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Topobase™

Archive – Technical Training

Autodesk Topobase Administrator

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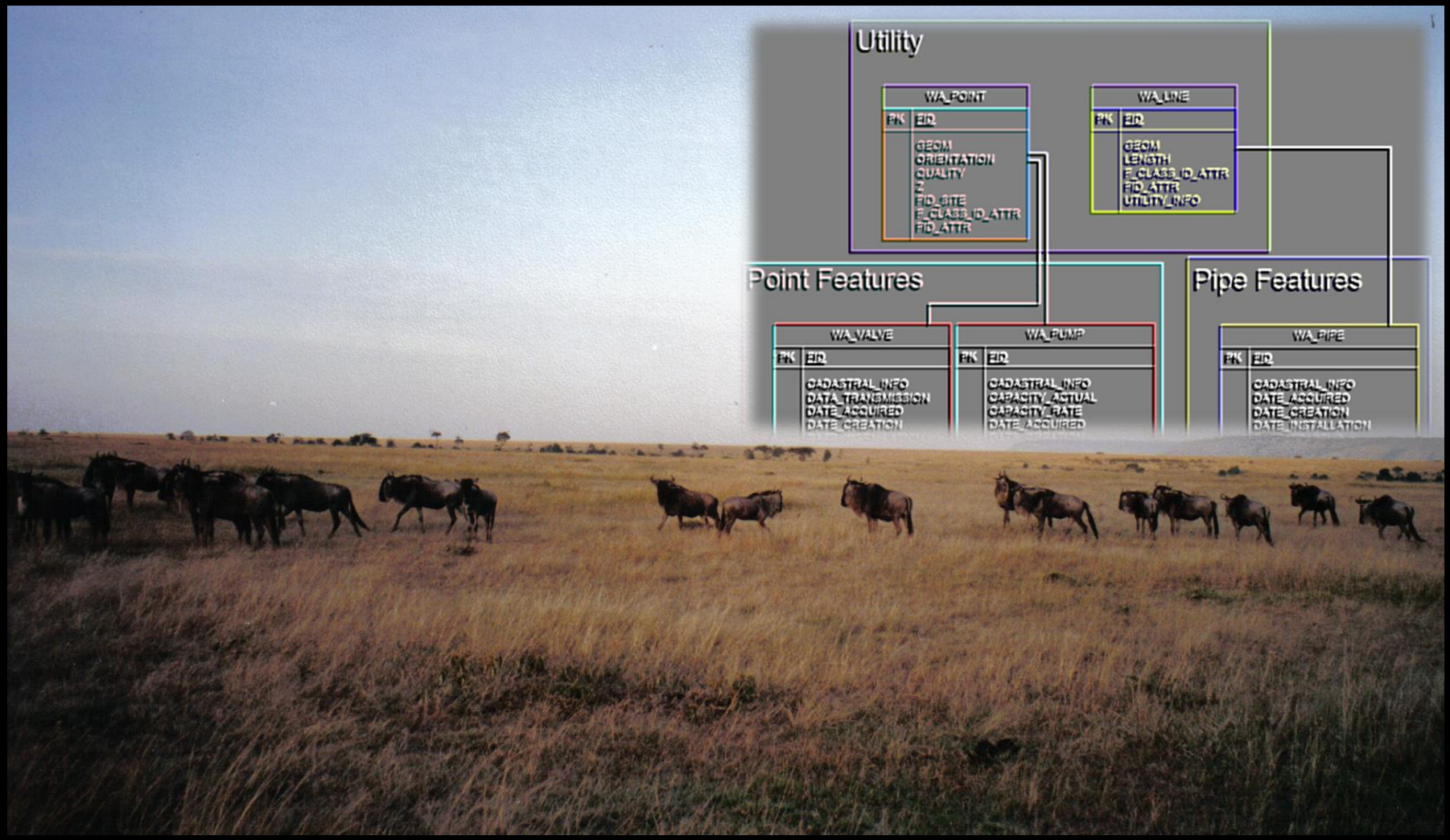

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Chapter Overview

- This chapter teaches you how to create a topology for nodes and lines in a network such as a water network.
- You will learn how to define templates and conditions for tracing.
- Then you will import data into the Topobase Water Module which has a data model with a pre-defined topology, feature classes and business rules to maintain the consistency of your data.
- Additionally, you will learn how to register Oracle views inside a Topobase document.

Utility Model

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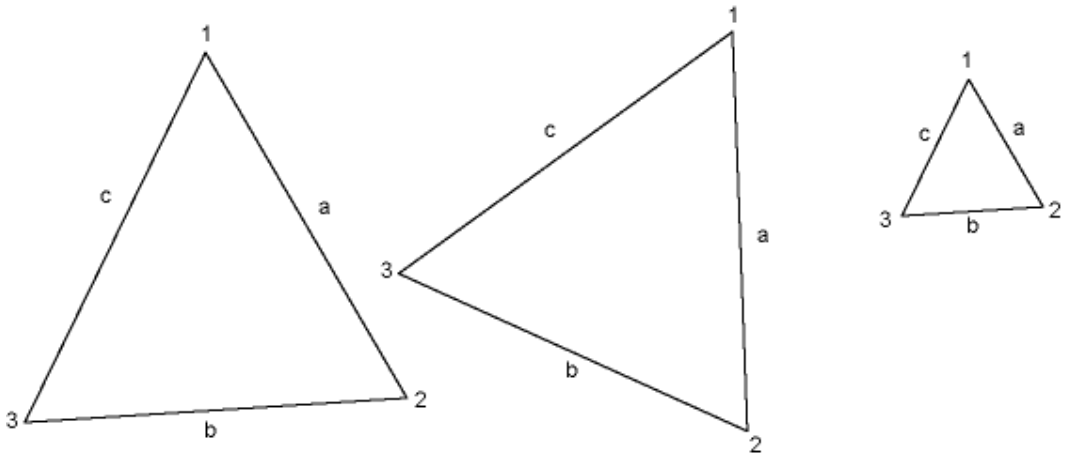
Chapter Objectives

By the end of this chapter, you will be able to:

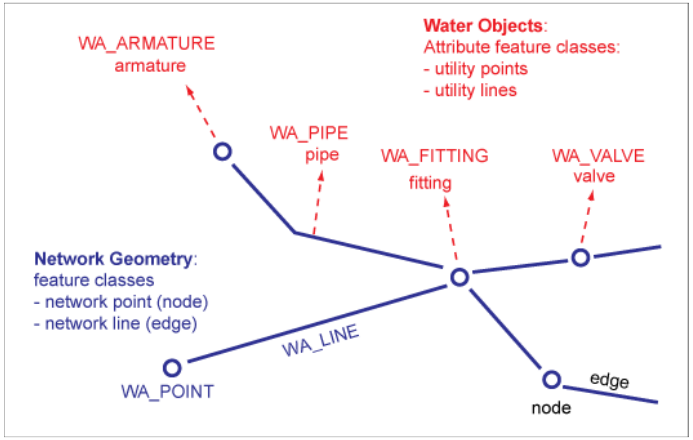
- Create a Utility Model.
- Define stop conditions and cost functions for network analysis.
- Create Tracing templates.
- Validate the topology.
- Understand the process of data migration of Oracle data into the water data model.
- Register Oracle views as Topobase feature classes.

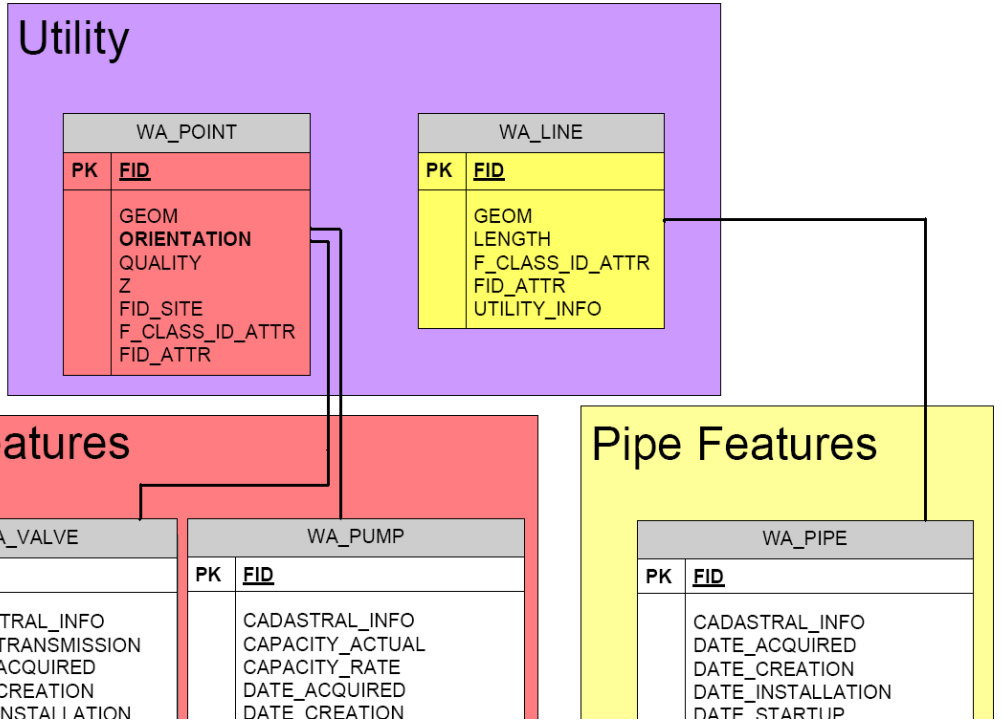
5.2 Understand the Utility Model

- The Topobase Utility model provides the basic network topology components that are used in the Water, Wastewater, Gas, and Electric modules.
- A network topology describes the relationships between elements in a network.

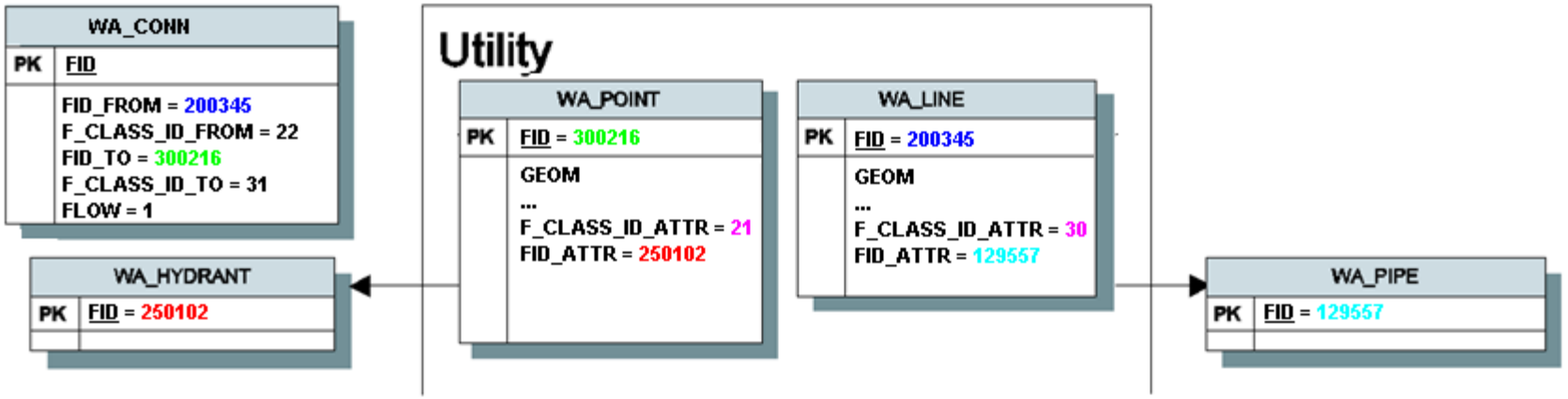


5.2 Understand the Utility Model +





5.2.1 Logical Topology Tables and Relations

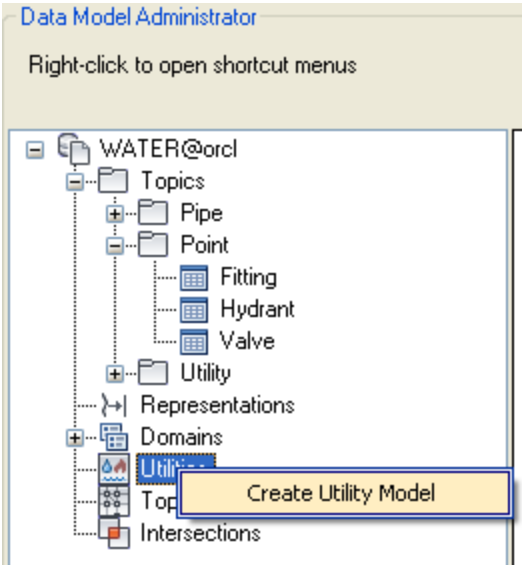


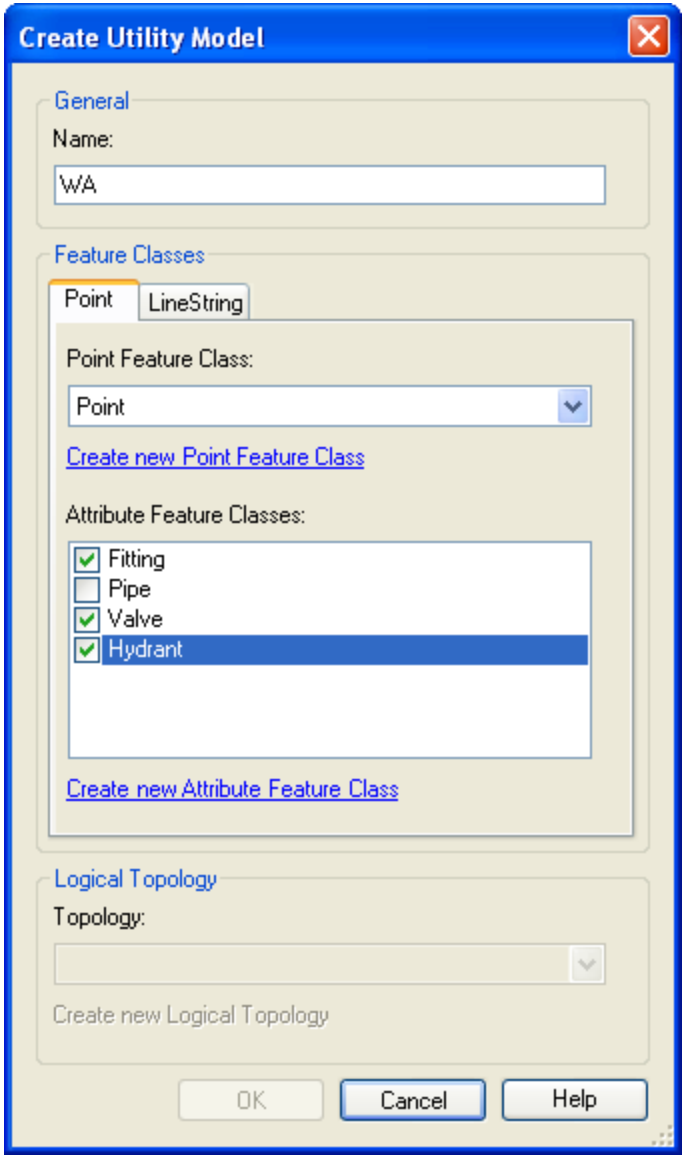
5.2.2 Creating a Utility Model

1. Create a point and line feature class.
2. Create attribute tables.
3. Create the utility model.
4. Initialize the topology.

5.2.2 Creating a Utility Model +

- Create the Utility Model





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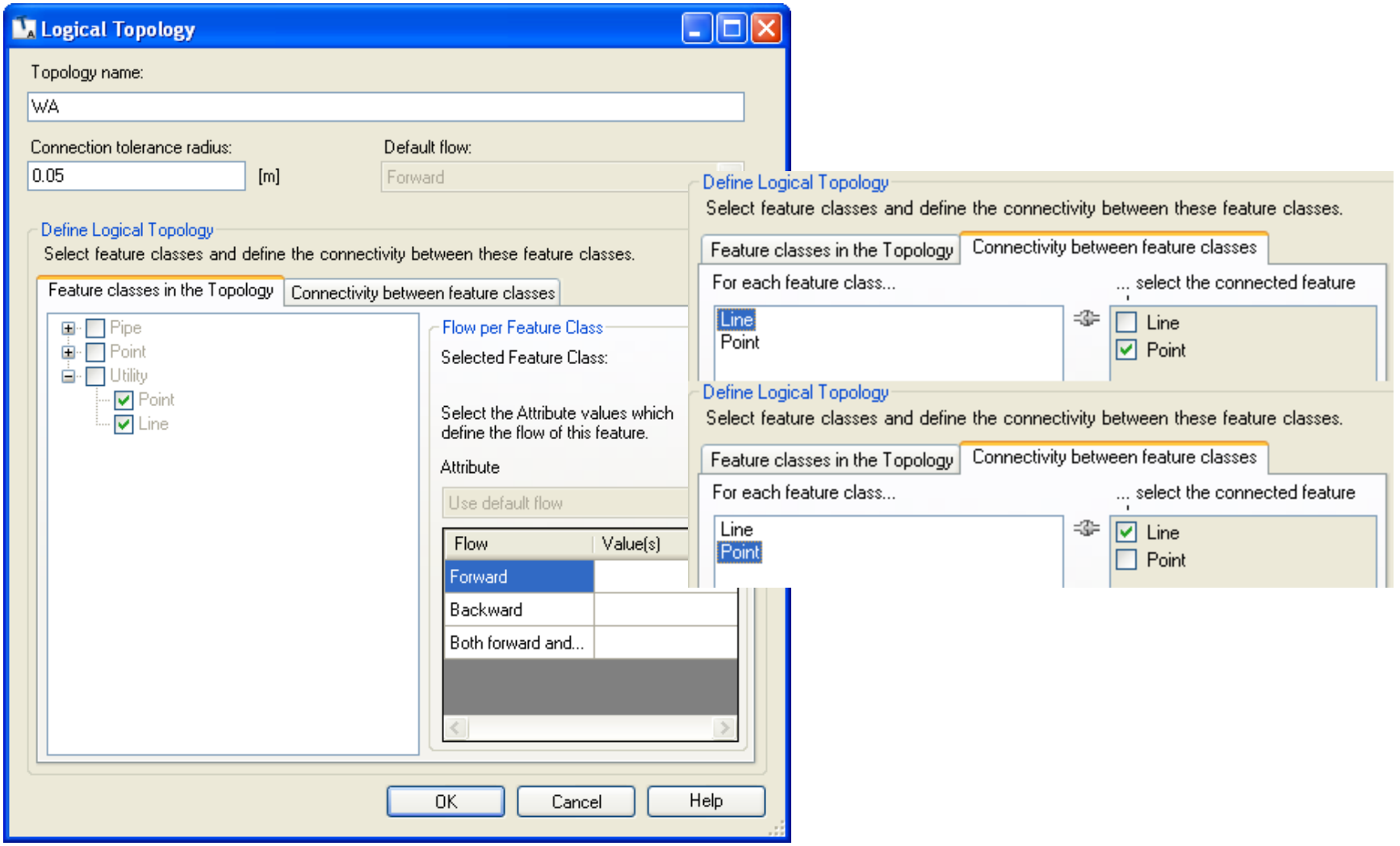
5.2.2 Creating a Utility Model ++

- Create the Utility Model



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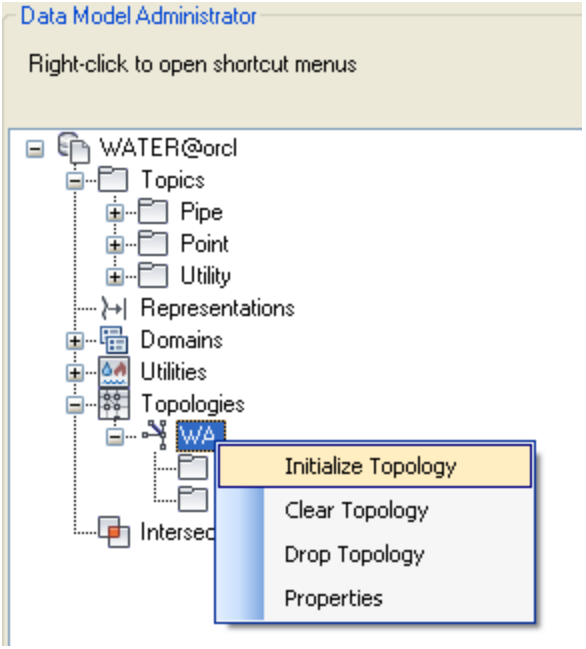
5.2.2 Creating a Utility Model +++

- Initialize the Topology

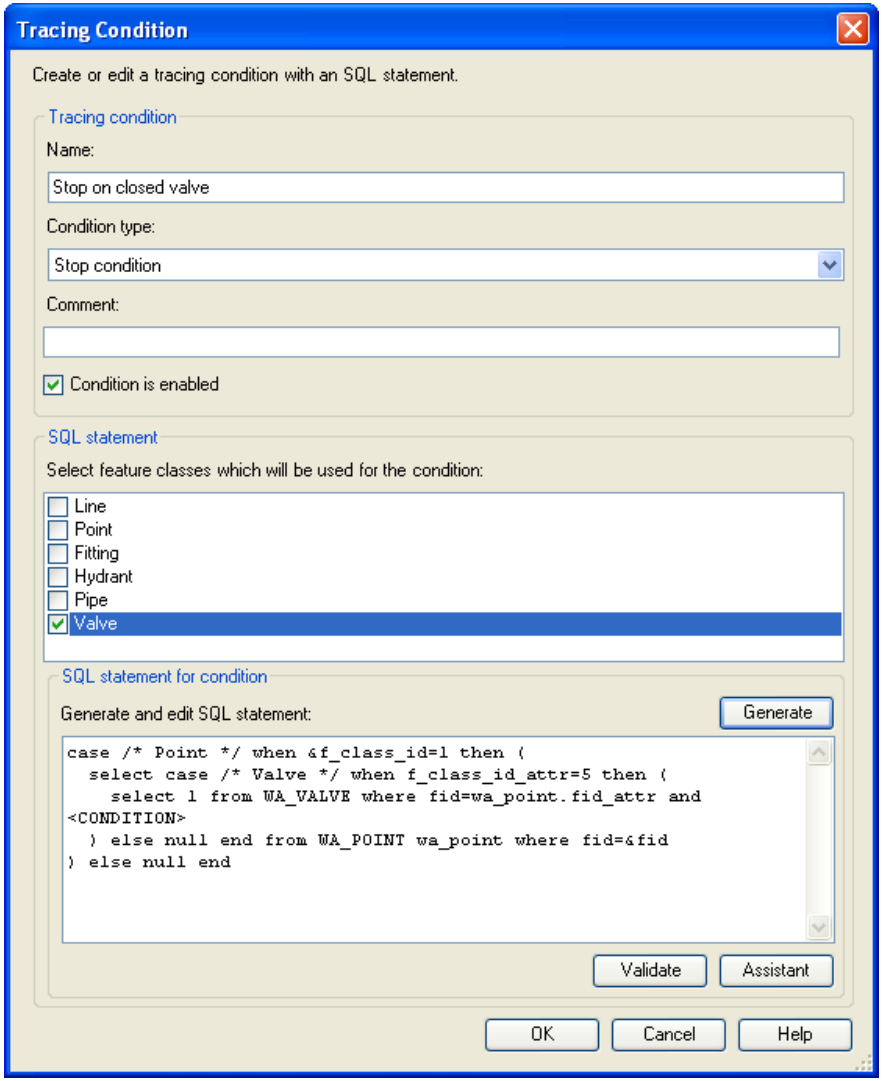


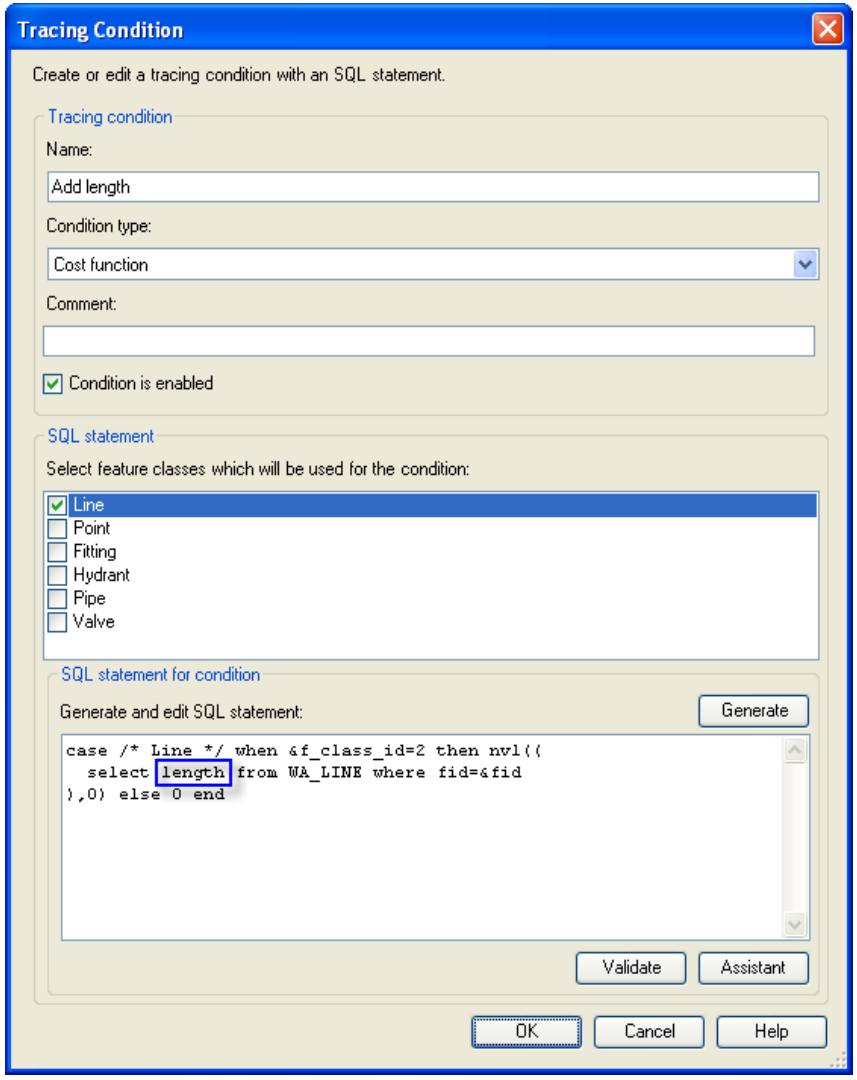
5.2.3 Conditions

- You can perform network analysis using two types of conditions:
  - Stop conditions
  - Cost functions

- To create a new condition, select the topology **WA** in the data model explorer. Right click **Conditions** and select **Create Condition**.

5.2.3 Conditions +





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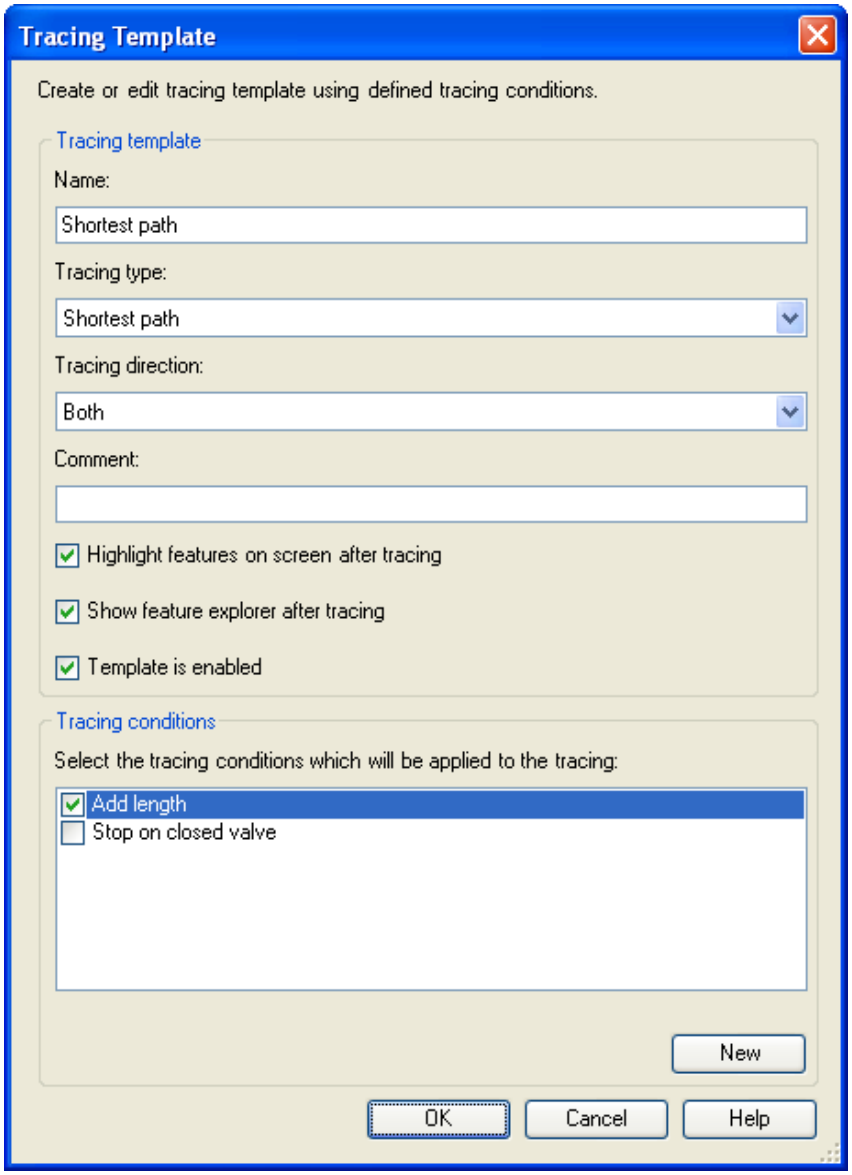
5.2.4 Tracing Templates

- Network tracing is the process by which all connected elements (nodes and edges) are highlighted given a starting element for the trace, and if necessary, a stop condition.

- Types of tracing templates in the Topobase Administrator:
  - Shortest path
  - Minimum spanning tree
  - Reachability
  - Cycle detection

- Trace can be defined with three directions:
  - Forward
  - Backward
  - Both: Bi-directional

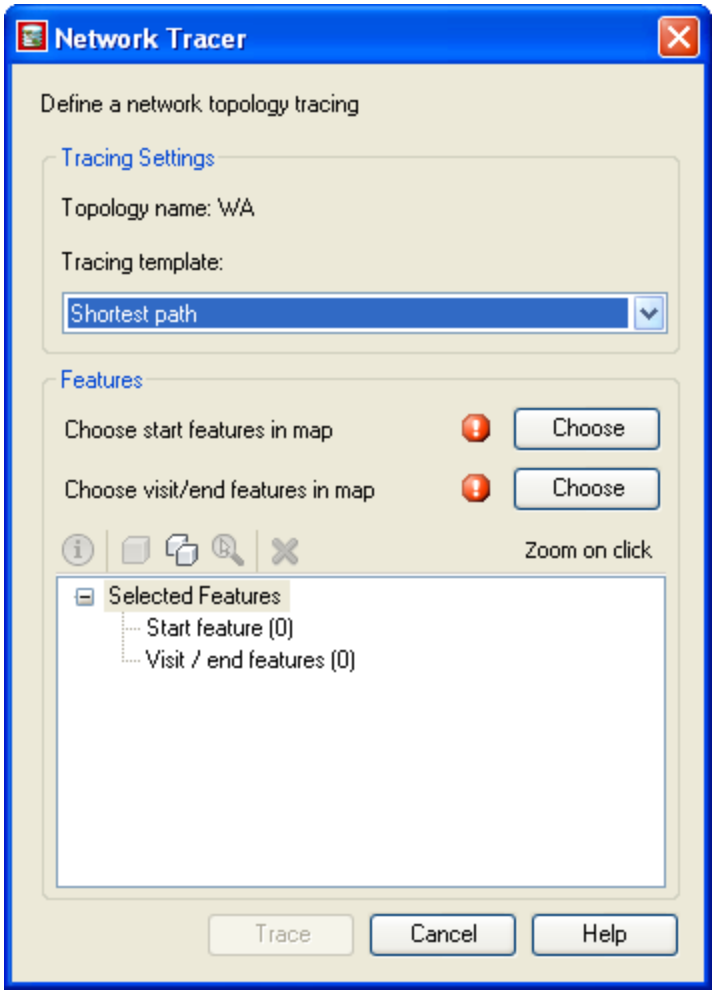
5.2.4 Tracing Templates +



5.2.5 Network Tracer

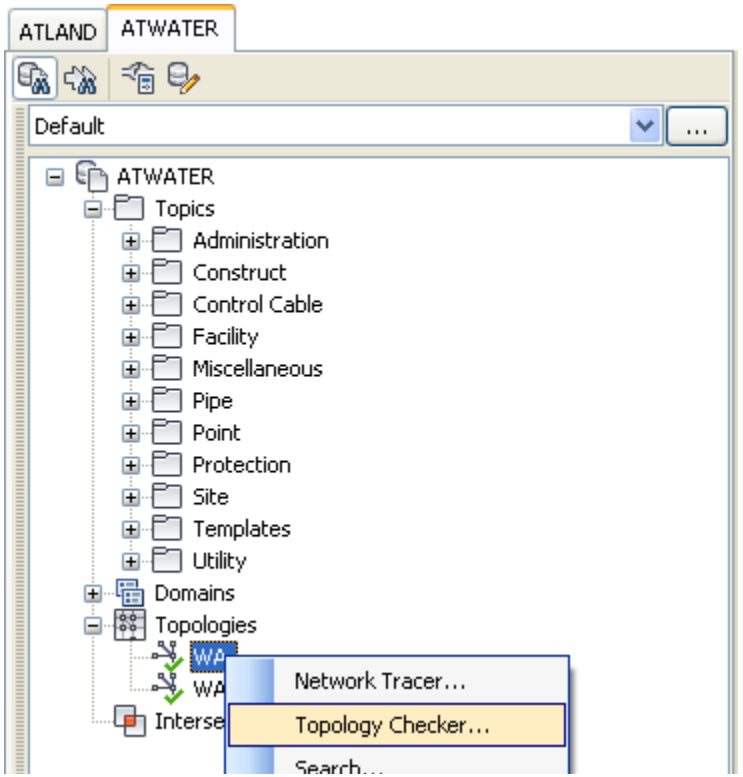
In the Topobase explorer, select **WA** under Topologies, **right-click** and select **Network Tracer.**

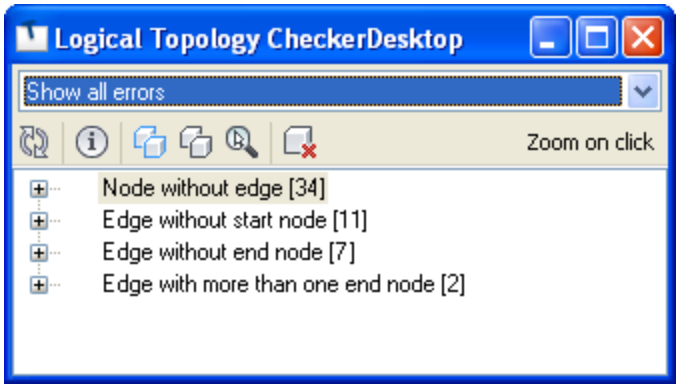
Shortest path result



5.2.6 Topology Checker

In the Topobase explorer, select **WA** under Topologies, **right-click**, and select **Topology Checker**.





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5.3 Data Migration into the Water Data Model

1. Create workspace and document with water data model.
2. Extend water data model according to the data source.
3. Drop spatial indexes.
4. Data migration with scripts.
5. Re-create spatial indexes.
6. Update calculated attributes.
7. Initialize the topology.

5.3 Data Migration into the Water Data Model +

Naming conventions

- Topobase system tables have the prefix **TB_*<table_name>***
- User feature classes are named with a prefix depending on the module:
  - Water: WA_
  - Wastewater: WW_, etc.
- Domain tables are assigned the suffix _**TBD**
- Label feature calsses are named with a suffix _**TBL**
- Boolean values are defined as **NUMBER(1)** where **0**=False and **1**=True
- Attributes related to domain tables have a prefix **ID_*<domain_name>***
- Attributes related to other feature classes or to attribute tables have a prefix **FID_<*table_name*>**
- Views are named with the prefix of the module plus _**V_*<table_name>***

5.3.2 Extend Water Data Model According to the Data Source

Feature class matching and creation

- Find out if the water nodes in your source data can be represented by the existing water data model Point attribute tables.

5.3.2 Extend Water Data Model According to the Data Source +

Attribute matching and creation

- Compare the structure of the foreign schema tables with the structure of the water data model tables, and find out which attributes in the water data model correspond to attributes defined in your source tables.

ATWATER.WA_PIPE Attribute name	SIMROSEWATER.WMAIN Attribute name	Description
name_number	main_name	Main name
pipe_length	pipe_length	Main length in meters
id_function	main_type	'M' water main line 'H' hydrant lead
id_material	mat_code	Material code
date_installation	inst_date	Installation date
min_depth*	min_depth	Minimum depth in meters
max_depth*	max_depth	Maximum depth in meters

5.3.2 Extend Water Data Model According to the Data Source ++

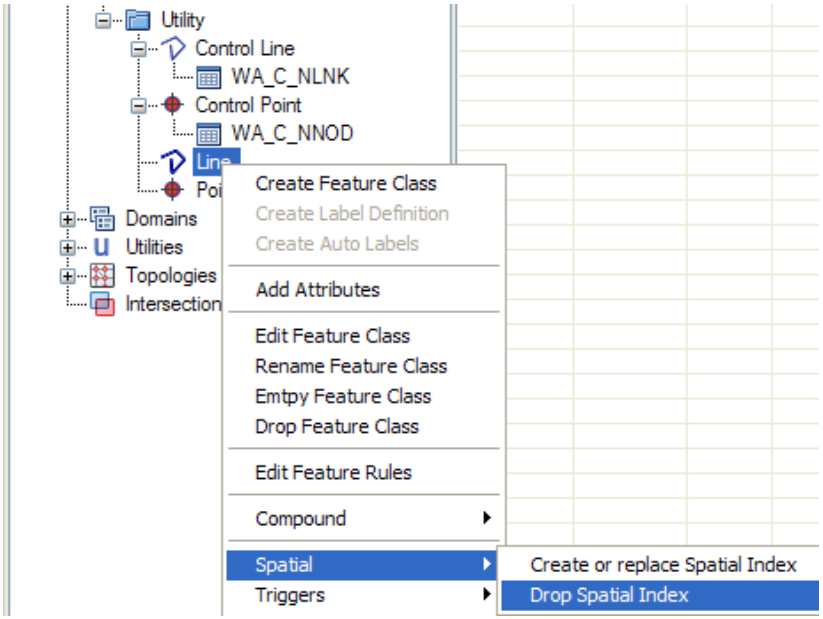
Domains

- If there are attributes related to a domain, you will analyze which values of the domain match with the values of your table.

DIRECTION	Description	WA_DIRECTION_TBD.ID
L	Left	2
R	Right	3
Null	To be determined	1001

5.3.3 Drop Spatial Indexes

Drop spatial indexes in Line (WA_LINE) and Point (WA_POINT)



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5.3.4 Insert Lines

Step 1. Add auxiliary column

ATWATER.WA_PIPE					
FID	NAME_NUMBER	DATE_INSTALLATION	ID_MATERIAL	...	MAIN_ID

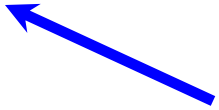
SIMROSEWATER.WMAIN					
MAIN_ID	GEOMETRY	MAIN_NAME	INST_DATE	MAT_CODE	...
8015		178B1	22/12/1987	CI	
8019		178C1	22/12/1987	CI	
10449		128A3	30/01/2004	GI	

ATWATER.WA_LINE						
FID	GEOM	F_CLASS_ID_ATTR	FID_ATTR	LENGTH	...	MAIN_ID

5.3.4 Insert Lines

Step 2. Insert attribute records into WA_PIPE

ATWATER.WA_PIPE					
FID	NAME_NUMBER	DATE_INSTALLATION	ID_MATERIAL	...	MAIN_ID
129557	178B1	22/12/1987	12		8015
129558	178C1	22/12/1987	12		8019
129559	128A3	30/01/2004	25		10449



SIMROSEWATER.WMAIN					
MAIN_ID	GEOMETRY	MAIN_NAME	INST_DATE	MAT_CODE	...
8015		178B1	22/12/1987	CI	
8019		178C1	22/12/1987	CI	
10449		128A3	30/01/2004	GI	

ATWATER.WA_LINE						
FID	GEOM	F_CLASS_ID_ATTR	FID_ATTR	LENGTH	...	MAIN_ID

SQL:

```
INSERT INTO ATWATER.WA_PIPE
            (main_id, name_number ,date_installation, ...)
SELECT      main_id, main_name, inst_date, ...)
FROM SIMROSEWATER.WMAIN;
```

5.3.4 Insert Lines

Step 3. Insert geometry into WA_LINE

ATWATER.WA_PIPE					
FID	NAME_NUMBER	DATE_INSTALLATION	ID_MATERIAL	...	MAIN_ID
129557	178B1	22/12/1987	12		8015
129558	178C1	22/12/1987	12		8019
129559	128A3	30/01/2004	25		10449

SIMROSEWATER.WMAIN					
MAIN_ID	GEOMETRY	MAIN_NAME	INST_DATE	MAT_CODE	...
8015		178B1	22/12/1987	CI	
8019		178C1	22/12/1987	CI	
10449		128A3	30/01/2004	GI	

ATWATER.WA_LINE						
FID	GEOM	F_CLASS_ID_ATTR	FID_ATTR	LENGTH	...	MAIN_ID
200345		30				8015
200346		30				8019
200347		30				10449

ATWATER.TB_DICTIONARY	
F_CLASS_ID	F_CLASS_NAME
30	WA_PIPE

SQL:

```
INSERT INTO ATWATER.WA_LINE
            (main_id, geom, f_class_id_attr)
SELECT      main_id, geometry, 30
FROM SIMROSEWATER.WMAIN;
```

5.3.4 Insert Lines

Step 4. Create indexes

ATWATER.WA_PIPE					
FID	NAME_NUMBER	DATE_INSTALLATION	ID_MATERIAL	...	MAIN_ID
129557	178B1	22/12/1987	12		8015
129558	178C1	22/12/1987	12		8019
129559	128A3	30/01/2004	25		10449

SIMROSEWATER.WMAIN					
MAIN_ID	GEOMETRY	MAIN_NAME	INST_DATE	MAT_CODE	...
8015		178B1	22/12/1987	CI	
8019		178C1	22/12/1987	CI	
10449		128A3	30/01/2004	GI	

ATWATER.WA_LINE						
FID	GEOM	F_CLASS_ID_ATTR	FID_ATTR	LENGTH	...	MAIN_ID
200345		30				8015
200346		30				8019
200347		30				10449

SQL:

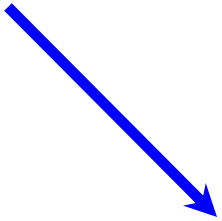
CREATE INDEX wa_pipe_main_idx ON WA_PIPE(main_id);

CREATE INDEX wa_line_main_idx ON WA_LINE(main_id);

5.3.4 Insert Lines

Step 5. Update relation between WA_LINE & WA_PIPE

ATWATER.WA_PIPE					
FID	NAME_NUMBER	DATE_INSTALLATION	ID_MATERIAL	...	MAIN_ID
129557	178B1	22/12/1987	12		8015
129558	178C1	22/12/1987	12		8019
129559	128A3	30/01/2004	25		10449



SIMROSEWATER.WMAIN					
MAIN_ID	GEOMETRY	MAIN_NAME	INST_DATE	MAT_CODE	...
8015		178B1	22/12/1987	CI	
8019		178C1	22/12/1987	CI	
10449		128A3	30/01/2004	GI	

ATWATER.WA_LINE						
FID	GEOM	F_CLASS_ID_ATTR	FID_ATTR	LENGTH	...	MAIN_ID
200345		30	129557			8015
200346		30	129558			8019
200347		30	129559			10449

SQL:

```
UPDATE WA_LINE a
SET fid_attr =
        (SELECT b.fid
        FROM WA_PIPE b
        WHERE b.main_id = a.main_id)
```

5.3.4 Insert Points

Step 1. Add auxiliary column

ATWATER.WA_HYDRANT				
FID	NAME_NUMBER	ID_HYDRANT_COLOR_RATE	...	HYDRANT_ID

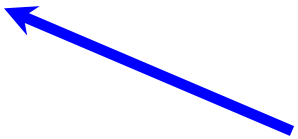
SIMROSEWATER.HYDRANT				
HYDRANT_ID	GEOMETRY	HYDRANT_NAME	COLOR_RATE	...
2903		H0008	B	
4017		H0015	O	
2915		H0018	G	

ATWATER.WA_POINT					
FID	GEOM	F_CLASS_ID_ATTR	FID_ATTR	...	HYDRANT_ID

5.3.4 Insert Points

Step 2. Insert attribute records into WA_HYDRANT

ATWATER.WA_HYDRANT				
FID	NAME_NUMBER	ID_HYDRANT_COLOR_RATE	...	HYDRANT_ID
250101	H0008	5		2903
250102	H0015	3		4017
250103	H0018	4		2915



SIMROSEWATER.HYDRANT				
HYDRANT_ID	GEOMETRY	HYDRANT_NAME	COLOR_RATE	...
2903		H0008	B	
4017		H0015	O	
2915		H0018	G	

ATWATER.WA_POINT					
FID	GEOM	F_CLASS_ID_ATTR	FID_ATTR	...	HYDRANT_ID

SQL:

```
INSERT INTO ATWATER.WA_HYDRANT
            (hydrant_id , name_number, id_hydrant_color_rate)
SELECT      hydrant_id, hydrant_name, DECODE(color_rate,'R',2,'O',3,'G',4,'B',5,1)
FROM SIMROSEWATER.HYDRANT;
```

5.3.4 Insert Points

Step 3. Insert geometry into WA_POINT

ATWATER.WA_HYDRANT				
FID	NAME_NUMBER	ID_HYDRANT_COLOR_RATE	...	HYDRANT_ID
250101	H0008	5		2903
250102	H0015	3		4017
250103	H0018	4		2915

SIMROSEWATER.HYDRANT				
HYDRANT_ID	GEOMETRY	HYDRANT_NAME	COLOR_RATE	...
2903		H0008	B	
4017		H0015	O	
2915		H0018	G	

ATWATER.WA_POINT					
FID	GEOM	F_CLASS_ID_ATTR	FID_ATTR	...	HYDRANT_ID
300215		21			2903
300216		21			4017
300217		21			2915

SQL:

```
INSERT INTO ATWATER.WA_POINT
            (hydrant_id, geom, f_class_id_attr)
SELECT      hydrant_id, geometry, 21
FROM SIMROSEWATER.HYDRANT;
```

ATWATER.TB_DICTIONARY	
F_CLASS_ID	F_CLASS_NAME
21	WA_HYDRANT

5.3.4 Insert Points

Step 4. Create indexes

ATWATER.WA_HYDRANT				
FID	NAME_NUMBER	ID_HYDRANT_COLOR_RATE	...	HYDRANT_ID
250101	H0008	5		2903
250102	H0015	3		4017
250103	H0018	4		2915

SIMROSEWATER.HYDRANT				
HYDRANT_ID	GEOMETRY	HYDRANT_NAME	COLOR_RATE	...
2903		H0008	B	
4017		H0015	O	
2915		H0018	G	

ATWATER.WA_POINT					
FID	GEOM	F_CLASS_ID_ATTR	FID_ATTR	...	HYDRANT_ID
300215		21			2903
300216		21			4017
300217		21			2915

SQL:

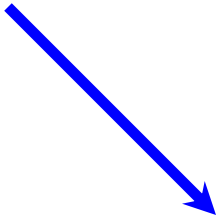
CREATE INDEX wa_hydrant_idx ON WA_HYDRANT(hydrant_id);

CREATE INDEX wa_point_hydrant_idx ON WA_POINT(hydrant_id);

5.3.4 Insert Points

Step 5. Update relation WA_POINT & WA_HYDRANT

ATWATER.WA_HYDRANT				
FID	NAME_NUMBER	ID_HYDRANT_COLOR_RATE	...	HYDRANT_ID
250101	H0008	5		2903
250102	H0015	3		4017
250103	H0018	4		2915



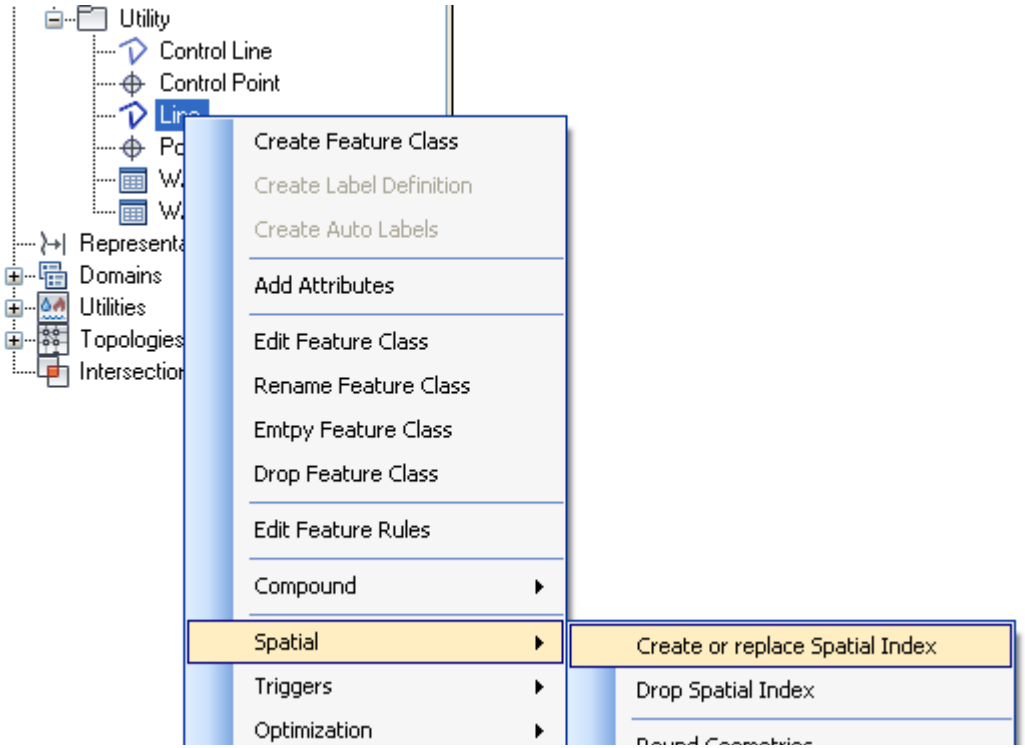
SIMROSEWATER.HYDRANT				
HYDRANT_ID	GEOMETRY	HYDRANT_NAME	COLOR_RATE	...
2903		H0008	B	
4017		H0015	O	
2915		H0018	G	

ATWATER.WA_POINT					
FID	GEOM	F_CLASS_ID_ATTR	FID_ATTR	...	HYDRANT_ID
300215		21	250101		2903
300216		21	250102		4017
300217		21	250103		2915

SQL:

```
UPDATE wa_point a
SET fid_attr =(SELECT b.fid
               FROM WA_HYDRANT b
               WHERE b.hydrant_id = a. hydrant_id)
WHERE f_class_id_attr=21;
```

5.3.5 Re-create Spatial Indexes



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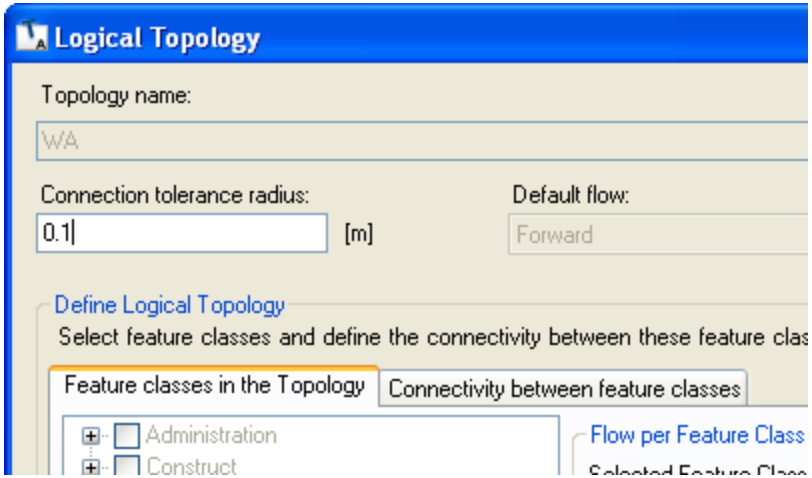
5.3.6 Update Calculated Attributes

- The length of the line is calculated by a client-side feature.
- When you inserted the lines in to the Line feature class, the rule was not triggered.
- There is an option in the Administrator to populate the length of the line.
- Select the Line feature class, **right-click**, and select **Update Length Attribute**.

5.3.7 Initialize the Topology

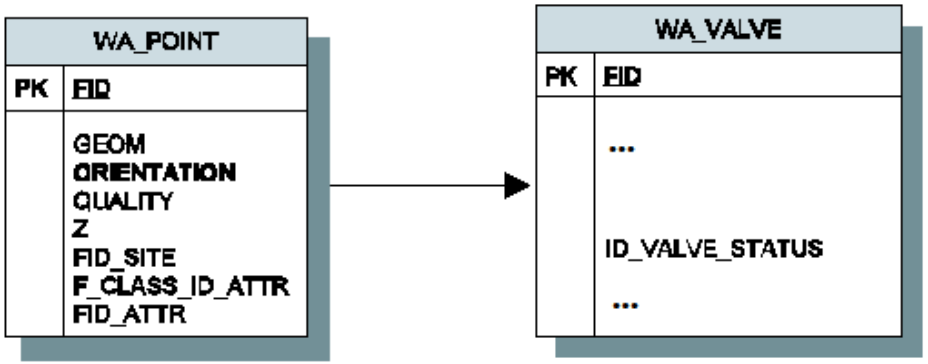
- In the Data Model Administrator, select **Topologies > WA** and **right-click**.
- Select **Properties** in the shortcut menu.



- Click **OK**.
- Navigate to the shortcut menu again and then select **Initialize Topology**.

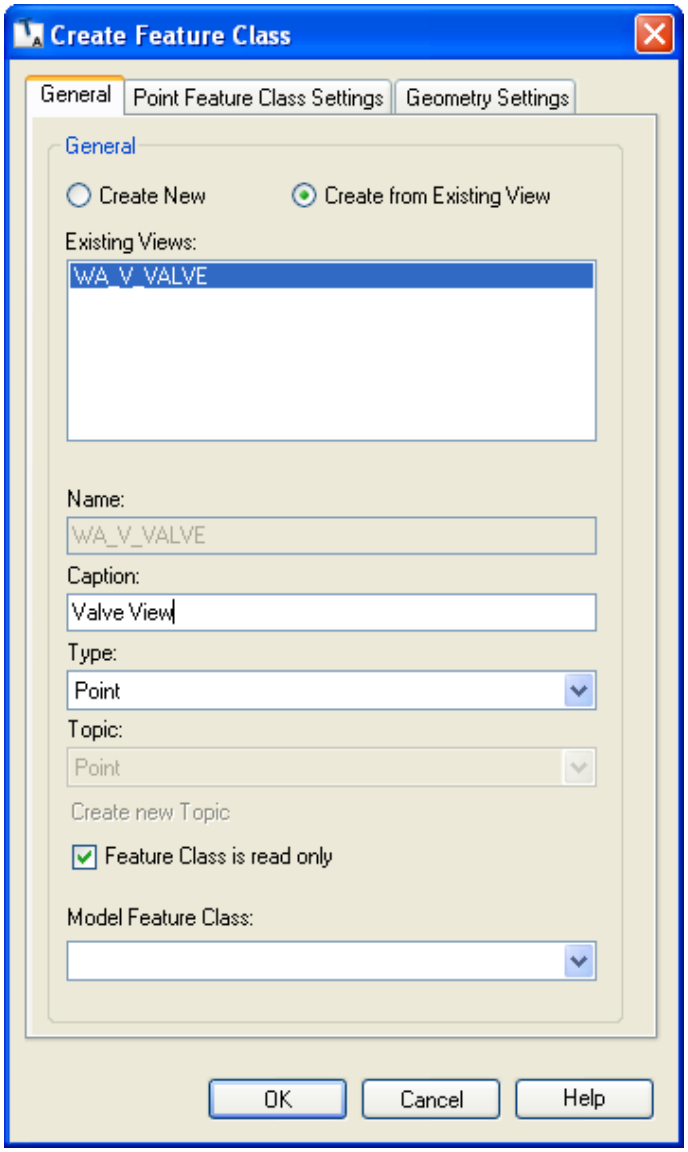
5.4 Creating a Feature Class from a View

- Topobase Administrator allows you to include Oracle views in Topobase documents so you can use them as feature classes.




```
CREATE OR REPLACE VIEW WA_V_VALVE
    (fid, geom, orientation, id_valve_status)
AS
    SELECT p.fid, p.geom, p.orientation, v.id_valve_status
    FROM WA_POINT p, WA_VALVE v
    WHERE p.fid_attr = v.fid
/
```

5.4 Creating a Feature Class from a View +



5.6 Chapter Summary

You should now be able to:

- Create a Utility Model.
- Define stop conditions and cost functions for network analysis.
- Create Tracing templates.
- Validate the topology.
- Understand the process of data migration of Oracle data into the water data model.
- Register Oracle views as Topobase feature classes.

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