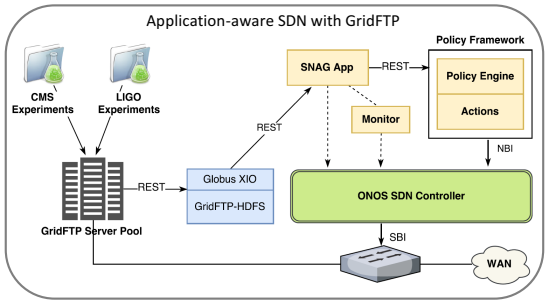
NSF Campus Cyberinfrastructure PI and
Cybersecurity Innovation for Cyberinfrastructure PI Workshop
October 3-4, 2017 | Albuquerque, NM

Quad Chart for: CC*DNI Integration: Innovating Network Cyberinfrastructure through Openflow and Content Centric Networking in Nebraska

Challenges:

- Integration of research and campus networking
- Improve performance and manageability of GridFTP transfers
- Bridge CMS data caching model with NDN distribution architecture
- Openflow hardware support

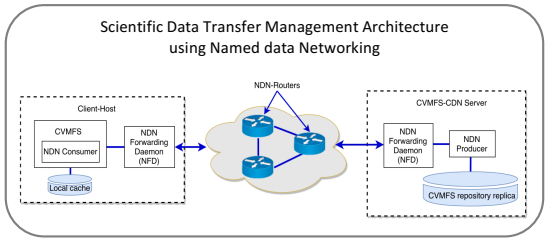


Scientific Impact:

- Application aware networking
- Policy driven resource management
- Improved flexibility enabling campus and research networks to coexist securely
- Improved data caching architecture for CMS and CernVM-FS projects

Solutions:

- Globus XIO plugin enabling SDN approach to GridFTP transfers
- Combining CernVM-FS filesystem with Named Data Networking
- Framework for large-scale data-intensive science using SDN and NFV



Metadata tag:

- *Conference paper published:* ***SNAG: SDN-managed Network Architecture for GridFTP Transfers***
- *Need continual collaboration with campus network team to benefit researchers end-to-end*

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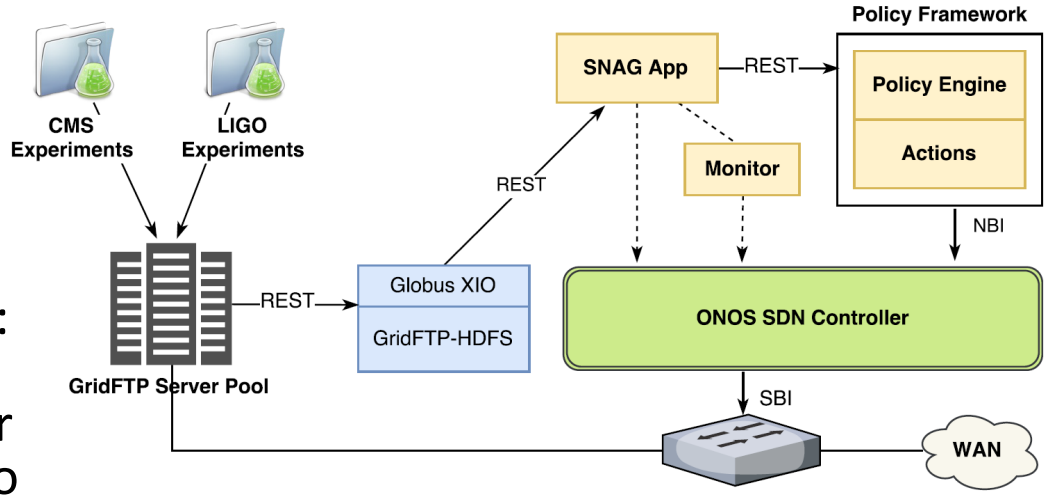
Differentiated Network Services for Data-intensive Science using Application-aware SDN

- **Application-aware service differentiation**: Application- and network-layer collaboration to influence network-layer control decisions for traffic prioritization.

- **Policy-driven resource management**: A policy-driven approach to decision making for defining per-flow, per user or per project policies. Can be used to regulate resource usage of various data-intensive science projects.



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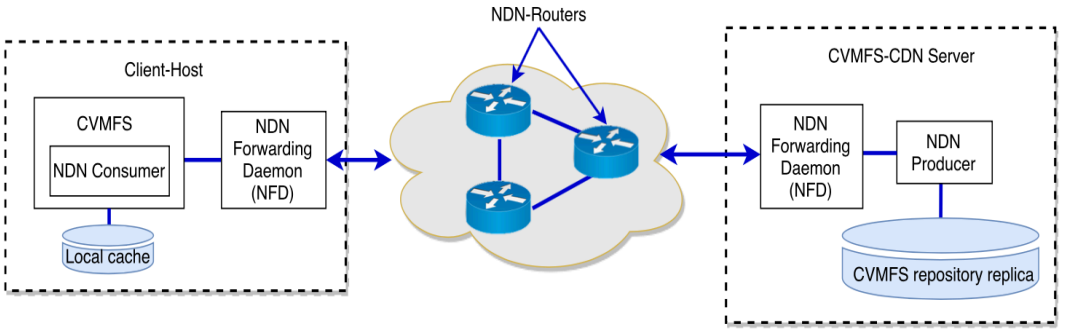
Scientific Data Transfer Management Architecture using Named Data Networking

- **How NDN is applicable to CernVM-FS (CVMFS)**
  - CernVM-FS maintains its data by using content-addressable storage which is applicable for the data name in NDN architectures.
  - CernVM-FS traditionally uses a Squid proxy hierarchy. NDN has in-network router caching capabilities which can replace or augment the traditional methods.
- **Problems addressed:**
  - Enabling CMS transfers through the CCN approach to handle large scientific data sets.
  - Mapping existing data stores to CCN-based in-network caching to benefit from spatial and temporal locality.



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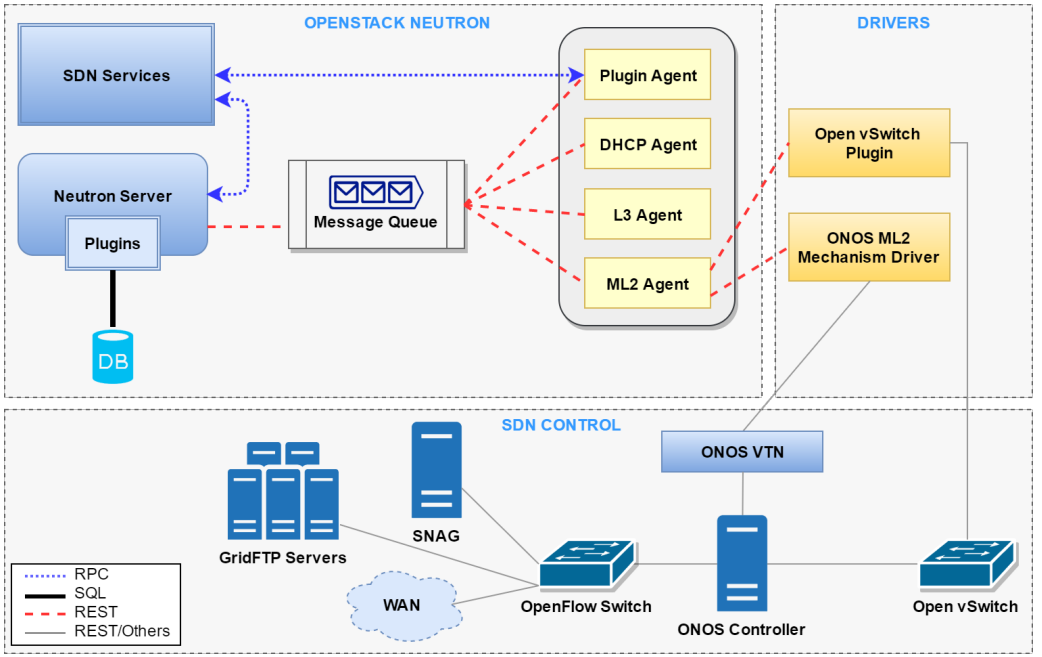
ScienceSDS: A Novel Software Defined Security Framework for Large-scale Data-intensive Science

- A novel security framework for large-scale data-intensive science using SDN and NFV.
- Framework enables *application*- and *network*-layer collaboration to optimize packet processing.
- Facilitates flexible and scalable security service composition using service chaining, meeting research and campus network integration requirements.



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