

# 6PlanetLab: Slice Computing with User-Oriented Addressing Model

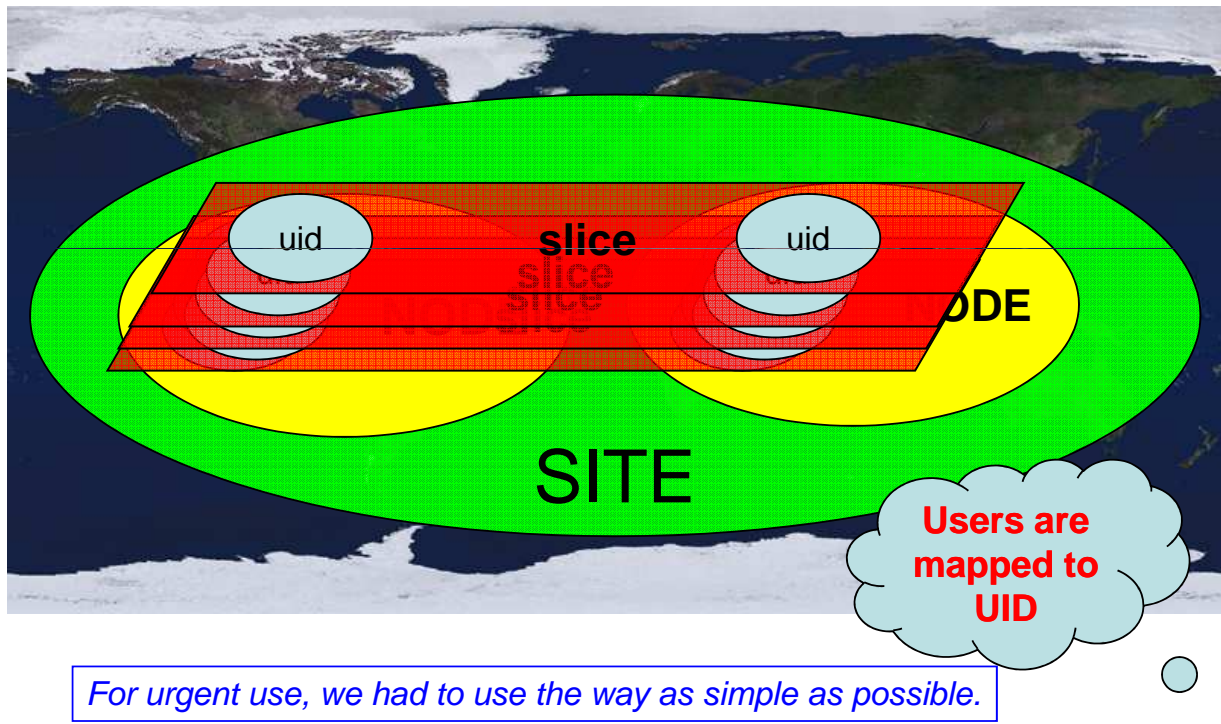
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## Case Study on Demands

- CNGI-CERNET2 has covered more than 100 universities
    - many of them need to do network experiments on new technologies
    - e.g. CNGI Large-scale Routing and Multicast Experiment
      - 13 universities runs experiments simultaneously
    - running over native IPv6
    - requiring native IPv6 multicast
    - requiring a variety of operating systems
    - requiring hierarchical administration
- ⇒ current PlanetLab cannot meet the requirements
- ⇒ Good news: new version of PLC support IPv6 now

# 6PlanetLab: Slicing without Mandatory Virtual Machines



## User Oriented Addressing

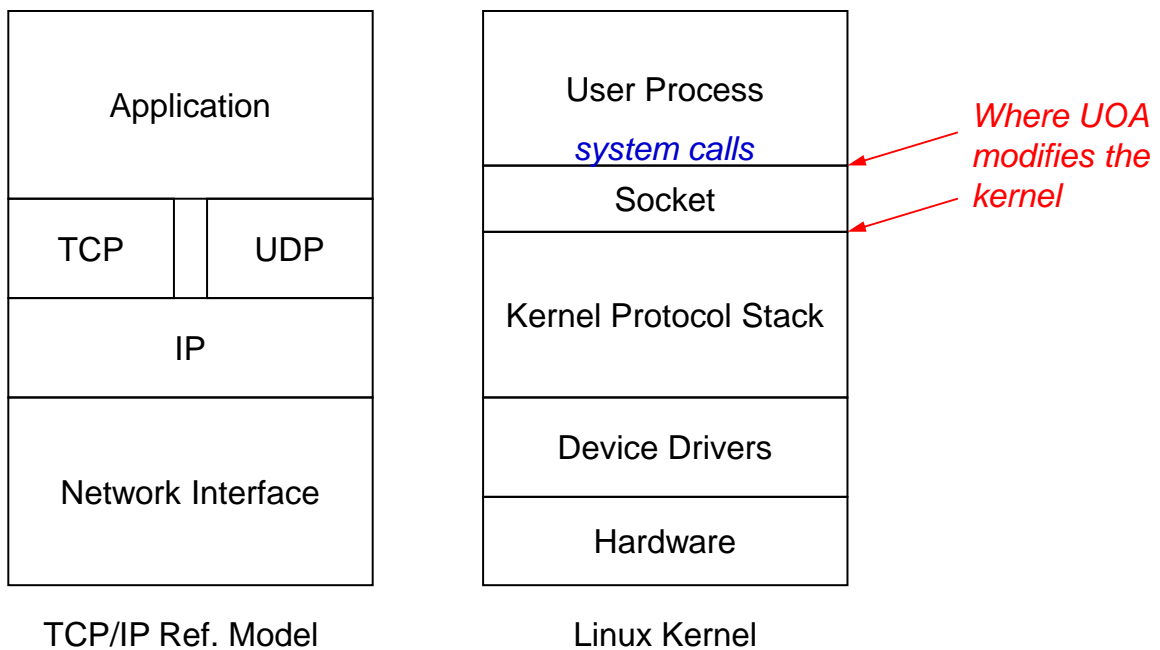
- Assigning address to host or interface is not enough for slice computing environment
  - port contention
    - e.g. in 6PlanetLab, where two schools may request using port 443 for their experiments simultaneously
  - differentiate user *locator* according to various understandings on traffic engineering in new multi-homing architecture
    - e.g. NIRA
- Idea
  - Make IP address assign to *user* directly

...but later things become more interesting with new challenges...

# Implementation Challenges

- UOA (User-Oriented Addressing)
  - add user-address association to OS kernel
    - interface for changing the association
      - *ioctl*
  - change system calls of socket API
    - TCP: *connect()*, *bind()*
    - UDP: *sendto()*, *bind()*
  - modify socket-protocol interface
    - for the semantic change of IN(6)\_ADDR\_ANY
  - design a set of administrative tools

## UOA Implementation



## Current State of Art

- Kernel patches
  - Linux 2.6.20 for x86 32-bit
  - Linux 2.6.22.9 for MIPS 64-bit Loongson
  - FreeBSD 7.0
- Experiment
  - Successful in lab and *thu1* of 6PlanetLab
- Plan
  - Deploy soon on all 6PlanetLab nodes

## 6PlanetLab vs. PlanetLab

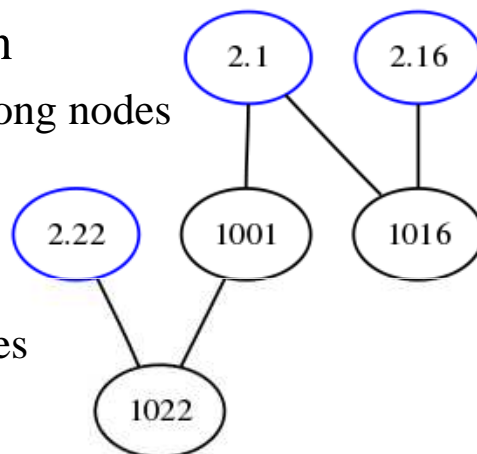
	<b>PlanetLab</b>	<b>6PlanetLab</b>
<i>Slicing support</i>	vserver	user-oriented addressing (UOA)
<i>Host OS</i>	customized Linux	native UNIX-like OS
<i>User OS</i>	Linux	Linux (or other based on optional Xen/VMWare)
<i>Infrastructure</i>	IPv4	IPv6 (accessible to IPv4 via IVI)
<i>Virtual Topology</i>	IPv4-over-IPv4 tunneling	IPv4-over-IPv6 IPv6-over-IPv6
<i>Management</i>	Centralized	Autonomous
<i>Monitoring</i>	Node / User	Node / Network Infrastructure / User

# 6PlanetLab User Interface

- Preparation
  - Gather information
    - [http://\[2001:da8:ffca:2676::4\]/](http://[2001:da8:ffca:2676::4]/) or <http://202.38.118.4/>
  - Register a user account
    - upload public key to system for SSH authentication
  - Login to system
    - watching available server resources
  - Get SIB client for deploying experiment
    - SIB: Slice Integration Background
      - a tool for executing common command on a certain group of nodes

## Example

- Testing 4-octet AS transition
  - IPv6-over-IPv6 tunneling among nodes
    - => wanted topology
  - quagga BGP session
    - => multi-domain
  - getting BGP views and updates



=> Yuncheng Zhu, Junxiu Lu and Maoke Chen, “*Potential Impacts of Four-Byte AS Numbers in Partial Deployment,*” to appear in ICON 2007, Adelaide, Australia, Nov 19 – 21, 2007

# Remarks

- Slice computing
  - For experiments
    - Researchers need
  - For real service
    - Common users: researchers, companies, geek players...
- New challenges in service-oriented slice computing
  - Scalability
    - Performance: availability, effectiveness/fairness, load balance...
    - Management
  - Economics
    - Mechanism of encouraging users instead of administrators
      - » Chicken or egg?

