Leveraging Oracle Spatial

At Queensland Department Of Main Roads

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Road Systems Unit
Listen – Innovate – Create
Overview

Scene Setting

- Queensland Department of Main Roads (MR)
  - It’s a big place!
- Oracle within MR
  - ARMIS infrastructure
    (“A Road Management Information System”)
- GIS within MR
  - Talking “spatial” in a “linear” world
Overview

Leveraging Oracle Spatial

1. Interoperability
2. Application architecture – Past, Present and Future
   - Spatial data services (SOA)
3. Data maintenance “frameworks”
Scene Setting...
Queensland Department of Main Roads
- Organisation Architecture

Queensland Department of Main Roads
• Road Systems and Engineering Group
  – Road Network Management Division
    • Roads Information Branch
      ➢ Road Systems Unit
Oracle within MR
- Database Systems Architecture

- Corporate “Master” server
- 14 District servers
  - Cloncurry
  - Cairns
  - Townsville
  - Barcaldine
  - Emerald
  - Roma
  - Mackay
  - Rockhampton
  - Bundaberg
  - Warwick
  - Toowoomba
  - Gympie
  - Nerang
  - Brisbane
Oracle within MR
- Database Systems Architecture

- Corporate “Master” server
- 14 District servers
- Sophisticated replication machinery over WAN

Delivers the 6 primary operational systems which constitute “ARMIS” (plus others…)

✔ Established Oracle enterprise architecture
✔ In-house Oracle expertise
✔ Oracle Spatial fits right in!
GIS within MR - Paradigm Clash

- MR is a “Linear” organisation
  - Lat/Long means very little
  - Chainage means everything

- “Killer App” is a strip-chart tool called **ChartView**

- GIS = Dynamic Segmentation
  - Plot linear data on a map
  - Presentation only
GIS Within MR
- Wide Spectrum of Users

Surveyors

**Concerns**
- DGPS
- Accuracy
- Precision
- Datum / Projection

**Tools of Choice**
- AutoCAD
- 12D
- MX

“The Rest”

**Concerns**
- Availability / Reliability
- Metadata (currency)
- Consistency across systems
- Ease of analysis
- Ease of inclusion in reports

**Tools of Choice**
- MapInfo Professional
- GeoMedia (not as popular)

Cartographers

**Concerns**
- Spatial consistency
- Metadata (source)
- Labelling
- High quality hard copy

**Tools of Choice**
- Genamap (phasing out)
- ArcGIS (phasing in)
1. Interoperability
Interoperability in MR
- Design Rules of Thumb

1. INTEROPERABILITY = “VIEW” + “INSTEAD OF” Trigger

2. Triggers on ALL spatial tables to preserve PK

3. Interoperability at data level
   • Antithesis of “vendor-specific”
   • SDO_GEOMETRY

4. Vendor-specific views (e.g. PK field name, data type)

5. Vendor-specific metadata (Oracle schema) to control access to data
Interoperability in MR
- Example – Digital Road Network (DRN)

- 3D GPS Road Centrelines
- MR App-specific Attributes
- Preserve PK
- 3D → 2D
- 2D → 3D
- Selective Editing

GeoMedia ✓
MapInfo ×

GeoMedia ×
MapInfo ✓

GeoMedia ✓
MapInfo ✓

DRN CENTRELINES_BIUDR
DRN CENTRELINES
DRN CENTRELINES_2D
DRN CENTRELINES_2D_BIUDR
DRN_CLINES_MAPVIEW
DRN_CLINES_MAPVIEW_BIUDR
DRN_CLINES_MV_DATA

GeoMedia 9
MapInfo 8
GeoMedia 8
MapInfo 9
GeoMedia 8
MapInfo 9
GeoMedia 9
MapInfo 8
GeoMedia 8
MapInfo 9
GeoMedia 9
MapInfo 8
Interoperability in MR
- Benefits thus far

- Successful data interoperability
  - MapInfo, GeoMedia, Genamap
  - (ArcGIS … underway)
- Single source of data
- Data management (backup, replication, security)
- Ease of use → Increased use
  - GIS data custodians empowered
  - Productivity increased / data update cycles shortened
  - Renewed interest / uptake by MR staff
2. Application Architecture
Application Architecture in MR - Historical

**Textual Apps**
- **Pres.**
  - Oracle Forms
    - Client / server
    - Linear location model
  - Business logic divided between Oracle Forms and Database
- **Bus.**
  - DBMS
- **Data**
  - Oracle Forms
  - DBMS

**Spatial Apps**
- **Pres.**
  - Desktop GIS
    - Spatial location (dynamic segmentation)
  - Business logic entirely within client application
- **Bus.**
  - Files
  - Data storage proprietary file system based
- **Data**
  - DBMS "bit bucket" storage

- Oracle Forms
- Desktop GIS
- Oracle Forms
- DBMS
- Files
- DBMS
Application Architecture in MR
- Recent Changes – Exploiting Oracle Spatial

Spatial Apps

- Client applications focus on presentation / user interface
- Oracle Spatial taking on business logic of data management
- INTEROPERABILITY (Common data)
Application Architecture in MR
- Future Directions – Service Oriented Architecture

Textual AND Spatial Apps

**Pres.**
- Client applications entirely presentation / user interface

**Bus.**
- Business logic implemented as services (including “wrappers” for database procedures)

**Data**
- Database functionality packaged as services

- Client applications entirely presentation / user interface
- Business logic implemented as services (including “wrappers” for database procedures)
- Database functionality packaged as services
Application Architecture in MR
- Future Directions – Spatial Services

- Bridge between Linear and Spatial reference systems

- Services to both GIS and non-GIS applications
  - Nearest road
  - GPS → Chainage
  - Chainage → Lat/Long
Application Architecture in MR - Future Directions – Spatial Services
Leveraging Oracle Spatial with MapInfo

3. Data Maintenance Frameworks
Data Maintenance in MR
- Definition

Includes

• Maintenance of core systems data
  – Road centrelines / network definition
  – Road corridor management systems data
  – Road asset management systems data

Excludes

• Propagation of 3rd party data
  – Currently requires a data management environment
    • Up-to-date
    • Available / accessible for MR operators
  – Ultimately expect this to be “external services”
Data Maintenance Frameworks
- Data Flow Lifecycle

Mobile Data Capture

Desktop GIS

Operational Systems

Validation & Verification Services

• Query
• Display
• Report

Services

WAREHOUSE

LIVE

LOAD W.I.P.

Query
Display
Report
Data Maintenance Frameworks
- GIS to Oracle Spatial

- “Managed” GIS environment
- Workspace Manager not quite there…
- Minimal client application
  - “boot-strapping”
  - data & metadata driven
- All business logic contained in the database (close to the data!)
Oracle Spatial
- Benefits to come…

• Further decrease in data update cycles
• “Merge” with textual systems
  – Core operational system becomes spatial
• WMS and WFS
• Georaster

...Watch this space!
Thankyou!