ArcGIS Schematics

Contribution To QA/QC & Inside Plant Diagraming

Patrick Dolémieux - Product Manager
More than 20 years in AM/FM and GIS
AGENDA

- Definitions
- Asset Repository
- Network Connectivity
- Symbology
- 1st Task – QA/QC
- 2nd Task – Inside Plant
- 3rd Task – Import ISP in GDB
- Questions/Answers
DEFINITIONS
A simplified representation of an object or a set of objects, intended to explain its structure and to make the way it operates understandable.
DEFINITION

A drawing or diagram representing a set of relationships.
A way to represent any type of network and diagram within a symbolic system, in a defined space, and without scaling constraints.
PRODUCTS

- ArcGIS Schematics 2.3

- ArcGIS Schematics Designer

- ArcInfo 8.3 or 9.0
GEODATABASE

- Refineries
- Gas Plants
- Valves
- End Caps
- Pipes
- Pipe Intersections
ISP DATABASE

**VALVES Table**

<table>
<thead>
<tr>
<th>ID</th>
<th>TYPE</th>
<th>ENABLED</th>
<th>PLACING_DATE</th>
<th>MAINT_DATE</th>
<th>NUMBER</th>
<th>PLANT_NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Main In</td>
<td>0</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>101</td>
<td>101</td>
</tr>
<tr>
<td>9</td>
<td>Main In</td>
<td>0</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>102</td>
<td>101</td>
</tr>
<tr>
<td>10</td>
<td>Main In</td>
<td>0</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>103</td>
<td>101</td>
</tr>
<tr>
<td>11</td>
<td>Secondary</td>
<td>0</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>104</td>
<td>101</td>
</tr>
<tr>
<td>12</td>
<td>Secondary</td>
<td>0</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>105</td>
<td>101</td>
</tr>
<tr>
<td>13</td>
<td>Secondary</td>
<td>0</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>106</td>
<td>101</td>
</tr>
<tr>
<td>14</td>
<td>Secondary</td>
<td>0</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>107</td>
<td>101</td>
</tr>
<tr>
<td>15</td>
<td>Secondary</td>
<td>0</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>108</td>
<td>101</td>
</tr>
<tr>
<td>16</td>
<td>Secondary</td>
<td>0</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>109</td>
<td>101</td>
</tr>
</tbody>
</table>

**EQUIPMENTS Table**

<table>
<thead>
<tr>
<th>ID</th>
<th>TYPE</th>
<th>PLACING_DATE</th>
<th>MAINT_DATE</th>
<th>NUMBER</th>
<th>PLANT_NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Meter</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>201</td>
<td>101</td>
</tr>
<tr>
<td>9</td>
<td>Meter</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>202</td>
<td>101</td>
</tr>
<tr>
<td>10</td>
<td>Meter</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>203</td>
<td>101</td>
</tr>
<tr>
<td>11</td>
<td>Meter</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>204</td>
<td>101</td>
</tr>
<tr>
<td>12</td>
<td>Meter</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>205</td>
<td>101</td>
</tr>
<tr>
<td>13</td>
<td>Meter</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>206</td>
<td>101</td>
</tr>
<tr>
<td>14</td>
<td>Meter</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>207</td>
<td>101</td>
</tr>
<tr>
<td>15</td>
<td>Pump Type A125</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>301</td>
<td>101</td>
</tr>
<tr>
<td>16</td>
<td>Tank Type TS25</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>302</td>
<td>101</td>
</tr>
</tbody>
</table>

**DPIES Table**

<table>
<thead>
<tr>
<th>ID</th>
<th>DIAMETER</th>
<th>PLACING_DATE</th>
<th>MAINT_DATE</th>
<th>FROM_NODE_NUM</th>
<th>TO_NODE_NUM</th>
<th>PLANT_NUMBER</th>
<th>FROM_PPORT</th>
<th>TO_PPORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>18</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>103</td>
<td>203</td>
<td>101</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>20</td>
<td>18</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>203</td>
<td>106</td>
<td>101</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>21</td>
<td>18</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>106</td>
<td>402</td>
<td>101</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>22</td>
<td>18</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>102</td>
<td>202</td>
<td>101</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>23</td>
<td>18</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>202</td>
<td>105</td>
<td>101</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>24</td>
<td>18</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>105</td>
<td>401</td>
<td>101</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>25</td>
<td>8</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>101</td>
<td>201</td>
<td>101</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>26</td>
<td>8</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>201</td>
<td>104</td>
<td>101</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>27</td>
<td>8</td>
<td>1/14/2004</td>
<td>1/14/2005</td>
<td>104</td>
<td>304</td>
<td>101</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
OUTSIDE PLANT

Geometric Network
★ Refineries
★ Gas Plants
★ Valves
★ End Caps
★ Pipes
★ Pipe Intersections
★ Net Junctions
Explicit Attributes
INSIDE PLANT

Link Ports

HEAT EXCHANGER

Origin
SCHEMATIC SYMBOLS

PUG 2004 Conference – Houston, TX - February 23-25
1ST TASK: QA/QC
QA/QC

• Task: Check the features connectivity within the ESTANCIA North A8 zone and correct errors

• Tools: Using out of the box ArcMap, ArcGIS Schematics, and ArcGIS Schematics Designer
TECHNICAL WORKFLOW

OPENING

Geodatabase

MySchematic

ArcGIS Schematics

Documents Links

Nodes

ID  DOCID  EID  OID

Geo  Schem

Xg1Yg1  Xs1Ys1
Xg2Yg2  Xs2Ys2
XgsYsn  XsnYsn

Display

Read

Update

Check

Read

Update

PUG 2004 Conference – Houston, TX - February 23-25
• Designer
  • Use the standard Document Type (Rename)
  • Populate the Graphic Types (from ArcMap)
  • Set the Attributes and Properties
OPEN ARCGIS SCHEMATICS DESIGNER
2\textsuperscript{nd} TASK: INSIDE PLANT
• Task: Show the customization steps to build an ISP application.

• Tools: Arc Object and ArcGIS Schematics Designer and SDK
DEMONSTRATION
CONCEPTUAL MODEL

Outside Plant
Inside Plant

Schematic Document

Schematic Database

Brazil.mdb
GeoDatabase
Other Databases

ISP

MySchematic.mdb

ARACAIU CUBATAO

Schematic Element

Schematic Graphic Type

ISP Pipes
ISP Valves
ISP Equipments

Data Source

Other Databases

PUG 2004 Conference – Houston, TX - February 23-25
CUSTOMIZATION STEPS

- Designer
  - Add a new Data Source
  - Create a new Document Type
  - Create the Graphic Types
- Write the VB code
  - Schematic Function
  - Arc Object Function (call the Schematic Function)
- Designer
  - Behaviors
VB CODE

Option Explicit

Private WithEvents m_ngWorkspace As NGOLib.NgWorkspace 'Main Schematics Object
Private WithEvents m_ngAlgo As NgoALGOLib.NgAlgo 'Algorithm Object

Public Function Initialize(CurrentWorkspace As NGOLib.NgWorkspace)
  Dim lngCW As NgToolsComp.NgCommandsWrapper
  Dim lngUP As NGOLib.NgUserProcedureSet

  Set m_ngWorkspace = CurrentWorkspace
  For Each lngUP In CurrentWorkspace.UserProcedureSets 'Initialize all user procedures
    If lngUP.Name = "NgToolsComp.NgCommandsWrapper" Then
      Set lngCW = lngUP.Object
    Exit For
    End If
  Next

  Set m_ngAlgo = lngCW.NgAlgo 'New NGOAlgLib.NgAlgo

End Function

Public Function LaunchISP(ByVal AttrPlantName As String)
  On Error GoTo errorHandler

  Dim curDctype As NgDocumentType 'create a document type object
  Set curDctype = m_ngWorkspace.GetDocumentType("ISP") 'set it to a specific document type
  curDctype.OpenDocument (AttrPlantName) 'Open the document you want

  Exit Function
  errorHandler:
  MsgBox Err.Description
End Function
Private Function MxDocument_OnContextMenu(ByVal x As Long, ByVal y As Long) As Boolean
Dim pMxDoc As IMxDocument 'Document object
Dim pMap As IMap 'actual map
Dim pEnumFeature As IEnumFeature
Dim pEnumFeatureSetup As IEnumFeatureSetup
Dim pFeature As IFeature
Dim pDS As IDataset
Dim p_app As IApplication 'Main application object

Dim pFeatureName As String 'used to check feature class names
DimngoWorkspace As INgWorkspace 'Main Schematics object
Dim pMyClass As BrazilProc 'Custom VB class

SetngoWorkspace = NgSpatial.NgWorkspace 'get the current Schematics workspace
Set p_app = Application 'get the current ArcMap application
Set pMxDoc = p_app.Document 'get the current ArcMap document object
Set pMap = pMxDoc.FocusMap 'get the current map in focus
Set pEnumFeature = pMap.FeatureSelection 'get all currently selected features
Set pEnumFeatureSetup = pEnumFeature
pEnumFeatureSetup.AllFields = True
Set pFeature = pEnumFeature.Next
Do While (Not pFeature Is Nothing) 'loop through the features

Set pDS = pFeature.Class
myst = Mid(pDS.Name, 9)
If myst = "refineries" Or myst = "gas_plants" Then
' see if this is refineries or gas_plants object

Dim myint As Integer
myint = pFeature.Fields.FindField("NAME") 'find which field is the Name column

For Each procset InngoWorkspace.UserProcedureSets 'loop through schematics procedures

If procset.Name = "BrazilDemo BrazilProc" Then
' find custom procedure
Debug.Print procset.Name
Set pMyClass = procset.Object 'instantiate it
 Exit For
End If
Next procset

If Not pMyClass Is Nothing Then
pMyClass.LaunchISP pFeature.Value(myint) 'call the procedure
End If

End If
Set pFeature = pEnumFeature.Next
Loop

MxDocument_OnContextMenu = False 'allow the right click menu to still work
End Function
OPEN ARCGIS SCHEMATICS DESIGNER

PUG 2004 Conference – Houston, TX - February 23-25
3rd TASK: IMPORT ISP INTO GDB

CUBATAO
Task: Create and import the ISP diagram of the Cubatao refinery into the Geodatabase

Tools: Out of the box ArcMap and ArcGIS Schematics
WORKFLOW

- Create Diagram
- Export Diagram To Dataset
- Append Feature Class To Feature Class
- Import Attributes In Feature Table
- Recreate Geometric Network
- Connect OSP Features To ISP Features
FINAL RESULT

CUBATAO
Open to Questions

Patrick Dolémieux
pdolemieux@esri.com
ArcGIS Schematics

Contribution To QA/QC & Inside Plant Diagraming

Thank you