

Spatial Database Modeling: Different Options

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May 22/03 URISA Seminar

Introduction

- **Advancing & converging technologies.**
- **Greatest benefits for enterprise implementations:**
 - Better delivery of applications
 - Better integration of other systems
 - Better data management tools
 - Better modeling of business processes and assets
- **Greater skill sets (i.e. bus. analysis, data modeler, application developer, DB admin).**
- **Greater need to define business needs to ensure success.**

Spatial Data Structure Influence:

- **Data Management.**
- **Complexity of application designs.**
- **Reliability of spatial query results.**

Broad GIS Data Structure Categories

- Flat Files.
- Relational DBMS.
- Spatial Object- Relational DBMS.

Flat Files

- **Practicality often related to size of organization.**
- **Requires good Data Management policies.**
- **Limited spatial extent or edge boundary conflicts.**
- **Application development more involved.**
- **Available functionality reduced.**

Relational DBMS

- **External DBMS.**
- **Joins & relates as needed or programmatic.**
- **Flexibility to access other system data.**
- **Benefits of DBMS Data Management, reporting, forms, etc..**
- **Limited GIS functionality applied to external data (i.e. thematic mapping).**

Spatial Data in External DBMS

- **Leverage Data Management benefits.**
- **Performance on large datasets.**
- **Seamless spatial extent.**
- **Tighter integration with other business systems.**
- **Reduced access to GIS functionality.**

Spatial Object- Relational DBMS

- **Smallworld, ESRI's Geodatabase, Autodesk's Design Server**
- **Four categories of commitment & benefits**
 - 1st – Basic data management benefits
 - 2nd – Basic object class benefits
 - 3rd – Relational benefits
 - 4th – Greater data man. & asset modeling benefits

Spatial Object – Relational DBMS:

1st - Basic data management benefits

- **Apply existing grouping/categories to data.**
- **Data Management benefits of an enterprise DBMS**
- **Seamless spatial extent**

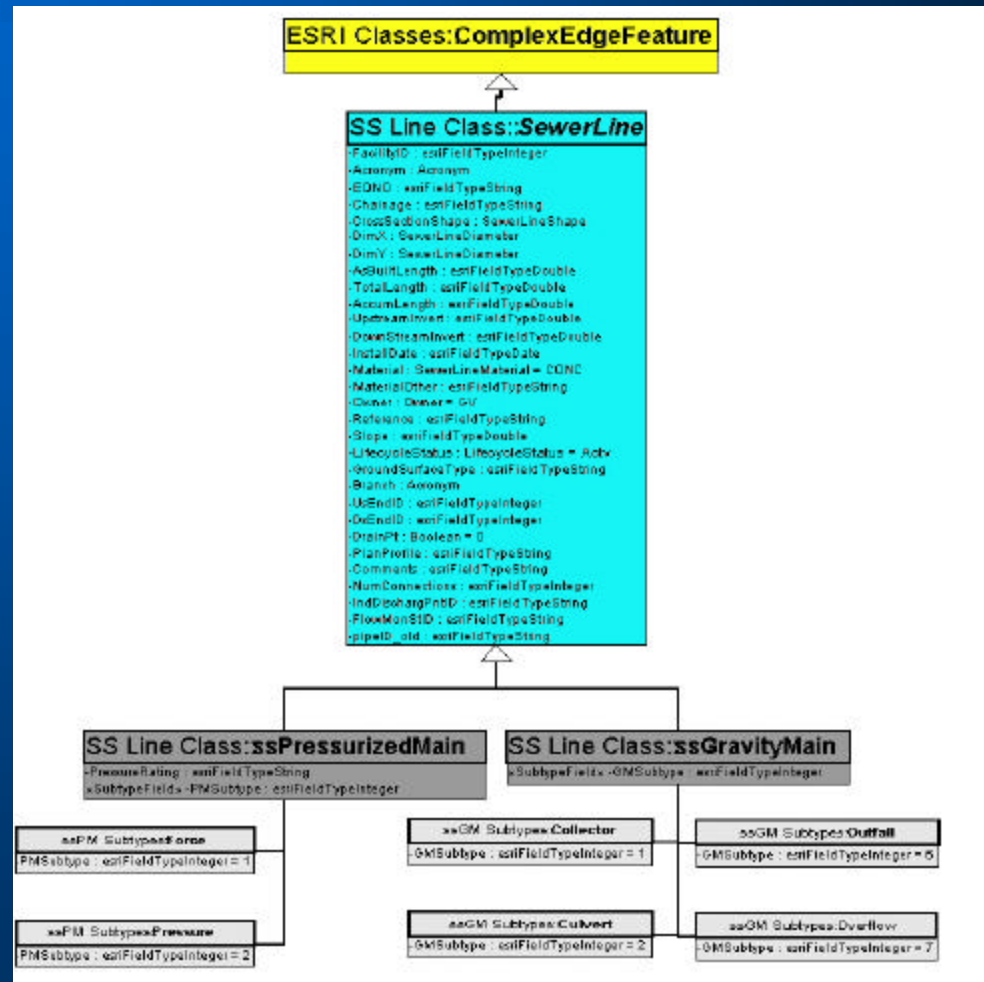
Spatial Object – Relational DBMS:

2nd – Basic object class benefits

- **Data integrity through Domain Class**
- **Class Inheritance:**
 - Further categorizing of spatial data (i.e. assets) to recognize important physical or operational differences.
 - Ensure common characteristics are consistently defined (i.e. attributes, geometry)

Spatial Object – Relational DBMS:

Class Inheritance



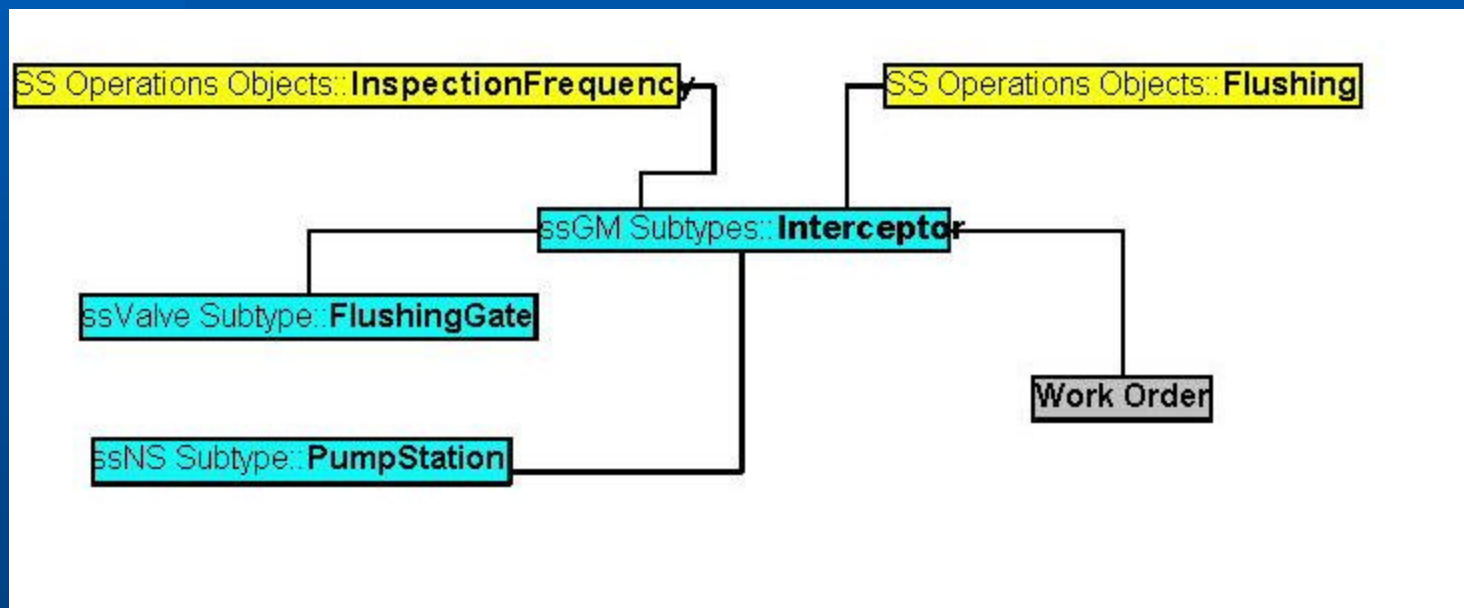
Spatial Object – Relational DBMS: 3rd – Relationships (Spatial & Non-spatial)

- **Business rules can influence:**
 - **Data integrity** (i.e. ensuring correct assets are associated) .
 - **Analysis** (i.e. maintenance history of one asset helps understand a related asset).
 - **Reporting** – results summary report and map .
- **Apply relationships throughout class hierarchy (i.e. all sewer pipe or gravity main overflow).**

Spatial Object – Relational DBMS:

Relates Support:

- Asset's physical relationships
- Daily maintenance processes
- Asset's condition/history
- Business admin (i.e. budgeting)



Spatial Object – Relational DBMS: 4th – Greater Data Management & Modeling

- **Versioning**

- Long transaction editing(i.e. manages deltas)
- Historic roll backs

- **Geometric Networks**

- **Network tracing** (i.e. to visually locate maintenance activities, emergency response)
- **Flow analysis** (i.e. optimism network, planning)

Conclusion

Advancing & Converging technologies offer greater benefits:

- Different skills, not always more complex.
- Supports enterprise data management practices.
- Spatial object-relational DBMS supports
 - Better modeling of the real world features.
 - Greater detail in the business processes.

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