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Research Cyber-Infrastructure Today

**Computation**
- Shared Resource (XSEDE, PRAC)
- Standardized
- NSF-Funded

**Networking**
- Over 200 universities with 40/100Gb Connectivity
- Standardized
- NSF-Funded

**Storage**
- Largely Balkanized
- No Standards Requirement
- No CI Funding
The Open Storage Network: Distributed National-Scale Storage for Research

A Repository for Active Publicly-Funded Research Data

- Unified Administration
- Standardized and Scalable System
- Purpose-Built System
- Distributed Platform
- Fast, Reliable Data Transfer Performance
- Accessible and Sustainable
Community Benefits

The OSN will enable increased scientific discovery

- Assist in the Definition of Standards
- Leverage Community-Built Tools
- Enable Data Sharing
- Cultivate Data Discovery
- Improve Data Dissemination
Six Prototype Deployment Sites

- Northeastern Storage Exchange
- San Diego Supercomputing Center
- University of Illinois
- RENCI
- Northwestern University
- Johns Hopkins University

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Prototype Technical Goals

Ξ Leverage Existing Cyber-Infrastructure Resources Ξ
High-Speed Networking | Funded Datasets

Ξ Efficient Systems Management Ξ
Centralized Management/Monitoring | Limited Use of On-Site Staff | Deployed in SUs

Ξ Provide Safe, Reliable, Consistent Storage Ξ
Policy-Based Redundancy | Data Locality | Geography-Aware Replication | Workload Specific

Ξ Encourage Familiarity with Petascale Systems Ξ
Prototype Details

Hardware is Deployed in “Scalable Units”

~1 PB of Object Storage per Scalable Unit

One Scalable Unit =
Capable of 40Gbps Sequential IO

Geography-Aware Replication =
Data Protection, Data Locality
OSN POD Storage View

- Ceph Object Gateway
- Ceph MON Service
- Ceph OSD Service

1.44 PB Raw Storage; 0.93 PB Useable Storage

Initial Deployment Configuration Management Software Updates Network Changes

Usage Tracking System Status Logs

OSN Command Center
Ceph is:
- Distributed Object Store
- Redundant and Self Healing
- Scales out Efficiently
- Runs on Commodity Hardware
- Open Source

How Objects are Stored:
- The Object Gateway saves Objects to a Storage Pool
- The Storage Pool has Storage Policies for the Objects
- The CRUSH Map assigns Objects to Placement Groups and Placement Groups to OSDs (hard drives) based on the Storage Policies of the Pool
Ceph-Ansible

- Maintained by Red Hat/Ceph at: https://github.com/ceph/ceph-ansible.
- The OSN deploys: 3 MONs, 3 MGRs, 180 OSDs and 3 RGW services.
- Installed Ceph on 6 PODs from a single command center with one shared Ceph-Ansible code base.
- 98% of the tasks needed to deploy Ceph on a POD are completed with Ceph-Ansible.
- The OSN has contributed back to the Ceph-Ansible project by contributing code and bug fixes.
Additional Ceph Configuration Details

- Nautilus (v14.2) from the community Yum repository on CentOS 7.
- The buckets.data pool uses an erasure code profile.
- Disks are encrypted with dmcrypt.
- Load Balancing with HAProxy.
- Monitoring is done using the Telegraf MGR module. The full Telegraf, InfluxDB and Grafana (TIG) stack is hosted on PODs and command center.
- Additional OSN Ansible roles have been created to Ceph configuration not managed by Ceph-Ansible.
OSN Configuration Management Workflow
OSN User Access
Questions?

openstoragenetwork.org