HiPACE
Reconfiguration of the Network Gateway for HiPACE Systems

I. Introduction

This proposal addresses concerns about Washburn University’s current network (WUNet) gateway to High-Performance Academic Computing Environment (HiPACE) and related systems. Current network access limitations for HiPACE have negatively impacted the educational, research, and scholarship activities of faculty members and students. The existing network configuration, as implemented by Information Systems & Services (ISS), has operational limitations and is inconsistent with WUNet’s architectural strategies for direct and remote network access to specialized computing resources.

The proposed gateway reconfiguration will resolve network connectivity issues and provide WUNet consistency for supporting these types of systems. The planned change is for ISS to migrate the current WUNet-HiPACE gateway system (Exhibit A) from a Microsoft Windows platform to a more flexible and higher performing Linux solution (Exhibit B). This change will streamline faculty/student HiPACE use by eliminating the need for duplicate logons and FTP transfers and improving HiPACE software patch maintenance procedures.

II. Design Summary

The proposed design was developed based on ISS’ interpretation of requirements previously expressed by faculty and on solutions that are compatible with WUNet architecture and strategy. It promotes the goal that the HiPACE network is independent of the WUNet core infrastructure and isolated by VLANs, physical switches, or other sub-network equipment. The physical WUNet infrastructure is shared, but server/services isolation will be maintained through advanced software. No direct logical connections will exist between the HiPACE sub-network and WUNet. This approach will streamline HiPACE’s access and operational processes and minimize potential interruptions to WUNet performance and operations.

This solution features a Linux-based proxy server/firewall, protected networks, and infrastructure services that address faculty needs as well as Washburn’s policy/procedural requirements. A proxy server (or servers if required) will manage the interconnection between WUNet and the HiPACE sub-network. Network-related services will be provided both on the WUNet and HiPACE sides of the proxy server:

WUNet Public Services:

- Publicly accessible IP address to permit access from on or off campus
- SSH/SFTP console and file transfer access
- Web Server – Provide direct access to HiPACE server output, system monitoring, and server related needs for effective collaborative research and educational use of the system
- Integrated authentication with Washburn Banner access (Luminis LDAP)
HiPACE Network Services

- Authenticated web proxy – Allows users to access Internet websites and services after authentication. System accounts can be accessed without prior authentication for updates, etc.
- Caching proxy – Facilitates faster downloads of system updates and large downloads for multiple systems
- DNS server – Provides DNS services and DNS caching for systems
- DHCP Server – Provides optional DHCP support for dynamic IP assignment
- Time Server – Provides network time services for systems
- NFS Server/Client – Allows for common files system access for Linux servers
- Web Server – Provides a website capability for content managed by faculty using the HiPACE systems.
- LDAP Proxy/pass-through – Facilitates use of a common set of credentials on WUNet and HiPACE sub-net
- NFS client – allow NFS exported file systems from the HiPACE server to be available to remote users on the gateway system.

This is not an exhaustive list; additional services will be provided as determined in consultation with the HiPACE coordinating group.

III. HiPACE Systems Access and Management

System access/authentication will be managed via LDAP using (general person) data from Washburn’s Banner database. This process will ensure that only Washburn faculty, staff, students, and authorized external affiliates and collaborators will have access to these systems. Access will be based on group membership; only individuals selected by the HiPACE coordinating group and authorized by the VPAA’s office will have access to the HiPACE gateway and related systems. ISS will work with the VPAA’s office to develop a standardized method for quickly providing access to non-Washburn collaborators and partners via Banner processes.

The proxy server will be managed by ISS based on the needs of the users of the HiPACE sub-network.

ISS will continue to exercise its network management responsibilities, at the WUNet level, in the event of security problems reported by national or other cybersecurity agencies (e.g., USCERT) or major incoming/outgoing network traffic problems caused by external, ill-intentioned sources or inadvertent internal actions. Management, operations, maintenance, and support of systems within the HiPACE sub-network are the responsibility of the HiPACE coordinating group. A contact person will be identified by the HiPACE coordinating group to work with ISS’ Systems & Network Services team during this gateway migration project. This work will be completed based on HiPACE scheduling recommendations.
IV. Physical Infrastructure and Costs

The proposed design consists of a virtual server hosted on an existing VMWare cluster with the option of migrating to dedicated hardware, if needed. This gateway server is a Red Hat Enterprise Linux 5 system with compatible, open-source software. Software will include, but not be limited to: OpenSSH, Apache, Squid Proxy, Bind, and Red Hat’s dhcpd, ntpd, and nfs services. The core network infrastructure will share existing WUNet 1-gigabit Ethernet connectivity with the proxy server and 100Mbit links where Gigabit is not available. No additional hardware or software expenditures are anticipated for this solution.

Depending on HiPACE requirements, migration to a dedicated physical gateway server configuration may be desirable. This option would include one or more dedicated physical servers and dedicated network infrastructure equipment. Any dedicated hardware implementation would be performed in collaboration between ISS and the sponsoring faculty or departments. HiPACE gateway upgrade costs would be borne by the requesting party.

V. Implementation

ISS will immediately begin building the HiPACE gateway server as a VMware virtual machine client. The current Windows-based gateway will continue to operate in parallel with the new Linux-based gateway until such time as the HiPACE coordinating group is satisfied with the new system. The Windows-based gateway will then be decommissioned.

Decisions on the implementation of specific features and functions beyond those already listed will be worked out collaboratively between ISS and the HiPACE coordinating group.

VI. Approval/Actions

The HiPACE Steering Committee approved the jointly developed plan on April 21, 2010. Work was completed during Summer, 2010.
Current WUNet Gateway Design (simplified)

Washburn U. Network

HIPACE gateway
Non-bridged network connections, no proxy services

HiPACE sub-network

HiPACE Cluster

Campus/Internet services:
Windows remote desktop
CIFS file share

HiPACE sub-net services:
CIFS file share

Other Science/Staffer servers

WUAD and other client devices

Exhibit A
Proposed WUNet Gateway
HiPACE design (simplified)