XCAST on PlanetLab

~ Deploying an Overlay Network on a Private PlanetLab ~

A Demonstration

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WIDE Project (XCAST WG)

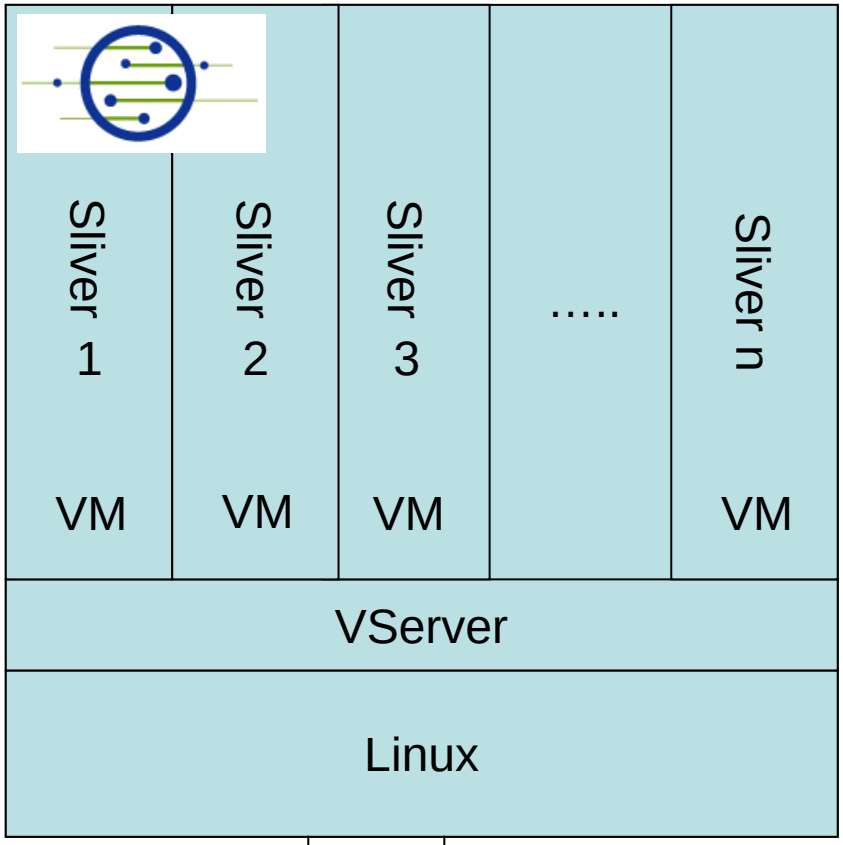
Overview

- Purpose
  - Create an overlay network testbed for SAM RG experiments
- Approach
  - Use private PlanetLab (PL) for testing
  - Implement in User Mode Linux similar to PL Virtual Network Infrastructure (VINI) described in SIGCOMM 2006 paper
- Results
  - Use XCASTv6 enabled UML on private PL
  - Connect nodes through UDP Tunnels
  - Use XCAST client application to demonstrate operation
- Significance
  - Goal is to deploy this on actual PL and make available to other researchers in SAM RG

PlanetLab

- More than 750 nodes form PlanetLab world-wide
  - More information at http://www.planet-lab.org
- A “private PlanetLab” is a separate network where the hosts run the PL software and there is a local master node (MyPLC)
- The PL kernel is freely availabe to set up a private PL
- We have a private PL of 4 machines with a MyPLC node
  - We will connect to this for the demo

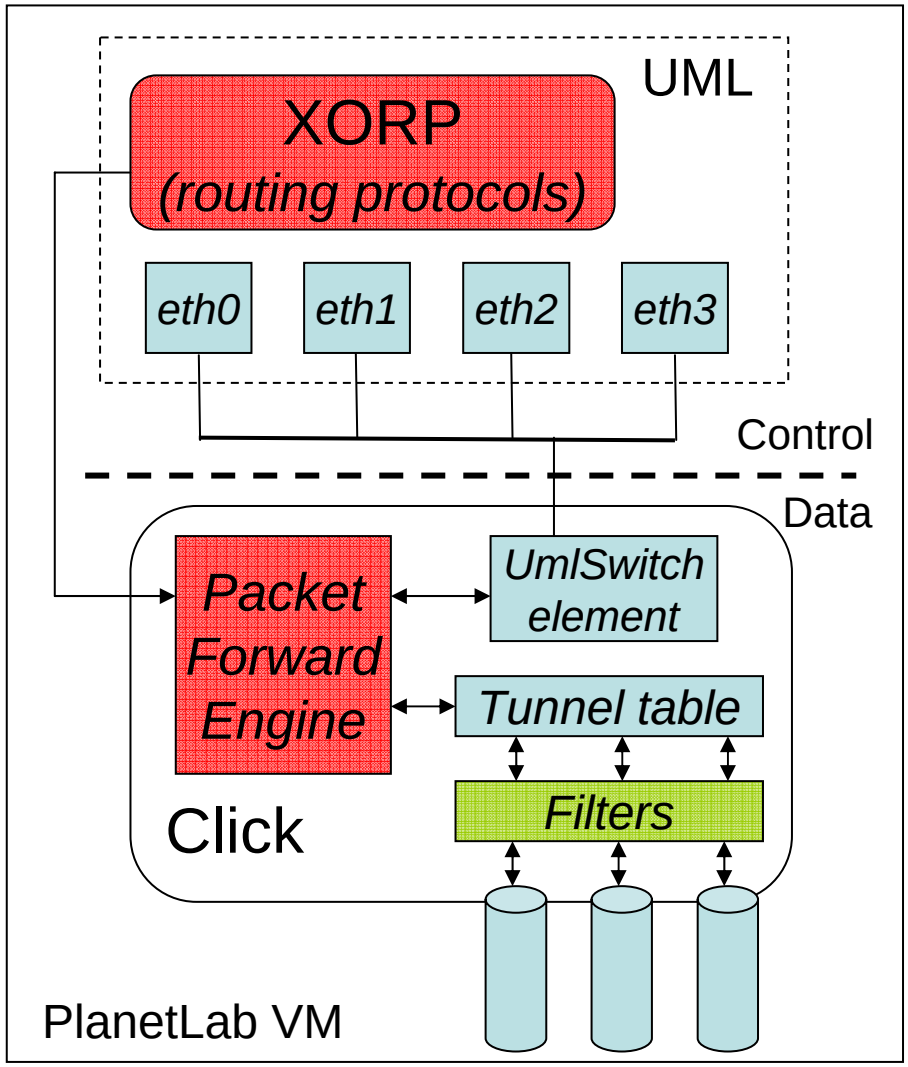
PL Nodes are Allocated as Virtual Nodes



- A user is allocated a slice
- A sliver is the slice on a single node
- Each sliver is isolated and uses a Vserver
- Network interface and routing table are shared among the VMs

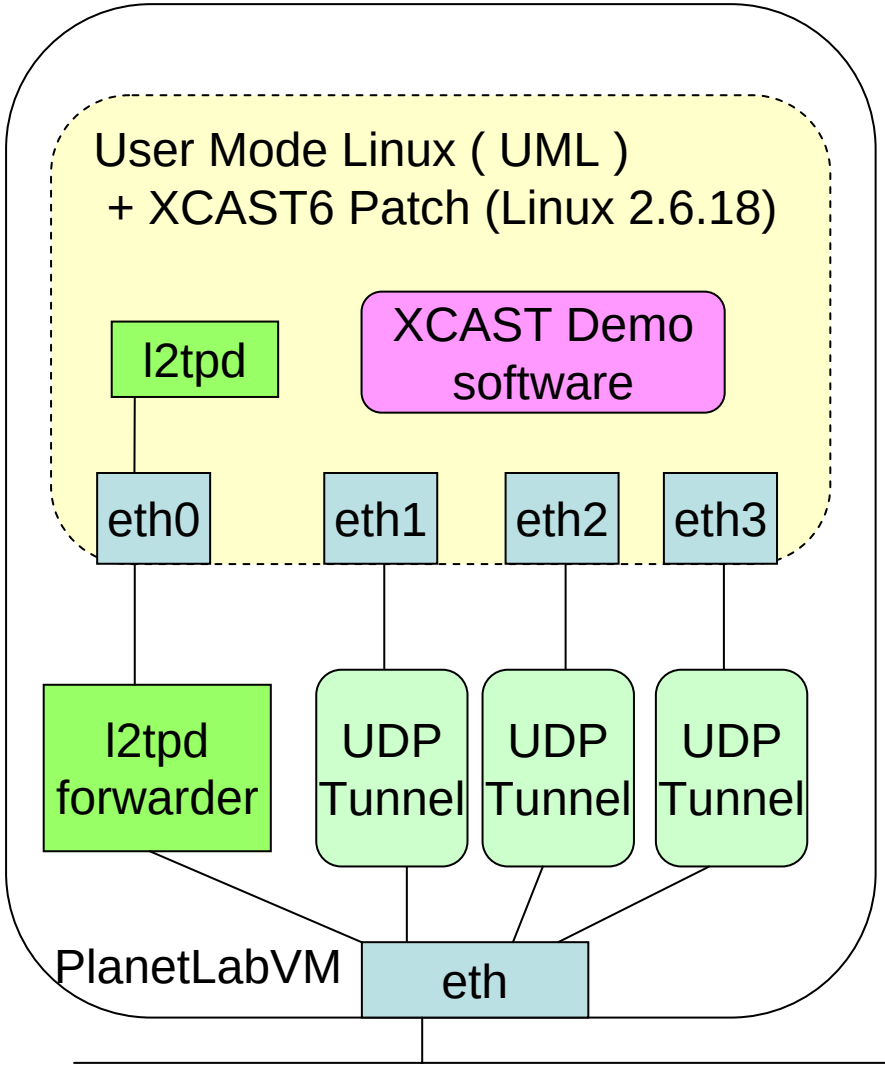
PL-VINI (SIGCOMM'06)

[http://vini-veritas.net/]



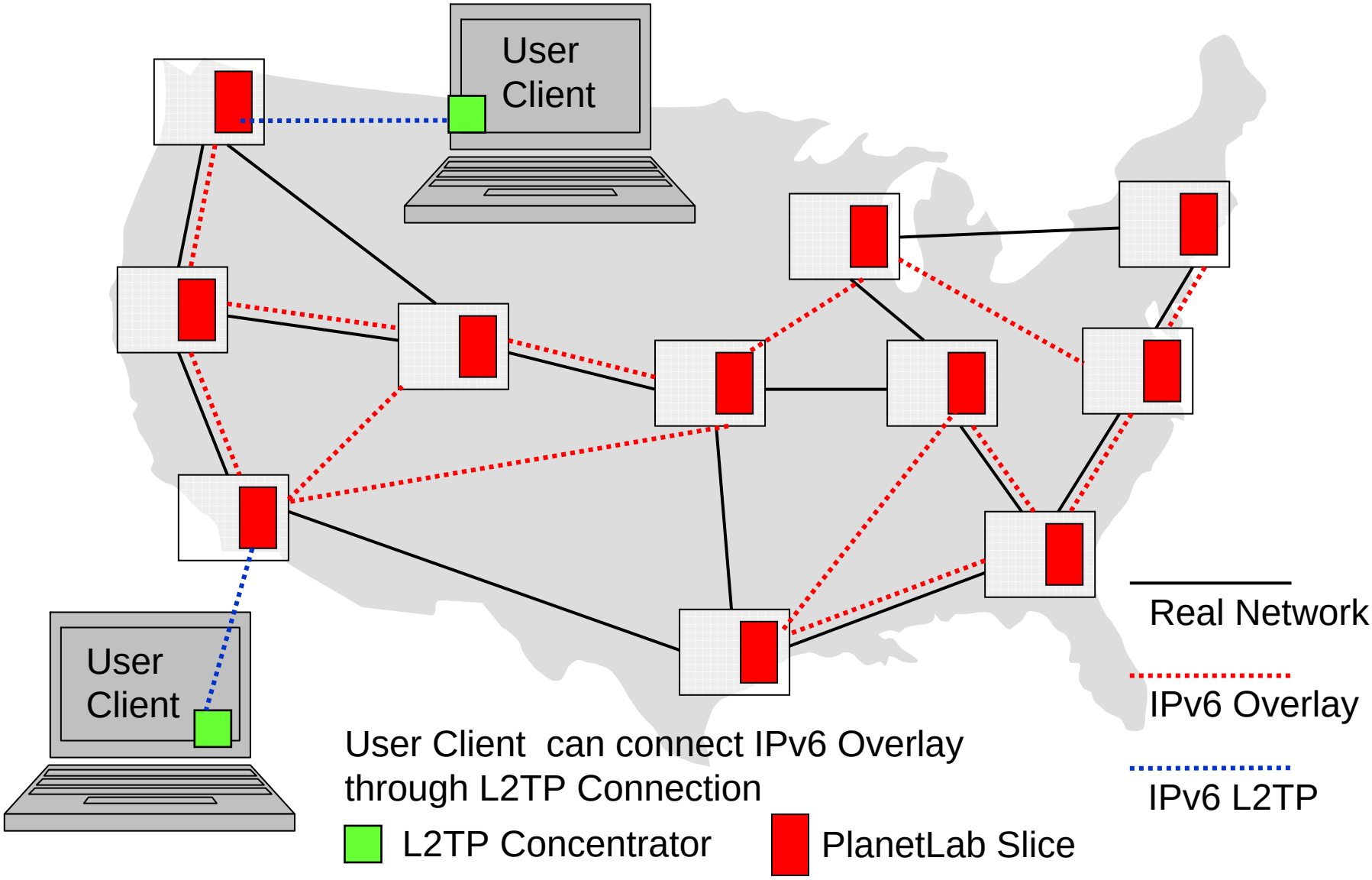
- Virtual Network Infrastructure over PlanetLab
- To allow slices to experiment with network layer without having to modify kernel
- Two components
  - UML (User Mode Linux) - private network interfaces for each VM
  - "Click" - packet forwarding engine
- Using openVPN for external link

Deploying an Overlay on PlanetLab

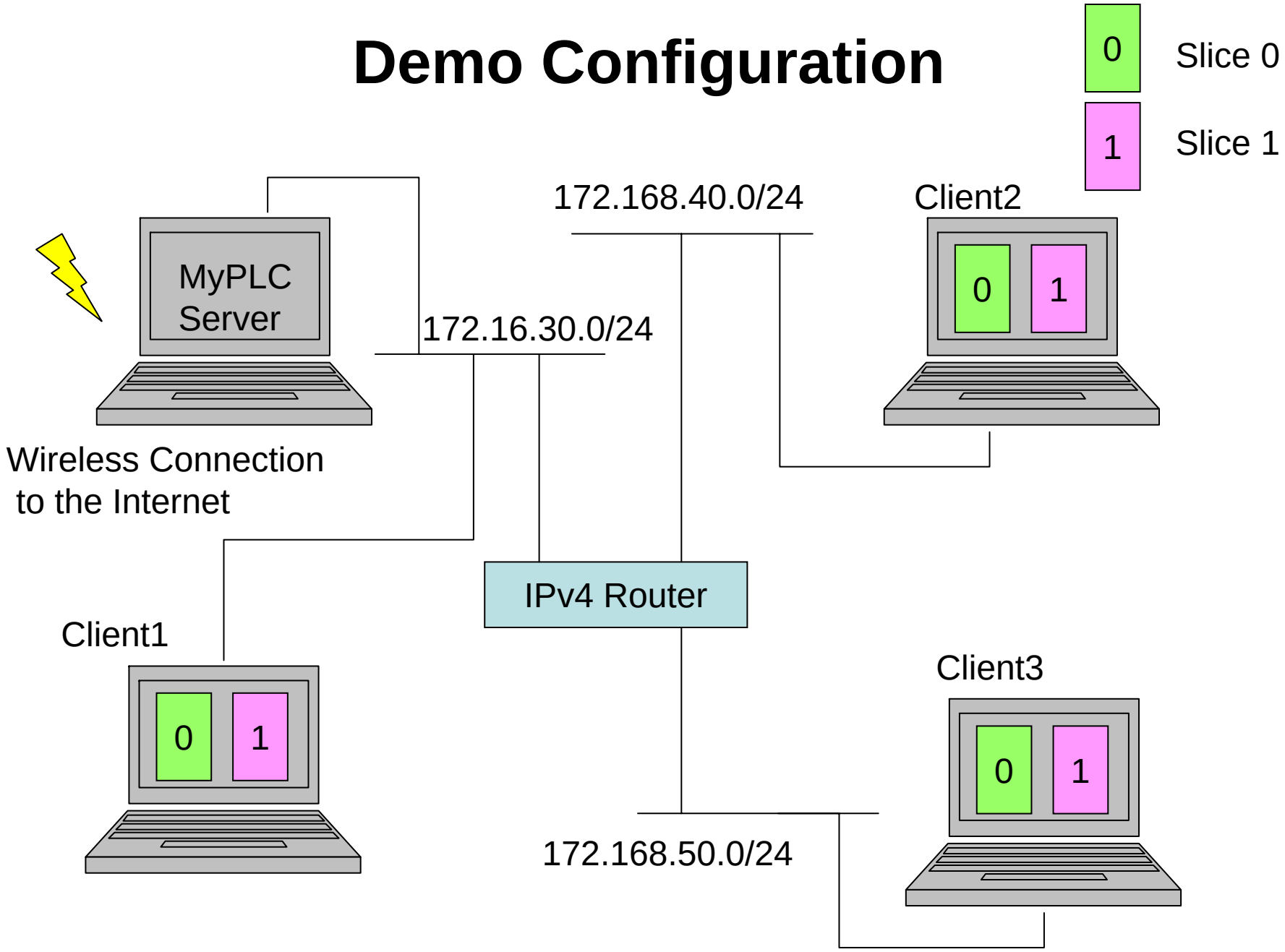


- Use UML as a VM
  - Enable kernel modification.
  - Utilize kernel routing table
- Tunneling packet by UDP tunneling
- L2TP enables outside user to join the overlay network
- UDP tunnels are configured through an automated script

Integrated IPv6 Access Technology (L2TP)



Demo Configuration

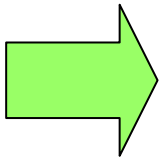


Orbit : Auto Configuration of UDP Tunnel and Route

Topology Configuration file

```
nodes:
 pl0: pl_demo@pl0.xcast.jp
 pl1: pl_demo@pl1.xcast.jp
pl0:
 tun:
  eth0:
   addr: 2001:100::1
   plen: 64
   port: 10000
   connect:
    node: pl1
    intf: eth0
   forward:
    - 2001:110::/64
```

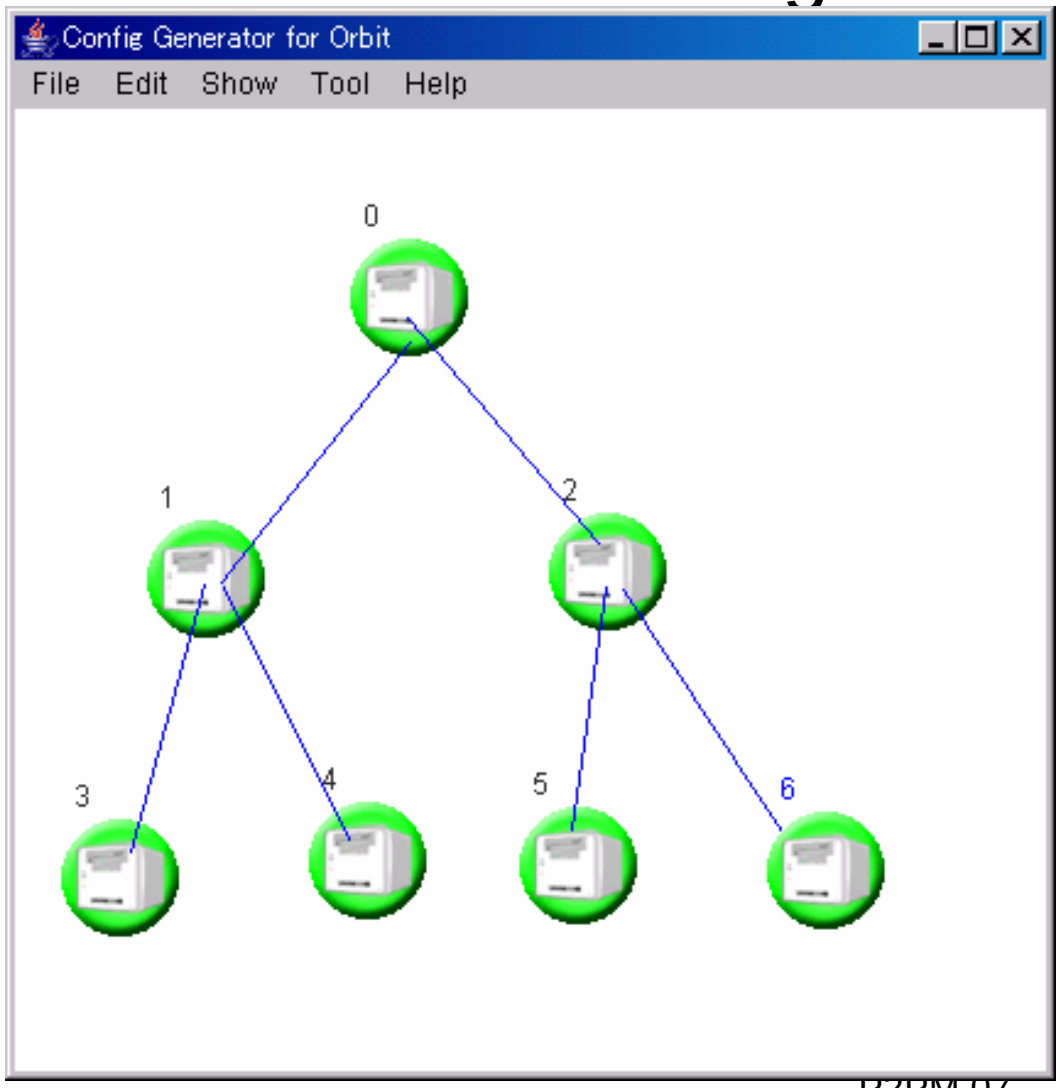
```
pl1:
 tun:
  eth0:
   addr: 2001:100::2
   plen: 64
   port: 10000
   connect:
    node: pl0
    intf: eth0
....
```



Automatic configuration for each node

Graphical Config Editor

- Create Orbit config File using GUI




```
nodes:
 pl0: pl_demo@pl0.xcast.jp
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…
pl0:
 tun:
  eth0:
   addr: 2001:100::1
   plen: 64
   port: 10000
   connect:
    node: pl1
    intf: eth0
   forward:
    - 2001:110::/64
```
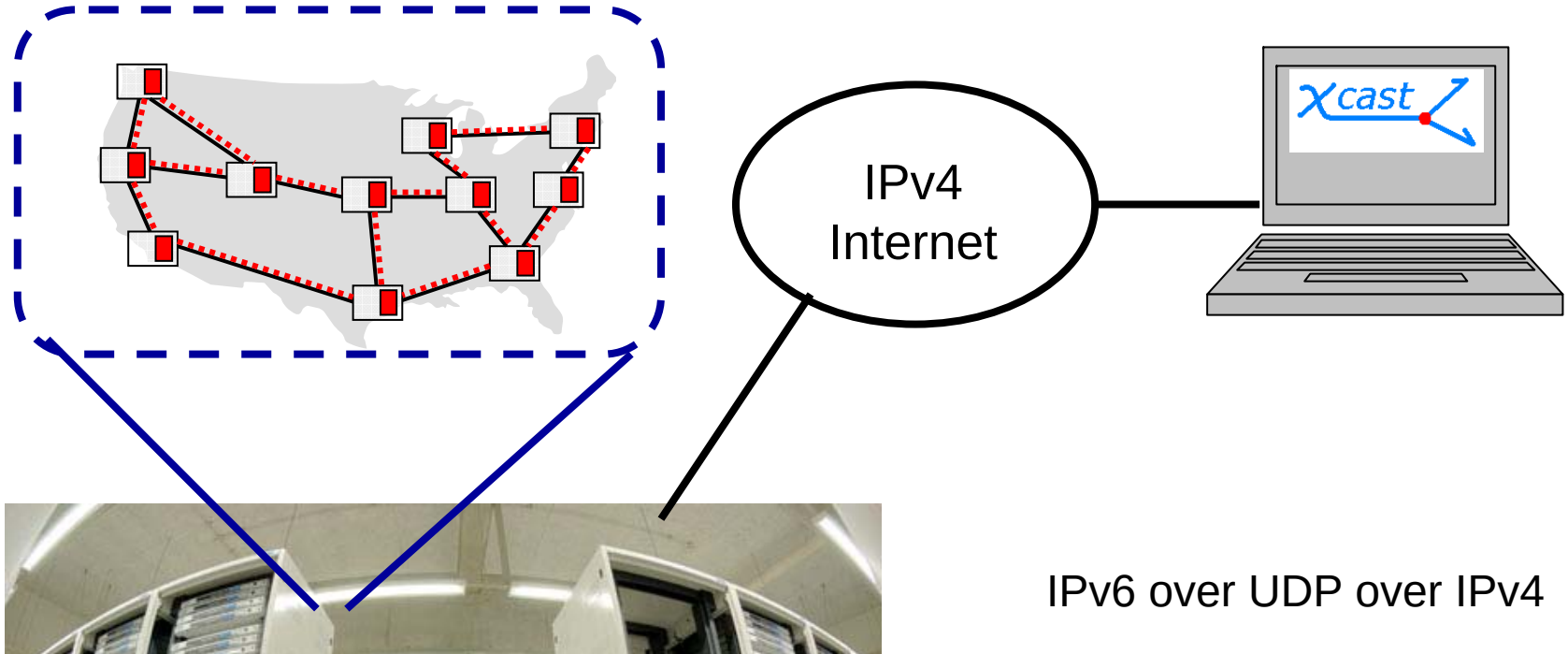

Demo

1. Booting MyPLC (Private PlanetLab)
2. Configure overlay network using Orbit
3. Run XCAST6 demo software
4. StarBED Demonstration

Large Scale Experiment with StarBED



IPv6 over UDP over IPv4

StarBED, the internet emulator
with 680 cluster of PC & VLAN-SW
http://www.starbed.org/

Next Steps

- Performance measurement
  - Delay, Jitter, Bandwidth
  - Improvement
- Packaging for PlanetLab / MyPLC users.
  - Documentation
  - Source code will be public.

- Large scale deployment in StarBED