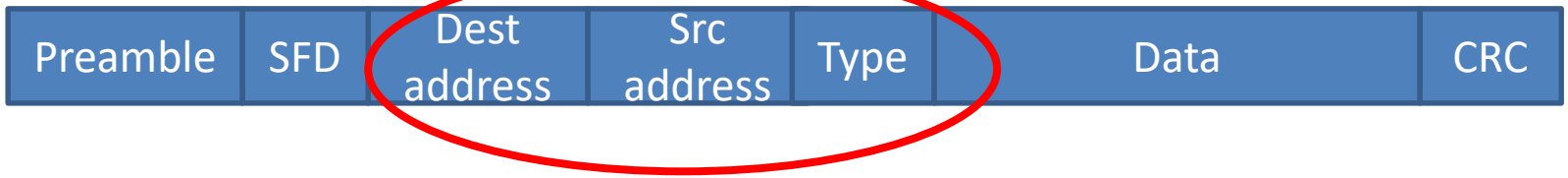
Tools Set-2: Digging deeper into the Link Layer (Computer Networks Lab)

Kameswari Chebrolu

Link Layer



- **Framing**
- Reliable Data Transfer
- **Ethernet Technology**

- **WiFi Technology**
- MAC Protocols
- Switching
- VLANs

Ethernet: "ethtool"

- ethtool eno1 (properties)
- ethtool –i eno1 (driver)
- ethtool –S eno1 (statistics)
- ethtool –s eno1 speed 10 autoneg off (change speed to 10Mbps with auto-negotiation off)
- ethtool –p eno1 (blink the led lights)

May not be installed by default (do "sudo apt-get install ethtool").
Choose the arguments carefully.

WiFi: "iw"

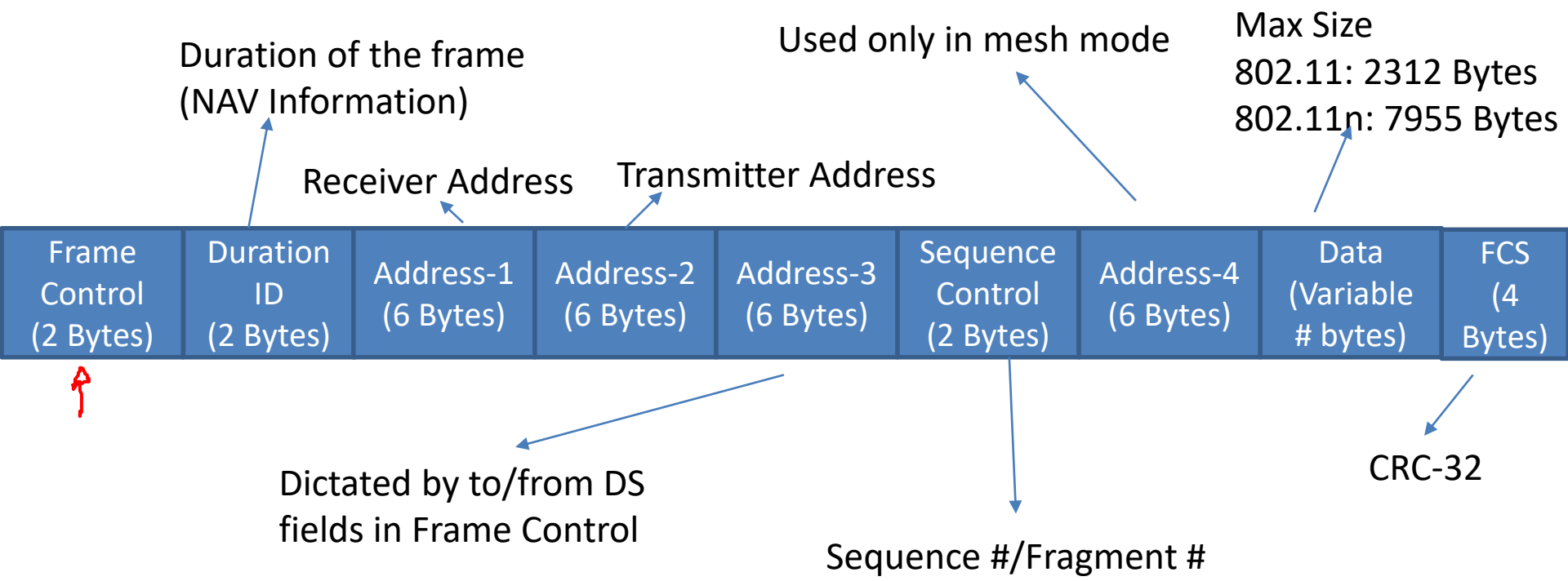
- iw dev
- iw dev wlp1s0 link
- iw dev wlp1s0 scan

Framing/Ethernet/WiFi: "wireshark"

- Link layer headers
- 802.11 Standard
  - Collecting wireless trace in "monitor" mode hard
    - Refer to https://wiki.wireshark.org/CaptureSetup/WLAN
  - Beacons
  - Authentication
  - Association
  - Types of Packets: Data, Control, Management

https://wiki.wireshark.org/SampleCaptures#Sample_Captures (search for WiFi)

Frame Format



Frame Control

Indicates if all received frames are to be processed in order

Is it a retransmission?

Indicates if the frame is protected

more fragments belonging to the same frame are to follow

Management, Control or Data

Mgt: beacon, probe req/resp, assoc req/resp, auth req/resp
Ctl: ack, RTS, CTS
Data: data, poll

Is frame to DS?

Is frame from DS?

Used by client to indicate to AP that it is going into power save mode

Used by AP to tell client that AP has more data buffered for client at the AP

Summary

- Concepts: Headers, Ethernet/WiFi technology
  - ethtool, iw and wireshark

References

- https://www.linuxjournal.com/content/fun-ethtool
- https://wireless.wiki.kernel.org/en/users/documentation/iw
- https://wiki.wireshark.org/CaptureSetup/WLAN