

NetSim v9.1 – CR

- **PHY Layer**
 - Protocol – IEEE 802.22
 - Minimum and Maximum frequency range is 54MHz to 862MHz
 - Channel Bandwidth – 6,7,8
 - Modulation Techniques – QPSK, 16QAM, 64QAM
 - Coding Rate – 1/2, 2/3, 3/4, 5/6
 - Back off start and Back off end range between 0 to 15
 - Transmitter Power – 1 to 5000 mW
 - DL_UL_Ratio – 1:1, 1:2, 1:3, 1:4
 - IFQP Cycle Length – 0 to 15
 - IFQP Duration – 1 to 16
- **MAC Layer**
 - Duplexing – TDD
 - DSX_Request and Response Retries
 - T7, T8, T14, T16, T29 and T31 waiting timers are available.
 - Channel check time, NonOccupancyPeriod, Channel detection time, False alarm probability, Channel move time, Num sensing period, Sensing period, Sensing Interval, Candidate channel refresh time, Backup channel refresh time, Candidate channel time and Wait before channel moves are available
 - Sensing mode
 - ISO_Country_Code
- **Transport Layer**
 - UDP, TCP (Old Tahoe, Tahoe, Reno, New Reno)
- **Application Layer**
 - File Transfer Protocol (FTP)
 - Database Application
 - Email Application
 - HTTP Application
 - Constant Bit Rate(CBR) Application
 - Voice traffic
 - Voice codecs include G.711, G.723, G.729, GSM – FR, GSM EFR
 - CBR service
 - VBR services
 - Silence suppression via deterministic model and DTMC
 - Video Traffic
 - Continuous Normal VBR
 - Continuous State Auto Regressive Markov Model
 - Quantized State Continuous Time Markov Model
 - Simple IPB Composite Model
 - Custom Model: Users can develop custom application model based on
 - Packet size and inter-arrival time available in the following probability distributions: Exponential, Constant
 - Peer to Peer application

Protocol source C codes available for user modification

Output Performance Metrics: A variety of network performance is reported including

- Network Statistics
- Link metrics
- CR Base Station Metrics
- CR CPE Metrics
- CR Incumbent Metrics
- CR Channel Metrics
- IP metrics, TCP / UDP Metrics etc
- Dynamic metrics (Graphical plot of an attribute over time) is available for application throughputs

Detailed Packet Trace: Users can log details of each packet as it flows in the network.

Detailed Event Trace: Users can log each event of the protocol FSM while execution of the discrete event simulation

Command Line Interface

- CLI mode of running for more concise and powerful means of control
- Facilitates use of automated scripts for running batch simulations
- Model network configurations using XML based configuration files

Packet Animator

- Animates packet flow over wired and wireless links, as well as node movement
- Color variation for data, control and error packets
- Animation settings via play, pause and time-slide

Wireshark Interfacing: pcap files can be recorded at each node which can be opened in Wireshark for protocol analysis