



# An Introduction to JTC 1/SC 41

v1.0

ICT Mirror Committee  
Luxembourg  
2018-12-06

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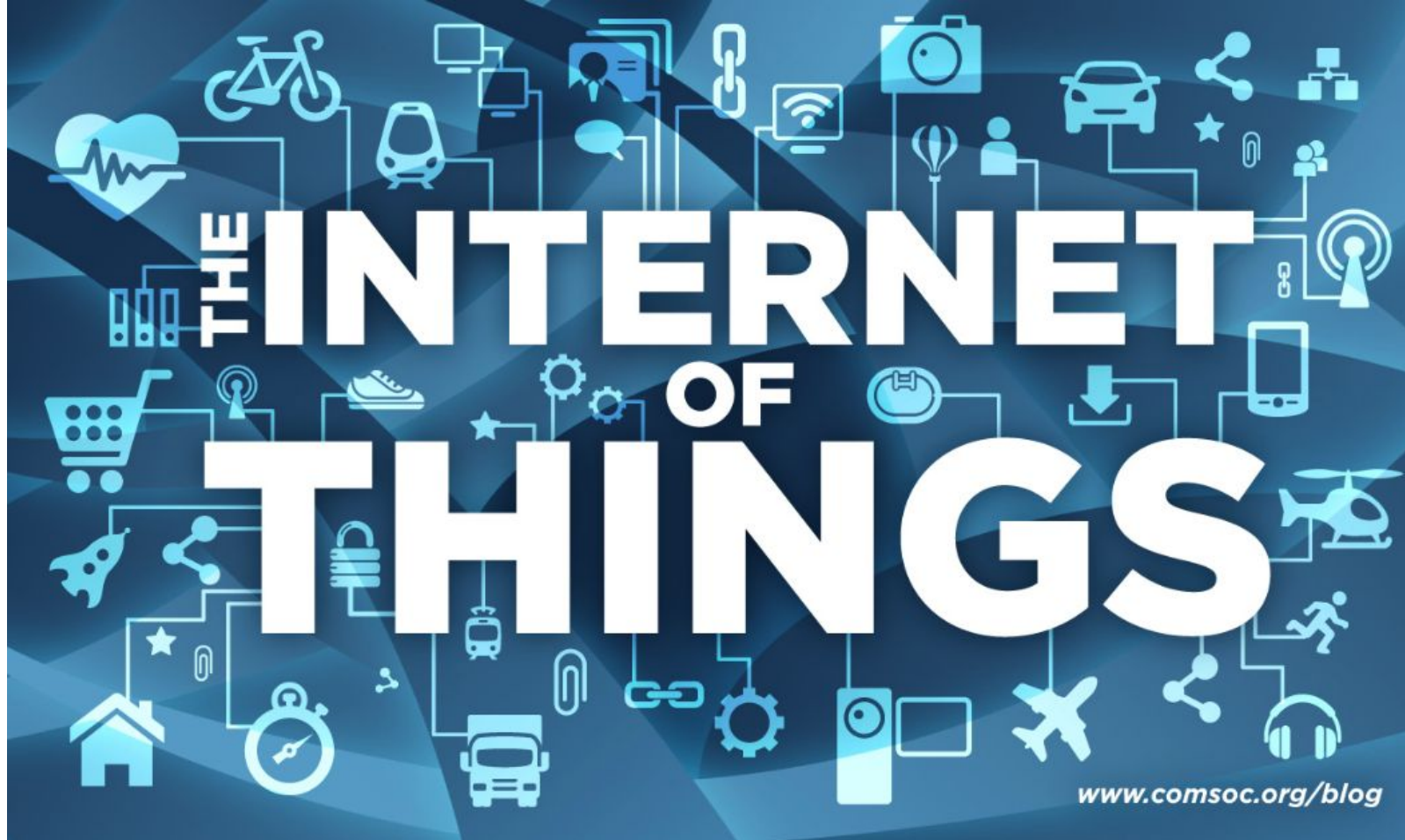
# JTC 1/SC41 Terms of references

**Title:** Internet of Things and related technologies

**Scope:** Standardization in the area of Internet of Things (IoT) and related technologies.

1. Serve as the focus and proponent for JTC 1's standardization programme on the Internet of Things and related technologies, including Sensor Networks and Wearables technologies.
2. Provide guidance to JTC 1, IEC, ISO and other entities developing Internet of Things related applications.





[www.comsoc.org/blog](http://www.comsoc.org/blog)

# ISO/IEC Definition of IoT

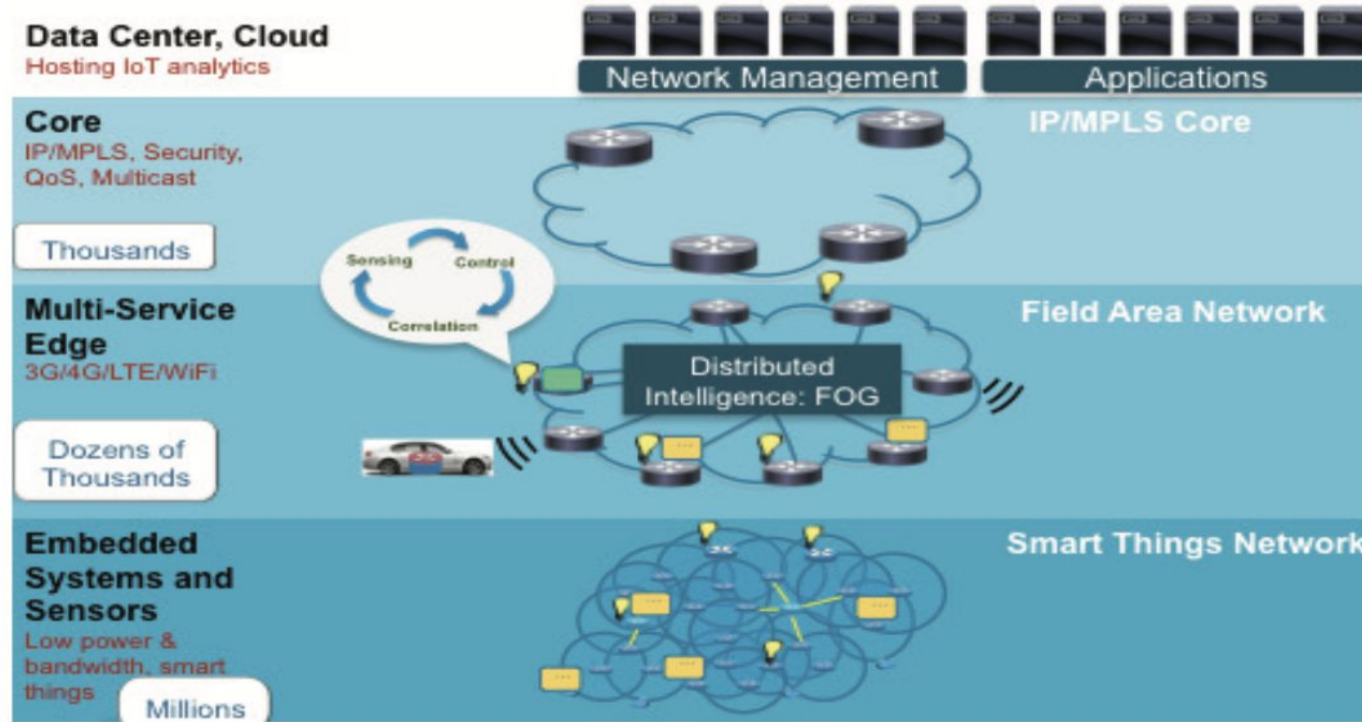
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*..infrastructure of interconnected entities, people systems and information resources together with services which processes and reacts to information from the physical and virtual world.*

ISO/IEC FDIS 20924

# A Distributed and Network centric System or System of Systems

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



**CLOUD**



**EDGE/  
FOG**



**Extreme  
Edge/  
MIST/  
SWARM**

## Communication Technologies

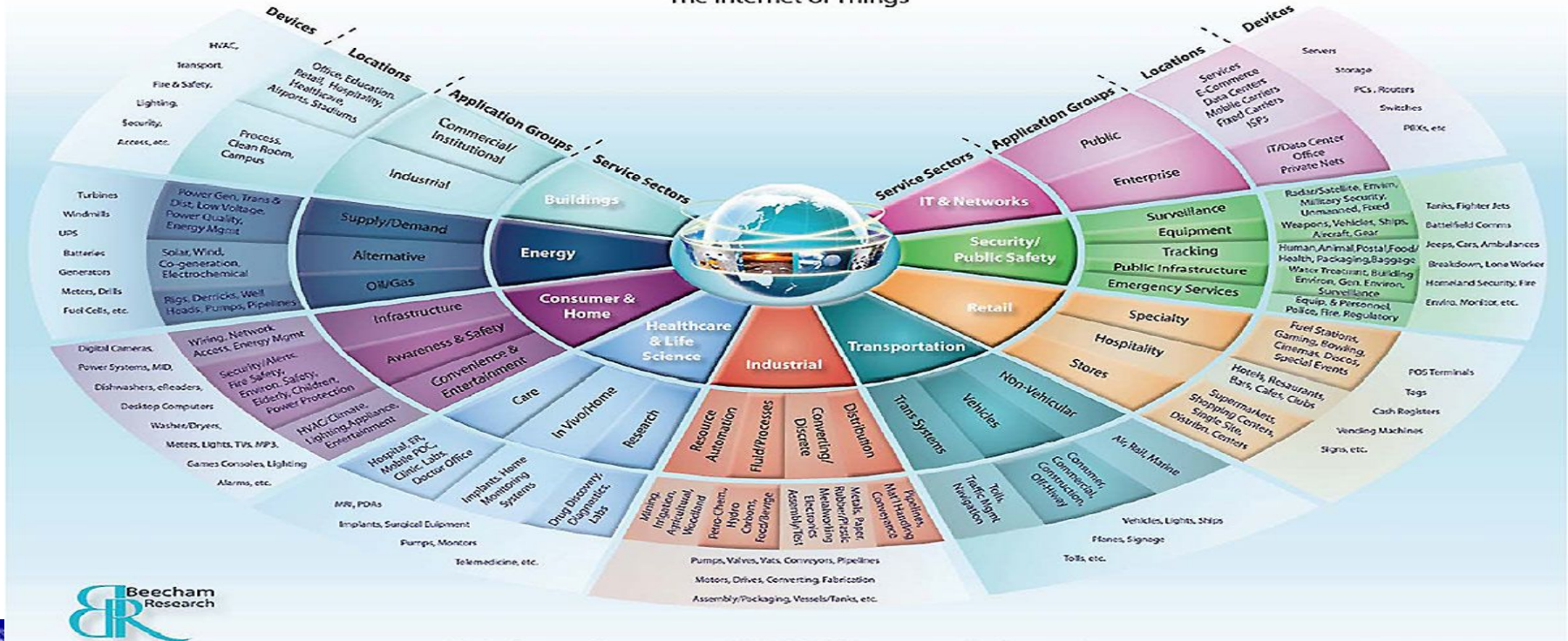
	NFC	RFID	Blue-tooth®	Blue-tooth® LE	ANT	Proprietary (Sub-GHz & 2.4 GHz)	Wi-Fi®	ZigBee®	Z-wave	KNX	Wireless HART	6LoWPAN	WIMAX	2.5-3.5 G
Network	PAN	PAN	PAN	PAN	PAN	LAN	LAN	LAN	LAN	LAN	LAN	LAN	MAN	WAN
Topology	P2P	P2P	Star	Star	P2P, Star, Tree, Mesh	Star, Mesh	Star	Mesh, Star, Tree	Mesh	Mesh, Star, Tree	Mesh, Star	Mesh, Star	Mesh	Mesh
Power	Very Low	Very Low	Low	Very Low	Very Low	Very Low to Low	Low-High	Very Low	Very Low	Very Low	Very Low	Very Low	High	High
Speed	400 Kbs	400 Kbs	700 kbs	1 Mbs	1 Mbs	250 kbs	11-100 Mbs	250 kbs	40 Kbs	1.2 Kbps	250 kbs	250 Kbs	11-100 Mbs	1.8-7.2 Mbs
Range	<10 cm	<3 m	<30 m	5-10 m	1-30 m	10-70 m	4-20 m	10-300 m	30 m	800 m	200 m	800 m (Sub-GHz)	50 km	Cellular network
Application	Pay, get access, share, initiate service, easy setup	Item tracking	Network for data exchange, headset	Health and fitness	Sports and fitness	Point to point connectivity	Internet, multimedia	Sensor networks, building and industrial automation	Residential lighting and automation	Building automation	Industrial sensing networks	Sensor networks, building and industrial automation	Metro area broadband Internet connectivity	Cellular phones and telemetry
Cost Adder	Low	Low	Low	Low	Low	Medium	Medium	Medium	Low	Medium	Medium	Medium	High	High

Learning for Every Learner, Learning for Every Learner



# An horizontal technology with a wide-range of applications

The Internet of Things





# With a wide-range of requirements

100 = feature is of utmost importance for the industry

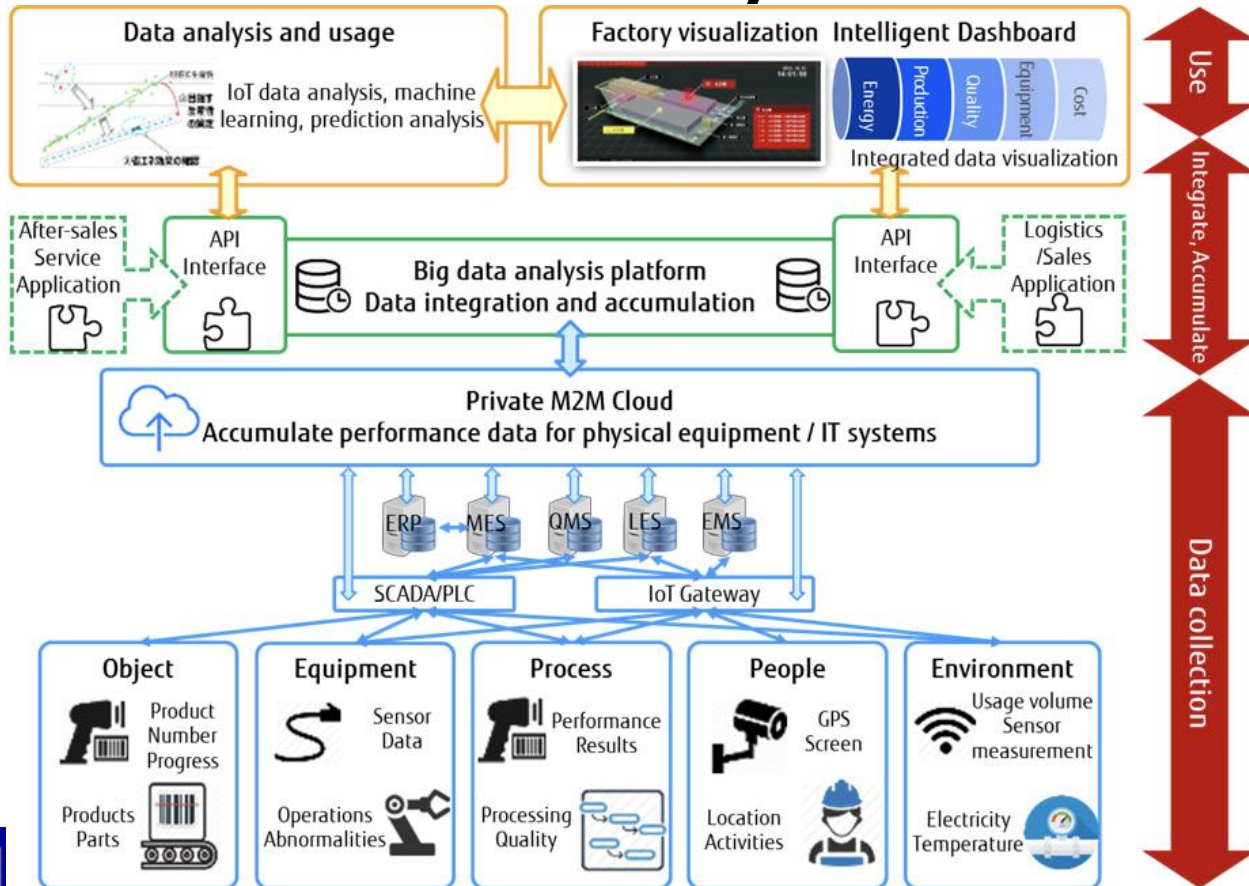
Need	Industry sector							
	Manufacturing	Automotive	Smart building/ life safety	Asset/ utility mgmt	Smart grid	Consumer IoT	Entertainment	Transportation
Mobility	55	98	10	50	10	55	80	97
Ultra low latency (<10ms)	95	100	85	5	5	15	15	95
Autonomy	95	100	100	7	100	50	45	100
Security	100	100	100	90	100	25	30	100
Local network bandwidth	100	100	90	10	10	35	90	100
WAN network bandwidth	35	30	55	15	10	55	90	45
Peer-to-peer communication	80	90	85	10	50	90	85	100
Prioritization	100	100	15	45	90	10	55	45
Self-organization discovery	60	50	20	95	40	65	90	60
Artificial intelligence/ machine learning	100	60	100	65	85	45	60	95

IEC Whitepaper on Edge Intelligence, 2017-10,  
[http://www.iec.ch/whitepaper/pdf/IEC\\_WP\\_Edge\\_Intelligence.pdf](http://www.iec.ch/whitepaper/pdf/IEC_WP_Edge_Intelligence.pdf)

# IoT Systems and Systems of Systems

- Network centric
- Distributed and M2M driven (Communications, transactions)
- Data intensive
- ‘Smart’ objects/systems (Autonomous or semi-autonomous)
- (Heterogeneous)
- Some systems are Cyber-Physical and/or Socio-Technical

# A Smart Factory - IT View



Easily in the order of 0,5 TB per day

Fujitsu and INESA Group Collaborate on Smart Manufacturing Project for "Made in China 2025"  
Fujitsu Limited, Fujitsu (China) Holdings Co., Ltd., INESA (Group) Co., Ltd.  
Tokyo and Shanghai, October 05, 2016,  
<http://www.fujitsu.com/global/about/resources/news/press-releases/2016/1005-02.html>

# THE COMING FLOOD OF DATA IN AUTONOMOUS VEHICLES

RADAR  
~10-100 KB  
PER SECOND

SONAR  
~10-100 KB  
PER SECOND

GPS  
~50KB  
PER SECOND

CAMERAS  
~20-40 MB  
PER SECOND

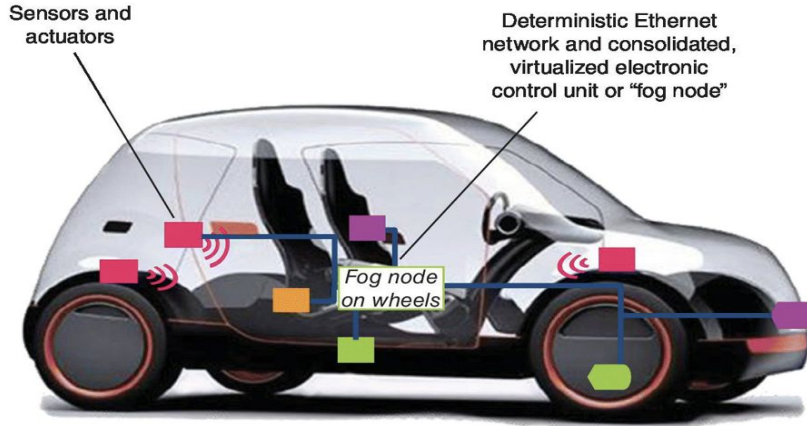
AUTONOMOUS VEHICLES  
**4,000 GB**  
PER DAY... EACH DAY

LIDAR  
~10-70 MB  
PER SECOND

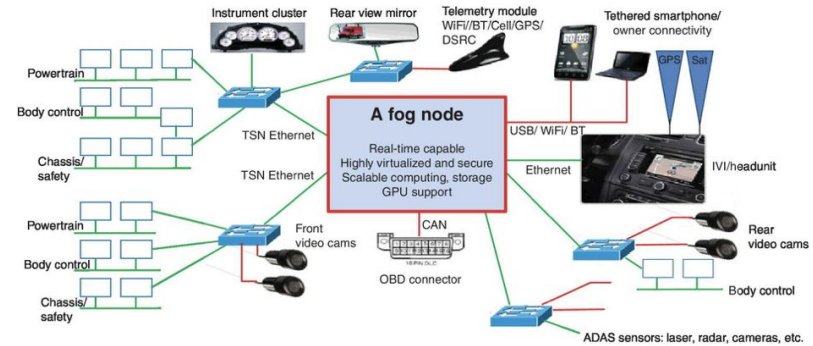




# Mobile 'edge' / Fog



**Figure 8.1** The future automobile as fog computing on wheels.

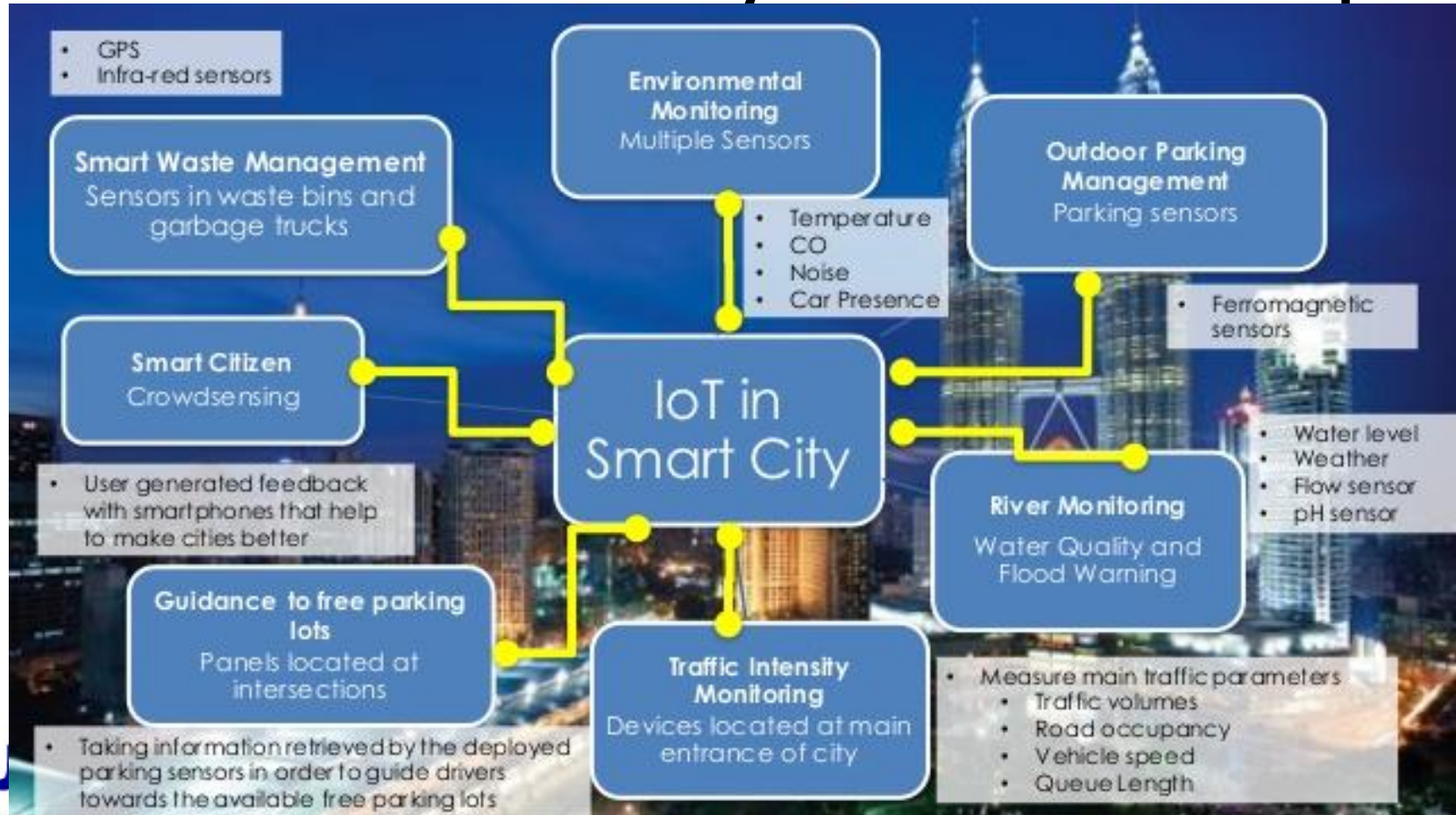


**Figure 8.7** Future automotive E/E architecture.

The Role of Fog Computing in the Future of the Automobile  
 FLAVIO BONOMI, 1 STEFFAN POLEDNA, 2 and WILFRIED  
 STENNER<sup>2</sup>  
 Mung Chiang; Bharath Balasubramanian; Flavio Bonomi. Fog  
 for 5G and IoT (Information and Communication Technology  
 Series.) (p. 191). Wiley. Edition du Kinde.



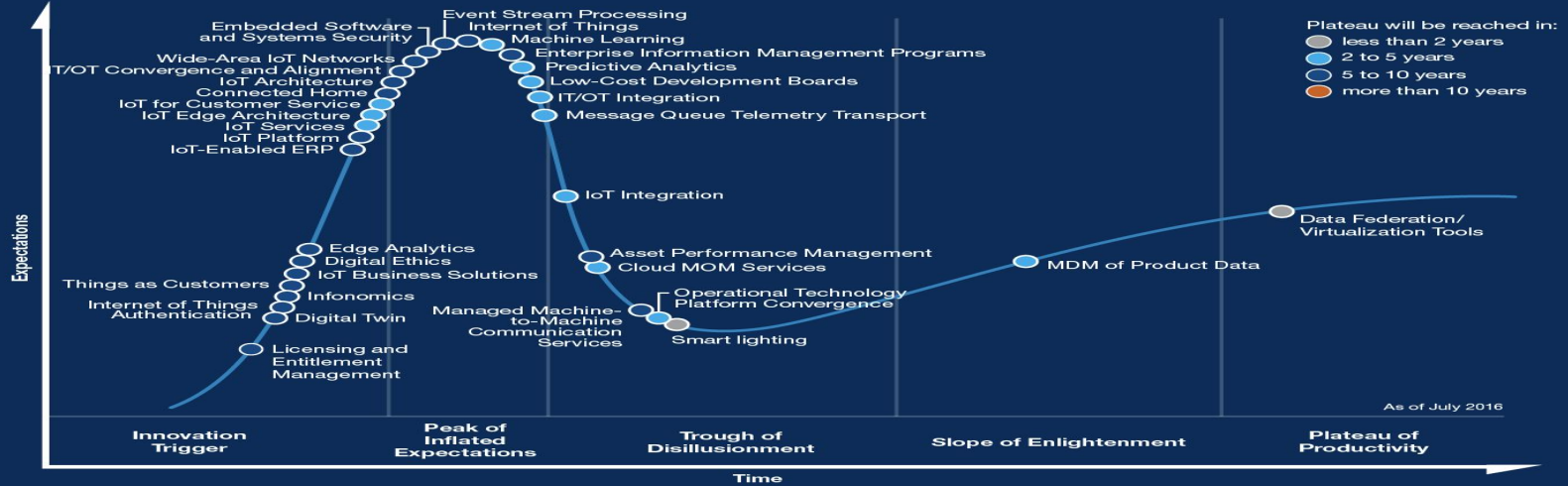
# IoT in a smart city - some examples





# Wide maturity range of technologies and applications

Gartner Hype Cycle for the Internet of Things, 2016



[gartner.com/SmarterWithGartner](http://gartner.com/SmarterWithGartner)

Source: Gartner  
© 2016 Gartner, Inc. and/or its affiliates. All rights reserved.

**Gartner**

http://www.slideshare.net/ghatf/devising-a-practical-approach-to-the-internet-of-things



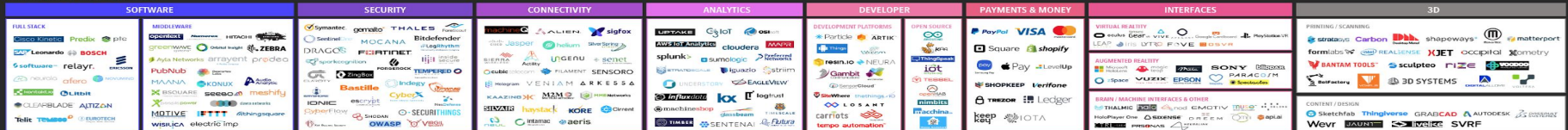
# In a diverse and complex market

## Internet of Things Landscape 2018

### APPLICATIONS (VERTICALS)



### PLATFORMS (HORIZONTALS)



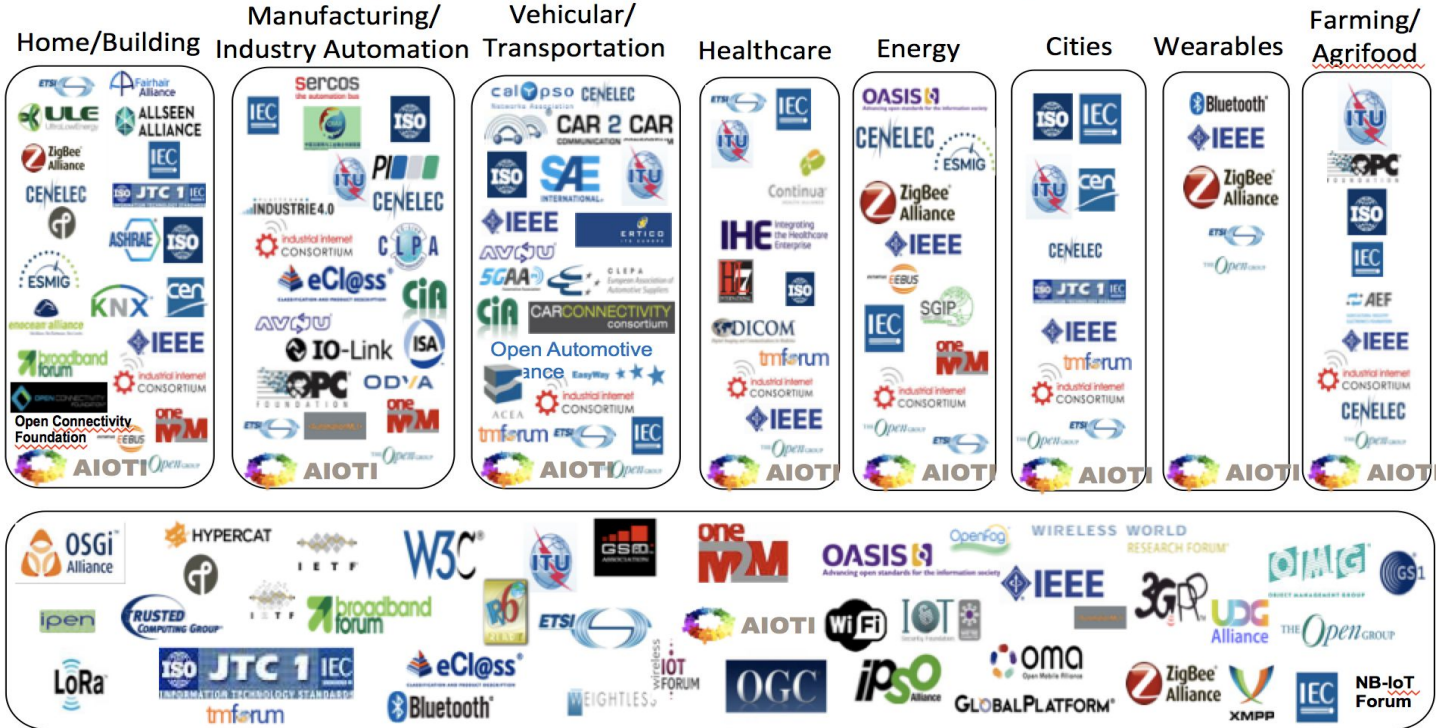
### BUILDING BLOCKS



http://mattturck.com/wp-content/uploads/2018/02/2018\_Matt\_Turck\_IoT\_Landscape\_Final.pdf

# And a diverse and complex SDO ecosystem

## IoT SDOs and Alliances Landscape (Vertical and Horizontal Domains)



Source: AIOTI WG3 (IoT Standardisation) – Release 2.7

Horizontal/Telecommunication

# Key Implications for SC41

- Strong need for foundational standards (Reference Architecture, Vocabulary)
- Challenges to get a consensus on some technical topics given the continuing evolution of the technology and the market.
- Horizontality challenges from both a technical (overlaps with topics like cloud computing, security,..) and application domain standpoint
- ‘Not reinventing the wheel’ given the high level of activities in SDOs and consortia.

# Principal Strategic approaches

- Use a system approach
  - Practice strategic planning
  - Embrace an agile approach
  - Work cooperatively with SDO's and leverage their work
  - Work cooperatively with other JTC 1, ISO and IEC entities, considering joint work
- Actively explore new areas and options with study groups



# JTC 1 Norway Plenary Resolution

## **Resolution 12 – Establishment of JTC 1 Subcommittee SC 41, Internet of Things and related technologies**

JTC 1 establishes a Systems Integration entity (see SD 24, Systems Integration Standardization Guidelines) in the form of a new Subcommittee 41 on Internet of Things and related technologies initially comprising the work of JTC 1/WG 7 and JTC 1/WG 10.

# A System Committee

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Succinctly:

- Works in a collaborative fashion
- Maintain a holistic view of the area under its responsibility
- Communicate, socialize this view
- Seek and coordinate collaborative work (SWG, joint projects,...), with internal (ISO and IEC) and external (SDOs) entities
- May also delegate work to other internal entities

# ISO/IEC JTC 1/SC41



# SC 41 History

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- Created 2016-11
- Incorporate the projects of JTC 1/WG 7 (Sensor Networks, created in 2010) and JTC 1/WG10 (IoT, created in 2014)
- First Plenary 2016-06 Seoul, Korea



# SC41 Summary (2018-09-23)

- Published standards: 19
- Active projects: 15
- 25 Participating countries
- 9 Observing countries
- 8 'A' Liaisons

# Membership 2018-09-23

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## **25 ‘P’ Members**

Australia, Austria, Belgium, Canada, China, Denmark, Finland, France, Germany, India, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Malaysia, Netherlands, Norway, Russia, Singapore, Sweden, Switzerland, UK, USA

## **9 ‘O’ Members**

Argentina, Belarus, Iceland, Iran, Kenya, Mexico, Pakistan, Saudi Arabia

**284 experts registered**

# Membership 2018-05-31

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## **IEC Liaisons**

SEG7, TC 1, TC 65, TC 91, TC100, TA 16, TC 124, SyC AAL, SyC Smart Cities

## **ISO Liaisons**

TC 184, TC 211, TC 215, TC 269, TC 282/SC 2, TC 307

## **JTC 1 Liaisons**

SC 6, 17, 22, 24, 25, 27, 28, 29, 31, 32, 35, 36, 37, 38, 39, 40

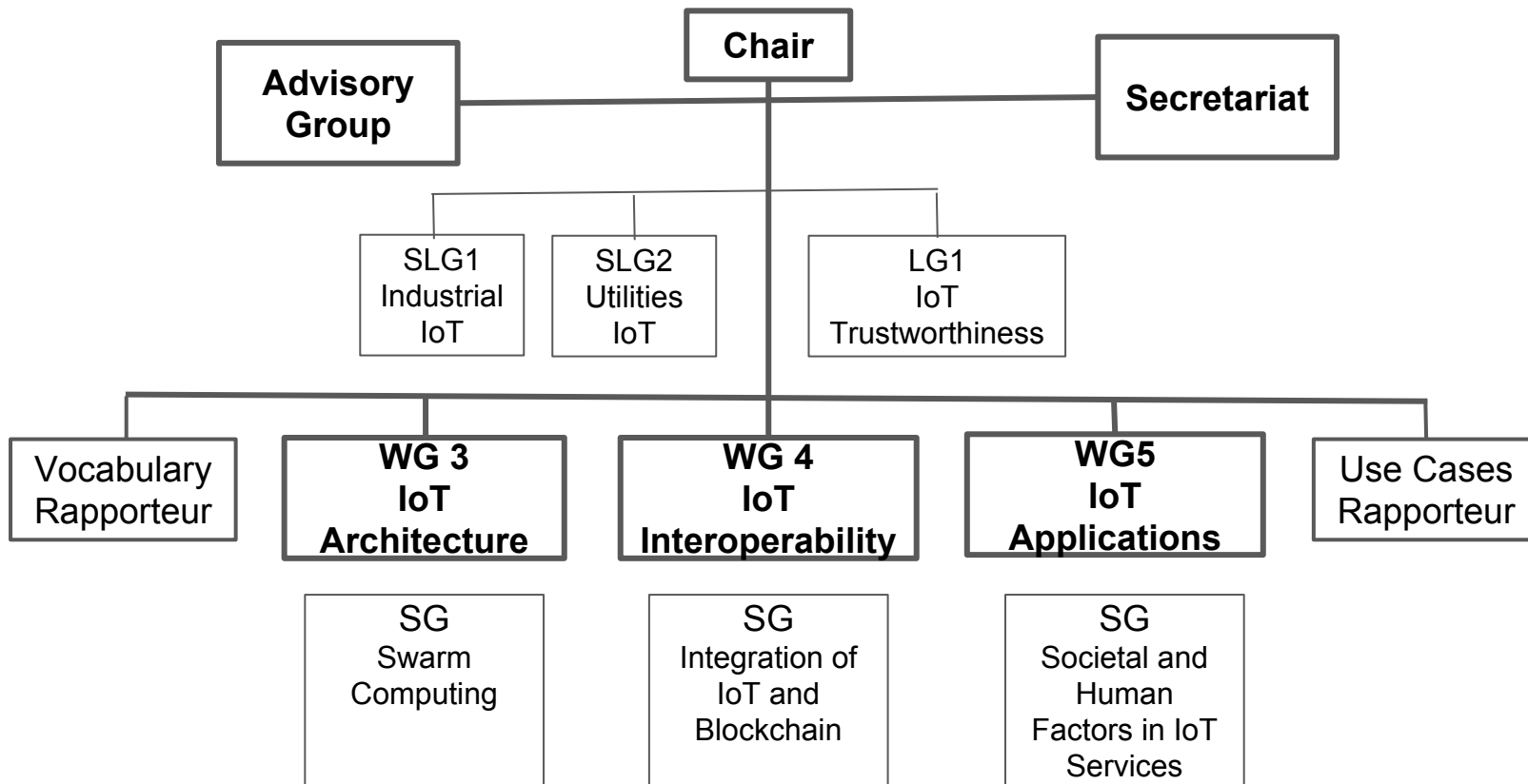
## **A Liaisons**

AIM, GS1, IIC, OCF, OGC, ITU-T, INCOSE, AIOTI

## **C Liaisons**

IEEE P.1931.1 (WG 5), IEEE IMS TC 9 (WG 5), SCOTT (WG5)

# SC41 Structure (2018-11-30)

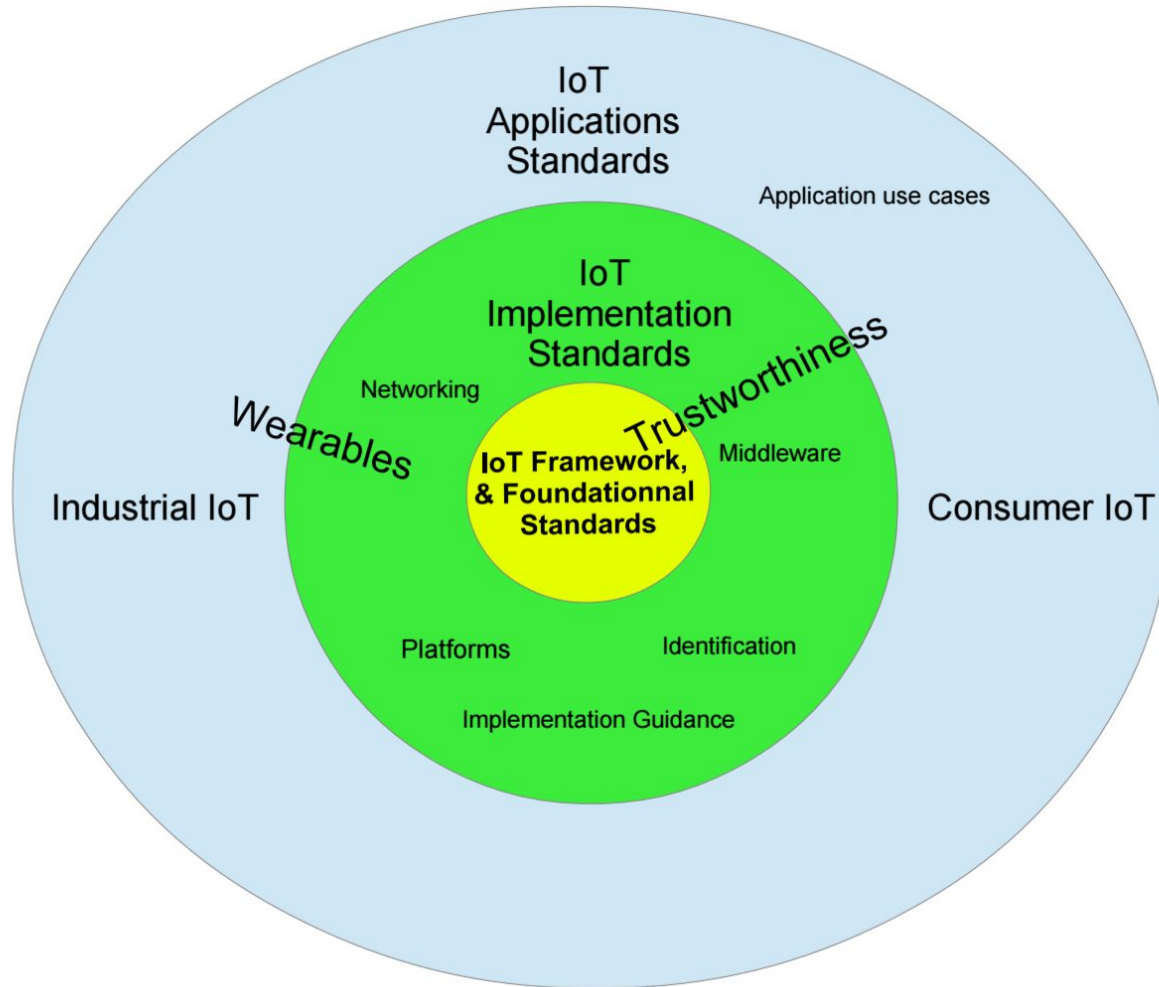




# Strategic Directions

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# SC41 Space



# Study Groups (1)

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## **Edge Computing**

Work completed 2017-11. TR in progress

## **IoT Trustworthiness**

Work completed 2018-05. Project in progress. 1 NWIPs.

## **Industrial IoT (IIoT)**

Work completed 2018-05. TR in progress. 2 NWIPs

## **Real-Time IoT**

Work completed 2018-05. 1 NWIP.

## **IoT Use Cases**

Work completed 2018-05. Recommendations accepted. 1 NWIP.

# Study Groups (2)

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## **Reference Architecture and Vocabulary**

Work completed 2018-05. Recommendations accepted and being implemented.

## **Wearables**

Work completed 2018-11. NWIP and explore collaboration with IEC TC124.

## **Reference Architecture and Vocabulary Harmonization**

Work completed 2018-11. Implementation strategy accepted.

## **Societal and Human Factors in IoT Based Services**

Created 2018-07-06.

## **Integration of IoT and Blockchains**

Created 2018-07-06.



# Study Groups (3)

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**Swarm computing.**

Created 2018-07-06.

# Foundational Standards

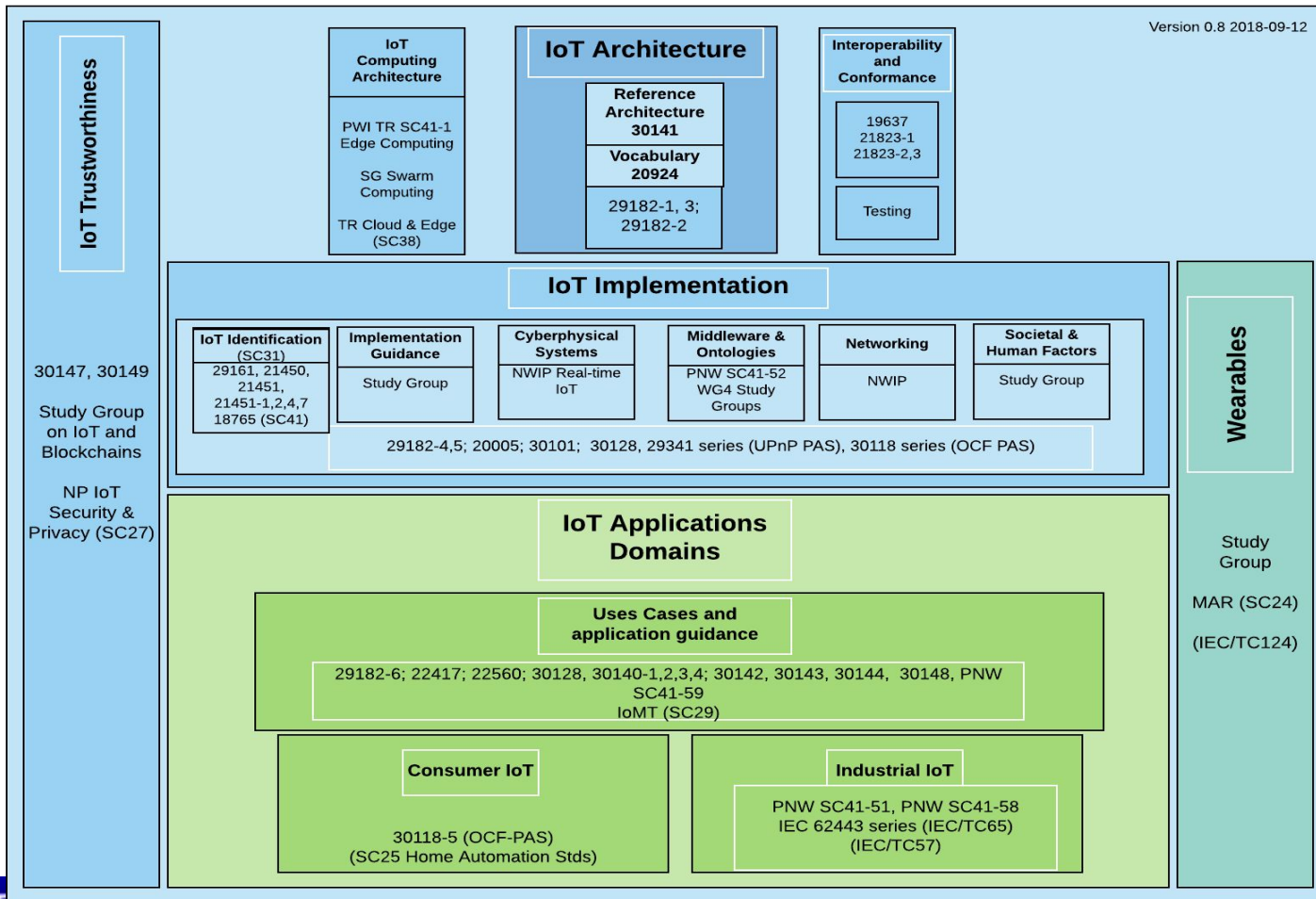
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- **ISO/IEC 30141** - Internet of Things (IoT) - Reference Architecture (RA)
- **ISO/IEC 20924** - Internet of Things (IoT) - Vocabulary

# IoT RA Scope

- ✓ The ISO/IEC 30141 Internet of Things Reference Architecture (IoT RA) specification sets a common language across the world for discussion and agreement on IoT topics.
- ✓ It consists of a general IoT reference architecture in terms of defining system characteristics, Conceptual Model, Reference Model, architecture views and trustworthiness for IoT.
- ✓ It is a base for developing of context specific architectures that aims to give a better understanding to stakeholders, manufacturers, application developers, customers and users on how to develop IoT Systems.

# SC41 Space





# Conclusions

- SC41 has to deal with a complex and evolving ecosystem of technologies and markets, and SDOs
- A system approach is used for standard development, with a strategic focus
- Capitalizing on the excellent work done by JTC 1/WG 7 and WG10, SC41 has already a substantial portfolio of standards and projects.
- Six Study Groups have successfully concluded, many with New Work being proposed
- Five Study Groups are active to explore possible New Work or progress existing standards.



# ANNEX: Project Status

As of 2018-10-31

# WG 3 Projects Status (5 projects)

No.	Project	Current Stage	Status
3.1	ISO/IEC 20924 ED1 Internet of Things (IoT) - Vocabulary	FDIS	<ul style="list-style-type: none"><li>• Under FDIS ballot.</li><li>• FDIS ballot closes on 2018-11-09.</li></ul>
3.2	PWI TR JTC1-SC41-1 ED1 Internet of things (IoT) - Edge Computing	PWI	<ul style="list-style-type: none"><li>• PDTR text for comments should be submitted to IEC CO by 2018-12-07.</li></ul>



# WG 3 Projects Status (5 projects)

No.	Project	Current Stage	Status
3.3	ISO/IEC 30147 ED1 Internet of Things (IoT) – Methodology for implementing and maintaining trustworthiness of IoT systems and services	WD	<ul style="list-style-type: none"> <li>• WD will be discussed in WG 3 Yokohama meeting.</li> <li>• CD should be submitted to IEC CO by 2019-06-10.</li> </ul>
3.4	ISO/IEC 30149 ED1 Internet of Things (IoT) — Trustworthiness framework	AWI	<ul style="list-style-type: none"> <li>• NP ballot closed on 2018-08-31: Approved.</li> <li>• Proposed DoC and WD will be reviewed and considered at WG 3 Yokohama meeting.</li> </ul>

# WG 3 Projects Status (5 projects)

No.	Project	Current Stage	Status
3.5	PNW JTC1-SC41-67 Internet of Things (IoT) — Real-time IoT framework	NP	<ul style="list-style-type: none"><li>• Under NP ballot.</li><li>• NP ballot closes on 2019-01-04.</li></ul>

# WG 4 Projects Status

## (3 projects)

No.	Project	Current Stage	Status
4.1	ISO/IEC 21823-1 ED1 Internet of Things (IoT) - Interoperability for IoT Systems - Part 1: Framework	FDIS	<ul style="list-style-type: none"><li>• Under internal process in IEC CO for FDIS ballot.</li><li>• FDIS text was submitted to IEC CO in 2018-09 for FDIS ballot.</li></ul>
4.2	ISO/IEC 21823-2 ED1 Internet of Things (IoT) - Interoperability for IoT Systems - Part 2: Transport interoperability	CD	<ul style="list-style-type: none"><li>• CRM on CD is held in Yokohama (2018-11-27). (SC41N0710)</li></ul>

# WG 4 Projects Status (3 projects)

No.	Project	Current Stage	Status
4.3	ISO/IEC 21823-3 ED1 Internet of Things (IoT) - Interoperability for IoT Systems - Part 3: Semantic interoperability	CD	<ul style="list-style-type: none"><li>• Under CD for comments.</li><li>• Comments on CD closes on 2018-11-30.</li></ul>



# WG 5 Projects Status

## (8 projects)

No.	Project	Current Stage	Status
5.1	ISO/IEC 30144 ED1 Internet of Things (IoT) – Wireless sensor network system supporting electrical power substation	WD	<ul style="list-style-type: none"> <li>• WD will be discussed in WG 5 Yokohama meeting.</li> <li>• CD should be submitted to IEC CO by 2019-06-10.</li> </ul>
5.2	ISO/IEC 30142 ED1 Internet of Things (IoT) - Underwater Acoustic Sensor Network (UWASN) - Network management system overview and requirements	WD	<ul style="list-style-type: none"> <li>• WD will be discussed in WG 5 Yokohama meeting.</li> <li>• CD should be submitted to IEC CO by 2019-04-15.</li> </ul>

# WG 5 Projects Status (8 projects)

No.	Project	Current Stage	Status
5.3	ISO/IEC 30143 ED1 Internet of Things (IoT) - Underwater Acoustic Sensor Network (UWASN) – Application Profiles	WD	<ul style="list-style-type: none"><li>• WD will be discussed in WG 5 Yokohama meeting.</li><li>• CD should be submitted to IEC CO by 2019-04-15.</li></ul>
5.4	ISO/IEC TR 30148 ED1 Internet of Things (IoT) —Technical requirements and application of sensor network for wireless gas meters	PDTR	<ul style="list-style-type: none"><li>• CRM on PDTR is held in Yokohama (2018-11-28). (SC41N0728)</li></ul>

# WG 5 Projects Status (8 projects)

No.	Project	Current Stage	Status
5.5	ISO/IEC 30160 ED1 Internet of Things (IoT) – Application framework for industrial facility demand response energy management	AWI	<ul style="list-style-type: none"><li>• NP ballot closed on 2018-09-21.</li><li>• Proposed DoC will be reviewed and considered at WG 5 Yokohama meeting.</li></ul>
5.6	ISO/IEC 30161 ED1 Internet of Things (IoT) - Requirements of IoT data exchange platform for various IoT services	AWI	<ul style="list-style-type: none"><li>• NP ballot closed on 2018-09-21.</li><li>• Proposed DoC will be reviewed and considered at WG 5 Yokohama meeting.</li></ul>

# WG 5 Projects Status (8 projects)

No.	Project	Current Stage	Status
5.7	ISO/IEC 30162 ED1 Internet of Things (IoT) - Compatibility requirements and model for devices within industrial IoT systems	AWI	<ul style="list-style-type: none"><li>• NP ballot closed on 2018-10-05.</li><li>• Proposed DoC will be reviewed and considered at WG 5 Yokohama meeting.</li></ul>
5.8	PNW JTC1-SC41-59 Internet of Things (IoT) - System requirements of IoT/SN technology-based integrated platform for chattel asset monitoring supporting financial services	AWI	<ul style="list-style-type: none"><li>• NP ballot closed on 2018-10-05.</li><li>• Proposed DoC will be reviewed and considered at WG 5 Yokohama meeting.</li></ul>

# ANNEX: White Papers Projects

As of 2018-11-30



# Agricultural IoT

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Further to Resolution 178, JTC 1/SC 41 notes with interest the initiative of its Chair, François Coallier, to edit a White Paper on Agricultural IoT. JTC 1/SC41 also appreciates that Veerandra Vasametty (India) agreed to team with François Coallier to edit this document. This White Paper will elaborate on the SC41 Chair contribution on Smart Farming to IEC/SEG 8 (Annex A of SC41 N0754) and include IoT use cases.

JTC 1/SC41 encourage its experts to contribute to this White Paper and looks forward to reviewing a first draft at its next Plenary in May 2019.

# Biomedical instrumentation and Wearable Healthcare systems

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Further to Resolution 178, JTC 1/SC 41 notes with interest the initiative of Mohan Kumar (India) and Kate Grant (UK), IoT Use case rapporteur, to collaborate on the development of a White Paper on Biomedical instrumentation and Wearable Healthcare systems building on the work of Mohan Kumar in this area.

JTC 1/SC41 encourage its experts to contribute to this White Paper and looks forward to reviewing a first draft at its next Plenary in May 2019.