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FUNCTIONAL DESIGN AND SPECIFICATION FOR PLANT SECURITY AND SURVEILLANCE SYSTEM

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Abstract

The Plant CCTV will provide the plant operators with an overview of the important parts of the power plant. This will help them to identify any major mechanical problems. The system will also be used to identify and track any intruder who may have broken into the premises. As per the CCTV System architecture, the system will be available for monitoring in the CCR, CHP Control room and security room at service building. IP Camera based CCTV System shall be provided for Plant CCTV System. All cameras of plant CCTV system shall be connected to Industrial Ethernet switch for transferring cameras video signals. The system shall be provided with redundant UPS Power supply. The power supply provision shall be such that on failure of one power supply the other power supply shall cater to the requirement of the equipment so as never to hinder the functioning of the system in any manner due to power supply failure.

***Keywords*:**Plant CCTV, Camera, Visualization, Intruder.

1 INTRODUCTION

In the recent trend the CCTV system has come into great advance and use. The system solves many security problems and provides great surveillance system in a factory, power plant or any other industry. The developing system provides a system which is integrated with three different systems, they are, the surveillance system, the access control system and the video monitoring system.

The developing system will identify and generate an alarm if any such invalid intruder gets into the power plant and try to get access in it.

The IP based CCTV system shall be provided for Plant CCTV System. All cameras of plant CCTV system shall be connected to Industrial Ethernet switch for transferring cameras video signals.

The system shall be provided with redundant UPS Power supply. The power supply provision shall be such that on failure of one power supply the other power supply shall cater to the requirement of the equipment so as never to hinder the functioning of the system in any manner due to power supply failure. Communication with the VMS shall be tightly restricted. Each VMS host server shall be deployed behind a standard and LAN/WAN security firewall, benefiting from the virus and malware protection software and other encryption and intrusion defenses in place on that network.

The VMS shall support multiple levels of user and administrator password authentication and privileges management to control access to the system. Each VMS shall keep a running log of all user access. These logs shall be retrievable by authorized administrators, but no user shall be able to remove entries from a log. The VMS shall distribute notification of alarms to clients who have requested notification. All video associated with the alarm shall be displayed automatically on receipt of an alarm.

When an alarm occurs in the security or control system server, the live video output of the camera associated with that alarm shall be switch directly to an alarm monitor. The user shall be able to acknowledge the alarm to clear the monitor using the numeric keypad.

Cameras that are directed to alarm monitors will not be

removed from the queue unless explicitly cleared by the operator. It shall be possible to create a queue of alarm monitors to manage multiple alarm view simultaneously.

An alarm monitor shall be available at the end of alarm monitor queue to cycle the camera views from acknowledged alarms if the number of cameras to view exceeds the number of alarm monitors. Once the alarm monitor queue is filled any new alarm will be placed in the queue relative to its priority and time of occurrence. Existing activated alarm camera views shall reshuffle to accommodate the new alarm in the event that all the available alarm monitors are used the oldest active alarm cameras shall be added to the cycling alarm monitor. The alarm views shall cycle on this final alarm monitor until acknowledged and cleared by an operator in the event of multiple alarms added to this monitor.

2 LITERATURE SURVEY

In this section, different methods of video surveillance system are described and they are as follows:

- **A system design for surveillance systems protecting critical infrastructures:** Basic foundations are alluring focuses for assaults by interlopers with various unfriendly points. Present day data and sensor innovation gives capacities to identify such assaults. The target of this work is to diagram a framework plan for observation frameworks went for assurance of basic foundations, with the attention on early risk location at the border of basic foundations. The diagram of the framework configuration depends on an appraisal of partner needs. The necessities were recognized from interviews with space specialists and framework administrators.

  The framework outline of the surveillance framework and the client necessities as far as capacities were then decided. The outcome comprises of the framework outline for observation frameworks, containing the frameworks abilities, the framework structure, and the frameworks procedure. The result of the work will have an effect on the usage of the

observation frameworks as for the sensors used, the sensor information calculations and the combination procedures.

- **Video Surveillance Systems :** In this paper, the authors have reviewed of many existing video surveillance systems. With the developing amount of security video, it winds up crucially that video surveillance framework have the capacity to help security work force in checking and following exercises. The point of the observation applications is to recognize, track and characterize targets. In this paper is portrayed question demonstrating, movement investigation and change discovery. In this paper a plan of our video observation framework has additionally been depicted.

  Video surveillance systems are widespread and common in many environments. Video surveillance has been a key part in guaranteeing security at airplane terminals, banks, gambling clubs, and remedial establishments. All the more as of late, governments offices, organizations, and even schools are moving in the direction of video observation as a way to expand open security. The capacity of removing moving items from a video grouping is a basic and vital issue of these vision frameworks. For systems using static cameras, background subtraction is the method typically used to segment moving regions in the image sequences, by comparing each frame to a model of the scene background.

- **Automatic Alert of Security Threat through Video Surveillance System :** Close Circuit Television Camera (CCTV) has played very important role in many surveillance and security systems. However, such framework requires nonstop observing by human and consequently there is plausibility of disappointment in view of weariness or weakness. The prerequisites of nonstop checking can be abstained from utilizing sensor frameworks which can alarm the human on the event of undesired occasion.

  By breaking down the captured video, data about the danger and cause can be acquired rapidly and precisely keeping in mind the end goal to take alleviating activities. However, in the absence of light, camera cannot detect such

threat. This paper reviews different approaches for detecting object and its motion, tracking of object and activity analysis in order to prevent adverse consequences. It additionally proposes procedure to enhance the security of Nuclear Power Plant utilizing existing methodologies with proper adjustment.

- **Survey Paper on Smart Surveillance System:** This paper deals with the survey of Smart surveillance monitoring system using Raspberry pi. Video Surveillance is imperative to the extent security is concerned nowadays. Business spaces, schools and healing centers, stockrooms and other testing indoor and open air conditions require top of the line cameras. The present advances require RFIDs which are exorbitant and subsequently the security space in all ends up costly and consequently there was a need to chip away at this.

  This paper describes the use of low cost single on board computer Raspberry Pi. This new innovation is more affordable and in this venture it is utilized as an independent stage for picture preparing. It builds the utilization of versatile innovation to give fundamental security to our homes and for other control applications. The proposed home security framework catches data and transmits it through a 3G Dongle to a Smart Phone utilizing web application Raspberry pi.

3 MODULES OF THE SYSTEM

The system has three modules, they are as follows:
a. The DSS Surveillance System
b. The Access Control System
c. The Video Monitoring System

a. The DSS Surveillance System : It is based on DSS platform is a software for user to manage DSS and it has the following functions:
i) Multi-device, multi-channel real time monitoring and record

playback
ii) Local snapshot, record mark and etc. of playback record.
iii)E-map function allows user to position the device at any time.
iv) Audio intercom allows client to communicate with front-end device and broadcast.
v) Video intercom, remote unlock and talk.
vi) Easy management and Control TV Wall display synchronously.
vii)Customize monitoring plan and supports multi-channel/window video tour.
viii)Alarm activation with alarm video.
ix) Mouse simulating rocker to control PTZ. Fisheye and speed dome link.
x) Access control, alarm controller arm/disarm. Behavior analysis, people count, heat map.

b. The Access Control System : It is integrated with the Third Party CCTV system. All ACM controllers are connected in event up loader mode. The Transaction data is pushed through APIs. Whenever any event takes place, the related data will be transferred to the Third party CCTV system through TCP or Signal R. SignalR is a library for developers that simplifies the process of adding real-time web functionality to applications.

c. The Video Monitoring System : It is deployed along the entire length of fence /boundary of the power plant and all the entries and exit gates. System will be capable of providing 24 hour continues surveillance using cameras, VMS and Video Analytics features of the system. System will have analytics features implemented for motion detection and identifying the intruders based on various rules and filters configured in the system. Alarms would be raised based on the system configuration.

4 SYSTEM ARCHITECTURE

Our developing system architecture consists of the following parts :

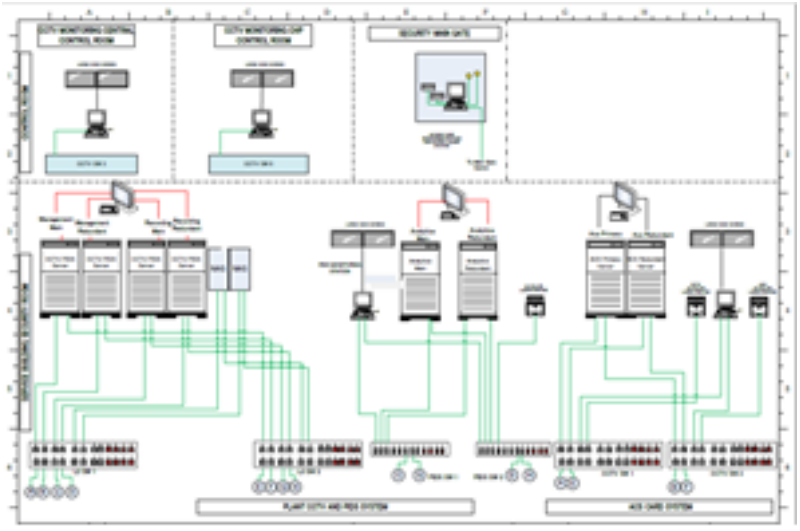

Figure 1: System Architecture

a. Layer 2/ Layer 3 Manage Switch: Layer 3 switching functionality to move data and information across networks (IKS-G6824A series). Command line interface (CLI) for quickly configuring major managed functions.

Figure 2: Manage Switch

b. Industrial Ethernet Switch : The EDS-510E Gigabit managed Ethernet switch is designed to meet rigorous mission

critical applications, such as factory automation, ITS and process control.

Figure 3: Manage Switch

c. Server : The powerful and reliable PowerEdge T430 two-socket tower server delivers performance, expandability, and quiet operation to office environments. The PowerEdge T430 is an excellent fit for a wide range of office workloads.

Figure 4: Server

d. Network Array Storage : The Dell Storage NX3230 is a

capacity dense, dedicated network-attached storage (NAS) solution integrated with advanced file-sharing software designed to help smaller offices stay efficient and productive.

Figure 5: Network Array Storage

e. Workstation PC : The OptiPlex 7020 business-class desktop delivers essential performance, security and manageability features to match your productivity needs.

f. A3 HP Color LaserJet Printer : The HP printer would be used by the operator if there is any such emergency to make a print out of any image captured and if there is any such need of getting a copy of the access card details.

5 IMPLEMENTATION OF THE SYSTEM

a. DSS System : The DSS System consists of the many parts ,one of its main part is Master and Slave server, where Master server is the only controller which manage data, device and dispatch other distribution work. In the system, only master server will enable database mysql server, tomcat and CMS and etc. Role of distribute server includes device management + video media transfer +video storage, only enable corresponding function services, such as DMS, MTS, SS, ARS, PCPS and etc. The entire system has only one port to user which is master server IP

Figure 6: Printer

address.

b. Event Notification System : External applications that require receiving event data from iQ Series can receive this information as alarm output data or Notification data. This data/information is sent via simple TCP/IP socket as XML data. In order to receive this notification the recipient application can build their own PORT LISTENING application and obtain data that is sent through specific ports.
This data can be used by these application for their own data manipulation or show in their own UI.iOmniscient disclaims any express or implied warranty, relating to sale or use of information including product liability or warranty in relation the external third-party application using this SDK. It is assumed that iQSeries application is installed in the same network as the receiver. The configurations like IP Address of receiver, port number without firewall are all setup and ready. Notification is enabled in the logical camera setting using the iQ Series Client application.

Following are the XML Codes for generating the alarm notification via the system :

2011/11/10-12:38:22:595
<?xml version="1.0" encoding="utf-16"?>
<Alarm xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:type="AlarmInfo">
<AlarmCamera>
<CameraID>4</CameraID>
<ServerID>22879138</ServerID>
<ProductType>5</ProductType>
<CameraDescription>Objectdetsensit</CameraDescription>
</AlarmCamera>
<AlarmID>2537</AlarmID>
<AlarmType>1</AlarmType>
<TypeDescription> Object </TypeDescription>
<AlarmTime>2011-11-10T12:38:22.577</AlarmTime>
<JTEAlarmTime>2011-11-10T12:37:17.577</JTEAlarmTime>
<FilterArea>Aoi</FilterArea>
<FilterType>SizeandAspect</FilterType>
<FilterName>Bag</Filtername>
<ColorFilterType>Allow</ColorFilterType>
<ColorFilterName>Black</ColorFilterName>
<Bounding_Box>
<Point1>
<X>10</X>
<Y>132</Y>
</Point1>
<Point2>
<X>26</X>
<Y>132</Y>
</Point2>
<Point3>
<X>26</X>
<Y>148</Y>
</Point3>
<Point4>
<X>10</X>
<Y>148</Y>
</Point4>
</Bounding_Box>
<ImageUrl> http://10.1.1.59:80/Images/22879138_2537.jpg</ImageUrl>
<VideoUrl>http:// 10.1.1.59:80/GetVideo/22879138_2537/6pmOb94U0</VideoUrl>
<AlarmImage>jpg</AlarmImage>
</Alarm>

Figure 7: XML code for Object Detection

c. Access Control System : Solus access control system can be integrated with the Third Party CCTV system. All ACM controllers are connected in event up loader mode. The Transaction data is pushed through APIs. Whenever any event takes place, the related data will be transferred to the Third party CCTV system through TCP or Signal R. Purpose of Access card

```
<!ELEMENT Alarm (AlarmCamera+, AlarmID, AlarmType, TypeDescription, AlarmTime,
JTEAlarmTime, FilterArea, FilterType*, FilterName*, ColorFilterType*, ColorFilterName*,
Bounding_Box+, AlarmImage)>
<!ELEMENT AlarmCamera (CameraID, ServerID, ProductType, CameraDescription)>
<!ELEMENT CameraID (#PCDATA)>
<!ELEMENT ServerID (#PCDATA)>
<!ELEMENT ProductType (#PCDATA)>
<!ELEMENT CameraDescription (#PCDATA)>
<!ELEMENT AlarmID (#PCDATA)>
<!ELEMENT AlarmType (#PCDATA)>
<!ELEMENT TypeDescription (#PCDATA)>
<!ELEMENT AlarmTime (#PCDATA)>
<!ELEMENT JTEAlarmTime (#PCDATA)>
<!ELEMENT FilterArea (#PCDATA)>
<!ELEMENT FilterType (#PCDATA)>
<!ELEMENT FilterName (#PCDATA)>
<!ELEMENT ColorFilterType (#PCDATA)>
<!ELEMENT ColorFilterName (#PCDATA)>
<!ELEMENT Bounding_Box (Point1+, Point2+, Point3+, Point4+)>
<!ELEMENT Point1 (X, Y)>
<!ELEMENT X (#PCDATA)>
<!ELEMENT Y (#PCDATA)>
<!ELEMENT Point2 (X, Y)>
<!ELEMENT X (#PCDATA)>
<!ELEMENT Y (#PCDATA)>
<!ELEMENT Point3 (X, Y)>
<!ELEMENT X (#PCDATA)>
<!ELEMENT Y (#PCDATA)>
<!ELEMENT Point4 (X, Y)>
```

Figure 8: Object Intrusion

system is to control access to all vital areas within the important plant buildings by electronic card reader system. Access Control System shall be common for two units of the plant and shall be provided with individual configuration of access rights via access control software for controlling access to different locations.

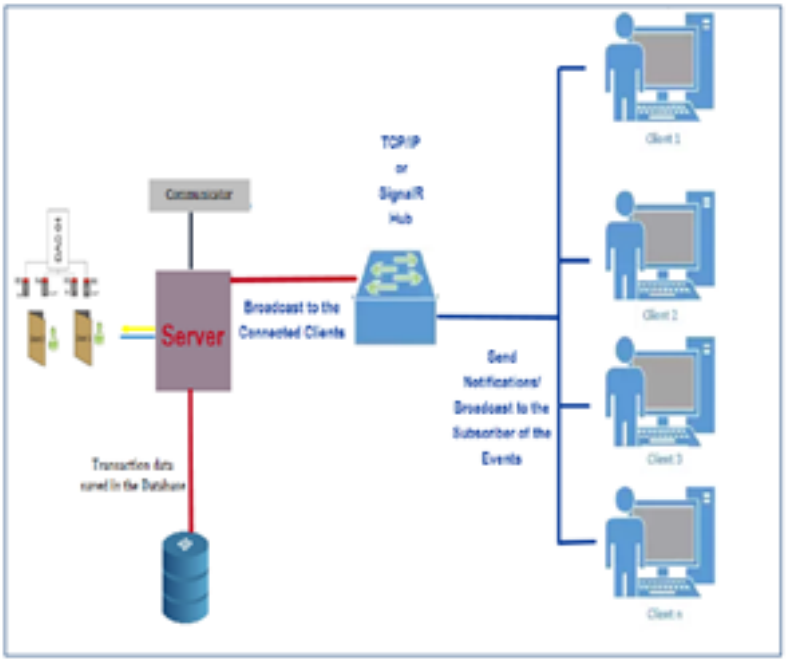

Figure 9: Architecture of ACS System

d. Video Management And Video Analytics System : DSS is a flexible, scalable, high reliable and powerful central management system. Integrating with multiple surveillance systems, DSS provide the central management, information sharing, convenient connection and multi-service cooperation. It is capable of managing devices, live view, storage and playback, alarm linkage, at the same time, DSS also support POS, VDP, ITC.

6 RESULTS

After completing all the steps of the configuration of different systems together, an application is being developing with the help of which the operator can keep the record of the alarms generating.

7 CONCLUSION

Security threat in sensitive work premises is largely connected with human entryin different profiles at the installation. Effective Security Management in a large enterprise with multiple locations is a challenging task. And even more challenging where thousands of Employees receive several visitors including vendors, contractors and VIP customers at times.
System is capable of integration with other subsystems such as CCTV or Visitor Management Systems, so that vital alerts generated by system can be investigated and responded without any time loss. All reports related to Contract workers and management of the contractors involved can be done through this module. The modules talks with the devices as explained in the technical functionality, and all report scan be gathered in real time.

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