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Oracle Database Workspace Manager: Support for Oracle Spatial and Graph Topology Data Model

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Introduction

Workspace Manager, a feature of Oracle Database, allows application developers and DBAs to version topologies stored in the Oracle Spatial and Graph topology data model. A workspace is a virtual environment in which to isolate a collection of changes to one or more topologies, keep a history of changes and create multiple topological scenarios for "what if" analysis in the same database. This can save money, time and labor over traditional approaches of copying data.

The Oracle Spatial and Graph topology data model manages data about nodes (points), edges (lines), and faces (polygons) in a topology. Topological relationships include such relationships as contains, inside, covers, covered by, touch, and overlap with boundaries intersecting. Topological relationships remain constant when features are edited or the coordinate space is deformed, such as by twisting or stretching.

Topologies are useful when there is a high degree of feature editing and a strong requirement for data integrity across maps and map layers. Additionally, topology-based queries typically perform faster for queries involving relationships such as adjacency, connectivity, and containment. Land management (cadastral) systems and spatial data providers benefit from these capabilities.

Overview

The Oracle Spatial and Graph topology data model and schema persistently store topology data in Oracle Database. Information about geometry layers and topological elements is stored in the following tables:

- One or more user-named feature tables

- *<topology-name>*_EDGE$

- *<topology-name>*_NODE$

- *<topology-name>*_FACE$

- *<topology-name>*_RELATION$

- <topology-name>_HISTORY$

When a topology is versioned, the following mechanisms ensure that a valid view of the versioned topology is maintained for every workspace:

- A topology is versioned by a special form of the Workspace Manager `EnableVersioning` procedure. It versions all of the tables associated with a topology at the same time. Versioning is disabled on a topology in a similar fashion, using the `DisableVersioning` procedure.

- Workspace Manager includes a special form of the spatial procedures that add and delete a topology geometry (feature) layer. The Workspace Manager procedures must be used in place of the spatial procedures to add or delete a feature associated with versioned topology:

- Oracle Spatial and Graph allows one user at a time to edit topological elements contained in a window of interest. This prevents conflicts. The editing application must invoke the Workspace Manager lock rows procedure on the elements to be loaded into the editing window before loading them. When editing is finished, the Workspace Manager unlock rows procedure must be invoked to allow another user to edit the same topological elements.

- When changes to a versioned topology are merged, refreshed or rolled back, only Workspace level procedures can be used. Table level procedures are not supported.

See the Oracle Database documentation, *Workspace Manager Developer's Guide* and *Oracle Spatial and Graph Topology Data Model and Network Data Model Graph Developer's Guide*, for complete information on versioning and using the Oracle Spatial and Graph topology data model.

Versioning a Topology

You must invoke the `SDO_TOPO.INITIALIZE_METADATA` procedure at least once on a topology before you version-enable the tables associated with the topology. The `INITIALIZE_METADATA` procedure creates or recreates sequences and indexes on edge, node, face, and relationship tables. You can also invoke the `SDO_TOPO.INITIALIZE_METADATA` procedure as needed after version-enabling a topology.

A version-enabled topology must have at least one feature table. To version-enable a topology, you must specify the topology name as the `table_name` parameter to the `EnableVersioning` procedure, and you must specify the `isTopology` parameter as `TRUE`. For example:

```
EXECUTE DBMS_WM.EnableVersioning
                (table_name => 'xyz_topo',
                 isTopology => TRUE);
```

The preceding example version-enables the `xyz_topo` topology; that is, it version-enables all feature tables associated with the `xyz_topo` topology, as well as the `XYZ_TOPO_NODE$`, `XYZ_TOPO_FACE$, XYZ_TOPO_EDGE$, XYZ_TOPO_RELATION$,` and `XYZ_TOPO_HISTORY$` tables.

To disable versioning on any topology tables, you must disable versioning on all tables associated with the topology by specifying the topology name as the `table_name` parameter to the `DisableVersioning` procedure and the `isTopology` parameter as `TRUE`.

Exceptions

Exceptions apply to the preceding guidelines about version-enabling and version-disabling topology tables in the following cases:

- If a feature table of a topology is the child table of a referential integrity constraint with `CASCADE` option with a table that is not in the topology

- If a feature table of a topology is the parent table of a referential integrity constraint with a table that is not in the topology

In these cases, you must version-enable or version-disable the feature table separately. First call the `EnableVersioning` or `DisableVersioning` procedure on the feature table along with any tables required by the referential integrity constraint and then invoke the `EnableVersioning` or `DisableVersioning` procedure specifying the topology name.

Adding a Geometry Layer to a Versioned Topology

The Workspace Manager procedures that add or remove a topology geometry layer in a version-enabled topology are:

- `DBMS_WM.ADD_TOPO_GEOMETRY_LAYER`

- `DBMS_WM.DELETE_TOPO_GEOMETRY_LAYER`

These procedures have the same format and meaning as the Spatial Topology procedures `SDO_TOPO.ADD_TOPO_GEOMETRY_LAYER` and `SDO_TOPO.DELETE_TOPO_GEOMETRY_LAYER`, which should be used with non-versioned topologies.

Editing a Versioned Topology

Pessimistic locking is used to edit version-enabled topologies. Before elements of a topology can be edited, the associated table rows must be locked. To edit the elements of a topology in a workspace (including the `LIVE` workspace), follow these steps:

- Use the Workspace Manager procedure `DBMS_WM.LOCKROWS` to put version locks on all the elements of the topology contained in a window of interest.

- Invoke the Oracle Spatial Topology Java client `LoadWindow` method for the same window of interest.

To lock or unlock rows in tables associated with a topology, you must specify the topology name as the table_name parameter to the `DBMS_WM.LOCKROWS` or `DBMS_WM.UNLOCKROWS` procedure, and you must identify the window containing the rows by using the `Xmin, Ymin, Xmax,` and `Ymax` parameters. You must also not specify the `where_clause` parameter. For example:

```
EXECUTE DBMS_WM.LockRows
                 (workspace => 'ws1',
```

```
            table_name => 'xyz_topo',
        Xmin => 0.1,
        Ymin => 0.1,
        Xmax => 0.5,
        Ymax => 0.5 );
```

The preceding example puts version locks on all the rows of the specified topology contained in the specified window.

Merging, Refreshing, Rolling Back Topology Changes

Use the `MergeWorkspace`, `RefreshWorkspace`, and `RollbackWorkspace` procedures to merge, refresh, or roll back tables associated with a topology. Do not use the `MergeTable`, `RefreshTable`, or `RollbackTable` procedure on a version-enabled table associated with a topology.

Conclusion

Workspace Manager can version topologies that are stored in the Oracle Spatial and Graph topology data model. Use workspaces to isolate a collection of changes to one or more topologies, keep a history of changes and create multiple topological scenarios for "what if" analysis in the same database.

For technical information, software downloads and sample code go to:
http://www.oracle.com/technology/products/database/workspace_manager/index.html

http://www.oracle.com/technology/products/spatial/index.html

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