NRIC VII

June 14, 2005

FOCUS GROUP 1A
Near Term Issues for Emergency / E9-1-1 Services

Report #3

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1. Results in Brief

1.1 Executive Summary

The FCC has called upon NRIC VII Focus Group 1A ("FG1A") to present recommendations for a consistent, common set of thresholds for the time required to complete database queries and for identifying all major traffic concentration points in the E9-1-1 architectures and defining the metrics and thresholds that should be used to determine where traffic concentrations are unacceptably high. The stakeholders consisted of representatives from the wireless industry, the Public Safety community, and other participants in the wireless E9-1-1 industry.

Optimum timing thresholds have been identified and were based on existing network element technology. Timing thresholds were considered in a holistic manner. The FG 1A addressed timing thresholds and did not address delivery of content or actions when timers expire. Report # 2 speaks in detail to data content and recommendations on ALI format display.

At this time, FG1A agrees that there are no concentration points where concentration is unacceptably high. Furthermore, we do not foresee any circumstance in which concentration will become excessive except as explained below. In some cases excessive concentration can be mitigated by adding redundancy and/or diversity. Even in cases where such redundancy and diversity do not exist, however, FG 1A does not necessarily recommend immediate implementation of such mitigation. The short term cost of duplicating soon-to-be replaced network components may outweigh the benefits of replacing the components with new and more reliable technology. Therefore FG 1A recommends, where commercially reasonable, the implementation of such mitigation be considered on a forward looking basis as new E 9-1-1 systems are created and modified.

Note that congestion is not the same as concentration; therefore, recommendations for congestion will not be provided in this document. It is suggested that a future NRIC is the appropriate entity to review this issue.

The members of FG1A are pleased to provide these recommendations for the consideration of the NRIC and the FCC. The following sections provide greater detail and background for the above recommendations.

1.2 Key Findings/Recommendations

The FG 1A identified three areas that are involved in the timing of Database queries and established recommended timing thresholds, where possible. The three areas are as follows:

1. Routing query from Mobile Switching Center (MSC) to Mobile Positioning Center (MPC)/ Gateway Mobile Location Center (GMLC),

2. PSAP initial query to ALI for location of E9-1-1 caller, and
3. PSAP re-bids for updated caller location information.

The team approached the traffic concentration discussions by first defining the differences between concentration and congestion. Concentration is defined as the point within the telecommunication network, where the function of E9-1-1 related network infrastructure elements and/or networks converge (i.e. selective router). A concentration point may or may not be susceptible to congestion. The team was able to focus on the chartered objective of presenting recommendations for identifying all major traffic concentration points and where traffic concentrations are unacceptably high.

The concentration metrics and thresholds should define the point where the level of traffic concentration is unacceptably high. Together, the definition of concentration and what determines a major concentration point have clarified that the concentration threshold is the point at which a single failure or interruptive incident could significantly delay or prevent the delivery of calls to the PSAP and/or diminish the adequacy or availability of data. To the extent that the capacity of a component is not exceeded, there should be no limit to the amount of traffic concentration. The mitigation of a single failure or interruptive incidence is achieved by diversity and redundancy or by "five nines" of reliability. Traffic concentration has been determined to be unacceptably high when:

- Concentration exceeds the design limits of the hardware/software.
    - If a component is designed for a maximum amount of voice or data throughput while maintaining a P.01 grade of service, these limits must not be exceeded. In the event that such limits are exceeded, installation of redundant and diverse components will NOT restore adequate concentration levels, since failure of the redundant node will then overwhelm the remaining node and exceed the capacity of the network. In such cases the solution may be to increase the design limits of the existing components. In all cases, care should be taken to recognize or anticipate the potential impact downstream.
- Uptime of a single, non-redundant and non-diverse network component fails to achieve 99.999%
    - In the event that a single, non-redundant and non-diverse component cannot achieve "five nines" of reliability, the component should be made redundant and diverse. In the event that a component cannot maintain 5 nines even when redundant and diverse, triple and quadruple redundancy should be considered until such reliability is achieved

Design for the delivery of E9-1-1 service today depends upon a high degree of concentration. The network today appropriately manages concentration to avoid unnecessary call delay or failure to provide for the delivery of complete and accurate data to handle emergencies effectively. We do not foresee any circumstance in which E9-1-1 network concentration is or may become excessive.

Although FG 1A is chartered with addressing near-team issues, it is important to consider future technology advances, such that our recommendations do not impede those advances.

Focus Group 1A has agreed that the following entities are the major concentration points in an E9-1-1 network. See section 6 for details.

- PSAP
- ALI
- Selective Router
- SS7 Network Elements
- MPC
- GMLC
- PDE
- SMLC

1.3 Future Reports

Per the NRIC VII Charter, future reports from Focus Group 1A will include the following:

A final report recommending ways and describing Best Practices to address near-term E9-1-1 issues. The report shall include issues from the earlier interim reports. Finally, the report shall recommend Best Practices addressing high E9-1-1 network concentration points.

2. Introduction

Following is the NRIC VII Charter for Focus Group 1A:

The Council shall address the following topics:

Focus Group 1A - Near Term Issues for Emergency/E9-1-1 Services

The Council shall, by December 16, 2005 provide a report that contains near term emergency communications network Best Practices with supporting documentation.

In addition, the Council shall study specific issues that are identified below. The Council shall coordinate with other forums (e.g., Emergency Services Interconnection Forum (ESIF), National Emergency Numbering Association, etc.) so that each issue can be addressed as efficiently and completely as possible. The Council shall:

- Recommend accuracy requirements for location information particularly for rural, suburban, and urban areas and recommend ways to verify that accuracy requirements are met.[1] Investigate location technologies that could improve accuracy and/or reduce cost.

[1] The work of ESIF Subcommittee-G will be considered in this effort.

- Develop recommendations that will lead to a consistent format for information passed to Public Service Answering Points (PSAPs) for Phase 1 and 2 call and location information. This format must resolve any inconsistencies that would otherwise result from using vendor specific formats for transmitting information from Mobile Positioning Centers to PSAPs.
- Develop a consistent, common set of timing thresholds for the database queries and for obtaining location information.
- Identify all major traffic concentration points in E9-1-1 architectures, such as E9-1-1 tandems, Selective Routing Databases (SRDB), Mobile Positioning Centers, and Automatic Location Identification (ALI) databases. The Council shall then define metrics and thresholds that should be used to determine where traffic concentrations are unacceptably high. The Council shall develop Best Practices to reduce traffic concentration wherever it has been determined to be too high. This includes developing Best Practices for the size and diversity of different databases. This may also include developing Best Practices aimed at improving the database process or reducing the number of database queries.

The following two items were originally assigned to 1A and have since moved to 1C.

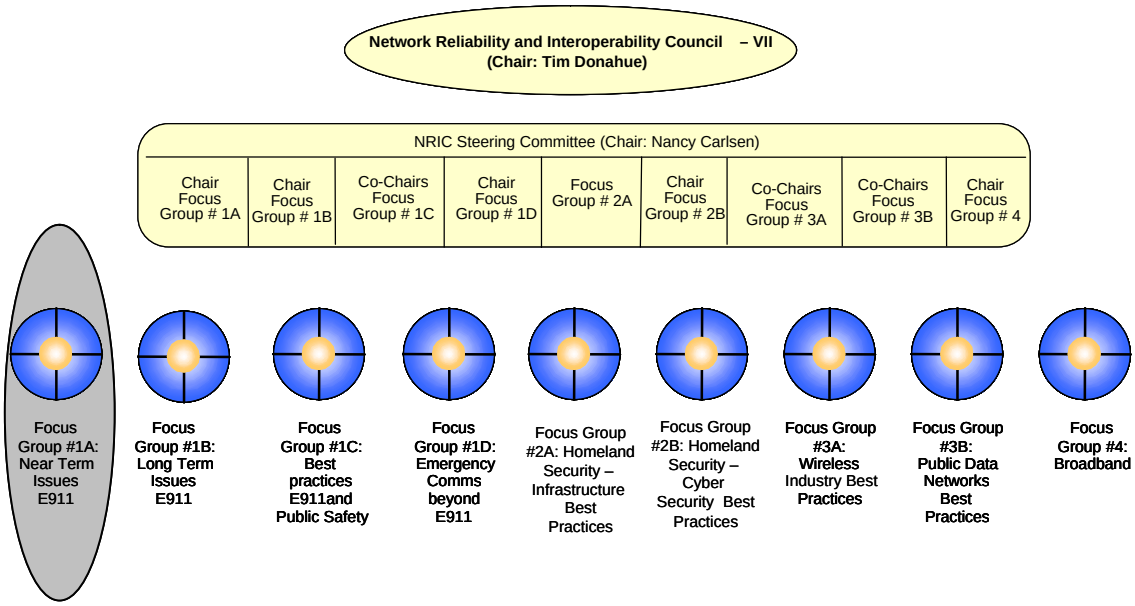
- Specify the information that is to be sent to callers when major E9-1-1 network elements fail. Moved to 1C
- Enumerate and evaluate the factors that should be considered in deciding whether redundant E9-1-1 tandems and alternate PSAPs should be provided to avoid a “fast busy” or a recorded message when one or more non-redundant network elements fail. Moved to 1C.

Milestone #3

By June 28th, 2005,NRIC VII Focus Group 1A (FG1A) will identify all major traffic concentration points in E9-1-1 architectures, such as E9-1-1 tandems, Selective Routing Databases (SRDB), Mobile Positioning Centers, and Automatic Location Identification (ALI) databases. The Council shall present a report recommending a consistent set of thresholds for the time required to complete database queries, and the metrics/thresholds for determining unacceptably high traffic concentration points.

2.1 Structure of NRIC VII

The structure of the Network Reliability and Interoperability Council is as follows:



2.2 Focus Group 1A Team Members

Focus Group 1A consists of 59 members who worked together to accomplish the objectives of Report #3. Focus Group 1A Members (as of May 06, 2005)

NAME	COMPANY/AGENCY
Anderson, Michael	Ericsson Inc.
Arnold, Greg	Nokia
Ballantyne, Wayne	Motorola
Ballentine, Greg	APCO/MARC
Bonner, Brye	Motorola
Boyd, Mary (Current FG1A Chair)	Intrado
Breen, Tom	BellSouth
Cade, Bill	APCO
Carlson, Scott	Nortel
Dickinson, Dick	TCS
Dressler, Bob	Polaris Wireless
Fitzsimmons, Leo	Nokia
Fontes, Brian	Cingular
Forbes, Lolita	Verizon Wireless
Foster, Darryl	Cos Communications
Glazier, Nathan	Western Wireless
Goldman, Stu	Lucent
Grajski, Kamil	Qualcomm
Gurss, Robert (Bob)	APCO
Hanna, Joe	APCO
Hastings, Anna	SBC
Hight, Gary	Cingular Wireless
Hixson, Roger	NENA
Hoffman, Charlie	NTIA
Howell, John	Nextel
Jensen, Ryan	T-Mobile
Jureka, Joe	Nortel
Kemper, Rick	CTIA
Linse, Phil	Qwest
Linsner, Marc	Cisco Systems, Inc.
Lorello, Tim	TCS
Malnati, Francis	Verizon Wireless
Mao, Jeng	NTIA
Marrengoni, Paul (FCC Observer)	FCC OET Office
Marzolf, Steve	Commonwealth of Virginia & NASNA
McCarley, Wanda	APCO
McKee, Charles	Sprint
McNiff, Brian	TechnoCom
Mobbs, Jackson A.	Alltel
Morgenstern, Dale	AT&T
Nixon, Jim (FG1B Chair)	T-Mobile

NAME	COMPANY/AGENCY
Partyka, Janice	TechnoCom
Pavon, Gustavo	True Position
Prest, Art	Rural Cellular Assoc.
Propst, Jim	Sprint
Rauscher, Karl	Lucent
Rollender, Doug	Lucent
Rosnick, John	Nextel
Rousseau, Jean-Michel	Nokia
Ryan, Fran	Sprint
Sanders, Amy	Lucent
Schmidt, Richard	Cingular
Seawright, Rob	Cingular Wireless
Sherwood, Susan	Verizon Wireless
Ward, Marilyn	APCO
Wheeler, Wendy	Alltel
Whisman, Mindy	Cingular
Whitmer, Darold (former FG1A Chair)	Intrado
Vanderheiden, Gregg	University of Wisconsin-Madison

2.3 Consistent, Common Set of Timing Thresholds and Major Traffic Concentration Points Subcommittees

Consistent, Common Set of Timing Thresholds Leader; Susan Sherwood
Major Traffic Concentration Points Leader; Phil Linse

2.3.1 Subcommittee Members:

Consistent, Common Set of Timing Thresholds

Dick Dickinson
Mary Boyd
Steve Marzolf
Wayne Ballentyne
Anna Hastings
Fran Ryan
Jackson Mobbs
Scott Carlson
Michael Anderson
Dale Morgenstern
Charlie Hoffman
Rick Kemper
Paul Marrengoni
Bob Montgomery
Doug Rollender
Bob Sherry (Intrado)

Major Traffic Concentration Points
Dick Dickinson
Tom Breen
John Rosnick
Rob Seawright
Roger Hixson
Doug Rollender
Joe Jurecka
Bob Sherry (Intrado)
Anna Hastings
Mary Boyd
Larry Meyers (Sprint)
Scott Carlson
Michael Anderson
Dale Morgenstern
Charlie Hoffman
Rick Kemper
Paul Marrengoni
Bob Montgomery

3. Background (Milestone #3)

Currently, timers for database queries are inconsistent across the various E9-1-1 service providers and equipment used in delivery of E9-1-1 data to PSAPs. This results in inconsistent delivery of location data to a given PSAP and may cause difficulties in standardizing PSAP operations and training call takers. Consistent timers would increase efficiency in E9-1-1 deployments as well as PSAP operations and call taker training.

Please refer to section 6 for details on timers for database queries.

Technological advances and growth in some E9-1-1 network elements have increased concentration. The telecom industry has developed best practices for managing the challenges associated with the trade off between increased reliability vs. the increase in concentration. Any recommendation made by NRIC FG 1A should support the advancement of technologies and mitigation of the impacts from those technology advancements.

FG 1A has agreed that the following entities are the major concentration points in an E9-1-1 network. See section 6 for details.

- PSAP
- ALI
- Selective Router
- SS7 Network Elements
- MPC

- GMLC
- PDE
- SMLC

4. Objective, Scope, and Methodology (Milestone #3)

4.1 Objective

The NRIC VII Charter directs Focus Group 1A to make recommendations for a consistent set of thresholds for the time required to complete database queries and to identify all major traffic concentration points in E9-1-1 architectures, such as E9-1-1 tandems, Selective Routing Databases (SRDB), Mobile Positioning Centers, and Automatic Location Identification (ALI) databases. The FG 1A shall then define metrics and thresholds that should be used to determine where traffic concentrations are unacceptably high. This includes developing Best Practices for the size and diversity of different databases. This may also include developing Best Practices aimed at improving the database process or reducing the number of database queries.

4.2 Scope

Focus Group 1A agrees that substantial investment in personnel, procedures and technology have been made by wireless carriers, the public safety answering points (PSAPs), local exchange carriers (LECs), E9-1-1 System Service Providers (E9-1-1SSP), and Customer Premises Equipment providers to support Phase I and Phase II location information delivery.

Therefore, the recommendations in this report are forward looking, and are not intended to require conversions of existing deployments. Rather, these recommendations should be incorporated into future wireless E9-1-1 Phase 1 and Phase 2 implementations when commercially reasonable. They should also be considered as system requirements for future changes associated with Phase 1 or Phase 2.

With regard to the concentration thresholds, FG 1A agrees that traffic concentration must exist for a network to be operationally efficient and is often managed through telecom advances. The scope of that portion of this document is to advise the council on the recommendations on how to manage traffic concentration.
The recommendations of this document are to include both ANSI-41 and PCS-1900 networks. Please reference J-STD-036B for specific architectural detail.

4.3 Methodology

To develop the contents of this report, Focus Group 1A divided into two sub committees. The database timing subcommittee evaluated existing technology for the

delay in E9-1-1 network elements. Once determining the existing timing thresholds proceeded with its recommendations. The concentration threshold subcommittee first defined the difference between concentration and congestion. Once determining the scope, this sub-committee proceeded with identifying the major concentration points, thresholds and metrics.

As documented in Section 4.4, Conference calls and face to face meetings were held periodically to collaborate and recommend language for the report. Final acceptance of the report was accomplished through many conference calls and face to face meetings.

4.4 Meeting Schedule

(NOTE: Subcommittee's held conference calls that are not included here.)

Date	Activity
March 2004	3/20/2004 NRIC VII Kick Off Meeting
May 2004	5/20/2004 in person meeting at Intrado's Longmont, CO facility
July 2004	7/21/2004 conference call
August 2004	8/24&25 in person meeting at Nextel's Reston, VA facility
October 2004	10-14-2004 conference call
November 2004	11/9 & 10, in person meeting at AT&T's Bedminster, NJ facility
November 2004	11/12/2004 conference call
November 2004	11/14/2004 conference call
November 2004	11/15/2004 conference call
December 2004	12/13 & 14, in person meeting in Atlanta (hotel near airport)
January 2005	1/6 & 7, in person meeting in Washington, DC (Lucent Labs)
January 2005	1/13, conference call
January 2005	1/14 conference call
January 2005	1/21 conference call
February 2005	2/2/2005 conference call
February 2005	2/3/2005 conference call
February 2005	2/4/2005 conference call
March 2005	3/2 & 3, in person meeting in Arlington, VA
March 2005	3/7/2005 conference call
March 2005	3/10/05 conference call
March 2005	3/16/05 conference call
March 2005	3/230/5 conference call
March 2005	3/30/5 conference call
April 2005	04/04/05 conference call
April 2005	4/6/05 conference call
April 2005	04/11/05 conference call
April 2005	4/13/05 conference call
April 2005	4/22/05 conference call
April 2005	04/25/05 conference call
April 2005	4/26/05 conference call

April 2005	4/27/05 conference call
April 2005	4/29/05 conference call
May 2005	5/3 & 4, in person meeting in Arlington, VA
May 2005	5/11/05 conference call
May 2005	5/18/05 conference call
May 2005	5/25/05 conference call
June 2005	06/01/05 conference call

5. Key Definitions

Concentration Point: The point within the telecommunication network, where the function of E9-1-1 related network infrastructure elements and/or networks converge.

Congestion: Congestion occurs when concentration points experience a larger traffic load than their capacity. Traffic concentration must exist in order for traffic congestion to occur.

Major Concentration Point: The concentration point where a single failure or interruptive incident could significantly delay or prevent the delivery of calls to the PSAP and/or diminish the adequacy or availability of data.

Note: a concentration point is susceptible to congestion.

6. Recommendations

6.1 Timing Thresholds for Database Queries

Consistent timing thresholds are necessary for a number of reasons that include: efficient PSAP operations, ease of PSAP call taker training, consistent vendor software and equipment development, efficient and quicker deployment of Enhanced 9-1-1 services, and consistent delivery of location information. Timing of re-bids, in particular, is important in order for the PSAP to receive the most accurate and up-to-date Phase 2 location information and will reduce the overall number of database queries. Re-bidding too frequently can result in interruption of PDE/SMLC location calculations resulting in less accurate location fixes, extended voice path disruption, and overloading of data circuits.

The Focus Group identified three areas that are involved in the timing of ALI queries and established recommended timing thresholds, where possible. The three areas are as follows:

1. Routing query from MSC to MPC/GMLC,
2. PSAP initial query to ALI for location of E9-1-1 caller, and
3. PSAP re-bids for updated caller location information.

Note that the FG 1A addressed timing thresholds and did not address delivery of content or actions when timers expire.

Focus Group 1A recommends that the following timing thresholds to be used consistently going forward. The recommendations below indicate the highest timing thresholds. This Focus Group recognizes that certain timing thresholds may impact the delivery of location data. In many instances we expect that performance will be better than the following thresholds:

6.1.1 Routing Query from MSC to MPC/GMLC (applies to Phase 1 and Phase 2)

Phase 1

- MSC query to MPC/GMLC for routing instructions is made in less than 1 second
- MPC/GMLC responds to MSC immediately or no later than 4 seconds with cell sector routing information.
- MSC routes calls immediately upon receipt of a response from the MPC/GMLC, but it will wait no less than 5 seconds, nor more than 6 seconds for a response from the MPC/GMLC. This is to avoid causing the MSC to invoke default routing.

Phase 2

- MSC query to MPC/GMLC for routing instructions is made in less than 1 second
- For situations where an interim or quick fix is intended to be used for call routing, the MPC/GMLC directly or indirectly queries, depending on network protocols, the PDE/SMLC and waits up to 4 seconds to get response before deciding whether to route call on lat/long or cell sector.
- MPC/GMLC responds to MSC within 5 seconds with routing instructions.
- MSC routes calls immediately upon receipt of a response from the MPC/GMLC, but it will wait no less than 5 seconds, nor more than 6 seconds for a response from the MPC/GMLC. This is to avoid causing the MSC to invoke default routing.

6.1.2 PSAP Initial Query to ALI for Location of E9-1-1 Caller (applies to Phase 1 and 2 as specified)

Phase 1 (Cell Sector Address and Callback Number)

- PSAP receives call and should query ALI for location immediately.
- ALI should respond with location immediately, if available, or send query to MPC/GMLC immediately.
- MPC/GMLC gateway responds to ALI with CBN and cell sector location information in up to 8 seconds.

- ALI waits up to 10 seconds for location response from MPC/GMLC (regardless of interface type) before responding to PSAP query. Upon receipt of the information from the MPC/GMLC response, the ALI is transmitted.

Phase 2 (Caller Latitude & Longitude, callback number)

- When the MPC/GMLC originally becomes involved in processing a call, it will directly or indirectly query, depending upon the network protocol, the PDE/SMLC and the PDE/SMLC performs location calculations and has up to 30 seconds to respond to MPC/GMLC with caller latitude and longitude. MPC/GMLC places response in a cache (temporary storage).
- PSAP receives call and queries ALI for location immediately.
- ALI should respond with location immediately, if available, or send query to MPC/GMLC immediately.
- Upon initial query from ALI, MPC/GMLC responds to ALI with cell sector (Phase 1 information) or caller latitude/longitude (Phase 2 information), depending on timing of response from PDE/SMLC. MPC/GMLC gateway responds to ALI in up to 8 seconds.
- ALI waits up to 10 seconds for location response from MPC/GMLC (regardless of interface type) before responding to PSAP query. Upon receipt of the information from the MPC/GMLC response, the ALI is transmitted.
- If PSAP receives cell sector (Phase 1 information) on initial location query, PSAP must re-bid no sooner than 15 seconds to receive caller latitude/longitude (Phase 2 information).

6.1.3 PSAP Re-Bids For Updated Caller Location Information (Phase 2 only)

- PSAP must wait at least 15 seconds after receipt of initial Phase 2 caller location information before initiating a new query for updated location information.
- ALI sends query to MPC/GMLC immediately.
- PDE/SMLC has up to 30 seconds to respond. MPC/GMLC waits up to 8 seconds for response from PDE/SMLC before responding to ALI. MPC/GMLC responds to ALI with cell sector (Phase 1 information) or caller latitude/longitude (Phase 2 information), depending on timing of response from PDE/SMLC. MPC/GMLC gateway responds to ALI in up to 8 seconds.
- ALI waits up to 10 seconds for location response from MPC/GMLC (regardless of interface type).
- PSAP should re-bid again (after first mid-call location query) no sooner than 15 seconds to get updated caller Phase 2 latitude and longitude.
- Subsequent mid-call location updates should be initiated no sooner than 15 seconds apart and can continue as long as the call is active

6.2 Concentration, Metrics and Thresholds

Focus Group 1A wishes to emphasize that these recommendations are for concentration points and not congestion. The team reviewed the different points within the E9-1-1 network and identified the following major concentration points;

6.2.1 PSAP

Public Safety Answering Point (PSAP)
The PSAP is a network element that receives the Emergency Service call from the E9-1-1 Selective Router or through direct connection from the originating serving switch. With the delivery of the call the PSAP has voice contact with the calling party but does not have sufficient location information to assist in the handling of the call. The PSAP queries the ALI database for this information.

The PSAP consists of multiple call taker positions. These call taker positions may be situated behind a PBX, ACD, multi-line hunt group or some other mechanism to distribute the call to a call taker position. These devices may generate concentration situations, depending upon the configuration. As the call is received the PSAP's CPE queries the ALI for location information that may aid in the dispatch to the incident. The information is then displayed visually on a screen at a call taker position. The call taker may dispatch to the 1st responders or may transfer call to a secondary dispatch center. Other points of concentration beyond the initial delivery of emergency service calls do occur, but are not within the scope of this report.

The PSAP has been determined to be a major concentration point due to its function and position within the emergency service telephone network. The PSAP function provides a destination for the aggregated 9-1-1/E9-1-1 routed traffic that originates from multiple network operators and multiple telecommunications technologies that are capable of appropriately routing 9-1-1 traffic to PSAPs. In addition, the loss of the entire PSAP will inhibit the dispatch of emergency services.

6.2.2 ALI

Automatic Location Identification (ALI)
The ALI database is a network element that may be involved in routing a call and receives a query from the PSAP to retrieve information that will be displayed at the PSAP. For wireline calls the ANI of the caller is contained in the query and the caller's name and location are returned to the PSAP.

For wireless calls the query may contain a key (such as an Emergency Services Routing Key [ESRK]) for which the ALI must query the wireless network's ALI Database (MPC) to obtain location information, e.g. Wireless Phase 2 location information. When it receives a response from the wireless network the ALI database formats a response and returns the information to the PSAP.

The ALI database has been determined to be a major concentration point due to its function and position within the emergency service data network. The ALI function allows the PSAP to query for data that provides the location identification information for E9-1-1 routed traffic that originates from multiple network operators and multiple telecommunications technologies that are capable of appropriately routing E9-1-1 traffic to PSAPs. The loss of an ALI may also impact the ability of a Selective Router to route the call in some technological designs. In addition, the loss of the ALI will prohibit the display of the location that may be used to dispatch emergency services.

6.2.3 Selective Router

Selective Router ("SR")

A Selective Router is a network element that routes 9-1-1 dialed calls to the appropriate public safety answering point based on the call's related Emergency Service Number. The SR is a Public Switched Telephone Network circuit switch that serves a tandem function for 9-1-1/E9-1-1 voice traffic. The SR has been determined to be a major concentration point due to its function and position within the emergency service telephone network. The SR function allows for the aggregation and routing of 9-1-1/E9-1-1 traffic that originates from multiple network operators and multiple telecommunications technologies that are capable of appropriately routing 9-1-1 traffic to the SR. The SR is considered a major concentration point since failure of a selective router could result in the lack of 9-1-1/E9-1-1 service.

6.2.4 SS7 Network Elements

Signaling System 7 ("SS7") Elements

For the purpose of the emergency service telephone network, SS7 (Signaling System 7) is an architecture and protocol consisting of several specific network elements that are used for performing out-of-band signaling in support of call establishment, routing and information exchange functions (e.g.: SPs, STPs, SCPs). Where SS7 signaling is used to support E9-1-1 call traffic, the signaling is imperative to provide the exchange of information between call elements and is required to provide and maintain service.

The SS7 network's function allows for the aggregation and routing of out-of-band signaling for the transport of 9-1-1/E9-1-1 traffic that originates from multiple network operators and multiple telecommunications technologies. Where the end to end signaling of 9-1-1 traffic may include only SS7 signaling or some portion of SS7 and MF signaling, unlike MF signaling, the aggregated use of SS7 networks by network operators and multiple telecommunications technologies makes the SS7 network a major concentration point. The SS7 network is considered a major concentration point since the loss of the SS7 network in the setup of 9-1-1 emergency calls will prevent the delivery of calls, between network switching elements, which are destined for the PSAPs.

6.2.5 MPC

Mobile Positioning Center ("MPC")
The Mobile Positioning Center (MPC) is an ANSI-41 wireless network element that processes two way communications between the MSC, PDE and ESME (ALI) in order to determine location and call routing information. The MPC to MSC communications provides routing instructions to the MSC. The MPC to PDE communications facilitates the determination of location of the wireless handset. The MPC to ALI communications provides for the relay of wireless data to the PSAP.

If any one of these MPC communications / processes fails, wireless E9-1-1 will either degrade or fail, such that all wireless calls will default to basic 9-1-1 at a default PSAP. The MPC often serves multiple carriers and typically serves the entire United States. The failure of the MPC could result in the loss of the expected data to allow effective routing and handling of the call. Therefore the "hub" functionality of the MPC in the wireless E9-1-1 process makes it a significant concentration point in the wireless E9-1-1 network.

6.2.6 PDE

Position Determining Entity ("PDE")
The Position Determining Entity (PDE) is an ANSI-41 wireless network element that calculates the latitude and longitude of E9-1-1 calls. Some wireless carriers own and operate their own PDE. Other wireless carriers rely upon third party PDEs that serve multiple wireless carriers. Different PDEs use different technologies for calculating the caller's location. Regardless of technology, the failure of a PDE can result in the loss of Phase 2 data for all calls generated by one or more wireless carriers.

To the extent that the PDE serves multiple carriers' facilities or aggregates data from multiple MSCs, it should be considered a major concentration point. Although the failure of the PDE does not impact 9-1-1 call completion, the failure of a PDE would result in the loss of the expected data to allow effective handling of the call.

6.2.7 GMLC

Gateway Mobile Location Center ("GMLC")
The Gateway Mobile Location Center (GMLC) is a GSM/UMTS wireless network element that processes two way communications between the MSC, SMLC and ESME (ALI) in order to determine location and call routing information. The GMLC to MSC communications provides routing instructions to the MSC. The GMLC to MSC communications facilitates the determination of location of the wireless handset. The GMLC to ALI communications provides for the relay of wireless data to the PSAP.

If any one of these GMLC communications / processes fails, wireless E9-1-1 will either degrade or fail, such that all wireless calls will default to basic 9-1-1 at an appropriate or default PSAP. The GMLC often serves multiple carriers and typically serves the entire United States. The failure of the GMLC could result in the loss of the expected data to allow effective routing and handling of the call. Therefore the "hub" functionality of the GMLC in the wireless E9-1-1 process makes it a significant concentration point in the wireless E9-1-1 network.

6.2.8 SMLC

Serving Mobile Location Center ("SMLC")
The Serving Mobile Location Center ("SMLC") is a GSM/UMTS wireless network element that calculates the latitude and longitude of E9-1-1 calls. Some wireless carriers own and operate their own SMLC. Other wireless carriers rely upon third party SMLCs that serve multiple wireless carriers. Different SMLCs use different technologies for calculating the caller's location. Regardless of technology, the failure of a SMLC can result in the loss of Phase 2 data for all calls generated by one or more wireless carriers.

To the extent that the SMLC serves multiple carriers' facilities or aggregates data from multiple areas of the networks, it should be considered a major concentration point. Although the failure of the SMLC does not impact 9-1-1 call completion, the failure of a SMLC would result in the loss of the expected data to allow effective handling of the call.

7. Next Steps

NRIC VII Focus Group 1A will continue to work on the milestones assigned to us.

By December 6th, 2005 the Council shall develop Best Practices to reduce traffic concentration wherever it has been determined to be too high. This includes developing Best Practices for the size and diversity of different databases. This may also include developing Best Practices aimed at improving the database process or reducing the number of database queries.

8. Appendix 1 – Sources and Documentation

"Enhanced Wireless 9-1-1 Phase 2", PN-3890-RV2, J-STD-036-B, Rev B v9., October 2004

9. Appendix 2 – Sources and Documentation

Network Topology Diagram., found in file "NRICVII_FG1A_Appendix2_june_2005.PDF".

10. Appendix 3 – Sources and Documentation

The last report NENA 02-010 was referenced, and FG 1A would like to further clarify that this reference should be NENA 02-010, revised November 9th, 2004.

11. Appendix 4 – Abbreviations and Acronyms

Acronym	Meaning
9-1-1	Basic 9-1-1 service. Voice traffic
E9-1-1	Enhanced 9-1-1 service. Voice and Data traffic
ALI	Automatic Location Identification
ALI-DB	Automatic Location Identification Data Base
A-GPS	Assisted-Global Positioning System
APCO	Association of Public-Safety Communications Officials, International
ATIS	Alliance for Telecommunications Industry Solutions
CMOS	Complementary Metal Oxide Semiconductor
CoS	Class of Service
CPE	Customer Premises Equipment
dB	Decibel
DTx	Discontinuous Transmission
E9-1-1SSP	E9-1-1 System Service Provider
E-OTD	Enhanced Observed Time Difference of Arrival
ESIF	Emergency Services Interconnection Forum
FCC	Federal Communications Commission
GMLC	Gateway Mobile Location Center
GPS	Global Positioning System
GSM	Global Systems for Mobile Communications
HDTV	High Definition Television
IC	Integrated Circuit
L1/L2/L5	Various channels within the GPS signal
LMU	Location Measurement Unit
MHz	Megahertz
MPC	Mobile Positioning Center
MS	Mobile Subscriber
MSC	Mobile Switching Center
MSAG	Master Street Address Guide
MTA	Metropolitan Trading Area
NASNA	National Association of State Nine-One-One Administrators
NENA	National Emergency Number Association
NPRM	Notice of Proposed Rule Making
OET-71	FCC Office of Engineering and Technology Bulletin No. 71
PDE	Position Determining Entity
Phase 1	FCC mandate that wireless E9-1-1 calls be delivered with call back number and cell site identification

Phase 2	FCC mandate that wireless E9-1-1 calls be delivered with Phase 1 data plus latitude/longitude estimate of where the caller was when they dialed 9-1-1
PSAP	Public Safety Answering Point
RF	Radio Frequency
SatNav	Satellite Navigation
SMLC	Serving Mobile Location Center
S/N	Signal to Noise ratio
SRDB	Selective Routing Databases
TDOA	Time Difference of Arrival
U-TDOA	Uplink TDOA
UMTS	Universal Mobile Telecommunications System
WAAS	Wide Area Augmentation System
WiFi	Wireless Fidelity
WLAN	Wireless Local Area Network
WLS	Wireless Location Signatures
Z-height	Location coordinate indicating altitude