Physical Security in Retail

by

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Abstract

Security cameras systems are essential to any business. They provide a peace of mind and the owner knows what is happening in the business. However having the latest security systems can cost thousands of dollars so many businesses settle with off the shelf DVR systems. But off the shelf DVR systems are limited by both hardware and software and may not fully provide the need the business is looking for. By having a custom PC DVR system, the user is able to determine the type of cameras to use, the amount of cameras, the size of the hard drive and be able to view live feed of the camera so you know what is happening to your business at real time all at a affordable price.
Introduction

Super Sam is a convenience store and has problems with crime, such as robbery, theft from customers and employees, fights in the parking lot, drug deals, people using stolen credit cards at the ATM and for purchases. At times the local police ask for video surveillance after the crime. Either the business does not have a camera in the spot or they do not have the video footage due to it being recorded over. I thought I had solved the problem by installing a DVR (Digital Video Recorder) from Sam’s Club, but the hard drive had crashed two weeks later and had limited ways to use it. On the hardware side, it was only able to support up to eight cameras. They still had blind spots and needed additional cameras. Some of the wires turned out to be a bit short and we had to order longer ones adding extra cost to the system. On the software side, the DVR was limited to viewing one camera at a time, limited editing features, and it was difficult using the settings. Overall, it wasn’t user friendly. The solution is to create a customizable system that has features the business would actually use.

The project peaked the interest of Ketan Patel who owns multiple convenience stores throughout Cincinnati area. He asked to use two locations as a test to see if the project would be a perfect fit to his business since he cannot be at all locations at the same time. The two locations that that were used for this project was Fast Max in Amelia and Nicholsville Grocery in Bethel.

Statement of Need

In many small retail stores, the security systems are usually DVR systems that are bought off the shelf at some tech store since small business cannot afford to have a high
tech system, which can cost thousands of dollars. The DVR systems are limited to what is provided in the box, the number of cameras, the type of cameras, the length of the wires and the storage. So the business usually makes due with what is in the box since security is something that doesn’t make money. Super Sam has had problem with crime ranging from theft, fights, and drug deals in parking lot.

**Proposed Solution**

I created a custom security system for the business. One that is affordable for the small businesses but also at the same time have great features that larger business has with their surveillance system. The system also has automatic back ups for the video footage in case the main hard drive fails. I implemented a central storage where the video files will be back up so incase an employee needs to have access the video files during certain situations. For example, if a customer says they handed $20 to the employee, but they actually handed $10, the employee can review the video on the spot to prove what they actually handed. The employee will be able to review the video with a laptop. The challenges that I will face will be teaching the users how to use the system and build it to where it can be affordable. The goal is to create a custom system that fits the business needs and budget.

**User Profile**

<table>
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<tr>
<th>User Profile Form</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Application:</strong> Geo Vision DVR Software</td>
</tr>
<tr>
<td><strong>Potential Users:</strong> Business Owner</td>
</tr>
<tr>
<td><strong>Software and Interface Experience:</strong> The user should have experience on surveillance system and basic pc skills to operate the software to complete the tasks.</td>
</tr>
</tbody>
</table>
Experience with Similar Applications:
The user has only recently started using DVR software on a DVR system, which is not user friendly to begin with. The user also must be able to operate a pc.

Task Experience:
The user is experienced in using DVR software and should be able to translate them when using it on a pc. User should be able to view recorded videos, change settings of the cameras edit the clips, view a live stream burn them to a DVD or email it to whom it may concern.

Frequency of Use:
The system would be used daily to check video surveillance and be able to view live stream from a mobile device.

Key Interface Design Requirements that the Profile Suggests:
This is a networking project. The interface will be of the software. When turning it on, the user will able to view the live feed of the cameras and will be able to access the settings depending on the tasks that is need to be completed.
System Design

The project self has these main goals.

- The user is able to view live feed from a web browser or mobile device.
- The user can review video on the main system to edit and make clips.
- The user can review video on a separate terminal from a back up on the central storage.
- The user can view video from multiple locations on one screen.

For the user to view live feed the DVR server acts webcam server when configured. The user view live feed from a web browser via static IP address. As shown in Figure 1 the user would enter the static IP address and is greeted to a login screen. He user enters in the user name and password and is able to view the cameras as shown in figure 2. The static IP address must be purchased from the local Internet Service Provider (ISP). The static IP from Super Sam is provided by Cincinnati Bell, which is included in their small business package (Cincinnati Bell).
The user is able to view live feed from mobile devices via GeoVision app that is available for both Android and iOS operating system. The user must have an IP address, username and password to access live feed. The option must be configured first for the apps to gain access to the live feed. SSL 3.0 secures the live feed connection.

The user can also review video from the GeoVision video log. The video log can view recorded video from the source it was record to. The user can select the date and the time. Each video file is called an event. The user can select the event to play the file. Another feature is multi-view. When the user enters in a date and time it plays all the events that was recorded from every camera at the same time. The user can select an event and edit the length, brightness, and contrast to create a video file. This would be important incase an incident like a robbery and the user can burn the video file to a DVD and give it to law enforcement.
The user can review video on a separate terminal from a backup on the central storage. This was achieved by setting up a central storage connected to the router. The video files are automatically backed up to the central storage once it is done recording. The files can be viewed from the video log app that is installed on a laptop. First the laptop needs to gain access to the central storage via network storage. Then the video log must connect to the central storage to access the files. The layout is the same as the video log on the main system. The user mainly an employee can save video file and write up a report of any incident may occur. The reason for this idea came about when customers would come back in and ask if they had left any items they bought or personal belongings such as keys, wallets, and credit cards. The owner would have to go back to the office while the customer is left alone at the counter. The owner could be gone for minutes since it would take time to find the exact time to look up the time the customer was in. Also when an employee is working they would not have access to the system. With the laptop the owner and an employee can look up the event right at the counter and even show the customer the footage for verification. The reason the video is recorded to the central storage is so the recorded files on the main system and backup are not tampered with also the owner did not want employees to have access to the system. The files that are backed up to the central storage are read only and cannot be deleted with out administrator permission.

For an owner that has multiple locations to view it would be convenient to view live feed on one screen. To do this the user would install a program called DMview on to a computer that is running a Windows PC running XP, Vista, 7, or 8. The program can view up to 32 cameras at a time. First the user would configure the IP address, user name
and password into host. Then the user would click on the host and select the cameras they want to view. This way the user can select up to 32 cameras from any combination of hosts.

**Technical Elements**

**Hardware**

The hardware that is used is a custom PC that has an Intel E5200 processor with 4GB of RAM and 500GB hard drive running Windows 7. The router that is used is a Linksys E3000 (Cisco). This hardware was already in place at the start of the project. This was the hardware used due to the budget. Hardware that was added is a GeoVision GV-800 Video Capture Card that will be placed in the PC via PCI slot. The card will be able to connect up to 16 cameras. The business wanted to add 12 cameras at the moment and will use the remaining four as it sees fit in the future.

The minimum hardware requirements for the GeoVision GV-800 Video Capture Card as seen in figure 3 (GeoVision Inc).

![Minimum System Requirements For One Card, CIF Resolution](image)

The features of the GeoVision GV-800 Video Capture Card are that it can support up to 16 cameras and up to 4 audio channels. GeoVision has other DVR cards that can support up to 32 cameras. The DVR card was within the budget and met the business need.
The cameras connect to the PC with the GeoVision GV-800 Video Capture Card. The cables are ran through the drop ceiling from the cameras to the back office where the system is located. The cables are out of sight and nobody can tamper with them. As seen in figure 4 there are two methods for backups. One is an external hard drive for automatic backups for the recorded videos that is connected directly to the PC DVR and one that is connected to the router. The one that is connected to the router is for central storage.

(Figure 4) Diagram

Software

The software that is used is GeoVision 8.5.7 DVR software (GeoVision Inc) after looking at multiple DVR software I decided to go with Geo Vision DVR software. With GeoVision I am able to view live feed using the Geo Vision app on both android and iOS and be able to view live feed from any browser. The system also has automatic back up so
the video files can be backed up to another source such as an external hard drive. The software can send email and text alerts if a camera detects motion when it is not suppose too for example if a person is attempting to pick the lock at night the camera will detect motion and notify the owner via email or text.

The other reason for choosing the software is for the ease of use. It is simple to use with it menu systems to complete the tasks needed. The system can also automatically login and start recording incase the system had a power surge. The software comes bundled with the GV-800 Video Capture Card.

**Testing**

The system testing took place in January. Below are the results to some of the main functions of the system.

Testing Functional requirements

1. Webview
2. Mobile View
3. Central Storage
4. Backup Recordings
5. Employee view

<table>
<thead>
<tr>
<th>Req No:</th>
<th>Item #</th>
<th>Test Case #</th>
<th>Input</th>
<th>Expected output</th>
<th>Actual Output</th>
<th>Pass/Fail</th>
<th>Reason</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Ip address</td>
<td>login screen</td>
<td>Page not displayed</td>
<td>Fail</td>
<td>Web server not configured</td>
<td>1-4-2014</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
<td>Ip address</td>
<td>Login screen</td>
<td>Login screen</td>
<td>Pass</td>
<td></td>
<td>1-4-2014</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Username and password</td>
<td>Web view</td>
<td>User does not have permission</td>
<td>Fail</td>
<td>The user was not authorized</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>------------------------</td>
<td>---------</td>
<td>-------------------------------</td>
<td>------</td>
<td>----------------------------</td>
<td>---</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>3</td>
<td>Username and password</td>
<td>Web view</td>
<td>User does not have permission</td>
<td>Fail</td>
<td>The user was not authorized</td>
<td>1-5-2014</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>4</td>
<td>Username and password</td>
<td>Web view</td>
<td>Webview</td>
<td>Pass</td>
<td>User has access</td>
<td>1-5-2014</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>5</td>
<td>Ip address</td>
<td>User login</td>
<td>Address not correct</td>
<td>Fail</td>
<td>Port not specified</td>
<td>1-6-2014</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>6</td>
<td>Ip address</td>
<td>User login</td>
<td>Address not correct</td>
<td>Fail</td>
<td>Port needs to be forwarded</td>
<td>1-6-2014</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>7</td>
<td>Ip address</td>
<td>User login</td>
<td>User login</td>
<td>Pass</td>
<td></td>
<td>1-11-2014</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>8</td>
<td>User login</td>
<td>Live view</td>
<td>Live view</td>
<td>Pass</td>
<td></td>
<td>1-11-2014</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>9</td>
<td>Configure central storage on router</td>
<td>Turn on storage</td>
<td>Storage turned on</td>
<td>Pass</td>
<td></td>
<td>1-11-2014</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>10</td>
<td>Connect hard drive to router</td>
<td>Accept storage</td>
<td>Format not supported</td>
<td>Fail</td>
<td>Needed to be fat 32 instead of NTFS</td>
<td>1-11-2014</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>11</td>
<td>Set videos to record to storage</td>
<td>Videos record to storage</td>
<td>Videos record to storage</td>
<td>Pass/Fail</td>
<td>But videos were not recording to main drive</td>
<td>1-12-2014</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>12</td>
<td>Set videos to backup to storage</td>
<td>Videos back up to central storage</td>
<td>Backup server not enabled</td>
<td>Fail</td>
<td>Have to configure backup server</td>
<td>1-12-2014</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>13</td>
<td>Set videos to backup to storage</td>
<td>Videos back up to central storage</td>
<td>Videos back up to central storage</td>
<td>Pass</td>
<td></td>
<td>1-12-2014</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>14</td>
<td>Set videos to back up to external hard drive</td>
<td>Videos back up</td>
<td>Videos back up</td>
<td>Pass</td>
<td></td>
<td>1-12-2014</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>15</td>
<td>Install video viewer to laptop</td>
<td>Installation successful</td>
<td>Installation successful</td>
<td>Pass</td>
<td></td>
<td>1-18-2014</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>16</td>
<td>Point</td>
<td>Storage</td>
<td>Storage</td>
<td>Fail</td>
<td>Network</td>
<td>1-18-2014</td>
</tr>
</tbody>
</table>
video viewer app to central storage | found | not found | storage not configured
---|---|---|---
5 | 5 | 17 | Storage found | Can not connect | Fail | User does not have permission | 1-19-2014
5 | 5 | 18 | Storage found | Storage found | Pass | | 1-19-2014

**Budget**

The budget for this project for Super Sam is $1500.00. It is similar to the other two locations. The cost of the GV-800 Video Capture Card is $300 dollars. The cost of each camera is $40 each and with 12 that comes to $480. 150 feet of BNC cables cost about $14 and need 12 with total $168. Other costs that are added are an external hard drive for backups (750 GB) that cost $90. There is a larger internal hard drive (2 TB) for the PC that cost ($90). The total cost comes to $1128. The budget does not include the cost of the PC, battery backup, and the router these are the things that the things the business already had.

**Timeline**

Below is the Gantt chart as shown below in figure 5.
September: Research different security system options.

October- November: Find a supplier and ordered the parts that were needed. Also planning where to install the cameras. The quantity of cameras needed and run the wires through the drop ceiling to the back office. I ordered the static IP address from Cincinnati Bell and the technician came out and set it up. I configured the router to the static IP address. Made sure current system that used the Internet such as the ATM, credit card terminal, EBT terminal, and lottery terminal worked properly. Some of the systems had issues but reconfiguring them fixed it.
December: Taught the user how to use the system such as how to view videos, edit, and burn files to DVD. I tested the system to see if software is running smoothly, add cameras, reposition other ones, and add storage.

January: Started to setup the back up, mobile and web view, and setup the laptop for mobile view. Did system testing and fixed the problems that came with setting them up and made sure it ran successfully. Taught employees how to use the laptop terminal.

Talked to Ketan Patel and showed him the setup to see if he would like to have the system at his business and agreed to test out in two of his business.

February- March: Set up system at the other two locations. Do system testing. Teach owner and managers how to use the system.

Conclusion

The GeoVision DVR Software meets the business needs in terms of scalability with cameras and storage. Also, with viewing live feed on mobile devices, the owner knows what is happening at the business in real time. The project is can be applied to different types of small businesses and they can have the peace of mind that their business has a surveillance system they can count on all at an affordable price.

Lessons I learned from this project is that it takes time to do research and planning. You have to find the best technology that fits the business need and you have to learn to work with the budget you have learn where to make sacrifices and meet the dead line with the working deliverables and also educating the user turned out to be a big step in its own since not everyone is computer literate.

Future Recommendations
If I had all the money in the world I would build the system from scratch. Not just use the system that the business already had. Also use cameras that can do 1080p recording and use wireless ones with Ethernet redundancy. Install additional cameras in each aisle. Have storage server that can hold those recording and use iPads for the employees view on what is going within and outside the property of the business.
Works Cited


