Oracle Spatial and Graph 18c RDF Semantic Graph

18ᶜ ORACLE® Database

As part of Oracle Spatial and Graph in Oracle Database, Oracle delivers advanced RDF Semantic Graph data management and analysis. With native support for World Wide Web Consortium (W3C) standards – RDF and OWL are standards for representing and defining semantic data and SPARQL is a query language designed specifically for graph analysis – application developers benefit from the industry's leading open, scalable graph data platform on Oracle Database with triple-level security, and high performance and availability. Graphs are becoming central to a new category of social network and linked data applications common in health sciences, finance, media and intelligence communities.

RDF SEMANTIC GRAPH NEW FEATURES 18C

- Oracle Database In-Memory
- List-hash composite partitioning (new in 18c)
- Faster loading of RDF quads with long literals (new in 18c)
- Native support for Turtle and Trig formats (new in 18c)

RDF SEMANTIC GRAPH NEW FEATURES 12.2

- SPARQL 1.1 Update operations and RDF ORDER BY query option
- RDF views on property graph data and Property graph views on RDF data
- SEM_APIS.SPARQL_TO_SQL function for SQL translation of a SPARQL query
- SPARQL Query orardf functions like, sameCanonTerm, textScore
- Oracle Flashback Query support

KEY FEATURES

- Proven scalability over 54 billion triples, up to 8 petabytes of triples
- Native support for W3C standards for semantic data, ontologies and inferencing – RDF, RDFS, OWL, SPARQL, RDB2RDF, SKOS

Storing, Loading, and Operations on RDF Data

RDF Semantic Graph has proven scalability to over 54 billion triples (LUBM 200K benchmark) and scales to the 8 petabyte limit of Oracle Database. It supports parallelized loading and DML, querying, and inferencing on RDF/OWL models. A model is similar to an application table; each model contains a set of subject – object – relationship triples organized as an RDF/OWL graph of directed labeled edges. The normalized, compressed and partitioned storage architecture requires up to 60% less hardware than other graph stores for more scalable and performant operations. The Oracle Multitenant cloud architecture is transparently supported.

Native Inferencing Using RDFS, OWL 2, SKOS, and User-Defined Rules

RDF Semantic Graph has native, forward-chaining, persistent inferencing supporting W3C RDFS, and OWL 2 RL / EL profiles and Simple Knowledge Organization System (SKOS). It supports user-defined rules, and a plug-in framework to accommodate third party reasoners for specialized inferencing. User-defined inferencing extensions can create new RDF resources during the rules deduction process and implement customized efficiencies for existing rules. Other optimizations include: incremental inference that updates an entailment after triple inserts; compact data structures for large owl:sameAs sets; and parallel inference on multi-core or multi-CPU architectures. Ladder-based inferencing supports triple-level label security.

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- Up to 60% data compression to enhance query, load, inference performance
- Triple-level Label Security
- Parallel, direct path bulk load
- Scalable partitioning enhances load and inference performance and concurrent operations for large RDF data sets
- SPARQL, SPARQL/Update, SPARQL endpoint and Java APIs via open source Apache Jena / Joseki & Sesame
- Querying RDF/OWL via SQL, with embedded SPARQL graph patterns
- Support for Virtual Models
- Ontology-assisted querying of table data using SQL operators
- Semantic indexing for documents based on popular natural language processors
- Cytoscape plug-in graph visualization
- Protégé ontology editing

KEY BENEFITS
- Native standards-based RDF graph support for linked data and social interaction analysis
- Scalability to support the largest graphs
- DoD-strength security
- Graph analytics and BI interoperability
- RDF views on relational data facilitates enterprise integration
- Leading partner tools for visualization, ontology engineering and more
- SQL, relational and XML data interoperability
- Related products
- Oracle Database 12*c*
- Oracle Partitioning
- Oracle Exadata Database Machine
- Oracle Advanced Analytics – Data Mining and Oracle R Enterprise.

Querying RDF Graphs in Oracle Database

RDF Semantic Graph supports SPARQL queries using open source Apache Jena / Joseki and Sesame endpoints and their associated Java development environments. User-defined functions and aggregates can be added to SPARQL queries. RDF/OWL data can also be queried using SQL; the SEM_MATCH table function embeds SPARQL graph pattern queries in a SQL query. Virtual models provide a view-like feature to combine models for ease of querying.

Viewing Relational Data as RDF Triples

RDF views on relational tables, views, and SQL query results are supported. The W3C specifications for automatic mapping (called Direct Mapping), custom mapping (using the W3C R2RML language) and materializing views are supported. RDF views present relational data in RDF triple format so it can be queried using SPARQL and connected with other linked data and RDF graphs to relate and facilitate enterprise data integration.

RDF, XML and Relational Interoperability

Ontology-assisted SQL querying allows SQL queries to extract semantically complete results from table data by associating relational data with ontologies that organize the domain knowledge of the data. The SPARQL Gateway presents SPARQL query results as XML for tools that support XML data, such as Oracle Business Intelligence.

Fine-grained Security

The default access control to an RDF graph is at the model level. Triple-level security using the Oracle Label Security Option is supported to define sensitivity labels on individual triples and users that conditionally restrict a user's access to triples. [1]

Graph Analytics and Visualization

SPARQL property path expressions find graph patterns across any length path and in-memory graph analytics find reachability, shortest path, within-cost, and nearest-neighbor. Graph query results can be materialized for use with Oracle Advanced Analytics Data Mining and Oracle R Enterprise. Visualize graphs with popular tools. Making Your Data Sheet Accessible to Readers with Disabilities

Semantic Indexing for Documents

Semantic indexing for documents provides an index type that works with third party natural language extractors and annotators. It stores meaningful information in the form of RDF triples that is extracted from unstructured documents, table data and URLs. Documents indexed semantically can be searched using SEM_CONTAINS operator within a standard SQL query. The search criteria are expressed using SPARQL query patterns that operate on the information extracted from the documents.

Advanced Performance and Scalability for Semantic Web Applications

RDF Semantic Graph supports parallelism, basic table compression, partitioning, Oracle Real Applications Clusters and Oracle Exadata Database Machine for the most demanding enterprise-class performance and scalability. Required licensing for this functionality is: Oracle Database Enterprise Edition, Oracle Spatial and Graph and Oracle Partitioning.

An Open Data Management Solution

RDF Semantic Graph features are integrated with leading third party graph tools and applications and Oracle Business Intelligence and Advanced Analytics. Oracle helps shape, drive, implement and support the latest open standards for the Semantic Web. Oracle is a W3C member and a participant in technical working groups for RDF, SPARQL, RDB2RDF, OWL and OGC GeoSPARQL. Oracle is committed to standards.

RDF Semantic Graph brings the power and value of semantic analysis to your business applications. It supports graph-based applications in domains ranging from national intelligence and financial fraud detection to the data integration in life sciences. Oracle provides world-class performance, scalability, security, and manageability to your RDF data assets.

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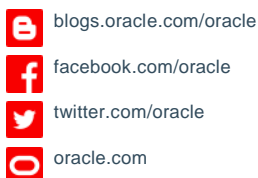
Integrated Cloud Applications & Platform Services

Oracle is committed to developing practices and products that help protect the environment