

# Oracle CODE Property Graphs 101

Oracle CODE Los Angeles

Dan VlamiS

February 27, 2018

@VlamiSoftware

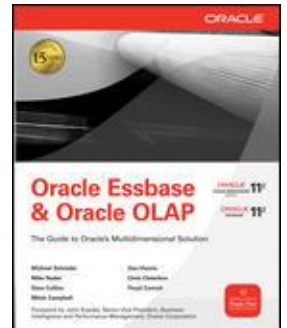
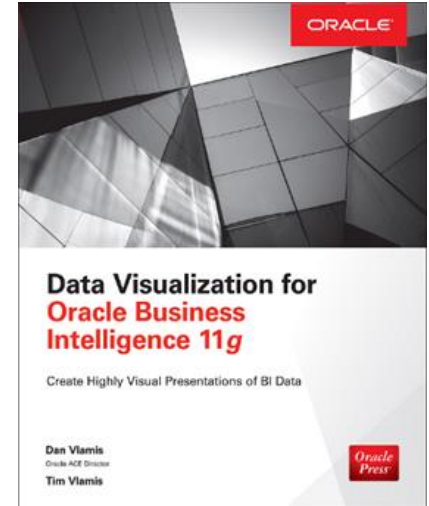
# VlamiS Software Solutions

- VlamiS Software founded in 1992 in Kansas City, Missouri
- Developed 200+ Oracle BI and analytics systems
- Specializes in Oracle-based:
  - Enterprise Business Intelligence & Analytics
  - Analytic Warehousing
  - Data Mining and Predictive Analytics
  - Data Visualization
- Multiple Oracle ACEs, consultants average 15+ years
- [www.vlamiS.com](http://www.vlamiS.com) (blog, papers, newsletters, services)
- Co-authors of book “Data Visualization for OBI 11g”
- Co-author of book “Oracle Essbase & Oracle OLAP”
- Oracle University Partner
- Oracle Gold Partner

 EDUCATION RESELLER

 Gold  
Partner



Specialized  
Oracle Business Intelligence  
Foundation Suite 11g





# Dan Vlami background

## Dan Vlami – President

- Founded Vlami Software Solutions in 1992
- 30+ years in business intelligence, dimensional modeling
- Oracle ACE Director  
- Developer for IRI (expert in Oracle OLAP and related)
- BIWA Board Member since 2008
- BA Computer Science Brown University
- @dvlami



# Presentation Agenda

- Show quick demo of graph possibilities
- Background on Property Graphs in Oracle Database
- Show overview of steps to get started
- Go through steps to get started
- Show demo of property graph using Cytoscape
- Next steps
  - Introduce Analytics and Data Summit Conference
  - Graph resources

# Two Graph Data Models

## Social Network Analysis

### Property Graph Model

- Path Analytics
- Social Network Analysis
- Entity analytics

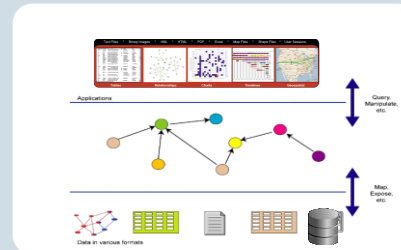


- Financial
- Retail, Marketing
- Social Media
- Smart Manufacturing

## Linked Data Semantic Web

### RDF Data Model

- Data federation
- Knowledge representation
- Semantic Web



- Life Sciences
- Health Care
- Publishing
- Finance

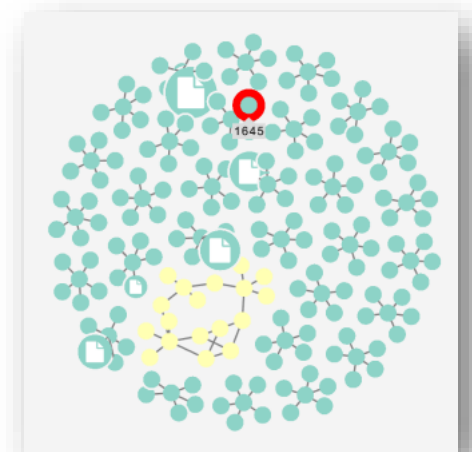
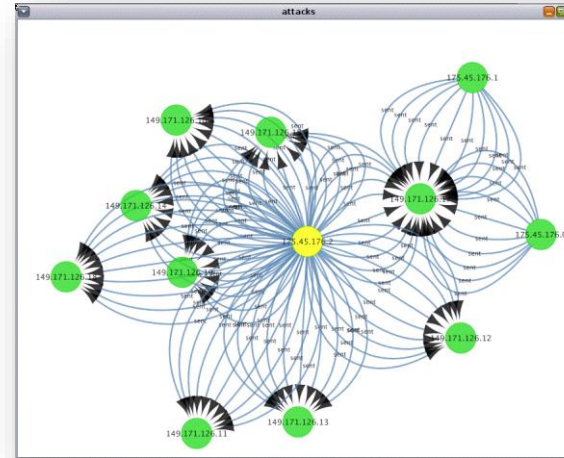
Use Case

Graph Model

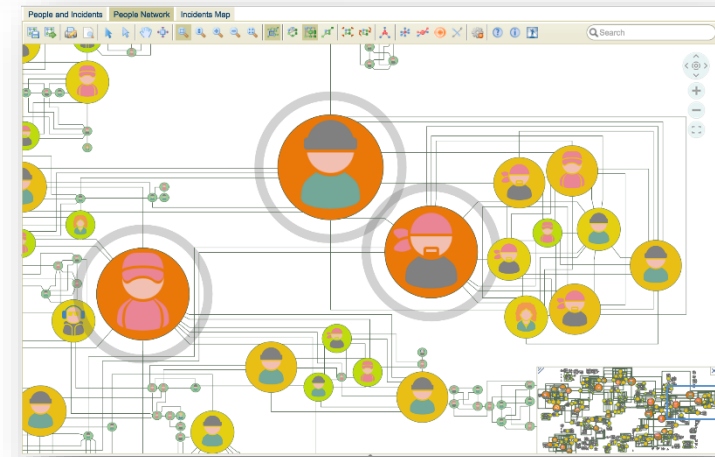
Industry Domain

# Graph Database Features:

- Scalability and Performance
- Graph analytics
- Graph Visualization
- Graph Query Language
- Standard interfaces
- Integration with Machine Learning tools



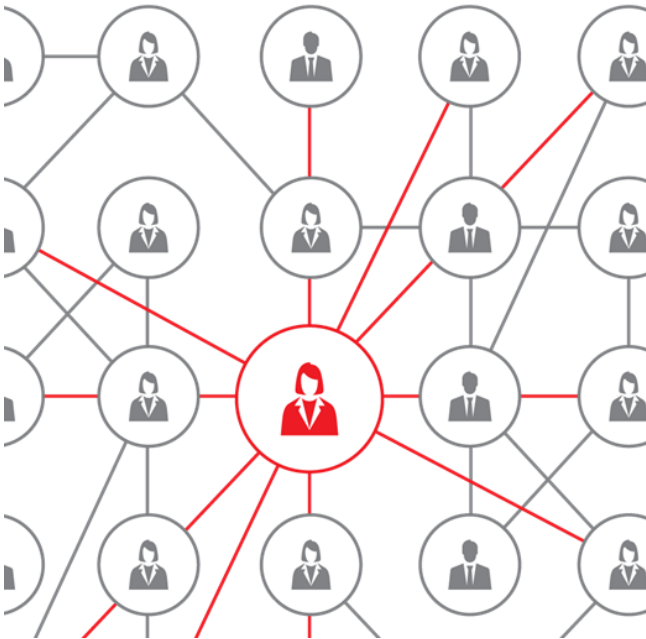
*Courtesy Linkurious*



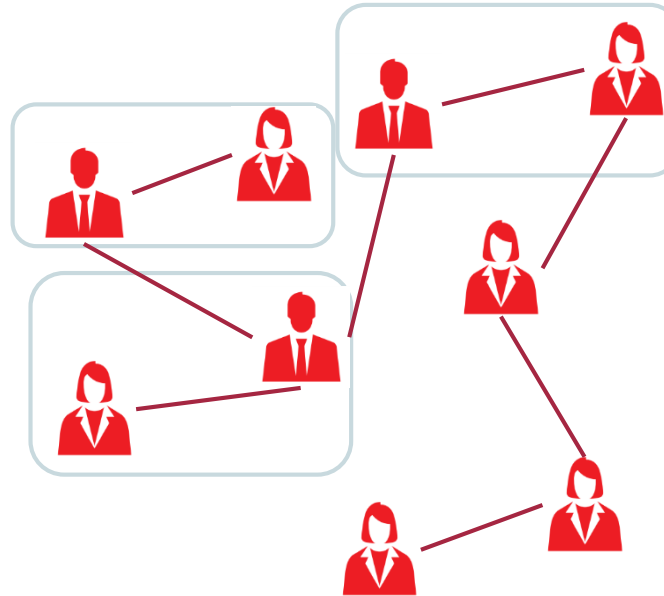
*Courtesy Tom Sawyer Perspectives*

# Graph Analysis for Business Insight

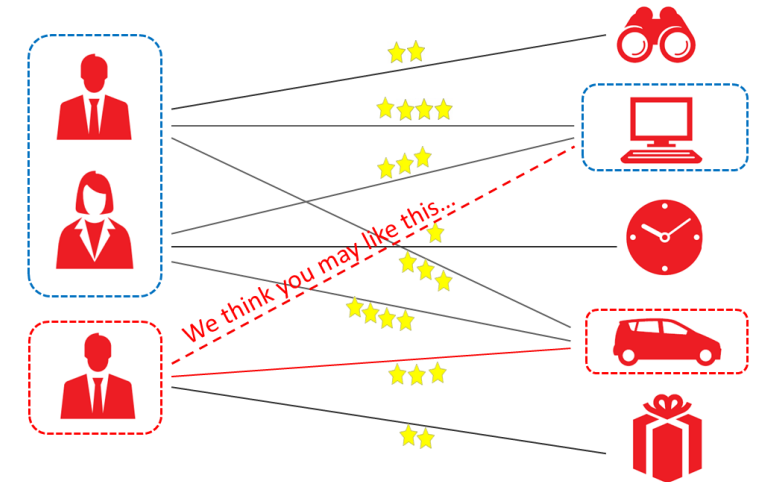
## Identify Influencers



## Discover Graph Patterns in Big Data

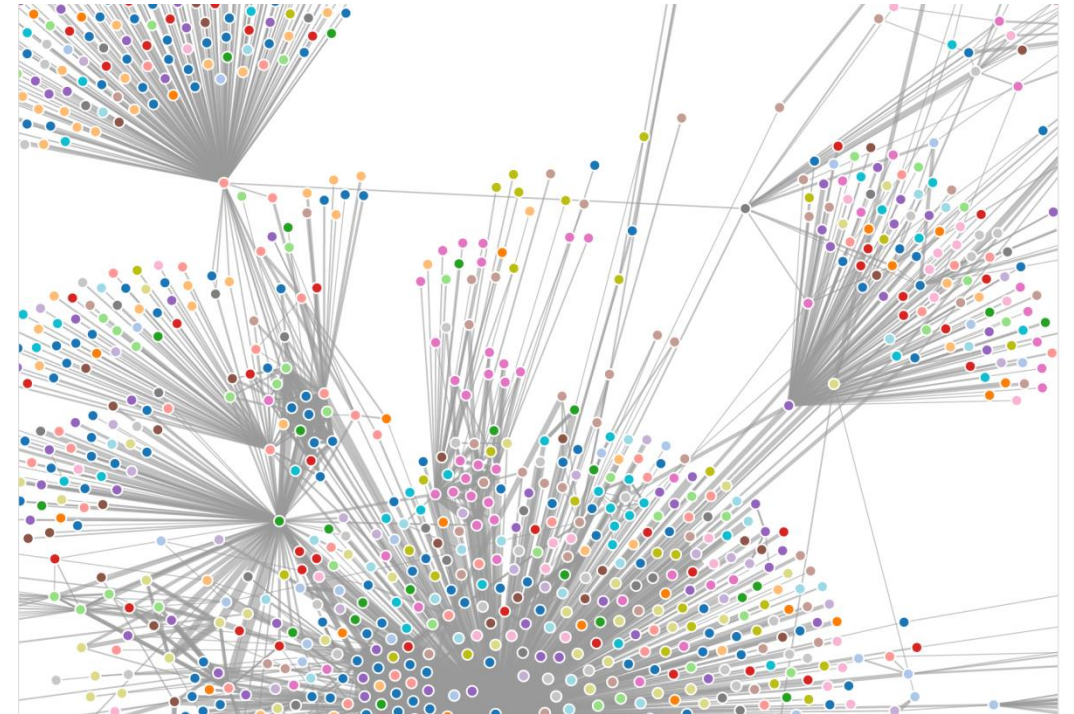


## Generate Recommendations



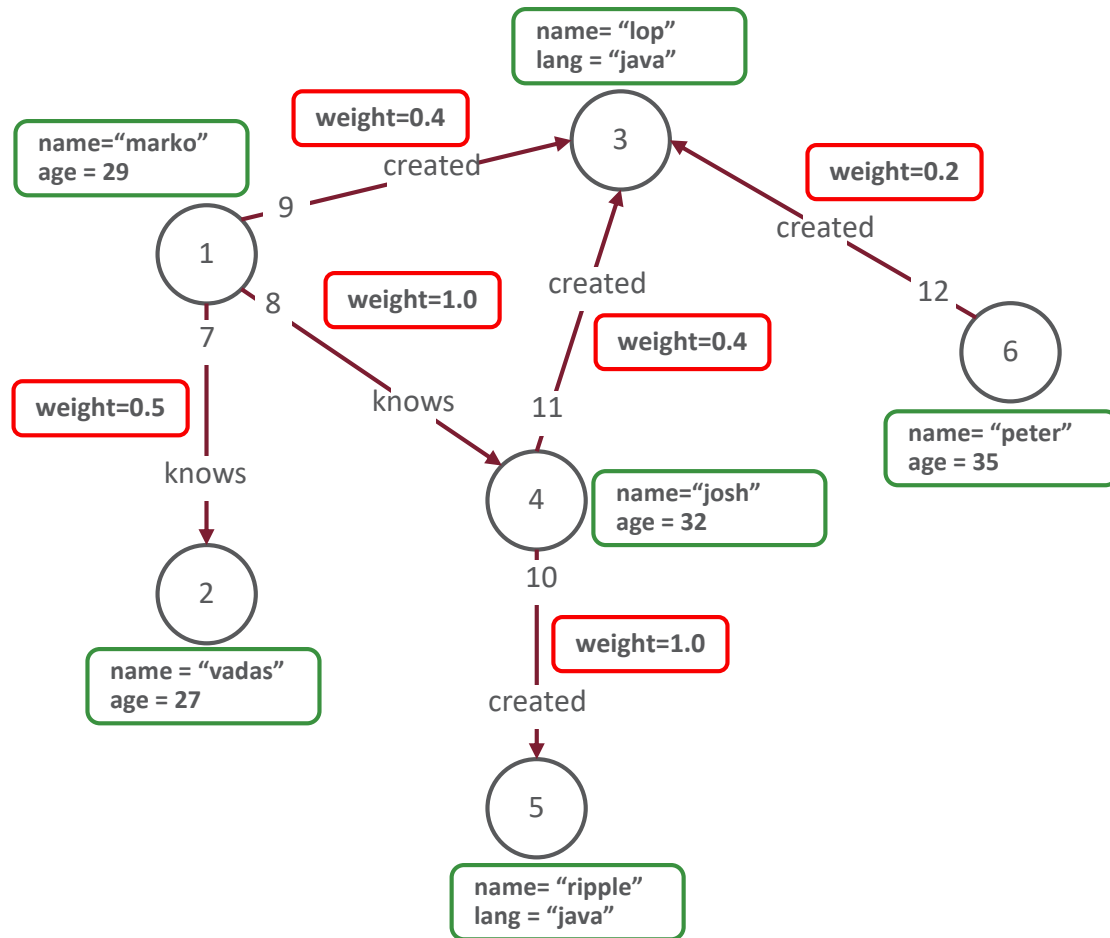
# Some Use Case Scenarios

- **Finance**
  - Customer 360, Fraud detection
- **Public Sector**
  - Tax Evasion, Crime network analysis
- **Retail**
  - Recommendation, sentiment analysis
- **Manufacturing**
  - Analyzing complex bill of materials (BoM)





# The Property Graph Data Model

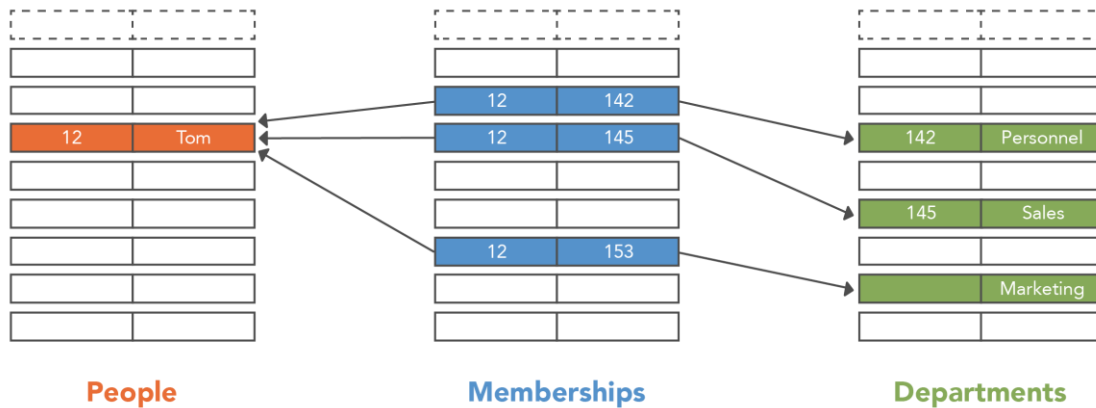


- A set of vertices (or nodes)
  - each vertex has a unique identifier.
  - each vertex has a set of in/out edges.
  - each vertex has a collection of **key-value** properties.
- A set of edges (or links)
  - each edge has a unique identifier.
  - each edge has a head/tail vertex.
  - each edge has a label denoting type of relationship between two vertices.
  - each edge has a collection of **key-value** properties.

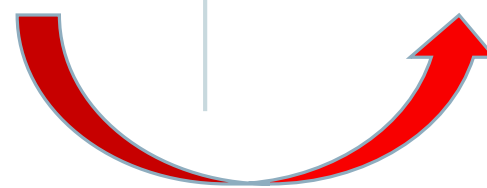
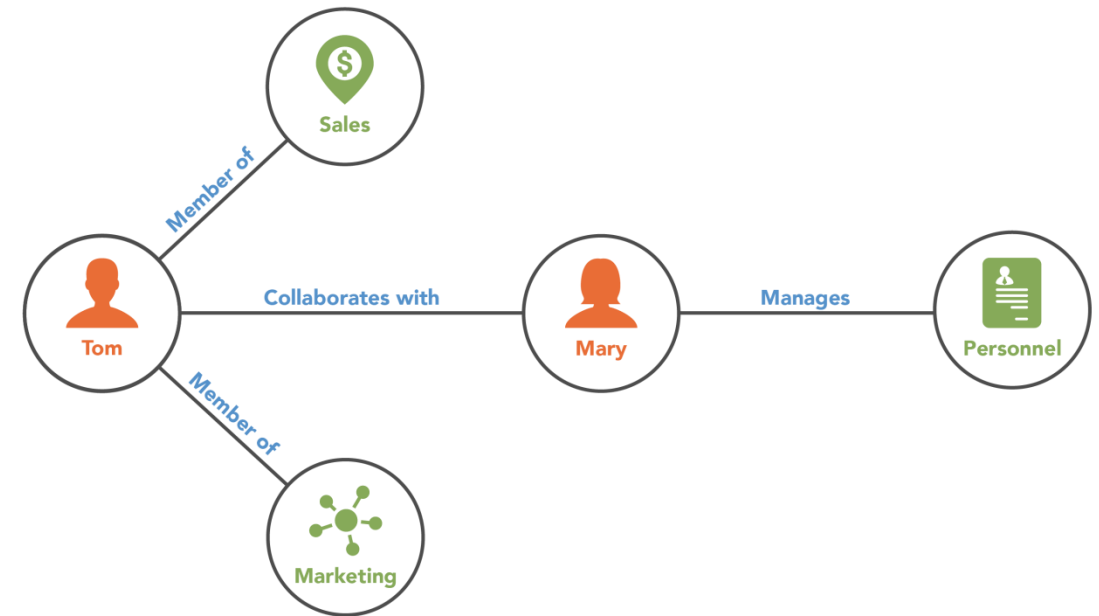
<https://github.com/tinkerpop/blueprints/wiki/Property-Graph-Model>

# Relational Model vs. Graph Model

- Relational Model

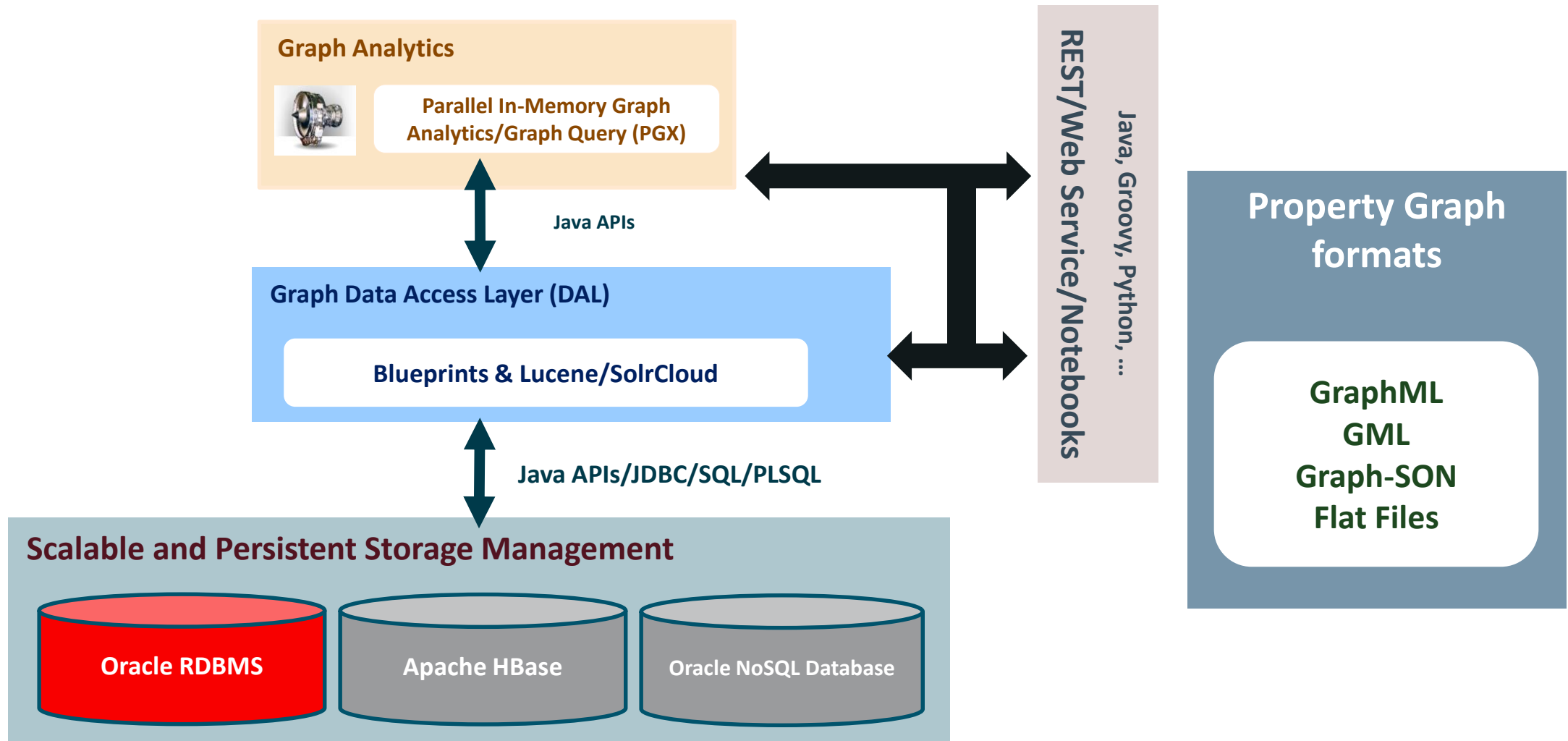


- Graph Model

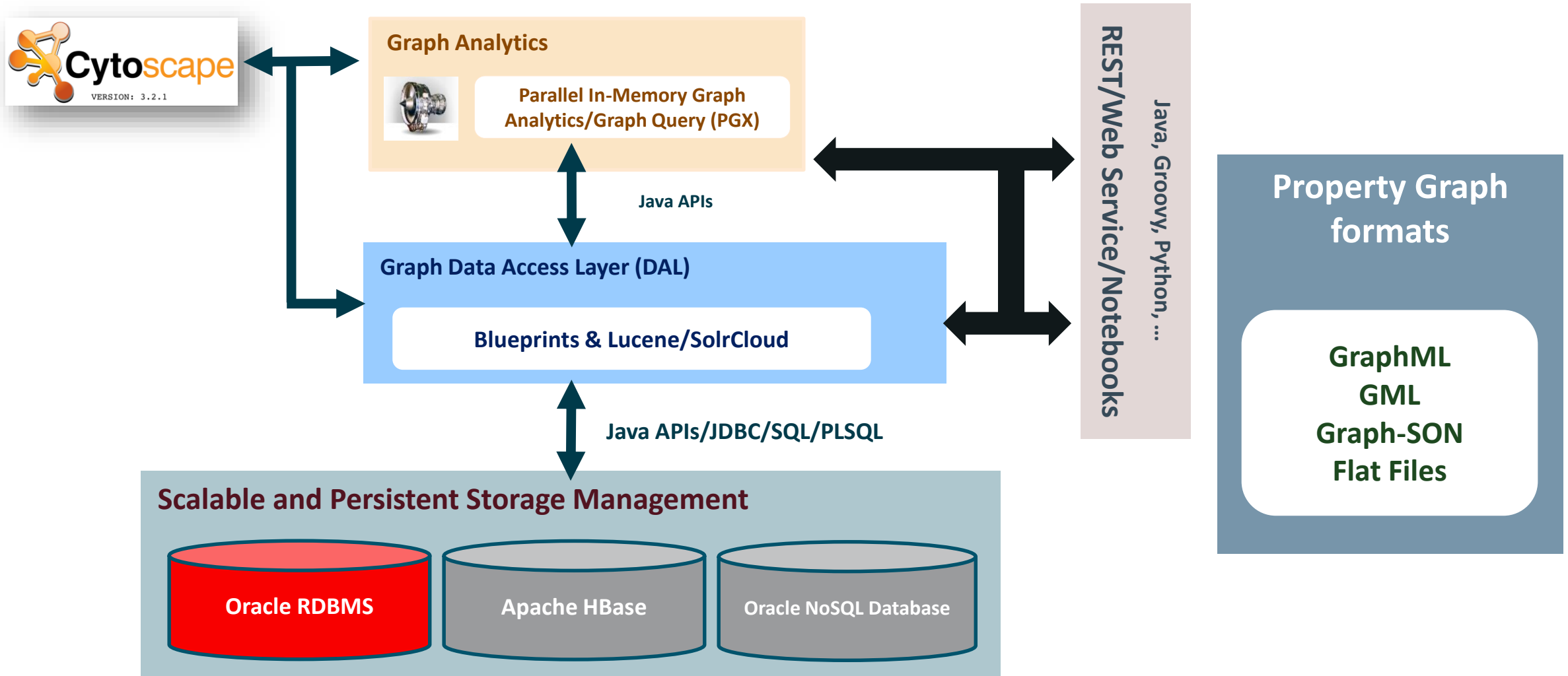


Courtesy: Tom Sawyer 2016

# Architecture of Property Graph Support

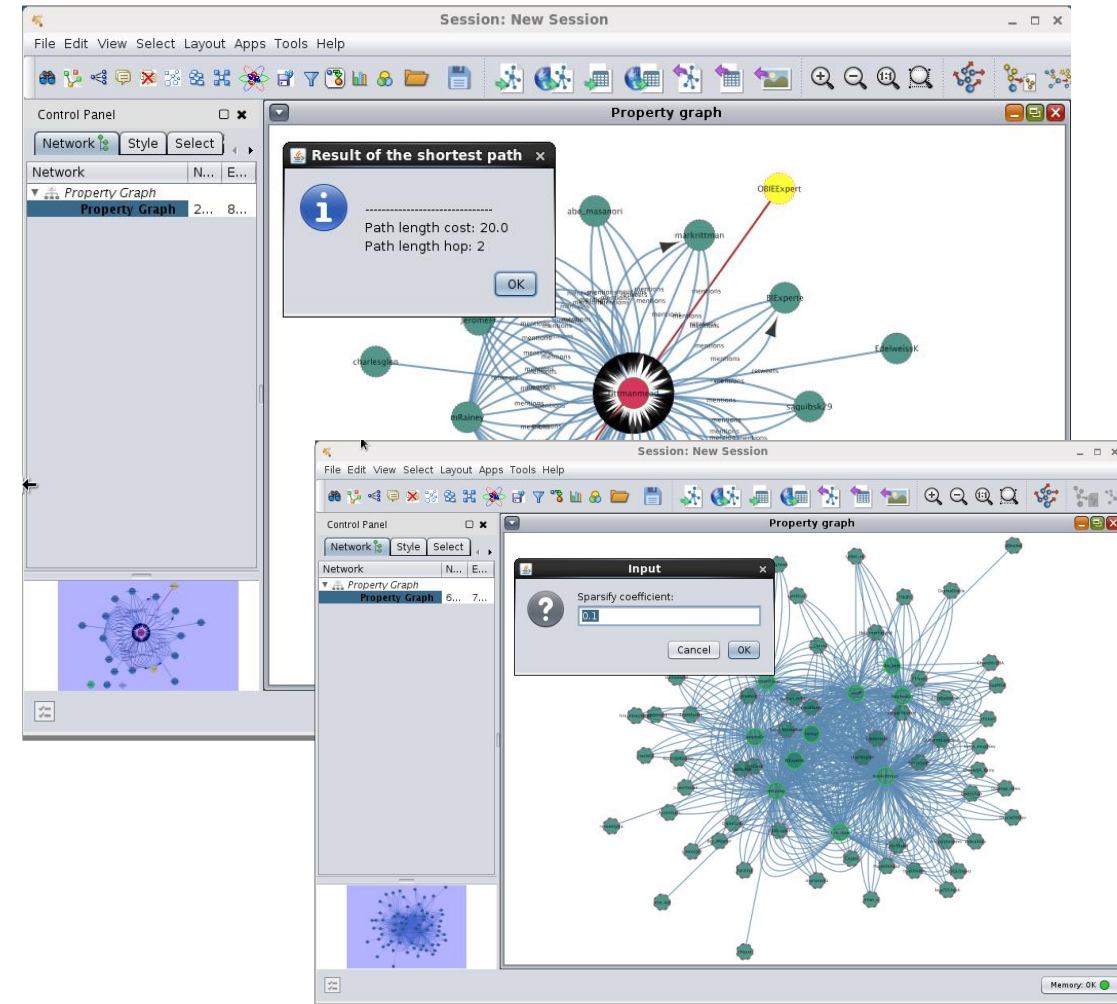


# Architecture of Property Graph Support



# Visualizing Property Graphs (with Cytoscape)

- Cytoscape supports Property Graph
- Connects to Oracle Database, Oracle NoSQL Database, or Apache HBase
- Runs Page Rank, Clustering, Shortest Path, etc
- Alternative to command-line for in-memory analytics once base graph created



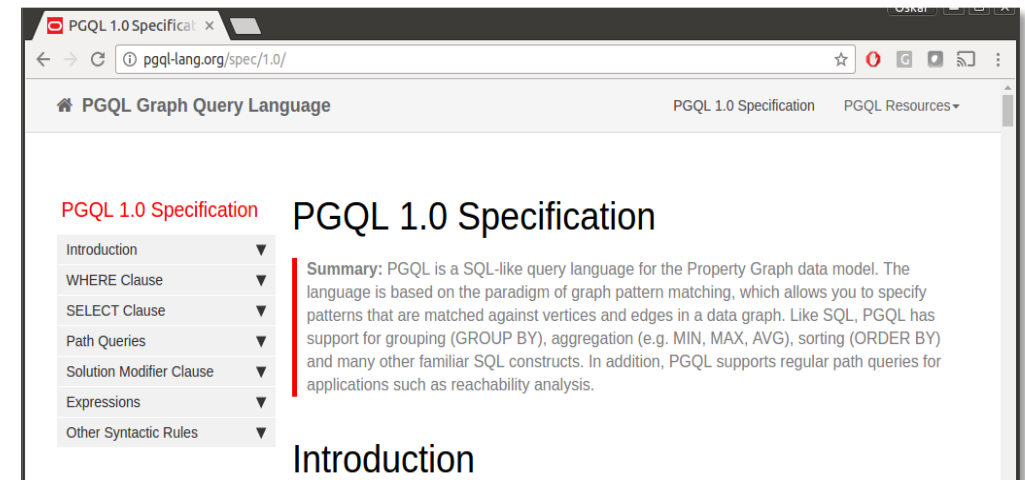
# Pattern matching using PGQL

- SQL-like syntax but with graph pattern description and property access
  - Interactive (real-time) analysis
  - Supporting aggregates, comparison, such as max, min, order by, group by
- Finding a given pattern in graph
  - Fraud detection
  - Anomaly detection
  - Subgraph extraction
  - ...

- Proposed for standardization by Oracle
  - Specification available on-line
  - Open-sourced front-end (i.e. parser)



<https://github.com/oracle/pgql-lang>



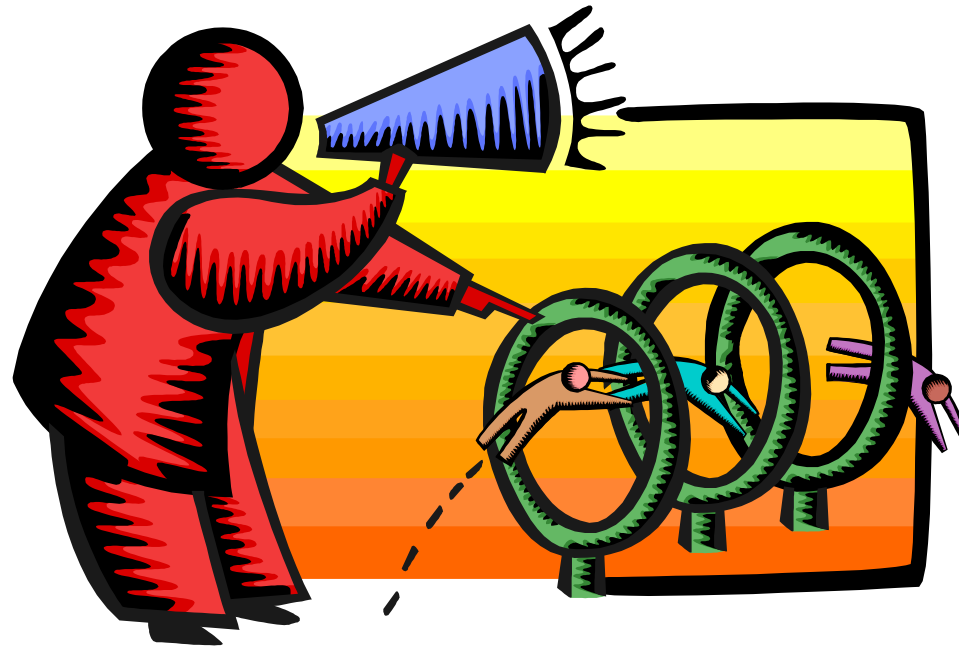


# How to Get Started with Property Graphs

- Details in blog article by Arthur Dayton of VlamiS
  - <http://www.vlamiS.com/blog/2018/2/5/creating-a-property-graph-on-oracle-database>
- Find some data (we take from HR – employees – Manager)
- Get environment set up
  - Start with VM <http://www.oracle.com/technetwork/database/enterprise-edition/databaseappdev-vm-161299.html>
  - Install Eclipse so have java environment
  - Install patch
  - Download Cytoscape
  - Download Cytoscape for Oracle app
- Create views to get data into graph-ready form
- Use Eclipse to write Java code to create graph
- Run Cytoscape and start playing with your graph



# Demo

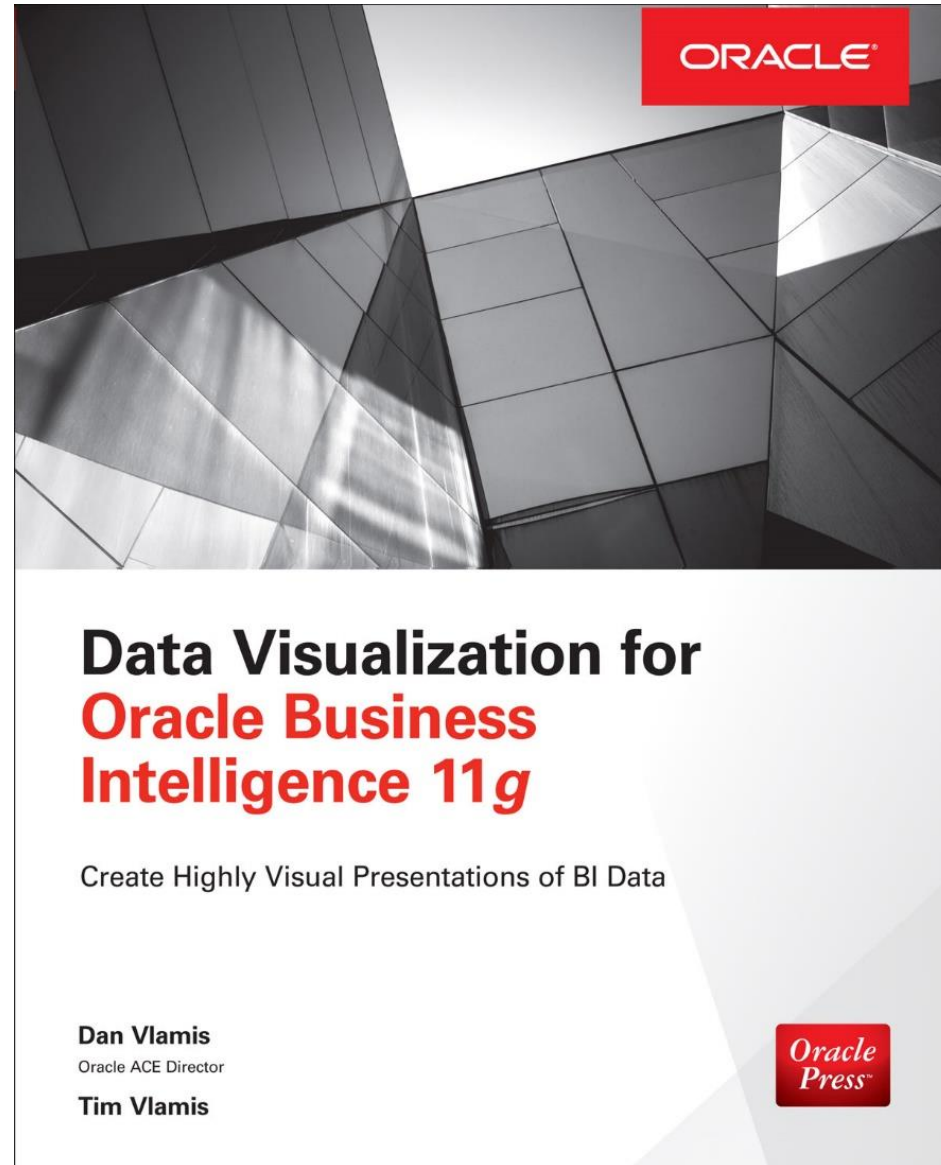






# Drawing for Free Book

Add business card to basket  
or fill out card





# ANALYTICS AND DATA SUMMIT 2018

All Analytics. All Data. No Nonsense.

March 20–22, 2018

Oracle HQ, Redwood Shores, CA

[www.AnalyticsandDataSummit.org](http://www.AnalyticsandDataSummit.org)

**24+ Spatial + Graph sessions, 10 Graph sessions. From hands on labs/intros to get started, to use cases in finance, manufacturing, blockchain, IoT and more  
Expert speakers from Oracle development and the user community**

# Graph Developer Training Day

March 19, 2018 at Oracle HQ Conference Center, Redwood Shores, CA



- A free full-day workshop to help you develop property graph applications using Oracle technologies, delivered by the Oracle product team
- Targeted toward developers, architects and data scientists
- View agenda at <https://blogs.oracle.com/oraclespatial/announcing-graph-developer-training-day>
- RSVP to [marion.smith@oracle.com](mailto:marion.smith@oracle.com) by March 6 if interested






# Resources

- Oracle Spatial and Graph & Big Data Spatial and Graph on OTN  
[oracle.com/technetwork/database/options/spatialandgraph](https://oracle.com/technetwork/database/options/spatialandgraph)  
[oracle.com/technetwork/database/database-technologies/bigdata-spatialandgraph](https://oracle.com/technetwork/database/database-technologies/bigdata-spatialandgraph)  
– White papers, software downloads, documentation and videos
- Blog – examples, tips & tricks  
[blogs.oracle.com/oraclespatial](https://blogs.oracle.com/oraclespatial) | [blogs.oracle.com/bigdataspatialgraph](https://blogs.oracle.com/bigdataspatialgraph)
- [www.vlamis.com/blog/2018/2/5/creating-a-property-graph-on-oracle-database](https://www.vlamis.com/blog/2018/2/5/creating-a-property-graph-on-oracle-database)
- Oracle Big Data Lite Virtual Machine - a free sandbox to get started  
[www.oracle.com/technetwork/database/bigdata-appliance/oracle-bigdatalite-2104726.html](https://www.oracle.com/technetwork/database/bigdata-appliance/oracle-bigdatalite-2104726.html)  
– Hands On Lab included in [/opt/oracle/oracle-spatial-graph/](#) or <http://github.com/oracle/BigDataLite/>

# Resources



- Online communities
  -   Oracle Spatial & Graph SIG user groups (search “Oracle Spatial Community”)
  -  @SpatialHannes, @Jeanlhm, @alanzwu - follow the S&G team
- Spatial and Graph AskTOM Office Hours (every month)
  - [https://devgym.oracle.com/pls/apex/dg/office\\_hours/3084](https://devgym.oracle.com/pls/apex/dg/office_hours/3084)
- Vlamis Software Solutions
  - <http://www.vlamis.com>
  - Arthur Dayton at [adayton@Vlamis.com](mailto:adayton@Vlamis.com), @arthurdayton116
  - Dan Vlamis at [dvlamis@Vlamis.com](mailto:dvlamis@Vlamis.com), @dvlamis
  - [www.vlamis.com/blog/2018/2/5/creating-a-property-graph-on-oracle-database](http://www.vlamis.com/blog/2018/2/5/creating-a-property-graph-on-oracle-database)