APPLICATION OF IP MONITORING
IN THE SUPERVISING SYSTEM OF A BUILDING

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Summary. Thanks to the development of modern technologies in the electronics field it is possible to directly connect the camera to computer networks. The purpose of this solution is to display the images from cameras installed in the object being monitored. Therefore, we can watch the image from any camera by means of any computer connected to the Internet or the telephone situated in GSM network range. The camera is provided with network interface and with assigned individual IP address or uses a domain with corresponding redirection of ports. No cabling is necessary for monitoring if WiFi radio transmission is used but the camera should be situated within WiFi network range and provided with power supply.

Key words: WiFi networks, IP camera, monitoring

INTRODUCTION

IP monitoring uses Internet devices; every device is provided with an IP address assigned in a static or dynamic manner. This address consists of a series of digits separated by means of dots (4 groups containing 3 digits each or 5 groups containing 3 digits each in new systems). All devices working in the network are identified on the basis of their assigned IP addresses. If the devices working in the network are provided with statically assigned IP addresses and with the corresponding software, their remote operation is possible from any location by means of the search engine.

Owing to limited number of IP addresses and to the fees associated with the static address, they are dynamically assigned by many service providers to DHCP (e.g. Internet network Neostrada TP). In such case it is difficult to localize the devices with variable address and for this purpose we can use a domain enabling the localization of the actual IP address of our router. The domain is defined as an unique string (universally unique identifier) precisely identifying IP address of our router. In order to use this opportunity we have to register the domain on one of DNS servers and to enter the relevant data into the router thereafter. After entering the domain name and password into our router, the redirection to IP address assigned to our device will take place after the domain name entry into the search engine.

The study presents the manner of configuration for the router and IP cameras in order to create the system monitoring a residential building. The building is connected to Internet network by means of Neostrada TP link with variable IP address.

Vigor DrayTek 2820Vn has been applied owing to stable operation and advanced configuration menu i.e. ADSL router. The router has been integrated with FI8916W and FI8905W IP cameras manufactured by Foscam and equipped with LAN and WLAN interface. FI8916W camera designed for indoor installation is provided with built-in loudspeaker and microphone and FI8905W camera is designed for outdoor installation. The both cameras are equipped with diode infrared radiators to enable the monitoring in complete darkness.

The layout diagram for the monitoring is illustrated in Fig.1.
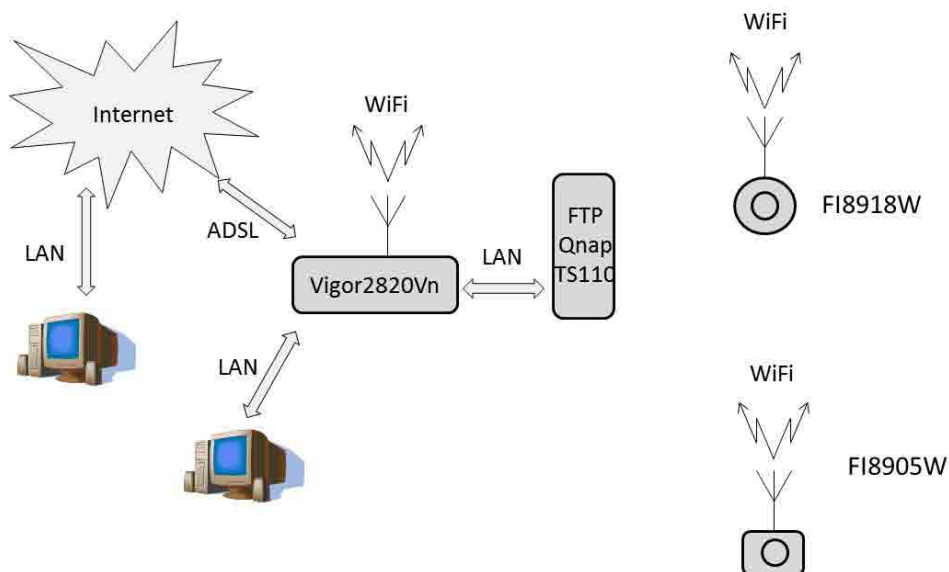
Fig. 1. Hardware structure for Internet network including WiFi cameras.

Figure 1 illustrates the hardware structure used for the creation of the object monitoring system. The system consists of the following components:
- ADSL Vigor2820Vn router,
- five (5) FI8918W indoor cameras,
- three (3) FI 8905W outdoor cameras,
- FTP Qnap TS110 server,
- PC computers in the internal and external Internet network.

The cameras are connected with the router via WiFi radio network using WPA2 encryption and MAC filtration as the data transmission protection.

CAMERA CONFIGURATION

The camera configurations have been carried out by means of Internet Explorer as the search engine and IP Camera Tool program. The program makes it possible to detect IP cameras which are initially connected with operating router by means of a cable. After the starting of IP Camera Tool program, the window is displayed (Fig. 2); this window contains IP addresses of all cameras con-

nected to our router. Having selected the correct camera we have to perform its configuration to enable easy detection of and connection with the camera.
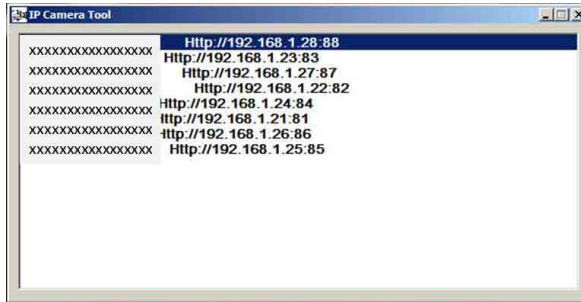

Fig. 2. Program window used for IP cameras searching

The first step of the camera configuration is the setting of administrator password. Figure 3 illustrates the configuration menu window enabling the change of the camera administrator password and addition of the new users.
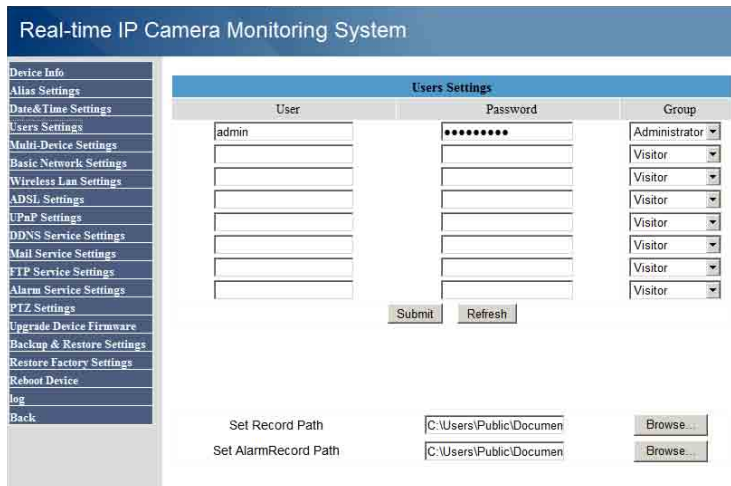

Fig. 3. Menu window for camera users

After the setting of administrator password, the assignment of the static IP address and port has been commenced. It should be emphasized that the camera IP address setting should be included in the router addresses pool assigned dynamically to DHCP and that the port should not be used by other devices in the network. The settings for the address and port are illustrated in Fig. 4.

Fig. 4. Window containing the camera IP address settings menu

The next phase consists in the setting of WiFi radio interface between the camera and router. Therefore we have to open Wireless Lan Settings tab between the camera and router and to find the radio networks as well as to select our network and to enter WPA encryption password thereafter. If MAC filtration is activated we have to enter mac-address of the camera into router menu and to enable radio connection with the camera. An example of WiFi network in camera is illustrated in Fig. 5.
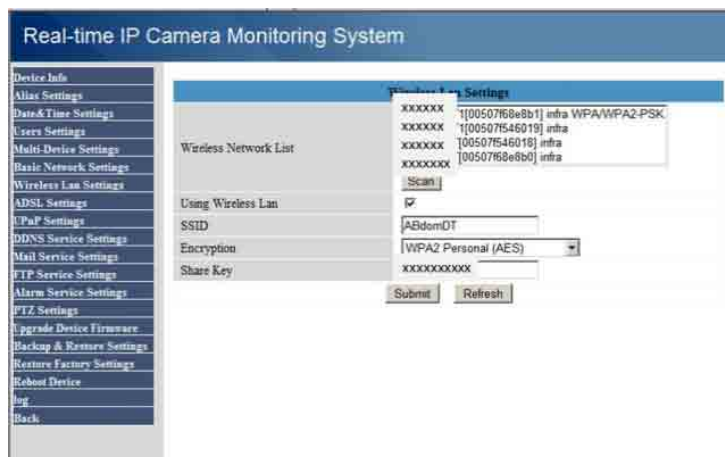
Fig. 5. Window containing the settings of wireless WLAN network

An image can be transmitted and recorded by the camera in case of movement detection in its field of view. Additionally the camera activates a sound signal informing the operator about the zone infringement. Furthermore it is possible to transmit the pictures from the camera to E-mail address or their registration on FTP server. The configuration of E-mail service is illustrated in Fig. 6 and FTP server configuration in Fig. 7.

Fig. 6. Configuration of E-mail account for the transmission and receipt of pictures recorded
by the camera at the time of zone infringement

Fig. 7. Configuration of the account on FTP server for the transmission and receipt of pictures
recorded by the camera at the time of zone infringement

In order to enable the transmission of the pictures by the camera in case of detected move-
ment, it is necessary to set the camera sensitivity and the sequence of the transmission of the pic-
tures. Additionally it is possible to set the time of picture recording by the camera. An example of
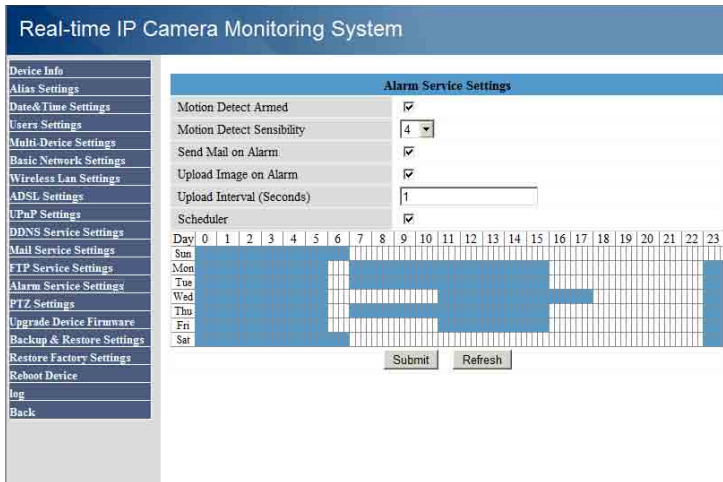settings for the camera is illustrated in Fig. 8.

Fig. 8. Settings for alarm and sequence of the transmission of pictures at the time of zone infringement

ROUTER SETTINGS

After these settings the camera will be visible in internal network and will send recorded pictures to the E-mail address and will record them on FTP server. In order to enable the access to the cameras from the computers connected to the external network, it is necessary to set the domain and to redirect the ports to IP addresses. An example of settings for the router is illustrated in Fig. 9.
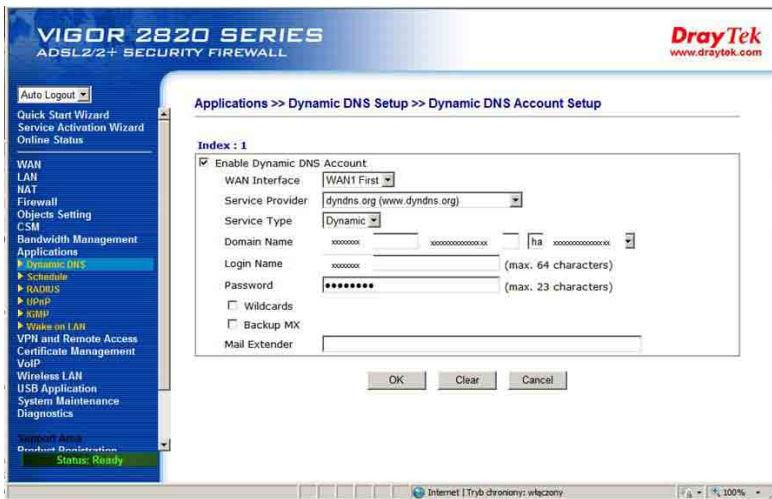

Fig. 9. Domain setting in router menu

Having redirected the ports (Fig. 10) we can watch the situation in the object being monitored in real time.
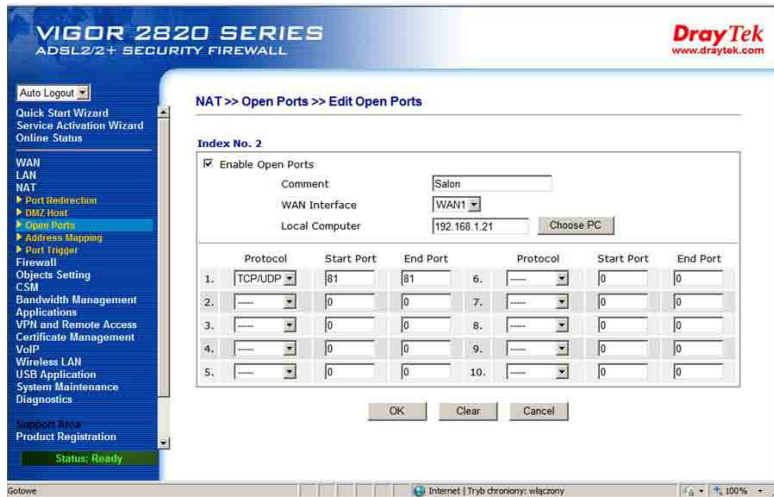

Fig. 10. Ports redirection window

IP cameras manipulators windows are illustrated in Fig. 11 and 12. The purpose of virtual manipulator of an indoor camera is to enable its rotation towards the object we want to watch. The manipulator can serve nine IP cameras simultaneously.
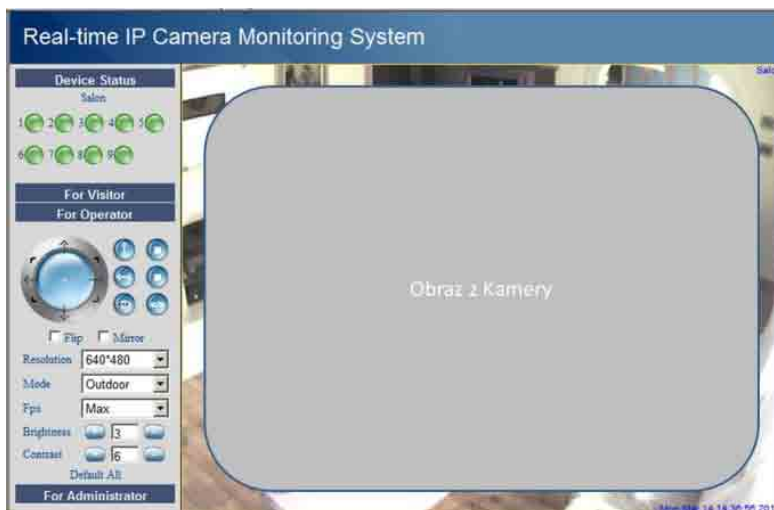

Fig. 11. Indoor camera manipulator window
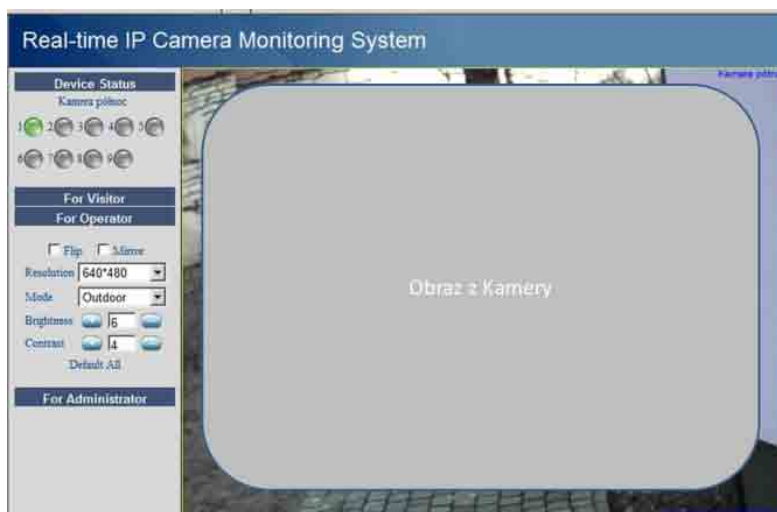OBRAZ Z KAMERY = Picture from camera

Fig. 12. Outdoor camera manipulator window
OBRAZ Z KAMERY = Picture from camera

CONCLUSION

IP cameras entering into monitoring systems eliminate the conventional cameras which have to be connected with the monitoring station by means of cables.

Owing to their unlimited capabilities created by the software of the cameras, it is possible to perform the monitoring from any location on Earth and to reproduce the record from the cameras at any place provided with the computer connected to Internet network.

The pictures can be sent by IP camera to specified E-mail address. Therefore the record can not be removed from the camera by the person infringing the zone being protected.

However there is an disadvantage of IP cameras, because they are completely dependent on the Internet network. They are unable to perform their role in case of Internet failure but the picture is recorded on local servers.

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http://www.draytek.pl/

http://www.foscam.pl/

ZASTOSOWANIE MONITORINGU IP W SYSTEMIE NADZORU BUDYNKU

Streszczenie. Rozwój nowoczesnych technologii z dziedziny elektroniki umożliwił bezpośrednie łączenie kamery z sieciami komputerowymi. Rozwiązanie to pozwala na oglądanie obrazów z kamer zainstalowanych w monitorowanym obiekcie, dzięki czemu mamy możliwość oglądania obrazu z dowolnej kamery przy pomocy dowolnego komputera podłączonego do internetu lub telefonu znajdującego się w zasięgu sieci GSM. Kamera wyposażona jest w interfejs sieciowy ma przydzielony własny adres IP lub wykorzystuje ona domenę z odpowiednim przekierowaniem portów. Jeśli korzystamy z transmisji radiowej WiFi to monitoring nie wymaga rozprowadzania kabli, wystarczy, że kamera będzie umieszczona w zasięgu sieci WiFi oraz będzie miała zasilanie.

Key words: sieci WiFi, kamera IP, monitoring