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NUMBERING FOR INTERNET-BASED RELAY SERVICES REPORT

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The Industry Numbering Committee (INC) provides an open forum to address and resolve industry-wide issues associated with planning, administration, allocation, assignment and use of North American Numbering Plan (NANP) numbering resources within the NANP area.

This document is maintained under the direction of ATIS and the INC. Suggestions for improvement of this document are welcome. They should be sent to the Alliance for Telecommunications Industry Solutions, INC Staff, 1200 G Street NW, Suite 500, Washington, DC 20005. All changes to this document shall be made through the INC issue resolution process and adopted by the INC as set forth in the *ATIS Operating Procedures*.

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1.0 EXECUTIVE SUMMARY

Solution Overview

A North American Numbering Council (NANC) Action Item[1] to the Alliance for Telecommunication Industry Solutions (ATIS) Industry Numbering Committee (INC) regarding Video Relay Service (VRS) numbering has led to the production of this report. To meet the understood goals, the INC proposes that VRS Users[2] be assigned geographic North American Numbering Plan (NANP) numbers using currently available call routing methods and that a centralized mechanism administered by a neutral party be provided for obtaining a VRS User's current Internet Protocol (IP) address based on the assigned telephone number (TN).

A hearing caller may reach a VRS User either by:

1. dialing the VRS User's geographic NANP number [Plain Old Telephone Service (POTS) Routing]. The call will be routed to the VRS provider selected by the called VRS User. The VRS provider will then set up a video call between the Communications Assistant (CA) and VRS User using the IP address associated with the VRS User's telephone number; or

2. dialing the toll free telephone number of the hearing caller's chosen VRS provider and providing the CA with the telephone number of the VRS User they wish to reach (Toll-Free Routing). The VRS provider will then set up a video call between the Communications Assistant and VRS User using the Internet address associated with the VRS User's telephone number.

VRS Users may reach a hearing party by originating a video call with a VRS provider of their choice and providing the to-be-called number. The centralized mechanism for linking the VRS User telephone number to their IP address is not required.

A VRS User may set up a video call to another VRS User using called user's telephone number to determine the called party's current IP address via the centralized mechanism. (Depending on the resolution of security issues, such call set up may be direct or via the calling party's chosen VRS provider. A CA is not required.)

The INC has further considered the issues of the manner in which VRS Users might obtain telephone numbers, the means for routing calls to these numbers to the VRS User's chosen VRS provider, and the nature of the centralized mechanism for associating VRS Users' telephone numbers with their current IP addresses.

1 Action Item can be found in the NANC Meeting Record of January 24, 2006.

2 As indicated in Section 8, the glossary, the term "VRS User" refers to the deaf user of Video Relay Services.

The solutions offered by INC members for VRS are applicable to IP Relay. On the other hand, the INC does not recommend any changes for IP Captioned Telephone Service at this time.

2.0 INTRODUCTION AND BACKGROUND

The Federal Communications Commission (FCC) has long promoted the availability of services to the broadest possible range of users. Through regulations promulgated in various dockets, the FCC has guided the development of service for users including "persons with disabilities." Evidence of this effort can be seen, for instance, in Code of Federal Regulations Title 47 – Telecommunications, Part 6[3] and Part 64[4]. The Industry Numbering Committee (INC), in its capacity of providing guidelines on numbering issues responds herein regarding a numbering strategy and database approaches offered by INC members that may be used to advance the public policy objectives of the FCC.

2.1 History of TRS/VRS

First instituted as a uniform nationwide system in 1993, Telecommunications Relay Service (TRS) has evolved to a multifaceted initiative facilitating wired and wireless communications. It has long been recognized that those unable to fully hear a voice conversation can be greatly aided with sighted substitutes via interpreters. American Sign Language (ASL) is an example of a sighted substitute for the spoken word. Typed text also acts as a substitute. Lately, developments in telecommunications and video have presented both ASL and text messaging as transmittable media for use in advancing the goals of TRS. VRS and IP Relay Service are today being delivered over the Internet. However, without standardization of delivery and accessibility, these services are not consistently available to the users of relay services. The FCC has, on behalf of these needs, been overseeing several VRS proceedings, including the VRS Declaratory Ruling and Further Notice of Proposed Rulemaking (VRS FNPRM) in CG Docket No. 03-123[5].

2.2 Recent Activity/Directives

Seeking clarity on the relationship of VRS to numbering, the NANC was approached with a request for assistance and provided with a report[6]. Discussion led to an Action Item for INC to take the lead in developing a technical response/recommendation regarding the VRS numbering and interoperability issue raised during the NANC meeting.

2.3 NANC Request and Purpose of Recommendation

This report represents the collective work, of the INC in an effort to provide guidance on telephone numbering issues and database scenarios regarding VRS. It has been the

3 PART 6--ACCESS TO TELECOMMUNICATIONS SERVICE, TELECOMMUNICATIONS EQUIPMENT AND CUSTOMER PREMISES EQUIPMENT BY PERSONS WITH DISABILITIES.

4 PART 64-- MISCELLANEOUS RULES RELATING TO COMMON CARRIERS; Subpart F: Telecommunications Relay Services and Related Customer Premises Equipment for Persons With Disabilities.

5 In the Matter of Telecommunications Relay Services and Speech-to-Speech Services for Individuals with Hearing and Speech Disabilities CG Docket No. 03-123, rel May 9, 2006; FCC 06-75.

6 See the NANC Meeting Record of January 24, 2006: Section V, Subsection L, Report by Karen Strauss: A Uniform Numbering Scheme for Video Relay Service (VRS) Users and Providers.

goal of the INC to provide recommendations where possible and options where specific recommendations did not emerge. This report represents collective efforts of several service providers and vendors, including VRS providers that chose to join ATIS and participate in the work of the INC's VoIP Subcommittee.

3.0 ASSUMPTIONS AND GOALS

3.1 Objectives & VRS Goals

At the January 24, 2006 NANC meeting representatives from Communications Services for the Deaf, Inc. (CSD) provided a report called *A Uniform Numbering Scheme for Video Relay Service (VRS) Users and Providers*. CSD asked the NANC to do the following:

> *"In order for VRS to be functionally equivalent to voice telephone services, deaf and hard of hearing individuals, using video broadband communications, need uniform and static end-point numbers linked to the NANP that will remain consistent across all VRS providers, so that they can contact one another and be contacted to the same extent that PSTN and VoIP users are able to identify and call one another. CSD requests that the NANC support dialing uniformity for VRS and point-to-point video users."*[7]

The NANC delegated this responsibility to INC saying:

> *"The INC will look at this from a technical and operational point of view."*[8]

The NANC assigned an Action Item to INC as follows:

> *"Take the lead in developing a technical response/recommendation regarding Video Relay Service (VRS) interoperability issue raised during the NANC meeting."*[9]

To help achieve the public policy goals addressing interoperability and functional equivalency with respect to the Deaf being able to "contact one another and be contacted to the same extent that Public Switched Telephone Network (PSTN) and VoIP users are able to identify and call one another," the INC has adopted the following objectives:

- Provide the ability for VRS Users to be assigned and be reached using a 10 digit geographic TN when dialed by hearing callers from the PSTN. (Hearing person dials TN, interpreter is added to call and call terminates to user that is assigned the TN.)
- A deaf user must be able to use the TN of another deaf person to set up a call to them (e.g., a video call from one customer's equipment[10] to another customer's equipment; no CA added).

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7 North American Numbering Council Meeting Minutes January 24, 2006 (Final)

8 Ibid

9 Ibid

10 The use of "customer equipment" or "user equipment" also is intended to include stand alone software running on a personal computer. See Section 8, glossary for other synonyms used for "customer equipment" in this report.

- VRS Users must be able to change their incoming and/or outgoing VRS provider of choice.[11]

In the FCC Declaratory Ruling and Further Notice of Proposed Rulemaking on May 9, 2006, the FCC stated:

> *"All VRS consumers should be able to place a VRS call through any of the VRS providers' service, and all VRS providers should be able to receive calls from, and make calls to, any VRS consumer."*[12]

From this direction, INC has adopted the goal of supporting the following additional scenarios:

- Hearing to Deaf Calls – A hearing person dials the toll free TN of a VRS provider; upon reaching an interpreter, the hearing person tells the VRS provider which ten-digit TN to call. The call then is set up to the deaf user.
- Deaf to Hearing Calls – A deaf person contacts a VRS provider, which initiates a call; the VRS provider uses a TN to set up a call with the hearing person.

One resulting notable requirement is that:

- Any VRS User can be called by any other VRS User or by any VRS provider using the TN of the called VRS User, instead of requiring the IP address of the called VRS User.

This document will address other forms of Internet-based relay in addition to VRS (See Section 3.3.2). The INC will address numbering for VRS and for IP Relay separately, but has not addressed integration of the two services under a single telephone number.

3.2 Number Allocation, Assignment, Functionality

In the context of this report, a telephone number is a unique End User identifier. While basic PSTN routing uses the digits of the telephone number, that number often serves just as an identifier which is mapped to a different number such as, a Location Routing Number (LRN) for Local Number Portability (LNP), or to an SS7 destination point code (DPC) for enhanced services like calling name display. Additionally, TNs are being used to send messages to Internet enabled devices. When one person sends a mobile text message to another person, they send the text message to a TN, but the network that carries that text message is an IP network. Since an IP network cannot use TNs for routing, mapping to an IP address allows the text message to properly transmit to the desired recipient.

The Internet uses the Domain Name System (DNS) to map identifiers (domain names such as atis.org or fcc.gov) to the appropriate IP addresses for communication.

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11 This does not imply that VRS users do or do not have the ability to change their provider of choice on a call by call basis.

12 FCC's Declaratory Ruling and Further Notice of Proposed Rulemaking In the Matter of Telecommunications Relay Services and Speech-to-Speech Services for Individuals with Hearing and Speech Impairment, CG Docket No. 03-123, p. 1, para. 1

The Internet Engineering Task Force (IETF) has developed a protocol called ENUM to define how to map a TN to available services an End User associates with that number (User ENUM) or to a point of interconnection with a serving carrier (Infrastructure ENUM). ENUM achieves this by first converting the TN into a domain name and then using the DNS to map the domain name into a Uniform Resource Identifier (URI) (e.g.,sip:17948675309@provider.com). URIs have the advantage of being relatively static, changing rarely, while IP addresses can be dynamic, changing frequently. Other DNS queries are required to resolve the URI to an IP address.

Numbers may be assigned to VRS Users in a number of ways, as discussed in Section 4:

- Numbers may be directly allocated to VRS service providers by NANPA or the Pooling Administrator (PA). The VRS service provider would in turn assign them to VRS Users.
- VRS service providers might obtain numbers from existing voice service providers and in turn assign them to VRS Users.
- VRS service providers might obtain numbers from some neutral third party and in turn assign them to VRS Users.
- VRS Users could obtain numbers directly from voice service providers and arrange for routing to their chosen VRS provider.
- VRS Users might obtain numbers directly from a neutral third party.
- VRS service providers might act as agents for VRS Users to obtain numbers from existing voice service providers.

Since VRS Users are spread throughout the United States and most will desire a local number, numbers will be required from a large number of rate centers. VRS providers (VRS provider's operations and CA location), in contrast, may serve the entire customer set from only a few or even a single location. The small number of VRS Users per end office may not warrant dedicated facilities from each end office to the serving relay center.

Two approaches to routing calls to relay centers are as follows:

3.2.1 PSTN Transport via Call Forwarding

VRS User numbers could be call forwarded to the serving relay center. Call Forwarding is a pervasively deployed central office feature that allows use of existing PSTN routing and shared facilities. If the forwarded-to number is a toll free number, transport charges can be billed to the receiving VRS provider for recovery from the Interstate TRS Fund rather than requiring the VRS User to apply for reimbursement. Moreover, toll free service can provide advanced call management features to help VRS provider load balance traffic and maintain high call completion. Where call forwarding is employed signaling from the end office to the VRS provider must support delivery of the Redirecting Number parameter so the VRS provider can determine the VRS User being called.

3.2.2 VoIP Transport

If VRS telephone numbers are obtained from VoIP service providers, then after the call has been delivered to the VoIP service provider's PSTN point of interconnection, the call delivery to the relay center could be via IP with IP-based routing and signaling techniques.

3.3 Relay Number & Routing Database

Internet-based relay services operate on an IP Network. For example, VRS traditionally uses protocols such as SIP and H.323 to handle calls between the VRS provider and the VRS User. Alternatively, IP Relay may be based on instant messaging protocols. In all cases, there is a need to provide a Central Routing Database that enables multiple providers to reach any End User.

3.3.1 Current VRS Call Processing

Currently, hearing VRS Users call the toll free number of a VRS provider. When the CA answers, he or she obtains the call setup information. The way the called party is identified varies among providers. It could be a registered name of the user, a name the user made up for themselves [like an Instant Messaging (IM) screen name], or some other unique identifier. Some providers use a proxy number which can be any TN, but is not used to route calls outside of the specific provider's network. Since proxy numbers are specific to a given provider, the numbers do not support interoperability between providers.

Video calls from one deaf person to another deaf person, i.e. point-to-point calls, can be difficult, for example, the process might work like this:

- The calling party sends an IM to the person they want to call. They ask if they are there and if so to send their IP address.
- The called party opens up their "DOS Prompt" screen on their PC. They put in the command "ipconfig" into the DOS Prompt. The response is the IP address and DNS information associated with the PC. The called party highlights the IP address and copies it. They then paste it into their IM and send it to the calling party.
- The calling party uses the IP address to establish a call with the called party.

3.3.2 Other Internet-based Relay Service Processing

As noted above, there are other IP-based relay services available today. This section describes these services and how interoperability may apply to them.

3.3.2.1 IP Relay

In Internet Protocol Relay, messaging capabilities, e.g. via a web page or Instant Messaging (IM) are used to set up a messaging session between the Relay User[13] and the CA. It is still logical to assign NANP numbers and have them routed to a designated relay provider for incoming calls. Because the messaging capabilities have their own naming conventions and existing mechanisms to determine Relay User IP addresses, interoperability may depend not on a central database providing (directly or indirectly) the deaf Relay User's current IP address but on providing an IM screen name, handle, or appropriate web page URL that will resolve to an IP address corresponding to the messaging provider's service.

13 As indicated in Section 8, the glossary, the term "Relay User" refers to a person utilizing text or video to connect to communication assistant (CA) or a video interpreter (VI) in order to place calls to a hearing telephone user.

3.3.2.2 IP Captioned Telephone Service

Although one manner of implementing this service is discussed in Appendix 2, it is unclear whether all providers plan to implement it in that fashion. While the INC believes that the solutions considered for VRS and IP Relay are extensible to IP Captioned Telephone Service (IP CTS), no specific implementation is proposed at this time.

3.3.3 Internet Naming and Addressing

Naming and addressing is an integral part of any communications network. "Names" are memorable strings of numbers or words which consumers use to make phone calls, send emails, or access web pages. "Addresses" are often lengthy strings of numbers used by networks to identify network elements. Communications networks map names to addresses for the purposes of routing messages and establishing sessions between network elements like telephone switches. The PSTN employs LRNs to "route correct" dialed TNs for call routing and signaling.

A relay provider uses IP technology and the public Internet to connect to a Relay User. This does not mean the relay provider is part of the Internet; it simply means the relay provider uses IP technology for establishing the connection via the Relay User's Internet connection.

Most importantly, a relay provider uses IP naming and addressing protocols. IP networks use domain names as names and IP addresses as addresses. More specifically the Internet maps domain names and URI, such as http://www.atis.org/inc, to an IP address to enable connectivity.

Internet Service Providers (ISPs) maintain an inventory of IP addresses. When a device like a PC or a mobile phone connects to the network, the network temporarily may assign a dynamic IP address to the device rather than assign a permanent static IP address. This allows the network to conserve IP addresses. The same device may have different IP addresses at different times, and the network will maintain the mapping between the device and the IP address.

In the case of the VRS application, VRS Users will have an IP connection provided by an ISP. It is the ISP's network that will assign an IP address to the user equipment. Today, some VRS User end points update the VRS provider's platform every time a new IP address is assigned by their ISP. When the VRS provider receives an incoming call for the user, the VRS provider maps the unique identifier established between the user and the VRS provider, e.g., user ID, to the appropriate IP address. This same technique could be used to update a centralized database maintained by a neutral third party administrator and accessible by all VRS providers.

3.3.4 Need for a Central VRS Routing Database

There is a need for a central database that maps the TNs assigned to the VRS User to an Internet address. This is necessary to enable the following objectives defined in Section 3.1:

- Point-to-Point Calls – A Deaf person dials (initiates a call) using the TN from their user equipment and the call is set up to another deaf person; no interpreter is added.

- Hearing to Deaf Calls – A hearing person dials the toll free TN of a VRS provider selected by the hearing caller, reaches an interpreter, and tells the VRS provider which TN to call. The call is set up to the VRS User.

These calls must traverse an IP network(s) for the broadband Internet leg of the call; therefore, an Internet address is needed for routing. For example, a hearing caller will use a toll free TN to call a specific VRS provider. The caller then gives the TN of the deaf person to the VRS provider. To terminate the call, the VRS provider requires an Internet address. Therefore, they must map the TN provided to an Internet address.

Each VRS provider should have access to the same mapping information for the deaf person's TN, so that each VRS provider has the ability to complete a call to any VRS User. The authoritative source of mapping information should be maintained by a neutral third party [see Section 3.4], so that each VRS provider has the same access to the same information. The details of that mapping information are dependent on solutions described in Section 4.2 of this document.

In summary, a central VRS routing database that maintains TN to Internet address mapping information for calls to VRS Users is necessary for TN-IP call routing. The database should be maintained by a neutral third party.

3.4 Aspects of Neutral Third Party Administration

More than one entity may be required to provide services to the entire Internet-based Relay industry. As such, these entities must be neutral third parties to all Internet-based relay providers and, if procuring telecommunication service, also must be neutral to telecommunication service providers.

In the context of this document, relay service neutral third party refers to an entity that has no ownership or affiliation with any Internet-based relay service provider. This entity shall be referred to as the relay service neutral third party. The relay service neutral third party refers to an entity that will be selected to provide services to the entire Internet-based relay service industry and therefore must not be in a position to show any preference to any one Internet-based relay service provider. The relay service neutral third party shall not:

- Be an Internet-based relay provider;
- Be owned by an Internet-based relay provider;
- Be an affiliate of an Internet-based relay provider;
- Have an organizational affiliation with an Internet-based relay provider; or
- Be permitted to have an equity stake in, or a board member involved with, any Internet-based relay provider.

There might be multiple instances (e.g., routing database administrator and numbering administrator) where a relay service neutral third party is identified. It has not been determined whether the routing database administrator has to be neutral to the telecommunications service industry; however, it is agreed that the relay number administrator shall not be a telecommunications service provider (e.g., as is required of NANPA).

3.5 Privacy Requirements

Each of the options described in this document result in the creation of one or more aggregate databases of telephone numbers allocated to deaf and hard of hearing people. For example, relay service neutral third parties identified in this document will maintain a database of Internet-based relay service TNs allocated to multiple service providers. The fact that it contains TNs used by multiple Internet-based relay service providers makes this an aggregate data base. These numbers can be assumed to be assigned to deaf or hard of hearing consumers.

The database of the deaf user telephone numbers can potentially be used for inappropriate purposes, such as improper business or marketing practices.

The FCC already has taken note of one issue, improper marketing practices, in a Public Notice dated January 26, 2005. In this Public Notice the FCC states:

> *We will instruct the TRS* Fund *administrator that, effective March 1, 2005, any provider found to be engaging in the improper marketing or call handling practices described below will be ineligible for compensation from the Interstate TRS Fund (Fund).*[14]

The Public Notice goes on to say:

> *… we understand that some providers use their customer database to contact prior users of their service and suggest, urge, or tell them to make more VRS calls. This marketing practice constitutes an improper use of information obtained from consumers using the service, is inconsistent with the notion of functional equivalency, and may constitute a fraud on the Interstate TRS Fund because the Fund, and not the consumer, pays for the cost of the VRS call.*[14]

Due to the sensitive nature of information contained in such databases, there must be a privacy requirement for the entities that maintain these databases that limits the dissemination of information contained in these databases. In addition there must be strict data use requirement for use of these databases such that these data are only used for establishing sessions for the purposes of communications and are not used for unintended purposes such as telemarketing.

This privacy requirement is intended for databases where one can reasonably draw the conclusion that the TN is assigned to a deaf or hard of hearing person. This privacy requirement does not cover a database that maintains the deaf or hard of hearing person's TN among other TNs if this number is not distinguishable as belonging to a deaf person.

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14 From FEDERAL COMMUNICATIONS COMMISSION CLARIFIES THAT CERTAIN TELECOMMUNICATIONS RELAY SERVICES (TRS) MARKETING AND CALL HANDLING PRACTICES ARE IMPROPER AND REMINDS THAT VIDEO RELAY SERVICE (VRS) MAY NOT BE USED AS A VIDEO REMOTE INTERPRETING SERVICE, 26-January-2005, http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-05-141A1.pdf

In order to guard against improper marketing practices, Internet-based relay providers will not be allowed to receive a copy of an aggregate database of Internet-based relay service TNs. Aggregate databases are those maintained by relay service neutral third parties, such as routing database providers or relay service TN administrators, which, by their very nature, include TNs from multiple Internet-based relay service providers. The result of this requirement is that only relay service neutral third parties will be able to receive an aggregate database of Internet-based relay service TNs.

Further, privacy requirements are necessary to ensure that criminal activities (e.g., scams, identity theft, etc.) are not perpetrated using any TNs potentially associated with a deaf or hard of hearing person.

4.0 DESIGN COMPONENTS DESCRIPTION

VRS interoperability requires two major components: a means for NANP numbers to be assigned to VRS Users and a central database to link those numbers to an Internet address that can be used by any relay provider or VRS User to set up a call. The central database solution requires a neutral third party administrator. This central database also will require an administrative structure and oversight body to manage the contractual relationships required to maintain data access and integrity in order to use this approach to support VRS.

4.1 Number *Assignment to VRS Users*

There are several processes through which NANP numbers could be assigned to VRS Users.

4.1.1 Number Allocation to VRS Providers by NANPA or Pooling Administrator

Numbering resources could be allocated to Internet-based relay providers by NANPA or the Pooling Administrator. An Internet-based relay provider could then assign numbers to VRS Users.

4.1.2 Relay Providers Purchase Services with Associated TNs to Assign to VRS Users

VRS providers each may establish commercial agreements with voice providers for the purpose of obtaining TNs for assignment to VRS Users.

4.1.3 Relay Providers Obtain TNs from an Administrator to Assign to VRS Users

VRS providers may obtain numbers from a new neutral third party telephone number administrator which obtains service from existing voice providers.

4.1.4 VRS User Subscribes to Voice Service and Call Forwards to Relay Provider of Choice

VRS Users may subscribe to a voice service to obtain a number which is call forwarded to their VRS provider of choice.

4.1.5 VRS User Obtains TN from Neutral Third Party Administrator

The neutral third party receives the request for VRS service from a VRS User. The VRS User also indicates their choice of VRS provider and the city/state with which the VRS User wants the TN associated.

4.1.6 Relay Providers Obtain Numbers as Agents for VRS Users

VRS providers could obtain a number from a voice service provider acting as an agent for a VRS User. In this case, the VRS User rather than the VRS provider is the customer of record for the TN.

4.2 VRS Routing Database

The INC considered two alternatives contributed by INC members for implementing a central database solution: the Number Portability Administration Center (NPAC) and a database that uses the Internet Domain Name System (DNS). This central database approach requires the formation of a competent body, or the use of an existing body to provide oversight and industry representation. This body will need to include all interested VRS providers to effectively coordinate the development of implementation requirements and manage ongoing database operations with the designated database provider. This body should be accountable for the effectiveness of this solution to the industry, the NANC, and the FCC.

The following table shows interdependency characteristics of the database options. For further technical descriptions of database options, see Appendix 1: Technical Descriptions of Database Options.

Comparison Table 1

Interdependency Characteristics

Top Tier Database Characteristic	**DNS**	**NPAC**
What is the first database queried for call set up?	DNS Service provider queries a central dynamic DNS Database, which provides the IP address	Routing Database SP(s) Two steps, the first step is SP queries Relay Service routing database to identify the relay service provider having the IP Address
Aside from the relay SP/Relay User and first step identified above, what is the next party involved?	None Direct call set up via internet from relay provider to **Relay** User equipment	**Relay** User Designated Relay Provider The relay provider must signal SETUP to the designated provider.
What is the interaction with the designated relay provider hosting the IP address of the Relay User's equipment?	Designated relay provider must update the DNS with the **Relay** User's current IP address Call set up and media flow not dependent upon designated service provider.	Signal Call Set Up Message to Designated Service Provider
Does a non-designated relay provider need to depend on the called user's designated relay provider for call set up signaling?	No	Yes
Does a non-designated relay provider need to depend on the called user's designated relay provider for media (video) path?	No Direct internet connection between relay provider and the **Relay** User	Optional Media may flow through designated relay provider's platform or directly via the Internet.

For which calls does a non-designated relay provider need to depend on the called user's designated relay provider? (call types: hearing to deaf; deaf to deaf; dial around using toll free number)	None	All

4.2.1 NPAC

The NPAC is the entity that maintains the database of record for LNP in the United States and Canada. Today it associates ported and pooled telephone numbers with PSTN routing and other information. Carriers download a copy of the NPAC data to their networks and query this copy during call set up. It has been proposed that the NPAC could also associate Uniform Resource Identifiers (URIs) with Relay User telephone numbers so as to meet the goals outlined in Section 3.

The NPAC solution consists of placing URIs for Relay User telephone numbers for each relay service in the NPAC. These URIs are downloaded to entities that qualify as a relay service neutral third party. This downloaded information is queried by the relay provider during call set up. In the VRS case, the URI would resolve to the Relay User's designated relay provider's IP address, allowing for call set up signaling through that relay provider. For VRS, the media either can go through the relay provider or directly to the Relay User. In both the VRS and IP Relay cases, the URI would contain the messaging protocol or application information allowing any capable relay provider to set up a call to the Relay User.

4.2.1.1 VRS

The NPAC approach for VRS requires that call signaling always goes through the consumer's designated relay provider. The URIs in the central database identify the relay provider associated with each number and that provider has the VRS User's IP address. Provisioning for the NPAC approach is shown in Appendix 1 Figure 1.

Each VRS provider maintains its own local database of IP addresses of its VRS customers, which is updated by the VRS User's Customer Equipment. As shown in Appendix 1 Figure 2, a hearing caller dialing the VRS TN is routed to the VRS User's Relay provider which launches a query to its own local database to obtain the VRS User Customer Equipment IP address necessary to initiate the broadband VRS leg of the call.

As shown in Appendix 1 Figure 3, a hearing caller may reach the VRS User via the VRS provider of their choice by calling that provider's toll free number. The CA for this originating VRS provider would use the 10-digit VRS number given to it by the calling party to query a relay service neutral third party database to identify the terminating VRS provider owning the database containing the VRS User equipment IP address. The originating VRS provider would then initiate call setup to the terminating VRS provider owning the database. The terminating provider would then set up a broadband connection to the VRS User's equipment.

As shown in Appendix 1, Figure 4, VRS Users may set up a peer to peer call (no CA involved), by initiating a call to their designated provider. That provider will query a relay service neutral third party database and use the resulting URI to set up a call to

the designated VRS provider of the called VRS User. The called party's provider will in turn set up a connection to the called VRS User's equipment using the current IP address from the database it maintains.

The NPAC approach requires VRS providers to provision URIs into the NPAC through the network service provider associated with their customers' telephone numbers and to arrange to query a relay service neutral third party provider's database during call setup. This approach is similar to the current approach used by telecommunications service providers provisioning ported TNs. The NPAC must establish controls to allow only relay service neutral third parties to download relay URI data. The NPAC URI would contain a VRS provider domain rather than per-user domain, e.g. 17948675309@vrsprovider1.com (the user part of the URI must identify the specific VRS User).

4.2.1.2 IP Relay

For IP Relay, the NPAC will contain an appropriate URI for the messaging service to be employed. If the service is a publicly available one, for example, one of the common Instant Messaging (IM) services then the URI will allow setup of a session with that user without going through the Relay User's designated relay provider. In this case, resolution of the host part of the URI will be through normal DNS processes.

The URI would be provisioned by a designated IP relay service provider through the network service provider for the TN in the same way as for VRS.

When a hearing user dials the Relay User telephone number, the call would route to the designated IP Relay service provider, similar to VRS as shown in Appendix 1 Figure 2. That provider then would retrieve the necessary information from its local database (or from a relay service neutral third party database where applicable) to set up the IP relay leg to the called Relay User, similar to VRS as shown in Appendix 1 Figure 2.

When a hearing caller selects an IP relay service provider other than the called party's designated provider (e.g., by dialing that IP Relay service provider's toll free number) the call would route to that IP Relay service provider which would then set up the IP relay call to the called Relay User using the URI obtained by querying a relay service neutral third party database. In the case of existing publicly accessible IM protocols (e.g., AOL Instant Messenger™ Service) interaction with the designated relay provider is not required. If a protocol proprietary to the designated provider is the only one available, then interoperability may not be supported unless the designated relay provider makes available some gateway function.

An IP Relay User wishing to set up a peer to peer call to another IP Relay User could send an initial set up message to their IP relay service provider. For protocols that have referral mechanisms, the IP relay provider could refer the IP Relay User to the correct URI of the called party if the called party URI used the same protocol as the calling party. For protocols that do not support relay, the relay service could return a text message with the URI (or screen name) of the addressed user. For calls where the protocol of the calling party is not the same as the called party, the IP relay service could provide gateway services or refer the calling party to a suitable gateway service.

4.2.2 DNS

This approach uses the Internet DNS capabilities to provide the central database. DNS is the system that translates the domain names familiar to Internet users, e.g. atis.org or fcc.gov, to the actual IP addresses needed for routing.

To support relay service interoperability using the DNS, an ENUM query could be employed allowing a query for the phone number domain to return an IP address or URIs for each relay service. The domain name part of the URI ultimately would resolve to an appropriate IP address.

4.2.2.1 VRS

In the DNS approach for VRS, the central database could maintain the VRS User's IP address information and make it directly available to VRS relay providers and potentially to users on a per-call basis.

Dynamic DNS (DDNS) is an existing DNS capability used to link domain names to IP addresses when those addresses are dynamically rather than statically assigned. While DDNS normally involves the user equipment directly updating the DNS server with its current IP address, support of legacy equipment may require that the user equipment continue to update the user's designated relay provider. The relay provider in turn would update the DDNS server so as to make the IP address available to other parties. In application to VRS, the VRS User's equipment IP address would be associated in the DDNS with a domain based on the VRS User's telephone number. The provisioning flow for this approach is shown in Appendix 1, Figure 5.

As shown in Appendix 1 Figure 6, a hearing caller dialing the VRS User's number is routed to the End User's designated VRS provider who launches a query to this single shared Dynamic DNS server to directly obtain the VRS equipment's IP address necessary to initiate the broadband VRS leg of the call via the public Internet. Alternatively, the VRS provider may query a local database (if it maintains one) for the VRS User's IP address.

As shown in Appendix 1 Figure 7, a hearing caller may reach the VRS User through the VRS provider of the hearing caller's choice by calling that provider's toll free number and providing the VRS User's number to the CA. The CA would launch a query to the Dynamic DNS server to directly obtain the VRS equipment's IP address necessary to initiate the broadband VRS leg of the call via the public Internet. The called VRS User's designated provider has no involvement on such calls unless they happen to be the provider chosen by the hearing caller as well.

To handle peer to peer calls, users would ideally be able to query the DDNS server directly to obtain the current IP address. Because of legacy equipment limitations and until security issues are resolved, it is proposed that the query instead route through the user's designated relay provider. This flow is shown in Appendix 1, Figure 8.

4.2.2.2 IP Relay

The Central DNS will be provisioned with a URI for the IP Relay service associated with the Relay User's telephone number. The URI will be encapsulated in a NAPTR

record. Information for IP Relay and for VRS will be provisioned under individual domains.

The URI would be provisioned by the called party's designated relay service provider into the DNS.

When a hearing user dials the Relay User telephone number, the call would route to the called party's designated IP relay service provider, much as for VRS in Appendix 1 Figure 6. That provider would query its local data store and use the information to set up the IP relay leg to the called user; again, much as for VRS as shown in Appendix 1 Figure 6. Alternately, the called party's designated IP relay provider could query the DNS like any other relay provider.

When a hearing caller selects an IP Relay service provider other than the designated one (e.g., for example by dialing that IP Relay service provider's toll free number) the call would route to that calling party's selected IP Relay service provider. That IP Relay service provider would then query the DNS to retrieve the appropriate URI and use it to set up the IP relay leg to the called user. In the case of existing publicly accessible IM protocols (e.g., AOL Instant Messenger™ Service) interaction with the called party's designated IP relay service provider is not required. For calls where the protocol of the calling party is not the same as the called party, the IP relay service could provide gateway services or refer the calling party to a suitable gateway.

As discussed above the ideal call flow for a peer to peer call would be for the IP Relay User to query the DNS to obtain the appropriate URI directly. But to address legacy equipment and pending the resolution of security issues, it is proposed that the query be directed toward the user's relay provider which would in turn query the DNS to obtain the URI and pass it to the VRS User.

5.0 DESIGN COMPONENT ANALYSIS

5.1 Number Assignment to Relay Users

Note that each approach described below is not exclusive; that is, a single or multiple approaches potentially can be employed simultaneously by relay providers.

5.1.1 Number Allocation to Relay Providers by NANPA or Pooling Administrator

Under current regulations, this approach would require that relay providers become certified as local exchange carriers in each jurisdiction in which they require numbering resources. In a report titled *VoIP Service Providers' Access Requirements for NANP Resource Assignments* dated July 19, 2005[15], the NANC recommended that the FCC should change their existing rules and allow VoIP service providers (called IP-enabled service providers) to be assigned numbering resources (with conditions) from the NANPA and PA without first becoming certified local exchange carriers. It is our opinion that Internet-based relay service providers fit into the category of VoIP providers described in that report.

Like VoIP users, Relay Users are spread throughout the United States and most will desire a local number. Relay providers, or VoIP providers, would seek numbers in rate centers to meet the demand of their customers. Numbers would be assigned in blocks of 1,000 by the Number Pooling Administrator to providers in these rate centers. Number Pooling is a number conservation measure put in place by the FCC in 2001. It is measures like these and other conservation measures that allow the industry to distribute numbers efficiently even for service providers that do not have a significant number of customers.

The FCC has not yet acted on this recommendation. In addition, this approach requires investment of additional resources and is therefore not a desirable alternative for some providers. One final concern with this approach is if blocks are assigned directly to relay providers, then these numbers are effectively marked as being "deaf user numbers." To the degree that this is viewed as compromising the privacy of such users, this approach may be undesirable.

Relay providers, as is the case with any entity, may obtain numbers directly from the NANPA and PA if they comply with the regulations. In addition, INC believes that the proposed changes to industry numbering guidelines to accommodate VoIP Providers also would accommodate Internet-based relay providers. Therefore, no separate recommendation for changes to the guidelines is necessary to accommodate the direct assignment of TNs to relay providers. However, INC does not view as the direct assignment of numbering resources as a solution that all providers will use and INC will propose other solutions that may be viable to more providers.

5.1.2 Relay Providers Purchase Services with Associated TNs to Assign to VRS Users.

This approach is viable today and corresponds to that taken by most VoIP service providers. Procedures would have to be established, however, to support movement of

15 http://hraunfoss:fcc.gov/edocs_public/attachment/DOC-265351A1.doc

VRS Users from one relay provider to another since, under this approach the relay provider, rather than the VRS User would be the number assignee of record. While this issue has been addressed for VoIP providers there may be additional issues that result when the movement of a VRS User from one relay provider to another does not involve a change of underlying network service provider.

5.1.3 Relay Providers Obtain TNs from an Administrator to Assign to VRS Users. This approach may be employed coincident with other approaches so as to not limit a VRS provider's options for obtaining numbering resources.

The availability and use of a neutral third party would support consistent availability and accountability for numbering resources needed by VRS providers focused primarily on competing for the delivery of relay services. The neutral third party would allocate TNs and arrange voice services for delivery of inbound calls to relay providers. This eliminates the need to individually procure and manage voice services needed for assignment to their clients as is required for their clients to establish service and reach their (VRS) call center.

A neutral third party could acquire, manage and allocate the underlying voice services accompanied by telephone numbers from VoIP providers, resellers, and/or directly from LECs which provide the underlying PSTN connectivity network services in a manner that is consistent with FCC rules and regulations, including those rules and industry practices unique to relay services.

The neutral third party could monitor and track utilization and administer the forecasting mechanisms necessary to manage and maintain a sufficient quantity of resources available for assignment in each city/state based upon demand forecasts provided directly by authorized relay providers.

The neutral third party would promote the fair and equitable access and availability of numbering resources by all relay providers that was not dependent upon a provider's size or resources. In addition, the costs associated with the neutral third party approach to administration and management would be uniquely identifiable; this would be important in the event that the anticipated costs would be borne by the Interstate TRS Fund.

Beyond those activities borne by the Interstate TRS Fund, the neutral third party could also provide "enterprise services" to fulfill the varying needs of relay providers without burdening the industry with services needed and delivered to any one VRS provider as may be required to manage operations. This approach is used to provide services to telecommunications providers offered by the NANPA on an enterprise basis.

Use of a neutral third party is "implementation neutral" in that the "requirements" and Service Level Agreements (SLA) in delivering features and functionality by the vendor (administrator) can be established and monitored by the relay providers and telecommunications industry whether the procurement of services is accomplished via a federal procurement or through a legal entity such as a LLC.

It is worthy to note that existing neutral third party services provided to the industry through the NANPA and PA vendor serves as a model and that it is not unrealistic to consider the use of the services provided by the existing NANPA and PA vendor(s) at

the time of procurement so long as the operations and costs were traceable for allocation and payment by the Interstate TRS Fund.

Likewise, it is not unrealistic to assume the entity selected to develop and administer a numbering and routing database under the DNS or NPAC approaches could act both as the routing system developer as well as the neutral third party performing all the services described above.

Furthermore, since the relay service administration requirements address the unique needs of the relay provider and user community, it is not unrealistic to expect that vendor selection and procurement may warrant the use of a bid process, as opposed to supplementing existing vendor neutral third party services with those required of the NANPA or PA.

Vendor selection for the neutral third party would allow prospective vendors to bid on one or both aspects of the relay service capabilities needed to deliver number allocation and routing functionality, namely, the numbering administration and system development/management.

As with any changes regarding the management and administration of numbering resources, this approach would require inclusion in an anticipated FCC order to implement a relay services solution. This would also require the development of appropriate administration methods and procedures with Commission and/or industry oversight mechanisms. As such, while this approach might simplify obtaining numbers – particularly for smaller providers – it may delay VRS interoperability if it was the only method available to obtain numbering resources.

In addition to the requirements described in Appendix 3, Suggested Neutral Third Party Regulations, the neutral administrator also would be required to be neutral with respect to telecommunications (number) providers as well as with respect to relay providers.

5.1.4 VRS User Subscribes to Voice Service and Call Forwards to Relay Provider of Choice

This approach also would be possible today. It does, however, require more effort on the part of the VRS User and might complicate reimbursement of telephone service charges if the FCC were to decide that such charges are reimbursable. VRS Users could change relay providers by working directly with their voice service providers.

5.1.5 VRS User Obtains Telephone Number from Neutral Third Party Administrator

This approach may be employed coincident with other approaches so as to not limit a VRS User's options for obtaining an initial or subsequent change to the provider of choice. For example, a VRS User could call the designated relay provider of choice to initiate service or a second relay provider to initiate a change to the relay provider of choice for incoming relay service.

A neutral third party may facilitate the process of establishing or changing relay providers. In addition, the neutral third party may assist someone who is authorized by the VRS User to establish and maintain the VRS User's account.

Use of a neutral third party administrator to provide telephone numbers to VRS Users has the advantage of reducing the burden on relay providers. Additionally, this approach

may be simpler for VRS Users than having to go to a LEC, as in 5.1.4., but may be more complicated than obtaining a number through a relay provider. On the other hand, this approach would add to the set of requirements necessary for an anticipated FCC order to implement a Relay Service solution and would require the development of appropriate methods and procedures with Commission and/or industry oversight mechanisms. As such, while it might simplify obtaining numbers, VRS interoperability may be delayed if this is the only method available to obtain numbering resources.

In addition to the requirements described in Section 3.4, the neutral administrator would also be required to be neutral with respect to telecommunications (number) providers as well as with respect to relay providers. See Appendix 3 section 2.0.

5.1.6 Relay Provider Obtain Numbers as Agents for VRS Users

Under the agency model, the VRS provider acts as an agent for the VRS User in obtaining telephone service and a telephone number to be used for VRS calls. The VRS User provides an authorization to their chosen VRS provider which in turn obtains service from a LEC, CLEC, VoIP, or other voice service provider that has numbers in the desired rate center. The voice provider assigns a number and sets up service showing the VRS User as the number assignee and the VRS provider as the agent to whom bills are sent. The voice provider also will arrange routing of direct dialed calls to the VRS provider.

If the VRS User elects to change VRS providers, the VRS User provides an authorization transferring the agency for their service to the new VRS provider. The new VRS provider then makes this authorization available to the serving voice provider and thus takes over the billing and can change the number to which calls are forwarded to the new VRS provider's number. If it so chooses, the new VRS provider may port the number to another underlying network service provider.

The agency model does not require setting aside of resources for VRS service that may be stranded but makes use of existing carrier inventories on an as-needed basis.

The agency model maintains End User "ownership" and control of the telephone number and the ability to change VRS providers without requiring the VRS User to deal with voice service providers. In the model where VRS providers obtain numbers from voice service providers, there is no clear process for moving such numbers from one VRS provider to another where a change in underlying network service provider is not made.

The agency model allows the VRS provider to handle all the requirements of obtaining a number for those VRS Users who want "one stop shopping" and allows VRS providers to compete on their quality of service. VRS providers have many alternatives for obtaining numbers from existing carriers or other voice service providers, and competition for their business should keep costs low.

The agency model does not introduce another layer of personnel, process, and cost in the number procurement process, unlike neutral third party models of VRS number acquisition.

5.2 VRS Routing Database

5.2.1 NPAC

Some existing VRS User equipment automatically updates a VRS provider's database with the user equipment's current IP address. The NPAC approach allows this user equipment to continue to operate in the current mode. The NPAC approach requires each VRS provider to create a mapping between its VRS User telephone numbers and the VRS User equipment current IP address.

The NPAC approach requires that relay providers work through the network service provider for their customers' telephone numbers to provision corresponding URIs in the NPAC. This may be relatively simple for the relay provider where the user obtained the number through the relay provider but more complex where the user obtained the telephone number directly from a voice service provider. Relay providers will need to make arrangements with the Relay User's voice service provider to update the URI.

Relay providers must make arrangements with a relay neutral third party provider to query its database.

In the VRS case, the NPAC approach requires the involvement of the VRS User's designated provider on incoming and outgoing calls, including direct dialed calls between two VRS Users. Some relay providers object to the participation of the designated provider on hearing-dialed calls where the hearing caller has selected a different relay provider. Some relay providers believe that there are important benefits to the designated relay provider's involvement on all calls. Some relay providers and users object to relay provider involvement on peer to peer calls. Some relay providers and users believe that the benefits of direct dialed peer to peer calls outweigh the potential concerns of some VRS providers.

If the direct allocation to relay providers for number acquisition model is not employed, then there may be issues of how a relay provider controls the NPAC record for relay service when the NPAC shows the number as belonging to the underlying network service provider, which is a different entity.

The requirement for having all queries directed to a relay service neutral third party database provider, addresses concerns with any relay provider having a list of all VRS Users' telephone numbers. This results in there being three entities involved in a call set up outside of the hearing caller direct dialed case.

5.2.2 DNS

The DNS is the standard name to Internet resource translation mechanism. It is flexible and extensible. As the DNS is an industry standard, many vendors are in a position to provide the DNS capabilities needed to support relay interoperability thus allowing competitive procurement. Various capabilities built on DNS, e.g. delegation, ENUM, and Dynamic DNS, provide a range of methods to support relay interoperability.

The DNS approach allows direct call set up to any VRS User by all VRS providers and by other VRS Users through their chosen provider for peer to peer calls. This may reduce costs, because extra providers are not required on some call types. The DNS approach eliminates the objection that some relay providers have to the participation of

the designated provider on hearing-dialed calls, where the hearing caller has selected a different relay provider.

A neutral third party will be required to manage the Dynamic DNS.

This model does not result in any relay provider having a list of VRS User telephone numbers beyond their customer list (given that zone transfers are prohibited).

Dynamic DNS is the current Internet approach to associating domain names with dynamically-assigned IP addresses.

5.2.3 Comparison Table 2 – Database Characteristics

Top Tier Database Characteristic	**DNS**	**NPAC**
What data is provisioned in the (top tier) database?	IP address	URI
Where is the IP Address located?	Single Centralized Database	Multiple Individual Databases (At Database of Relay SP of Choice)
Other than the (top tier) database, are there others which have to be queried to complete the call?	No	Yes Routing database provider(s) and relay provider of choice
Aside from relay Service Providers/Relay Users, in how many locations is data stored?	1 (IP address in DNS)	2 (IP address @ designated Service Providers; URI in NPAC/Relay Service neutral third party
Are relay providers Required to maintain a local Database for the customers who have selected them as the designated relay provider?	No	Yes
Does the selected relay provider "host" the customer address information, e.g. IP address of the Relay User?	No	Yes
Which database is updated with the customers' equipment IP Address for discovery?	Dynamic DNS but through the Selected Relay Provider	Selected Relay Provider's Database

Who provisions the data in top tier?	Relay Providers	Voice Service Providers serving the TN
Who do relay providers query first?	Dynamic DNS Provider	Third Party Routing Provider(s).
What is the medium used between the Relay User and the relay provider for Video Relay Service (VRS)?	Broadband Internet	Broadband Internet
Are Relay Users required to depend upon other parties to update/change their preferred relay SP?	Required Whether the TN is brought by the customer or provided by the VRS provider, the provider must update the database.	Required Voice Service Provider serving the TN must make a record change in the NPAC.

6.0 SECURITY CONSIDERATIONS

The call processing and routing database solutions described in Sections 4.2 and 5.2 of this document utilize Internet technology and services. Spam, spit (spam over Internet telephony), impersonation, viruses, worms and denial of service attacks are some of the behaviors that have to be guarded against while defining solutions that use Internet technology. It is important to review the solutions and make recommendations and comments regarding Internet security.

This section reviews some of the security considerations associated with the routing database solutions considered. It is worth noting that both of the routing database solutions considered require modifications to how relay providers interact with other relay providers, how relay providers interact with a new entity providing routing database services, and how relay providers interact with the Relay Users and how the Relay Users interact with each other.

6.1 NPAC Solution

The NPAC solution has the following assumptions:

- The Relay User selects a relay provider.
  This relay provider will handle call signaling for all incoming and outgoing calls for the user (the Relay User can use the interpreters of another relay provider, however, the call to the other relay provider would be set up by their selected relay provider).
- The Relay User's equipment will update the selected relay provider with its IP address.
- Relay providers provision a URI associated with a Relay User's telephone number (TN) to the NPAC.
  This is done either directly or through a telecom service provider that provides TNs to the relay provider.
- The URI data is provisioned only to a pre-approved relay service neutral third party.
- The NPAC is considered the registry for the URI data and the relay service provider neutral third party provides the database that is queried by the relay provider.
- The relay provider uses the URI to establish the call to the Relay User by signaling to the Relay User's pre-selected relay provider.
  Signaling always goes between the originating relay provider and the terminating relay provider, media can go directly between the originating relay provider and the Relay User or it also can go through the relay provider.

  The terminating relay provider provides the Relay User's IP address to the originating relay provider over the signaling connection.

6.1.1 Relay User Security

When the user starts up their relay application, it establishes connections to the incoming gateway/proxy server of the relay provider. Standards based challenge/response mechanisms allow the relay provider to authenticate its users.

This is a standard Internet registration process. The client (i.e., the Relay User's application) initiates a registration with the server (i.e., the relay provider's gateway/proxy server). Once this registration is done, the server can initiate

communications with the client, such as for an incoming telephone call. Where a firewall is involved, it might block incoming communication if there was no registration process.

For incoming calls to the Relay User, as well as terminating calls to the Relay User, signaling is done only between the Relay User and its selected relay provider over an authenticated connection. This applies to incoming direct dialed calls and to incoming calls from other relay providers. It also applies to Relay User originated calls to hearing people, other Relay Users, other relay providers, and to 911. This is a restricted domain which limits the danger of attack while allowing for call processing for the Relay User.

6.1.2 Relay Provider Security

The relay provider must interface with three different entities: the Relay User, the relay service provider relay service neutral third party and other relay providers. The section above describes the security between the relay provider and the Relay User.

It is recommended that there be a virtual private network (VPN) connection between the relay provider and the relay service neutral third party. A VPN will provide a secure connection between the relay provider and the relay service neutral third party which will ensure that the communications are not vulnerable to malicious behavior. Most importantly it will maintain the security of the deaf user's TN and URI. Three of the more common methods for providing VPNs are:

- Network-based VPN – This requires a network provider to set up the VPN and incurs recurring charges from the network provider to operate the VPN.
- IPsec (IP security) – Security engineers set up an IPsec tunnel. This is done using standard network and security infrastructure. There are no recurring charges related to IPsec.
- TLS (Transport Layer Security) - Security engineers set up an IPsec tunnel. This is done using standard network and security infrastructure. There are no recurring charges related to IPsec.

For additional security, a VPN could also be used between relay service providers, but it is not essential. The decision as for usage must be uniform across relay providers.

6.1.3 Routing Database Provider

Interfaces to the NPAC are over a direct secure network connection. NPAC personnel will be required to approve the relay service neutral third party in order to allow them to receive the relay service URI data.

The relay service neutral third party should not allow the public Internet access to its URI database. Access to this database is only to relay providers. Access to the database is only done over a secure VPN.

6.2 DNS Solution

The DNS solution has the following assumptions:

- The Relay User's equipment updates the user's relay provider with its current IP address. The relay provider in turn, updates the DDNS provider with the user's IP address and domain name. (Direct user updates are technically possible with some equipment but raise other issues.)
- Incoming calls to the Relay User query the DDNS server to obtain the IP address of the user. The designated relay provider can query a local data store instead on calls to its customers.

- Relay providers and deaf users directly establish a signaling and media connection to a called Relay User's device.
- The relay provider selected by the user is only required to be involved in direct dialed incoming calls. The call goes to the selected relay provider who queries the DDNS server and then terminates the call to the user.
- Other relay providers signal directly to the Relay User and not through the designated relay provider.
- For originating calls the deaf Relay User's device queries their designated relay provider. If the call is to another deaf Relay User, the relay provider will provide the information for the originating user to set up the call directly.
- On peer to peer calls, the originating deaf Relay User signals directly to the Relay User once they have obtained the proper address.

6.2.1 Relay User Security

In order to support a call from any relay provider or any Relay User (direct user-to-user video call), no filtering based on source IP address is assumed because the user does not know in advance the IP addresses of the entities making the call. This is the current configuration under which VRS operates today.

6.2.2 Relay Provider Security

The DDNS proposal contemplates that any Relay User may signal directly to any relay provider to place an outgoing call. This means that relay providers must allow calls from anyone; their incoming firewall must permit incoming connections from any IP address. This is the current mode of operation. Relay providers should thus take appropriate measures to guard against attacks.

6.2.3 Routing Database Provider

Since only relay providers are allowed to update or query the database, a number of existing techniques would be used to restrict access to the central database server accordingly. These include access control lists that limit access to known IP addresses of relay providers and Secure VPNs as described in Section 6.1.2 and 6.1.3.

7.0 RECOMMENDATION

To meet the goals outlined in Section 3.1, the INC recommends that

- relay users be assigned geographic NANP numbers, reflecting their location if desired, which will route to the relay provider of their choice when dialed by a hearing caller
- the relay users obtain numbers through the relay service providers. Additionally, relay users should be able to obtain NANP numbers directly from a voice service provider, or utilize an existing number, if desired.
- relay providers obtain numbering resources either from voice service providers or, if they choose, by qualifying to obtain resources from NANPA or the PA under existing guidelines
- a central database managed by a neutral third party can be deployed to support interoperability between relay providers. The INC examined several alternatives contributed by INC members for how this may be accomplished.

7.1 Number Acquisition

Relay Users should be able to be assigned a geographic NANP number(s), reflecting their location if desired, as is available today to hearing users. It is expected that this TN will be routed by the voice service provider to the relay service provider chosen by the Relay User. Such numbers should be portable as requested by the Relay User.

Relay Users should be able to obtain numbers through their relay provider. It is expected that relay providers, through commercial agreements, would be able to obtain local numbers. In cases where this is not possible, for example rural areas served by a single provider, the approach of purchasing local service and using forwarding techniques could be employed. Additionally, relay users should be able to obtain NANP numbers directly from a voice service provider, or utilize an existing number, if desired.

Relay providers can, of course, obtain numbering resources directly if they are willing to meet obligations under the current guidelines. It is also possible that such guidelines will be relaxed in the future but the INC does not recommend changing guidelines specifically to support relay services.

7.2 Central Database

The INC recommends that a central database solution be employed to support interoperability between relay providers. This central database should be managed by a neutral third party. The INC examined several alternatives contributed by INC members for how this may be accomplished. Two alternatives examined by the INC are detailed in this report. Both approaches rely on the VRS User's Equipment updating a relay provider when the equipment's IP address changes. The central database associates the VRS User's telephone number with either a URI identifying the relay provider that holds the current IP address (NPAC) or associates the telephone number with the current IP address as updated by the relay provider (DNS). The database thus either makes the IP address directly available to other providers as needed to complete calls or indicates through which relay provider the call must be routed to complete.

Although INC performed its analysis on numbering issues using these two models, other models for achieving interoperability may exist.

8.0 ACRONYM LIST & GLOSSARY

8.1 Acronyms List

ASL: American Sign Language

ATIS: Alliance for Telecommunications Industry Solutions

CA: Communications Assistant

CLEC: Competitive Local Exchange Carrier

CSD: Communications Services for the Deaf

DNS: Domain Name System

DPC: Destination Point Code

FCC: Federal Communications Commission

IETF: Internet Engineering Task Force

IM: Instant Messaging

INC: Industry Numbering Committee

IP: Internet Protocol

IP CTS: Internet Protocol Captioned Telephone Service

ISP: Internet Service Provider

LEC: Local Exchange Carrier

LNP: Local Number Portability

LRN: Location Routing Number

NANC: North American Numbering Council

NANP: North American Numbering Plan

NPAC: Number Portability Administration Center

PA: Pooling Administrator

POTS: Plain Old Telephone Service

PSTN: Public Switched Telephone Network

SIP: Session Initiation Protocol

SLA: Service Level Agreement

SP: Service Provider

TN: Telephone Number

TRS: Telecommunications Relay Service

URI: Uniform Resource Identifier

VPN: Virtual Private Network

VRS: Video Relay Service

8.2 Glossary

Competitive Local Exchange Carrier (CLEC) – is a telecommunications carrier that competes with the incumbent local exchange carrier (ILEC) that originally had an exclusive franchise for a given area.

Communications Assistant (CA) -– Specially trained operator who interprets or relays the conversation between two or more users of TRS.

Customer Equipment – Any equipment, technology, or software that is used by the Relay User to make a relay call.

Domain Name System (DNS) –The Internet uses the Domain Name System (DNS) to map identifiers (domain names such as atis.org or fcc.gov) to the appropriate IP addresses for communication.

Dynamic DNS (DDNS) -– Dynamic DNS is an existing DNS capability used to link domain names to IP addresses when those addresses are dynamically rather than statically assigned.

End User (EU) – The ultimate user of a telecommunications service

ENUM –The Internet Engineering Task Force (IETF) has developed a protocol called ENUM to define how to map a TN to available services an End User associates with that number (User ENUM) or to a point of interconnection with a serving carrier (Infrastructure ENUM). ENUM achieves this by first converting the TN into a domain name and then using the DNS to map the domain name into a Uniform Resource Identifier (URI).

Exchange – A geographic area tariffed by a state utilities commission and served by an incumbent Local Exchange Carrier (LEC). A LEC's franchise territory is comprised of multiple Exchanges and the Basic Local Calling Areas are defined by Exchanges. The Exchanges are generally in the state General Subscriber Services Tariff, Section A3.

The term "Exchange" denotes a geographic area generally smaller than a Local Access Transport Area (LATA) and usually embraces a city, town or village and its environs. Subscribers in a given Exchange area may be served by one or more central offices together with the associated facilities or subscribers in an Exchange area may be served by a central office located in an adjacent Exchange area. (A LATA is usually comprised of multiple Exchanges.)

Instant Messaging (IM) – A form of real-time communication between two or more people based on typed text.

Internet Protocol Captioned Telephone Service (IP CTS) – IP CTS is used by someone who can speak but has difficulty hearing phone conversations. During a phone call the voice of the hearing party is looped to the CA who captions the conversation which is sent over IP to be displayed on the Relay User's computer, phone, or other display device. This allows the user to both listen to what is said over the

telephone (to the extent possible) and simultaneously read captions of what the other person is saying.

Interoperability – The ability for the Deaf or hard of hearing users to contact one another and be contacted to the same extent that Public Switched Telephone Network (PSTN) and VoIP users are able to identify and call one another independent of their relay service provider.

Interstate TRS Fund – The fund used to compensate eligible relay service providers for the costs of providing TRS. Under FCC rules, interstate telecommunications carriers and interconnected VoIP providers contribute to the Interstate TRS Fund based on a percentage of their interstate end-user telecommunications revenues. The current Interstate TRS Fund administrator is the National Exchange Carrier Association, Inc.

IP Relay – IP Relay allows people who have difficulty hearing or speaking to communicate through the telephone system with hearing persons. IP Relay is accessed using a computer and the Internet or mobile handsets using instant messaging solutions or custom applications, rather than a TTY and a telephone.

North American Numbering Council (NANC) – NANC is an advisory committee to the FCC on numbering matters related to the North American Numbering Plan.

Neutral Third Party – In the context of this document, neutral third party refers to a company that has no ownership or affiliation with any Telecommunications Relay Services (TRS) provider. (See section 3.4)

Point-to-Point Call – For purposes of this report, the term point-to-point call refers to a direct call between two deaf users. No interpreter is used on the call.

Rate Center – Rate Center is used for numbering resource applications and reports to associate telephone numbers with a geographic area, as defined by the relevant regulatory agency. A Rate Center is also a uniquely defined point (Vertical & Horizontal Coordinates) located within an exchange area from which mileage measurements are determined. These measurements can be used with the tariffs in the message rating processes.

Relay Provider – An entity that is authorized to collect from the Interstate TRS Fund for providing TRS. Within the context of this report relay provider is defined to only include providers of IP based TRS.

Relay Service Neutral Third Party – An entity that will be selected to provide services to the Internet-based relay service industry and therefore must not be in a position to show any preference to any one Internet-based relay service provider.

Relay User – This is the deaf or hard of hearing user of a relay system/service.

Telecommunications Relay Service (TRS) – A service that allows persons with hearing or speech disabilities to place and receive telephone calls. Various forms of PSTN based TRS include the following:

- TTY
- Captioned Telephone

- Speech-to-speech

Various forms of Internet based TRS include the following:

- IP Relay
- Video Relay Service (VRS)
- IP Captioned Telephone

Uniform Resource Identifiers (URIs, aka URLs) – are short strings that identify resources in the web: documents, images, downloadable files, services, electronic mailboxes, and other resources, e.g.,sip:17948675309@provider.com or http://www.w3.org/Addressing/#background

Video Relay Service (VRS) – An Internet-based form of TRS that allows deaf or hard-of-hearing users of American Sign Language (ASL) to communicative through the telephone system with hearing persons by using a remote video interpreter called a VRS CA. The VRS User communicates with the VRS CA by video using ASL over a videoconferencing software or hardware system running over a broadband Internet connection. The VRS CA relays the conversation between the parties using sign language over video with the VRS User and by voice over the telephone with the hearing party. VRS allows conversations to flow in near real time and in a faster and more natural manner than text-based TRS.

VRS User –This is a deaf or hard of hearing person who communicates using American Sign Language and uses a video relay service.

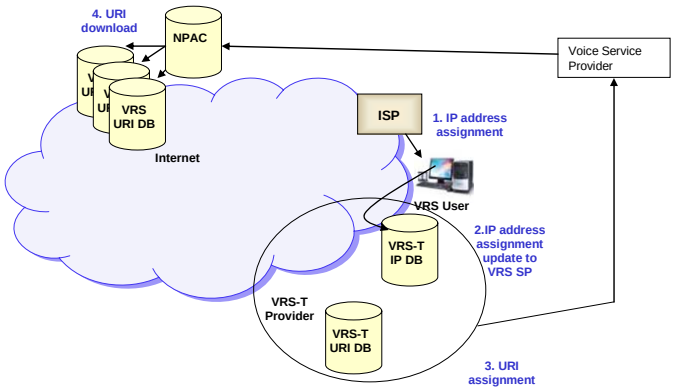
APPENDIX 1 TECHNICAL DESCRIPTIONS OF DATABASE OPTIONS

NPAC – Provisioning

In this architecture, shown in Figure 1, provisioning works as follows:

1. VRS User equipment obtains an IP address from its ISP.
2. VRS equipment provides this IP address to a server maintained by the user's chosen VRS provider.
3. The VRS provider working through the Voice Service Provider for the number arranges for a TN-URI association that links the TN to the VRS provider's call server to be provisioned in the NPAC. This association will generally be unchanged unless the VRS User elects to change VRS providers.
4. Multiple relay service neutral third party service providers with a user relationship with the NPAC download the full set of records for all VRS Users to be stored in a local database to be queried by VRS providers during call setup.

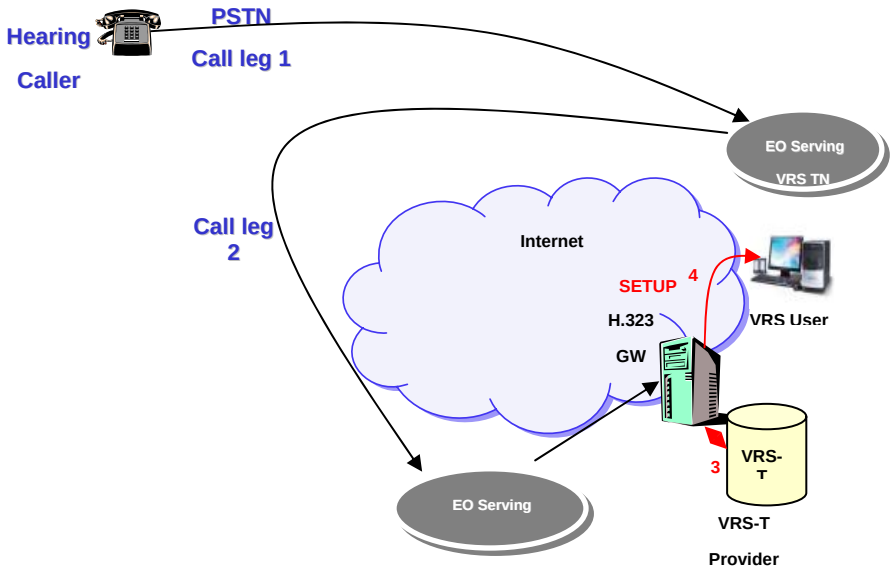
Figure 1
NPAC-Provisioning



NPAC – Hearing Caller Dials VRS User TN

1. A hearing caller dials the VRS User number. The call is routed to PSTN end office serving the number.
2. The call is routed to the VRS User's chosen VRS provider where the CA answers.
3. The VRS provider will retrieve the current IP address from its server.
4. The VRS provider sets up the call from the CA to the called VRS User equipment. Note: For information regarding media flow not shown below, please refer to Section 4.2.1.

Figure 2
NPAC-VRS
Hearing Caller Dials Deaf VRS User TN

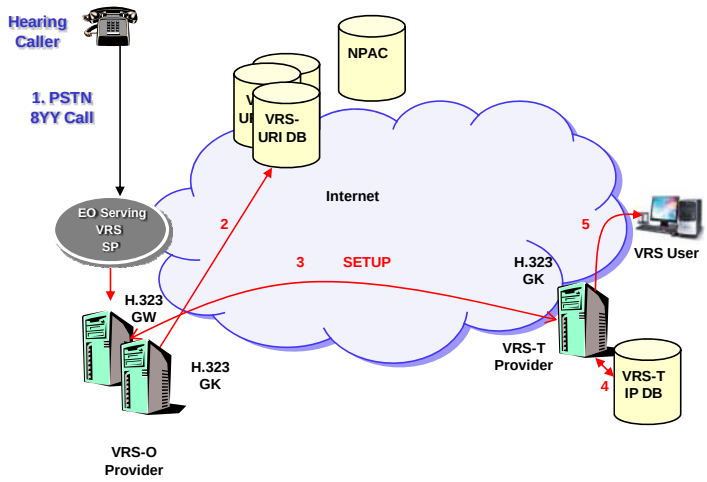


NPAC – Hearing Caller Selects VRS Provider

Call Setup

1. A hearing caller dials the toll free number of the VRS provider he or she has selected. The call routes to the VRS provider and is answered by the CA. The caller provides the VRS User telephone number.
2. If the originating VRS provider (chosen by the calling party) is not the one that serves the called number, the originating VRS provider will query a relay service neutral third party database provider to obtain a URI to route the call. Note that the protocol for such queries is a matter between the relay service neutral third party and the VRS provider.
3. The originating VRS provider will use the URI to send a SETUP message to the terminating VRS provider that serves the number.
4. The terminating VRS provider will retrieve the current IP address from its server.
5. The terminating VRS provider will set up the call to the called VRS User equipment. Note: For information regarding media flow not shown below, please refer to Section 4.2.1.

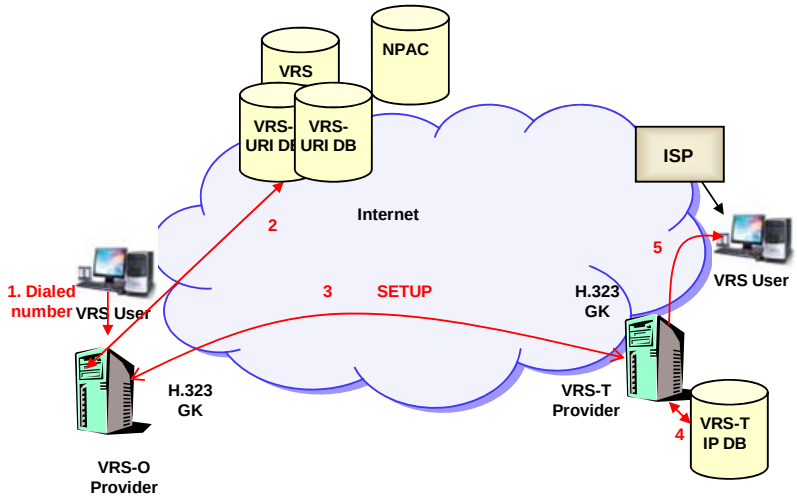
Figure 3
NPAC -Hearing Caller Selects VRS Provider



NPAC – VRS User to VRS User Call

1. A VRS User dials the terminating VRS User number through their chosen relay provider.
2. If the originating VRS provider (chosen by the calling party) is not the one that serves the called number, it will query a relay service neutral third party database for a URI to route the call.
3. If the originating VRS provider is not the one that serves the called number, it will use the URI to send a SETUP message to the terminating VRS provider that serves the number.
4. The terminating VRS provider will retrieve the current IP address from its server.
5. The terminating VRS provider will set up the call to the called VRS User equipment. Note: For information regarding media flow not shown below, please refer to Section 4.2.1.

Figure 4
NPAC-Deaf VRS User to Deaf VRS User



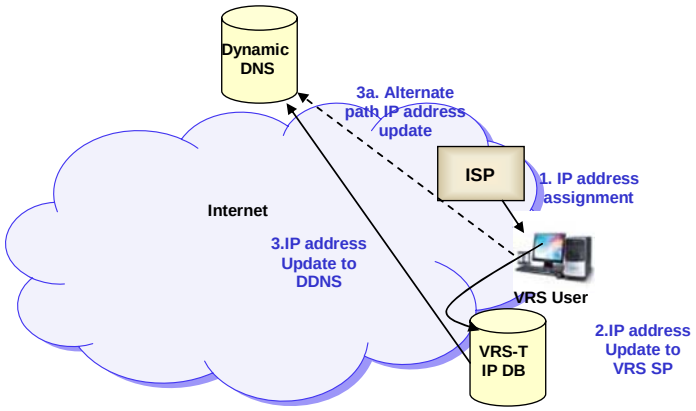
DNS – Provisioning

In this architecture provisioning works as follows:

1. equipment obtains an IP address from its ISP
2. VRS User equipment, in turn, provides this IP address to the designated VRS provider.
3. The designated VRS provider forwards the IP address update to the central Dynamic DNS server. This server updates or provisions an IP address record for the domain name corresponding to the VRS TN.

3a. Alternatively, the DDNS might be directly updated or provisioned by VRS User equipment.

Figure 5
DNS -Provisioning



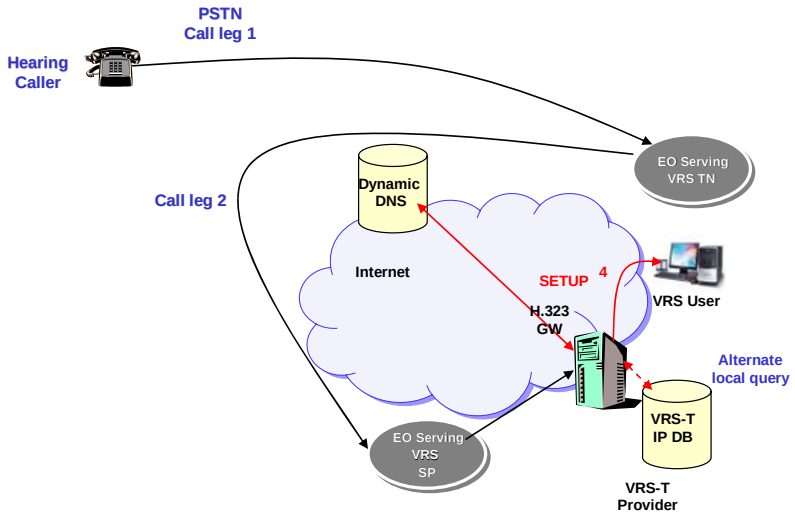
DNS – Hearing Caller Dials VRS User TN

1. A hearing caller dials the VRS User number. The call is routed to PSTN end office serving the number.
2. The call is routed to the VRS User's chosen VRS provider where the CA answers.
3. The VRS provider will launch a query to the Dynamic DNS server based on the telephone number information received.

3a. Alternately, the VRS provider may obtain the IP address from its local server.

4. The VRS provider may then set up the call directly to the called VRS User's equipment using the IP address obtained. Note: For information regarding media flow not shown below, please refer to Section 4.2.2.

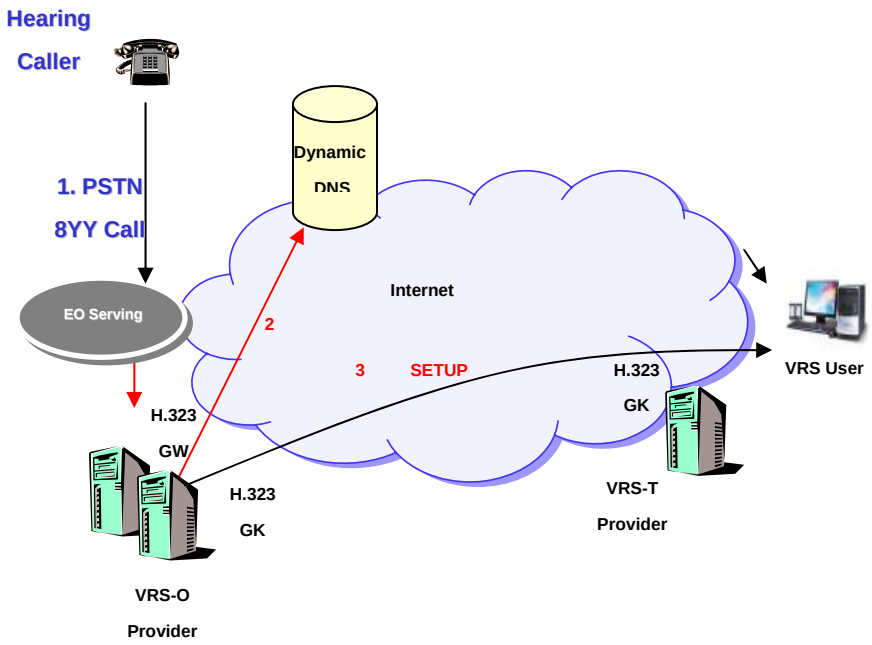
Figure 6
DNS - Hearing Caller Dials VRS User TN



DNS – Hearing Caller Selects VRS Provider

1. A hearing caller dials the toll free number of the VRS provider he or she has selected. The call routes to the VRS provider and is answered by the CA. The caller provides the VRS User telephone number.
2. The VRS provider will launch a query to the Dynamic DNS server.
3. The VRS provider may then set up the call directly to the called VRS User's equipment using the IP address obtained.

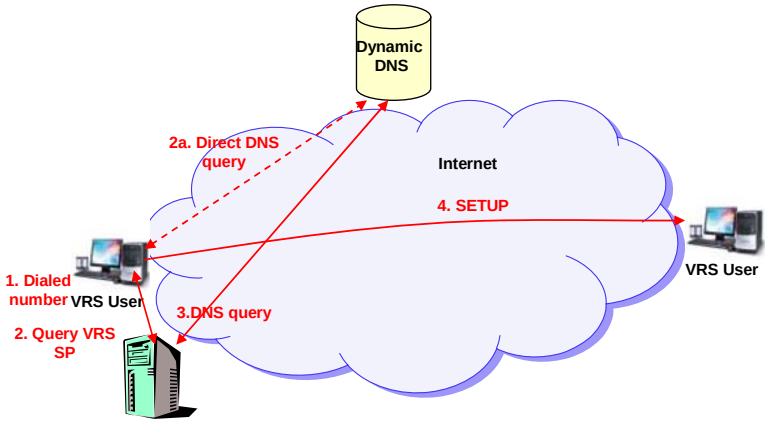
Figure 7 - DNS
Hearing Caller Selects VRS Provider



DNS – VRS User to VRS User

1. A VRS User dials the terminating VRS User number.
2. The VRS User equipment queries the designated VRS provider
   2a. Alternately, the originating VRS User will launch a query to the Dynamic DNS server.
3. The VRS provider queries the DDNS and provides the resulting IP address to the VRS User equipment.
4. The originating VRS User may then set up the call directly to the called VRS User's equipment using the IP address obtained.

Figure 8
DNS - VRS User to VRS User

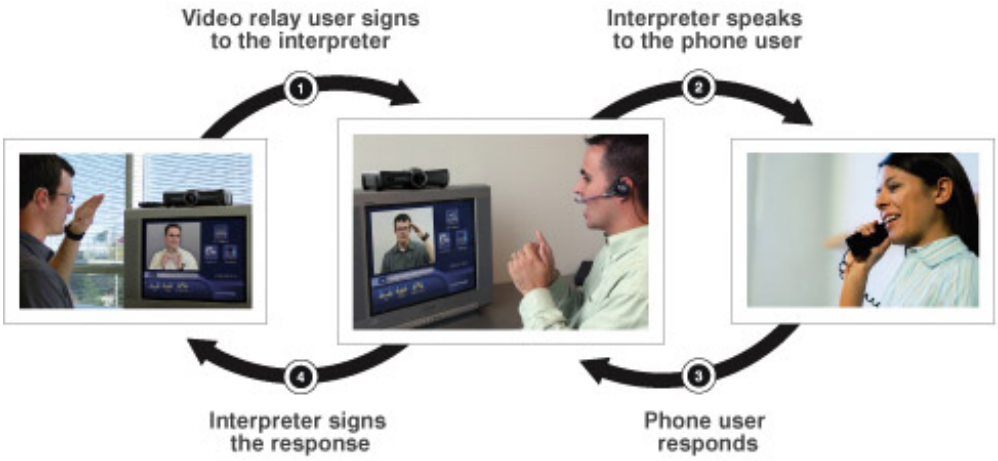


APPENDIX 2 – FORMS OF INTERNET-BASED RELAY SERVICES

Video Relay Service (VRS)

VRS, like other forms of telecommunications relay service (TRS), allows persons who are deaf or hard-of-hearing to communicate through the telephone system with hearing persons. The VRS caller, using a television or a computer with a video camera device or videophone and a broadband (high speed) Internet connection, contacts a VRS CA, who is a qualified sign language interpreter. They communicate with each other in sign language through a video link. The VRS CA then places a telephone call to the party the VRS User wishes to call. The VRS CA relays the conversation back and forth between the parties -- in sign language with the VRS User, and by voice with the called party. No typing or text is involved. A voice telephone user can also initiate a VRS call by calling a VRS center, usually through a toll-free number.

The VRS CA can be reached through the VRS provider's Internet site, or through video equipment attached to a television. Currently, approximately a dozen providers offer VRS. Like all TRS calls, VRS is free to the caller. VRS providers are compensated for their costs from the Interstate TRS Fund, which the FCC oversees.



Photograph courtesy of Sorenson Communications, INC.

Internet Protocol Relay (IP Relay)

IP Relay allows people who have difficulty hearing or speaking to communicate through the telephone system with hearing persons. IP Relay is accessed using a computer and the Internet or mobile handsets (i.e., BlackBerry®, Treo™, T-Mobile Sidekick®) using instant messaging solutions or custom applications, rather than a TTY and a telephone. So individuals who use IP Relay do not need to invest in a TTY; they simply use the computer or mobile handset to communicate by text. When conversing over IP Relay, people who are deaf, hard-of-hearing, or have difficulty speaking can participate in a conference call or go online while holding a conversation.

Unlike traditional TRS, where a TTY user contacts a TRS center via telephone lines and the communication assistant (CA) at the TRS center calls the receiving party via voice

telephone, the first leg of an IP Relay call goes from the caller's computer, or other Web-enabled device, to the IP Relay Center. The second leg of the call, as with traditional TRS, is from the CA to the receiving party via voice telephone through the public switched telephone network.

There are no additional costs to consumers for IP Relay beyond a computer or other Web-capable device and an Internet connection. IP Relay service providers are compensated from the Interstate TRS Fund, which the FCC oversees.

Photograph courtesy of Sorenson Communications, INC.

Internet Protocol Captioned Telephone Service (IP CTS)

IP CTS allows people who have difficulty hearing but can speak to communicate through the telephone system with hearing persons. IP CTS is accessed using a computer and the Internet along with a standard PSTN telephone. So individuals who use IP CTS simply use the computer or mobile handset as a display unit to read the conversation by text.

People who are deaf or hard-of-hearing make a voice to voice call to the other party on a standard telephone and the PSTN; at the same time, the voice of the called party is directed from the consumer's telephone to a personal computer (or similar device) that routes it to the provider via the Internet. The provider, in turn, sends back to the consumer the text of what was spoken. As a result, the consumer can both hear (to the extent possible) what the called party is saying over the standard voice telephone headset, and read the text of what the called party said on the computer or similar device.

There are no additional costs to consumers for IP CTS beyond a computer or other Web-capable device, an Internet connection, a telephone, and a telephone line. IP CTS providers are compensated from the Interstate TRS Fund, which the FCC oversees.

APPENDIX 3 – SUGGESTED NEUTRAL THIRD PARTY REGULATIONS

Introduction

Throughout this document, there are references to a relay service provider neutral third party. This entity (or entities) provide(s) services that all Internet-based relay service providers will rely on to provide service to their customers. Because of this fact, it is important that the relay service provider neutral third party must not be affiliated with any Internet-based relay provider. Section 1.0 of this Appendix provides text based on neutrality requirements[16] for the North American Numbering Plan Administrator (NANPA) that could be used to describe requirements for a relay service provider neutral third party.

It also may be desirable that at least some of these entities also be neutral with respect to providing telecommunications services. Section 2.0 of this Appendix provides text based on neutrality requirements for the North American Numbering Plan Administrator (NANPA) that could be used to describe requirements for a telecommunications service neutral third party.

1.0 Suggested Neutral Third Party Regulations Governing the Relay Service Neutral Third Party

(a)(1) *Neutrality.* The relay service neutral third party shall be non-governmental entities that are impartial and not aligned with any particular Internet-based relay service provider. Accordingly, while conducting their operations under this section, the relay service neutral third party shall ensure that they comply with the following neutrality criteria:

(i) The relay service neutral third party may not be an affiliate of any Internet-based relay service provider. "Affiliate" is a person who controls, is controlled by, or is under the direct or indirect common control with another person. A person shall be deemed to control another if such person possesses, directly or indirectly -

(A) An equity interest by stock, partnership (general or limited) interest, joint venture participation, or member interest in the other person ten (10%) percent or more of the total outstanding equity interests in the other person, or

(B) The power to vote ten (10%) percent or more of the securities (by stock, partnership (general or limited) interest, joint venture participation, or member interest) having ordinary voting power for the election of directors, general partner, or management of such other person, or

[16] This suggested language is adapted from 47 C.F.R. Section 52.12(a)(1). This document is publicly available at http://www.access.gpo.gov/nara/cfr/cfr-table-search.html#page1.

(C) The power to direct or cause the direction of the management and policies of such other person, whether through the ownership of or right to vote voting rights attributable to the stock, partnership (general or limited) interest, joint venture participation, or member interest) of such other person, by contract (including but not limited to stockholder agreement, partnership (general or limited) agreement, joint venture agreement, or operating agreement), or otherwise;

(ii) The relay service neutral third party and any affiliate thereof, may not issue a majority of its debt to, nor may it derive a majority of its revenues from, any Internet-based relay service provider. "Majority" shall mean greater than 50 percent, and "debt" shall mean stocks, bonds, securities, notes, loans, or any other instrument of indebtedness; and

(iii) Notwithstanding the neutrality criteria set forth in paragraphs (a)(1) (i) and (ii) of this section, the relay service neutral third party may be determined to be or not to be subject to undue influence by parties with a vested interest in the outcome of Internet-based relay service. The FCC may conduct an evaluation to determine whether the relay service neutral third party meet the undue influence criterion.

(2) Any subcontractor that performs relay service neutral third party functions must also meet the neutrality criteria described in paragraph (a)(1).

2.0 Suggested Neutral Third Party Regulations Governing the Telecommunications Neutral Third Party

(a)(1) *Neutrality.* The telecommunications service neutral third party shall be non-governmental entities that are impartial and not aligned with any particular telecommunication industry segment. Accordingly, while conducting their operations under this section, the telecommunications service neutral third party shall ensure that they comply with the following neutrality criteria:

(i) The telecommunications service neutral third party Agent may not be an affiliate of any telecommunications service provider(s) as defined in the Telecommunications Act of 1996. "Affiliate" is a person who controls, is controlled by, or is under the direct or indirect common control with another person. A person shall be deemed to control another if such person possesses, directly or indirectly -

(A) An equity interest by stock, partnership (general or limited) interest, joint venture participation, or member interest in the other person ten (10%) percent or more of the total outstanding equity interests in the other person, or

(B) The power to vote ten (10%) percent or more of the securities (by stock, partnership (general or limited) interest, joint venture participation, or member interest) having ordinary voting power for the election of directors, general partner, or management of such other person, or

(C) The power to direct or cause the direction of the management and policies of such other person, whether through the ownership of or right to vote voting rights

attributable to the stock, partnership (general or limited) interest, joint venture participation, or member interest) of such other person, by contract (including but not limited to stockholder agreement, partnership (general or limited) agreement, joint venture agreement, or operating agreement), or otherwise;

(ii) The telecommunications service neutral third party and any affiliate thereof, may not issue a majority of its debt to, nor may it derive a majority of its revenues from, any telecommunications service provider. "Majority" shall mean greater than 50 percent, and "debt" shall mean stocks, bonds, securities, notes, loans, or any other instrument of indebtedness; and

(iii) Notwithstanding the neutrality criteria set forth in paragraphs (a)(1) (i) and (ii) of this section, the telecommunications service neutral third party may be determined to be or not to be subject to undue influence by parties with a vested interest in the outcome of numbering administration and activities.

(2) Any subcontractor that performs telecommunications service neutral third party functions must also meet the neutrality criteria described in paragraph (a)(1).

APPENDIX 4 TABLES

Characteristics & Comparison Table

Table 3 below describes the possible "sources" for VRS Users in obtaining numbering resources with respect to commonly known and new vehicles analyzed in this report. Each VRS User may employ one or more of these approaches, for example, if they require more than one number or prefer a particular approach.

Table 3

VRS User Options and Considerations when Obtaining TN(s)	Via VRS Provider	Via neutral third party	Direct From Voice SP*
Who the VRS User calls to change VRS SP	New VRS SP [or neutral third party (1) if exists]	Neutral third party (1) [or new VRS(2) SP possible]	Voice SP via call redirection
What party must then be contacted by the VRS provider or neutral third party to change the incoming VRS SP of choice?	The VRS User old VRS SP or the new VRS SP network provider [or neutral third party 1) if exists]	Voice SP	Not applicable
Who is the party of record for the TN?	VRS SP is the voice customer(3)	Neutral third party is the voice customer(4)	VRS User
Which party selects the underlying Network SP?	VRS SP(3,4)	Neutral third party (4)	VRS User
Reimbursed by the Interstate TRS Fund?	Yes - Via annual Cost Study	Yes – Directly from TRS	Undetermined

* A Voice Service Provider for the purposes of this Table may be a wireline, wireless, VoIP, reseller, etc., service provider.
** Only FCC specified entities may draw from the Interstate TRS Fund, namely, authorized relay providers.
(1) TN acquisition and destination changes to reach new incoming VRS provider of choice may be accomplished via a web page
(2) VRS providers would have access to neutral third party system to change destination of VRS number to reach new VRS provider's call center.
(3) neutral third party may be customer of record if VRS provider obtained TNs from neutral third party.
(4) Or VoIP voice SP if voice services provided by VoIP SP.

TN Administration/Provisioning Characteristics

Top Tier Database Characteristic	DNS	NPAC
Is there a mandatory relationship between the process proposed by the database alternative and the voice service/TN assigned to the Relay User needed for the voice leg of the call?	Relay User will generally obtain a TN from a relay SP that arranges routing of direct dialed calls but Relay User may employ any service/number they direct/forward to their relay provider of choice.	The TN-URI update process (necessary to identify the relay SP dbase hosting the IP address) requires the coupling of the voice service provisioning to the database provisioning via the LNP process.
Aside from the Relay User, which party(s) is involved when obtaining service at first?	Generally, the VRS Provider will arrange routing of TN and update DNS	New VRS SP notifies Voice SP updates URI in NPAC notifies Routing database SPs
Aside from the Relay User, which party(s) is involved when a Relay User wants to change relay SPs?	Generally, the new VRS provider or voice SP will work with its underlying network SP to initiate the LNP process.	New VRS provider requests its underlying network SP to initiate LNP porting process, including URI update in NPAC.
How may a Relay User establish "voice service with a TN" to be used by the hearing (to dial and reach the deaf) for the hearing incoming voice leg of a relay call?	Relay User generally will obtain a TN from a relay SP, but can obtain their own number and voice service and port or forward it to their relay SP of choice.	Generally, an Relay User must obtain number from a relay SP. Relay User can use their own number by porting it to the new relay SP.
How is changing relay SPs accomplished?	Generally TN obtained from relay SP then new relay SP effectuates NPAC change so calls route to the new relay SP. In cases where Relay User obtained their own voice service, the Relay User can point their TN to a new relay SP.	The Relay User must ask a new relay SP to effectuate an NPAC changes (port) for both the voice service (LRN) and the relay database (URI).

APPENDIX 5 OTHER CONSIDERATIONS

The following items deal with topics considered to be outside the purview and scope of the INC. These items came to the attention of the INC during the preparation of this report and are intended as points or topics that will need a more in-depth review by the appropriate subject matter experts.

1 Rulemaking Proceedings

Pursuant to the Commission's July 13, 2006 Further Notice of Proposed Rulemaking (FNPRM) titled “Telecommunications Relay Services and Speech-to-Speech Services for Individuals with Hearing and Speech Disabilities (CG Docket No. 03-123),” various stake holders provided comments in ex parte filings which may be of interest to the NANC.

2 Use of a Single Number with Multiple Services

In considering IP-based relay services, the INC, for the purposes of this report, has considered those services independently and has assumed a single number would be associated with a single relay service. This assumption simplifies implementation and may reflect the preferences of users who wish to associate different devices with different telephone numbers as is generally the case with hearing users today. There are, however, other possibilities, and some users may wish to use the same telephone number to provide access to different relay services.

The INC has identified two places to implement a multiple relay service capability: either in the initial voice service routing call leg, or in the network of the relay provider to which the call is routed.

Implementation in the voice service leg is relatively straightforward; the Relay User can use programmable forwarding capabilities to change the relay provider, and thus the relay service, to which the call is forwarded. While a Remote Call Forwarding arrangement is not suitable for this type of application, since a service order is required to change the forwarded-to number, traditional style call forwarding would be workable. A user could thus have a number ring through a VRS relay provider when at home or route to an IP relay provider when traveling with a messaging-capable device. The forwarded-to provider would know what information it needed to obtain from the central database to complete the call to the Relay User.

Implementation in the relay service provider portion of the call will be more complex. A user will need to interact with the relay provider to select the service to be used on incoming calls. It is not clear whether the user would be able to employ different relay providers for different relay services. If the same provider was employed for each service, then that relay provider could tell how the Relay User was connected (VRS versus IP relay) and select the type of service to provide based on that information.

3 Neutral Third Party Number Administration & Help Desk

Although it is not anticipated, it may be necessary to employ the services of a Neutral Third Party Numbering Administrator to assist VRS providers and Relay Users regarding numbering issues and difficulties. Use of a neutral third party administrator, as described in Section 4.1.3 and 4.1.5 may provide the following additional benefits and administrative functions.

3.1 Administration Services to Providers

Providers experiencing difficulty in effectuating a change or updating information associated with its clients' database records, e.g., when executing users' requests to change its service provider of choice, may obtain assistance directly from the neutral third party. This assistance may include access to records, activity, and procedural guidelines and obligations.

3.2 Administration Services to Relay Users

Relay Users experiencing difficulty in effectuating a change may utilize the services of the neutral third party. The neutral third party can assist Relay Users directly to change that User's provider or to provide related industry Guidelines.

4 Reimbursement from the Interstate TRS Fund

Costs such as the costs of implementing and providing uniform numbering required by the FCC historically have not been imposed on users of Internet-based relay services; instead any costs incurred by providers have been reimbursed through adequately adjusted TRS reimbursement rates. Certain costs of providing Internet-based relay services are included in the annual submissions providers file with National Exchange Carrier Association (NECA), and these cost submissions are used in developing the rates for the various Internet-based relay services. Under the current rules, any additional costs associated with implementing and providing any FCC requirements for a uniform numbering plan for Internet-based relay services should also be allowed for purposes of the NECA cost submissions and as an exogenous cost, so that providers can be reimbursed for these costs. Historically, the only entities which have been reimbursed from the Interstate TRS Fund are the fund administrator (currently NECA) and approved TRS providers. It would require action by the FCC for other entities (such as a neutral third party administering a central database) to be reimbursed from the Interstate TRS Fund for costs related to implementing and providing uniform numbering.