

軍 공개SW 발전 세미나

- 제79회 Open Technet -



IoT 산업에서의 오픈소스 활용 방안

- Data Technology 관점 -

김대영

2015년 9월 17일

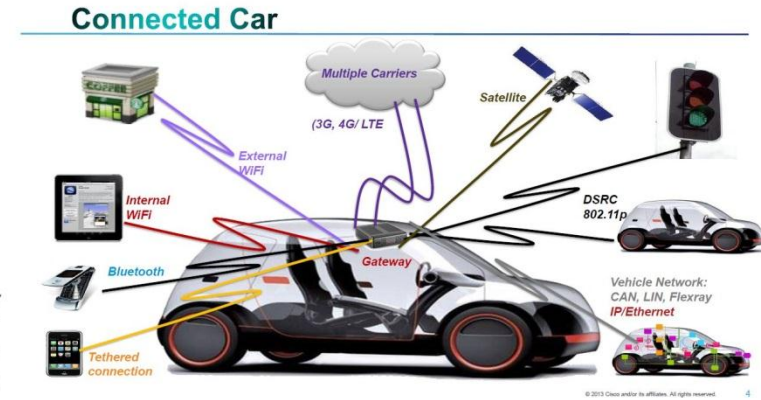
Director, Auto-ID Labs, KAIST

센터장, 사물인터넷 연구센터, KAIST

Professor, School of Computing, KAIST

- kimd@kaist.ac.kr, <http://oliot.org>, <http://autoidlab.kaist.ac.kr>, <http://resl.kaist.ac.kr> <http://autoidlabs.org> <http://gs1.org>

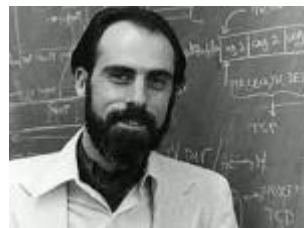
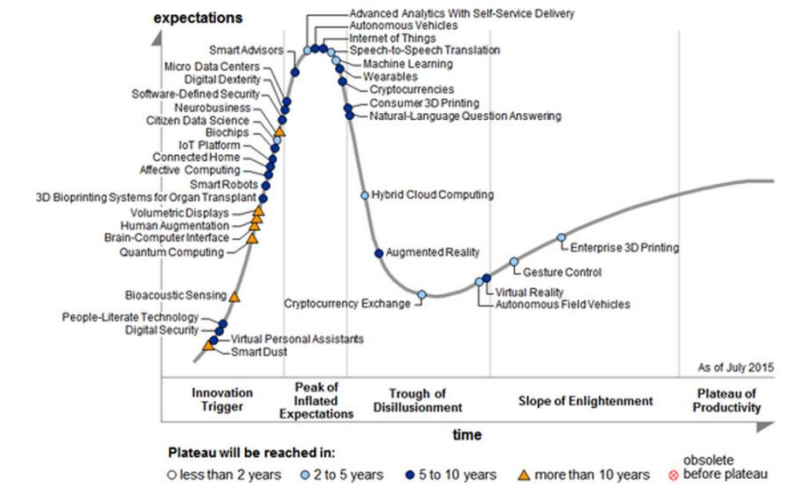
(사물) 인터넷 [Internet of Things] 이란?



사물인터넷의 파급효과



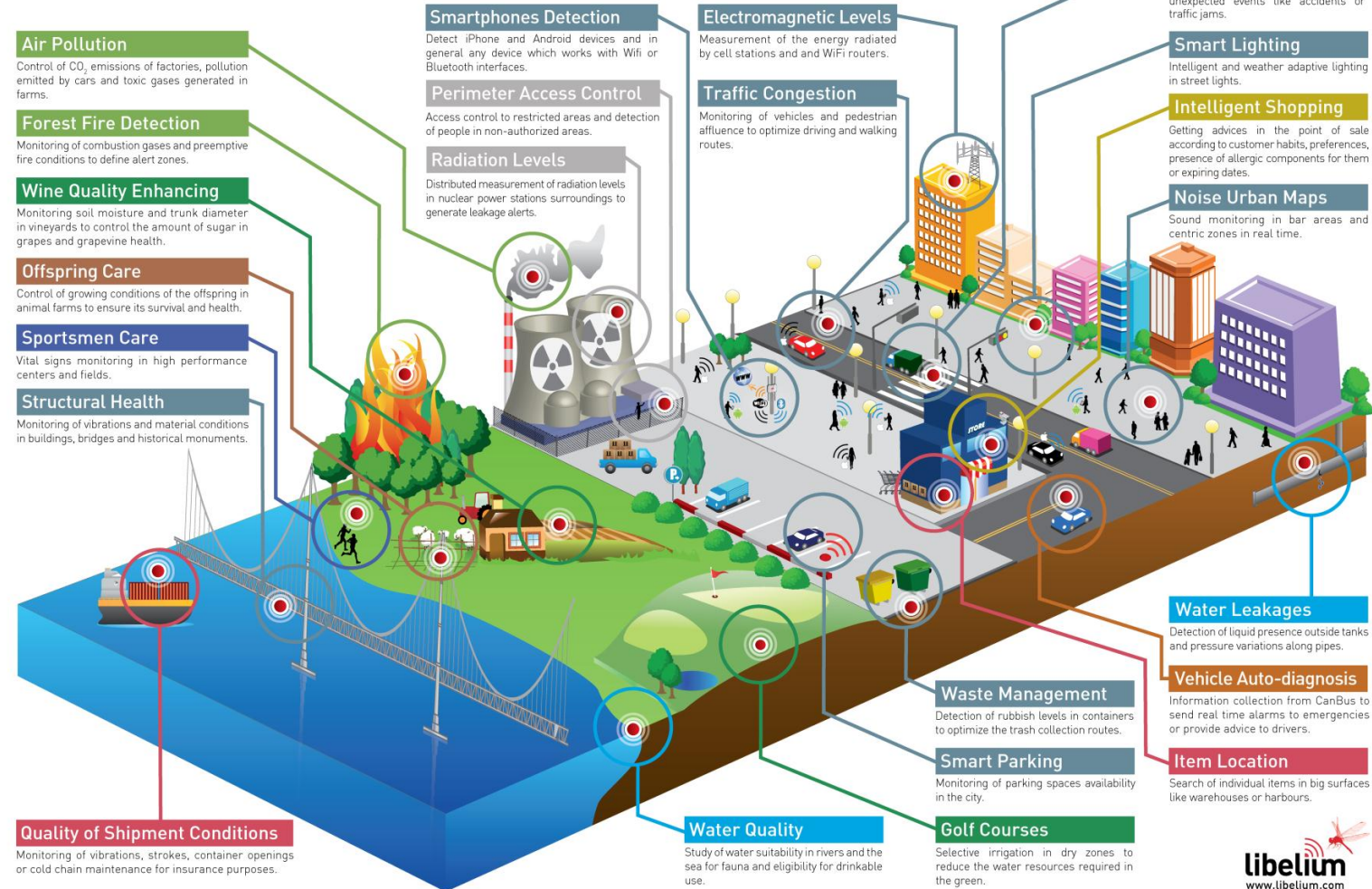
Figure 1. Hype Cycle for Emerging Technologies, 2015



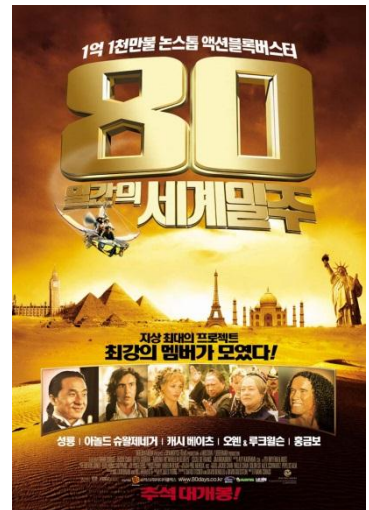
사물 인터넷 사회



Libelium Smart World



Passepartout



(IoT 예제) 커넥티드 자동차 (VW, HP)



Driver behaviour analysis

Usage based insurance



Road quality analysis

Road maintenance optimization



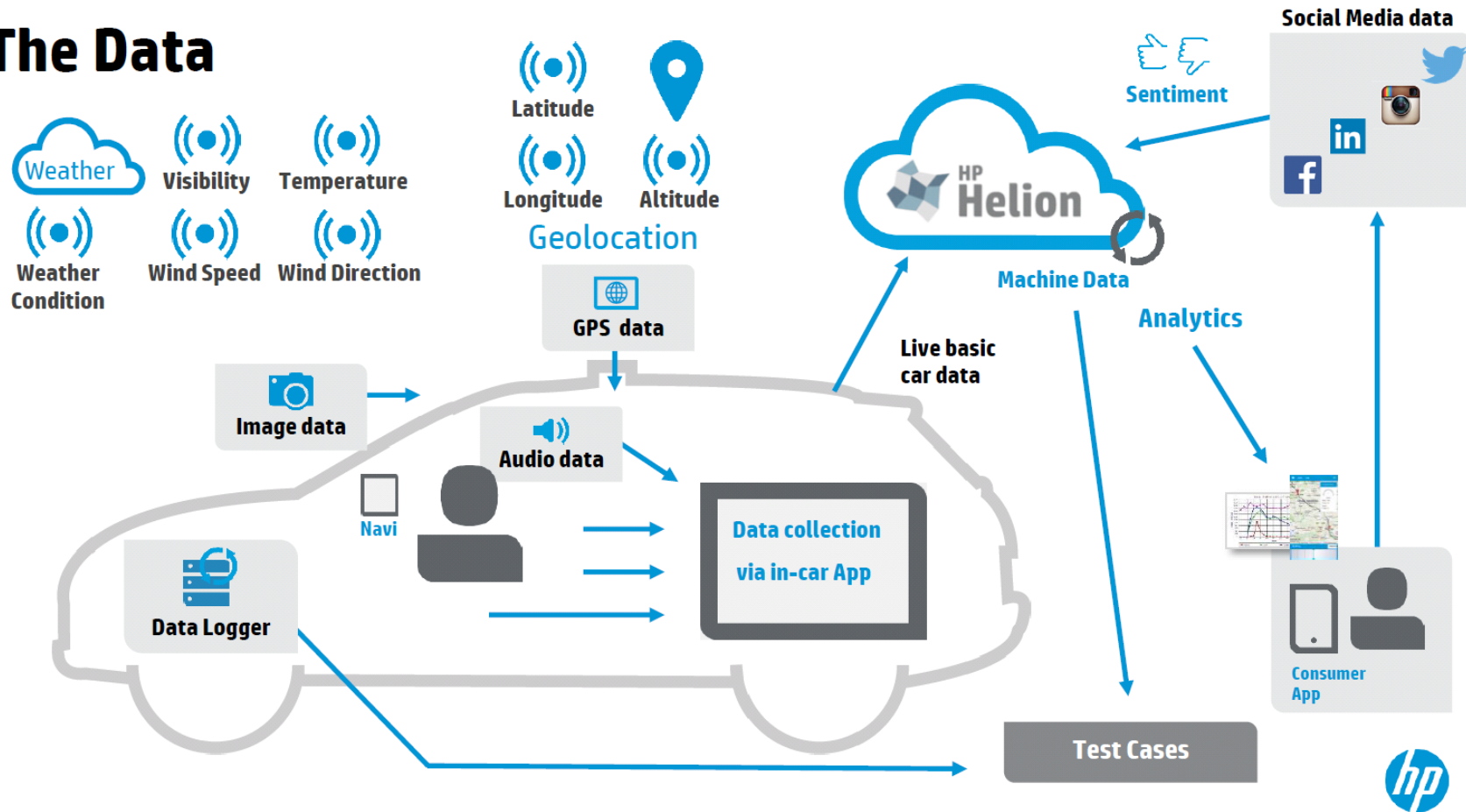
Social media analysis

Channel optimization

(IoT 예제) 커넥티드 자동차 (VW, HP)



The Data



5

(IoT 예제) 커넥티드 자동차 (VW, HP)



Usage Based Insurance

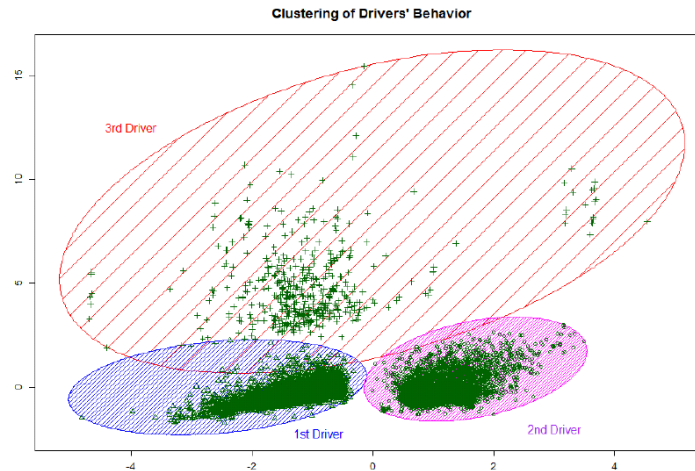
Determine driving behavior

Business case:

- Insurance, car rental or car sharing companies can develop new business models
- Pay-how-you-drive

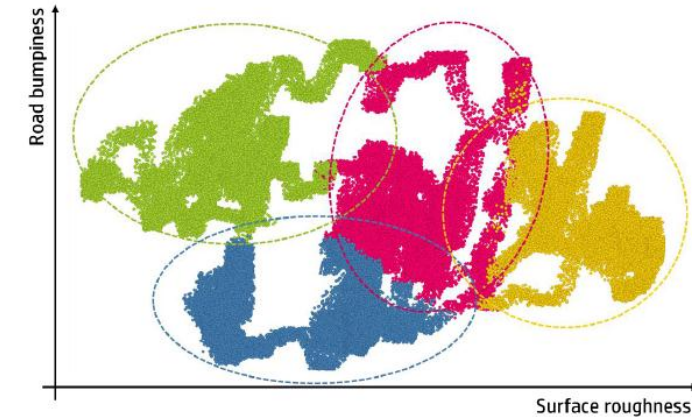
Drive-Style clusters:

- Based on combined throttle position, lateral acceleration, driving assistant intervention, breaking habits, steering corrections, speed



Road Maintenance Optimisation

Continuous road surface identification



Pothole detection

Lat: 4° 30' 58.2834"
Long: 38° 16' 15.1458"

(IoT 예제) 헬스케어 (Withings)



This site uses cookies to offer you a better browsing experience. Find out more on how we use cookies and how you can change your settings.

» I got it.



STORE

PRODUCTS

SUPPORT

CORPORATE



Account



ACTIVITÉ



ACTIVITÉ POP



HOME



SCALES



PULSE O₂



AURA



BABY



BLOOD
PRESSURE
MONITOR



ACCESSORIES

● ACTIVITY ● WEIGHT ● HEART ● SLEEP ● ENVIRONMENT

It's swim o'clock

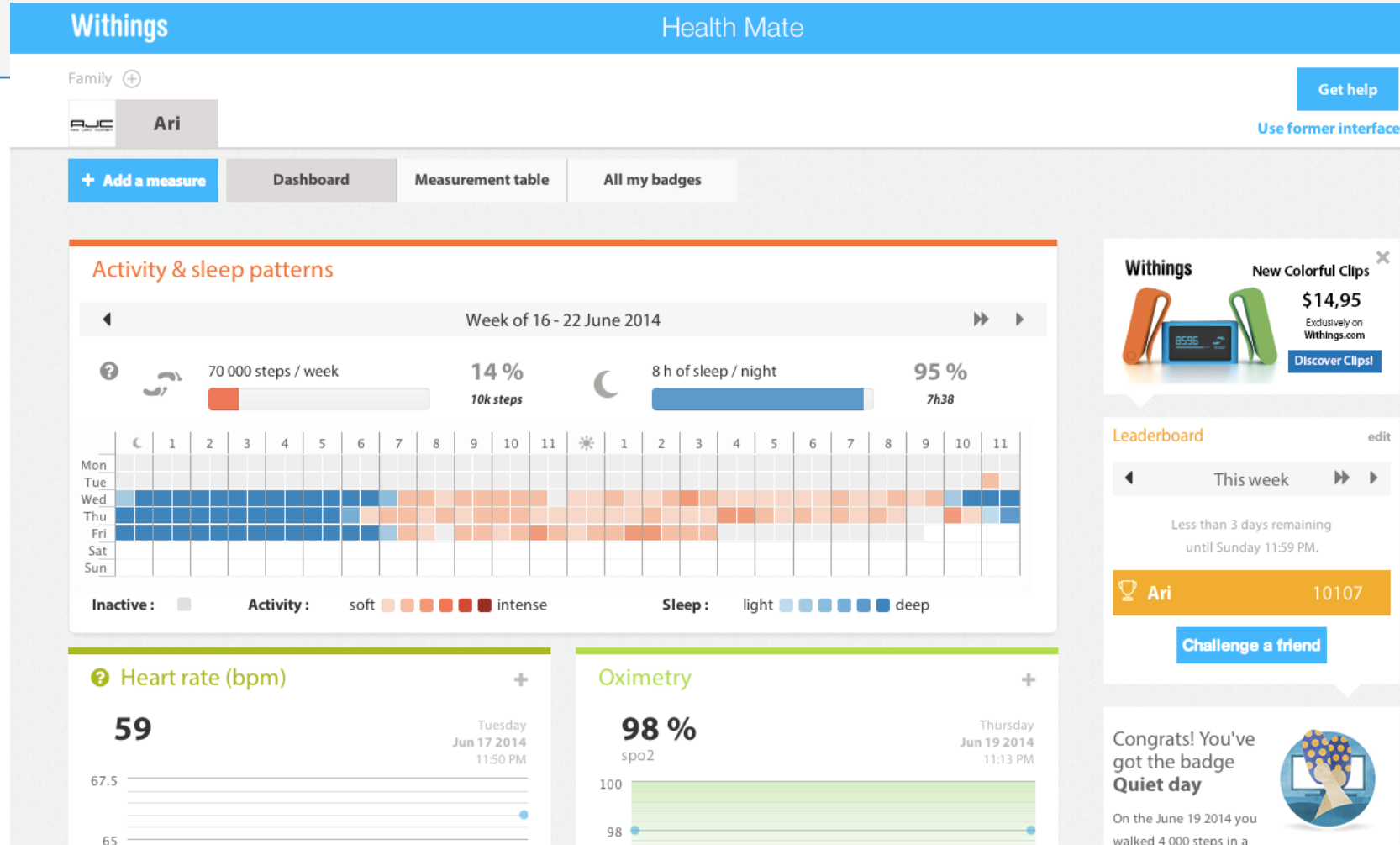
Activité Pop automatically recognizes swim. Just put it on, dive in and the watch will log your full session and record calories burned.



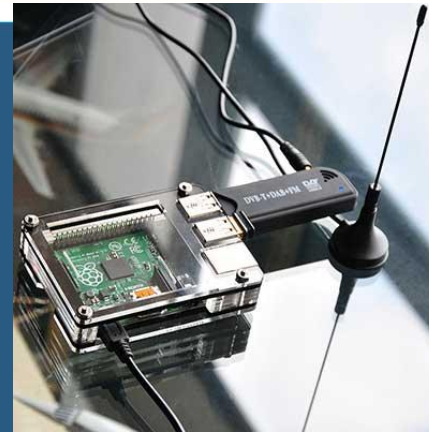
(IoT 예제) 헬스케어 (Withings)



- Withings : Internet of Things, Cloud, and Big Data

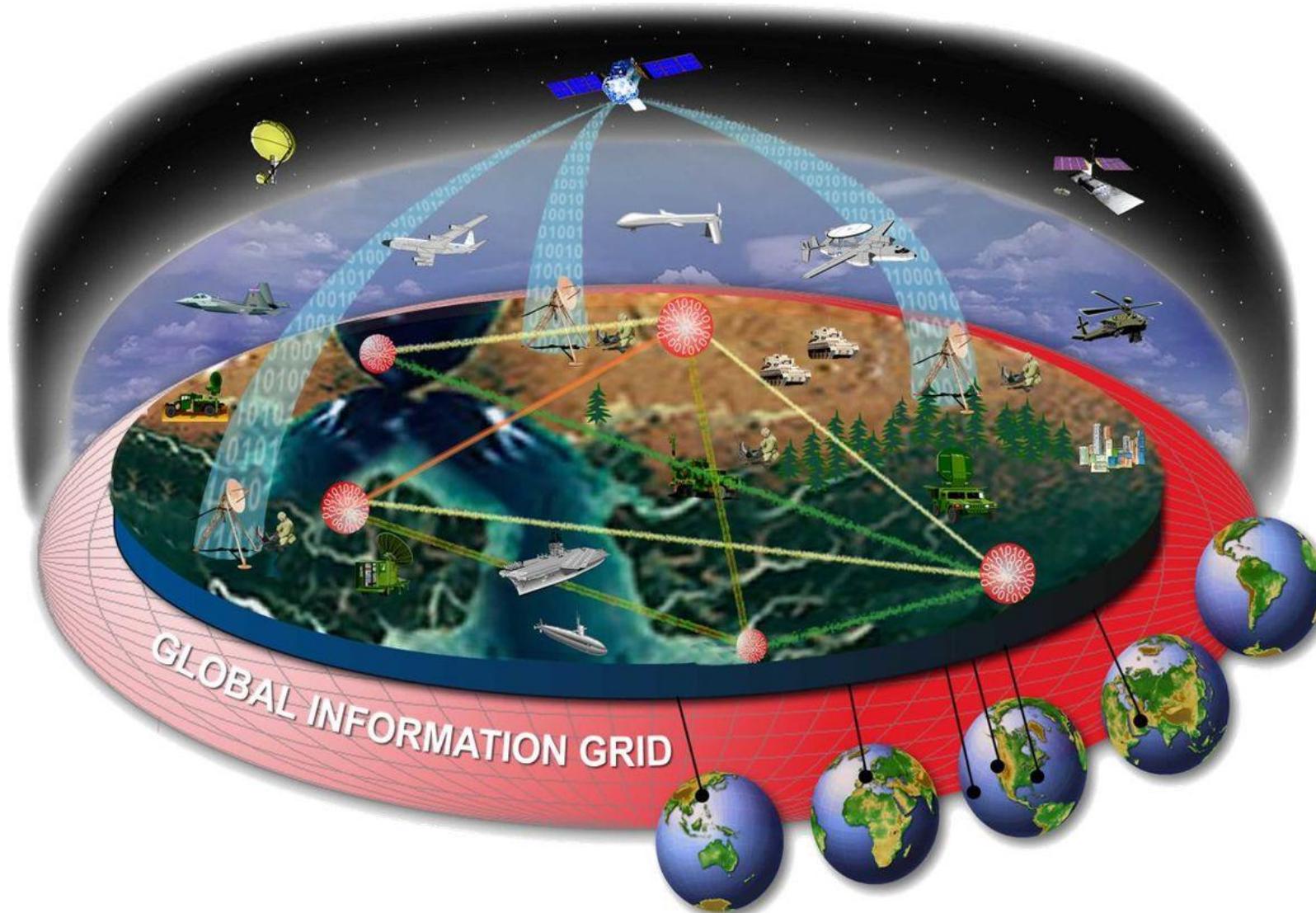


(IoT 예제) 민간항공기 실시간 추적 (FlightAware)



<https://ko.flightaware.com/live/>

국방은 이미 사물인터넷 구축?



NCW



국방은 이미 사물인터넷 활용 노력



경제의 틀을 바꾸면
미래가 달라집니다.

[기고] GS1 바코드 적용 통한 식품안전 강화

2015. 01. 06 15:42 입력 | 2015. 01. 06 18:38 수정

 미래창조과학부  대한민국 국방부 Ministry of National Defense	보 도 자 료	http://www.msip.go.kr http://www.mnd.go.kr
2015. 2. 17(화) 조간(온라인 2.16. 14:00)부터 보도하여 주시기 바랍니다.		
문의 : 미래부 소프트웨어정책과 김도균 과장(02-2110-1810), 이철영 주무관(02-2110-1818) 인터넷신산업팀 유성완 과장(02-2110-1720), 장기철 사무관(02-2110-1722) 국방부 정보체계통합담당관 이광제 과장(02-748-5930), 김종화 중령(02-748-5941)		

미래부-국방부, 공개소프트웨어(SW)· 사물인터넷(IoT) 확산을 위해 손 맞잡아

- 공개SW 및 IoT 분야 기술개발·활용 촉진을 위한 MOU 체결 -

- 미래창조과학부(장관 최양희, 이하 '미래부')와 국방부(장관 한민구)는 2.16(월) 공개 소프트웨어(이하 'SW')와 사물인터넷(IoT) 관련 기술개발·활용 촉진을 위한 협력 양해각서(이하 'MOU')를 체결하였다고 밝혔다.

신병훈련

병영생활

지능형전투체계

감시정찰

사건사고예방

군수품 물류혁신

군의료체계



최지안 중령(진)
국군복지단 검사실장

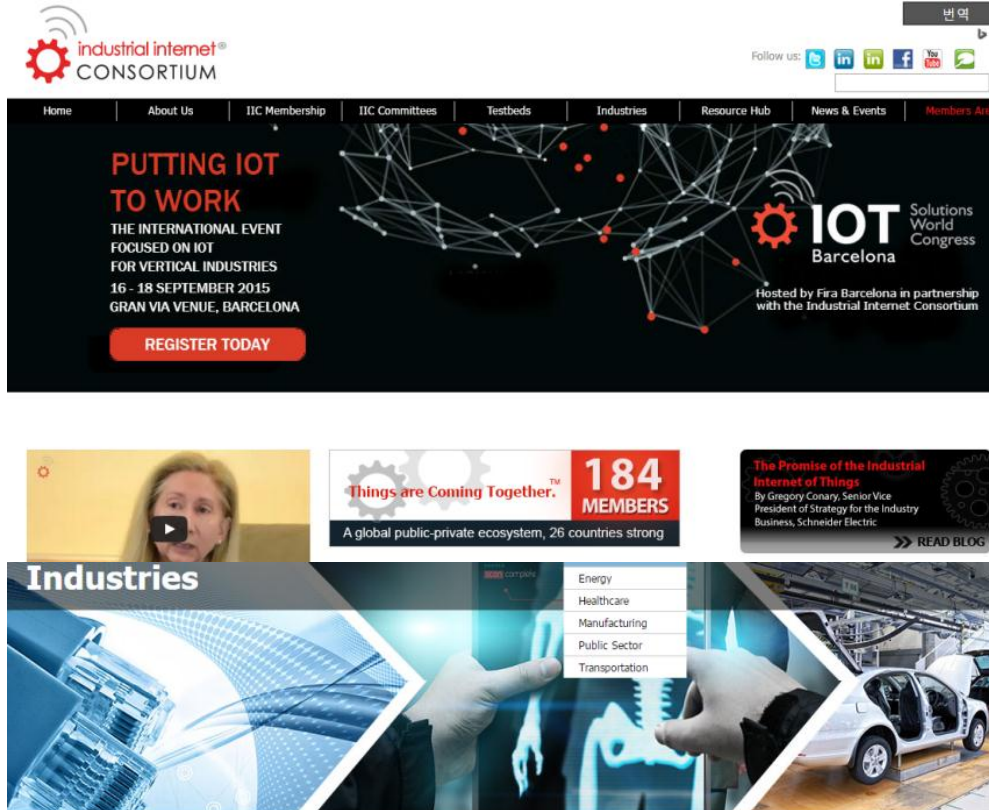
사물인터넷 표준과 기술들



Industrial Internet (산업인터넷) Consortium



<http://www.industrialinternetconsortium.org/>



- Goal: build and prove a common architecture that spans sensor to cloud, interoperates between vendors, and works across industries

1. Intelligent Machines
+
2. Big Data & Analytics
+
3. People at Work

Delivering new solutions and unlocking new potential and value for industry

Slide 14

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Opportunities across every industry



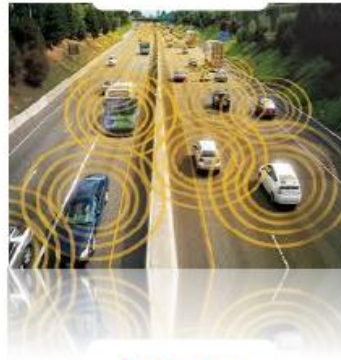
\$30B

fuel cost saving
in aviation
industry



92M

vehicles with
Internet
connectivity on
the road by 2016



\$63B

productivity
improvement in
healthcare



\$27B

productivity
improvement in
rail industry



\$66B

fuel cost saving
in gas powered fleets



68%

decrease in crime
rates with video
surveillance



\$90B

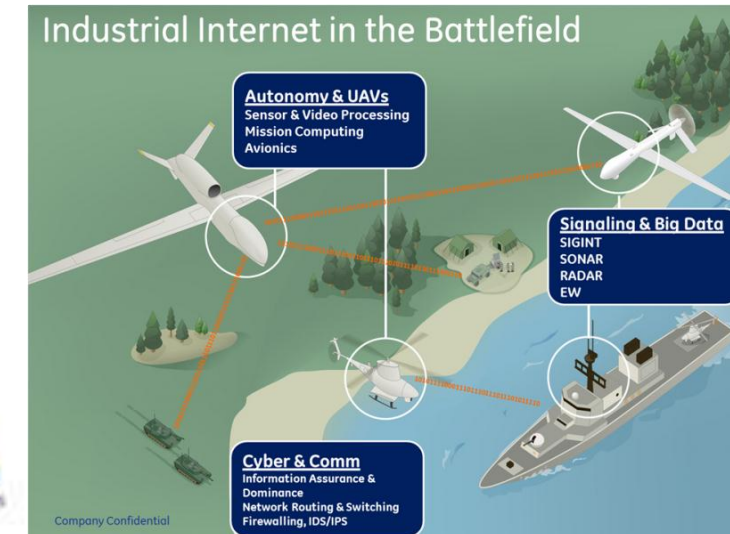
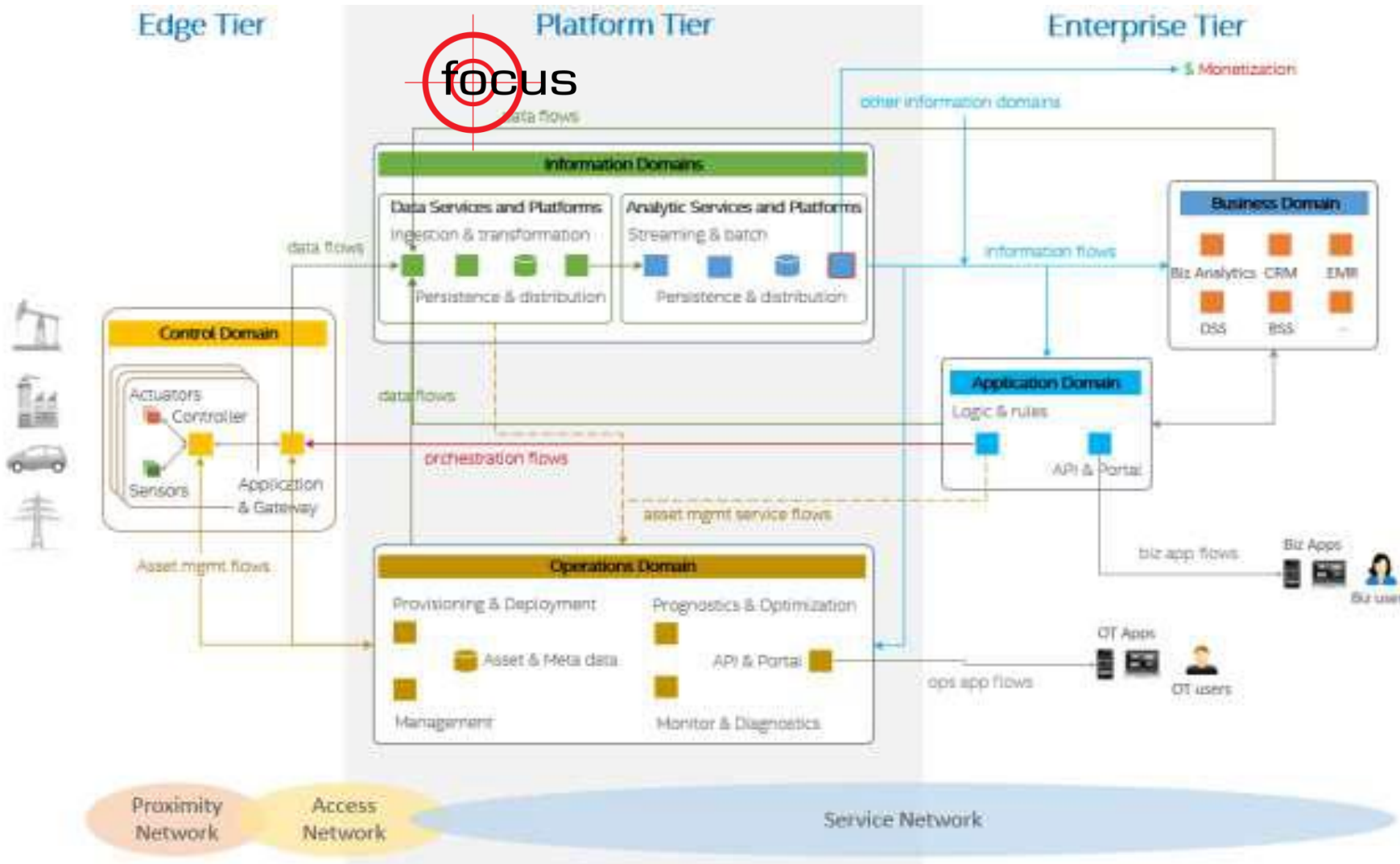
reduction in
Cap X in oil & gas
exploration and
development



Source: Industrial Internet: Pushing the Boundaries (2012, Evans & Annunziata)

© AUTO-ID LABS / KAIST

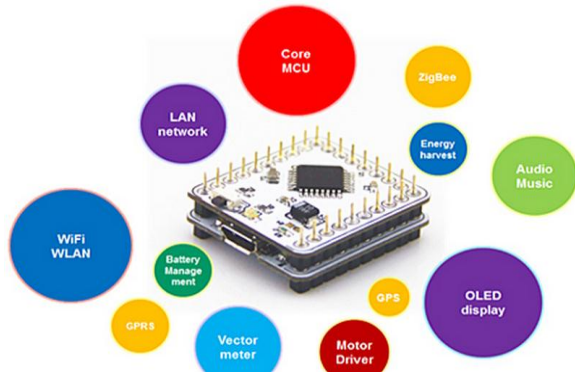
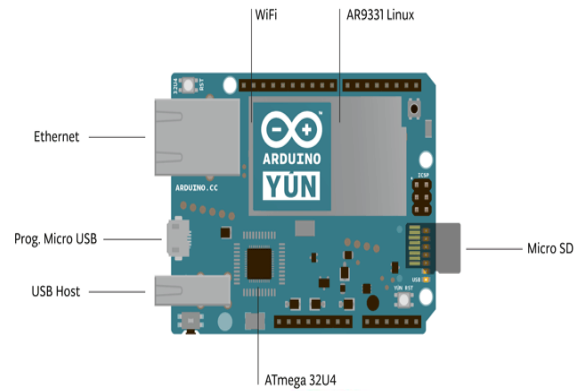
산업인터넷 표준 아키텍처



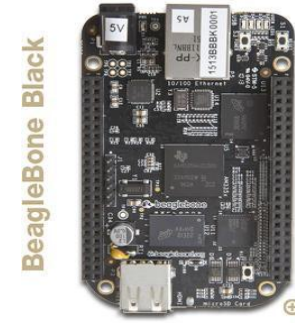
IoT 오픈소스 – 하드웨어 (예)



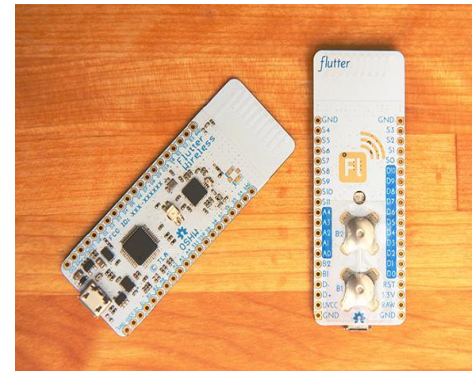
<http://www.arduino.cc/en/Main/ArduinoBoardYun?from=Main.ArduinoYUN>



<https://www.microduino.cc/>



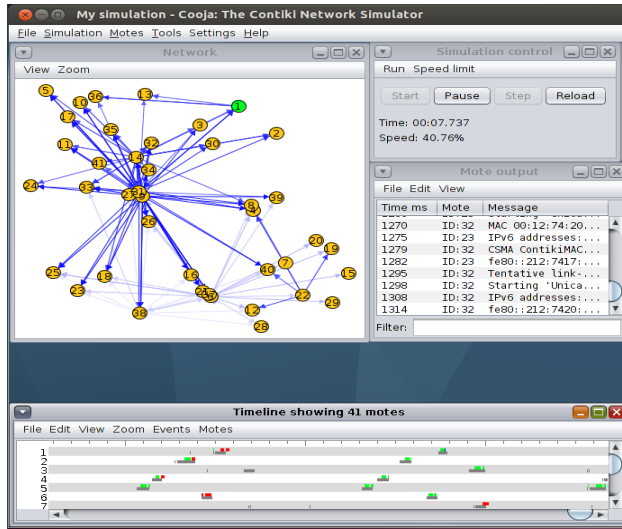
<http://beagleboard.org/>



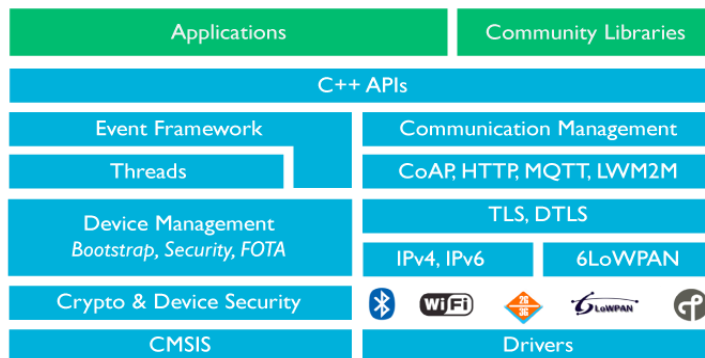
<http://www.flutterwireless.com/>



IoT 오픈소스 – 운영체제 (예)



<http://www.contiki-os.org/>

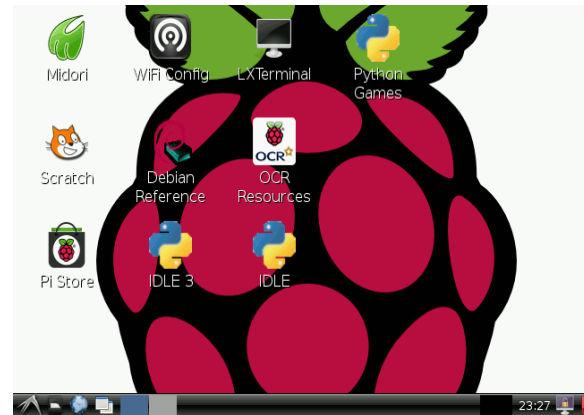


Cortex®-M

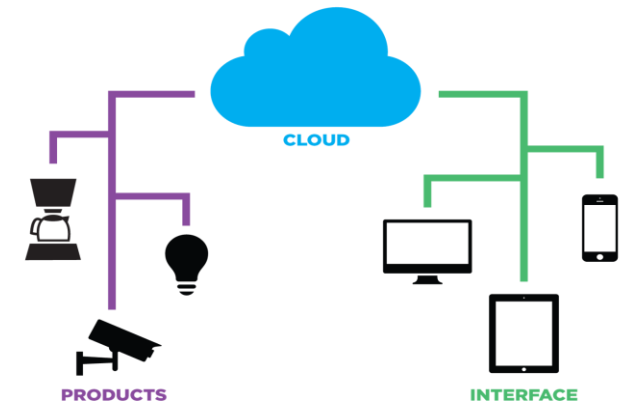
Sensors

Radio

<https://mbed.org/>



<http://raspbian.org/>

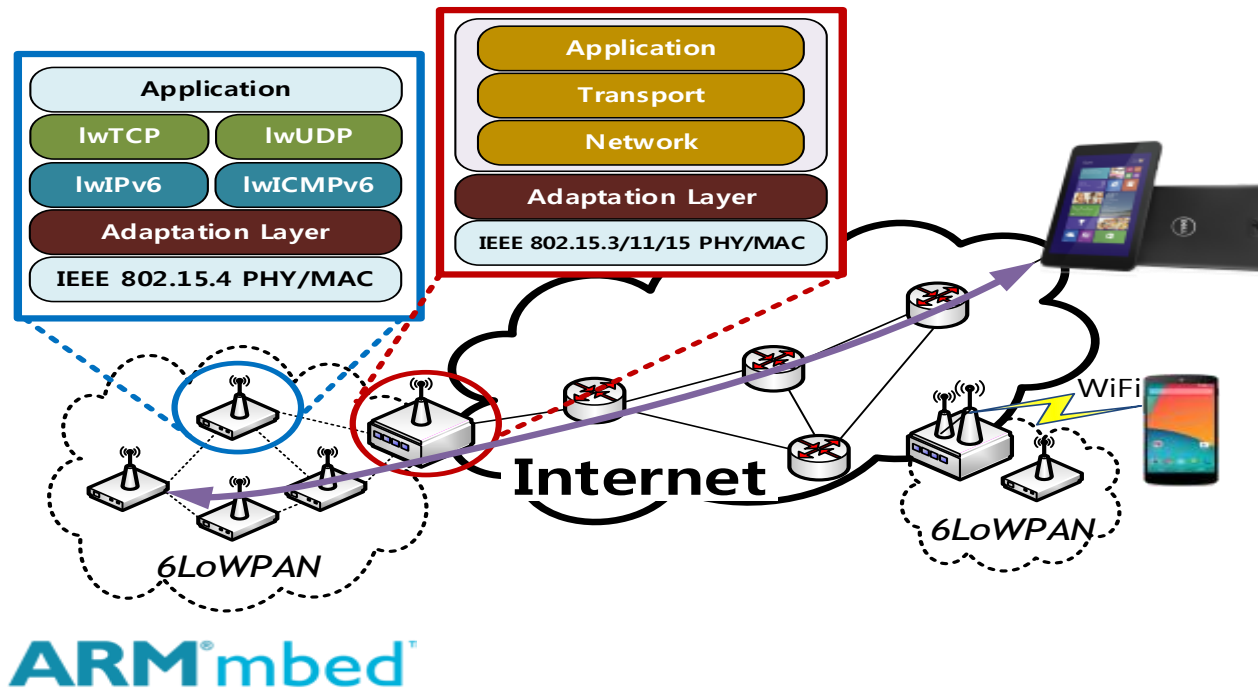


<https://www.spark.io/>

IoT 오픈소스 – 네트워크 (예)



- IPv6 over Low power Wireless Personal Area Networks (6LoWPAN)
 - A set of Internet standards defined by IETF, which is a promising network technology for THINGS in the IoT
 - Enables IP communications over resource-limited and low-power wireless networks (IEEE 802.15.4, Bluetooth Low Energy, etc.)
 - IETF 6Lo, Roll, CoRE, Dice, and 6man Working Groups



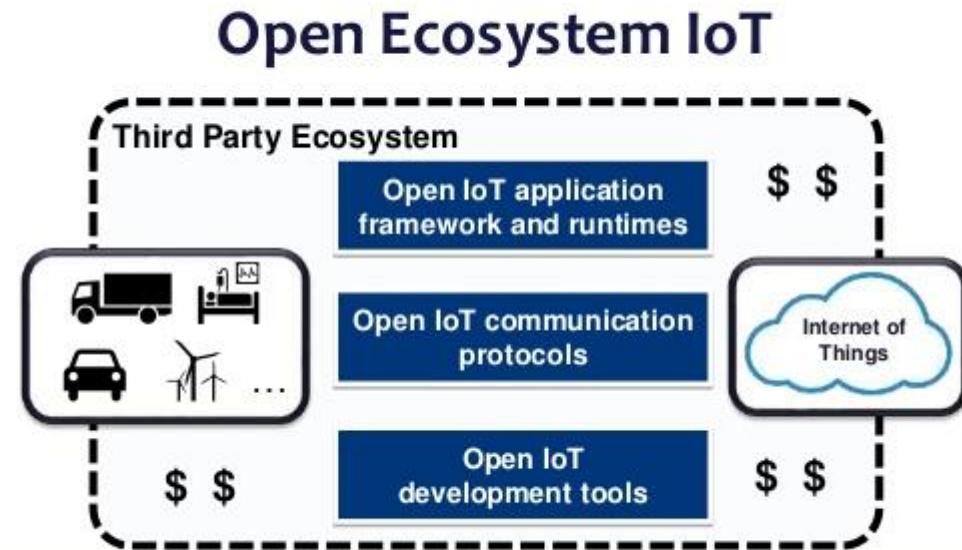
APP	Application Layer CoAP DTLS	IETF CoRE / DICE WG
TRN	Transport Layer TCP UDP	IETF
NET	Network Layer (IPv6) RPL	IETF 6MAN WG / ROLL WG
Adaptation	Adaptation Layer Header Compression Neighbor Discovery Routing Transmission Auto-conf. ...	IETF 6Lo / 6TISCH WG
PHY/LNK	MAC / PHY IEEE 802.15.4 Bluetooth Low Energy Power Line Comm.	IEEE / Bluetooth SIG



IoT 오픈소스 – 개발환경(예)



<http://iot.eclipse.org/>



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IoT 오픈소스 프로젝트 – Ollot (Open Language for IoT)

GS1 (International Non Profit Organization)



In 1999, the "Internet of Things" was first coined by *Kevin Ashton* who cofounded the Auto-ID Center(Labs) at the MIT

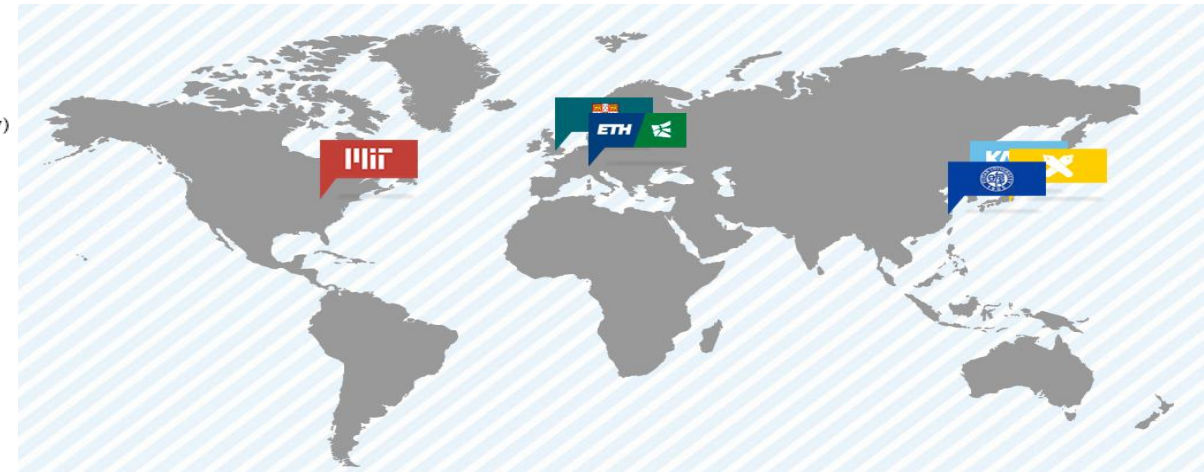
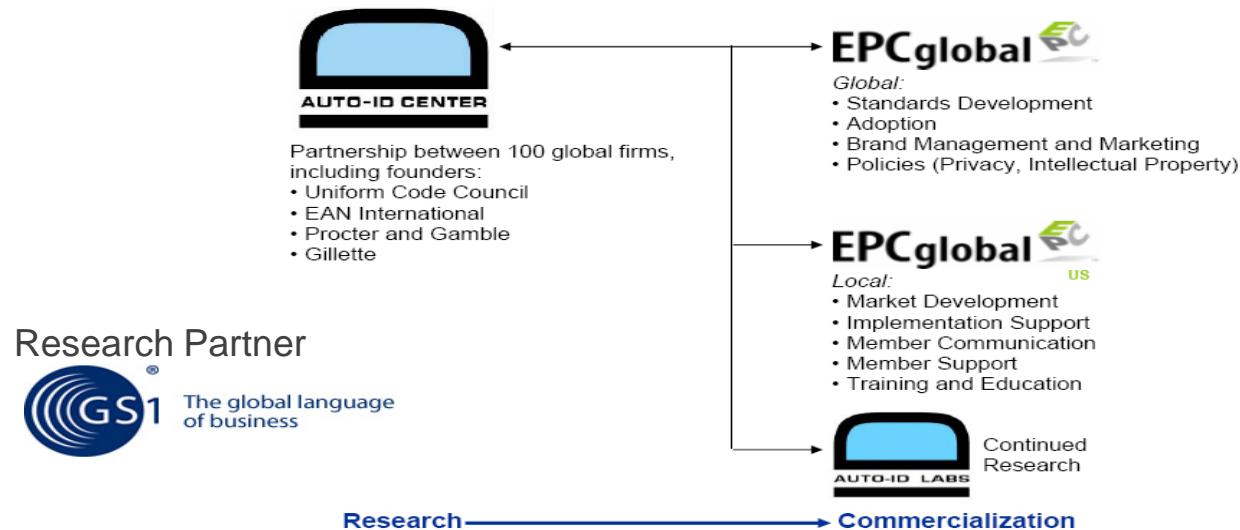


Auto-ID Labs



- The Auto-ID Labs are an independent network of currently six academic research labs that research and develop new technologies for revolutionizing global commerce and providing previously un-realizable consumer benefits.

<http://autoidlabs.org>



RESEARCH DIRECTORS



Business Processes and Applications



Software and Network



Hardware



GS1 in Healthcare/Medical, Food Safety



U.S. Department of Health & Human Services

FDA U.S. Food and Drug Administration
Protecting and Promoting Your Health

Home Food Drugs Medical Devices Radiation-Emitting Products Vaccines, Blood & Biologics Animal & Veterinary Cosmetics Tobacco Products

Medical Devices

Home Medical Devices Device Advice: Comprehensive Regulatory Assistance Unique Device Identification

Device Advice: Comprehensive Regulatory Assistance

- Unique Device Identification
- FDA UDI Help Desk
- Global UDI Database (GUDID)

Unique Device Identification (UDI)

Unique Device Identification: Get e-mail updates

- UDI Rule and GUDID Guidance
- Benefits of Unique Device Identification
- Compliance Dates for UDI Requirements
- Accredited Issuing Agencies

UDI Rule and GUDID Guidance

The Food and Drug Administration (FDA) has released a **final rule** requiring that most medical devices distributed in the United States carry a unique device identifier, or UDI. It also applies to certain combination products that contain devices and to devices licensed under the Public Health Service (PHS) Act (e.g., donor screening assays).

A UDI system has the potential to improve the quality of information in medical device adverse event reports, which will help the FDA identify product problems more quickly, better target recalls and improve patient safety. In developing the proposed UDI system, the FDA worked closely with industry, the clinical community and patient and consumer groups, and conducted four pilot studies.

A UDI is a unique numeric or alphanumeric code that consists of two parts:

- a device identifier (DI), a mandatory, fixed portion of a UDI that identifies the labeler and the specific version or model of a device, and
- a production identifier (PI), a conditional, variable portion of a UDI that identifies one or more of the

Fictitious example of what a unique device identifier (UDI) would look like on a medical device label. The label contains information about the product name, its expiration date, reference and lot numbers, manufacturer information, bar code, and details about the item. (View larger image.)

Are you ready for changes to food labelling?

Time is running out for compliance... but we're here to help.



L 304/18

EN

Official Journal of the European Union

22.11.2011

REGULATION (EU) No 1169/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 25 October 2011

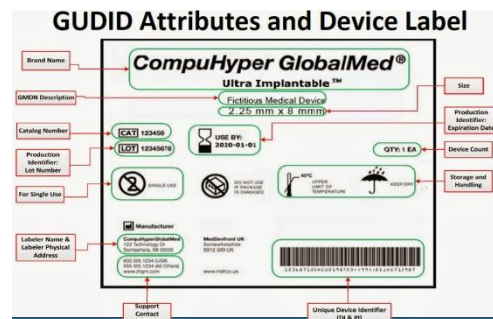
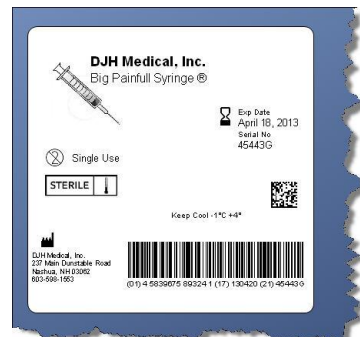
on the provision of food information to consumers, amending Regulations (EC) No 1924/2006 and (EC) No 1925/2006 of the European Parliament and of the Council, and repealing Commission Directive 87/250/EEC, Council Directive 90/496/EEC, Commission Directive 1999/10/EC, Directive 2000/13/EC of the European Parliament and of the Council, Commission Directives 2002/67/EC and 2008/5/EC and Commission Regulation (EC) No 608/2004

(Text with EEA relevance)

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

- (4) According to Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety (?) it is a general principle of food law to provide a basis for consumers to make informed choices in relation to food they consume and to prevent any practices that may mislead the consumer.

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 114 thereof,



Slide 23

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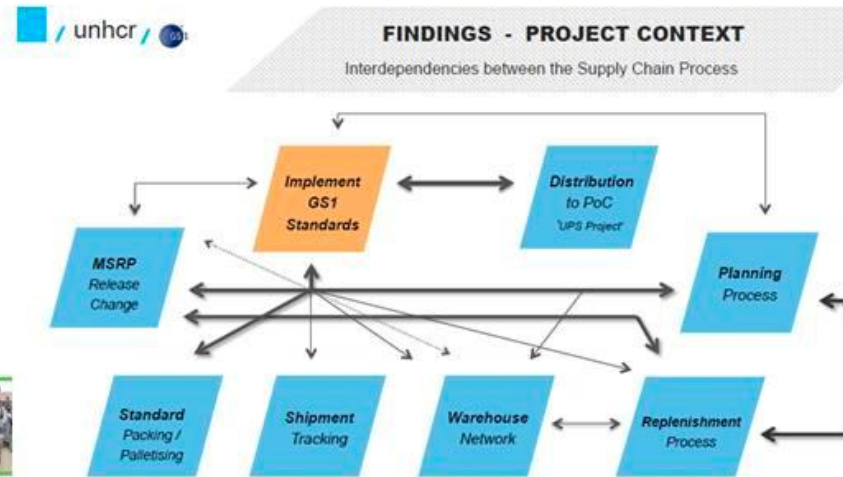
GS1 in Humanitarian Logistics

New GS1 application standard for visibility in rail

Provides roadmap for rail stakeholders to gain visibility of rolling stock and access to real-time information



PROTECTING AND ASSISTING PERSONS OF CONCERN. THE ROLE OF LOGISTICS



"In any complex organisation or where action of multiple partners intertwine, anything that standardises and simplifies sharing of data holds significant value. EPCIS just makes sense in rail."

Philip Leslie
Business Development Manager, Coriel



The road to the Internet of Things: Hope that GS1 in Rome



AllJoyn™



ZigBee®

Control your world



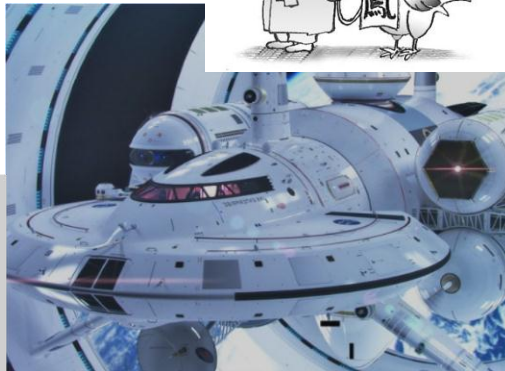
KAIST의 IoT 오픈소스 기반 생태계 조성 노력



共有



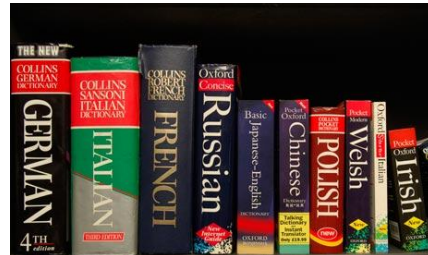
봉이(鳳伊)



GS1 Philosophy and Internet of Things



my opinion...



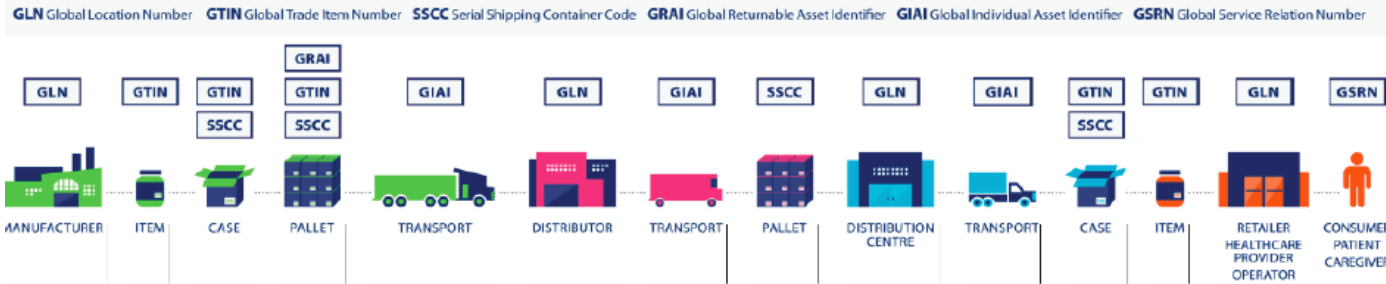
We remodel GS1 Architecture for IoT



Identify – Capture – Share



IDENTIFY: GS1 Standards for Identification



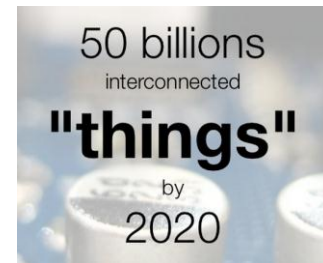
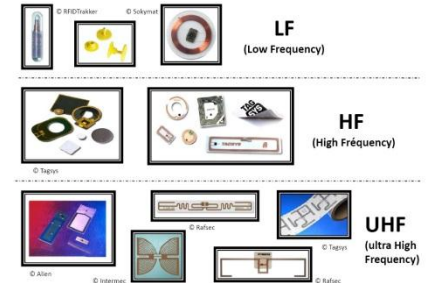
CAPTURE: GS1 Standards for Barcodes & EPC/RFID



SHARE: GS1 Standards for Data Exchange



© 2014 GS1



OPEN
INTERCONNECT
CONSORTIUMSM



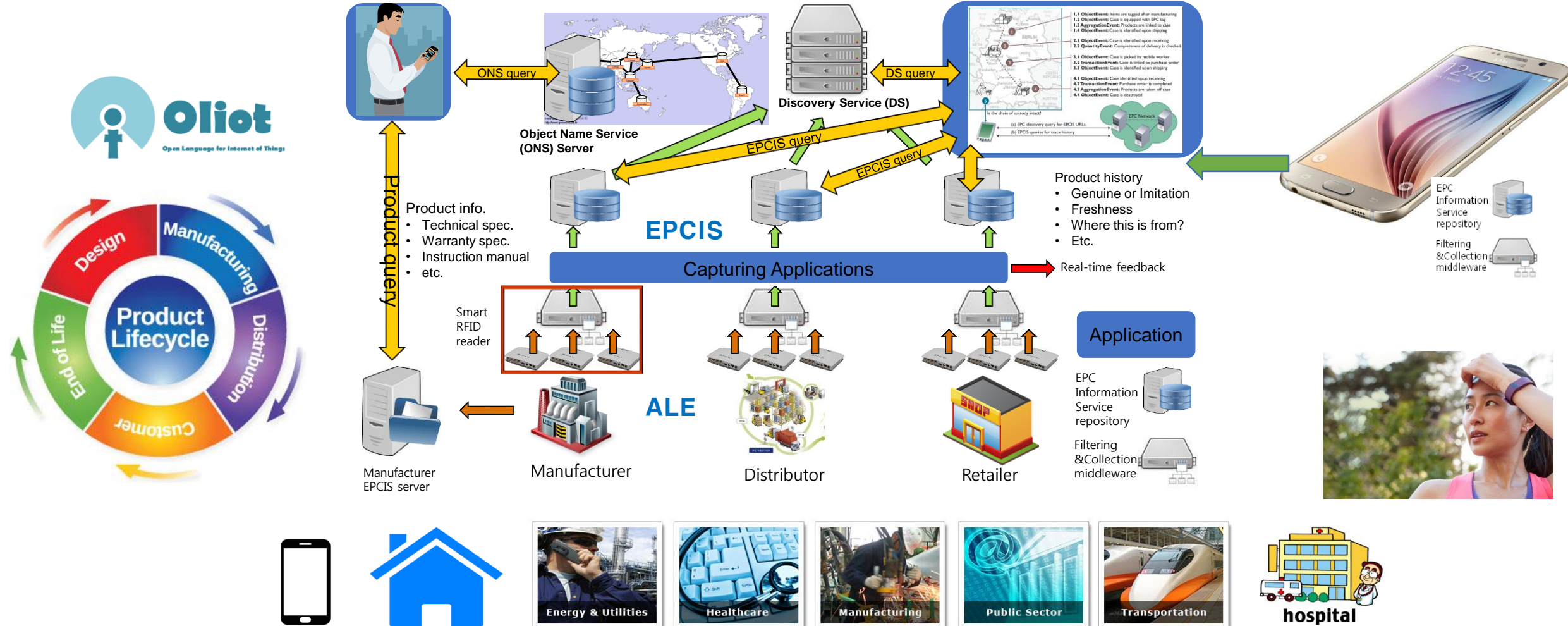
AllJoynSM

THREAD
GROUP



GS1/EPCglobal Standards

GS1/EPCglobal Architectural Framework and Extension



사물 생애 주기 관리를 통한 IoT 서비스 (예. Ybrain)

14

ybrain

YBRAIN
TOTAL FUNDING
\$4.1 million

FUNDING STAGE : SERIES A
CATEGORY : HARDWARE

Ybrain makes medical wearable tech. Its first device is a headband that claims to slow the effects of Alzheimer's.

INVESTORS
STONEBRIDGE CAPITAL



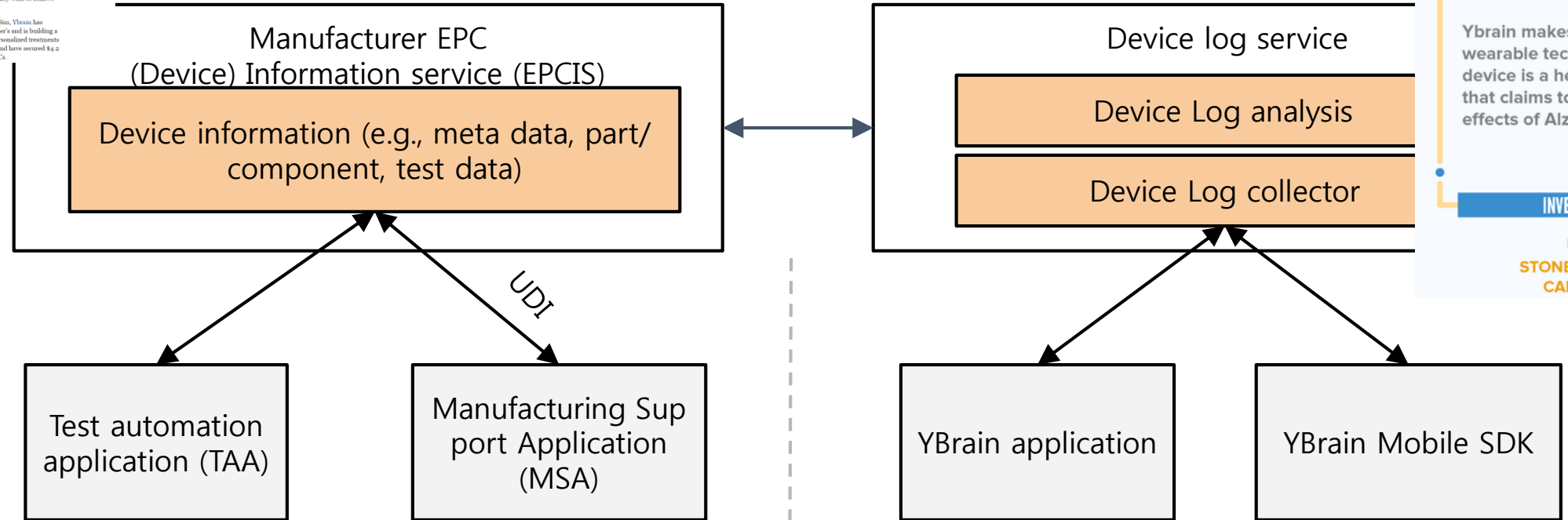
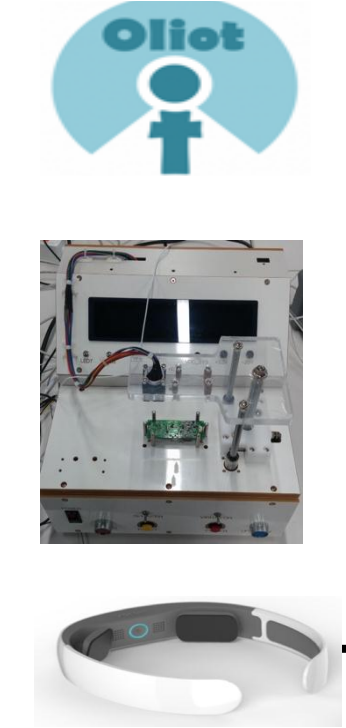
Forbes / Forbes Asia

Korean Healthtech Startup Closing In On Cure For Alzheimer's

Korea's startup landscape remains partial to gaming. Demand has been growing at such a staggering clip that the industry now accounts for 96% of the country's mobile app revenues. The government is also providing financial assistance — to the tune of \$90 million — to help shoulder rising demand. But though many welcome such incentives, the figures indicate that the trend is nearing its saturation point, and suggest that it may be time for the country's fleet of young entrepreneurs to be leveraging their talents in a slightly different direction, one that favors long-term sustainability, and a means of overcoming the alarming rate of failure that startups and small businesses have been receiving as of late.

One healthtech startup in Seoul's affluent Gangnam district feels that product technology is not only a more beneficial direction to take, it's a necessity for South Korean startups if they want to achieve longevity.

Headed by CEO and Founder Kiwon Lee, and Chief Strategic Officer Hyunsoo Shin, Ybrain has developed medical wearable devices for patients suffering early onset Alzheimer's and is building a mobile healthcare platform for detailed analytics for disease diagnosis and personalized treatments and services. They have already been approved by the FDA for clinical trials, and have secured \$4.2 million in Series A funding round last summer from several leading Korean VCs.



PCB test
Final test

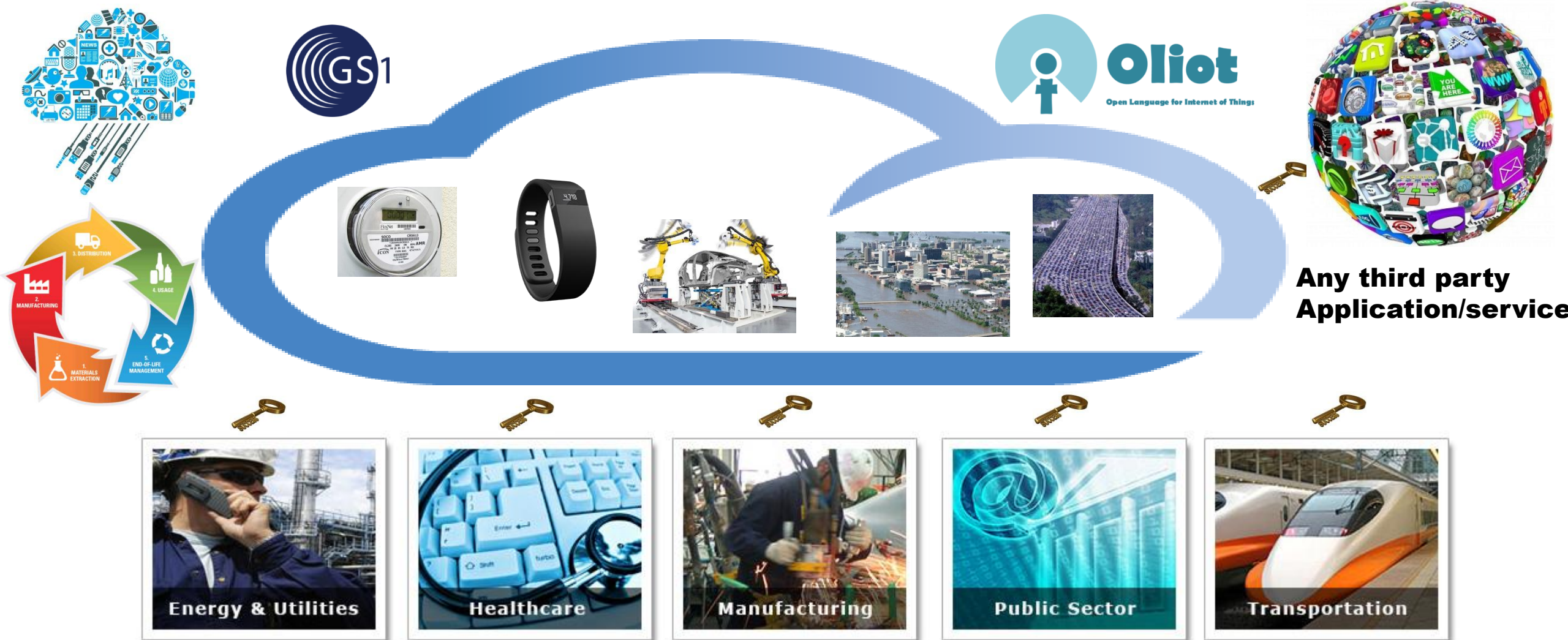
UDI assignment

device usage log

system log



Oliot IoT 플랫폼 오픈소스 비전



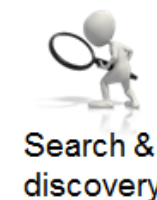
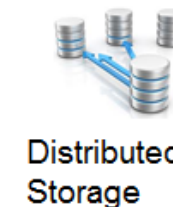
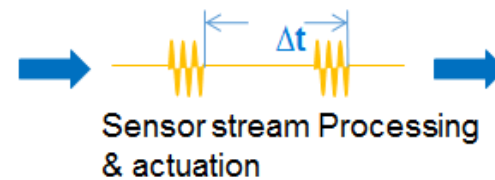
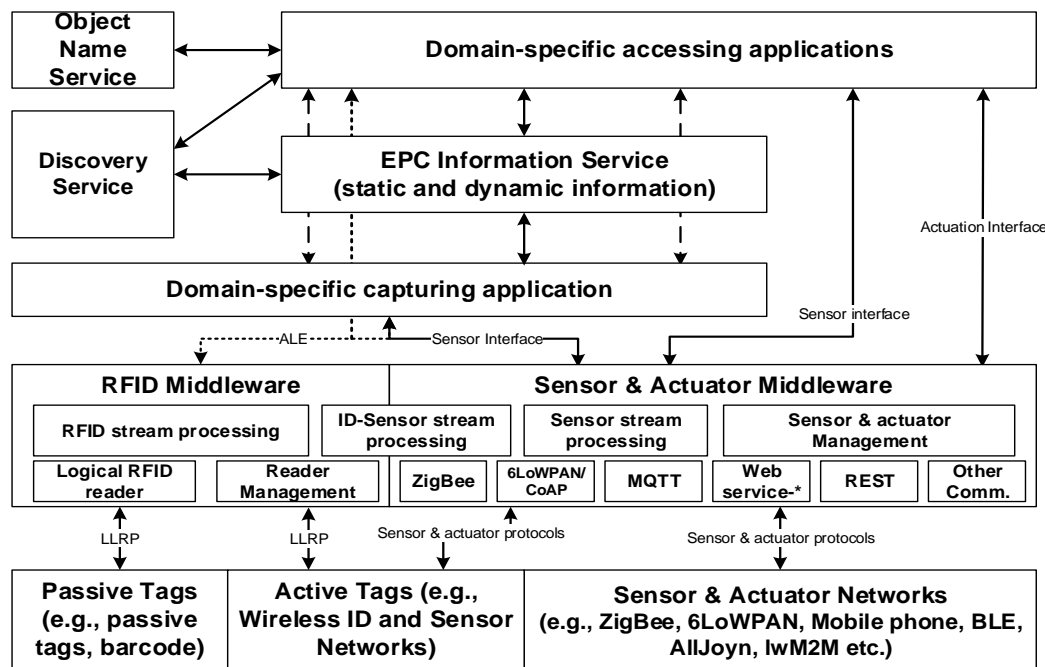
Open Language for the Internet of Things



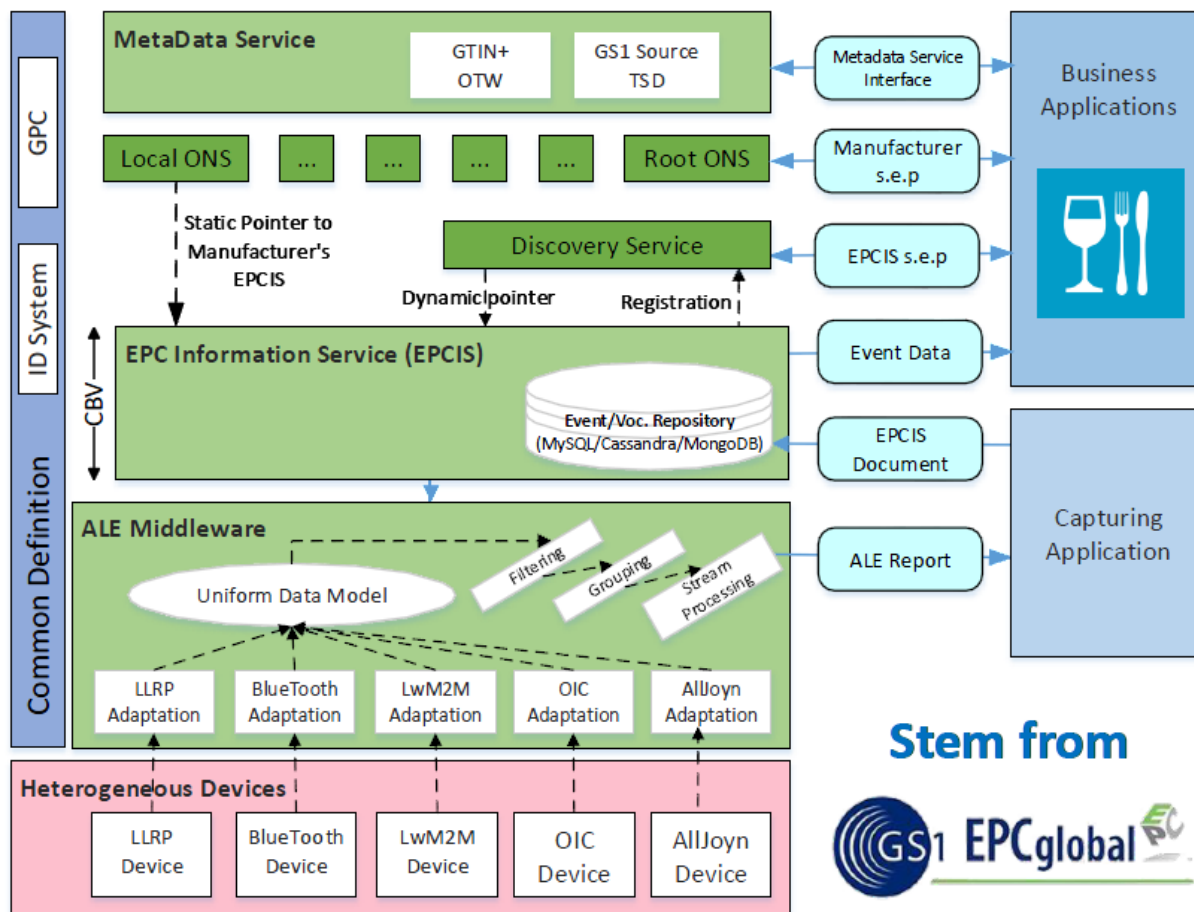
Open Language for IoT (Oliot) is an ID-based IoT framework.



- Based on GS1 standard ID (e.g., URI-convertible GTIN)
- Is to build a ID-based framework to identify, capture, control and share information about smart things



Oliot 2.0



Stem from



Features of Oliot Infrastructure

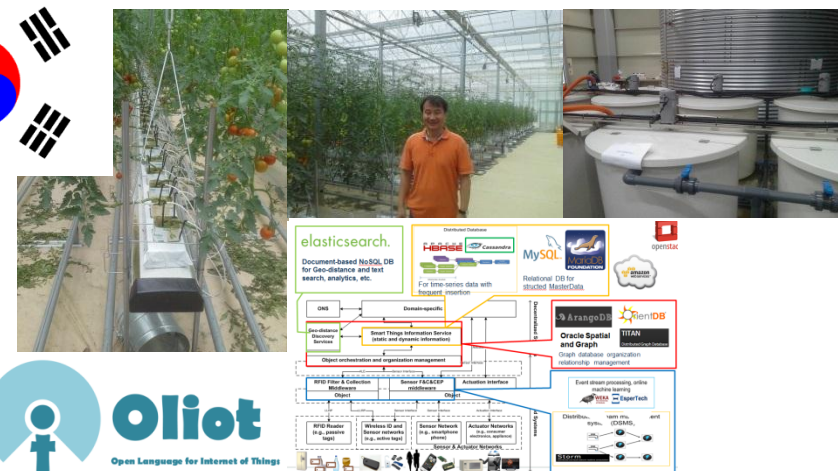
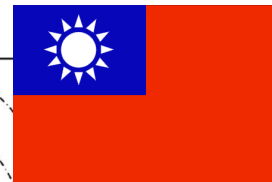
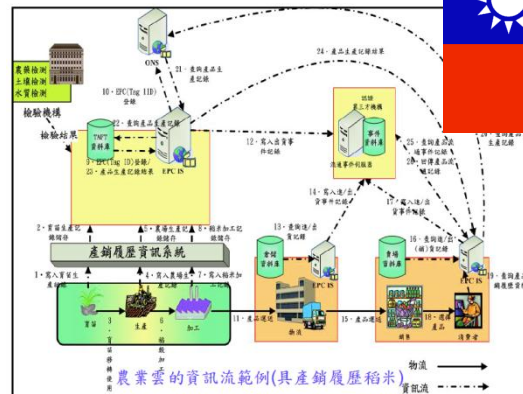
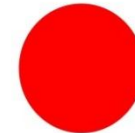
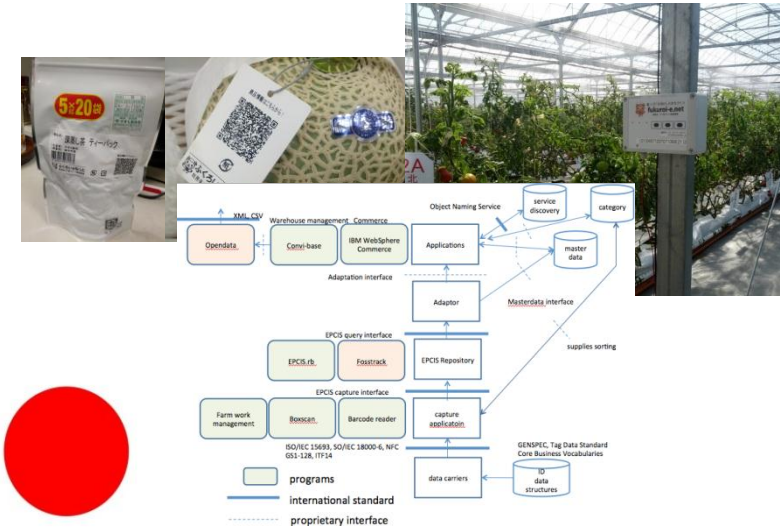
- **ID System**
Various protocols supported
Interoperable endpoint URN scheme
- **GPC Extension**
IoT services are represented
Linked way of describing components
- **Metadata Service**
Provides static information about things.
GS1 source style and GTIN+ on the web style
- **LLRP**
Device Connectivity
connectivity with heterogeneous devices.
Connected to ALE adaptation layer
- **ALE**
integrates various connectivity protocols
processes data from the smart devices
- **EPCIS**
EPCIS v1.1 compliance
Scalability & Flexibility
Embedded extended Core Business Vocabulary
- **ONS**
Service records registration
NS/DNAME delegations
Searching for the services provided by things
- **DS**
lookup dynamic information about the given GS1 key
Searching for the List of EPCIS Related with things

Oliot Project I. Smart Agriculture and Food Safety Systems Project (Guardian)



National Agriculture IoT project

- Title: agricultural IoT systems for food safety and quality
- Funded by the High-Tech Development Plan (863) of the Science and Technology (MOST), China.
- Objectives
 - Food safety and quality management
 - Core technologies development
 - Scalable platform and standards
 - Credible platform for government, B2B and end users
 - Business model
 - Pilot project in Shandong and Shanxi province
- Participants: >20 universities, institutes, and companies
- Duration: 2011.1.1-2013.12.31



Oliot Project 2. Healthcare Application (Dr. M Season 2)



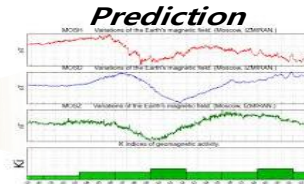
(1) Health Monitoring



(2) Medical Support



[6] Business Model

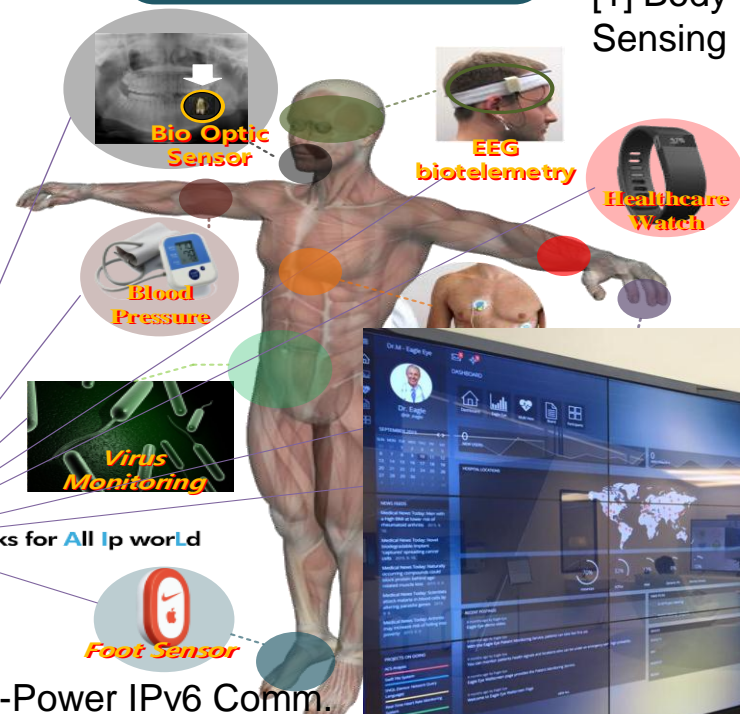


[4] Disease Analysis & Estimation



Smart Sensors

[1] Body Signal Sensing

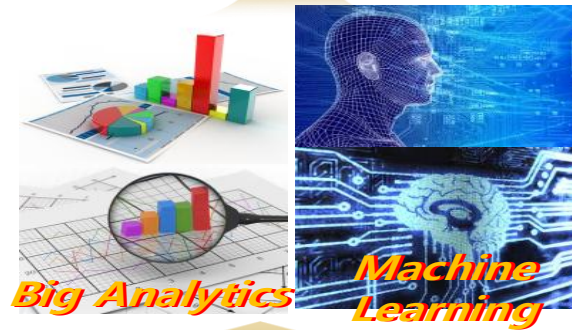
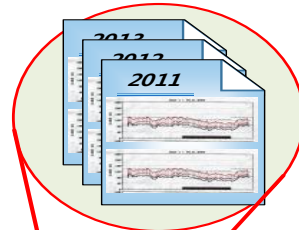


Disease knowledge

RESEARCH/DISEASE AREA	FY2011
1. CANCER	38,180
2. GENETICS	7,025
3. PREVENTION	5,059
4. BIOTECHNOLOGY	5,025
5. NEUROSCIENCE	4,147
6. HEART and CARDIOVASCULAR	3,984
7. WOMEN'S HEALTH	3,984
8. BRAIN DISORDERS	3,984
9. BEHAVIORAL and SOCIAL SCIENCE	3,984
10. RARE DISEASES	3,984
11. INFECTIOUS DISEASES	3,984
12. BIOMEDICINE	3,984
13. PEDIATRICS	3,984
14. HIV/AIDS	3,984
15. HEALTH DISPARITIES	3,984
16. AGING	3,984
17. STEM CELL RESEARCH	3,984
18. MINORITY HEALTH	3,984
19. MENTAL HEALTH	3,984
20. ENDOCRINOLOGICAL DISEASE	3,984
21. HUMAN GENOME	3,984
22. BIOGRAPHICS	3,984
23. IMMUNIZATION	3,984
24. VACCINE RESEARCH	3,984
25. CHRONIC DISEASES	3,984
26. NEURODEGENERATIVE	3,984
27. SUBSTANCE ABUSE	3,984
28. NUTRITION	3,984
29. DISEASES OF THE LUNG (and cancer)	3,984
30. HEALTH SERVICES	3,984
31. DIABETES (TYPE 1 AND 2)	3,984
32. DERMATOLOGY	3,984
33. DRUG ABUSE	3,984
34. HEMATOLOGY	3,984
35. AUTOIMMUNE DISEASE	3,984

[5] Disease Knowledge

Historical Data



DrM Database



Real-time Monitoring Data

[3] IoT Platform & Data Analysis

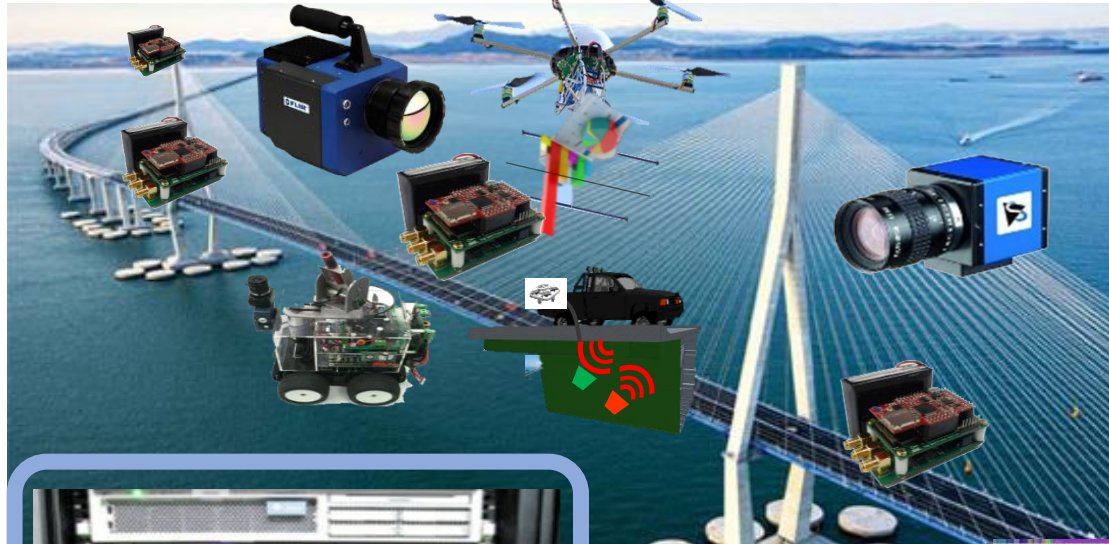
[2] Low-Power IPv6 Comm.



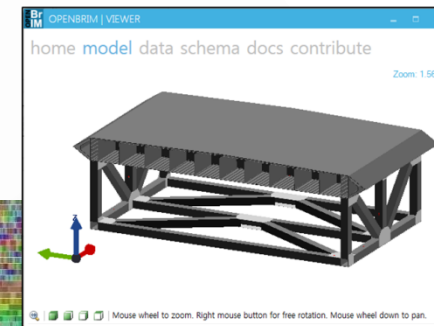
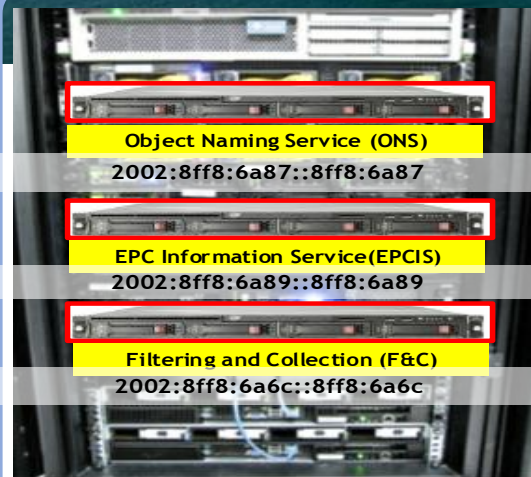
Oliot Project 3. Bridge Management



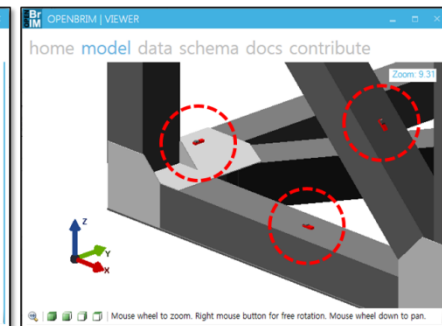
Embedded Sensor Data



Stanford ENGINEERING
Civil & Environmental Engineering



(a) 3-D view of Stiffened truss girder



(b) Detail view of sensor geometry

Data Fusion

Pattern
Recognition

Machine
Learning

Slide 36

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Thank you!