Data Synchronization: Autodesk® AutoCAD® Map 3D Enterprise, FME®, and ESRI® ArcGIS®

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Sacramento Area Sewer District (SASD) chose AutoCAD® Map 3D Enterprise software industry models as the front-end GIS application for creating and editing sewer assets. SASD needed a synchronization solution so that the SASD enterprise GIS (ArcGIS®) could be updated accordingly. The long-transaction functionality (jobs) in AutoCAD® Map 3D Enterprise industry models provides a framework where inserted, edited, and deleted features can easily be queried for synchronization. In this roundtable session, we discuss how to use AutoCAD® Map 3D jobs in conjunction with FME® data conversion software to synchronize ESRI® ArcGIS®.
Key learning objectives

At the end of this class, you will be able to:

- Identify the database tables used in an AutoCAD® Map 3D Enterprise industry model to work with jobs.
- Customize job states to provide a synchronization state.
- Query inserts, edits, and deletes in an AutoCAD® Map 3D Enterprise industry model job.
- Explain how FME® data conversion software can be used in conjunction with Map 3D jobs to update ESRI® ArcGIS®.
Introduction
Sacramento Area Sewer District (SASD)

- Sacramento, California
- Sewer Utility providing service to more than 1 million people in the Sacramento region.
- Mission: To efficiently collect sewage from homes and businesses within the Sacramento area.
- Vision: To provide the best value of any sewage collection utility in California, as measured by cost and level of service.
What is AutoCAD® Map 3D Enterprise?

- Product Name Evolution
  - Autodesk® Topobase™ <2011
  - AutoCAD® Map 3D 2012 Enterprise
  - AutoCAD® Map 3D 2013/2014
    - Industry Model Functionality

- Enterprise GIS
- Uses FDO in AutoCAD®
Why AutoCAD® Map 3D Enterprise?

- AutoCAD®!!
- Enterprise GIS
  - Oracle® RDBMS
  - Multiuser Editing
  - Long Transaction Functionality - Jobs
- Customization
  - Business Rules and Workflows
  - A comprehensive set of assemblies (API) to extend the capabilities of AME.
Pre-Existing ESRI® ArcGIS®

- ArcSDE® (Spatial Database Engine) on SQL Server
- Enterprise Solution
  - AutoCAD® Map 3D is not a replacement, rather a supplement
  - Used to view and query assets
  - “Talks to” Maximo Asset Management
The Challenge

- ArcGIS® must be synchronized with AutoCAD® Map 3D
  - Inserts, Updates, and Deletes completed in AutoCAD® Map 3D need to be copied to ArcGIS®.
  - Geometry and Attribute Values.
AutoCAD® Map 3D Jobs

- Long Transactions
- Accommodate QA/QC Processes
- Paper trail of edits used for synchronization
Job Tables

- **TB_JOB** – Contains the list of all jobs
- **TB JOB STATE** – Stores the job state configuration
- **TB_JOB_STATE_TRANSITION** – Stores the job state transition rules
- **TB_JOB_VERSION** – Stores the complete history of every feature.
Job States

- Tables to Edit:
  - TB_JOB_STATE
  - TB_JOB_STATE_TRANSITION
Using Job Tables to Query Inserts, Updates, and Deletes
Set job

- SETJOB Function

```sql
create or replace
function SETJOB(n number) return number is
begin
    INDUSTRYMODELNAME.job3.SETJOB(n);
    return (n);
end;
```

- Set Job (ID = 4) Current

```sql
select SETJOB(4) from DUAL;
```
### TB_JOB_VERSION Table

- Stores **complete history** of every feature

```sql
SELECT * FROM tb_job_version;
```

<table>
<thead>
<tr>
<th>JOB_VERSION</th>
<th>CONFLICT</th>
<th>EXPIRATION_DATE</th>
<th>FID</th>
<th>JOB_ID</th>
<th>JOB_OLD_VERSION</th>
<th>JOB_OPERATION_ID</th>
<th>OPERATION_DATE</th>
<th>OS_USER_NAME</th>
<th>STATE</th>
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<td></td>
<td>2 19-NOV-13</td>
<td>DBURGAS</td>
<td>3</td>
</tr>
</tbody>
</table>
Queries

- Query Inserted Features

```sql
select * from SSLATERALLINE where fid in (select FID from TB_JOB_VERSION where JOB_ID = 4 and JOB_OPERATION_ID = 1);
```

- Query Updated Features

```sql
select * from SSLATERALLINE where FID in (select FID from TB_JOB_VERSION where JOB_ID = 4 and JOB_OPERATION_ID = 2);
```

<table>
<thead>
<tr>
<th>JOB_OPERATION_ID</th>
<th>Specifies the job operation ID. Mandatory.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 = INSERT,</td>
<td>1 = Indicates that this feature has already been existing, at the moment of the job enabling of the feature class.</td>
</tr>
<tr>
<td>2 = UPDATE,</td>
<td></td>
</tr>
<tr>
<td>3 = DELETE</td>
<td></td>
</tr>
</tbody>
</table>
Using FME® for Synchronization
FME® Desktop

- Safe Software – www.safe.com
- Translate between over 300 supported formats
- Geometry and Attribute Data
- Workspace – Configured to move data from reader to writer with ability to transform along the way
- Reader - Oracle® Spatial Object
- Writer – ESRI Geodatabase (ArcSDE® Geodatabase)
FME Workspace
Parameters

- Parameters are used to feed data to an FME workspace prior to running.
Key Attribute

- Key Attribute required in both systems
- AutoCAD® Map 3D FID is a good candidate
- SASD uses a grid number
FME® Desktop can be used to translate data between disparate data sources. For SASD, FME® Desktop is used to synchronize ESRI® ArcSDE® with AutoCAD® Map 3D Enterprise. Using the job tables and queries discussed earlier, FME® can be configured to read job edits and translate those edits to ArcSDE.
Roundtable Topics

- Disparate Data Issues
- CAD vs. GIS
- ArcGIS® for AutoCAD®
## Domains: AutoCAD® Map 3D vs. ESRI ArcGIS®

<table>
<thead>
<tr>
<th>Key</th>
<th>Value</th>
<th>Short Value</th>
<th>Active</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Acrylonitrile Butadiene Styrene</td>
<td>ABS</td>
<td>✔️</td>
</tr>
<tr>
<td>2</td>
<td>Asbestos Cement</td>
<td>ACP</td>
<td>✔️</td>
</tr>
<tr>
<td>3</td>
<td>Brick</td>
<td>BRK</td>
<td>✔️</td>
</tr>
<tr>
<td>4</td>
<td>Concrete Cylinder</td>
<td>CCP</td>
<td>✔️</td>
</tr>
<tr>
<td>5</td>
<td>Cast Iron Pipe</td>
<td>CIP</td>
<td>✔️</td>
</tr>
<tr>
<td>6</td>
<td>Cement Mortar Lined Coated Steel</td>
<td>CML</td>
<td>✔️</td>
</tr>
<tr>
<td>7</td>
<td>Corrugated Metal</td>
<td>CMP</td>
<td>✔️</td>
</tr>
<tr>
<td>8</td>
<td>Concrete Poured In Place</td>
<td>CON</td>
<td>✔️</td>
</tr>
<tr>
<td>9</td>
<td>Cured In Place</td>
<td>CPP</td>
<td>✔️</td>
</tr>
<tr>
<td>10</td>
<td>Corrugated Steel</td>
<td>CSP</td>
<td>✔️</td>
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<tr>
<td>11</td>
<td>Ductile Iron</td>
<td>DIP</td>
<td>✔️</td>
</tr>
</tbody>
</table>

**OOTB Industry Models store the Key**

**ESRI ArcSDE stores the Short Value**