

Computing

GCSE Computer Science – Networks and topologies

Assessment Opportunities	Literacy/Reading opportunities	CEIAG Links
<p>Within every half term, there will be a minimum of 2 low stakes quizzes. These will be automatically marked out of 20.</p> <p>There will also be an end of unit test which will be based on past exam questions. These questions are then marked and gone through as a class.</p>	<p>Networks - Computer networks and topologies - OCR - GCSE Computer Science Revision - OCR - BBC Bitesize</p> <p>3.1a - Network Types & Performance - OCR GCSE (J277 Spec) CSNewbs</p> <p>Network Topologies – GCSE Computer Science OCR Revision – Study Rocket</p>	<ul style="list-style-type: none">• Penetration tester• Application analyst• Applications developer• Cyber security analyst• Data analyst• Forensic computer analyst• IT trainer• Machine learning engineer

Curriculum vision:

“Our aim is to deliver a curriculum that is inclusive, relevant and progressive for all learners.”

Topic 1.3 – Computer networks, connections and protocols. Lesson 1 – Types of network

FIRST ASSESSMENT
SUMMER 2022

The big picture

Why is this relevant for the students?

Video to introduce topic:

<https://www.youtube.com/watch?v=oaNfeCIDMu0>

- We use networks on a daily basis. We use them to read our emails, to message our friends and family and so on. They are a vital part of our use of technology and an increasingly important aspect in our lives. Understanding the structure of networks and how they operate can help us use them effectively.
- Why is it a good idea to network computers together? Consider what we hope to gain from this. Consider if there may be any dangers or risks from networking computers together.

Notes: Use Context Setting task to engage students and create discussion. Maybe link to flipped resources if you use flipped learning.

Objectives

What should the students be confident/able to do at the end of the session?

- Understand why we network computers together.
- Understand what is meant by a LAN.
- Understand what is meant by a WAN.

Notes: These are the core learning that the students should develop during the lesson. This will link to the activities that provide ability to assess the Objectives.

Engagement

What will make the students want to learn?

- Relating the use of networks to their everyday lives. Showing them how important networks are and what they take for granted being able to do through the use of networks.

Notes: A short activity that stimulates the students. Ideas taken from big picture activity could be used.

Assessment for Learning

Expected progress

- A student can name things that can be shared over a network.
- A student can recall the acronyms for LAN and WAN.

Expected progress: This is likely to be activities and Learning tasks that meet your expectations for the class progress towards the objectives.

Good progress

- A student can describe the benefits of connecting devices over a network.
- A student can describe the characteristics of both LANs and WANs.

Good progress: This would show a development from basic understanding and be indicative that some students use stretch and challenge material during the lesson.

Exceptional progress

- A student understands the risk vs reward of connecting computers in a network.
- A student understands the implications of using existing telecommunications infrastructure in a WAN.

Exceptional progress: This would indicate the level of progress if all extension activities have been completed and at 8/9 levels of understanding.

The sticking points

What do I want students to remember?

- To be able to identify the key benefits and risks of connecting computers in a network.
- To be able to describe the structure of the four types of network that are covered.

Notes: A list of concepts that you want the students to remember by the end of the lesson.

Notes

Keywords

What exam/specification specific words should the students be confident with and need to know?

- Network
- LAN
- WAN

Notes: Multiple Choice Questions will assess these keywords; use the MCQs supplied.

You may wish to customise these as needed.

Differentiation

How will I enable access to each area of learning?

- Provide visual diagrams of the structure of each network to allow students to visual the structure of a network as well as reading a description.
- Provide differentiated worksheets of a low and medium level, suitable for the needs of each student.

Notes: Use of stretch task ideas supplied may support high end differentiation.

You will need to modify the resources to meet the needs of your students specifically. You may wish to refer to Departmental or School policies on differentiation methods used within your centre.

Activity 1

What tasks will I ask the students to complete to develop their understanding during the lesson?

- Ask students to identify five daily activities that they use a network for. Discuss with students how they would carry out these activities if they could not make use of a network. Are there any activities they would not be able to do? Would they need to change how they do any of the activities considerably without the use of a network?

Notes: Use the Activities given to develop the students' knowledge of the topic. Each activity may need further differentiation/adaptation for your needs.

Reference the Common misconceptions/FAQ guide to support your delivery of the topic.

Activity 2

What tasks will I ask the students to complete to develop their understanding during the lesson?

- Worksheet Activity 1: Give students the worksheet to complete and ask them to fill in the ideas for what can be shared over a network and what some of the downsides of building a network could be.
- The low level worksheet provides students with more structure and potential areas on which to focus.

Notes: Use the Activities given to develop the students' knowledge of the topic. Each activity may need further differentiation/adaptation for your needs.

Reference the Common misconceptions/FAQ guide to support your delivery of the topic.

Activity 3 / Extension

What tasks will I ask the students to complete to develop their understanding during the lesson?

- Worksheet Activity 2: Give students the worksheet to complete and ask them to fill in the characteristics and functions of a LAN and a WAN from their research.
- The low level worksheet provides students with more structure for their research in the form of questions for them to research. The medium level worksheet provides students with less structure for their research in the form of key points to research.

Notes: Use the Activities given to develop the students' knowledge of the topic. Each activity may need further differentiation/adaptation for your needs.

Reference the Common misconceptions/FAQ guide to support your delivery of the topic.

Summary/Plenary**How will I check that students have retained the knowledge?**

- Write down three things learnt from today's lesson and one you don't understand.
- Compare these with another student in the group.
- Identify any differences of opinion within the class/group.
- Place a sticky note on the board as you leave the room describing any areas you still don't understand.

Notes: Use the MCQs to check basic understanding of Keywords and Topics.

Use the LOR to develop deeper knowledge and allow Peer Assessment and Review. This can be developed to use the LOR ideas as homework etc.

Homework/Flipped learning

Lesson 2 – LAN network hardware and factors that affect the performance of a network

The big picture

Why is this relevant for the students?

- Video to set the scene on the hardware devices – router/switch and how they work: <https://www.youtube.com/watch?v=EWTJKcg7Pj8> in simple terms.
- In order to create a LAN network, we need certain hardware. There are certain pressures that can be placed on a network that can affect its performance.
- Ask students:
 - what hardware is needed to create a LAN
 - to consider how the computer will be connected together and what might be required to do this.
 - what we mean by the performance of a network and why this might be important.

Notes: Use Context Setting task to engage students and create discussion. Maybe link to flipped resources if you use flipped learning.

Assessment for Learning

Expected progress

- Students can describe the role of each of the components needed to create a LAN.
- Students can identify the factors that affect the performance of a network.

Expected progress: This is likely to be activities and Learning tasks that meet your expectations for the class progress towards the objectives.

Good progress

- Students can explain why these factors affect the performance.

Good progress: This would show a development from basic understanding and be indicative that some students use stretch and challenge material during the lesson.

Exceptional progress

- Students can explain how these factors can be improved or possibly overcome.

Exceptional progress: This would indicate the level of progress if all extension activities have been completed and at 8/9 levels of understanding.

Objectives

What should the students be confident/able to do at the end of the session?

- Identify the components required to create a LAN.
- Describe the role of each component in a LAN.
- Understand what is meant by the performance of a network and why this is important.
- Explain the factors that can affect the performance of a network.

Notes: These are the core learning that the students should develop during the lesson. This will link to the activities that provide ability to assess the Objectives.

The sticking points

What do I want students to remember?

- The role of each piece of hardware in a LAN
- How the hardware interacts in the transmission of data packets
- understand what is meant by the performance of a network
- What factors can affect the performance of a network

Notes: A list of concepts that you want the student to remember by the end of the lesson.

Notes

Engagement

What will make the students want to learn?

- Complete a classroom activity of asking one student to be a sending computer and one student to be a receiving computer. The sending computer will use a pile of mini-whiteboards to write a message across at least 10 mini whiteboards – labelling each with a sequence number. (These are like packets.) All other students will be routers around the world that accept the packet and route it towards the destination. Packets can take different routes around the network and the receiving computer pieces these back together again.
 - Depending upon the group of students you could intercept a packet and make it get 'lost' from the network. This can create discussion of what happens if a full message is not received by the receiving device.
- Ask students if they have ever been frustrated by their computer or mobile device working very slowly. Explain to them what might be causing that to happen and what might be affecting the performance of the network they are trying to use.

Notes: A short activity that stimulates the students. Ideas taken from big picture activity could be used.

Keywords

What exam/specification specific words should the students be confident with and need to know?

- LAN
- Packet
- Wireless access point (WAP)
- Router
- Switch
- Network interface card (NIC)
- Transmission media
- Network performance

Notes: Multiple Choice Questions will assess these keywords; use the MCQs supplied. You may wish to customise these as needed.

GCSE Computer Science

The Academy of St Nicholas

Differentiation

How will I enable access to each area of learning?

- Provide differentiated worksheets of a low and medium level, suitable for the needs of each student.
- Provide a structure/template for the leaflet for those students who may struggle to design and complete the task.

Notes: Use of stretch task ideas supplied may support high end differentiation.

You will need to modify the resources to meet the needs of your students specifically. You may wish to refer to Departmental or School policies on differentiation methods used within your centre.

Activity 1

What tasks will I ask the students to complete to develop their understanding during the lesson?

- Explain to students the concept of a packet of data: that data is separated into packets to be transmitted across a network; that there needs to be hardware in place that helps with the transmission of these packets and the direction in which they are transmitted. Ask students to consider why we need to package data in this way and what might happen to the data packets if there wasn't any hardware to help guide the transmission of each packet.
- Refer back to the engagement activity just completed.

Notes: Use the Activities given to develop the students' knowledge of the topic. Each activity may need further differentiation/adaptation for your needs.

Reference the Common misconceptions/FAQ guide to support your delivery of the topic.

Activity 2

What tasks will I ask the students to complete to develop their understanding during the lesson?

- Worksheet activity 2.
- Ask students to complete the worksheet, drawing lines between the correct hardware term and definition.

Notes: Use the Activities given to develop the students' knowledge of the topic. Each activity may need further differentiation/adaptation for your needs.

Reference the Common misconceptions/FAQ guide to support your delivery of the topic.

Activity 3 / Extension

What tasks will I ask the students to complete to develop their understanding during the lesson?

- Ask students to create a leaflet for a business to explain how they can get the best out of their network. Their leaflet should explain the factors that can affect the performance of a network and how these can possibly be overcome.

Notes: Use the Activities given to develop the students' knowledge of the topic. Each activity may need further differentiation/adaptation for your needs.

Reference the Common misconceptions/FAQ guide to support your delivery of the topic.

Summary/Plenary**How will I check that students have retained the knowledge?****Keyword bingo**

- Write six words from the given list that are about the topic.
- The teacher will read the words out in a random order and if you have them in your list cross them out.
- First player to get all their list crossed out wins.

Notes: Use the MCQs to check basic understanding of Keywords and Topics.

Use the LOR to develop deeper knowledge and allow Peer Assessment and Review. This can be developed to use the LOR ideas as homework etc.

Homework/Flipped Learning

Lesson 3 – Client-server and peer-peer networks

The big picture

Why is this relevant for the students?

- If you save your work on a laptop, then want to work on it at school – how do you get to the file?
- Should you save all of your work in one central location, or save your work on the device where you are working on it?

Notes: Use Context Setting task to engage students and create discussion. Maybe link to flipped resources if you use flipped learning.

Objectives

What should the students be confident/able to do at the end of the session?

- Understand what is meant by a client-server network.
- Understand what is meant by a peer-to-peer network.

Notes: These are the core learning that the students should develop during the lesson. This will link to the activities that provide ability to assess the Objectives.

Engagement

What will make the students want to learn?

- Ask students to consider the roles of different people in a restaurant – the servers take the orders and bring out what they have been asked for. The chefs/cooks/bartenders do all the processing behind the scenes. The customers (clients) make the requests and receive what they have ordered.
- Ask students to consider what might happen if everyone in the restaurant could fulfil every role. Would it be chaos? Would there be advantages?

Notes: A short activity that stimulates the students. Ideas taken from big picture activity could be used.

Assessment for Learning

Expected progress

- Students can state the purpose of a client, server and peer.

Expected progress: This is likely to be activities and Learning tasks that meet your expectations for the class progress towards the objectives.

Good progress

- Students can describe benefits of both models.

Good progress: This would show a development from basic understanding and be indicative that some students use stretch and challenge material during the lesson.

Exceptional progress

- Students can apply their understanding to a new context and make recommendations about which model is best, providing justification.

Exceptional progress: This would indicate the level of progress if all extension activities have been completed and at 8/9 levels of understanding.

The sticking points

What do I want students to remember?

Be able to describe:

- the role of a client in a client-server model
- the role of a server in a client-server model
- the role of a peer in a peer-peer model.

Notes: A list of concepts that you want the students to remember by the end of the lesson.

Keywords

What exam/specification specific words should the students be confident with and need to know?

- Client
- Server
- Peer

Notes: Multiple Choice Questions will assess these keywords; use the MCQs supplied. You may wish to customise these as needed.

Notes

Differentiation

How will I enable access to each area of learning?

- Differentiated groups for the peer teach that will offer peer support.
- Guided question on worksheet will provide a structure for students to follow if needed.

Notes: Use of stretch task ideas supplied may support high end differentiation.

You will need to modify the resources to meet the needs of your students specifically. You may wish to refer to Departmental or School policies on differentiation methods used within your centre.

Activity 1

What tasks will I ask the students to complete to develop their understanding during the lesson?

- Students are to try and define the key words based on their existing knowledge and discussion from the engagement activity. Display the answers for discussion and note taking.

Notes: Use the Activities given to develop the students' knowledge of the topic. Each activity may need further differentiation/adaptation for your needs.

Reference the Common misconceptions/FAQ guide to support your delivery of the topic.

Activity 2

What tasks will I ask the students to complete to develop their understanding during the lesson?

- Ask the students to identify which model the school uses. They should try to identify which devices are clients (workstations/PCs/laptops) and which devices are servers (file server/email server/print server).
- As an extension, ask students to justify why the school has chosen this model.

Notes: Use the Activities given to develop the students' knowledge of the topic. Each activity may need further differentiation/adaptation for your needs.

Reference the Common misconceptions/FAQ guide to support your delivery of the topic.

Activity 3 / Extension

What tasks will I ask the students to complete to develop their understanding during the lesson?

- Worksheet Activity 2. Give students the worksheet to complete and ask them to place the correct statements in the correct network structure. They have a choice of client-server and peer-to-peer. Some statements may be suitable for both structures.
- The low level worksheet has some hints for the statements to help students identify them correctly. The medium level worksheet has no hints.

Notes: Use the Activities given to develop the students' knowledge of the topic. Each activity may need further differentiation/adaptation for your needs.

Reference the Common misconceptions/FAQ guide to support your delivery of the topic.

Summary/Plenary

How will I check that students have retained the knowledge?

- Write three things you have learnt from today's lesson and one you don't understand on a sticky note and post it on the board as you leave the class.
- Add your name if you want specific help with a task.

Notes: Use the MCQs to check basic understanding of Keywords and Topics.

Use the LOR to develop deeper knowledge and allow Peer Assessment and Review. This can be developed to use the LOR ideas as homework etc.

Homework/Flipped Learning

Lesson 4 – The Internet

The big picture

Why is this relevant for the students?

- We use the internet on a daily basis, but do we realise what is involved in this? What is working away in the background for us to do this?
- Video (13 minutes) Warriors of the Net – shows a journey of a data packet and how the Internet works : https://www.youtube.com/watch?v=PBWhzz_Gn10

Notes: Use Context Setting task to engage students and create discussion. Maybe link to flipped resources if you use flipped learning.

Objectives

What should the students be confident/able to do at the end of the session?

- Understand
 - the internet is a worldwide collection of computers
 - the role of DNS as part of the internet
 - what is meant by hosting
 - what is meant by the cloud
 - how web servers and clients work together.

Notes: These are the core learning that the students should develop during the lesson. This will link to the activities that provide ability to assess the Objectives.

Engagement

What will make the students want to learn?

- What happens when you type a web address into a web browser?
- How do the packets know where to go, and what happens when they get there?

Notes: A short activity that stimulates the students. Ideas taken from big picture activity could be used.

Assessment for Learning

Expected progress

- Students can define the terms DNS, hosting, and the cloud.

Expected progress: This is likely to be activities and Learning tasks that meet your expectations for the class progress towards the objectives.

Good progress

- Students can explain the role and purpose of each of the terms.

Good progress: This would show a development from basic understanding and be indicative that some students use stretch and challenge material during the lesson.

Exceptional progress

- Students understand how the nature of hosting and cloud services relates to the client-server model.

Exceptional progress: This would indicate the level of progress if all extension activities have been completed and at 8/9 levels of understanding.

The sticking points

What do I want students to remember?

- Be able to describe the role of DNS.
- Be able to describe what internet hosting is.
- Be able to describe how data is stored in the cloud.

Notes: A list of concepts that you want the student to remember by the end of the lesson.

Keywords

What exam/specification specific words should the students be confident with and need to know?

- Internet
- DNS
- Hosting
- The cloud
- Web servers and clients

Notes: Multiple Choice Questions will assess these keywords; use the MCQs supplied. You may wish to customise these as needed.

Notes

Differentiation

How will I enable access to each area of learning?

- Differentiated groups for the peer teach that will offer peer support
- Guided question on worksheet will provide a structure for students to follow if needed

Notes: Use of stretch task ideas supplied may support high end differentiation.

You will need to modify the resources to meet the needs of your students specifically. You may wish to refer to Departmental or School policies on differentiation methods used within your centre.

Activity 1

What tasks will I ask the students to complete to develop their understanding during the lesson?

- Students put the steps in order so that a student can access the OCR Games website.

Notes: Use the Activities given to develop the students' knowledge of the topic. Each activity may need further differentiation/adaptation for your needs.

Reference the Common misconceptions/FAQ guide to support your delivery of the topic.

Activity 2

What tasks will I ask the students to complete to develop their understanding during the lesson?

- Worksheet Activity 2 – Peer teaching:

Separate students into groups of three. Assign them either DNS, hosting or the cloud as their topic.

In their groups, students need to research their topic, using the guiding questions on their work sheet. They need to put together a 5 minute peer teach that they will present to the rest of the class. Each student in the group should be involved in presenting the peer teach in some way.

Presentations could be carried out next lesson to allow time for further planning.

Notes: Use the Activities given to develop the students' knowledge of the topic. Each activity may need further differentiation/adaptation for your needs.

Reference the Common misconceptions/FAQ guide to support your delivery of the topic.

Activity 3 / Extension

What tasks will I ask the students to complete to develop their understanding during the lesson?**Summary/Plenary****How will I check that students have retained the knowledge?**

Worksheet L4 plenary description cards

- Provide students with four definitions written down on four small sheets of paper, one definition for each of the terms DNS, hosting, the cloud and the Internet.
- Have four boxes at the front of the class. Ask the students to put their name on each paper and post it in the box with the correct term as they leave the classroom. The boxes can be reviewed to identify any learners that have misunderstood the term.

Notes: Use the MCQs to check basic understanding of Keywords and Topics.

Use the LOR to develop deeper knowledge and allow Peer Assessment and Review. This can be developed to use the LOR ideas as homework etc.

Homework/Flipped learning

Lesson 5 - Topologies

The big picture

Why is this relevant for the students?

Most computers and devices are connected together via networks. This opens up new opportunities and advantages. What are the advantages? Students make a list and discuss

Notes: Use Context Setting task to engage students and create discussion. Maybe link to flipped resources if you use flipped learning.

Objectives

What should the students be confident/able to do at the end of the session?

Students will be able to:

- identify a Star and Mesh topology
- understand the difference between a partial and a full mesh
- discuss the advantages of using different topologies.

Notes: These are the core learning that the students should develop during the lesson. This will link to the activities that provide ability to assess the Objectives.

Engagement

What will make the students want to learn?

- Networks are all around you, in school, at home in businesses and hospitals.
- If you wanted to connect three computers together in a network, how would you do it?
- Draw a diagram to represent your solution - Include the parts, devices and wires.
- Be ready to explain your diagram.

Notes: A short activity that stimulates the students. Ideas taken from big picture activity could be used.

Assessment for Learning

Expected progress

- Can identify a network topology from a given drawing
- Can create a drawing of a given topology that is reasonable accurate (e.g. star, all devices connect to a central device).

Expected progress: This is likely to be activities and Learning tasks that meet your expectations for the class progress towards the objectives.

Good progress

- Can draw an accurate representation for all 3 topologies (including both a full and partial mesh).
- Can provide some advantages for each topology.

Good progress: This would show a development from basic understanding and be indicative that some students use stretch and challenge material during the lesson.

Exceptional progress

- Can recommend a suitable topology for a given scenario, with detailed justification.

Exceptional progress: This would indicate the level of progress if all extension activities have been completed and at 8/9 levels of understanding.

The sticking points

What do I want students to remember?

- The diagram of a Mesh and Star Network.
- The difference between a full mesh and a partial mesh.
- Advantages and disadvantages of both.

Notes: A list of concepts that you want the student to remember by the end of the lesson.

Keywords

What exam/specification specific words should the students be confident with and need to know?

- Topology
- Mesh Network
- Star Network
- Partial Mesh
- Full Mesh

Multiple Choice Questions will assess these keywords; use the MCQs supplied.

You may wish to customise these as needed.

Notes

Differentiation

How will I enable access to each area of learning?

- Student discussion
- Feedback from students
- Outcome of the Activities

Notes: Use of stretch task ideas supplied may support high end differentiation.

You will need to modify the resources to meet the needs of your students specifically. You may wish to refer to Departmental or School policies on differentiation methods used within your centre.

Activity 1

What tasks will I ask the students to complete to develop their understanding during the lesson?

- Ask students to draw the topology for their usual IT suite.
- They should include any printers, switches or other networked devices in the room.
- Praise accurate representations, but focus on the identification of network devices and recognising how they are connected.

Notes: Use the Activities given to develop the students' knowledge of the topic. Each activity may need further differentiation/adaptation for your needs.

Reference the Common misconceptions/FAQ guide to support your delivery of the topic.

Activity 2

What tasks will I ask the students to complete to develop their understanding during the lesson?

- Use string and cups or string and students to create the Star and Mesh networks.
- Teacher ask students to justify the layout.
- Teacher breaks a wire (remove a string) - students discuss what impact this has on the Network
- Simulate adding another computer or device (add another student) - what impact does it have on the Network?

Notes: Use the Activities given to develop the students' knowledge of the topic. Each activity may need further differentiation/adaptation for your needs.

Reference the Common misconceptions/FAQ guide to support your delivery of the topic.

Activity 3 / Extension

What tasks will I ask the students to complete to develop their understanding during the lesson?

- Slide 21 and 22: students complete the encryption games to experience and learn more about the process and how it works.

Notes: Use the Activities given to develop the students' knowledge of the topic. Each activity may need further differentiation/adaptation for your needs.

Reference the Common misconceptions/FAQ guide to support your delivery of the topic.

Summary/Plenary**How will I check that students have retained the knowledge?**

- Write down two truths and one lie about things you have learnt about in computer science.
- Teacher nominates students to give one of their three facts, the class identify if it is a truth or a lie.
- Continue until questions are exhausted or everyone has had a go.

Notes: Use the MCQs to check basic understanding of Keywords and Topics.

Use the LOR to develop deeper knowledge and allow Peer Assessment and Review. This can be developed to use the LOR ideas as homework etc.

Homework/Flipped Learning



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OCR Resources: *the small print*

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