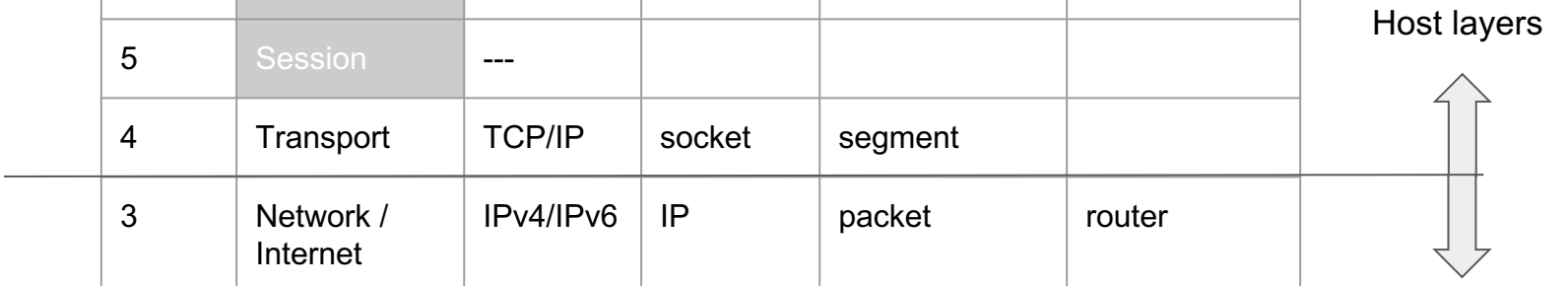
OSI and TCP/IP Models

Layer	Name	Example Protocol	Naming	Transported	Hardware Device
7	Application	http	url	data	
6	Presentation	---			
5	Session	---			
4	Transport	TCP/IP	socket	segment	
3	Network / Internet	IPv4/IPv6	IP	packet	router
2	Data Link / Link	Ethernet	MAC	frame	switch
1	Physical	802.11g	Interface	symbols	hub, bridge



IPv4 Packet Header

Offsets	Octet	0								1								2								3							
Octet	Bit	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0	0	Version				IHL				DSCP						ECN		Total Length															
4	32	Identification																Flags			Fragment Offset											
8	64	Time To Live								Protocol								Header Checksum															
12	96	Source IP Address																															
16	128	Destination IP Address																															
20	160	Options (if IHL > 5)																															
⋮	⋮																																
60	480																																

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0	0	1	0	1	0	1	0	0	1	1	1	0	1	1	1	1	0	0	0	0	0	1	0	0	1	1	0	1	0	0	0	0	0
4	32	1	1	1	0	1	1	0	1	0	0	0	1	1	0	0	0	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	1
8	64	Time To Live								Protocol								Header Checksum															
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⋮	⋮																																
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Checksum Calc

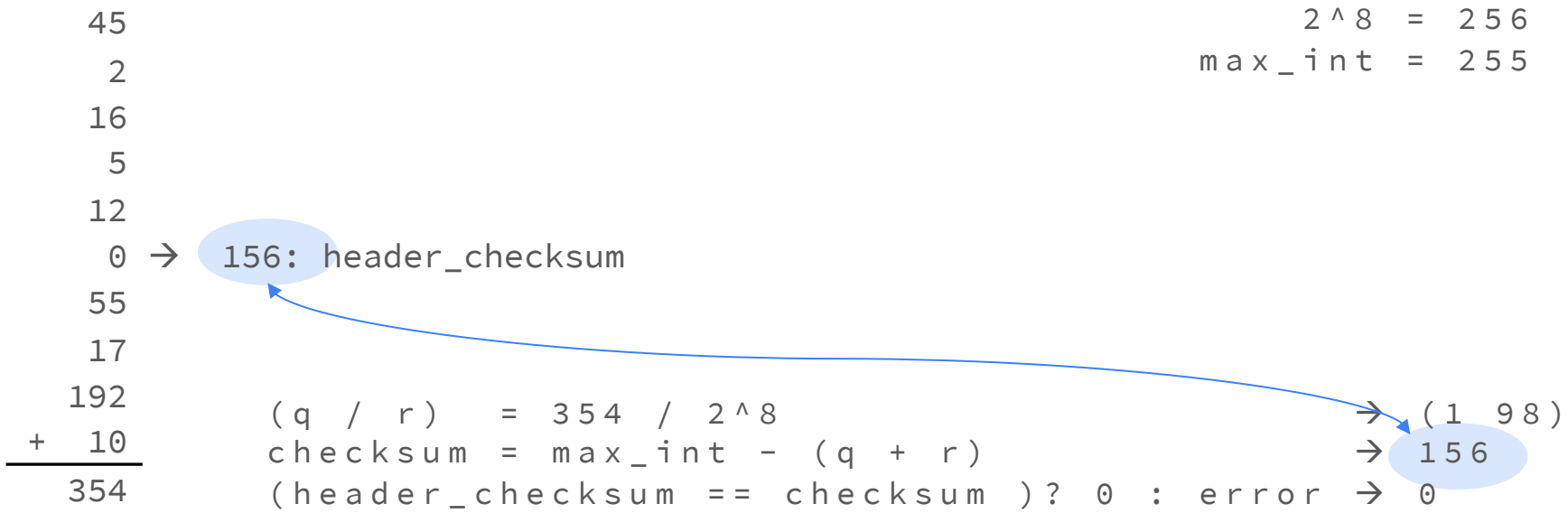
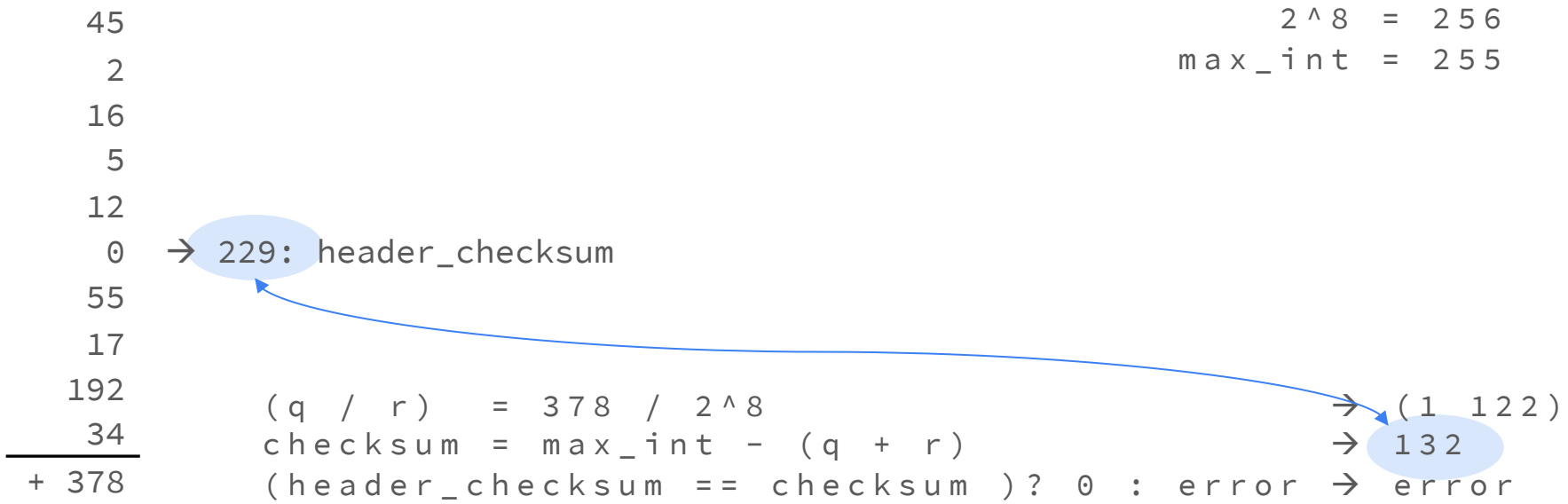
```
2^16 = 65,536
max_int = 65,535
```

- 1010 1001 1101 1110 → 43486
- 0000 1001 1010 0000 → 2464
- 1110 1101 0001 1000 → 60696
- 1010 0011 0010 0101 → 41765
- 1010 1001 1101 1110 → 43486
- 1000 1011 0110 1100 → 0 35692 ← header_checksum
- 1110 1101 0001 1000 → 60696
- 1010 0011 0010 0101 → 41765
- 0000 1001 1010 0000 → 2464
- 1110 1101 0001 1000 → 60696

```
sum = 357518 (without the header_checksum)

(q / r) = 357518 / 2^16          → (5 29838)
checksum = max_int - (q + r)     → 35692
(header_checksum == checksum ) ?  0 : error  → 0
```

Checksum: using 8-bits (from 156.txt)



Checksum: using 8-bits (from 229_error.txt)