ProtoGENI
and undergraduate courses

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## Experiment Options

- View Activity Logfile
- Swap Experiment In
- Terminate Experiment
- Modify Experiment
- Modify Settings
- Clear Feedback Data
- Show History
- Duplicate Experiment
- Experiment File Archive

### 188 Free PCs, 6 reloading

<table>
<thead>
<tr>
<th>PC Model</th>
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### Experiment (tbres/event-test)

```sh
set ns [new Simulator]
source tb_compat.tcl
set maxnodes 32
set tarball "/proj/tbres/duerig/event/node.tar.gz"
set servercmd "/local/node/start-server"
set clustercmd "/local/node/start-cluster clusterd-nofilter"
set clientcmd "/local/node/start-clients 1 5 localhost"
set lanstr ""

# The pubsub server node
set node0 [sn0 node]
set node0 $node0 d710
set node0 $node0 FBSD72-STD
set server [($node0 program-agent -command "$servercmd")]
set clusters [new EventGroup $ns]
set clients [new EventGroup $ns]

# Agent nodes
for {set i 1} {i <= $maxnodes} {incr i} {
    set node($i) [sn0 node]
    set node($i) $node($i) d710
    set node($i) $node($i) FBSD72-STD
    set node($i) $node($i) /usr/testbed/lib $tarball
    set cluster($i) [($node($i) program-agent -command "$clustercmd")]
    set client($i) [($node($i) program-agent -command "$clientcmd")]
    append lanstr "$node($i)"
    $clusters add $cluster($i)
    $clients add $client($i)
}
```
Getting started

• Professor creates new project
  — approved by testbed admin

• TAs then join that project (group leader)
  — approved by the project head

• Students also join
  — approved by the project head or TA
Education

- Emulab used in a couple of dozen classes
- ProtoGENI used in two
Assignments

- Put everything in an NS file or RSpec, give it to all students
- Can include software packages and dependencies
- More advanced classes can have students create their own topologies
Grading

- Run every student’s code in a consistent environment

- Few concerns about side effects or malice
Environment

- Forgiving!

- (Almost) nothing a student can do that can’t be recovered easily
Courseware

- Standard environment no matter what university the class is taught at

- Can adapt textbook exercises to GENI/Emulab
  - This was done for a class at Calvin College
http://www.emulab.net/

http://www.protogeni.net/

http://users.emulab.net/trac/emulab/wiki/Classes

http://cs.calvin.edu/activities/emulab/comer.html