IoT Workshop

Trygve Laugstøl <trygvis@trygvis.io>

What is IoT

What is IoT

- Not “a computer connected to the internet”
  - Then it is really just another computer connected to the internet
- Must be something else
  - It is simply devices that are resource constrained
    - Usually in more than one way
- Autonomous operation, the connection might not be permanent

IoT is just a concept

- *The Internet of Things (IoT) is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these objects to connect and exchange data.*[1]

[1] Wikipedia "Internet of Things"

What differentiates a computer from an IoT device?

- Constrained in (one or more of):
  - Memory
  - CPU
  - Network bandwidth and/or latency
  - Storage

Going back to basics

What is the internet again?

OSI model

1. Physical Layer
2. Data Link Layer
3. Network Layer
4. Transport Layer
5. Session Layer
6. Presentation Layer
7. Application Layer

- Wikipedia: OSI model
- Wikipedia: OSI model#Examples

Layer 1: Physical Layer

- 10BASE5, 10BASE2
- 10BASE-T / 100BASE-TX / 1000BASE-TX
- 802.11a/b/g/n PHY
- RS-232

Layer 2: Data Link Layer

- Ethernet
- WiFi
- Bluetooth
- Token Ring

Layer 3: Network Layer

- IP
- ICMP
- IPX

Layer 4: Transport Layer

- TCP
- UDP

Layer 5: Session Layer

- “sockets”
- NetBIOS

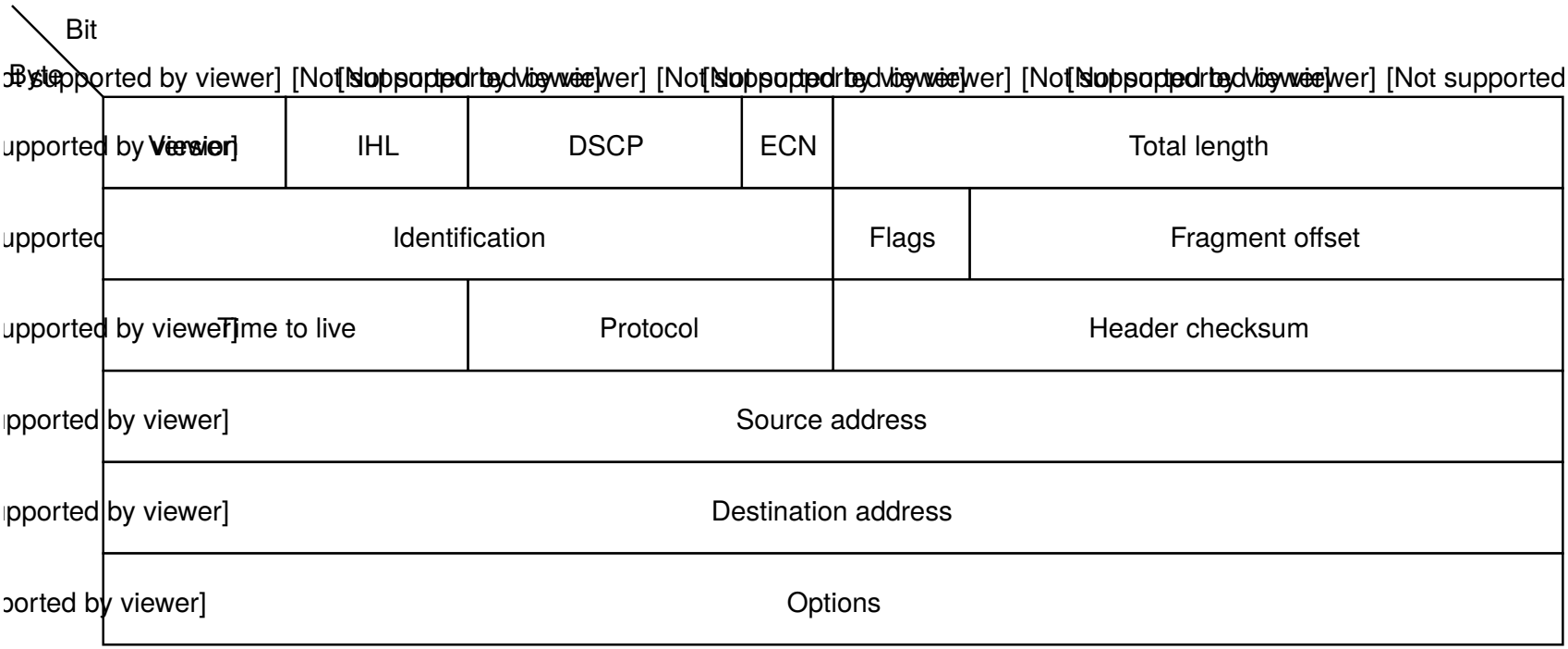
Layer 6: Presentation Layer

- SSL

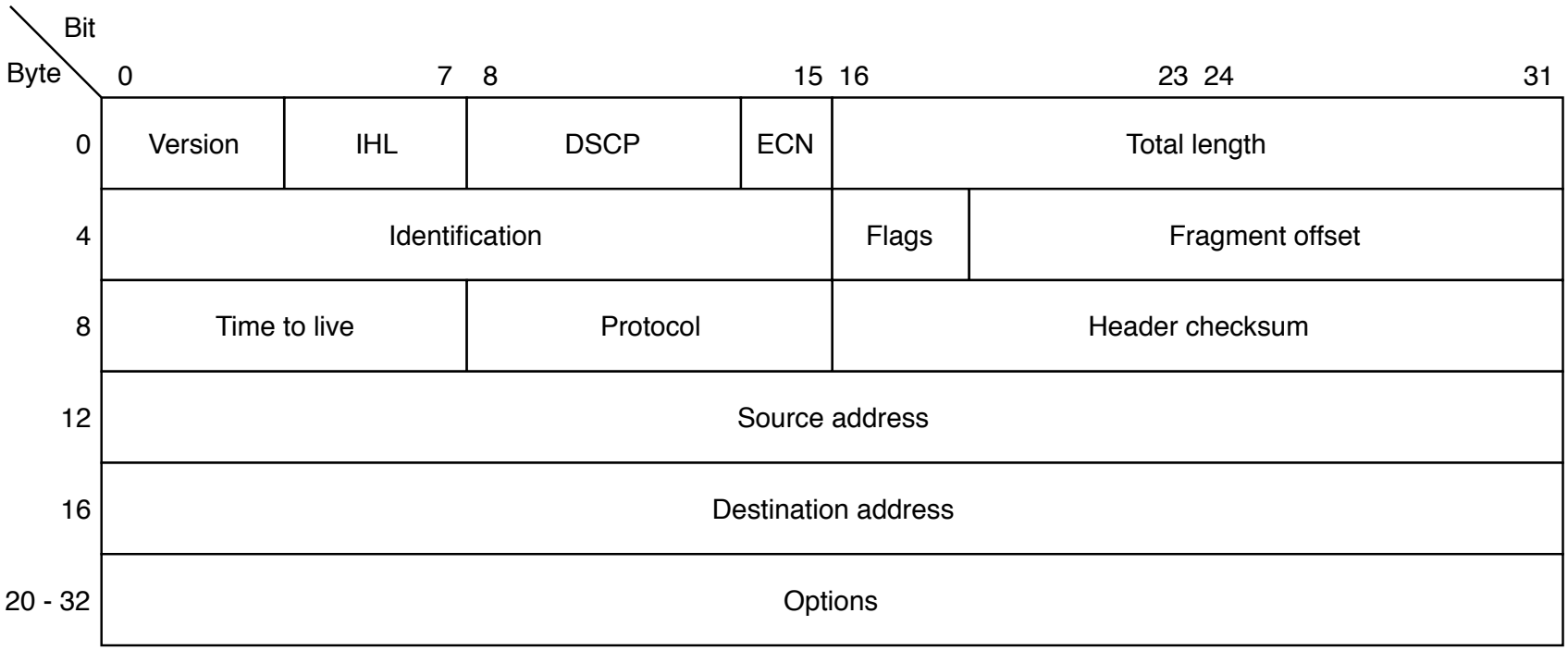
Layer 7: Application Layer

- HTTP
- MQTT
- DNS
- (everything else..)

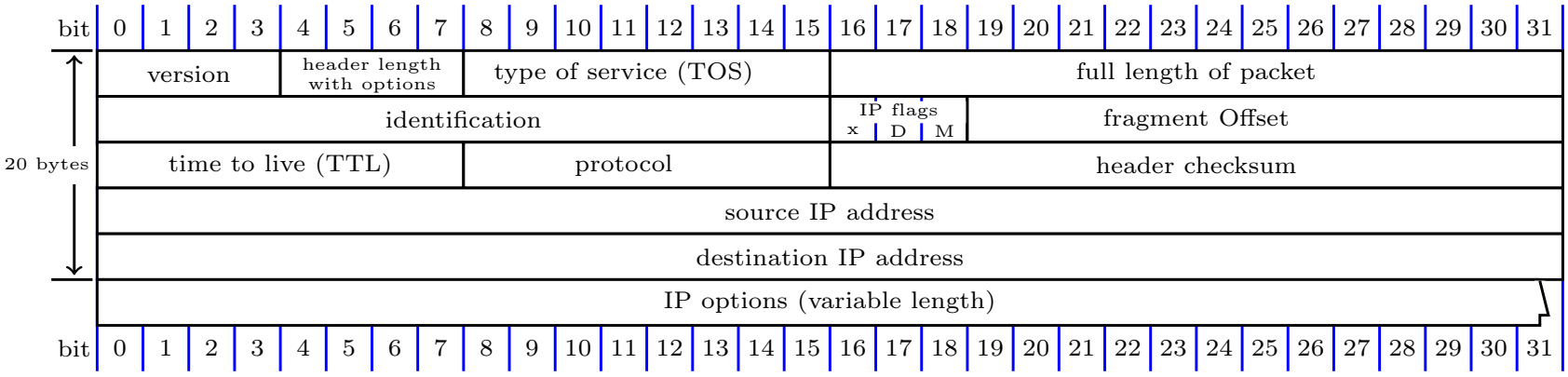
Details: IP


Bit
Byte
[Not supported by viewer] [Not supported by viewer] [Not supported by viewer] [Not supported by viewer] [Not supported by viewer] [Not supported by viewer] [Not supported by viewer] [Not supported by viewer]
upported by viewer] Version
IHL
DSCP
ECN
Total length
upported
Identification
Flags
Fragment offset
upported by viewer]
Time to live
Protocol
Header checksum
pported by viewer]
Source address
pported by viewer]
Destination address
ported by viewer]
Options

Details: IP


Bit
Byte
0
7
8
15
16
23
24
31
0
Version
IHL
DSCP
ECN
Total length
4
Identification
Flags
Fragment offset
8
Time to live
Protocol
Header checksum
12
Source address
16
Destination address
20 - 32
Options

Details: IP


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
version
header length with options
type of service (TOS)
full length of packet
identification
IP flags
x
D
M
fragment Offset
time to live (TTL)
protocol
header checksum
source IP address
destination IP address
IP options (variable length)
20 bytes
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

Notes

Assignments

- Measure round trip time/latency. Measure UDP, TCP. Measure when the packet size is greater than the MTU