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October 10, 2012

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

Re: WC Docket No. 10-90,
GN Docket No. 09-51,
CC Docket No. 01-92.

Dear Ms. Dortch:

Evans Griffiths & Hart, Inc. (EGH) offers the attached comments on databases in today's Public Switched Telephone Network (PSTN) and their role in the transition to IP telephony.

As a supplier of Operations Support Systems (OSS) software to major US telecommunications service providers, EGH is familiar with the key databases on which the PSTN relies—in particular, the Line Information Data Base (LIDB) used in call setup for lookup of subscriber attributes, including Calling Name (CNAM).

EGH is the leading provider of *Administrative System* software used by LIDB service providers to provision data in their LIDBs (we are not, ourselves, LIDB providers). As a software supplier with this expertise, we offer these comments on:

- What LIDB is.
- The key services this system of databases provides today.
- LIDB services that will continue to be needed in some form following PSTN sunset—and how they may be provided.
- Why PSTN sunset offers a unique opportunity to address and resolve issues of accuracy and availability in delivery of CNAM and Caller ID.
- Why the Commission—and industry—should begin to consider these issues now, and not wait until later in the PSTN sunset planning process.

Respectfully submitted,

/signed/

EVANS GRIFFITHS & HART, INC.
Lauren M. Crocker
President

Comments on PSTN Databases and the Transition to IP Telephony

October 2012

Introduction

- EGH is a supplier of Operations Support Systems (OSS) software to major US telecommunications service providers. In this role we are intimately familiar with major databases on which the PSTN relies—in particular, the Line Information Data Base (LIDB) that today is used for lookup of Calling Name (CNAM) and other subscriber attributes.
- EGH fully supports the FCC's move to formally "sunset" the PSTN and move to all IP-based telecommunications.
- EGH recognizes that, in planning the PSTN transition, the FCC wishes to ensure that all services provided by the PSTN, today's "network of record," are identified and accounted for, either as telecom services that must be continued, or as PSTN-specific services that will no longer be needed.
- As a software supplier with expertise in LIDB, EGH offers these comments on:
  - What LIDB is.
  - The key services this database provides today.
  - Services provided by LIDB today that will continue to be needed in some form following PSTN sunset—and how they may be provided.
  - Why PSTN sunset offers a unique opportunity to address and resolve issues of accuracy and availability in delivery of CNAM and Caller ID.
  - Why the FCC—and industry—should begin to consider these issues now and not wait until later in the PSTN sunset planning process.

LIDB overview

- The PSTN's LIDB system is a real-time distributed database consisting of servers deployed in certain Service Control Point (SCP) hosts on the North American SS7 signaling network.
    - As others have noted[1], "PSTN sunset" implies sunset of the SS7 network as well, since the SS7 signaling network operates in conjunction with the PSTN's network of time-division multiplex (TDM) switches. This raises the question of what happens to PSTN-related databases such as LIDB that are, today, accessed via the SS7 network.
- The LIDB concept is specific to the North American Numbering Plan.
- LIDBs are operated by the dominant incumbent Local Exchange Carriers (LECs) and by several non-carrier data services providers.
    - The most prevalent LIDB software implementation (used by the large incumbent LECs, among others) is by Telcordia. Several LIDB operators have implemented their own LIDB software. LIDBs are typically provisioned by an upstream Administrative System. EGH is the leading provider of LIDB Administrative System software.
- LIDB data records are keyed by Telephone Number (TN), either a main telephone line or a Special Billing Number.
- Originating and terminating end office switches, as well as Operator Support System switches, query (or "dip") LIDB TN records via the SS7 network to obtain attributes of the calling and called TNs needed for call completion.
- Other systems, carrier and non-carrier, on-network and off-network, query LIDB to obtain data about a TN for a variety of purposes, including non-telecom business applications.
- LIDB was first introduced in the late 1980s to support validation of alternately billed calls (collect, bill-to-third, and calling card). While LIDB continues to provide these services today, applications of LIDB have broadened and expanded over time to include additional services.
- The most notable use of LIDB today is lookup of Calling Name (CNAM) by terminating switches for delivery to subscribers' Caller ID display.

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[1] See, for example: *Technical Challenges in the PSTN Transition from Plain Old Telephone Service (POTS),* attachment to comments submitted by Richard Shockey, September 4, 2012.

What data is in LIDB?

- TN data records in LIDB include the following elements:
  - *Telephone Number Ownership.* Designates the carrier that currently "owns" the TN and the subscriber.
    - *Account Owner* (AO). This field typically contains the Operating Company Number (OCN). There are cases where the AO is not the service provider that holds the business relationship with the end subscriber. For example, a carrier may "wholesale" TNs to a non-carrier service provider, such as a VoIP provider. In these cases the AO field may hold the OCN of the TN-owning carrier and not the non-carrier service provider.
    - *Billing Service Provider* (BSP) and *Revenue Accounting Office* (RAO). Designate the entity providing billing services for this TN.
  - *Calling Name* (CNAM). Queried by a terminating end office switch to obtain the calling party's Calling Name for display to the called party.
  - *Calling Name Privacy* (CNP). Indicates whether or not the calling party's CNAM may be displayed to the called party.
  - *Billed Number Screening* (BNS). Indicates whether collect or billed-to-third-party calls may be completed to this TN. BNS includes:
    - *Collect Acceptance Indicator*
    - *Third Number Billing Indicator*

    A subscriber may choose not to allow collect calls and/or third-party billing to their number. In some cases a service provider initiates denial of collect and third party billing as a fraud prevention measure.
  - *Service and Equipment Indicator* (SEI). Denotes the type of line—residence, business, pay phone, hotel, hospital, prison, PBX, CENTREX, *etc.* Used by the originating end-office switch (in conjunction with OLNS, below) to determine appropriate treatment of the call.
  - Originating Line Number Screening (OLNS). Fine-grained attributes of a TN used in call origination. For example,
    - *Station-paid call blocking*
    - *Free Directory Assistance calling*
    - *Directory Assistance Call Completion (DACC) blocking.* DACC is often a revenue source for service providers who charge for the value-added service of connecting the caller once a requested number has been obtained. *DACC blocking* disables this service offer to the caller.

- *ZIP+4.* 9-digit ZIP code of the subscriber's service address. Used in location determination for routing of "311" information service calls as well as toll-free "nearest retail outlet" calls.
- *Primary (or Preferred) Interexchange Carrier* (PIC) and *IntraLATA Primary Interexchange Carrier* (LPIC). Carrier(s) to which toll calls originated from this TN are to be routed.
- *Calling Card PIN.* Used for validation of line-based calling card PINs. While line-based calling cards have experienced a significant decline and are no longer offered to new subscribers in many jurisdictions, some state regulatory bodies require that carriers continue to support existing (grandfathered) cards.
- *Billing Name and Address* (BNA) and *Service Start Date* (SSD). Data elements derived from the subscriber's business relationship with the service provider. Increasingly used in non-call-completion applications, such as retail consumer credit validation.

Contemporary practices and concerns

- Data for a wireline TN is typically stored in just one operator's LIDBs, according to the choice of that TN's Account Owner.
  - LECs who are LIDB operators store their TNs in their own LIDBs.
  - Other incumbent LECs and many CLECs store TN data with a LIDB operator of their choice.
    - Several LIDB operators vie competitively to store the LIDB data of smaller LECs, CLECs and other service providers.
  - A PSTN end office switch determines which LIDB to dip for a given TN based on data from the "LIDB Access Routing Guide" (LARG) and "Calling Name Access Routing Guide" (CNARG), published by Telcordia, and stored in the Global Title Translation tables of the switch. Local Number Portability (LNP) data is also applied to route LIDB data queries.
- In the past, many wireless carriers did not store their TN data in LIDB.
  - Generally, wireless carriers have not offered the types of services for which LIDB is dipped at call origination in wireline networks.
  - Storing wireless TN CNAM in LIDB (for delivery to landline subscribers' Caller ID devices) was not a wireless carrier priority.

- Increasing interest in delivery of CNAM for wireless TNs, particularly for business mobile, has led more wireless carriers to begin to store their TN data, particularly CNAM, in LIDB.
  - LIDB data for wireless TNs may be stored in multiple LIDBs:
    - To satisfy inter-carrier business arrangements.
    - To overcome technical issues in routing LIDB queries for wireless TNs.[2]
- Other service providers (such as VoIP providers) may choose not to store typical PSTN wireline data (*e.g.,* BNS) in LIDB. Increasingly, however, such providers find business value in storing their TNs' CNAM data in LIDB and/or in non-LIDB CNAM databases.
- Querying carriers pay LIDB operators "per dip" (*i.e.,* for each query).
  - These charges are part of inter-carrier settlement payments (but are distinct from inter-carrier call termination charges).
  - This business model originated at the inception of LIDB in the 1980s, when the dominant LECs were both the principal querying carriers and the LIDB operators.
  - Per-dip charges can be a significant source of revenue for LIDB operators.
    - A common business arrangement is for a LIDB operator to share TN query revenue with the service providers who store their TN data in the operator's LIDBs.
  - The per-dip business model has been called into question in recent years as:
    - Competition to provide voice services has expanded beyond the traditional carriers,
    - The communications industry has moved towards flat rate (*vs.* per-unit) calling models, and
    - Voice revenues have decreased.

    These concerns have led some providers not to dip LIDB (*e.g.,* for CNAM) on every call, but instead:
    - Dip LIDB only if data for the TN is in the operator's own LIDB,
    - Dip a non-LIDB CNAM database, or
    - Not dip any database for CNAM, and deliver to the called party a generic "UNAVAILABLE" / "OUT OF AREA" or location- (NPA-NXX) derived CNAM string—*e.g.,* "MASSACHUSETTS" or "LEXINGTON MA."
  - Some business arrangements between service providers and LIDB operators result in TN data being stored in multiple LIDBs to reduce LIDB dip charges.

[2] This is also true of Toll-free TNs, which are frequently stored in multiple LIDBs.

- Increasingly, LIDB data is queried in applications unrelated to PSTN call completion.
  - LIDB data is generally viewed as *trusted*. Well-established carrier business processes help to ensure the accuracy of data in LIDB, making this database of interest to industries outside of telecom.
  - Carrier-vetted subscriber data in LIDB can support validation of identity and trust in applications such as retail credit.
    - *Example:* Open Identity Exchange (OIX) *Telecom Data Trust Framework* proposed for the NIST *Trusted Identities in Cyberspace* program.
    - LIDB data elements that reflect the subscriber's relationship with the service provider can be applied in this manner, including:
      - Billing Name and Address (BNA)
      - Service Start Date (SSD)
  - LIDB data can be queried to determine working telephone number status; for example, in the screening of telemarketing lists.
  - Such non-telecom applications of LIDB data are revenue-generating for LIDB operators.
- CNAM is increasingly relied on by subscribers; it is perceived more and more as an integral part of basic telephone service. However, *consistent* and *accurate* delivery of CNAM can be problematic.
  - CNAM is an unregulated service. There are currently no regulatory requirements or industry standards regarding universal availability or accuracy of CNAM.
  - CNAM data is constructed from a variety of source data, depending on the CNAM database provider. Insuring the quality of CNAM data is an ongoing challenge for CNAM providers.
  - Service providers take diverse approaches to storage of CNAM data for their TNs. Not all CNAM data is stored in databases accessed via the SS7 network using LARG and CNARG routing.
  - Some carriers permit subscriber self-service entry of CNAM data for their originating TN. Subscriber-entered CNAM may be less meaningful to a called party deciding whether or not to answer a call.
  - Wireless carriers are only just beginning to deliver CNAM for calls completed to mobile phones.
  - For various business and technical reasons, service providers sometimes intentionally do not dip for or deliver CNAM.
  - Service providers sometimes fail to remove CNAM data for ported-out TNs. This can yield CNAM results that are inconsistent from call to call, depending on which of several databases is dipped for the TN.

- Caller ID (Calling Party Number) "spoofing" also causes inaccurate CNAM delivery.

Can LIDB function across the transition to the all-IP network?

- Current LIDB implementations offer an IP interface.
- LIDB can also be queried from IP networks using signaling translation ("SIGTRAN") to pass queries and responses between the IP and SS7 networks.
- Some carriers already take advantage of these IP capabilities. These carriers will have more options as they plan their transitions; for example, with LIDB supporting concurrent SS7 and IP querying during a transition period.

Does LIDB have a role in the post-PSTN all-IP network?

- Even though LIDB supports IP queries, carriers may ultimately prefer solutions with potentially lower operating costs and better alignment with next generation network database needs.
- Data elements consolidated in LIDB today ultimately may be distributed across functionally distinct databases according to purpose.

What LIDB services must be cared for in the PSTN transition?

- As the FCC establishes guidelines and recommendations for the PSTN-to-IP transition, today's LIDB services must be examined to see how they should be cared for in the transition.
- Looking at today's LIDB data elements in the context of the transition to IP, we can ask the following questions:
  - Which LIDB data elements are critical to core communications (call-completion) and must be planned for in the next-generation network?
  - Which elements are obsolescent and may be allowed to sunset with the PSTN?
  - Which LIDB data elements pertain to services that are regulated by state public utilities commissions or the FCC? Transition plans for these data elements will need to take the regulatory environment into account.
  - Which data elements pertain to services that are unrelated to call completion? These can be left to the carriers to consider as part of their product planning.

- To stimulate discussion, we make a "first pass" at assessing the future of today's LIDB data elements:
  - *Ownership.* TN ownership data is used for billing in the PSTN environment. It can reasonably be assumed that IP calling mechanisms will care for billing-related data.
  - *CNAM.* Since CNAM can be carried as part of SIP (Session Initiation Protocol) call setup, all-IP calling is technically capable of delivering CNAM without a database lookup at the terminating end. Yet, interconnected VoIP calling has led to instances of Caller ID and CNAM "spoofing" which has raised consumer and regulatory concerns:
    - Is there a need for *authenticated* CNAM?
    - What are the specific drivers?
    - Must terminating carriers *trust* CNAM that is passed from the originating end?
    - Or, would carriers prefer to dip an authoritative source (*e.g.,* a trusted LIDB-like database) for CNAM?
    - Should Calling Name Privacy (CNP) be continued as a service attribute?
  - *BNS—Collect* and *Bill-to-Third.* Will the all-IP network retain alternate billing services, or will the industry drop these capabilities? If alternate billing is retained, should it remain possible to *block* collect or bill-to-third calls? How will this be done? Will collect and bill-to-third calling be regulated, and if so, will regulation be at the state or Federal level? If carriers seek to eliminate collect and bill-to-third calling, will regulators allow their elimination?
  - *Originating Line Number Screening* (OLNS). Will the ability to block calls based on characteristics of the originating line number continue in the all-IP network?
    - Calls from a hotel room phone; from a prison line?
    - Optional services billed back to the originating line?
  - *Service and Equipment Indicator.* In the PSTN, SEI is used in conjunction with OLNS to determine the treatment of originated calls. Carriers will need to determine whether SEI data from LIDB is also needed for other applications.
  - *ZIP+4.* Used in "311" information services routing. LIDB operators typically sell this as an unregulated service; they will need to determine how to provide a comparable service in the IP network.

- *Calling Card PINs.* Line-based calling card use is diminishing rapidly. Will calling cards be discontinued entirely in the all-IP network? Or will some regulators require carriers to continue to offer line-based calling cards generally, or at least retain existing, grandfathered calling cards? If line-based calling cards are retained in the all-IP network, some mechanism for PIN validation will be required.
- *Billing Name and Address* (BNA). This non-call-related service generates revenue for service providers. The service providers will determine how to continue to provide these services; regulatory guidance is likely not needed.
- *PIC, LPIC.* These interexchange carrier values are used in the establishment of PSTN toll calls. It is not clear, however, whether service providers today query LIDB for these values or obtain them from elsewhere in the network. Service providers will need to determine whether, where, and how these data elements will be stored and queried in the IP network.

Can an operator simply "pull the plug" on LIDB?

- Suppose one or more operators decided to "pull the plug" on their LIDBs:
  - Would that be possible, or allowed…
    - From a network operation perspective?
    - From a regulatory perspective?
  - What would be the technical impacts and regulatory implications?

Conclusions and Recommendations

- As the FCC and industry stakeholders assess the moving parts of the PSTN-to-IP transition, LIDB and its services are key pieces of the puzzle to be considered.
- Timely planning is important.
  - There may be regulatory questions that take time to address and resolve.
  - Each carrier and LIDB operator will need time to assess:
    - How the existing data elements they store in their respective LIDBs are used today.
    - The direction they will take with LIDB services in the future.
  - Regardless of whether LIDB is carried into the IP world or the TN data in LIDB is migrated to new databases, careful transition planning will be needed to minimize any impact these changes might have on telecommunications services.

- The transition to all-IP telephony presents a unique *and timely* opportunity for industry stakeholders, and the FCC, to assess the value of CNAM in today's communications infrastructure and to steer its future. Questions to consider include:
  - Has CNAM become an essential element of voice communication today? Should it be universally available? Should it be authenticated?
  - Should stakeholders collaborate to establish industry-wide standards for the provisioning and delivery of CNAM in the all-IP network? Would such standards benefit the consumer? The industry?
- To facilitate a smooth transition, industry should leverage service provider TN data provisioning processes that are already in place. For example, administrative systems associated with today's LIDBs can be utilized during the transition (to provision new IP databases as well as LIDB) and then retained in the all-IP world (to provision databases supporting the all-IP network).
- EGH recommends that subject matter experts in the service provider and supplier communities associated with PSTN databases such as LIDB participate in the transition planning process, to ensure the data elements maintained in these critical "network of record" databases are fully taken into account.
- As a software supplier to the industry having familiarity with these databases and the roles they play, EGH is prepared to contribute to these efforts.

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