NENA STANDARDS FOR

E9-1-1 CALL CONGESTION MANAGEMENT

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NENA STANDARDS

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NENA's Technical Committee has developed this document. Recommendations for change to this document may be submitted to:

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1 Executive Overview

1.1 Purpose and Scope of Document

This document provides a framework for consideration of the various factors impacting the management of call congestion and traffic engineering for E9-1-1 networks. A network reference model is provided for use in referring to generic E9-1-1 network entities. This is followed by a section that outlines generally accepted industry practices for traffic engineering for E9-1-1 networks.

This document focuses on the use of trunking capacity between network entities as the primary means of managing call congestion. It is acknowledged that enhanced methods of managing call congestion may be developed that leverage new intelligent network capabilities. It is also acknowledged that other points within the various networks involved in delivery of E9-1-1 calls have an impact on the level of service and call volumes supported, however, these potential enhancements and other network elements are not within the scope of this version of this document.

This Standard is intended to provide a guideline for all telecommunications carriers (including local exchange carriers (LECs), competitive local exchange carriers (CLECs), commercial mobile radio services (CMRS), satellite carriers, etc), E9-1-1 network providers, and public safety agencies for how to manage call congestion in an overall E9-1-1 network.

1.2 Reason to Implement

This document is intended to provide greater parity between any type of E9-1-1 call, regardless of the source of it's origination (wireless, traditional landline, VoIP, PBX/MLTS etc.)

1.3 Benefits

Use of this Standard will:

- Provide greater parity between any type of E9-1-1 call, regardless of the source of it's origination (wireless, traditional landline, VoIP, PBX/MLTS etc.)
- Establish that it is not only acceptable but necessary to control call congestion to provide a reliable robust E9-1-1 System.

1.4 Acronyms/Abbreviations

See the NENA Master Glossary of 9-1-1 Terminology at:
http://www.nena9-1-1.org/9-1-1TechStandards/Standards_PDF/NENA_01-002.pdf

1.5 Effective Date

This document is effective as of March 6, 2003 Document Terminology
The terms "shall ", "must " and "required" are used throughout this document to indicate required parameters and to differentiate from those parameters that are recommendations. Recommendations are identified by the words "desirable" or "preferably".

1.6 Reason for Issue

This document is issued to serve as a NENA Standard for controlling congestion in all types of E9-1-1 networks.

1.7 Reason for Reissue

This is the original issue of this document. NENA reserves the right to modify this document. Whenever it is reissued, the reason(s) will be provided in this paragraph.

1.8 Date Compliance

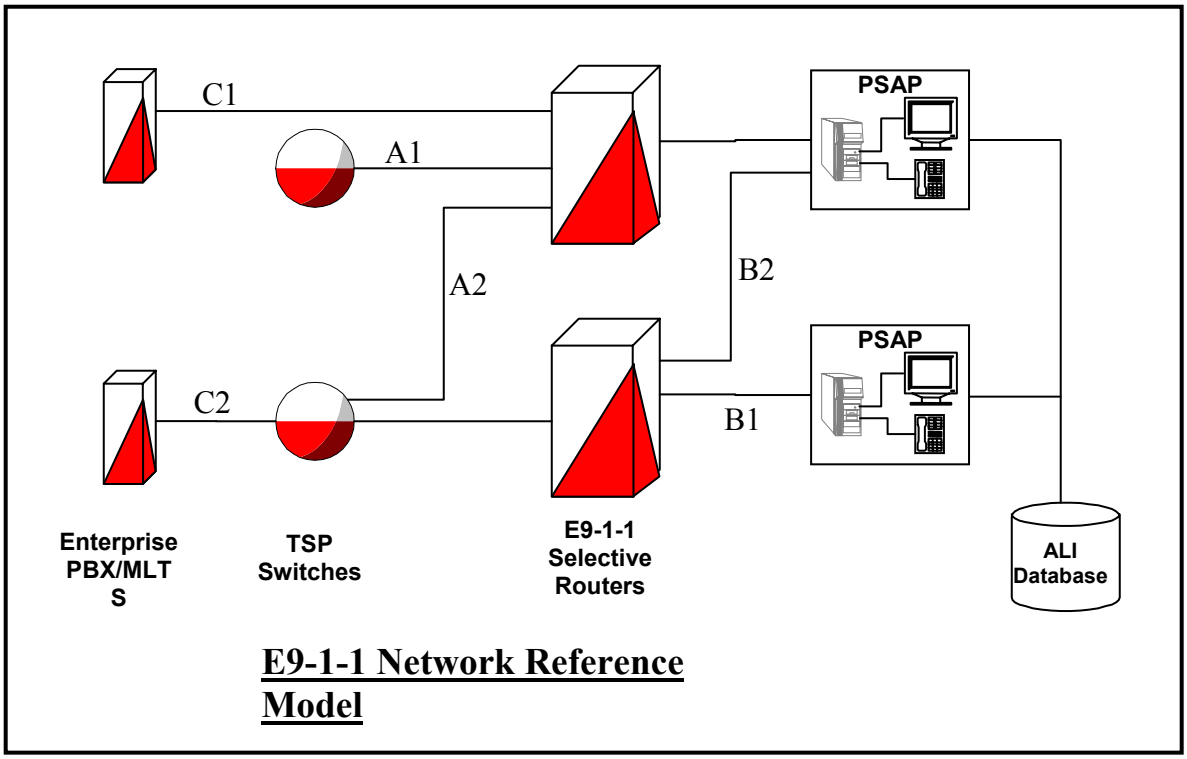
All systems that are associated with the 9-1-1 process shall be designed and engineered to ensure that no detrimental, or other noticeable impact of any kind, will occur as a result of a date/time change up to 30 years subsequent to the manufacture of the system. This shall include embedded application, computer based or any other type application.

To ensure true compliance the manufacturer shall upon request provide verifiable test results to an industry acceptable test plan such as Telcordia GR-2945 or equivalent.

2 Technical Description: E9-1-1 NETWORK CALL CONGESTION MANAGEMENT

2.1 E9-1-1 Network Reference Model

The following diagram provides a network reference model and associated descriptions of the network entities.



E9-1-1 Network Reference Model

2.1.1 A: TSP Switches to SR Connections

Network reference point A represents the network connections established between a Telecommunications Service Provider (TSP) serving switch entity and an E9-1-1 Selective Router (SR) entity. (NOTE: In this document the term TSP is used to refer to a business that provides voice or data transmission services. These services are provided over a telecommunications network that transmits any combination of voice, video and/or data between users. A TSP could be, but is not limited to, a Local Exchange Carrier (LEC), a wireless telecommunications provider, a Commercial Mobile Radio Service provider, or a PBX service provider. The reader should not confuse this usage with the Telecommunications Service Priority (TSP) system.)

2.1.1.1 A1: Represents a dedicated E9-1-1 trunk group established as the sole connectivity between this network entity and the E9-1-1 SR. (NOTE: A separate trunk group is required for each unique NPA if CAMA-MF signaling is used.)

2.1.1.2 A2: Represents the application of multiple dedicated E9-1-1 trunk groups supporting connectivity between this network entity and one or more E9-1-1 SRs. This application may be used when the originating TSP switch serves a geography that covers multiple SR service areas. It may also be used when the E9-1-1 network for the served area includes paired or redundant SRs. Depending on the configuration of SR to PSAP connections (Ref Point B), this application may be used to support overflow or alternate routing scenarios, as well. (NOTE: A separate trunk group is required for each unique NPA if CAMA-MF signaling is used.)

2.1.1.3 B: SR to PSAP Connections

Network reference point B represents the network connections established between an E9-1-1 Selective Router (SR) entity and an E9-1-1 Public Safety Answering Point (PSAP).

2.1.1.3.1 B1: Represents a dedicated E9-1-1 trunk group established as the sole connectivity between this PSAP and any E9-1-1 SR.

2.1.1.3.2 B2: Represents the application of multiple dedicated E9-1-1 trunk groups supporting connectivity between this PSAP and multiple E9-1-1 SRs. This application may be used when the PSAP jurisdiction boundaries are within multiple SR service areas. It may also be used when the E9-1-1 network for this PSAP is designed with paired or redundant SRs. Depending on the configuration of TSP Switch to SR connections (Ref Point A), this application may be used to support overflow or alternate routing scenarios, as well.

2.1.1.4 C: Enterprise Private Branch Exchange/Multi Line Telephone System (PBX/MLTS) to Selective Router (SR) Connections

Network reference point C represents the network connections established between an Enterprise PBX or MLTS entity and an E9-1-1 Selective Router entity.

2.1.1.4.1 C1: Represents a dedicated E9-1-1 trunk group established as direct connectivity between this Enterprise PBX/MLTS entity and an E9-1-1 SR

2.1.1.4.2 C2: Represents connectivity between the Enterprises PBX/MLTS entity and the local TSP Switch entity for delivery of E9-1-1 calls. This connectivity may be dedicated as an E9-1-1 trunk group or shared depending on the technical capabilities of both the Enterprise PBX/MLTS entity and the TSP Switch entity.

2.2 Assumptions

2.2.1 E9-1-1 Selective Router

This document assumes the application of an E9-1-1 SR entity in delivery of E9-1-1 calls to a PSAP. It is acknowledged that some network architectures may use direct trunking between the originating switch and the PSAP. Although many of the concepts discussed in this document might apply to these types of situations, they are not directly addressed.

2.2.2 E9-1-1 Direct Trunking

This document assumes that dedicated direct 9-1-1 trunk groups are used between the originating switch and the E9-1-1 selective router. It is acknowledged that some network architectures may involve "intervening switches" in the call delivery path. These network elements are outside the scope of this version of this document.

2.2.3 Governmental Requirements

If local or state requirements conflict with the Standards or recommendations presented in this document, they should supersede these Standards or recommendations.

2.3 Traditional E9-1-1 Traffic Engineering

2.3.1 Call Congestion Management through Trunk Engineering

The primary method of call congestion management in E9-1-1 networks is through the specific engineering and control of trunk group sizes. To avoid potential overloading of a PSAP or the E9-1-1 network, emergency service trunk groups from TSP Switch entities are limited in size.

Successful traffic engineering for an E9-1-1 network requires a holistic view of the entire network. Cooperation and an open exchange of information between all involved network providers and PSAPs are required to facilitate a successful outcome. It is acknowledged that in some situations PSAP choice may force changes to trunk group sizing that will affect the overall grade of service in a given network.

2.3.2 Grade of Service Objectives

Specific grade of service requirements for an E9-1-1 network vary across the country. In some cases, state legislation dictates the level of service required for E9-1-1. In other areas, the required level of service is defined within specific service agreements between the public safety entity and the 9-1-1 service provider or the local exchange carrier.

In addition to legislative or contractual service level agreements, organizations responsible for E9-1-1 network engineering should consider consulting other industry references regarding overall E9-1-1 network reliability. As an example, the NENA Network Quality Assurance document or reports from the FCC Network Reliability Council could be consulted.

(Section 2.3.2 Grade of Service Objectives continued)
Carriers should use normal traffic engineering guidelines and practices to determine the number of trunks required to support E9-1-1 traffic from a defined geographic service area at the agreed to level of service. It is recommended that service providers engineer E9-1-1 trunk groups to provide a P.01 grade of service. This grade of service objective should be applied to all E9-1-1 trunk groups, including Reference Points A, B, & C. It is understood that typical E9-1-1 traffic can have large spikes in call volume. It is recommended that carriers engineer to the average busy hour of the average week during the busy season.
(NOTE: P.01 GOS is; the probability (P), expressed as a decimal fraction, of a telephone call being blocked. P.01 is the grade of service reflecting the probability that one call out of one hundred during the average busy hour will be blocked. P.01 is the minimum recommended Grade of Service for 9-1-1 trunk groups.)

2.3.3 Definition of Geographic Serving Area

E9-1-1 trunk groups should be engineered to support a defined geographic serving area. Traditionally, this serving area was synonymous with the serving area of the originating TSP switch. However, introduction of new telecommunications technologies and services, such as competitive local exchange carriers, MLTS, LNP, and wireless services, has created situations where the serving area of an originating TSP switch requires that multiple trunk groups be provisioned to properly support E9-1-1 services.

The specific geographic serving area definition should be determined cooperatively between the originating switch provider, the E9-1-1 service provider, and the public safety entities. Each type of originating switch provider has unique factors that will impact this definition. Consideration should be given to the service area coverage, potential call blocking scenarios, and the number of PSAPs involved in the service area. Generally speaking, the geographic serving area should be defined in such a way that a single trunk group from an originating switch can be translated for default routing to an appropriate PSAP.

2.3.4 Determining Initial Trunk Group Size

When a new E9-1-1 trunk group is established, it should be engineered to support the current or anticipated E9-1-1 call traffic with consideration given to forecasted growth over the next 12 months. Determination of the actual or forecasted E9-1-1 call traffic statistics is the responsibility of the originating switch provider. Call traffic statistics may have to be estimated by the originating switch provider. Acceptable methods include, but are not limited to, estimates based upon the number of subscribers, number of network access lines, or by comparison to similar areas or environments where E9-1-1 service is already implemented. It is also appropriate to use locally accepted practices where they exist.

It is recommended that E9-1-1 trunk groups have a minimum of two (2) trunks in every trunk group.

2.3.5 Performance Monitoring

It is the responsibility of each TSP Switch provider and the E9-1-1 SR providers to monitor call traffic conditions on their E9-1-1 trunk groups to assure service levels are in compliance with the agreed to grade of service levels. It is recommended that monthly traffic studies be performed after initial implementation of an E9-1-1 trunk group and that they be continued until call traffic has stabilized. Adjustments to trunk group sizes should be effected based on the outcome of the periodic traffic studies. Major changes or events in the network may suggest that additional or ad hoc studies be performed. When network changes are made due to increased E9-1-1call traffic, the specific results of the traffic studies should be shared with the E9-1-1 SR provider for use in monitoring the overall E9-1-1 network.

3 References

N/A