BlueTruth Raw Data Feed (BRDF) Functional Specification

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References and Relevant Documents

[1] BS EN ISO 9001:2008: Quality Management Systems - Requirements.

[2] TickIt Guide to Software Quality Management System Construction and Certification.

[3] RFC7159 – The JavaScript Object Notation (JSON) Data Interchange Format

[4] RFC2616 – Hypertext Transfer Protocol – HTTP/1.1

Glossary: List of Standard Abbreviations

Term	Description
BRDF	BlueTruth Raw Data Feed
HTTP	Hypertext Transfer Protocol
JSON	JavaScript Object Notation
URL	Uniform Resource Locator

1 Introduction

Bluetooth technology is embedded in billions of electrical devices world wide. Many devices (e.g. mobile phones, tablet computers, laptop computers etc) are carried by vehicle drivers or are embedded within a vehicle's system. Each Bluetooth device emits a unique signature that can be harvested and time stamped by an SSL OutStation. These signatures can then be made available to an InStation.

Analysing the collected signature information on an InStation enables the creation of origin and destination information for each detected Bluetooth signature including the time taken (i.e. journey times) between OutStations.

The System consists of the following components:

- OutStation; located roadside or wherever the user wishes to obtain the Bluetooth ID's from.
- InStation; there can be multiple occurrences of the InStation desktop applications as well as a Web Portal for data visualisation.

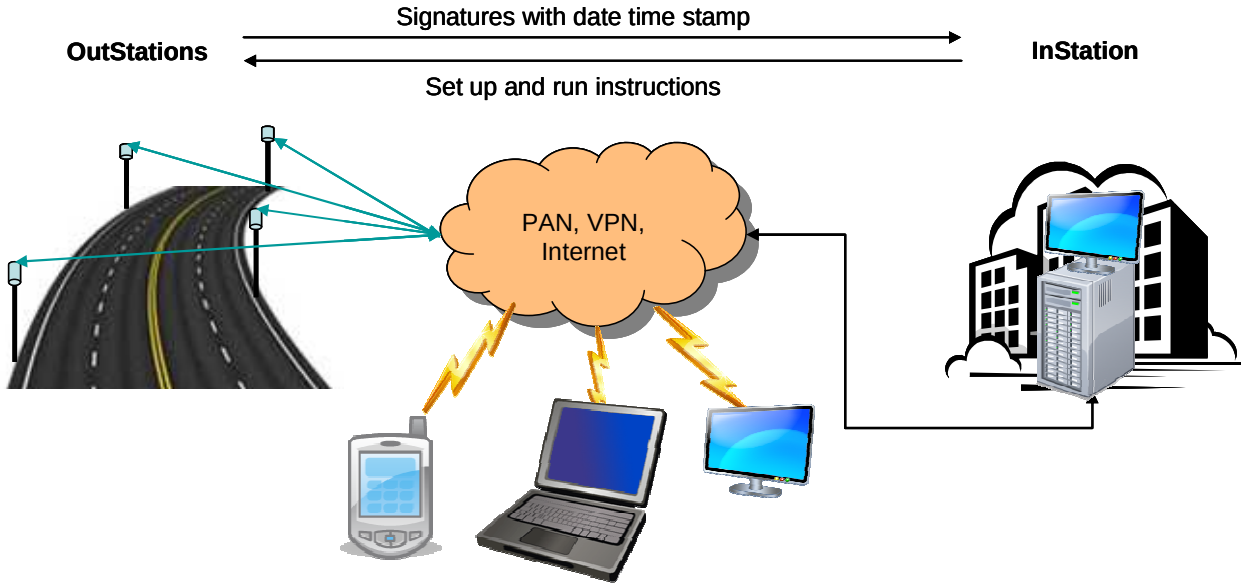

Figure 1 Components of the existing BlueTruth infrastructure

The main function of the OutStation is to provide Bluetooth device statistics and pass this information to the InStation. The main function of the InStation is to receive the data from OutStations, process and archive the data in the local database.

This document describes the design of the BlueTruth Raw Data Feed (BRDF) client application which will retrieve the data from the local InStation database and pass them to the recipient server. The components of the system are presented in Figure 2.

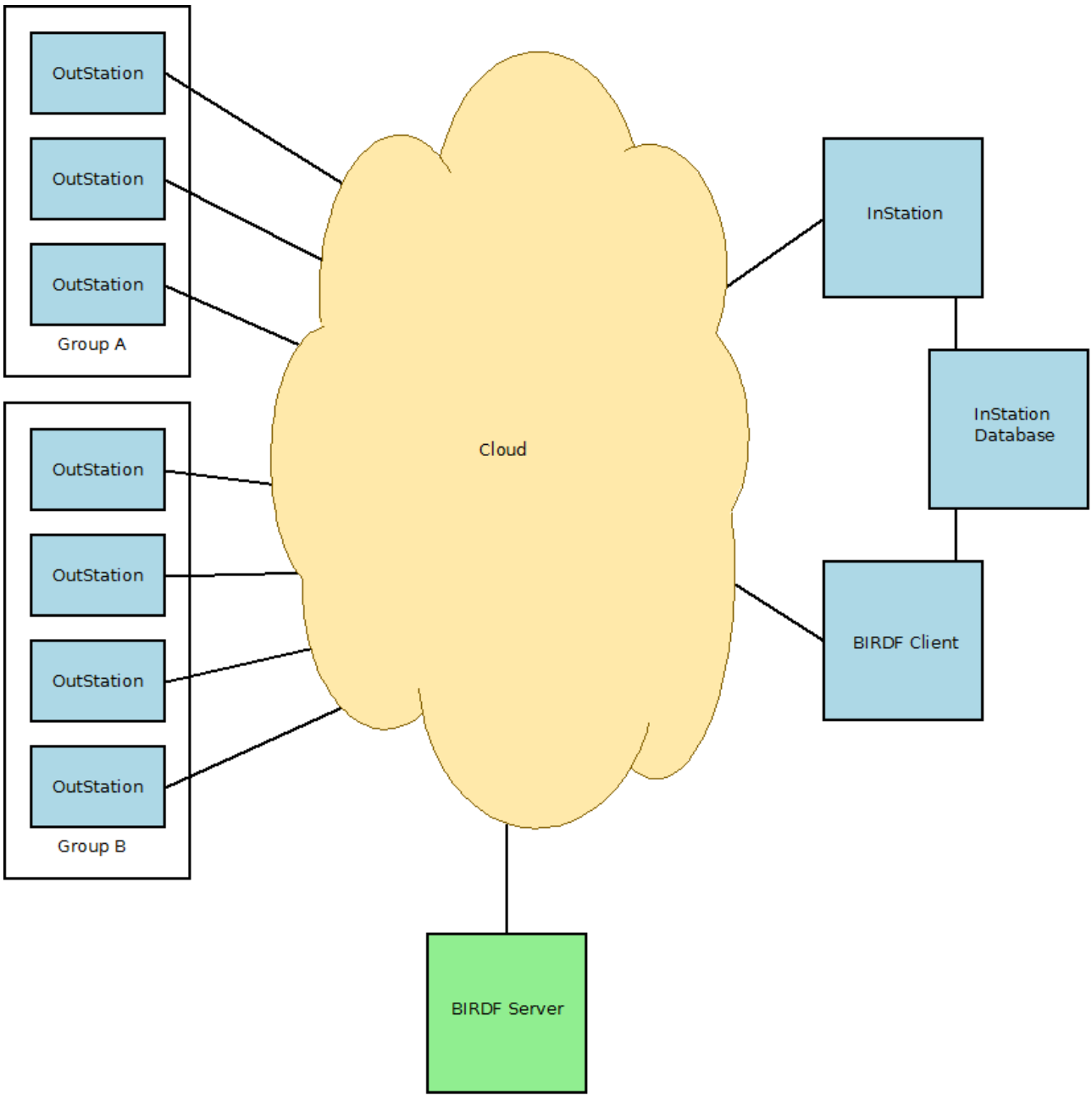

Figure 2 Components of BlueTooth Raw Data Feed

2 General Description

The purpose of BRDF is to provide raw near real-time data from the BlueTruth OutStations of interest. The data sent from the BRDF client consists of records that contain the following information:

- OutStation site detector identifier,
- Encoded BlueTruth device MAC address of each detected device,
- First, reference and last observation time of each detected device.

BRDF will be a client periodically trying to connect to one preconfigured URL which will act as a server. When connected the client will pass the raw data using JSON format over HTTP application layer. Each set of records must be acknowledged so that the client can avoid duplicate transmission. The BRDF will retrieve the data to be transmitted from the local database. Each set of records will be passed once using a transmit and acknowledge sequence.

3 Data Format

The data is passed using JSON format [3]. Only ASCII characters can be used.
The JSON schema is:

```
{
    "$schema": "http://json-schema.org/draft-03/schema#",
    "title": "BlueTruth Raw Data Feed",
    "description": "The format of data to be sent",
    "type": "object",
    "properties": {
        "outstationId": {
            "description": "The unique identifier for an OutStation",
            "type": "string"
        },
        "time": {
            "description": "The record start time",
            "type": "integer"
        },
        "duration": {
            "description": "The record time duration",
            "type": "integer"
        },
        "status": {
            "description": "The OutStation status: OK, FAULTY, UNCOMMISIONED",
            "type": "string"
        },
        "detections": {
            "description": "A record of each detected device. If no devices were
detected or if the OutStation is faulty this record should be blank",
            "type": "array",
            "items": {
              "id": {
              "description": "The encoded detected device MAC address. The
      mapping from MAC address into ID must be unique",
                  "type": "string"
              },
              "startTime": {
                  "description": "The first observation of the device",
                  "type": "integer"
              },
              "refTime": {
                  "description": "The reference point time estimation. This
      value could be somewhere between startTime and endTime. This value depends
      on antenna pattern. For omni-directional antenna this point should be the
      nearest to the OutStation antenna",
                  "type": "integer"
              },
               "endTime": {
                  "description": "The last time the device was observed",
                  "type": "integer"
              }
            }
        }
    },
    "required": ["outstationID","time","duration","status"]
}
```

The maximum number of “detections” item value is configurable.
Example of data record:

```
{
      "outstationId":"A60PD-4",
      "time":1424297947,
      "duration":60,
```

```
	"status":"OK",
	"detections": [
	{
		"id":"0123456789ABCDEF",
		"startTime":1424297947,
		"refTime":10,
		"endTime":20
	},
	{
		"id":"FEDCBA9876543210",
		"startTime":1424297951,
		"refTime":15,
		"endTime":30
	}
	]
}
```

4 OutStation – InStation Protocol Differences (v3.0 vs v4.0)

This section is provided for information only.
The OutStation to InStation protocol is different for OutStations v3.0 and v4.0.
In version 3.0 the observed Bluetooth devices are reported as they are detected with no filtering. The InStation has to calculate the reference point time out of a sequence of observations for each device.
In version 4.0 the observations of Bluetooth devices are prefiltered and only start/reference point/end observation times are provided. This prefiltering significantly reduces the amount of data between OutStation and InStation and makes the protocol resistant against communication drop outs.
For current / legacy version 3 devices, the data is received by the InStation and pre-processed into version 4 format before being included in the raw data output stream.

5 Communication Protocol

To exchange information the HTTP 1.1 protocol will be used [4].
The client will periodically connect to the preconfigured server. Upon connection it will post the data. When posting the data JSON records will be sent. The server must accept the record with "STATUS 200 OK" response.
On program start-up or when no data is to be sent a record with no detections should be submitted.
In the case of connection failure the program should try to reconnect after some delay.

Example of data exchange:
[Client -> Server]

```
POST /RawDataFeedPath HTTP/1.1
Host: 37.152.43.178:80
Content-Type: text/plain
Content-Length: 52

{
	"outstationId":"A60PD-4",
	"time":1424297947,
	"duration":60,
	"status":"OK",
	"detections": [
	{
		"id":"0123456789ABCDEF",
		"startTime":1424297947,
		"refTime":10,
		"endTime":20
	},
```

```
      {
            "id":"FEDCBA9876543210",
            "startTime":1424297951,
            "refTime":15,
            "endTime":30
      }
      ]
}
```

[Server -> Client]

```
HTTP/1.1 200 OK
Date: Sat, 05 Oct 2013 21:21:12 GMT
```

6 Miscellaneous

The two servers will communicate using HTTP using agreed URLs. To minimise spoofing attacks the submitting party will send the data to a specified URL and the receiving party will accept the data only from a specified IP address.

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Synopsis:
This document provides a description of the functional capabilities of a BlueTruth Raw Data Feed

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