APPLICATION NOTE

Product Family: N/A

Number: AN-MISC-033

Subject: Using Wireshark to view/capture ethernet data

Date Issued: 5-5-2013

Revision: Original

Tools Needed:

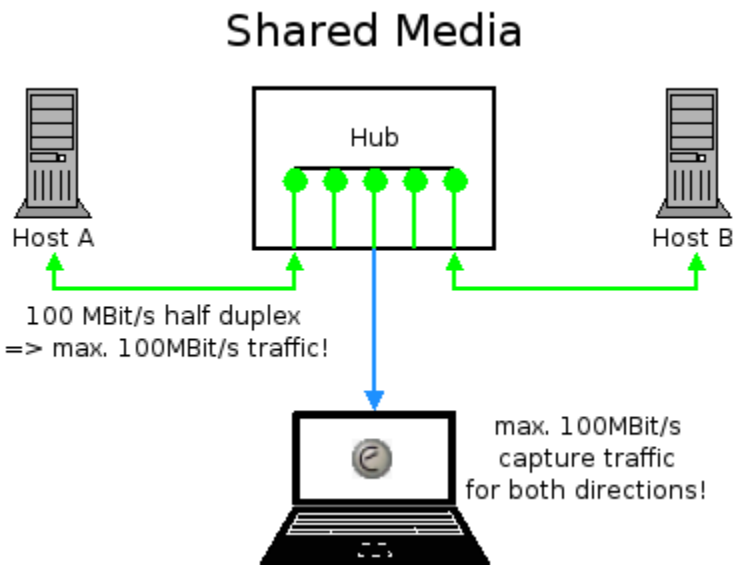
- PC with Wireshark installed (www.wireshark.org)
- An Ethernet hub or a managed switch with "Port mirroring" capability

Wireshark installation is pretty straight forward. Be sure to install the WinPcap when it prompts you to. This is necessary to be able to capture the data.

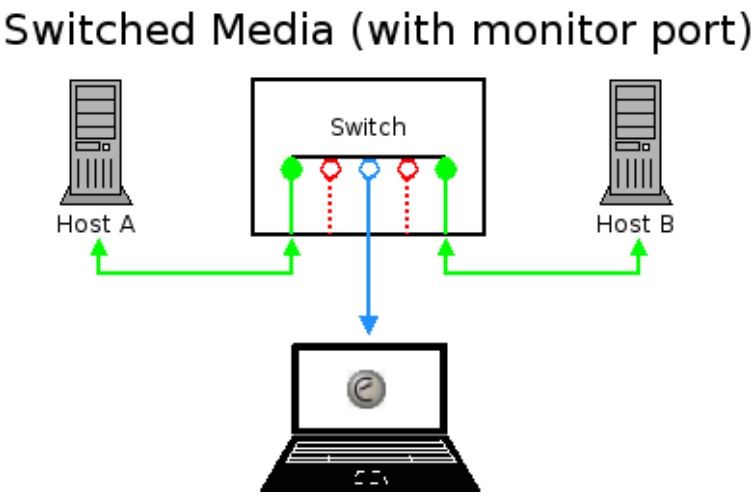
Ethernet hubs are very difficult to find but they are by far the easiest to setup for a capture. You can still buy Netgear DS108 hubs occasionally but you have to search pretty extensively for them. Beware of switches that say they are hubs. The only way you will be able to tell is by trial and error in trying to capture data that you know for sure is present on a different port than your PC.

It is important to note that using both hubs and managed switches with port mirroring will affect the network timing. Port mirroring will affect the relative packet timing. You will also not be able to trust the timing that you see in Wireshark for the packets coming from the port mirror. The switch will typically queue up several mirrored packets before sending them out the port to Wireshark. Using a hub will force the devices to half duplex which will significantly affect the timing to all devices connected to the hub. The methods above should only be used for logical flow analysis and packet coherency. They should not be used to troubleshoot network timing issues. More complicated methods will have to be employed for this (using network taps or a PC with bridged network interfaces and using special software).

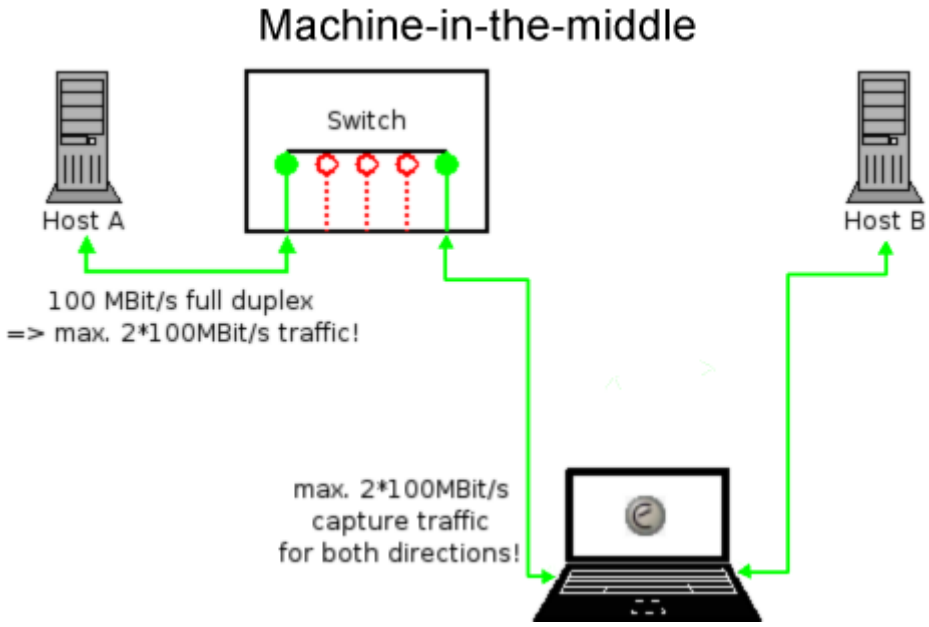
Also note that if you are capturing data coming from or to the PC that is running Wireshark, no hub or special switch is needed. This can be useful if testing Modbus and using the Modbus simulator tools (Modbus Poll and Modbus Slave). If you are capturing DirectSoft data, Lookout Direct or Kepware stuff, you shouldn't need a special switch or hub.



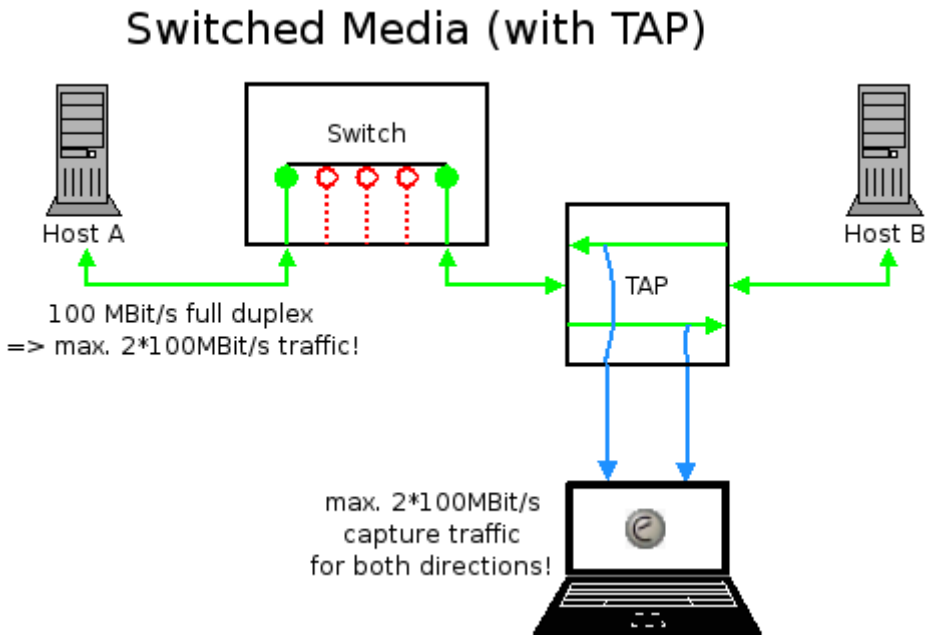
Example of a hub setup.



Example of a port mirror setup.

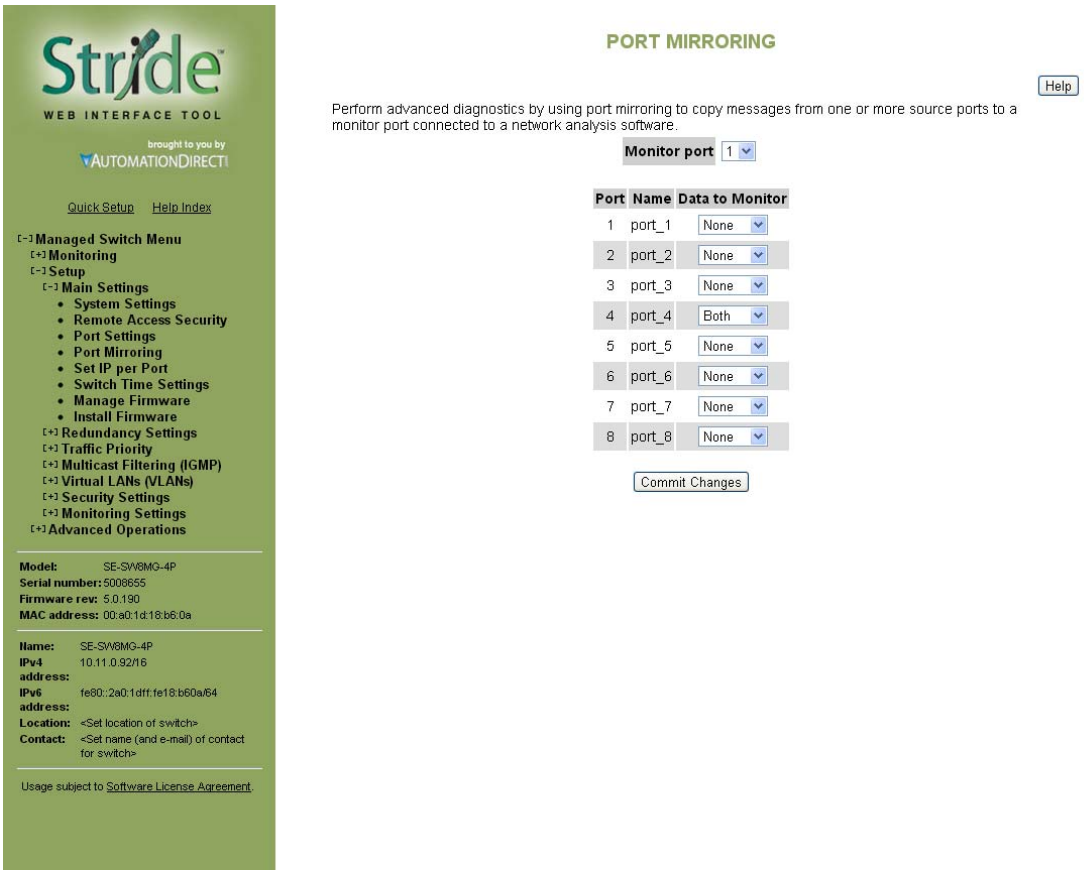


Example of using a PC with 2 network interfaces.



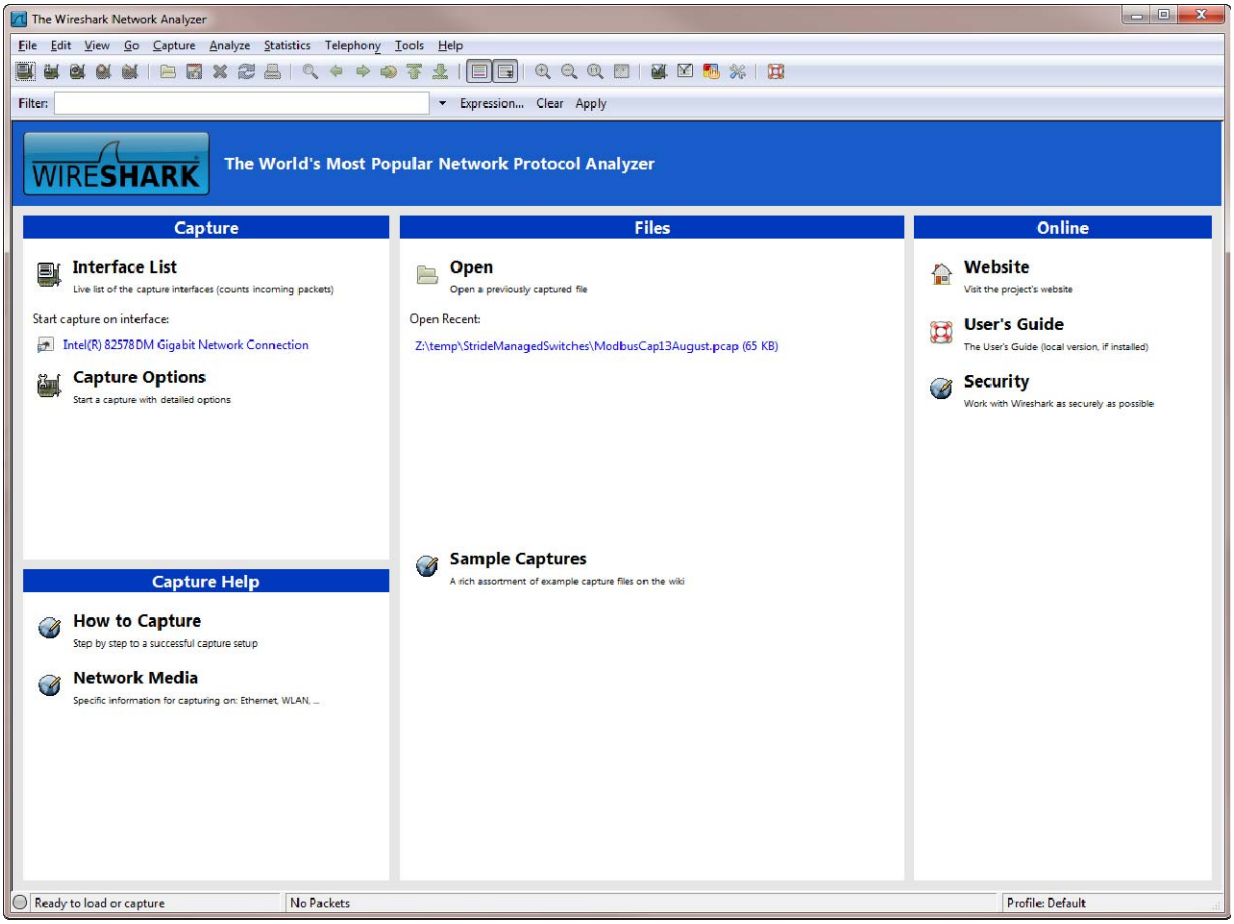
Example of using a Network Tap (note that a Tap has 2 outputs which equates to difficulty of use with Wireshark).

Setting up port mirroring on a managed switch is pretty simple with most switches. Basically, all you are doing is tell the switch to take data coming from 1 port and to send it out another port (the port that your PC running Wireshark is connected to). The example shown below is how you would accomplish this with our Stride Managed switches. In the example below, you would plug the PC running Wireshark into Port 1 (the Monitor port) and you would be able to see all of the traffic that is going in and out of Port 4. Multiple ports could be enabled to monitor.

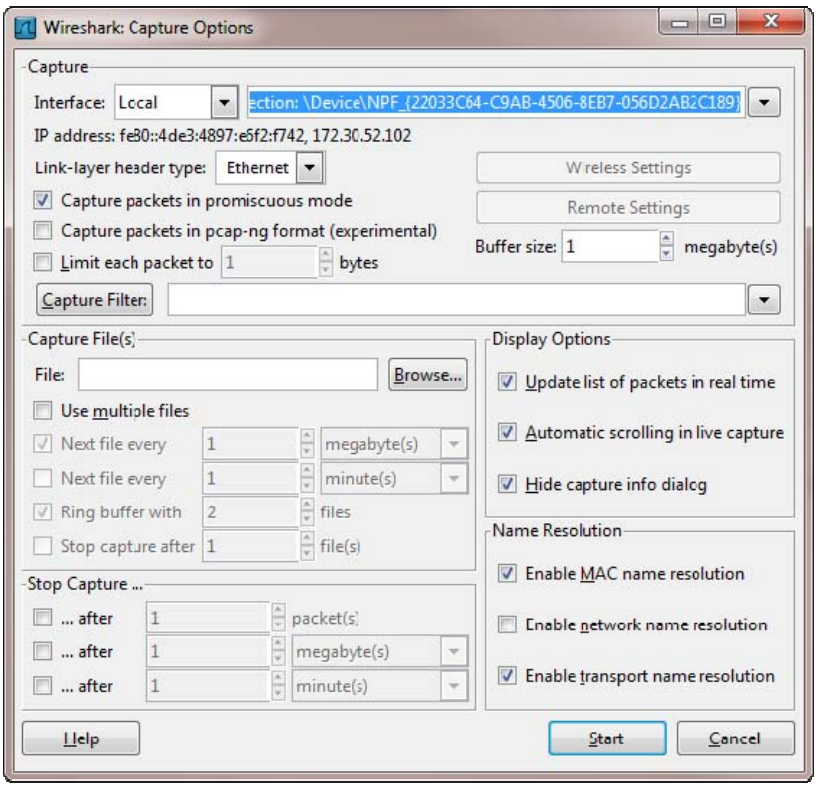


Instructions:

Start Wireshark session:



Click on Capture and Options:



There are several important selections in this dialog box.

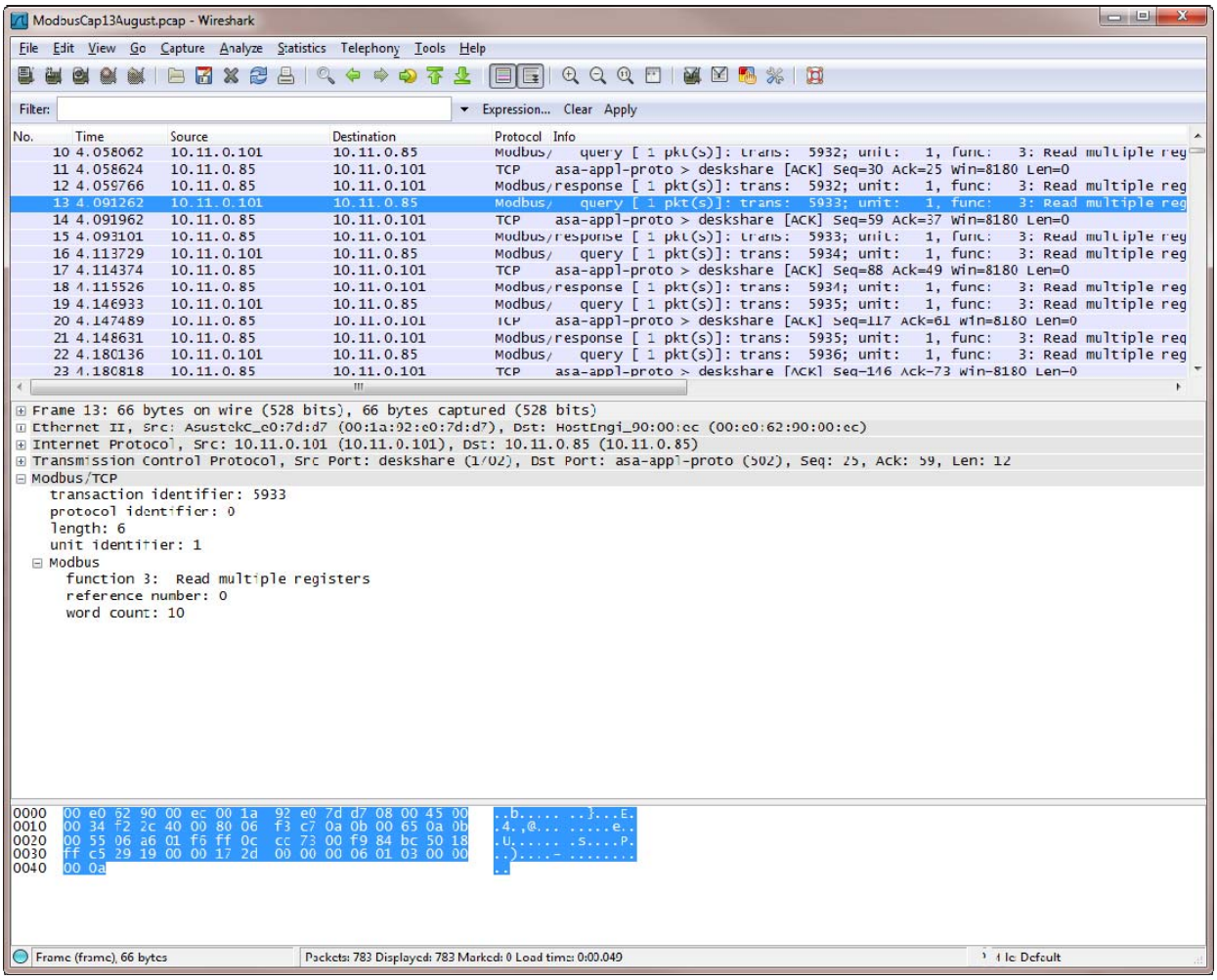
- Interface: On many PCs, there are multiple Network cards. You will need to select the network card that is physically connected to the hub or port mirror output port. The easiest way to figure out which interface to use is simple trial and error. Pick one, start the capture and look for data. If you don't see it, stop the capture, pick a different interface and try again until you see the data you are expecting. You can also choose Capture>Interfaces to quickly choose the interface you want capture data on. In that dialog box, it shows the traffic that is currently being seen by the interfaces. This may help in determining which interface you want to capture.
- Buffer size: If you are expecting a long capture, increase the buffer size to a sufficiently large number. If you increase the number to too large a value it will bog down your PC.
- Capture packets in promiscuous mode: Leave this on
- Limit each packet: It's best to leave this off.
- Capture Filter: This is good to use when doing long captures. You can select the IP addresses of the devices you care about and it will only save the data for those devices and you can save tremendously on file size.
- Display options: This is completely based on personal preference. If you are looking for specific events that are occurring frequently, turn all these on and you can see the traffic as it is being captured.

- Name Resolution: Leave as set above.
- Capture Files: This is used for very long captures. You can set it up to capture to multiple files to keep the file size smaller.
- Stop Capture: You can use this to automatically stop the capture based on file size, packet count or time.

The dialog below shows a quick way of choosing the Interface to capture on if you do not need the more advanced selections of the Capture>Options window.

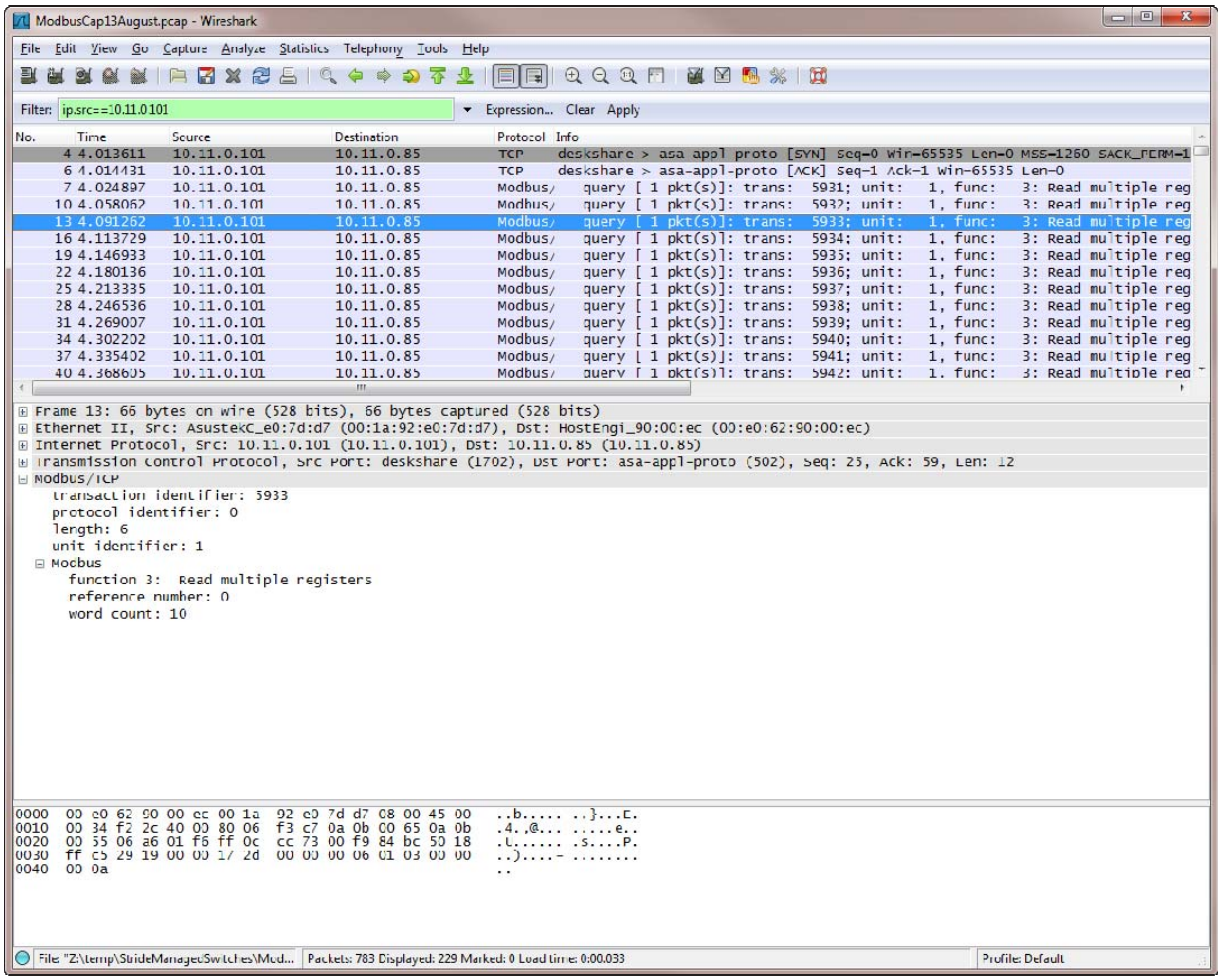
You can also click on the Details button in the Wireshark Capture Interfaces dialog to cross reference with the Network Interface properties.

Once you have made all the correct selections, hit the Start button and Wireshark will start capturing data.



There are 3 panes that contain the packet data. The top pane contains the network Packet List. It contains a list of all the packets going back and forth between the different devices (depending upon whether you are using a hub, port mirroring on managed switch and filter settings). The middle pane is the Packet Details view that interprets the data bytes and displays them in a more easily read fashion. The bottom pane is the Packet Bytes view shown in hex format.

There is also a Display Filter option that can be used to remove some of the 'chatter' that you see in the Packet List pane but still have the data available to view if needed by clearing out the display filter. Here is an example of a display filter to show all of the packets that were sourced from a specific IP address. To view the different syntax and filter options available, click on the Expression button to the right of the Display filter line.

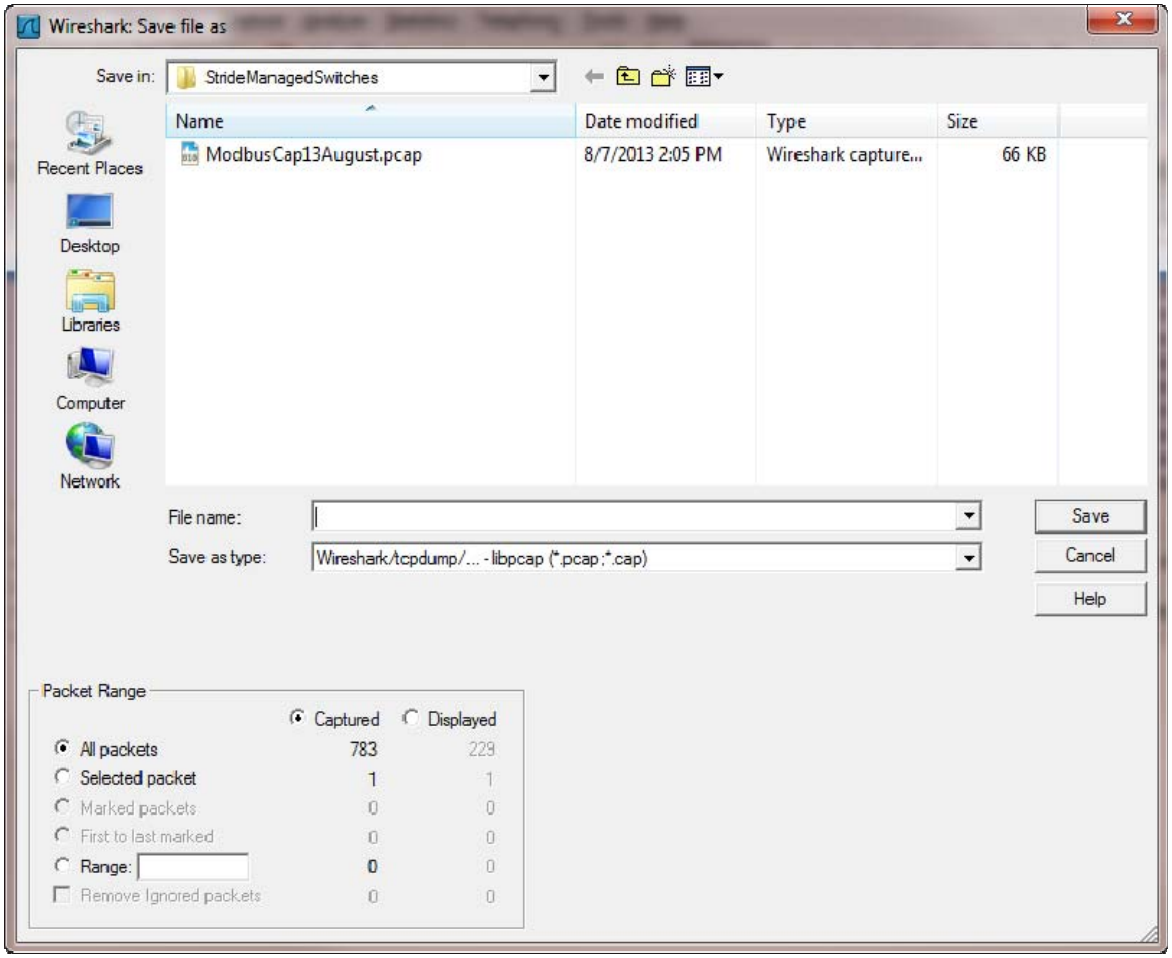


Some examples of Display filters:
ip.src == 10.11.0.101 (Shows only packets where 10.11.0.101 is the source device)
ip.addr == 10.11.0.101 (Shows only packets where 10.11.0.101 is the source or destination)
tcp (Shows only packets where TCP protocol is in the packet)

Other useful display filters for ADC products:
tcp.port==502 works for Modbus TCP
tcp.port==44818 works for EtherNet/IP
udp.port==2222 works for EtherNet/IP I/O Messaging
udp.port==28784 for HOST Ethernet products (EBC100, ECOM100, EDRV, etc..)
udp.port==8888 works for Productivity3000 discovery
udp.port==9999 works for Productivity3000 software connection
tcp.port==9999 works for C-more Programming Software
tcp.port==25 for SMTP email, also typing in smtp works as well
tcp.port==21 for FTP

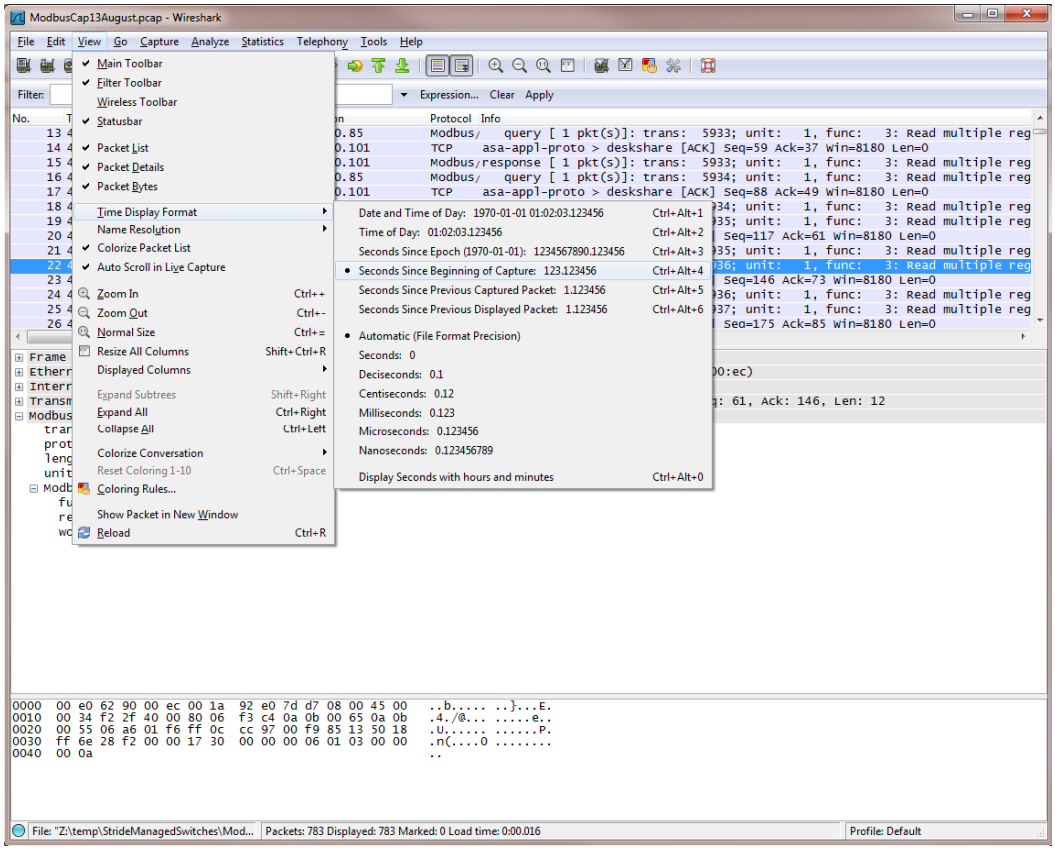
tcp.port==11110 for C-more passthrough
tcp.port==80 for web servers
tcp.port==11102 for C-more remote access

To save a capture, simply click on File>Save As. There are a couple of choices you can make. You can save only the data shown after the Display filter is applied or you can save all of the captured data. You can also choose a range of Ethernet frames to save.



Also note that the PCAP file will ZIP very well. It will typically save to about 20% of the size of the original file. Very good for emailing…

Another setting that is used frequently is the Time Display format that is shown on the left hand side in the Traffic view pane. Sometimes it is easier to view the time elapsed from the previous packet and sometimes it is easier to view the time elapsed from the beginning of the capture to more easily reference time between non-adjacent packets. To change this view, go to View>Time Display Format and you will see the various selections there.



Technical Assistance: If you have questions regarding this Application Note, please contact us at 770-844-4200 for further assistance.