Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

INTERNET OF THINGS DIGITAL ASSIGNMENT – 1

Submitted By: Awantika Joshi || 19BCE2613

1) Explain M2M technology with a suitable example:

M2M means 'Machine to Machine'. It describes the interplay of billions of gadgets and machines that are related to the net and to every different application. These gadgets integrate computing abilities that permit them to seize facts approximately about the sector around them and proportion this with different related gadgets, growing an intelligent community of 'things' or structures.

The foremost cause of device-to-device generation is to faucet into sensor facts and transmit it to a community. Unlike SCADA or different faraway tracking tools, M2M structures regularly use public networks and get right of entry to methods -- for example, mobile or Ethernet -- to make it extra cost-effective.

Four basic degrees which are common to most M2M primarily based totally packages are as follows:

• Collection of statistics

• Transmission of statistics through a communication network

• Assessment of statistics

• Response to the to be had information

The traits of M2M are as follows:

• Low energy, Low-cost, Low processing power

• Infrequent and small statistics transmissions

• Enormous number of MTC nodes

• Point-to-factor communication

• Low latency and Reliable transmission (QoS)

• No mobility or constrained mobility

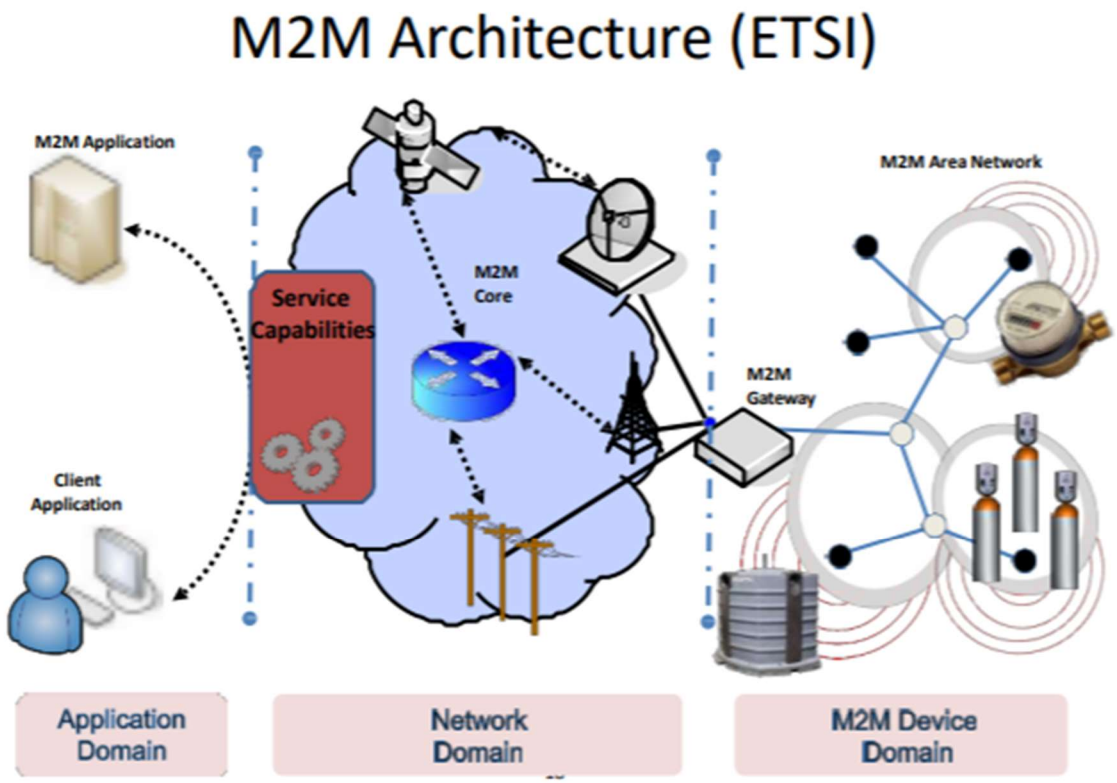


Fig. M2M Architecture

The possibilities in the realm of M2M can be seen in four major use cases, which we've detailed below:

1. MANUFACTURING

Every production surroundings—whether or not its meals processing or well-known product production—is based on generation to make sure fees are controlled nicely and approaches are finished efficiently. Automating production approaches within one of these fast-moving surroundings is anticipated to enhance approaches even more. In the

producing world, this can contain tremendously computerized gadget protection and protection procedures.

For example, M2M gear permit enterprise proprietors to be alerted on their smartphones while a crucial piece of gadget desires servicing, intending to cope with problems as fast as they arise. Sophisticated networks of sensors linked to the Internet may want to even order substitute elements automatically.

2. HOME APPLIANCES

M2M is expected to take home-based IoT to the following level. Manufacturers like LG and Samsung are already slowly unveiling clever domestic appliances to assist make sure a better fine of lifestyles for occupants.

For example, an M2M-successful washing system ought to ship indicators to the owners' clever gadgets as soon as it finishes washing or drying, and a clever fridge ought to automatically order groceries from Amazon as soon as its stock is depleted. There are many more examples of domestic automation which could probably enhance fine of lifestyles for residents, along with structures that permit contributors of the family to remotely manage structures the usage of their cellular gadgets. In conditions wherein a the homeowner makes a decision to go away paintings early, she or he ought to touch the house heating machine earlier than leaving paintings to ensure the temperature at domestic will be crust upon arrival.

3. HEALTHCARE DEVICE MANAGEMENT

One of the biggest opportunities for M2M technology is in the realm of health care. With M2M technology, hospitals can automate processes to ensure the highest levels of treatment. Using devices that can react faster than a human healthcare professional in an emergency situation make this possible. For instance, when a patient's vital signs drop below normal, an M2M-connected life support device could automatically administer oxygen and additional care until a healthcare professional arrives on the scene. M2M also allows patients to be monitored in their own homes instead of in hospitals or care centers. For example, devices that track a frail or elderly person's normal movements can detect when he or she has had a fall and alert a healthcare worker to the situation.

4. SMART UTILITY MANAGEMENT

In the brand new age of strength efficiency, automation will speedy come to be the brand new normal. As strength businesses search for new approaches to automate the metering process, M2M involves the rescue, assisting strength businesses mechanically acquire strength intake data, a good way to correctly invoice customers. Smart meters

can music how a whole lot strength a family or enterprise makes use of and mechanically alert the strength company, which supplants sending out an worker to study the meter or requiring the customer to offer a reading. This is even extra essential as utilities flow in the direction of extra dynamic pricing models, charging customers extra for strength utilization at some point of peak times.

The challenges M2M means Smart: Smart services, Smart connectivity, Smart devices. Smart implies challenges:

- Coordination of devices (multiple locations, special device sorts and vendors)
- Complicated interplay logic
- Hardware limitations (RAM,CPU)
- Interoperability issues
- Various communication / control protocols

M2M V/S IoT:

While many use the phrases interchangeably, M2M and IoT arent the same. IoT wishes M2M, however, M2M does now no longer want IoT.

Both phrases relate to the conversation of related gadgets, however, M2M structures are regularly isolated, stand-on my own networked equipment. IoT structures take M2M to the subsequent level, bringing collectively disparate structures into one large, related ecosystem. Data accumulated from M2M gadgets are used by carrier control applications, while IoT statistics are regularly included with corporation structures to enhance commercial enterprise overall performance throughout more than one group.

Communication Protocol Differences:

- **M2M**

– Uses propriety or nonIP based communication protocols for communication within M2M area networks

– Common protocols include Zigbee, Bluetooth, Modbus, Bus, Wireless, etc.

- **IoT**

– HTTP, CoAP, Web sockets, MQTT, XMPP, DDS, AMQP

M2M vs. IoT: What's the difference?

M2M	IoT
Machines	Sensors
Hardware-based	Software-based
Vertical applications	Horizontal applications
Deployed in a closed system	Connects to a larger network
Machines communicating with machines	Machines communicating with machines, humans with machines, machines with humans
Uses non-IP protocol	Uses IP protocols
Can use the cloud, but not required to	Uses the cloud
Machines use point-to-point communication, usually embedded in hardware	Devices use IP networks to communicate
Often one-way communication	Back and forth communication
Main purpose is to monitor and control	Multiple applications; multilevel communications
Operates via triggered responses based on an action	Can, but does not have to, operate on triggered responses
Limited integration options, devices must have complementary communication standards	Unlimited integration options, but requires software that manages communications/protocols
Structured data	Structured and unstructured data

History of M2M

While the origins of the acronym are unverified, the primary use of machine-to-machine communication is frequently credited to Theodore Paraskevakos, who invented and patented era associated with the transmission of data over telephone lines, the idea for modern-day caller ID.

Nokia turned into one of the primary groups to apply the acronym within side the overdue 1990s. In 2002, it partnered with Opto 22 to provide M2M wi-fi communique offerings to its customers.

In 2003, "*M2M Magazine"* launched. The e-book has since described the six pillars of M2M as faraway monitoring, RFID, sensor networking, clever offerings, telematics, and telemetry.

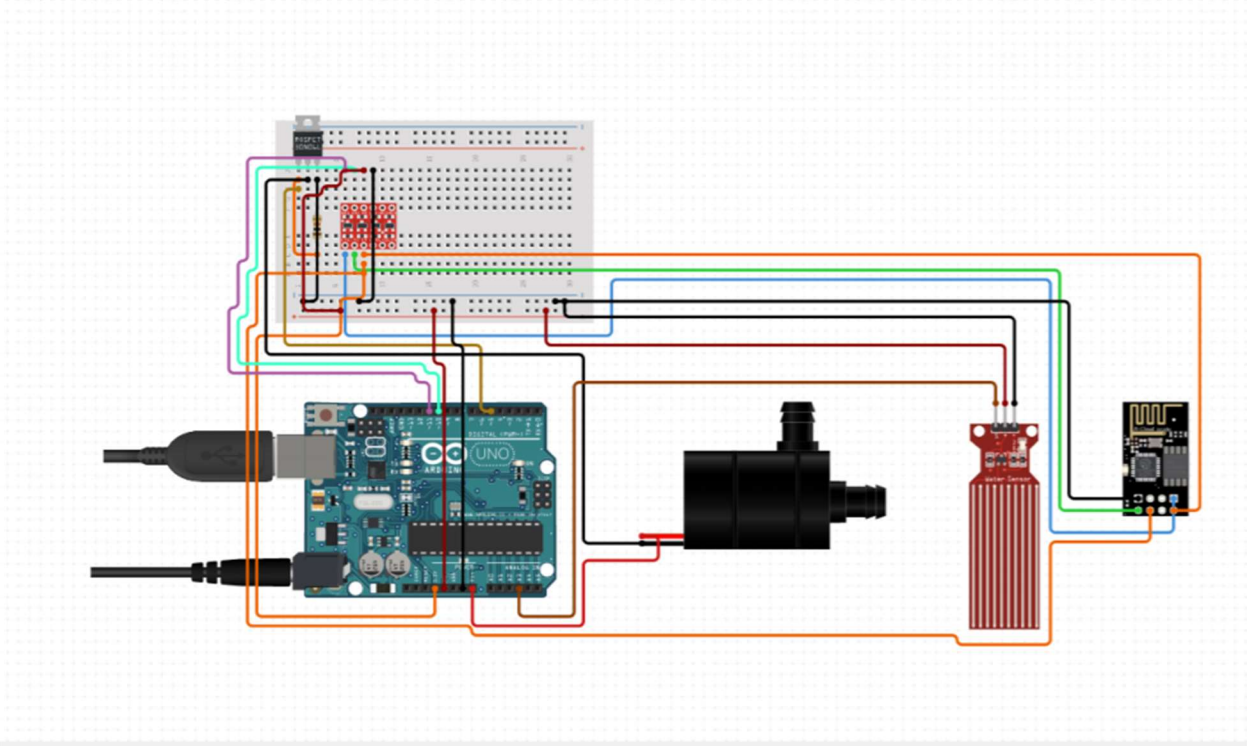
2. Design a module for smart city, named smart municipal water release approach. The tank should have two sensors one is to identify the maximum tank capacity and the other is to maintain the minimum water level as a backup. The tank should automatically release the water at a particular time on every day. The water which is released by tank should be noted in online cloud. Consider ThingSpeak / Amazon Web Service (AWS) for this process. Design the same using any simulator (TinkerCad) / NodeMCU / others and display the diagram here:

Inventory:-

1. Arduino uno
2. Bread Board – Half Size
3. Submersible Pool Water Pump
4. Water Flow Sensor G1/2
5. Water lever Sensor Model
6. Wifi Moduel (ESP-8266)
7. Jumper Wires
8. Logic Level Converter Bi-Directional
9. 10K Ohm Resistor

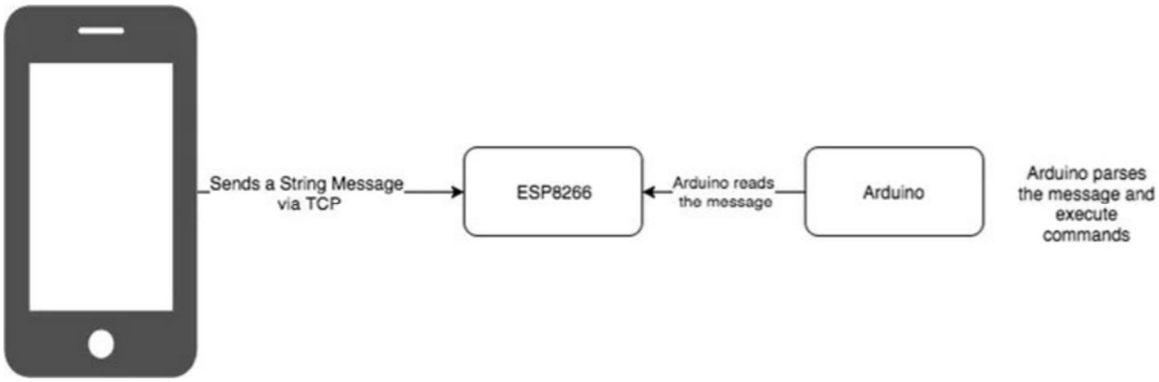
10. N-Channel MOSFET 60V 30A

Circuit Diagram:-



Reference: - The Diagram was created using the website “circuit.io”.

Communication Process for ESP8266



Cloud Connectivity: - We store the data read by the sensors on the cloud using things speak.

Code:-

```
#include <SoftwareSerial.h>

SoftwareSerial espSerial = SoftwareSerial(2,3);

// arduino RX pin=2 arduino TX pin=3 connect the arduino RX pin to esp8266 module TX pin -

connect the arduino TX pin to esp8266 module RX pin

float Water_flow =A0; //water level sensor

float Water_pressure= A1; //Water Pressure Sensor

float level_value;

float flow_value;

int motor =5;

String apiKey = "5G0NEIEWV7FQWERTY"; // replace with your channel's thingspeak WRITE API

key

String ssid="kavin"; // Wifi network SSID

String password ="12345612"; // Wifi network password

boolean DEBUG=true;
```

```
#define VOLTAGE_MAX 5.0
#define VOLTAGE_MAXCOUNTS 1023.0
//=========================
showResponse====================================
void showResponse(int waitTime){
long t=millis();
char c;
while (t+waitTime>millis()){
if (espSerial.available()){
c=espSerial.read();
if (DEBUG) Serial.print(c);
}
}
}
//======================connection to
thinkspeak.com================================================
boolean thingSpeakWrite(float value1){
String cmd = "AT+CIPSTART=\"TCP\",\""; // TCP connection
cmd += "184.106.153.149"; // api.thingspeak.com
cmd += "\",80";
espSerial.println(cmd);
if (DEBUG) Serial.println(cmd);
if(espSerial.find("Error"))
{
if (DEBUG) Serial.println("AT+CIPSTART error");
return false;
}
String getStr = "GET /update?api_key="; // prepare GET string
getStr += apiKey;
```

```
getStr +="&field1=";
getStr += String(value1);
//getStr +="&field2=";
//getStr += String(value2);
// ...
getStr += "\r\n";
// send data length
cmd = "AT+CIPSEND=";
cmd += String(getStr.length());
espSerial.println(cmd);
if (DEBUG) Serial.println(cmd);
delay(100);
if(espSerial.find(">"))
{
espSerial.print(getStr);
if (DEBUG) Serial.print(getStr);
}
else
{
espSerial.println("AT+CIPCLOSE");
// alert user
if (DEBUG)
{ Serial.println("AT+CIPCLOSE");
return false;
}
return true;
}
//==============================setup==============================
=======
```

```
void setup() {
DEBUG=true; // enable debug serial
//----------my sensor code-----------
pinMode(LED_BUILTIN, OUTPUT);
pinMode(motor, OUTPUT);
pinMode(Water_flow,INPUT);
pinMode(Water_pressure,INPUT)
Serial.begin(9600);
espSerial.begin(115200); // enable software serial
// Your esp8266 module's speed is probably at 115200.
// For this reason the first time set the speed to 115200 or to your esp8266 configured speed
// and upload. Then change to 9600 and upload again
//espSerial.println("AT+RST"); // Enable this line to reset the module;
//showResponse(1000);
//espSerial.println("AT+UART_CUR=9600,8,1,0,0"); // Enable this line to set esp8266 serial speed to
9600 bps
//showResponse(1000);
espSerial.println("AT+CWMODE=1"); // set esp8266 as client
showResponse(1000);
espSerial.println("AT+CWJAP=\""+ssid+"\",\""+password+"\""); // set your home router SSID and
password
showResponse(5000);
if (DEBUG) Serial.println("Setup completed");
}
//
==============================loop==============================
===
```

```
void loop() {
//---------my gas sensor value reading-------------------
level_value= analogRead(Water_flow);
flow_value=analogRead(Water_pressure);
delay(1); //delay in between reads for stability
float t = level_value(VOLTAGE_MAX / VOLTAGE_MAXCOUNTS);
float f = flow_value(VOLTAGE_MAX / VOLTAGE_MAXCOUNTS);
thingSpeakWrite(t); // Write values to thingspeak
// thingspeak needs 15 sec delay between updates, */
delay(20000);
thingSpeakWrite(f);
delay(20000);
//motor condition
if(t<=80){
digitalWrite(motor,HIGH);
}else{
digitalWrite(motor,LOW);
}
}
```

SmallSEOTools

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