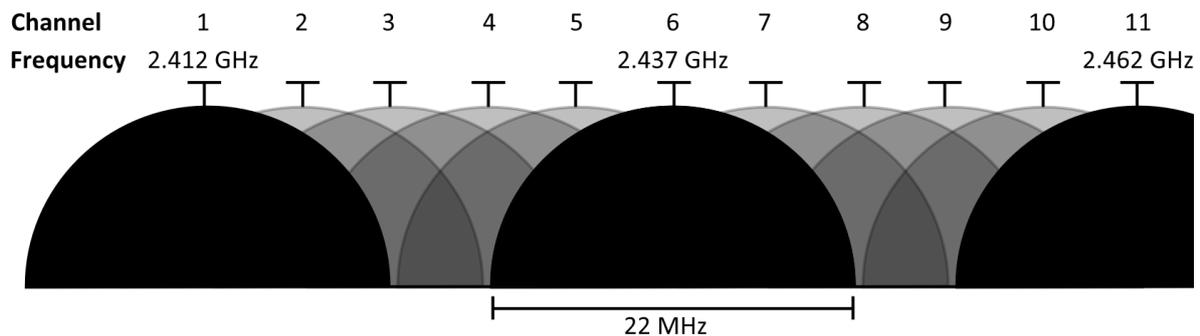


Wi-Fi Channels and Frequency



Wi-Fi is a trademarked name for the IEEE 802.11 standard. Wi-Fi works at the microwave **frequencies** of 2.4 GHz and 5 GHz. The frequencies used for the 802.11g standard are shown above. Each Wi-Fi **Access Point (AP)** operates on a specific **channel** which uses 22 MHz of **bandwidth**. If your neighbour's access point uses the same channel then your network will slow down. Although the channels overlap, if you use channels far enough apart then they will not interfere – e.g. your neighbour uses channel 1 and you use channel 6. The newer 802.11ac standard uses the 5 GHz frequency. This is less crowded and therefore has less **interference**.

Wi-Fi Encryption

Encryption encodes communication so that only those who have the password to **decrypt** it can do so. As Wi-Fi communications go through the air, it is essential that they are **encrypted** so that other users cannot read them. Wi-Fi uses a number of methods to encrypt the data. **WEP (Wired Equivalent Privacy)** is an older standard of encryption which can be **cracked** in minutes. This has been replaced by **Wi-Fi Protected Access (WPA and WPA2)**. WPA2 is the most secure of these. Home Wi-Fi uses a **Pre-Shared Key (PSK)** which users type into their device or computer. The device then uses this key to encrypt and decrypt information which it sends over Wi-Fi.

Network performance

The performance of a network is the service quality which the user experiences. There are a number of aspects which we measure the performance of:

- **Bandwidth** – the maximum rate of transfer of data
- **Throughput** – the actual rate of transfer of data through the network
- **Latency** – the delay taken from a packet being sent from the sender to being decoded by the receiver
- **Jitter** – the amount of change in the delay of packets
- **Packet loss** – the percentage of packets which are corrupted and don't correctly arrive with the receiver.

A number of factors can cause a network to underperform. Many users trying to use the same **switch** or **hub** at the same time will cause the network to slow down. This is called **network congestion**. A physical break in a major wire on the Internet will also slow down the network as this will cause congestion on the other routes. **Power failures**, switch or server failures and **viruses** or **malware attacks** can all affect network performance.

The performance of Wi-Fi networks is negatively affected by many factors. **Physical obstructions** such as walls, **interference** from other devices on the same frequency, the channel being shared by many other devices, the **signal strength** not being strong enough and the size of the **antenna** will all reduce the performance of a Wi-Fi network.

Q 18

1. Match the acronyms on the left to their meanings on the right.

AP	Pre-Shared Key	
WEP	Access Point	
WPA	Wireless Protected Access	
PSK	Wired Equivalent Privacy	[4]

2. Wi-Fi operates on different channels. What is a channel? Fill in **one** circle.

- It is the encryption method used
 - It is the frequency which the devices will communicate at
 - It is the power signal used when transmitting
 - It is another name for the device
- [1]

3. Which of the following will reduce the performance of a Wi-Fi network? Tick **four** boxes.

- | | | |
|--|--|---|
| <input type="checkbox"/> A concrete wall | <input type="checkbox"/> Size of antenna | <input type="checkbox"/> The size of the AP |
| <input type="checkbox"/> The processor speed | <input type="checkbox"/> Interference | <input type="checkbox"/> Signal strength |
- [4]

4. To prevent other users reading our Wi-Fi communications we encode them so each device can only read them with a password. What is this process called?
_____ [1]

Wi-Fi & Network Performance - Questions

5. Which IEEE standard deals with Wi-Fi? _____ [1]

6. Your neighbours use channels 1 and 11 on their wireless networks (802.11g). What channel would be best for you to use? _____ [1]

7. Your wireless network has a low throughput. You are currently using the older 802.11n standard. Which standard would improve your network performance? Fill in **one** circle.

- 802.11g
- 802.11ac

[1]

8. You upgrade your Wi-Fi Access Point to a faster standard but experience no difference in throughput. Which of the following reasons is most likely? Fill in **one** circle.

- The standards all have the same throughput
- You haven't changed the angle of the antenna
- You need to upgrade all devices which connect to the AP

[1]

9. Complete the text below using the words beneath.

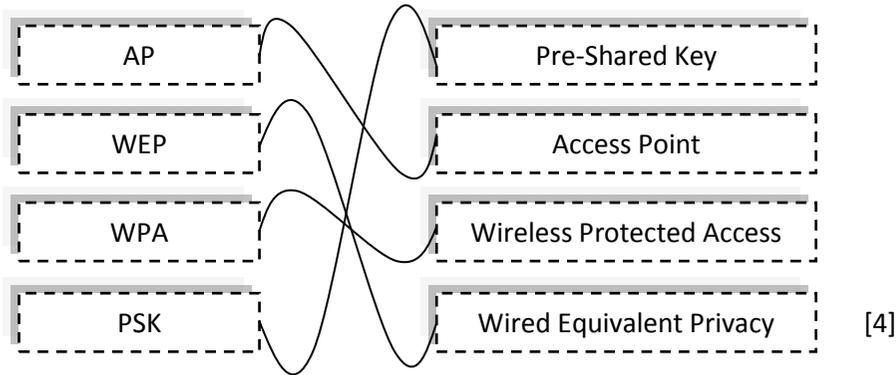
Networks have a number of performance issues. If you are unable to watch video on the network this is due to there not being enough _____. Sometimes you can watch video, but there is a delay of several seconds before a simple web page is received. This is due to the _____ between your computer and the server. On a poor quality connection a high _____ will occur and packets will need to be resent. If packets are delayed by different amounts when they go through the network then there is a high _____ on the network.

jitter packet loss bandwidth latency

[4]

10. A Wi-Fi connection uses 802.11g on channel 6. What is the minimum and maximum frequency which it will be using?
From _____ to _____ [2]

1. Match the acronyms on the left to their meanings on the right.



2. Wi-Fi operates on different channels. What is a channel? Fill in **one** circle.

- It is the encryption method used
 - It is the frequency which the devices will communicate at
 - It is the power signal used when transmitting
 - It is another name for the device
- [1]

3. Which of the following will reduce the performance of a Wi-Fi network? Tick **four** boxes.

- A concrete wall
 - Size of antenna
 - The size of the AP
 - The processor speed
 - Interference
 - Signal strength
- [4]

4. To prevent other users reading our Wi-Fi communications we encode them so each device can only read them with a password. What is this process called?
Encryption [1]

Wi-Fi & Network Performance - Answers

5. Which IEEE standard deals with Wi-Fi? 802.11 [1]

6. Your neighbours use channels 1 and 11 on their wireless networks (802.11g). What would channel would be best for you to use? 6 [1]

7. Your wireless network has a low throughput. You are currently using the older 802.11n standard. Which standard would improve your network performance? Fill in **one** circle.
 802.11g
 802.11ac [1]

8. You upgrade your Wi-Fi Access Point to a faster standard but experience no difference in throughput. Which of the following reasons is most likely? Fill in **one** circle.
 The standards all have the same throughput
 You haven't changed the angle of the antenna
 You need to upgrade all devices which connect to the AP [1]

9. Complete the text below using the words beneath.

Networks have a number of performance issues. If you are unable to watch video on the network this is due to there not being enough **bandwidth**. Sometimes you can watch video, but there is a delay of several seconds before a simple web page is received. This is due to the **latency** between your computer and the server. On a poor quality connection a high **packet loss** will occur and packets will need to be resent. If packets are delayed by different amounts when they go through the network then there is a high **jitter** on the network.
jitter packet loss bandwidth latency [4]

10. A Wi-Fi connection uses 802.11g on channel 6. What is the minimum and maximum frequency which it will be using?
 From 2.426 GHz to 2.448 GHz [2]

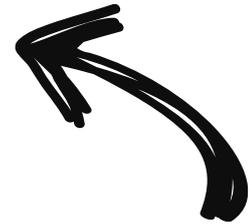
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