

CompactPCI and VoIP solve emergency services radio interoperability problems

By Gregory Peacock



In this article Gregory discusses how interoperability issues are addressed by an open programmable Radio and VoIP gateway based on PICMG 2.16 CompactPCI standards.

Two-way radio systems are the most critical link in any public safety agency's communications structure. Yet many agency radio systems used by first responders are incompatible with one another, creating disastrous complications. Different radio frequency bands, signaling, and access control methods are primary causes of radio system incompatibility. Flexible and user friendly, yet secure, communications networks must also meet the needs for first responders representing multiple public safety agencies. Budget constraints dictate that municipal governments leverage equipment infrastructure and minimize ongoing personnel and training costs.

Radio interoperability is not just a convenience; it's a matter of life and death. If police, fire, and EMS crews cannot talk to each other, the margin for error and loss of life can be profound. Lack of radio interoperability was cited by the September 11 Commission Report and by former New York Mayor Giuliani as a contributing factor to loss of life by New York area emergency response teams.

The lack of radio interoperability is typical today among our country's 50,000 public safety agencies. Rich Nowakowski, for example, Chicago's project manager for radio interoperability, stated "Thirty to 35 public safety agencies operate on a daily basis in the two-mile-square downtown area known as the Loop, but none of them can talk to each other."¹

SAFECOM Statement of Requirements

In 2004, the Department of Homeland Security's SAFECOM program released the first national Statement of Requirements for Wireless Public Safety Communications and Interoperability. For the first time,

agencies concerned with public safety communications have a document that defines future interoperability requirements for crucial voice and data communications in day-to-day, task force, and mutual aid operations. The SAFECOM requirements document is driving the development of interface standards that will meet public safety practitioner needs and offer industry a resource that can help it better align research and development efforts with user-community demand.

Technology is clearly critical to achieving interoperability. The Department of Homeland Security is encouraging local agencies to plan for evolving interoperability solutions from the limited options employed today, such as swapping radios, to more sophisticated solutions such as gateways and shared systems. Technology advances will typically reduce the necessity for the system operation training that existing solutions require.

Leveraging legacy systems

The events of September 11, 2001 escalated the importance of radio interoperability for public service organizations across the country. Voiceboard's solution to the radio interoperability problem is BridgeWay. BridgeWay is an open programmable Radio and VoIP gateway based on PICMG 2.16 CompactPCI standards. BridgeWay leverages existing installed legacy systems and communications infrastructure, reducing overall costs and offering an immediate solution to radio interoperability problems.

Refer to Figure 1, the BridgeWay Radio Gateway. The key elements of BridgeWay act in combination to achieve an elegant solution to radio interoperability issues. Radios may be seamlessly and reliably networked with each other, to command center personnel, to users connected remotely via IP networks, and to users on PSTN and wireless networks.

Refer to Figure 2, the BridgeWay Logic Diagram. The major elements used by

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BridgeWay to achieve seamless radio interoperability are:

- **Universal Radio Interface:** Ensures compatibility with the wide variety of radio models in use. Most of the interface parameters are software programmable, allowing remote configuration of the radio interface.
- **DSP resource:** Supports DTMF, call progress, voice prompting, conferencing, and a full VoIP Media Gateway.
- **VoIP Gateway:** Allows linking of remote emergency task teams with centralized command centers and highly mobile workstations over IP networks. An important feature of VoIP is the redundant communication paths inherent in the IP network.
- **Gateway Softswitch:** Manages the interoperability of BridgeWay with network connected VoIP end terminals through standard H.323 and SIP protocols.
- **Radio Conferencing Management Module:** A firmware program optimized to meet the special communication requirements of conferencing between multiple radio and telephone users.
- **H.110 Switched TDM bus:** Supports switching between multiple resources, as well as facilitating the addition of commonly used PBX features, such as call transfer, hold, and tandem dial.

■ **PICMG 2.16 Redundant Packet Switched Backplane:** Supports high availability and redundant operation for mission critical reliability.

BridgeWay includes dual IP connections to the redundant 2.16 backplane, eliminating single points of failure and increasing reliability to the levels required for mission critical communications.

BridgeWay's key elements combine to simplify use of the system by emergency response personnel with minimal training. Radio users are able to access the BridgeWay system and follow straightforward voice prompt instructions. The inclusion of voice prompting in the BridgeWay system achieves the simplified level of operation required. This aspect of BridgeWay is particularly important because emergency communications systems are accessed by personnel representing multiple public safety agencies.

BridgeWay's voice prompting feature allows unattended user control of the system, eliminating the necessity for ongoing operator personnel and training costs, a major benefit for municipalities. Voice prompting, coupled with interactive user response, allows secure access procedures to be established. Members of an emergency response task team can be provided the current security access codes assigned during their initial briefing.

Multiple preset conferences can be quickly assigned, allowing secure access by emergency task team members. Impromptu *meet me* conferences can be created by radio users at any time. Keypad radio users may call each other, access personnel at emergency command centers, or place calls to public telephone and wireless networks users. Should the user radio lack a keypad, then pre-assigned routing may be employed to switch the call.

BridgeWay includes redundant Ethernet connections for communication with remotely located emergency command center operators using computer workstations or IP telephones. BridgeWay's T1/E1 facility supports tandem dial capabilities for accessing command center PBXs, the PSTN, and cellular wireless networks.

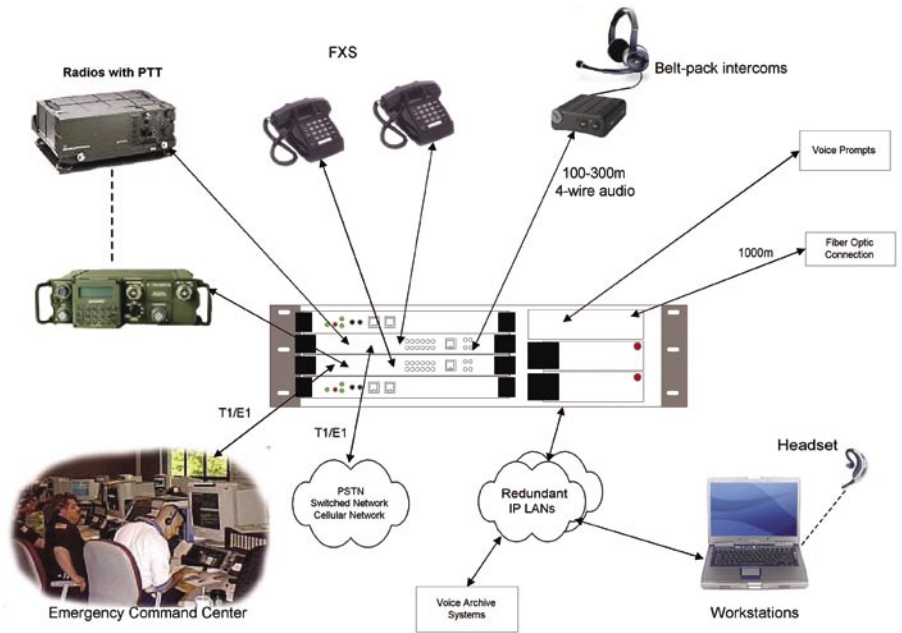


Figure 1

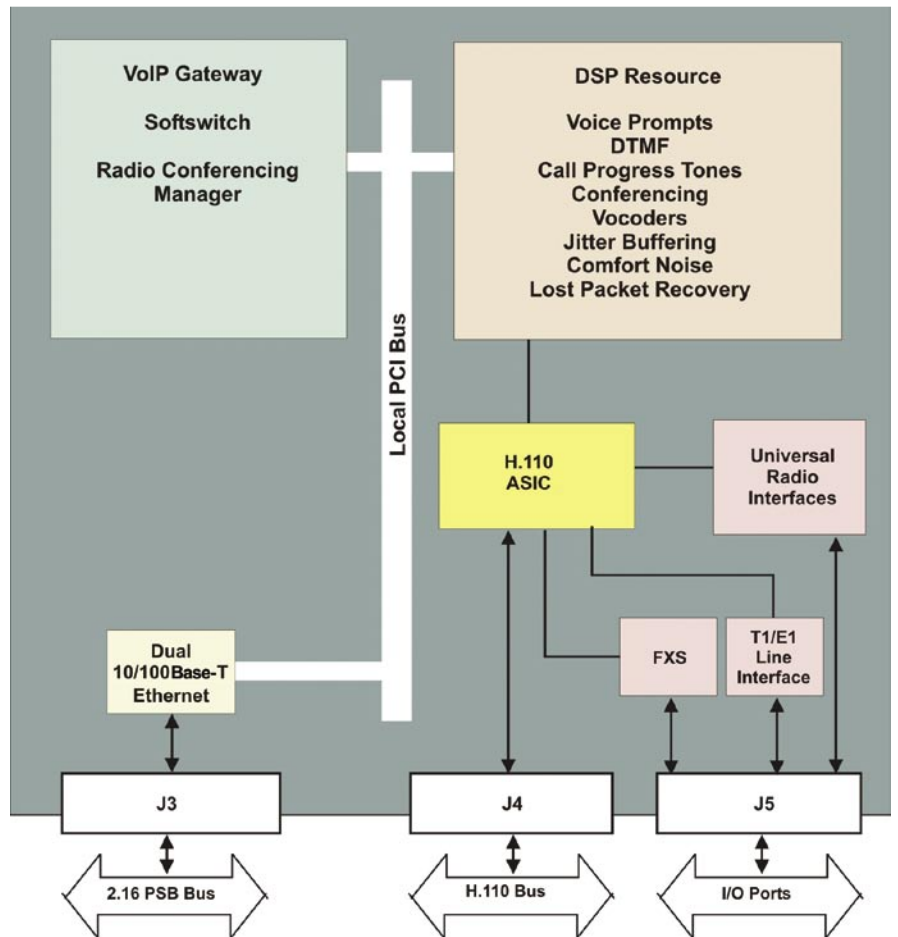


Figure 2

Earlier this year BridgeWay participated in joint interoperability field trials involving combined international military allies, homeland security, and municipal emergency response teams. The interoperability configuration during the field trial was similar to that depicted in Figure 1.

[1] Primedia Business Magazine 2002-2003

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