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Week 7 Workshop

COS10025 – Technology in an Indigenous context project

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Acknowledgement of Country

We respectfully acknowledge the Wurundjeri People of the Kulin Nation, who are the Traditional Owners of the land on which Swinburne’s Australian campuses are located in Melbourne’s east and outer-east, and pay our respect to their Elders past, present and emerging.

We are honoured to recognise our connection to Wurundjeri Country, history, culture, and spirituality through these locations, and strive to ensure that we operate in a manner that respects and honours the Elders and Ancestors of these lands.

We also respectfully acknowledge Swinburne’s Aboriginal and Torres Strait Islander staff, students, alumni, partners and visitors.

We also acknowledge and respect the Traditional Owners of lands across Australia, their Elders, Ancestors, cultures, and heritage, and recognise the continuing sovereignties of all Aboriginal and Torres Strait Islander Nations.

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Workshop 7

The aim of today's workshop is to focus on your team design ideas and start finding hardware and software required for each design idea

Basic computer network

Network types

Basic network architecture

Activity 1: Based on a design idea, find appropriate hardware components



What is a Computer network?

A computer network comprises two or more computers that are connected—either by cables or wireless—with the purpose of transmitting, exchanging, or sharing data and resources.

You build a computer network using hardware (e.g., routers, switches, access points, and cables) and software (e.g., operating systems or business applications).

Geographic location often defines a computer network. For example, a LAN (local area network) connects computers in a defined physical space, like an office building, whereas a WAN (wide area network) can connect computers across continents.

The internet is the largest example of a WAN, connecting billions of computers worldwide.



Network types

Here are the most common and widely used computer network types:

LAN (local area network): A LAN connects computers over a relatively short distance, allowing them to share data, files, and resources. For example, a LAN may connect all the computers in an office building, school, or hospital. Typically, LANs are privately owned and managed.

WLAN (wireless local area network): A WLAN is just like a LAN but connections between devices on the network are made wirelessly.

WAN (wide area network): As the name implies, a WAN connects computers over a wide area, such as from region to region or even continent to continent. The internet is the largest WAN, connecting billions of computers worldwide. You will typically see collective or distributed ownership models for WAN management.

MAN (metropolitan area network): MANs are typically larger than LANs but smaller than WANs. Cities and government entities typically own and manage MANs.

PAN (personal area network): A PAN serves one person. For example, if you have an iPhone and a Mac, it's very likely you've set up a PAN that shares and syncs content—text messages, emails, photos, and more—across both devices.

How do they work?

Computer networks connect nodes like computers, routers, and switches using cables, fiber optics, or wireless signals. These connections allow devices in a network to communicate and share information and resources.

Networks follow protocols, which define how communications are sent and received. These protocols allow devices to communicate. Protocols specify the format of messages and also how devices should respond to messages. Each device on the Internet uses an Internet Protocol (IP) address, a string of numbers that uniquely identifies a device and allows other devices to recognize and find it.

Routers are virtual or physical devices that facilitate communications between different networks. Routers analyze information to determine the best way for data to reach its ultimate destination. Switches connect devices and manage node-to-node communication inside a network, ensuring that bundles of information traveling across the network reach their ultimate destination.



Example of Computer networks

The wired or wireless connection of two or more computers for the purpose of sharing data and resources form a computer network. Today, nearly every digital device belongs to a computer network.

In an office setting, you and your colleagues may share access to a printer or to a group messaging system. The computing network that allows this is likely a LAN or local area network that permits your department to share resources.

A city government might manage a city-wide network of surveillance cameras that monitor traffic flow and incidents. This network would be part of a MAN or metropolitan area network that allows city emergency personnel to respond to traffic accidents, advise drivers of alternate travel routes, and even send traffic tickets to drivers who run red lights.



Basic Network Architecture

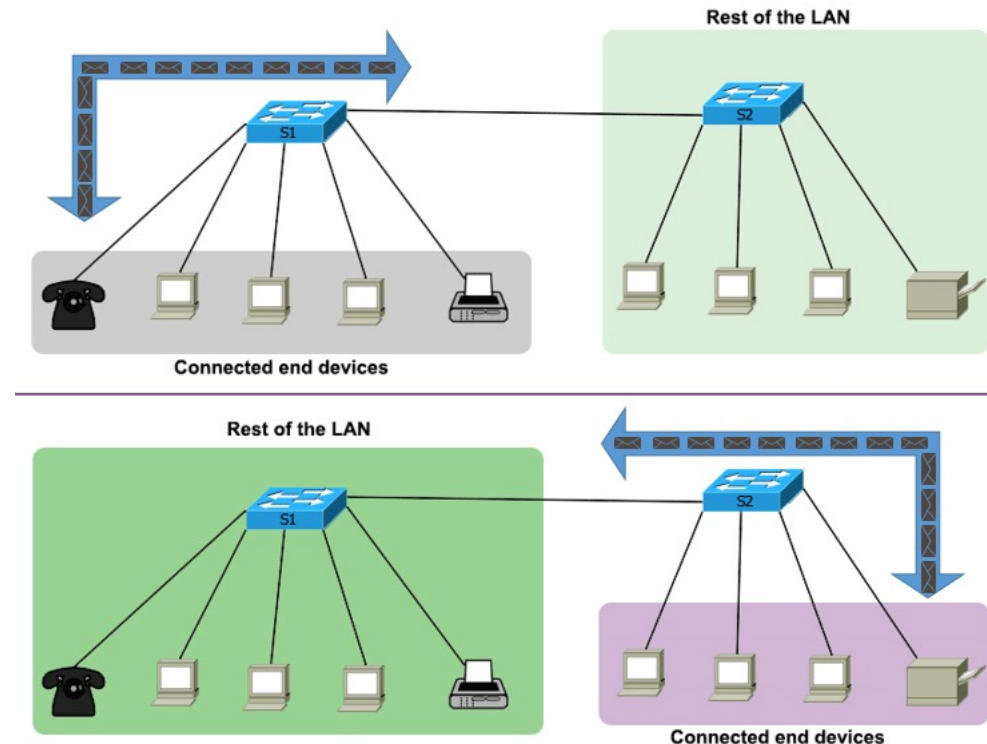
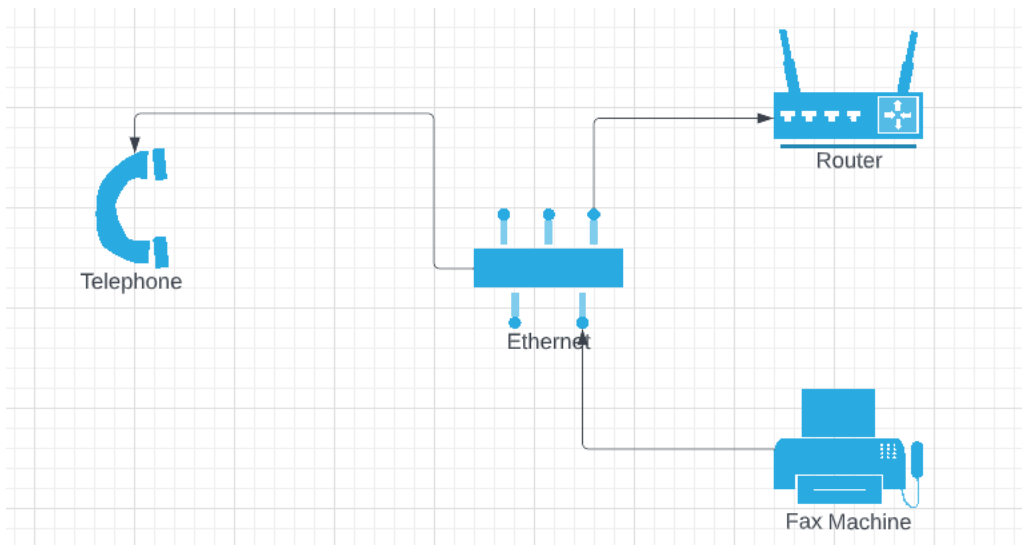
The three-layer hierarchical model contains three layers: **core**, **distribution**, and **access**.

- Level 1 – Access (The access layer enables end user devices such as computers, smart phones and sensors to connect to the network)
- Level 2 – Distribution (The distribution layer connects the access layer to the core layer)
- Level 3 – Core (The core layer is the backbone of the network. Sometimes called the backhaul in cellular networks or the uplink in satellite networks)

Access layer

The access layer is the first layer of the three-layer hierarchical model. This layer allows end users to access the network. This layer also connects user-devices such as PCs, IP phones, wireless access points, printers, and scanners to the network.

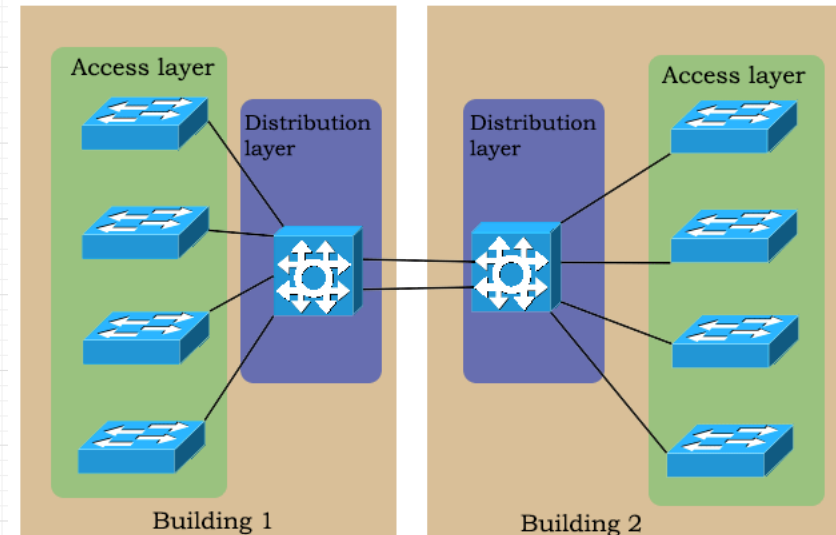
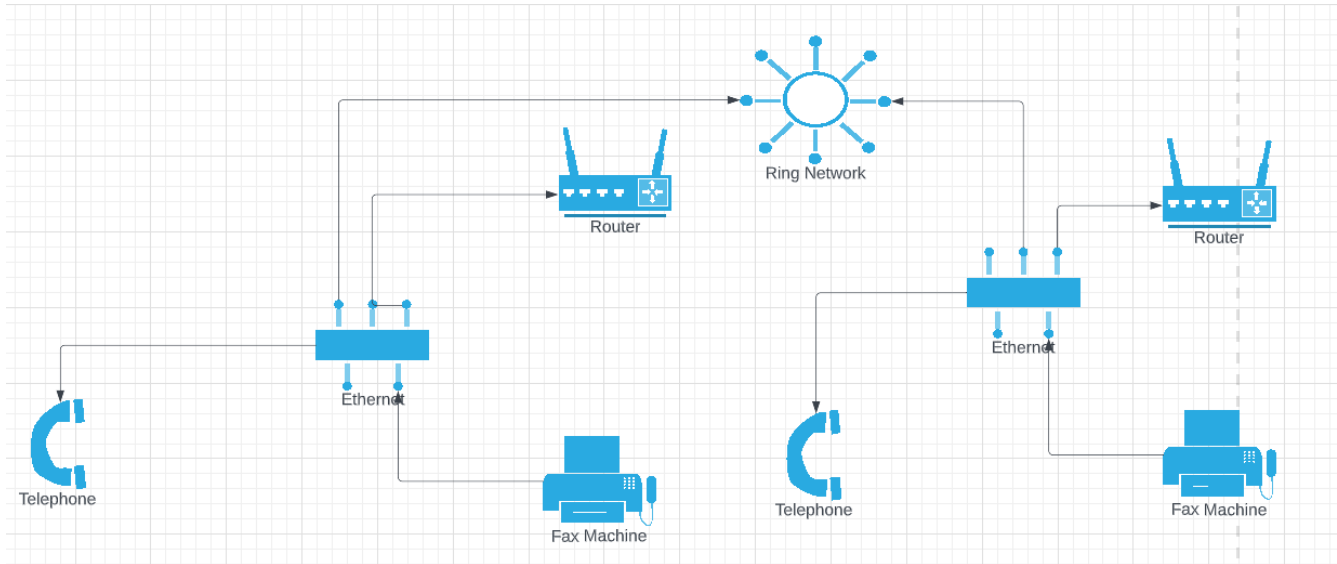
The main functions of this layer is connecting various types of end devices to the LAN network.



Distribution layer

The distribution layer is the second layer of the three-layer hierarchical model. Switches connected in this layer are known as the *distribution* switches. Unlike access switches, distribution switches do not provide any service to end devices. Distribution switches connect the access switches.

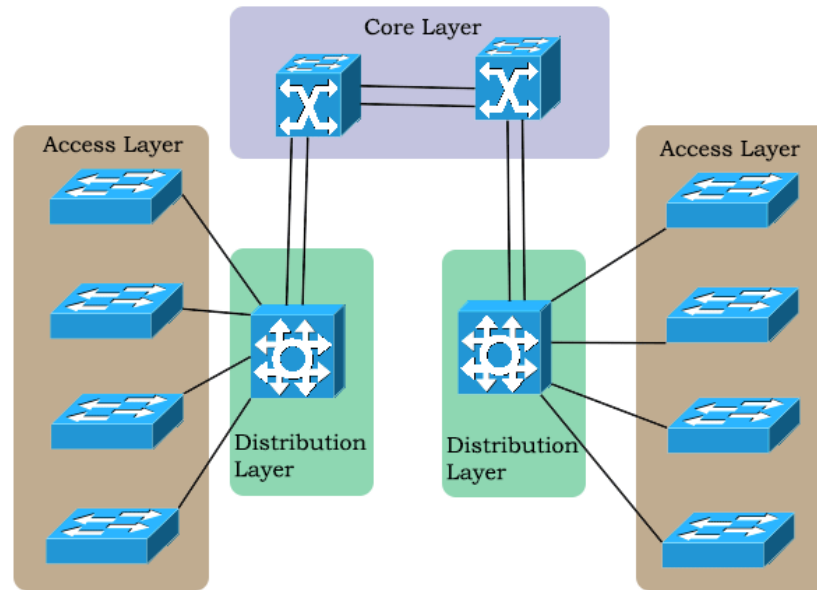
The main functions of the distribution layer switches is to provide connectivity between the access layer switches



Core layer

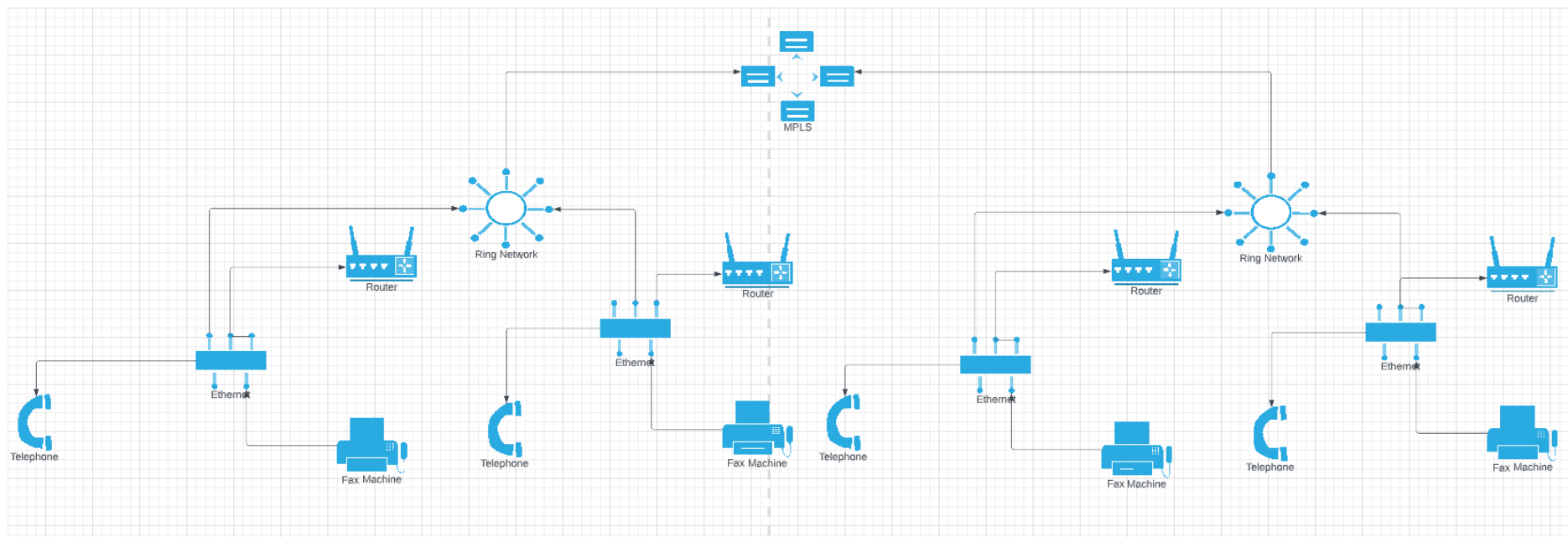
This is the third layer of the three-layer hierarchical model. Switches that work in this layer are known as the *core switches*. Core switches connect distribution switches.

In a complex and large network, core switches reduce cabling needs and switch ports while still allowing all devices to send data to all other devices in the LAN.



Core layer

In the below figure, MPLS Multiprotocol label switching is a networking technology that acts as a core layer that directly connect distribution switches



Mix and Match Options

- There will often be many options for the access, distribution and core
 - Specialised networks may be used for some applications
 - Eg for sensor networks LoRa or ZigBee may be used
 - Some networks may be used because there are no other options
 - Satellite uplinks although expensive, with substantial delay and limited bandwidth have great coverage
 - Often the distribution and core will be part of the same network
 - Where a WiFi network is used for access and a cellular network is used to connect to the Internet the cellular network is both the core and distribution
 - There may not be a distribution network
 - Where a satellite link is used to connect a WiFi network to other networks
- In your project you are to come up with a number of designs which you will evaluate



Assessment #2: Innovation Concept

- Second phase of the project
 - Team-based assessment
 - Due date: 3rd Oct 2022, 23:59 pm
 - Marks allocated: 25% of your final mark
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- Recommended word-count range: 1200 words for each team member (4800 for 4 team members or 6000 words for 5 team members or 7200 words for 6 team members)
 - Aim of this task:
 - Expects the team to explain your team design idea/concept based on your defined learning issues/problems
 - Each team should explain 3-4 design ideas for 4 to 5 team members or 4-5 design ideas for 5 to 6 team members



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Assessment #2 – Part A

Assignment 2 – Innovation concept (team-based)

The Part A of Assignment 1

- Project Overview

A detailed description of the project topic, project goals and objectives. The team should explain the steps to achieve those goals and their expected outcomes.

- Project requirements

It refers to the actions, processes and conditions/criteria to achieve the outcome of the project



Assessment #2 – Part B

You will briefly write about the following

Design idea/concept - Explain your team's design concepts/ideas based on identified learning issues/problems.

Each **team** should explain 3-4 design ideas for 4 to 5 team members or 4-5 design ideas for 5 to 6 team members

Design idea/concept

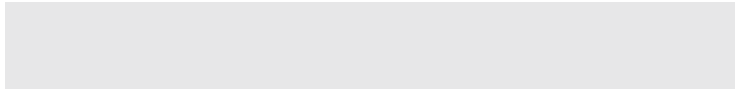
- A brief introduction to the learning issue/problem identified
- A description of the design idea/concept
 - Design outline (design idea) - A layout of the design idea with a detailed explanation of the concept
 - Design Specifications - List of hardware and software requirements - Explain in detail each hardware/software required
 - Design benefits - How does the design idea benefit the township in accordance with the telecommunication guidelines such as access & equity, health & safety, appropriateness, affordability, environmental health, and sustainable livelihoods
 - Design Constraints - What are some of the potential challenges identified during the implementation & maintenance phase of the design idea/concept

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Activity 1

Based on a design idea, find appropriate hardware components

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1st Activity

Aim : Based on a design idea, find appropriate hardware components

Instructions :

1. What is preferred network (wired/wireless) depends on LAN, WAN....?
2. List out connecting devices/components for a design idea based on number of user, signal range, strength, connectivity of devices, distribution of users, available infrastructure, purpose of the network.
3. Check the network architecture (3 different levels)
4. Align each device/component to each level of the network .



Teamwork: 1 hour

Next week

- Analyse project budget for each design idea (design concept)
- Finalise Assessment 2 Innovation concept before the submission due week 8