

Troubleshooting Network Connectivity

A Guide to Identifying and Resolving Network Related Issues

Troubleshooting Network Connectivity

Often times you may run into issues when attempting to connect a foreign network device to your existing local area network (LAN) or access services outside of your LAN which are available to the rest of the Internet. This guide is meant to help you in identifying and troubleshooting these issues.

Networking Terminology

We'll start by getting you acquainted with some general networking terms.

- IP Address – Address that is assigned to each device on your network that is unique to each device. Written in the form of four octets separated by a period. (e.g. 192.168.1.101) *Note: No two devices connected to the same local area network should contain the same IP address.*
- Dynamic IP Address – Network address that is automatically received from your router (DHCP server) generally requiring no further network configuration. This generally includes IP address, subnet mask, default gateway, and at least one DNS server address (*see below for definition of additional terms*).
- Static IP Address – Network address that is manually assigned to a network device generally including IP address, subnet mask, default gateway, and at least one DNS server address. All addresses must be input manually. (*See “Determining Static IP Assignment” below.*)
- DHCP – Acronym for Dynamic Host Configuration Protocol. Allows a network device to automatically request it's network settings from your router (DHCP server) without any further network configuration in most instances.
- DHCP Range – An allocation of addresses within the router (DHCP server) that will be issued to network devices requesting a dynamic IP. *Usually ranges from either 192.168.x.2-100 or 192.168.x.100.254. Note: Static assignment should lie outside of the router's DHCP range.*
- DNS – Acronym for Domain Name Server. Allows a network device to resolve a hostname to an IP address. *For example: In order to access www.google.com (hostname), the network device must query a DNS server which contains a database of corresponding IP addresses/hostnames. The DNS server will then reply with the IP address of the queried hostname (www.google.com).*
- LAN – Acronym for Local Area Network. Consists of all devices physically connected to a network that are generally only accessible within the local network. Devices do not contain a publicly accessible IP address. *Usually consists of all device placed behind your router.*
- Router – Device used to allow all devices within your local area network to communicate with outside networks/services (i.e. Internet). *This device is generally connected to your broadband cable, dsl, or satellite modem.*
- Switch – Device used to physically connect multiple network devices often via a CAT5/6 cable. Data is sent directly from a single source port to a single destination port. *Is more efficient than a network hub.*
- Hub – Also used to physically connect multiple network devices via CAT5/6 cabling. However, data is received from a single source port and output to all other ports. *Less efficient than a switch.*

- Subnet Mask – Ethernet setting defining the size of the logical network; the number of additional network devices which the device is able to communicate with. *In most cases you will stick with a subnet mask of 255.255.255.0 which can consists of up to 254 network devices.*
- Gateway Address – Ethernet setting used to communicate with devices outside of the local network (i.e. Internet). Whenever an address needs to be accessed that does not fall within your local network, this request is passed along to the gateway (router) which in-turn passes the request to the outside network device.
- Port (logical) – An endpoint to a logical connection. *For example: In order to access a website through your web browser, the default request is sent via port 80 which is defined by “<http://>” preceding the web address. This defines the type of service which the device is attempting to access.*
- Bandwidth – The amount of data that can be transferred between two network devices in a given set of time.

Typical Network Configuration

Below you will find a hierarchal diagram of a typical network configuration. *Note: Connecting a router to an existing router in order to expand the number of network ports is not advised; instead use a network switch.*

- Internet (i.e. Escient services)
 - Modem (Broadband Connection)
 - Router (Translates between your LAN and the rest of the internet)
 - Computers, Escient Vision, Escient Fireball, and other network devices.

Ethernet Connection Test

Vision provides a connection test which often helps in identifying the source of a connectivity issue. (Setup>Network>Ethernet) This test entails the following items:

```
Checking hardware configuration
MAC address:
Checking ethernet link...
Requesting dynamic interface configuration...
Determine subnet mask, DNS, router and IP addresses
Subnet mark:
DNS1 address:
DNS2 address:
Router address:
IP address:
Checking IP address...
Checking Router address...
Checking DNS addresses...
DNS lookup of w.openglobe.net...
DNS lookup of eCDDB.cddb.com...
Determine external IP address
External IP address:
Checking time service...
Connecting to w.openglobe.net:443...
Connecting to w.openglobe.net:1755...
Connecting to w.openglobe.net:8000...
Connecting to eCDDB.cddb.com:8080...
```

Key items within this test will help you to troubleshoot the issue.

- **Checking Ethernet Link** – Determines whether a physical link is detected on the unit's Ethernet port. Ensures that Vision is able to detect the connected hub/switch/router or other connectivity device. Steps to troubleshoot:
 - Verify amber link light on the unit's Ethernet port.
 - Verify Ethernet cable by disconnecting the cable from Vision and connecting it to another network device such as a laptop (ensure wireless connectivity is disabled). Check for link indication.
 - Try alternate port on the connected hub/switch/router.
 - Replace Ethernet cable with another known good cable.

- **Requesting Dynamic Interface Configuration** – Requests network settings from your router (DHCP server). Steps to troubleshoot:
 - Ensure that there is a router (DHCP server) present within the local network.
 - Verify that DHCP is enabled within your router configuration.
 - Swap Ethernet cable with a known good cable.
 - Try assigning Vision a static IP address. *If the connection test fails, save your Ethernet settings and attempt to ping Vision within the local network in order to determine if Vision is accessible within the local network. (See "Static IP Assignment" and "PING Command" below.)*
 - Test connectivity using another network device such as a laptop. *Note: If you happen to notice a "limited or no connectivity" message displayed within your PC's system tray, a physical link was detected on the network cable but your PC is unable to retrieve an IP address from what is generally your router (DHCP server) just as Vision was unable to. When testing this, ensure that all wireless access is disabled on the laptop.*

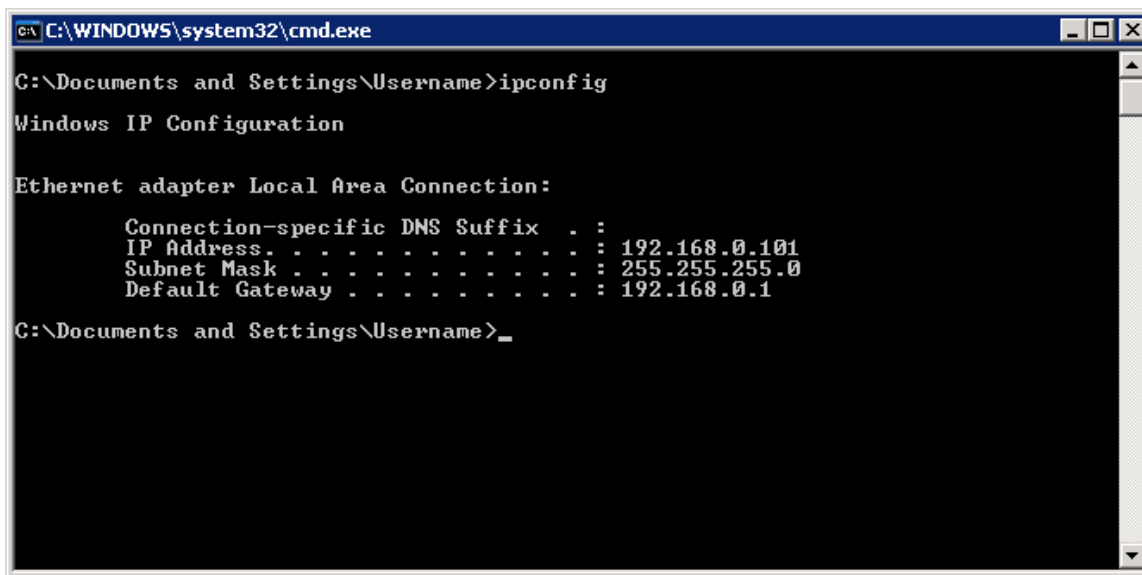
- **DNS Lookup** – Determines the IP address of key Escient services based on hostname (noted in connection test). *Services include initial registration, CD/DVD identification, streaming internet radio, and software updates.* Steps to troubleshoot:
 - DNS server may not contain an entry for the queried hostname. Input an alternate DNS server such as "4.2.2.3" or "207.250.129.8".
 - If Ethernet settings have been manually entered (Static), verify that the static IP, subnet, and gateway addresses are correct. At least one DNS server is required.
 - Verify that your broadband connection is functioning properly and you are able to browse the web from a computer connected to the same network.

- **Connecting to...** - Verifies that Vision is able to access Escient web services on particular ports. Any failure within this test indicates that either your router/firewall or ISP is blocking these ports. Check router configuration and, if needed, your ISP. The following services correspond to each port.
 - TCP port 443 – Software Updates & Initial Registration.
 - TCP port 1755 – Radiolo Streaming Radio
 - TCP port 8000 – Shoutcast Streaming Radio
 - TCP port 8080 – Audio CD Identification

Static IP Assignment

Assigning a valid static IP is dependant on the existing IP scheme of your network. In order to determine the current IP scheme of the network, this will require another functioning network device such as a PC. From the PC click Start>Run and enter “cmd” within the run prompt; click OK.

Within the resulting command prompt enter “ipconfig” and press <Enter>. The PC’s IP address, subnet mask, and default gateway will be displayed (see below). This information will be used to assign Vision an appropriate static IP address.



```
C:\WINDOWS\system32\cmd.exe
C:\Documents and Settings\Username>ipconfig

Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . : 
    IP Address. . . . .               : 192.168.0.101
    Subnet Mask . . . . .             : 255.255.255.0
    Default Gateway . . . . .         : 192.168.0.1

C:\Documents and Settings\Username>_
```

When assigning Vision’s network settings, both the subnet mask and default gateway will remain the same as the PC. However, the IP address must be unique and differ from all additional network devices. You will also need to ensure when assigning Vision a static IP that the assigned IP address does not fall within the DHCP range of your router (DHCP server). Typically the DHCP range will cover either 192.168.x.2 – 192.168.x.100 or 192.168.x.100 – 192.168.x.254. Therefore, if your computer displayed an IP address of 192.168.1.101, then an appropriate static IP would be 192.168.1.55 (below the DHCP range). Again, the last field (octet) of the IP address will need to differ from that of your PC.

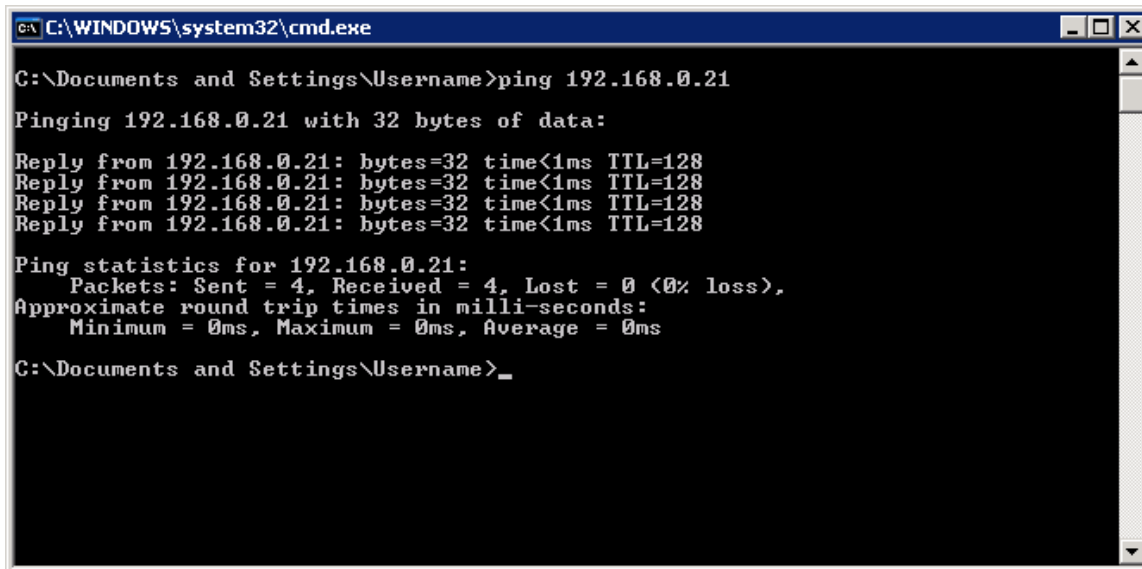
The last required field is DNS. Only one DNS server is required, though two may prove more reliable. Generally the gateway address will be assigned to DNS1. For DNS2 we often suggest using a root DNS server such as “4.2.2.3”.

For example, based on the above network configuration (ipconfig results) I would assign Vision the following:

- IP: 192.168.0.55
- Subnet: 255.255.255.0
- Gateway: 192.168.0.1
- DNS1: 192.168.0.1
- DNS2: 4.2.2.3

PING Command

The PING command is used to test network connectivity between two devices (i.e. between the PC and Vision). This will allow us to determine if Vision is communicating within the local network.



```
C:\WINDOWS\system32\cmd.exe
C:\Documents and Settings\Username>ping 192.168.0.21
Pinging 192.168.0.21 with 32 bytes of data:
Reply from 192.168.0.21: bytes=32 time<1ms TTL=128
Reply from 192.168.0.21: bytes=32 time<1ms TTL=128
Reply from 192.168.0.21: bytes=32 time<1ms TTL=128
Reply from 192.168.0.21: bytes=32 time<1ms TTL=128
Ping statistics for 192.168.0.21:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\Documents and Settings\Username>_
```

Simply click Start>Run and enter “cmd” within the run prompt; click OK. Within the command prompt, type “ping <ip address>”; replacing <ip address> with Vision’s corresponding IP address (displayed within Setup>Network>Ethernet Settings).

The result will be either multiple “reply from” responses or multiple “request timed out” responses.

“Reply from” indicates that the unit is communicating within the local network. “Request timed out” indicates that the unit is not responding on the network. *A mix of the two indicates packet loss which is generally caused by faulty network hardware/cabling unless wireless is involved.*

Here’s an example of a successful test indicating that the network device (Vision was reachable):

```
Pinging 192.168.0.21 with 32 bytes of data:
Reply from 192.168.0.21: bytes=32 time<1ms TTL=128
Reply from 192.168.0.21: bytes=32 time<1ms TTL=128
Reply from 192.168.0.21: bytes=32 time<1ms TTL=128
Reply from 192.168.0.21: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.0.21:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Here’s an example of a test indicating that the network device (Vision) was unreachable:

```
Pinging 192.168.0.21 with 32 bytes of data:

Request timed out.
```

Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.0.21:

Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),