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**GGIM: Future Proofing the Provision of Geoinformation -
Emerging Technologies: Connecting Place.**

Steven Hagan, Vice President, Server Technologies



1 **NEW** DEFINITION IS ADDED ON **UPDICTION**

1,600+ **READS ON Scribd.**

13,000+ HOURS **MUSIC** STREAMING ON **PANDORA**

12,000+ **NEW ADS** POSTED ON **craigslist**

370,000+ MINUTES **VOICE CALLS** ON **skype**

98,000+ **TWEETS**



320+ **NEW** **twitter** ACCOUNTS

100+ **NEW** **LinkedIn** ACCOUNTS

1 **NEW** **associated content** ARTICLE IS PUBLISHED

THE **WORLD'S** **LARGEST** **COMMUNITY** **CREATED** **CONTENT!**

20,000+ **NEW** **POSTS** ON **tumblr.**

13,000+ **iPhone** APPLICATIONS **DOWNLOADED**



QUESTIONS **ASKED** **ON** **THE** **INTERNET...**

100+

Answers.com

40+

YAHOO! Answers

25+ HOURS **TOTAL** **DURATION**



600+ **NEW** **VIDEOS**

70+ **DOMAINS** **REGISTERED**

60+ **NEW** **BLOGS**

1,500+ **BLOG** **POSTS**

168 MILLION **EMAILS** **ARE** **SENT**

694,445 **SEARCH** **QUERIES**

1,700+ **Firefox** **DOWNLOADS**

695,000+ **facebook** **STATUS** **UPDATES**

50+ **WORDPRESS** **DOWNLOADS**

79,364 **WALL** **POSTS**

125+ **PLUGIN** **DOWNLOADS**

510,040 **COMMENTS**

GO-Globe.com



Global Drivers for Connecting Place

- BIG Data – Terabytes, Petabytes, Exabytes, Zettabytes, Yottabytes
 - Sensors, RFID, LIDAR, Raster, 3D, Terrain and City Models
 - Tagged Data, Social Media, Semantics, Ontologies
 - SDIs, INSPIRE, Linked Open Data -- Persistent Relationships
- BIG Hardware:
 - CLOUD Platforms – Public and Private
 - Cheaper, more powerful – Clusters of Commodity Servers, Virtualization: = Greener
 - Massively parallel database machines – Software Enablement - Hadoop
- BIG Software –
 - Spatially Enable All Applications: ERP, CRM, Business Intelligence, Public Sectors
 - Real Time Analytics – Spatially Aware: Biggest value from fastest response – Streams and Events -- Internet of Things
 - Support Standards – OGC, ISO
 - CyberSecurity
 - Engineered Systems – Fully installed and tested (Labor Cost is now Dominant Factor)

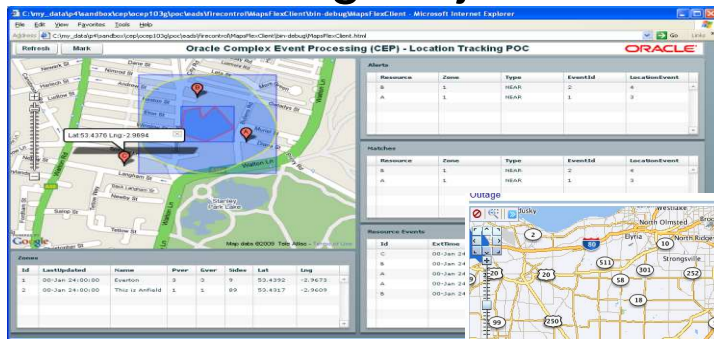
Data Volume & Variety Explosion Continues - Terabytes, Petabytes, Exabytes, Zettabytes



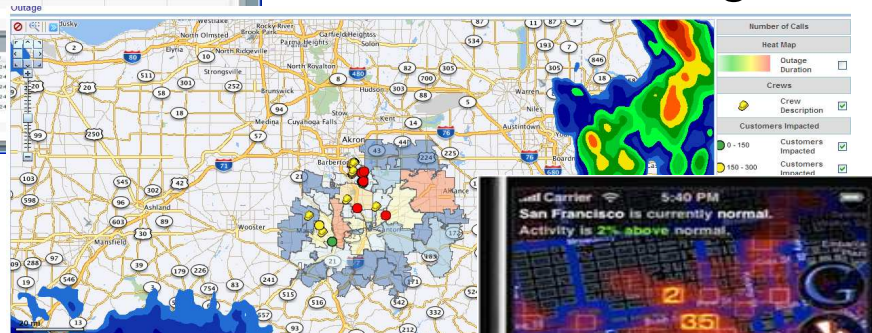
- Sensors, RFID, LIDAR, Raster, 3D, Terrain and City Models, SDIs
- New data products for consumers, mobility, defense, intelligence, land and water mgmt, transportation, environment, agriculture, and constituent services
- Terrain Models and 3D for planning, maintenance, emergency response, tourism
- Tagged Data , Semantics , Ontologies -
- Location is a Powerful Organizing Principle
- Integrate Social Media (Video, Audio, Text, Wikis, Facebook, Imagery) with Spatial

Data Velocity: Spatially-aware Real-Time Streams / Events / “Internet of Things”

Track Moving Objects – Cars, UAVs




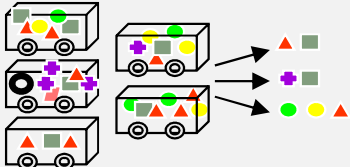
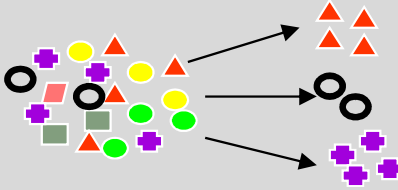
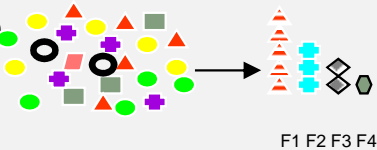
Real-Time Business Intelligence



Real-Time Pattern Detection

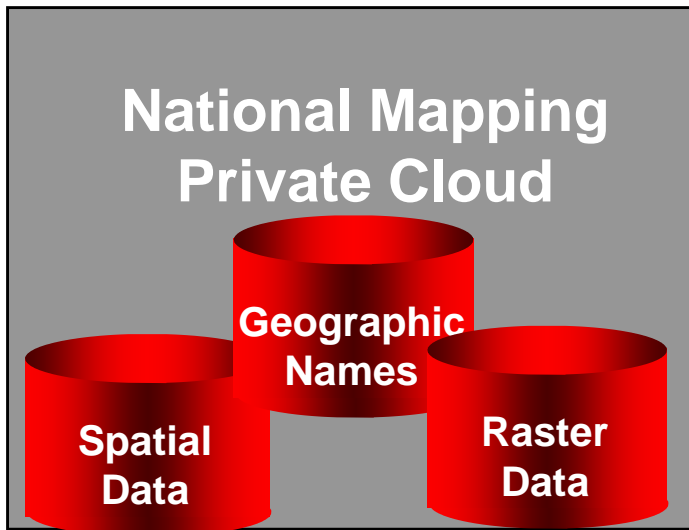
- Ultra-high throughput (1 million/sec++) and microsecond latency
- Detect patterns in the flow of events and message payloads, CEP
- Filtering, correlation, and aggregation across event sources
- Business Intelligence in Real Time

Connecting: Tools to Find Connections: Discovery & Predictive Analysis

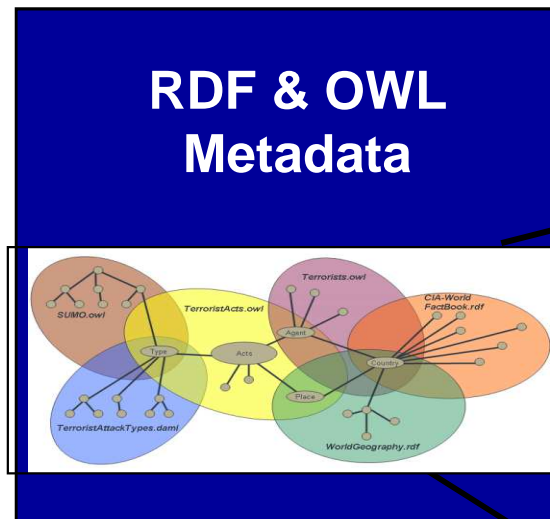
Problem Classification	Sample Problem
<p>Anomaly Detection</p> 	<p>Given demographic data about a set of customers, identify customer purchasing behavior that is significantly different from the norm (Fraud?) . For Sensors, Events – problem? Good News?</p>
<p>Association Rules</p> 	<p>Find the items that tend to be purchased together and specify their relationship – market basket analysis</p>
<p>Clustering</p> 	<p>Segment demographic data into clusters and rank the probability that an individual will belong to a given cluster. For customers / govt constituents, what do they want to know about?</p>
<p>Feature Extraction</p> 	<p>Given demographic data about a set of customers, group the attributes into general characteristics of the customers</p>

Ontology-driven Geospatial Applications - Connect Actionable Knowledge

Application Ontologies



- Simple Features
- GeoRaster
- Topology
- Networks
- Gazetteers



- Data Integration
- National Map schemas
- Geographic names
- Temporal
- Naïve Geography



Environmental Monitoring



Famine Relief



Disaster Response

Connecting: Seeking Order through Standards

- ISO
 - TC 211
 - TC 204
- Open Geospatial Consortium(OGC)
 - Simple Features
 - GML
 - Web Services
- De-facto Standards
 - SHP, MGE, DXF, KML
- Professional Standards
 - ISPRS, FIG, WMO
- Java, .NET, Flash



SQL3/MM Spatial

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UN-GGIM – Open Standards Opportunity

- Open standards are a crucial component in assuring member nations' ability to share / apply geospatial information and cooperatively respond to crisis events.
- It is extremely important to test and pilot standards, technology and information best practices in a policy context. Only then will we be able to be certain that we are prepared for future emergencies.
- Through the UN GGIM process, together with member nations, industry partners, and organizations like ISO TC/211 and the Open Geospatial Consortium and other NGO's represented here this week, we have a unique opportunity to leverage existing processes and resources to test policy readiness for future emergencies and other challenges.

NIST Definition of Cloud Computing

Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

5 Essential Characteristics

- On-demand self-service
- Resource pooling
- Rapid elasticity
- Measured service
- Broad network access

3 Service Models

- SaaS
- PaaS
- IaaS

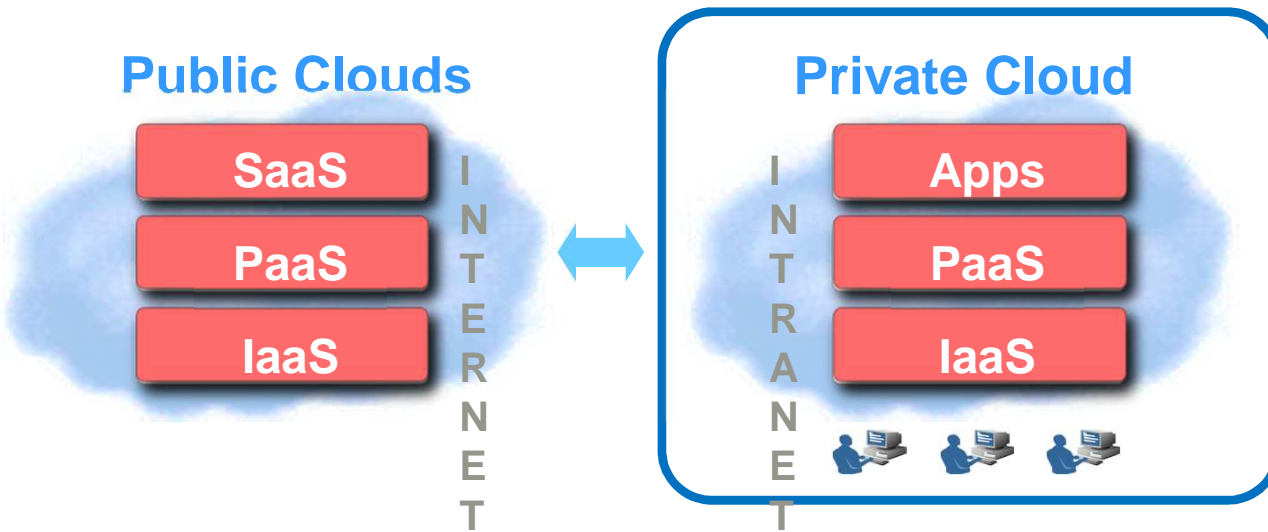
4 Deployment Models

- Public Cloud
- Private Cloud
- Community Cloud
- Hybrid Cloud

Source: [NIST Definition of Cloud Computing v15](#)

Public Clouds and Private Clouds

- Used by multiple tenants on a shared basis
- Hosted and managed by cloud service provider



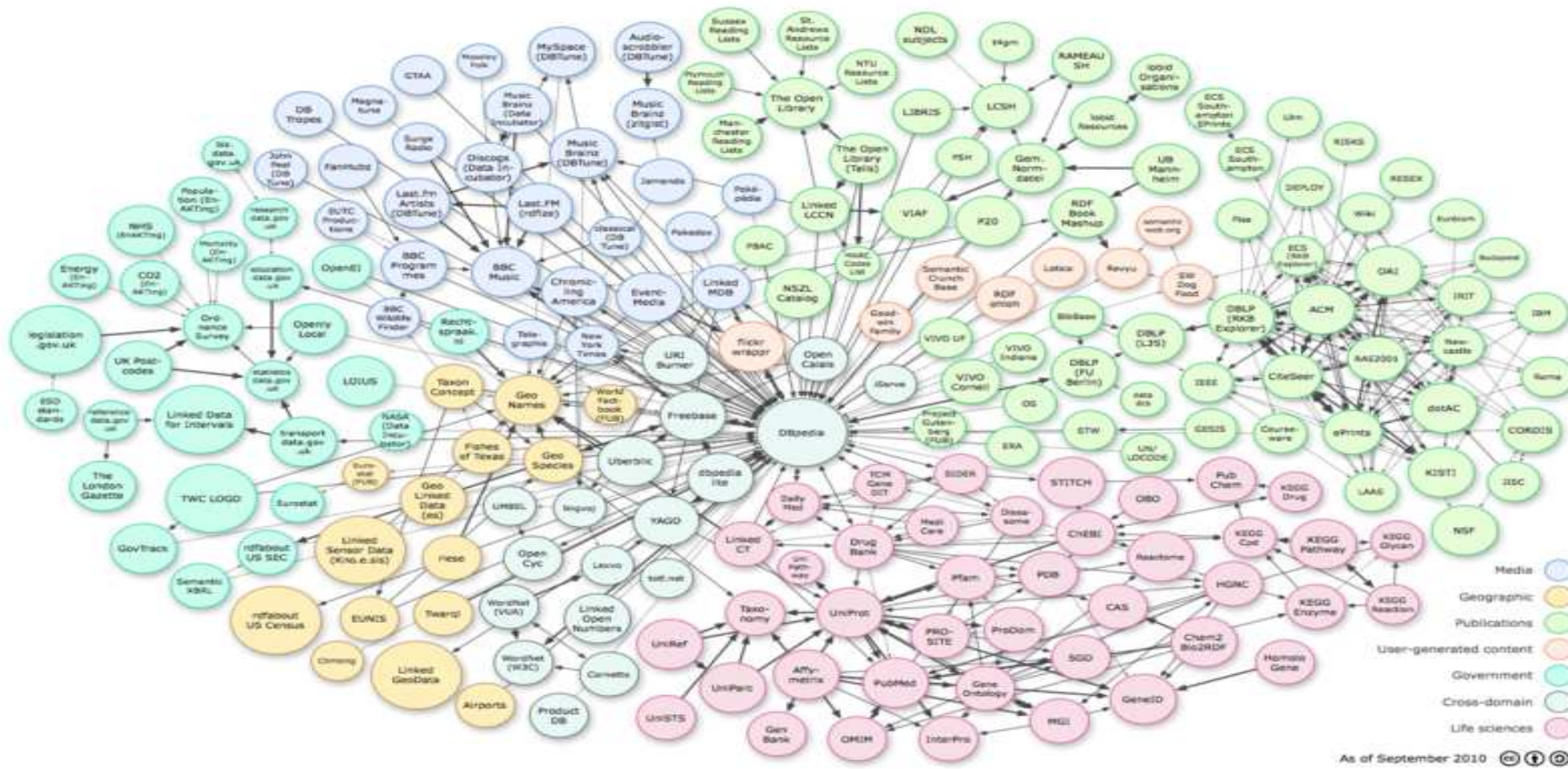
- Exclusively used by a single organization
- Controlled and managed by in-house IT

Trade-offs

Lower <i>upfront</i> costs	↔	Lower <i>total</i> costs
Outsourced management	↔	Greater control over security, compliance, QoS
OpEx	↔	CapEx & OpEx

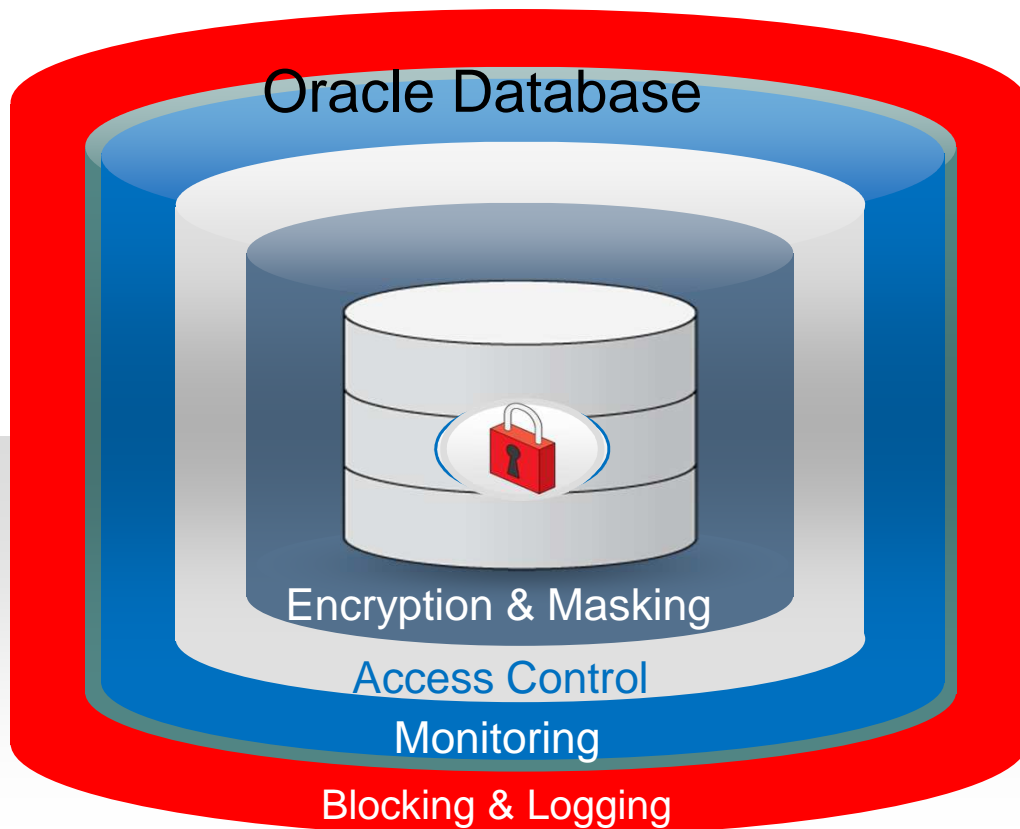
Oracle Technology Supplies both Public and Private clouds

Connecting: With other Services and Clouds



Connecting: CYBERSECURITY is Major Challenge

Information Security and Privacy



Monitoring

- Configuration Management
- Audit Vault
- Total Recall

Access Control

- Database Vault
- Label Security

Encryption & Masking

- Advanced Security
- Secure Backup
- Data Masking

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Connecting Place: Geospatial at Core

External Data Sources

Transactional & Operational Systems
 Contents Repository
 Databases
 Web resources
 Blogs, Mails, news



Financial Data

Telephone Records

Internet Traffic

Real-time Data Streams



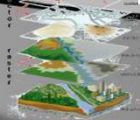
Search, Presentation, Report,
 Visualization, Query



Enterprise Data Management Infrastructure

Secured

GeoSpatial



Historical Records

POIs

Demographics
 Customer Data
 Call Records

Documents



Automatic Responses and Publishing



SMS Console Alerts



EV Grid Management



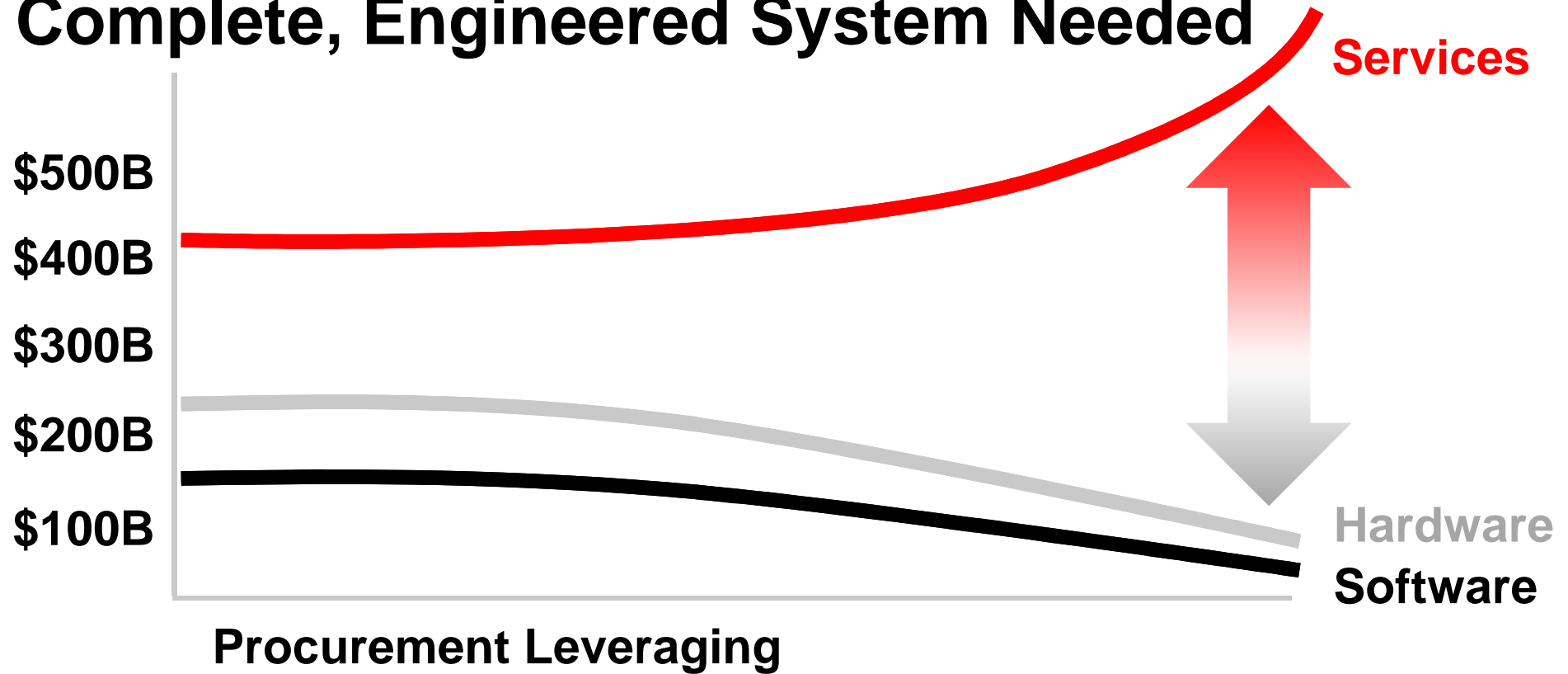
Workflow Initiation



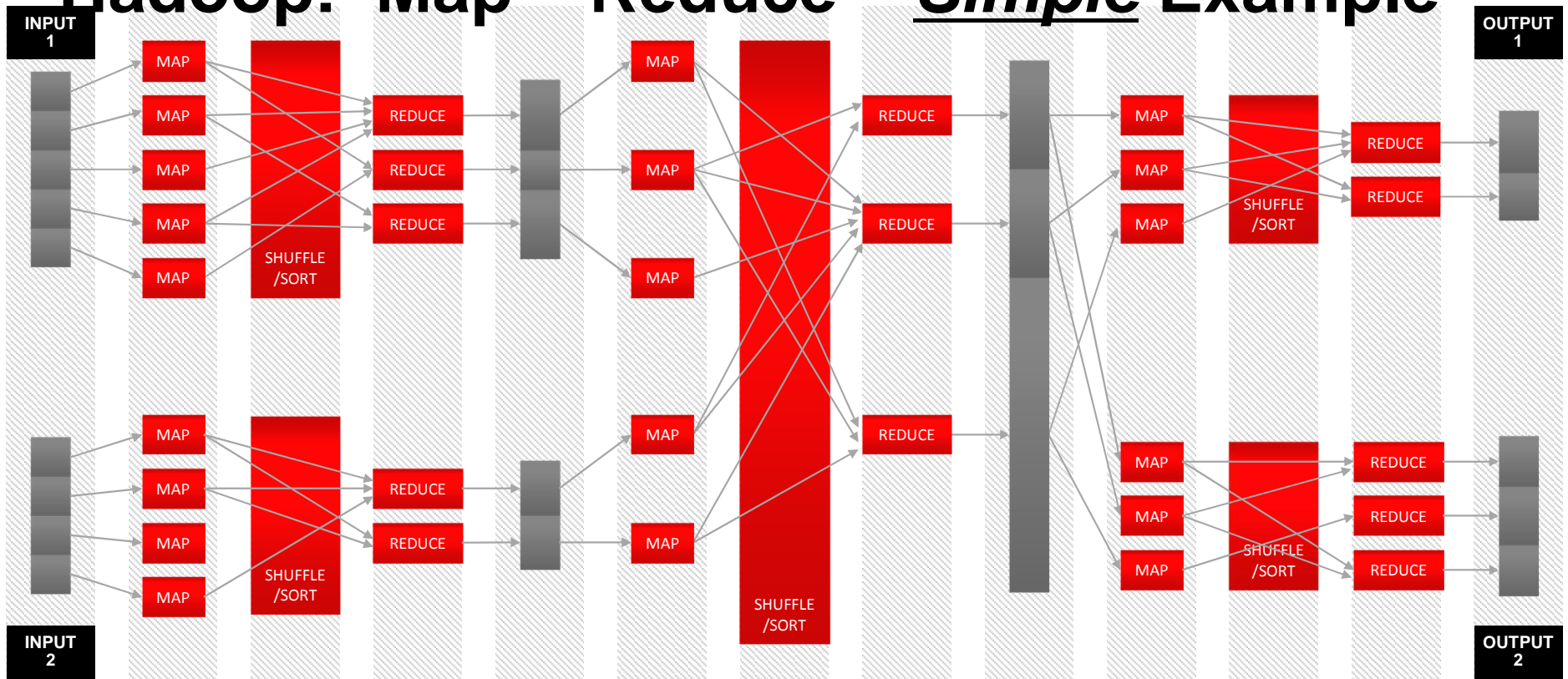
Real-time Dashboards

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HW/SW Efficiencies: But Labor Costs Growing - Complete, Engineered System Needed



Big Data: Batch-Oriented Processing using Hadoop: Map – Reduce – *Simple Example*



Open Source: Why Build Your Own Hadoop Appliance?



Time to Build
Optimizations
Maintenance

Open Source vs. Complete Systems

- CrowdSourced Geospatial Location Data
- VS.
- Certified Spatial Sources of Data
 - Use Case Examples are Ambulances / Police / Fire
- Your System – Is it Mission Critical ? Do you Depend on it?
- If System down, Are your Customers / Constituents Hurt?
- Maintenance: Do your people Add Value or do maintenance?

Connecting Place: Best With Complete Platforms

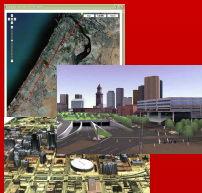
Big Data



Generated Geographic Information



Sensors Streaming Data



Geo-referenced Video, 3D, LiDAR

Simplified Spatial IT



Support for Open Standards



Spatial Database, Application Server, BI, tools



Support by Leading Partner solutions



Spatially-enabled Engineered Systems



Deep Analytics



Real-time Spatial Event Processing



Dense Visualization



Spatial Analysis

On Premise, On Cloud, Shared Services



Shared GeoSpatial Services Location Aware Everything

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Cloud Computing

Oracle Engineered Systems

