



Power 911 Intelligent Workstation

Nortel Networks Meridian 1 PBX Telephony

March 2004

POSITRON PUBLIC SAFETY SYSTEMS

Introduction

This document describes the functionality and architecture of a PSAP system using a Nortel Networks **Meridian 1 PBX** for Telephony, under control of a Positron Public Safety Systems **Power 911 Intelligent Workstation**.

Please note that due to product evolution, enclosed specifications are subject to change.

Highlights

Positron's Meridian 1 based IWS 9-1-1 system is by far the most advanced and reliable, providing all of the following:

Full complement of NENA Recommended Interfaces

The Positron approach includes a Life Line 100 E9-1-1 ANI/ALI Controller, which provides the **standard interfaces** mandated by NENA.

CAMA and ISDN-BRI 9-1-1 Support

The system's Life Line 100 E9-1-1 ANI/ALI Controller supports **CAMA 9-1-1** and/or optionally **ISDN-BRI 9-1-1**.

Intelligent Workstation with First-Party CTI Call Control of an M1 PBX

Positron's Power 911 Intelligent Workstation provides on-screen control of M1 call handling in an E9-1-1 environment.

The First-Party call control (call control interface at each position) ensures that there is **no single point of failure** that would negatively impact call control at more than one position.

Optional Backup Mechanism in case of M1 PBX Failure

Positron is the only vendor offering an optional backup mechanism that **allows 9-1-1 calls to be answered in the event of failure of the M1 PBX**. The Life Line 100 controller can, upon PBX failure, automatically re-route the 9-1-1 Trunks to a system of backup phones. Without the backup mechanism, the PBX effectively becomes a system-wide single point of failure.

Highlights (continued)

All 9-1-1 functions provided by equipment manufactured solely for the 9-1-1 environment, by a manufacturer dedicated exclusively to Public Safety

This ensures **timely development of new features** as mandated by ever changing 9-1-1 requirements. Recent examples are the deployment of Enhanced MF (10/20 Digit ANI) and Phase II FCC.

The alternate approach of having 9-1-1 functionality reside on a PBX has the disadvantage of relying on the PBX manufacturer for timely development of any specific features needed to support the ever-changing requirements of 9-1-1 (as the 9-1-1 market is a small segment for their PBX product, their responsiveness to the needs of the 9-1-1 community is not assured).

Advanced intelligent handling of intra-PSAP transfers

Power 911 allows a call to be **transferred any number of times** from one position to another within the PSAP, all the while **with full accompanying ANI/ALI and TTY data**.

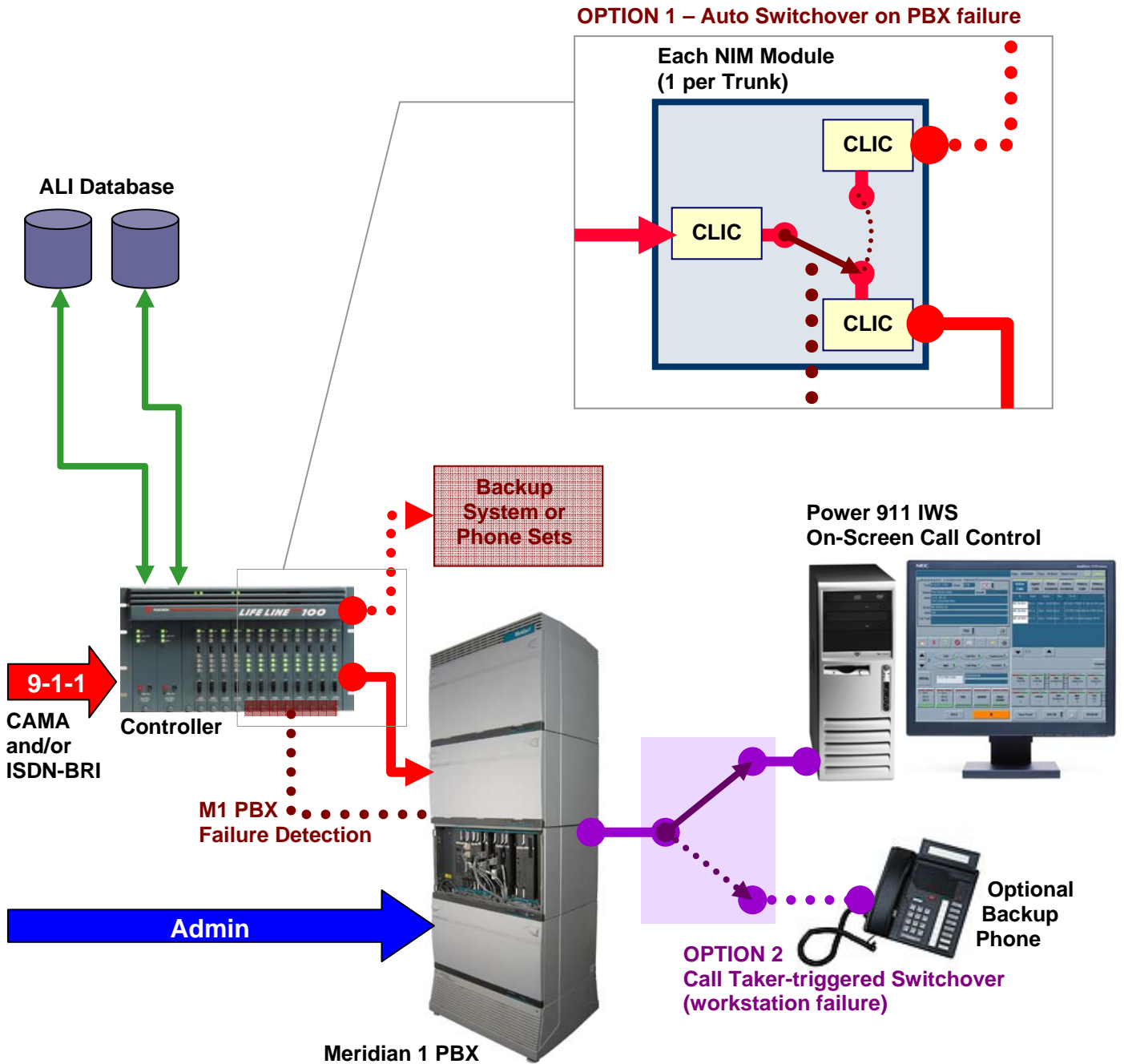
Some systems are weak in this regard, relying solely on information provided by a CTI server, with the consequence that only the first intra-PSAP transfer allows ANI/ALI data to be displayed. This is a problem if the first transfer was erroneously sent to the wrong place: When transferring the call a second time (to the correct recipient), ANI/ALI may not be displayed.

Value added to standard Meridian features

Positron's Power 911 doesn't just provide access to Meridian Features, Power 911 also **greatly enhances the functionality** they provide.

Examples (detailed within this document) include: Abandoned Call Tracking, even before, during and after RAN (Recorded Announcement), Join and Listen selection via a list of agent names and Auto logout from the ACD Queue when the headset is unplugged.

Power 911 w/ Meridian PBX System Architecture



Call Flow Overview

- E9-1-1 Trunks (**CAMA** and/or **ISDN-BRI**) carry calls from the tandem to the Life Line 100 ANI/ALI Controller, which then feeds the lines to the M1 PBX.
- Administrative lines (7-Digit Emergency, Ringdowns, etc.) are fed directly to the M1 PBX.
- The M1 PBX makes calls available to the answering positions via the PBX's Automatic Call Distribution (**ACD**) mechanism and/or the PBX's common line appearances (i.e. **bridged appearance**).
- **First-Party Call Control** - Each Power 911 Intelligent Workstation is equipped with its own independent telephony interface, providing on-screen call control with no single point of failure.

Call Flow Scenario

The following describes a typical call flow scenario:

1. A Caller dials 9-1-1 and is routed via the Tandem to one of the E9-1-1 Trunks.
2. The Positron Life Line 100 ANI/ALI Controller's NIM Module associated with the particular trunk (each trunk has its own dedicated NIM – Network Interface Module) detects the call, decodes the ANI, and immediately triggers an ALI database lookup.
3. ALI is requested simultaneously over redundant links to the ALI Database pair. The Life Line will use whichever ALI comes back first.
4. While the ALI lookup process is occurring, the Life Line controller is also passing the call through to the M1 PBX. The call is routed from the NIM to the M1 PBX where it enters an ACD (Automatic Call Distribution) queue.
5. The ACD function routes the 9-1-1 call to an appropriate logged-in calltaker.
6. When the calltaker answers the call, the Life Line 100 controller immediately sends the associated ALI to the calltaker's position. Since the Life Line 100 performs ALI lookup as soon as ANI is decoded (i.e. does not wait for a calltaker to answer), and holds it in a buffer until needed, ALI will often be immediately available to the calltaker upon call pickup.
7. The calltaker can transfer the call as appropriate (either back out over the Tandem, to an external party via the PBX, or to an internal party via the PBX).
8. 9-1-1 Calls that are not transferred can be released.
9. Calls received over administrative lines enter the M1 PBX directly, and are accessible at the answering positions as presented by the PBX.

Life Line 100 E9-1-1 ANI/ALI Controller

The Life Line 100 E9-1-1 ANI/ALI Controller is designed to meet the strict demands of E9-1-1. It supports **MF**, **Enhanced MF** and **ISDN-BRI**, as well as **FCC Phase I and II** wireless requirements.

The Life Line exceeds industry reliability standards and provides exceptional functionality.

Performance

The non-blocking design of the Life Line 100 ensures that all calls are processed simultaneously, eliminating any potential bottleneck situations.

Each trunk interface contains a dedicated MF receiver, allowing the Life Line 100 to decode the ANI of multiple calls faster. ALI is requested immediately after ANI is decoded, and often available prior to the call being answered.

The Life Line 100 controller provides:

- Direct Interface to E9-1-1 Trunks.
- ANI Decoding (MF and Enhanced MF).
- ALI Lookup
- NENA mandated standard interfaces
- Redundancy for 9-1-1 related functions
- Optionally: Fallback Mechanism to Backup Phone System



- **AC/DC** provides power
- Fully redundant


- **SIO** runs 12 display ports
- Each port is independent
- Fully redundant

- **COM** provides all inter-module communications via dedicated processor
- Communication to external devices (ALI,)
- Fully redundant
- Performs ALI dip as soon as ANI is received, typically before call is answered

- **NIMs** perform call processing, central office interface and telephone functions
- Every NIM functions independently of the COM module, or other NIM's on the shelf (including reception and decoding of MF tones)

Benefits of a Controller-based design

Positron's controller-based approach to Meridian integration provides significant advantages to public safety users. Specifically, there are four key issues which are best addressed with the use of an E9-1-1 ANI/ALI Controller when building on a Meridian 1 PBX. These are summarized in the following table...

Key Issue	 POSITRON M1 with Controller	OTHER VENDORS M1 without Controller
9-1-1 functions performed by dedicated mission-critical hardware	9-1-1 functions performed by equipment designed specifically for mission-critical 9-1-1	9-1-1 functions resides within non-mission critical hardware designed for business use
Backup Mechanism in case of Meridian Failure	Built-in Backup Mechanism in case of Meridian Failure. The PSAP can still answer 9-1-1 calls	No Backup mechanism. Operationally, a PSAP-wide Single Point of Failure
Equipment designed and manufactured specifically for 9-1-1	Rely on a manufacturer devoted to Public Safety and its 9-1-1 related issues (Enhanced MF, Wireless, No Single Point of Failure)	Dependence on a PBX manufacturer for whom Public Safety is a small share of their market
Timely Software Releases driven by your 9-1-1 needs	Positron Releases are driven solely by the needs of the 9-1-1 community and its end-users	PBX vendor releases are not driven by 9-1-1

Nortel Networks Meridian 1 PBX

The Nortel Networks Meridian 1 PBX is used for Telephony, and provides:

- Interface to E9-1-1 Trunks (via Life Line 100).
- Direct Interface to 7 Digit Emergency Lines.
- Direct Interface to Administrative Lines.
- Direct Interface to Ringdown Lines.
- ACD Queuing.



First-Party Call Control Interface

A digital line from the PBX which would normally have terminated on a phone set (i.e. such as a Meridian 2216) instead connects to a terminal adapter at the answering position. This “Power 911 Meridian Interface” emulates the Meridian phone set and connects to the Power 911 Intelligent Workstation computer via an RS232C connection, giving Power 911 the ability to both control the “virtual” Meridian phone, and display on-screen information that a physical set would have displayed via its LCD indicators. It also provides a voice path.

Compatible with Symposium

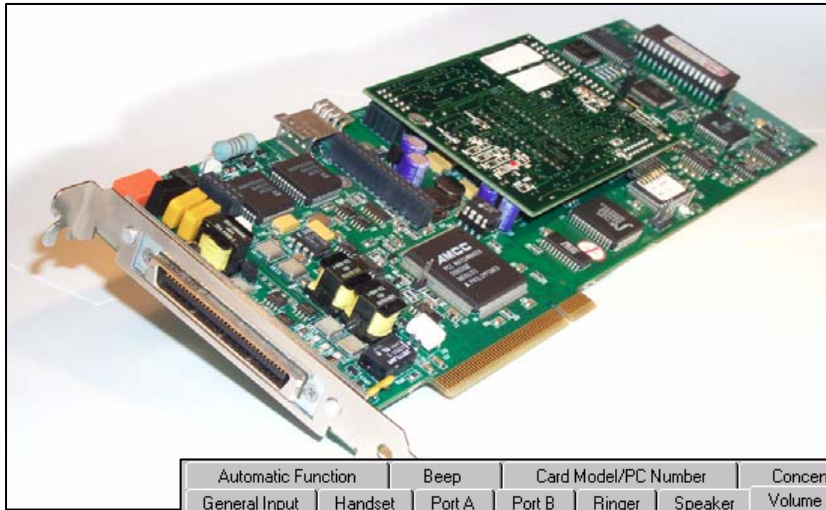
Symposium Call Center Server (SCCS) is a PC-based PBX component operating on a separate server and connected to the M1 via private LAN. Symposium provides, among other things, additional call flow management and reporting capabilities such as skills-based routing and MIS reporting based on skill sets.

Power 911 does not require Symposium, but is compatible with its use. Multiple Queue Assignments controlled by Symposium provide for faster agent logon and simpler agent logon configuration. Configuring a call routing fallback scenario into the M1 (via Default ACD DN per CDN port, and ACD key with default ACD DN) allows the system to remain operational in the event of Symposium server failure.

IAP/PC Card

The IAP/PC card is a PCI-bus card which resides in each workstation computer. It's on-board DSP (Digital Signal Processor) provides TTY signal processing, audio recording, as well as integration to Radio audio via its Balanced and Adjustable High Quality Audio Interface.

IAP/PC Card



Automatic Function	Beep	Card Model/PC Number	Concentrator	Dialer
General Input	Handset	Port A	Port B	Ringer
Speaker	Volume	System Information		
Receive handset [Slider] 13	Radio receive [Slider] 10	Recorder [Slider] 10		
Agent transmit handset [Slider] 20	Radio transmit [Slider] 10	Speaker [Slider] 20		
Trainer transmit handset [Slider] 20	Load Default Apply Now Save	Ringer [Slider] 50		
Status: None				

Comprehensive Backup Options

Option 1

Backup Mechanism in case of M1 PBX Failure

Positron's design philosophy has always been to ensure reliability via redundancy and distributed processing, with the goal of **No Single Point of Failure** in mind. Given this orientation, we felt that PBX-based 9-1-1 systems should be afforded the same level of fault tolerance. We therefore engineered a solution that provides for a fallback should the PBX fail.

The backup option equips each of the Life Line 100's NIMs (Network Interface Modules) with 3 "CLIC" line interfaces (instead of the standard 2). In the event of loss of the PBX, the Life Line 100 can automatically (or under PSAP control) switch all 9-1-1 trunks to the corresponding third CLICs which in turn are connected to plain old telephones, multi-line phones or a telephone system. **Regardless of failures in the PBX, 9-1-1 calls can still be answered.**

The backup mechanism is **intelligent**. When switching to backup mode, both idle trunks and trunks with calls in progress are routed to the backup phone system. When switching back to normal operation, **idle** trunks are **immediately** switched back to the PBX, while any **calls in progress** on the backup phone system **remain on that system until the call is released.**

Option 2

Backup Mechanism in case of Workstation Failure

Positron's Power 911 Intelligent Workstation provides First-Party CTI call control whereby each position has its own independent CTI Computer Telephony Interface to the M1 PBX. This ensures no single point of failure for call control - other designs that depend on a central CTI Server risk PSAP-wide loss of call control should that server (or the LAN) fail.

While Power 911 does not require a physical phone set at the answering position (call handling is performed on-screen), an optional switch allows a call taker to switch a position to a physical backup phone set – this provides for continued call handling should a workstation or monitor problem occur.

Advanced Telephony Features

Power 911 supports the following telephony line types and features...

Supported Line Types

- 9-1-1 CAMA trunks.
- ISDN-BRI 9-1-1 (optional)
- Administrative lines (POTS, BRI, PRI) with or without Caller ID
- Virtual ringdown lines (regular loop-start lines where CO assures ring signaling)

Telephony Features

Feature	Power 911
Answer	✓
Release	✓
Dial	✓
Re-Dial	✓
Conference (Same Line and No-Hold)	✓
Transfer (Supervised Transfer and Blind Transfer)	✓
Hold	✓
Private Park / Unpark	✓
Call Forward	✓
Mute	✓
Automatic agent Logon / Logoff (headset detection)	✓
Not Ready	✓
Make Set Busy	✓
ACD (Forced Connect and Non-forced Connect)	✓
Supervisory Listen and Join	✓
Shared lines with barge-in capability via M1 Privacy override	✓
Display ACD Queue Statistics	✓
Replicate LCD Display	✓
Lines pool on outgoing lines (via prefix dialing)	✓

Comprehensive Abandoned Call Handling

Power 911 provides complete treatment of abandoned calls in a Meridian ACD environment. Abandoned calls are handled appropriately regardless of when they were abandoned, even throughout the various phases of RAN (Recorded Announcement).

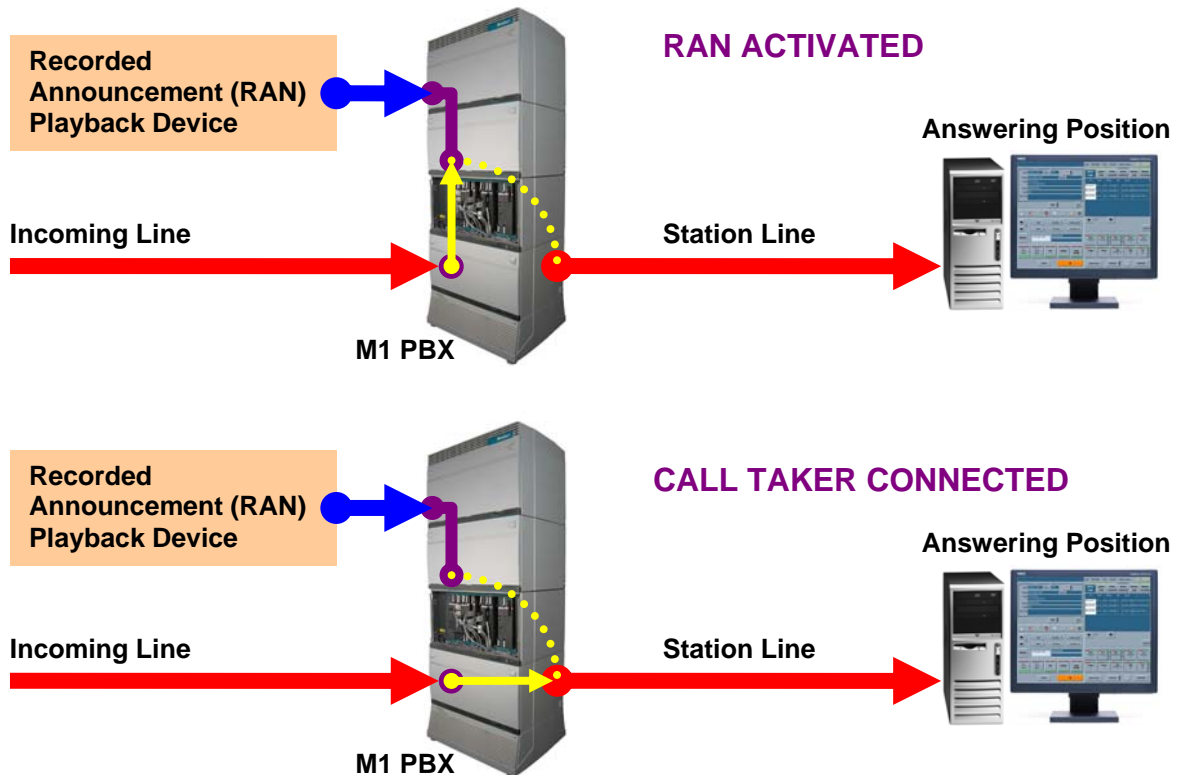
What is RAN? - RAN is the mechanism which allows the Meridian to trigger a Recorded Announcement for playback to a caller in an ACD queue.

When the call first rings into the Meridian M1 ACD PBX, the M1 recognizes the call, connects the call to the RAN device, and triggers the playback of the Recorded Announcement. RAN is deactivated when the caller is connected to a calltaker.

Power 911 correctly handles Abandoned Calls regardless of which stage in the above process the call is abandoned in:

- **Before RAN** - i.e. the Meridian did not have sufficient time to activate the Recorded Announcement.
- **During RAN** - i.e. while the caller is listening to the Recorded Announcement.
- **After RAN** - i.e. the Recorded Announcement is no longer active.
- **After Calltaker has answered.**

Meridian 1 RAN Architecture



Proper handling of ALI when transferring calls to another position

Positron's Power 911 ensures that ALI data is properly handed off to other positions to which a 9-1-1 call is transferred.

In the diagram on the following page, Calltaker A initially answers the 9-1-1 call. Calltaker A's screen displays the caller's ALI. Calltaker A then transfers the call to Calltaker B via the Meridian. Calltaker B's screen will then show that caller's ALI. Calltaker B transfers the call to Calltaker N. Calltaker N's screen will then show that caller's ALI. This can go on indefinitely for any number of intra-PSAP transfers.

Power 911 intelligently tracks where the ALI data should appear, regardless of how many times the call has been transferred within the PSAP.

Some solutions only allow ALI data to follow along on the FIRST transfer to another position (due to a CTI Server limitation). This can be a problem even if the PSAP does not normally perform more than one internal transfer, since if that first transfer is accidentally sent to the wrong party, the re-transfer to the correct party will not allow ALI to be displayed. Again, Positron's Power 911 places no limit on such transfers, ALI will always follow with the call.

Advanced handling of TTY when transferring Baudot TTY calls to another position

Positron's Power 911 ensures that TTY data is properly handed off to other positions to which a 9-1-1 call is transferred.

When a TTY call comes in, the conversation between the caller and the first calltaker is displayed on-screen in the TTY module. For Baudot TTY calls (i.e. the majority of TTY calls), the TTY caller can be transferred to another calltaker.

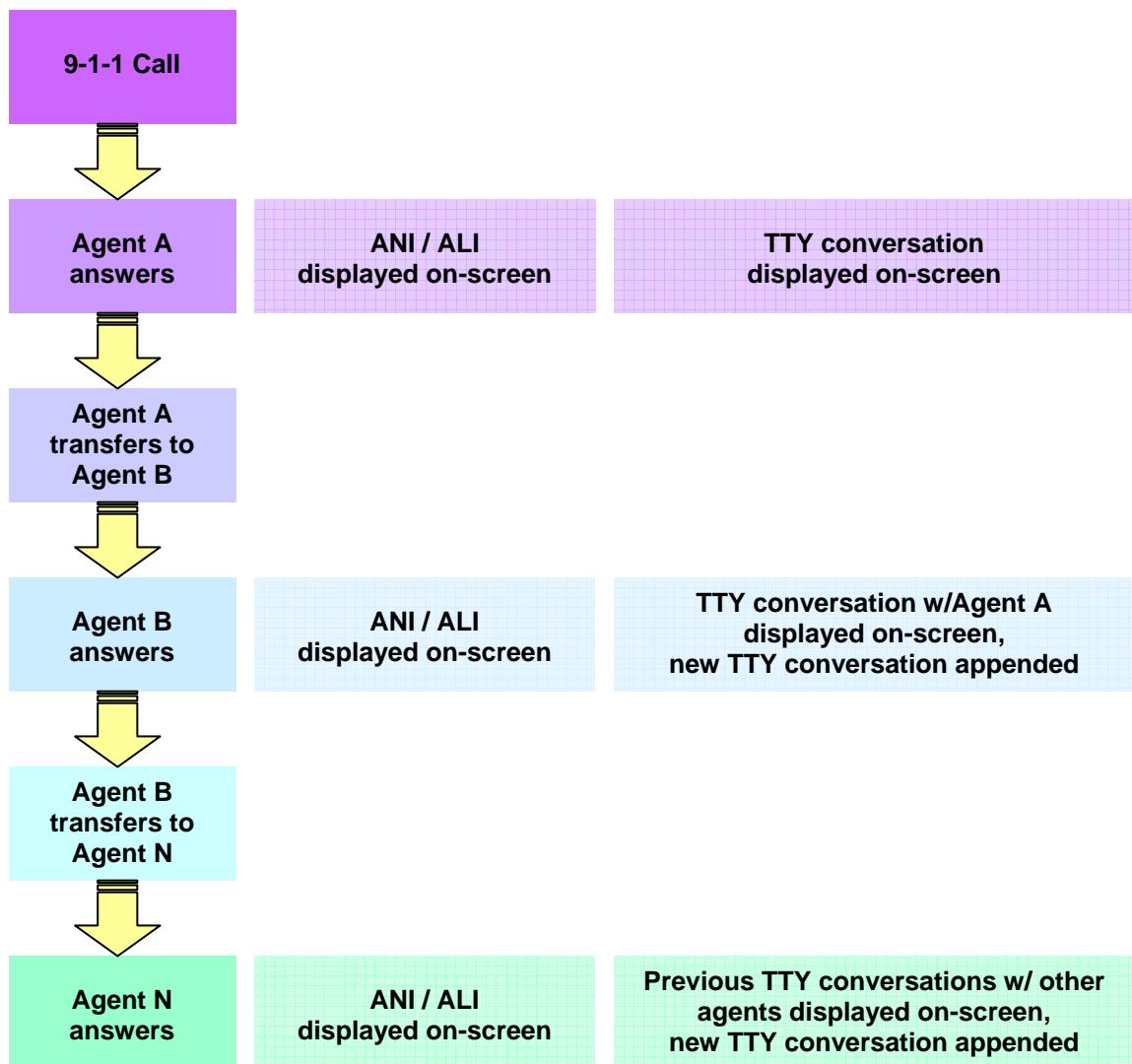
This is where the advanced handling comes in: The second calltaker is automatically placed in TTY mode, and both sides of the entire TTY conversation (from the first calltaker) automatically show up in the second calltaker's TTY module. Further TTY conversation is appended to the initial TTY text. The second calltaker can even transfer the TTY to a third position, and a fourth, and so on, and the TTY conversation will follow along, and be updated accordingly. The entire TTY conversation is also permanently stored within the system for future review.

The above is summarized in the diagram on the following page.

Call and Data flow between positions as a call is transferred within the PSAP

The following diagram summarizes the two sections on the previous page...

Call and Data Flow between positions within the PSAP



Advanced handling of call source when transferring calls to another position

Positron's Power 911 ensures that a call's source is properly tracked as it is transferred to other positions. Power 911 therefore allows any calltaker (initial or subsequent) to **select a transfer destination button, without having to worry about how the transfer should take place.**

The agent can therefore click on the transfer button for, say Fire Station A, and Power 911 will decide how to transfer the call: A 9-1-1 call will be transferred via the tandem to Fire Station A. A call from an administrative line will be transferred via the PBX to Fire Station A. The key benefit to calltakers is that they only have to press that one single destination button labeled "Fire Station A", regardless of the type of line involved. Power 911 automatically takes care of the details of how different line types are handled.

Other systems which rely on a CTI server interface to determine where the call is from have an inherent limitation, in that any subsequent calltaker to which the call is transferred may only see that the call is from "extension" #####, instead of where the call is truly from.

Multiple Tandem Support

Power 911 implements an intelligent call routing feature which provides support for large PSAPs which are served by more than one Central Office. This feature allows Power 911 to select appropriate lines in order to minimize the number of long distance calls. This can result in a substantial reduction in operational costs. In addition, multiple area-code splits can be handled transparently to the user.

Synchronization of Meridian PBX to NetClock

Power 911 provides the ability to synchronizing the Meridian PBX to a NetClock time source. This ensures all components within the system are synchronized to a known and accurate time base.

Enhancing Standard Meridian Features

Positron's Power 911 Intelligent Workstation doesn't just provide access to standard Meridian Features, Power 911 also greatly enhances the functionality provided.

Join and Listen Features

Two standard features of the Meridian PBX are the ability to listen in on a particular agent's conversation (i.e. "Listen"), and to actively participate in that conversation (i.e. "Join"). Normally, the Meridian requires that you know the position number that is handling the call you want to join or listen in on.

Power 911 adds significant value to these features by providing a list (Group Agents List, shown below) which displays all agents logged on to Power 911. In addition to indicating each agent's status as follows...

Status (ACD Column)	Comments
READY	Agent ready to receive all types of calls (ACD and Non-ACD)
NOT-READY	Agent is ready to receive all call types EXCEPT ACD
OFF	Agent will not receive any calls

... the list also allows any agent to be selected by name (these are displayed in the list) for the purposes of listening in or joining the conversation. Simply double-clicking the "Listen" or "Join" field next to the agent's name will toggle the features ON or OFF.

Group Agents List

Active Calls	Group Agents				
Agent	Position	ACD	Listen	Join	
user1	CE-01	NOT-READY	OFF	OFF	
user2	CE-02	READY	ON	OFF	
user3	FD-03	READY	OFF	OFF	
CCSF_POS5	SUP-05	READY	OFF	OFF	
CCSF_POS4	DEP-04	NOT-READY	OFF	OFF	

Enhancing Standard Meridian Features (continued)

DCW (Display Queue)

Normally, the Meridian PBX requires that you enter the Queue number, and then press the DCW button to display the status of that ACD Queue in the 2-line LCD display of the phone set.

Power 911 can assign on-screen feature buttons that will provide single-button display of Queue statistics. The information is displayed on-screen within the Telephony Module.

For a given Queue, the following will be displayed:

- Number of calls waiting to be answered.
- Number of agents logged into the ACD Queue.
- Time that the first incoming call has waited to be answered.
- Number of calls that have overflowed into other queues.

Auto Handset ACD Login/Logout

Power 911 provides automated ACD Login and Logout depending on whether the agent's headset (or handset) is plugged-in or not:

- Logging onto Power 911 will automatically log the agent onto the ACD Queue if the headset is plugged-in. If the headset is not plugged-in, the agent is not automatically logged-on (to ACD), and a "Headset disconnected" message is displayed on-screen.
- While using Power 911, if the agent unplugs the headset, he or she will automatically be logged-off the ACD Queue. A "Headset disconnected" message will also be displayed.
- If the agent unplugs the headset while on a call, a "Headset disconnected with active calls" message is displayed, but the agent will only be logged off the ACD Queue after release of the call.

Single / Multiple ACD Queues

Power 911 supports the Meridian MQA (Multiple Queue Assignment) feature if present.

Enhancing Standard Meridian Features (continued)

Extended Wrap-up Time

Power 911 can optionally extend the wrap-up time after a call well beyond the Meridian's maximum available setting of 30 seconds. Power 911's Programmable Automatic Not-Ready can be set to place the agent in the "Not-Ready" state automatically at the end of each call. When the agent is ready, he or she can press the "Not-Ready" feature button to toggle it off, allowing further ACD calls to ring at that agent's workstation.

Support of multiple user profiles

(Login ID driven environment) Large PSAPs require support for cross-functional roles within the same application (Fire, Police, EMS). Power 911 has a feature which allows an agent to log on with different usernames, password's and Roles (Fire, Police ...). Based on these parameters, the system configuration and environment can change as required.

An agent can switch roles in seconds, for example to change from a call-taking screen and associated system configuration to a Dispatcher screen and its associated system configuration.

Getting More Information

To find out how Power 911 can give you the Power to Respond, please contact:

- your Regional Sales Manager (www.positron911.com/corporate/contact)
- email info@positron911.com
- call 800-443-3313

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