Advanced Performance and Scalability for Semantic Web Applications
Introduction
Oracle Database 11g Enterprise Edition delivers advanced semantic data management capability not found in any other commercial or open source triple store. The semantic features are part of the Oracle Spatial 11g option. Oracle Database 11g incorporates three key performance and scalability features that address the most demanding enterprise-class semantic web solutions. Oracle’s semantic database features exploit the benefits of the table compression (direct load operations) feature in Oracle Database Enterprise Edition and the Partitioning Option, while fully supporting Real Applications Clusters (RAC). For this reason, users of the RDF/OWL features of the Oracle Spatial option are required to license Oracle Database Enterprise Edition and the Partitioning option.

Compression
The Semantic Technologies feature of Oracle Spatial transparently and automatically uses the table compression feature of Oracle Database Enterprise Edition. This is known as compress direct load operations in release 11.1 and compress basic in release 11.2. It compresses data by eliminating duplicate values in a database block. All database features and functions that work on regular database blocks also work on compressed database blocks.

Some key benefits that compression brings to Semantic Web solutions include:

• Up to 3x or higher reduction in storage costs. These savings also extend to test, development, backup and disaster recovery environments, further magnifying the cost savings.

• No adverse impact on query performance, as queries read the compressed version of data directly without having to decompress it. In fact, query performance may improve due to improved disk scan rate and reduction in the number of I/Os.

• Enhanced memory efficiency, as data in memory is in a compressed format. This allows more data to be stored in memory and reduces number of I/Os, which may improve performance.

Partitioning


The Oracle database architecture includes partitioning, in which a single logical table and its indexes are broken up into one or more physical tables, each with its own index. Semantic indexes associated with partitioned tables can be partitioned; range partitioning is the partitioning scheme supported for semantic indexes.

Partitioning offers significant performance, scalability, and manageability benefits, including the following:

• Reduced response times for long-running queries; partitioning can reduce disk I/O operations.
• Reduced response times for concurrent queries; I/O operations run concurrently on each partition.
• Easier index maintenance, because of partition-level create and rebuild operations.
• Ability to rebuild indexes on partitions without affecting the queries on other partitions.
• Ability to change storage parameters for each local index independent of other partitions. Partitions can also be split, merged, and exchanged.

Real Application Clusters (RAC)


Oracle Real Application Clusters (RAC) option supports the transparent deployment of a single database across a cluster of servers, providing fault tolerance from hardware failures or planned outages. Oracle RAC running on clusters provides Oracle’s highest level of capability in terms of availability, scalability, and low-cost computing. Oracle RAC supports mainstream business applications of all kinds. This includes OLTP, DSS, and Oracle’s unique ability to effectively support mixed OLTP/DSS environments.

Oracle RAC provides very high availability for applications by removing the single point of failure with a single server. If a node in the cluster fails, the Oracle Database continues running on the remaining nodes. Individual nodes can be shutdown for maintenance while application users continue to work. Oracle Real Application Clusters provides flexibility for scaling applications. To keep costs low, clusters can be built from standardized, commodity-priced processing, storage, and network components. When you need more processing power, simply add another server without taking users offline servers to gain horizontal scalability.