Network Infrastructure: Using SDN to Facilitate Data Transfer Project (CC-NIE) Scope

General information

The table below provides general information about the service and primary resources involved project/initiative.

Project Manager	Laurie Harris
Project Sponsor(s)	Tracy Futhey
Primary operational resource(s)	John Pormann
Other key operational resources (to whom the PCS and primary operational resources are accountable)	Charley Kneifel, John Board, Robert Johnson, Julian Lombardi
Service owner (functional)	John Pormann
Service manager (technical)	Travis Montgomery
Service(s) impacted	Duke's production network, DSCR, Duke test partner departmental networks

Resources/Project team

Jeffrey Chase, Victor Orlikowski, John Pormann, Tom Milledge (TBD), Dan Fredrick, Mark DeLong, Cara Bonnett

Description

Research computing is seeing very rapid growth in storage demands. Some estimates put the compound aggregate growth rate for storage capacity as high as +60% per year. Multiple units within Duke are seeing similar growth rates at, or above, +50% per year. This includes "traditional" computationally intensive research areas like the Duke Shared Cluster Resource (DSCR), the Institute for Genome, Sciences, and Policy (IGSP), the Center for Human Genetic Variation (CHGV), and the Brain Imaging Analysis Center (BIAC).

Given Duke's substantial investment in "backbone" bandwidth, the problems that researchers face in data-transfer and network-related research are clearly at the "edge" of the network: the switches that live in department- or school-level data-centers and data-closets, and the actual file servers that contain their data. This project aims to increase the network's performance at the edge, by both increasing the switch and the file server capabilities to 10Gbps Ethernet.

We will upgrade several key data-centers with 10Gbps-capable edge switches. We will connect those switches to the campus backbone (optics/transceivers), and to individual file servers (optics/transceivers as well as network interface cards/NICs). As a result, researchers will be able to move data at higher speeds (10Gbps raw bandwidth), from the edge, through the core, and out to other internal edge sites as well as external network connections. Through the inclusion of research/openflow VRF appliances, researchers can better take advantage of remote, cloud-provided information technology resources. The reliance on currently available technology will also provide a template that can be replicated for future high-performance data needs.

This project is funded through a two-year grant from the National Science Foundation under the Campus CyberInfrastructure program (funding is available beginning 1/1/2013). Grant PI is Tracy Futhey; co-PI is John Board.

Goals

The goals of this project are to
- Provide a significant, usable increase in network bandwidth without requiring noticeable changes to a researcher's workflow through implementation of a multi-vendor, standards-based solution
- Deploy new tools (e.g. HSCP and GridFTP) for better performance
- Provide training, 1:1 consultation and support to researchers on tools like HSCP and GridFTP through the Scalable Computing Support Center
- Enable the DSCR to be a better resource for university research computing through connectivity into the SDN bypass network

Assumptions

To be determined by sponsors and team.

Constraints

- Testing activities may be constrained by availability of local research staff in partner departments; equipment loans are for a specific period of time and testing activities need to be concluded within the loan time period.
- OIT does not control local IT resources that are needed to implement network configuration changes on local servers.

Exclusions

To be determined by sponsors and team.

Risks

To be determined by sponsors and team.

Costs

Year One					
			Unit Cost	Total	Notes
Personnel	Senior IT Analyst	25% FTE			Staffing costs are TBD
Equipment	48-port 10Gps Ethernet Switches (10G-BASE-LR/SR)	5	25,000.00	125,000.00	
	Transcievers (uplink and server ports)	40	1,000.00	40,000.00	
	Network Interface Cards (10G-BASE-LR/SR) with transcievers	10	450.00	4,500.00	
	Transciecers for NICs	10	1,000.00	10,000.00	
	Research/openflow VRF Appliances	2	5,000.00	10,000.00	
	Transcievers for research/openflow VRF appliances	4	1,000.00	4,000.00	

Total Year One				$193,500.00	

Year Two					
			Unit Cost	Total	Notes
Personnel	Senior IT Analyst	25% FTE			Staffing costs are TBD
Equipment	48-port 10Gps Ethernet Switches (10G-BASE-LR/SR)	5	25,000.00	125,000.00	
	Transceivers (uplink and server ports)	10	1,000.00	10,000.00	
	Network Interface Cards (10G-BASE-LR/SR) with transceivers	10	450.00	4,500.00	
	Research/openflow VRF Appliances	4	5,000.00	20,000.00	
	Transceivers for research/openflow VRF appliances	8	1,000.00	8,000.00	
Total Year Two				$167,500.00	

Deliverables

Deliverable	Produced/maintained by	Approved by
Project plan	Harris/Pormann	Sponsors
Communications plan	Bonnett	Sponsors/Cake
Status reports	Harris	N/A
Meeting notes	Pormann	N/A
Use Cases	Board	Sponsors
Test Plan	TBD	Board/Chase
Standard Template for Research/ Production Network Integration	TBD	TBD
Annual Project Report(s) to NSF	Futhey/Board	TBD
Final Project Report to NSF	Futhey/Board	TBD
Project Outcomes Report for NSF (for public audience)	Futhey/Board	TBD

Schedule

4th Quarter 2012 (October through December)

- Select up to 5 vendors to invite for product evaluation sessions
- Hold vendor product evaluation sessions (via Telepresence)
- Select equipment for testing; arrange for equipment loans
- Create/finalize equipment test plan
- Establish locations for test beds
- Prepare physical infrastructure for testing

Scope statement for CC-NIE Project

1st Quarter 2013 (January through March)

- Install and configure (3) edge switches and instrumentation
- Conduct testing on vendor 1 equipment in closed environment; document results
- Expand testing to multiple vendors in closed environment; document results
- Expand testing to include initial live departments (IGSP, Physics); document results
- Determine how additional test partners will be selected
- Finalize selection of additional test partners
- Determine if newly-developed technologies should be added to testing

2nd Quarter 2013 (April through June)

- Determine if improvements to 10Gb for test partners networks are required; implement improvements as needed
- Acquire newly-developed technologies as needed; add to testing plan
- Begin testing with additional test partners
- Investigate HSCP and Grid FTP tools; document initial findings

3rd Quarter 2013 (July – September)

- Continue testing with additional test partners
- Determine if newly-developed technologies should be added to testing
- Acquire newly-developed technologies as needed; add to testing plan

4th Quarter 2013 (October – December)

- Submit 1st annual report (October 1)
- Conclude testing and document results
- Determine if capacity improvements/changes to uplinks are needed
- Create network design document with updated Campus CI plan
- Purchase equipment as needed

1st Quarter 2014 (January – March)

- Deploy new network design, equipment
- Investigate I2 performance tools; document initial findings

2nd Quarter 2014 (April – June)

- Conclude network design changes, testing

3rd Quarter 2014 (July – September)

- Conduct transition to operations activities
- Provide training, consultation and support to researchers
- Finalize plan for I2 performance tool deployment
- Finalize plan for HSCP and Grid FTP tool deployment

4th Quarter 2014 (October – December)

- Submit 2nd annual report (October 1)
- Finalize Standard Template for Research/Production Network Integration
- Draft final grant report and public-facing outcomes report

Submit final grant report and outcomes report by March 30, 2015 (90 days after end of grant period).

Success Indicators

Success for the grant is the production of the required research-backed reports on the status of software defined networking in an enterprise environment. The project team and sponsors will define project success indicators for Duke.

Scope Change Management

Because this project is tied to a grant, any requests for scope change will have to be approved by the grant PI/co-PI. The project manager will submit any scope change requests to the project sponsors. Those changes recommended by the sponsors will be submitted to the PI/co-PI for final approval. The Duke Research Computing Advisory Committee (RCAC) will act as an arbitration body if necessary.

Project/Initiative Closure, Transition to Operations

This project involves testing of "experimental" hybrid devices. Those selected for deployment on Duke's production network will go through OIT's Service Readiness Board and Change Management review processes.

Distribution

John Board, Bob Johnson, Charley Kneifel, and Julian Lombardi