Class - 7 (19/2/19)

→ diff b/w wireless and wired network?

- propagation medium
- cost
- Signal strength
- broadcast (p2p also possible)
  - ↓ radio → omnicast antenna
  - ↓ bluetooth → unidirectional antenna

ISM bands
↳ industrial scientific medical bands
VANET → vehicular ad hoc N/w

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- Data rate

→ Network Topology
- types - (centralized, decentralized, hybrid)
  - ↳ eg LAN (Wifi, Cellular N/w)
  - ↳ decentralized means ad-hoc
- fully-connected (mesh)
- multi-hop (N/w) (consume less power)
- advantages of centralized topology and disadvantages
- advantage and disadvantages of ad-hoc (p2p)
- ~~advan~~ " —— " —— of multihop p2p

Q Identify at least 2 appl of WSN in our day to day life!

Q As a user of wireless device, what do you think, what are the issues that needs to be resolved

Q What do you think what is biggest research area in wireless technology?

Home-work ass^{n} (Group-1) ↓ ~~Ass~~ do ques

Q How do you set up WLAN in adhoc mode or infrastructure mode (Steps)?

Q Name at least 5 popular sensors along with their company
Popular OS for WSN (at least 3)

Class-8 (21/2/19) ↗ Data link layer

* Wireless Medium Access Control (WMAC)
- Errors control → CRC, checksum
- P2P broadcast
- Channel access problem

Arrestum kt tatyyaari

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- MAC protocol
  - issues
    - utilize channel efficiently
    - real time traffic support
    - synchronization
    - shared broadcast medium
    - Lack of central coordination
  - types of protocol (~~ALOHA, Slotted ALOHA~~ not well suited for random acces. Space ↑)
    - scheduling based → central authority, TDMA, CDMA, SDMA
    - contention based → nodes will decide
      - ALOHA → failed
      - CSMA → diff flavours of CSMA
      - CSMA/CD → keep listening to channel while transmitting
        - collision detected by current detection

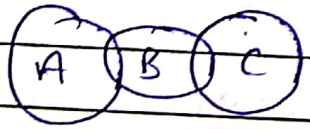
Q. Study CSMA/CA?

Class-9 (22/2/19)

* Wireless Media Disperse Energy
  - collision detection difficult
  - Hidden terminal problem (due to carrier sensing problem)

A → ~~B~~ ← C

Station A is hidden from C and C is hidden from A



- Exposed terminal problem

A ← B C ⇄

→ How to cope up with hidden/exposed terminals

* MACA
  - 2 short messages → RTS (request to send) CTS (clear to send)

stack ?. A abcd

C

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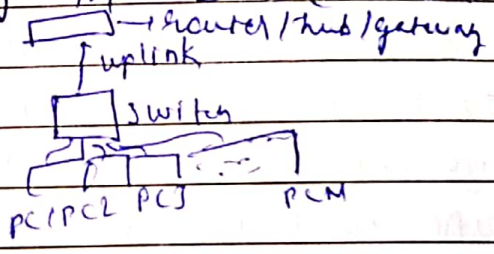
Algo:
A sends an RTS (tells B to prepare)
B replies a CTS (echoes message length)

Q. Issues in MACA? why RTS collision is an issue

Class - 10 (28/2/19)
ppt-1 → layers [
ppt-2 → layers [Physical + DLL]

Q. what is the topology in Lans [ ]?
↳ Star



Class - 11 (1/3/19)

	my	correct
Hidden →	A	B
exposed →	~~B, C~~ B, F	—

→ issues in MACA protocols
→ MACA has no ACK
✓ → MACAW has ACK to improve reliability
→ replaces RTS-CTS-DATA to RTS-CTS-DS-DATA-ACK
↳ data sent
✓ → better soln to exposed terminal problem
✓ → RRTS in MACAW to solve "Starvence"
↳ request RTS

Assign
Q.1 Read the papers MACAW (1997), Bhargavan
Q.2 why MACAW specials backoff (BEB) concept?
Q.3 Need for modulation and AM, FM, PM, along with their appl - 5

Sensor N/W

UOP UJESH

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Q.4 ASK, PSK, FSK along with their applications → 6

class-12 [PPT-full] [7/3/19]

class-13 [8/3/19]

→ types of standard bodies globally providing hardware & software standards
↳ IEEE, IETF, wifi alliance, FCC..
→ Standard terminology
↳ talk group → people working to develop stds
↳ draft → still working
↳ standard → a ratified and final technical description
→ 802.11 Ratified standards
→ Wireless LAN (WLAN)
→ WAP and NICs
→ WLAN features
↳ must be flexible within reception area
↳ ad hoc n/w w/o pre planning
↳ more robust against disasters
↳ no wiring difficulties
→ Applications (home, office)
↳ Goals.
↳ ease of use
↳ power eff
↳ robust to noise
↳ security
→ IEEE standardization
802.3, 802.11, 802.15.1, 802.15.4, 802.16
Ethernet wifi bluetooth Zigbee WiMax
802.11 v/s wifi?

→ IEEE 802.11 features
↳ initially it was at 1 and 2 Mbps
↳ 902 - 928 MHz 26MHz | 2.4 ↔ 2.4877 GHz 83.5MHz | 5.15 ↔ 5.35 GHz 200 MHz

→ 802.11 Infrastructure

→ Transmission media
↳ 3 physical medium → infrared, radio, microwave

→ EMW spectrum
↳ Optic

→ Infrared LAN
↳ 2 ways to set up
↳ p2p directed beam used to create
↳ diffused config: signals diffuse by reflecting them off of some type of surface

→ Infrared Adv / Disadv
adv → ↳ high bandwidth
↳ no licensing
↳ electrical devices do not interfere with infrared
dis → ↳ use of light
↳ can't move
↳ short range

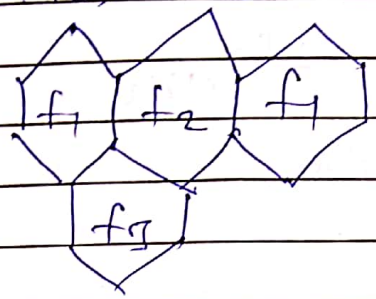
→ Microwave
↳ narrow bandwidth
↳ licensed + unlicensed

→ Radio freq
↳ spread spectrum

→ 802.11 DSSS
↳ chip sequence [BPSK or QPSK

→ Major source of Interference
↳ cochannel → client compete to access the medium

↳ Adjacent channel
Every client and access point on overlapping channels talk over each other

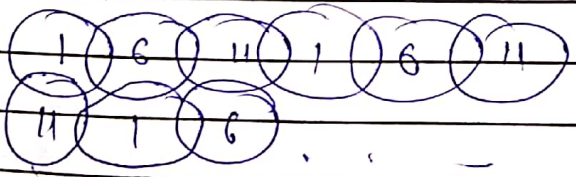


adjacent cells cant use same frequency
non-adjacent cells can use same freq.

↳ Non-wifi
non-802.11 devices compete for medium access.

→ Interference
↳ CSMA/CA for co-channel interference
↳ to reduce adjacent co-channel interference, use non-overlapping channels

→ 802.11 Non-overlapping channels
→ channels separated by 5MHz
→ ~~13~~, ~~5MHz~~ 20MHz channel avail ~~@~~ in (2.4 to 2.4 ~~8~~3)
→ non-overlapping channels can be used
→ 802.11 non-ov - - -



→ 802.11 frequency Hopping
↳ 79 non-overlapping channels each 1-MHz

→ 802.11 WLAN Infrastructure
↳ Station [STA] architecture
↳ Access point [AP] architecture
↳ Station select an AP and get associate with it
↳ support roaming, time synchronization

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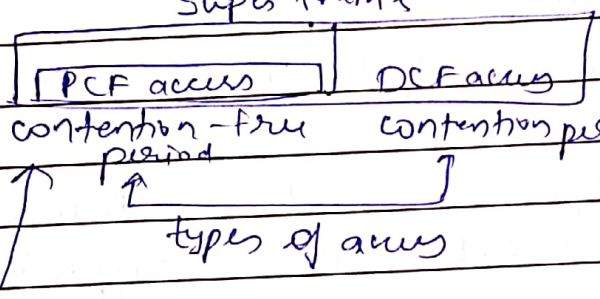
↳ Basic Service Set [BSS]
all the stations under one AP.
↳ Extended service set [ESS]
set of one or more BSS conn. by DS
↳ Distribute system [DS]
to interconnect all the BSS

→ 802.11 Initial Link Setup
→ BSS Discovery
(i) ↳ probe request [Passive scanning or active scanning]
(ii) ↳ probe response : sent advertising the SSID, supported data rate, encryption, types, ...
(iii) ↳ authentication open sequence 1
(iv) ↳ ——— 1 ——— 2
(v) association request
(vi) association response
State diagram : DFA
→ Roaming
↳ moving from one BSS to another w/o losing conn
↳ it does not define how roaming should be done
→ 802.11 MAC Layer
↳ two kinds of carrier sense
(i) virtual carrier sense → check amt of received RF energy CCA (clear channel Assessment)
(ii) physical carrier sensing → with help of RTS, CTS packets

Class-14 [12/3/19]

→ virtual carrier sensing
↳ NAV → N/w Allocator Vector
↳ =0 → medium free
↳ >0 → wait until it was to 0

point → PCF and DCF [distr. coordination fun^n]
↳ access methods [CSMA/CA ← DCF
↳ PCF (optional in a station)
↳ Super frame



time-critical service

→ Traffic services
↳ Asynchronous service (mails)
↳ Time-bounded (PCF) (contention-free)

→ Access methods
• DCF CSMA/CD [mandatory]
• DCF RTS/CTS
• PCF

→ Interframe Spacing (IFS)
↳ time interval b/w frames

→ IFS types
↳ SIFS (Shortest IFS)
Min. no of time slots are being assigned (highest priority traffic)
→ used for ACK packets, CTS, Data frame just after CTS

Q Compare 3 transmission mediums for WLAN.
Q Find out which 802.11 is supported by laptop
Q What is the speed of wireless connection
Q Concept of non-overlapping channels in FHSS

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↳ PIFS (point IFS)
↳ medium priority, time bounded service (PCF)
PIFS = SIFS + slot time
↳ DIFS (
↳ lowest priority, asynchronous data service (DCF)
DIFS = SIFS + 2* slot time

→ Access control logic (How a frame is sent?)

→ Collision Avoidance
↳ exponential backoff

→ CSMA/CA Broadcast (802.11) (using backoff)
↳ ack waits for SIFS time
↳ when medium is free stations will wait for DIFS time
↳ concept of elapsed back-off (fairness is ensured)
↳ NAV → stores the duration received from RTS/CTS packet
↳ the neighbouring station will set their contention period to whatever it is in the RTS.

→ CSMA/CA | Unicast (802.11)

→ Fragmentation Mode
↳ after every fragment if the station will receive ACK.

→ PCF (for infrastructure mode)
centralized (point coordinator) controls everything
↳ waits for PIFS

→

Scanned by CamScanner

802.11n

SYC

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Class - 15 [14/3/19] π day 3.14.19

→ PCF super frame timing
- polling done by central A.P.
- used PFS issues polls
- round-robin fashion
- {big flow diagram in ppt}

→ Frame format

(i) Frame control [2 bytes]
version, type, subtype, Retry, power mgmt, ToDS, fromDS

(ii) Duration / ID [2 bytes]

(iii) 4 address fields
- SA (src address)
- TA (transmitter address)
- RA (receiver address)
- DA (destination address)
- BSSID

→ Power management in BSS

Class - 16 [15/3/19] [PPTs] [Copies]

ppt [shashank] = Physical Layer 802.11
- PLCP
- PMD (transceiver of phy. layer)

Ppt [Prince Raj] = 802.11 Infrastructure mode