



Technical Solutions

Mutual Aid

Mutual Aid Solution...Introduction...

THIS MUTUAL AID ANALYSIS HIGHLIGHTS THE FOLLOWING

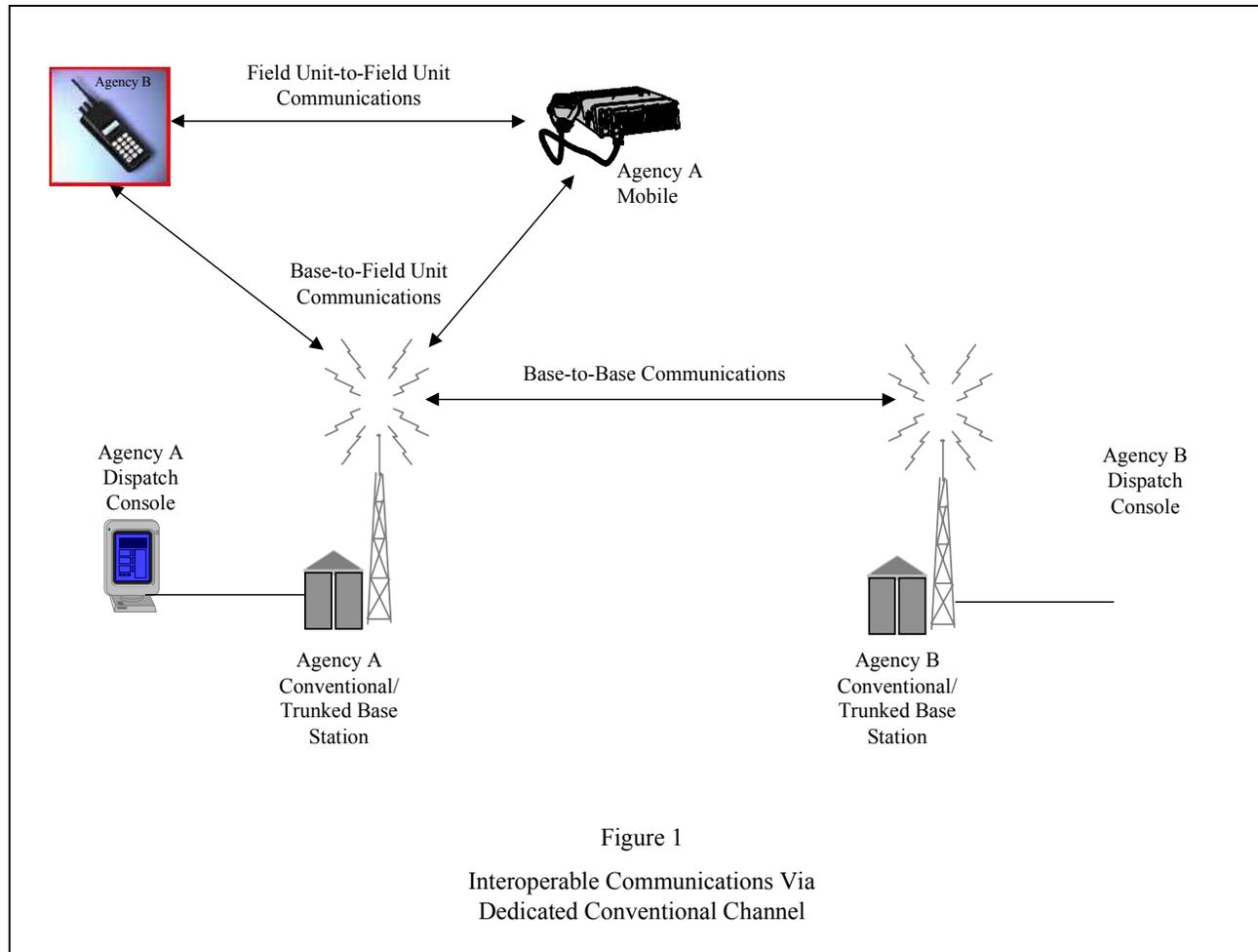
- Technical description and conceptual drawings
- Appropriate uses
- Advantages and disadvantages
- Costs
- Spectrum requirements
- Management issues
- Security and standards issues
- Implementations

MUTUAL AID IS A PROVEN TECHNIQUE FOR PROVIDING INTEROPERABILITY AMONG PUBLIC SAFETY AGENCIES WITH COMMON OR ADJACENT AREAS OF RESPONSIBILITY

- Mutual aid involves implementation of a specific, dedicated conventional channel for shared use by one or more public safety agencies
- Typically, agencies use a base station or repeater whose frequency is accessible by all intended users and located so it provides coverage for the area(s) where interoperability is required
- Mutual aid may include fixed resources at multiple sites that form a large, multijurisdictional network
- Mutual aid frequencies are not used for everyday operations, nor are they part of a specific agency's system; they are reserved for interagency communications during events that require mutual aid (e. g., natural disasters, airplane crashes, acts of terrorism)
- In the 800 megahertz (MHz) public safety band, a National Public Safety Planning Advisory Committee (NPSPAC) calling or tactical channel can be used for interoperability

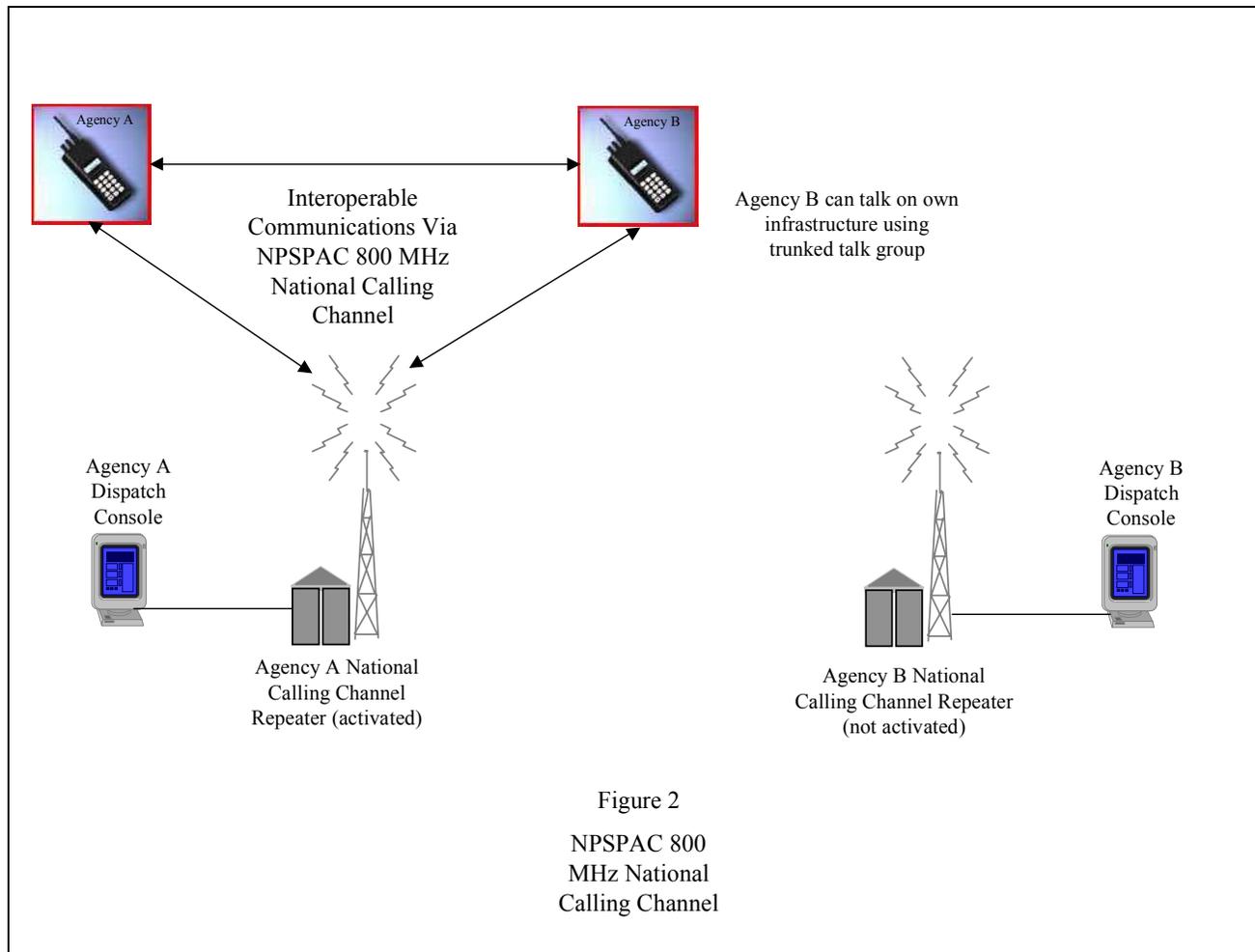
Mutual Aid Solution...Conceptual Drawings...

THE DRAWING BELOW ILLUSTRATES THE CONCEPT OF MUTUAL AID USING DEDICATED CONVENTIONAL CHANNELS



Mutual Aid Solution...Conceptual Drawings...

THE DRAWING BELOW ILLUSTRATES THE CONCEPT OF MUTUAL AID IN THE 800 MHz BAND



Mutual Aid Solution...Appropriate Uses...

MUTUAL AID IS A VIABLE SOLUTION FOR PUBLIC SAFETY INTEROPERABILITY WHEN—

- A standing resource is needed to provide coverage for one or more jurisdictions
- Existing operational resources are unsuitable for interoperability
- Agencies involved are over-the-air (OTA) compatible. That is, they—
 - Are licensed and equipped to use the same band
 - Use the same modulation type
 - Use the same vocoder, if applicable, for digital modulation
- Agencies have slots available in their field units for the mutual aid channel(s)
- Simple, rapid user access is required
- Dispatcher control is needed or can be coordinated
- Tower and equipment space is available
- Agencies involved coordinate well with each other

Mutual Aid Solution...Advantages...

MUTUAL AID HAS SEVERAL ADVANTAGES

- Establishes interoperability capability separate from operational resources
- Minimizes confusion when multiple agencies respond to emergencies
- Provides rapid communications access for field units using channel or mode selectors
- Provides coverage for specific areas or over a wide area such as a multicounty region or a state
- Provides resources that can be controlled by dispatchers
- Can use specific frequencies that are nationally coordinated for mutual aid use

Mutual Aid Solution...Disadvantages...

MUTUAL AID ALSO HAS SEVERAL DISADVANTAGES

- Equipment and implementation costs may be significant
- Tower, antenna, and equipment space may be required
- Maintenance and any associated rental of equipment and communications lines may produce ongoing costs
- Participating jurisdictions must coordinate multijurisdictional implementation
- Field units must be OTA compatible with the fixed mutual aid equipment and with other units used
- Frequencies may need special coordination for mutual aid use and cannot be used for operations

Mutual Aid Solution...Costs...

COSTS MAY BE SIGNIFICANT

- If increased coverage is necessary, significant costs are required to implement, maintain, and operate additional infrastructure (including base equipment and communication lines)
- Field unit costs include—
 - Reprogramming
 - Possibly, vehicle installation of equipment that is OTA compatible with the fixed mutual aid equipment and other units
- Maintenance and any associated rental of equipment and communications lines may produce ongoing costs

Mutual Aid Solution...Spectrum Requirements...

MUTUAL AID REQUIRES ADDITIONAL SPECTRUM

- Because operational resources are not used, additional spectrum must be coordinated and licensed specifically for mutual aid communications
- If an agency is planning to use an NPSPAC channel, the agency must use the licensed channel in accordance with the regional plan for that region

MUTUAL AID REQUIRES SIGNIFICANT MANAGEMENT BY THE PUBLIC SAFETY AGENCIES INVOLVED

- Agencies involved must manage actual operations
- They must coordinate equipment implementation, maintenance, and operation
- They must develop guidelines
 - To define appropriate use of the resource
 - To establish control of the resource
 - To govern real-time control of the resource by console operators and field users
- They must identify funding and resources for implementation and maintenance
 - Capital funding for the infrastructure components
 - Funding or responsibility for equipment maintenance
 - Funding for any ongoing rental costs of communications lines, towers, and equipment space
- They may need to take special steps to coordinate frequencies for mutual aid
- They may need to manage encryption keys

MUTUAL AID CAN AFFECT COMMUNICATIONS SYSTEM SECURITY

- Security may be addressed through the use of—
 - Encryption in the field units
 - Transparent base stations and repeaters
 - Encryption/decryption equipment at the consoles
- However, encryption algorithms must be compatible, and interoperability key(s) must be managed
- Mutual aid raises standards issues only by requiring modulation compatibility and, if applicable, use of the same vocoder

MUTUAL AID HAS BEEN IMPLEMENTED IN LOCAL, STATE, AND FEDERAL PUBLIC SAFETY ENVIRONMENTS

- Mutual aid interoperability has been implemented to some degree for multiagency communications within and across jurisdictions in virtually every populated region of the United States
- As Figure 1 illustrates, a typical simplex implementation provides base-to-base communications, base-to-field unit communications, and direct field unit-to-field unit communications
 - Field units can be either mobiles or portables
 - Coverage is limited to the range of the individual bases or mobile/portable units involved in a given call
 - Co-channel interference between neighboring jurisdictions is reduced by channel monitoring and coordination among users
- As Figure 2 illustrates, the NPSPAC 800 MHz National Calling Channel and four additional tactical channels can provide nationally coordinated spectrum resources for public safety mutual aid use
 - This solution provides console-to-field unit communications or, through a repeater, communications among field units
 - Field unit communications are limited by the range of the repeater
 - Co-channel interference is mitigated by restricting access to repeaters and by coordination among users
 - Repeater access is restricted by deactivating the repeaters' in-cabinet repeat function until mutual aid is required in a specific location. When it is required, dispatchers may coordinate activation
 - Repeaters used for mutual aid interoperability should be equipped with console wireline priority and control
- One typical simplex implementation is Florida Law Enforcement Intercity in Seminole and neighboring Brevard counties
- The PSWN Program is considering using mutual aid channels in its Washington, D.C. pilot project