Assignment 1 – FIT9137 S1 2020

Submission instructions

Deadline: End of week 8
Submission format: PDF only. You can use any freely available PDF converter.
Submission platform: Upload a single PDF (combine Part A and Part B reports into one PDF) via Turnitin assignment on Moodle.
Late submissions:

- via special consideration request
- or, without special consideration request, you lose 10% of your mark per day that you submit late. Submissions will not be accepted more than 3 days late.

Plagiarism:
This is an **individual assignment. Group work is not allowed.**
It is an academic requirement that your submitted work be original.
Zero marks will be awarded **for the whole submission** if there is any evidence of copying, collaboration, pasting from websites, or copying from textbooks.

Further Note: When you are asked to use Internet resources to answer a question, this does not mean copying and pasting text from websites. Write answers in your own words such that your understanding of the answer is evident.

Marks:

- The overall assignment is worth **20% of your unit marks**.
- Part A is marked out of **50 nominal marks** and worth **12.5% of your unit marks.**
- Part B is marked out of **35 nominal marks** and worth **7.5% of your unit marks.**

Part A. Technical Report

Assume that you work for the company below, and write **a technical report** for a customer of the company, evaluating different technologies to meet the customer's networking requirements.

The rest of this specification is organised into two parts:

1) the scenario, which explains the situation of the (fictitious) company you work for, and
2) the instructions how you should approach this task.

1. Scenario

Your role / company overview: You are a consultant working for ***HiWiFi Solutions***, a start-up company with around 15 employees in Melbourne. Your company offers design and implementation of "**Smart Home and Office Automation**" solutions mostly to property developers who are building new houses and want to equip the houses with the latest technology for security, convenience and entertainment.

Your customer is **Melbourne Builder Inc. (MBI),** a local property development company who builds houses including people with limited mobility, hearing, vision and spatial awareness. Due to current COVID-19 situation, MBI is also aiming to provide solutions to professionals who are working and/or studying from home. **MBI** has requested an initial proposal for a smart home setup from your company. Your task is to prepare a report for your CIO covering the networking aspects of this project.

Business requirements:

1. Your technical report should include several options to meet a variety of needs and lifestyles (e.g. a basic option, a mid-tier option and a luxury option).
2. MBI wants to know on the advantages and vulnerabilities of the different "smart home" products. You can decide what kind of devices you want to suggest.
3. Many smart home devices require a local WiFi network as well. You should include a section in the report that suggests a potential WiFi setup.

Your task:

In order to write the technical report, you will need to do some research into smart home devices. You can be very creative here. Some example aspects of home automation are: smart lighting solutions, smart door locks, automatic window blinds, internet-enabled security systems, voice-enabled devices, smart appliances (fridges, washing machines, vacuum cleaner), smart solar panels

and batteries etc. You do not have to cover all these areas, just pick some that fit well together and that you find interesting.

Research and analysis expected in the technical report:

- MBI expects you to give them enough arguments to convince their customers, in particular with respect to **costs** and **benefits** of the proposed new technologies.
- Go into some technical detail to explain differences between technologies. It will be useful to create tables and figures for some of the comparisons. You can answer questions such as
  - What devices are involved in each option and what are their functions?
  - How can the devices be controlled? E.g. are there physical controllers (switches, dimmers, displays) and/or a smartphone app?
  - How can the different devices work together? E.g. a scenario might include motion sensors for a security system, but they could also be connected to the smart heating and lights.
  - What kind of (wired and wireless) network technology should be installed in the new buildings in order to support the smart home system?
- A conceptual high level diagram showing how the proposed technologies could be integrated within the home automation network.

2. Instructions

Writing reports is an essential aspect of any IT career. You will be expected to deliver reports that are accurate and factual, that provide evidence for your findings, and that look professional.

Before you start

Before starting to write, think about your **audience**, i.e., who is reading the report? Don't write for your tutors. Write to address your customer's need! Carefully read the **marking rubric** on Moodle to find out what we expect you to write for the different grades.

Sources and referencing

Any claims or recommendations that you make should be **substantiated** with supporting references. That means that you cannot just claim that *A* is better than *B,* you have to **argue why** that is the case and **point to external sources** that can serve as evidence.

You can use the unit's recommended textbooks and other standard literature as sources, but you will also need to use additional documentation to find all the technical information and commercial details for this report. Here are a few pointers to get you started. You do not need to read all of these, they are just suggestions for your own literature research:

- Overview of home automation on Wikipedia: https://en.wikipedia.org/wiki/Home_automation
- Techradar: Best smart home devices 2020: get comfy with smart lighting, heating and more: https://www.techradar.com/au/news/smart-home-devices
- PcMag: https://au.pcmag.com/smart-home/44138/the-best-smart-home-devices-for-2019
- Telstra Smart Home: https://www.telstra.com.au/smart-home
- zigbee alliance https://www.zigbee.org
- Benefits and risks of Smart Home technology https://www.sciencedirect.com/science/article/pii/S030142151630711X

Whenever you use material from an external source, make sure that you **reference** that source. You also need to assess the **quality and reliability** of the source – e.g., a company might say that their product is better than the competition's, but you cannot easily trust them. An independent expert review of different technologies is much more trustworthy.
You should use the APA referencing style, which is explained in detail here:

https://guides.lib.monash.edu/citing-referencing/apa

Marks are deducted for poor referencing.

Presentation

Part A (Technical Report) should look professional, which means you need to pay attention to **spelling, punctuation, grammar**. It is important that your report has a **clear structure**. There is a strict limit of **five pages plus one title page**, with a font size of at least 10pt. The page limit includes all images, tables, references etc. Any text beyond the page limit will not be marked. You can find a sample report structure on Moodle.

Tips

You can find great tips on how to write a report on Monash's web pages. Here is a link to get started:
Language and Learning Online web site:
https://www.monash.edu/rlo

Part B. WLAN Design and Security

For this task, you will perform a **WLAN site survey**. Your task is to produce a map of (part of) a building (e.g. your home) that gives an overview of the wireless networks that are available, as well as an analysis of the network.

What you will need: a WiFi-enabled laptop (some smartphones also work, see below), and a place to scan. You can perform a survey of your home. If you don't own a suitable device that you could use for this activity, please contact us to figure out an alternative.

This activity has two sub-tasks:

B.1 Survey

Create a map of the place (e.g. your home) you want to survey. A simple floorplan will be sufficient, it doesn't have to be perfectly to scale. See the appendix for an example. Your survey should cover an area of **at least 40 square meters** (e.g. 5x8 meters, or 4x10, or two storeys of 4x5 each). Be creative – the survey can include hallways or outside areas. Be sure to take the analysis in part b) into account, by designing your survey to include walls, door etc. it will be easier to write something interesting in part b).

Furthermore, your survey must include **at least two WiFi access points (APs).** These can be your own, but can also include neighbours' APs. If you want, you can create an additional AP with a phone (using "Personal hotspot" or "Tethering" features).

For the survey, use a WLAN sniffing tool (see below) at **minimum five different locations** on your map. For each location, record the technical characteristics of all visible APs. Depending on the scanning tool you use, you can record features such as the *network name*, *MAC address, signal strength, signal to noise ratio (SNR), 802.11 version(s) supported*, *band* (2.4 or 5 GHz) and *channel(s) used.*

Add the data gathered from the survey into the map of the covered area. On the map you should indicate the location of the access points and the locations where you took measurements.
For the access points, use the actual location if you know it, or an approximation based on the observed signal strength (e.g. if it's your neighbour's access point and you don't know exactly where it is).
For each measurement point, you can either add the characteristics directly into the map, or create a separate table with the details. You can submit several maps if you choose to enter data directly into the maps, or a single map if you use additional tables. Create the map yourself, do **not** use the mapping features available in some commercial (i.e., paid) WLAN sniffing tools.

(15 marks)

B.2 Report

Write a report (**word limit 600**) on your observations analysing the data collected in the previous step. Your analysis should investigate the following aspects:

- Channel occupancy: Are different access points competing on the same channels? Are they configured to use overlapping channels? Could the configuration be improved?
  (5 marks)
- Interference from walls, doors etc.: How do different materials affect signal strength and/or noise? Can you notice a difference in attenuation for different APs? (5 marks)
- Coverage: Do the access points sufficiently cover the desired area? Could the placement or configuration be improved? (5 marks)
- Any other aspect of your own choice. Here are a few suggestions:
  - measure the attenuation caused by your own body
  - measure the download and upload speeds in different locations
  - determine the overlap that has been implemented to enable roaming
  - describe how you interpolated the locations of access points from the signal strengths

  Describe your findings and explain them with some technical detail (i.e., not only say *what* you found, but also *how* you performed the analysis or *why* you think the network is behaving that way).
  (5 marks)

Tools

You can use e.g. Acrylic Wifi (https://www.acrylicwifi.com/en/) for Windows, NetSpot (http://www.netspotapp.com) for Mac OS and Windows, and LinSSID or wavemon for Linux. If you have an Android smartphone, apps like Wifi Analyzer can also be used. On iOS, WiFi scanning apps do not provide enough detail, so iPhones won't be suitable for this task.

For drawing the site maps, any drawing tool should work, for example LucidChart, or even presentation tools such as PowerPoint, Keynote or Google Slides. Scans of hand-drawn maps are acceptable if they are neat and easily readable.

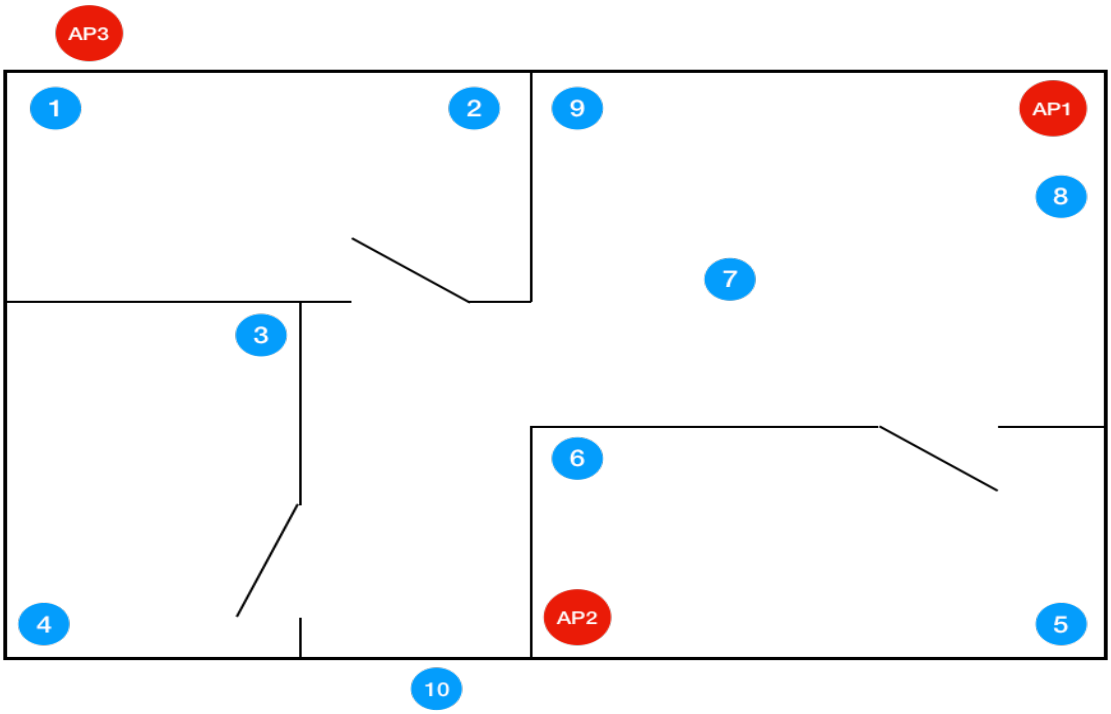
Presentation

Part B (WLAN design and security) doesn't have any page limit. Your report should look professional.

Appendix:

Example Floorplan/Map for Part B

This is just to give you an idea of the level of detail required in the floorplan / map. In addition to the map, your survey would have to include tables that contain details and measurements for the indicated locations.



Dimensions: 5m (width), 8m (length)
Red circles: locations of access points
Blue circles: locations of measurements