Digital Transformation through Geospatial Innovation

Steven Hagan
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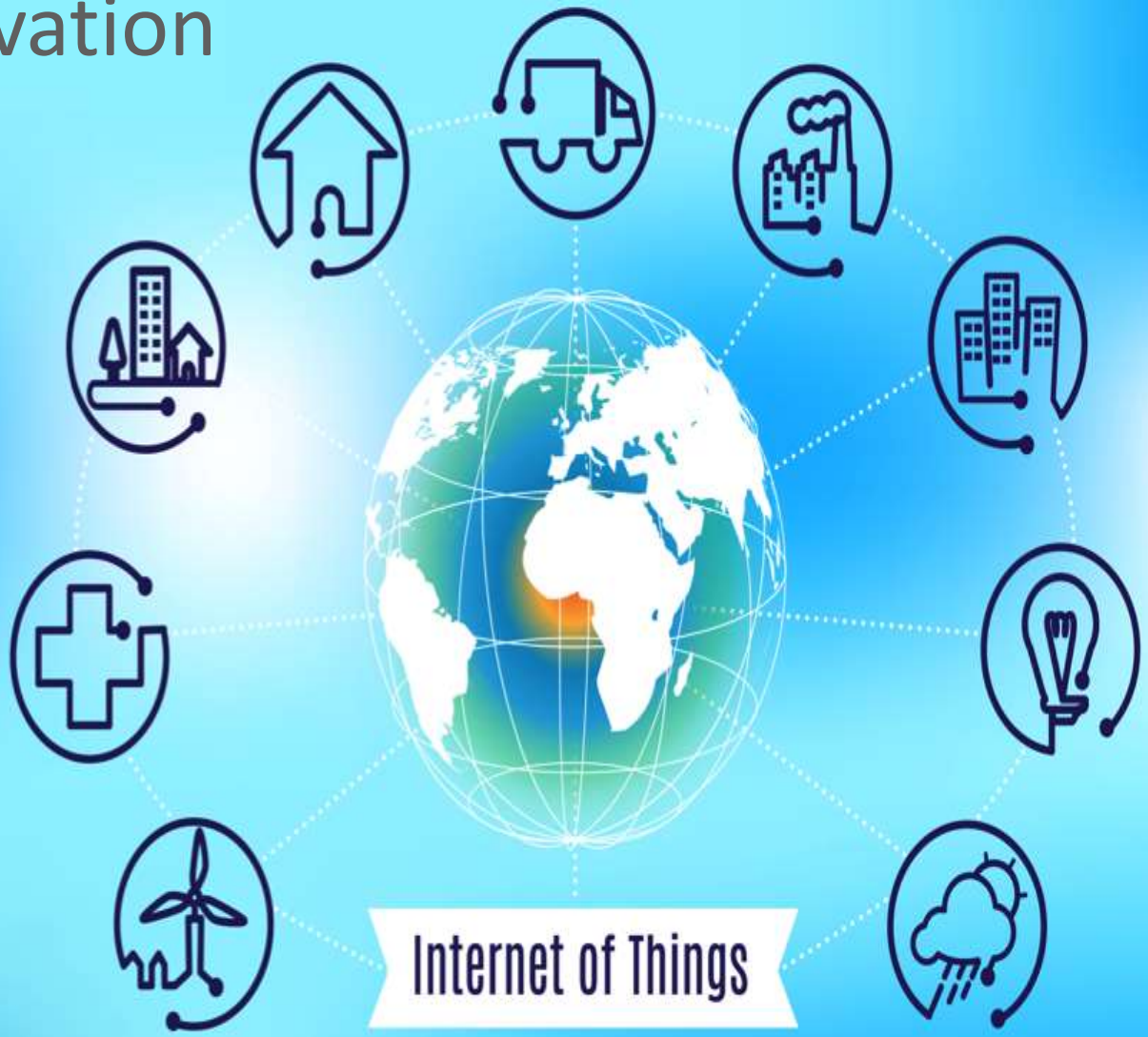
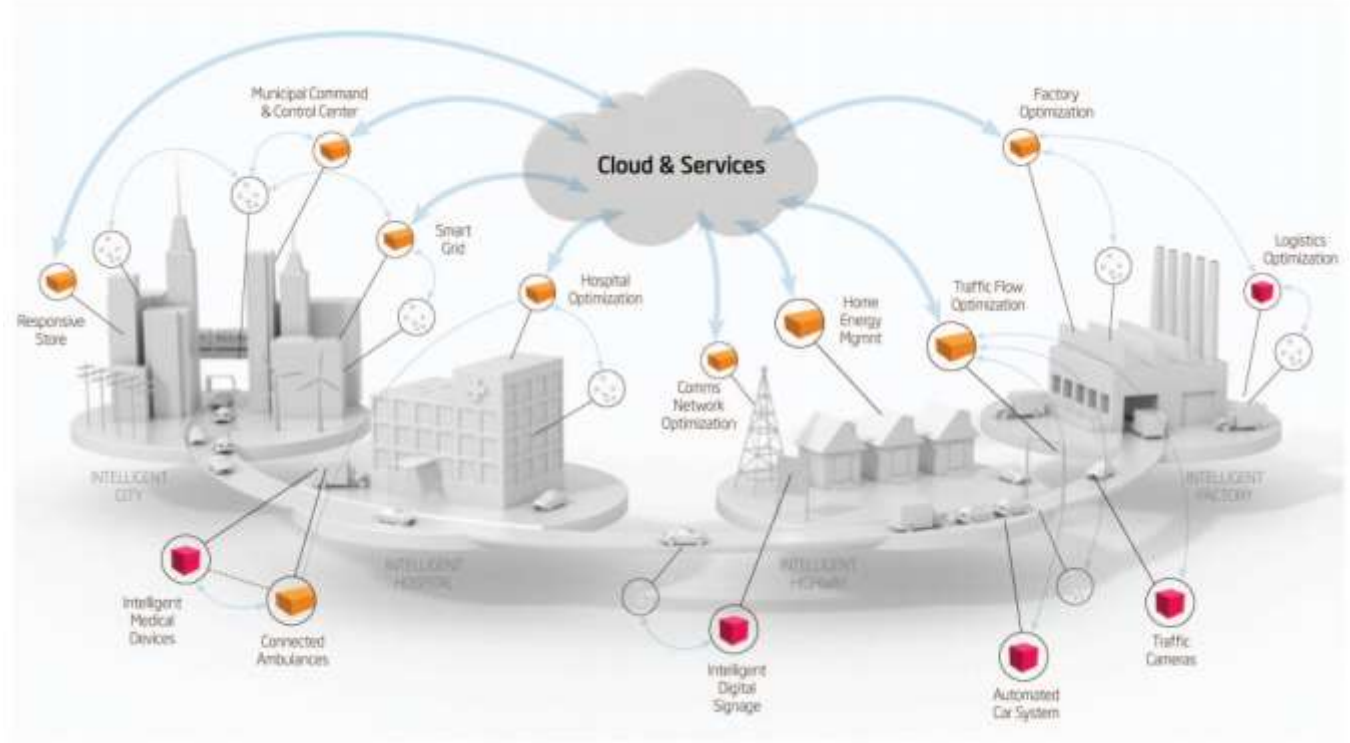
Database
Oracle

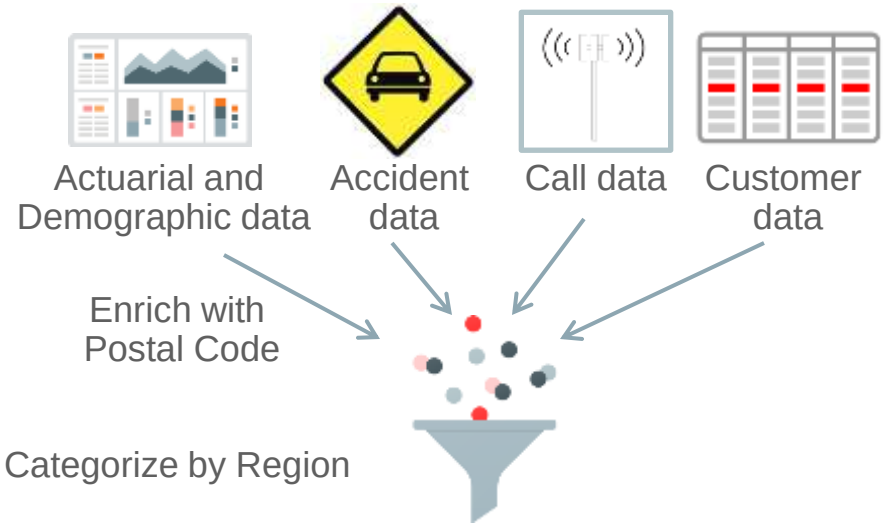


GeoSpatial Innovation Architecture

Connecting & Optimizing a System of Systems
Edge Computing, Networks & Latency, Distributed Clouds



BI / Analytics Use Case: Linking Information by Location
Insurance Industry



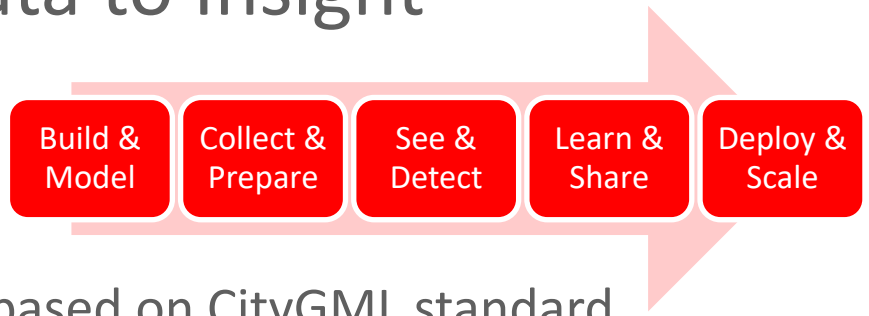
Data Products for Rate Structures Underwriting/Risk Analysis

86% Of Insurance companies agree that analyzing multiple data sources together is crucial to making accurate predictions

88% Agree that linking information by location is key to combining disparate sources of Big Data

Source: "The big data: How data analytics can yield underwriting gold."
Survey conducted by Ordnance Survey and Chartered Insurance Institute, 25 April 2013.

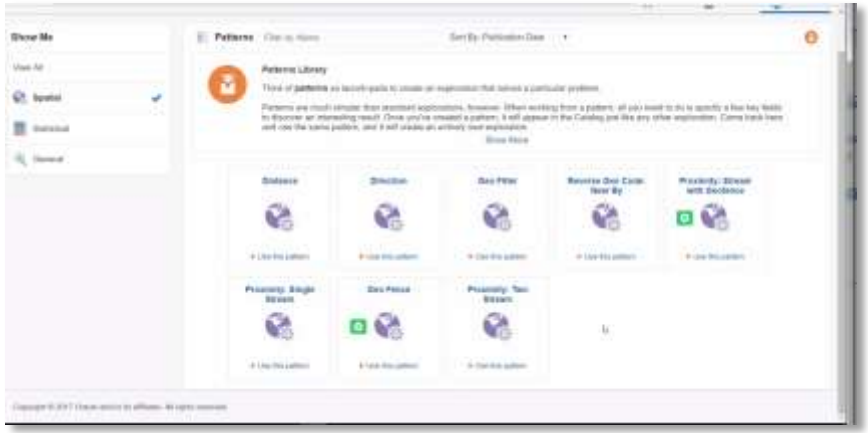
Berlin City Model: From Data to Insight



- Create a 3D city model, fully textured, based on CityGML standard
  - Spatial objects including their semantics in 3DCityDB on Oracle Spatial and Graph
- Huge amounts of LiDAR data, orthophotos and oblique imagery together with 2D data and building attributes
  - Integrated into a single database
- Either rendered (virtualcityMAP) or used for simulations
  - Economic Atlas (for City Marketing purposes), Solar Atlas, Noise Emission, ...
- Shared as open data, hosted by Berlin Business Location Center
  - Delivered as CityGML

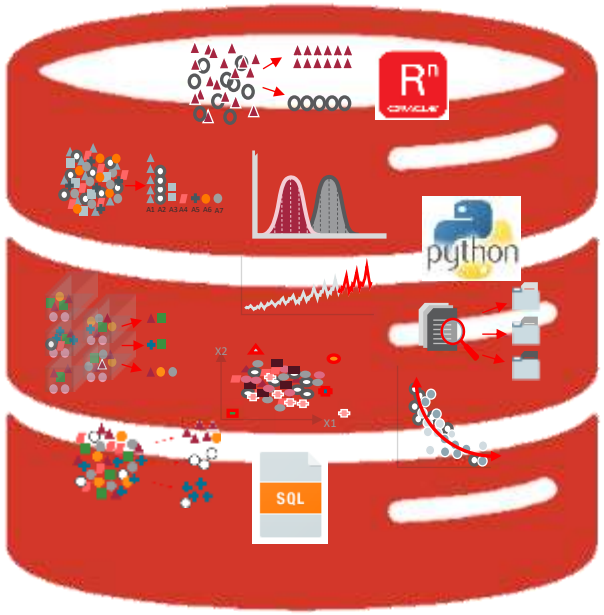
Stream Analytics: Feed the Machine Learning / AI Cloud

- Providing complex event processing on flowing streams with zero coding
  - Streaming data correlation
  - Streaming data aggregation
  - Pattern Matching
  - Spatial Analytics
  - Machine Learning probability scoring
  - Graphical Visualization
- Based on messaging integration
  - Kafka support
- Various location-related patterns prebuilt



Machine Learning Algorithms Require Data
Use Edge computing, Fog computing, Central Cloud
As appropriate for your situation & Network Latency

Move the Algorithms, Not the Data!



Likelihood

Class Prior Probability

$$P(c \mid x) = \frac{P(x \mid c)P(c)}{P(x)}$$

Posterior Probability

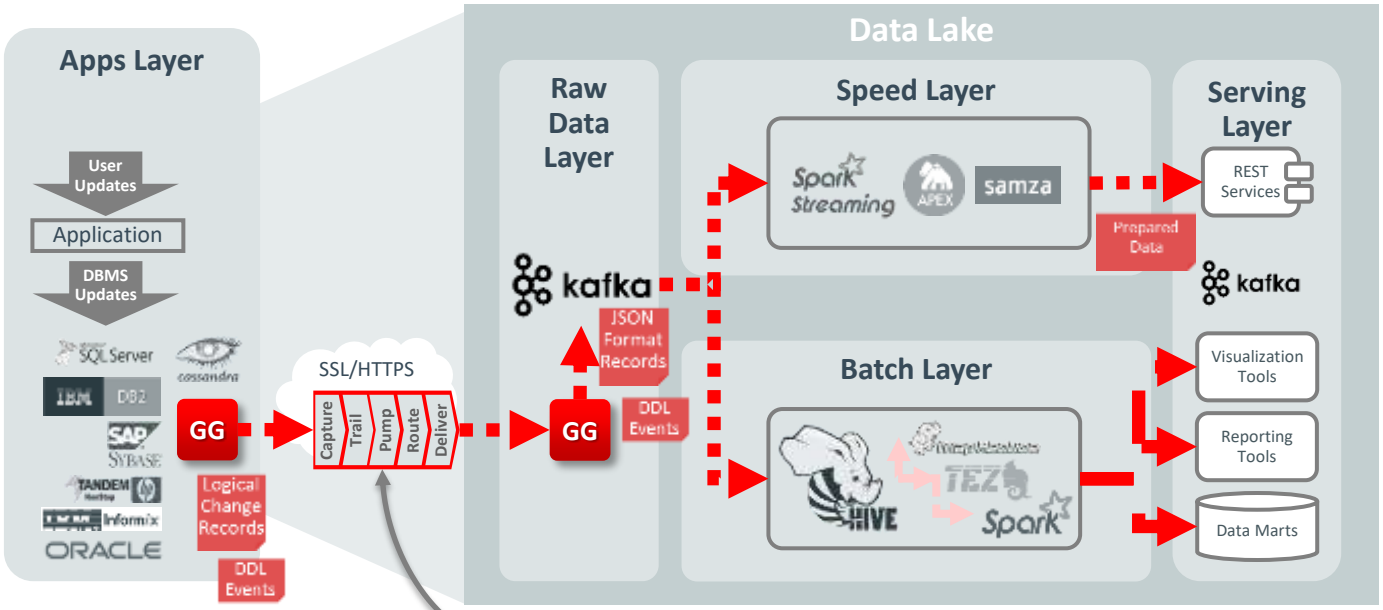
Predictor Prior Probability

$$P(c \mid \mathrm{X}) = P(x_1 \mid c) \times P(x_2 \mid c) \times \cdots \times P(x_n \mid c) \times P(c)$$

An “AI Database” or “Thinking Database”? → It Changes Everything

Data Pipeline / Analytics - Example with Oracle

***Fastest, most scalable** and **non-invasive** way to ingest data. Benefits of low-impact on Sources, micro-second access to transactions and ability to replicate schema (DDL) events for downstream automation of change impact.*



GG used with 4 of top 5 largest Kafka clusters in the world…

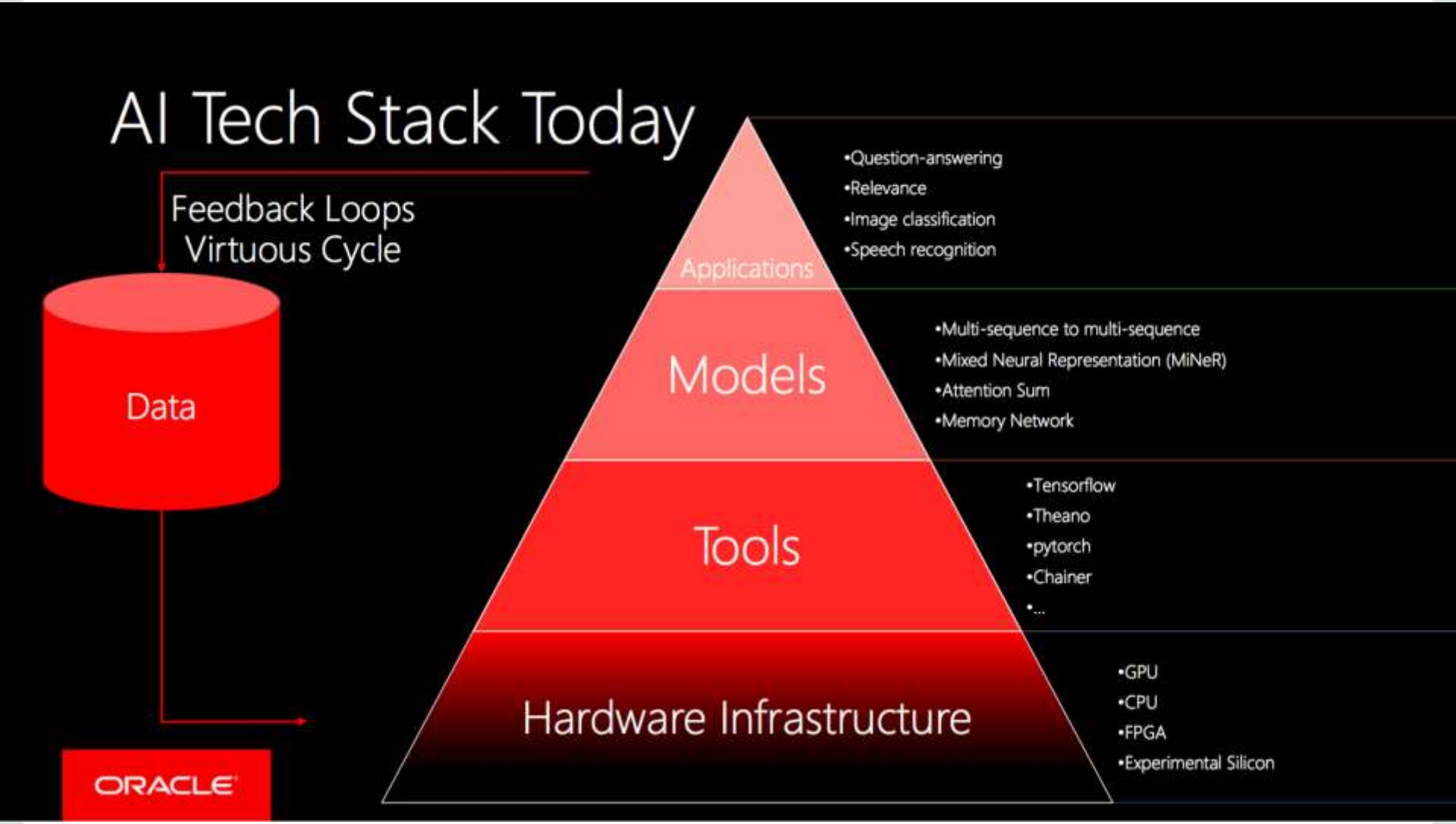
EBay runs 200 billion transactions per day; more than 25 TB of changed data via GoldenGate per day and less than 2 seconds of end-to-end latency

LinkedIn operates GoldenGate on >200 databases across 5 global data centers

Quickbooks.com runs GG on Oracle, SQL Server and DB2 hosted on AWS

Apple iTunes and Salesforce drive Apps transactions via GoldenGate into ODS / Kafka data service tier

AI Tech Stack Today



SECURITY: Who Wants Your Data? (and tries hard to get it)

Insiders

Nation States

Former Employees

Personal Data
Financial Data
Trade Secrets
Regulated Data

Criminals

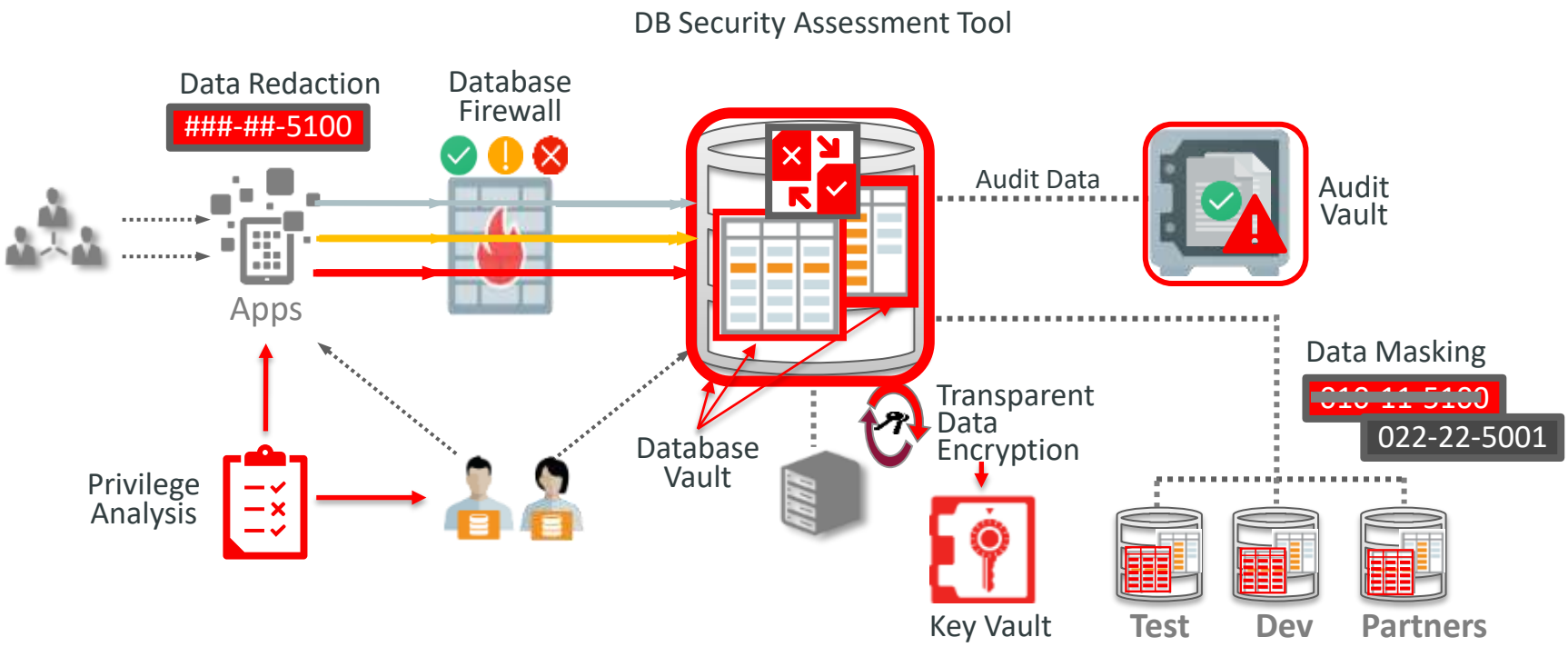
Curiosity Seekers

Hacktivists

Customers

Competitors

Database MAXIMUM SECURITY ARCHITECTURE



Digital Transformation: The Need for Performance

- Manage huge volumes of machine generated data
- Apply database benefits to fundamental data management challenges
- No scalability boundaries

Massive Networks

National Topology Sets

TB to PB Raster Image Sets

Unified Geocoding, Routing, Mapping

Massive Point Clouds

- Enable Integrated Operational Systems

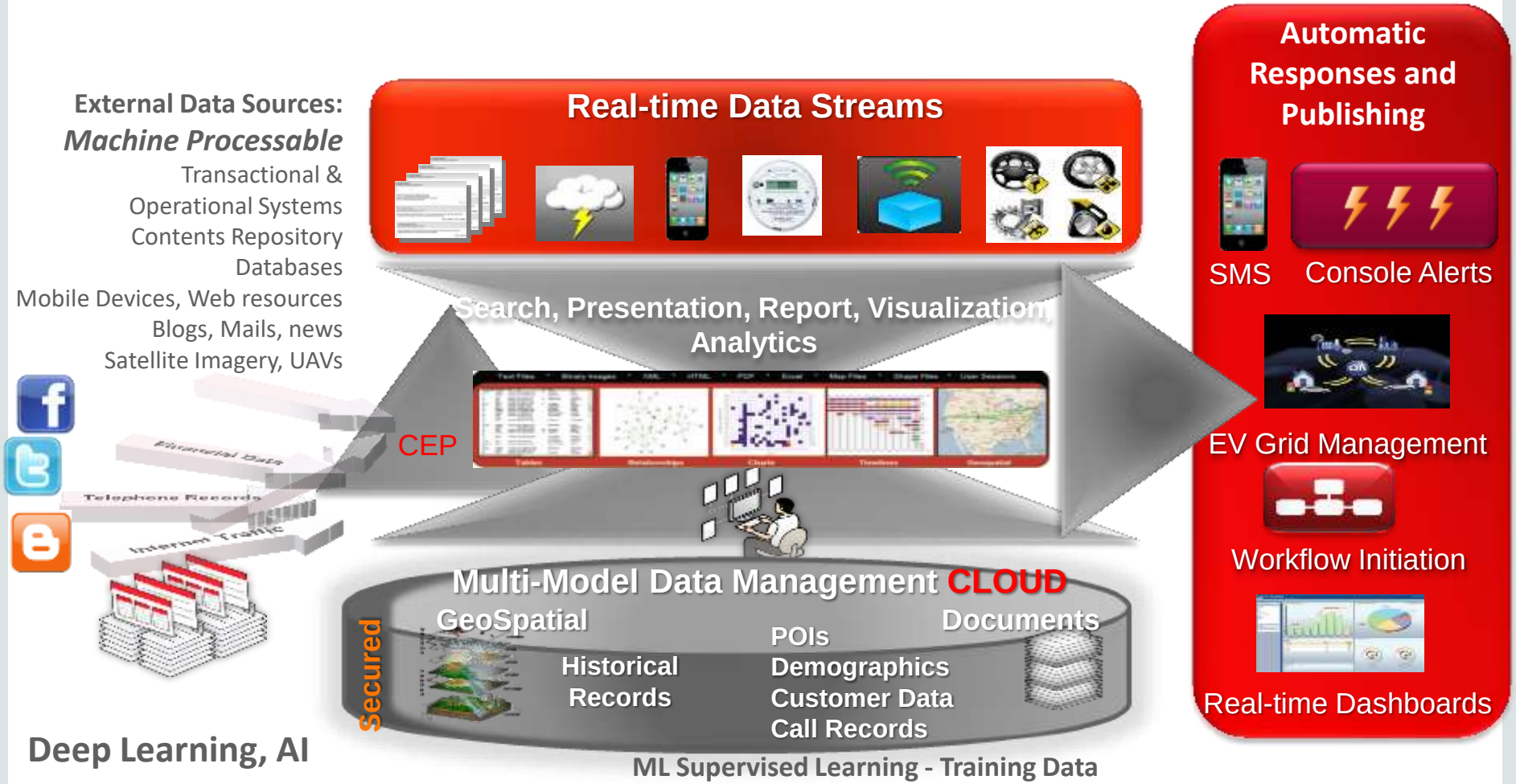
You Enhance Innovation & Sharing By Using **STANDARDS**

e.g. – The Spatial / Semantics/ Statistics Data Domains

- **ISO**
  - **TC 211; TC 204, 19115**
- **Open Geospatial Consortium**
  - **Simple Features; GML; Web Services**
- **De-facto Standards**
  - **SHP, MGE, DXF, KML**
- **Professional Standards**
  - **ISPRS, FIG, WMO,DDI, SDMX**
- **Java, .NET, Flash**
- **W3C: RDF,OWL, SPARQL, GeoSPARQL**
- **TAGGED METADATA – agree on tags**

SDMX

Optimize Enterprise: one Multi-Model Store *not* several separate Specialty Stores



SECURE STORE