

# **IoT Architecture Fundamentals**

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# Disclaimer

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# Agenda

- Theoretical introduction
- IoT data path
- Sensors
- Gateways
- Backend systems
- Buy vs. Build
- Conclusion
- Q&A

# What is IoT?

- Global network of entities
- Self configurable
- Highly standardized
- Describing relationships between physical and virtual entities
- Integrates intelligent gateways and interfaces
- Single network of entities and services



**(Business + Technology) x Reality = IoT**



# Revolution or Evolution?

ICT System consists of ERP, BW, PI, MDG, SoA components, BI ...



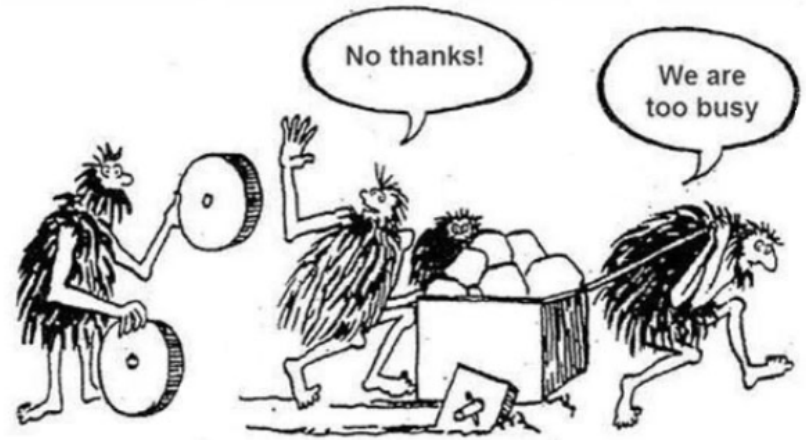
Production/physical system consists of SCADA, RFID, WSN, M2M ...



**IoT is here to extend boundaries including interoperability between existing and new technical components rather than replace them.**

# Invite a wheel?... Why not!

But look around first for wheels already available and get inspired.



At areas where standards are already mature...

For example Building and Industrial automation



# Components involved

Are Real world entities enriched by sensing, actuation capabilities.





# IoT Data path



	<b>IPSO</b>	<b>TCP/IP</b>
<b>Application layer</b>	CoAP	HTTP/FTP/SNMP
<b>Transport layer</b>	UDP	TCP/UDP
<b>Network layer</b>	6lowPAN	IPv4/IPv6
<b>Link layer</b>	802.15.4.e	802.3 eth 802.11 wifi

# Sensor/Actuator

Are very basic and deployment specific elements capable of take action based on received message or send alerts when send criteria are matched.



## Challenges:

- Info Security (certificate distribution)
- Power management (battery, harvesting)
- Physical security (if installed on public places)



# Gateway

- Data access + aggregation and retention
- Physical to Virtual entity transformation
- Field protocol integration
- Highly standardized API for data access



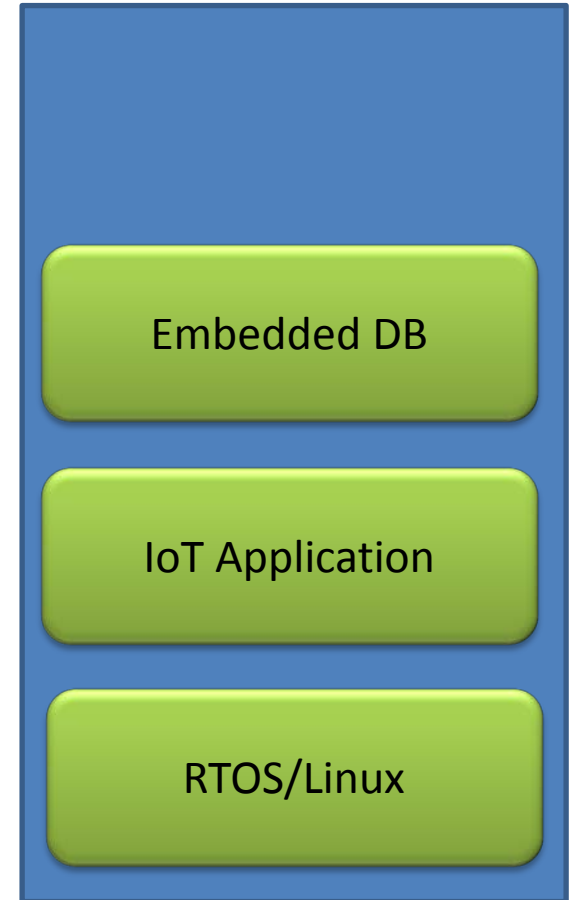
# Database based Gateway

## PROS:

- Easy to develop and integrate
- Persistent data storage
- Standardized access (JDBC/ODBC)

## CONS:

- Not real time responses
- Mainly for read operations



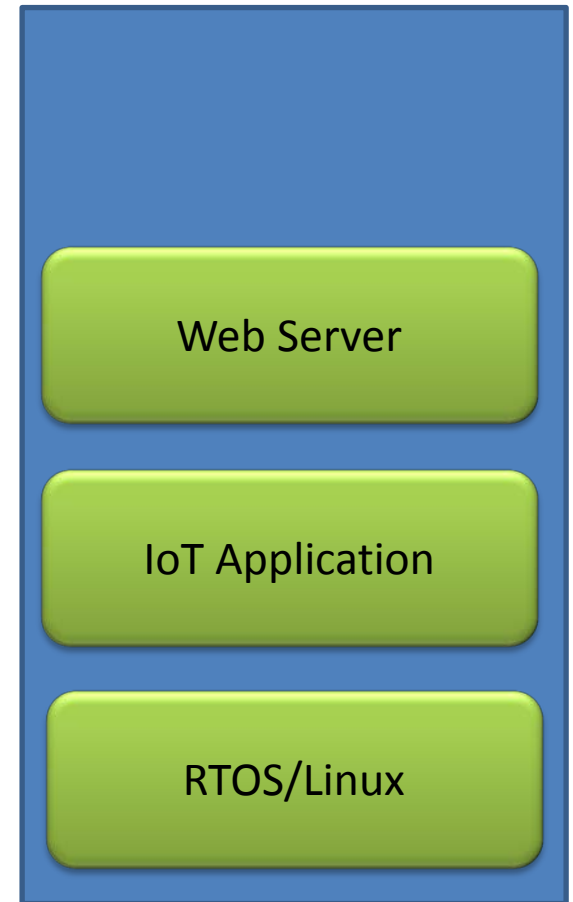
# Program based Gateway

## PROS:

- Close to real time responses
- Standardized access (SoA, WSDL/Rest)
- Subscribe/Publish possible

## CONS:

- No persistence on gateway
- Data aggregation inside IoT Application



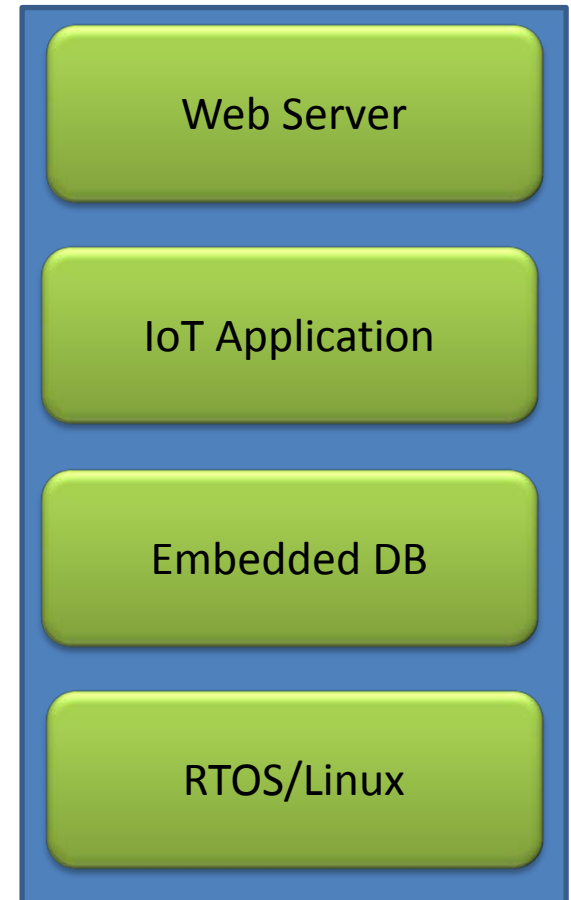
# Hybrid Gateway

## PROS:

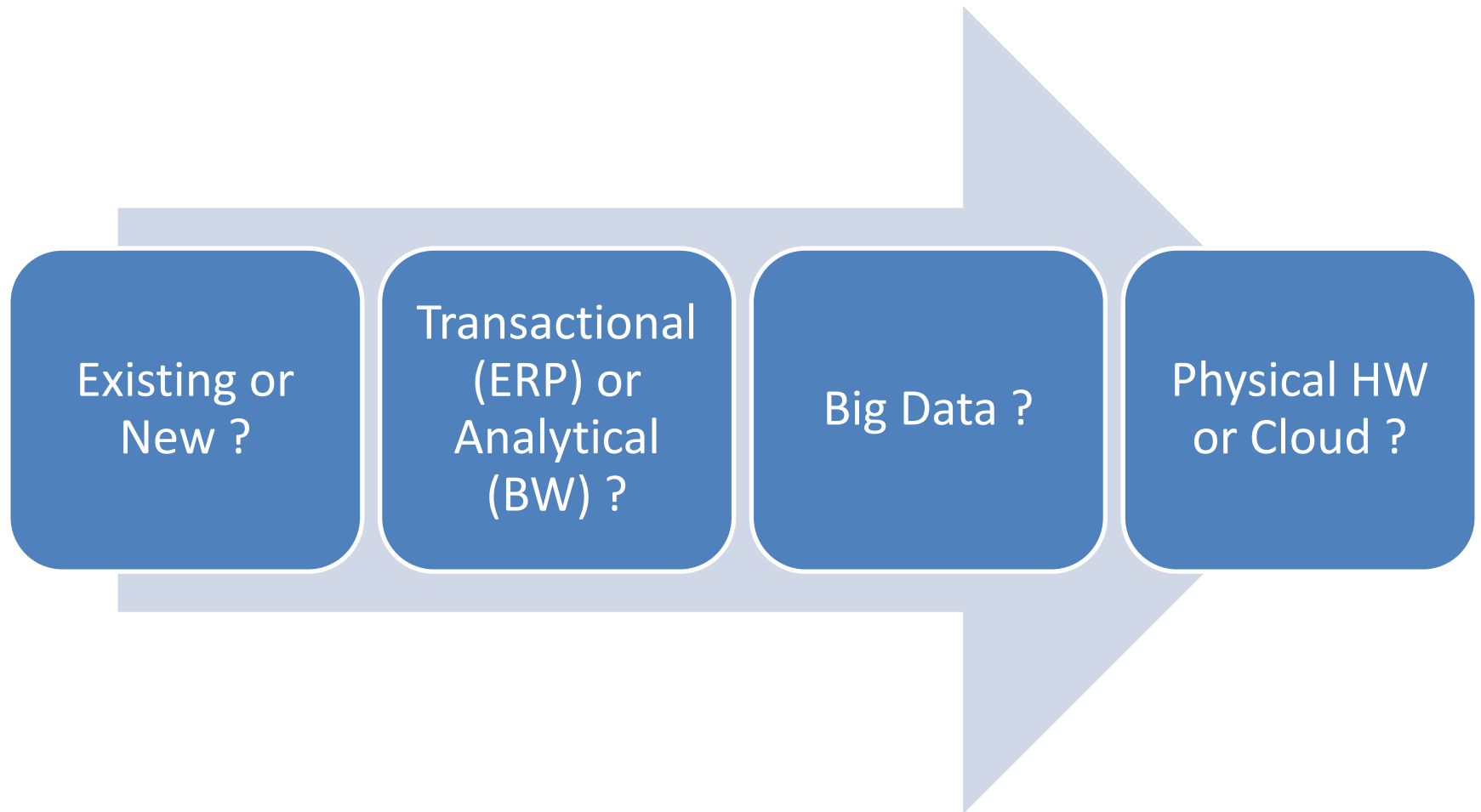
- Combine benefits of previously mentioned gateways
- Ideal for large deployments
- Can serve with IoT services in area where deployed

## CONS:

- Higher complexity



# Backend systems



# ERP vs. BW

ERP integration is more complex ,require BPE IoT compatible, enrich business processes with real world values.

BW integration is less complex, based on WSDL, ODBC. Providing extensions in analytical part only.

Ideal solution from IoT point of view is hybrid system combining OLAP and OLTP functionality in single system (Big Data).



# Cloud and Big Data

- Big Data are rather about “Big things” what we can do with data than size of data on disk.
- Cloud is way of consumption of IT resources in flexible and scalable way.

# Buy vs. Build

$$\text{TCO} = \text{Effort} + \text{Price}$$

	Unique (Single case)	Platform	Solution (Standardized)	
Buy	Vendor	Vendor>Customer	Vendor	Price
Customize	Vendor<Customer	Vendor<Customer	Vendor<Customer	
Build	Customer	Customer	Customer	

Effort

# Conclusion

IoT is not only about sensors or protocols, it is rather complex technology solution what will interact with our existing systems.

Standards for IoT protocols are missing. But as far as Reference Architectures are in place I strongly believe that implemented systems will define communication standards rather than organizations 😊

# Q&A

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