Internet of Things

An Introduction

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The Planet Is Getting Smarter

Conducting Business with Anyone, Anytime, Anywhere Critical

2.5 Quintillion

bytes of new data generated daily

Internet of information

83% of GenYers

have joined a social network

Internet of engagement

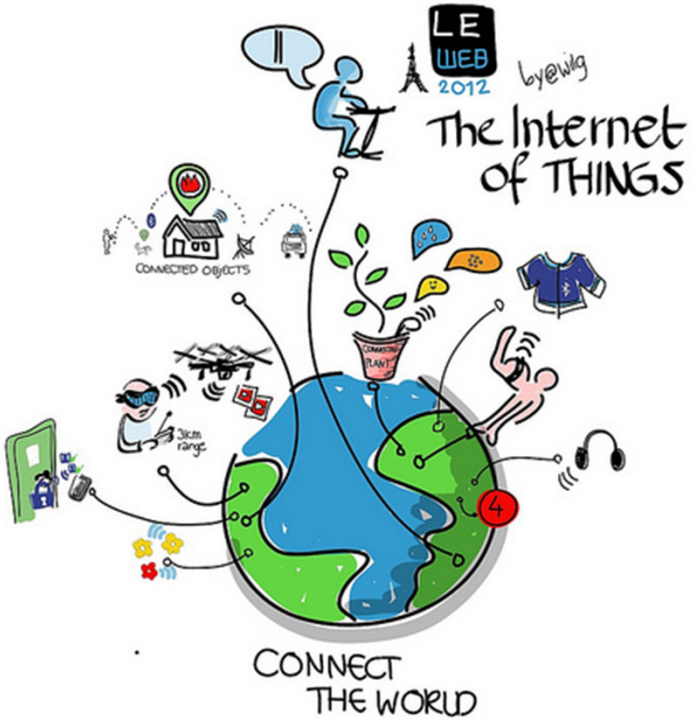
9.6 Billion

connected devices

Internet of "things"

McKinsey's Viewpoint

- **9 billion** devices around the world are currently connected to the Internet, including computers and smartphones
- The number is expected to increase dramatically within the next decade, with estimates ranging from **50 Billion devices** to reaching **1 trillion**
- The Internet of Things has the potential to create ***economic impact of $2.7 trillion to $6.2 trillion***[1] annually by 2025



Source: Disruptive Technologies, McKinsey Global Institute, May 2013

New Technologies Present Opportunities for Business

Big Data

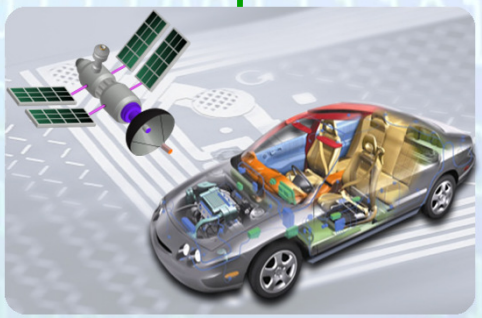
Cloud Computing

Mobile

Business

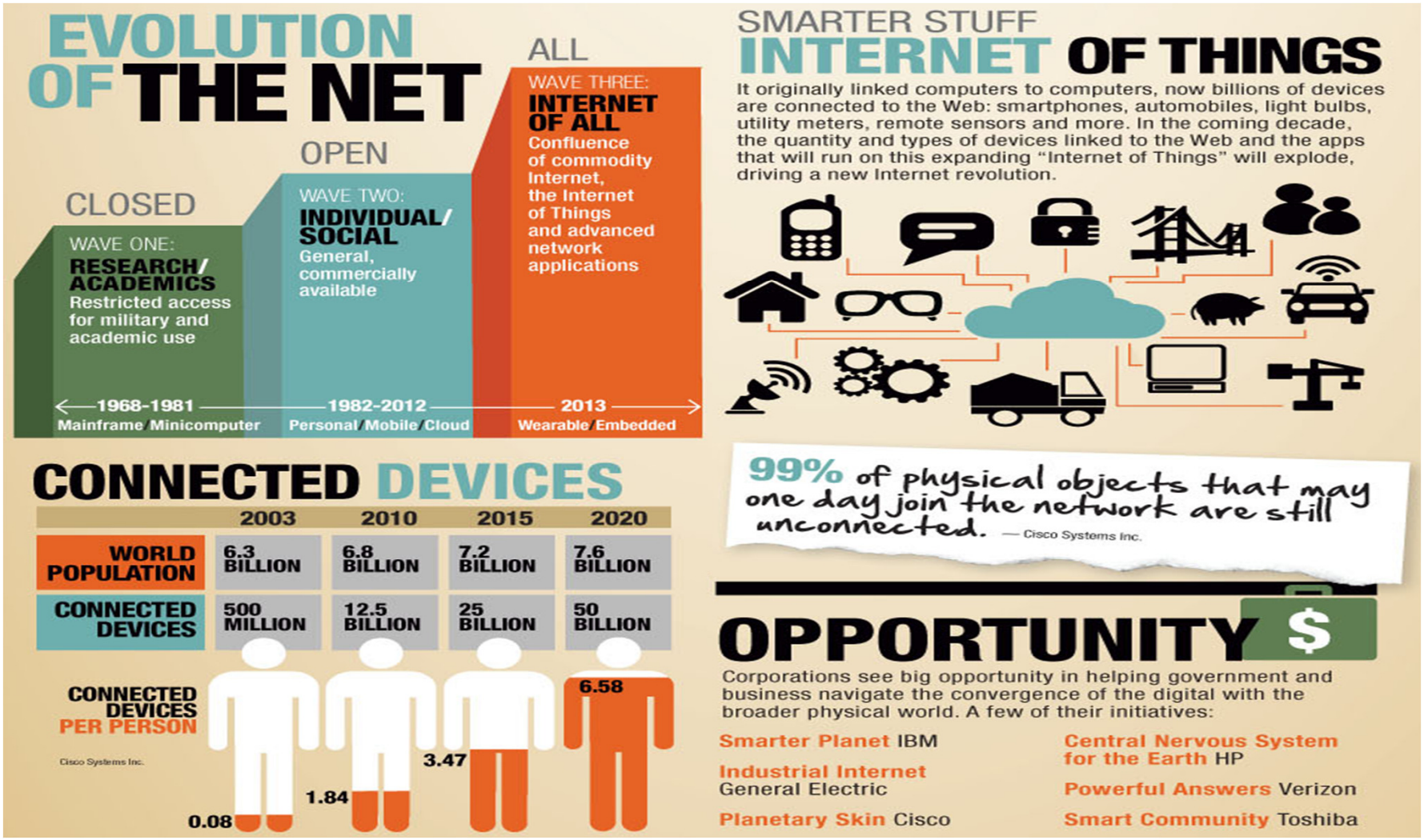
Customers • Partners • Employees

Social Media



Internet of Things

The Internet of Things is the next Internet Frontier

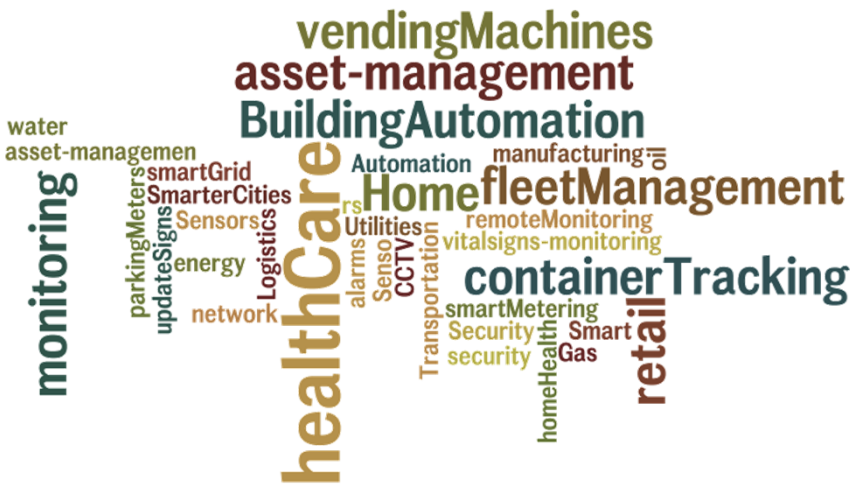


Source:http://www.digitalcommunities.com/articles/FutureStructure-The-New-Framework-for-Communities.html

The Internet of Things instruments our entire world



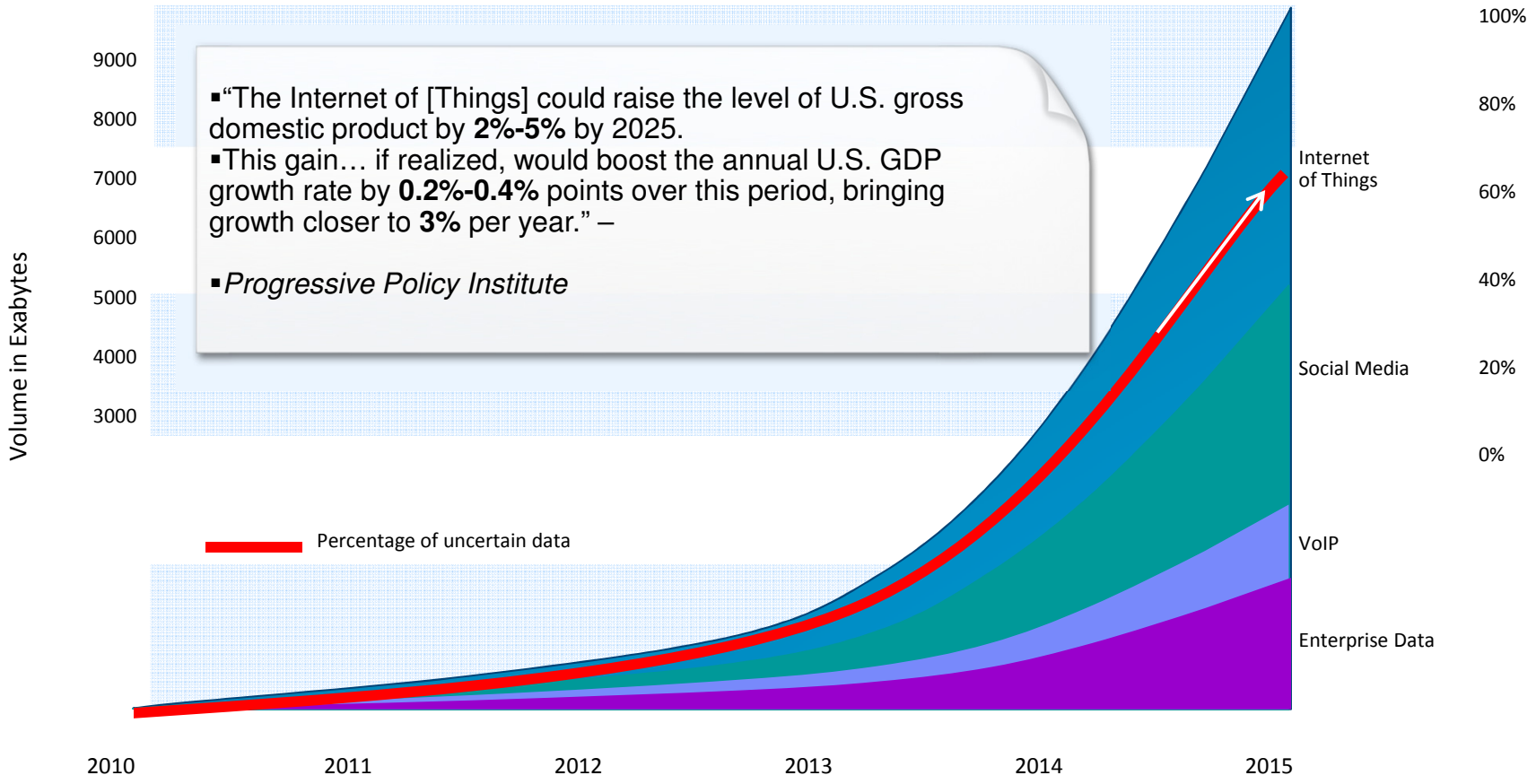









This is, and will, drive Big Data volumes



Sources: IBM Global Technology Outlook – 2012
http://www.progressivepolicy.org/wp-content/uploads/2013/09/09.2013-Mandel_Can-the-Internet-of-Everything-Bring-Back-the-High-Growth-Economy-1.pdf

… but this isn't just about scale

5 years ago

- My phone only talked to other phones
- It sent data to others when I asked it to
- Mobile phone companies led the market

Today

- My phone can connect to almost anything
- It shares and receives information automatically
- Computer & content companies drive the market

Tomorrow?

- What will replace it?
- Who will it talk to?
- What companies will lead?

?

IDC – Forecast

2020 View

Source: IDC, December 2013

- **212B** Installed Things
- **30B** autonomously connected things
- Public Sector, Distribution & Services, Manufacturing & Resources, and Consumers Lead Segment Growth Rates
- Approximately **3 Million Peta Bytes Of Embedded Systems Data** (Excludes Streaming, Surveillance Type Data
- **$8.9Trillion** Of Business Value

GSMA “Connected Life” forecast $4.5T in 2020

- Connected Life is everything that is connected and how they interact: cars, mobile devices, buildings, sensors **and people**

- Top Ten in 2020

1. Connected Car	$600 billion
2. Clinical Remote Monitoring	$350 billion
3. Assisted Living	$270 billion
4. Home and Building Security	$250 billion
5. Pay-As-You-Drive Car Insurance	$245 billion
6. New Business Models for Car Usage	$225 billion
7. Smart Meters	$105 billion
8. Traffic Management	$100 billion
9. Electric Vehicle Charging	$75 billion
10. Building Automation	$40 billion

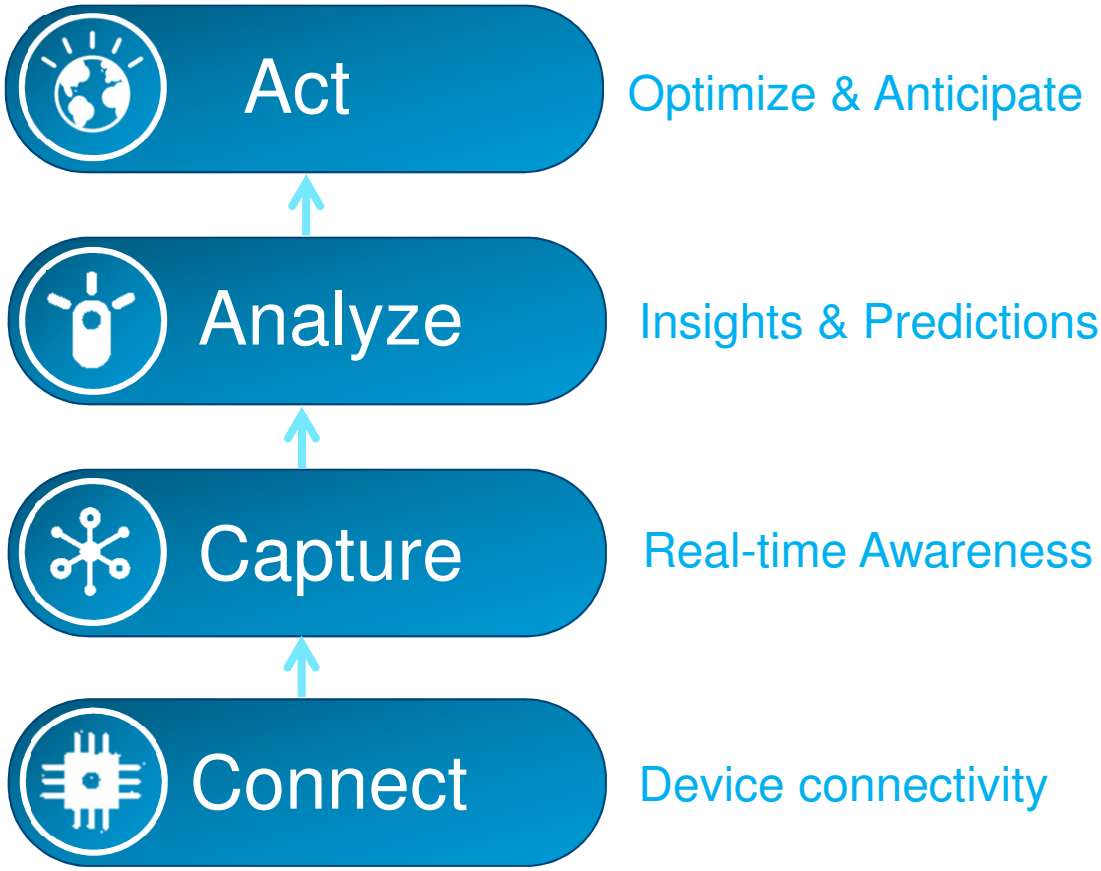
Source: http://www.globaltelecomsbusiness.com/article/2985699/Connected-devices-will-be-worth-45t.html

All Internet of Things Use Cases have a Common Set of Fundamental Requirements

- Easily on-board any connected “thing”
- Create a real-time communication channel with the “thing”
- Begin capturing data from the “thing” and store it in a historian DB
- Provide access to the collected data
- Pay for the service based on usage

- Extended Requirements:
  - Provide a layer of analytics on the data in both real-time and on historical trend data
  - Trigger events based on specific data conditions
  - Interact with the “thing” from business apps and/or from mobile devices

Realise value at a number of stages



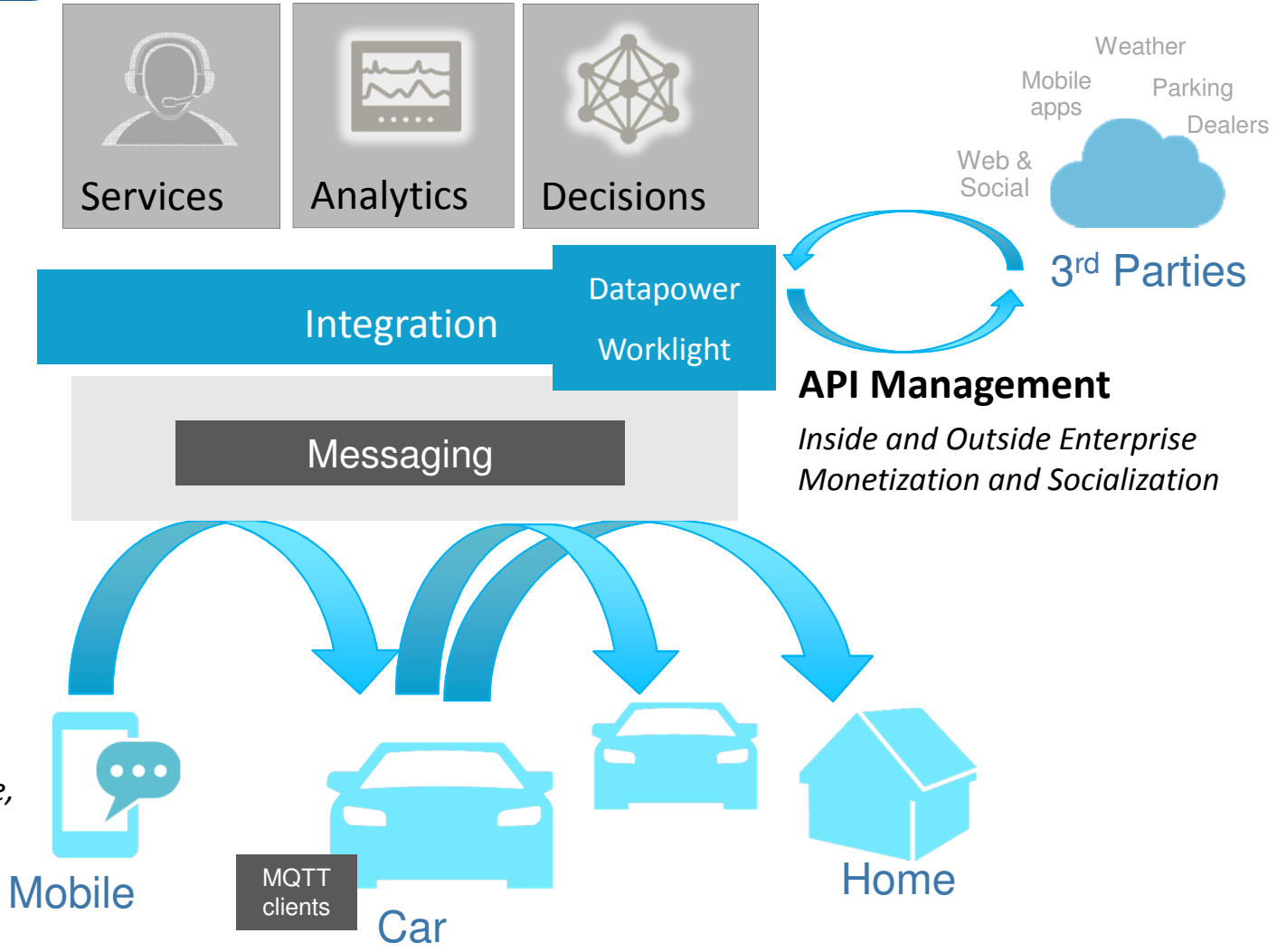
Connect *approach with Event Based Messaging*

Flexible
Loosely coupled applications

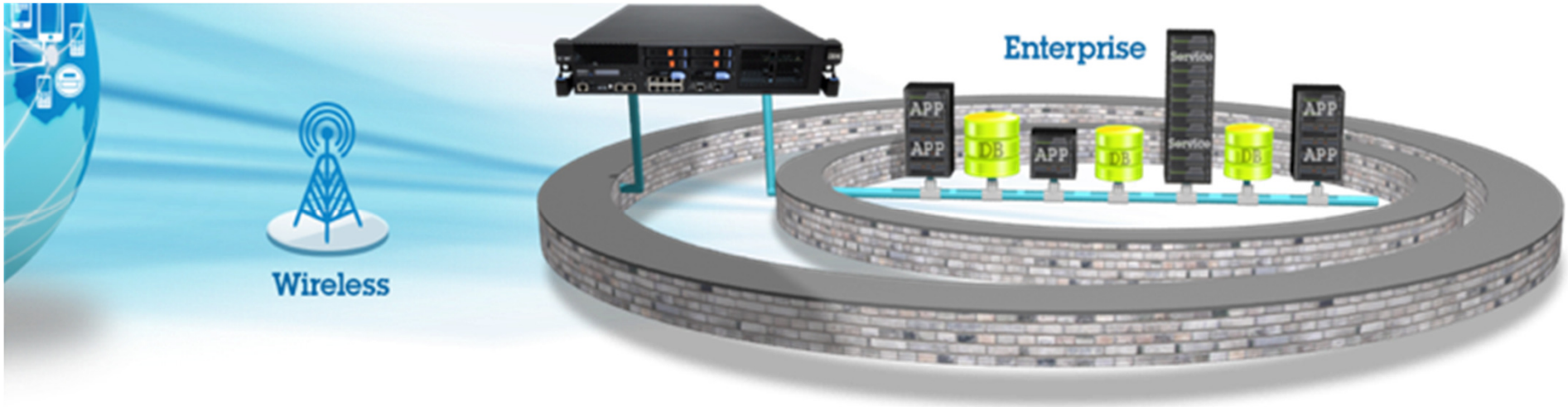
Available
Integrated into Enterprise (SOA)

Bi-Directional
Real-time not polling

Secure
Connections with Mutual authentication
Persistent Channels
External API calls in enterprise, mobile data over MQTT



Capture *and Quickly Create new Applications*



Easy to Deploy
Hours not Weeks

Secure and Reliable
DMZ Ready Appliance

Easy to Integrate
Open Standards

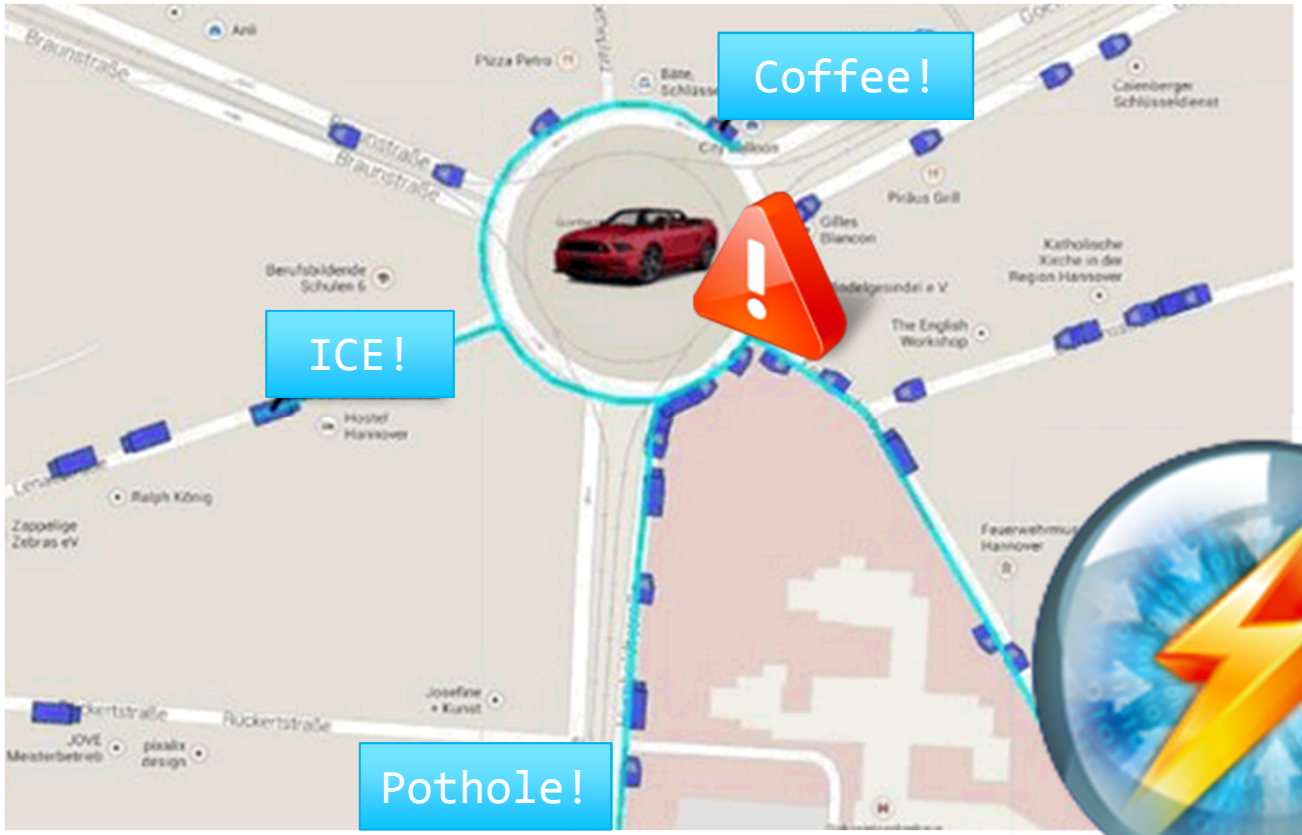
Developer Friendly
Simple Programming Model

Analyze

Streaming Data to Create new Applications

Typical response times today are a 15-90 second.

'Latency is a driver distraction issue' Roger Lanctot – Strategy Analytics



- Longitude
- Latitude
- Direction
- Altitude
- Sensors
- Weather
- Road surface

InfoSphere Streams

- **Correlate**
- **Filter**
- **GeoSpacial**
- **Anonymise**
- **Trending**

Act *to Generate Value from Big Data*

Actionable Insights

Predictive Maintenance
& Quality

ODM
Decision
Management

Cognos
Business
Intelligence

SPSS
predictive analytics

IIB
Integration

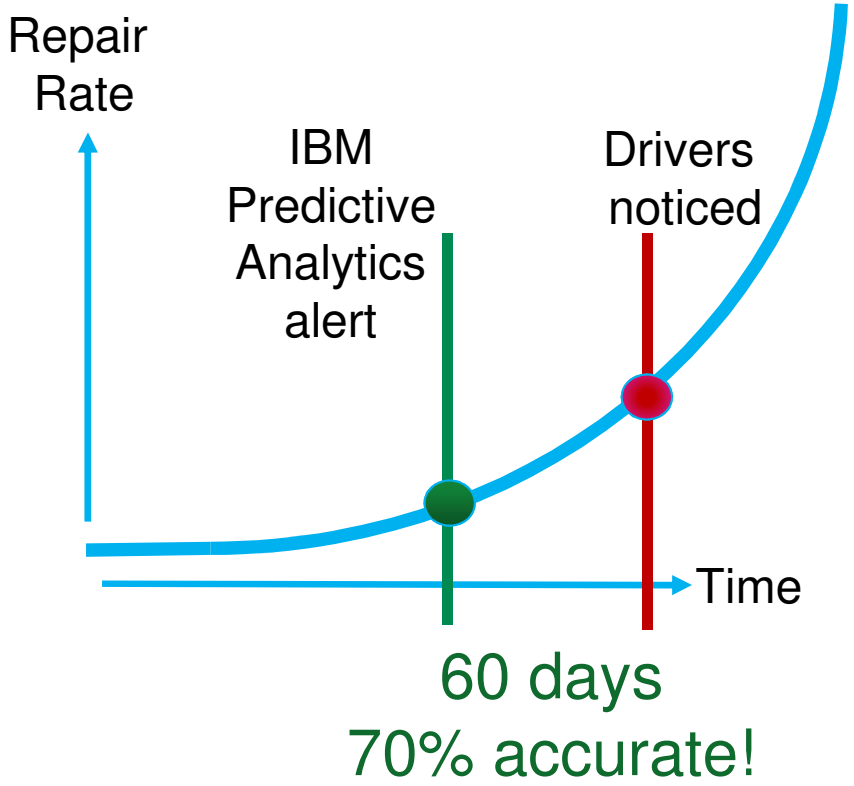
Vehicle sensor data (MQTT)

Vehicle History data (SQL)

Dealer data (REST)

Act *for Better Customer Service*

Condition Monitoring & Predictive Maintenance



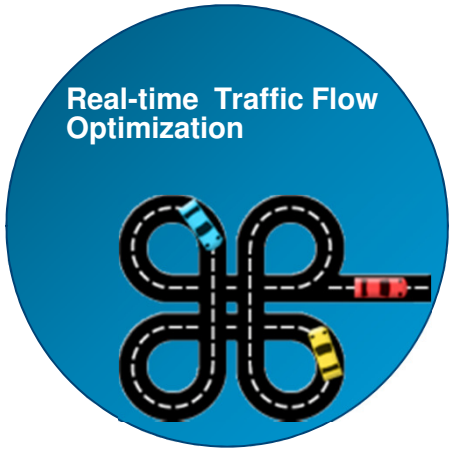
Warranty Savings

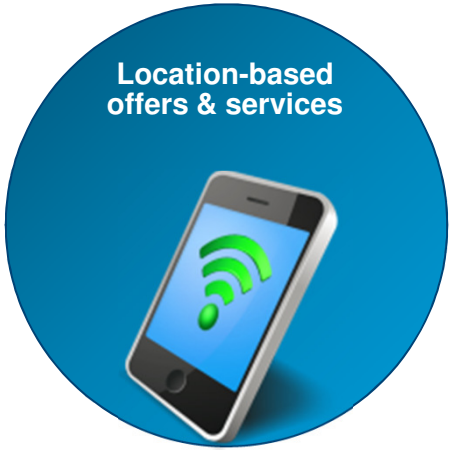
Customer Experience

What's the Opportunity Cost for not doing it?

BMW Uses
IBM Predictive Maintenance
on test vehicles to identify Issues before released to customers

Imagine the Possibilities of Analyzing *All* this Data in Real-time





What do we mean by Devices in the Internet of Things?

Typically End user interaction B2C, B2E

Typically M2M

Edge Gateways
Device hubs/controller that act as hubs/concentrators for connecting devices.

Embedded Controllers
Filtering of duplicate read events, Store-based HVAC & lighting controls, Industrial Network Gateways (SCADA)

Sensors
Power meters, weather data SCADA sensors, pressure, volume, RFID readers, Motion detectors…

Actuators
Tag printers, status lights, Load generation, HVAC and lighting, Valves, switches and pumps…

5 mobile trends with significant implications for the enterprise

Mobile enables the Internet of Things
Global Machine-to-machine connections will increase from 2 billion in 2011 to **18 billion** at the end of 2022

Mobile is primary
91% of mobile users keep their device within arm's reach 100% of the time

Mobile must create a continuous brand experience
90% of users use multiple screens as channels come together to create integrated experiences

Insights from mobile data provide new opportunities
75% of mobile shoppers take action after receiving a location based messages

Mobile is about transacting
96% year to year increase in mobile cyber Monday sales between 2012 and 2011

What does it mean to be easy to do business with?

"Amazon, Apple and Netflix provide the customer satisfaction benchmarks to which banks must aspire"

~ Where is the ROI on Customer Experience in the Banking Industry? Bank Systems & Technology, 2012

Banking:
Can I instantly add a family member to my credit card account?

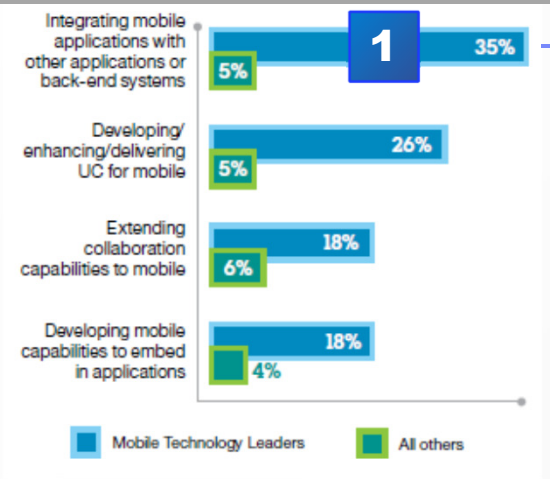
Insurance:
Can I report an accident on my mobile device and automatically trigger a tow truck and taxi?

Healthcare:
Can I shorten hospital stays by one or two days without compromising treatment quality?

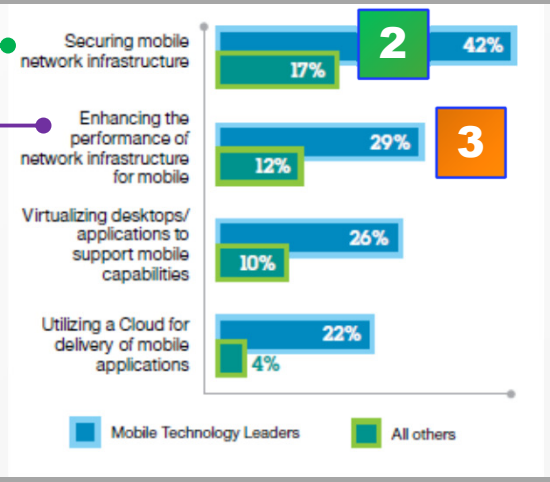
Government:
Can I speed up passport control at the border for pre-certified frequent travelers?

Three best practices to successfully unlock back office capabilities and information for seamless cross channel interactions

Mobile infrastructure integration initiatives

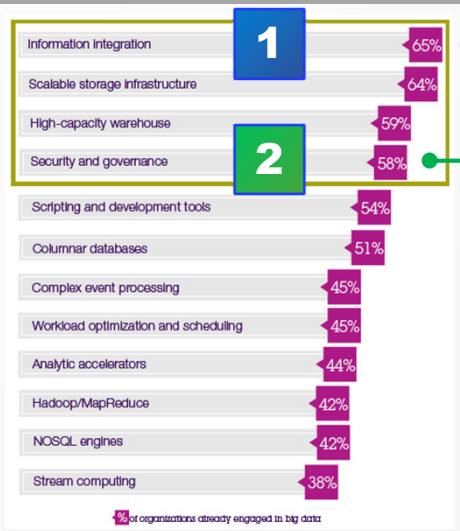


Mobile infrastructure optimization initiatives



1 Integration
2 Security
3 Performance

Big data infrastructure



Cloud Competitive Advantage

(% who have achieved through cloud)

		Chasers	Challengers	Pacesetters	% Pacesetters surpass Chasers
Strategic reinvention	Reinvent customer relationships	25%	46%	59%	+136%
	Innovate products/services rapidly	30%	51%	52%	+73%
	Build new/improved business models	30%	44%	51%	+70%
Better decisions	Use analytics extensively to derive insights from big data	20%	44%	54%	+170%
	Share data seamlessly across applications	27%	51%	59%	+119%
	Make data-driven, evidence-based decisions	30%	62%	65%	+117%
Deeper collaboration	Make it easier to locate and leverage knowledge of experts anywhere in ecosystem	34%	51%	61%	+79%
	Improve integration between development & operations	34%	49%	59%	+74%
	Collaborate across organization & ecosystem	34%	45%	58%	+71%

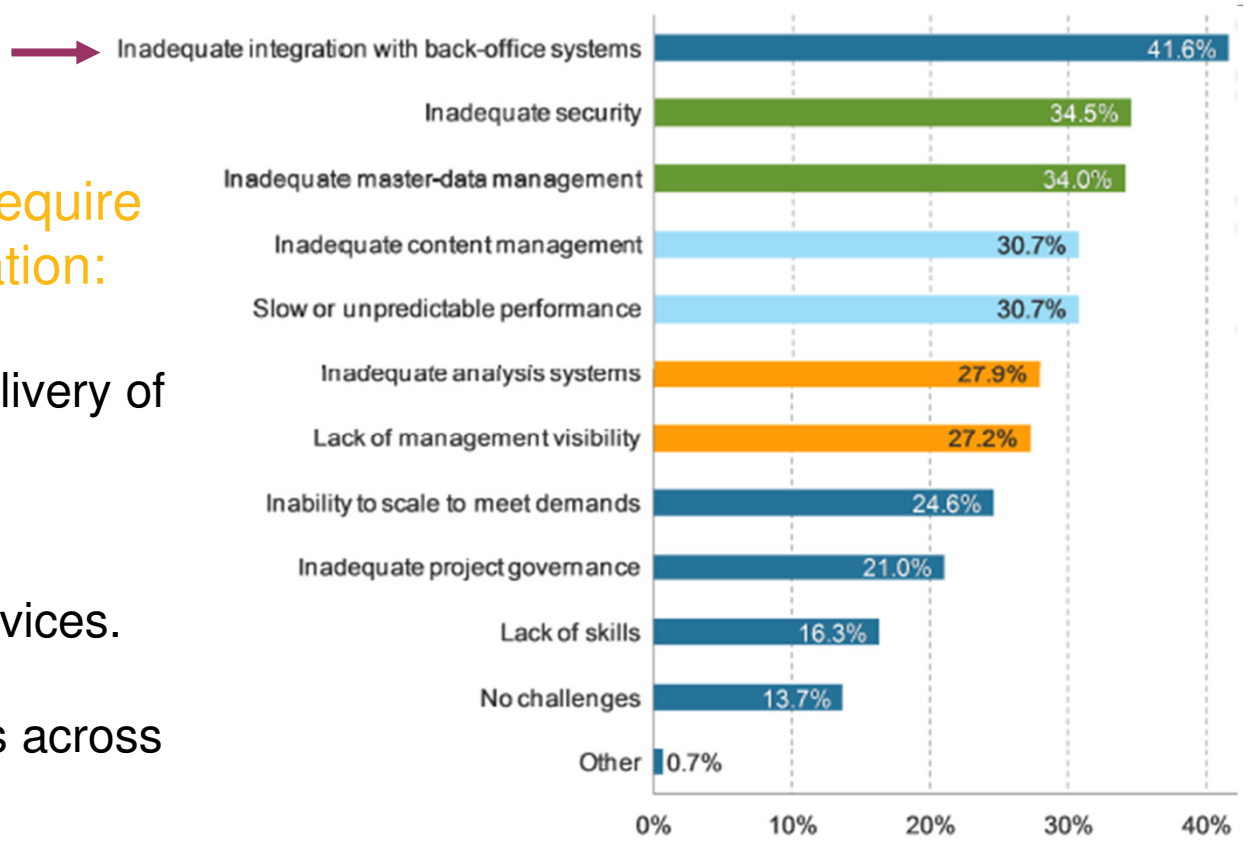
1

Source: IBM Global IT Study on Mobile Infrastructure 2013

Top Barrier: Inadequate Integration with Back Office Systems

Systems of engagement require three new forms of integration:

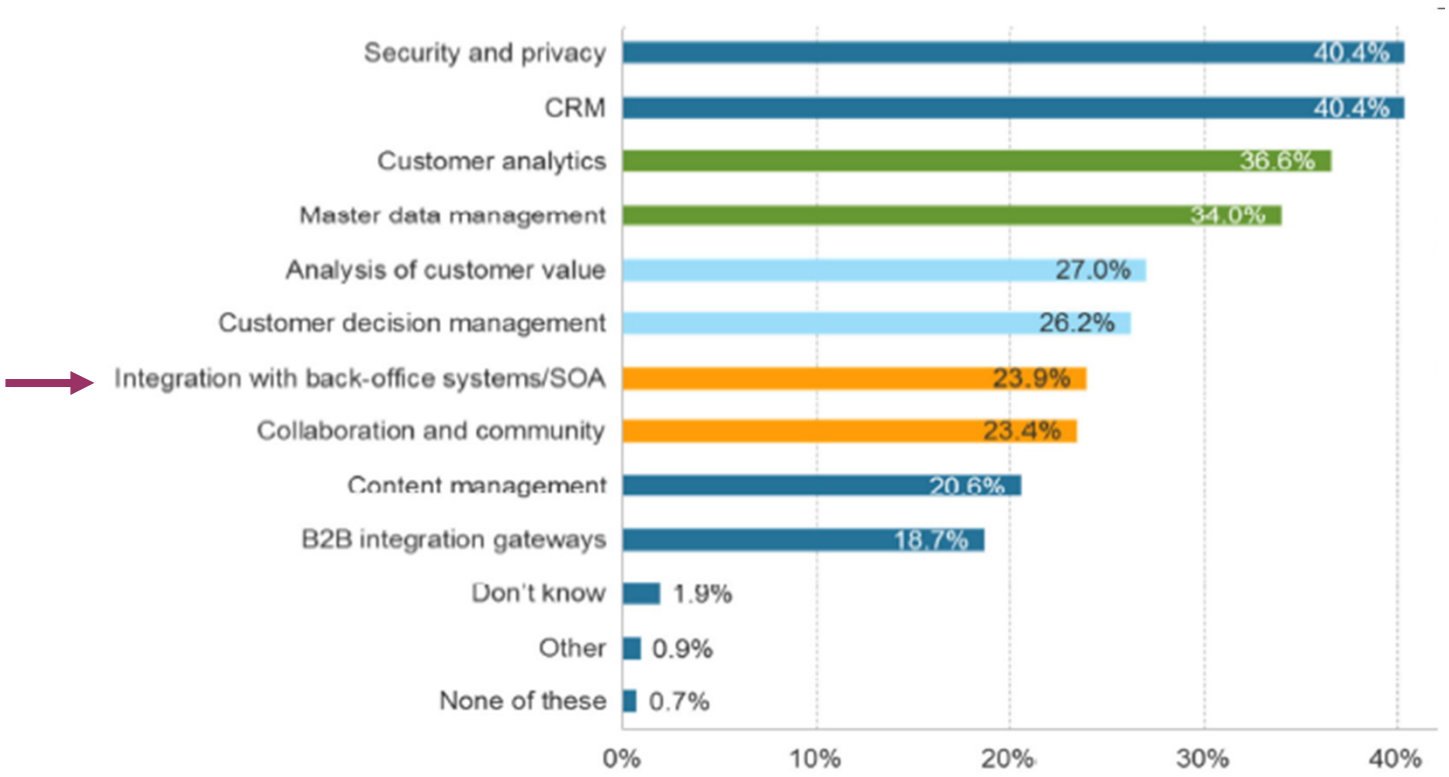
- Collection, analysis, and delivery of information in “real time.”
- Information delivery to and communications with new devices.
- Management of interactions across channels.



Source: A commissioned study conducted by Forrester Consulting on behalf of IBM, Q1 2013

Top 3 Investment Priorities Misaligned with Biggest Barrier

Enterprises likely need more additional integration investment than they realize.



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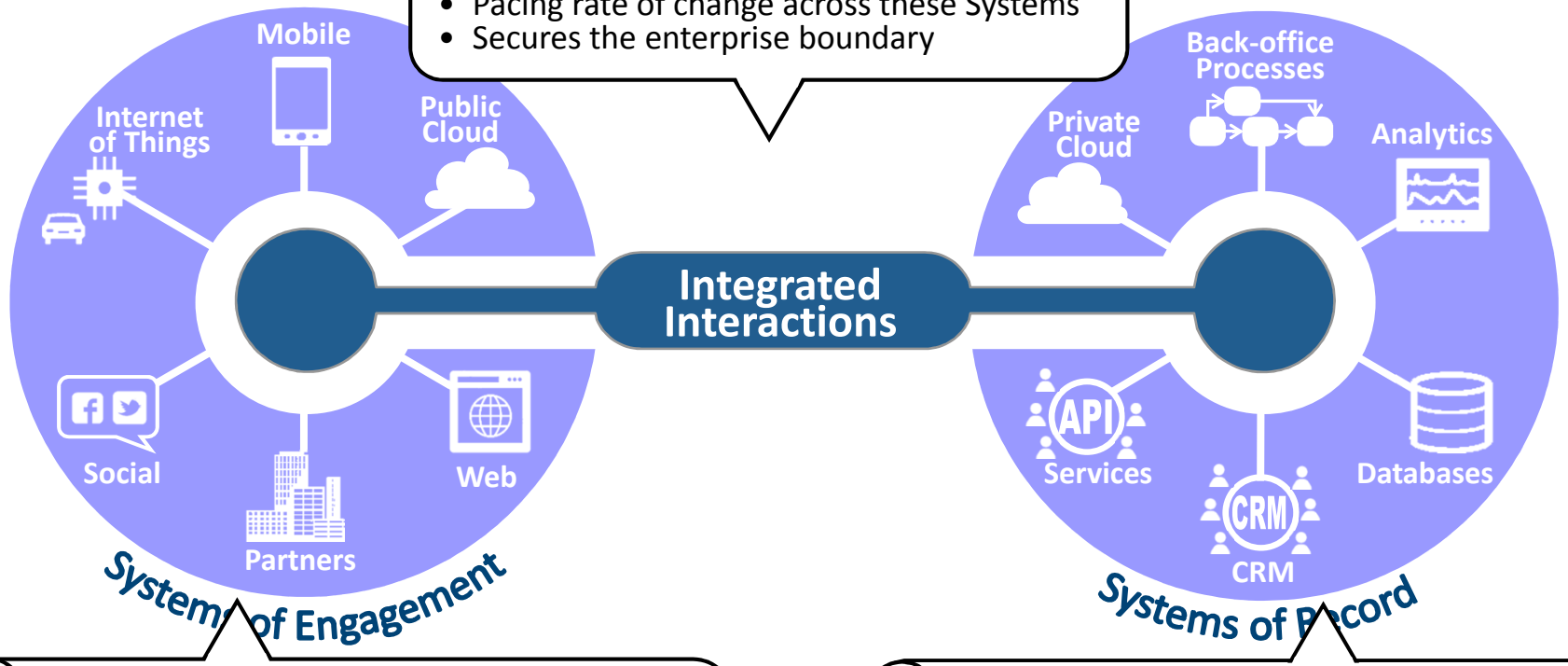
Integrating Systems of Engagement and Record



3 Bring hybrid world together

- Unifying cloud and on premise investments
- Pacing rate of change across these Systems
- Secures the enterprise boundary

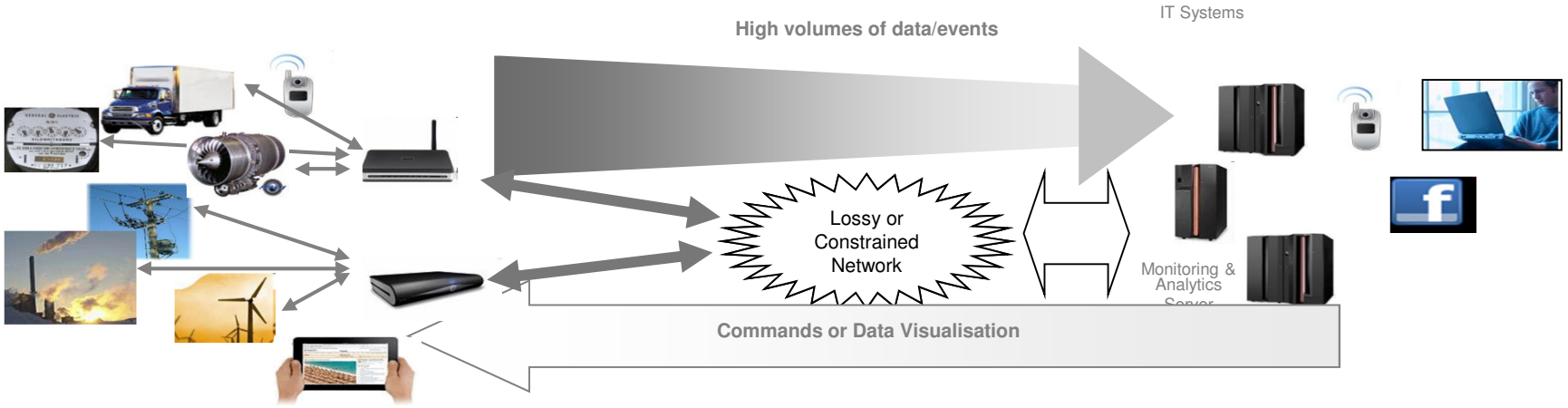
1 Freedom to innovate rapidly

- APIs that enable developers to easily create new Systems of Interaction
- Easy for developers to rapidly consume existing capabilities of Systems of Record via APIs

2 Preserve integrity & stability

- Scales Systems of Record as these are driven by new workloads from Systems of Engagement
- Maintains stability and integrity of processes, data and applications in Systems of Record

Open Connectivity for Mobile, M2M and IoT - MQTT



A lightweight publish/subscribe protocol with predictable bi-directional message delivery

In the era of a Smarter Planet, open source and standards are essential

1999 Invented by Dr. Andy Stanford-Clark (IBM), Arlen Nipper (now Cirrus Link Solutions)

2004 MQTT.org open community

2011 - Eclipse PAHO MQTT open source project

2013 – MQTT Technical Committee formed

Cimetrics, Cisco, Eclipse, dc-Square, Eurotech, IBM, INETCO Landis & Gyr, LSI, Kaazing, M2Mi, Red Hat, Solace, Telit Comms, Software AG, TIBCO, WSO2

Evolution of an open technology

Introducing IBM MessageSight

Optimized Internet Messaging platform for Mobile Applications and the Internet of Things

- The growth of mobiles, sensors and intelligent devices demands a change to how we do business
- IBM MessageSight is a secure, easy to deploy appliance-based messaging server that is optimized to address the massive scale requirements of the machine to machine (m2m) and mobile use cases
- Designed to sit at the edge of the enterprise and can extend your existing messaging infrastructure or be used standalone
- Part of the MobileFirst family integrating with BigData and Analytics engines to provide an end to end solution

IBM MessageSight Ke

Designed for Things

- Optimized gateway for Things and Mobile devices
- Efficient open protocol
- Event-driven awareness
- Open and industry agnostic
- Fine-grained security policies

Developer Friendly

- Free dev virtual appliance
- Simple yet powerful APIs
- Simple messaging paradigm
- 40+ MQTT client libraries

Easy to Deploy

- Up and running < 30 minutes
- Task oriented UI guides administrator through first steps
- Simple and scalable management through policies

Secure Reliable Appliance

- Hardened Appliance Form Factor with secure firmware (signed and encrypted by IBM) and no user-visible, general purpose OS
- Virtual appliance

Easy to Integrate

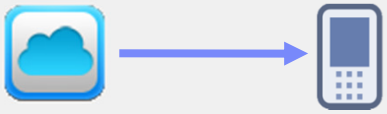
- JMS
- WebSockets
- MQ
- Integration Bus
- Worklight

Internet Scale

- 13M non-persistent msg/sec
- 400K persistent msg/sec
- 1M concurrent connections
- Predictable microsecond latency under load
- Highly available

MQTT Client on Mobile - Experiences

Push Notification



- Real-time Alerts
- Analytics Tracking
- Assured Delivery

Rich Framework

- ✓ Two-way Communication
- ✓ Rich / HTML Messages
- ✓ Status Channels
- ✓ Security
- ✓ Simple

Low Bandwidth & Cost

Very efficient bandwidth usage

Much cheaper alternative to SMS

Low Power Usage

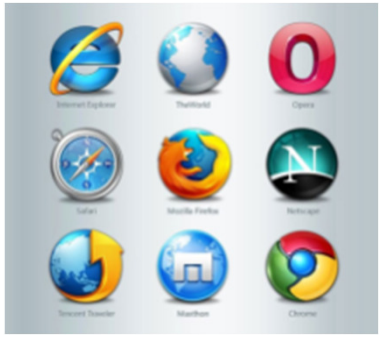
0.3041%

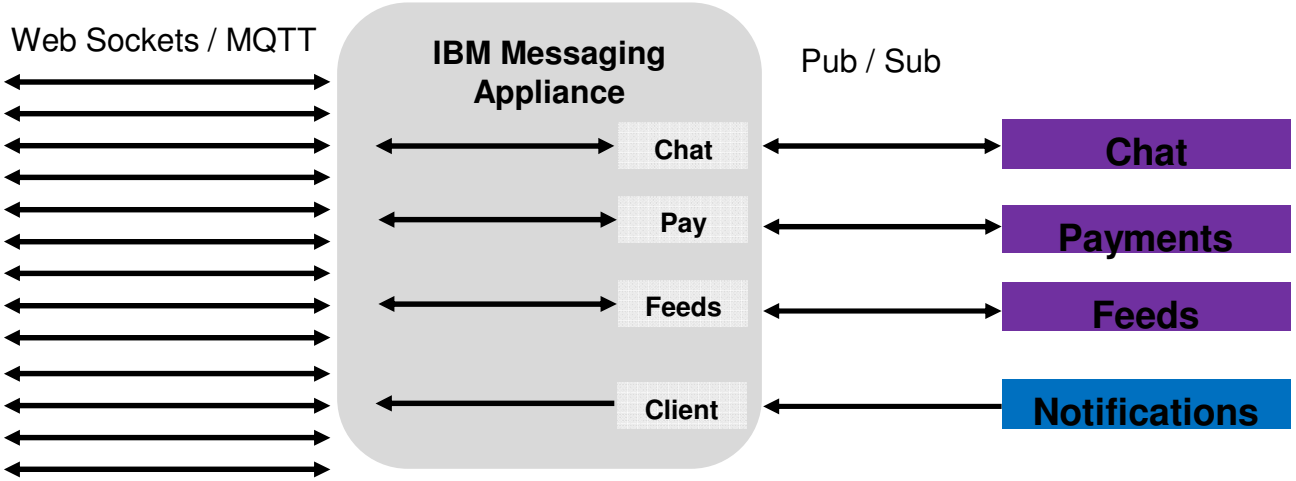
0.0047%

% Battery per Hour

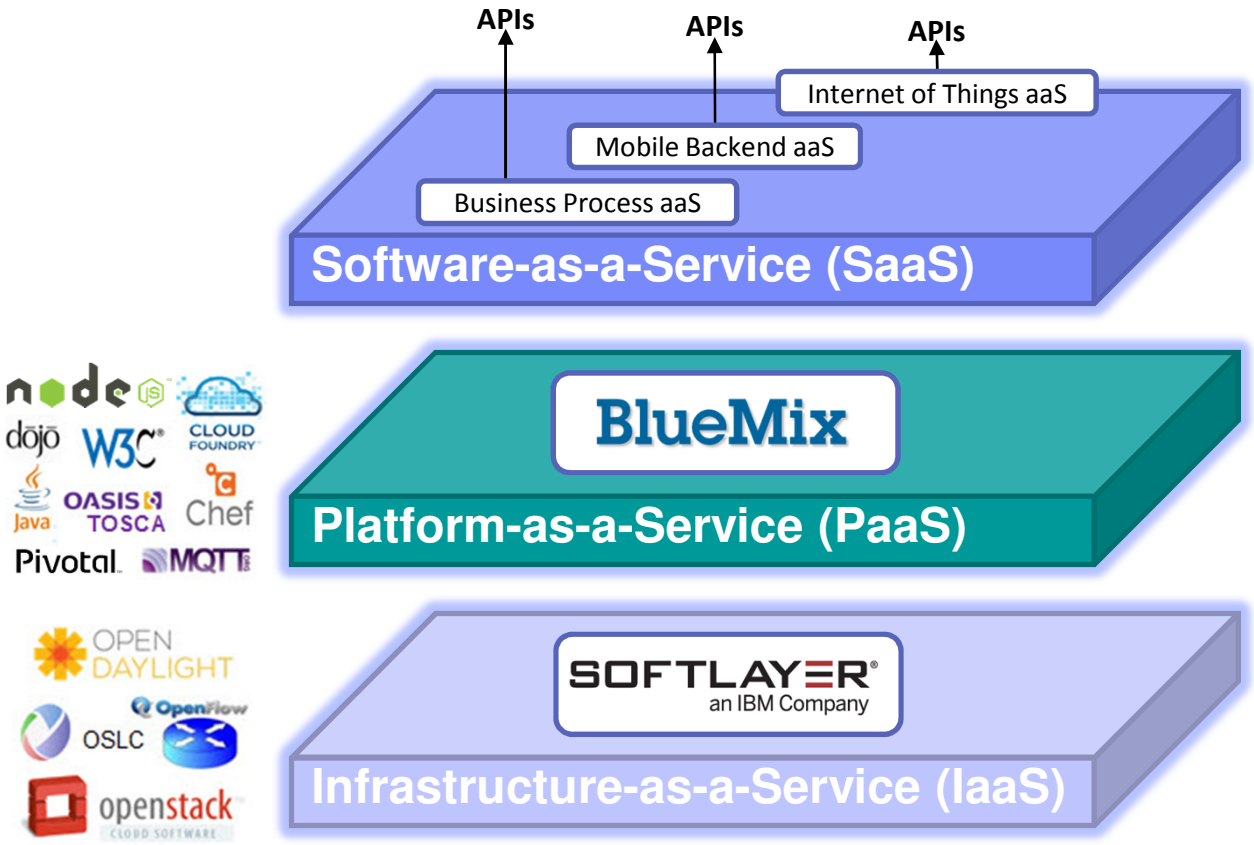
Edge of Network: Mobile Use Cases

MOBILE
mobile event notification
mobile CRM at customer contact
mobile data gathering for business intelligence
mobile collaboration
mobile payments
medical monitoring, automated medical records
vehicle telematics, security, routing
realtime dashboards





Cloud is Increasingly Important

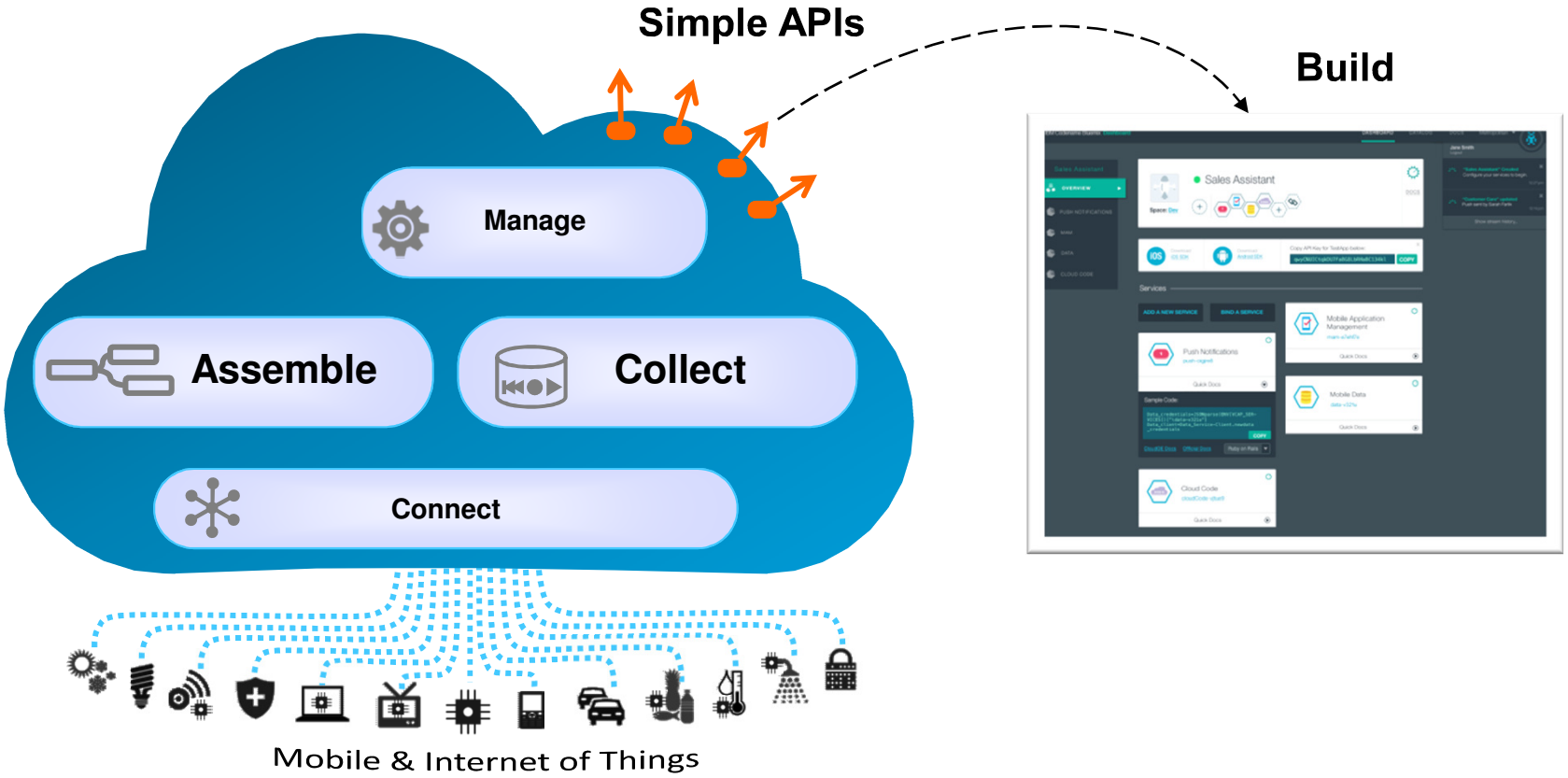


I want to **use** an Application

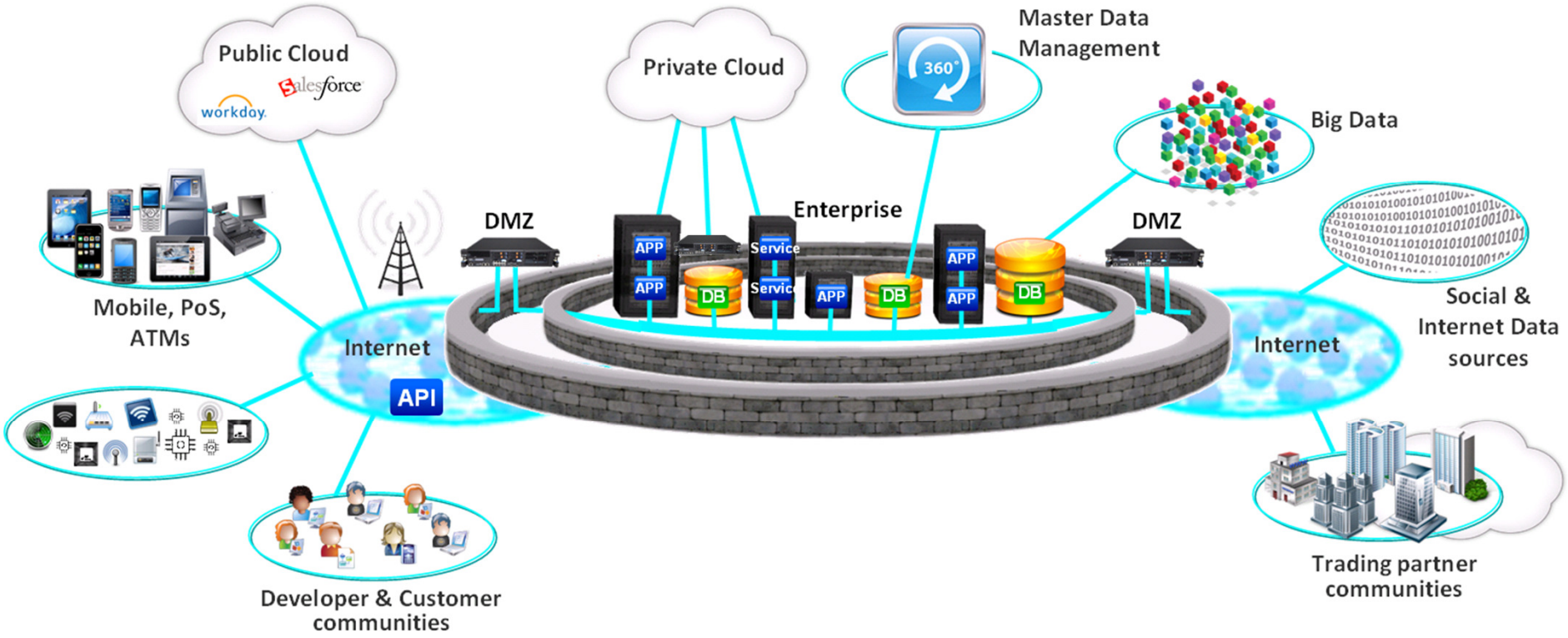
I want to **build** an Application

I want to **run** an Application

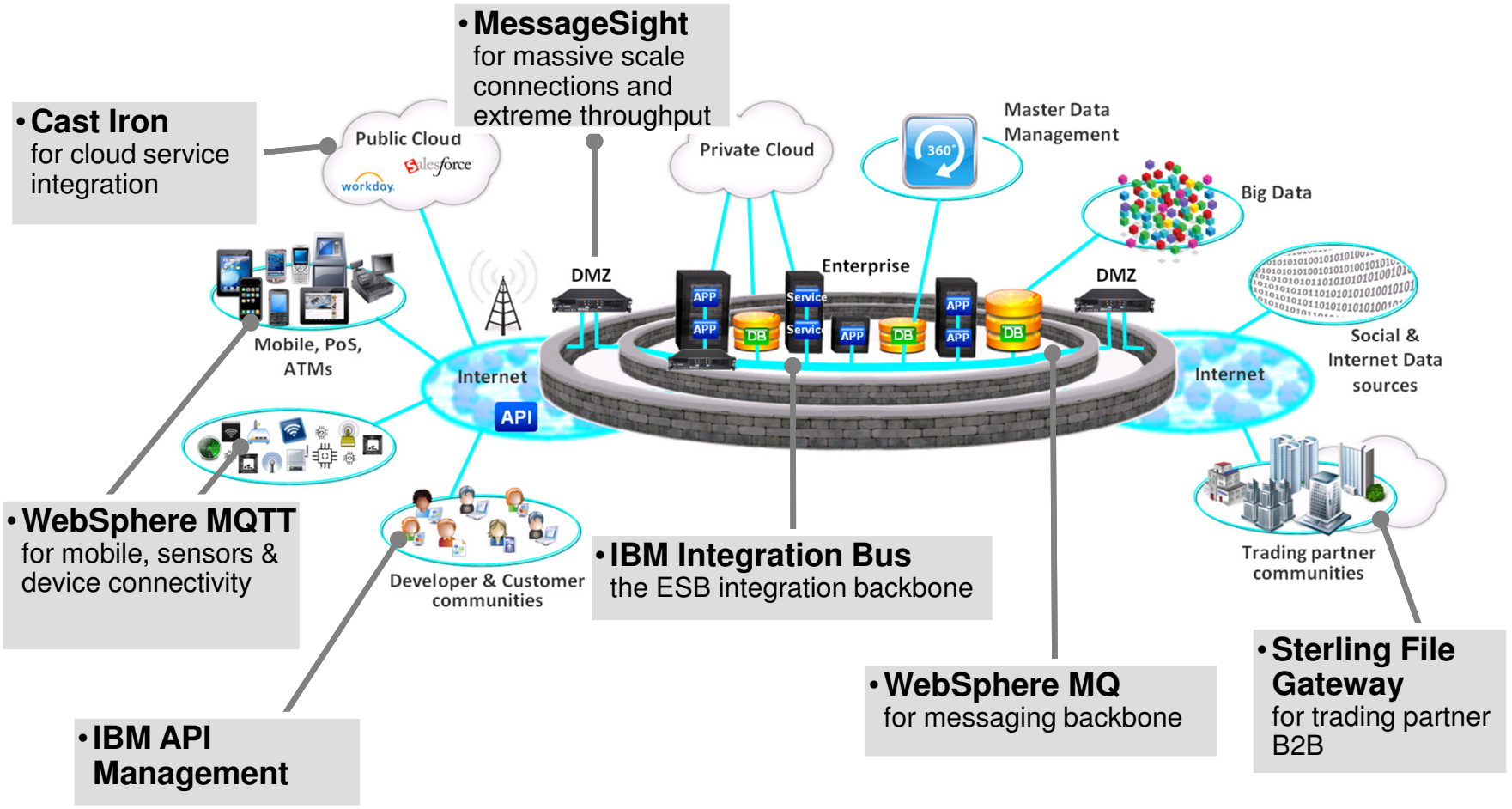
IBM Internet of Things Cloud



Integration



IBM Integration



- **Cast Iron** for cloud service integration
- **MessageSight** for massive scale connections and extreme throughput
- **WebSphere MQTT** for mobile, sensors & device connectivity
- **IBM Integration Bus** the ESB integration backbone
- **IBM API Management**
- **WebSphere MQ** for messaging backbone
- **Sterling File Gateway** for trading partner B2B