Department of Electronic & Telecommunications Engineering

University of Moratuwa

EN3250 Internet of Things / EN2560 Internet of Things Design and Competition

Individual Assignment

2020 Batch **Semester 5**

Overview:

- The time allocated for this assignment is 1 ½ hours
- This is an open-book, individual assignment conducted in-class
- The answers should be submitted to Moodle as a single PDF named <IndexNo>.pdf

Prerequisites:

- Wireshark installed and running on your computer
- Wireshark PCAP file assigned to you (nokia.pcap) to be downloaded from Moodle.

Evaluation:

- Submitted written assignment
- Viva if necessary

Important Guidelines:

- Please provide justification for all your answer using appropriate references and screen captures.
- Answers to each sub-section should be within a limit of 150 words.
- Use bulleted lists, diagrams to support your answer wherever possible.

Problem 1 [60 marks]

The given PCAP file (nokia.pcap) shows WiFi management frames where a Nokia mobile device (STA) attempts to connect with an access point (AP).

Please provide justification for every answer using references to relevant packet numbers, packet traces, or screen captures from Wireshark or by any other means. Answers to all sections should be within a limit of 150 words. Use bulleted lists, diagrams to support your answer wherever possible.

(a) Provide a brief overview of the activities captured in the nokia.pcap file. *[10 marks]*

(b) How does the STA initiate the connection process and at what point in the file ? *[10 marks]*

(c) What are the Service Set Identifier (SSID) and the Basic Service Set Identifier (BSSID) of the AP ? What is the need for two IDs? *[10 marks]*

(d) What other alternative mechanism is available in WiFi to initiate the process ? What advantage(s) does it have compared to the method seen in the capture? *[10 marks]*

(e) Suggest two ways of finding the *Beacon Interval* from the information in the nokia.pcap file. *[10 marks]*

(f) Find the data rates supported by the AP and the channel used. *[10 marks]*

Problem 2 [30 marks]

A smart skipping rope can measure skip time, total skip number, calories burned, and tangles and make this information available to the outside world as a set of CoAP resources. These resources, as well as the battery level of the skipping rope can be monitored on a mobile device acting as a CoAP client. The information is updated on the mobile device every 1 second.

(a) Described how the different resources on the skipping rope would be uniquely identified, giving examples. *[10 marks]*

(b) Illustrate the application layer information flow between the skipping rope and the mobile device using a sequence diagram. *[10 marks]*

(c) Discuss the advantages and disadvantages of using CoAP as compared to the Message Queue Telemetry Transfer (MQTT) protocol for this purpose. *[10 marks]*

Problem 3 [60 marks]

The integration of IoT technology in industrial settings has brought about significant advancements in efficiency and automation. Consider a **manufacturing facility** that utilizes Industrial IoT (IIoT) for various processes.

(a) Identify five parameters that can be monitored/controlled via an IIoT system in a typical manufacturing environment. *[10 marks]*

(b) Describe the potential return on investment (RoI) of monitoring/controlling 2 of the parameters that you identified in (a) above. *[10 marks]*

(c) Discuss the challenges of implementing IIoT in industrial settings, providing specific examples for each. *[10 marks]*

(d) If the IIoT data analysis and decision-making is to be carried out centrally at a cloud resource, identify suitable devices/networks/protocols/communication technologies to be used and sketch a suitable network architecture. *[10 marks]*

(e) Imagine you are a consultant for a manufacturing company looking to implement IIoT in their operations. What factors should the company consider when selecting IIoT solutions ? Provide a brief plan outlining the steps they should take to ensure a successful IIoT implementation. *[20 marks]*