OPNET Tutorial

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Outline

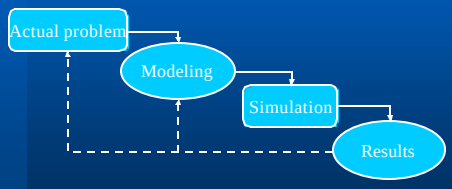
- OPNET products
- Modeler v8
- Modeling hierarchy
  - Network
  - Node
  - Process
- Editors
- Simulation
- Analysis
- Debugging
- Radio

History

- OPNET Technologies Ltd. Products (originally MIL3)
  - iTGuru: *Intelligent Network Mgmt*
  - Service-provider Guru
  - Netbiz: *Automated Network Design*
  - WDM Guru
  - ***Modeler***

Modeling

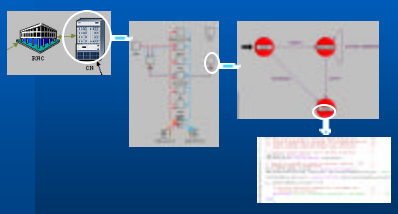
- Simulation Steps



OPNET Modeler v8

- Clients : Motorola, Nortel, Lucent, Cisco, …
- Event based
- Graphical user interface
- Hierarchical Modeling
  - Network
  - Node
  - Process

Hierarchy



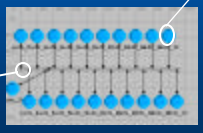
Editors

- Network
- Node
- Process
- Packet
- Link
- Antenna pattern

Network Model

- Wizard
- Built-in technologies
- Create your own

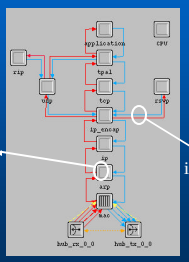
node, subnet



link

Node Model

- Generic devices
- Vendor devices
- Your own models
- ❖Module
  - ❖ Processor
  - ❖ Queue
  - ❖ Transceivers
- ❖ Packet stream
- ❖ Statistic wires

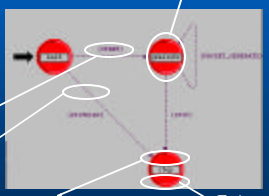


module

interface

Process Model

- State transition diagram
- States
  - Forced (green)
  - Unforced (red)



state

condition

transition

Enter exec

Exit exec

Proto-C Programming

- Proto-C
  - C/C++
  - Kernel Procedures

KP

C

Some Common KPs

- Packet package
  - op_pk_create()
  - op_pk_send()
  - op_pk_destroy()
  - op_pk_nfd_set
- Interrupt package
  - op_intrpt _type()
  - op_intrpt _code()
  - op_intrpt _schedule_self()
  - op_pk_nfd_set
- simulation package
  - op_sim_time()
- ID package
  - op_id_self()
  - Op_topo_parent()

Link Model

- Connection between nodes
  - Point-to-point
  - Bus
  - Radio
- Create or modify
- DS1, OS-196, …
- ***Verify links***

Packet Model

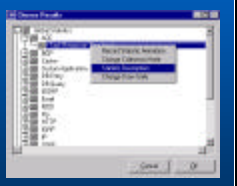
- Entity for carrying all information
- Should be created, passed and destroyed
- Formatted
  - Fields
- unformatted

How to model

- Create new project
- Create the network
- Create the nodes
- Create the state-machine processes
- Write the proto-C codes
- Create other elements: link,…

Pre-Simulation

- Define statistics needed
- Chose output format
  - Vector
  - Scalar
  - Animation

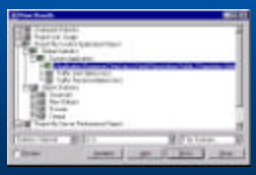


Simulation

- Run simulation
  - Single
    - Configure
      - Duration
      - Seed
      - Attributes
  - Sequence
    - Unix shell scripting
    - Configure seq.

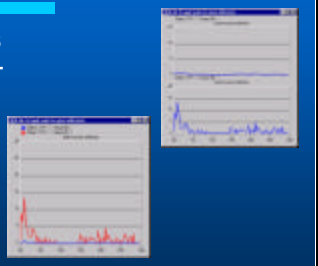
Results

- View results
- View results (advanced)



Results

- **Display results**
  - **View in OPNET**
    - **Scalar**
    - **vector**
  - **Export**
    - **MATLAB**
    - **Spreadsheet**



Debugging

- **The big problem!**
- **Compilation**
  - **OPNET compilation result window**
  - **Look at *cc-err* file**
- **Simulation**
  - **Look for clues in OPNET messages**
  - **Look at *err_log* & *session_log* files**
  - **ODB**

Radio Modeler

- **Nodes**
  - **Mobile**
  - **Satellite**
- **Antenna (transceiver)**
  - **Pattern editor**
- **Mobility (trajectory)**
- **OPNET models**
  - **GPRS**
  - **UMTS**

Thank you!