RoIP Versus VoIP Solutions

Purpose

This document highlights solution sets, which exist in today's requirements related to RoIP, **R**adio **O**ver **I**nternet **P**rotocol technology. This paper will outline the differences between VoIP and RoIP as seen by our communications users, and direct the reader to a valid path to success in identifying RoIP requirements.

Introduction

RoIP is an upper level technology of the more common term, VoIP (**V**oice **O**ver **I**nternet **P**rotocol). VoIP provides the Internet vehicle for moving voice audio from point-to-point via the Internet. There are many low cost providers of VoIP, as the only requirement is to carry voice from point-to-point. See Figure 1: VoIP Block Diagram below.

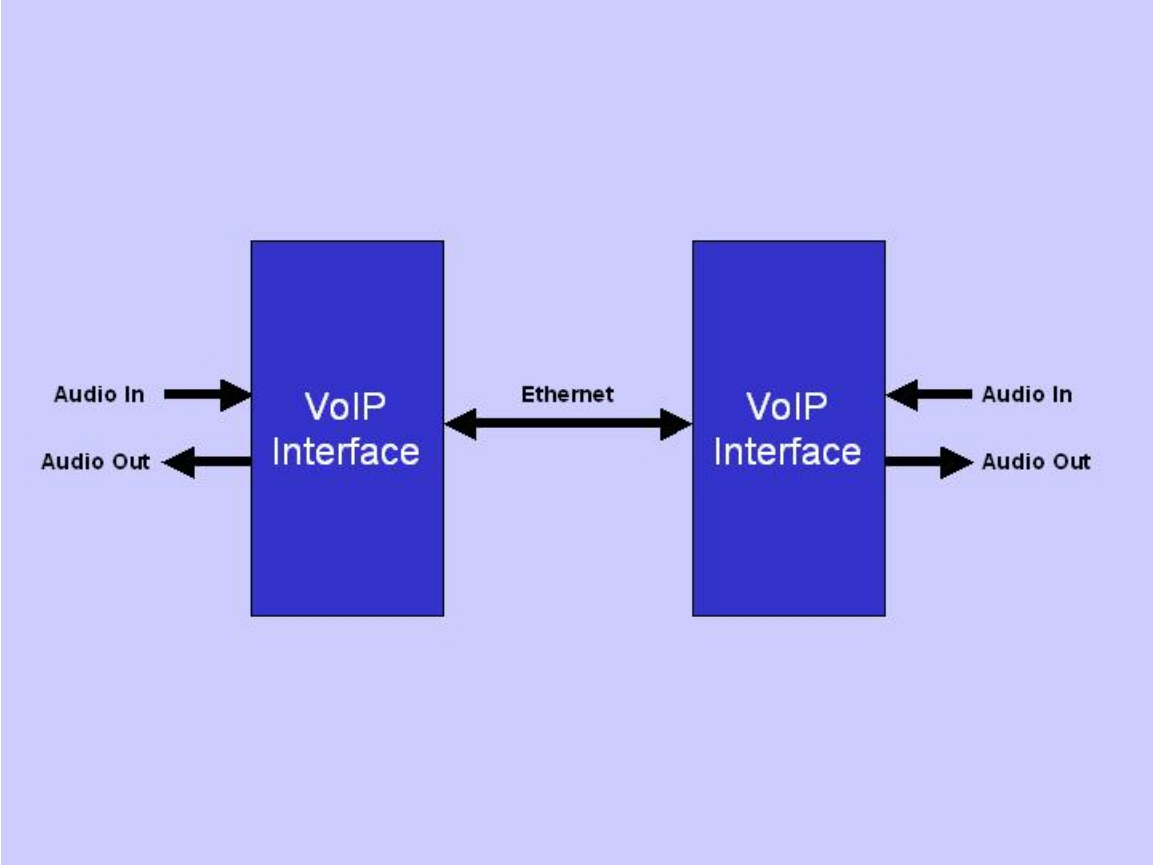

Figure 1: VoIP Block Diagram

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VoIP technology works extremely well for basic audio communications, but lacks in fundamentals when attempting to transfer radio communications from point-to-point. When utilizing radio audio, there are requirements above basic VoIP, which must be taken into consideration. See Figure 2: RoIP Block Diagram.

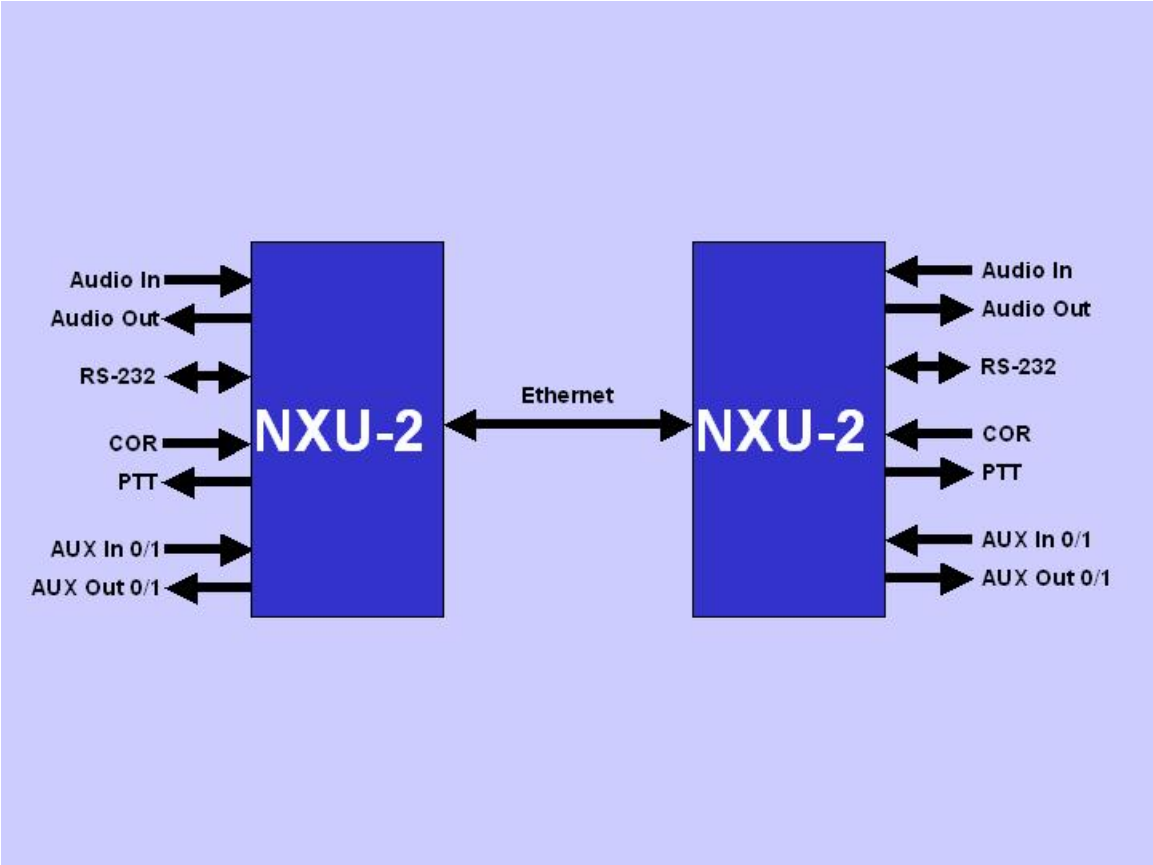

Figure 2: RoIP Block Diagram

There are two signals required to control devices and send audio to and from radios. The two signals are **PTT** (**P**ush-**T**o-**T**alk) and **COR** (**C**arrier **O**perated **R**elay.)

- **PTT**

  This function is required by a radio when the user wishes for the audio to travel out via the radio and over the air to a distant radio user. The user pushing the PTT button on the side of the radio microphone to speak achieves PTT on a hand held radio. The button push keys the radio and allows the voice audio to travel via radio waves to the distant end-user radio. Any time voice audio travels from a radio over the air, that radio must receive the PTT to allow transmission of the audio. All radios have either a PTT button on the microphone, or a PTT input on its input/output connectors for external equipment usage.

- **COR**

  This function allows a device connected to a radio, to have prior knowledge the receive signal is coming from the radio. Most radios do not have a COR output. When a COR output is not available, the device connected to the radio must have the ability to create the COR. Creating COR for a radio, which does not supply COR, can be done by using

VOX (**V**oice **O**perated **X**mit) detection. The device receiving the radios voice signal must use VOX and audio delay to successfully key and forward the audio.

- **VOX**

  The VOX algorithm will signal COR present whenever the incoming audio exceeds a set threshold. The signal can be tones, voice or noise, and the threshold can be varied for different conditions.

These two requirements, PTT and COR, are a step above the standard VOIP technologies; it requires a technology capable of providing a means to transport PTT and COR, while traveling the Internet with the VOIP, or voice audio.

Requirement

If you have any of the following requirements, please refer to the solutions section of this White Paper.

- Console to Radio requirements
- Radio to Radio requirements
- Replacement of phone lines for Radio to Radio or Console to Radio requirements
- Repeater to Repeater requirements
- Repeater to Radio requirements
- Console to Console requirements
- Most any 4-wire audio to 4-wire audio requiring signaling

Solutions

Solutions to all bullets listed under Requirement can be addressed by one product, the NXU (Network Extension Unit) manufactured by Raytheon. Related White Papers and Application Notes may be obtained from the dealer network, directly from the Sales department or from http://www.raytheon.com,

The NXU is intended for use with radio communications consoles, communications radios, and Raytheon products such as the ACU-1000 Interconnect Unit. A general-purpose stand-alone device interfaces full duplex audio, one RS-232 port, and three status bits onto an Ethernet network. A pair of NXUs can form a simple system that creates a transparent communications link between the two. The NXU at one end (usually the equipment end) is the *server*; the one at the other end (usually the operator end) is the *client*. The audio, RS-232, and status bits are transparently transferred between the server and the client.

See Figure 3: Simple NXU Radio System below illustrates a basic NXU application in which a communications transceiver is connected via a network to a remote audio console. The transmit/receive audio and PTT/COR signals are transported digitally across the network and appear at the other end. The network data transfer is transparent to the user, and the operator at the audio console can use the radio as if it were located right beside him.

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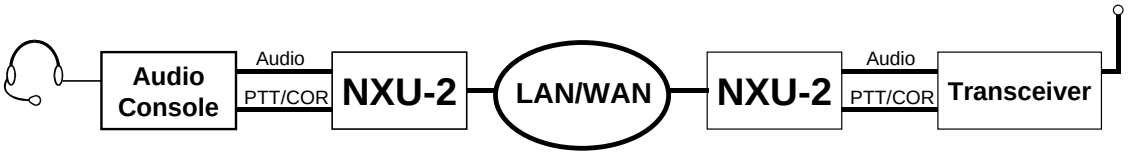

Figure 3: Simple NXU Radio System

Conclusions

In conclusion, VoIP technology is changing our lives, but it does have limitations. When attempting to transfer radio, console, or any audio requiring the use of COR and PTT, it requires equipment specifically designed for those tasks.

Acronyms

COR: Carrier Operated Relay - A receiver signal that gives a positive indication a carrier or signal is being received and the receiver is unsquelched. Same as COS.

Key: To key a transmitter means to cause it to transmit.

PTT: Push-to-Talk. An active PTT signal causes a transmitter to key.

RoIP: **R**adio **O**ver **I**nternet **P**rotocol – A method of sending voice audio and COR/PTT commands over the Internet. Commonly used by companies to simplify routing radio communications over the Internet.

VoIP: **V**oice **O**ver **I**nternet **P**rotocol – A method of sending Voice signals over the Internet. Commonly used by VoIP phones and many other Internet voice programs. No COR/PTT commands are required.

RX: Receiver or Receiving.

TX: Transmit or Transmitter.

VMR: **V**oice **M**odulation **R**ecognition. A type of squelch, which is activated only by spoken words and not by tones, noise, or other audio information.

VOX: **V**oice **O**perated **X**mit (Transmit). A circuit or algorithm, which causes a transmitter to key or some other action when voice is present. This squelch type is activated by any audio signal, and is not restricted to voice only.

References

Handbook of Patchwork Interoperability, Michael W. Cox, Raytheon, Revision 2.2, September 2004.

NXU Installation and Operation Manual, P/N 5000-600200, Revision 3.1, Raytheon

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