TWO-WAY RADIOS, ALSO KNOWN AS push-to-talk radios, have been a steady fixture in public safety, utilities, manufacturing, recreation, and warehousing industries for more than 50 years. From public agencies to emergency operations to global businesses, many workers depend on these ubiquitous devices to enable communications among their field and mobile workforces.

Until recently, however, two-way radio systems have been isolated. Based on proprietary technologies, push-to-talk radios, which include Land Mobile Radio (LMR), cellular, and wireless LAN, have been unable to connect outside their own networks. Not only do these networks lack interoperability with other voice networks, they are also incapable of handling new communications modes such as messaging, presence, and video. Such lack of interoperability greatly limits the usefulness of these crucial communications tools—exemplified most dramatically during catastrophic events when fire, police, and local emergency workers are unable to share critical information due to radio incompatibilities.

Cisco IPICS creates communications interoperability by joining radio systems with IP networks. By David Barry
Everywhere

This lack of communications interoperability extends to any industry where enterprises conduct business-critical voice communications on traditional communications systems, including transportation, financial services, retail, and the public sector (see sidebar, “IPICS in Action: Maher Terminals”). Large-scale replacement of these systems is disruptive and impractical. Regardless of the industry, a new network-based solution from Cisco—the Internet Protocol Interoperability and Collaboration System, or IPICS—aims to close this communications interoperability gap seamlessly and economically.

How IPICS Works
Cisco IPICS is a systems-level, network-based solution for integrating traditional communications systems with other disparate voice, video, and sensor networks. In addition to providing scalability and investment protection, Cisco IPICS takes full advantage of IP standards and the network infrastructure for greater resilience, scalability, and security, says Ken Chen, product manager in the Safety and Security Systems Business Unit at Cisco.

The Cisco intelligent network is the foundation for IPICS, providing the quality of service (QoS) and IP multicast that is critical for real-time communications. To bring radio traffic onto the IP network, companies deploy LMR gateways—Cisco Integrated Services Routers with special voice services, interface cards, and digital signal processor (DSP) functionality installed. The Cisco LMR gateways convert analog radio traffic to IP traffic, thereby extending radio’s reach to other IP-based devices while preserving the investment in traditional radio systems.

Each radio channel (or talk group as is the case with hoot-and-holler systems) is mapped to an IP multicast address. Users on IP-connected devices, such as the Cisco IPICS Push-to-Talk Management Center (PMC) client application on a PC or laptop, can also participate in these channels, enabling users that were previously blocked from communications to join the push-to-talk network.
Additionally, PSTN, cellular networks, and cellular push-to-talk networks (such as Sprint Nextel Push to Talk) can be seamlessly integrated into the Cisco IPICS architecture. This comprehensive voice interoperability delivers push to talk everywhere—interoperability from any push-to-talk voice device to any other push-to-talk voice device regardless of the underlying networks.

Security is also part of the Cisco IPICS solution. Users on a Cisco IPICS PMC client, for example, must log in securely and be authenticated by Secure Sockets Layer (SSL) before admission to a talk group. PMC client users can also access various channels based on user privileges or on demand via dispatch.

The first phase of the Cisco IPICS solution focuses on putting the foundation in place for basic connectivity and management between IP networks, various voice communications systems, and two-way radio networks. The focus will later shift to integrating other resources into the Cisco IPICS collaboration environment, such as standard telephones, cell phones, video feeds, remote sensors, and GPS devices.

Competing Interoperability Solutions
Two competing approaches for achieving interoperability among radio systems include using the same radio system or using gateway devices. While using the same radio system among all organizations and agencies can be an ideal solution, it isn’t practical. For public safety alone, a

IPICS in Action: Maher Terminals
Maher Terminals is one of the world’s largest shipping container operators, handling about 1.2 million containers a year at its 450-acre headquarters in the Port of New York and New Jersey in Elizabeth, New Jersey. Maher has long used push-to-talk radios among its 250 employees and several hundred contract workers—including field personnel operating cranes moving 40-ton containers on and off ships and personnel on the ground coordinating the container movement.

Increasingly, Maher needed to enable communications between workers in the field and in offices where radio reception was spotty. By deploying the new Cisco IPICS, Maher has enabled instant communications between field and office personnel on IP phones (and PC-based softphones), and with others on 700 Sprint Nextel Push-to-Talk cell phones. According to Steve Rummel, vice president of data systems at Maher, “Integrating the Sprint-Nextel phones leveraged an already substantial investment in the phones.” Beyond cost savings, IPICS provides immediate flexibility that the previous communications system lacked. For example, Maher can now easily patch together channels to create talk groups among any assortment of devices as required by a project—such as an incoming ship—for instant communications among that group. In the future, Rummel hopes to link key employees with US Customs and the Department of Homeland Security under a single push-to-talk system.
IPICS in Action: Incident Management

Imagine this: A fire breaks out in a high-rise building, and the fire chief needs to be updated quickly on what has transpired as he heads to the location. Using Cisco IPICS and the incident management application, the incident commander at the scene (one of the first-responder firefighters) can communicate with dispatch to orchestrate real-time communication among not just the fire chief but everyone involved in squelching the fire as fast as possible. The application’s intuitive, drag-and-drop functions allow dispatchers to set virtual talk group (VTG) templates, activate VTGs to begin conferences, add or remove participants in VTG templates and active VTGs, and monitor active VTGs and events—all based on users’ roles and policies and privileges assigned by an IPICS operator. The Cisco IPICS PMC client helps end users participate, through an IP network, in one or more VTGs simultaneously.

Meanwhile, the fire chief receives a page from the incident management application that contains a URL address. On screen, the chief is taken to a rich conferencing environment. Instantly, he can begin talking directly with the incident commander on location, firefighters on route on their push-to-talk radios, and other officials on their cellular phones. He also can bring up a display of the building’s assets—location of stairwells, exits, etc. (IPICS will integrate GIS technology and perform database lookups to match addresses to building information). Using presence technology and GIS, the chief can also see the location of the fire and the resources in transit.

tap into a converged voice, video, and data IP network where rich communications extend everywhere. Ultimately, an IP-based network solution such as Cisco IPICS will render these gateway devices obsolete, says Zanone.

Radio Interoperability Using IP

An IP network-based interoperability solution for push-to-talk, LMR, and hoot-and-holler systems is preferred over the aforementioned alternatives because it connects communications paths together so that people can talk using their existing systems and devices. (Hoot-and-holler systems are hard-wired radio networks widely used in the financial industry for instant communications among stock brokers and analysts; these systems can be very costly, however, as they use separate leased line circuits to connect remote offices. With IPICS, they become part of the converged network.) In addition, IPICS is flexible and allows for dynamic linking of networks, organizations, and users on a case-by-case or emergency basis, a fundamental requirement for interoperability during a catastrophe.

Zanone offers an example of a critical event within the financial services industry. Financial analysts and brokers continually monitor worldwide events to gauge their impact on futures markets such as oil, grain, or other commodities. If a natural disaster, such as a hurricane, develops and threatens oil platforms in a region, this information or “situational awareness” about the storm must be relayed to many people within a brokerage firm so they can reach consensus on how best to advise their clients. With Cisco IPICS, the brokerage firm can quickly bring together onto a conference call a broad group of people on different systems, including push-to-talk radios, hoot-and-holler, PSTN, cell phones, and brokers on laptops.

Real-Time Operations Management

The power and flexibility of an IP-based network approach is demonstrated by the Cisco IPICS solution that integrates an incident management application—which virtualizes resources such as users, user groups, or radio channels—across multiple networks and operational domains for dispatch or incident command (see adjacent sidebar). This IPICS solution provides dynamic orchestration of various resources for the event, and allows for graceful escalation and de-escalation as the situation unfolds for the policies, roles, or responsibilities change, says Zanone. Companies and public safety departments can bring in resources on an as-needed basis and easily remove them when the incident is over. What’s more, additional data such as Geographic Information Systems (GIS) and presence and database information (e.g., the location of stairwells in an individual high-rise building or surveillance camera images) can be incorporated and conveyed contextually to anyone who needs it in real time. All of these capabilities make for more efficient, collaborative incident management control.

While providing an immediate tactical solution to voice interoperability, an IP-based network solution such as Cisco IPICS builds on the most widely deployed, scalable technology that will be driving innovative communications solutions in the future. Radio systems will become another application, like voice, video and data, on the IP network—and will take advantage of application convergence to achieve new, powerful capabilities.

FURTHER READING

- Cisco IPICS
cisco.com/go/ipics
- Cisco IPICS Deployment Options
cisco.com/packet/181_6d1