NICTA

Orbit Management Framework (OMF) Demonstration

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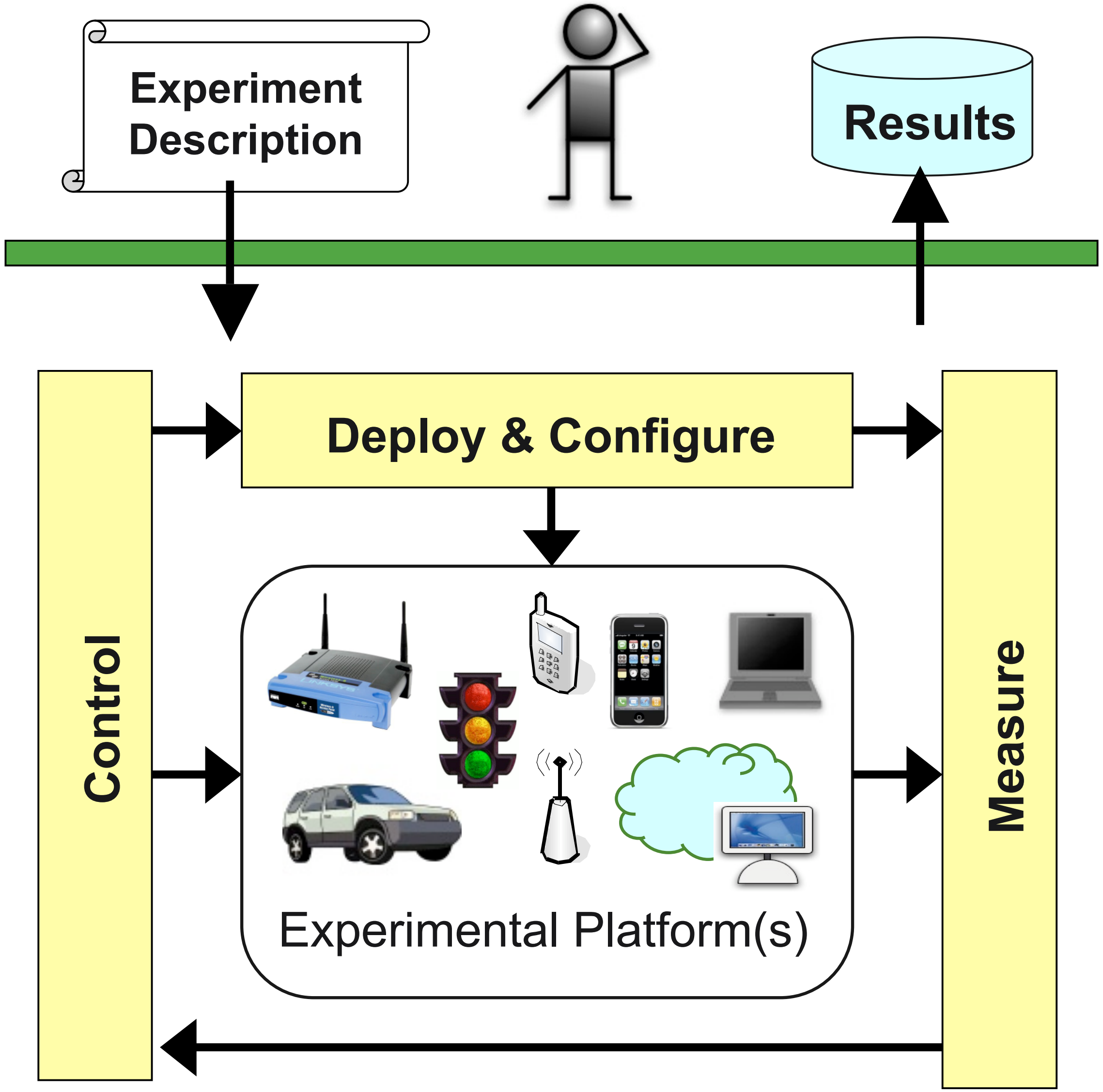
Australian Research Council

NICTA Members

NICTA Partners

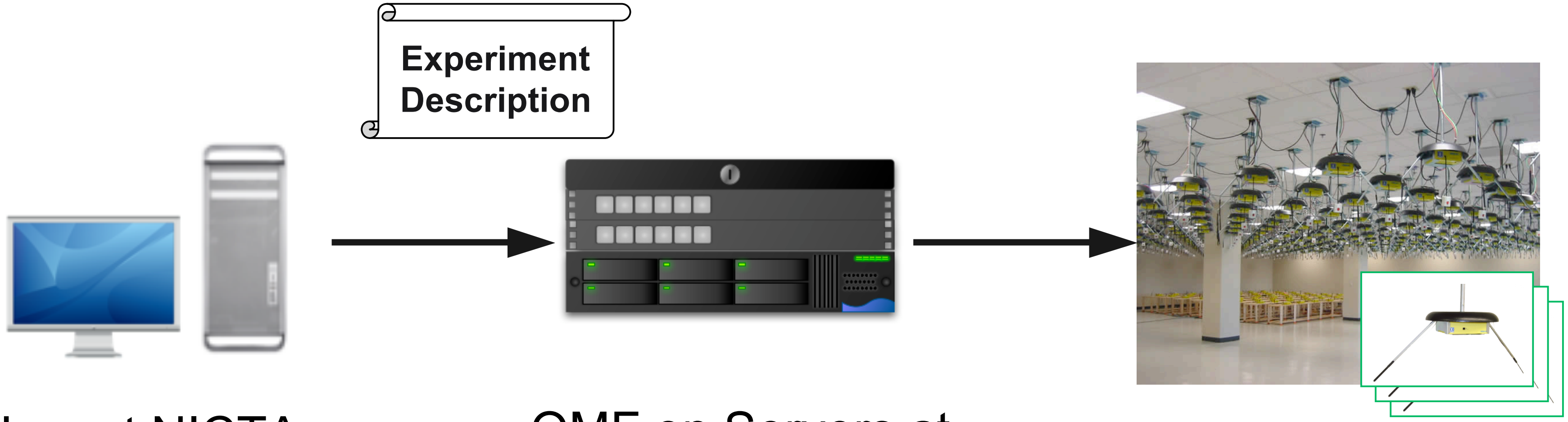
OMF - User View



Simple Multi-path Experiment

Overview

- Ad-Hoc Mesh Network + WiFi 802.11g
- Ad-Hoc routing with Multi-Path capability (OLSR from PhD NICTA)
- Constant traffic from one node to another

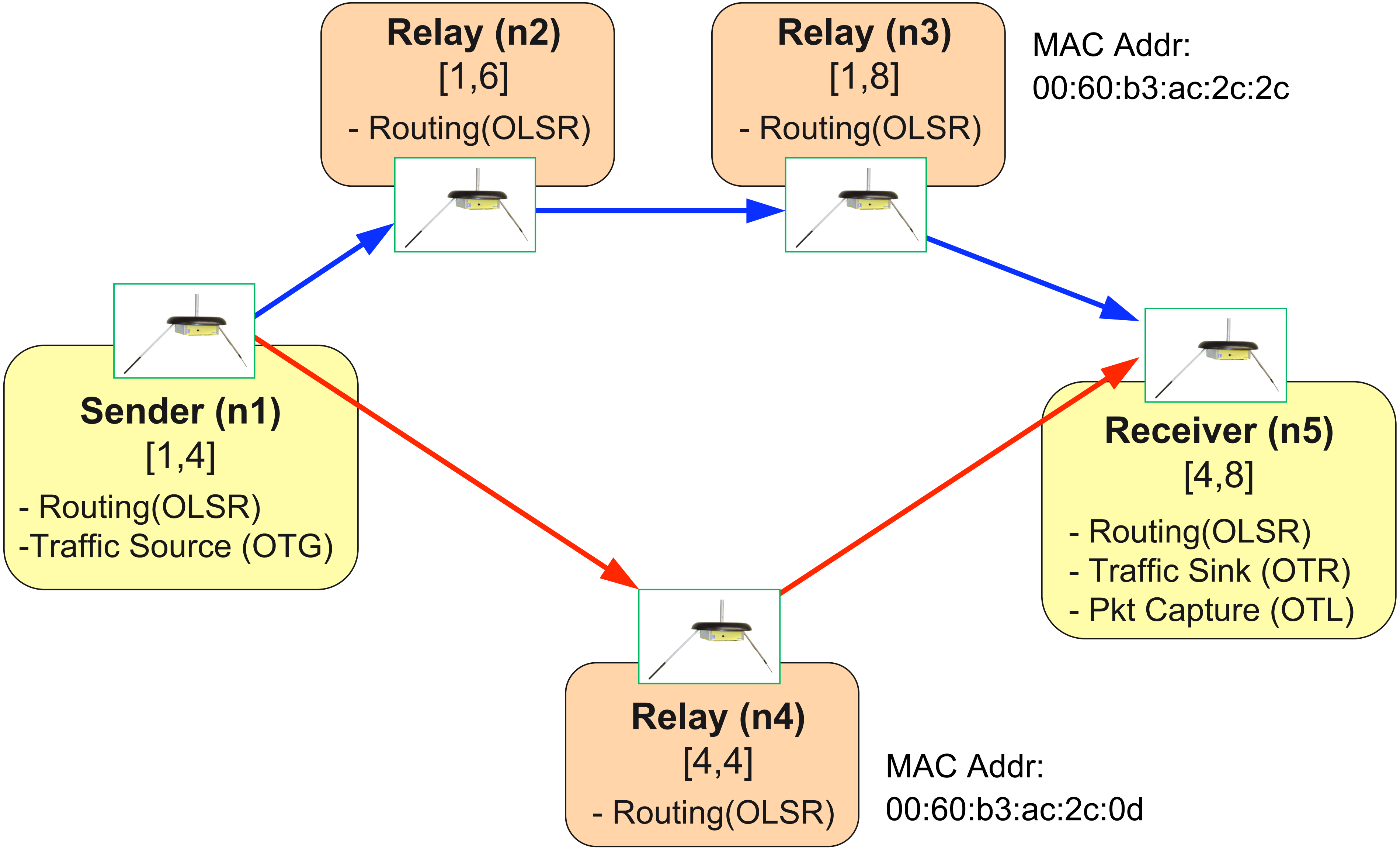


User at NICTA

OMF on Servers at WinLab

OMF on Wireless Testbed at NICTA

Simple Multi-path Experiment



Relay (n2)
[1,6]
- Routing(OLSR)

Relay (n3)
[1,8]
- Routing(OLSR)

MAC Addr:
00:60:b3:ac:2c:2c

Sender (n1)
[1,4]
- Routing(OLSR)
-Traffic Source (OTG)

Receiver (n5)
[4,8]
- Routing(OLSR)
- Traffic Sink (OTR)
- Pkt Capture (OTL)

Relay (n4)
[4,4]
- Routing(OLSR)

MAC Addr:
00:60:b3:ac:2c:0d

Experiment Script

Experiment Description

1. **SETUP**
2. **OPERATIONS**

- SETUP
  - Describe network Topology
  - Configure & Associate applications to nodes
  - Configure network Interfaces
- OPERATION
  - Implement the Topology
  - List of Actions to perform

Experiment Script

- SETUP - Describe network Topology
  - See example script
  - Other available methods:

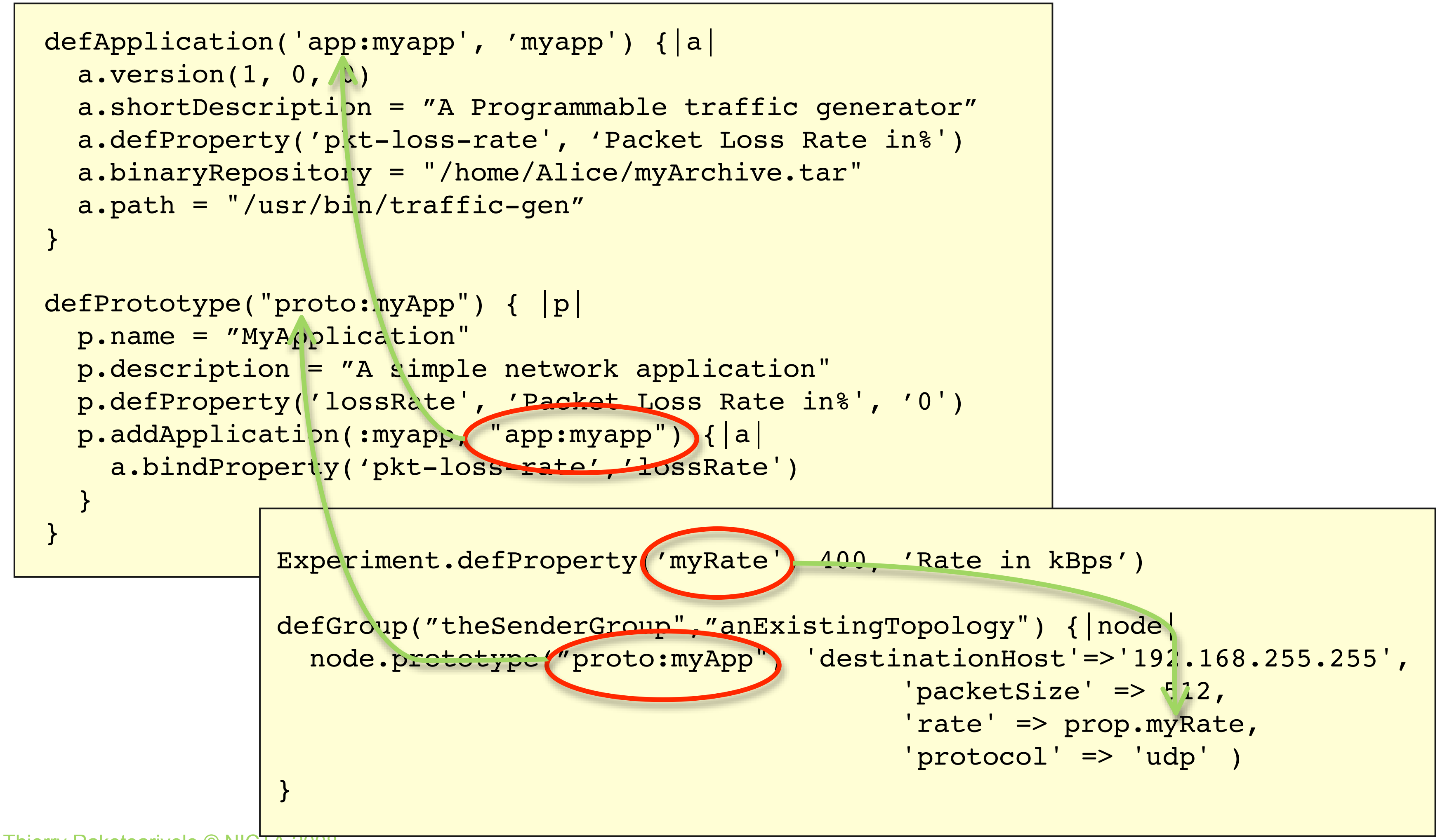
```
defTopology(’myTopo') { |t|
  baseTopo = Topology['system:topo:active']
  for count in 1..4
    # Draw a random node
    aNode = baseTopo.getUniqueRandomNode
    # Add it to this topology
    t.addNode(aNode)
  end
}
```

```
defTopology(’aSubTopology') { |t|
  parentTopo = Topology[‘myTopo’]
  aNode1 = parentTopo.getNodeByLabel(“n_1”)
  aNode2 = parentTopo.getNodeByLabel(“n_4”)
  t.addNode(aNode1)
  t.addNode(aNode2)
}
```

```
defTopology(’myTopo') { |t|
  baseTopo = Topology['system:topo:active']
  someNodes = baseTopo.select( :method => :random,
                               :number => 4,
                               :name => ″n_%i%",
                               :features => {:wifi => "atheros”,
                                             :bt => "false",
                                             :mem => ″1Gb",
                                             :channel => ″6″})
  t.addNodes(someNodes )
  t.addLink(″n_1",″n_2", {:rate =>54, :per =>0.1, :asymmetric => true })
  t.addLink(“n_2",″n_3", {:rate =>12, :per =>0.2, :asymmetric => true })
}
```

Experiment Script

- SETUP - Configure and Associate applications to nodes
  - See example script - Other available methods:



```
defApplication('app:myapp', ’myapp') {|a|
  a.version(1, 0, 0)
  a.shortDescription = ”A Programmable traffic generator”
  a.defProperty(’pkt-loss-rate', ‘Packet Loss Rate in%')
  a.binaryRepository = "/home/Alice/myArchive.tar"
  a.path = "/usr/bin/traffic-gen”
}

defPrototype("proto:myApp") { |p|
  p.name = ”MyApplication"
  p.description = ”A simple network application"
  p.defProperty(’lossRate', ’Packet Loss Rate in%', ’0')
  p.addApplication(:myapp, "app:myapp") {|a|
    a.bindProperty(‘pkt-loss-rate’,’lossRate')
  }
}
```

```
Experiment.defProperty(’myRate', 400, ’Rate in kBps’)

defGroup(”theSenderGroup",”anExistingTopology") {|node|
  node.prototype(”proto:myApp", 'destinationHost'=>'192.168.255.255',
                                  'packetSize' => 512,
                                  'rate' => prop.myRate,
                                  'protocol' => 'udp' )
}
```

Experiment Script

- SETUP - Configure Network Interface
  - See example script

- OPERATION - Implement the Topology
  - See example script
  - Other available methods:

```
allGroups.net.w0.enforce_link = {:topology => 'mainTopology', :method => ’mackill'}

Or

allGroups.net.w0.enforce_link = {:topology => 'mainTopology', :method => ’ebtable'}
```

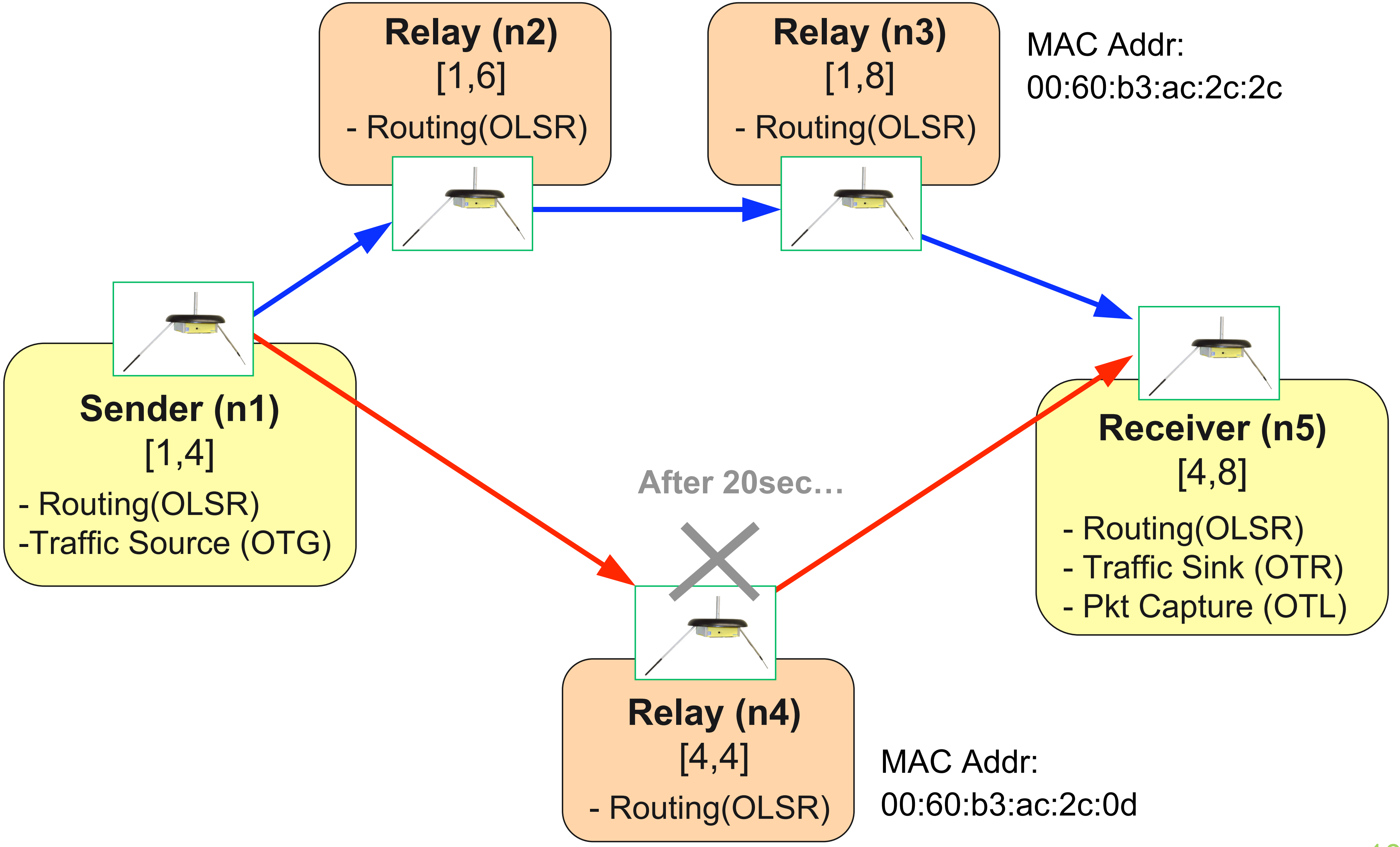
  - Extendable, support for new technology = a new ‘method’
  - Warn user if the Topology is not feasible (next OMF release)

Experiment Script

- OPERATION - List of Actions to perform
  - Available methods:

```
whenAllUp { ... }  # Execute actions when all nodes are UP

whenAllInstalled { ... }  # Execute actions when all Apps on all nodes are ready to run

wait 30

info “Some messages...”

prop.myRate = 900

allGroups.exec(“/usr/bin/someCommand -someParameter 123”)

allGroups.startApplications

allGroups.stopApplications

Experiment.Done

## Same as above but for a specific group:

group(“myGroup”).startApplications

Etc...
```

Running the Experiment….



Relay (n2)
[1,6]
- Routing(OLSR)

Relay (n3)
[1,8]
- Routing(OLSR)

MAC Addr:
00:60:b3:ac:2c:2c

Sender (n1)
[1,4]
- Routing(OLSR)
-Traffic Source (OTG)

After 20sec…

Receiver (n5)
[4,8]
- Routing(OLSR)
- Traffic Sink (OTR)
- Pkt Capture (OTL)

Relay (n4)
[4,4]
- Routing(OLSR)

MAC Addr:
00:60:b3:ac:2c:0d

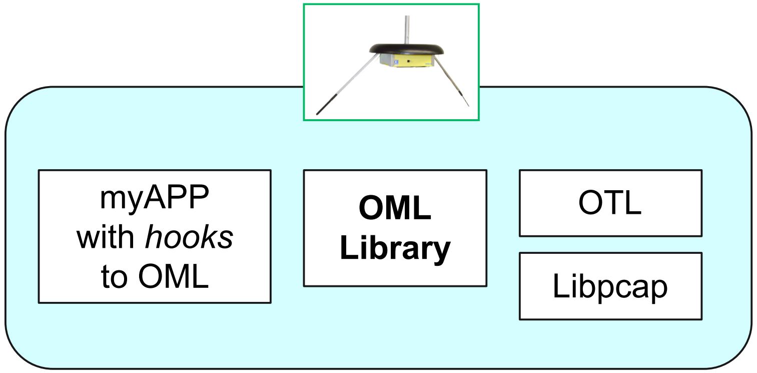
Experiment Script - Taking Measurements

- The OMF Measurement Library (OML) - 2 available methods

  A. Add measurement *hooks* in your App code + Compile App with OML library

  B. Use built-in packet tap OTL, which is based on existing libpcap (….)
  Define filters

```
// - 1
omlc_init(name, &argc, argv, o_log);

// - 2
static OmlMPDef oml_def[] = {
  {"ts", OML_DOUBLE_VALUE},
  {"pkt_length", OML_LONG_VALUE},
  {"dst_host", OML_STRING_PTR_VALUE},
  {"dst_port", OML_LONG_VALUE},
  {NULL, (OmlValueT)0},
};

// - 3
static OmlMP* oml_mp;
oml_mp = omlc_add_mp("udp_out", oml_def);

// - 4 - before starting your app
omlc_start();

// - 5 - within your app’s execution
omlc_process(oml_mp, v);
```



myAPP with *hooks* to OML

OML Library

OTL

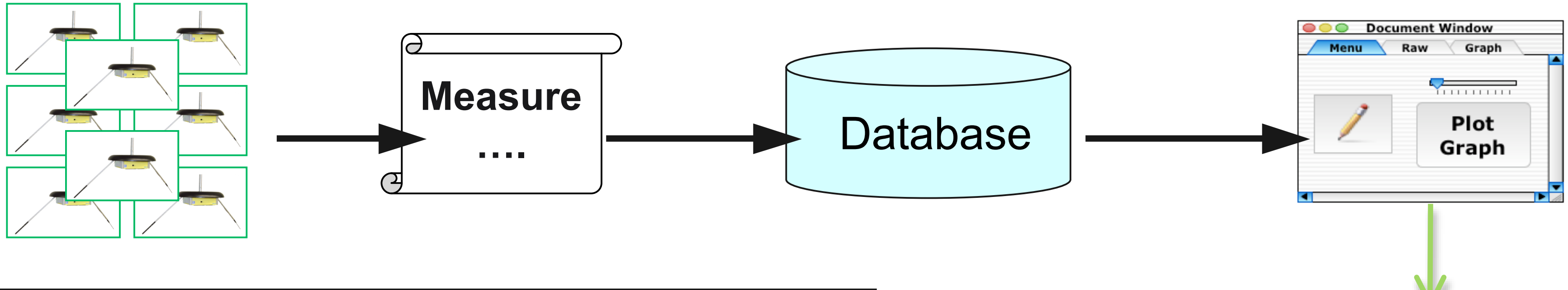
Libpcap

```
// Libpcap specific filters
// (i.e. tcpdump ‘expressions’)
dst host 192.168.0.1
```

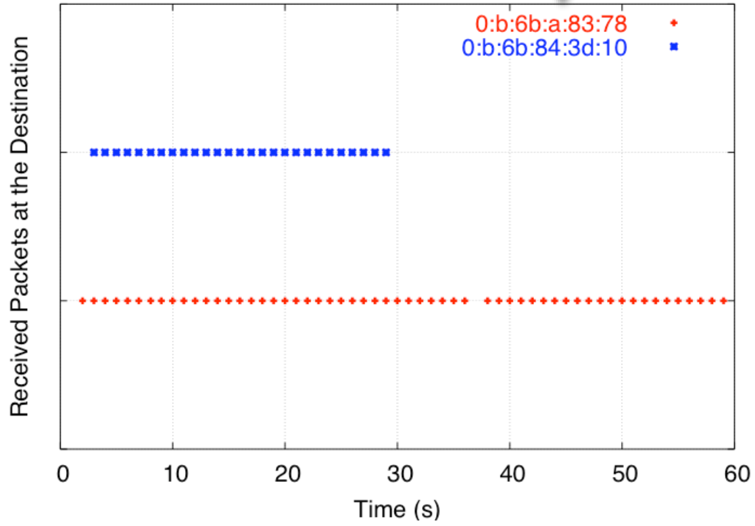
Processing and Viewing the results

Each node: OML Measurement Point(s) & Filter(s)

Server: OML Collection & Storage Services



```
defApplication('app:myapp', ’myapp') {|a|
  …
  a.defMeasurement(”mp1") { |m|
    m.defMetric('pkt_seqno', 'long')
    m.defMetric('pkt_size', 'long')
  }
}

defPrototype("proto:myApp") { |p|
  p.addApplication(:myApp, ”app:myapp") {|a|
    …
    a.measure(’mp1’, :interval => 1.sec) {|m|
      m.add('pkt_seqno')
      m.add('pkt_size', :filter => ‘builtin:avg’)
    }
  }
}
```



Thank you

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