ENABLING EMERGENCY COMMUNICATIONS INDOORS

The Importance of High Reliability, Fault-Tolerant, In-Building Wireless Public Safety Commuications Systems

CANADA HQ
8618 COMMERCE COURT
BURNABY BC, V5A 4N6
CANADA

UNITED STATES HQ
1400 112TH AVE SE, STE 100
BELLEVUE, WA 98004
USA

UNITED KINGDOM HQ
40 CAVERSHAM ROAD
READING, BERKSHIRE RG1 7EB
UK

CONTACT
+1 (833) 502-2144
INFO@AVARIWIRELESS.COM
WWW.AVARIWIRELESS.COM

AVARI WIRELESS

Reliability is Critical

In the event of a crisis, public safety personnel require reliable emergency responder radio coverage. Being able to communicate with their public safety two-way radio systems in buildings is crucial for first responders to execute time-sensitive and mission-critical tasks to protect themselves, and the public. Response personnel cannot afford to experience disruptions in communications for any reason. Always being connected is the baseline requirement.

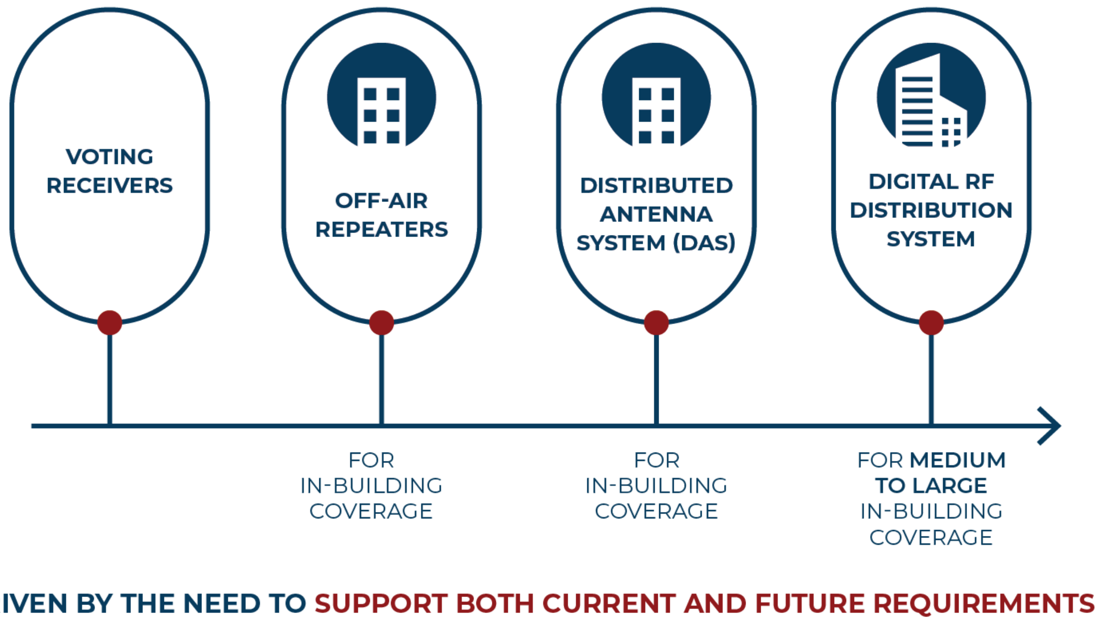
Unfortunately, this is not always the case. For example, building materials, including newly tinted windows may weaken or completely block out wireless signals. In-building Distributed Antenna Systems (DAS), also referred to as Emergency Responder Radio Communication System (ERRCS) or Enhancement Systems (ERCES) are often installed in buildings to provide these necessary means of communication. These DAS systems retransmit Radio Frequency (RF) signals within buildings to ensure all areas receive adequate radio coverage for external public safety radio systems. This includes both public and non-public areas, such as fire command rooms, basements, tunnels, parking garages, exit stairwells and passageways, elevator areas, etc.

According to the National Public Safety Telecommunications Council (NPSTC), a public safety grade communication network is recommended to have 99.999% availability which corresponds to a maximum of 5.26 minutes of downtime per year. In order to achieve this, single points of failure must be eliminated with some level of system redundancy.

Sadly, over time, the shortcomings of in-building first responder radio communication have become horribly apparent. Often in times of need, communication systems are not living up to the standards the NPSTC has set, and the consequences are dire. We look back at past events like 9/11, or the Route 91 Festival mass shooting, and we see that these tragic events share a common theme. Extremely congested radio traffic across multiple different channels, with a lack of ERRCSs in buildings, can ultimately lead to system and communication failures, meaning responders are not able to hear critical messages and instructions.

It has been 22 years since 9/11 and 6 years since the Route 91 calamities, and similar problems persist to this day, despite the availability of DAS solutions with technological advancements.

Over the years, public safety communications have evolved from simple fire call boxes to analog land mobile radio (LMR) systems, to digital LMRs and trunked radio systems. Today the evolution continues with a shift to multi-mode broadband LTE systems, combining voice comms with data (including video, VoIP and IoT), providing higher situational awareness as well as enabling new technical appliances such as sensors, infrared, location mapping, and drones. These advancements and new technologies have provided significant value for first responders, however, *without the right in-building communications network in place, the advantages that these advancements offer are simply not available.*



Critical communication failures will continue to occur if proper systems are not implemented within buildings to promote the retransmission of RF, to ultimately ensure effective and reliable communication for when you need it most.

Redundancy Equals Reliability

Although redundancy is not always a mandatory contractual requirement, it is a large factor to consider in eliminating single-point failures in mission critical wireless communications system to provide the required level of reliability. The simplest form of network redundancy is duplicating the system in its entirety, 1:1 redundancy. Full system redundancy is ideal and very effective, but in many situations, it may not be an option due to space and cost.

In this article, an alternative and cost-effective method will be described - a fault-tolerant system.

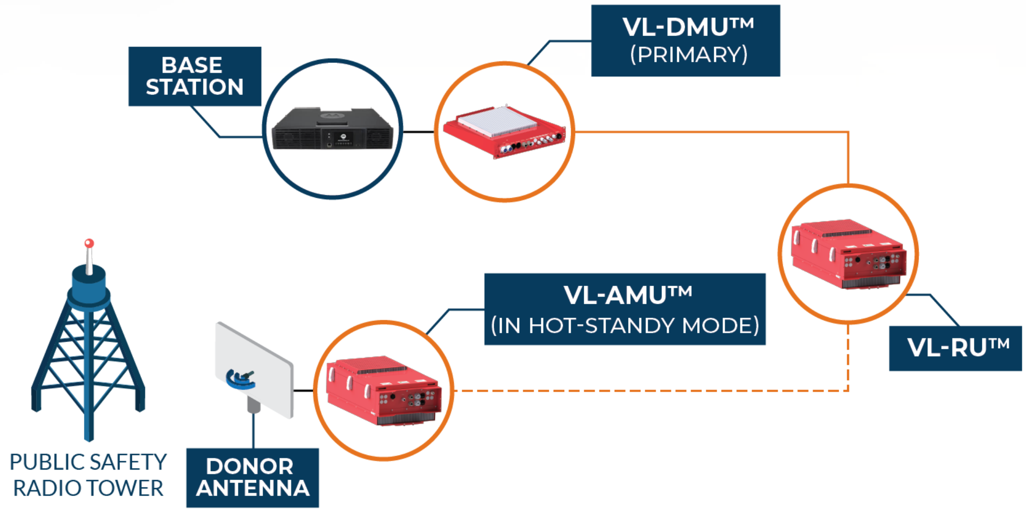
The Avari® VL™ Fault-Tolerant System

The Avari Wireless VL™ digital Distributed Antenna System (DAS) for ERCES applications provides a software-enabled fault-tolerant architecture with headend redundancy and failover operation. This solution offers varying degrees of equipment redundancy and coverage protection that can be tailored to meet specific project needs and budgets. The solution ranges from providing redundant modules within the same equipment to having fully redundant headend equipment and eventually fully redundant remote units (VL-RU™).

The partial redundancy approach described below is much more economical than putting in place a fully redundant set of remote units, yet it still provides highly effective coverage protection should an issue occur. To protect the system headend, which can be a single point of massive failure, a primary master headend unit (direct connect VL-DMU™ in this example), and a secondary master unit (off-air feed VL-AMU™ shown) with a diverse fiber path to all remote locations are necessary. Under normal operating mode, both the primary master unit and secondary master unit are feeding the same signal to the remote units via two diverse fiber paths.

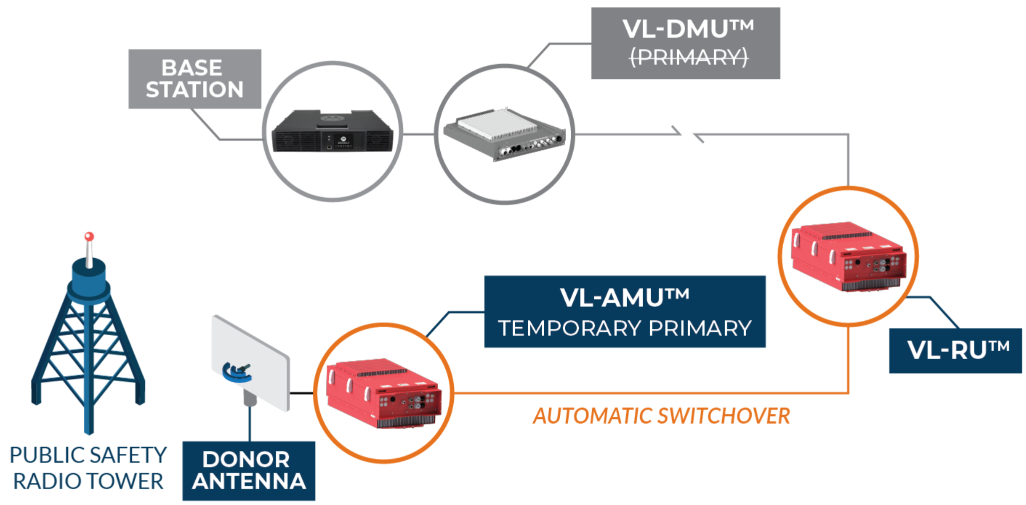
The remote units by default process the signals from the primary host and ignore the signal coming from the secondary host.

NORMAL OPERATION



In the case of primary master unit failure, and/or primary fiber failure, the intelligent remote unit(s) will detect a loss of signal and automatically switch to utilize the signal from the secondary host and its optical link. When a remote unit fails, only coverage to a certain area is affected depending on how much coverage overlap is in the RF design. To further protect against remote unit failure, Avari offers redundant RF modules within the same remote unit. The automatic failover can be performed at the remote unit level as well as a module level.

AUTOMATIC SWITCHOVER OPERATION



AVARI WIRELESS

Intelligent Element Manager

The Avari VL™ Element Manager (VL-EM™) is an intelligent controller that centralizes, streamlines, and automates the management and control of the Avari digital DAS for ERCES applications. It offers a user-friendly graphical interface for administrators and normal operators to perform their operations and maintenance tasks.

The VL-EM™ continuously monitors the operating condition of the digital DAS network and reports alarms in real-time when faults are detected. It not only provides basic failover capabilities when headend equipment fails or fiber gets cut, but it can also interact with external systems to analyze faults and determine the appropriate course of action to achieve self-healing. For example, it can interpret the type of signal source failure to determine if a complete headend failover is required or if only certain traffic channels need to be re-routed.

Enabling Emergency Comms Indoors Has Never Been More Important

Avari continues to be laser-focused on finding new, more reliable ways of dealing with key ERCES deployment challenges as we strive to provide our end-users with the very best solution leveraging the latest digital hardware technology and intelligent software. We do this by working closely with our customers to create innovative solutions that not only meet the end users' needs but also take advantage of new capabilities never thought possible before. By doing this, we offer the industry's most advanced and resilient DAS architecture with self-healing capability for the world's most critical public safety communication infrastructures.