

ProtoGENI Experimenter Tools

Robert Ricci

GEC 5

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Slices vs. Experiments

- Slice: Collection of resources
 - Control framework deals with slices
- Experiment: User-defined activities
 - On top of control framework
- ProtoGENI is a control framework
 - Plan to port Emulab experiment tools

Resources

Make nodes

```
set client [$ns node]
set server [$ns node]
```

Pick specific hardware types for them

```
tb-set-hardware $client pc
tb-set-hardware $server pc3000
```

A single link between them

```
set link0 [$ns duplex-link $node1 $node2 1000Mb 50ms DropTail]
```

Loops and conditionals

```
for {set i 1} {$i < $N_NODES} {incr i} {
    if {$i % 2 == 0} {
        .....
    } else {
        .....
    }
}
```

Experiment Software

Load operating system images on nodes

```
tb-set-node-os $client WINXP-STD
```

```
tb-set-node-os $server FC8-STD
```

Install software on the nodes

```
tb-set-node-rpms server "http://some-server/apache-2.2.i386.rpm"
```

```
tb-set-node-tarfiles client "/cygdrive/c /proj/testbed/client.tgz"
```

Create an agent to start and stop programs

```
set apache [$server program-agent -command "httpd"]
```

Experiment Actions

```
# Link between nodes changes bandwidth 10 minutes into experiment
```

```
$ns at [expr 60 * 10] "$link0 bandwidth 20Mb"
```

```
# Link goes down completely after 20 minutes
```

```
$ns at [expr 60 * 20] "$link0 down"
```

```
# Start webserver at start of experiment
```

```
$ns at 0 "$apache start"
```

```
# Build up a sequence of events
```

```
set build [$ns event-sequence {  
    $builder run -command "./configure"  
    $builder run -command "gmake"  
    $builder run -command "sudo gmake install"}]
```

```
# Turn on automatic tracing for a link
```

```
$link0 trace
```



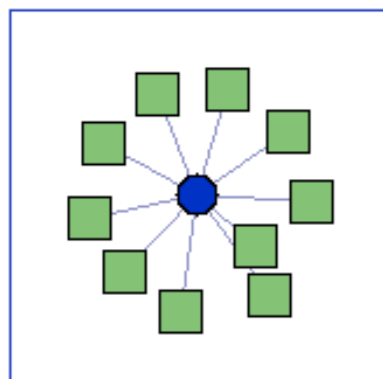
51 Free PCs, 0 reloading			
pc600 0	pc850 0	pc3000 18	pc2400w 19
pc2000 3	pc3000w 11	pc6000 0	pc2400c2 0
pc2400h4 0	pc2830qx2 0	pc2400qx2 0	

'eeide' Logged in. Mon Jul 20 3:16pm MDT

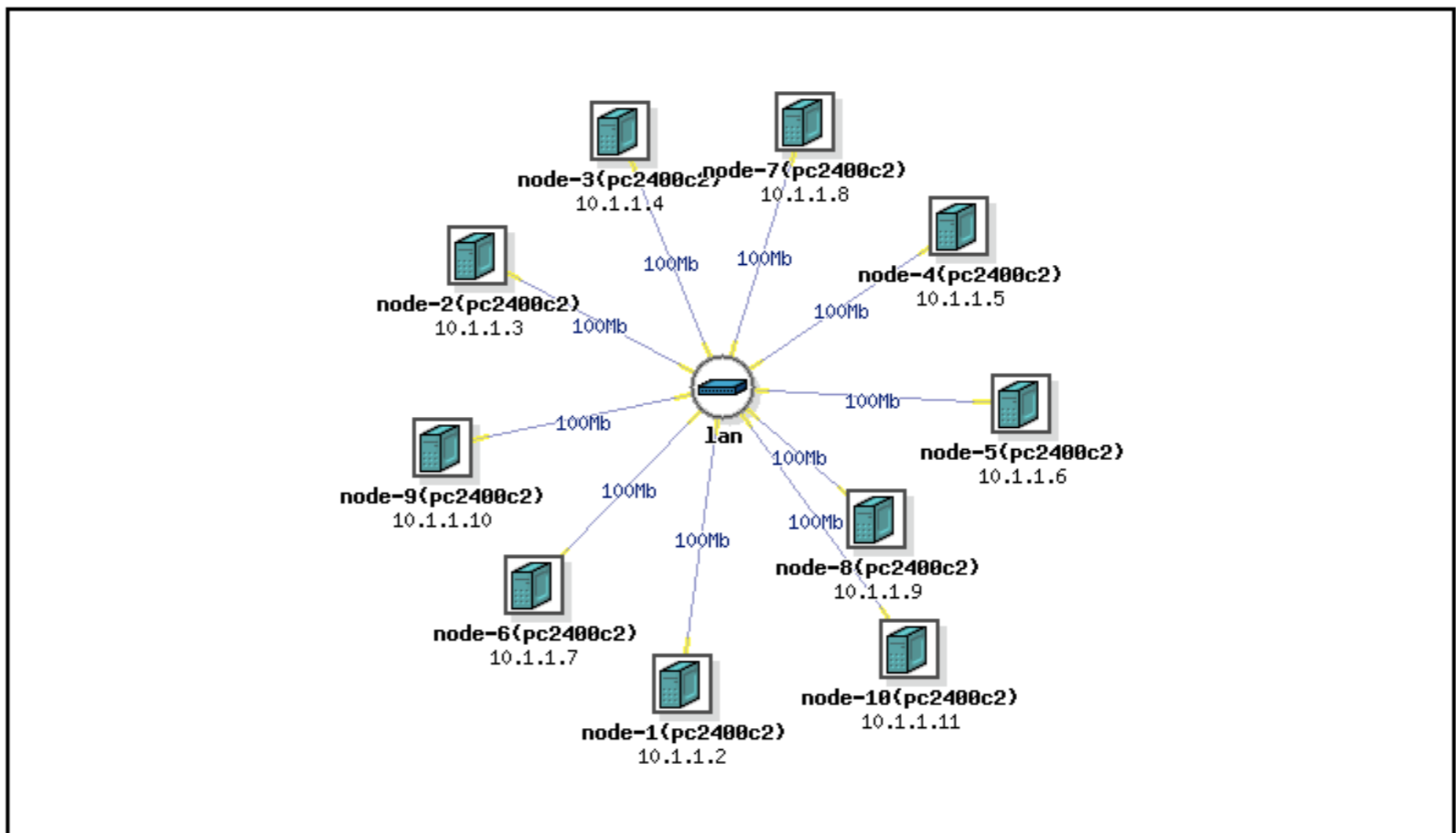
Experiment (alchemy/tribe2)

- ### Experiment Options
- [View Activity Logfile](#)
 - [Swap Experiment In](#)
 - [Terminate Experiment](#)
 - [Modify Experiment](#)
 - [Modify Settings](#)
 - [Clear Feedback Data](#)
 - [Show History](#)
 - [Duplicate Experiment](#)
 - [Experiment File Archive](#)

51 Free PCs, 0 reloading			
pc600 0	pc850 0	pc3000 18	
pc2400w 19	pc2000 3	pc3000w 11	
pc2400c2 0	pc2400qx2 0		



- Settings
- Visualization
- NS File
- Details



- Zoom Out
- Zoom In
- Hide Details
- Full Screen

Scripting

- Command line tools on Emulab servers
- XML-RPC interface to Emulab
 - Remote queries and commands
- Scripting via Emulab's event system
 - E.g., start and stop programs, trafigens, ...
 - E.g., bring nodes and links up and down

Workbench

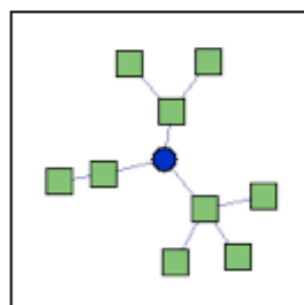
- Research to refine & expand “experiments”
- Encapsulate all inputs: NS, OS, SW, data
- Capture and persist experiment outputs
- Track & navigate through revision history
- Parameter-based exploration
- Currently in prototype [Eide+, NSDI '07]

Template bt-4-4-0-final (11656/10)

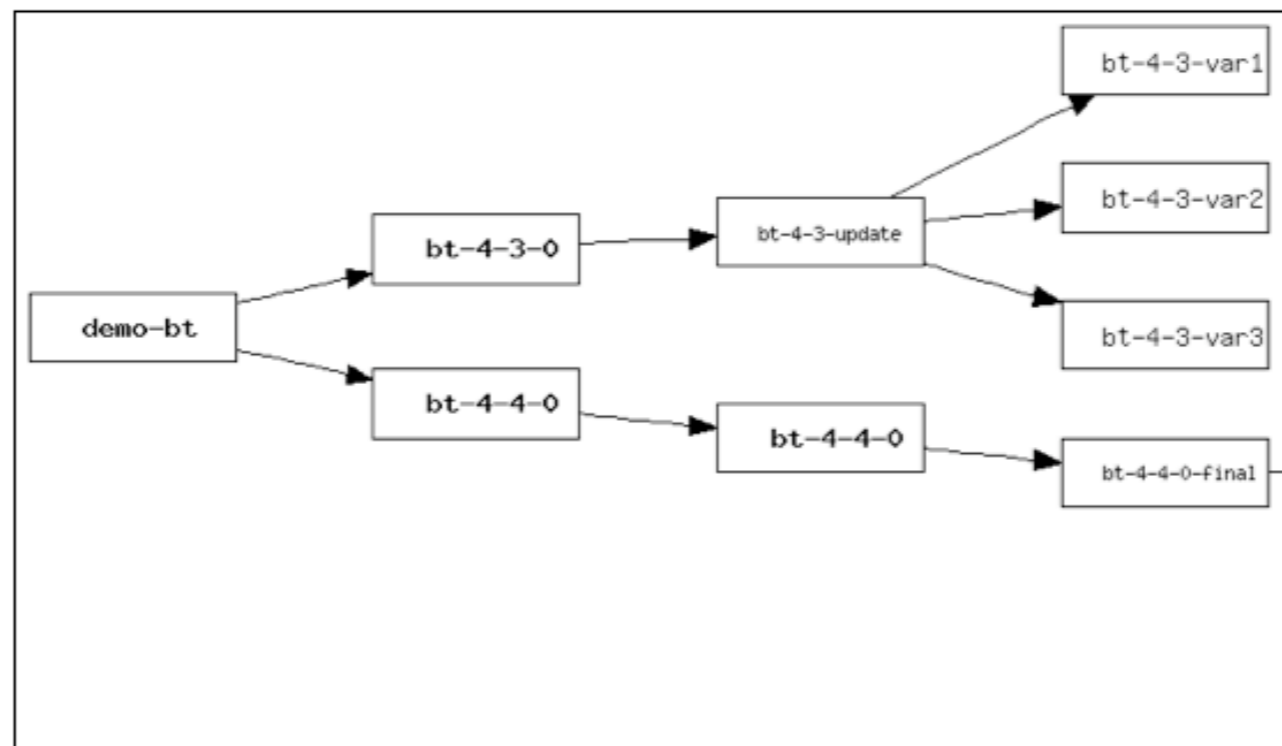
'eeide' Logged in.
Mon Jul 20 2:26pm MDT

Template Options

- [InActivate Template](#)
- [Modify Template](#)
- [Instantiate Template](#)
- [Create New Template](#)
- [Add Metadata](#)
- [Search Template](#)
- [Browse Datastore](#)
- [Browse CVS Repository](#)
- [View Records](#)



Topology NS File History



Hide Template Recursive? Hide Hidden Templates Zoom Out Zoom In

Details

GUID:	11656/10
ID:	bt-4-4-0-final
Project:	compadres
Group:	compadres
Creator:	eeide
Created:	2006-11-01 23:25:28
Description:	This is a demonstration template. It is ...
Parent Template:	11656/9

Parameters

Name	Default Value	Description
BT_HARDWARE	pc3000	BitTorrent host hardware type
BT_OSID	RHL90-UPDATE	BitTorrent host OS
CABLE_CLIENT_BANDWIDTH	2Mb	LAN-link BW for cable clients
CABLE_CLIENT_COUNT	3	Number of cable clients
CABLE_CLIENT_LATENCY	25ms	LAN-link latency for cable cli ...
DSL_CLIENT_BANDWIDTH	2Mb	Link BW for DSL clients
DSL_CLIENT_COUNT	2	Number of DSL clients
DSL_CLIENT_LATENCY	25ms	Link latency for DSL clients
DURATION	60	Experiment duration (sec)
ROUTER_HARDWARE	pc3000	Router hardware type
ROUTER_OSID	FBSD410-UPDATE	Router OS

Integration into Emulab

- Most tools run on Emulab server
 - Remote access via web, XML-RPC
- NS file read into a set of database tables
 - Client machines self-configure
 - Experimenter tools consult DB
- Much coordination done through event sys.

Porting to ProtoGENI

- Hope to start in Spiral 2
- Turn script invocations into RPCs
- Will probably stress control framework
 - Likely lead to design revisions
- Will remain server-based, not run on client machines

Porting to Other CFs

- Some experience with this
 - Most Emulab tools can run on PlanetLab
- Hook: Just need to be able to install some basic software to bootstrap
- Ease will depend on closeness to SFA
 - But of course we are all making changes

Other Tools: seash

- Part of Seattle (Million node GENI) project
- Interactive shell
- List, run code on, check stats of Seattle vessels
- Additional tools in development

seash examples

Finding your resources

```
username@ !> browse
Added targets: %1(IP:port:vesselname), %2(IP:port:vesselname), ...
Added group 'browsegood' with X targets
```

Running code on one node

```
username@ !> on %1 run helloworld.py
username@ !> on %1 show log
```

Running code on a group of nodes

```
username@ !> on browsegood
username@browsegood !> run helloworld.py
username@browsegood !> show log
```

emulab.net
protogeni.net

