Where IBM Is Going with Mobile Computing

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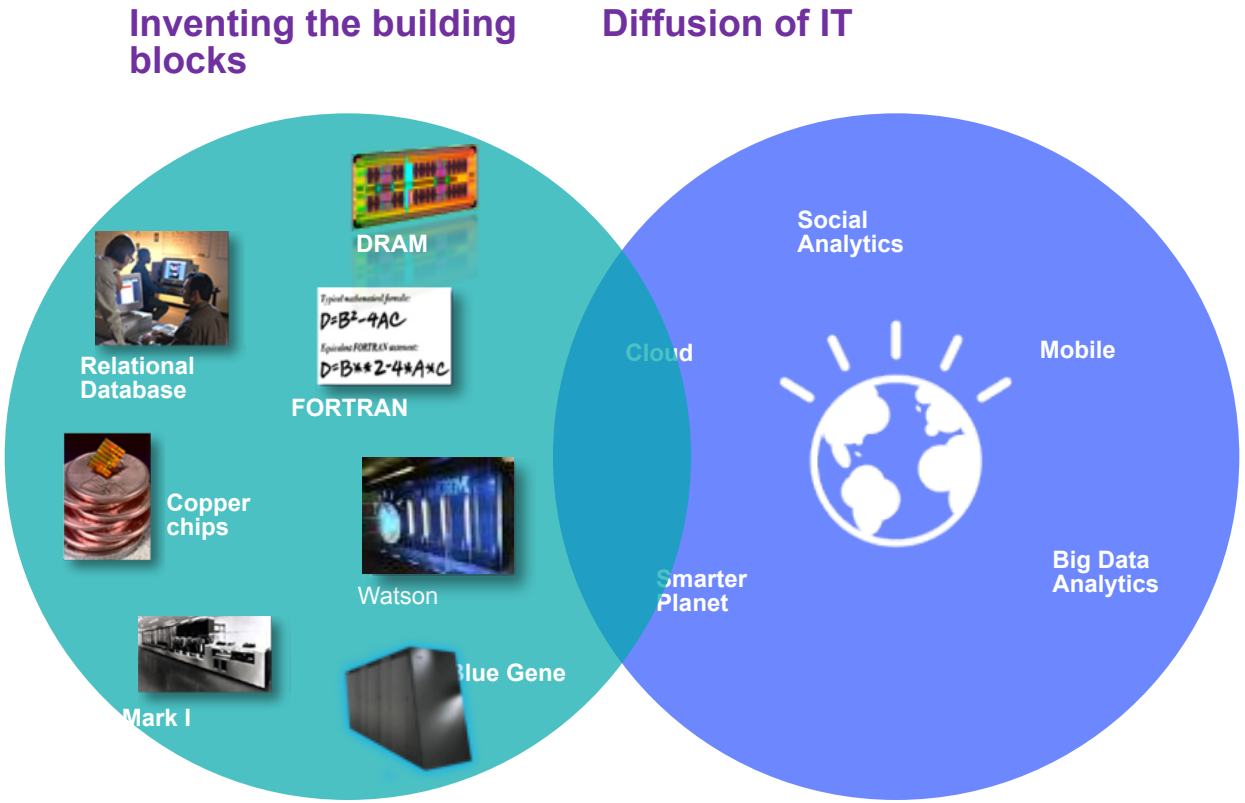
IBM Research: A Culture of Innovation



68 years of innovation


5 Nobel Laureates


9 Medals of Technology


5 National Medals of Science


6 Turing Awards

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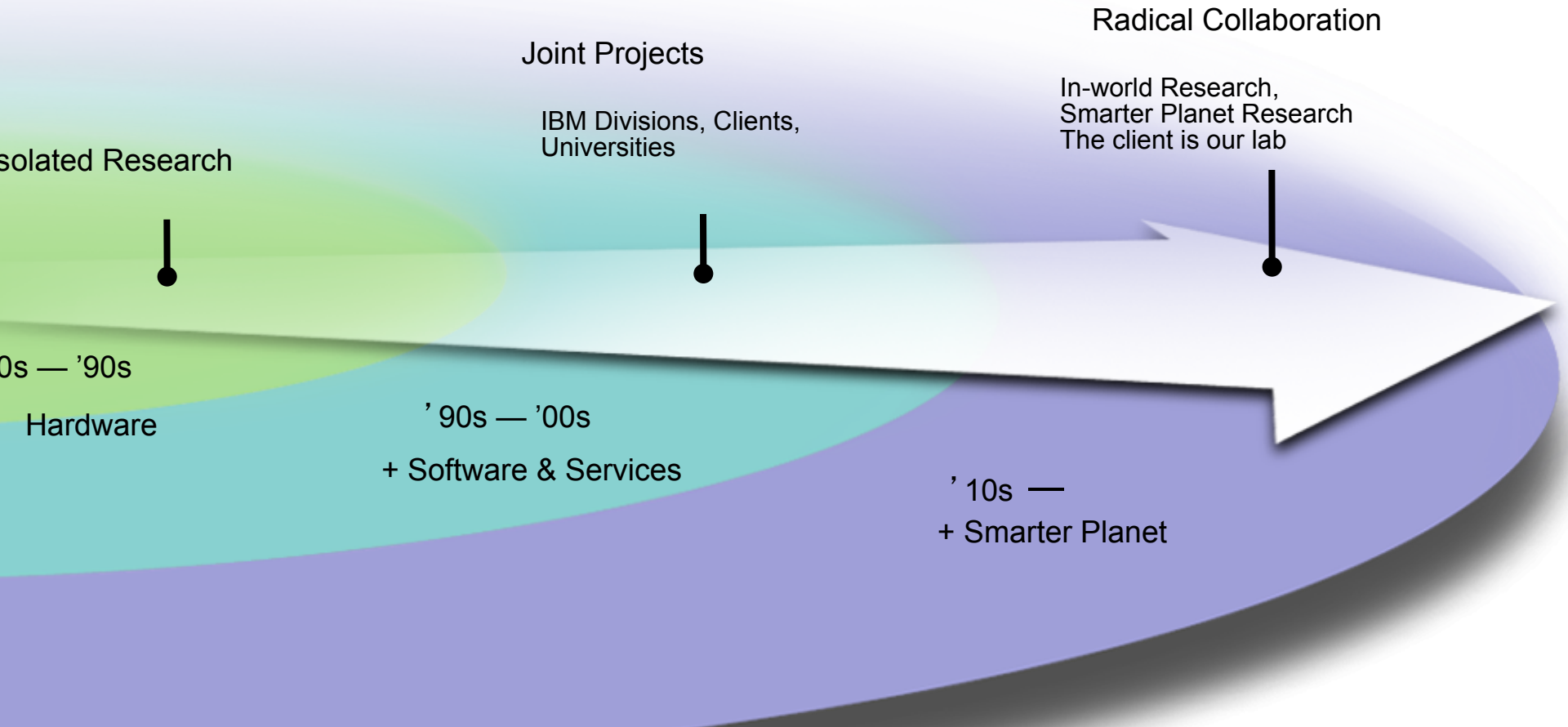
IBM Research: Open and Collaborative

The Eras of IBM Research: “The World Is Now Our Lab”



Outline

The challenges of mobile development, runtime and management

Interaction paradigms – Wearable meets Cognitive

Mobile Analytics - Making Sense of all this Data

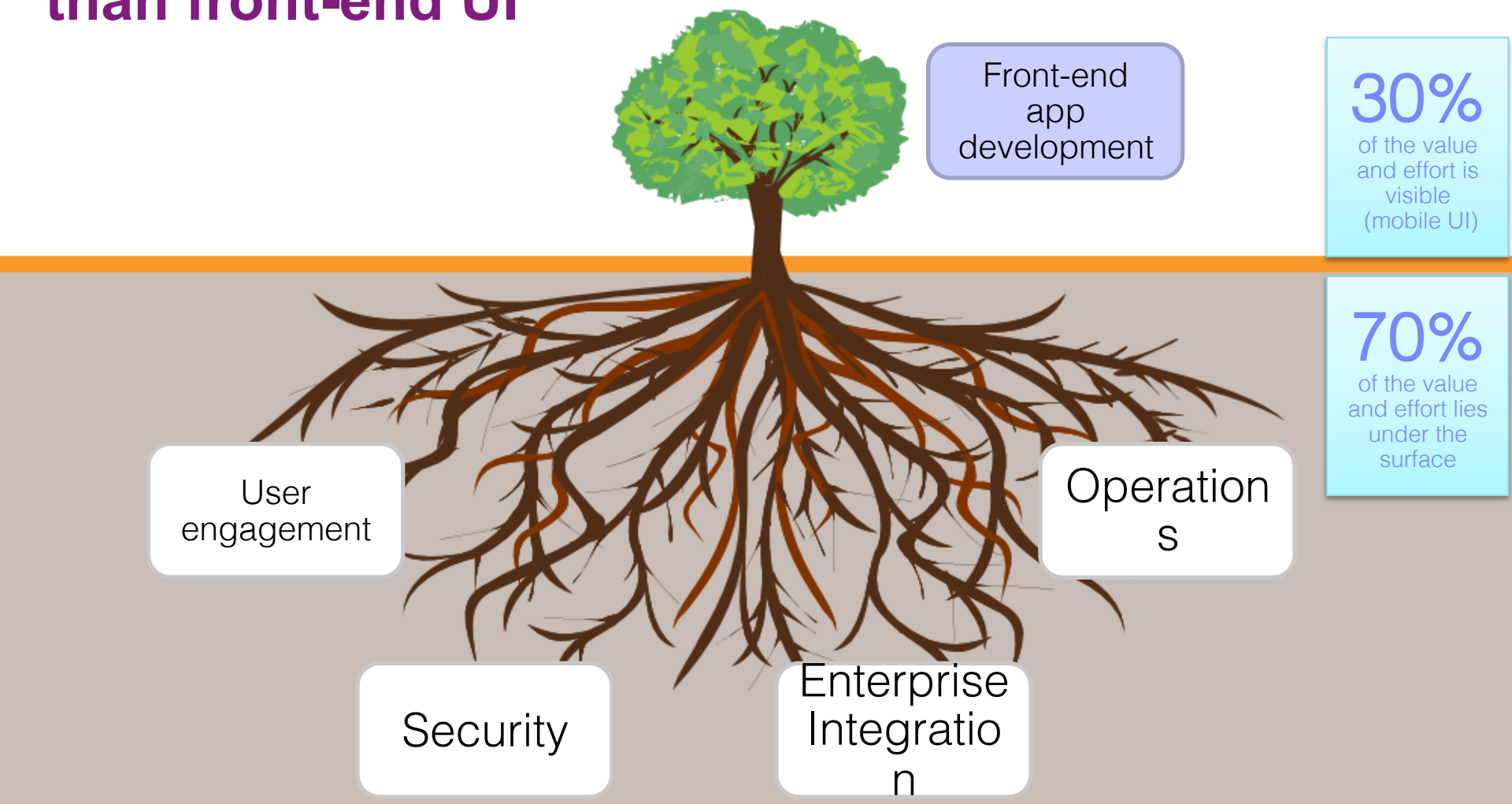
Advanced Runtime and Development Services for Mobile 2.0

Our new reality … changed by Mobile

Mobile is a Transformational change for all Industries

Insurance

Practical considerations: mobile apps go deeper than front-end UI



A new Mobile Era, We Have Moved From…

Single transactions to	›	personalized engagement
Millions of PCs to	›	billions of mobile devices
Structured data to	›	massive amounts of unstructured data
Static applications to	›	dynamic compos-able services
Rigid infrastructure to	›	an elastic cloud infrastructure
Reactive security	›	Intelligent, proactive protection


Don’t give up ☺

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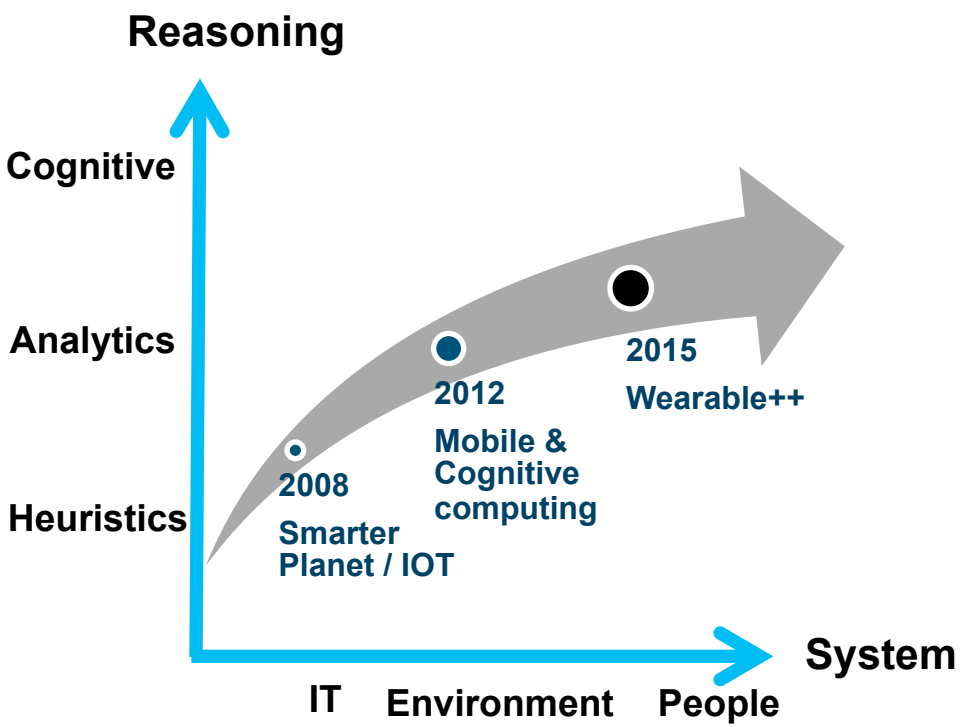
We are on a verge of a new era Wearable - where people and their surroundings are accompanied by growing number of devices that enable unprecedented cognitive interactions



Exponential growth in numbers and diversity of sense and respond devices aimed at people driven by consumers and enterp

New type of data, about people, enable objective perception of people's physiological and emotional state

Wearable++

Sensing, understanding and augmenting human interactions via new devices and technologies (e.g. wearables) aimed at people

New opportunities to engage customers, transform industries and professions and change our lives

New cognitive models to understand and interact with people in context

This is an evolution at the intersection of Mobile, IoT, and Cognitive computing

Enterprise scenarios require scale, robustness, analytics, and new cognitive models

Smart Environments

Disney Invest 1$B in MyMagic+

Industries: Retail, T&T, M&E, Education
IBM Plays: Smarter Commerce, Smarter Cities, Social, E&U

Wellness

Pay as you live insurance

Industries: Healthcare, Insurance
IBM Plays: Smart Workforce

Transforming Professions

Virgin Atlantic greeting its passengers using wearable tech

Industries: Retail, T&T, Banking, E&U, Industrial
IBM Plays: Front Office, Smart Asset Management, Safety

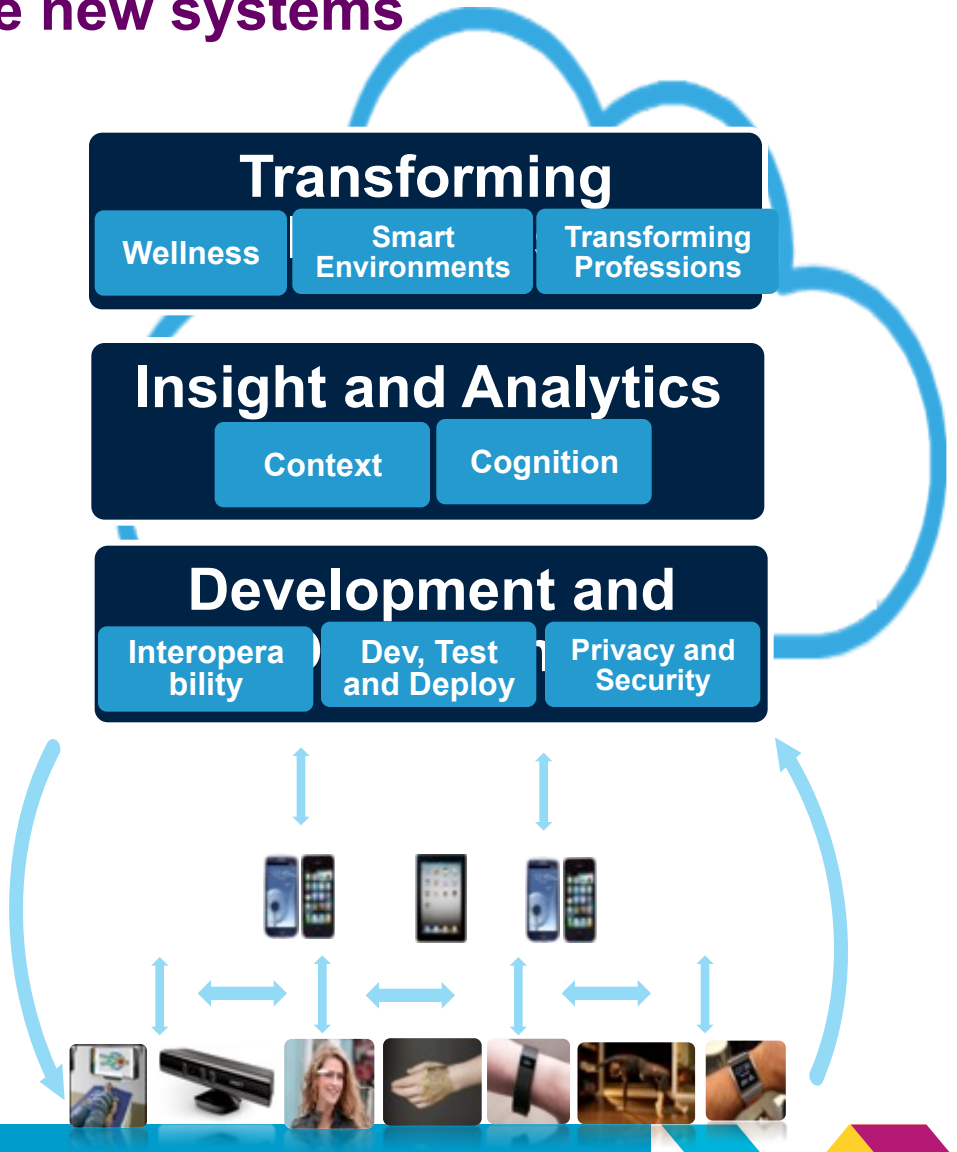
Wearable computing devices will be $30.2 billion market by 2018, CAGR of 43.4% (BBC research)

1 Billion devices are expected to be shipped in 2019 (ABI Research)

This new evolution introduces new challenges to build, manage and comprehend these new systems

Challenges

Systems of Engagement	Systems of Insight
Device Interoperability	Multi dimensional Context
Multi Platform Deployment	Social meets physical
Extreme Distribution	Cognitive Modules
Dynamic Interactions	Privacy and Security

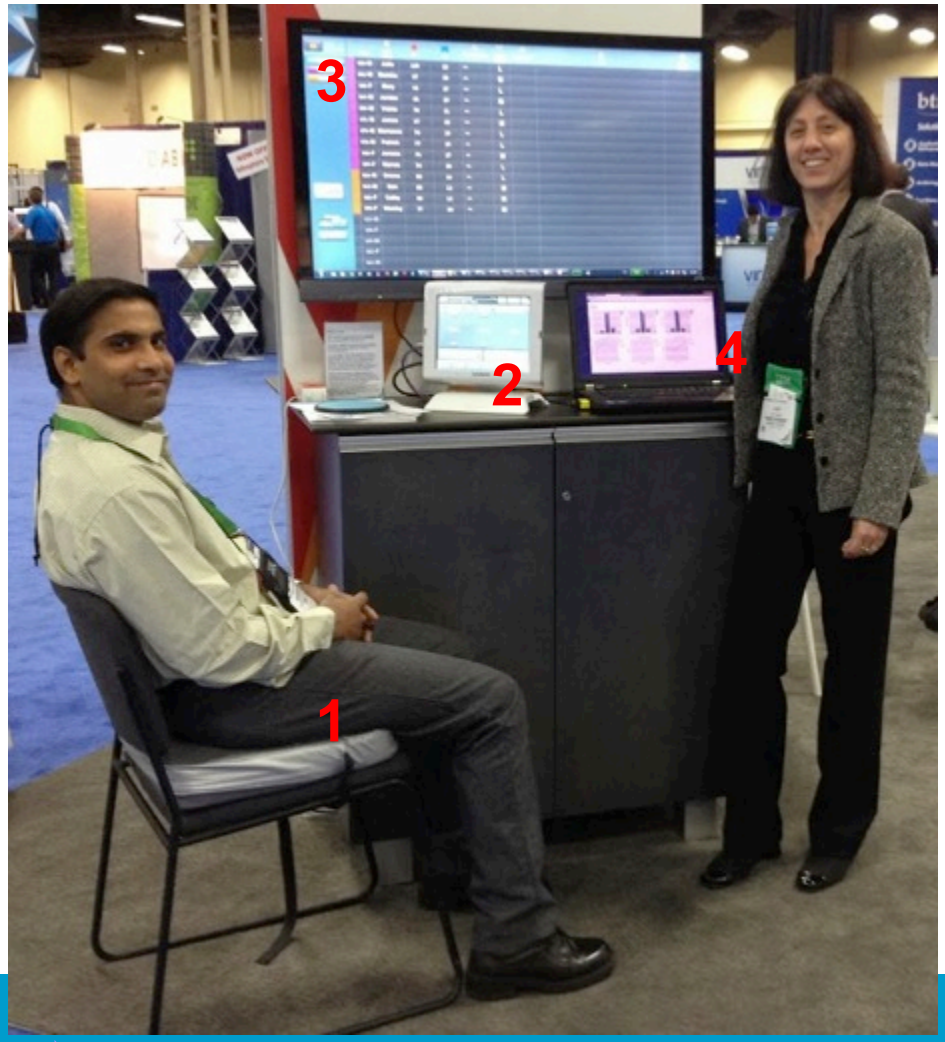


Technologies Overview

- **Multi-Objects Recognition System**
  - Uses advanced computer vision techniques for multi objects detection
  - Robust for perspective capture
  - Able to distinguish between products from the same brand and even in sub-brand
  - Multi-objects segmentation

- **Visualization**
  - Uses augmented reality for natural augmentation in context
  - Accurate Pose estimation for 3D Warping

Sleep Well, Live Well Demo
IBM and EarlySense Use Cognitive Models to Help Improve Sleep Patterns and Promote Good Health



1. EarlySense Sensor under the pillow
   - Generates KPI's
     - Heart Ratio (HR)
     - Respiration Rate (RR)
     - Movement
2. Personal Monitor
   - You can see your performance in terms of HR, RR and movement
3. Emergency Monitor
   - Shows people with problematic KPI's
   - Authorized staff can take actions in real time
4. BI Monitor for at rest analysis of accumulated data

- More details on Youtube

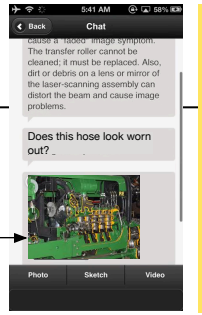
1. The Connected Tractor has a sensor package that reports location (GPS), temperature, humidity, accelerometer, etc.

TI SensorTag

GPS

Connected tractor sensor data

2. Problem! There is an overload in the engine's temperature sensor (caused by a heat lamp)



6. He thinks a hose is cracked so he opens a chat with his supervisor and sends him some photos and videos to confirm the damage.

This content is linked back to the work order in Maximo via the Engaging Infrastructure middleware.

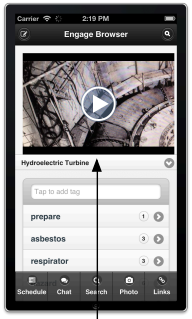
The supervisor confirms the hose is cracked, so the worker replaces the hose and closes the work order.

camera

Field Worker App

location reporting

APN / GCM



5. The worker needs a refresher on how to open and inspect the engine for this model tractor.

He finds a YouTube video linked to the work order showing him how to perform the procedure.

IoT & Mobile Back-end-as-a-Service Cloud

IoT Device Connectivity & Message PubSub
IBM MessageSight

MBaaS Location Service

Chat Service

Image Service

YouTube Service Broker

YouTube

IoT Data Store
IBM Informix

Data Access APIs

Asset Analytics
BigInsight / Streams

create work order

Maximo Broker Service

create work order

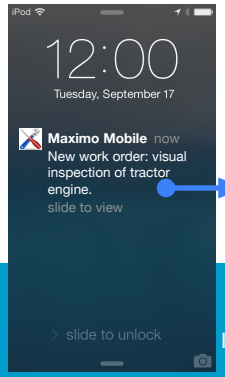
Engaging Infrastructure Middleware

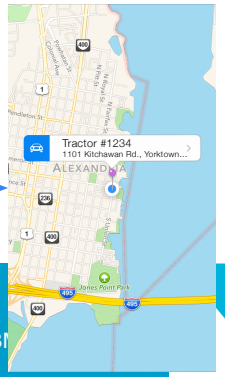
Push Notification Service
IBM Xtify

C&SI Maximo
Work order system of record

3. Analytics detects an overheating engine and triggers a work order for a preventative maintenance inspection to ensure the engine isn't damaged. The work order is assigned to the worker closest to the tractor's GPS location. Worker locations are tracked in the MBaaS Location Service.

4. Engaging Infrastructure detects a new work order and sends a push notification to the worker to do a visual inspection.





Mobile and IoT integrated scenario

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Mobile Analytics - Making Sense of all this Data

Advanced Runtime and Development Services for Mobile 2.0

Goal Create comprehensive, standards-based, spatiotemporal support for the IBM platform, middleware and solutions

Collect & Store data

Collect Business and operational spatiotemporal events from heterogeneous sensor environment
Collect GPS traces and filter out noisy data.
Integrate and enrich with GIS data
Index & Store location information

Visualization and Analytics

Track location of mobile devices and moving assets
Detect space-time aware situations and incorporate into business decisions and events
Interactive discovery and analysis on historical data

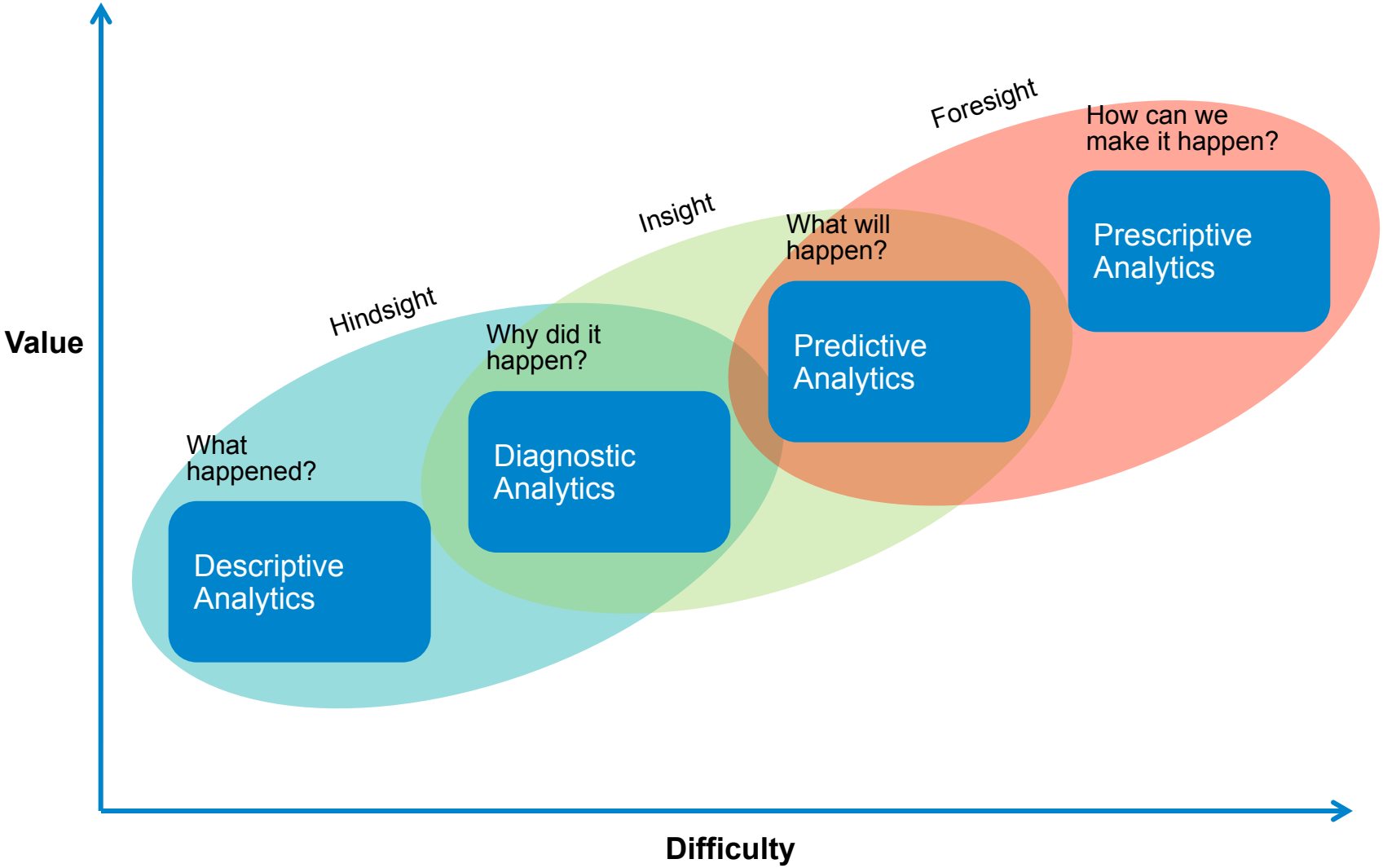
Operational Decision Management

Trigger actuators and business processes upon rules and detected situations
Push alerts to mobile devices and operators
Refine & Create business rules in visual context

Proactive Event-Driven Computing

Forecast and ***respond*** to future events and situations ahead of time

Analytics Explained



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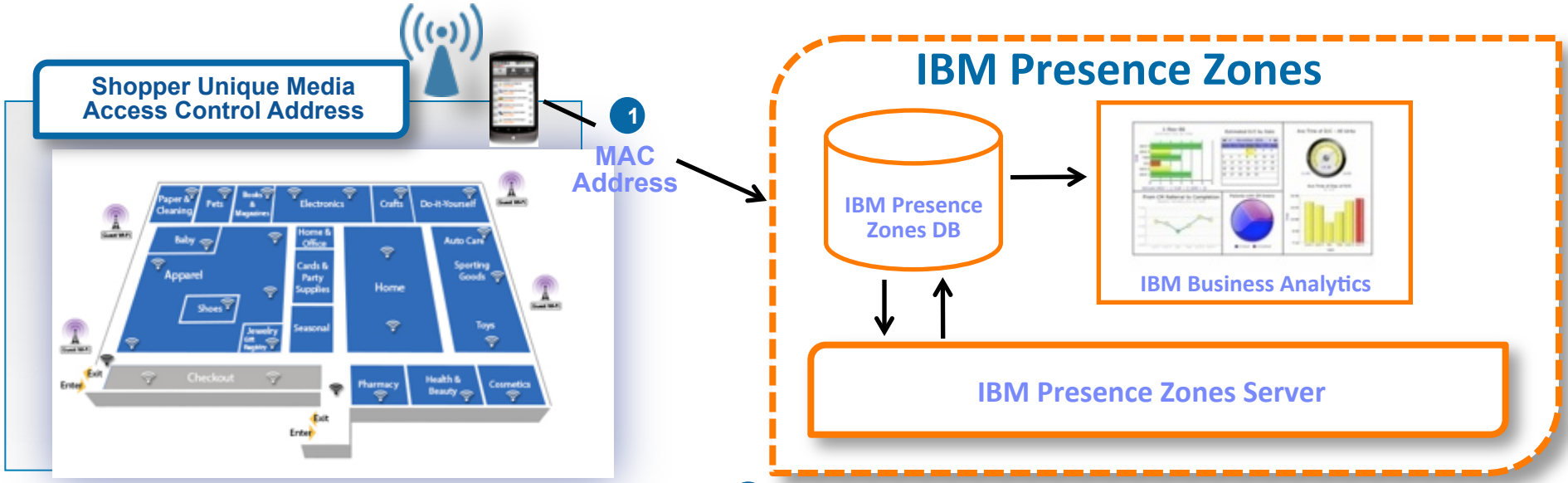
Innovative In-Store Customer Presence Detection



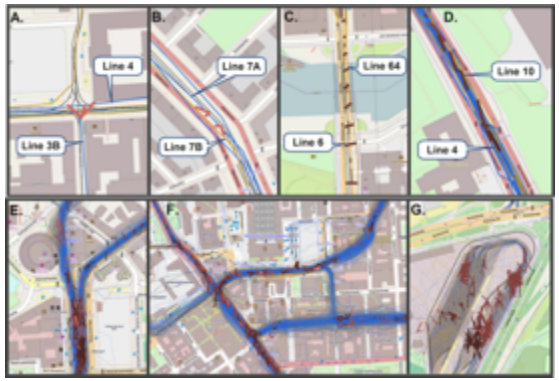
Taking digital traffic analysis to the store 2

Web metrics	Store metrics
Session / First session	Store visit / first store visit
Unique/Repeat visitor	Unique/rep store visitor
Session duration	Store entry/exit duration
Page views per session	Number of zones visited
Avg new/repeat session len	Avg time spent in store; new/rep

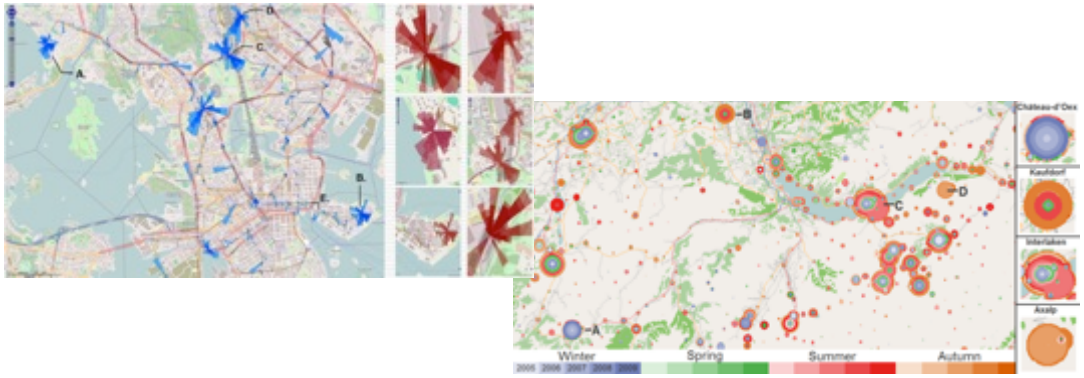
Web metrics	Store metrics
Avg time per page	Time spent in each zone
Traffic volume	Total visitors to store
Bounce rate	Short durations, no zones visited
Frequency per unique visitor	Number of zones visited
Unique visitor per store / time	Recurring store entries

IBM Spatiotemporal Analytical Workbench

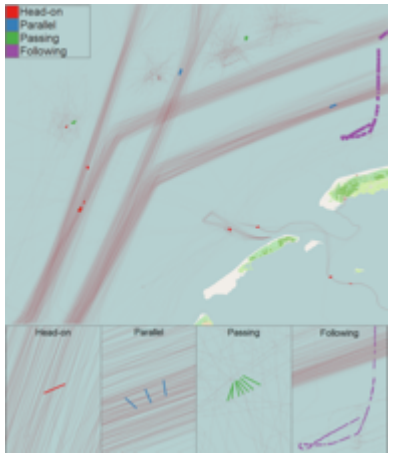
Combining Advanced ST Analysis + Advanced Visualization + User Interaction



Movement analysis and pattern detection In public transportation



Understanding temporal distribution of event data



Movement analysis, clustering and pattern detection in maritime transportation

Spatiotemporal clustering of events and locations

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Basic backend location-based services (LBS)

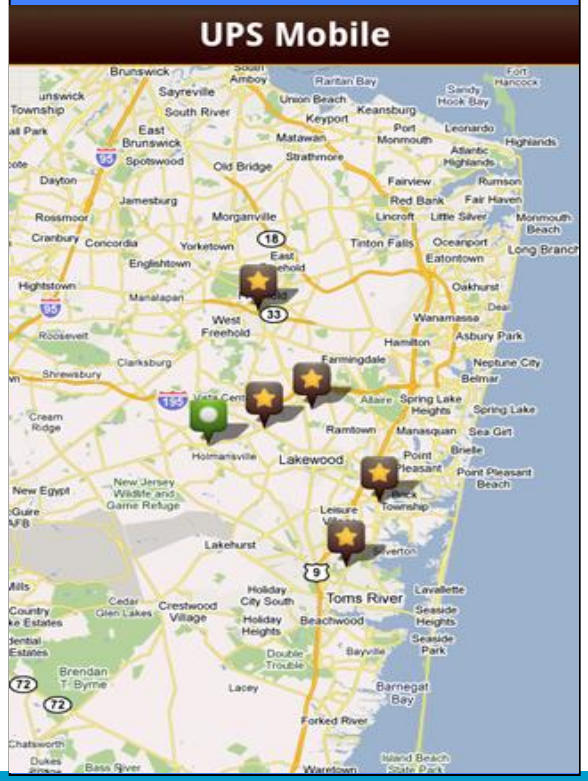
Spatiotemporal Context Management

Create/Read/Update/Delete Context, Geo-Fences, Entities

Geospatial queries

Range queries: e.g., find all UPS/FedEx locations within 1-mile radius

Proximity searches: e.g., find 10 nearest UPS/FedEx locations



Geospatial triggers

- Invoke listener's code to e.g., send a coupon whenever a VIP customer enters / exits one of the electric shops.
- Remotely lock tablet application when logged-in person's Smartphone is outside 20m range for more than 1min

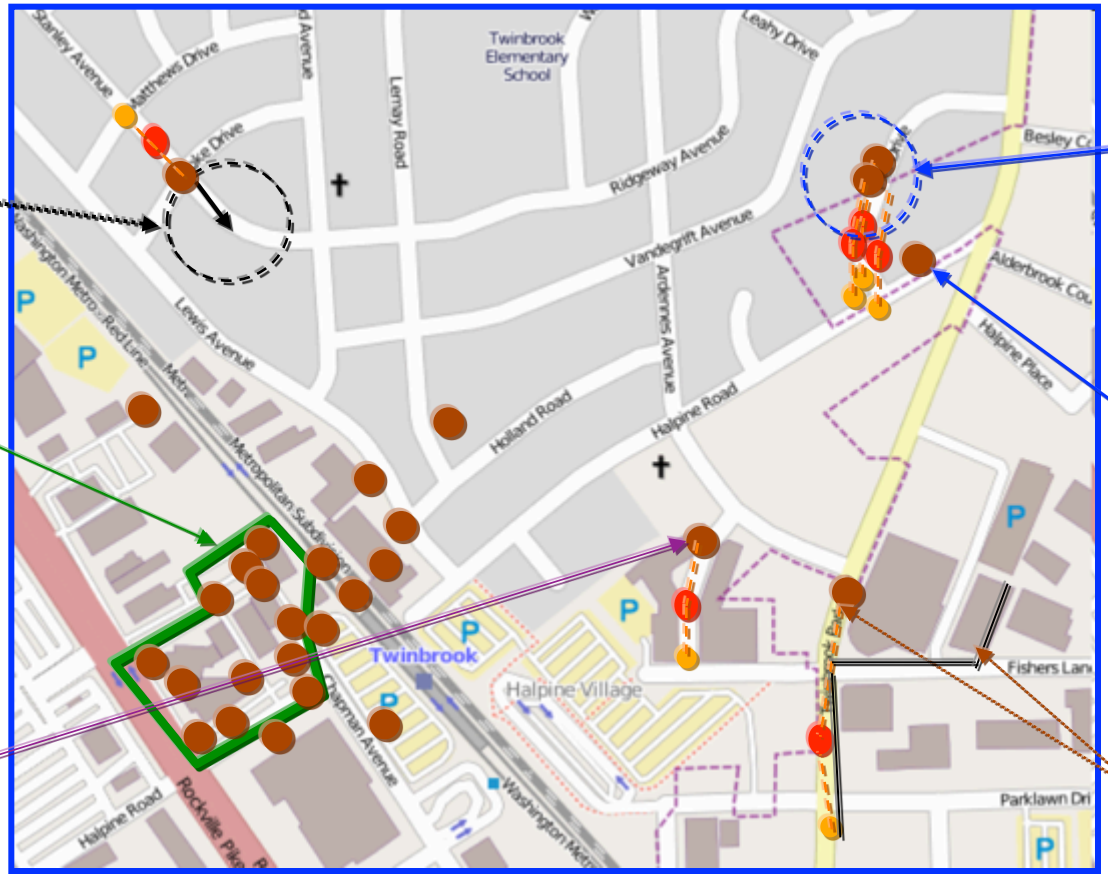
Advanced triggering capabilities

Notify listener if a certain spatiotemporal condition had occurred

Entity Entering / exiting / dwelling inside / outside geofence

Not all employees are inside / outside the facility within 5 min

The entity speed is above the threshold



GROUPS Entering / exiting / dwelling inside / outside geofence

Entity left the group (distance more than 100 m for more than 1 min)

Deviation from route by more than 200 m for longer than 5 min

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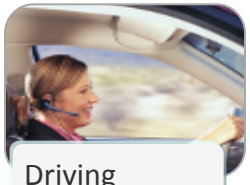
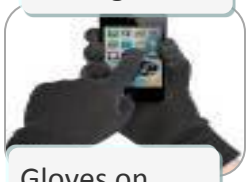
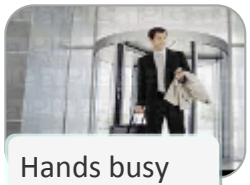
Secure Multi-Factor Authentication – from Active to Passive identification

Situation

Authentication Tests


Driving


Gloves on


Hands busy


Bad light


Public place

Voice

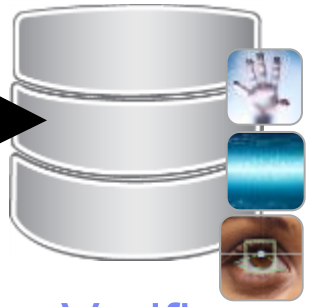

Gesture


Face reco


QRCode / NFC

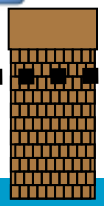

Q&A

Enrollment



Auth. service selects challenges

Verifies against enrollment



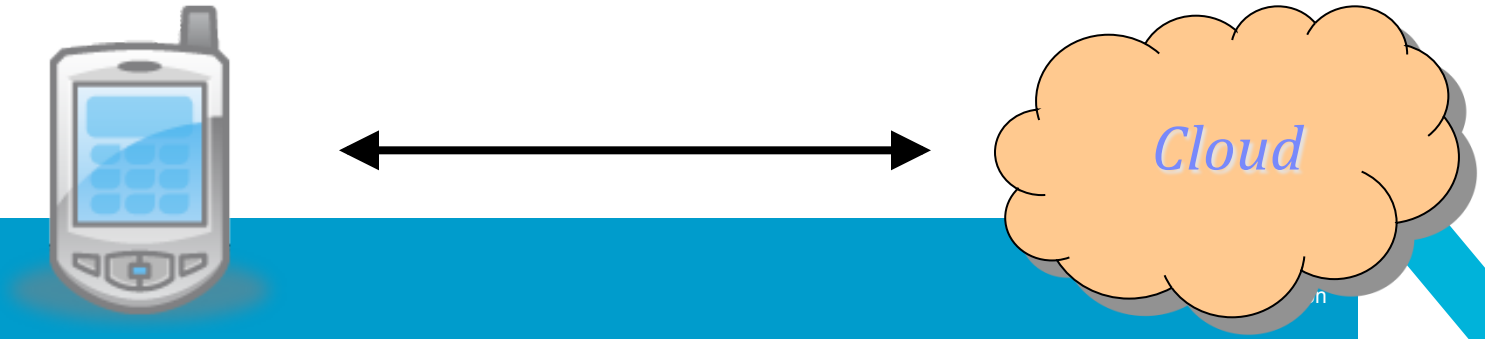
Application Security and Data Privacy

Goal:

- Give users control on their private data
- Detect and prevent release of sensitive information to unauthorized parties
  - … through the entire execution lifecycle of a mobile app: from mobile front-ends to cloud-based back-ends

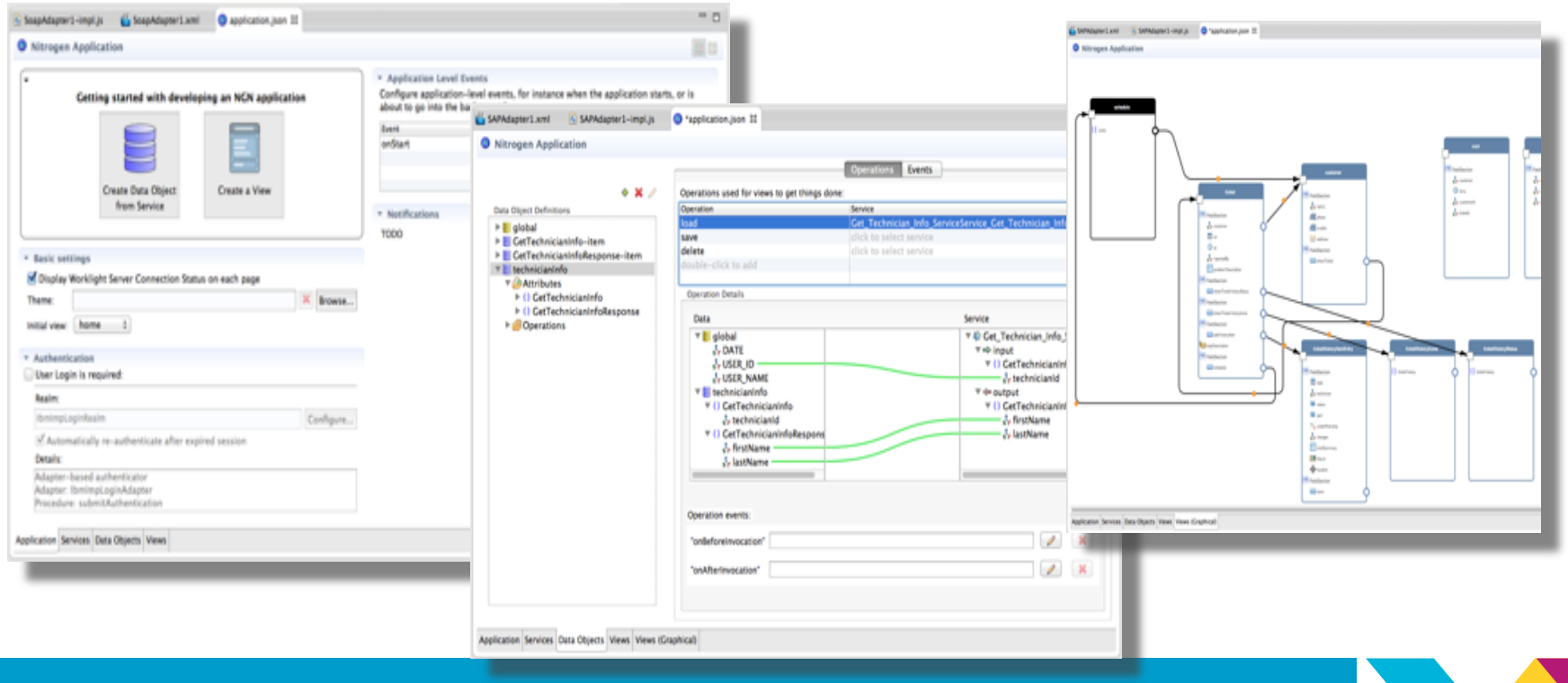
Technical Directions:

- Static and dynamic analysis of existing apps, app rewriting and healing
- Application modularization and rewriting
- "Secure by design" containers
- Compound leakage patterns: analysis of data collected from multiple applications and multiple devices
- Approaches that allow to edit/revoke released data



Rapid mobile application development
IBM Worklight App Framework

Wizard-based enterprise and public API discovery	Extensibility of app logic and UI components	Out-of-the-box app architecture takes care of “plumbing”	Controlled look and feel, compliant with target mobile OS	Fast screen generation, screen flow control	Integrated with Worklight Studio



Mobile applications analysis – Anti-Patterns

Exec Summary

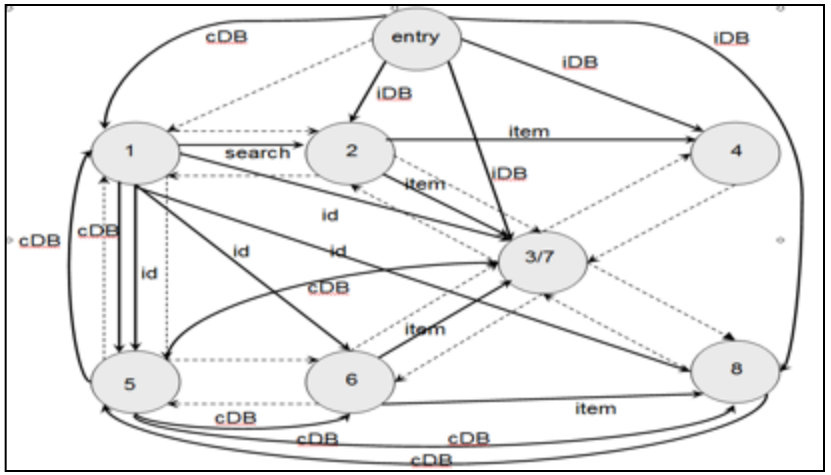
- Automatically identify and fix **syntactic**, **semantic** and global **anti-patterns** in mobile applications
- Identify and collect semantic and syntactic anti patterns and best practices for improving the application **UX and Performance**.
- Dynamically optimize applications according to the user specific behavior or common behavior of many users

Customer Value and Business Impacts

- Extremely reduce the time spent by developers and experts that manually inspect customers applications, in order to provide code fixes. Provide the developers in line automated support suggesting transformations from the ani-patterns to the best practices
- Enable easy fixing and creation of highly performing, efficient apps, with superior UX

Technical Challenge – Open Problems:

- Data flow analysis for JavaScript
- Extracting state machine from apps
- Refactoring of anti-pattern for JavaScript
- Refactoring of anti-pattern for the mobile application
- point-to analysis or other well known analysis for JavaScript
- Semantic anti-patterns identification – No best practices available
- On the top of the formal representation further code analysis and transformation algorithms to be explored.



Web legacy, mobile enablement

Exec Summary

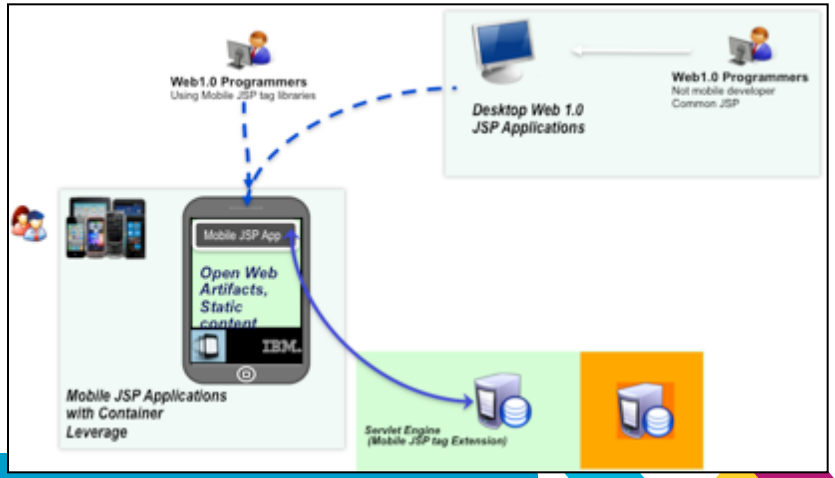
- Enable customers to easily extend their existing Web1.0 (JSP) application to mobile while leveraging existing technology (code & skills) with the UI and the UX expected from a mobile app.
- Provide mobile JSP tag libraries for enriching Web1.0 applications as well as native WL client containers, for calling the remote web1.0 application while exposing the application to device capabilities and hosting static content inside the container to minimize access to server

Technical Challenges

- Define and develop a custom JSP tag library for declaration of mobile web applications utilizing the device capabilities (what is the natural declarative method for defining mobile web?)
- Develop native client side containers (android/iOS) that would enable loading of pages from a remote server while accessing static web content hosted on the device to minimize networking and server accesses (requires a sophisticated solution to deal with same origin policy and security issues)

Customer Value and Business Impacts

- A real need coming from WebSphere clients who want to maintain their Web1.0 applications while mobile enabling them (WAS/ WebSphere portal/ WebSphere Commerce customers)
- Bring every WAS customer into the world of Mobile, while addressing common adoption inhibitors (such as large code bases in place , lack of skills..) and leveraging existing investments
- Provides a rapid method for mobilizing the volume of web sites and portals, entry point without new skills




BRIGHT
FUTURE
AHEAD