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**Health Billing System - System Design**

**Introduction describing the proposed solution -** the proposed solution aims to enable the implementation of a new Health Billing System (HBS) that will allow the direct flow of electronic invoices to Medavie Blue Cross. This solution has the advantages of implementing the new HBS at the lowest possible cost, that is, the solution aims to acquire the smallest possible number of servers and other components without compromising network security or performance.

**Rationale for the proposed solution (include a benefit and risk) -** the proposed solution has the following benefits:

* Due to the use of a firewall, the internal network is protected from most hacker attacks or unauthorized access;
* Dedicated servers were used for each task, facilitating network maintenance and performance;
* Dedicated backup server provides greater security against HBS data loss;

And risks:

* The VPN used on the hospital administrator's computer can be a security risk for HBS;
* Employees can breach security without realizing it;
* The solution does not have a security plan for physical access to HBS installations.

**List of servers** - Following the recommendations present in sites like <https://support.jetglobal.com/hc/en-us/articles/219401657-Server-Hardware-Sizing-Recommendations>, for a correct dimensioning of the necessary configurations for the acquisition of any server it is necessary to take into account some factors such as number of users, execution packages, database size, growth rate, operating system requirements, among others.

Since many of these factors are not reported in the scope of the project, the settings recommended here might not adequately meet the needs of the project.

**Proxy Server:** The role of the proxy server is to be an intermediary between computers and servers on a network and the Internet. As the proxy server can be used with basically three objectives: 1- Share the Internet connection when there is only one IP available, because the proxy is the only one actually connected to the Web and the other computers access it. 2- Improve the access performance through a page cache, as the proxy stores the most accessed pages and files, and when someone requests one of the pages already stored in the cache, it will be transmitted automatically, without having to download it again. 3- Blocking access to certain pages, as all internet access goes through the proxy, it is easy to deploy a list of addresses or words that should be blocked. For a small network, a dedicated server would not be necessary for this function, but to give greater performance the network deployed here will be used a computer with Windows Server 2019 operating system dedicated to this function.

a. CPU: 3.1 GHz 64-bit processor \*

b. Memory: 16 GB \*

c. Storage: 160-GB hard disk with a 60-GB system partition \*

d. Software: Windows Server 2019 Standard (U$ 972) and Wingate Proxy Server

e. Anticipated costs for Hardware and Software: C$ 276.99 Lenovo Thinkcentre M93 Tiny Intel I3-4160t 3.1Ghz 16GBb 256gb SSD (<https://www.ebay.ca/i/124013252412>)

\* System requirements for Windows Server 2019

**Web Server -** Web server is a computer with software and hardware configured for hosting applications. The codes developed for the web pages are stored in the internal memory of the server. The software is responsible for communicating through protocols with the client's computer, which in this case is Medavie Blue Cross staff. Thus, the main function of the Web Server is to process requests through scripts and respond appropriately. In this solution, the Web Server communicates with the Database Server to access various Reports requested by Medavie Blue Cross staff.

a. CPU: Xeon Bronze 3206R 1.9 GHz

b. Memory: 16 GB

c. Storage: 1 TB Hard Disk

d. Software: Windows Server 2019 Standard (U$ 972)

e. Anticipated costs for Hardware and Software: EA $1,613.89 HPE ProLiant ML350 Gen10 Entry - tower - Xeon Bronze 3206R 1.9 GHz - 16 GB (<https://www.grandandtoy.com/en/product/IM897PPM.aspx>)

**Database Server** - Database servers have the function of storing and managing data in a structured way. Server allows clients, who in this case are Medavie Blue Cross staff, to access the history of patients, surgeries, staff who worked on all Operating Room cases, Operation Database and Data Warehouse.

a. CPU: 2x Intel® Xeon® Gold 5120 2.2G, 14C/28T, 10.4GT/s, 19.25M Cache, Turbo, HT (105W) DDR4-2400

b. Memory: 2x 16GB

c. Storage: 4x 240GB SSD

d. Software: Windows Server 2019 Standard (U$ 972)

e. Anticipated costs for Hardware and Software: CAD $10,283.00 PowerEdge R840 Rack Server (<https://www.dell.com/en-ca/work/shop/servers-storage-and-networking/poweredge-r840-rack-server/spd/poweredge-r840/pe_r840_p1?configurationid=a67193b9-5c2e-4dbc-9821-0e62a7ff5f00>)

**Backup Server -** Backup server is the dedicated server that stores only backup data from other servers on the network. In this case, the same configuration as the Database server was used, since the Database server will probably be the server with the largest volume of data generated daily, and if there is a problem with the Database server, the database server Backup can be used for temporary access to the database.

a. CPU: 2x Intel® Xeon® Gold 5120 2.2G, 14C/28T, 10.4GT/s, 19.25M Cache, Turbo, HT (105W) DDR4-2400

b. Memory: 2x 16GB

c. Storage: 4x 240GB SSD

d. Software: Windows Server 2019 Standard (U$ 972)

e. Anticipated costs for Hardware and Software: CAD $10,283.00 PowerEdge R840 Rack Server (<https://www.dell.com/en-ca/work/shop/servers-storage-and-networking/poweredge-r840-rack-server/spd/poweredge-r840/pe_r840_p1?configurationid=a67193b9-5c2e-4dbc-9821-0e62a7ff5f00>)

**Application Server -** Application server has the function of providing an environment for the installation and execution of applications, which in this case are the STAR, HSM and PHS applications, thus centralizing and dispensing the installation on client computers.

a. CPU: Xeon Bronze 3206R 1.9 GHz

b. Memory: 16 GB

c. Storage: 1 TB Hard Disk

d. Software: Windows Server 2019 Standard (U$ 972)

e. Anticipated costs for Hardware and Software: EA $1,613.89 HPE ProLiant ML350 Gen10 Entry - tower - Xeon Bronze 3206R 1.9 GHz - 16 GB (<https://www.grandandtoy.com/en/product/IM897PPM.aspx>)

**Network Diagram**

