

# Interoperability Explained

---

## Definition

Interoperability is the term associated with the ability for two or more parties, with dissimilar communications devices, to operate with each other

- **Defined Communications devices**
  - ▶ 2-way radios (either analog or digital)
  - ▶ Conventional or Trunked
  - ▶ Handheld, Mobile or Base radios
  - ▶ Local Console Operator
  - ▶ Telephone or Handset Operator

# Tactical Communications Bridge

---

Interoperability Interface Solutions



# Interoperability Explained

---

## Basic Requirements

Interoperability interfaces requires some basic operational features to fit into this class of devices

- Communication mode independent
  - ▶ ‘Analog’ radios must be able to talk to ‘Digital’ radios
  - ▶ VHF radios must be able to translate UHF radios
  - ▶ Different manufactures radios must communicate
    - Motorola radios can talk to Kenwood radios
- Must be reliable in both temperature and operation

# Interoperability Explained

---

## Nice Features

Interoperability interfaces with some of the following features add to their usefulness

- Ease in Interfacing
  - ▶ Pre-manufactured radios cables
  - ▶ Automatic adjustment of the receivers audio
  - ▶ Field adjustable without lots of additional equipment
  - ▶ Ability to operate from +12V DC
- Ease in Set-up
  - ▶ Recallable radio personalities (Audio levels, operation modes etc)
  - ▶ Easy method for setting up talk groups

# Interoperability Explained

---

## Nice Features

- Light enough for field transportation
- Ruggedly constructed
- Ability to service/upgrade in the field
- Computer degree not needed to operate interface
- Affordable interface and cables

# Interoperability Explained

---

## Security Requirements

The Interoperability interface must not affect or require disclosure of the radios security codes or confidential operational modes

- Operates from the radios audio
  - ▶ Receiver interfacing is handled from the radios headphone receiver audio accessory jack
  - ▶ Transmit interfacing is handled from the radios microphone audio input

# Interoperability Explained

---

## Talk Groups or Nets

A common term used in describing a units capabilities is “How many ‘Talk Group’ or ‘Nets’ does the unit support”? The term indicates how many separate conversations, comprised of any of the systems radio ports, can be operating, at the same time, without interfering with any other talk group.

# Interoperability Explained

---

A two radio port example



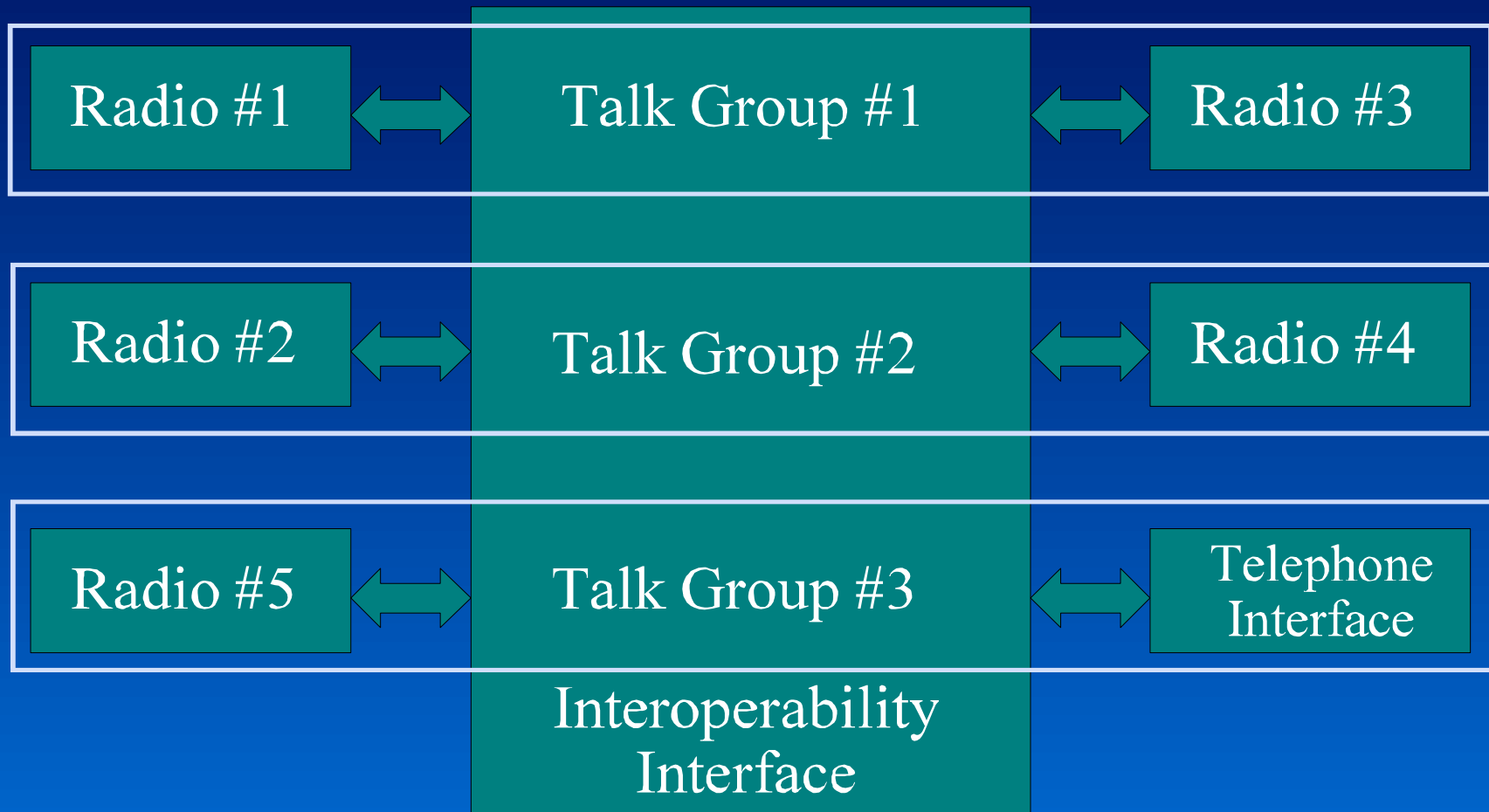
In this example, only one talk group is possible because of the number of radio ports. The basic formula for calculating a units performance is

$$[Minimum\ Talk\ groups = (Total\ Radios / 2)]$$

If the unit can not meet this requirement, then one should question the system performance capabilities.

# Interoperability Explained

Multi-port, Multiple Talk Group Example



# Interoperability Explained

---

## Multi-port, Multiple Talk Group Explained

$$[Talk\ groups = (Total\ Radios / 2)]$$

This example utilizes a six port interface. Therefore the interface should support a minimum of three talk groups.

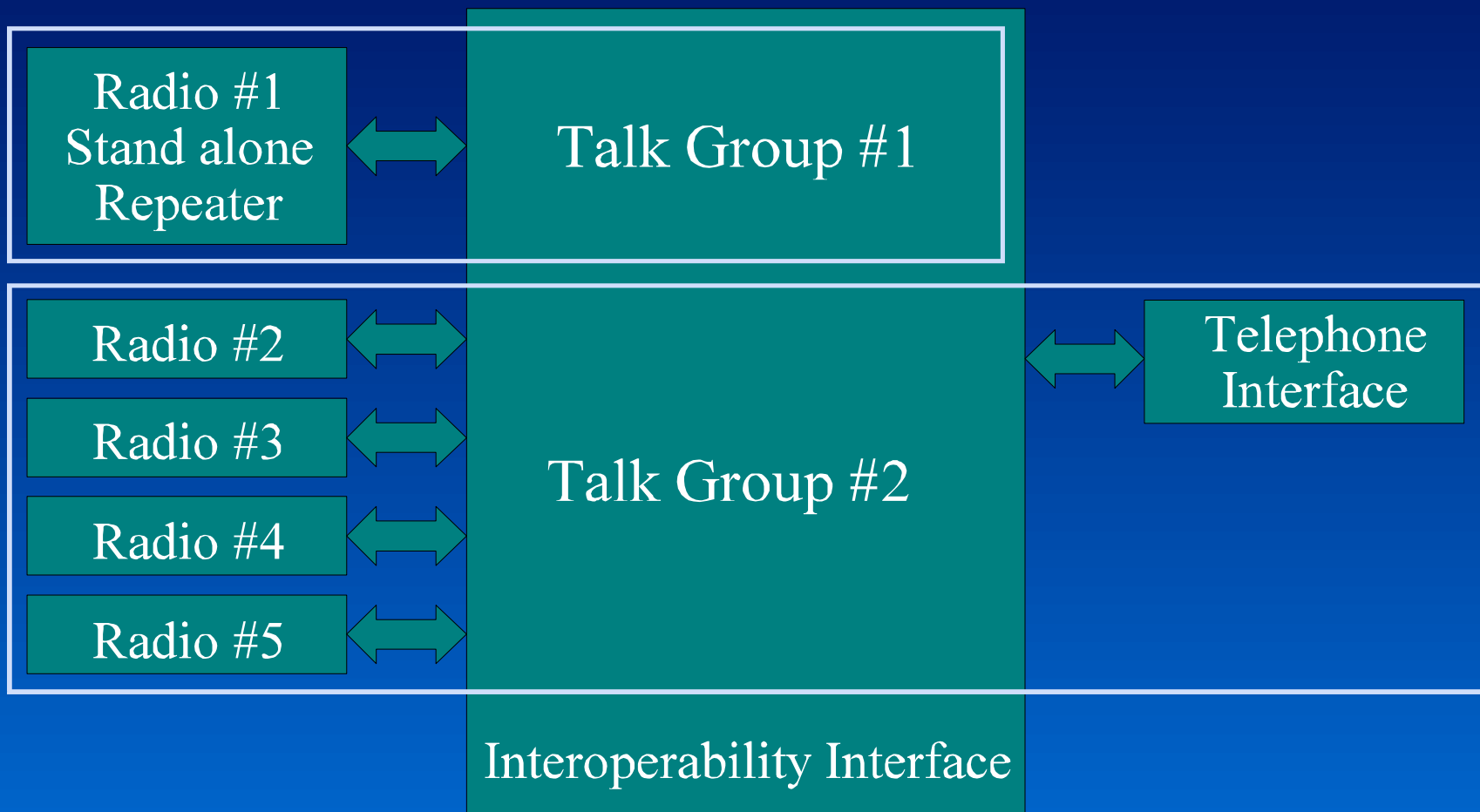
Group #1: Radio #1 connected to Radio #3

Group #2: Radio #2 connected to Radio #4

Group #3: Radio #5 connected to the Telephone line

# Interoperability Explained

## Multi-port, Multiple Talk Group Example



# Interoperability Explained

---

## Multi-port, Multiple Talk Group Explained

This example utilizes a six port interface but is only using two of the three talk groups.

Group 1: Radio #1 configured as a standalone repeater to provide a central communications hub

Group 2: Radio #2,3,4,5 are connected to the telephone line. This configuration allows an off-site supervisor to be part of the incident command

This example requires the Interoperability interface to be able to handle more than a general radio, it requires the ability to operate as a full-duplex repeater controller as well as a multi-port interface.

# Interoperability Explained

## Specialized Example: Trunked radio interface

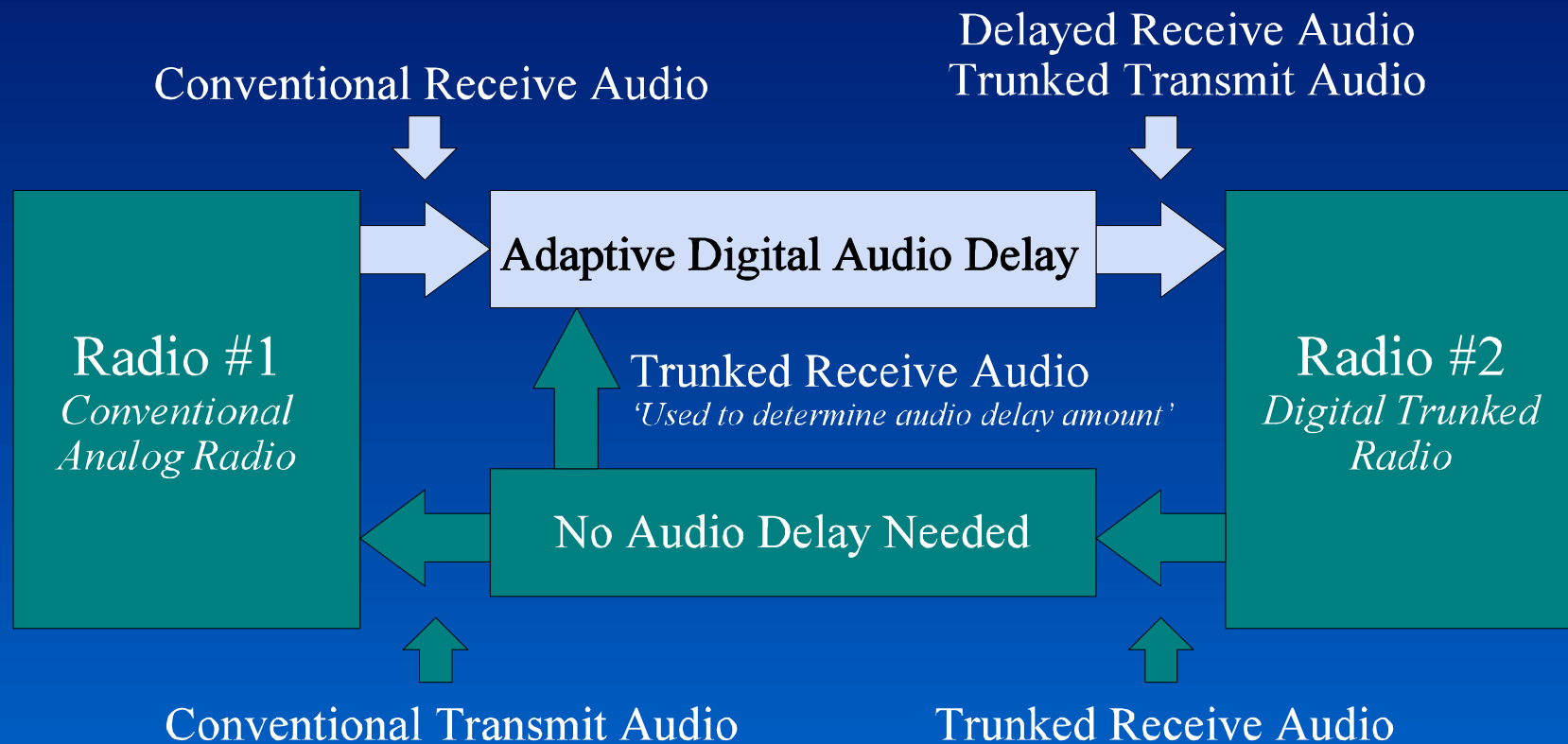


This example interfaces a Conventional Analog Radio to a Trunked Digital Radio. A few requirements are needed for a smooth interface between the two different operation mode communication systems.

Trunking systems have access delays (from  $\frac{1}{2}$  second to 3 seconds) as they search for an open channel, and switch the operators radio to the available channel. A method must be used to “adapt” to the trunking radios access delay so voice information is not lost.

# Interoperability Explained

Specialized Example: Trunked radio interface



# Interoperability Explained

---

## Specialized Example: Trunked radio interface

- When the Conventional Radios receiver goes active, the Interoperability Interface delays this audio, for up to 3 seconds, or until the Trunking radio's 'Channel Available' tone goes away
  - ▶ If the Trunking radio's channel tone is longer than 3 seconds a Trunk Fail condition occurs
- When the Trunked Radios receiver goes active, the Interoperability Interface presents a Transmit condition to the Analog Radio, without delay

*Conclusion: For seamless connection between Conventional and Trunked radio systems, the Interoperability Interface must have an audio delay. The delay keeps information from being lost while the Trunked radio searches for an available channel.*

# Interoperability Conclusion

---

## What the Interoperability Interface Needs

- Interface must be easy to set-up
- Interface must be able to handle different radio operational modes (Analog, Digital, Trunked...)
- Interface must support several radio types
- Interface must support multiple talk groups
- Interface needs to operate from +DC for field use
- Most important, Must be affordable

# Thank You!

---

Link Communications, Inc.  
1035 Cerise Road  
Billings, MT 59101

Voice: +406-245-5002  
Fax: +406-245-4889

[www.link-comm.com](http://www.link-comm.com)

Providing Quality Multi-Port Interoperability Interfaces  
Since 1989