Wireless Medium Access Control and CDMA, 3G, WiMax, 4G and 5G Networks

Lesson 04
Wireless Medium Access Control Specialized methods

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CSMA/CD (Carrier Sense Multiple Access/ Collission Detect)

- Cellular digital packet data (CDPD)
- CSMA/CD checks whether a collision is detected at the transceiver before transmitting

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CSMA/CD (Carrier Sense Multiple Access/ Collission Detect)

- Ethernet LAN uses the CSMA/ CD protocol

- Based on the concept *speak and sense interference, in case of interference then speak again*.

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Addressed Receiver Based Protocol

- ARCNET (attached resource computer network)

- A token having an address is passed, first to the nearest node, then to the next nearest, and so on, in the form of a token-passing ring.

- The addressed node receives the signals

GSMData Link Layer Control

- Controlled flow of packets to and from the network layer and provides access to multiple services.

- GPRS data link layer at the MS has three sublayers—MAC (media access control), RLC (radio link control), and LLC (logical link control). Data link layer at the BSS has two sublayers, MAC and RLC2. The RLC manages radio link resources issues.

GPRS DATA LINK LAYER CONTROL

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WLAN IEEE 802.11x

- Standard Ethernet uses CSMA/CD
- Not possible to both transmit and receive on the same channel using radio transceivers
- Therefore an 802.11 wireless LAN takes measures only to avoid collisions
- Does not detect collissions. IEEE 802.11 standard therefore uses CSMA/CA

WLAN IEEE 802.11x MAC LAYER

- The MAC layer performs the addressing and recognition of frames in support of the LLC

- MAC implements using CSMA/CA plus RTS (Request to Send) /CTS (Clear to Send) handshaking before the data transfer

- A distributed coordination function (DCF)

- Power management

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Multiple physical layers

- Same MAC support

- Mobile node roaming within an ESS (Extended Service Set) by registration and node association, dissociation, and re-association on moving to another BSS (Basic Service Set)

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Media Access Collision Avoidance (MACA) Protocol

- A new channel access protocol

- Attempts to overcome exposed and hidden wireless stations problem without any carrier sense

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MACA– A Three way handshake protocol

- (i) A station (WS-A) sends a Ready-to-Send (RTS) control packet

- (ii) Other station (WS-B) acknowledges a Clear-to-Send (CTS) control data packet. A control packet is of size much less than data packe.

- (iii) WS-A transmits the data packet.

MACA

- Control packets RTS and CTS also communicate the time duration allotted for the data transfer
- A channel thus gets reserved before a data packet transmits

Issue in MACA

- **P**roblem of exposed and hidden problem can still exist in MACA. Data packet still might suffer collision.

- When two adjacent stations, WS-A and WS-C (a hidden node) simultaneously transmit RTS to WS-B or

- A CTS message transmits to WS-A and simultaneously

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Issue in MACA

- RTS message transmits from WS-C.
- CTS from B for A is delayed, when A and C both had sent RTS to B.
- Control packet delay also exists in MACA

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Media Access Collision Avoidance Wireless (MACAW) LAN protocol

- MACAW also based on MACA RTS/CTS control packet handshake scheme of MACA

- Consists of additional packets/frames

- Four-way handshake more reliable Data packets recover by the MAC sub-layer if ACK is not received. This is due to provisioning of a new RTS if ACK is not received during the allotted duration

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MACAW FOUR WAY HANDSHAKE PROTOCOL

- (i) A station (WS-A) sends a RTS
- (ii) Other station (WS-B) acknowledges by CTS control data packet
- A control packet is of size much less than data packet

MACAW FOUR WAY HANDSHAKE PROTOCOL

- (iii) WS-A transmits the data packet.
- (iv) WS-B acknowledges (ACK) the data packet

CHANNEL TIME RESERVATION

- Control packets RTS and CTS also communicate the time duration allotted for the data transfer
- A channel thus gets reserved before a data packet transmit

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RETRANSMIT RTS (RRTS)

- WS-A RRTS control packet retransmits, if ACK is not received from WS-B

- If new RTS received by WS-B before the duration of receipt of ACK ends for WS-A, then the WS-B do not send new CTS

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Summary

- CSMA/CD not usable in wireless

- WLAN IEEE 802.11 MAC implements using CSMA/CA plus RTS (Request to Send) /CTS (Clear to Send) handshaking before the data transfer

- WLAN MAC uses distributed coordination function (DCF)

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Summary

- MACA CSMA-RTS/CTS Three way handshake
- MACAW CSMA-RTS/CTS Four way handshake

End of Lesson 04
Wireless Medium Access Control Specialized methods