

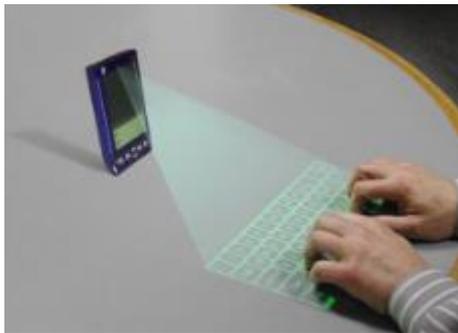
Mobile Development & Runtime Challenges for Today and Tomorrow

Gabi Zodik

IBM Research Global MobileFirst Leader

Department Group Manager of Mobile and Industry Solutions

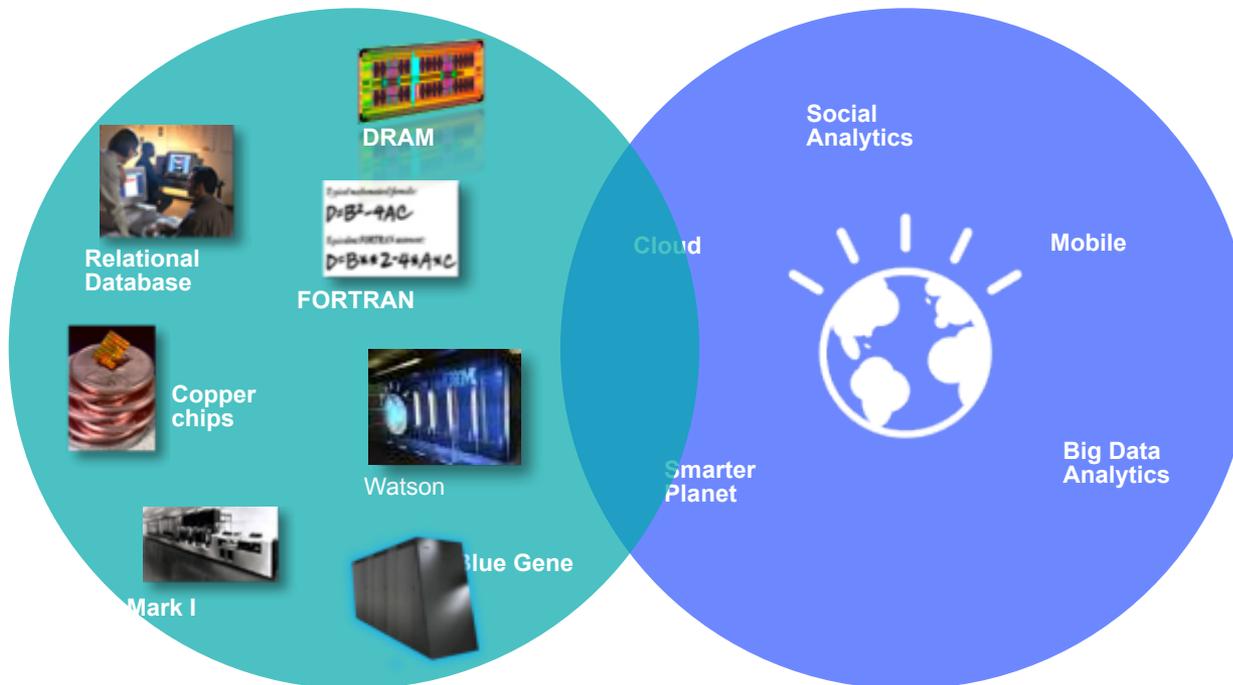
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IBM Research: A Culture of Innovation

Inventing the building blocks

Diffusion of IT



68 years of innovation



5 Nobel Laureates



9 Medals of Technology



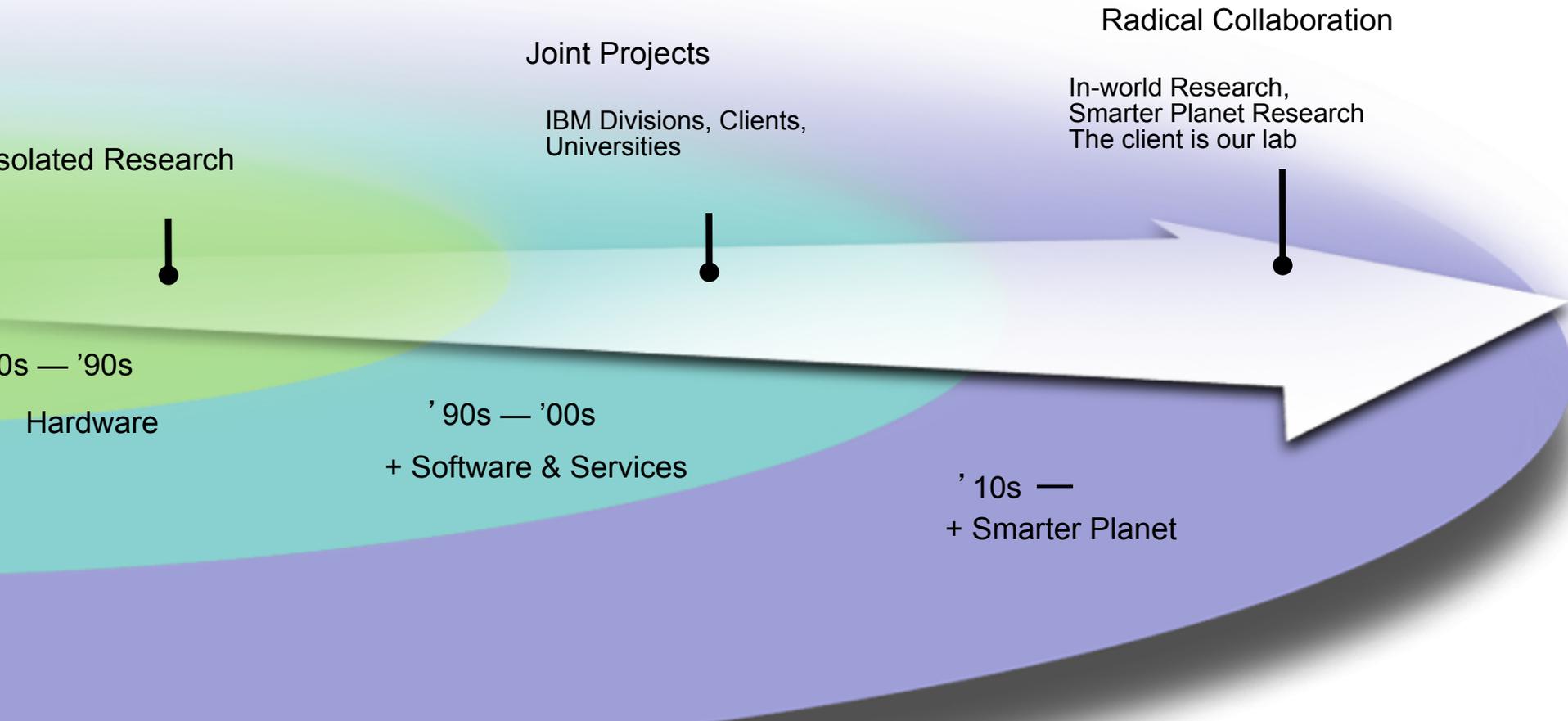
5 National Medals of Science



5 Turing Awards

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

Adhoc Computing – 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

Healthcare



Insurance

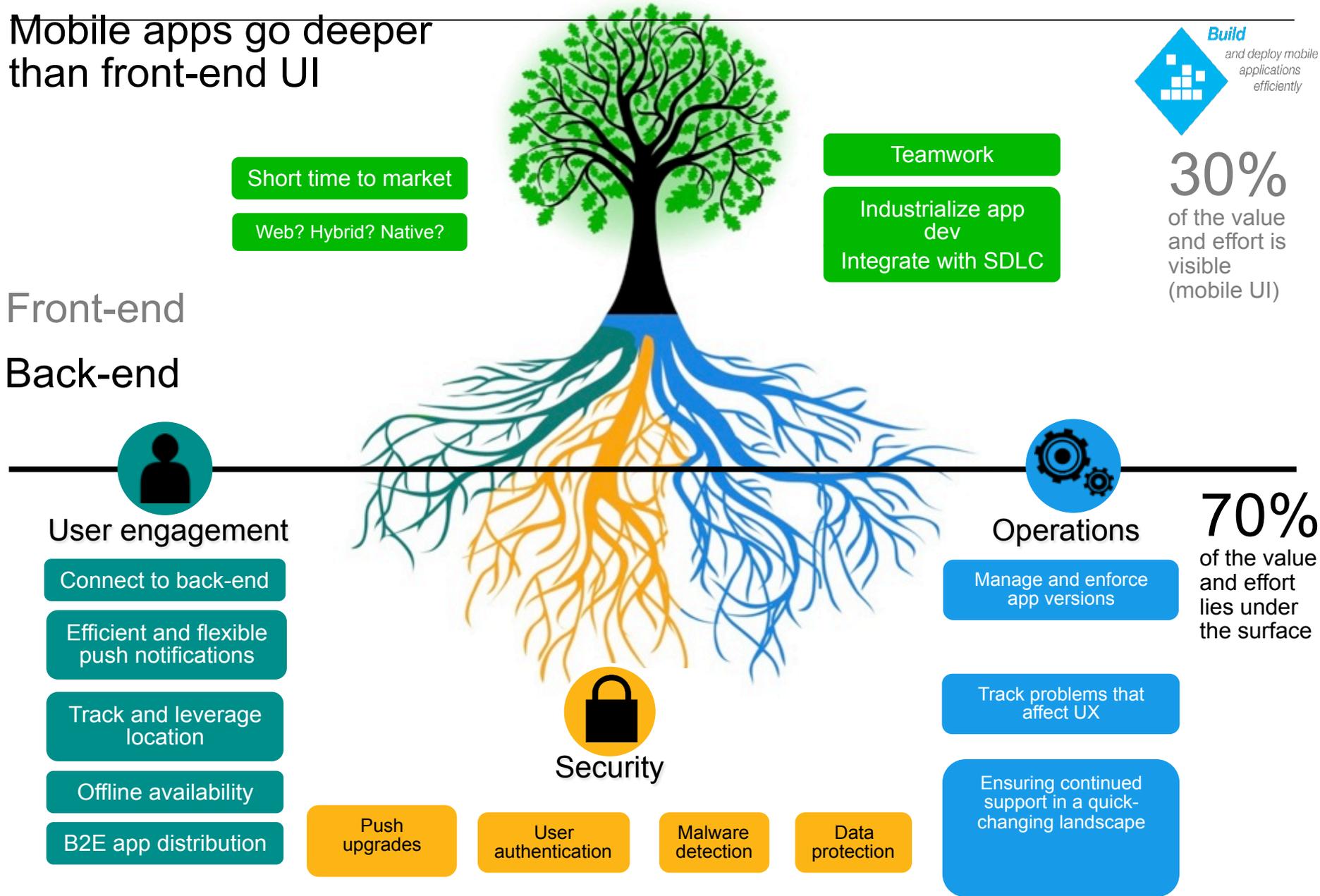


Mobile apps go deeper than front-end UI



30% of the value and effort is visible (mobile UI)

Front-end
Back-end



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

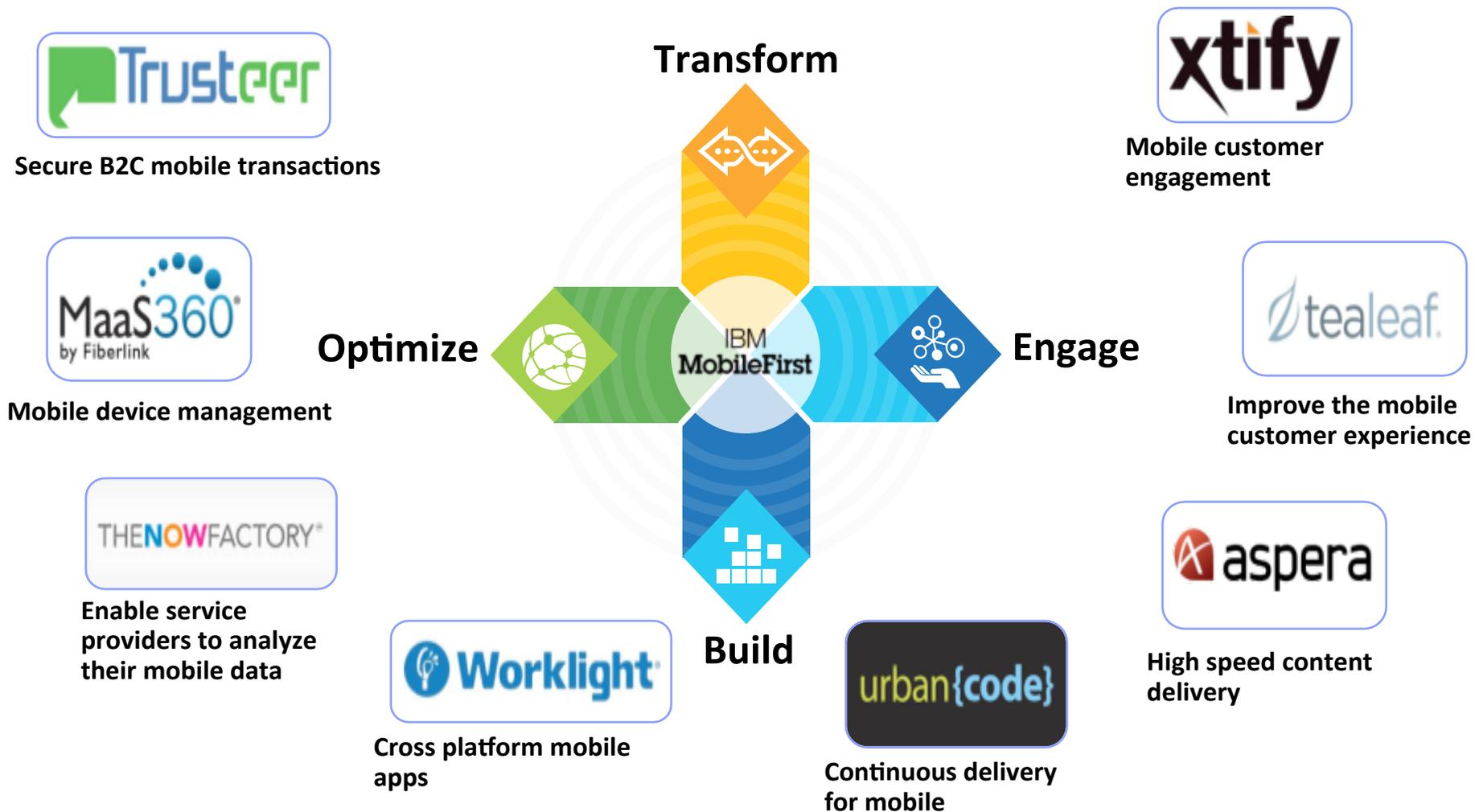


Processes businesses need to address

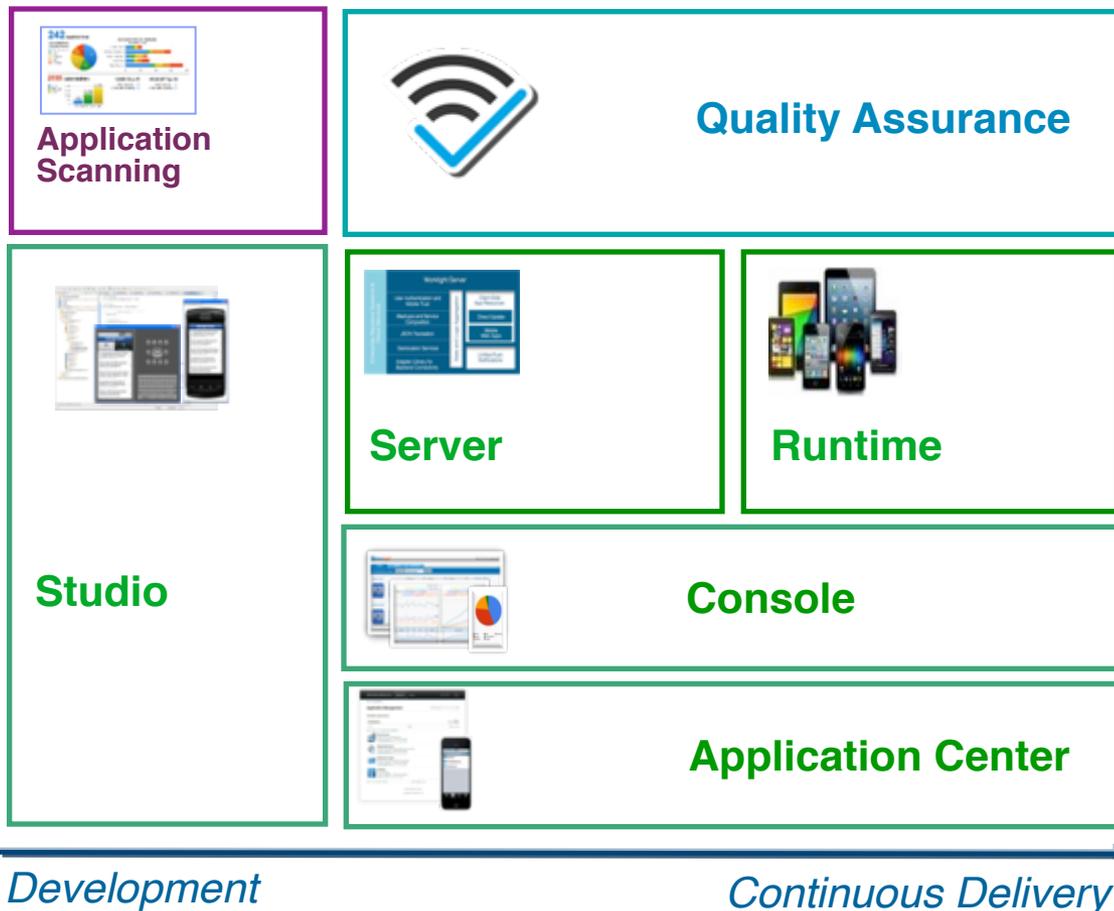
- Transform **strategy and operations** (e.g., multi roles)
- Build and deploy multi-platform mobile applications
- Optimize **mobile experience** to build loyalty
- Leverage analytics to turn information into insights
- Continuously update your mobile application
- Deliver exceptional performance leveraging the new scalable 3 tier architectures
- Support BYOD and a mobile workforce
- **Oversee security, risk and compliance**



IBM MobileFirst acquisitions



The IBM Worklight Platform supports the complete mobile application lifecycle



Application Scanning
Detect code vulnerabilities at the time of development

Quality Assurance
Collect beta test feedback, crashes and analyze user sentiment

Foundation
Development, Runtime, Operations Console & Private Store



IBM Bluemix Mobile Cloud Services

Scalable Backend Services to Accelerate & Enrich Apps

Integration
Connect with
APIs &
Systems of
Record

Analytics
for reporting
and insight

Workflow
to automate
next actions

Cloud Storage
for mobile data
management

Security
to prevent
unauthorized
access to data



Cloud
Integration



Embeddable
Analytics



Rules



Mobile Data



Mobile Application
Security



Mobile Quality
Assurance



Workflow



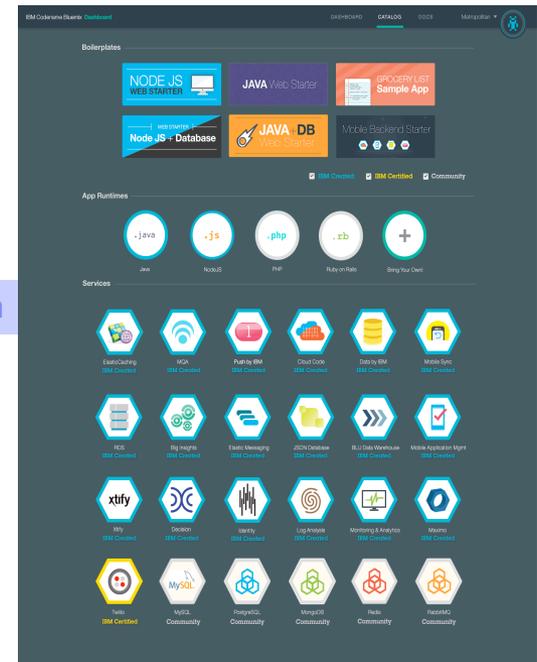
Cloudant
NoSQL DB



Supporting hybrid Mobile application backend connecting Cloud APIs to the Worklight Platform



Shared Identity Token



Extend your enterprise mobile app platform investment through Cloud APIs:

- Worklight ready SDK that can be plugged into your project
- Lifecycle management controls API access for BlueMix services
- Worklight security framework integrates with BlueMix mobile application and services



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The next computing platform is a plethora of Wearable, IoT and Mobile devices

People will use multiple devices that seamlessly work together to accomplish their goals

Activity tracking

- Heart rate
- Oxygen saturation
- Body temperature
- Calories burned



Camera Augmentation



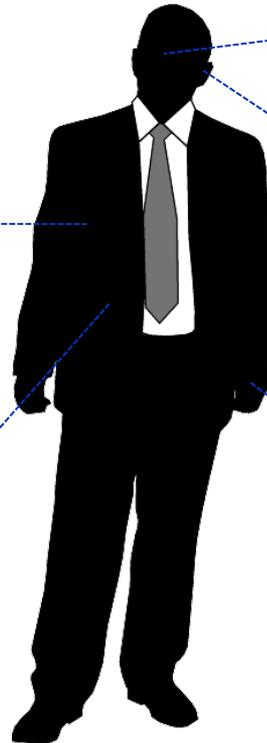
Voice Call Music



Checking Time Alarm News & Alerts GPS



Browsing Messaging Calendar



Wearable enables new business opportunities

Not supported by smart phones driven by always on, hands free, new sensors

B2E - Transforming Professions



Field worker safety



Emergency response



Customer service



Smart conference



Smart law enforcement



Field worker effectiveness



Smart doctor

B2C - Engaging Customers



Payments



Elderly Monitoring



Amusement parks



Customer loyalty



Pay as you live insurance



Banking



Healthcare



Shopper analytics



Home caring

New computation and data capture is growing on Wearable and Mobile devices

Four tier architecture

Distributed application deployment topologies – from Single App to Multi App Multi Device

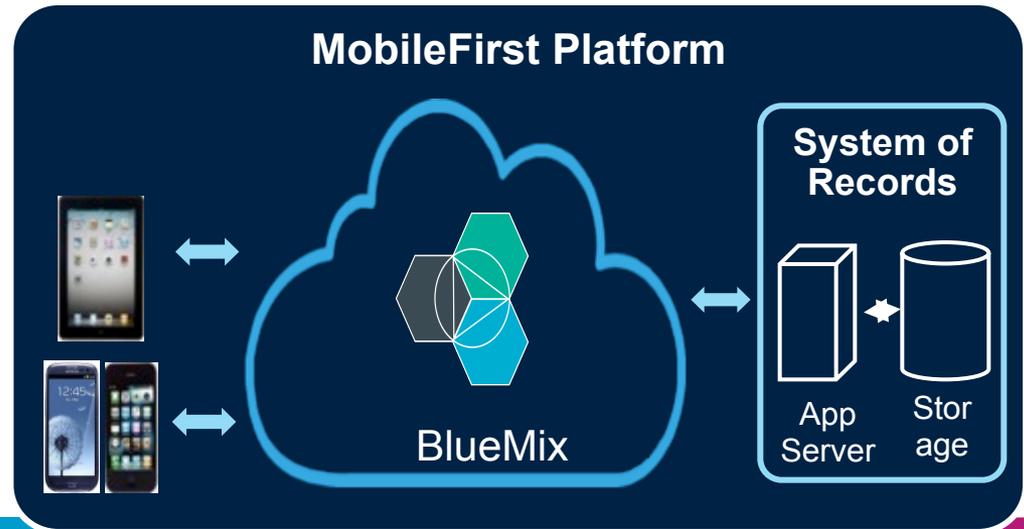
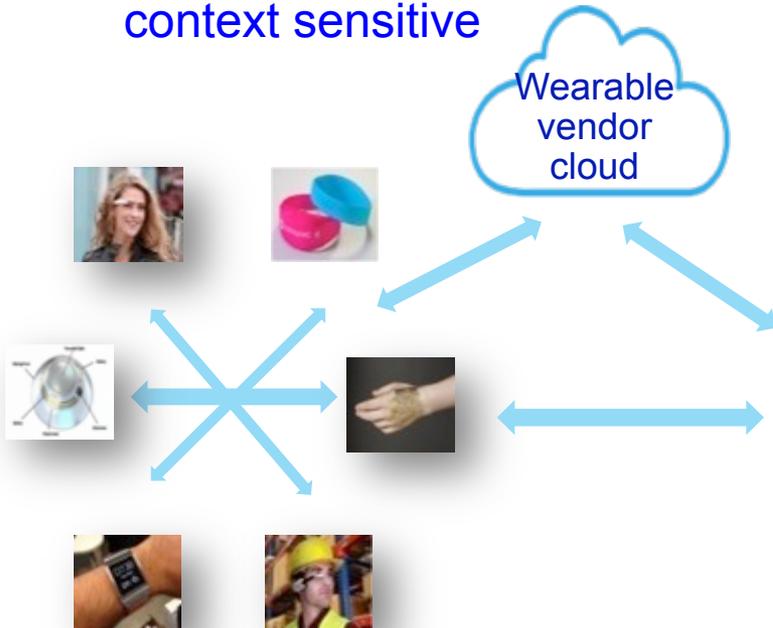
Diverse SDKs and device APIs

Dynamicity - application logic is context sensitive

E2E privacy & security

Need to maintain Data consistency across tires

We need a simple programming model to overcome the complex distributed topologies





As Seen By
Stranger 2



As Seen By
Stranger 1

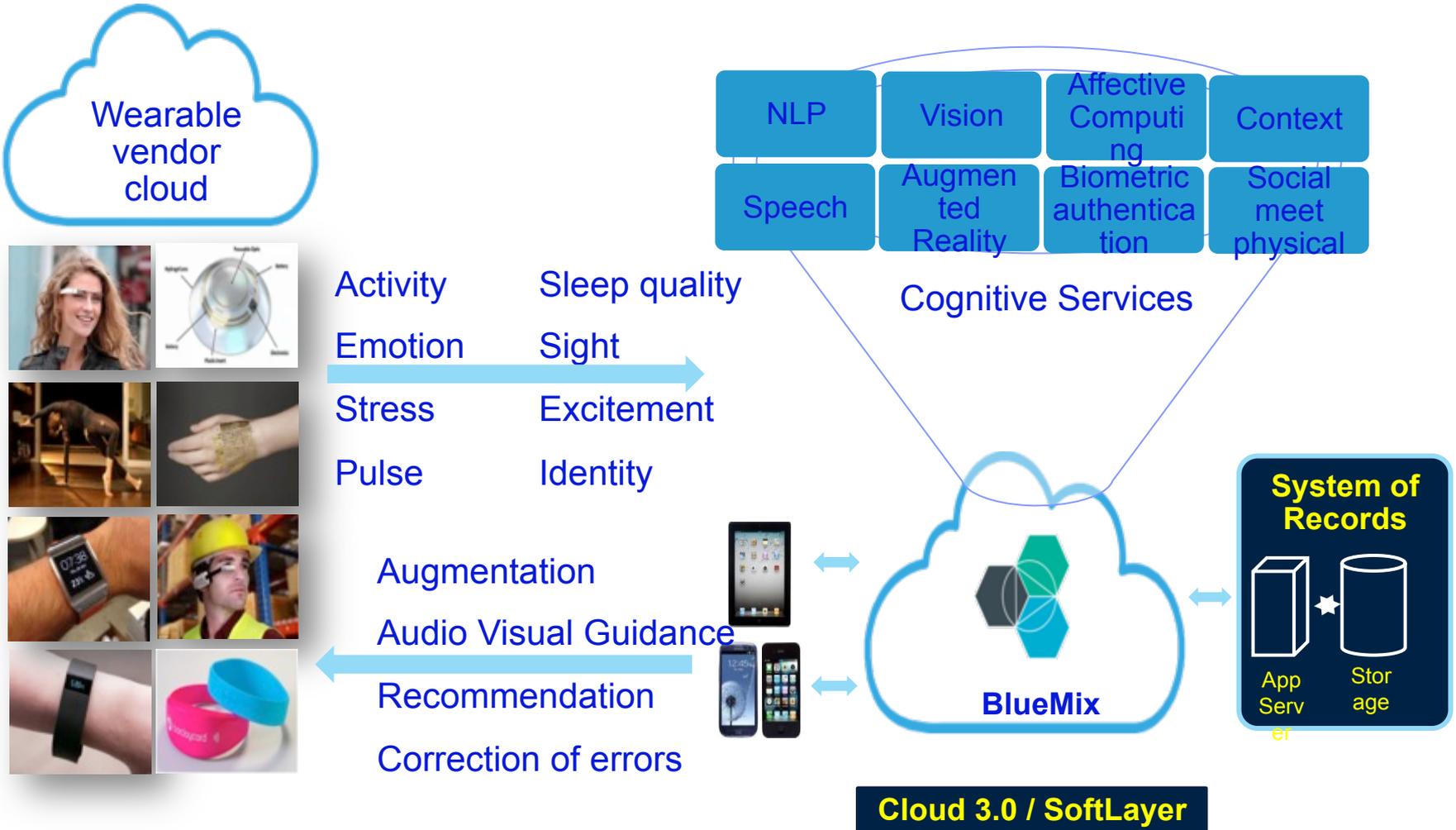


As Seen By
You



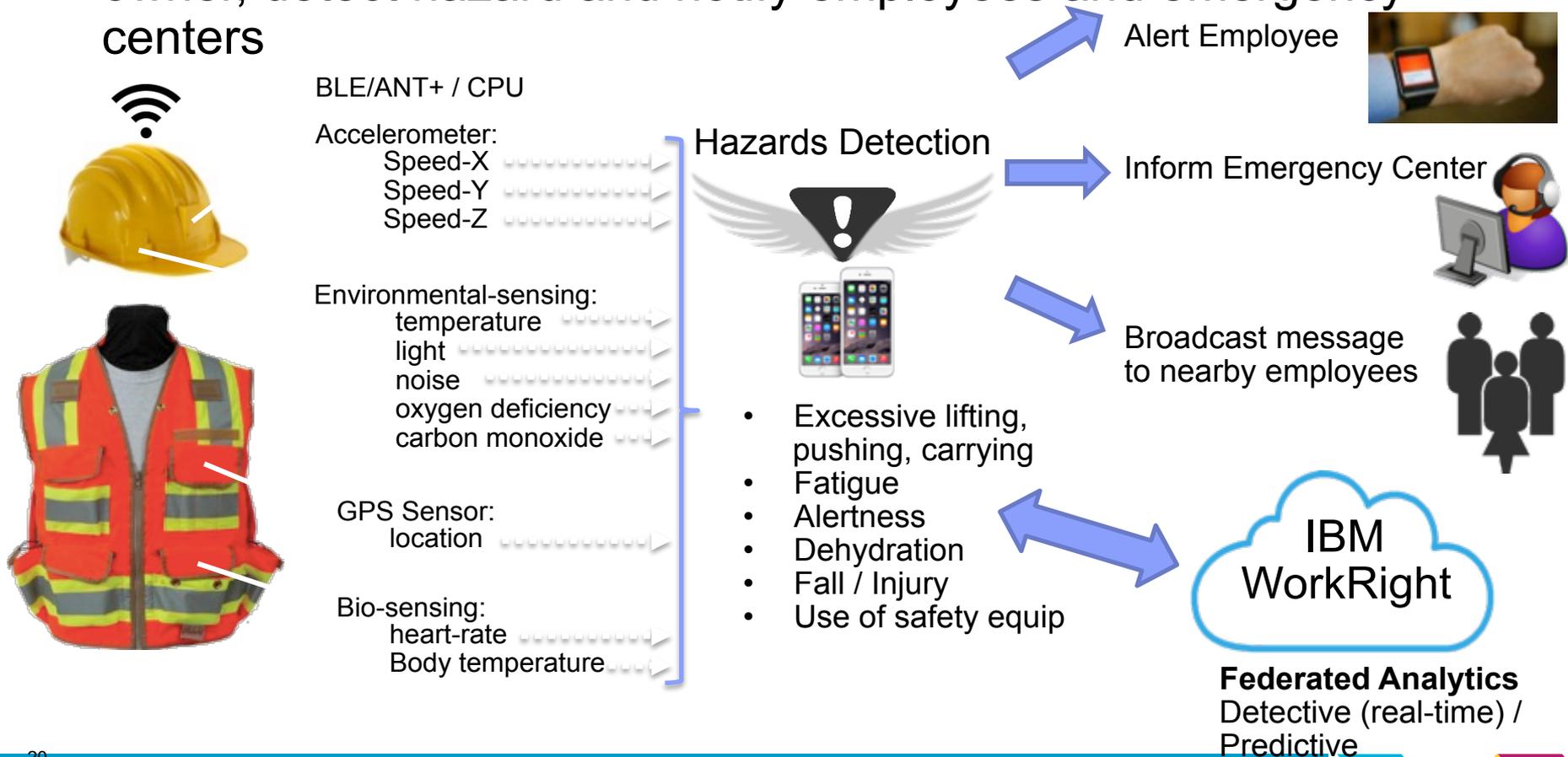
Wearables are the new I/O for cognitive and analytics

We need Cognitive systems to make sense of all this data

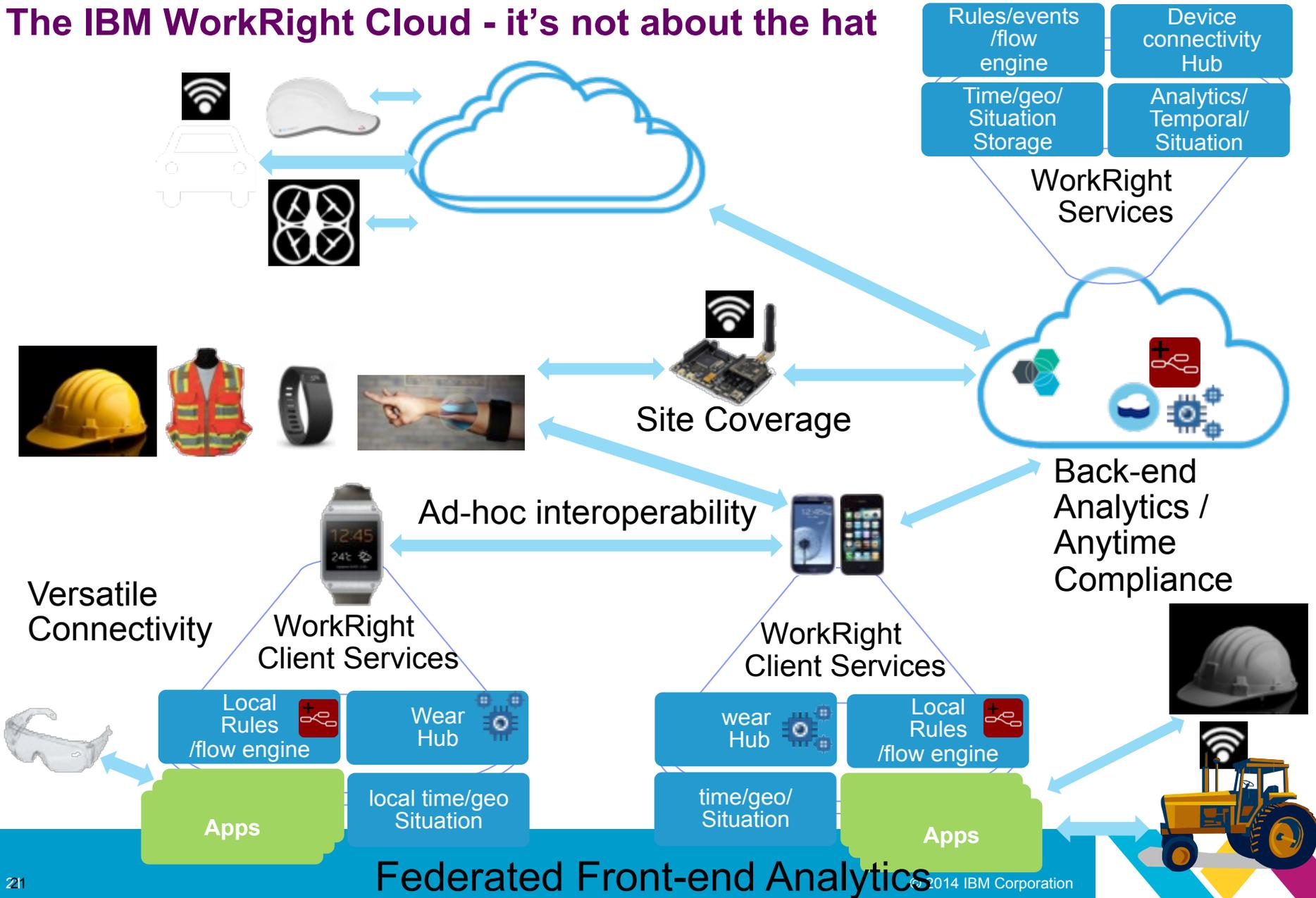


The Guardian Angel Mobile App

The Guardian Angel mobile application works as your personal protective application. It allows intuitive specification of “shields” that govern the personal wellness and safety of their owner, detect hazard and notify employees and emergency centers



The IBM WorkRight Cloud - it's not about the hat



Demo Workright



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



Augmented Reality for Maintenance - Challenges

- Vision Challenge
 - Non planar objects
 - various faces look different
 - 2D/3D mapping capabilities
 - Working with 3D objects
 - Natural Augmentation
 - Realtime considerations
 - Fast yet accurate pose estimation
 - Various lighting conditions
 - Outdoor/indoor noise/saturation

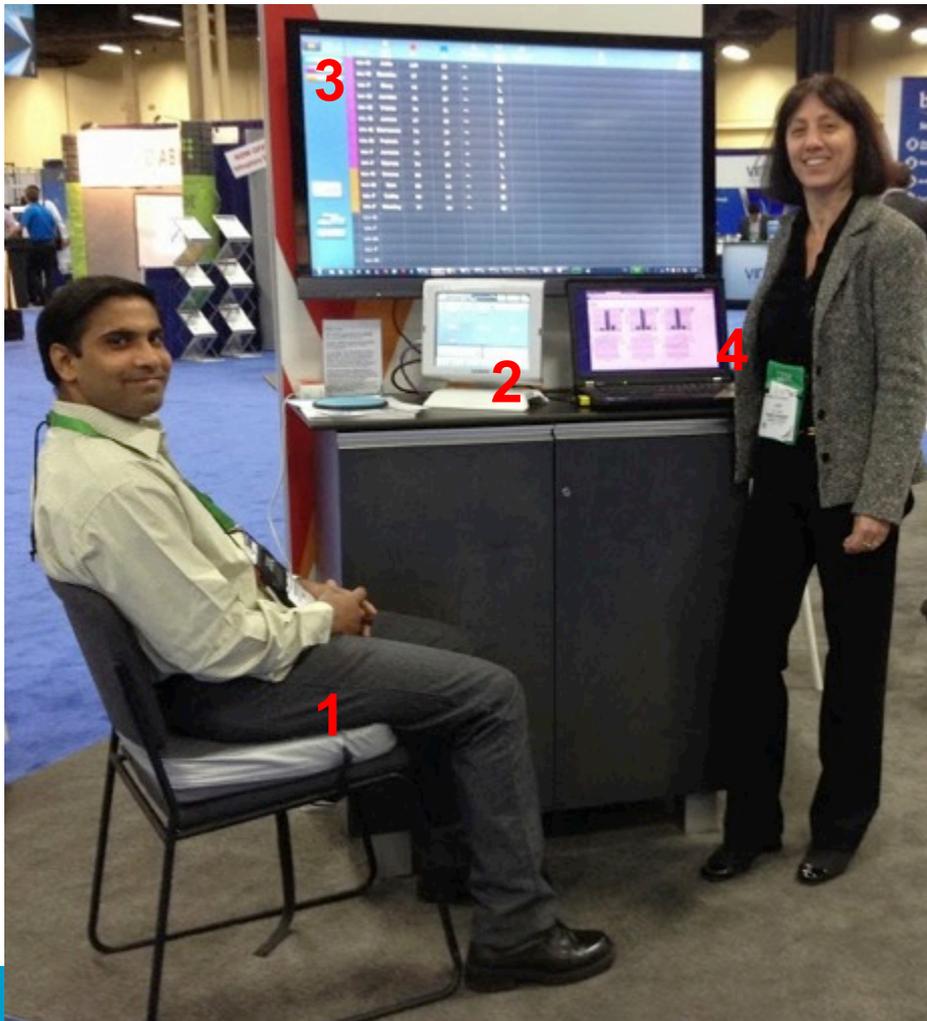


Demo AR



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](#)



Demo Mobile IoT Convergence



Outline

The challenges of mobile development, runtime and management

Adhoc Computing – Wearable meets Cognitive

Mobile Analytics - Making Sense of all this Data

Advanced Runtime and Development Services for Mobile 2.0



A 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



Smarter Systems Need to Respond to Space and Time Situations



Risk Management

Enhance maritime risk management done by customs agencies with analysis of vessel route and movement patterns



Fleet Management

Allow operators to track and trace their fleet, assist to drivers and monitor dangerous driving behavior



Retail

Offer coupons to customers who drove near a store 3 times in the past week

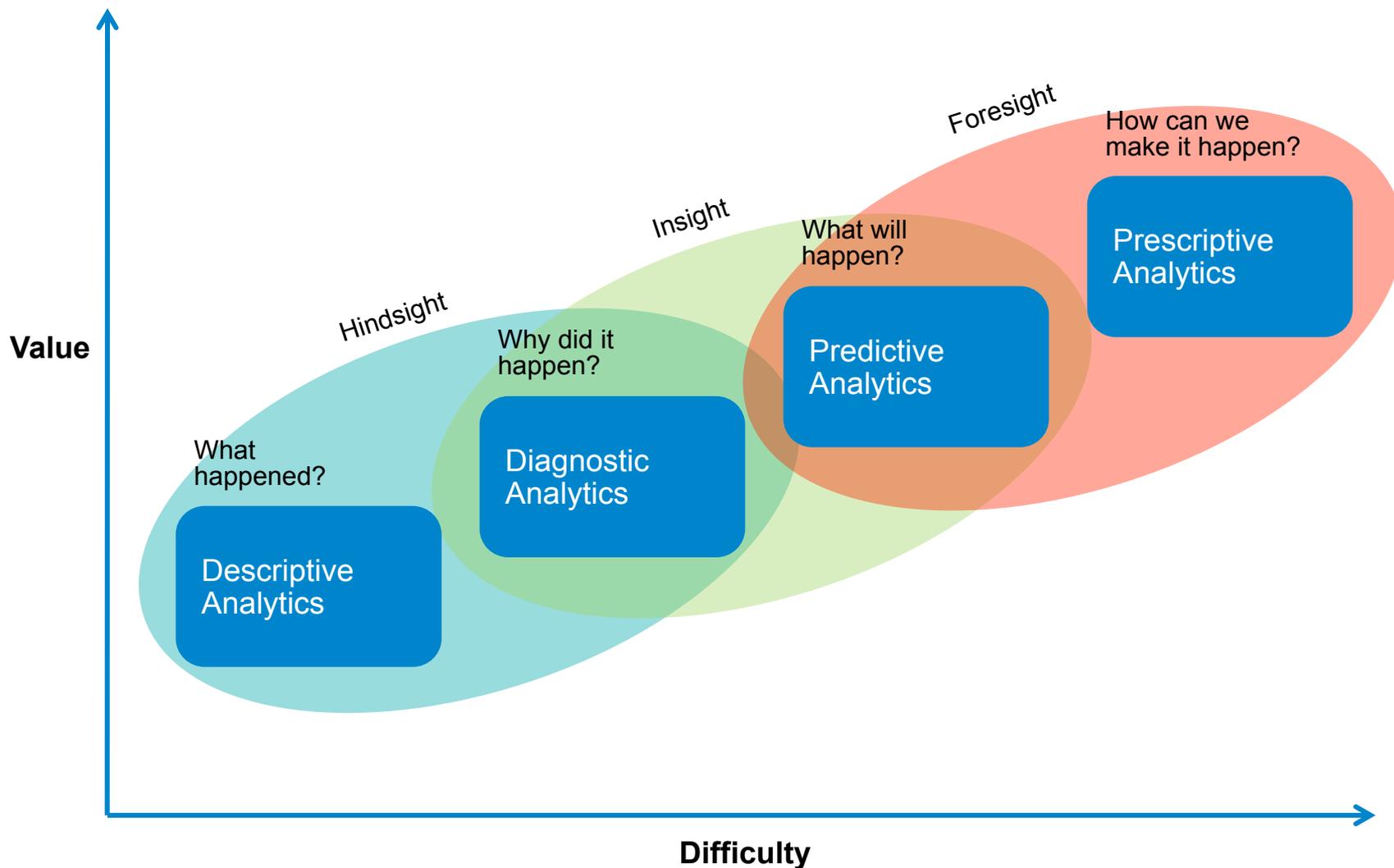


Safety and Security

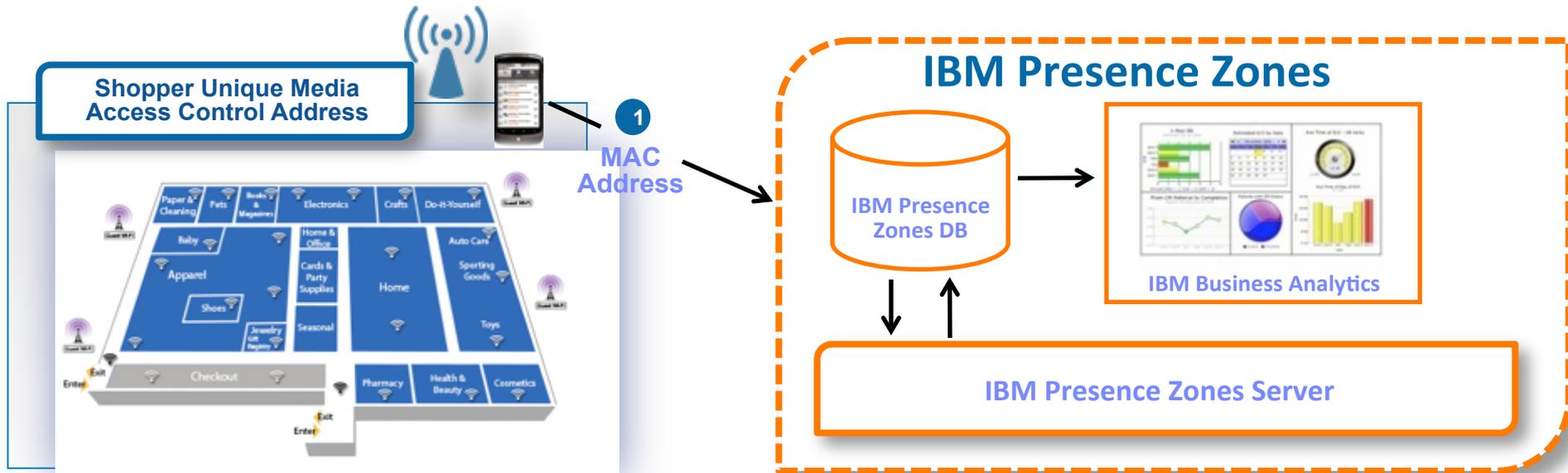
Alert when detecting inadvertent entrance to restricted zones or dangerous patterns, e.g. vehicles approaching each other



Analytics Explained



Innovative In-Store Customer Presence Detection



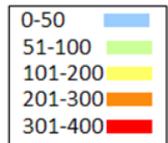
Taking digital traffic analysis to the store ²

Web metrics	Store metrics	Web metrics	Store metrics
Session / First session	Store visit / first store visit	Avg time per page	Time spent in each zone
Unique/Repeat visitor	Unique/rep store visitor	Traffic volume	Total visitors to store
Session duration	Store entry/exit duration	Bounce rate	Short durations, no zones visited
Page views per session	Number of zones visited	Frequency per unique visitor	Number of zones visited
Avg new/repeat session len	Avg time spent in store; new/rep	Unique visitor per store / time	Recurring store entries

Marketing manager gets trends analysis



Date:2013-10-03

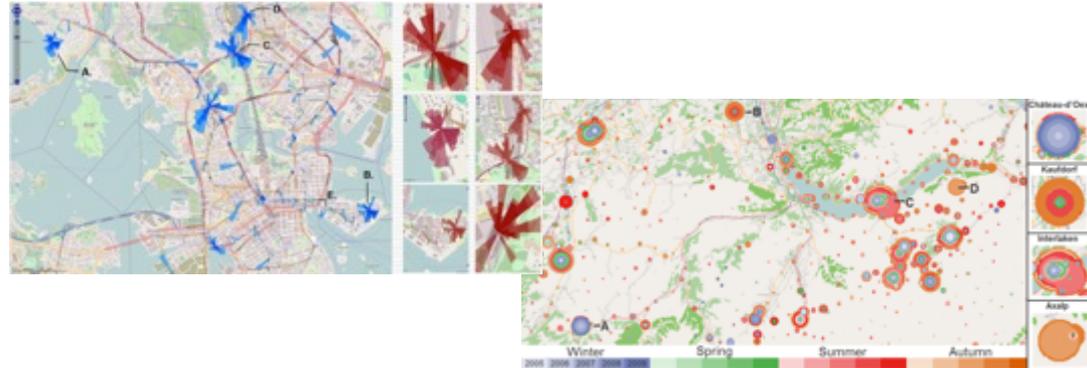


IBM Spatiotemporal Analytical Workbench

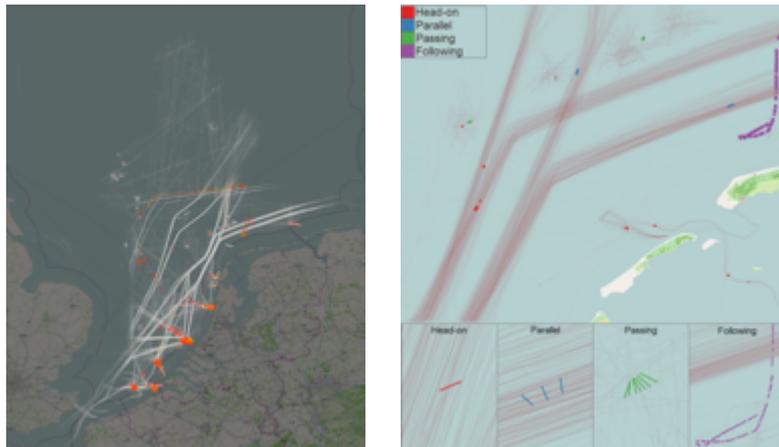
Combining Advanced ST Analysis + Advanced Visualization + User Interaction



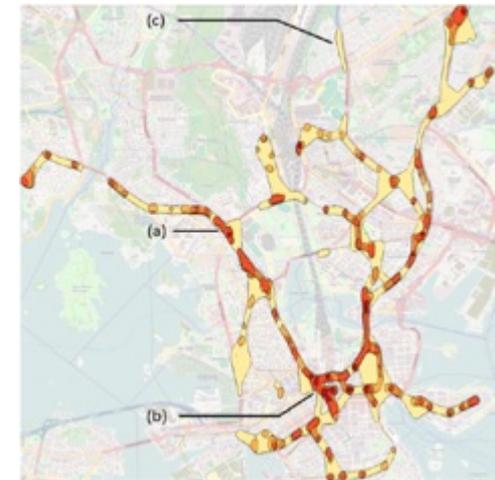
Movement analysis and pattern detection In public transportation



Understanding temporal distribution of event data



Movement analysis, clustering and pattern detection in maritime transportation



Spatiotemporal clustering of events and locations



Demo VA



Basic backend location-based services (LBS)

Spatiotemporal Context Management

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

Order tracking

Tracking no: 23663-24562-122
See your order >>

Status	On route	Location
	Estimated arrival in 1 day February 20, 2006 Priority air courier	In flight from Chicago to Paris

Route

01	Packing your order February 18, 2006 - 11:32 AM	amazon.com
02	Pickup by FedEx February 18, 2006 - 3:02 PM	FedEx Express
	On route by ground	
03	FedEx hub, Chicago February 18, 2006 - 8:27 PM	FedEx Express
	On route by air	
04	FedEx hub, Paris Est. arrival: February 19, 2006 - 7:25 AM	FedEx Express
05	European customs check	
	On route by ground	
06	FedEx hub, Bordeaux (FR) Est. arrival in 1 day	FedEx Express
	On route by ground	
07	Delivered to you Est. arrival in 1 day	FedEx Express

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



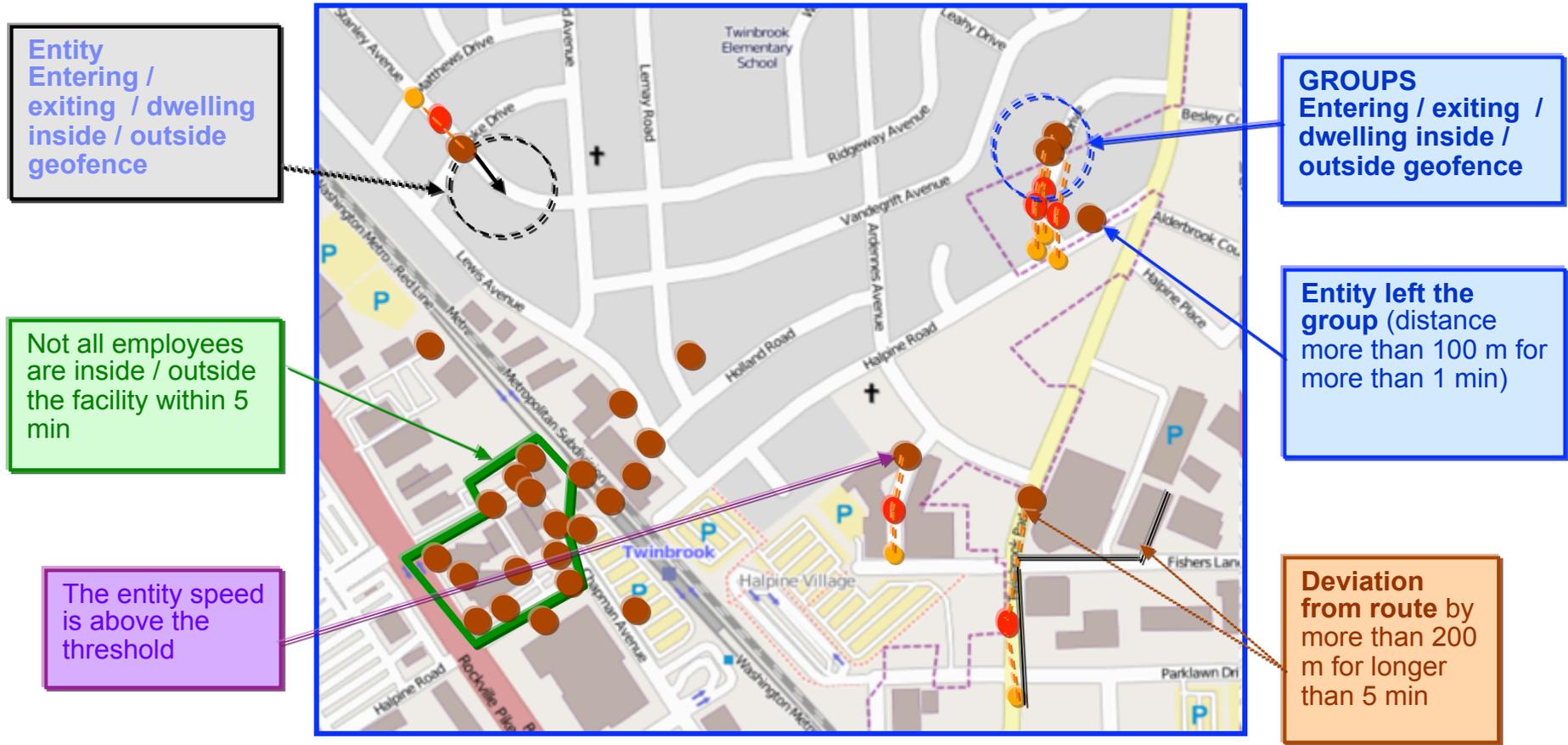
Geospatial triggers

- 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



Demo Location



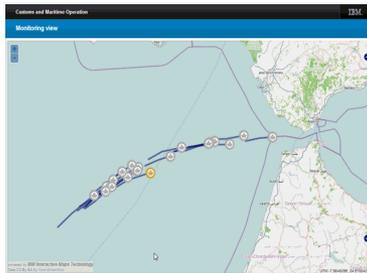
Technologies implementing S/T Solutions



AN

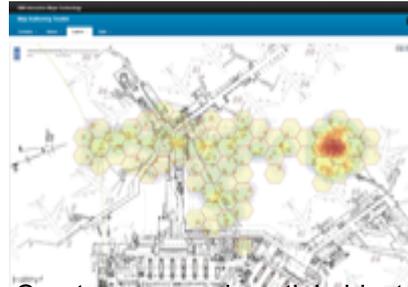
Visualization & VA

IBM Interactive Maps Technology



Embed interactive map-based visualizations for data-in-motion in web apps

IBM Map Authoring Toolkit



Create maps and spatial objects. Assign business meaning to locations

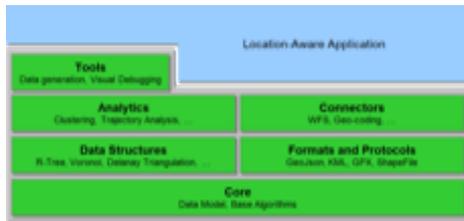
IBM Spatiotemporal Analytics Workbench



Create insight from spatiotemporal big data

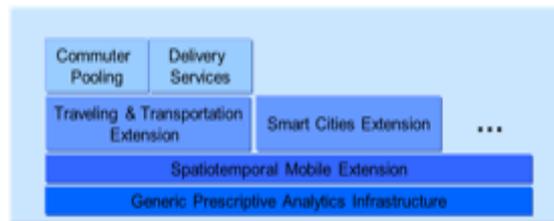
Analytics Engines & Toolkits

IBM Location Intelligence Toolkit



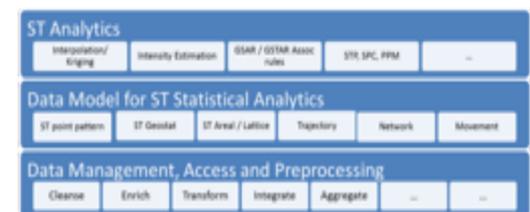
Standards-based libraries and tools for developing location-aware applications

Prescriptive ST Mobile Analytics



Automatically suggest behavioral policies for mobile entities and systems

Predictive ST Mobile Analytics



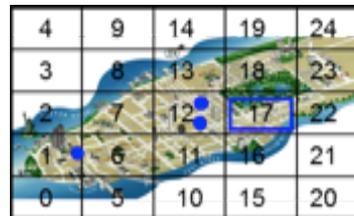
Provide actionable insight in the context of mobile platform and its data

Runtime Services

Presence Zones Indoor Location Based Services

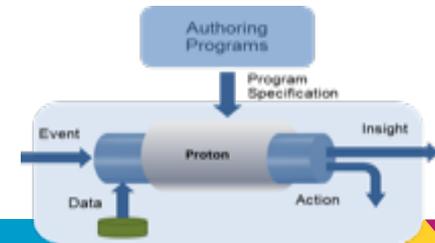


Scalable Geo-fence Technology



Highly scalable dynamically adjusting grid-based spatial indexing

IBM Proactive Technology Online



Scalable engine for complex event processing

Outline

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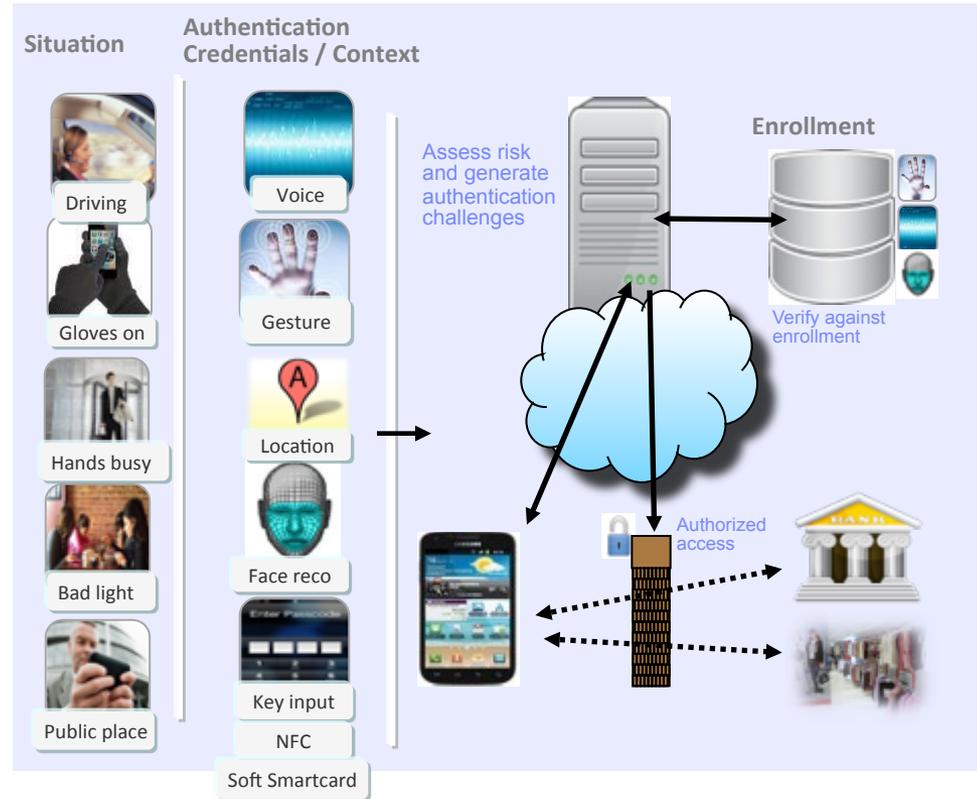
Mobile Analytics - Making Sense of all this Data

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Secure Multi-Modal Context Based Authentication

Business Concern	Solution Approach
New risks associated with mobile device accessing the enterprise / services	Use context and strong authentication to reduce unauthorized access risk
“Compliant” userid / password entry on mobile devices has low user satisfaction	Use mobile device built-in sensors -- alternative authentication modalities, including biometrics. Eliminate traditional 2 factor hardware tokens.
Mobile devices have become security tokens (credential caching) that are easily lost or stolen	
User interaction with mobile devices is brief, dominated by authentication	Balance security requirements with improved usability
Situational Impairments	Multi-factor authentication allows selection of authentication modality appropriate for the context



Reduce security risk through context aware usable strong authentication and risk-based access



Demo Biometric Auth.



Rapid mobile application development IBM Worklight App Framework

Wizard-based enterprise and public API discovery

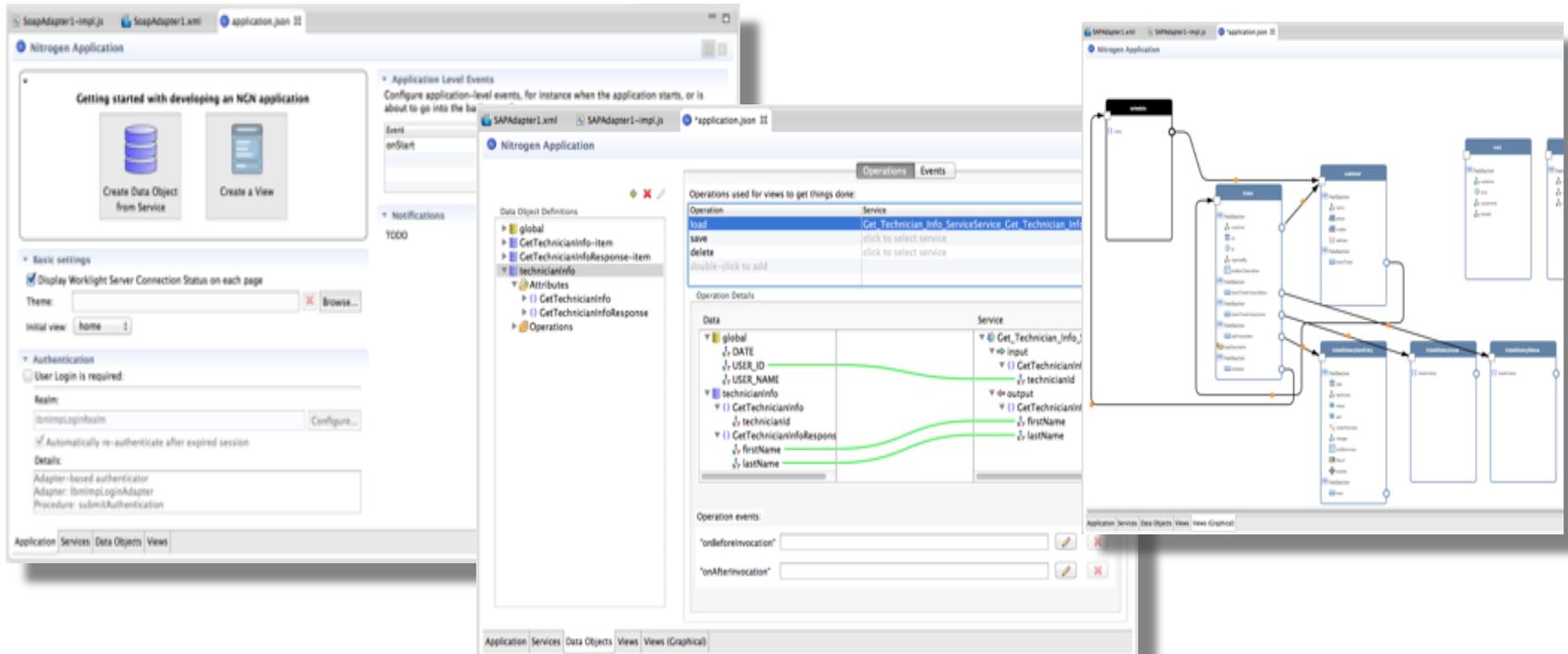
Extensibility of app logic and UI components

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



Exec Summary

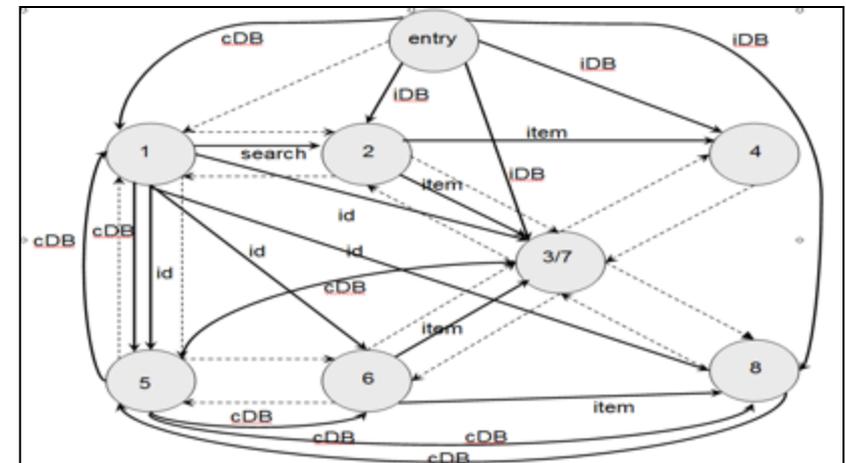
- Automatically identify and fix **syntactic**, **semantic** and global **anti-patterns** in mobile applications
- Identify and collect semantic and syntactic anti patterns and best practices for improving the application **UX and Performance**.
- Dynamically optimize applications according to the user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



Exec Summary

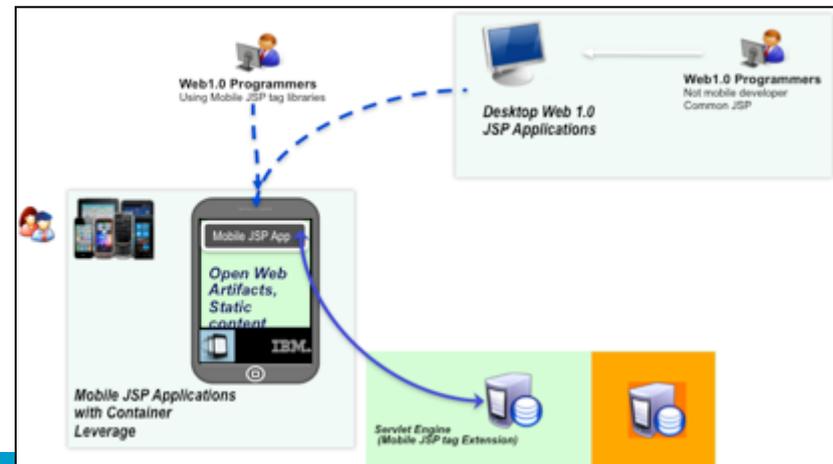
- Enable customers to easily extend their existing Web1.0 (JSP) application to mobile while leveraging existing technology (code & skills) with the UI and the UX expected from a mobile app.
- Provide mobile JSP tag libraries for enriching Web1.0 applications as well as native WL client containers, for 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

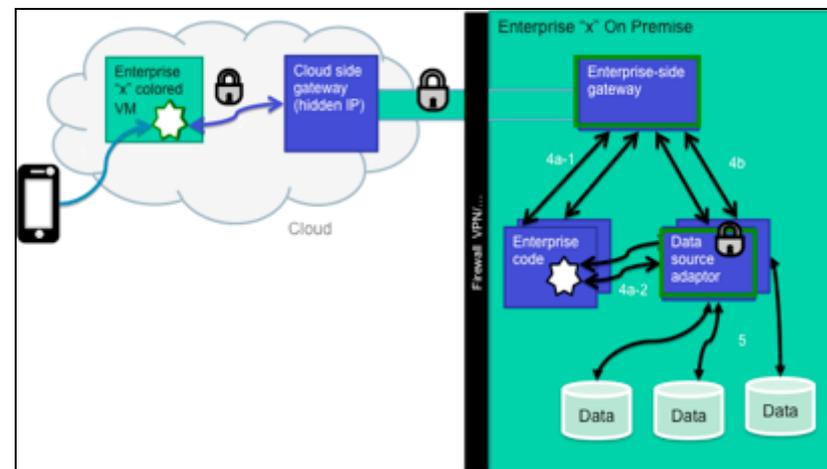


Exec Summary

- **A framework for secure and controlled delivery of enterprise data to the cloud, which**
 - Encapsulates an end-to-end security solution that protects the data on its way to and inside the cloud
 - Incorporates a secure tunnel between the enterprise and the cloud
 - Seamlessly integrates with the enterprise data-sources
 - Allows a fine-grained control over the data items that leave the enterprise boundaries, which is realized via access rules and censorship transformations
 - Supports in-enterprise processing of data
 - The only way to handle classified data that must not be shipped to the cloud
 - Also helps reducing the amount of data to be transmitted
 - Is a vehicle for complex censorship transformations and access checks

▪ Business Value

- A cost-effective, drop-dead simple solution for secure cloud-to-enterprise connectivity
 - A simple mobile app project no longer has to become a complex and costly security project which takes ages to be approved by CISO
- Makes a strong case for IBM cloud offering
- Allows to switch from backend-powered Worklight adaptors to cloud-based solutions (which is something that customers and partners are already looking for)





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