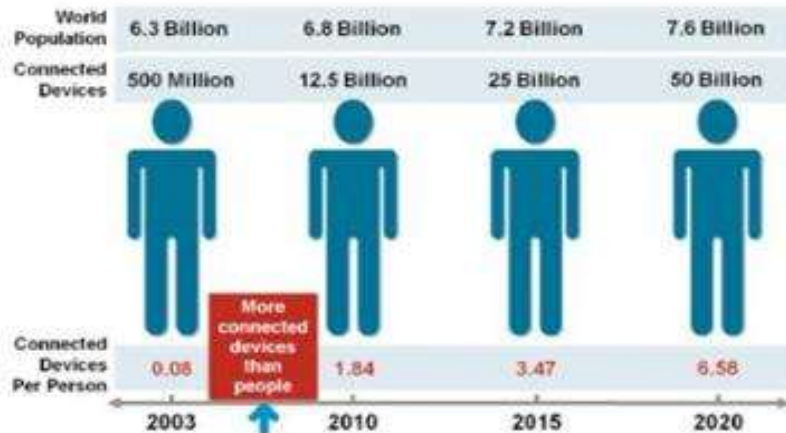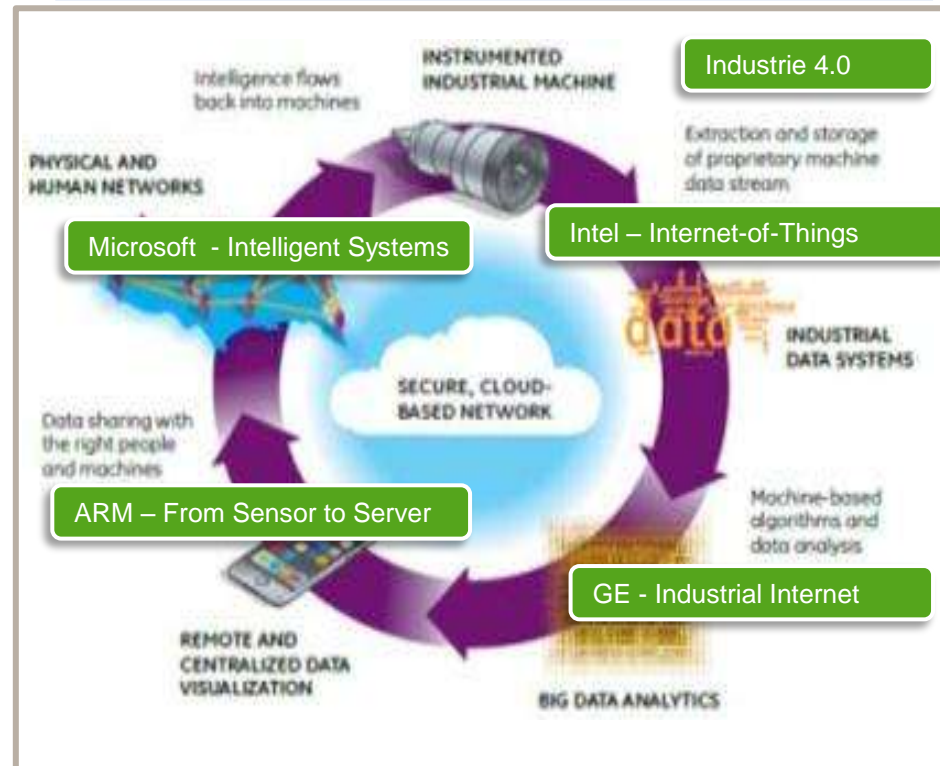# Internet of Things Session

- Sukriti Jalali

What is IoT

- Integrates elements — such as sensors, actuators and communications devices — into information systems, people, places, things
- Enable and automate operational, business processes and related interactions
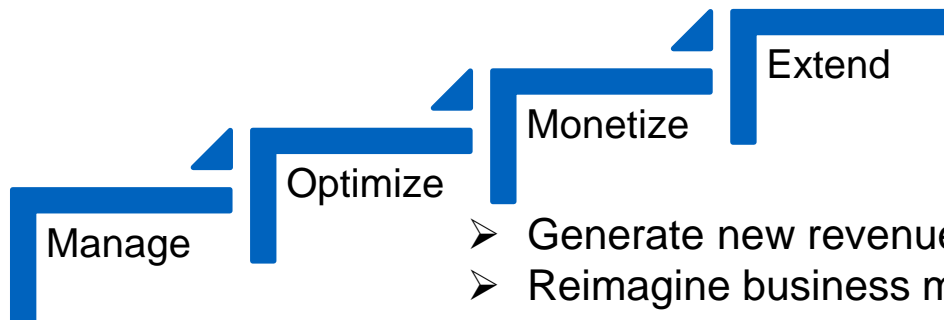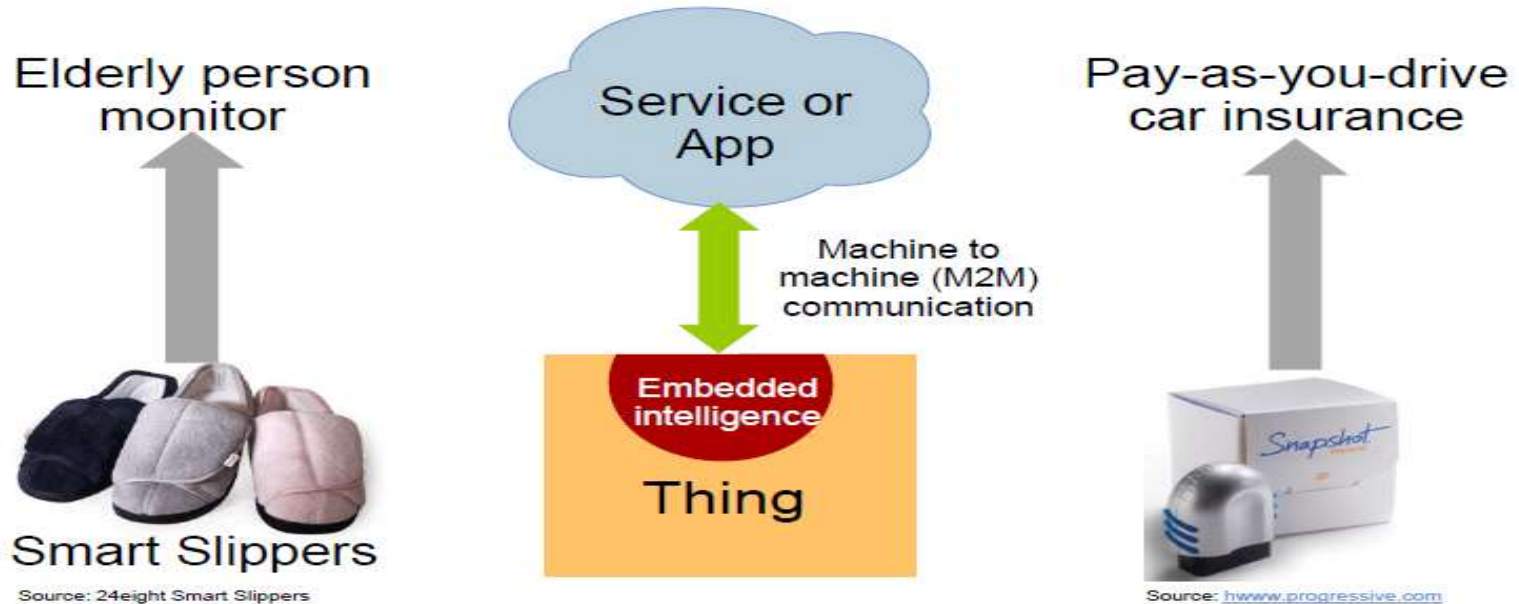
The Internet of Things Was "Born" Between 2008 and 2009

World Population	6.3 Billion	6.8 Billion	7.2 Billion	7.6 Billion
Connected Devices	500 Million	12.5 Billion	25 Billion	50 Billion
Connected Devices Per Person	0.08	1.84	3.47	6.58
	2003	2010	2015	2020

More connected devices than people

Source: Cisco IBSG, April 2011

Integrating Technology and Business

Industrie 4.0

Microsoft - Intelligent Systems

Intel – Internet-of-Things

ARM – From Sensor to Server

GE - Industrial Internet

Intelligence flows back into machines

INSTRUMENTED INDUSTRIAL MACHINE

PHYSICAL AND HUMAN NETWORKS

Extraction and storage of proprietary machine data stream

SECURE, CLOUD-BASED NETWORK

INDUSTRIAL DATA SYSTEMS

Data sharing with the right people and machines

Machine-based algorithms and data analysis

REMOTE AND CENTRALIZED DATA VISUALIZATION

BIG DATA ANALYTICS

Hardware + Software + Communication + Analytics (Physical + Digital)

Pairing of Services & Things

Elderly person monitor

Smart Slippers

Source: 24eight Smart Slippers

Service or App

Machine to machine (M2M) communication

Embedded intelligence

Thing

Pay-as-you-drive car insurance

Source: hwww.progressive.com

Manage → Optimize → Monetize → Extend

- Generate new revenue streams
- Reimagine business models
- Target new markets and customer bases
- Improve efficiency of core business processes
- Develop smarter products and services

IoT is Big – $328B Technology & Services Market

$262 Billion	**Big Data, User Analytics**	**Layer 5:** Analytics
	(icons: car, luggage, dog, person, crops, tractor, oil, bulb, camera, building, chair, washing machine, monitor, shoe, etc.)	**Layer 4:** Apps & Services
$18 Billion	**Cloud, Data Centers, Servers, Storage**	**Layer 3:** Computing & Storage
	Middleware Components, Protocols, Standards — Device side API, enterprise side API, device management, app development framework, data compression, encryption, security	
$17 Billion	**2G/3G/4G, Mesh, WiFi, ZigBee, WWAN, Ethernet, WLAN, WPAN, Weightless…**	**Layer 2:** Communications & Networking
	Standards and Protocols — MQTT, D2D, D2S, S2S, CoAP, SOAP, DTLS…	
$31 Billion	*(images of devices, wearables, sensors, smart meters, etc.)*	**Layer 1:** Things: Hardware, Power, Protocols

IoT will include **26 billion installed units** by 2020

Gartner.

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Semi led IoT
- no one company has complete and competitive portfolio

- High **Strategic** Focus on IoT – Low power devices, IoT gateways, wearable, New BUs

- **Acquisitions** to broaden IoT portfolio

- Industry level **collaboration** – Industrial Internet Consortium, Open Interconnect Consortium, HyperCat

- **Services Driven** Design from a System Driven Design – value and profitability moving to service and content provider, move closer to consumer, enterprise IoT

- Building strong **partnerships** with rest of the technology ecosystem providers, telecom players and large SIs

- **Semi Equipment**: how to optimize, deliver new products, services, value added offerings

Intel launches Internet of Things division

TI offers cloud-ready system solutions designed for IoT

Telenor partners with ARM to bring IoT to global customers

Intel, Mitsubishi collaborate on IoT automation for smart factories

ST, TI work with Thingsquare to simplify Internet-of-Things

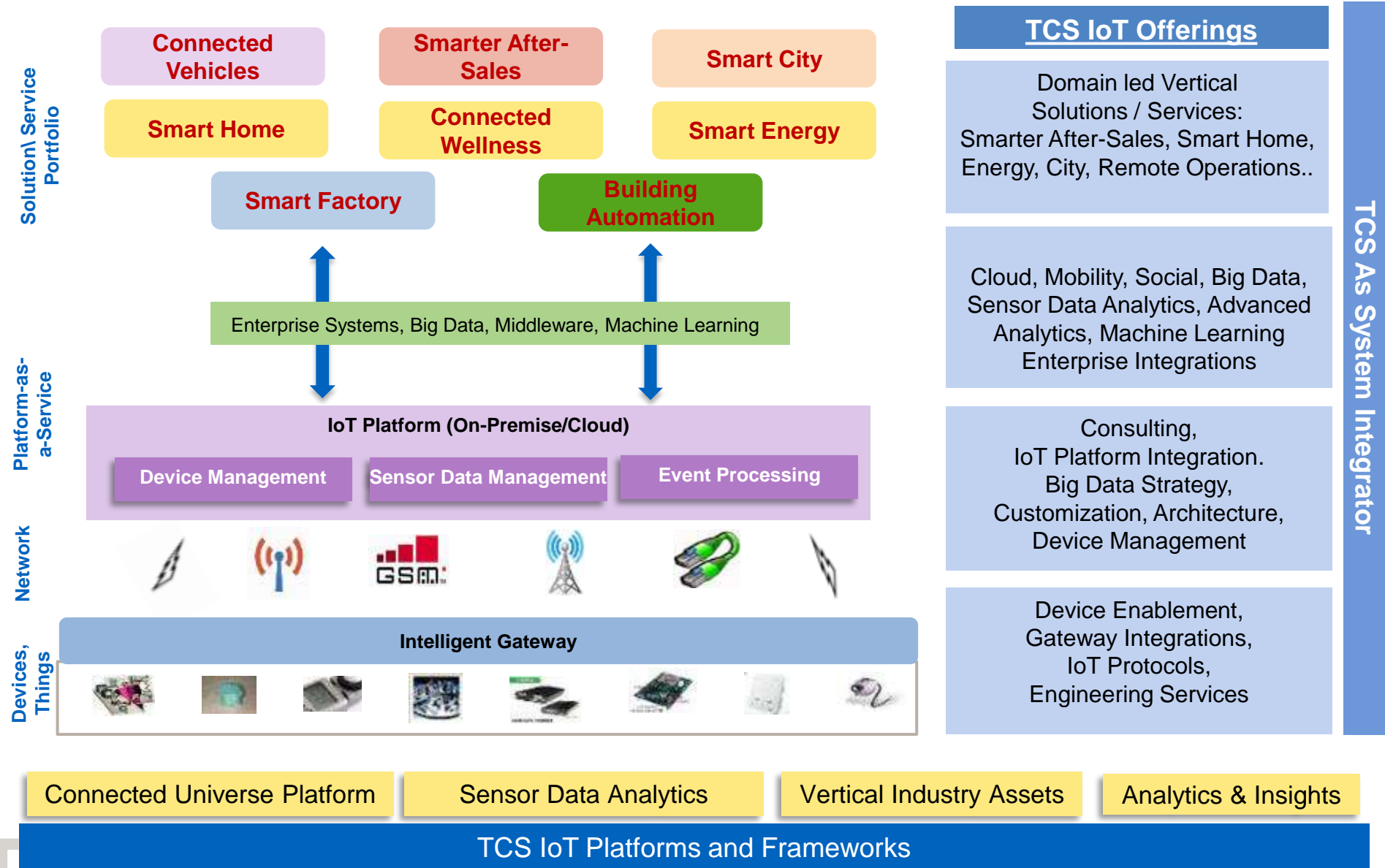TI connects LED lighting to the Internet of Things

Freescale partners with ARM, Oracle on IoT
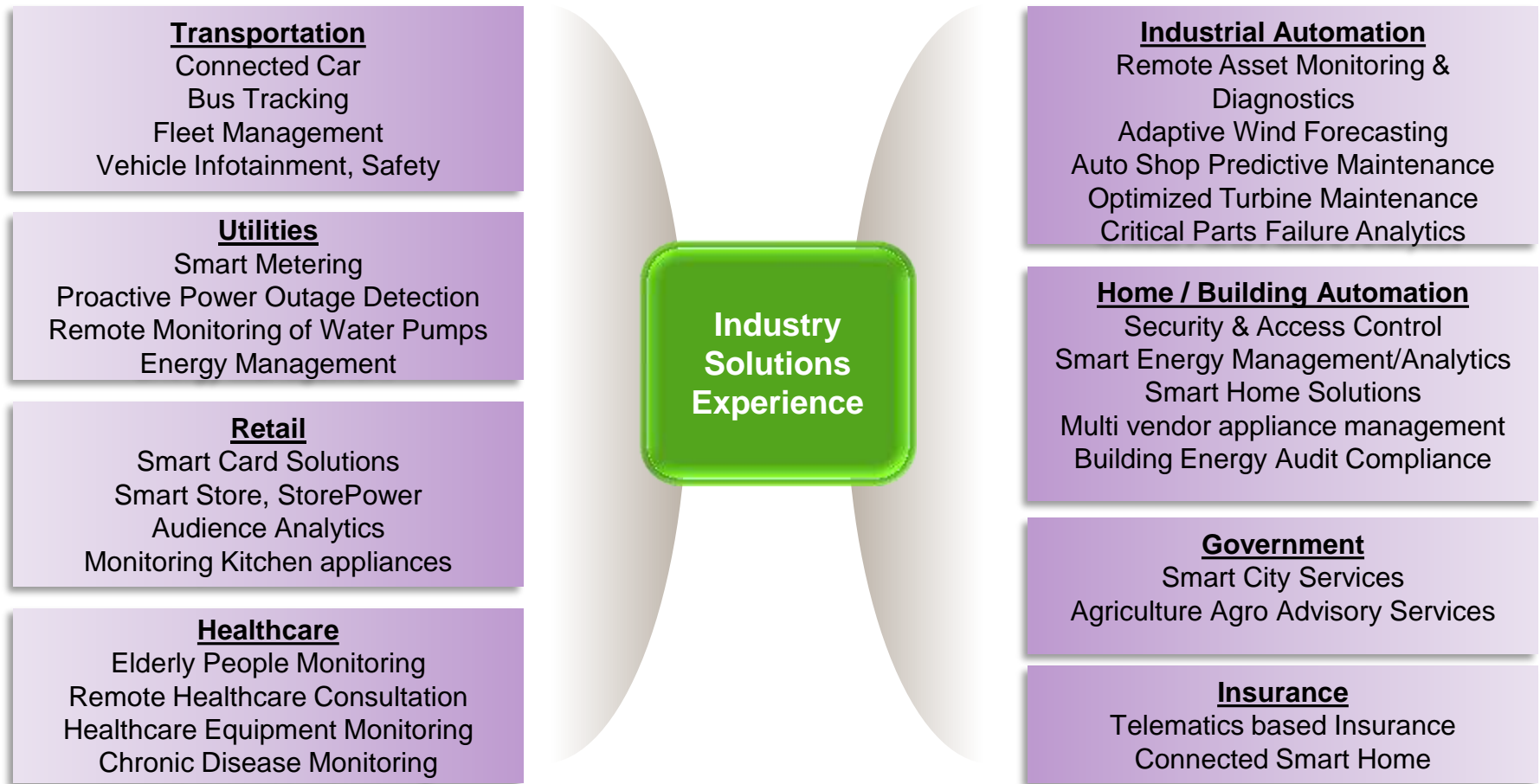
ARM acquires Sensinode

TCS IoT Offerings
And role play as a system integrator

Solution\Service Portfolio

| Connected Vehicles | Smarter After-Sales | Smart City |
| Smart Home | Connected Wellness | Smart Energy |

Smart Factory   Building Automation

Platform-as-a-Service

Enterprise Systems, Big Data, Middleware, Machine Learning

IoT Platform (On-Premise/Cloud)

Device Management | Sensor Data Management | Event Processing

Network

Devices, Things

Intelligent Gateway

TCS IoT Offerings

Domain led Vertical Solutions / Services:
Smarter After-Sales, Smart Home, Energy, City, Remote Operations..

Cloud, Mobility, Social, Big Data, Sensor Data Analytics, Advanced Analytics, Machine Learning Enterprise Integrations

Consulting,
IoT Platform Integration.
Big Data Strategy,
Customization, Architecture,
Device Management

Device Enablement,
Gateway Integrations,
IoT Protocols,
Engineering Services

TCS As System Integrator

| Connected Universe Platform | Sensor Data Analytics | Vertical Industry Assets | Analytics & Insights |

TCS IoT Platforms and Frameworks

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TCS IoT/M2M Expertise - Snapshot

Transportation
Connected Car
Bus Tracking
Fleet Management
Vehicle Infotainment, Safety

Utilities
Smart Metering
Proactive Power Outage Detection
Remote Monitoring of Water Pumps
Energy Management

Retail
Smart Card Solutions
Smart Store, StorePower
Audience Analytics
Monitoring Kitchen appliances

Healthcare
Elderly People Monitoring
Remote Healthcare Consultation
Healthcare Equipment Monitoring
Chronic Disease Monitoring

Industry Solutions Experience

Industrial Automation
Remote Asset Monitoring & Diagnostics
Adaptive Wind Forecasting
Auto Shop Predictive Maintenance
Optimized Turbine Maintenance
Critical Parts Failure Analytics

Home / Building Automation
Security & Access Control
Smart Energy Management/Analytics
Smart Home Solutions
Multi vendor appliance management
Building Energy Audit Compliance

Government
Smart City Services
Agriculture Agro Advisory Services

Insurance
Telematics based Insurance
Connected Smart Home

IoT Relevant Alliances

❑ Intel, Freescale, Qualcomm
❑ Digi, Axeda (PTC), Bosch, ILS, Sensinode (ARM)
❑ Microsoft, SAP, Oracle, Hitachi

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Connected Equipment
Smarter After-Sales driven by IoT

Comprehensive offering for HiTech Equipment Manufacturers to reimagine their after-sales service functions, driven by data from connected equipment and leveraging Cloud, Mobility, Advanced Analytics & Big Data platforms

- Reactive actions post failure, customer calls
- Unscheduled downtime
- Low customer stickiness
- Dependency on experts and / or technicians
- Low contract coverage of installed base
- Significant operational costs, low innovation

- Just-in-time and proactive service model
- Zero unscheduled downtime
- Improved customer loyalty
- Workforce, spare parts optimization
- Service level agreements, value added services
- Predictive analytics linked integrated processes

http://www.tcs.com/industries/high_tech/Pages/TCS-Connected-Equipment-Offering.aspx
http://www.tcs.com/resources/white_papers/Pages/Smarter-After-Sales-Service-Support-Internet-of-Things.aspx
http://www.tcs.com/resources/white_papers/Pages/Digital-Reimagination-Equipment-After-Sales.aspx

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What is being done @TCS / HiTech

- IoT Incubation headed by Anita N, under direction from CEO and CTO

- Every ISU has IoT as a focus area and has defined specific use cases
  - myIoT (retail), connected wellness (insurance), plant in a mobile (mfg.)

- HiTech collaborating closely with CTO, Digital, Analytics, EIS teams
  - Smarter After-Sales, Smart Home, Industrial are HiTech focus areas

  - Joint asset development, pursuits

  - IoT ecosystem development, alliances, analyst relations

  - Competency building (Axeda, Digi, Azure ML, Bosch)

  - Connected Equipment asset on Predictive Analytics demoed at NA Customer Summit, Sep 2014

*"Technology and service providers, including ARM, Intel, Bosch, Microsoft and **Tata Consultancy Services**, are working toward establishing a dominant ecosystem platform"*
- Gartner Market Trends, 2014

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Semi accounts

Client	Area	Updates
Intel	Alliance, GTM	- TCS selected as a preferred engineering partner - IoT GTM workshops done (Ireland, India) - Joint opportunities being pursued
AMAT	Connected Equipment (service management)	- AMAT CEO IoT Challenge - Consulting opportunities in AGS, Big Data project - Meetings done with CIO
Carl Zeiss - Microscopy	Connected Equipment (advanced analytics)	- Workshop done with Customer Support - Draft approach note on PoC areas shared
Carl Zeiss - SMT	Connected Equipment (service management)	Small opportunities in service order, ticketing etc.
G&D	Connected Equipment (service management)	- Meetings done with India team as well as R&D / ecosystem team (Germany) - Engagement with India team being discussed
ASML	Connected Equipment (advanced analytics, service management)	Sensitization done with accounts Workshop to be planned
NXP	Connected Equipment (advanced analytics)	Discussion just initiated with NXP-manufacturing
AMD, Sun Edison	Prospects	Customer Summit leads

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TCS Sample Assets

TCUP – A high performance, scalable platform for Internet-of-Things

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TCS Sensor Data Analytics Platform

Sensor Data Analytics

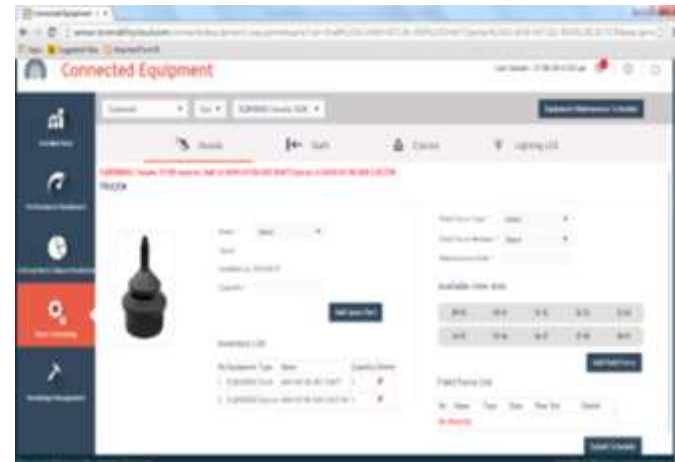Data Acquisition | Transformation & Storage | Data Correlation | Data Analytics | Predictive Analytics

Acquire, Analyze and Report on the enormous data from any sensor or machine log

Predictive Analytics based Smarter Service

Features

- Advanced (Big Data) analytics to convert sensor data to meaningful information

- Granular level of **predictive analytics**

- Historical records and equipment parameters used to determine probability of failure & time left to failure

- Ensure spare parts & field engineers availability

- Just in Time maintenance services

- Leveraging digital technologies and TCS' Sensor Data Analytics Platform

Demo at TCS NA Customer Summit – Sep '14

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Thank You