Program Summary

DoIT provides support for 1,200 virtual and 150 physical servers. Housed in DoIT data centers to take advantage of climate control, power conditioning and redundancy, fire suppression systems, secure physical access and high-speed networks, these servers can be managed by the customer or DoIT administrators.

DoIT server administration includes consultations with customers, operating system installations, patching and upgrades, virus scanning and mitigation, monitoring and alerting as well as data protection options.

Further centralization is recommended for cost savings and risk transference. Base VMs are offered at a third of the price of just a network connection and can be customized to meet most requirements. This is a potential growth area positioned to cut costs and add value and is currently understaffed.

Criterion 1: Importance to University Mission / Operations

Importance to Mission

This program supplies the server foundation for all enterprise-class services and most of the divisional and department online services that support NIU’s academic initiatives. Server administrators within DoIT support the enterprise-class systems like PeopleSoft, Blackboard and OnBase, while distributed IT support across campus use the server infrastructure to support their own local needs for applications, databases, and file sharing without the added risk, support burden, and increased cost that comes with running a robust and secure server infrastructure.

Importance to Operations

Every business, including the university, runs on technology. This technology has three primary components: a network, someplace to store the data, and somewhere to run the applications. These servers are used to run our applications. To do without this environment is to have a university with no applications.

A compute cloud is the most cost-effective method of providing server resources. Cloud computing relies heavily on virtualization and provides significant benefits over individual servers. It makes efficient use of hardware, saves money in heating and cooling of data center facilities and allows for a much higher optimization of server computing power. DoIT’s storage program provides a private cloud environment that services more than 90% of NIU’s servers. In addition to the other benefits it is secure and highly available, much more so than the physical servers housed in NIU’s colleges and divisions.

These operational efficiencies can only be properly leveraged by bringing all distributed physical and virtual servers across campus into DoIT’s secure and redundant data centers.

Program Portfolio

While a robust server infrastructure cannot guarantee academic excellence, it does provide the foundation for any university’s teaching and learning environment. Without secure, highly-available applications, faculty and students would no longer have the anywhere, any time access to the course materials and online collaboration tools that are now the expected features of any 21st-century university.
Program Synergy

DoIT’s server infrastructure is available for any unit on campus to use for both production and development workloads. Servers are customizable and can be deployed rapidly at a reasonable cost. For any departments who have recently sunk costs into expensive physical servers, there is ample space in DoIT data centers for co-locating those servers and at least giving them the physical security and environmental controls often lacking in other campus buildings.

Criterion 2: Quality / Effectiveness

Functions and Services

This program provides and supports a variety of hosting and management options:

- Virtualization allows multiple and independent virtual machines (VMs) on a single physical server. Currently managing more than 1,200 VM’s, DoIT has dramatically lessened the cost of cooling systems and network infrastructure while saving additional space in our data centers.
- Because of the benefits virtualization brings to most applications, fewer than 150 physical servers remain in DoIT’s Data Centers under central management.
- DoIT provides secure and environmentally-controlled data center space for co-locating physical servers managed by distributed IT support.

Measures of Quality

1. System availability is measured against both planned and unplanned downtime.
2. Mean Time to Resolve (MTTR) measured by the time between the reporting and the resolution of an incident
3. Mean time to fulfill deployment requests

Evidence of Quality

1. System availability: In the last four years, there have been no unplanned outages in the virtual environment. A recent advance allows us to perform maintenance and even restart this equipment with no downtime.
2. Mean Time to Resolve (MTTR) measured by the time between the reporting and the resolution of an incident
3. Mean time to fulfill deployment requests: Virtual servers can be deployed within days, rather than waiting the weeks required to procure, acquire and install a physical server and its operating system.
Quality Improvement

Over the last five years DoIT has moved to a heavily virtualized server environment which has multiple advantages over physical servers:

- A virtual server can be deployed in less than a day as compared to several months it can take to procure, acquire, rack and configure a physical server.
- Virtual servers make more efficient use of the hardware, by consolidating and running at 80-90% utilization compared to the typical 10-15% for a single application running on a physical server.
- Virtual servers are flexible and can respond in real time to the ebb and flow of business and academic cycles by adding resources on the fly to meet peak performance requirements and then removing the resources when no longer needed.
- Multiple virtual servers run on a cluster of physical servers and save money in heating, cooling, rack space and network infrastructure.
- A virtual server is highly available without the cost of additional hardware. Virtual technologies allow processes to move among hosts and allow an application to remain available during maintenance or hardware failure.

However, DoIT’s virtual server hardware is over five years old and out of warranty. DoIT is in the process of converting to new hardware that is superior in management and its ability to add or replace hardware with a minimum of effort.

While DoIT is responsible for the day-to-day operation of the systems, Oracle manages the patching on a semi-annual schedule so that we are always current. Because these are in a standard configuration they can be transferred to Oracle-owned hardware running in our data center or moved to the cloud, when feasible and cost-efficient, forming an important stepping stone to a great move to external cloud hosting in the future.

Criterion 3: Productivity / Efficiency

Scope of Program

This program provides more than 1,200 virtual servers for enterprise-class and departmental-sized applications. Because of growing demand, DoIT is in the process of converting to a new hardware platform that will hold 30% more than the current production environment. Virtual servers are preferred because they are cost effective, can be easily customized and deployed, can be adjusted rapidly to meet changing performance requirements and provide high availability for individual servers with no additional hardware. However, not all servers are candidates for virtualization and this program provides hosting and administration for physical servers as well.

Server hosting and administration includes:

- consultations with customers;
- operating system support, including license fees, upgrades and security patches;
• multiple options for data protection and backup restoration;
• hardware maintenance and monitoring 24 / 7 / 365 with alerts and optional reports emailed to customers;
• high-speed low latency interconnections to enterprise grade storage and the NIU network with bandwidth speeds up to 1Gbps;
• virus scanning and mitigation.

The infrastructure required to provide well-performing virtual servers is complex. Disk subsystems (SANs) are connected through a redundant fiber switch fabric. The virtual servers run on blade servers that are interchangeable and easily replaceable. Both data and network traffic flow over the unified fabric through the fabric interconnects to either the disk subsystem or the network.

**Productivity Comparison**

At NIU, the physical attributes of the servers, RAM and CPU, can easily be scaled up or down for anticipated increases or decreases in use throughout the year. Popular cloud-hosting services like Amazon and Microsoft currently do not include support or backups in their advertised monthly fees, making the DoIT offering more than cost-competitive. In some cases, like Amazon EC2, backups are not even available as a paid option.

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<th>NIU</th>
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**Resource Comparison**

When the virtual environment was initially created almost six years ago DoIT had 2.5 FTEs dedicated to it. The environment has grown from 8 servers hosting VM’s to 26 and the staffing has shrunk to .5 FTE. Given the criticality of the environment this needs to be addressed and cross training efforts are underway. However, the extra work is not easily absorbed without replacing at least some of the vacated positions.

**Cost and Revenues**

Costs are continually decreasing and rates have been lowered twice since the program began in FY13. Virtual to physical server consolidation ratios were predicted to be 20:1 at the onset of the project, but are closer to 35:1 on the production environment and as high as 85:1 in development. The new hardware platform has lowered software licensing costs and created a less expensive backup solution. A cost modeling exercise is underway to determine how much rates can be lowered for the next fiscal year.

The current budget constrictions at NIU fairly demand that nearly all physical servers be replaced with virtual servers that require no periodic refresh charges or heating/cooling charges and that free up distributed IT staff time and space in campus buildings that could be better used to support the academic mission.
Criterion 4: Internal & External Demand

External Demand

Because this program’s focus is to facilitate the ability of the university to focus on students, academics and the world by providing enabling services and supporting the student and academic initiatives, most of the demand comes from inside the university.

With spare capacity in the virtual environment and in its data centers, DoIT is in a position to sell the service as demand rises. There are already regional entities using our data centers as co-location facilities for disaster recovery and business continuity and DoIT has begun to discuss both the virtual and physical server hosting services with additional external entities in an attempt to continue to grow this service.

Internal Demand

DoIT is responsible for the technology infrastructure of the university and is the single biggest user of this service. But multiple departments on campus are also customers and as budgets continue to decline, the internal demand for a more cost-effective program like this will rise. Procuring a virtual server requires only a monthly fee and a week to deliver, significantly less than even the network connection for a physical server. Moreover, the virtual environment requires no ongoing capital expense for departments because DoIT builds in capital refresh funds into the low monthly fee.

Moreover, DoIT’s virtual servers are protected by both physical and cyber security measures and live in data centers with redundant power and cooling, fire suppression, monitoring capabilities and enterprise class network and storage, amenities that the typical department would be unable to reproduce for any reasonable cost. Federal and state regulations increasingly require growing security measures and compliance for health-related data (HIPAA), credit-card processing (PCI), student data (FERPA), law enforcement data (CJIS) and more. It is simply unreasonable to pay the high cost of compliance within each college and department that chooses to run its own server environment.

Criterion 5: Opportunity Analysis

Cost Savings Opportunities

The DoIT staff count for supporting the virtual server infrastructure has shrunk over the last year from 2.5 FTE to .5 FTE. This is not sustainable. DoIT needs at least one more FTE to continue to maintain and enhance the service. New hardware was purchased resulting in lowering software licensing costs and they are now at a minimum. Automation to programatically build VMs as they are requested could lead to cost savings as it would free up server administrators from redundant low-level tasks and allow them to work on higher value activities.

Future Revenue / Resources

Selling virtual servers to local and regional entities who prefer not to maintain their own infrastructure will lead to additional revenue.

Business continuity and disaster recovery capabilities are enhanced by having equipment in geographically dispersed locations. DoIT has already sold space in our data centers to entities wishing to have an off-site location for their redundant equipment. That practice could be expanded.

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**Improvement Opportunities**

There are several departments on campus running their own virtual environments. At least some of them could easily be folded into DoIT’s existing environment enabling savings on licensing costs, additional hardware and management personnel by eliminating redundancy.

Automating virtual server creation will lead to program improvements. Hiring an additional resource would also increase the effectiveness of the program by enabling further enhancements.

**Opportunities in the Field**

The program is already at the leading edge of cost effective daily operation of servers. For exemplary service, there are two further features that can be pursued. One feature is the provision of servers at other external cloud providers such as Amazon. The other feature is to enable the real time automated purchase, set up, tear down and billing of servers here in our private cloud. DoIT is not recommending these features as an institutional priority at this time.