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April 24, 1996

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Mr. Jason Karp
Policy and Program Planning Division
Common Carrier Bureau
Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

Re: Telephone Number Portability, CC Docket No. 95-116

Dear Mr. Karp,

This letter will respond to your request to Karen Weis, Julie Ladieu-Walton, and Patricia VanMidde of AT&T for further information in connection with the above-referenced docket. AT&T welcomes the opportunity to provide further information and guidance on the implementation of a permanent number portability solution. Under the Telecommunications Act of 1996, the Commission is required to adopt regulations that will result in the prompt nationwide deployment of statutorily-defined number portability for local exchange customers. AT&T believes that the FCC can and should meet this requirement by issuing an order designating the Location Routing Number ("LRN") solution as the sole, permanent number portability solution and setting forth a detailed implementation schedule for its deployment.

First, this letter will elaborate on the implementation schedule for the industry-consensus permanent number portability solution - the Location Routing Number ("LRN") solution - previously described in AT&T's Comments in this proceeding. Second, this letter will explain the delays, inefficiencies, and anti-competitive effects that would result from proposals which would allow various carriers to select the solutions to be used to support number portability in their networks. In addition, this letter will address the latest in a series of proposed alternative solutions, the Query on Release ("QOR") call model. This additional information about the LRN implementation schedule, the "Carrier's Choice" approach, and QOR, will buttress the already convincing record that demonstrates LRN is the sole solution that meets the statutory requirement for local number portability.

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Recycled Paper

LRN Implementation Schedule

AT&T's Comments proposed that LRN deployment begin in third quarter 1997. According to AT&T's schedule, LRN could be deployed in a total of 84 MSAs by the third quarter 1998. Under AT&T's proposal, implementation would begin in third quarter 1997 in one MSA in each of two states -- Illinois and Georgia -- where state public utility commissions have ordered that LRN be implemented as the permanent number portability solution. None of the parties filing Reply Comments on April 5, 1996, in the aforementioned docket stated any objections to AT&T's proposed schedule.

AT&T believes that this schedule could be implemented even more aggressively simply by extending it to begin in third quarter 1997 in one state in each of the seven RBOC regions. For example, the Commission could require LRN to be introduced in one MSA in each of the seven RBOC service regions during third quarter 1997, following a schedule like those adopted by the Illinois and Georgia state commissions. The Commission could then further require the introduction of LRN in at least three additional MSAs per state during both fourth quarter 1997 and first quarter 1998. This slow "ramp up" in these early quarters would allow a careful, controlled introduction of portability and the regional service management systems ("SMS"). Once this phase is completed, the Commission could require LRN to be deployed in at least four additional MSAs during both second and third quarters 1998. This plan would achieve a deployment of LRN in a total of 7 MSAs in third quarter 1997, 28 MSAs in fourth quarter 1997, 49 MSAs in first quarter 1998, 77 MSAs in second quarter 1998, and 105 MSAs in third quarter 1998.

This proposal is achievable because the switch generic update required for the LRN application on 5ESS switches will be available in December, 1996. This means that deployment of the switch generic can begin in first quarter 1997 in those offices in which the LRN application is scheduled to be installed in third quarter 1997. Likewise, the switch generic installations on the remaining vendors' switches may proceed two quarters ahead of the application installations throughout the deployment schedule. Attachment 1 depicts AT&T's proposal of the LRN regional timeline.[1]

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[1] AT&T's schedule addresses implementation of number portability for POTS local exchange services. The Commission does not have an adequate record for implementation of number portability for some services, such as 500 service and 900 service. In order to develop an implementation schedule for portability for these services, the Commission would at a minimum require an accepted architecture, an accepted call model, and industry examination of the technical and logistical issues involved in implementing portability for these services. No such information has been provided to the Commission, and therefore AT&T does not address implementation of portability for these services here.

"Carrier's Choice"

A few parties (almost exclusively incumbent local exchange carriers) have suggested that each carrier be permitted to select its own portability solution, so long as it provides certain specified routing information and meets certain quality standards. The "Carrier's Choice" proposal will delay the implementation of a permanent number portability solution, impact competing carrier's networks, and deny consumers the seamless high quality service they have come to expect. Thus, the "Carrier's Choice" approach is not simply a matter of carrier freedom, but is fundamentally flawed, and could prevent the Commission from accomplishing the stated goals of the Telecommunications Act of 1996.

"Carrier's Choice" Will Cause Unnecessary and Anti-Competitive Delay

The most important effect of the Carrier Choice approach is that it will significantly delay the implementation of number portability. As the overwhelming majority of comments have shown, and as the Illinois and Georgia commissions have found, LRN is a permanent solution that can be implemented in selected areas by third quarter 1997, and extended to additional areas immediately thereafter. These state commissions recognize that LRN -- and LRN alone -- has been demonstrated to fully and fairly support service provider portability for all carriers, including support of operator services, 911/E911 functions, and "vertical" features such as call forwarding. LRN's capabilities are the result of two years of intensive industry scrutiny in both informal and formal fora and continued technical refinement by proponents and vendors.

As a result of this time and resource intensive process, all necessary LRN software (both generic and application) will be available for installation and use in all major vendor switches by second quarter 1997, and all additional signaling software and hardware will be available by May 1997. Therefore, LRN is a permanent portability solution that is technically feasible, and can be scheduled for deployment by a date certain in an order issued immediately by the Commission. Such Commission action would simply be building on the work of state commissions that have issued orders for the deployment of LRN -- and the availability of number portability -- by third quarter 1997.

Selecting "Carrier's Choice" as an option would prevent the FCC from ordering a specific implementation schedule. It is clear that the use of alternative solutions by carriers will require time: vendors have committed to firm time frames only for LRN, and the only current alternative -- Pacific Bell's QOR proposal -- was submitted to vendors on March 18, 1996, just six weeks ago. All of the industry examination, carrier input, architecture refinement, generic and application software development that was necessary for LRN would need to be repeated for QOR. An optimistic estimate of general availability of switch software for QOR would be no earlier than first quarter

1998,[2] leaving aside further delays that could well result from concerns raised by industry participants.

If all carriers were permitted to develop their own "solutions," number portability would likely be delayed to accommodate development of QOR for PacBell, or any other alternative solution that a carrier deems most appropriate for its network.[3] There is simply no basis for the Commission to put off selecting a permanent portability solution when the Act establishes that the Commission must, to the extent possible, take definitive action on number portability within six months.[4] The extensive record developed in this docket and in the states makes such action on LRN possible immediately, and demonstrates further that deployment of LRN is necessary to promote local exchange competition and fulfill the Act's requirements.

"Carrier's Choice" Would Raise Significant Network Interoperability Issues

"Carrier's Choice" would result in multiple carriers utilizing varying solutions and could threaten the seamless and efficient interoperability of the nation's telecommunications networks. As a result, the implementation, coordination, and testing of these individual carrier solutions -- which would almost certainly become operational at different times -- would have to be managed carefully.[5] The management process would be substantially complicated by multiple solutions. If the Commission oversaw these processes, its work would be significantly and unnecessarily increased. If state commissions were permitted to resolve these issues, the potential for inconsistent technical standards would be multiplied. Moreover, all of the logistical issues -- provisioning, billing, operations systems, testing -- that have been addressed for LRN[6] would be resurrected for resolution

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[2] If stable switch requirements were provided for QOR today, this schedule would push QOR availability into 1998, assuming that the more complicated QOR scheme could be accommodated as quickly as that proposed for PacBell's earlier (and now unsupported) release to pivot ("RTP") solution.

[3] Indeed, there would appear to be no way for the Commission to prevent potentially unending delay under this approach except to establish a "cut off" date, which is at odds with the premise of "Carrier's Choice" that carriers should be afforded an opportunity to develop their own solutions. The only logical "cut-off" date is the six months prescribed by the Act, and LRN is the only solution sufficient under the Act that is available to meet this deadline.

[4] 47 U.S.C. § 251(d).

[5] Indeed, it is truly surprising that incumbent exchange carriers that suggest (incorrectly) that there are significant implementation issues for LRN, then advocate that even more portability solutions should be thrown into the implementation mix.

[6] The state commissions in Georgia and Illinois have addressed and accounted for these issues in their LRN implementation schedules. Georgia Number Portability, Docket No. 5840-U, Selection Committee Report ("Georgia Selection Report") to the Georgia Public

again, this time with multiple call models. None of this would promote the development of a rapid, efficient nationwide telecommunications infrastructure, which is precisely why the Commission should choose the LRN solution and ensure that it is implemented in a uniform and fair manner nationwide.

"Carrier's Choice" also raises significant issues regarding interoperability. Even if implementation problems were surmounted, once different solutions were up and running, their varying nature and requirements would likely impede the interoperation of carrier networks. For example, use of the QOR solution by one carrier, (discussed in greater detail, infra), would raise issues for all carriers in an environment in which LRN is used by some other carriers. As explained more fully below, QOR is based on a call routing attempt to a "ported" customer's previous serving switch. QOR requires that network signaling contain SS-7 signaling messages that indicate a call attempt has been made to the switch that previously served the ported customer. This information would be contained in the SS-7 Forward Call Indicator ("FCI") parameter, as a bit-segment referred to as a "Routing Attempt Indicator." The specifications provided for QOR state that QOR routing attempts should not be made to switches that are not able to recognize this "Routing Attempt Indicator."[7]

No provision has been made, in the specifications or elsewhere, to ensure that such routing attempts[8] will not take place or if they do, that they will not inadvertently be directed to alternative carriers using LRN. Thus, not only will QOR carriers be required to address and resolve these issues, so will all carriers using LRN. LRN does not raise a similar problem because it does not use Routing Attempt Indicators.

This interoperability problem is another reason that "Carrier's Choice" is not simply a matter of individual carrier freedom because it impacts other carriers' networks and the development of viable local competition. These problems also demonstrate that multiple solutions force some carriers to rely on the efficiency of other carriers' solutions and network operations, reducing all carriers to the performance level of the most inefficient carrier.

Service Commission ("Georgia PSC"), January 8, 1996; Joint Petition for approval of Stipulation and Agreement Relating to the Implementation of Local Number Portability, Order, Illinois commerce Commission, Dkt. 96-0089, March 15, 1996.

[7] Nortel Technology, Query on Release Specification Document, Draft Version 3.0, §§ 6.0 and 7.0, March 20, 1996. A copy of this document is attached.

[8] Such routing might occur where an incumbent does not properly update the customer and routing information in its switches and databases, such that its network does not recognize that the called number belongs to an alternative carrier using LRN.

Query on Release (QOR)

The Carrier's Choice approach is being used by a few incumbents to promote a specific proposal, QOR, as a viable alternative number portability solution. QOR is not a permanent solution and does not fulfill the Act's requirements for number portability. In fact, QOR is an interim solution that eventually would be replaced by LRN. Moreover, short-term cost reductions alleged under QOR have not been documented and do not appear significant in all events. Finally, cost reductions under QOR, if any exist, would disappear when the few carriers using QOR deploy LRN as their permanent solution.

QOR Is Not A Permanent Portability Solution

By design, QOR is intended to serve as an interim measure, transitional to a permanent number portability solution,[9] because it is unable to support number portability in an environment in which a large number of telephone numbers have been "ported."[10] More significantly, QOR is designed to be replaced by LRN.[11] If the Commission delays implementation of LRN to allow for development of QOR, in effect, it would be postponing the deployment of a currently feasible permanent solution in order to permit some carriers to develop an interim solution -- an interim solution which will later be replaced by the permanent solution that was available from the start.

The inevitable replacement of QOR by LRN also has implications for QOR's purported justification. Some carriers, for example, have suggested that QOR will reduce their costs. While AT&T will discuss the merits of these cost arguments in greater detail, infra, it is sufficient to note that it is hard, if not impossible, to understand how incumbent carriers will save money by implementing QOR and then LRN, rather than simply implementing LRN in the first instance.

QOR Will Not Operate In A Competitively Neutral Manner

QOR will not ensure a "level playing field" for all carriers seeking to provide local exchange service. QOR is a proposal in which a switch in the call path (the "pivot switch") signals the end office to which the NPA-NXX of the called number was originally assigned, and reserves a call path from the calling party to that end office. If

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[9] See Letter ("QOR Letter") to D. Smith, Vice President-Sales, Ericsson, et. al. from J.W. Seaholz, Chief Technology Officer, Bell Atlantic, et. al., dated March 18, 1996 ("the core of this work will be to provide an analysis on the technical and economic feasibility of implementing QOR and transitioning at some time to an N-1 (LRN) solution.").

[10] See Nortel Technology, Query on Release Feature Specification Document, draft version 0.3, dated March 20, 1996 ("QOR for portable NPA-NXXs in which a large number of DNs (dialed numbers) have ported is discouraged.")

[11] See QOR Letter. A detailed discussion of QOR follows, infra.

the number has not been "ported," the end office will signal back to the "pivot switch," and the reserved call path will be utilized to complete the call. If, on the other hand, the number has been "ported," the end office will return a "failure" signaling message to the "pivot switch," the reserved call path will be taken down, and a database query will be performed to identify the LRN of the customer's serving end office. At this point, the call will be routed and completed using the LRN call processing model. The QOR call model is thus a combination of PacBell's earlier RTP "solution" and LRN.[12]

QOR is based on the assumption that virtually all local exchange customers will remain with the incumbent exchange carrier. Calls to customers who have not "ported" their numbers would be processed much as they are today. Calls to customers who have switched carriers, however, would always be subject to additional call processing steps that other calls would not be (most significantly, the failed attempt to reach the customer at his prior serving switch). These additional call processing steps would be consequential. Based on typical performance of SS-7 signaling functions, AT&T estimates that QOR would impose an incremental post-dial delay of more than one second on calls to "ported" numbers, as compared to calls to "non-ported" customers.[13] As a result, QOR would not ensure that customers would have the ability "to retain, at the same location, existing telecommunications numbers without the impairment of quality, reliability, or convenience when switching from one telecommunications carrier to another,"[14] as required by the Telecommunications Act. For this reason alone, the Commission should reject attempts to delay implementation of LRN to allow for development of QOR.[15]

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[12] Attachment 2 illustrates call flows for LRN, RTP, and QOR, respectively.

[13] This one second difference represents over 40% of the total mean time permitted for 800 service calls. Attachment 3 shows the differential post-dial delays caused by QOR and RTP. Attachment 3 also shows that LRN will result in significantly smaller and uniform post-dial delay for calls to "portable" NXXs.

[14] 47 U.S.C. § 153 (a)(46).

[15] LRN will provide such capability to telecommunications customers as the Act requires. First, queries performed under LRN will not add appreciable time to call processing in contrast to QOR . As Attachment 3 shows, LRN queries will increase total call processing less than one-half second on those calls on which they are performed. Moreover, despite the persistent misrepresentations of some commentators, LRN does not require a query on every call that exits an LRN carrier's network or an LRN-capable switch. See Number Portability, A Report of the Industry Numbering Committee, Proposed Final Draft, ¶¶ 13.1.3.3.1. and 13.1.3.3.2. LRN will result in queries only on calls to NXXs that have been deemed "portable," meaning that numbers in that NXX block can be ported. Thus, LRN call processing steps will depend not on whether the subscriber has "ported" his number, but on the NXX block in which the customer's resides; some customers in these blocks will port while others will not. Under LRN, call

Moreover, the Commission must reject portability solutions that would disadvantage alternative carriers. Increased call completion time on calls to alternative carrier's networks will likely be perceived (incorrectly) as reflecting an inferior quality of service provided by alternative carriers. This will serve as an automatic negative "advertisement" to those customers remaining with incumbent carriers who might otherwise sample alternative exchange service. Further, it is entirely possible, indeed likely, that incumbent carriers will seek to exploit call completion differentials, of whatever magnitude, in claims of superior service. There is no reason for the Commission to create this advantage for incumbent exchange carriers.

QOR Cost Savings Are Not Verifiable and May Be Illusory

As noted above, the primary argument offered in support of QOR is that it will enable some carriers to reduce their costs. There is no reason to conclude that QOR will result in dramatic cost savings during any period. In addition, the Commission should recognize that whatever cost reductions QOR can generate will be limited to the interim period of its deployment, and that such cost reductions will essentially disappear when incumbent carriers upgrade to LRN.[16]

The primary cost savings that incumbents have attempted to identify for QOR is a reduction in signaling costs. It is argued that with QOR, the incumbent will not need to purchase as many Signal Control Point ("SCPs") to support number portability. When compared to LRN, QOR does not appear likely to result in a dramatic reduction of the SCPs needed in the initial phases of number portability. Industry estimates indicate that, under LRN, one SCP pair will be required for each 1,000,000 subscriber lines that are deemed portable. With just 4 SCP pairs, an incumbent could support portability of 4,000,000 subscriber lines. In California, 4 PacBell SCP pairs would allow approximately one quarter of all subscribers to benefit from portability; further, because GTE also provides service in California, deployment of 2 SCPs by it would increase this number to 6,000,000, or one-third of all subscribers. This would afford substantial coverage for the initial phase of LRN implementation under any schedule.

These costs would not appear to differ significantly using QOR. Under QOR, each incumbent would need to deploy at least one SCP pair (assuming that the pair could perform all necessary queries). At $2.5 million per SCP pair, the cost difference for PacBell during the initial phase of portability under the two solutions would total at most $7.5 million, and for GTE would total at most $2.5 million. In context, these are not substantial costs; they represent charges of approximately 50 cents per line for PacBell and less than $1 per line for GTE. Spread over the period from second quarter 1996 to

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processing will not depend entirely on whether the customer has chosen to stay with the incumbent, unlike QOR.

[16] These savings would likely be offset by the costs of implementing successive number portability solutions.

third quarter 1998, this cost would represent less than two cents per subscriber line for PacBell and no more than four cents per line for GTE.

Moreover, this cost difference disappears completely when the transition from QOR to LRN subsequently occurs. Each incumbent exchange carrier will then implement LRN and will deploy the SCPs and other signaling resources to support it. The incumbent only will have postponed this investment, and will, in fact, incur additional costs that would not otherwise have been incurred if it had implemented LRN initially.

To a lesser degree, incumbents have suggested that QOR will reduce costs by limiting the number of queries needed to support number portability. Many fewer calls require queries than might be assumed. Neither QOR nor LRN require incumbent exchange carrier queries on intraswitch calls or on interLATA calls. Together, these calls comprise 46% of all calls.[17] QOR thus has the potential to reduce costs for incumbents on the remaining 54% of call attempts, which are interswitch, intraLATA calls.[18] Under LRN, queries are not required unless the called number is in a portable NPA-NXX. Thus, if half the NPA-NXXs in a service area are deemed portable (a significant number in the initial stages of portability), then only half of interswitch intraLATA calls would require a query. QOR would then reduce query costs on only 27% of all calls.

Importantly, incumbent carriers have not seriously attempted to quantify the savings, either on a per query or an aggregated basis, that will result from any averted queries. It is thus not possible to estimate the savings value that QOR will provide in this regard. Conversely, and just as important, incumbent carriers have not seriously attempted to quantify the additional costs associated with the unnecessary reservation of call paths on calls to "ported" numbers under QOR. There is thus no way to determine whether the savings effect outweighs the cost effect.

If you have any questions, please do not hesitate to call me.

Sincerely,

Billy J. Brady

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[17] Intraswitch calls account for approximately 32% of all attempts; interLATA calls account for 14% of all attempts.

[18] With the introduction in the states of intraLATA toll competition, increasingly, IXCs are handling more intraLATA toll calls; therefore, less than 54% of all call attempts would be candidates for cost savings through QOR.

LRN Regional Timeline

2Q96	3Q96	4Q96	1Q97	2Q97	3Q97	4Q97	1Q98	2Q98	3Q98
FCC Order									

Each MSA Installation Comprises Approx. 25 Switches: 20 ILEC & 5 CLEC

Network Upgrades

	MSA Impl. Plan	MSA Test Plan	Install Generic 1 MSA	Install Generic 3 MSAs	Install Generic 3 MSAs	Install Generic 4 MSAs	Install Generic 4 MSAs	Install Generic 4 MSAs	Install Generic 4 MSAs
					Install LRN App 1 MSA	Install LRN App 3 MSAs	Install LRN App 3 MSAs	Install LRN App 4 MSAs	Install LRN App 4 MSAs

SMS

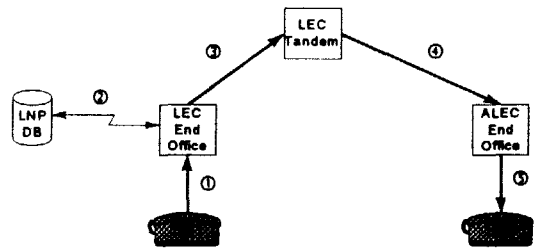
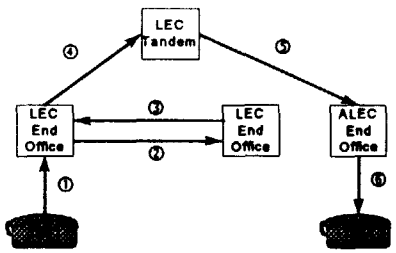
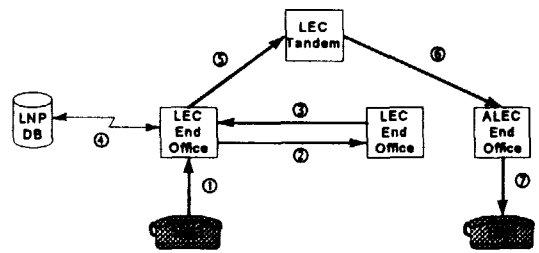
Review IL RFP

Issue Nat'l. RFP & Select Vendor

Develop Req'ts. ← Build SMS → Test SMS

By End 3Q98, LRN in 15 MSAs per Region, Total 105 Nationwide

Call Flows for Ported Numbers

Call Model	Description	Call Flow Diagram	Incremental Post Dial Delay (PDD)
LRN (Location Routing Number)	LRN Returned from Database Query		475 ms
RTP (Release to Pivot)	LRN Returned from Release Switch		750 ms
QOR (Query on Release)	LRN Not Returned from Release Switch, then LRN Returned from Database Query		> 1 second

Post Dial Delay for LRN, RTP, and QOR Call Models

LRN Post Dial Delay	
Formulate LRN Query Message and Send to Database	100ms
Transport LRN Query Message through STP to Database	50ms
Database Query Processing	125ms
Transport LRN Response Message through STP to Switch	50ms
Process Response Message and Formulate Routing Message	150ms
Total LRN Post Dial Delay	475ms

Release to Pivot Post Dial Delay	
Formulate Initial Routing Message and Send to Release Switch	100ms
Transport Routing Message to the Release Switch	50ms
Process Routing Msg., Determine LRN and Formulate Release Message	400ms
Transport Release Message to the Pivot Switch	50ms
Process Release Message and Formulate New Routing Message	150ms
Total Release To Pivot Post Dial Delay	750ms

This is an optimal scenario for RTP by assuming direct connectivity between the Release and Pivot switches. Each additional switch in the call path would introduce at least an additional 50ms increase in Post Dial Delay.

Query on Release Post Dial Delay	
RTP less Process Release Message and Formulate New Routing Message	600ms
LRN	475ms
Total Query on Release Post Dial Delay	1075ms

As is the case for RTP, this scenario is also optimal for QOR. Additional switches in the call path are likely and will further increase the PDD.

Comparision of LRN and QOR Post Dial Delays

The following table shows the PDD comparison for the LRN and QOR call models when the customer of an incumbent calls another incumbent's customer vs. a new entrant's customer who has ported his or her number.

Incumbent's Customer Calls Customer of:	Incremental PDD for: LRN	QOR
Incumbent	475 ms	negligible
New Entrant	475 ms	greater than 1 sec

DRAFT

Version 0.3

Query On Release

FEATURE SPECIFICATION DOCUMENT

MARCH 20, 1996

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1.0 Introduction

Query on Release (QoR) is an enhancement that minimizes the number of database queries demanded by an AIN- or IN-based solution to LNP. In particular, QoR eliminates the need to query the LNP SCP on calls to non-ported DNs within a portable NPA-NXX. The Query on Release capability described in this document supplements the LRN capability defined in FSD 30-12-0001, Generic Switching and Signaling Requirements for Number Portability.

QoR is engaged by the (N-1) switch when it receives a call to a DN in a portable NPA-NXX. QoR routes the call over ISUP facilities to the donor switch instead of launching an LNP query. If the called DN has not ported, the call terminates at the donor switch; otherwise, the call is released back to the switch undertaking QoR. This switch then performs the LNP query. Standard LNP processing prevails thereafter.

2.0 Background

QoR enhances the capabilities described in FSD 30-12-0001, Generic Switching and Signaling Requirements for Number Portability. QoR is not a stand-alone capability; it is for use with LNP. An office capable of QoR is, by implication, capable of LNP.

QoR is an optional and administrable capability; it can be enabled or disabled at each QoR-capable switch for each portable NPA-NXX.

QoR can be initiated by any QoR-capable office. Intermediate and terminating switches can distinguish a QoR routing attempt from a regular call-attempt by means of a new *Routing Attempt* indicator included in the ISUP IAM FCI parameter. The *Routing Attempt* indicator is a companion to the *Translated Called Number Indicator* field:

¥ the *Translated Called Number Indicator* field is set in the ISUP IAM FCI during a QoR routing attempt to prevent succeeding switches from launching an LNP query (or initiating a nested QoR routing attempt);

¥ the *Routing Attempt* indicator is set in the ISUP IAM FCI during a QoR routing attempt to coerce succeeding switches to release the ISUP connection if the QoR routing attempt fails to locate the called DN at the donor switch.

QoR routing attempts should not be directed toward intermediate and donor switches that lack the software necessary to recognize the new *Routing Attempt* indicator in the ISUP IAM FCI, unless these switches can be administered to release the ISUP connection by other means if the QoR routing attempt fails.

QoR is most effective when the percentage of DNs in a portable NPA-NXX that have moved off the donor switch is low to moderate Ñ because in this case the probability of finding the DN at the donor switch during the QoR routing attempt is high. The use of

QoR for portable NPA-NXXs in which a large number of DNs have ported is discouraged.

QoR relies on ISUPÕs ability to RELease connections back to the initiating switch when a routing attempt fails to find the called DN at the donor switch. Should a routing attempt encounter MF interworking, the initiating switch has no choice but to discontinue QoR, since the MF connection cannot be collapsed. In this case, the switch receiving the routing attempt over the MF facility will complete the call successfully, but perhaps at the cost of trunk tromboning. The use of QoR at a particular switch for a given NPA-NXX is discouraged if ISUP routing to the donor switch is not available.

3.0 User Perspective

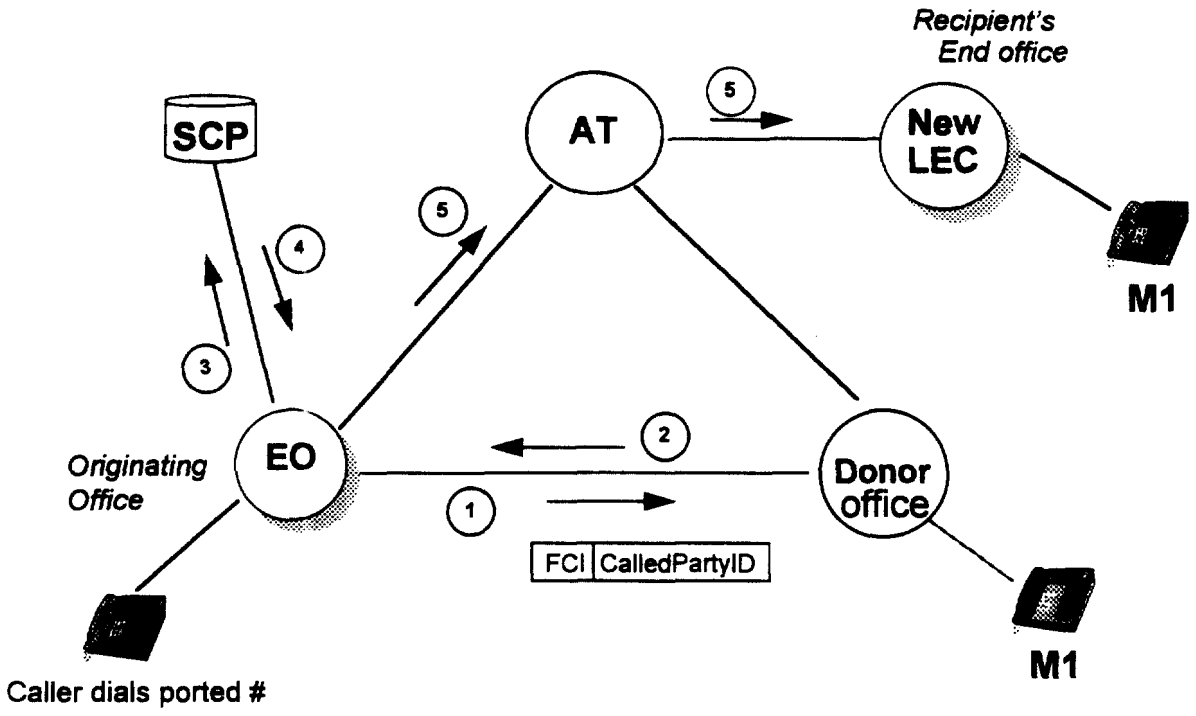
QoR is a system-initiated capability; the end-user cannot explicitly activate QoR, and is unaware of QoRÕs operation.

QoR does not interfere with the originatorÕs ability to designate an interexchange carrier for a call; QoR adheres to the (N-1)-carrier paradigm for LNP queries.

4.0 Call Flows - Network Views

Figure 1 below depicts the call flow for a number portability scenario with the Query on Release enhancement.

Figure 1: Basic Call Flow Network View



In the above network scenario

1. The originating End Office attempts to set up the call to the donor switch by sending an ISUP IAM message. The dialed number and the FCI are sent to the donor switch as part of the normal call set up
   - the FCI prevents the receiving switch from launching an LNP query
   - for non-ported numbers, the call is completed
   If the DN is not found at the donor switch, the call is released.
2. A Release with cause value = unallocated DN is returned to the originating switch.
3. The LNP trigger is hit once Query-on-Release is completed for a ported number, i.e., upon receiving a Release message with cause = unallocated DN, the originating office sends a query to the LNP SCP.
4. The SCP returns the Location Routing Number (LRN) of the Dialed Number.
5. The originating office routes the call to the recipient's end office.

5.0 Feature Operation at Initiating Switch

5.1 Initiation

QoR activates at the Information Analyzed Detection Point (DP) of the Originating Basic Call Model. Subject to the escape criteria in section 5.2, QoR should be engaged on any call to a DN in a portable NPA-NXX against which QoR is enabled.

5.2 Escape Criteria

QoR shall apply the same escape criteria as the LRN trigger. These escape criteria are summarized below:

QoR shall not be initiated if the call can be completed intraswitch (i.e., if the called DN is equipped on the same switch that contains the originating call).

QoR shall not be initiated if the call is interLATA, or the call is intraLATA toll and the current service provider is not the designated carrier for the call. Instead, the call should be routed to the appropriate interexchange carrier

QoR shall not be initiated if the call requires operator handling (e.g.,on 0-, 0+ or coin calls). Instead, the call should be routed to the appropriate operator service center.

QoR shall not be initiated if the call originates from an ISUP trunk and the IAM message contains an FCI parameter within which the Translated Called Number Indicator Field is set to Number Translated. (This would indicate that a previous switch has either performed an LNP query or is undertaking a QoR routing attempt.)

5.3 Precedence

Switch-based features operating within the Analyze Information Point In Call (PIC) take precedence over QoR:

¥ QoR should not be initiated if the call is blocked because of code- or toll-restrictions;
¥ QoR should not be initiated if the call encounters code- or toll-diversion;
¥ QoR should not be initiated if the call is blocked by station dialling restrictions;
¥ QoR should not be initiated if the call encounters network management code blocking;
¥ QoR should operate normally during Automatic CallBack and Recall attempts once TCAP processing indicates that the call can proceed.

AIN PODP triggers at the Information Analyzed DP take precedence over QoR. QoR may be initiated after a PODP trigger if the switch receives a *Continue* operation in response to the AIN query. Similarly, QoR may be initiated if the switch receives an *Analyze Route* operation in response to a PODP query, the *Analyze Route* operation indicates LEC routing or does not include carrier information, and the *Analyze Route* operation supplies a new Called DN with an NPA-NXX eligible for QoR.

QoR takes precedence over LNP triggers including those at the Information Analyzed DP. The LNP trigger may be encountered should the QoR routing attempt prove unsuccessful. (If convenient, the QoR can be conceptualized as an option associated with the six-digit AIN LNP trigger definition.)

QoR takes precedence over IN LNP triggers. The IN LNP trigger may be encountered subsequently should the QoR routing attempt prove unsuccessful. If convenient, the QoR can be conceptualized as an option associated with the six-digit IN LNP trigger definition.

QoR takes precedence over LNP triggers at the Termination Attempt DP, i.e., QoR takes precedence over the OCT LNP trigger

5.4 Operation

QoRÕs operation is described in three parts:

¥ launching the routing attempt to the donor switch;
¥ receiving a call-proceeding indication; and
¥ receiving a release indication.

5.4.1 QoR routes to donor switch

Once activated, QoR selects a route to the donor switch associated with the called DN.

QoR should choose the same route as would be selected when the switch processes an LNP response message for a non-ported DN in the same NPA-NXX (i.e., were QoR disabled for the NPA-NXX in question, routing would proceed identically on receipt of an LNP response message without an LRN).

As an objective, QoR should ensure that the selected route references ISUP facilities. If the QoR routing attempt egresses from the initiating switch over MF facilities, QoR terminates (as the MF connection cannot be released from the call path) and the call proceeds as a regular MF trunk call. The remaining requirements in this section assume that the routing attempt is undertaken over ISUP facilities. Refer to Section 8 for more information on MF interworking.

For Originating Call Model LNP triggers, QoR bypasses these triggers at the Information Analyzed DP. Call-processing resumes at the Select Route PIC using the route supplied by QoR.

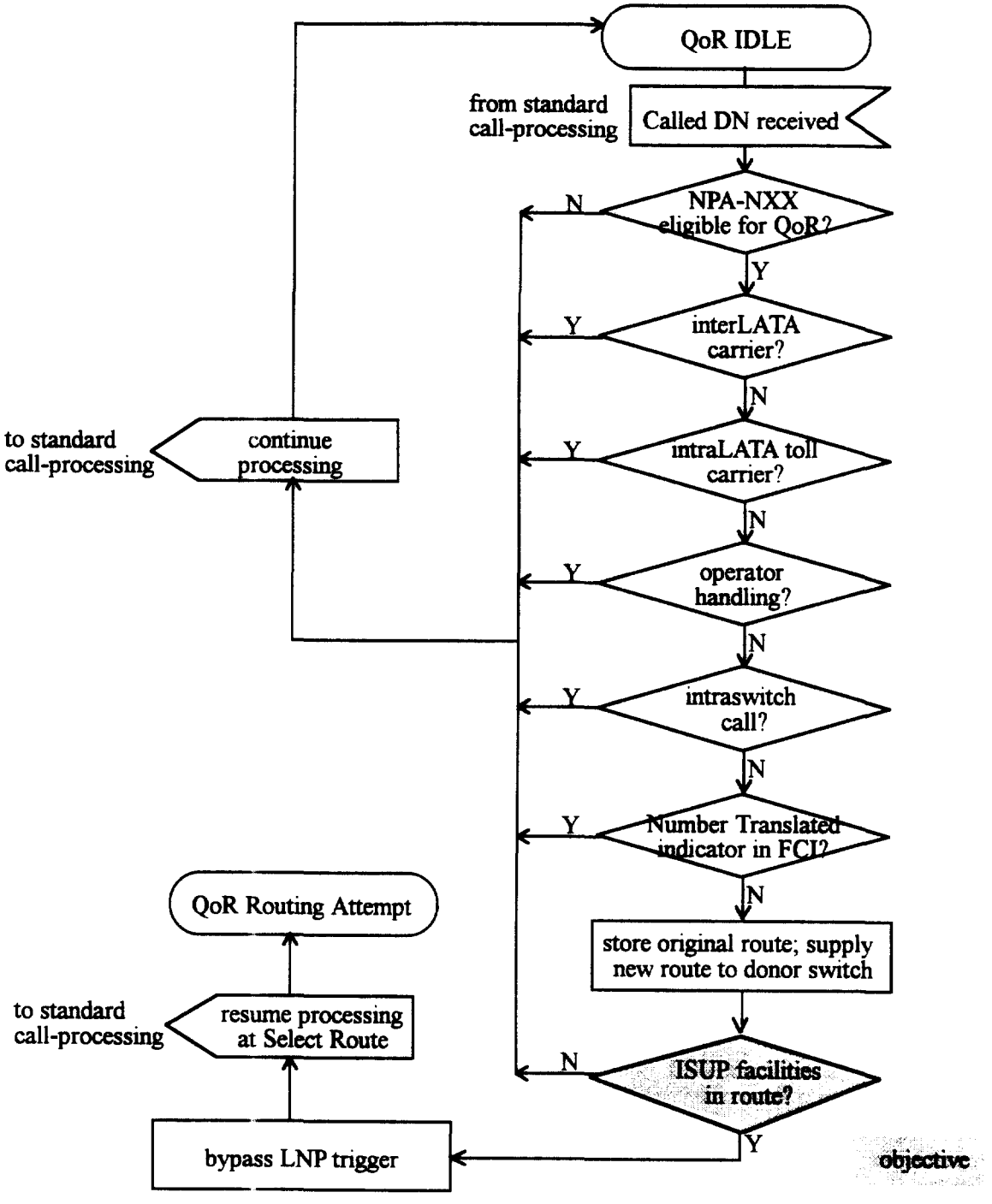
For the OCT LNP trigger, QoR forces the call to terminate on a route (trunk) to the donor switch rather than a DN at the originating switch, bypassing the OCT LNP trigger at the Termination Attempt PIC. OCT is encountered only on DN terminations.

Call-processing selects an idle ISUP circuit, formulates an ISUP IAM message according to the procedures set forth in GR-317 and GR-444, and sets

¥ the *Translated Called Number Indicator* Field in the IAM FCI parameter to *Number Translated*. Setting this field will prevent a succeeding switch from launching an LNP query during the QoR routing attempt;

¥ the *Routing Attempt* indicator in the IAM FCI parameter to *Routing Attempt in progress*. Setting this field will coerce a succeeding switch to release the call connection if the QoR routing attempt fails.

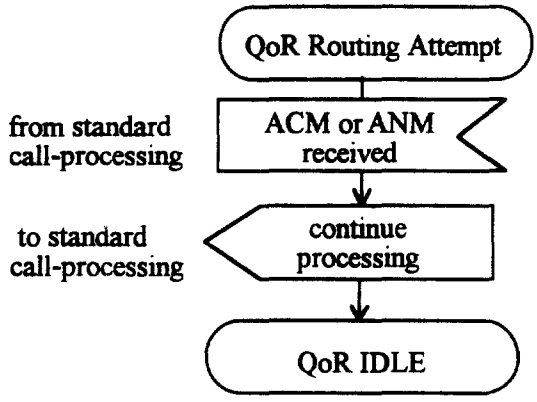
Call-processing sends the ISUP IAM message and waits for a reply. On receipt of an ISUP ACM or ANM, QoR proceeds as described in section 5.4.2; on receipt of an ISUP REL, QoR proceeds as described in section 5.4.3


QoR IDLE
from standard call-processing
Called DN received
NPA-NXX eligible for QoR?
N
Y
interLATA carrier?
Y
N
intraLATA toll carrier?
Y
N
operator handling?
Y
N
intraswitch call?
Y
N
Number Translated indicator in FCI?
Y
N
store original route; supply new route to donor switch
ISUP facilities in route?
N
Y
bypass LNP trigger
to standard call-processing
resume processing at Select Route
QoR Routing Attempt
to standard call-processing
continue processing
objective

5.4.2 QoR receives a call-proceeding indication

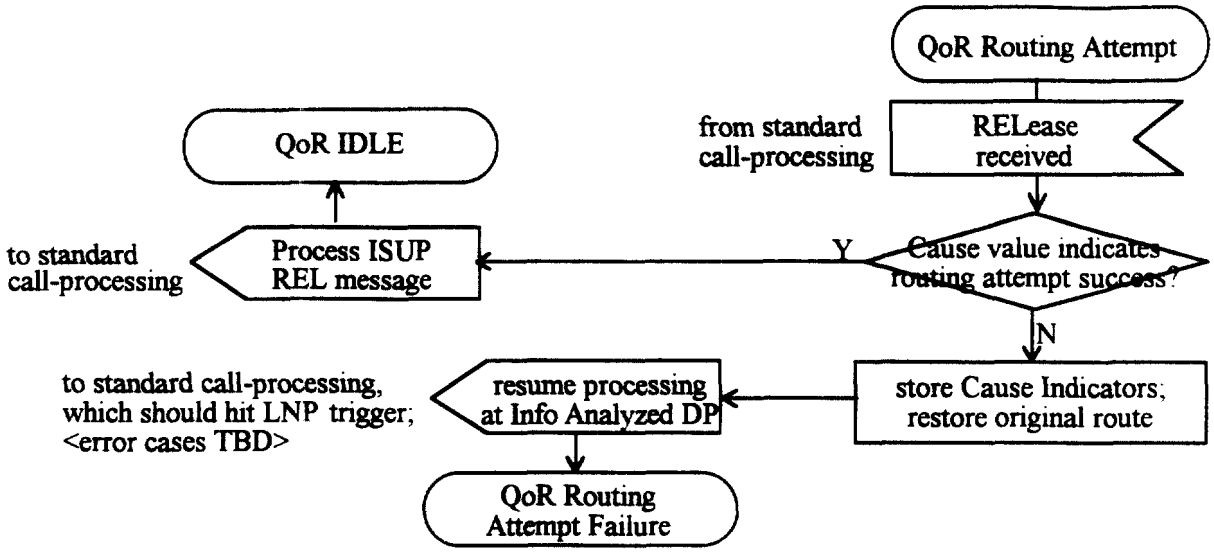
QoR interprets an ISUP ACM or ANM as an indication that the routing attempt is proceeding. QoR terminates (ends) on receipt of either an ACM or ANM, and the call is handled by standard call-processing thereafter.

Note: Receipt of an ISUP ACM may also be an indication that the call has encountered MF interworking; please see Section 8 for more information.



5.4.3 QoR receives a release indication

On receipt of an ISUP REL message from a succeeding switch, standard call-processing at the QoR switch should release and idle the outgoing ISUP circuit, and formulate and send an RLC message to the succeeding switch (according to the procedures outlined in GR-317 and GR-444). QoR should then inspect the mandatory Cause value in the ISUP REL message to determine whether the routing attempt succeeded or failed.



Routing Attempt succeeds:

The routing attempt is deemed successful if the Cause value in the ISUP REL message implies that the Called DN is located at the donor switch. A list of such Cause values is provided in Table 1.

Table 1 RELease Cause Values indicating that an LNP query need not be done

16 - Normal Call Clearing
17 - User Busy
18 - No user responding
19 - No answer from user
21 - Call Rejected
22 - Number Changed
27 - Destination Out of Order

As an objective, the Cause values that QoR interprets as an indication of a successful routing attempt shall be administrable at each QoR-capable office, and the Cause values listed in Table 1 shall constitute the default set.

QoR terminates on receipt of an ISUP REL message containing a Cause value indicating a successful routing attempt. Standard call-processing is then left to clear the call to the originating access or preceding switch using the procedures in GR-317 and GR-444.