# The IoT Inc Business Meetup Silicon Valley

*Opening remarks and guest presentation*

Join us on November 5 at 6PM PST

## The IoT Food Chain

Picking the Right Dining Partner is Important

**Dean Freeman**
Gartner Research

Iot-Inc. **Meetup**
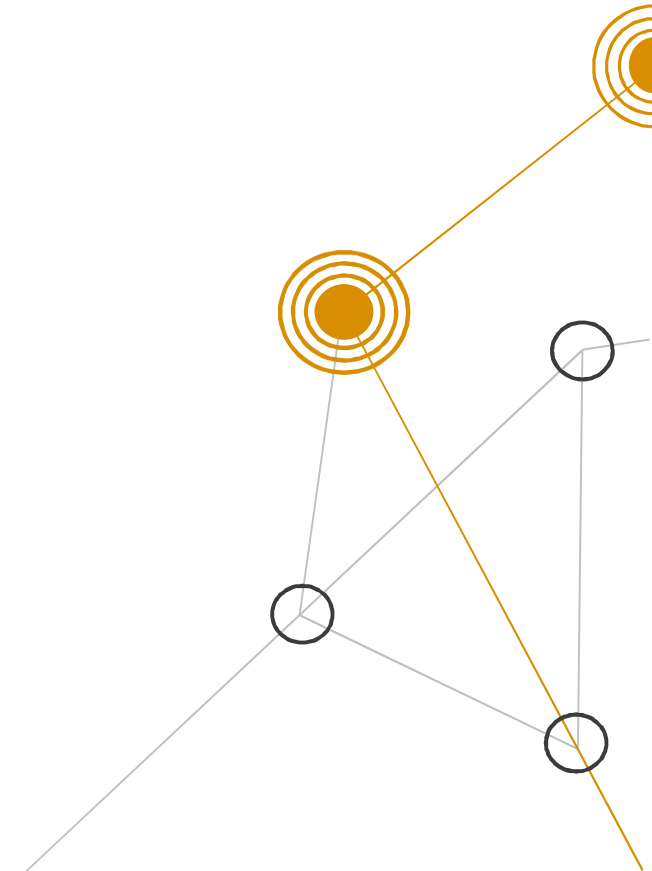
Bruce Sinclair (Organizer): bruce@iot-inc.com

# Target of Meetup

**For business people selling products and services into IoT**

but of course everyone else is welcome: techies, end-users, …

**Focus of presentations and discussions:**

# Looking for Help

**Reviews**

- Help attract great speakers and members
- If you've been attending for a while and like the group, go to homepage to leave a review

**Help for our sponsor**

- Need to justify their continued support
- Plug and Play are looking to partner with companies big and small

**Become a sponsor**

**Suggest locations to hold future meetings**

# Two-Day IoT Workshop

**Bruce is delivering his 2-day intensive workshop**

**"From Concept to Plan to Proof of Concept"**

**Mountain View Computer History Museum on Dec. 14-15**

**Details at: http://www.iot-inc.com/training**

**Register at: http://iotworldevent.com/academy/2015/**

# Coming Up

**Next Meeting, First Thursday of December -> 3RD**

Hima Mukkamala, Head of Engineering, Predix

*Hey IT, Meet OT*

Discount codes available for:

RE·WORK  San Francisco - Nov. 12 – 13          San Jose - Dec. 2 - 3

Presentation, recording, video and announcements for today's meeting will be sent in one week to everyone who provided their email

My email: bruce@iot-inc.com

# Success in the IoT is Dependent upon where you are in the Food Chain, and who is Feeding who

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# Key Issues

- What does the IoT food chain look like?

- How to enjoy the meal.

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# What Is Digital Business?



The creation **of new business designs** reached by blurring the digital and physical worlds … via an unprecedented convergence of people, business and things.

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# The Internet of Things Is the Accelerant

**2009**

**1.6 Billion Personal Devices**

**0.9 Billion Internet Connected Things**
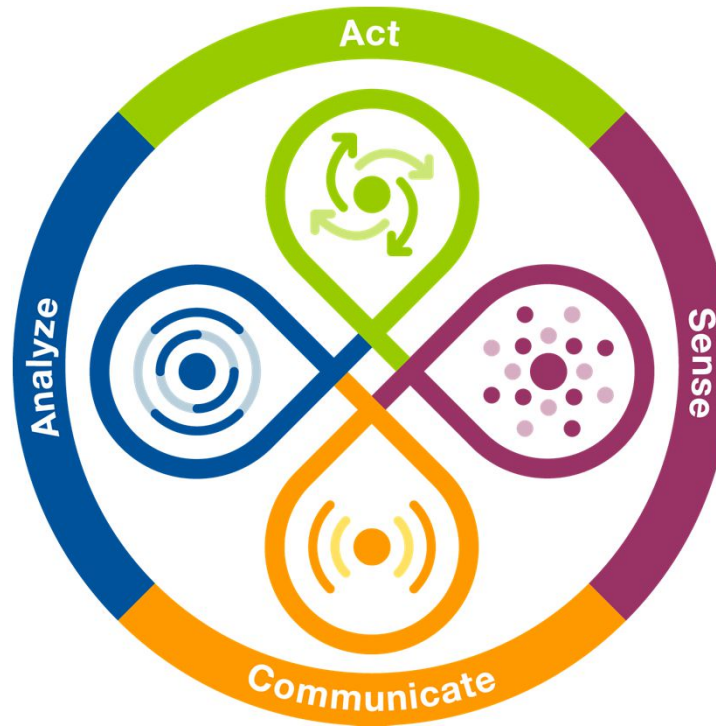
**2020**

**7.3 Billion Personal Devices**

**30 Billion Internet Connected Things**

**Things Connected to the Internet Will Outnumber People by at Least 5 to 1**

Act

Sense

Communicate

Analyze

Source: Forecast: Internet of Things, Endpoints and Associated Services, Worldwide, 2014

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# What is IoT?

The IoT is the network of *dedicated**
physical objects that contain …

- Embedded technology, to …

- Sense or interact with their
  internal state or external
  environment.

The IoT comprises an
ecosystem that includes things,
communication, applications and
data analysis.
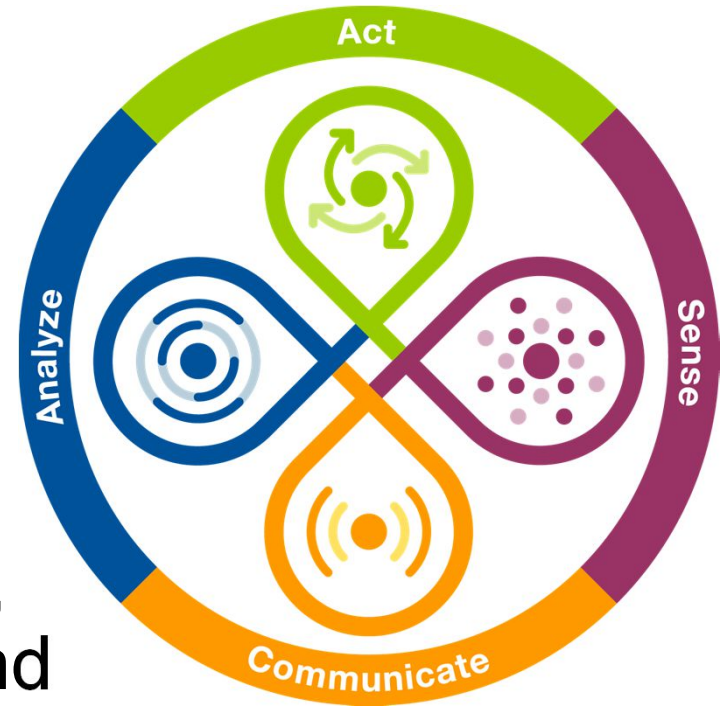
*Excludes general purpose devices such as PCs and smartphones

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# The Internet of (Very Different) Things

- Expect 8 billion shipments in 2020.
- Many smart versions of existing product markets.
- Key challenge: Where to focus?

Shipments in 2020
(millions of units)

(Selected items for illustration)
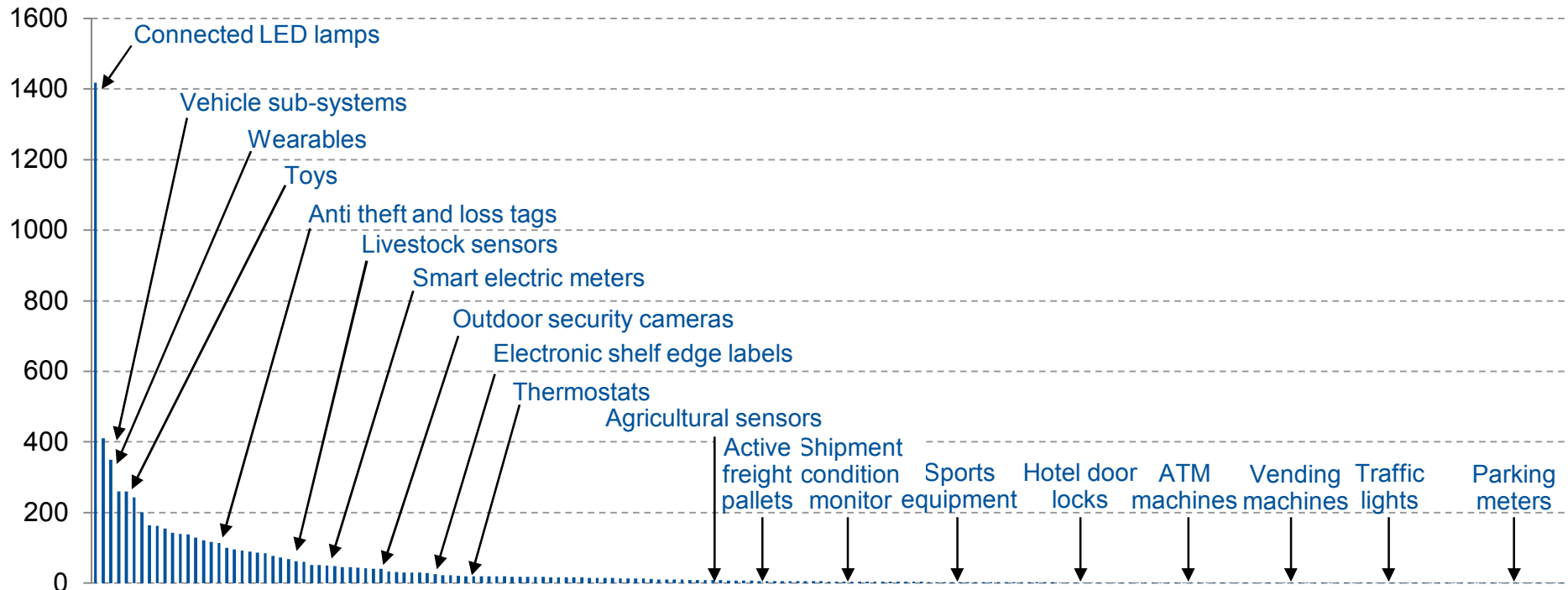


Chart labels (left to right, highest to lowest):
- Connected LED lamps
- Vehicle sub-systems
- Wearables
- Toys
- Anti theft and loss tags
- Livestock sensors
- Smart electric meters
- Outdoor security cameras
- Electronic shelf edge labels
- Thermostats
- Agricultural sensors
- Active freight pallets
- Shipment condition monitor
- Sports equipment
- Hotel door locks
- ATM machines
- Vending machines
- Traffic lights
- Parking meters

Y-axis: 0, 200, 400, 600, 800, 1000, 1200, 1400, 1600

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# Why Now?

Significant Cost declines over the past 10 years
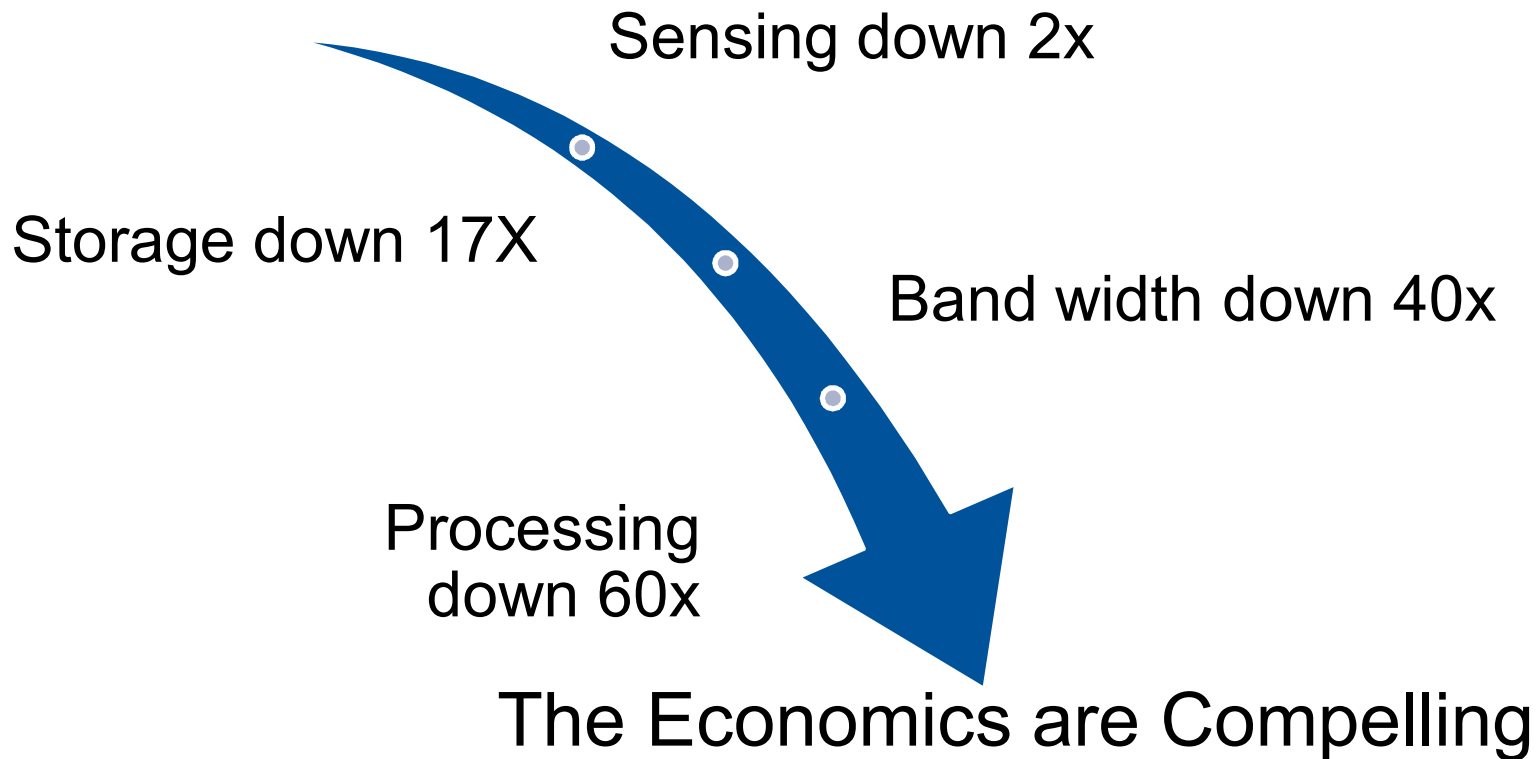


Sensing down 2x

Storage down 17X

Band width down 40x

Processing down 60x

The Economics are Compelling

Source: Intel, Gartner

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# The IoT Hype Cycle Points to the IoT Journey

**expectations**

iBeacons and Bluetooth Beacons
Internet of Things
Predictive Analytics
Smart Transportation
Wearables
Low-Cost Development Boards
Home Energy Management/Consumer Energy Management
IT/OT Alignment
Automobile IP Nodes
Cloud MOM Services
Personal Health Management Tools
Operational Technology Platform Convergence
Operational Technology Security
Big Data
High-Performance Message Infrastructure
Enterprise Manufacturing Intelligence

IT/OT Integration
Quantified Self
IoT Architecture
Event Stream Processing
Wide-Area IoT Networks
Embedded Software and Systems Security
Real-Time Analytics
IoT Platform
Connected Home

Operational Intelligence Platforms
Wearable User Interface in Logistics
Things as Customers
IoT Business Solutions
IoT-Enabled ERP
Energy Harvesting
Internet of Things Authentication

Managed Machine-to-Machine Communication Services

Licensing and Entitlement Management
Digital Security

As of July 2015

| Innovation Trigger | Peak of Inflated Expectations | Trough of Disillusionment | Slope of Enlightenment | Plateau of Productivity |

**time**

Plateau will be reached in:
○ less than 2 years    ◔ 2 to 5 years    ● 5 to 10 years    ▲ more than 10 years    ⊗ obsolete before plateau

Source: "Hype Cycle for the Internet of Things, 2015," 21 July 2015 (G00272399)

- Nearly unprecedented hype around IoT
- Unclear value propositions
- Difficult IoT deployments
- Steps to take to avoid the "trough"

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# Choosing an IoT Platform:
# Drives Your IoT Food Chain



**iBPM**

**ERP**

**Control System**

Rules, Alerts and Triggers

Replenishment

Application Platform

APIs

Functionality

Device Management

Reboot, Update, Location Data

**Asset and Device Management**

Data Storage
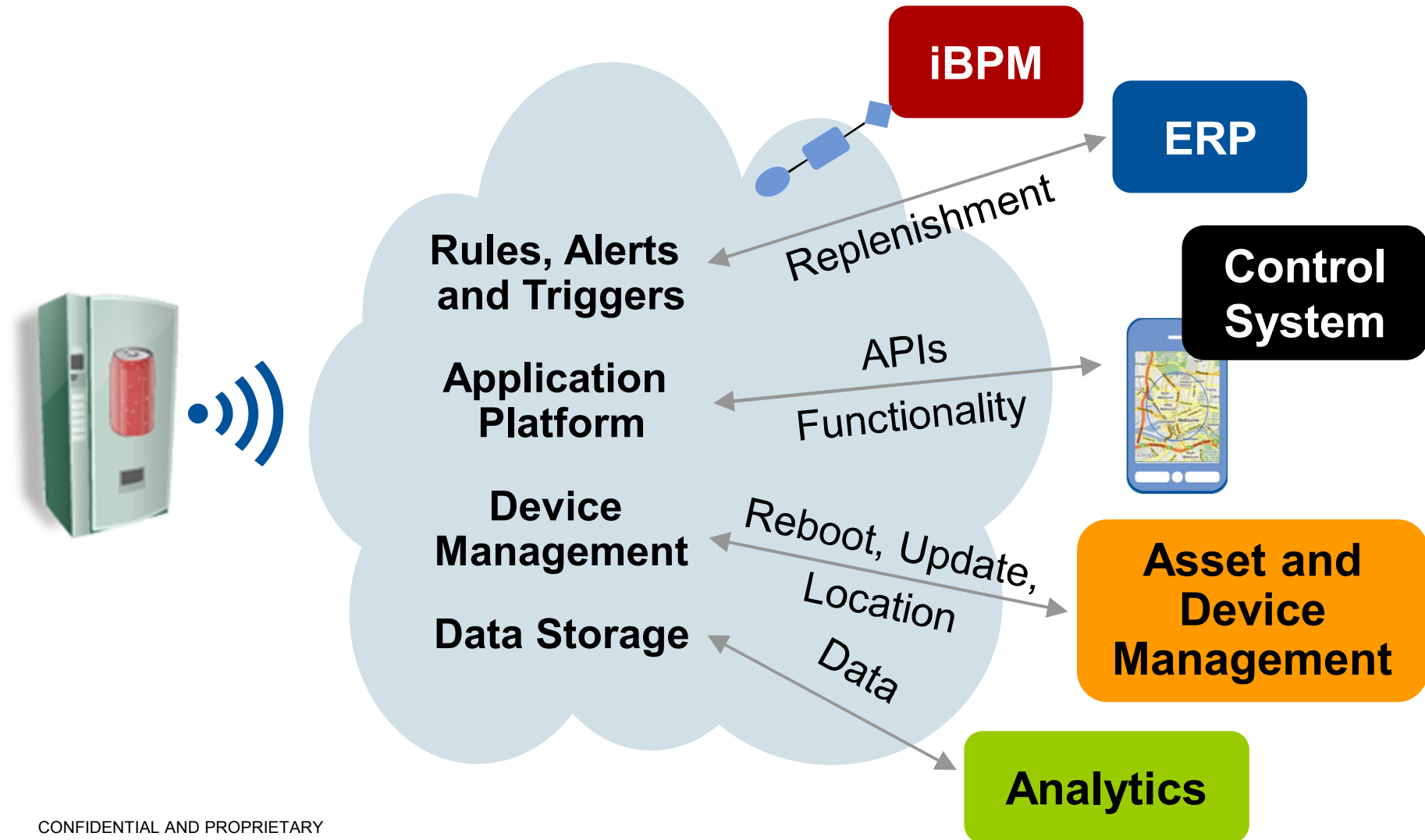
**Analytics**

# Another Way to Look at the Food Chain

| | **Consumers** | **Enterprises** |
|---|---|---|

**Level 5: Analytics** — Big data, user analytics

**Level 4: Apps and services** — Baby monitoring service or app; home security service | Vending machine refilling and maintenance service

**Level 3: Computing and storage** — Data centers, servers, storage, cloud platforms

**Level 2: Comms. and networking** — M2M communications: Cellular, mesh, Wi-Fi, ZigBee, …

Gateways, data compression, aggregation and security

**Level 1: "Things"** — Baby monitor, home automation devices | Vending machine refilling and maintenance service

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# Risk Appetite and Business Case Will Drive Your Architecture Choice
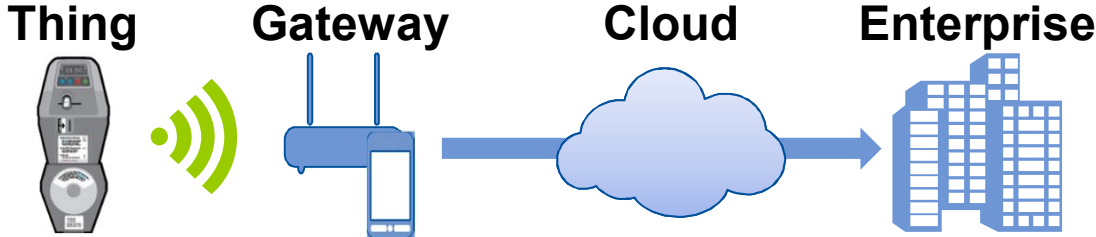


Thing — Gateway — Cloud — Enterprise

**Thing-Centric**
- User Interface
- Application
- Data
- Analytics

**Gateway / Smartphone-centric**
- User Interface
- Application
- Data
- Analytics

**Cloud-centric**
- User Interface
- Application
- Data
- Analytics

**Enterprise-centric**
- User Interface
- Application
- Data
- Analytics

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# IoT Food Chain



**Silicon Devices**
Sensing, Processing, Communications

**Things**
Smart Meters, Lighting, ADAC, Wearables

**Gateways**
Smart phones, PC's, routers, smart routers

**Services**
Analytics, Predictive Modeling, Applications

**Security**

**Middleware**
Security, IoT Platforms

**Cloud**
Servers, Storage

**Communications**
Wireless, Cellular, Wired, Protocols

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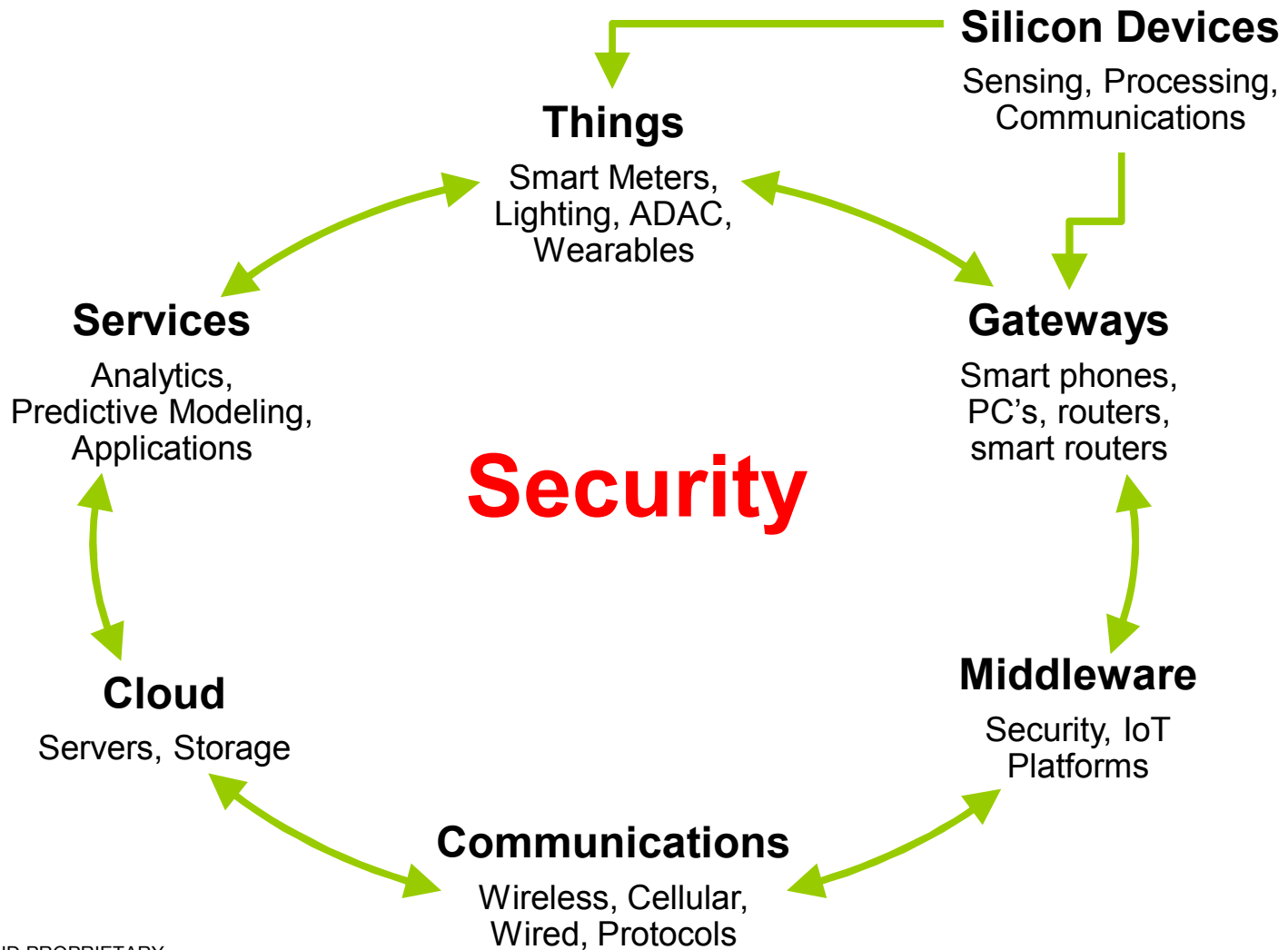
# IoT Infrastructure

- Silicon device manufacturers

- Goal: Get silicon into as many things, and gateways as possible
  - Develop maker platforms
    - Arduino
    - Raspberry Pi
    - Edison
    - Others
  - Security
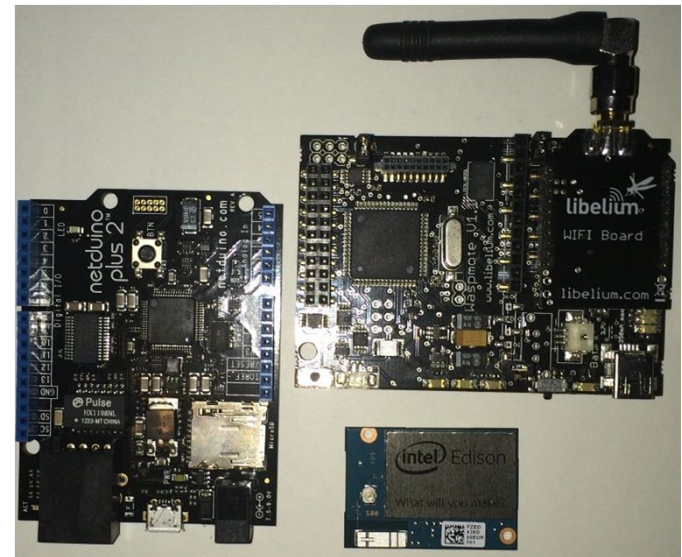
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# IoT Infrastructure

- Things

- Goal: Build things/Devices and potentially capitalize on application.

  - Use maker platform

  - Develop application

  - Develop/partner for infrastructure

  - Make Money

- Ultimate goal is to provide service

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# IoT Infrastructure

- Gateways

- Goal: gain profit in moving data from edge to the cloud.

  - Router/Server

  - Platforms

  - Analytics

  - Cloud

  - Security

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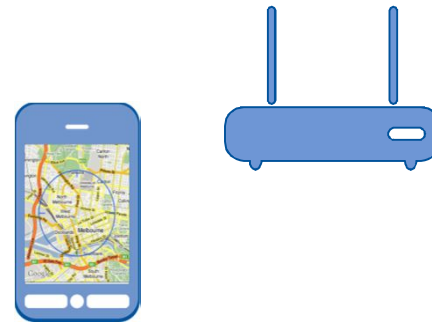
# IoT Infrastructure

- Middleware

- Goal: gain profit in moving data from edge to the cloud.

  - Software

  - Rules

  - Aggregation

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# IoT Infrastructure

- Communications

- Goal: Increase revenues by providing data services.

  - Cellular or wireless services for data transfer

  - Communication protocols.

  - Optimize for mobile IoT uses/fleet management

  - Fixed asset uses

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# IoT Infrastructure

- Cloud Providers

- Goal: Provide data services and storage
  - Analytics
  - Privacy
  - Storage
  - Platforms

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# IoT Infrastructure

- Services

- Goal: Create an IoT infrastructure that is seamless to the client

  - Software from edge to the Cloud

  - Consult/Provide applications

  - Cloud services

  - Analytics

  - Predictive modeling

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# IoT Infrastructure

- The IoT infrastructure is tightly interlinked and must operate smoothly

- Security at each handoff is critical

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# Platforms, Critical for a Good Meal
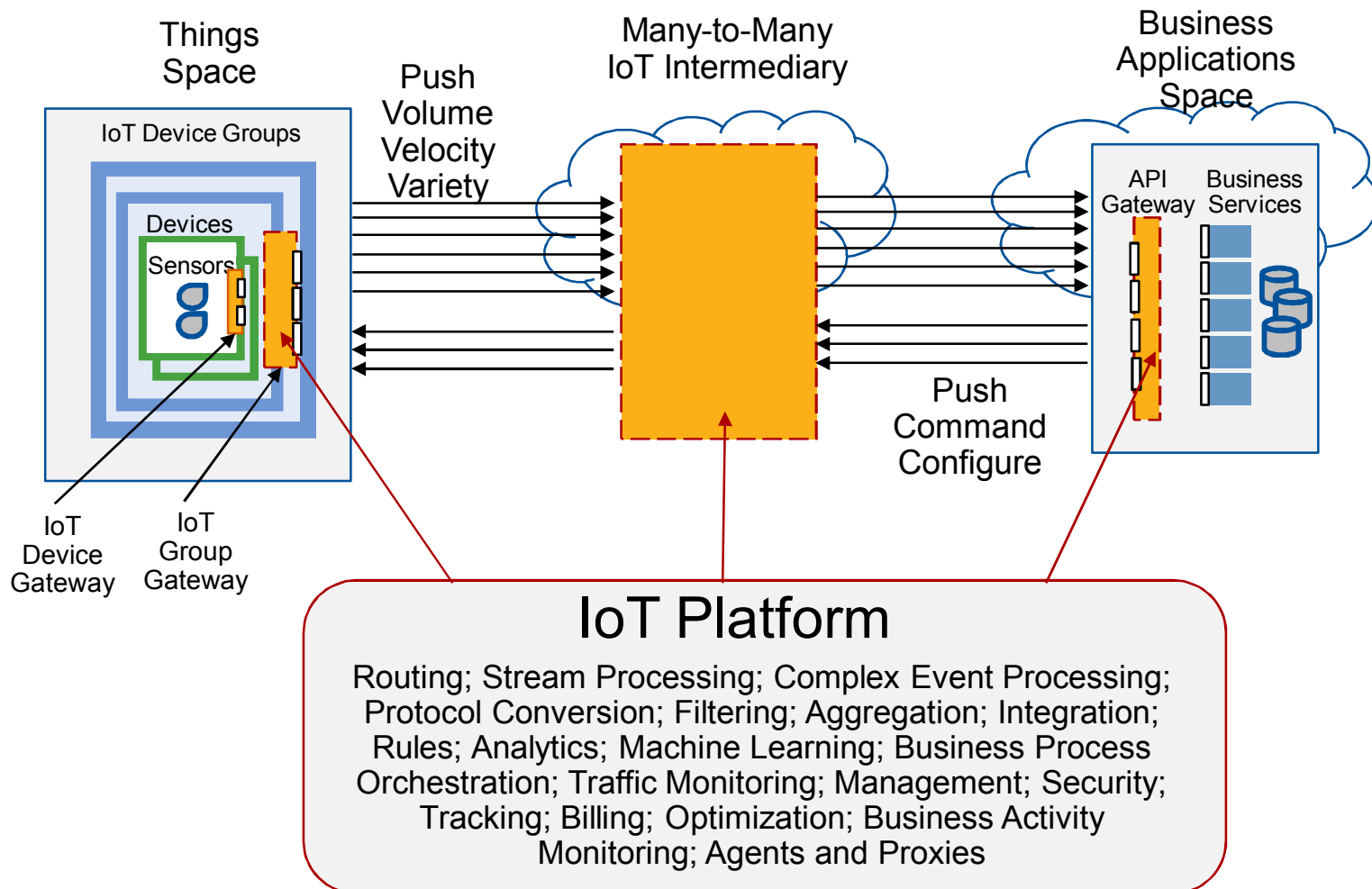
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# Internet of Things: Platform Architecture



Things Space

IoT Device Groups

Devices

Sensors

Push Volume Velocity Variety

IoT Device Gateway

IoT Group Gateway

Many-to-Many IoT Intermediary

Push Command Configure

Business Applications Space

API Gateway

Business Services

## IoT Platform

Routing; Stream Processing; Complex Event Processing; Protocol Conversion; Filtering; Aggregation; Integration; Rules; Analytics; Machine Learning; Business Process Orchestration; Traffic Monitoring; Management; Security; Tracking; Billing; Optimization; Business Activity Monitoring; Agents and Proxies

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# Why Do I Need an IoT Platform?



- **Business**

  - I'm trying to connect to my things to

    - Improve my processes or costs

    - Drive new revenues

    - Meet management or regulatory requirements

- **Technical**

  - I need to connect to my:

    - External

      - Products

    - Internal

      - Legacy things

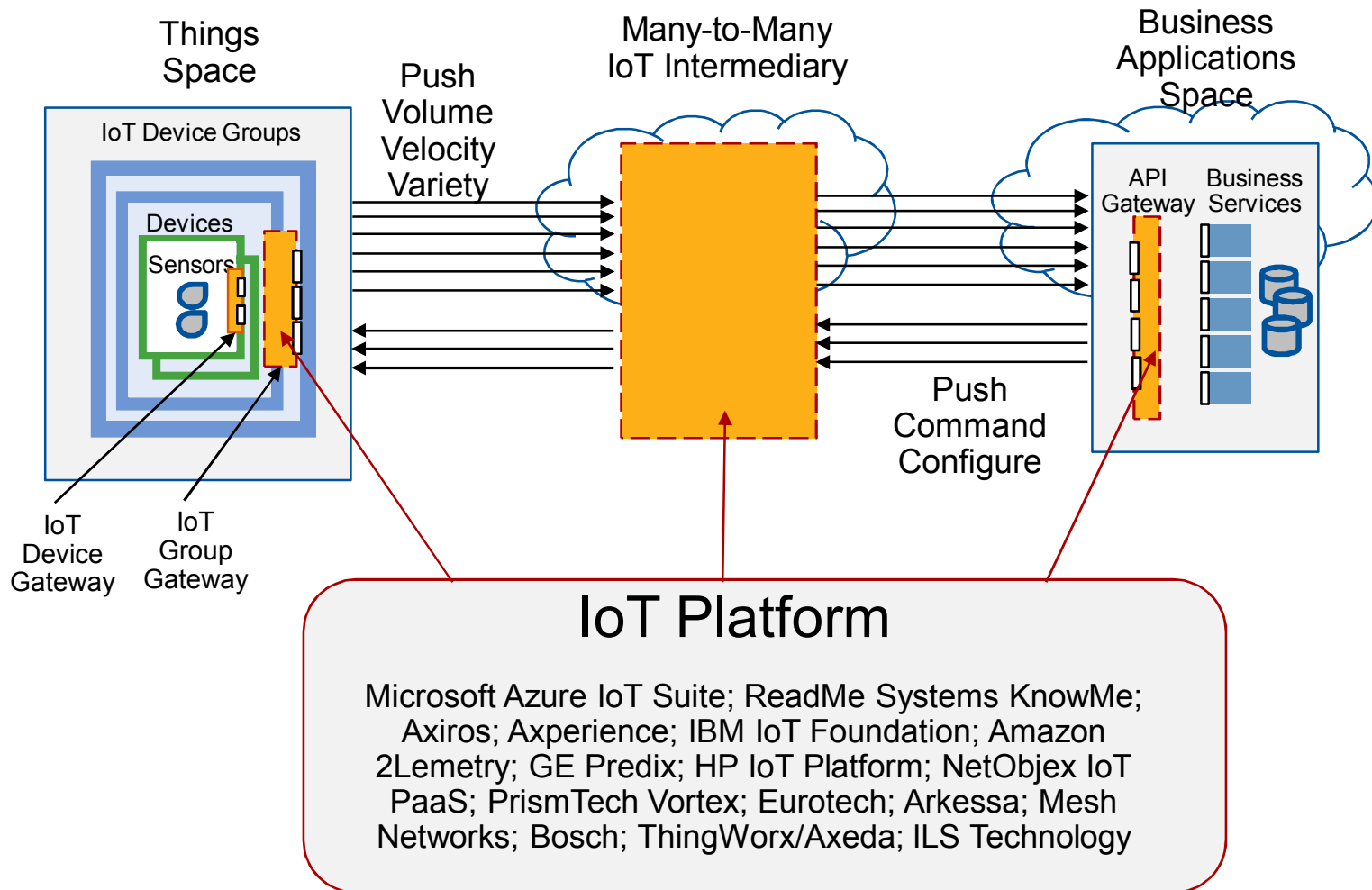      - Heterogeneous things

      - Legacy IoT Platforms

Unless I have a business need, I will use a 3$^{rd}$ party solution

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# IoT Platforms Are A Key Building Block for a Digital Business

- IoT Platforms:

  - Monitor, control & manage IoT Endpoints & their software

  - Aggregate and analyze IoT Endpoint data – all which collectively renders a desirable business outcome, e.g., predictive maintenance.

  - Bridge between IoT end-points and enterprise applications, data bases and other back-end environments

  - Technically, IoT Platforms accomplish this via some combination of device management, IoT-focused middleware (e.g., aPaaS, iPaaS), and some combination of security, APIs, application development, business rules, CEP, UI, analytics and visualization tools.

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# Internet of Things: Platform Architecture



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Push Volume Velocity Variety

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Many-to-Many IoT Intermediary

Business Applications Space

API Gateway

Business Services

Push Command Configure

## IoT Platform

Microsoft Azure IoT Suite; ReadMe Systems KnowMe; Axiros; Axperience; IBM IoT Foundation; Amazon 2Lemetry; GE Predix; HP IoT Platform; NetObjex IoT PaaS; PrismTech Vortex; Eurotech; Arkessa; Mesh Networks; Bosch; ThingWorx/Axeda; ILS Technology

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# For Success Platforms Must be Versatile
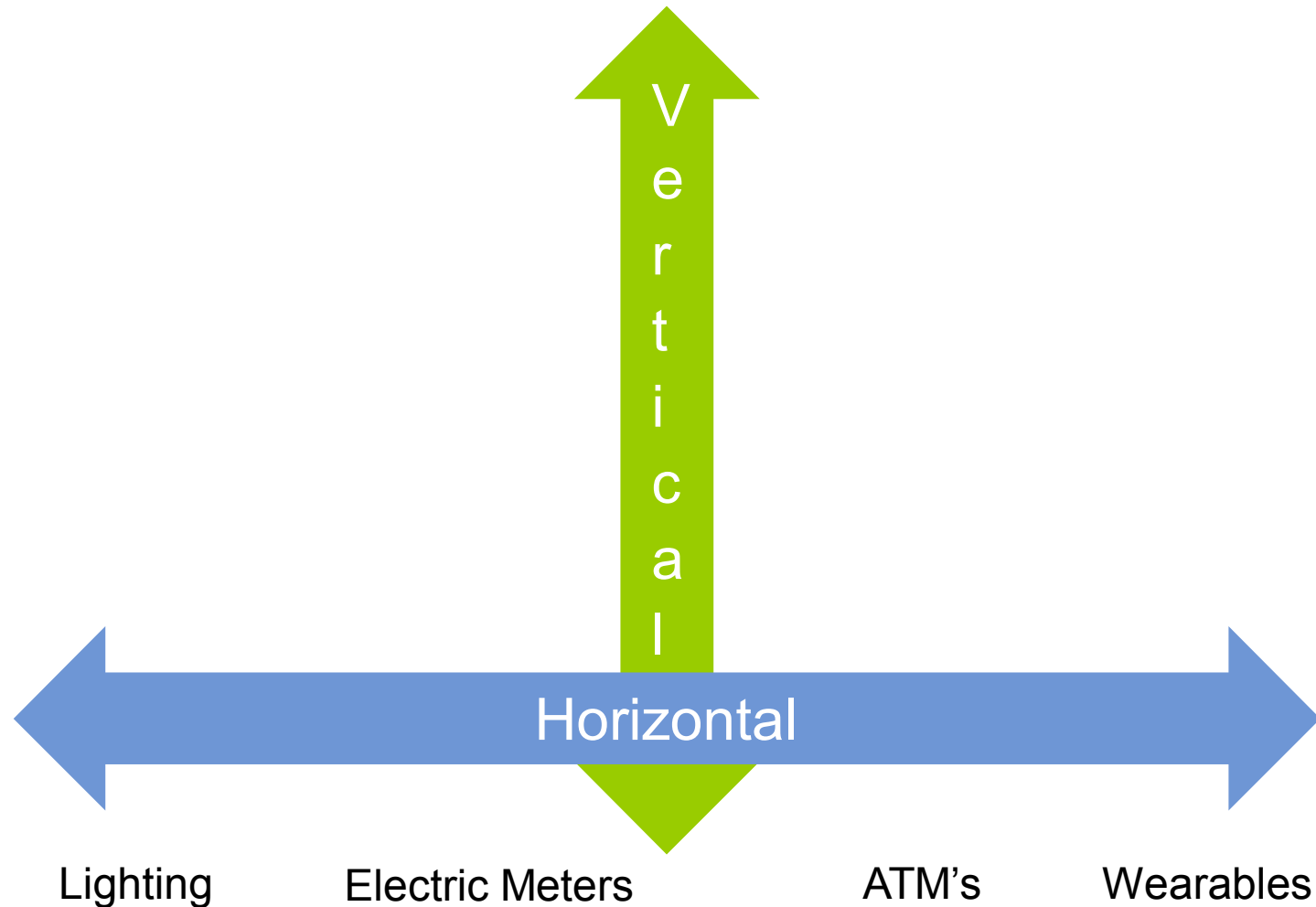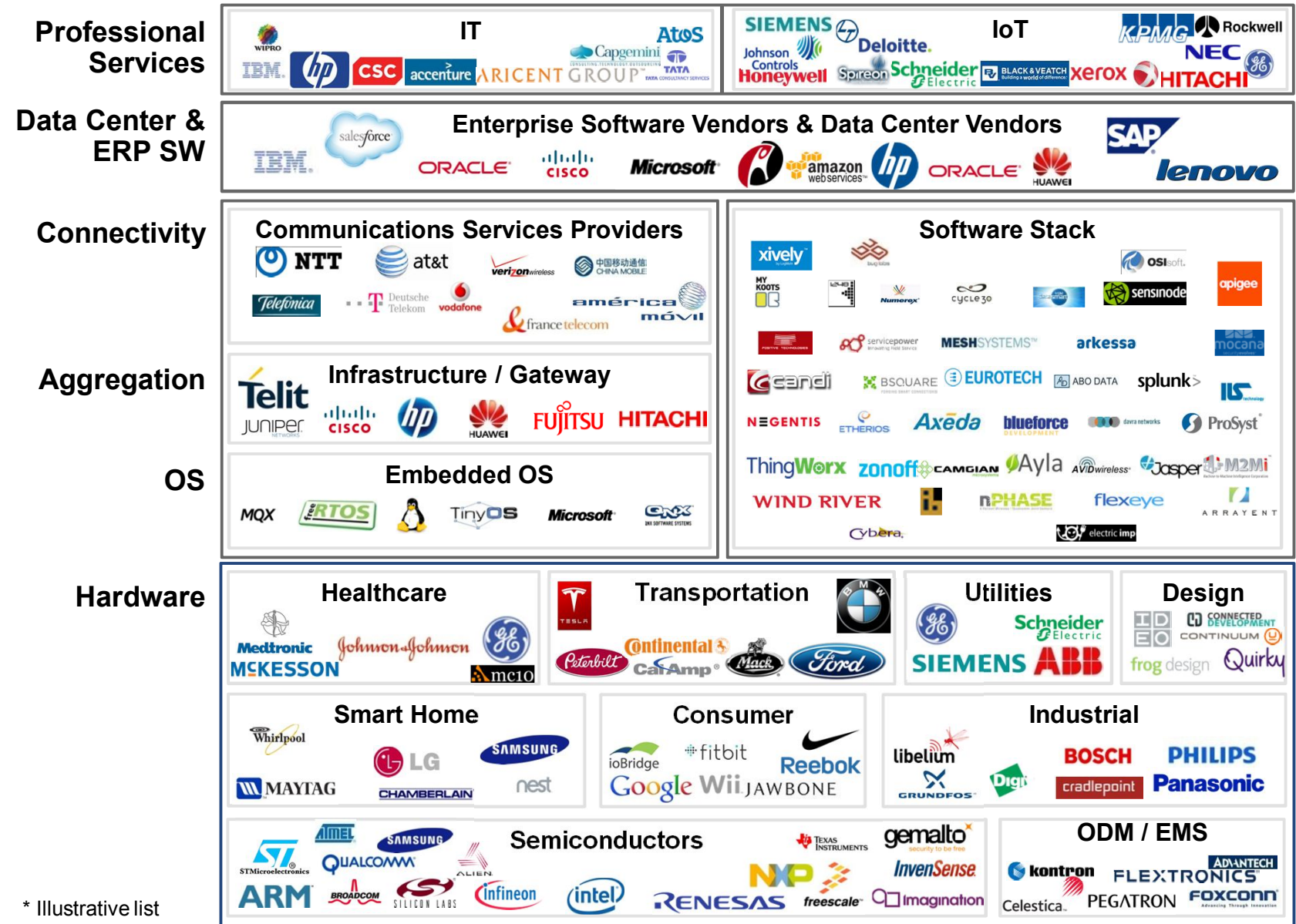
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# Key Issues

- What does the IoT food chain look like?

- How to enjoy the meal.

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# A Crowded IoT Ecosystems ... Partnerships Are Critical to Succeed



**Professional Services** — IT / IoT

**Data Center & ERP SW** — Enterprise Software Vendors & Data Center Vendors

**Connectivity** — Communications Services Providers / Software Stack

**Aggregation** — Infrastructure / Gateway

**OS** — Embedded OS

**Hardware** — Healthcare, Transportation, Utilities, Design, Smart Home, Consumer, Industrial, Semiconductors, ODM / EMS

* Illustrative list

# Behind Every IoT Project There is a Business Priority

**Reduce costs**

**Optimize process**

**Improve efficiency**

**INTERNAL**

**Grow revenues**

**New business**

**Satisfy customers**

**EXTERNAL**



# Digitizing Your Business

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# IoT Uses

**Optimize**
- Asset performance management
- Mobile workforce management
- MRO reduction

**Charge**
- Dynamic pricing
- Transactive and P2P energy
- Beyond the meter services (EV, EE)

**Operate**
- Distributed energy resource mgmt
- Emergency restoration operations

**Extend**
- Home energy management
- Demand response automation

**Engage**
- Energy efficiency
- Self-service

# IoT Benefits

| | |
|---|---|
| Improve Operations | Enhance Services |
| Optimize Assets | Generate Revenues |
| Conserve Resources | Increase Engagement |
| Improve Well-Being | Provide Security |

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# Applications Drive the Intelligence

On, Off, Dimming
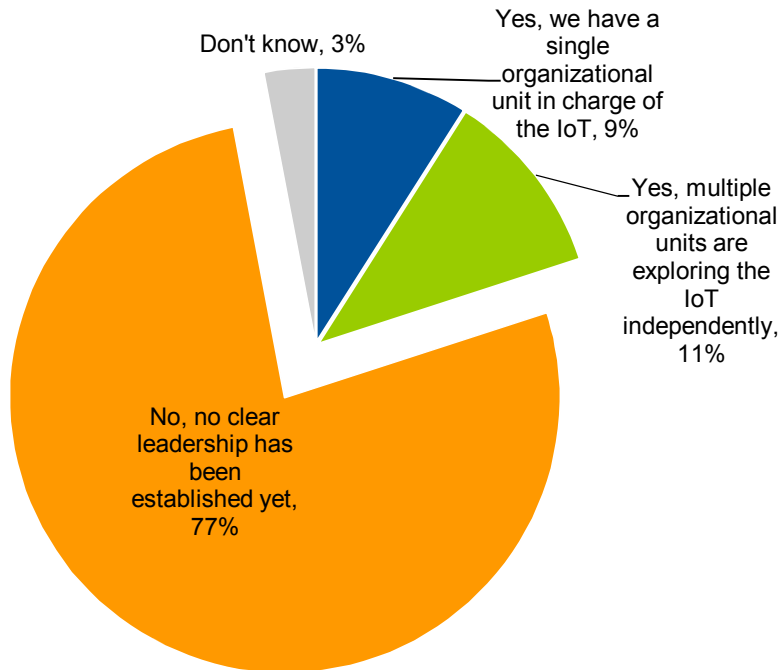
Gunshot detection,
Video, Weather

# Despite the future importance of the IoT, few organizations have built governance for the IoT and more than half have no plans to establish a COE for the IoT
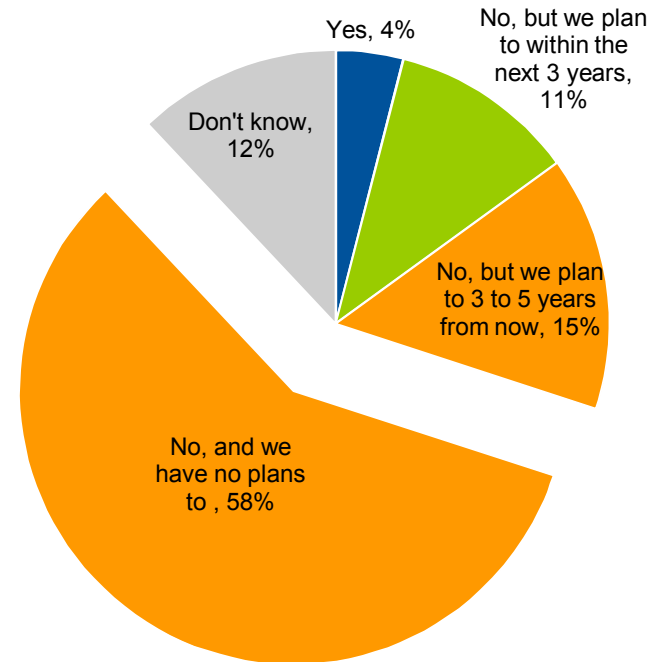
n=456

Q. Has your organization established leadership for its IoT efforts?

Q. Have you established a Center of Excellence (COE) for the IoT?

## Established Leadership

Don't know, 3%

Yes, we have a single organizational unit in charge of the IoT, 9%

Yes, multiple organizational units are exploring the IoT independently, 11%

No, no clear leadership has been established yet, 77%

## Established Center of Excellence

Yes, 4%

No, but we plan to within the next 3 years, 11%

Don't know, 12%

No, but we plan to 3 to 5 years from now, 15%

No, and we have no plans to , 58%

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# Many Markets, Limited Opportunity, Choose Carefully



Shipments in 2020 (Millions)

49 percent of IoT are <100 m/y

Indoor LED Lighting - business

Automotive Body

Indoor LED lighting, consumer

STB

Healthcare monitoring

Smart TV

Automotive EV/HEV

Automotive Infotainment

Agriculture Sensor Mote

Power Plant Process Sensor

Pets Control Strap

Burglar alarm control units

Smart building appliances

Smart Mattress Pad

Intelligent Mirror

Smart Electric Meter

Smart Gas Meter

Lost luggage sensors

Road traffic Sensor

Parking Lot Sensor

Pets Control Strap

Thermostats

Garden / Plant sensor

Condition monitor

Oil / Gas Pipeline Sensor

Dishwasher

Chest Straps

Smart Dispensing Devices - Consumer

Solar Power Panels - Consumer

Drinking Water Process Sensor

Commercial Aircraft

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# Wrap up

- The IoT is a complex interwoven food chain

- Partnering is critical to insure success

- Business opportunities abound

- Semiconductor opportunity high volume low cost

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# Recommendations- To Enjoy the Meal

✓ Develop your initial IoT architecture and policy by EoY 2015:

- Use this to create use case scenarios

✓ Use the IoT to Develop your Digital Business Strategy

- Experiment with IoT to establish business value on an internal / external basis

✓ Identify your Potential Dining Partners

- Start with your existing partners, then branch out

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# Enjoy the Meal!

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# Recommended Gartner Research

➔ **Forecast: Internet of Things, Endpoints and Associated Services, Worldwide, 2014**
Peter Middleton and others (G00270264)

➔ **The 12 Principles of Application Architecture for Digital Business and IoT**
Yefim V. Natis, Ross Altman (G00263480)

➔ **Internet of Things Can Help Public-Sector Services Reduce Costs and Engage Citizens**
Anurag Gupta and Jim Tully (G00264413)

➔ **What Securing the Internet of Things Means for CISOs**
Earl Perkins (G00259020)

➔ **Hype Cycle for the Internet of Things, 2014**
Hung LeHong and Alfonso Velosa (G00264127)

For more information, stop by Gartner Research Zone.

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# Recommended Gartner Research

➔ **Market Trends: TSPs Must Invest in the Rapidly Evolving IoT Ecosystems Now**
Alfonso Velosa and others (G00259158)

➔ **Survey Analysis: The Internet of Things Is a Revolution Waiting to Happen**
Nick Jones, Stephen Kleynhans, Leif-Olof Wallin (G00272799)

➔ **Build Your Blueprint for the Internet of Things, Based on Five Architecture Styles**
Hung LeHong (G00269736)

➔ **The Internet of Things Will Demand New Application Architectures, Skills and Tools**
Nick Jones (G00262905)

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