SLATE

Services Layer at the Edge

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ATLAS Sites Jamboree
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Outline

- What is **SLATE**?
- The motivation
- The **SLATE** Vision
- Current technology explorations
- Challenges and open questions
- Wrap up

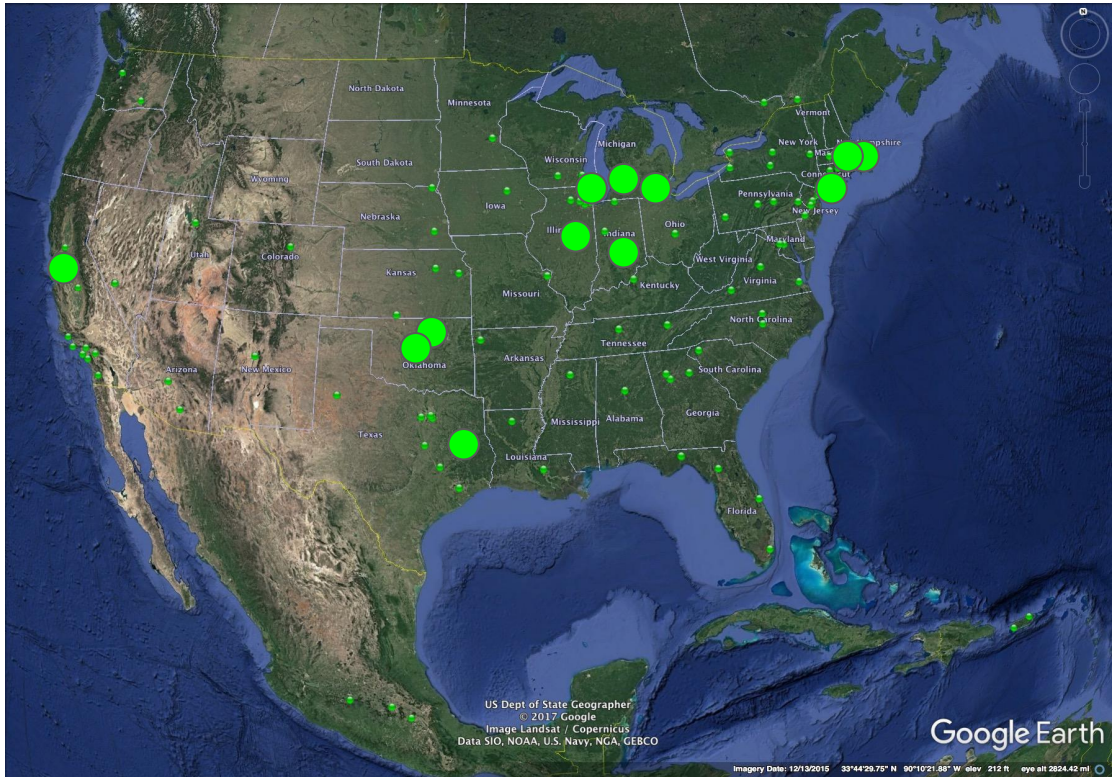
What is **SLATE**?

- NSF DIBBs award, "SLATE and the Mobility of Capability"
- Equip the ScienceDMZ with service orchestration capabilities, federated to create scalable, multi-campus science platforms
- Platform for service operators & science gateway developers

The motivation

Automate distributed platforms

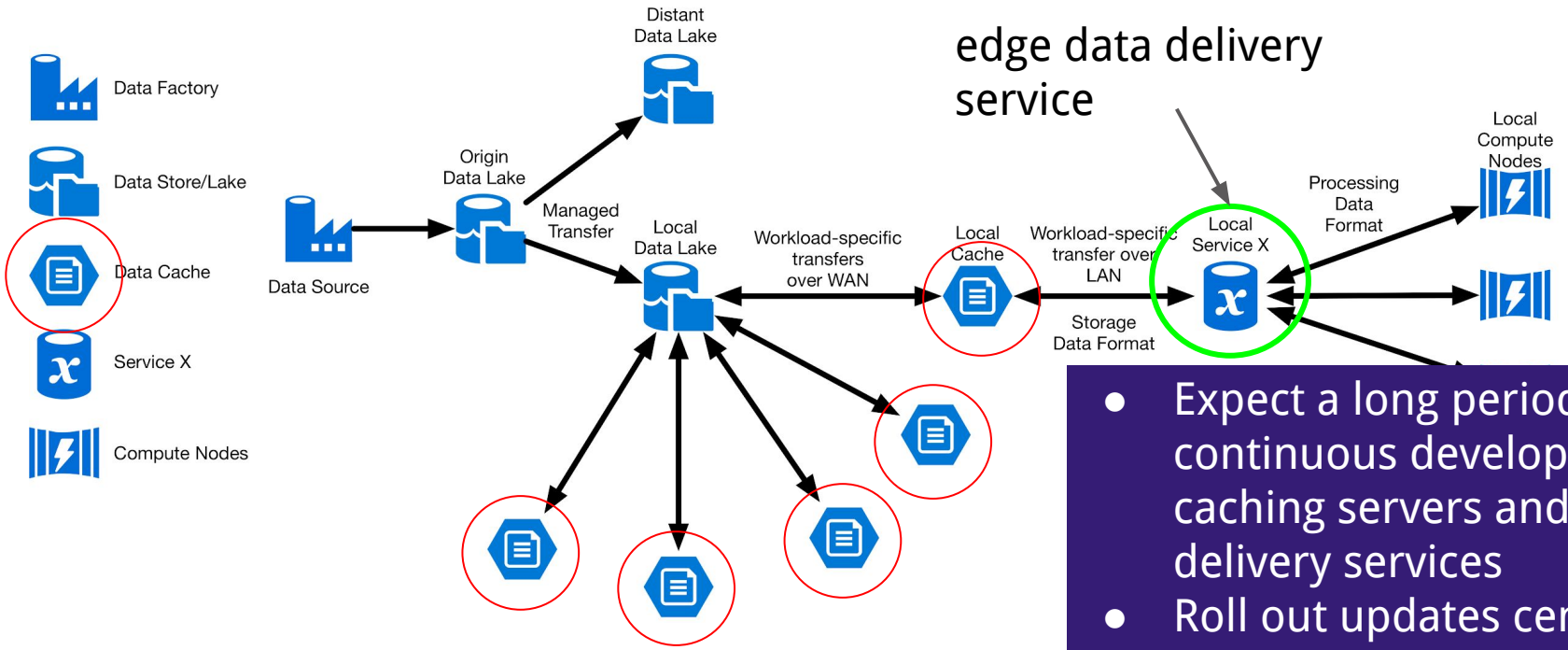
- US ATLAS Computing Facility has 11 production sites each with a set of edge services operated on behalf of ATLAS.
- There are 45 US ATLAS institutions in total.
- There are many more WLCG sites globally



Deployment is difficult!

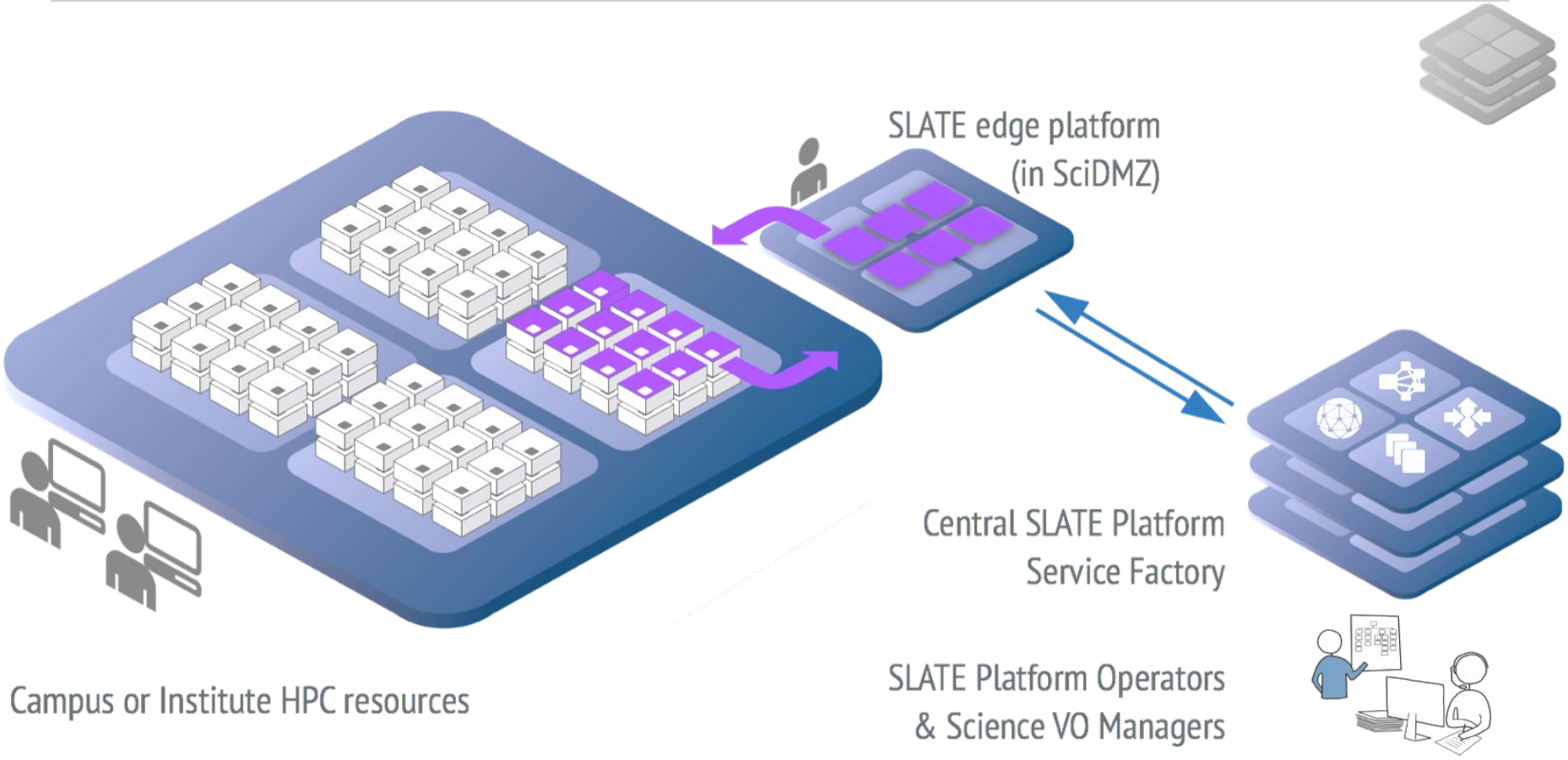
- **A broken DevOps cycle!**
- Deployment means:
  - Finding a friendly sysadmin at the site
  - Having them procure hardware or a virtual machine
  - Sending them the deployment instructions and hoping for the best
- Operations problems too:
  - Someone has to make sure it actually keeps running
  - Latency in updates across sites make it extremely difficult to rapidly innovate platform services

Use Case: caching network a data lake



- Expect a long period of continuous development of caching servers and delivery services
- Roll out updates centrally
- Configure & control centrally

The **SLATE** Vision

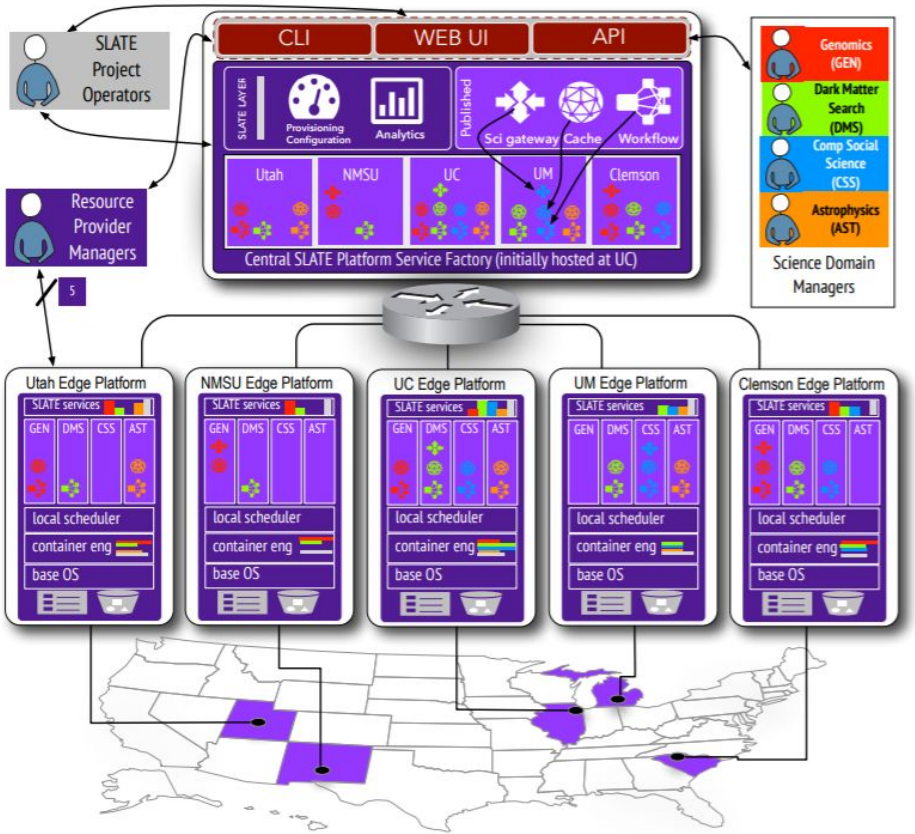

SLATE edge platform
(in SciDMZ)
Central SLATE Platform
Service Factory
SLATE Platform Operators
& Science VO Managers
Campus or Institute HPC resources

Services **L**ayer **A**t **T**he **E**dge

- A ubiquitous *underlayment* -- the missing shim
  - A generic cyberinfrastructure substrate optimized for hosting edge services
  - Programmable
  - Easy & natural for HPC and IT professionals
  - Tool for creating "hybrid" platforms
- DevOps friendly
  - For both platform and science gateway developers
  - quick patches, release iterations, fast track new capabilities
  - reduced operations burden for site administrators

Concepts & components

- Containerized services in managed clusters
- Services curated with security in mind
- **Standalone or federated**
- Widely used open source technologies for growth and sustainability



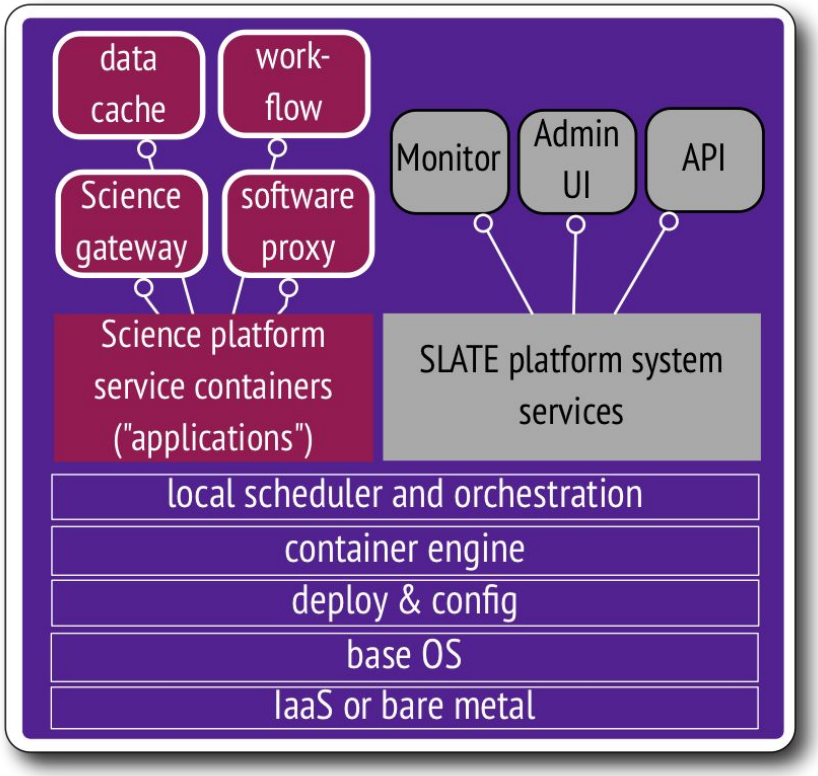
”Mock up” Examples

- `slate app install --cluster=uchicago-mwt2,umich-arc harvester:latest`
- `slate app install --cluster=alcf-edge htcondorce`
- `slate app install --cluster=mycluster arccache`
- `slate app status [appname]`
- `slate app status [appinstancename]`
- `slate app delete xcache`
- `slate app delete xcache --instance xcache-ivukotic-mwt2`
- `slate app delete xcache --cluster='uchicago-*'`
- `slate app delete --cluster=uchicago-rcc --org=ATLAS`

Current explorations

Technology investigations

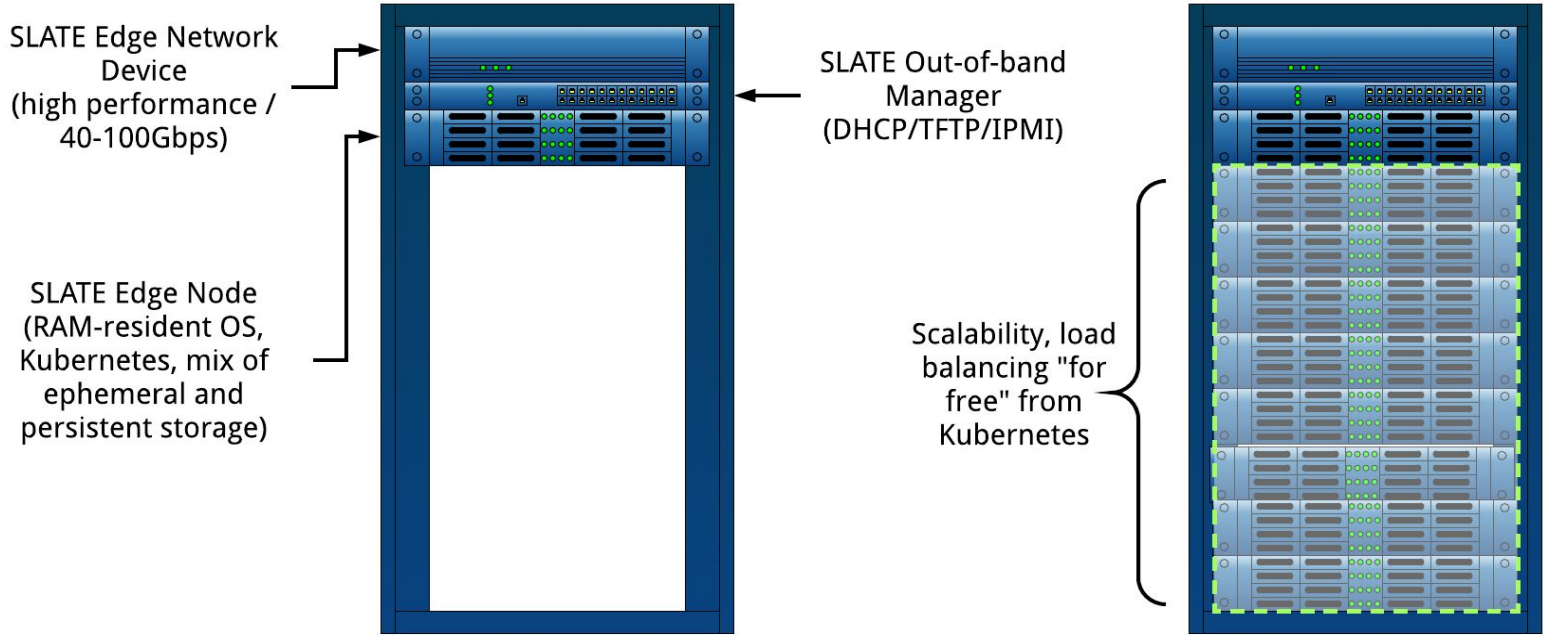
- Rethinking the stack
  - Starting from bare metal
  - Up to the application
- Reusing existing technologies where possible
  - and building our own software as needed



Technology examples

- **RancherOS** - lightweight Linux OS for Containers
  - Linux Kernel + Busybox + Docker = RancherOS
  - Booted from the Network directly to Memory
- **Rancher** - Web interface for managing containers, Kubernetes
- **Kubernetes** (k8s) for container-based orchestration
  - Open source system for deploying and automatically scaling and managing services
  - Currently have 4 sites (Chicago, Michigan, Utah, New Mexico State) with prototype deployments

SLATE Edge Clusters



Containerizing XCache for **SLATE**

Ilija Vukotic

- Already several Docker containers exist.
- There is an autobuilt one in slateci/xcache.
- A simple deployment (single server) tested in three different Kubernetes clusters (CERN, MWT2, Google).
- Need a robot certificate before scale/reliability testing.
- Next steps:
  - Rucio fix for correct path construction.
  - XCache monitoring (reporting based on cache cinfo data)
  - Small scale testing
  - More complex deployment - cluster with autoscaling.

Challenges and open questions

Challenges are many!

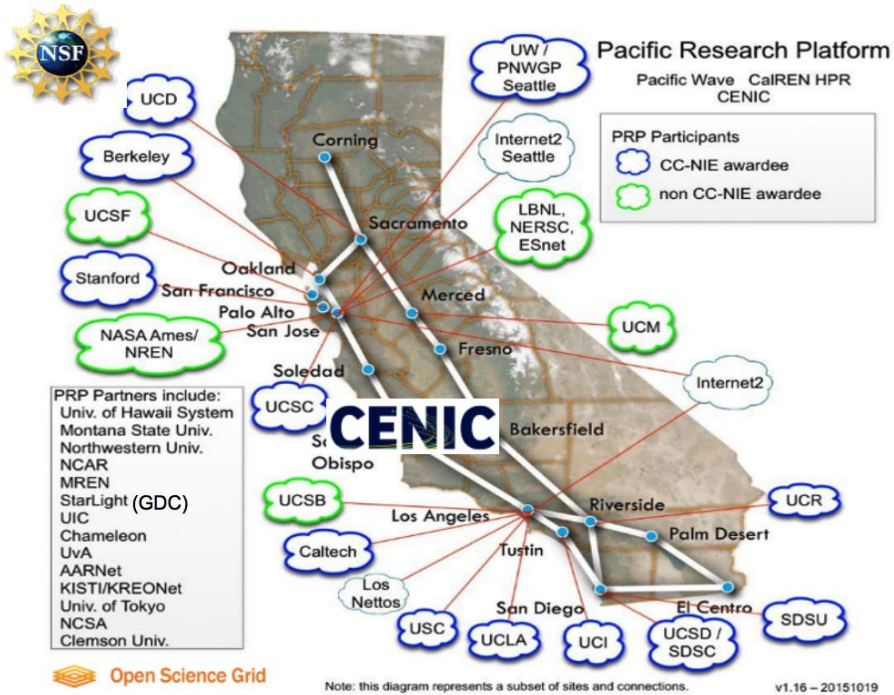
Cybersecurity and policy

- On premise services, potentially managed by third parties, present additional risks that need to be understood
  - Engagements with CISO from our campuses
  - Engagement with Center for Trustworthy Scientific Cyberinfrastructure

Scientific outreach

- Underlayment to Science
  - Embedded with science collaborations with multi-institution cyberinfrastructure - distributed data services, software, job routing
  - Developers associated with the Science Gateways Community Institute

Research Platforms: Regional, National, Global



NATIONAL RESEARCH PLATFORM

The First National Research Platform Workshop:
Toward A National Big Data Superhighway

Montana State University, Bozeman
August 7-8, 2017

Purpose:

(1) to bring together representatives from PRP partners and outside interested institutions, including domain scientists, network and system administrators, campus CIOs, regional network leaders, and representatives of ESnet, Internet2, the Quilt, XSEDE, and the National Science Foundation

(2) to discuss expansion of the PRP and address the potential challenges and benefits of scaling the Science DMZ model to a national level and creating a National Research Platform (NRP).

Chairs: Jim Bottum, Internet2, and Larry Smarr, Calit2, UCSD
Program Chair: Tom DeFanti, Calit2, UCSD

Workshop report, slides, and videos at www.pacificresearchplatform.org

Source: Louis Fox, CENIC

Internet2 2017 Technology Exchange 15-18 October, San Francisco

Growing interest among US universities to connect to a "national platform" for collaborative science

SLATE Platform Open Questions

- Do we build a single **SLATE** platform that uses logical partitioning to serve our "customers"?
  - A single target, but more operations support needed from the **SLATE** team
- *Or* do we build a reference platform that serves as a pattern and upstream for other organizations?
  - Give organizations more control, but more costly
- Should we plan to include high performance networking devices in our specification, or leverage existing ones at the site?

A role for "lightweight" sites?

- First introduced at Lisbon WLCG meeting in 2016 during infrastructure models session - "ubiquitous cyberinfrastructure"
- If a **SLATE** existed, could we reduce needed manpower to operate these sites?

We need your help!

- To help us define the "right way" to do this that works for your: cloud / site / institution / service
- We're developing two reference documents to establish a community vocabulary & a reference architecture
  - Architecture
  - Vocabulary

Please comment!

all are welcome

Summary

- Reduce barriers to supporting collaborative science
- Give science platform developers a ubiquitous "CI substrate"
- Change distributed cyberinfrastructure operational practice by mobilizing capabilities in the edge
- We need input from the ATLAS sites community! Please consider joining us!

Thank you!

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