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VC707 Ethernet Design

October 2012

XTP148

Revision History

Date	Version	Description
10/23/12	4.0	Regenerated for 14.3.
07/25/12	3.0	Regenerated for 14.2. Used content from AR46384.
05/08/12	2.0	Updated for 14.1
04/12/12	1.1	Minor updates.
03/09/12	1.0	Initial version for 13.4.

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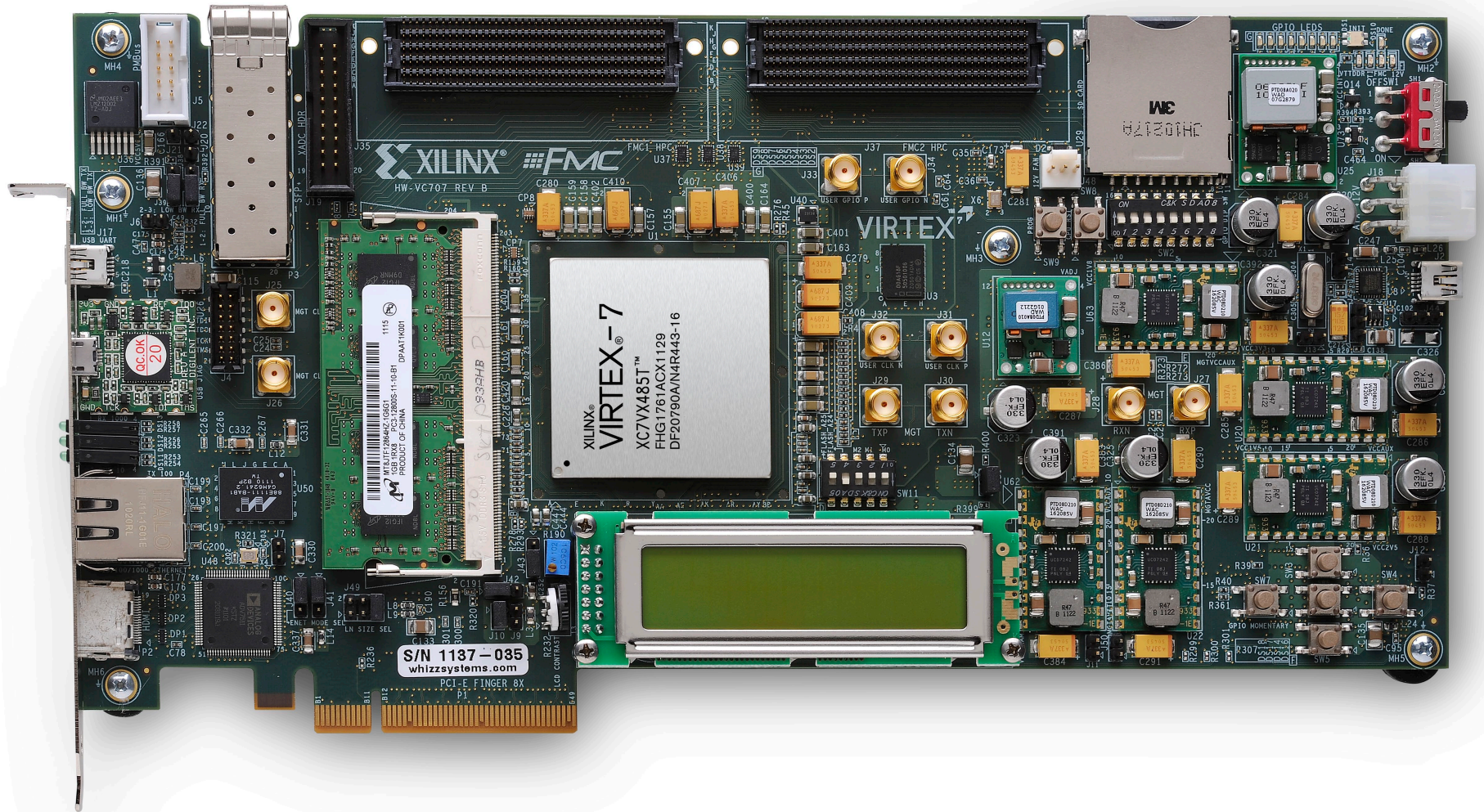
Overview

- VC707 Board
- VC707 Setup
- Run SGMII Ethernet Example Design
- References

Virtex-7 Ethernet Capability

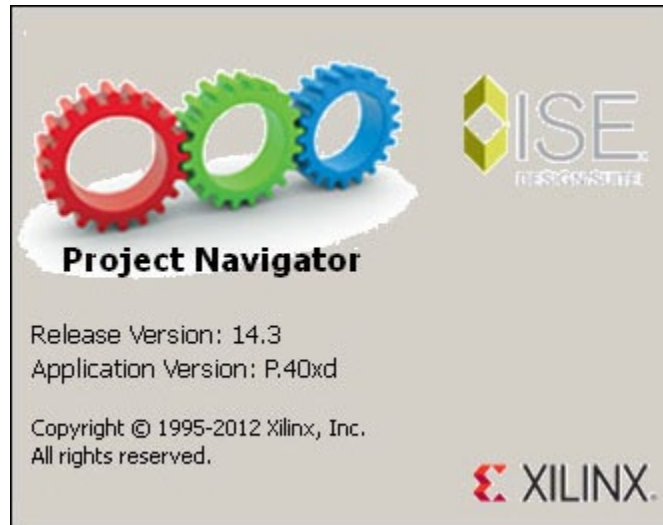
- **VC707 Supports SGMII Capability**
 - Board TX to Host
- **LogiCORE Ethernet Example Design**
 - RDF0164.zip
 - Available through <http://www.xilinx.com/vc707>
 - Content generated using [AR46384](#)
- **LogiCORE IP Tri-Mode Ethernet MAC**
 - See [UG777](#) for details

Xilinx VC707 Board



ISE Software Requirements

➤ Xilinx ISE 14.3 software



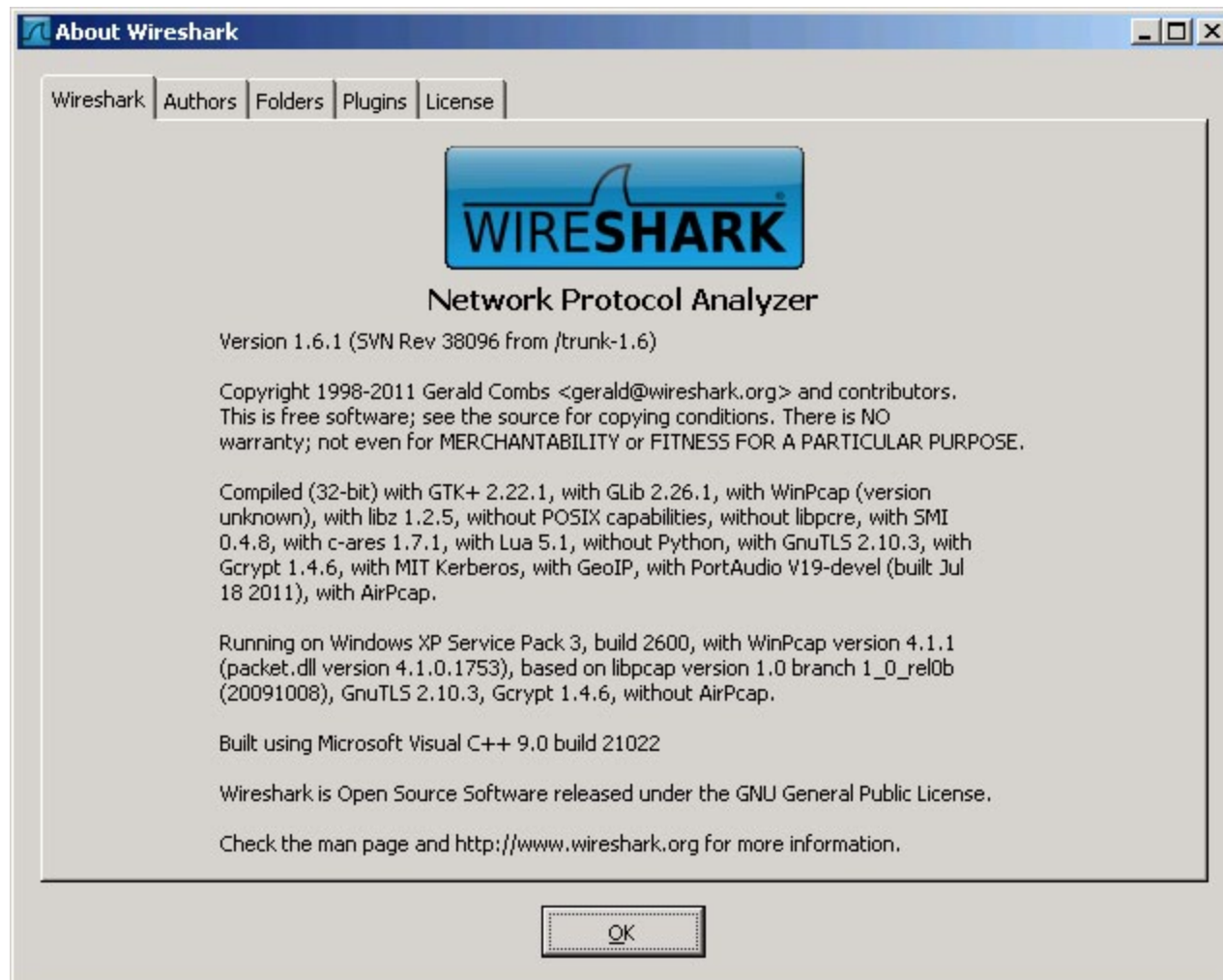
ChipScope Pro Software Requirement

➤ Xilinx ChipScope Pro 14.3 software



ChipScope Pro Software Requirement

➤ Wireshark Protocol Analyzer available at <http://www.wireshark.org/>



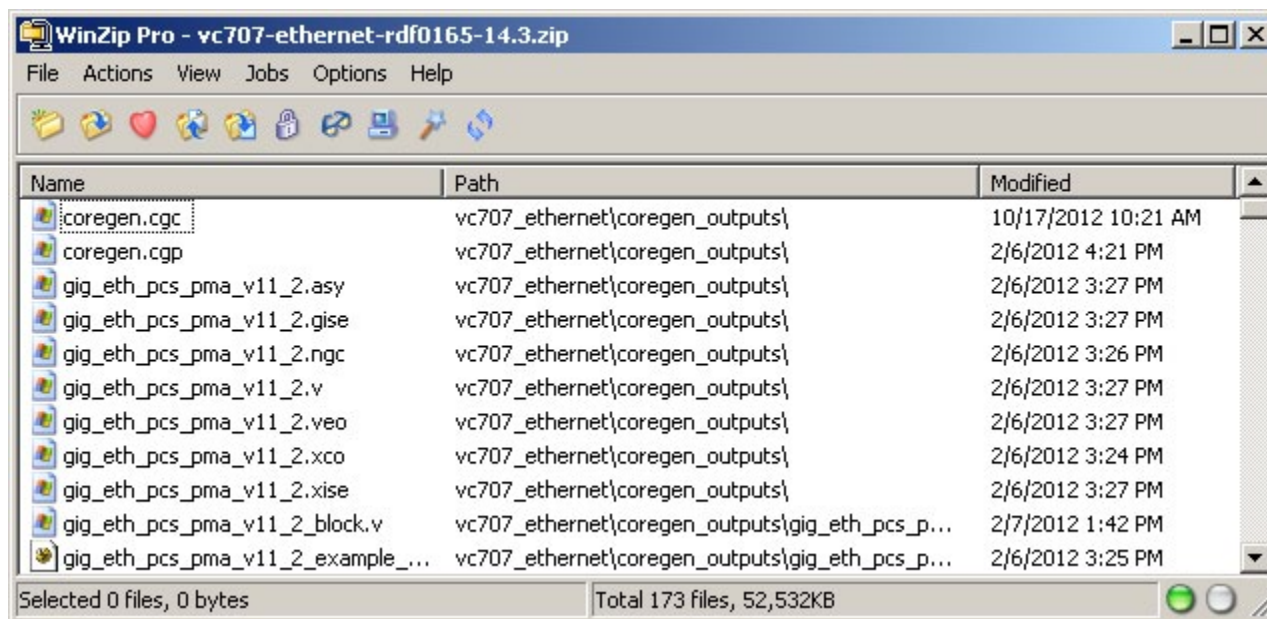
Note: Presentation applies to the VC707

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Download VC707 Ethernet Design

➤ Unzip the VC707 Ethernet Design Files (14.3 CES)

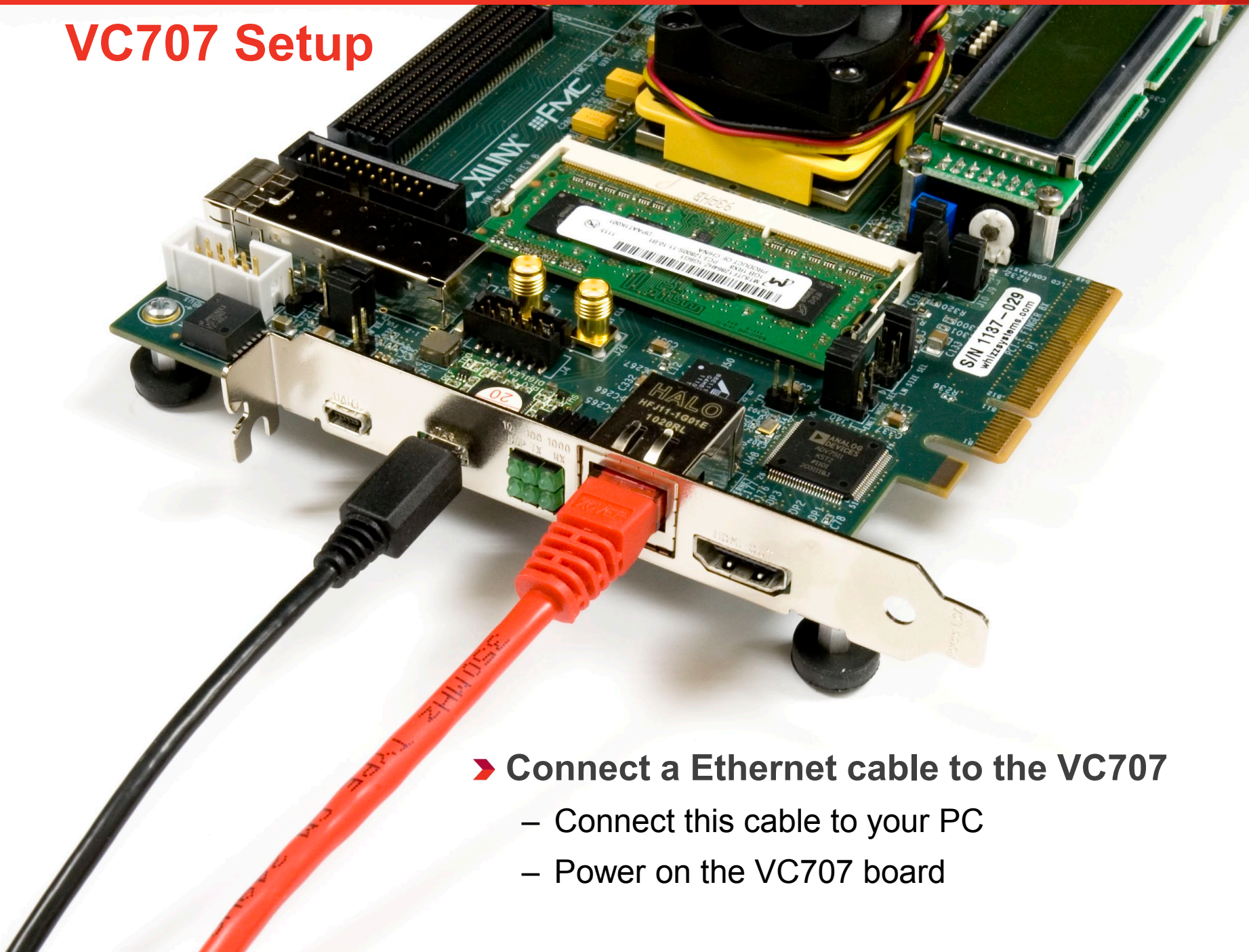
– Available through <http://www.xilinx.com/vc707>



VC707 Setup

- Connect a USB Type-A to Micro-B cable to the USB JTAG (Digilent) connector on the VC707 board
 - Connect this cable to your PC

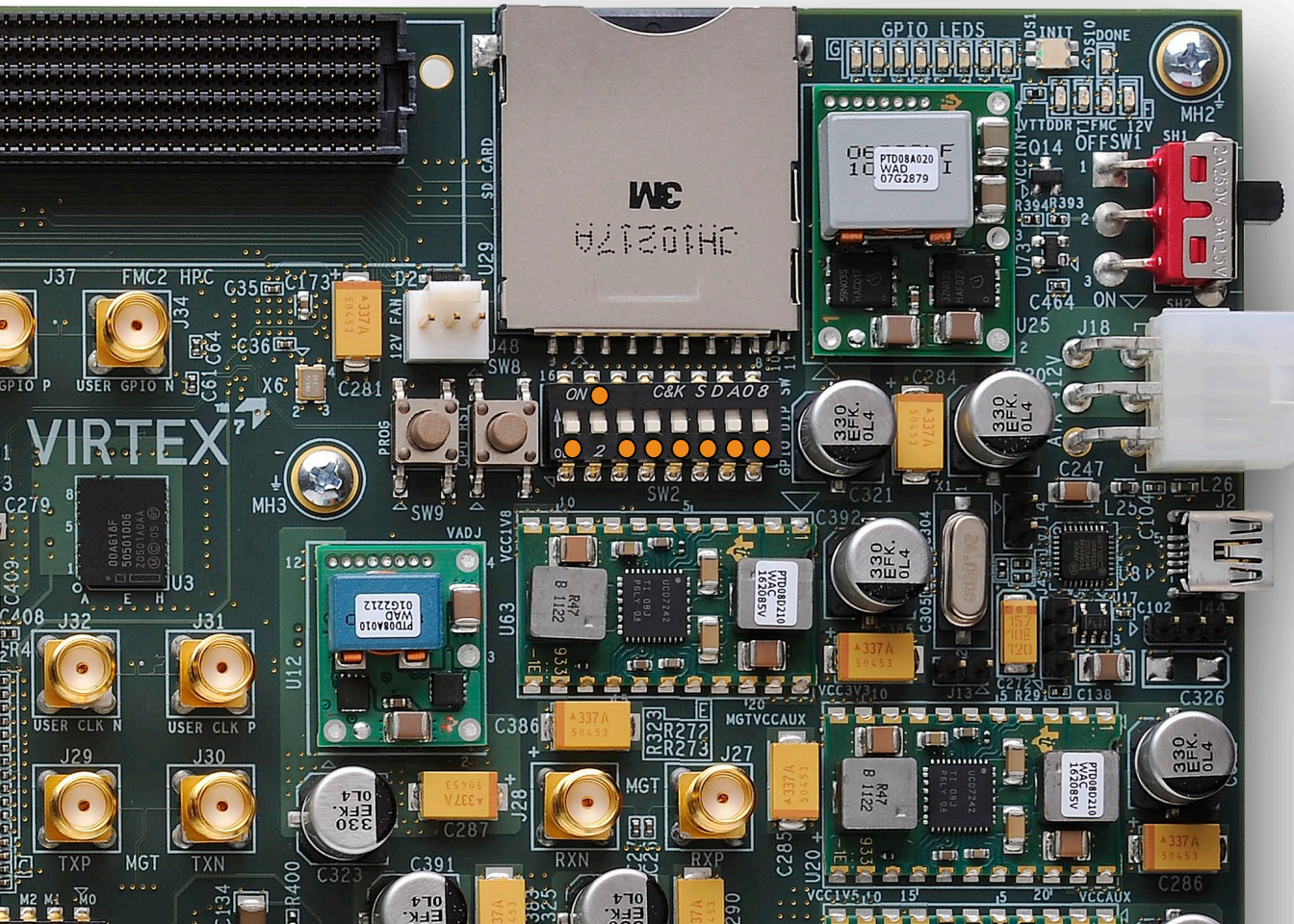
VC707 Setup



- **Connect a Ethernet cable to the VC707**
 - Connect this cable to your PC
 - Power on the VC707 board

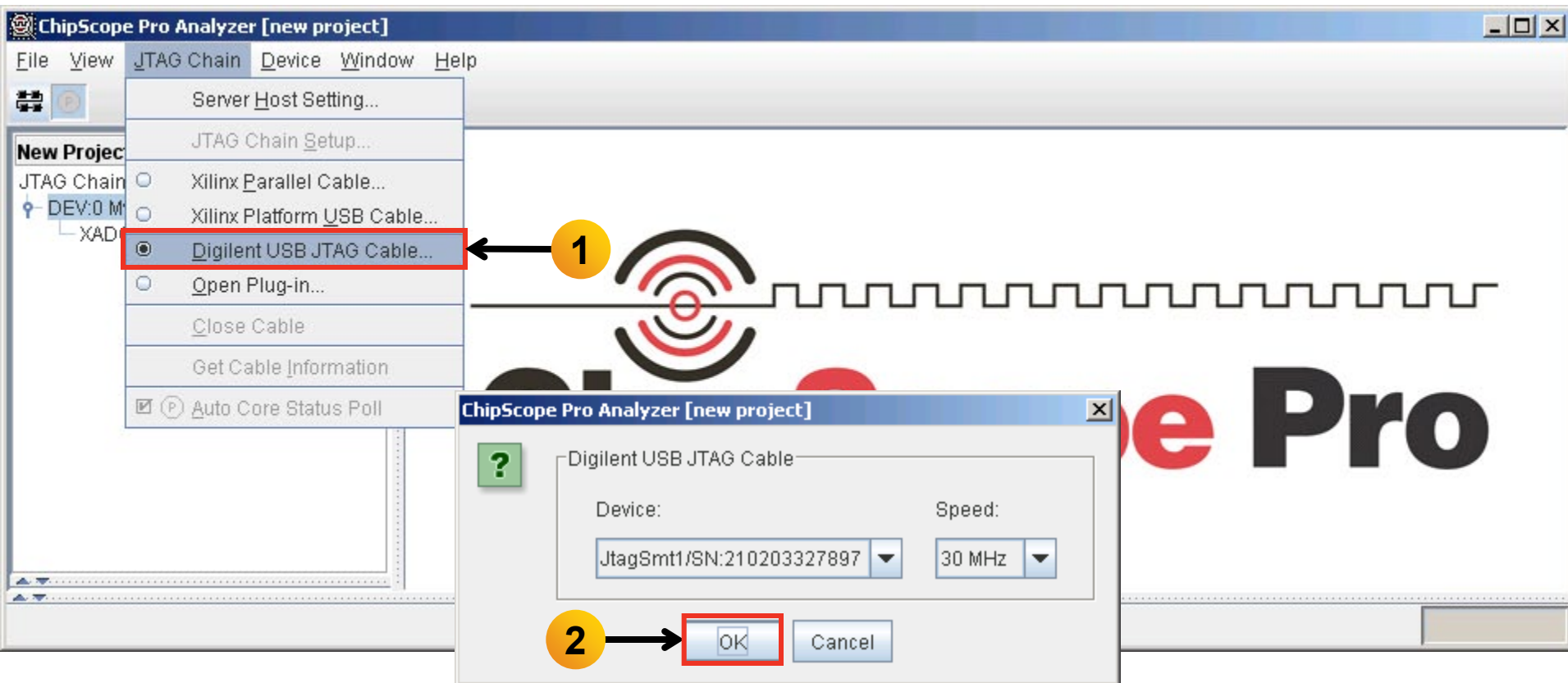
VC707 Setup

- Set SW2 to 01000000 (1 = on, Position 1 → Position 8)
- This the device to 1 Gbps and turns off the packet generator



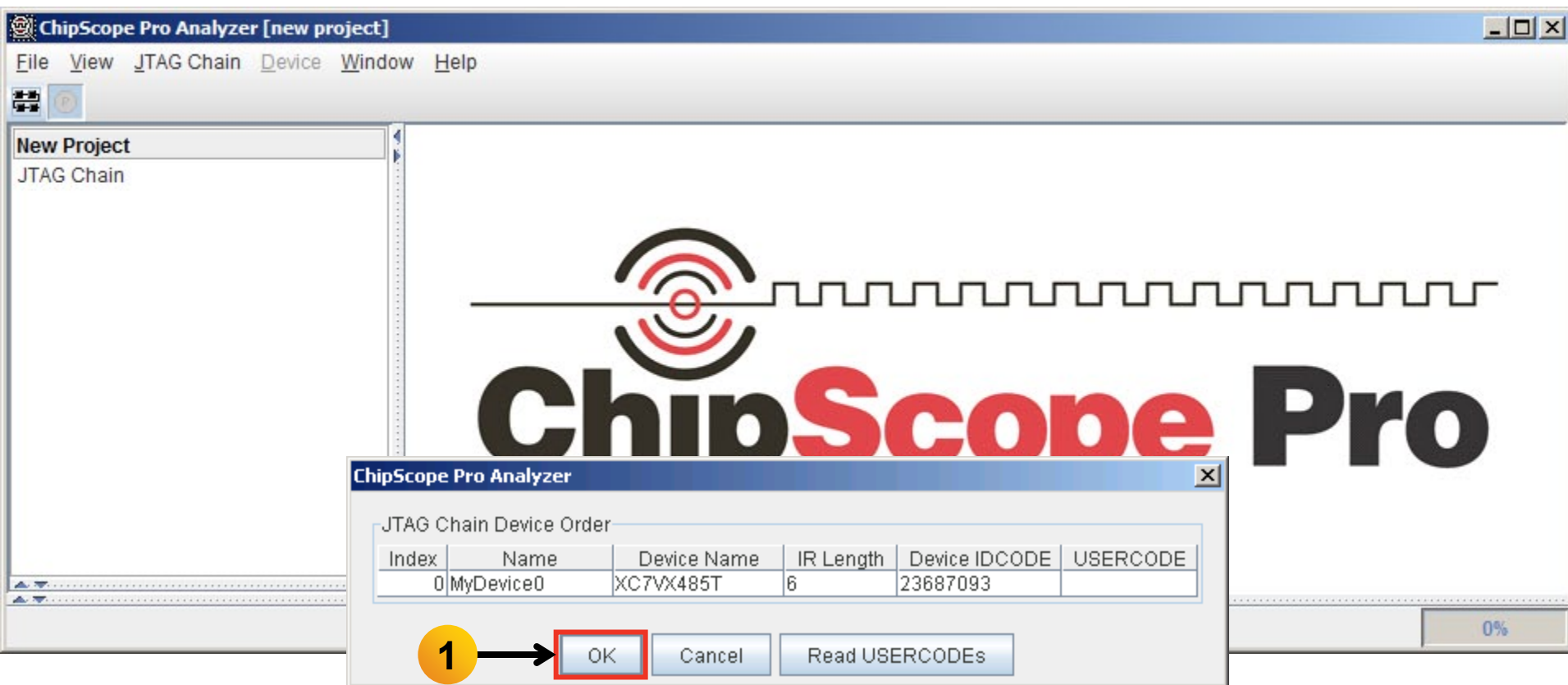
Run Ethernet Example Design

- Open ChipScope Pro and select JTAG Chain → Digilent USB Cable... (1)
- Verify 30 MHz operation and click OK (2)



Run Ethernet Example Design

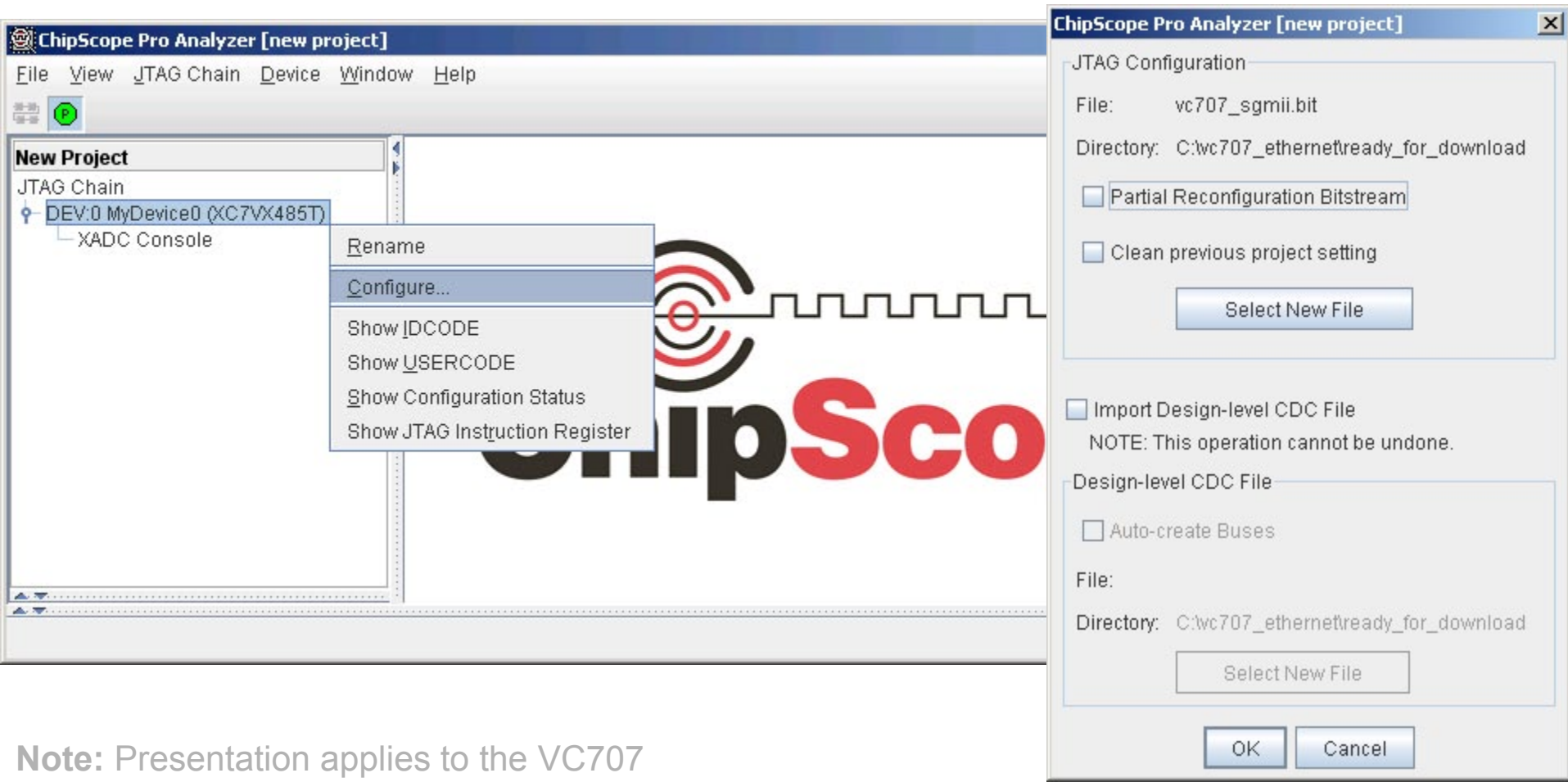
➤ Click OK (1)



Note: Presentation applies to the VC707

Run Ethernet Example Design

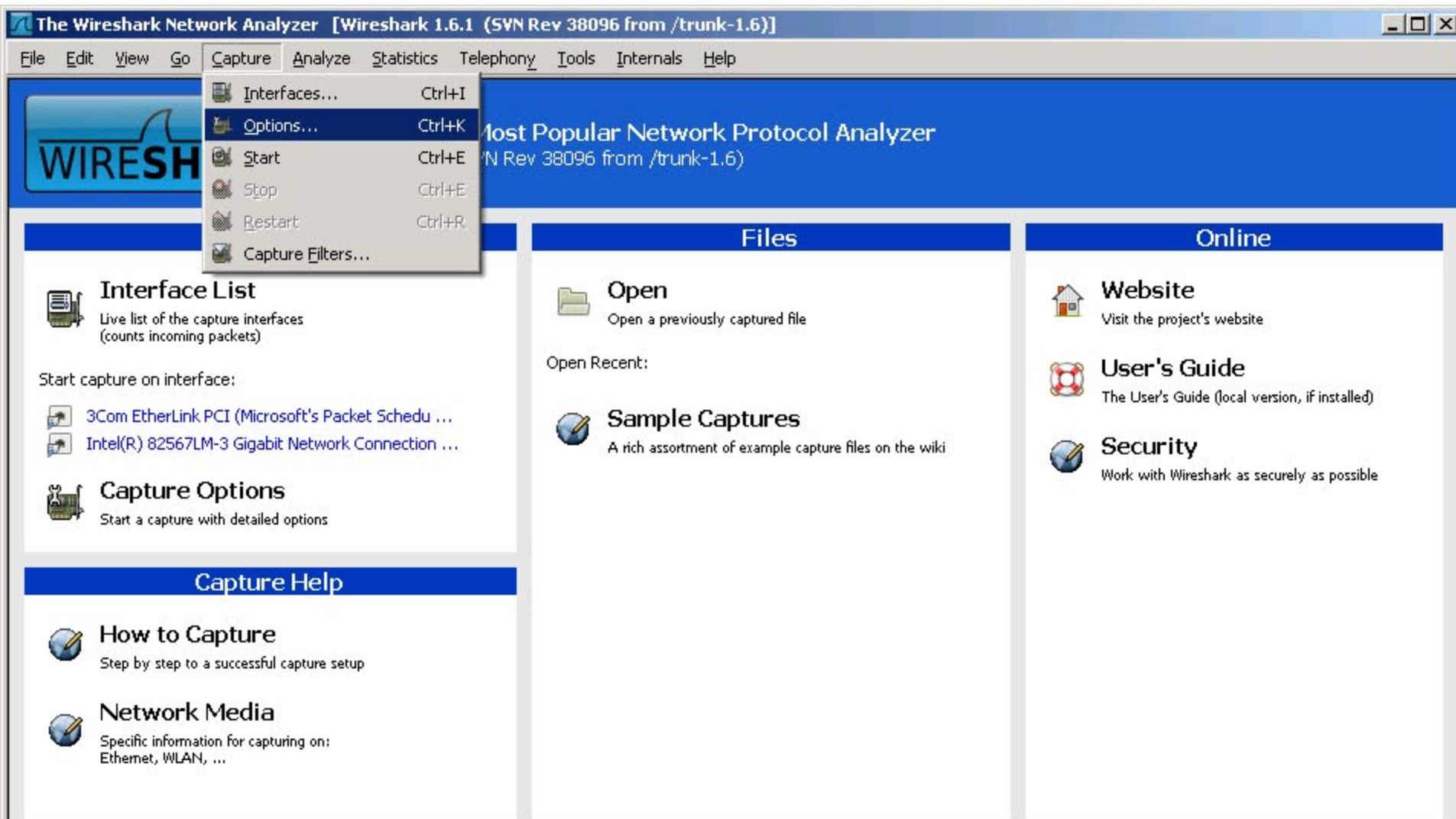
- Right-click DEV:0 MyDevice0 (XC7VX485T) and select Configure...
- Select <Design Path>\ready_for_download\vc707_sgmii.bit



Note: Presentation applies to the VC707

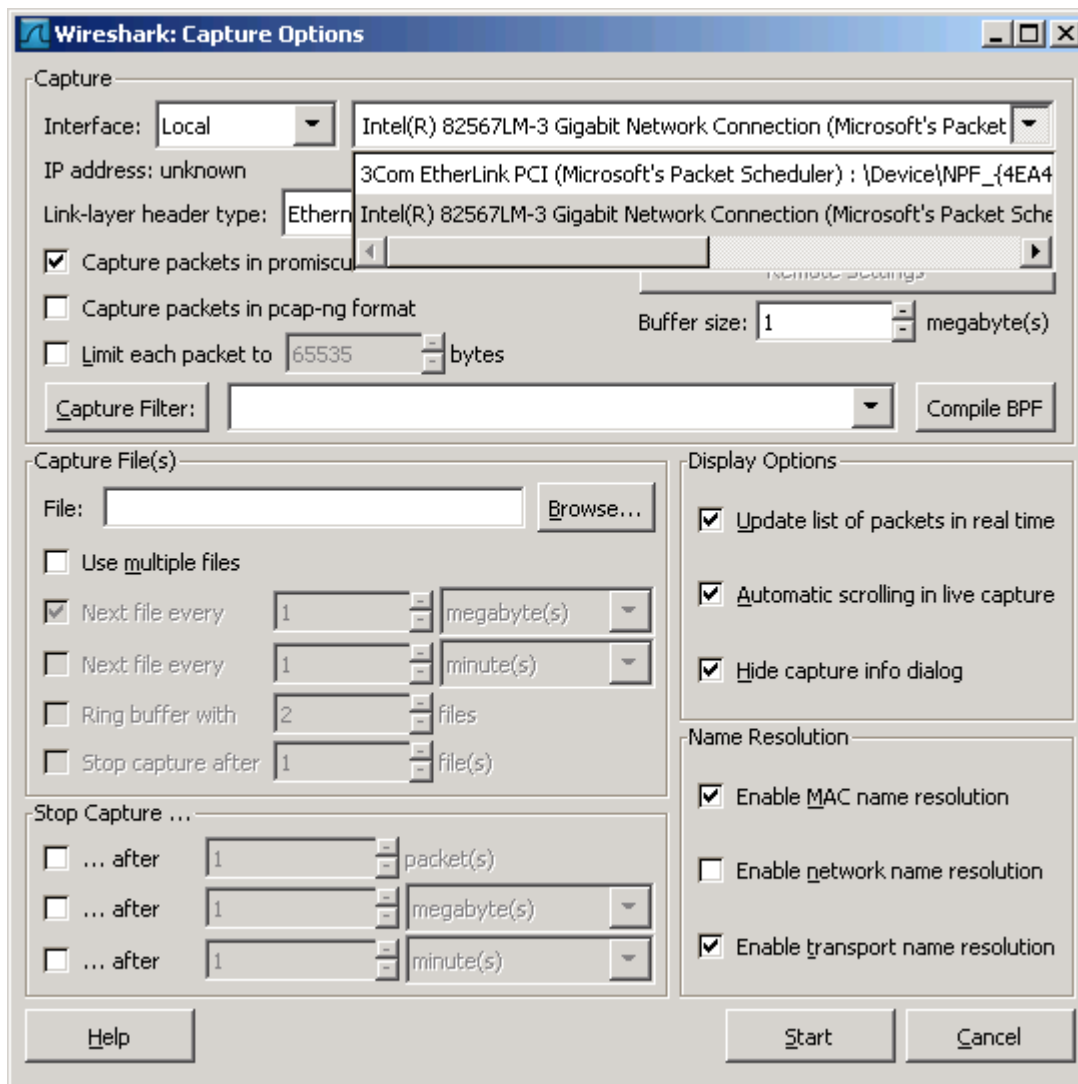
Run Ethernet Example Design

➤ Open Wireshark and select Capture → Options...



Run Ethernet Example Design

➤ Select your PC's Gigabit Ethernet connection; click on Capture filter

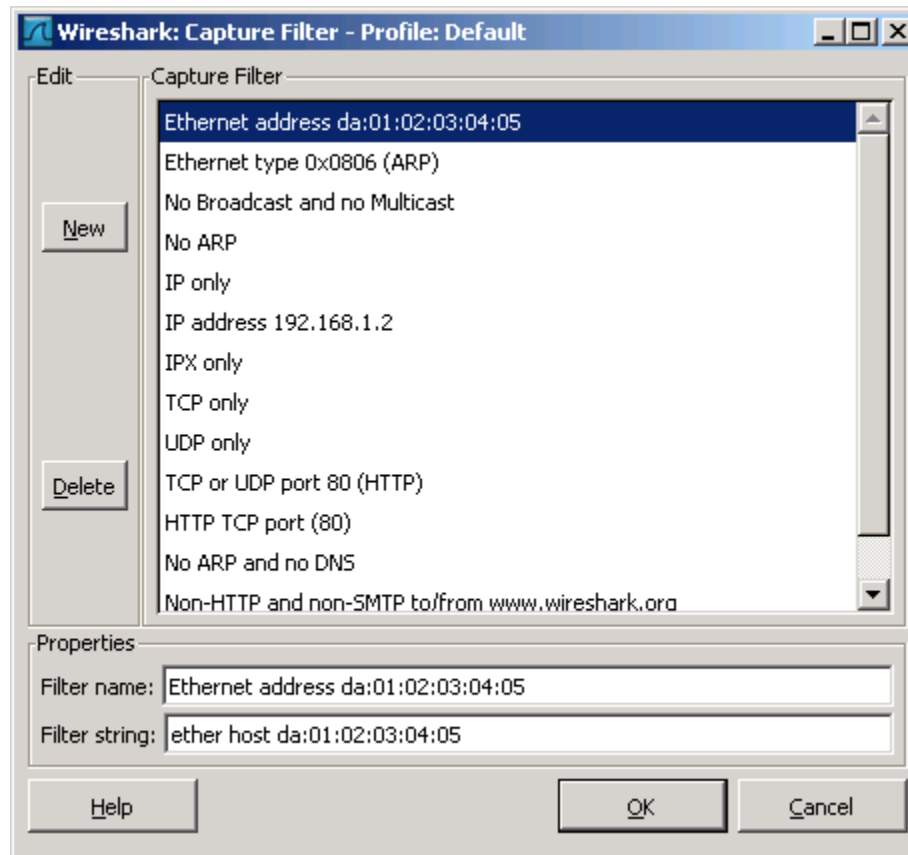


Run Ethernet Example Design

➤ Type in the following filter and click OK:

Ethernet address da:01:02:03:04:05

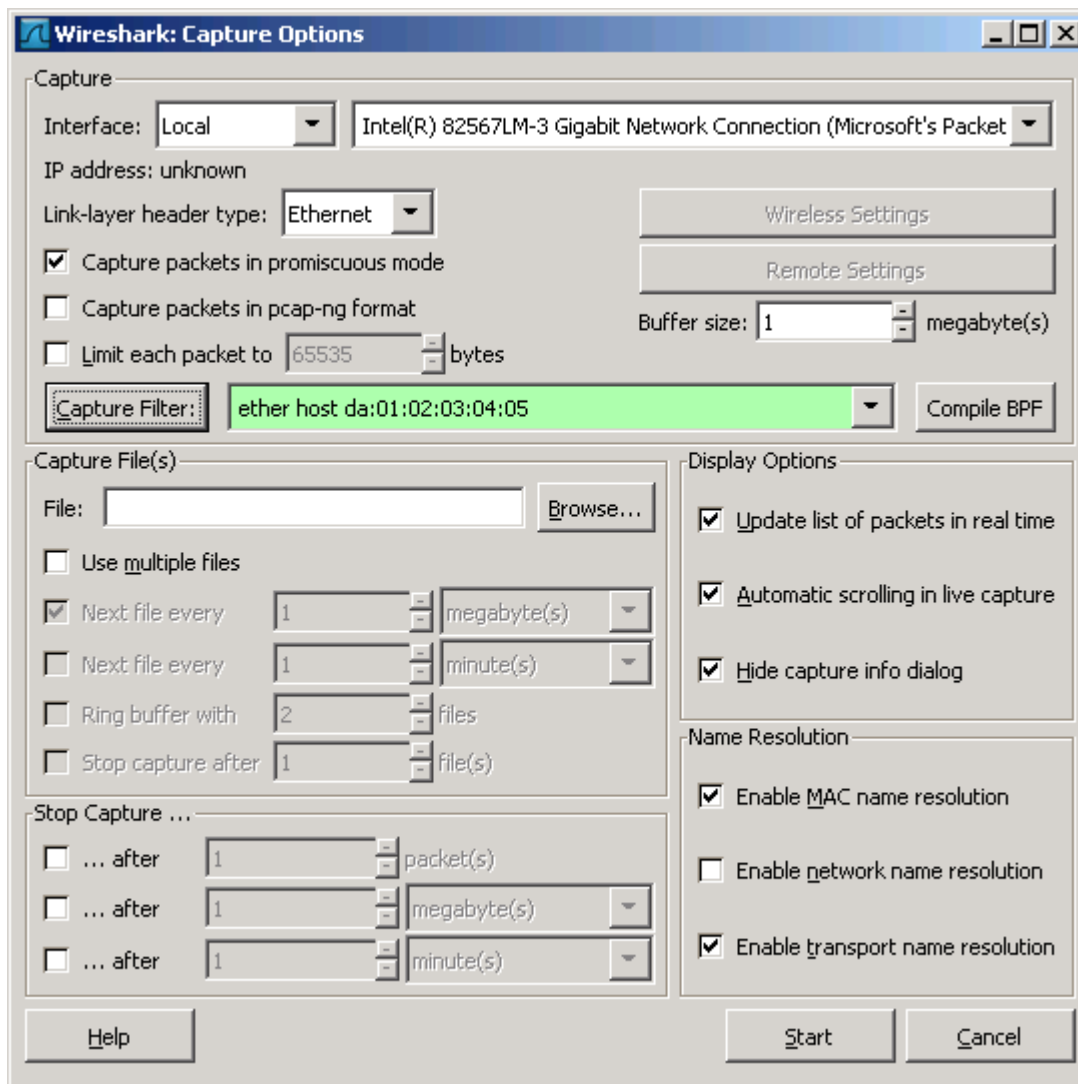
ether host da:01:02:03:04:05



Note: Presentation applies to the VC707

Run Ethernet Example Design

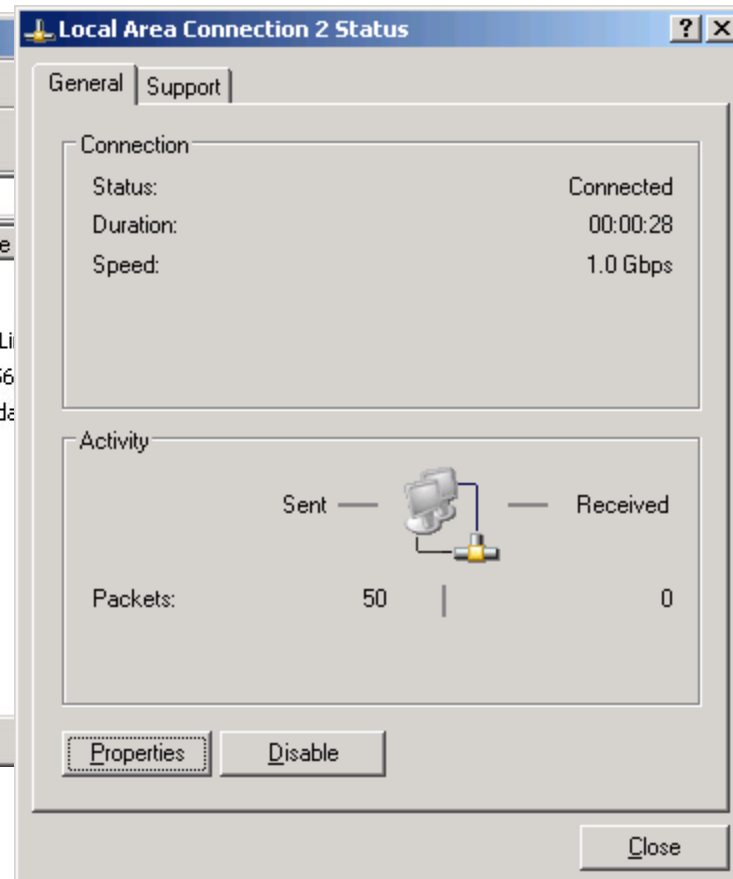
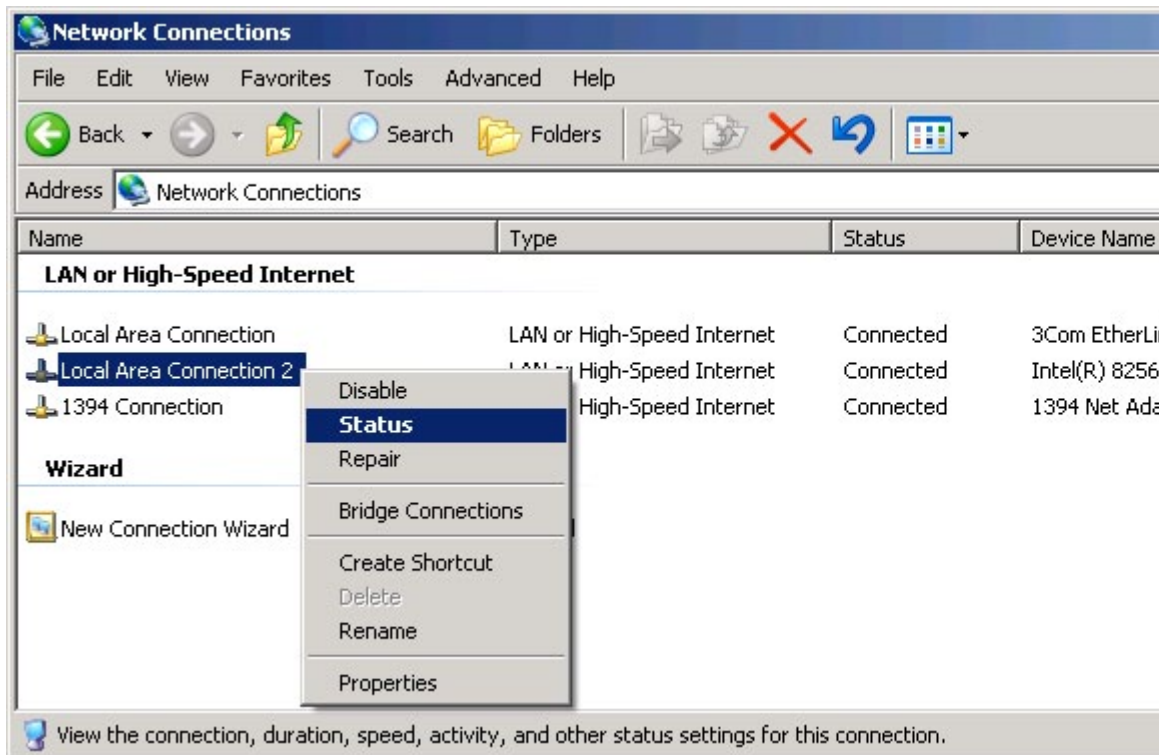
➤ Click Start



Note: Presentation applies to the VC707

Run Ethernet Example Design

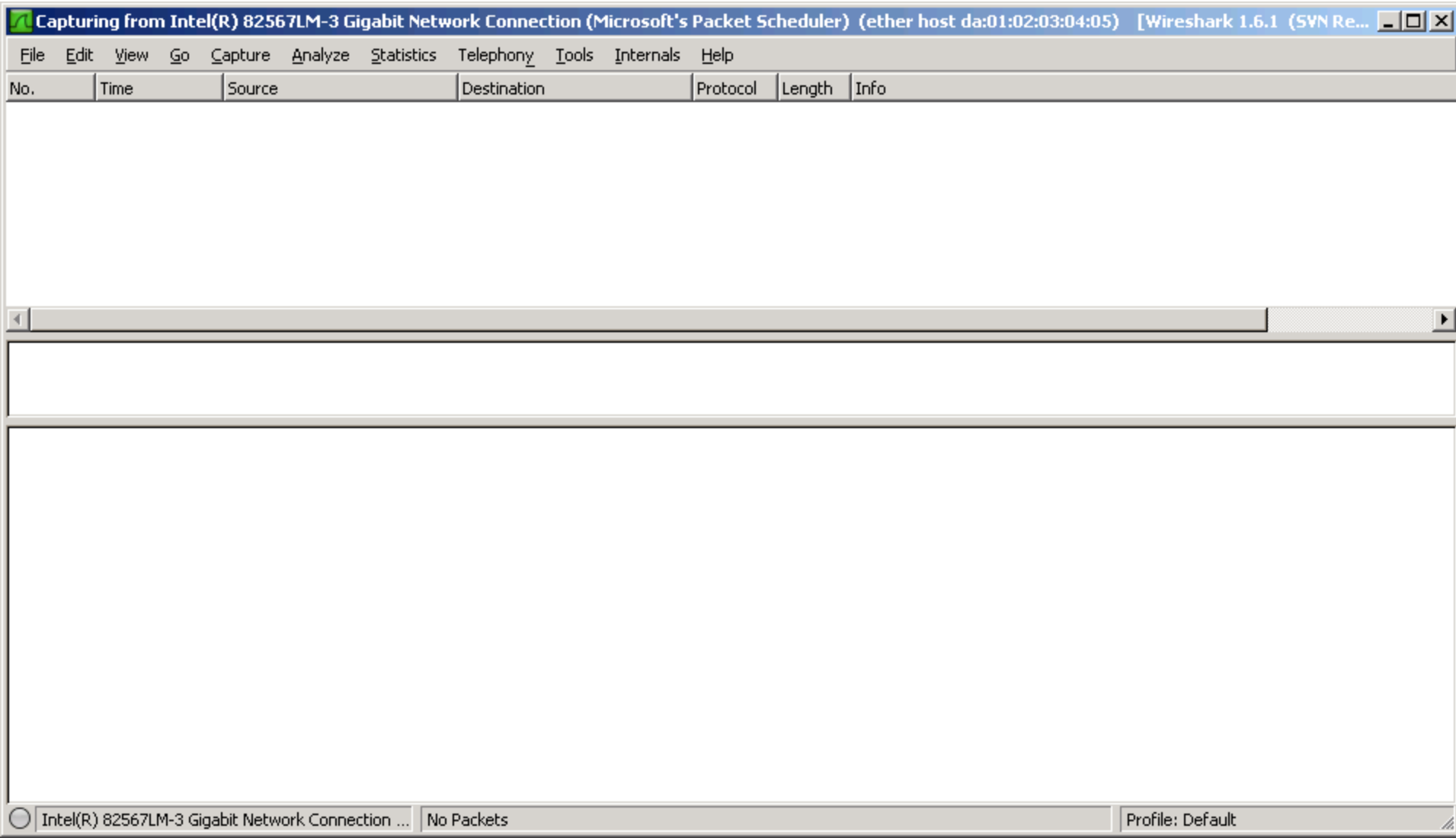
- Open your Network Connections control panel
- Right click on the Gigabit network connection and select Status
- The status dialog will show you the speed and number of packets



Note: Presentation applies to the VC707

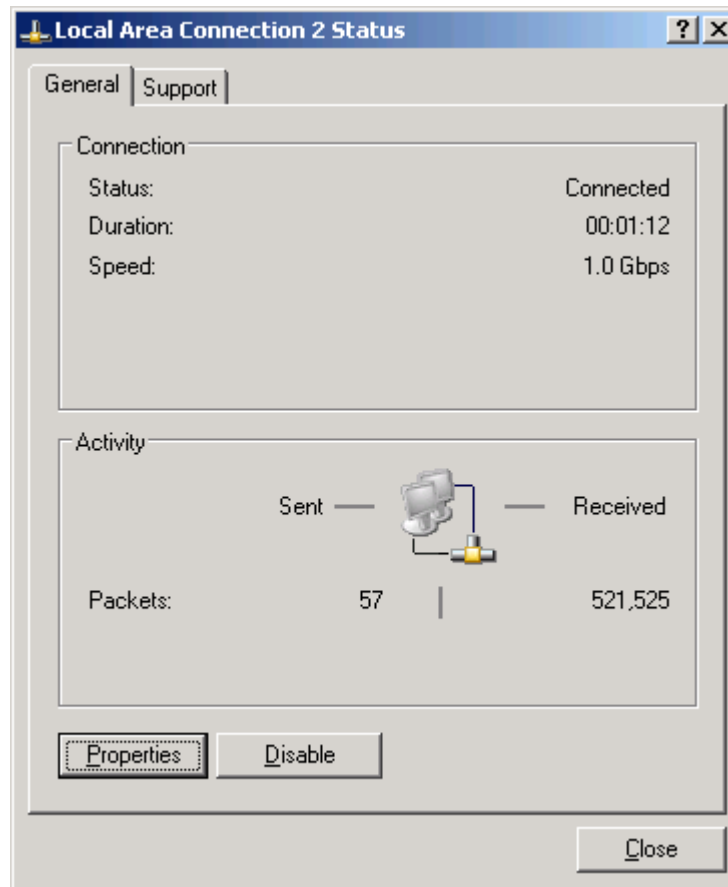
Run Ethernet Example Design

➤ Wireshark should show no packets



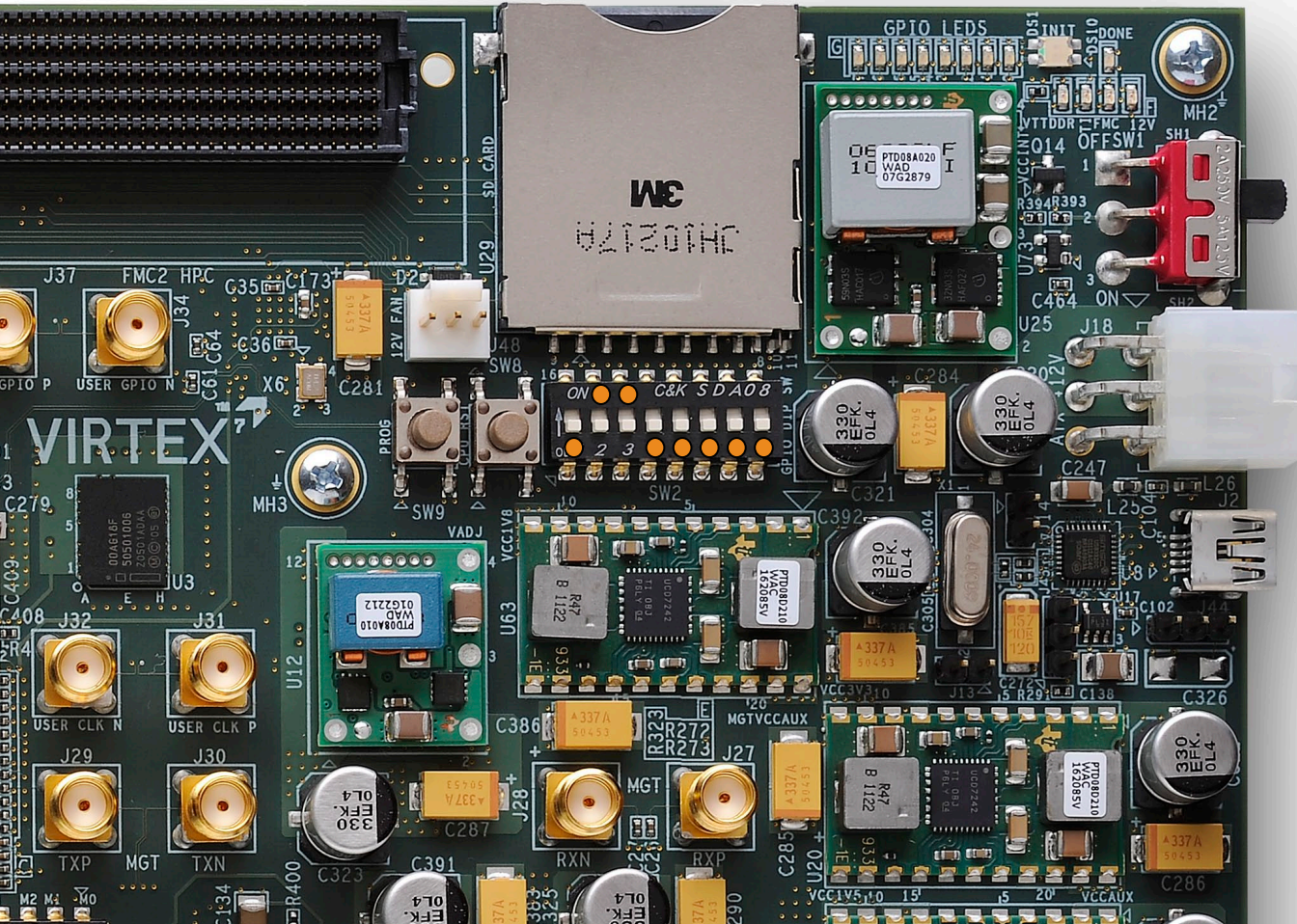
Run Ethernet Example Design

- The status dialog shows a few packets received



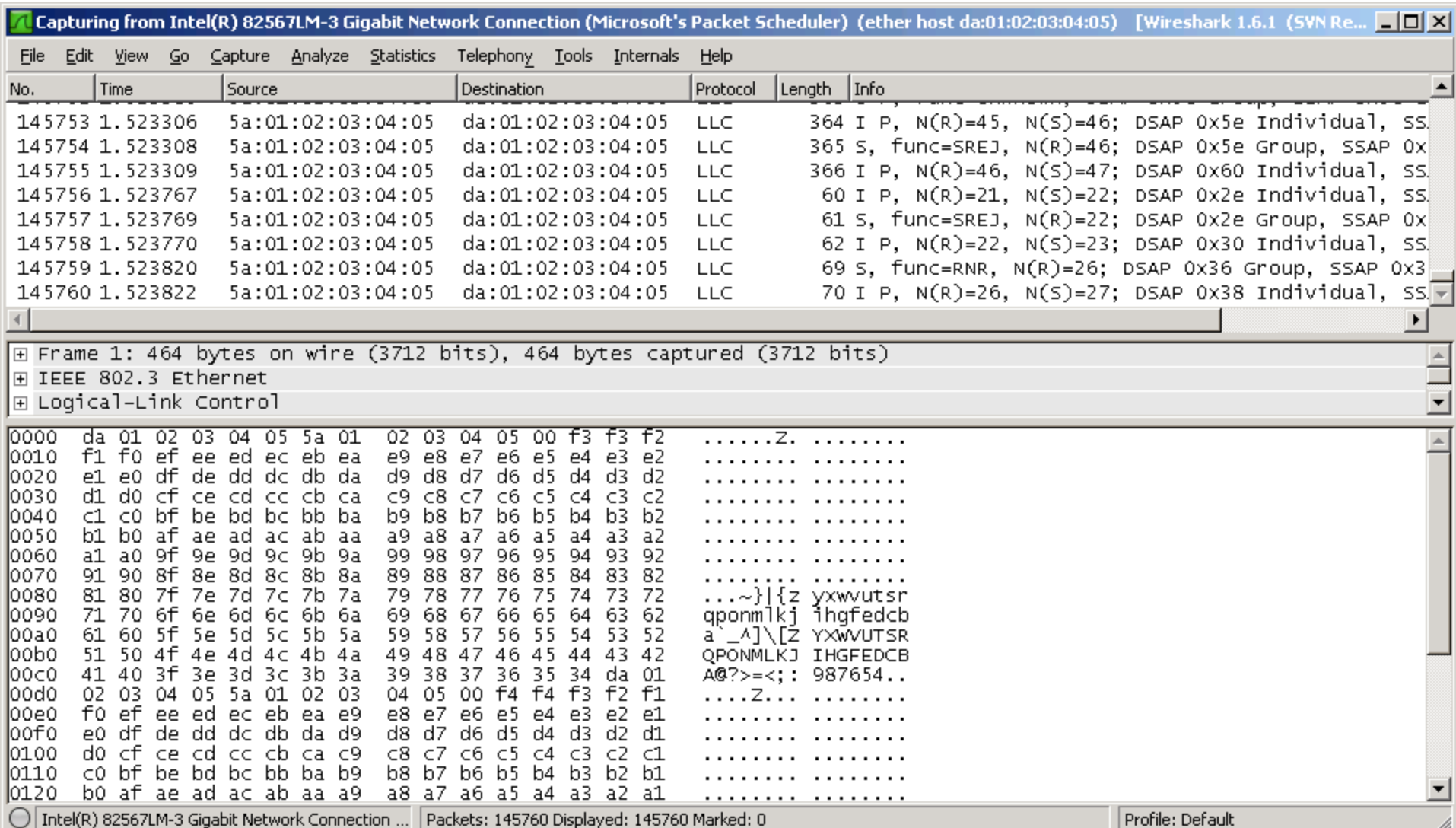
Run Ethernet Example Design

- Set SW2 to 01100000 (1 = on, Position 1 → Position 8) for a moment to run the packet generator
- Set SW2 back to 01000000



Run Ethernet Example Design

➤ Wireshark captures and displays the actual packets



Capturing from Intel(R) 82567LM-3 Gigabit Network Connection (Microsoft's Packet Scheduler) (ether host da:01:02:03:04:05) [Wireshark 1.6.1 (SVN Re...]

No.	Time	Source	Destination	Protocol	Length	Info
145753	1.523306	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	364	I P, N(R)=45, N(S)=46; DSAP 0x5e Individual, SS
145754	1.523308	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	365	S, func=SREJ, N(R)=46; DSAP 0x5e Group, SSAP 0x
145755	1.523309	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	366	I P, N(R)=46, N(S)=47; DSAP 0x60 Individual, SS
145756	1.523767	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	60	I P, N(R)=21, N(S)=22; DSAP 0x2e Individual, SS
145757	1.523769	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	61	S, func=SREJ, N(R)=22; DSAP 0x2e Group, SSAP 0x
145758	1.523770	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	62	I P, N(R)=22, N(S)=23; DSAP 0x30 Individual, SS
145759	1.523820	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	69	S, func=RNR, N(R)=26; DSAP 0x36 Group, SSAP 0x3
145760	1.523822	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	70	I P, N(R)=26, N(S)=27; DSAP 0x38 Individual, SS

Frame 1: 464 bytes on wire (3712 bits), 464 bytes captured (3712 bits)

IEEE 802.3 Ethernet

Logical-Link Control

Offset	Hex	ASCII
0000	da 01 02 03 04 05 5a 01 02 03 04 05 00 f3 f3 f2	.....Z.
0010	f1 f0 ef ee ed ec eb ea e9 e8 e7 e6 e5 e4 e3 e2	.....
0020	e1 e0 df de dd dc db da d9 d8 d7 d6 d5 d4 d3 d2	.....
0030	d1 d0 cf ce cd cc cb ca c9 c8 c7 c6 c5 c4 c3 c2	.....
0040	c1 c0 bf be bd bc bb ba b9 b8 b7 b6 b5 b4 b3 b2	.....
0050	b1 b0 af ae ad ac ab aa a9 a8 a7 a6 a5 a4 a3 a2	.....
0060	a1 a0 9f 9e 9d 9c 9b 9a 99 98 97 96 95 94 93 92	.....
0070	91 90 8f 8e 8d 8c 8b 8a 89 88 87 86 85 84 83 82	.....
0080	81 80 7f 7e 7d 7c 7b 7a 79 78 77 76 75 74 73 72	...~}|{z yxwvutsr
0090	71 70 6f 6e 6d 6c 6b 6a 69 68 67 66 65 64 63 62	qponmlkj ihgfedcb
00a0	61 60 5f 5e 5d 5c 5b 5a 59 58 57 56 55 54 53 52	a`_^]\[Z YXWVUTSR
00b0	51 50 4f 4e 4d 4c 4b 4a 49 48 47 46 45 44 43 42	QPONMLKJ IHGFEDCB
00c0	41 40 3f 3e 3d 3c 3b 3a 39 38 37 36 35 34 da 01	A@?>=<;: 987654..
00d0	02 03 04 05 5a 01 02 03 04 05 00 f4 f4 f3 f2 f1	....Z... ..
00e0	f0 ef ee ed ec eb ea e9 e8 e7 e6 e5 e4 e3 e2 e1	.....
00f0	e0 df de dd dc db da d9 d8 d7 d6 d5 d4 d3 d2 d1	.....
0100	d0 cf ce cd cc cb ca c9 c8 c7 c6 c5 c4 c3 c2 c1	.....
0110	c0 bf be bd bc bb ba b9 b8 b7 b6 b5 b4 b3 b2 b1	.....
0120	b0 af ae ad ac ab aa a9 a8 a7 a6 a5 a4 a3 a2 a1	.....

Intel(R) 82567LM-3 Gigabit Network Connection ... Packets: 145760 Displayed: 145760 Marked: 0 Profile: Default

Run Ethernet Example Design

➤ Select a packet in the upper panel

The image shows a Wireshark packet capture window. The title bar reads "Capturing from Intel(R) 82567LM-3 Gigabit Network Connection (Microsoft's Packet Scheduler) (ether host da:01:02:03:04:05) [Wireshark 1.6.1 (SVN Re...". The menu bar includes File, Edit, View, Go, Capture, Analyze, Statistics, Telephony, Tools, Internals, and Help. The packet list pane shows several packets, with packet 145760 selected. The packet details pane shows the structure of the selected packet: Frame 145760: 70 bytes on wire (560 bits), 70 bytes captured (560 bits), IEEE 802.3 Ethernet, and Logical-Link Control. The packet bytes pane shows the raw data in hexadecimal and ASCII.

No.	Time	Source	Destination	Protocol	Length	Info
145753	1.523306	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	364	I P, N(R)=45, N(S)=46; DSAP 0x5e Individual, SS
145754	1.523308	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	365	S, func=SREJ, N(R)=46; DSAP 0x5e Group, SSAP 0x
145755	1.523309	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	366	I P, N(R)=46, N(S)=47; DSAP 0x60 Individual, SS
145756	1.523767	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	60	I P, N(R)=21, N(S)=22; DSAP 0x2e Individual, SS
145757	1.523769	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	61	S, func=SREJ, N(R)=22; DSAP 0x2e Group, SSAP 0x
145758	1.523770	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	62	I P, N(R)=22, N(S)=23; DSAP 0x30 Individual, SS
145759	1.523820	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	69	S, func=RNR, N(R)=26; DSAP 0x36 Group, SSAP 0x3
145760	1.523822	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	70	I P, N(R)=26, N(S)=27; DSAP 0x38 Individual, SS

Frame 145760: 70 bytes on wire (560 bits), 70 bytes captured (560 bits)

IEEE 802.3 Ethernet

Logical-Link Control

Offset	Hex	ASCII
0000	da 01 02 03 04 05 5a 01 02 03 04 05 00 38 38 37	.....Z. ....887
0010	36 35 34 33 32 31 30 2f 2e 2d 2c 2b 2a 29 28 27	6543210/ .-,+*)('
0020	26 25 24 23 22 21 20 1f 1e 1d 1c 1b 1a 19 18 17	&%\$#"!
0030	16 15 14 13 12 11 10 0f 0e 0d 0c 0b 0a 09 08 07	.....
0040	06 05 04 03 02 01	.....

Intel(R) 82567LM-3 Gigabit Network Connection ... Packets: 145760 Displayed: 145760 Marked: 0 Profile: Default

Run Ethernet Example Design

➤ Use the arrow keys to move to the next packet

The image shows a Wireshark packet capture window. The title bar reads "Capturing from Intel(R) 82567LM-3 Gigabit Network Connection (Microsoft's Packet Scheduler) (ether host da:01:02:03:04:05) [Wireshark 1.6.1 (SVN Re...". The menu bar includes File, Edit, View, Go, Capture, Analyze, Statistics, Telephony, Tools, Internals, and Help. The packet list table has columns for No., Time, Source, Destination, Protocol, Length, and Info. The selected packet is 145759, which is an LLC packet with a length of 69 bytes. The packet details pane shows the frame structure: Frame 145759: 69 bytes on wire (552 bits), 69 bytes captured (552 bits), IEEE 802.3 Ethernet, and Logical-Link Control. The packet bytes pane displays the raw data in hexadecimal and ASCII.

No.	Time	Source	Destination	Protocol	Length	Info
145753	1.523306	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	364	I P, N(R)=45, N(S)=46; DSAP 0x5e Individual, SS...
145754	1.523308	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	365	S, func=SREJ, N(R)=46; DSAP 0x5e Group, SSAP 0x...
145755	1.523309	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	366	I P, N(R)=46, N(S)=47; DSAP 0x60 Individual, SS...
145756	1.523767	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	60	I P, N(R)=21, N(S)=22; DSAP 0x2e Individual, SS...
145757	1.523769	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	61	S, func=SREJ, N(R)=22; DSAP 0x2e Group, SSAP 0x...
145758	1.523770	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	62	I P, N(R)=22, N(S)=23; DSAP 0x30 Individual, SS...
145759	1.523820	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	69	S, func=RNR, N(R)=26; DSAP 0x36 Group, SSAP 0x3...
145760	1.523822	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	70	I P, N(R)=26, N(S)=27; DSAP 0x38 Individual, SS...

Frame 145759: 69 bytes on wire (552 bits), 69 bytes captured (552 bits)

IEEE 802.3 Ethernet

Logical-Link Control

```
0000  da 01 02 03 04 05 5a 01 02 03 04 05 00 37 37 36  .....Z. ....776
0010  35 34 33 32 31 30 2f 2e 2d 2c 2b 2a 29 28 27 26  543210/. -,+*)('&
0020  25 24 23 22 21 20 1f 1e 1d 1c 1b 1a 19 18 17 16  %$#"! .. ....
0030  15 14 13 12 11 10 0f 0e 0d 0c 0b 0a 09 08 07 06  .....
0040  05 04 03 02 01  .....

```

Intel(R) 82567LM-3 Gigabit Network Connection ... Packets: 145760 Displayed: 145760 Marked: 0 Profile: Default

Run Ethernet Example Design

➤ Viewing several packets, you can see a simple changing pattern

The image shows a Wireshark packet capture window. The title bar reads "Capturing from Intel(R) 82567LM-3 Gigabit Network Connection (Microsoft's Packet Scheduler) (ether host da:01:02:03:04:05) [Wireshark 1.6.1 (SVN Re...". The menu bar includes File, Edit, View, Go, Capture, Analyze, Statistics, Telephony, Tools, Internals, and Help. The packet list table has columns for No., Time, Source, Destination, Protocol, Length, and Info. The selected packet is 145758, which is an LLC packet with a length of 62 bytes. The packet details pane shows the frame structure: Frame 145758: 62 bytes on wire (496 bits), 62 bytes captured (496 bits), IEEE 802.3 Ethernet, and Logical-Link Control. The packet bytes pane displays the raw data in hexadecimal and ASCII.

No.	Time	Source	Destination	Protocol	Length	Info
145753	1.523306	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	364	I P, N(R)=45, N(S)=46; DSAP 0x5e Individual, SS...
145754	1.523308	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	365	S, func=SREJ, N(R)=46; DSAP 0x5e Group, SSAP 0x...
145755	1.523309	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	366	I P, N(R)=46, N(S)=47; DSAP 0x60 Individual, SS...
145756	1.523767	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	60	I P, N(R)=21, N(S)=22; DSAP 0x2e Individual, SS...
145757	1.523769	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	61	S, func=SREJ, N(R)=22; DSAP 0x2e Group, SSAP 0x...
145758	1.523770	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	62	I P, N(R)=22, N(S)=23; DSAP 0x30 Individual, SS...
145759	1.523820	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	69	S, func=RNR, N(R)=26; DSAP 0x36 Group, SSAP 0x3...
145760	1.523822	5a:01:02:03:04:05	da:01:02:03:04:05	LLC	70	I P, N(R)=26, N(S)=27; DSAP 0x38 Individual, SS...

Frame 145758: 62 bytes on wire (496 bits), 62 bytes captured (496 bits)

IEEE 802.3 Ethernet

Logical-Link Control

```
0000  da 01 02 03 04 05 5a 01 02 03 04 05 00 30 30 2f  .....Z. ....00/
0010  2e 2d 2c 2b 2a 29 28 27 26 25 24 23 22 21 20 1f  .-,+*)(' &$$#"! .
0020  1e 1d 1c 1b 1a 19 18 17 16 15 14 13 12 11 10 0f  .....
0030  0e 0d 0c 0b 0a 09 08 07 06 05 04 03 02 01       .....

```

Intel(R) 82567LM-3 Gigabit Network Connection ... Packets: 145760 Displayed: 145760 Marked: 0 Profile: Default

References

References

➤ Tri-Mode Ethernet Media Access Controller

- Tri-Mode Ethernet MAC Product Overview
 - <http://www.xilinx.com/products/intellectual-property/TEMAC.htm>
- Tri-Mode Ethernet MAC Data Sheet – DS818
 - http://www.xilinx.com/support/documentation/ip_documentation/tri_mode_eth_mac/v5_2/ds818_tri_mode_eth_mac.pdf
- LogiCORE IP Tri-Mode Ethernet MAC User Guide – UG777
 - http://www.xilinx.com/support/documentation/ip_documentation/tri_mode_eth_mac/v5_2/ug777_tri_mode_eth_mac.pdf



Documentation

Documentation

➤ Virtex-7

- Virtex-7 FPGA Family

- <http://www.xilinx.com/products/silicon-devices/fpga/virtex-7/index.htm>

➤ VC707 Documentation

- Virtex-7 FPGA VC707 Evaluation Kit

- <http://www.xilinx.com/products/boards-and-kits/EK-V7-VC707-G.htm>

- VC707 User Guide

- http://www.xilinx.com/support/documentation/boards_and_kits/ug885_VC707_Eval_Bd.pdf