OSiRIS
Open Storage Research Infrastructure

Ceph and Software Defined Networking for Multi-Institutional Research

NSF Award 1541335: CC*DNI DIBBs: Multi-Institutional Open Storage Research InfraStructure (MI-OSiRIS)
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OSiRIS: Posix and object storage for research

100 Gb Fiber Loop
Michigan Lambda Rail (MiLR)

4 Gb

2 x 40Gb Alternate (shared with AGLT2)

VAN ANDEL INSTITUTE

MICHIGAN STATE UNIVERSITY

UNIVERSITY OF MICHIGAN

16 NVMe OSD (cache tier pools)

10Gb MiLR Alternate

10Gb MiLR Alternate

10Gb MiLR Alternate

IU

Network topology and performance information feedback to Flange SDN rules

Multi-institutional Ceph Cluster -
MON, MDS, OSD at each site

WAYNE STATE UNIVERSITY

OSiRIS is a 600 OSD, 5PiB **Ceph storage** cluster expanding soon to 840 OSD and 7.4PiB. The cluster spans 3 Michigan research universities with a 'cache' component at the Van Andel Institute. Our goal is to provide transparent, high-performance access to the same storage infrastructure from any of our campuses.

Enabling Science Collaborations

VAN ANDEL INSTITUTE
Building on existing collaboration between MSU and the VAI, OSiRIS has installed 'cache' hardware and NFS gateway services at the institute to enable direct access and faster access to key research data. OSIRIS at VAI will enable VAI bioinformaticians to work with MSU researchers to better understand Parkinson's disease and cancer, and will allow VAI researchers with MSU appointments to access the computational resources at MSU ICER.

Global Nightlights: NOAA has begun transferring to researchers at UM its archive of nighttime satellite imagery comprised of all images captured from 2 different satellite programs: DMSP (1993-2016) and VIIRS (2012-ongoing). This will be the only complete collection of nighttime imagery anywhere. By keeping portions of this archive on OSiRIS we enable wider usage of the datasets by researchers outside the institution.

JETSCAPE
The JETSCAPE collaboration at WSU is an NSF funded multi-institutional effort to design the next generation of event generators to simulate the physics of ultra-relativistic heavy-ion collisions. OSiRIS provides the collaboration with a universally available storage platform for collaborative access to data.

INSTITUTE FOR SOCIAL RESEARCH UNIVERSITY OF MICHIGAN
Homed at the UM ISR, the NIH funded 5 year project 'Effect of the Placental Epigenome on Stunting in a Longitudinal African Cohort' uses OSiRIS to store and share selected data to a wider community
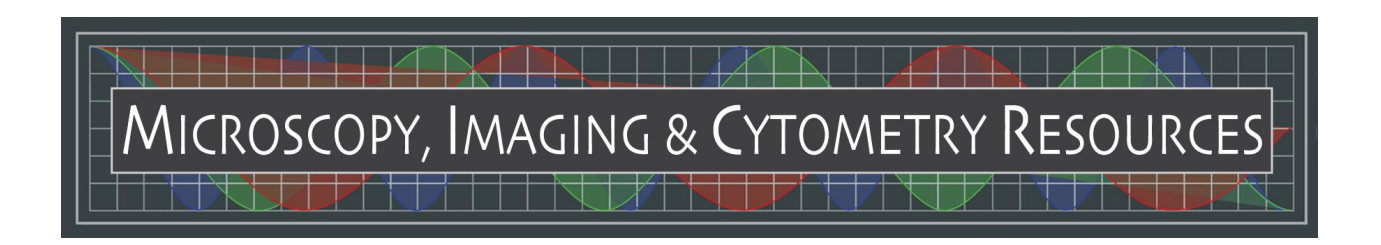
U.S. NAVAL RESEARCH LABORATORY
U.S. Naval Research Lab is collaborating with researchers at UM to share their high-resolution ocean models with the broader community. This unclassified data was stored on Navy computers that were not easily accessible to many researchers. OSiRIS has enabled scientists worldwide to leverage these models.
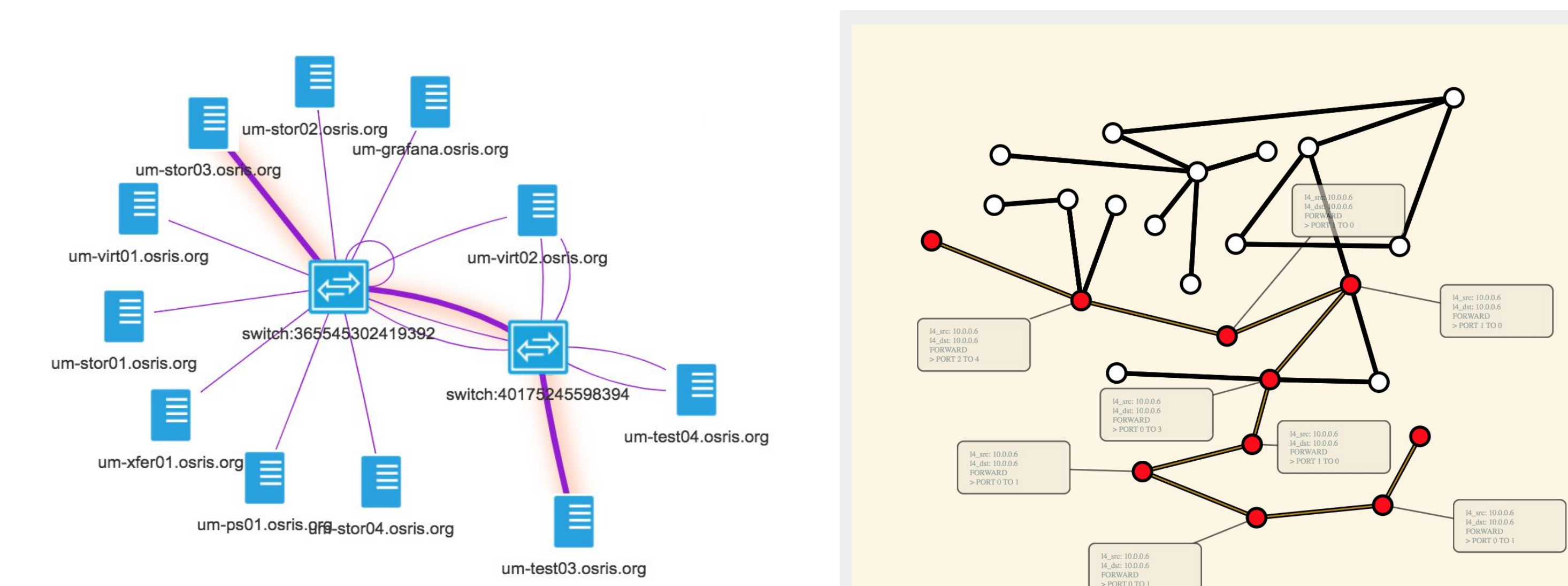
MICROSCOPY, IMAGING & CYTOMETRY RESOURCES

At WSU the Microscopy, Imaging & Cytometry Resources (MICR) core aims to enhance the peer-reviewed funded research activities of WSU investigators whose research requires microscopy, imaging resources, flow cytometry and related techniques. They leverage OSiRIS to enable wider access to imaging data.

ATLAS EXPERIMENT
The ATLAS Event Service is designed to leverage object stores like OSiRIS for fine grained physics event data which can be retrieved and computed in small chunks and leverage transient compute resources.

NMAL: Advanced Network Management

OSiRIS Network Management Abstraction Layer
Advanced network monitoring and control services - led by the team at **Indiana University CREST.**

um-stor03.osris.org
um-stor02.osris.org
um-grafana.osris.org
um-virt01.osris.org
um-virt02.osris.org
um-stor01.osris.org
switch:365545302419392
switch:401752455598394
um-test04.osris.org
um-xfer01.osris.org
um-ps01.osris.org
um-stor04.osris.org
um-test03.osris.org

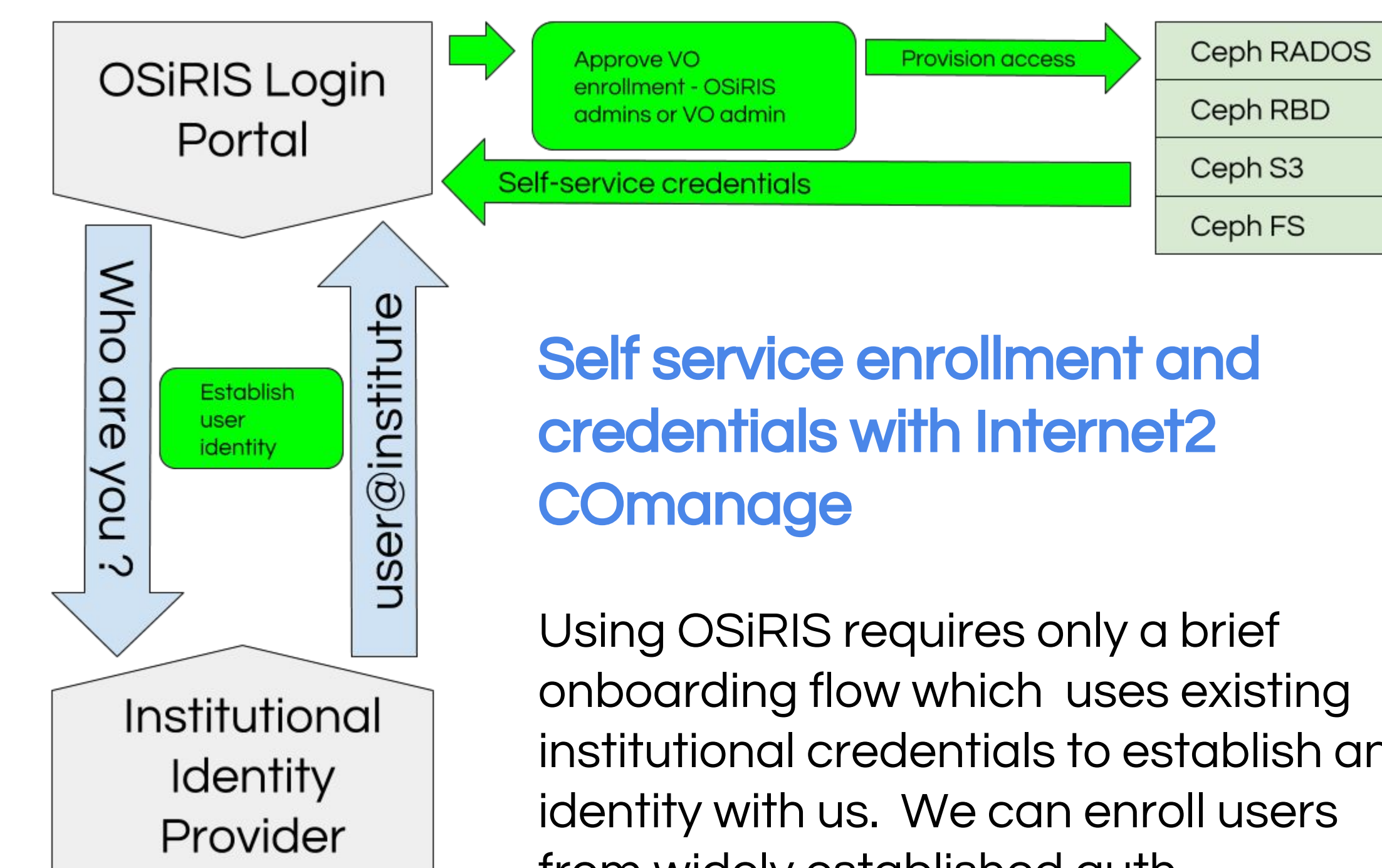### UNIS - Unified Network Information Service

UNIS-DB aggregates network performance, LLDP topology, and host metrics from our perfSonar mesh sent to it by the perfSonar Periscope extension so it can be applied to network control and information.
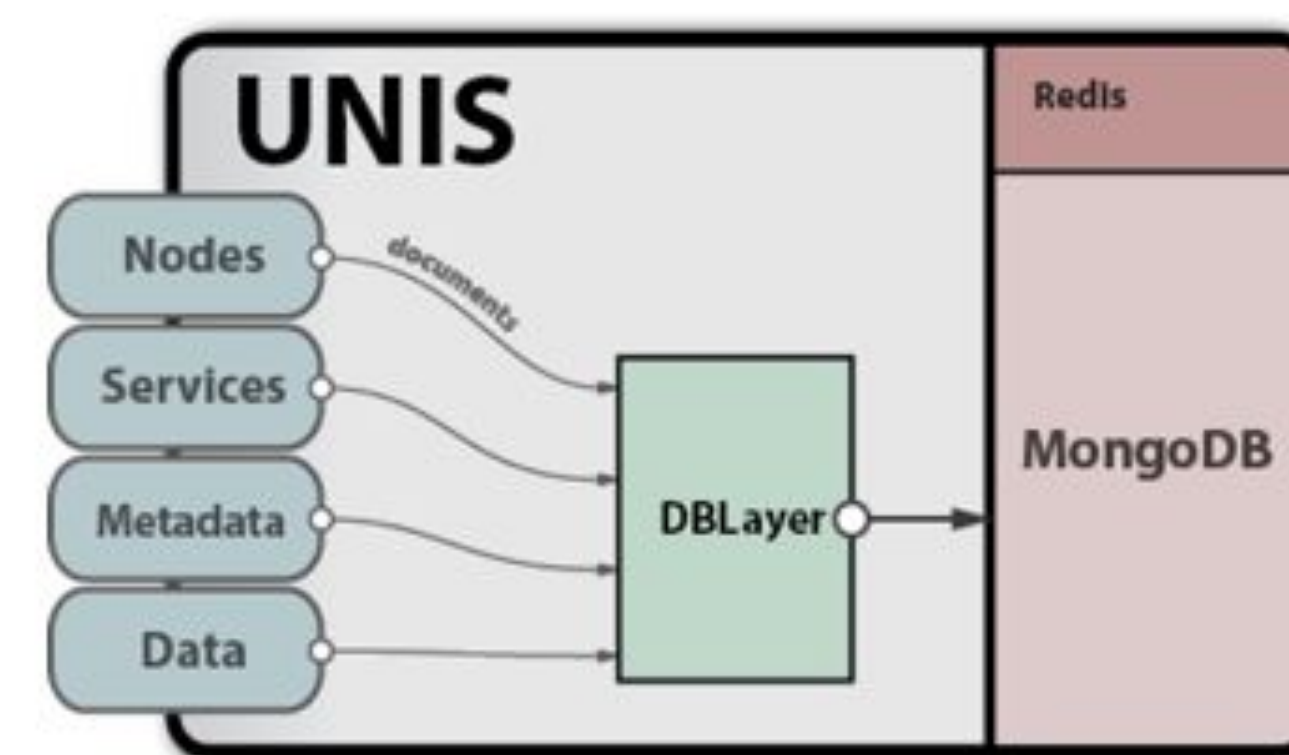
NMAL gives us real-time feedback into the topology of our network from hardware switches and software Openvswitches

→ Which we'll use for real-time network pathing decisions with Flange rules

UNIS
Nodes
Services
Metadata
Data
DBLayer
Redis
MongoDB

Bridging Ceph and Institutional Credentials

OSiRIS Login Portal

Approve VO enrollment - OSIRIS admins or VO admin → Provision access

Self-service credentials

Ceph RADOS
Ceph RBD
Ceph S3
Ceph FS

Who are you ?

user@institute

Establish user identity

Institutional Identity Provider

Mapping Identities in CephFS

Coming in the near future: We are making modifications to the ceph client component which will allow us to set unix uid/gid information matching OSiRIS rather than the local client. Authenticity of the information will be matched against capabilities for client keys kept on our cluster.

This will enable CephFS posix mounts with consistent uid information at multiple sites.

Leveraging campus auth and NFSv4

In some cases we can also leverage institutional Kerberos domains and provide Kerberos authenticated NFSv4 mounts to campus users which map their on-campus identity to their OSiRIS identity.

Users of the UM and MSU computing clusters have direct mount access to OSiRIS storage on HPC login and transfer nodes.

Self service enrollment and credentials with Internet2 COmanage

Using OSiRIS requires only a brief onboarding flow which uses existing institutional credentials to establish an identity with us. We can enroll users from widely established auth federations including InCommon and eduGain.

Thanks to COmanage plugins we authored, enrolling in an OSiRIS virtual organization automatically grants access to OSiRIS storage and enables self-service of the necessary Ceph client credentials.