

TCP Segments (1/5)

1

TCP transmits messages in the form of individual data blocks –
TCP segments

- When dividing the message (**segmentation**) each segment is provided with a TCP header that contains all of the necessary command and control information
- Maximum segment size is agreed on in each case at connection setup
- TCP segments are encapsulated into IP datagrams for transport
- If an IP datagram with a TCP segment is lost, the TCP segment is not acknowledged and retransmitted after timeout

TCP Segments (2/5)

2

Format of a TCP segment

0	4	10	16	31
Source port			Destination port	
Sequence number				
Acknowledgment number				
HLEN	Reserved	Code bits	Window size	
Checksum			Urgent Pointer	
Options				Padding bits
Payload				

TCP Segments (3/5)

3

Structure of a TCP header (1/3):

- **Source port** (16 bits) – Source port associated with the application process that began the connection
- **Destination port** (16 bits) – Destination port associated with the application that receives the transmitted data
- **Sequence number** (32 bits)
 - For numbering of the sent segments in the direction of transmission
 - An initial value is exchanged during connection establishment
 - Increase in the number of previously sent bytes takes place in each case

TCP Segments (4/5)

4

Structure of a TCP header (2/3):

- **Acknowledgment number** (32 bits) – used for confirmation of received segments on the receiver side
- **Header length** (4 bits) – length of the TCP header in 32-bit words
- **Code bits** (6 bits) – indicate which fields in the header are valid
- **Window** (16 bits) – number of bytes that the receiver can hold in its input buffer
- **Checksum** (16 bits) – calculated from TCP header, TCP payload and a pseudo header (which is calculated from TCP and IP data)
- ...

TCP Segments (5/5)

5

Structure of the TCP header (3/3):

- **Urgent Pointer** (16 bits) – besides the payload it indicates urgent – out-of-band – data, e.g., interrupts, which must be transmitted as fast as possible, e.g. without being stored in the input buffer
- **Options** – for the inclusion of extra functionality, e.g. Maximum Segment Size – MSS, Window Scale Option – WSopt, Timestamps Option – TSopt, Selective Acknowledgement, Connection Count – CC
- **Padding bits** – fill up the length of the TCP segment headers to a word limit of 32 bits