Isaac Computer Science

Network security

GSCE Student Booster

Key Information

1) Remember this booster is here to **help you**. Please consider your behaviour in the chat.
2) If you are in a room with a teacher/group, please login to the meeting. This is so we can mark your attendance. This information goes into a **prize draw**.
3) Make sure the name on the meeting is the **SAME** as the name on your Isaac account. We can't mark you present if they don't match.

Learning outcomes

- Explain the need for network security
- Be able to describe common threats to network security
- Identify methods of protecting data held on a network
- Understand the purpose of testing network security

Comment in chat

Why network security ?

[redacted] 1 What we know about the cyberattack that leaked one of PlayStation's most anticipated games

Cyber-attack on UK's [redacted] 2 registers revealed

8 August

[redacted] 3 of Manchester says its data 'likely copied' in cyberattack

The incident comes amid a spate of cyberattacks on British institutions and businesses this year, including the BBC, Boots, British Airways, Royal Mail, WH Smith, and JD Sports.

Friday 9 June 2023 13:54, UK

Highgate Wood [redacted] 4 closed following cyber attack

6 September

Why network security ?

Click any of the headlines for the full story.

Wolverine: What we know about the cyberattack that leaked one of PlayStation's most anticipated games

Cyber-attack on UK's electoral registers revealed

8 August

University of Manchester says its data 'likely copied' in cyberattack

The incident comes amid a spate of cyberattacks on British institutions and businesses this year, including the BBC, Boots, British Airways, Royal Mail, WH Smith, and JD Sports.

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Handout 1 - 5 minutes

1 2 3 4 5 Go

Network threats

Match up the threats with the definitions.

GSCE Booster: Network security

Handout 1 – Network threats match up

Match the network threats with the definition. You can use Isaac Computer Science to help you with this task. Isaac Computer Science network security

If you have time, add any other threats you might be aware of.

THREATS	DEFINITIONS
Data interception and theft	A program that generates all combinations of characters until it finds the combination that matches the password.
IP address spoofing	Altering a packet's source address so that it appears that the packet came from a trusted source
Denial of service	Overwhelming a server with requests so that legitimate requests cannot be handled
SQL injection	Insertion or "injection" of a SQL query via the data entered on a web page
Brute force attack	Someone who deliberately gains, or attempts to gain, unauthorised access to a computer system with the intent to cause damage or steal data
Hacker	Capturing data sent across a network, to read or possibly modify it

If you have time, add any other threats you know

Network threats – answers

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A fictional scenario

Impact of network security failure

- When network security fails, a **breach** can occur, as we saw in the video.
- A **breach** is *"an incident in which data, computer systems or networks are accessed or affected without authorisation."* according to the National Centre for Cybersecurity.

Impact of network security failure

Poll

- What do you think was the average cost of a **data breach** in the UK in 2022 - 2023 ?

1. $1.1 million
2. $4.2 million
3. $2.5 million
4. $3.4 million

Impact of network security failure

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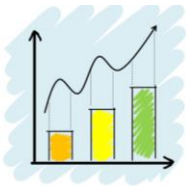


Impact of network security failure

1 2 3 4 5 Go

Handout 2 - 5 minutes

Use Handout 2 to investigate the impact when network security fails.

GSCE Booster; Network security

Handout 2 – Impact of network security failure

Read the following article and answer the questions below.

NEWS 3 NOV 2023

OpenAI Reveals ChatGPT Is Being DDoS-e

https://www.infosecurity-magazine.com/news/openai-reveals-chatgpt-is-being/

Q1 What did the users do as a result of the attack?

Q2 Who claimed responsibility for the attack?

Terminology explained

DDOS	Distributed denial-of-service attacks use botnets (robot networks) to all make requests at once to overwhelm a server
Hacktivists	A group of hackers who attack based on political or social reasons rather than for financial gain
Threat actors	Threat actors are either people, or groups of people, who pose a cybersecurity threat. Often for financial gain.

Controlling access to networks

- It is essential to control access to networks to protect the stored data.
- Organisations that store personal data also have a legal obligation to keep data secure.
- **Authentication (**checking the person logging in is who they say they are) can be done in several ways.

Controlling access to networks

Comment in chat

Which types have you used ?

1. Passwords
2. Two factor authentication (2FA)
3. Biometric authentication
4. Access rights and access levels
5. MAC address filtering
6. Firewalls
7. Physical security

Handout 3 – 10 minutes

Controlling access to networks

- **Passwords** are one way of controlling access.
- Use Handout 3 to create some rules for effective password use.

Password text	Time to crack
password	
123456	
password123	
G1antTurtle	
G1antT&rtle	
Pocketjuicetractor	

Comment in chat

Controlling access to networks

- **Two factor authentication** (2FA) improves security against weak or stolen passwords by using
  - Something you **know** (e.g. your password)
  - Something you **have** (e.g. a code sent to your phone)

Comment in chat

Controlling access to networks

- **Biometric authentication** uses a physical characteristic that is **unique,** such as your fingerprint.
- **Access rights** and **access levels** can be set up on a network. These allow users to access only the files they need to and what actions they can do with those files (read, edit or delete).

Controlling access to networks

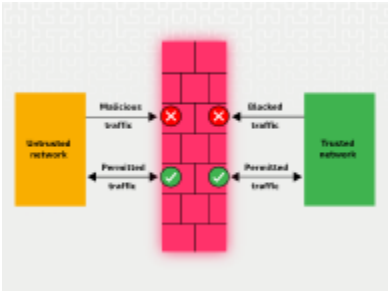
- **MAC address filtering** is a method used to control which devices can connect to a network.
- This allows devices to access or be blocked from accessing a network based on their physical (MAC) address embedded within the device's network adapter.

Controlling access to networks

Comment in chat

- Physical security is protecting the physical aspects of a network, such as having a security guard, or locking doors.
- What network devices might be in a locked room ?
- What other forms of physical access can you think of ?

Controlling access to networks – firewalls



Web based activity – 6 minutes

Controlling access to networks

- Use this game to practice applying firewall rules.
- https://cybergamesuk.com/firewall

Comment in chat

Controlling access to networks

Now which types have you used ?

1. Passwords
2. Two factor authentication (2FA)
3. Biometric authentication
4. Access rights and access levels
5. MAC address filtering
6. Firewalls
7. Physical security

Comment in chat

Controlling access at Google

Encryption for network security

- Data that is transmitted over a network can be intercepted, so it is usually encrypted to make it unreadable if intercepted.
- A message that has not been encrypted is known as **plaintext**. The encrypted version is referred to as **ciphertext**. A **key** is required to turn the plaintext into ciphertext.

Encryption for network security

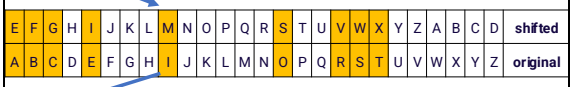
Comment in chat

- A simple encryption method is Caesar cipher. In this method, the **key** is a number.
- This key is how many places in the alphabet each letter of the message has been shifted i.e. with a key of 2, A would become C.
- Use this site https://cryptii.com/pipes/caesar-cipher-decoder to decrypt this message:

Mweeg fsswxiv

Encryption answer

Mweeg fsswxiv



Isaac boosters

Testing the security of networks

- **Penetration testing** is done to make sure that the system is secure from hackers or other malicious attacks by discovering weaknesses or vulnerabilities in a system that could be exploited.

Testing the security of networks

- There are two types of penetration testing
- 'White box' simulates a malicious insider, who could have information to help them in the attack such as usernames.
- 'Black box' simulates an external attack, when the person testing the system has no knowledge of the system.

Testing the security of networks

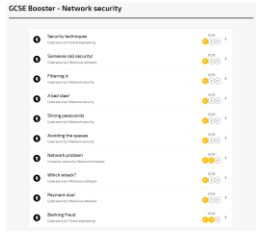
- **Network forensics** is the process of monitoring and analysing network traffic.
- Understanding what is normal activity within a network can help identify suspicious activity such as a cyber-attack.
- Records of user logins, web pages visited and other user activity can also help identify security breaches.

Testing the security of networks

- **Ethical hacking** is used to describe someone who hacks a system but does not intend to cause any harm.
- If the permission of the network owner is given, this activity can be classed as **penetration testing,** otherwise it is illegal.

Isaac Gameboard practice

- If you want more network security practice, then try this gameboard.
- You will need to sign in to **Isaac Computer Science** or register for a free account if not done already.



ncce.io/isc-security

Learning outcomes

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Further information

You will find further information on **Network Security** on the Isaac Computer Science website.

Click here to visit Isaac Computer Science

Whilst you're there, why not check out our other GCSE boosters?

"I see how technology has really helped us get better and better at our job"

Anne Keast-Butler
(Director of GCHQ)

Thank you

Isaac Computer Science

STEM LEARNING