EVOLVING ROLE OF IOT FOR ENERGY APPLICATIONS

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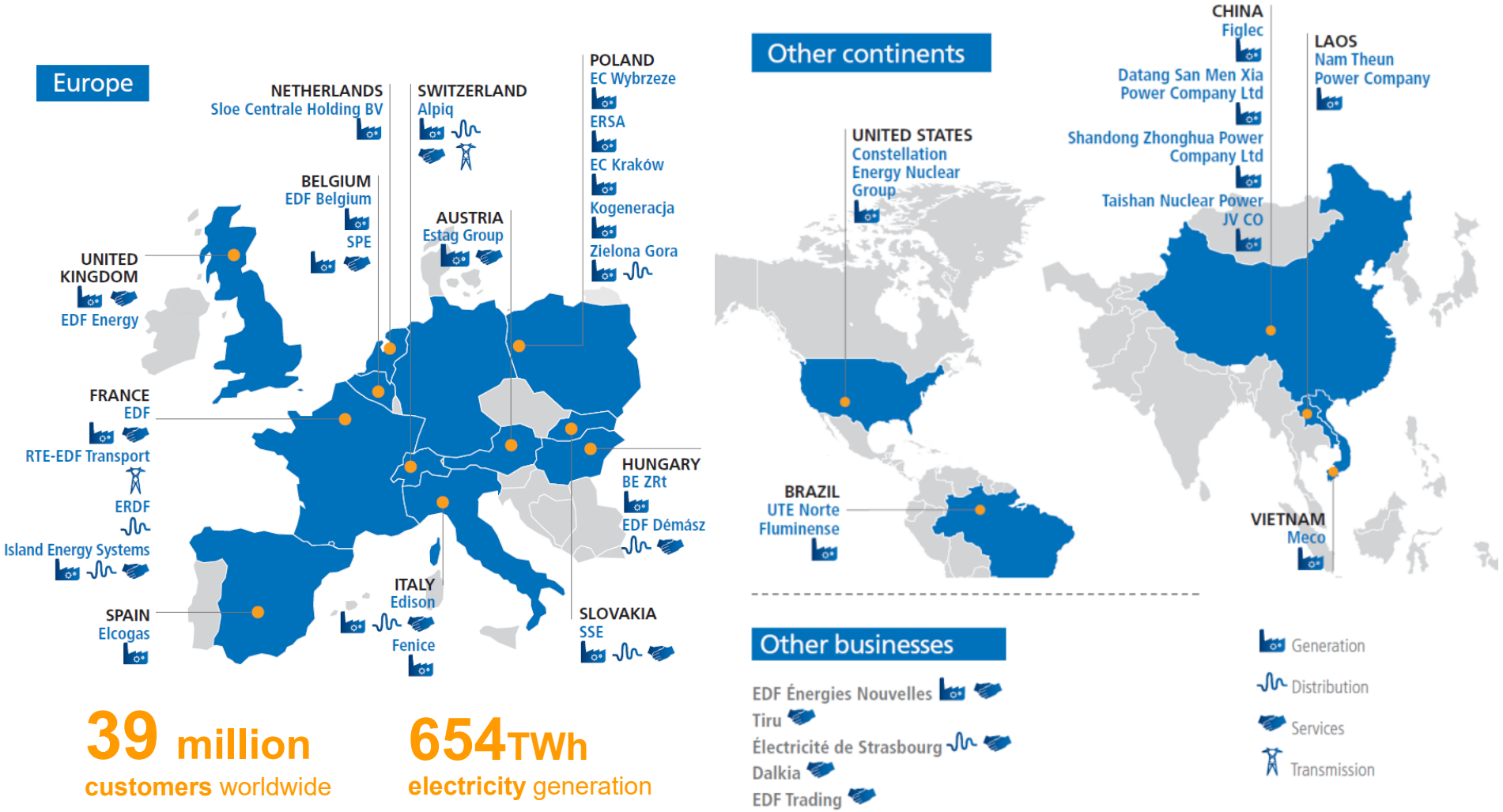
EDF VP Smart Energy Standards

IoT Workshop
Berlin – May 13th, 2016

Outline

- How IoT increases visibility of the performance, visibility of where we lose energy, and where the savings potential really is
- How IoT allows energy to be managed in real time based on immediate data rather than historic patterns of energy use
- How IoT opens the doors to energy services and payment tariffs that could dramatically reduce business energy costs and boost their sustainability credentials

EDF in brief : a global energy leader



39 million
customers worldwide

654TWh
electricity generation

160,000
employees worldwide

€75.6 billion
in **sales (47% out of France)**

€543 million
invested in R&D

17g of CO_2
per kWh generated In France

"SMART GRIDS"

IoT:

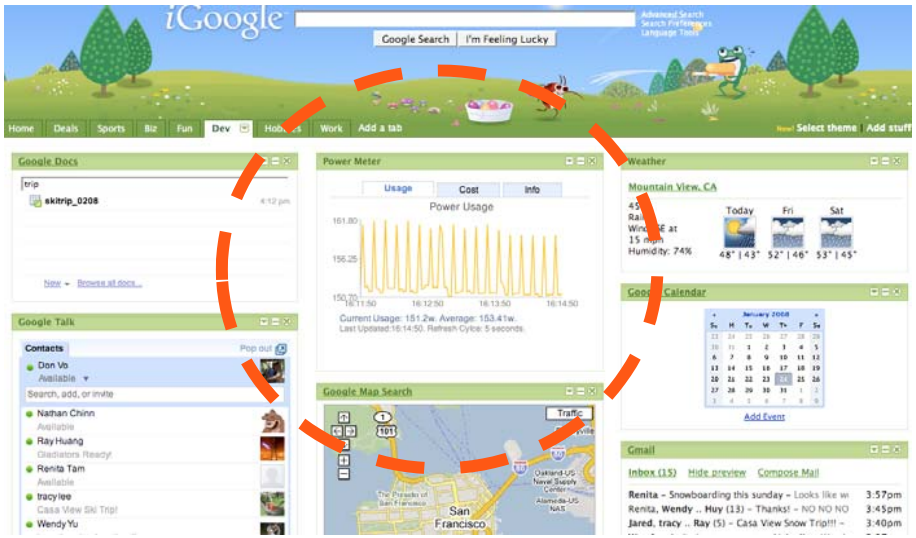
Increased performance visibility

Knowing in real time the consumption allows to save ~~15%~~ 3%

Google PowerMeter BETA

Yello Strom

(April 2008)

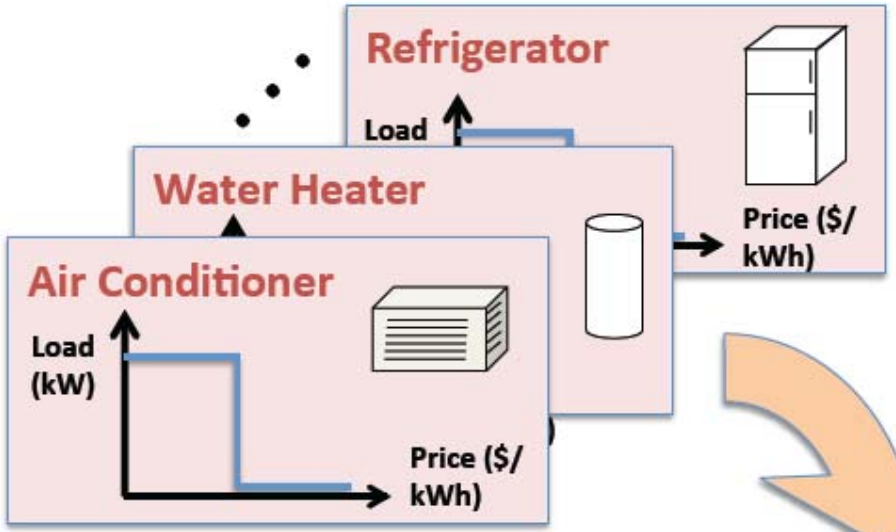


Home Energy Management Systems: information and decision platforms

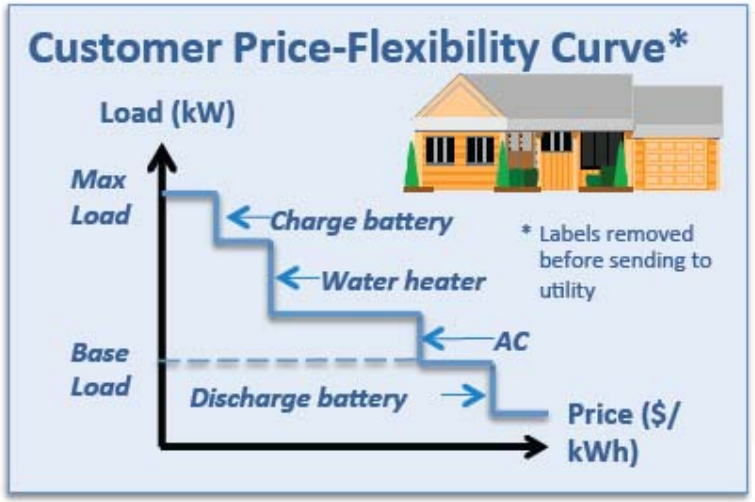
Transactive Grid Overview

Pacific Northwest NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965

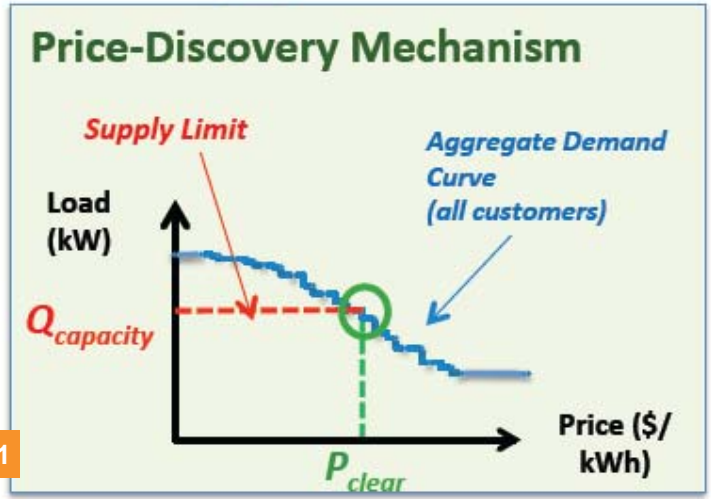
1. Automated, price-responsive device controls express customer's flexibility (based on current needs)



2. Customer system aggregates responses to form overall price flexibility curve



3. Utility aggregates curves from all customers

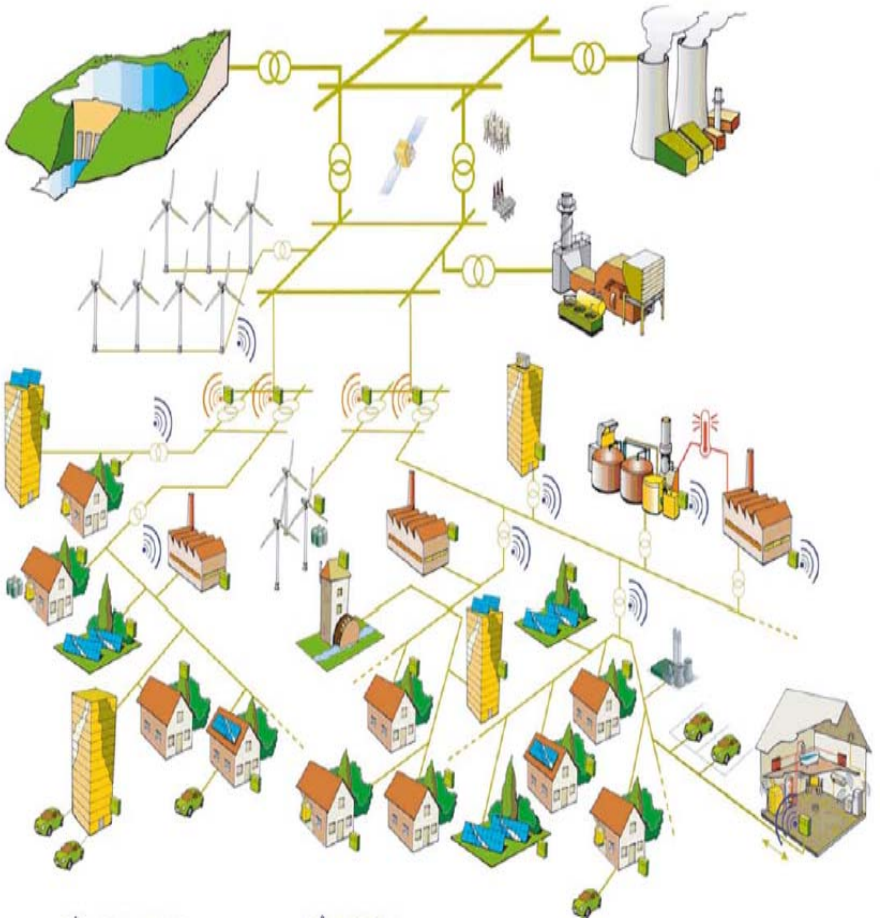


4. Aggregator determines price at which grid objective achieved, broadcasts to consumers

"SMART GRIDS"

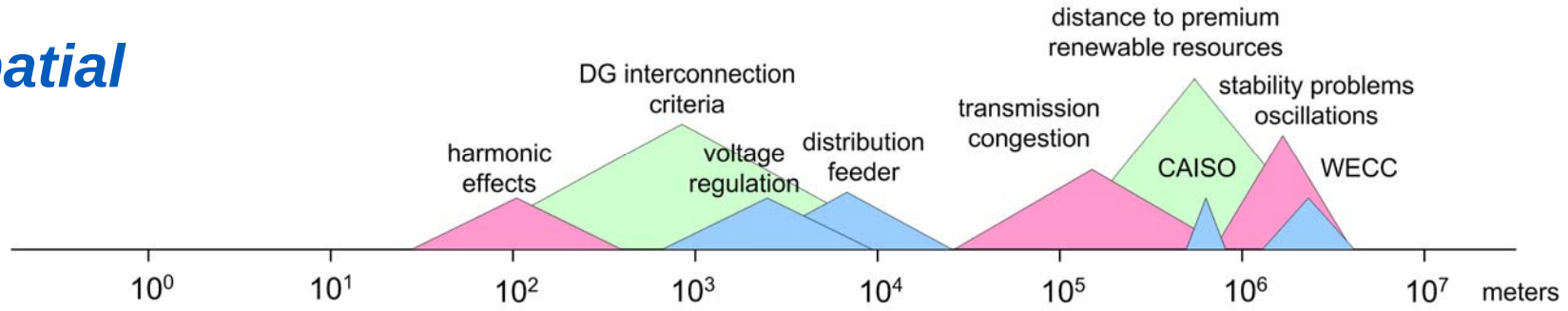
IoT:

Allows more real time operations



Increasing span of control
Decreasing timing of information, decision, control

Spatial



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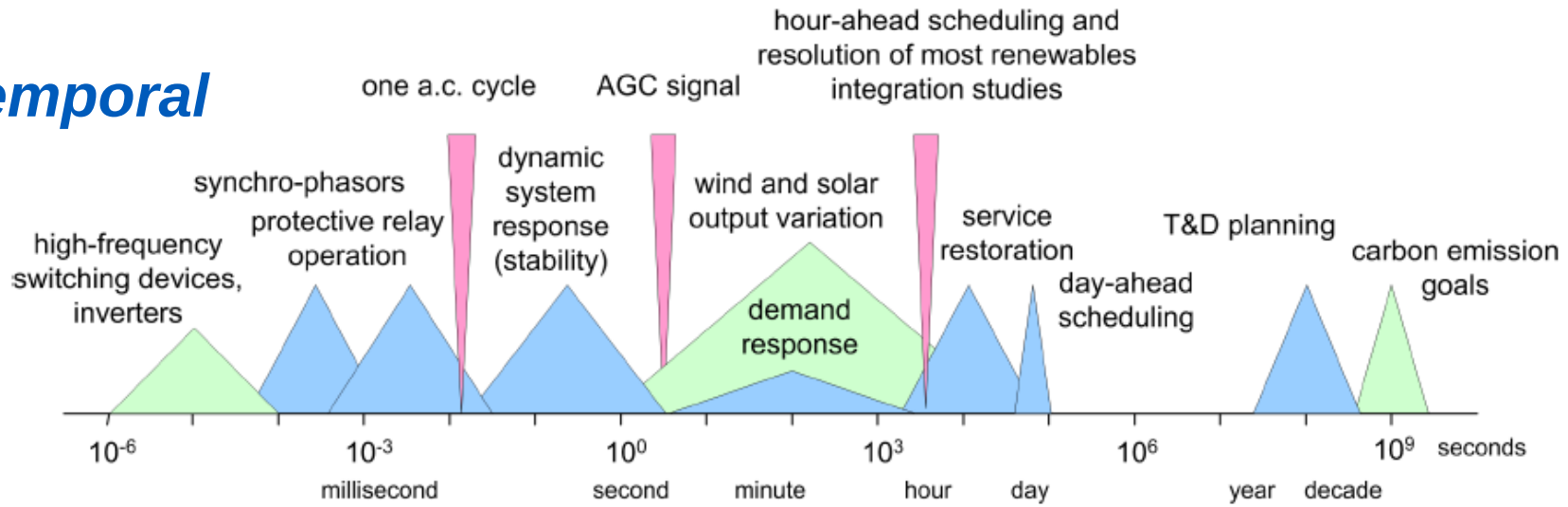
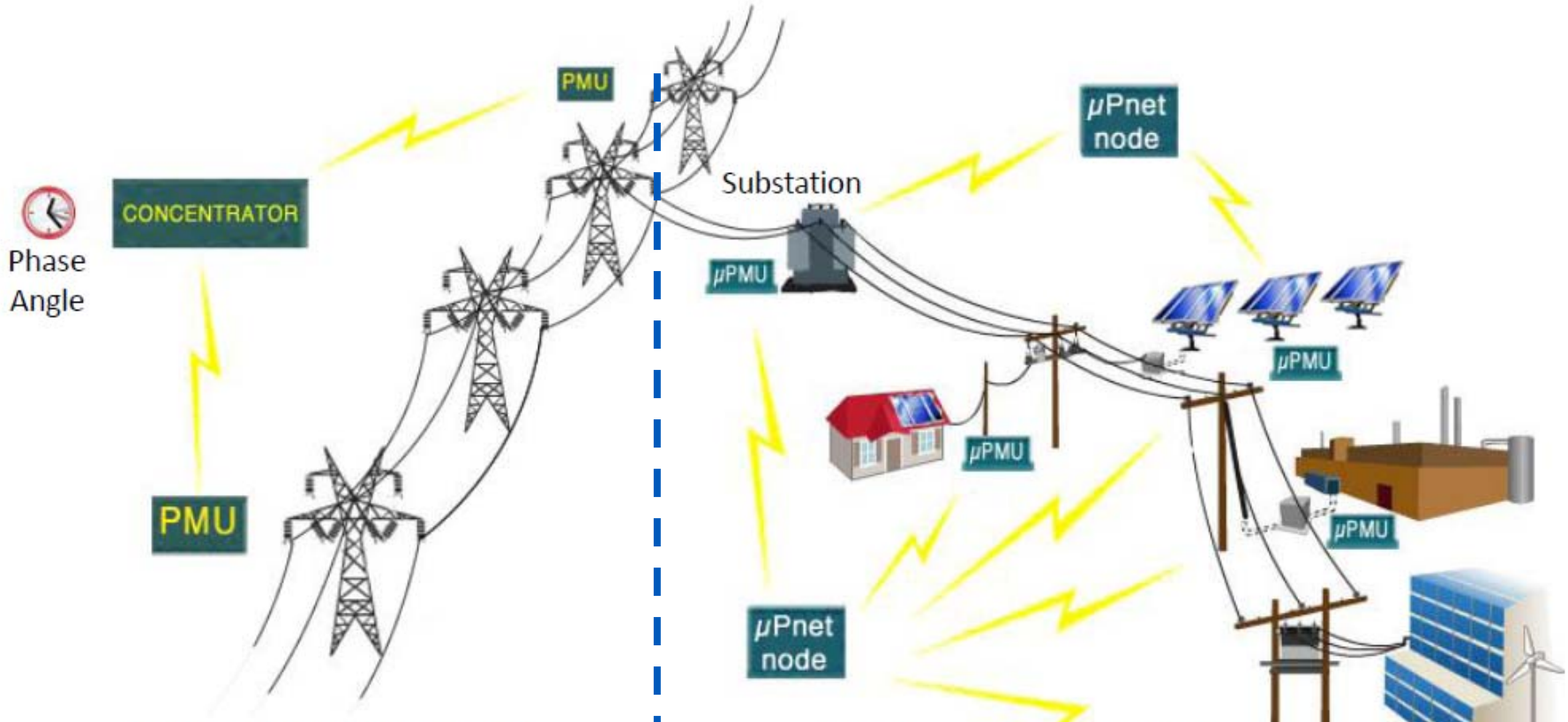
Temporal



EDF

Micro-synchrophasors on the Distribution system to detect local conditions



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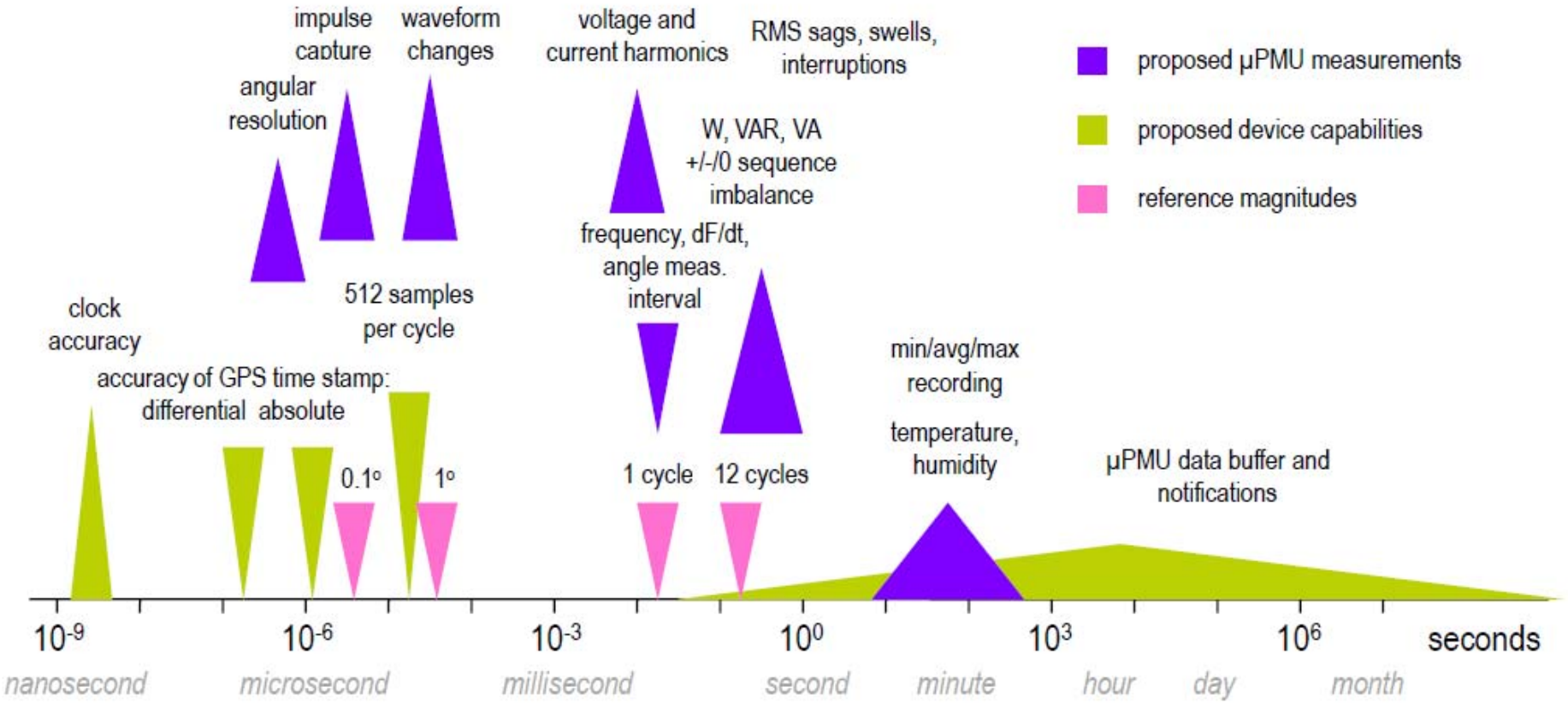
Enhanced time micro-scale management



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Example:
Feasible and affordable technical solutions

- higher resolution than conventional PMUs: aiming for < 0.05°
- 512 samples per cycle
- phase-locked sampling for power quality measure-ments, and time-based sampling for synchronized measurements

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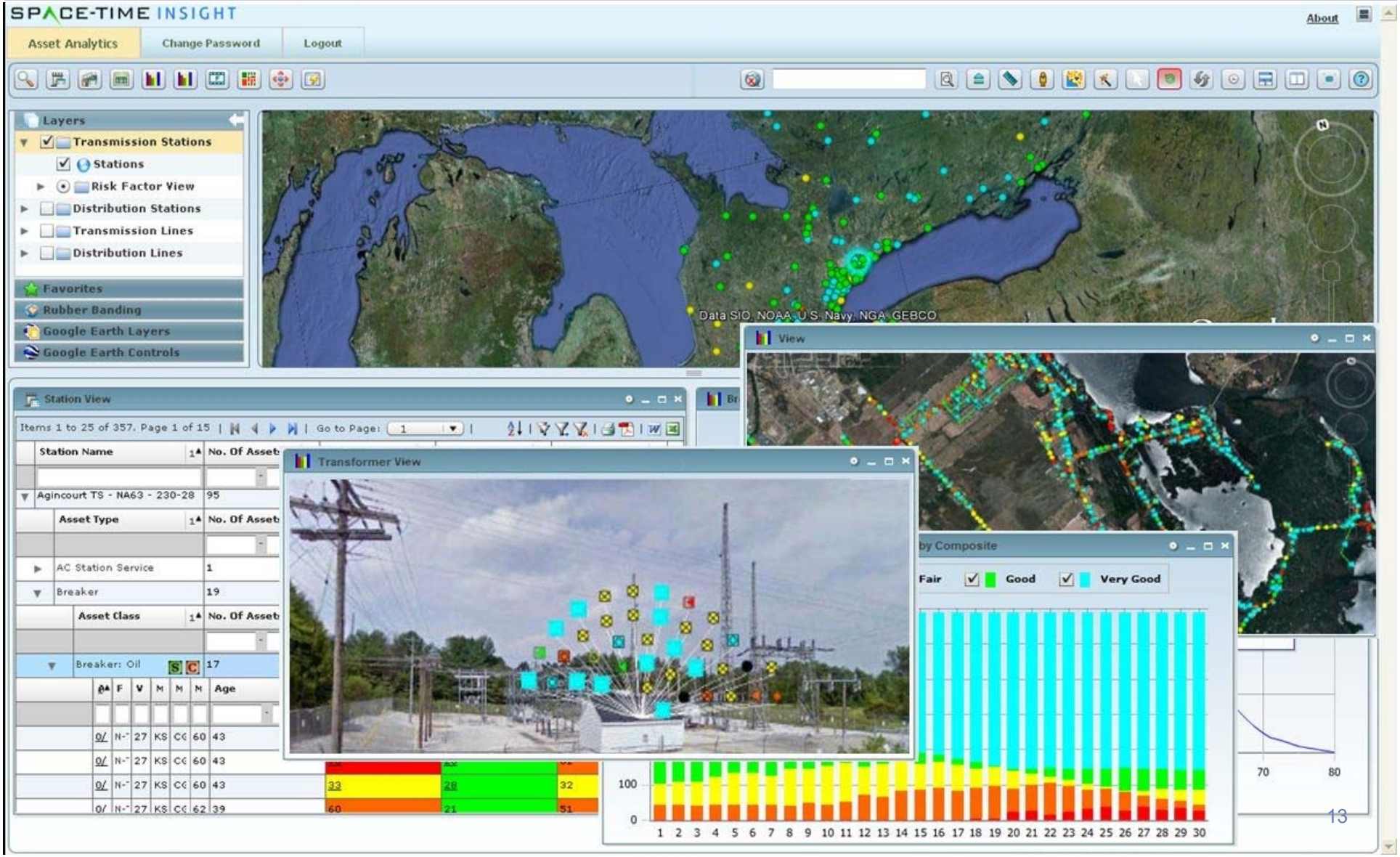
PSL

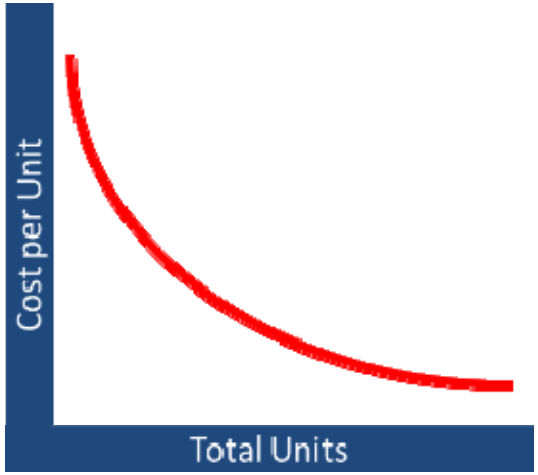
Present - Real-time situational awareness




"SMART GRIDS"
IoT : new utilities business models

Utility Economics Are Changing

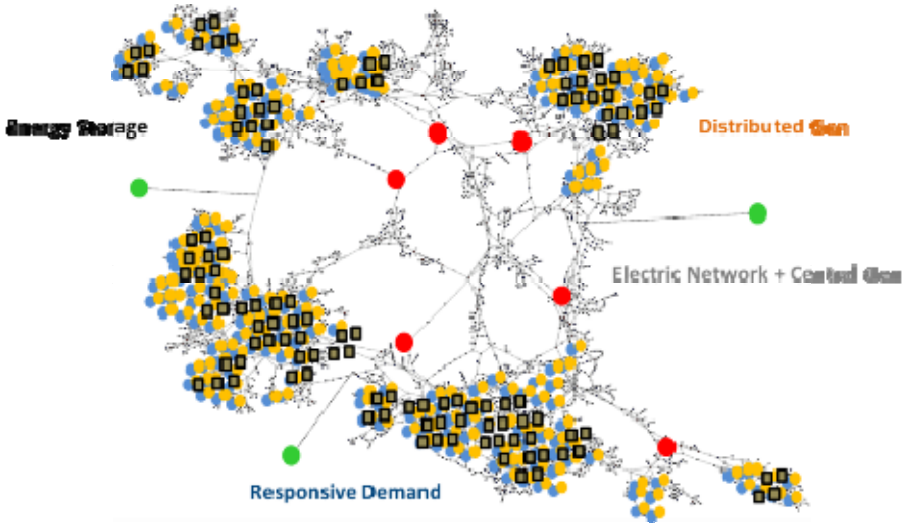
Economies of Scale



Economies of Scope

amazon

Network Economics

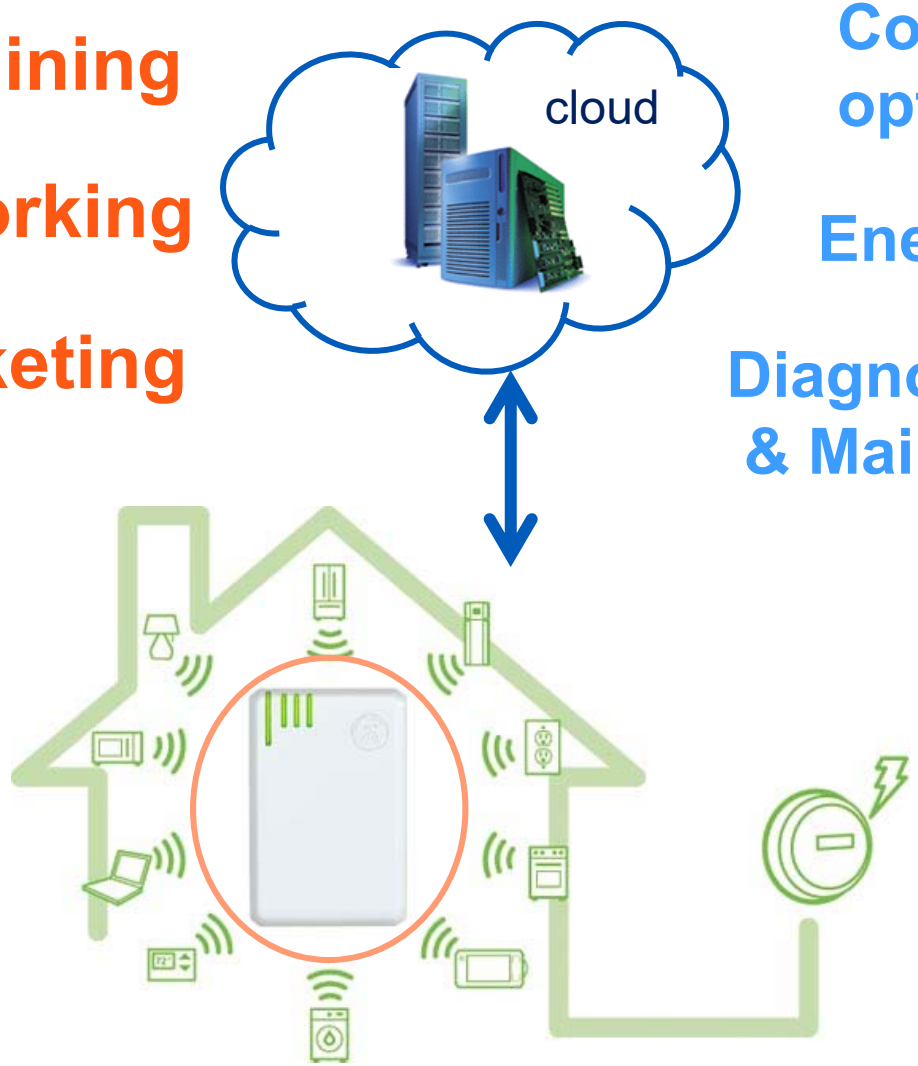


With the power of the cloud on top: A “cornucopia” of services ?

Data Mining

Social Networking

Marketing

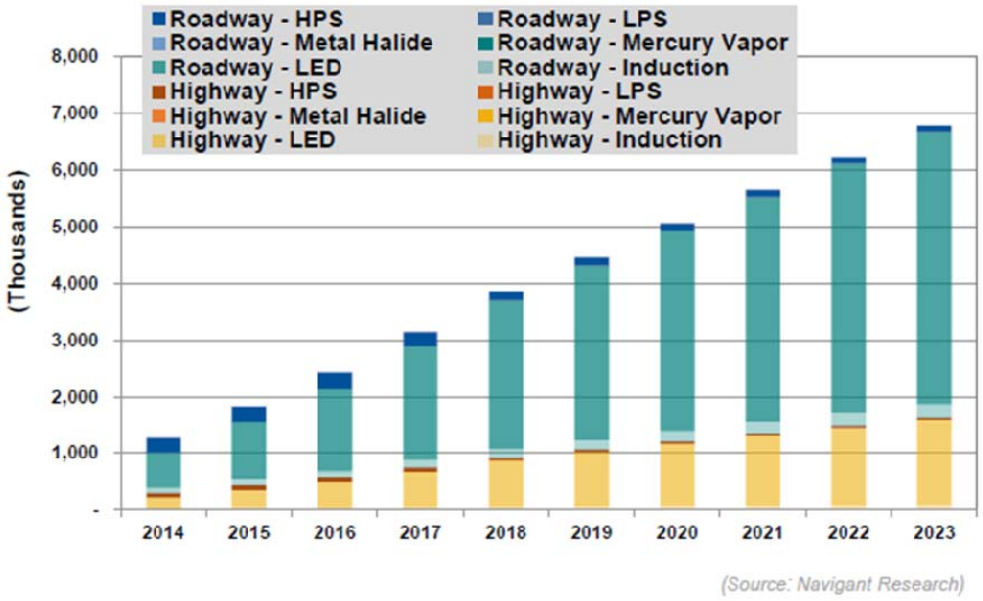


Comfort optimization

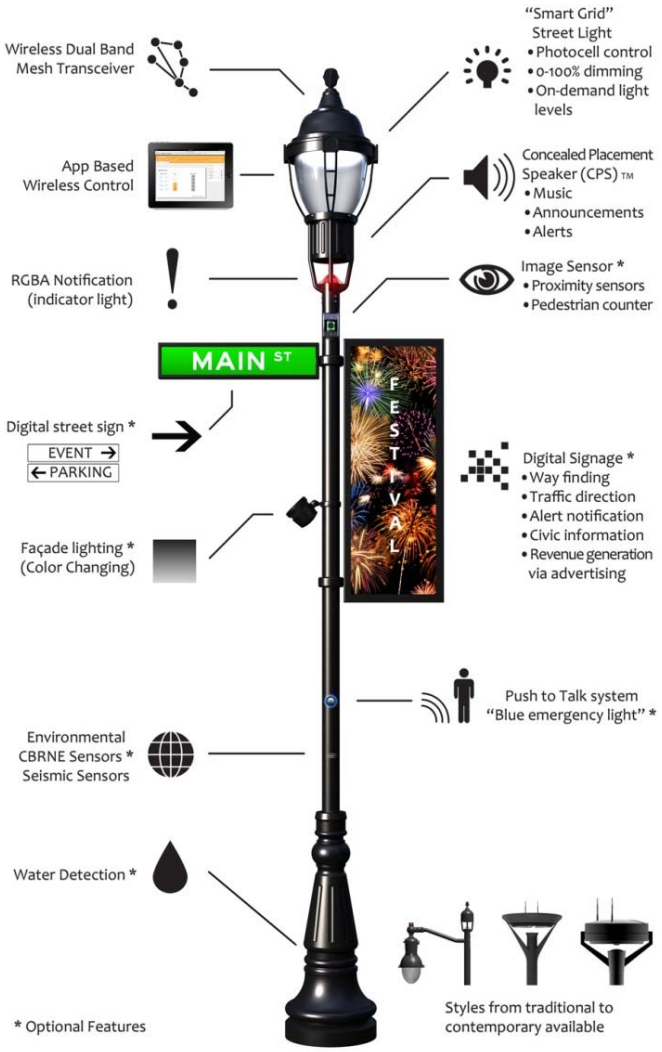
Energy Efficiency

Diagnostics & Maintenance

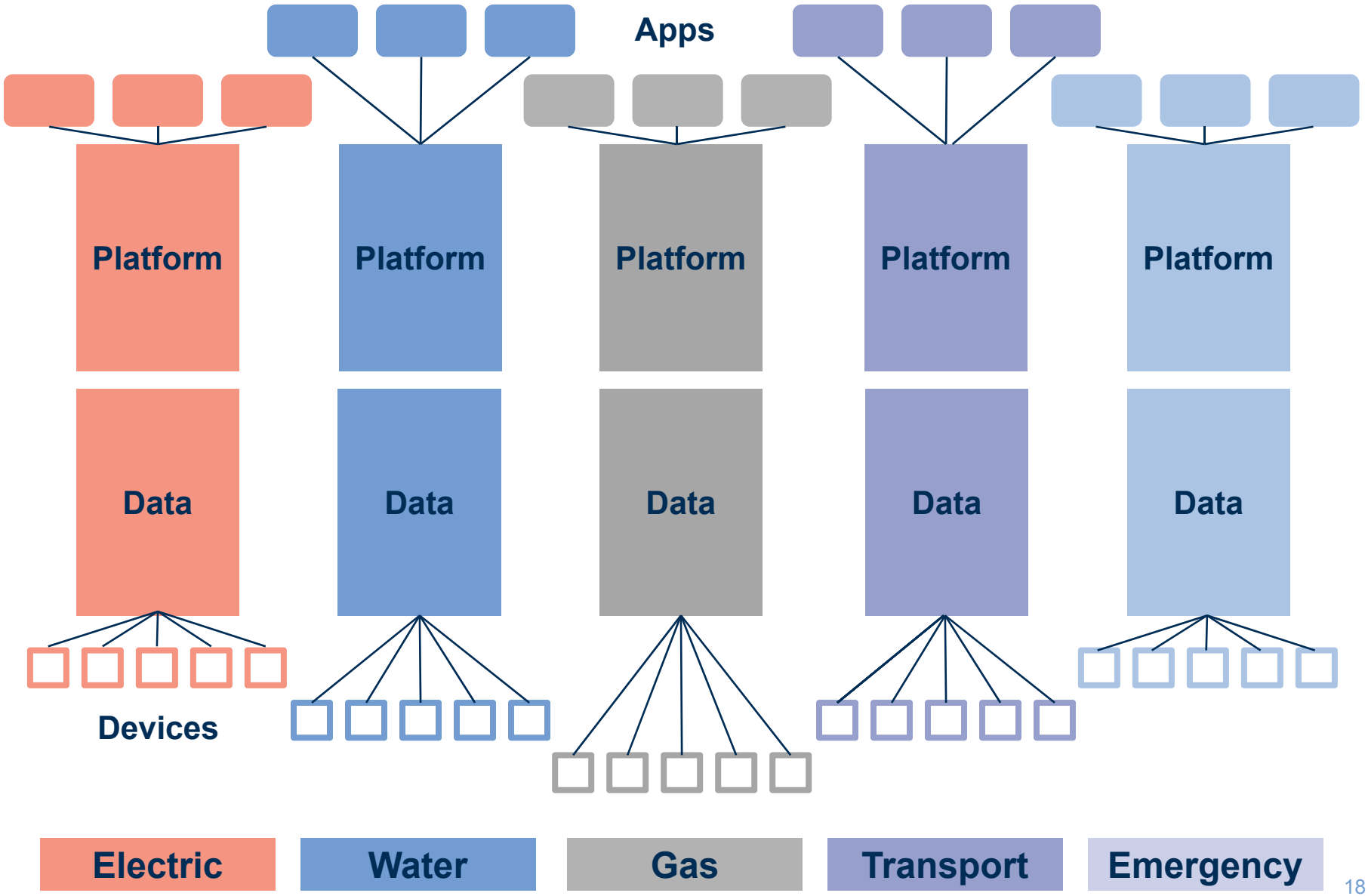
A first killer App: Smart Street Lighting

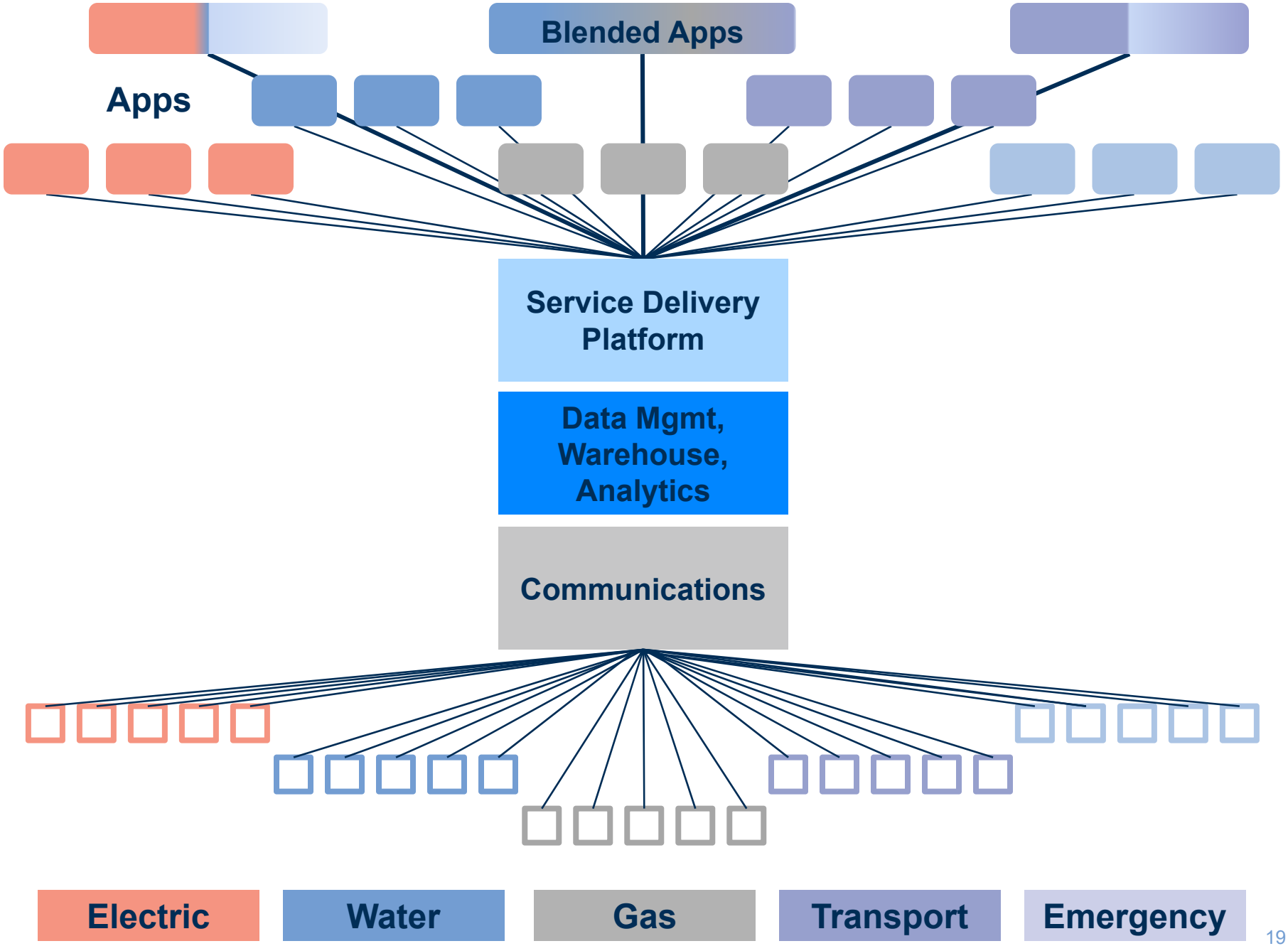


6.8 million units in 2023
20.4% CAGR



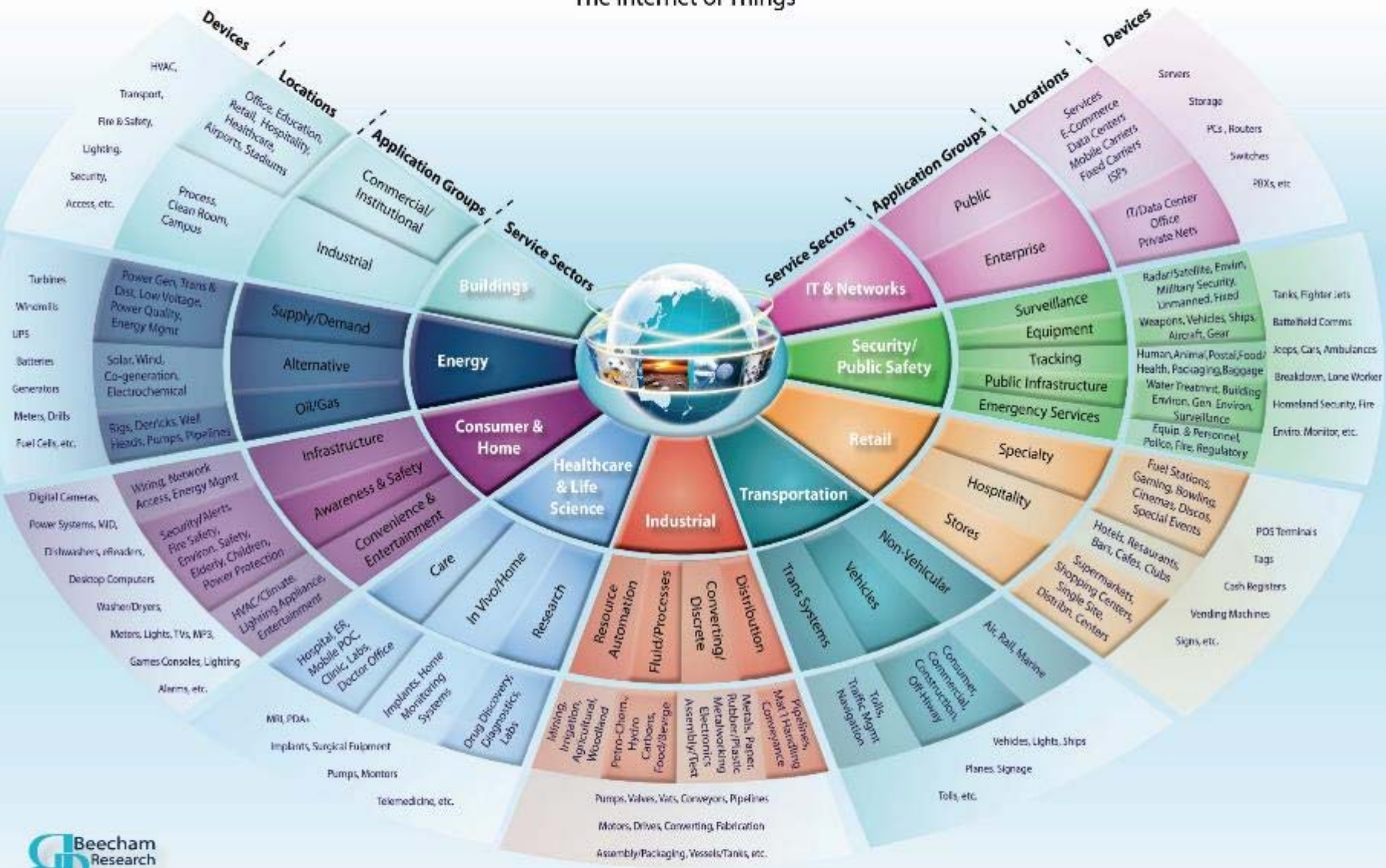
Current applications live in “silos”




Blended Apps
Apps
Service Delivery Platform
Data Mgmt, Warehouse, Analytics
Communications
Electric
Water
Gas
Transport
Emergency

M2M World of Connected Services

The Internet of Things



Beecham Research

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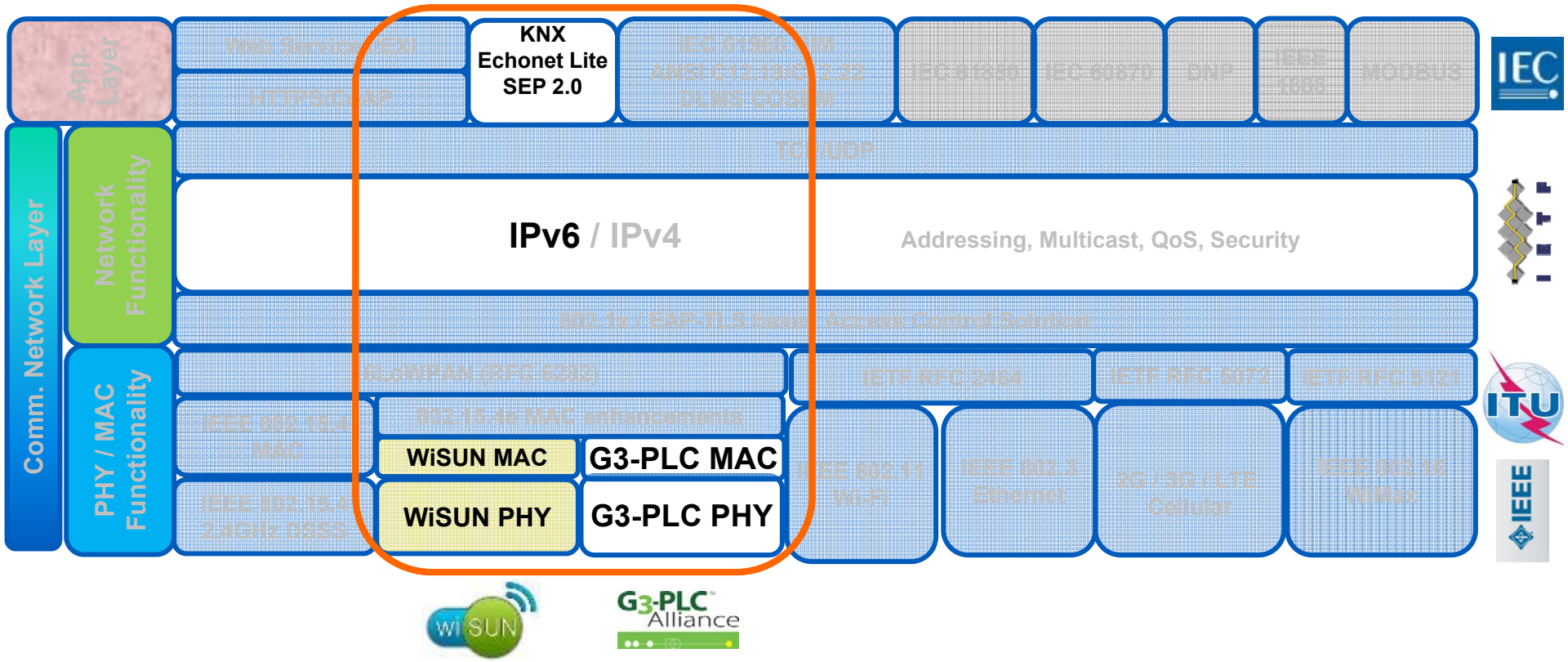
Very strong foundation of two communication technologies



- **Standardization at all levels to ensure interoperability and reduce technology risk for utilities**
- **Enables common application layer over various wired and wireless communication technologies**

Smart Energy-Smart Cities: Smart is cool !

City of London: « Smart Trash Cans » (2012's Summer Olympics)

But what can be accepted easily by citizens ?
if it is free….. you are probably the product!

Can the fair value of a service be really free ?
Privacy and Cybersecurity need also to be designed !

Conclusions

- Growing vital needs in clean sustainable energy are served by the never-ending evolution of technologies
- ***Standardization*** is a key to pre-resolve the extreme challenge of complexity
- Technical, Business, Regulatory decisions should be made keeping in mind the *physical nature of the unique overall system they address (make sure to close the control loop)*
- A major challenge of Smart Energy is *striking new balance* between all stakeholders (Utilities, Regulators, Vendors) enabling the full value of liberalization
- Liberalization and Markets have a lot of great virtues, but they cannot create their own conditions of existences: they must be designed !
- Customers need to be involved for acceptance: *Cybersecurity and Privacy should be guaranteed by design*

Standards = Smart Energy “chromosomes”

Thank you