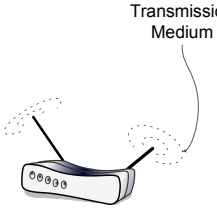
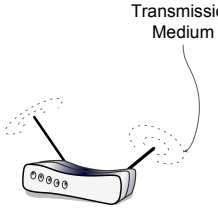
Wireless Security

COMP 435
Fall 2017
Prof. Cynthia Sturton

Administrative

- Course Evaluations
  close Wednesday 12/6
- Final Exam
  Saturday 12/9, 4-7PM, SN 014
- Poster Session
  Wednesday 12/4, 3:35-4:50, SN 014 & Lobby





Network Interface Card (NIC)

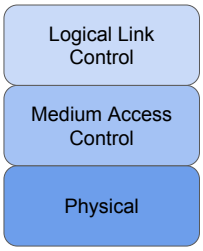
- Communicates radio signals with the Access Point (AP)
- Identified by MAC address
  - Medium Access Control
  - 48- or 64-bit
  - Ideally, fixed and unique

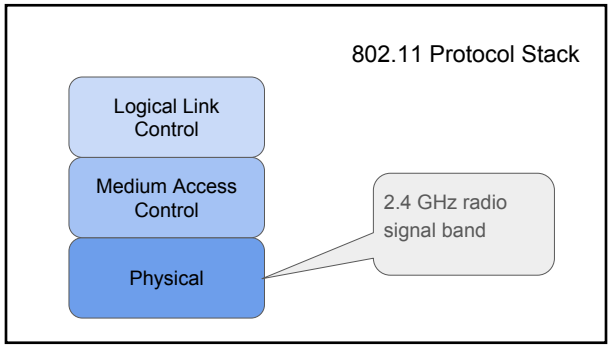
Threats to Wireless Security

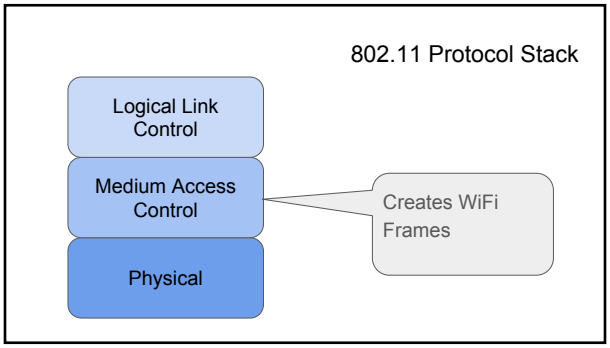
- Association
- MAC Spoofing
- MITM
- Network Injection

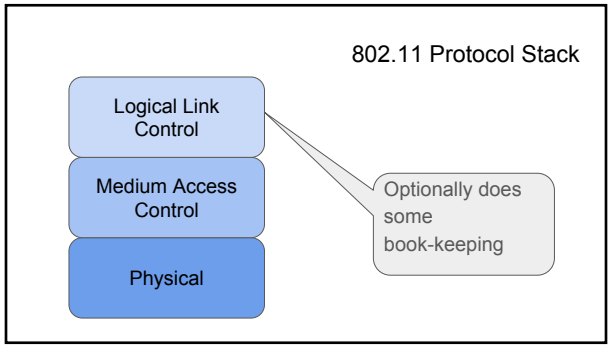
802.11x

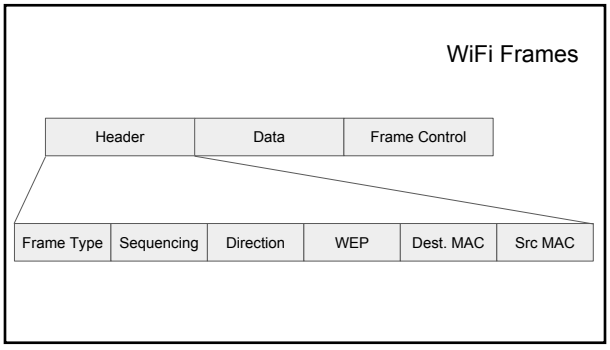
802.11 Protocol Stack




802.11 Protocol Stack
Logical Link Control
Medium Access Control
Physical
2.4 GHz radio signal band


802.11 Protocol Stack
Logical Link Control
Medium Access Control
Physical
Creates WiFi Frames

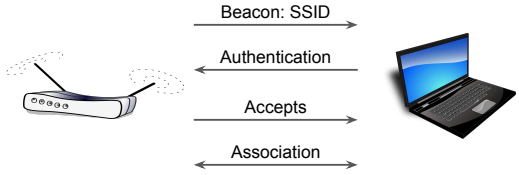

802.11 Protocol Stack
Logical Link Control
Medium Access Control
Physical
Optionally does some book-keeping


WiFi Frames
Header
Data
Frame Control
Frame Type
Sequencing
Direction
WEP
Dest. MAC
Src MAC

Management Frames

- Beacon
  - Advertises a network accepting connections
  - Service Set ID (SSID)
- Authentication
  - NIC's request to an AP
- Association
  - Follows authentication
  - Encryption agreed on

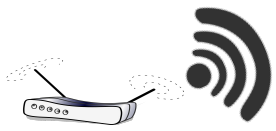
WiFi Protocol



SSID

- 32-bit character
- Broadcast in Beacon Frame
- Included in ongoing communication

Client Authentication

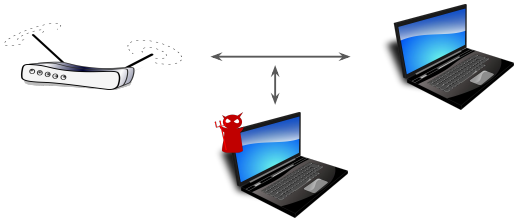


- Open Mode:
  - AP broadcasts beacon
  - Any client can request a connection
- Client authentication:
  - MAC addresses
- Attacks:
  - Inauthentic MACs
  - MAC spoofing

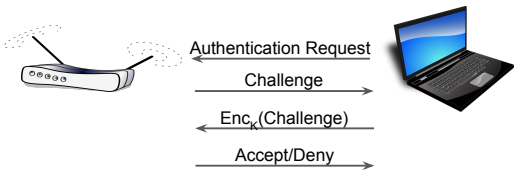
Server Authentication

- Closed Mode:
  - Client broadcasts connection request
  - Any AP can reply
- Server Authentication:
  - SSID
- Attacks:
  - Promiscuous AP
  - Leveraging preferred associations

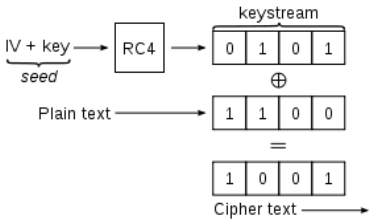
Threat: Stealing the Association



WEP: Wired Equivalent Privacy



WEP: Wired Equivalent Privacy



WEP Insecurity

- 40 or 104-bit key
- Users have to enter key
  - HEX strings

0xb0fa93ad712df8321ac39decbd

  - ASCII strings

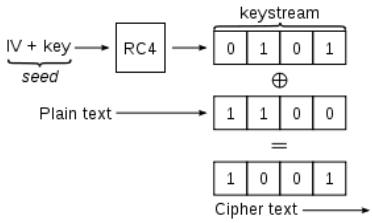
s8j3ls.pc9gl5

- Keys are not chosen uniformly at random from key space

WEP Insecurity

- Key changes infrequently
- Susceptible to brute force

WEP Insecurity: Weak Encryption Algorithm



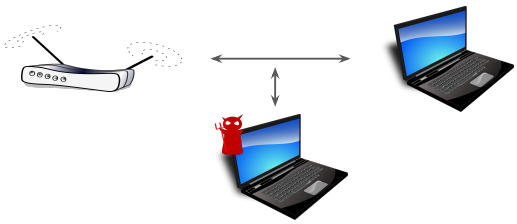
WEP Insecurity

- SSIDs are known identities
- MACs are spoofable
- Key is shared by all on the network

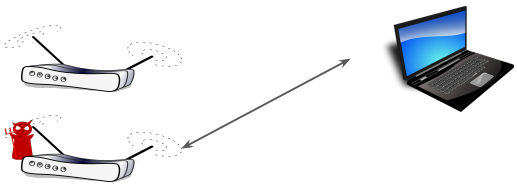
WiFi Protected Access (WPA)

- Changing keys
- Authentication
- AES
- Stronger, encrypted integrity check

Attack on WPA: MITM



Attack on WPA: Malicious AP



Mobile Device Security

Threats to Mobile Devices

- Lack of physical control
- Personal devices (BYOD)
- 3rd party apps
- Auto-synching
- QR codes
- Location services

Buffer Overflow: a brief review