Internet of Things

Industry Use Cases

Phil Coxhead
Certified Consulting IT Specialist
IBM Hursley, United Kingdom

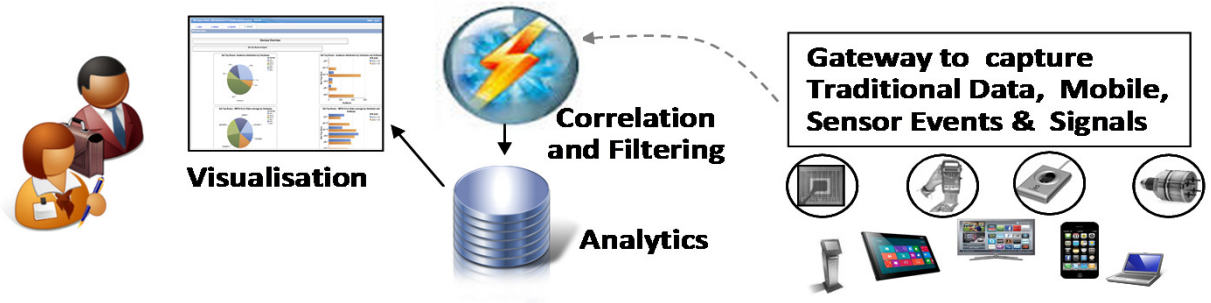
@philcoxhead
phil_coxhead@uk.ibm.com

MessageSight solutions for **Telco**

What are they interested in doing today?

- Selling new services to their enterprise subscribers

  an example: distributed data capture and commercial realtime analytics offerings



What problems are they facing?

- High cost of providing bandwidth
- Managing large numbers of simultaneous mobile and M2M communications
- Usage based data consumption and renewal

What is needed?

- Efficient protocols that provide security, speed, and choice of service levels
- Carrier-grade gateway capability
  (easily managed, highly available, dependable, secure, high performance)
- Easy development, deployment and management

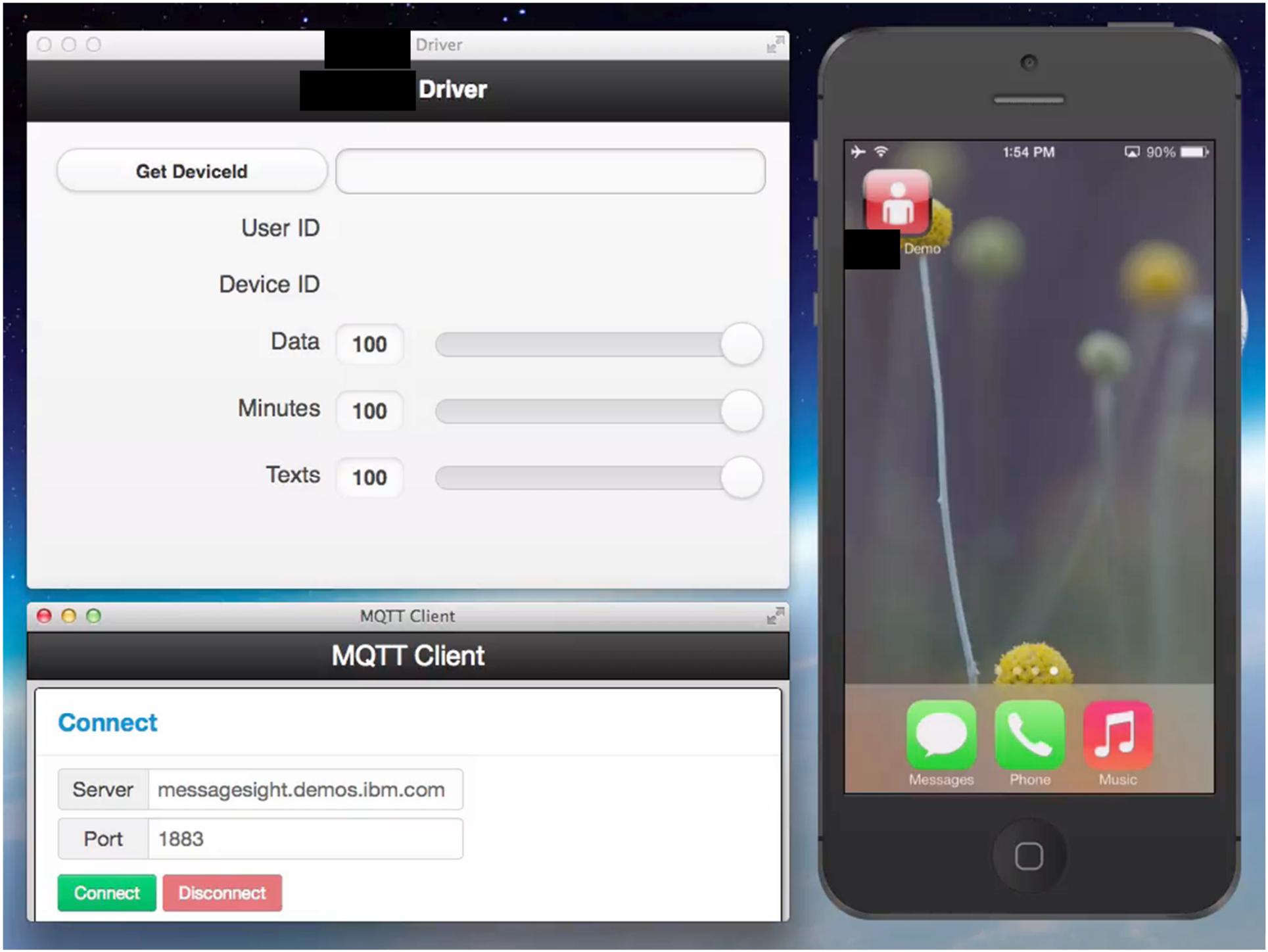
MessageSight solutions for Telco

How do MQTT and MessageSight respond to these needs?

- MQTT has **8x** less wireless bandwidth overhead than HTTP and HTTPS
- MQTT latency is **50µs** app-to-app on fast network
- MQTT provides multiple service levels, including assured message delivery
- MessageSight provides fine grained messaging policies
- One MessageSight appliance can handle
  - 1 Million Concurrent Connections
  - 13 Million non-persistent messages/sec
  - 0.6 Million persistent messages/sec
- Two MessageSight appliances can be coupled to provide high availability

MQTT and MessageSight together provide unique value

- Less bandwidth, allowing more attractive offerings
- Hardened, appliance form factor for security and easy install and management
- Open protocols (WebSockets, JMS, MQTT) and MQ Connectivity for easy integration to both the internet and the enterprise


Driver
Driver
Get DeviceId
User ID
Device ID
Data
100
Minutes
100
Texts
100
MQTT Client
MQTT Client
Connect
Server
messagesight.demos.ibm.com
Port
1883
Connect
Disconnect
1:54 PM
90%
Demo
Messages
Phone
Music

MessageSight solutions for **Banking**

What are they interested in doing today?

- Provide reliable push confirmations to customers to avoid repeated queries (and as a result, to reduce load on systems of record)
- Provide secure push communication channel to customer
- Avoid cost of SMS usage for applications requiring alerting and confirmation
- Support large volumes of financial transactions (for mobile payments)
- Provide an innovative and satisfying customer experience

What problems are they facing?

- Reduce costs of SMS messaging (typically each message costs €0,03)
- SMS lacking key Quality of Service characteristics (guaranteed delivery, security, speed)

What is needed?

- Fast reliable notification with strong security
- Assured delivery and speed
- Low transmission overhead and battery use
- Privacy (encryption capability)
- Open protocols (eg Websockets, JMS, MQ(TT))
- Ability to use SMS as a last resort

Internet of Things usecases exist in every industry

	Banking					
 Monetize	Cash replacement solutions Mobile Banking					
 Optimize	Optimized Cash management					
 Extend	Banking the un-banked Biometrics Smarter Subsidies					
 Control	Remote ATM Management Dynamic Authorization					

MessageSight solutions for **Banking**

How do MQTT and MessageSight respond to these needs?

- Provide reliable delivery of messages
- Provide secure communication channel to customer
- Avoid cost of SMS usage for pushing data to users
- Support large volumes with low latency
  (**93x** higher mobile throughput than HTTP)
- Efficient use smartphone communications capability
  (**11.89x** less battery to send, **170.9x** less battery to receive than HTTP)

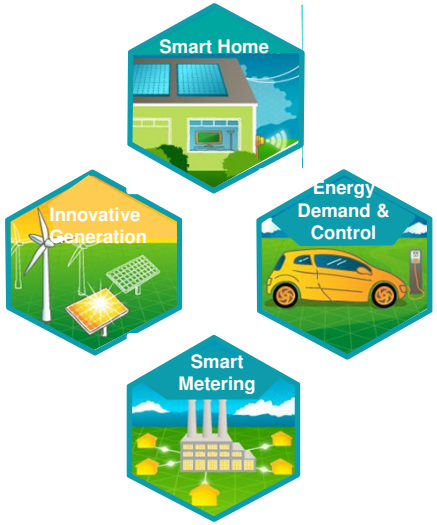
MQTT and MessageSight together provide unique value

- Reduced costs for data transport and alerting
- Efficient use of smartphone hardware
- Hardened, appliance form factor for security and easy install and management
- Open protocols (WebSockets, JMS, MQTT) and MQ Connectivity
  for easy integration to both the internet and the enterprise
- Low latency

MessageSight solutions for **Energy and Utilities**

What are they interested in doing today?

- Monitor/communicate/control usage, including private solar production
- Push information on tariffs to devices with local intelligence
- Delay non-essential usage to non-peak hours
- Adjust usage within comfort ranges
  (home and water heating, home cooling, lighting)



What problems are they facing?

- Ability to scale to millions of meters gathering vast amounts of energy usage data in real time
- Assured delivery of outbound messages to individual meters / devices
- Ability to interconnect homes with back-office to offer customer incentives for preferred energy usage
- Integration with historical data sources in enterprise systems for real time predictive analysis

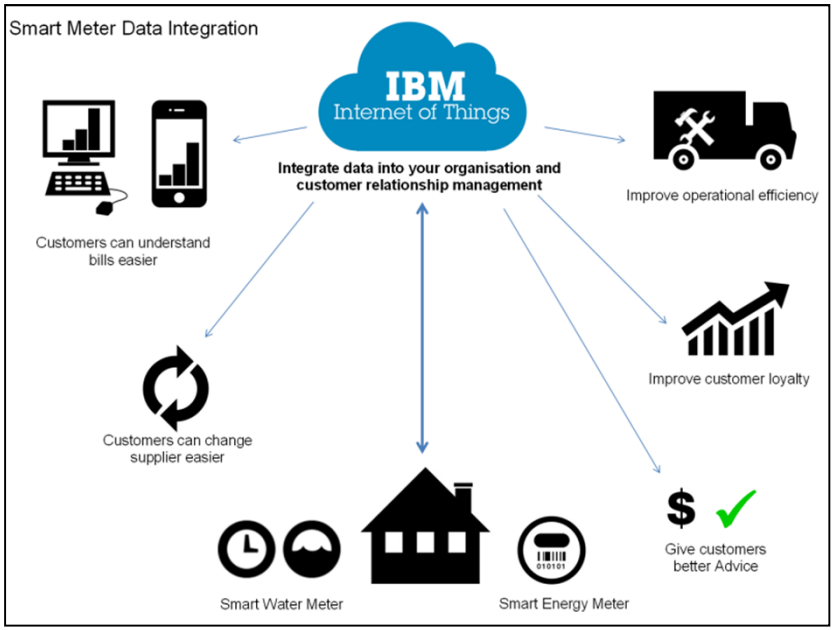
What is needed?

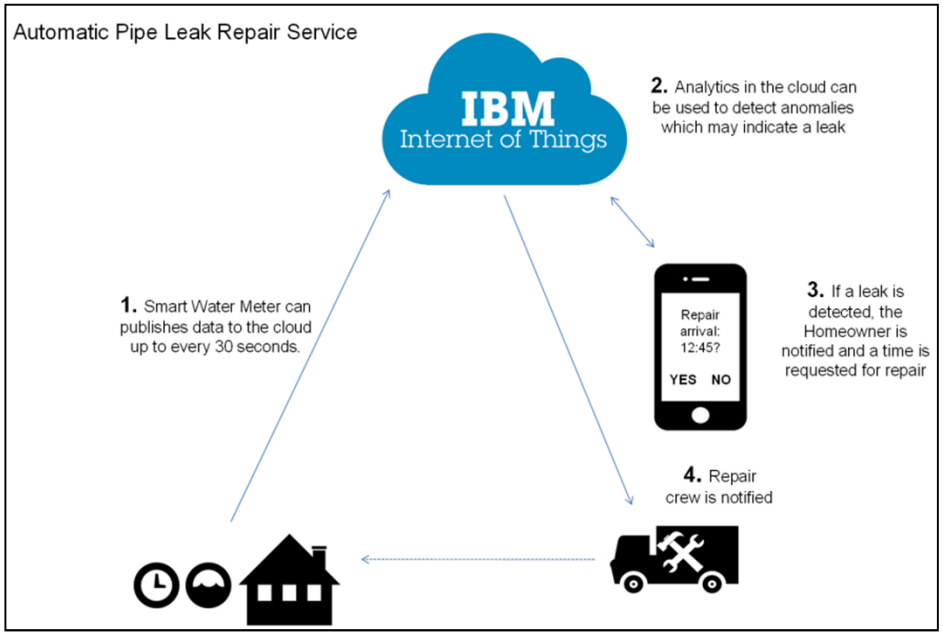
- Efficient, secure and reliable two way communication to receive meter readings
  and to send control commands to meters and devices
- Easy integration to enterprise systems for analysis and feedback to adjust to needs and constraints
- Persistent and exactly once delivery of messages
- Scalability to millions of endpoints and simultaneous messages

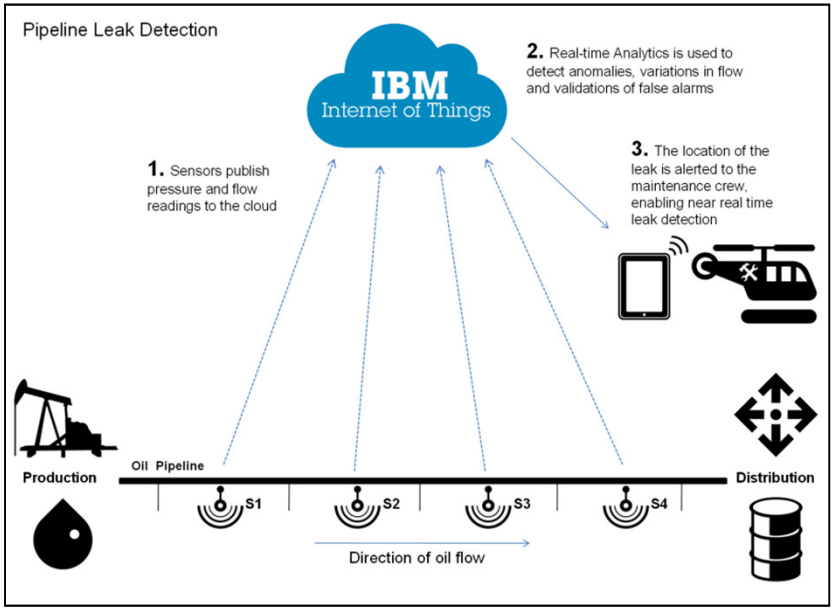
Internet of Things usecases exist in every industry

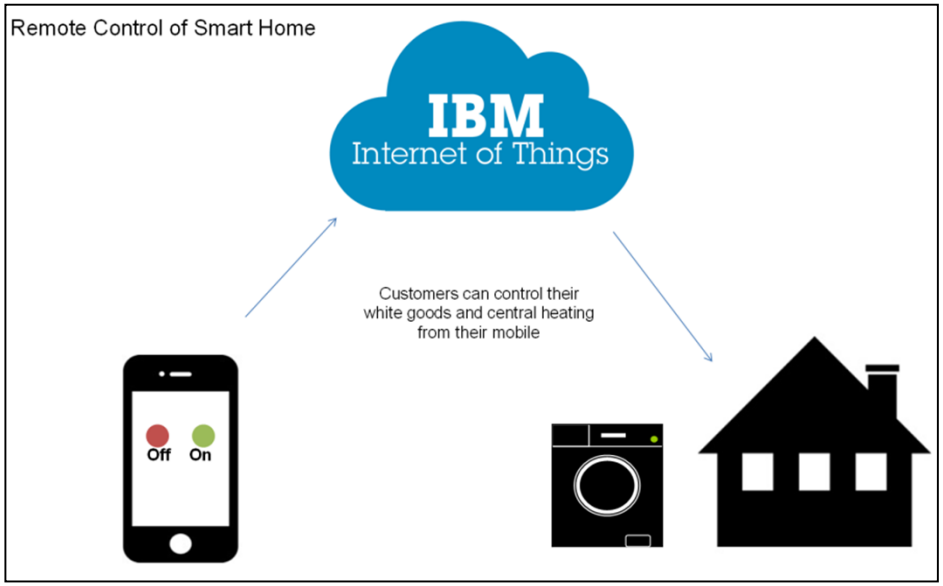
						E&U
 Monetize						Pay-per-use energy
 Optimize						Delay non-essential supply during peak loads
 Extend						Smart home services
 Control						Remotely control consumer devices

Energy & Utilities Examples – *Smart Energy*









MessageSight solutions for **Energy and Utilities**

How do MQTT and MessageSight respond to these needs?

- Efficient messaging protocol to reduce bandwidth requirements and data plan costs
- Secure bi-directional messaging enables smarter real-time decision making
- Reduces cost of managing communication to devices

MQTT and MessageSight together provide unique value

- Saves time, effort & money for the consumer: households can make informed decisions to modify their energy usage
- Energy companies can improve forecasting and identify peak loads in advance to ensure the consumers' energy needs are satisfied

MessageSight solutions for **Travel and Transportation**

What are they interested in doing today?

- Minimize costs and downtime, maximize utilisation
- Communicate information to personnel « on the road » (Rail, Air, Trucks, Ships, Bus, Taxi)
  - Alert to changes in schedules, unanticipated situations and emergencies
  - Push information about reservations and seats
- Communicate information to customers
  - Confirm ticket sale / reservation to smartphone
  - Alert customers to changes in service
- Send documents and status from/to vehicle to support customs logistics and maintenance
- Monitor switches and equipment
- Communicate with specialized industrial terminals
- Push work orders and schedules (for maintenance, parking, logistics, etc.)

What problems are they facing?

- Cost of data transport and of confirmation through SMS
- Lack of real-time information
- Inefficient distribution to interested parties

What is needed?

- Efficient use of bandwidth, guaranteed delivery, publish/subscribe semantics
- Hardened, appliance form factor for security and easy install and management

Internet of Things usecases exist in every industry

					Transport	
 Monetize					Paid Alerts to travellers Congestion charging	
 Optimize					Smart Cities Traffic mgmt Airport Management	
 Extend					Mobility Services	
 Control					Crowd mgmt Timetable mgmt Asset mgmt	

MessageSight solutions for **Travel and Transportation**

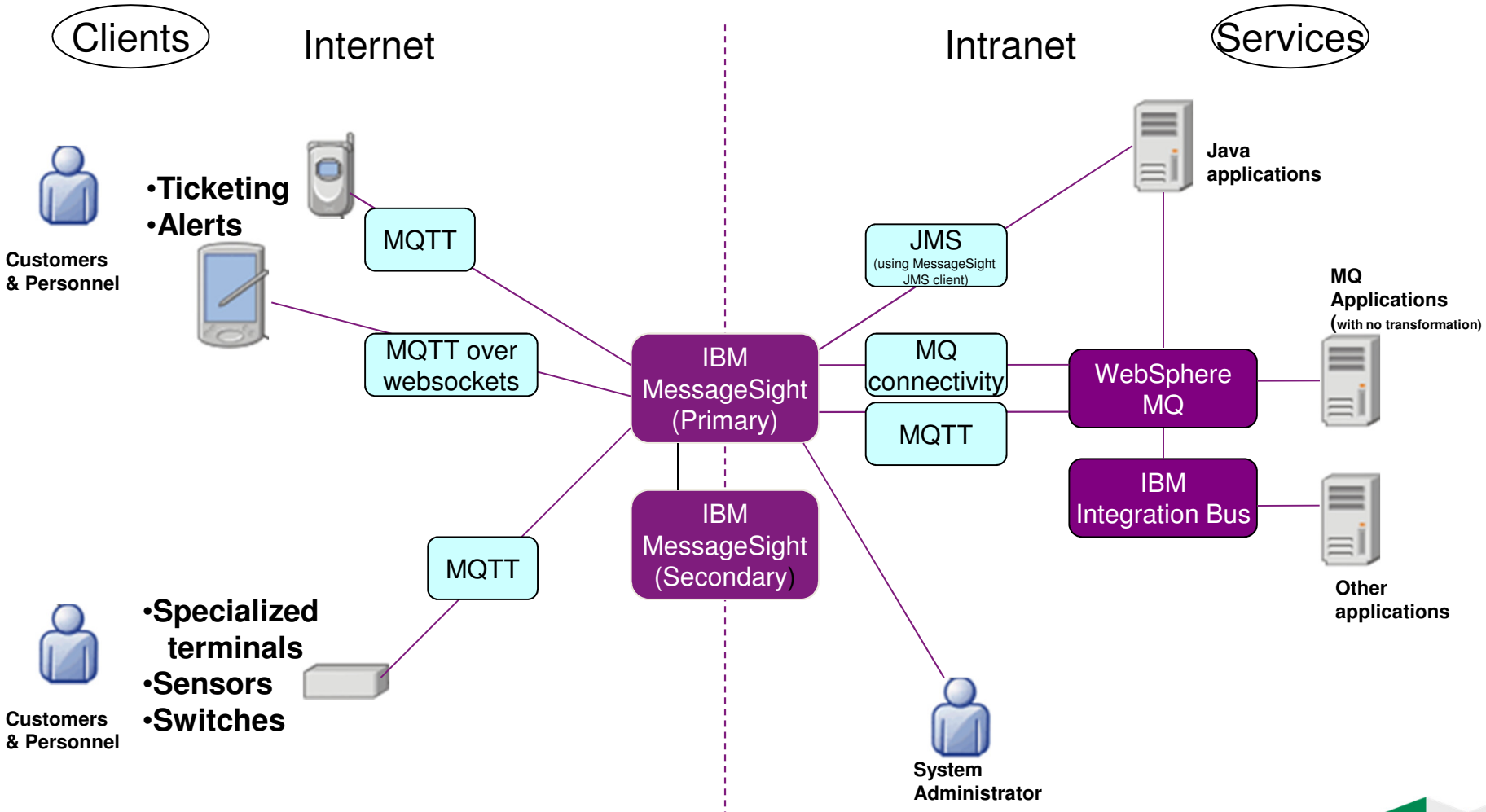
How do MQTT and MessageSight respond to these needs?

- They provide bidirectional real-time information transport over limited bandwidth facilities, with security and various Quality of Service options including deferred delivery and guaranteed delivery
- MQTT has **8x** less wireless bandwidth overhead than HTTP and HTTPS
- Support both mobile and M2M use cases

MQTT and MessageSight together provide unique value

- Less bandwidth, allowing considerable savings in data transport costs
- Hardened, appliance form factor for security and easy install and management
- Open protocols (WebSockets, JMS, MQTT) and MQ Connectivity for easy integration to both the internet and the enterprise

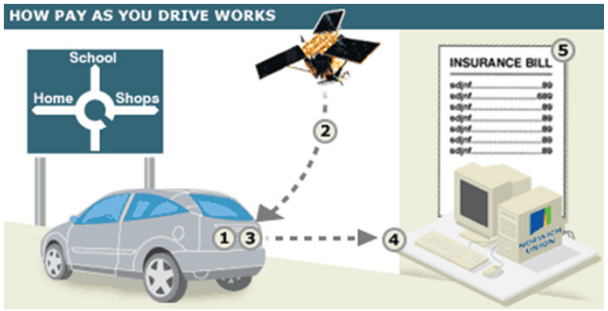
Example: MessageSight Solution Architecture in Rail



MessageSight solutions for **Insurance**

What are they interested in doing today?

- Usage-based insurance
  (considered to be better for consumers than credit-based)
- Early entry into the accident-repair cycle
  to reduce costs of repairs (not leave the field to the OEM actors)
- Insurance claims submission



What problems are they facing?

- Ability to track usage for large numbers of policyholders
- Automated notification in case of accident
- Data capture and transmission of data for insurance claims

What is needed?

- Efficient, dependable protocols for low-bandwidth data transmission
- Standards-based solutions for embedded systems
- Standards-based solutions for interoperability

Samples of **Insurance** Implementations

- **AllState**: *DriveSafe*
  - speed, time
- **State Farm**: *In-Drive*
  - Speed, time
  - Turn data
  - GPS
- **Progressive**: *Snapshot*
  - Speed, time
  - accelerometer
- **Hartford**: *TrueLane*
  - Speed, time
  - GPS

- Implementations vary in the type of data collected
- In-Drive and TrueLane programs also come with options like emergency services and real-time diagnostics

Insurer	Program	Discount %			Fee
		Start	Max.	Avg.*	
Progressive	Snapshot	0	30	10	none
State Farm	In-Drive	5	50	10	$7/yr.
Allstate	Drivewise	10	30	14	$20/yr.
Hartford	TrueLane	5	25	11	none

* Some insurers limit data capture based on consumer privacy concerns

MessageSight solutions for **Insurance**

How do MQTT and MessageSight respond to these needs?

- Efficient messaging protocol to reduce bandwidth requirements and data plan costs
- Support both mobile and M2M use cases
- Efficient use of smartphone communications capability
  (**11.89x** less battery to send, **170.9x** less battery to receive than HTTP)

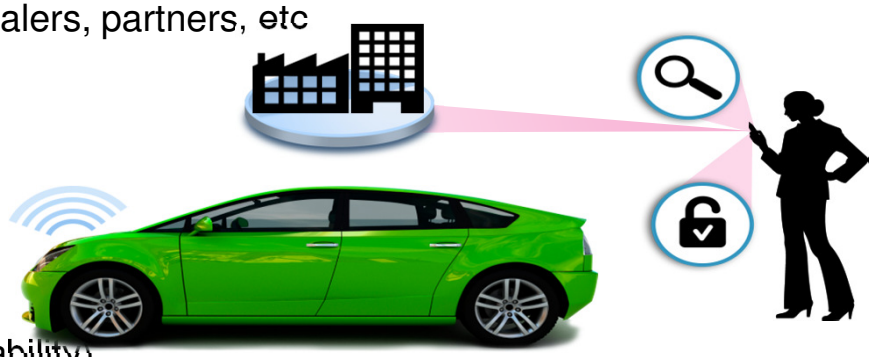
MQTT and MessageSight together provide unique value

- Connect to millions of vehicles gathering telematic data in real time
- Easy integration with internet and back-end systems to support communication with other interested parties
- Low-overhead communication with mobile applications on smartphones

MessageSight solutions for **Automotive**

What are they interested in doing today?

- Offering new innovative services to the drivers, dealers, partners, etc
- Find my car / unlock my car
- Predictive analysis for parts failure
- Impose limits on policy and driver
  (who can go where at what speed..)
- Unattended car rental
- eCall 2015 (EU regulation on emergency call capability)
- Assisted / Automated driving system



What problems are they facing?

- Connect to millions of vehicles gathering telematic data in real time, analyze the data, and determine message response back to a single or multiple vehicles or other interested parties
- Ability to store messages for vehicles that temporarily lose communication
- Integrate with existing data sources in enterprise systems such as vehicle service history records
- Integrate with partners

What is needed?

- Efficient and reliable two way communication
- Access security to ensure information is only sent between authorised vehicles and trusted sources
- Open protocols (WebSockets, JMS, MQTT) and MQ Connectivity
  for easy integration to both the internet and the enterprise

Internet of Things usecases exist in every industry

			Automotive			
 Monetize			Pay-per-drive car rental			
 Optimize			Component predictive replacement Fleet mgmt			
 Extend			In-car Movies, Music, Games Highly Automated Driving			
 Control			Remote Drive-train optimization			

MessageSight solutions for **Automotive**

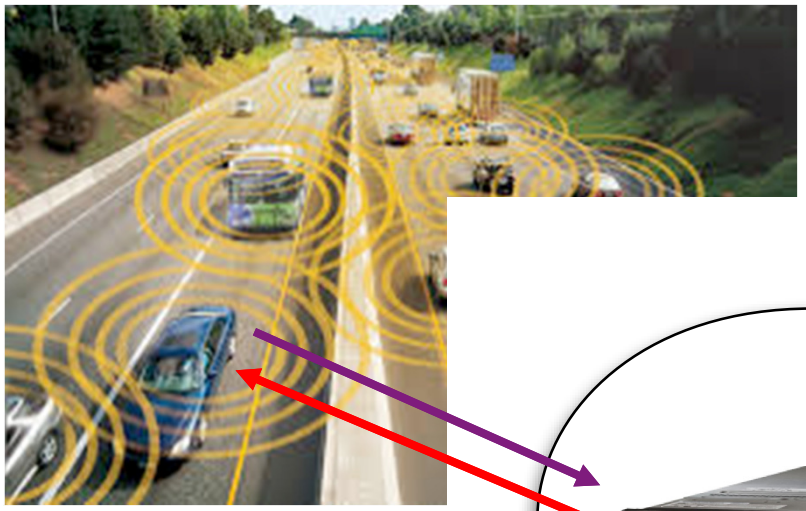
How do MQTT and MessageSight respond to these needs?

- Efficient messaging protocol to reduce bandwidth requirements and data plan costs
- Secure bi-directional messaging enables smarter real-time decision-making
- Increase the speed of reaction to business stimuli

MQTT and MessageSight together provide unique value

- Connect to millions of vehicles gathering vast amounts of telematic data in real time, analyze the data, and determine message response back to a single or multiple vehicles or other interested parties
- Reduce cost of managing communication to devices
- Save time, effort and money for the vehicle owner: there is no longer a need to visit the garage on a fixed interval

IBM Connected Vehicle Cloud



PANDORA

NATIONAL WEATHER SERVICE

IBM

SOFTLAYER

IBM Predictive Maintenance

IBM MessageSight

MQTT.ORG

PUBLISH

SUBSCRIBE

IBM
InfoSphere Streams

IBM Integration Bus

Emergency Services

IBM Worklight

Be First.

MessageSight solutions for **Retail**

What are they interested in doing today?

- Drive increased revenue by proactively targeting mobile customers
- Interact more directly with the customer the instant they are spending for increased customer satisfaction
- Capture and correlate customer buying activities in real time to track and measure effectiveness of offers and maximize opportunities for increased selling
- Drive personalized cross-sell and up-sell based on activities and location
- Drive efficiencies in logistics and do real-time location tracking using RFID integrated with back-end systems

What problems are they facing?

- Ability to capture customer attention
- Ability to convert customer knowledge into sales
- Integration with back-end systems

What is needed?

- Ubiquitous sensing capability – which can be provided by smartphones
- Ability to push targeted recommendations “just at the right time”
- Open protocols (Websockets, JMS, MQTT)
- MQ connectivity for back-end and internet

Internet of Things usecases exist in every industry

				Retail		
 Monetize				Cash replacement Sensor enabled Loyalty cards		
 Optimize				Delivery and stock replenishment optimization Store layout optimization		
 Extend				Smart Vending Machines Delivery Lockers		
 Control				Store energy mgmt Store parking mgmt Dynamic price labels		

MessageSight solutions for **Retail**

How do MQTT, MessageSight and IBM products respond to these needs?

- Bidirectional integration between back end and front end systems provides compelling retail / in-store experience based on knowledge of customer, and real-time tracking capability for the supply chain
- IBM MessageSight, IBM Integration Bus, and ODM can work together to process events and generate interactive shopping experience and personalized offers
- Systems of engagement through interactive mobile application developed with IBM Worklight (including geo-fencing) enhances relevance and immediacy of recommendations
- Geospatial analytics provided by InfoSphere Streams

MQTT and MessageSight together provide unique value

- Improved customer satisfaction through timely offers, additional services and information on products, less time spent queuing and paying
- Deepening customer relationships and increasing revenue

MessageSight solutions for **Healthcare**

What are they interested in doing today?

- Monitoring of various health parameters anywhere and any time
- Track medication data
- Integrate with hospital monitoring equipment

What problems are they facing?

- Data confidentiality and reliability of communications
- Avoid data loss or « blind spots » during the day
- Ability to store messages if temporarily lose communication
- Integrate with existing systems in partner ecosystem (hospital, doctor, insurance, pharmacy, government, ..)
- Affordability for large numbers of users

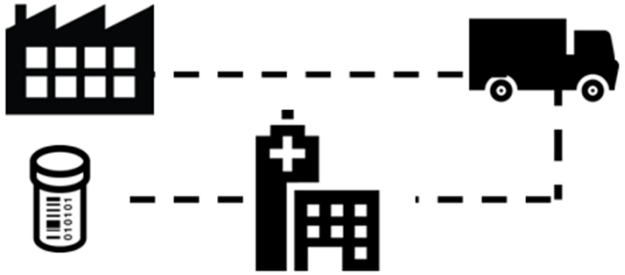
What is needed?

- Efficient and reliable communication
- Access security to ensure information is only seen by appropriate trusted sources
- Open protocols (WebSockets, JMS, MQTT) and MQ Connectivity for easy integration to both the internet and the partner ecosystem

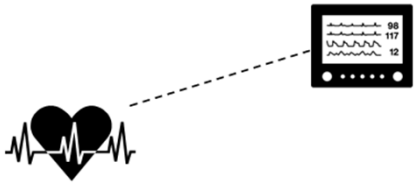
Internet of Things usecases exist in every industry

		Healthcare				
 Monetize		Paid home care family services				
 Optimize		ER Bed Resource Mgmt				
 Extend		Life style monitoring				
 Control		Remote Hospital environment Mgmt				

Healthcare Examples – *Smart Health*

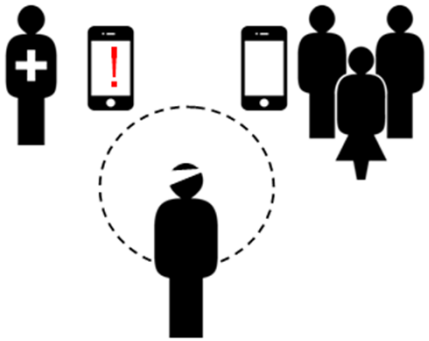


Tracking of drugs from manufacture to patient

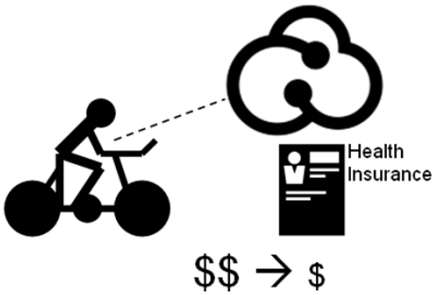


Remote monitoring of patient vital signs for chronic conditions and implantable devices

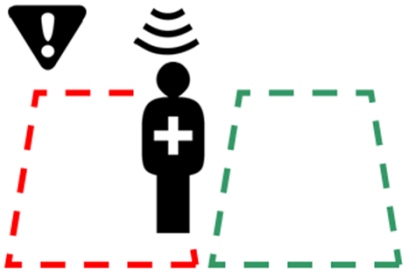
Tracking of hospital equipment and instruments



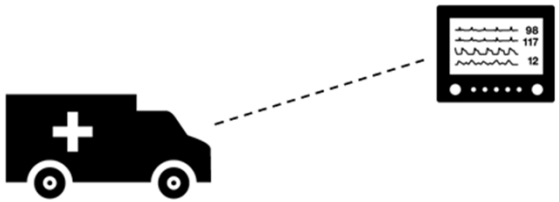
Coordinated patient care with family and carer alerts



Lifestyle and fitness monitoring as part of wellness program



Staff access and cross infection controls



Advance telemetry of inbound patient clinical data to hospital

MessageSight solutions for **Healthcare**

How do MQTT and MessageSight respond to these needs?

- Efficient messaging protocol to reduce bandwidth requirements and data plan costs
- Secure and reliable messaging
- Various qualities of service, including option of assured once-and-only-once delivery

MQTT and MessageSight together provide unique value

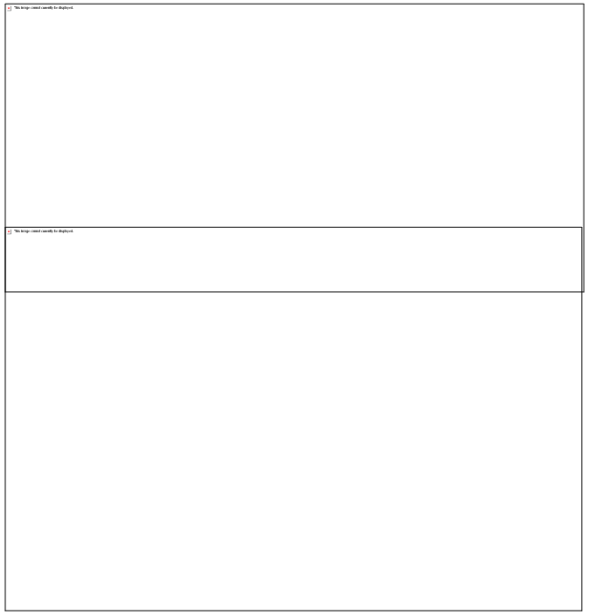
- Potential to connect to millions of individuals, allowing gathering vast amounts of health monitoring data in real time
- Improved ability to monitor health data in non-clinical conditions
- Reduce cost of managing communication to monitoring devices, with simple appliance installation
- Save time, effort and money for the various stakeholders – Patients, doctors, hospital staff, pharmacists, insurers, government health agencies: reduced need for hospitalisation and scheduling of monitoring procedures.

MessageSight solutions for **Communications**

(News Media and Publishing)

What are they interested in doing today?

- Find new business models in a world where paper is being inexorably replaced as a communication vehicle (increasingly dominated by electronic delivery via internet, podcasts and e-books)
- Respond to increasing demand for trusted sources of news and of news and information
- Increase speed, volume and depth of coverage
  (e.g. Nancy Gibbs, managing editor of Time Magazine, says
  « I believe Time's mission is more vital than ever – not just weekly but daily, hourly and by the minute, when news is breaking «
- Ability to push information to a multitude of mobile platforms
- Reduce costs of delivering their products to customers



What problems are they facing?

- Secure, ensured delivery to their subscribers
- Interactive capability to get feedback from subscribers and to host discussions with interested parties
- Cost of data transport

What is needed?

- Efficient use of bandwidth, guaranteed delivery, publish/subscribe semantics
- Ability to communicate with large numbers of users simultaneously
- Hardened, appliance form factor for security and easy install and management
- Open protocols for use on the Web and mobile phones (WebSockets, MQTT)

MessageSight solutions for **Communications**
(News Media and Publishing)

How do MQTT and MessageSight respond to these needs?

- They provide bidirectional real-time information transport over limited bandwidth facilities, with security and various Quality of Service options including deferred delivery and guaranteed delivery
- MQTT has **8x** less wireless bandwidth overhead than HTTP and HTTPS
- Support both mobile and web use cases

MQTT and MessageSight together provide unique value

- Less bandwidth, allowing considerable savings in data transport costs
- Hardened, appliance form factor for security and easy install and management
- Can be used to distribute efficiently to large numbers of subscribers simultaneously
- Open protocols (WebSockets, MQTT)

Use cases? It just takes a little imagination…

Networking
by **Claire Vanner**| 17 September 2013

Farmers in Essex are using the Cow Tracking Project to keep tabs on their cattle.

A farm in Essex has been connecting its cows to the Internet to monitor their behaviour.

The team behind the Cow Tracking Project attaches a GPS device to each cow, and places sensors around their shed to monitor their movements and sleeping habits. That information is then sent to the farmer's computer and phone via text and emails.

If a cow starts acting differently or gets separated from the herd, the farmer can locate it to make sure it has not become lame or picked up an infection thanks to daily updates on the computer.

Information is on not only the individual cows and their behaviour over time, but also their interaction with each other.

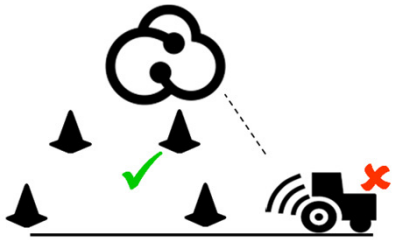
By monitoring cattle 24/7, the project can save farmers from having to put in extra labour and spending money on antibiotics after infections have fully developed.

"We reckon every case [of cow infection] we get costs us £300," John Torrance, a farmer in Essex, told the BBC. "Every case you reduce, potentially you're reducing your costs."

"We'll be able to find out how much a cow is eating, how much a cow is drinking and lying down and sleeping. An important part of milk production is that a cow has to lie down and sleep."

It is the first time the technology has been used on a dairy herd in the UK and it could change the way farmers look after their animals.

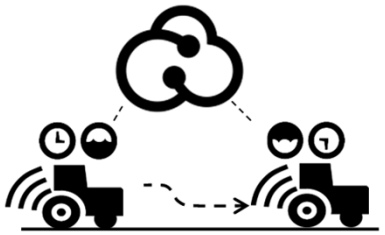
Agricultural Examples – *Smart Food*



Geofencing

Many large and expensive vehicles are rented rather than purchased. Vehicles should only be operated within geographic boundaries. With Bi-directional communication the vehicle can be disabled when it transgressing the boundary, preventing inappropriate use and theft, and notifying the renting company of the transgression.

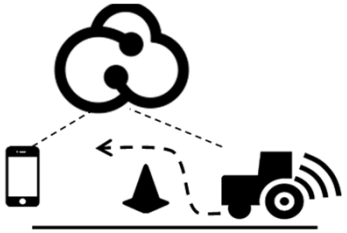
Products: MessageSight
InfoSphere Streams for Geo-location toolkit



Pay per drive Rental

Capture information on where, when, and how a vehicle was used during rental to charge personalised fees.
Include penalties for speeding, using the vehicle on prohibited roads or areas.
Provide feedback to driver (when stationary) of their current bill.

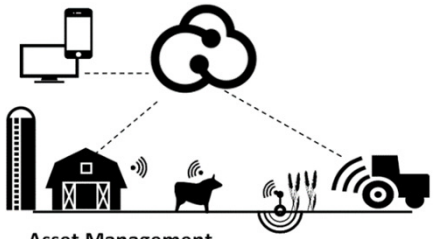
Products: MessageSight, IIB to integrate with enterprise systems.
Optional: Worklight for app development and Mgt



Driverless Ploughing

Remotely manage the routes of Combine Harvesters
Real-time feedback to smartphones, etc.
Manage several machines at once in unison.

Combined with pay per use hire, it could be more efficient
For a farmer to hire 3 at once and get crops cut at the optimum
Time for him.



Asset Management

Track consignments moved using multiple modes of transport.
Maintain accurate records between the vehicle, driver and the office.
Reduce lost or mislaid deliveries, speed time through customs with automated inventory management.

Products: MessageSight for communication
IIB for integration with the enterprise
optional: Worklight for app development and management
•Required Services involvement or 3rd parties with technology like RFID or NFC for tracking consignments in and out of the vehicles,
•Requires Maximo.

Tracking through Supply Chain

Track consignments moved using multiple modes of transport.
Maintain accurate records between the vehicle, driver and the office.
Reduce lost or mislaid deliveries, speed time through customs with automated inventory management.

Products: MessageSight for communication
IIB for integration with the enterprise
optional: Worklight for app development and management
•Required Services involvement or 3rd parties with technology like RFID or NFC for tracking consignments in and out of the vehicles,
•Requires Maximo.

Be First. ►► ►

Replace SMS with Mobile for Customer Experience

How do MQTT, MessageSight and other IBM products help?

- Bidirectional integration between back end and front end systems provides unique customer experience based on knowledge of customer, and offerings related to their surroundings at any moment in time
- IBM MessageSight, IBM Integration Bus, and ODM can work together to process events and generate interactive guidance and personalized offers
- Systems of engagement through interactive mobile application developed with IBM Worklight (including geo-fencing) enhance relevance and immediacy of recommendations
- Geospatial analytics provided by InfoSphere Streams
- MQTT Mobile Push protocol offers
  - Privacy (encryption capability)
  - Low battery usage
  - Guaranteed delivery
  - Speed
  - Minimum overhead in data transmission

MQTT and MessageSight together provide unique value

- Improved customer satisfaction through timely information, offers, and additional services, with less time spent querying, queuing and paying
- Deepening customer relationships and increasing revenue

IBM IoT Initiatives

- Connected Cars
  - Tizen
  - QNX
- Allseen / AllJoyn Connected Home
- Linux Foundation
- Texas Instrument device enablement
- Qualcomm device enablement --- not yet
- Marvel device enablement for appliances
- Broadcomm (Eletrolux)
- Medical device manufacturers – Phillips Medical, others….
- Whirlpool
- Continental in Partnership – Integrators for Automotive
- Transwiseway – truck fleets
- Telco 3 of the top 4 tier 1 carriers in the US.
- Mars Wrigley, Kimberly Clark
- Caterpillar
- Banks
- Package Delivery companies in multiple geo's
- Car Rental Companies (top 5)
- ZipCar, Relay Riders, etc.
- And many more

HTTP IS NOT THE IOT'S FRIEND

- No QoS, no reliable messaging
- Heavy, hundreds of bytes of overhead
- Not designed for wireless, high latency
- No pub/sub 1:many, many:many, etc
- in summary, for connected car HTTP is ..

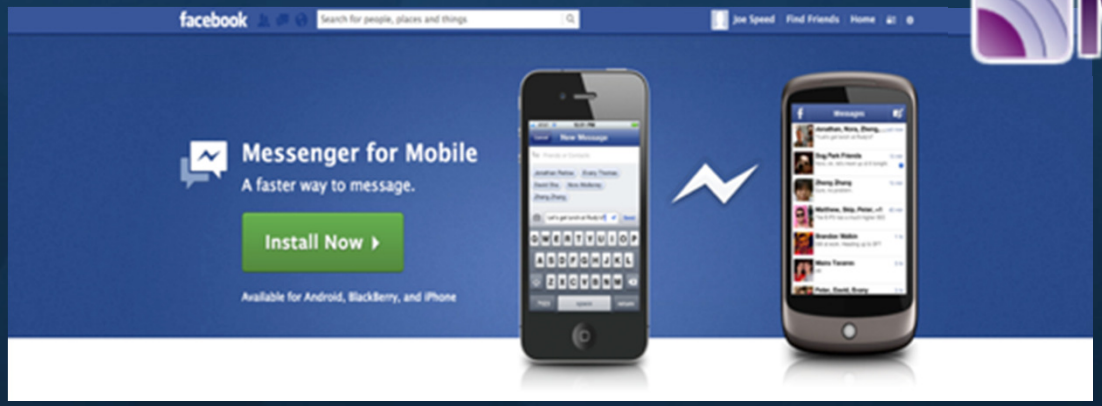
Slow, heavy, unreliable

MQTT FOR MOBILE MESSAGING

Faster M2M and User Experience

+ pub/sub with QoS - engineered for wireless
+ socket, TLS 1.2, mutual auth, etc.
+ MQTT vs HTTPS on Android & 3G
  - 93x faster throughput,13k msg/sec on my iPad
  - 1/8th network overhead – faster, cheaper
  - 1/170th battery to receive, 1/11th to send
+ **Open** standard, **open** source, very fast & reliable
+ eclipse.org/paho C, Java, JavaScript
+ mqtt.org for dozens of languages, platforms

FACEBOOK MESSENGER

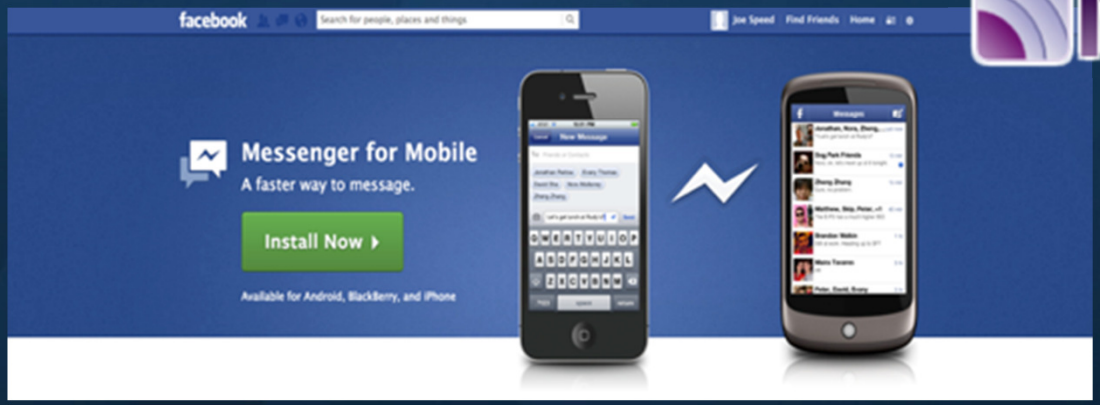


+ 725M mobile users, popular, highly rated, **very fast**
+ Speed of UX is **big competitive advantage**

Security	●●●●●
Battery Consumption	●●●●●
Data Usage	●●●●●

Facebook Messenger
FACEBOOK
★★★★½ (1,052,572)

FACEBOOK MESSENGER



"..performance improvements designed to make your messaging experience even better. To do this without killing battery life, we used a protocol called MQTT … designed to use bandwidth and batteries sparingly… phone-to-phone in hundreds of milliseconds, rather than multiple seconds."

- Lucy Zhang, Facebook Engineer

facebook.com/lucyz

TRY IT FOR YOURSELF

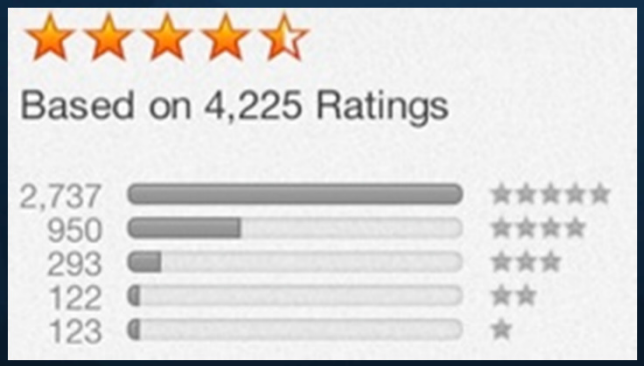
Facebook Messenger

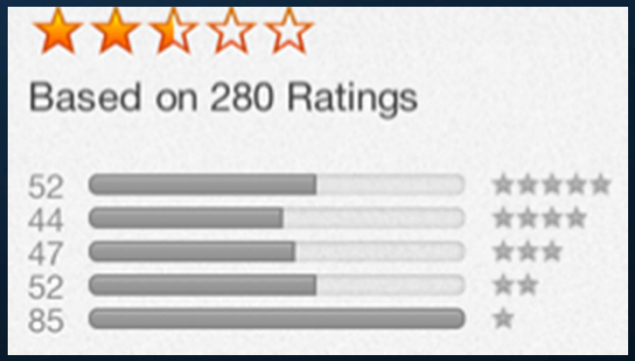
MQTT

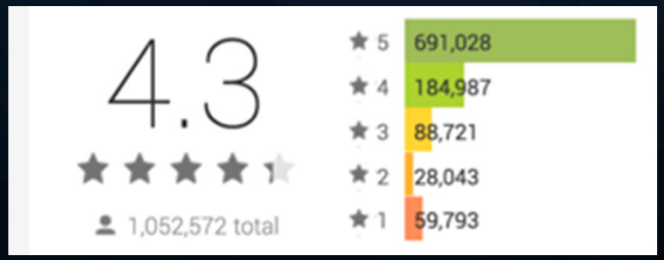
VS

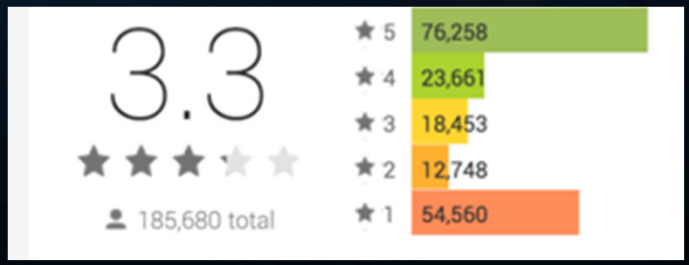
Google Hangouts

~~MQTT~~









Summary

- IoT is happening now
- Usecases exist in every industry
- New Business Opportunities will continue to elolve
- Imagination is the key
- Be prepared!


Thank You
Be First.