

# OMF: a Control and Management Framework for Networking Testbeds

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NICTA Members



Department of State and  
Regional Development



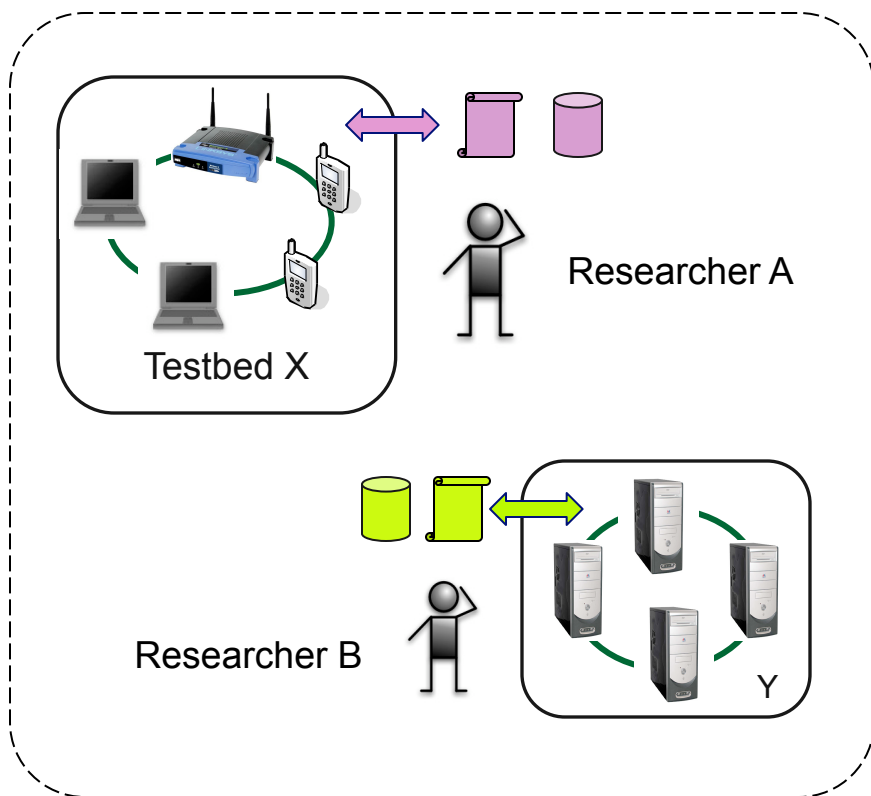
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## Introduction to OMF from a user's perspective

(system and operator's perspective see: <http://omf.mytestbed.net>)

1. How do we do experiments? limitations?
2. OMF, a framework to address these limitations
3. How to experiment with OMF?
4. Future Works

# 1. The Problem



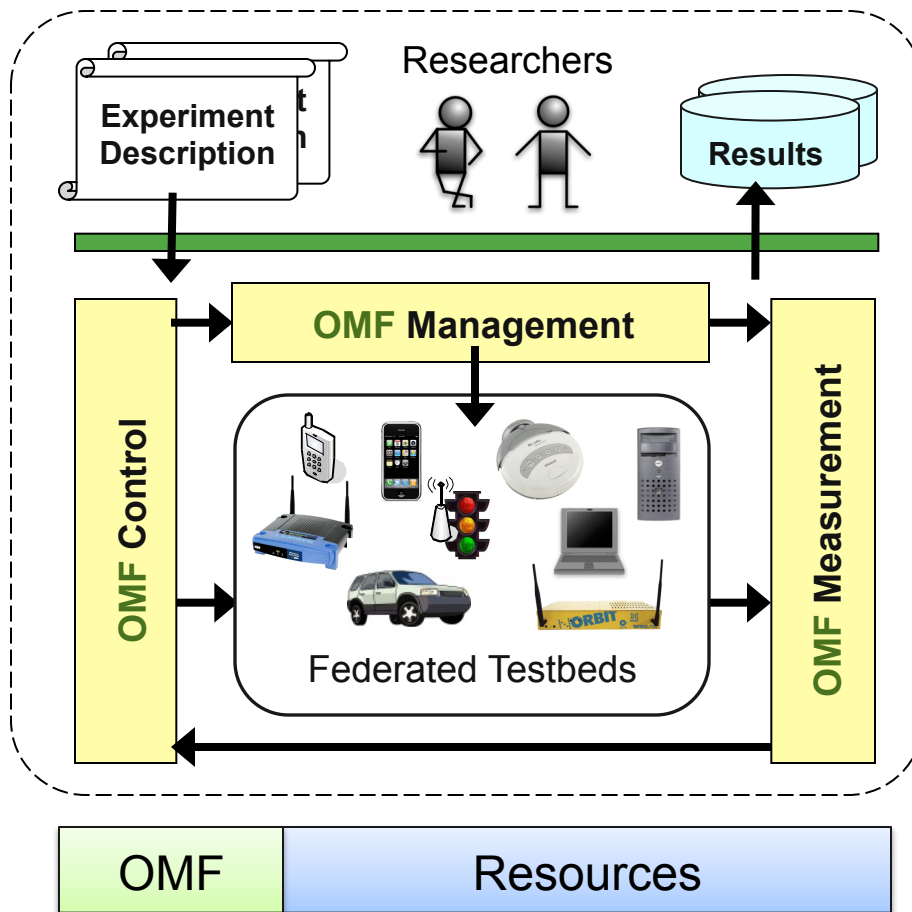
## How do we do experiments today ?

- Independent initiatives
- Non-optimal (re) use of resources (both spatial & temporal)
- High setup costs , low accessibility
  
- Weak experimental methodologies
- Ambiguous descriptions
  - Hard to reproduce
  - Low statistical confidence
  - Low peer verification

Software & Management

Resources

## 2. Our Approach



### OMF a unified framework

#### Managing Testbed

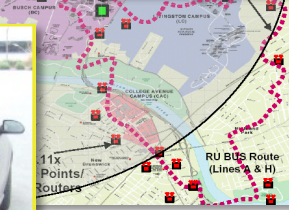
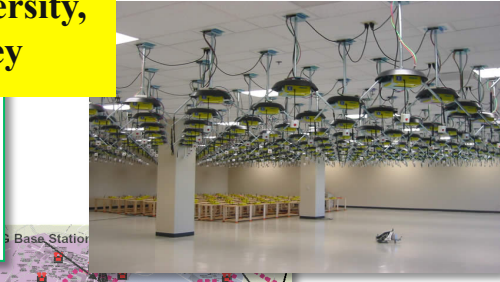
- abstraction for many resource types
- allocate & configure resources
- lower setup & operation cost

#### Controlling Experiment

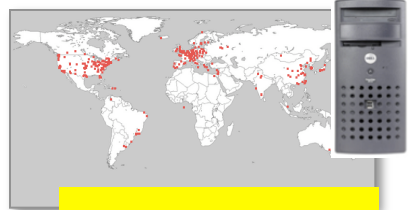
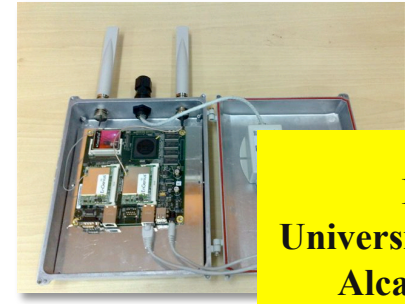
- systematic description
- systematic measurement collection
  - Reproducibility  
(within & across testbeds)

# 2. Where is OMF currently used?

**Rutgers University,  
New Jersey**



**INRIA  
University of Thessaly  
Alcatel-Lucent**



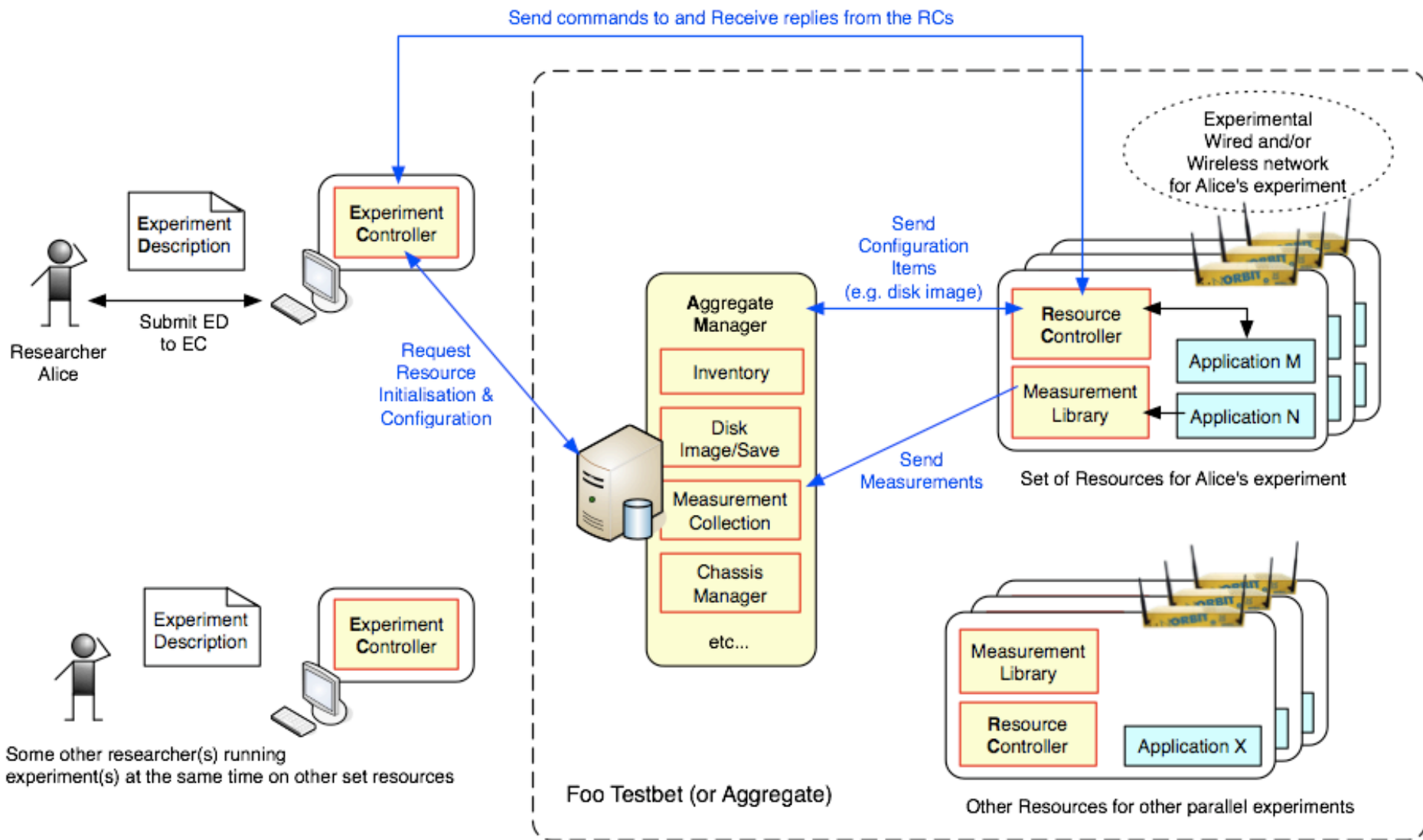
**PlanetLab  
(early integration)**



**NICTA, Sydney**



# 2. OMF System Overview (current release)

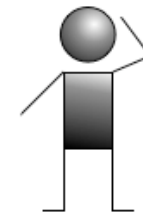


# 3. How to experiment with OMF?

## A. Experiment Description and Instrumentation

```
defGroup("source", [1,2]) { |node|  
  node.addApplication("UDPgen") { |app|  
    app.setProperty("dst", "10.0.0.2")  
    ...other property setup...  
    app.measure("udp_out", :interval => 5)  
    ...other measurement setup...  
  }  
  ...specific configs for this group...  
}  
...more definition...  
allGroups.net.w0 { |w|  
  w.type = "g"  
  w.mode = "ad-hoc"  
  ...more configs for all groups...  
}  
whenAllInstalled {  
  allGroups.startApplications  
  wait 30  
  group("source").stopApplications  
  ...more actions...  
}
```

```
defApplication("UDPgen", "otg2") { |a|  
  
  a.path = "/usr/bin/otg2"  
  a.description = "A Traffic Generator"  
  ...other application attributes...  
  
  a.defProperty ("dst", etc...)  
  a.defProperty ("pktsize", etc...)  
  ...other application property...  
  
  a.defMeasurement("udp_out") { |m|  
    m.defMetric("timestamp", :float)  
    m.defMetric("seq_no", :long)  
  }  
}
```



# 3. How to experiment with OMF?

## B. Deployment and execution

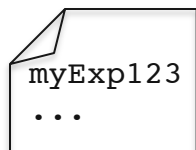
```
> omf exec myExp123

INFO NodeHandler: init OMF Experiment Controller 5.2.270
INFO NodeHandler: init Experiment ID: x_2009_10_08_15_07_45
INFO NodeHandler: Web interface available at: 10.0.0.200:4000
INFO Experiment: load myExp123
... other info about experiment properties ...

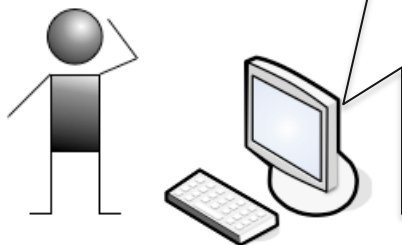
INFO whenAll: *: 'apps/app/status/@value' fires
INFO n_1_3: Device 'net/w0' reported Not-Associated
INFO n_1_2: Device 'net/w0' reported 06:0B:6B:57:BC:1B
INFO n_1_3: Device 'net/w0' reported 06:0B:6B:57:BC:1B
INFO exp: Request from Experiment Script: Wait for 30s....
... other info from experiment ...

INFO Experiment: DONE!
INFO run: Experiment x_2009_10_08_15_07_45 finished after 1:11

> _
```



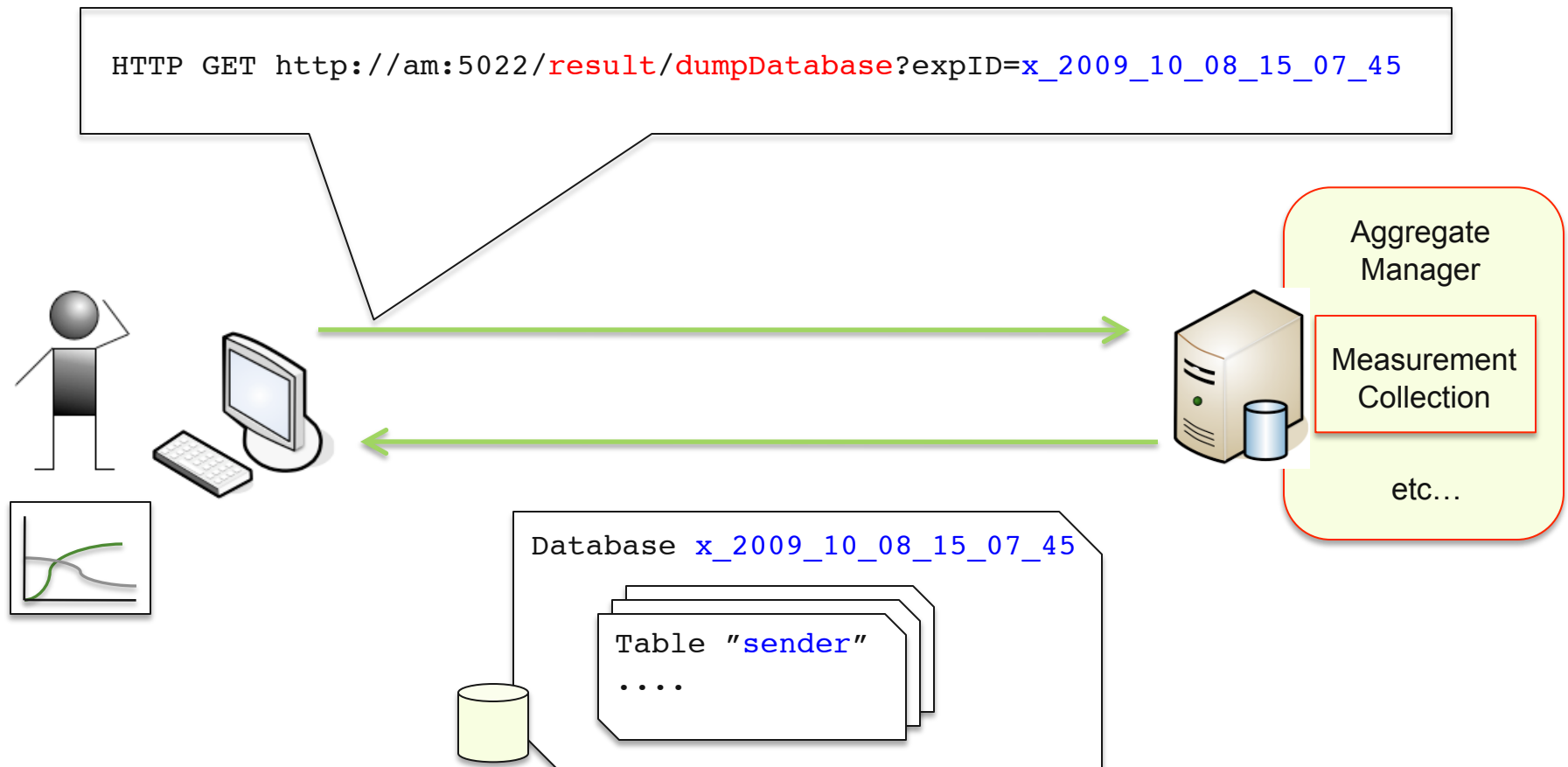
myExp123  
...





# 3. How to experiment with OMF?

## C. Measurement Access and Analysis



# 3. How to experiment with OMF?



## D. Experimenting further

- Reproduce with different parameters & testbeds
- Support wired & wireless devices (PlanetLab, Wifi, Motes, ...)
- Support mobile disconnected experiments (cars, robots)
- Support traffic shaping (link emulation)
- Support handheld mobile devices
- Support resource virtualization

Complete user guide and tutorials: <http://omf.mytestbed.net>

## 4. What is next ?

- **Resource sharing via virtualization**
  - OpenVZ, Xen, how to slice wireless medium?
- **Federation of testbeds**
  - Design with emphasis on flexibility and de-coupling
  - Discussions on integration with Planetlab, ORCA
- **Support for more resources**
  - OMF on handheld phone devices (3G, WiMax, ...)
  - OMF on off-the-shelf robots
- **More experiment control features**
  - Steerable experiments (resource context, measurements)

**Thank you**

**Any questions?**

<http://omf.mytestbed.net>



From imagination to **impact**