적용사례를 통해 본
IoT 활용 전망과
실시간 Analytics Platform 전략

조 외 현

January 29, 2015

ParStream

Strong IoT momentum with CEO's & CIO's

WORLD ECONOMIC FORUM

2015 Tech Predictions

1. **Digital transformation**
2. **Internet of Things**
3. **Convergence of big data with consumer data**
4. Hybrid cloud
5. Collaboration
6. **Predictive analytics will lead big data**
7. **Mobile wearable technology**
8. A Platform and orchestration is needed
9. Networked Economy
10. The end of apps

Gartner SYMPOSIUM ITXPO® 2014

Top 10 Strategic Technology Trends for 2015

1. Computing Everywhere
2. **Internet of Things**
3. 3-D Printing
4. **Advance, Pervasive Analytics**
5. Context-Rich Systems
6. **Smart Machines**
7. Cloud Computing
8. Software Defined Infrastructure
9. Web-scale IT
10. Risk-Based Security

FORRESTER®

Predictions 2015

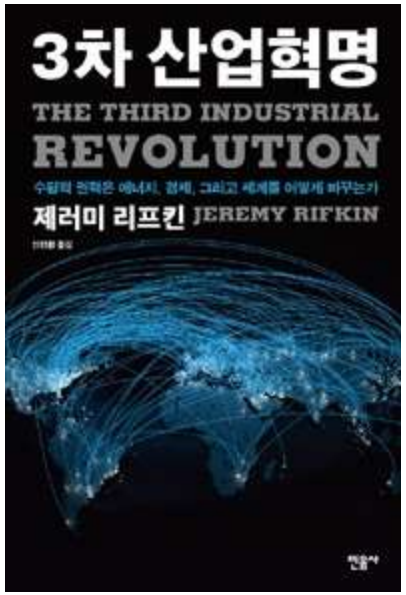
IoT software platforms will become the rage in 2015 and drive IoT Adoption

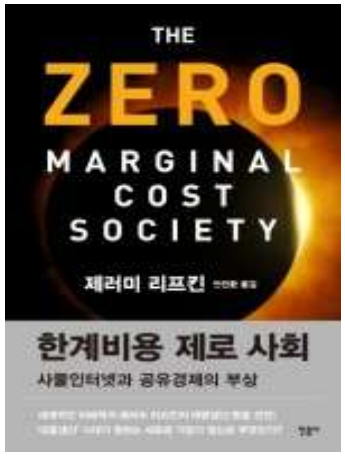
The Rise of IoT – New Era of Super Connectivity: CES 2015

'사물인터넷 시대의 기회와 장애 요인'을 주제로 무대에 오른
제레미 리프킨(Jeremy Rifkin)

Super Connectivity

100x ~ 1000x
than Internet





Analytics drives business value in IoT

Gartner

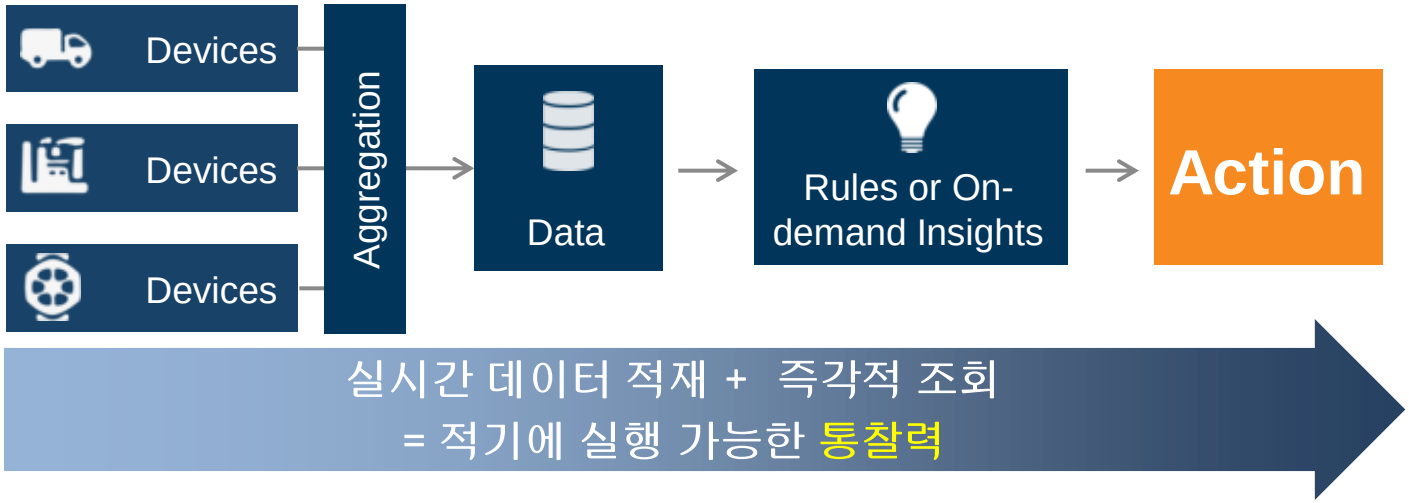
Analytics have been transformative in wide areas of customer and product service. Sensor enabled industrial analytic applications are the next frontier

July 2014

Forbes

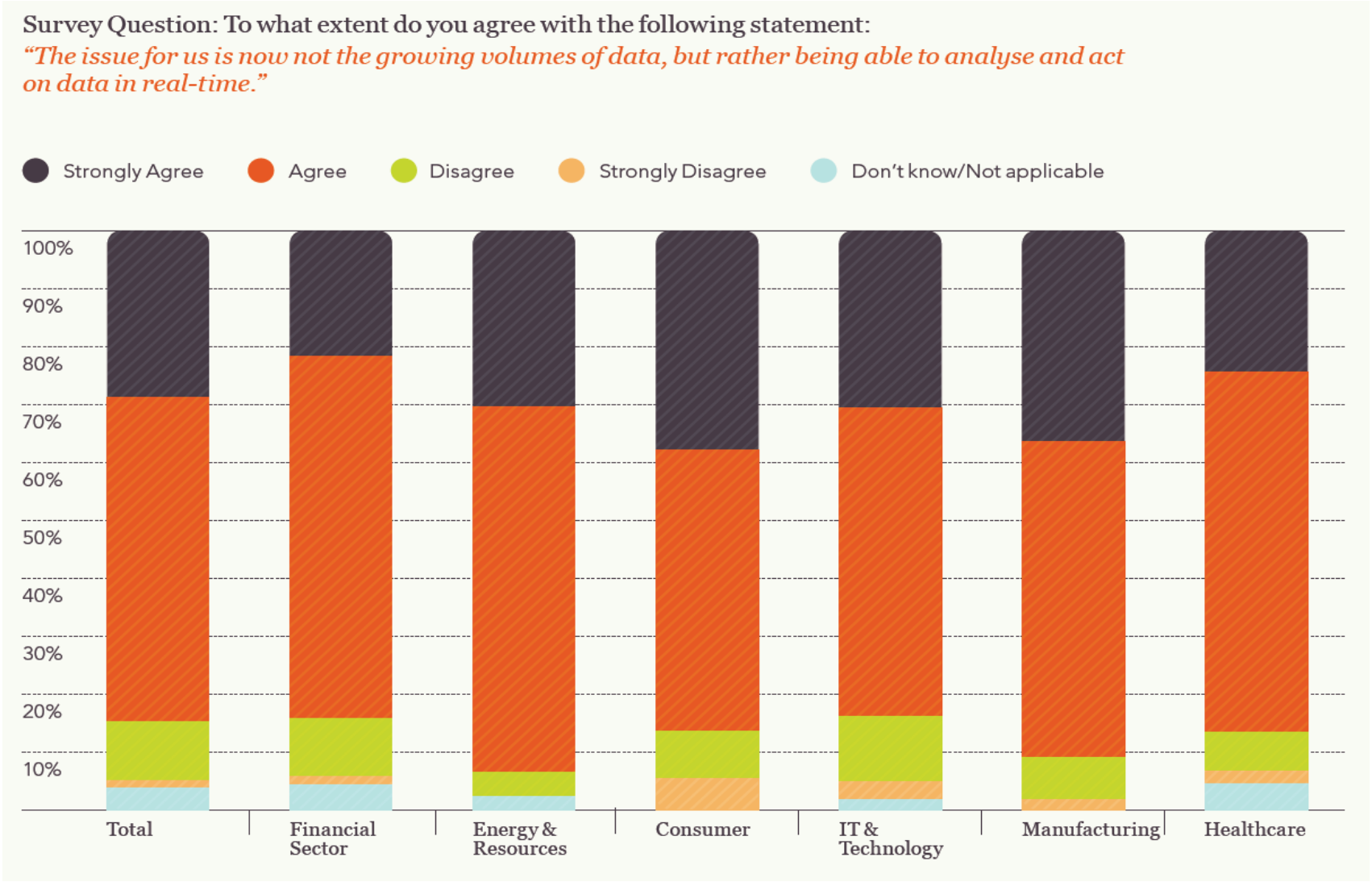
"The value of IoT is in the data. The quicker enterprises can start analyzing their data the more business value they can derive."

June 2014



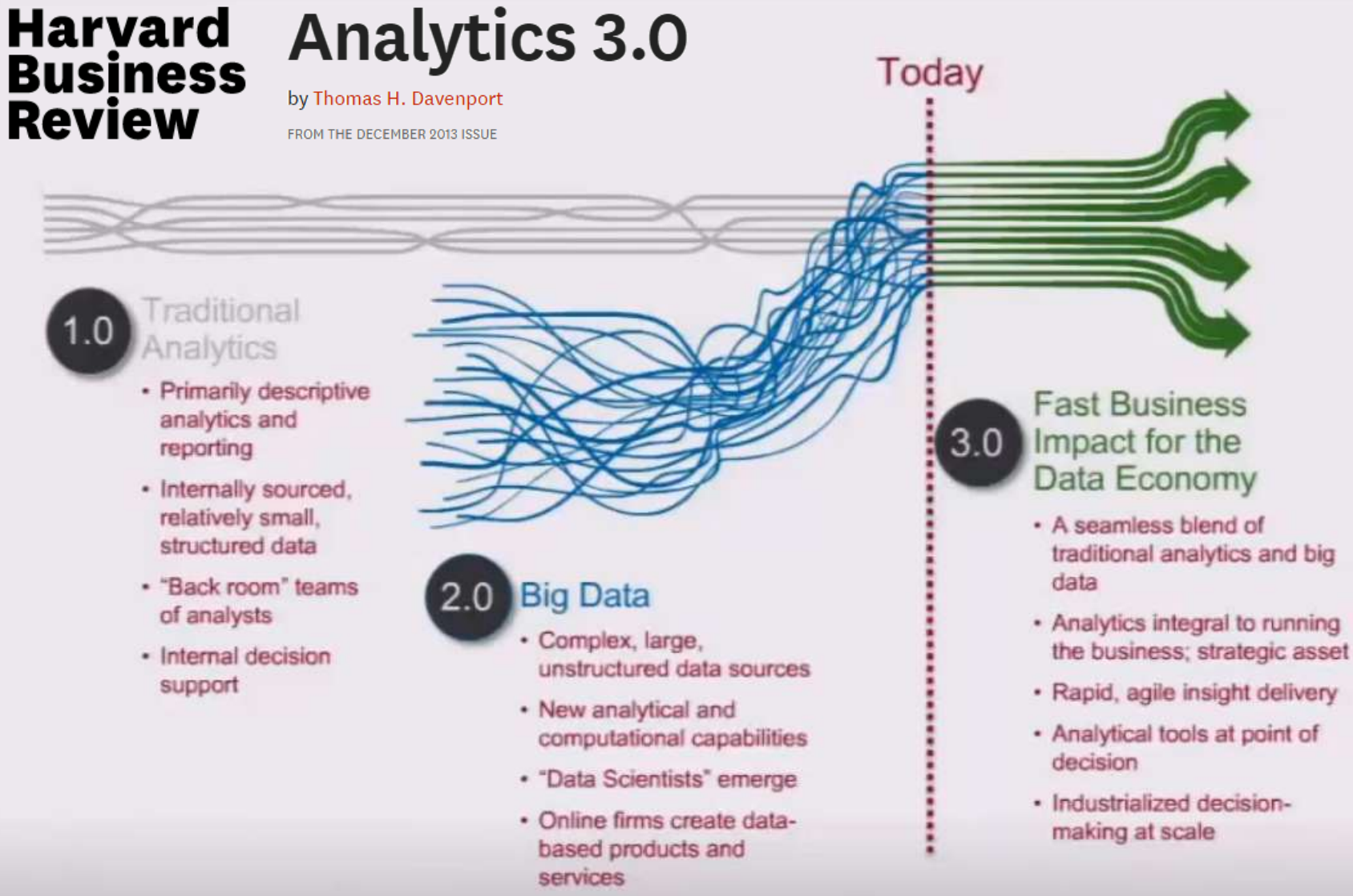
Real-Time Needs Everywhere

"85% of respondents say the issue is not about volume but the ability to analyse and act on the data in real time"



Source: Cap Gemini Study "The Deciding Factor: Big Data & Decision Making"

Analytics 3.0 | Fast Business Impact for the Data Economy



IoT (Internet of Things) 확산과 새로운 비즈니스 모델

- 다양한 사물(Things)들이 인터넷과 연결

CISCO (2013.12)

- 2020년 370억개의 IoT 기기 전망
- 향후 10년동안 공공 **4조6천억$**, 민간 **14조4천억$** 가치 창출

Gartner

- 2020년 인구 77억명, 스마트 기기 73억개, IoT 기기 260억개 전망
- **억$** 규모
- **분터**
- 기 전망,
- 존재

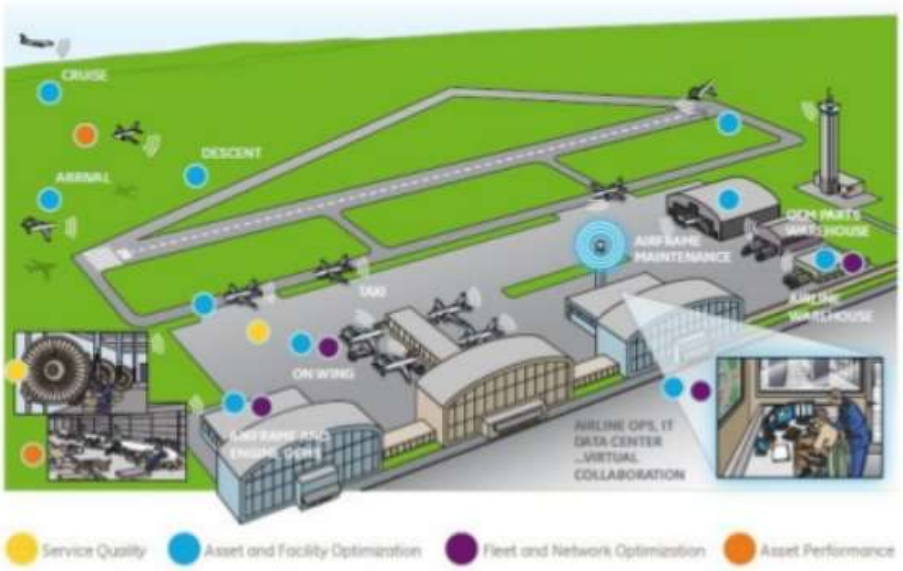
2014, 기업내 IoT, 2012년에 비해 333% 증가 <Forrest Research>

Industrial Internet & Sensor

산업용 인터넷은 특정 산업 내 효율성 향상 및 생산 공정 자체의 새로운 변화를 가져올 수 있음.

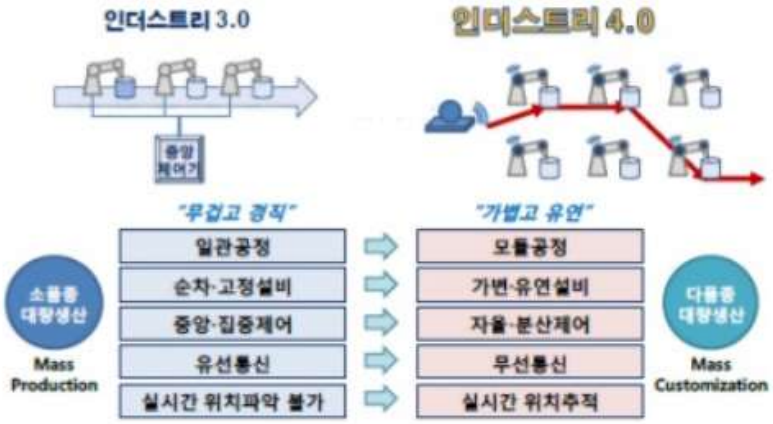
산업용 인터넷

항공 산업용 인터넷



- 항공기 정비, 비행 관제 등 공항에서 필요한 다양한 기능들을 최적화 및 자동화

Industry 4.0 : 생산 공장

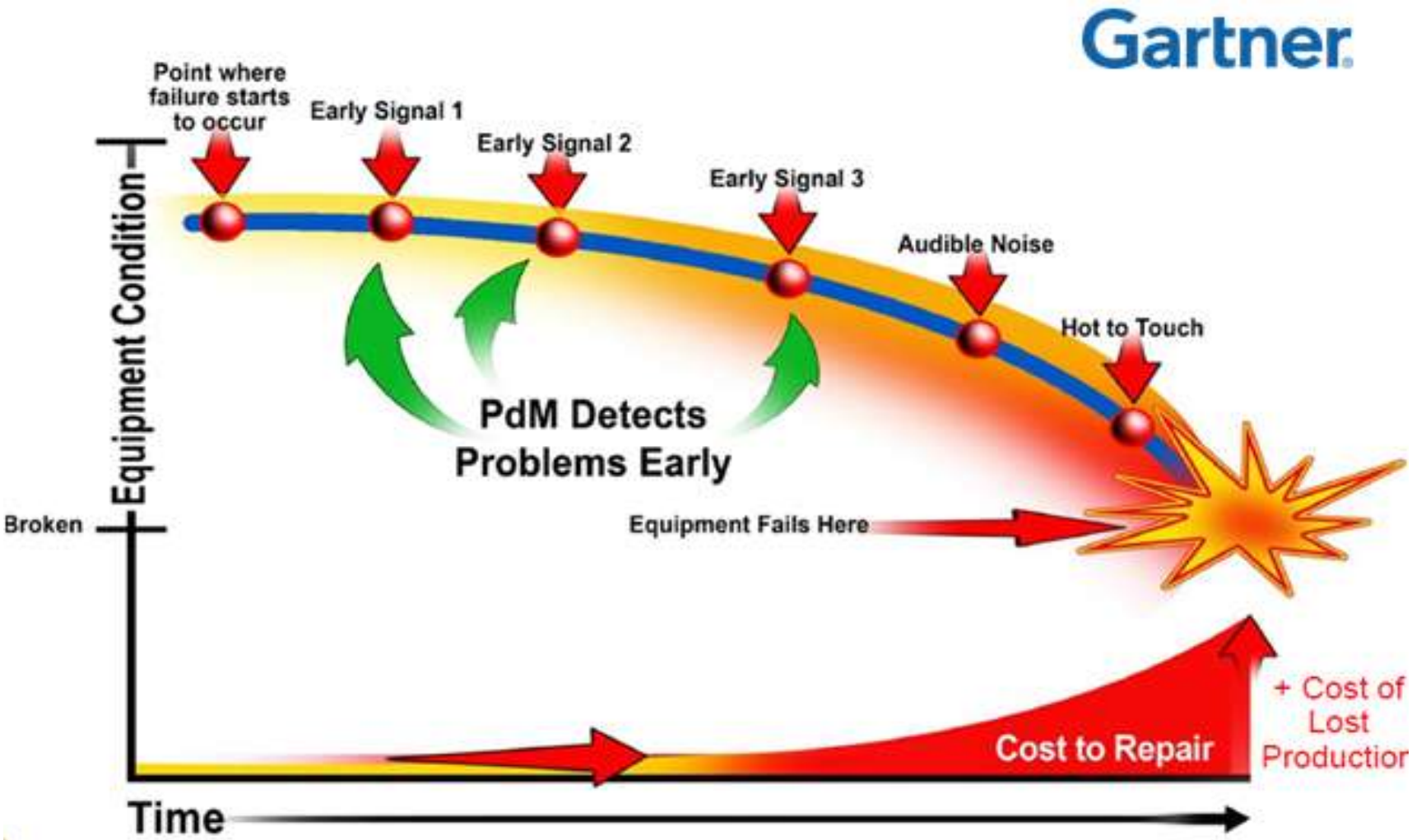


- IoT와 함께 다품종 대량 생산 방식을 지향
  - 3D 프린터의 지향점
- Industry 4.0 적용 대상 산업에 대한 고민이 필요

Source : Industrial Internet : Pushing the Boundaries of Minds and Machines(GE), POSRI 보고서,'인더스트리 4.0, 독일의 미래 제조업 청사진'

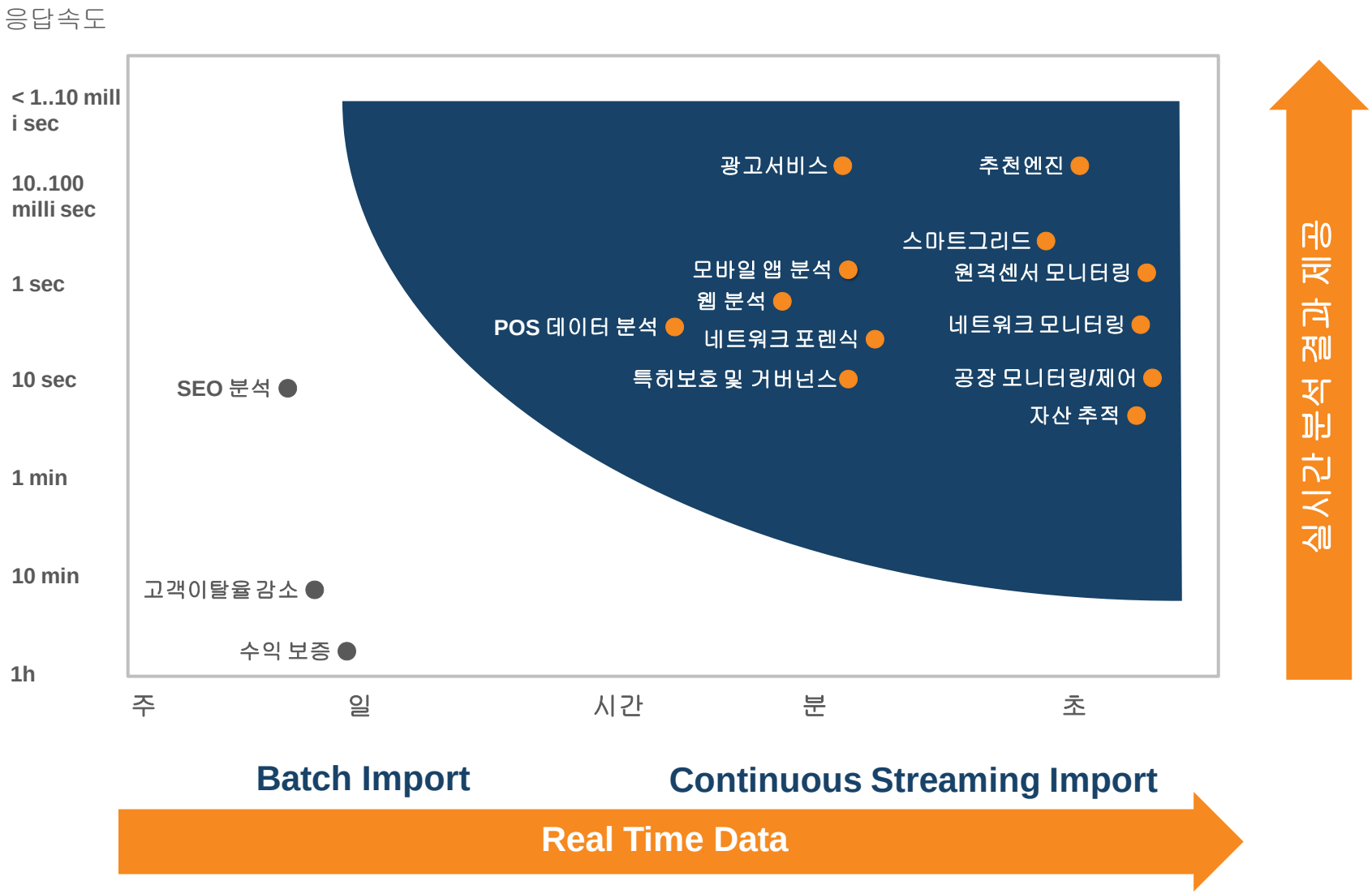
IoT 실시간 데이터에 대한 즉각적 분석의 가치

Time = Money



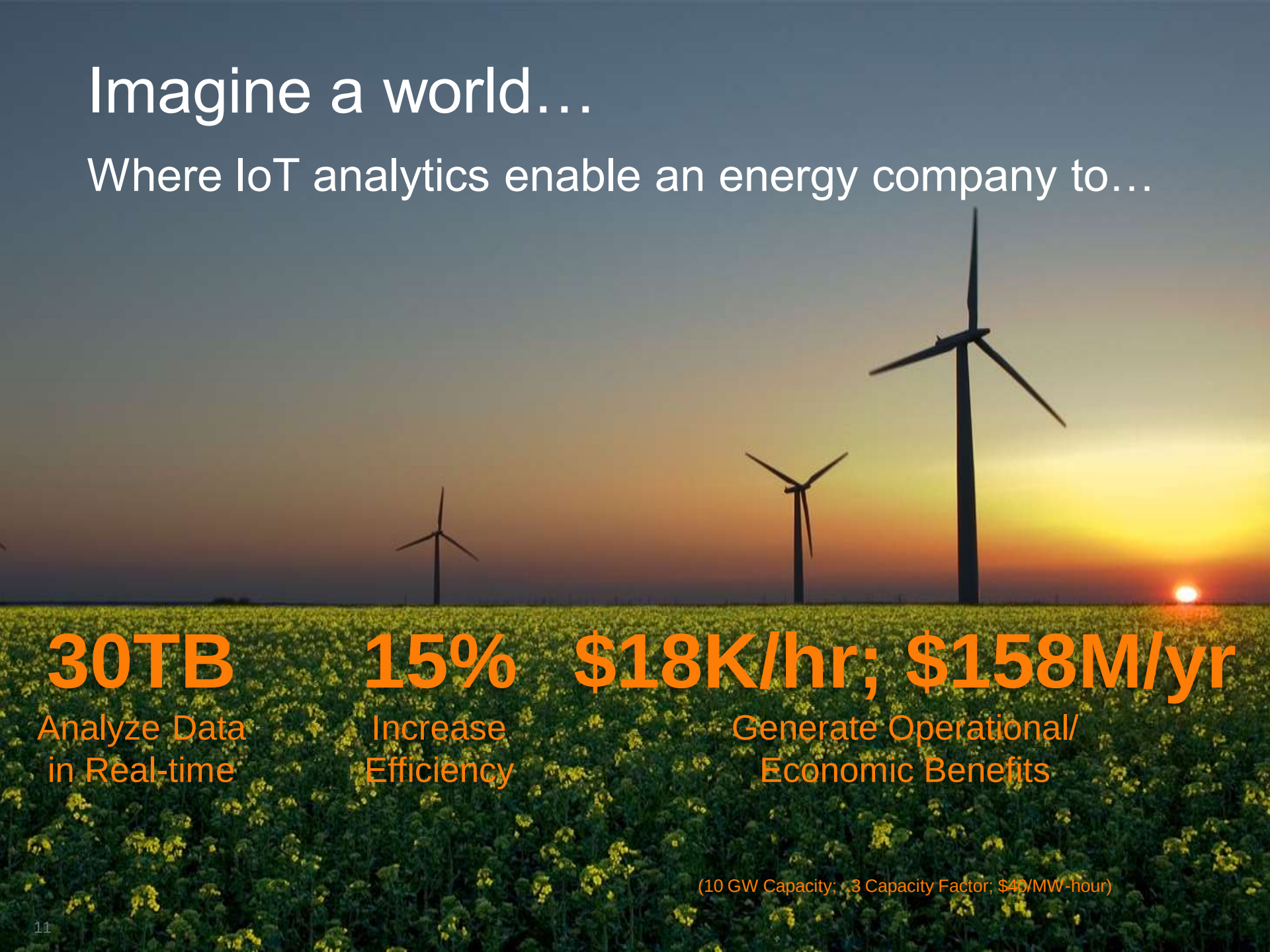
업무 특성에 맞는 인프라 및 서비스 구축

- 데이터의 활용가치 제고: 실시간 분석을 통한 즉각적인 통찰력 제공



Imagine a world…

Where IoT analytics enable an energy company to…



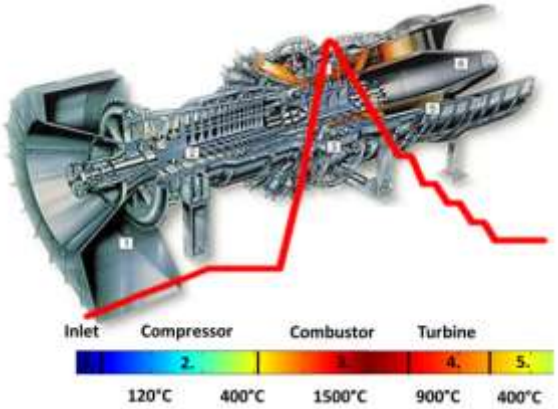
30TB
Analyze Data in Real-time

15%
Increase Efficiency

$18K/hr; $158M/yr
Generate Operational/ Economic Benefits

(10 GW Capacity; 3 Capacity Factor; $40/MW-hour)

Customer Proof Point for IoT in Manufacturing: Real-time Analytics for Gas Turbine Monitoring



SIEMENS

Business Challenge

- Optimization of complex systems for efficiency and operational (automated) decisions in real-time
- Enabling new service-driven business models

Use Case

- 5,000 data points per sec/turbine for real-time analytics and historical storage for model-based learning/root cause analysis.

Value Proposition

- Real-time monitoring of continuous data-flow for immediate insights/actions
- “Analytical Historian” enabling storage and analytics in an integrated platform by immediately importing and storing all sensor readings

Benefits/Results

- Improved startup with less vibration equals less deterioration
- Less NOx emission
- Improved overall efficiency
- Prediction of material fatigue

Customer Proof Point for IoT in Manufacturing: Real-time Analytics for Semiconductor Testing

GALAXY
SEMICONDUCTOR INTELLIGENCE

Business Challenge

- Current MySQL environment requires pre-built aggregations. The ability to perform root cause analysis is limited.
- Computing aggregations takes too long reducing machine utilization and causing more scrap product.

Use Case

- One Automated Testing Equipment handles 24 wafers per lot, 1 wafer generates 1 Billions test results. Data volume required pre-built aggregations which took too long to build

Value Proposition

- Real-Time monitoring of continuous data-flow for immediate insight /action to reduce waste and increase outputs
- Unlimited scalability allows Galaxy to market to bigger semiconductor testing and manufacturing companies

Benefits/Results

- Improved Machine Utilization: Current batch style analysis of test data causes expensive test machines to be underutilized
- Revenue Increase: Increased data volume opens new, more lucrative markets, ability to sell to larger customers
- New Products: Drill down analysis to detail test results leads to new insights
- Cost Savings: Ability to analyze detail level data expected to produce new insights in causes of test failures

Customer Proof Point for IoT in Automotive/Telematics: Real-time Analytics for Sensor Data/Vehicle Monitoring

OCTO

Business Challenge

- Optimization of multiple systems for efficiency and operational (automated) decisions on billions of records
- Enabling new service-driven business models

Use Case

- Real-time monitoring of continuous GPS data and events flows

Value Proposition

- Over 260 million new records/month for real-time analytics
- 31 billion records of historical data
- It collects all data from different systems near-real-time

Benefits/Results

- Reduced overall data manipulation time by over 90%
- Reduced annual hardware by over 60%
- Improved execution time and scheduling efforts
- Improved analysis/prediction of driver profiles

Customer Proof Point for IoT in Renewable Energy: Real-time Analytics for Wind Turbines

ENVISION

Business Challenge

- Optimize wind turbine performance by quickly adjusting to changing environmental factors (e.g., wind direction, temperature, etc.)
- Minimize turbine downtime thru predictive maintenance.

Use Case

- Real-time and continuous monitoring of data from 20,000 wind turbines, including analysis of over 20TB of historical data

Value Proposition

- Real-time monitoring of continuous data-flow for immediate insights/actions
- “Analytical Historian” enabling storage and analytics in an integrated platform by immediately importing and storing all sensor readings

Benefits/Results (estimated)

- 15% improvement in productivity
- Decreased downtime
- $158M of annual economic benefits

Car Insurers Promise Discounts If Big Brother Watches You Drive

Standard Rating Customers
By Age and Driving History

→

User-based Car Insurance
By Monitored-Driver Offering

시장 전망(Insurance Telematics)

- Car Insurance using Driver Data to Set Prices
  - 연 40% 성장
  - 2020년 $3.6B 시장규모
- Car Insurance using Driver Data will be a Market Standard
  - 2014년 시장규모 < 5%
  - 2020년 26%(in US), 38%(in UK) 시장점유율

시장 선도 기업들

- Volkswagen
- BMW
- Zurich Insurance Group
- Axa Savings
- Allianz SE

구현 개념

- 제휴: Insurer + Car Makers
- 자체: Insurer + Smartphone Apps & Devices
- 보험료 30%할인: 개인정보 제공의 가치보다 커야
- 가입자: 사고 시 빠른 대응, 응급구조 및 수리 지원
- 보험사: 사고발생 유무 확인 및 사고 순간의 원인규명 자료, 개인별 보험료 산정 정보 획득

With Big Data, Moneyball Will Be on Steroids

Braves center fielder Jason Heyward : With two outs in the ninth inning of a one-run game between the Atlanta Braves and New York Mets in July 2013.

일반적인 야구 해설

Heyward "[raced] over from the right-center gap," then "dove and fully extended his big body to catch the ball inches from the ground.

Heyward for "[getting] on his horse to make an all-out diving catch."

Source: July 24, 2014 Newsweek

With Big Data, Moneyball Will Be on Steroids

- Big data is about to change how baseball is managed, analyzed and consumed

At the MIT Sloan Sports Analytics Conference in March 2014, the catch was described in a very different language: Turner's batted ball traveled at 88 miles per hour toward the gap; split the two nearest outfielders, stationed some 81 and 83 feet away; and hung in the air for four seconds. Heyward caught the ball because his first movement came three-hundredths of a second quicker than teammate Reed Johnson's, and his top speed was three miles per hour faster than Johnson's. But the key to the play was an almost perfect route to the ball: He traveled a path that was 97 percent true to a straight line.

2014년 3개 MLB구장, 2015년 전체 구장 적용계획
➔ 야구 분야 새로운 데이터 분석가 및 일자리 창출

데이터분석을 이용한 새로운 언어의 야구 해설

- 터너가 친 공은 시속 88마일로 빈 공간으로 날아갔습니다.
- 근처의 2명의 외야수 사이를 갈랐는데 이들로부터 각 81피트와 83피트 떨어져 있었습니다.
- 볼의 공중 체류시간은 4초 동안 이었습니다.
- 헤이워드가 그 볼을 잡을 수 있었던 것은 그의 최초의 움직임이 팀 동료인 리드 존슨 보다 3/100초 빨랐기 때문이었습니다.
- 그의 최고 속도가 존슨 보다 시속 3마일 빨랐던 것입니다.
- 그러나 무엇보다 그 경기의 중요한 핵심은 볼을 향한 거의 완벽한 경로였습니다.
- 헤이워드의 이동경로는 공의 낙하지점과 일직선상으로 97% 일치하였습니다.

Source: July 24, 2014 Newsweek

How Heineken Interacts With Customers Using Big Data: The First Interactive Bottle

Connected Bottles
using
Internet

http://www.youtube.com/watch?v=Bv0SiX_yzws

How Heineken Interacts With Customers Using Big Data: IoT + Creativity = Innovation

IoT + Creativity
=
Innovative Entertainment

- Real-time Mobile Marketing Initiatives
- In-Store Data on Where a Customer Purchases What Type of Beer
- Connected Bottles Take Drinking Beer to a New Level

Cisco & Fog/Edge Computing

Travel Use Case: bd4travel

bd4travel

bd4travel ("Big Data for Travel") off
customers and customer segm
individu

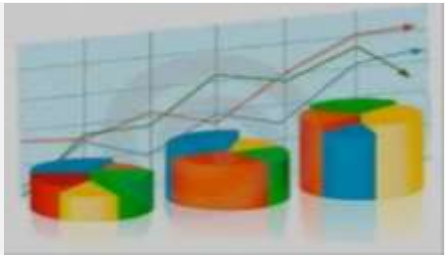
"Very smart technology with the potential to change the way travel is sold".

Chris Nourse
Director Of Operations, Multicom

bd4travel wins the Brand USA Marketing Innovation Award at this year's Travel Innovation Summit@The Phocuswright Conference

IoT analytics has a set of distinct requirements.

Problem

Big Data Data is growing faster and bigger because of number of sensors	**10B+ rows 5TB+**	
Fast Data Data streamed from sensors requires fast ingestion	**1M+ rows per sec**	
Edge Analytics IoT data is mostly generated at the 'Edges' of the network	**100+ Locations**	
Real-Time Insights Use cases require near Real Time Analytics	**<1 sec query response time**	

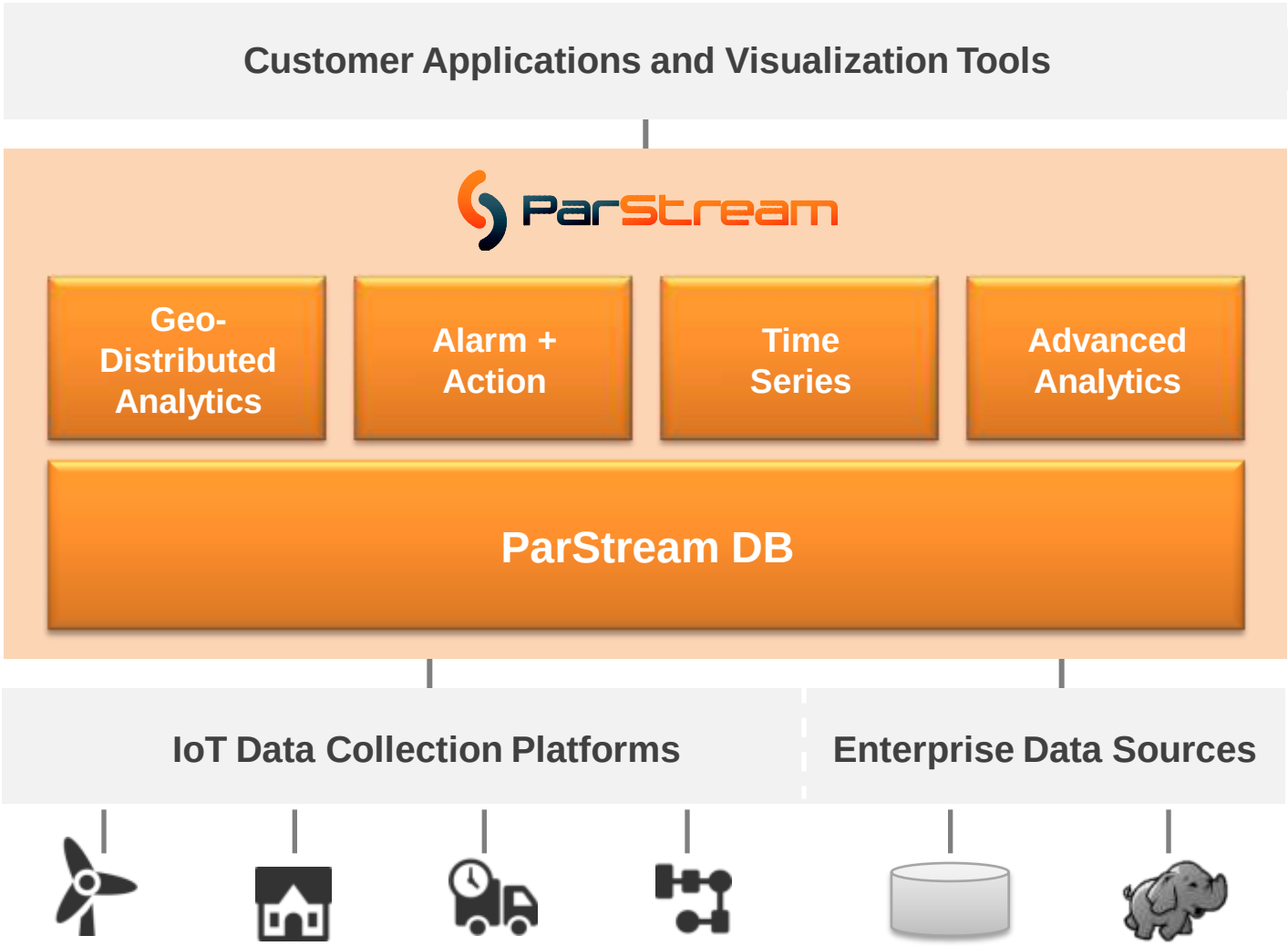
IoT analytics has a set of distinct requirements.

Problem

Big Data Data is growing faster and bigger because of number of sensors	**10B+ rows 5TB+**	**Wind turbine:** 100 turbines x 100M rows per year **Race car:** 400M records / day x 365 days test drive **Telco:** 1.000 cells x 1.000 rows / sec x 1 days - wow **Traffic analysis:** 60M cars x 1 read / min x 365 days **Oil rig:** 1 rig = 8 billion records / day (not verified)
Fast Data Data streamed from sensors requires fast ingestion	**1M+ rows per sec**	**Network monitoring:** 1M rows per sec per cell **Asset monitoring:** 60M cars x 1 reading per minute **Airplane monitoring:** 4 turbines x 3k sensors x 100Hz **Oil exploration:** 10.000 wells x 100 sensors x 1Hz **Oil rig:** 1 drilling rig x 10.000 sensors x avg 100Hz
Edge Analytics IoT data is mostly generated at the 'Edges' of the network	**100+ Locations**	**Manufacturing:** 300.000 plants in US (2012) **Cars / ships / airplanes:** >1 billion world wide **Telco:** 190.000 cell towers in US (2013) **Oil:** 950.000 wells worldwide; 500.000 in US **Mobile advertising**: de-central adserving / monitoring
Real-Time Insights Use cases require near Real Time Analytics	**<1 sec query response time**	**Dashboarding:** real-time visualization, many queries **Network monitoring:** root cause analysis, optimization **Asset monitoring:** conditional monitoring, safety **Security:** anomalie detection, building safety **Traffic:** location aware recommendations

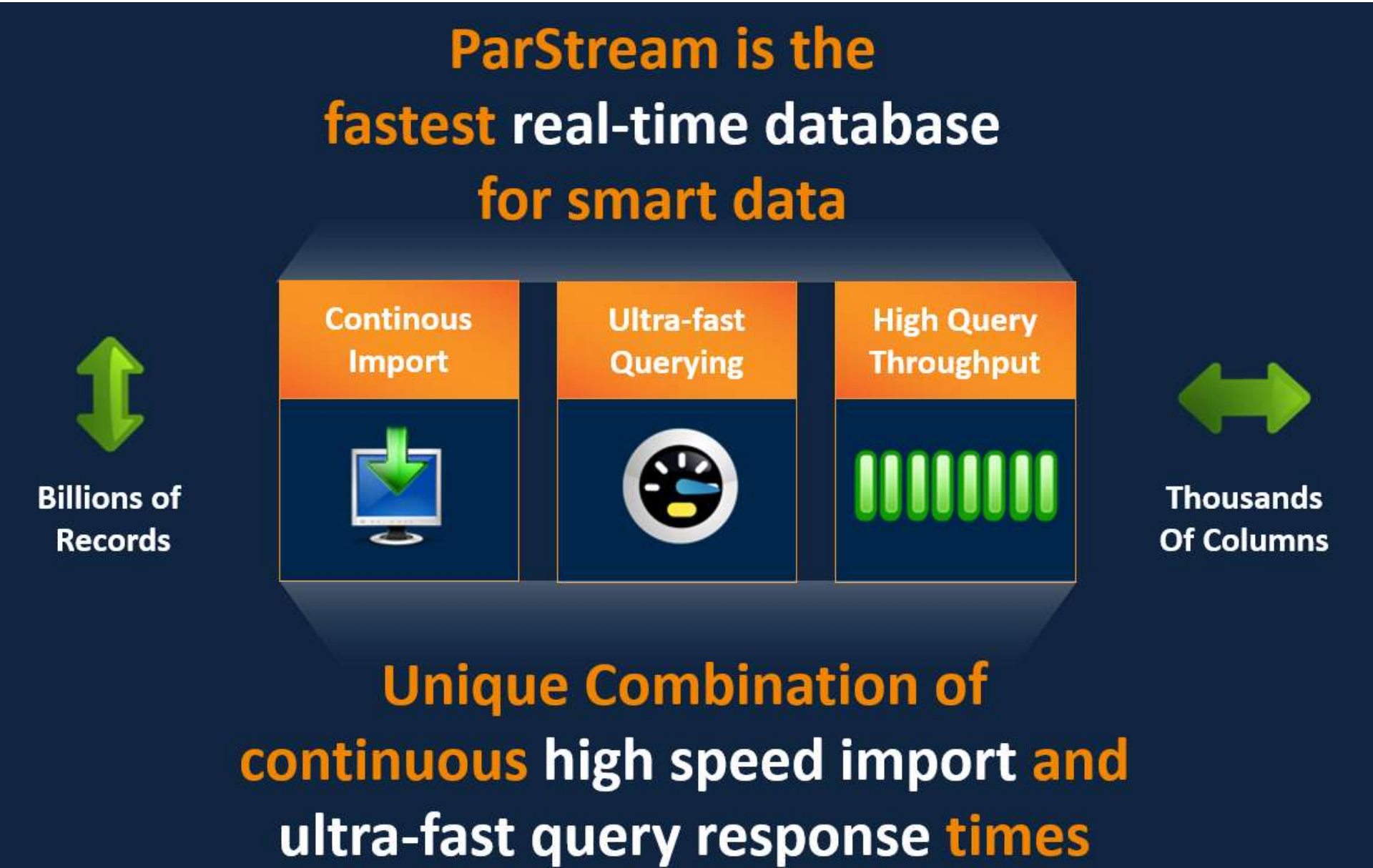
ParStream is the only solution for all IoT analytic requirements.

Solution



ParStream : Import / Query 동시 처리

Solution



Existing products don't fulfill IoT requirements.

Problem

Requirements \ Product	ParStream	Columnar Databases Vertica, Redshift	Row-based Databases Oracle, Informix...	Value Stores Cassandra, MongoDB	Hadoop Batch Cloudera, Hortonworks	Hadoop Streaming Spark / Shark Storm
BIG DATA Capacity	●	●	–	●	●	●
FAST DATA Import	●	–	–	●	●	●
EDGE Analytics Capability	●	–	–	–	–	–
REAL TIME Insights	●	–	–	–	–	–
INTEGRATED Platform	●	●	●	–	–	–
IoT DATA Storage Structure	●	–	●	●	–	–

See details in backup

Representative customers validate ParStream's technology and value.

Traction

searchmetrics	etracker Know Now.	metagenopolis mgps.eu	CAKE	citi
Reduced 150 servers to 4	300 concurrent users; 400 days continuous uptime	60B rows capacity	500 concurrent users	Replace 30TB Oracle data-warehouse
Import time 2 weeks → 4 hours	10b+ rows; 150ms avg. response time	100x faster than closest competitor	40x faster than closest competitor	Response time < 1 second

ParStream Ecosystem:
Integrated with Leading IoT Solutions

Solution

Industry-leading Product Recognition

Cisco Entrepreneurs in Residence

Silicon Valley Open Innovation Challenge NOKIA

database TREND-SETTING PRODUCTS 2014

TECH TRAILBLAZERS

CIO TOP STARTUP 2013 #1 Big Data Startup

BIG DATA 50 2014 Startup50.com

CRN EMERGING VENDORS 2014

RED HERRING 100 WINNER GLOBAL

RED HERRING WINNER 100 EUROPE

Gartner 2012 CoolVendor

ParStream is the most reliable System in our Data Center

CTO, etracker

ParStream enabled us to scale internationally - TCO is much lower than with Hadoop

VP Eng, Searchmetrics

ParStream was 40 times faster than its nearest competitor.

CTO, Cake Marketing

Summary: Five Big Data Trends for 2015

- ✓ **A Connected Future: The Internet of Things Taking Off**
  (사물인터넷: 소비자와 기업에게 무한한 가능성을 제공하고 우리 삶의 모든 면에 침투)
- ✓ **A Shift Towards Data-Driven Culture**
  (스마트 실시간 대시보드를 포함한 데이터 중심의 프로세스와 의사결정 문화로 전환)
- ✓ **Owning Up to Your Own Identity – Claiming Your Personal Data**
  (데이터 소유권에 대한 사고의 전환으로 개인정보 거래시장 활성화: Handshake, DIME)
- ✓ **Big Data Security Analytics Gaining Traction**
  (실시간의 빅데이터 보안 분석 도입 확대: 405labs, Sentinel Labs, fiD3)
- ✓ **Time to Experiment with Data Lakes**
  (생각과 관망에서 벗어나 데이터 호수를 이용한 다양한 실험을 할 시기)

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ParStream