Private Switch 9-1-1 Overview

This document contains useful information in the event a full PS911 implementation is desired, whether it is done proactively as a PBX service "enhancement", to satisfy an applicable 9-1-1 mandate under state law, or to mitigate 9-1-1 call processing issues discovered by dialing test 9-1-1 calls.

1.0 Generic Requirements for Private Switch 9-1-1 Service

The Basic Assumptions applicable to the PS911 service configurations described in this document are:

- The local community has enhanced 9-1-1 service (E9-1-1)
- The E9-1-1 system includes Automatic Number Identification (ANI), Automatic Location Identification (ALI), and Selective Routing (SR) features
- The E9-1-1 system utilizes a centralized ALI database management system.
- Every station line associated with the PBX has the ability to dial 9-1-1 or 9-9-1-1. It is incumbent on the owner-operator of a PBX to test the ability to dial 9-1-1 and assess the need for the PS911 service enhancement. Please refer to Section 7.0 of this document for recommended procedures for conducting test 9-1-1 calls from PBX station lines.
- The PS911 service enhancement is mandatory for PBX switches that provide telephone service to residential end users (*ref. Texas Health and Safety Code Section 772*), but is strongly recommended by Tarrant County 9-1-1 as an optional upgrade to all PBX switches equipped with digital trunks (PRI-ISDN).

2.0 Private Switch 9-1-1 Call Processing in the PBX

The processing of a 9-1-1 call that originates from a PBX station line begins with the PBX's recognition of the dialed digits (i.e. 9-9-1-1 and 9-1-1) as an emergency call. The subsequent processing steps critical to a successful PS911 service are:

- Recognition of station lines that are assigned full 10-digit, NANP-valid DID numbers and station lines that are "intercom-only" stations or non-assigned stations (e.g. "outdial" lines and "rollover" lines).
- Programming in the PBX must ensure that station lines that are not assigned full 10-digit numbers are associated with an active 10-digit, NANP-valid number that will be transmitted as CLID or CPN when a 9-1-1 call is made from a non-DID station line.
- Programming in the PBX must route 9-1-1 calls to the switch ports associated with the PRI outdial trunks or the dedicated 9-1-1 trunks, depending on the chosen PS911 trunk configuration.
- When using the PRI trunk configuration, the PBX must transmit specific CLID or CPN in the call setup message.

- When using the dedicated CAMA-type trunk configuration, the PBX must transmit 8-digit ANI following the CAMA signaling protocol described in Section 6.1 of this document.

When using the dedicated CAMA-type trunk configuration, the PBX must also be programmed to route 9-1-1 calls over regular PBX trunks should the dedicated CAMA-type trunks be unavailable due to "out of service" or "traffic-busy" conditions. (Note that calls not routed over dedicated CAMA-type trunks will not deliver the PS911 enhancements.)

3.0 PS911 Call Processing in the 9-1-1 Selective Router

The processing of 9-1-1 calls by the 9-1-1 Selective Router should be the same regardless of whether the call was delivered to the 9-1-1 Selective Router via message trunks serving a Central Office Switch or via dedicated CAMA-type trunks that connect a PBX directly to the 9-1-1 Selective Router.

The call processing steps are:

- Programming is written in the 9-1-1 Selective Router for each incoming trunk group. This programming includes assigning a single numbering plan digit (NPD) that is used to identify the area code that goes with to the 7-digit number in the ANI transmitted by the PBX to construct a full 10-digit number.
- The 9-1-1 Selective Router uses the NPD + 7-digit ANI to search the selective routing database for the code to use in routing the call to the appropriate 9-1-1 trunk group that serves the appropriate 9-1-1 answering point.
- The Selective Router transmits the full 10-digit number to the 9-1-1 answering points in the Tarrant County 9-1-1 District.
- A default routing code is assigned to each incoming 9-1-1 trunk group to enable the 9-1-1 Selective Router to complete calls in the event of ANI failures. When using the dedicated CAMA-type trunk configuration, the default routing code ensures calls are routed to the 9-1-1 answering point that serves the location of the PBX.
- All call control features of the Selective Router, such as Fixed Transfer, Selective Transfer, Manual Transfer, Alternate Routing, Speed Dial, Forced Disconnect, etc. work the same on 9-1-1 calls from PS911 sites as other 9-1-1 calls.

4.0 PS911 Database Requirements

In addition to successfully delivering 10-digit ANI to the 9-1-1 answering point, the PS911 service enhancement requires the creation and maintenance of database records in the designated 9-1-1 database management system. Each and every telephone number that may be transmitted as ANI from a PBX site must be uploaded to the 9-1-1 database management system in accordance with the NENA Recommended Standard 02-010 or a locally approved alternative. Tarrant County 9-1-1 has designated Southwestern Bell Telephone as the 9-1-1 database management system provider. Detailed methods and procedures for PS911 database maintenance will be provided upon execution of a PS911 Service Agreement with Tarrant County 9-1-1.

4.1 Other Database Considerations

Some PBX environments present more complex challenges. The PS911 service may not be able to accommodate off-premises station lines, for instance, if the lines are terminated at locations outside the geographic area served by the 9-1-1 selective router. In very large PBX system configurations, there may be multiple PBX switches and/or remote modules that are networked to serve multiple locations with a common numbering plan using DID numbers out of the same NPA/NXX. **These unique situations must be dealt with on a case-by-case basis with the participation of the PBX vendor, the dial-tone provider, the 9-1-1 network and database provider(s), Tarrant County 9-1-1, and sometimes other 9-1-1 agencies if overlaps with other jurisdictions are involved.**

5.0 Implementing PS911 for PBX Switches Using PRI-ISDN Trunks

A PBX equipped with PRI-ISDN trunks may, or may not, normally deliver station level ANI to a 9-1-1 answering point when the originating station line dials 9-9-1-1 or 9-1-1. Tarrant County 9-1-1 has specified in contracts executed with local exchange telephone service providers that the billing telephone number (BTN) be transmitted as the 9-1-1 ANI whenever the serving central office of the PRI trunks routes a call to the 9-1-1 Selective Router via the dedicated 9-1-1 trunks serving that central office if the PBX customer has not implemented a PS911 service enhancement through the 9-1-1 District. Thus, the 9-1-1 Selective Router uses the BTN to query the selective routing database for the routing code that identifies the 9-1-1 answering point that will receive the call. The CPE at the 9-1-1 answering point then uses the BTN to retrieve the ALI record associated with the BTN from the 9-1-1 database. This record contains the name and main address of the PBX owner/operator. Note that this is the desired 9-1-1 call processing for any PBX that has not implemented a PS911 enhancement.

It must be noted, however, that certain programming in the PBX and/or in the serving central office that provides the PRI trunks can adversely affect the processing of a 9-1-1 call. In cases where a PBX is programmed to send calling line identification (CLID or CPN) on outgoing calls to enable outgoing caller identification, there is a possibility that the CLID or CPN would be transmitted as the ANI on a 9-1-1 call. Whenever this occurs, the SR tandem may not route the call to the correct 9-1-1 answering point, and the ALI display will read “No Record Found” when the call is answered by the 9-1-1 dispatcher. These are the end results if ALI records have not been uploaded to the 9-1-1 database management system for every number the PBX might transmit as CLID or CPN.

THE NEED TO TEST THE ABILITY TO PLACE 9-1-1 CALLS FROM EVERY PBX THAT USES PRI-ISDN TRUNKS CANNOT BE OVER EMPHASIZED.

5.1 Considerations for Successfully Transmitting Calling Station Number Identification on 9-1-1 Calls From PBXs With PRI Trunks

The Generic Requirements PS911 Service in Section 1.0 of this document apply to all trunking alternatives, including the PRI alternative. Careful attention must be paid to configuring PRI trunks to successfully transmit CLID or CPN to a serving central office, and have the CLID or CPN transmitted as 9-1-1 ANI when the serving central office routes the emergency call to the 9-1-1 Selective Router.

There are several issues to consider when seeking to utilize PRI in lieu of dedicated CAMA-type circuits to implement PS911. The following questions should be answered when evaluating whether or not PRI is an option or best practice.

- The PBX owner must consider the type of lines providing service within the PBX. Does the PBX have non-Direct Inward Dial (non-DID) lines behind the PBX? If the answer is "yes", then the PBX owner must take the necessary steps to either map the non-DIDs to specific DIDs for ANI on a 9-1-1 call or convert the non-DID lines to DIDs. If the PBX does not have the mapping capability then an adjunct station translation box may be acquired and added to the PBX to ensure the correct DID is passed.

  Example: Non-DID numbers cannot form an outgoing number like DID numbers from a PBX. It is not valid to make a 7-digit number by prefixing the DN with the NXX. For example: A PBX has an NXX of 972 and a DID range of 1000-1999. An extension within this DID range, e.g. 1010, will form a calling number of 972-1010 which is valid and unique. However a non-DID telephone e.g. DN 2500, would form a calling number of 972-2500. Because this is outside the DID range of 1000-1999, this number will most likely misroute because it could be allocated to a different subscriber or not be in the system at all. Thus special arrangements need to be made for non-DID telephones within the PBX

5.2 PRI Signaling Protocols

Because there are various ways to pass information between a PBX and the serving central office on a PRI, it is essential to achieving proper switch translations that the telephone company identify what Protocol is used by the PBX. The specific protocol must be communicated to the dial-tone provider in order to obtain proper translations at the end office switch.

- It is becoming a common practice for a PBX to transmit station level ANI over PRI trunks to support the delivery of Caller Line Identification (CLID) on regular calls. It is important to understand how this feature could have an adverse impact on 9-1-1 calls. If the serving central office does not support separate translations for CLID on non-emergency calls and CLID on 9-1-1 calls, there is a degradation of the 9-1-1 system if an ALI record for the station level ANI has not been pre-loaded into the 9-1-1 database. Precisely how the serving central office switch handles CLID on

Resources

All questions regarding the testing of 9-1-1 calls from sites located within the following list of communities should be referred to Richard Atkins, ENP, Assistant Director, Tarrant County 9-1-1 District at 817-820-1182 or ric@tc911.org.

1. City of Arlington
2. City of Azle
3. City of Bedford
4. City of Benbrook
5. City of Blue Mound
6. City of Burleson
7. City of Colleyville
8. City of Crowley
9. D/FW Airport
10. City of Dalworthington Gardens
11. City of Edgecliff Village
12. City of Euless
13. City of Everman
14. City of Forest Hill
15. City of Fort Worth
16. City of Grand Prairie
17. City of Grapevine
18. City of Haltom City
19. City of Haslet
20. City of Hurst
21. City of Irving
22. Joint Naval Air Station (JNAS)
23. City of Keller
24. City of Kennedale
25. City of Lake Worth
26. City of Lakeside
27. City of Mansfield
28. City of North Richland Hills
29. City of Pantego
30. City of Pelican Bay
31. City of Richland Hills
32. City of River Oaks
33. City of Saginaw
34. City of Sansom Park
35. City of Southlake
36. City of Watauga
37. City of Westlake
38. City of Westover Hills
39. City of Westworth Village
40. City of White Settlement
41. Unincorporated Tarrant County

Note: All portions of the cities listed above are included, even when a portion of a city overlaps into an adjacent county.