IoT Service Transformation

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October 28, 2015

- Service Trends and Transformation

- Connected Products and IoT

- Intersection of IoT and Services

- Connected Service Response and Examples

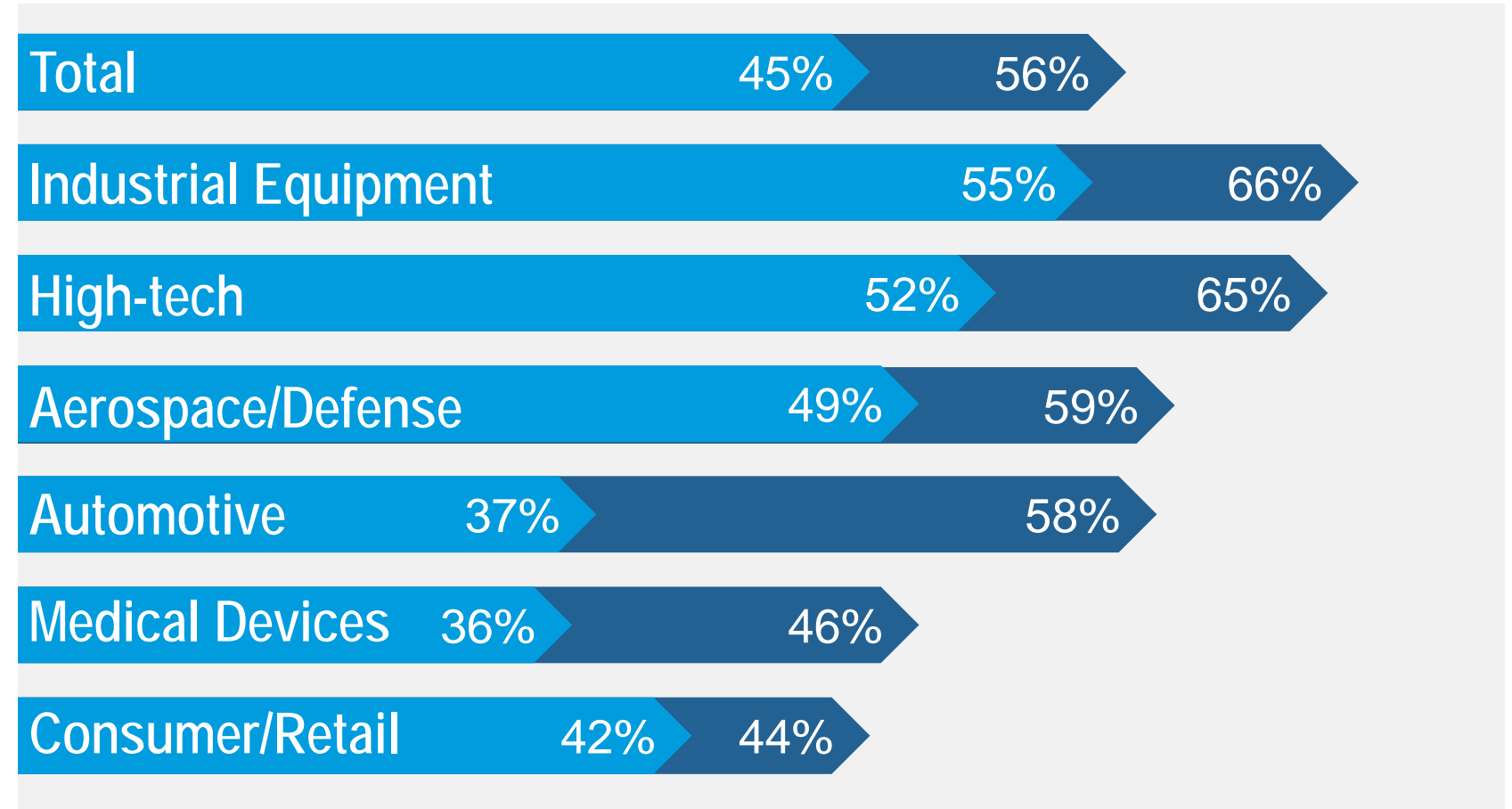Service Trends and Transformation

Service is a Key Source of Both Revenue and Profit Growth for Manufacturers

Service
Drives Revenue and Profit

Customers
Prefer Outcome- or Performance-based Contracts

Internet of Things
Enables Operational and Strategic Service Transformation

Firms operating service as a profit center

Category	Today	In 3 Years
Total	45%	56%
Industrial Equipment	55%	66%
High-tech	52%	65%
Aerospace/Defense	49%	59%
Automotive	37%	58%
Medical Devices	36%	46%
Consumer/Retail	42%	44%

Today ■   In 3 Years ■

Source: Oxford Economics study commissioned by PTC

Manufacturers are Transforming their Service Business Models
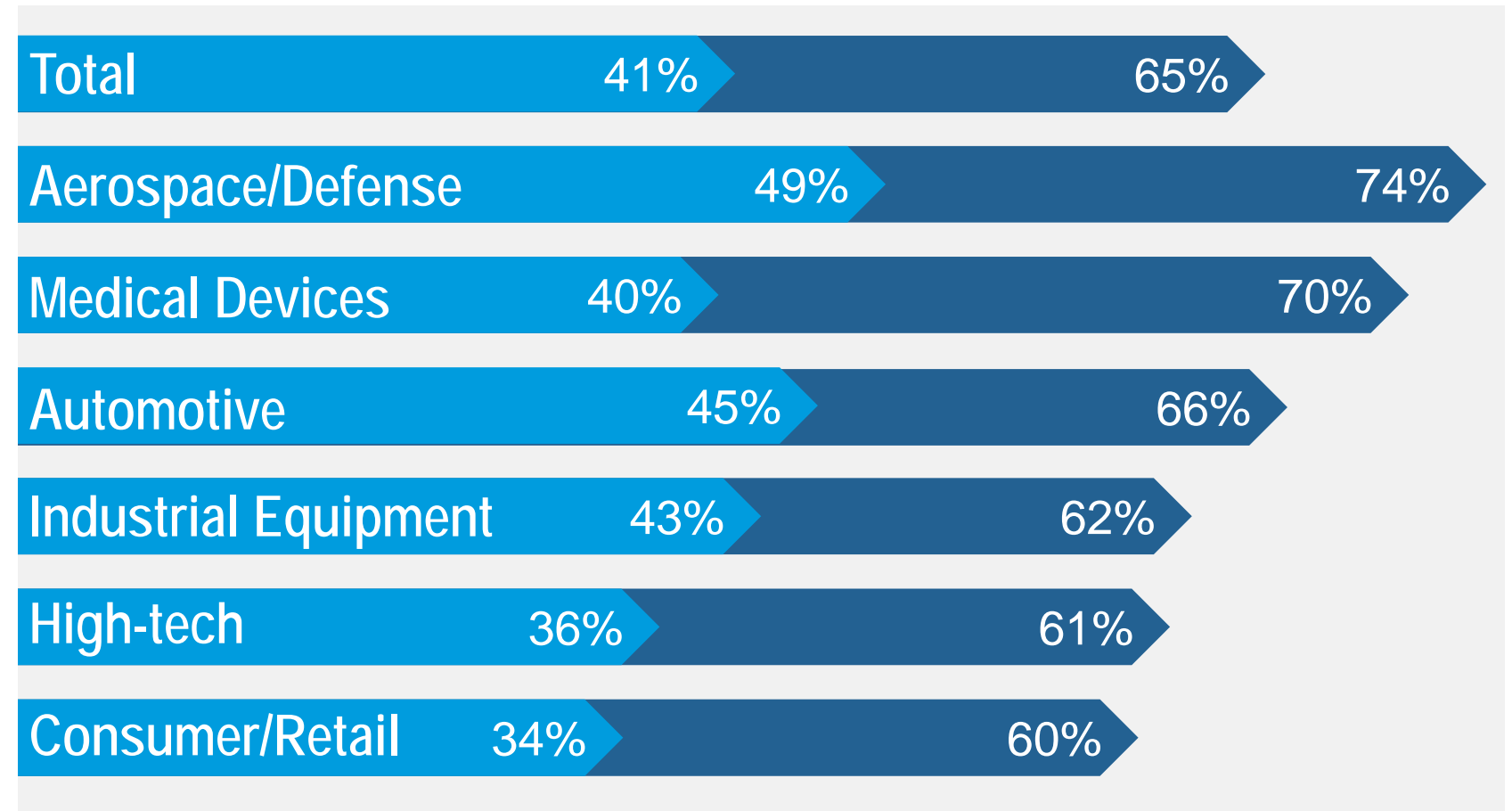
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Manufacturers are Rapidly Migrating to Outcome Based Services

Service
Drives Revenue and Profit

Customers
Prefer Outcome- or Performance-based Contracts

Internet of Things
Enables Operational and Strategic Service Transformation

Performance-based Service Contracts Becoming Common

Category	Today	In 3 Years
Total	41%	65%
Aerospace/Defense	49%	74%
Medical Devices	40%	70%
Automotive	45%	66%
Industrial Equipment	43%	62%
High-tech	36%	61%
Consumer/Retail	34%	60%

Today ■ In 3 Years ■

Source: Oxford Economics study commissioned by PTC

Leading Manufacturers Understand Lifetime Service Value

PRODUCT MODEL	SERVICE PARTS	FIELD SERVICES Break / Fix Model Cost-plus	SERVICE CONTRACTS SLAs	OUTCOMES-BASED SERVICES MODEL
LAGGING	**FORMATIVE**	**MODERATE**	**PROGRESSIVE**	**BEST-IN-CLASS**

Service Continuum →

Sale of Products   Sale of Outcomes
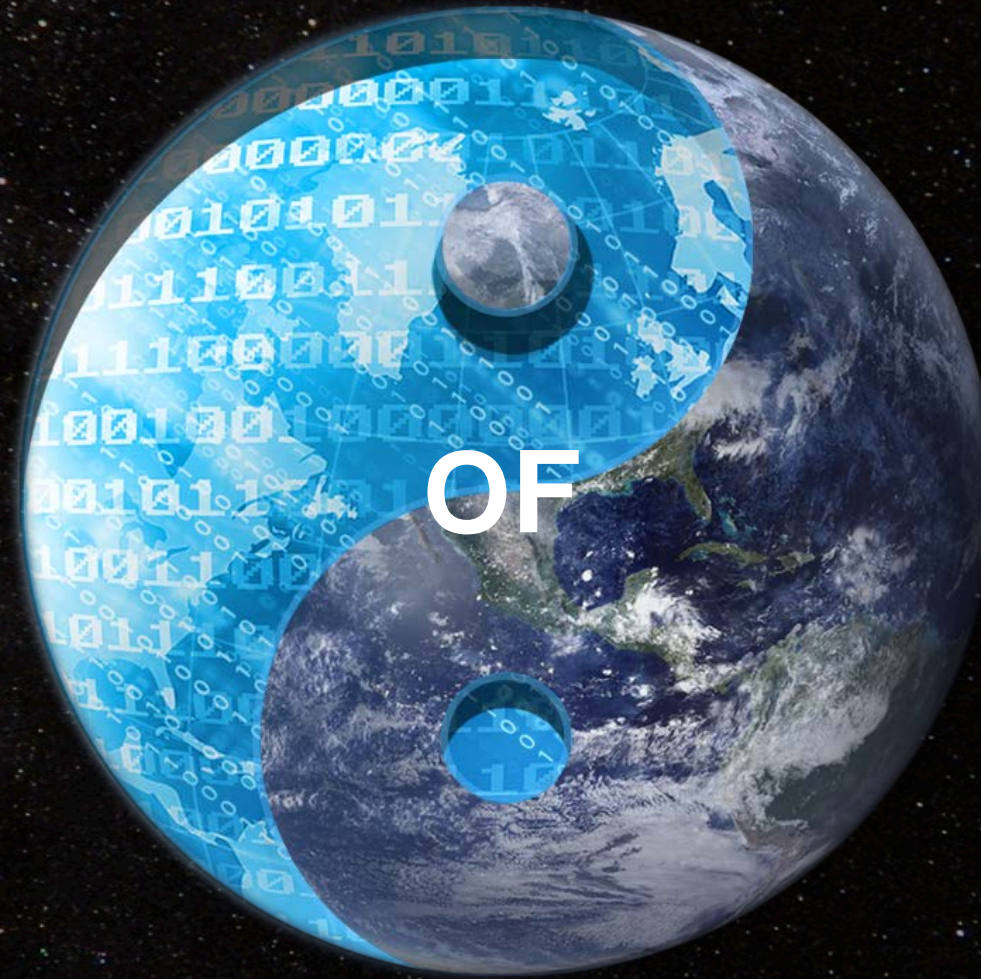
Connected Products and IoT

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DIGITAL WORLD
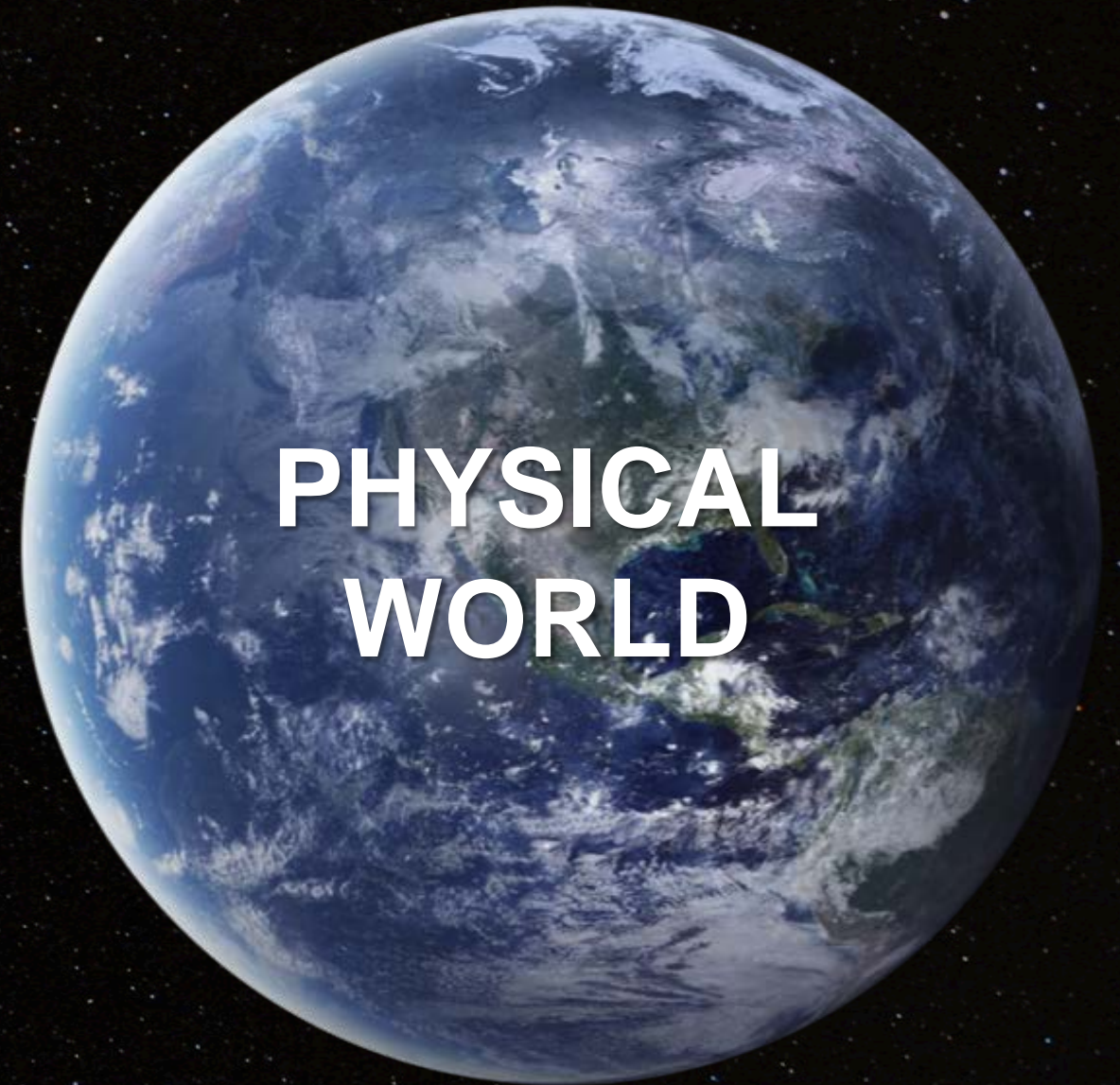
PHYSICAL WORLD

INTERNET
Digital World

OF

THINGS
Physical World

Prior engines:
– 1 KB/Flight
– 30 Parameters measured
– 1 snapshot/flight

New generation engines:
– 500 GB/Flight
– 5,000 parameters measured
– 1 snapshot/second

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"If you went to bed last night as an industrial company, you're going to wake up today as a software and analytics company"

Jeff Immelt, CEO GE
GE Minds + Machines Conference

~18 million vehicles in the field

~4,000 dealerships in 90 countries

~50,000 service people

~12,000 diagnostic trouble codes implemented in onboard diagnosis

Up to 70,000 diagnosis sessions per day worldwide
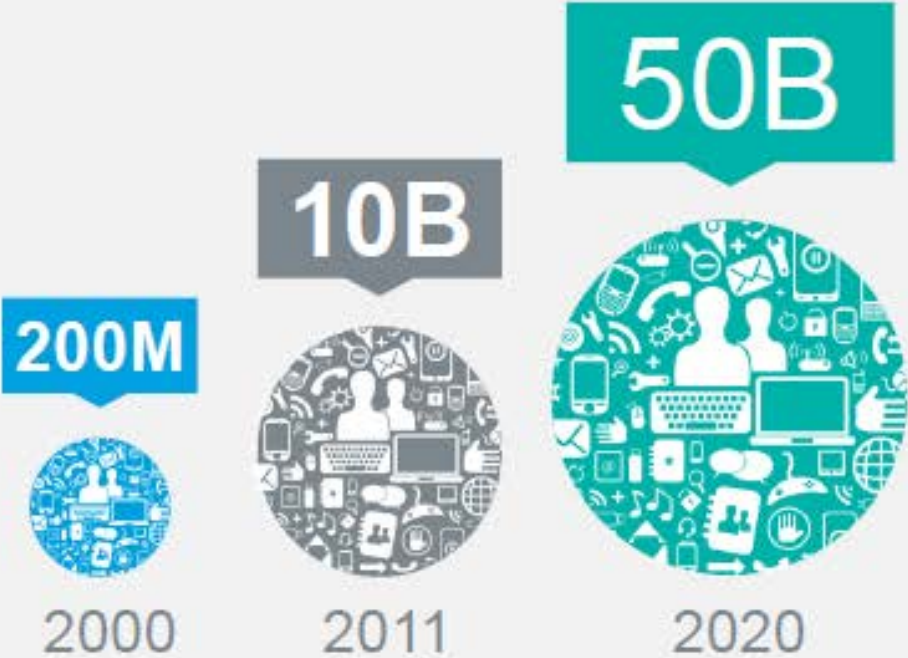
> 40 terabytes of data ready to be used now > Big Data!

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"The lines between hardware, software, and services are blurred or are disappearing."

Tim Cook, CEO
Apple

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Hyperconnectivity

Number of connected devices

200M

10B

50B

2000

2011

2020

"Software is eating much of the value chain of industries that are widely viewed as primarily existing in the physical world"

– Marc Andreessen

"The Internet of Things . . . will change everything – including ourselves"
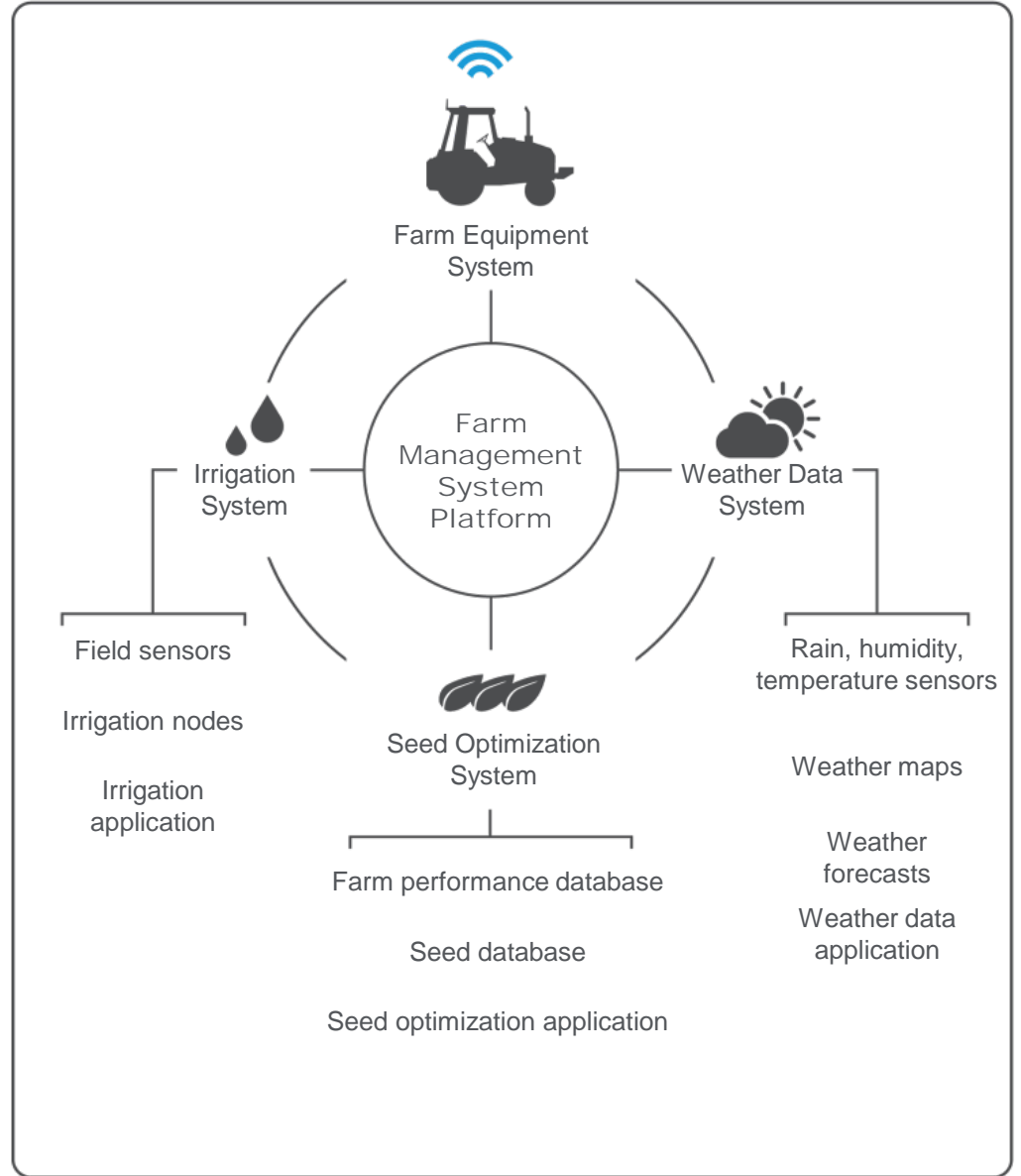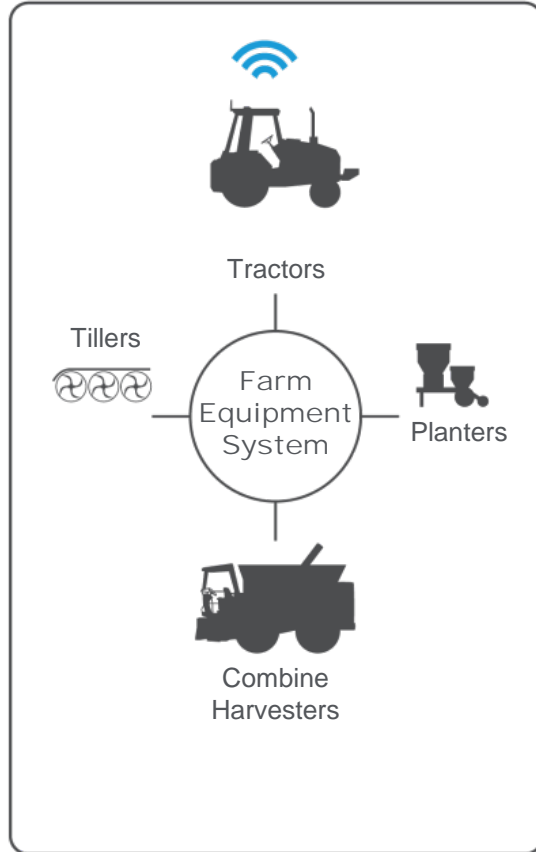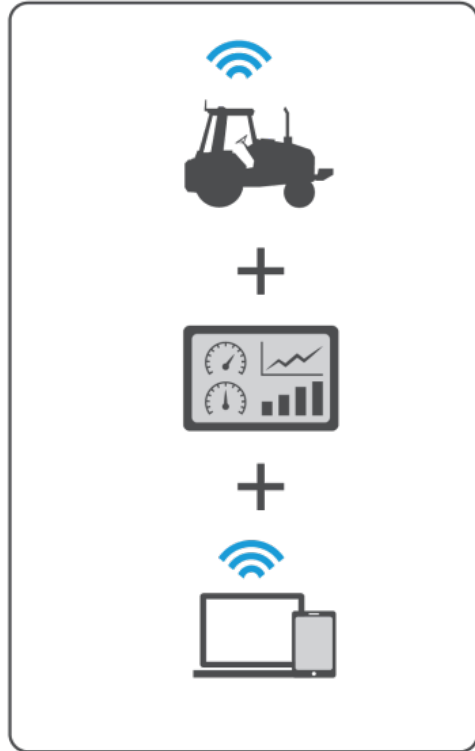
– Dave Evans, Cisco's chief futurist

…Providing customers/sellers more contextual information

#SalesSummit #DF15

salesforce

THINGS are Changing Along With their Utility

Product	Smart Product	Smart, Connected Product	Product System	System Of Systems

Tractors

Tillers

Farm Equipment System

Planters

Combine Harvesters

Farm Equipment System

Farm Management System Platform

Irrigation System

Weather Data System

Field sensors

Irrigation nodes

Irrigation application

Seed Optimization System

Farm performance database

Seed database

Seed optimization application

Rain, humidity, temperature sensors

Weather maps

Weather forecasts

Weather data application

> The **changing nature of products** is disrupting value chains, **forcing companies to rethink and retool** nearly everything they do internally."
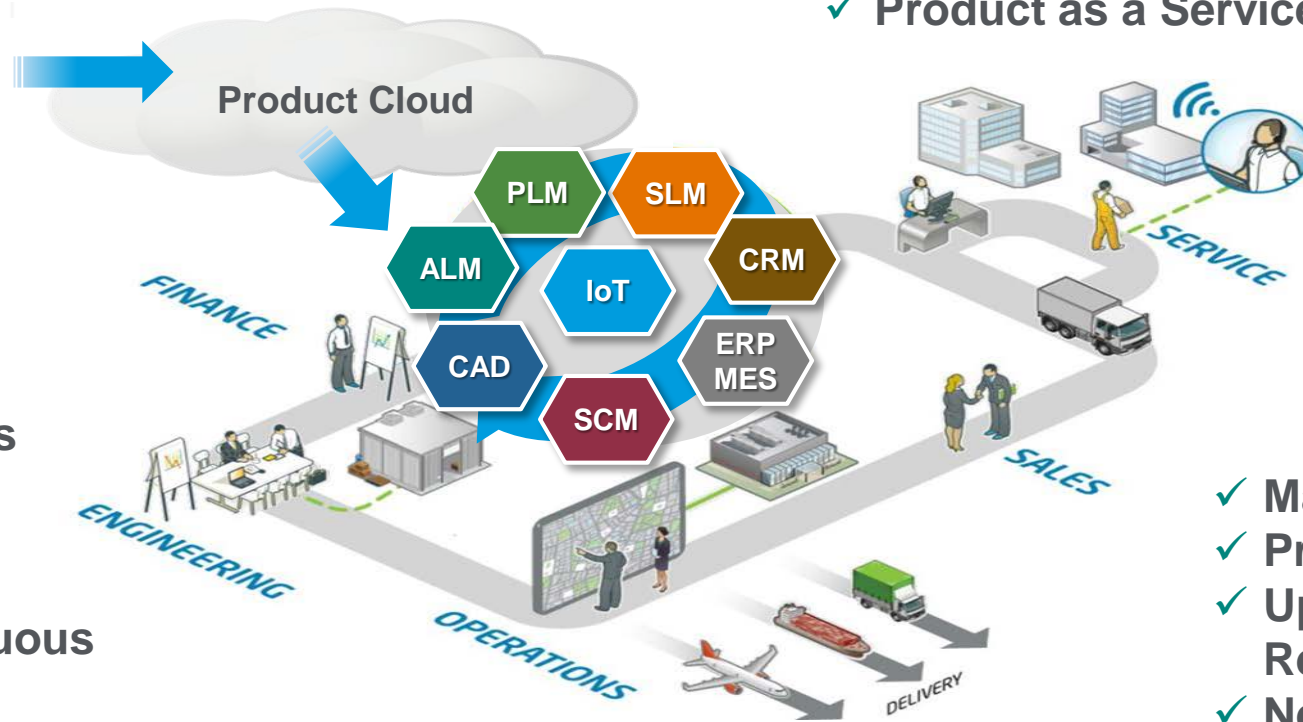
✓ **Remote Service**
✓ **Automated Service**
✓ **Customer Self Service**
✓ **Predictive Service**
✓ **Product as a Service**

Gartner® **#1**

Manufacturing industry will be the #1 industry sector by share of global economic value-add.

– Forecast: The IoT, Worldwide, 2013

✓ **Usages-based Billing**
✓ **Subscription Services**
✓ **Warranty Management**
✓ **Point-of-Sale Payments**

Product Cloud

PLM | SLM
ALM | IoT | CRM
CAD | SCM | ERP MES

FINANCE
SERVICE
ENGINEERING
OPERATIONS
SALES
DELIVERY
Assets

✓ **Marketing / Lead Generation**
✓ **Product & Performance Benchmarking**
✓ **Up-sell, Cross-sell, Automated Replenishment**
✓ **New Offerings / New Markets**

✓ **Design for Continuous Innovation**
✓ **Usage-based Requirements Analysis**
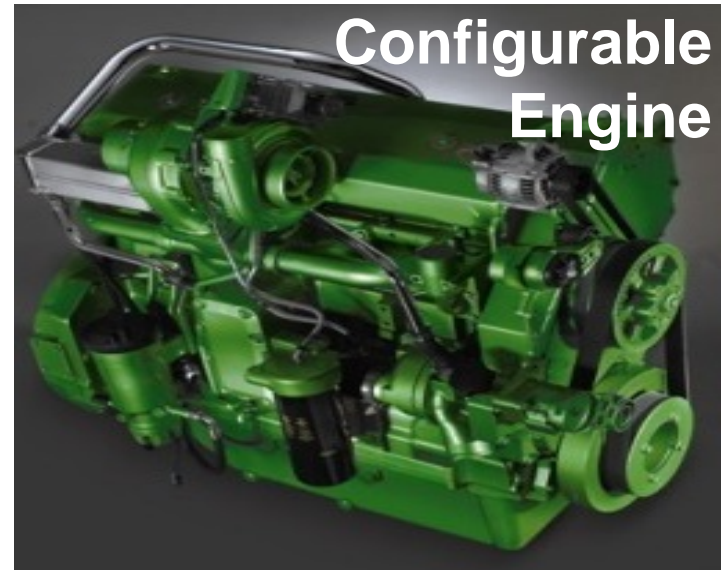✓ **Remote Software Management**
✓ **Connected Quality**

✓ **Condition Based Maintenance**
✓ **Predictive Maintenance**
✓ **Sensor and Data Aggregation**
✓ **Manufacturing Operations Intelligence**

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Configurable Engine

New Principles of Product Design

- Design becomes a **systems engineering** problem with **increased IT and R&D collaboration**

- **Software-driven product variability** enables new low-cost options

- Design enables **evergreen products** that can be continually upgraded, often remotely

- **New user interfaces** and **augmented reality** reduce the need for controls on the product itself

- Continuous monitoring of real-world performance data enables **ongoing quality management**

- Product designs can allow **remote service** and **support new business models**

- Products of broader systems require **system interoperability and codesign**
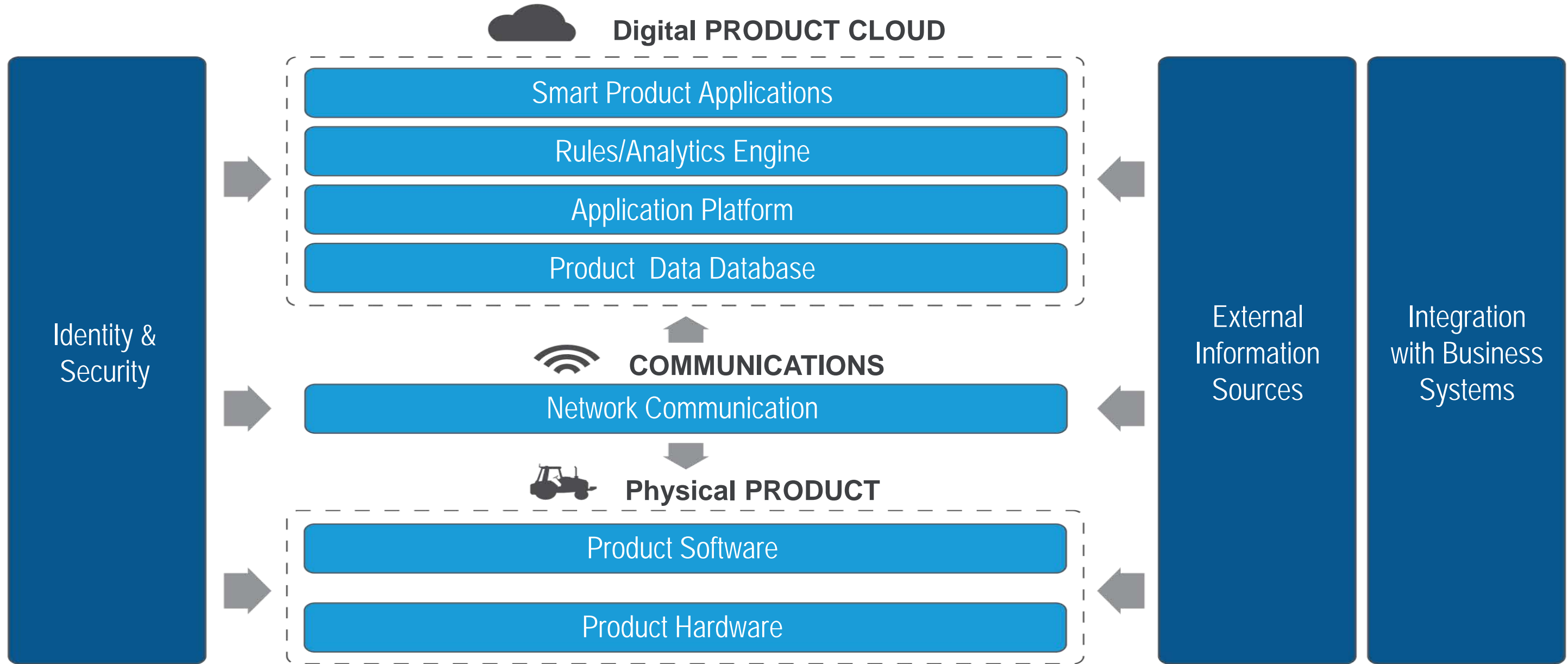
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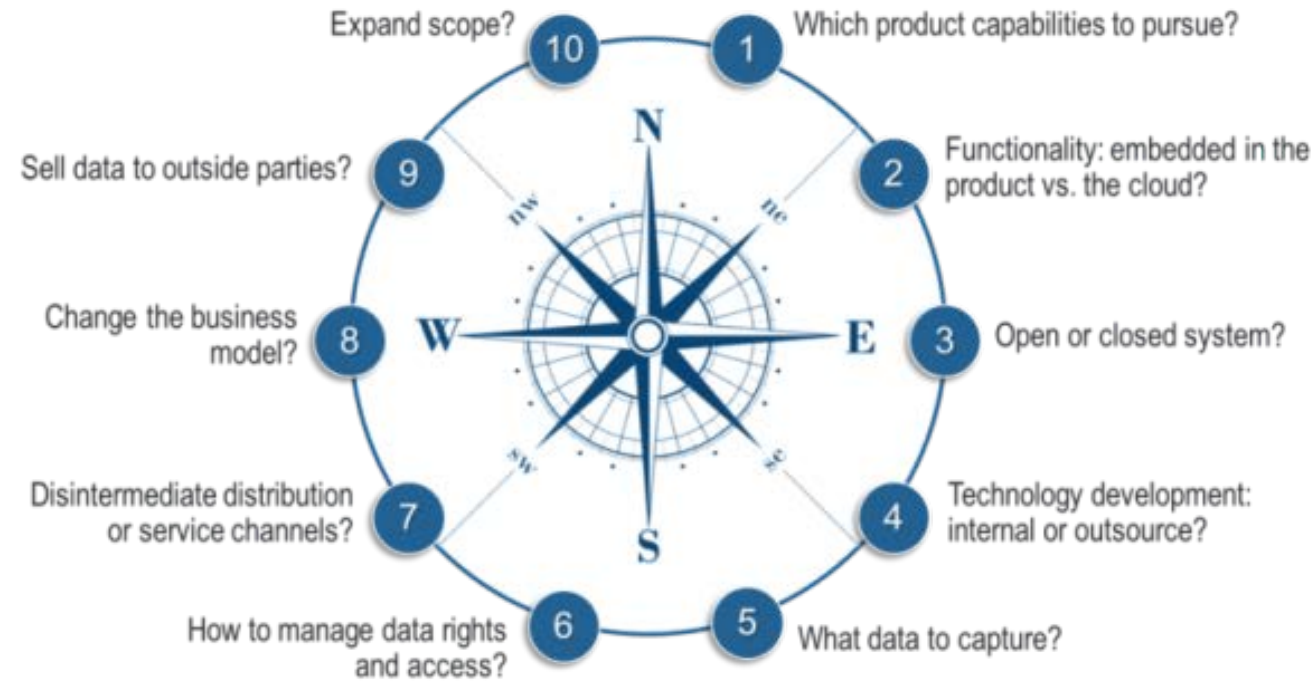Elevator / Escalator Manufacturer

Urban Mobility Solutions

New Service Delivery Approaches

- Technicians can diagnose problems remotely to enable **one-stop service**

- Shift from reactive to **proactive and remote service** and potential to **optimize or disrupt service channels and providers**

- Predictive analytics can anticipate problems and enable **preventative service**

- **Augmented-reality-supported service** increase service efficiency and effectiveness

- Service expands to **new value added services** via the new data, connectivity, and analytics available

The Technology Stack

Digital PRODUCT CLOUD

Smart Product Applications

Rules/Analytics Engine

Application Platform

Product Data Database

COMMUNICATIONS

Network Communication

Physical PRODUCT

Product Software

Product Hardware

Identity & Security

External Information Sources

Integration with Business Systems

- **In a smart, connected world companies face 10 new strategic choices, each of which require trade-offs. For example:**
  - **Which product capabilities to pursue?** Companies can now offer many new capabilities, but customers may not value or pay for the added cost
  - **What data to capture?** Product data is fundamental to value creation and competitive advantage, but adds significant costs and risk
  - **Should the company change its business model?** Service oriented models ensure the value of product performance improvements and service efficiencies are captured

Intersection of IoT and Services

26 Key IoT Use Cases Across Business Functions

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Service is the Killer App for IoT?

MARKETING / SALES	PRODUCT DEVELOPMENT	OPERATIONS / MANUFACTURING	SERVICE / SUPPORT	INFORMATION / OPERATIONAL TECHNOLOGY	CUSTOMER
Customer Insights and Opportunities	Connected Product Usage Analysis	Asset and Material Tracking	Monitoring and Diagnostics	Flexible Product and Asset Connectivity	Usage and Performance Dashboard
Flexible Billing and Pricing Models	Connected Product Quality Analysis	Connected Operations Intelligence	Remote Service	Identity and Security Management	Customer Self-Service
New Value Added Services	Connected Software Management	Unified Key Performance Indicators	Automated Service Execution	Scalable IoT Operations Management	Product Personalization
		Real-Time Asset Health Monitoring	Condition-Based Predictive Maintenance	Seamless IoT Data Integration	
		Operations Management Improvements	Connected Service Parts Planning	Automated Analytics and Actions	
			Warranty Cost Management	Rapid IoT Application Development	

Service is the Leading Use Case for Internet of Things (IoT) Technology

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Smart, Connected Products Drive Two Levels of Accelerated Service Transformation

Service
Drives Revenue and Profit

Customers
Prefer Outcome- or Performance-based Contracts

Internet of Things
Enables Operational and Strategic Service Transformation

Breakthroughs in Operational Effectiveness

Reactive ➡ Proactive

On Site ➡ Remote

Blind ➡ Data Driven

Historic ➡ Present & Future

Strategic Differentiation

New Product Sales ➡ Products as a Service

Break Fix ➡ Performance Based

Equipment Uptime ➡ Operation Optimization

Product Value Chain ➡ Customer Value Chain

Service Automation Opportunities

Connected Warranty
4) **Entitlements** automatically identified and validated based on machine utilization
- Policy coverage and compliance

2) IoT application monitors sensor data and determines that problem or other conditions exist that trigger service events

Connected Diagnostics
3) Knowledge Base, Diagnostics Rules, and maintenance schedules are used to identify required action for situation

Remote Service
5) **Service response** automatically initiated
- Automated machine adjustment
- Remote service
- Software download
- Customer self-service

IoT Platform

Connected Parts Mgmt
6) Parts forecasting optimization & ordering informed by real-time asset location, owner, utilization, condition

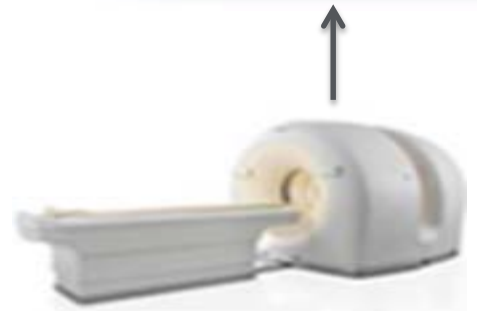**Connected FSM / Tech Optimization**
7) Field Service ticket is automatically opened and a technician is scheduled

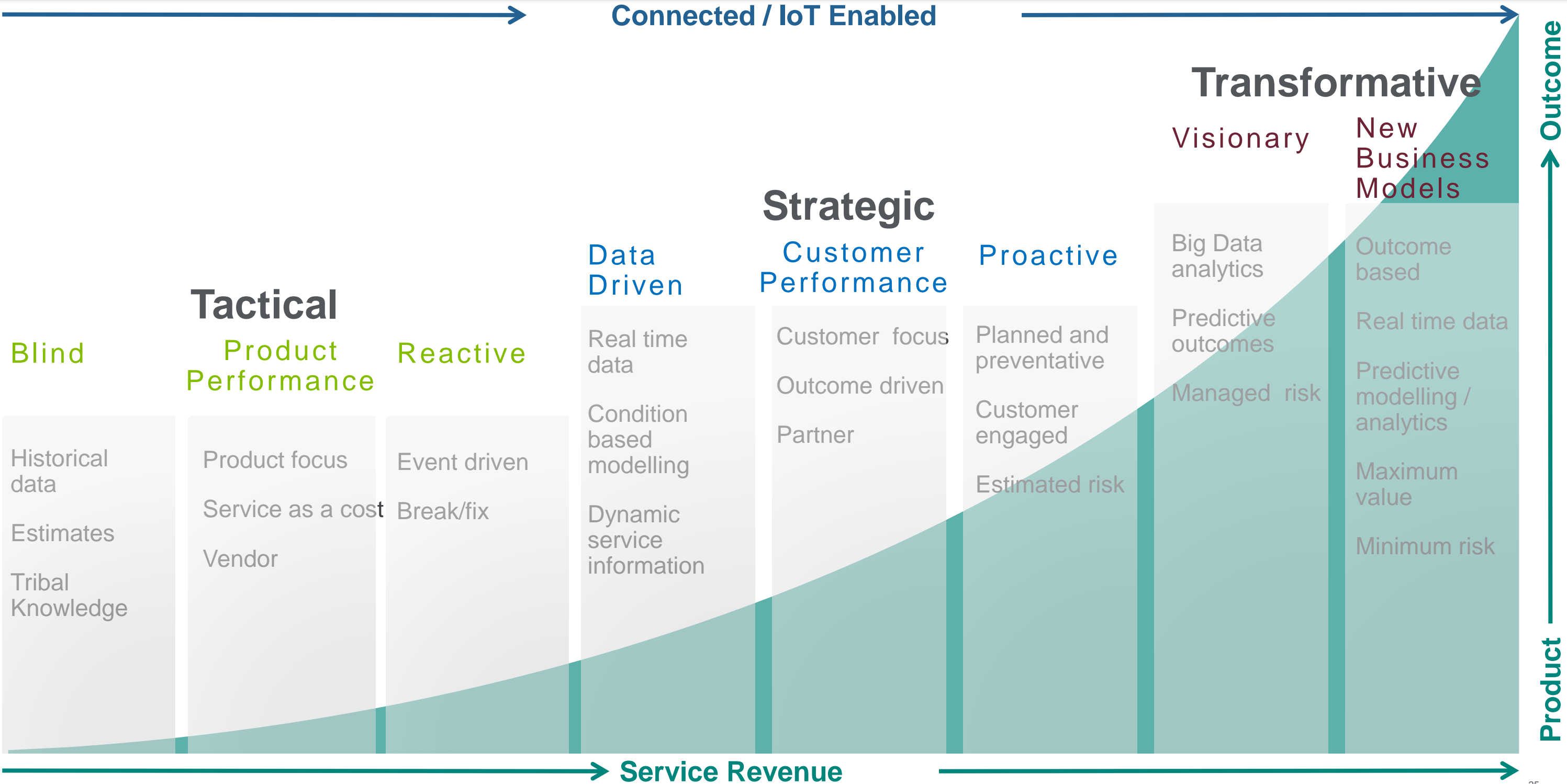1) Critical machine sensor **data continually captured**

Connected Technician Mobile App
8) Interactive Service Delivery with contextual part procedural, and diagnostics information attached to service order for the technician

The Service Continuum
Using Service in New Ways to Capture Value

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Connected / IoT Enabled

Outcome →

Transformative

Visionary

New Business Models

Strategic

Data Driven

Customer Performance

Proactive

Big Data analytics

Predictive outcomes

Managed risk

Outcome based

Real time data

Predictive modelling / analytics

Tactical

Product Performance

Reactive

Real time data

Condition based modelling

Dynamic service information

Customer focus

Outcome driven

Partner

Planned and preventative

Customer engaged

Estimated risk

Maximum value

Minimum risk

Blind

Product focus

Service as a cost

Vendor

Event driven

Break/fix

Historical data

Estimates

Tribal Knowledge

Product →

Service Revenue →

Smart, Connected Service for Smart, Connected Products

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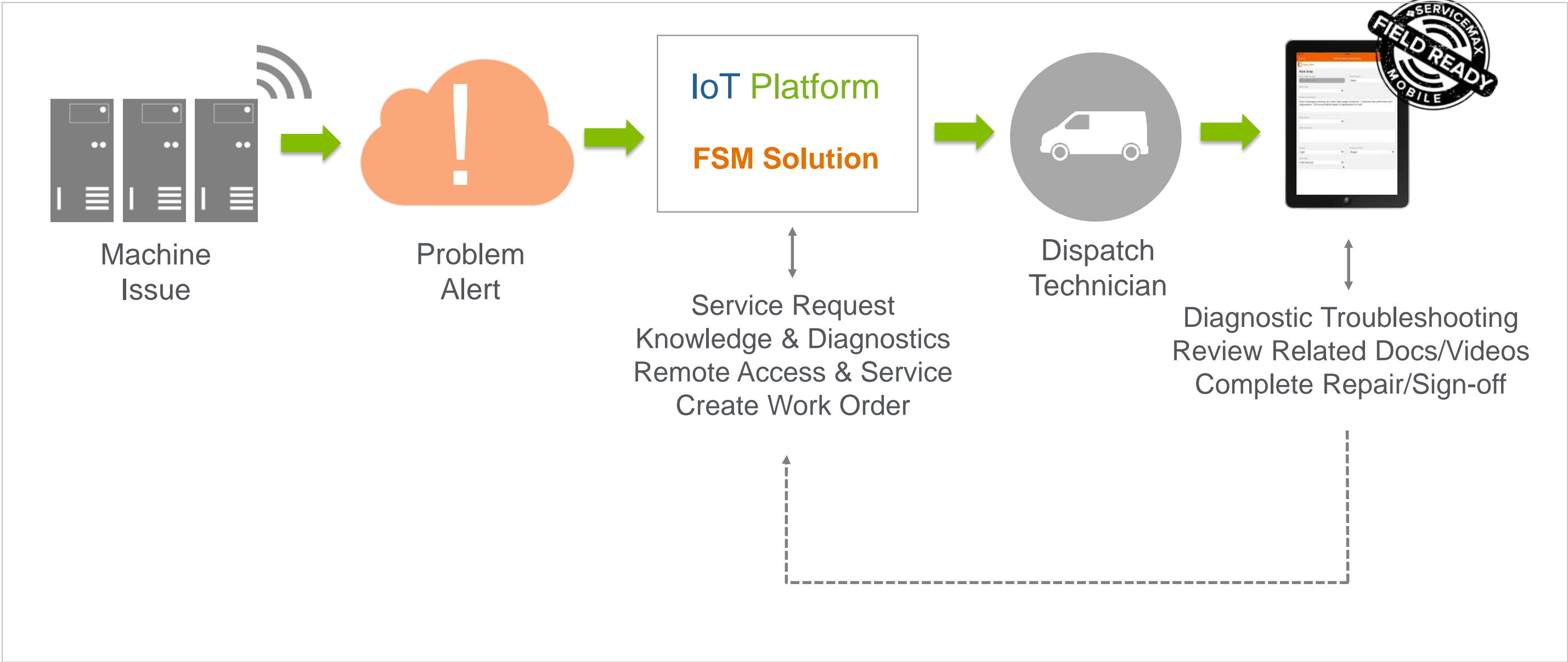| Smart Embedded Software Service	Connected Asset Service	Shifting Service Delivery and Business Models
Check software compatibility **Install** and validate software update **Configuration** and operation changes via software patch download	**Access** real-time and historical asset data **Remote** monitoring **Remote access**, perform diagnostics, transfer files **Real time** location, owner, condition, operation data	**Paradigm Shift:** **Product** is now the sensor for the customer **Diagnose** before dispatch **Create** alternate business models

Connected Service Examples

Machine
Issue

Problem
Alert

IoT Platform

FSM Solution

Service Request
Knowledge & Diagnostics
Remote Access & Service
Create Work Order

Dispatch
Technician

Diagnostic Troubleshooting
Review Related Docs/Videos
Complete Repair/Sign-off

Key Features

- **Remote Access, Monitoring, File Download**

- **Automated Diagnostics and Solution Identification**
  - When possible, solutions can be automatically identified via mapping to error codes, conditions, and other monitor able machine state.

- **Interactive Diagnostics**
  - Leverage real time and historic machine data while troubleshooting via "Guided Search" capability.

- **Ticket / Case Creation**
  - Leverage ThingWorx event monitoring to trigger creation of call center tickets and diagnostics sessions based on error codes, conditions, or utilization levels.
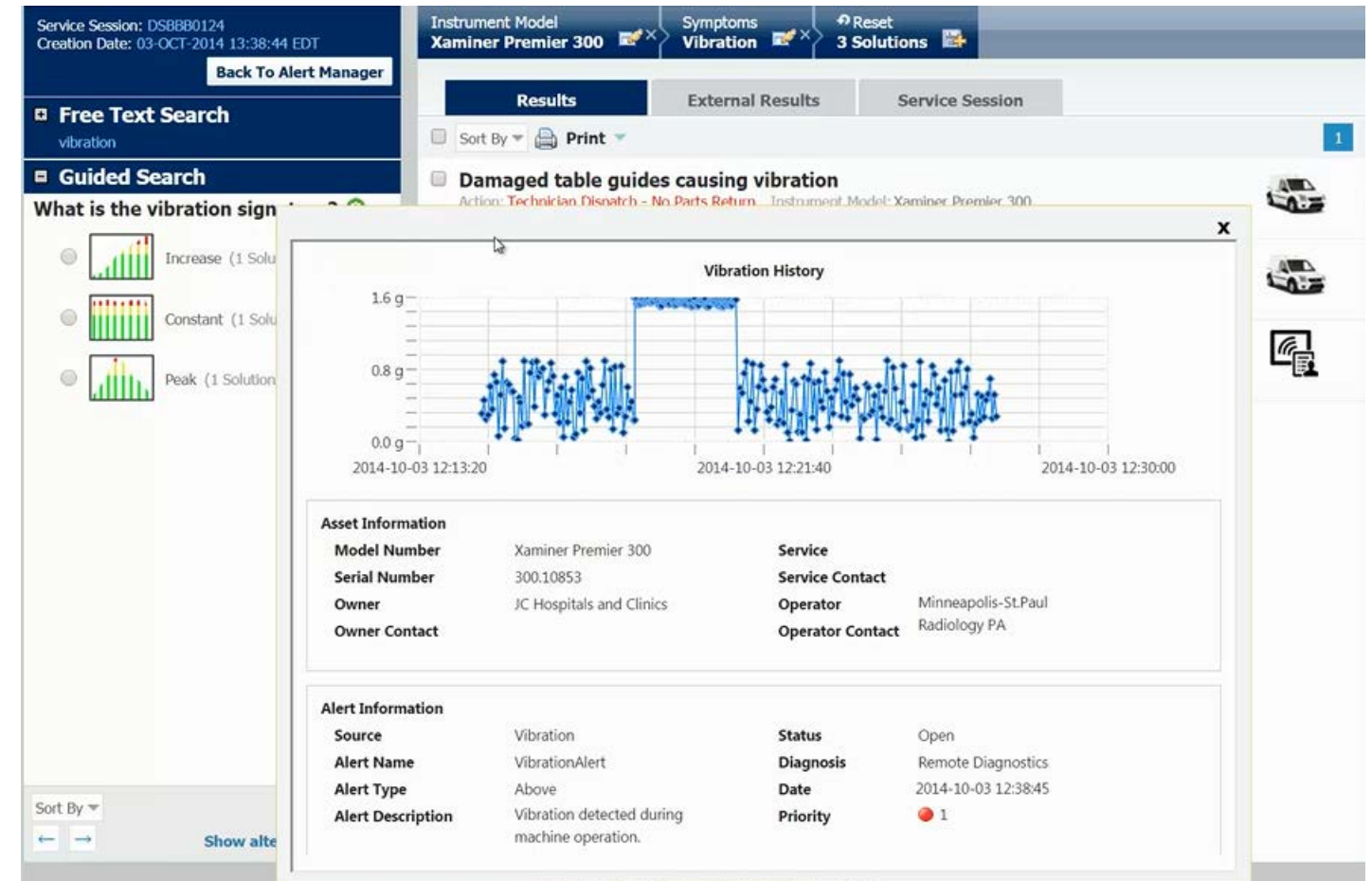
Remote access to real-time and streaming machine data for complex diagnostic situations

iQor Automates Diagnostics and Expertise

When malfunctions happen, companies often use reverse logistics to send equipment to a repair depot, such as iQor. With 32,000 employees and operations in 17 countries, iQor is one of the largest reverse-logistics companies in the world, supporting companies such as DirecTV, Google, HP, Microsoft, and SONOS.

Initiatives

- Automate diagnostics and expertise

- Enable low skill techs to perform equal to high expertise techs

- Build a knowledge base of expert product repair information

- Reduce cost of repair process to remain competitive

- Satisfy client demand for process improvement and innovation

Solution

- PTC Service Knowledge and Diagnostics

- ThingWorx

iQor uses a depot management software that was purchased from PTC and is no longer supported by PTC.

Expected Results

- $1M cost savings per year

- Faster defect diagnosis and accelerated repair times

- Improve first call resolution and client satisfaction score

- Lower cost of ownership by lowering handle time

- Reduce repeat returns

- Build out and refine knowledgebase and leverage for real-time insights and strategic planning

- **Context**: filters the information to exactly what the user needs

- **Content**: efficient and effective for performing the needed service

- **Connection**: access to the product or related business systems to perform service

Conclusion

- Things (Products) are quite simply **changing**

- The **Digital and Physical Worlds** are merging

- Smart, connected products dramatically **increase opportunities for value creation and higher productivity** throughout the economy but very dramatically within Service offerings

- Smart Connected Products provide the ability to **offer outcome based services** with confidence

- **Services is the Killer App for IoT**… Descriptive, Prescriptive, and Predictive are all possible

Evolving Service Landscape

A world of connected products | Providing customers with outcomes | No more customers, just partners