







# **Internet of Things (IoT) as input system of GISc**

**Dr. Eko Budiyanto**

# Navigating the next industrial revolution

Revolution	Year	Information	
	1	1784	Steam, water, mechanical production equipment
	2	1870	Division of labour, electricity, mass production
	3	1969	Electronics, IT, automated production
	4	?	Cyber-physical systems

# IoT

*Definition*

the use of intelligently connected devices and systems to leverage data gathered by embedded sensors and actuators in machines and other physical objects.

GSM Association, 2014

# IoT

*Definition*

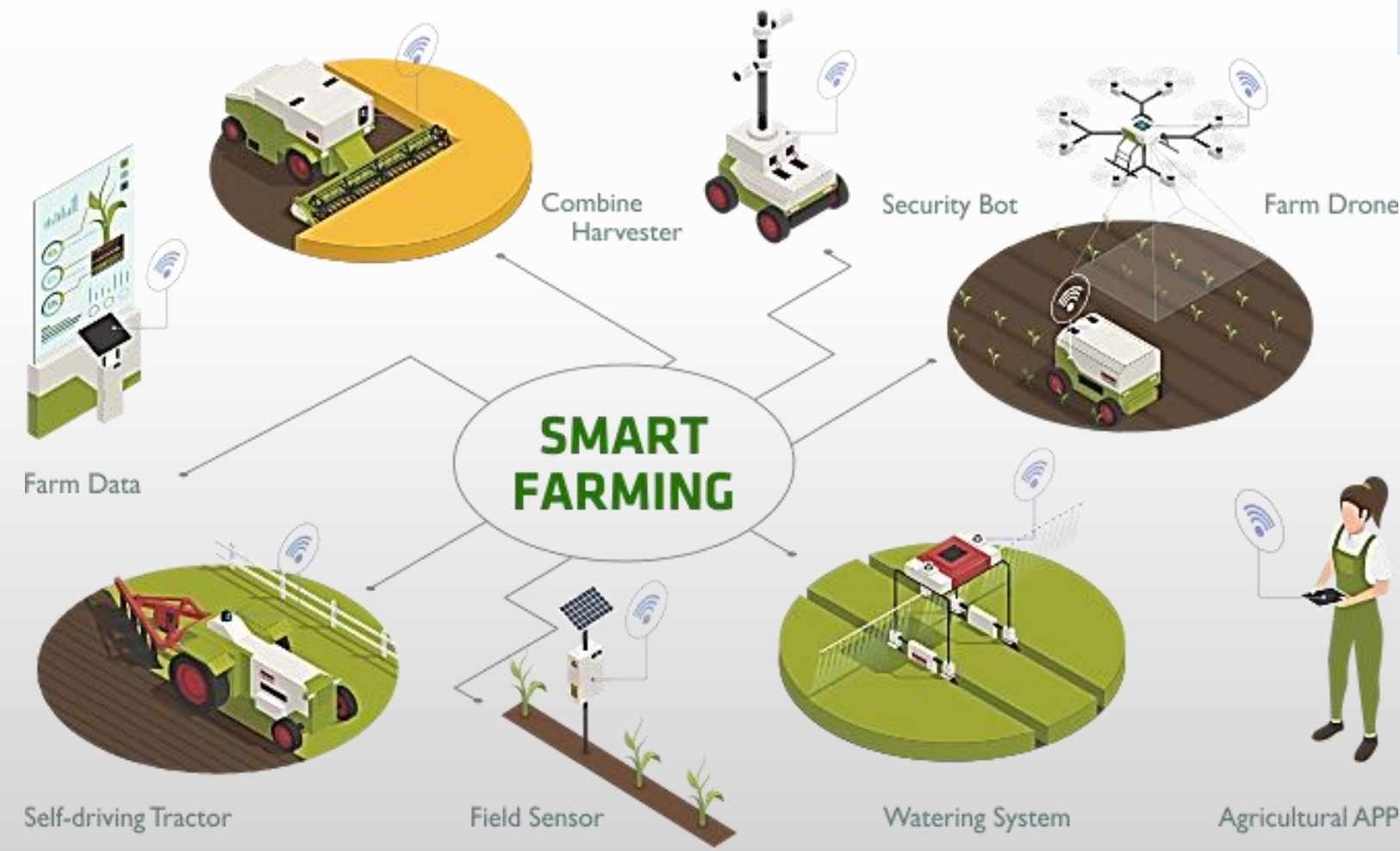
a system of interrelated devices connected to a network and/or to one another, exchanging data without necessarily requiring human-to-machine interaction

Patricia Moloney Figliola, 2020

# IoT

## Example of IoT Application

- Environment
- Security
- Agricultural
- Military



Monitoring of weather, water quality, soil, air, etc

Traffic light, traffic cctv, etc

Cctv environment etc

Smart farming tools

Armament and defense systems

# IoT

*Smart Capabilities*



## Monitoring

External environment monitoring

## Control

Product function control

## Optimization

Predictive diagnostic, Product performance, Cost reduction

## Autonomy

Autonomous product enhancement, Self diagnostic & repair

## Efficient decision

Real-time data for decision making

**IoT** *Element*

**IoT**  
**Devices**

- **Sensors**
- **Actuators**
- **Cyber-physical control loops**
- **Robotic components**

Emmanuel Bacelli, 2021

## T IoT Functional Component

- ❖ Module for interaction with local IoT devices
- ❖ Module for local analysis and processing
- ❖ Module for interaction with remote IoT devices
- ❖ Module for application specific data analysis & processing
- ❖ User interface



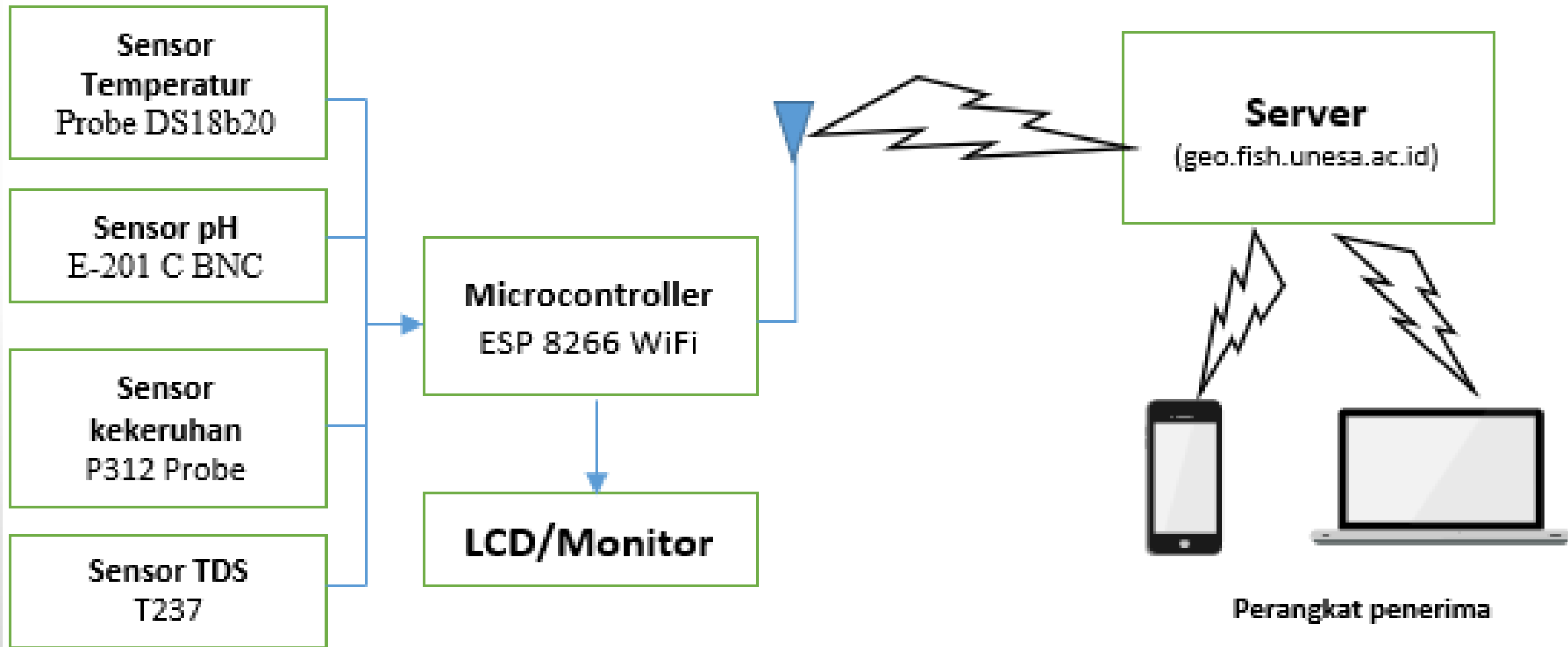
# IoT

*Element*

- **Physical objects (hardware) equipped with IoT modules,**
- **Internet connection device,**
- **Cloud data center**

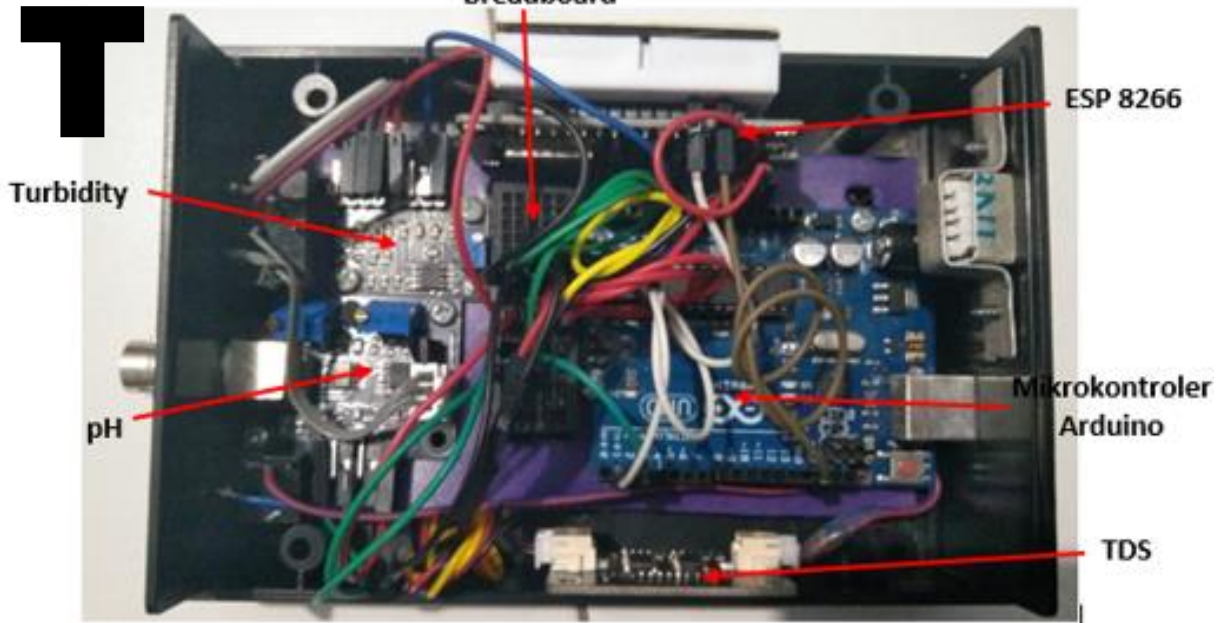
(Efendi, 2018)

# IoT Element

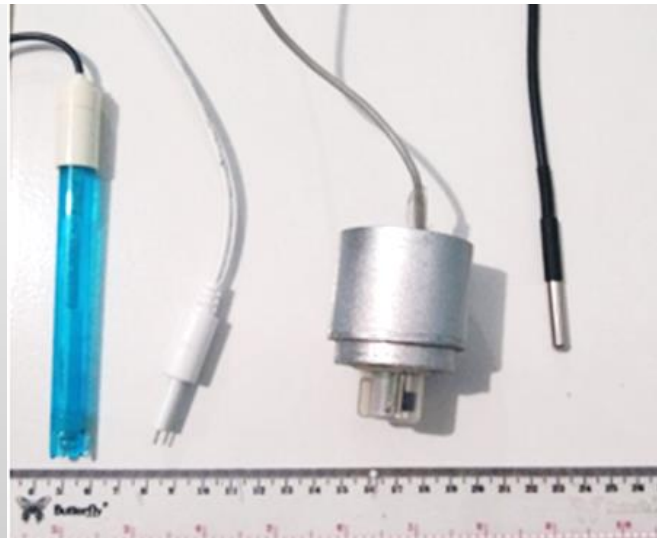


(Budiyanto, 2021)

# IoT Hardware Element



(Budiyanto, 2021)



## PENGEMBANGAN PERANGKAT KERAS Sistem Monitoring Kualitas Air

Sistem perangkat sensor terpasang

Turbidity

TDS

pH

Suhu

Microcontroller

Data Kualitas Air

WSN- IoT Based

# IoT Hardware Element



(Budiyanto, 2021)

# lo Cloud Data (Database) Element

# T

## MySQL Database

The screenshot displays the phpMyAdmin interface for a MySQL database named 'geofish\_watermonitor2021' on a localhost server. The interface includes a navigation sidebar on the left with a tree view of the database structure, including tables like 'data\_admin', 'data\_realtime', 'data\_sensor', and 'pelanggan\_gangguan'. The main area shows a table structure overview with columns for Table, Action, Rows, Type, Collation, Size, and Overhead. The table list includes 9 tables, with a total of 555 rows and 144 KiB size. The interface also features a top navigation bar with options like Structure, SQL, Search, Query, Export, Import, Operations, Routines, Events, Triggers, and More. At the bottom, there is a 'Check all' checkbox and a 'With selected:' dropdown menu.

Table	Action	Rows	Type	Collation	Size	Overhead
<input type="checkbox"/> data_admin	★ Browse Structure Search Insert Empty Drop	5	InnoDB	utf8_general_ci	16 KiB	-
<input type="checkbox"/> data_realtime	★ Browse Structure Search Insert Empty Drop	1	InnoDB	utf8_general_ci	16 KiB	-
<input type="checkbox"/> data_sensor	★ Browse Structure Search Insert Empty Drop	1	InnoDB	utf8mb4_general_ci	16 KiB	-
<input type="checkbox"/> pelanggan_gangguan	★ Browse Structure Search Insert Empty Drop	0	InnoDB	utf8_general_ci	16 KiB	-
<input type="checkbox"/> pelanggan_id	★ Browse Structure Search Insert Empty Drop	136	InnoDB	utf8_general_ci	16 KiB	-
<input type="checkbox"/> pelanggan_meter	★ Browse Structure Search Insert Empty Drop	137	InnoDB	utf8mb4_general_ci	16 KiB	-
<input type="checkbox"/> pelanggan_pemakaian	★ Browse Structure Search Insert Empty Drop	136	InnoDB	utf8_general_ci	16 KiB	-
<input type="checkbox"/> pelanggan_pemakaian_backup8	★ Browse Structure Search Insert Empty Drop	129	InnoDB	utf8_general_ci	16 KiB	-
<input type="checkbox"/> total_pemakaian	★ Browse Structure Search Insert Empty Drop	10	InnoDB	utf8_general_ci	16 KiB	-
<b>9 tables</b>	<b>Sum</b>	<b>555</b>	<b>InnoDB</b>	<b>utf8_general_ci</b>	<b>144 KiB</b>	<b>0 B</b>

↑  Check all With selected: ▾

(Budyanto, 2021)

# IoT Software Element

## Sketch

(Budyanto, 2021)

```
#include <OneWire.h>
#include <DallasTemperature.h>
#define ONE_WIRE_BUS 2

OneWire
oneWire(ONE_WIRE_BUS);
DallasTemperature
sensor(&oneWire);

int tdspin = A0;
int turbidpin = A1;
int datatds,dataturbid,data4 ;
float temperatur;
String datasensor;

void setup()
{
    Serial.begin(9600);
    sensor.begin();
}

void loop()
{
    // AMBIL DATA TDS
    datatds = analogRead(tdspin);

    // AMBIL DATA TURBIDITY
    dataturbid = analogRead(turbidpin);

    // AMBIL DATA TEMPERATUR
    //sensors.setResolution(11);

    sensor.requestTemperatures();
    temperatur =sensor.getTempCByIndex(0);

    //String datasensor = String(datatds)
    +("#")+String(dataturbid)+("#")+ String(temperatur) ;

    Serial.println(datasensor);

    Serial.print("TDS = "); Serial.println(datatds);
    Serial.print("Turbidity = "); Serial.println(dataturbid);
    Serial.print("Temperatur = ");
    Serial.println(temperatur,4);

    Serial.println("-----");
    delay(10000);
}
```

# IoT Interface Element

UNESA Universitas Negeri Saragayu

## SMART WATER QUALITY MONITORING and MANAGEMENT SYSTEM (SWQ2MS)

Spamdus Pedukuhan Genjahan - Desa Genjahan Kecamatan Ponjong, Kabupaten Gunungkidul

Kualitas Air

- Saat ini
- Data Seri
- Peta

Pelanggan

- Baru
- Daftar
- Info Lokasi

Pemakaian

- Catat Meter
- Bayar
- Rekap

Skim Prototype Industri  
Prodi Pendidikan Geografi-FISH-UNESA-2021

SMART WATER QUALITY MONITORING AND MANAGEMENT SYSTEM (SWQ2MS)

### PETA JARINGAN

Spamdus Genjahan, Desa Genjahan, Kecamatan Ponjong, Kabupaten Gunungkidul

Kembali 1/2" 3/4" 1" 2" Fasum Pelanggan

SMART WATER QUALITY MONITORING AND MANAGEMENT SYSTEM (SWQ2MS)

### GRAFIK TDS

Spamdus Genjahan, Desa Genjahan, Kecamatan Ponjong, Kabupaten Gunungkidul

Data saat ini

# 210.00

ppm

Standar Air Bersih  
...ppm - ... ppm

Standar Air Minum  
...ppm - ... ppm

Kembali pH TDS Temperatur Kekeruhan

# IoT

*What to learn*

# IoT Devices

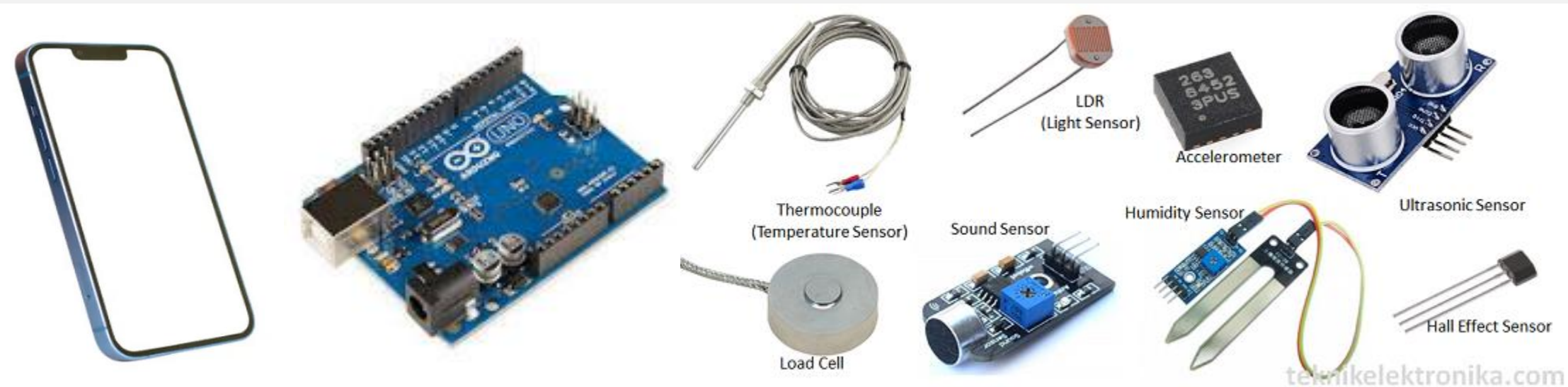
- **Hardware** : Sensors, microcontroller, server, output device
- **Software** : sketch, php, html, javascript, OpenLayers
- **Database** : phpMyAdmin, MySQL
- **Network** : Wifi, GSM

```
#include <OneWire.h>
#include
<DallasTemperature.h>
#define ONE_WIRE_BUS 2

OneWire
oneWire(ONE_WIRE_BUS);
DallasTemperature
sensor(&oneWire);
```

```
int tdspin = A0;
int turbidpin = A1;
int datatds,dataturbid,data4 ;
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void setup()
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}
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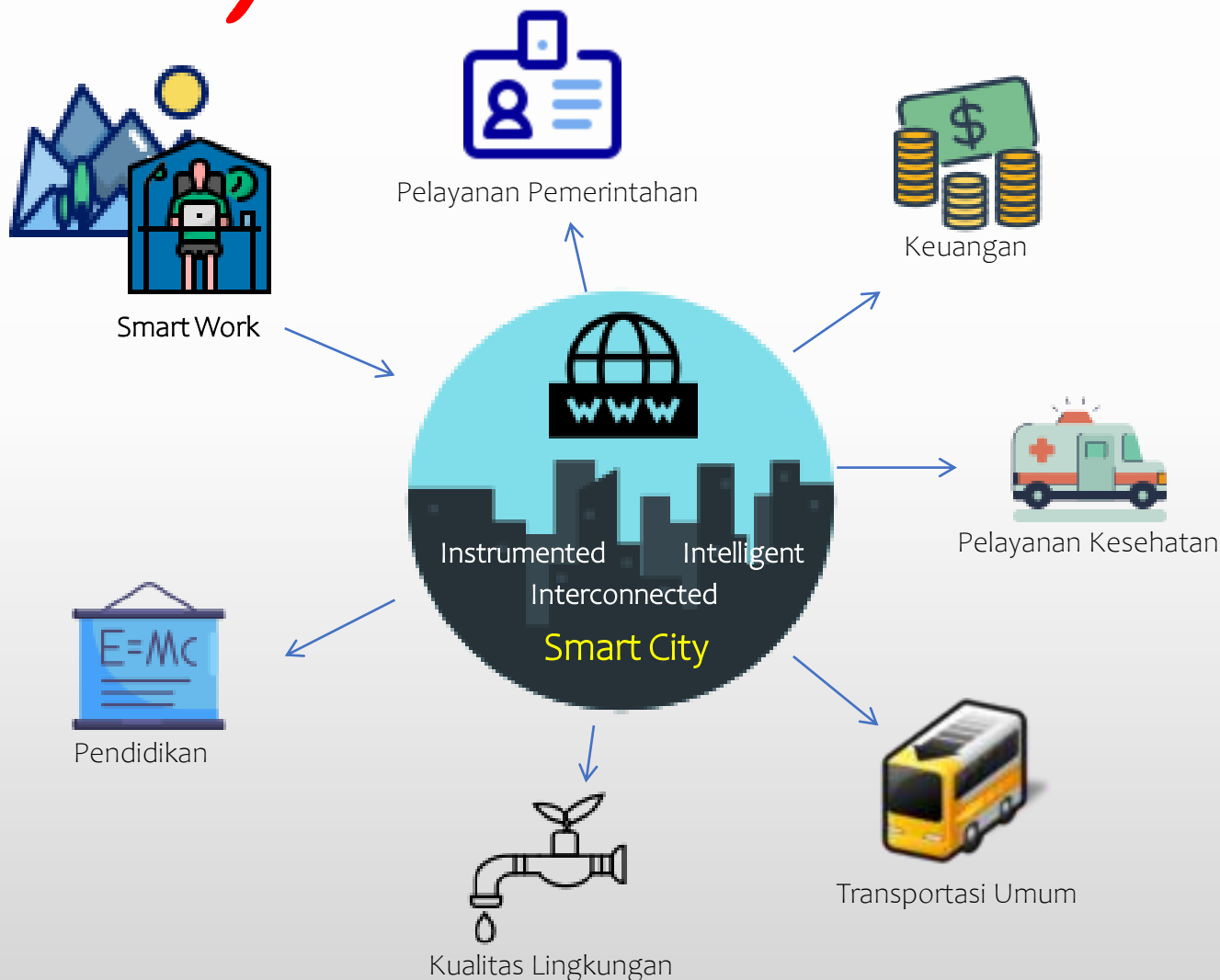




# IoT

Research topics to support Indonesian smart city concept

## Smart City



a **city management** concept based on **Information and Communication Technology (ICT)** so that cities become **smarter** and more **efficient** in the utilization of various existing resources, as well as **improving service and quality the life** of the urban community while still **prioritizing environmental sustainability**.



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NASIONAL IBU KOTA  
NUSANTARA  
TAHUN 2022-2042



Kementerian  
PUPR RI

**lo**

**T** *Thank You*