The Development Status of IoT and Smart Cities in Taiwan

Smart System Institute (SSI)

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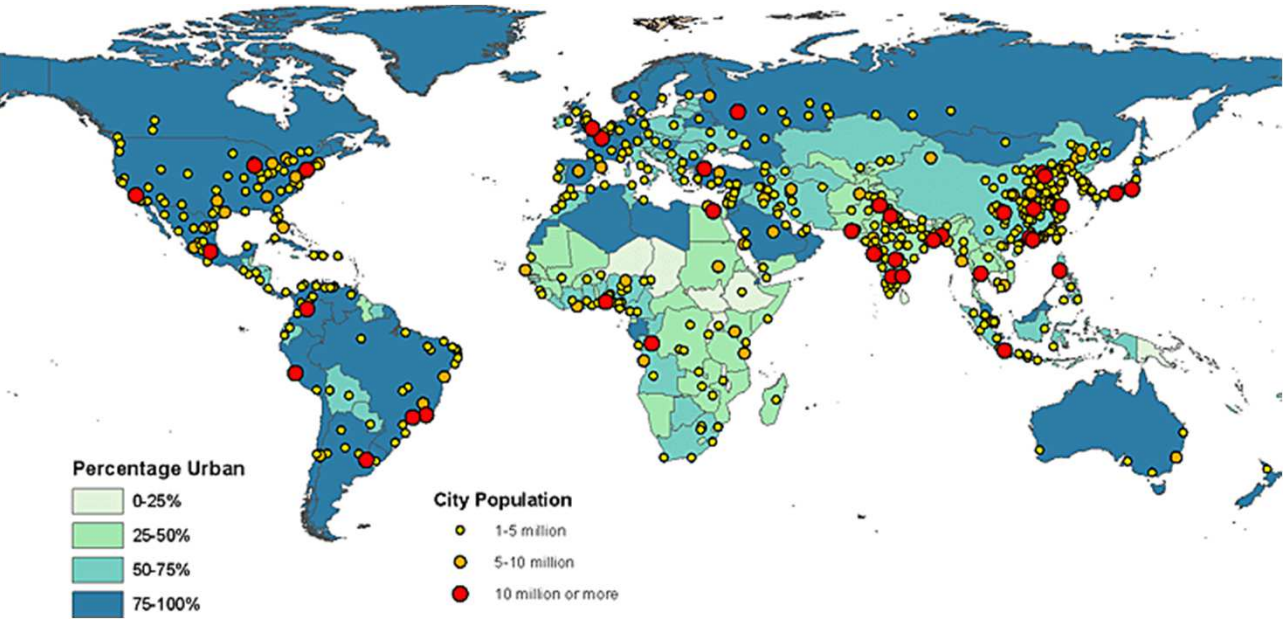
Outline

- **Internet of Things (IoT) enable Smart City Development**
- Taiwan's Smart City Status and Solutions
- Future Insights

Smart City Opportunities

- By **2050**, **70%** of the world's population is projected to be urban.
- Will have **29 Megacity** where more than 10 millions people live in.
- Densely populated cities face several challenges, such as transportation, safety, pollution, health-care… etc.

Percentage of urban population and agglomerations by class size, 2025



Key Challenges As faced by All Cities

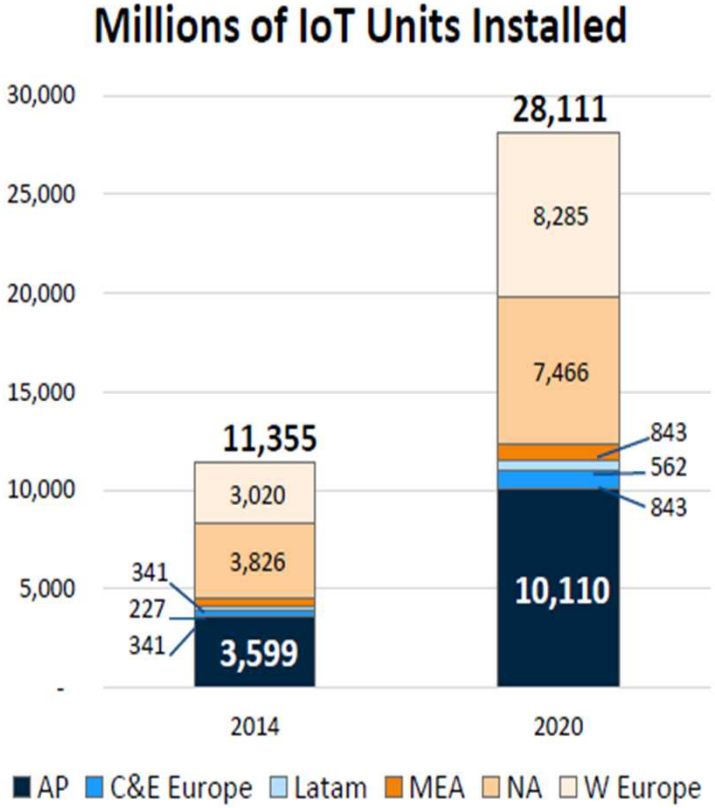
- Growth
  - Population growth
  - Economic growth
- Competition
  - Cities competing for investment and talented workforce
  - Citizen expectations for a high quality of life
- Sustainability and Efficiency
  - Transportation
  - Local pollution and carbon reduction targets
  - Limitation of natural resources
  - Public transportation efficacy
- Aging infrastructure
  - Often beyond its intended life span

Reference: ABB, 2016 Source: UN, IEEE

Internet of Things (IOT) Market Trend

Increasing Cost Effective, Connected Things and Objects within cities

- Gartner's Prediction - Internet of things : **15 Billions or 1 Trillion things connected by 2020**
- IDC's Prediction: **2020 28 Billions IoT Units**



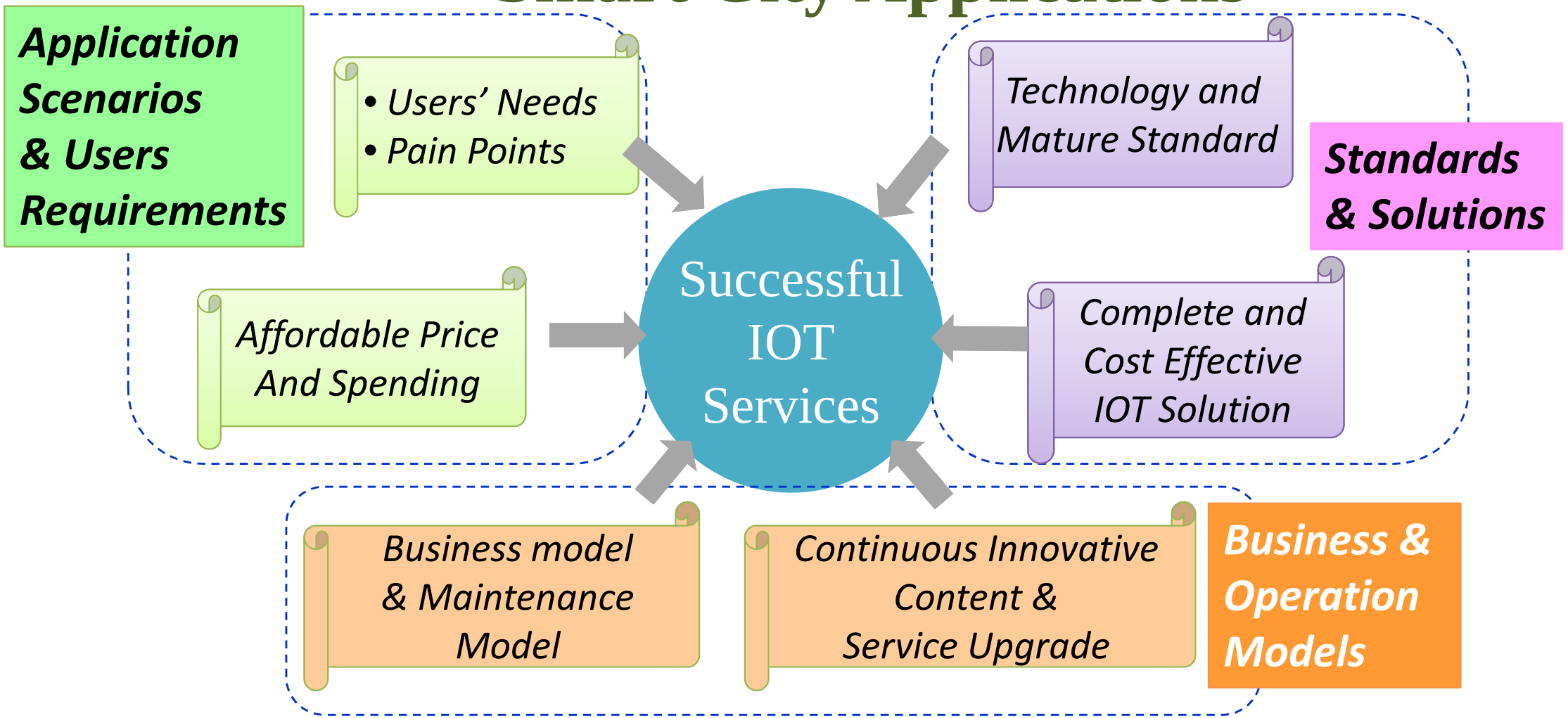
AP will provide 31.7% of total units installed in 2014 rising to 36.0% in 2020

The 2014 IoT TAM will be USD 731B in AP out of USD 2,297B globally

AP units installed will have a CAGR of 20% through 2020, WW 17.5%

The 2020 IoT AP TAM will be USD 2.60 trillion out of USD 7.07 trillion globally

Key Successful Factors of IOT enabled Smart City Applications

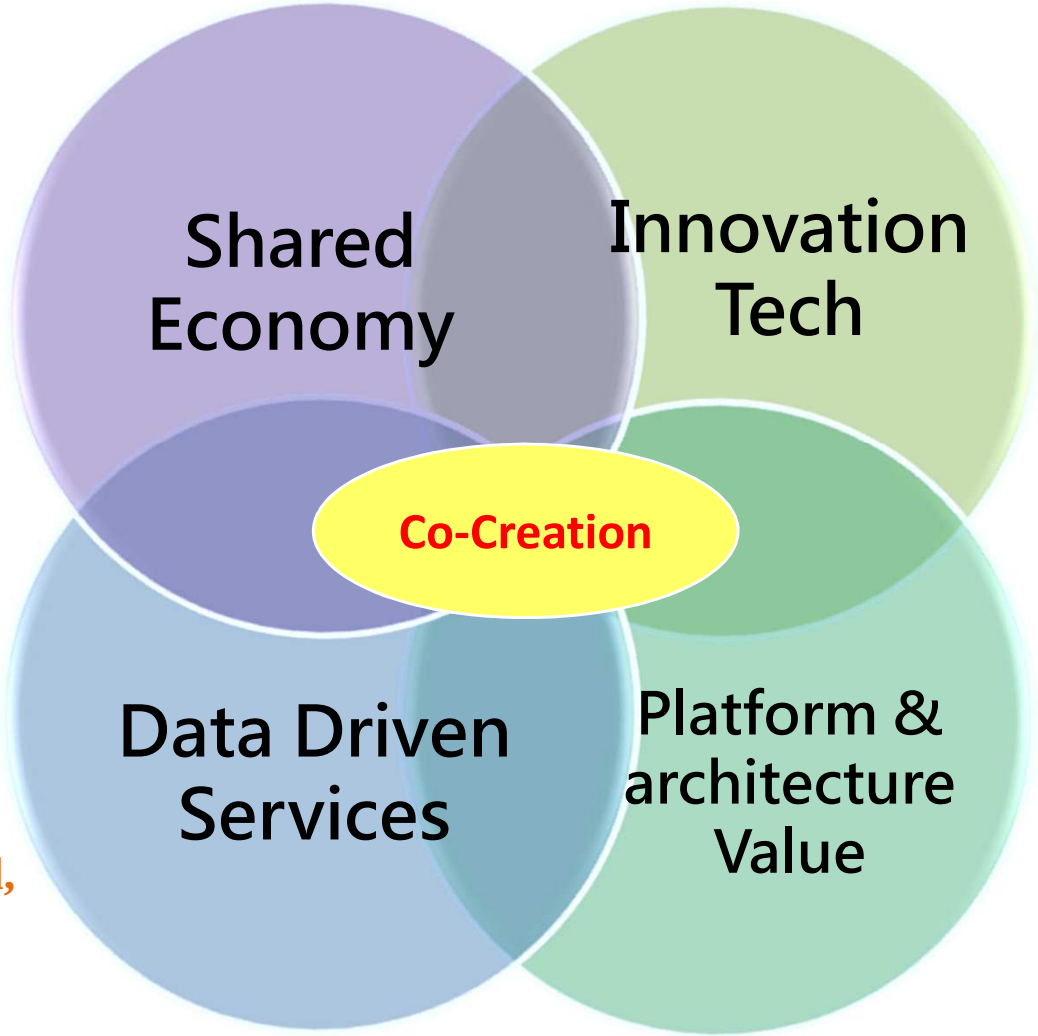


Smart City Value Chain and Ecosystem

Successful IOT services= function of (User behavior、Service/Content、Solutions、Devices、Network、Business Model、Operation Model)

IoT Derives New Business Models

- **Shared and Collaboration based Services**
- 「Usage」vs 「Ownership」
- 「Collaboration」vs. 「Competition」
- 「Sharing」vs「Trade」



- **Innovation will last long**
- **From new tech to new services**

- **Platform integrates cross domain assets to form Services**
- **Architecture (like Fog) extends the capability of platform and of smart city**

- **Devices may take small, but data will go big**

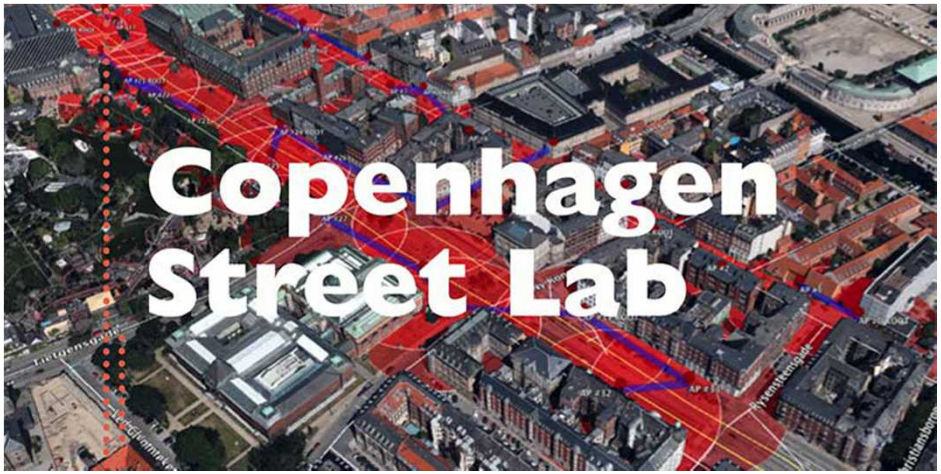
Co-creation with strategical partners to achieve greatest value.

City Serves an Open Innovation Lab

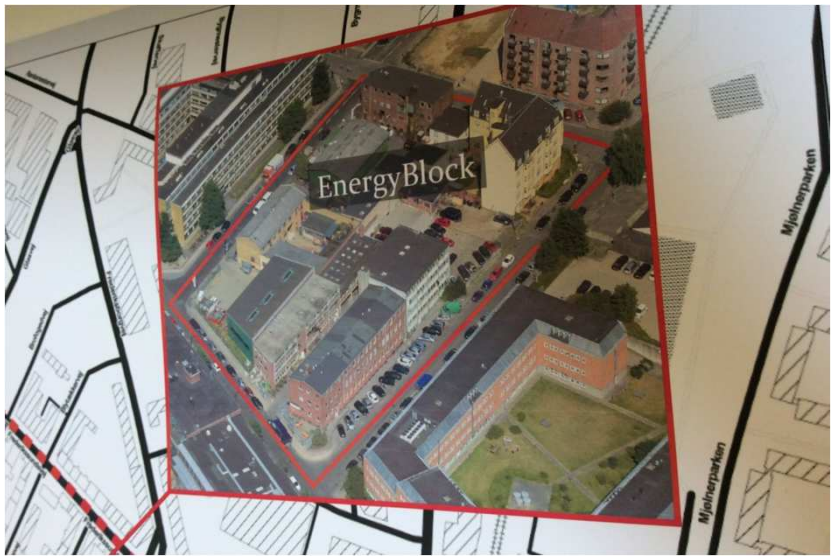
- City area as an **Open Innovation Lab** for **pilot trial** to accelerate the growth of smart city and to encourage the innovative technology or service/applications.
- Service providers or start-ups have the chance to verify their proposed solutions/technologies, while Gov./citizens may change their prospection about the future of smart city.

City of Copenhagen

Examples of Copenhagen



Street lab is in the city center, where people can test new solutions under real urban conditions. So far they have tested solutions such as **smart parking**, **care of urban nature**, **waste management** and measurement of **air quality**.



Energy Block, located in Copenhagen's north-west quarter, is a testing area for sustainable solutions based on **decentralized energy** and blockchain technology. It aims to investigate and demonstrate the potential of the use of **renewable energy** sources **in the real urban environment**.

Successful Case
Data-Driven Energy Efficiency

U.S Department of Energy (DoE) initiated ***The Standard Energy Efficiency Data (SEED) Platform™*** is an open source software application that fills a major market need for data-driven energy efficiency program design and implementation. The SEED Platform enables streamlining of complex building data and allows users to share selected data with partners or make it publicly available.

Standard Energy Efficiency Data (SEED) is:

A Database

- Building owners, governments, or other entities can use SEED to store building energy performance data according to a common, extensible taxonomy

A Data Transfer Mechanism

- SEED includes a standard API which a data owner can use to share selected data with third parties.

An Analysis Platform

- SEED provides a standard structure for building energy data to support a variety of analyses.
- As an open-source publicly-documented database, 3rd parties can build applications for SEED to utilize data in new ways.

SEED Platform Benefits:

Open Source Platform

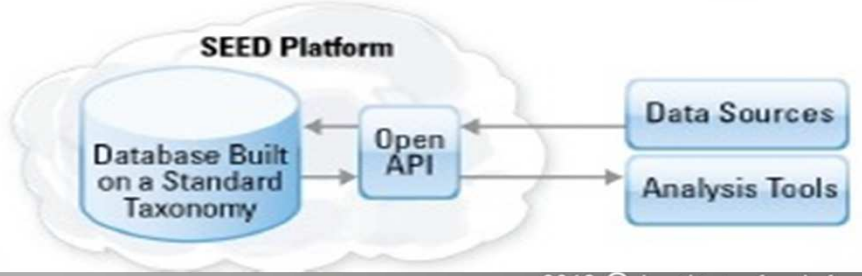
- Low cost for local government to use
- Set up in a matter of minutes
- Security and backup/redundancy in place

Flexible Input Mechanisms

- Portfolio Manager web services
- Spreadsheet upload
- API in future
- Direct entry through web forms in future

Common between jurisdictions

- Comparison of approaches & shared learning
- Sharing of resources & analysis approaches
- 3rd party creation of standardized apps



Consumer Empowerment
Green Button

Smart Disclosure Policy (by U.S Office of Management and Budget)

- the Obama Administration has focused on the "smart disclosure" of data—the act of making data more readily available and directly useful to consumers in the marketplace.
- Smart Disclosure enables to build comprehensive data privacy mechanism and to integrate open data and my data to create profound business opportunity of big data.

Smart Disclosure and Consumer Decision (by U.S Office of Management and Budget)

- is an innovative new tool designed to empower consumers make better informed decisions and benefit from new products and services powered by data.
- allow to expanding access to data in machine-readable formats so that innovators can create interactive services and tools that allow consumers to make important choices in sectors such as health care, education, finance, energy, transportation, and telecommunications.

Green Button **is initiated by U.S DoE in January 2012, a secure way to get your energy usage information electronically**

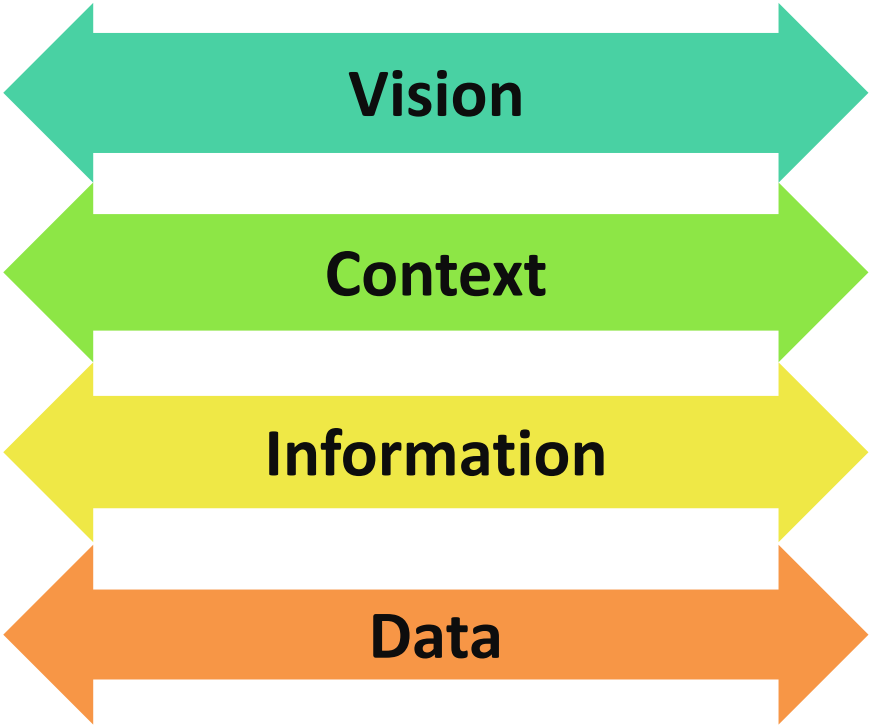
- Today, more than 60 million households and businesses can use Green Button to access their own energy usage data from their electric utility(58+), and a growing set of companies are offering products, services, and applications(65+) that use Green Button data.

Summary 1: Need to have in-depth collaboration with Cities

- To tackle the city's problems, increase city's efficiency & to improve living quality (citizen centric) and increase city competitiveness.
- Provide urban services focused on citizens' experience.
- Support/encourage citizens' participation.

Smart City Operating Governance Framework

City Operations
=
Efficiency



City Environment
=
Citizen Centric

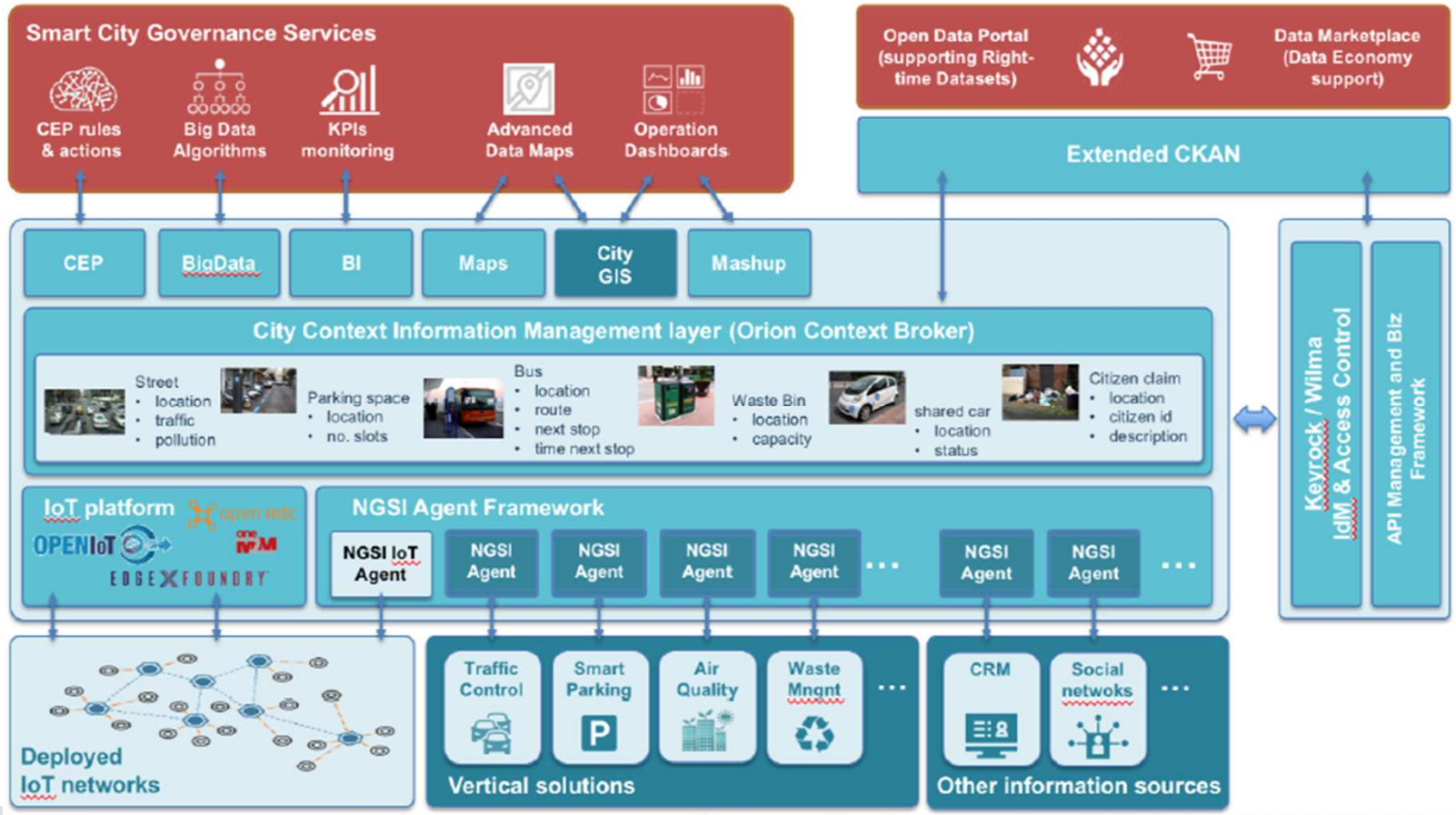
Measurements and Key Performance Indicators

Source: Gartner, 2016; k-smartcity.kr

Summary2 : Smart City Requires Combination of Vertical and Horizontal technology/systems

- **Integration of different technology into a strategic approach to sustainability, citizen well-being and economic development.**
- **Connecting city's vertical systems to become a large-scale Smart City IoT/IoE System.**

Smart City Reference Architecture by FIWARE



Source: FIWARE

Summary 3: Making Sense of Data

- Smarter cities of all sizes are capitalizing on new technologies and insights to transform their systems, operations and service delivery, which sees transformative possibilities in using ***big data*** and ***analytics*** for deeper insights.
- **Open data** provides free of charge information, which gives citizens or private-sectors opportunities to create innovative service or applications.
- According to Mckinsey Global institute analysis, ***Open data*** (public information and share data from private source) can help unlock ***$3 trillion to $5 trillion*** in economic value annually across areas such as energy, transportation, education, health-care…..

- Data Availability
  >> **Data** is the King
- Data Accessibility
  >> **Access** is the Queen

Source: Mckinsey Global Institute analysis, City Data Exchange Market

London Datastore:
City Open Data Platform

- Receives over 30,000 visits a month
- 450+ transport app has been created using open data

https://data.london.gov.uk/

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- Internet of Things (IoT) enable Smart City Development
- **Taiwan's Smart City Status and Solutions**
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Taiwan's Internet of Things (IOT) Development Strategies

Taiwan Official IOT Development Strategies

Concluded by 2011 IOT Strategic Review Board (SRB) Meeting (Oct. 2011)

(1) Technology & Industry Development

1. Core Technology Research/Development and IPR Development
2. Influence International Standards

↓

Incubating Large-scale IOT System Integration Companies

↓

Verifying Killer IOT Applications in 2 Major Trial Fields

↓

Building Taiwan as a Global and Asia-leading IOT Innovation Center

(2) Field Application & Promotion

Disaster Prevention/Relief

Smart Transportation

Smart Buildings /Cities

Smart Grid

Distribution and Logistics

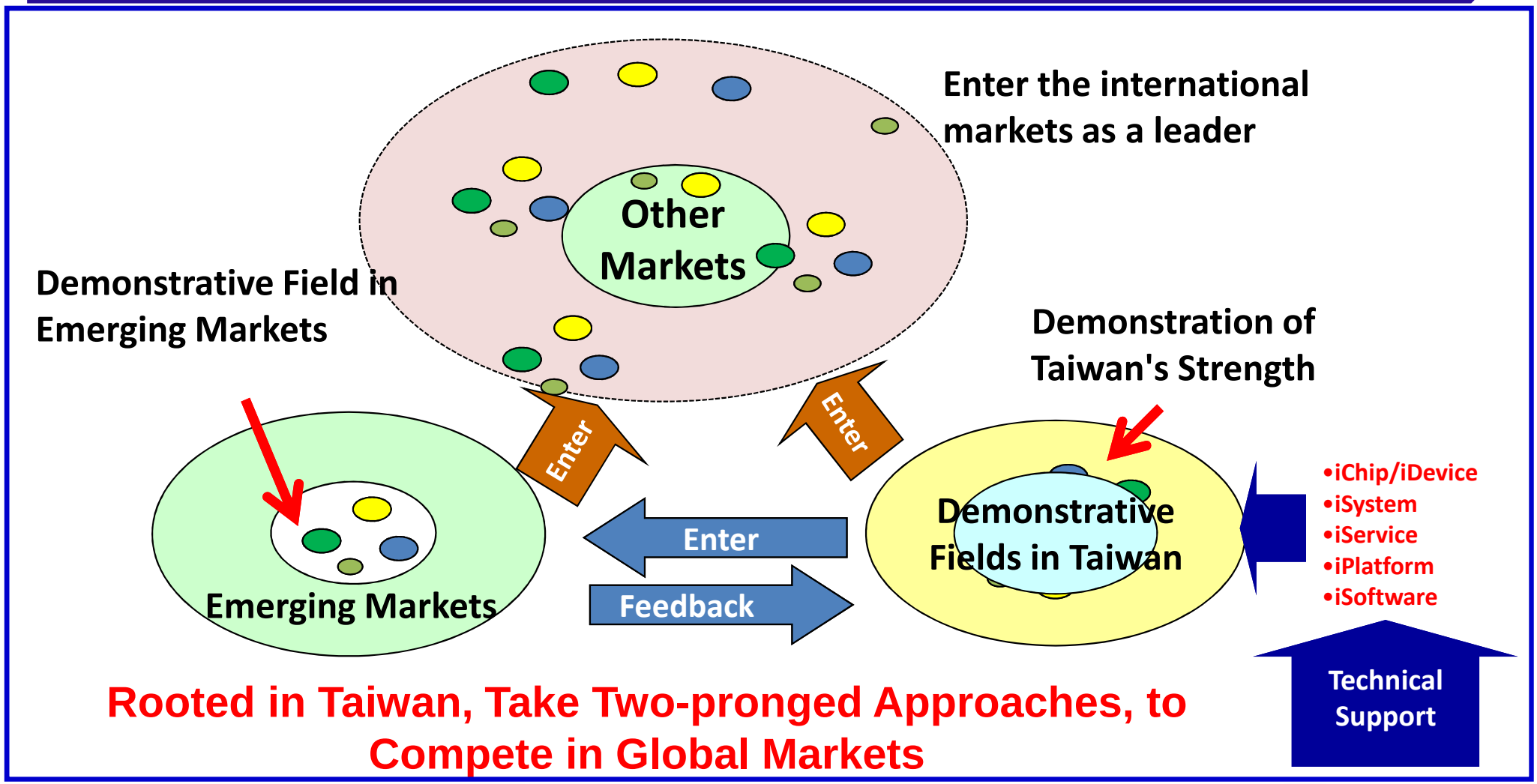
Taiwan is great for Smart City Collaboration and Trials

- A densely populated country facing urgent challenges to use new technologies to solve mobility, environmental and safety issues
- Constantly promoting PPPP-based initiatives in the area of IOT based Applications

Mobile Penetration:	127% of the population (‘16) 29.7M subscribers
Internet Penetration:	83.8% of the population 19.7M subscribers
Population:	23,464,787 persons (‘16)
Island Land Area:	36,175 km2
Population density	649 persons/km2
GNI (Gross National Income) per capita:	US$ 22,598 (‘15)
Strong Industrial Clusters	3C industry Semiconductor & IC design

Strategy : Solution Field Trials to New Market Development

Topology Internationalization: Integrate the industry, academy, and research units to collaborate in international application field export



Rooted in Taiwan, Take Two-pronged Approaches, to Compete in Global Markets

III's Operation & Business Focus

* Founded 1979, HQ in Taipei
* Government sponsored NPO
- 1800+ personnel
- 75%+ holding M.S. or Ph.D

* Goals:
- Development of Taiwan's ICT industry
- promotion of information society in Taiwan

III's R&D Awards

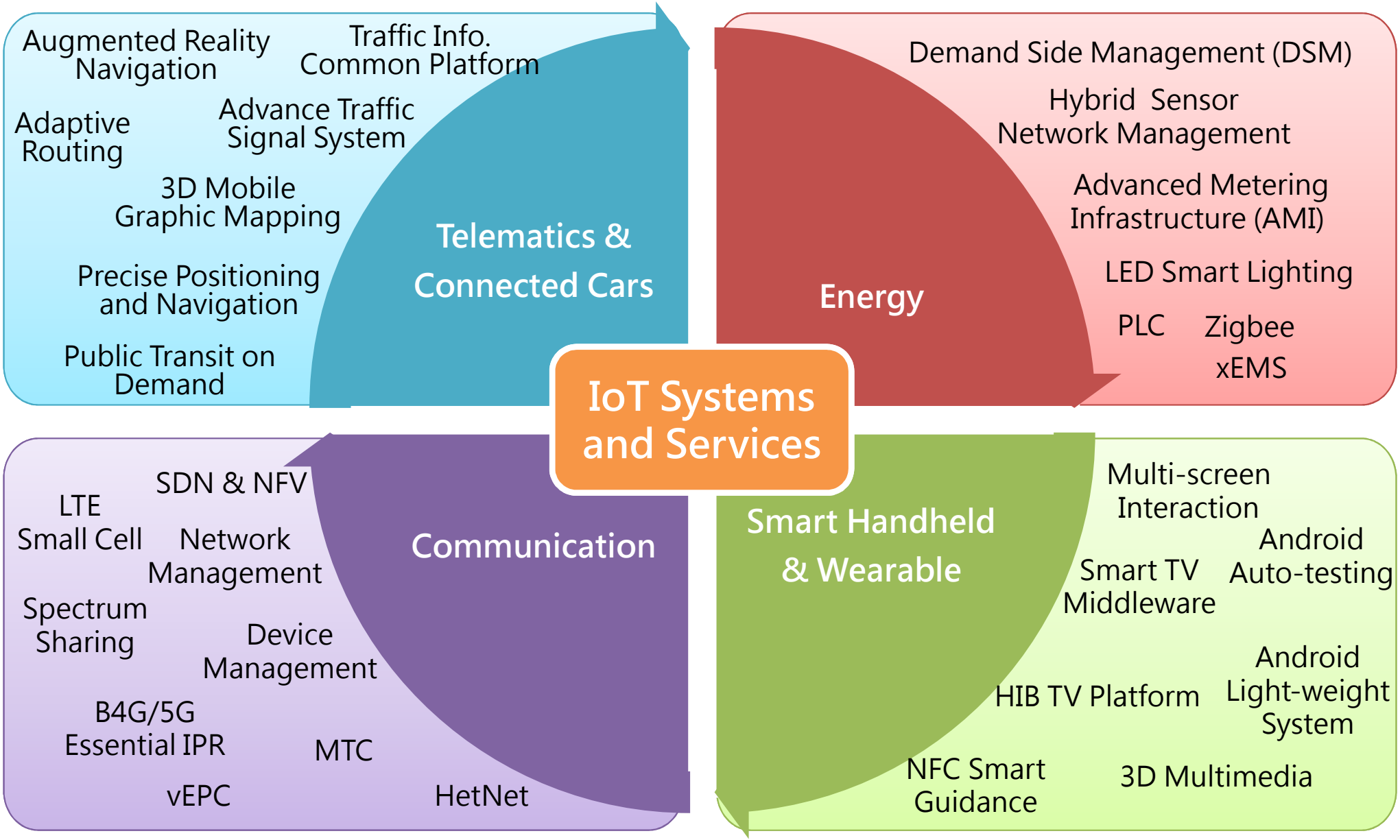
WITSA

2017 – Remote Master
Smart Glass Solutions
2015 - Smart Energy Solution

2016 – Smart Glasses Guides
2013 – Zigbee CraneAbide
2013 – BestLink
2012 – RFID-MF

2014 SS Shapewear
2012 Interactive InMedia Bus info stop

Smart System Institute (SSI)
ICT/IoT Core Competence



Taiwan's Involvement in Related Standards

Taiwan's Standardization
TAICS TC8: Internet of Vehicles (IoV

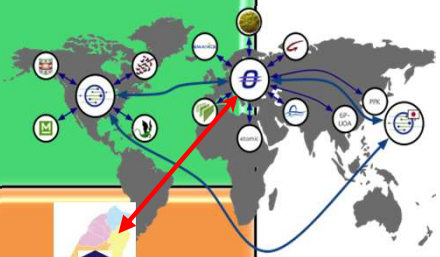
International Collaboration and Relationship

❖Japan

- Smart Vehicle (standard and technology)
- Smart energy
- SDN (Okinawa Open Labs)

❖ France (UPMC, INRIA, CEA Leti, Sigfox...)

- IoT technology and platform
- M2M in 5G research and testbed



IoT Technology Development

❖ USA

- Talent exchange, visiting with USC, Columbia, MIT, etc.
- Standards / Alliance: OpenADR, OpenFog, NIST smart city

❖ Europe

- Smart Energy and Smart City collaboration
- 5G for Factories of the Future

IoT Platform：

Product Description

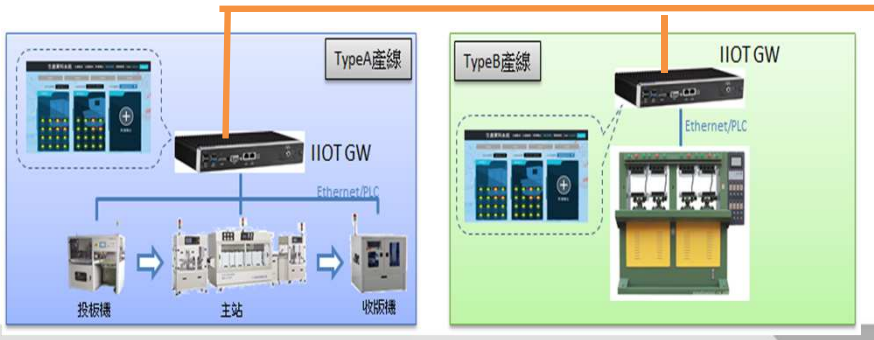
- Edge to cloud integration ready
- Provide standard methods to connect machines, data, and system
- Analytical insights to optimize industrial infrastructure & operations

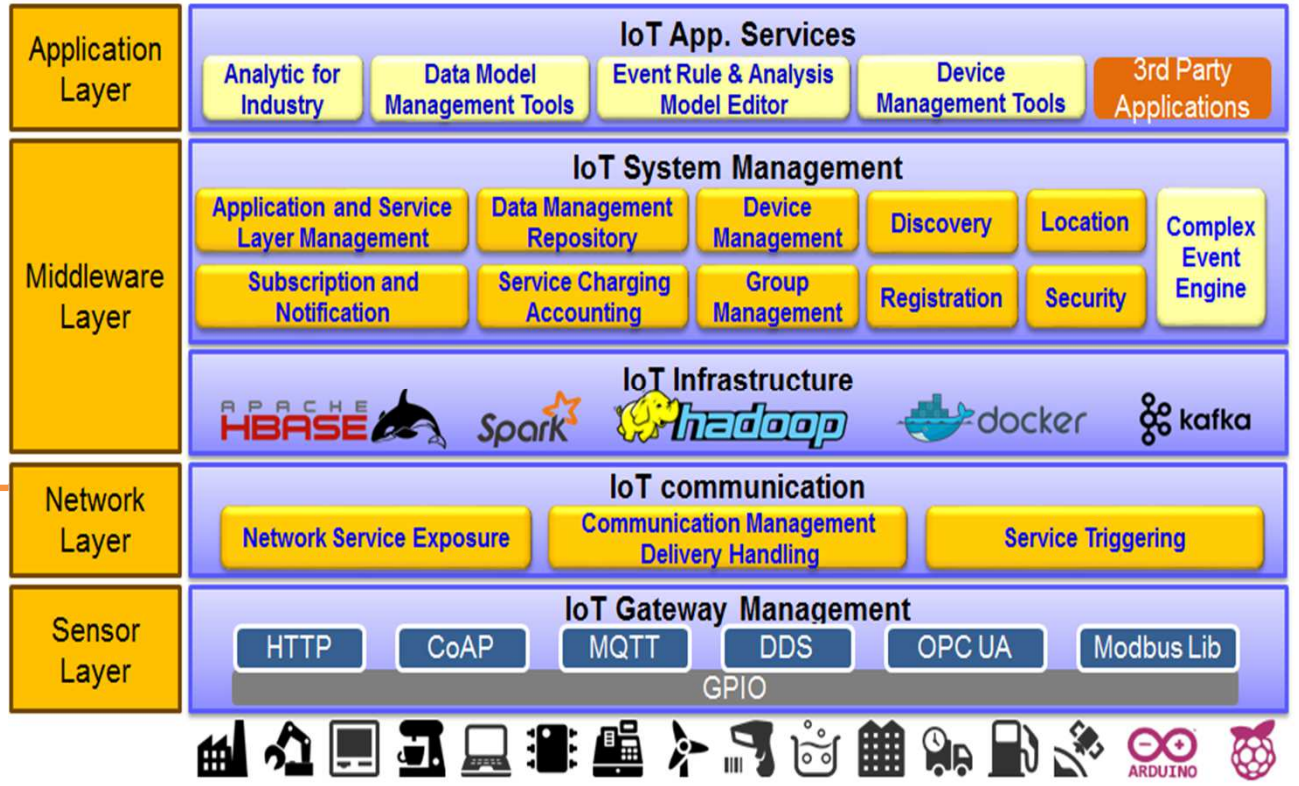
Features

- IoT Data management
- Application & Service management
- Device Management
- Analytical for Industry
- Edge to connect machines/devices
- Accounting & Charging

Partnership

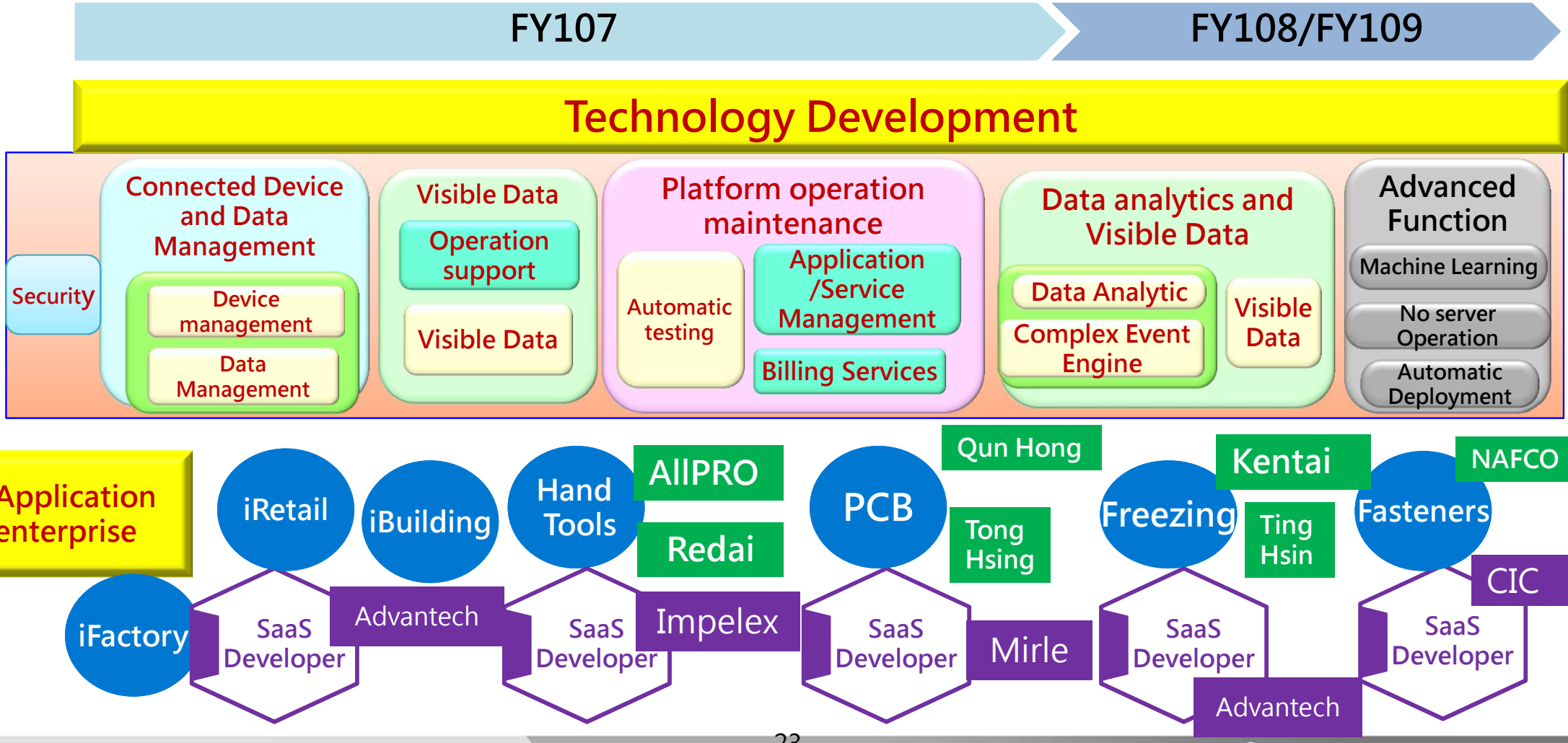
III, Advantech, ADLINK, NEXCOM, ITRI





Business Models and Ecosystem of IOT Platform - EI-PaaS

EI-PaaS Platform is a cloud-based IoT platform jointly developed between III and Adantech and enables enterprise to save platform developing time and aims to **deliver IoT SaaS Enabling cloud platform** for industrial connected devices and system integration application for vertical domain field such as Smart Manufacturing, Smart Retail, Smart Logistic, Smart PCB, Smart Hand Tools in order to satisfy the industry needs in the area of intelligent device , digitalized data and manufacturing visualization



Smart Communication:
III NB-IOT Open Lab

UE:
Hwawei、
Qualcomm、
Intel、
Amarisoft

Sanjole

R&S

Azimuth

III UE emulator

TM500

NB-IoT eNB

S1-lite

III CSGN

Amarisoft
Polaris

T6a

SCEF

Non-IP

SGi

IP service

App Server

Smart home (electric/water/gas meters)、Smart parking、Smart city、Smart building、Agriculture/environment monitor、Wearable devices etc..

Partners: Aalto University in Finland

Services:

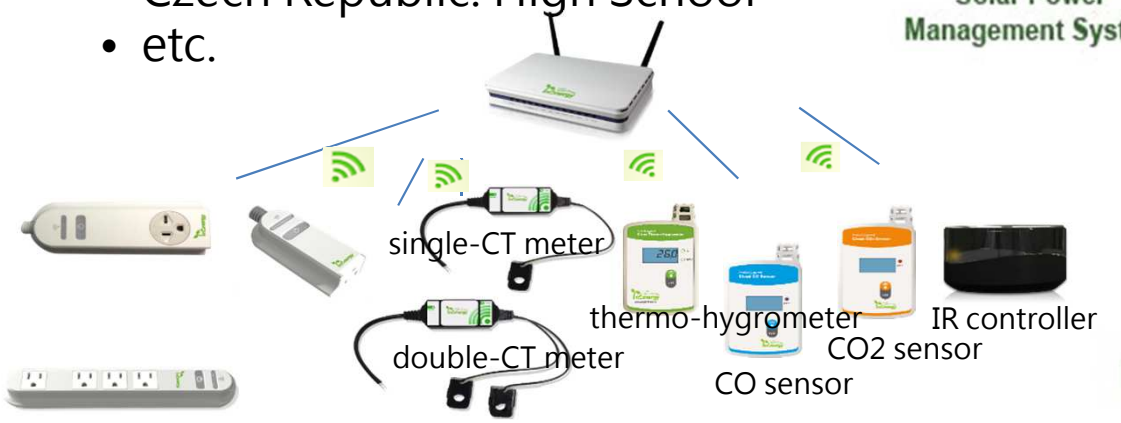
- III NB-IoT eNB & CSGN
- Tester equipment: Sanjole、R&S、Amarisoft、Commercial UEs、TM500、
- III UE emulator
- Inter-operable system test: Tput、latency..
- Sensor and application development

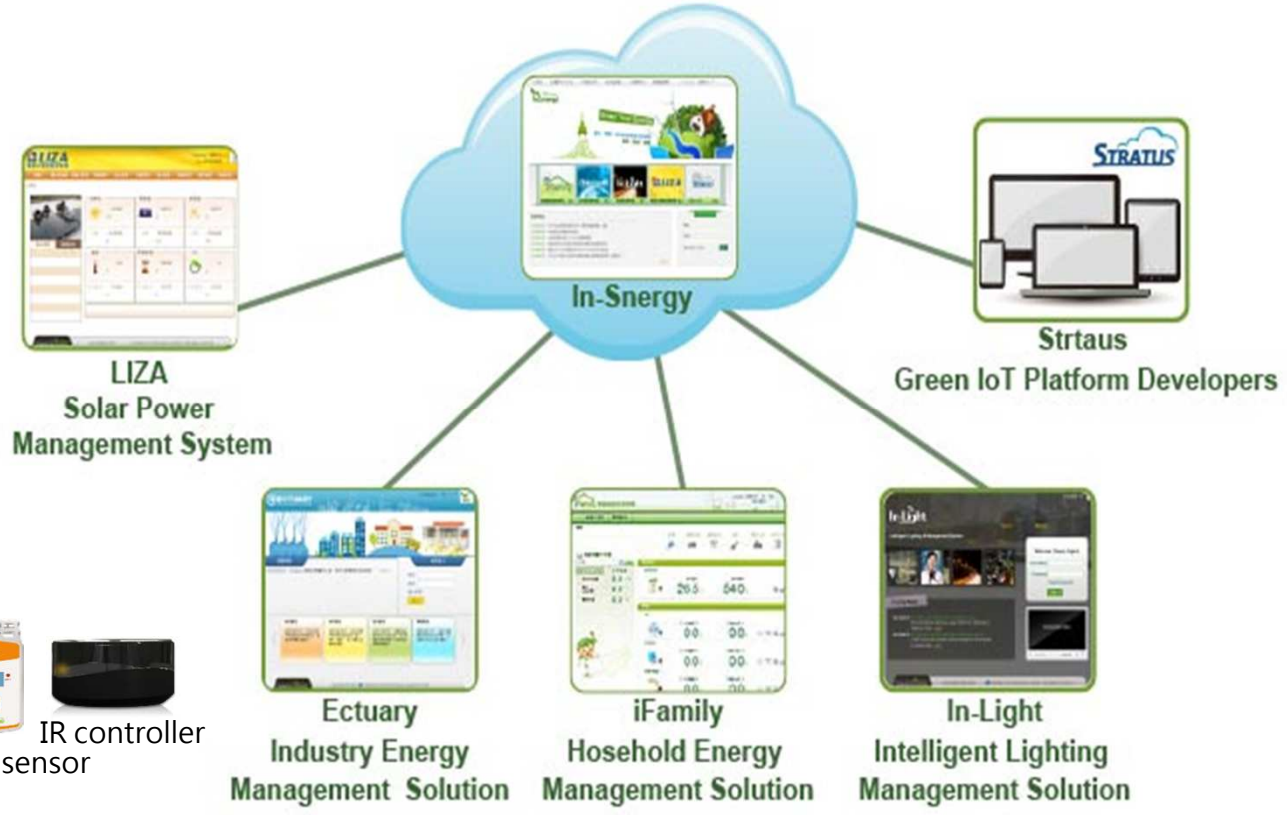
Smart Energy
IOT enabled Energy Management System

- Integrated support for a variety of IOT devices
- Remote monitoring & control of appliances
- Data analytics and intelligent decision support

Customers

- 7-11 Chain Stores
- Optical Company : Auo Optronics
- Daikin, Hitachi
- Burkina Faso, Africa: Solar Power Monitoring and Maintenance
- Czech Republic: High School
- etc.



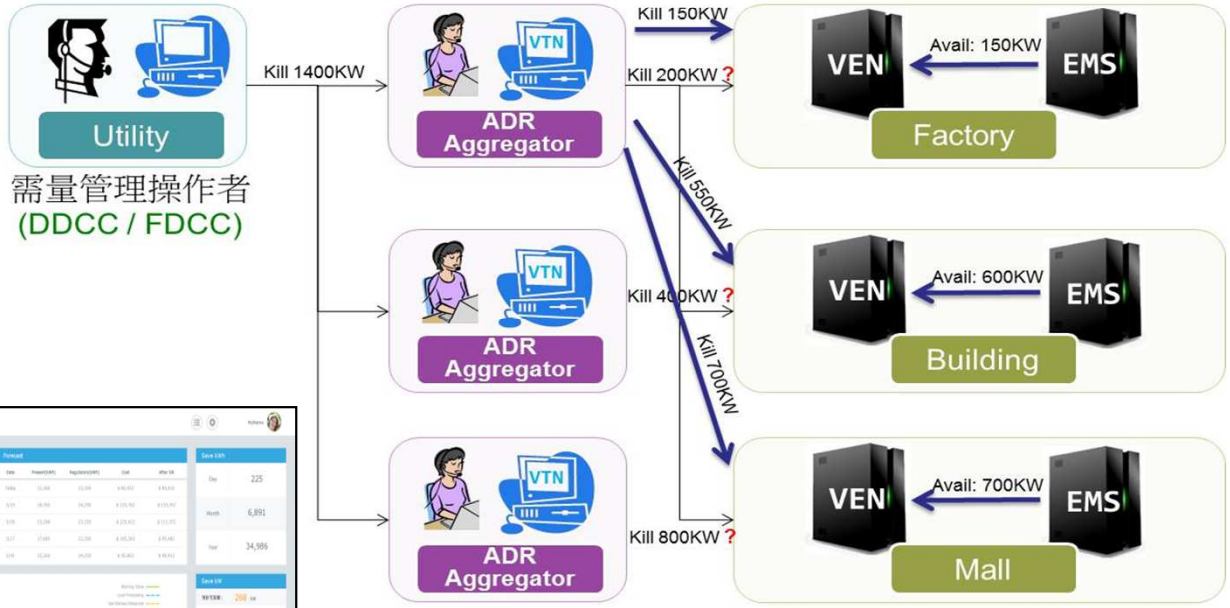


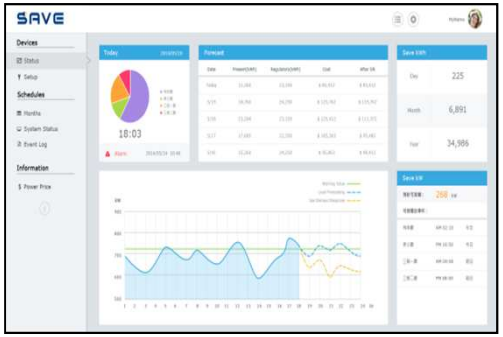
Smart Energy：
Demand Response Management System(DRMS)

- OpenADR 2.0 Certified DRMS
- Taiwan’s 1st ADR Field Trial
- Support for Direct Load Control (DLC) and Demand Bidding

Partners

- Taiwan Power Company
- Domestic ESCOs
- Local Universities
- Fujitsu (Japan), etc.





Smart Wearable:
Smart Glass Solution- Remote Master

Product Description

- **Remote Master leverages dynamic object tracking and image synchronization technologies to ensure the guidance information's integrity and enable the accuracy of the remote annotations.**

Features

- Dynamic Object Tracking
  - ➢ Provide the accuracy remote annotation.
  - ➢ Response Time < 170 ms/frame, Accuracy > 94%
- Image Synchronization Technology
  - ➢ Calibrate the screen overlap

Partnership

- Jorjin
- China Steel Corporation
- Formosa

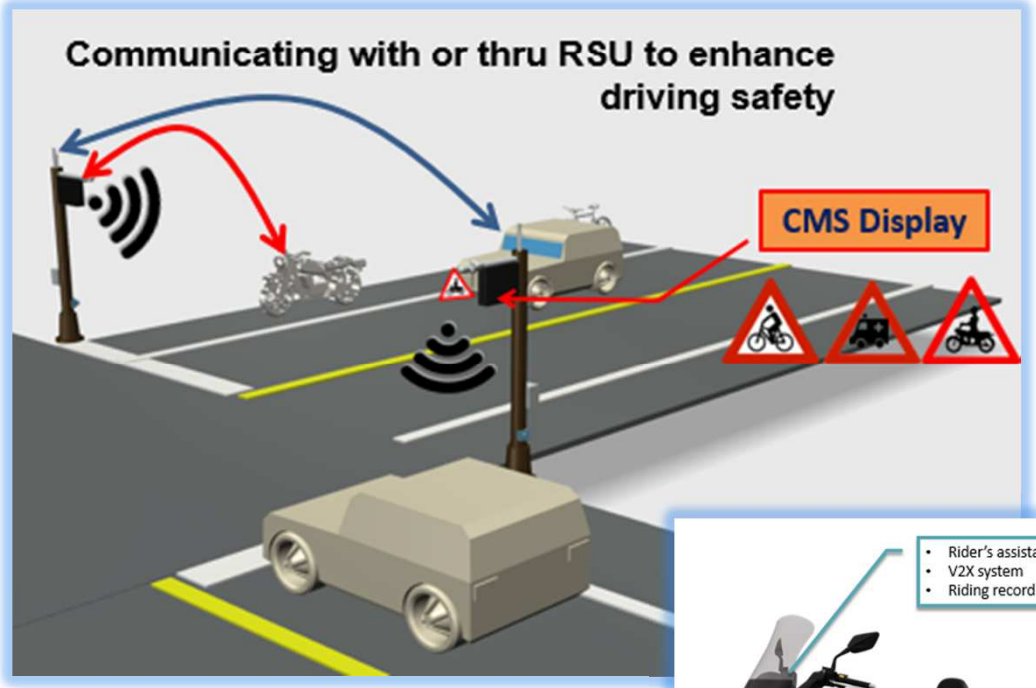
Smart Transportation:
V2M Motorcycle Safety System

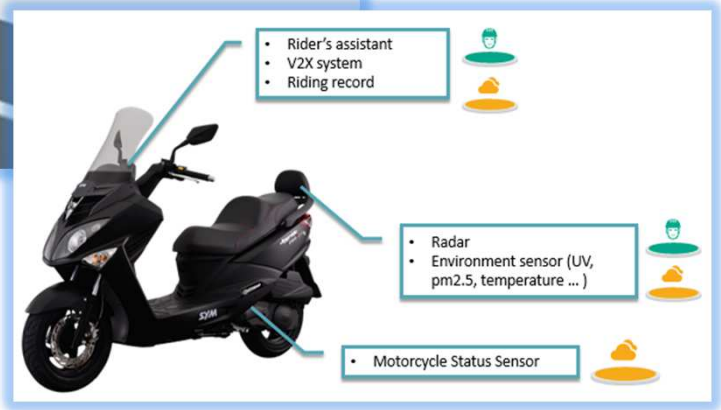
Product Description

- Enhanced driving safety via two-wheeler V2X
- Accurate diagnosis and analysis thru real-time data analytics
- ECO friendliness by various supporting services

Features

- Check motorcycle conditions and analyze rider's behavior regularly.
- Utilize UHF band beacons to inform surrounding vehicles to prevent car accidents.
- Support integrated & highly secured communications to enable "talks" to rider's smartphone and cloud services.





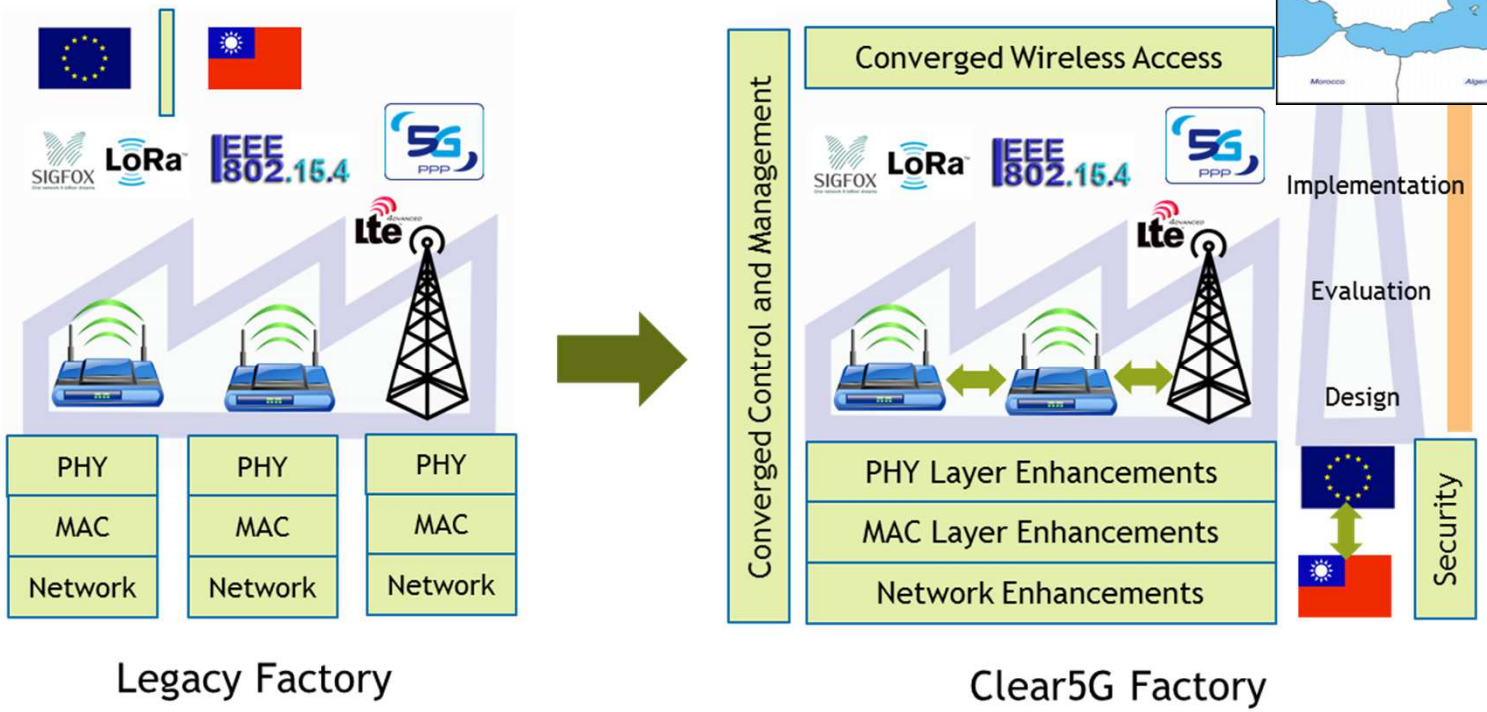
Partnership

- SYM
- ensoul
- SanJet
- ALPHA
- NEXCOM

5G URLLC and International Collaboration
H2020 Clear5G

Converged wireless access for reliable 5G MTC for factories of the future

- Objective: Design, develop, validate, and demonstrate an integrated convergent wireless network for Machine Type and Mission Critical Communication (MTC/MCC) services for Factories of the Future (FoF)



Application Scenarios:

- Distributed Machine Data Communication
- Moving Object Communication

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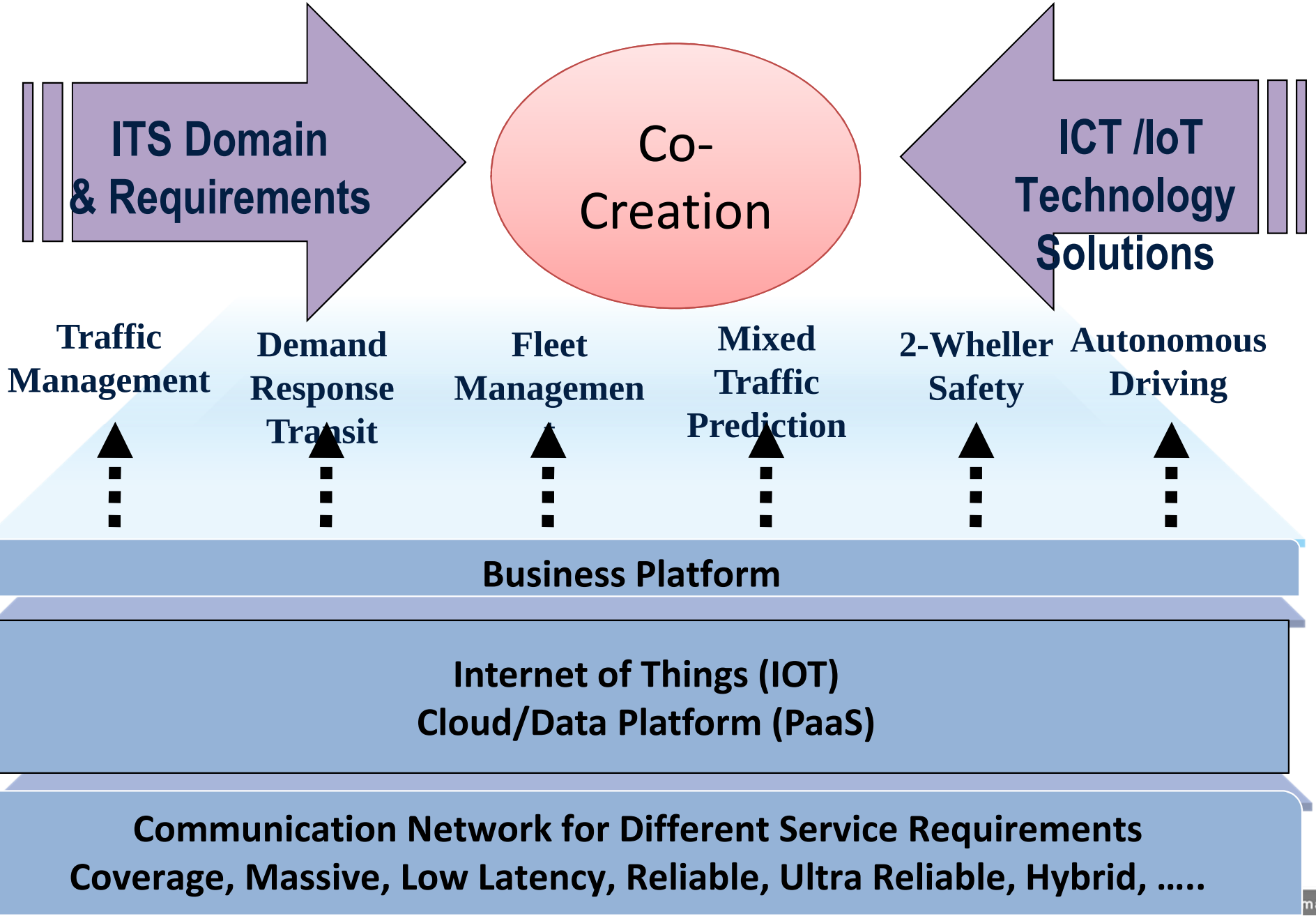
Summary: The 3rd Wave Transformation



Thank You

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