A Strategic View of ISO/IEC JTC 1/SC41 IoT and related technologies

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- An introduction to ISO / IEC JTC 1
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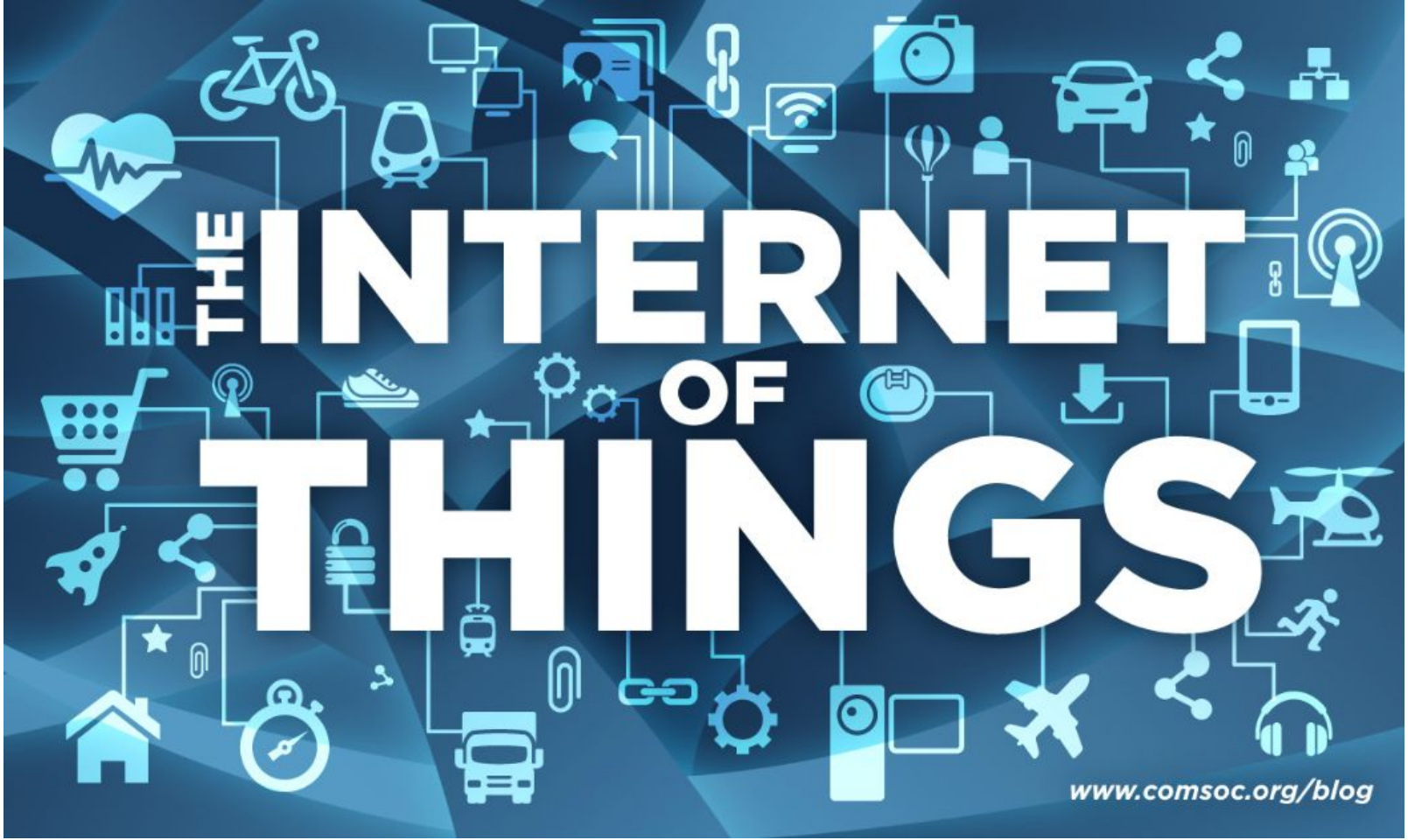


http://cladirect.com/wp-content/uploads/2015/06/theinternetofthings.jpg

ISO/IEC Definition of IoT

..an infrastructure of interconnected entities, people, systems and information resources together with services which process and react to information from the physical world and from the virtual world

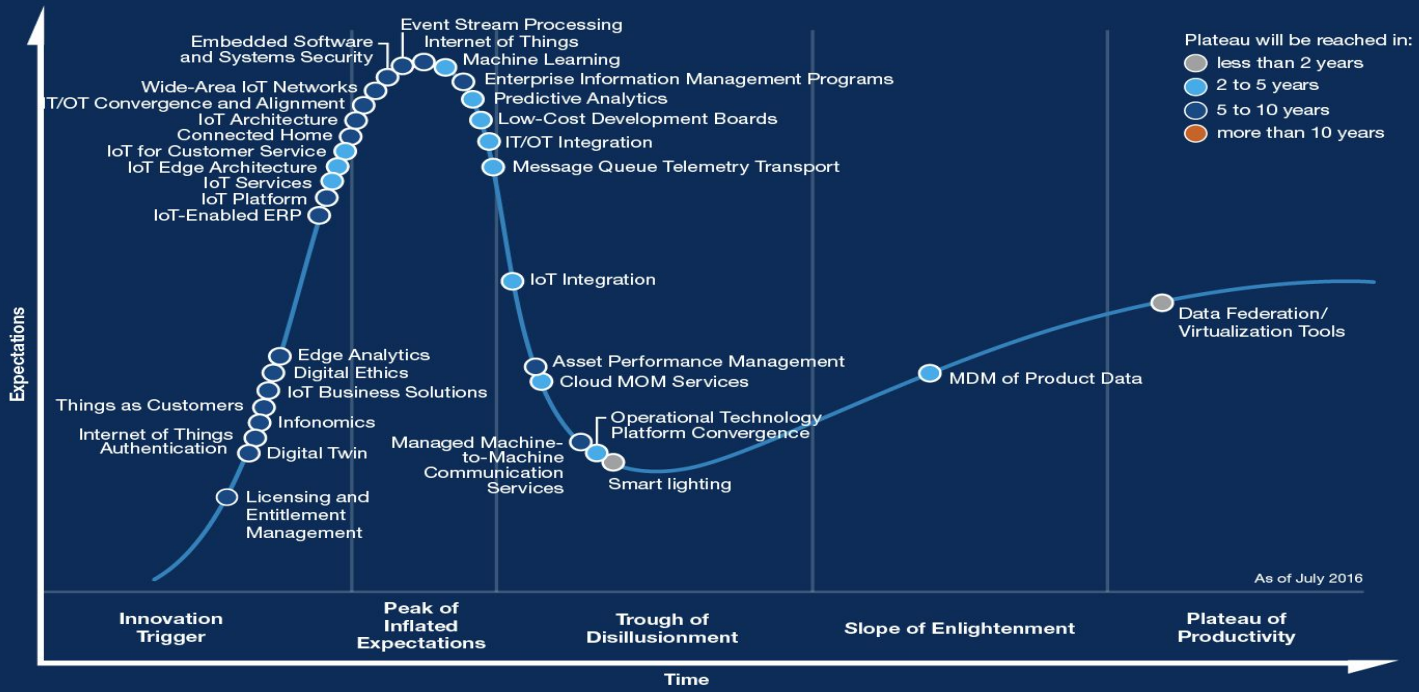
ISO/IEC DIS 20924

IoT Systems and Systems of Systems

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

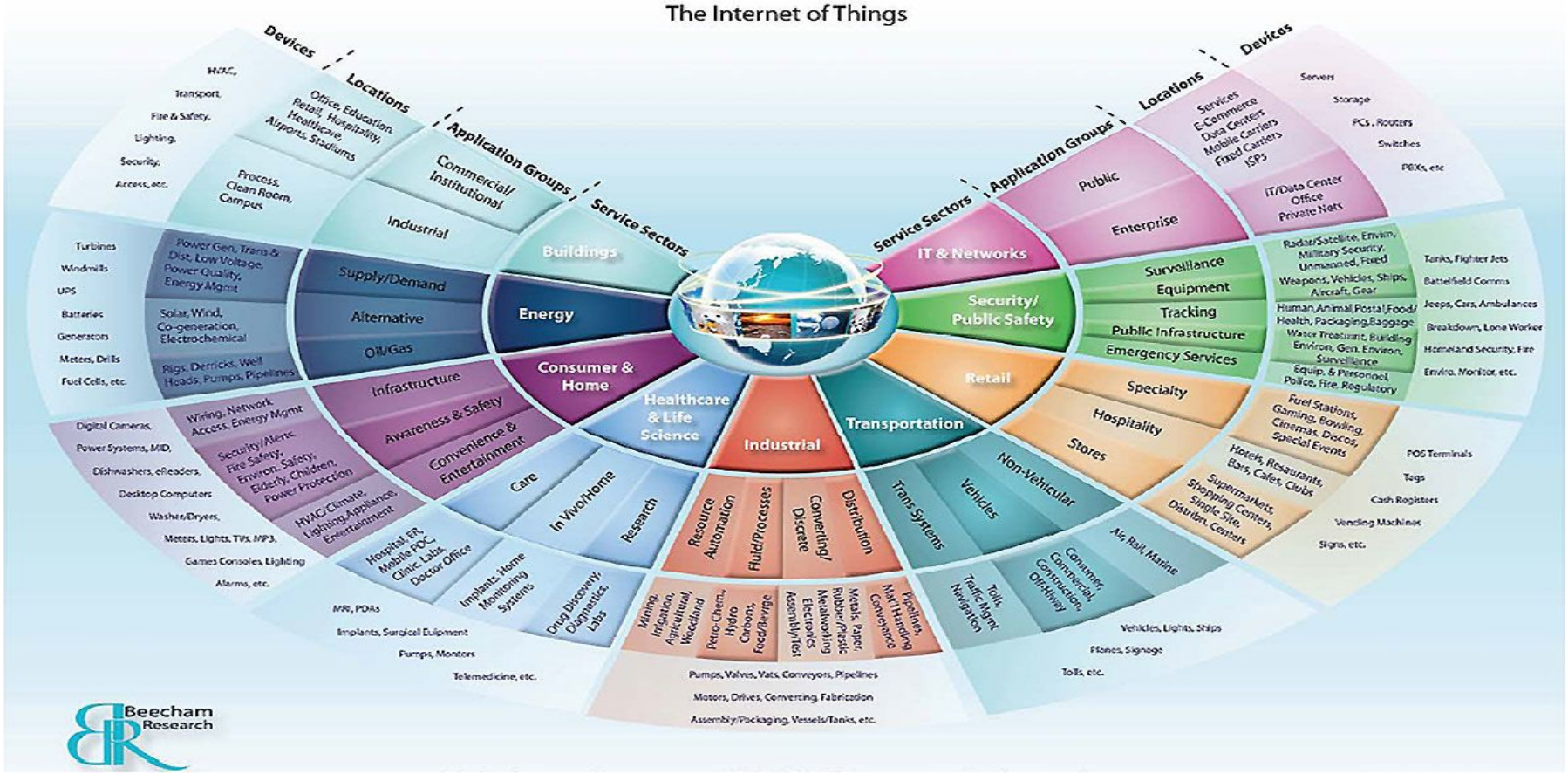
http://www.slideshare.net/ghaff/devising-a-practical-approach-to-the-internet-of-things

Gartner Hype Cycle for the Internet of Things, 2016



gartner.com/SmarterWithGartner

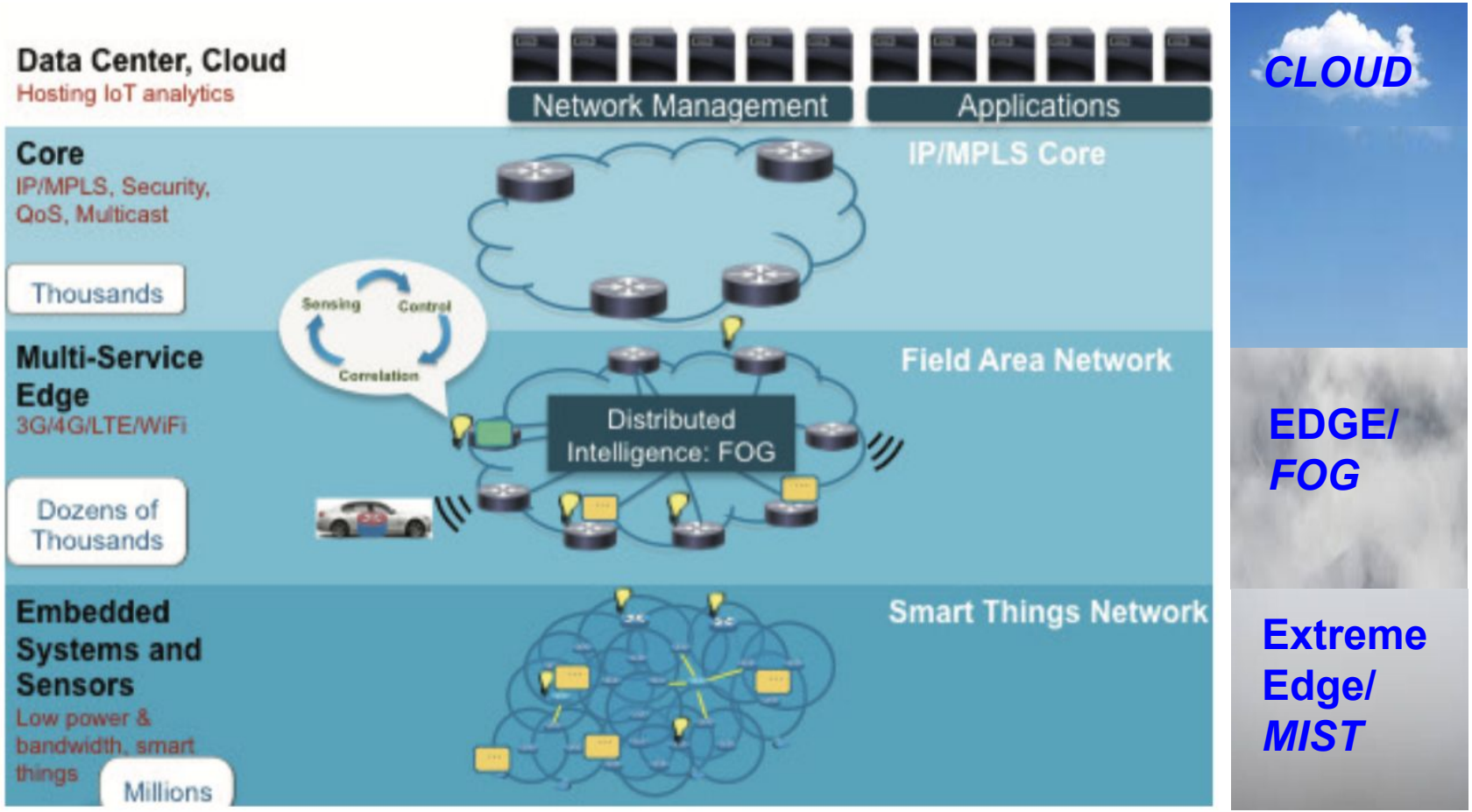
Gartner



http://www.symplio.com/2011/09/4-infographics-about-internet-of-things/

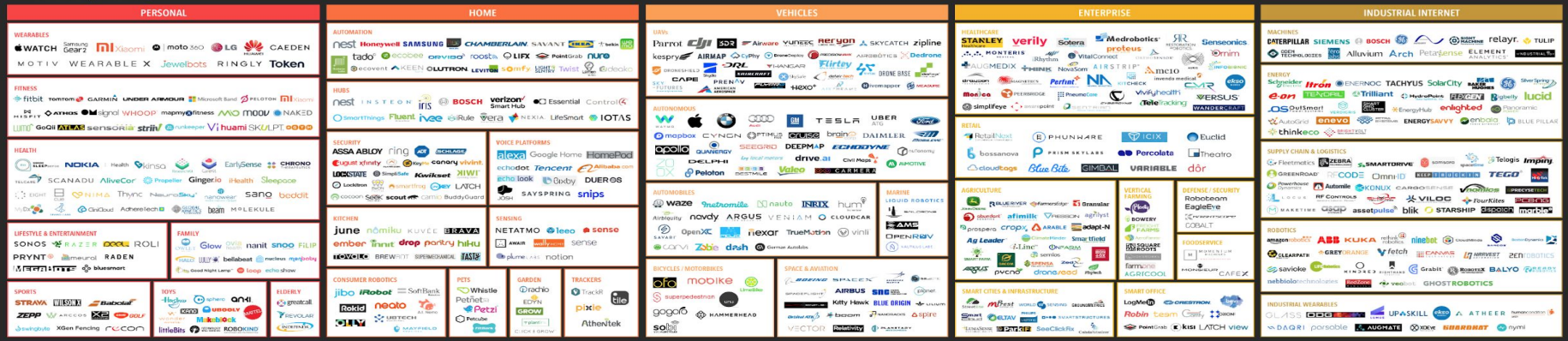
Need	Industry sector							
	Manufacturing	Automotive	Smart building/ life safety	Asset/ utility mgmt	Smart grid	Consumer IoT	Entertainement	Transportation
Mobility	55	98	10	50	10	55	80	97
Ultra low latency (<10ms)	95	100	85	5	5	15	15	95
Autonomy	95	100	100	7	100	50	45	100
Security	100	100	100	90	100	25	30	100
Local network bandwith	100	100	90	10	10	35	90	100
WAN network bandwith	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

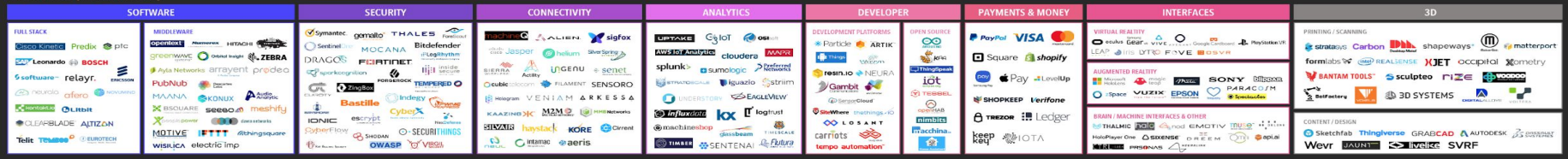
IEC Whitepaper on Edge Intelligence, 2017-10, http://ieeexplore.ieee.org/document/8141874/

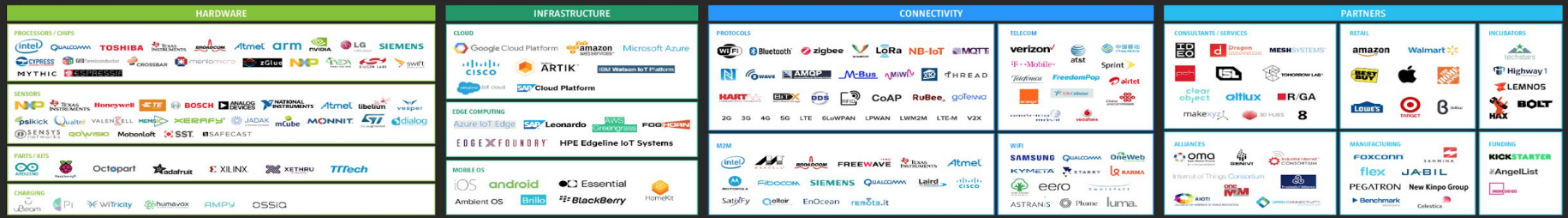


Modified from: *Fog Computing and Its Role in the Internet of Things*, Flavio Bonomi, Rodolfo Milito, Jiang Zhu, Sateesh Addepalli, Cisco Systems Inc.

Internet of Things Landscape 2018







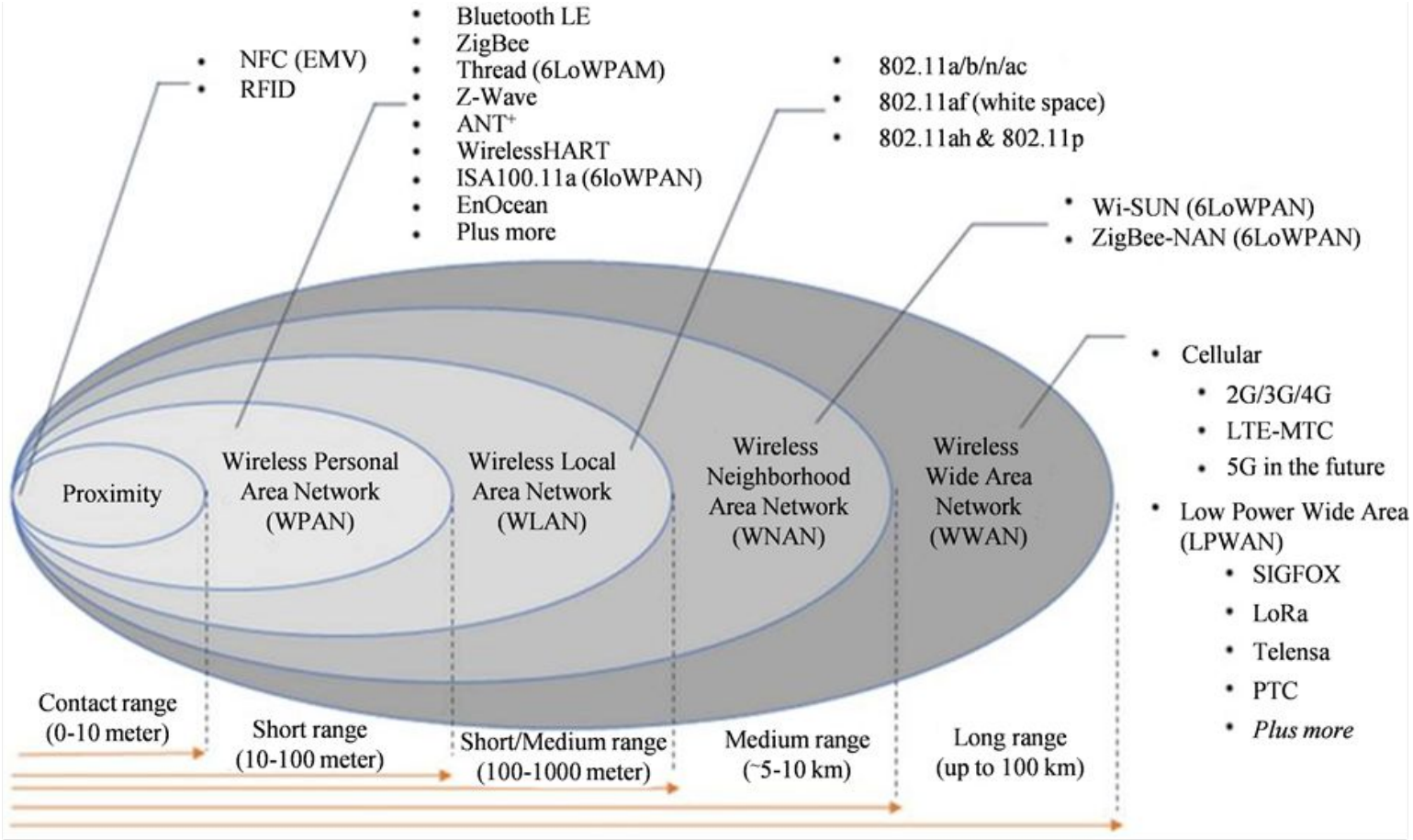
Final version, revised and updated as of February 7, 2018

FIRSTMARK
EARLY STAGE VENTURE CAPITAL

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/ait.2016.62002

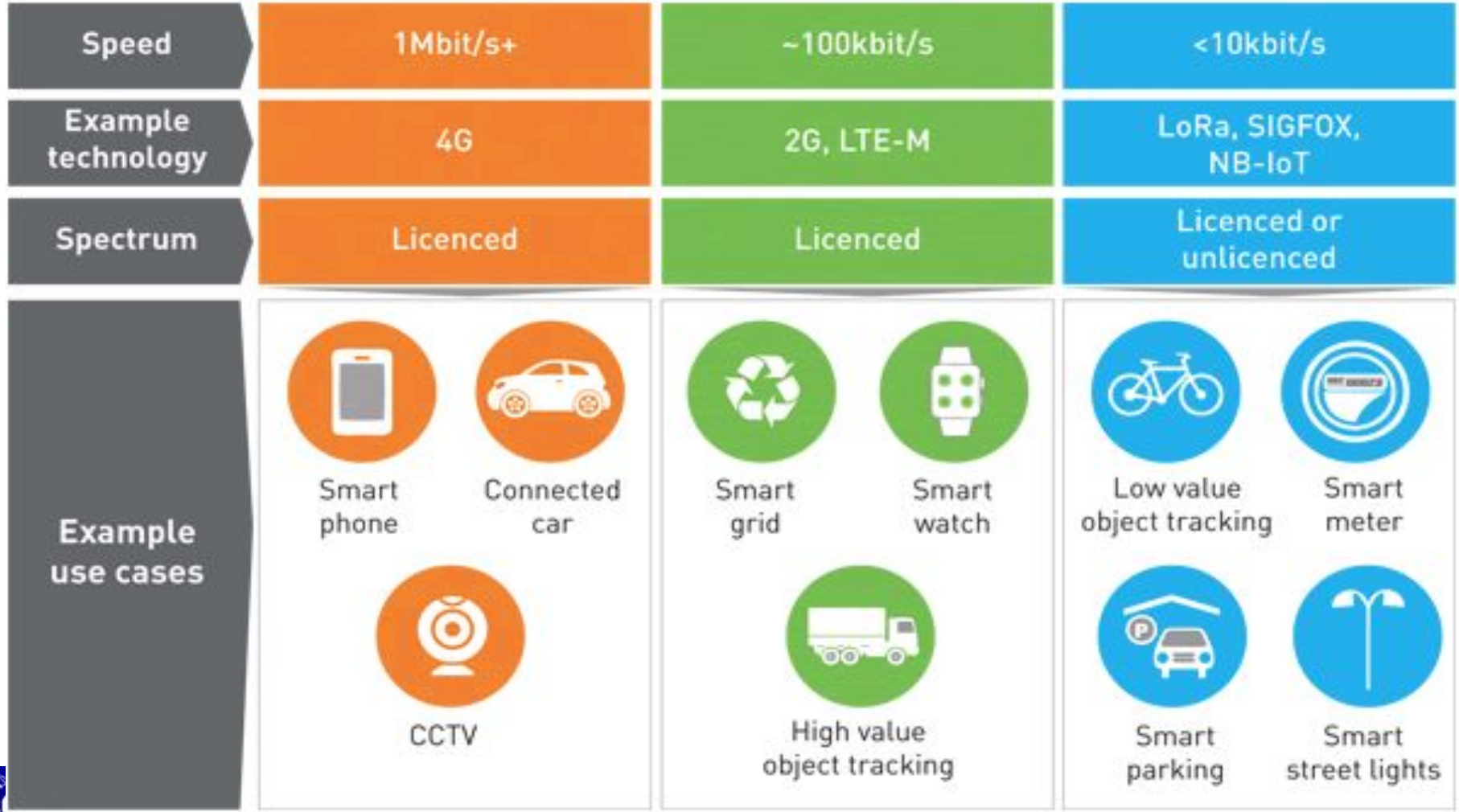
A Study of Efficient Power Consumption Wireless Communication Techniques/ Modules for Internet of Things (IoT) Applications

Mahmoud Shuker Mahmoud, Auday A. H. Mohamad
Computer Technology Engineering Department, Al-Mansour University College, Baghdad, Iraq



Communication Technologies

	NFC	RFID	Blue-tooth®	Blue-tooth® LE	ANT	Proprietery (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	Senor 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



https://www.i-scoop.eu/internet-of-things-guide/lpwan/

ISO/IEC JTC 1

ISO/IEC JTC 1

- Joint committee of ISO and IEC created in 1987 with the mandate to elaborate standards in IT
- 3159 published standards
- 4500 registered experts

ISO JTC 1 IEC
INFORMATION TECHNOLOGY STANDARDS

Technical Areas	JTC1 Subcommittees and Working Groups
Application Technologies	SC 36 - Learning Technology
Cultural and Linguistic Adaptability and User Interfaces	SC 02 - Coded Character Sets SC 22/WG 20 – Internationalization SC 35 - User Interfaces
Data Capture land Identification Systems	SC 17 - Cards and Personal Identification SC 31 - Automatic Identification and Data Capture Techniques
Data Management Services	SC 32 - Data Management and Interchange
Document Description Languages	SC 34 - Document Description and Processing Languages
Information Interchange Media	SC 11 - Flexible Magnetic Media for Digital Data Interchange SC 23 - Optical Disk Cartridges for Information Interchange
Multimedia and Representation	SC 24 - Computer Graphics and Image Processing SC 29 - Coding of Audio, Picture, and Multimedia and Hypermedia Information
Networking and Middleware	SC 06 - Telecommunications and Information Exchange Between Systems SC 25 - Interconnection of Information Technology Equipment SC 38 - Cloud Computing and Distributed Platforms
Office Equipment	SC 28 - Office Equipment
Green IT	SC 39 – Sustainability for an by IT
Programming Languages and Software Interfaces	SC 22 - Programming Languages, their Environments and Systems Software Interfaces
Security	SC 27 - IT Security Techniques SC 37 - Biometrics
Software, Processes and Systems	SC 07 - Software and System Engineering SC40 – IT Governance and IT Management
Internet of Things	SC41 – Internet of Things and related technologies
Artificial Intelligence & Big Data	SC42 – Artificial Intelligence
Smart Cities	WG11 - Smart City
3D Scanning and Printing	WG12 – 3D Printing and Scanning

JTC 1 Systems Integration Matrix

Version 1.2, 2017-10-08

	Application technologies	Cultural and Linguistic Adaptability and User Interfaces	Data Capture land Identification Systems	Data Management Services	Document Description Languages	Information Interchange Media	Multimedia and Representation	Networking and Middleware	Office Equipment	Green IT	Programming Languages and Software Interfaces	Security	Software, Processes and Systems	Accessability	Big Data	Internet Of Things	Cloud Computing	Smart Cities	3D Scanning & Printing	Smart Machines
SC 02 Coding		X																		
SC 06 Network								X							x	x	x	x		x
SC 07 Sw&Sys	X												X		x	x	x	x		x
SC 17 Cards ID			X												x	x	x	x		x
SC 22 Prog. Lang		x								X										x
SC 23 Disk						X														
SC 24 Graphic							X											x	x	
SC 25 Interc.								X								x				
SC 27 Security												X	x		x	x	x	x		x
SC 28 Office Eq.									X										x	
SC 29 Multimed.							X			x				x	x	x			x	
SC 31 Data Cap			X												x	x	x	x		x
SC 32 Data int.				X											x			x	x	
SC 34 Doc.					X															
SC 35 User Int.		X																		
SC 36 Learn	X																			
SC 37 Bio											X							x		
SC 38 Middl								X					x		x	x	X	x		x
SC 39 IT Sust.									X						x			x		
SC 40 Gov & M													X				x	x		x
SC 41 IoT			x					x				x	x		x	X	x	x		x
SC 42 AI	x											x	x		X	x	x	x		X
WG11 Smart Cities								x				x	x		x	x	x	X		x
WG12 3D Sc. & Pr.			x			x	x		x										X	

Other JTC 1 Standards & Projects Related to IoT

- Under the JTC 1 Secretariat (PAS process)
  - ISO/IEC 29341 series - UPnP Device Architecture
  - ISO/IEC DIS 30118 - OCF
- SC27 - IT Security techniques
  - NP Guidelines for security and privacy in IoT
- SC31- Automatic identification and data capture
  - ISO/IEC/IEEE 21450 & 21451 series Smart transducer interface for sensors and actuators
  - ISO/IEC 29161 - Data structure - Unique identification for IoT
- SC38 - Cloud Computing and Distributed Platform
  - ISO/IEC NP TR 23188 - Cloud computing - Edge computing landscape

JTC 1/ SC41

ISO JTC1 IEC
INFORMATION TECHNOLOGY STANDARDS

ITU IoT St-Petersburg, Russia 2018-06-05

History

- 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

Terms of references

Title: Internet of Things and related technologies

Scope: Standardization in the area of Internet of Things 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.

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

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

SC41 Summary

- Published standards: 15
- Active projects under development (NWIs and PWI included): 12
- 25 P-members and 8 O-members

Membership 2018-05-31

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

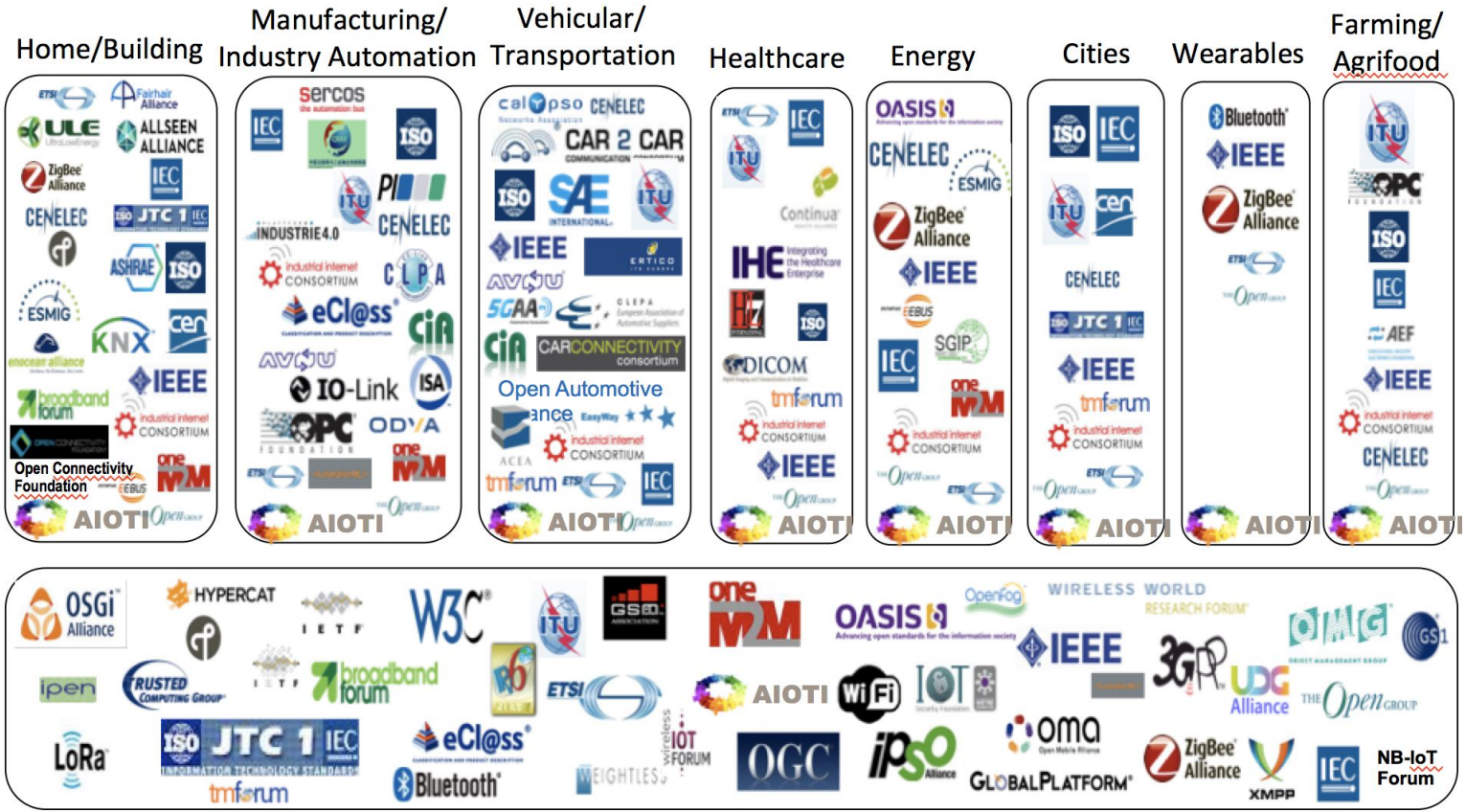
8 'O' Members

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

284 experts registered

ISO JTC1 IEC
INFORMATION TECHNOLOGY STANDARDS

IoT SDOs and Alliances Landscape
(Vertical and Horizontal Domains)



Source: AIOTI WG3 (IoT Standardisation) – Release 2.7

Membership 2018-05-31

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

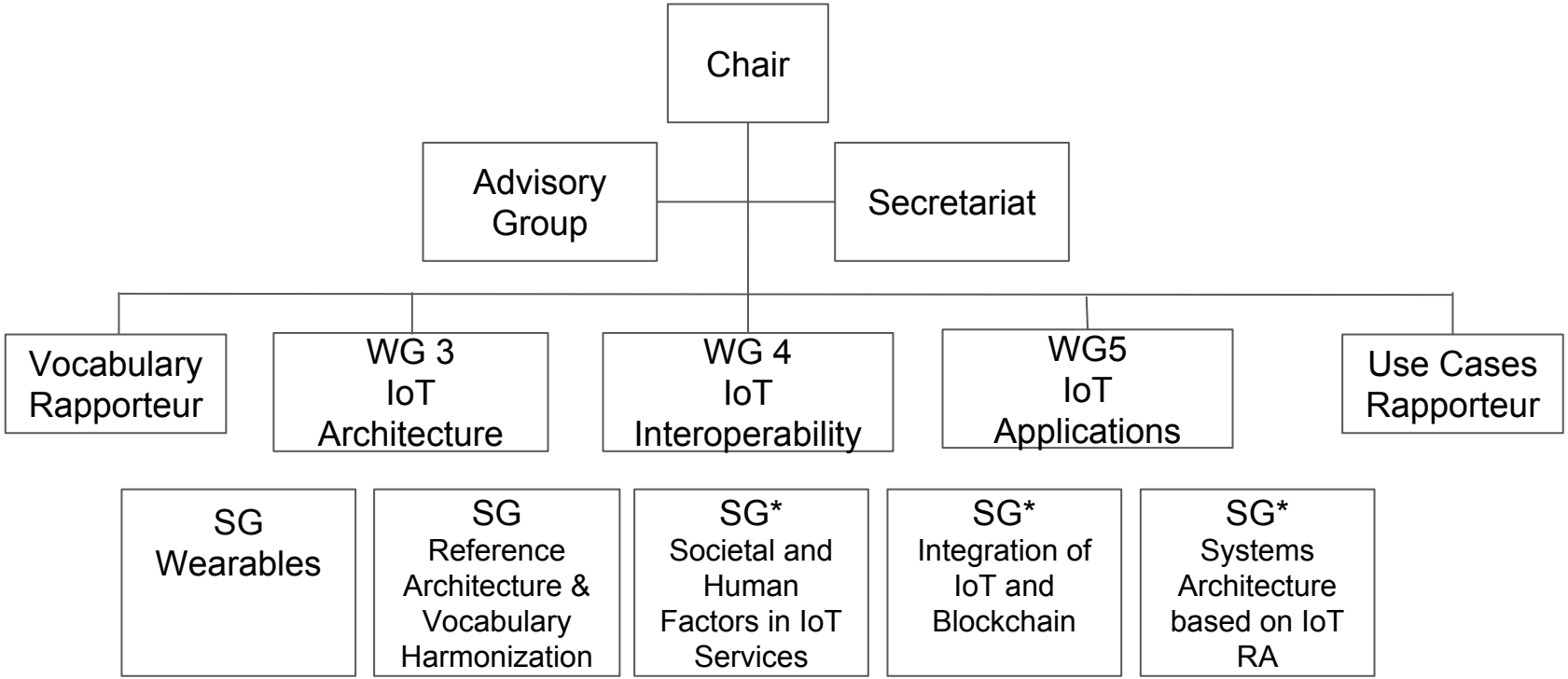
A Liaisons

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

C Liaisons

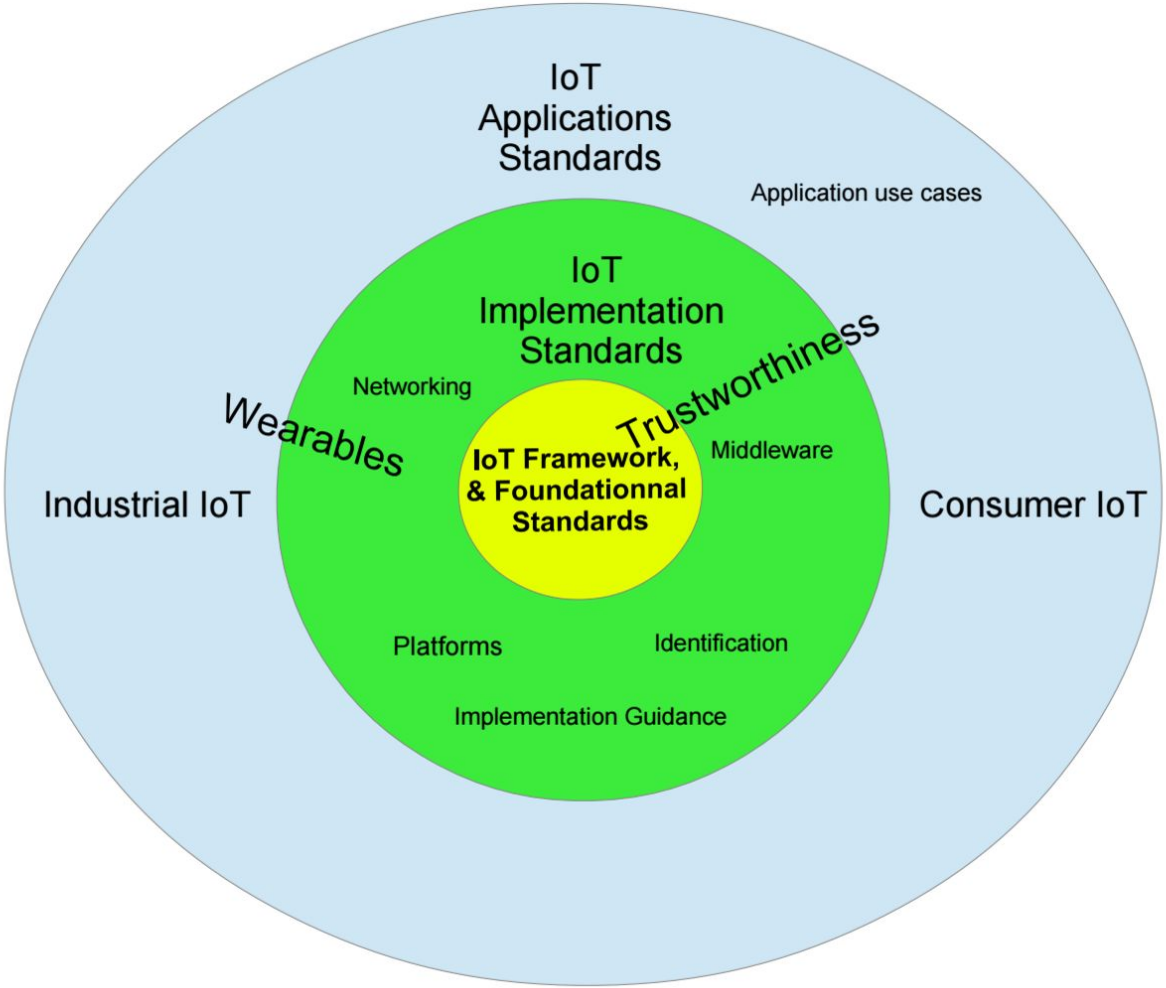
IEEE P.1931.1 (WG 5), IEEE IMS TC 9 (WG 5), SCOTT (WG5 - under consideration)

SC41 Structure (2018-05-18)



*Under Letter Ballot

SC41 Space



ISO JTC1
INFORMATION TECHNOLOGY STANDARDS

Foundational Standards

- **ISO/IEC 30141** - Internet of Things (IoT) - Reference architecture
- **ISO/IEC 20924** - Internet of Things (IoT) - Vocabulary *(Translated in Russian)*

Study Groups (1)

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, including one from Russia

Real-Time IoT

Work completed 2018-05. 1 NWIP.

IoT Use Cases

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

Study Groups (2)

Reference Architecture and Vocabulary

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

Wearables

Initial work completed 2018-05. Work continuing to elaborate NWIP and explore collaboration with IEC TC124.

Reference Architecture and Vocabulary Harmonization

Created 2018-11. Implementation strategy for recommendation of previous SG.

Societal and Human Factors in IoT Based Services

Letter Ballot to close 2018-06.

Integration of IoT and Blockchains

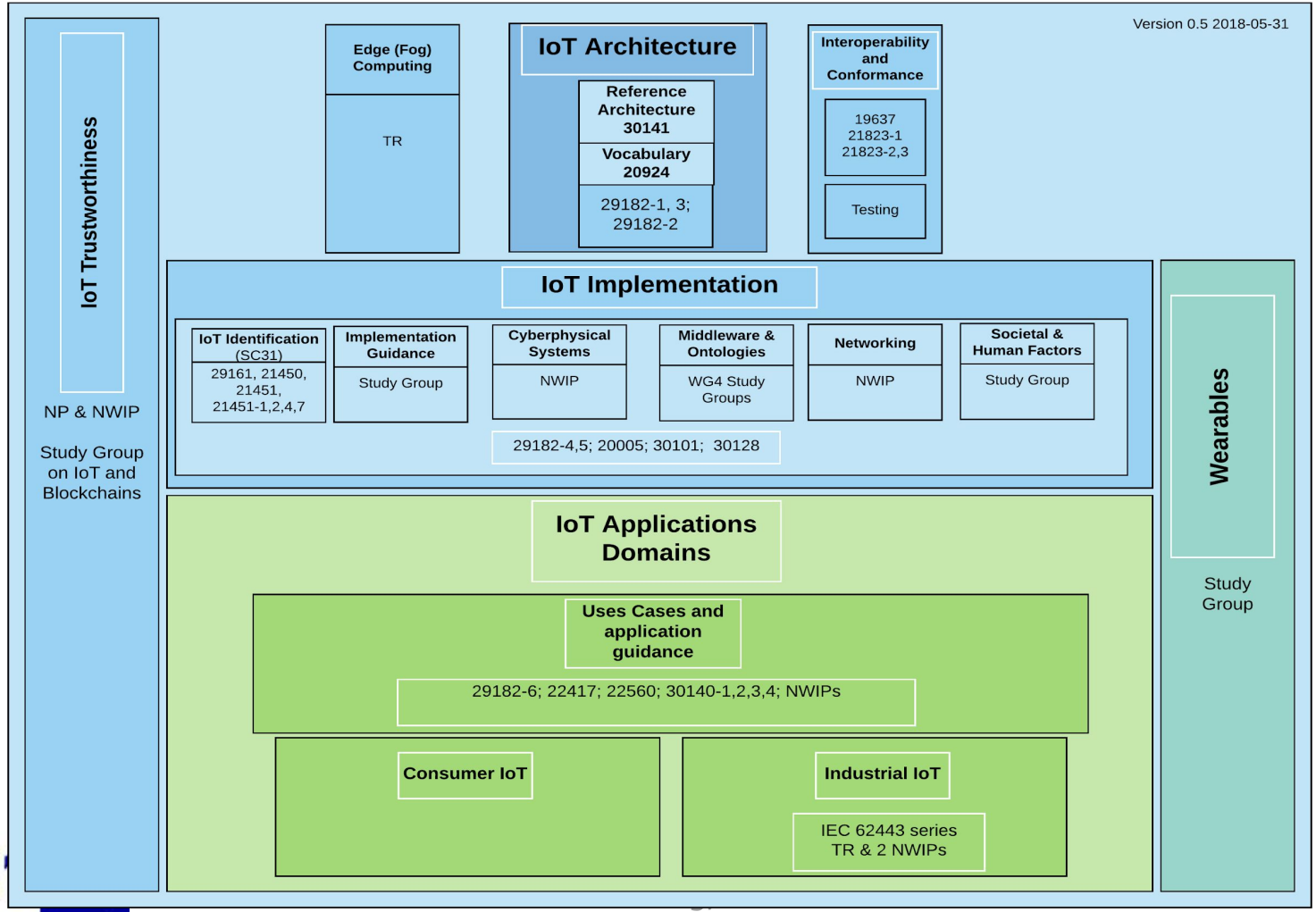
Letter Ballot to close 2018-06.

Study Groups (3)

Context Specific Solution / System Architecture based on IoT Reference Architecture

Letter Ballot to close 2018-06.

SC41 Space


Version 0.5 2018-05-31
IoT Trustworthiness
NP & NWIP
Study Group on IoT and Blockchains
Edge (Fog) Computing
TR
IoT Architecture
Reference Architecture 30141
Vocabulary 20924
29182-1, 3; 29182-2
Interoperability and Conformance
19637
21823-1
21823-2,3
Testing
IoT Implementation
IoT Identification (SC31)
29161, 21450, 21451, 21451-1,2,4,7
Implementation Guidance
Study Group
Cyberphysical Systems
NWIP
Middleware & Ontologies
WG4 Study Groups
Networking
NWIP
Societal & Human Factors
Study Group
29182-4,5; 20005; 30101; 30128
IoT Applications Domains
Uses Cases and application guidance
29182-6; 22417; 22560; 30140-1,2,3,4; NWIPs
Consumer IoT
Industrial IoT
IEC 62443 series
TR & 2 NWIPs
Wearables
Study Group

To conclude

- 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 either operating or under consideration to explore possible New Wok
- Since ITU-T has an A liaison with JTC 1/SC41, ITU-T experts can and are invited to participate and contribute.
- Joint work with ITU-T entities is also possible.


Thank You!

Annex
SC41 Work Program Status as of 2018-11-13

WG 3 Projects Status (4 projects)

No.	Project	Current Stage	Status
3.1	**ISO/IEC 30147** ED1 Internet of Things — Methodology for trustworthiness of IoT system/service	NP	• NP ballot closed on 2018-04-13: Approved • Comments received at NP ballot will be reviewed and considered in WG 3 Berlin meeting.
3.2	PWI TR JTC1-SC41-1 ED1 IoT Edge Computing	PWI	• PDTR text for comments will be submitted to IEC CO by 2018-05-19.

WG 3 Projects Status (4 projects)

No.	Project	Current Stage	Status
3.3	ISO/IEC 20924 ED1 Information technology - Internet of Things (IoT) - Definitions and vocabulary	DIS	• DIS (CDV) ballot closed on 2018-03-30. • CRM will be held during the Berlin meeting week.
3.4	ISO/IEC 30141 ED1 Information technology - Internet of Things (IoT) - Internet of Things Reference Architecture (IoT RA)	FDIS	• FDIS ballot has started: 2018-05-11 to 2018-07-06.

WG 4 Projects Status (5 projects)

No.	Project	Current Stage	Status
4.1	ISO/IEC 21823-1 ED1 Information technology - Internet of Things (IoT) - Interoperability for Internet of Things Systems - Part 1: Framework	DIS	• Now under DIS (CDV) ballot: DIS ballot closes on 2018-07-20.
4.2	ISO/IEC 21823-2 ED1 Information technology - Internet of Things (IoT) - Interoperability for Internet of Things Systems - Part 2: Network connectivity	WD	• 1st WD was circulated for comments in November 2017. • CD text shall be submitted to IEC CO by 2018-10-15.

WG 4 Projects Status (5 projects)

No.	Project	Current Stage	Status
4.3	ISO/IEC 21823-3 ED1 Information technology - Internet of Things (IoT) - Interoperability for Internet of Things Systems - Part 3: Semantic interoperability	WD	• 1st WD was circulated for comments in November 2017. • CD text shall be submitted to IEC CO by 2018-10-15.

WG 4 Projects Status (5 projects)

No.	Project	Current Stage	Status
4.4	ISO/IEC 30140-3 ED1 Information technology - Underwater Acoustic Sensor Network (UWASN) - Part 3: Entities and interfaces	FDIS	• Now under FDIS ballot: FDIS ballot close on 2018-06-15.
4.5	ISO/IEC 30140-4 ED1 Information technology - Underwater Acoustic Sensor Network (UWASN) - Part 4: Interoperability	FDIS	• Now under FDIS ballot: FDIS ballot close on 2018-06-15.

WG 5 Projects Status (3 projects)

No.	Project	Current Stage	Status
5.1	ISO/IEC 30144 ED1 Sensor network system architecture for power substations	NP	• NP ballot closed on 2018-04-13: Approved • Comments received at NP ballot will be reviewed and considered in WG 5 Berlin meeting
5.2	ISO/IEC 30142 ED1 Underwater Acoustic Sensor Network (UWASN) -- Network management system overview and requirements	NP	• NP ballot closed on 2018-04-06: Approved • Comments received at NP ballot will be reviewed and considered in WG 5 Berlin meeting.

WG 5 Projects Status (3 projects)

No.	Project	Current Stage	Status
5.3	ISO/IEC 30143 ED1 Underwater Acoustic Sensor Network (UWASN) -- Application Profiles	NP	• NP ballot closed on 2018-04-06: Approved. • Comments received at NP ballot will be reviewed and considered in WG 5 Berlin meeting.

Annex B
Future Plenaries

Future Plenary Meetings

- 2018 (the second half year): Yokohama, Japan, November 26-30 (Confirmed)
- 2019 (the first half year): China, May 26-31 (Confirmed)
- 2019 (the second half year): Russia (to be confirmed)
- 2020 (the first half year): Kista, Sweden, May 24-29(Confirmed)
- 2020 (the second half year): USA (To be confirmed)
- 2021 (the first half year): Montréal, Canada (To be confirmed)
- 2021 (the second half year): India (To be confirmed)