Insurance Agency Server Virtualization and Web Site

By

Richard Gory

Submitted to
the Faculty of the Information Technology Program
in Partial Fulfillment of the Requirements for
the Degree of Bachelor of Science
in Information Technology

University of Cincinnati
College of Applied Science

April 2009
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____________________________________________________________________
Richard Gory Date

____________________________________________________________________
Mark Stockman, Faculty Advisor Date

____________________________________________________________________
Hazem Said, Ph.D., Department Head Date
Acknowledgements

I would like to take this opportunity to thank everyone who helped me throughout the duration of my project. A special thanks goes to Professor Mark Stockman for providing sound advice, and for taking time to insure my success. I would also like to thank my family for being very supportive, and understanding of my schedule.
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Abstract

The Jim Brown Independent Insurance Agency was in need of centralizing computer system resources, and having a Web site developed. The Insurance Company Server Virtualization and Web Site project was developed to provide a cost-effective and reliable system to consolidate company data, and to develop a Web site for the agency.

The system resource centralization was accomplished by deploying two virtual servers running the Microsoft Server 2008 operating system. The virtual servers are hosted on a single 64-bit host server also running the Microsoft Server 2008 operating system with the Hyper-V virtualization role enabled.

The first virtual server functions as a file server to consolidate shared data, and also as an Active Directory domain controller to provide authentication and access control. System backups are configured to write data to an external NAS device. The second virtual server functions as a Web server to host the Web site. The Web site presents a company overview, services offered, service area, claim assignment submission information, and contact information.

Additional deliverables include a system installation and setup guide, an administration and maintenance guide, a disaster recovery plan, a security audit, and a hypervisor comparison document (VMware ESXi vs. Microsoft Hyper-V Server 2008).
Insurance Agency Server Virtualization and Web Site

1. Statement of the Problem

1.1 Introduction

Jim Brown owns a small independent insurance agency based in Bowling Green, Kentucky. Mr. Brown is by training and profession an insurance adjuster, but has neither formal computer system training nor much experience using computers. Mr. Brown’s agency does make use of computer systems, but at a very basic level.

Figure 1 details a high-level workstation configuration of Mr. Brown’s existing systems.

<table>
<thead>
<tr>
<th>Workstation</th>
<th>OS</th>
<th>Dial-Up Internet Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>Windows XP</td>
<td>✔</td>
</tr>
<tr>
<td>#2</td>
<td>Windows XP</td>
<td>✔</td>
</tr>
<tr>
<td>#3</td>
<td>Windows XP</td>
<td>✔</td>
</tr>
<tr>
<td>#4</td>
<td>Windows 95</td>
<td>✗</td>
</tr>
</tbody>
</table>

Figure 1. High-Level Workstation Configuration

Mr. Brown’s agency uses Microsoft Word and Excel on the Windows XP workstations. There is also an old insurance adjustment software application that runs on the Windows 95 workstation. Data from this old application is printed on a laser printer, and then scanned into digital form (as a PDF file) on one of the Windows XP workstations to be sent to clients via e-mail.

The agency has no centralized computer system resources, and each workstation currently functions as an independent system. The workstations are not connected via a network, nor are there backup strategies in place. Each of the Windows XP workstations is connected to the Internet via a separate dial-up connection.
Mr. Brown’s agency does not currently have a Web presence, and he has expressed an interest in having a Web site developed. He stated that by having a Web site, his company would be showing its customers that it meets current visibility standards, which is quite prominent these days. Mr. Brown also observed that most of his company’s competitors had Web sites, giving them a visible presence on the Web. Currently, his agency is only listed in reference books, while most of the industry is going paperless. He feels that computers are the tools most used by customers, so it is very important that his agency modernize to market the business (2).

1.2 Current Configuration

Figure 2 illustrates a diagram of the current configuration of Mr. Brown’s systems.

Figure 2. Current Systems Configuration (2)
1.3 Current Challenges

The Jim Brown Independent Insurance Agency faces a number of Information Technology challenges, such as:

- No centralized storage of company data
- No easy method of sharing data between workstations
- No backup strategy / system (data is at risk)
- No Web presence

The current system poses security risks and is difficult and inefficient to manage.

Each workstation must have a separate printer and Internet connection. Finally, additional administrative overhead is required to manage the current environment.

The two key areas of Information Technology from which these problems arise are networking and Web technology.

2. Product Description and Intended Use

A local area network has been implemented, and two virtual servers based on Microsoft’s Server 2008 operating system developed. These virtual servers run on a single 64-bit Dell T105 host server (4) running Microsoft Hyper-V Server 2008 operating system (8, 9, 10, 11, 12, 13).

- Virtual server #1 serves as a network file and print server, and also runs all of the required services to host Active Directory, DNS, and DHCP.
- Virtual server #2 serves as a Web server, and hosts the new Web site.
- Active Directory is used to secure network access, and to insure that user data is stored on network server file shares.
- The servers and all associated user data are backed up to a Network Attached Storage (NAS) device (1) to insure data recoverability.

NOTE: See the “Design Protocols” section for detailed information regarding systems and network configuration.
2.1 User Profile

Network data security is based on Active Directory, and requires the following user account classes:

- Network Administrator
- Supervisor User
- General User

These roles are granted based on membership in Active Directory security groups.

2.1.1 Network Administrator

The network administrator role has complete, system-wide access to all data, and has the following security associations:

- Active Directory Enterprise Administrator
- Active Directory Domain Administrator
- Local Workstation Administrator

The password for the “administrator” account is in the possession of the following people:

- Jim Brown (company owner)
- Richard Gory (system developer)

2.1.2 Supervisor User

The supervisor role has complete access to all network file shares, and can access all company-related data (including accounting/financial information).

User with this role = Jim Brown


### 2.1.3 General User

The general user role has access to general-purpose file shares, but will be restricted from accessing sensitive information (such as accounting/financial information).

Users with this role = Staff

### 2.2 Design Protocols

#### 2.2.1 Design Architecture

##### 2.2.1.1 Hypervisor Research

One of the tasks associated with the autumn quarter Senior Design proposal was to evaluate the following virtual server technologies:

- Microsoft Hyper-V Server 2008
- VMware ESXi

Both of these virtualization environments are available free, and require a 64-bit host system with hardware-assisted virtualization and data execution prevention (DEP) (8, p. 4) (10,11,16).

A compatible host server system was acquired, and an evaluation of each virtualization environment was performed to compare and contrast the advantages and disadvantages of each (4, 10, 16).

After the evaluation was completed, the findings were documented and Microsoft Hyper-V Server 2008 was chosen as the virtualization platform.
2.2.1.2 Server Configuration

Two virtual servers were implemented running on a Dell T105 64-bit proof-of-concept server utilizing Microsoft Hyper-V Server 2008 as the host hypervisor.

After the host server operating system was loaded and configured, each of the Windows Server 2008 virtual servers was then loaded and configured.

Figure 3 details the operating system role configuration of each virtual server.

<table>
<thead>
<tr>
<th>Server</th>
<th>Services</th>
<th>Primary Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>Active Directory, DNS, DHCP, File &amp; Print Services</td>
<td>Domain Controller, DHCP, Network File Shares, Network Printers</td>
</tr>
<tr>
<td>#2</td>
<td>Web Services (IIS)</td>
<td>Host Web Site</td>
</tr>
</tbody>
</table>

Figure 3. Server Configurations

Virtual server #1 is used to provide the following features:

- Single sign-on authentication via Active Directory
- DNS & DHCP
- Network file shares (centralized file storage)
- Shared network printer(s)

Group Policy is used to redirect user documents folders and desktops to the file server. A network login script provides access to network shares via a mapped network drive.

Virtual server #2 is used to host the Web site (IIS), but the Web pages (HTML & CSS files) are stored on the file server (#1) in a network share.

2.2.1.3 Miscellaneous Tasks

The Windows XP workstations are networked together via an Ethernet switch. Internet connectivity is accessible to the network via a broadband connection provided by a local ISP. The old insurance adjustment software is loaded on one of the Windows XP
workstations so that the old Windows 95 workstation can be decommissioned. Mr.
Brown indicated that he would have a local resource take care of this step, but I will
provide assistance if required.

2.2.2 System Backup / Data Protection

Data backup policies and procedures have been implemented utilizing the
following technologies:

- Windows Server Backup (Windows Server 2008)
- Volume Shadow Copy

System backups are configured to write data to an external NAS device (1). The
system backup process has been automated so that minimal administrator interaction is
required.

2.2.3 Develop Web Site

The second phase of this project involved the development of a Web site. To
accomplish this project, Mr. Brown was interviewed to evaluate the agency’s
requirements, and then a Web site developed to address his needs. The Web site was
developed using modern site development tools (Microsoft Expression Studio 2), and
makes use of Cascading Style Sheets (CSS) for all appropriate formatting (3).

The site has also been tested against the W3C Markup Validation Service to
insure compliance with current standards.
The Web site presents the following general information:

- Company Overview
- Services Offered
- Service Area
- Contact Information
- Claim Assignment Submission Information

### 2.2.4 New Configuration

Figure 4 illustrates a diagram of the new configuration of Mr. Brown’s systems.
2.2.5 Document System Configuration, Policies, & Procedures

The Jim Brown Independent Insurance Agency previously had no documentation, policies, or procedures in place regarding their computer systems. The following documentation has been developed:

- Virtualization Host Setup & Installation Reference
- File Server Setup & Installation Reference
- IIS Web Server Setup & Installation Reference
- Administration & Maintenance Reference

2.2.6 Develop Disaster Recovery Plan

A disaster recovery plan (policies & procedures) has been developed to assist with the restoration of operations in the event of system failure or disaster including the following:

- Business Impact Analysis
- Recovery Strategy
- Recovery Team
- Train Staff / Emergency Procedures
- Employee Contact List & Meeting Locations
- Data Backup & Recovery
- Document Preservation
- Critical Resource Retrieval List

2.2.7 Perform Security Audit

An on-site security audit has been performed including the following:

- Interview Staff
- Perform Security Vulnerability Assessment
- Review Applications & Operating Systems Access Controls
- Analyze Physical Access to Systems
3. Deliverables

The following is a list of project deliverables:

1. Dell T105 Proof-of-Concept Server (Virtualization Host)
2. Virtual Server #1 (Active Directory, DNS, DHCP, File & Print Services)
3. Virtual Server #2 (IIS Web Server)
4. Virtual Workstation (used for access validation)
5. Web Site
6. System Installation & Setup Guide
7. System Administration & Maintenance Guide
8. Disaster Recovery Plan
9. Security Audit
10. Hypervisor Comparison (VMware ESXi vs. Microsoft Hyper-V Server 2008)

NOTE: See the appendix for additional information dealing with deliverables 6-10.

4. Design and Development

4.1 Budget

The budget for this Senior Design project is taken directly from the proposal created in Senior Design 1, and no modifications are warranted at this time.

Figure 5 details the final budget for this project.

<table>
<thead>
<tr>
<th>Component</th>
<th>Qty</th>
<th>Retail Cost</th>
<th>Actual Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dell T105 64-Bit Host Server</td>
<td>1</td>
<td>$2,000.00</td>
<td>$1,200.00</td>
</tr>
<tr>
<td>NAS (Buffalo HS-DH1.0TGL/R5 Terastation)</td>
<td>1</td>
<td>500.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Virtualization Environment: Microsoft Hyper-V Server 2008</td>
<td>1</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Windows Server 2008 Std. Edition (with 5 CALs)</td>
<td>1</td>
<td>999.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Windows Web Server 2008</td>
<td>1</td>
<td>469.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Windows Server 2008 Standard 5 CAL Pack</td>
<td>1</td>
<td>199.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Microsoft Expression Studio 2</td>
<td>1</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>16-Port Network Switch (10/100)</td>
<td>1</td>
<td>250.00</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>$4,417.00</strong></td>
<td><strong>$1,200.00</strong></td>
</tr>
</tbody>
</table>

Figure 5. Final Budget (1, 4, 10, 11, 16)
4.2 Timeline

In Senior Design 1 (autumn), a Dell T105 server was acquired, and an evaluation of both hypervisor environments was completed. The server build process began, and the quarter ended with the final presentation.

In Senior Design 2 (winter), the server build process was completed, and the required services were configured. All of the required server roles were enabled, including Active Directory, Group Policy Objects (GPO), and system backups.

Extensive system testing took place during this quarter. An on-site interview of Jim Brown was conducted, and a Web site developed. The quarter ended with the Design Freeze presentation.

In Senior Design 3 (spring), an on-site security audit was conducted, and all required project documentation was developed. Extensive system testing took place during this quarter including several design reviews. The final project review with Jim Brown took place, and the project concluded on May 7 at Tech Expo.
The project was completed as detailed in Figure 6, which depicts an organized event timeline.

4.3 Hardware and Software

The following is a list of the hardware required for this project:

- Dell T105 64-bit quad-core server
- Buffalo HS-DH1.0TGL/R5 Terastation (NAS)
- Netgear FS116 16-port 10/100 Ethernet switch

A Buffalo Network Attached Storage (NAS) device is used for system backup and archival purposes. A 16-port Ethernet switch is used to provide connectivity for the host server, workstations, NAS, ISP-supplied router, and Ethernet-equipped printers.
The following is a list of the software required for this project:

- Windows Server 2008 Standard Edition (Hyper-V role enabled): Host server
- Windows Server 2008 Standard Edition: Virtual server #1
- Windows Web Server 2008: Virtual server #2
- Microsoft Expression Studio 2: Web site development

The Microsoft Windows Server 2008 and Expression Studio 2 software were acquired from the MSDN Academic Alliance site, so there is no cost associated with these products for this project.

4.4 **System Testing**

The system developer (me) is responsible for testing all of the technology components of the project.

4.4.1 **Dell T105 Proof-of-Concept Server (Virtualization Host)**

- Hardware diagnostics have been run to insure that all major hardware components function as expected.
- The server has been run 24 x 7 since the initial build in November, and has been rebooted numerous times to insure proper startup.
- Windows System and Application logs are monitored to insure that no operating system-related issues have occurred.
- A number of system backups and restores have been run on this server to insure data recoverability.

4.4.2 **Virtual Server #1 (Active Directory, DNS, DHCP, File & Print Services)**

- This server functions as the Active Directory domain controller, and special attention has been paid in monitoring the Windows System, Application, and DNS logs to insure that no operating system or domain-related issues have occurred.
- The server has been rebooted numerous times to insure proper startup.
Several member systems (WEB01, WS01) have been joined to the AD domain to insure that Active Directory is functioning properly.

A number of “test” user accounts have been created to insure the following items are functioning properly:

- Group Policy
- Folder Redirection
- Network Logon Script
- Access to Shared Folders

A number of system backups and restores have been run on this server to insure data recoverability.

### 4.4.3 Virtual Server #2 (IIS Web Server)

- Windows System, Application, and IIS logs are monitored to insure that no operating system-related issues have occurred.
- The server has been rebooted numerous times to insure proper startup.
- A number of system backups and restores have been run on this server to insure data recoverability.

### 4.4.4 Web Site

The Web site hosted on virtual server #2 (WEB01) is configured to allow anonymous access, and accessibility has been verified as follows:

- From the Web server itself.
- From a virtual Windows XP workstation (WS01) joined to the JBIIA.COM domain (both logged in as myself and also a “test” user).
- From my personal workstation (not joined to the domain).

All pages have been verified as rendering properly in the following browsers:

- Apple OS-X Safari 3.2.1
- Microsoft Internet Explorer 6 (IE6)
- Microsoft Internet Explorer 7 (IE7)
- Microsoft Internet Explorer 8 (IE8)
- Mozilla Firefox 3.0.8
All hyperlinks have been verified as functioning properly, and map to the correct pages or e-mail addresses.

4.5 User Acceptance Testing

A Windows XP virtual workstation (WS01) was created to simulate the workstations used by Jim Brown and his staff. This workstation has been joined to the JBIIA.COM domain, and is used to validate network share access and folder redirection.

The system developer is responsible for performing system access testing to verify the following items are functioning properly:

- Physical workstations are joined to the JBIIA.COM domain.
- Network connectivity is functional between the HV-HOST server and the existing Windows XP workstations.

Jim Brown and his staff are responsible for performing user acceptance testing to verify the following items are functioning properly:

- Folder Redirection (Desktop folder, Documents folder, and Start Menu folder)
- Network Logon Script (the mapping of shared network drives)
- Access to Shared Folders (ensure proper permissions)
## 4.6 Risk Management

The primary project risks are detailed in Figure 7, which include the steps taken to ensure that the project was successfully completed.

<table>
<thead>
<tr>
<th>Risk</th>
<th>Level</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall behind project timeline for key tasks</td>
<td>Medium</td>
<td>Update the project timeline on a weekly basis, and frequently review with my technical advisor.</td>
</tr>
<tr>
<td>Scope creep / project change</td>
<td>Medium</td>
<td>Review project plan and current status frequently with Mr. Jim Brown. Ensure that the project continues to meet expectations.</td>
</tr>
<tr>
<td>Server build tasks taking longer than expected due to unfamiliarity with Windows Server 2008</td>
<td>Medium</td>
<td>I am very familiar with Windows Server 2003, but less so with Server 2008. I purchased a 1400 page reference guidebook “Windows Server 2008 Inside Out” to provide additional technical information should it be required.</td>
</tr>
<tr>
<td>Loss of data due to hardware failure, or accidental file deletion</td>
<td>High</td>
<td>I purchased next business day onsite support for my Dell T105 proof-of-concept server; this will provide replacement parts quickly in the event of hardware failure.</td>
</tr>
</tbody>
</table>
|                                                    |            | My project fundamentally deals with virtual servers. The bulk of my build, configuration, and development time will be spent working with virtual machines (files on a disk). I make backup copies of all virtual server files each time modifications are made. Each virtual server file is stored on four separate disks as follows:  
1. First internal disk (Dell T105 server)  
2. Second internal disk (Dell T105 server)  
3. External USB disk (located at my home)  
4. Portable external USB disk (located offsite) |
| Failure to get timely response to information requests from Jim Brown and staff | High       | A number of tasks in my project plan require that I interview Jim Brown and staff, so it is very important that nothing delay this process. I will send Jim Brown frequent updates regarding upcoming tasks, and work to insure that expectations are met. |

*Figure 7. Risk Management Matrix*
5. Proof of Design

5.1 Host Server (HV-Host)

5.1.1 Server Manager (Top Section)

The top section of this administration tool displays server summary information, and the main roles that this server has been assigned (Figure 8).

Figure 8. Server Manager (Top Section)
5.1.2 Server Manager (Bottom Section)

The bottom section of this administration tool displays features summary information (Figure 9).

![Server Manager (Bottom Section)](image)

**Figure 9. Server Manager (Bottom Section)**
5.1.3 Hyper-V Manager

This administration tool displays virtual machine information (Figure 10).

Figure 10. Hyper-V Manager
5.1.4 Windows Server Backup Administrator

This administration tool displays system backup information (Figure 11).

Figure 11. Windows Server Backup Administrator
5.1.5 Windows Server Backup – Target Folder Structure

This screenshot displays the target folder structure for virtual server backups (Figure 12).
5.2 Virtual Server #1 (FS01)

5.2.1 Server Manager (Top Section)

The top section of this administration tool displays server summary information, and the main roles that this server has been assigned (Figure 13).

![Server Manager (Top Section)](image)

*Figure 13. Server Manager (Top Section)*
5.2.2 Server Manager (Bottom Section)

The bottom section of this administration tool displays features summary information (Figure 14).

![Server Manager (Bottom Section)](image_url)

**Figure 14. Server Manager (Bottom Section)**
5.2.3 Active Directory Users and Computers

This administration tool displays Active Directory configuration information (Figure 15).

Figure 15. Active Directory Users and Computers
5.2.4 DNS Manager

This administration tool displays DNS configuration information (Figure 16).

Figure 16. DNS Manager
5.2.5 DHCP Manager

This administration tool displays DHCP configuration information (Figure 17).

Figure 17. DHCP Manager
5.2.6 Shared Folder Manager

This administration tool displays Shared Folder Manager configuration information (Figure 18).

Figure 18. Shared Folder Manager
5.2.7 Shared Folder File System Structure

This screenshot displays the Shared Folder File System Structure information (Figure 19).

Figure 19. Shared Folder File System Structure
5.3 Virtual Server #2 (WEB01)

5.3.1 Server Manager (Top Section)

The top section of this administration tool displays server summary information, and the main roles that this server has been assigned (Figure 20).

![Server Manager (Top Section)](image)

Figure 20. Server Manager (Top Section)
5.3.2 Server Manager (Bottom Section)

The bottom section of this administration tool displays features summary information (Figure 21).

![Figure 21. Server Manager (Bottom Section)](image-url)
5.3.3 Internet Information Services (IIS) Manager (Features View)

This administration tool displays Web site features information (Figure 22).

Figure 22. Internet Information Services (IIS) Manager (Features View)
5.3.4 Internet Information Services (IIS) Manager (Content View)

This administration tool displays Web site content information (Figure 23).

Figure 23. Internet Information Services (IIS) Manager (Content View)
5.4 Web Site

5.4.1 Home Page

This Web page displays the initial “Home” page information (Figure 24).

Figure 24. Home Page
5.4.2 About Us Page

This Web page displays “About Us” information (Figure 25).

Figure 25. About Us Page
5.4.3 Services Page

This Web page displays “Services” information (Figure 26).

Commonwealth Business Services, Inc., provides our customers professional claim service. Our staff is experienced in all lines of Insurance Claims Adjusting.

Our services include:

**Property Loss:**
- Computer Estimating
- Full Adjustment Personal Lines
- Full Adjustment Commercial Lines
- Appraisals Only
- Building Evaluations
- Business Income
- Mobile Homes
- Marine
- Fidelity

**Heavy Equipment and Commercial Trucks:**
- Adjuster Estimates with LKQ Parts Utilization
- All Makes and Models
- Commercial Tractors and Trailers

Figure 26. Services Page
5.4.4 Service Area Page

This Web page displays “Service Area” information (Figure 27).

![Service Area Page](image)

Commonwealth Business Services, Inc., services ROUTINE CLAIMS within a 100 mile radius of the home office located in Bowling Green, Kentucky.

Commonwealth Business Services, Inc., services any LARGE DOLLAR EXPOSURE claims and losses throughout the entire Commonwealth of Kentucky and northern Tennessee.

Some of these type losses are:

- Lumber Industry - Buildings, Machinery, Equipment
- Commercial and Residential Property Losses
- Heavy Equipment Losses
- Commercial Truck and Trailer Losses
- Cargo Loss Surveys
- Catastrophic General Liability Accidents
- Catastrophic Truck and Automobile Accidents

Please use the following link to Assign a Claim

**Contact Information:**

Commonwealth Business Services, Inc.
PO Box 8664

Figure 27. Service Area Page
5.4.5 Assign a Claim Page

This Web page displays “Assign a Claim” information (Figure 28).

Figure 28. Assign a Claim Page
5.4.6 Contact Us Page

This Web page displays “Contact Us” information (Figure 29).

![Contact Us Page]

**Figure 29. Contact Us Page**
6. Conclusions and Recommendations

6.1 Conclusion

In conclusion, the project has been developed, tested, and completed as outlined in the Timeline (see section 4.2 for reference).

It is clear that the Jim Brown Independent Insurance Agency currently faces numerous Information Technology challenges. The agency will greatly benefit from using modern server virtualization technology to consolidate company data, and increase market visibility by implementing a Web site.

The project solves the challenges currently faced by the agency, and also provides expandability for future growth.

6.2 Recommendations

It became apparent during the development of the Disaster Recovery plan and Security Audit that these topics have thus far not been a priority for the Jim Brown Independent Insurance Agency. Solving the deficiencies discovered during the development of these documents should be made a company priority.
A significant part of this project deals with the development of the following documents:

- System Installation & Setup Guide
- System Administration & Maintenance Guide
- Disaster Recovery Plan
- Security Audit
- Hypervisor Comparison (VMware ESXi vs. Microsoft Hyper-V Server 2008)

These five reference guides are in a separately bound document “package”, and are meant to accompany this document for Senior Design project submission.
References


2. Brown, Jim, Personal interview. (October 10, 2008).


5. Geonetta, Sam, Personal interview. (October 6, 2008).


7. McMahon, Russell, Personal interview. (October 2, 2008).


