3.1 Introduction

In this chapter OPNET 17.5 is used to simulate different scenarios namely IEEE 802.11a and n for three parameters in IPv4 and IPv6 environment (Throughput , delay and jitter) has considered to evaluate the network performance for IPv4 and IPv6 which are all Quality of services Measures .

3.2 Simulation Scenarios

To test our previous QoS strategy as a comparative method, in this study:

- Using OPNET 17.5 to implement our VoIP network.
- Setting up several nodes.
- Use an exponential traffic source to re-create a typical voice conversation over VoIP.
- Different protocols will be use.
- Measuring throughput, end-to-end delay, packet loss and jitter.
- Plotting our results and comparing them to our theory based predictions.

In our deployment all nodes configured to use the G.711 codic, Its formal name is Pulse code modulation (PCM) of voice frequencies, it is commonly used in VoIP application., this codic transmits information at a rate of 64kbps [18] .The network infrastructure is WLAN .OPNET 17.5 was used to simulate four different scenarios namely IEEE 802.11a, and n According to traffic analysis, three parameters: Throughput, delay and jitter has considered to evaluate the network performance IPv4 and IPv6**.** In each scenario there a small network represents light traffic and a large network with background traffic to generate the VoIP.

3.2.1 Network Designed Components:

This section discusses the main network components used in the suggested network models running on OPNET 17.5 and the devices used in. the **small network**: 8 WLAN work station, SIP server, 16 port switch Ethernet , Firewall, router, and 100 Base T full duplex for wired connection where used to build IP backbone for ipv4 and ipv6.

For **Large network**: 11 WLAN work station ,two wired IP phone , two servers (HTTP server ,video conference server for background traffic) ,SIP server, 16 port switch Ethernet, Firewall, router, and 100 Base T full duplex for wired connection where used to build IP backbone for ipv4 and ipv6.

Scenario (1)

Data rate 54 Mbps, Data rate 600 Mbps and numbers of nodes that use technology 802.11a, n using IPV4 small and large network in 240sec. see **Figure (3.1)** and **Figure (3.2)**

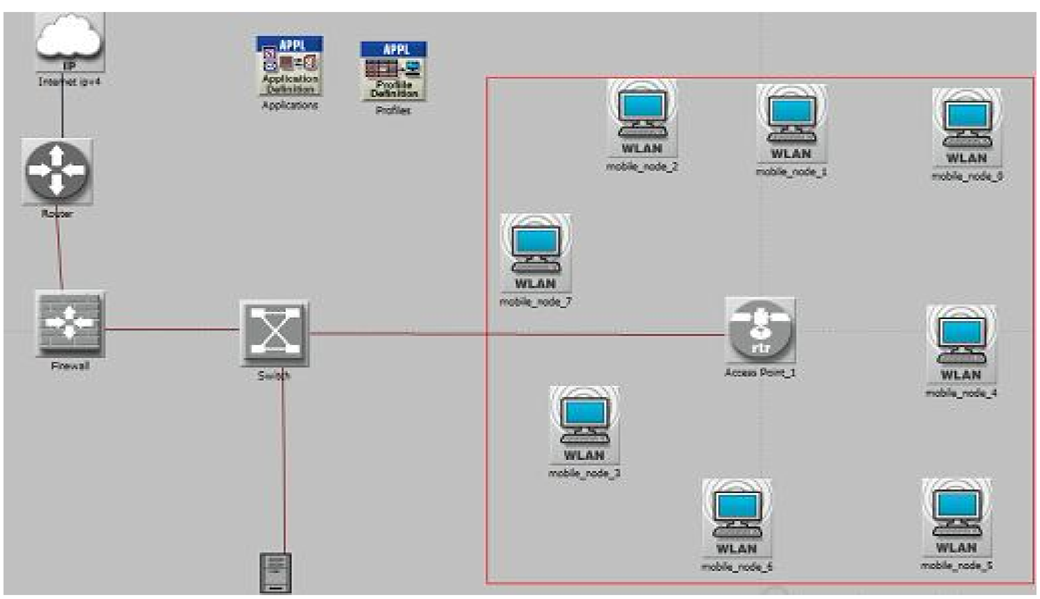

Figure (3.1) The configuration of IPV4 Network showing VoWiFi small network

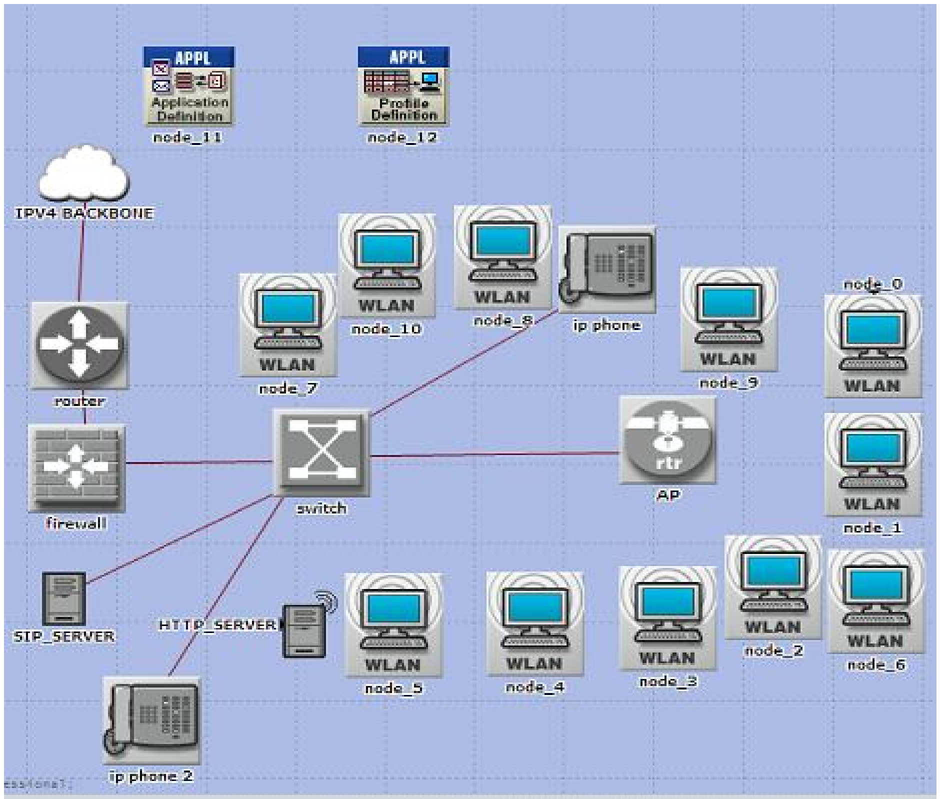

Figure (3.2) The configuration of IPV4 Network showing VoWiFi large network

Scenario (2):

Data rate 54 Mbps, Data rate 600 Mbps and number of nodes that use technology 802.11a ,n using IPV6 small and large network in 240sec.see **Figure (3.3)** and **Figure (3.4)**

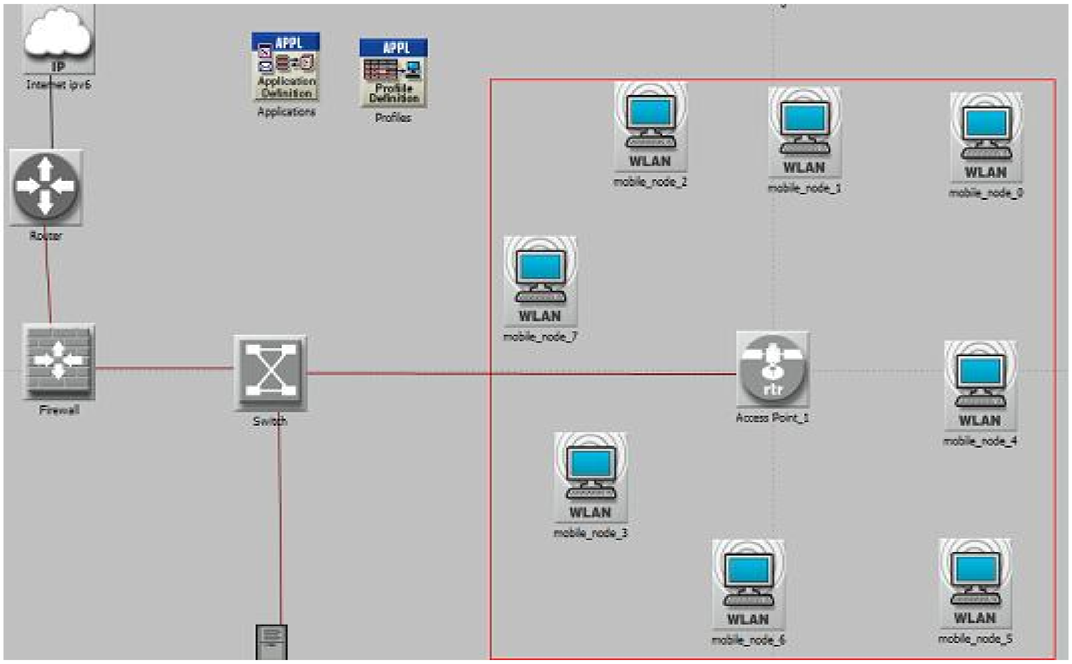

Figure (3.3) The configuration of IPV6 Network showing VoWiFi small network

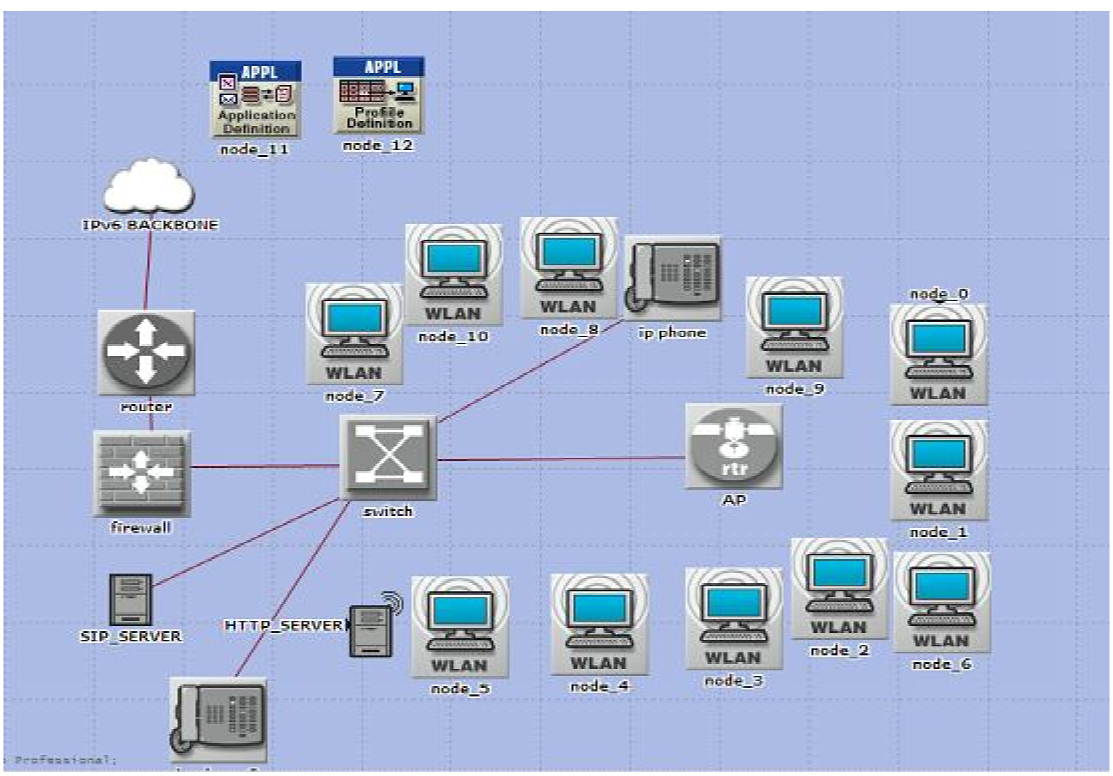

Figure (3.4) The configuration of IPV6 Network showing VoWiFi large

network

3.2.2 Application parameter configuration

The **Application _ Configuration** include a name and a description table that specifies various parameters for the VOIP application see **Figure (3.5)**. The specified application name is used while creating user profiles on "**Profile_ Configuration**" object. The **Profile_ Configuration** is used to create user profiles. These user profiles can be specified on different nodes in see **Figure (3.6)**.

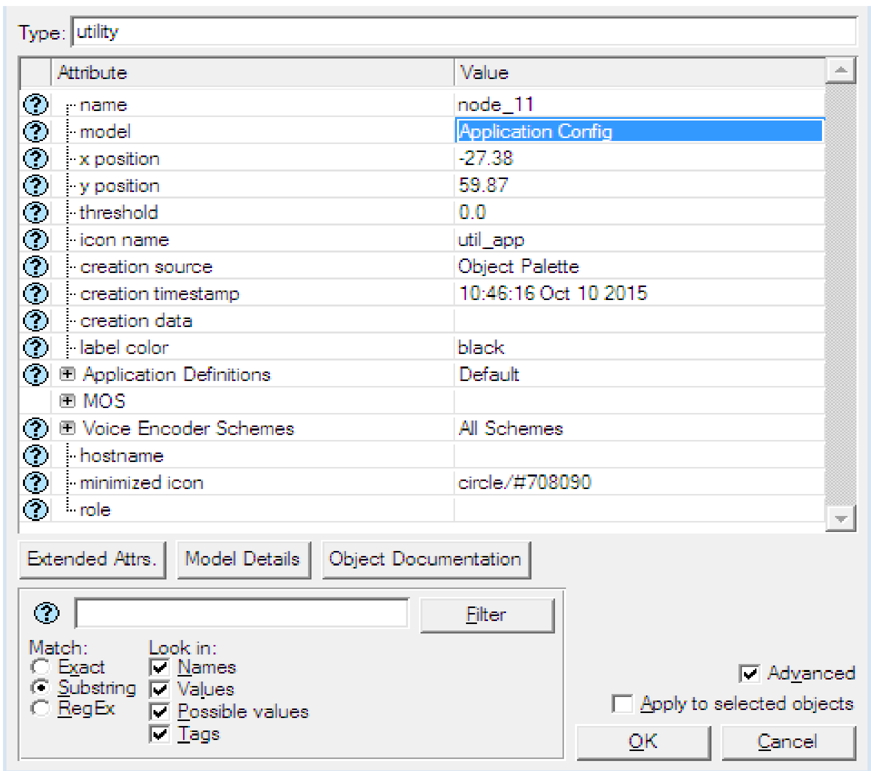

Figure (3.5) Profile_ Config attribute dialogue box

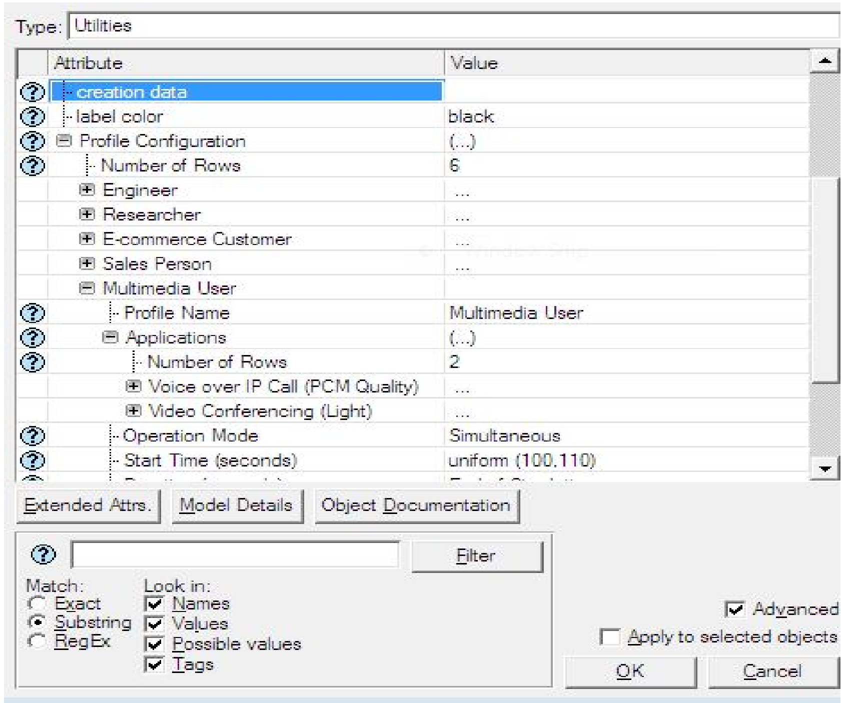

Figure (3.6) VoIP application configuration

3.2.3 Simulation To Measure QoS

OPNET is the simulator tool used for designing the network and deploying VOIP technology. used to simulate two different scenarios namely IEEE 802.11 a, & n according to traffic analysis, for three parameters: Throughput, End To End Delay and jitter has considered to evaluate the network performance for IPv4 and IPv6 using UDP as transmission protocol.

In **figure (3.7)** from the start the first event the program read the parameter from the initial value and create an array parameter: amount of data transferred from the first time to the last time of the simulation and send it with no of node (flow ID) this data can used to calculate and plot, to get the throughput for VoIP node filtered the received packet and it occur time using the mathematical equation to get throughput **E (2.1)** that mentioned in chapter 2.

In **figure (3.8)** start the first event the program read the parameter from the initial value and creates an array parameter: Delay at the source, Delay at the receiver, Network delay from the first time to the last time of the simulation based on the time interval and the event of nodes queuing packet and nodes receiving packet End To End Delay calculate using mathematical equation **E (2.2)** that mentioned in chapter 2.

In **figure (3.9)** start the first event the program read the parameter from the initial value and creates an array parameter: random jitter, deterministic jitter, bit error rate from the first time to the last time of the simulation depend on deferent between delay packet and time. Jitter can calculate using mathematical equation **E (2.3)** that mentioned in chapter 2.

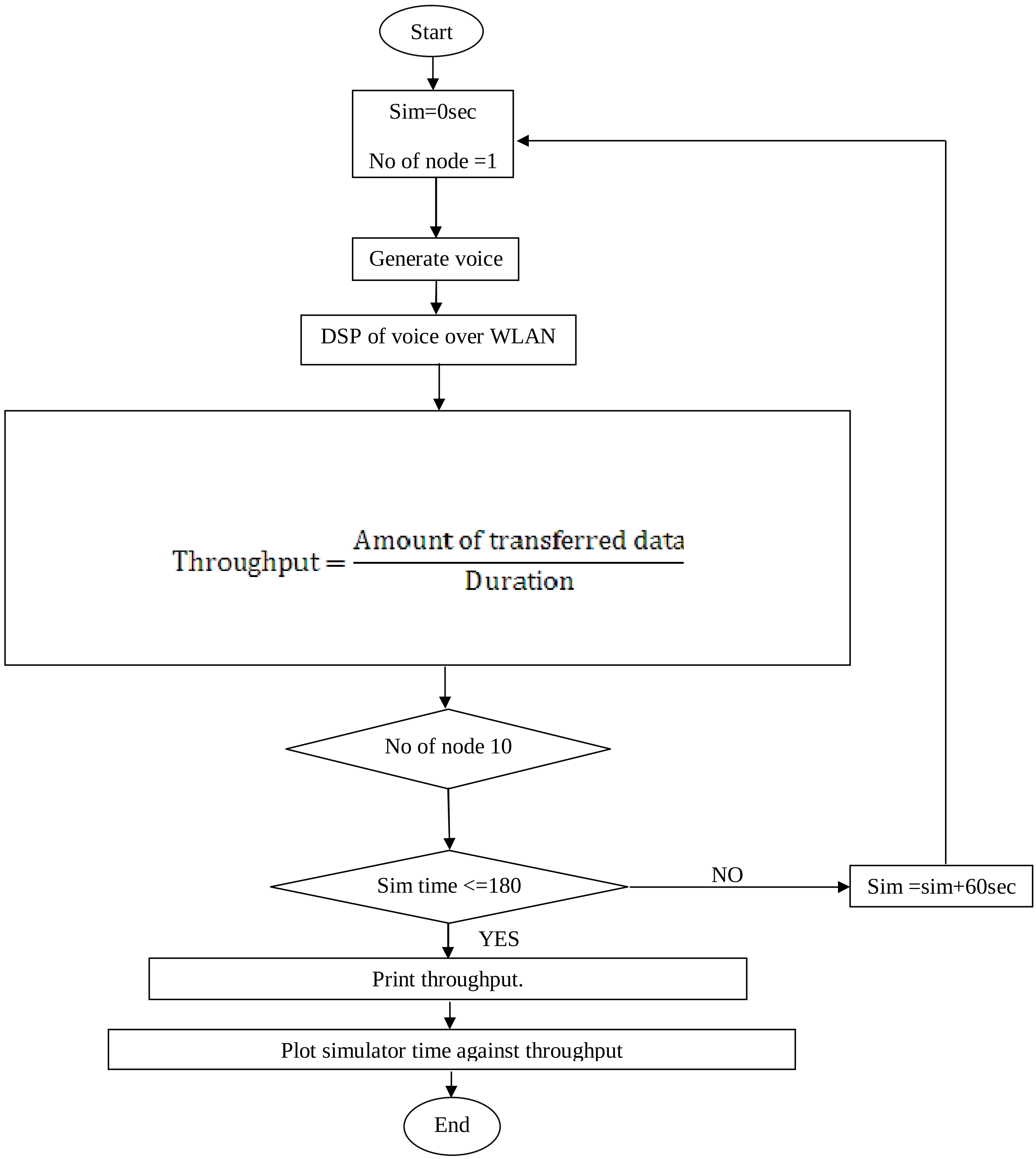

Figure (3.7): Simulation flowchart Throughput vs. simulation time

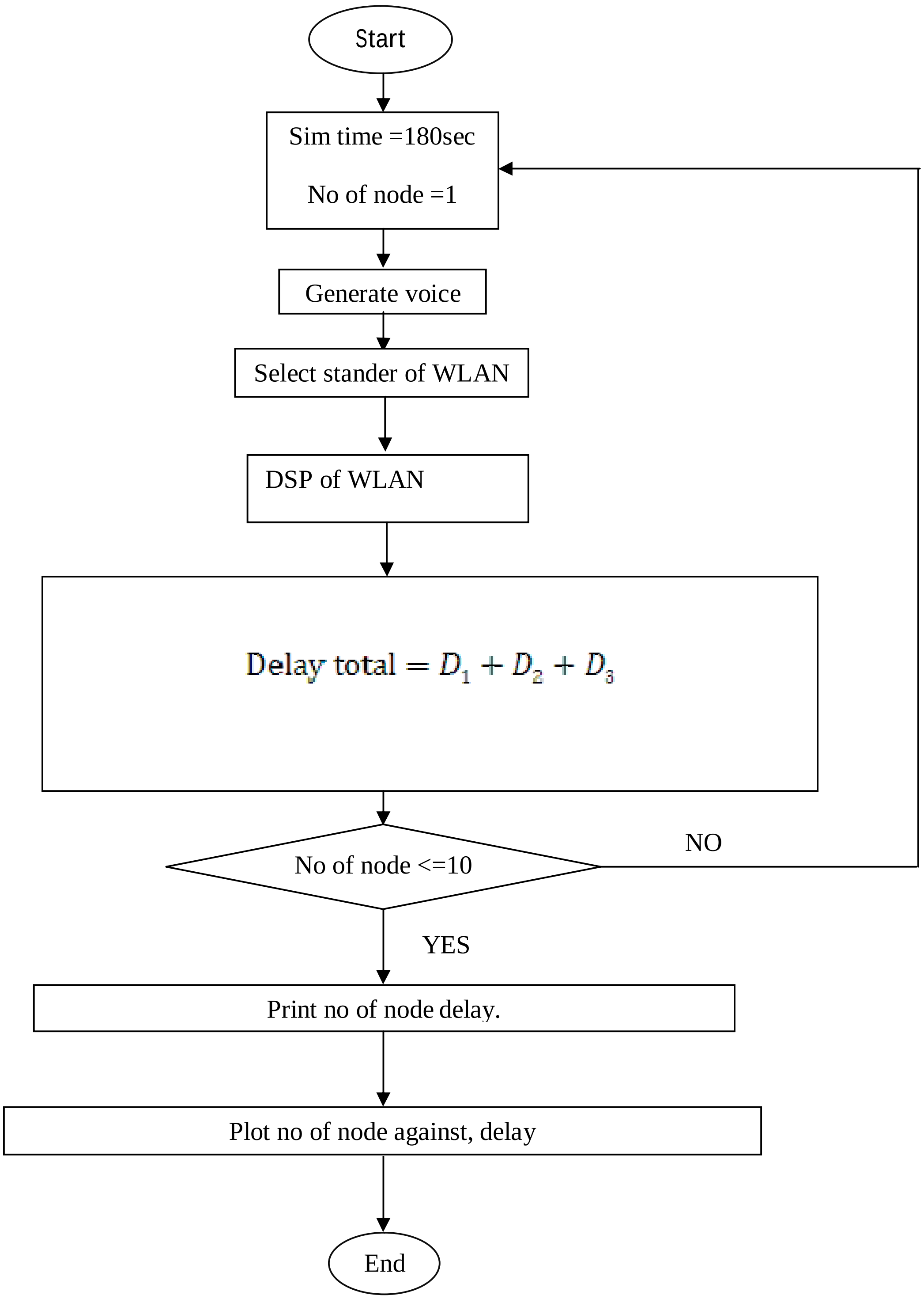

Figure (3.8): Simulation flowchart End To End Delay

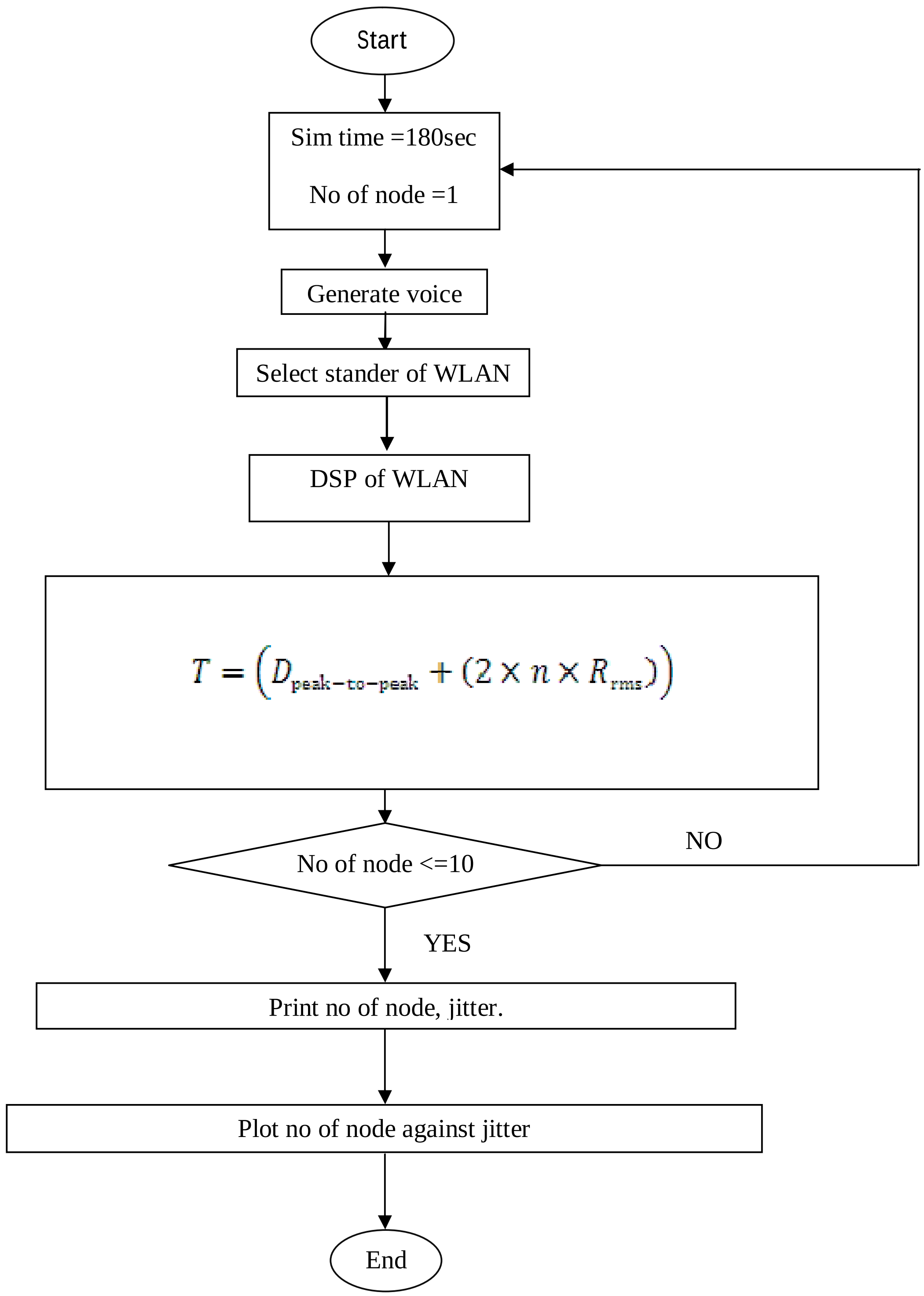

Figure (3.9*):* Simulation flowchart jitter

3.2.4 Simulation Parameters:

The Simulation environment setup parameters which affect the performance of our system are depicted in **Figure (3.10). Figure (3.11)** and **Table (3.1)**

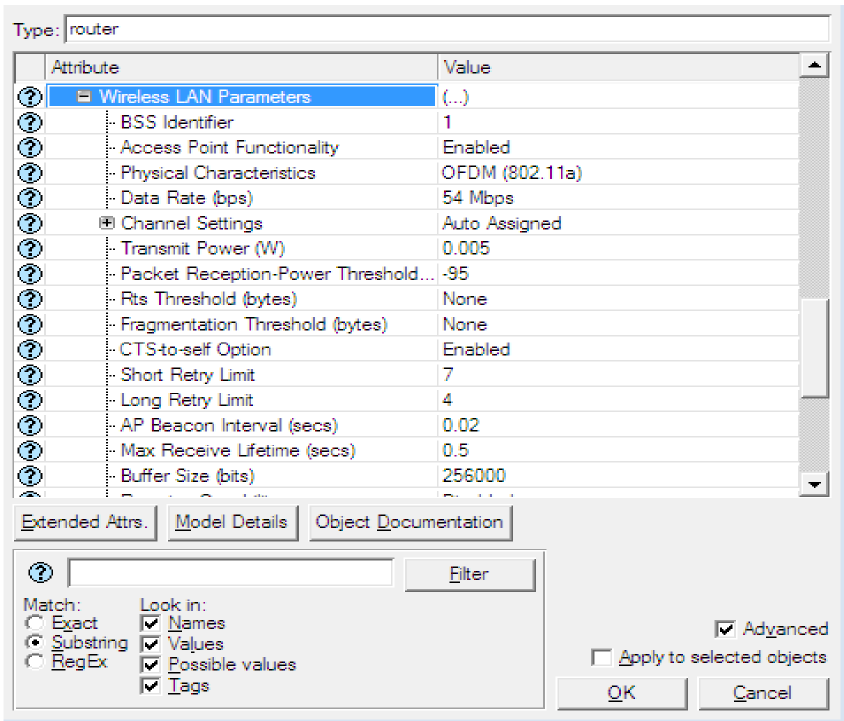

Figure (3.10):): Example for Wireless network parameters

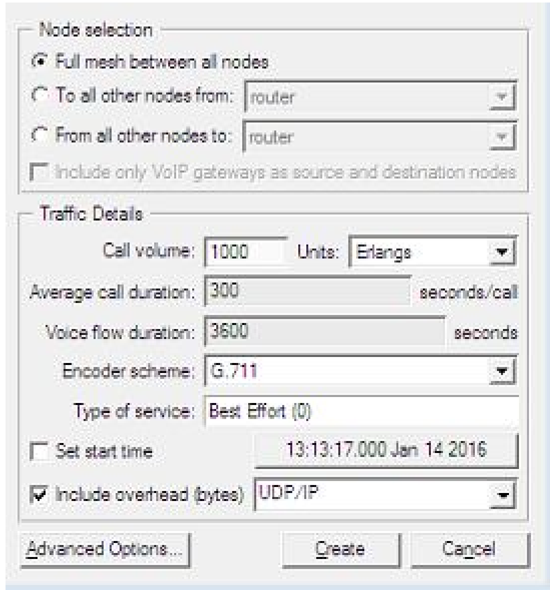

Figure (3.11): Codec and transmission protocol configuration

Table (3.1) Simulation Environment parameter

Numbers of nodes	10 nodes
Network scale	Office
Specify size	100*100 m2
Technology	IPv4 and IPv6 Wi-Fi (IEEE802.11 a, n)
Data rate	54 , 248 Mbps
Link model	100 Base T full duplex
Application	Voice over IP call (PCM Quality)
Voice encoding	G.711
Duration of simulation	180 second