from the Order):**
  125. Discussion. We deny Pacific's request that we require all N-1 carriers, including interexchange carriers, to meet the implementation schedule we established for LECs. Such a requirement is not mandated by the 1996 Act, which subjects only LECs, not interexchange carriers engaged in the provision of interexchange service, to our number portability requirements. Moreover, petitioners have not demonstrated a need for us to impose such requirements under our independent rulemaking authority under Sections 1, 2, and 4(i) of the Communications Act of 1934, as amended. In that regard, we are not convinced that Pacific's hypothetical situation, whereby the N-1 carrier would not perform any queries and the original terminating LEC would thus have to

perform all the queries not performed by the originating LEC, will arise often. The industry already appears to favor using the N-1 scenario, under which the N-1 carrier performs the database query, as indicated in the majority of comments on call processing scenario issues received pursuant to the original Notice of Proposed Rulemaking. The vast majority of interLATA calls are routed through the major interexchange carriers, and the two largest interexchange carriers, at least, claim they plan to deploy portability as soon as possible. Therefore, most interLATA calls will be queried by the major interexchange carriers, not the incumbent LECs. Moreover, as we stated in the First Report & Order, we wish to allow carriers the flexibility to choose and negotiate among themselves which carrier shall perform the database query, according to what best suits their individual networks and business plans. Finally, we decline to address Pacific's argument that, if the terminating carrier is forced to perform queries, that would violate our fourth performance criterion. Since we are eliminating our fourth performance criterion, Pacific's argument is moot.

126. We clarify, however, per NYNEX's request, that if an N-1 carrier is designated to perform the query, and that N-1 carrier requires the original terminating LEC to perform the query, then the LEC may charge the N-1 carrier for performing the query, pursuant to guidelines the Commission will establish in the order addressing long-term number portability cost allocation and recovery.

➢ **Second Report and Order, FCC 97-289, ¶¶72-75 (1997) (Quoted from the Order):**
72. The *Architecture Task Force Report* considered and made recommendations on several issues which were not otherwise addressed in the *Technical & Operational Task Force Report*, including the following: (1) what entity shall be required to make the query to determine the service provider of the called party (N-1 Call Routing); and (2) whether carriers may block default routed calls (Default Routing). Because these two specific issues will have a significant impact on the efficiency and effectiveness of local number portability, each will be discussed more fully below.

73. <u>N-1 Call Routing.</u> The NANC recommends that the carrier in the call routing process immediately preceding the terminating carrier, designated the "N-1" carrier, be responsible for ensuring that database queries are performed. None of the parties commenting on the NANC's recommendations addresses this issue. We adopt the NANC's recommendation that the N-1 carrier be responsible for ensuring that databases are queried, as necessary, to effectuate number portability. The N-1 carrier can meet this obligation by either querying the number portability database itself or by arranging with another entity to perform database queries on behalf of the N-1 carrier.

74. In the *First Order on Reconsideration*, the Commission recognized that queries would most likely be performed by the N-1 carrier if the industry adopted the Location Routing Number solution. Industry consensus is that the Location Routing Number system is the best method to satisfy the Commission's performance criteria for long-term local number portability. The efficient provisioning of number portability requires that all carriers know who bears responsibility for performing queries, so that calls are not dropped because the carrier is uncertain who should perform the database query, and so that carriers can design their networks accordingly or arrange to have database queries performed by another entity. Consistent with our finding in the *First Order on Reconsideration*, we conclude that the Location Routing Number system functions best if the N-1 carrier bears responsibility for ensuring that the call routing query is performed. Under the Location Routing Number system, requiring call-terminating carriers to perform all queries may impose too great a burden on terminating LECs. In addition, obligating incumbent LECs to perform all call routing queries could impair network reliability.

75. We note, however, that the requirement that the N-1 carrier be responsible for ensuring completion of the database query applies only in the context of Location Routing Number as the long-term number portability solution. In the event that Location Routing Number is supplanted by another method of providing long-term number portability, we may modify the call routing process as necessary. We note further that if the N-1 carrier does not perform the query, but rather relies on some other entity to perform the query, that other entity may charge the N-1 carrier, in accordance with guidelines the Commission will establish to govern long-term number portability cost allocation and recovery.

INTERPRETATION:
- 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. (This is a direct quote from the Architecture Plan.)

CITE:
➤ **Second Report and Order, FCC 97-289, ¶¶76-78 (1997) (Quoted from Order):**
   76. Default Routing. The NANC recommends that we permit carriers to block "default routed calls" coming into their networks. A "default routed call" situation would occur in a Location Routing Number system as follows: when a call is made to a telephone number in an exchange with any ported numbers, the N-1 carrier (or its contracted entity) queries a local Service Management System database to determine if the called number has been ported. If the N-1 carrier fails to perform the query, the call is routed, *by default*, to the LEC that originally serviced the telephone number. The original LEC, which may or

may not still be serving the called number, can either query the local Service Management System and complete the call, or "block" the call, sending a message back to the caller that the call cannot be delivered. The NANC found that compelling LECs to query all default routed calls could impair network reliability, and that allowing carriers to block default routed calls coming into their networks is necessary to protect against overload or congestion that could result from an inordinate number of calls being routed by default to the original LEC. In light of these network reliability concerns, we will allow LECs to block default routed calls, but only in specific circumstances when failure to do so is likely to impair network reliability.

77. CTIA argues that the NANC's default routing recommendation will significantly, and negatively, affect CMRS providers. According to CTIA, even if number portability is limited initially to the wireline network, CMRS providers must still modify their method of routing calls from their customers to wireline customers who have ported their numbers. During the period prior to December 31, 1998, the date by which CMRS providers are required to have the capability to deliver calls to ported numbers, CMRS providers that have not yet implemented such capability will be required to rely on default routing to complete subscriber calls. CTIA argues that default routed calls should not be blocked, because "[a]llowing incumbent LECs to block default routed calls when they may be acting as the only means of conducting a query and, thus, allowing a call to be completed, would discriminate against wireless carriers . . . ."

78. In the *First Report & Order*, we required CMRS providers to have the capability of querying number portability database systems in order to deliver calls from their networks to ported numbers anywhere in the country by December 31, 1998. We established this deadline so that CMRS providers would have the ability to route calls from their customers to a wireline customer who has ported his or her number, by the time a substantial number of wireline customers have the ability to port their numbers between wireline carriers. Under this deployment schedule, the initial deployment of long-term local number portability for wireline carriers will occur prior to the date by which CMRS providers must be able to perform database queries. During this period, CMRS providers are not obligated by our rules to perform call routing queries or to arrange for other entities to perform queries on their behalf. Thus, if wireline LECs are allowed to block default routed calls, calls originating on wireless networks (to the extent that the CMRS provider is the N-1 carrier) could be blocked. For this reason, we will only allow LECs to block default routed calls when performing database queries on default routed calls is likely to impair network reliability. We also require LECs to apply this blocking standard to calls from all carriers on a nondiscriminatory basis. In the event that a CMRS or other service provider believes that a LEC is blocking calls under circumstances unlikely to impair network reliability, such service provider may bring the issue before the NANC. We direct the NANC

9

==to act expeditiously on these issues. Although CMRS providers are not responsible for querying calls until December 31, 1998, we urge them to make arrangements with LECs as soon as possible to ensure that their calls are not blocked. We note that if a LEC performs database queries on default routed calls, the LEC may charge the N-1 carrier, pursuant to guidelines the Commission will establish regarding long-term number portability cost allocation and recovery.==

➢ **NORTH AMERICAN NUMBERING COUNCIL ARCHITECTURE & ADMINISTRATIVE PLAN FOR LOCAL NUMBER PORTABILITY (Quoted from the document):**
   Par. 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."

INTERPRETATION:
* Regardless of the status of a carrier's obligation to provide number portability, e.g., has been granted a waiver or is operating outside a mandated area, all carriers have the duty to route calls to ported numbers.

CITE:
➢ **FCC NOTICE OF APPARENT LIABILITY FOR FORFEITURE, DA 04-1304, RELEASED MAY 13, 2004, ¶¶ 4, 13 (Quoted from the Notice):**
   4. Regardless of the status of a carrier's obligation to provide number portability, all carriers have the duty to *route* calls to ported numbers. In other words, carriers must ensure that their call routing procedures do not result in dropped calls to ported numbers. In this regard, the Commission stated clearly:

   > We emphasize that a carrier operating a non-portability-capable switch must still properly route calls originated by customers served by that switch to ported numbers. When the switch operated by the carrier designated to perform the number portability database query is non-portability-capable, that carrier could either send it to a portability-capable switch operated by that carrier to do the database query, or enter into an arrangement with another carrier to do the query.

   13. The Commission's rules are clear regarding the obligation to route calls and to query the number portability database. Since the *Second Report and Order* in 1997, the Commission has required the N-1 carrier to ensure that the number portability database query is performed. No exception exists for non-LNP-capable carriers.

❑   EXTENDED AREA SERVICE (EAS) CALL:

LNPA CONSENSUS:
- On intraLATA calls to EAS codes, the originating carrier is the N-1 carrier and is responsible for the query on all calls to portable EAS codes.

- In cases where the originating carrier's switch supports the function to route interLATA EAS calls to ported numbers as a local call via an interLATA LRN, and trunking to all potential final destinations (or their POIs in the EAS area) have been established, the query will be performed in the originating switch.

- On interLATA calls to EAS codes where the originating carrier does not support the function to route the call as a local call to ported numbers via an interLATA LRN, the donor carrier in the terminating LATA performs the role of the N-1 carrier (i.e does the database dip and routes the call to the switch serving the ported number). In this instance, the donor carrier will perform the LNP query in the terminating LATA in either that carrier's donor end office or terminating LATA tandem, whichever terminates trunks from the originating LATA on calls to EAS codes. (Note that the terminating LATA tandem case is only applicable if the donor carrier has a tandem in the terminating LATA, and all switches in the originating LATA that can place local calls to the EAS codes in the terminating LATA have trunking to the tandem in the terminating LATA per mutually accepted interconnect agreements.) The originating carrier is responsible for compensation to the donor carrier for performing the N-1 database dip function.

The donor carrier in the terminating LATA may charge the originating carrier for transit (consisting of transport and switching) of the call.

This language takes into account current technical limitations and regulatory constraints as well as existing configuration issues. Carriers may consider making modifications to their querying and routing arrangements as technology upgrades and changes to interconnecting configurations permit.