

Wireless LAN Protocols (1)

Wireless has complications compared to wired.

Nodes may have different coverage regions

- Leads to hidden and exposed terminals

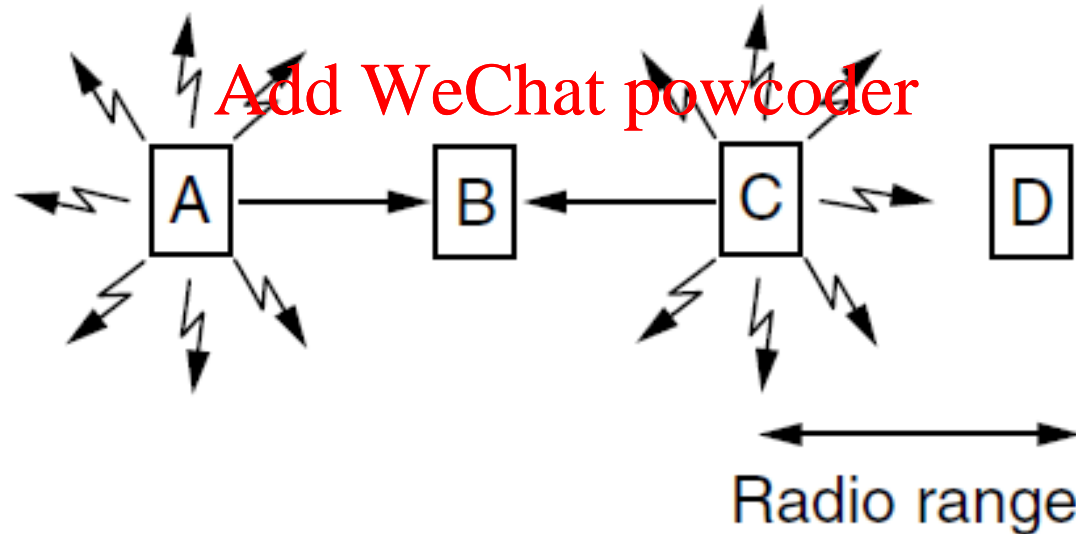
Nodes can't detect collisions, i.e., sense while sending

- Makes collisions expensive and to be avoided

Wireless LANs (2) – Hidden terminals

Hidden terminals are senders that cannot sense each other but nonetheless collide at intended receiver

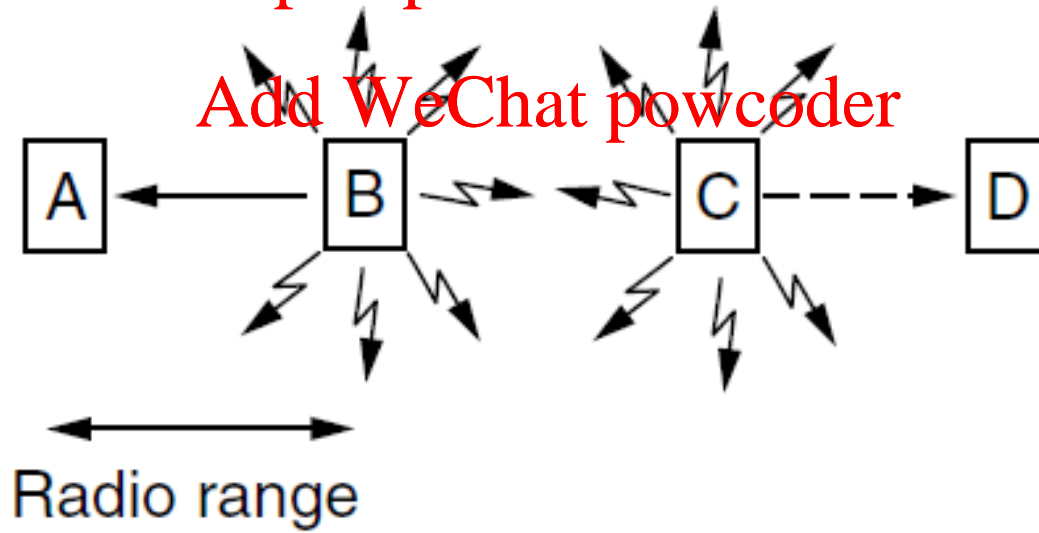
- Want to prevent loss of efficiency
- A and C are hidden terminals when sending to B



Wireless LANs (3) – Exposed terminals

Exposed terminals are senders who can sense each other but still transmit safely (to different receivers)

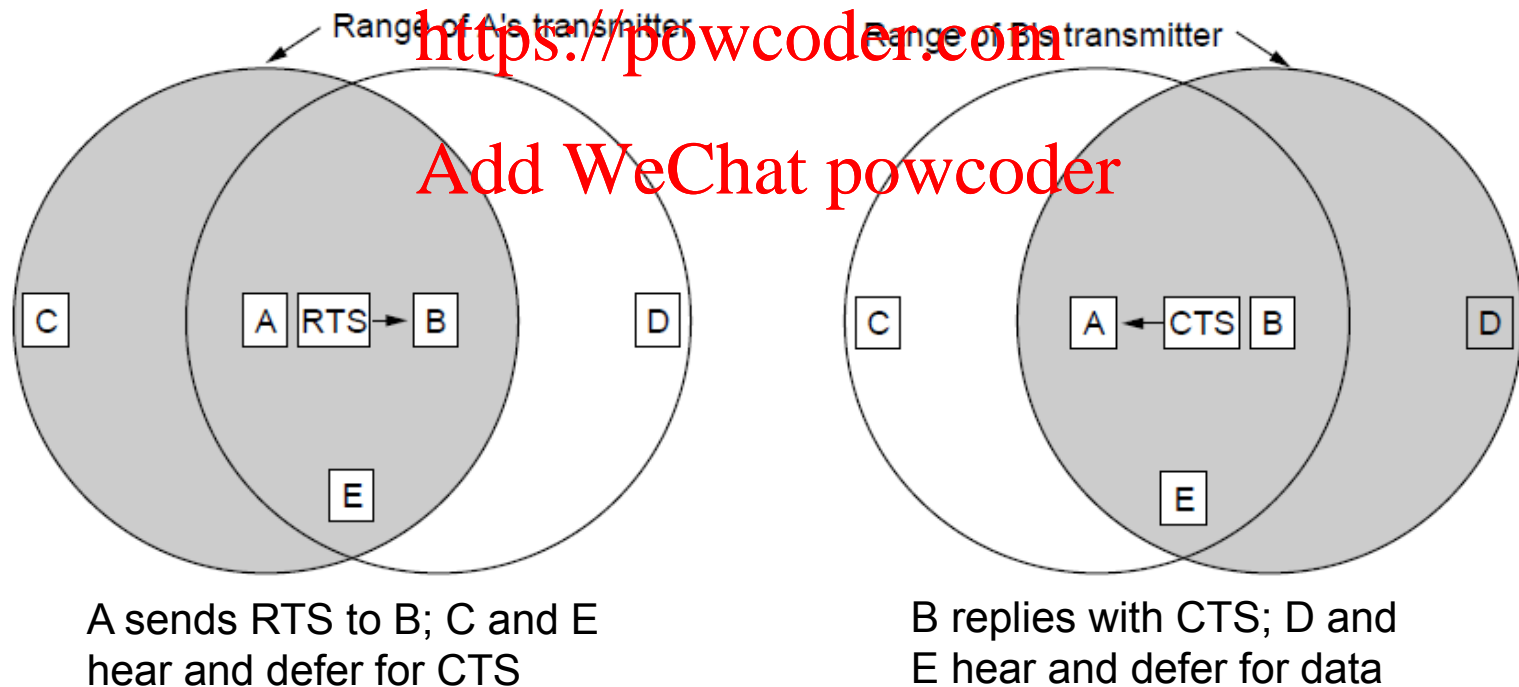
- Desirably concurrent transmission improves performance
- B \rightarrow A and C \rightarrow D are exposed terminals



Wireless LANs (4) – MACA

MACA protocol grants access for A to send to B:

- A sends RTS to B [left]; B replies with CTS [right]
- A can send with exposed but no hidden terminals



Wireless LANs

- 802.11 architecture/protocol stack »
- 802.11 physical layer »
- 802.11 MAC »
- 802.11 frames »

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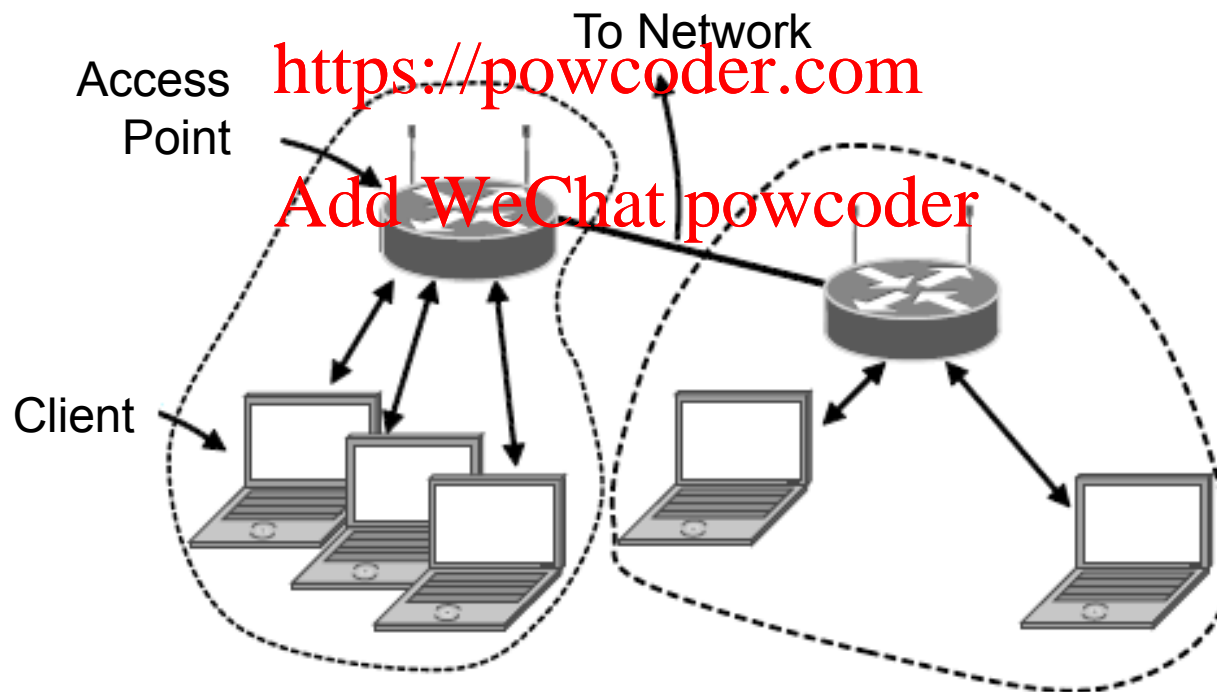
<https://powcoder.com>

Add WeChat powcoder

802.11 Architecture/Protocol Stack (1)

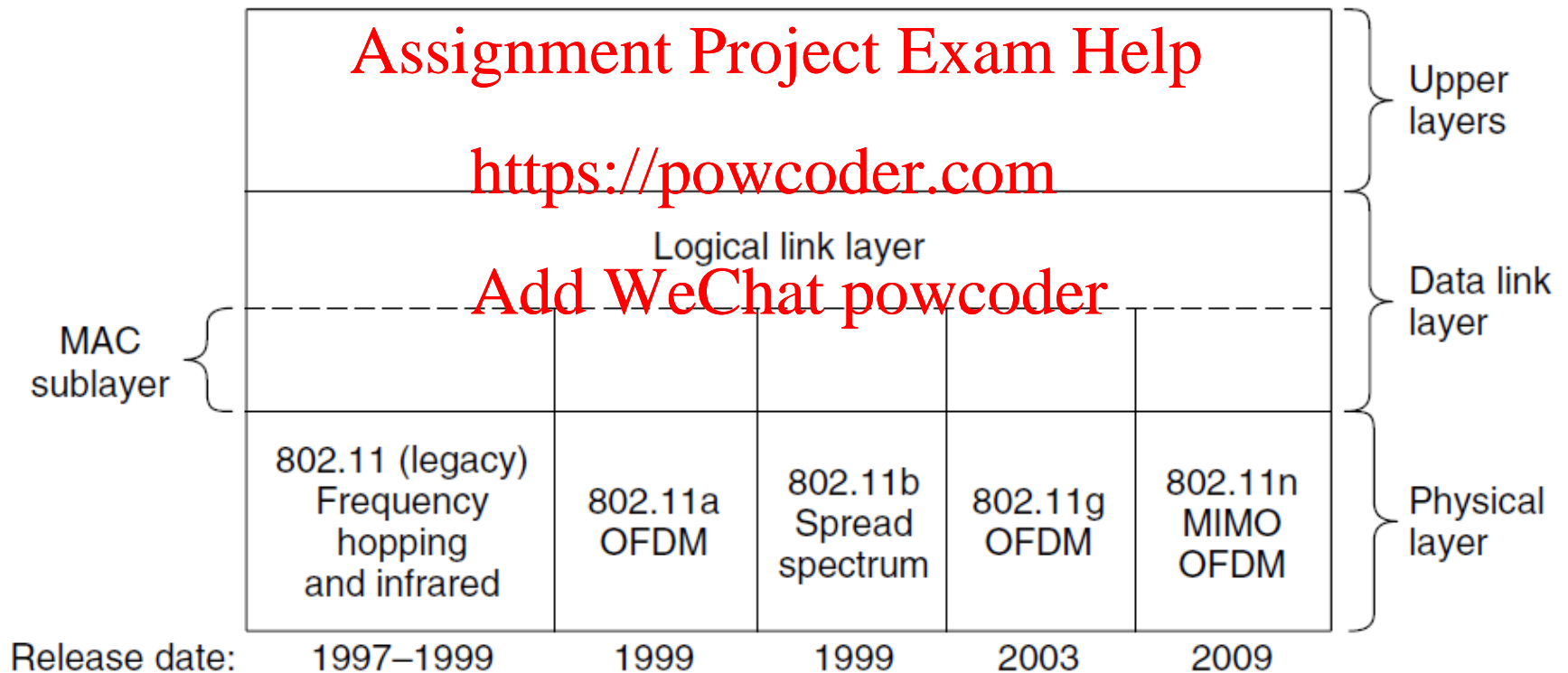
Wireless clients associate to a wired AP (Access Point)

- Called infrastructure mode; there is also ad-hoc mode with no AP, but that is rare.



802.11 Architecture/Protocol Stack (2)

MAC is used across different physical layers



802.11 physical layer

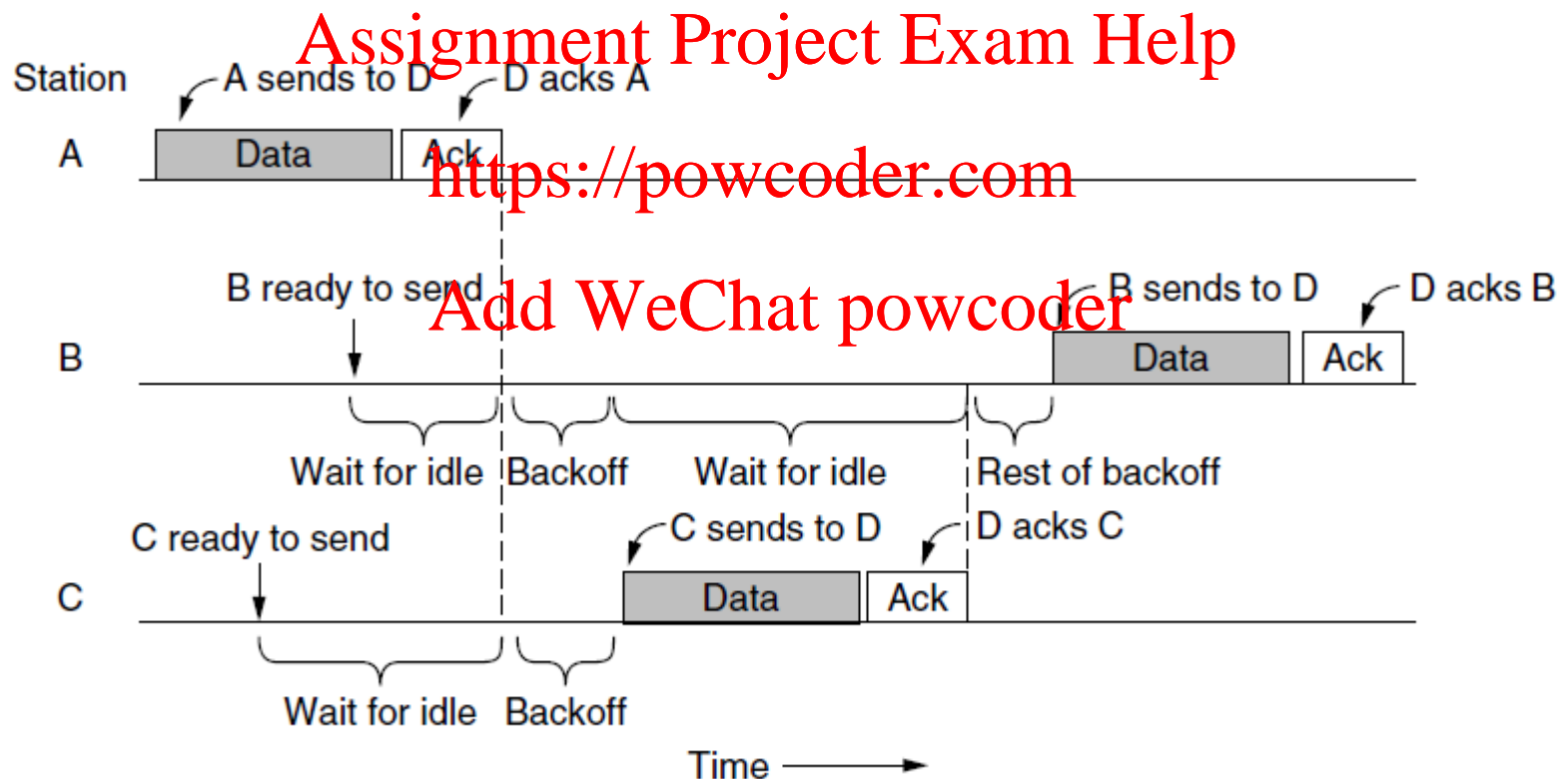
- NICs are compatible with multiple physical layers
 - E.g., 802.11 a/b/g

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Name	Technique	Max. Bit Rate
802.11b	Spread spectrum, 2.4 GHz	11 Mbps
802.11g	OFDM, 2.4 GHz	54 Mbps
802.11a	OFDM, 5 GHz	54 Mbps
802.11n	OFDM with MIMO, 2.4/5 GHz	600 Mbps

802.11 MAC (1)

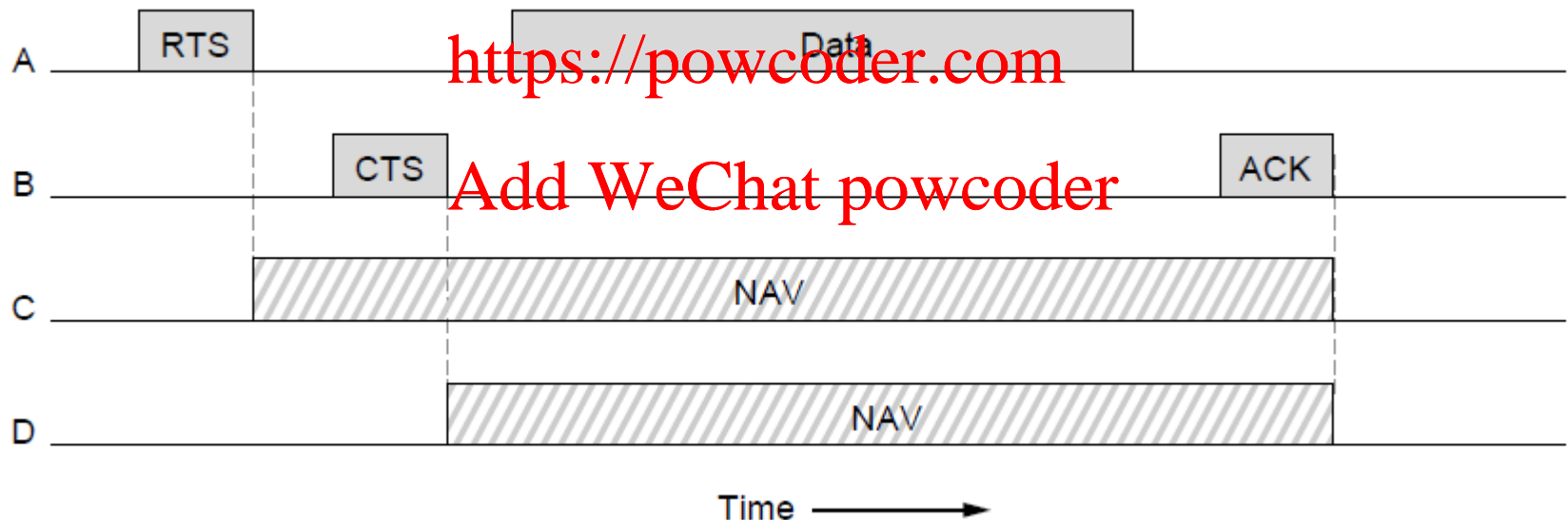
- CSMA/CA inserts backoff slots to avoid collisions
- MAC uses ACKs/retransmissions for wireless errors



802.11 MAC (2)

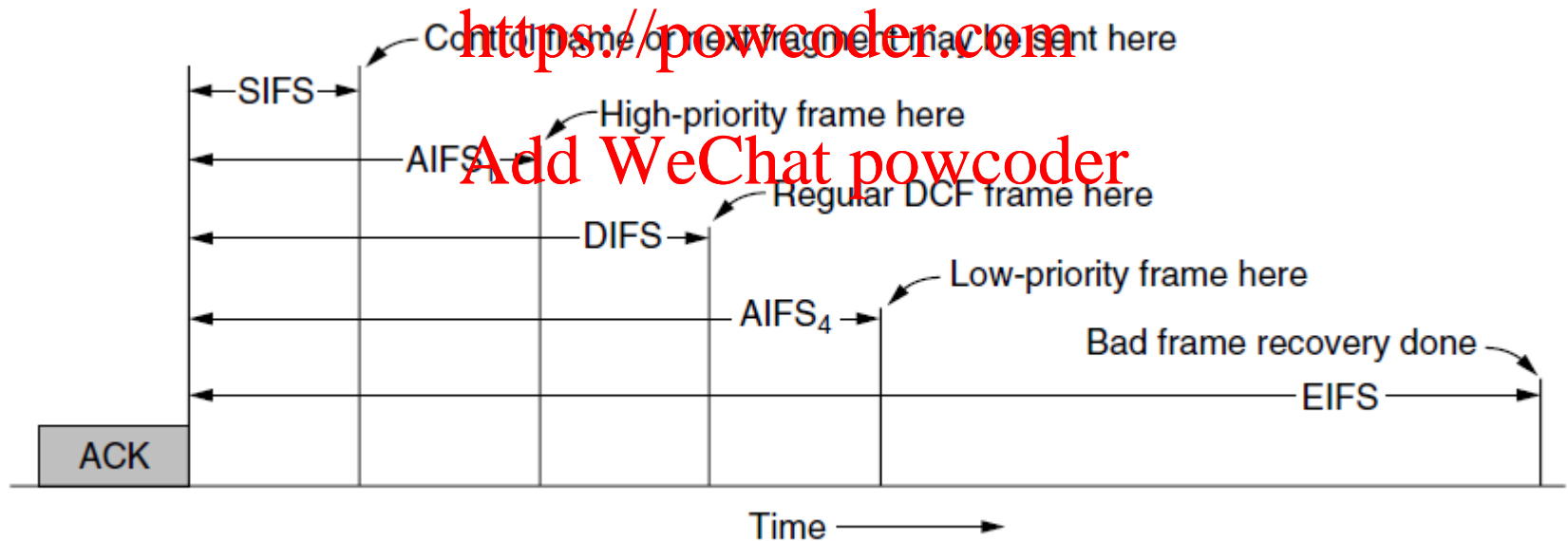
Virtual channel sensing with the NAV and optional RTS/CTS (often not used) avoids hidden terminals

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802.11 MAC (3)

- Different backoff slot times add quality of service
 - Short intervals give preferred access, e.g., control, VoIP
- MAC has other mechanisms too, e.g., power save



802.11 Frames

- Frames vary depending on their type (Frame control)
- Data frames have 3 addresses to pass via APs

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