



Internet of Things

Introduction - Actualization - IIoT

Presented by ,
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R&D Engineer
IoT Applications

Agenda

IoT Introduction

What is IoT

Recent Buzz

Illustration

How is it different

Actualizing IoT

Actualizing IoT

Cloud IoT Platform

Protocols

DIY

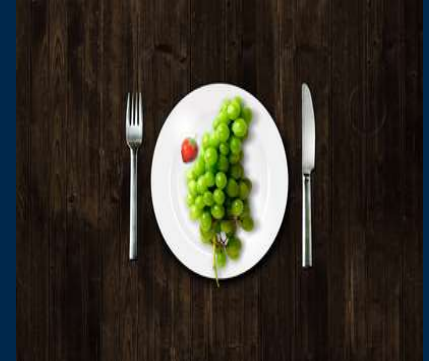
IIoT

I 4.0

Illustration

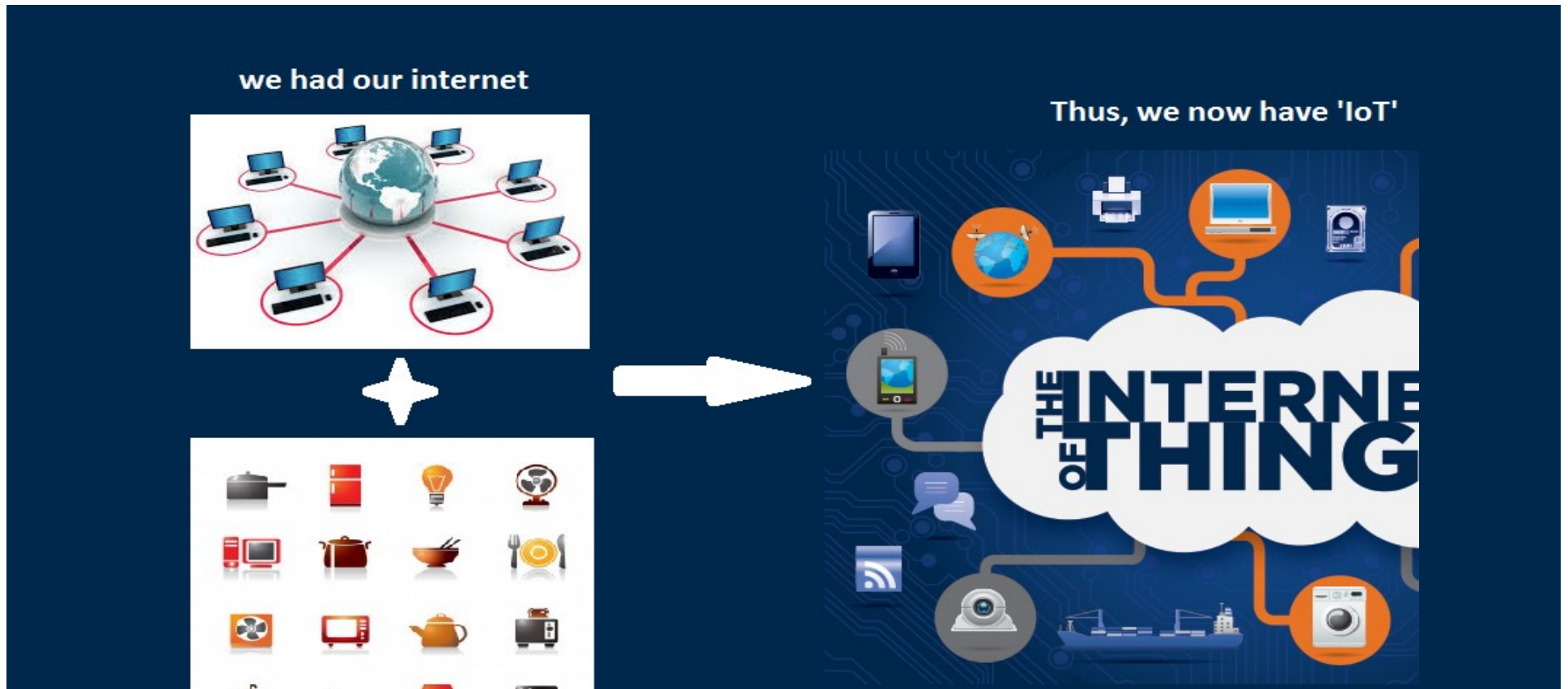
Relevance

Are they connected?



24-Feb-18

What is IoT(Internet of Things)?

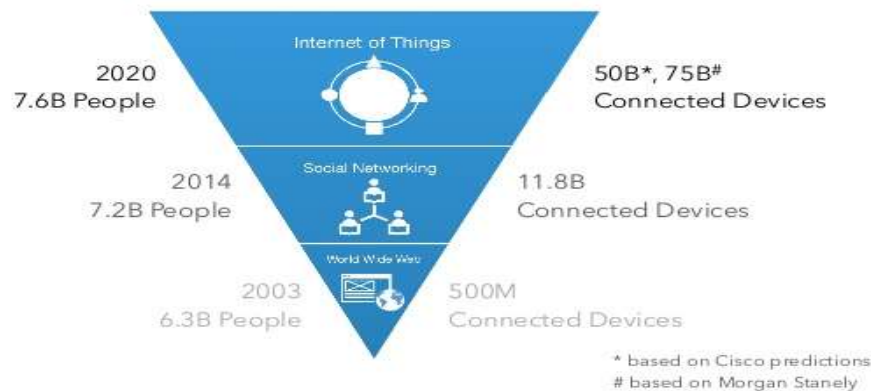


The recent buzz

The Internet Evolution

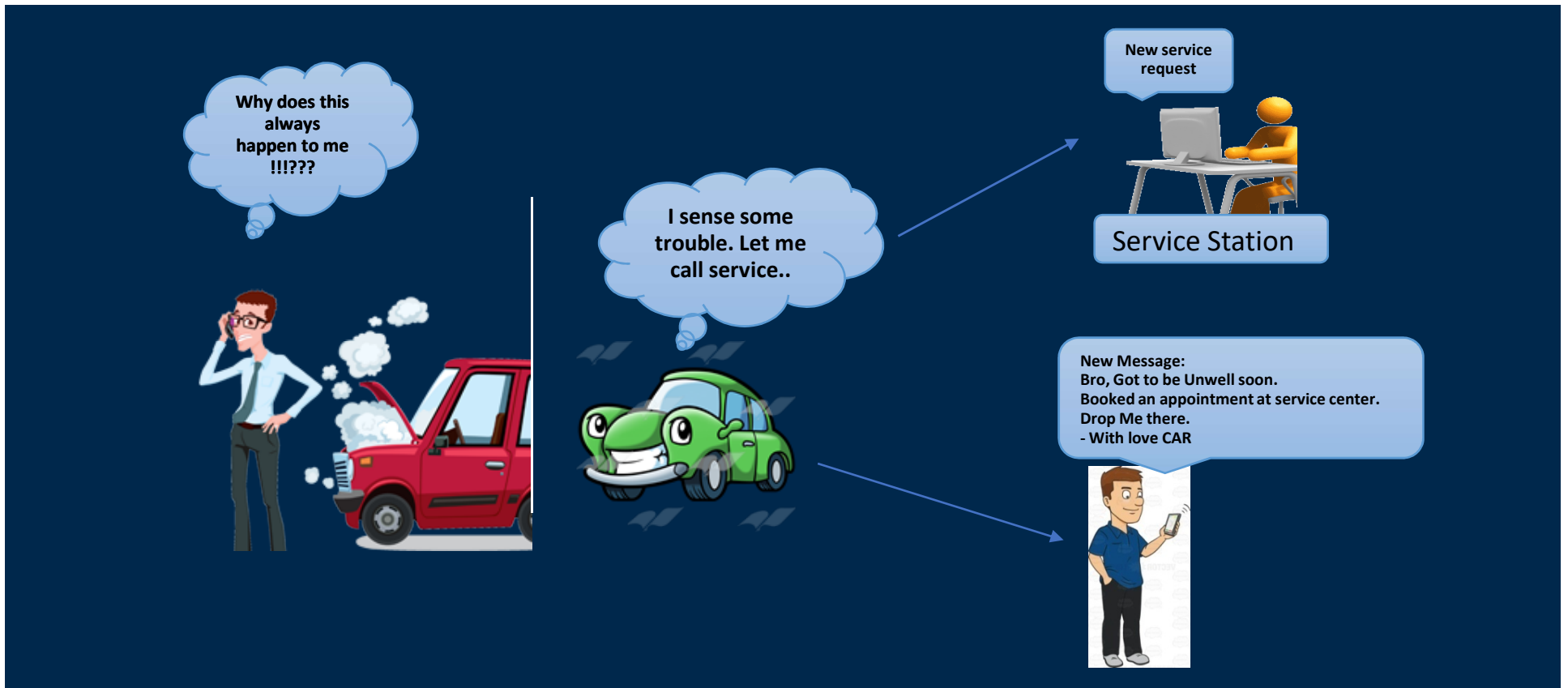
Information sharing to information generation and intelligence

The next revolution would be interconnection of every possible object on the Planet Earth, creating a New Internet called Internet of Things.

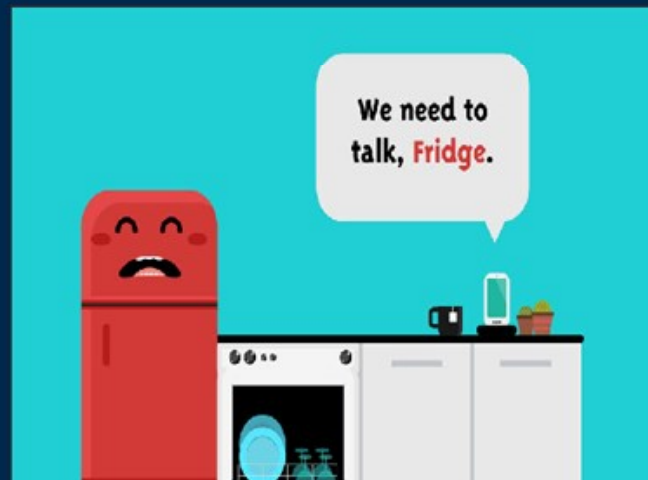


- World Population: As of August 2016 , it was estimated at 7.4 billion
- There are more than 12 billion devices that can currently connect to the Internet
- In next 5 years there will be 50 billion devices connected to internet.
- Consumer applications will drive the number of connected things
- While enterprise will account for most of the revenue

An Illustration



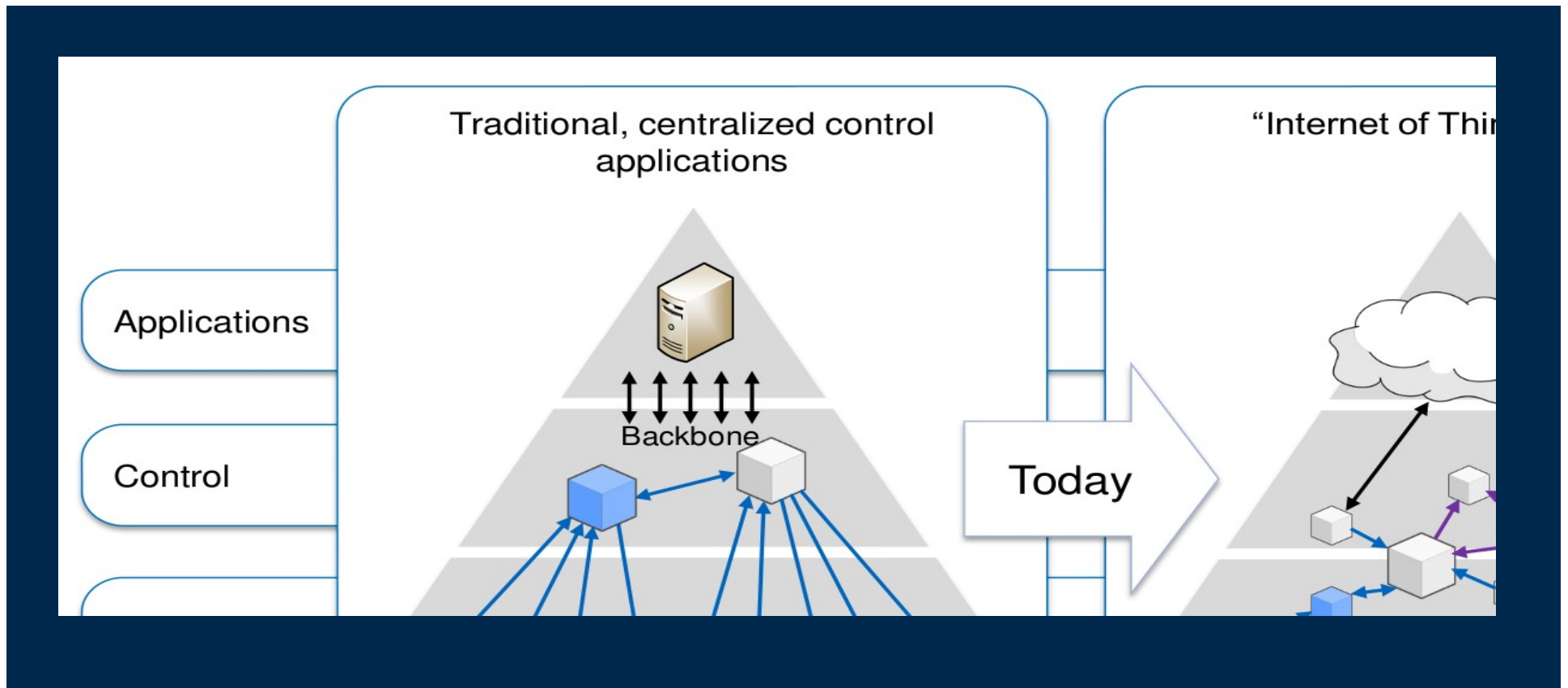
An Illustration



An Illustration



Isn't it already there?



It is as Iron-Man evolved



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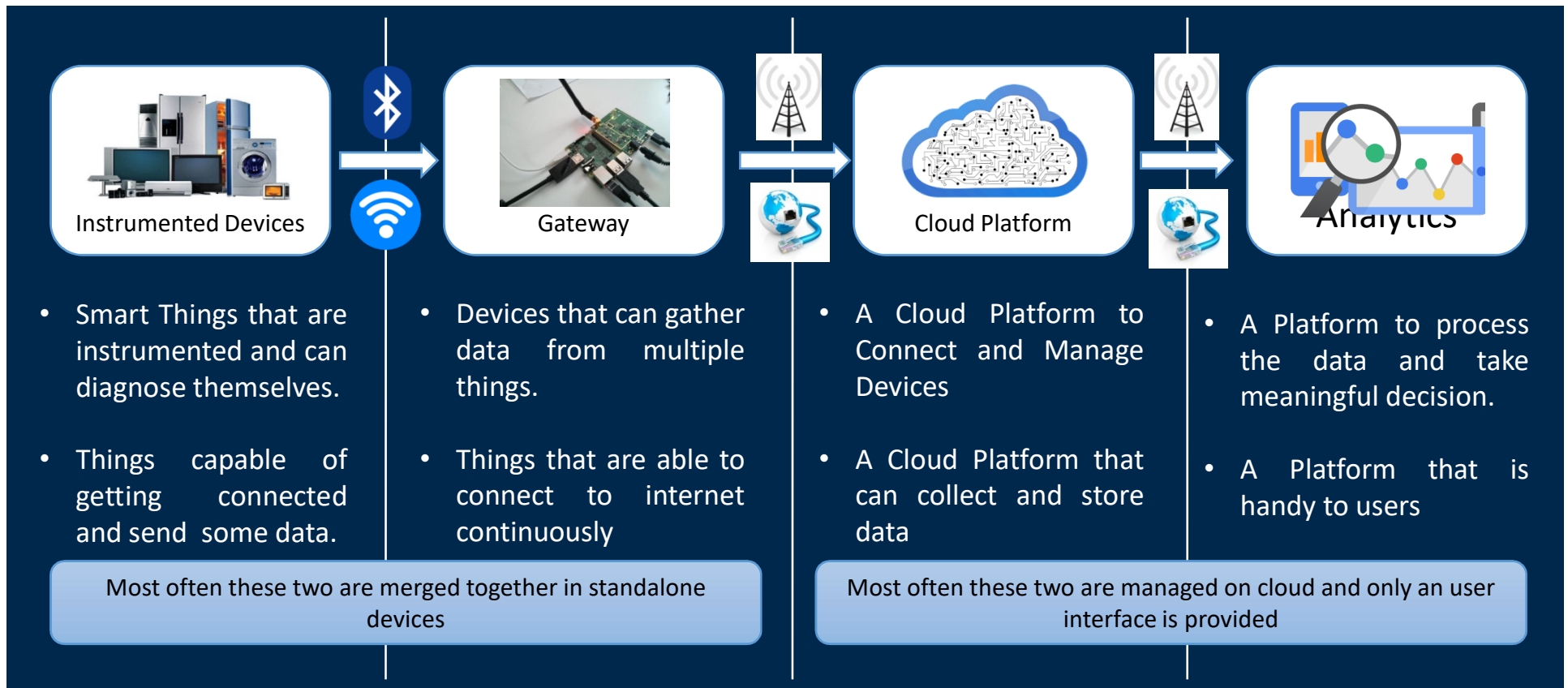
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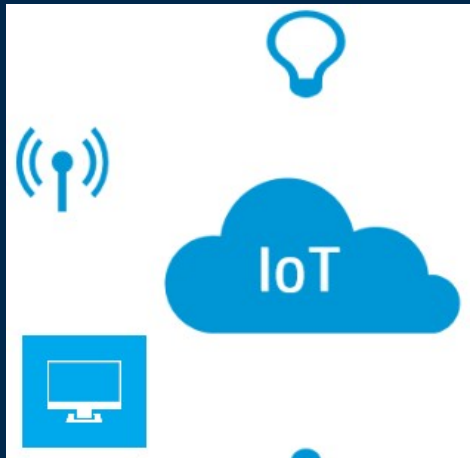
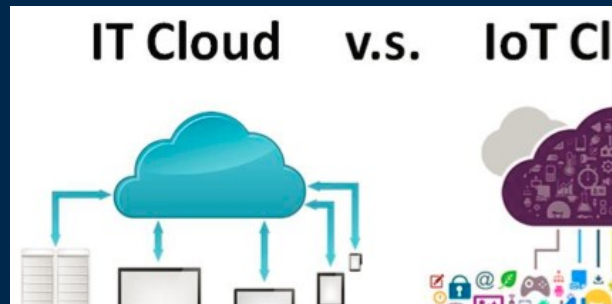
Illustration

Relevance

Actualizing IoT



Cloud IoT Platform



- Cloud computing Platform is a type of Internet-based computing that provides shared computer processing resources and data to computers and other devices on demand.

Internet of things platform

- Device management
 - Security
 - Device connectivity
 - Device communication
 - Event Management
 - It should have high availability and should easily integrate with database, analytics and other web services
- IoT platform forms the backbone of internet of Things where in the devices and applications connect and interchange data.
 - It should be capable of high scalability and real time message processing.

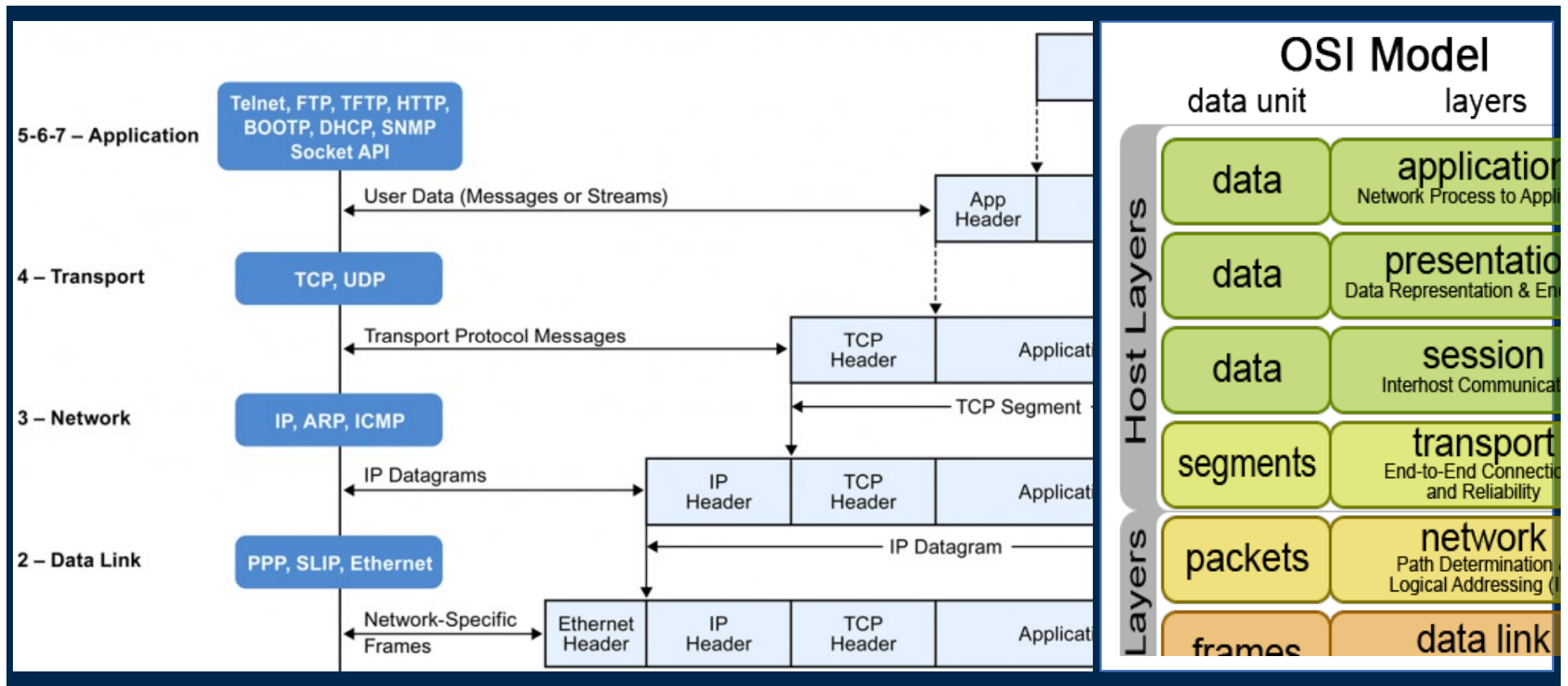
Leading Platforms

- IBM - Bluemix
- Amazon - AWS
- Microsoft - Azure

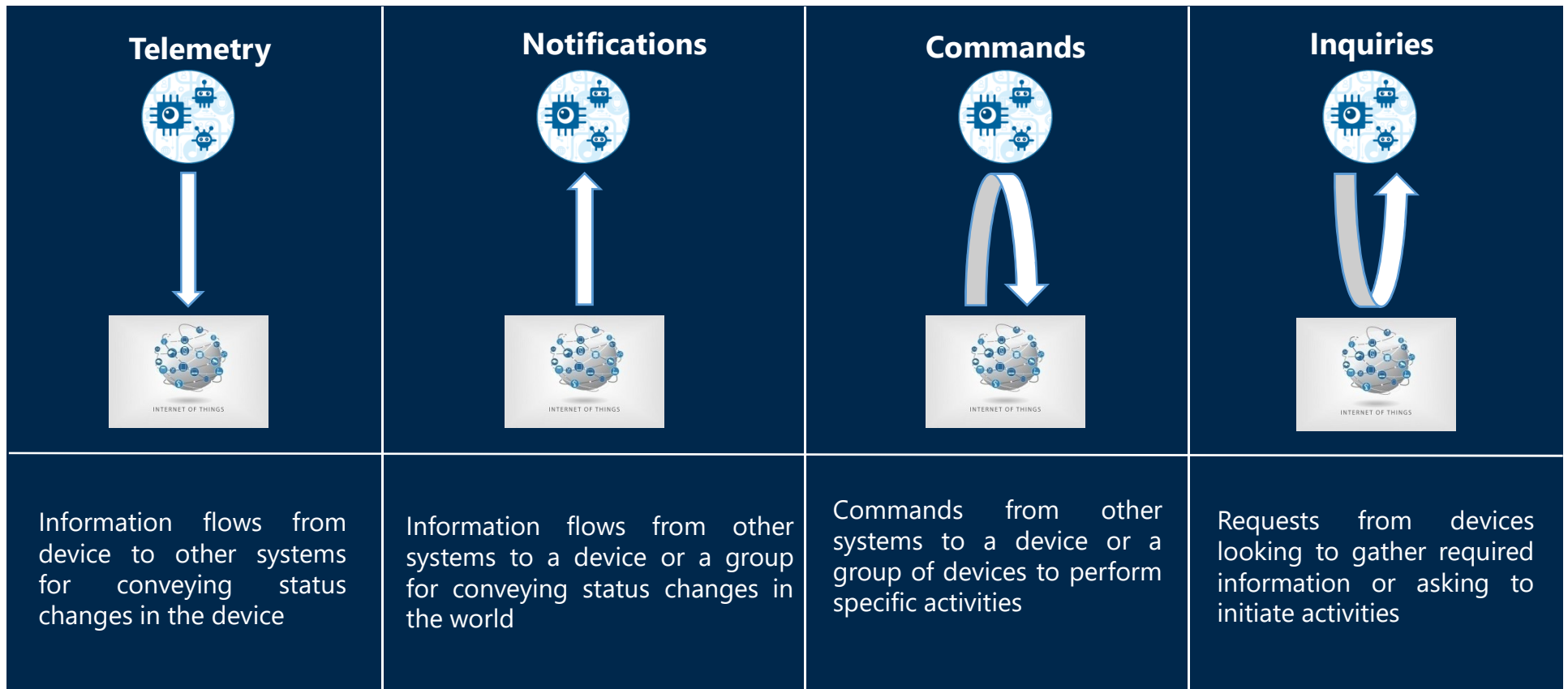
Open Source

- KAA
- Thinger
- Kura

OSI for 'I' in IoT

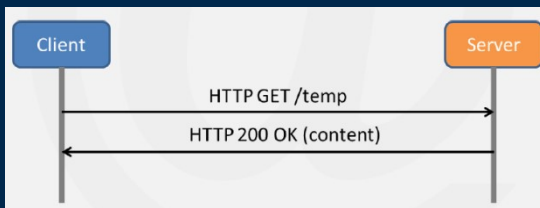


Communication between things.



Conventional Web Application Layer

- This layer interacts with software applications that implement a communicating component.
- Identifying communication partners, determining resource availability, and synchronizing communication.
- The Hypertext Transfer Protocol (HTTP) is an application protocol for distributed, collaborative, hypermedia information systems.



Push on client

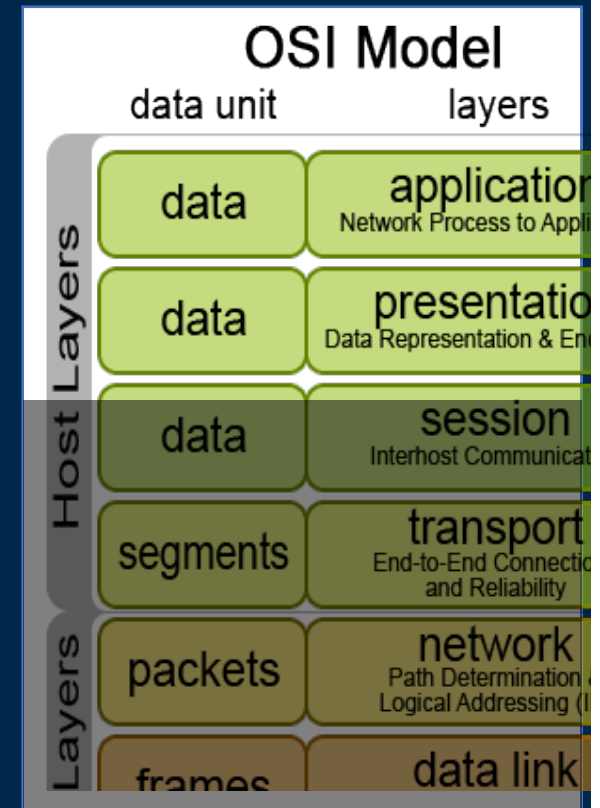
- server sent events
- Long Polling
- no Quality of Service

Heavy weight

- ASCII, text based headers
- client more complex (ASCII parser)
- more bytes to pay on data transfer

Other Back logs

- No “messaging middleware”
- REST architecture
- Resources access by URIs



What's it to do with Protocols?

Real Time Messaging

- In the Internet of Things, autonomous electronic devices exchange information with each other and with other computer systems over the Internet.
- Real-time communication technology is an absolute requirement for the development of Internet of things (IoT) applications.

Light Weight

- But these devices neither have the machine equivalent of our normal personal computer systems nor run Web browsers.
- These interconnected devices are usually of short range low power wireless devices with their own predefined set of operations or purpose.

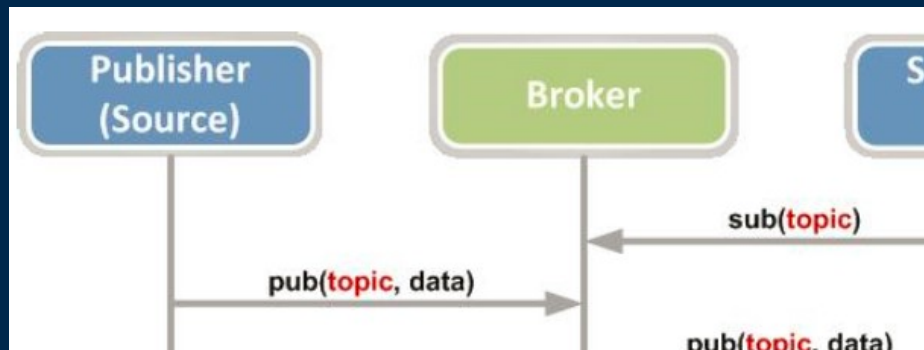
Because of this, the protocols that are currently used on the internet cannot be directly used in these devices.

Imagine the use case where your phone communicates with your lights. If it takes several seconds before your lights turn on, that's a failed user experience

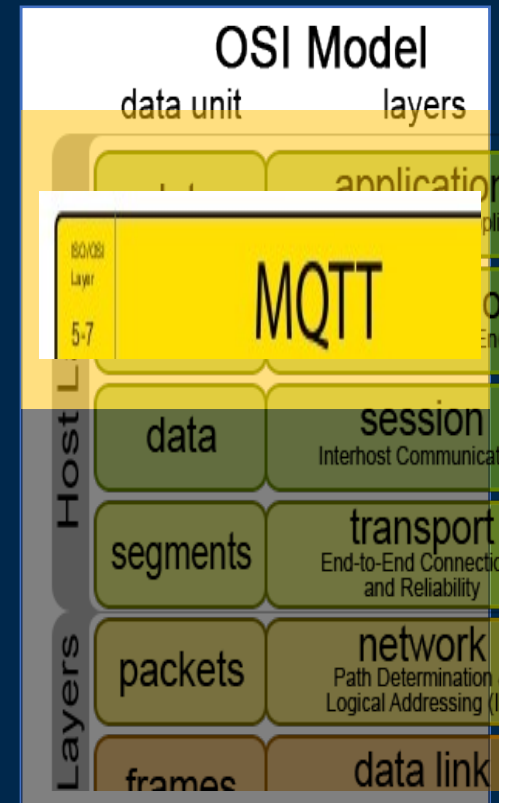


Application Layer for IoT : MQTT

- MQTT(Message Queuing Telemetry Transport) is a machine-to-machine (M2M)/"Internet of Things" connectivity protocol.
- It was designed as an extremely lightweight **publish/subscribe** messaging transport. It is useful for connections with remote locations where a small code footprint is required and/or network bandwidth is at a premium
- MQTT was found by IBM and in 2013 it was donated to OASIS (Organization for the Advancement of Structured Information Standards)



- The publish-subscribe model requires a message broker. The broker is for distributing messages to interested clients based on the topic of a message.



MQTT Features

Lightweight

- smallest packet size 2 bytes (header)
- reduced clients footprint

Security

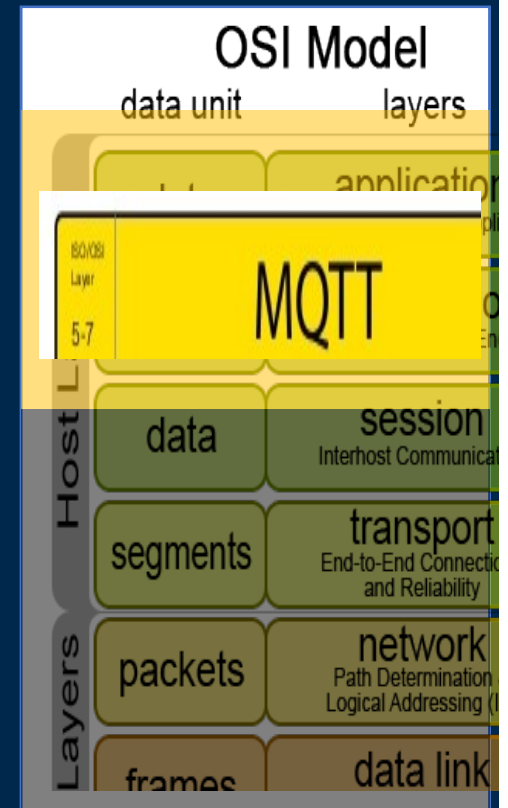
- MQTT is over TCP ... use SSL/TLS for security
- username/password on connection
- encrypt payload

Reliable

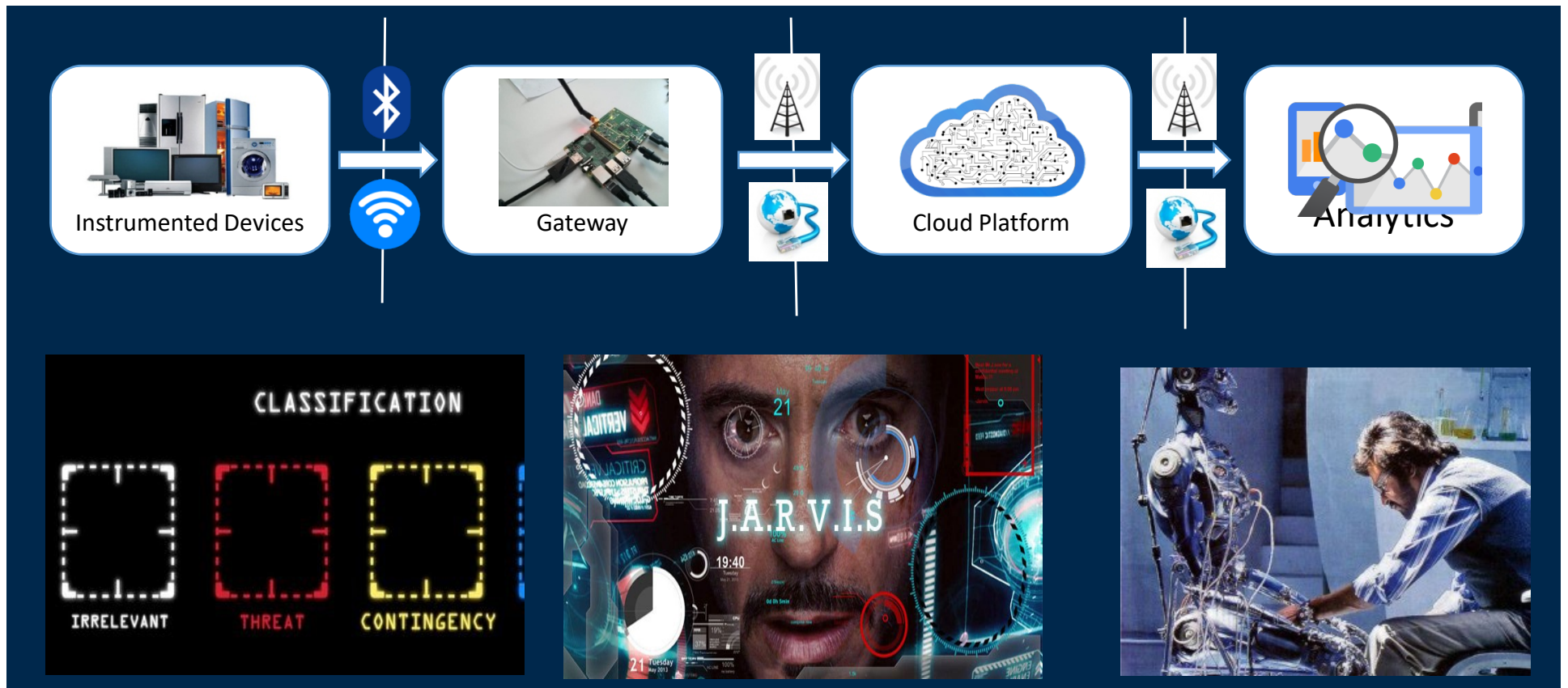
- Three QoS levels
- avoid packet loss on client disconnection

Simple

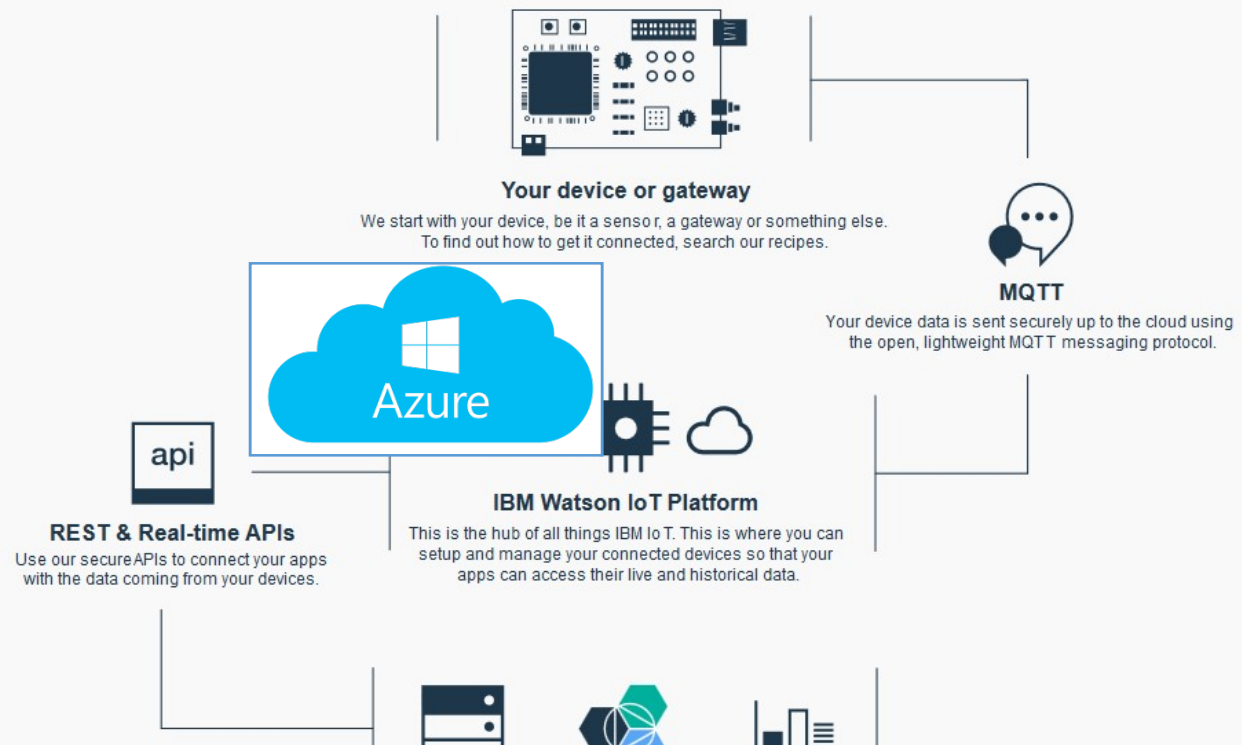
- TCP based : socket connection oriented
- Asynchronous : no wait for response
- Publish/Subscribe : decoupling producers and consumers
- Payload agnostic : any data format (text, binary, JSON, XML)



Actualizing IoT



Implementing IoT



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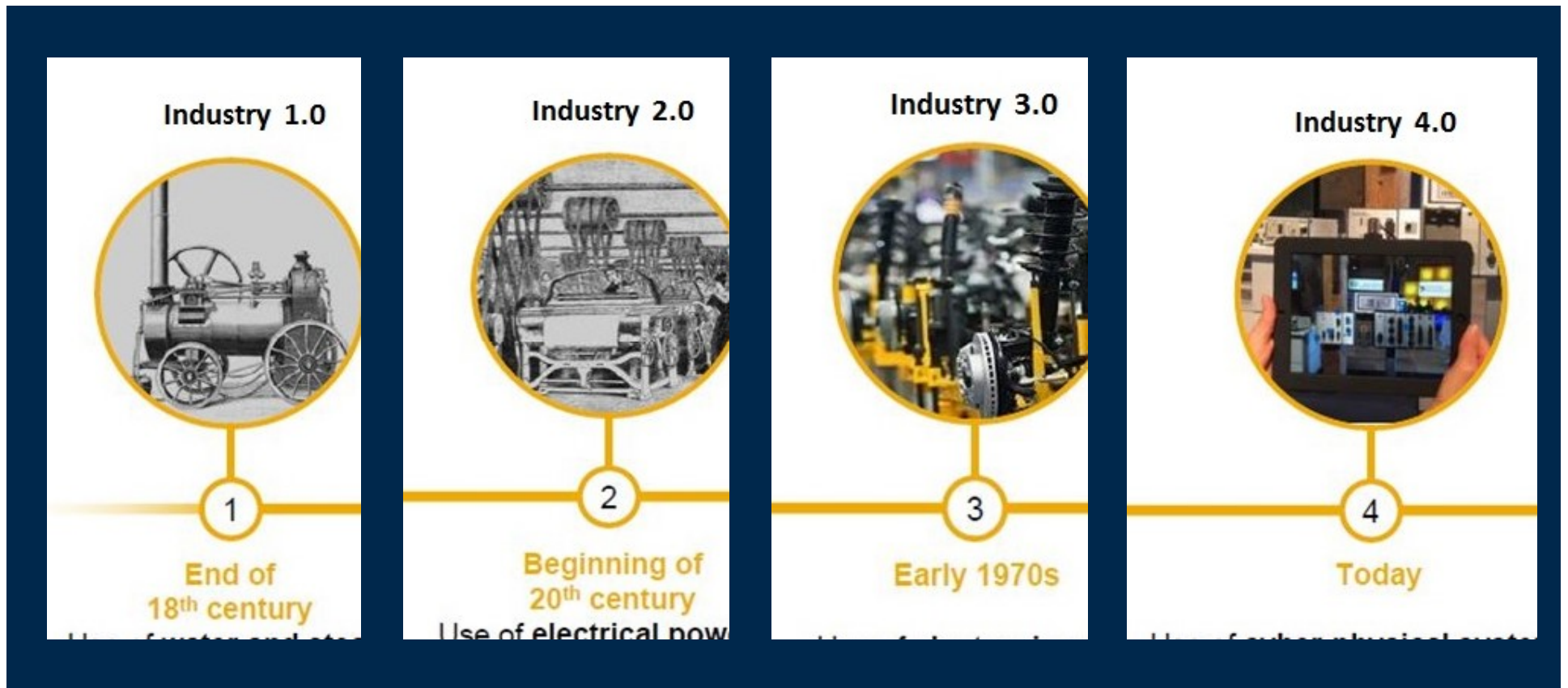
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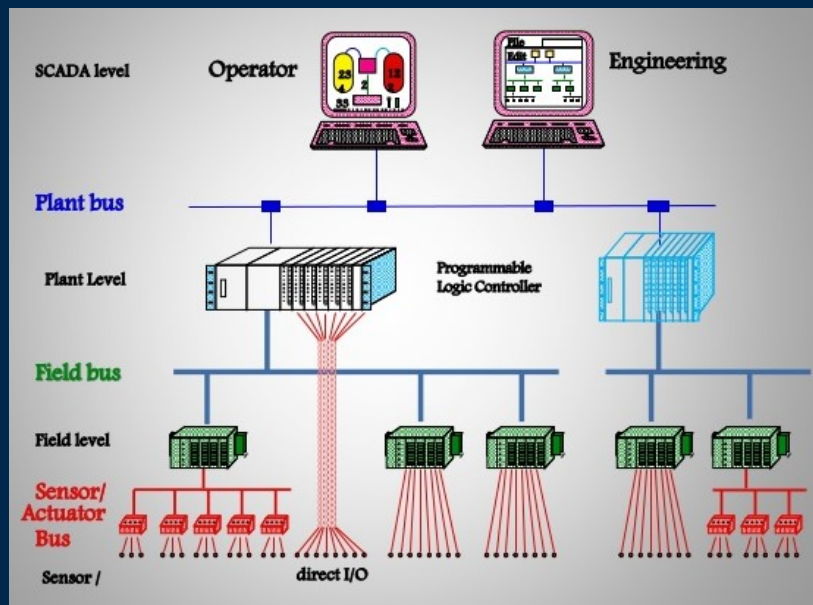
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Relevance

i4.0 : IIoT



Relevance

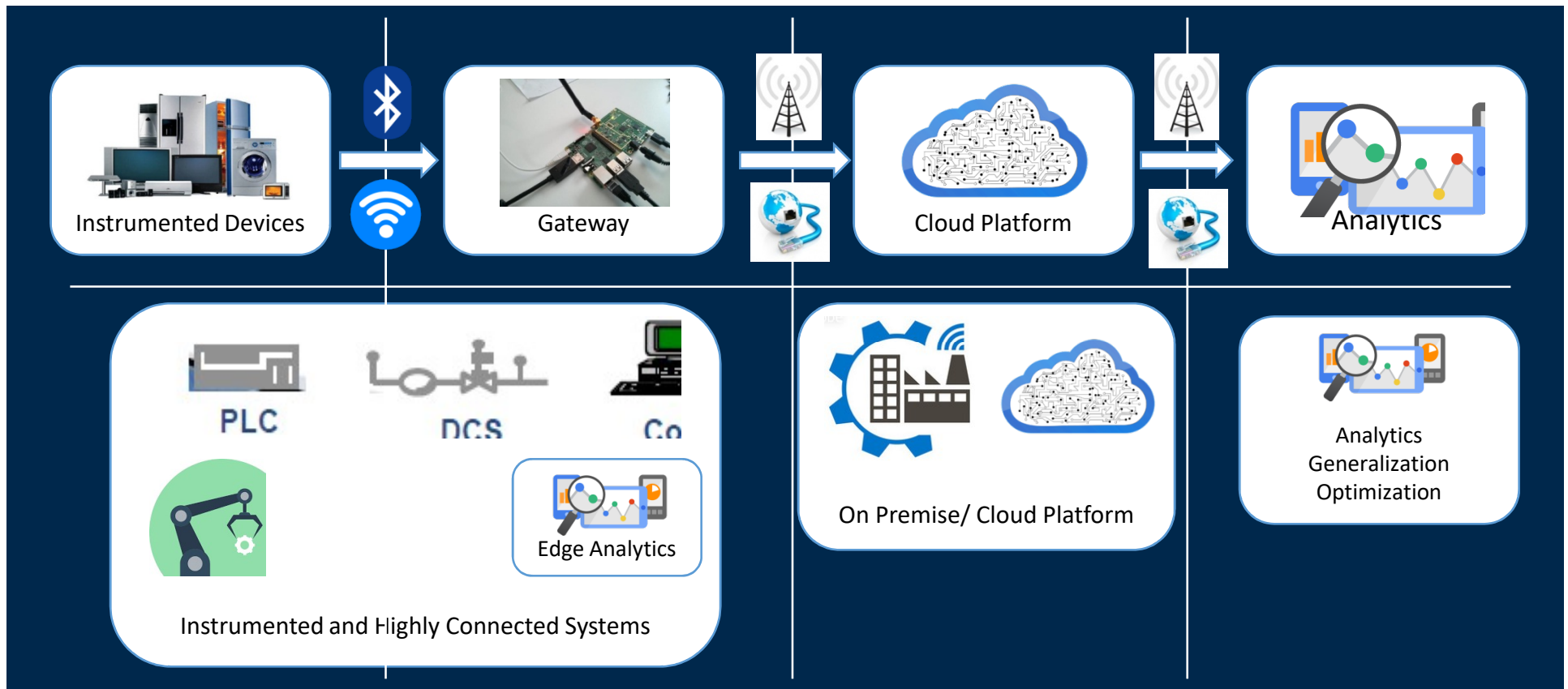


- What if the plant manager wants to be updated of the plant status all the time?
- What if the research team wants to try out new optimization algorithm on the system?
- How to derive maximum system utilization by shifting the trend from preventive maintenance to predictive maintenance?
- How to manage the plant inventory in real time avoiding product stocking?
- How to make workplace and workmen safe?




Monitoring and control

Monitoring and control
System optimization
Enterprise system integration

IIoT: Difference from IoT

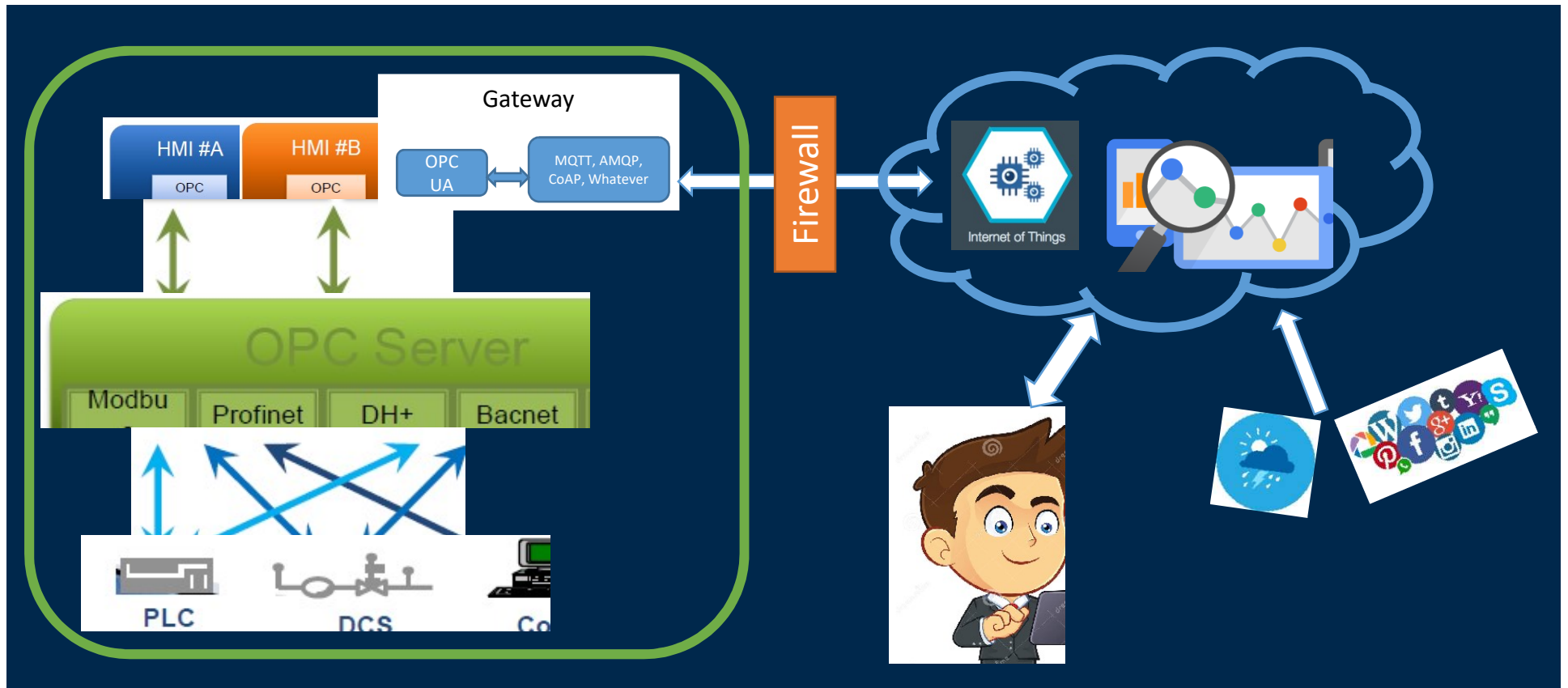


IIoT : Challenges

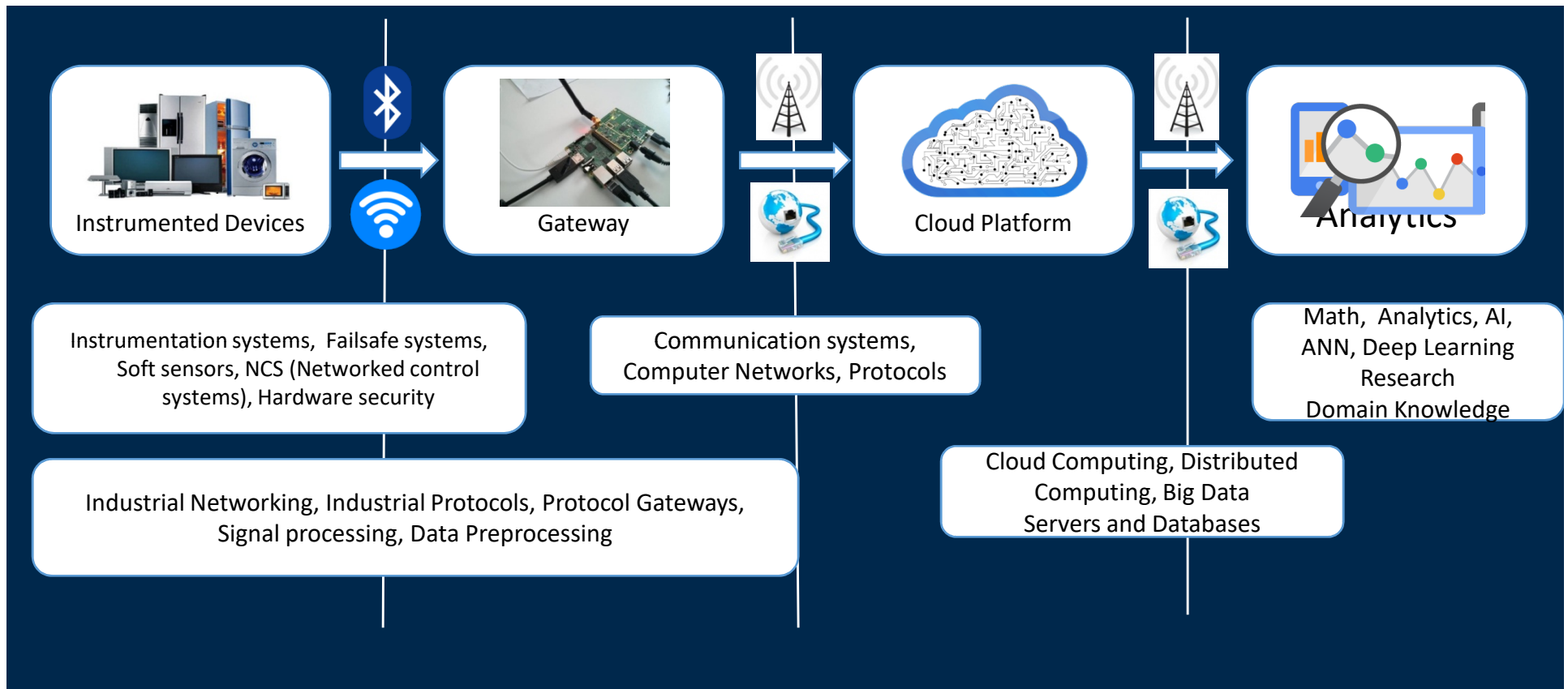
<p>Instrumented and Highly Connected Systems</p>  <p>PLC DCS Edge Analytics</p>	<p>On Premise/ Cloud Platform</p> 	<p>Analytics Generalization Optimization</p> 
<ul style="list-style-type: none"> • Devices from multiple vendors - Multiple communication protocols. • Highly fail safe systems – No introduction of new devices. • High cyber attack surface vulnerability - less susceptibility of bidirectional communication. • Less physical and network availability. Production systems cannot take frequent changes. 	<p>Data Security } On Cloud Systems</p> <p>Multi tenancy }</p> <p>Scalability } On Premise Systems</p> <p>Maintenance }</p>	<ul style="list-style-type: none"> • Field of exploration and research • No – one specification fits all – algorithms • Generalization to multiple systems is a research field.

Security on all layers. Implementing inherent secure design

Illustration



What do I do?



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Thank You

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