Assignment brief
Learning Outcomes and Assessment Criteria 2020-21

Sample number: 3

Unit Title: Information Technology Systems – CN1/3/AA/01G

Overview of assessment task

Create a presentation on Computer Communication and Network Topologies to be used in the training of a computer technician. Use the Notes pages to contain your scripted descriptions, comparisons and evaluations.

Task 1
Describe how analogue signals can be used to transmit binary data. Describe also how digital signals can be used to transmit binary data. Compare these two techniques.

Task 2
With the aid of a diagram, describe five network topologies. Compare these in terms of factors such as their costs and vulnerability to faults.

Task 3
Evaluate the application of three different types of communication system.

You should write clearly and concisely, aiming to cover the requirements of the assignment in between 600 and 1000 words.

Learning outcomes and assessment criteria

Learning Outcomes	Assessment Criteria
3. Understand the application and operation of communication systems	3.1. Compare analogue and digital communication systems 3.2. Compare 5 network topologies 3.3. Evaluate the application of three different types of communication systems

Grading Descriptors and Components 2020-21

Sample number: 3

Unit title: Information Technology Systems – CN1/3/AA/01G

GD 1: Understanding of the subject

Merit	Distinction
The student, student's work or performance: a. demonstrates a **very good** grasp of the relevant knowledge base	The student, student's work or performance: a. demonstrates an **excellent** grasp of the relevant knowledge base

GD 2: Application of knowledge

Merit	Distinction
The student, student's work or performance: a. makes use of relevant • concepts with **either** b. breadth or depth that goes beyond the minimum required to Pass	The student, student's work or performance: a. makes use of relevant • concepts with **both** b. breadth and depth

GD 7: Quality

Merit	Distinction
The student, student's work or performance: a. is structured in a way that is **generally** logical and fluent	The student, student's work or performance: a. is structured in a way that is **consistently** logical and fluent

COMPUTER COMMUNICATION AND NETWORK TOPOLOGIES

FOR COMPUTER TECHNICIANS

TRANSMITTING BINARY DATA WITH AN ANALOGUE SIGNAL

TRANSMITTING BINARY DATA WITH A DIGITAL SIGNAL

DIGITAL AND ANALOGUE BINARY DATA TRANSMISSION COMPARISON

BUS NETWORK TOPOLOGY

RING NETWORK TOPOLOGY

MESH NETWORK TOPOLOGY

PARTIAL MESH NETWORK TOPOLOGY

STAR NETWORK TOPOLOGY

TREE NETWORK TOPOLOGY

5G MOBILE PHONE COMMUNICATION SYSTEM

INFRARED TV REMOTE COMMUNICATION SYSTEM

DAB RADIO COMMUNICATION SYSTEM

A PRESENTATION ON:

COMPUTER COMMUNICATION AND NETWORK TOPOLOGIES *(SCRIPT)*

Provider Name:

Access Diploma Title: Access to HE Diploma (Computing)

Unit Title and Code: Information Technology Systems CN1/3/AA/01G

Assignment Title and number: Ass. 2 – Computer Communication and Network Topologies

Assessor Name:

Assignment briefing and mapping to unit:
Create a presentation on Computer Communication and Network Topologies to be used in the training of a computer technician. Use the Notes pages to contain your scripted descriptions, comparisons and evaluations.

Task 1 (AC 3.1)
Describe how analogue signals can be used to transmit binary data. Describe also how digital signals can be used to transmit binary data. Compare these two techniques.

Task 2 (AC 3.2)
With the aid of a diagram, describe five network topologies. Compare these in terms of factors such as their costs and vulnerability to faults.

Task 3 (AC 3.3)
Evaluate the application of three different types of communication system.

You should write clearly and concisely, aiming to cover the requirements of the assignment in between 600 and 1000 words.

LO 3 Understand the application and operation of communication systems
AC 3.1. Compare analogue and digital communication systems
AC 3.2. Compare 5 network topologies
AC 3.3. Evaluate the application of 3 different types of communication systems

SLIDE 1

"Computer Communication and Network Topologies"

This presentation demonstrates computer communication and network topologies for use in computing and by a computer technician.

SLIDE 2

"Transmitting Binary Data with an Analogue Signal"

You can express binary data in an analogue signal by changing the frequency, amplitude, or phase of its waveform. The frequency of a wave is defined by how many full waves occur in a second. 10 waves would be 10 Hz. The shorter the wave, the more they'll occur and the higher the frequency/Hz. The height of a wave is described as its amplitude. Phase is used to describe the difference between parts of a wave or waves of the same frequency and wavelength. If a wave was upside down to another otherwise identical wave, it would be out of phase by 180^{o}. When binary data is transmitted through phase-shift, each wave of the standard signal could be decoded as logical 1 and every wave out of phase could be decoded as logical 0.

SLIDE 3

"Transmitting Binary Data with a Digital Signal"

A digital signal can transmit binary data through alternating values. Commonly two values are used. When sending a digital signal along copper wire these values could be -5v and +5V. Manchester Encoding represents data through the increase or decrease in voltage. An increase would represent a logical 1 and a decrease would represent a logical 0. There are many advantages to this method. Every bit of data combines to a neutral voltage which avoids voltage drift from the wire retaining charge, and since every bit is guaranteed to have a voltage change this can be used as a pseudo clock for the sender and receiver to keep in time, avoiding time drift which prevents a bit being read twice or not at all.

SLIDE 4

"Digital and Analogue Binary Data Transmission Comparison"

Benefits are brought by both digital or analogue binary transmissions. While multiple streams of data and a higher bandwidth can be achieved with an analogue transmission known as frequency division multiplexing (FDM), it is susceptible to interference and may be unreadable when sent over long distances. Digital transmissions are susceptible to the same interference, however, have a much greater tolerance as only a difference in the state needs to be recognisable as opposed to the whole waveform. As digital transmission saturates the whole line, turns are taken for different data to be sent, called time division multiplexing (TDM). This can be overcome by using multiple lines and with digital-only mediums like fibreoptic becoming cheaper, this can be more efficient over long distances and even overall.

SLIDE 5

"Bus Network Topology"

The Bus network topology is one of the most cost-effective networks due to its small footprint of cable. It's easy to install as each device is connected in what becomes a daisy chain. The only additional equipment needed is a terminator at each unconnected end of the cable to avoid signals bouncing back and the corruption of data being sent. Corruption of data will also occur if two devices transmit at the same time. This topology is also vulnerable to critical failures if any cable is damaged or if any of the systems aren't active.

SLIDE 6

"Ring Network Topology"

The Ring network topology is relatively low cost as each device is connected in one ring of wire. A repeater would have to be at and powered separately from each device to ensure functionality when a device was turned off. While this topology allows each device the opportunity to transmit their data before repeating what it's received (as data is repeated around the ring in one direction), it is vulnerable to failures as a transmission couldn't surpass a broken connection.

SLIDE 7

"Mesh Network Topology"

A Mesh network topology, the most expensive topology, is the most forgiving of system faults, however, every device is required to be connected to every other device. Even if communication can't be achieved directly between devices, the transmission could be relayed through another. A device would have to be completely disconnected from the network to be unreachable. This topology is secure as communication can be direct, this also allows data to be sent as and when without waiting for another device to finish.

SLIDE 8

"Partial Mesh Network Topology"

Much like a Mesh network topology, a Partial Mesh topology allows for faults through multiple routes of connection. This provides a lower fault tolerance than a Mesh network, however, is more cost-effective due to less cable, and still provides a higher redundancy than other topologies.

SLIDE 9

"Star Network Topology"

The Star network topology incurs additional cost due to the need for a central device that manages the network. This central device (sometimes called a router) introduces a single point of failure,

however, any errors between the central device and another will only affect that device. Because each device can communicate directly with the central device, turns can be allocated which allows all data an opportunity to be transmitted.

SLIDE 10

"Tree Network Topology"

The Tree network topology is a combination of many others and is as strong or weak as the sum of its parts. The internet as we know it is a Tree Topology, as it consists of many different connected networks. While the disadvantages of this network would depend on which elements where present, the advantage would be the cost as different instances of networks can be installed depending on the criticality of the data to be transmitted.

SLIDE 11

"5G Mobile Phone Communication System"

5G networks use a much larger range of, and higher, microwave frequencies than mobile networks that came before. The addition of full-duplex communication now being possible, which means that data can be transmitted and received at the same time, at the same frequency allows incredibly fast rates of data transfer. A latency as fast as 1ms can be achieved which will be integral to the future of connected devices such as self-driving cars.

SLIDE 12

"Infrared TV Remote Communication System"

Many TV remotes use infrared light waves to transmit binary data to the TV. Each button press is translated into a sequence of light bursts that the TV receives through a sensor and translates into a command. It's an incredibly cheap and effective line of sight simplex (meaning one way) transmission as the remote receives no feedback, however, the user acknowledges if the transmission of data has been successful and will retry if not.

SLIDE 13

"DAB Radio Communication System"

DAB radio also uses simplex communication by only receiving data through digitally encoded radio waves. The low frequency of these waves passes through most structures allowing them to be received within a large radius of the transmission. This combined with low manufacturing cost due to no transmitter circuitry being required makes it an ideal system for users to have in their home, as well as their car or on their person.