

# HERE & NOW: AN IOT DESIGN METHOD PART #1

A method from Megatris Comp.



Creative Commons License

Here&Now by Megatris Comp. LLC is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License.

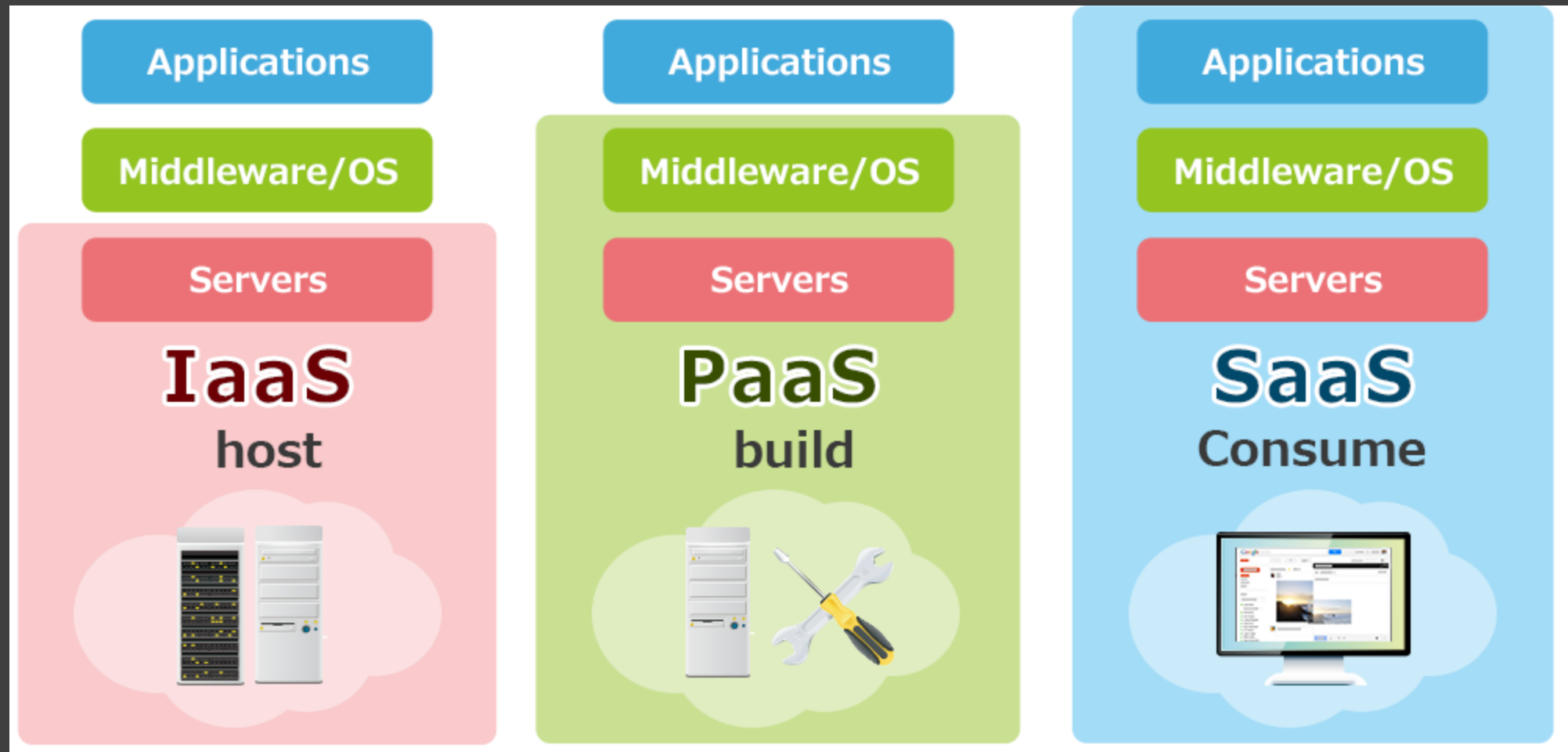


# **BUSINESS AND TECHNOLOGICAL CONTEXT**

# CONTEXTUAL CHARACTERISTICS

- Intelligent objects introduce a new vision for strengthening communication, relationship and business.
- Each system must be able to communicate with other systems in use because integration brings scalability, adaptability, flexibility and greater efficiency.

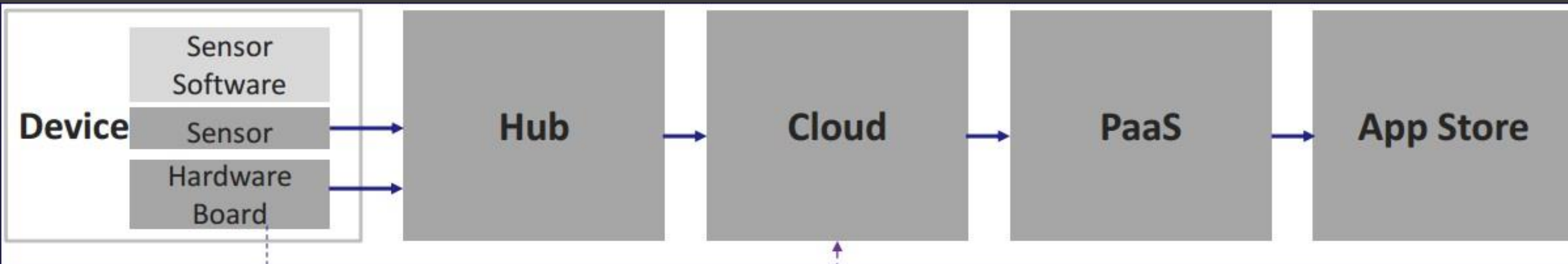
# CONTEXTUAL CHARACTERISTICS



The key to development are the services, not the objects.

# IOT BOUNDARY CONDITIONS

- Governance in place of:
  - hardware (fixed or mobile, in house or in cloud),
  - software (middleware and control and monitoring solutions)
  - resources ICT (VMs, networking throughput and connection, ...)



# BUSINESS BOUNDARY CONDITIONS

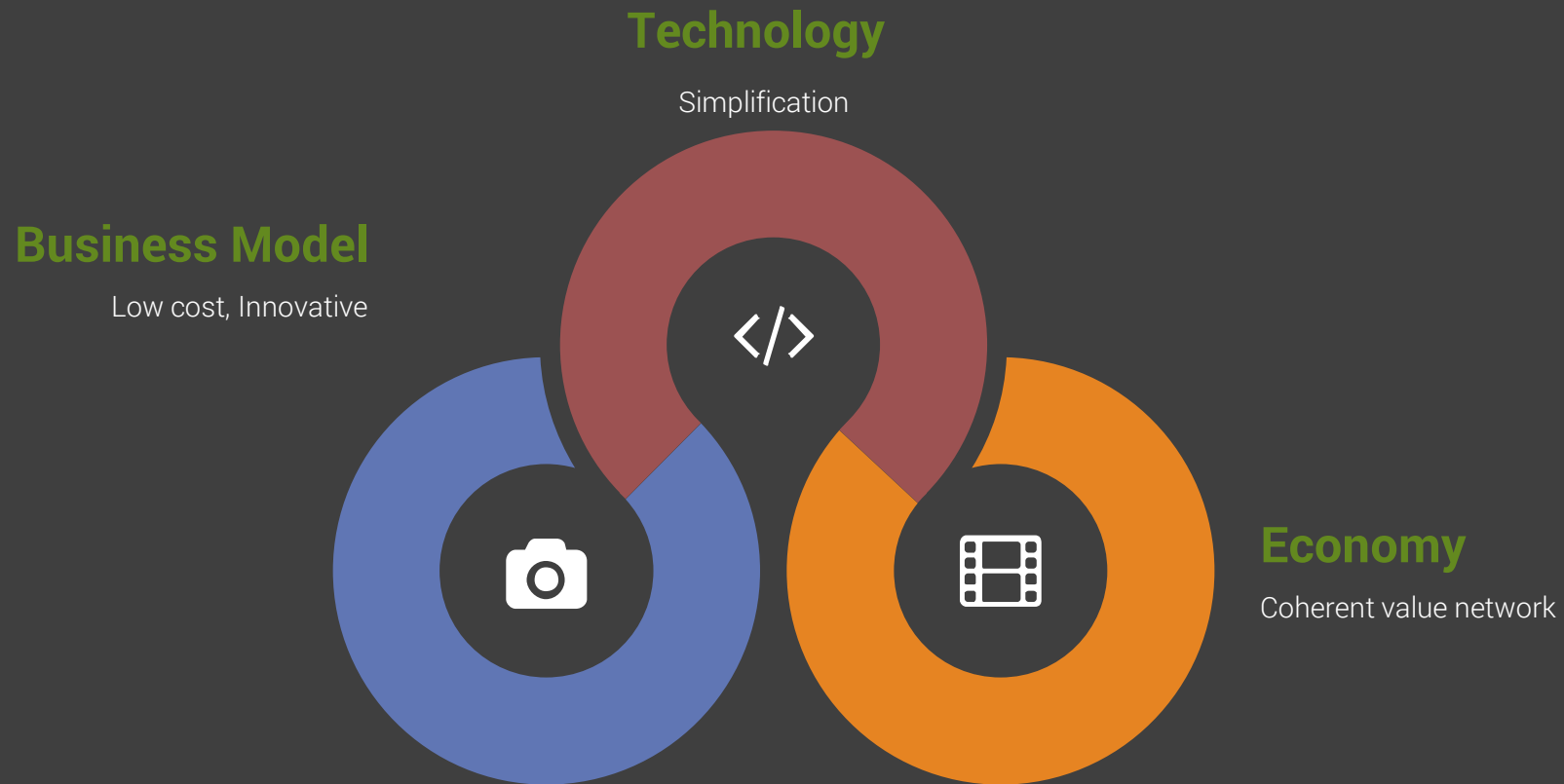


- To have a disruptive innovation in place.
- IoT is *disruptive* as it breaks with the past, using technological innovation to create products and / or services. (**The Economist**: *The path to self-disruption: Nine steps of a digital transformation*)
- The breaking point is the change in strategy: instead of working on established habits of the people and the progressive improvement of existing products or services, using creativity and imagination to design products and services which do not exist yet.

# INTEGRATION OF BUSINESS-SOFTWARE

- IoT on one hand and social media on the other hand are connecting the world using a new logic of use and service.
- It is clear that the world of objects connected and communicating is able to quickly transform and greatly our needs and our habits in a positive sense .
- New business must start from this new vision of technology and the world in which we live.
- To be smart means to have applications **that short-circuit the information by modulating key services in digital**. Programming makes use of API (Application Programming Interface) and the Agile method, in a combination that has ushered in a new era of development called DevOps.

# BUSINESS BOUNDARY CONDITIONS



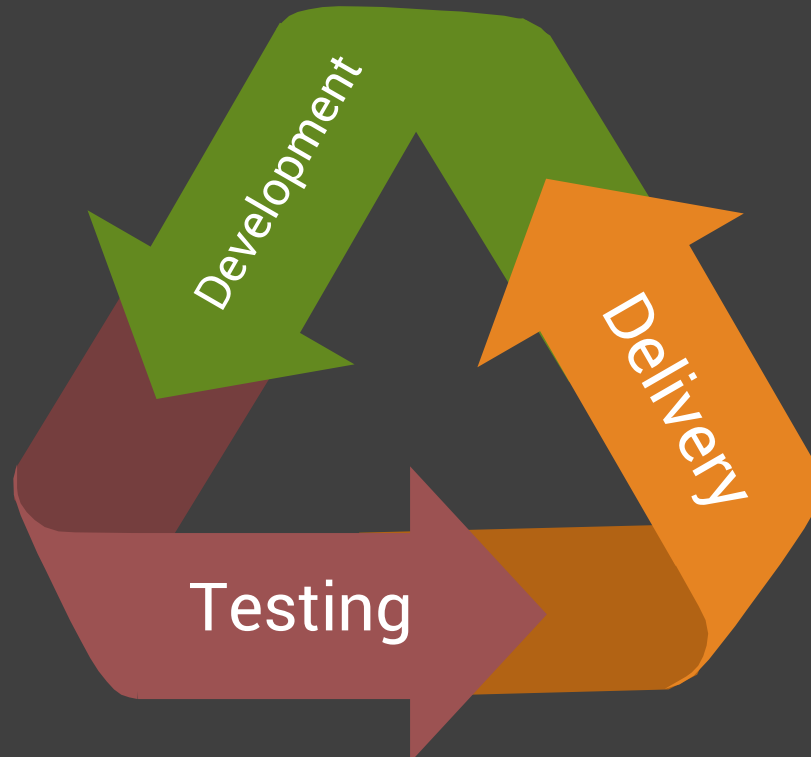




# **BUSINESS AND TECHNOLOGICAL CONTEXT**

# WHY HERE & NOW

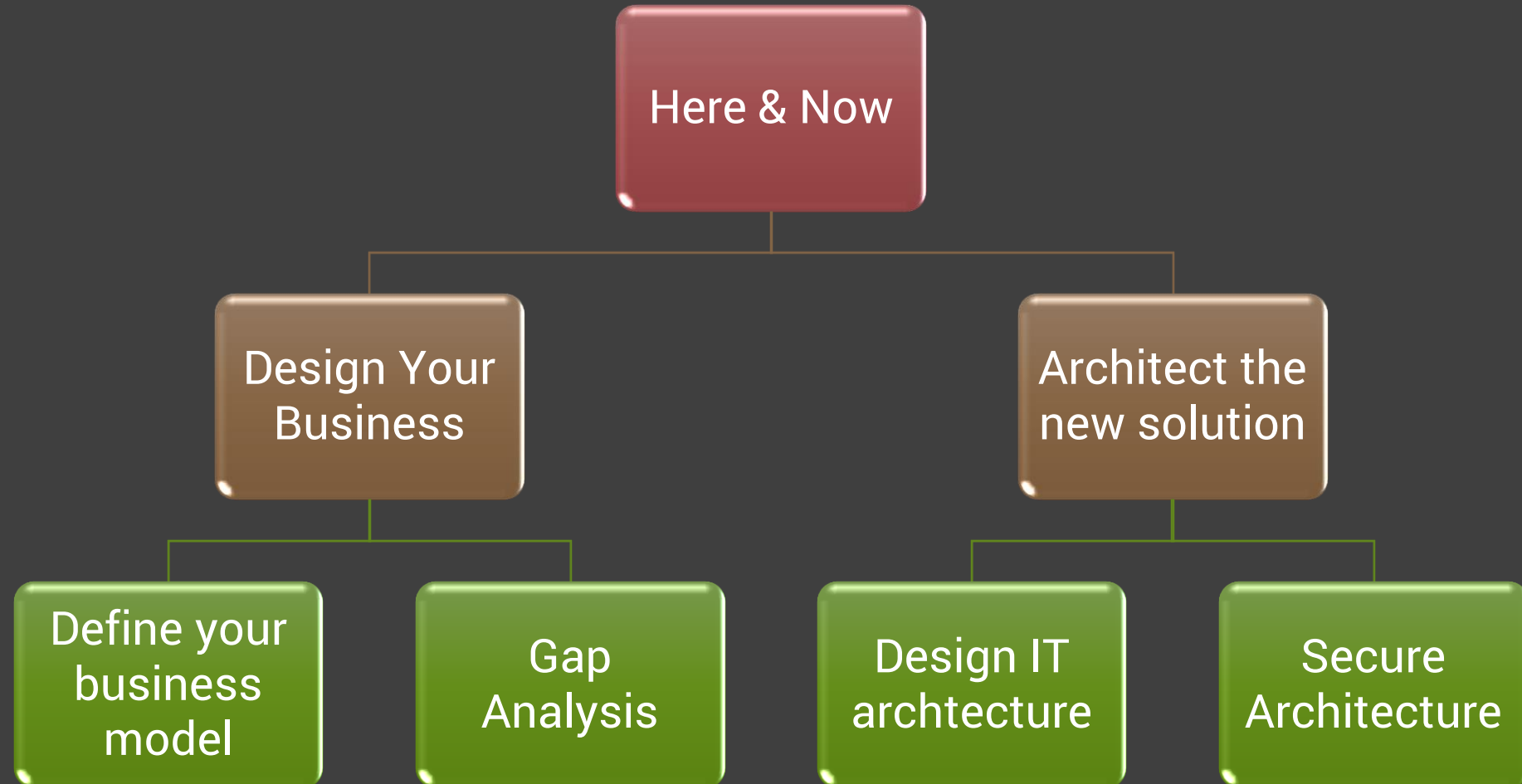
- Here: the app is here means just near people and satisfies their needs
- Now: continuous delivery helps to generate a continuous flow of new services with users feedback rather than a long period of waterfall production with a unique and often bad app



# BASIC PRINCIPLES

- The customer at the center of everything is the way to develop the business.
- We all become users, each with specific needs.
- Put in place a transition from the Customer Relationship Management (CRM) to Customer Experience Management (CEM).
  - Smart Objects can help relationship with its users, routing information flows more efficiently and functionally.
  - It best supports the **individual digital life** (productivity, physical and mental capability) and, secondly, help track the behavior and requirements to better align services.

# THE METHOD



# PAY ATTENTION

Business steps excluded to avoid too many steps that requires a big amount of time.

On request we could do a dedicated session.



**ARCHITECT THE NEW SOLUTION**

# ADAPTATIVE APP

- Adaptiveness is a basic characteristic of apps
  - Readily capable of adapting
  - OO and polymorphism as a vehicle



# DESIGN IOT ARCHITECTURE

- Cloud, mobile and Internet of Things need increasingly flexible, distributed and pervasive software able to adapt to the diverse needs of the interlocutors with whom they relate.
- Driver of development, according to Gartner forecasts, will be the preferences and use of services associated with the IoT from consumers.
- The increasing **information flows** will be managed and controlled on analysis, integration and data representation matrices or rules
- It has to strengthen the application of release rate to remain aligned with the time to market



# BASIC PRINCIPLES

- Agile methodologies, DevOps, Big Data Management, analytics and collaboration with internal and external stakeholders
- Each application project must become the result of a lot of work enterprise team.
- Using a road map characterized by a software development that needs to include real-time comparison moments to validate the quality of the results and, in the case, allowing to quickly change with appropriate adjustments.
- IoT generates a big growth of complexity and this entails new set of criteria and development of release. How? Developing **contextual applications, liquid, intelligent and connected**. This means designing software with some **new cognitive artificial intelligence** able to deploy applications that have some level of understanding depending on context, learn and act autonomously with respect to routine activities

# 4 NEW APPLICATION STRATEGIES

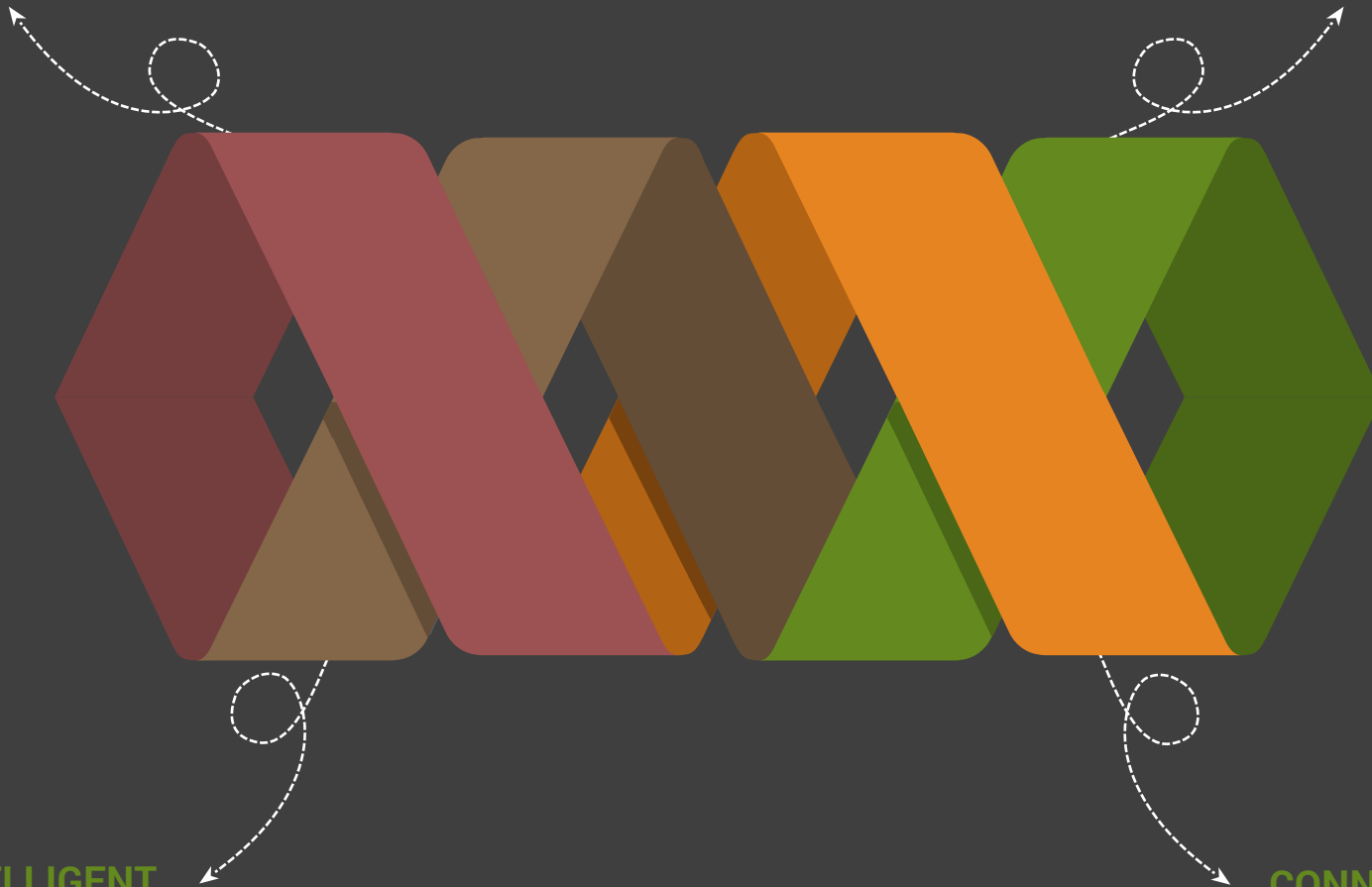
## CONTEXTUAL APPLICATIONS

Interrelated conditions which influence an adaptive app

## LIQUID APPLICATIONS

## INTELLIGENT APPLICATIONS

## CONNECTED APPLICATIONS



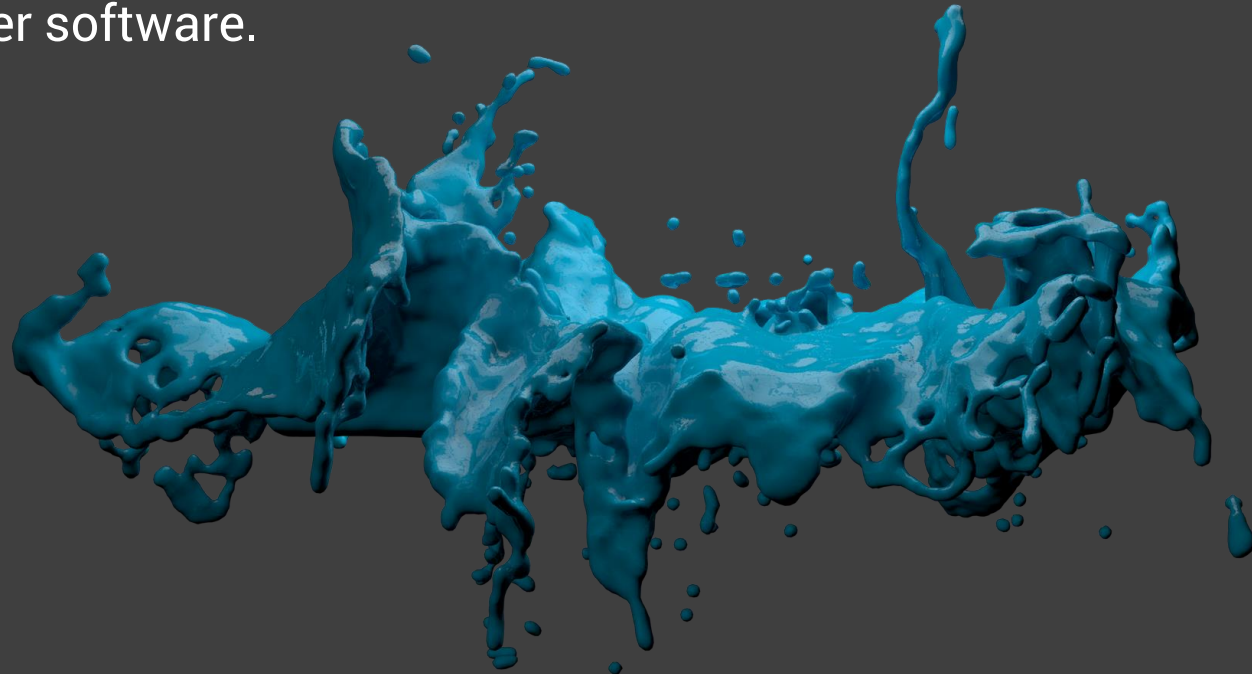
# CONTEXTUAL APPLICATIONS

- Context definition:  
*it is any information that can be used to characterize a specific situation.*
- An Internet Smart Objects App (ISOA) adapts his behaviour depending on its interactions and characteristics of environment (of which is aware) and user characteristics (age, sex, history, ...) and cloud status.



# LIQUID APPLICATION

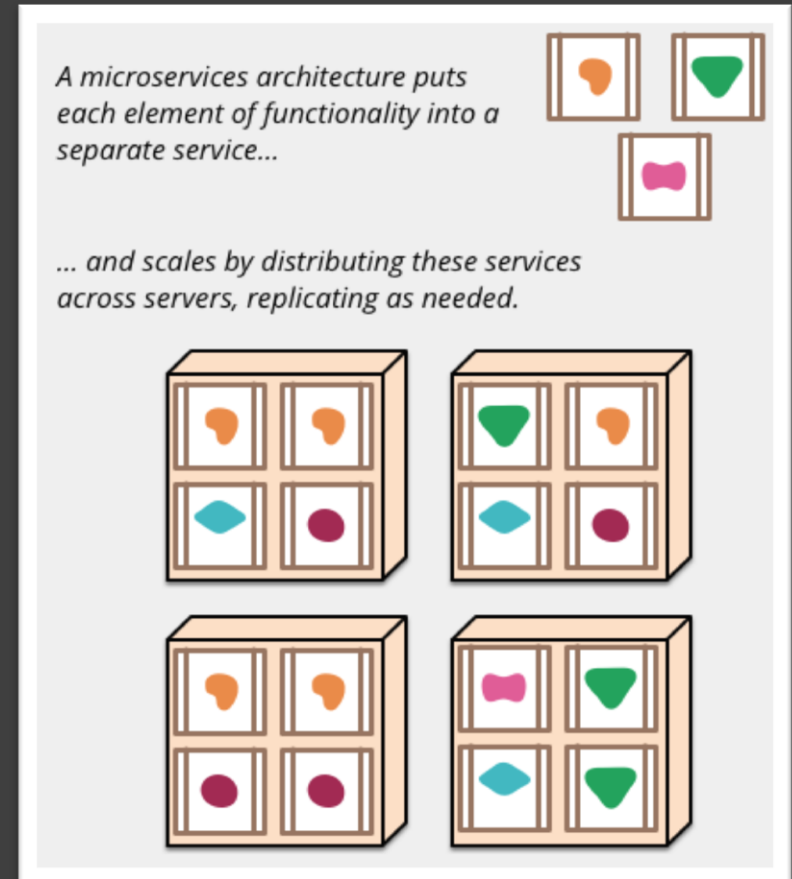
- It is a new buzz word that hides old programming techniques
- Liquid applications are assembled leveraging modular architectures, next-generation integration techniques and a cloud-first, mobile-first mindset.
- An important tool (described in detail below) is Microservices
- Adopt new development approaches that incorporate smaller, reusable components to continuously deliver software.



# MICROSERVICES

The microservice architectural style is an approach to develop a single application as a suite of small services, each running in its own process and communicating with lightweight mechanisms, often an HTTP resource API.

There is a bare minimum of centralized management of these services, which may be written in different programming languages and use different data storage technologies



# IOT & MICROSERVICES

IoT (Internet of things) is expanding. More and more devices are now connected, big companies like Samsung, Google and LG are working on the home consumer sector to create a simple way to **connect everything to internet** (IoE – internet of everything).

Every device becomes connected and intelligent thanks to the cloud.

We strongly think that a Microservices architecture based on **cloud services** can monitor, analyze data and send-receive commands to/from every object in the IoT cloud.

The object it's not only a thing, but also an agent, that using his mobile devices has the ability to use microservices.

It's clear that we need a simple way to manage so different sources of data and **Microservices are the key** to do that.

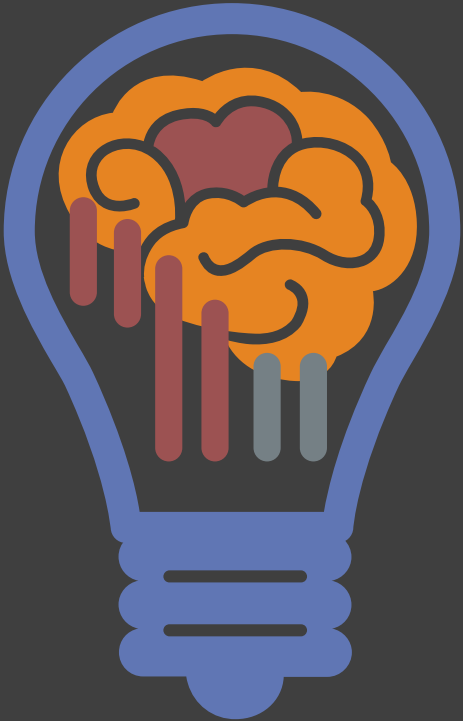
# CONTEXTUAL MICROSERVICES ARCHITECTURE FOR THE IOT

A possible solution to easily control the IoT systems is to create an intelligent platform using a microservices architecture.

Each service has one and simple behavior and it's called when a specific event occurs in the system.

Everything is event driven and the flow from the start to the end is influenced by the **context**.

# INTELLIGENT APPLICATIONS





# INTELLIGENT APPLICATIONS DEFINITION

We define intelligent an app that is basicly able to get some independent decision and is able to learn something from its experience.

*“Various kinds of intelligence tasks could define benchmark problems that would represent the various gradations of intelligence. Such gradations may be used to define the progress of AI programs.”* From Subhash C. Kak ,**Can We Define Levels Of Artificial Intelligence?**

# WHAT IS MACHINE LEARNING?

- Machine reads the data, learns from the data, uses it to make predictions
- Can show you correlation but not necessarily causation
- Can find relationships and patterns within volumes of data that the human mind is incapable of processing

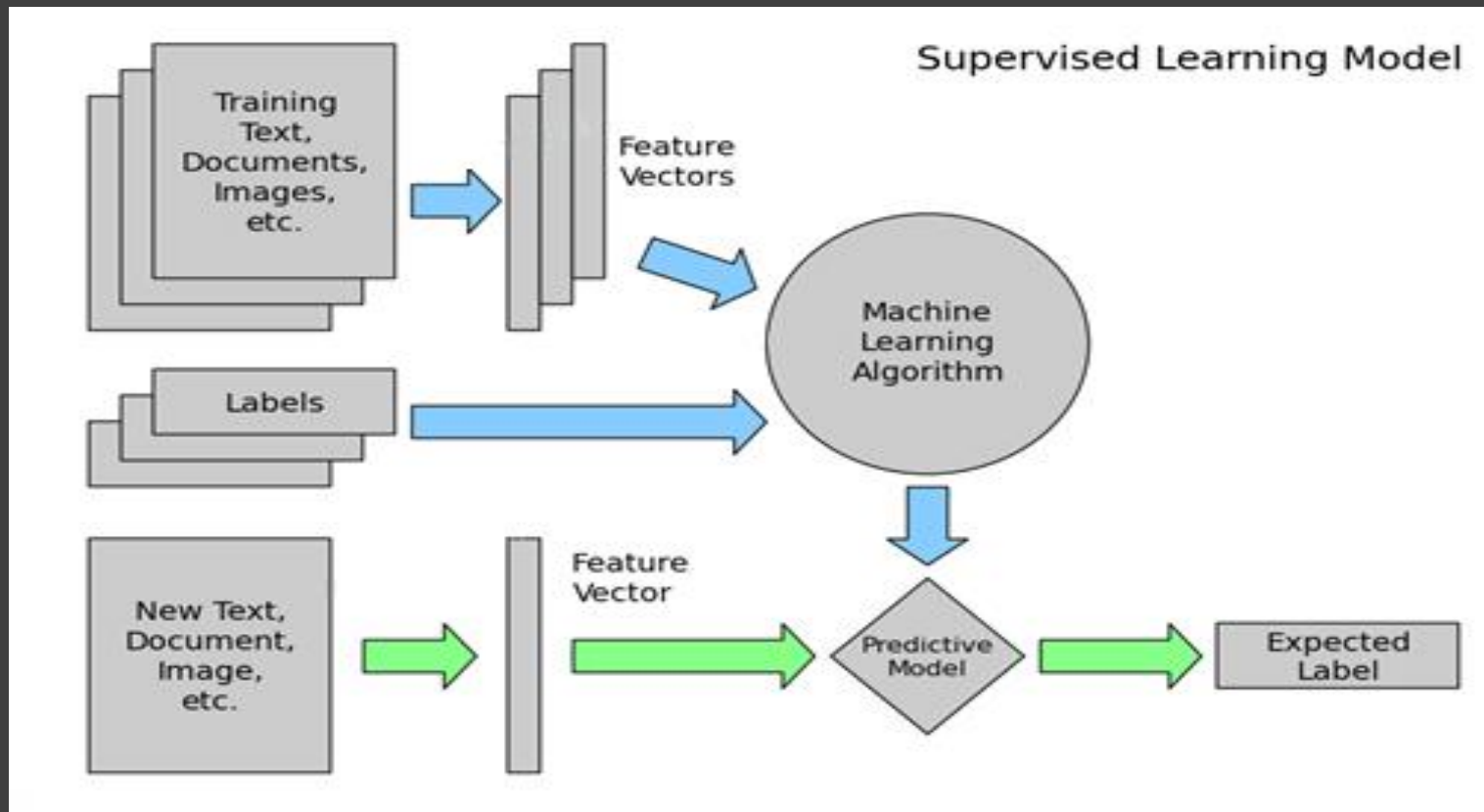
# WHY MACHINE LEARNING?

- Volume of data collected growing day by day.
- Data production will be 44 times greater in 2020 than in 2009.
- Every day, 2.5 quintillion bytes of data are created, with 90 percent of the world's data created in the past two years.
- Very little data will ever be looked at by a human.
- Data is cheap and abundant (data warehouses, data marts); knowledge is expensive and scarce.
- Knowledge Discovery is **NEEDED** to make sense and use of data.
- Machine Learning is a technique in which computers learn from data to obtain insight and help in knowledge discovery.

# MACHINE LEARNING METHODS IN #IOT

Supervised learning – class labels / target variable known

General Schema



Here & Now environment

- Knowledge is extracted from the input of a context
- It is composed by events of the context

# GENERATIVE VS DISCRIMINATIVE

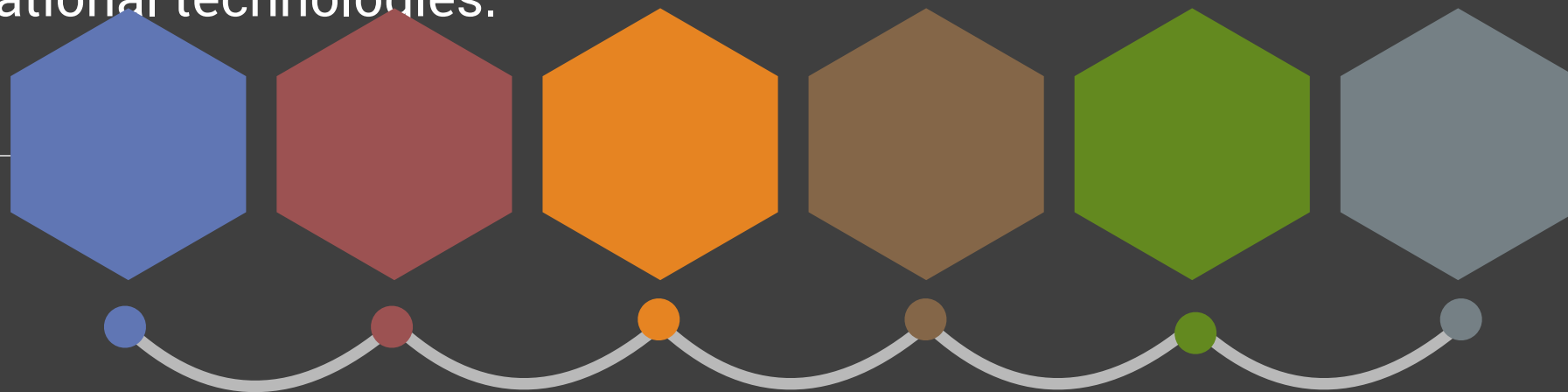
- Generative model – learns model for generating data, given some hidden parameters.
  - Learns the joint probability distribution  $p(x,y)$ . e.g. HMM, GMM, Naïve Bayes etc.
- Discriminative model – learns dependence of unobserved variable  $y$  on observed variable  $x$ .
  - Tries to model the separation between classes.
  - Learns the conditional probability distribution  $p(y|x)$ . e.g. Logistic Regression, SVM, Neural networks etc.

# CLASSIFICATION

- Classification – Supervised learning.
- Commonly used Methods for Classification
  - Naïve Bayes
  - Decision tree
  - K nearest neighbors
  - Deep learning: Neural Networks
  - Support Vector Machines.

# CONNECTED APPLICATIONS

- Connected applications provide with the technical means to interface with:
  - cloud app,
  - partners and customer ecosystems,
  - and with the Internet of Things ecosystem.
- Rewire for the borderless business by introducing new ecosystem strategies, designing applications for resiliency, and integrating information and operational technologies.



# CONNECTION: AGENT VS HUMAN

- Teams may use genre systems sequences of interrelated communicative actions strategically or habitually to structure their collaboration.
- Genre systems are organizing structures within a community, providing expectations about the purpose, content, form, participants, time and place of communicative interaction in other words, the *why, what, how, who/m, when, and where*. Purpose (why), content (what), form (how), participants (who/m), time (when) and place (where).

From Wanda Orlikowski, *Genre Systems: Structuring Interaction through Communicative Norms*

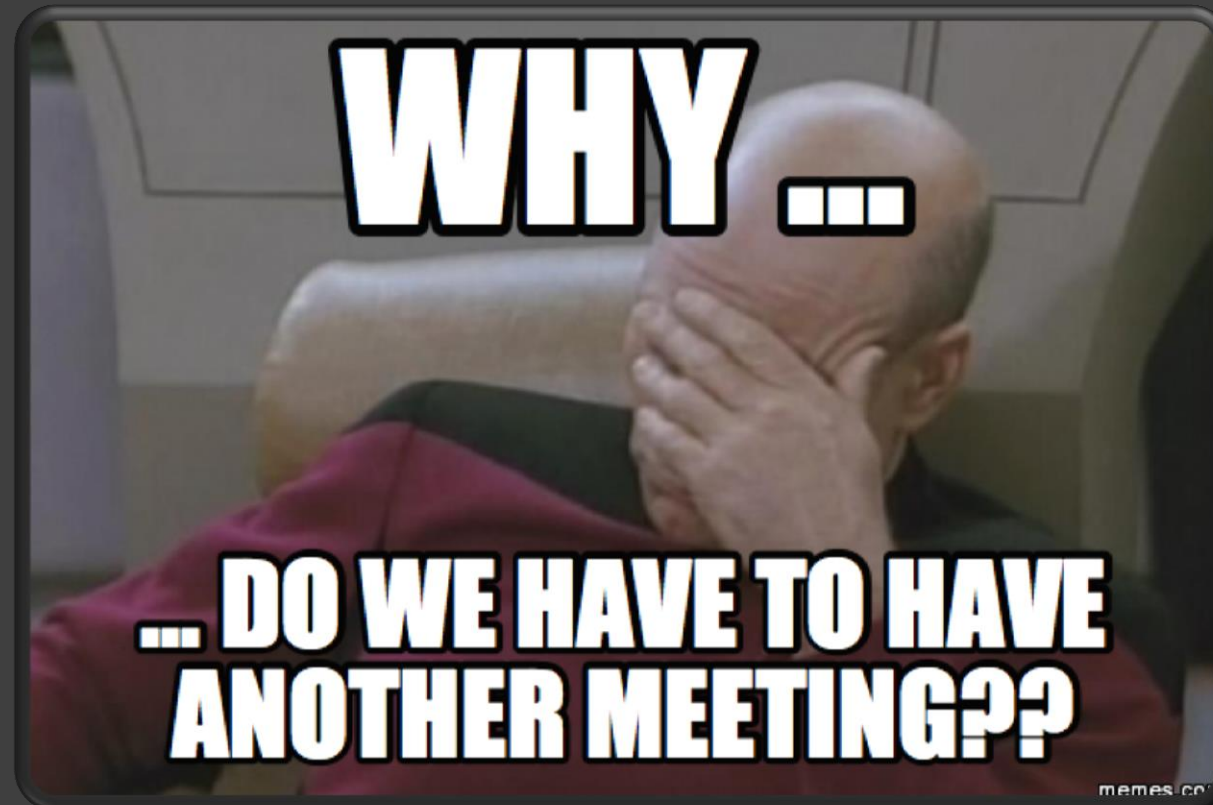


# CONNECTED APPLICATIONS

- Comms (local-area)
- All IoT sensors require some means of relaying data to the outside world. There's a plethora of **short-range**, or local area, wireless technologies available, including: RFID, NFC, Wi-Fi, Bluetooth (including Bluetooth Low Energy), XBee, Zigbee, Z-Wave and Wireless M-Bus. There's no shortage of wired links either, including Ethernet, HomePlug, HomePNA, HomeGrid/G.hn and LonWorks.
- Comms (wide-area)
- For long range, or wide-area, links there are existing mobile networks (using GSM, GPRS, 3G, LTE or WiMAX for example) and satellite connections. New wireless networks such as the ultra-narrowband SIGFOX and the TV white-space NeulNET are also emerging to cater specifically for M2M connectivity. Fixed 'things' in convenient locations could use wired Ethernet or phone lines for wide-area connections.

Part II will describe the steps of the method and screenshots of artifacts.

We hope to see you again! 😊





## Megatris Comp. LLC

We create cloud services and mobile apps to make people life easier.  
Our mobile apps are integrated with Megatris Cloud to sell services  
and goods.

[www.megatris.com](http://www.megatris.com)  
1250 Oakmead Pkwy, Sunnyvale, CA 94085, USA