Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	WC Docket No. 13-97
Numbering Policies for Modern Communications	)	
	)	
IP-Enabled Services	)	WC Docket No. 04-36
	)	
Telephone Number Requirements for IP-Enabled Services Providers	)	WC Docket No. 07-243
	)	
Telephone Number Portability	)	CC Docket No. 95-116
	)	
Developing a Unified Intercarrier Compensation Regime	)	CC Docket No. 01-92
	)	
Connect America Fund	)	WC Docket No. 10-90
	)	
Numbering Resource Optimization	)	
	)	
Technology Transitions Task Force	)	CC Docket No. 99-200
	)	
Petition of Vonage Holdings Corp. for Limited Waiver of Section 52.15(g)(2)(i) of the Commission's Rules Regarding Access to Numbering Resources	))))	GN Docket No. 13-5
	)	
Petition of TeleCommunication Systems, Inc. and HBF Group, Inc. for Waiver of Part 52 of the Commission's Rules	))	

REPLY COMMENTS OF SHOCKEY CONSULTING

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I.   Introduction and Summary

My name is Richard Shockey. I am the principal of Shockey Consulting located in Fairfax County Virginia. I am also the Chairman of the Board of Directors of the SIP Forum an industry promotion group for the Session Initiation Protocol [SIP] which is the principal technical standard for the Ongoing TDM to IP Evolution.[1] In addition, I have served on the FCC Communications Security, Reliability and Interoperability Council III.

I have previously commented to the Commission on the Vonage Petition, Technologies Transition Task Force and testified at The FCC's Public Switched Telephone Network Transition Workshop on December 2011. [2] [3] [4]

In addition, I help co-found and co-chaired the Internet Engineering Task Force ENUM working group that developed RFC 6116 which was designed to facilitate network interconnection for services using E.164 addressing. [5]

The Commission has correctly chosen at this time to undertake a strategic review of the US North American Numbering Plan [NANP] Transition with a view towards how these systems evolve as part of the overall PSTN Transition. The evolution of the NANP and the PSTN are inseparable and will require reasonable and prudent adjustment to the policies surrounding how numbers are issued, how they are used, the roles and responsibilities of NANP resource holders and the underlying numbering databases that are essential to the security and reliability of the phone system.   Many companies have created new innovative services using the NANP. There

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[1] Views contained in this document are purely those of Mr. Shockey and do not necessarily represent the views of the SIPForum its member companies and participants.

[2]   http://apps.fcc.gov/ecfs/document/view?id=7022009347 (Vonage Petition)

[3] http://apps.fcc.gov/ecfs/document/view?id=7022105978   (Technical Transitions Task Force)

[4] http://www.fcc.gov/events/public-switched-telephone-network-transition-0

[5] http://datatracker.ietf.org/wg/enum/charter/

is every reason to believe they will continue to do so if the NANP and its databases can be restructured with a view to an all IP future.

II. The PSTN Transition is underway and the NANP Transition must be part of that.

The Commission needs no further data on the current state of real-time communications networks. The Commission's own 477 data indicate that perhaps as high as 30% of all US Voice traffic is being switched using IP based SIP/IMS systems now, often over highly managed IP networks in order to maintain effective Quality of Service and Quality of Experience guarantees. Virtually all Cable Voice core networks use SIP/IMS, CLEC's RLEC's and ILEC's all have SIP/IMS networks in place especially for their enterprise customers. It has been estimated that SIP Trunking for enterprises will surpass T1 TDM trunks by 2015. [6] The continued default use of TDM to interconnect SIP/IMS systems degrades the capabilities SIP/IMS has brought to the market and a serious impediment to further innovation. Last but not least it is clear that the CRMS carriers are moving very quickly to SIP/IMS based Voice over Long Term Evolution [VoLTE].

The Commission should make clear, on a daily basis if necessary, that the PSTN Transition is an inevitability. TDM/SS7 networks need to be retired, eventually. The Commission should make clear that NANP Numbering Policy will change and it will seek to adopt forward looking policies such as the ones I outline below. In addition it should encourage all carriers to continue to negotiate all IP interconnections agreements "in good faith", at the very least, for those end points that are currently SIP/IMS reachable. It is clear that a SIP Interconnection "overlay network" as begun to form. The Commission should take no actions to inhibit current voluntary

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[6] http://www.infonetics.com/pr/2013/SIP-Trunking-and-SBC-Enterprise-Survey-Highlights.asp

mutually beneficial SIP interconnection agreements until a variety of technical issues are resolved.

III.   First Principals: The Importance of Naming and Addressing in Networks.

One of the least understood, but most important things about communications is the need for consistent and predictable naming and addressing. Modern communications is impossible without it.

When we receive postal mail, (remember those bits of paper in the physical mail box), there is an address on the front of the envelope. The US Post office knows how to get the mail to you because it has designed the addressing scheme for physical mail and the ZIP Code structure used by automated sorting equipment.

You don't think about this very much because it works. However the principals involved in routing physical mail is the same for the Internet, electronic mail and the phone system. Somewhere, somehow there must be a consistent, understandable, reliable and standard methodology and databases that all users understand to route a call or move a bit from point A to point B.

In electronic communications the requirements on naming and addressing are even more stringent. Names and Addresses must be authoritative, as well as globally unique and the system and organization that issues the numbers must have the trust of all parties involved. Trust is central to the reliability of the entire Telephone Number system but parts of that are currently beginning to break down, especially in the case of Caller ID validation and spoofing.

Naming and Addressing are two distinct concepts. A Name in electronic communications is a single, globally unique, logical abstraction to address or destination. In the modern US telephone system phone numbers derive their authority from a global system that begins with the International Telecommunications Union and is passed down to individual nation states that then issue phone numbers to consumers. The E.164 telephone numbering plan is globally

authoritative and guarantees that no two phone numbers issued to consumers are the same anywhere in the world.

However in the United States and Canada and other countries that have adopted Number Portability the telephone number is an abstraction to the underlying network addressing scheme, which in the US is referred to as a Local Routing Number. Every single telephone call in North America that uses the NANP relies on two databases, the Local Exchange Routing Guide [LERG] and the Number Portability Administration Center [NPAC] that match the phone number to its underlying PSTN routing number. The phone network also relies on other databases including LIDB, BIRRDS, etc. These databases must be trusted by every single telecommunications carrier to be constantly available, reliable, and up to date.

The Internet is no different. The Internet works because there are several globally reliable and trusted databases for issuing names and addresses. Names in the Internet Context are the familiar domain names issued by ICANN accredited registrars from top level domain operators, such as .US, .COM in the single global root database structure that is referred to as the DNS. Addresses are the IP numbers issued by the various Internet Registries ARIN, RIPE, APNIC and LANIC. Much like the phone system, no two names in the Domain Name System [DNS] can be same and the DNS must be "trusted" to return a globally unique IP address when asked.

One cannot underestimate the investment that consumers and business have in communications naming and addressing. A telephone number is perceived by the public to be a simple easily understandable means of communications. Business and consumers rely on the stability and integrity of telephone numbering to make phone calls. Business and consumers rely on Domain Names to bring customers to their web sites or route E-Mail. Countless studies have shown that both consumers and businesses do not like changing their phone numbers, email address or domain names arbitrarily.

Phone numbers can and will be used to create innovative services now and in the future. The PSTN Transition is beginning to highlight how Phone Numbers can and should become more

like Internet Domain names and that the NANP numbering databases may look more like the DNS in the future.

IV.   The United States should move to National 10 Digit Dialing.

As the current PSTN Transition evolves it is becoming apparent that the structure of PSTN dialing itself is becoming an impediment to rationalizing the existing NANP structure and modernizing the numbering databases that enable naming and addressing in the PSTN. The Commission is concerned about number exhaust and management issues. National 10 dialing is a precondition to that. It should be self-evident by now that with mobile devices and overlay codes probably 80% of US PSTN dialing uses 10 digits. National 10 digit dialing solves lots of problems. First currently there can be no 0 or 1 in of a US North American Numbering Plan [NANP] dial string at the D-digit (NPA-NXX-XXXX) where the N in NNX is technically the D-digit. This is currently necessary where local 7 digit dialing is permitted. Mandating national 10 digit dialing immediately increases the size of the US NANP by 20% and overcomes multiple issues in number exhaust in several jurisdictions. This easy to implement, even within the existing TDM/SS7 networks and would, in my opinion, take around 3 years.

V.   The United States should move to National Geographic Number Portability and the Commission should clearly state that is the ultimate goal.

The Commission should make clear that one of the important goals of PSTN Transition and Next Generation NANP planning is the eventual realization of National Geographic Number Portability. The preconditions now are clear. The Universal Service/Intercarrier Compensation reform clearly orders a move to a national bill and keep model. If this is achieved, the rationale for LATA's will no longer exist and the existing numbering databases can be modified to allow a US Consumer or Enterprise to essentially keep their phone number, mobile or landline forever and port that number between any carrier on any access network, anywhere in the United States. The formal abstraction between naming and addressing in the phone networks will be complete.

The original rationale for Local Number Portability was to enhance competition. The imposition of Local Number Portability was one of the most successful creations of the 1996 Act but the restriction on porting within a LATA hampered its usefulness and created anti-competitive conditions where, for instance, a mobile customer could essentially keep their mobile number if they moved out of a LATA (and paid their bill) but were forced to change the number if they decided to change carriers outside the originating service LATA. There is no technical reason for this state of affairs to continue. PSTN routing to PSAP's can be accommodated under this scheme and should be part of any planning on NG 911 transition.

The real reason for National Geographic Number Portability is that, according to the US Census Bureau nearly, 12 percent of *the entire United States population* moves every year! [7] Though it is not clear how many of those moves were within a LATA boundary, it is clear that outdated numbering regulations are imposing a burden on United States citizens who have to change their phone number when they move. This is a major inhibitor to future innovation using the NANP.

Some commenters have noted a "quaint" attachment to certain NPA Area Codes. They have certainly been the subject of historically important Seinfeld episodes. [8] With the huge expansion of Area Codes over the past 20 years I really wonder if anyone knows, much less cares where 352, 678, 479, 689, 856 actually are located.

In my judgment, Area Codes have lost any rational attachment to geography even now and such distinctions should go the way of the use of Exchange Names like Pennsylvania 6-5000. [9] [10]

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[7] http://blogs.census.gov/2012/12/10/america-a-nation-on-the-move/

[8] http://en.wikipedia.org/wiki/The_Maid_%28Seinfeld%29

[9] http://www.nytimes.com/2013/02/09/business/john-e-karlin-who-led-the-way-to-all-digit-dialing-dies-at-94.html?pagewanted=all&_r=0

[10] http://lyricsplayground.com/alpha/songs/p/pennsylvania65000.shtml

VI.   The Restructuring of the NANP Numbering Databases.

All IP interconnection of SIP/IMS traffic is occurring now. Service providers have used the NECA Operating Company Number [OCN] located in the numbering databases to identify who is the Terminating Carrier of Record for a SIP/IMS session and through the application of local policy and data provided through the mutual exchange of Excel Spreadsheets, establish all SIP IP connections between two service providers who have made such voluntary mutual arrangements. Though this process works for now, it will not scale much further.   I addition the impending introduction of Voice over LTE , which is SIP/IMS based, and brings the promise of all High Definition Voice to mobile networks across carrier boundaries and now highlight's the need for a major look at how the existing numbering databases are structured and calls into question if new databases are needed to enable all IP Interconnection at national scale.

It should be obvious that a transition of the PSTN to an all IP world will require databases that are Internet Protocol centric and that can accommodate IP data such as URI's. In addition the structure of these databases need to be designed in such a manner to be more open and friendly to innovation if new services are designed that may wish to use NANP numbers.

There are already some examples in existence. The FCC itself, has contracted with a vendor to deploy a RFC 6116 ENUM system to facilitate its iTRS service. [11] The industry has long used ENUM systems to facilitate Local Number Portability Look-ups internally and facilitate SMS and MMS routing between carriers. [12] [13] The industry itself promoted several Carrier ENUM initiatives in past years including one from CableLabs called PeerConnect and another from Incumbent carriers known as CC1 LLC.

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[11] http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-10-161A1.doc

[12] http://www.netnumber.com/solutions-mms-sms-routing.htm

[13] http://www.syniverse.com/products-services/product/ENUM-Services

It well known that the NPAC itself has fields within the database that could be used for IP related services. [14]

What is clear is that the technology is available to IP enable numbering databases. The industry has not deployed these solutions widely for various reasons.

There should be no doubt in the Commissions mind that the telecommunications industry knows how to create SIP IP centric numbering databases it's only a question of the industry actually sitting down choosing one or more solutions sooner rather than later. I do not necessarily propose that RFC 6116 be a National Standard for next generation NANP databases, only note that the problem has been given extensive technical investigation and has a tremendous record of deployment in carrier networks.

The decision on what modifications to existing databases are needed or what new databases should be defined should the next phase of the NANP/PSTN Transition. The role of the Commission in the ongoing technical discussion of IP numbering databases should be to gently "nudge" the industry towards a selecting appropriate technical solutions but also make sure that technical and policy discussions about such databases are conducted in an open multi-stakeholder consensus driven process where all elements of the industry can reasonably participate and the costs and governance structures of these existing or new databases are well understood.

Many elements of the industry may look upon the restructuring of the numbering databases to demand the FCC immediately and without delay order the incumbents to implement SIP/IMS interconnection for *all* PSTN traffic now. I'm deeply sympathetic to the costs innovative CLEC's and Cable Operators have had to bear by shouldering the full cost of signaling gateways and media transcoding in order to reach TDM endpoints on ILEC networks. But to expect a

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[14] https://www.npac.com/lnpa-working-group/nanc-change-orders

"flash cut" of the ILEC networks to accommodate 100% SIP/IMS traffic is unrealistic at this time. The Commission has made it clear in the ICC/USF reform order that it expects all participants to "negotiate in good faith" for all IP interconnection. The Commission should reaffirm that directive.

This argues the logical first step in the PSTN Transition is to encourage the restructure of the NANP databases with IP Interconnection data, then encourage the Interconnection of the known SIP/IMS enabled endpoints and migrate TDM endpoints over time. As pointed out earlier this could represent nearly 50% of all US voice traffic by 2015. Of course at some point there will have to be a true Sunset of the PSTN and perhaps penalties assessed for recalcitrant operators who will not convert but we are not at that point.

VII. The emerging problem of Caller-ID Spoofing will also require restructuring of the NANP databases

The Federal Communications Commission and the Federal Trade Commission have been inundated with complaints from consumers and businesses on the emerging problem of Caller ID Spoofing, massive violations of the Do Not Call List, robocalling, vishing , swatting, reports of serious crime and Telephony Denial of Service attacks [15] that have devastated individuals, businesses and even Public Safety Answering Points.

This is a complex problem that will need multifaceted solutions that include both regulatory, legislative and technical solutions. The Chairman's report to Congress on the Truth in Caller ID Act points out many of these issues. [16] The Senate Commerce Committee recently held excellent hearings with industry FCC and FTC Enforcement Bureau staff. [17]

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[15] https://krebsonsecurity.com/tag/telephony-denial-of-service-attack/

[16] http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-11-1089A1.doc

[17] http://www.commerce.senate.gov/public/index.cfm?p=Hearings&ContentRecord_id=c1eec086-3512-4182-ae63-d60e68f4a532

As with most good things, the Transition of the PSTN has had unintended consequences. As IP technology made voice calling more cost efficient the ability of criminal elements to exploit that advantage has exploded. The problem is not confined to the US. The Canadian Radio-television and Telecommunications Commission is reporting similar problems. [18]

The Chief Technology Officers of both the FCC Dr. Henning Schulzrinne and the FTC Dr. Steven Bellovin, to their eternal credit, have recently reached out to the Standards Development Organizations, in particular the Internet Engineering Task Force [IETF] asking for assistance in defining solutions that could overcome some of these problems. [19]

One of the possible solutions would carriers or potentially consumers to validate the Caller ID that is being presented to them at the point of call termination. This would require some form of cryptographically valid key material to be inserted into existing or new NANP numbering databases. If the terminating network or consumer could not cryptographically validate the Caller ID might be considered malicious and perhaps even dropped buy the terminating carrier or consumer. Some FCC rules would need to be altered here but it is a technical sound and deployable idea that has precedent in IETF protocols such as DNSSEC and DKIM for e-mail.

The Caller ID problem begs the question of should primary and secondary holders of NANP resources police the traffic on their networks. It is apparent that much of the problem is generated by SIP/TDM gateways at the edge of carrier networks that serve wholesale customers. Those gateways are not easily identifiable and that has made the Track and Trace problem for malicious calling more difficult. The Commission should consider convene a workshop among service providers to see if there are any known techniques to "firewall" these gateways to more closely identify where some of this traffic is coming from.

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[18] http://www.theglobeandmail.com/technology/tech-news/crtc-sounds-alarm-over-controversial-phone-apps/article4516986/

[19] http://datatracker.ietf.org/wg/stir/charter/

Since it is clear the Caller ID spoofing problem is international in scope the Commission may wish to consider reaching out to its Regulatory counterparts, such as the CRTC in Ottawa to see if a coordinated approach can be negotiated.

I believe the FCC and the FTC need to go back to Congress and seek the revision of the Truth in Caller ID Act. Personally I think the practice should be banned completely and some highly limited arrangement made for "Certification of Need" for a constricted list of legitimate caller ID spoofing situations. It is clear that as Captain Spock said in the Motion Picture 'The Wrath of Kahn', "Were I to invoke logic, however, logic clearly dictates that the needs of the many outweigh the needs of the few."

I'm particularly disturbed by a Federal Appeals Court Ruling in the 5th Circuit that struck down an innovative Law in Mississippi that attempted to strengthen aspects of the Caller ID Anti Spoofing Act. [20]   The Court, wrongly in my opinion, struck down a reasonable and rational attempt by the State of Mississippi to protect its citizens due to a finding of Federal preemption.

Much stronger penalties need to be imposed on violators. The use of the NANP databases may be one of many, technical, regulatory and legislative solutions to a problem that has become a petulance on the land.

What the Caller ID situation highlights, once again, is the imperative that the industry to begin to restructure or create new NANP databases now.

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[20] http://arstechnica.com/tech-policy/2012/12/federal-judges-affirm-right-to-caller-id-spoofing-if-its-non-harmful/

VIII.   The NANP Transition will require more clarity on Roles and Responsibilities of Number Assignment entities and their customers.

As it stands now the Commission requires holders of NANP resources to comply with certain limited rules. First they must support Local Number Portability and Pooling when applicable. Second they must support FCC Form 502 known as Numbering Resource Utilization Forecast [NRUF] reporting. This is all well and good and the current FCC supported numbering trials have highlighted that Trial participants MUST support these rules. What the Vonage Petition record has highlighted is that many CLEC's have a thriving and innovative business reselling NANP resources to 3rd parties who may or may not eventually show up in the NANP databases as SPID or Alt-SPID. The reselling of NANP resources by licensed carriers is a "good thing" and has fostered tremendous innovation and brought new products and services to consumers.

The question is are the Roles and Responsibilities of NANP resource holders sufficient in a PSTN/NANP Transition.   How are the resources going to be policed, can "bad actors" be disciplined. Who actually has NANP resources now and why? What are the terminal characteristics of these endpoints? Are they TDM, SMS only, SIP/IMS, a Utility meter, a car? The existing databases and the FCC data do not show how the NANP resource is actually being utilized. Can resellers of NANP resources discipline their wholesale customers for malicious activity? Under what terms and conditions? This is not clear to anyone in the industry.

If the Commission chooses to continue issuing NANP resources to non-licensed carriers it needs to clarify the Responsibilities on how those companies use the resources. .

IX.   SMS800 needs to develop a plan for the PSTN Transition now

It is beyond outrageous, to the point of being utterly incomprehensible why the SMS800 organization has not discussed much less developed a forward looking plan on how the 8XX number system is going to be transitioned to an all IP world. These are among the most valuable

and consequential parts of the NANP and utterly essential to millions of American businesses. The Commission should demand answers.

X.   FCC Authority to Act is not in question, but what is the role of the States

The commission correctly concludes that it has plenary authority over the NANP authorized by Section 251 (e) [1] of the Act. In addition, the FCC's plenary authority for the Numbering plan has been successfully upheld by the US Second District Court of Appeals in a case involving Number Pooling in 2001. [21] I would also point out that the recent City of Arlington Texas vs FCC Supreme Court ruling affirmed the Commissions right to the Chevron Deference in cases where the "expert agency" has explicit statutory authority and Section 251 (e) [1] is pretty explicit. [22]

Traditionally the States have had some role in the management of the NANP, however if it becomes clear that numbers no longer have any geographic meaning and LATA's are essentially going away the Commission and the States need to revisit the question of what the Federal State responsibility over numbering is. Traditional discussions of number resource exhaustion and CO code exhaust are going the way of buggy whips.   Frankly I have no idea what to suggest.

What is abundantly clear is numbering policy either at the State or Federal level should not be used as a tool to inhibit innovation or slow down the inevitable PSTN transition.

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[21] 267 F.3d 91 People of the State of New York & Public Service Commission of the State of New York v Federal Communications Commission etal Decided Sept 28, 2001

[22] www.supremecourt.gov/opinions/12pdf/11-1545_1b7d.pdf

Respectfully submitted.

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