

Network Simulation and Testing

Polly Huang
Department of Electrical Engineering
National Taiwan University
<http://cc.ee.ntu.edu.tw/~phuang>
phuang@cc.ee.ntu.edu.tw

Polly@NTU Copyright © 2008 1

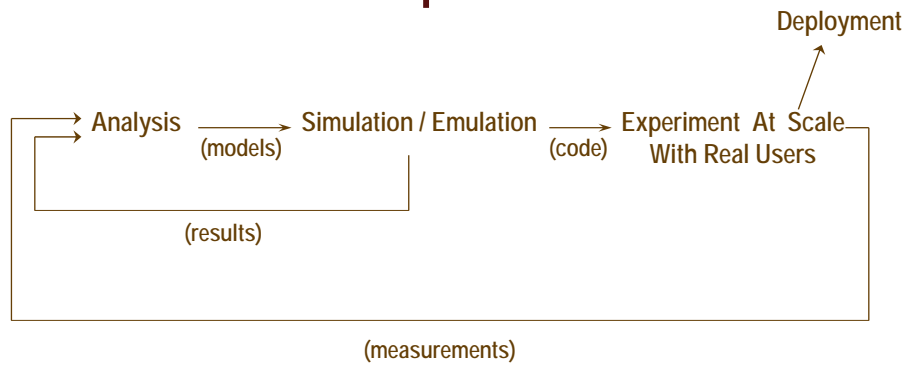


PlanetLab

Largely based on Larry Patterson's slides

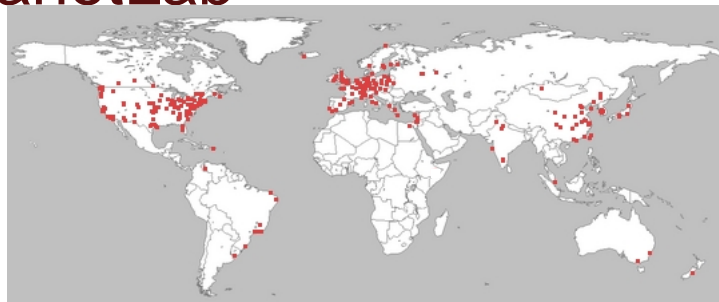
2

Validation Gap



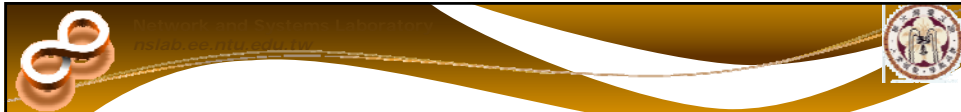
3

PlanetLab



- 800+ machines spanning 400 sites and 40 countries
- Supports *distributed virtualization*
each of 600+ network services running in their own *slice*

4

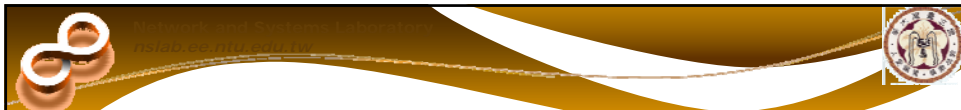


Slices

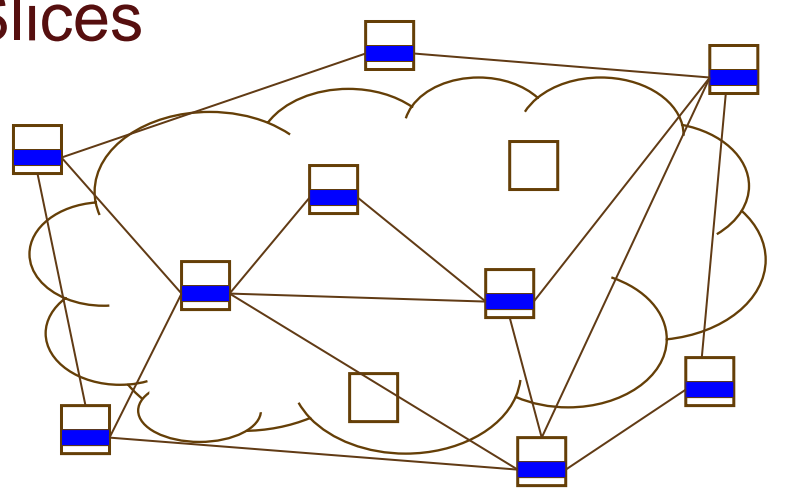


A cloud-shaped outline containing 12 empty square boxes, arranged in a pattern that roughly follows the shape of the cloud. There are 12 boxes in total: 1 at the top, 2 on the left side, 2 in the upper-middle, 2 in the lower-middle, 2 on the right side, and 3 at the bottom.

5

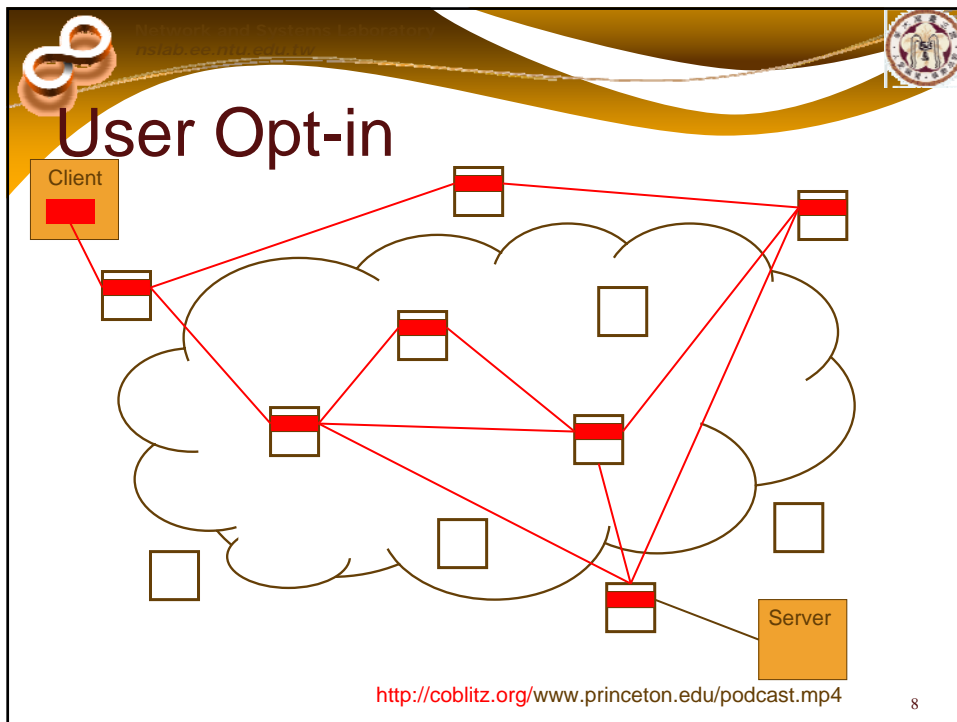
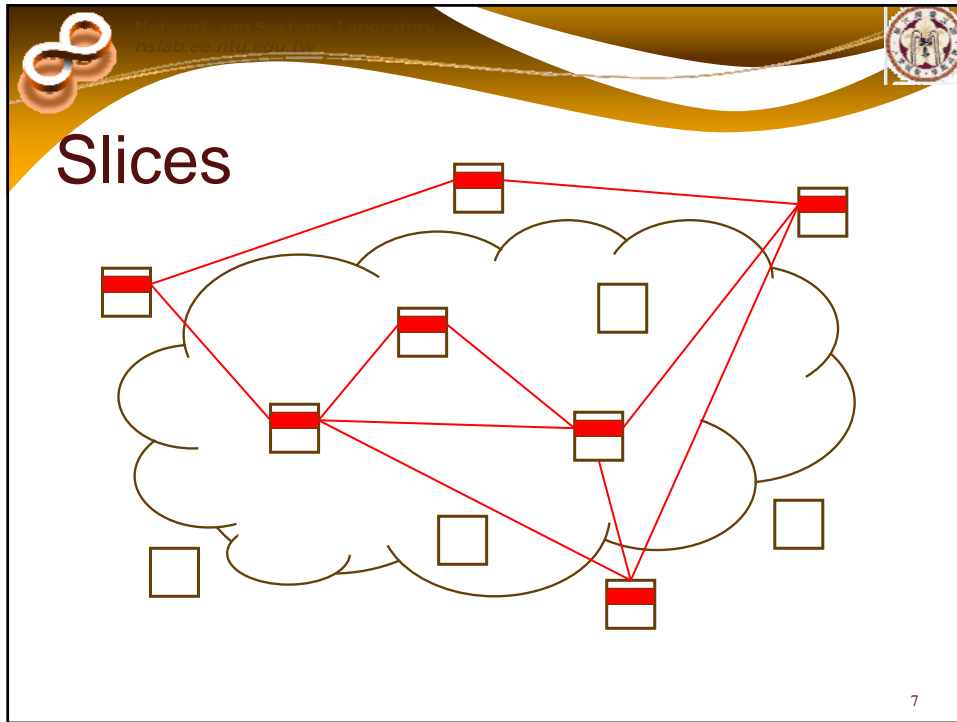


Slices

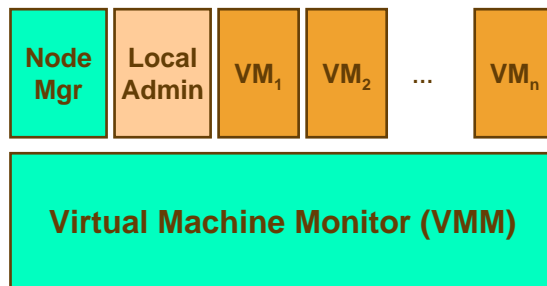


A cloud-shaped outline containing 12 square boxes. Some boxes are filled with a blue horizontal bar, representing data slices. The boxes with blue bars are located at the top-left, top-middle, top-right, middle-left, middle-middle, middle-right, bottom-left, and bottom-right positions. The boxes in the upper-middle and lower-middle areas are empty.

6

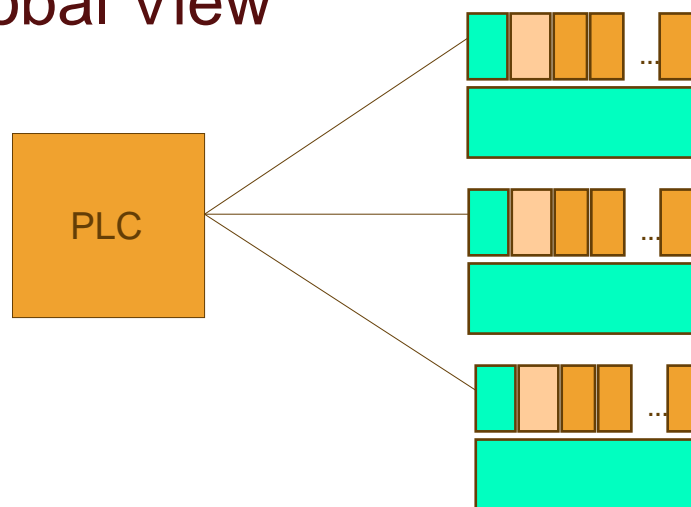


Per-Node View

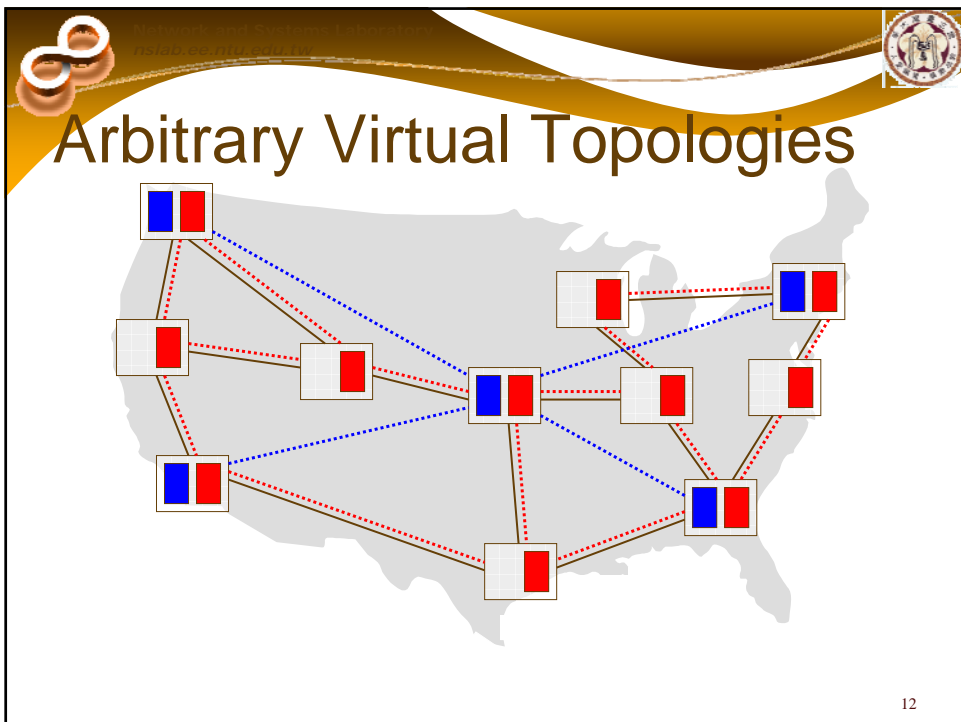
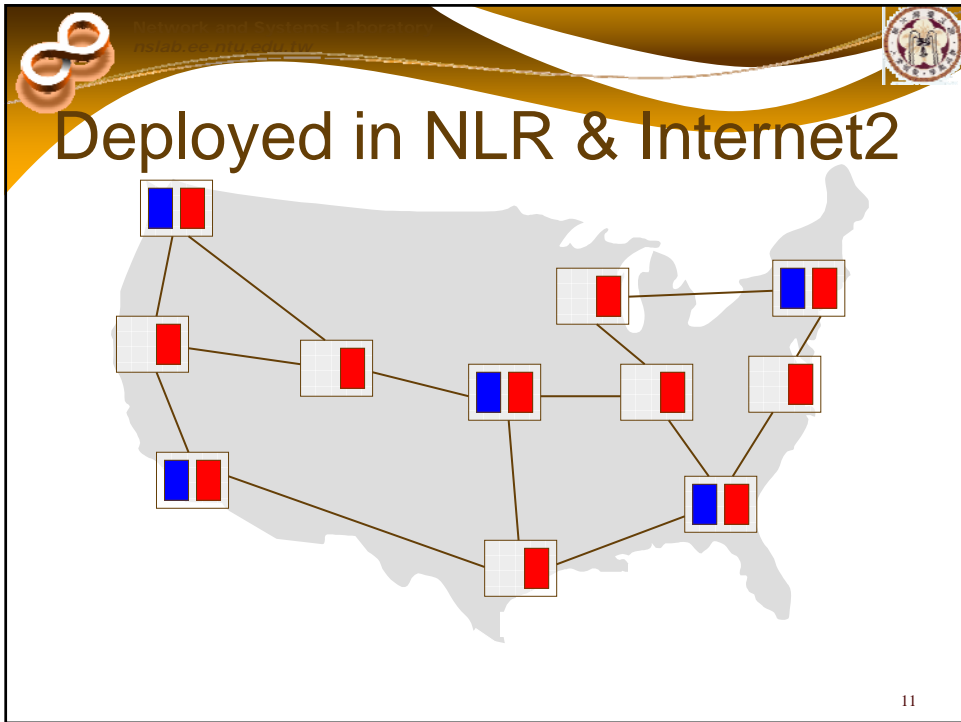


9

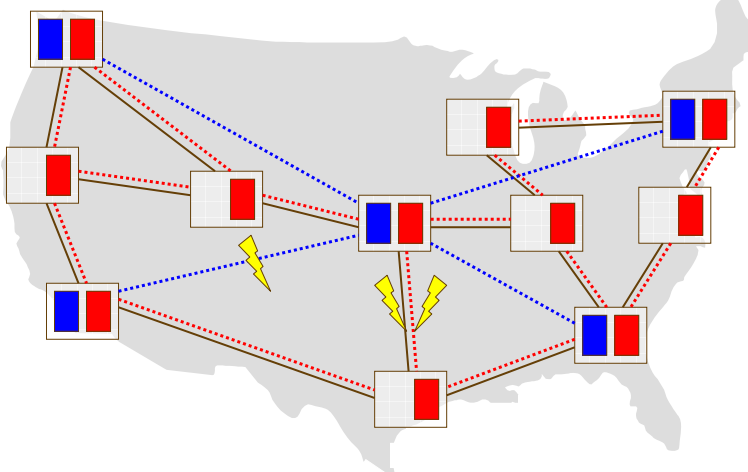
Global View



10



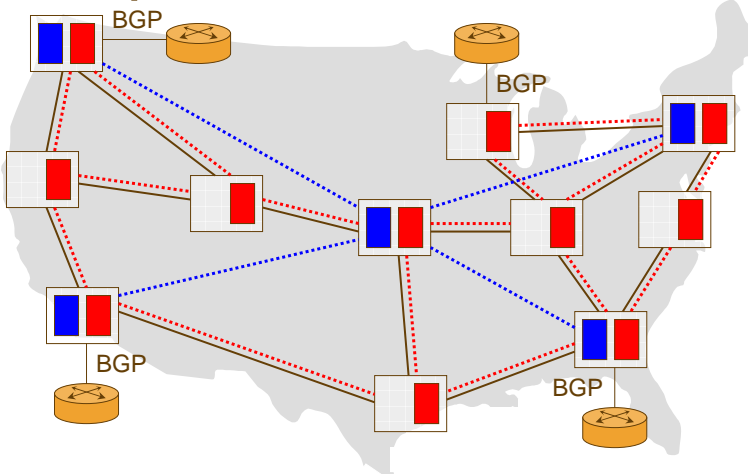
Exposes Network Failures



A network diagram overlaid on a map of the United States. It features several nodes, each represented by a square with a red and blue vertical stripe. These nodes are interconnected by a network of solid black lines and dotted red lines. Three yellow lightning bolt symbols are placed on the map, indicating network failures at specific locations: one in the central-western region, one in the central-southern region, and one in the southern region. The diagram illustrates how these failures can disrupt the network's connectivity.

13

Participate in Internet routing



A network diagram overlaid on a map of the United States, similar to the one above. It features the same nodes (squares with red and blue vertical stripes) and their interconnections. In addition, five orange cylindrical icons representing BGP routers are placed on the map. Each router is connected to one of the nodes in the network, with the label "BGP" positioned above or below the connection. This diagram illustrates how these nodes participate in Internet routing through BGP.

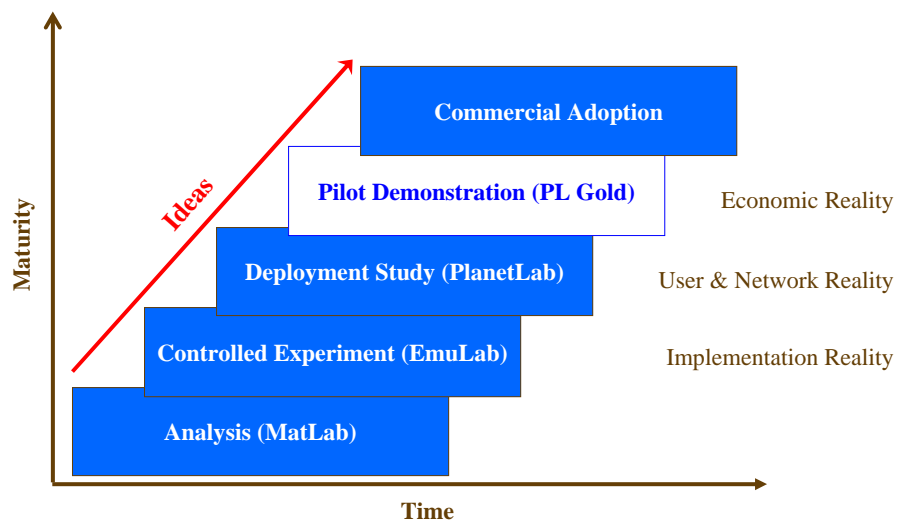
14

Usage Stats

- Users: 2500+
- Slices: 600+
- Long-running services: ~20
 - content distribution, scalable large file transfer,
 - multicast, pub-sub, routing overlays, anycast,...
- Bytes-per-day: 4 TB
 - 1Gbps peak rates not uncommon
- Unique IP-addr-s-per-day: 1M

15

Deployment Gap



16



Case Study: Content Distribution

Scalable Algorithms
(Simulation)

60-91% better
throughput

↓
CoDeeN
(Deployed on PlanetLab)

25 million
hits per day

↓
CoBlitz
(Pilot Demonstrations)

University Channel
Fedora Core
CiteSeer
European Telco

↓
?

17



PlanetLab: Two Perspectives

- Useful research platform
- Prototype of a new network architecture

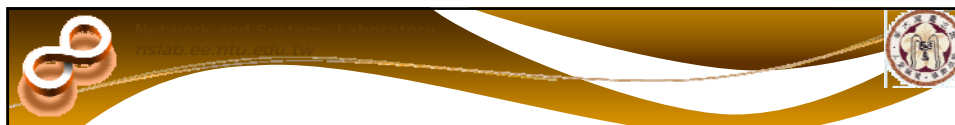
18



More Information

- www.planet-lab.org
- codeen.cs.princeton.edu/coblitz

19



Using Planetlab: How To

Largely based on Jerry Wu's Slides

20

Create an Account

- <http://www.planet-lab.org>
- Create an account



The screenshot shows the PlanetLab website with a navigation menu on the left and a main content area. The 'Create an account' link is circled in red. The website header includes the PlanetLab logo and the tagline 'An open platform for developing, deploying, and accessing planetary-scale services'. The main content area has sections for 'Federation', 'PlanetLab', and 'PlanetLab login'. The 'PlanetLab login' section includes fields for 'Email' and 'Password', a 'Log in' button, and a 'Create an account' link circled in red. There are also links for 'Forgot your password?' and 'Announcements'.

Generate RSA Key Pairs

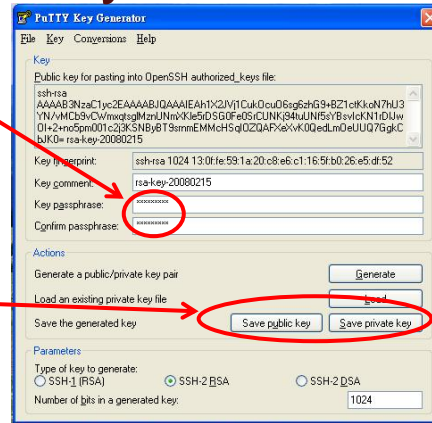
- Prepare an RSA key pair
- Use PuTTYgen
 - Google and download it!
 - Generate your key-pair



The screenshot shows the PuTTY Key Generator window. The 'Key' section is empty, indicating 'No key'. The 'Actions' section has a 'Generate' button circled in red, along with 'Load' and 'Save' buttons. The 'Parameters' section shows 'Type of key to generate' set to 'SSH-2_BSA' and 'Number of bits in a generated key' set to '1024'.

Generate RSA Key Pairs

- Set pass-phrase
- And save
 - Public and private keys



23

Create a Slice

- Ask the manager of a planetlab node to create a slice for you (e.g. Your TA)
- You have to provide
 - Your account
 - Your public & private keys
 - Purpose of usageTo the manager to create a slice

24

After You have a Slice

- Login to the site
 - <http://www.planet-lab.org>

The screenshot shows the PlanetLab website homepage. At the top left is the PlanetLab logo with the tagline "An open platform for developing, deploying, and accessing planetary-scale services". Below the logo are navigation links: "About | Status | Support | Documentation | Community | Software". The main content area is divided into three columns. The left column contains a "PlanetLab" menu with sub-items: "About", "Consortium", "Federation", "History", "Sites", "Projects", "Status", "Support", "Site Assistant", "Documentation", "API", "AUP", "Bibliography", and "FAQ". The middle column has a "Federation" section with text about the OneLab Project and a "PlanetLab" section with text about the global research network. The right column features a "PlanetLab login" form with fields for "E-mail" and "Password", a "Login" button, and links for "Forgot your password?" and "Create an account". Below the login form is an "Announcements" section with a link to "Federation".

25

Enter Management Page

- Then click on "Slices" link

The screenshot shows the PlanetLab website homepage, similar to the previous one, but with a user logged in. The user's name "gntu.edu.tw" is displayed in the top right corner. The "PlanetLab login" form is now a user management menu with the following items: "Sites", "My Site", "Nodes", "My Nodes", "Slices" (highlighted with a red circle), "Sirius", "Users", "My Account", "Log out", and "About". The rest of the page content remains the same as in the previous screenshot.

26

Enter Management Page

- Click your slice to enter the management page

PlanetLab
An open platform for developing, deploying, and accessing planetary-scale services

About | Status | Support | Documentation | Community | Software

Home

Slices for r93922115@ntu.edu.tw's sites

Slice Name	Users	Expiration
ast_streaming	[redacted]@ntu.edu.tw	Mar 5, 2008

Copyright © 2007 The Trustees of Princeton University

ntu.edu.tw

- Sites
 - My Site
- Nodes
 - My Nodes
- Slices
 - Sirius
- Users
 - My Account
 - Log out
- About

27

Add Nodes to Your Slice

- There are plenty of nodes!

PlanetLab
An open platform for developing, deploying, and accessing planetary-scale services

About | Status | Support | Documentation | Community | Software

Home

Slice ast_streaming - Nodes

Select a site to add nodes from.

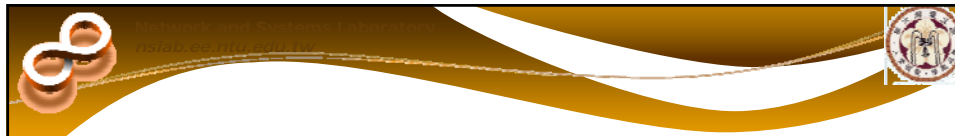
- Academia Sinica - Taiwan
- All Sites--
- Academia Sinica - Taiwan
- ADGETUSOCTE
- Amnouda University in Cairo
- Amnouda University of Beirut
- Arizona State University
- Astra University
- AT&T Labs - Research
- Baylor University
- Beihang University
- Beijing Institute of Technology, Intelligent Information Network Lab
- Bim-Croton University of the Niger
- Birkbeck University of London
- Boston University
- Brigham Young University
- Brown University
- Bruegan University of Technology and Economics
- California Institute of Technology
- CANARIE

ntu.edu.tw

- Sites
 - My Site
- Nodes
 - My Nodes
- Slices
 - Sirius
- Users
 - My Account
 - Log out
- About

Announcements


- Federation
PlanetLab is engaged in a federation trial with the Onelab Project. The plan is to migrate European ...



The TA Will Prepare

- Your PlanetLab login account and password
 - username: 'netsim_team#@nslab.ee.ntu.edu.tw'
 - password: emailed to each team
- Your slice name
 - “ntuee_team#”

29



You Need To

- Create and upload your **public key** to your team account in PlanetLab
 - **Complete this task of Lab 1 today!**
- Login to by slice name and the passphrase of public key
 - adam.ee.ntu.edu.tw
 - eve.ee.ntu.edu.tw
- Add nodes to your slice and login into the nodes
 - **Complete Lab 1 & Lab 2 next Friday!**
- Install program to the nodes on your slice
- Run an example experiment

30

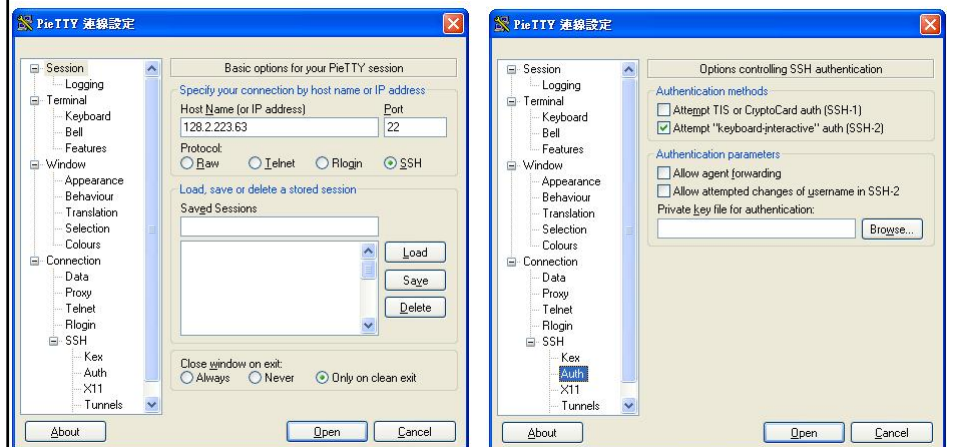
Login into a Node

- After adding some nodes, you have to wait several days before login into it!
- You can use either
 - Your PC with MS windows system
 - An UN*X server and command line

31

Login Through Windows PCs

1. Find the target node's IP address
2. Choose your authentication file (RSA private key)





Login Through UN*X PCs

- # `ssh -v -i <RSA private key path> -l <username> <target node address>`
- You may have to enter the passphrase (like a password, issued by TA)!

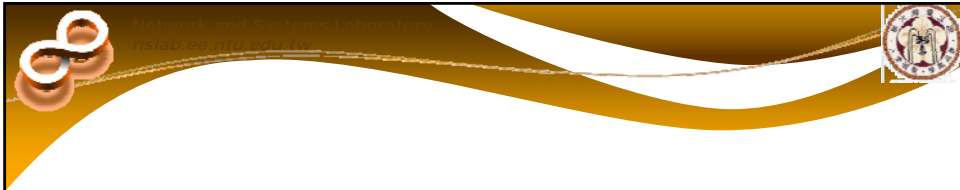
33



Upload Program to UN*X PCs

- Only Linux-compatible executable files are allowed
- # `scp -i <RSA private key path> <your file>
<user name>@<target node address>:<remote path>`

34



Questions?

Polly@NTU

Copyright © 2008

35