Wireless networking

IB Computer Science

Content developed by Dartford Grammar School
Computer Science Department
HL Topics 1-7, D1-4

1: System design
2: Computer Organisation
3: Networks
4: Computational thinking
5: Abstract data structures
6: Resource management
7: Control
D: OOP
HL & SL 3 Overview

Network fundamentals
3.1.1 Identify different types of networks
3.1.2 Outline the importance of standards in the construction of networks
3.1.3 Describe how communication over networks is broken down into different layers
3.1.4 Identify the technologies required to provide a VPN
3.1.5 Evaluate the use of a VPN

Data transmission
3.1.6 Define the terms: protocol, data packet
3.1.7 Explain why protocols are necessary
3.1.8 Explain why the speed of data transmission across a network can vary
3.1.9 Explain why compression of data is often necessary when transmitting across a network
3.1.10 Outline the characteristics of different transmission media
3.1.11 Explain how data is transmitted by packet switching

Wireless networking
3.1.12 Outline the advantages and disadvantages of wireless networks
3.1.13 Describe the hardware and software components of a wireless network
3.1.14 Describe the characteristics of wireless networks
3.1.15 Describe the different methods of network security
3.1.16 Evaluate the advantages and disadvantages of each method of network security
Topic 3.1.14

Describe the **characteristics** of wireless networks
Types of wireless networks

- WiFi
- WiMAX
- 3G
- LTE
Wi-Fi (Wireless Fidelity)

- Also called **Wireless LAN (WLAN)**
- Used in **laptops/mobile devices** to connect wirelessly to home network
- Most preferred network type to implement a home network
- Allows relatively slow to fast data transmissions (depending on the version)
- **Backwards compatible** with most older Wi-Fi standards (a/b/g/n)
- **Small transmitting radius** makes it suited for homes, usually <20m
WiMAX

- WiMAX = Worldwide Interoperability for Microwave Access
- Designed for **large distance** high speed internet access
- Relatively cheap method of providing internet over a large area - suited for **poorer countries**
- Rivalled by **Long Term Evolution (LTE)** standard
- Can be used as a form of wireless variant of DSL phone transmission lines
3G (Third Generation)

- The primary way mobile phones access the internet today
- Allows the tunnelling of phone lines (mobiles don't have to switch back to phone network when receiving a call)
- Relatively fast
<table>
<thead>
<tr>
<th>Generation</th>
<th>Speed</th>
<th>Technology</th>
<th>Features</th>
</tr>
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<tbody>
<tr>
<td><strong>2G</strong></td>
<td>9.6/14.4 kbps</td>
<td>TDMA, CDMA</td>
<td>2G capabilities are achieved by allowing multiple users on a single channel via multiplexing. 2G enabled mobile phones can be used for data along with voice communication.</td>
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<tr>
<td><strong>3G</strong></td>
<td>3.1 Mbps (peak)</td>
<td>CDMA 2000 (1XRTT, EVDO)</td>
<td>3G provides amazing internet browsing speeds.Opens the door to a whole bag of opportunities with video calling, video streaming, etc. In 3G, universal access ad portability across different device types are made possible. (Telephone &amp; PDA's)</td>
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<tr>
<td><strong>3.5G</strong></td>
<td>14.4 Mbps (peak)</td>
<td>HSPA</td>
<td>3.5G supports even higher speeds and enhances higher data needs.</td>
</tr>
<tr>
<td><strong>4G</strong></td>
<td>100-300 Mbps (peak) 3-5 Mbps</td>
<td>WiMAX LTE</td>
<td>Speeds for 4G are increased to lightning fast in order to keep up with data access demand used by various services. It also supports HD streaming. HD phones can be fully utilized on a 4G network.</td>
</tr>
</tbody>
</table>
**3G vs 4G**

How 3G compares to 4G across a range of everyday mobile activities:

- **Downloading a game (20MB)**
  - 3G: 3 minutes
  - 4G: 25 seconds

- **Streaming music**
  - 3G: 10 second buffer possible disruption during playback
  - 4G: 1 second buffer

- **Streaming SD video**
  - 3G: 20 second buffer possible disruption during playback
  - 4G: 1 second buffer

- **Streaming HD video**
  - 3G: 1-5 minute buffer disruption during playback
  - 4G: 30 second buffer

- **Uploading an image**
  - 3G: 25 seconds
  - 4G: 1 second