

# Geographic Routing of Toll Free Services

## Introduction

Routing calls based on the caller's location is an important aspect of many toll free services, whether a call originates from a wireline, wireless, or VOIP caller. For example, a toll free subscribing business may wish to have calls to its toll free number routed to its premises or service location closest to the caller or to a call center designated to handle calls from a particular area. Toll free routing may be determined based on originating location so as to minimize their costs. Other examples include:

1. Shared Use toll free businesses route calls to licensees who have subscribed to receive all calls originated from specific defined territories.
2. Calls originating from certain area codes, or even from large sections of the country can be blocked (using the SMS/800 Database), thus limiting unwanted misdials and calls from consumers residing outside the subscriber's service area. While this protects the toll free subscriber from needing to respond to unwanted calls, it also avoids the confusion and frustration that consumers experience upon reaching a "wrong number".
3. Emergency service organizations (e.g. poison control centers and suicide hotlines) often make use of toll free numbers that are dialed by individuals who need critical, often immediate assistance. These calls are often routed according to the emergency provider located closest to the caller, who can respond quickest to the situation at hand.
4. Originating caller information for a toll free call may be needed by network managers in protecting their networks during mass calling events or emergencies. During these events the network managers may want to re-re-route calls or drop calls in order to prevent the network from becoming overloaded and risk possible shutdown.

**This white paper provides an overview of toll free location-based routing, identifies specific roadblocks to accurately routing those calls in the current environment, and offers up suggestions for overcoming those limitations within the context of current rules and regulations.**

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## Technical Characteristics of Location-Based Toll Free Routing

Historically, the caller's Telephone Number ("TN") has been used to approximate the caller's geographic location, using the NPA/NXX of the TN assigned to the caller to determine the rate center and local service provider central office serving the customer, as provided in the Local Exchange Routing Guide ("LERG") industry database. As TNs have traditionally been assigned to customers that are physically located within the boundaries of the specified rate center, service providers have treated the NPA/NXX of a caller's assigned TN, for calling number, as a geographic location identifier.<sup>1</sup>

Thus as the originating service provider makes routing decisions for toll free calls based on the callers' location, the provider generally uses the NPA/NXX of the calling number to determine the caller's location. Toll free calls can be routed based on the options available in the SMS/800 "Area of Service" (AOS) functionality. SMS/800 AOS parameters allow for Toll Free calls to be routed based on the originating caller's:

- a. Country/US Territory
- b. State
- c. Area Code
- d. LATA
- e. Rate Center/NPA-NXX/NXX
- f. Telephone Number

The originating service provider's switch queries a toll free Service Control Point (SCP) for routing instructions, including the toll free number and the caller's telephone number in the query. The SCP returns the Carrier Identification Code (CIC) of the selected toll free service provider and optionally translates<sup>2</sup> the toll free number into a geographic number based on logic downloaded from SMS/800. Both CIC and number translation may depend on the location indicated by the caller's telephone number.

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<sup>1</sup> Calling number is used loosely here to refer to ANI, SS7 Charge Number, and SS7 Calling Party Number parameters.

<sup>2</sup> The SCP may contain the logic to translate the number into a geographic number that has been downloaded from SMS/800 or it may contain just very minimal routing information and the call would simply be forwarded to the proper carrier by the SCP. For these numbers, the translation logic would be contained within the carrier's own network and may still require translation in order to properly route the call.

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The prevalence of wireless roaming and nomadic VoIP has rendered this approach less effective, as the calling party's telephone number may not be an accurate reflection of his or her geographic location. The toll free industry has expressed concern<sup>3</sup> about the diminishing effectiveness of this current number-based routing methodology.

In the wireless case, the originating service provider may have more accurate information about the caller's location, for example the cell site from which the call originated. This information is not, however, in a form that can be used by the existing toll free SCP query; to make use of this information would require changes in switch software, toll free SCP logic, and to the SMS/800 database. Given that many of the switching platforms and some SCPs are manufacture discontinued and carriers are planning to replace them as they transition to IP, such changes would be a major undertaking. The situation is further complicated, since some wireless carriers do not perform their own toll free queries but hand toll free calls off to an access tandem or an aggregator for such processing. In this case the changes to the SS7 protocol and corresponding switch software would also be required.

Location information based on cell site or even GPS is sometimes used by the toll free service provider. This information is used after the initial routing to a selected toll free service provider and is not provided in the signaling stream that sets up the toll free call (for the reasons discussed above) but through independent commercial arrangements.

### Privacy Considerations

In the developing IP/SIP environment, as opposed to the existing TDM/SS7 PSTN, it will be possible to develop effective location based routing of toll free calls -- but this is a work in progress. To facilitate that work it is necessary for the industry to understand how rules regarding privacy may

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<sup>3</sup> SNAC Issue 2614 "Standardize Wireless Toll Free Call Processing" was opened in May 2003; SNAC Issues 3119 "Industry Standardization of Toll Free Aggregated Traffic" and 3120 "TF Industry VOIP Originating ANI Requirement" were opened in December 2006; and SNAC Issue 3423 "Incorrect Originating Information" was opened in May, 2013. Also see ATL Communications Notice of Ex Parte, CC 95-155, filed June 15, 2014.

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affect the use of accurate location information, particularly for wireless callers.

Current rules clearly authorize use of calling number for toll free routing and permit delivery of billing number to the toll free subscriber. Given the issues that have arisen around use of customer location information, in particular as may be provided by smart-phones, some carriers have expressed concerns about using network or CPE derived location information for routing calls from mobile callers without obtaining their consent<sup>4</sup>. Understanding the Commission's perspective on this issue would help the industry move forward in closing the gap with respect to location-based routing for toll free.

### Common Carrier Status:

As an FCC- and state-registered common carrier, the toll free service provider is bound by an extensive body of federal and state requirements, including laws and regulations relating to the protection of customers' privacy. Responsibilities in this regard are primarily governed by Section 222 of the Communications Act of 1934, as amended, 47 U.S.C. § 222 and Part 64, Subpart of the FCC's rules (47 C.F.R. §§ 64.2001 et seq.) pertaining to Customer Proprietary Network Information ("CPNI"). As defined by the Act, CPNI is information "that relates to the quantity, technical configuration, type, destination, *location*, and amount of use of a telecommunications service subscribed to by any customer of a telecommunications carrier, and that is made available to the carrier by the customer solely by virtue of the carrier-customer relationship; and information contained in the bills pertaining to telephone exchange service or telephone toll service received by a customer of a carrier." (Emphasis added).

Through rulemakings and enforcement actions, the FCC has resolved difficult issues related to its CPNI rules, including establishing minimum notice standards, determining when opt-in and opt-out choices for consumers are appropriate, adopting data sharing rules and reasonable data security measures, and requiring notification to law enforcement and consumers in the event of data breaches. As a result of the Commission's

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<sup>4</sup> See letter dated November 13, 2013 from ATIS to Ann Stevens, Deputy Chief, Competition Policy Division, Wireline Competition Bureau, FCC.

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actions, the Section 222 protections are sound, well understood by industry and consumers, and judicially approved<sup>5</sup>.

In its Declaratory Ruling released June 27, 2013, Implementation of the Telecommunications Act of 1996: Telecommunications Carriers' Use of Customer Proprietary Network Information and Other Customer Information, the Commission:

1. Par. 8: did not adopt any new rules
2. Par. 33: "We also reiterate that section 222(c) (1) [of 47 USC] allows a telecommunications carrier to use, disclose, or permit access to this CPNI 'in its provision of (A) the telecommunication service from which such information is derived, or (B) services necessary to, or used in, the provision of such telecommunications service.'"

Note that Section 222 (b) of Title 47 states: "A telecommunications carrier that receives or obtains proprietary information from another carrier for the purpose of providing any telecommunications service shall use such information only for such purpose, and shall not use such information for its own marketing efforts."

The combination of these two provisions (in the statute) indicates that Congress contemplated the transfer of CPNI in the provision of telecommunications services, and specifically permitted it. Moreover, Section 222(b) clearly imposes upon carriers an obligation to use such information only "for such purpose."

Section 222(a) clearly states that "Every telecommunications carrier has the duty to protect the confidentiality of proprietary information of, and relating to, other telecommunications carriers, equipment manufacturers, and customers, including telecommunications carriers reselling telecommunications services provided by a telecommunications carrier."

The toll-free carrier's operations and business practices are designed to ensure compliance with these regulations, and they are obligated to file annual compliance reports with the FCC.

### **Purpose for Which Access to Protected Information is sought:**

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<sup>5</sup> See Location-Based Services: An Overview of Opportunities and Other Considerations, FCC Wireless Telecommunications Bureau, May 2012, p. 5.  
[http://transition.fcc.gov/Daily\\_Releases/Daily\\_Business/2012/db0530/DOC-314283A1.pdf](http://transition.fcc.gov/Daily_Releases/Daily_Business/2012/db0530/DOC-314283A1.pdf).

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Toll-free carriers require access to originating location information for the limited purpose of assuring proper routing of toll-free calls to the dialing party's intended destination. The routing of telephone calls requires the interconnection of thousands of switches and networks operated by the multitude of carriers who participate in the ubiquitous, national, public switched telephone network. FCC and state regulations assign responsibility to these carriers for timely and accurate routing and termination of calls made via their networks. In order to carry out this mandate, carriers exchange the information necessary (primarily the originating caller's telephone number) for timely and accurate call routing and billing, including information which is not available to the general public.

### Granularity of location information

For the most part, toll free calls that are routed based on the originating callers' location currently utilize the caller's telephone number, which corresponds with a "fuzzy" location (usually within miles of the caller's location). However with cellular devices the originating caller's telephone number no longer can be relied upon to provide fuzzy location, and so other methods of determining the caller's geographic location may be warranted. There are a number of ways in which location can be specified that can provide that same level of granularity, or even greater location specificity, as required by the Toll Free Subscriber. These include:

1. V and H Coordinates;
2. Cell tower location;
3. Lat/long measurement (which can be truncated to create "fuzzy location" ); or
4. "Fuzzy location" Zip Code.

Call set-up in IP can be designed so as to purposely *decrease* location accuracy inherent in the data stream. Cell ID provides a medium level of accuracy (in approx. 8 seconds – clearly too long for acceptable call set up), while assigned cell tower is virtually immediate and provides basically area code/exchange accuracy.

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Other approaches to coding location could be developed, such as dividing the country into a grid and assigning a number to identify each square. The assigned number could be used to route the call appropriately.

Toll Free Subscribers using location based routing are implicitly conveyed information about a calling location. Today that information may be just about the rate center to which the caller's number is assigned, rather than a roaming wireless or nomadic VoIP customer's actual current location.

**While “fuzzy” location data should be available to indicate the location to which the call is to be routed, that is different from transmitting “actual current location.” In determining the degree to which notice and consent requirements are warranted, consideration should be given to the granularity of location information passed through to the Toll Free Subscriber.**

### Opt-In /Opt-Out Considerations/Impacts to Toll Free Customers

The management of privacy concerns inevitably involves trade-offs. For example, if user consent is required before an LBS (Location Based Service) provider can use location information from the user's cell phone, the carrier sharing the location information needs to determine (based on CPNI rules)<sup>6</sup> whether it should be done on an opt-in or opt-out basis and how frequently that consent needs to be renewed (e.g. weekly, monthly, annually, or never). The extent and frequency of an LBS provider's access to protected information, and the perceived sensitivity of the protected information, typically shape the restrictions pursuant to which the provider is required to operate.

In the case where a caller is actually a *customer* of the LBS provider, participating in an ongoing commercial relationship via a location-enabled data or voice application, the wireless carriers' notice and consent rules provide a useful and necessary mechanism for protecting privacy.

It is important to recognize, however, that every additional layer of protection has a significant negative impact on toll free subscribers and on their customers who call them on their toll free numbers. Requiring a toll free provider to engage every caller in an “opt-out” or “opt-in” interaction

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<sup>6</sup> See 47 CFR 64 Subpart U

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would involve significant additional processing time. That time comes at a cost to customers and their callers.

As a rule, callers want their calls to complete quickly, and do not want to deal with time-consuming, interactive voice response systems, which are frequently viewed as annoyances; this is especially true when callers do not expect to encounter an automated interaction. In addition, the longer a caller is on a call, the greater the likelihood that the call will be disconnected. Thus, the imposition of opt-in or opt-out requirements would be detrimental to both toll free customers and the callers attempting to reach them, while having at best a miniscule impact on the protection of the callers' privacy.

### Conclusion

Because a toll free number may have different terminating points across the country, identification of the calling parties' locations is often indispensable to the provision of the service.

Today, the on-going erosion in the geographic underpinnings of the North American Numbering Plan is gaining increased visibility and attention in the telecommunications industry. Taken together, the de facto nomadic nature of mobile telephone service, the proliferation of mobile devices, and their impact on determining an originating caller's location have compromised the toll free carriers' ability to route and bill mobile and nomadic VOIP originated calls on the basis of the TN.

Where both the extent and frequency of access to protected information are limited and where the carrier is subject to the FCC's strict CPNI regulations, as well as other obligations placed upon common carriers, there is no need or reason to impose an additional layer of protection. A toll-free carrier that is registered with the Federal Communications Commission as an interstate telecommunications service provider operates as a common carrier, subject to the laws and regulations imposed by federal and state governments. When a toll free telecommunications provider requires geographic originating location for the limited purpose of correctly routing toll free calls to its customers, and the location information passed on to Toll Free Subscribers is of a general "fuzzy" nature, that information should be provided free of the notice and consent obligations.

## **Geographic Routing of Toll Free Services**

Increasing customer and device mobility should not compromise seamless and accurate toll free geographic routing, and mechanisms to provide accurate location based routing of toll free calls should be developed with as minimal impacts on performance and added caller interaction as are consistent with the determination of caller privacy interests.