Combining Bentley Geospatial Products with Oracle Spatial to Manage 3D City Base Maps
Agenda

• Introduction / 3d City GIS
• Leveraging Oracle Spatial with Bentley Products
• Building 3D cities base maps
• Conclusion
Introduction

Key elements to consider when building 3D City GIS for sustaining infrastructure
Where are we today?

- A keen interest for 3D City models
  - Google Earth / Virtual Earth
  - Increasing number of cities creating/managing their 3D Models
  - New standards (CityGML, KML)
  - Dedicated conferences (Imagina, Geoweb)
  - Utilities (3d radar scanning)
Where are we today?

- Recognized benefits of 3D City visual simulation:
  - Urban planning simulation
  - Tourism promotion
  - Team collaboration
  - …
Examples
Where are we today?

- 3D City models are frequently seen as specific “pretty” products dedicated to specific projects
  - Accuracy, metadata and even sometimes geospatial coordinates are lost
  - Updates are difficult
  - Limited / very narrow use
Where are we today?

Early adopter feedbacks indicate:

- Effective and ethical use of 3D City models requires data quality management
- Updates of 3D City models are a major issue to make the use of 3D City models sustainable
- ...

3D City GIS eSeminar

Enhance Your City GIS Using 3D Data for the Design, Planning, and Management of Intelligent Cities

Date: Thursday, April 29, 2010
Time: 11:00 a.m. EDT, 3:00 p.m. GMT, 4:00 p.m. BST, 5:00 p.m. CEST
Duration: 1 hour
Cost: FREE

Join Bentley and Terrasolid in an interactive presentation featuring exciting 3D City GIS modeling and management technologies designed to improve the accuracy and usefulness of your municipal GIS.

By attending this eSeminar, you will:

- Discover the advantages of modeling city infrastructure in 3D
- Understand how LiDAR Point Clouds are being used to create 3D City GIS models
- Learn how 3D City GIS data can be maintained and analyzed

This free eSeminar will take an innovative look at the evolving trends in GIS and LiDAR, and how these technologies are converging to make 3D municipal and campus infrastructure modeling more accessible to governments around the world.

Register today for this free eSeminar. We guarantee you will not look at GIS the same way again!

Register Now

Additional eSeminars coming soon!

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3D City GIS

April 2010
Oracle Spatial
User Conference
Bentley vision: towards a 3D City GIS

• It’s an information management systems using 3D City model as a platform
Leveraging Oracle Spatial in Bentley Products
Interoperability with Oracle Spatial

- Bentley Geospatial Server
- Any PL/SQL Client
- Bentley Industry Applications via Two-Tier Direct Connection
- Bentley Map via Two-Tier Direct Connection
- Other GIS Systems Compliant with Oracle Spatial
- Bentley Map Enterprise Connection
- Bentley Industry Applications Enterprise Connection
Bentley Geospatial Oracle Strategy

- Excellent Oracle Database Citizen
  - Create 100% Oracle Spatial Standard data
  - Use Oracle Spatial metadata and coordinate systems
  - Use Oracle standard versioning (Workspace Manager)
  - Not requiring any proprietary schemas, tables or fields (no MSLink)
  - No need for addition/change in database tables
Registering features
**Bentley Geospatial Oracle - Level of Support**

- **Bentley Geo Web Publisher**
  - Time component
  - Light editing

- **Oracle Locator**

- **Oracle Spatial**

- **Bentley Geospatial Server**
  - Simultaneous Multi User Editing
  - Long transactions, optimistic and pessimistic locking
  - Time component

- **Bentley Geospatial Industry Applications**
  - Direct editing of Oracle Spatial databases
  - Full support of Oracle topology model
  - Short transactions

- **Bentley Geospatial Desktop**
Geospatial Desktop

Direct Connect Functionality
- Attach/Open directly from Oracle
- Import from Oracle
- Geometry support
- Topology Support
- Coordinate Systems
- Text, Feature-Linked text
- Coded Domains
- Loading Tools (DGN2SDO)
- Short Transaction (Pessimistic)
- Oracle 11G 3D (e.g. Building, utilities)
- Oracle Spatial 11g Geo Raster
Bentley Geospatial Server

- Live viewing/editing
- Disconnected editing
- Long transaction pessimistic
- Long transaction optimistic
  - Multi-user editing on same area
  - Conflict resolution
- Geometry and topology support
- Coordinate systems
- Text, feature-linked text
- Coded domains
- Time component support
- Fully customizable – web services
- Oracle 11G 3D
- Oracle Spatial 11g GeoRaster
Bentley Geo Web Publisher

- Live Publishing
- Geometry support
  - Polygon (including transparency)
  - Lines (including line styles)
  - Point text
  - Point Cell (symbols)
- Database Light Editing
  - Insert in Oracle Spatial
  - Domains
- Time component support
- Oracle Spatial 11g GeoRaster
Other Geospatial products supporting Oracle Spatial

- Bentley Cadastre
  - Create, Maintain, and Analyze Land and Property Information
- Bentley Fiber/Copper
  - Design and Management of Fiber/Copper Outside Plant Networks
- Bentley Electric
  - Efficient GIS for Electric Utilities
- Bentley Gas
  - Efficient GIS for Gas Utilities
- Bentley Water
  - GIS for Managing Water Utility Assets
- Bentley WaterGems
  - Water Distribution Modeling and Management
Building 3D cities base maps
DEMONSTRATION

Editing
• Bentley MAP
  • Sketch a new building
  • Post to Oracle
  • Modify the building
  • Post to Oracle

Data provided by Quebec City, Canada
DEMONSTRATION

3D disconnected mode
• Selecting a predefined connection
• Extracting geo raster as tiled tif file with reprojection
• Reviewing the compound document
• Loading in Bentley MAP
DEMONSTRATION

3D Thematic Analysis
**Bentley MAP:**
- View Oracle Spatial 3D data
- Query streets and terrain
- Thematic mapping
- Overlay with zoning areas and defined height limits

Data provided by Quebec City, Canada
Determining Fresnel zone clearance

The concept of Fresnel zone clearance may be used to analyze interference by obstacles near the path of a radio beam. The first zone must be kept largely free from obstructions to avoid interfering with the radio reception. However, some obstruction of the Fresnel zones can often be tolerated, as a rule of thumb the maximum obstruction allowable is 40%, but the recommended obstruction is 20% or less.

For establishing Fresnel zones, first determine the RF Line of Sight (RF LoS), which in simple terms is a straight line between the transmitting and receiving antennas. Now the zone surrounding the RF LoS is said to be the Fresnel zone.\[^3\]

The general equation for calculating the Fresnel zone radius at any point P in between the endpoints of the link is the following:

$$F_n = \sqrt{\frac{n\lambda d_1 d_2}{d_1 + d_2}}$$

where,
- $F_n$ = The nth Fresnel Zone radius in metres
- $d_1$ = The distance of P from one end in metres
- $d_2$ = The distance of P from the other end in metres
- $\lambda$ = The wavelength of the transmitted signal in metres

The cross section radius of the first Fresnel zone is the highest in the center of the RF LoS which can be calculated as:

$$r = 72.05 \sqrt{\frac{D}{4f}}$$

where
- $r$ = radius in feet
- $D$ = total distance in miles
- $f$ = frequency transmitted in Gigahertz.

Or even:

$$r = 17.32 \sqrt{\frac{D}{4f}}$$

where
- $r$ = radius in metres
- $D$ = total distance in kilometres
- $f$ = frequency transmitted in gigahertz.

Conclusion

- Bentley has a full suite of products leveraging the Oracle Spatial 11G 3d data model
- 100 percent compliant, no database change required
- 2 tier and 3 tier. Direct and disconnected.
- Strong 3d analysis tools.
- 3d editing.
THANK YOU.