1st Threat and Risk Information Exchange Day

Focus on Technologies and Capabilities for Situational Awareness and Information Sharing

Patrick Sack
CTO, Oracle National Security Group

Oracle's R&D drives Standards and Technologies for all Industries

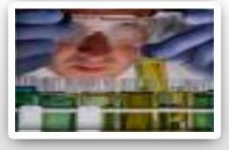
Aero & Defense

11 of Top 11

Automotive

Over 300 OEMs & Suppliers

Chemicals



5 of Top 10
Global

Communications

20 of Top 20 Service Providers

Consumer Products

65 of Top 100

Education & Research

9 of Top 10 Academic Univ

Engg & Construction

4 of Top 5
Fortune 500

Financial Services

10 of Top 10
Global Banks

Health Care

Over 300 Leading Providers

High Technology

25 of Top 25 Electronic OEMs

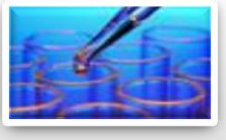
Industrial Mfg

9 of Top
10 Global

Insurance

20 of the Top 20
Global Insurers

Life Sciences



20 of Top 20 Pharmaceuticals

Media / Entertainment

All in Fortune's
Global 500

Oil & Gas

6 of Top 7
Companies

Professional Svcs

9 of Top 10 Global IT Service Firms

Public Sector

Over 1,500 Organizations

Retail

20 of Top 20

Travel & Transportation

3 of Top 5 Airlines

Utilities

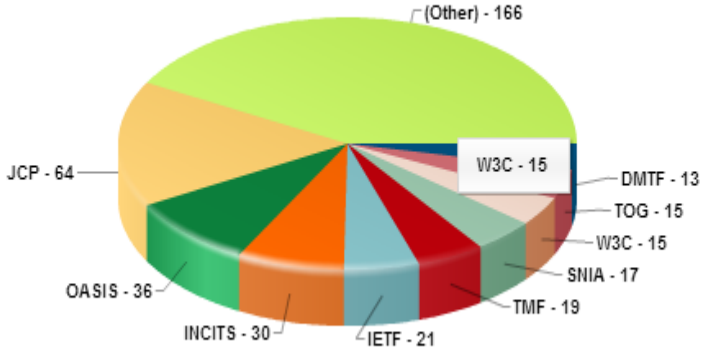
20 of Top 20

ORACLE

Oracle Standards Body Participation

- Oracle currently has **323** employees actively involved in **422** technical working groups, and **69** administrative or policy committees

- **A Bias Towards Leadership:** Oracle employees serve in 283 leadership positions across 102 standards setting organizations



Must improve Sharing of Threat and Risk information across all domains, sectors, industries and audiences

The reality is we live in a world where billions of connected people and devices generate huge quantities of data associated with Natural Disasters, Terrorist Acts, Cyber Crimes, Social Engineering and others.

Communities of interest must:

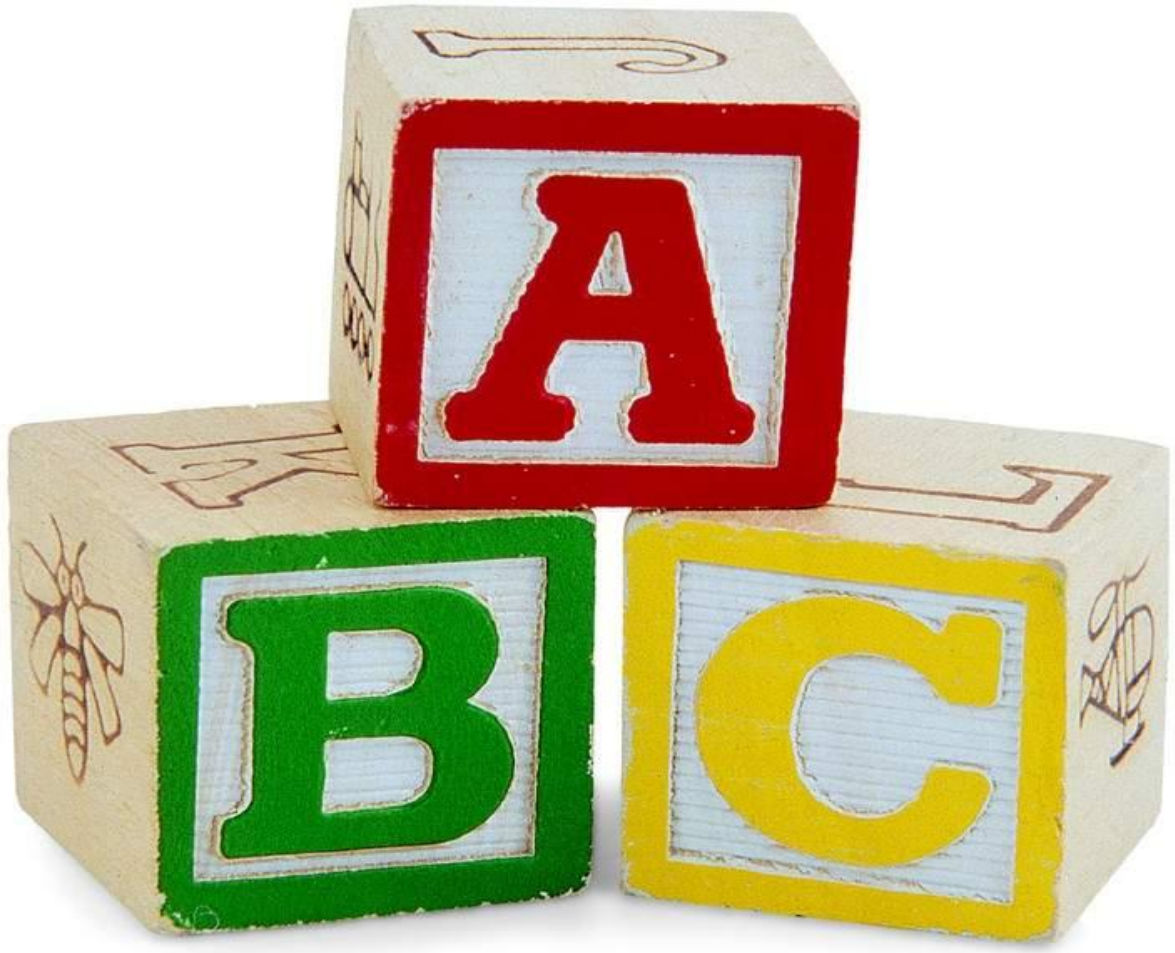
1. Collect voluminous amounts of **fragmented** data
2. Quickly parse out what is valuable
3. Integrate and make sense of it

Respond Appropriately

A (Pessimistic) View on Cyber Security

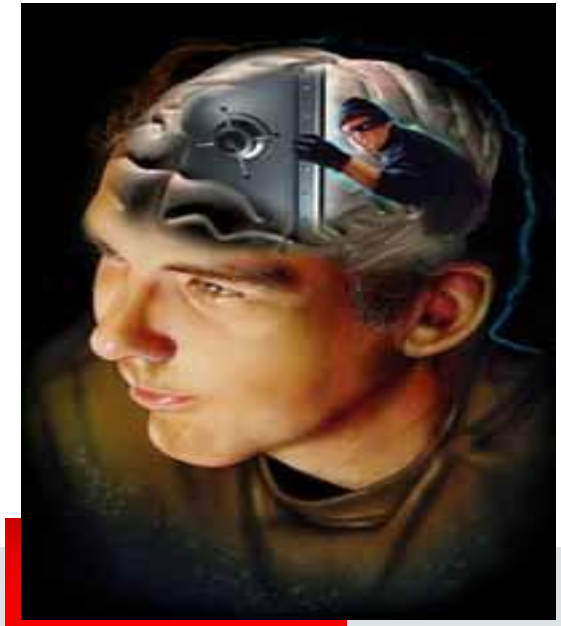
- Advanced Persistent Threats continue to grow & evolve with no retribution
  - Ungoverned geographies and/or no extradition agreements
- Crimeware/ransomware growing from established market and model
  - +800 criminal forums with ~1.5M participants doing rapid collaboration
- Cyber SME skills shortage
  - Still defining job descriptions, org roles, establishing curriculums, compensation, etc.
- Unclear what makes for “Reasonable Standards of Care”
  - Who is or should (anyone) be accountable when something happens

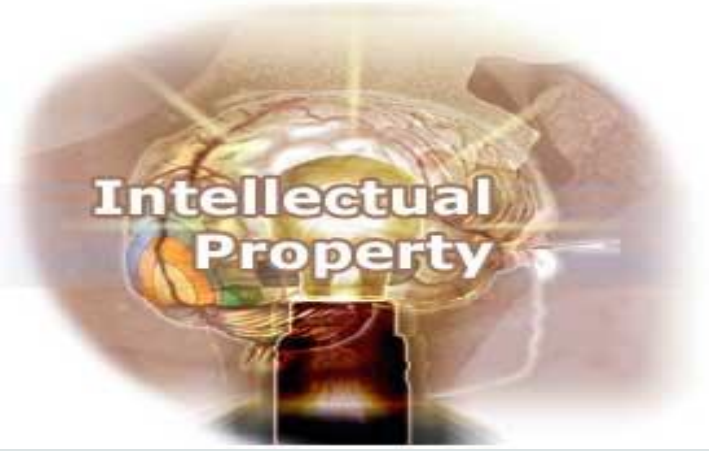
Information	Price/Record
Fresh credit card data	$20-25
Stale credit card data	$2-7
Medical record	$50
Hijacked email account	$10-100
Bank account credentials	$10-1000



Drivers for Threat and Risks Information Sharing

“A” is for Assets



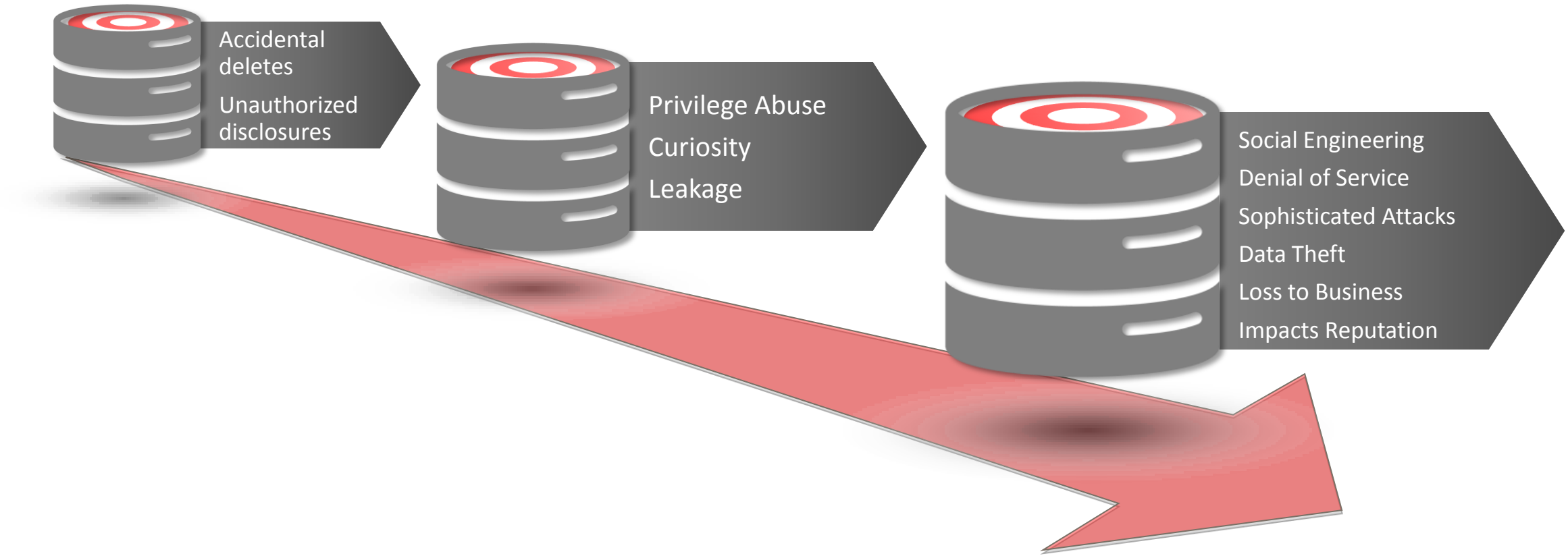


“B” is for Brand

Compliance

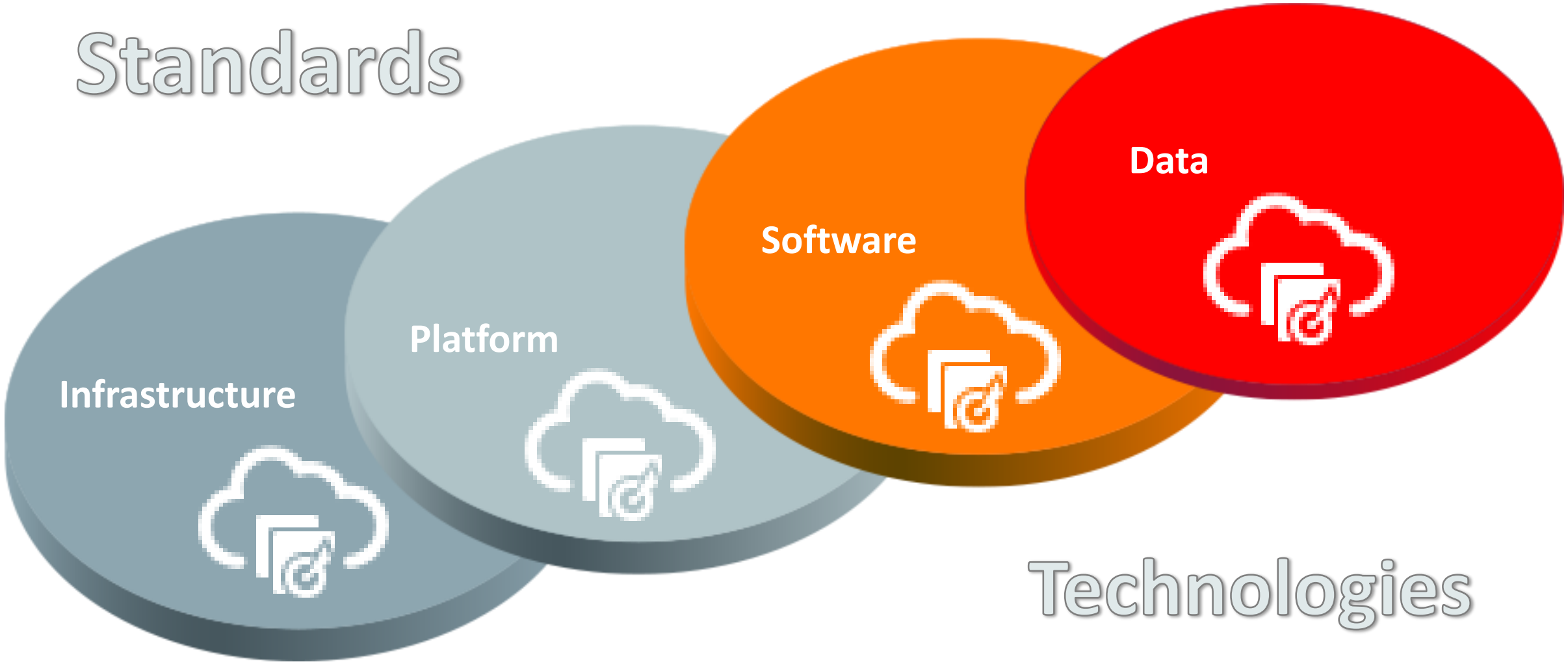
- NIST
- FIPS 140-1 & 201
- OFAC
- PCAOB Audit
- 21CFR Part 11
- GLB
- Sarbanes-Oxley
- FTC 16 CFR 314
- HIPAA
- PIPEDA
- Patriot Act
- CA SB 1386
- WA SB 6043
- ND SB 2251
- IL SB 1479
- PA SB 705
- EU Privacy
- Basel II
- HSPD-12
- FERPA
- FISMA PL107-347
- BSA

From Mistakes to Malicious



Source: Adapted from Kuppinger Cole Presentation, March 2013

Oracle - Data Informing Smarter Action Everywhere



Oracle Data and Information Services Today

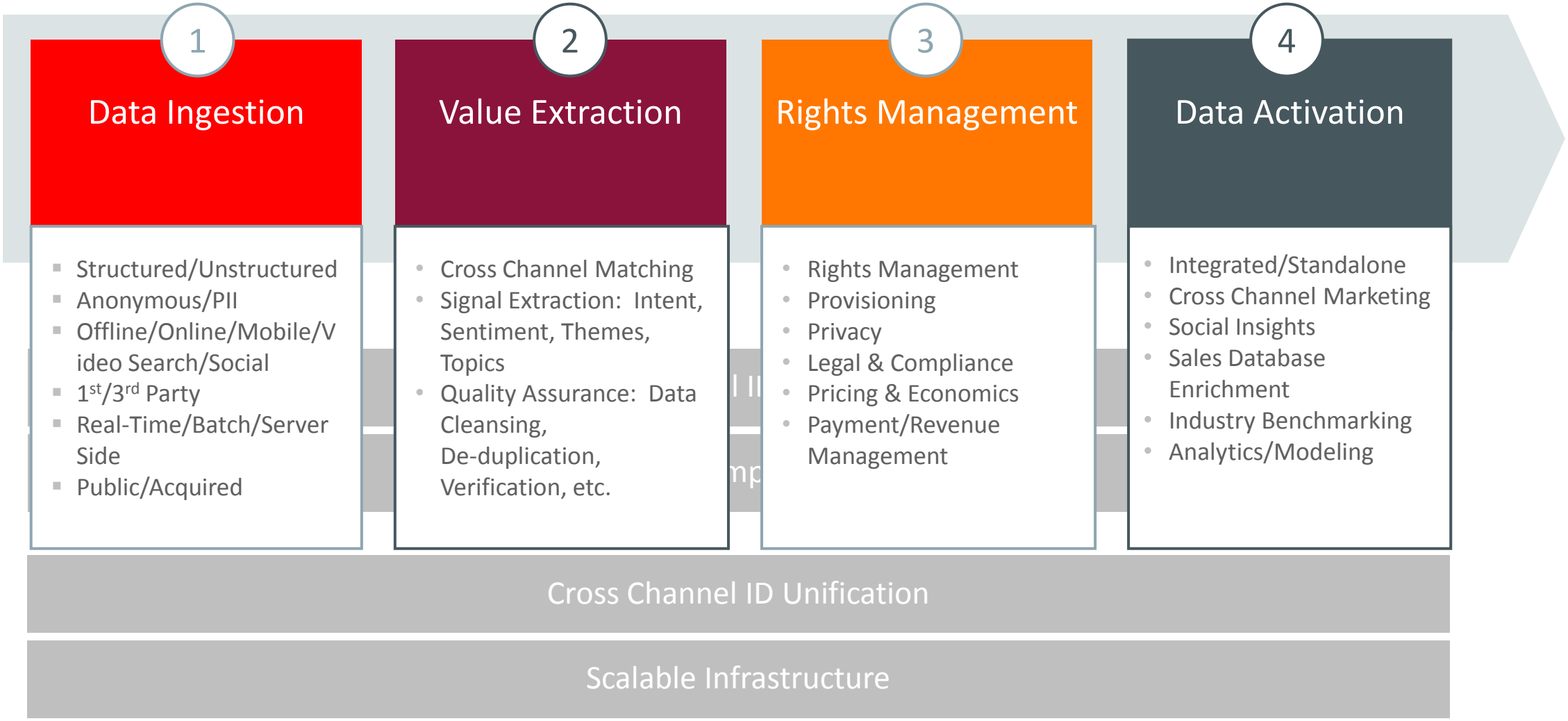
Pre-Negotiated Data Rights

- *Rights Management*
- *Privacy*
- *Legal & Compliance*

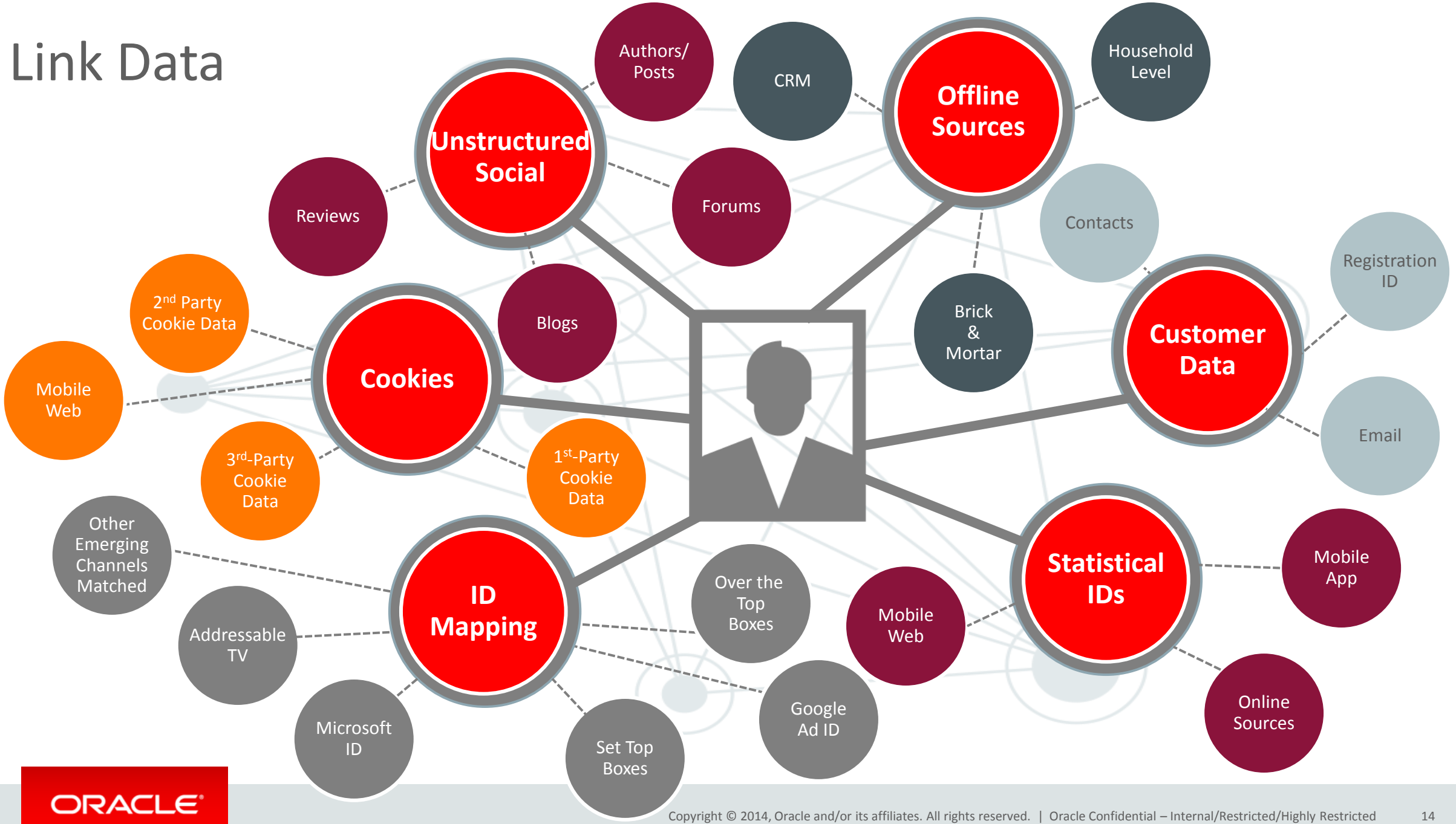
Brand Data *Collections – Ad Tech*

- *7.5 trillion marketing data transactions on 1B monthly profiles*
- *Over 700 million unstructured messages daily from 40 million sites in 19 languages*
- *240 million B2B companies and contacts worldwide.*

Information flow: Cross Domain, Industries & Audiences



Link Data



Customer Benefits

Actionable Data

- Data driven qualification and prospecting
- Discover the right People
- Enrich customer Data
- Hot Topics
- Key Indicators
- Sentiment
- Language Indicators
- Themes and Terms

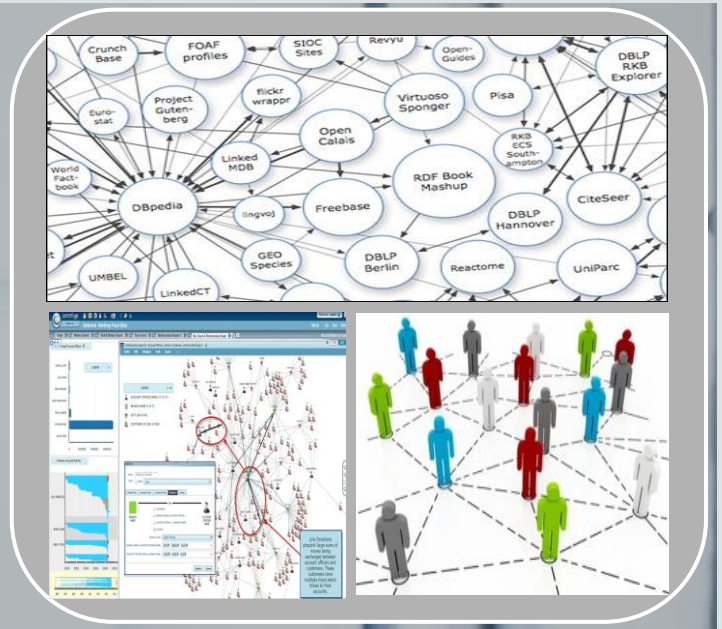
- Timely
- Available
- Accurate
- Consistent
- Reliable
- Secure

Link Data and Graph Analytics the key

Link Data and Graph Analytics

Enabling Cross Domain Information Sharing of Risk & Threat Information

Operating at the speed of Wire



Why Link Data and Graph Analytics for Information Sharing

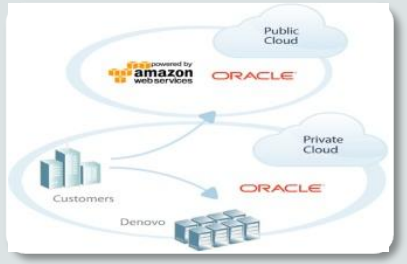
Enable Secure Access to all data and Undercover New Intelligence

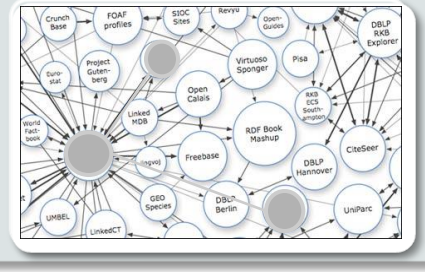
- Integrate data access across the communities and domains without moving the data.
- Establish common vocabulary for data access, discovery and search
- Enforce fine-grained information security to meet entitlements and compliance
- Uncover new relationships, properties/sentiments and behaviors of current threats
- Anticipate emerging threats based on key indicators, behaviors and trends
- Respond appropriately based on situation

Link Data and Graph Use Cases

Linked Data & Data Integration

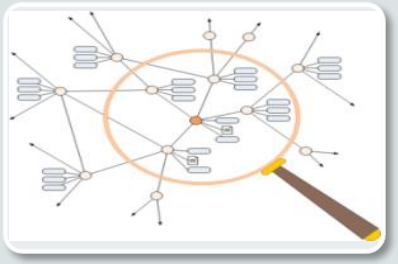
- Unified metadata model across enterprise domains
- Validate semantic and structural consistency

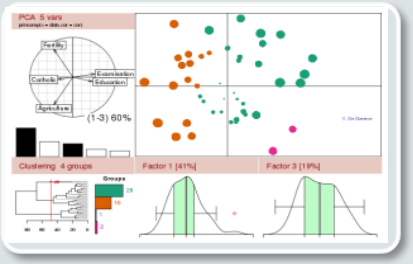




Text Mining & Entity Analytics

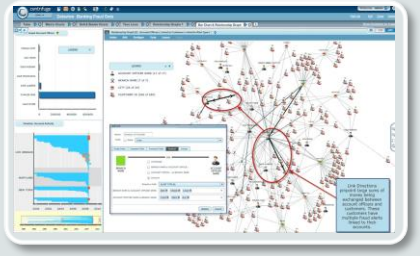
- Find related content & relations by navigating connected entities
- "Reason" across entities





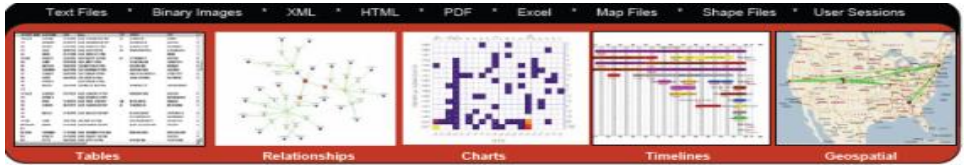
Social Media Analysis

- Analyze content using integrated **metadata**
  - Blogs, wikis, video
  - Calendars, IM, voice



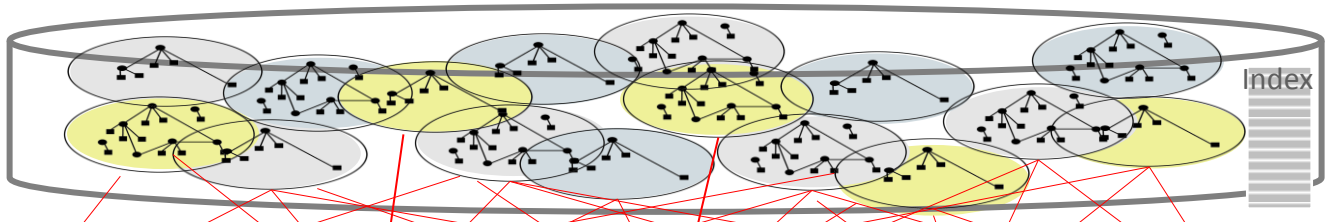
Link Data for Enterprise

Access & Presentation Layer



Enterprise metadata registry

(integrated graph metadata)



Data Servers

Event Server | Big Data Appliance | Content Mgmt | BI Server | Data Warehouse

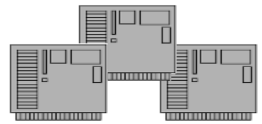
Data Sources / Types

Machine Generated Data

Social Media

Human Sourced Information

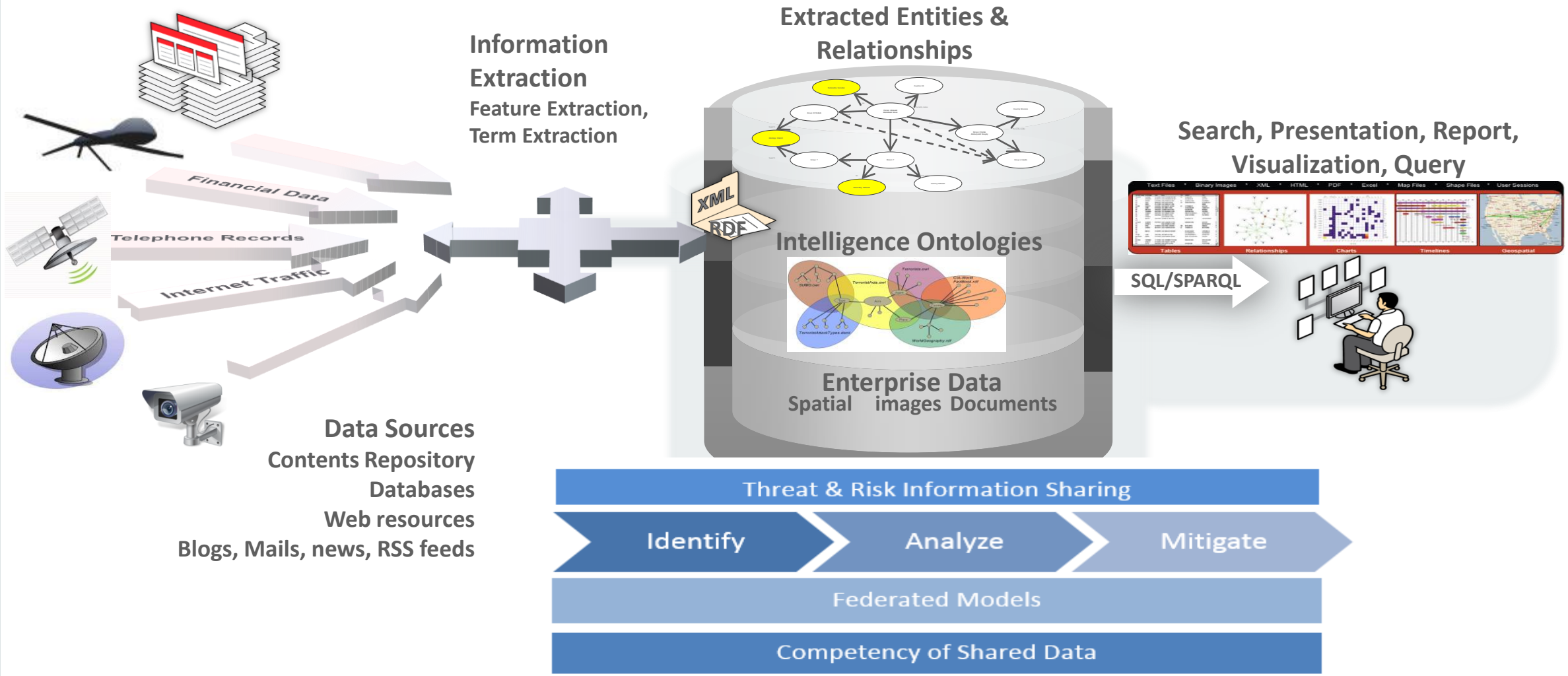
Subscription Services



Transaction Systems

National Risk & Threat Intelligence Scenario

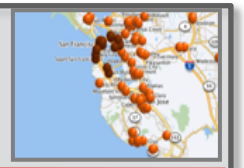
Unified Big Data Platform



Unified Big Data Platform

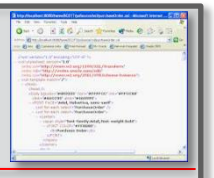
All data types, interoperable, secure, consistent, accessible at scale

SPATIAL



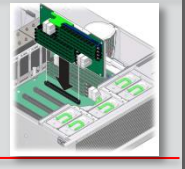
- Native Whole Earth 3D Model
- Full OGC and ISO Compliance
- Extreme Scale
- Compatible with all major GIS Tools
- Geodetics/Topology/Planar Networks
- GeoRaster/Point Clouds/LIDAR

DOCUMENTS/ XML



- Full Native XML Support
- Full Support for XML Ingest
- XQuery, DOM
- SQL XML, XQJ
- XSLT
- NameSpaces Support

SEMANTIC DRIVEN QUERY

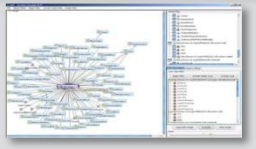


- Ontological Knowledge Layer
- Self-Service Answers
- Rapid Creation
- Mobile Push
- Free Form Discovery
- Flexible Visualization

Hadoop

- Parallel Distributed Processing
- Compute and Storage Co-resident
- Map Reduce Processing
- NoSQL
- Bi-Directional HDFS Connectors
- Big Data SQL

GRAPH



- Native Extreme Scale Graph DB
- 10-30x Faster than Neo4J
- SPARQL1.1, SPARQ/SQL
- GeoSPARQL
- Jena, Sesame, Joseki WS
- W3C: RDFS, OWL2 RL-EL, SKOS
- RDF, RDB2RDF, RDFa

JSON

JSON
JavaScript Object Notation

- Full Native JSON Support
- NoSQL Key Value
- Direct Java Get/Put Commands
- SQL overtop JSON
- Rest WS
- New SQL JSON Commands
- No Schema

Data Discovery & Visualization

- Auto discovery and categorization
- Runs on HDFS
- Flexible Visualization
- Easy Triage of New Data Sets
- Mash up data sets
- Extensible Visualization Options

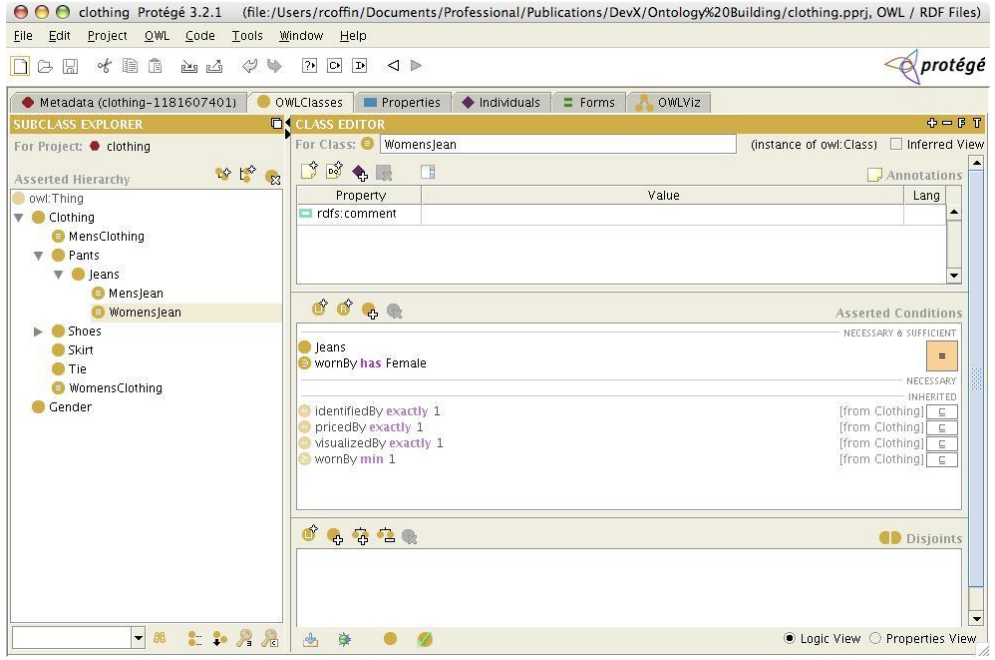
ADVANCED SQL

- In Database Data Mining
- Advanced Algorithm Support
- Predictive Analysis and Modeling
- Enterprise R Statistics
- Security
- Data Pattern Matching
- Text Mining and Processing

ORACLE

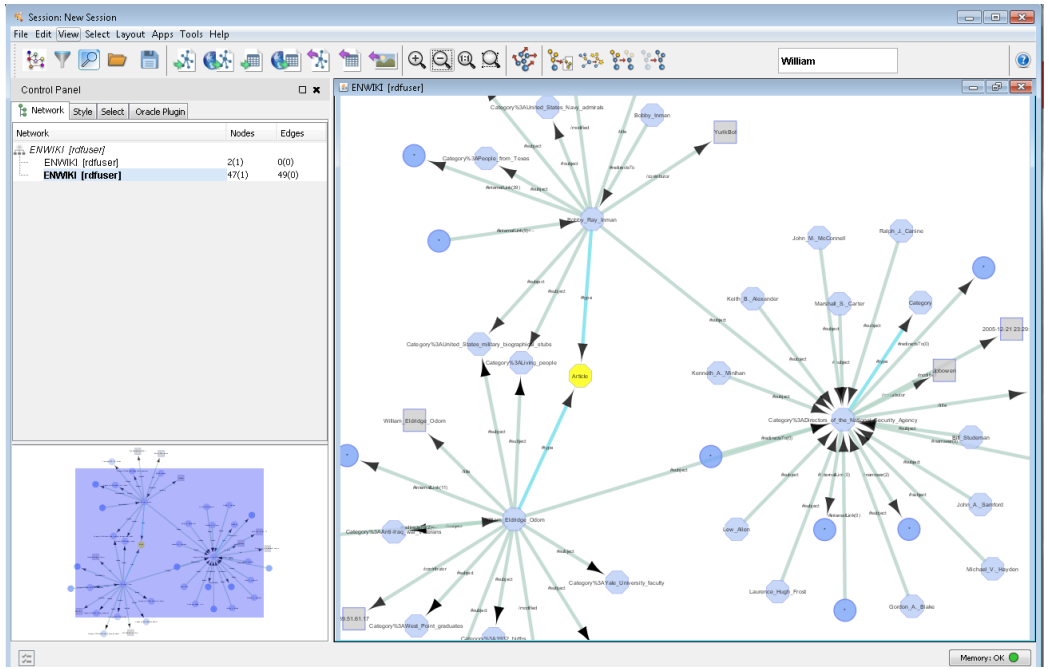
RDF Semantic Graph: Graph Visualization & Modeling Support Open and Standards Based

Semantic Modeling



Protégé

Graph Visualization



Cytoscape

Innovations in Risk & Threat Analytics

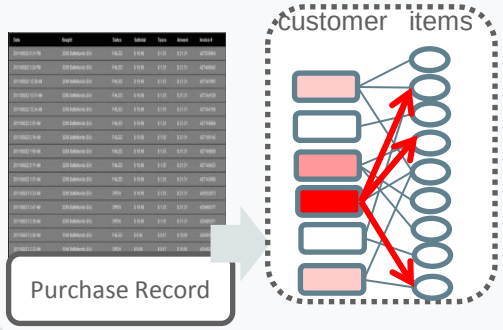
Operating at the Speed of Wire

ORACLE

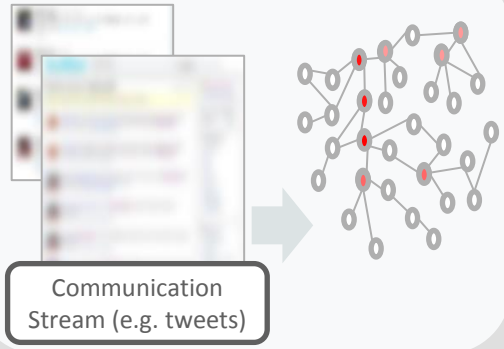
Graph Analysis – Model Data as a Graph

- Graph analysis considers relationships and properties between entities
- Straight forward concept, but difficult to implement

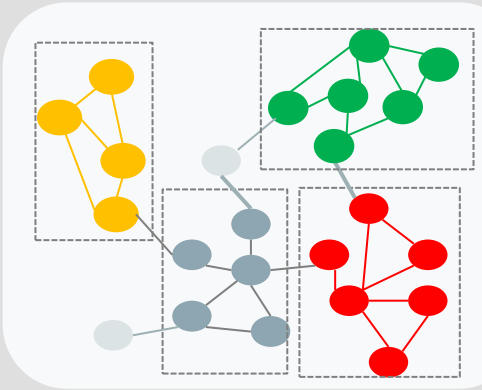
Object Recommendation



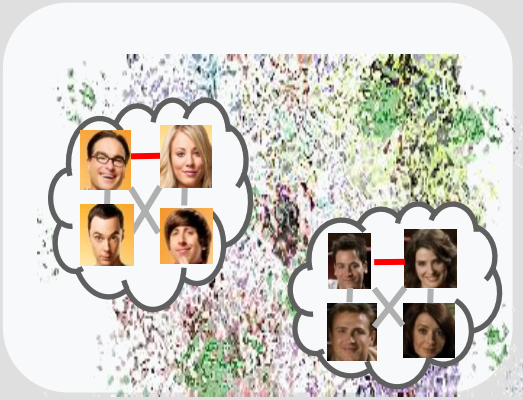
Influencer Identification



Community Detection

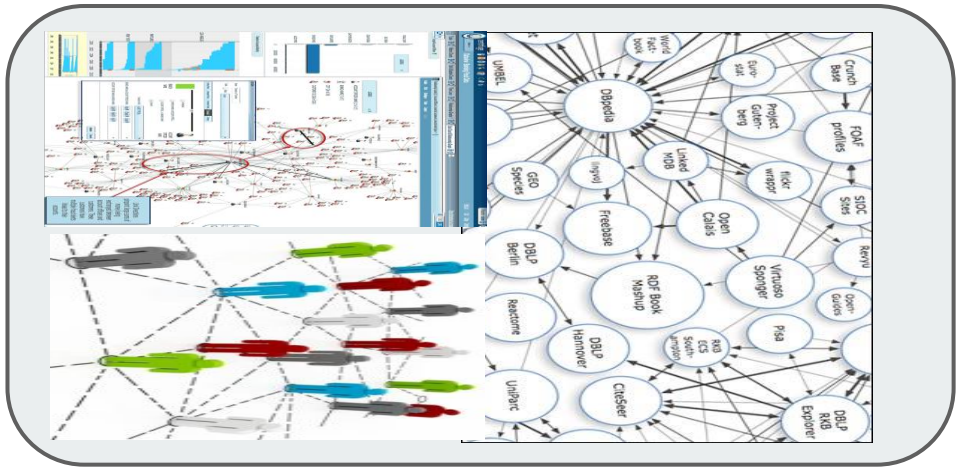


Graph Pattern Matching



Oracle's investment in Link Data, Graph & Analytics

- Simplifying graph analytics
- Standards based: W3C
- Strong partner ecosystem
- Optimized and scalable solutions



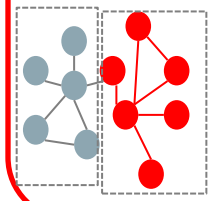
- Security: **Security labels at "triple" level** (OLS).
- Transactional: Concurrent loading and updates
- Manageable: Use existing DB tools, utilities and expertise
- Multi-type support: graph, relational, search, geospatial
- Multi-platform: Relational database, NoSQL, Hadoop

ORACLE

Built-in Algorithms and Graph Mutation

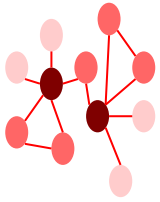
- Provide rich set of built-in (parallel) graph algorithms.

Detecting Components and Communities



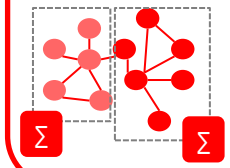
Tarjan's, Kosaraju's, Weakly Connected Components, Label Propagation (w/ variants), Soman and Narang's Spacification

Ranking and Walking



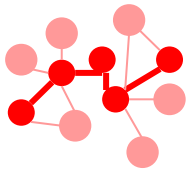
Pagerank, Personalized Pagerank, Betwenness Centrality (w/ variants), Closeness Centrality, Degree Centrality, Eigenvector Centrality, HITS, Random walking and sampling (w/ variants)

Evaluating Community Structures



Conductance, Modularity Clustering Coefficient (Triangle Counting) Adamic-Adar

Path-Finding

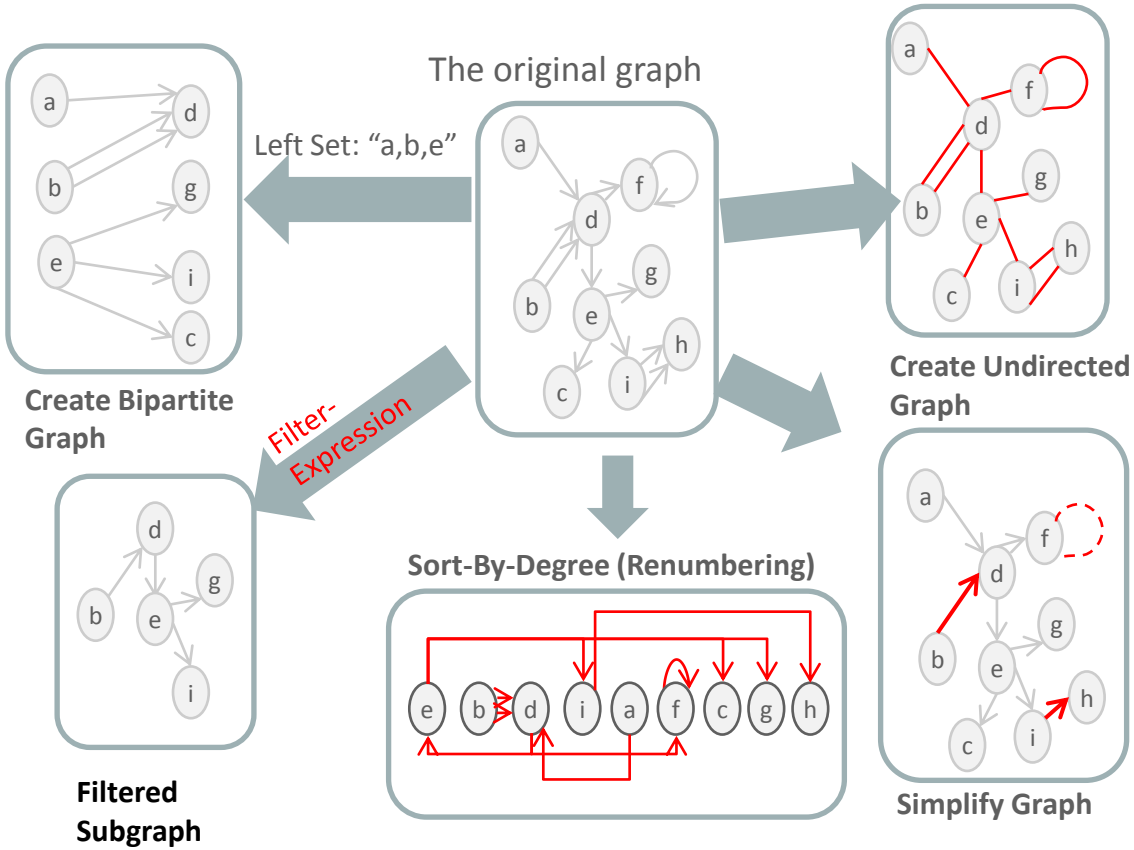


Hop-Distance (BFS) Dijkstra's, Bi-directional Dijkstra's Bellman-Ford's

Link Prediction SALSA (Twitter's Who-to-follow)

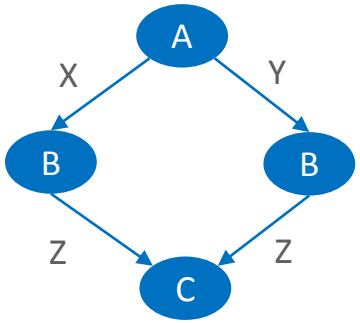
Other Classics Vertex Cover Minimum Spanning-Tree(Prim's)

- as well as parallel graph mutation operations

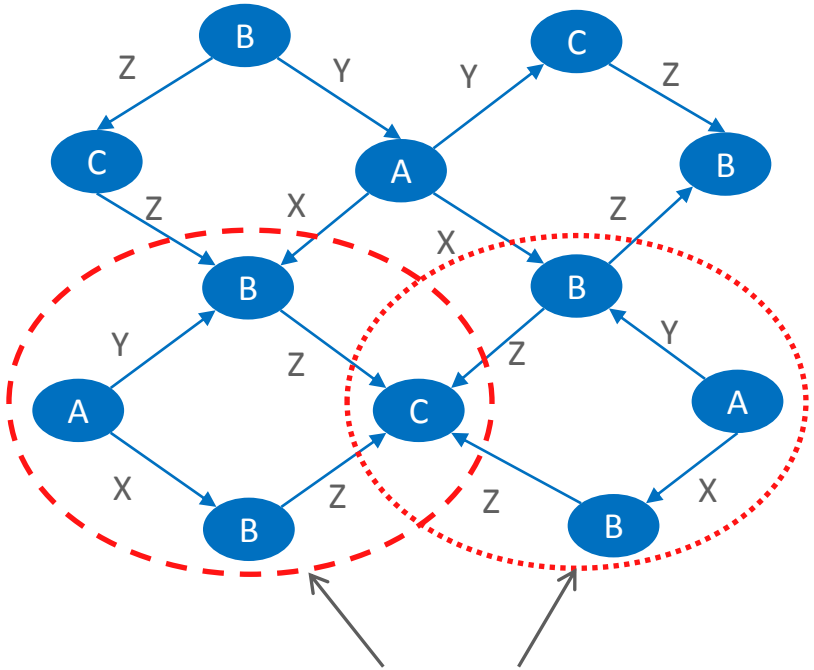


Subgraph Isomorphism Problem

Query Graph Q



Data Graph G



Subgraphs of G that are isomorphic to Q

Isomorphism Criteria:
1. Structure of the graph matches
2. Properties on nodes and edges match

The Problem:
Find all subgraphs of G that are isomorphic to Q

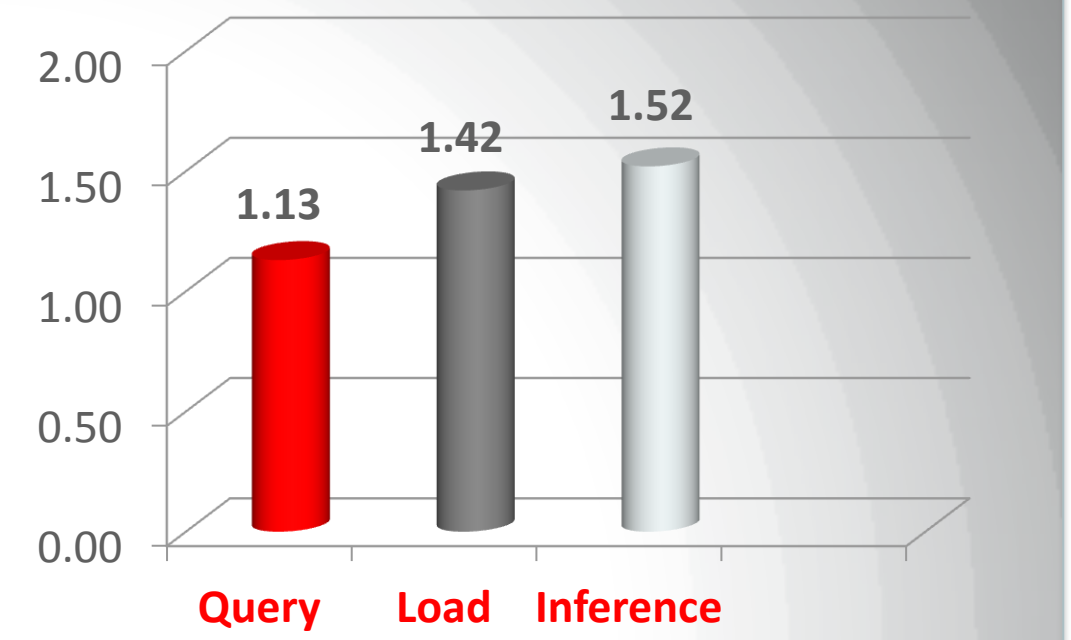
World's Fastest Big Data Graph Benchmark

1 Trillion Triple RDF Benchmark with Oracle Spatial and Graph

- **World's fastest data loading performance**
- **World's fastest query performance**
- **Worlds fastest inference performance**
- **Massive scalability: 1.08 trillion edges**

- **Platform**: Oracle Exadata X4-2 Database Machine
- **Source**: w3.org/wiki/LargeTripleStores, 9/26/2014

Oracle Database 12*c* can load, query and inference millions of RDF graph edges per second



Driving Information Access Through Technology Innovation

Use the Right Tool for the Job and benefit from the Power of "AND"

SQL

Hadoop

Change the Business

- Disrupt competitors
- Disintermediate supply chains
- Leverage new paradigms
- Exploit new analyses

NoSQL

Scale the Business

- Serve data faster
- Meet mobile challenges
- Scale-out economically

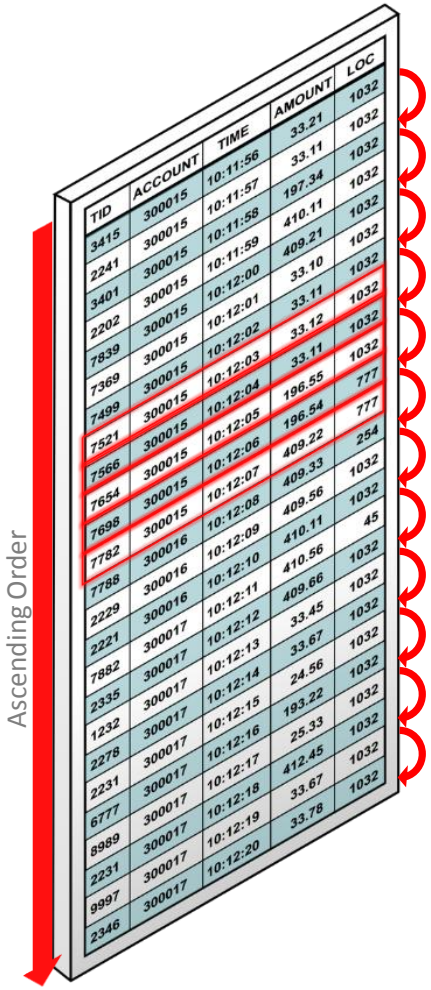
Relational

Run the Business

- Integrate existing systems
- Support mission-critical tasks
- Protect existing expenditures
- Ensure skills relevance

SQL Based Pattern Matching within Database

Simplifying Analytics for complex Big Data collections




```
Select * from
Transactions MATCH_RECOGNIZE
(
…
PATTERN(S X{2,4} Y)
DEFINE S AS (type = T),
       X AS (loc =
PREV(loc)),
       Y AS (loc !=
PREV(loc))
…
)
```

- Clickstream logs:
  - sessionization, search behavior
- Business transactions:
  - fraud detection, stock analysis
- Sensor data:
  - Automated observations and detections
- Complex results from simple requests

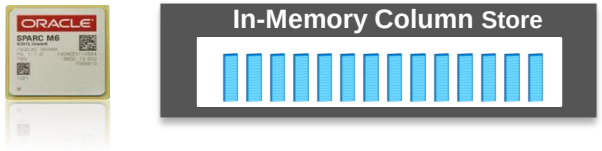
Terabyte Scale Computing

Use Case

- 218 Billion Records
- Search - “titanium”
- Match - 2,054,141 records
- Time 0.64 seconds

341 Billion records scanned per second

Hundreds of billions records scanned per second



M6-32 SuperCluster -

Big Memory Machine

32 TB DRAM

32 Socket, 384 Cores

3 Terabyte/sec Bandwidth

1 Rack - 1000X Faster

ORACLE

The Ultimate Software Optimization: Hardware

Performance

DB In-Memory Acceleration Engines

Reliability

Application Data Integrity

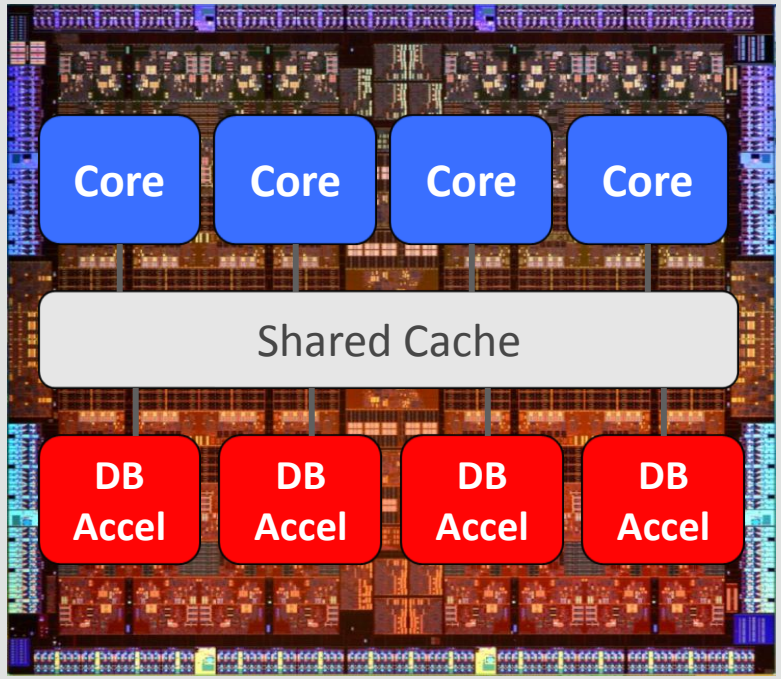
Capacity

Compression Engines

Coming in 2015

Performance: Database In-Memory Acceleration Engines

SPARC M7



32 Database Accelerators (DAX)

- SIMD Vectors used by Oracle DB In-Memory were designed for graphics, not database
- New SPARC M7 chip has 32 optimized database acceleration engines (DAX) built on chip
- Independently process streams of columns
  - E.g. find all values that match 'California'
  - Up to 170 Billion rows per second!
- Like adding 32 additional specialized cores to chip

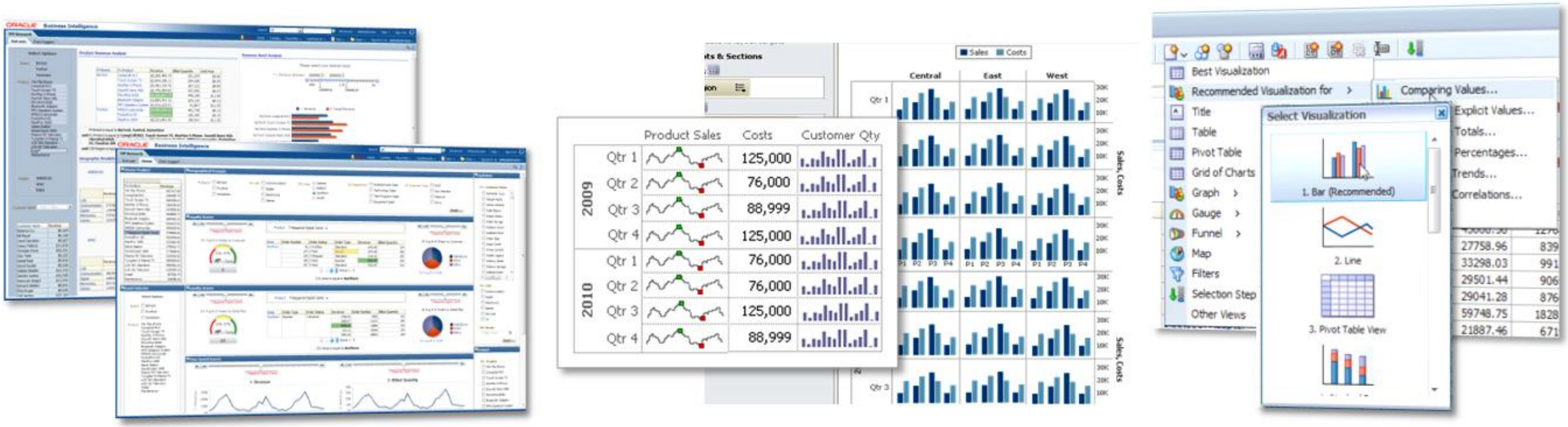
2.7 Trillion rows per second on a 16 Socket Server

ORACLE

Analyst Driven Answers from Semantic Data Layer

Speed of Thought Interactive Analysis

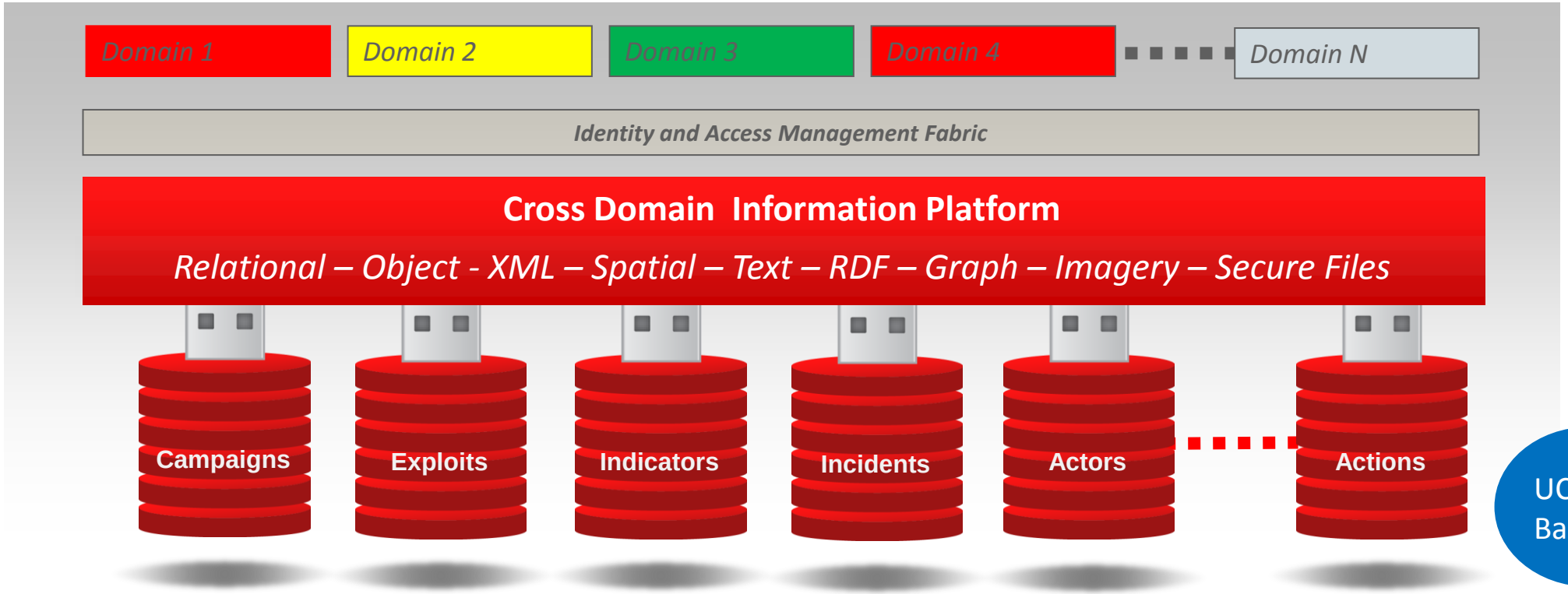
- Highly Interactive Analysis
- Free Form Data Exploration
- High Density Visualizations
- View Auto Suggestions
- Contextual Actions
- All on Mobile



Cross Domain Information Sharing Platform

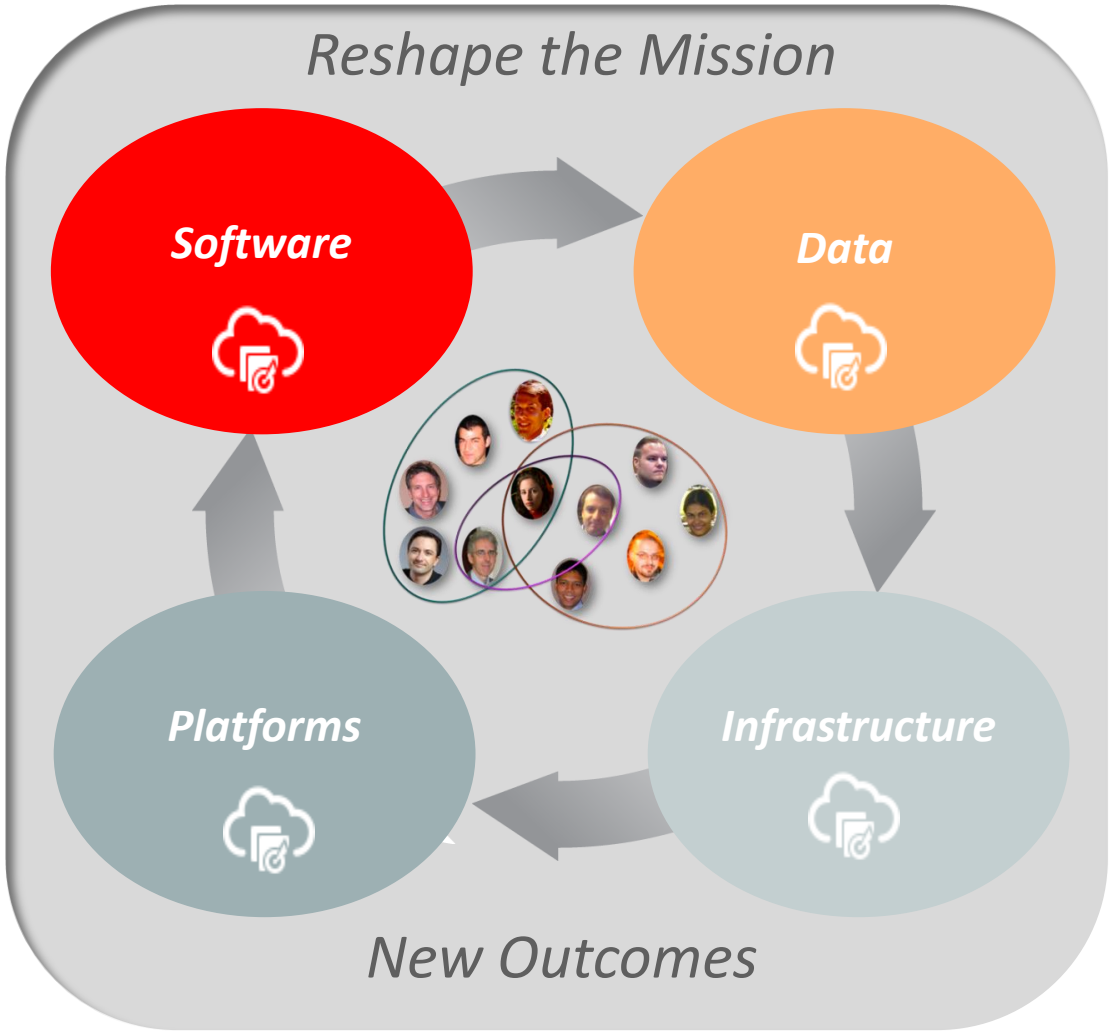






Cross Industry, Sector and Classification Levels

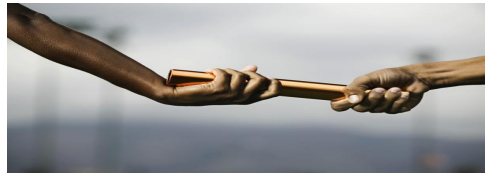
Keeping up with Data Growth and Demand for New Intelligence!



- *Data As a Service* – Create new intelligence that provides advantage
- *Link Data* – Integrate data and common vocabulary to navigate, search and retrieve
- *Graph & Advanced Analytics* – Undercover and Illuminate new intelligence that can reshape the mission
- *Security* – Enabler of Entitlements and Compliance
- *Standards & Innovations* – The foundation to meeting the outcomes

Summary - *Timely & Reliable Information is Not Optional*

- Drive information sharing and compliance standards
- Establish a common vocabulary of meanings and terms
- Enable Analyst or System to decipher and connect dots in a meaningful way
- Tag and Secure data for information sharing across all “Domains”
- Build a strong community and partner ecosystem
- Drive timely decisions through consistent, secure, accurate Information
- Operate at the extreme speed

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