Shimizu IoT System
Sensor Data Collector Documentation

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1 INTRODUCTION

1.1 Introduction

The Sensor Data Collector of Shimizu IoT System is use to collect PH, TDS, EC,... and other environment parameters. This product use an Arduino board (Uno/Mega) connecting with AtlasScientific's sensors and DS18B20 temperature sensor. It can be communicated and controlled via UART.

This document introduces how the Sensor Data Collector work and how to control it. Its intended audience comprises Developers and Testers who need to understand how this module work and how to control it.

1.2 Operation Principle

The Sensor Data Collector collect environment parameters every periodic time and save to EEPROM (max. 10 lastest datasets). User can change the collection's period or get all saved datas at anytime by sending command to the collector.

It's highly recommended that two data collection be at least 2 minutes apart to ensure the accuracy of sensor data.

All the parameters be collected:

- **EC:** Conductivity
- **TDS:** Dissoved Solids
- **SAL:** Salinity
- **GRA:** Specific Gravity
- **OXY:** Dissoved Oxygen
- **PH:** pH
- **ORP:** ORP
- **TEM:** Temperature

1.3 Definitions, Acronyms and Abbreviations

Definitions	**Description**
Primary device	The control device (Computer, Raspberry,...)
Secondary device	The sensor collector (Arduino)
JSON	JavaScript Object Notation

Table 1: Definition table

2 HARDWARE INTERFACE

2.1 Hardware list

No.	Hardware
1	Arduino board (Uno/Mega)
2	Atlas Conductivity K 1.0 Kit
3	Atlas Dissolved Oxygen Kit
4	Atlas pH Kit
5	Atlas ORP Kit
6	DS18B20 temperature sensor

Table 2: Hardware list

2.2 Sensor connection

2.2.1 Atlas sensors

We use specific circuits to communicate with Atlas sensors, and Arduino communicate with these circuits using I2C interface. Protocol for these circuits can be found in datasheets.

- Circuit's Rx to Arduino's SDA pin
- Circuit's Tx to Arduino's SCL pin
- I2C speed: 100kHz.
- Power supply: 5VDC.

2.2.2 DS18B20

DS18B20 temperature sensor use 1-wire connection.

- Red wire to VCC.
- Black wire to GND.
- Yellow wire to D2 pin of Arduino.
- Power supply: 5VDC.

2.3 Computer connection

Arduino communicates with control device using UART interface.

- Arduino Hardware Serial 0.
- Baud rate 115200.

3 COMMUNICATION PROTOCOL

3.1 Package format

This system use JSON as data exchange format. Command and Response packet have 3 field. Data packet replace field "D" with 8 sensor data fields.

Key	***Name***	***Value***	***Detail***
"T"	Type	**"CMD"**	Command frame
		"RES"	Response frame
		"DATA"	Data frame
"F"	Function	**"TIME"**	Change sensor schedule
		"SENS"	Get sensor data
"D"	Data		Data depend on function and type

Table 3: JSON packet format

3.2 Communication flow

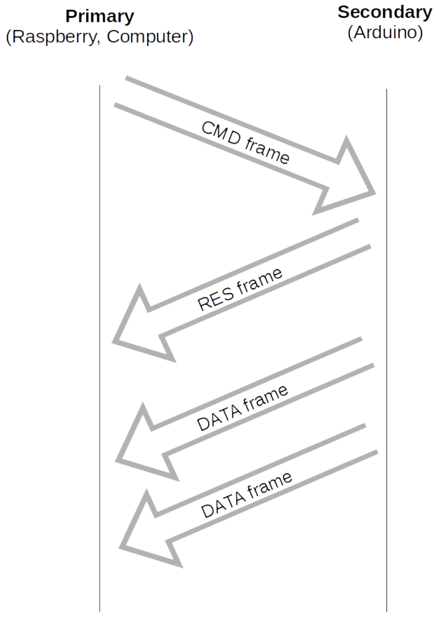

Figure 1: Communication flow

4 FUNCTION DETAILS

4.1 Function TIME

Description

To change the periodic time to read and store sensor value.

Packet format

Command frame

```
{T: "CMD",
 F: "TIME",
 D: "<TimeInMinute>"}
```

Response frame

```
{T: "RES",
 F: "TIME",
 D: "<ResponseCode>"}
```

Notes

- <TimeInMinute>
  - Must be an unsigned interger.
  - Must larger than 2 minute.
- <ResponseCode>
  - "OK" if operation success, the periodic time has been changed.
  - "ER" if operation fail, <TimeInMinute> is invalid.

4.2 Function SENS

Description

To immediately read all the sensors and send back all stored data.

Packet format

Command frame

```
{T: "CMD",
 F: "SENS",
 D: ""}
```

Response frame

```
{T: "RES",
 F: "SENS",
 D: "<NumberOfPacket>"}
```

Data frame

```
{T: "DATA",
 F: "SENS",
 OXY: "<SensorData>",
 ORP: "<SensorData>",
 PH: "<SensorData>",
 EC: "<SensorData>",
 TDS: "<SensorData>",
 SAL: "<SensorData>",
 GRA: "<SensorData>",
 TEM: "<SensorData>"}
```

Notes

- <NumberOfPacket> is number of following data packets (max. 10).
- <SensorData> have format of float number.
- <SensorData> have value of "xxx" if there's error while reading sensors.
- The oldest dataset will be send first. The last data packet contain the latest dataset.