



# ISSI Network Simulation Tool

## Project Description

### SNAPSHOT

The Public Safety Communications Research (PSCR) program is developing a tool that models the Project 25 (P25) Inter-RF Subsystem Interface (ISSI) protocols to evaluate system performance for various deployment configurations. The goal is to provide users with insight as to how the ISSI works and offer a mechanism for simulating deployment configurations and parameter settings without setting up expensive test beds and demonstrations.

### BACKGROUND

Because land mobile radio (LMR) systems from some manufacturers use proprietary protocols that are not capable of communicating with another manufacturer's LMR system, the P25 (Project 25) ISSI was developed by TIA (Telecommunications Industry Association) in conjunction with the P25 Steering Committee. The ISSI enables radio frequency subsystems (RFSS) from different manufacturers to be connected together. As more testing and demonstration events are planned for ISSI prototypes and products, a simulation tool that models the behavior of the ISSI may be handy for planning these experiments. The simulation tool can provide feedback on overall system performance including the audio quality and latency in setup. The tool is especially helpful for large deployment topologies where experimental setups and demonstrations may be too costly to realize.

### AN INNOVATIVE APPROACH

We are developing a model for the ISSI as an extension to the NS-2 simulation platform. NS-2 is a discrete event simulator for networking research. NS-2 contains models for many of the existing network technologies and protocols upon which new protocols can be added, or existing ones extended or modified. Some example protocols that already exist for NS-2 that can be used to support the P25 ISSI model are Ethernet, Internet Protocol version 4 (IPv4), User Data Protocol (UDP), Session Initiation Protocol (SIP), and Real-Time Transport Protocol (RTP). Our ISSI model (an NS-2 extension) includes the call control manager, mobility manager, and transmission control manager as specified in TIA-102.BACA-A, as well as extensions to existing NS-2 SIP models.

- The call control manager enables the establishment and termination of talk group calls and SU-to-SU (subscriber unit) calls, as well as the various configuration parameters (e.g., priority, availability check, emergency call/non-emergency call).
- The mobility manager handles the movement of the SUs from RFSS to RFSS.
- The transmission control manager handles the transmission of the RTP (e.g., voice) packets.

### VALUE TO PUBLIC SAFETY

Emergency response agencies can use the ISSI simulation tool to model (or emulate) the behavior of the ISSI to help answer a multitude of configuration and parameter issues before, during, and after deployment. The tool can:

- Be used for network planning purposes to produce network-satisfying solutions based on application requirements
- Help troubleshoot potential issues in an experimental setup to forecast application expectations in a physical network

### RESULTS

The ISSI simulation tool's user interface displays an animated topology that highlights the paths of active calls and lists link capacity. The tool facilitates quantitative and qualitative network performance analysis with user-specified incident scenarios.