

All Things Connected Alliance

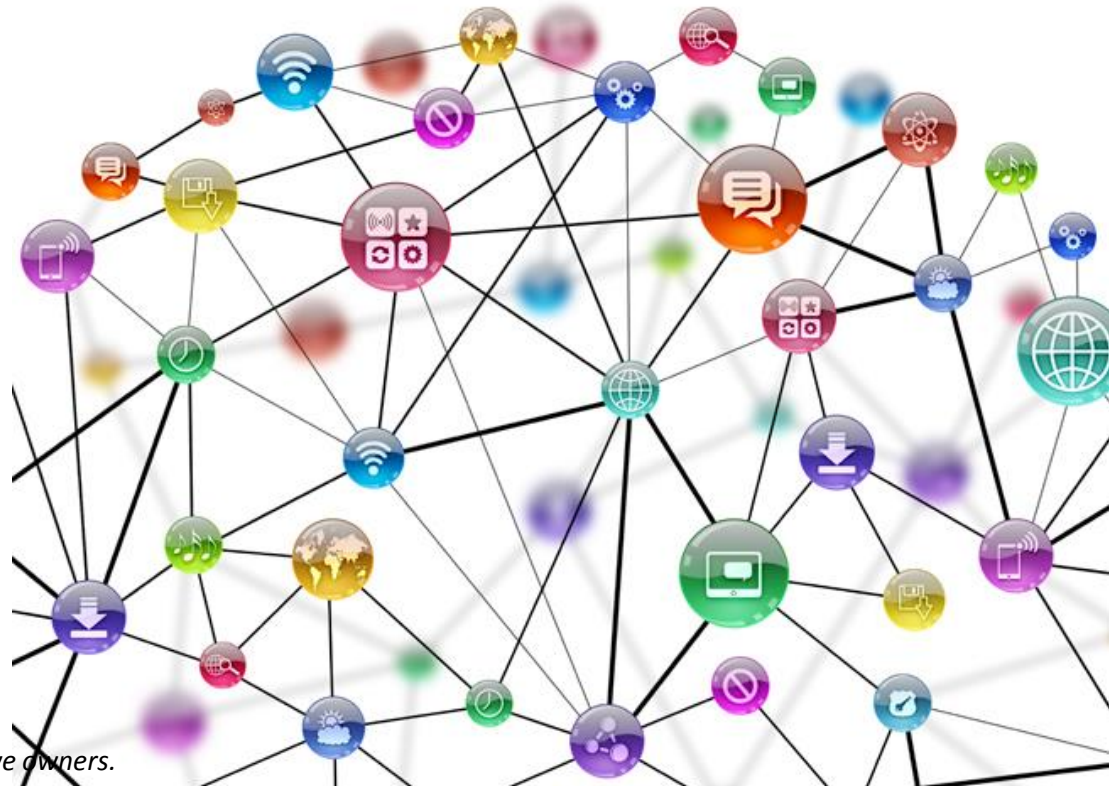


INTEROPERABILITY & IOT: GETTING EVERYTHING CONNECTED 1st Sept, 2016

<http://www.terrapinn.com/exhibition/iot-show-asia/University-Theatre.stm>



@ckvishwakarma
@atcalliance
#IoTSG



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Factory



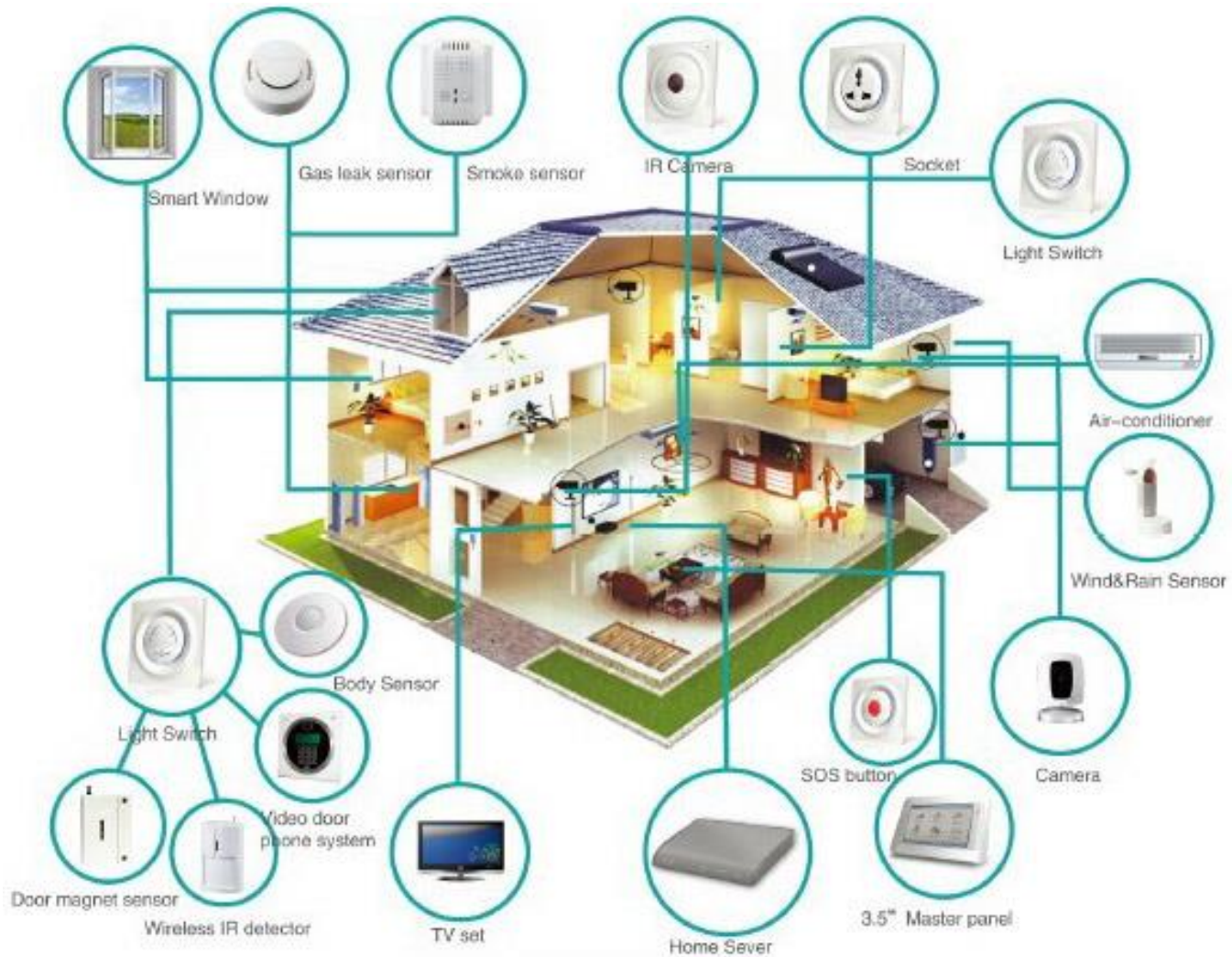


Hospital



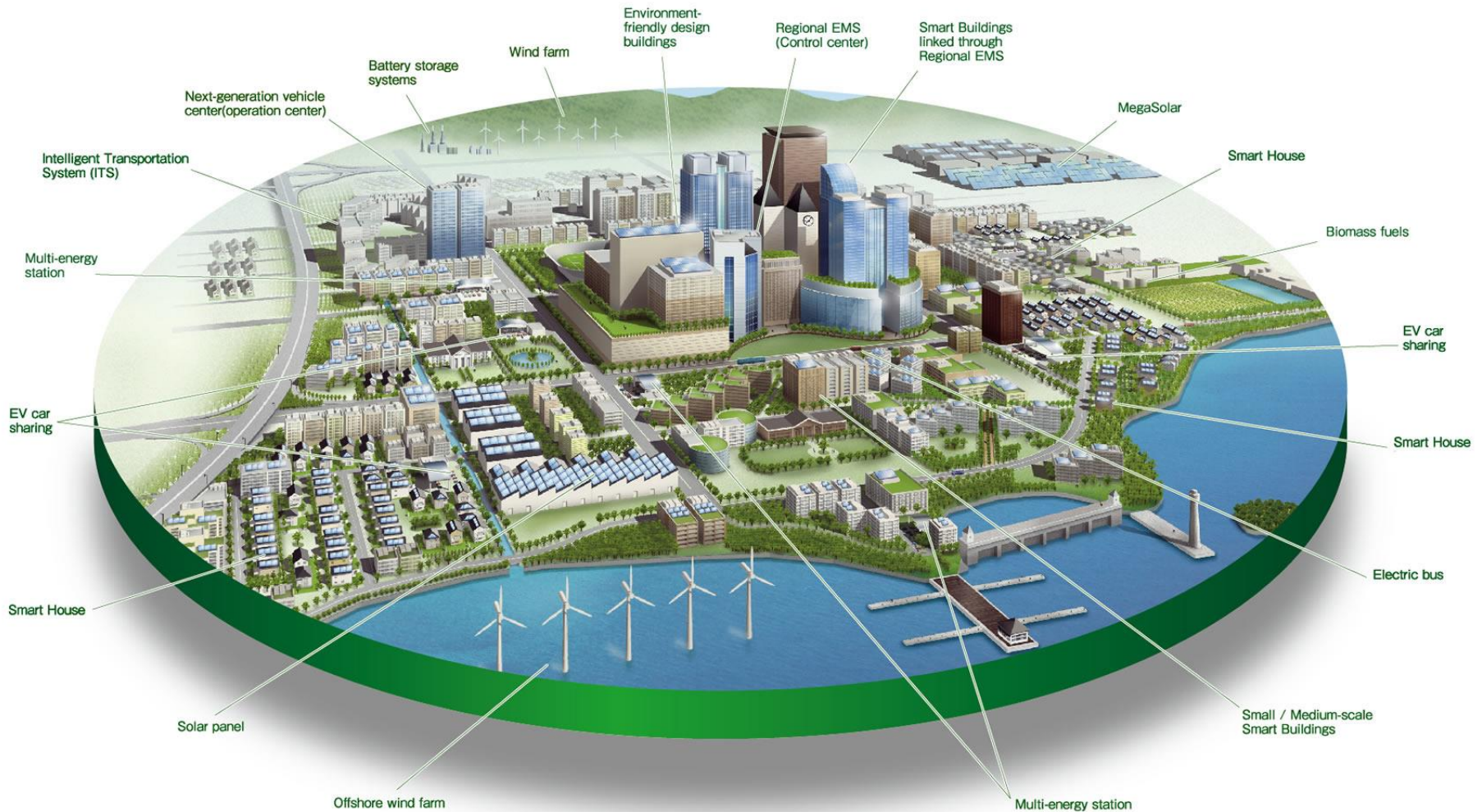


Home





City



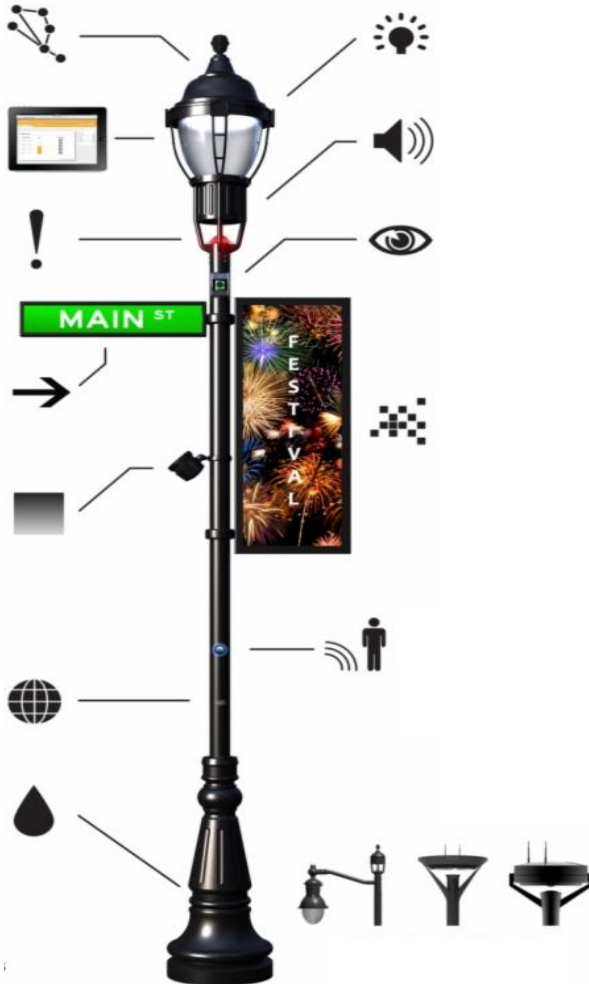
F. Calabrese, K. Kloeckl, and C. Ratti (MIT), "WikiCity: Real-Time Location-Sensitive tools for the city"





Concept

The Internet of Things is not a single technology, **it's a concept** in which most new things are **connected and enabled**.





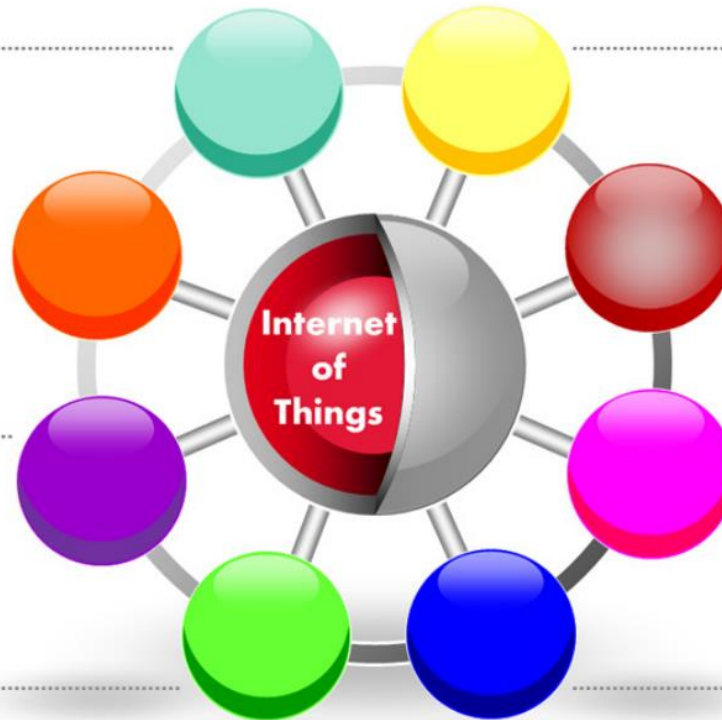
Definition

A dynamic global network infrastructure

with self configuring capabilities

based on standard and interoperable communication protocols

where physical and virtual “things”



have identities, physical attributes, and virtual personalities

use intelligent interfaces,

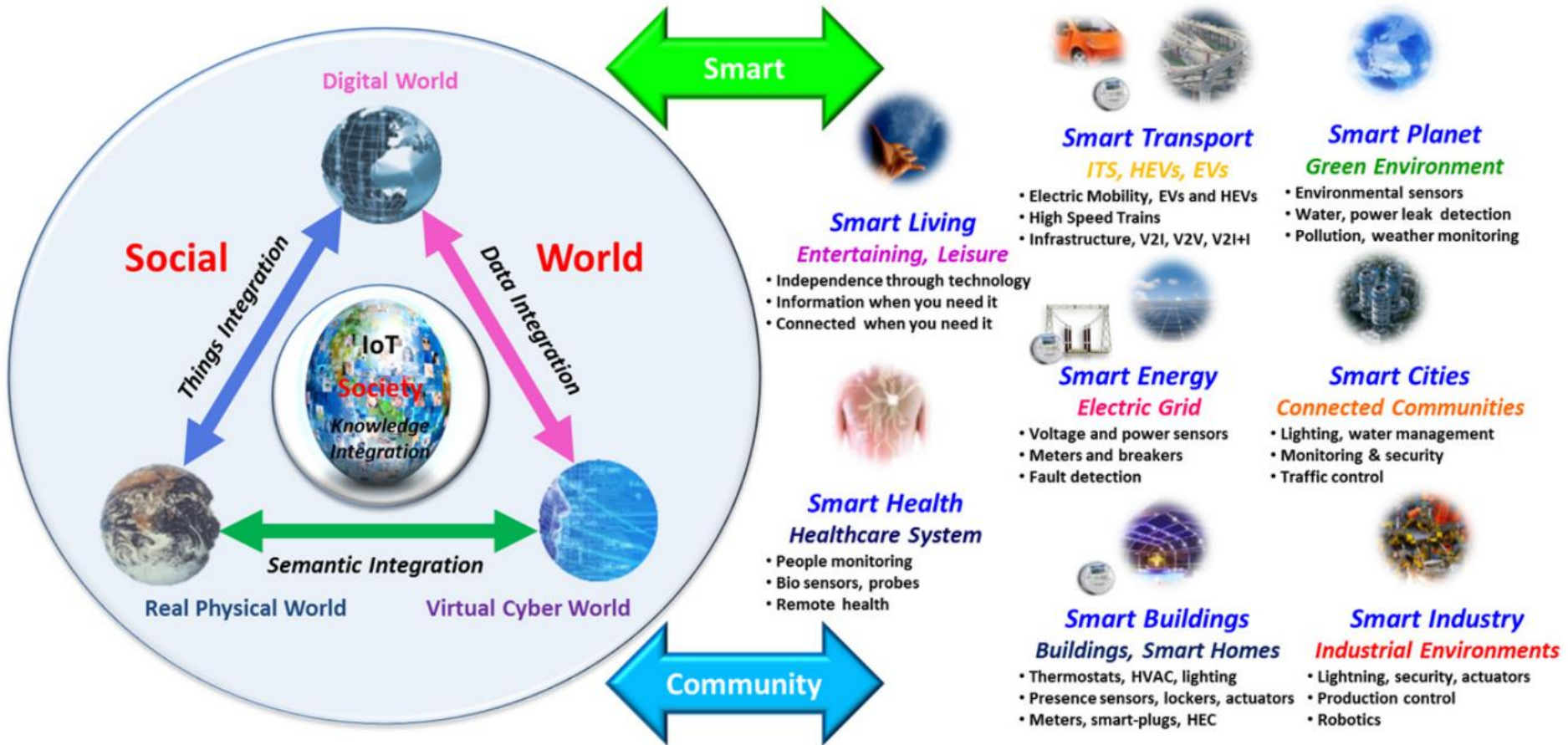
and are seamlessly integrated

into the information network.





Context

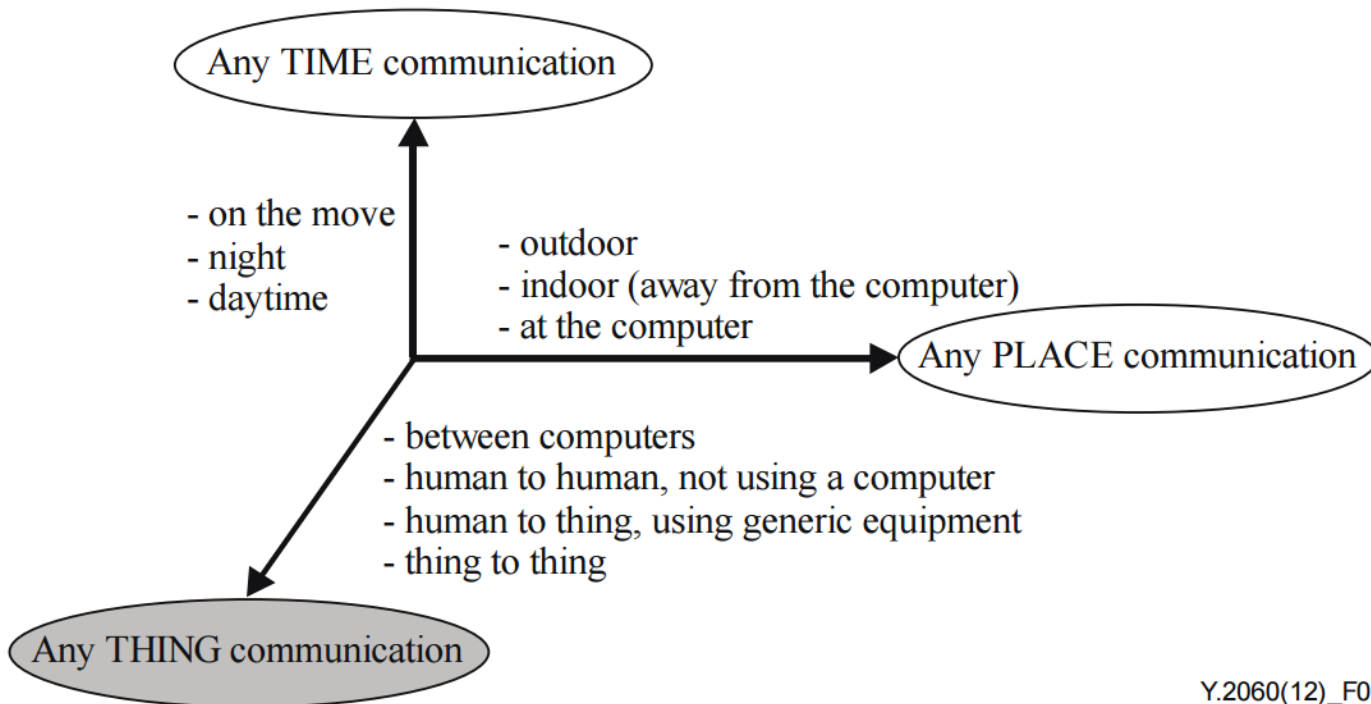


http://www.internet-of-things-research.eu/pdf/IERC_IoT-Pan%20European%20Research%20and%20Innovation%20Vision_2011_web.pdf





Dimensions



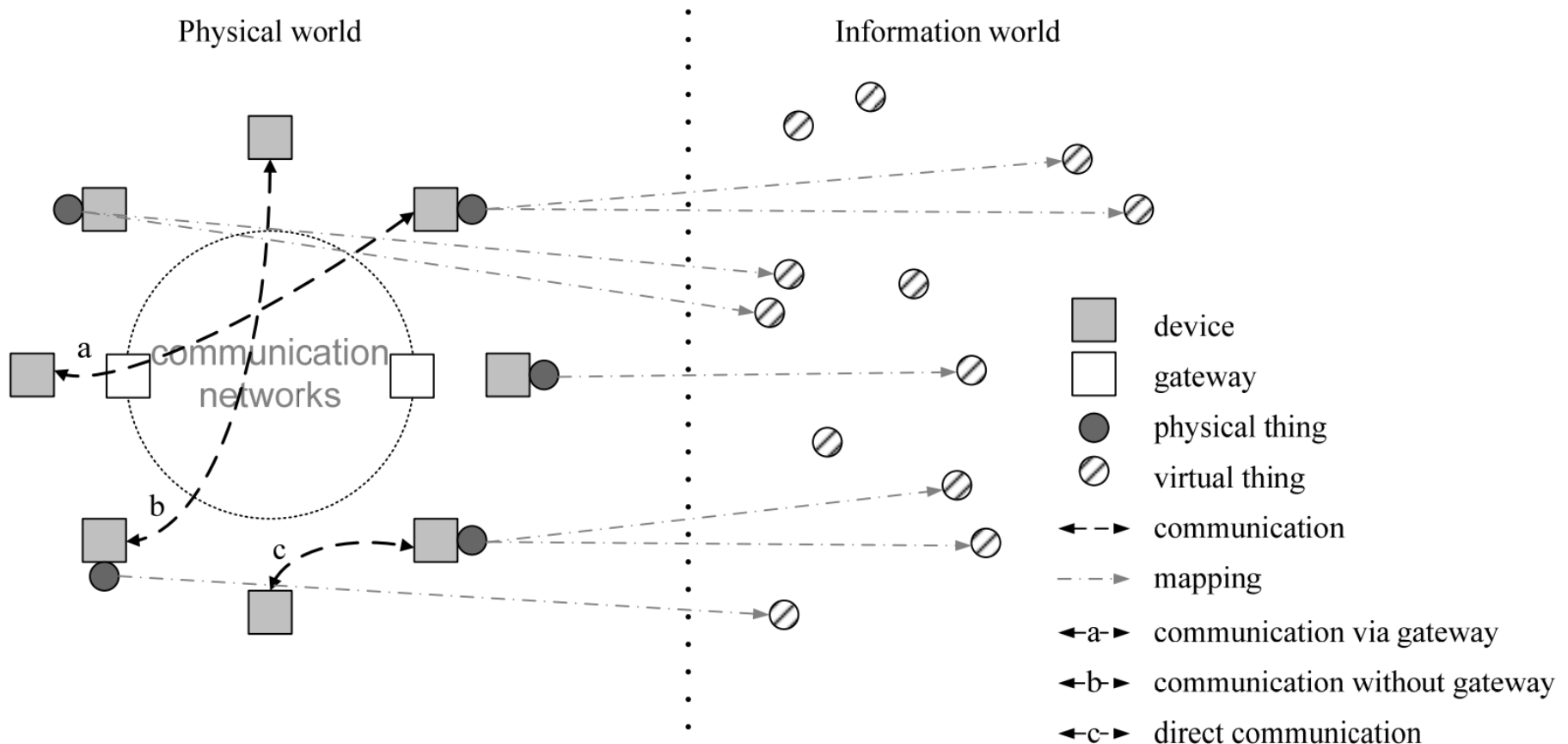
Y.2060(12)_F01

The new dimension introduced in the Internet of things [b-ITU Report]





Two Worlds



Technical overview of the IoT

Overview of the Internet of things, ITU-T Y.4000/Y.2060 (06/2012)



[illegible]



Challenge

The Internet of Things offers a potential economic impact of \$4 trillion to \$11 trillion a year in 2025.



Of the total potential economic value the IoT enables, **interoperability** is required for **40 %** on average and for nearly **60 %** in some settings.

¹Adjusted to 2015 dollars; for sized applications only; includes consumer surplus. Numbers do not sum to total, because of rounding.







Interoperability





Definition

-  “the ability to make systems and organizations work together”.
-  **IEEE** “the ability of two or more systems or components to exchange information and to use the information that has been exchanged”.





Seamless

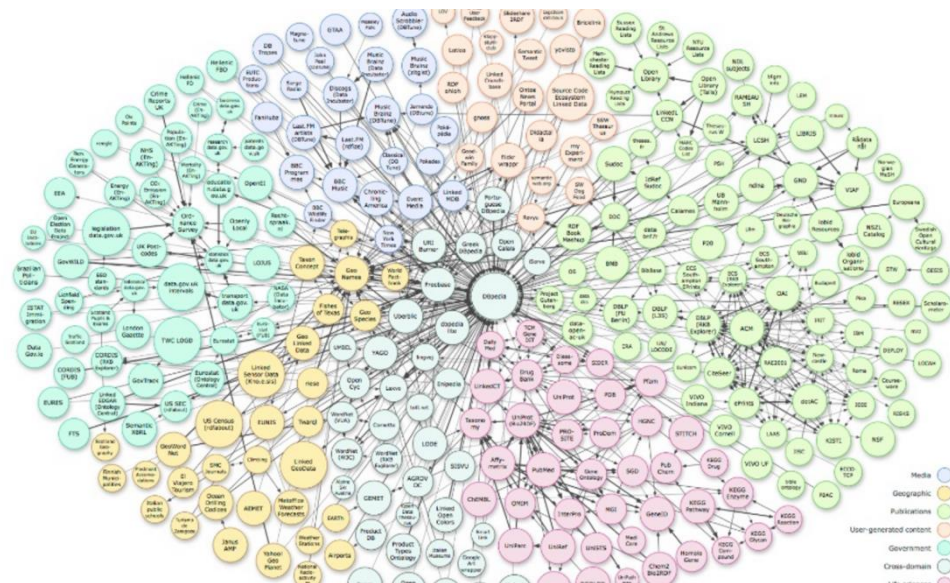
- A technological paradigm or **framework without proprietary gates** – but with security standards—is hard to imagine today—but **so is the seamless connectivity and unprecedented insight IoT promises.**





Connections

- Overcoming the challenge of **interoperability** may be the **single most important hurdle** for IoT to reach mass adoption, as it is what enables the boundless **'connections'** of a connected world.





Hetrogeneous

- As for the IoT, future networks will continue to be heterogeneous, multivendors, multi-services and largely distributed. Consequently, the risk of non interoperability will increase.





Interoperability framework

- High-dimensional
 - co-existence of many systems (devices, sensors, equipment, etc.) in the environment that need to communicate and exchange information





Interoperability framework

- Highly-heterogeneous
 - lot of manufacturers
 - targeting diverse application domains
 - extremely difficult (if not impossible) to reach out for global agreements and widely accepted specification.





framework

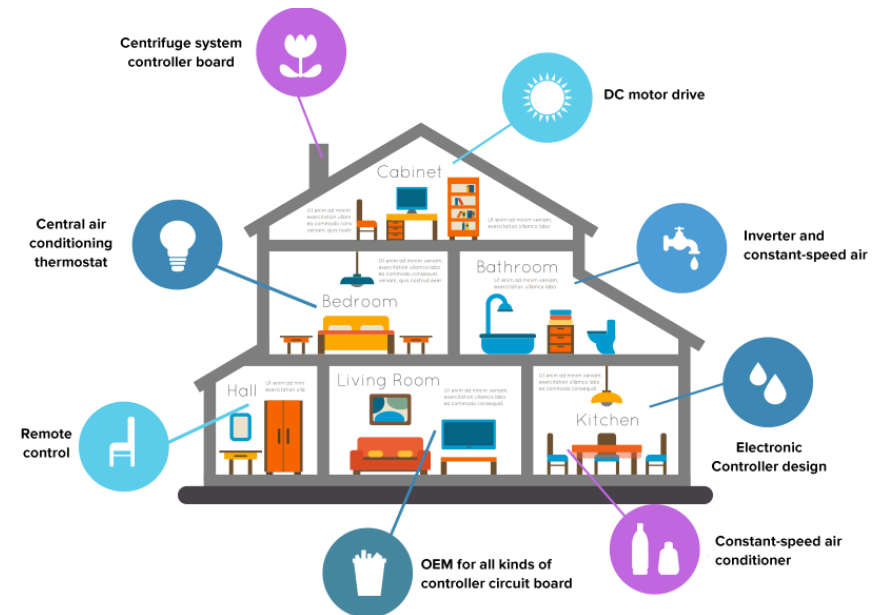
- New Things (that were not even considered at start) are entering (and leaving) the environment all the time
- Support new unforeseen formats and protocols but that need to communicate and share data in the IoT.





Interoperability framework

- Hard to describe/model
 - Existence of many data formats
 - different languages, that can share (or not) the same modelling principles, and that can be interrelated in many ways with one another.





Customer

- *a **fragmented** environment of **proprietary** IoT technical implementations will inhibit value for users and industry.*
- *While full interoperability across products and services is not always feasible or necessary, purchasers may be hesitant to buy IoT products and services **if there is integration inflexibility, high ownership complexity, and concern over vendor lock-in.***





Considerations

- Thing Interaction
 - there is more than one option to how things will interact with other things or the users.
 - situations where interactions with individual things are needed.
 - situations where the ability to query and control large groups of things at the same time is also required.





Considerations

- Virtual Representation of Things
 - how things are represented, and described
 - shared schema or ontology for things





Considerations

- Searching, Finding and Accessing Things
 - Should we be able to search for things by their unique ID, IP, location, name or/and in combination with other properties?
 - How can we discover, search, locate or track mobile things that may move from one location or network to another?
 - How should things be organized, deployed, managed and secured?





Considerations

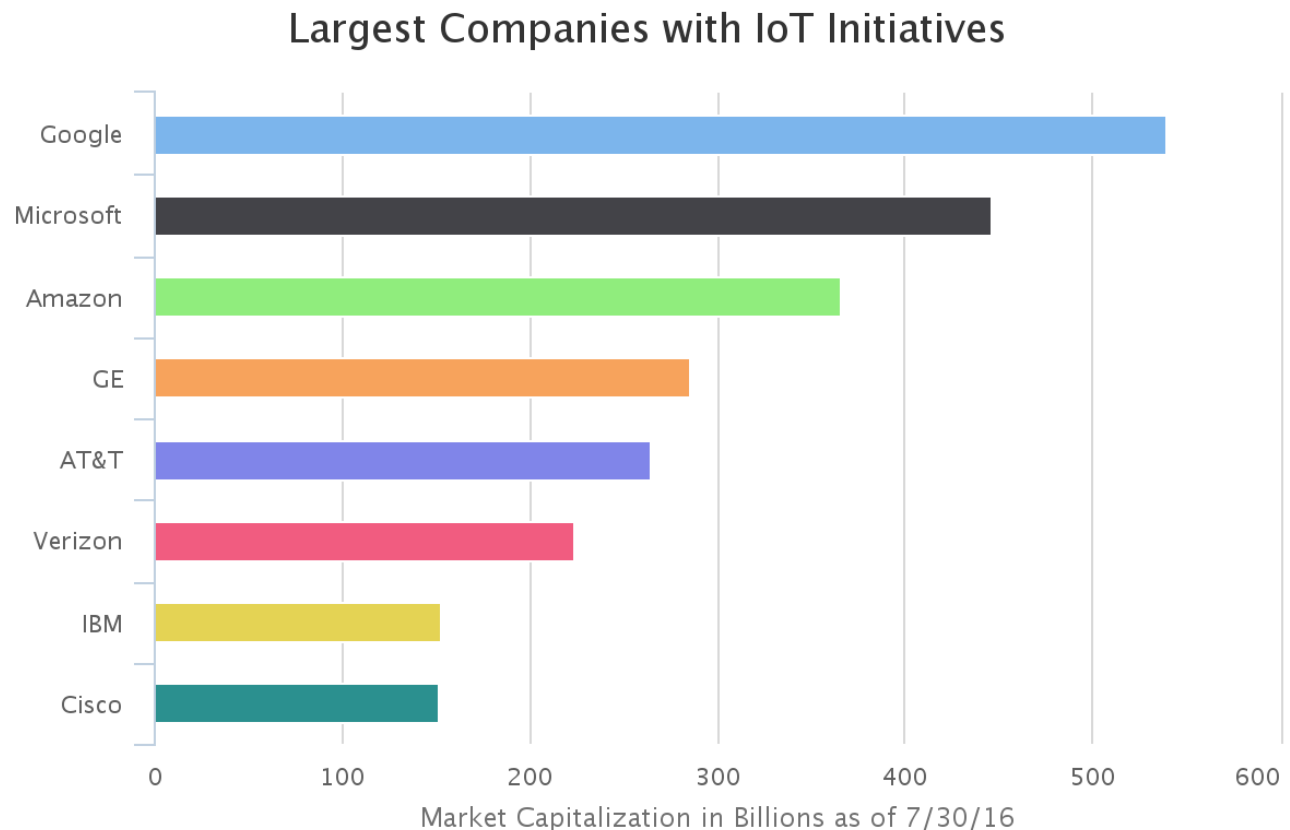
- Syntactic Interoperability between Things
 - syntactic interoperability deals with the packaging and transmission mechanisms for data over a network.
 - to ensure that data flow is interoperable between the various networks and among a mixture of devices.
 - Translation functionalities in networks or in some devices, gateways or in the form of middleware sitting on the edge of a network are most likely needed.





Collaboration

Fragmentation will exist until the giants can play nice



<http://cdn.ttgtmedia.com/ITKE/uploads/blogs.dir/284/files/2016/08/IoT-initiatives-market-capitalization.png>

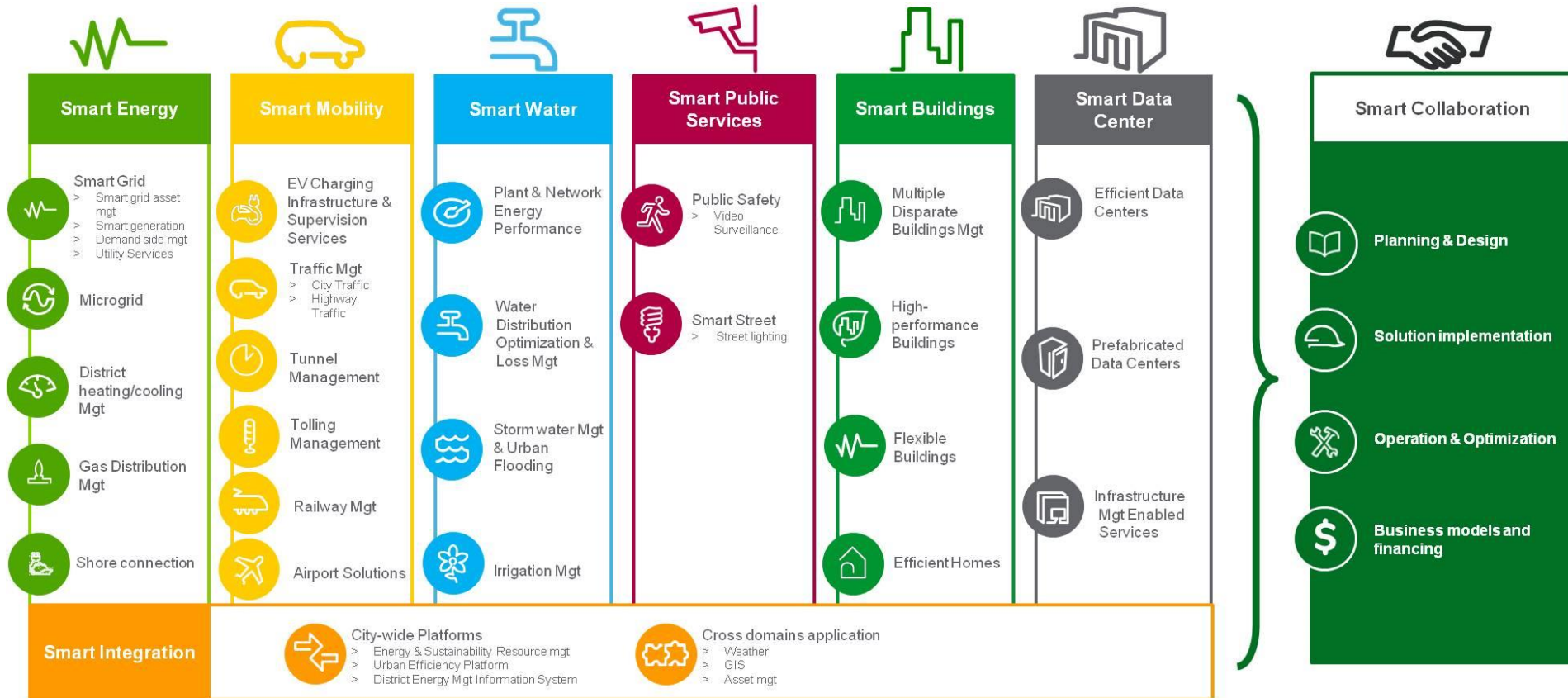
Highcharts.com

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Collaboration



<http://blog.schneider-electric.com/wp-content/uploads/2015/08/Smart-Cities-Segments.jpg>



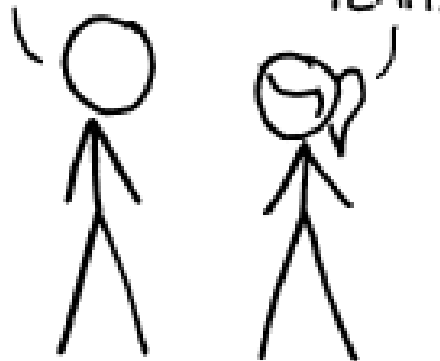


Takeaway

HOW STANDARDS PROLIFERATE:
(SEE: A/C CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC.)

SITUATION:
THERE ARE
14 COMPETING
STANDARDS.

14?! RIDICULOUS!
WE NEED TO DEVELOP
ONE UNIVERSAL STANDARD
THAT COVERS EVERYONE'S
USE CASES.



SOON:

SITUATION:
THERE ARE
15 COMPETING
STANDARDS.



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