



**State of Michigan
Virtual Center of Excellence**

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Category

Information Communications Technology Innovations

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Section B: Executive Summary

Michigan Department of Information Technology (MDIT) is charged with serving 19 State agencies and the critical IT needs for Michigan citizens in the most cost effective and efficient fashion. With the recent economic climate in Michigan, MDIT chose to embrace a shared services environment, enabling interoperability of servers across various agencies, and reducing underutilized single agency application servers.

MDIT deployed server virtualization through an innovative Virtual Center of Excellence (VCoE), focused on providing a platform that maximized capacity, accelerated the problematic implementation process, and monitored the density ratio of physical to virtual—so that costs could be reduced and remain competitive. The VCoE framework is based on the novel concept of capacity-on-demand for streamlined server infrastructure deployments, which is standardized for ease of support, process driven, and highly available.

The decidedly successful VCoE approach has pioneered the ground work for much broader enterprise wide deployments for other emerging needs in shared services including: document management, call centers, and externally connected users.

We were able to contain the client costs to a bare minimum by sharing the core infrastructure for server virtualization, negotiating an enterprise license agreement to cover essential health checks, training on new features, regularly scheduled assessments along with the licenses that can be used wherever needed, and using a matrix support team approach. This provided an innovative approach to solving many other similar business problems with technology – greatly simplifying scaling of capacity and reducing capital costs by requiring less hardware, lowering operational costs, contributing towards greening of IT through reduced power, cooling, and physical space needs.

The VCoE model fits perfectly with the long term strategic directions for MDIT – the core infrastructure servers provide a private cloud for virtualized systems; physical hardware is deployed asynchronously; security policies are centrally governed; and shortened processes are used to manage configurations, changes, and problem management. Virtual systems are inherently fault tolerant, highly available, and are uniquely capable in the disaster recovery space. These same criteria provide an inventive approach for future shared services.

In early 2008, MDIT kicked off the project to standardize the virtualization service and ensure that the offerings were supportable. This resulted in the establishment of the VCoE. The team worked closely with the MDIT Enterprise Architecture group, and created an enterprise class server virtualization environment as a rated service for MDIT's client agencies. The resulting shared service eliminated the disparate virtual server environments and led us towards a production class virtual server deployment platform as a standard rated offering.

By adopting a “virtual first” ideology, MDIT was able to require the use of virtual servers where feasible, helping us achieve a high ratio of physical to virtual servers and substantially increase the pace of virtualization. Today, there are 160 virtual servers from a variety of state agencies, implemented across multiple security zones, resulting in savings of \$22,400 per month. Requests in progress will double the volume in the next six months. Significant greening of MDIT's datacenters has already saved an estimated 48 kWh and 14 BTU/hr in power and cooling, and 300+ units of rack space.

Section C: The Business Problem & Solution

Server virtualization started in 2005 within state government by the state's Unemployment Agency. The goals of the project were to virtualize 23 physical test and development servers onto 6 physical hosts, to provide for additional capabilities for future virtual servers, and to reduce the total cost of ownership. Early on in 2005, VMware ESX was selected as the enterprise standard for server virtualization, based on research done through Gartner and Forrester.

This initial virtualization initiative quickly expanded to include the remainder of DELEG and the Department of Education. As interest in virtualization technologies increased within state government, it began to take on a fragmentary approach. Several varied environments were established and the hardware and software versions used began to stray from any sort of standards.

The unsupportable nature of this method was quickly discovered; these challenges resulted in server virtualization being viewed internally as not "ready" for the enterprise and the initiative was limited to include only test or development servers. Problems in accommodating the expanding desire for server virtualization included the lack of:

- Governance or oversight,
- Standards and policies,
- Rates to provide ROI to the requesters,
- Trained support staff, and
- Documented processes for request fulfillment.

We also recognized that new template driven processes would need to be created. Due to the speed with which virtual systems can be deployed, our configuration management and change management procedures had to be adapted accordingly. Problem management also necessitated new thinking, as problems can move within the infrastructure as virtual servers migrate across various physical hosts. Additionally, tight controls would be needed to reduce server sprawl, which can grow out of control due to the newfound efficiency with which servers can be created.

To assist in addressing these problems, consulting services were engaged by the state in January 2008. We worked closely with a cross functional team consisting of resources from Technical Services, Data Center Configuration and Hosting Services, the Office of Enterprise Security, Enterprise Architecture, Telecommunications, the Office of Financial Services, and our Enterprise Storage and Backup Team. This enabled us to assess the existing environment and establish an architectural direction for the future virtual server farm.

Deliverables from this initiative included:

- Virtualization Candidate Assessment using Capacity Analyzer,
- Virtualization Infrastructure Gap Analysis & Recommendation,
- Virtualization Infrastructure Detailed Design and Migration Process,
- Virtual Infrastructure Supportability – processes, run books, and documentation,
- Rates to cover the core infrastructure, training, hardware, software, accommodate projected growth, and the Enterprise License Agreement, and
- Pilot Implementation and a strategy for future migrations.

Currently, the support for the VCoE is provided by one dedicated architect, a senior technical resource, and a trained matrix team utilizing existing staff. The VCoE also worked closely with the MDIT Enterprise Architecture group to ensure alignment with the organization's strategic goals and objectives. The state signed an Enterprise License Agreement with VMware, streamlining the management of the virtual infrastructure capacity.

Initial hardware for the virtual hosts was purchased, operational procedures were defined, VCoE staff received training, and the core infrastructure for both internal and public facing virtual servers was installed. An initial assessment was done to project the growth in demand for virtual servers, and a capacity plan was set to add to the capacity to stay ahead of demand. This was essential to accommodate the faster provisioning without waiting for lengthy hardware procurement, installation and OS implementation. Using templates enabled the creation of virtual machines very quickly.

These efforts in establishing a supportable, documented, and standardized enterprise class environment for virtualization have provided us with the benefits of meeting demands for new server requirements and improving client satisfaction at reduced cost.

Time in Operations: Server virtualization has been active in the state since 2005. In 2007, MDIT began the plan for moving towards an enterprise solution. VCoE was formed to address the challenges encountered in the disparate environment. The current virtualization infrastructure has been in production since June 2008.

Communications: Throughout the project, a very clear communication across the entire working team was of paramount importance to a successful completion. At the end of the pilot, we hosted a variety of informational meetings and a symposium to educate our business partners on the use of virtual servers. This approach has built trust and strong collaboration. MDIT's Enterprise Architecture, the gateway to new and hardware refresh projects, is adapting a "Virtual First" approach to leverage the features and benefits of virtual farm. We also follow MDIT's ITIL based change management process to communicate to the clients on any maintenance activities related to the VCoE infrastructure.

Section D: Significance

VCoE framework for MDIT has now become a ground-breaking methodology for future shared service deployments due to its transferability across any shared platform.

Improved Service Levels – The hosting and provisioning process has been shortened considerably from 45 days to less than 14. The steps to procure the hardware are handled proactively so the capacity stays at least one quarter ahead of the demand. When a major project needs virtual machines that exceed the available capacity, the normal procurement processes are initiated. In the first major successful rollout of virtual machines, the VCoE was able to meet a project deadline and created 46 Windows servers in a matter of hours versus many weeks for setting up traditional physical hardware.

Availability of Critical Systems – Reliable, highly-available solutions for Michigan's mission critical applications are provided in most cost-effective manner. The Disaster Recovery (DR) environment consists of the farm spread across in two hosting centers with a well documented and tested DR plan. There are very robust data replication

methods and well tested recovery processes that are part of the DR plan to build the client trust for recovery of their critical processing needs.

Policy Alignment – The strategic direction for enterprise virtualization capability is aligned to both the Governor’s Cabinet Action Plan and the MDIT Strategic Plan Goal 6 to “Improve IT Service Management and Infrastructure.” In addition to this goal, the VCoE has created positive momentum for a multitude of other goals. Virtualization solutions have been a component of broader efforts to cut operational costs, both through volume discounts and consolidation.

MDIT is also engaged in “greening” of our datacenters through virtualization reducing datacenter space, power, and cooling requirements. The hardware platform in use was chosen to provide 4 U power in a 2 U form factor, and uses the CPU’s utilization-based power saving feature. Using a very conservative estimate, the 160 servers currently virtualized have already generated savings of some 300+ units of rack space and an estimated 48 kWh and 14 BTU/hr of power and cooling.

The transition from mainframe to client server environments tends to lead to server sprawl, as application owners traditionally request hardware on an application-by-application basis. Through the requirement of “virtual first” MDIT is able to control server sprawl, helping us achieve an ever higher ratio of physical to virtual servers and correspondingly increase the level of savings.

Citizens:

Peace of Mind – The inherent feature of the design allows failover within and across the remote data centers. The State of Michigan citizens know that they will have the services they use on a daily basis available whenever they need them. Through collaboration on recovery testing and by providing regular reporting on their data backups, clients have developed a higher level of trust and confidence.

Lower Costs – Rate development process was inclusive of all costs including the core infrastructure for virtual farm, physical server hardware refreshed on a life cycle basis, centrally managed pool of licensed, trained support staff, hosting of the servers, monitoring and their data communication needs. By pooling all the charges, cost of ownership with usage of virtual servers has decreased the charges and allowed agencies to re-allocate those savings towards much needed citizen programs.

MDIT:

Ease of Support – Standardization and common processes have reduced complexity and allowed staff to focus solely on tasks to troubleshoot the “real” issues. Downtime arising from regular patching and version upgrades is completely manageable through migration of workloads. Servers are built with tested templates and administration is done using consistent processes.

Increased Security – We have isolated critical virtual infrastructure through the use of network segmentation and firewall rules defined, and implemented controls ensuring data security and integrity as well as separation of duties. We have deployed hardware into multiple security zones, further isolating internal and public facing virtual servers to meet the requirements for financial systems and other sensitive data, and improve DR capabilities.

Increased Staff Capability – Due to use of best practice standards, processes, and a shared technical knowledge, teams have the ability to support additional demands and deliver quality service within expected timelines.

React to Client Demands – The VCoE solution has given MDIT staff the ability to forecast utilization and meet client demand within hours of a request. Through the use of capacity planning tools, we are able to project and increase capacity requirements well ahead of demand.

Section E: Benefit of the Project

Standardizing an enterprise level virtualization service using the Center of Excellence approach within State of Michigan has shown great benefits and set a futuristic model for developing other shared services for hardware, software and infrastructure platforms.

Financial Savings/Cost Avoidance:

We developed a standardized rated service which allows cost recovery of not only the upfront capital expenses but also the ongoing costs associated with server hosting.

The table below illustrates the significant cost difference attained through the use of virtualization technologies. As the adoption rate increases, these costs will continue to decrease due to economies of scale.

	Physical	Virtual
Technical Support	\$475	\$390
Hardware (Upfront \ Capital Expense)	\$115 (48 month depreciation)	N/A
Network Connection (3 x \$40)	\$120	N/A
Housing Expenses (2U)	\$30	N/A
SAN Ports (2 x \$75)	\$150	N/A
VM Infrastructure Rate*	N/A	\$280
Monitoring	\$130	\$130
20 GB system disk	N/A	\$80
Total Monthly per server	\$1,020	\$880
Total Monthly (125 servers)	\$127,500	\$110,000

*VM Infrastructure rate includes upfront capital costs, recurring monthly hosting expenses, and ongoing hardware refreshes.

By using virtual servers, charges to agency are reduced by 16%. This represents a \$140 savings per month when compared to purchasing a physical server. Over the four-year life of a server, this represents a \$6,720 savings to the agency. An agency that has 125 servers over that same period would save approximately \$840,000.

Additional savings are realized through “greening” our datacenters through virtualization, which reduces datacenter space, power, and cooling requirements. The 160 servers currently virtualized have already achieved estimated savings of:

- 300+ units of rack space,
- 48 kWh of power, and
- 14 BTU/hr in cooling costs.

Per Gartner Research, 25% of total datacenter operational costs are due to power and cooling, and thus further expansion of our virtual server environment will continue to generate additional savings.

Non-Financial Return on Investment:

There are many additional benefits to our implementation of virtualization technologies beyond the financial arena.

- Higher availability and reliability through the use of VMware High Availability, Fault Tolerance, and Site Recovery Manager
- Effective management of system downtime
- Easy provisioning, testing and auditing of virtual machine disaster recovery
- Efficient and timely SAN based backups via VMware Consolidated Backup
- More robust development environments
- Tools for better adherence to ITIL practices
- Streamlined OS upgrade paths (including base OS in the VM infrastructure rate)
- Shorter server hosting durations versus physical server provisioning – servers can be created in hours instead of weeks or months
- Positions us to provide cloud computing services to county and local governments and other entities as required

MDIT has been able to satisfy a variety of goals, even in difficult budgetary times, through the use of virtualization technologies. A centralized virtual infrastructure allows us to maximize operational efficiencies, deliver reliable and highly-available solutions with full disaster recovery capabilities, and maximize return on investment.

We are doing more with less – it is cheaper, faster, and better. The Virtual Center of Excellence has been a great success story within the Michigan Department of Information Technology and a significant cost-benefit to the agencies that we serve.

By further leveraging of VCoE framework to other business needs requiring a centrally governed platform to gain the same benefits, Michigan is enhancing the service delivery model, improving the reliability, supportability, competitiveness and overall processes. Achieving the business objectives in a more matured technology solutions model is an added benefit, resulting in greater success with meeting the evolving needs for state agencies.

Even greater benefits are on the horizon by opening the Center of Excellence cloud as a platform for shared services for Michigan's other local and county governments, thereby enabling them to reap the benefits from an affordable and well-managed service without having to create and maintain redundant service offerings.