

Accredited

# AS and A LEVEL

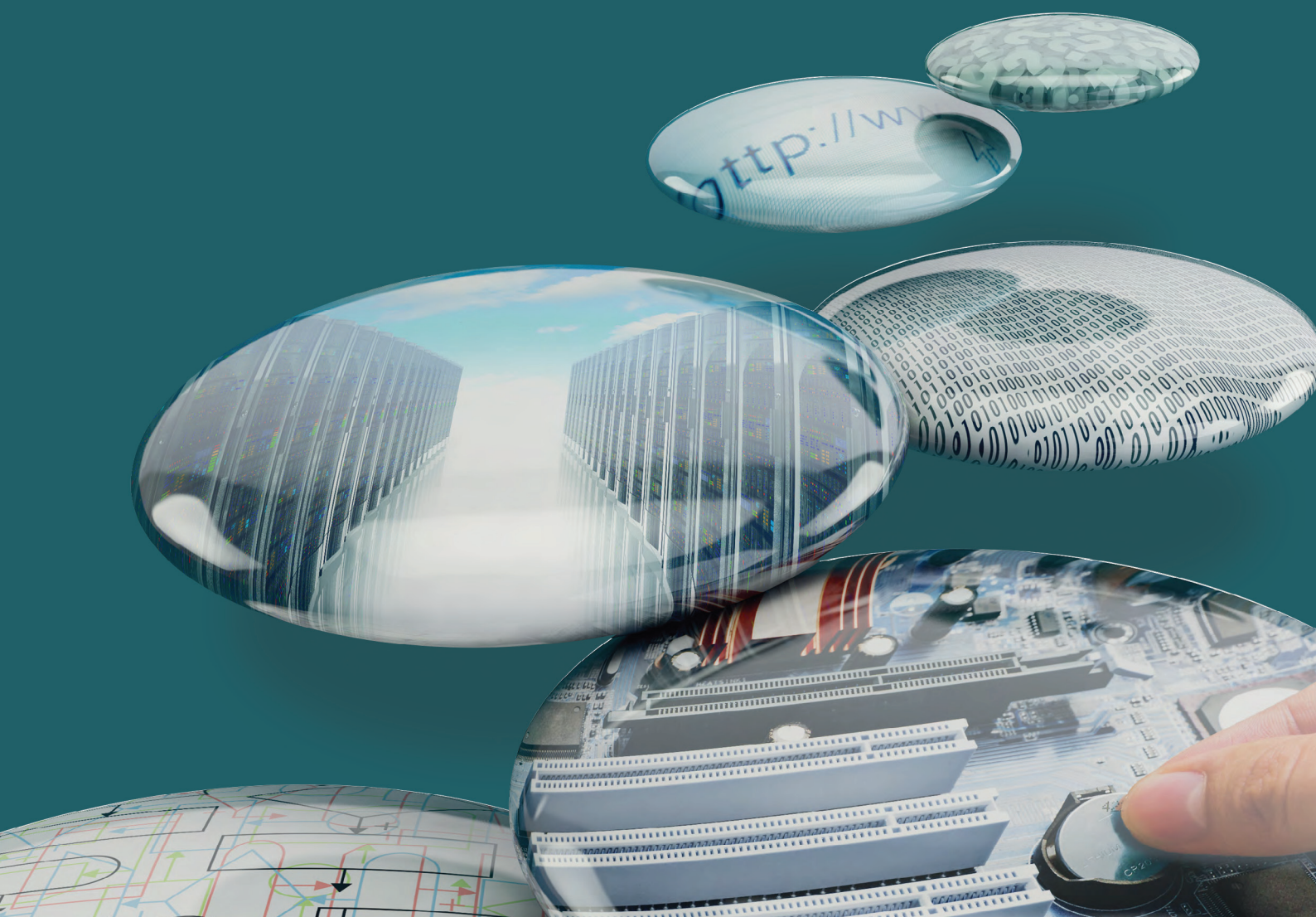
*Topic Exploration Pack*

H046/H446

# COMPUTER SCIENCE

Theme: Networks

September 2015



**CAMBRIDGE**  
UNIVERSITY PRESS  
[www.cambridge.org](http://www.cambridge.org)

**OCR**  
Oxford Cambridge and RSA

We will inform centres about any changes to the specification. We will also publish changes on our website. The latest version of our specification will always be the one on our website ([www.ocr.org.uk](http://www.ocr.org.uk)) and this may differ from printed versions.

Copyright © 2015 OCR. All rights reserved.

#### Copyright

OCR retains the copyright on all its publications, including the specifications. However, registered centres for OCR are permitted to copy material from this specification booklet for their own internal use.

Oxford Cambridge and RSA Examinations is a Company Limited by Guarantee. Registered in England. Registered company number 3484466.

Registered office: 1 Hills Road  
Cambridge  
CB1 2EU

OCR is an exempt charity.

# Contents

Contents .....	3
Networks.....	4



*This activity offers an  
opportunity for English  
skills development.*

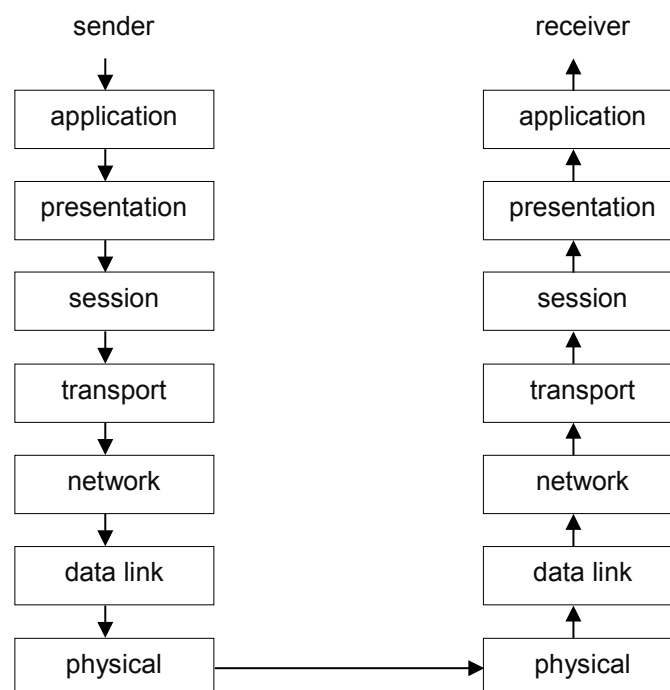


# Networks

## Introduction

Networks are collections of connected devices such as traditional desktop and laptop computers, mobile devices, and shared peripherals such as printers and storage devices. Networks operate on a global scale and it is vital those devices connected to the network are all able to communicate with each other. For this reason agreed protocols, or rules, operate. One important protocol is the transfer control protocol Internet protocol or TCP/IP. This is layered protocol establishing the rules for how each layer will communicate with the next.

When a message is sent across the network, it will pass through the layers from the application level to the physical level where the data is transferred to the receiver and processed through the same layers in reverse order.



Each device on a network is given an IP address assigned permanently by the administrator or more likely temporarily by the Dynamic Host Configuration Protocol server (DHCP). Since there are so many devices world wide this enables systems to allocate private local addresses on a private subnet.

When communicating beyond the private subnet, we need to locate remote resources by name rather than IP and the Domain Name System (DNS) does this by resolving the name to an IP address. Networks can be described by their range and Local Area Networks (LAN) correspond to the private subnets with local IP addresses connected to a larger system via some type of telecommunication device to other networks on a Wide Area Network (WAN). Data travelling across a network is generally sent as packets of data. Data is broken up into individual packets and given all the information needed to reach the destination and be reassembled into the original data. Data can then travel via any route among other data packets to make best use of the available connections and ensuring routes are not tied up dealing with individual data streams.

Data is being presented to networks constantly and it is the role of router firewalls to determine if the data is intended for and acceptable to a network. There is an excellent animation called 'warriors of the net' that explains this process effectively and in some detail. The website is <http://www.warriorsofthe.net>.

## Suggested activities

Using a suitable web-based trace route site, for example <http://traceroute.monitis.com>, it is possible to see a visual trace of the route taken to a specific site. By looking at various times and from various locations, it is possible to see the trace take various routes to the destination. The information provided can be used to locate the routers used in reaching the destination. By locating using the same website or similar website such as [http://www.ip-adress.com/ip\\_tracer/](http://www.ip-adress.com/ip_tracer/), it is possible to locate each of the routers accurately geographically and plot the route on a map.

Students should be aware of the hardware and software required to set up a network and will benefit from being able to set up a small network using any available devices and hardware. Failing this they could be allowed to add devices to an existing network under supervision.

There is a simple simulator for a network to show utilisation under different circumstances on [teach-ict.com](http://www.teach-ict.com/gcse_new/networks/hardware/resources/NWB_SIM.swf); [http://www.teach-ict.com/gcse\\_new/networks/hardware/resources/NWB\\_SIM.swf](http://www.teach-ict.com/gcse_new/networks/hardware/resources/NWB_SIM.swf)

There are other simulators available, for example from GNS3 <http://www.gns3.net/>



## Support material

Worksheet: Tracing the route taken to a destination.

Use <http://tracerroute.monitis.com> to trace the route from your computer to a website for a well-known domain.

The map will show the outline route.

Use the detailed IP addresses for the routers passed through on the journey and the website [http://www.ip-adress.com/ip\\_tracer/](http://www.ip-adress.com/ip_tracer/) to identify the exact location of the routers used and plot these on a map

Repeat the process at another time or from another location to see if the route changes.

Equipment list for building a network activity.

## Equipment required

Switch, selection of network cables, selection of devices, including a computer to act as a server, access point and mobile devices.

Worksheet for building a network activity.

Design and build a simple network installing (if necessary) software on a server to manage the network (DHCP). Connect the devices allocating some IP addresses and allowing the DHCP server to allocate others.

Plan the design to include all the devices available and use a program such as WireShark (<http://wireshark.com>) to monitor the traffic on the network.



We'd like to know your view on the resources we produce. By clicking on the 'Like' or 'Dislike' button you can help us to ensure that our resources work for you. When the email template pops up please add additional comments if you wish and then just click 'Send'. Thank you.

If you do not currently offer this OCR qualification but would like to do so, please complete the Expression of Interest Form which can be found here: [www.ocr.org.uk/expression-of-interest](http://www.ocr.org.uk/expression-of-interest)

### OCR Resources: the small print

OCR's resources are provided to support the teaching of OCR specifications, but in no way constitute an endorsed teaching method that is required by the Board, and the decision to use them lies with the individual teacher. Whilst every effort is made to ensure the accuracy of the content, OCR cannot be held responsible for any errors or omissions within these resources.

© OCR 2015 - This resource may be freely copied and distributed, as long as the OCR logo and this message remain intact and OCR is acknowledged as the originator of this work. OCR acknowledges the use of the following content: Thumbs up and down icons: alexwhite/Shutterstock.com

Please get in touch if you want to discuss the accessibility of resources we offer to support delivery of our qualifications: [resources.feedback@ocr.org.uk](mailto:resources.feedback@ocr.org.uk)





## OCR customer contact centre

General qualifications

Telephone 01223 553998

Facsimile 01223 552627

Email [general.qualifications@ocr.org.uk](mailto:general.qualifications@ocr.org.uk)



A DIVISION OF  
CAMBRIDGE ASSESSMENT

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored.

©OCR 2015 Oxford Cambridge and RSA Examinations is a Company Limited by Guarantee. Registered in England.  
Registered office 1 Hills Road, Cambridge CB1 2EU. Registered company number 3484466. OCR is an exempt charity.