

# Radio over Internet Protocol

Moving from hardware to software-based advanced technologies, such as Radio over Internet Protocol (RoIP), can offer improved operational efficiencies at a lower cost. With states developing interoperability plans for submission to receive Public Safety Interoperability Communications (PSIC) and SAFECOM grant funding, many are considering RoIP solutions because they can go a long way to extending the reach of interoperability solutions and satisfying new grant program guidance.

PSIC program guidance requires states to consider advanced and cost effective technologies that can establish effective and sustainable interoperable communications, not just for first responders, but between them and other emergency organizations such as hospitals, emergency managers and the American Red Cross. The guidance tells states to look beyond the costly tradition of buying new radio systems to deploying technologies that establish interoperability between new and legacy radio systems, and with other communications devices. RoIP is a very useful “support player” in this context. So it is important to understand the technology, how it works, and how it can benefit emergency response.

## What is Radio over Internet Protocol or RoIP?

RoIP takes Internet Protocol (IP) input from “traditional” gateways (modems that convert any radio or communications stream to IP) and uses software to tie them together, forming talk groups and other linkages dynamically. RoIP is not just about linking radios. It enables interoperable communications between new and legacy public safety radio systems, commercial wireless and wired phones, handheld or desktop computers and any other connected communications device. It allows a dispatcher to dynamically drag and drop parties and channels to form and dissolve talk groups remotely and in real time, on an as-needed basis.



## How does it work?

RoIP converts communications of all kinds into the universal language of Internet Protocol using SIP or Session Initiation Protocol and other international voice over IP standards. User devices connect to base stations. Base stations connect to IP gateways which are manufactured and sold by a wide variety of companies. At the IP gateway, software transcodes the voice communication into IP packets. This transcoded voice stream is then transmitted through IP links (public or private networks) to the RoIP software and then to other gateways, where it is converted into the language of the receiving device.

## What types of devices can utilize RoIP technology?

End users can use any communications device they wish including legacy and new radios, analog and digital UHF and VHF radios, analog and digital PBX phones, cell phones, software phones, IP phones, PDAs, and computers. This flexibility allows agencies and individuals that do not use

public safety radios to be tied into the emergency communications stream when necessary, whether it is the Mayor, hospitals, public health, the National Guard or an expert that is needed during an emergency event.

## Is RoIP secure?

Like any IP system, RoIP systems support high levels of security using a variety of techniques that can include identity management for both user and device authentication (if the device is IP-based), access and use security based on assigned permissions, encryption, and the ability to monitor, audit and record activity. They cannot, however, change the security of any transmission that is not IP-based, i.e. the initial over the air communication.

## Who's using it today?

RoIP technology is well known in the US military, increasingly in business, and is now being considered by emergency agencies across the US. One notable safety implementation is in Clallam County, WA which just installed a RoIP network that joins 42 federal, state, tribal, transit, and utility agencies (including the Canadian Mounties) without buying a single new radio.

### What are the benefits of RoIP?

RoIP technology offers a number of benefits:

- Complete interoperability with communications equipment, from P25 radios to new 700 MHz broadband, across multiple frequencies.
- Lower cost as there is no need to buy new equipment to be interoperable.
- Faster implementation, usually within 6 months.
- Easy upgrades with only a software download, not equipment replacement.
- Secure talk group connections between radios and any other communications devices.
- Dynamically scalable communications platforms, run by an authorized party from anywhere with Internet access, allowing them to control who is on talk groups, assign listen-only privileges, monitor conversations and users, and add/remove users from a talk group, all in real time.
- Geographically independent communications, with remote control over talk geographically dispersed users.
- Enriched media - such as images and maps - delivered through IP enabled devices.

### What are the caveats?

Traditionally, achieving radio interoperability meant buying a new radio system. RoIP separates the issue of interoperability from the issue of new equipment. With RoIP, users can connect any communications device to any other communications device. However, RoIP is not a replacement for new radio systems. It only can be used to connect systems and cannot resolve issues such as coverage gaps, or the need for new radio features. It should be considered part of an emergency communications toolkit - not the whole thing.

### If plans are in place to upgrade a radio system, should RoIP still be considered?

Yes. RoIP will usually be a valid tool within an overall interoperability solution as most plans for buying new P-25 radio systems are limited to first responders. However, first responders need to communicate with many other parties who will never have P-25 radios, such as the Mayor or the National Guard. RoIP fills this gap. It is also important for agencies to perform a cost/benefit analysis of different solutions across the full range of organizations that need to be possible solution(s) is selected. For example, a new P-25 system may make great sense for various police and fire agencies in an area. But RoIP connections to emergency medical, EOC, public health and transportation may be far more cost effective and operationally useful than buying them all P-25 radios, or even a few to hand around.

### Can RoIP systems from different technology companies communicate with each other?

Almost and SAFECOM is about to ratify a standard to do just that. It is a bit more complicated to communicate functionality (e.g. push to talk) from system to system, but that issue is being worked and should be resolved in just over a year according to the SAFECOM timetable. By comparison, P-25 has been in the works for well over a decade, and the similar standard, ISSI, to allow Motorola radios to communicate with MA/COM ones (not directly, but through wired communications like RoIP) was recently demonstrated, but products reflecting it will not be available for at least 18 months.



### How is RoIP related to Core Services?

RoIP systems use the IP and SIP standards, among others, so connecting competing systems is relatively easy if the agencies, their gateway addresses and their CODECs are known. But with tens of thousands of organizations with radio systems, where does this information reside? How do you connect with an organization you may not have known before the emergency occurred? Rather than inefficiently collecting information in a wide variety of paper and stove-pipe electronic places, Core Services are shared tools that benefit all emergency agencies by enabling interoperability across emergency response domains and jurisdictions. Agencies can use two Core Services, Agency Locator and Identity Management, to store their agency's contact information and the rules for linking radio systems and forming talk groups for a given area and incident type. By accessing the data bases of these Core Services when an emergency strikes, a RoIP solution (as well as data communications products) has the information needed to enable interoperable communications. Core Services are a new idea on which COMCARE and others are working. Please visit [www.comcare.org/Core\\_Services.html](http://www.comcare.org/Core_Services.html) for more details.

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