

2018 Texas Instruments Online Challenge

3Com NIC Board Analysis



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Analysis

The electronic device selected is a network interface card, or network interface controller, (abbreviated NIC) from a 1999 3Com computer. 3Com was a technology manufacturer renowned for their modems, servers, routers, and other computer network products; it was fully absorbed by Hewlett-Packard (HP) in 2010. The NIC was chosen because of its prestige condition and repurposed for this project since it and its host computer were going to be recycled.

NICs are hardware components connecting computers to local area networks (LAN). This NIC, implemented on an expansion board as an application-specific integrated circuit (ASIC), could be found in devices such as personal computers (PCs), servers, etc. The main component is the Parallel Tasking II chip. Parallel Tasking® technology was more efficient in data and packet transfer over the peripheral component interconnect (PCI) resulting in better application performance and less CPU usage for the host computer. This was achieved by allowing streaming of a full Ethernet packet over the PCI bus during a single bus operation as opposed to preceding technology where multiple operations were needed to transfer a full packet; the NIC has a 10 Mbps signal rate.

There are two chips on this board: a coaxial transceiver interface (CTI) and an Ethernet DC/DC converter. Made by National Semiconductor, the CTI is a cable line driver/receiver for Ethernet type local networks; the company was absorbed by Texas Instruments in 2011. This chip, designed to meet IEEE Standard 802.3, was one of few during its time with an embedded jabber timer. The internal precision circuitry enabled receive-mode collision detection that terminated signals when a collision occurred. The Ethernet DC/DC converter, made by Valor, is known for its cost effective design, continuous short circuit, overload protection, and a direct interface to power the converter ON/OFF. Its current limiting property allows continued operation after the removal of a short circuit or an output overload. The converter connects devices with a serial interface over a standard LAN network allowing the serial device to be controlled from a central computer.

Another component was a Motorola transistor - transistors are semiconductors that are used to switch or amplify electronic signals and electrical power. A voltage regulator, used to ensure the output voltage remains within the acceptable range of the electronic system, was also found. Passive components, used to store or dissipate power, found on the board are resistors, transformers, capacitors, and inductors. There is also a RJ-45 port and a BNC connector.

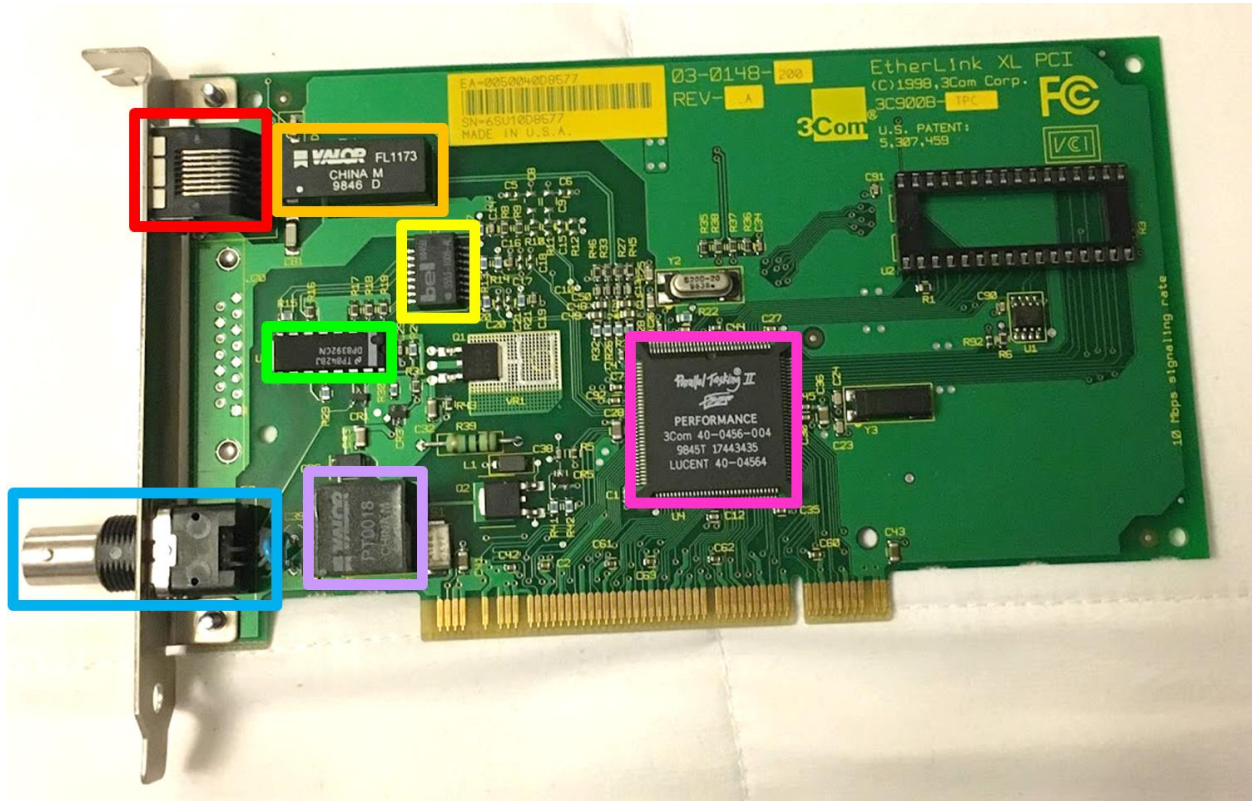
We learned a few lessons from this experiment. The first was how to take apart a computer safely and to not touch the surface or circuit connections of any boards. We learned the difference between servers and NICs - a server delivers data and process requests to another computer via a network while the NIC connects a device to the network. Another lesson was that many different components are used to make a functional product. We also learned how to read data sheets and the difference between active and passive components.

References:

- Network Interface Card (NIC)
 - <https://study.com/academy/lesson/network-interface-card-nic-types-function-definition.html>
- IC TRANSCEIVER COAX INT 16-DIP (Part Number: DP8392CN)
 - [http://datasheetz.com/data/Integrated%20Circuits%20\(ICs\)/Drivers,%20Receivers,%20Transceivers/DP8392CN-datasheetz.html](http://datasheetz.com/data/Integrated%20Circuits%20(ICs)/Drivers,%20Receivers,%20Transceivers/DP8392CN-datasheetz.html)
- Valor FL 1173 -- Transformer complies with IEEE 892.3
 - <https://www.digchip.com/datasheets/parts/datasheet/356/EPA1829C-pdf.php>
- Valor PT0018 Ethernet DC/DC converter
 - http://www.ben.cz/_d/datasheet/pm7202.pdf
- Motorola t30-55el transistor
- Parallel Tasking II 3Com 40-0456-004 9845T 17443435 Lucent 40-04564 (OR 3Com 40-0456-004 PCI Network Card XL---Parallel Tasking II)
 - <http://images.cxtec.com/PDF/3COMCA/3COMBC.PDF>
 - http://www.mtmnet.com/3C905B_TX_NM_25.htm
- Bel S553-1006-AE--transformer--Type: Lan 10G Base-T
 - <https://www.digikey.com/product-detail/en/bel-fuse-inc/S553-1006-AE-F/S553-1006-AE-F-ND/4310202>

Figures:

Figure 1: Network Interface Card (NIC) PCB Diagram



RJ-45 port
Valor FL-1173 Transformer
Bel S553-1006-AE Transformer

IC Transceiver COAX INT 16-DIP
BNC Connector
Parallel Tasking II 3Com Chip

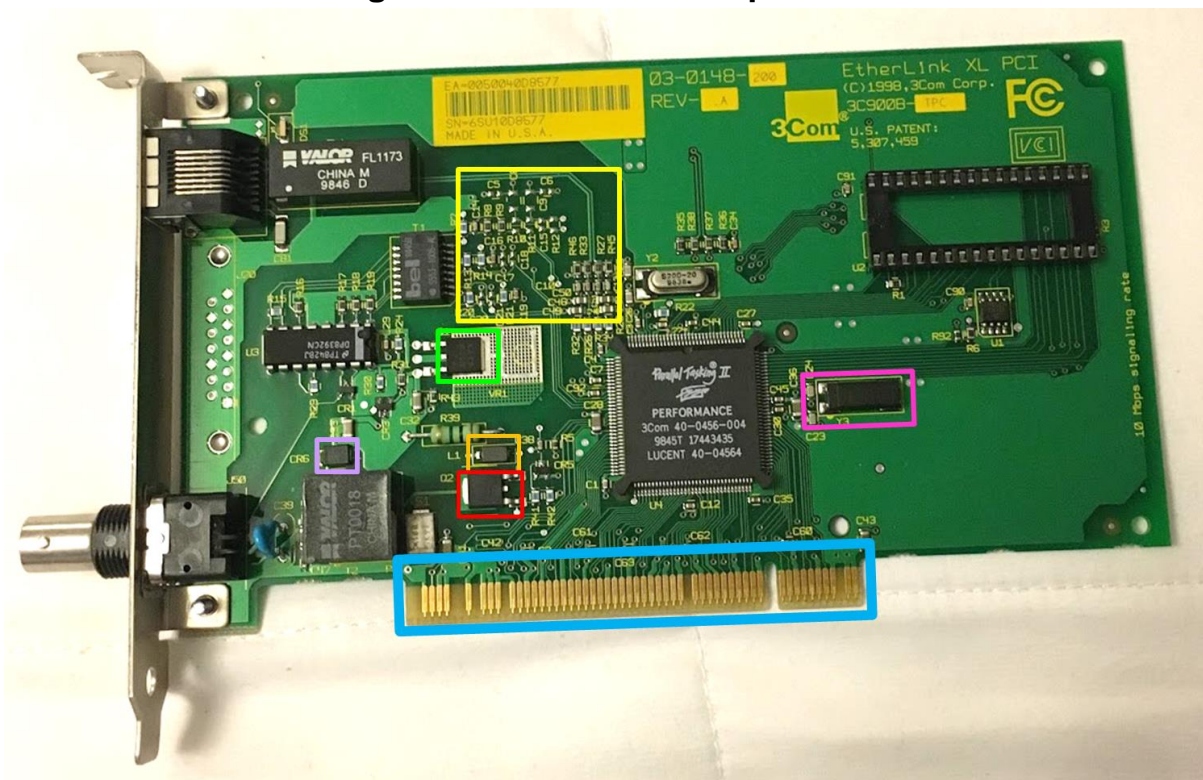
Figure 2: Input Ports



RJ-45 port

BNC Connector

Figure 3: Additional Components



Transistor

Inductor

Surface Mounted Capacitors and Resistors

Voltage Regulator

Motherboard Connection

Crystal

Figure 4: Side view of NIC board

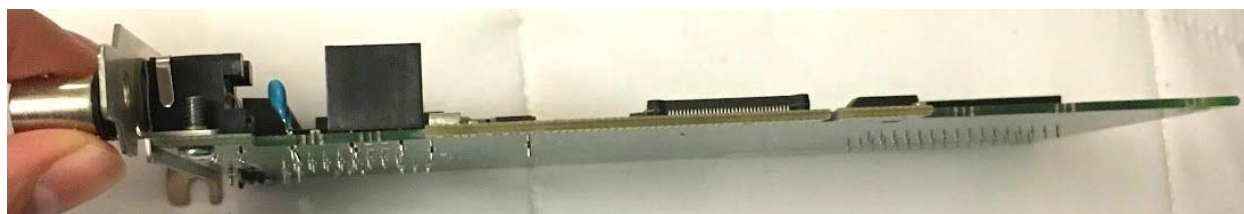


Figure 5: The back of the Network Interface Card (NIC)



Figure 6: Observing the NIC under magnifying lenses and extra light.

