Port Config

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| *Port number* | | | | *Port Type* Sensor (0)  Actuator (1) | *On-demand mode*  True(1)  False (0) | *Event triggered mode*  True (1)  False (0) | *Time mode*  True (1)  False (0) |

Timer

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 15 | 14 | 13 | 12 | 11 | 0 |
| Time Unit | | | | Time *(in Binary Coded Decimal)* | |
| *hour*  True (1)  False (0) | *minute*  True (1)  False (0) | *second*  True (1)  False (0) | *millisecond*  True (1)  False (0) |

Event

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 15 | 14 | 13 | 12 | 11 | 0 |
| Event Limit Count  Threshold (one) (0)  Range (expects another packet) (1) | Actuator Type  Digital (0)  Analog (1) | Greater than (1)  Less than (0) | Equal (1)  Not Equal (0) | Data  *(in Binary Coded Decimal)* | |

Actuator Details

data

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 15 | 14 | 13 | 12 | 11 | 0 |
| Port Number (of the actuator) | | | | Data  *(in Binary Coded Decimal)* | |

If On demand on Actuator

|  |  |
| --- | --- |
| 11 | 0 |
| Port Data in BCD | |

HEADER & TAIL CONNECT RELATIONSHIP TO QUEUE INDEXS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

ERROR FLAG

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|  |  |  |  | Cannot access SD card | Sent configurations is broken | Maximum attempts reached (Asking config from sink) | No SD Card read |
|  |  |  |  | * Is the file name correct? * Is the file too long? It uses a format size * Does the file exist? Check SD card contents |  |  | * Try checking if CS\_PIN is correct * Is CS\_PIN set to OUTPUT and SET to HIGH? * Is it working with Ethernet? Make them work together. They use a common pin (SS Pin) * Is the SD card formatted correctly? Set it to FAT (16 preferably) * Meaning: Initialization failed |

PACKET TYPE FLAG­­

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|  |  |  |  |  | Node Discovery | Node configuration | Request startup config |

TO SEND FLAG (to check if may sesend ditto)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|  |  |  |  |  | Node Discovery | Node configuration | Request startup config |

Api = 2 //node config related matters

|  |  |
| --- | --- |
| **COMMAND** | **DESCRIPTION** |
| 00 – FF | ALL CONFIG RELATED STUFF |

Api =3

|  |  |
| --- | --- |
| **COMMAND** | **DESCRIPTION** |
| 00 | NODE DISCOVERY - Request Keep alive / Probe Node Status |
| 01 | NODE DISCOVERY - Node Status reply |
| 02 | NODE DISCOVERY - Network Config |
| 03 | NODE DISCOVERY - Network Config Acknowledgement reply |
| 04 |  |
| F6 |  |
| F7 | SENSING / ACTUATE – Send Port Data |
| F8 | NODE CONFIGURATION – Received Configuration (Acknowledgement) |
| F9 | STARTUP ERROR - Cannot access SD card |
| FA | STARTUP ERROR - Sent configurations is broken |
| FB | STARTUP ERROR - Maximum attempts reached (Asking config from sink) |
| FC | STARTUP ERROR - No SD Card read |
| FD | STARTUP - A successful hello world from load from sd card |
| FE | STARTUP - Request Node Config |
| FF | STARTUP - Receive Configuration (Ack) |

TYPES OF REPLIES SENT

1. Node Status Reply (from Node Status Request)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **SEGMENT NAME** | Header | Source | Destination | API | Count | Command | Footer |
| **VALUE** | FF | 1 | 0 | 3 | 0 | 1 | FE |

1. Request config from sink node

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **SEGMENT NAME** | Header | Source | Destination | API | Count | Command | Footer |
| **VALUE** | FF | 1 | 0 | 3 | 0 | FE | FE |

1. Acknowledge
   1. Node config (applied config)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **SEGMENT NAME** | Header | Source | Destination | API | Count | Command | Footer |
| **VALUE** | FF | 1 | 0 | 3 | 0 | F8 | FE |

* 1. Node startup (after receive)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **SEGMENT NAME** | Header | Source | Destination | API | Count | Command | Footer |
| **VALUE** | FF | 1 | 0 | 3 | 0 | FF | FE |

* 1. Network config (ack)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **SEGMENT NAME** | Header | Source | Destination | API | Count | Command | Footer |
| **VALUE** | FF | 1 | 0 | 3 | 0 | 03 | FE |

1. Port data
   1. Timer/Event/ODM

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SEGMENT NAME** | Header | Source | Destination | API | Count | Command | Port Num | Port Value | Footer |
| **VALUE** | FF | 1 | 0 | 3 | 0 | F7 | 00 | 1023 | FE |

1. Startup errors
   1. No SD Card read

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **SEGMENT NAME** | Header | Source | Destination | API | Count | Command | Footer |
| **VALUE** | FF | 1 | 0 | 3 | 0 | FC | FE |

* 1. Max attempts reached

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **SEGMENT NAME** | Header | Source | Destination | API | Count | Command | Footer |
| **VALUE** | FF | 1 | 0 | 3 | 0 | FB | FE |

* 1. Sent configuration broken

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **SEGMENT NAME** | Header | Source | Destination | API | Count | Command | Footer |
| **VALUE** | FF | 1 | 0 | 3 | 0 | FA | FE |

* 1. Cannot access SD card

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **SEGMENT NAME** | Header | Source | Destination | API | Count | Command | Footer |
| **VALUE** | FF | 1 | 0 | 3 | 0 | F9 | FE |

1. Hello world (if load startup config from sd is successful)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **SEGMENT NAME** | Header | Source | Destination | API | Count | Command | Footer |
| **VALUE** | FF | 1 | 0 | 3 | 0 | FD | FE |

TIMER 0 – delay, millis, micros

TIMER 1 – PWM, Servo

TIIMER 2 – tone (8bit)

SD Card notes: FAT16

CONFIG0.LOG – CONFIGB.LOG

|  |  |  |
| --- | --- | --- |
| Pin # | Purpose | Module Used |
| 27 | Hardware SS Pin (Slave Select) | Startup Module |
| 11 | MOSI (SPI Communication) |
| 12 | MISO (SPI Communication) |
| 13 | SCK (SPI Communication) |
| 0 & 1 | Serial Communication (TX,RX) | Coding, Debugging, Xbee |
|  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Digital | Port | Port | Analog |
| 4 | 0 | 6 | 0 |
| 5 | 1 | 7 | 0 |
| 6 | 2 | 8 | 1 |
| 7 | 3 | 9 | 2 |
| 8 | 4 | A | 3 |
| 9 | 5 | B | 4 |

|  |  |
| --- | --- |
| **Segment Name** |  |
| Header | 0 |
| Source | 1 |
| Destination | 2 |
| Application Programming Interface (API) | 3 |
| Config Version | 4 |
| Count | 5 |
| Socket | 6 |
| Command | 7 |
| Length |  |
| Footer |  |

Command Codes

|  |  |
| --- | --- |
| **Command Code** | **Description** |
| 0 | Time based set |
| 1 | Time ­­­based response |
| 2 | On-demand set |
| 3 | On-demand response |
| 4 | Event triggered set |
| 5 | Event triggered reply (Output port) |
| FF | Acknowledge |

Check odm register

Check branching

**Protocol**

Note: You cannot have analog data at port 5 below

Note: No range mode in event if it is digital sensor; it is always read as = to 1/0 (bit 12 & 13 are set to 0 instead but not read)

No event triggered on actuator

**Network Configuration (Node Discovery) Packet Node Status Request (Node Discovery) Packet**

|  |  |
| --- | --- |
| **Segment Name** |  |
| Header |  |
| Source |  |
| Destination |  |
| API |  |
| Command Type == 01 | 00 |
| Logical Address | ------- skipped------ |
| Sink address |  |
| Footer |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Segment Name** | **Node Startup Configuration Reply** | |  |
| Header | FF  00  01  03  FF | | |
| Source |
| Destination |
| API |
| Command Type (API = 3) |
| Part | 00 | | 01 |
| Logical address | 01 | |  |
| Physical Address | 02 | |  |
| Config Version | 01 | |  |
| Port Config [c] | 01 // digital sensor timer  15 // digital sensor timer odm  2D // digital actuator timer odm  37 // digital sensor timer event odm analog actuator (7)  44// digital sensor odm  5C // digital actuator odm  61 // analog sensor timer  7C// analog actuator odm  8D // analog actuator timer odm  93 // analog sensor timer event (range) (digital actuator (5)  A7// analog sensor timer event (threshold) odm analog actuator (8)  B4 // analog sensor odm | |  |
| actuatorValueOnDemand[c] | 0000  0000  0001  0000  0000  0001  0000  7170  8090  0000  0000  0000 | 0  1  2  3  4  5  6  7  8  9  A  B |  |
|  |  | |  |
| timerSegment[c] |  |  | 1030  1060  2005  2045  0000  0000  4002  0000  1010  1015  1600  0000 | 0  1  2  3  4  5  6  7  8  9  A  B |
| eventSegment[c] | 0000  0000  0000  4001  0000  0000  0000  0000  0000  B090 8045  4070  0000  0000  0000  0000  0000  0000  0000  0000  0000  0000  8045  0000  0000 | 0  1  2  3  4  5  6  7  8  9  A  B  0  1  2  3  4  5  6  7  8  9  A  B |  |
| actuatorDetailSegment[c] | 0000  0000  0000  7180  0000  0000  0000  0000  0000  5001  8090  0000 | 0  1  2  3  4  5  6  7  8  9  A  B |  |
| Footer | FE | |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Segment Name** | **Receiving (update this tho)** | | | | | **ODM**  **Actuator (Analog)** | **ODM**  **Actuator**  **(Digital)** | **Timer** | **Event**  **Reset Config** | | | **ALL IN ONE PORT (Analog Sensor)** | **All in one (Digital ACTUATOR)** | | **Node Startup Config Request (send to sink)** | **Node Discovery (Request)(sink > node)** |
| Header |  | |  | | FF | | | | | | | | | | | |
| Source |  | |  | | 00 | | | | | | | | | | | |
| Destination |  | |  | | 01 | | | | | | | | | | | |
| Application Programming Interface (API) (API 2 IS CONFIG) | 02 | | | | | | | | | | | | | 03 | | |
| Configuration version (*if API ==2*) | 01 |  | | 01 | | 03 | 03 | 04 | 05 |  |  | 05 | 05 | |  |  |
| Command Type (if API == 3) |  |  | |  | |  |  |  |  |  |  |  |  | | FE | 00 |
| Count | 00 | 01 | | 02 | | 00 | 00 | 00 | 00 |  |  | 00 | 00 | |  |  |
| Port configuration | 1D | 02 21 | | 44 59 72 | | 8C | 5C | 91 | A2 | 02 ---- stores to C (@ other half of segment) | 02 | B7 | 6D | |  |  |
|  |  | | | | |  |  |  |  |  |  |  |  | |  |  |
| Timer (*time based pin reading*) | 1002 | 4030 | | 2030 | |  |  | 1100 |  |  |  | 4030 | 1006 | |  |  |
| Data (*on-demand pin reading & response commands*) |  | | | | |  |  |  |  |  |  |  |  | |  |  |
| Threshold data (*event triggered pin reading*) |  | 7025 | | 8016  3029 | |  |  |  | 6035 | 9090  3120 | C120  7140 | C035  D090 | N/A | |  |  |
| Actuator details (*event triggered pin reading*) |  | 6180 | | 7001 | |  |  |  | B090 | 7001 | 9120 | 7060 |  | |  |  |
| ODM Actuator Data | 0001 |  | |  | | 0360 | 0000 |  |  |  |  | N/A sensor eh | 0001 | |  |  |
| Footer |  | |  | | FE | | | | | | | | | | | |

Error flag

* Check flow kung tama pa
* Check if gets actuator odm segment
* Check if it initializes properly (pin and port #)

Update paper on couting sa port beh (@Result)

Print port config (all)

5B, 6B for final touches

2H, or 4H for out line before final touches...

Erasers for shadowing or lighting in the eyes.

**ERROR FLAG**

Sent out when != 0 , therefore may error

Unsigned long 2 bytes

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|  |  |  |  |  |  |  |  |  |  |  |  | Invalid port configuration code | too much  commands  for node | old config version sent | invalid  api |

ON DEMAND REGISTER

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|  | 1 |  |  |  |  |  | 1 |  |  |  | 1 |  |  |  |  |
| 41 10 | | | | | | | | | | | | | | | |
| 1 |  |  |  |  |  |  | 1 |  |  |  | 0 |  |  |  |  |
| 81 10 | | | | | | | | | | | | | | | |

FF 00 01 02 01 00 1D 10 02 FE

FF 00 01 02 01 01 02 70 25 31 80 21 40 30 FE

FF 00 01 02 05 00 62 80 16 30 29 70 01 FE

FF 00 01 02 05 00 A2 60 35 B0 90 FE

Threshold Parts Location

0 C

1 D

2 E

3 F

4 10

5 11

6 12

7 13

8 14

9 15

A 16

B 17

|  |  |  |
| --- | --- | --- |
| Index | Message | Character count |
| 0 | @ PORT CONFIG SEGMENT | 21 |
| 1 | @ TIME SEGMENT | 14 |
| 2 | @ EVENT SEGMENT | 15 |
| 3 | @ ACTUATOR SEGMENT | 18 |
| 4 | Time based | 10 |
| 5 | Event base | 10 |
| 6 | ODM | 3 |
| 7 | Port Num: | 10 |
| 8 | onDemandRegister: | 18 |
| 9 | Value of AND: | 14 |
| 10 | Value of TEMP: | 15 |
| 11 | Invalid port configuration! | 27 |
| 12 | Range Mode | 10 |
| 13 | Threshold mode | 14 |
| 14 | Keep AlIve Message Requested | 28 |
| 15 | Actuator Segment: | 18 |
| 16 | Reset Segment Counter | 21 |
| 17 | Getting Next Command | 20 |
| 18 | All commands served | 19 |
| 19 | Port Details: | 14 |
| 20 | Setting Timer Segment: | 23 |
| 21 | Updated Timer Segment: | 23 |
| 22 | Full Timer Segment: | 20 |
| 23 | Updated Event Segment1: | 24 |
| 24 | Full Event Segment1: | 21 |
| 25 | No SD Card Read | 15 |
| 26 | Cannot access sd card | 21 |
| 27 | Logical Address: | 17 |
| 28 | Physical Address: | 17 |
| 29 | Config Version: | 16 |
| 30 | Actuator onDemand Segment: | 31 |
| 31 | Port Value: | 12 |
| 32 | Sensor | 6 |
| 33 | Actuator | 8 |
| 34 | Incoming Port Configuration | 27 |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

|  |  |
| --- | --- |
| **Segment Name** | **Size**  **(in bytes)** |
| \Header | 1 |
| Source |
| Destination |
| Application Programming Interface (API) (API 3 IS node discovery) |
| Count |
| Port |
| Data ( on reply) | 2 |
| Footer | 1 |