



# Network

TCP/IP and OSI Network models



# Principles

---

Companies in the past had problems with everything:

- Only IP is alive?

- Only Ethernet is alive?

- Standards?

# OSI or TCP/IP(DoD) models

---

TCP/IP stack and TCP/IP model are different!

OSI

Application
Presentation
Session
Transport
Network
Data Link
Physical

TCP/IP model (old)

Application
Transport
Internet
Link

TCP/IP model (current)

Application
Transport
Network
Data Link
Physical

Reason:

standards

encapsulation/hiding

every layer has functions

Every “level” is responsible for Protocol

# OSI example

---

Application
Presentation
Session
Transport
Network
Data Link
Physical

HTTP/HTTPS/DHCP/DNS/FTP/LDAP/NTP/POP/SIP/SSH/Telnet/SNMP

TCP/UDP

IP/ICMP/IGMP

Ethernet/PPP/Frame-relay/x.25/ATM

Electricity/Light/Sound

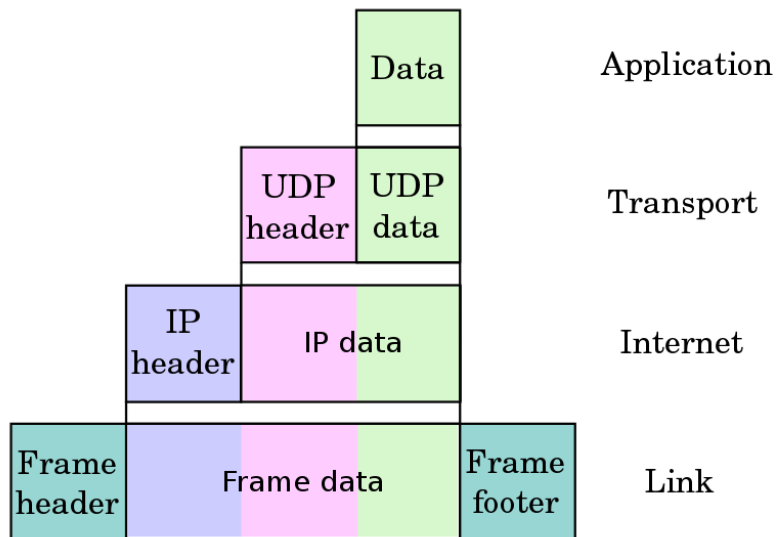
Simplified model from a network engineer perspective:

Application
Transport
Network
Data Link
Physical

[http://standards.iso.org/ittf/PubliclyAvailableStandards/s020269\\_ISO\\_IEC\\_7498-1\\_1994\(E\).zip](http://standards.iso.org/ittf/PubliclyAvailableStandards/s020269_ISO_IEC_7498-1_1994(E).zip)

# Encapsulation

---



History about koschei or matreshka

# OSI & encapsulations. Step 1

---

I want to send

DATA



Little history about the task and the standard

# Ethernet port pictures



## OSI & encapsulations. Step 2

---



Is that possible to deliver the DATA over ETHERNET without IP/TCP/UDP?

YES!

But standard is DATA over IP over ETHERNET (to have routing)



# OSI & encapsulations. Step 3

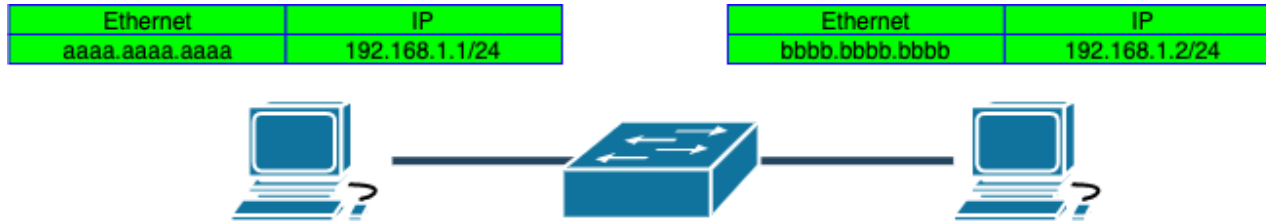
---



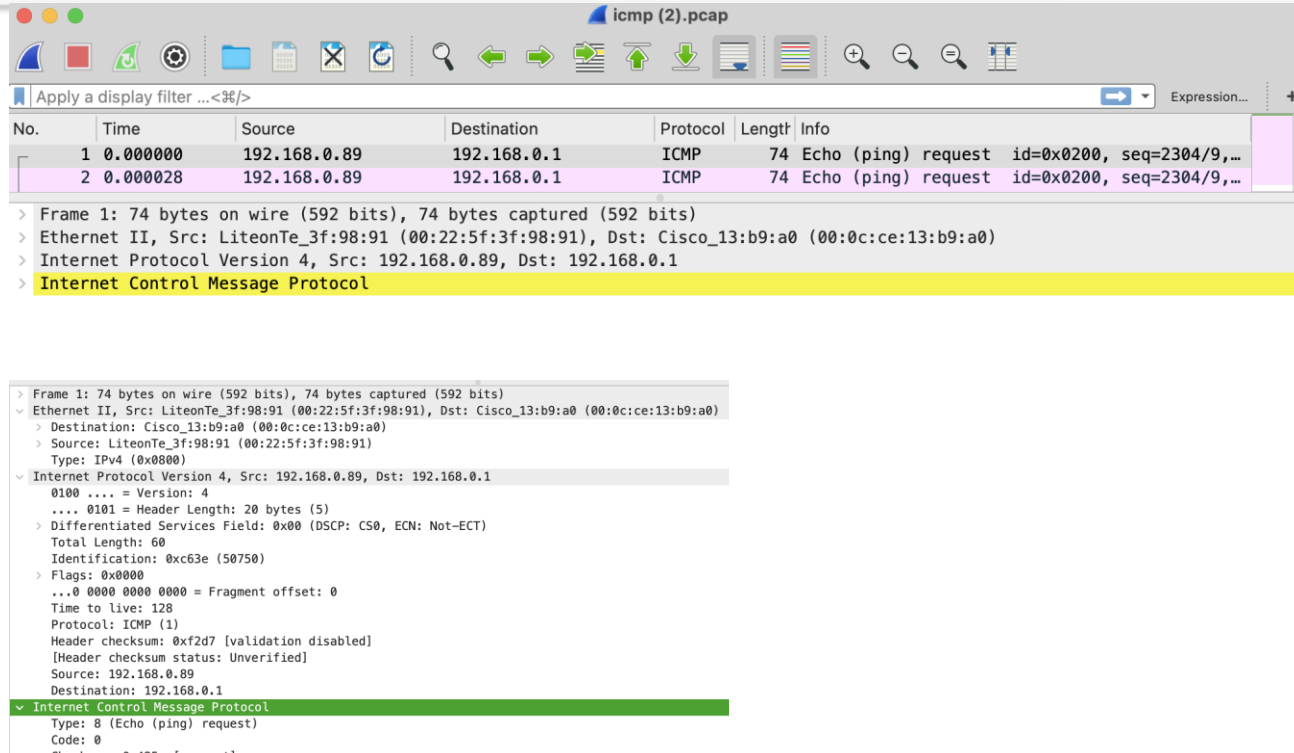
HTTP/S	DATA over TCP over IP over ETHERNET
ICMP	DATA over IP over ETHERNET
FTP	DATA over TCP/UDP over ETHERNET
DHCP	DATA over TCP/UDP over ETHERNET
DNS	DATA over TCP/UDP over ETHERNET
Torrent	DATA over UDP over ETHERNET
VOIP	DATA over UDP over ETHERNET
TELNET	DATA over TCP over ETHERNET
SSH	DATA over TCP over ETHERNET

In OS there is a Library with matching

# Don't think that way



# Encapsulations



The image shows the Wireshark network protocol analyzer interface. The top toolbar includes icons for file operations, display filters, and packet navigation. Below the toolbar is a display filter bar with the text "Apply a display filter ...<#>". The main packet list shows two ICMP Echo (ping) requests from 192.168.0.89 to 192.168.0.1. The details pane for the selected packet (No. 2) shows the following structure:

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	192.168.0.89	192.168.0.1	ICMP	74	Echo (ping) request id=0x0200, seq=2304/9,...
2	0.000028	192.168.0.89	192.168.0.1	ICMP	74	Echo (ping) request id=0x0200, seq=2304/9,...

The details pane for packet 2 shows the following structure:

- Frame 1: 74 bytes on wire (592 bits), 74 bytes captured (592 bits)
- Ethernet II, Src: LiteonTe\_3f:98:91 (00:22:5f:3f:98:91), Dst: Cisco\_13:b9:a0 (00:0c:ce:13:b9:a0)
- Internet Protocol Version 4, Src: 192.168.0.89, Dst: 192.168.0.1
- Internet Control Message Protocol

The expanded details for the Internet Control Message Protocol show the following structure:

- Type: 8 (Echo (ping) request)
- Code: 0
- Checksum: 0x125e (4686)

wireshark

[https://wiki.wireshark.org/Internet\\_Control\\_Message\\_Protocol?action=AttachFile&do=view&target=icmp.pcap](https://wiki.wireshark.org/Internet_Control_Message_Protocol?action=AttachFile&do=view&target=icmp.pcap)

# Encapsulations

---

Can IP be sent without an Ethernet header via an Ethernet port?

No!

Can PPP be sent via Ethernet port?

No! PPP can be sent only over Ethernet. Hello to PPPoE

What about IP over Ethernet over MPLS over IP over Ethernet?

Yes.

IP over MPLS over IP over Ethernet?

Yes

Ethernet over Ethernet?

Not really.

**THANK YOU**