

Tech Talk

With Bob Dolph

Addressing the Protocols Of Networking

Internet-connected appliances are starting to pop up everywhere. With leading appliance manufacturers such as GE making big plans for future growth in the security industry, it will only be a matter of time before Web connectivity will be everywhere. Technology and pricing barriers have been broken, making this a viable security option. This month, we are going to take a quick look at some network equipment connectivity tips, fundamentals and terminology (see *Diagram 1 below*).

Know the Basics of IP Cameras

Network-ready cameras connected to the Internet are located and controlled by way of an Internet protocol (IP) network address. These addresses are divided into classes A-E (See *Diagram 2*). Currently, IPv4 (version 4) is an IP network address number made up of four numerical groups separated by a period. A typical 32-bit IP address would look like 216.28.61.145, where each group represents an eight-bit binary number (28 or 0-255 decimal) called an octet.

You can quickly reference an IP address to its class by the beginning binary bits (0,1) or the address' decimal value (0-255). Two addresses

should not have the same number on the same network. The network part of the address identifies the network the device belongs to. The *host* or *node* part identifies the actual device. Notice the above IP address is class C and is typically assigned to a medium-sized business with the network address part being 216.28.61 and the device address part being the 145.

New Protocol Will Soon Increase Internet Capacity

The Internet currently has the availability of 232 -- or around 4 billion -- unique address locations. With the explosion of Internet devices in the past five years, this is not enough capacity.

The next protocol, version IPv6, now being rolled out worldwide, has 2128 -- or around 340 trillion trillion -- IP addresses. Due to its large address size, the new IPv6 address numbers can be represented as hexadecimal (16-bit groups) with colon delimiters. The above IPv4 address of 216.28.61.145 would convert to IPv6 ::D81C:3D91 (double colon mean leading null groups). To ease the confusion it could also still be represented as :216.28.61.145, similar to the IPv4 format.



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BOB'S TIPS

- A static IP address is needed for a reliable Internet connection.
- There should not be any duplicate IP addresses assigned on a network.
- IP version 6 uses colon delimiters; there is no IPv5.
- Utility program can help debug IP problems.

For now, we must use a process called *dynamic addressing* (DHCP) to make a limited number of IP addresses go around. When you log onto a network server or ISP (Internet service provider), an IP address is selected for your device from a preassigned set of addresses. It is then temporarily assigned to your PC or IP camera. This saves addresses by assuming not all devices are logged on the network all the time.

Use Stationary Addresses for IP Cameras

So what does all this have to do with IP cameras? For reliably locating a device on the Web, such as a camera, you need to have an IP address that is not dynamic, but stationary. This is referred to as a *static address*.

To help with this problem, there are a few things that can be reviewed. A static address can be assigned, but this will cost you; some camera manufacturers (www.mobotix.com) can provide a dynamic DNS service (www.dyndns.org), which allows you to alias a dynamic IP address to a static host name. Another choice is installing a network router between your LAN and the Internet.

Diagram 1 – Basic Network Terminology

IP Address	A unique Internet protocol IP address for devices on a network
MAC Address	A device address called the Media Access Control layer
LAN	A commercial or residential local area network
WAN	A wide-area network such as the Internet
Ethernet	A LAN utilizing twisted, coaxial cable or wireless devices
100Base-TX	100Mbps over two pair of data grade twisted-pair wire (Cat 5, 5E, 6)
DHCP	Assignment of changing dynamic addresses on a network
Static Address	An IP address that does not change on a network
Router	Smart switching device used to connect networks together

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Routers Can Track Dynamic Addresses

A router is a device that allows communications between two networks; in our case, the LAN with our cameras and the Internet. The router examines each packet of data and then decides from an internal set of instructions what to do with it. Routers can be programmed with options that allow them to track changing dynamic addresses and report back to the ISP. Some CCTV manufacture have suggested routers such as the NetGear RT311 (www.netgear.com) and the Proxim Netline 4S (www.proxim.com). As always, check with your IP camera manufacturer or distributor to see what they recommend.

Here are some utilities that can make life easier when setting up and trouble-shooting network devices like your IP camera: Microsoft® Windows 98SE, and later with WINIPCFG, which will show your IP and MAC addresses; Tracert, to trace your Internet connections; and Telenet, to communicate with the network device. The Web site www.network-tools.com has some very handy online utilities. I also recommend checking the network training material at ATV's (Advanced Technology Video) site at www.atvideo.com for more details on what has been discussed here.

Update on Last Month's 'pCAM'

Some of you have been asking where you can get the PDA CCTV lens calculator shareware program I mentioned in last month's column. You can either download it from www.securitysales.com or at the author's site of www.davideubank.com. It is free and the author asks to register it if you like it. Enjoy.

Diagram 2 – Internet IP Address Classifications

	0	8	16	24	Decimal:
Class A	0	Network		Host	0.0.0.0-127.255.255.255
Class B	1 0	Network		Host	128.0.0.0-191.255.255.255
Class C	1 1 0	Network		Host	192.0.0.0-223.255.255.255
Class D	1 1 1 0	Multicast			224.0.0.0-239.255.255.255
Class E	1 1 1 1 0	Reserved			240.0.0.0-255.255.255.255