Program LoRaWAN dengan Library LMIC (LoRaWAN MAC in C)

- **Inisialisasi**

```
#include <lmic.h>
#include <hal/hal.h>
#include <SPI.h>

static const PROGMEM u1_t NWKSKEY[16] = { 0x2E, 0xA8, 0xBD, 0xCA, 0xF4, 0x73, 0x5A,
                                          0x95, 0x29, 0xFD, 0x64, 0xAE, 0x64, 0xE1, 0xF0, 0x82 };
static const u1_t PROGMEM APPSKEY[16] = { 0xE5, 0xDD, 0xE4, 0xF3, 0xFD, 0x95, 0xC2,
                                          0xE1, 0x2D, 0x3A, 0xB8, 0xCF, 0xFD, 0x10, 0xF1, 0x56 };
static const u4_t DEVADDR = 0x26041ECE ;

const lmic_pinmap lmic_pins = {
  .nss = 18,
  .rxtx = 0,
  .rst = 23,
  .dio = {26, 33, 32},
};
```

- **Setup**

```
#ifdef VCC_ENABLE
  // For Pinoccio Scout boards
  pinMode(VCC_ENABLE, OUTPUT);
  digitalWrite(VCC_ENABLE, HIGH);
  delay(1000);
#endif

  os_init();
  LMIC_reset();
  LMIC_setClockError(MAX_CLOCK_ERROR * 1 / 100);

#ifdef PROGMEM
  uint8_t appskey[sizeof(APPSKEY)];
  uint8_t nwkskey[sizeof(NWKSKEY)];
  memcpy_P(appskey, APPSKEY, sizeof(APPSKEY));
  memcpy_P(nwkskey, NWKSKEY, sizeof(NWKSKEY));
  LMIC_setSession (0x13, DEVADDR, nwkskey, appskey);
#else
  LMIC_setSession (0x13, DEVADDR, NWKSKEY, APPSKEY);
#endif
```

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```
#if defined(CFG_as923)
  LMIC_setupChannel(0, 923200000, DR_RANGE_MAP(DR_SF12, DR_SF7),  BAND_CENTI);
#else
# error Region not supported
#endif

  LMIC_setLinkCheckMode(0);
  LMIC.dn2Dr = DR_SF10;
  LMIC_setDrTxpow(DR_SF7, 14);
  do_send(&sendjob);
```

- **Send data**

```
void do_send(osjob_t* j) {
  if (LMIC.opmode & OP_TXRXPEND) {
    Serial.println(F("OP_TXRXPEND, not sending"));
  } else {
    float fVoltage3 =  pzem_3.voltage();

    fVoltage3 = fVoltage3 / 1000;

    uint16_t uVoltage3 = LMIC_f2sflt16(fVoltage3);

    byte bVoltage3Low = lowByte(uVoltage3);
    byte bVoltage3High = highByte(uVoltage3);

    payload[0] = bVoltage3Low;
    payload[1] = bVoltage3High;

    LMIC_setTxData2(1, payload, sizeof(payload) - 1, 0);
  }
}
```

- **Receive data**

```
switch (ev) {
case EV_TXCOMPLETE:
  Serial.println(F("EV_TXCOMPLETE (includes waiting for RX windows)"));
  if (LMIC.txrxFlags & TXRX_ACK) {
    Serial.println(F("Received ack"));
  }
  if (LMIC.dataLen) {
    Serial.println(F("Received "));
    Serial.print(LMIC.dataLen);
    Serial.println(F(" bytes of payload"));
  }

  os_setTimedCallback(&sendjob, os_getTime() + sec2osticks(TX_INTERVAL), do_send);
  break;
}
```

Program Sensor PZEM-004T

- **Inisialisasi**

```
#include <PZEM004Tv30.h>
#define RXD1 14
#define TXD1 13
PZEM004Tv30 pzem_3(&Serial1);
```

- **Setup**

```
Serial1.begin(9600, SERIAL_8N1, RXD1, TXD1);
```

- **Read data**

```
float fVoltage3 = pzem_3.voltage();
float fCurrent3 = pzem_3.current();
float fPower3 = pzem_3.power();
float fPf3 = pzem_3.pf();
float fEnergy3 = pzem_3.energy();
```

- **Reset PZEM**

```
pzem_3.resetEnergy();
```

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Program Realtime Firebase

- **Inisialisasi**

```
#include <FirebaseESP32.h>
#define FIREBASE_HOST "monitoring-energy-2-default-rtdb.firebaseio.com"
#define FIREBASE_AUTH "iIwdDZ1cBkqP9LMaUAo7QXyAN7zvayzb2fkMuT0u"

FirebaseData firebaseData;
```

- **Setup**

```
Firebase.begin(FIREBASE_HOST, FIREBASE_AUTH);
```

- **Read data**

```
if (Firebase.getInt(firebaseData, "/Control_Relay3/valRelay3")) {
  if (firebaseData.dataType() == "int") {
    int val = firebaseData.intData();
    Serial.println(val);
    digitalWrite(led, val);
  }
}
```

Program Waktu

- **Inisialisasi**

```
#include <NTPClient.h>
#include <WiFi.h>
#include <WiFiUdp.h>

const char *ssid     = "...";
const char *password = "qwer1234";
const long utcOffsetInSeconds = 25200;

WiFiUDP ntpUDP;
NTPClient timeClient(ntpUDP, "id.pool.ntp.org", utcOffsetInSeconds);
```

- **Setup**

```
WiFi.begin(ssid, password);
timeClient.begin();
```

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- **Mendapatkan waktu**

```
timeClient.update();
unsigned long epochTime = timeClient.getEpochTime();
struct tm *ptm = gmtime ((time_t *)&epochTime);
int monthDay = ptm->tm_mday;

if (monthDay == 25) {
  if (timeClient.getHours() == 16) {
    if (timeClient.getMinutes() == 3) {
      if (timeClient.getSeconds() >= 30 && timeClient.getSeconds() <= 60) {
        Serial.println("RESET ENERGY");
        pzem_3.resetEnergy();
      }
    }
  }
}
```

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