Research on the Design and Implementation of Video Surveillance System Based on WiFi-Mesh Network

Wang Weiqiang[1, a]

[1] Chongqing College of Electronic Engineering, China

[a]wwq0109@126.com

Keywords: WiFi-Mesh Network, Video Surveillance System, Design, Implement

Abstract. This thesis proposes a new wireless video surveillance system implementation, using Wireless Mesh Networks(WMN) as the data bearer network, using VLC video server to build the video transmission and preservation solution, using SD card to save the historical surveillance video and building an FTP server for the client to get access to these videos. The design combines the structural flexibility, strong coverage, multi-hop short-distance high-speed transmission capability of the wireless mesh network with the excellent video streaming technology, video codec processing capabilities of the VLC video server together. This should greatly enhance the extensibility and scalability of the video surveillance system.

Introduction

Due to the structure of rigid cellular telephone long-distance wireless communication system used by the unstable signal transmission quality and thus not suitable for high data rate applications. The traditional wireless local area network (WLAN) due to the need for a core node as a network access point, making the network structure is simple, the whole network is not redundant design, which will inevitably lead to a network access node become the bottleneck of the entire network, once the network access node paralysis, the entire wireless network cannot communicate properly. While WLAN transmission distance is short, it is difficult to achieve long-distance communications expansion. WiFi-Mesh network using wireless ad-hoc form, between the central node does not need to build the network, each node network access and routing functions, the node can direct peer communications, while node also can forward data from other nodes, thus forming a grid-like network. Because each node has a routing function, data can be multi-hop transmission on the network, which makes WiFi-Mesh network has a strong coverage and scalability. Configure the bridge and gateway capabilities Mesh router can easily make WiFi-Mesh network and existing networks, such as cellular networks, wireless sensor networks, Ad Hoc networks, wireless local area network or the Internet merging [1].

WiFi-Mesh networks can be used in homes, businesses, schools, hospitals, more remote location of tourism and leisure venues as well as some places require rapid deployment and temporary installation, the application prospects. International Organization for Standardization is also active in the development of WiFi-Mesh networks norms and standards such as IEEE802.11, IEEE802.15, IEEE802.16, etc. have set up a special working group to focus on the Mesh network standard. We believe that studying these norms and standards and will greatly promote the development of WiFi-Mesh network instance applications and wireless Mesh network also will bring people's online life richer experience.

The Construction of WiFi-Mesh Networks

OLSR Routing Protocol Mechanism. OLSR protocol also provides support for multiple network interfaces, established within an interface table, used to record the correspondence between the primary interface for each node addresses and other interface address, regular interactive interface control information between the nodes, so that you can OLSR well applied in multiple network interfaces environment. When an interface is not used OLSR communications, and for communication with the external network, OLSR provides external network information

notification mechanism, so that the nodes can own external network information and it will inform other similar nodes, which often act as a gateway node , achieve interworking with external networks. It also makes OLSR can be a good Internet network integration, to achieve good application extensions [2].

Also in order to reduce the time topology information and multi-interface control information exchange network protocol data load, OLSR protocol defines a multi-hop relay (Multipoint Relay, MPR) node, a node that is able to cover all neighboring nodes, at least 2-Hop neighbor nodes nodes in the cluster nodes; and this node with respect to the multi-hop relay nodes are called multihop relay node select node (Multipoint Relay Selector, MPRS). Here that the cover is meant to reach, means that all node reaches its neighbor nodes and 2-Hop neighbor node through these limited RN. Topology information and multi-interface control information is only between the MPR and MPRS node transfer, thus greatly reducing the data dissemination protocol in the network.

The Establishment of WMN based on Olsrd. To build a WiFi-Mesh network must first put olsrd run up on the node, because OLSR already have the characteristics of self-organization, as long as the routing protocol up and running, you can get information between nodes neighboring node through the exchange hellomessage, and mutual exchange of messages through the topology advertise itself known network topology, network topology eventually get the whole network; each node will calculate the route according to their topology table, build their own routing table. To be able to run on the nodes olsrd up requires the following three steps: cross compiler, protocol configuration and runtime environment generates.

(1) cross-compiler to run olsr routing protocols in the embedded environment, you need to cross-compile the source code to generate energy to run the executable file in the embedded development board. There are top-level directory in the source code of a makefile.inc file, which is defined in the makefile need to use local variables, the inside of the CC that is arm-linux-gcc cross-compiler that is compiled tool chain, and then run make command can be a top-level directory. You will eventually get an executable file named olsrd at top-level directory.

(2) protocol configuration to run olsrd olsrd also need some configuration, olsrd configuration items can be in the top-level directory / files folder beginning olsrd.conf to the file, which olsrd.conf.default.full file contains olsrd All configuration items, which contains a set of protocol port, basic functions, external plug-ins, and network interfaces, and can be copied and then according to the actual situation.

(3) The operating environment will need to generate Olsr run the appropriate file into the specified location, you first need to put the node configuration file olsrd.conf root file system / etc directory; olsrd-ipv4.lock olsrd due to the need to prevent a unified runtime node olsrd simultaneously run multiple programs, so you need to create olsrd-ipv4.lock file in / var / run / down; and finally just need cross compiled olsrd files are copied to the root file system node can run inside. When the node configured network interfaces, the mode is set to Ad hoc, then a background process mode olsrd, so that the nodes can interact agreement, continue to build their own global routing information table to obtain the entire network topology map so that nodes can normal network traffic within the network-wide. Since the topology information exchange between nodes take some time, so when the application should be in agreement after a period of time the program starts pause time to run their own applications [3].

The Implementation of Mesh Network Video Surveillance System

There are three main nodes in the system: video capture node, a wireless gateway nodes and monitor client node. The whole system there are wireless networks and WiFi-Mesh network combination, a wireless network nodes running OLSR routing protocol, nodes form WiFi-Mesh network through information exchange, each node can transmit data to other nodes, and each node also have basic video capture capabilities is the terminal node. Monitor client node in a wired LAN, connect and wireless access to the same router gateway node via twisted pair.

(1) Video capture node. The video capture node hardware is consisted of the USB camera, USB wireless adapter and embedded system development plate. On the VLC video server-based software

to build their own video servers, which use VLC for video capture devices to achieve control, to complete the save function, etc. as well as video push, while achieving and monitoring client orders to interact by controlling the interaction protocols.

(2) Wireless gateway node. In order to achieve the integration of wired and wireless, this paper wireless and wired gateway node in the same node as for the wired network, a wireless gateway node communicate via a wireless network interface and wireless network nodes, constitute part of the wireless Mesh network At the same time through the same cable network interface with a wired network. Such a wired network monitoring node can get the data in a wireless network each node through these gateway nodes. At the same time because the monitoring node and other nodes in the same wired network cable, the monitoring node and can easily get the data wired nodes.

(3) Monitor the client node. Monitor client node through interactive protocol to request and receive video capture node coming video information in a timely manner to the monitor screen display for reference monitoring personnel to watch. At the same time, through the interface operation, monitoring the client node to the video capture node can send control information in order to achieve control of the node. In the design, monitoring node to set up the Windows operating system-based PC, through the monitoring system to achieve the reception, display and control the interaction of information.

The Implementation of the Video Service Control Protocol

Video service control protocol (Video Service Control Protocol, VSCP) is mainly used to control commands and monitoring video capture node between the client interaction. System, video capture node and monitor client interaction is used in client / server mode, the video capture node as a video server, monitoring client as the client sends a request to implement the protocol monitor field point.

Protocol requests mainly refers monitor client requests sent to the video capture terminal. The main function is to monitor client acquisition and display field point of video information, and because the network bandwidth limitations for real-time video transmission nodes can not be too much at the same time; and because the monitor client community purpose real-time display field limit the number of points, you can not real-time video information for all field points simultaneously displayed on the monitor screen, the number of field points simultaneously displayed on the monitor screen is a finite value in the network bandwidth and monitoring interface size balanced consideration of two factors. That is to say, under the supervision of field points too much, it is necessary to turn the page on the monitor client interface system to achieve the monitoring of all field points. Well, in this action is implied visual field of non-point video transmission interface is closed. Therefore, the client should send a video monitor shutdown request [4].

Collection node is the base node of the system, is responsible for collecting video information field point, save and monitor the receiving end of a command, analysis, response, transmission of video information will be given to VLC video server to control. Here the acquisition nodes collectively referred to as video service system. Video server system in the form of server monitoring client accepts client connections, the connection is established to monitor the client receives a command request, and then parse the command and call the appropriate module to complete a service request to monitor the client.

The Design and Implementation of Monitoring Client

Monitor client is client terminal video surveillance system, customers get to the field point to watch the video information through a terminal interface system, but also on the video capture node video playback control buttons on and off via the interface control, and in order to achieve a large number of field points monitoring requirements, in the interface system supports screen flip function, and when the network is not good can be achieved sentinel watch, specify the video information in a single point of view. Extraction of the history of video information accessed

through third-party FTP client software, video capture node of the video in the form FTPserver provide external information resources, monitor client through any third-party FTP client input node addresses and corresponding services port numbers can browse and download history video information. So, for browsing and extracting features documented history of video information is no longer to make a specific presentation [5].

Conclusions

At present, the research and application of WiFi-Mesh networks is in full swing, as building a wireless Internet network technology, WiFi-Mesh network has the advantages that other conventional wireless communication network unparalleled. Multi-hop, self-organization are its most prominent two characteristics, these two features bring it with a flexible network structure and layout, a multi-level network protocol for the line, multi-hop low interference caused by short-distance transmission high-speed transmission capacity and strong wireless coverage.

References

[1] Xun Zhu: Intelligent Systems and Applications, Vol. 6 (2014) No 53, p.1-6

[2] C.E.Perkins: Computer and Network, Vol. 12 (2005) No 27, p.74-76

[3] E.M.Royer: Mobile Computing Systems and Applications, Vol. 1 (2006) No 33, p.11-14

[4] E.Belding-Royer: Guangxi Normal University, Vol. 3 (2007) No33, p.121-124

[5] Hongtao Deng: Distance Vector Routing, Vol. 12 (2003) No37, p.59-63