



PSI3542 SISTEMAS EMBARCADOS PARA IOT 2019

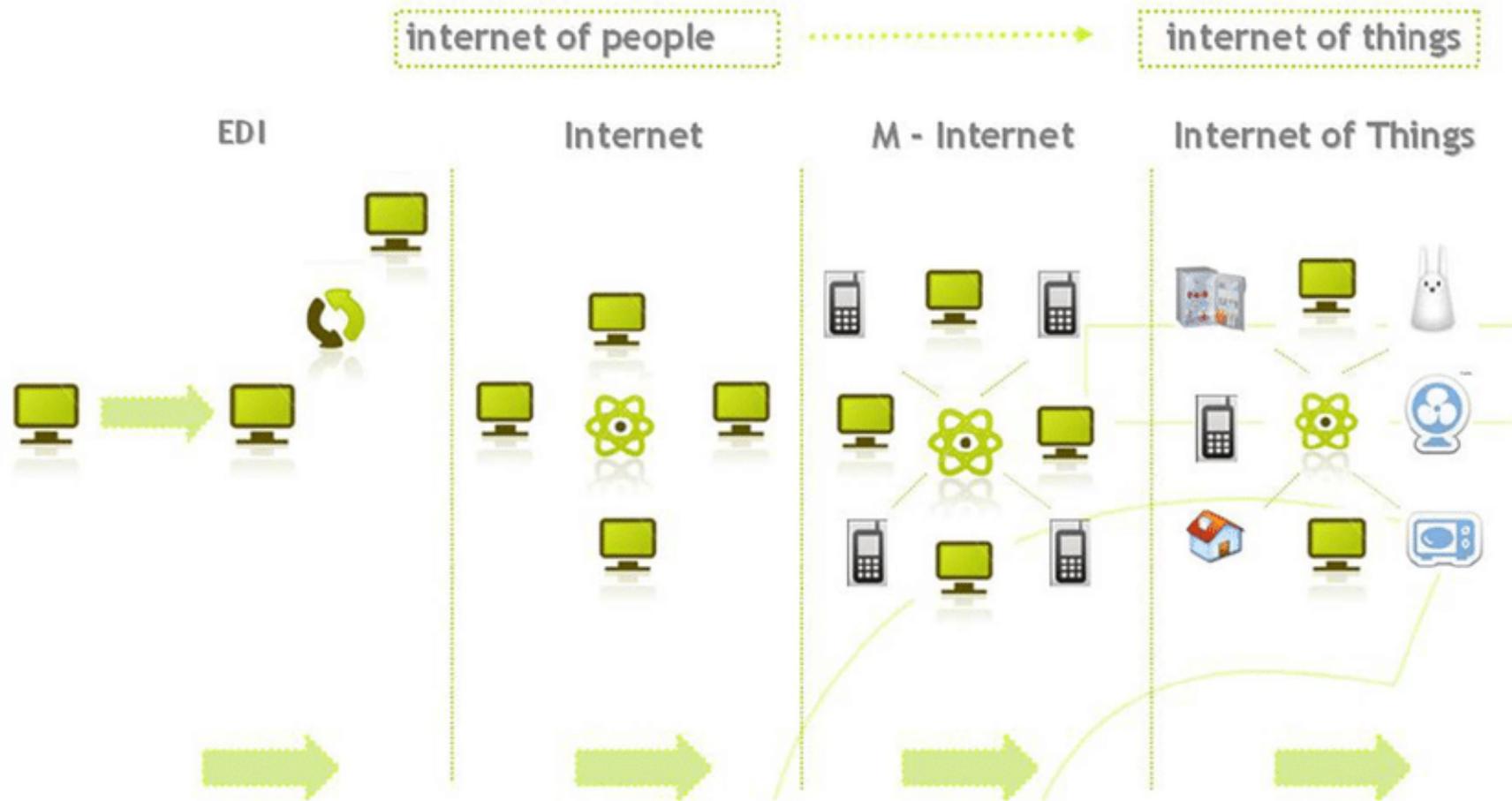
PROF. SERGIO TAKEO KOFUJI

PSI-EPUSP

AULA 01 – 01/08/2019

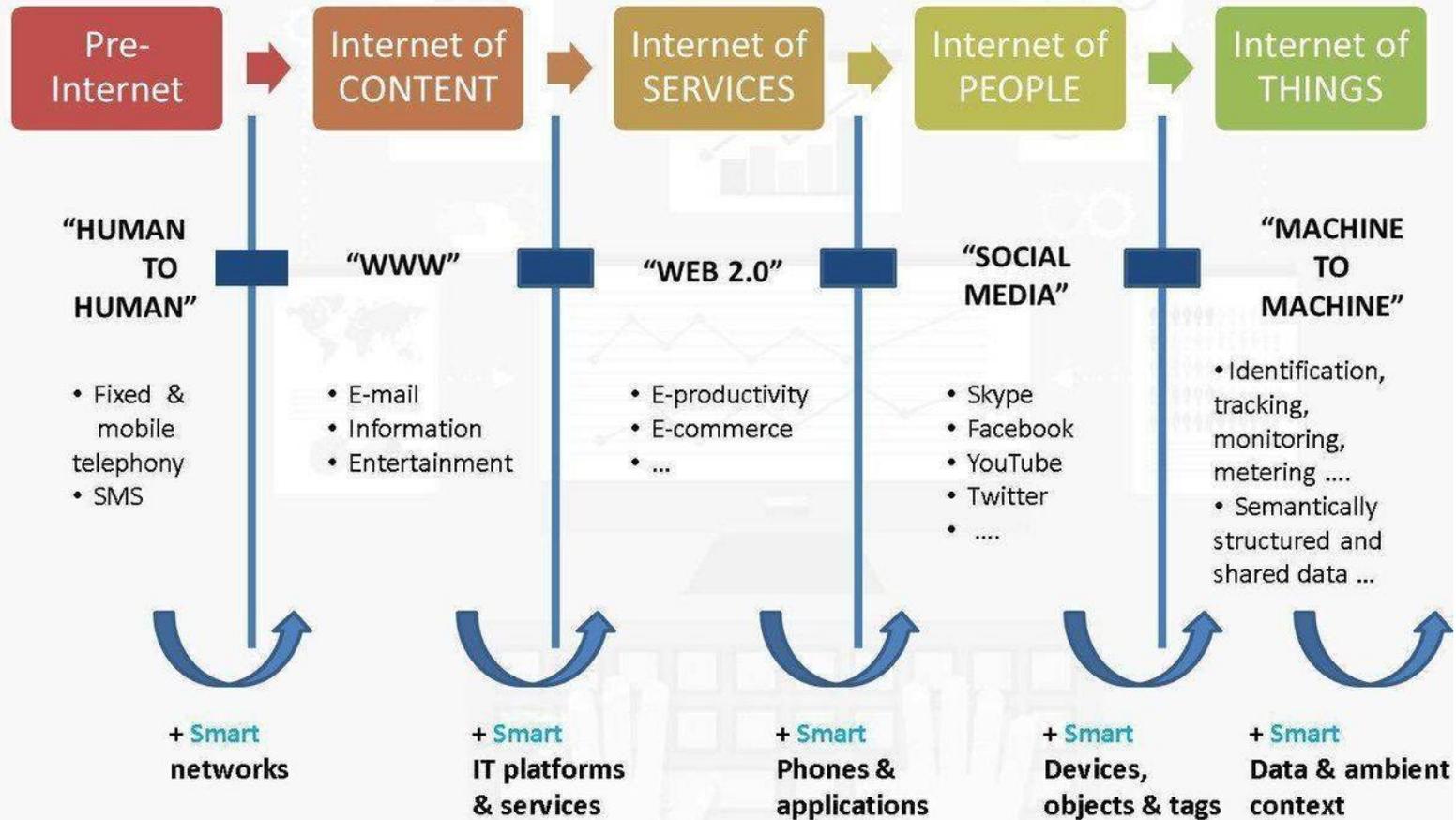
INTRODUÇÃO À DISCIPLINA

IoT - Evolução



FONTE: ALTER TECHNOLOGY GROUP

Evolution of Internet of Things



PLATAFORMA
IOT

COMUNICAÇÃO

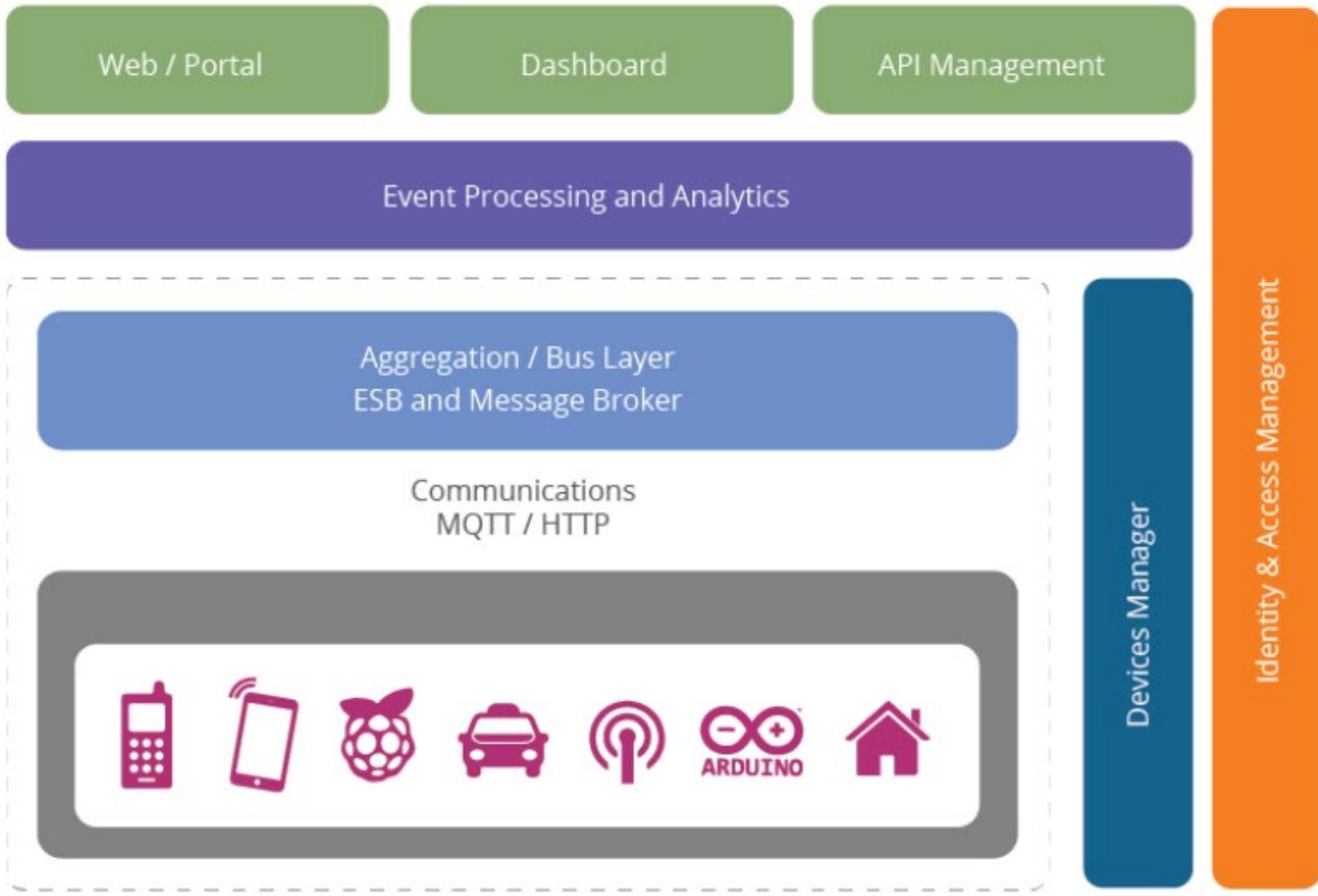
DISPOSITIVOS

PROPOSTA DA DISCIPLINA

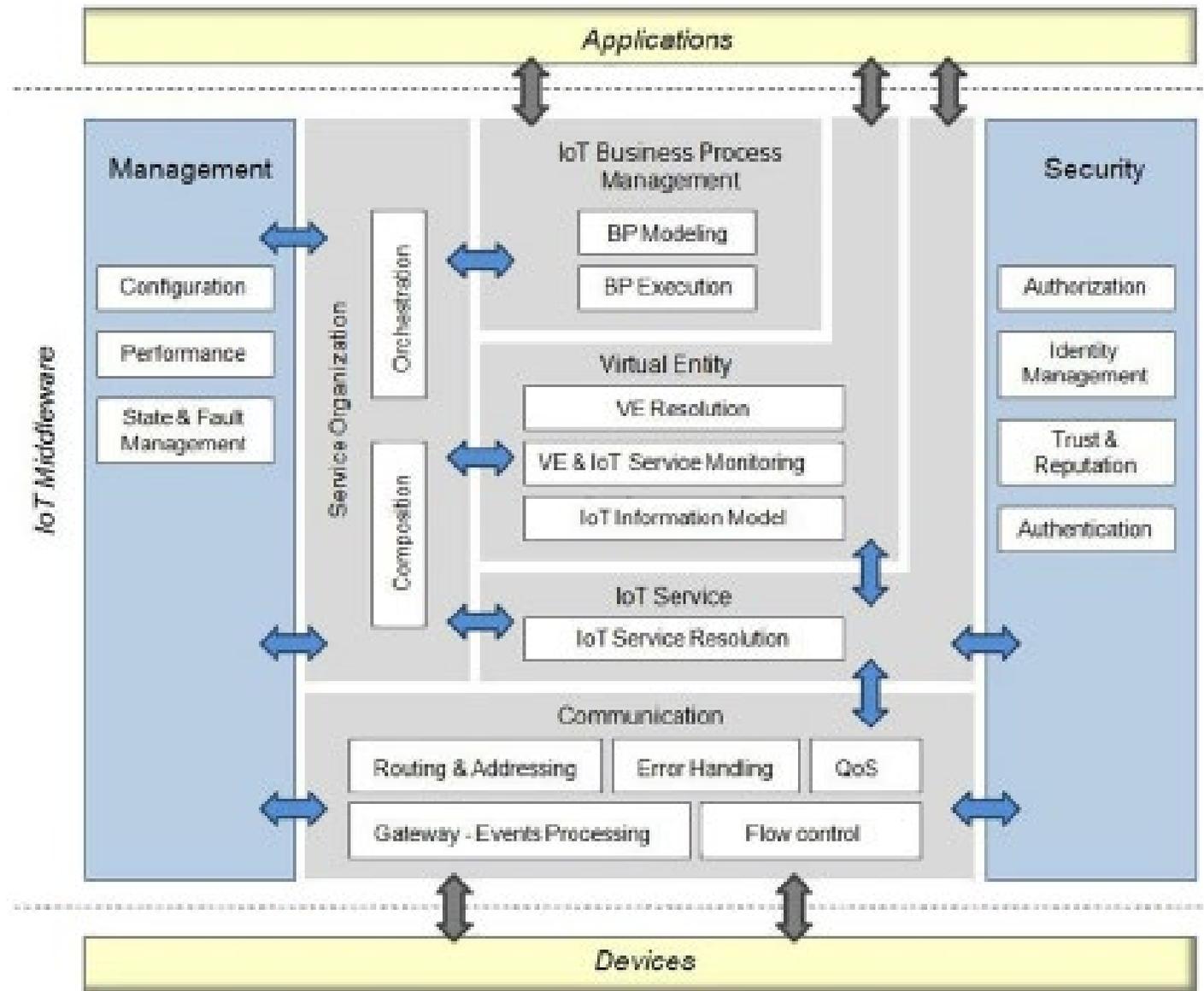
Reference architectures for IoT. IEEE software 2016.

Internet of Things (IoT) reference architectures are evolving in close collaboration between research and industry.

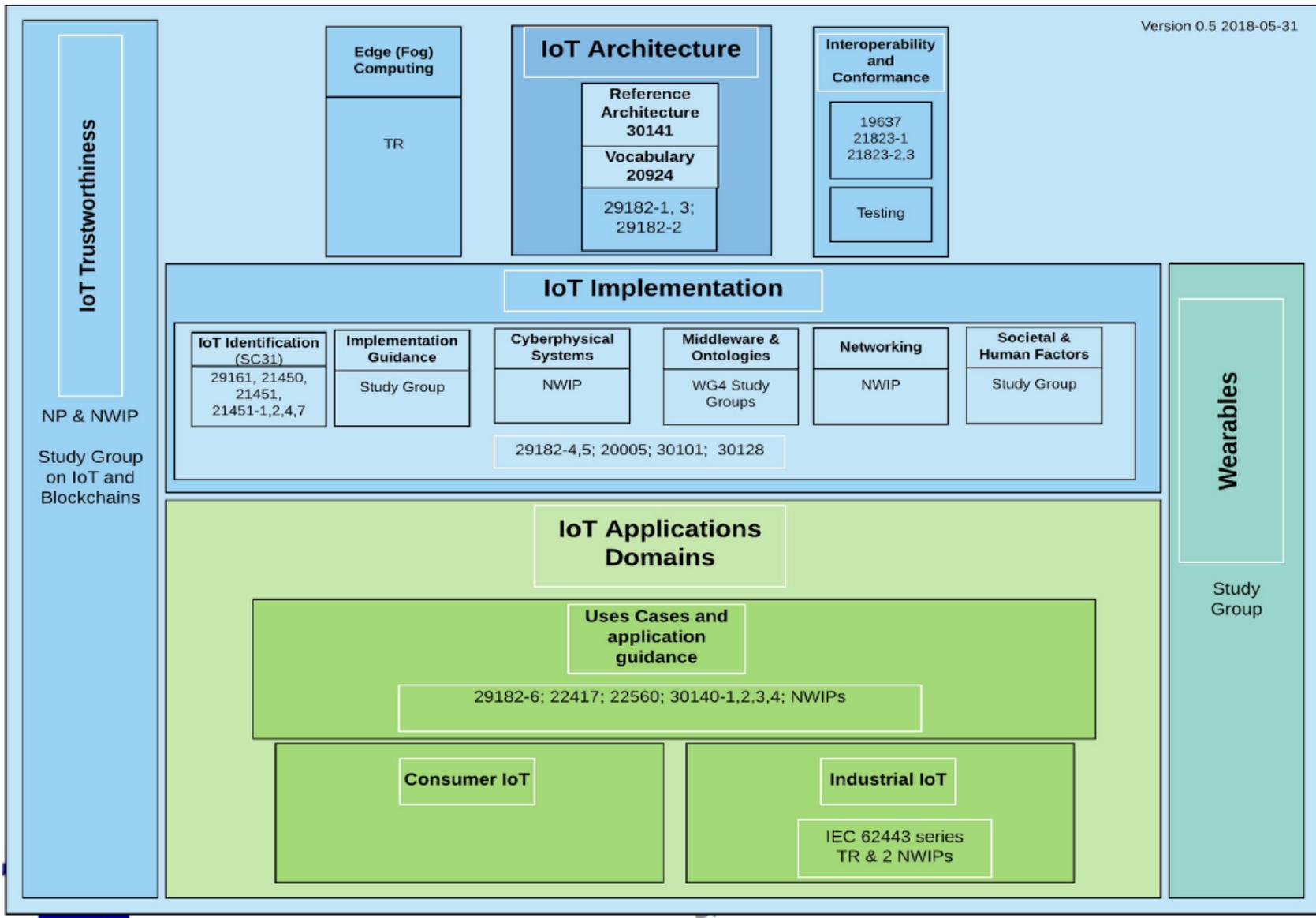
Category	Initiative	Description	Status	URL
IoT reference architecture models	Reference Architecture Model Industrie 4.0 (RAMI 4.0)	A reference architecture for smart factories dedicated to IoT standards, which started in Germany and today is driven by all major companies and foundations in the relevant industry sectors.	Version 1 as of July 2015	www.zvei.org/en/association/specialist-divisions/automation/Pages/default.aspx
	Industrial Internet Reference Architecture (IIRA)	The Industrial Internet Consortium (founded by AT&T, Cisco, General Electric, IBM, and Intel) has delivered a reference architecture for broader consideration and discussion.	Version 1.7 as of June 2015	www.iiconsortium.org
	Internet of Things—Architecture (IoT-A)	The IoT-A delivered a detailed architecture and model from the functional and information perspectives. The project also performed a detailed analysis of system requirements.	The final architectural reference model for the IoT v.3.0 as of July 2013	www.iot-a.eu/public/public-documents/d1.5/view
	Standard for an Architectural Framework for the Internet of Things (IoT)	The IEEE P2413 project has a working group on the IoT's architectural framework, highlighting protection, security, privacy, and safety issues.	An ongoing activity, with no white papers or defining documents as of Sept. 2015	https://standards.ieee.org/develop/project/2413.html
	Arrowhead Framework	This initiative enables collaborative automation by open-networked embedded devices. It's a major EU project to deliver best practices for cooperative automation.	Ongoing updates and release of material by spring 2016	www.arrowhead.eu



WSO2



IOT-A



ISO

DISPOSITIVOS

- FUNCIONALIDADE
 - SENSOR, ATUADOR
- COMPLEXIDADE
 - SIMPLES, SMART
- CAPACIDADE DE PROCESSAMENTO
 - BAIXA X ALTA
- CAPACIDADE DE COMUNICAÇÃO
- AUTONOMIA
 - BATERIA, ENERGIA SOLAR/EOLICA/VIBRACAO, ALIMENTAÇÃO EXTERNA
- SISTEMA OPERACIONAL

PARTE PRÁTICA

- RASPBERRY PI
- SMARTPHONE ANDROID

DISPOSITIVOS IOT

Redes celulares 4G, 5G

- LTE-M (CAT-M)

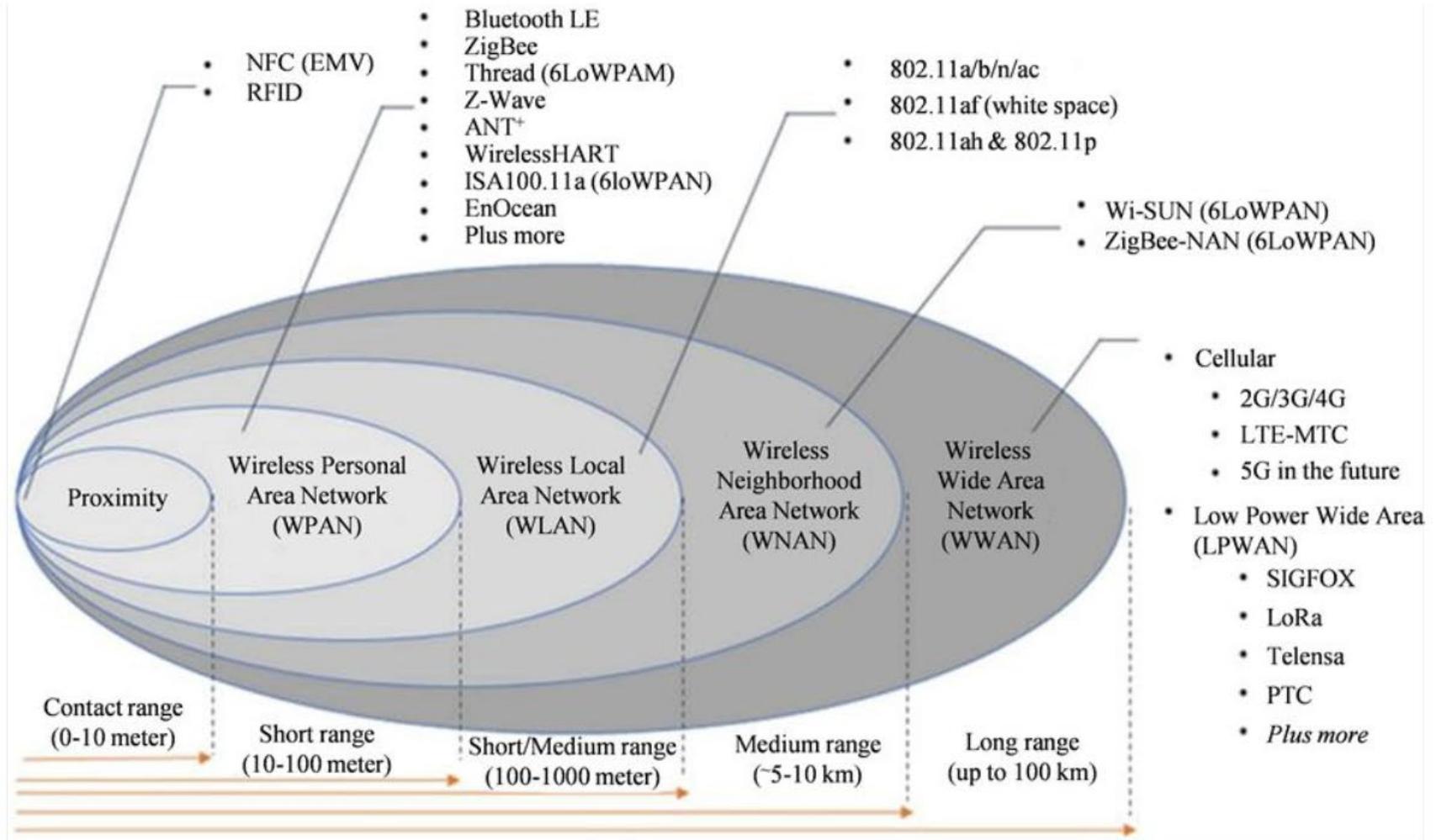
LPWAN

- SIGFOX
- LORA
- NB-IOT

OUTROS

- BLUETOOTH,
ZIGBEE (BAIXO
ALCANCE)
- WIFI
- RADIO

COMUNICAÇÃO



http://file.scirp.org/html/1-4000110_65802.htm
 Advances in Internet of Things
 Vol.06 No.02(2016), Article ID:65802, 11 pages
[10.4236/aiit.2016.62002](https://doi.org/10.4236/aiit.2016.62002)
 A Study of Efficient Power Consumption Wireless Communication Techniques/ Modules for Internet of Things (IoT) Applications
 Mahmoud Shaker Mahmoud, Auday A. H. Mohamad
 Computer Technology Engineering Department, Al-Mansour University College, Baghdad, Iraq

PROTOS DE COMUNICAÇÃO

MQTT

COAP

DDS

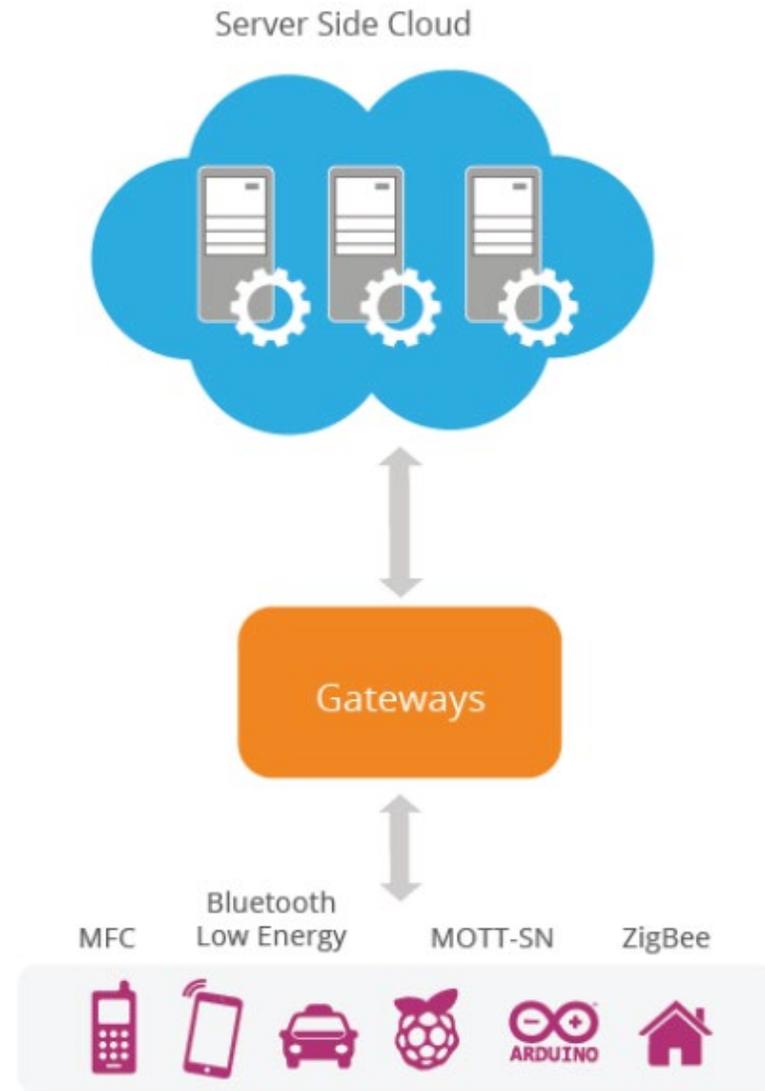
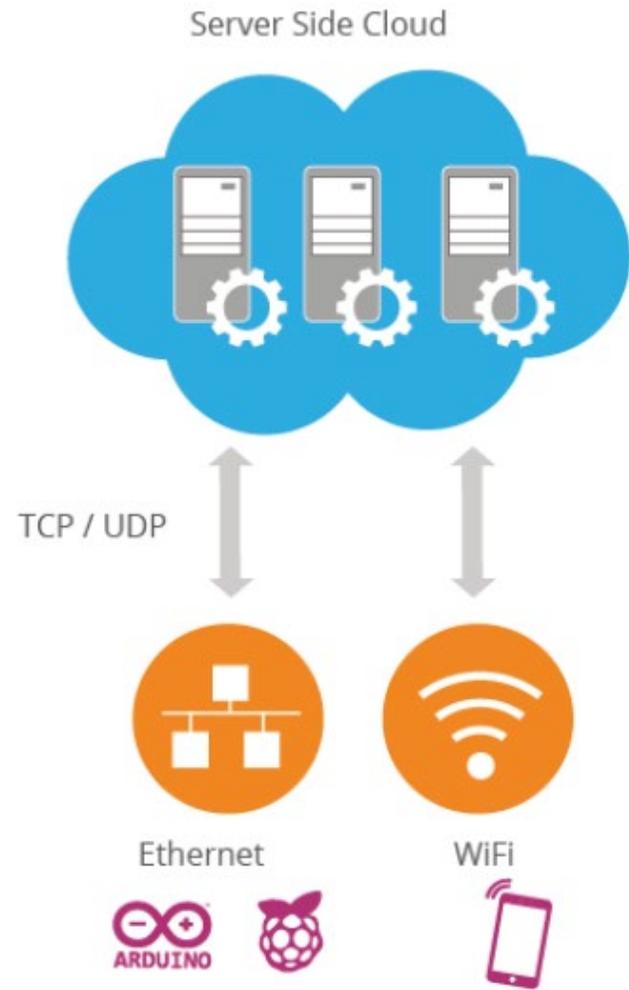
PLATAFORMAS PROPRIETÁRIAS

- IBM WATSON
- MICROSOFT AZURE

PLATAFORMAS OPEN/FREE

- FIWARE
- HELIX

PLATAFORMA DE IOT



WSO2

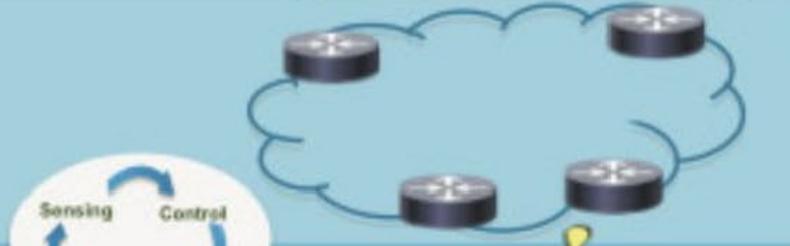
Data Center, Cloud
 Hosting IoT analytics



Core
 IP/MPLS, Security,
 QoS, Multicast

IP/MPLS Core

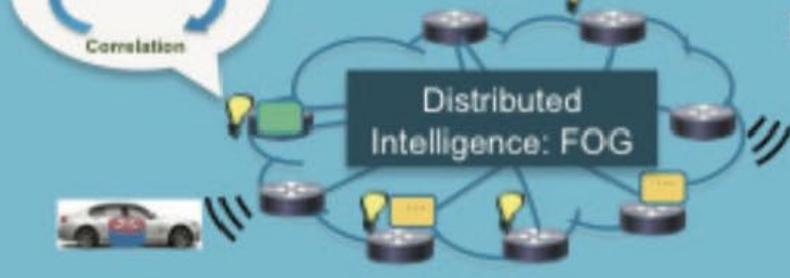
Thousands



Multi-Service Edge
 3G/4G/LTE/WIFI

Field Area Network

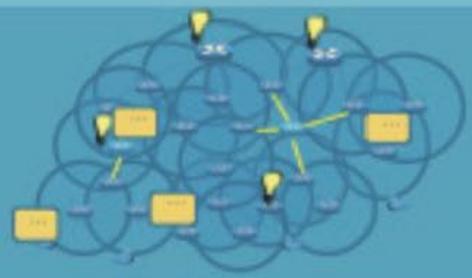
Dozens of Thousands



Embedded Systems and Sensors
 Low power & bandwidth, smart things

Smart Things Network

Millions



CLOUD

EDGE/ FOG

Extreme Edge/ MIST

Modified from: *Fog Computing and Its Role in the Internet of Things*, Flavio Bonomi, Rodolfo Milito, Jiang Zhu, Sateesh Addepalli, Cisco Systems Inc.



PARTE TEÓRICA – CONCEITOS DE IOT E SISTEMAS EMBARCADOS PARA IOT

- O QUE DISTINGUE UM SISTEMA EMBARCADO CONVENCIONAL DE UM SISTEMA EMBARCADO PARA IOT?

PARTE PRÁTICA

- UTILIZAÇÃO DE PLATAFORMAS EM NUVEM E FERRAMENTAS
 - FREEBOARD
 - NODERED
 - IBM WATSON, MICROSOFT AZURE, ETC
 - FIWARE, HELIX
- RASPBERRY PI

APLICAÇÕES E ESTUDOS DE CASOS

- DOMÓTICA
- ASSISTENTE PESSOAL COM INTERFACE HUAMNO-MAQUINA POR VOZ

PROJETO FINAL

TOPICOS A SEREM ABORDADOS

AVALIAÇÃO

- TESTINHOS (SOCRATIVE)
 - TRABALHOS EM CLASSE (GRUPO)
 - PROJETO FINAL (EM GRUPO)
-
- $NF = 10\% \cdot \text{TESTINHOS} + 30\% \cdot \text{TRABALHOS} + 60\% \cdot \text{PROJETO}$

PLATAFORMAS DE ENSINO

- MOODLE
 - FORMA OFICIAL DE COMUNICAÇÃO DA DISCIPLINA
- SLACK

DUVIDAS?

KOFUJI@USP.BR