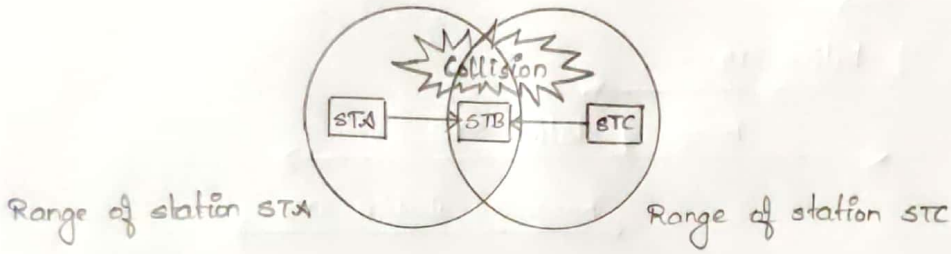
QUESTION

What are hidden & exposed station problem? Methods to prevent them?

ANSWER

Hidden Station Problem

Suppose that there are 3 stations: STA, STB & STC, where STA & STC are transmitting while STB is receiving. The stations are in a configuration such that the 2 transmitters STA & STC are not in the radio range of each other. This is shown in the following figure.



The above diagram shows that STA starts transmitting to STB. Since STC is out of radio range of STA, it perceives that the channel is free & starts transmitting to STB. The frames received by STC are garbled & collision occurs. This situation is known as the hidden station problem.

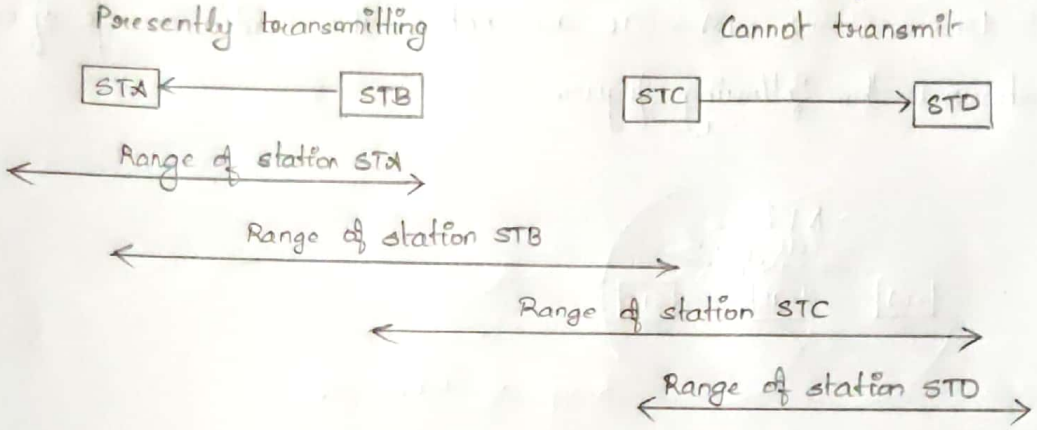
Solution:- The exposed terminal problem is solved by the MAC (medium access control) layer protocol IEEE 802.11 RTS/CTS, with the condition that the stations are synchronized & frame sizes & data speed are the same. RTS stands for Request to Send & CTS stands for Clear to Send.

A transmitting station sends a RTS frame to the receiving station. The receiving station replies by sending a CTS frame. On receipt of CTS frame, the transmitting station begins transmission.

Any station hearing the RTS is close to the transmitting station & remains silent long enough for the CTS. Any station hearing the CTS is close to the receiving station & remains silent during the data transmission.

Exposed Station Problem

Suppose that there are 4 stations labelled STA, STB, STC & STD, where STB & STC are transmitters while STA & STD are receivers at some slot of time. The stations are in a configuration such that the 2 receivers STA & STD are out of radio range of each other, but the 2 transmitters STB & STC are in radio range of each other. This is shown in the following figure.



The above diagram shows that a transmission is going on from STB to STA. STC falsely concludes that the transmission will cause interference & stops its transmission attempts to STD. However, interference would not have occurred since the transmission from STC to STD is out of range of STB. This prevention of transmission is called exposed station problem.

Solution :- It is solved by the MAC layer protocol IEEE 802.11 RTS / CTS, with the condition that the stations are synchronized & frame sizes & data speed are the same. A transmitting station sends a RTS frame to the receiving station. The receiving station replies with a CTS frame. On receipt of CTS frame, the transmitting station begins transmission. Any station hearing the RTS is close to the transmitting station & remains silent long enough for the CTS. Any station hearing the CTS is close to the receiving station & remains silent during the data transmission.