



How **WAVE**[®] Works

What's Behind the Industry's Most Respected Critical Communications Platform

Twisted Pair Solution's award-winning WAVE software technology enables partners and customers to build and operate secure, highly scalable communications solutions in the world's most demanding environments. Recognizing that the best approach to solving the complexities of communications interoperability is to use standards-based software to unify diverse communications technologies, WAVE is trusted when communications is absolutely indispensable.

With a WAVE-enabled network, radio systems of all types can operate seamlessly together regardless of make, model and frequency. Analog, IP and cellular telephones can be patched in to a radio network and used as push-to-talk devices to transmit and receive radio voice traffic, and intercom systems can be used to broadcast voice communications from multiple sources and locations. Paging systems can also be harnessed to facilitate rapid message or alert distribution from non-standard sources. PCs and smartphones can be used as push-to-talk radios or as end-points for any other communications device, and existing group communications technologies such as hoot & holler systems and airport crash phones can be expanded to include new groups and ad hoc participants.

WAVE technology consists of software building blocks and development tools designed around a simple and elegant concept: convert all forms of communication to IP packets, use the network to carry those packets between endpoints, and build distributed intelligence and management capabilities at the network edge to connect the endpoints together.

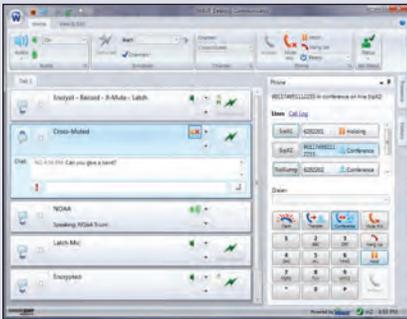
Twisted Pair's patent-pending technology converts communications from individual users' devices into group-level IP packets that can be forwarded to other devices and users. Once brought into a WAVE domain, these interoperable communication sessions are subject to management and security controls, and may be bridged, recorded, joined into conferences, or routed to devices outside of the system.

WAVE is Radio-over-IP (RoIP) software that connects any IP accessible device, including:

- Two-way radios
- PCs
- Telephones
- Mobile devices
- Satellite systems
- Broadcast systems
- Paging systems
- Intercoms
- WAVE provides an easy and cost-effective entry into RoIP by eliminating the need to understand the intricacies of IP networks or IP-based telephony
- WAVE is accepted as the gold standard for RoIP technology, having been deployed in some of the most demanding military, government and private sector applications around the world
- WAVE is compliant with the Bridging Systems Interface (BSI), a RoIP standard developed by industry with government support.
- WAVE is the only RoIP technology to be issued with a Certificate of Networkiness by the U.S. Army
- WAVE is able to expose and exploit the data functionality of modern radio systems via a user-friendly interface that can run off industry standard PC hardware
- WAVE client applications are quick to install, easy to learn and are user-friendly, enabling rapid system deployment and turn up
- The WAVE SDK enables software developers to create custom applications for any use or environment that build on the current and future capabilities of WAVE, other applications and physical communications technology



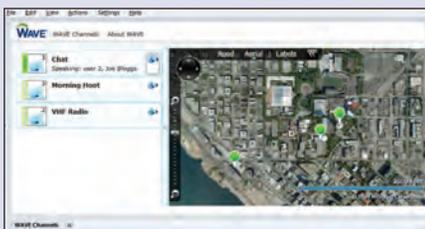
WAVE Dispatch Communicator™



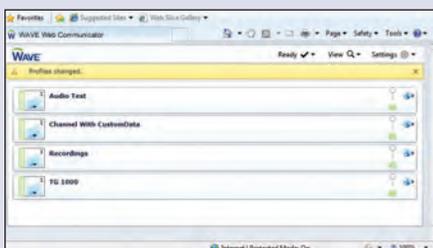
WAVE Desktop Communicator™



WAVE Mobile Communicator™



WAVE Lync Communicator™



WAVE Web Communicator™

With audio data converted into IP packets and streamed across the network, a new set of devices can directly link together and participate simply and easily in critical communications. Careful use of IP multicast, QoS, and transcoding technology minimizes network bandwidth requirements. All of your devices, endpoints, and configurations are presented in clean, understandable, and manageable user interfaces. Plus, since all WAVE systems are built from just a few modular components, you can configure them in an infinite number of ways to meet the unique requirements of your organization.

Building Your WAVE System

Every WAVE system begins with at least one WAVE Management Server, a web application that configures the system. All WAVE components are administered using the WAVE Management Server, and the collection of WAVE components controlled by a single WAVE Management Server is called a WAVE Domain.

While you must have the WAVE Management Server to setup other WAVE system components, a WAVE Domain can run as a “headless” peer-to-peer system if the WAVE Management Server is disabled for any reason. This feature improves the survivability of WAVE systems in hostile or extreme environmental situations.

Next, the WAVE Media Server acts as a media processing engine for the system, performing digitizing, mixing, and audio transcoding. The WAVE Media Server software runs as a service on any Windows PC or Linux Server. In small WAVE deployments, a PC acting as a WAVE Media Server can perform other services, acting as a print server, for example. Large installations may have multiple WAVE Media Servers, which can be spread over wide geographic areas and connected via a WAN, a VPN or the Internet. Distributed servers enhance system resiliency and enable local dial-in connections to globe-spanning WAVE conferences, or connect geographically dispersed radio transmitters for better coverage.

WAVE Dispatch Communicator is a state-of-the-art IP dispatch console system designed for critical communications dispatch applications. Dispatch Communicator provides a console operator with full dispatch functionality via an intuitive, easy-to-use desktop client running on a single, industry-standard PC.

WAVE Desktop Communicator is an intuitive PC-based application that allows office-bound and mobile workers to quickly and effectively communicate and collaborate in distributed environments. Desktop Communicator provides easy access to channels and groups, telephony, simulcast, recording and instant replay.

WAVE Mobile Communicator allows smartphone users to access Push-to-Talk (PTT) radio channels from their phones, converting devices they always carry with them into inexpensive alternatives to expensive mobile radios.

WAVE Lync Communicator extends Microsoft's Lync platform for enterprise users by adding PTT connectivity between office-based information workers and their mobile colleagues who are using two-way radios and smartphones. Every WAVE client is designed to provide intuitive, flexible, highly cost-effective solutions to improve your organization's performance while lowering your operational costs.

WAVE Web Communicator is a feature-rich web application that allows any office-based or mobile worker to monitor, transmit, and receive audio from multiple communication systems such as two-way radio networks and telephones using a browser-based application.

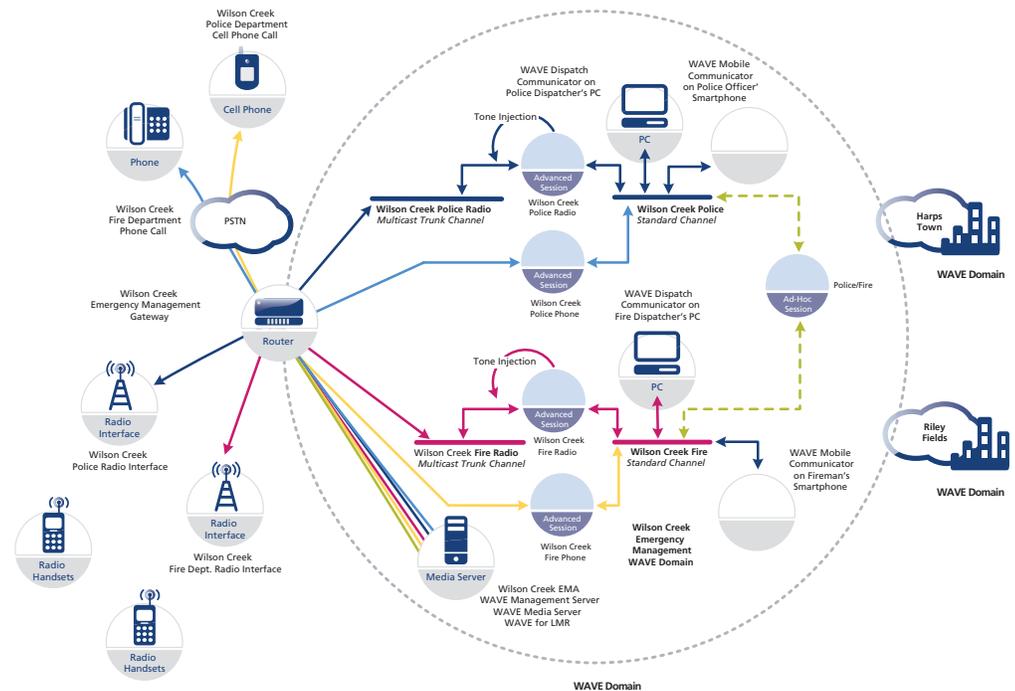
WAVE Channels are logical components used to group communications devices in the system. Channels often contain related devices, like “all the police radios” or “all the phones on the second floor.” There are several different kinds of WAVE Channels, each specialized for distinct roles. Most commonly used is the “Standard Channel,” which allows human-operated devices like phones and PC clients to participate in WAVE. “Trunk Channels” connect non-user components, such as the WAVE Media Servers and hardware gateways. Other types of Channels are used for multiplexing, IP phone paging, and various special tasks. Channels have distinct transmit and receive “ends,” identified by unique IP addresses, so they act like thoroughways for signal traffic.

WAVE Sessions join devices together in an audio conference. Sessions can be used to form tactical associations created on the fly when needed, unlike Channels, which are usually created when the system is initially configured. Sessions are very flexible and can group together different devices, entire Channels, or other Sessions. A session participant can be any type of device, including a WAVE Desktop Communicator, a two-way radio user, or a phone caller. There are several types of specialized WAVE Sessions. “Meet-Me Sessions” create simple dial-in conferences. “Group Call Sessions” create conferences by having the Media Server make outbound calls. These make a great foundation for emergency notification, intercom, or Hoot and Holler systems. “Channel Access Sessions” let dial-in telephone users connect to a WAVE Channel. “Advanced Sessions” are the most sophisticated. These can perform special tasks, like sending control tones to radios. Plus, WAVE can record, store, and playback audio for any type of Session.

Putting the Components Together

To illustrate how the components of a WAVE system work together, consider the example of the Emergency Management Authority (EMA) of the hypothetical town of Wilson Creek, Alaska. The EMA handles all police and fire communications, but as in many other municipalities, the police and fire departments have different radio systems that are unable to communicate with each other, which causes problems when they need to work together. Rather than invest in expensive new radios for all users, the town deployed a WAVE system.

With the WAVE system, police and fire communications now share the same router and network, but maintain separate dispatchers and radio channels. This is important because these organizations need to maintain their autonomy and keep using their existing radios. A single PC hosts the WAVE Management Server and WAVE Media Server. Radio traffic is digitized by the router, and then made available on two multicast trunk channels. Tone injection is configured so the dispatchers can send channel changes and high/low power signals to the tone-controlled radios.

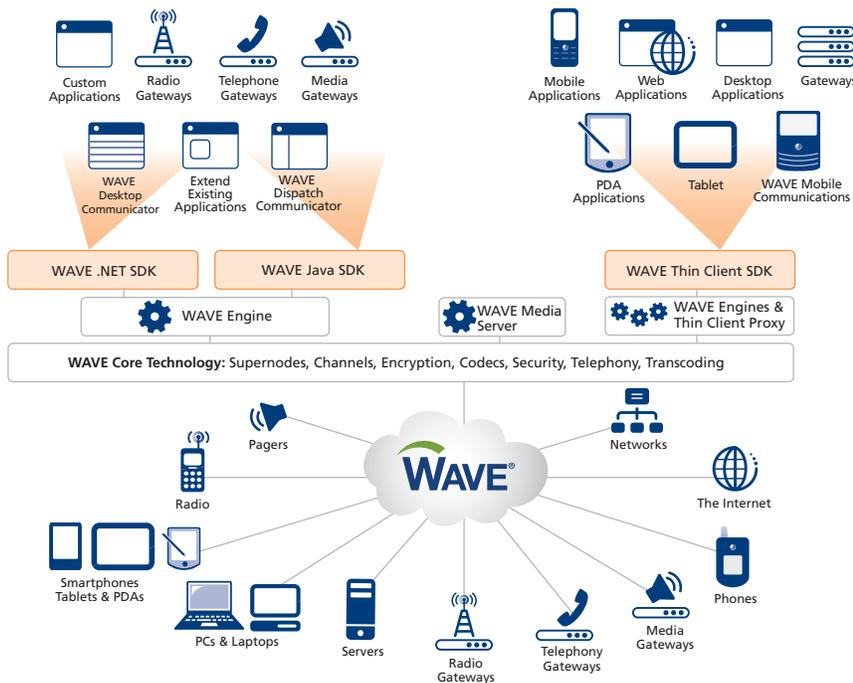


WAVE can easily send two different sets of tones to the two different radio systems. When needed, phone calls can also be digitized by the router and bridged to a radio channel. Police and fire dispatchers control their communications from PCs using the WAVE Dispatch Communicator. When the fire and police departments need to communicate on a major incident, either dispatcher can bridge radio channels in seconds by creating an ad-hoc session. The communications remain bridged as long as needed, and then normal operations can be restored just as easily. The two departments can talk when needed without changing radios or installing new gear in their mobile units, and the dispatchers retain control over their own department’s communications.

WAVE SDK

The WAVE Software Development Kit (SDK) gives you access to the innovative WAVE Engine so you can build advanced Radio-over-IP (RoIP) applications. It helps you extend the power and reach of your existing communications hardware and software products, or create something truly new and distinctive that will remove technology barriers so your organization can better communicate.

With a WAVE-enabled solution, users can speak on channels, record and play back instant-replay audio, connect to microphone and speaker devices, make and receive VoIP phone calls, send text messages, and see who is speaking, typing or calling. In any of these scenarios, specialized WAVE-powered applications provide unique and compelling differentiation typically not available through a pre-packaged offering.



WAVE CORE FUNCTIONALITY

Operating Systems

- Windows XP/Vista/Win7
- Windows Server 2003/2008
- Redhat Enterprise Linux 5.1
- Includes support for 64-bit operating systems

IP Telephony

- SIP and H.323

IP PBXs

- Asterisk
- Avaya Communications Manager
- Cisco Integrated Services Router (ISR)
- Cisco Call Manager and Call Manager Express
- Cisco CUCM 7
- Nortel BCM and CS 1000
- SIPx 3

Radio Gateways

- By-Light TRICS
- C4i RIU
- Cisco 2800 Series Router E&M
- Dialogic DMG4000
- JPS NXU-2 / ACU-1000
- NICS RAVIN Audio Gateway
- Telex IP-223 / NI-223
- Voice Interop AM 360

Embedded UC Integration

- Adobe Connect
- IBM Sametime
- Microsoft OCS 2007

SDK APIs

- .NET 2.0 / 3.5 SP1
- Java JRE 1.6.0

Supported Smartphone Devices

- BlackBerry® Torch™ 9800
- BlackBerry® Bold 9000¹
- BlackBerry® Tour 9600¹
- Windows Smartphone²

¹ RIM OS 4.6/4.7

² Windows Mobile 6.0/6.1/6.5 Professional/Touch
Windows Mobile 6.0/6.1/6.5 Standard/Smartphone
Windows CE 5.0

ABOUT WAVE

WAVE software empowers your mobile workforce with critical communication applications for secure, real-time collaboration anywhere on any device built upon a battle-tested communications interoperability platform that delivers voice, video, location, presence and other forms of data deployed as an enterprise product or cloud based service throughout commercial, public sector and defense organizations worldwide. Proven in thousands of the most complex deployments around the world, WAVE helps you integrate and control a truly unified communications system so that office-based and mobile workers can simply talk, make decisions and act. WAVE has a Certificate of Networkability from the U.S. Army and is on the NATO Approved Fielded Products List.

© Copyright 2011 Twisted Pair Solutions, Inc. WAVE is a registered trade mark of Twisted Pair Solutions, Inc. Wide Area Voice Environment, WAVE Desktop Communicator, WAVE Dispatch Communicator, WAVE Mobile Communicator and WAVE IP Phone Client are all trademarks Twisted Pair Solutions, Inc. All other trademarks mentioned in this document are the property of their respective owners. All rights reserved. Specifications are subject to change without notice.

Let's Talk

If you've got a MOTOTRBO radio system, we're ready to prove how WAVE can extend its dispatch capabilities.

twistpair.com
info@twistpair.com
+1 (206) 442-2101

CORPORATE HEADQUARTERS

3131 Elliott Avenue
Suite 200
Seattle, WA 98121 USA
(T) +1.206.442.2101
(F) +1.206.812.0737
(E) sales@twistpair.com

EMEA

Davidson House
Forbury Square
Reading, RG1 3EU
(T) +44.118.900.1110
(F) +44.118.900.1111
(E) sales.emea@twistpair.com

APAC

2 St Peters St
Glenelg East, Adelaide
South Australia, 5045
(T) +61.(08).8376.5905
(F) +61.(08).8125.6570
(E) sales.apac@twistpair.com