PRAGMA Resources Group Updates

Philip Papadopoulos (Interim Working Group Lead)

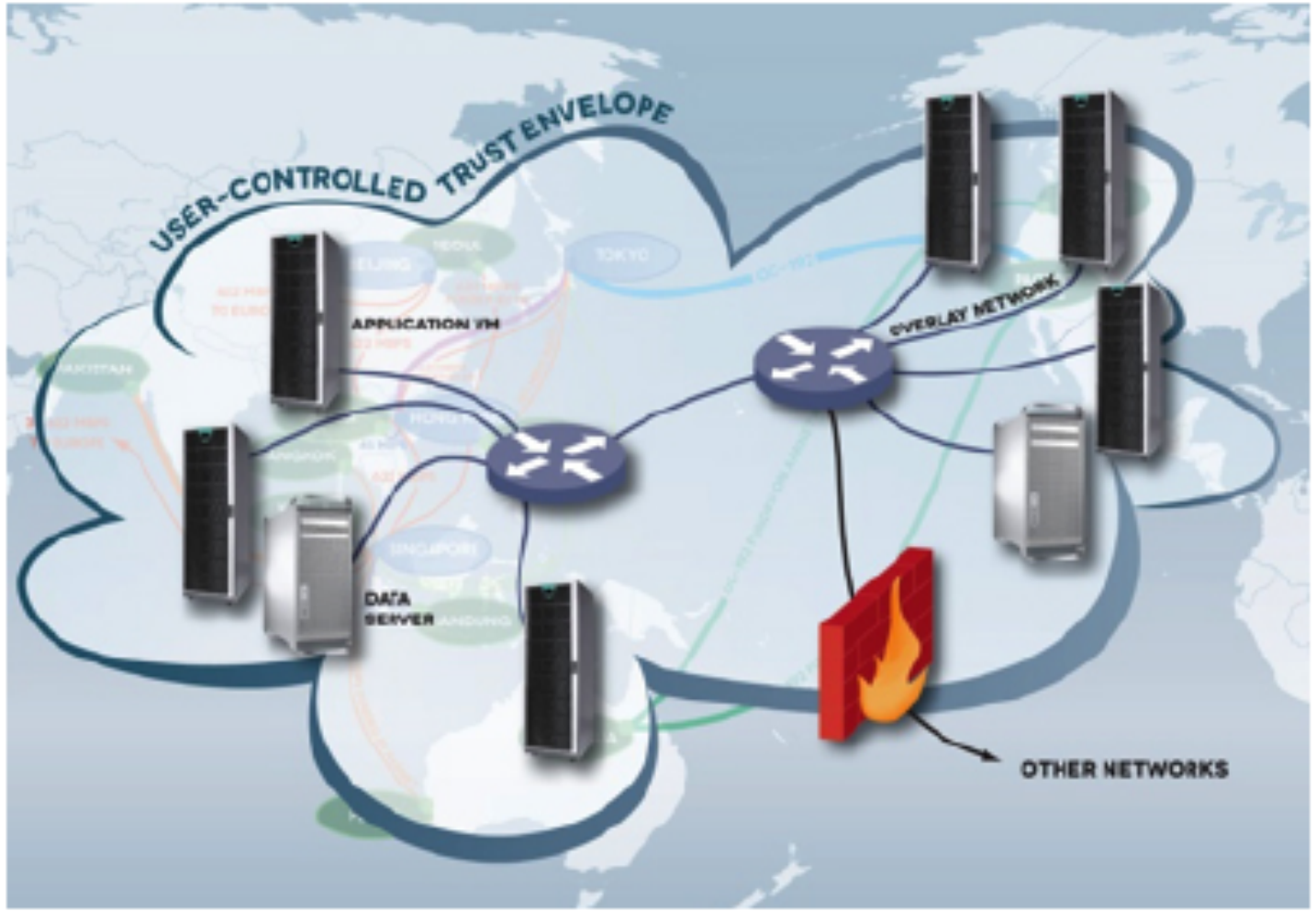
Reporting on SIGNIFICANT WORK by a LARGE Cast of Researchers

Personnel Changes

- Cindy Zheng Retired ~1 year ago → Philip Papadopoulos “promoted” to working group co-chair
- Yoshio Tanaka has taken a new position at AIST that makes travel to PRAGMA meetings nearly impossible for the next 2 years → Yoshio “promoted” to ex-officio chair. Phil “promoted again” to working group chair

- So, We’re looking for a some able, hardworking people to take on significant leadership roles in the Resources working group.

Distributed Clouds with Trusted Envelopes enabled by Overlay Networks



- Virtualization to enable complex software deployment at multiple physical sites
- Overlay networks to create a trusted environment to share resources
- Controlled access to data to support data sharing

PRAGMA ENT (Experimental Networking Testbed)

- Formulated at PRAGMA 25
  - Co-Leads: Mauricio Tsugawa, University of Florida, Kohei Ichikawa, Nara Institute of Science and Technology
  - Part of 1st working group session dedicated to moving this forward to the next step.

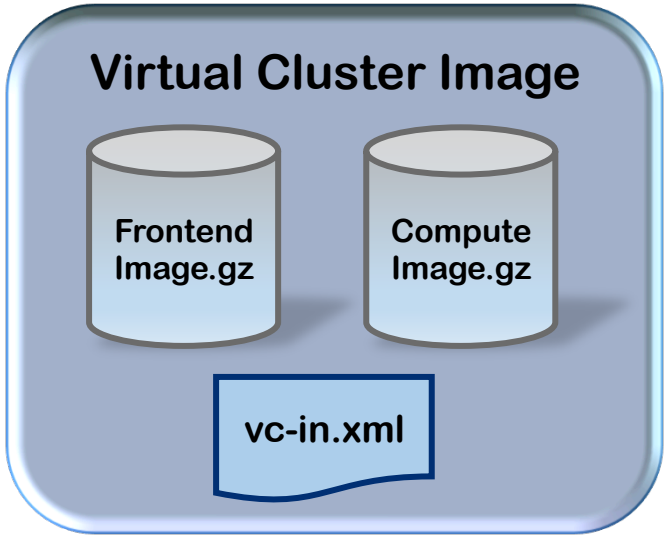
Significant Activities in Resources Working group (one-line summaries)

- Improvements to PRAGMA bootstrap: distribute images via Amazon Cloud Front to port virtual clusters to different sites (Pong* (NAIST) and Luca (UCSD))
- Revision 0 of a personal cloud controller (PCC) using pragma_bootstrap and HTC condor. Web interface to simplify use (Yuan* (Indiana) and Shava (UCSD)
- First heartbeats of PRAGMA-ENT Openflow Testbed (Kohei (NAIST), Mauricio (U Florida), Pong (NAIST), Luca (UCSD), Many others actively participating
- Virtualization of Lifemapper Server, Database, Web Interface (Aimee (Kansas) and Nadya (UCSD) (Biodiversity Expedition)
- IPOP overlay networking with Windows (Renato (U Florida), Paul (Wisc) (Lake Ecology Expedition)

* Graduate students

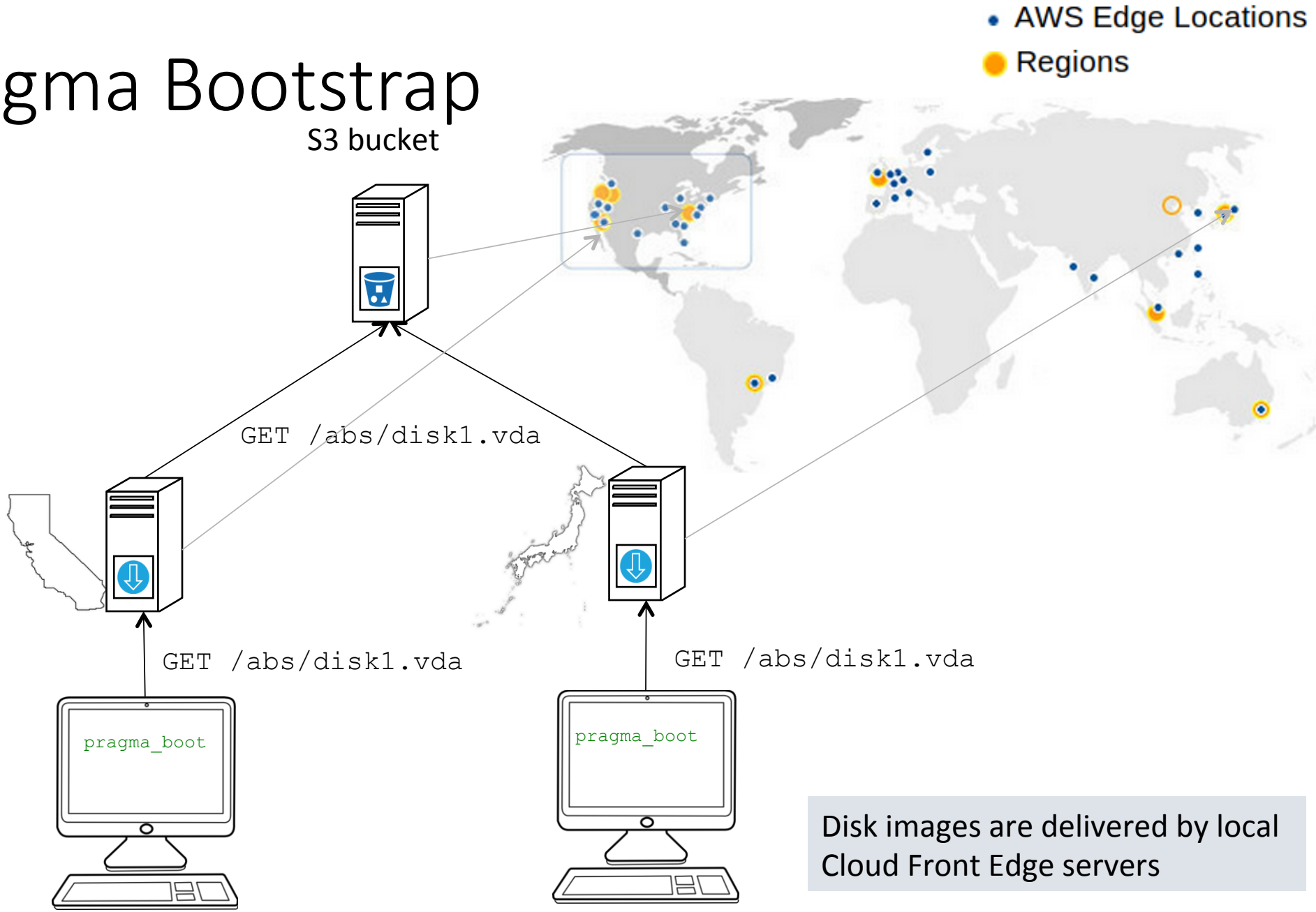
Pragma Bootstrap

1. Virtual Cluster Images Standard
2. Deployment mechanism



- Automatically deploy and bootstrap PRAGMA compliant virtual clusters
- Available at: https://github.com/pragmagrid/pragma_boot
- Plugins architecture (to support more platforms)

Pragma Bootstrap



Disk images are delivered by local Cloud Front Edge servers

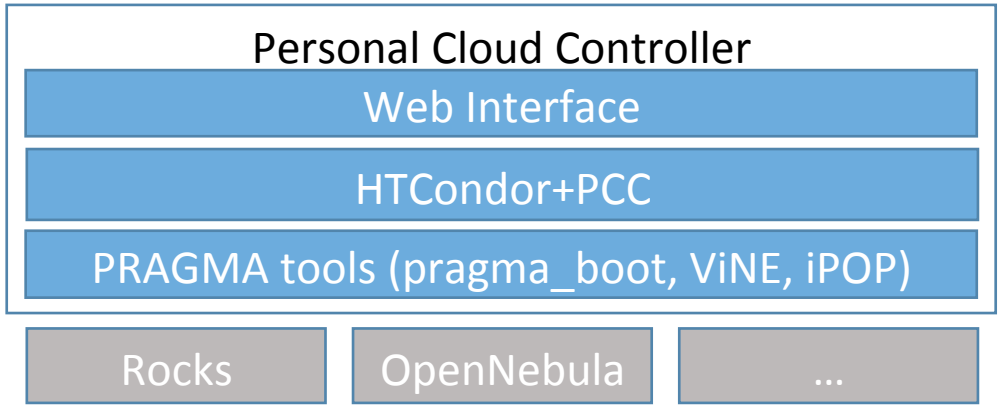
Personal Cloud Controller (PCC)

(Yuan Luo, Shava Smallen, Beth Plale, Philip Papadopoulos)

- Goals:
  - Enable **lab/group** to easily **manage** application **virtual clusters** on available resources
  - Leverage PRAGMA Cloud tools: pragma_bootstrap, IPOP, ViNE.
  - Lightweight, extends HTCondor from U Wisc.
  - Provide command-line and Web interfaces
- Working Group: Resources

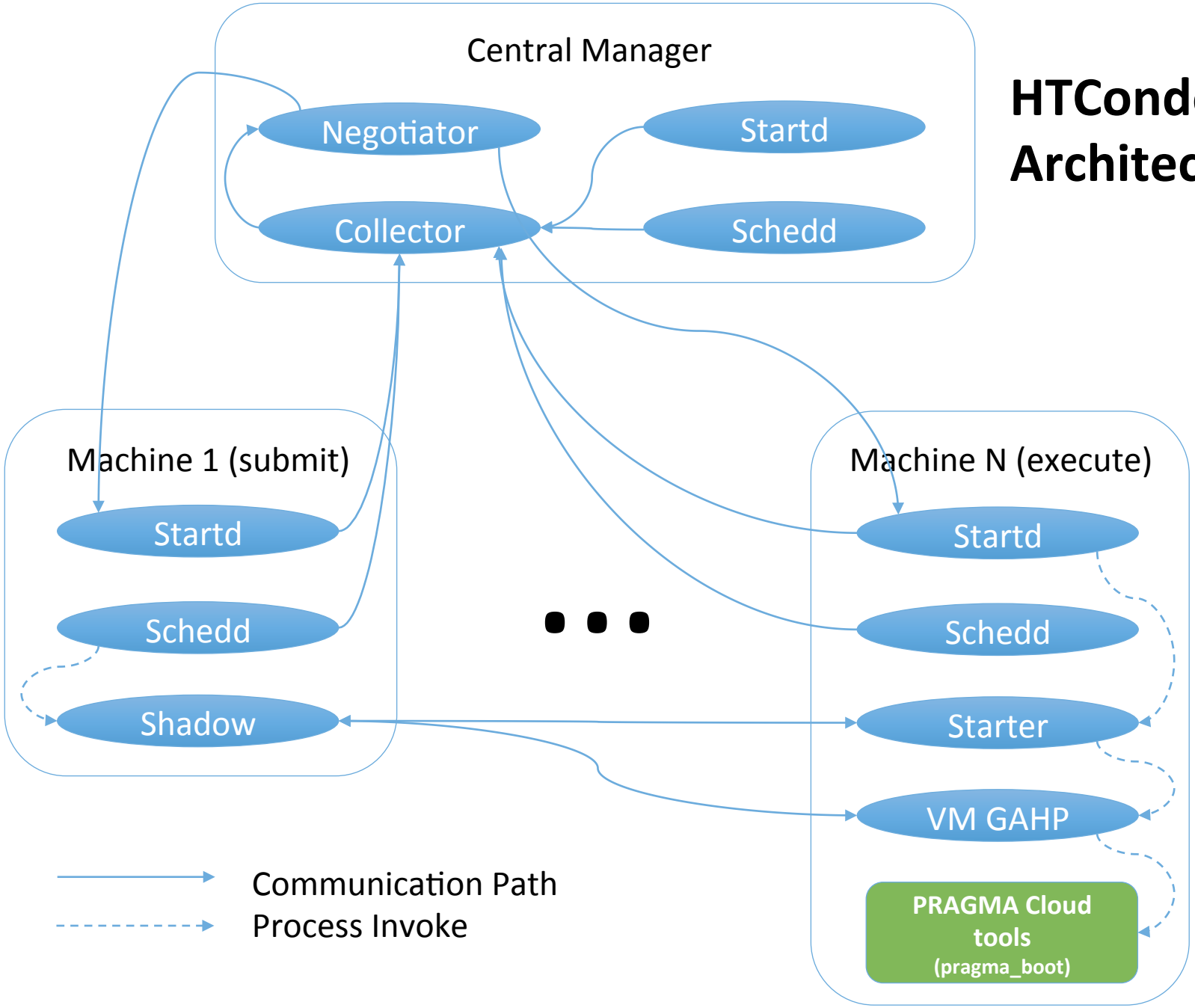
Personal Cloud Controller (PCC) - cont.

- Current status
  - Start and monitor virtual cluster using pragma_bootstrap via HTCondor (VM GAHP)
  - Web interface prototype (PHP)
- Near-term goals
  - Add increased controllability and robustness (April – June)
  - Multi-site clusters (July – Sept)



- Longer-term goals
  - Data-aware scheduling
  - Fault tolerance
  - Provenance

HTCondor-PCC Architecture



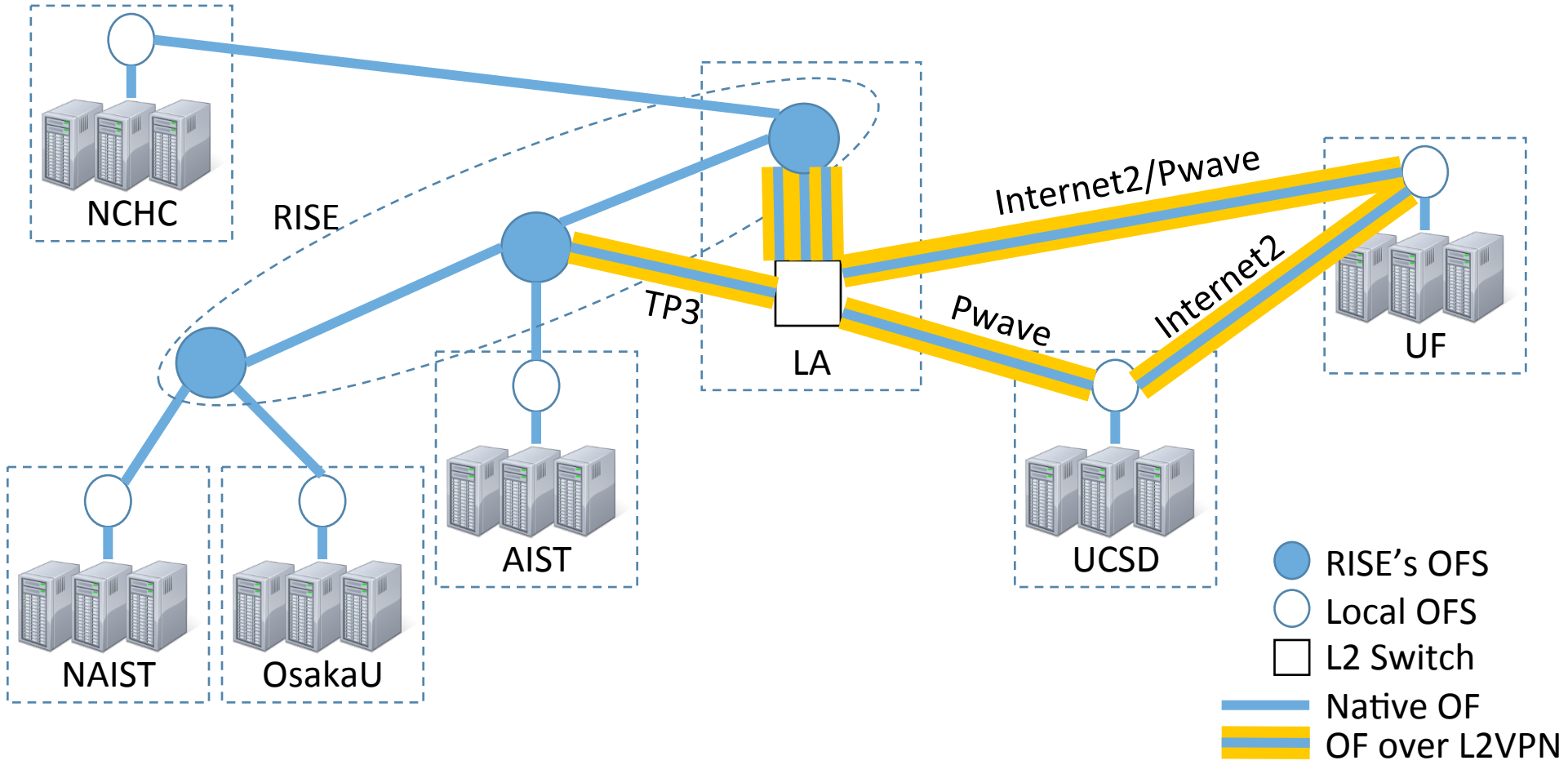
PRAGMA-ENT Goals

- Build a breakable international SDN testbed for use by PRAGMA researchers
- Provide access to SDN hardware/software to PRAGMA researchers
- Integrate with overlay networks (e.g., ViNe)

PRAGMA-ENT Progress

- Established in PRAGMA-25 (Oct-2013)
- Collaboration using pragma-ent@googlegroups.com
  - If interested, please send join requests to tsugawa@acis.ufl.edu
  - 20 members
  - 10 Institutions
  - Support from Internet2, KDDI, NICT, FLR
- First group meeting: SC'13 (Nov-2013)
  - Monthly conference calls ever since
- Presence at Internet2 2014 Global Summit (Denver, Apr 06-11)
  - Jim Williams (IU/Internet2)
  - Chris Griffin (UF/FLR)
  - Jin Tanaka (KDDI)

Connecting US and NCHC into the RISE Switch in LA + Multipath between JP and US



Data Challenges

Scalability

meet tomorrow's needs as oppose to only today's

Local storage

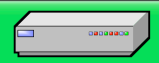
Data storage

Cloud Storage

- Administration
- Availability
- Sharing
- Performance tuning
- Data management operations: *snapshots, replication, cloning*
- Data quality & new data integration

Data transfer

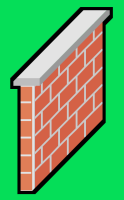
Network Router



Network Bridge

- Need centralized/unified file transfer
- Allow multiple users and sites to setup simple or complex file transfers
- Have tools for file transfer jobs
  - *build &customize*
  - *manage & monitor*
  - *audit*

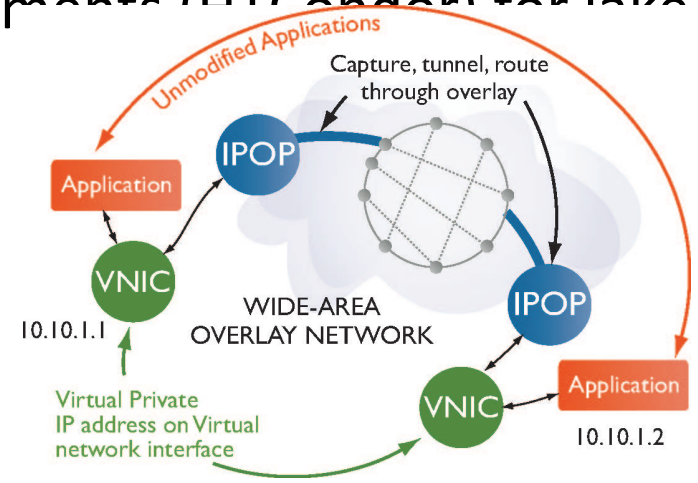
Network Hub



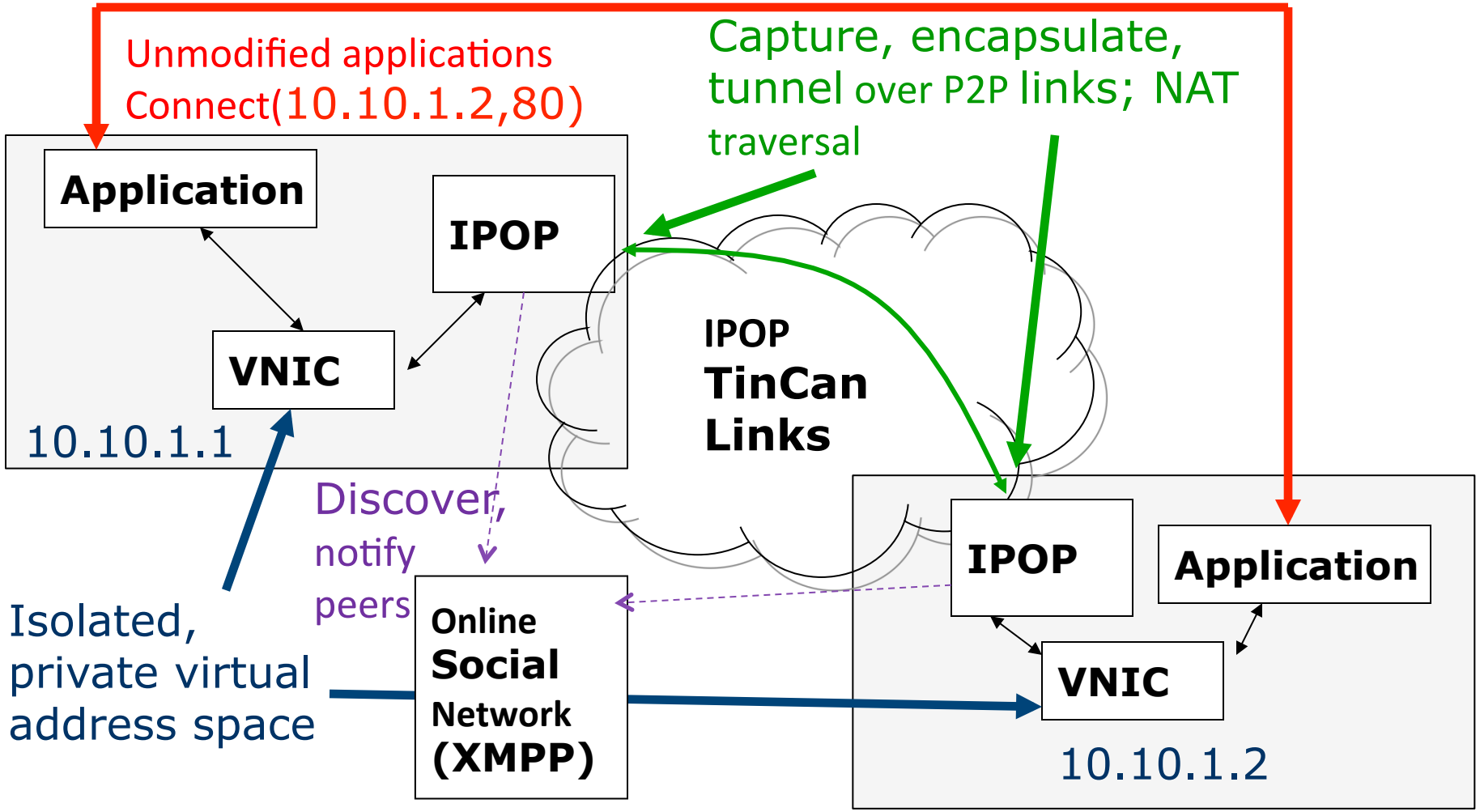
Firewall

Goals

- Enhancements to the IPOP codebase
  - Improved functionality
  - Use of standards (XMPP, ICE, STUN, TURN)
  - Support for additional devices (Android; OpenWRT)
  - IPv6 support
- Demonstrate applicability of overlay
  - Support of collaborative computing environments (HTCondor) for lake ecology modeling



Architecture



Progress – IPOP overlay

- Major code redesign
  - Decoupled architecture:
  - TinCan links - datapath
    - End-to-end private tunnel links with NAT traversal
    - C/C++; reuses libjingle, XMPP, STUN, TURN
  - VPN controllers – GroupVPN and SocialVPN
    - Setup TinCan links (on-demand, proactively)
    - Configure virtual IP addresses
    - JSON/RPC API ; Python, or other languages

Accomplishments

- Deployment of IPOP overlay network – PRAGMA la
- Cross-institution HTCondor pools
  - U. Florida, U. Wisconsin, Virginia Tech
  - Desktops, servers; virtual and physical
  - Ability to grow to tap additional resources
    - VMs at these (and other institutions)
    - Including commercial clouds

Relevance

- IPOP is a low-barrier overlay technology that can be used to create “trust envelopes” for PRAGMA collaborations
- Open-source software available for all PRAGMA partners