



4.9.2.3 Wireless Networking

- 1) A family uses a wireless computer network at home.

Describe **two** security measures that the family should put in place to ensure that the wireless access point is secure **and** explain how these measures will make wireless connections to the access point more secure.

[2 marks]

- **Use WPA/WPA2 (WiFi Protected Access) to encrypt transmissions so intercepted transmissions cannot be understood;**
 - **Disable broadcast of SSID (Service Set Identifier) so the network is harder to discover because its SSID will not appear in normal network searches;**
 - **Use MAC address whitelist so that only devices with a known MAC address can connect to the network;**
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- 2) A school has installed a wireless network with multiple wireless access points.

- a) What hardware component is needed for each device that is going to be connected to the wireless network?

[1 mark]

- **Wireless network interface card;**

A student is trying to use his own mobile device on the school network. He has all the necessary hardware and software, all the hardware devices are working correctly, and he knows the correct SSID and WPA2 key for the school network. However, he is still not able to connect to the wireless network.

- b) Describe a security measure, other than logging in, that the school might have put in place that is preventing this student from connecting his own mobile device to the network.

[3 marks]

- **MAC address whitelist;**
- **The wireless access point checks the MAC address of the device against a list of allowed devices;**
- **Only devices with a MAC address on the list are allowed to connect;**





- c) Explain why preventing students from using their own mobile devices on the wireless network is likely to improve the performance of the school network.

[2 marks]

- A network has limited bandwidth;
- Preventing some devices from joining the network will decrease network traffic;
- There is less contention for the shared wireless channel, reducing the likelihood of collisions;

- d) Explain the role of a Service Set Identifier (SSID) in wireless networking.

[2 marks]

- SSID is a unique identifier for a wireless network;
- A wireless client must use the same SSID as the access point to join the wireless network;

- e) WPA2 is an example of a protocol. Explain what is meant by a protocol.

[2 marks]

- A set of rules...;
- That allow two devices to communicate;

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- 3) Explain how disabling SSID (Service Set Identifier) broadcasting can increase the security of a wireless network.

[2 marks]

- The SSID of the network will not be visible to devices searching for networks;
 - This means that only users who know the SSID of the network can attempt to connect;
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- 4) Explain how the use of a MAC (Media Access Control) address allow list can increase the security of a wireless network.

[2 marks]

- A MAC address is unique to every network interface card
 - Only devices whose MAC addresses are on the allow list are permitted to connect.
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- 5) Mobile phones and other devices can connect to a network via the wireless access point. The wireless connection uses the CSMA/CA protocol with Request to Send/Clear to Send (RTS/CTS).

A laptop connected to the wireless access point has data to send the other computer.

Explain how the CSMA/CA protocol with RTS/CTS will be used during this transmission

[6 marks]

- A device with data to send listens to see if the channel is idle;
 - If another transmission is in progress then the device continues to wait before again checking if the channel is idle;
 - The waiting periods are randomised;
 - When no data signal is present, the device sends a RTS;
 - Two hidden devices may both detect the channel as idle and transmit an RTS at the same time, causing a collision;
 - The receiver/WAP responds with a CTS;
 - If the CTS is received then the device can begin to transmit;
 - The CTS informs other devices in range that they should defer transmission for the specified period;
 - If a CTS is not received then the device goes back to waiting;
 - The receiver sends an ACK (acknowledgement) to the transmitter after all the data is received;
 - If the transmitter did not receive an ACK within a reasonable time period it will go back to waiting;
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