

INET3700 Assignment 1

REQUIREMENTS MANAGEMENT AND NETWORK DESIGN

GROUP 3

BARNES, SHANNON

GRAY, TRISTAN

GUERRA, ALONSO

RHO, YONG SEUNG

Contents

Introduction	2
Rationale	3
Servers.....	4
Network Diagram.....	7

Introduction

Our proposed solution for the new Health Billing System (HBS) is to extend our current on-premises hardware with the purchase of three additional servers to support this system: a database server, a web application server, and a report server. The former two will be accessible onsite or through a VPN connection, allowing hospital administrators to input information as needed regardless of where they are located. The latter server will be kept in a demilitarized zone (DMZ), available with proper login certifications. This server will be used for the secure webpage, where Medavie Blue Cross staff can access reports. This data will be encrypted for confidentiality.

In addition to historic records of patients, surgeries, and staff, the database server will include a data warehouse connected to the existing web services such as STAR, HSM, and PHS via API. This will allow that information to be referenced as needed in reporting.

To maximize the reliability of the system, we have included in our proposal an additional server hosted on-the-cloud. This resource will be used for back up and will be encrypted locally prior to being uploaded to the cloud instance for security.

Rationale

Based on the requirements, we believe this solution would be the easiest to implement. Considering that HDS already has on-premises servers, we assume that there is already support for this within the organization. This means they should not be limited by the need to hire additional new staff, such as a cloud specialist. Similarly, existing staff would have a smaller adjustment period without having to transition to a new cloud environment/authentication system.

One main benefit of this is the availability of servers even without internet connectivity. In a situation where the site loses connection for a period, the database would still be available locally. This would allow information to be input offline and then uploaded when the connection is restored. However, there are a few risks associated with this proposal. The upfront cost would be higher due to the cost of the hardware, and we would be responsible for maintaining the security and integrity of the hardware itself, along with being responsible for maintenance and updates/upgrades. We would need to account for potential hardware failure and take steps to reduce any potential impact if this were to occur (like implementing RAID 10 and cloud backups).

The advantages of a cloud-based system, such as, built-in security, scalability, high reliability, and automatic upgrades and maintenance are the reasons why we decided to host our backup system off-site. However, the difficulties in integrating authentication of cloud-based systems for the core functionality of our Health Billing System, the training required to bring staff up to speed on the new system, and the higher monthly costs are why we decided to stick to an on-premise solution for our core functionality.

Servers

1. SW/OS: Windows Server 2016^[41] (MSSQL Server)

Price: \$988.99 + tax

Windows Server is the platform for building an infrastructure of connected applications, networks, and web services, from the workgroup to the data center. It bridges on-premises environments with Azure, adding additional layers of security while helping you modernize your applications and infrastructure. Windows Server is easy to install and provides a total solution from web services to cloud backup. We can build the billing system that meets the requirements in a short time and leverage the existing support staff for the hospital network since the existing systems run on the same Operating System. In addition, we also consider scalability that many billing solutions such as Medisoft System^[2] and American Medical System^[3] have adopted this operating system. The portability is better than others. Based on the minimum hardware requirement to run Windows Server, we will select our components such as CPU, Memory, and Storage for our billing system.

The minimum hardware requirements to run Windows Server.^[41]

CPU	<ul style="list-style-type: none">• 1.4 GHz 64-bit processor• Compatible with x64 instruction set• Supports NX and DEP• Supports CMPXCHG16b, LAHF/SAHF, and PrefetchW• Supports Second Level Address Translation (EPT or NPT)
Memory (RAM)	<ul style="list-style-type: none">• 512 MB (2 GB for Server with Desktop Experience installation option)• ECC (Error Correcting Code) type or similar technology, for physical host deployments
Storage	32 GB

These minimum system requirements apply to all installation options (Server Core, Server with Desktop Experience, and Nano Server) and both Standard and Datacenter editions.

2.SW/SQL Server: Microsoft SQL Server 2016 Standard^[5]

Price: \$847.99 + tax

Leveraging Transparent Data Encryption (TDE) to ensure your data is always encrypted, period. Always Encrypted holds true regardless of where the data sits, whether it's in use or in transit. If in-memory Online

Transaction Processing, or OLTP, Businesses experience near-instant transactions when running reports and complex queries. AlwaysOn Availability allows organizations to protect data with ease — and flexibility. SQL Server uses data mirroring to improve failover for groups of databases. The Stretch Database feature in SQL Server 2016 is the true bridge between your on-premise solution and your data in the Azure cloud. [\[6\]](#)

For our billing system, the recommended hardware requirements are considered to support maximum user and device limits. We assume that less than 10 users will use this system.

3. HW/CPU: Intel Xeon E E-2224 Quad-core (4 Core) 3.40 GHz Processor - 8 MB Cache - 4.60 GHz Overclocking Speed - 14 nm - Socket H4 LGA-1151 - 71 W - 4 Threads [\[7\]](#)

Price: 275.89 + tax

These CPU factors include the clock frequency, the number of processor cores, and the size of the cache memory. We should meet the minimum CPU requirement for Windows Server and maximum users will use in optimal performance. According to Comsense [\[8\]](#), 4-8 cores is recommended for smaller companies that use Windows Server.

4. HW/Memory: 16GB DDR4-2400MHZ REG ECC Module [\[9\]](#)

Price: \$181.23 + tax

Basically, ECC should be supported due to Window Server requirements. The more RAM the server has for better performance, the quicker the execution will complete. We should consider how many users will have accessing and pulling data, how often our data need to be update, how much processing must be done to access database, what rate is the database growing. the database size grows for optimal performance for example, MS-SQL Standard itself requires 1 GB RAM and 6 GB free disk space. According to the Jet Analytics BI Solution [\[10\]](#), A good rule of thumb is to reserve 1 GB of RAM for the OS by default, plus an additional 1 GB for each 4 GB between 4-16 *and* another 1 GB for every 8 GB installed above 16 GB.

5. HW/Storage: 1TB * 2ea

Storage 1: WD_BLACK SN850 1TB NVMe PCI-e (Gen 4) Internal Solid State Drive with Heatsink (WDBAPZ0010BNC-WRSN) [\[11\]](#)

Price: 316.99 + tax

Storage 2: Samsung 980 Pro 1TB NVMe PCI-e Internal Solid State Drive (MZ-V8P1T0B/AM) - En[\[12\]](#)

Price: \$289.99 + tax

We should consider that the storage is going to last for a while when we plan. Growing database has an effect on the size of the storage. Computers that run Windows Server must include a storage adapter that is compliant with the PCI Express architecture specification. Persistent storage devices on servers classified as hard disk drives must not be PATA. Windows Server 2016 does not allow ATA/PATA/IDE/EIDE for boot, page, or data drives. We also consider that RAID 1 disks to prepare for failure of disk and enough disk space for files, database files, and backups. Database files, Microsoft SQL Server transaction logs, and search index files must be stored for optimal performance. We will purchase two storage units from different manufactures to configure RAID 1.

Network Diagram

The following schema depicts the components of our proposed solution, as well as their connections.

