

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

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Link Layer

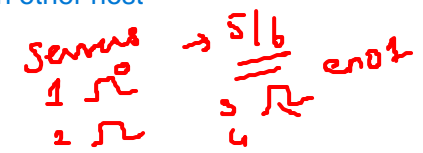
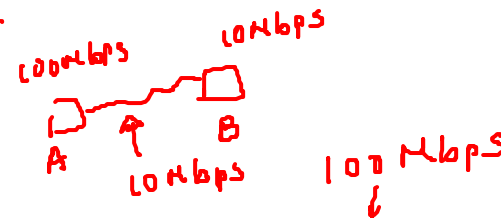


- **Framing**
- Reliable Data Transfer
- **Ethernet Technology**

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

Ethernet: “ethtool”

- ethtool eno1 (properties) interface
do this command and then u will find which eth interface u have IP address desktop
- ethtool -i eno1 (driver) ← software
- ethtool -S eno1 (statistics)
- ethtool -s eno1 speed 10 autoneg off (change speed to 10Mbps with auto-negotiation off)
fix the speed and dont auto negotiate with other host
- ethtool -p eno1 (blink the led lights) servers → 516 eno1
servers...multiple interfaces



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

WiFi: "iw"

wireless

desktop ✗
laptop ✓

- iw dev

this cmd gives name of the interface

- iw dev wlp1s0 link

which AP it is connected etc etc

"lp"

- iw dev wlp1s0 scan

scans all AP's nearby

scan
"root" permission

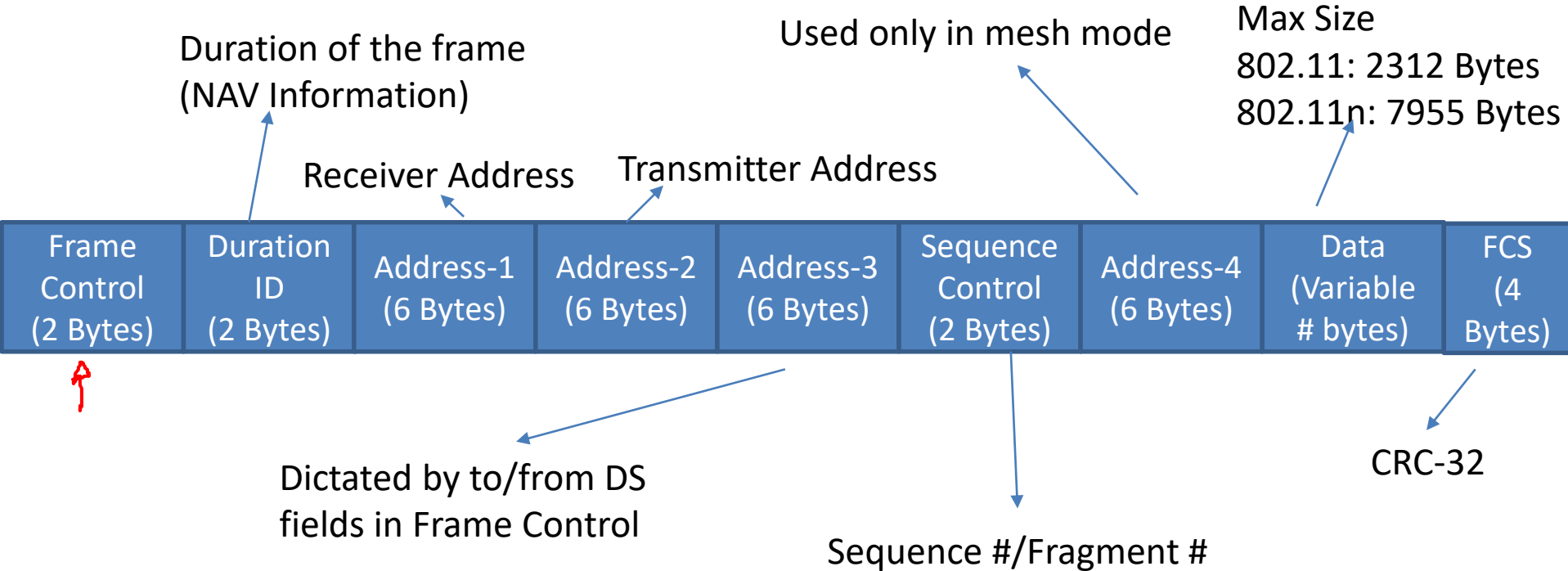
Framing/Ethernet/WiFi: “wireshark”

- 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

beacons, Auth

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

Frame Format



Frame Control

more fragments belonging to the same frame are to follow

Is it a retransmission?

Indicates if the frame is protected

Indicates if all received frames are to be processed in order

Protocol Version (2 Bits)	Type (2 Bits)	Subtype (4 Bits)	To DS (1 Bit)	From DS (1 Bit)	More Frag (1 Bit)	Retry (1 Bit)	Power Mgmt (1 Bit)	More Data (1 Bit)	WEP (1 Bit)	Order (1 Bit)
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Management,
Control or
Data

Is frame to DS?

Is frame from DS?

Mgt: beacon, probe req/resp,
assoc req/resp, auth req/resp

Ctl: ack, RTS, CTS

Data: data, poll

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> 