Orbit Management Framework (OMF)

Tutorial

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• **Introduce** OMF, and **demonstrate** how to use it

• **Create** interests, and **build** future collaboration

• Outline:  
  1. Overview  
  2. Getting Started: a simple example  
  3. The Next Steps…  
  4. Glimpse of Future Features  
  5. Conclusion
1. Overview

2. Getting Started: a simple example

3. The Next Steps… a ‘less simple’ example

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Overview

• Why do we need a framework to **use** and **manage** testbeds?
  
  ▪ User
    - support “*experiment cycles*” + scientific rigour
    - validation, accuracy & reproducibility
  
  ▪ Operator
    - ease management tasks
    - optimize resource utilization (intra / inter)

• Other existing frameworks: PlanetLab tools, Emulab

• **OMF**
  - support for *experiment cycles*
  - ease management tasks
OMF - User View

- Experiment Description
- Results
- Deploy & Configure
  - Control
  - Experimental Platform(s)
  - Measure
OMF- Operator View

Control & Management Network

Node Handler
Console

Grid Services
Server(s)
DB

Node Agent
Node 1

Node X

Testbed(s)

Experiment Network(s)

Experimental Network(s)

Apps A
ML
Overview

- **Where?**
  - Orbit, Winlab
  - Rutgers University
  - NICTA Sydney

- **How-To deploy OMF?**
  - Open source code & Debian-style packages
  - Installation Guide
  - Support (omf-deploy@lists.nicta.com.au)
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Getting Started: a simple example

- Simple Experiment
  - Scenario
  - Experiment script & description language

- Ad-Hoc
- 802.11a
- CBR
- Exp. Script...
Getting Started: a simple example

• Executing the experiment
  ▪ Same experiment description on 2 different testbeds
  ▪ 1st run at NICTA… - demo -
  ▪ 2nd run at Orbit Winlab… - demo -

• The results - demo -
  User-defined measurement points & filters
  Unified collection scheme
  SQL-based database
  User processing scripts
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The Next Steps… a ‘less simple’ example

- The Experiment
  - Scenario
  - Experiment script & description language

Diagram:
- Sender
- Relay A
- Relay B
- Relay C
- Receiver

- Ad-Hoc
- OLSR daemon
- Multi-paths
- Mac filtering
- 802.11g
- CBR
- Exp. Script…
The Next Steps… a ‘less simple’ example

• Executing the experiment at NICTA…
  - demo -

• Processing the results
  - demo -

• What’s next ?
  ▪ Apps installation & node Imaging / Saving
  ▪ Wrapper around other popular apps (e.g. iperf)
  ▪ Your own scheme / algorithm …. 

Up for you to try… ( http://www.orbit-lab.org/ )
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Glimpse of Future Features

• **Federation:**
  Experimentation on / across multiple testbeds

• A unique *description* → many instances
  • How to describe an experiment & required resources?
  • How to discover/schedule resources & map descriptions?
  • How to federate multiple organizations?

• An experiment across testbeds → enhanced capabilities
  • Further description, discovery, scheduling, mapping issues
  • How to coordinate resource usage across locations?

• PlanetLab’s “Hello World” with OMF - *demo* -
Glimpse of Future Features

• Resource Sharing: System & Communication abstractions
  ➞ at which level and layer to virtualize?

• OS / Hardware virtualization

• Network / Link Layer virtualization
  ➞ e.g. how to share wireless medium?

• Current trials: - Xen virtual machines on NICTA’s testbed
  - Space and Frequency sharing

• Issues: adapt to user needs & to new technologies
Glimpse of Future Features

- Other features under development
  - Additional access methods (e.g. web interface)
  - Generic processing & visualization tools
  - Default context measurements (e.g. system stats)
  - “Disconnected” mode (e.g. mobile testbeds)
  - “Batch” mode
  ...

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Conclusion

• Need for a framework to use and manage testbeds
  Support full experiment cycle & increase scientific rigour
  Ease management & Optimize resource utilization
  \(\rightarrow\) **OMF**: deployed, used, and being actively improved

• Tutorial on using OMF
  High-level experiment description
  Controlled experiment execution
  Unified measurement collection

• Future OMF… **v2**: Federation of multiple testbeds
  Resource Virtualization
  Enhanced user experience
  New / Other network technologies
Thank you

Any questions?

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