

NetSim v9.1 – IOT

NetSim is a discrete event simulator covering a broad range of wired, wireless, mobile and sensor networks. It comes with a simple and user friendly GUI which features drag and drop functionality for devices, links, application etc. The specifications for the IOT module expected in v9 are –

- Design network, simulate and observe the performance of 6LoWPAN network using NetSim GUI
 - Devices: Sensor Motes, 6LoWPAN Gateway, Routers, switches, AP, Nodes can be dragged and dropped for network design
 - Data link and physical layer implementation is as per IEEE 802.15.4 standards.
 - Network layer is IPV6 (RFC 2460) and can run both on IPV4 and IPv6.
 - Routing via AODV (RFC 3561), OLSR (RFC 3626), ZRP
 - 6LoWPAN Gateway will switch the packet from one network from another,
- Facility to conduct various experiments for differing input / output parameters
 - Input: Beacon Order, Superframe Order, Backoff Exponent, Power Consumption, Battery life Extension, CCA type, Channel Number, Routing Time, Phy SHR Duration, Receiver Sensitivity, ED Threshold, Channel Characteristics
 - Output: Routing Overhead, Delay, Power Consumption, Lifetime of motes, Packet Delivery ratio, Routing Time, Actual Vs Sensed path of agent
- **PHY Layer**
 - Protocol – IEEE 802.15.4
 - Frequency Band – 2400MHz
 - Data rate – 250 kbps
 - Chip rate – 2000 Mchips/s
 - Symbols Rate – 62.5 ksymbols/s
 - Modulation Technique – O-QPSK
 - Min LIFS Period – 40 symbols
 - Min SIFS Period – 12 symbols
 - Unit Back off time – 20 symbols
 - Phy SHR Duration – 3,7,10,40 symbols
 - Phy symbol per octet – 0.4, 1.6, 2,8
 - Turnaround time – 12 symbols
 - CCA Mode
 - Carrier_Sense_Only
 - Energy_Detection
 - Carrier_Sense_With_EnergyDetection
 - Receiver Sensitivity and EDThreshold
 - Transmitter Power - 1 to 100 dBm
- **MAC Layer**
 - Protocol – IEEE802.15.4
 - AckRequest – True, False
 - Beacon Mode – Enable, Disable
 - Beacon order and Super Frame order – 0 to 15
 - MaxCSMABackoff – 0 to 5
 - MinCAPLength – 440 symbols
 - Maximum Back off Exponent, Min Back off Exponent and Maximum Frame Retries
 - Unit Back off period – 20 symbols
 - GTSDesc persistent time – 4 sec
- **Power**
 - Power Source – MainLine , Battery
 - Battery
 - Energy Harvesting – on, off
 - Initial Energy – 0 -1000 mW
 - Transmitting current – 0 to 20 mA, Idle Mode Current – 0 to 20 mA, Receiving Current – 0 to 20 mA, Sleep Mode Current – 0 to 20 mA, Recharging Current – 0 to 1.0 mA
 - Voltage – 0 to 10 V

- **Network Layer**
 - IPv6
 - Prefix_Length
 - AODV Routing Protocol
- **Transport Layer**
 - UDP, TCP (Old Tahoe, Tahoe, Reno, New Reno)
- **Application Layer**
 - Sensor_App
 - 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
- IEEE802_15_4Metrics
- Power Model Metrics
- AODV 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

MATLAB Interface: NetSim can be interfaced with MATLAB offline or online (run-time)