

Internet Engineering

241-461

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Defining TCP

- ◊ Needs
 - Addressing
 - Src & Destination
 - Sequence Numbers
 - Acknowledge received data
 - Inform window size
 - Transmit Segments
 - Data accuracy protection
 - Magic Data
 - SYN & FIN
 - Segment maximum lifetime

Addressing

- ◊ Each Connection
 - My Network Address
 - My Port Number
 - Peer Network Address
 - Peer Port Number
- ◊ Network Addresses
 - Belong to Network Layer
 - Let Network layer handle those
- ◊ Port Numbers
 - Responsibility of Transport Protocol
 - TCP needs to handle them

Addressing (2)

- ◇ My vs Peer
 - One segment
 - Exists in Network
 - ▷ What is My ?
- ◇ Each segment is from one TCP to another
 - Source & Destination
- ◇ Each TCP segment needs
 - Source Port Identifier
 - Destination Port Identifier

Information Encoding

- ◇ Text vs Binary
 - Human vs Computer
- ◇ TCP uses BINARY
 - More efficient
 - ▷ Network bandwidth
 - ▷ Processing costs
- ◇ Binary encoding issues
 - Not all computers the same
 - Bigger problem in the past
 - ▷ Still exists today

Port Identifiers

- ◇ Identifier just a number
 - An integer
 - 16 bits
 - ▷ convenient size
 - ▷ big enough
 - ▷ not too big
- ◇ TCP Header (so far)

Source Port

Destination Port

Sequence Number

- ◇ 32 bit number
 - Needed in every segment



Acknowledgment

- ◇ 32 bit number
 - Sequence next expected
 - So must have same value range as SEQ



- ◇ But not in every segment
 - Cannot send ACK before receiving SEQ
- ◇ So, just in most segments

Acknowledgment

- ◇ 32 bit number
 - Sequence next expected
 - So must have same value range as SEQ



Window Size

- ◇ 16 bit number
 - Return to size of window size later
- ◇ In every segment

Source Port	Destination Port
Sequence Number	
Acknowledgment Number	
A	Window Size

Data Reliability

- ◇ Checksum
 - Verifies data unmodified
 - Accidental modifications
 - ▷ not deliberate attacks

Source Port	Destination Port
Sequence Number	
Acknowledgment Number	
A	Window Size
Checksum	

Future Expansion

- ◇ Protocol might need revision
 - Or data not in every segment
- ◇ Add room for expansion
 - Or optional data

Source Port	Destination Port
Sequence Number	
Acknowledgment Number	
A	Window Size
Checksum	
	Expansion Space

- ◇ But how big is this?
 - Need size field

Future Expansion

- ◇ Protocol might need revision
 - Or data not in every segment
- ◇ Add room for expansion
 - Or optional data

Source Port	Destination Port
Sequence Number	
Acknowledgment Number	
Hdr Len	A
Window Size	
Checksum	
Expansion Space	

Magic Data

- ◇ Need to be able to send
 - SYN
 - FIN
- ◇ Those are data
 - but not normal data
- ◇ Only ever once in a segment (each)
 - Exist or do not exist

Source Port	Destination Port
Sequence Number	
Acknowledgment Number	
Hdr Len	A
SFF	
Window Size	
Checksum	

Complete TCP Header

Source Port	Destination Port						
Sequence Number							
Acknowledgment Number							
Hdr Len	Reserved	U	A	P	R	S	F
Checksum		Window Size		Urgent Pointer			

- ◇ Sent with every segment
 - Contains some data not examined yet