Nov. 2018

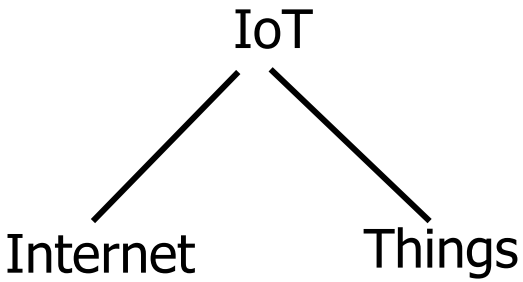
IoT – Technology, Architecture & Standards

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(balakrichenan@afnic.fr)

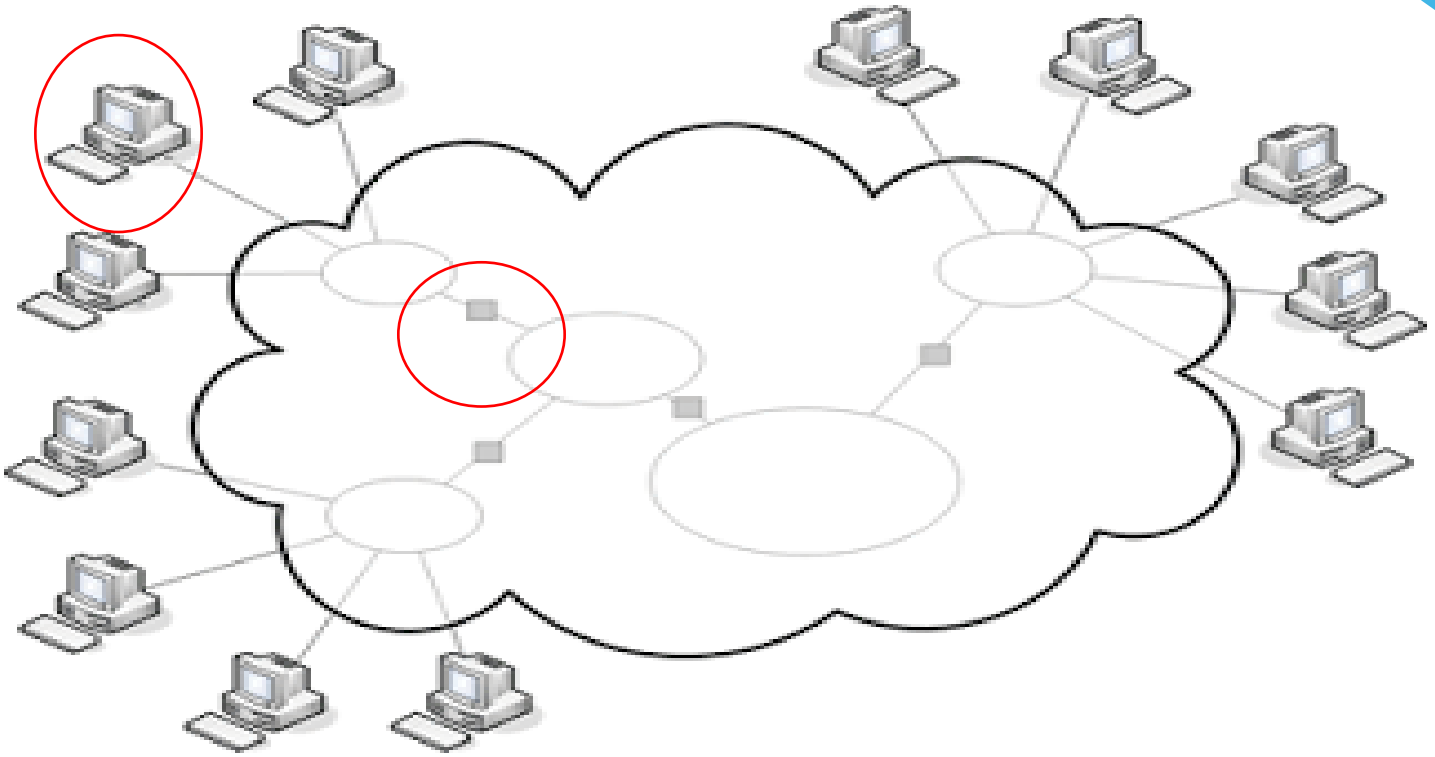
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Introduction

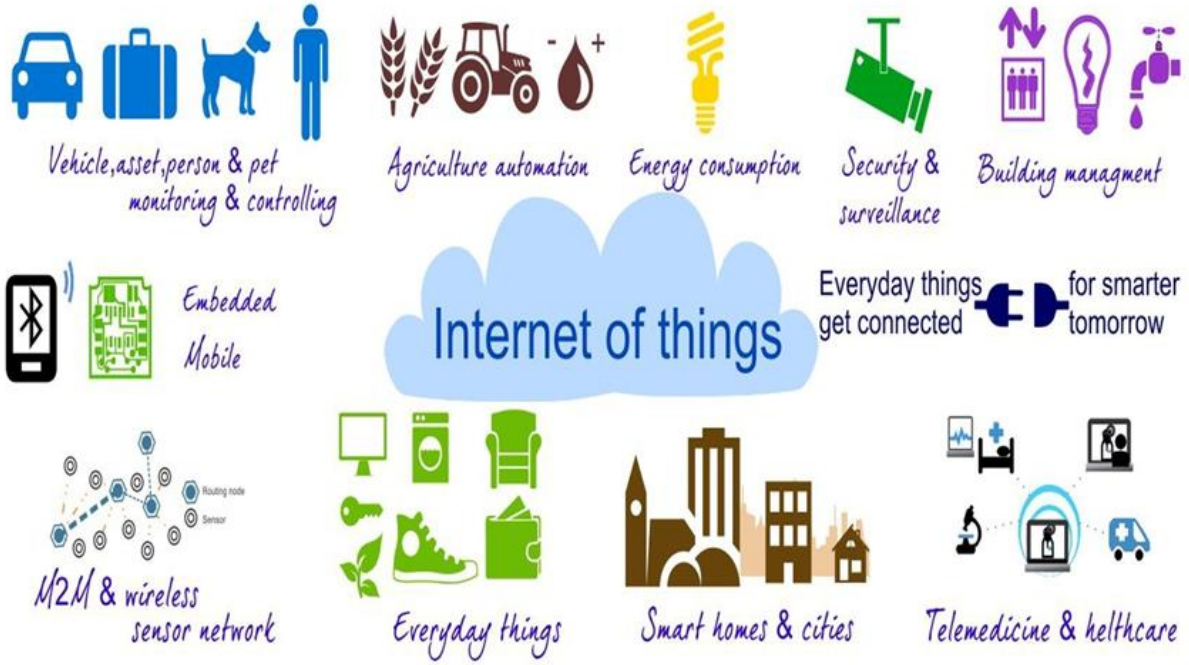
IoT



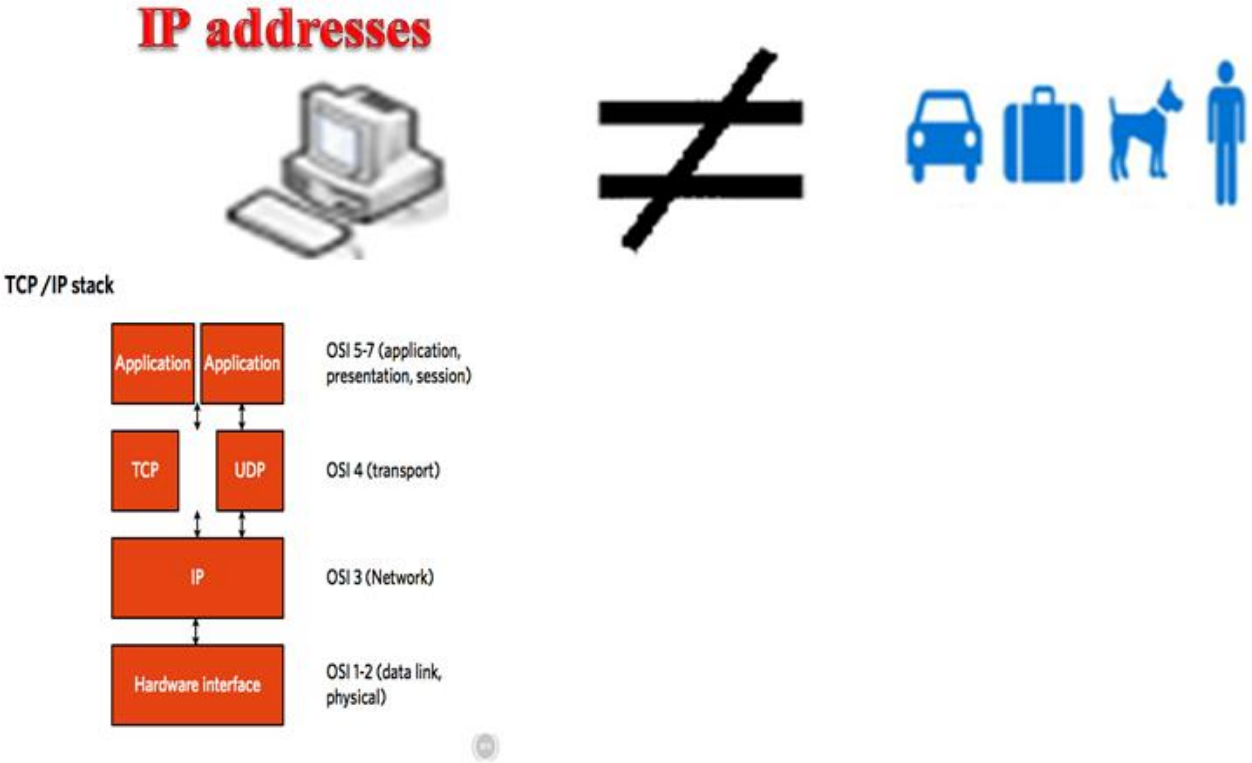
The « Things » in the Internet



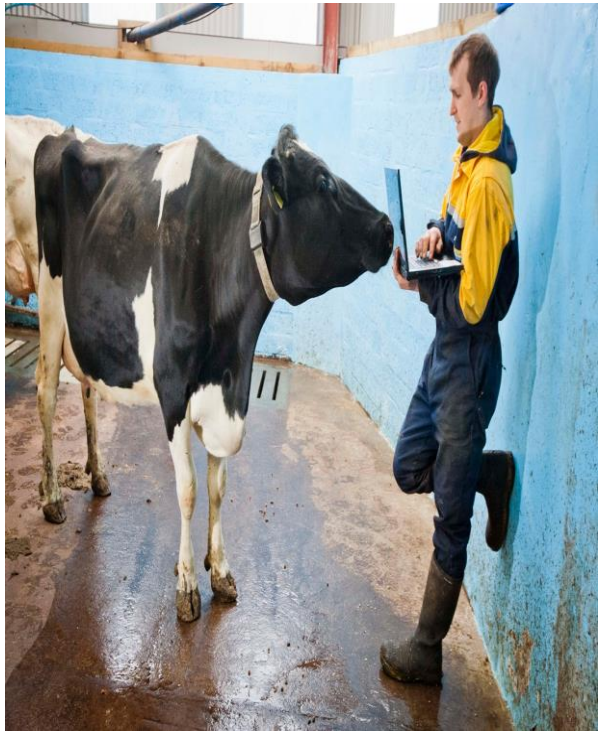
The « things » in the IoT



Difference between things in the Internet and IoT



IoT is currently I(*Intranet*) of Things



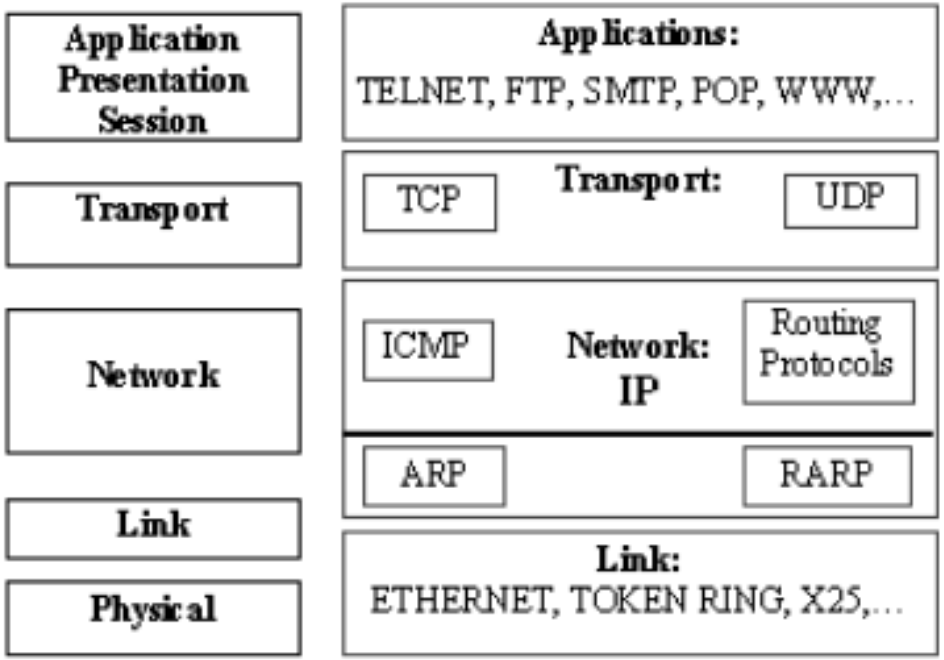


Need = I(*Internet*) of Things

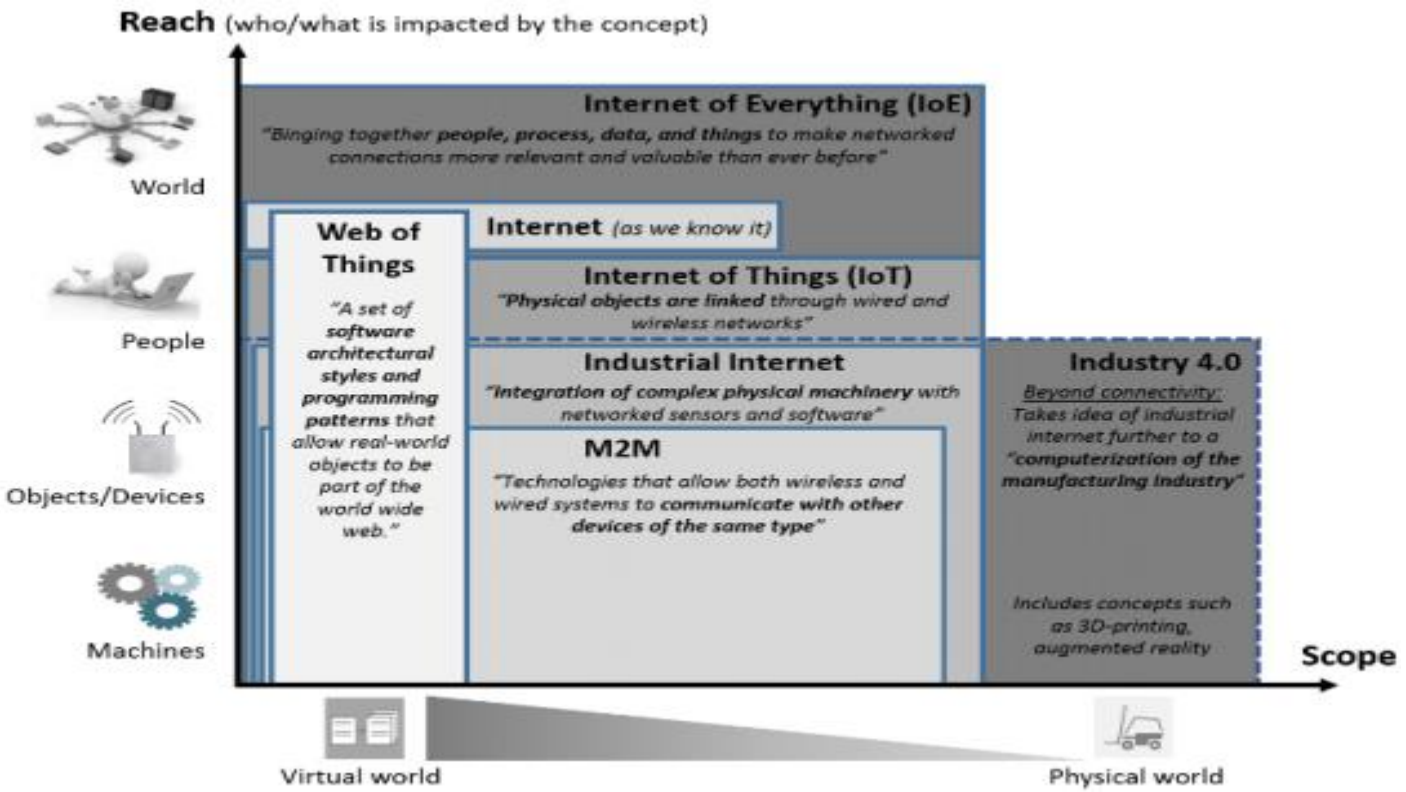


Architecture

Internet Architecture

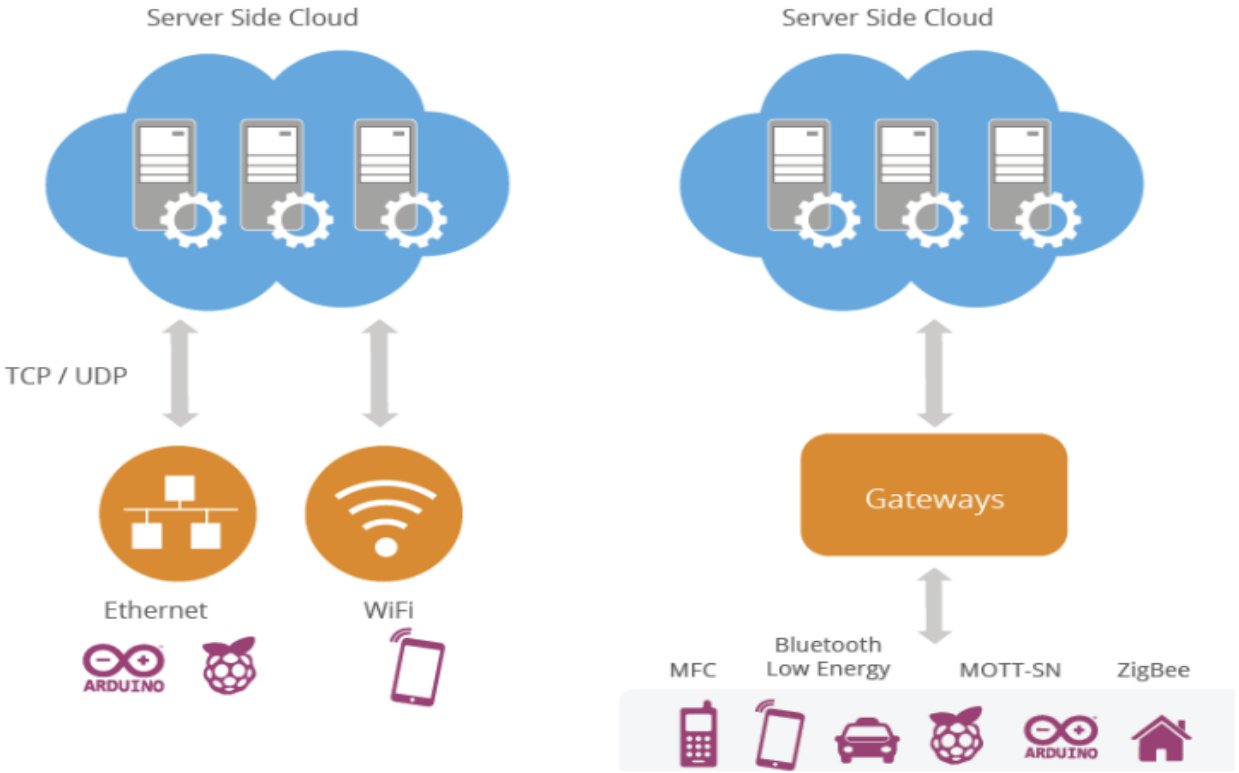


Different definitions of IoT



Sources: Wikipedia, McKinsey, IoT Analytics

Basic IoT Architecture



Source : WSO2

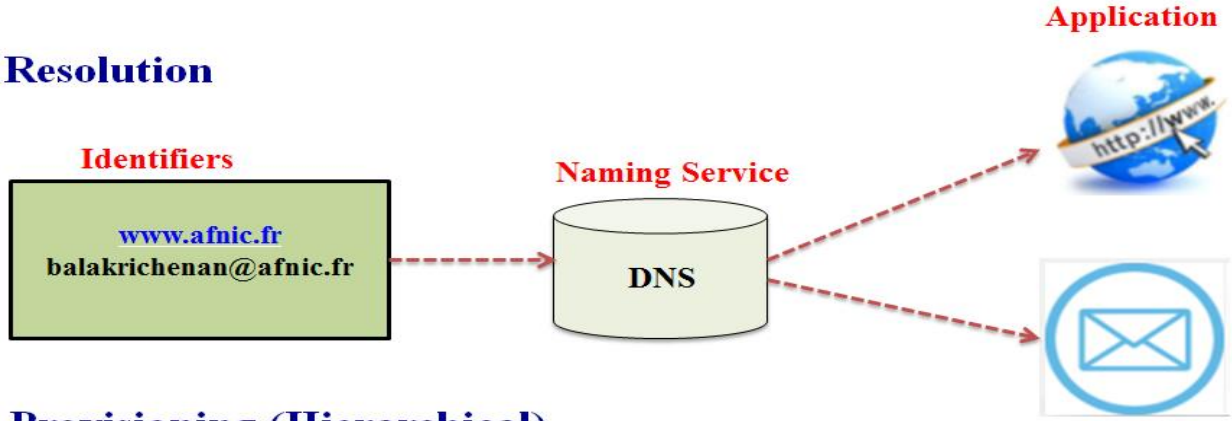
IoT Reference Architecture



Source : WSO2 reference architecture

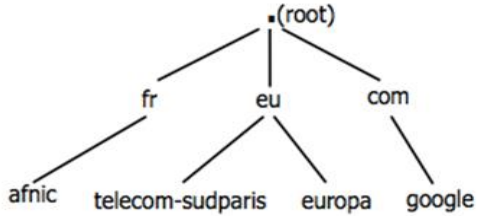
Identifiers and resource discovery

Resolving the Internet identifier to its resource in the Internet



Provisioning (Hierarchical)

Naming Authority



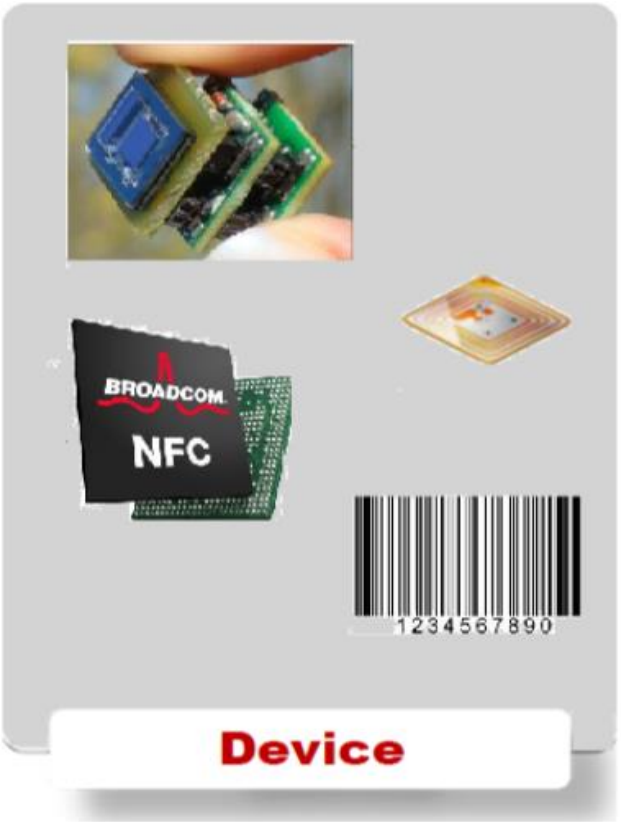
Naming convention for the Identifiers

IETF

- Domain names, URI
- IP Addresses (IPv4/IPv6)

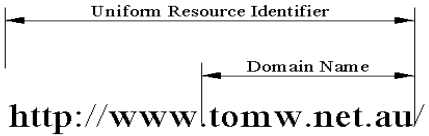
Getting the things identifiable





IoT Identification standards

IETF



ISO/IEC 15459



GS1



ISO 2108



Consumer industry using DNS

Resolution

Naming Convention = EPC

Barcode

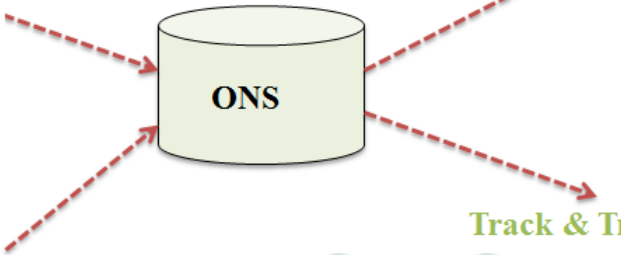


Application

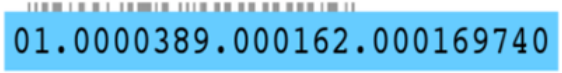
Extended Packaging



Naming Service



RFID

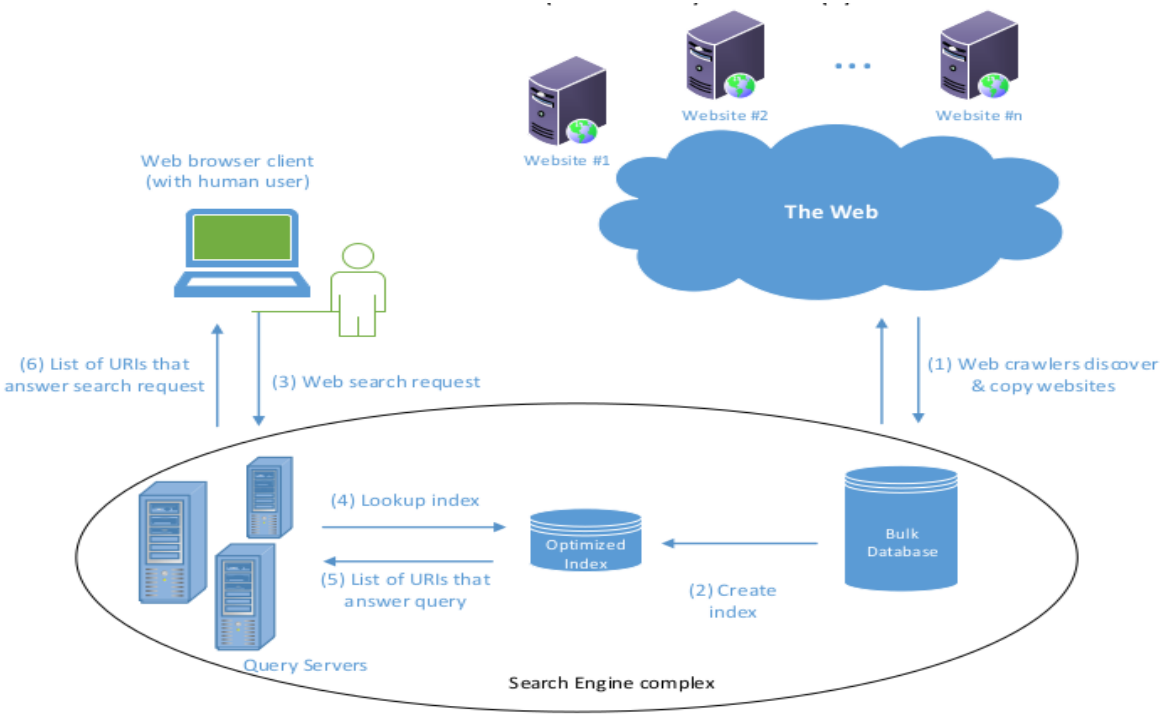


Header	Company Code	Product Code	Serial Number
8 bits	28 bits	24 bits	36 bits

Track & Trace

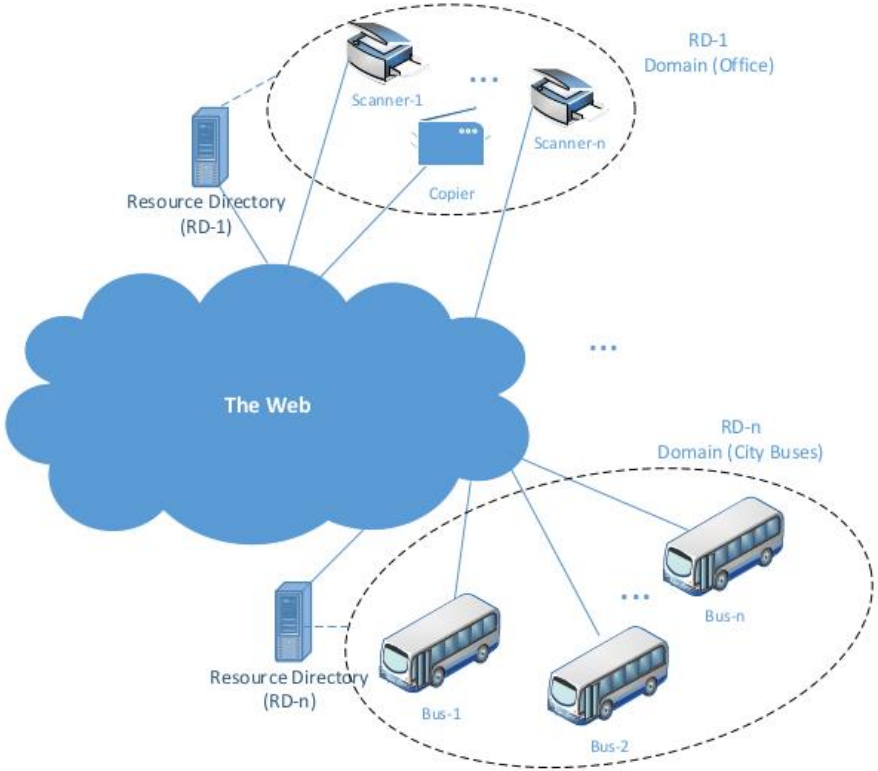


Resource discovery in the Internet



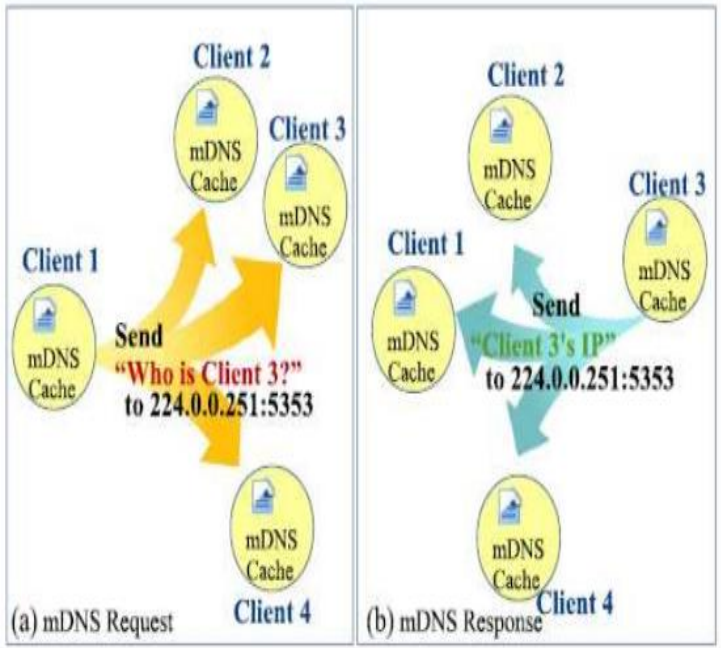
Source : InterDigital Communications, Inc

Resource discovery in the IoT - RD



Source : InterDigital Communications, Inc

Resource discovery in IoT – mDNS, DNS-SD

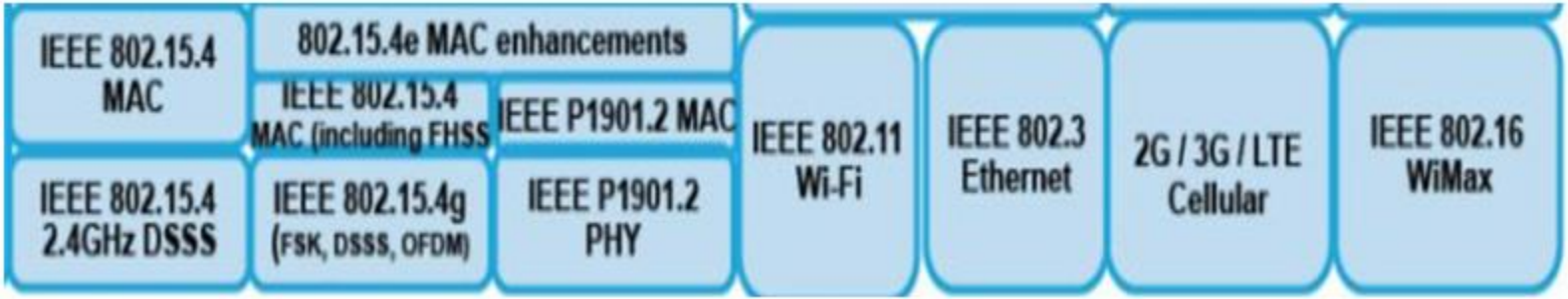




Source : Kookmin Univeristy

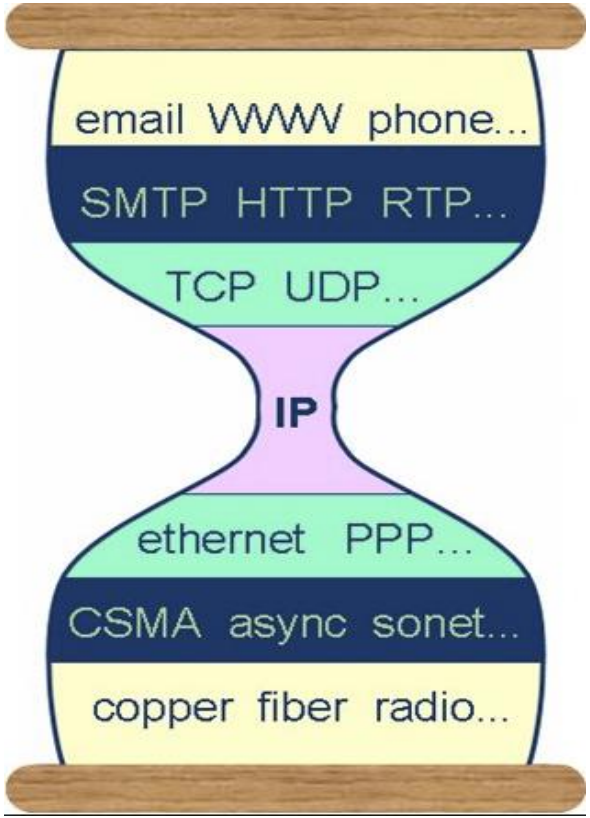
Communication technologies for IoT

Major communication standards at the PHY/MAC layer



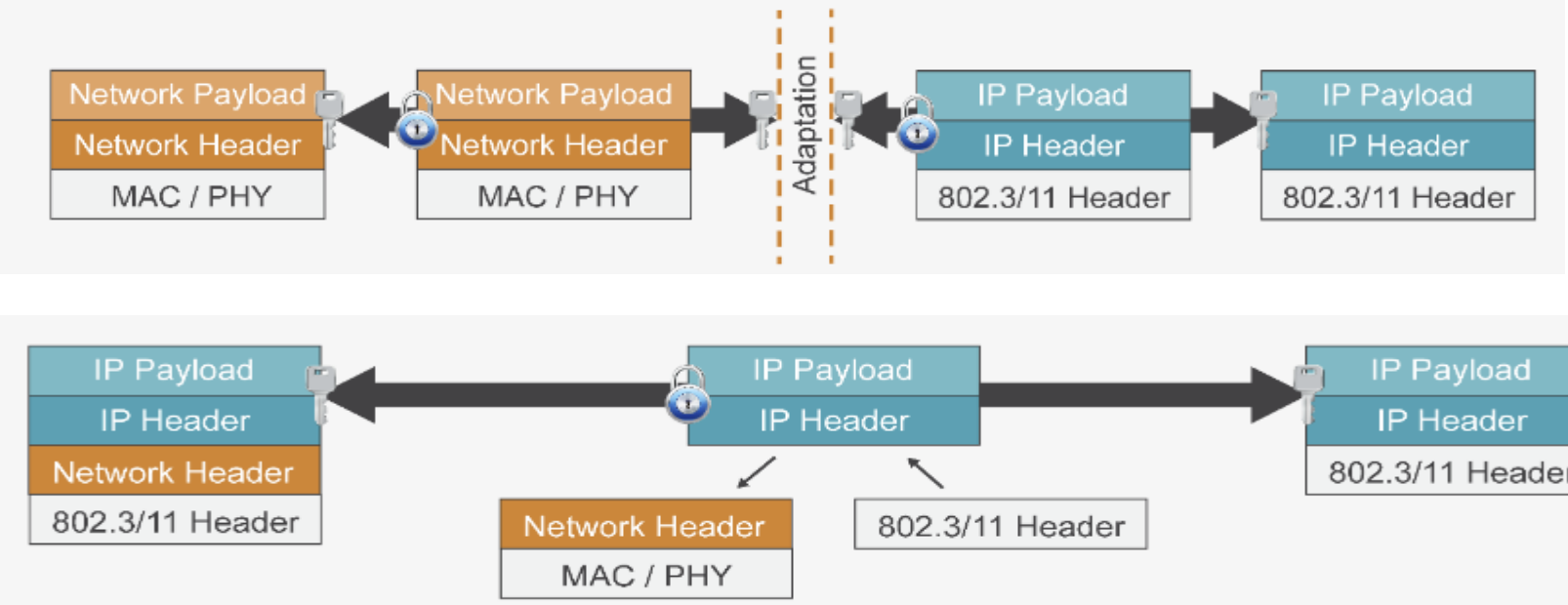
Source : Open standards reference model

Internet Hour glass model



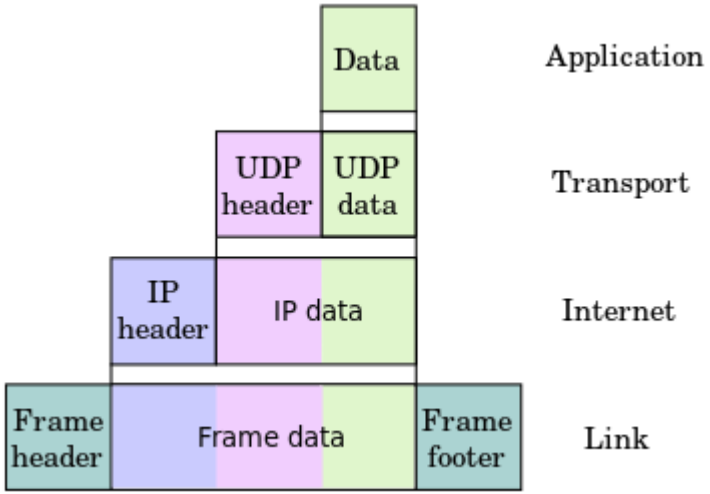
Source : Wikipedia

IP adaptation requirement for IoT



Source : Silabs Inc.

Encapsulation in the Internet

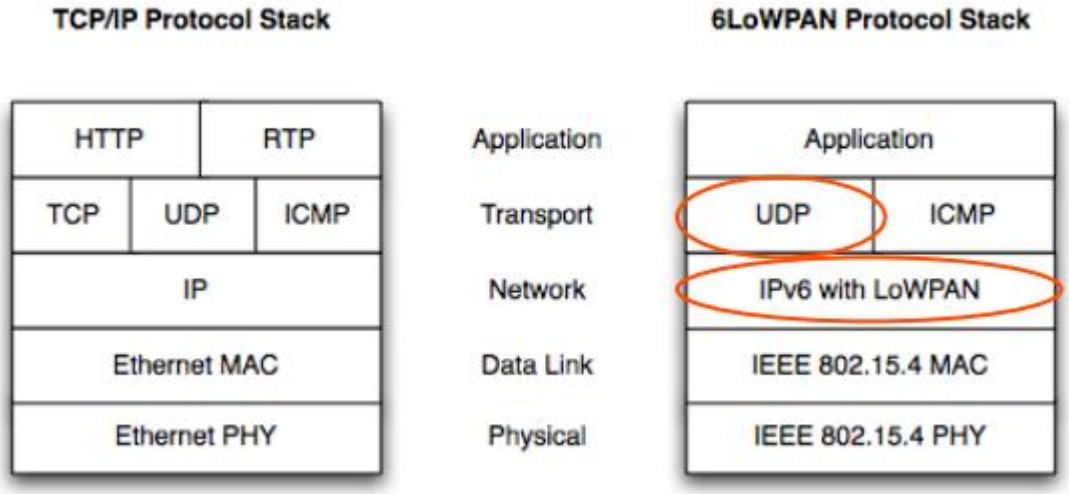


Source : Wikipedia

Adaptation to IP for IoT - Standards

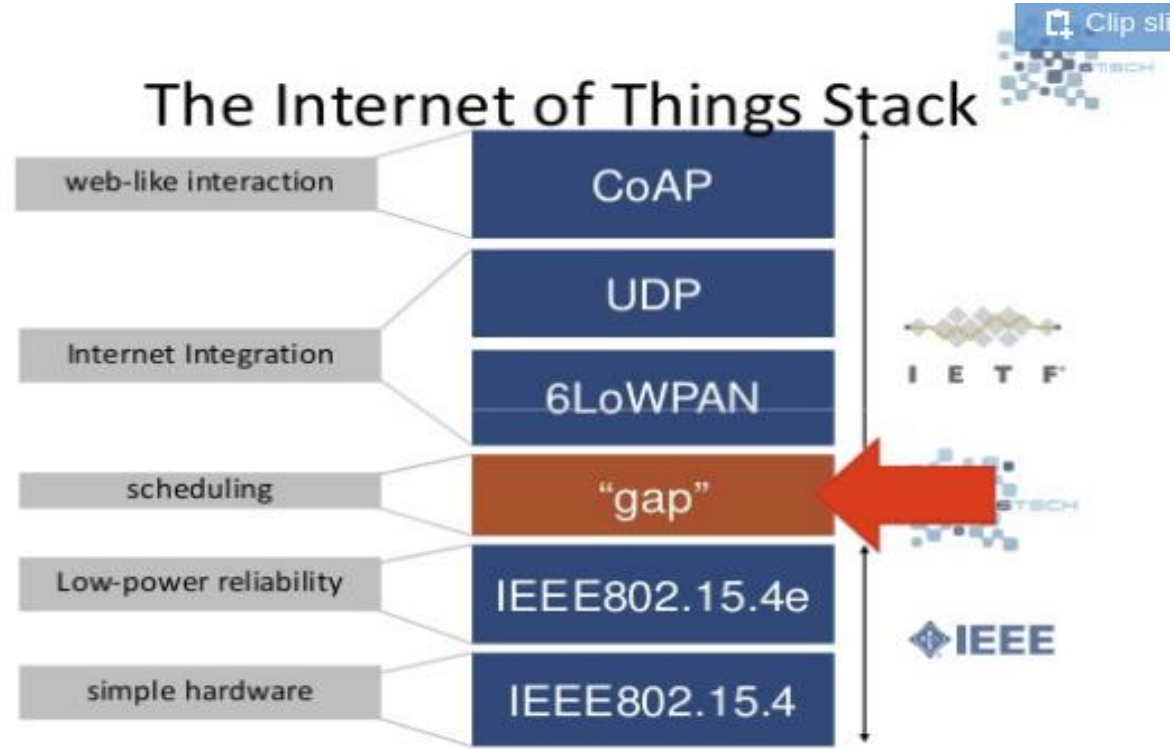


IoT – Network Layer Encapsulation Protocols – 6LoWPAN



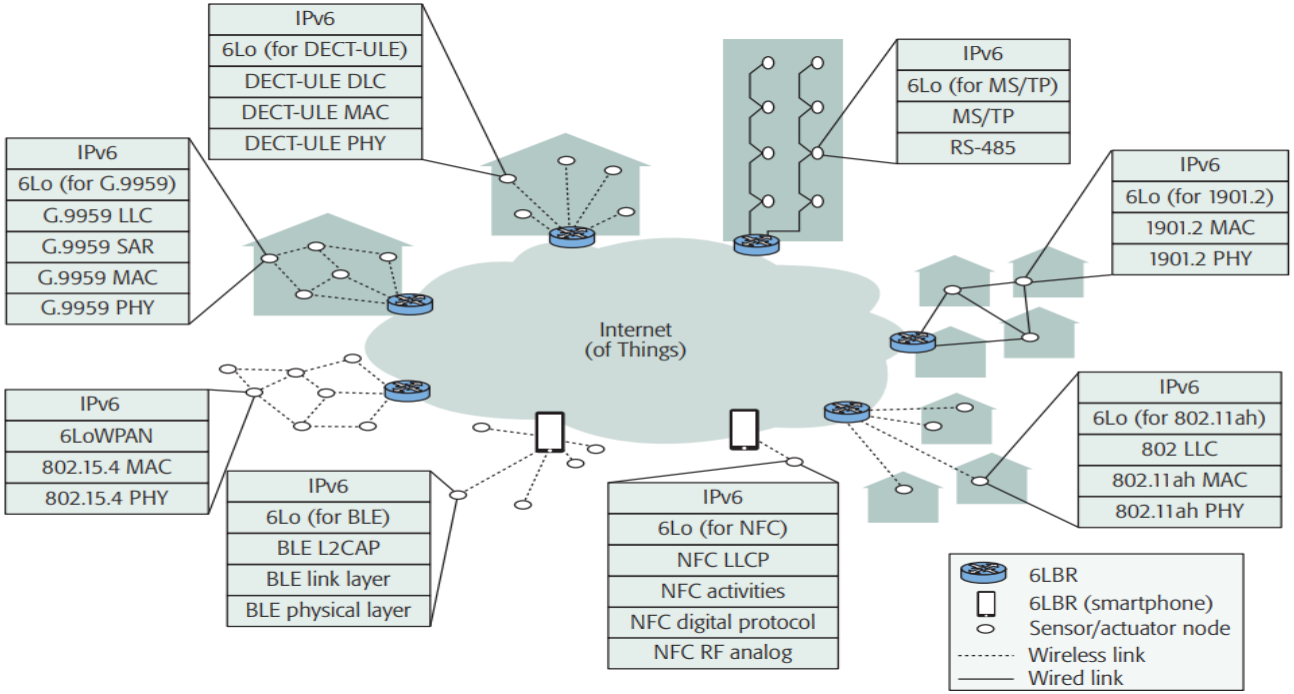
Source : Prof. Dr. Mesut Güneş ⋅ 6. 6LoWPAN

IoT – Network Layer Encapsulation Protocols – 6TiSCH



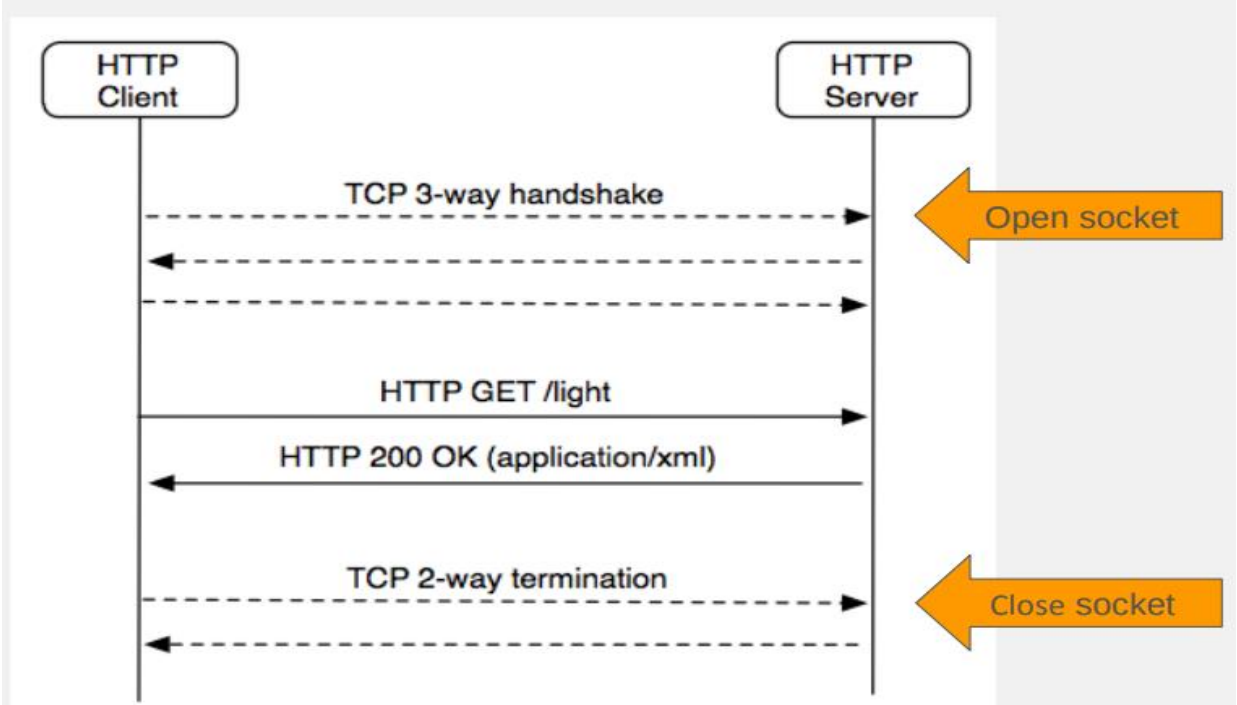
Source : IPv6 & IoT conference

IoT – Network Layer Encapsulation Protocols – 6Lo



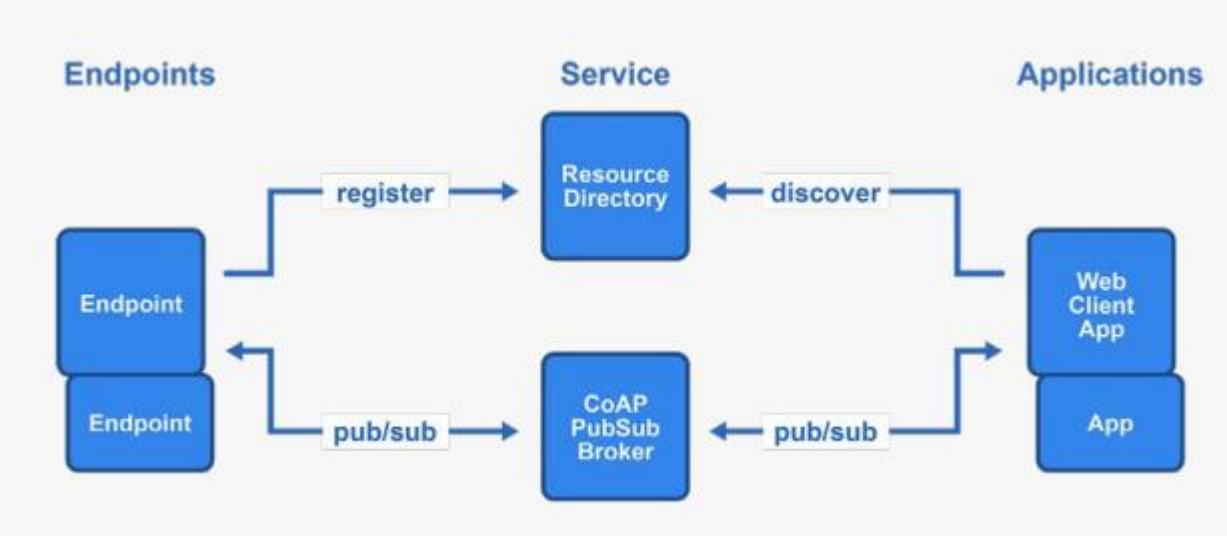
Source : From 6LoWPAN to 6Lo: Expanding the Universe of IPv6-Supported Technologies for the Internet of Things

Application protocols in the Internet - HTTP



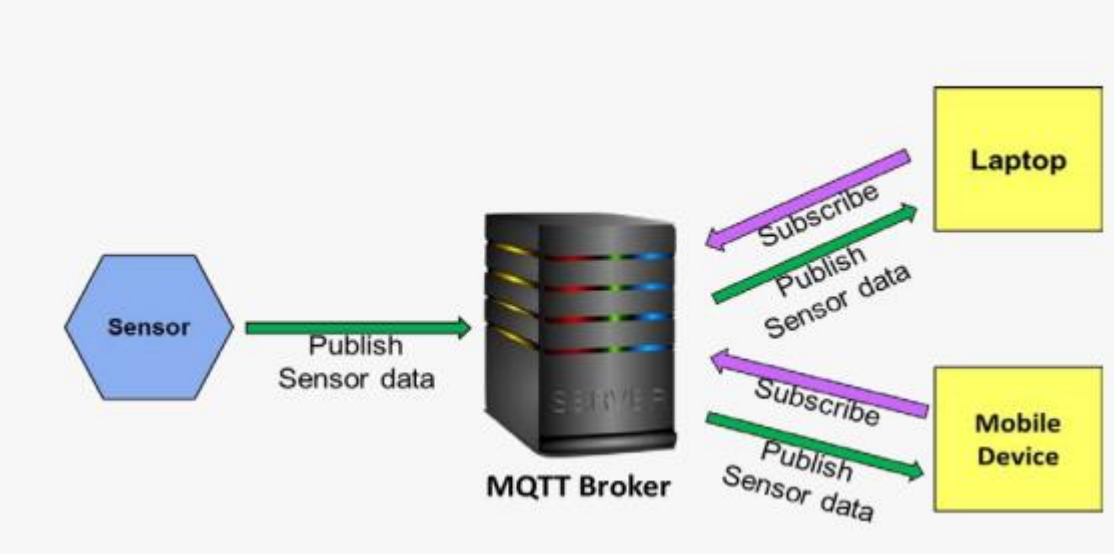
Source : Silabs

Application protocols in the IoT - CoAP



Source : Silabs

Application protocols in the IoT - MQTT



Source : Silabs

Data serialization format for the IoT

	Character-based	Concise Binary
Document-Oriented	XML	EXI
Data-Oriented	JSON	CBOR

Source : : Universitat Bremen

Questions ?