Managing Australia's GeoSpatial Information using Oracle Spatial

Stuart Ross & Trevor Tracey-Patte
Oracle Spatial Users Forum

Aug 2005
Geoscience Australia

- Geoscience Australia is Australia's national agency for geoscience research and geospatial information.
- Clients include State authorities, petroleum and minerals industries, emergency management, environmental managers and departmental policy advisors
- Data holdings > 600 Tb growing at 20% per year
- Approximately 1.5Tb stored in Oracle in both Spatial and ESRI formats
Corporate Data Model (CDM)

- Series of relational tables that stores and manages data across GA within shared and individual data structures using common corporate business rules
- **Oracle Spatial functionality a key concept of the CDM**
- Extensive use of spatial querying capabilities
- Data types include points, lines, polygons and 3D
- Handles multiple datums and conversions
- Scale independent
Corporate Data Model (CDM)

- Discoverability
- Reusability
- Enable access
- Reduce redundancy
- Standardise development
- Common core structure
- Governance model
Holds geometry and common attributes

Holds attributes for the specific data theme
GA’s Application Demo
MapViewer Integration
As a Developer...

- Queries
- Functionality
- A couple of tips
Queries

• **Find**
  • Everything
  • Specific things

• **That interacts with**
  • User defined point, line, polygon
  • Database defined object

• **Web pages with dynamic input**
Functionality

- Lat/long columns to point geometry
  - Not function based index due to RLS
- Convert points to generalized line
  - Using Safe’s FME
- Convert lines to polygon
  - Using aggr_convexhull
- Convert polygon to offshore part only
  - Using sdo_geom.sdo_difference with Australian coastline – Oracle error
Functionality

- Mapping Applications live from the Database
  - UMN Mapserver
  - Based on user input
Functionality
Functionality

- **Create geometries programmatically**
  - 5 minute blocks
  - Original data from GIS
    - Incomplete
    - Inaccurate
Tip #1

• **Where Geom is not null**
  • Does not use spatial index
  • Cannot index the geometry object
  • Index an object element eg sdo_gtype
    • Used by our mapping applications
Tip #2

- Oracle system variable
  - Spatial_query_speed = 'SLOW'
- Tip for multi-table, multi-predicate spatial queries (indexes on predicates) only
- The secondary filter (relate) is the slowest part of a spatial query

```sql
select /*+ ordered */ b.manager, e.manager
from boxes b, envelopes e
where b.opening = 'side'
and e.colour = 'blue'
and sdo_relate(e.geom, b.geom,
               'mask=anyinteract query=window') = 'TRUE'
```
Tip #2

```sql
select /*+ ordered */ b.manager, e.manager
from boxes b, envelopes e
where b.opening = 'side'
and primary filter (sdo_filter)
and secondary filter (relate)
and e.colour = 'blue'
```

- 1000 rows in each table, 50 ‘side’ rows and 50 ‘blue’ rows
- Each ‘side’ row spatially intersects via MBR with 50 envelope rows
  - 5 of these are ‘blue’
- 10 ‘side’ and ‘blue’ records that actually spatially intersect

- Primary filter operates on all (not just blue) records – 50 times on 1000 rows
- Secondary filter operates on all (2500) returned records – 50 times on 50 rows
- All spatially intersecting records are found (not just blue)
- ‘Blue’ records are filtered out
Tip #2

```sql
select /*+ ordered */ b.manager, e.manager
From boxes b, envelopes e
Where b.opening = 'side'
And sdo_filter(e.geom, b.geom, 'query=window') = 'TRUE'
And e.colour = 'blue' -- indexed
And sdo_geom.relate(e.geom, 'anyinteract', b.geom, 0.5) = 'TRUE'
```

- 1000 rows in each table, 50 ‘side’ rows and 50 ‘blue’ rows
- Each ‘side’ row spatially intersects via MBR with 50 envelope rows
  - 5 of each of these are ‘blue’
- 10 ‘side’ and ‘blue’ records that actually spatially intersect

- Primary filter operates on all (not just blue) records – 50 times on 1000 rows
- Blue records are filtered out as Oracle performs indexed predicates first
  - Returns 50 by 5 records
- Secondary filter operates on all returned (250) records
- Faster by a factor of at least 20
Managing Australia's GeoSpatial Information using Oracle Spatial

Stuart Ross & Trevor Tracey-Patte
Oracle Spatial Users Forum