Network Simulator 2 (NS2)

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OUTLINE

• Introduction of NS2
• Installation of NS2
• NS2 basic programming
• Visual Sensor Network
• Implementation of VSN in NS2
• Introduce new TCP flavor In WSN
• Implementation of TCP through NS2
Network Simulator2 (NS2)

- **NS (version 2)** is an object-oriented, discrete event driven network simulator developed at UC Berkely written in C++ and OTcl (Tcl script language with Object-oriented extensions).
- **Ns2** is a widely used simulation tool to simulate the topologies, behaviors and protocols for wired and wireless network.
Installation of NS2

- NS2 is an open-source simulation tool that runs on Linux.

- You can also run this simulation tool on windows using cygwin.
Cygwin

- Cygwin is a Linux like environment for Windows.

- cygwin1.dll : acts as a Linux API emulation layer providing the Linux API functionality.

- Collection of tools which provide Linux look and feel.
Cygwin Installation Steps

- Download cygwin setup from www.cygwin.com
Cygwin Installation (Cont..)
Cygwin Installation (Cont..)

Select Root Install Directory
Select the directory where you want to install Cygwin. Also choose a few installation parameters.

Root Directory:
C:\Crossbow\cygwin

Install For:
- All Users (RECOMMENDED)
  Cygwin will be available to all users of the system. NOTE: This is required if you wish to run services like sshd, etc.
- Just Me
  Cygwin will only be available to the current user. Only select this if you lack Admin. privileges or you have specific needs.

Default Text File Type:
- Unix / binary (RECOMMENDED)
  No line translation done; all files opened in binary mode. Files on disk will have LF line endings.
- DOS / text
  Line endings will be translated from unix (LF) to DOS (CR-LF) on write and vice versa on read.

Read more about file modes...

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Cygwin Installation (Cont..)
NS2 Installation

- Download zip file of ns2.29 (allinone) from: http://www.isi.edu/nsnam/dist/ns-allinone-2.29.2.tar.gz
- Copy ns-allinone-2.29.2.tar to directory c:/cygwin/usr/local.
- Click on the cygwin icon and then go to the folder local.
- Run the command “./install” for installation of Ns2.
- After the installation there are some messages to set the environment variables and library paths.

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Setting of Environment Variable

- /usr/local/ns-allinone-2.29.2/ns-allinone-2.29/bin,
- /usr/local/ns-allinone-2.29.2/ns-allinone-2.29/tcl8.4.11/unix,
- /usr/local/ns-allinone-2.29.2/ns-allinone-2.29/tk8.4.11/unix.

From this setting you will be able to run Xgraph.

Similarly it gives some messages to set your library paths, set those path using the cygwin command prompt.
Library Path Setting

dali@wei /usr/local/ns-allinone-2.29.2/ns-allinone-2.29
$ LD_LIBRARY_PATH=/usr/local/ns-allinone-2.29.2/ns-allinone-2.29/
    otcl-1.11

dali@wei /usr/local/ns-allinone-2.29.2/ns-allinone-2.29
$ LD_LIBRARY_PATH=/usr/local/ns-allinone-2.29.2/ns-allinone-2.29/
    lib

dali@wei /usr/local/ns-allinone-2.29.2/ns-allinone-2.29
$
Run the first Example

- Go to the ns -tutorials folder and copy the examples.
- Paste them into any folder from where you want to run that.
- Run “example1b.tcl” by giving the command “ns example1b.tcl”.
- If it gives you the display and NAM (network animator) runs then ns2 installation successfully completed.
Run the first Example
NS2 Basics

Create and configure the network
Slow to run but fast to change
quickly exploring a number of scenarios

Algorithm running
Packet processing
Byte manipulation
Fast to run slow to change
Tcl Script

• Firstly create a new simulator object
  
  ```tcl
  set ns [new Simulator]
  ```

• Now open a file for writing for the nam trace data
  
  ```tcl
  set nf [open out.nam w]
  $ns namtrace-all $nf
  ```

• Add a 'finish' procedure that closes the trace file and starts nam
  
  ```tcl
  proc finish {} { global ns nf $ns flush-trace close $nf exec nam out.nam & exit 0 }
  ```

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Tcl Script (Cont ...)

- Now tell the simulator object to execute the 'finish' procedure after 5.0 seconds of simulation time.
  
  "\$ns at 5.0 "finish"
  
- This command finally starts the simulation.
  
  "\$ns run"
Topology Creation in NS2

Create Nodes:
- Create the first node: set n0 [$ns node]
- Create the second node: set n1 [$ns node]
- Here [$ns node] used to create nodes.

Create Link:
- $ns duplex-link $no $n1 1Mb 10ms DropTail
Topology Creation in NS2

1

0

Bandwidth: 1Mb
Delay: 10ms
Queue Type: Drop Tail
Sending Data

- In ns, data is always being sent from one 'agent' to another.
- To create a UDP agent and attach it to node to send data from node0

- **Create the Agent:**
  ```
  set udpo [new Agent/UDP]
  ```
- **Attach the Agent:**
  ```
  $ns attach-agent $no $udpo
  ```
Sending Data

• Create Traffic Agent:
  
  set cbro [new Application/Traffic/CBR]

• Packet Size:

  $cbro set packetSize_ 500

• Sending Interval:

  $cbro set interval_ 0.005

• Attach a CBR traffic generator to the UDP agent:

  $cbro attach-agent $udpo
Receiving Data

- Now create a Null agent which acts as traffic sink and attach it to node n1.
  
  ```
  set nullo [new Agent/Null]
  $ns attach-agent $n1 $nullo
  ```

- Now Attach two agents to each other to allow communication
  
  ```
  $ns connect $udp0 $nullo
  ```

- Now tell the CBR agent when to send data and when to stop sending
  
  ```
  $ns at 0.5 "$cbro start"
  $ns at 4.5 "$cbro stop"
  ```