



# The Auto Negotiation Service Between Router and IP Camera Based on UPnP

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**ABSTRACT**—The IP camera is more and more common. How to manage numerous IP cameras is a relevant problem today. In this paper, we will introduce a solution to people who have a lot of IP cameras running at the same time. They can easily manage their IP cameras by this way.

## I - Introduction

IP camera (Internet Protocol camera) is a networked digital video camera that receives control data and sends image data over a local area network or the internet. The IP camera, like any network device, is assigned an IP address when it is connected to your router and powered on. Some of them require a network cable connection and some are wireless and transmit their packets via radio frequency signals over the Wi-Fi network. Users can access the IP camera by typing in a specific IP address with a web browser, a video streaming player or mobile application to watch the camera live stream, receive push alerts, and check the camera recordings and configure IP camera setting wherever you are.

## II - Background

Connecting an IP camera from your computer is easy. But the question now is; how do you manage multiple IP cameras from your computer?

The challenge is that when your IP cameras increase, you need to find a way to manage them effectively. You can set port forwarding rules on the router for your IP cameras one by one, or enable the UPnP feature on your router. When you need to access your IP cameras it's not easy to remember each of their IP address. And it should be a problem to easily access their configuration webpage or video streaming.

In this paper, we propose a solution called "The Auto Negotiation Service between Router and IP Camera Based on UPnP" that can display all IP cameras information in the router webpage. Users do not need to write down IP address of each IP cameras, they just need to type in the router's IP address with a web browser.

They can know the IP address, MAC address and device name of all IP cameras connected to this router.

## III - How Auto Negotiation Works

This Auto Negotiation Service between Router and IP Camera feature is based on UPnP technology. Users can connect to the web page of the IP camera by clicking the IP camera list directly on the router. This is illustrated in Fig.1.

192.168.0.150	000D0DA00731	EDS52008F_LOBBY	CONNECT
192.168.0.100	000D0DA0072A	EDS5200_VIPROOM	CONNECT

REFRESH

Fig.1. IP Camera List

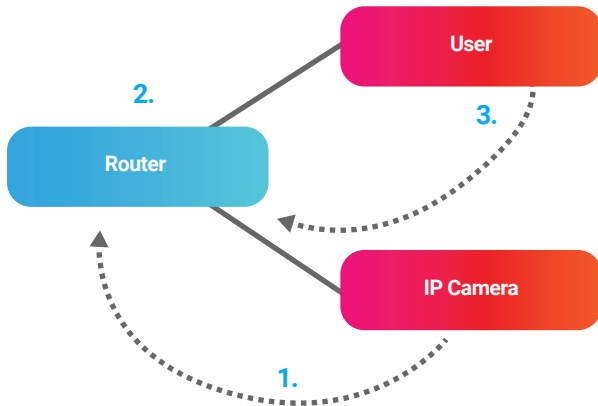


Fig.2. The router side works

#### IV - Conclusion

In this solution, when the IP camera power is on and connected to the network, this device can be found in the IP camera list of the router easily. By clicking the connect button, users can login on the configuration page of the IP camera and watch live streams. The router and the IP camera can negotiate to each other automatically.

#### A. Router side works

Once the router received UPnP probe packet, it can be recognized as an IP camera that supports auto negotiation

feature by looking up the UPnP description field. If the IP camera supports auto negotiation feature, the router will update its IP camera list. This is illustrated in Fig.2.

1. IP camera sends UPnP probe with specific description.
2. Port forwarding rule created by UPnP, and the router updates its own IP camera list
3. User access webpage of the router to get IP camera list

#### B. IP camera side works

The description field of UPnP probe packets contain the device name, MAC address, HTTP port, RTSP port, RTCP port, etc.

The IP camera sends out UPnP probe with specific description when power is on. When the setting of IP camera is being changed, the IP cameras will send out UPnP probes again to update its information on the router. Make sure that there is the latest information of the IP camera on the router.