

# Standards for IoT at the EDGE

*Overcoming the challenges, as a Corporation or an SME*

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**For:** Information

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[NOTE: all figures and information correct as of that date]



# Introductions



Lindsay Frost @NEC is

- Chief Standards Engineer  
NEC Labs Europe GmbH  
(Heidelberg, Germany)
- Member StandICT.eu  
Expert Advisory Group



Lindsay Frost @ETSI is

- Board member of ETSI
- Chairman of ETSI ISG CIM  
Context Info. Management
- ETSI OCG AI Chairman
- CEN/CLC/ETSI delegate to  
CG SmartManufacturing

Previous roles included

- Board member of Home Gateway Initiative
- Co-chairman of HGI Smart Home group
- Chair of ETSI TISPAN WG5 Home Networks
- Chair WFA Mobile Convergence
- NLE R&D Mgr. in 3GPP, 802.11e
- Ph.D in experimental physics



# NEC Laboratories Europe GmbH



**NEC Laboratories Europe GmbH, Heidelberg, Germany**

**[www.neclab.eu](http://www.neclab.eu)**



# Open, global ICT standards ...



## Open, inclusive environment

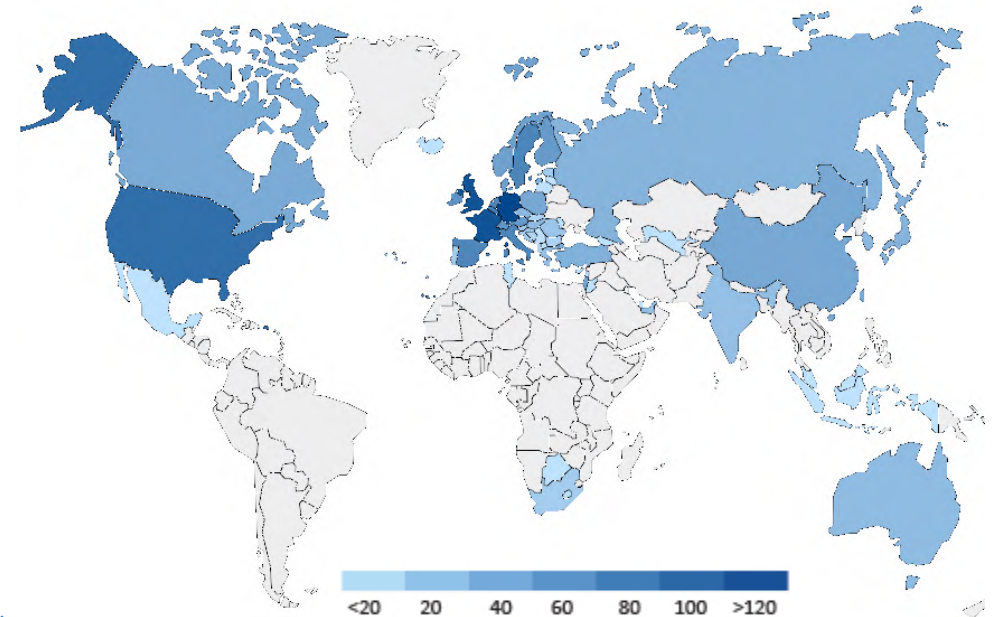
- ✔ To support the development and testing of globally applicable standards
- ✔ For ICT systems and services across all sectors of industry and society

## Independent, non-profit organization

## 30-years track record of technical excellence

## Available to all; standards free of charge

- ✔ Over 48 000 standards published to date
- ✔ Over 1 800 standards published annually
- ✔ 19 million downloads annually



- ❖ 25% SMEs
- ❖ 20% membership growth over the last 10 years
- ❖ Over 100 technical groups with more than 4 000 meetings
- ❖ More than 50 conferences and interop events per year
- ❖ More than 32 000 participants to physical meetings per year
- ❖ More than 35 000 participants per year via e-meetings



# ETSI Standards for IoT & EDGE

# The home of ICT standards...



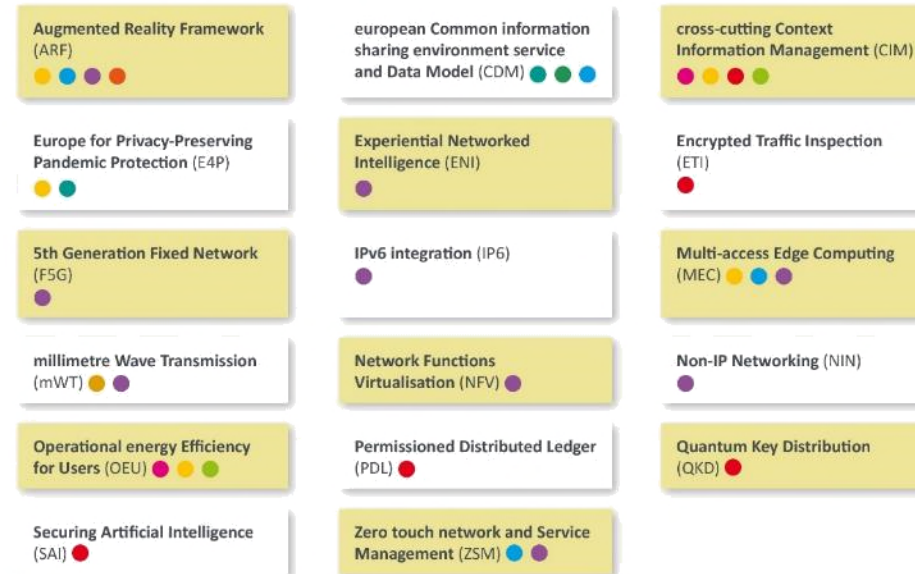
## Committees, Projects & other groups



## ETSI Partnership Projects



## Industry Specification Groups



## Open Source Group



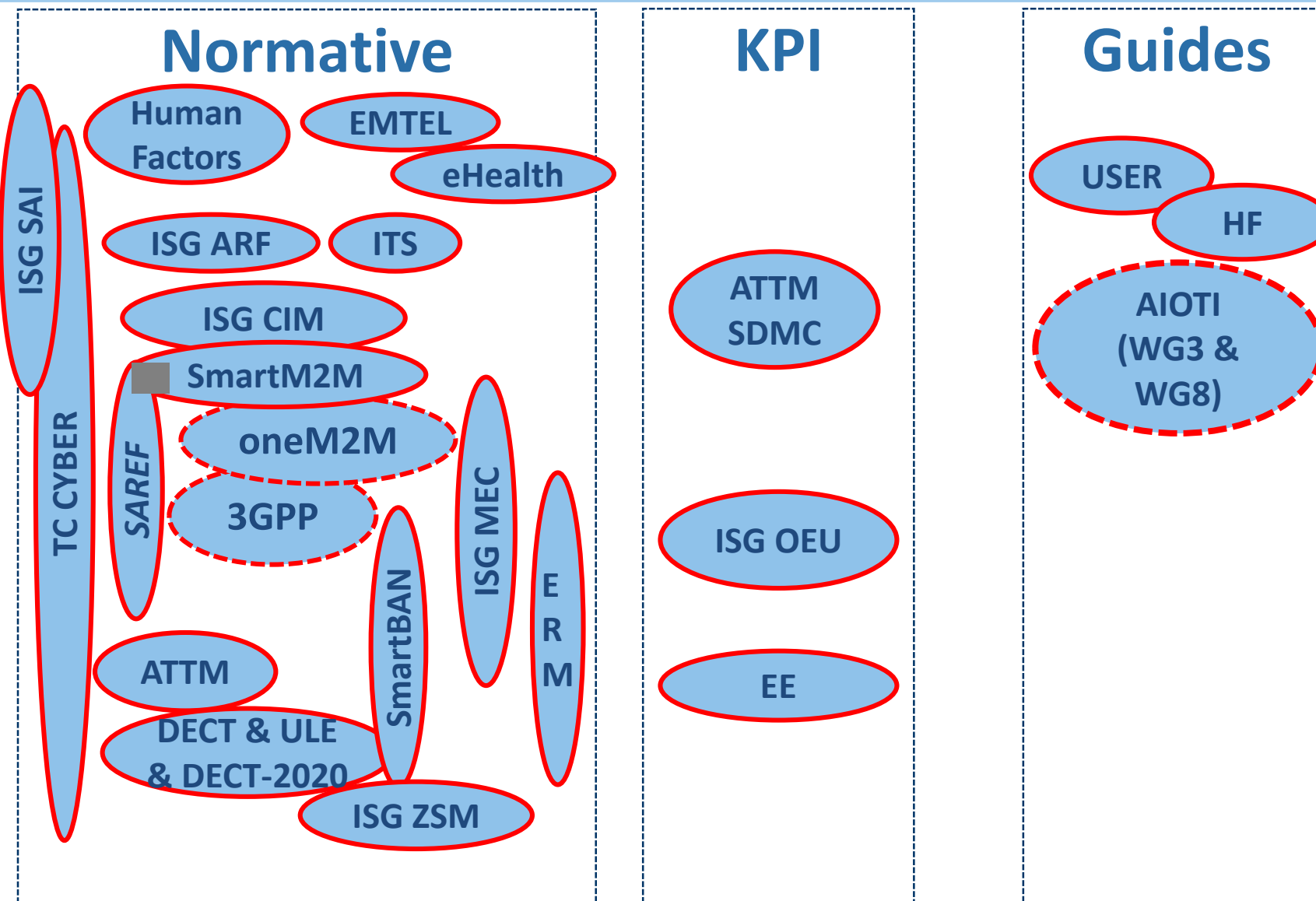
## IoT & EDGE

- ✓ 5G
- ✓ IoT / M2M
- ✓ Cybersecurity
- ✓ Multi-access Edge Computing
- ✓ Automated Network Management
- ✓ Artificial Intelligence
- ✓ Blockchain (Distributed Ledgers)



# ETSI activities cover (nearly) the full IoT stack

<b>User &amp; Business</b>
Services
Services Intrastructure
<b>Context Information</b>
M2M Infrastructure
WAN Connectivity
<b>Semantics</b>
Gateway / Aggregator
Local Network
IoT Devices
Chipsets





# ETSI activities related to IoT (alphabetical links)

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[3GPP](#) (3rd Generation Partnership Project)

[ATTM](#) (Access, Terminals, Transmission and Multiplexing)

[ATTM SDMC](#) (Sustainable Digital Multiservice Cities)

[CYBER](#) (CyberSecurity)

[DECT & ULE](#) (Digital Enhanced Cordless Telecommunications)

[EE](#) (Environmental Engineering)

[eHealth](#)

[EMTEL](#) (Emergency Communications)

[ERM](#) (EMC and Radio Spectrum Matters)

[ESI](#) (Electronic Signature)

[Human Factors](#)

[ISG ARF](#) (Augmented Reality Framework)

[ISG SAI](#) (Securing AI)

[ISG CIM](#) (Context Information Management)

[ISG MEC](#) (Multi-access Edge Computing)

[ISG OEU](#) (Operational Energy Efficiency for Users)

[ISG PDL](#) (Permissioned Distributed Ledger)

[ISG ZSM](#) (Zero-touch Service Management)

[ITS](#) (Intelligent Transport Systems)

[oneM2M](#)

[SmartBAN](#) (Smart Body-Area Networks)

[SmartM2M & SAREF](#) (Smart App REference Ontology)

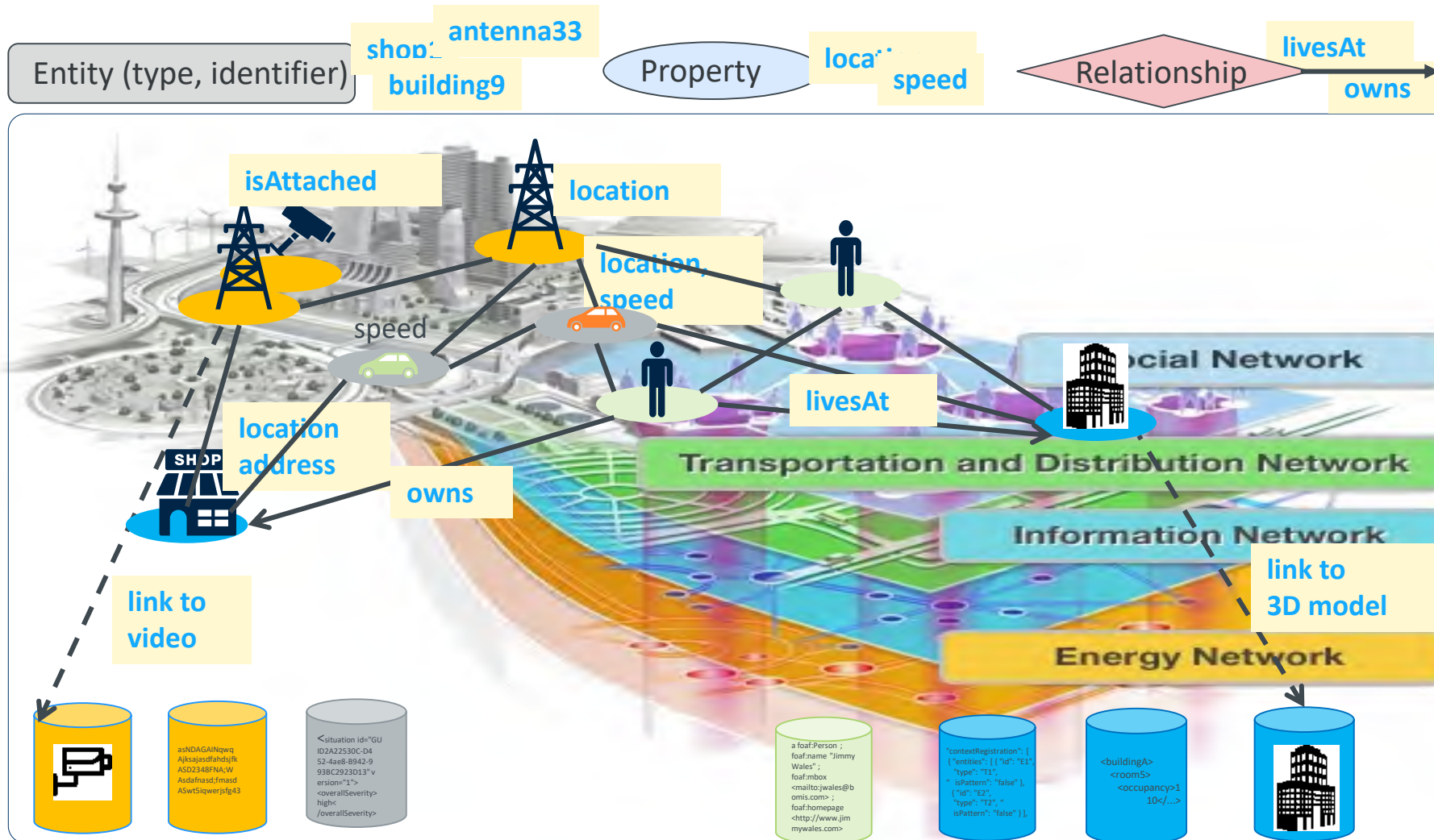
[USER](#)



# Dealing with all the DATA



# Real World Scenarios are complex *and* evolving



We need to link up all information in a reliable way.

We need to care for privacy, license, data quality.

It needs flexibility + interoperability.



# ETSI ISG CIM: NGSI-LD Protocol: Publish/subscribe Linked data and then Query



Spec: [https://www.etsi.org/deliver/etsi\\_gs/CIM/001\\_099/009/01.03.01\\_60/gs\\_CIM009v010301p.pdf](https://www.etsi.org/deliver/etsi_gs/CIM/001_099/009/01.03.01_60/gs_CIM009v010301p.pdf)

Machine Reasoning Systems

**Context Information Management Layer**

**User Apps**

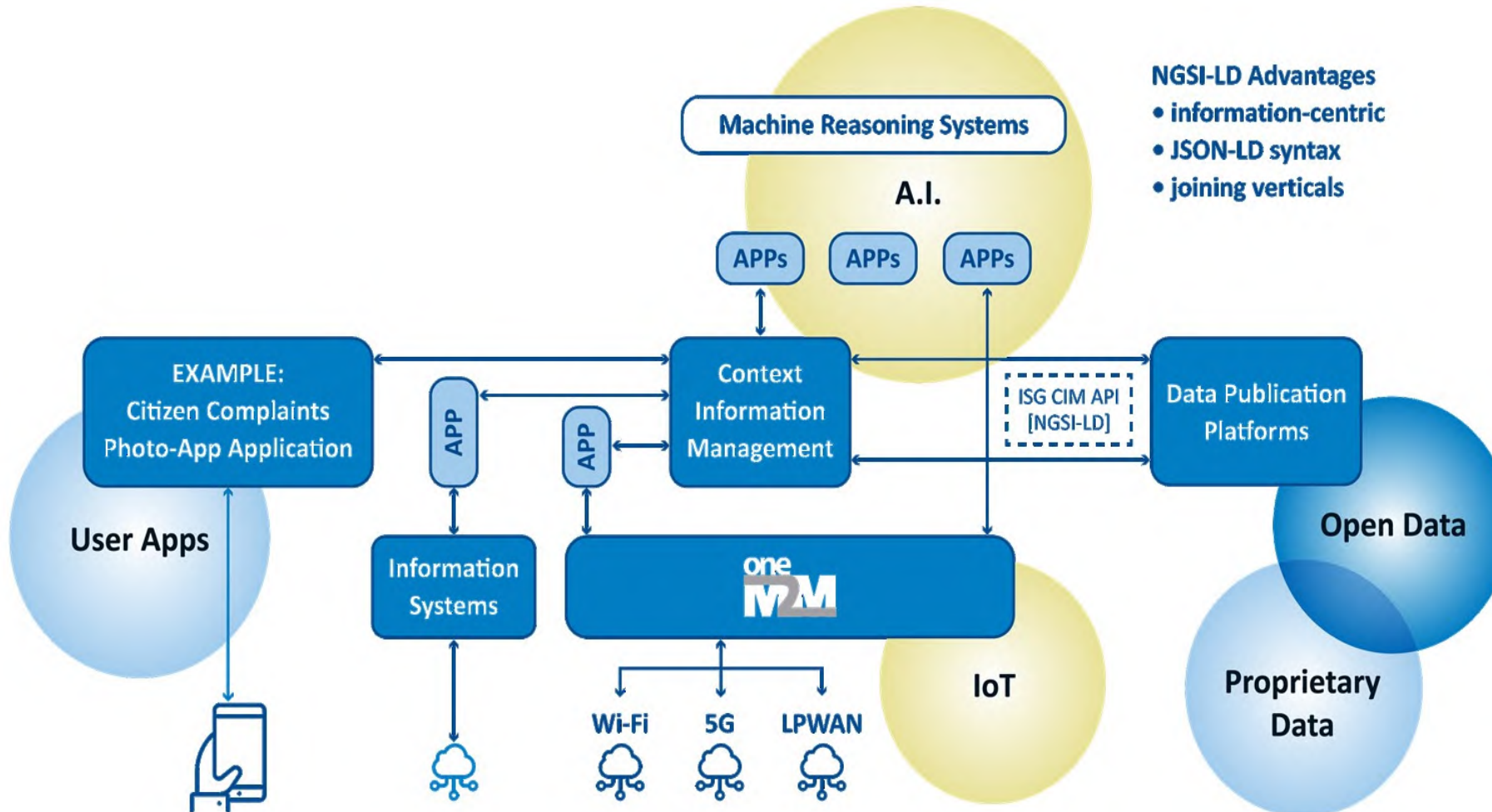
**IoT**

**Open Data**

# ETSI ISG CIM: NGSI-LD Protocol: Publish/subscribe Linked data and then Query



Spec: [https://www.etsi.org/deliver/etsi\\_gs/CIM/001\\_099/009/01.03.01\\_60/gs\\_CIM009v010301p.pdf](https://www.etsi.org/deliver/etsi_gs/CIM/001_099/009/01.03.01_60/gs_CIM009v010301p.pdf)



- NGSI-LD Advantages**
- information-centric
  - JSON-LD syntax
  - joining verticals

Query: find all stores in city “Metropolis” ?

```
GET /ngsi-Id/v1/entities?type=Store&q=address[addressRegion]=="Metropolis" HTTP/1.1
Host: localhost:9090
Accept: application/json
Link: <https://uri.etsi.org/ngsi-Id/primer/store-context.jsonld>;rel="http://www.w3.org/ns/json-ld#context";type="application/ld+json"
```

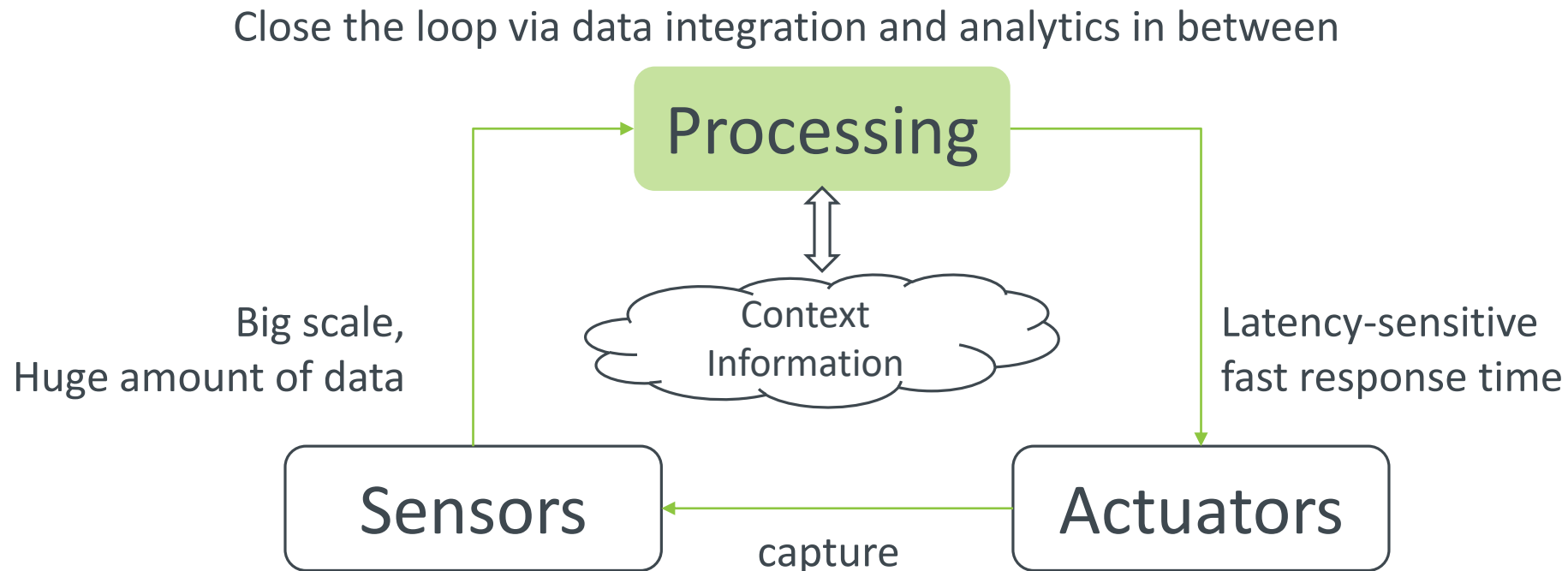


NEC:  
Build on  
the standards.  
Design for the future

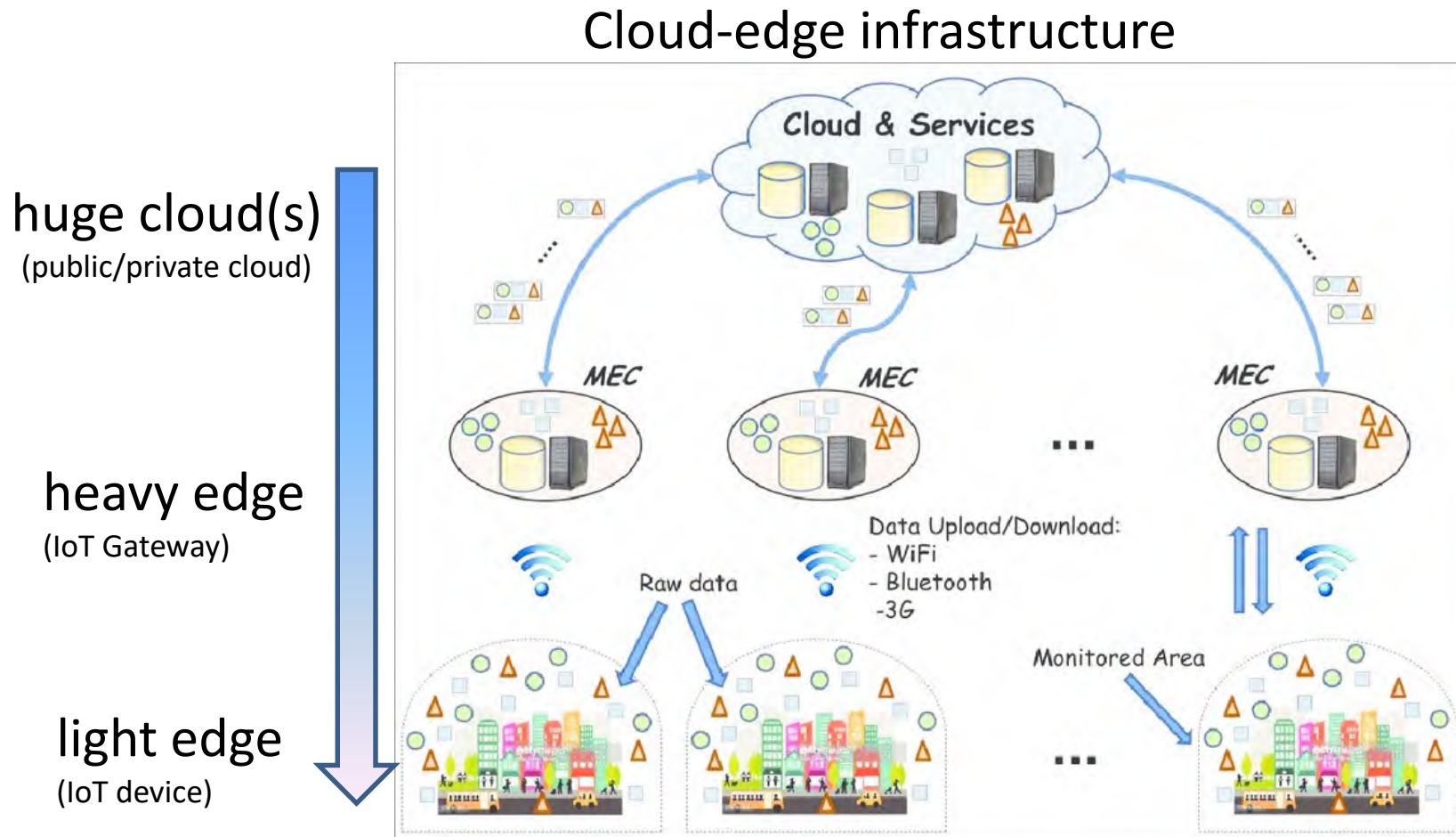


# Internet of Things (IoT): A process, not a sound bite

- ✔ Contextual data are constantly generated and to be used at edges
- ✔ Many IoT services required the closed loop of sensing, analyzing, decision-making, and reacting; fast response time; automated workload management
- ✔ Cloud-only based architecture is not enough to meet service requirements for IoT, due to inefficient bandwidth consumption, latency limit, privacy concerns



# Edge Computing/Fog Computing



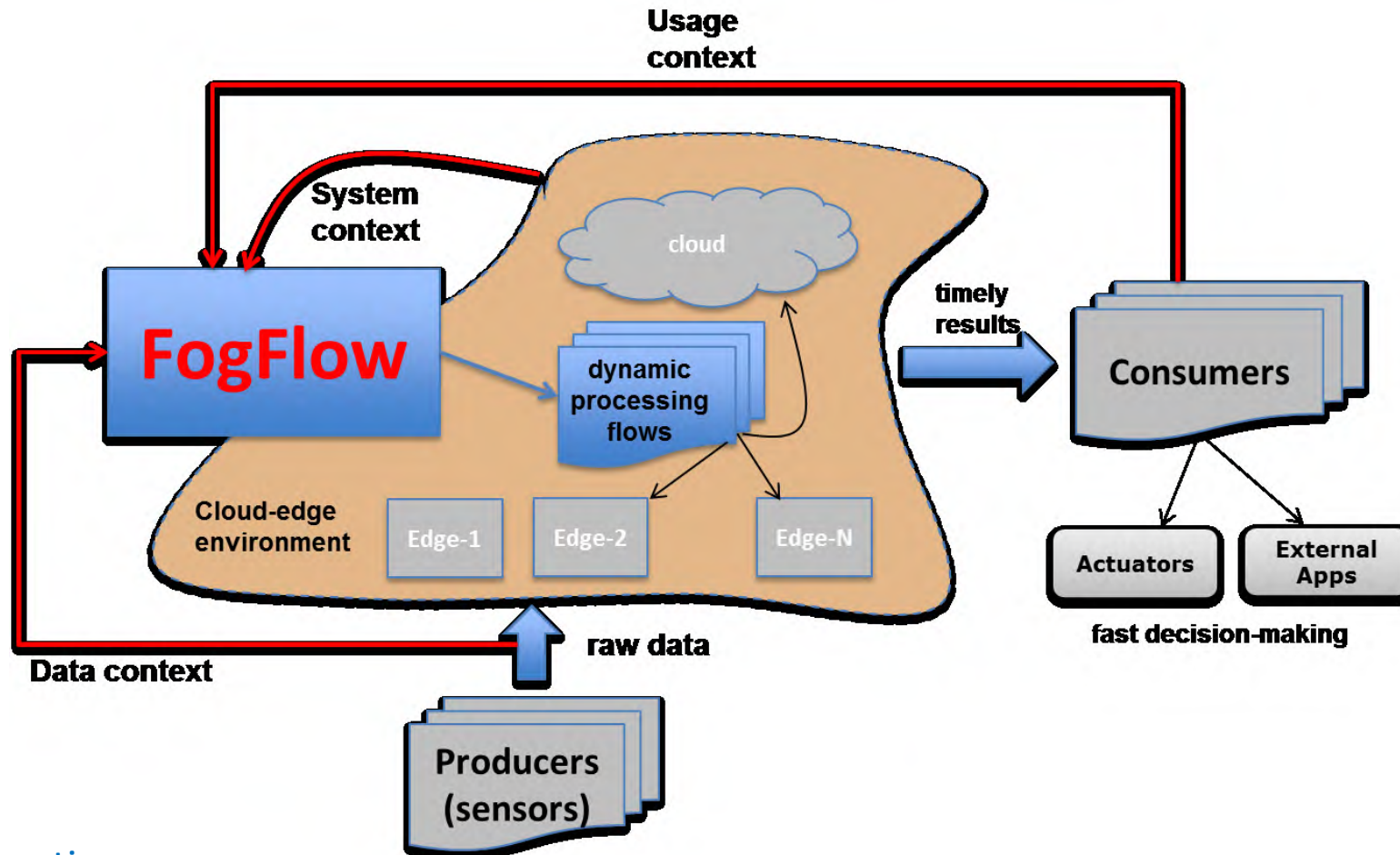
Technical benefits  
of edge/fog computing

- ❑ *Low end-to-end latency for latency-sensitive applications/services*
- ❑ *low bandwidth consumption*
- ❑ *Better privacy-preserving*

Virtualizing the cloud and edges

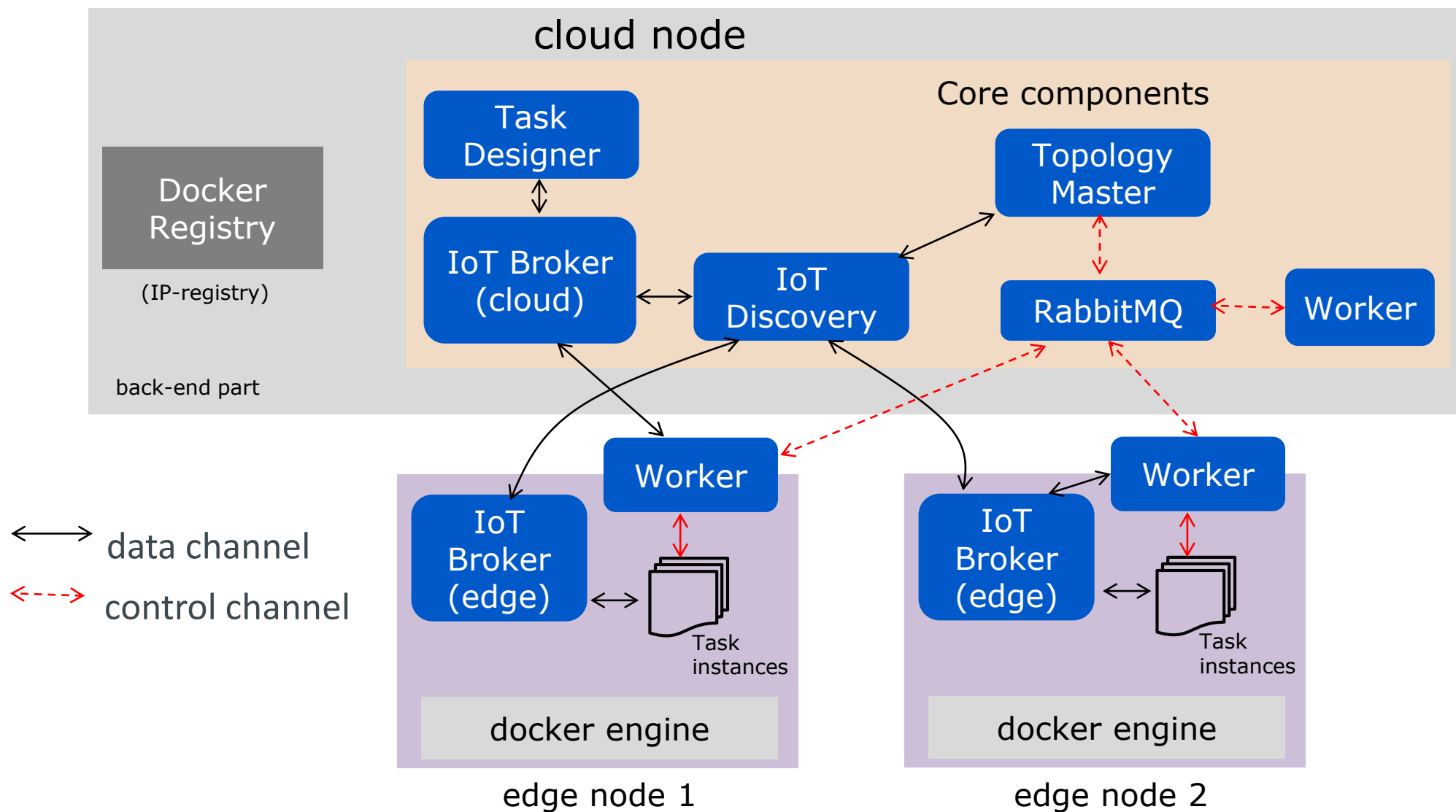
# FogFlow System: High Level View

FogFlow is a cloud-edge service orchestrator to orchestrate dynamic NGSI-LD based data processing flows on-demand between producers and consumers for providing timely results to make fast actions, based on context (system context, data context, and usage context)





# FogFlow System: Deployment View



Note: FogFlow open-source software will implement NGSI-LD API, a standard of ETSI ISG CIM.

A detailed tutorial of FogFlow:

<https://fogflow.readthedocs.io/en/latest/>

Open-source code: <https://github.com/smartfog/fogflow>

FogFlow presentation at CNCF SIG-Runtime:

<https://www.youtube.com/watch?v=4QQingkZr1w>

Research Area  
System  
Platforms for  
IoT and AI



B. Cheng, J. Fürst, G. Solmaz, T. Sanada, “**Fog Function: Serverless Fog Computing for Data Intensive IoT Services**,” in the proceedings of 2019 IEEE Conference on Service Computing (IEEE SCC’19) (**Won the best paper award**), Milan, 2019, pp.28-35

B. Cheng, G. Solmaz, F. Cirillo, E. Kovacs, K. Terasawa and A. Kitazawa, “**FogFlow: Easy Programming of IoT Services Over Cloud and Edges for Smart Cities**”, in IEEE Internet of Things Journal, 2017 (IoT-J Best Paper Award Runner-Up)



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M I C

FED4IoT



ETSI  
supports  
EU members &  
(global) stakeholders



# Teaching and learning...

ETSI has created educational materials on ICT standardization

Modular design to suit different education levels and study

Download for free from: [www.etsi.org/standardization-education](http://www.etsi.org/standardization-education)

Funded by the European Commission and  
the European Free Trade Association

✔ Set of 380+ slides

✔ Textbook, “Understanding ICT Standardization: Principles and Practice”



# Accelerating time to market...

## ETSI's Centre for Testing and Interoperability

- ✔ Conducts interoperability test events
- ✔ For a wide range of ICT implementations

## Plugtests™, Hackathons and Hackfests

- ✔ To support the efficient validation and implementation of standards
- ✔ To help industry bring new products and services to market faster and with greater confidence of success



## A recognized IPR Policy

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The ETSI IPR Policy seeks to reduce the risk that ETSI standards-making efforts might be wasted if SEPs are unavailable under FRAND terms and conditions

The main objective of the ETSI IPR Policy is to balance:

- ✓ the rights and interests of SEP holders to be rewarded for the use of their SEPs in the implementation of ETSI Standards
- ✓ the need for implementers to get access to the technology defined in ETSI standards under FRAND terms and conditions

No involvement of ETSI in any commercial discussion on IPR matters

The ETSI IPR online database allows public access to patents which have been declared as (potentially) essential to ETSI standards





