

COMMUNICATIONS SYSTEMS

By Sid Heal

Throughout the ages, information has been conveyed with smoke, bugles, drums, flags, mirrors, lights, messengers, dogs and even birds. Nowadays, computers, radios, telephones and fax machines are taken for granted. All of these methods are used together to create a system to ensure that information is promptly and clearly sent and received. When designing a communications system for disaster management or a tactical operation, it is important to understand underlying needs, particularly who needs to communicate with whom, how often and with what kind of “traffic.”

A *communications system* is a group of independent but interrelated elements necessary for establishing, maintaining and operating communications. They include the various methods for transmitting information and the myriad configurations these take on and are limited only by the imagination and resourcefulness of the planner.

One of the most fundamental questions to be answered is whether the system should be primarily a collaborative or non-collaborative one. A collaborative communications system is one that requires compatible equipment or software for both the sender and recipients. A system that uses radios is a good example. Both the sender and the recipients must be equipped with compatible equipment and a common frequency. Collaborative systems

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are the norm for emergency responders but frequently result in mismatches when one agency or discipline cannot communicate with another simply because of incompatible equipment, especially radios.

A *non-collaborative communications system* is one that allows communication without requiring compatible equipment. Non-collaborative systems are especially useful when impromptu communications are required. A public address system for crowd control is an example of a non-collaborative communications system since the recipients do not need to have any special equipment, nor even need to cooperate to receive communications. Likewise, the stench added to natural gas to alert anyone of a gas leak is a non-collaborative communication. Other examples include red lights and sirens on ambulances, fire engines and police cars, fire alarms, and the verbal warnings at the ends of escalators and moving sidewalks.

In addition, participants will not always be available at the same time. Thus, some method must be established to ensure that essential information is available for those who may not be accessible at a particular time or place. *Synchronous communications* systems require all participants to communicate at the same time. Radios and telephones are examples of communications devices that are synchronous, since when a sender transmits a message all the receivers must be listening at the same time. Likewise, meetings and briefings are synchronous methods of communicating. An *asynchronous communications* system is one that provides communications but does not require all participants to be involved at the same time. The best example of an asynchronous communications system is an email or text message. Either of these can be sent to one or many people who can then read them and reply at their convenience.

For all practical purposes, there are almost no communications systems that are exclusively collaborative or synchronous (or vice versa) but rather some combination. How a communications system is intended on being used will determine what types of equipment will be needed and how they will be used.

A component of a communications system is a *communications network*. In simple terms, a communications network is a group of communication

stations linked by a common means of communicating. A communications network manages information. This means that only those members who are a part of the network can receive and transmit information with one another.

Information on a network is disseminated through one of two methods. The first method is by broadcasting. Information that is *broadcast* is simultaneously sent to a wide audience — anyone with access to the network, in fact. The main advantage of broadcasting is that it gets the information to the widest audience in the shortest amount of time with the least effort. Commercial television and radio networks are examples of broadcasting, as are newspapers and magazines. With an audience with the same informational needs, broadcasting is an

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extremely efficient means of communicating, and this method is often used during tactical operations and disaster responses for situation reports, weather reports and for disseminating plans.

When an audience has a need for different types of information, broadcasting becomes problematic.

A “point-to-point” transmission is more efficient. This method is also called narrowcasting. Information that is *narrowcast* is sent to specific users who have a need for it. Narrowcasting has two advantages over broadcasting. First, the information can be customized to fit the needs of the recipients.



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Second, because information is often re-sent depending on the needs of the user, each sender becomes a filter to provide the information needed without retransmitting the entire message. That said, narrowcasting also has two disadvantages. The first is that it takes much longer to “saturate” a group with the necessary information since it must be sent more than once. Second, every time a message is re-sent it increases the possibility of error and distortion.

Networks can further be divided into channels. For most purposes, a *communications channel* is the route and medium that links two or more stations. Stations may share more than one channel. For example, it is not unusual to have multiple command posts linked by radio, telephone, email and messengers, each of which constitutes

a separate communications channel. Because different echelons of command share functional responsibilities, like logistics, intelligence and operations, each of these may have a different radio frequency (channel), all of which terminate in the same stations.

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