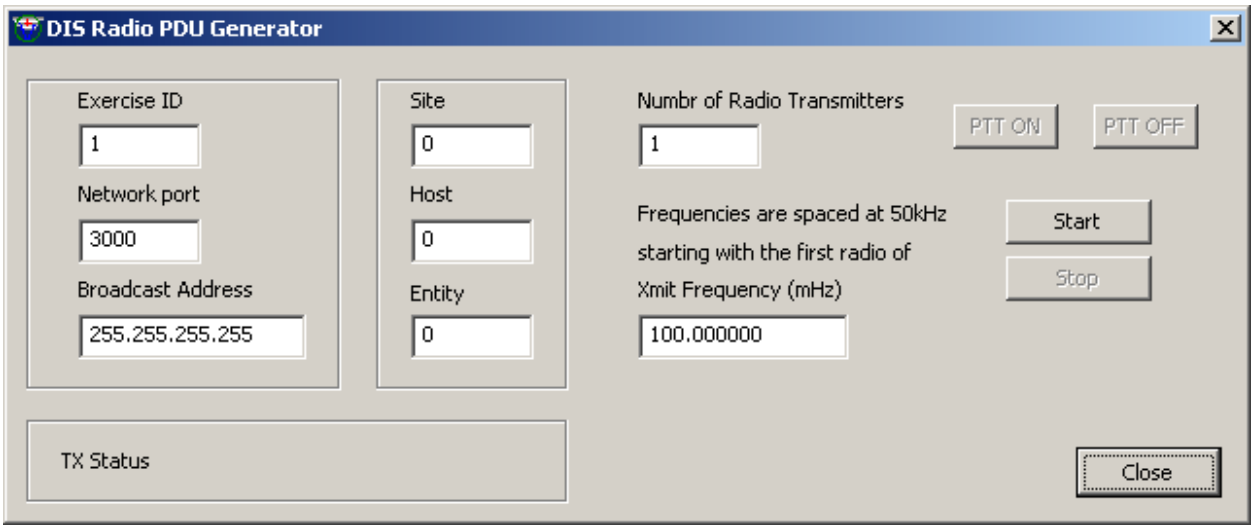
Radio PDU Generator
USER'S MANUAL



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1 Revision History

Ensure you have the latest release of this document before relying on this information.

Version	Revision	Date
1.0	Initial Release	July 19, 2004
1.1	Corrected misc, and added explanations	July 20, 2004
1.2	Updated to show that SIGNAL PDUs can be generated under certain unusual conditions.	May 1, 2006

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1.1 Before Reading This Document

The reader should be familiar with the Department of Defenses DIS (Distributed Interactive Simulation) network. Protocol.

1.2 Terms And Acronyms

CPU	Central Processing Unit
DIS	Distributed Interactive Simulation
HLA	High Level Architecture
DLL	Direct Linking Library
DOS	Disk Operating System
DSP	Digital Signal Processor
I/O	Input/Output
ISA	Industry Standard Architecture
PTT	Push-To-Talk
SNR	Signal to Noise Ratio
Z	Impedance
VOX	Voice Operated Relay
DSP	Digital Signal Processor

INTRODUCTION

DIS is a government/industry initiative to define an infrastructure for linking simulations of various types at multiple locations to create realistic, complex, virtual worlds for the simulation of highly interactive activities. Part of the DIS protocol deals with radio simulation, so that multiple simulations can communicate via simulated radios and intercoms. This tool allows a user to produce simulated radios on the network that conform to the DIS specification, IEEE-1278.1a 1998.

To date, there a many government installations using DIS, in particular, to conduct military exercises using multiple simulators, simulated radio communications gear, etc.

The Radio PDU Generator is a software tool for generating large numbers of transmitter and signal PDUs for testing purposes. Some military exercises can contain over 500 radio entities on the network, and the tools provides a means to load these networks during testing to determine if DIS radio equipment can operate under load. The reader therefore, must be familiar with the protocol and the equipment under test.

The radios that are generated by this tool generate an 800 Hertz tone, and therefore can be used to diagnose radio receiver problems.

This tools is for simulating network loads, not for diagnosing radio receiver problems. In fact there is little need for monitoring this tools radio transmitters, since it is only a tone, and the audio sample rates and compression schemes are fixed.

INSTALLATION

This software is normally distributed free of charge with SimPhonics other software tools and systems used for DIS radio simulation.

There is only one file needed for operation of this software, RadioPDUGen.exe. This file is distributed with VComm, SimPhonics DIS/HLA voice networking software add-on the V+, a visual programming system from SimPhonics used for creating audio systems for simulation.

SimPhonics also distributes this software separately from SimPhonics main web site at www.simphonics.com. The exact URL for the download may change over time, but is currently located at:

Radio PDU Generator runs on Microsoft Windows 2000 and XP and later operating systems.

If the software was obtained as part of V+, the file will be located at c:\program files\vplus\. If this file is downloaded and installed separately, copy it to this location, creating the necessary folders if they are not already present. If the file is already present, overwrite it only if it is a newer date or version.

THEORY OF OPERATION

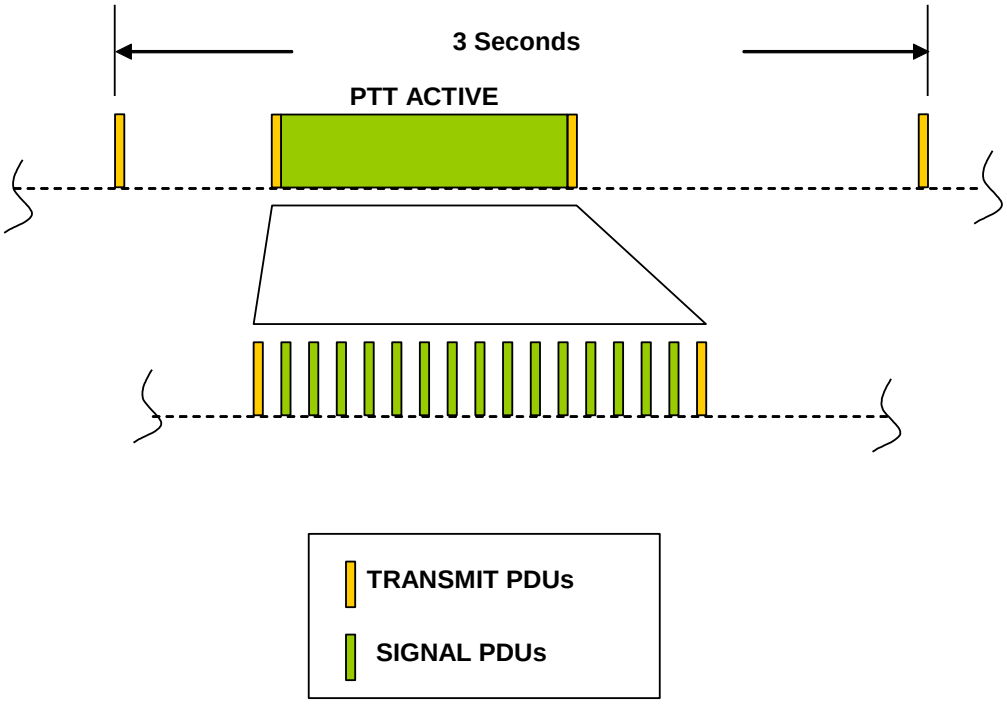
The Radio PDU Generator is a simple dialog based software application that generates both transmitter and signal PDUs depending on the configuration and user settings.

The user can configure the system to simulate one or more radios on the network at one time. DIS radios are represented on the network as a transmitter PDU and a signal PDU. The transmitter PDU carries information about the simulated transmitter while the signal PDU carries the actual data for the audio being transmitted by the radio.

Transmit PDUs are sent out at regular intervals while the signal PDUs are only sent when audio data is being sent, such as when the PTT is active. Transmitter PDUs are sent once every three seconds per radio, while signal PDUs are sent at roughly 16 times per second per radio. The amount and timing of signal PDUs are dependant on the audio compression scheme and sample rate. Other radios may send data at different rates.

A transmit PDU is also generated at the beginning of the signal PDU sequence. (On inactive to active PTT transitions)

The figure below shows a typical section of network time, where a single radio is present, with a transmission lasting for about a second is shown.



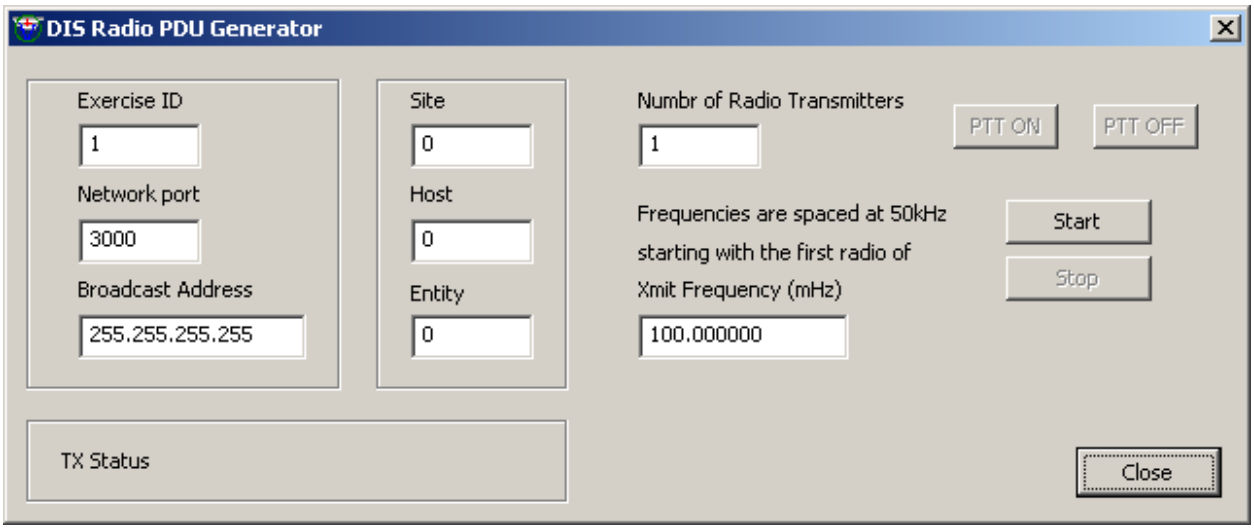
The Radio PDU Generator application generates radio and signal PDUs with the following audio characteristics:

Compression Scheme:	**16 Bit PCM**
Sample Rate:	**8,000 Hz**
Number of Samples Per Signal PDU:	**480**

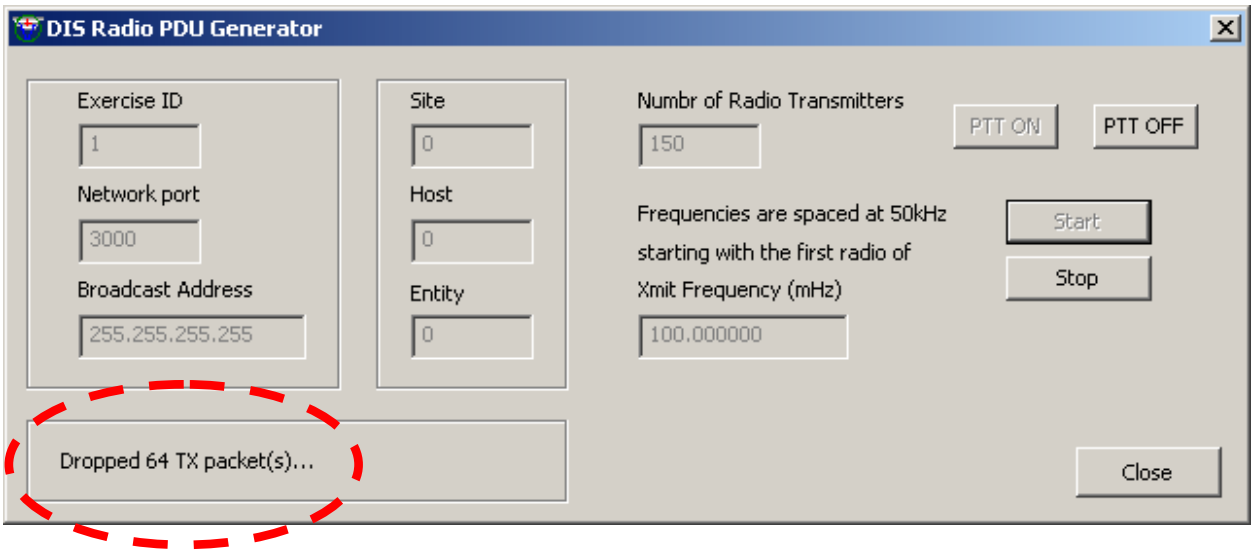
Transmitter and antenna location is 0,0,0. The audio is a pure sine wave at 800 Hertz. Further details of the signal and transmit PDU data is shown at the end of this document.

USING THE GENERATOR

The Radio PDU Generator is a simple dialog based software application. All of the user controls are shown in the screen shot below. Multiple instances may be used at the same time to achieve different combinations of signal and transmit PDUs.



There is a limit to the number of transmit and signal PDUs that this system can generate. This is dependant on the network speed, computer speed, etc. A Pentium 4, 2.2gHtz machine on a 100mb network can generate approximately 130 to 140 radios while transmitting before packet loss begins to occur. The bottom left corner of the dialog box indicates when transmission loss begins to occur.



Remember that this system is for network load testing and not DIS audio equipment diagnostics.

NETWORK SETTINGS AND OPERATION

The default network port is 3000, and the default broadcast address is “255.255.255.255”, or all addresses. This is known as broadcast mode. Other modes are available including multicast mode by setting different broadcast addresses. There are three modes that can be setup using the “Broadcast Address” settings.

BROADCAST

Set the Broadcast Address to 255.255.255.255. This sends packets to all address on the network. Most routers keep these type of packets from going past router boundaries, and therefore usually remain within the local network. However use caution when using broadcast mode, since network administrators may be looking for you after using this mode.

UNICAST

Set the Broadcast Address to a specific IP address, such as 192.168.1.121. This sends the packet to a single IP address on the network.

MULTICAST

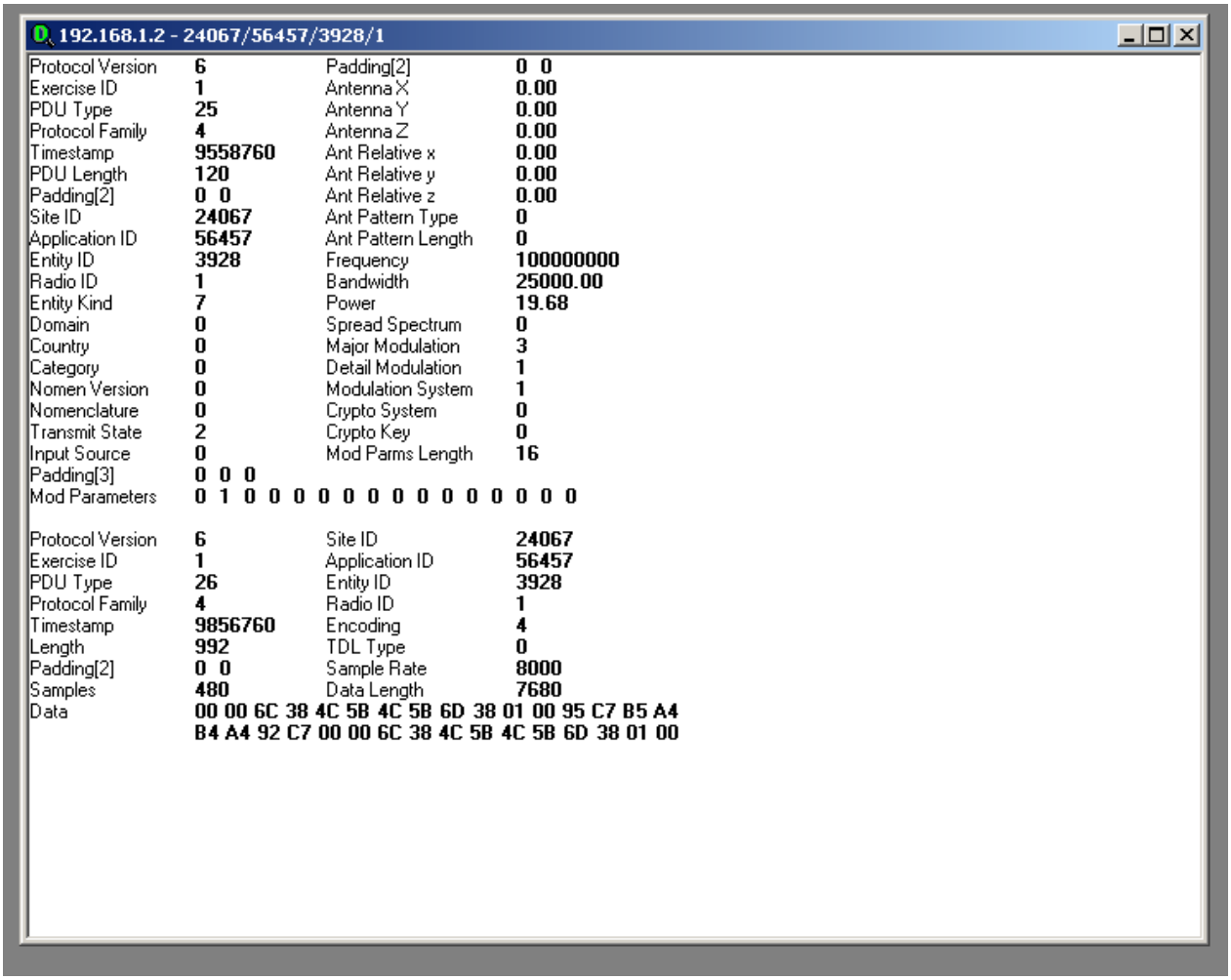
Set the Broadcast Address to a valid multicast address such as 224.2.2.3. The Time-To-Live (TTL) is set to 5 and is hard coded for multicast addressing. Note also that multicast requires multicast routers, etc. Multicast sends packets to IP addresses that are part of the multicast group.

NOTES:

When the system is on and transmitting (PTT ON) and the Stop button is clicked without first setting PTT OFF, then the generator will continue to generate SIGNAL PDUs. This is by design to help to diagnose problems with DIS vendor equipment.

DEFAULT DIS RADIO DATA

The screen shot below of SimPhonics VComm monitor shows the details of the settings for this system. The user can change some of these settings.



The sample rate is fixed at 8000 Hertz, and the compression scheme is fixed at 16 bit PCM.

ENTITY ID

The entity ID for the radio is automatically generated if the fields for SITE, HOST, and ENTITY or left at zero. The radio ID portion of the DIS ID is automatically generated by the system, and starts at 1 and is incremented for each radio.

2 References

SimPhonics Home Page: http://www.simphonics.com