



Achieving Voice, Video, and Data Interoperability

By Cornet Technology, Inc., A Leader in Communication Systems and Solutions



ABSTRACT

Twelve years after 9/11 a rapid collaborative response has become imperative, however, achieving this imperative is still a challenge.

Post 9/11, gateways were deployed by military, public safety, disaster management, emergency communications and homeland defense organizations to achieve radio interoperability across different radio networks and land line phones. These voice gateways were useful when radio interoperability was the only challenge. Over the years, satellite, smart phones with cameras, and IP phones have been added to the communication mix. Today, interoperability systems support multi-user conferencing using the entire spectrum of communications devices and capitalize on 3G and 4G technologies to deliver voice, video and data connectivity.

This paper presents some of the challenges faced by modern day interoperability and discusses the benefits of gateways as a force multiplier that delivers full voice/video/data situational awareness. Also discussed is Cornet Technology's (CTI) TVCS InterConnect family of IP network-linkable communication gateways which deliver video, voice, and data interconnectivity through a simple, user-friendly, and scalable solution.

Introduction

The need for communication interoperability for a variety of military, homeland defense, emergency communications, and disaster management applications is well established. This paper argues that a quick and inexpensive solution to communication interoperability can be fulfilled through an efficient, feature-rich, and easy to administer communication interconnect solution.

Technology Challenges – Short background

Military, homeland defense, and emergency/disaster management organization often face situations that require a coordinated, cross-agency response. Effective inter-agency communication is a necessity to meeting this requirement. However, achieving this cross-agency communication proves to be challenging, especially where mobility and equipment diversity are the norm.

Network Islands: Historically, communications equipment has been the purview of individual organizations. Organizations bought the best equipment for their specific needs. This led to the development of network technology islands or silos and was sufficient as long as the operation or emergency was independently worked. However, emergencies cross community, state, and national boundaries, creating the need for increased inter-agency, even multi-national communication and cooperation.

Scalability: A gateway solution should offer the ability to support evolving mission requirements. A small site supporting a few radios/phones may need to expand to support a large number of radios/phones. One command and control site may network multiple sites together over an IP network to create an integrated communications domain.

Unified Communications -- Voice, Video, and Data: Situational awareness is expanding beyond voice to rely on video and data/texting. Today, video can be captured and streamed from the users in the field to headquarters, from field location to field location and from headquarters to all involved. Additionally, texting is becoming a preferred means of communicating; it is often faster, requires less bandwidth than voice communications, and provides an additional communications path when voice circuits are unavailable. The addition of all this extra technology is putting a strain on bandwidth availability.

Operator Consoles: As technology pushes the performance envelope, operator interfaces take on more capabilities. The challenge is to create human/machine interfaces (HMI) that enable novices to quickly become experts without the need for extensive training. New HMIs must be well-organized, intuitive, and designed for swift execution of tasks.

Reliability and Redundancy: Mission critical operations are often conducted in challenging and harsh environments. Damage to existing infrastructure forces responders to become self-sufficient. To meet this challenge, communications systems must be capable of operating in harsh conditions, be interoperable, and offer redundancy of critical system resources to ensure maximum uptime.

Communications Interconnect

A communications interconnect, also often referred to as a Gateway, offers proven and robust technology for connecting the widest range of communication devices into a cohesive communication network. Interconnects remove the technology barriers between communications device (e.g. handheld radios and cell phones) incompatibility and interoperability. This is accomplished by:

Breaking down network islands: Interconnectivity is achieved by performing protocol conversion between diverse communications devices thus breaking down the barriers between network islands. This approach enables users to utilize systems they already have deployed; eliminating the need to acquire new or different devices whenever a crisis arises that requires a joint effort. See Diagram 1.

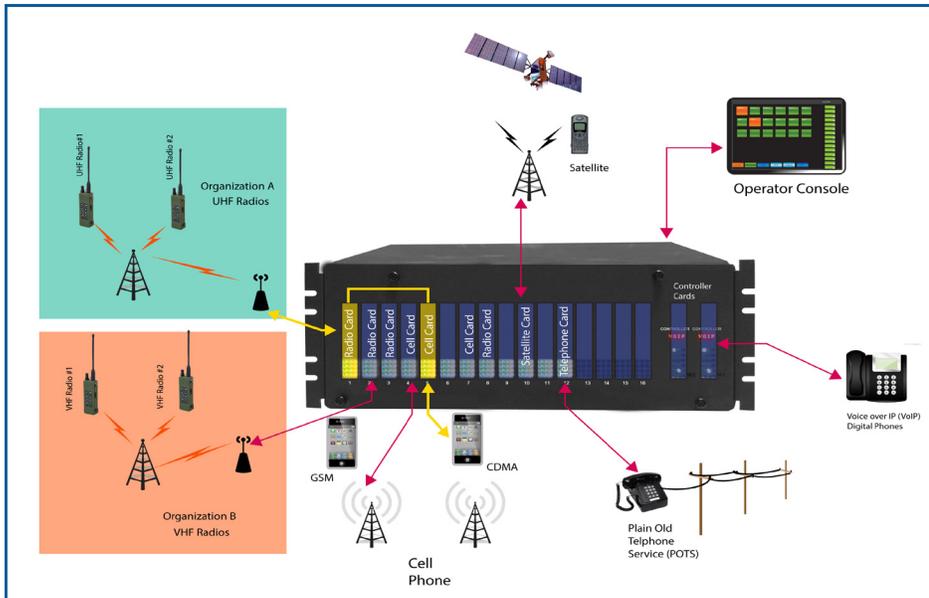


Diagram 1. Yellow lines show a VHF radio making a call to a CDMA radio through an interconnect.

Conferencing: The benefits of a communications interconnect goes beyond simple one-to-one cross-device voice communications. Voice conferencing services also enable multiple callers using the same or dissimilar devices to participate in ad hoc or scheduled conferences to exchange information. These conferences can be facilitated through an operator or formed from an individual's device. Interconnects can also offer the ability to make intercom calls within a facility. See Diagram 2 below.

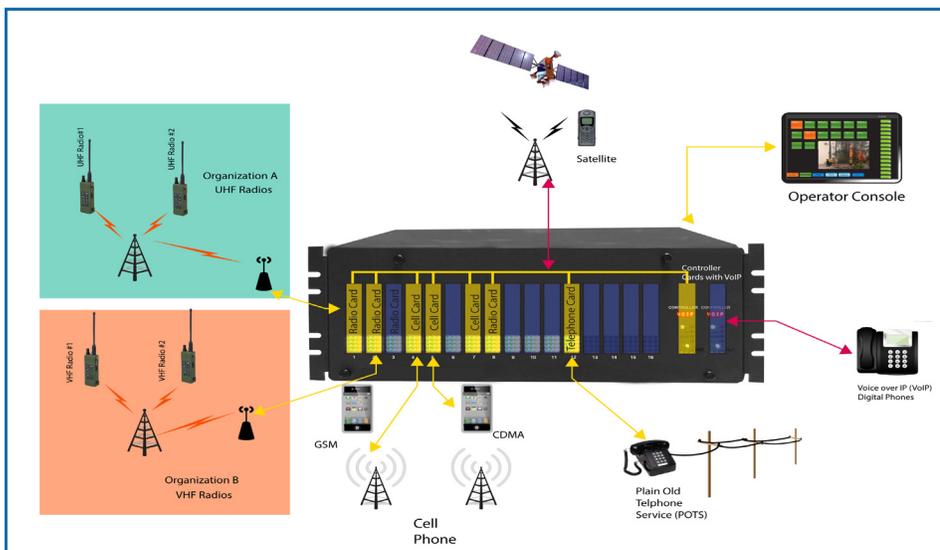


Diagram 2. Yellow lines show conferencing connectivity through an interconnect unit.

Unified Voice, Video, Data Communications: Exchange of video and text messages to devices with the appropriate video and text message technology can also be performed with an interconnect. This capability allows real-time video and text messaging to be shared among responders and with command and control headquarters providing immediate awareness. See Diagram 3.

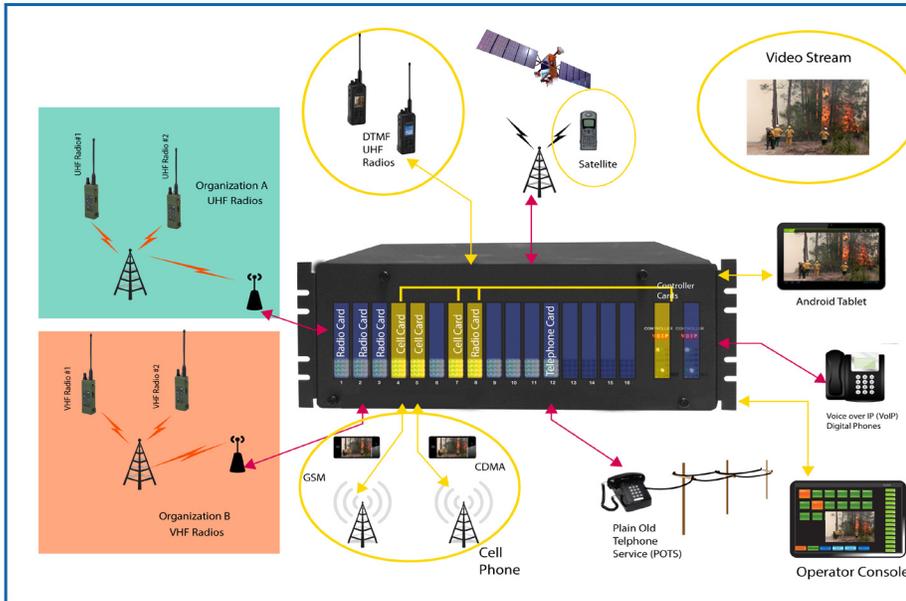


Diagram 3: Shows streaming video or photograph sharing

Operator Consoles: Commanders or operators manage communications with field personnel and external agencies using the HMI at the operator console. For operators of various experience levels to manage these communications and create call connections efficiently, the HMI must be well-organized and intuitive.

Reliability of an Interconnect: Losing communication in the middle of a situation is unacceptable, therefore interconnect products provide a solution based on redundancy.

Cornet Technology’s TVCS InterConnect Switches

Interoperability technology will eventually move toward open networks where connectivity will happen in a network cloud. However, procuring and installing new network technology is expensive, time consuming, and may be beyond the reach of smaller organizations.

Cornet Technology’s TVCS InterConnect family provides optimum interoperability today using existing devices. It does this by facilitating interoperability between new and existing communications systems. TVCS InterConnect eliminates network islands by connecting multiple dissimilar systems and creating a single interoperable system.

In addition to interoperability, the TVCS InterConnect delivers conferencing between users with the ability to add a user to the conference at any time. Two types of conferencing are offered: ad-hoc and scheduled. Ad-hoc conferences can be initiated by anyone at the spur of the moment. Users with DTMF (Dual-Tone Multi-Frequency) capable devices can make conference connections at will; users without DTMF capability require an operator to assist with conference set-up. The system also includes an

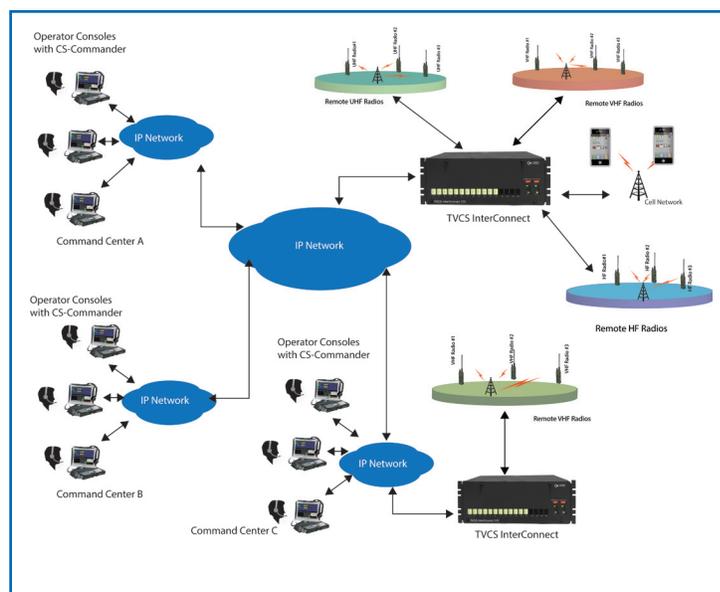
optional recorder card with enough memory to record continuously for 30 days. Users can easily select the required channel for playback based on channel or timestamp information.

Added Functionality

Unified Communications: The TVCS InterConnect product family pushes the interoperability envelope by adding video sharing. By incorporating an internal video encoder and video server, both standard and high definition video can be streamed to multiple devices simultaneously. This enables both video enabled field devices and command centers to access video in real-time. In addition to video, the TVCS InterConnect handles text messaging among enabled devices. This ability lets a simple text message to be exchanged between different devices or broadcast to all connected devices.

Networked Interoperability: Different agencies often have multiple active zones of operation during a situation. TVCS InterConnect gateways located in each active zone can be connected over an IP WAN to create a large interoperable area of operation consisting of multiple zones. In this scenario communication is conducted through the connected InterConnect gateways seamlessly enabling a user in one region to call a user in another region regardless of device in use. See diagram 4 below.

Diagram 4: Example of interconnected networks.



Command Center Mission Control: In situations where there is a need for increased conferencing capability, CTI offers the TVCS Omni. The TVCS Omni allows an operator to participate in multiple open calls or conferences all on a single headphone in addition to offering full interconnect functionality. This capability enables the operator to participate in multiple conferences simultaneously.

Operator Console

The TVCS InterConnect CS-Commander operator console provides a simple interface with powerful capabilities. The CS-Commander turns any computer or tablet into a full featured voice terminal with push-to-talk capabilities. This desktop communicator enables users to establish bidirectional voice communication to any device attached to the TVCS InterConnect. The CS-Commander supports

the following:

- Tablet or PC-based VoIP (AS-SIP, SIP) terminal
- Available communication channels and status visibility
- Ability to set-up multi-party conferences
- Push-to-Talk (PTT) switch and Finger-on-glass (FOG) PTT switch



Diagram 5. CS-Commander Operator Console

Benefits

Ease of installation and administration: The TVCS InterConnect is easy to install and administer.

Secure and reliable: All audio, video, and messaging can be completely secured over an IP network via Assured Services - Session Initiation Protocol (AS-SIP). The InterConnect interface is also compatible with many common encryption devices in use today.

High reliability: The TVCS InterConnect features a ruggedized chassis designed to withstand various extreme conditions. Port cards are hot-swappable, power supply and optional controller redundancy is also offered to ensure maximum uptime.

Scalability: The InterConnect is scalable from implementing the minimum solution (1 port card) to a fully loaded chassis. Additionally, multiple InterConnects can be connected together, providing increased capability over a wide area.

Models

TVCS InterConnect 120: The TVCS InterConnect 120 is a 4RU chassis which supports the following:

- Two controller cards and 16 port cards (with 2-4 interfaces each)
- Four T1/E1 PRI ports and 64 VoIP voice connections
- Port Card Types: 4 port radio cards, 2 port radio cards with messaging or radio control, 4 port FXS/FXO cards, 2 port GSM/CDMA cards, 2 port Magneto

- cards, and 4 port E&M cards
- Solid state recorder card
- Video encoder card, video server card
- Dual hot swappable AC power supply trays

TVCS InterConnect 40: The TVCS InterConnect 40 is a 1RU chassis which supports the following:

- Four T1/E1 PRI ports and 64 SIP VoIP connections
- Up to 16 interfaces

TVCS Omni: The TVCS Omni is a 4RU chassis which supports the following:

- Designed for Command and Control applications which enable a single operator to participate in multiple conferences and intercom calls
- Two controller cards and 16 port cards (with 2-4 interfaces each)
- Four T1/E1 PRI ports and 64 VoIP voice interface ports
- Port Card Types: 4 port radio cards, 2 port radio cards with messaging or radio control, 4 port FXS/FXO cards, 2 port GSM/CDMA cards, 2 port Magneto cards, and 4 port E&M cards
- Solid state recorder card
- Video encoder card, video server card
- Dual hot swappable AC power supply trays

TVCS InterConnect 60R: The TVCS InterConnect 60R is a ruggedized form factor which supports the following:

- Designed to fit in a variety of military vehicles
- Connects in-vehicle operators with other operators (intercom)
- Interfaces with COMSEC equipment
- Interfaces with military radios, land line phones, and field PBX in multi-party conferences

Summary

On scene commanders no longer rely on voice communications alone for situational awareness, video and data are increasingly being used to obtain precise details of an evolving situation. Modern gateways such as Cornet Technology's TVCS InterConnect must provide interoperability between these diverse communications technologies to enhance the command and control environment. The TVCS InterConnect is a hybrid gateway that combines the utility of voice conferencing gateways with the benefits of IP networks to deliver full voice, video, and data interoperability to a variety of communications devices from the command center to the field operators. IP-networked TVCS InterConnects can expand a commander's reach by providing user access to communications assets distributed over a very large area of operation. The TVCS InterConnect line of products is ideally suited to providing the interoperability needed in today's diverse communications world.

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For more information on the TVCS InterConnect and how interconnects solve interoperability problems please contact sales at sales@cornet.com or 703-658-3400.

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