Team - Project 2

Project Leader

Alexander Fosdick	**Nov 21, 2017**
NAME	**DATE**

Project team member

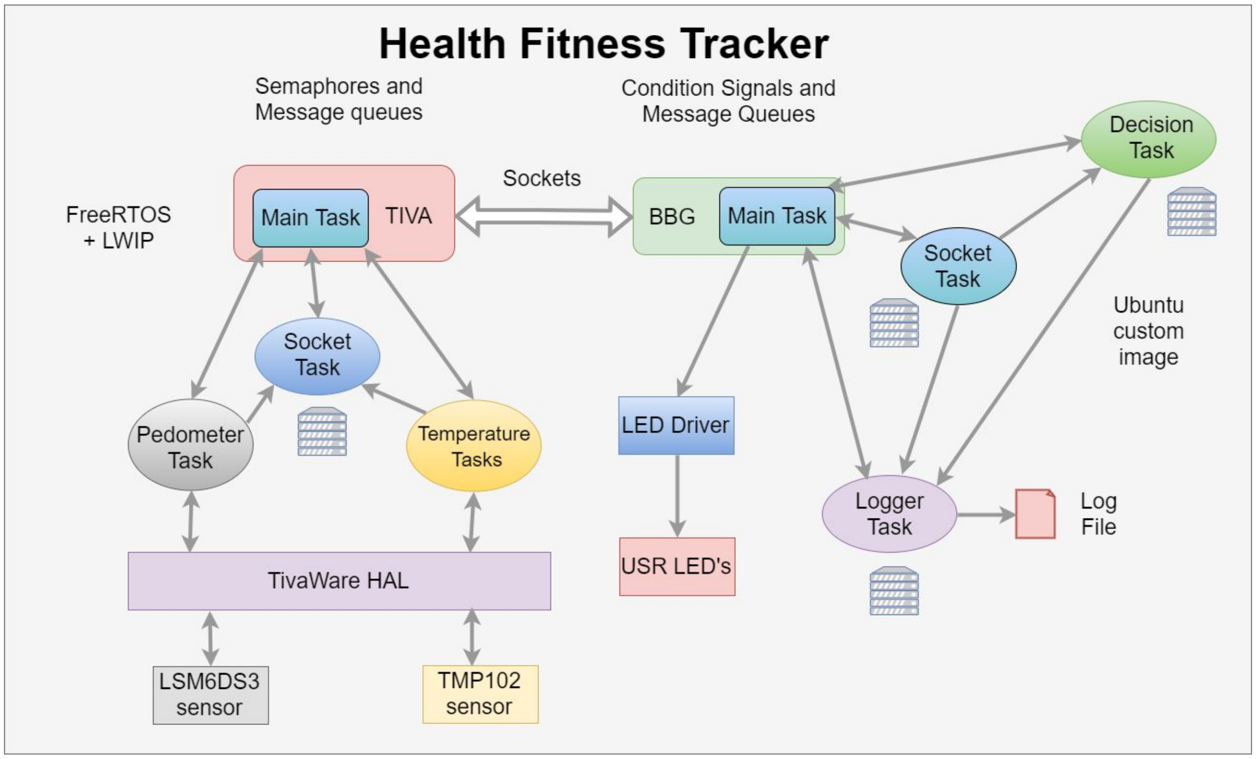
Vihanga Bare	**Nov 21, 2017**
NAME	**DATE**

Project team member

Virag Gada	**Nov 21, 2017**
NAME	**DATE**

Topic - Health Data logging and Storage system.

Software Architecture:



Components:

1. **BeagleBone Green**
2. **Linux OS on BBG**
3. **TIVA Board**
4. **Free RTOS on TIVA**
5. **TIVA ware HAL library**
6. **Temperature Sensor (TMP 106)**
7. **Pedometer (Sparkfun LSM6DS3)**
8. **lwIP API**
9. **BSD Sockets API**

Description - Health Monitoring application (like FitBit) which tracks footsteps and body temperature and sends this data using socket communication to log the data.

TIVA Tasks -

- Pedometer task (Sparkfun LSM6DS3) retrieves data from pedometer sensor (I2C communication). A timer overflow will cause the task to run and retrieve data.
- Temperature task (Sparkfun TMP106) retrieves data from temperature sensor (I2C communication). A timer overflow will cause the task to run and retrieve data.
- Socket task to send above data values over lwIP TCP sockets.
- Main task to monitor all above tasks and create them.

BEAGLEBONE tasks -

- Socket task to receive data over BSD sockets.
- Logger task to log this data into log file depending on the log levels and request.
- Decision task is used to analyze the data sent by the sensors and give a notification to the user based on the values.
- Main task to monitor all above tasks and create them.

Mechanisms -

Userspace Mechanisms -

- Sockets API for TCP sockets
- TIVA ware HAL library for interfacing with all sensors
- I2C libraries to define our own I2C communication API
- Pthreads API(mutex, condition variables) to synchronize communication between multiple thread tasks

Kernel -

- Socket system calls (open, close, read, write)
- Semaphores to synchronize any kernel module data

Data structures -

```
typedef enum loglevel
{
        ALERT,
        WARNING,
        INITIALIZATION,
        INFO,
}LogLevel;

typedef enum{
         MAIN_TASK,
         TEMP_TASK,
         PEDO_TASK,
         SOCKET_TASK,
            LOGGER_TASK,
            DECISION_TASK
          }Sources;

typedef enum{
            LOG_DATA,
            HEARTBEAT,
            DECIDE,
            SYSTEM_SHUTDOWN
}reqCmds;

typedef struct logger
{
  uint8_t sourceId;
  uint8_t requestID;
  uint8_t level;
  float data;
  char timestamp[32];
  char payload[100];
}LogMsg;
```

<u>**Routines highlighted-**</u>

BBG -

```
void initialize_queue(char * qName, mqd_t *msgHandle);
mq_send (queue,(const char*)&loggerstruct, sizeof(LogMsg), 1);
mq_receive (queue,(const char*)&loggerstruct, sizeof(LogMsg), 1);
void create_interval_timer(float timer_val);
void sighandler_sigint(int signum);

void *SocketThread(void *);
void *LoggerThread(void *);
void *DecisionThread(void *args);

write_to_driver();
```

TIVA -

```
void setupLSM6DS3();
void setupI2C2();
void setupTMP102();
void readTMP102(double *digitalTemp);
void readStepCount(uint16_t *stepCount);

void temperatureTask(void *pvParameters);
void pedometerTask(void *pvParameters);
void loggerTask(void *pvParameters);
void socketTask(void *pvParameters);

void vTimerCallBack(void *);

echo_init();
lwIPInit(g_ui32SysClock, pui8MACArray, 0, 0, 0, IPADDR_USE_DHCP);
tcp_write(tpcb,&logmsg,sizeof(LogMsg),1);
tcp_output(tpcb);
```