Radio Bridge User Guide

Advanced Simulation Technology inc.

Contents

The Voisus Radio Bridge performs two major functions:

- **Voice Rx/Tx:** Connect real radios to your network and stream live, over-the-air traffic to and from Voisus operators and the DIS network.

- **Remote Control:** Remotely control live radios over the network.

1   Voice Rx/Tx

ASTi's Voice Rx/Tx connects live and simulated training environments, distributing live, over-the-air voice traffic via data networks. It is officially supported for the following radio transceivers (RTs):

Description	Model
SINCGARS, SIP	RT–1523C/D
SINCGARS, ASIP	RT–1523E/F
Falcon II	PRC–117
Multiband Inter/Intra Team Radio (MBITR), JTRS Enhanced MBITR (JEM)	PRC–148
LOS Transceiver	URC–200

Other radio types are supported by manually configuring In Gain, In Threshold, Out Gain, and Rx Delay. ASTi recommends that manual configurations are done with ASTi support to ensure optimal performance.

1.1   Features

- **Radio Re-Transmission**

Extend live radio communications among distant sites through data networks.
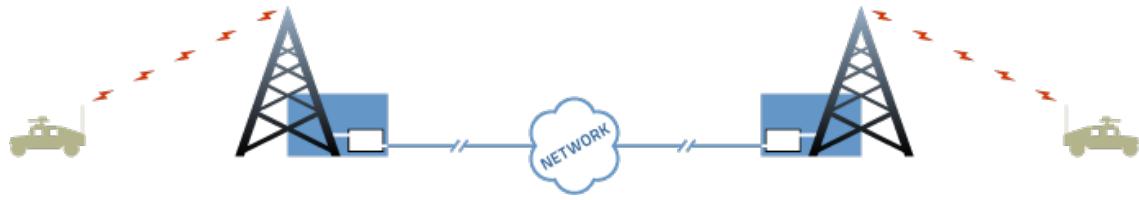
- **Radio Interoperability**

  Bridge incompatible radio systems and join multiple radio nets into conferences.


- **Flexibility**

  Combine a wide variety of live and simulated radios.
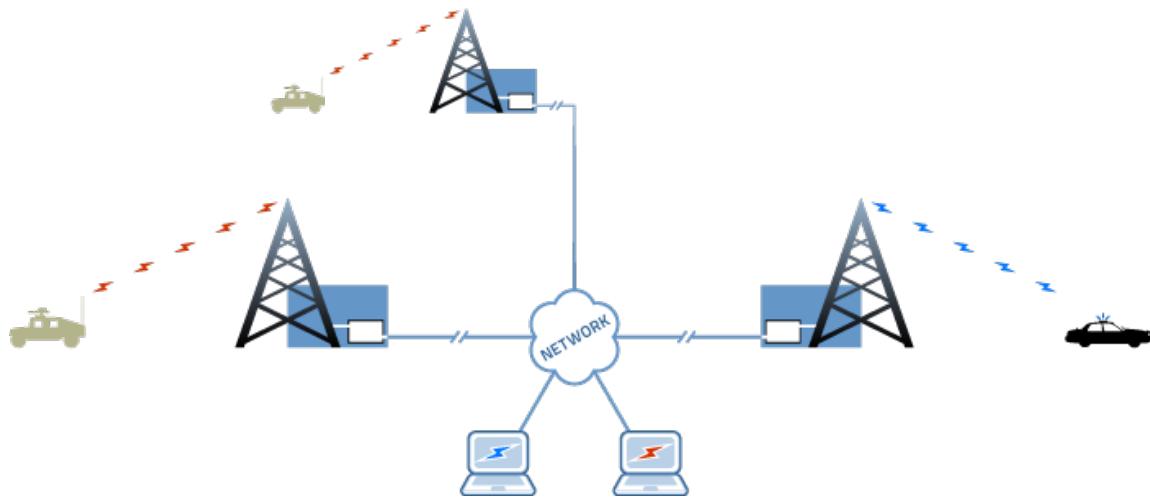
1.2   System Architecture

Live base radios connect to ACE-RIUs or AI-S (ASTi Interface - Single) devices, linking the live radios to the simulated training environment over the network.

Voisus Software Client on Customer PC
PTT

Voisus Hardware Client via the AI-S device
PTT   AI-S

Voisus Hardware Clients via the ACE-RIU
ACE-RIU
Handheld
Terminal
(HHT)

Voisus Server

ACENet

DIS

To Remote Sites:
DIS connection to radio simulations
(Live, Virtual, Constructive, Gaming)

Ethernet
Switch   NETGEAR

ACE-RIU   **Live Base Radios**

URC-200

PRC-117

Live Field Radios

4
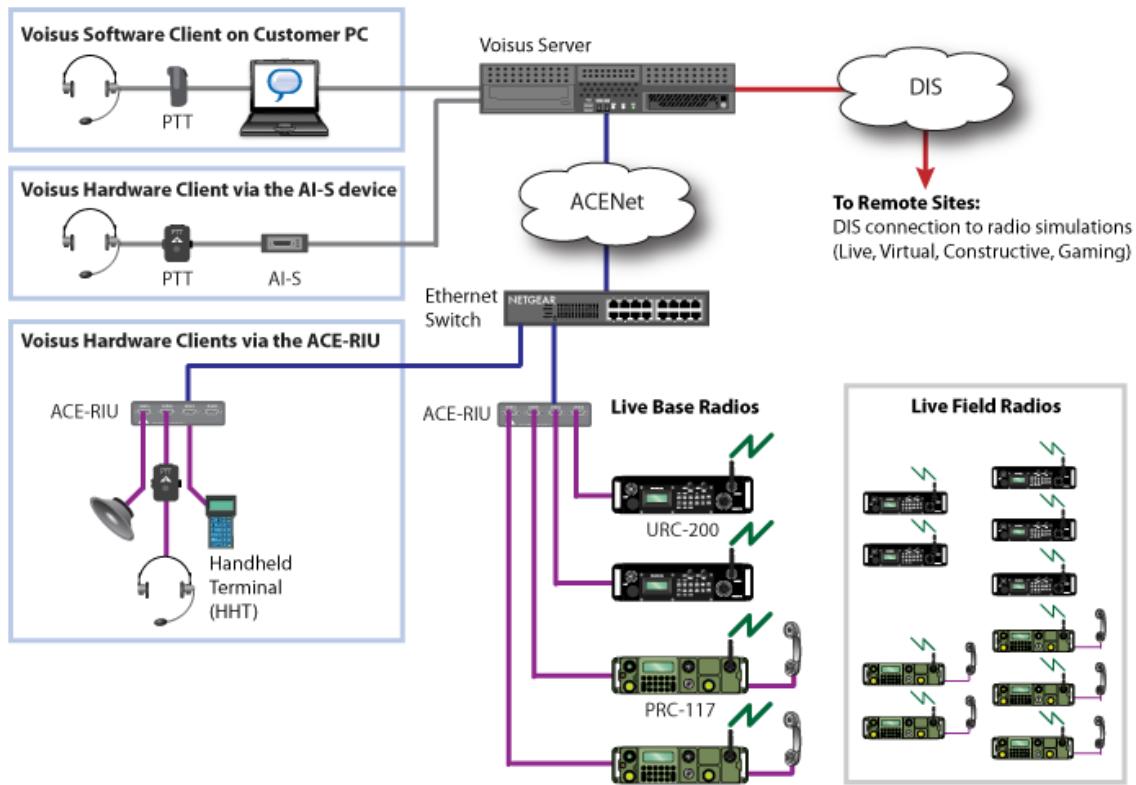
1.3 How Voice Rx/Tx Works
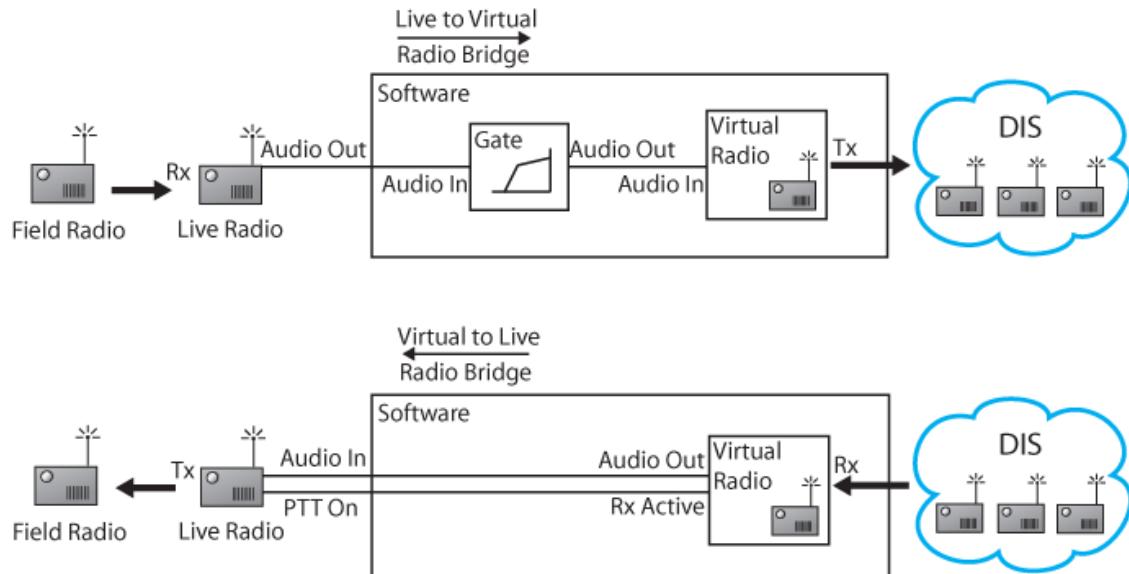
Live-to-Virtual

The live radio audio is digitized and sent through a software gate. The gate (or noise gate) controls the volume of the live radio signal by silencing the signal below a certain threshold value. This value is chosen such that when the live radio is idle the radio audio will fall below the threshold, and when it is actively receiving the audio will rise above the threshold. This way, the gate output will only be active when the live radio is actively receiving.

The gate output audio is then sent to a virtual radio, effectively relaying the live radio audio. When the live radio is actively receiving, the virtual radio will be actively transmitting and relaying the live radio audio.

Virtual-to-Live

When the virtual radio starts receiving a trasmission from another virtual radio, it sends the receive audio to the live radio. Along with the audio, a discrete signal is sent to activate the live radio's PTT. This way the live radio starts actively transmitting the audio received by the virtual radio.

Transitioning between Live-to-Virtual and Virtual-to-Live

Transitions between transmit states occur after a period of measured inactivity. If a live radio is sensed as actively receiving, it must cease receiving before it can transmit. Likewise, if a virtual radio is actively receiving, it must cease receiving before it can transmit.

5

1.4   Setup

Step 1: Live Radio Installation

Follow the steps below to install and configure the live base radios and live field radios. The live base radios are the radios that are connected to ACE-RIUs and AI-S devices. The live field radios are the remote radios out in the field.

1. **Configure Base Radio Settings**

   Configure the following settings on the live base radio.

Setting	SINCGARS RT–1523C/D	SINCGARS RT–1523E/F	PRC–117	PRC–148*	URC–200
Volume	Max (Full CW)	9	9	4	Max (Full CW)
Mic Gain	Whisper = OFF	Whisper = OFF	N/A	Mic Lvl = High	N/A
Squelch	ON	ON	ON	ON	ON
Model	SC or FH	SC or FH	SC or FH	SC or FH	SC or FH
COM-SEC	PT or CT	PT or CT	PT or CT	PT or CT	PT or CT

   *Additional configuration for the PRC–148:

   - MODE /Audio Path = TOP AUDIO. Disconnect the PRC–148 from the ACE-RIU before switching the Audio Path to TOP AUDIO. "Hot switching" the radio's audio path may cause the ACE-RIU to go offline, requiring system reboot.

2. **Connect Base Radio to ACE-RIU or AI-S Device**

   Connect the base radio's handset connection point to an ACE-RIU or AI-S device with the appropriate cable:

Device	ASTi cable
ACE-RIU	CA-D9M-NC6M–25-C
AI-S	CA-D15M-NC6M–25-C

   Ensure that the ACE-RIU or AI-S device is connected to the Voisus server through the network.

3. **Configure SC Frequencies and RH Net Settings**

   Configure unique SC frequencies or FH net settings for each base radio. These settings must be unique to ensure proper system performance.

4. **MODE-FH and COMSEC-CT**

If MODE-FH or COMSEC-CT settings are selected on any of the radio nets, follow the proper procedures for loading the FH Data or COMSEC Keys into the base and field radios. Refer to the radio's manual for fill procedure details.

5. **Set Transmit Power**

Ideally, the base radio should be installed so that a high fidelity radio link with field radios is established using LOW transmit power on the base radio. OE–254 (tower) antennas are highly recommended for increasing ranges, improving RF link fidelity and greatly reducing the chance of RFI.

The base radio may be set to MEDIUM transmit power, but the possibility of Radio Frequency Interference (RFI) between the base radio and the ASTi system is increased. If system malfunctions occur (such as spurious transmissions or increased audio noise), re-establish the base radio to field radio links using LOW power.

Base radios should not use HIGH transmit power. RFI will occur between the base radios and the ASTi system.

6. **Configure Field Radios**

Configure the nets on field radios with MODE and COMSEC panel settings that match the corresponding nets on the base radios.

7. **Perform Standard Radio Check**

The final step in the live radio installation procedure is to perform a standard radio check between each set of base and field radios as part of the system operational checkout.

Step 2: Configure Hardware

1. Using the Voisus web interface, open the Radio Bridge App and navigate to Configure > Hardware.

2. Locate the ACE-RIU or AI-S device that the base radio is connected to. Devices are listed by MAC address.

3. Name the Channel Identifier associated with the base radio. On the ACE-RIU, this is the channel the radio is connected to. For the AI-S, which has only one channel, this is the name of the whole device.

Step 3: Scenario Management

1. Navigate to Configure > Scenarios > View All.

2. Create a new Scenario. If desired, use the RadioBridge4 or RadioBridge8 example scenario, which are preconfigured with eight nets.

3. Run the Scenario and open it.

Step 4: Comm Plan

If necessary, edit the net names, frequencies, waveforms, and other parameters to match the virtual radio nets that the live radios will bridge to.

Step 5: DIS Settings

Configure the DIS Settings for your specific exercise.

Step 6: Voice Rx/Tx

On the Voice Rx/Tx page you will map the live radio's Channel Identifier to a Virtual Net. The Channel Identifier is the name of the channel on an ACE-RIU or AI-S device that the live radio

is connected to. The Virtual Net enables communication between the live radio and virtual radios over the network.
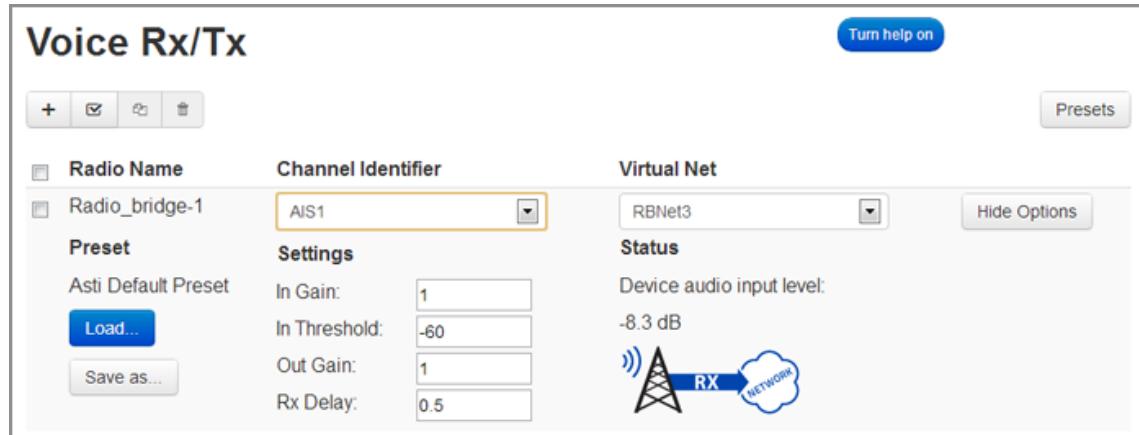
Add a Live Radio

1. Click the "+" button to add a new live radio.

2. Click to radio name to edit it.

3. Use the drop-down menu to select the Channel Identifier associated with the live radio. Channel Identifiers are named on the Configure > Hardware page.

4. Select a Virtual Net for communication between the live radio and virtual radios.

5. The live radio will now be able to communicate with simulated radios using the same Virtual Net.

Advanced Configuration

The Show Options button displays advanced settings that can be used to fine-tune the audio characteristics of the live radio interface. In most cases, with a standard, supported live radio, these parameters should not need to be modified.

- **Presets:** If changes are made to the settings, use the "Save As..." button to save them for future use. The "Load..." button loads presets saved to your server.

- **Settings:** Fine-tune the audio characteristics of the live radio interface.

    - **In Gain:** A gain multiplier applied to live radio receive audio. This gain is applied before the audio gets to the detection logic (see In Threshold, below). A larger value results in network operators receiving live radio audio at a higher level.

    - **In Threshold:** A value in dB used as a threshold for detecting receive audio from the live radio.

9

- **Out Gain:** A gain multiplier applied to live radio transmit audio. A larger value results in live radio operators (for example, in the field) receiving transmissions from network operators at a higher level.

- **Rx Delay:** A delay value in seconds used to prevent spurious live radio re-transmissions ("chatter") that can occur with certain radio types. This is sometimes referred to as "hang time" or "drop out delay". In most cases, this value does not need to be adjusted.

- **Status:** View Rx/Tx status for live-to-virtual communications.

2 Remote Control

ASTi's Remote Radio Control has the ability to control live MIL radio assets remotely via the Voisus web interface. Live radios can be located in the same room or in a facility miles away. Radio configuration is performed quickly and conveniently over the network from any computer with a suitable web browser. Changes can be made on the fly without interruption to training and while monitoring the radio state to ensure that radios are operating properly and in the correct configuration.

2.1 Compatibility

Remote Radio Control is currently available for the following radios:

- URC–200

- PRC–117F

- PRC–117G

Contact ASTi to inquire about other live radios.

2.2 Equipment

The following equipment is needed for Remote Radio Control:

Hardware

- Voisus Server

- ACE-RIU (remote interface unit for audio input/output) or AI-S device (ASTi Interface - Single)

| Live Radio	ASTi cable
URC–200	CA-MS3116-D9M-L-B
PRC–117F	CA-D9M-MC2127-L-A
PRC–117G	CA-D9M–32J3F-L-A

Cables and Converters

- **Serial Data Cable:** connectes the live radio to the Serial Data Converter (below).

- **Serial Data Converter:** a compact module that converts serial data protocol from radio RS–232 to RIU RS–422. It is powered through the serial data line.

  Part Number: SDCM–01

- **Modular Data Cable:** connects the Serial Data Converter to the ACE-RIU serial data port.

  Part Number: CA-RJ12-RJ12

2.3   Setup

Step 1: Connect the Live Radio to an Audio Distribution Device

1. Using the Cables and Converters (section 2.2) described above, connect the live radio to an ACE-RIU or AI-S Device.

   The example below illustrates the cabling configuration for the URC–200.

To URC-200 ← ① ② ③ ④ **To ACE-RIU**

KEY

① URC-200 J2 Jack
X-Mode 26-pin MIL

② ASTi Serial Data Cable

③ Serial Data Converter

④ Modular Data Cable
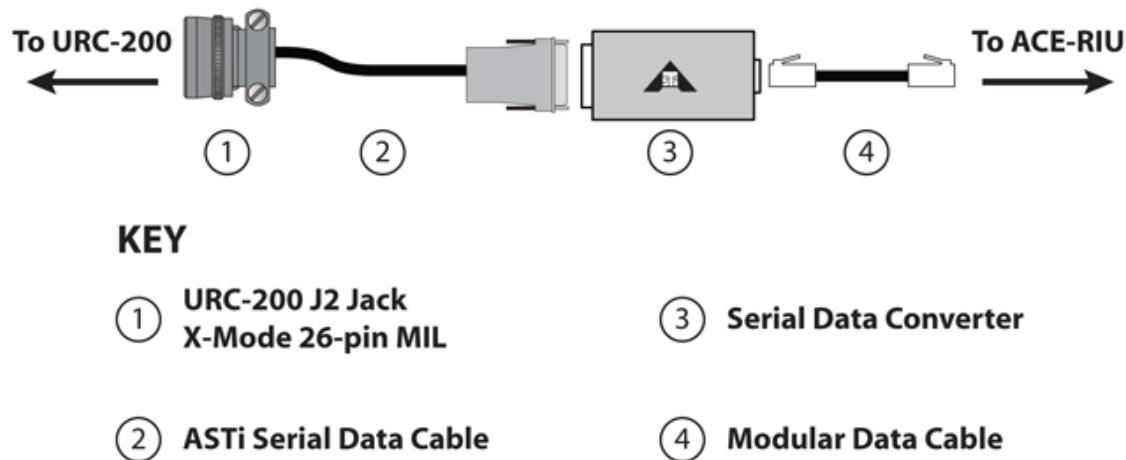
2. Connect the ACE-RIU or AI-S device to the Voisus server through the network.

11

Step 2: Configure the Live Radio

1. Activate the live radio and fill or preset the nets.

2. The PRC–117F and PRC–117G require the following serial port configuration:

   PRC–117F Serial Port Configuration

   Use the KDU to access the specific menu items:

   PGM > PORTS > REMOTE > DATA PORT

Field	Setting
ASYNCH RATE	19.2K
DATA BITS	8
PARITY	NONE
STOP BITS	1
FLOW CONTROL	NONE
ASYNCH ECHO	ON

   PRC–117G Serial Port Configuration

   PGM > RADIO CONFIG > GENERAL CONFIG > PORT CONFIG

Field	Setting
Port J3	ASCII
Baudrate	19200
Character Length	8
Parity	NONE
Stop Bits	1

Step 3: Configure Hardware

1. Using a web browser on the same network as the Voisus server, log in to the Voisus web interface.

2. Open the Radio Bridge App and navigate to Configure > Hardware.

3. Locate the ACE-RIU or AI-S device that the live radio is connected to. Devices are listed by MAC address.

4. Name the Channel Identifier associated with the live radio. On the ACE-RIU, this is the serial port the radio is connected to. For the AI-S, which has only one channel, this is the name of the whole device.

Step 4: Scenario Management

1. Navigate to Configure > Scenarios > View All.

2. Run an existing Scenario or create a new one and open it. If the sole purpose of your Scenario is to remotely control radios, the Comm Plan and DIS Settings are not required.

Step 5: Radio Remote Control

1. Open Remote Control via the "Remote Ctrl" button.

2. Click the "+" button and select the live radio type from the drop-down menu.

3. Click the radio's name to edit it.

4. Use the drop-down menu to select the Channel Identifier associated with the live radio. Channel Identifiers are named on the Configure Hardware page.

5. Click the "Enable" button to initiate remote control. While remote control is enabled, the keypad on the live radio will be locked. To unlock the live radio, disable remote control.

6. Click the "Turn help on" button to view specific information regarding remote control for your specific radio. For specific questions regarding parameters and ranges, reference the live radio's user manual.