



First-Time *drive.web* Network Administration

Scope

This document is intended for **drive.web** users who are creating a standalone network for the first-time. More complex systems requiring Wide Area Network (WAN) connections (either plant-wide or via the Internet) will require specific network information from the appropriate administrator.

Overview

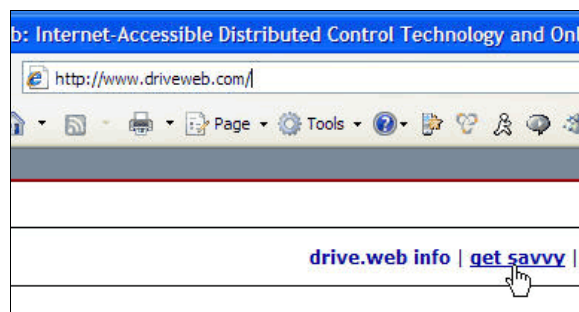
Although prior Ethernet networking experience is a plus, you do NOT have to be a networking expert to get your **drive.web** system up and running quickly. Generally, to set up a network, you will have to:

- Install the **savvy** software tools onto the computer you plan to use to administer the network (both Microsoft's Windows® and Mac OS X® operating systems are supported).
- Install the **drive.web**-ready hardware to be placed on the network.
- Connect the appropriate networking cables to *electrically* configure the network.
- Assign the appropriate Internet Protocol (IP) addresses to *logically* configure the network.

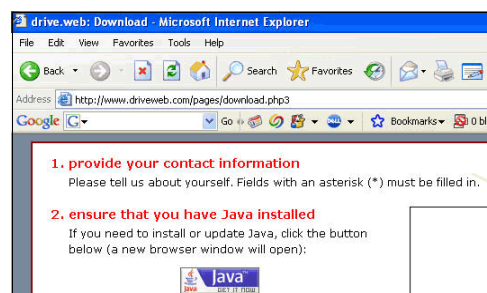
If unfamiliar with networking, review **Appendix A - Ethernet and Internet Protocol Basics** prior to proceeding.

Installing the savvy Software

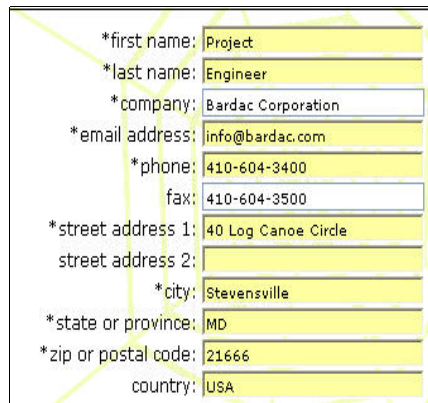
The latest version of the **savvy** software tool is available on the worldwide web at <http://www.driveweb.com>. On the home page, click on **get savvy**:



If this is your first visit to **driveweb.com**, you will be prompted to enter some contact information. This information will only be used by Bardac Corporation to follow-up with customers and will **NOT** be distributed to any other organization.

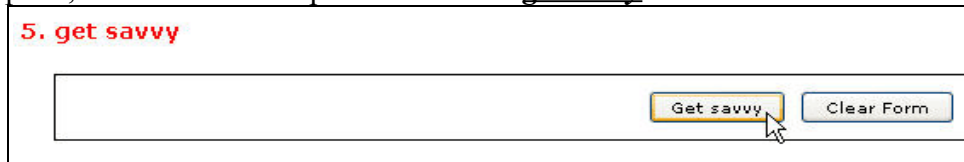


Enter all your contact info (the * indicates required fields).



*first name:	Project
*last name:	Engineer
*company:	Bardac Corporation
*email address:	info@bardac.com
*phone:	410-604-3400
fax:	410-604-3500
*street address 1:	40 Log Canoe Circle
street address 2:	
*city:	Stevensville
*state or province:	MD
*zip or postal code:	21666
country:	USA

When complete, scroll down to Step 5 and click the **get savvy** button.



5. get savvy

Get savvy Clear Form

At this point, your browser will receive a HTTP cookie so you will not have to re-enter your contact information on any subsequent visits to the web site on the same computer. When the next page appears, click the **get drive.web savvy** link to download the tools.



drive.web savvy

get drive.web savvy release notes

documentation

savvy user manual

getting started with savvy

getting started with savvy-SFD

pl-series dc drive configuration notes

Installing the drive.web-ready Hardware

While **smarty** modules are shipped ready-to-power and place on a network, **speedy** boards must be installed in the appropriate drive platform before configuring the network. The **speedy-sp** printed circuit board must be installed into a PL-Series DC Drive Version 5.12 (or later) while the **speedy-se** must be installed into an E-Series AC Drive Version 4.2 (or later).

Refer to the appropriate installation document for details.

Electrically Configuring the Network

With the **drive.web**-ready hardware installed, you are ready to configure your network. To build your network, you will require:

- A standard Category 5e cable (with 8P8C/RJ-45 connectors on both ends) for each **drive.web**-ready device and your computer.
- An Ethernet switch with sufficient ports to support all your **drive.web**-ready devices and the Administrator's computer.

Most Ethernet Network Interface Cards (NIC's) have both link and activity LED's to indicate network status. The **smarty** and **speedy** are no exception. The color codes are as follows:

<i>drive.web</i> device	Link LED	Activity LED
<i>dwlx smartys</i>	Green	Amber
<i>dwlx speedys</i>	Green	Green

The LINK LED indicates the network link is valid (i.e., OK) while the ACTIVITY LED indicates the local device has seen some Ethernet activity. If the ACTIVITY LED is flashing very quickly there are either **drive.web** connections to/from the associated device or it is currently discovered in the **savvy** tools *Device Directory*.

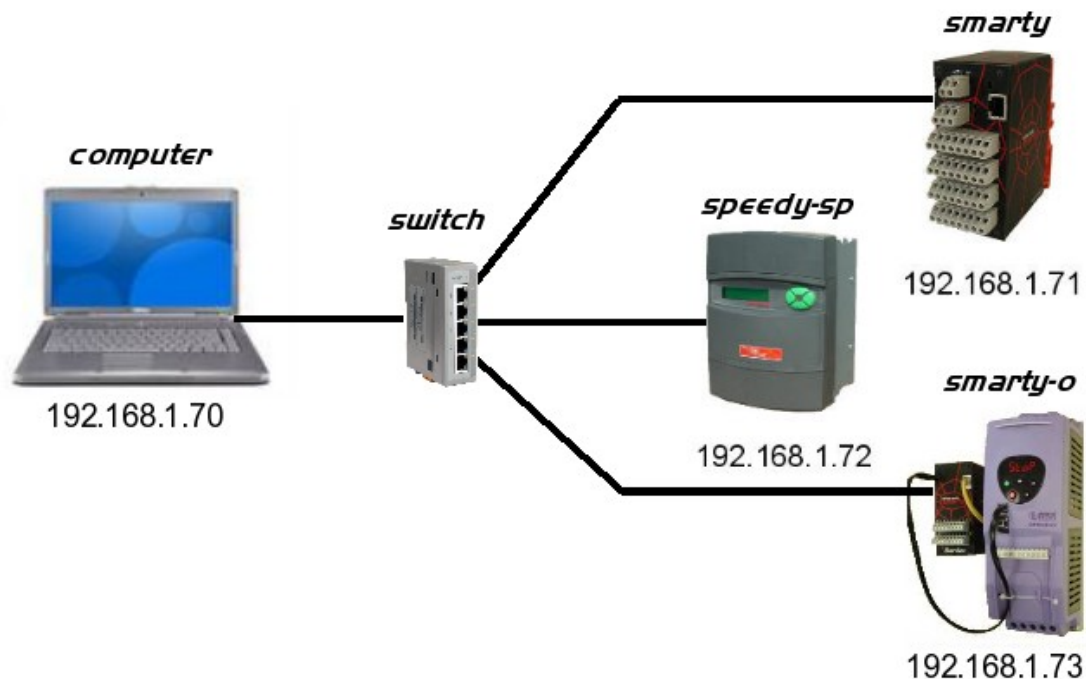
Connect a standard Cat-5e cable between each **drive.web**-ready device and the Ethernet switch. Finally, plug the Administrator's computer into the switch. Power-up the Ethernet switch, the **drive.web**-ready devices, and the computer. All the link LED's should go solid ON. If any link LED's are OFF, refer to the **Appendix B - Troubleshooting** section before attempting to logically configure your network.

Electrical Setup for Point to Point (PTP) Connection

A special case of a valid Ethernet network involves connecting only two devices: the Administrator's computer and the **drive.web**-ready device. If the computer's NIC does not support auto crossover detect, a single Cat-5e cross-over cable will be required to configure a valid network. If properly wired, the link LED on both the computer and the device still need to be on solid when connected.

Logically Configuring the Network

So, for our example, here is the network we want to build:



To *logically* configure this standalone network, a Class C private network with addresses in the range 192.168.1.1 through 192.168.1.254 will serve our purposes.

In addition to a range of IP addresses, you will need the serial numbers from each **drive.web**-ready product. The **drive.web** serial number is located on the sticker affixed to each device and has the format 00-04-bb-##-##-## where the last three octets (##) are hexadecimal numbers assigned by the factory (e.g., 00-04-bb-00-00-1a). Note, the **drive.web** serial number is the standard Ethernet Media Access Control (MAC) address.

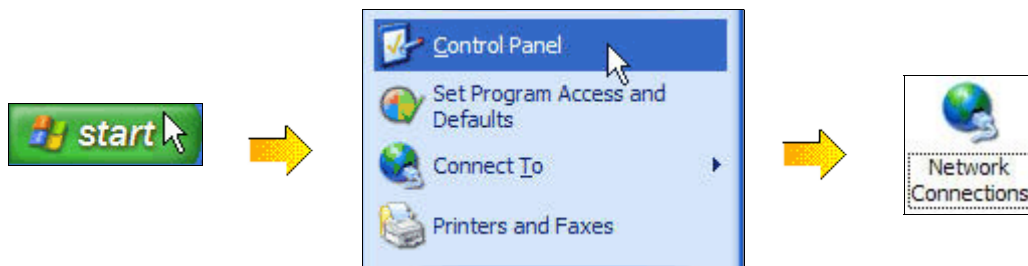
Our example system has four devices as follows:

Model Number	drive.web Serial No.	IP Address
computer	Don't Care	192.168.1.70
dwl10 smarty	00-04-bb-00-02-22	192.168.1.71
dwl11 smarty-sp	00-04-bb-00-00-bc	192.168.1.72
dwl13 smarty-o	00-04-bb-00-01-9a	192.168.1.73

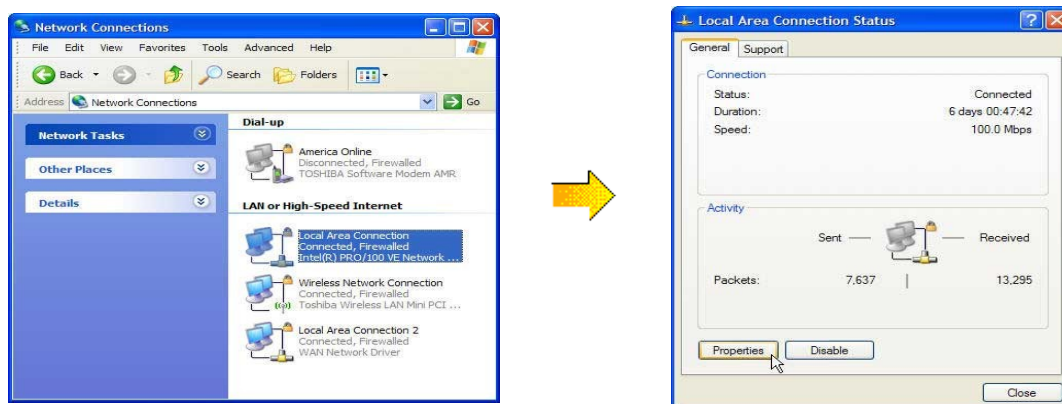
Setting the IP Address On Your Computer

Generally, for ease of use, computers are configured to obtain an IP address dynamically from a DHCP server. In our desired network, there is no DHCP Server to assign an address to your computer and the default addresses will not likely suit our purposes (logically). Therefore, you need to assign a static IP address to the computer.

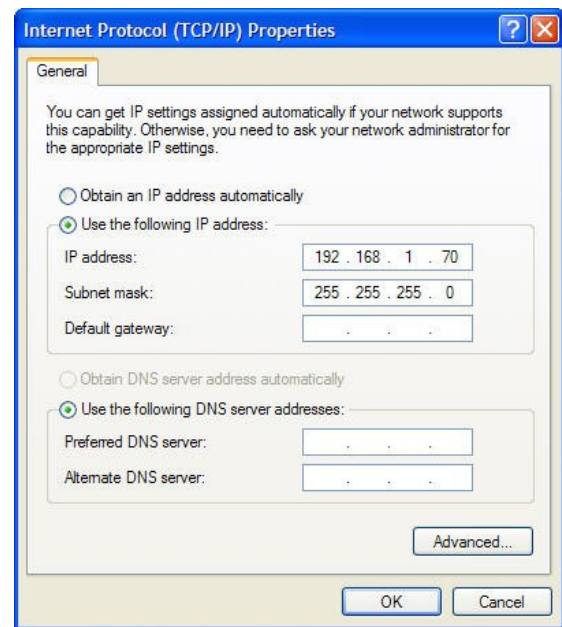
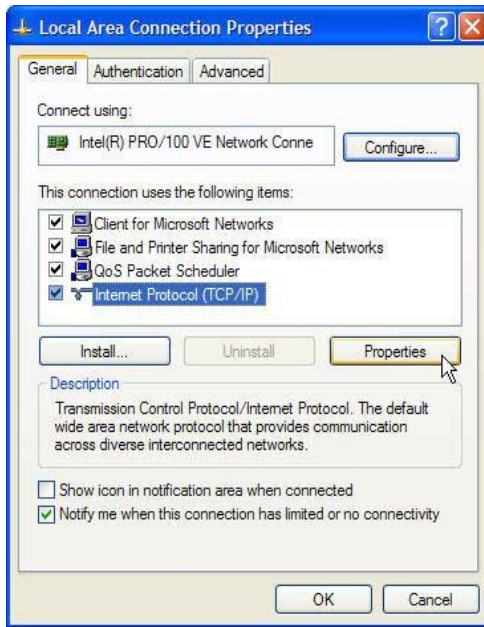
To set up your Windows XP computer, click *Start* menu and then select the *Control Panel* menu item. When the *Control Panel* folder opens, click on the *Network Connections* icon.



Click on the *Local Area Connection* icon, then the *Properties* button.



Then, select *Internet Protocol (TCP/IP)* item in the list. Click on the *Properties* button. Select the *Use the following IP address:* button, then set the *IP address:* and *Subnet mask:* to 192.168.1.70 and 255.255.255.0, respectively. Finally, click the *OK* button.



Required Firewalls Settings

Generally, today's operating systems include software firewalls. Although firewalls protect the user from malicious network activity, they also require a bit of manipulation to allow **savvy's** features to be exploited. When shipped, all **drive.web** devices ship with a default IP address of 10.189.189.189. This particular address was chosen to prevent duplication of IP addresses on most user networks when initially powered up.

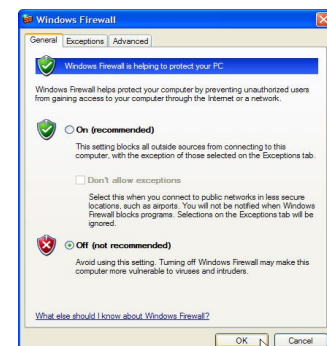
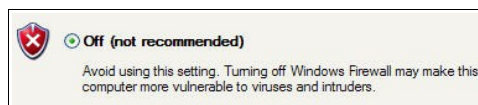
Unfortunately, to “see” these **drive.web** devices when connected to your computer's Ethernet port, it will require you to do one of the following:

- Turn off your computer's software firewall (easiest!).
- Allow the UDP Port 48556 (and if a Windows XP computer, multihome your Network Interface Card).

Turning Off Your Computer's Software Firewall

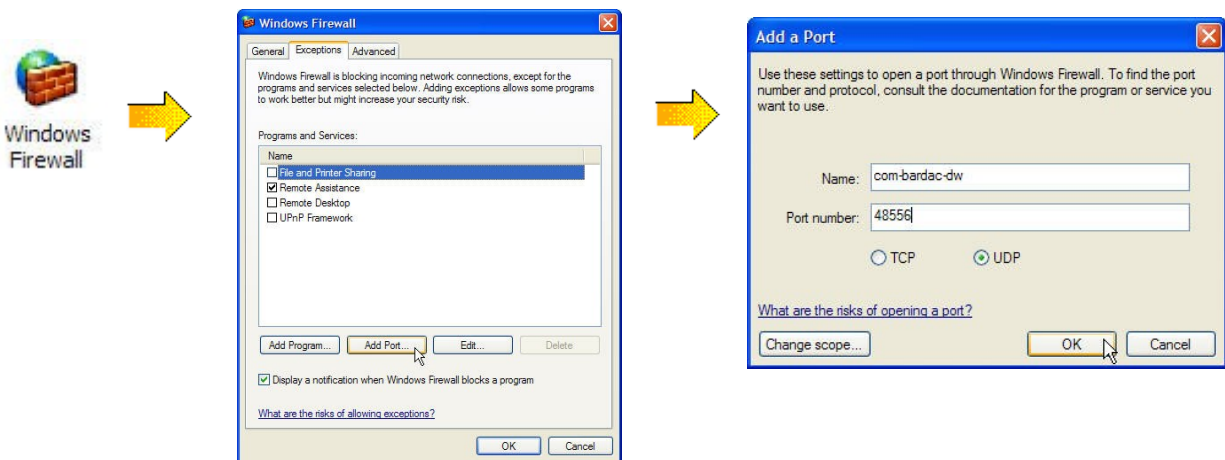
The simplest method to enable all of **savvy's** features is to disable your firewall. If you are creating your own standalone network, disabling your firewall should not pose any security risks.

For Windows XP, from the *Start* menu, select *Control Panel*, and then click on the *Windows Firewall* icon. Under the *General* tab, click the *Off* selection button and then the *OK* button to disable the software firewall.



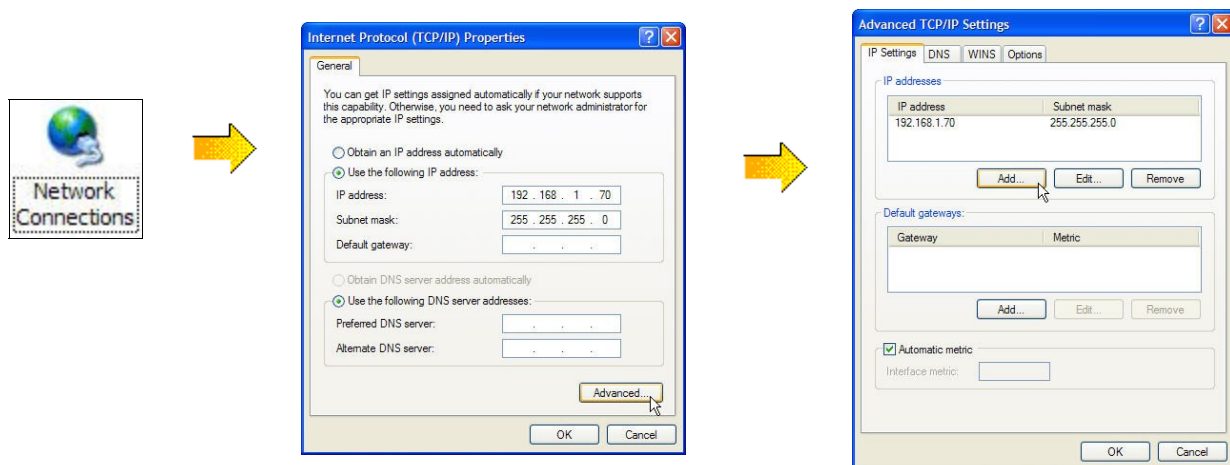
Opening UDP Port 48556

If you choose to leave your firewall ON, you will need to open UDP Port 48556 to support all the **savvy** tool's features. To open the port, from the *Start* menu, select *Control Panel* and then click the *Windows Firewall* icon. Under the *Exception* tab, click the *Add Port...* button. When prompted, use **com-bardac-dw** as the name and enter **48556** as the port number. Select the *UDP* button and then click the *OK* button.

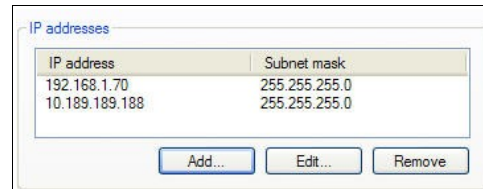
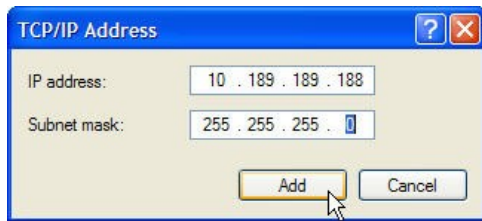


Multihoming your Network Interface Card (also required for Windows XP SP2)

In most cases, opening Port 48556 will enable all of **savvy's** features; however, due to a limitation in the the Windows XP SP2 Firewall, opening the port will not completely enable **savvy's** capabilities. You can work around this limitation by assigning a second IP address to your NIC. Effectively, you computer will be a member of both the final desired network and the device's shipping address network. To multihome your NIC, click the *Start* menu and then select the *Control Panel* menu item. When the *Control Panel* folder opens, click on the *Network Connections* icon. Then, highlight *Internet Protocol (TCP/IP)* and click the *Properties* button. After the *Internet Protocol (TCP/IP) Properties* dialog box appears. Click on the *Advanced...* button. When the *Advanced TCP/IP Settings* dialog box appears, click the *Add...* button.

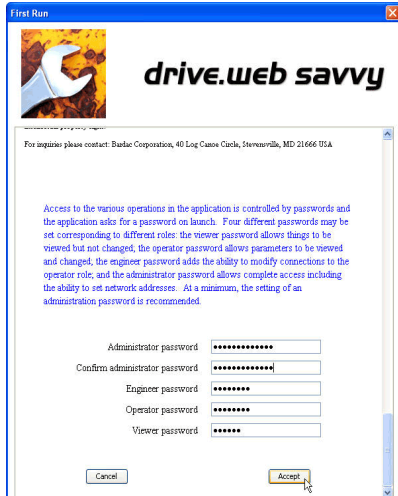


Your second IP address needs to be on the same subnet as the shipping address (10.189.189.189). When the *TCP/IP Address* data entry window appears, set the IP address to **10.189.189.188** with a subnet mask of **255.255.255.0**, then click the *Add* button.



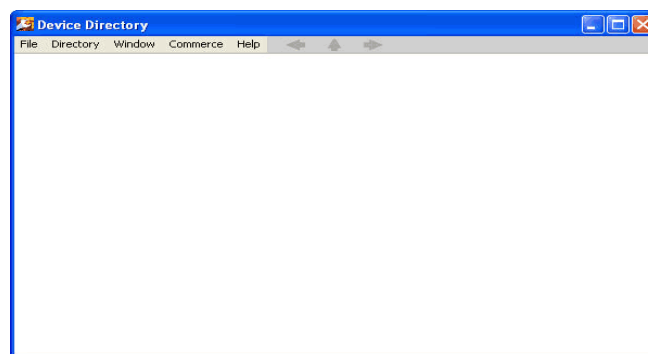
Launching the *savvy* Software Tools

With all the proper firewall and TCP/IP settings, launch the **savvy** application.



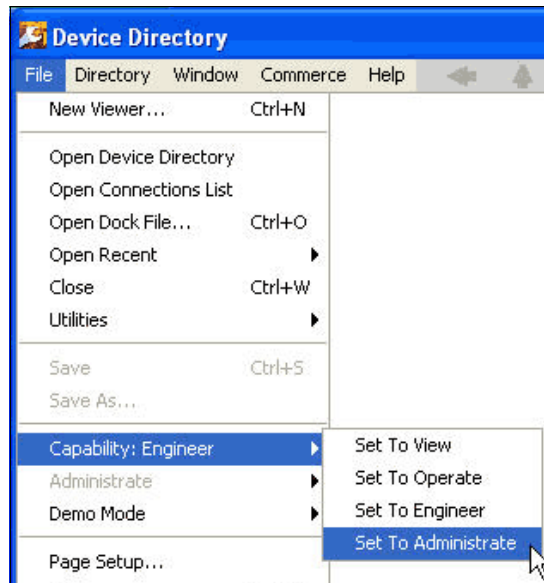
If this is your initial launch of the tools, the *First Run* dialog box (above left) will appear and you will be prompted to enter a password for each of the various Capability levels. Otherwise, the *Welcome to drive.web* dialog box (above right) will appear and you will be prompted for a password. Enter the *Administrator* password.

An empty *Device Directory* will appear.



Addressing Your *drive.web*-Ready Devices

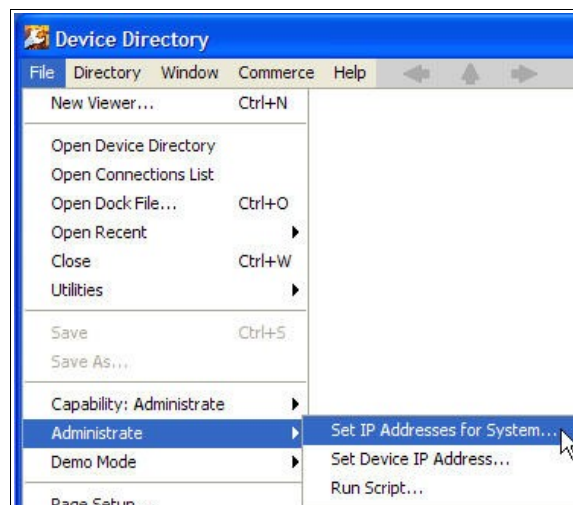
You must have *Administrate* capabilities in order to set the **drive.web**-ready device IP addresses. If under the *File* menu, the capability is not *Capability:Administrate*, use the *Set to Administrate* item in the pull down *Capability* menu.



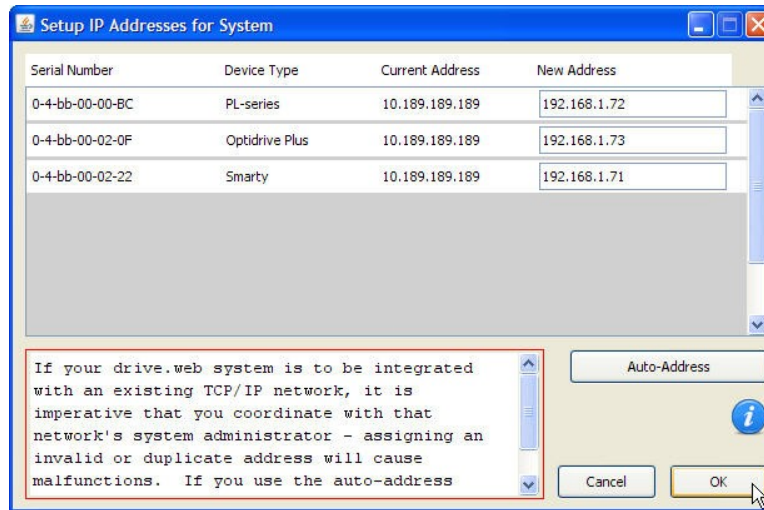
You will have to enter the password to change the **savvy** capabilities to *Administrate* (if set during initial installation).

Automatically Setting IP Addresses for Systems

If the network is properly configured, **savvy** has the capability to discover all the **drive.web** devices on the network and either automatically assign IP addresses or allow the user to set all the desired IP addresses in one fell swoop. First, select *Administrate* in the *File* menu, then select the *Set IP Addresses for System...* menu item.



The *Setup IP Addresses for System* dialog box lists the **drive.web** serial number, device type, and current IP address.



At this point, you have three choices on how to address your **drive.web** devices:

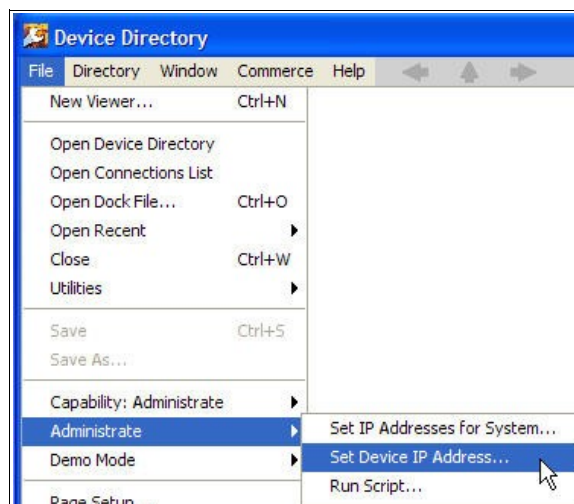
- Manually enter the desired IP address in the data entry box under the *New Address* heading (as shown above).
- Fill in the top address, then click the *Auto-Address* button. The IP addresses will be automatically incremented.
- Just click the *Auto-Address* button and the *New Address* fields will automatically be filled with a sequential IP addresses starting with the first address after your computer's IP address.

Duplicate IP addresses are a fundamental violation of the TCP/IP protocol and can cause message routing problems making the network inoperable. The **savvy** software will **attempt** to ensure there are no duplicate IP addresses prior to changing the IP address of any **drive.web** device.

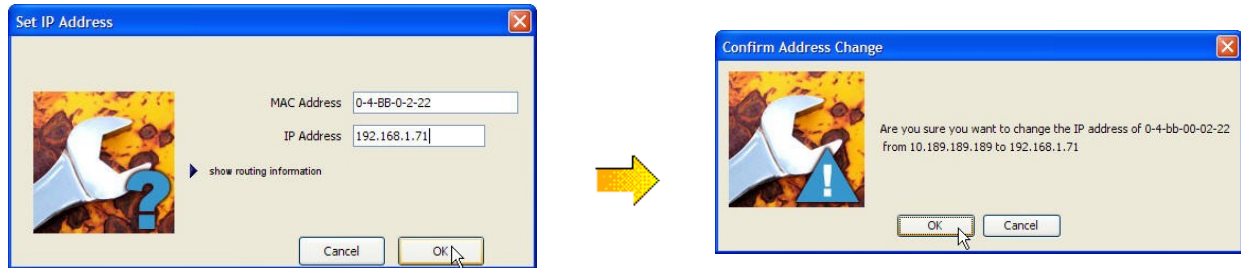
Ultimately, it is the responsibility of the user to ensure there are no duplicate IP addresses on the network.

Manually Setting Device IP Addresses

If you choose to manually assign each device's IP address, select the *Set Device IP Address...* in the *Administrate* menu.



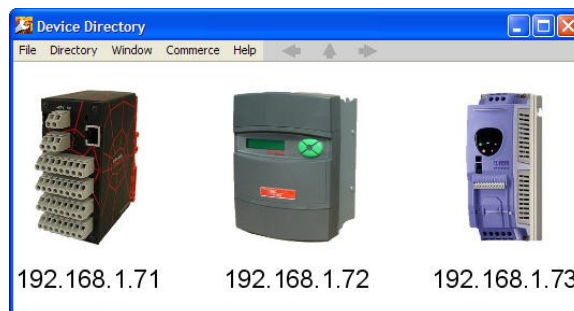
A *Set IP Address* dialog box will appear where the **drive.web** serial number and the desired IP address must be entered. When the dialog box appears, enter the appropriate serial number and IP address for the device (in this case a **smarty**). After clicking the *OK* button, a confirmation dialog box will appear prior to actually changing the IP address.



After the *Confirm Address Change* dialog box disappears, the IP address will be loaded and the **drive.web**-ready device will restart and be added to the *Device Directory*. Repeat this process for the **speedy-sp** and the **smarty-o**.

Final Device Directory

Regardless of whether you used the automatic or manual mode to set the IP addresses, the *Device Directory* should appear as follows:



If your *Device Directory* does not appear as expected, refer to **Appendix B - Troubleshooting** to resolve your networking/configuration problems and then re-perform the appropriate steps.

Congratulations! You have successfully setup your first **drive.web** network.

Appendix A - Ethernet and Internet Protocol Basics

10BaseT - The "10" in the media type designation refers to the transmission speed of 10 million bits per second (Mbit/s). The "Base" refers to baseband signaling indicating the signals are transmitted at their original frequency (there are no communication tricks like modulation performed). Finally, the "T" represents twisted-pair cabling.

100BaseTX – Like 10BaseT, the "100" refers to the transmission speed of 100 million bits per second (Mbit/s), the "Base" refers to baseband signaling, and the "TX" represents twisted-pair cabling. The X was added to distinguish this Fast Ethernet from other less prevalent standards (e.g., T4, SX, and BX).

ARP – (Address Resolution Protocol) The portion of Internet Protocol that resolves the logical IP address to the physical network's MAC addresses.

Cat5e – Category 5 Enhanced cable is 8 conductor cable (4 pairs) suitable for networks up to 1000BaseT (Gigabit Ethernet) for distances up to 100m (328 ft).

Class A Networks - A very large network which can have almost 17 million devices connected. For private user networks, the first octet is reserved as a 10 and addresses can vary from 10.0.0.0 through 10.255.255.255 (10/8 prefix).

Class B Networks - A fairly large network which can have over 1 million devices connected. For private user networks, the first octet is reserved as 172 while the second octet can vary from 16 through 31. Addresses can vary from 172.16.0.0 through 172.31.255.255 (172.16/12 prefix).

Class C Networks – A typical medium sized network which can have over 65,000 devices connected. For private user networks, the first octet is reserved as 192 while the second octet is reserved as 168. Addresses can vary from 192.168.0.0 through 192.168.255.255 (192.168/16 prefix). Typically, standalone **drive.web** networks will be Class C types.

DHCP – (Dynamic Host Configuration Protocol) On most networks, there is a DHCP Server that automatically assigns IP addresses when requested by user's computers to join the network. A possible negative side effect of dynamically assigning IP addresses is that devices may have different IP addresses from one session to another. The drive.web technology uses static IP addresses to facilitate peer-to-peer connections between drive.web-ready devices.

drive.web – The technology developed by Bardac Corporation for real-time control of motor controllers and industrial machinery. The physical transmission media is 10BaseT or 100BaseTX Ethernet while the **drive.web** protocol ensures timely delivery of data between peers on the network.

Ethernet – The wiring and signal standards associated with the physical media for creating the most popular type of local area network (LAN). Ethernet hardware complies with the Institute of Electrical and Electronics Engineers (IEEE) Standard 802.3. Rather than using proprietary hardware, the **drive.web** technology uses standard Ethernet hardware as the physical media.

Firewalls – Firewalls provide protection to LAN's from attacks originating on a WAN (such as the Internet). A firewall can be implemented in either hardware or software (or both), and by default, typically blocks ports and protocols which the **drive.web** technology uses for communications. You may have to grant access to these ports and protocols, refer to the forum at <http://www.driveweb.com> for details.

ICMP - (Internet Control Message Protocol) The portion of Internet Protocol which reports problems and other network specific information. The ping command uses this protocol.

IP Address – An Internet Protocol (IP) Address in the form of #.#.#.# where each # is an octet. For example, and IP Address of 192.168.1.20 is referred to as one-ninety-two DOT one-sixty-eight DOT one DOT twenty.

The IP Address is a logical address to the hardware and can be changed using the *drive.web* savvy software tools.

LAN – A local area network is a data network very limited in the geographical area it serves. A few square kilometers at most.

MAC Address - (Media Access Control) Each device on an Ethernet device has a peculiar physical address in the form of ##:##:##:##:##:## (where each ## field is two hexadecimal digits 0-f (base 16)). Any *drive.web*-ready device manufactured by Bardac Drives will have MAC addresses in the form 00:04:bb:##:##:## which is also the *drive.web* serial number.

Multihoming - A technique used to increase the reliability of the Internet which includes having multiple IP addresses for the same Network Interface Card (single link, multiple IP addresses).

Octet - An eight bit number in the range 0 to 255.

Port 48556 - (0xbdac) Bardac Corporation's registered port (com-bardac-dw) with the Internet Assigned Numbers Authority (IANA). This port may have to be opened in your firewall to allow the savvy tools to work properly.

8P8C/RJ-45 – The modular connector with eight positions, eight conductors (8P8C) used to terminate both ends of a typical Cat5e cable. The RJ-45 (Registered Jack-45) misnomer is a holdover from an older telcom connector with the same form factor but a different pin out. The male connector is similar to, but slightly larger, than standard modular phone line connector.

Subnet Mask – When used in conjunction with the IP address, limits the addresses which are logically considered to be on the same network. The subnet mask allows users to logically divide a range of IP addresses into multiple standalone networks.

Switched Hubs – Ethernet hubs are devices which allow the user to build a network using standard cables. In general, hubs have no intelligence and simply maintain the required wiring configuration to keep the network valid. In addition to maintaining the proper electrical connections, switched hubs have inherent intelligence to route data between its ports without affecting transmission on other ports effectively increasing the available bandwidth of the network.

Another benefit of using switched hubs is their filtering ability. Network traffic not destined to the devices connected to its ports is not transmitted to its local ports thereby preventing unnecessary traffic on local network. A properly designed *drive.web* system uses switched hubs to ensure timely delivery of data between peer devices.

To ensure reliable performance, switched hubs MUST be used.

savvy – The software tools designed and supported by Bardac Corporation to configure, design, and monitor *drive.web* systems.

UDP/IP - (User Datagram Protocol) The portion of Internet Protocol that allows users to send packets of data very fast, but provides no error checking or resending of data (is handled by the *drive.web* protocol). Used by *drive.web*-ready devices to send packets of data at the rate specified by the user.

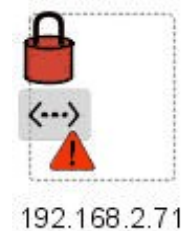
Appendix B - Troubleshooting

I can't see some of the **drive.web** products in the *Device Directory*.

- Make sure you are using the appropriate network adapter in the **savvy** preferences.
- Check all cabling for full insertion of the 8P8C/RJ-45 connectors into the sockets.
- Swap known good cables with those on the missing devices and try to rediscover.
- Ensure all the Link LED's are ON solid.
- Ensure none of the ports into which either the **drive.web**-ready devices or your computer are plugged is an uplink port.

I see a white box with an IP address, but it is locked.

- Electrically, your network is fine.
- Logically, your computer is not on the same network as the device.
- If the device address is not correct, set to the correct IP address using **savvy**.
- If the device address is correct, check your computer's IP Address and Subnet Mask to ensure your computer can logically "see" the device. A subnet mask of 255.255.255.0 will enable you to discover devices where the first three octets of the IP Address match those of your computer.



When trying to set a device's IP address, I get an exception.

- If an exception dialog box appears when trying to set a device's IP address, **savvy** could not communicate with the **drive.web**-ready device.
- Confirm you have recorded and entered the **drive.web** serial number correctly.
- Check the Link LED to ensure the **drive.web**-ready device is physically connected to the network.



Some of my LINK LED's are not lit.

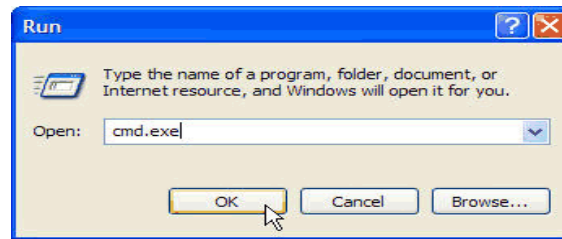
- Ensure all the drive.web-ready devices and the Ethernet switch are powered.
- Check to make sure the 8P8C/RJ-45 are completely plugged in at both ends and 'click' securely into the socket.
- Try a known good cable (i.e., a cable where the LINK LED is lit at both ends) to eliminate the cabling from consideration.
- Try another port on the Ethernet switch.

When I'm running **savvy**, I get java language exceptions.

The savvy software tool uses the Java Runtime Environment (JRE) to make it operating system independent. Most Windows computers have the JRE installed at the factory while OSX has the JRE incorporated into the operating system.

Sometimes, the installed Windows JRE version is not the most current (or lacks features required

by the latest release of **savvy**). To check the version installed on your Microsoft Windows computer, from the *Start* Menu choose the *Run...* command and type **cmd.exe**, then click the *OK* button.



At the command prompt type **java -version**:

```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Bardac>java -version
java version "1.6.0_01"
Java(TM) SE Runtime Environment (build 1.6.0_01-b06)
Java HotSpot(TM) Client VM (build 1.6.0_01-b06, mixed mode, sharing)

C:\Documents and Settings\Bardac>
```

If not installed (or corrupted), the command will not be recognized. The latest JRE for Windows (as well as other operating systems) can be downloaded on the worldwide web at <http://www.java.com>.

I'm not sure my computer's IP address is on the same network as my *drive.web*-ready devices.

To check the active Ethernet adapters (and their associated IP addresses) on your computer, run **cmd.exe** from the *Start* Menu and type **ipconfig**:

```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Bardac>ipconfig

Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . : 
    IP Address. . . . . : 192.168.1.15
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.1.1

Ethernet adapter Local Area Connection 2:

    Connection-specific DNS Suffix  . : 
    Autoconfiguration IP Address. . . : 169.254.101.152
    Subnet Mask . . . . . : 255.255.0.0
    Default Gateway . . . . . : 

Ethernet adapter Wireless Network Connection:

    Connection-specific DNS Suffix  . : 
    IP Address. . . . . : 192.168.1.69
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.1.1

C:\Documents and Settings\Bardac>
```

Confirm the IP address and subnet mask for the hardwired network adapter is on the same subnet as the ***drive.web***-ready devices.