

4.2 Technical Matrix

4.2.a Development

The technical matrix developed by the Task Force is a modified version of technical frameworks from other jurisdictions, adjusted to reflect issues specific to California. The technical matrix, entitled "LNP Framework," is included as Attachment 5. The technical matrix includes a section developed by California wireless service providers to reflect their specific technical concerns.

The Task Force reviewed each of the technical matrix attributes and agreed on a specific degree of importance (1 being less important, 2 being important and 3 being more important⁷) associated with LNP implementation. Each of the evaluators, using internal company expertise, subjected the LNP proposals to a substantial technical evaluation. Using the weighted value previously determined by the Task Force for each attribute, the evaluators were to determine, on a scale of 0 to 3, a particular LNP proposal's compliance with each technical matrix attribute. Therefore, if a particular attribute had a weighted value of 3 and an evaluator determined a LNP proposal deserved a 3 for compliance, that LNP proposal attribute would have a total weighted compliance value of 9 points.

4.2.b Distribution and Responses

All companies that presented LNP architectures to the Task Force on July 11 and 12, 1995, were contacted and asked to notify the Task Force of their willingness to participate in the RFI process. AT&T, MCImetro, GTE, US Intelco, Pacific Bell, and Nortel responded. Proponents were also asked to participate in formal technical presentations to the Task Force during November 8, 9, and 10, 1995. All invited proponents participated in the formal technical presentation process. Nortel did not submit a RFI response; its formal presentation discussed alternative switch triggers in support of LRN.

⁷ Two attributes received higher weightings: Attribute 5 (D.) Network Reliability Impact received a 4 (this weighting was increased from 3 to 4 after the date the Task Force issued the Technical Matrix); and Attribute 6 Service Interaction, received a 12 (this weighting was increased from 9 to 12 after the date the Task Force issued the Technical Matrix).

4.2.c Technical Assessment

Following the presentations on November 8, 9, and 10, 1995, the evaluators had until the November 30 meeting to assess each LNP proposal. Each evaluator was asked to consider the various proposals for compliance with the technical matrix. Some evaluators also took into account the following: relative economics; public policy; implementation impacts; and the benefits the proposal would bring to that evaluator's individual network.

Based on the weighting structure and technical compliance measures described above, each evaluator scored each attribute of each proposal prior to the November 30 - December 1, 1995, Task Force meeting. At that meeting, scores were reviewed on an attribute-by-attribute basis. Once an attribute was scored, any significant differences in scoring were discussed to ensure a common technical understanding of the issues by all evaluators. Where appropriate, evaluators adjusted scores based on clarified information.

The Task Force agreed that wireline evaluators would evaluate only the attributes associated with wireline networks, and that wireless evaluators would evaluate only the attributes associated with wireless networks. Whereas each wireline evaluator provided a score for each attribute on each proposal, wireless evaluators, as a group, provided a single composite score for each proposal.

The Task Force agreed that DRA and DCA could participate as evaluators. DRA and DCA evaluated only the wireline attributes.

The results of the scoring activity can be found in Attachment 6.

Prior to the reporting of scores, several companies (e.g., MCI, AT&T, TCG, ELI) expressed concern about the scoring of RTP because of uncertainty about whether RTP was being proposed as a stand-alone proposal or instead in combination with another proposal. Pacific Bell noted that it did not intend for RTP to be scored on a stand-alone basis.

Following the technical scoring, LANP was eliminated from further consideration because no participant supported its deployment.

4.3 Economic Evaluation

The November 27, 1995 ALJ ruling specifically requested information from the Task Force on the relative implementation costs of the LNP proposals (Item 1). In addition, the ALJ requested each carrier to

“... provide a comparative assessment of the relevant solutions’ implementation costs on their individual networks.” (Item 2)

4.3.a Development of Economic Assessment Matrix

At the October 12 and 13, 1995 meeting, the Task Force adopted an economic assessment matrix as a guideline to be used in developing economic information for evaluation purposes, (Attachment 7). The Task Force hoped that this matrix would permit direct relative comparisons between plans.

4.3.b Availability of Information

AT&T, Pacific Bell, and GTE provided economic study data at the December 14 and 15, 1995 Task Force meeting. AT&T presented its economic assessment of LRN based on a proxy model. MCI indicated its intent to file its economic assessment based on its proxy model, subsequent to the filing of this Report. Pacific Bell and GTE presented their economic assessments of LRN, RTP, CPC and NGN using their respective embedded network architectures. A copy of each company’s economic assessment package is included as Attachments 3a through 3c. These economic evaluations are the product of each proponent, and the Task Force does not endorse or support any of these economic evaluations. They are provided to the Commission as part of this Report for information purposes only.

At the December 14 and 15, 1995 meeting, Task Force participants reviewed the studies and determined that it was not clear that all studies followed the adopted economic evaluation matrix. Thus, there was insufficient information to perform a direct absolute dollar comparison between plans. In addition, there was some concern over the lack of details provided. Those participants that provided economic data stated that because of proprietary agreements with vendors, they could not disclose the detailed cost data used in the studies.

4.3.c Economic Assessment

Although some economic information was presented to the Task Force, it is not possible to answer Item 1 above because the network models used by the various participants were not similar enough to derive reliable relative costs. No consensus on the relative economic ranking of the proposals was possible due to this lack of data and the variation in network modeling approaches.

It is the responsibility of each service provider to provide the requested information for Item 2 above. Some service providers may elect to provide this information outside of this Report under seal directly to the Commission.

4.3.d Additional Economic Considerations

The Task Force agreed that additional work would be required to derive accurate estimates of LNP deployment costs. If the Commission wishes to pursue the economics of the various plans, several areas should be considered before additional work is undertaken.

1. In the early stages of development, vendors are very hesitant to provide precise prices for their products, so all studies are subject to revisions over time. Sharing vendor information about pricing is not possible due to proprietary agreements made with the vendors.
2. The Task Force may be able to provide a more detailed model to be followed by all participants in performing economic studies to ensure that results can be compared uniformly and equitably.
3. Emerging service providers can only assume a market penetration over time, and then price out a network cost for LNP based on that volume of business. It is possible that just adding each service provider's dollar costs could result in an overstatement of the cost of LNP due to an overestimate of market penetration by the competing new service providers.
4. There are substantial fixed, start-up costs for all LNP solutions. This can be a burden for the small service providers who have fewer lines and for whom the start-up cost per line is higher than for large service providers. It is desirable to allow third-party providers to aggregate demand from a multiplicity of service providers and to create a variable cost structure for the database needs of smaller service providers.
5. The costs of SMS and its implementation have not been included in economic estimates. Those costs are substantially the same for all proposals.

6. The cost of modifying each service provider's Operations Support Systems ("OSS") to accommodate LNP is important and has yet to be included in the economic studies. The impact on switch processor capacity of adding LNP functions may be economically important. However, the information needed to evaluate the impact is not available.
7. The Task Force has not included in its analysis the non-recurring and monthly recurring costs associated with interim LNP options that will be avoided when long-term LNP is deployed.

4.4 Switch Software Availability as of December 1995

The Task Force also evaluated the extent to which each of the proposals could be implemented in a timely fashion. Various parties provided verbal information at the December 14 and 15, 1995, Task Force meeting on the availability of switch software necessary to implement LNP solutions. At this meeting, the Task Force noted there were inconsistencies among switch software availability dates provided separately to the various participants by their switch vendors.

Because of these inconsistencies, the Task Force agreed to send a letter to each switch vendor requesting software availability dates for each LNP proposal by switch type. Switch vendors were asked to respond in writing with their most current information on software availability as of January 1996.⁸ A copy of the letter and the vendor responses are included as Attachment 8. Information on certain other related software issues that will affect implementation of any of the proposals was not available for evaluation.⁹

⁸ Written information from the switch vendors may vary from that which was presented at the December 14 and 15, 1995 Task Force meeting.

⁹ The information for switch software availability does not consider the timing or availability for SMS, databases (such as SCPs), billing systems, provisioning systems and other Operational Support Systems. These matters are discussed in more detail in Section 5.

4.5 Voting and Selection Process and Results

4.5.a Options Considered

The Task Force met on December 14 and 15, 1995, to attempt to select a long-term LNP solution for California. In addition to the LNP proposals previously evaluated, certain members of the Task Force suggested four additional architectures or migration paths for consideration (these additional architectures or migration paths had not previously been evaluated):

CPC/LRN: This proposal deploys CPC initially in a portion of the network. When LRN becomes available, it will be installed but not implemented until all CPC network elements also have the LRN capability. The LRN capability replaces the CPC capability simultaneously in all network elements and CPC is turned off.¹⁰

RTP/lrn¹¹: Both LRN and RTP use the location routing number ("lrn") as the routing mechanism and can co-exist either between networks or within the same network. This proposal uses a common routing mechanism (i.e., location routing number) and allows the triggering mechanism (AIN/IN, RTP, or both) to be the choice of the service provider. RTP uses the location routing number for routing purposes.

CPC/LRN/RTP: This proposal deploys CPC initially in a portion of the network. When LRN and RTP become available, they will be installed but not implemented until all CPC network elements also have the LRN and RTP capabilities. The LRN and RTP capabilities replace the CPC capability simultaneously in all network elements and CPC is turned off.

Common Routing: The Common Routing proposal by the California DCA was intended to encompass the following concepts. Rather than select one single local number portability solution the Commission would: (1) determine the routing mechanism which all telecommunications providers would be required to use, which most likely would be routing based on the location routing number; and (2) determine the routing information which all providers must pass, which likely would include: (a) the dialed number, (b) an indicator that a database inquiry had been accomplished, and (c) a routing number that can be understood by all providers. The Commission would allow each telecommunications provider to use the triggering mechanism of its choice so long as the routing mechanism and standards adopted by the Commission are met.

¹⁰ A draft transition sequence overview, developed by AT&T Communications Services, AT&T Network Systems, Siemens, Nortel and MCImetro is included as Attachment 9.

¹¹ "LRN/RTP" was the term used to denote "RTP/lrn" at the selection meeting on December 14 and 15.

4.5.b Process Description

The Task Force attempted to narrow the range of options for further consideration using the following voting protocol. Each evaluator voted for its first, second, and last (i.e., the option it preferred least) choice.

During this voting process, evaluators had the opportunity to consider the available technical, economic, and implementation information. In addition to the information available to the Task Force, service provider evaluators also considered the relative impacts of these factors on their respective networks and operations.

4.5.c Results

Previously, the Task Force agreed to use a "one company, one vote" standard. However, during the selection meeting all attending evaluators, including wireless subsidiaries/affiliates, were allowed to vote. Because the wireless service providers had insufficient time to caucus before this vote. Thus, rather than presenting a block vote as they had during the technical evaluation, each wireless service provider cast an individual vote.

GTE California, GTE Mobilnet and Contel Cellular abstained and objected to the voting process on the following grounds: 1) additional architectures (i.e., LRN/RTP, CPC/LRN, CPC/LRN/RTP, and Common Routing) were introduced on the day of the vote without sufficient information necessary for analysis; and 2) the economic analysis was not complete for each option being considered by the evaluators.

Of the 17 evaluators voting, 10 voted for LRN as their first choice. The first-choice votes of the remaining seven evaluators were for combinations of architectures or migration paths which had not previously been evaluated. Of these seven evaluators, four voted for LRN/RTP, one voted for CPC/LRN, and two voted for Common Routing.

The following table summarizes the results of the vote:

ARCHITECTURE	1st	2nd	LAST
CPC	0	0	4
NGN	0	0	11
LRN	10	4	0
RTP	0	1	0
LRN/RTP	4	5	0
CPC/LRN	1	3	0
CPC/LRN/RTP	0	1	0
COMMON ROUTING	2	0	0

The following table identifies the evaluators who participated in the selection meeting, and reflects their votes:

<u>EVALUATOR</u>	<u>FIRST</u>	<u>SECOND</u>	<u>LAST</u>
AT&T	LRN	CPC/LRN	NGN
Teleport Communications Group	LRN	LRN/RTP	NGN
Citizens Telecom	LRN	LRN/RTP	NGN
Roseville Telephone Company	LRN/RTP	LRN	NGN
GTE California	Abstained and objected to the process		
MCI/MCImetro	CPC/LRN	LRN	NGN
Pacific Bell	LRN/RTP	RTP	CPC
DCA	Common Routing	LRN/RTP	CPC
DRA	Common Routing	LRN/RTP	CPC
CCTA	LRN	CPC/LRN/RTP	NGN
MFS Intelenet of California	LRN	CPC/LRN	-----
Electric Lightwave Inc.	LRN	LRN/RTP	NGN
Contel of California	LRN/RTP	LRN	CPC
AirTouch Communications	LRN	-----	NGN
AT&T Wireless	LRN	-----	NGN
Pacific Bell Mobile Svcs	LRN/RTP	LRN	----
Los Angeles Cellular	LRN	-----	NGN
GTE Mobilnet	Abstained and objected to process		
Contel Cellular	Abstained and objected to process		
Time Warner AxS	LRN	CPC/LRN	NGN

5.0 Implementation Plans

This Section addresses the requirements for implementation of LNP in California.

5.1 Review of Implementation Timing

In addition to switch software availability dates, the projected availability dates of the items listed in Outstanding Implementation Issues, Section 5.4, need to be determined. It will be necessary to develop a time line which includes critical path items for a realistic implementation schedule.

5.2 Trial/Testing Issues

ALJ Question 5: The Task Force Report should provide the Commission with a recommendation on whether a trial of the recommended solution(s) is necessary, or whether another method of implementation should be considered. If a trial of the recommended solution(s) has been conducted elsewhere, the Report should include information on trial results.

The Task Force recommends that California service providers conduct testing leading to LNP implementation, rather than a trial that, once completed, is broken down and evaluated before LNP implementation. The testing should occur on a staged basis, beginning with lab testing by individual service providers, followed by lab-to-lab testing and limited live traffic in a controlled user group. The testing should include evaluation of any impacts on existing services (e.g., 911, CLASS services, and operator services), as well as impacts on intracompany and intercompany systems. The Task Force will use test results from other jurisdictions where available and appropriate.¹²

5.3 Risk Factors

This section details the risk factors associated with the implementation of LNP in California.

5.3.a Risk Factors Common to All Proposals

It should be noted that these risk factors may vary in degree among the proposals.

5.3.a.1 Switch Related Factors are:

1. The ability of switch vendors to provide a fully functional product to meet a California implementation schedule.
2. Lab testing could identify significant issues needing additional time for development/fixes.
3. The service provider deployment schedule for new generics required to support the LNP feature package.

¹² A brief overview of the status of other states actively reviewing LNP is contained in Attachment 10.

4. If a significant change is recommended by California service providers to the existing switch requirements documents, there may be a slip in the LNP implementation schedule. Minor changes may or may not impact the schedule.¹³
5. Some switch vendors have indicated they have no plans to develop software for some of the proposals for some of their switch types. (See e.g., Attachment 8, Switch Vendor Software Availability Responses.)

5.3.a.2 SMS Related Factors are:

1. All SMS business issues need to be resolved in a timely manner.
2. The ability of the SMS vendor to meet a California schedule.

5.3.a.3 General Items:

1. The specifics and timing of a Commission order will impact an LNP implementation schedule.
2. Potential inconsistencies among state and federal regulatory decisions could impact an LNP implementation schedule.
3. Changes to requirements for any necessary network or OSS capabilities may affect the availability timeframe for LNP in California. These capabilities include any items listed in the Outstanding Implementation Issues, Section 5.4, that are on the critical path.
4. Solutions that combine proposals may introduce additional interdependencies affecting implementation.

5.4. Outstanding Implementation Issues

The following issues need further definition and resolution prior to the implementation of LNP in California. This list is not intended to be exhaustive. Number assignment and administration were not discussed by the Task Force and are not addressed in this document.

¹³The Generic Switching and Signaling Requirements document for LRN Number Portability architecture is FSD30-12-0001 - Issue 1.00, 2/12/96. The switch requirements documents for RTP are: Bellcore GR002857-Core and MF-DOOG-951213-01. At this time, there are no switch requirements documents for CPC or NGN.

5.4.a Deployment Plan

- A deployment plan is required. It should include, but is not limited to, the following: 1) identification of all network and OSS capabilities, network interconnection, and methods and procedures necessary for LNP implementation; 2) identification and scheduling of the implementation of the minimum level of the items identified in 1) above necessary for the expedited LNP deployment; and, 3) scheduling for full implementation of all items identified in 1) above necessary for fully functional LNP deployment.
- The Commission should allow the California service providers reasonable and adequate time to address unresolved LNP deployment issues and to make recommendations to the Commission.
- The deployment plan must identify when LNP will be available in specific areas (e.g., NXXs).
- The deployment plan must specify switch types in California that are not capable of supporting number portability.
- The deployment plan must consider the impacts of LNP on wireless interconnection.
- The deployment plan must evaluate existing SS7 network capacity to support LNP, including STP capacity.
- The deployment plan must assess the impact of LNP on existing switches to determine if there is sufficient processor capacity.

5.4.b Non-participating Network Issues

Issues associated with non-participating networks may include but are not limited to:

1. What is the definition of a non-participating network?
2. How will service providers handle non-participants' traffic?
3. How will service providers be compensated for handling non-participants' traffic?
4. When will non-participating service providers become participating providers?

5.4.c SMS Development

In order to develop SMSs it will be necessary to develop requirements, conduct vendor(s) selection, conduct acceptance testing, and develop a deployment schedule.

5.4.d Database/SCP Development

Database/SCP development will necessitate the development of requirements, vendor(s) selection, acceptance testing, and a deployment schedule.

5.4.e Service Provider Internal OSS, Billing Systems, and Methods and Procedures

Service providers will have to modify their internal OSSs, billing systems, and develop methods and procedures for LNP in California. These modifications will depend on the solution(s) selected for LNP.

5.4.f Access to Number-Based Database Systems

When LNP is deployed, the ability to access existing number-based databases (e.g., Line Information Data Base ("LIDB")) must continue to exist.

5.4.g Operator Services

Operator services systems will require modifications in a number portability environment.

5.5 Triggering and Routing Issues

Two major components of call set-up in a LNP environment are the triggering mechanism and the routing mechanism. Triggering refers to the determination of when it is necessary to query a database. Routing refers to how calls will be routed through a network (or networks) from the originating switch to the serving switch.

Solutions that use different triggering mechanisms can co-exist so long as the same routing mechanism is used. This routing mechanism must include population of the appropriate SS7 fields¹⁴ and execution of software to provide the correct called number to the terminating switch. The routing mechanism used must include enough information so that calls can be routed properly between networks. The routing mechanism must also ensure that the receiving networks can determine if a database query has been performed on the call. The Task Force has agreed that the recommended routing mechanism is the location routing number.

5.6 Implementation Assumptions

1. Initial implementation of service provider number portability will not restrict or expand the customer's current ability to retain a number while moving within a limited geographic area.
2. Initial implementation of service provider number portability should not be delayed because of considerations related to the deployment of location number portability.
3. In the event of a LNP failure, the originating network will route calls according to the LERG.
4. A single statewide SCP will not be required.
5. The SMS will concurrently download information to service provider networks.

¹⁴ The following SS7 ISUP fields must be populated: Forwarded Call Indicator ("FCI"), General Address Parameter ("GAP"), and Called Number Field.

6.0 Response to ALJ Ruling Question #4a - 4g.

The ALJ Ruling was issued well into the Task Force's deliberations. As a result, there is not a one-for-one correlation between the questions in the ALJ Ruling and the evaluations and analyses performed by the Task Force. Nevertheless, the Task Force's efforts yielded information which is relevant to the questions in the ALJ Ruling. In the subsections below, we present such information, including references to the attributes of the technical matrix where appropriate.

6.1 (4.a) What is the estimated timeframe for complete implementation of a given solution? If a phased implementation would be more appropriate, what is the timeframe for this phase-in?

While the Task Force appreciates the Commission's desire to implement a long-term LNP solution by mid-1996, it is apparent from the switch software availability dates that none of the switch vendors will be able to support deployment of a LNP solution until sometime in 1997. However, switch software availability is only one necessary requirement for a full implementation of LNP in California. Other requirements are listed Section 5.4.

The Task Force intends to proceed using its current structure to resolve issues so that implementation of LNP can begin as soon as possible. The Task Force has not yet assessed a phased-in approach.

6.2 (4.b) Is the potential solution transparent to callers? Is functionality or quality of service impacted?

The following technical matrix attributes address the issue of transparency to callers:

Technical Matrix Attribute 1: End User Impacts

End User Impacts include:

- B) Call redirection transparency (Non-ported customer will perceive no difference when a number is ported.)
- C) Ubiquity (Portability available to all wireline customers within selected service area.)
- F) Number change required (No number change should be required)

Tally Information

CPC	NGN	LANP	LRN	RTP
662	423	675	682	641

Technical Matrix Attribute 5: Performance

Performance includes:

- A) Call set-up/post-dial delay
- B) Transmission quality
- C) Blocking
- D) Network reliability impact

Tally Information

CPC	NGN	LANP	LRN	RTP
924	965	929	993	973

Attribute 6: Service Interactions

Service Interactions include:

- A) ANI-based features
- B) Switch features
- C) ISDN features
- D) Messaging services
- E) Telephone Relay Services ("TRS")
- F) Vertical services
- G) Full equal access/multiple PIC
- H) Abbreviated dialing methodologies
- I) Automatic callback calling/Automatic recall
- J) Screening list editing
- K) Caller ID and privacy
- L) Caller ID with name
- M) Call forwarding
- N) Calls to ported service access codes numbers (e.g., 500, 800, 900)
- O) ISDN circuit-switched voice
- P) ISDN circuit-switched data
- Q) ISDN packet data
- R) Network voice messaging
- S) Customer originated trace
- T) Selective call acceptance
- U) Selective call rejection
- V) Customer originated service order activation/deactivation

Tally Information

CPC	NGN	LANP	LRN	RTP
480	310	438	507	490

Attribute 7: Operator Services

Operator Services include:

- A) Busy line verification
- B) Third party billing
- C) Calling card
- D) Collect calls
- E) Call trace
- F) Coin - local and toll (including Hotel/Motel Time & Charges)
- G) Branded DA capability
- H) Directory assistance call completion

Tally Information

CPC	NGN	LANP	LRN	RTP
524	486	523	553	484

Attribute 8: 911/E911 Impacts

Calls to 911 shall be routed to the proper PSAP. The proper number/address shall be displayed on 911 systems that utilize the billing number and on systems that utilize the calling number. Call control must be retained by PSAP.

Tally Information

CPC	NGN	LANP	LRN	RTP
144	114	115	144	144

Attribute 10: Rating and Billing

Rating and Billing include:

- A) Transparency within the rate center and outside the rate center
- D) Sent collect
- E) 800 calls from ported numbers
- K) CMDS message clearing

Tally Information

CPC	NGN	LANP	LRN	RTP
922	821	837	987	960

6.3 (4.c) Describe impacts on non-ported customers.

NGN will impact any service which depends on the presentation of the telephone number or name of the calling party. For example, when a customer with a ported number calls a non-ported customer who subscribes to Caller ID, the information appearing on the Caller ID display will not be recognizable as the calling party's directory number.

LRN and CPC may cause additional post-dial delay for calls made to non-ported customers because a database is queried on every interswitch call made to a portable NXX. However, in the case of those networks not fully SS7-deployed, overall post-dial delay may be reduced as a result of complete SS7 deployment to support LRN and/or CPC. Any incremental post-dial delay related to the deployment of LRN and/or CPC is expected by the proponents to be insignificant compared to post-dial-delay factors already present in every call, and therefore will probably be transparent to the calling party.

RTP will have no impact on non-ported customers, because calls to non-ported customers will complete as they do in a non-LNP environment.

6.4 (4.d) Describe compatibility of this solution with the wireless network. Will there be any delays in achieving wireless portability within the solution?

LRN, RTP, CPC, and NGN have not been specifically designed to include wireless operations and networks.¹⁵ Local number portability for the wireless companies raises different technical and service related issues which will need to be resolved. For example, seamless nationwide roaming, a basic service capability of wireless, requires specific wireless solutions and nationwide coordination to ensure no disruption in service for wireless roamers in a number portability environment.

The wireless industry has multiple network technologies and signaling protocols. Wireless companies have been (in some cases) significantly impacted by fraud. Wireless number portability solutions must be specifically designed for the wireless companies to ensure that fraud detection, prevention and location mobility does not become unduly difficult or expensive.

The four proposals noted above do not adequately address the unique technical and service related issues for wireless companies. Industry organizations will be researching and exploring resolution for wireless issues that will allow participation in local number portability.

6.5 (4.e) Describe the ability of this solution to migrate from service provider portability to location and service portability.

The following technical matrix attribute addresses the issue of migration from service provider number portability to both service and location portability.

Attribute 14: Application/Expandability

Tally Information

CPC	NGN	LANP	LRN	RTP
212	184	265	271	210

¹⁵ This response was submitted by the wireless Task Force evaluators. Wireline service providers may or may not agree.

6.6 (4.f) Describe any impacts on network reliability.

The following technical matrix attribute addresses issues of network reliability.

Attribute 5: Performance

- A) Call set-up/post-dial delay
- B) Transmission quality
- C) Blocking
- D) Network reliability impact
- E) Prevents "looping"
- F) Limits queries on intraoffice calls
- G) Limits queries on interoffice calls

Tally Information

CPC	NGN	LANP	LRN	RTP
924	965	929	993	973

Reliability from the end-user point of view is the ability to have every call made to, or received from, anyone at any time correctly routed and completed. This can be measured in terms of call completion probability over a finite period of time. The ability of the network to complete all calls to the correct terminating point is the ultimate measure of the network reliability. LNP implementation may have positive and negative impacts on network reliability. The ability to complete all calls is affected by many factors including overload conditions (e.g., earthquake), hardware failures, software failures, database synchronization errors, and data input errors.

Database architectures allow each service provider to have a fully synchronized copy of the master database which is maintained by the SMS administrator. Thus a hardware failure in one network does not affect call completions in other networks. In the case of a switch-based database, a failure of the host switch will cause failure of all calls requiring that switch for processing.

In today's networks, service application software, whether resident in switches or SCPs, has failure potential that can affect network reliability. Based on the 800 number portability experience, the probability of hardware failures is small compared to the probability of human input errors.¹⁶

¹⁶ All LNP solutions rely on additional database and switch updates. These additional updates inherently increase the potential for human input errors. The effect of these errors would be customer-specific.

6.6. a Comparison of The Proposals

LRN

LRN is based on multiple SCPs (an SCP pair can be sized to serve any number of switches from one to many) synchronized to a master SMS administered database using the SS7 network. In addition, a default routing mechanism will act as a fallback mechanism in the event of multiple simultaneous failures. A failure of a network element in one network will not necessarily cause failures in other networks. The anticipated rapid update capability of the SCP-based system minimizes any potential effects of input errors. All interswitch calls for both ported and non-porting numbers are handled the same.

CPC

CPC is based on the fault tolerant and geographically redundant SS7 network. This method has the same tolerance to hardware and software failures as LRN, as discussed above.

RTP

RTP places the database in the switch of the service provider to which the NXX code was originally assigned, rather than using an external SCP database. With RTP, the number of calls affected by a database failure (i.e., switch failure) is much smaller than alternatives that require large databases (e.g., SCPs) to serve multiple switches.¹⁷ As a switch-based solution, an RTP switch failure would cause calls to numbers ported from that switch to fail.

NGN

NGN uses a national SMS and a national database like 800 service does today. Service providers throughout the country will need to update their databases to ensure correct call routing. Calls to non-porting numbers do not involve a database query and will be unaffected by a database failure.

¹⁷ Pacific Bell presented an analysis on network reliability, in a number portability environment, contrasting RTP with other solutions from a network reliability standpoint. There was no consensus on the validity of the study.

6.7 (4.g) Numbering Impacts

The following technical matrix attributes address the impact of each proposal on numbering resources.

Attribute 15: Impact on North American Numbering Plans

- A) Number conservation/utilization/efficiency,
- B) Administration,
- C) NPA relief plans, overlay, NPA split, mass change (e.g., NPA boundary change)

Tally Information

CPC	NGN	LANP	LRN	RTP
162	164	207	262	256

Attribute 18: Impact on North American Number Plans - Wireless

- A) Internal routing numbers
- B) Special corporate account numbers

Tally Information

CPC	NGN	LANP	LRN	RTP
27	27	27	27	27

7.0 Recommendations

Recommendation Alternative Number 1

Introduction

The Commission has correctly decided that permanent local number portability is essential to the development of a competitive local exchange market. The currently available stop-gap interim LNP options, using the network functionalities employed to provide the LEC services RCF and DID, are costly and inefficient, and exacerbate barriers to market entry. Interim LNP options must therefore be replaced as soon as possible by a permanent LNP solution.

The Task Force's efforts have been guided since the Task Force's inception by the mission statement adopted unanimously in one of the earliest meetings:

The California Local Number Portability Task Force will evaluate, recommend, and, ultimately, implement a technically and economically feasible solution for service provider number portability that meets the needs of California consumers and carriers in a competitively neutral manner.

The Task Force did not choose these words casually: each word is included for a reason. Taken together, the words of the mission statement do at least two things. First, they place significant obligations on each member of the Task Force to devote the time and resources necessary to allow an informed comparative evaluation of the various permanent LNP solutions available. Second, and more importantly, they create a self-imposed mandate to the Task Force members to solve permanent LNP. That is, the mission statement makes it clear that the goal of the Task Force is now, and has been throughout its deliberations, to reach consensus on a single permanent LNP architecture that will be implemented by all carriers that complete calls to California consumers.

With the goals underlying the mission statement in mind, and after thorough technical and economic analysis of each LNP proposal, a clear majority of the Task Force evaluators have chosen to recommend LRN as the permanent LNP solution.¹⁸

True LRN vs. RTP/lrn

It has been clear from the outset of the technical evaluation process exactly what AT&T's proposed LRN solution entails. As conceived, LRN is a permanent LNP solution which engenders specific routing and triggering mechanisms. For routing purposes, LRN uses a routing address (also called the location routing number or "lrn") to identify the central office serving the called subscriber to which the call must be completed. With respect to triggering, LRN requires an SS7 database query to an external database, initiated via an AIN/IN trigger or equivalent TCAP - based trigger. The LRN solution is described in significant detail earlier in this Report.

¹⁸The following evaluators are signatories to this recommendation: AT&T and AT&T Wireless; AirTouch, CCTA, Citizens Telecom, Cox Enterprises, ELI, Falcon, MFS, MCI and MCImetro; TCG, and Time Warner.

Throughout the Task Force's evaluation and selection process, nomenclature has been a very important and contentious issue, because some Task Force members have used interchangeably the terms "LRN" (which denotes the AT&T LNP database solution) and "lm" (which denotes the location routing number, used as a routing mechanism for multiple kinds of triggers). For example, Pacific Bell proposed the combined architecture of "LRN/RTP," intending that lm would be the routing mechanism for LNP, and that RTP would be used as a trigger mechanism to obtain the lm from data resident in the donor switch. This proposal has since been named "RTP/lm" by the Task Force, to contrast it with "LRN," which is intended to denote "the complete package" -- a permanent external database LNP solution using AIN/IN triggers to initiate queries.

Why LRN Should Be Selected

Rather than choosing a common routing mechanism and allowing service providers to trigger as they see fit, the Commission should choose a single solution -- LRN -- as the long-term LNP solution for California. Since LRN minimizes impacts on service providers' existing network architecture and allows for phased implementation such that calls originating in non-participating networks can still be completed, it is emerging as the most viable long-term LNP solution nationwide.¹⁹ This is because LRN is the best solution since it not only provides service provider portability, but also location and service portability.²⁰ Just as in California, LNP task forces in other states have used exhaustive call model comparisons to weigh the pros and cons of each proposed LNP solution. LRN has consistently scored highest in these technical evaluations. The results of technical evaluations in California and elsewhere have driven switch manufacturers to have LRN software available for their respective switches by mid-1997.

LRN is the only permanent LNP solution that received a broad base of support from all segments of the California telecommunications industry. Numerous LECs, CLCs and wireless service providers support the testing and deployment of LRN.²¹ Indeed, although the wireless evaluators assert that no LNP solution has been designed specifically to address their operations and networks, each of the five wireless evaluators voting during the Task Force's selection meeting ranked LRN as either its first or second choice.²²

¹⁹Other states, including Illinois, New York, Georgia, and Maryland, have adopted LRN as the call model for permanent LNP deployment. In many of these states, Regional Bell Operating Companies, such as NYNEX, Ameritech, BellSouth, USWest, and Bell Atlantic have endorsed the use of LRN. Moreover, many California evaluators, such as AT&T, MCImetro, TCG, MFS Intelenet, Time Warner AxS, AirTouch, and ELI, have participated in selection committees in other states that have selected LRN.

²⁰In contrast, RTP/lrn does not support location or service portability and would ultimately likely need to be replaced by LRN.

²¹In contrast, RTP/lrn received support from only two market segments (LECs and one wireless service provider, Pacific Bell Mobile Services ("PBMS"), a subsidiary of Pacific Telesis). No CLC supported RTP/lrn as its first choice.

²²AirTouch, AT&T Wireless, and L.A. Cellular selected LRN as their first choice, PBMS selected LRN as its second choice, and GTE Mobilnet and Contel Cellular abstained and objected to the process. In contrast, RTP/lrn received only one vote from a wireless service provider (PBMS ranked RTP/lrn as its first choice).