

Monitoring device

System / Customer Requirements

The monitoring device should be able to:

- 1) Read RFID Tag, identify patient's identity, and report error if not found.
- 2) Read, log, verify, and display sensor's reading only if a card is registered.
- 3) Require card assigning if monitoring sensors are detached within 1 min cooldown period. i.e. sensors reading are out of valid range.
- 4) Send periodic data readings to local server only if a card is assigned to the device along with patient token.
- 5) Send an emergency message if sensors' readings are abnormal (in critical state).
- 6) Tags, display, and Sensors' processing is performed on the STM32F103C8 microcontroller.
- 7) Messages are sent from STM32F103C8 to the local server via ESP8266 Wi-Fi module.
- 8) Communication between STM32F103C8 and ESP8266 is held using UART.

Physical layout

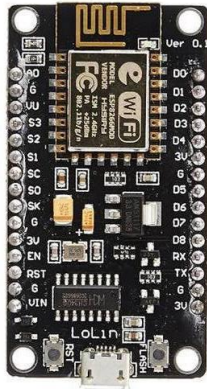
STM32F103C8	RFID reader
A5	Clk
A6	MISO
A7	MOSI
A4	SDA
A3	RST

STM32F103C8	TFT ST7735
B13	CLK
B14	MISO
B15	MOSI
B12	CS
B3	DC
B4	RST
B5	LED

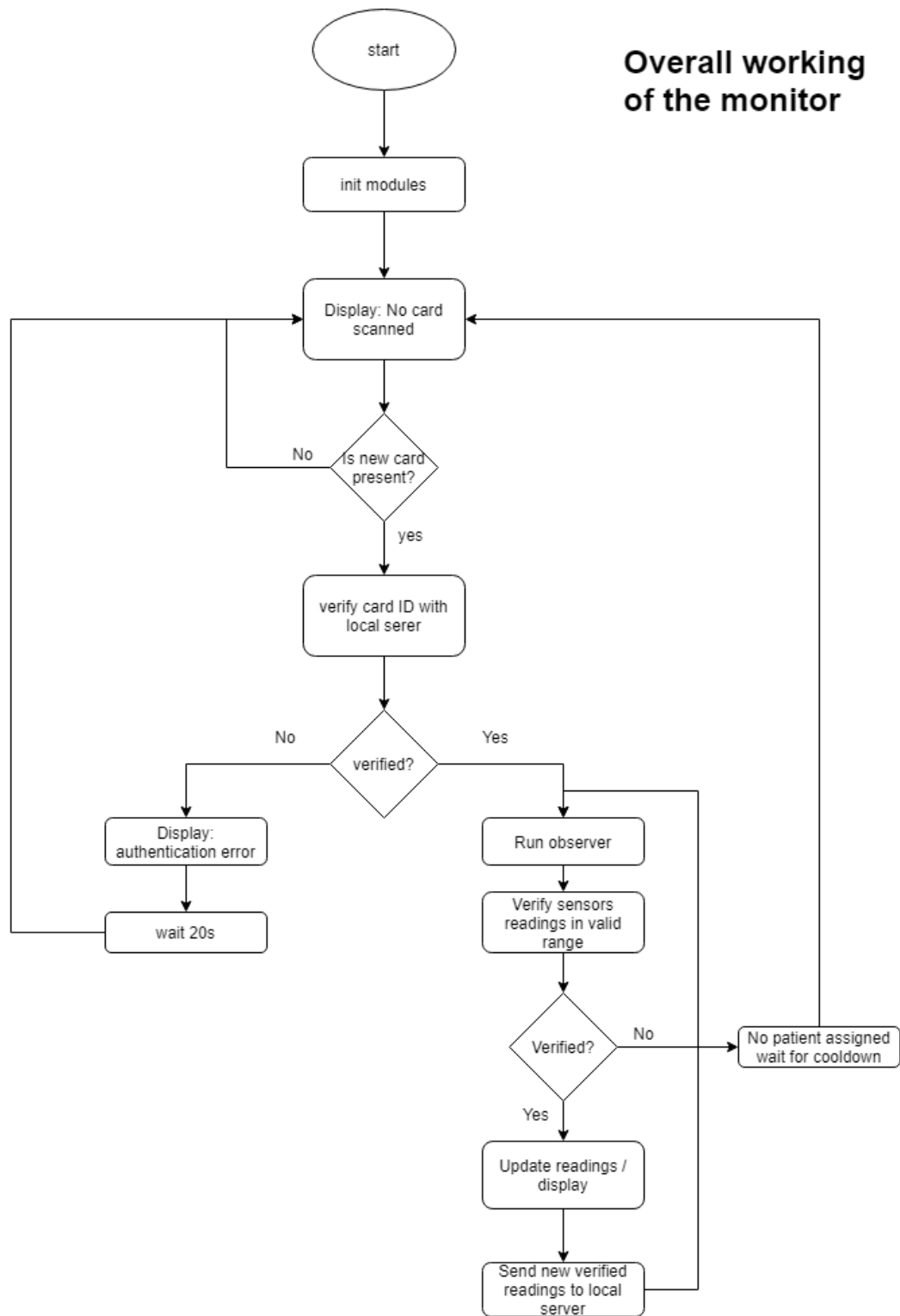
STM32F103C8	ESP8266 (NODE MCU)
A9 (Tx)	D7 (Rx)
A10 (Rx)	D8 (Tx)

STM32F103C8	SPO2 module
B6	SCL
B7	SDA

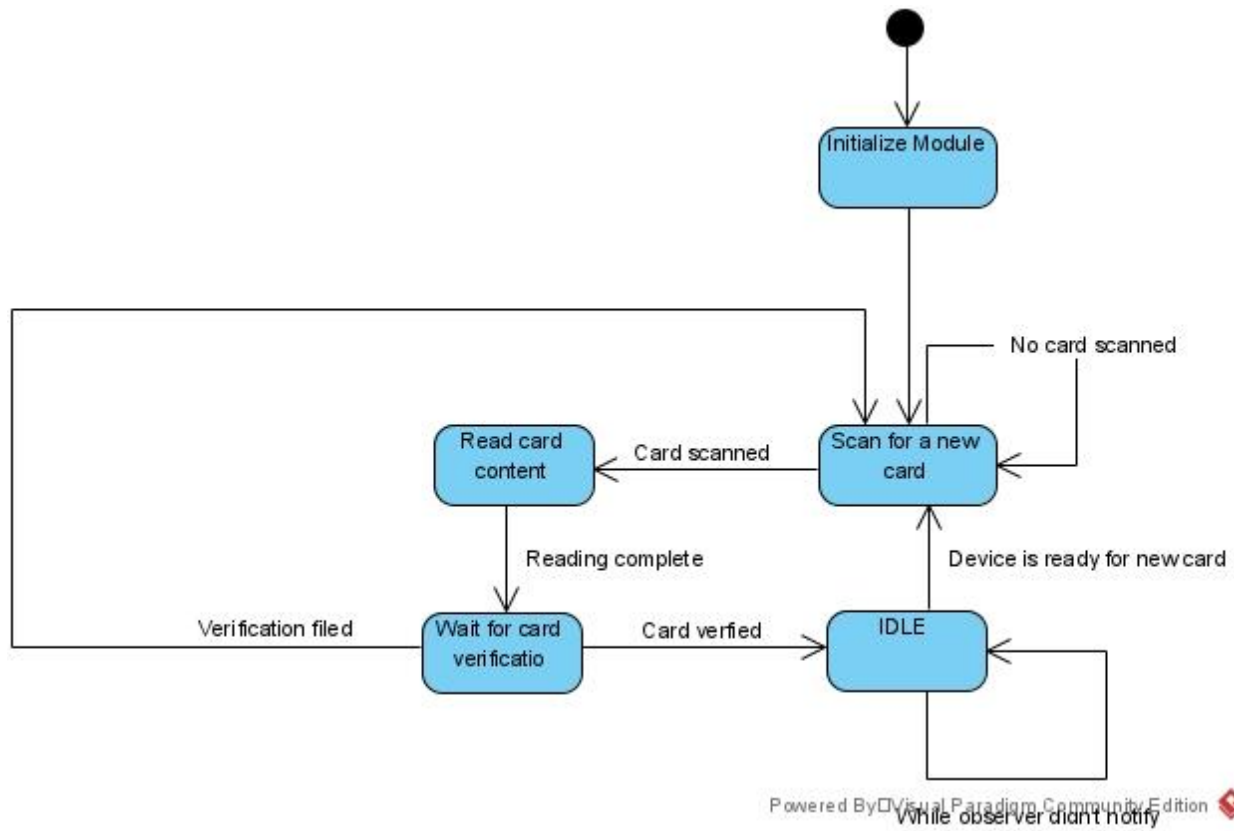
STM32F103C8	Body Temp sensor
B0 , B1	ADC PIN



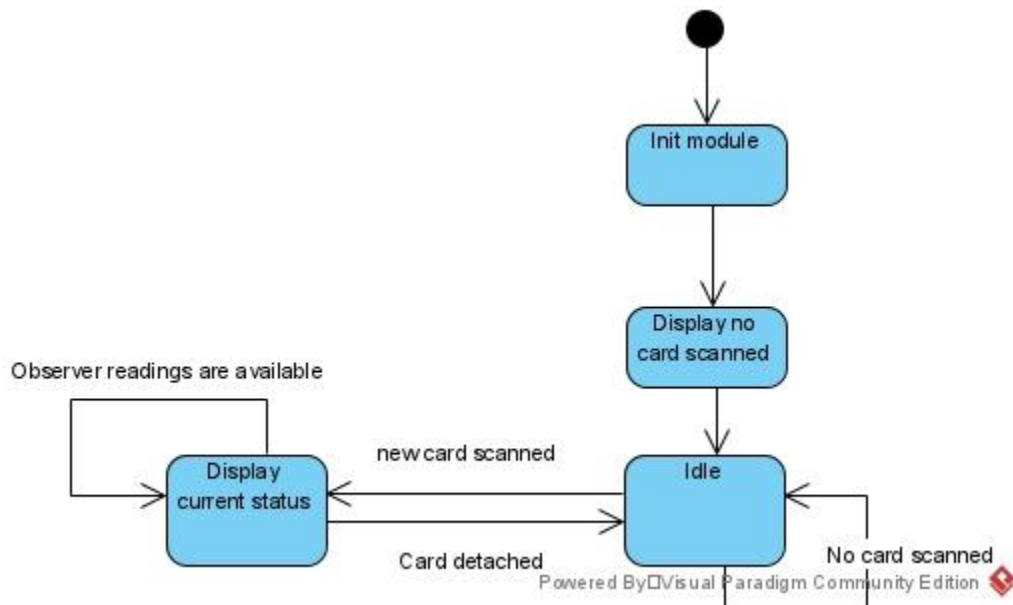
Overall device flow chart



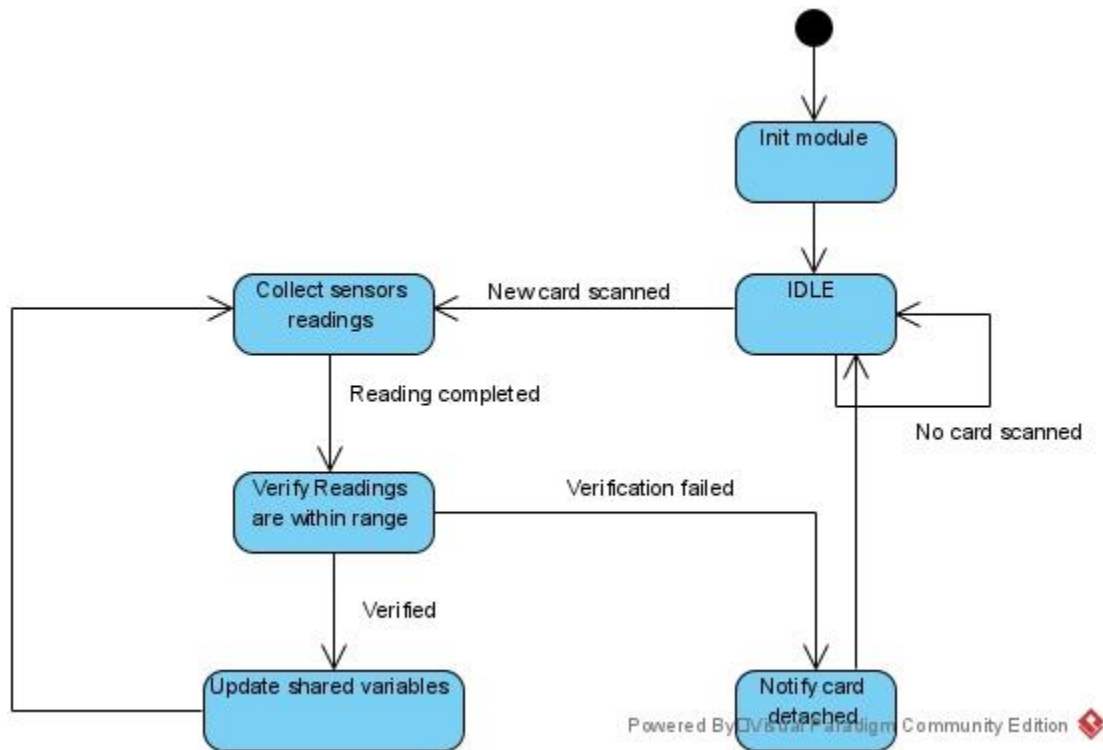
Reader FSM



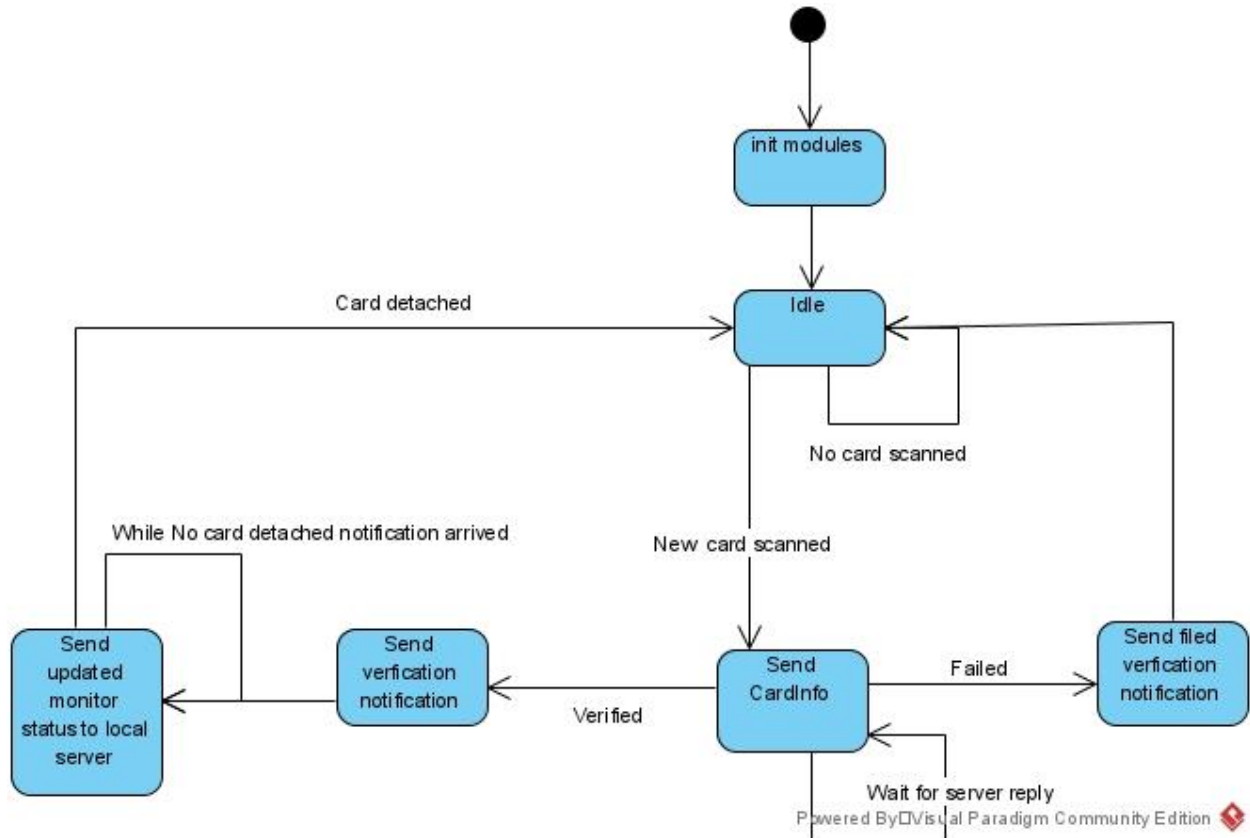
Display FSM



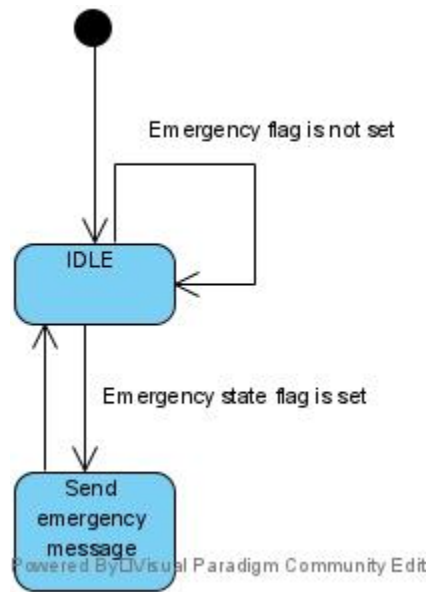
Observer FSM



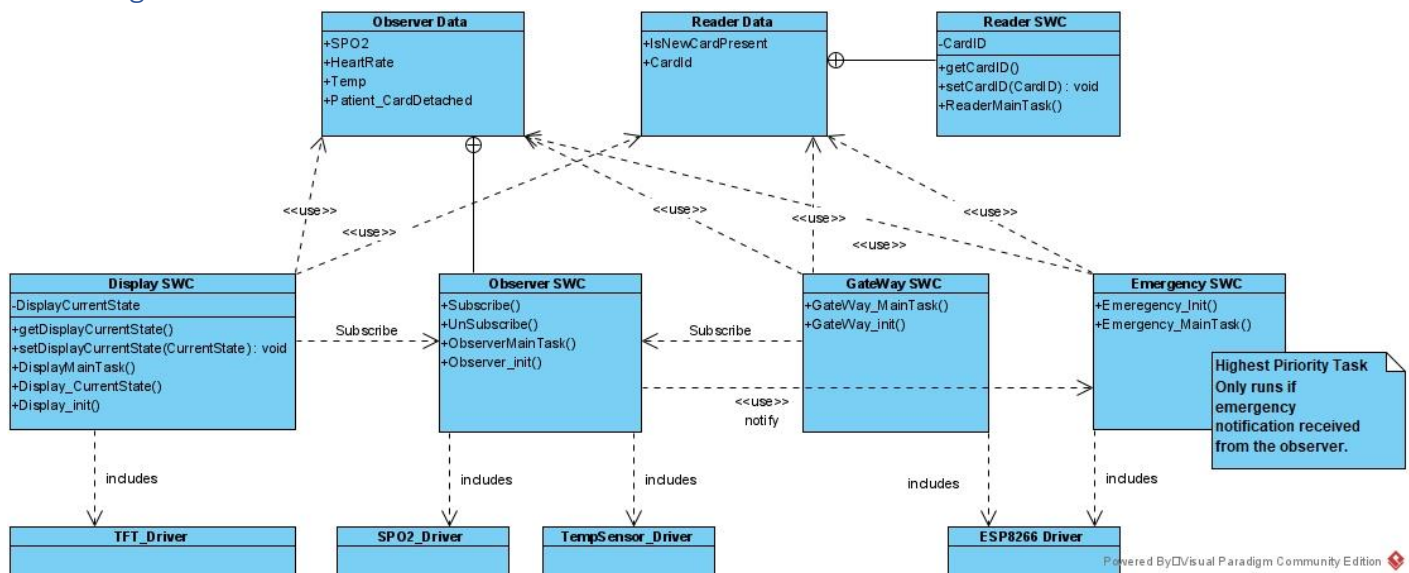
Gateway FSM



Emergency msg FSM



Class Diagram



RTOS Tasks specifications

ObserverMainTask:

Task is in blocked / idle state while no card assigned.

Task is in blocked / idle state if readings are out of valid range for 10 cycles in row

Task waits for a CardIsPresent Notification given by ReaderMainTask to be ready

Task's period = 100 ms

Task's priority = 1

DisplayMainTask:

Task is always ready.

Task's period = 1s

Task's priority = 1

Task uses CardIsPresent Notification to select a message to display

Task uses observer Dataum to display state

GateWayMainTask:

Task is ready only when a CardIsPresent notification received

Task sends vitals (dataum of the observer) along with CardId to ESP8266 gateway

Task's period = 1m

Task's priority = 2

ReaderMainTask:

Task is ready initially

Task is blocked after setting IsCardPresent notification and wait for CardDetached notification from Observer.

Task scan, store cardID and notify other tasks of new card attachment.

Task period: 20 ms

Task priority: 3

EmergencyMainTask:

Task is only ready when EmergencyNotification received from Observer task

Task clears the notification, send message, and go to blocked state again.

Task priority: 4

Task period: 10ms

Shared Data:

IsNewCardPresent

Direct to task notification given by Reader component to Observer , gateway, and display tasks

CardDetached

Direct to task notification given by Observer Task to Display, Reader, and Gateway

EmergencyMessage

Direct to task notification given by Observer Task to Emergency Task

Observer Dataum

A queue of messages provided by Observer and is available to all subscribed components to read only.

CardID

A queue of messages provided by Reader Task and is available to all components to read only.