

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

Drew Burgasser, P.E.
Vice-President, CAD Masters, Inc.

Class summary

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

Aerial map of a residential area with a large grey rectangular overlay in the center. The word "Introduction" is written in large blue text on the grey overlay. The map shows property lines, lot numbers (e.g., 6831, 6901, 6904, 6908, 6912, 6916, 6920, 6905, 6901, 6261), and street names (e.g., 370-197, 368-197). Blue lines with arrows indicate a path or boundary. A small black dot is visible on the map.

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.

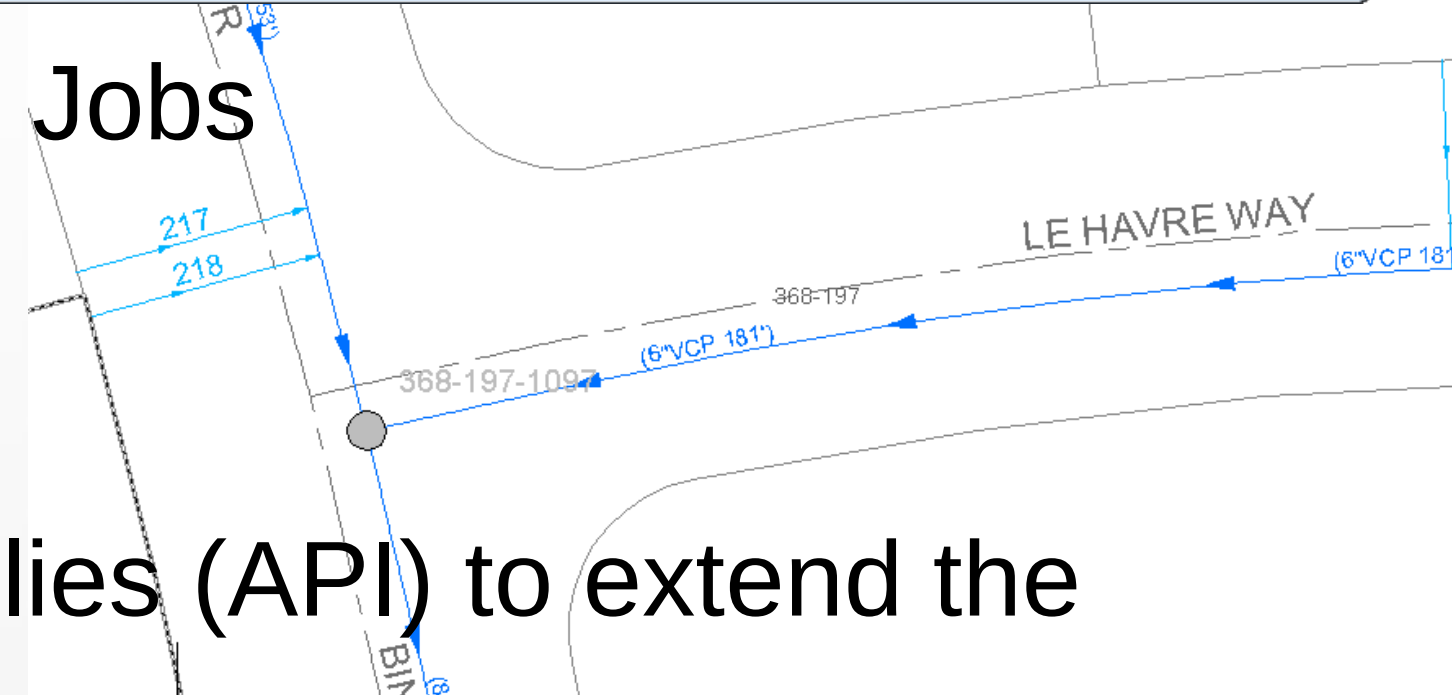
What is AutoCAD® Map 3D Enterprise?

- 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?

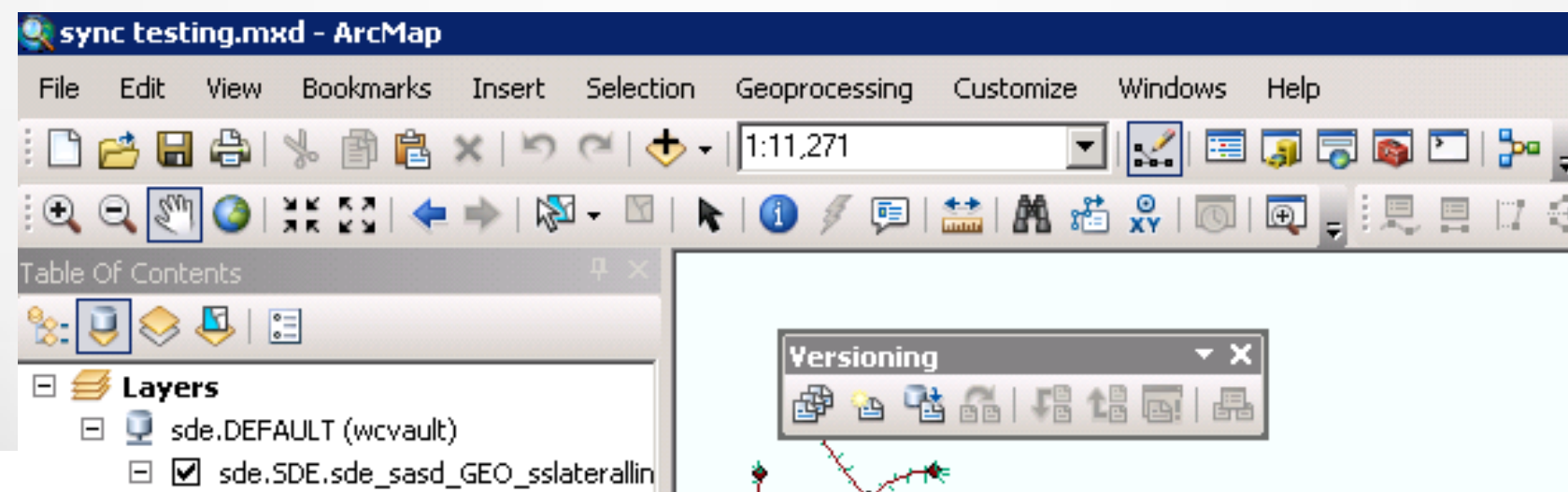
- AutoCAD®!!
- Enterprise GIS
 - Oracle® RDBMS
 - Multiuser Editing
 - Long Transaction Functionality - Jobs
- Customization
 - Business Rules and Workflows
 - A comprehensive set of assemblies (API) to extend the capabilities of AME.

The screenshot shows a software window titled "ssgravitymain - SASD_WW_REVA". It contains a form with several tabs: "Form", "Comments", "Lining/Encasement", "Timestamp", "Miscellaneous", and "Table". The "Form" tab is active, displaying fields for "Grid Number" (368-197-2115), "Asset ID" (54744), "Maximo GIS ID" (ML53034), "GXP Temp ID" (empty), "Diameter" (6), "Material Type" (Vitrified Clay Pipe), "Length" (181.00), "Upstream Inv Elev" (129.11), "Downstream Inv Elev" (128.55), "Slope" (0.0031), "Status" (OPERATING), and "Owner" (SASD). A "Split" dropdown is also visible. At the bottom, it says "Record 1 of 1 (Filter active)" and includes a toolbar with various icons for navigation and editing.



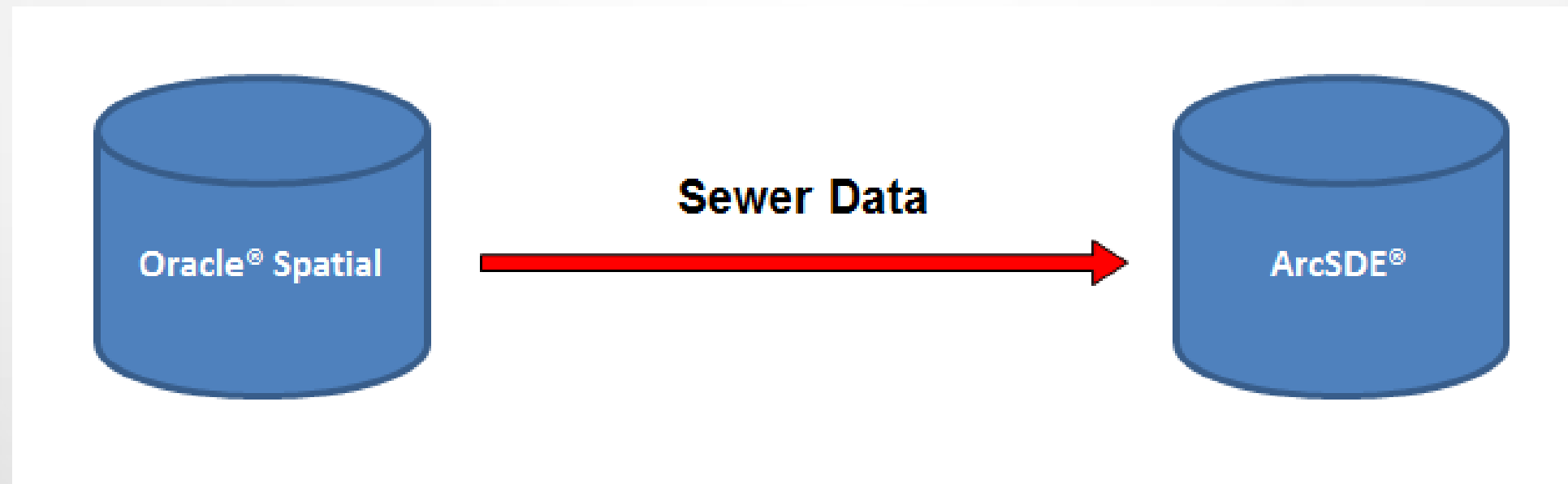
Pre-Existing ESRI® ArcGIS®

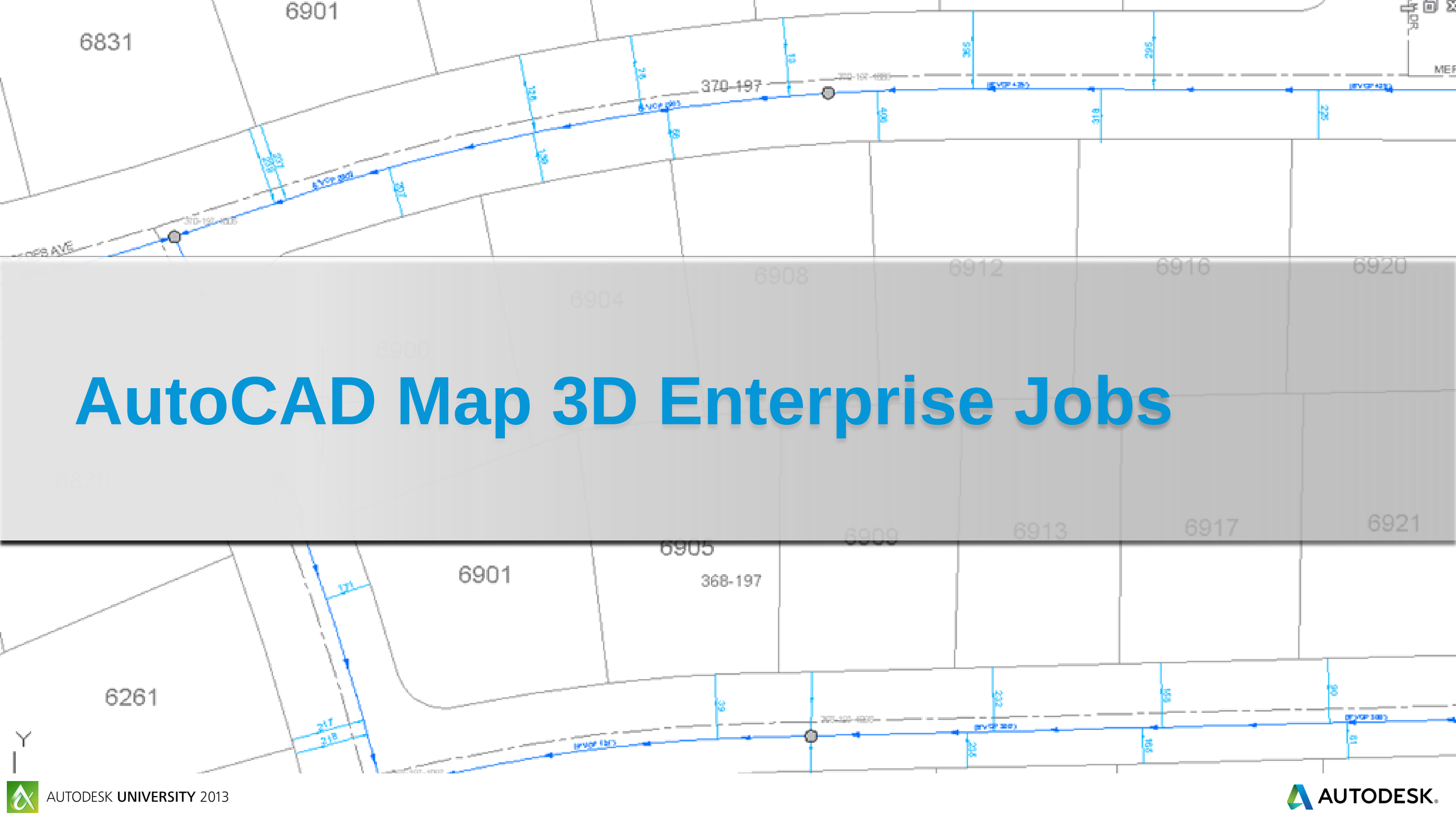
- ArcSDE® (Spatial Database Engine) on SQL Server
- Enterprise Solution
 - AutoCAD® Map 3D is not a replacement, rather a supplement
 - Used to view and query assets
 - “Talks to” Maximo Asset Management



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.



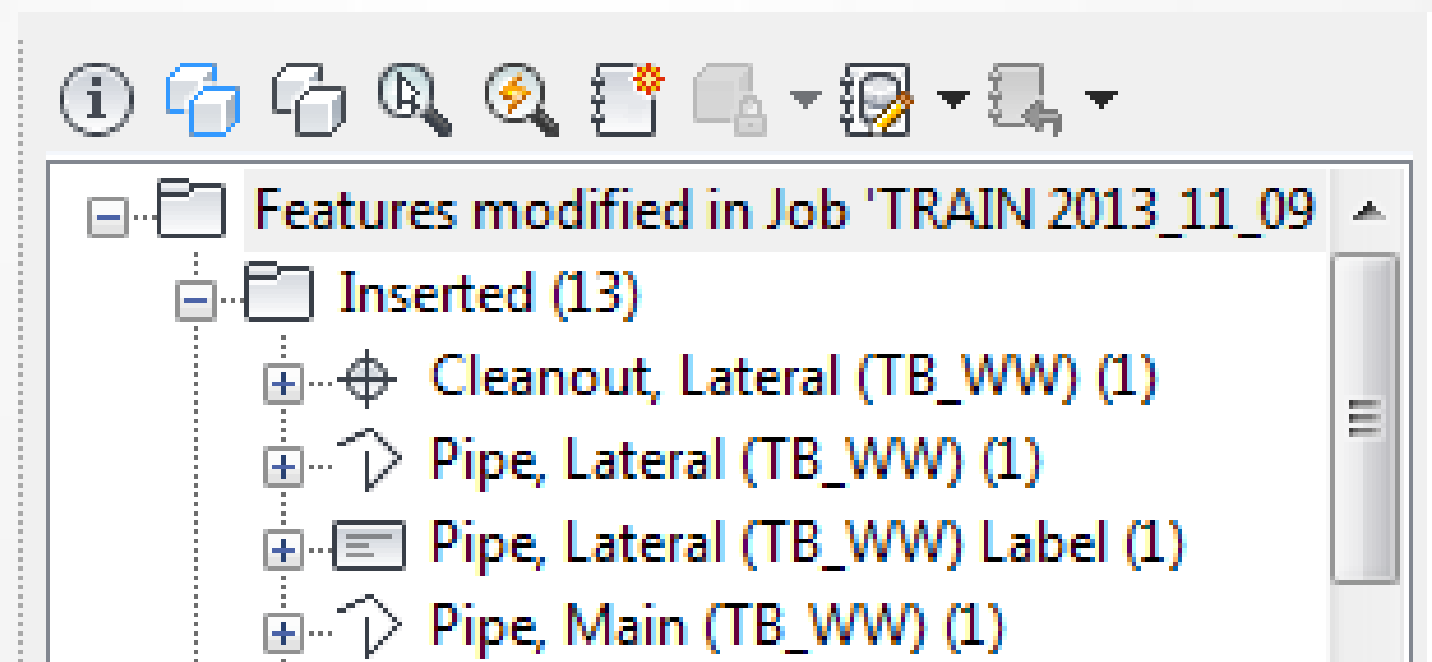
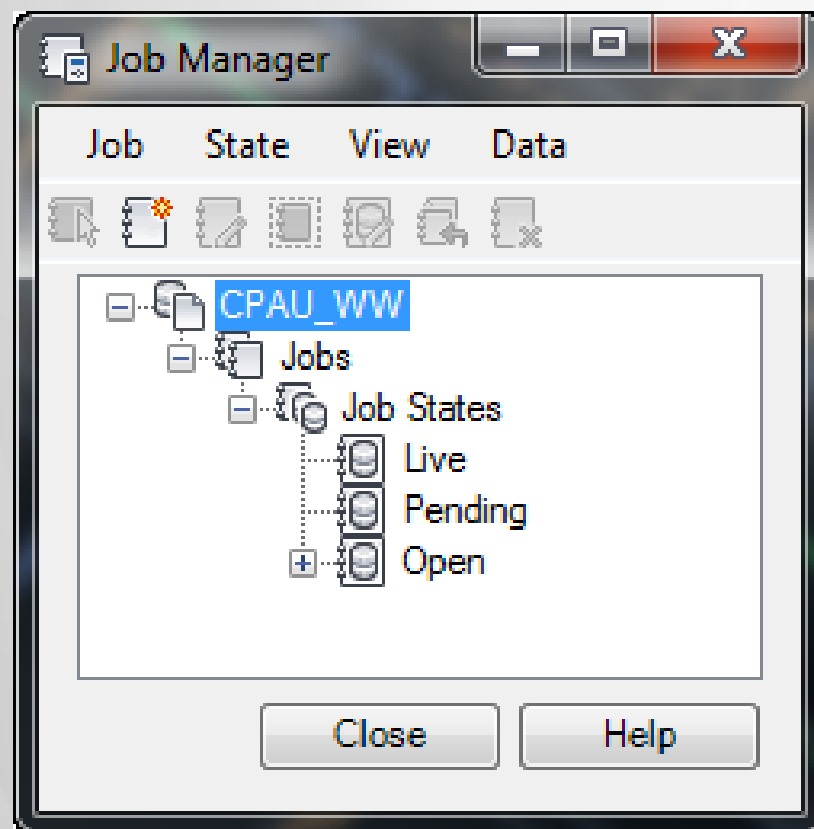
The background of the slide is a technical drawing from AutoCAD Map 3D. It shows a 3D perspective view of a road network. A blue line with arrows indicates a path or alignment. Various points along this path are labeled with text like '370-197', '370-198', '370-199', '370-200', '370-201', '370-202', '370-203', '370-204', '370-205', '370-206', '370-207', '370-208', '370-209', '370-210', '370-211', '370-212', '370-213', '370-214', '370-215', '370-216', '370-217', '370-218', '370-219', '370-220', '370-221', '370-222', '370-223', '370-224', '370-225', '370-226', '370-227', '370-228', '370-229', '370-230', '370-231', '370-232', '370-233', '370-234', '370-235', '370-236', '370-237', '370-238', '370-239', '370-240', '370-241', '370-242', '370-243', '370-244', '370-245', '370-246', '370-247', '370-248', '370-249', '370-250'. The drawing also shows property lines and lot numbers such as 6831, 6901, 6904, 6908, 6912, 6916, 6920, 6900, 6905, 6909, 6913, 6917, 6921, 6261, 6901, 6905, 368-197. A road is labeled 'DOES AVE'. The text 'AutoCAD Map 3D Enterprise Jobs' is overlaid in the center in a large, blue, sans-serif font.

AutoCAD Map 3D Enterprise Jobs



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

Default States	Customized States
Open	Open
Pending	Ready for QC
	QC Completed
	Synchronization
Live	Live
Deleted	Deleted

```
select * from tb_job_state;
```

Query Result x							
All Rows Fetched: 4 in 0.007 seconds							
	ID	NAME	DESCRIPTION	INITIAL_STATE	FEATURES_EDITABLE	USE_JOBID	
1	1	Live	(null)	0	0	0	
2	3	Open	(null)	1	1	1	
3	2	Pending	(null)	0	0	0	
4	4	Deleted	(null)	0	0	0	

Using Job Tables to Query Inserts, Updates, and Deletes

Set job

- SETJOB Function

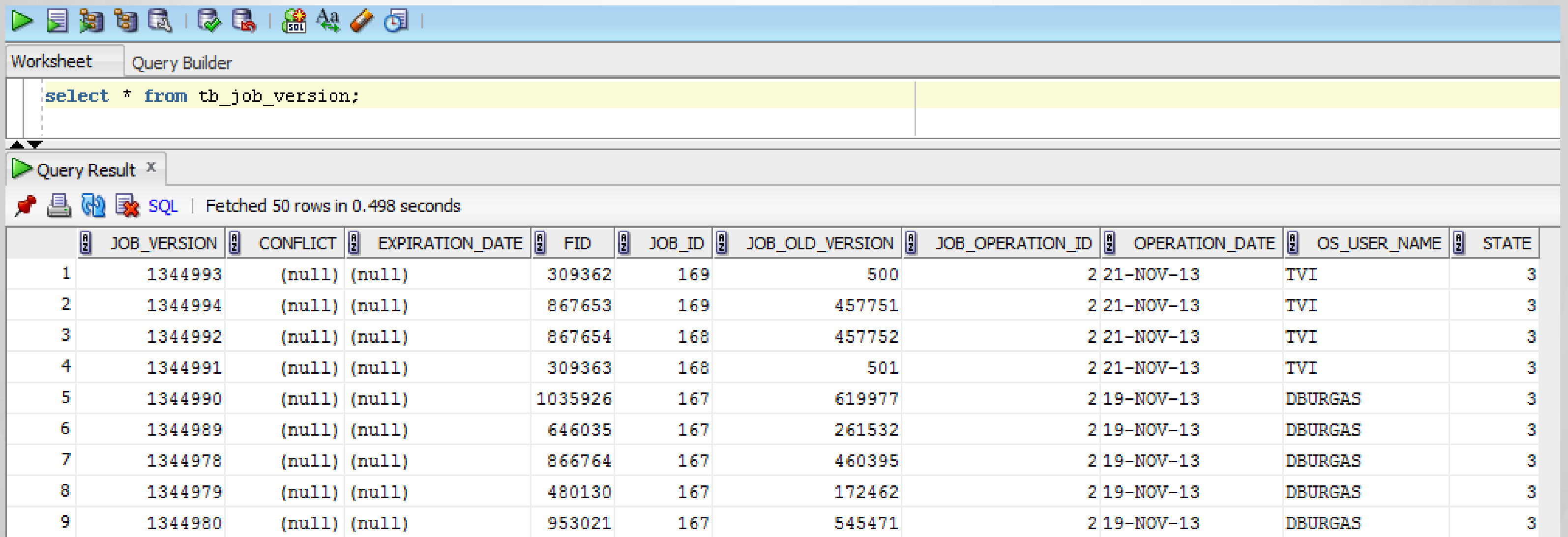
```
create or replace  
function SETJOB(n number) return number is  
begin  
    INDUSTRYMODELNAME.job3.SETJOB(n);  
    return (n);  
end;
```

- Set Job (ID = 4) Current

```
select SETJOB(4) from DUAL;
```

TB_JOB_VERSION Table

- Stores complete history of every feature



The screenshot shows a SQL query tool interface. At the top, there's a toolbar with various icons. Below it, a tab labeled 'Query Builder' is active. The query editor contains the SQL statement: `select * from tb_job_version;`. Below the query editor, a tab labeled 'Query Result' is active, showing the results of the query. The results are displayed in a table with 12 columns: JOB_VERSION, CONFLICT, EXPIRATION_DATE, FID, JOB_ID, JOB_OLD_VERSION, JOB_OPERATION_ID, OPERATION_DATE, OS_USER_NAME, and STATE. The table contains 9 rows of data, each representing a feature's history. The first row has JOB_VERSION 1344993, CONFLICT (null), EXPIRATION_DATE (null), FID 309362, JOB_ID 169, JOB_OLD_VERSION 500, JOB_OPERATION_ID 2, OPERATION_DATE 21-NOV-13, OS_USER_NAME TVI, and STATE 3. The subsequent rows follow a similar pattern with varying values for each column.

	JOB_VERSION	CONFLICT	EXPIRATION_DATE	FID	JOB_ID	JOB_OLD_VERSION	JOB_OPERATION_ID	OPERATION_DATE	OS_USER_NAME	STATE
1	1344993	(null)	(null)	309362	169	500	2	21-NOV-13	TVI	3
2	1344994	(null)	(null)	867653	169	457751	2	21-NOV-13	TVI	3
3	1344992	(null)	(null)	867654	168	457752	2	21-NOV-13	TVI	3
4	1344991	(null)	(null)	309363	168	501	2	21-NOV-13	TVI	3
5	1344990	(null)	(null)	1035926	167	619977	2	19-NOV-13	DBURGAS	3
6	1344989	(null)	(null)	646035	167	261532	2	19-NOV-13	DBURGAS	3
7	1344978	(null)	(null)	866764	167	460395	2	19-NOV-13	DBURGAS	3
8	1344979	(null)	(null)	480130	167	172462	2	19-NOV-13	DBURGAS	3
9	1344980	(null)	(null)	953021	167	545471	2	19-NOV-13	DBURGAS	3

Queries

■ Query Inserted Features

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

Query Updated Features

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

JOB_OPERATION_ID

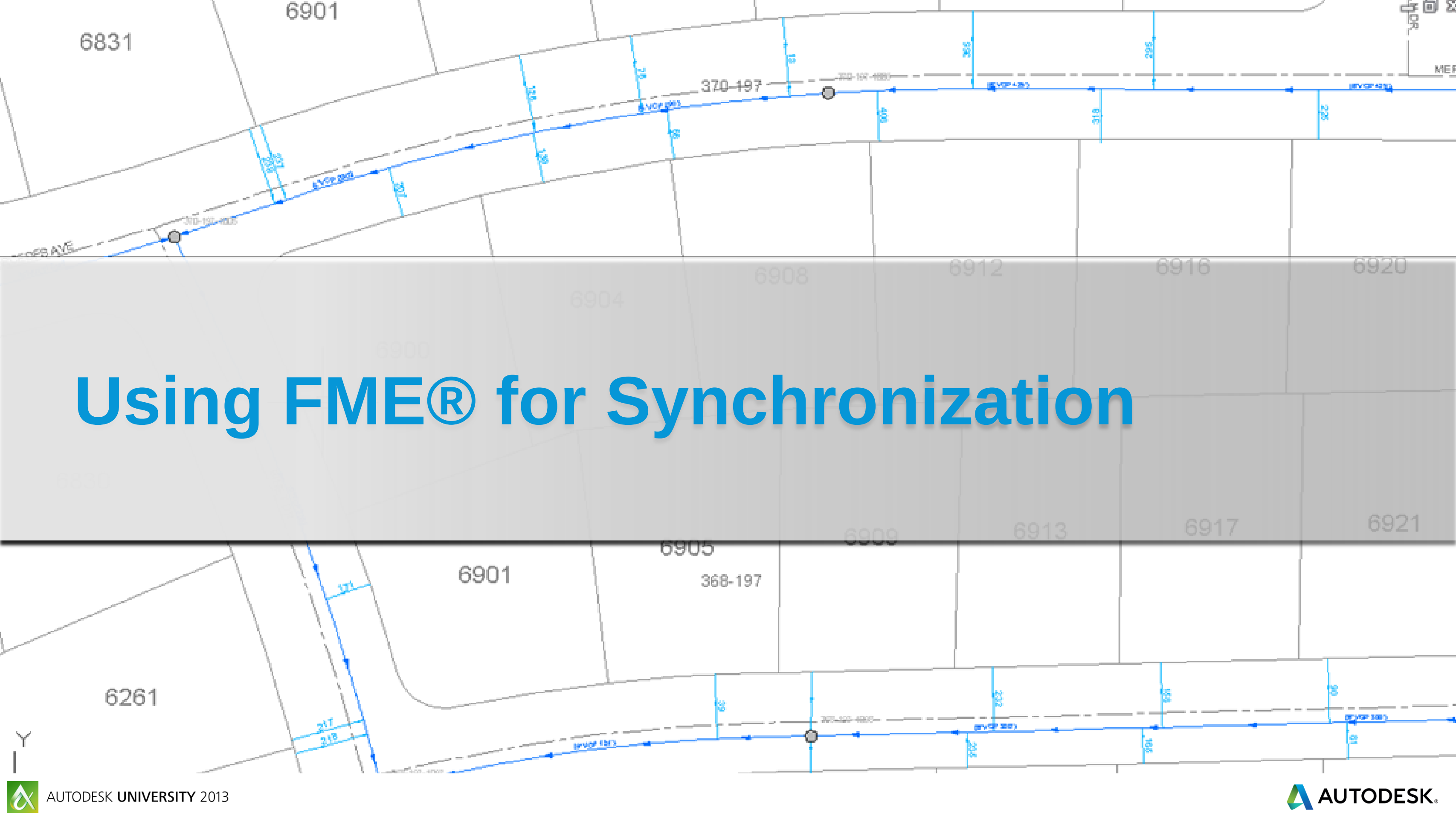
Specifies the job operation ID. Mandatory.

1 = INSERT,

2 = UPDATE,

3 = DELETE

- 1 = Indicates that this feature has already been existing, at the moment of the job enabling of the feature class.



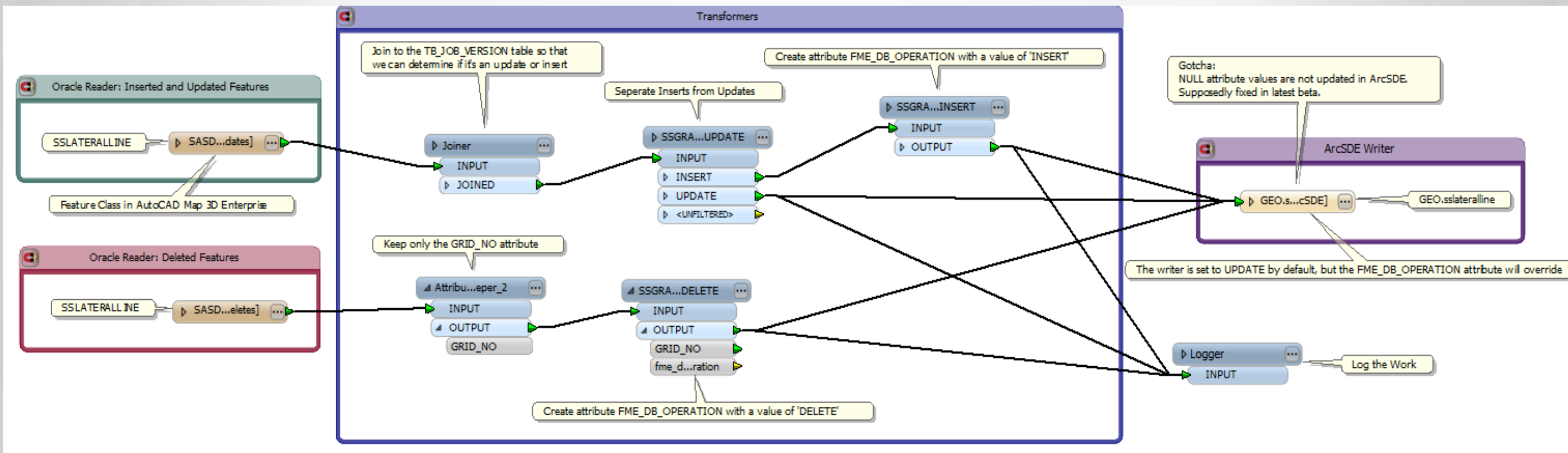
Using FME® for Synchronization



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.

User Parameters

Published Parameters

- [ORACLE_JOB_ID] Map 3D Job Number : 7
- [SDE_VERSION] Transactional Version : SDE_VERSION_NAME
- [ORACLE_SQL_BEFORE] SQL Statement To Execute Before Translation : select SETJOB(\$(ORACLE_JOB_ID)) from dual
- [ORACLE_WHERE_CLAUSE] WHERE Clause : FID in (select FID from TB_JOB_VERSION where JOB_ID = \$(ORACLE_JOB_ID))
- [ORACLE_DELETE_WHERE_CLAUSE] WHERE Clause : FID in (select FID from TB_JOB_VERSION where JOB_ID = \$(ORACLE_JOB_ID) and JOB_OPERATION_ID = 3)
- [ORACLE_SERVICE] Oracle Service : OSERVICE
- [ORACLE_INDUSTRY_MODEL] Oracle Industry Model : ORACLE_SEWER_DB
- [ORACLE_PASSWORD] Oracle Industry Model Password : *****
- [SDE_INSTANCE] SDE Instance Name : sde:sqlserver:SDESERVERNAME
- [SDE_DATABASE] Destination ESRI Geodatabase (ArcSDE) Dataset : SDE_DB_NAME
- [SDE_SERVER] SDE Server : SDESERVERNAME

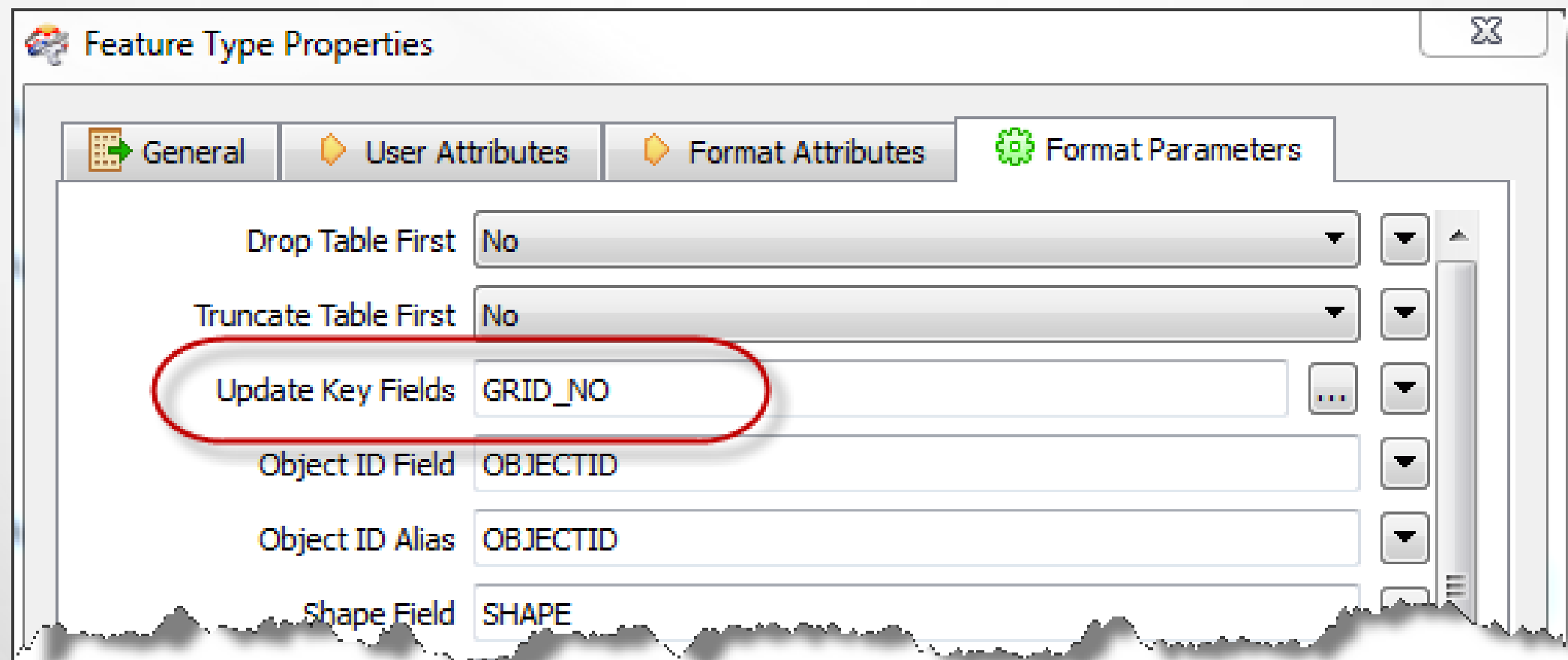
Untitled - Notepad

File Edit Format View Help

```
"C:\Program Files (x86)\FME.exe" sync.fmw --ORACLE_JOB_ID 4 --ORACLE_SERVICE OSERVICE --etc
```

Key Attribute

- Key Attribute required in both systems
- AutoCAD® Map 3D FID is a good candidate
- SASD uses a grid number



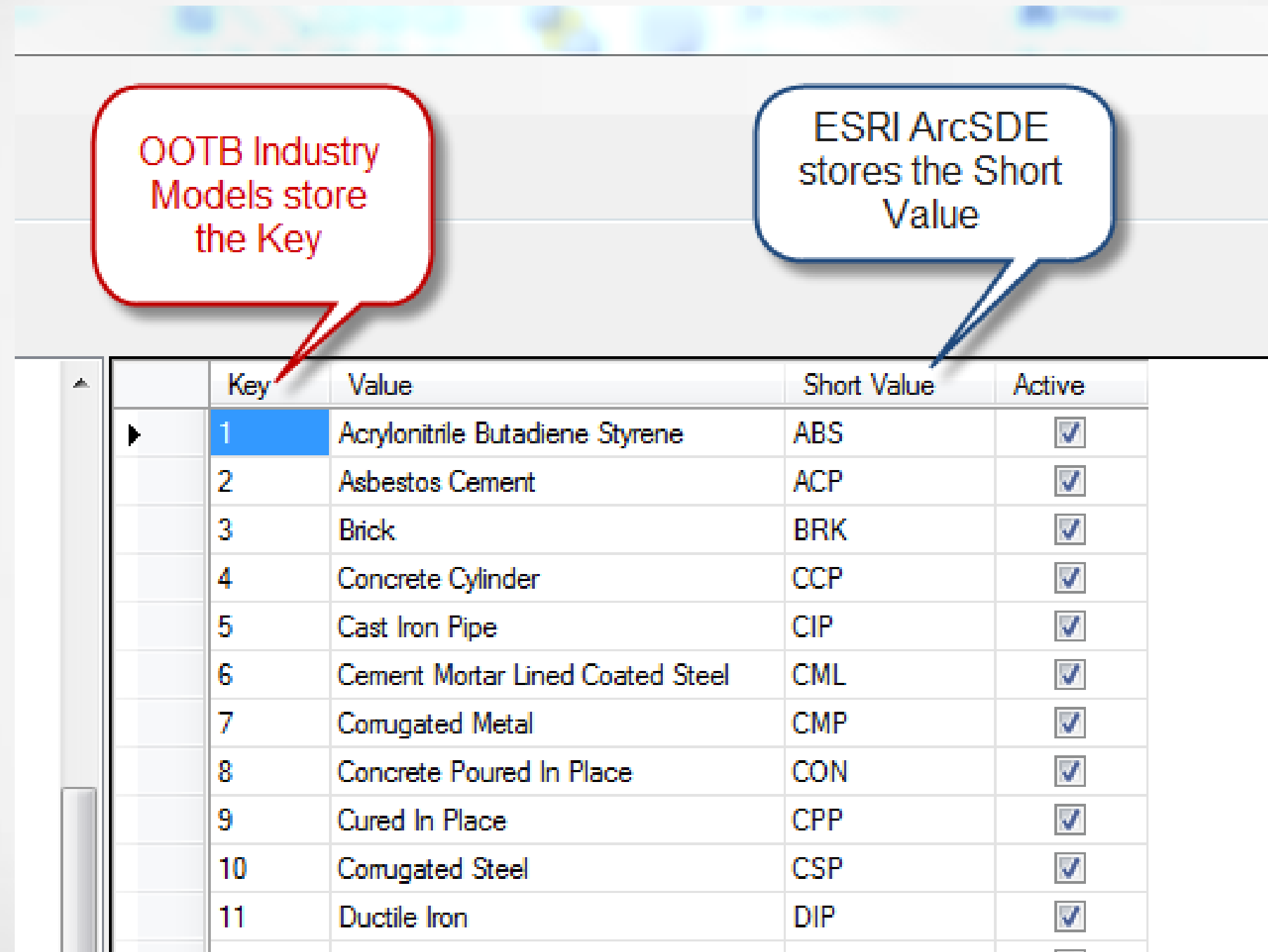
Conclusion

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®



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

