Increasing usability of the PRAGMA cloud testbed

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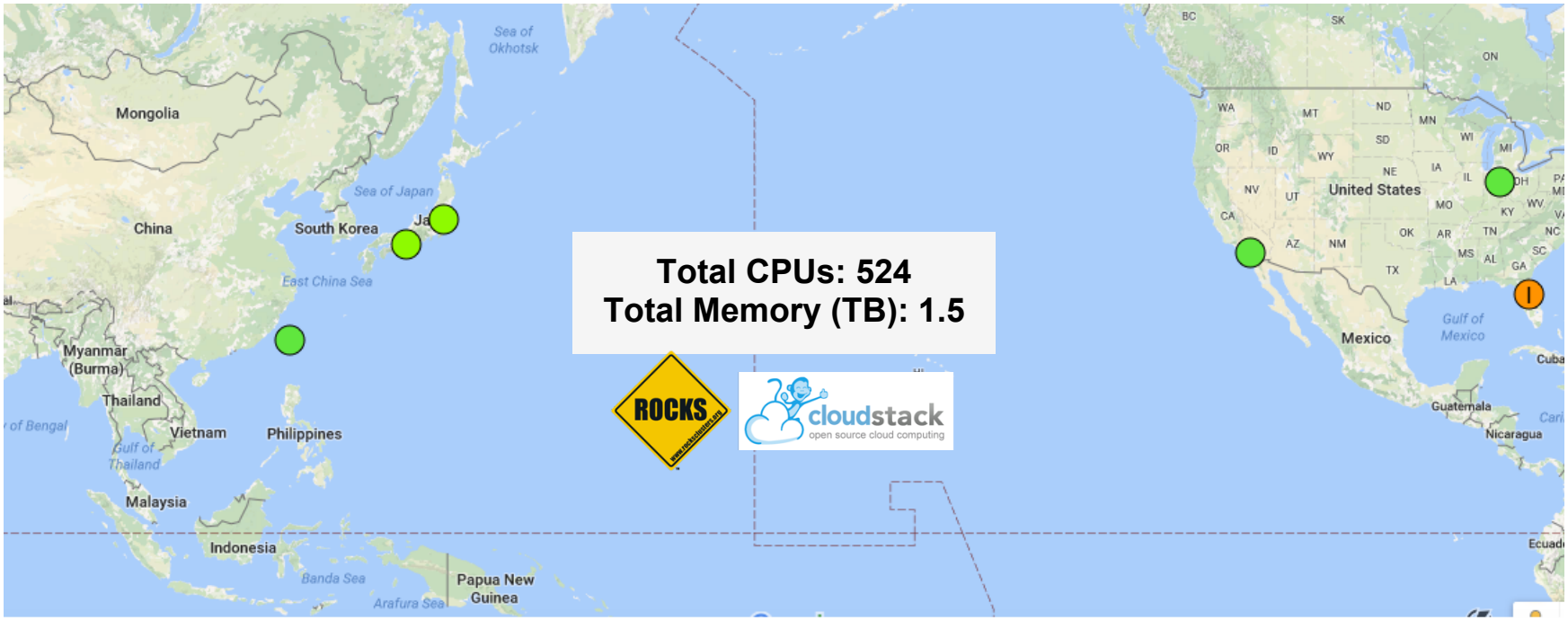
PRAGMA33

PRAGMA Cloud Testbed

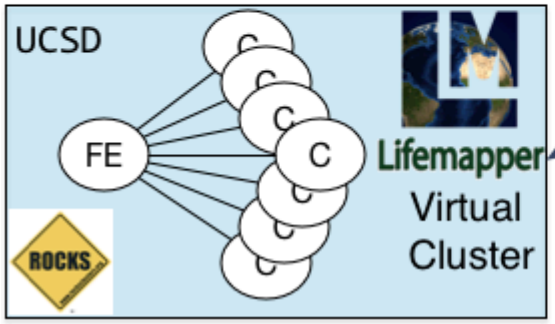
- **Goal**: A persistent Cloud testbed for Biosciences and other PRAGMA working group members to run application experiments.

Cloud Testbed Deployment

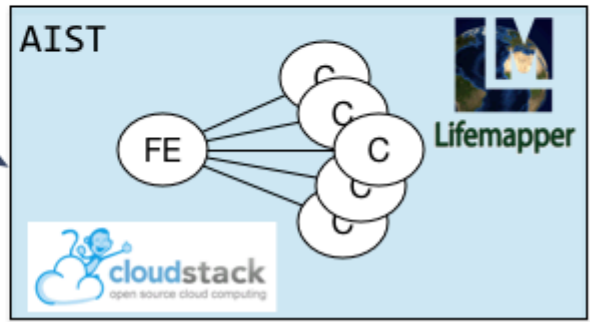


Motivation

Option 1: Re-author at AIST



Option 2: Automatic migration from UCSD to AIST



Format:
KVM + ZFS vol

Universal Format

Format:
KVM + QCOW2

Properties:
FQDN
IP Address Assignment
Number of compute nodes

PRAGMA BOOT…
Localize configuration

Properties:
FQDN
IP Address Assignment
Number of compute nodes

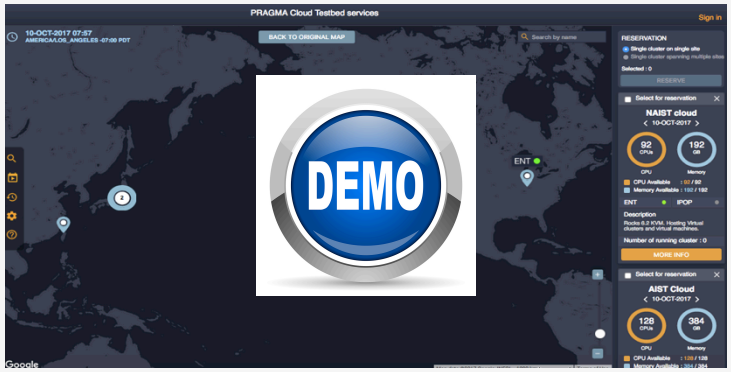
When (and where else) can I run my virtual cluster? cloud scheduler.

PRAGMA Cloud Scheduler

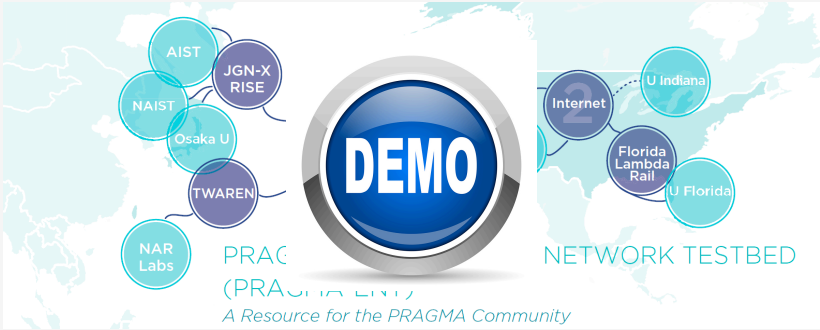
- **Goal: Low participation overhead and easy to use**
  - Sites only have to install a small package (SSH and pragma_boot) to participate
  - Users have convenient web interface to start up and manage their virtual clusters (new GUI demo)
- **Currently leverages the following tools:**
  - **pragma_boot**: Boots virtual clusters for users across PRAGMA institutions using local VM provisioning system. Currently supports Rocks and Cloudstack. Openstack coming.
  - **cziso/google drive:** Central repository of images stored as Clonezilla ISOs and converted on download to local image format (RAW, QCOW2, ZFS vol).

Increasing PRAGMA Cloud usability

New PRAGMA Cloud Web Interface



PRAGMA-ENT integration

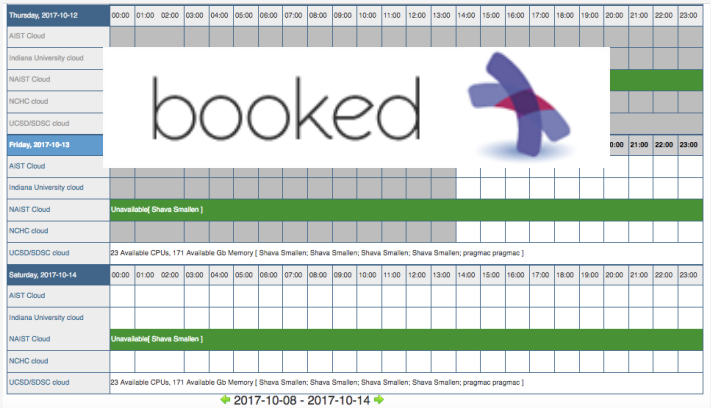


Openstack Integration

GPU Integration

A more intuitive PRAGMA Cloud Web interface

OLD PRAGMA Cloud Web Interface



- Existing batch and testbed schedulers were too complex for PRAGMA's needs
- Leveraged existing Booked room reservation tool rather than writing a new tool from scratch

- Leveraged undergraduate student talent at Thammasat University
- Intuitive map interface and graphics
- Early demo at PRAGMA32

NEW PRAGMA Cloud Web Interface

PRAGMA Cloud Web Interface Features

- Dashboard map view of the participating sites
- User login
- Single site reservation
- Querying resources
- View, monitor, and manage reservations
- Flexibility to add new features (e.g., GPUs)

Nannapas Banluesombatkul, Prapansak Kaewlamul, Prapaporn Rattanatamrong, Nadya Williams, Shava Smallen, "***PRAGMA Cloud Scheduler: Improving Usability of the PRAGMA Cloud Testbed***" to be published in The 21st International Computer Science and Engineering Conference, November 2017 Bangkok, Thailand.

Demo

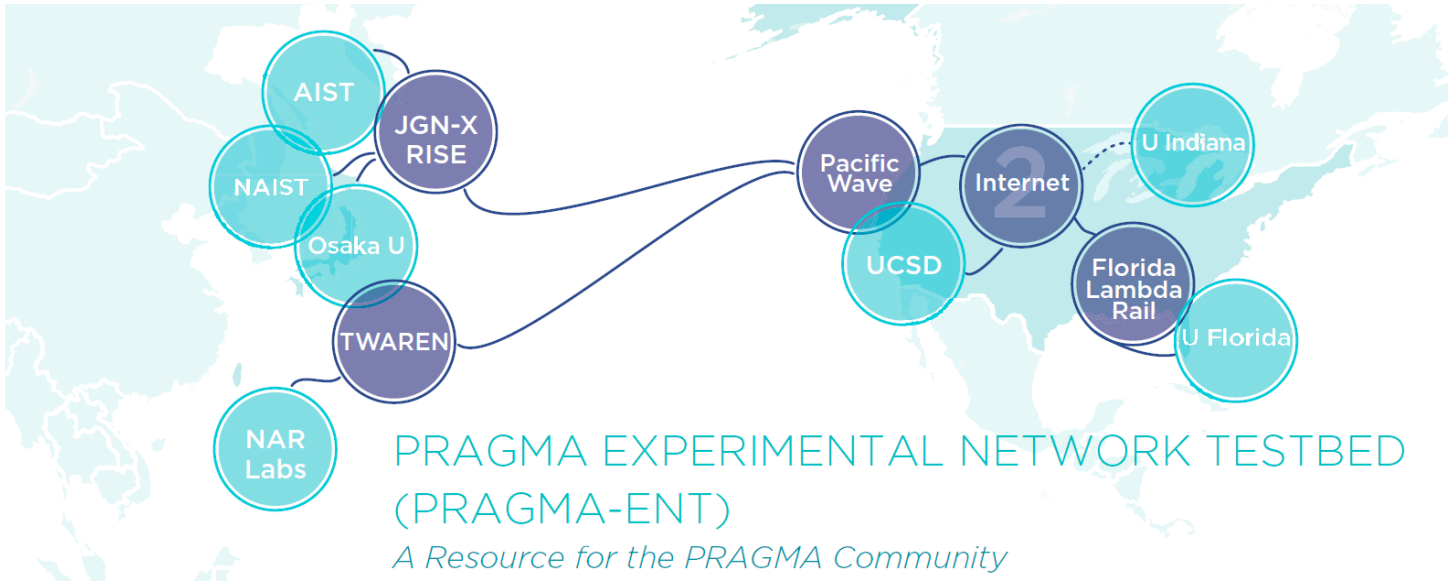
- Overview
- View site availability (who is using cluster)
- Create new reservation
- Manage reservations

Next steps for Cloud Scheduler

- **Add administrative interfaces**
  - User registration
  - User management
  - Group management and access control
  - Site and resource management

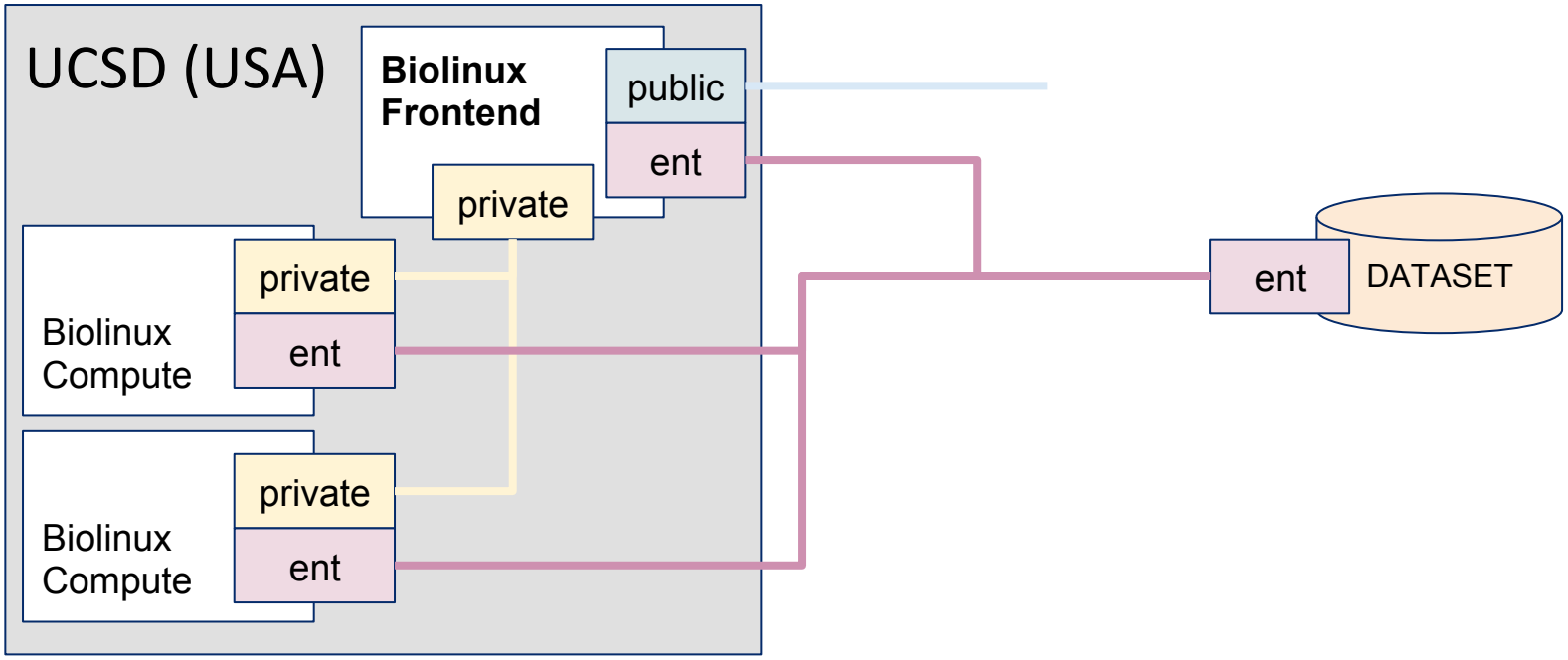
- **Working with Minsun Lee's undergraduate student, Eunjeong Jung, from Chungnam National University in South Korea.**

Virtual clusters can be ENT-enabled

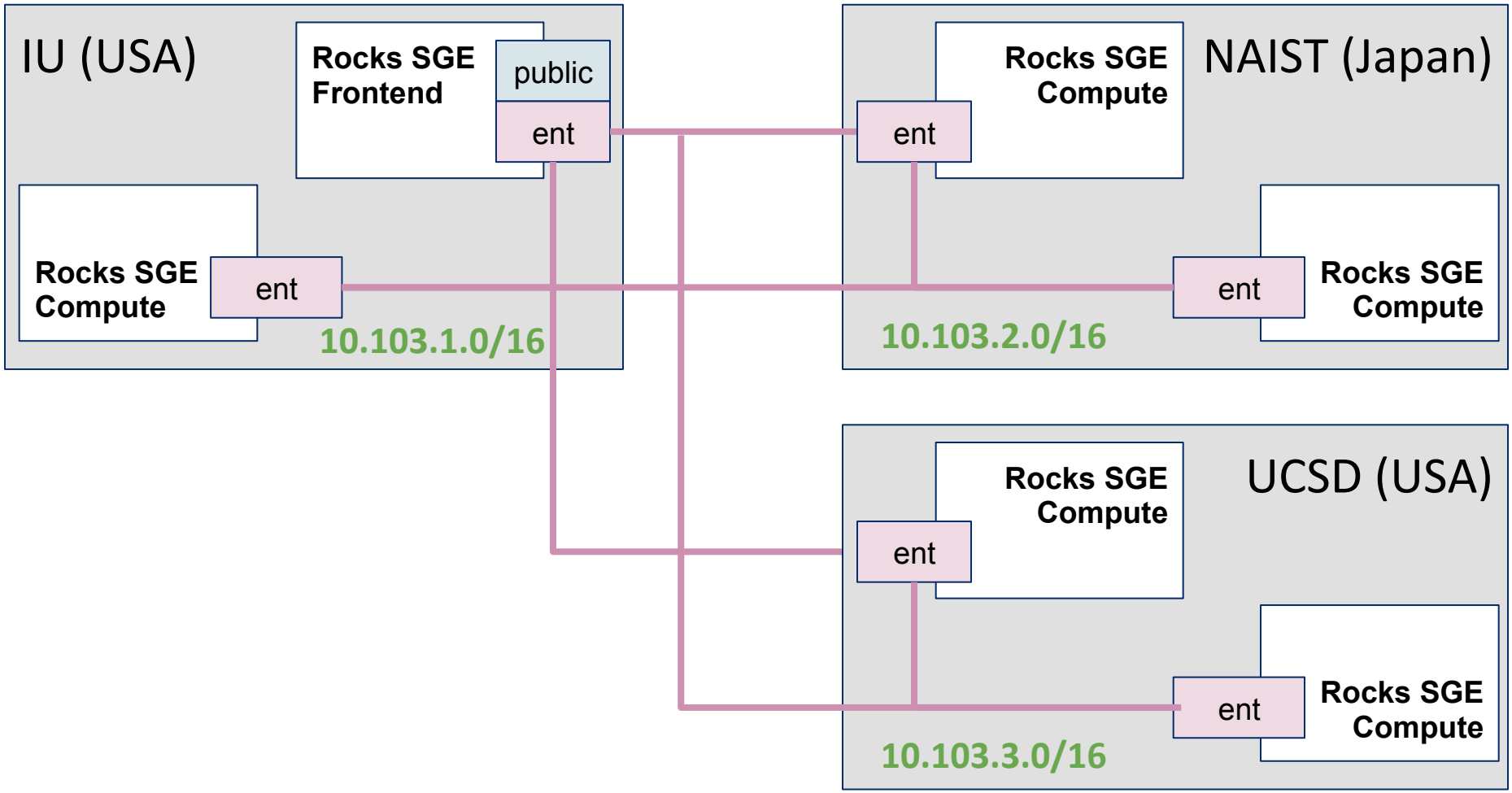


PRAGMA ENT is a breakable international software-defined network (SDN) testbed for use by PRAGMA researchers and collaborators.

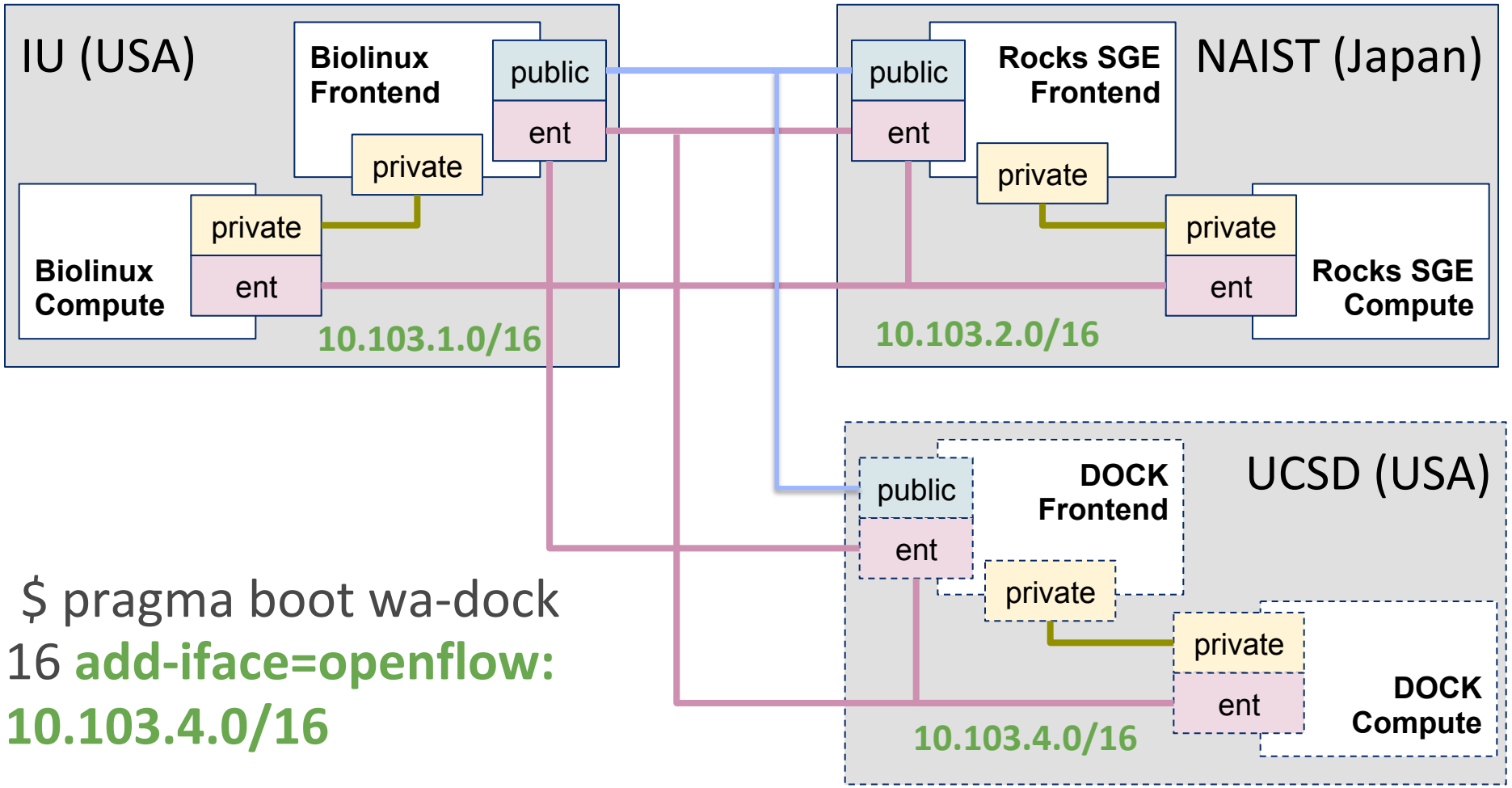
Use case: Protected Dataset



Use case: Multi-site virtual cluster



DEMO
Creating an ENT-enabled virtual cluster



$ pragma boot wa-dock 16 **add-iface=openflow: 10.103.4.0/16**

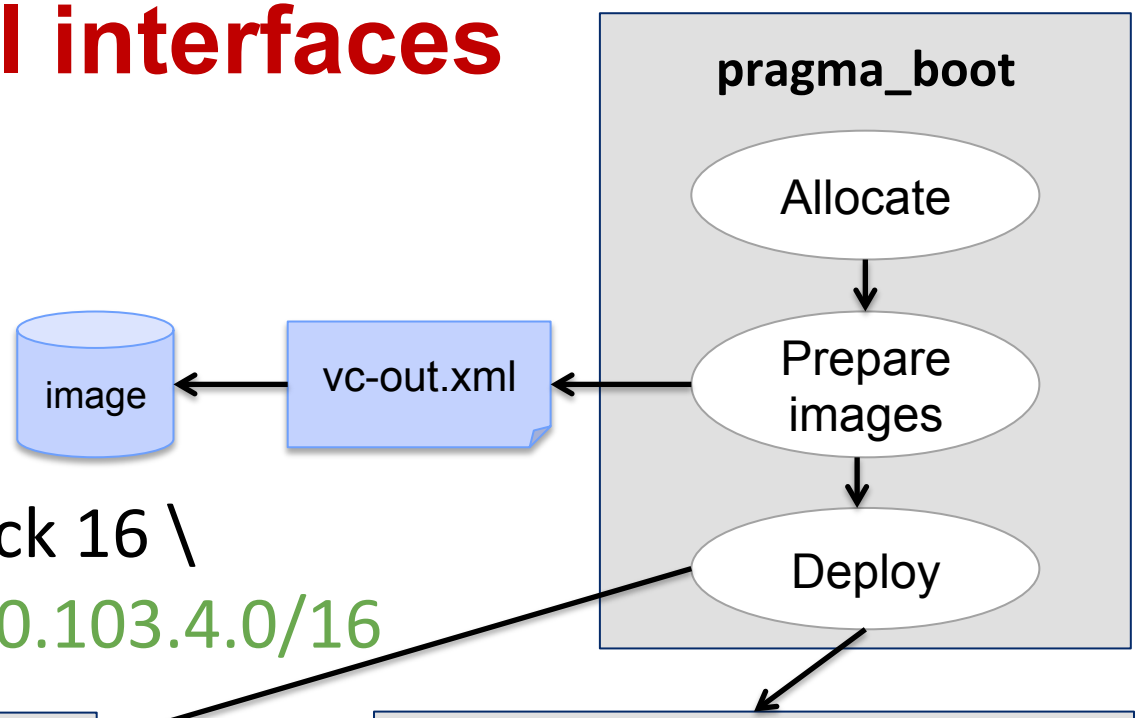
Demo

- Log onto Fiji and launch new cluster
- Log onto NAIST and ping IU on it's ENT interfaces

Add additional interfaces

kvm_rocks.conf

```
…
additional_interfaces = {
  'openflow': 'ovs'
}
…
```



$ pragma boot wa-dock 16 \
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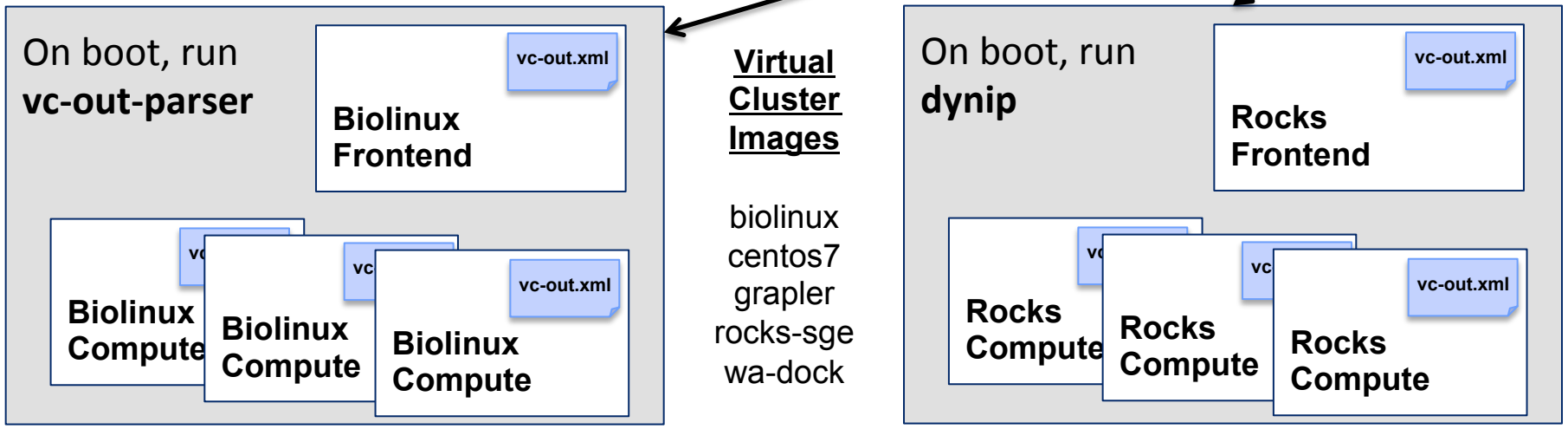

Enhanced vc-out.xml

```
<vc>
  <frontend fqdn="rocks-54.sdsc.edu" gw="198.202.88.1" name="rocks-54">
    <private ip="10.1.1.1" mac="b6:58:ca:00:01:25" mtu="1500" netmask="255.255.0.0"
subnet="10.1.0.0"/>
    <public ip="198.202.88.54" mac="b6:58:ca:00:01:26" mtu="1500" netmask="255.255.255.0"
subnet="198.202.88.0"/>
    <openflow ip="10.103.4.1" mac="b6:58:ca:00:01:28" mtu="1500"
netmask="255.255.0.0" subnet="10.103.4.0"/>
  </frontend>
  <compute count="1">
    <node cpus="1" gw="10.1.1.1" name="compute-0">
      <private ip="10.1.255.254" mac="b6:58:ca:00:01:27" mtu="1500" netmask="255.255.0.0"
subnet="10.1.0.0"/>
      <openflow ip="10.103.4.254" mac="b6:58:ca:00:01:29" mtu="1500"
netmask="255.255.0.0" subnet="10.103.4.0"/>
    </node>
  </compute>
 …
</vc>
```

Demo

- Ping tests

Next steps: Cloud Scheduler Web Interface

- Enable ENT IP addresses to be allocated and managed
- Enable virtual clusters to specify additional interfaces
- Enable multi-site virtual clusters

- **Working with Prapaporn (Nan) Rattanatamrong's undergraduate students, Visaruth (Meg) Punnium and Pasit (Beaw), from Thammasat University in Thailand.**

Goals for PRAGMA 34

- Finish Clonezilla repository integration with different drivers (e.g., Cloudstack)
- Finish integration of University of Florida
- Finish Openstack PRAGMA Boot driver
- Add UCSD Rockstar resource
- Container integration

More information

- Thank you to our collaborators at Thammasat University, NAIST, UF, and IU

- Email: pragma-cloud-admin@googlegroups.com
- Websites:
  - https://cloud.pragma-grid.net
  - http://pragma-grid.net/site-setup