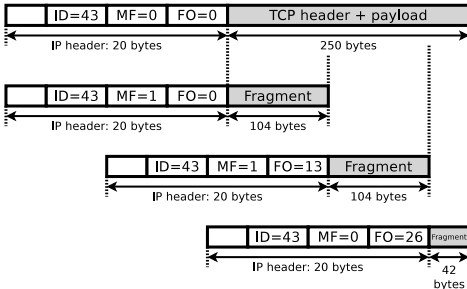


# Packet Fragmentation Example (1/2)

Original packet (unfragmented)



Source

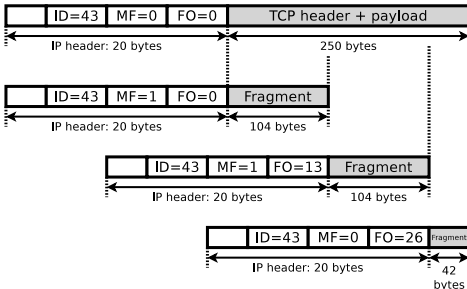
<http://www.netzmafia.de/skripten/netze/netz8.html>

- A TCP segment of 250 bytes length is transmitted via IP
- Maximum packet length: 124 bytes
- IP header length: 20 bytes
- Packet ID: 43
- The fragment offset is counted in 8-byte word increments
- The fragment must therefore be a multiple of 8

- Because all fragments belong to the same packet, the ID is equal for all fragments

# Packet Fragmentation Example (2/2)

Original packet (unfragmented)



- In the 1<sup>st</sup> fragment, fragment offset has value 0
- The MF flag has value 1, which indicates that more fragments will follow
- In the 2<sup>nd</sup> fragment, the fragment offset has value 13 ( $104/8 = 13$ ), which indicates the position of the fragment in the unfragmented packet
- The MF flag has still value 1, because another fragment will follow

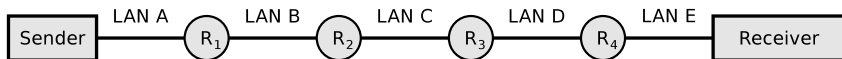
Source

<http://www.netzmafia.de/skripten/netze/netz8.html>

- In the header of last fragment, the MF flag has value 0, because it is the final fragment of packet 43
- The fragment offset has value 26, because 208 bytes ( $8 * 26 = 208$ ) have already been sent

## Another Fragmentation Example (1/2)

- 3,000 bytes payload need to be transmitted via the IP protocol
- The resulting packets must be fragmented because they are transmitted over multiple physical networks, whose MTU is  $< 3,000$  bytes



	LAN A	LAN B	LAN C	LAN D	LAN E
Network technology	WLAN	Ethernet	PPPoE	ISDN	Ethernet
MTU [bytes]	2,312	1,500	1,492	576	1,500
IP-Header [bytes]	20	20	20	20	20
maximum payload [bytes]	2,292	1,480	1,472	556	1,480

- Show in a graphical way how the packet is fragmented, and how many bytes of payload, each fragment contains

## Another Fragmentation Example (2/2)

