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This series of articles is intended to provide a general conceptual understanding of Interoperable Communications as they pertain to Public Safety Communications and Emergency Management/Incident Response support.

## Communications Interoperability & Public Safety Response (Article 1: *Introduction*)

Post 9/11, and in light of other recent disasters, the government has made a concerted effort to improve interoperability between multiple disparate communications systems used by Public Safety agencies. This effort is a large and daunting task. The efforts of many agencies to provide optimum communications on their local level have left us with a wide variety of system types and frequency bands to join together. These systems have become disparate for a reason: The systems were designed to support the unique needs of the individual agencies. The people responsible for that design have rightfully maintained "***Intra***-operability".

Migration of these various systems to a single frequency band and particular format is a long and extremely involved process, and while in this transition, there are multiple initiatives to attempt to comply with.

Some of these are:

- The Narrow Band Initiative,
- the Re-Farming Initiative,
- the NIMS report and,
- Various other attempts to optimize the use of the existing frequency spectrum to create a new communications landscape.

Within these articles, I will explain these initiatives, and the intent of the NIMS report, as well as look back at how we ended up with the various frequency bands and formats that we use today. We will also look into technologies of today, and the future, to show how they provide methods of bridging our present operations, with the targeted methods to come.

Today, interoperability is both technically and economically feasible. Wide-Scale Interoperability has not been achieved because no public safety agency can afford to give up intra-operability for un-managed Interoperability. We will discuss the intentions of The Department of Homeland Security and the management of their migration to an all-encompassing communications arena.

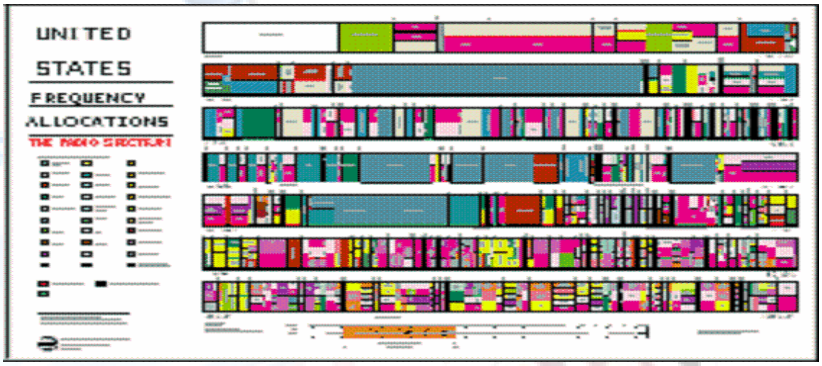
These articles will provide a source of general information, to enhance understanding of the much publicized issues surrounding Interoperable Communications, and Incident Response/Emergency Management support. Throughout this series, I will reference pertinent

government agencies to assist the reader in understanding the selection of methods and products that support interoperability.

It would be a good idea to introduce a few terms that you will notice recurring:

### Radio Frequency Spectrum

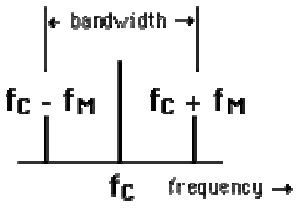
The radio frequency spectrum is that part of the energy spectrum that is designated for use by the FCC for any form of radio communications.




### Bandwidth

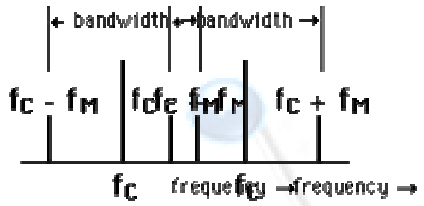
Bandwidths are assigned for all types of broadcast communication and this imposes a maximum signal frequency which may be transmitted. The bandwidths assigned to AM and FM radio limit the fidelity of music broadcasts in AM, but permit the luxury of stereo high-fidelity broadcasts by FM. The high signal frequencies **associated** with video broadcasting require higher bandwidths for channels assigned to television.

When you quote a frequency for a radio station, you generally quote the frequency of the carrier. But when you superimpose a signal on the carrier by AM or FM, you produce sidebands at the sum and difference of the carrier and modulation frequencies. This means that the transmitted signal is spread out in frequency over a bandwidth which is twice the highest frequency in the signal.



**Interference**

When two or more transmitted frequencies mix together, the resultant frequencies, both sum and difference will be introduced into the receivers of adjacent radios, causing those receivers to either desensitize to protect the receiver, or produce "noise" at the desired frequency.




**Simplex versus Repeated**

A simplex channel is defined as one frequency used for both sending and receiving.

A Repeated channel is defined as two frequencies used for a channel pair. One frequency is used for transmit and one is used for receive.

Simplex channels tend to be used for car-to-car or local communications. Repeated channels tend to be used as system channels or for when longer-range communications is desirable.

**Conventional versus Trunking**

A **conventional radio system** is one that uses Simplex and or Repeated channels that do not require proprietary coding to operate. This type of system requires one transmitter per radio conversation and each transmitter supports one particular channel

A **trunking system** is a radio system that utilizes a computer controller to provide the user with a variety of "Talk Groups" to communicate with. These talk group appear to work like conventional channels. The difference between the two is that the computer controller can select any of the "Trunking" frequencies to send and receive with as opposed to a particular transmitter having to be used for a particular channel.

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