



Technical Solutions

Radio Exchange

Radio Exchange Solution...Introduction...

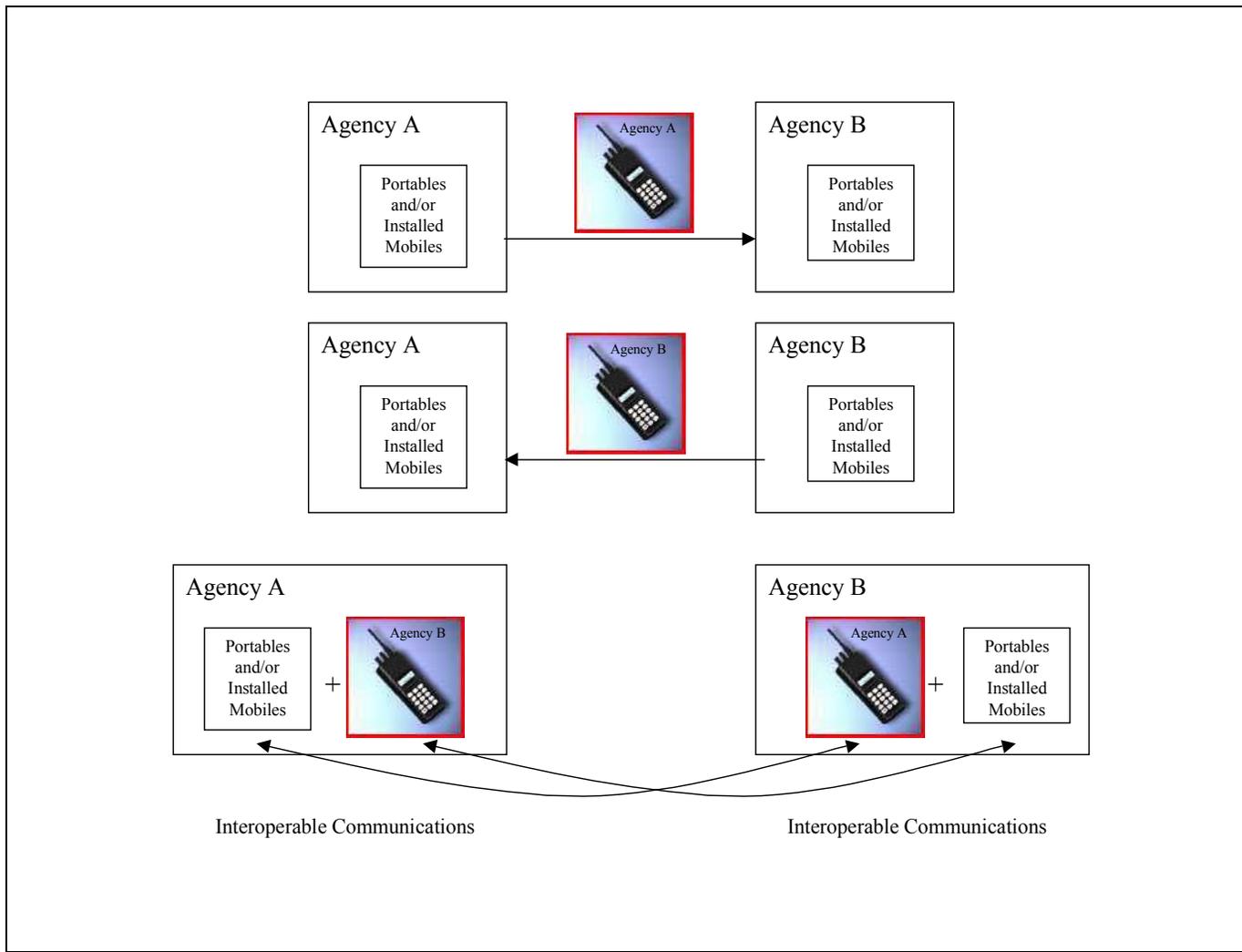
THIS RADIO EXCHANGE ANALYSIS HIGHLIGHTS THE FOLLOWING

- Technical description and conceptual drawings
- Appropriate uses
- Advantages and disadvantages
- Costs
- Spectrum requirements
- Management issues
- Security and standards issues
- Implementations

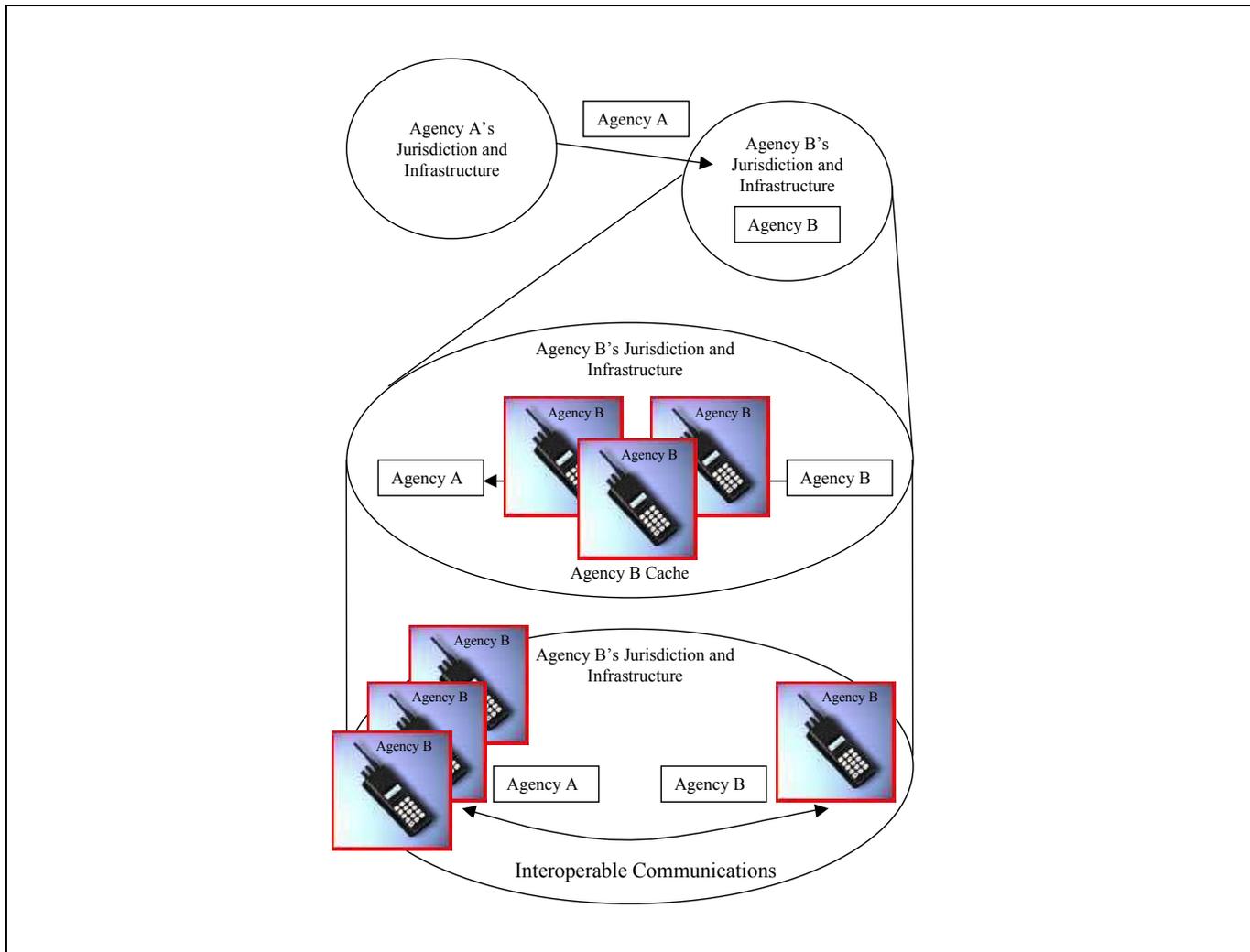
TECHNICALLY, RADIO EXCHANGE IS A SIMPLE TYPE OF INTEROPERABILITY

- The two forms of radio exchange are reciprocal and nonreciprocal. Either may be implemented using analog or digital modulation on simplex conventional channels, conventional repeaters, or trunked talk groups
- Reciprocal exchange occurs between agencies wishing to interoperate with each other; each agency provides radios that operate on its own system to the other agency
 - The radios may be portables or permanently installed mobiles
 - They usually provide interoperability via operational channels or talk groups, depending on the agreement established between the agencies
- Nonreciprocal exchange occurs when a host agency receives assistance from another agency located either within or outside the host agency's jurisdiction
 - The host agency provides both the infrastructure over which communications occur and the field units (usually portables) that operate over the infrastructure
 - The host agency maintains a cache of radios that operate on its system for rapid deployment to agencies providing assistance on a temporary basis

THE DRAWING BELOW ILLUSTRATES THE CONCEPT OF RECIPROCAL RADIO EXCHANGE



THE DRAWING BELOW ILLUSTRATES THE CONCEPT OF NONRECIPROCAL RADIO EXCHANGE



Radio Exchange Solution...Appropriate Uses...

RADIO EXCHANGE IS A VIABLE SOLUTION FOR PUBLIC SAFETY INTEROPERABILITY IN THE FOLLOWING SITUATIONS

- Interoperability must occur on a large scale on very short notice, such as in a natural disaster
- Users who need to interoperate use—
 - Different bands (for either conventional or trunked communications)
 - Incompatible trunked protocols
 - Otherwise incompatible systems, including—
 - Analog versus digital modulation
 - Wideband versus narrowband
 - Digital versus analog squelch codes
 - Incompatible digital modulation types and vocoders

Radio Exchange Solution...Advantages...

THE RADIO EXCHANGE SOLUTION HAS SEVERAL ADVANTAGES

- It offers interoperability between agencies with incompatible systems
- It does not require coordinating and licensing of additional frequencies
- It can provide interoperability on very short notice when guest agencies cannot provide their own compatible equipment or when compatibility is unknown

Radio Exchange Solution...Disadvantages...

RADIO EXCHANGE ALSO HAS SEVERAL DISADVANTAGES

- It requires potentially significant capital outlay for equipment purchase and ongoing costs to maintain loaner units
- It requires inventory management, and poor management may cause losses
- Guest users may cause confusion—
 - If they do not follow established host system procedures
 - If they do not understand host equipment capabilities

Radio Exchange Solution...Costs...

RADIO EXCHANGE CAN BE VERY COSTLY, DEPENDING ON THE NUMBER, AND THE CAPABILITIES, OF THE UNITS ACQUIRED AND MAINTAINED

- Radio exchange requires capital outlay for equipment loaned temporarily or permanently to other agencies
- The equipment must be procured and maintained, either in an operational environment (reciprocal exchange) or in a ready state (nonreciprocal exchange)
- The number and the capabilities of the units exchanged or cached determines the cost

RADIO EXCHANGE GENERALLY REQUIRES NO ADDITIONAL SPECTRUM

- Radio exchange typically uses previously licensed spectrum, regardless of mode (conventional or trunked)
- A host agency providing nonreciprocal interoperability could license a channel strictly for use with the cached loaner portables, but it is unlikely to do so
- It is more likely to have the loaner portables use one of its operational frequencies

Radio Exchange Solution...Management Issues...

RADIO EXCHANGE REQUIRES SIGNIFICANT MANAGEMENT BY THE PUBLIC SAFETY AGENCIES INVOLVED

- Radios must be inventoried regularly
 - Loaned radios should be tracked when issued
 - They should also be inventoried periodically during the exchange period
- Coordination can also require substantial effort. Formal interoperability procedures should be developed to ensure that guest users understand loaned radios' capabilities and follow established procedures on host systems

RADIO EXCHANGE CAN AFFECT COMMUNICATIONS SYSTEM SECURITY

- The loaning of mobile and portable radios raises a set physical security issues
 - The host agency no longer maintains control of the radios
 - In this situation, encryption creates a special concern because acquisition of a loaned radio may enable unauthorized users to intercept or spoof secure communications
- Radio exchange does not raise standards issues; its objective is to circumvent system incompatibility (i.e., to overcome lack of common standards)

Radio Exchange Solution...Implementations...

RADIO EXCHANGE HAS BEEN IMPLEMENTED IN LOCAL, STATE, AND FEDERAL PUBLIC SAFETY ENVIRONMENTS

- The U.S. Forest Service maintains a radio cache for use in fighting forest fires in the western United States
- Broward County, Florida, has loaned 800 megahertz (MHz) trunked portables to smaller jurisdictions in the county, and the county maintains a radio cache for loan during incidents
- High Intensity Drug Trafficking Area (HIDTA) agents in south Florida have been loaned some of the state's 800 MHz trunked portables for interoperability
- The Public Safety Wireless Network (PSWN) Program is implementing this solution in Vermont and New Hampshire