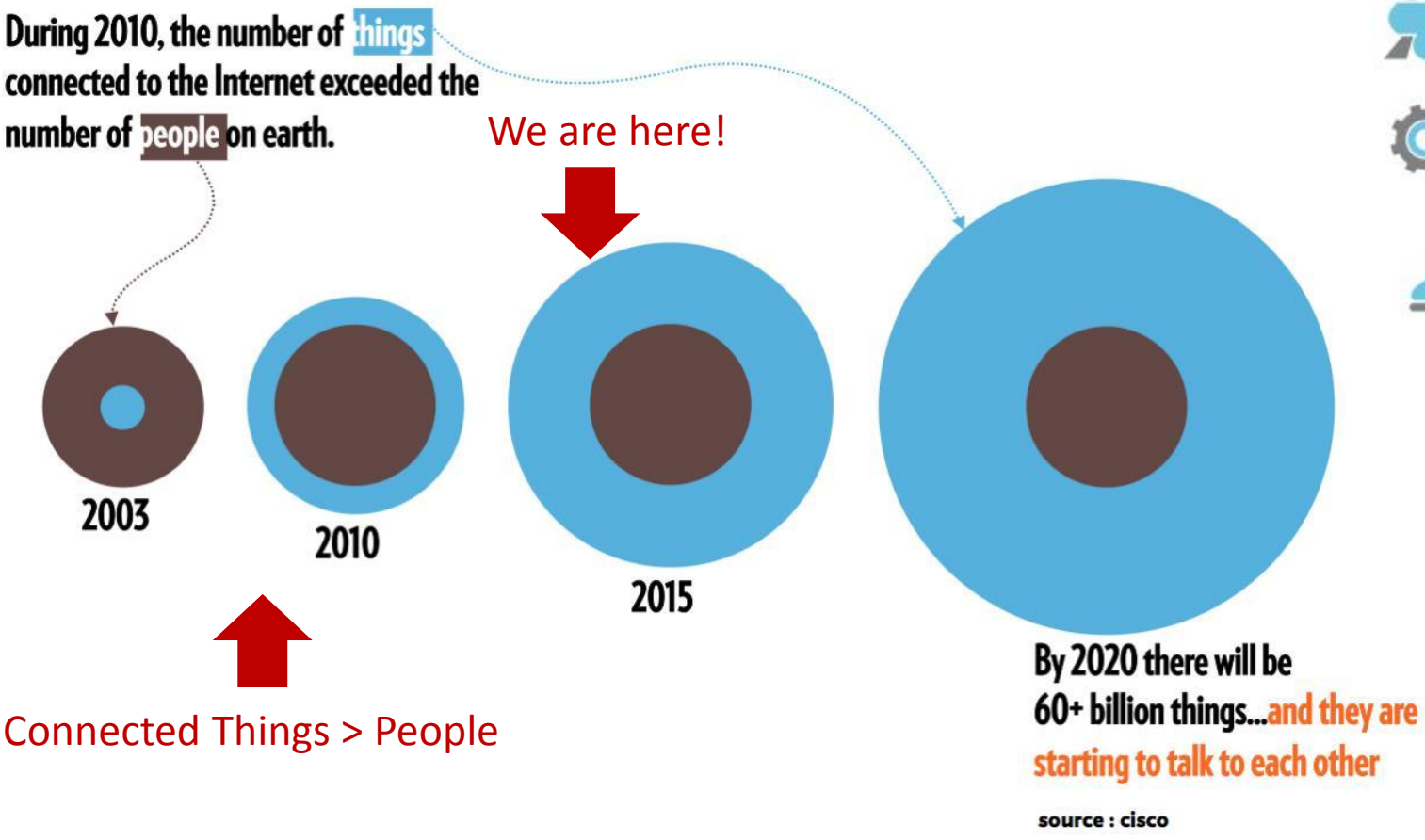
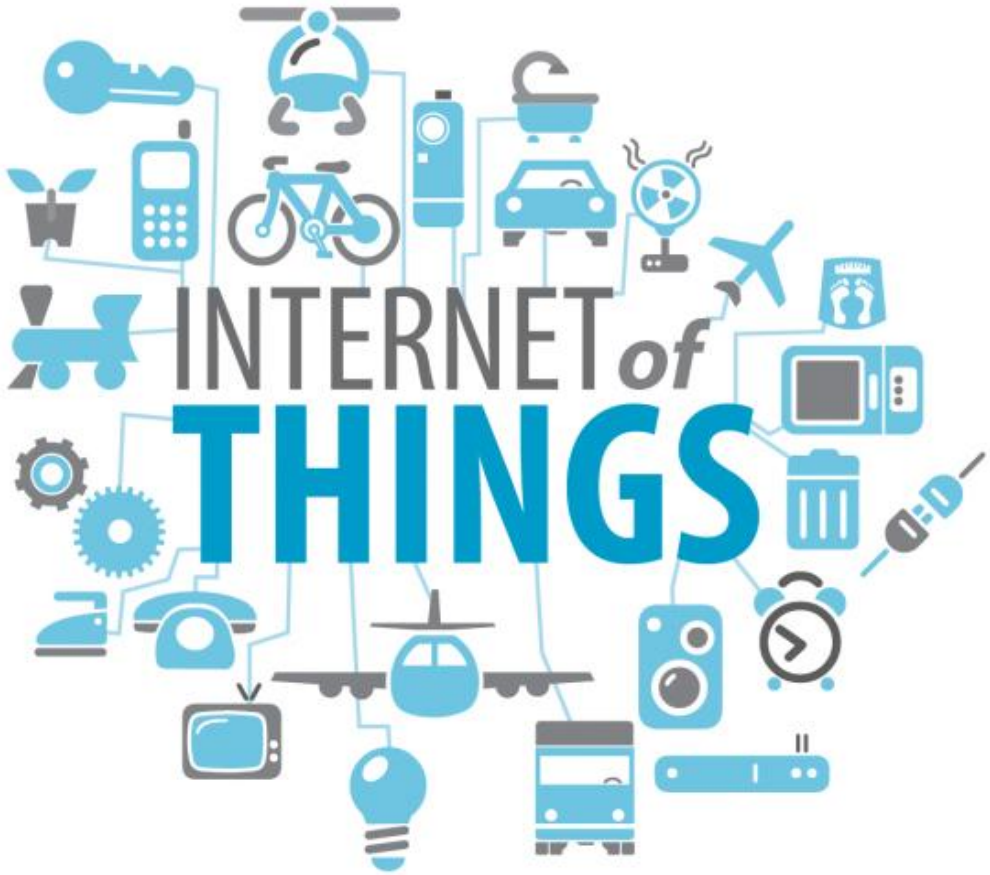
# IoT 기반 융합 서비스 기술

## - IoT 기반 서비스 기술 소개 및 활용방안

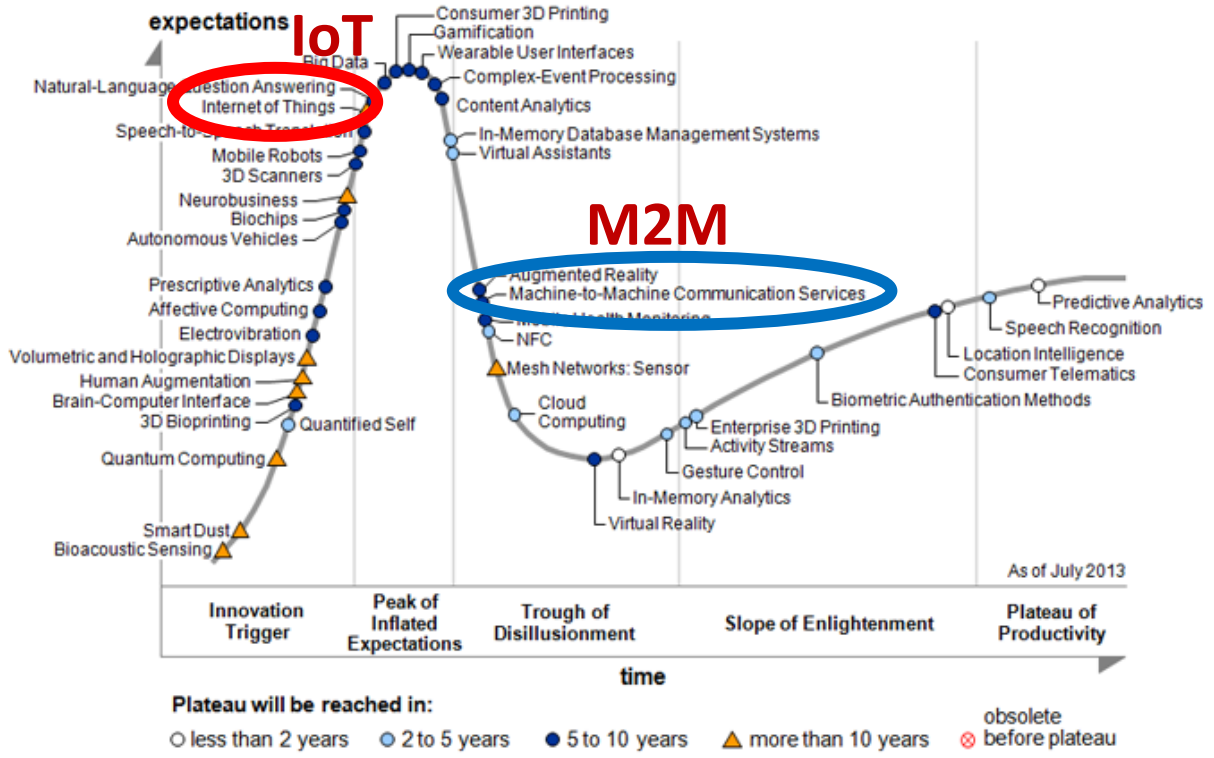

**임종대**
**한국오라클**

# 초연결 사회의 시작
## - Hyper-connected Society is coming

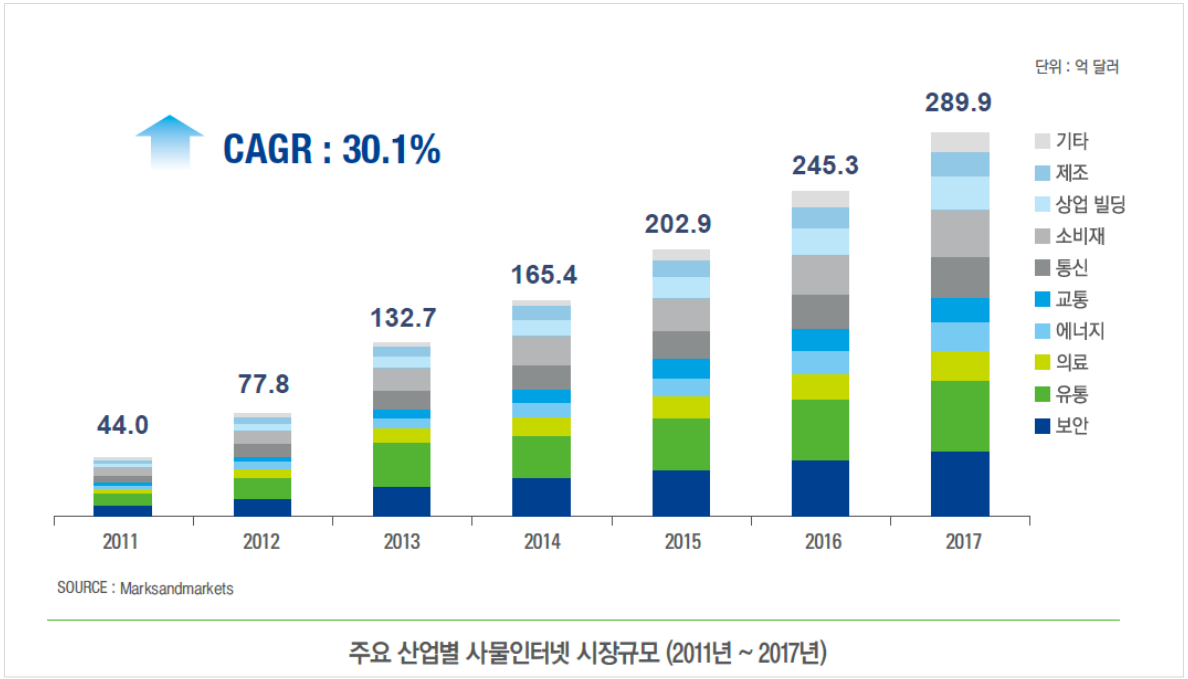


# 사물인터넷(Internet of Things)
## - IT산업에서 가장 빠르게 성장하고 있는 분야




Source: Gartner's 2013 Hype Cycle for Emerging Technologies




주요 산업별 사물인터넷 시장규모 (2011년 ~ 2017년)

# History of Internet of Things : 1990 ~


**사무엘 모스(Samuel Morse)**
**최초의 모스 코드 전송**
"What hath God wrought?"
from Washington, D.C. to Baltimore.

**1844**

ARPANET

**ARPANET 개발**
세계 최초의 패킷
스위칭 네트워크로
현재의 인터넷의 원형

**1969**

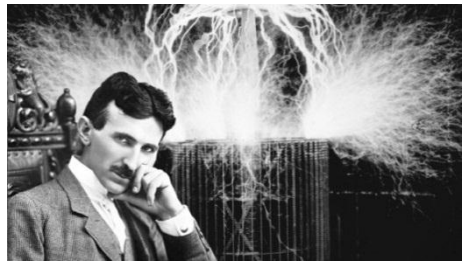

**Domain Name System**
**(DNS)의 시작**

**1984**

**1832**

**전신기의 발명**
**(Electromagnetic Telegraph)**
by Paul Schilling in Russia

**1926**



**니콜라스 테슬라(Nikola Tesla )**의 Colliers 잡지 인터뷰:
"When wireless is perfectly applied the whole earth will be converted into a huge brain, which in fact it is, all things being particles of a real and rhythmic whole.
*… We shall be able to communicate with one another instantly, irrespective of distance.*
… **A man will be able to carry one in his vest pocket.**"

**1974**

TCP/IP

**TCP/IP 개발**

**1989**


**WWW(World Wide Web )의 시작**
by Tim Berners-Lee(TimBL)

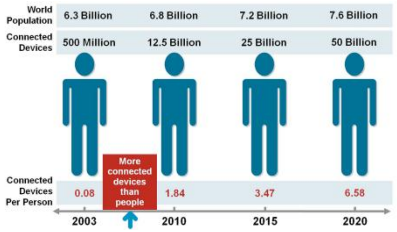
# History of Internet of Things : 1990 ~

**WearCam의 발명**
by Steve Mann

**1994**

**최초의 인터넷 냉장고**
by **LG**

**2000**




**IoT 시대의 시작**
by Cisco
Connected Device > People

**2008 ~ 2009**

**IPv6 시작**
인터넷에 연결되는 기기의 폭발적 증가를 대응

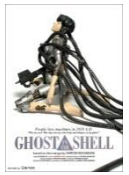
**2011**

**1990**

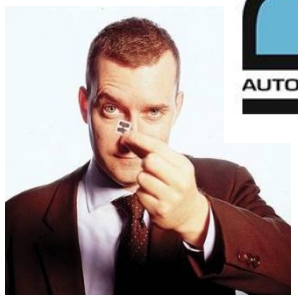
**최초의 인터넷 디바이스**
'89 INTEROP 컨퍼런스에서 John Romkey는 TCP/IP로 컴퓨터에 연결되어 원격으로 on/off 가능한 토스터기를 시연

**1995**

Java™




**1999**



AUTO-ID LABS

**Internet of Things 용어 등장**
MIT Auto-ID Center의 공동 설립자인 캐빈 애쉬턴(Kevin Ashton)은 "화장품 가게에서 립스틱을 찾지 못하는 일이 발생했는데, 이를 찾으려다 새로운 방식을 적용하게 됐다" 말함

**2003**

RFID

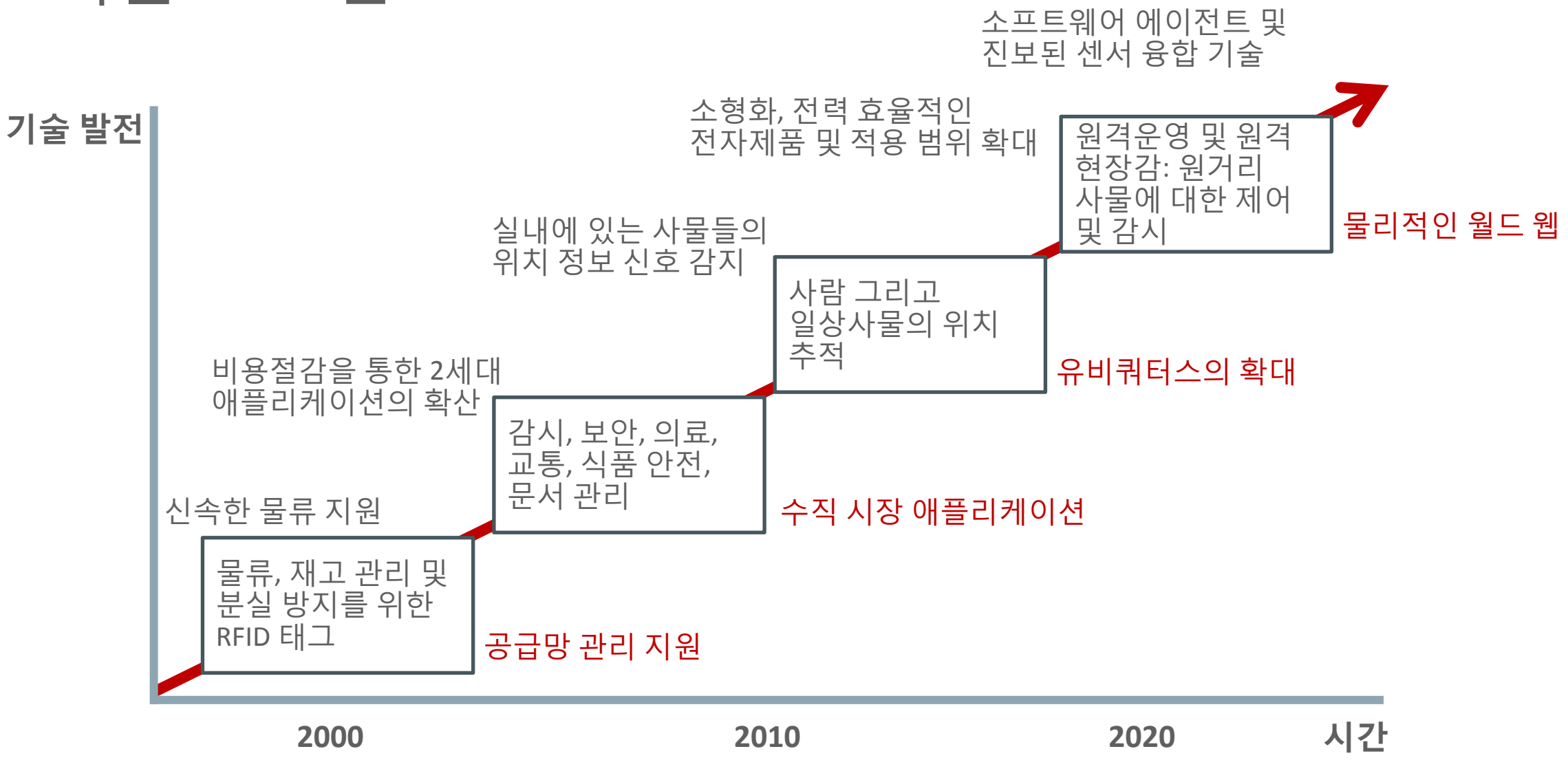
**RFID의 시대**
미 국방부(US Department of Defense)와 월마트를 시작으로 다양한 분야에 RFID가 활용되기 시작함

**2007**

**iPhone 출시**
by Apple

**1992 최초의 스마트폰**
사이먼(Simon by IBM)

# IoT 기술 로드맵




Source: SRI Consulting Business Intelligence

# IoT 디바이스의 지능화 수준

| | 수동형 사물 (Passive Object) | 응답형 사물 (Responder Object) | 능동형 사물 (Autonomous Object) |
|---|---|---|---|
| **사물 + 컨텍스트 정보 (Object + Context Information)** | 위치 정보 태그가 부착된 수화물<br>*"I'm here and haven't moved in 11 hours"* | 지능형 가로등<br>"I'm off, Turn me on? But there is still daylight" | 스마트 카<br>"Satellite navigation rerouting, using traffic flow monitors and crowd alert" |
| **사물 자체만의 정보 (Object-Only Information)** | 반려동물 ID 태그<br>*"I'm Fido 122"* | 주차 미터기<br>*"Forty-four minutes left on meter"* | 스마트 벤딩 머신<br>"Imminent stock-out of soda, I'm reordering" |
| **정보가 없거나 또는 일반적인 정보 (No Information or Generic Information)** | 음료수 캔<br>*"Let me point to content"* | 집안 조명<br>*"Turn me on remotely"* | 청소 로봇<br>*"It's 9 a.m. Time to work"* |

# 최신 IoT 사례 : Sproutling Smart Baby Monitor

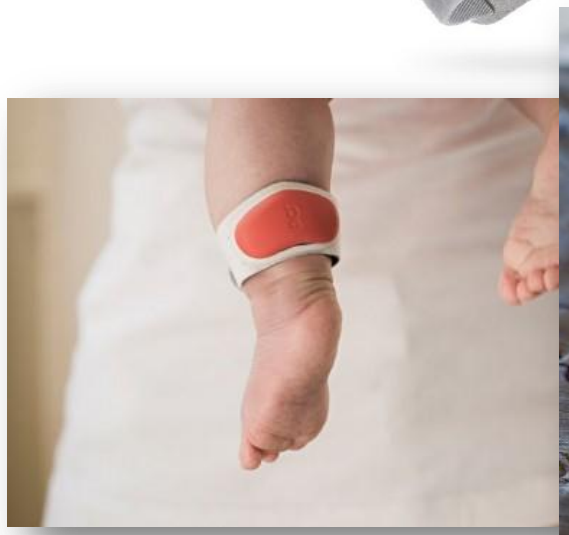
**“Sproutling Smart Baby Monitor” Video**

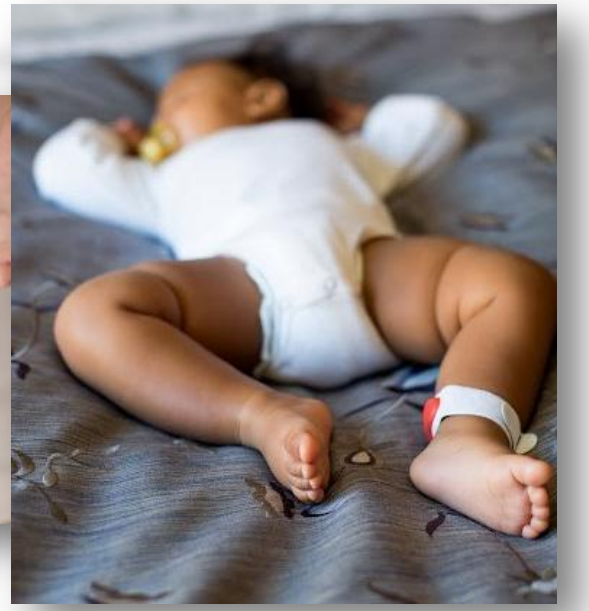
*https://www.youtube.com/watch?v=slyXHix8hLg*

# 최신 IoT 사례 : Sproutling Smart Baby Monitor
# - 아기의 수면 습관을 관찰 및 학습하고 예측

**아이용 웨어러블 밴드**

- 심장 박동수
- 체온
- 움직임
- 자세

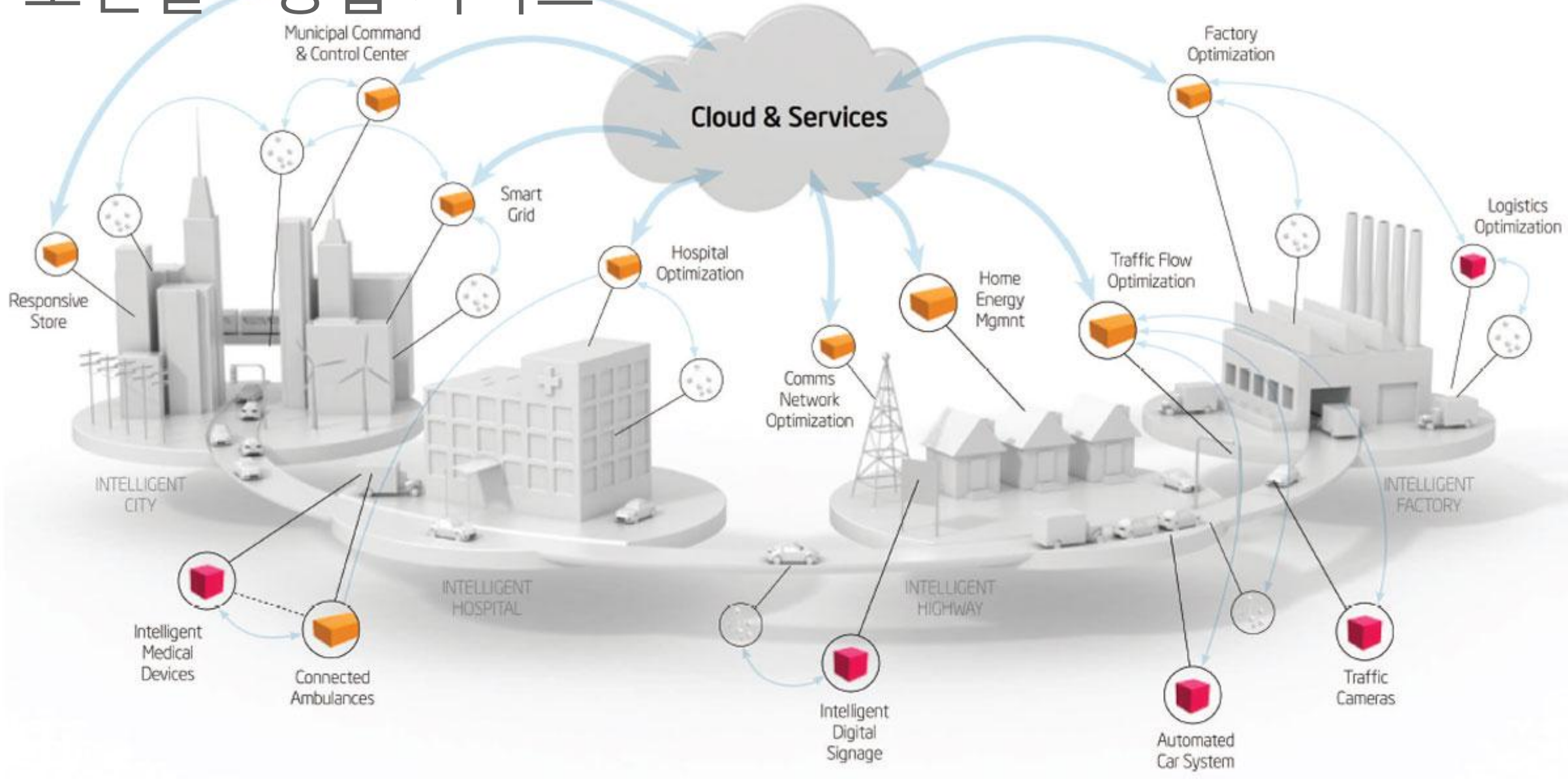




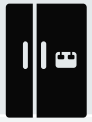
**스마트 폰**

- 취침 여부
- 예상 기상 시간
- 외부 소음
- 심장 박동수 이상


# 초연결 = 융합 서비스

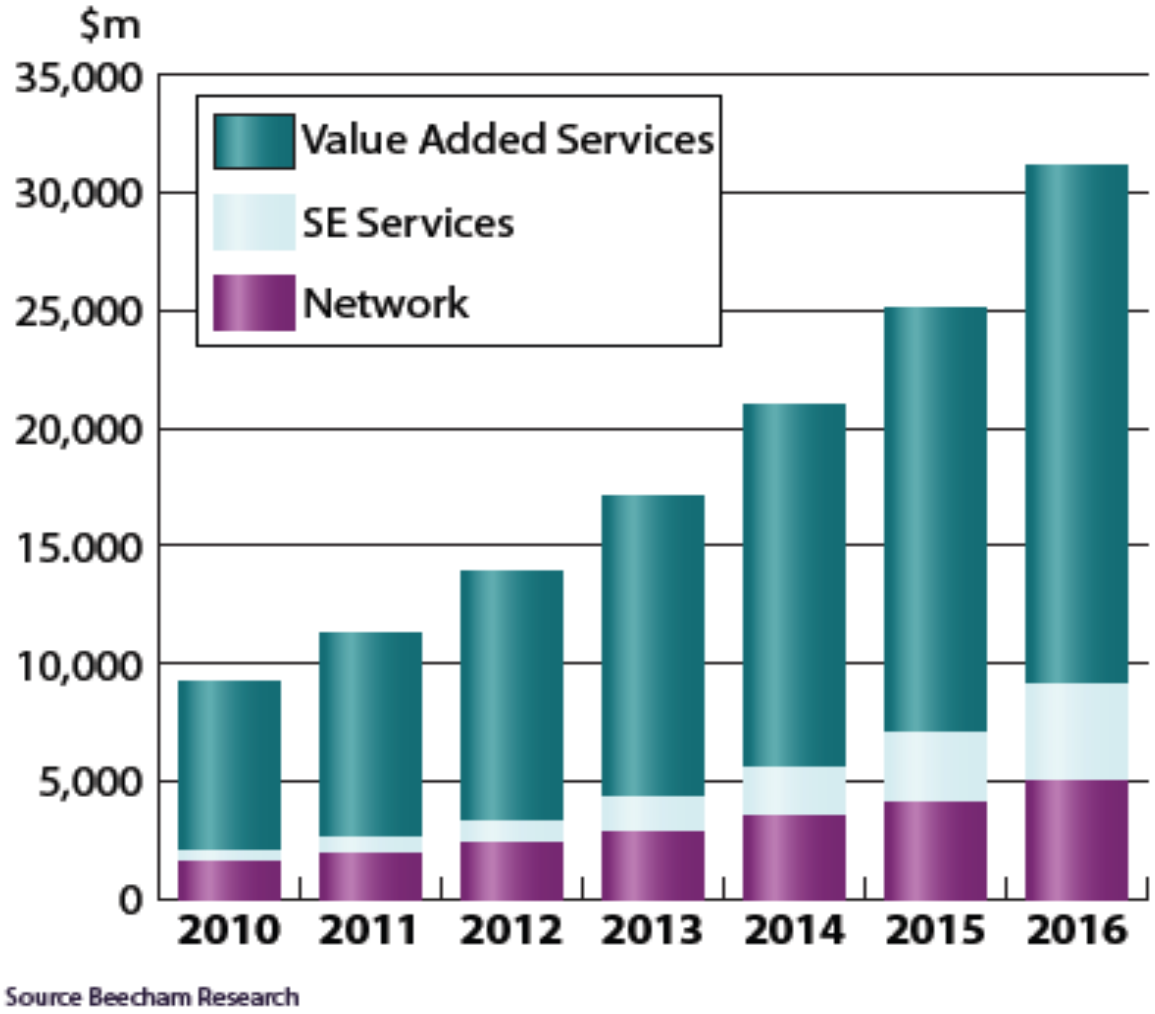

Municipal Command & Control Center
Cloud & Services
Factory Optimization
Smart Grid
Logistics Optimization
Responsive Store
Hospital Optimization
Traffic Flow Optimization
Home Energy Mgmnt
Comms Network Optimization
INTELLIGENT CITY
INTELLIGENT FACTORY
INTELLIGENT HOSPITAL
INTELLIGENT HIGHWAY
Intelligent Medical Devices
Connected Ambulances
Intelligent Digital Signage
Automated Car System
Traffic Cameras

# IoT 기반 융합 서비스 분야

| 분야 | 활용 예 | CAGR | 2017 |
|---|---|---|---|
|  Telematics | 텔레메틱스, 차량 종합관리(Fleet Mgmt), 운전자 성향 보험(Usage Based Insurance), 인포테인먼트(Infotainment) | 17% | $834M |
|  Farming | 인터넷에 연결된 농업 장비(Connect farming equipment), 농산물 모니터링(Monitoring crops), 가축 모니터링(Monitoring livestock) | 15% | $661M |
|  Industrial Automation | 제조 장비 자기 관리(Manufacture equipment self-management), 원격 장비 모니터링(Monitoring remote equipment) | | |
|  Utilities | 스마트 미터(Smart meters), 그리드 자기 관리(Grid self-management), 태양광 발전 및 풍력 발전 시설 관리(Solar and wind power plant management) | 8% | $468M |
|  Home Automation | 난방 시설, 조명 시설 및 가전 제품의 원격 제어 및 모니터링(Remote monitoring and control of heating, lighting, appliances.) | 16% | $417M |
|  Security | 가정 및 기업의 보안 감시(Home and business security and surveillance), 스마트 화재 경보(Smart fire alarm), 원격지 감시(Remote video monitoring) | | |
|  Health Care | 자택치료(Homecare), 노인 부양(Elderly care), 원격 의료(Tele-health), 응급 구조(Emergency help) | 15% | $355M |
|  Retails | 스마트 키오스크(Smart kiosk), 디지털 신호기반 타깃 광고(targeted advertisement based on digital signage) | 14% | $209M |

Source: Infonetics 2013

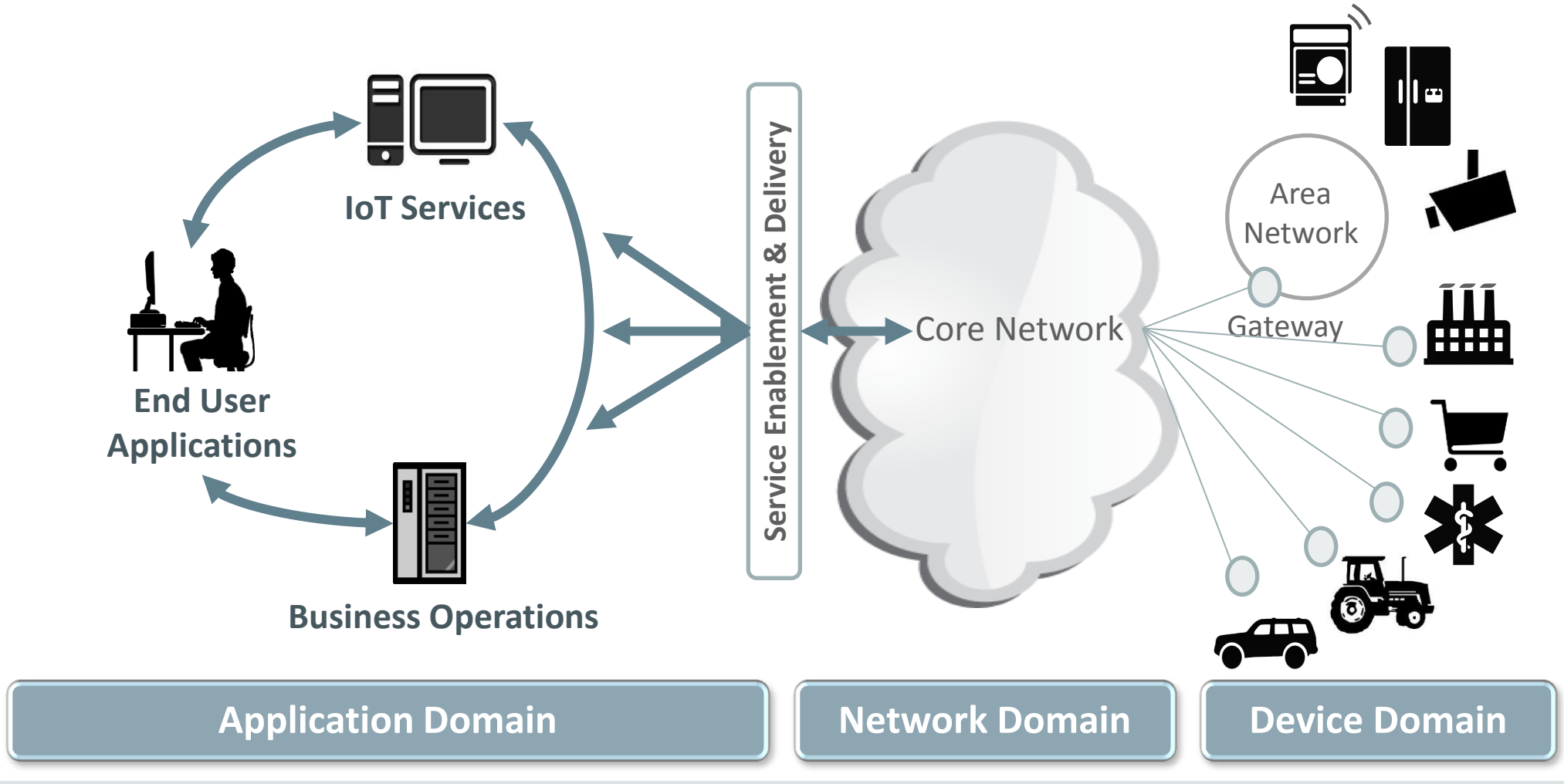
# IoT 기반 융합 서비스의 중요성



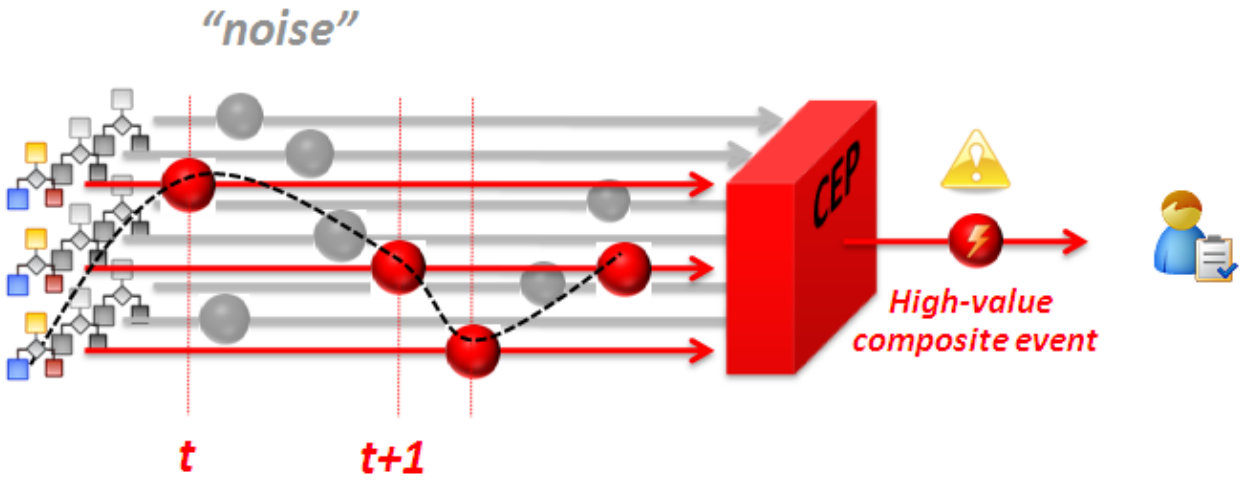

Value Added Service & Service Enablement > Network

Source: “Designing an M2M Platform for the Connected World”, Beecham Research

# The IoT Value Chain
## - 애플리케이션 | 네트워크 | 디바이스



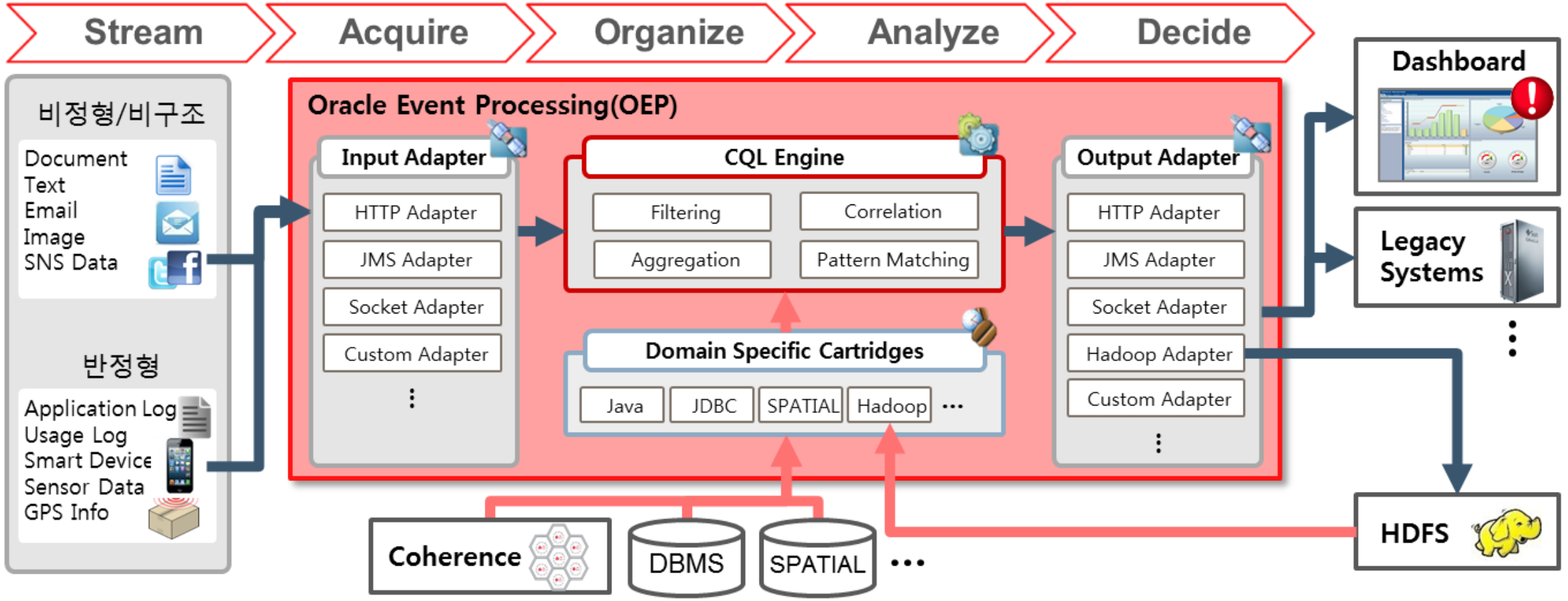
# Managing Complexity
## - 수많은 기기들로 발생하는 빅데이터의 실시간 처리 기술 필요



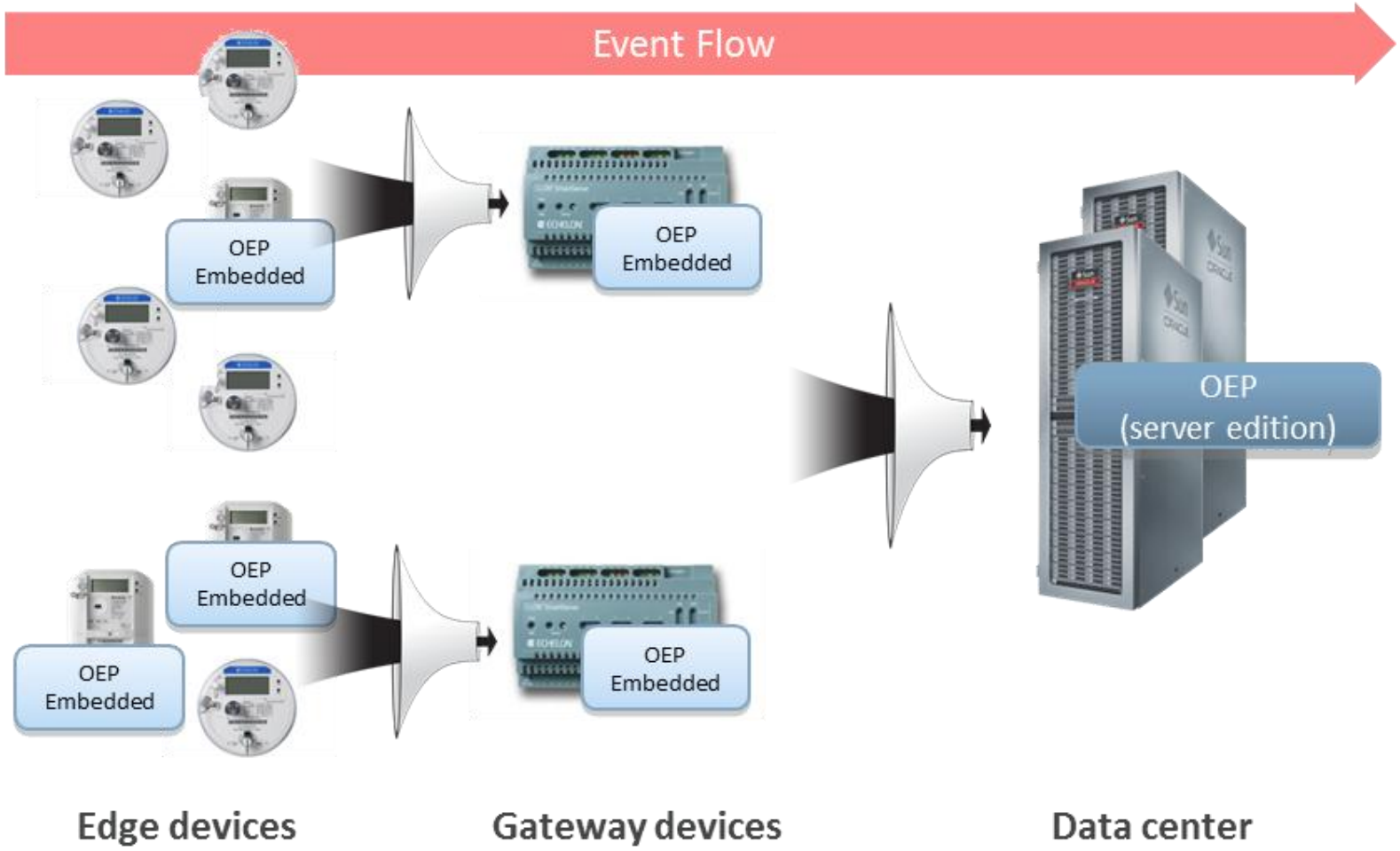

CEP 즉, Complex Event Processing 기술은 다양한 소스에서 발생하는 방대한 양의 복잡한 이벤트를 **실시간으로 감지하고 대응하는 기술**

| Big Data | Fast Data |
|---|---|
| Data at Rest | Data in Motion |
| Mine large static Files | Process Events at high Velocity |
| Analyze Later | Analyze Now |
| On Disk | In Memory |
| Hadoop, MapReduce, NoSql | Complex Event Processing (CEP) |

# Complex Event Processing(CEP) 솔루션 샘플 아키텍처
## - Oracle Event Processing



# Cascading Architecture
## - Devices → Gateways → Servers




- 이벤트가 발생하는 디바이스 단에서 기본적인 필터링, 통계 처리, 룰 적용 등을 수행 디바이스 단에서의 의사결정
- 노이즈 제거 등 서버 단으로 불필요한 데이터가 전달되지 않으며 다수의 스트림 간의 연관관계 분석 등을 광의의 이벤트 처리를 수행.

- **사례 연구** - ENERGY

# 스마트 그리드
# - ENERNOC

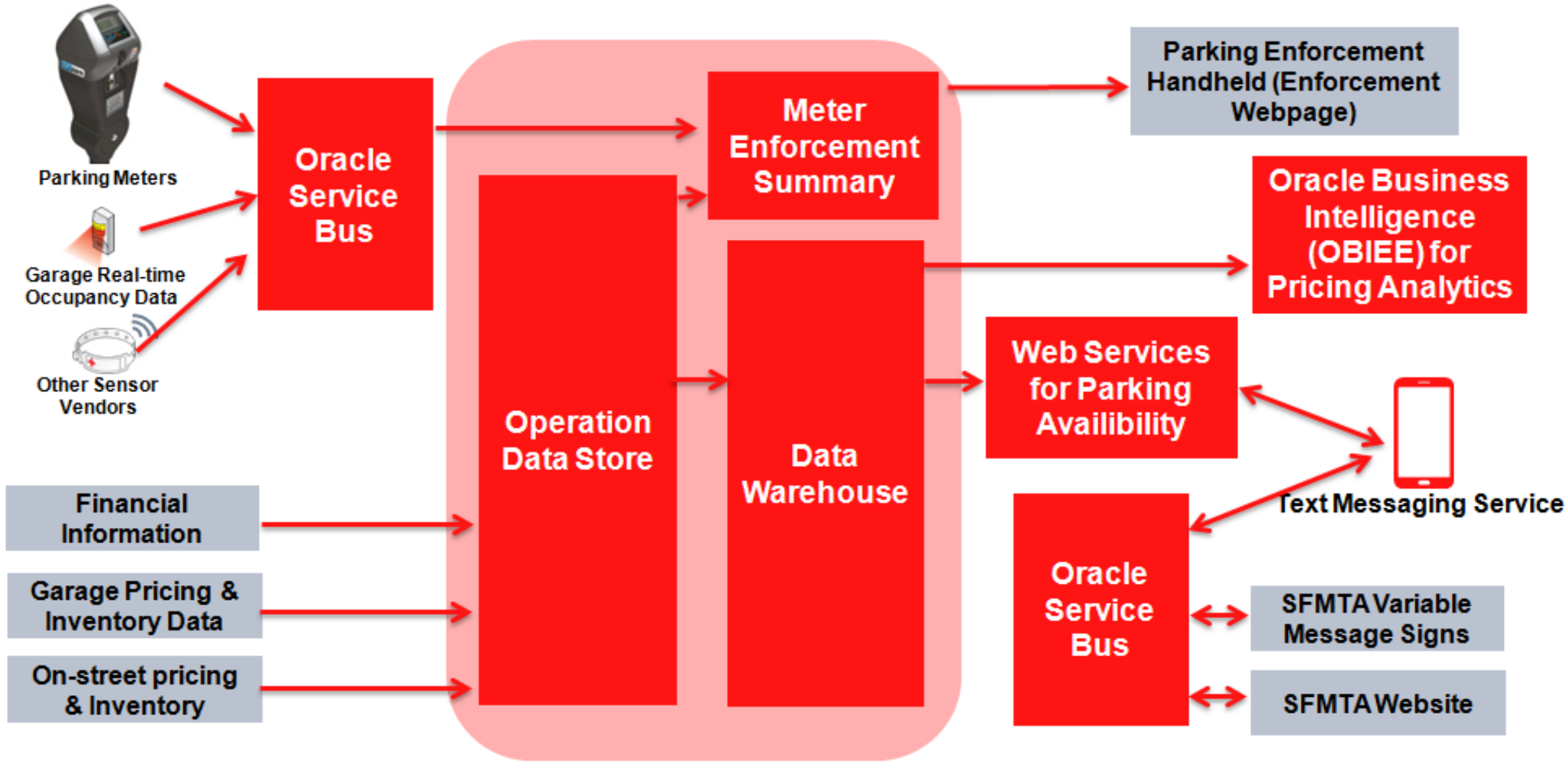
- 전력 블랙 아웃과 같은 재난을 미연에 방지하고, 녹색 에너지 사용을 촉진하고자 설립된, 전력 수급 조절 기업인 EnorNOC은 미국 각 지역에 설치된 전력망 설비로부터 실시간으로 데이터를 수집하여, 전력 수급 대응을 성공적으로 수행
- 스마트 그리드 (Energy Demand & Response Solutions)
  - '에너지 인터넷'이라고 불림
  - 4개의 솔루션(DemandSmart[Killer App], EfficiencySmart, SupplySmart, CarbonSmart)을 통하여 실시간으로 기업이 필요로 하는 전력 소요량을 측정하여, 이를 전력 공급망과 매칭을 시킴
  - 이를 위하여 각 지역에 설치된 전력망(송배전 배선로, 변압 설비, 사용자측 설비)에서 실시간으로 수집되는 데이터를, 역시 실시간으로 분석하여, 전력 수급 대응 액션을 취함

- **사례 연구 -** TRNASPORTATION

# 샌프란시스코 스마트 주차 관리 시스템
# - San Francisco Parking Management

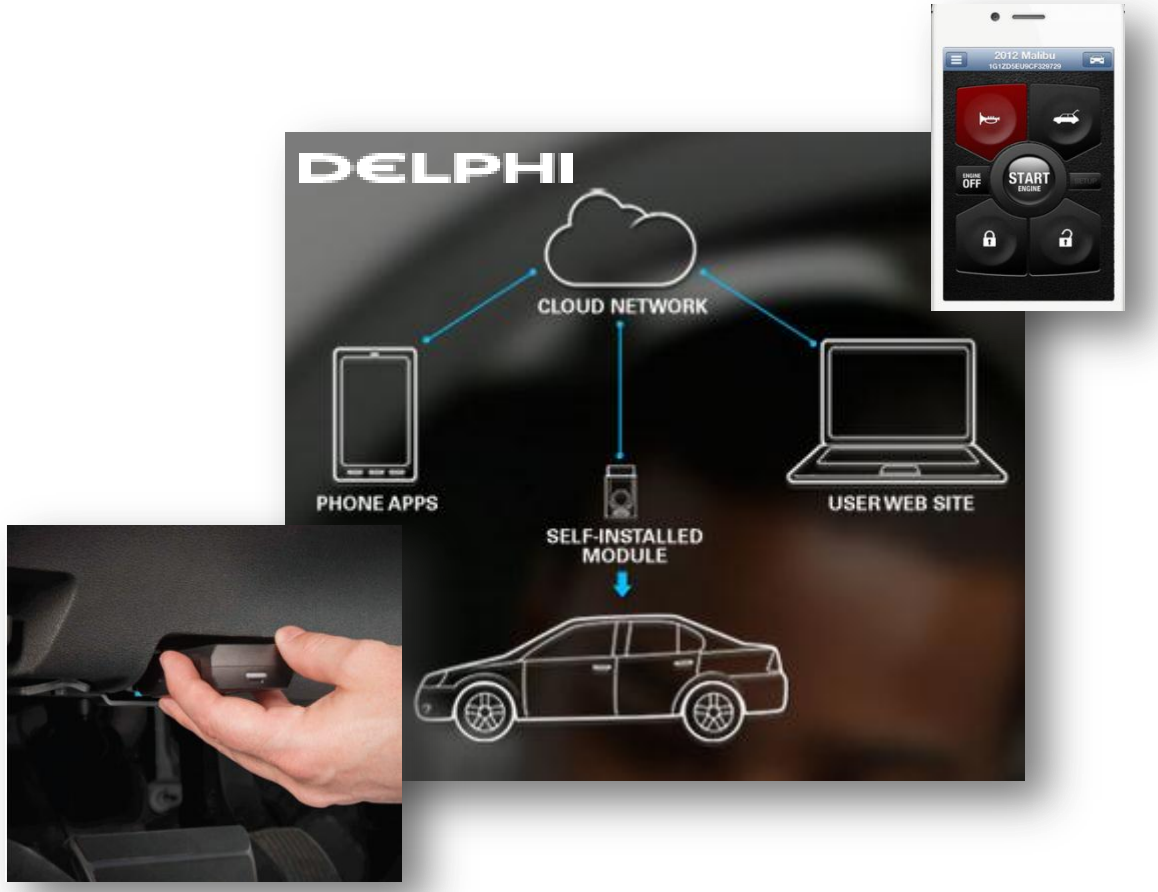
- The global first implementation of a city wide “smart” parking management system and technology to manage parking supply and demand more intelligently.
- “We have sensors at 8,200 of the city’s 27,000 metered parking spaces, and we get information from the gate arms at the city’s 14 garages”

# 샌프란시스코 스마트 주차 관리 시스템 - 아티텍처 개요



# 스마트 자동차 관리
# - Delphi Connect

- Delphi Connect is a small device that allows drivers to monitor and control their vehicle remotely via the Verizon LTE network.
- The device connects to the on-board diagnostics port found in all vehicles made after 1996, and monitors information about the vehicle's overall health, such as battery voltage, fuel level, and engine status.
- The device sends drivers alerts for maintenance issues, so that they know what is wrong before they take their car in to be serviced.
- The device includes GPS, so vehicle owners can see both historical maps of when, where, and how far they have driven, as well as real-time information about their vehicle's location.




- Drivers can use their smart phone to control their car, such as remotely locking or unlocking the doors. Parents can enable additional controls to monitor their teenage drivers, so that they receive an alert if their children leave a pre-established geographic region or go over a set speed limit.35

- **사례 연구 -** AGRICULTURE

# 스마트 해충 방제 시스템
# - Z-Trap

- Z-Trap is an electronic insect trap that helps farmers remotely monitor an insect population and protect their crops from insect damage.
- In 2010, insects cost U.S. farmers around $20 billion in damaged crops and an additional $4.5 billion for insecticide.13 Z-Trap helps prevent crop damage by using pheromones to trap insects and then compile data on the number of different types of insects in the trap.
- Z-Trap wirelessly transmits the data, including its GPS coordinates, allowing farmers to view a map of the types of insects that have been detected.14 By remotely monitoring pests, farmers can place traps at a density dictated by specific needs, thereby saving time and money and minimizing the use of insecticides.

- **사례 연구 –** ENVIRONMENT + PUBLIC

# 스마트 공공 쓰레기통 관리 시스템 - BigBelly

- BigBelly is a solar-powered trash receptacle and trash compactor that alerts sanitation crews when it is full. Waste management facilities use historical data collected from each BigBelly bin to plan their collection activities and make adjustments, such as adjusting the size of a receptacle.
- BigBelly systems are found throughout cities, corporate campuses, college campuses, parks, and beaches. Boston University has reduced its pickup from an average of 14 to 1.6 times a week.
- The university not only saves time, but also energy since its trash collectors are using fewer garbage bags and producing less CO2 during trash pickup. Given that household waste is expected to rise to 2.2 billion tons by 2025 from the current 1.3 tons produced now, additional tools will be needed to handle higher volumes of trash.

BigBelly SOLAR

- **사례 연구 –** HEALTHCARE( + LIFE STYLE )

# 개인화된 건강관리와 새로운 라이프스타일 경험
## - Nike : Nike+ , FuelBand

- Nike+ platform represents a shift for NIKE from a "product" to a "product +" experience.
- Fuelband monitors active lifestyle of 8 million users on a daily basis
- Current data grid volume is approximately 150,000 request per minute with about 40 million objects at any given time on the grid

# 감사합니다

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