SOLUTION for "Hidded terminal problem" & "Exposed terminal problem"

--> MACA - Multiple Access Collision Avoidance

03:37

IEEE 802.11 – COLLISION AVOIDANCE

★ 802.11 addresses these two problems with an algorithm called Multiple Access with Collision Avoidance (MACA).

Key Idea

★ Sender and receiver exchange control frames with each other before the sender actually transmits any data.
★ This exchange informs all nearby nodes that a transmission is about to begin.
★ Sender transmits a Request to Send (RTS) frame to the receiver.
   ○ The RTS frame includes a field that indicates how long the sender wants to hold the medium. Length of the data frame to be transmitted.
★ Receiver replies with a Clear to Send (CTS) frame
   ○ This frame echoes this length field back to the sender

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05:26

IEEE 802.11 – COLLISION AVOIDANCE

★ Any node that sees the CTS frame knows that

   ○ it is close to the receiver, therefore

   ○ cannot transmit for the period of time it takes to send a frame of the specified length

★ Any node that sees the RTS frame but not the CTS frame

   ○ is not close enough to the receiver to interfere with it, and

07:36

IEEE 802.11 – Collision Avoidance

★ The idea of using ACK in MACA is Proposed in MACAW: MACA for Wireless LANs.

★ Receiver sends an ACK to the sender after successfully receiving a frame.

★ All nodes must wait for this ACK before trying to transmit.

★ If two or more nodes detect an idle link and try to transmit an RTS frame at the same time

    ★ Their RTS frame will collide with each other

★ 802.11 does not support collision detection

    ★ So the senders realize the collision has happened when they do not receive the CTS frame after a period of time

    ★ In this case, they each wait a random amount of time before trying again.

    ★ The amount of time a given node delays is defined by the same exponential backoff algorithm used on the Ethernet.