Pearson Edexcel GCE

Applied Information and Communication Technology

Unit 9: Communication and Networks

8–26 May 2017
Assessment window: 3 weeks
Period: 10 hours

Paper Reference
6959/01

You must have:
Cover sheet, short treasury tag

Instructions

- Complete your candidate details on the cover sheet provided.
- All printouts must contain your name, candidate number, centre number and activity number.
- At the end of the examination:
  – *all printouts should be placed in the correct order*
  – *use a treasury tag to attach your printouts **(as shown)** to page 2 of the cover sheet.*

Information

- There are **five** activities in this examination totalling 88 marks. **Two** further marks are allocated to Standard Ways of Working.
- The marks for **each** question, within an activity, are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*

Advice

- Read through the Scenario carefully.
- Work through the activities in order.
- Attempt **ALL** activities.
- Label your printouts clearly as instructed.
- Printing must be undertaken within the examination period.

Turn over ▶

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Scenario

The Varma Loko ICT Skills Project

The government of the tropical island of Varma Loko is trying to improve the island's economic growth. At present there are thriving tourist and agricultural sectors. The high-tech sector is underdeveloped.

The government commissioned research to identify ways of developing a high-tech sector without having to rely on foreign investment. It has concluded that improving ICT education is an essential first step in the process.

The government has launched 'The Varma Loko ICT Skills Project' to look for cost-effective ways of improving ICT education throughout Varma Loko. The project manager, Viro De Ordoni, has decided to conduct a number of trials before making any major commitment.

One of these trials will look at education in primary schools in the interior of Varma Loko. Away from the coast much of Varma Loko is mountainous. There are several large towns with good communication links, but a lot of the population lives in rural villages with little infrastructure. Many of the villages have primary schools. There are no secondary schools in the villages.

Viro has chosen the village of Kampara Vilago for the trial. Kampara Vilago was selected for several reasons.

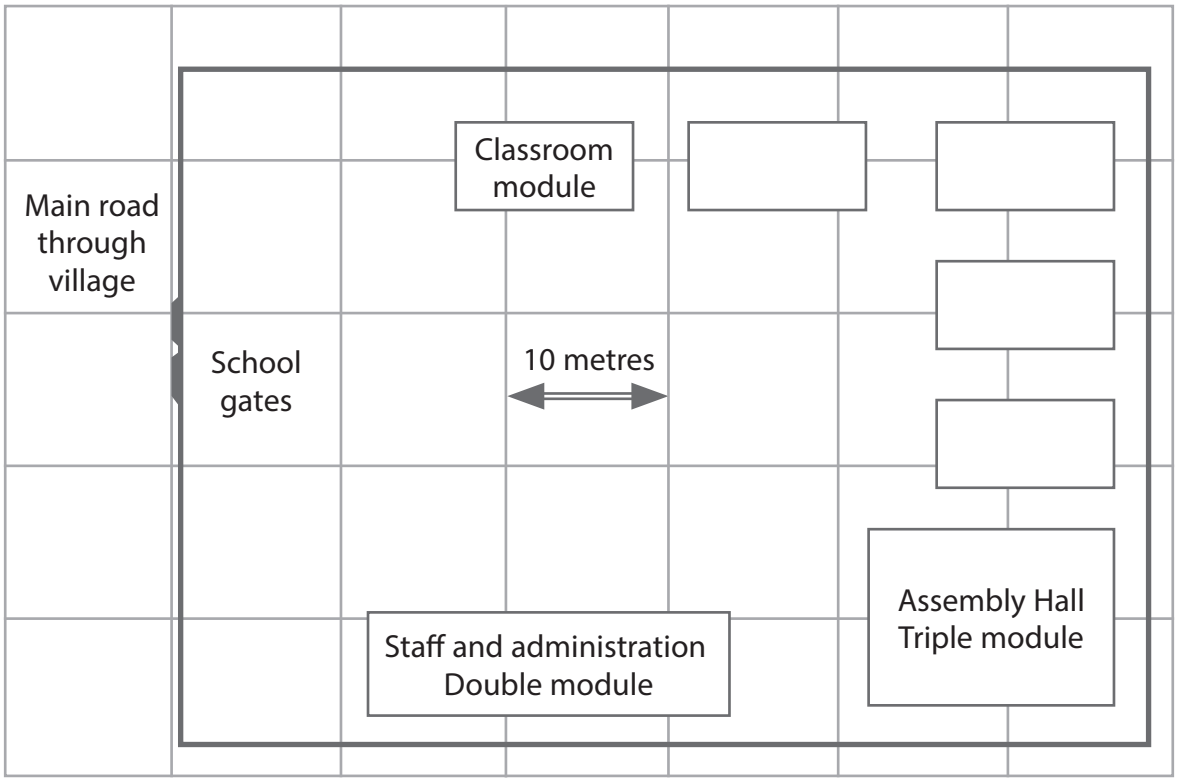
1 It has a primary school.
2 It has the average population size for rural villages in Varma Loko.
3 It has mains electricity.
4 It has shops, light industrial services and a telephone exchange. These serve several smaller villages.
5 It has a good road, which links the village to the town of Sekvanta some 20 km away.
6 It is only 35 km from the capital of Varma Loko, Precipaurbo, where Viro is based.

The Kampara Vilago trial will look at:

- the hardware needed to provide ICT facilities for primary level education
- the infrastructure needed to connect a rural primary school with the outside world
- software that is suitable for running the hardware
- software that is suitable for teaching ICT skills and supporting general education at primary level.

The Kampara Vilago Primary School is run by the Education Ministry. The school has six teachers, including the head teacher, plus a non-teaching school administrator. It can house up to 100 pupils, split into five year groups. The youngest group starts school when they reach the age of five. The oldest group are 9 to 10-year-olds. Class sizes vary from year to year but are generally in the range of 15 to 25 pupils for each of the five year groups.

The school is built from standard building modules. The layout is shown in the diagram.



All primary schools in Varma Loko are built in a similar fashion. The position and internal layout of each building may be altered to suit local conditions. More modules are added if a school's intake outgrows its accommodation. The largest village primary schools have up to 300 pupils.

The teachers and administrator use three PCs and a monochrome laser printer, supplied by the Education Ministry. The staff and administration module has internet access via ADSL. Viro wants to produce an 'everything-in-one-box' solution that could be deployed to any primary school. This will be trialled at Kampara Vilago. Existing ICT equipment will be retained but the 'everything-in-one-box' solution must include everything that is needed. You must not assume that additional equipment is already present.

Viro has hired you as an adviser for the Kampara Vilago trial. The overall project has a large budget but Viro has emphasised the 'cost-effective' part of the project brief.

Instructions to Candidates

All documents MUST have a header and a footer. The header must contain the activity number. The footer must contain your name, candidate number, and centre number.

A minimum font size of 10 should be used in all word processed documents, using a font type suitable for business purposes.

Diagrams should be large enough for the detail to be read.

Activity 1 – Types of network, components of a network (suggested time 2 hours and 10 minutes)

The teachers at Kampara Vilago Primary School are all competent computer users. However, they do not have any experience of teaching ICT skills. They are concerned about a lack of teaching resources and have asked the Education Ministry to produce some material suitable for their pupils.

Viro has delegated the task to you.

One request is for classroom posters that illustrate how various systems and pieces of equipment work.

The posters must:

- be A4 sized, but suitable for enlarging to A3
- have a good balance of text and images
- use language suitable for primary school pupils, although technical terms may be used for naming equipment.

The posters should be designed so that they are readable and understandable in greyscale.

(a) Produce a poster that explains the structure of:

- a personal area network (PAN)
- a local area network (LAN)
- a wide area network (WAN).

The poster should explain the different network types in the context of the scenario.

(10)

(b) Produce a poster that explains how a document is transmitted when it is sent from a PC in Kampara Vilago Primary School to a PC in the Education Ministry in Precipaurbo.

The poster should show the pieces of equipment and transmission media that the document passes through, with a simple explanation of each one.

(10)

Evidence to be submitted for (a) and (b)

On no more than **one** A4 page of computer output each:

- ❑ A poster explaining PAN, LAN and WAN networks.
- ❑ A poster explaining the route of a transmitted document.

(Total for Activity 1 = 20 marks)

***Activity 2 – Research, network design (suggested time 1 hour and 45 minutes)**

Viro intends to supply all the necessary ICT equipment as an 'everything-in-one-box' solution that can be deployed to any primary school.

Each box will contain:

- mobile computing devices for each of 25 pupils and two teachers
- charging equipment for the mobile devices
- a networkable colour printer
- a wireless router with integrated 5-port switch
- 100 metres of CAT 6 cable.

The mobile computing devices must:

- be easy to use, requiring the minimum of training for new users
- be able to join a WiFi network, with no additional devices required
- have sufficient battery life for a school day
- be able to run ICT software suitable for primary school pupils, including:
  - a word processor
  - a spreadsheet
  - a music package
  - a graphics package
  - an app development package
  - a programming / coding package.

In addition, the Education Ministry requires that the mobile computing devices have root / administrator access available so that the devices can be loaded with approved software and then locked to prevent further installations.

Viro has set two price points for you: £2500 and £4000.

Research the technology and produce a report for Viro.

The report must cover:

- printers
- wireless routers
- mobile computing devices that meet the requirements given by Viro and the Education Ministry
- any extra component(s) that you think will improve the 'everything-in-one-box' solution
- suggestions for the required software
- recommendations and budget for both price points.

Pay particular attention to the quality of your written communication.

Evidence to be submitted

On no more than **two** word processed A4 pages:

❑ A report for Viro.

Marks will be awarded for the quality of your written communication.

(Total for Activity 2 = 12 marks)

Activity 3 – Network management – system configuration (suggested time 2 hours and 10 minutes)

The 'everything-in-one-box' solution delivers one box for every 25 pupils. This means that Kampara Vilago Primary School will have four boxes. The school will therefore receive four wireless routers.

(a) Viro wants school staff to be able to set up their WiFi network to suit their own school layout. He asks you to produce a guidance sheet explaining the optimal placement of a wireless router.

The guidance sheet must contain a simple five-point plan that states what to do, or avoid doing, to get the best coverage and performance.

You must give a reason for each of your points.

(10)

(b) Each wireless router can act as a DHCP server. This can cause a problem if there are two or more wireless routers in a school's WiFi network. The largest primary school has 300 pupils.

Produce a guidance sheet for staff explaining how to set up DHCP so that **any** primary school's WiFi network will function correctly.

You must give a reason for each of your points.

(10)

Evidence to be submitted for (a) and (b)

On **one** word processed A4 page each:

- ❑ A guidance sheet for placement of a wireless router.
- ❑ A guidance sheet for setting up DHCP.

(Total for Activity 3 = 20 marks)

Activity 4 – Network design (suggested time 2 hours and 10 minutes)

The teachers and the administrator have the use of three PCs and a monochrome laser printer.

The staff and administration module has internet access via a router with a combined five-port switch.

The laser printer and PCs are networked by cable connections.

Viro has accepted your ideas for the 'everything-in-one-box' solution you identified in Activity 2 and has decided to go ahead with your recommendations for the £4000 price point.

Each box contains:

- mobile computing devices for each of 25 pupils and two teachers
- charging equipment for the mobile devices
- a networkable colour printer
- a wireless router with integrated five-port switch
- 100 metres of CAT 6 cable
- any extra items that you identified in Activity 2.

Kampara Vilago Primary School will be given four boxes.

The school has mains electricity. Each building module has wiring for lights and ceiling fans, plus a pair of power sockets. The power distribution box is situated in the corner of the staff and administration module nearest to the main gates. The present system uses a single ring main for all of the power sockets in all of the modules. This ring main is near to capacity and it would be unsafe to add any further electrical load to it.

Viro has agreed a small additional budget to allow local electricians to install any new wiring and link it to the power supply.

You now need to design an appropriate network solution.

(a) Use network design software to produce a network design for Kampara Vilago Primary School. You should include details of the network's power supply system in your diagram.

(14)

(b) Explain any major decisions that you have made with regard to the network, devices and equipment.

(6)

Evidence to be submitted for (a)

On **one** A4 page of computer output:

- ❑ Your network and power design.

Evidence to be submitted for (b)

On **one** word processed A4 page:

- ❑ Notes explaining each major decision made with regard to the network devices and equipment.

(Total for Activity 4 = 20 marks)

Activity 5 – Network management – policy documents (suggested time 1 hour and 45 minutes)

The Kampara Vilago Primary School set-up is complete and the trial period is about to start when Viro tells you about a problem.

Some of Varma Loko's politicians are concerned that primary school pupils may see inappropriate material when using the devices provided by the project. They have approached the Minister of Education with demands that something be done.

The politicians have suggested:

- white lists and black lists
- ISP filtering
- DNS filtering.

For political reasons, the Minister does not want to adopt any of their suggestions. However, he wants to explain why and to present a viable alternative. He has asked for a report that explains why the suggestions are unworkable and also provides a better solution.

Viro asks you to produce the report. He wants to avoid politics by keeping the report simple and factual.

The report should examine each suggestion and explain:

- how it might be implemented with the installed system
- any difficulties that it might cause
- how a pupil could circumvent it.

(a) Write a report for Viro about white lists and black lists, ISP filtering, and DNS filtering.

(12)

(b) Add a section to the report describing a viable alternative method that could be used to prevent pupils from seeing inappropriate material.

(4)

Evidence to be submitted for (a) and (b)

On **one** A4 page:

❑ A report on prevention methods.

(Total for Activity 5 = 16 marks)

Standard Ways of Working.

All printouts must contain the activity number, your name, candidate number, and centre number.

Pages must be securely fastened to the cover sheet and in the correct order.

A minimum font size of 10 should be used for all word processed documents.

(Standard Ways of Working = 2 marks)

TOTAL FOR PAPER = 90 MARKS

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