i-Bindya™ Technologies

Innovation • Intelligence • Information

Presents

IoT CHALLENGE 2020

15th March 2020

AAKAAR , IIT Bombay

GITHUB.COM/SINKU1196

INTERNET OF THINGS

SINKU KUMAR

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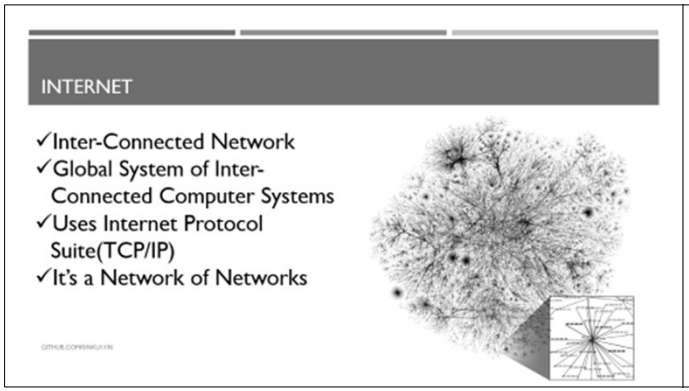
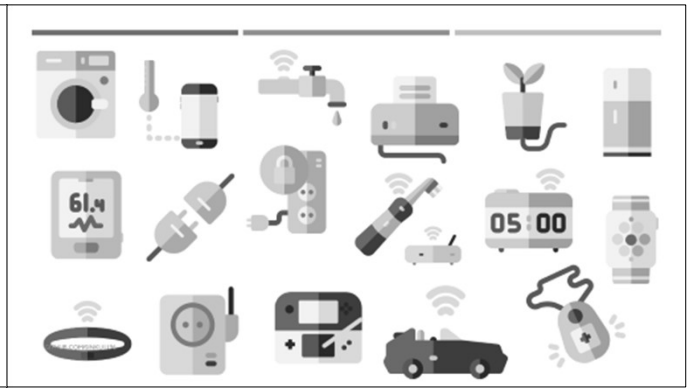
AGENDA

- Introduction
- IoT vs Others
- Reference Models
- I/O Interface
- Domain Specific IoT
- Development Boards
- Day 1 Hands-On
- Day 2 Hands-On
- Task Based Competition
- Atmel Studio Installation
- USBasp Driver Installation
- AVR Dude Configuration
- USB-TTL Driver Installation
- Serial Terminal Installation

INTERNET OF THINGS

Data → Information → Knowledge





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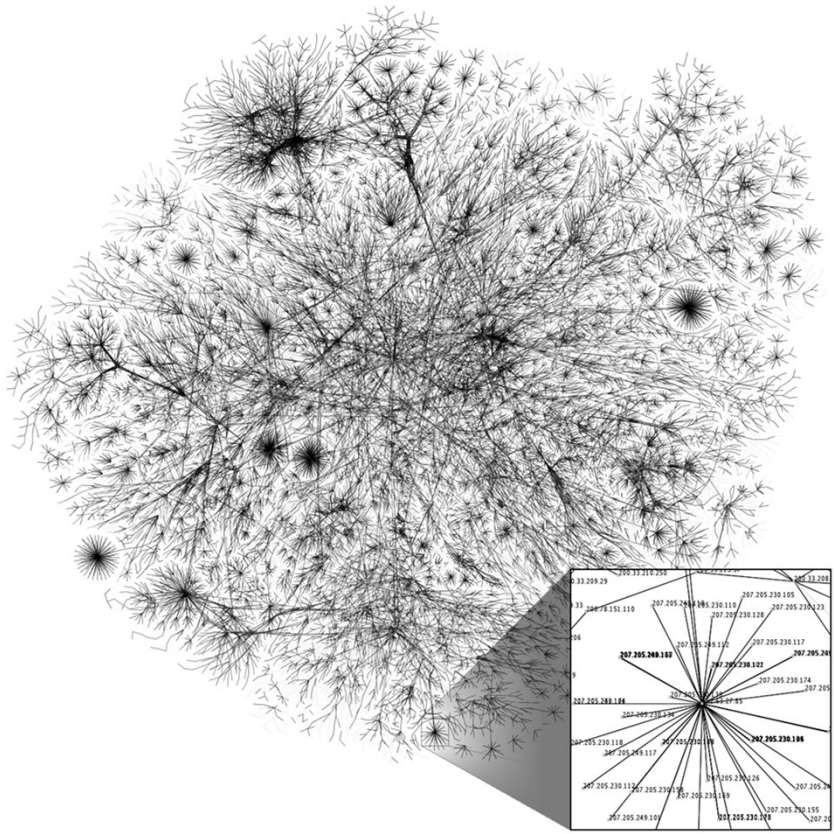
INTERNET

- ✓Inter-Connected Network
- ✓Global System of Inter-Connected Computer Systems
- ✓Uses Internet Protocol Suite(TCP/IP)
- ✓It's a Network of Networks



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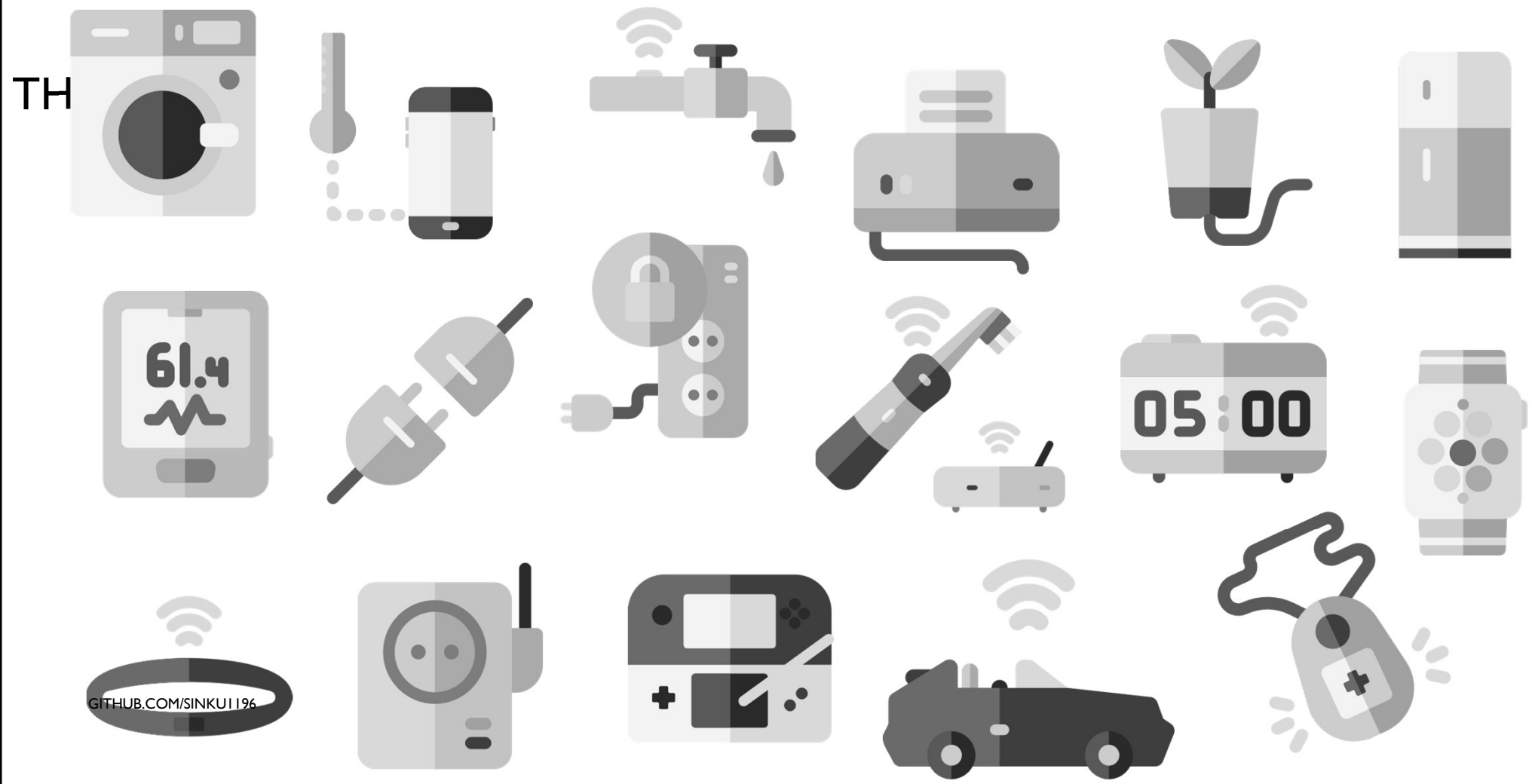

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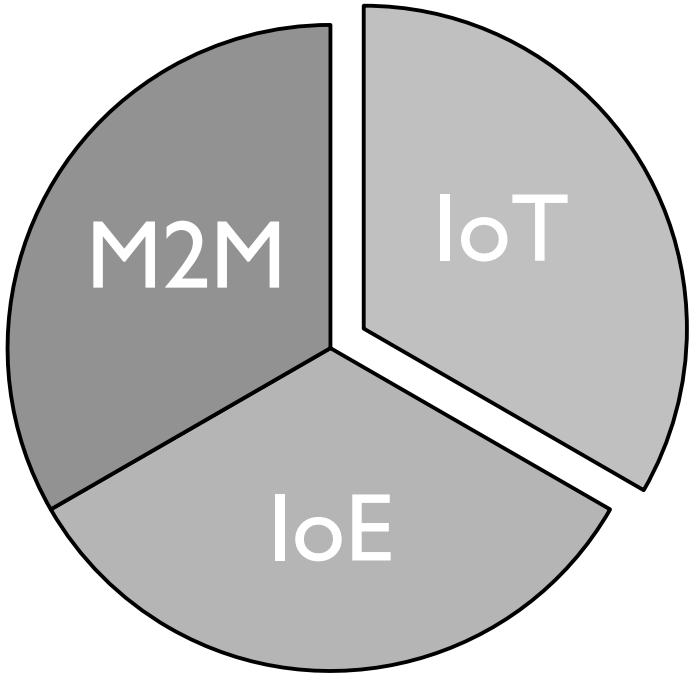
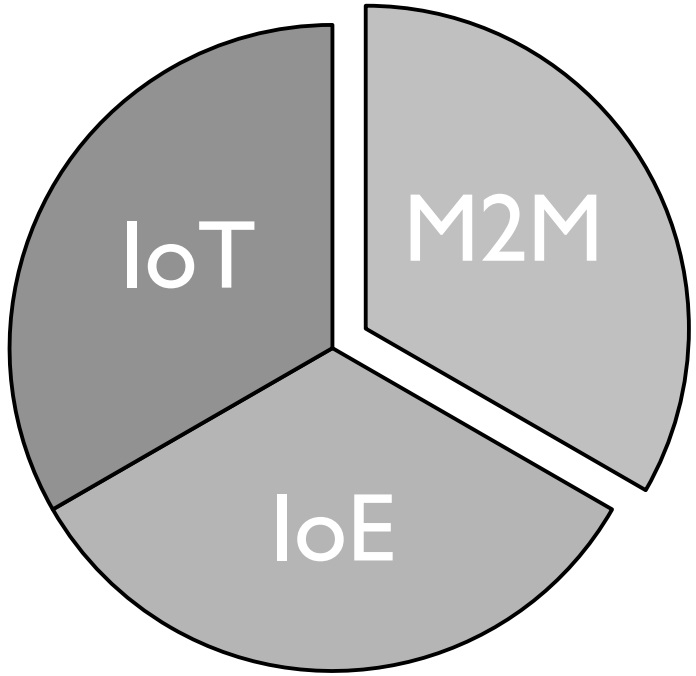
IOT VS IOE VS M2M

- ✓Internet of Things
- ✓Allows physical devices to connect with each other
  - ✓Connect
  - ✓Control
  - ✓Sense



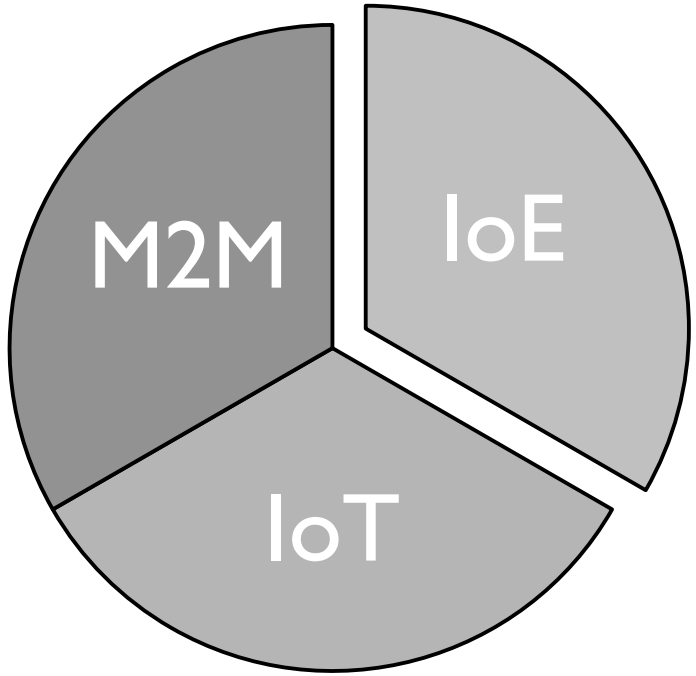
IOT VS IOE VS M2M

- ✓Machine to Machine
- ✓Used for Over 10 years
- ✓Notable in Telecom Area
- ✓Connects One Machine to Another



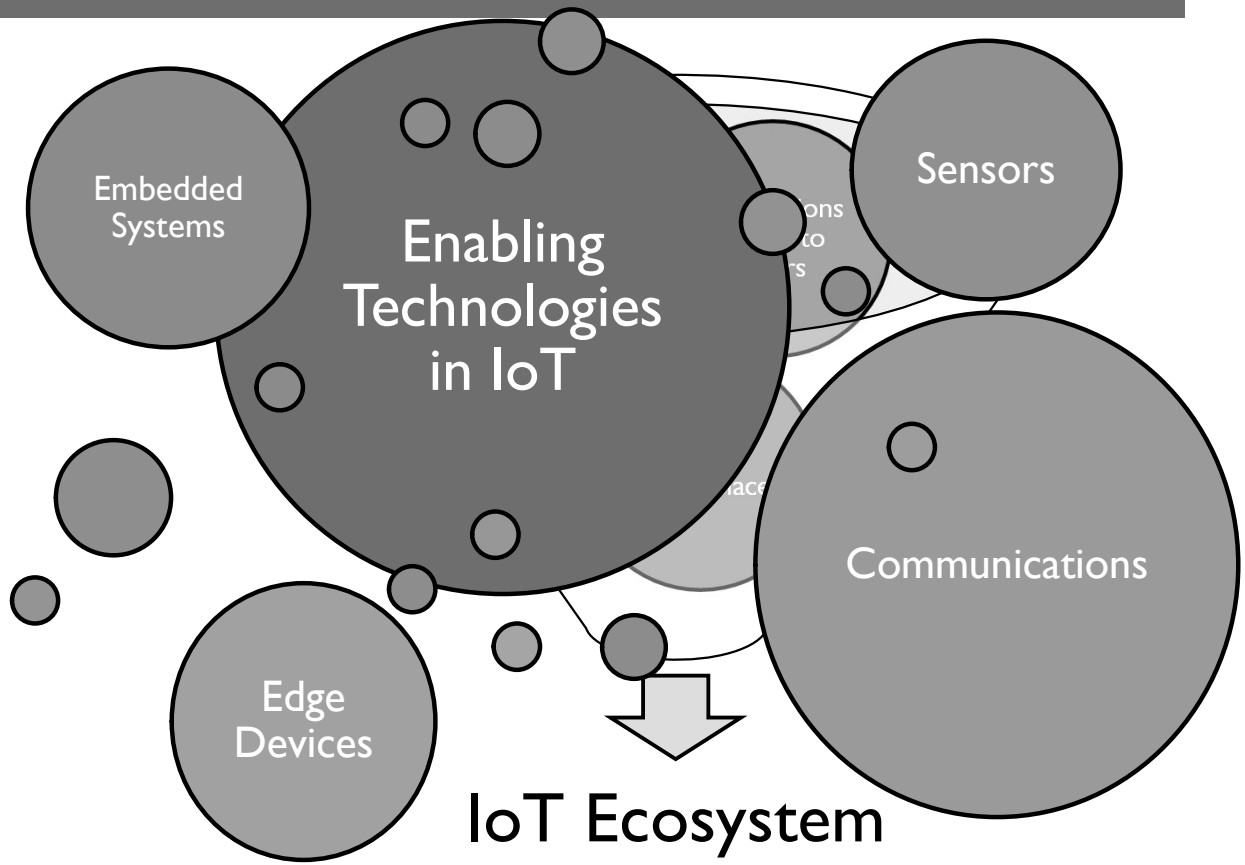
IOT VS IOE VS M2M

- ✓Internet of Everything
- ✓Unclear Idea
- ✓IoE Incorporates Wide range of Associations
- ✓The Idea Has Consequently The Most Astounding Scope

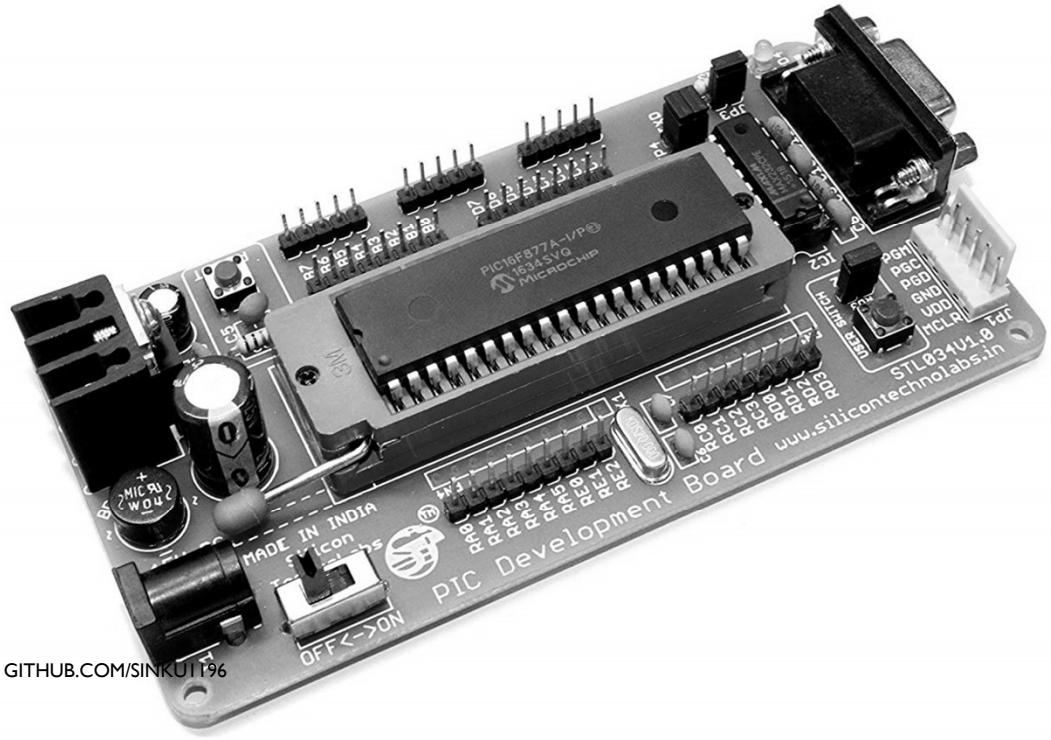


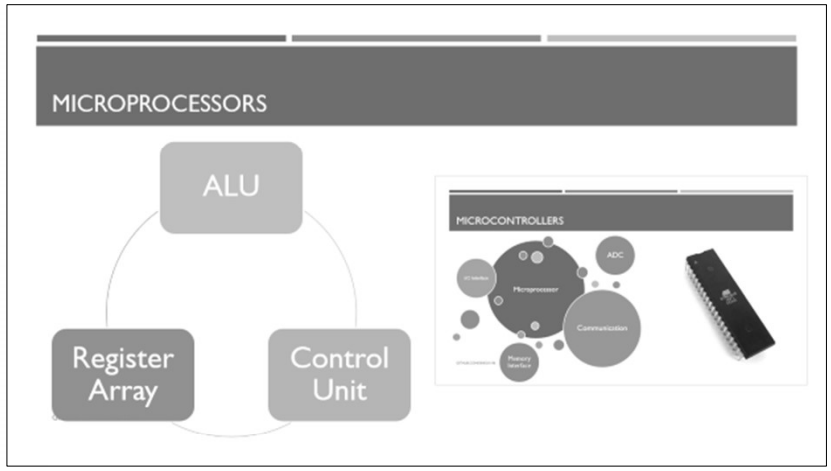
IOT ECOSYSTEM

- Components that enable businesses, governments, and consumers to connect.
- Includes
  - Remotes
  - Dashboards
  - Networks
  - Gateways
  - Analytics
  - Data Storage
  - Security



DEVELOPMENT BOARD





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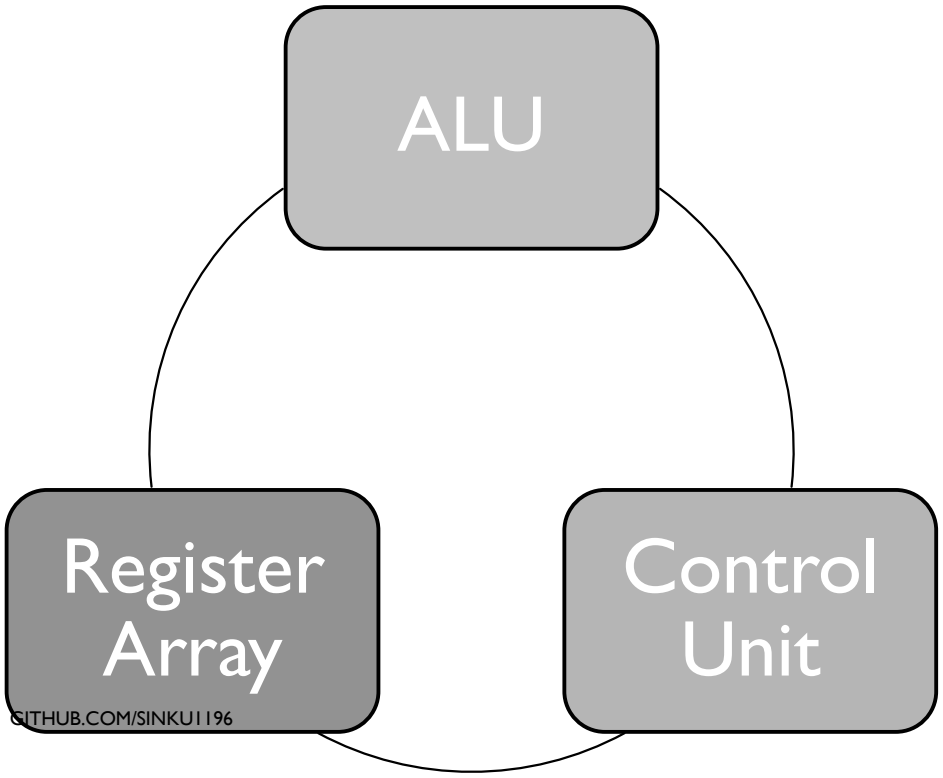
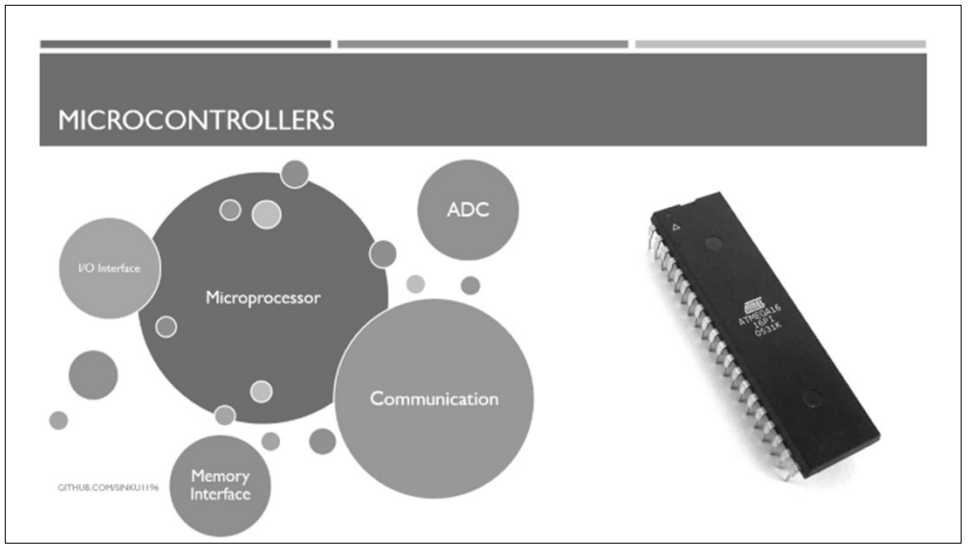
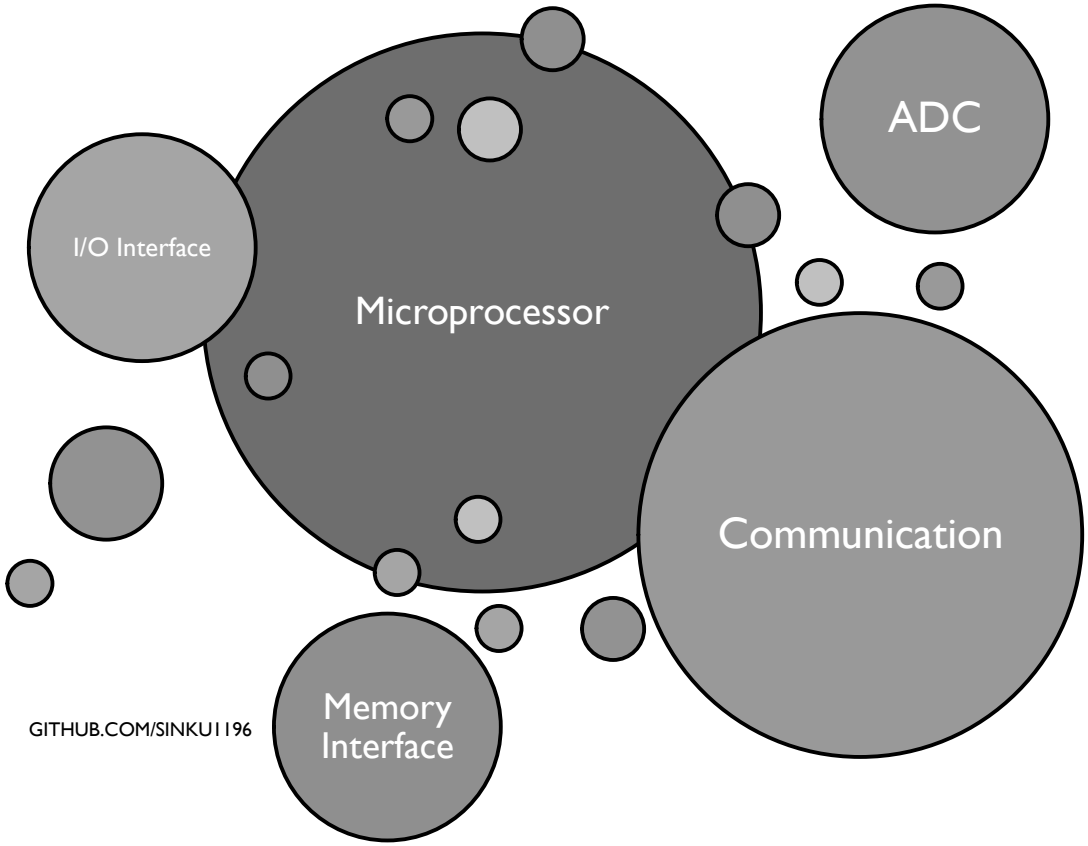
MICROPROCESSORS





MICROCONTROLLERS



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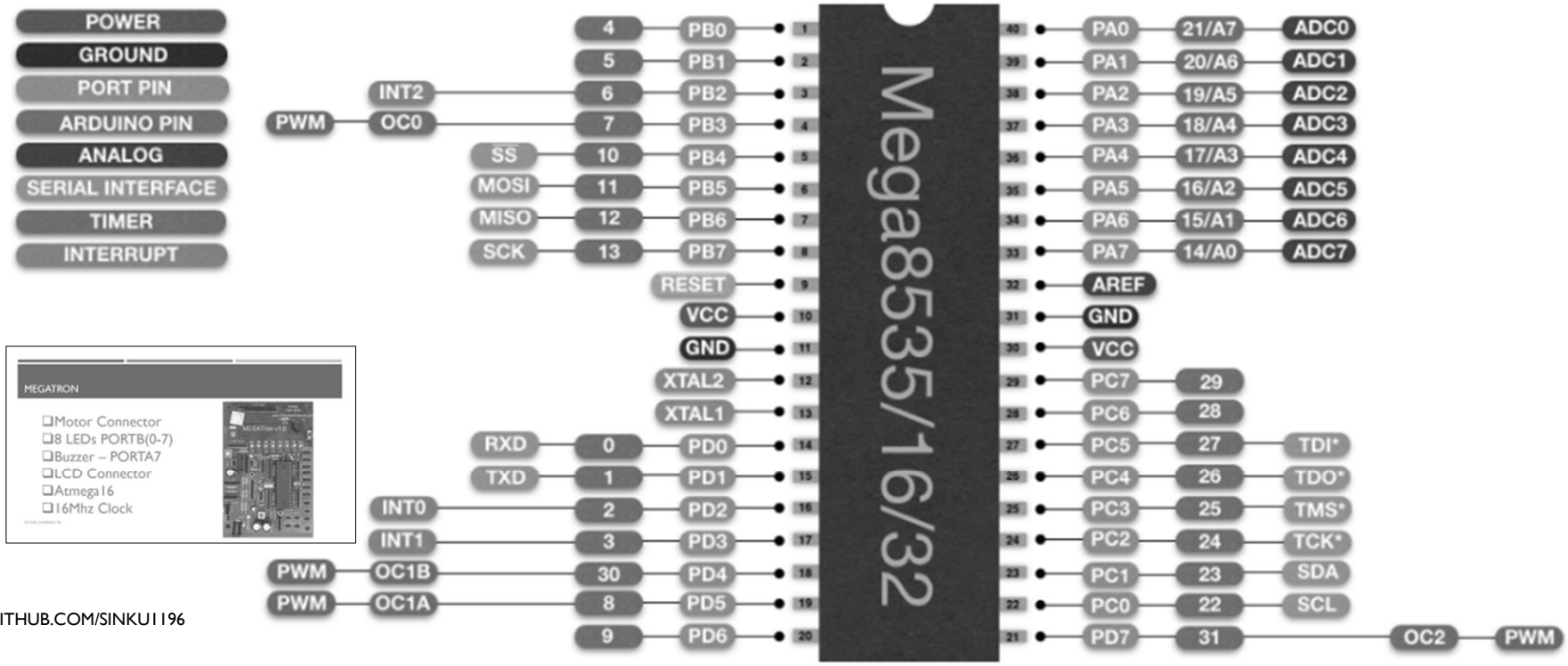
ATMEGA16



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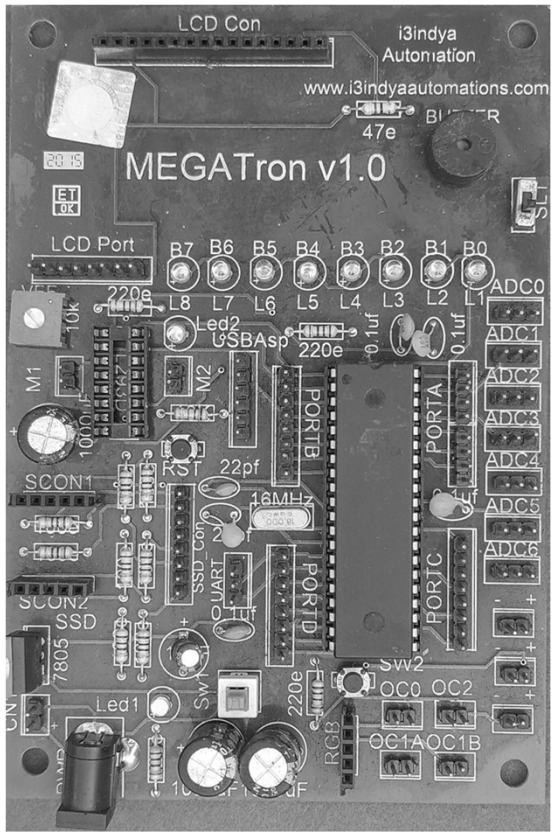
*JTAG are only available on ATmega16/32

MEGATRON

- Motor Connector
- 8 LEDs PORTB(0-7)
- Buzzer – PORTA7
- LCD Connector
- Atmega16
- 16Mhz Clock



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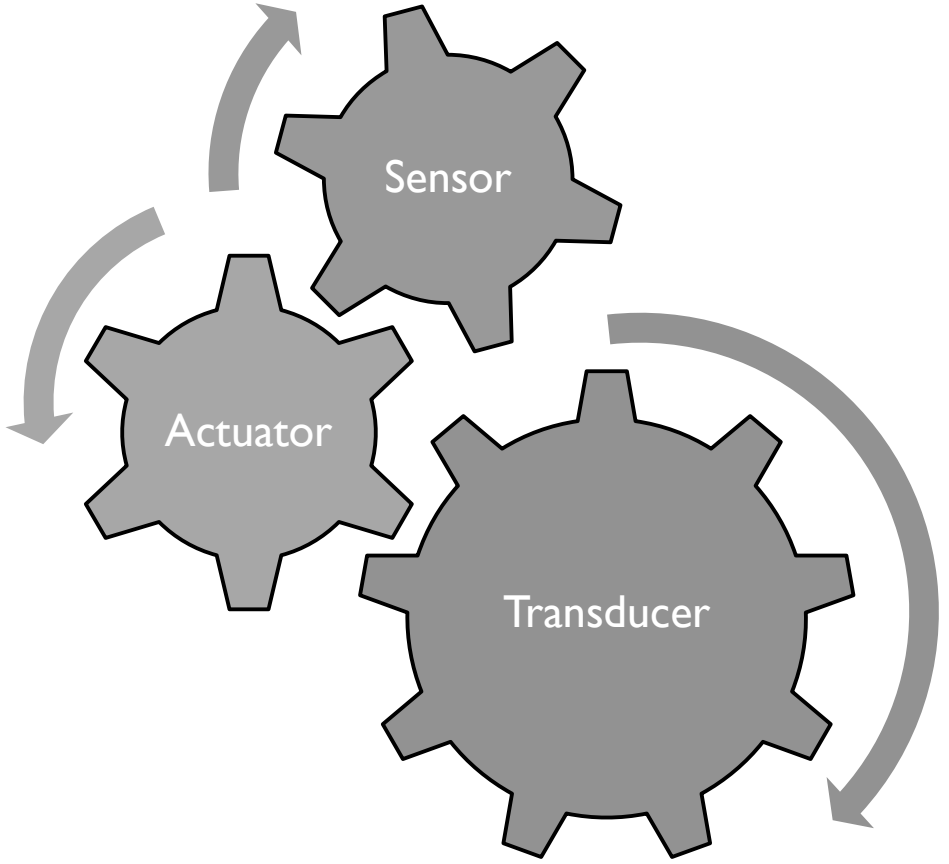
KIT CONTENTS

- ❑Megatron Board
- ❑USBasp
- ❑USB-TTL
- ❑LDR
- ❑Relay
- ❑Jumpers
- ❑ESP8266

TRANSDUCERS, SENSORS AND ACTUATORS

- Transducer
  - Sensor
  - Actuator



REGISTER DESCRIPTION FOR I/O PORTS

	7	6	5	4	3	2	1	0
Data Register	**PORTx7**	**PORTx6**	**PORTx5**	**PORTx4**	**PORTx3**	**PORTx2**	**PORTx1**	**PORTx0**
Data Direction	**DDx7**	**DDx6**	**DDx5**	**DDx4**	**DDx3**	**DDx2**	**DDx1**	**DDx0**
Input Pins	**PINx7**	**PINx6**	**PINx5**	**PINx4**	**PINx3**	**PINx2**	**PINx1**	**PINx0**

CONTROLLING ONBOARD ELECTRONIC COMPONENTS

- LED, Buzzer, Relay
- DDRx
- PORTx

```
DDRB = 0b10110101;  PORTB = 0b10110101;
```

0: Input
1: Output

0: Low
1: HIGH

COMMUNICATION

- uart_init() — Initialize UART
- uart_char() — Sends Character
- uart_string() — Sends String
- uart_num() — Sends Number
- uart_read() — Reads an Input

REGISTER DESCRIPTION FOR UART

	7	6	5	4	3	2	1	0
UCSRA	**RXC**	**TXC**	**UDRE**	**FE**	**DOR**	**PE**	**U2X**	**MPCM**
UCSRB	**RXIE**	**TXIE**	**UDRIE**	**RXEN**	**TXEN**	**UCSZ2**	**RXB8**	**TXB8**
UCSRC	**URSEL**	**UMSEL**	**UPM1**	**UPM0**	**UBS**	**UCSZ1**	**UCSZ0**	**UCPOL**

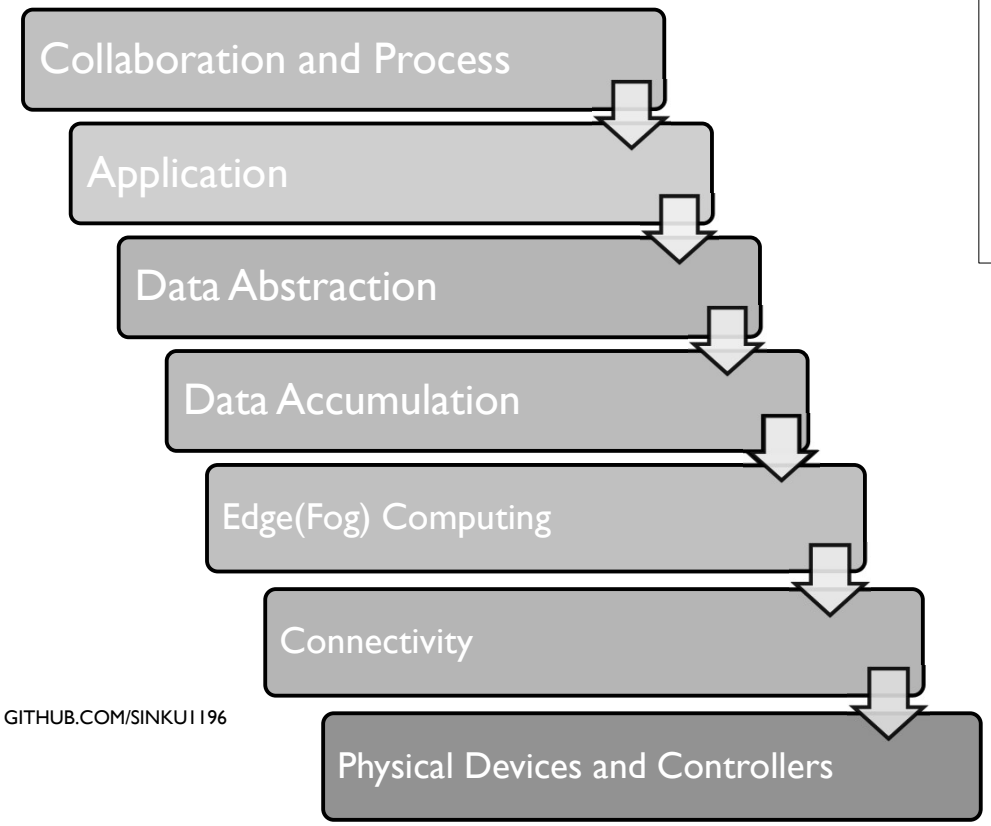
ANALOG SENSOR INTERFACING

- adc_init() Initialize ADC
- getdata() Reads an Input on ADC Pin

REGISTER DESCRIPTION FOR ADC

	7	6	5	4	3	2	1	0
ADCSRA	ADEN	ADSC	ADATE	ADIF	ADIE	ADPS2	ADPS1	ADPS0
ADMUX	REFS1	REFS0	ADLAR	MUX4	MUX3	MUX2	MUX1	MUX0

IOT REFERENCE MODEL



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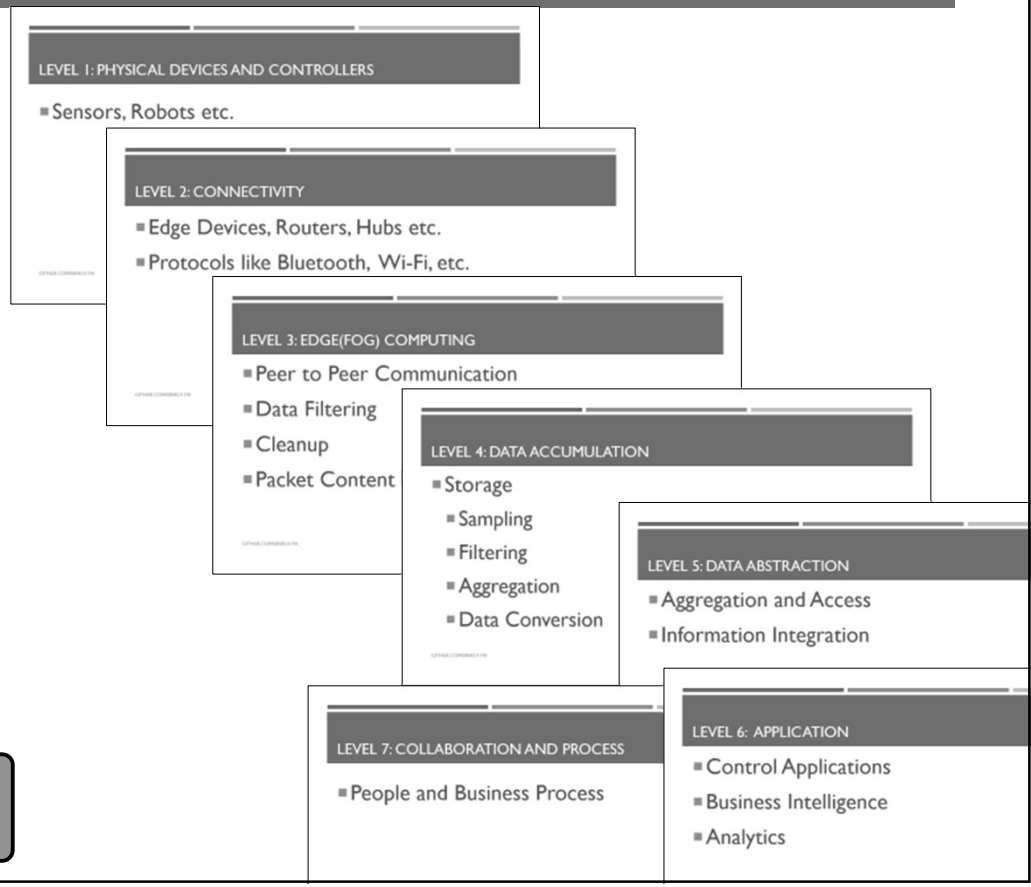


LEVEL 1: PHYSICAL DEVICES AND CONTROLLERS

- Sensors, Robots etc.

LEVEL 2: CONNECTIVITY

- Edge Devices, Routers, Hubs etc.
- Protocols like Bluetooth, Wi-Fi, etc.

LEVEL 3: EDGE(FOG) COMPUTING

- Peer to Peer Communication
- Data Filtering
- Cleanup
- Packet Content Inspection

LEVEL 4: DATA ACCUMULATION

- Storage
  - Sampling
  - Filtering
  - Aggregation
  - Data Conversion

LEVEL 5: DATA ABSTRACTION

- Aggregation and Access
- Information Integration

LEVEL 6: APPLICATION

- Control Applications
- Business Intelligence
- Analytics

LEVEL 7: COLLABORATION AND PROCESS

- People and Business Process

INTRODUCTION TO WI-FI(ESP8266) MODULE

- AT Commands
- Hayes Style Commands
- Room15 GitHub
- Perform AT Commands

CONTROLLING ESP8266

❑AT	OK
❑AT+RST	Resets Wi-Fi Module
❑ATE0	Enable/Disable Echo
❑AT+CWMODE=3	Set Wi-Fi Mode
❑AT+CWJAP="Wi-Fi Name","Password"	Connect to Hotspot
❑AT+CIPSTART	Start Connection with Server
❑AT+CIPSEND	Send Data to Server
GITHUB.COM/SINKU1196 ❑AT+CIPCLOSE	Closes the Existing Connection

INTERFACING ESP8266 WITH MEGATRON

- ESP8266 – Megatron
- Rx => Tx
- Tx => Rx
- Gnd => Gnd

IOT PLATFORM: THINGSPEAK

- Create an Account on ThingSpeak
- Create a Channel on ThingSpeak
- Copy Write API Key
- Paste it in Code

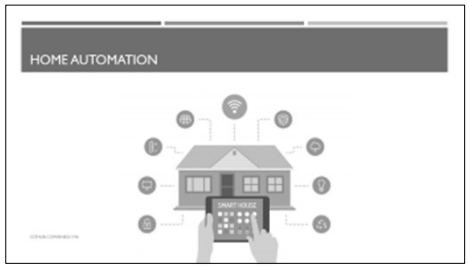
UPDATING FIELD DATA MANUALLY

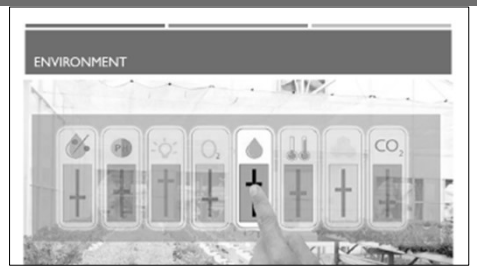
- Copy Write API Request
- Paste it in a new tab of browser
- Modify the field value
- Press enter to submit data

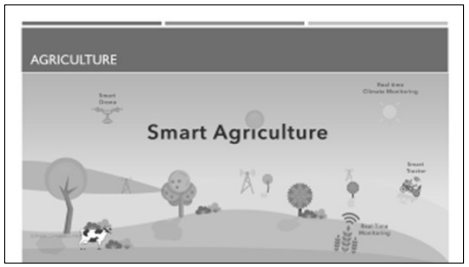
UPLOADING SENSOR DATA TO THINGSPEAK

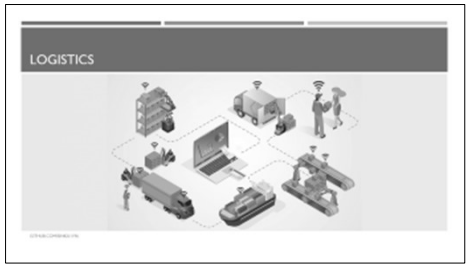
- ❑ Create a Channel on ThingSpeak
- ❑ Copy Write API Key
- ❑ Paste it in Code
- ❑ Modify Wi-Fi Credentials
- ❑ Build your solution
- ❑ Upload your hex file to board

DOMAIN SPECIFIC IOT









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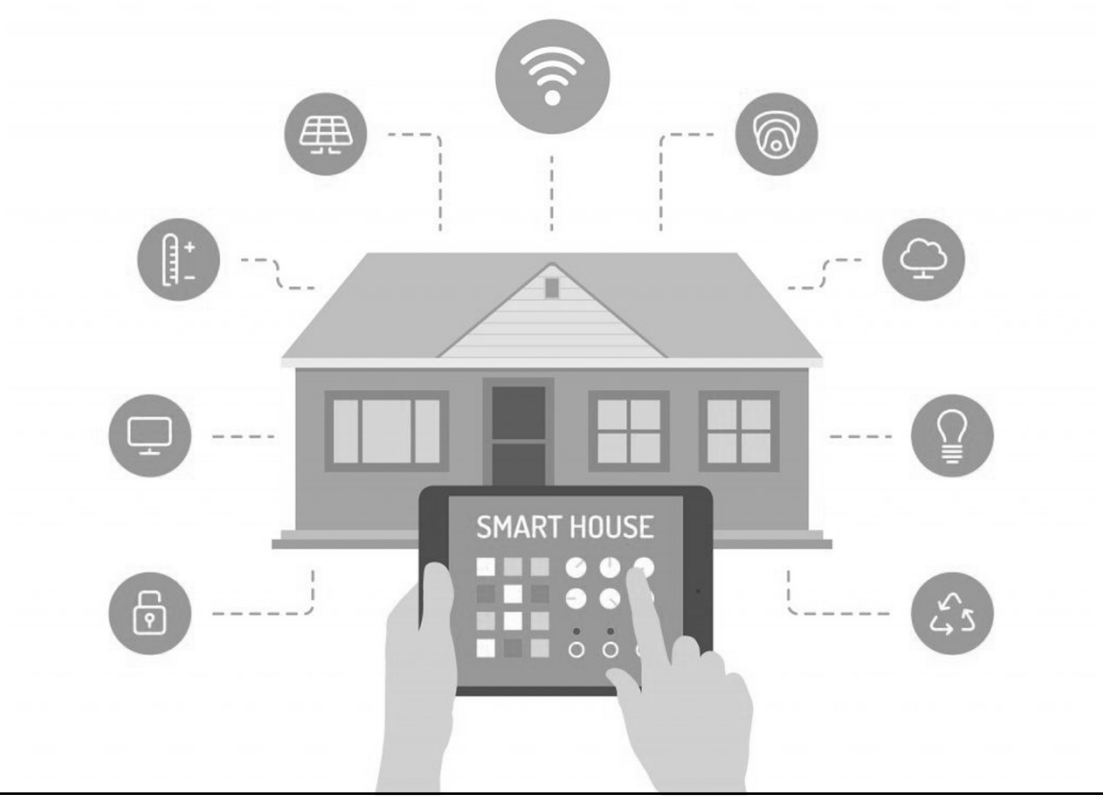
HOME AUTOMATION



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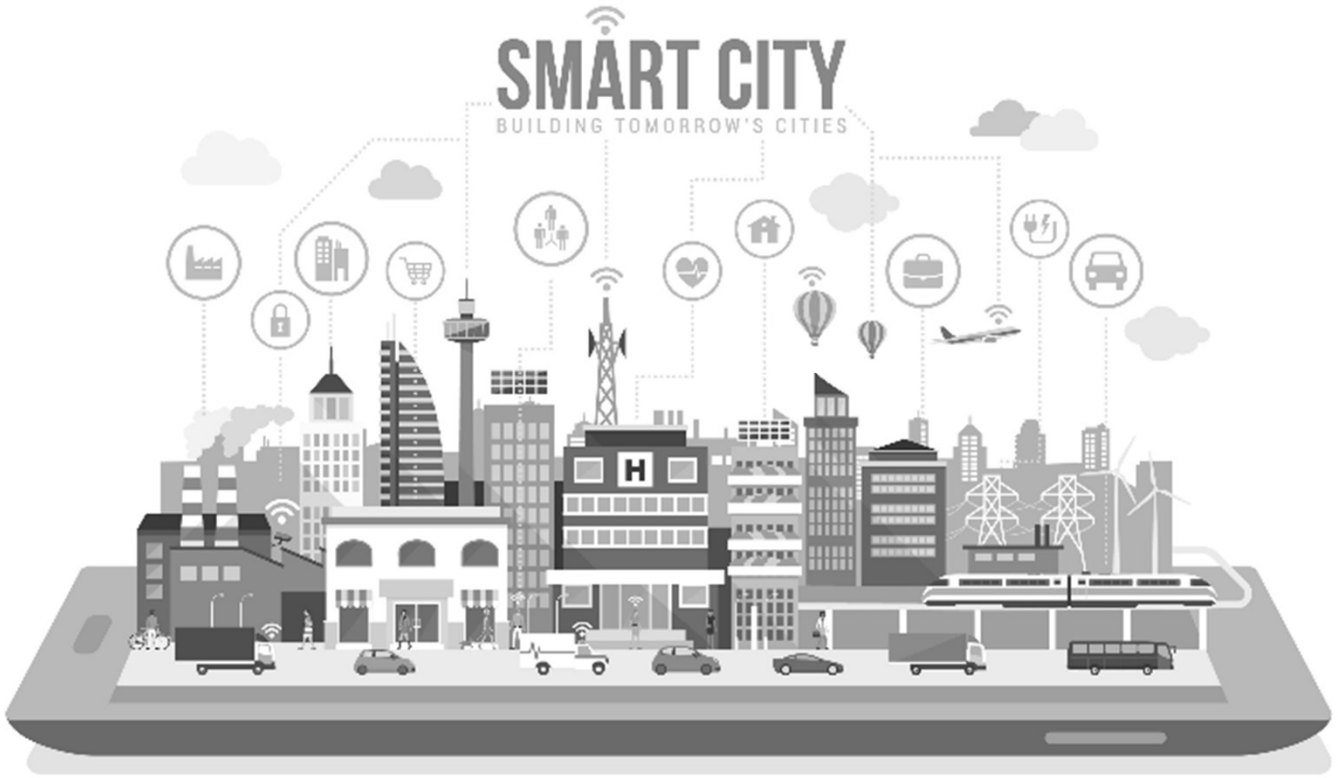
SMART CITIES



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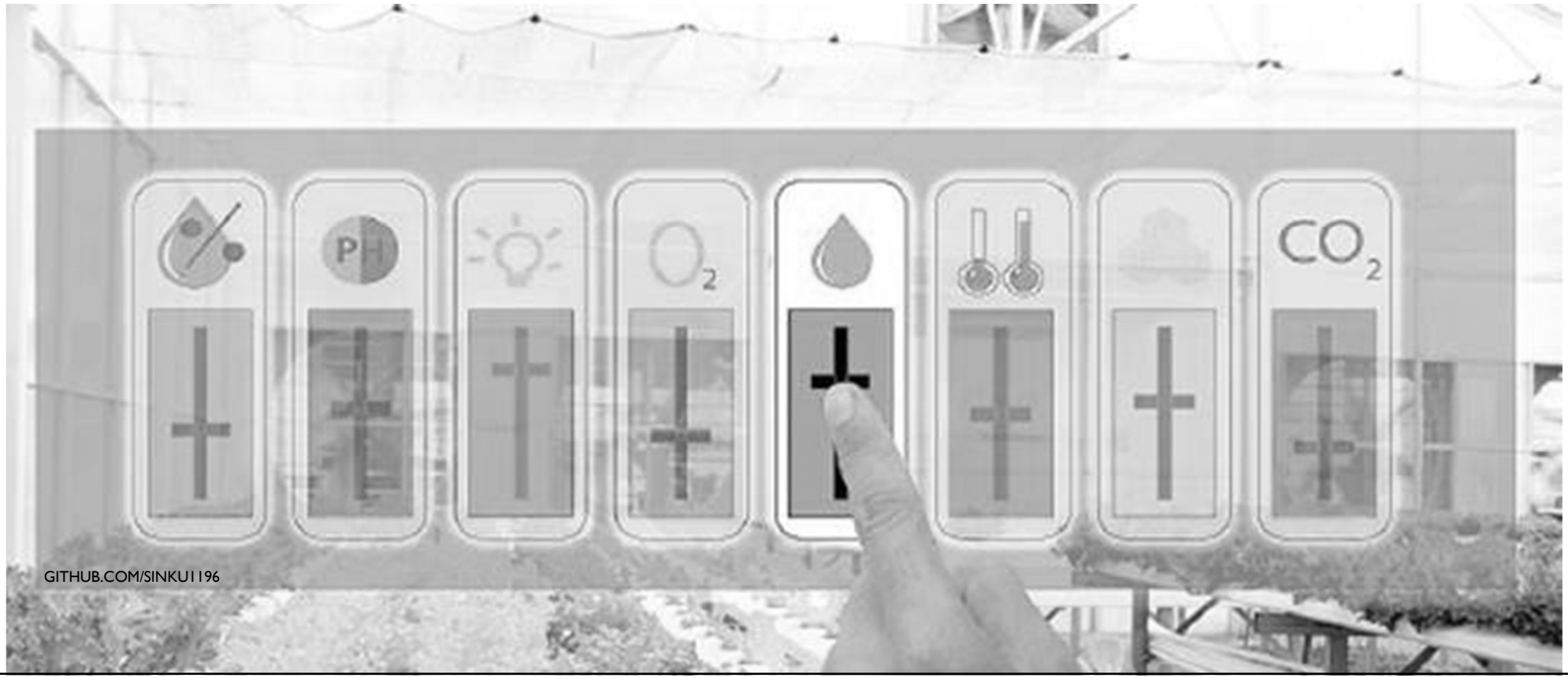
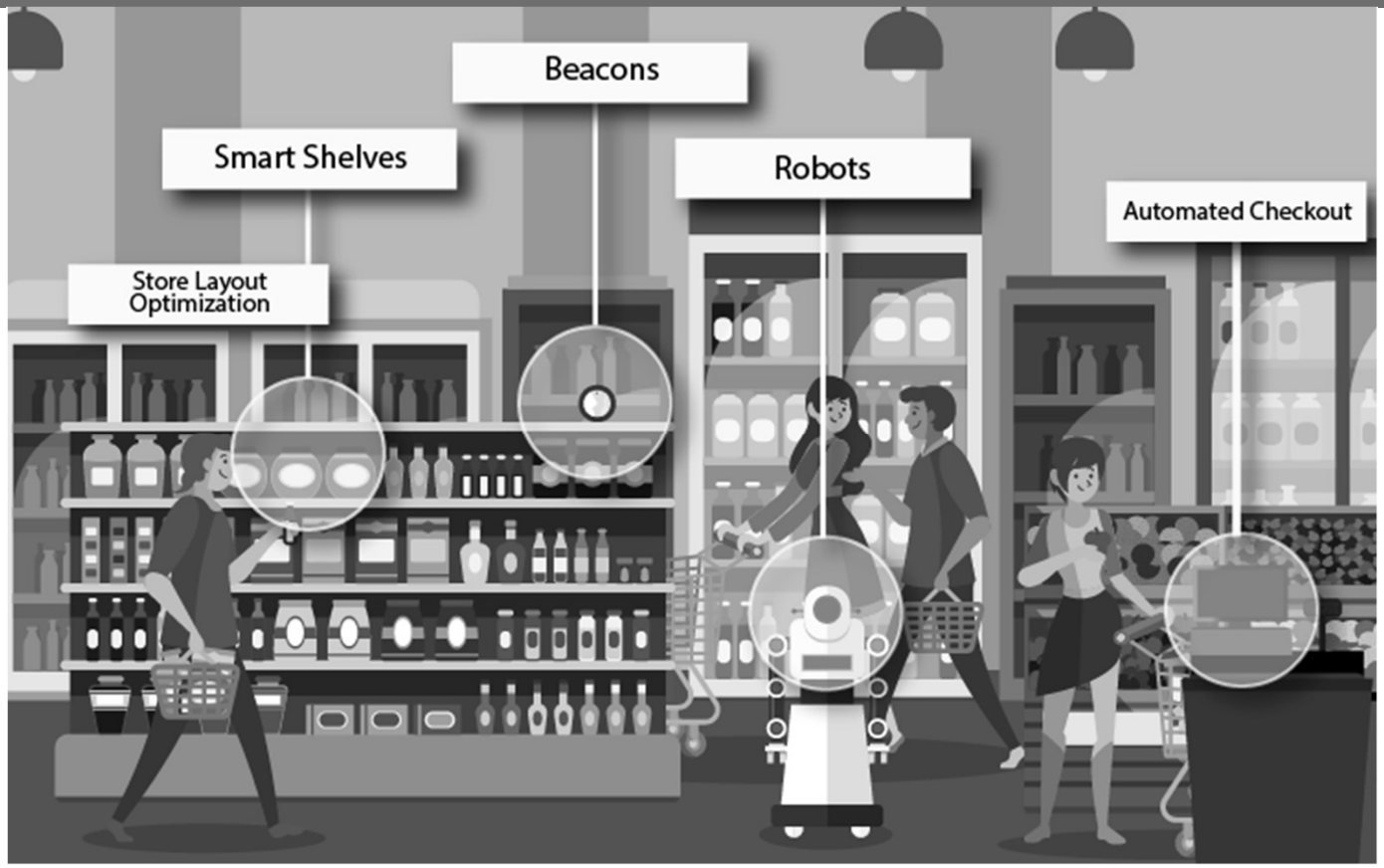
ENVIRONMENT



RETAIL



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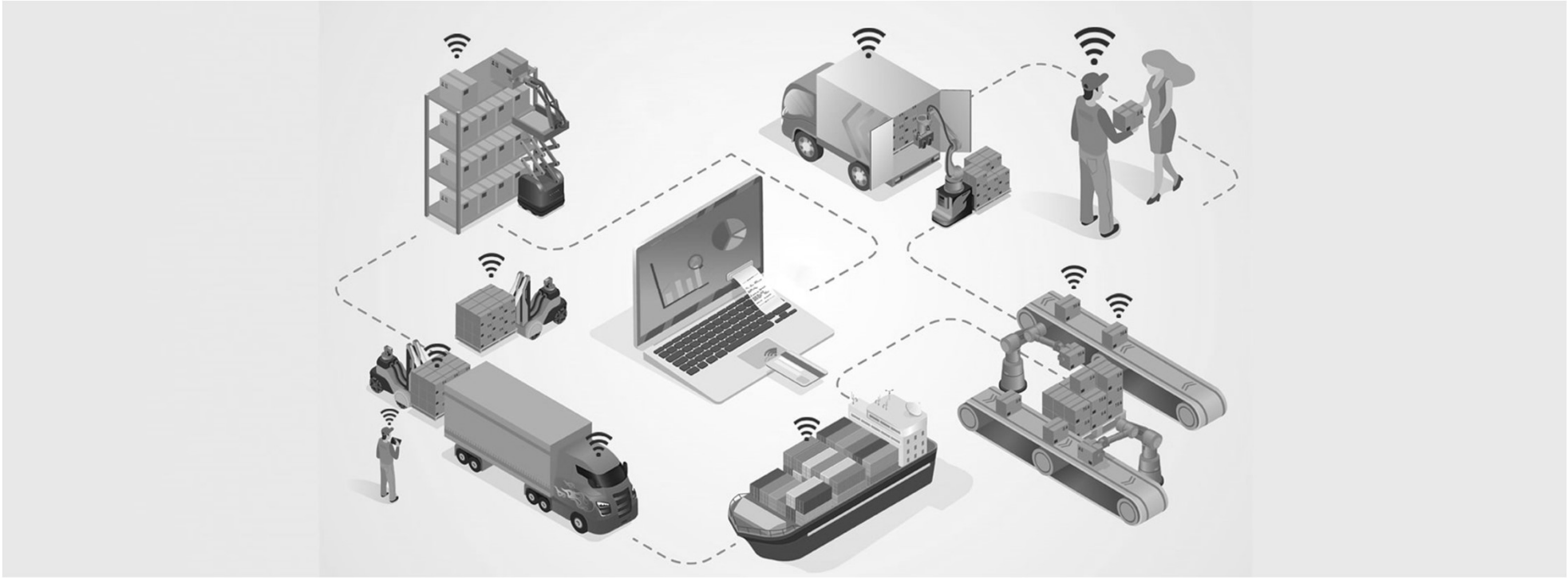
LOGISTICS



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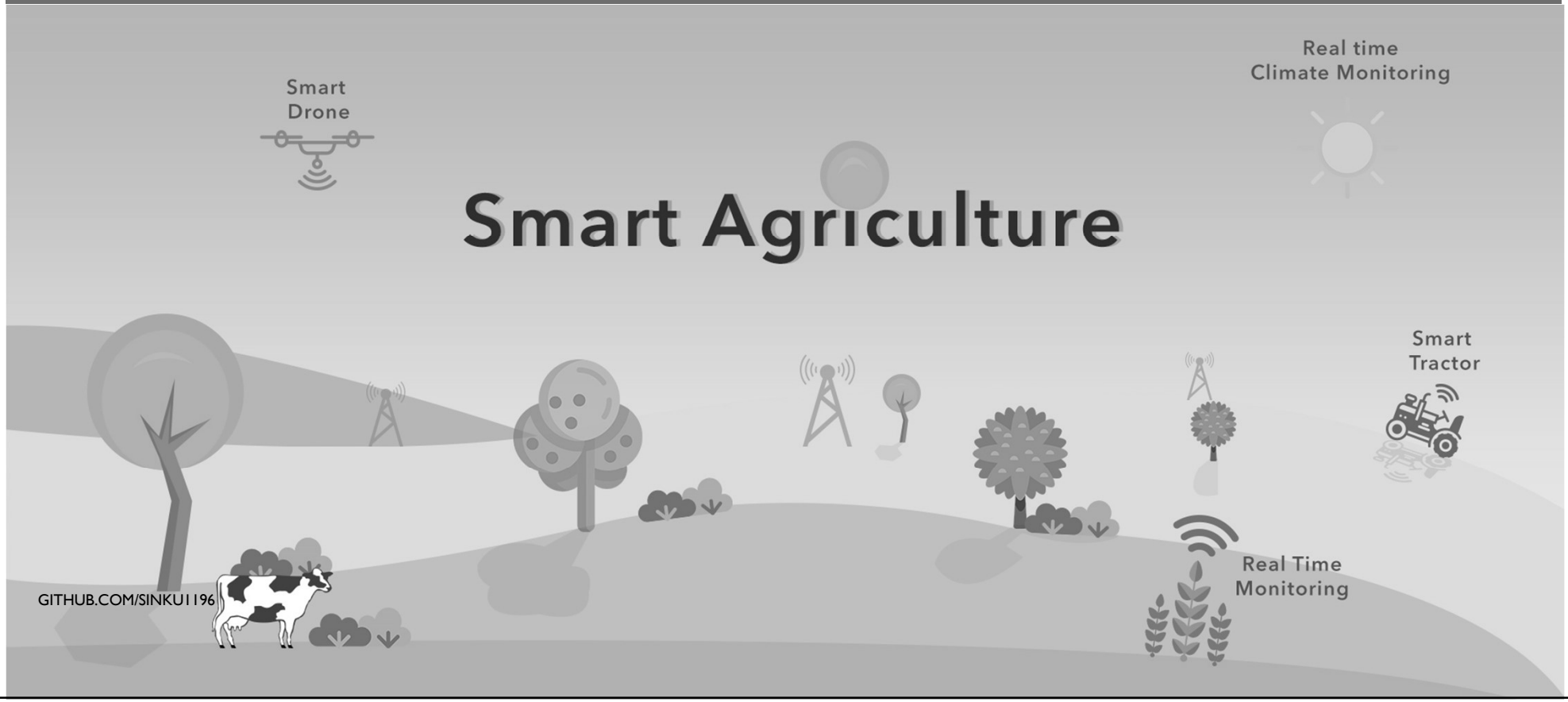
AGRICULTURE



HEALTH AND LIFESTYLE

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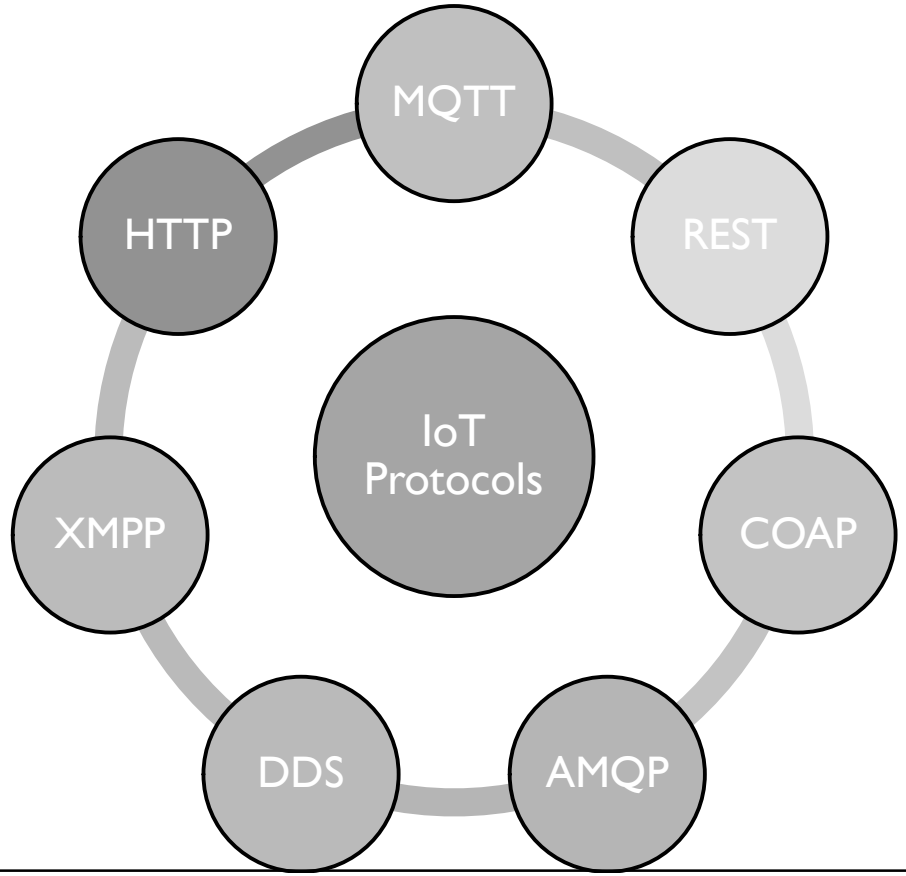
IOT PROTOCOLS



WHAT TO DO NEXT?

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RULES:

TASK BASED COMPETITION

CONGRATULATIONS TO:

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