

### 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)