

Centre de formació i ocupació

Enginyers
Industrials de Catalunya

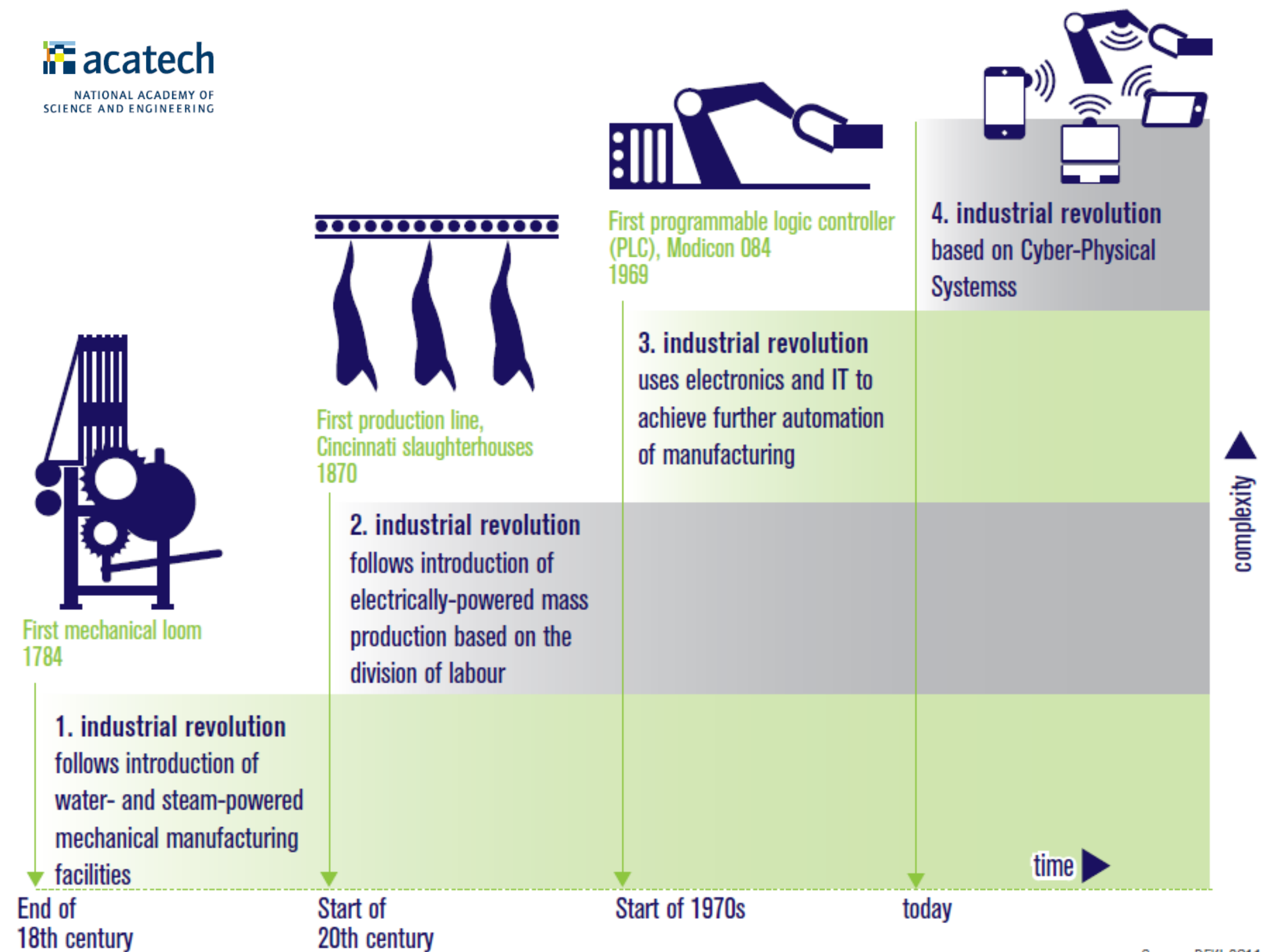
Formació contínua

ÀREA INDÚSTRIA 4.0

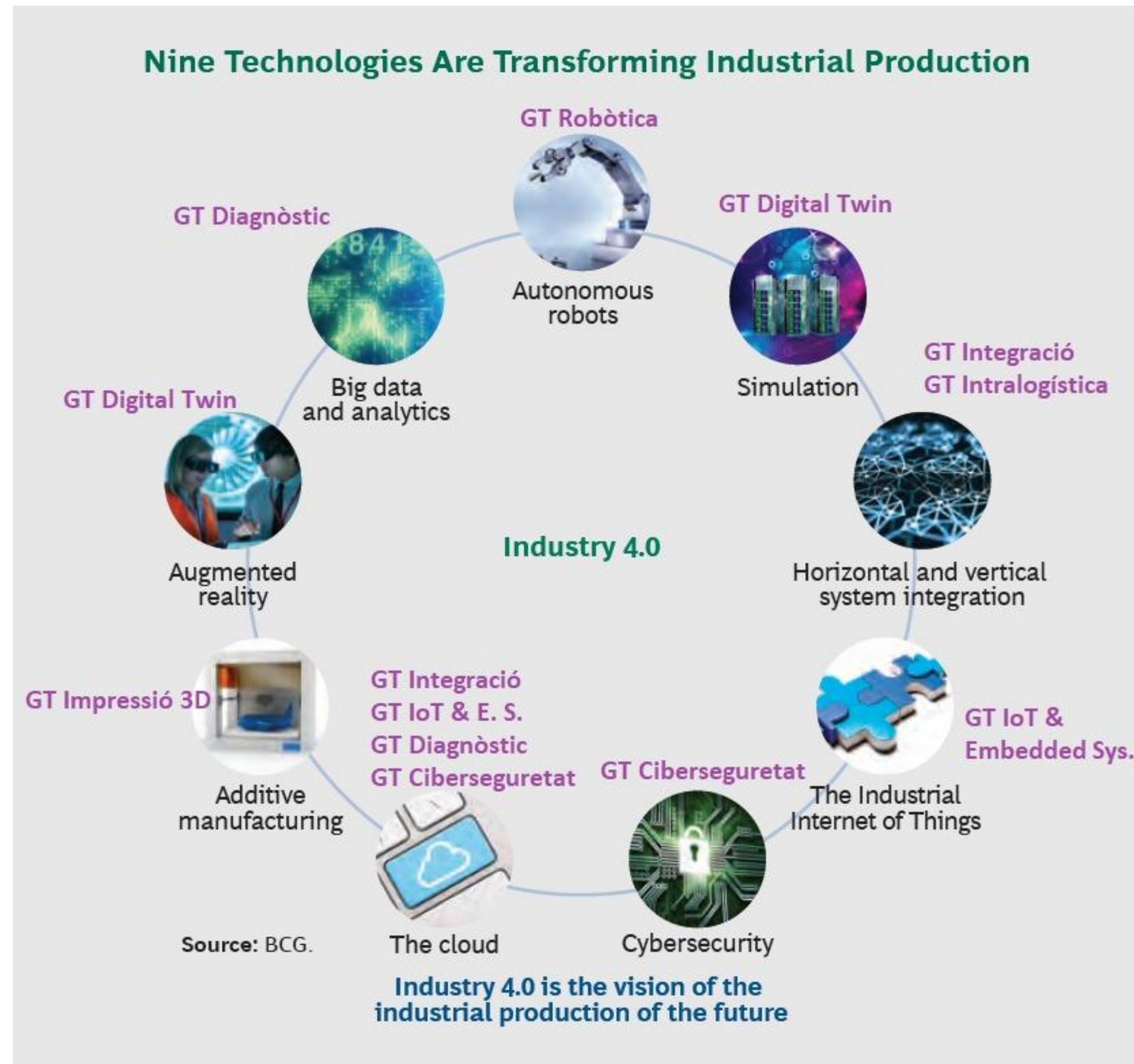
Xavier Pi

Internet of Things amb IA aplicada a la Indústria 4.0

La quarta revolució industrial: Indústria 4.0



Àrees de la Indústria 4.0



Més el Digital Twin al centre
i la IA a tot arreu

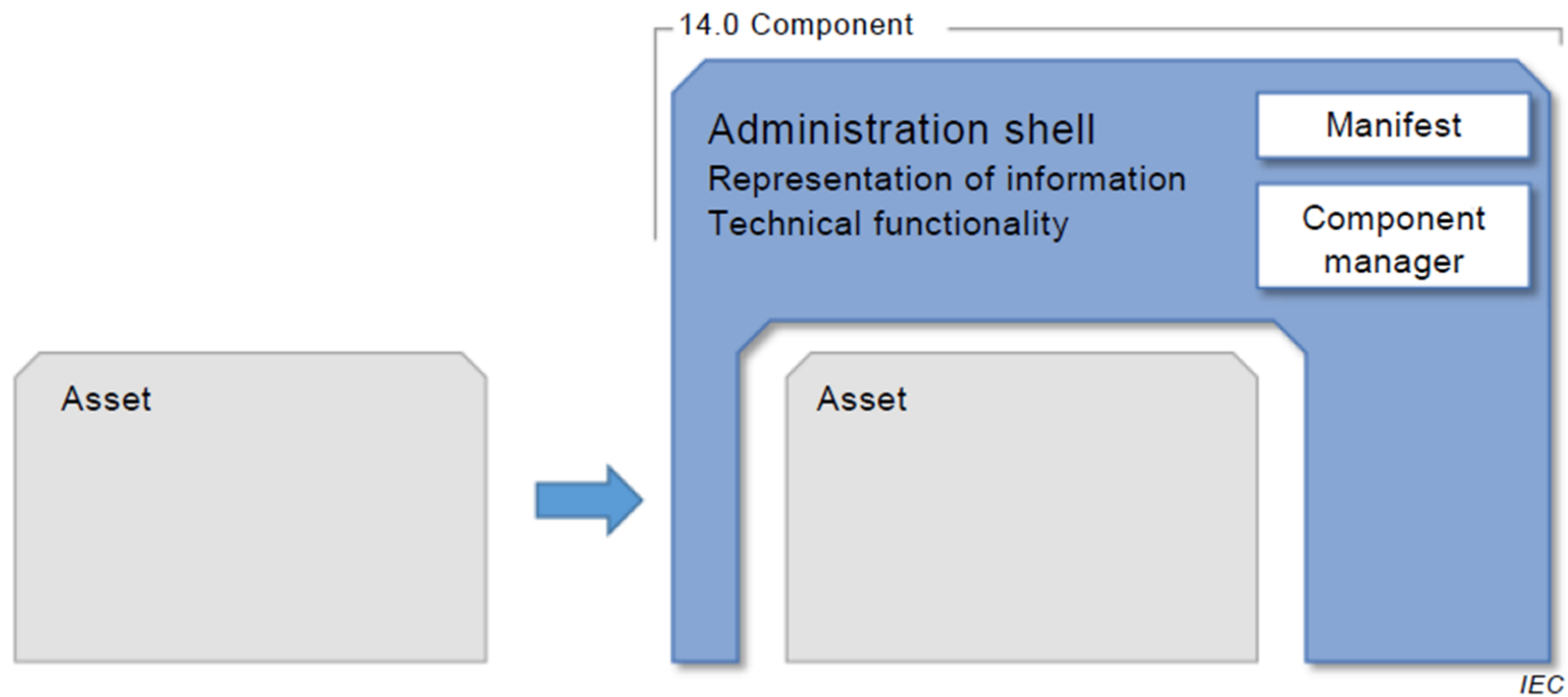
<https://transformaciodigital.enginyers.net>

Original (BCG)

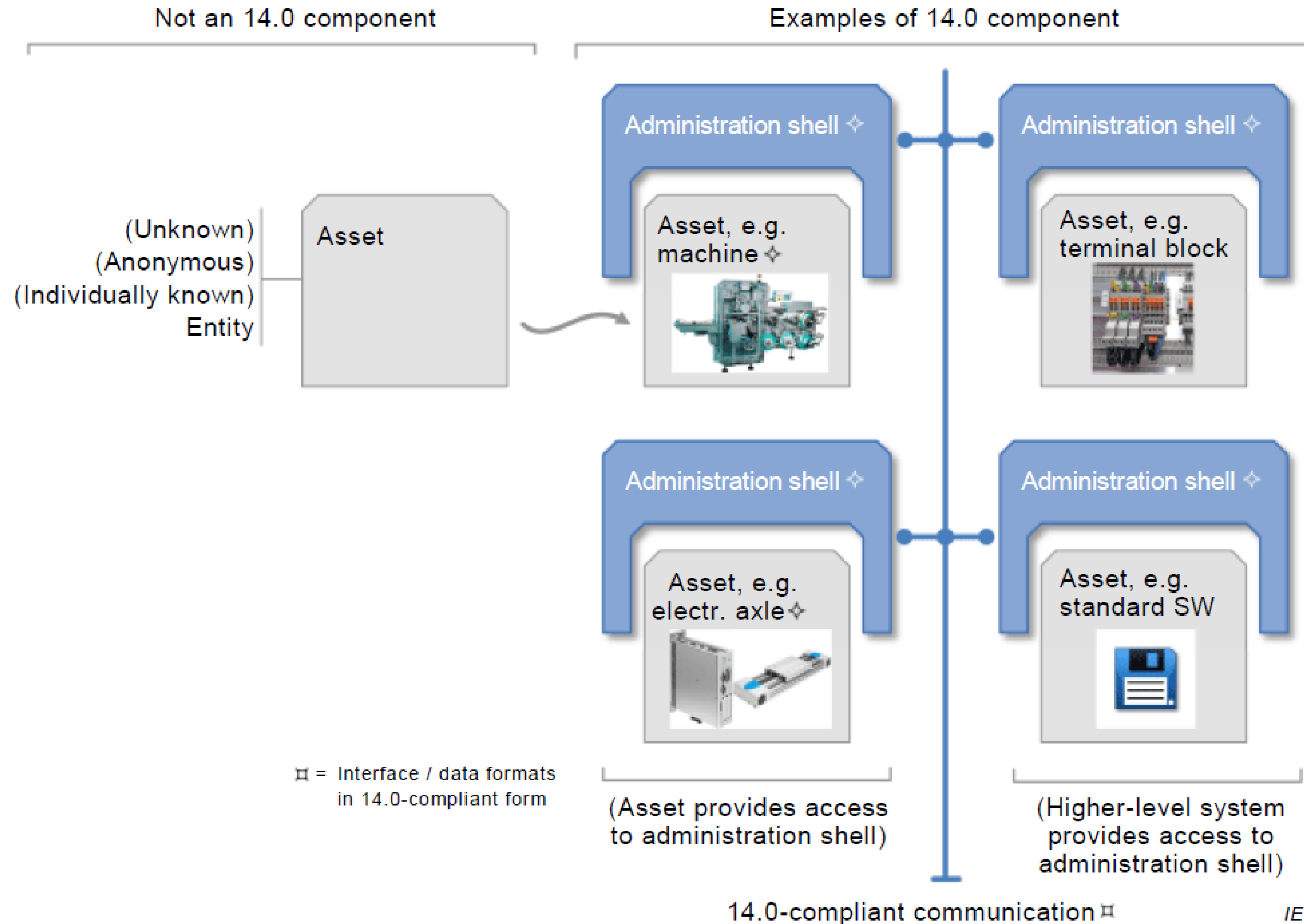
https://www.bcg.com/publications/2015/engineered_products_project_business_industry_4_future_productivity_growth_manufacturing_industries

Digitalització d'actius

DIN 91345 - RAMI 4.0: Reference Model Architecture Industry 4.0



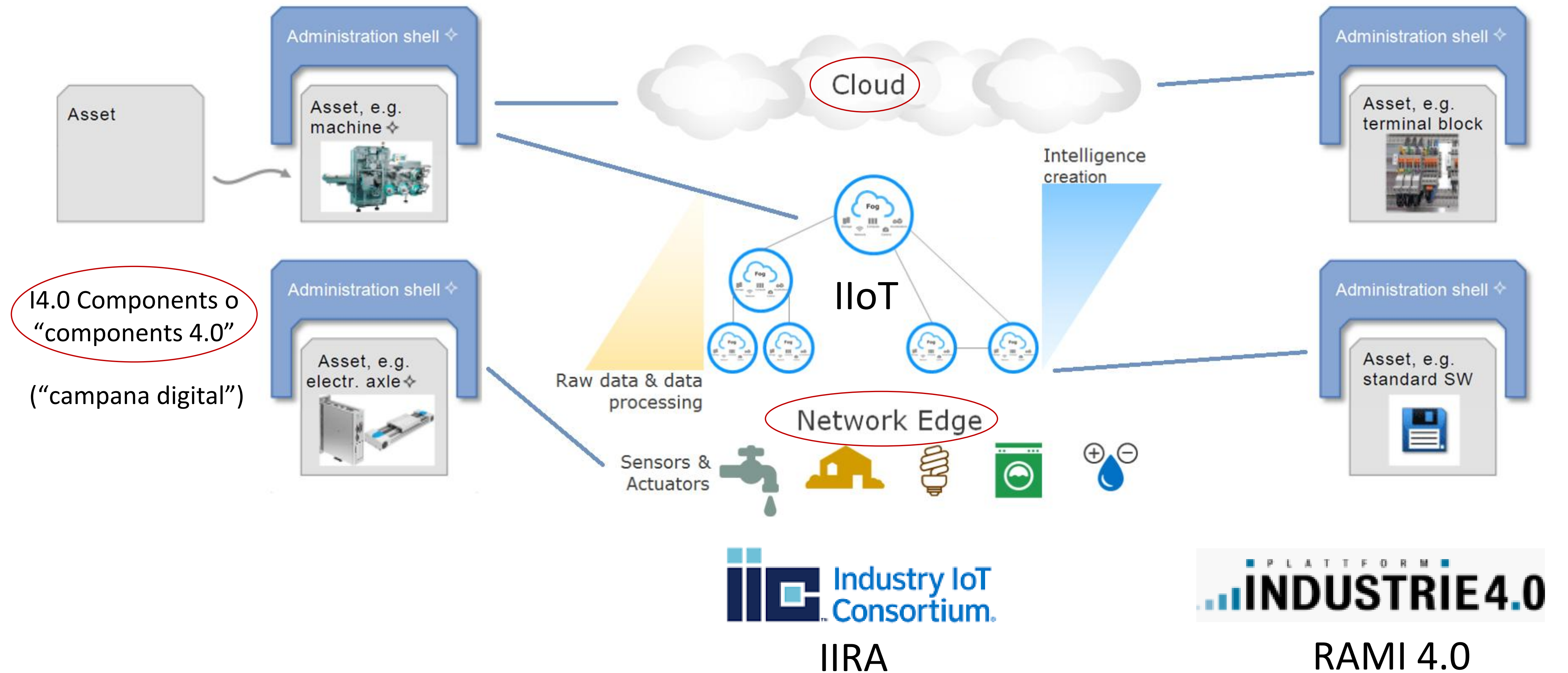
I4.0 Components, Sistemes Distribuïts (Visió OT)



I4.0 Components, Sistemes Distribuïts (Visió IT)

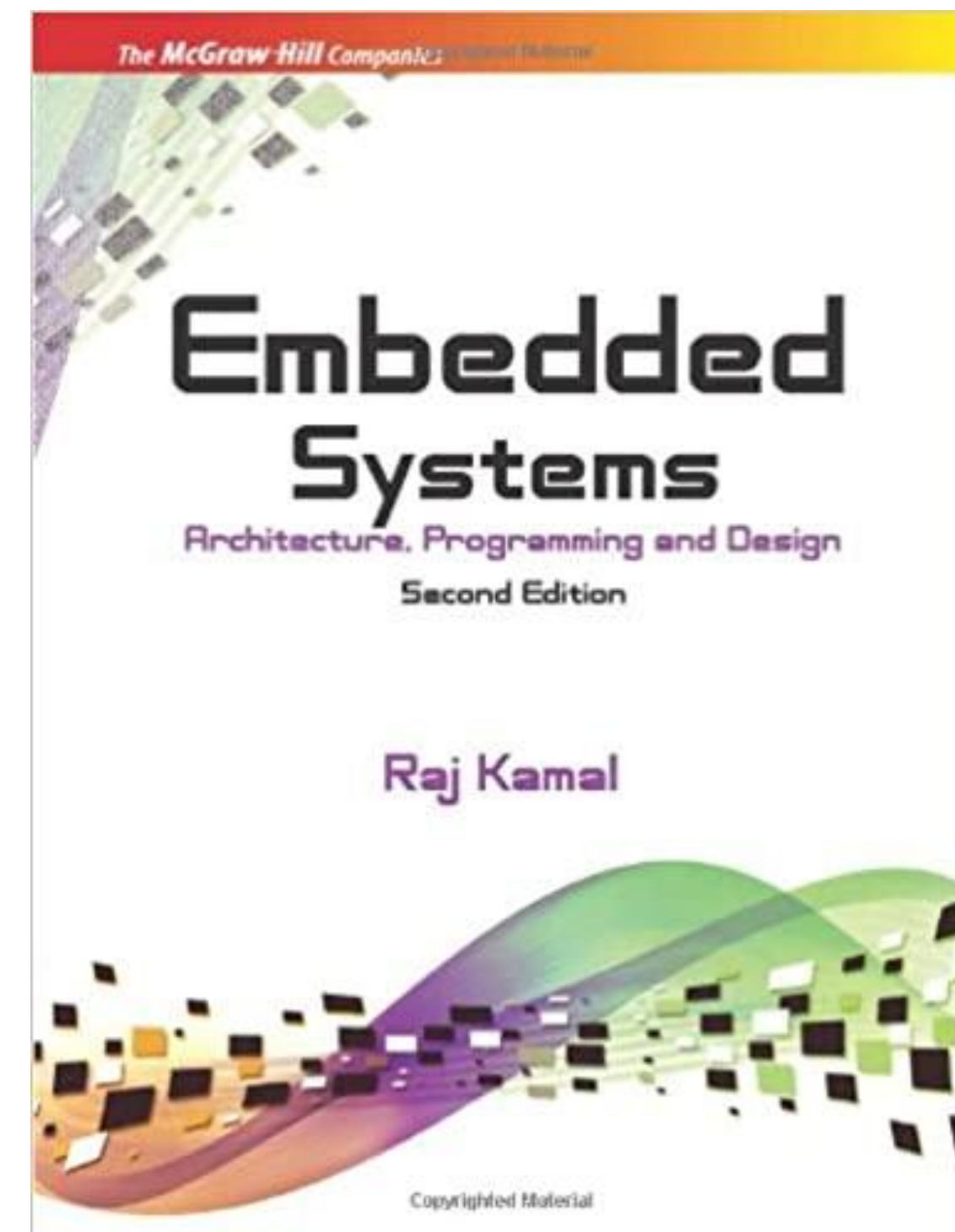
Safety: Protecció de les persones del sistemes

Security: Protecció dels sistemes de les persones



A l'any 2014 el GT va adoptar la classificació del professor Raj Kamal dels Embedded Systems:

- Escala petita (Arduino)
- Escala mitjana (ESP32)
- Escala sofisticada (Raspberry Pi)



JSON

→ ↺ https://www.json.org/json-en.html ☆ 📁 ⬇

🌐 Markdown ChatGPT 🛠 Base 64 Viewer 📄 Base64 Encode and...

Todos los i



Introducing JSON

العربية Български 中文 Český Dansk Nederlands English Esperanto Français Deutsch Ελληνικά עברית Magyar Indonesia Italiano 日本 한국어 فارسی Norsk Polski Português Română Русский Српско-хрватски Slovenščina Español Svenska Türkçe Українська Tiếng Việt

ECMA-404 The JSON Data Interchange Standard.

JSON (JavaScript Object Notation) is a lightweight data-interchange format. It is easy for humans to read and write. It is easy for machines to parse and generate. It is based on a subset of the JavaScript Programming Language Standard ECMA-262 3rd Edition - December 1999. JSON is a text format that is completely language independent but uses conventions that are familiar to programmers of the C-family of languages, including C, C++, C#, Java, JavaScript, Perl, Python, and many others. These properties make JSON an ideal data-interchange language.

JSON is built on two structures:

- A collection of name/value pairs. In various languages, this is realized as an *object*, record, struct, dictionary, hash table, keyed list, or associative array.
- An ordered list of values. In most languages, this is realized as an *array*, vector, list, or sequence.

These are universal data structures. Virtually all modern programming languages support them in one form or another. It makes sense that a data format that is interchangeable with programming languages also be based on these structures.

In JSON, they take on these forms:

An *object* is an unordered set of name/value pairs. An object begins with { *left brace* and ends with } *right brace*. Each name is followed by : *colon* and the name/value pairs are separated by , *comma*.

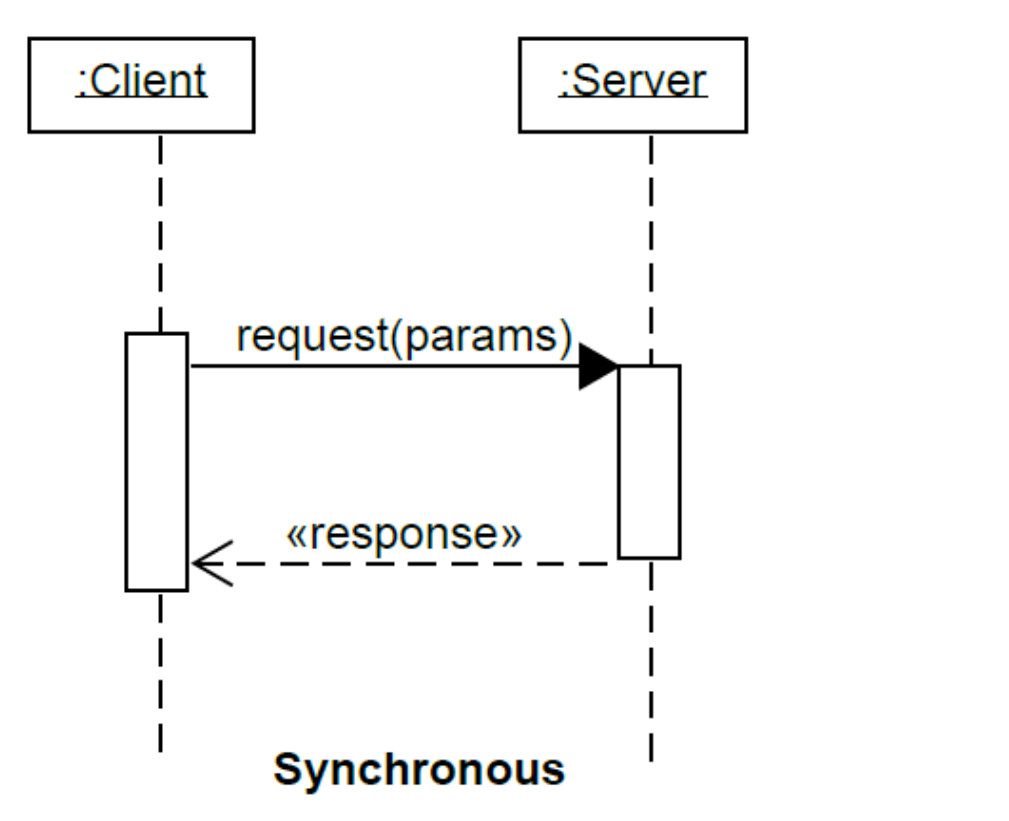
object

whitespace

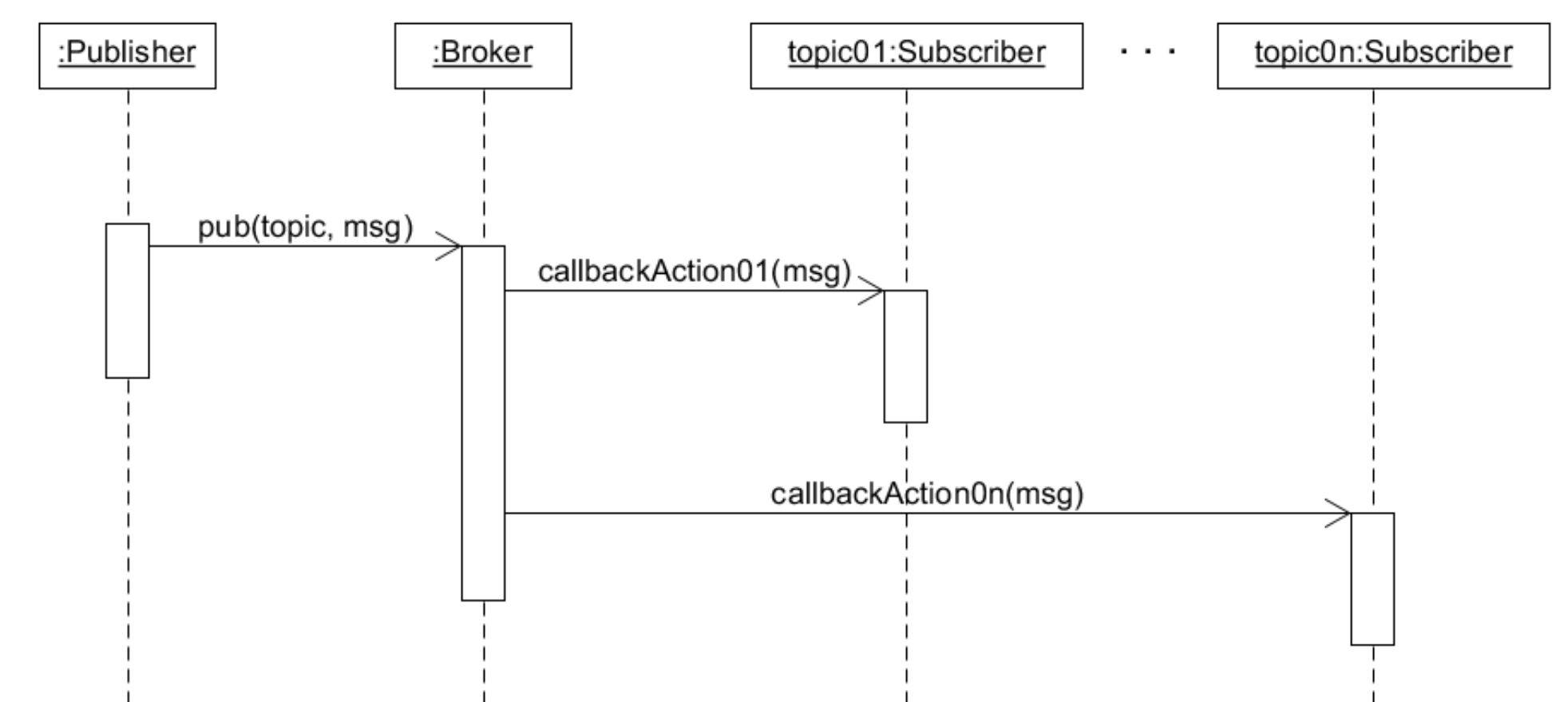
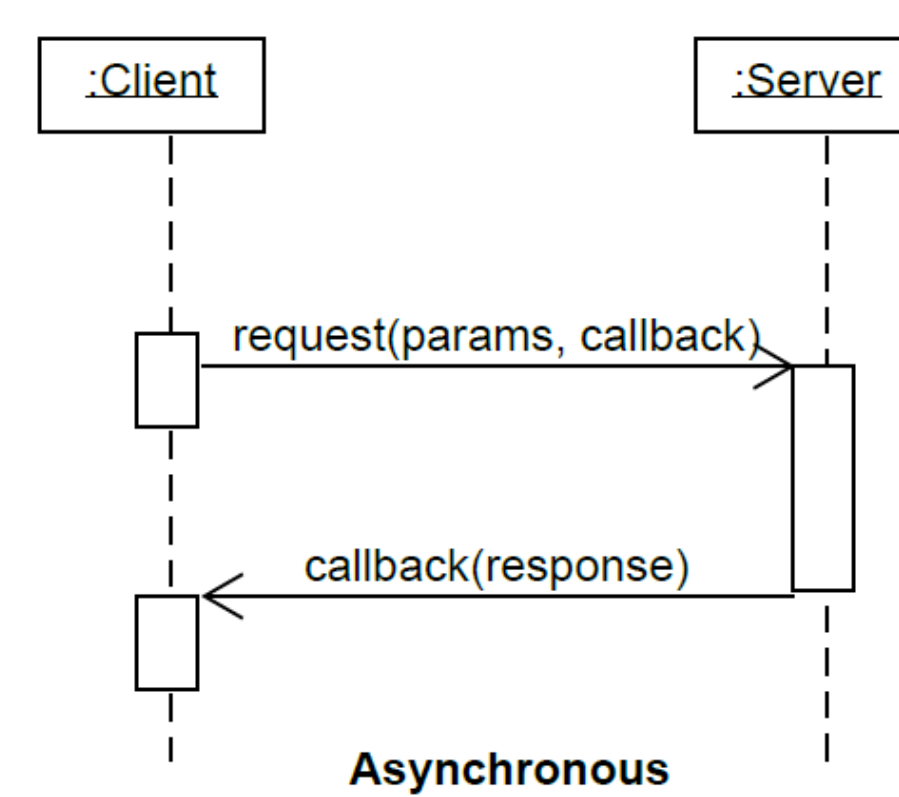
json
element
value
object
array
string
number
"true"
"false"
"null"
object
'{' ws '}'
'{' members '}'
members
member
member ', ' members
member
ws string ws '!' element

<https://es.wikipedia.org/wiki/JSON>

Arquitectures de comunicacions



Client-Server



PubSub (de naturalesa asíncrona)

Les architectures són agnòstiques en quant a la tecnologia.

Les implementacions requereixen un “[tecnology mapping](#)”, que bàsicament és concretar protocols o plataformes:

[MQTT](#), [HTTP](#), [OPC-UA](#)

Protocols HTTP, MQTT i noció d'API

- HTTP (Hypertext Transfer Protocol) RFC 1945

<https://datatracker.ietf.org/doc/html/rfc1945>

- MQTT (Message Queuing Telemetry Transport) OASIS 3.1.1

<https://docs.oasis-open.org/mqtt/mqtt/v3.1.1/os/mqtt-v3.1.1-os.html>

- API (Application Programming Interface). IoT: REST APIs

<https://ca.wikipedia.org/wiki/REST>

URLs

- <https://xavierpi.com/cam>
- <https://xavierpi.com/iotcam>
- <https://xavierpi.com/sens>
- <https://xavierpi.com/esp32cam>
- <https://wokwi.com/projects/449284053394935809> (Analog)
- <https://github.com/pixavier/mqtt4snap> (MQTT – Snap!)

Material exemples

ESP32

https://www.amazon.es/ELEGOO-Desarrollo-ESP-WROOM-32-Micro-USB-Microcontrolador/dp/B0D8T3N7HQ/ref=sr_1_1_sspa

ESP32 CAM

https://www.amazon.es/XTVTX-ESP32-CAM-Bluetooth-ESP32-CAM-MB-compatible/dp/B093GSCBWJ/ref=sr_1_4_sspa

Potenciòmetre(s)

https://www.amazon.es/FULARR%C2%AE-Premium-Rotativo-Potenci%C3%B3metro-Terminales/dp/B07PC436ZD/ref=sr_1_5_sspa

Xavier Pi

Comissió Transformació Digital

GT IoT & Embedded Systems

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