

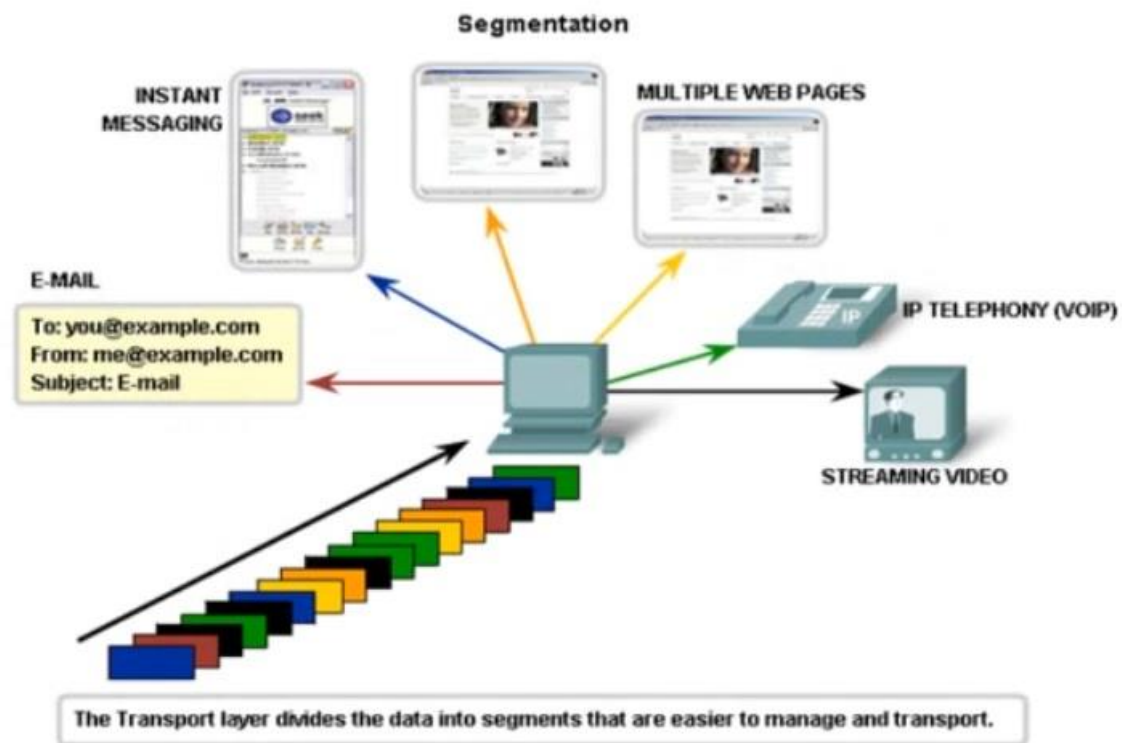


Transport Layer

Transport Layer Protocols

What does this Layer do ?

- Segmentation
- Flow Control
- Error Handling
- Segment Sequencing
- Service addressing
- Multiplexing



Transport Layer Protocols

- **Transmission Control Protocol (TCP)**

Connection-oriented

Reliable

- **User Datagram Protocol (UDP)**

Connection-less

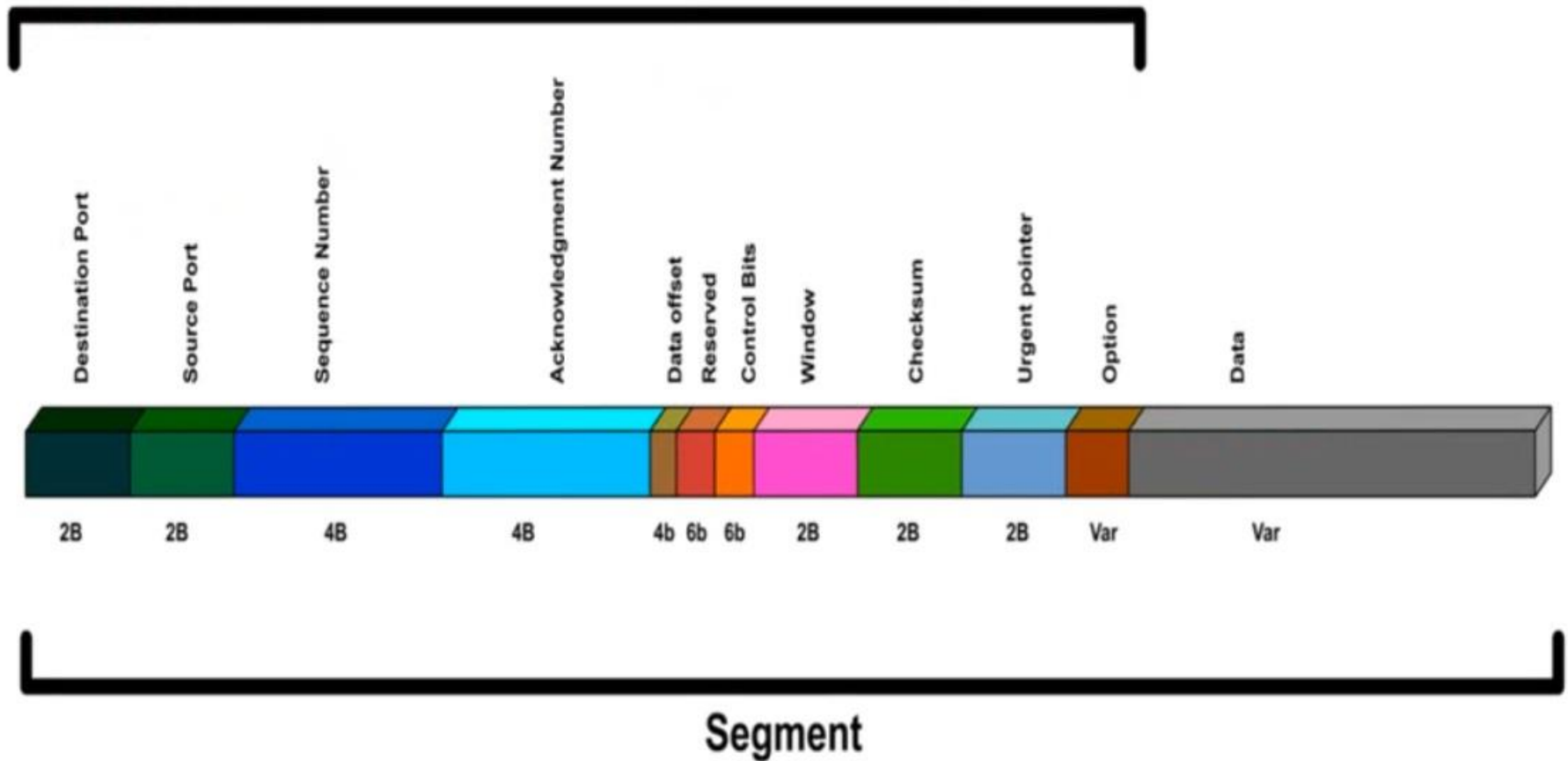
Unreliable



Transport Layer Protocols

Transmission Control Protocol (TCP)

TCPHeader

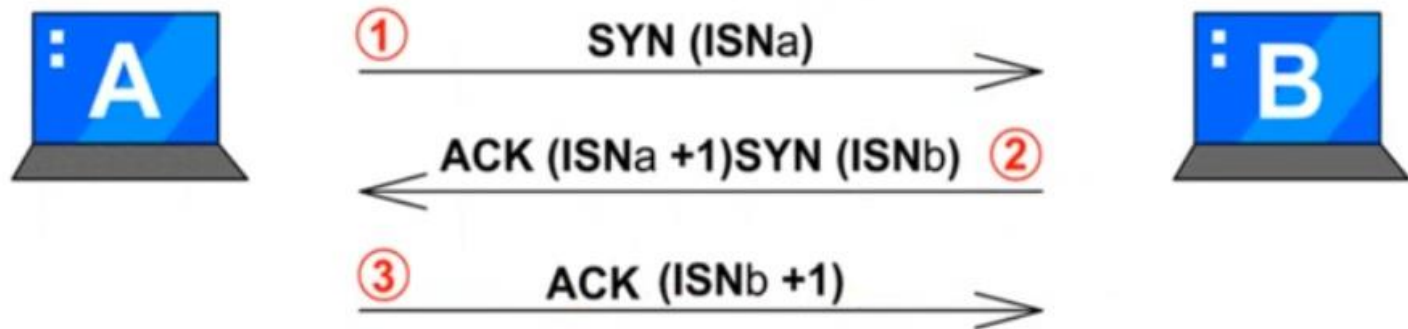


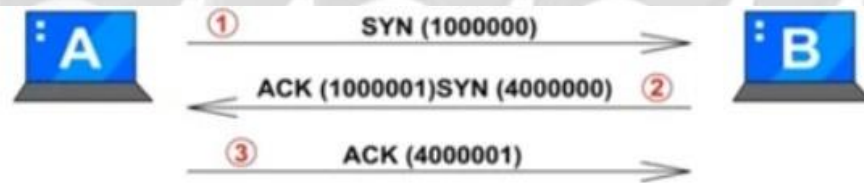


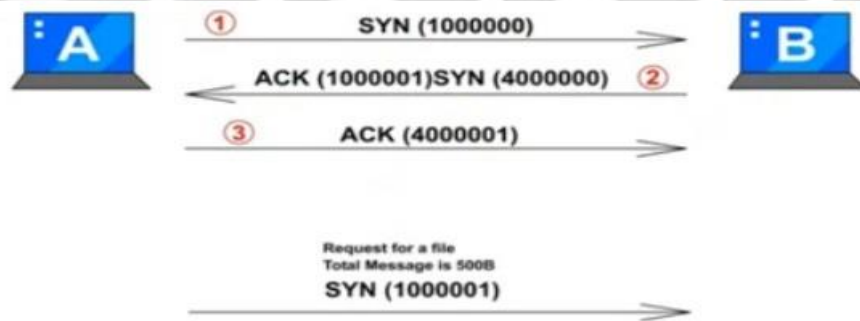
Transport Layer Protocols

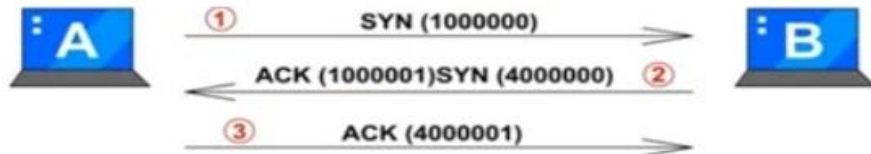
Transmission Control Protocol (TCP)

Three-way Handshake



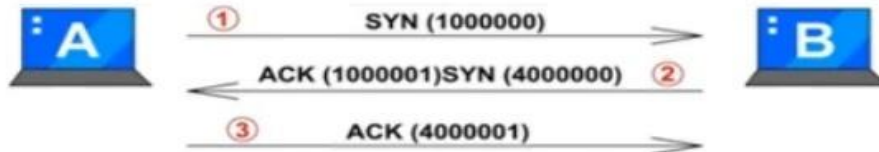






Request for a file
Total Message is 500B
SYN (1000001)

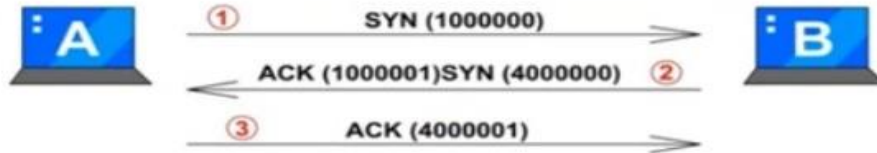
I got your 500B of Request
Send me more with Sequence# 1000501 (=1000001+500)
ACK (1000501)



Request for a file
Total Message is 500B
SYN (1000001)

I got your 500B of Request
Send me more with Sequence# 1000501 (=1000001+500)
ACK (1000501)

Here is some of your requested file
Total Message is 600B
SYN (4000001)

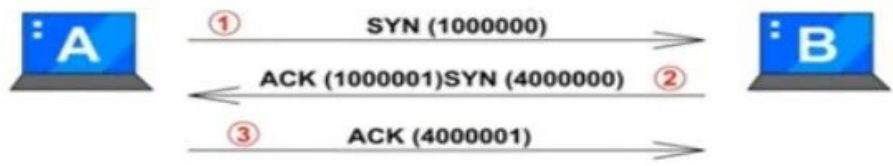


Request for a file
Total Message is 500B
SYN (1000001)

I got your 500B of Request
Send me more with Sequence# 1000501 (=1000001+500)
ACK (1000501)

Here is some of your requested file
Total Message is 600B
SYN (4000001)

I got your 600B of Request
Send me more with Sequence# 4000601 (=4000001+600)
ACK (4000601)



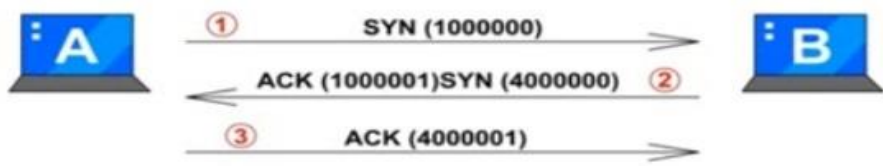
Request for a file
Total Message is 500B
SYN (1000001) →

I got your 500B of Request
Send me more with Sequence# 1000501 (=1000001+500)
ACK (1000501) ←

Here is some of your requested file
Total Message is 600B
SYN (4000001) ←

I got your 600B of Request
Send me more with Sequence# 4000601 (=4000001+600)
ACK (4000601) →

Continued Request for the file
Total Message is 500B
SYN (1000501) →



Request for a file
Total Message is 500B
SYN (1000001)

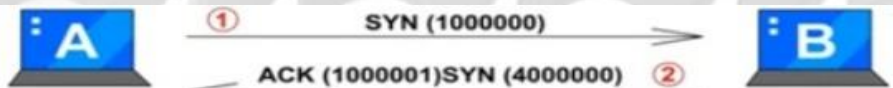
I got your 500B of Request
Send me more with Sequence# 1000501 (=1000001+500)
ACK (1000501)

Here is some of your requested file
Total Message is 600B
SYN (4000001)

I got your 600B of Request
Send me more with Sequence# 4000601 (=4000001+600)
ACK (4000601)

Continued Request for the file
Total Message is 500B
SYN (1000501)

I got your 500B of Request
Send me more with Sequence# 1001001 (=1000501+500)
ACK (1001001)



① SYN (1000000) →
← ACK (1000001) SYN (4000000) ②
③ ACK (4000001) →

Request for a file
Total Message is 500B
SYN (1000001) →

← I got your 500B of Request
Send me more with Sequence# 1000501 (=1000001+500)
ACK (1000501)

← Here is some of your requested file
Total Message is 600B
SYN (4000001)

← I got your 600B of Request
Send me more with Sequence# 4000601 (=4000001+600)
ACK (4000601) →

← Continued Request for the file
Total Message is 500B
SYN (1000501) →

← I got your 500B of Request
Send me more with Sequence# 1001001 (=1000501+500)
ACK (1001001)

← Here is some of your requested file
Total Message is 600B
SYN (4000601) →

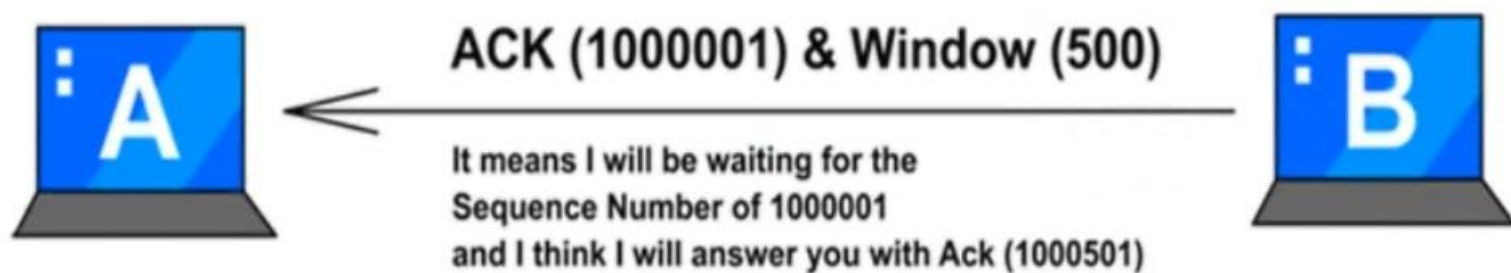
← And so on ...
I got your 600B of Request
Send me more with Sequence# 4001201 (=4000601+600)
ACK (4001201) →

- بستن session با ۴ پکت انجام می شود. طرفی که درخواست می کنه برای بسته شدن session ، یک بسته ارسال می کنه که بیت fin آن را set کرده است. طرف مقابل برای fin ارسال شده Ack ارسال می کنه و نیز fin خودشو ارسال می کنه و طرف مقابل هم برای fin ارسال شده Ack ارسال می کنه. این مرحله را connection termination می گویند.

Transport Layer Protocols

TCP

Flow control



Transport Layer Protocols

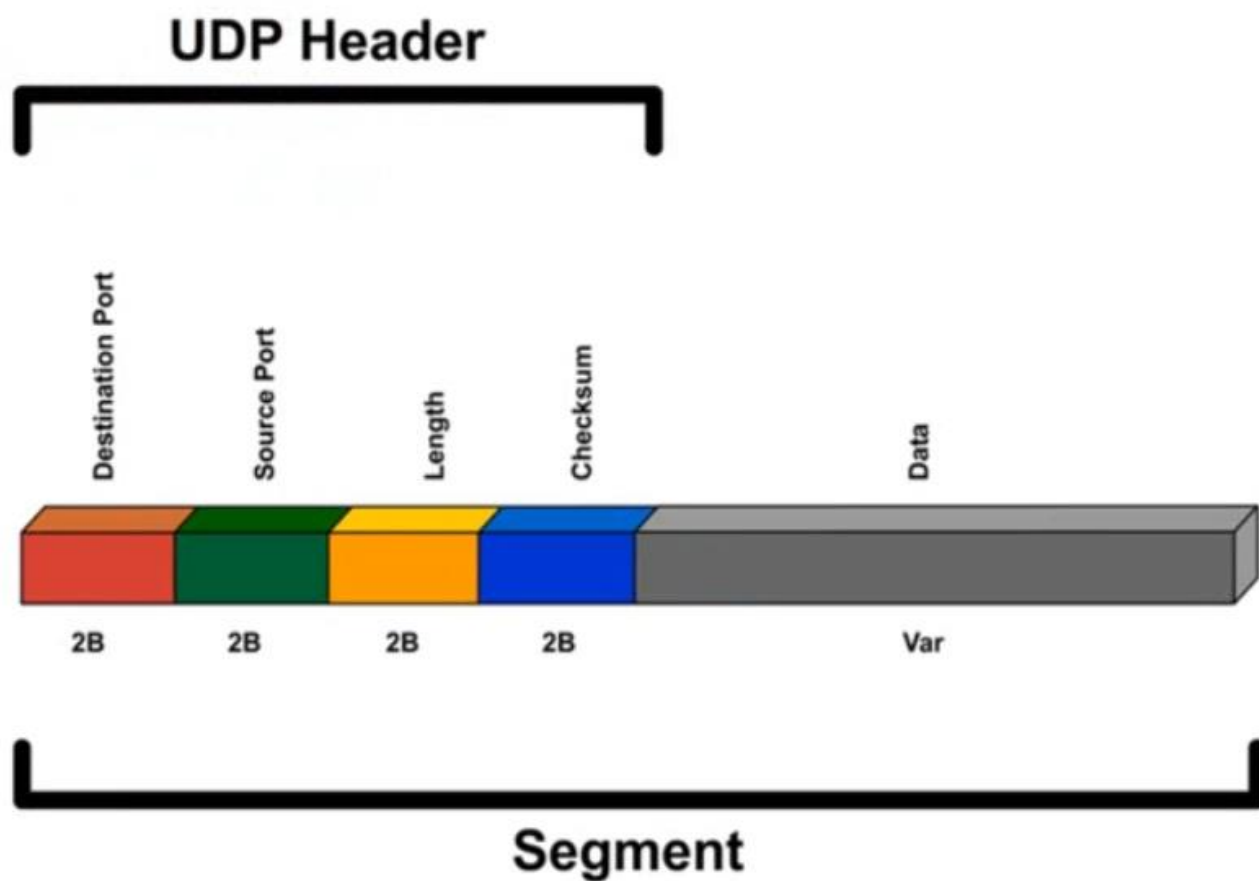
User Datagram Protocol (UDP)

Famous UDP applications

- DNS (Domain Name System)
- DHCP (Dynamic Host Configuration Protocol)
- Video and Voice Streaming

Transport Layer Protocols

User Datagram Protocol (UDP)



Transport Layer Protocols

User Datagram Protocol (UDP)

	TCP	UDP
Multiplexing	Yes	Yes
Error Recovery	Yes	No
Flow Control(Windowing)	Yes	No
Connection Establishment	Yes	No
Connection Termination	Yes	No
Segmentation	Yes	Yes