

GS3075 – Visualize This! Smart Grid Management in Utilities

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Class Summary

This class will show and tell how utilities can use Autodesk visualization tools and **integrate** with their smart meter systems to effectively **manage smart meters** in their network. The integrated solution will educate how you can use the **power of AIMS** technology to visualize various meter events and **empower operations personnel** to direct work in finding **resolutions to issues**.

Learning Objectives

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

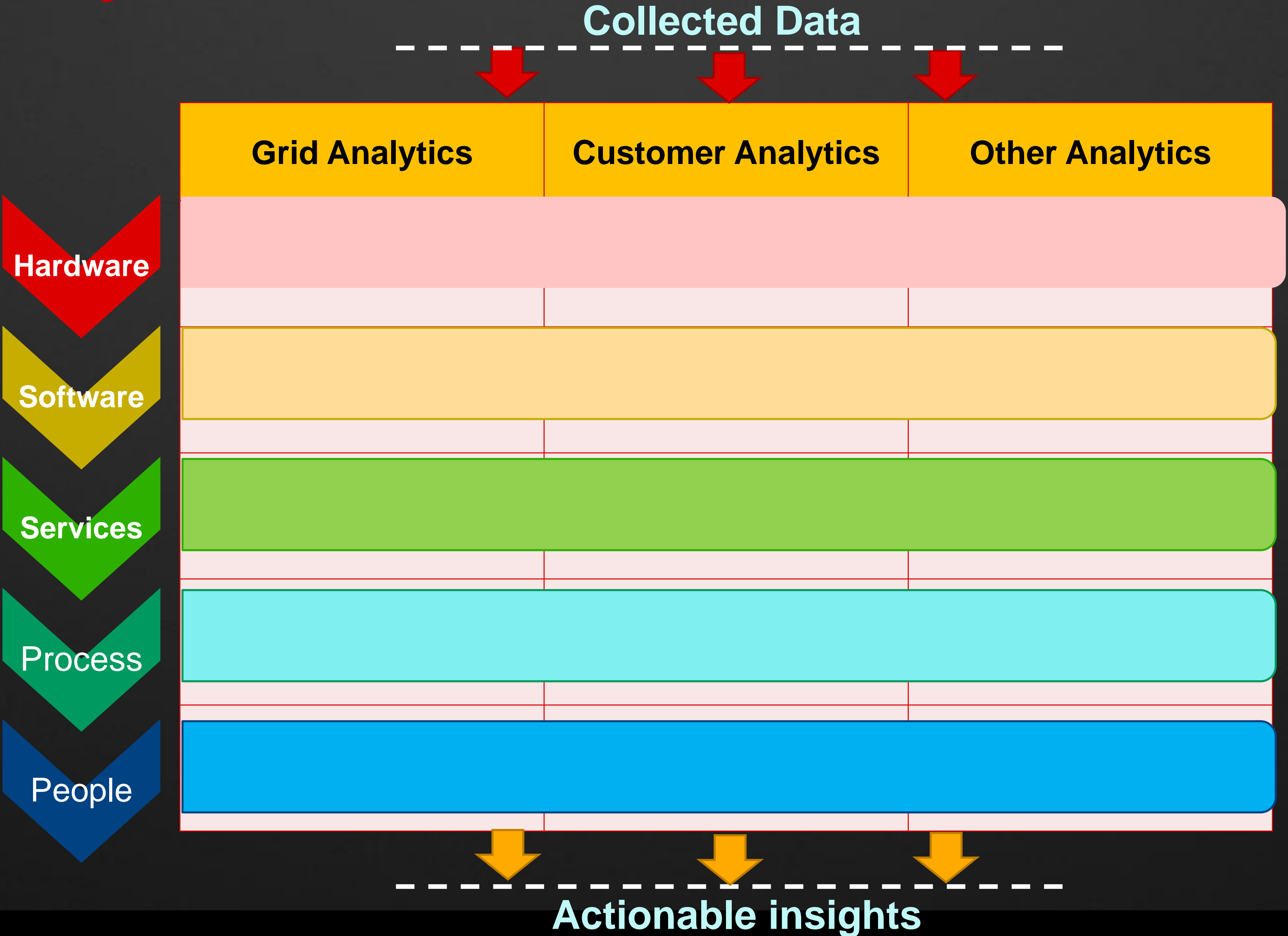
- Analytics trend in Utilities
- Autodesk solutions in Smart Grid Visualization
- AIMS Integration with Smart Grid Solutions
- Advanced features in AIMS Open Layers
- Large data visualization techniques with AIMS

Analytics in Utilities

What if?

- Your providers electrical network,
 - Can use information and communication technology to gather and act on the information.
 - Knows about itself and consumer its serving at all times.
 - Can give feedback to its managers to improve efficiency and reliability.
- That's what is called a **SMARTER GRID...**

Utility analytics



Essentials

TECHNOLOGY

- Hardware specific to analytics
- Software specific to analytics
- Integration of siloed data
- Technology Leadership for this initiative

People

- Dedicated internal resources
- Supplement with outside specialists
- Change management

Business Process

- Change towards To-Be
- Project Management
- Integration of siloed process
- Achieve ROI

Strategy

Align with corporate strategy
Metrics/Goals
Executive Sponsor buy-in

Utility analytics value curve

Courtesy:



Asset Optimization best practices

- **Technology** – Ensure it can support level of granularity needed
- **Business Process** – Base asset management on individual assets vs. categories
- **Strategy** – Tie analytics into network design | Ensure not installing over-sized assets
- **People** – Change management with buy-in from field operations.

Grid Optimization best practices

- **Technology** – Leverage existing systems and data
- **Business Process** – Add value to existing process
- **Strategy** – Connect analytics with key utility initiatives
- **People** – Prepare to relinquish some control of the grid data.

Customer operations best practices

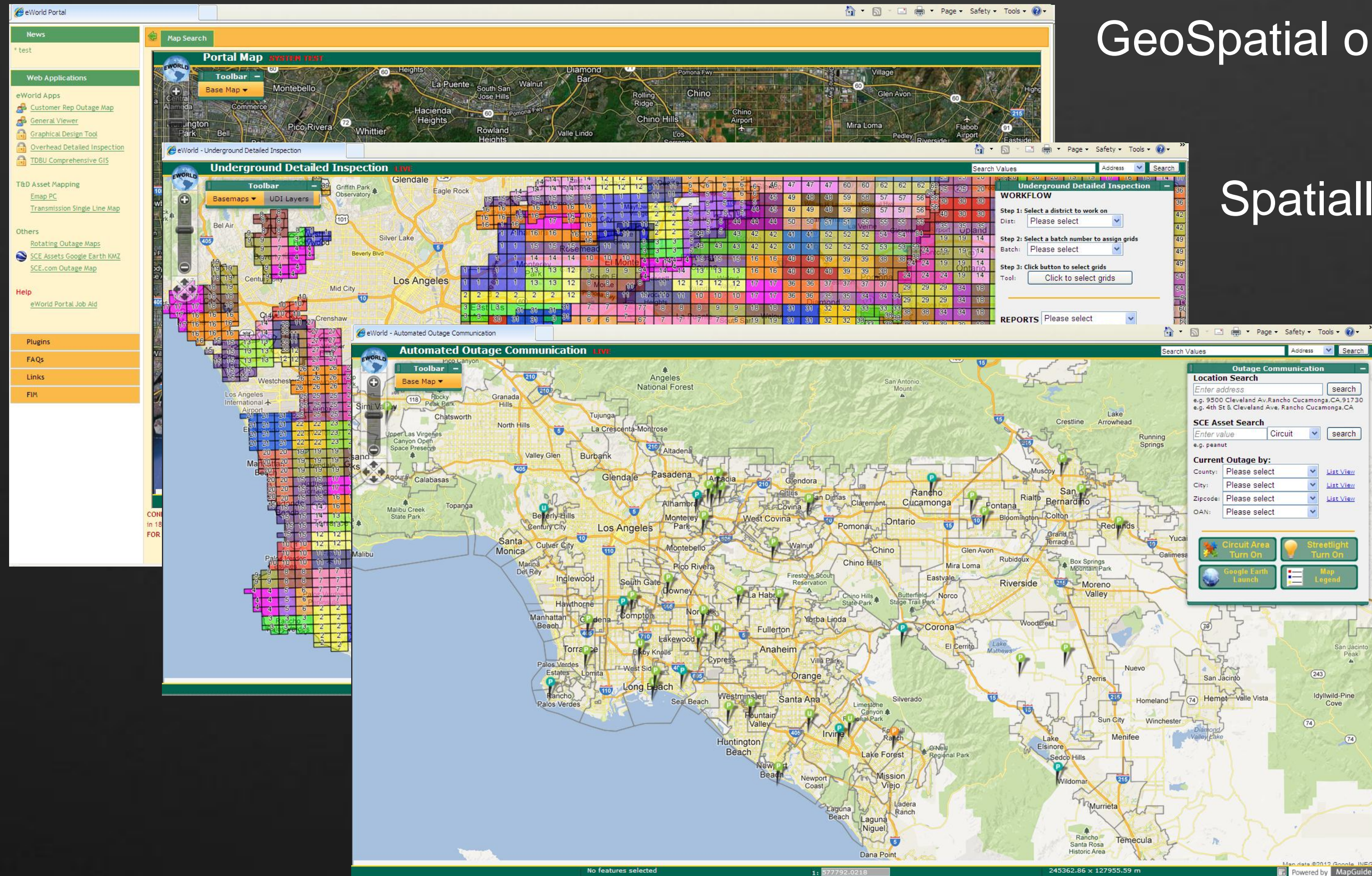
- **Technology** – Meter data is important, but consider other sources also
- **Business Process** – Embed analytics in key processes | Raise visibility
- **Strategy** – CSAT | Value from intelligent utility investments
- **People** – Cross-functional teams

Visualization/Analytics in SCE

Visualization of assets

- E-world – Enterprise power asset data on web map
 - § Distribution & Transmission assets
 - § Circuit data
 - § Customer data
 - § Outage data
- GIS – Transmission single line diagrams
- SmartConnect – Initiative to provide end-to-end management of smart meters

eWorld

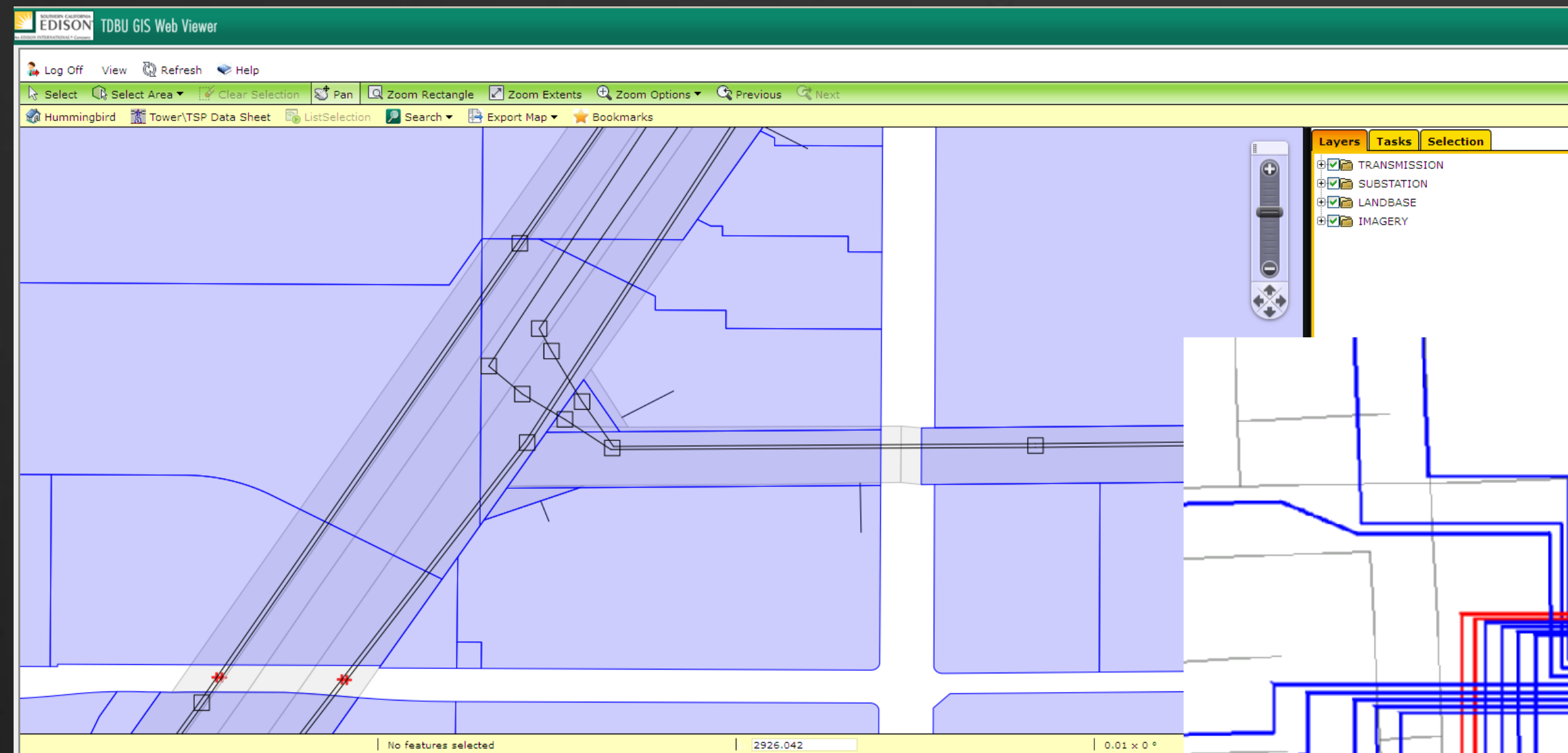


GeoSpatial one stop for asset info

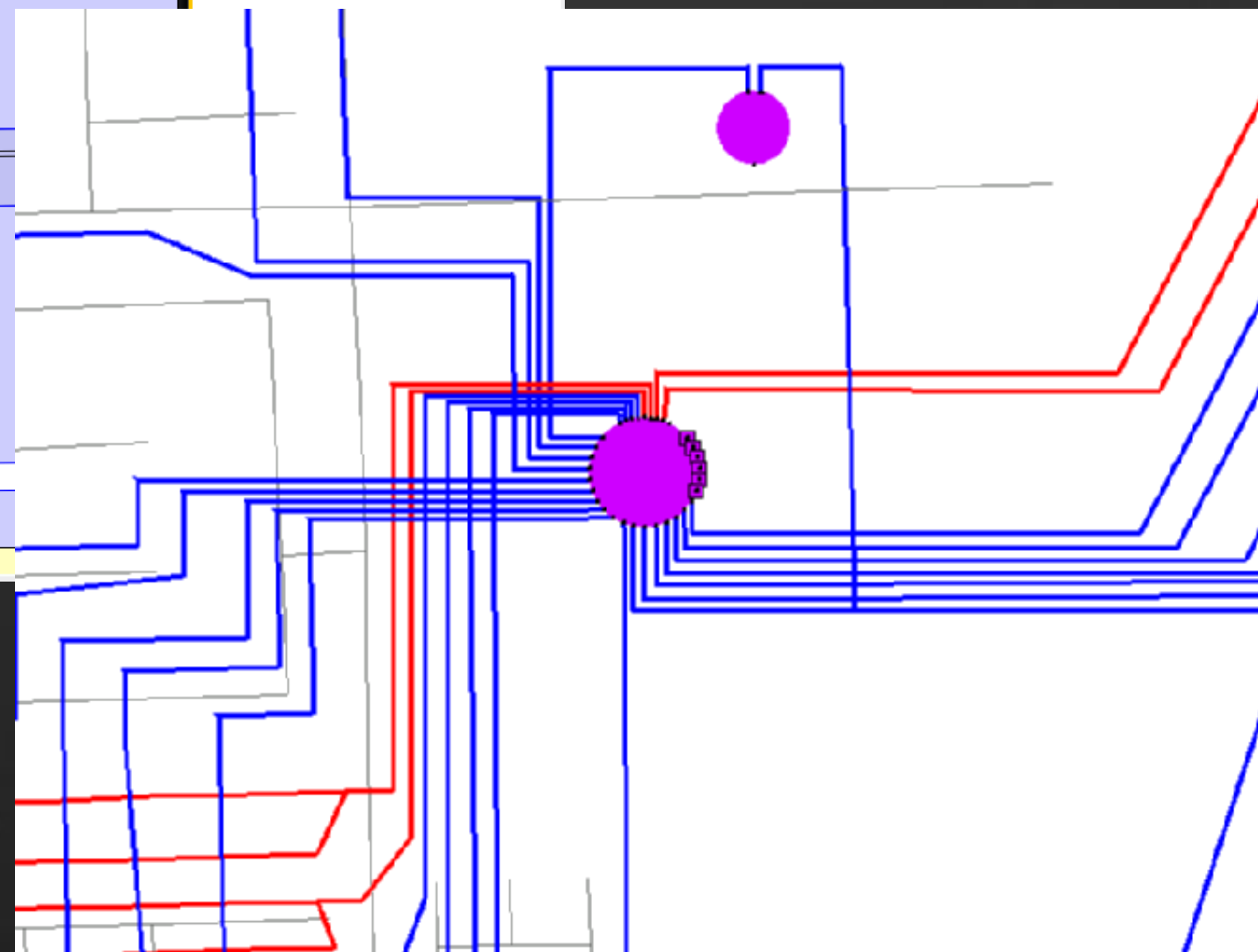
Spatially enabled workflow & management

Visualize real-time information

Centralized GIS mapping



Mapping against a common landbase
One asset location for all other platforms



Data maintenance in source systems

A screenshot of the Edison TDBU GIS Tower Data Sheet form. The form has a green header with the Edison logo and 'TDBU GIS'. Below the header, there are tabs for 'Tower Data Sheet' and 'Tubular Steel Pole'. The form contains several input fields and buttons. The 'Job States' section has radio buttons for 'Open', 'Pending', and 'Live'. The 'Circuit_FLOC' field is a text input. The 'Nominal Voltage' field is a dropdown menu. The 'Tower_FLOC' field is a text input. The 'Circuit Name' field is a text input. The 'Drawing No.' field is a text input. The 'Mile & Tower' field is a text input. The 'Latitude' field is a text input. The 'Structure Type' field is a dropdown menu. The 'Longitude' field is a text input. The 'Radius' field is a text input with a value of '1000' and a note '(1000ft to 5000ft)'. At the bottom, there are four buttons: 'Search', 'Import', 'Download Template', and 'Clear'. The footer text reads 'Copyright © 2011 Southern California Edison. All Rights Reserved'.

Online workflow for asset change approval

SCMAS – Objective & Scope

OBJECTIVE:

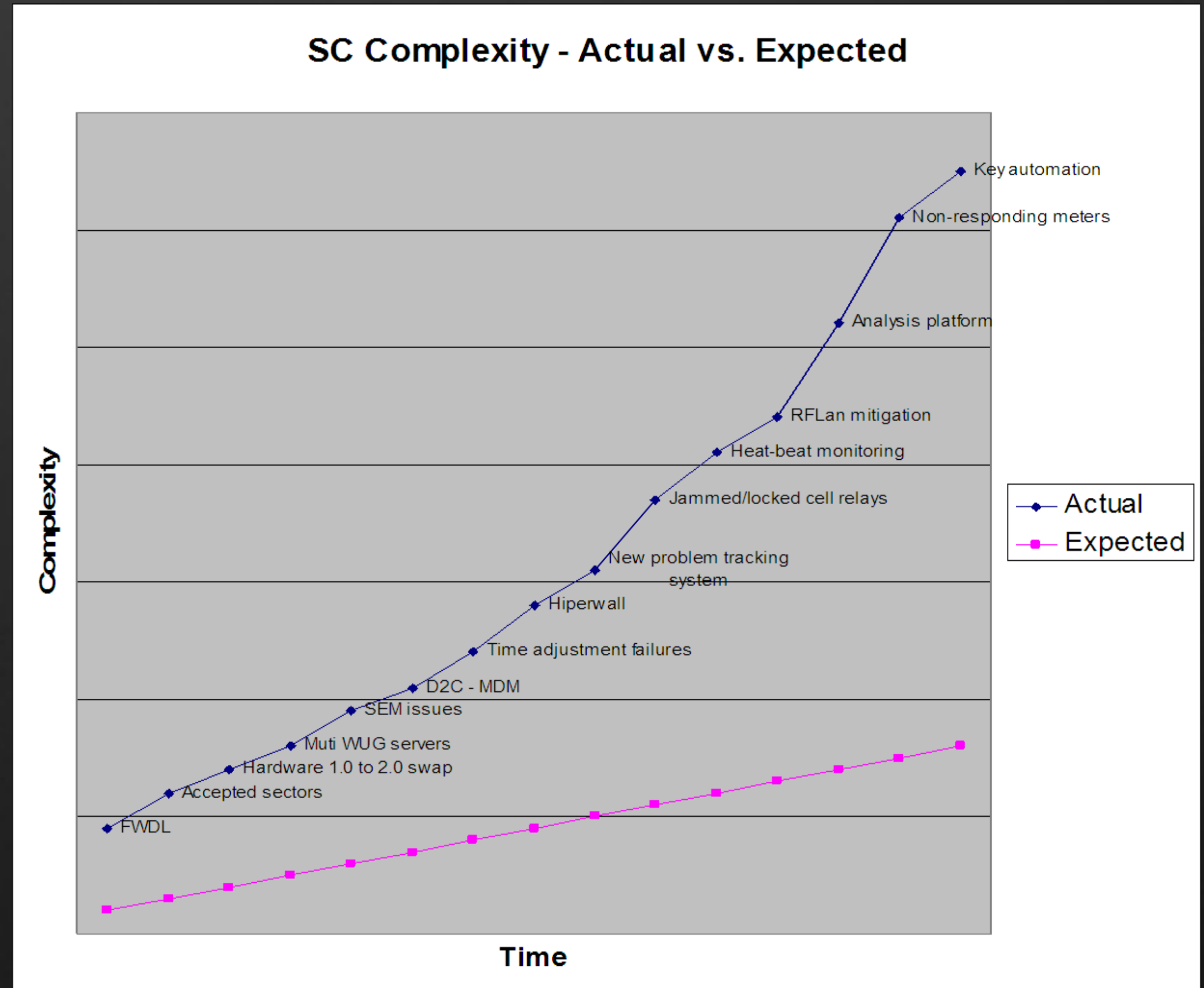
- To provide the SmartConnect Operations Center (SOC) with tools to ensure the **efficient and reliable operation** of the SmartConnect devices & mesh network. SCMAS will use the data from SmartConnect devices and provide **correlation and analysis** to identify and help mitigate over the air issues. With SCMAS, the SOC will have tools and processes to identify and address near time cascading events, optimize read performance, and **maintain the reliability** of SmartConnect field devices.

SCOPE:

- Data **collection** from field devices and access to multiple existing systems
- Data **analysis** and correlation using rules to identify events and incidents
- Incident and activity management to **assign and track tasks** in a 7/24 organization
- Incident **alerting and reporting** to insure issues are addressed quickly by the appropriate resources
- **Advanced visualization** that provides operations and management with **situational awareness** and a platform for advanced analytics

A \$1 billion dollar AML deployment requires reasonable tools for over-the-air operations

- Operating SmartConnect is more complex than anticipated
- On a daily basis after deployment SOC will need to address 5,000 incidents daily with an In Mitigation population of 30,000+ field devices



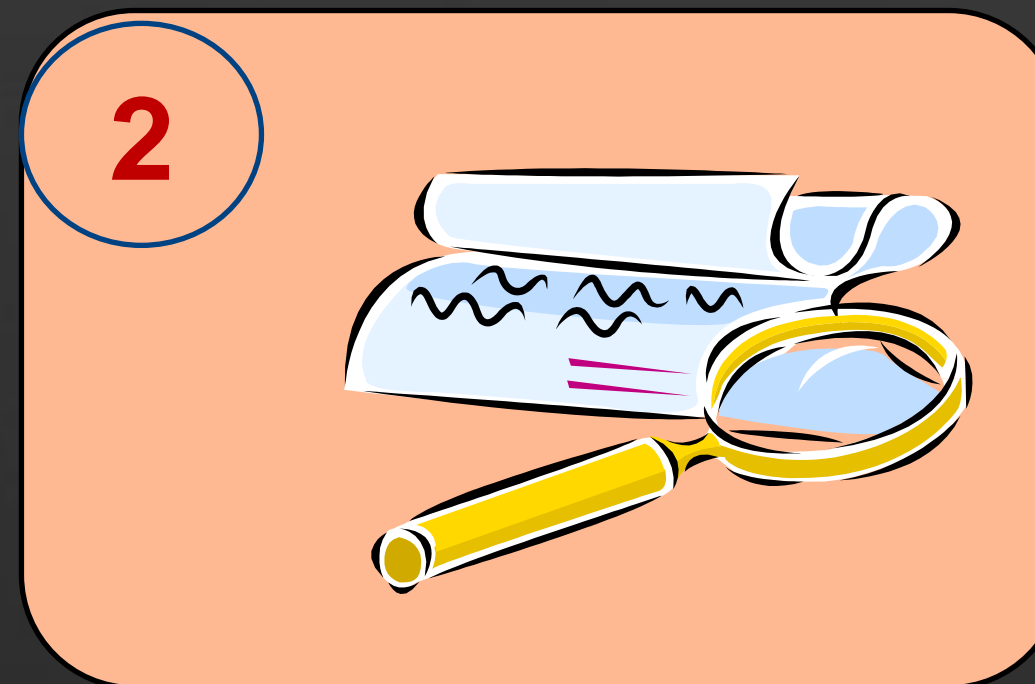
Key Objectives

- **Identification of Real Time Catastrophic Cascading Events**
 - Experience shows that embedded bugs can occur at any time.
 - Current tools not enough to identify these problems and the analytics to mitigate in a timely fashion to reduce the business impact
- **FWDL Success Optimization**
 - High FWDL success reduces exposure to identified issues and decreases truck rolls
- **Enhanced Billing Read Performance**
 - To maintain billing read rate performance SOC must address tens of thousands of un-responding meters on a daily basis and provide appropriate solutions to reduce pick-up reads and delayed bills.
- **Security**
 - The security detection system currently addresses selected pre-identified events
 - Identify anomalies that may not have a known specific pattern
 - Ensure operational integrity of RSS operations

Storyboard



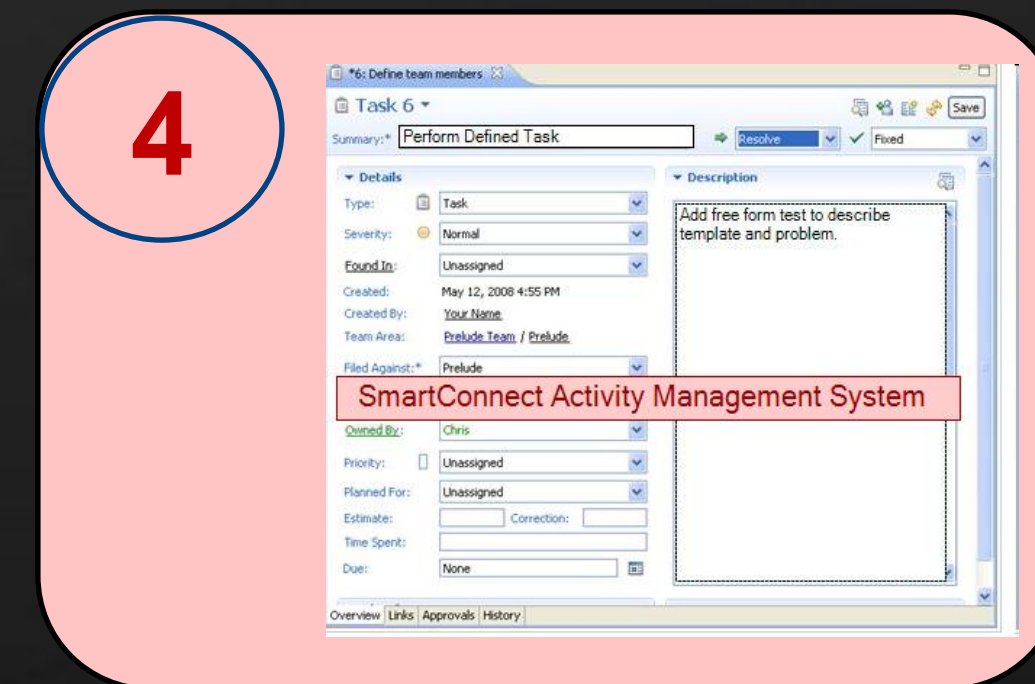
Communicate & Store



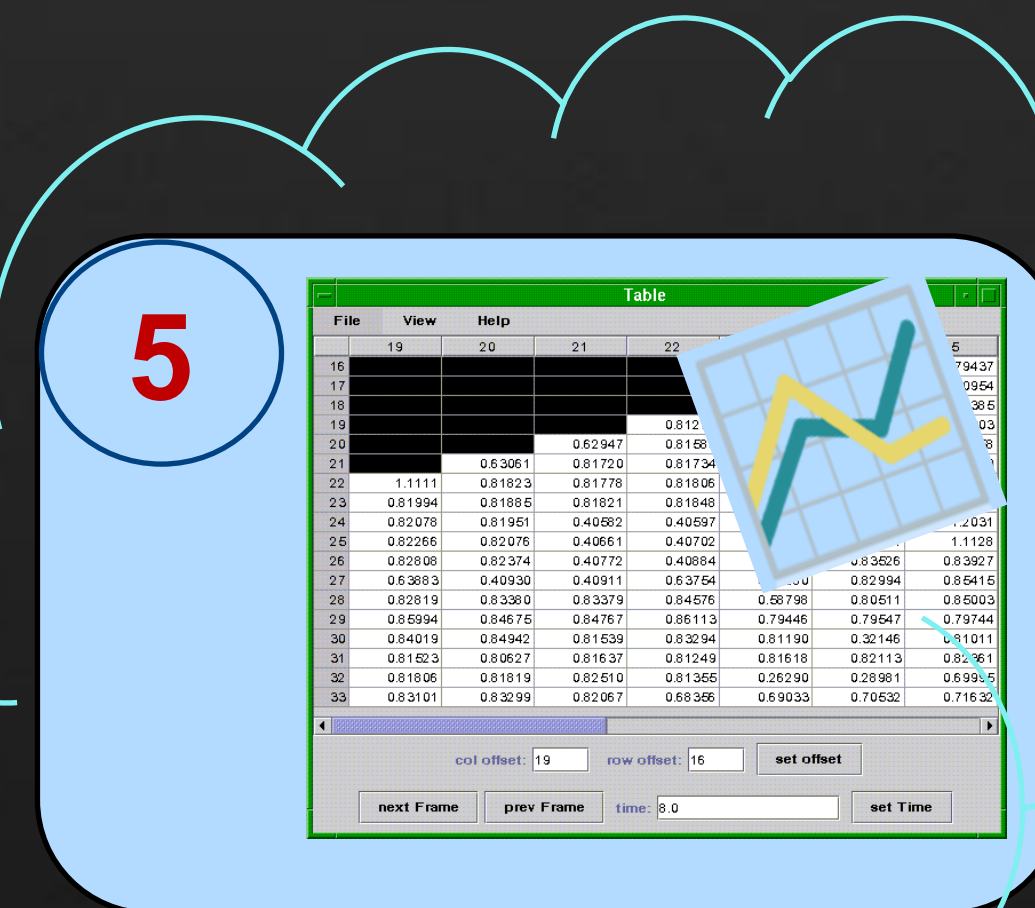
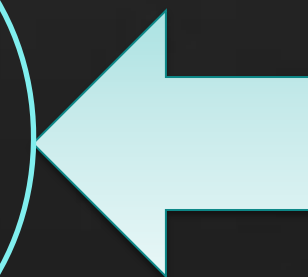
Detect Events & Incident Logging



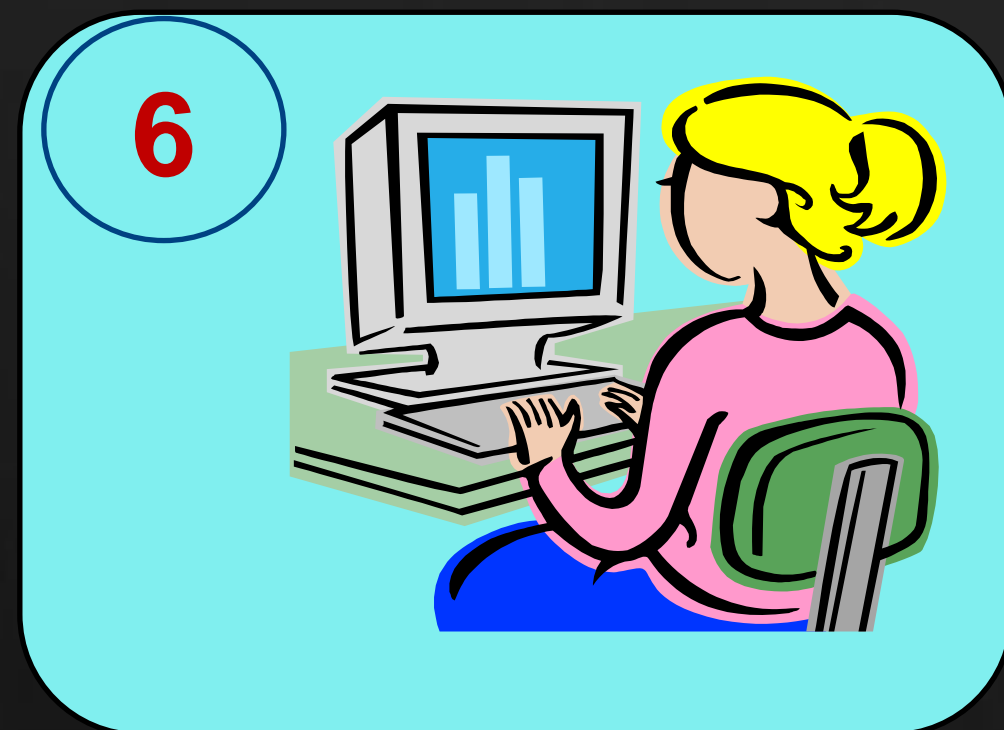
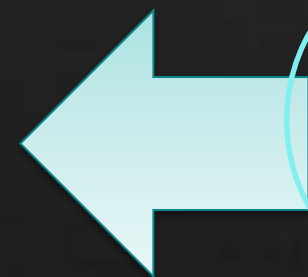
Visualize



Assign Work



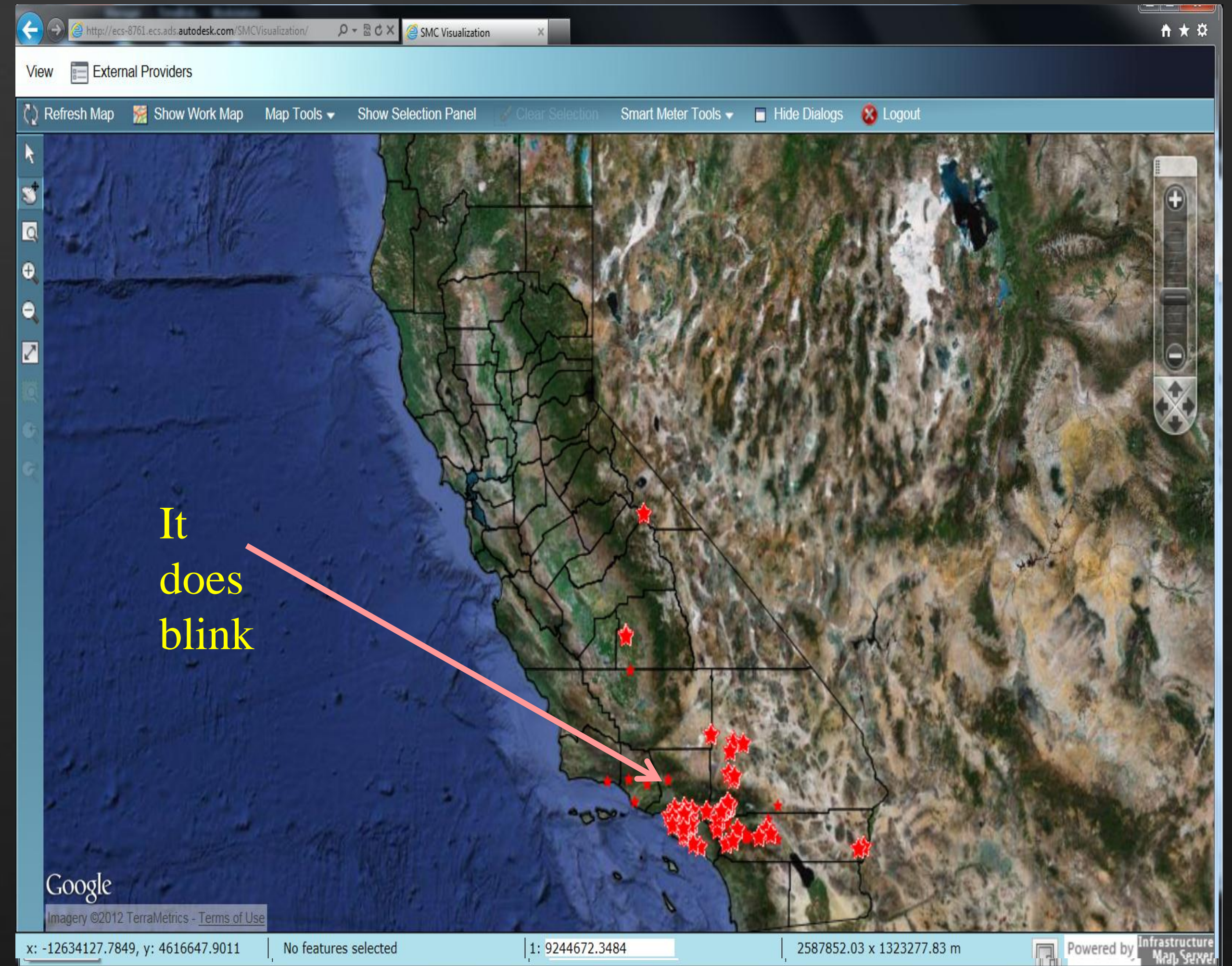
Analyze



Operate & Manage

Visualization Solution

- Built on top of AIMS 2012
- Shared env. with other AIMS applications
- **Features**
 - Visualization Template Management
 - Device themeing based on workgroup templates
 - Create workgroups from map
 - Analyze devices in BOBJ from map
 - Export/Import device points.
 - Query/Save maps
 - Security



AIMS In Action

AIMS advanced features

Beyond the box

▪ Fusion Layout

- Multiple map management
- Floating Dialog open/close
- Custom widgets
- Dynamic layers
- Adhoc theming
- Template Management

▪ Open Layers

- Custom icons
- Animations

• Integration

- Business Objects
- Active directory
- Work management

• Google Maps

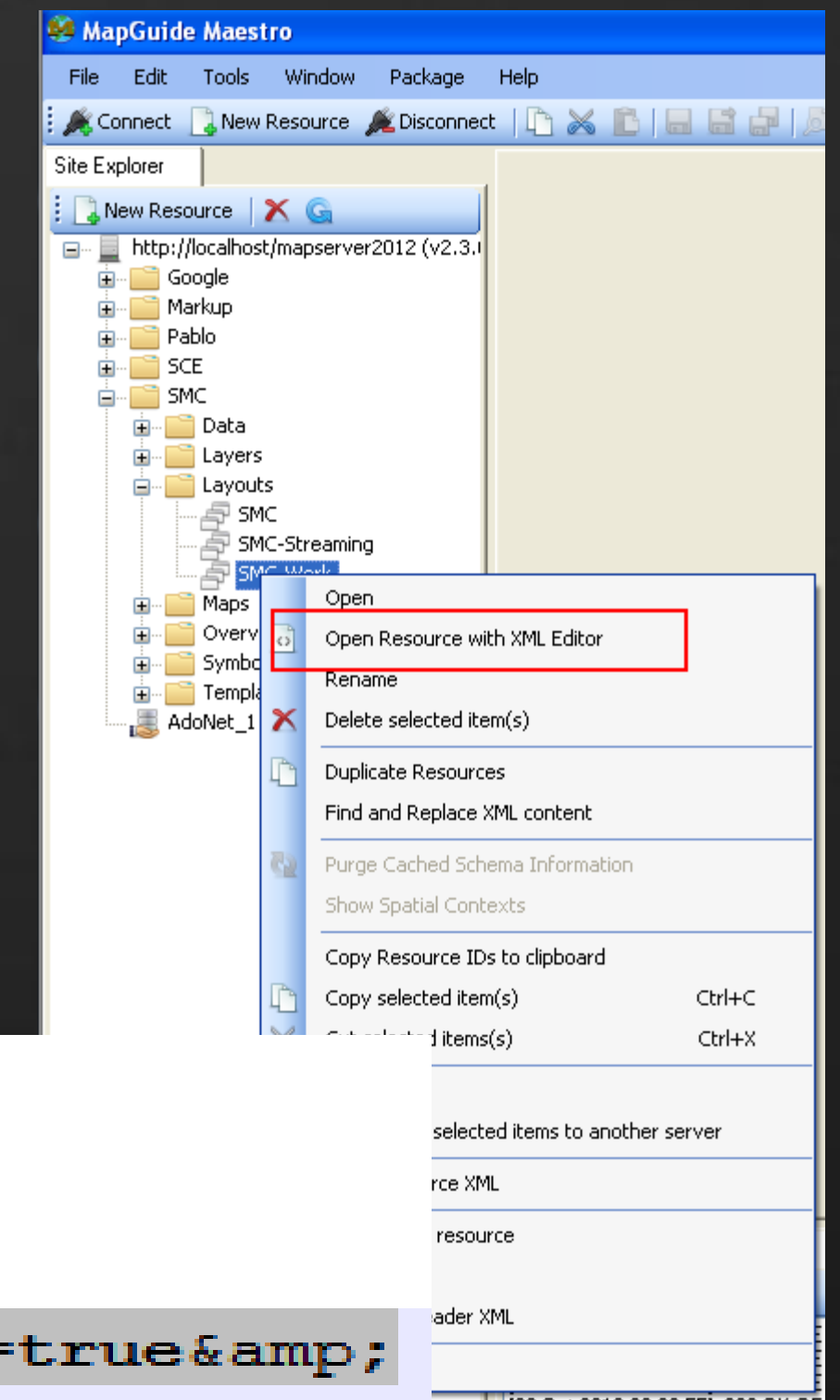
- Background maps
- Overlays (Weather, traffic..)
- Street view

Google Weather Overlay

- Simple change would give great content to your map

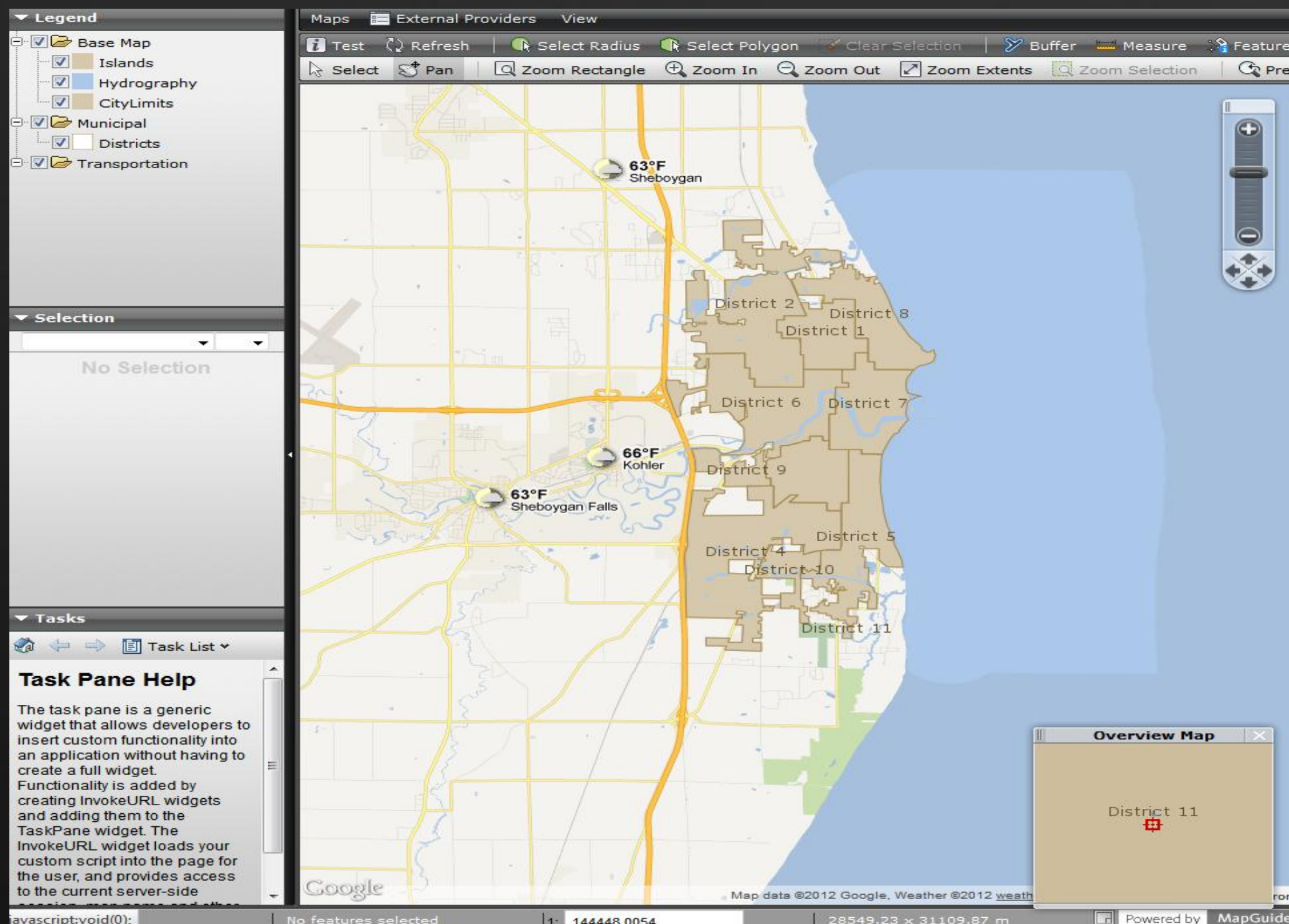
- 1) After creating and saving your fusion layout (with google maps)
- 2) Open the AIMS site in Mapguide Maestro (open source editor)
- 3) Edit resource (layout) as XML
- 4) Go to near the end of the file. Change the GoogleScript tag to below
- 5) Finally, Simple Code needs to be added to **index.html**

```
1177 </Disabled>raise</Disabled>
1178 </Widget>
1179 </WidgetSet>
1180 <Extension>
1181 <GoogleScript>https://maps.googleapis.com/maps/api/js?v=3.3&sensor=true&
1182 libraries=weather&client=</GoogleScript>
1183 </Extension>
</ApplicationDefinition>
```



Google Weather Overlay – How?

```
1177 .....<Disabled>raise</Disabled>
1178 .....</Widget>
1179 .....</WidgetSet>
1180 .....<Extension>
1181 .....<GoogleScript>https://maps.googleapis.com/maps/api/js?v=3.3&sensor=true&
      libraries=weather&client=
1182 .....</Extension>
1183 .....</ApplicationDefinition>
```



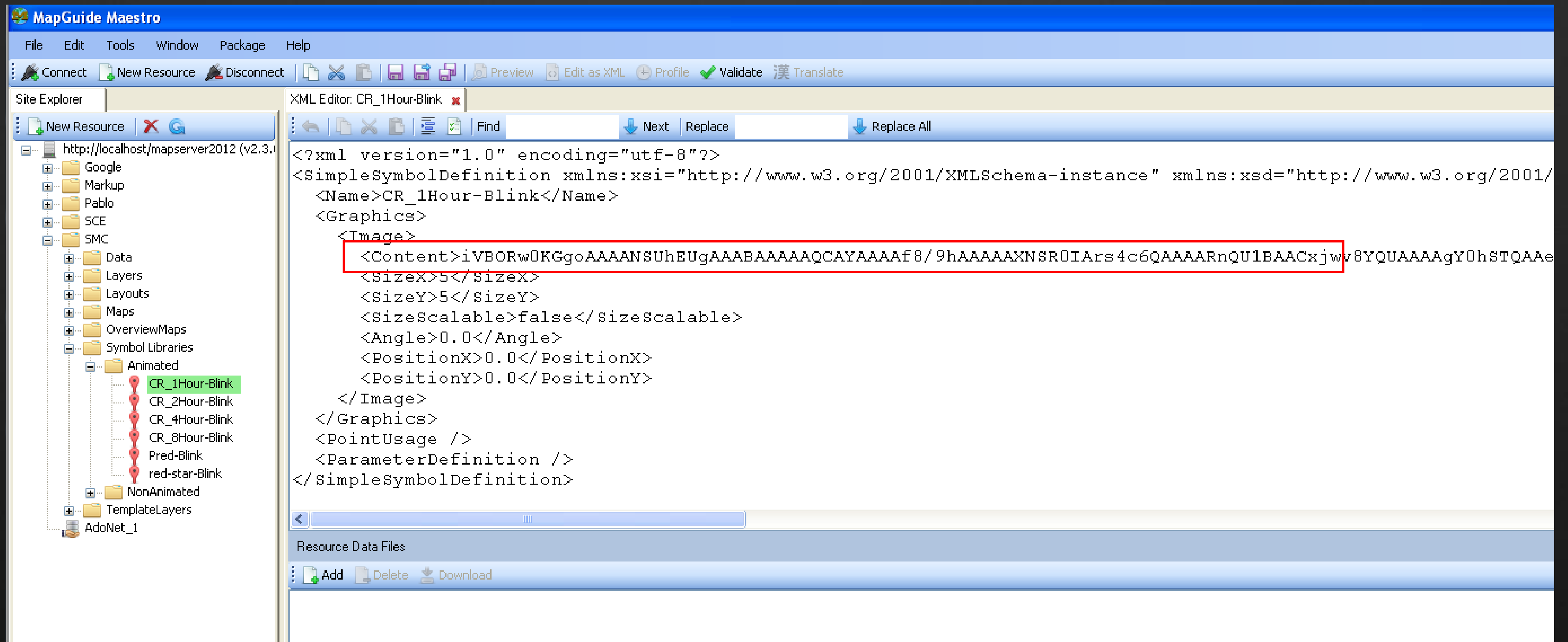
```
var fusionInitialized = function() {
    $('AppContainer').resize({forceResize: true});
    var mapWidget = Fusion.getMapById('Map');
    mapWidget.registerForEvent(Fusion.Event.MAP_LOADED, initPanelHandler);
    mapWidget.registerForEvent(Fusion.Event.MAP_LOADED, showClimate);
}
```

```
var showClimate = function() {
    var widgetSets = Fusion.applicationDefinition.widgetSets;
    for(var index = 0, len = widgetSets.length; index < len; index++) {
        var widgetSet = widgetSets[index];
        var maps = widgetSet.mapWidget.aMaps;
        for(var i = 0, l = maps.length; i < l; i++) {
            var map = maps[i];
            if(map.layerType != "Google") continue;
            var googleObject = map.oLayerOL.mapObject;
            var weatherLayer = new google.maps.weather.WeatherLayer({
                temperatureUnits: google.maps.weather.TemperatureUnit.FAHRENHEIT
            });
            weatherLayer.setMap(googleObject);
            var cloudLayer = new google.maps.weather.CloudLayer();
            cloudLayer.setMap(googleObject);
        }
    }
}
```


Custom Icons

- Icons
 - No direct (easy) way to upload in Studio tool
 - **How-To?**
 - Choose an custom icon, ensure size 16x16 pixels
 - Use websites (<http://base64converter.com/>) to convert to Base64 string
 - Open site in Mapguide Maestro
 - Edit Symbol Library
 - Copy and paste Base64 to <Content> tag
 - Save the resource and use it in Mapguide Studio to author layers.

Custom Icons - How?



Animations

- How to show alerts on map?
 - Need to create the following
 - Javascript helper file to manage animation
 - Adds “marker” layer in OpenLayer
 - Get points from data source
 - Read icon from server path
 - Add icon to “marker” layer
 - Widget to turn on/off animation
 - Wire it to “map loaded” and “moveend” events

Animations – How?

```
var markers = new OpenLayers.Layer.Markers("Markers");
var fusionMapwidget = Fusion.getWidgetById('Map');
var olMap = fusionMapwidget.oMapOL;

olMap.addLayer(markers);

var size = new OpenLayers.Size(16,16);
var offset = new OpenLayers.Pixel(-(size.w / 2), -size.h/2);

var icons = new Array()

for (var i = 0; i < myObject.AnimationInfo.length; i++) {
    var theIcon = null;
    var icon = icons[myObject.AnimationInfo[i].Icon];

    if (icon == null) {
        icon = new OpenLayers.Icon(widgetBase + '../images/animation/' + myObject.AnimationInfo[i].Icon, size,
offset);
        icons[myObject.AnimationInfo[i].Icon] = icon;
        theIcon = icon;
    } else {
        theIcon = icon.clone();
    }
    markers.addMarker(new OpenLayers.Marker(
        new OpenLayers.LonLat(myObject.AnimationInfo[i].Longitude, myObject.AnimationInfo[i].Latitude),
        theIcon));
}
```

Large data visualization

How to visualize large data set?

- **Collect and Warehouse data**
 - Grid Network data
 - As-built assets (non meter)
 - Customer Information
 - Other Enterprise data
- **Data Partitioning**
 - Views in database specifically tuned to map layers
 - Control joins (no of multiple table) in database views
 - Historic data view vs current data view
- **Model schema**
 - Star schema vs relational schema
- **Layer selection & scale threshold**
 - Limit selection of objects
 - Devices appear at < 100,000

References

- Utility Analytics Institute – <http://utilityanalytics.com/>
- Open Source Geospatial - <http://osgeo.org/>
- Open Layers – <http://openlayers.org/>
- Mapguide Demo site - <http://enterprise.mapguide.com/>
- SCE Smart Grid Initiative - <http://www.sce.com/PowerandEnvironment/smartgrid/default.htm>

Autodesk University Session Feedback

Your session feedback is very important to Autodesk.

- ✓ You can complete the session survey on your mobile device, PC, or at a survey station.
- ✓ Each completed session survey enters you in that day's drawing for a free AU 2013 pass.
- ✓ You can help make AU 2013 better!



ALSO: Complete the AU Conference Survey at a survey station and receive an AU 2012 T-Shirt!

THANK YOU

Q & A

