



# Internet of Things & Analisis Data

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**Konsep  
Internet of  
Things (IoT)**

**Piranti dan  
Konektivitas  
IoT**

**Analisis  
Data IoT**

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## ITU Definition

The IoT can be viewed as a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies (ICT).

*IoT dapat dipandang sebagai infrastruktur global untuk masyarakat informasi, memungkinkan layanan lanjutan dengan menghubungkan hal-hal (baik fisik maupun virtual) berdasarkan teknologi informasi dan komunikasi (TIK) yang ada saat ini dan terus berkembang.*

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Source: Recommendation ITU-T Y.2060

# Artinya...

*Hal-hal atau “Things” ini dapat bertukar informasi di antara mereka dan mengirimkan data ke perangkat dan sistem lain.*

*Juga dapat menerima data.*

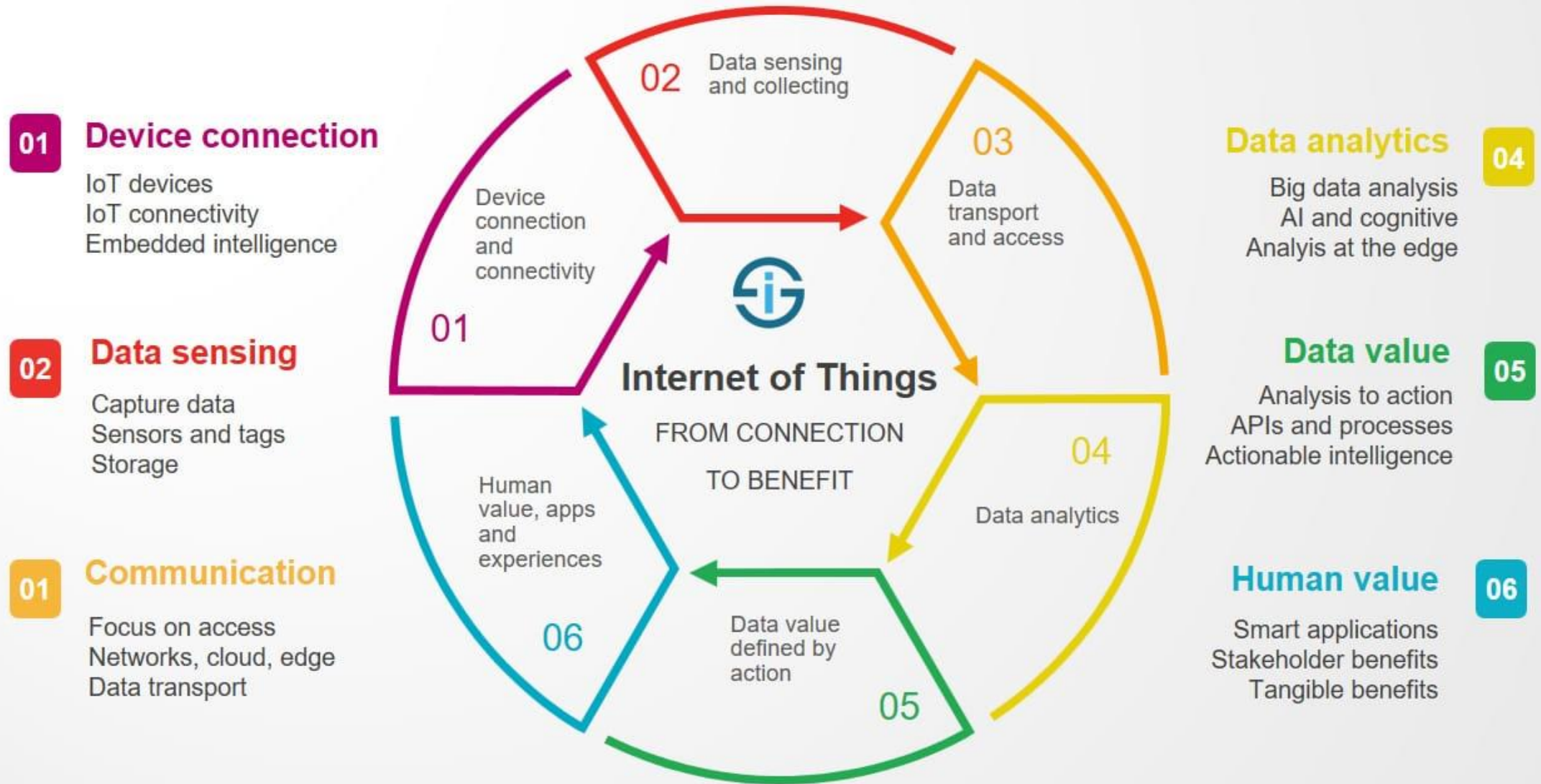
*Informasi yang mereka bagikan dapat berupa objek tempat mereka melekat dan lingkungan tempat mereka berada (melalui sensor yang datang dalam berbagai bentuk untuk parameter yang berbeda).*

*Perangkat dan mesin pintar juga dapat berbagi informasi tentang keadaan internalnya.*

# The Internet of Things

From connecting devices to human value

<https://www.i-scoop.eu/internet-of-things-iot/>



There will be as many as

**40 TO 80**  
**BILLION**  
connected objects  
by 2020.



There will be  
**10** connected  
objects  
for every man,  
woman, and child  
on the **PLANET.**



PEOPLE  
— ARE —

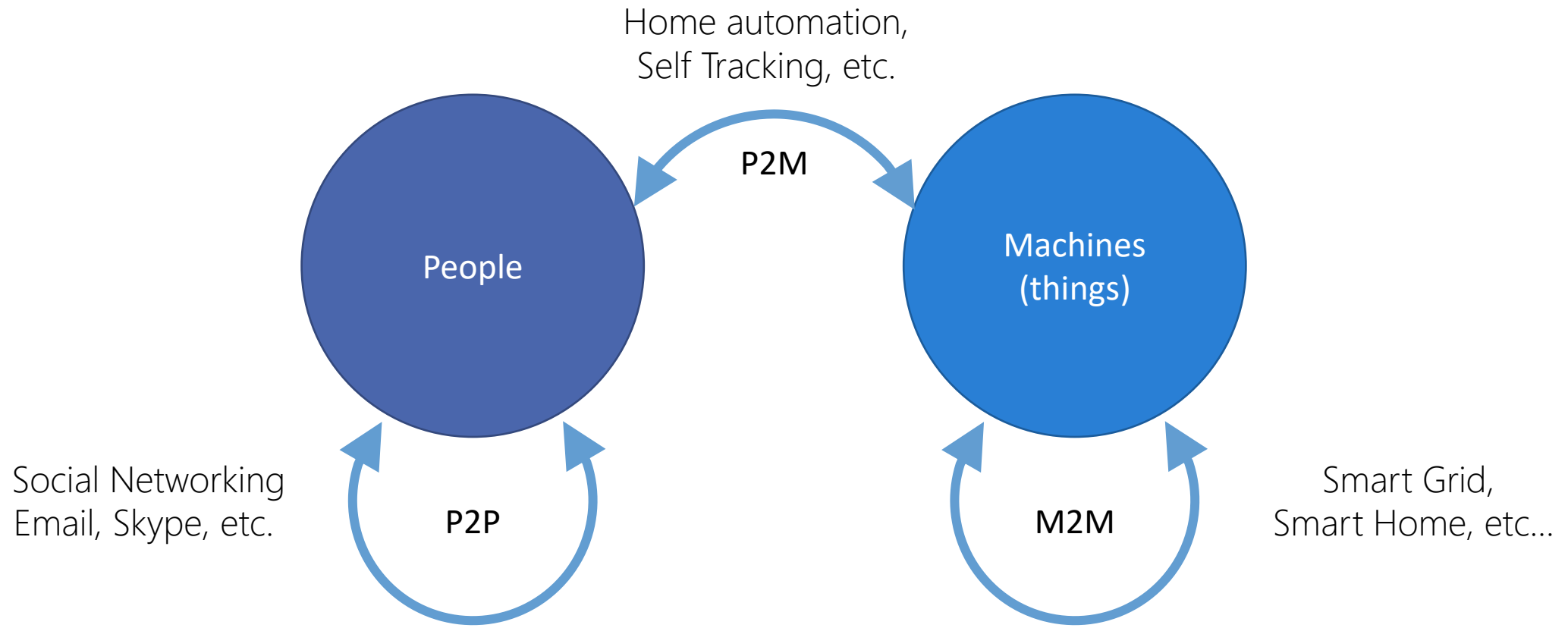
**“THINGS”**



Through the power of smart devices, people will not only consume data, but contribute observed data to the IoT through their phones and tablets as

**human sensors**

# Macam Komunikasi...



# Wireless, SWARMS dan CLOUDS



ZigBee®



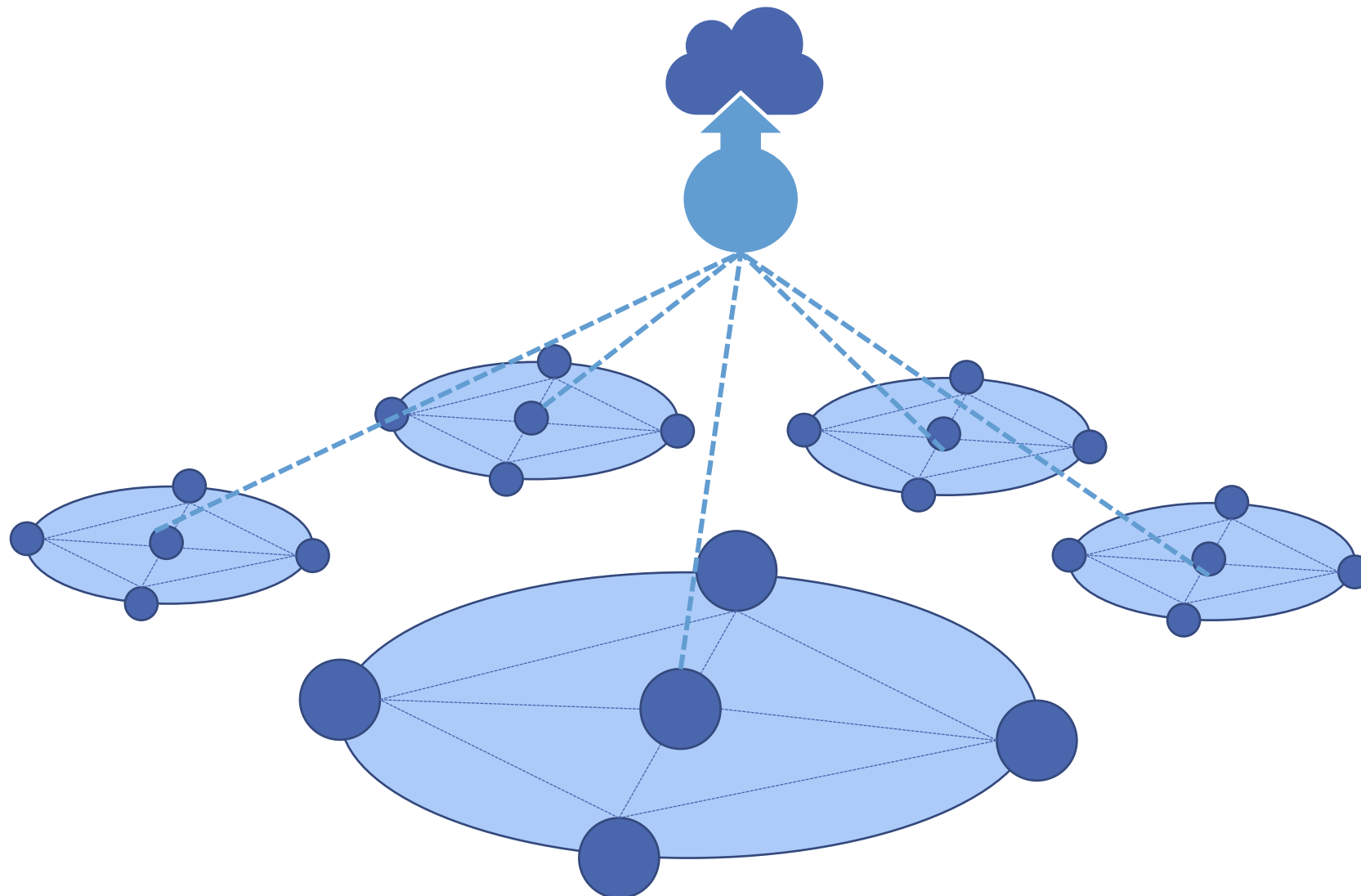
Bluetooth®



NFC



RADIO FREQUENCY IDENTIFICATION



Want to know more? Check out Cisco's Flavio Bonomi's ["Emerging Trends in Wireless in the Era of IoT"](#)

# IoT Protocol: MQTT dan OMA



Created by *Dr. Andy Stanford-Clark* of IBM and *Arlen Nipper* of Arcom in 1999

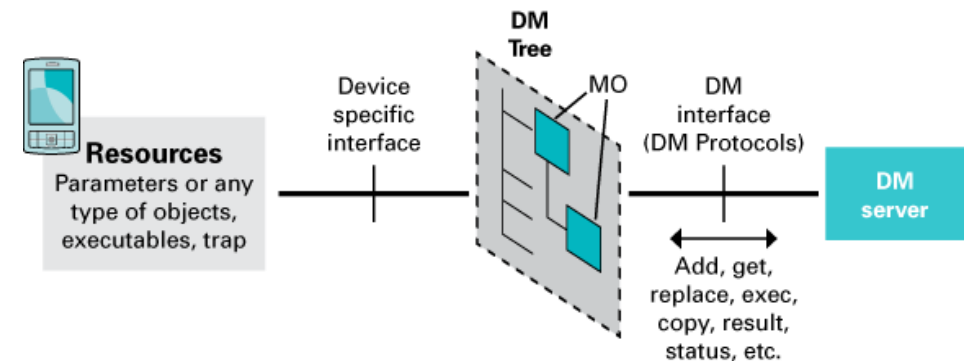
Undergoing the [OASIS](#) standardization process

**Message Queuing Telemetry Transport (MQTT)** is a lightweight broker-based publish/subscribe messaging protocol designed to be open, simple, lightweight and easy to implement.

- Where the network is expensive, has low bandwidth or is unreliable
- When run on an embedded device with limited processor or memory resources



The **OMA Device Management (DM)** Working Group specifies protocols and mechanisms to achieve the management of mobile devices, services access and software on connected devices.



<http://openmobilealliance.org/about-oma/work-program/device-management/>

## Wearables

- Entertainment
- Fitness
- Smart watch
- Location and tracking



## Building & Home Automation

- Access control
- Light & temp control
- Energy optimization
- Predictive maintenance
- Connected appliances



## Smart Cities

- Residential E-meters
- Smart street lights
- Pipeline leak detection
- Traffic control
- Surveillance cameras
- Centralized and integrated system control



## Smart Manufacturing

- Flow optimization
- Real time inventory
- Asset tracking
- Employee safety
- Predictive maintenance
- Firmware updates



## Health Care

- Remote monitoring
- Ambulance telemetry
- Drugs tracking
- Hospital asset tracking
- Access control
- Predictive maintenance



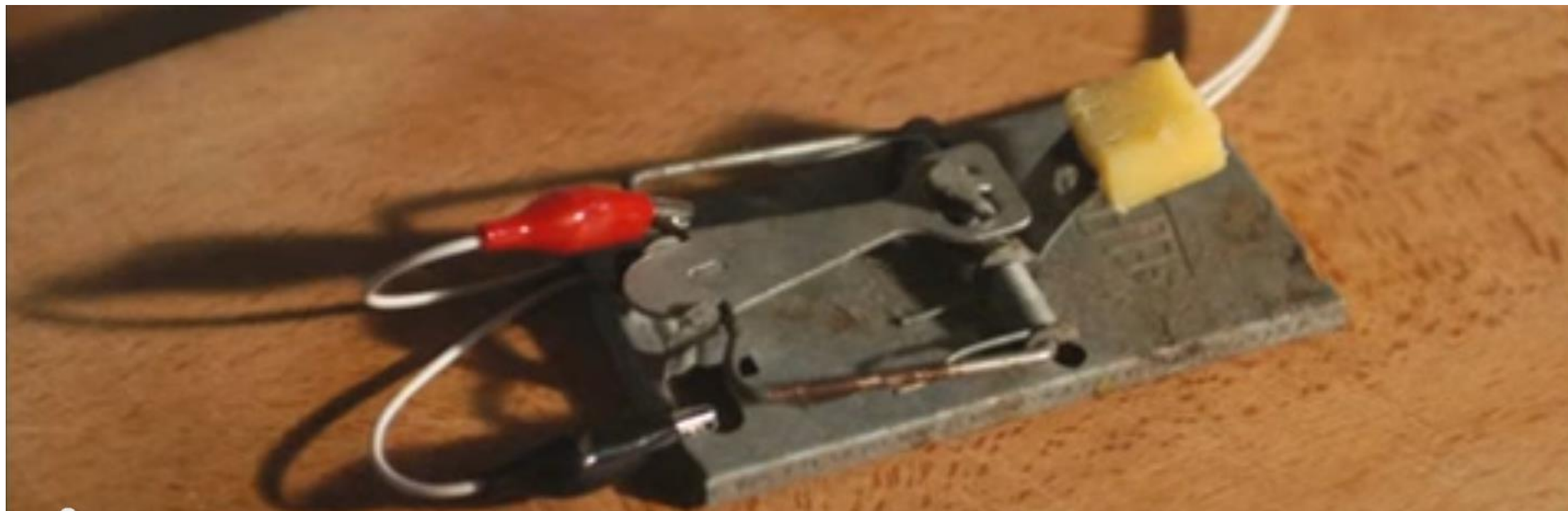
## Automotive

- Infotainment
- Wire replacement
- Telemetry
- Predictive maintenance
- C2C and C2I

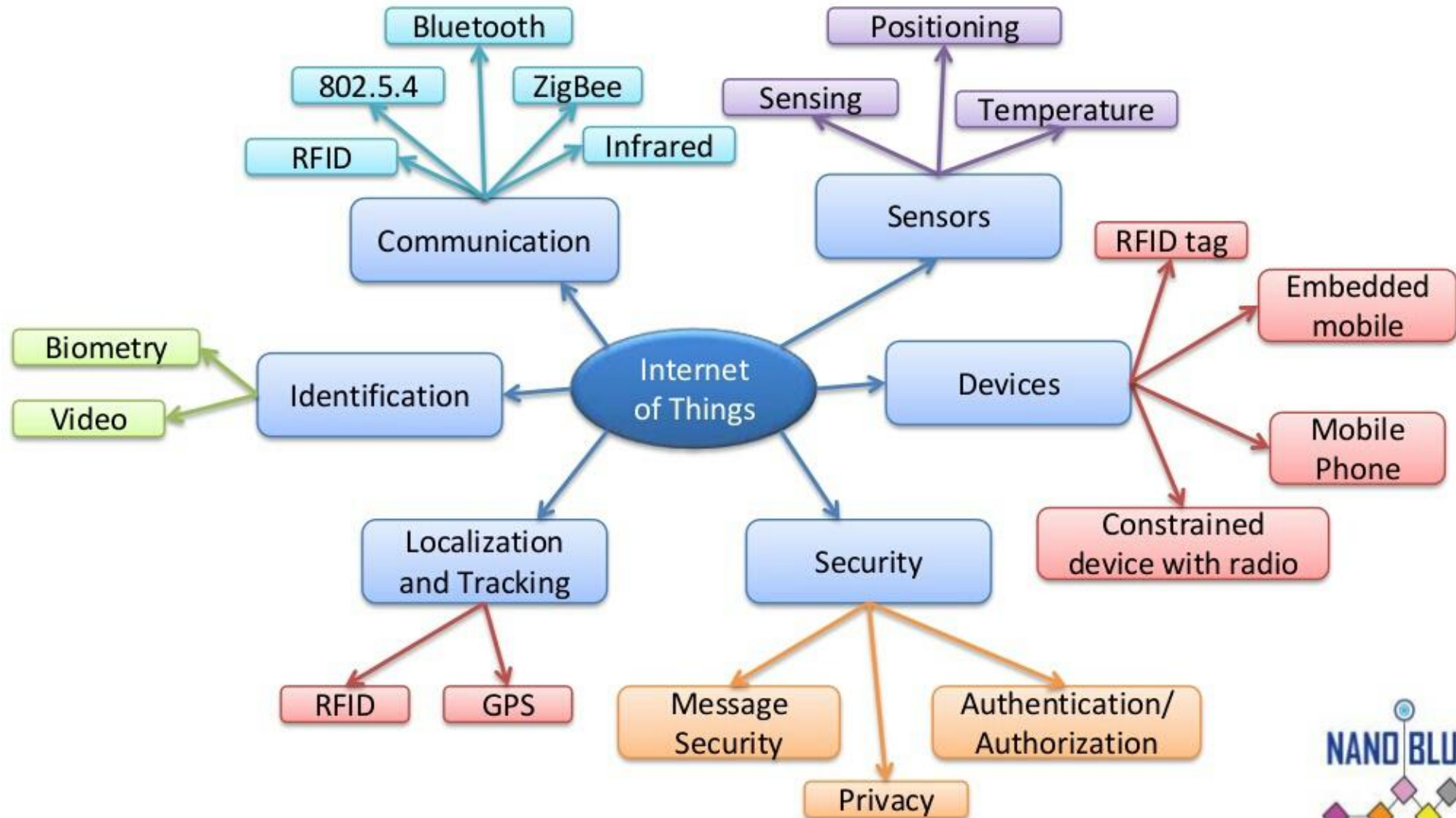


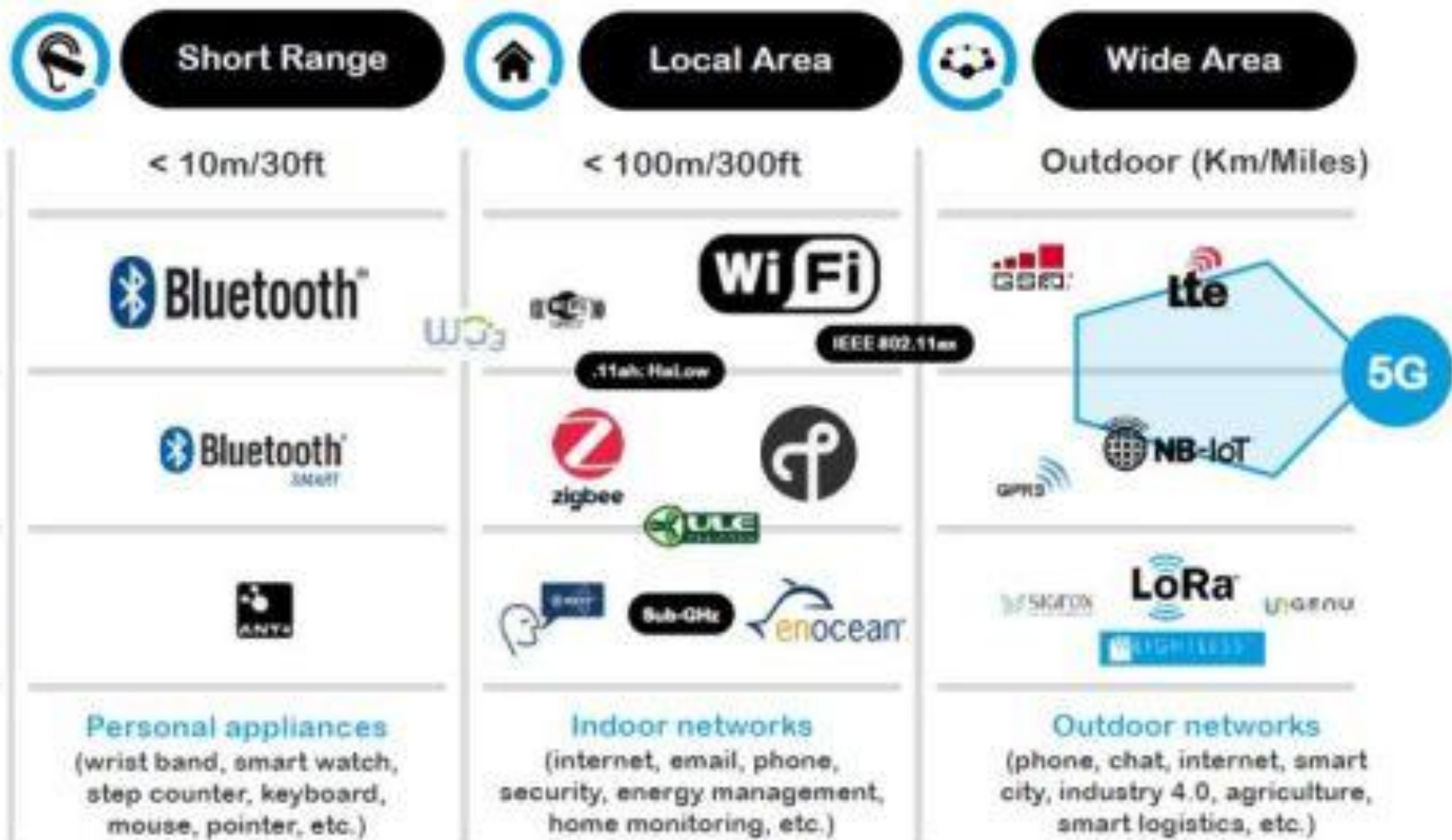


# Bikin jebakan tikus yang keren...!



# The IoT Connectivity

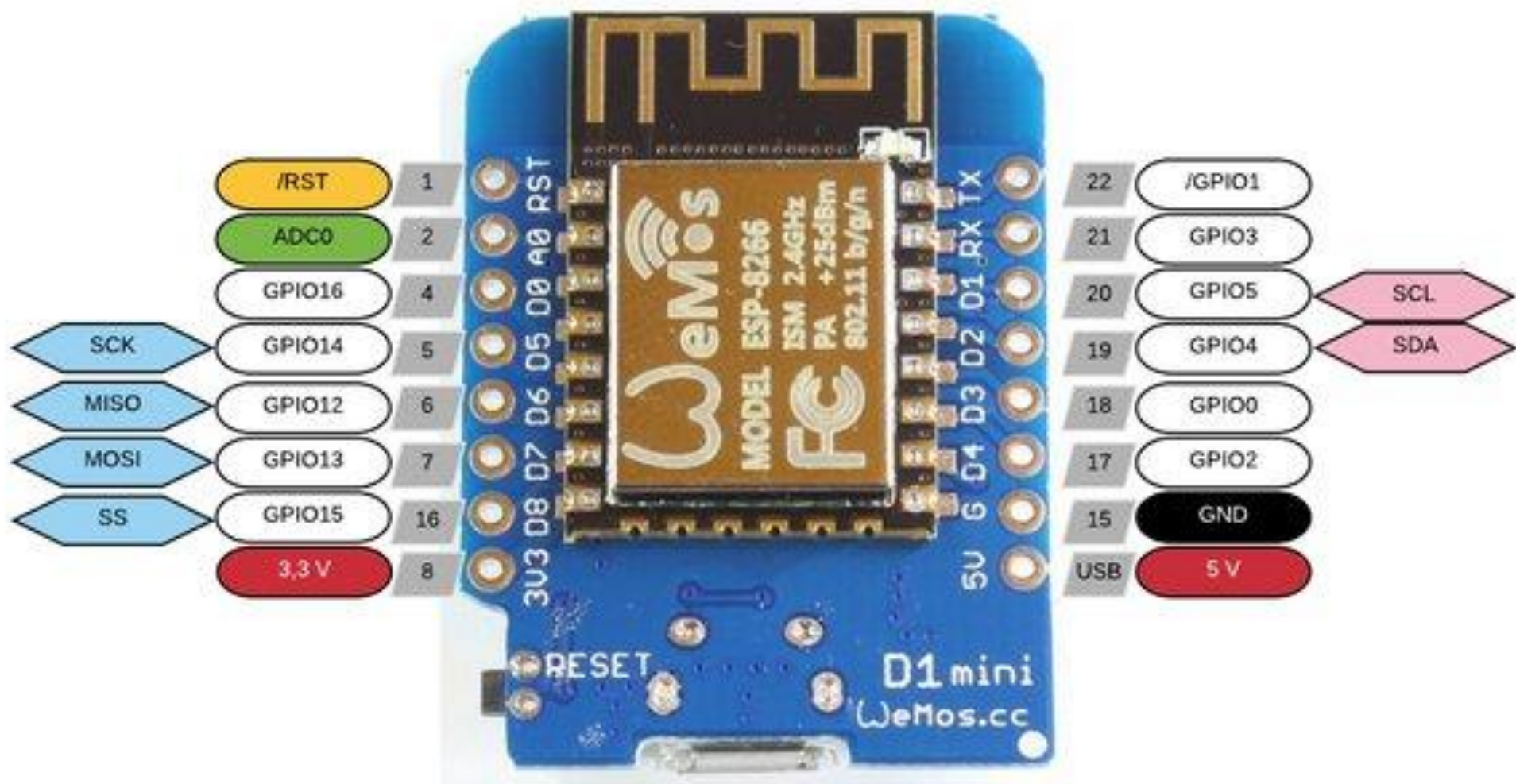




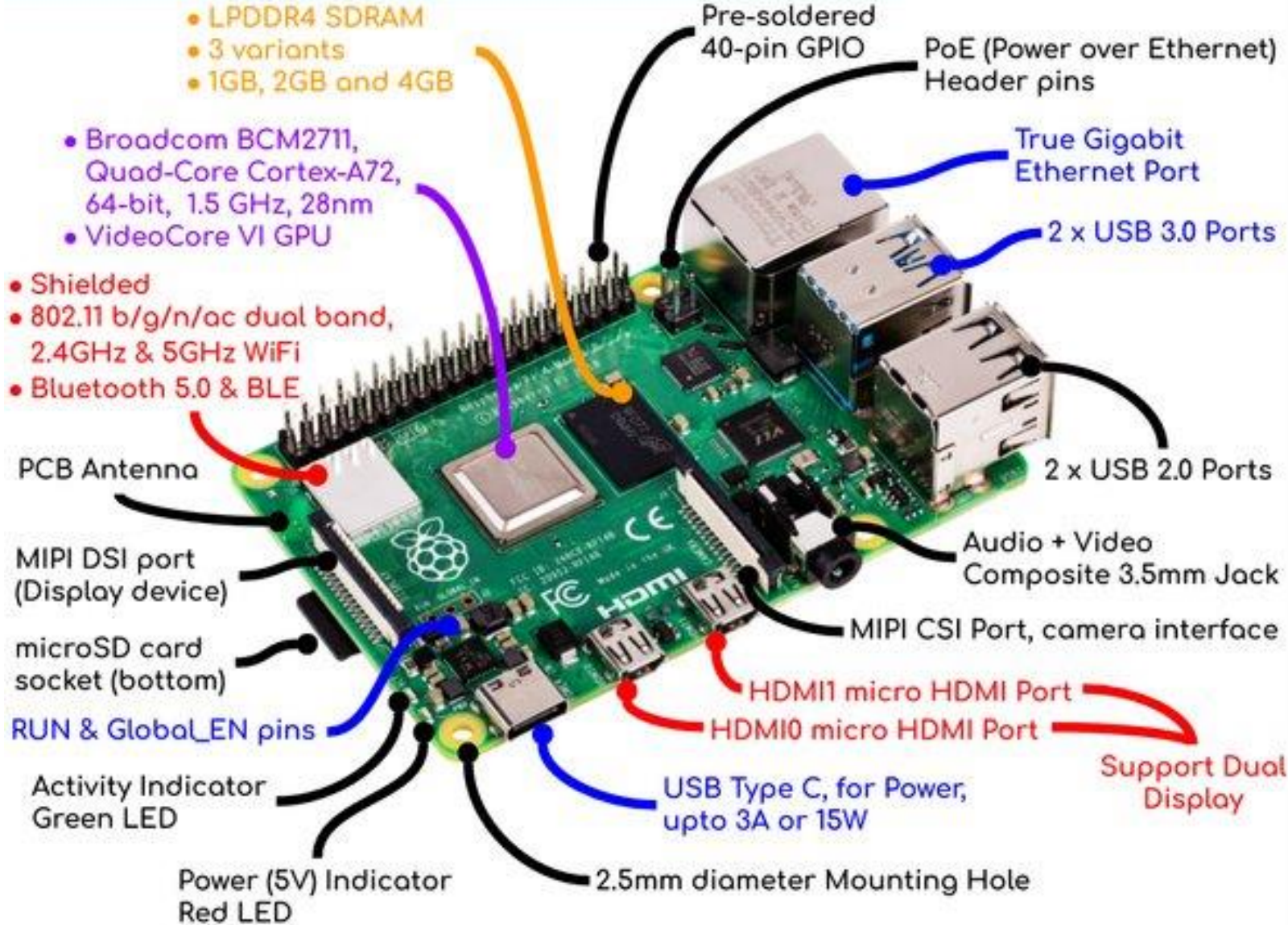


NodeMCU v3.0



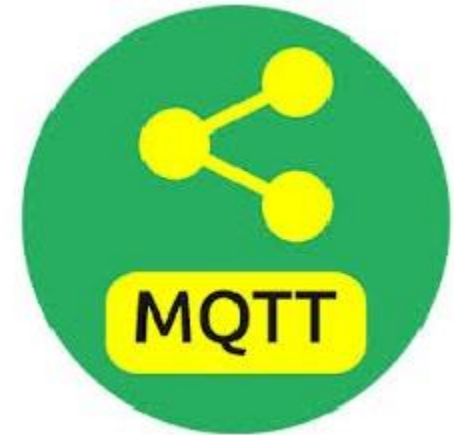


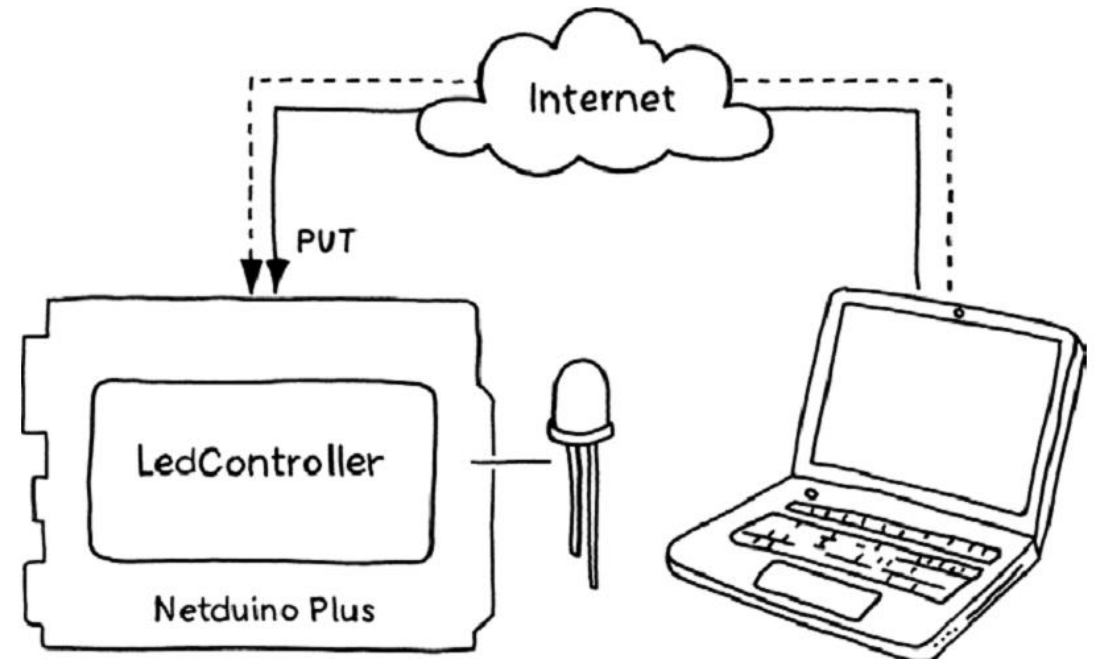
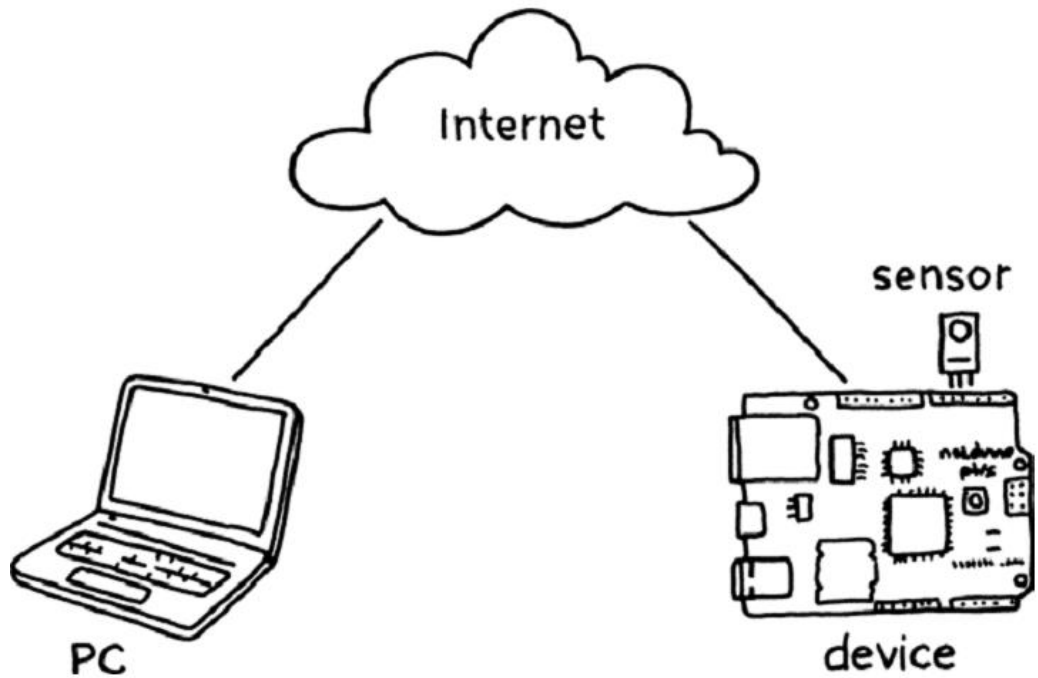
# Raspberry Pi 4 Model B Overview



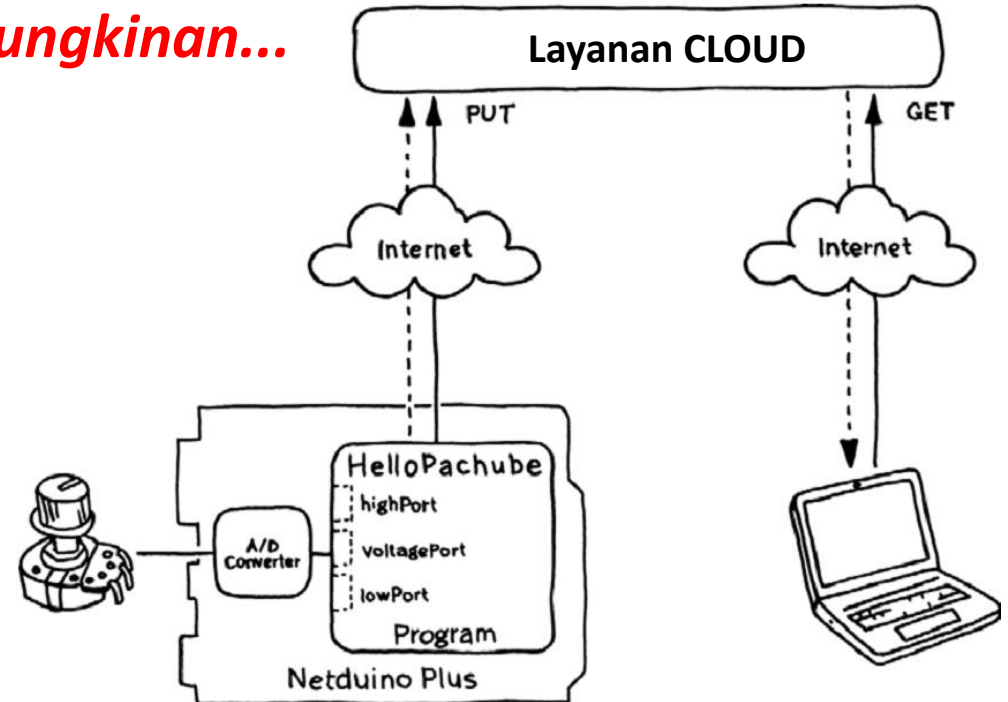
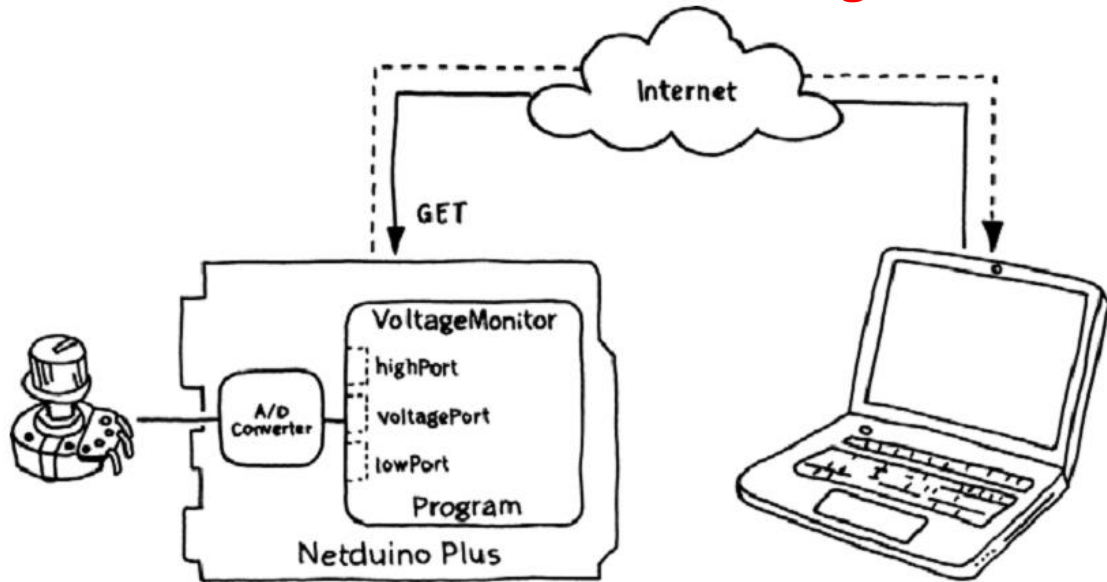
# Protokol Komunikasi

- Protokol **HTTP** - *Hyper Text Transfer Protocol*
- Protokol **MQTT** - *Message Queuing Telemetry Transport*



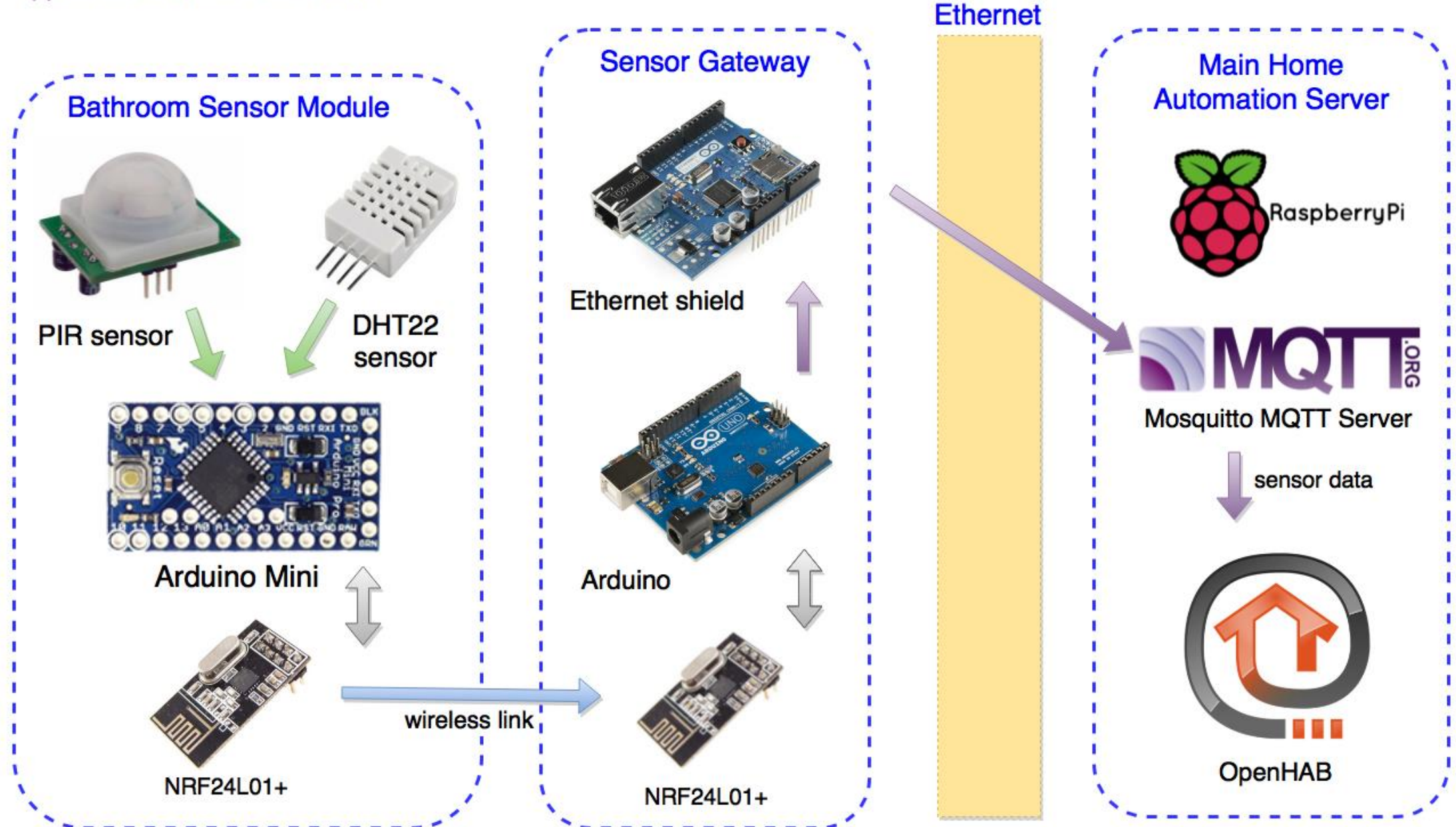


**Metode HTTP: Berbagai macam kemungkinan...**



# Home automation architecture #1

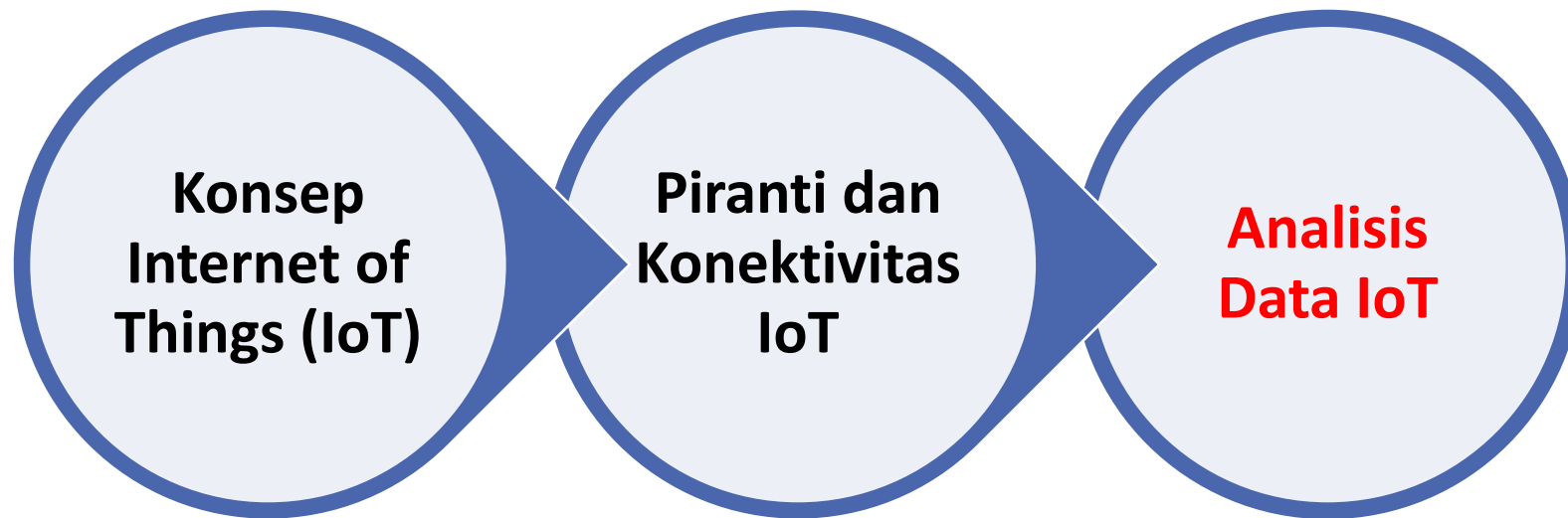
(c) Marcus @ Wetware Labs 2015



# 10 Jenis Sensor untuk aplikasi IoT

1. Sensor Suhu
2. Sensor Kelembaban
3. Sensor Tekanan
4. Sensor Jarak
5. Sensor Level
6. Accelerometer
7. Gyroscope
8. Sensor Gas
9. Sensor Inframerah
10. Sensor Optik





Things



Gateway



Network



Data  
Center

Cloud  
Analytics



## Collect

Send sensor data privately to the cloud.



## Analyze

Analyze and visualize your data with MATLAB.



## Act

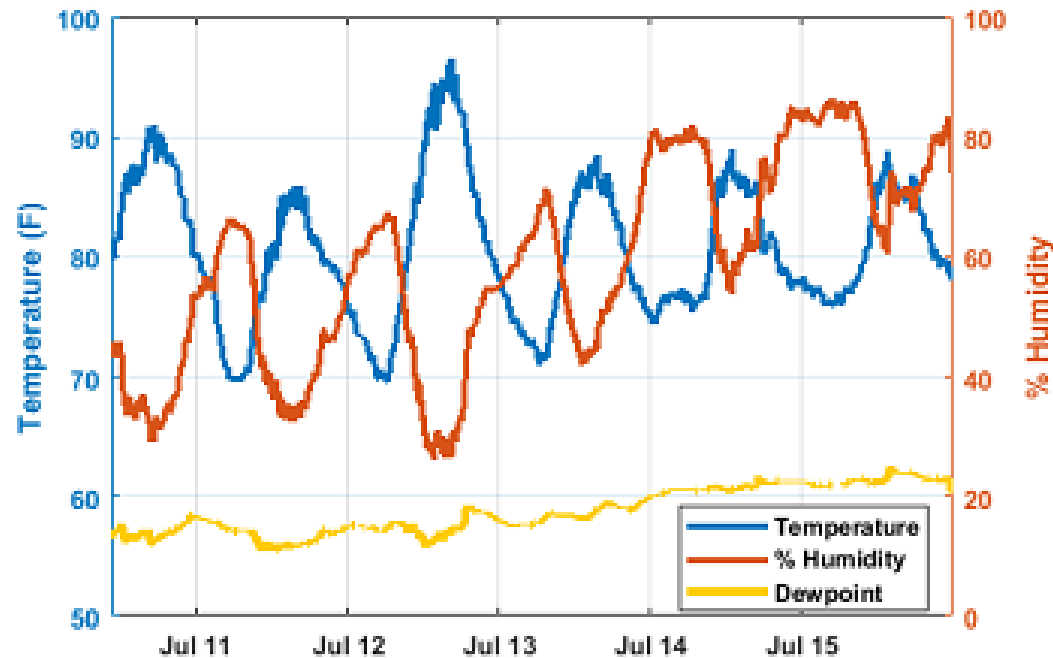
Trigger a reaction.

# Collect

- **Send sensor data privately to the cloud.**
  - There are sensors all around—in our homes, smart phones, automobiles, city infrastructure, and industrial equipment.
  - Sensors detect and measure information on all sorts of things like temperature, humidity, and pressure.
  - And they communicate that data in some form, such as a numerical value or electrical signal.



# Analyze



- **Analyze and visualize your data with MATLAB.**

- Storing data in the cloud provides easy access to your data.
- Using online analytical tools, you can explore and visualize data.
- You can discover relationships, patterns, and trends in data.
- You can calculate new data.
- And you can visualize it in plots, charts, and gauges.

# Act



- **Trigger a reaction.**

- Acting on data could be something as simple receiving a tweet when the temperature you are measuring goes above 70° F.
- Or you could set up a more intricate action such as turning on a motor when the water level in your water tank drops below a specified limit.
- You can even remotely control devices, such as battery-operated door locks, using the TalkBack app.

# Key Elements of the Industrial Internet

01

## Intelligent Machines

Connect the world's machines, facilities, fleets and networks with advanced sensors, controls and software applications

02

## Advanced Analytics

Combines the power of physics-based analytics, predictive algorithms, automation and deep domain expertise

03

## People at Work

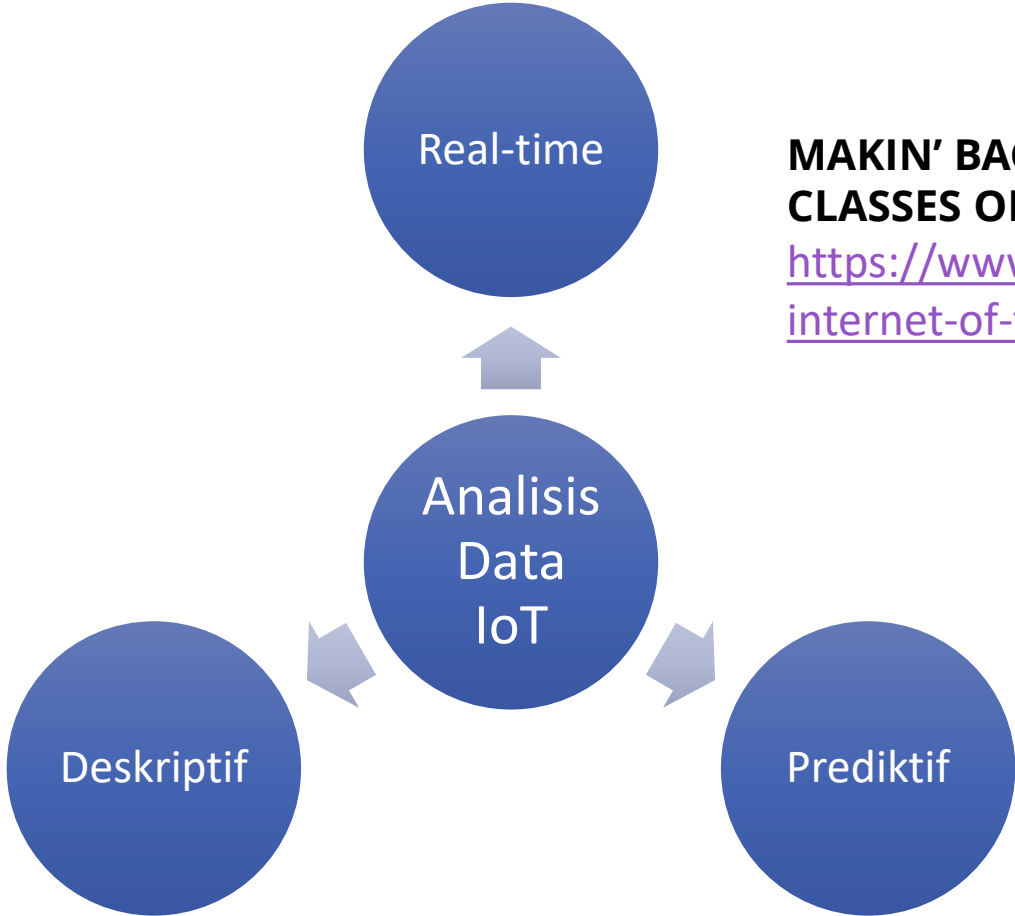
Connecting people at work or on the move, any time to support more intelligent design, operations, maintenance and higher service quality and safety

Based upon: Industrial Internet - Pushing the Boundaries of Minds and Machines



[slideshare.net/GE\\_MC\\_India/industrial-internet-pushing-the-boundaries-of-minds-and-machines](https://www.slideshare.net/GE_MC_India/industrial-internet-pushing-the-boundaries-of-minds-and-machines)

# Analisis Data IoT



**MAKIN' BACON AND THE THREE MAIN CLASSES OF IOT ANALYTICS**

<https://www.iot-inc.com/three-main-classes-internet-of-things-data-analytics-podcast/>

## Typical goal statements of PdM 4.0:

- Maximize **utilization**, minimize costly **downtime**
- **Replace close to failure** components only
- Enable **just in time estimating** order dates
- Discover **patterns for problems**
- KPI of **asset condition**
- Reduce **risk**



# Trend dalam *Big Data*

## *Mobile and real-time data dominate.*

- Pada tahun 2025, lebih dari seperempat data akan bersifat real-time, dan data real-time IoT akan mencapai lebih dari 95%.

## *Artificial Intelligence transform the norm.*

- Wawasan dihasilkan melalui teknologi baru seperti pembelajaran mesin dan pemrosesan bahasa alami.

## *Security stays significant.*

- Dengan meningkatnya jumlah data yang dihasilkan, perlindungan dan keamanan informasi sensitif dan pribadi menjadi sangat penting.

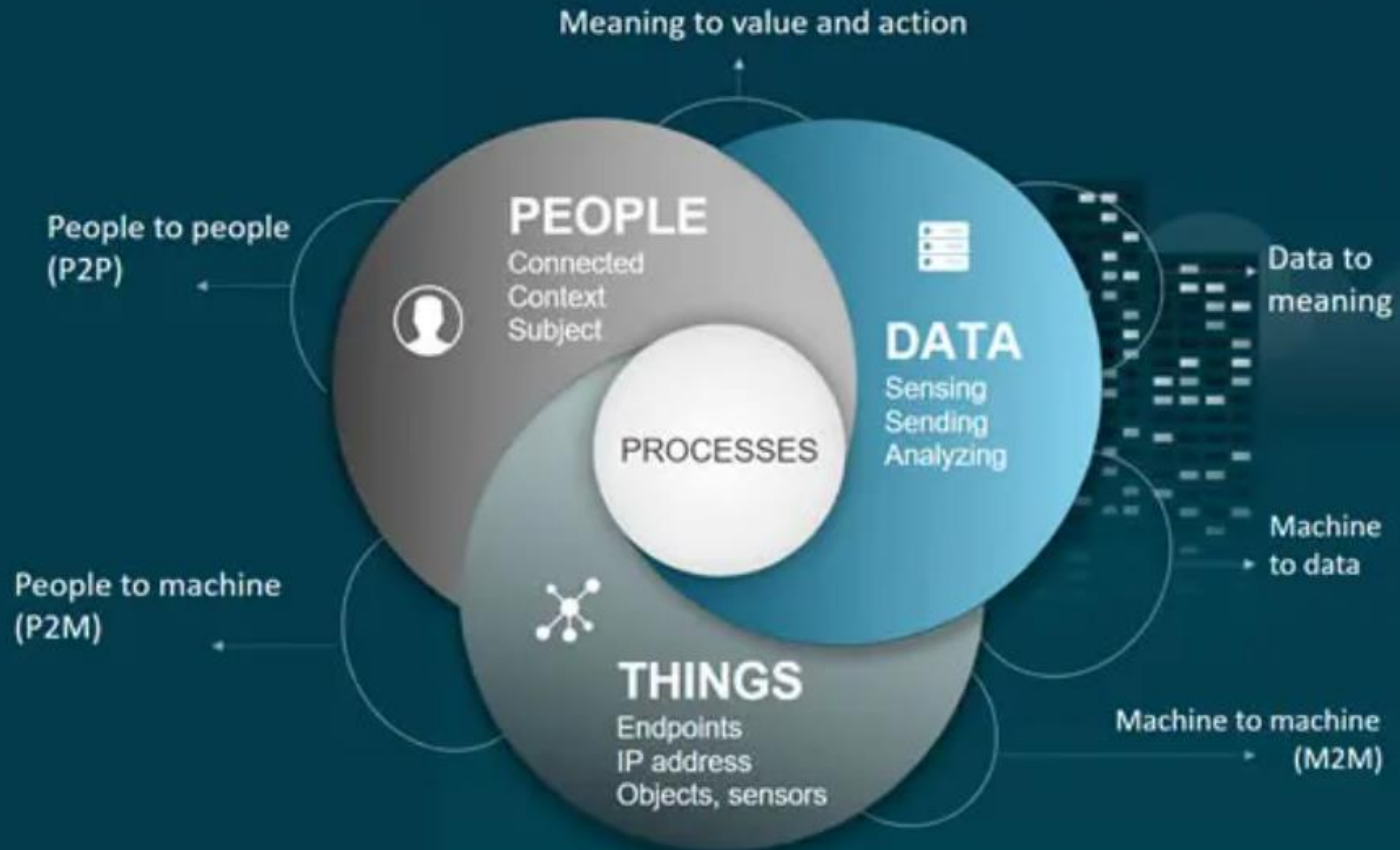
# INTERNET OF EVERYTHING



"The Internet of Everything (IoE) brings together people, process, data, and things to make networked connections more relevant and valuable than ever before—turning information into actions that create new capabilities, richer experiences, and unprecedented economic opportunity for businesses, individuals, and countries"



# People, processes, data and things



# Value at stake - drivers in the connection of everything



## People

Connect people in more relevant, valuable ways



## Processes

Right information to right person or machine at right time



## Things

Physical devices and objects connected to the Internet and each other



## Data

From data to useful actionable information and decisions/actions



## Sources

- Internet of Everything (IoE) Value Index <http://ow.ly/eXdM309rNRT>
- Embracing the Internet of Everything (PDF) <http://ow.ly/vli9309rNXk>
- The Internet of Everything is the New Economy <http://ow.ly/LPt2309rO0Q>

# INTERNET OF ROBOTIC THINGS (IoRT)

## IoRT market growth



## IoRT components

1

Intelligent device (robot) with embedded monitoring capabilities and additional sensor data from other sources.

2

Device can leverage local and distributed intelligence: analyze data from monitored event and access to data.

3

Fusion of various sensor data (embedded + sourced) with intelligence to determine actions to take and take actions.

Focus shift from today's predominant 'cyber' component of IoT to the 'physical' aspect of IoT as cyber-physical bridge between digital and physical - IoT and robotics in and for the physical world.








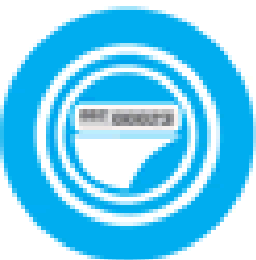


**Internet of Robotic Things (IoRT) is a concept where intelligent devices can monitor events, fuse sensor data from a variety of sources, use local and distributed intelligence to determine a best course of action, and then act to control or manipulate objects the physical world, and in some cases while physically moving through that world (ABI Research)**

The incorporation of the robotics aspect into the wider IoT transforms the landscape



### Sources

- The Internet of Robotic Things | ABI Research <http://ow.ly/qdIJ309n7JA>
- Internet of Robotic Things (IoRT) Market Worth \$21.44 Billion by 2022 <http://ow.ly/ae3Y309n7PT>

Speed	1Mbit/s+	~100kbit/s	<10kbit/s
Example technology	4G	2G, LTE-M	LoRa, SIGFOX, NB-IoT
Spectrum	Licenced	Licenced	Licenced or unlicenced
Example use cases	  <p>Smart phone      Connected car</p>  <p>CCTV</p>	  <p>Smart grid      Smart watch</p>  <p>High value object tracking</p>	  <p>Low value object tracking      Smart meter</p>   <p>Smart parking      Smart street lights</p>

# Terima kasih!

Ada pertanyaan..?

Email: [agfi@ugm.ac.id](mailto:agfi@ugm.ac.id) dan [agfi68@gmail.com](mailto:agfi68@gmail.com)