THE WOMEN'S CLINIC

NETWORK PROJECT

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Executive Summary

Overview

The aim of this report is to create a network design for The Women's Clinic. The Director, Mr. Capan has hired me on a contract basis, to help with the design and implementation of their new network environment and to unify two separate locations under one centralized area of control.

Objective

The main objective of this project is to design a network to fit the needs of The Women's Clinic. The goal is create an Active Directory to bring together both locations (domains) of The Women's Clinic into one centralized active directory for better management purposes. Successful testing and installation will result in allowing certain files and policies to be implemented on one system, control of employees in regard to what files they can access and change, and a system that can expand if the clinics choose to expand to either a new location, or just expand in terms of data storage.

Current Situation

The Women's Clinic is one of the largest health providers in North Texas. So far, they have two clinics. They have one clinic located in Denton, Texas and another smaller clinic located in Dallas, Texas. Currently, the clinic in Denton has over 1,000 patients, 4 doctors, 6 nurses, and around 3 staff members while the Dallas clinic has over 300 patients, 2 doctors, 3 nurses, and 2 staff members. Due to the size of the organization, designing a network to meet the needs of the current organization and the future of the organization will prove key to the success of The Women's Clinic.

So far, both the clinics in The Women's Clinic are operating separately. The Denton clinic has been operating without any main server to administrator group policies, or control over what actions their employees take. Currently, the Denton clinic is operating off of using Microsoft SharePoint and Outlook with discretion to share the many important and sensitive information about its patients, financial records, and other high risk documents to keep the clinic operating. Due to the addition of another clinic and a change in management, The Women's Clinic is facing a transition to create a system where both locations of their clinics can communicate properly and securely, and administer proper control of what employees can access and alter to ensure their patient's sensitive information is secure.

Proposed System

System Description

For our proposed system, the clinic is going to need approximately 3 servers, 15 laptops, 2 routers, 11 access points, 5 uninterruptable power supplies, and 5 regular use desktops. For our 3 servers, one of the servers will be set up as the active directory, as the remaining two will be set up as an domain controller, one in the Denton clinic and the other located in the Dallas clinic. This will allow for maximum reliability, meaning if one of the domain controllers were to go down, the other domain controller will take over so operations will continue smoothly.

For security reasons, we have requested 15 laptops versus 15 extra desktops. The main reason for this request is, if a doctor is logged in on a desktop in an exam room with practically full rights and he/she forgets to log out after helping a patient, this can create a security problem in regard to the patient and possibly a nurse or staff member with lesser rights (being able to view confidential files). The other benefit to having a laptop is the pure flexibility it brings, not having to log-in and log-off from desktop to desktop will cut down on a lot of time, giving our doctors and nurses more time to spend with patients.

For our regular staff, they will all need their own personal computer to use in their office or front desk. Since they're not in constant movement like our doctors and nurses, we've concluded a desktop would be the best solution for our regular staff. We will need a router with at least 10 ports for both of our locations.

Capital Requirements

Hardware Required:

Lenovo ThinkServer TD340

- Intel Xeon E5-2403 v2 1.80 GHz
- Tower Server with Optional Dual-Processors
- 8GB DDR3 SDRAM
- Memory Capacity : Up to 192GB
- Serial ATA & SAS
- RAID Levels: 0, 1, 1+0

  Estimated Costs: $599.99 x 3 = $1,799.97

ThinkPad E455 14.0"

- AMD A-Series A6-7000 (2.20GHz)
- 4GB Memory 500GB HDD
- AMD Radeon R4 Series
- 1366 x 768

  Estimated Costs: $426.55 x 15 = $6,398.25

Lenovo B40

- Intel Pentium G3240T Processor (2.70GHz 1333MHz 3MB)
- 4.0GB PC3-12800 DDR3L 1600 MHz
- 21.5" FHD LED (1920x1080)
- 1TB 7200 RPM
- Lenovo AC Wireless

  Estimated Costs: $499.99 x 5 = $2.499.95

Cisco Small Business RV016 Multi-WAN VPN Router

- 802.3, 802.3u
- 10/100Mbps
- SPI Firewall, DES and 3DES Encryption for IPSec VPN Tunnel, MD5 and SHA Authentication, URL Filtering
- 2 x 10/100Mbps, 13 x 10/100Mbps, 1 x 10/100Mbps RJ-45 port

  Estimated Costs: $340.99 x 2 = $681.98

- IEEE 802.11n, 802.11b, 802.11g, 802.3u and 802.3
- up to 300Mpbs
- 64/128 bit WEP (HEX & ASCII), WPA/WPA2 Radius, WPA/WPA2-PSK Encrption, WPS
- 2.412GHz – 2.484GHz
  Estimated Costs: $38.99 x 11 = $428.89

CyberPower Intelligent LCD Series (uninterruptable power supply)

- 1350 VA / 810W Capasity
- 1500 Joules of Surge Protection
- Up to 157 Minutes of Runtime at 50W
  Estimated Costs: $124.95 x 5 = $624.75

Software Required:

McAfee Enterprise Firewall -

- automated threat feeds, encrypted traffic inspection (SSH/SSL), intrusion prevention, antivirus, and content/URL filtering
  Estimated Costs: $2,125.00

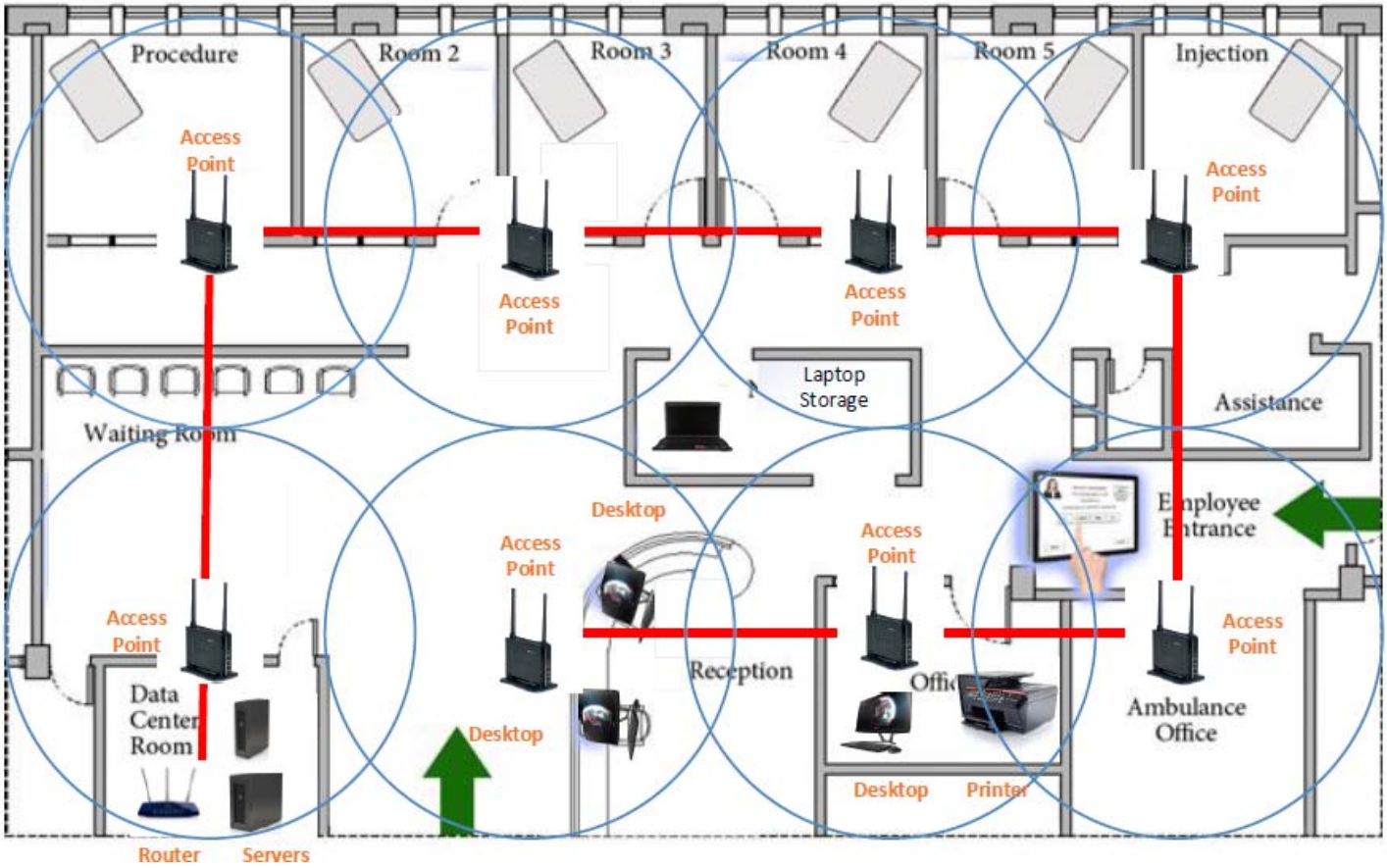
Servers:	**$1,799.97**
Laptops:	**$6,398.25**
Desktops:	**$2.499.95**
Routers:	**$681.98**
Access Points:	**$428.89**
UPS:	**$624.75**
Software:	**$2,125.00**
Total Costs:	**$14,558.79**

Physical Design

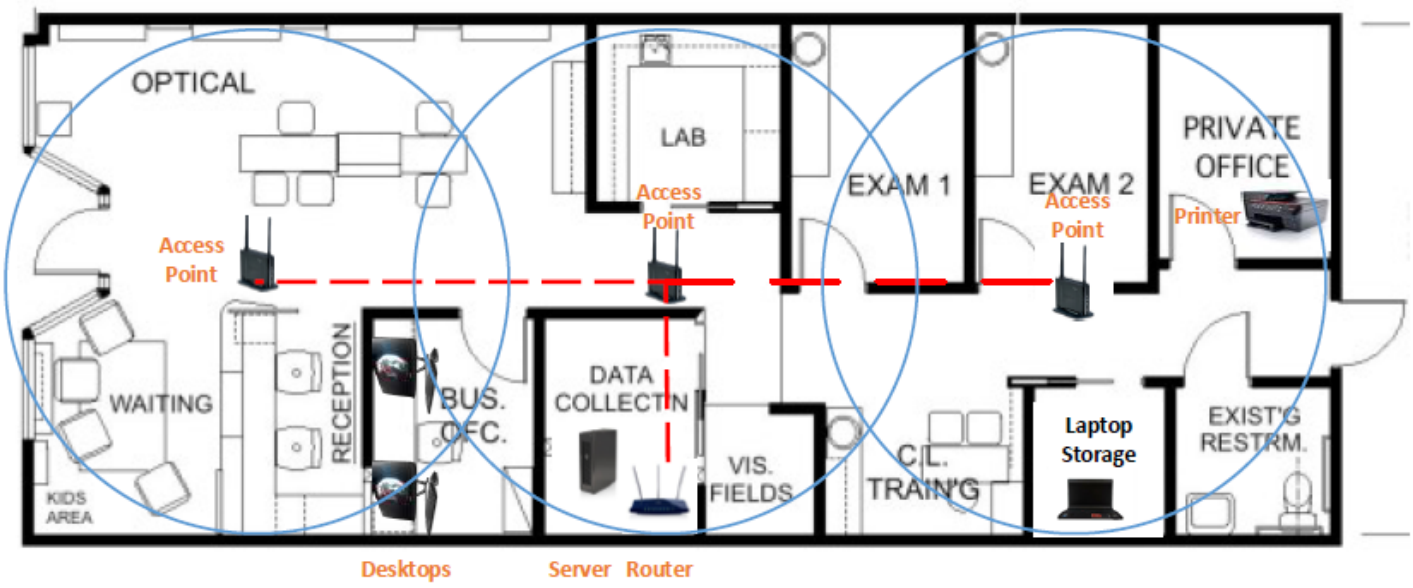
Physical Layout

On the following page, I have included floor plans for both the Denton and the Dallas clinics. In the following floor plans, details about each individual hardware is included. You will be able to see where the routers are located, followed by the servers, desktops, printers, and even where each access point will be installed. Included with both clinics is an estimate of the radius covered around each individual access point (represented by the blue circles), along with the requirements for where the cabling will be installed to reach each access point (represented by the red lines).

Denton Floor Plan:



Dallas Floor Plan:



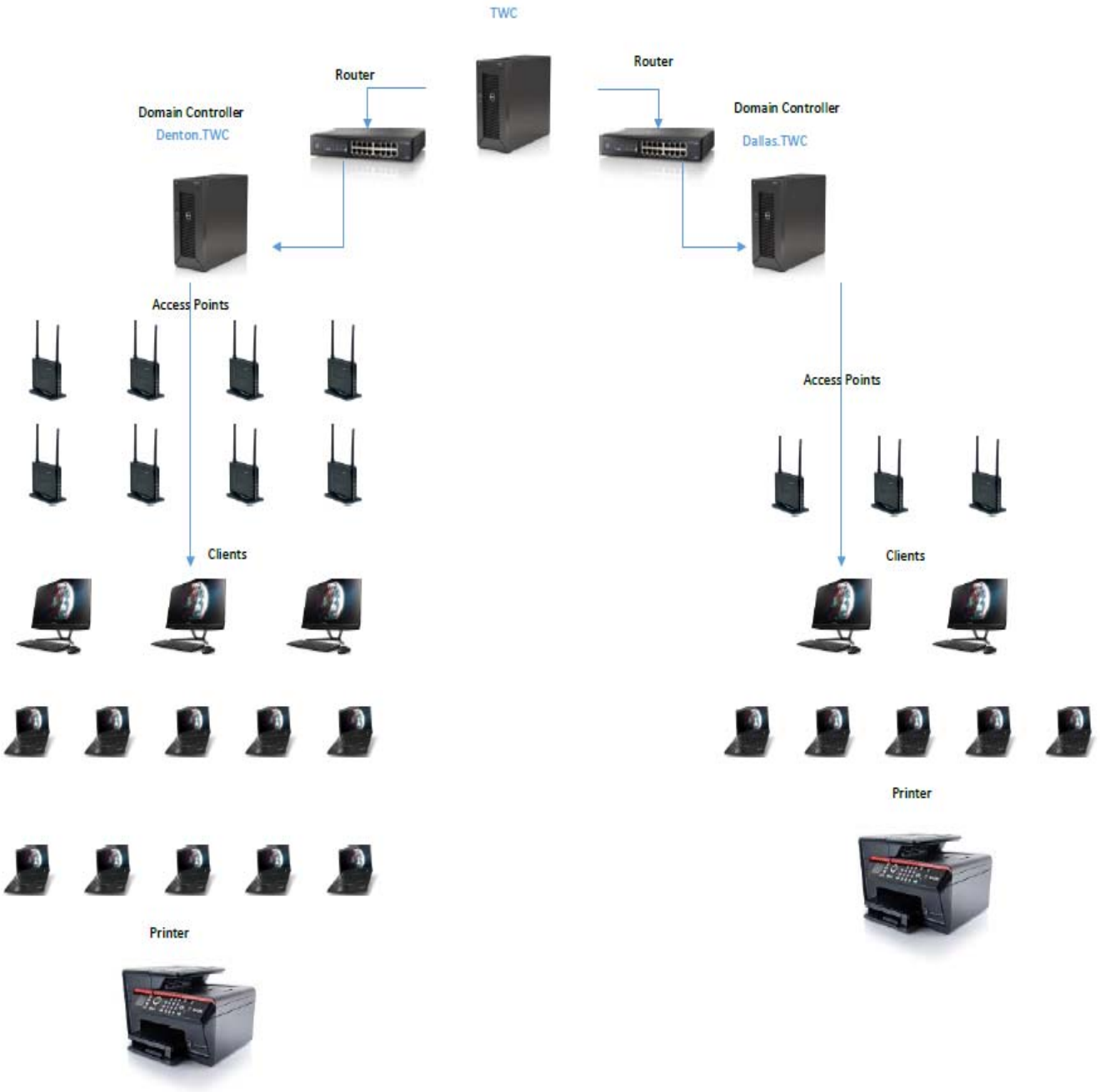
Note: Blue circles represent area covered by Wi-Fi, and the red lines represent the Ethernet cable to reach those access points that provide the Wi-Fi.

Network Design

For our network, we want to take full advantage of the most current technologies. For this reasoning, we are installing access points throughout our whole building. To take full advantage of this technology, we are giving our nurses and doctors Windows laptops – that way they are not restricted to logging in and out of each desktop – if desktops were installed in each room that is. For our staff, they will also be able to take advantage of these access points by having desktops built with wireless cards already integrated in.

To keep up with a network where data will be in high demand, we've chosen to install category 5 cables in our buildings. Category 5 cabling will give data transmissions of up to 100 Mbps, which will meet the demand of any future expansion the company chooses to do. Also, the category 5 cabling consists of four shielded-twisted pairs of copper wire which will cancel out any electromagnetic interference from other wire pairs and from external sources. So, the clinics will be safe to use any medical equipment such as ultrasounds, or MRI machines for example.

Network Star Topology Diagram



Logical Design

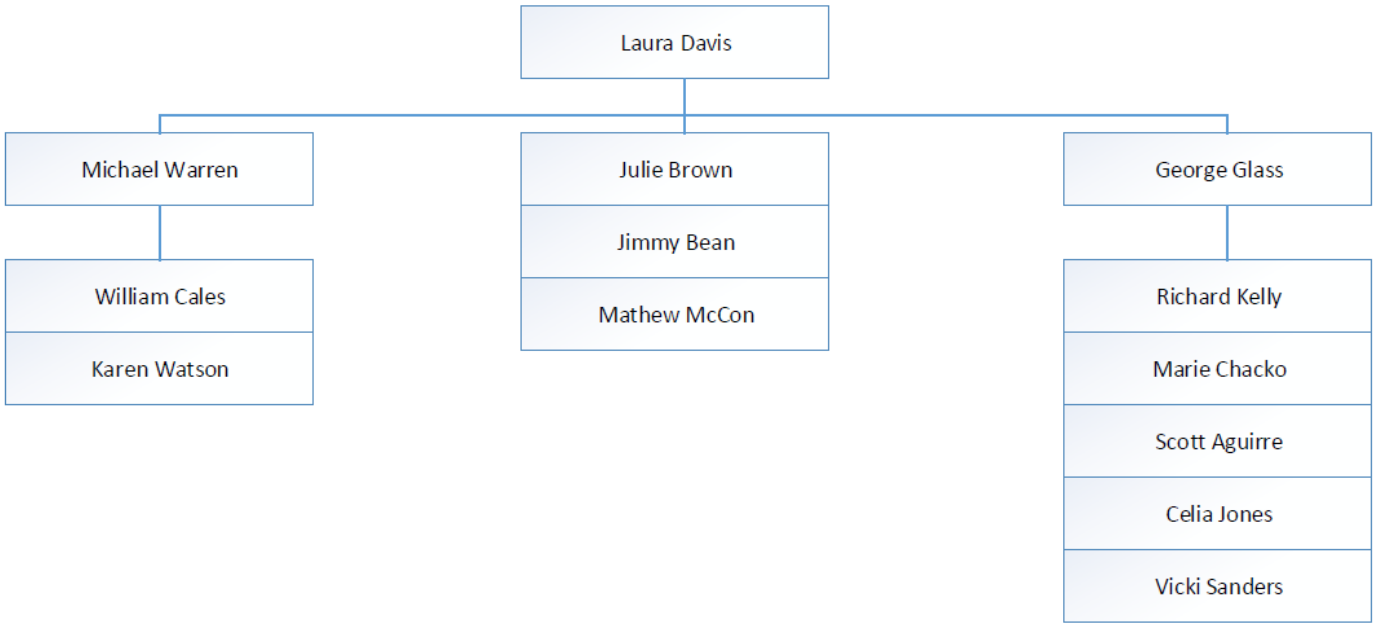
Organizational Structure

Due to the size of this organization in regard to the number of small employees and the lack of funds, certain departments that would be appear separate in other clinics have been combined to fit The Women's Clinic special circumstances. Management and Human Resources is a combined department, the same applies to the Insurance and Billing Department, and the Payroll and Accounting Department. These department specifications apply to both locations with The Women's Clinic.

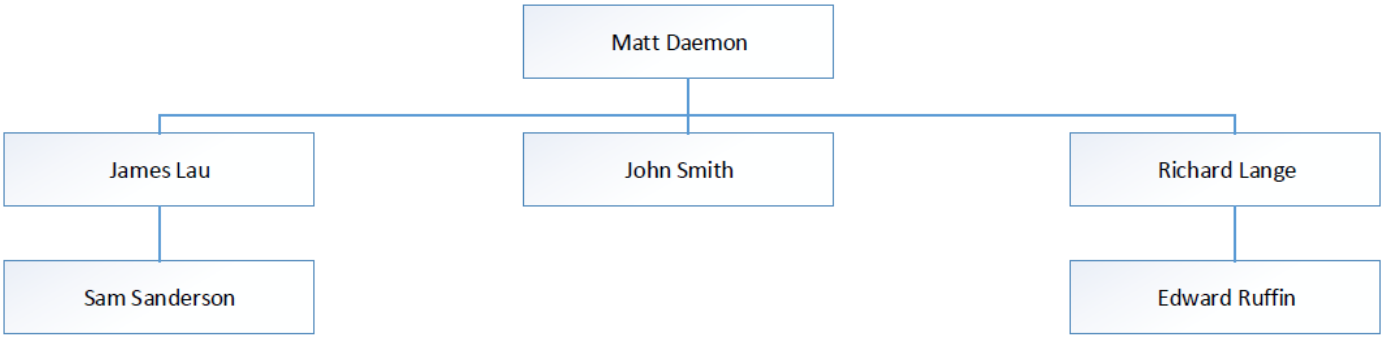
Both clinics are also the same in regard to distribution of power among employees. For example, at each clinic each job title such as Doctor, Nurse, and Staff has a person titled as Management and Human Resources. However, the Nurse and Staff Management position reports to the Doctor who has the management position. Each Doctor, Nurse, and Staff manages those who fall under their same job title. (Doctor who is in management manages other doctors, etc.) Only staff members can perform the job duties that fall under the Insurance and Billing Department, and the Payroll and Accounting Department.

Women's Medical Clinic Organizational Chart

Denton:



Dallas:



System Users and Groups

1. Management and HR:
   The members of this group are Laura Davis, Matt Daemon, George Glass, Richard Lange, Michael Warren, and James Lau. These members consist of Doctors, Nurses, and Staff members.

2. Insurance and Billing
   The members of this group are William Cales and Sam Sanderson. These members consist of only staff members.

3. Payroll and Accounting
   The members of this group are Michael Warren and James Lau. These members consist of only staff members.

4. Doctors
   The members of this group are Laura Davis, Julie Brown, Jimmy Bean, Mathew McCon, Matt Daemon, and John Smith.

5. Nurses
   The members of this group are George Glass, Richard Kelly, Marie Chacko, Scott Aguiree, Celia Jones, Vicki Sanders, Richard Lange, Edward Ruffin, and Katherine Ogden.

6. Staff
   The members of this group are William Cales, Sam Sanderson, Michael Warren, James Lau, and Karen Watson.

User Tasks & Applications Matrix

User Tasks

DEPARTMENT: BUSINESS SERVICES

Functions: Patient Services

Insurance and Billing

Payroll and Accounting

Management and Human Services

Patient Services

- Reception of incoming patients.
- Call intake from patients.
- Verification of patient information and insurance.
- Schedule appointments.
- Revise appointments.

Insurance and Billing

- Verify patient insurance eligibility.
- Update insurance provider services.
- Add new insurance providers.
- Submit patient insurance claims.
- Follow-up patient insurance claims
- Reconcile insurance claims to patient bill.

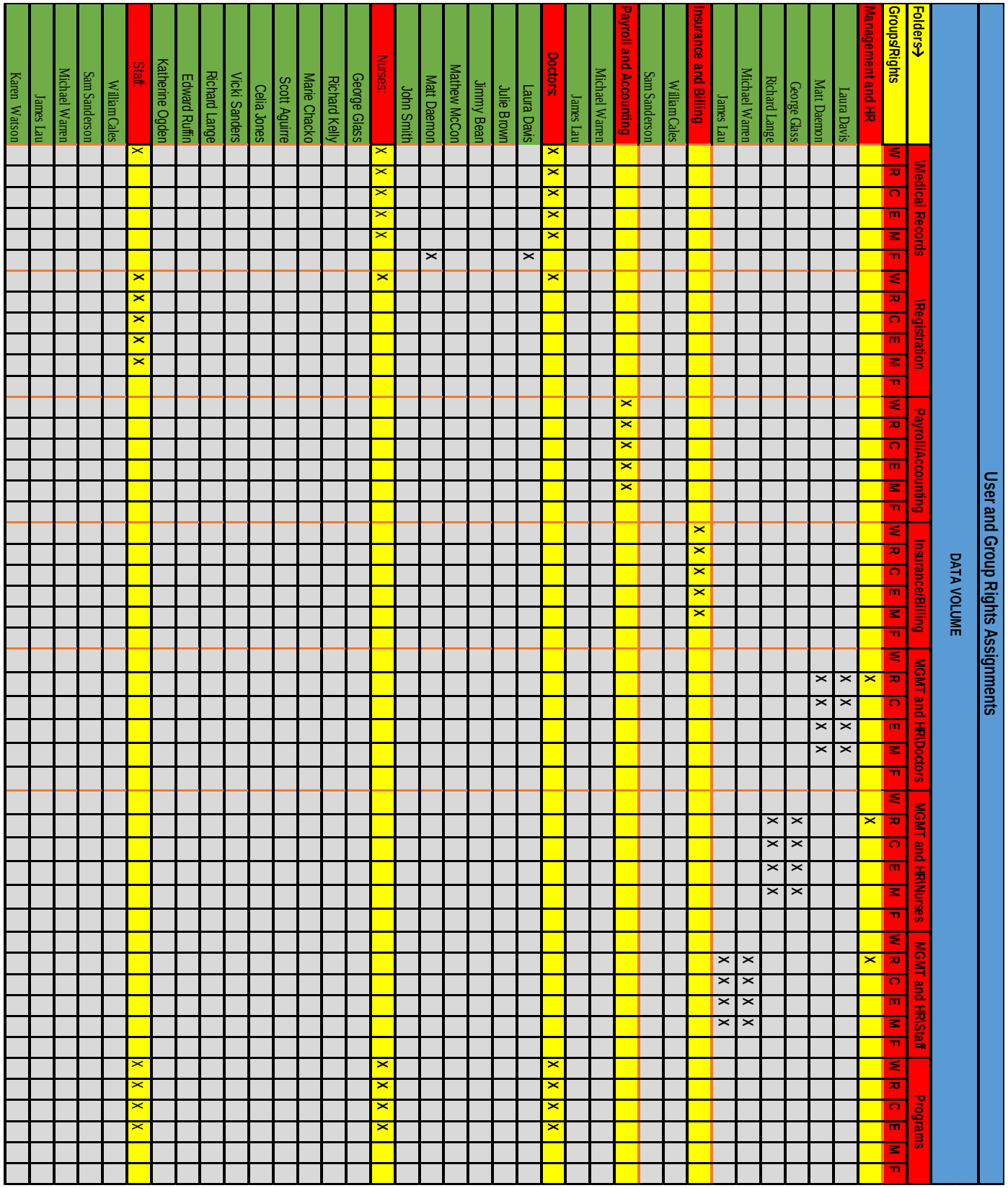
Payroll and Accounting

- Maintain employee records
- Reconcile employee work time.
- Manage employee benefits.
- Prepare quarterly FICA reports.
- Prepare quarterly tax reports.
- Prepare clinic budget reports.
- Maintain general ledger.
- Perform Accounts Payable function.
- Perform Accounts Receivable Function.
- Payroll administration.

Management and Human Resources

- Hire new employees
- Create new tasks or projects
- Review employee records
- Create training and development exercises for all employees
- Create/give benefits and compensations to employees
- Review hours worked by employees

Applications Matrix/User Rights



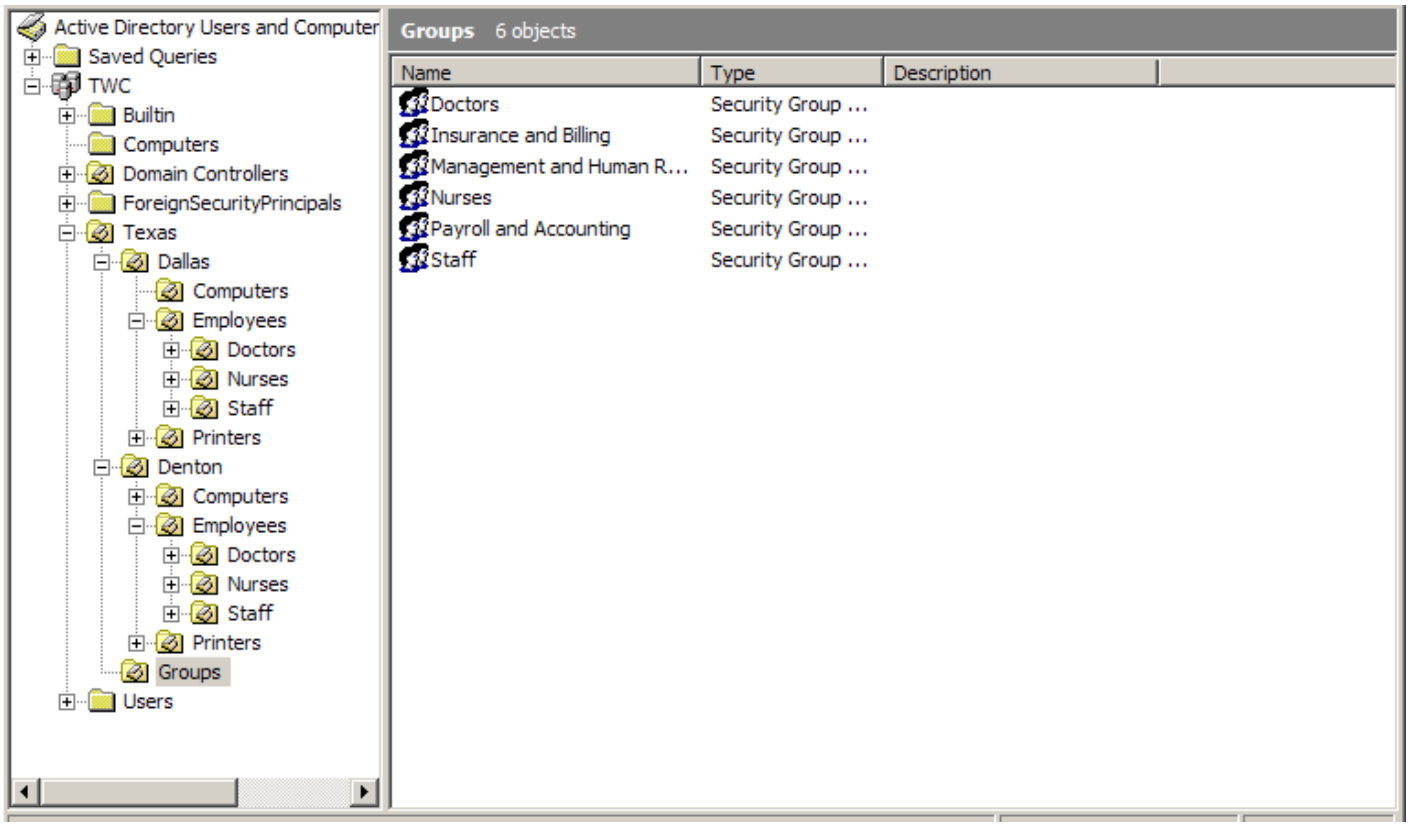
Group Planning Form

Group Planning Form			
Designer:	Jonathan Perry		
Date:	3/29/2015		
Group Name	Members	Context	Applications Required
Management and Human Resources	Laura Davis Matt Daemon George Glass Richard Lange Michael Warren James Lau		ClinicPro – Management and Human Resources
Doctors Nurses Staff	All doctors, nurses, and staff		Google Chrome Microsoft Office 2013 ClinicPro – Medical Records ClinicPro - Registration
Insurance and Billing	William Cales Sam Sanderson		ClinicPro - Insurance and Billing
Payroll and Accounting	Michael Warren James Lau		ClinicPro – Payroll and Accounting

Active Directory Design (AD)

The design of the Active Directory was built with organization and delegation of administration in mind. With organization, we created organizational units (OUs) so we could easily find the locations of our clinics, and certain objects such as users, groups, computers, and printers. Through creation of an Active Directory, we were able to achieve a decentralized means to management of users, and groups. With creation of organizational units, we were able to create and apply group policies, for management of users Registry settings throughout the whole network. From creating special groups, we were also able to delegate which groups could view certain files as part of the network drive.

AD Organizational Units (OUs)



Note: Organization units are represented by the folders. The organizational unit named "Groups" is selected, and you can see the groups created on the right side pane.

AD Naming Standards

We have decided to use a contiguous naming convention, for example each domain name created shares the same root name. Here is an example our contiguous name space.

TWC
Texas.TWC
Groups.Texas.TWC
Dallas.Texas.TWC

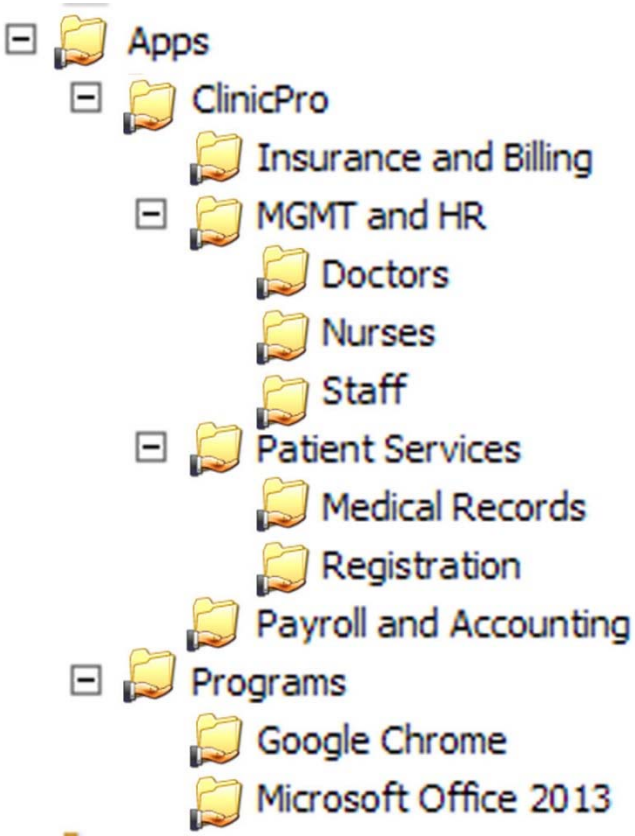
Computers.Dallas.Texas.TWC
Printers.Dallas.Texas.TWC
Employees.Dallas.Texas.TWC
Doctors.Employees.Dallas.Texas.TWC
Nurses.Employees.Dallas.Texas.TWC
Staff.Employees.Dallas.Texas.TWC

File System Design

Volume and Folder & Design Forms

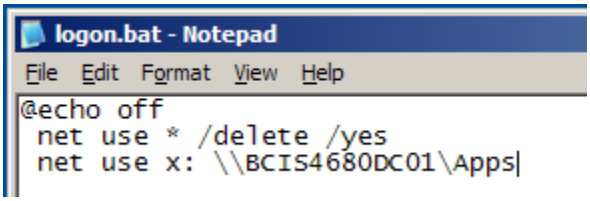
Volume Design Form	
Designer:	Jonathan Perry
Date:	4/18/15
Volume Name:	Apps
Maximum Capacity: 1 terabyte	

List of Folders

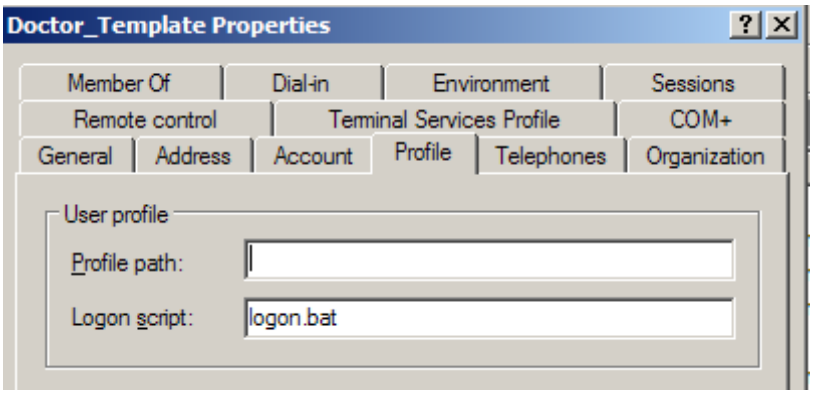


Login Scripting and Drive Mapping

In C:\WINDOWS\SYSVOL\sysvol\TWC\scripts, we have created a .BAT file that will automatically map the network drive the clinic is currently using. Here is an example of the script created:



To get this .BAT file to execute on the client's end, we had to change settings on each and every user that would need to execute this script. Below you can see an example of what had to be done.



The result of this script is that each user in our domain would get access to the files they needed every time they logged in. This also allows for security, if you create a guest account and don't want them see the network drive you can first, not apply this .BAT file and second, restrict them from being able to map network drives on our network for even further security.

Application and Data Access Rights

1. Apps\ClinicPro\Insurance and Billing

   The Insurance and Billing group, which consists of William Cales and Sam Sanderson, are given write, read, create, execute, and modify rights to this folder.

2. Apps\ClinicPro\Payroll and Accounting

   The Payroll and Accounting group, which consists of Michael Warren and James Lau are given write, read, create, execute, and modify rights to this folder.

3. Apps\ClinicPro\MGMT and HR

   The Management and HR group are given read rights to this folder.

4. Apps\ClinicPro\MGMT and HR\Doctors

   The Management and HR group are given read rights to this folder. However, due to the structure of the organization, head managers of the doctors Laura Davis and Matt Daemon are given read, write, create, execute, and modify rights to manage their employees, and also hire new doctors.

5. Apps\ClinicPro\MGMT and HR\Nurses

   The Management and HR group are given read rights to this folder. However, due to the structure of the organization, head managers of the nurses George Glass and Richard Lange are given read, write, create, execute, and modify rights to manage their employees, and also hire new nurses.

6. Apps\ClinicPro\MGMT and HR\Staff

   The Management and HR group are given read rights to this folder. However, due to the structure of the organization, head managers of the staff Michael Warren and James Lau are given read, write, create, execute, and modify rights to manage their employees, and also hire new staff.

7. Apps\ClinicPro\Patient Services

The doctors, nurses, and staff groups are all given read rights to this folder.

8. Apps\ClinicPro\Patient Services\Medical Records

   The doctors, nurses, and staff groups are all given read rights to this folder. However, doctors and nurses are given more rights in this folder. In this folder, doctors and nurses have read, write, create, execute, and modify. Only doctors and nurses are needed to make changes to a patient's medical record. If a patient asks one of the staff a question about the results of their appointment, the staff have the appropriate rights to view their file.

9. Apps\ClinicPro\Patient Services\Registration

   The doctors, nurses, and staff groups are all given read rights to this folder. However, staff are given more rights in this folder than the doctors or nurses. The staff have read, write, create, execute and modify rights due to the particular training of their job. They are trained specifically to make appointments for existing, or new patients. Doctors and nurses are given read rights in order to view the schedule of patients for that day if needed.

10. Apps\Programs

    The doctors, nurses, and staff groups are given read, write, create, execute, and modify rights for this folder. The programs in this folder are Microsoft Office 2013, and Google Chrome.

User Planning Form

User Name	Login Name	Job	Template Name	Clinic Location	Groups
Laura Davis	ldavis	Doctor	Doctor_WC	Denton	Management and Human Resources Doctors
Julie Brown	jbrown	Doctor	Doctor_WC	Denton	Doctors
Jimmy Bean	JBean	Doctor	Doctor_WC	Denton	Doctors
Mathew McCon	Mmccon	Doctor	Doctor_WC	Denton	Doctors
Matt Daemon	Mdaemon	Doctor	Doctor_WC	Dallas	Management and Human Resources Doctors
John Smith	Jsmith	Doctor	Doctor_WC	Dallas	Doctors and Nurses
George Glass	Gglass	Nurse	Nurse_WC	Denton	Management and Human Resources Nurses
Richard Kelly	Rkelly	Nurse	Nurse_WC	Denton	Nurses
Marie Chacko	Mchacko	Nurse	Nurse_WC	Denton	Nurses
Scott Aguirre	Saguirre	Nurse	Nurse_WC	Denton	Nurses
Celia Jones	Cjones	Nurse	Nurse_WC	Denton	Nurses
Vicki Sanders	Vsanders	Nurse	Nurse_WC	Denton	Nurses
Richard Lange	Rlange	Nurse	Nurse_WC	Dallas	Management and Human Resources Nurses
Edward Ruffin	Eruffin	Nurse	Nurse_WC	Dallas	Nurses
Katherine Ogden	Kogden	Nurse	Nurse_WC	Dallas	Nurses
Michael Warren	Mwarren	Staff	Staff_WC	Denton	Management and Human Resources Payroll and Accounting Staff
William Cales	Wcales	Staff	Staff_WC	Denton	Insurance and Billing Staff
Karen Watson	Kwatson	Staff	Staff_WC	Denton	Staff
James Lau	Jlau	Staff	Staff_WC	Dallas	Management and Human Resources Payroll and Accounting
Sam Sanderson	Ssanderson	Staff	Staff_WC	Dallas	Insurance and Billing Staff

User Template Form

All users have been created with the following altered default charactistics:

- Logon hours from 8am-5pm, Monday to Friday (to match clinic's operational hours)
- End Session – When a session limit is reached or connection is broken (so one user can't be logged in at two different computers)
- Logon Script – logon.bat (to automatically map the network drive at login)

Network Backup and Reliability

Backup Media

The servers stated in the hardware requirements has the capability of keeping data backed up in a data storage virtualization technology called RAID (redundant array of independent disks). RAID offers reliability, availability, performance, and capacity from combining multiple disk drive components into a logical unit for the purposes of data redundancy or performance improvement. RAID levels greater than RAID 0 provide protection against unrecoverable read errors, as well as whole disk failure. The server we are suggesting offers RAID 0, 1, and 10.

Backup Strategy

Even with the RAID solution mention earlier, we know that this isn't 100% safe. If somehow all of our data is lost, our backup strategy is use the software called Acronis. Rated as the best software for backing up your server, Acronis offers many great features. Acronis allows you to do incremental backups and imaging, it supports multiple file versions, encryption (which is a huge plus with confidential patient files). Acronis also allows you to back up your media from external drives, hard drives such as IDE or SATA, solid state drives, and most importantly it supports RAID arrays.

Administrator Account

A default administrator account has been set up with full rights, this account will only be used when necessary. Since our administrator account has several securities issues associated with it (if an outsider gets ahold of the account), we have taken a few steps to strengthen the security of this account from being compromised. The first half of this accounts password will be decided by Laura Davis, and the second half of the password will be decided by Karen Watson who is the Network Administrator of The Women's Clinic. Neither of the two will know each other's password.

Uninterruptible Power Supply

In case of a power failure or power outage, it's very important to keep your business continuously operating. With an uninterruptible power supply, your clinics will still have access to important files – such as your patient files, or financial files and you won't lose any previous changes you've made to any files. The uninterruptible power suppy we have suggested will allow up to 157 minutes of runtime at 50W, allowing your servers, routers, and client computers to keep running after power failure or power outage.

Network Security

Server Security

Knowing that this network is designed off the main purpose of keeping a secure system of only users within The Women's Clinic, continuing and applying that same mind set after implementation of this system will be our 1st main priority. To keep data about patients and even employees out of the wrong hands, there's a few steps we can take to keep your system secure.

- Monitoring Network Events: Helps detect potential threats, increases user accountability, and provides evidence of security breaches if they occur.
- Auditing – this is used to monitor and track activities. With this can audit account management, directory service access, logon events, object access, policy change, privilege use, process tracking, and system events. We suggest checking each of these weekly or monthly to ensure your system is safe.
- Update Services: Updates either manually or from being deployed by system administrators will fix known bugs, flaws, or vulnerabilities associated with Windows. We highly suggest checking for windows updates bimonthly.

Intruder Detection & Authentication

With sensitive information being within The Women's Clinic, the last thing you want is someone to break into your network and view these files. Like stated above in the Server Security section, you can perform routine auditing sessions to ensure your network is secure. Listed here are the main auditing events that should be monitored:

- Audit Account Management – Tells you about successful or unsuccessful password changes
- Audit Logon Events – Tells you when a user logs in and out of the Active Directory, and login failures to find out whether password hacking is occuring
- Audit System Events –Tells you when a system event takes place, such as the computer restarting

Firewall and Virus Protection

Protecting our users against malware, viruses, or Trojans is a huge concern. Certain malware can lead to serious computer invasion and damage, such as stealing password and data (patient medical records, etc.). Luckily, there are ways to protect yourself and your users against these types of threats. We highly recommend McAfee Firewall Enterprise, which provides automated threat feeds, encrypted traffic inspection (SSH/SSL), intrusion prevention, antivirus, and content/URL filtering. At $2,125, which covers your whole clinic – protecting your users and data will pay for itself.

NDS Policy Recommendations

We have created a few policies at a top level approach that'll cover every single user in The Women's Clinic. Whether you're a doctor, staff member, or even a manager these policies will affect everyone the same, however these policies have been filtered out for the administrator account. These policies that have been created with security in the mind, so that our patients here will be reassured that their personal information is safe within our network.

ALL USERS: (Except Administrator)

Remove:

- run menu
- network connections
- my network places
- frequent program list
- security tab
- CD Burning features
- Task manager

No:

- "computers near me" in my Network Places
- "Entire Network" in my Network Places

Hide:

- My network places on desktop
- Change or remove programs page
- Add new programs page
- Add a program from CD-ROM or Floppy Disk

Prohibit:

- Control Panel
- Access to properties of components of a LAN connection
- Access to properties of components of a remote access connection
- Access to the advanced settings item on the advanced menu
- Access to the properties of a LAN connection
- Access to the new connection wizard
- TCP/IP advanced config
- Adding and removing components for a LAN or remote access connection
- Connecting and disconnecting to a remote access connection
- Access to the command prompt
- Access to the registry editing tools
- Snap-ins

Denton and Dallas Staff Organizational Units have been permitted access to the control panel due to various requests from Staff employees to perform certain job duties.