



WLAN Lab
Opnet Tutorial

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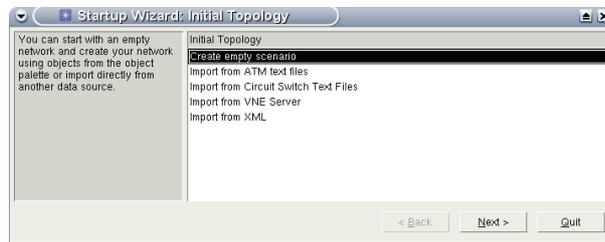
1. Log on to the computer.
2. Open the Opnet program by writing `opnet` in the shell.
3. After the opnet program has started you have to build a simple simulation of two WLAN stations.
4. Go to **File** and select **New**.
5. Select **Project** and click **Ok**.



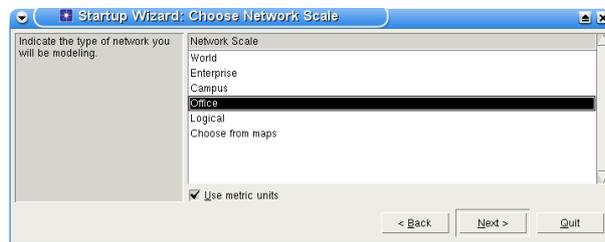
6. Give the project name according to your group name. For example, if your group number is A1 give the project name `projectA1` and the scenario name `scenario1`.



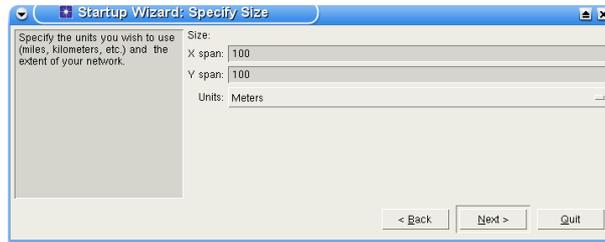
7. Select **Create empty scenario** and click **Next**.



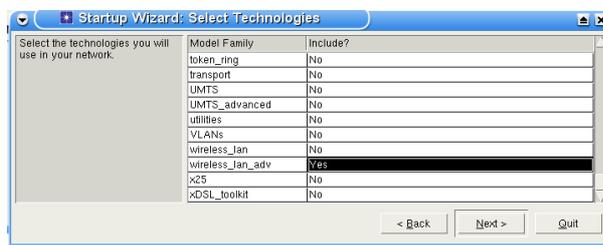
8. Select *Office* as Network Scale and select **Use metric units**.



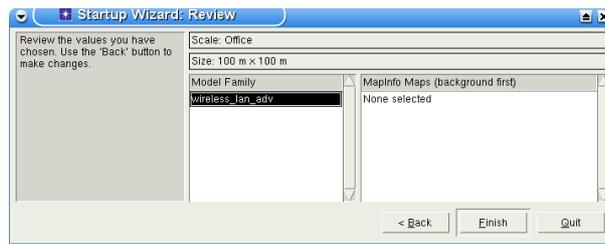
9. Specify the units as follows and click **Next**.



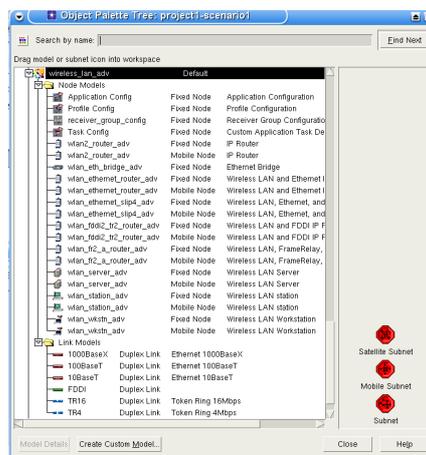
10. Scroll down to the bottom and select the technology *wireless_lan_adv* by clicking on the corresponding field in the **Include?** column, and click **Next**.



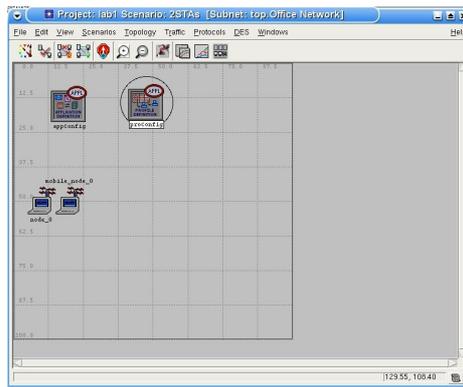
11. Click **Finish**.



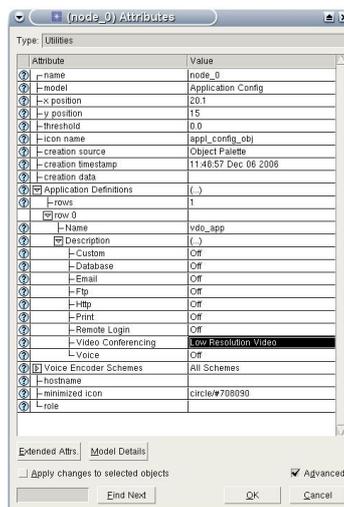
12. The Object Palette Tree will open which shows the different WLAN components as follows.



13. In this step, setup the network model in the project/network editor of the OPNET simulator as shown in the figure below.

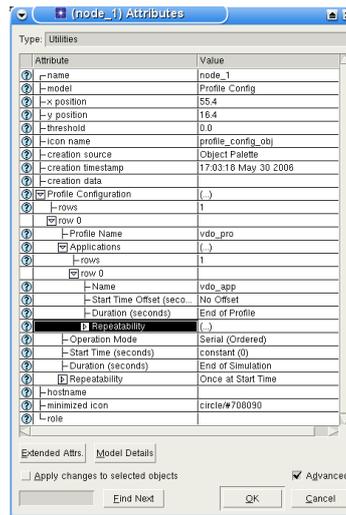


- (a) From **Node Models** under the item *wireless_lan_adv* in the the object palette, drag the *Application Config* object into the opnet workplace with pressing the left button of the mouse on and then press out the left button and press the right button to drop that in the workplace.
 - (b) In the same way, drag and drop the *Profile Config* object.
 - (c) Add one wireless LAN fixed workstation which is labelled *wlan_wkstn_adv, Fixed Node* and one wireless LAN mobile workstation which is labelled *wlan_wkstn_adv, Mobile Node* into the workplace.
14. Save your project by clicking **Save As...** and give the name of your file as `projectX` where X is your group number.
15. Configuring applications for the model
- (a) Use the *Application Config* and *Profile Config* nodes from the object palette.
 - (b) Configure the *Video Conferencing* application like as follows using the application configuration *Application Config*:
 - o Click the right button over the application config object, and then click on **Advanced Edit Attributes** to open a window with different attributes and corresponding values.
 - o Write *appConfig* for name attribute.
 - o Click on the *Application Definition* attribute. Add a row and name as *vd0_app*. Set the *Video Conferencing* item to *Low Resolution Video*.



(c) Configure the profile configuration:

- Write *proConfig* for name attribute.
- Deploy the application you have generated using the profile configuration and name it *vd_o_pro*.
- Under *Profile Configurations* in the applications list add a row and select the name *vd_o_app* from the drop-down menu.
- Select *Start Time Offset* as *No Offset*.
- Select *Start Time* of the simulation as constant (0) and keep the other items as default.



16. Configuring some basic attributes of the workstations

(a) Click onto the fixed station with the right mouse button and select **Advanced Edit Attributes**.

(b) Set the following values.

- *name*: node_0
- *x position*: 10
- *y position*: 50
- ...

(c) Click onto the mobile station with the right mouse button and set the attributes as follows.

- *name*: mobile_node_0
- *x position*: 20
- *y position*: 50
- *trajectory*: NONE (to make it stationary)

17. Deploying the profiles in the workstations and configuring

(a) Go to the attributes of *mobile_node_0*

- Set *Application: Destination Preference* and *Application: Supported Profiles* as follows.

[-] Applications	
[-] Application: ACE Tier Configur...	Unspecified
[-] Application: Destination Prefere...	(...)
[-] rows	1
[-] row 0	
[-] Application	vdo_app
[-] Symbolic Name	None
[-] Actual Name	(...)
[-] rows	1
[-] row 0	
[-] Name	Office Network.node_0
[-] Selection Weight	10
[-] Application: Multicasting Specif...	None
[-] Application: RSVP Parameters	None
[-] Application: Segment Size	64,000
[-] Application: Source Preferences	None
[-] Application: Supported Profiles	(...)
[-] rows	1
[-] row 0	
[-] Profile Name	vdo_pro
[-] Traffic Type	All Discrete
[-] Application: Supported Services	None
[-] Application: Transport Protocol ...	Default

- Set the following wireless LAN parameters like in the figure below:
 - *Physical Characteristics*,
 - *Data rate (bps)*,
 - *Transmit power (W)*,
 - *Packet Reception-Power Threshold (dBm)*.

[-] Wireless LAN Parameters	(...)
[-] BSS Identifier	Auto Assigned
[-] Access Point Functionality	Disabled
[-] Physical Characteristics	Direct Sequence
[-] Data Rate (bps)	11 Mbps
[-] Channel Settings	(...)
[-] Transmit Power (W)	0.001
[-] Packet Reception-Power Thr...	-67

(b) Go to the attributes of the node node_0.

- Set *Application: Supported Services*

[-] Applications	
[-] Application: ACE Tier Configur...	Unspecified
[-] Application: Destination Prefere...	None
[-] Application: Multicasting Specif...	None
[-] Application: RSVP Parameters	None
[-] Application: Segment Size	64,000
[-] Application: Source Preferences	None
[-] Application: Supported Profiles	None
[-] Application: Supported Services	(...)
[-] Application: Transport Protocol ...	Default

(Application: Supported Services) Table	
Name	Description
vdo_app	Supported

1 Rows Delete Insert Duplicate Move Up Move Down

Details Promote OK Cancel

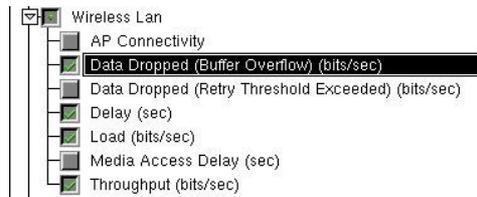
- Set the following three Wireless LAN parameters like in the figure below
 - *Physical Characteristics*
 - *Data rate (bps)*
 - *Transmit power (W)*

- *Packet Reception-Power Threshold (dBm)*

Wireless LAN Parameters	(...)
-BSS Identifier	Auto Assigned
-Access Point Functionality	Disabled
-Physical Characteristics	Direct Sequence
-Data Rate (bps)	11 Mbps
[-] Channel Settings	(...)
-Transmit Power (W)	0.001
-Packet Reception-Power Thr...	-67

18. Choose the statistics for the workstations

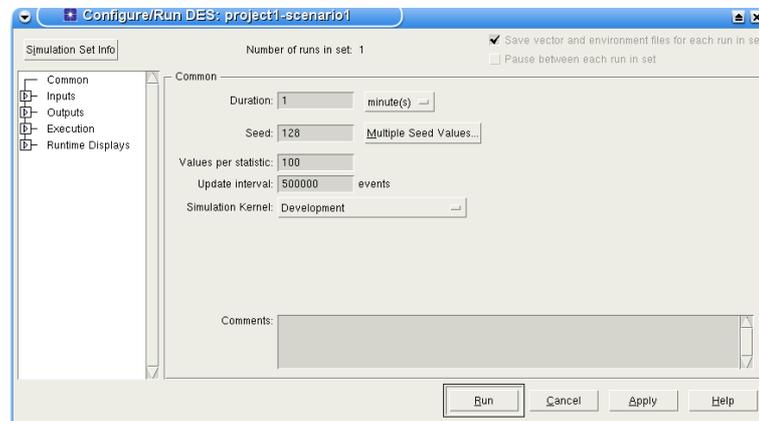
- Go to **DES** in the menu bar and click on **Choose Individual Statistics...**
- Click *Node Statistics*, then *Wireless LAN*. Check *Delay (sec)*, *Throughput (bits/sec)*, *Data Dropped (Buffer Overflow)*, *Load etc.* as follows.



- In the case of *Global Statistics*, you can check *Delay (sec)*, *Throughput (bits/sec)*, *Load (bits/sec)*, *Retransmission Attempts (packets)* etc.

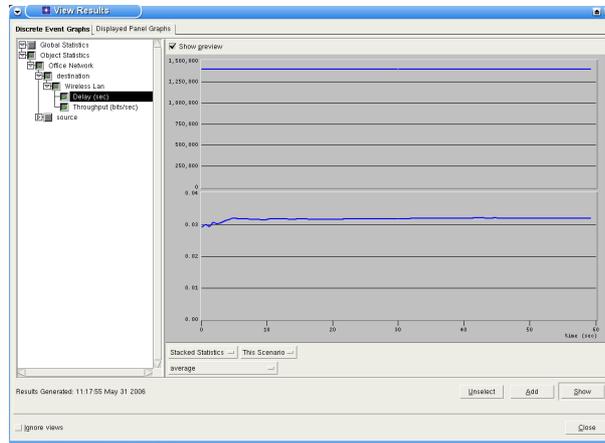
19. Run the simulation

- Go to **DES** in the menu bar and click on **Configure/Run Discrete Event Simulation**.
- set the items **Duration = 1 minutes**, **Seed =128** etc. as shown in figure below and run

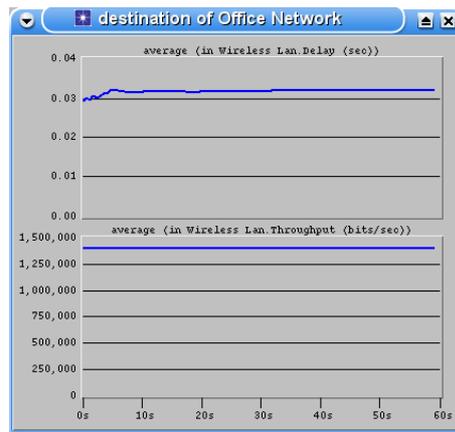


20. Collect the results:

- (a) Keep the mouse pointer over project editor and click the right button of the mouse. Choose **View Results** in the pop-up menu.
- (b) To get the average value, select **average** in the drop down menu which is set to **As Is** by default.



(c) Click on the **show** button and you will get a window like below.



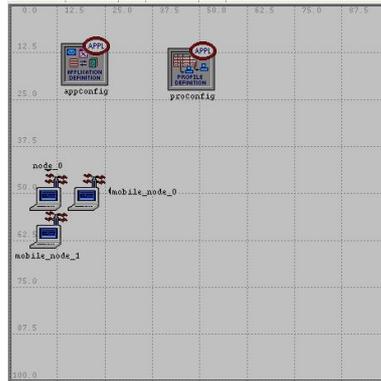
(d) Check other statistical results like global throughput, delay, Load etc.

- 21. Go to **Scenarios** in the menu bar, click duplicate scenarios and give a name to new scenario as scenario2.
- 22. Change *Data rate (bps)* for all nodes (node_0 and mobile_node_0) to **2 Mbps** in scenario2. Then run the simulation again and view results like 19 and 20.
 - (a) What difference have you observed in the case of throughput and delay?
 - (b) Checking the data dropped due to buffer overflow graph give some explanations.
 - (c) You can compare the results of scenarios by selecting all scenarios in drop down menu in results window.
- 23. Go to **Scenarios** in the menu bar, **switch to scenario scenario1**
- 24. Go to **Scenarios** in the menu bar, click duplicate scenarios and give a name to new scenario as scenario3.

25. Add another wireless LAN mobile workstation into the workplace in scenario3. It can be done in two ways. Adding from object palette or copy the mobile_node_0. Here we use the second one.

(a) Copy the *mobile_node_0*, paste into the workplace and set the following values.

- *name*: mobile_node_1
- *x position*: 10
- *y position*: 60
- ...



(b) Change *Data rate (bps)* for all nodes (*node_0*, *mobile_node_0*, *mobile_node_1*) to **11 Mbps**. Run the simulation and view results like 19 and 20.

(c) **Optional (if results behave wrong):** Set the wireless LAN parameter *Buffer Size (bits)* for *node_0* as 1024000

26. Go to **Scenarios** in the menu bar, **switch to scenario scenario2**

(a) Go to **Scenarios** in the menu bar, click duplicate scenarios and give a name to new scenario as *scenario4*.

(b) Change *Data rate (bps)* for all nodes (*node_0*, *mobile_node_0*, *mobile_node_1*) to **2 Mbps**. Run the simulation and view results like 19, 20 and 21 (a, b).

27. If you have time, you can make a new scenario with more mobile stations and observe the results.