ENGR 301 *Project Management*

Lecture 16 — Data Recorder MQTT Communication

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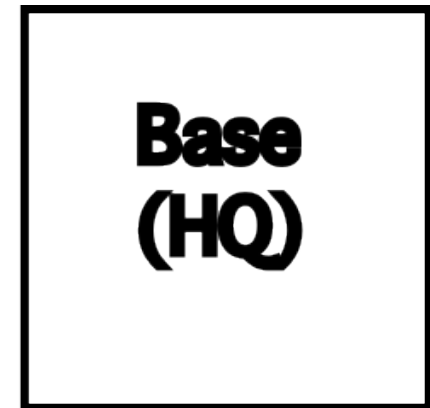*Victoria University of Wellington*

Introduction

This lecture explores the use of the MQTT protocol in the data recorder to transmit measurements from the field.

- The problem of remote sensing

- MQTT

- Architecture of the Data Recorder

- Problems and Workarounds

- Other Communication Methods
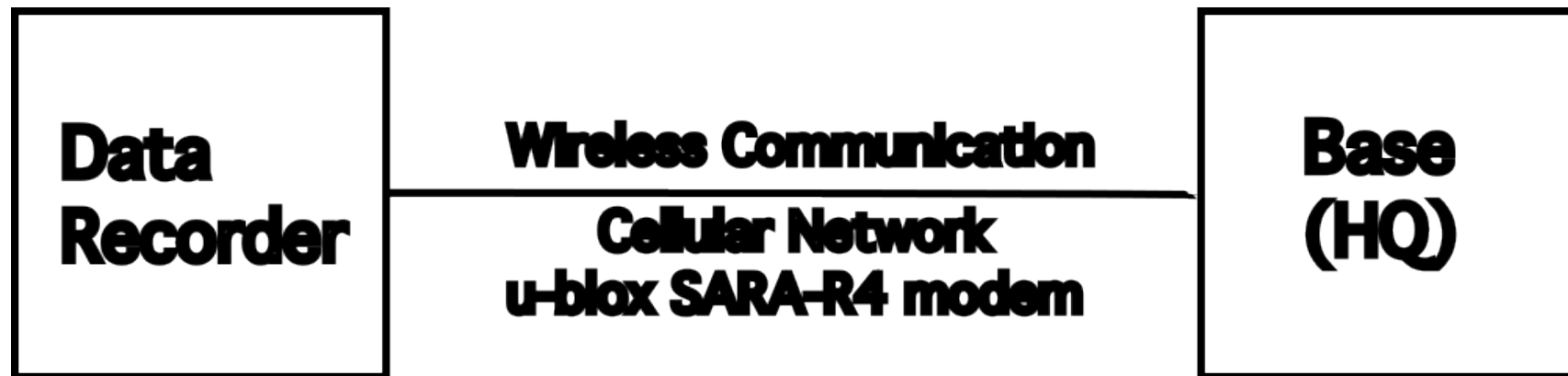
The Problem of Remote Sensing

Communication is one of several problems posed by remote sensing.

Data Recorder		Base (HQ)

How are measurements from the data recorder communicated to the organisational base?

The Problem of Remote Sensing

Communication is one of several problems posed by remote sensing.

| Data Recorder | Wireless Communication Cellular Network u-blox SARA-R4 modem | Base (HQ) |

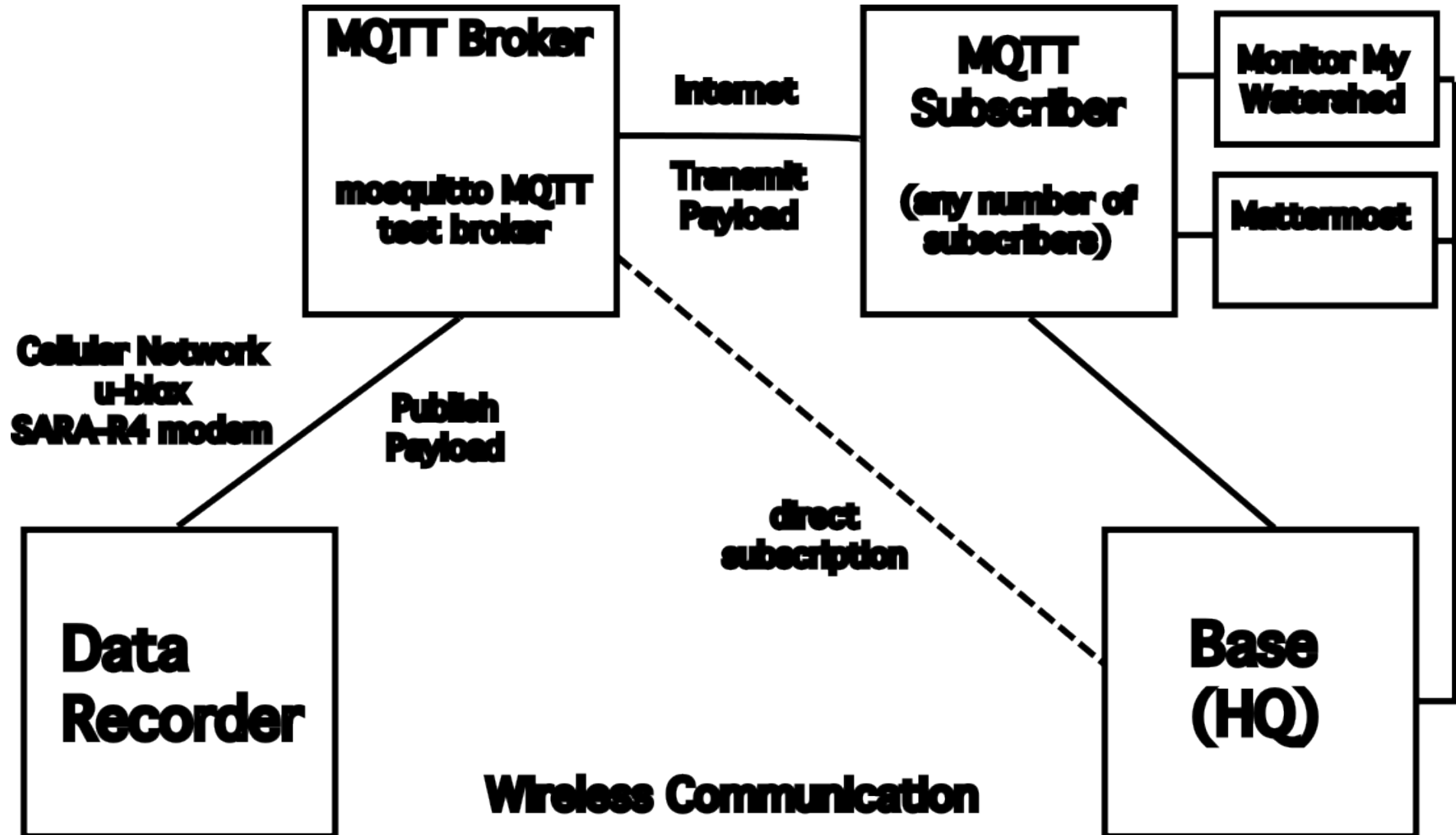Wirelessly!

The MQTT Protocol

Originally "MQ Telemetry Transport", now simply styled as MQTT.

- "a messaging protocol for the Internet of Things (IoT)"

- "extremely lightweight publish/subscribe messaging transport"

- "ideal for connecting remote devices with a small code footprint and minimal network bandwidth"

`https://mqtt.org`

Data Recorder MQTT Architectural Overview

u-blox SARA-R4 Implementation

The u-blox SARA-R4 features an implementation of the MQTT protocol, via AT commands (see Section 28 of the *SARA-R4 AT Commands Manual*).

There is a bug in the firmware which causes the SARA-R4 to become unresponsive, to "lock", under certain circumstances:

1. intermittent or no internet connectivity (no PDP address)

2. command `AT+UMQTTC=2,0,0,<topic>,<message>` sent to modem

3. SARA-R4 enters an indeterminate state (infinite loop) waiting for a response from the command.

u-blox SARA-R4 Workarounds

There are two ways to work-around this problem:

1. Only call the `AT+UMQTTC=2,0,0,<topic>,<message>` command when there's connectivity;

2. Implement the required MQTT functionality in MicroPython using SARA-R4 Internet protocol transport layer "TCP/IP services" `AT` commands.

The first approach may still fail; the second approach is viable and known to have been implemented.

Other Communication Methods

MQTT is not the only way the SARA-R4 provides for communication!

- `AT+UHTTP` commands available

- Send payloads directly to Monitor My Watershed, Mattermost, Hilltop server, etc.

- Need to work-around limitations of UART connection (no hardware flow control)

- Secure connections may be difficult to negotiate

- Multiple communication channels!

- Will likely want to retain MQTT functionality indefinitely!