UDP

USER DATAGRAM PROTOCOL

INTRODUCTION TO USER DATAGRAM PROTOCOL, A SIMPLE PACKET TRANSPORT SERVICE IN THE INTERNET PROTOCOL SUITE

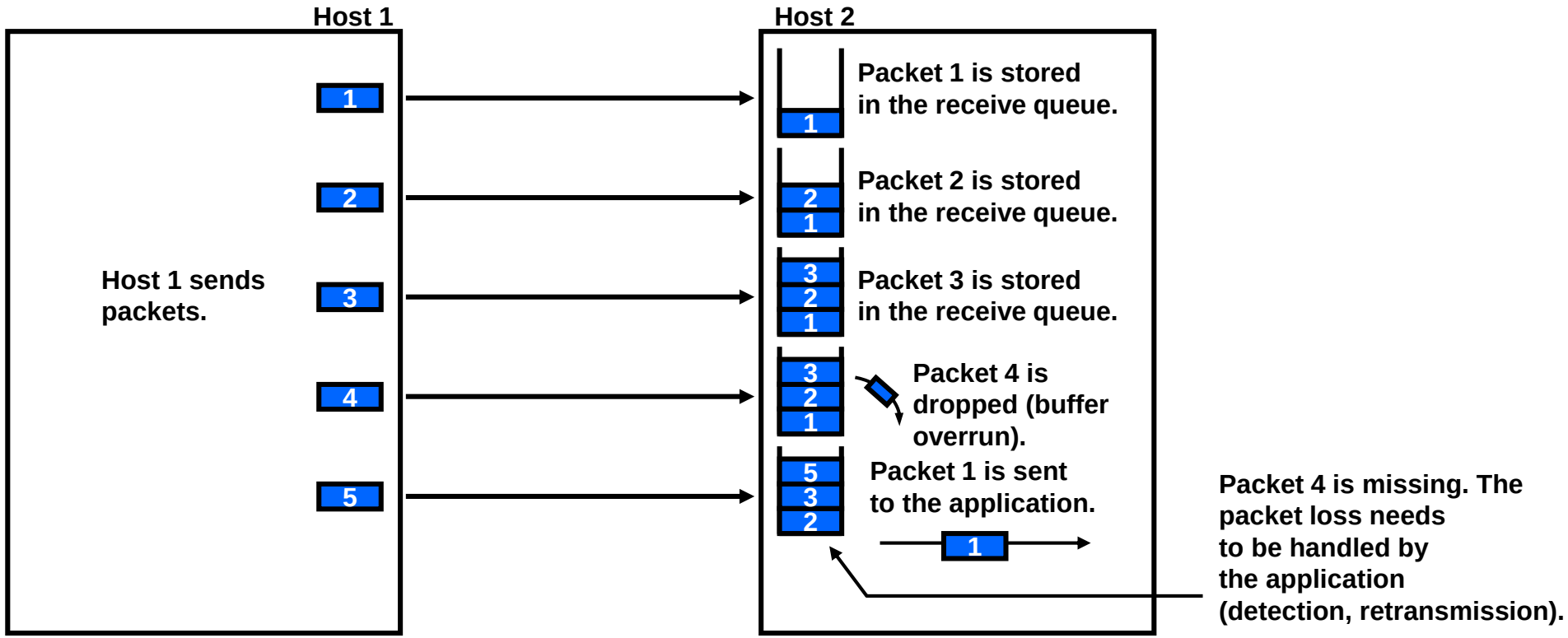
PETER R. EGLI
peteregli.net

Contents

1. UDP (RFC768) characteristics
2. UDP Service
3. Typical UDP applications
4. UDP Checksum
5. UDP versus TCP

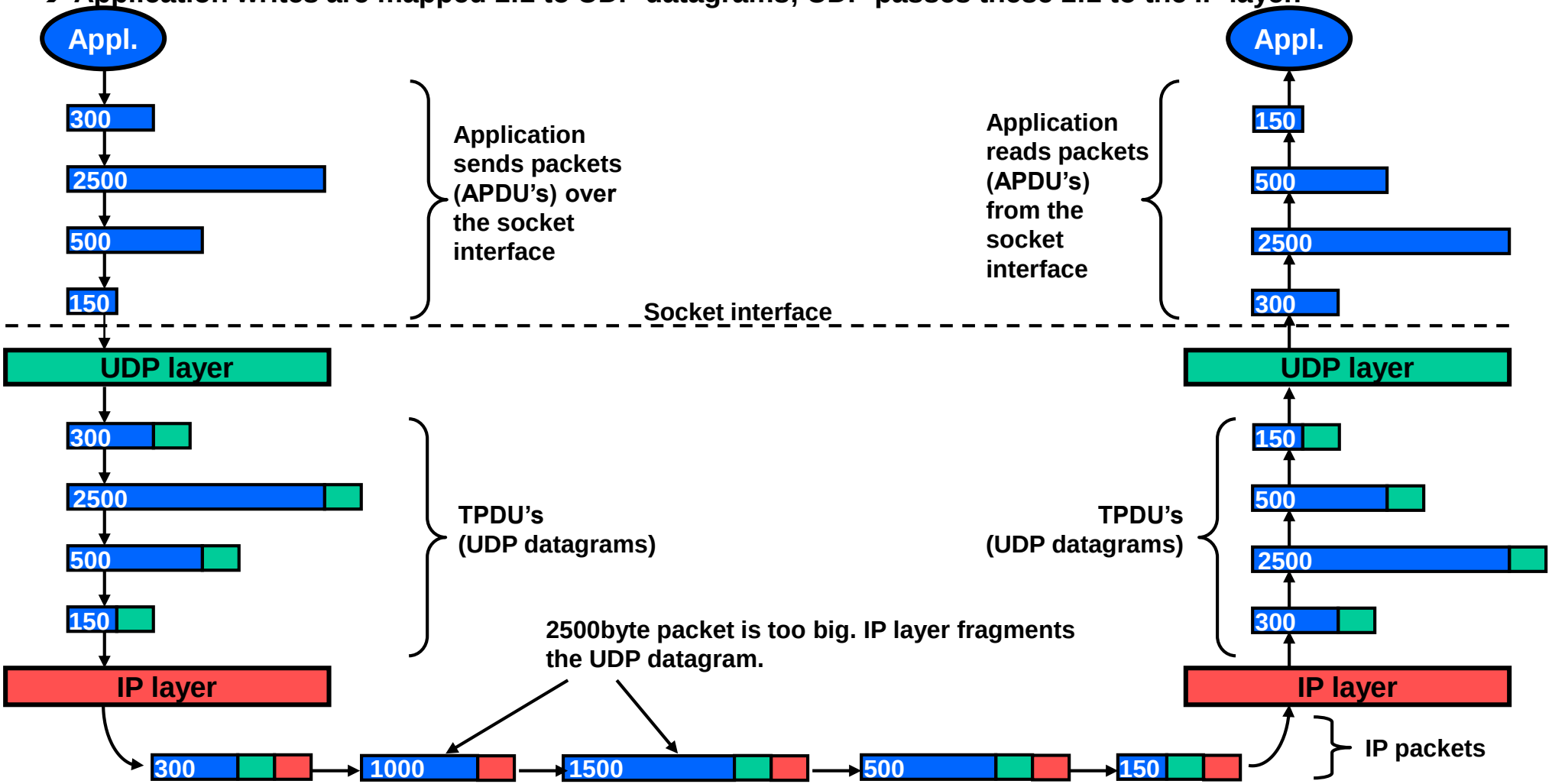
1. UDP (RFC768) characteristics

- No connection establishment/teardown; data is just sent right away.
- No flow control / congestion control, sender can overrun receiver's buffer:
  - ➔ UDP is not suited for bulk data transfer.
  - ➔ For data transfer with UDP a lock-step protocol is required (to be implemented by the application).
- No error control; corrupted data is not retransmitted (even though UDP header has a checksum to detect errors and report these to the application).



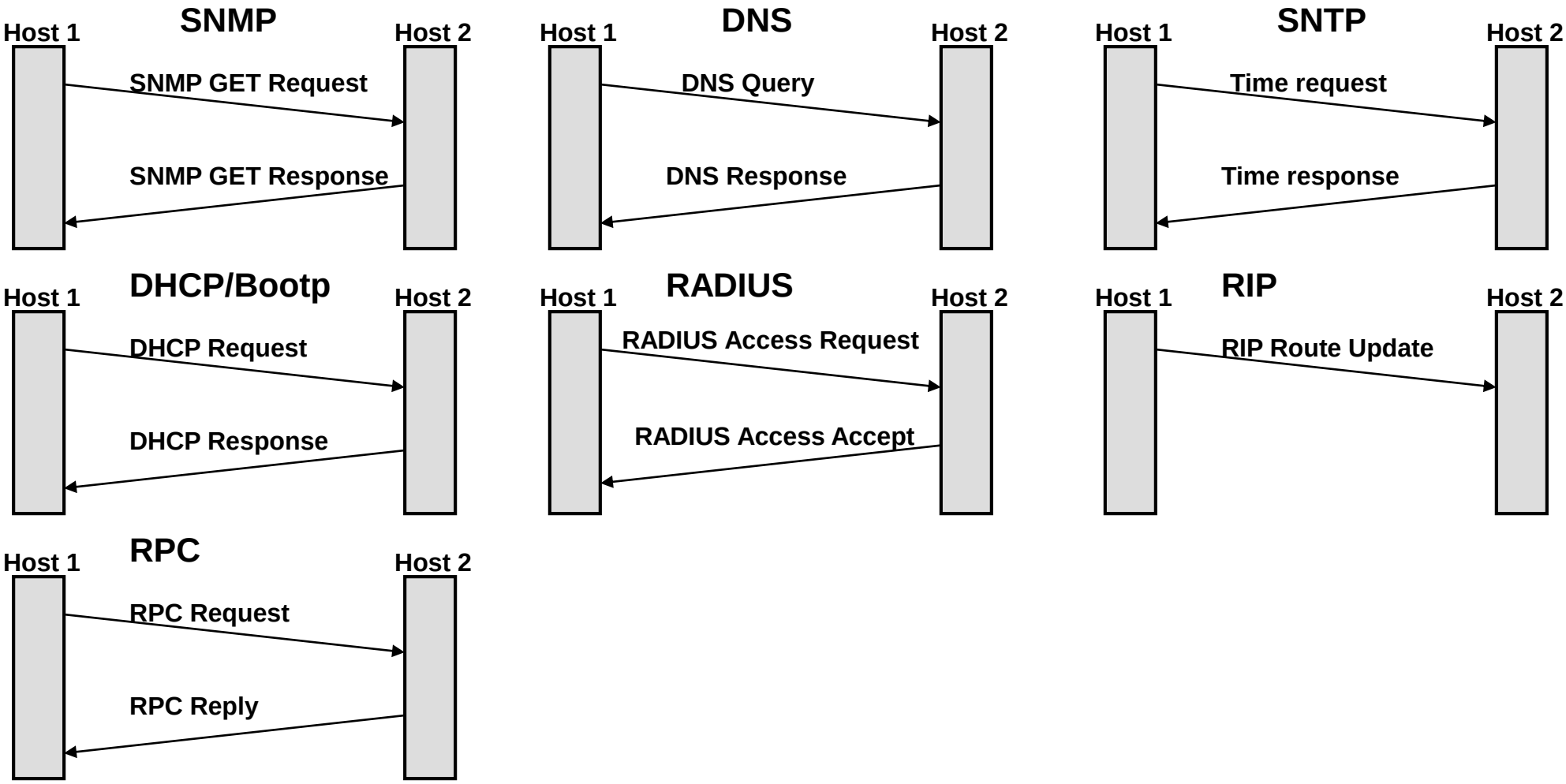
2. UDP service

➔ UDP is basically a simple extension of the IP datagram service.
➔ UDP adds multiplexing (on port number) to IP datagram service.
➔ Application writes are mapped 1:1 to UDP datagrams; UDP passes these 1:1 to the IP layer.



3. Typical UDP applications

UDP is best suited for applications with short command-response type „transactions“ that do not justify the establishment / release prior to the data exchange.

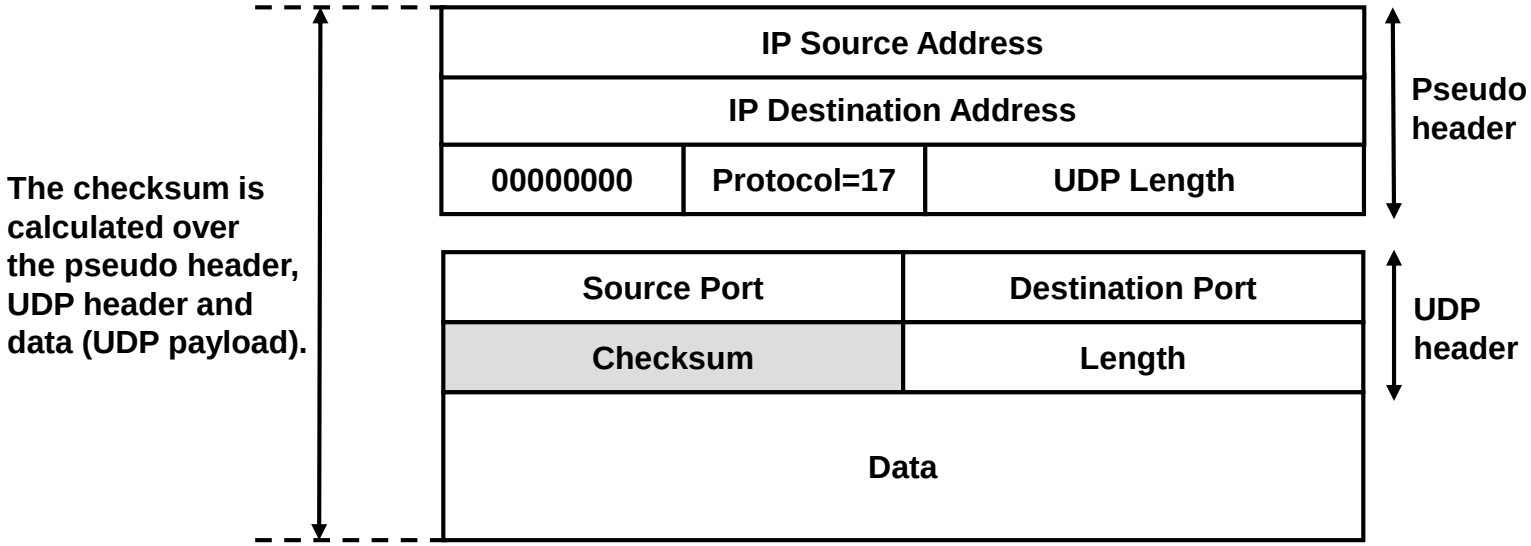


4. UDP checksum

➔ UDP has a checksum too that provides minimal protection against transmission errors.

➔ The checksum is optional; if it is not used it shall be set to 0.

➔ Becaus the IP addresses are used in the UDP checksum calculation,
UDP is tightly bound to the IP layer. Therefore UDP can only run on top of IP.



5. UDP versus TCP

TCP

➔ Connection-oriented, point-to-point (unicast)

➔ Reliable end-to-end:
No bit errors due to checksum.
Packet ordering preserved.
No duplicates.
No packet loss.

➔ Stream-oriented (no message boundary preservation)

➔ Has flow control to maximise throughput

➔ Has congestion control to minimise packet loss

➔ Analogon: phone 

Examples of application protocols using TCP:
HTTP, SMTP, FTP, TELNET

UDP

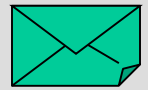
➔ Connection-less, best-effort

➔ Not reliable (no retransmissions)

➔ Message boundary preservation

➔ No flow control

➔ No congestion control

➔ Analogon: mail (snail mail) 

Examples of application protocols using UDP:
SNMP, DNS, TFTP, RTP, DHCP, SNTP

N.B.: It is possible to run application protocols over both TCP and UDP. E.g. DNS is normally run on UDP, but for zone transfers (higher data volume) DNS uses TCP. Actually there is a shift towards using TCP instead UDP since TCP can better provide security (SSL/TLS, simpler filtering in firewalls etc.).