

AWIPS Continuous Technology Refresh (CTR)

T04 Capability Additions to the ADE Architecture

T04 Capability Concept Descriptions

January 2006



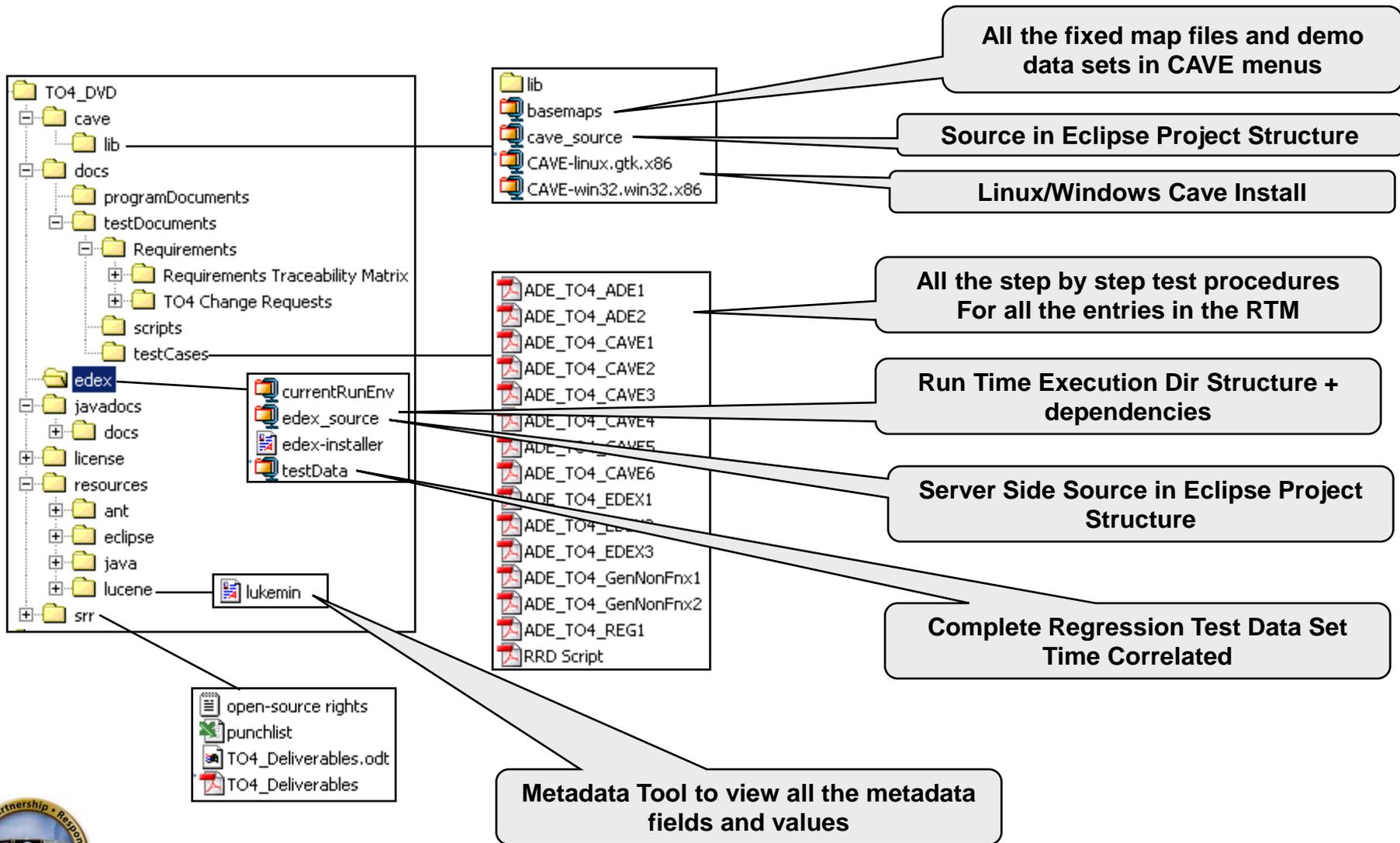
Presentation Introduction

Focus on new capability T04 added

- Top Level Architecture Review
 - CAVE product request flow architecture description
 - Data ingest architecture description
- Regression Test Environment Delivered in T04
- Function Additions
 - Volume Browser with successive disclosure of plot data
 - Spatial Index and Query Capability + GIS analysis
 - Product Dissemination
 - Math Scripting
 - SBN Radar Ingest
 - CAVE Drawing and Collaboration
 - CAVE XY Rendering {Skew-T, Hydro Graph, Initial GFE}
 - Objective Analysis Pattern {Barnes Single Pass}
- Preliminary Conceptual Security Architecture



T04 DVD Delivery Artifacts



Architecture Review

AWIPS Term Definitions

- **(SOA) Service Orientated Architecture:** concept of system functionality available to clients through network endpoints, usually includes a wide set of end points, I/O Routing, and simple Transforms
- **State Less SOA Service:** the condition where a service is independent of the order of the requests
- **Design Pattern:** describes a problem which occurs over and over and provides the core of the solution to the problem that is reusable over a wide range of situations
- **Container:** is an operating system process that holds the execution objects and provides communication interfaces
- **Layered Architecture:** an approach where the path from client to data is organized into precise layers with defined api's between layers
- **MetaData:** is data about the ingested data objects constructed to facilitate unique data retrieval



Architecture Review

AWIPS Definitions Continued

- **ADE:** AWIPS Development Environment, source code to execution framework enterprise development kit including tools
- **Canonical XML:** Well formed XML that follows high level rules, in AWIPS it is **dynamically extensible**
- **Technical Reference Architecture:** A physical software execution framework
- **JMS, JMX:** Java Messaging System (API), Java Management Extensions
- **CAVE:** Common AWIPS Visualization Environment
- **SEDA:** Serial Event Driven Architecture used for scaling up services and clustering boxes

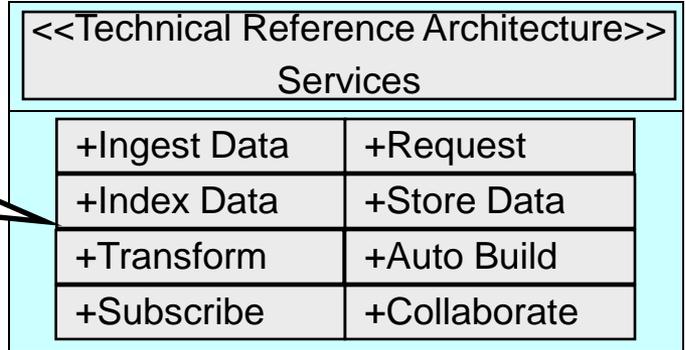


SOA Framework Concept Review

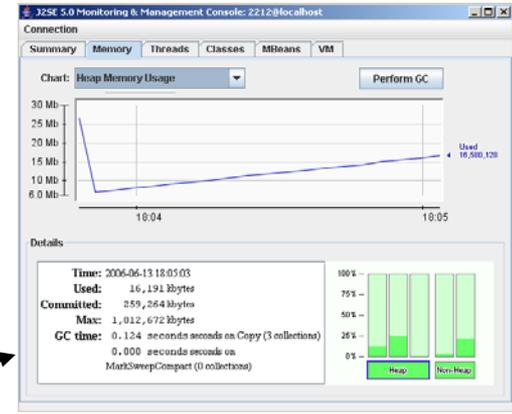
Extendible Reference Architecture – Minimize Coupling

- Core Base of Services**
- Micro Engine
 - Plug-in Framework
 - Extensible XML model
 - Core libraries

- Extend to a specific domain**
- Plug in specific libraries
 - Plug in data types, transforms

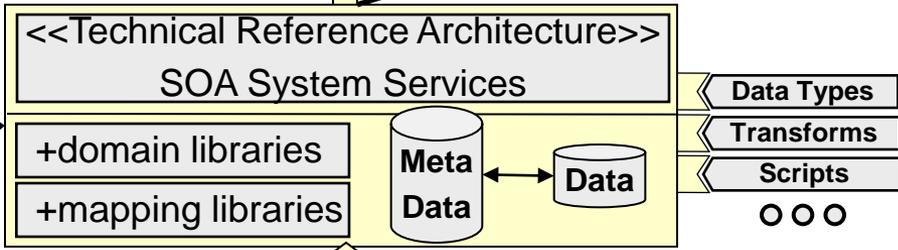


Remote Management (JMX)

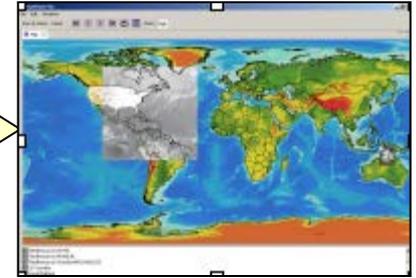
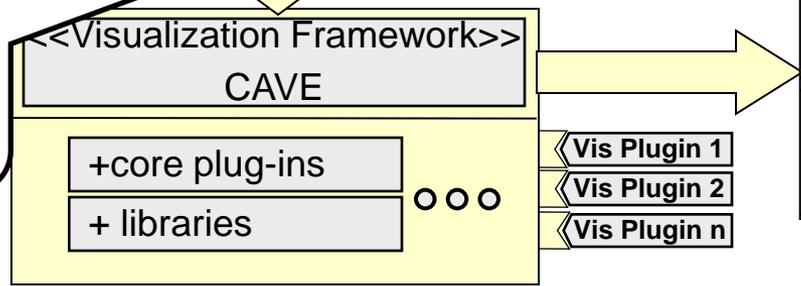


Satellite Feed

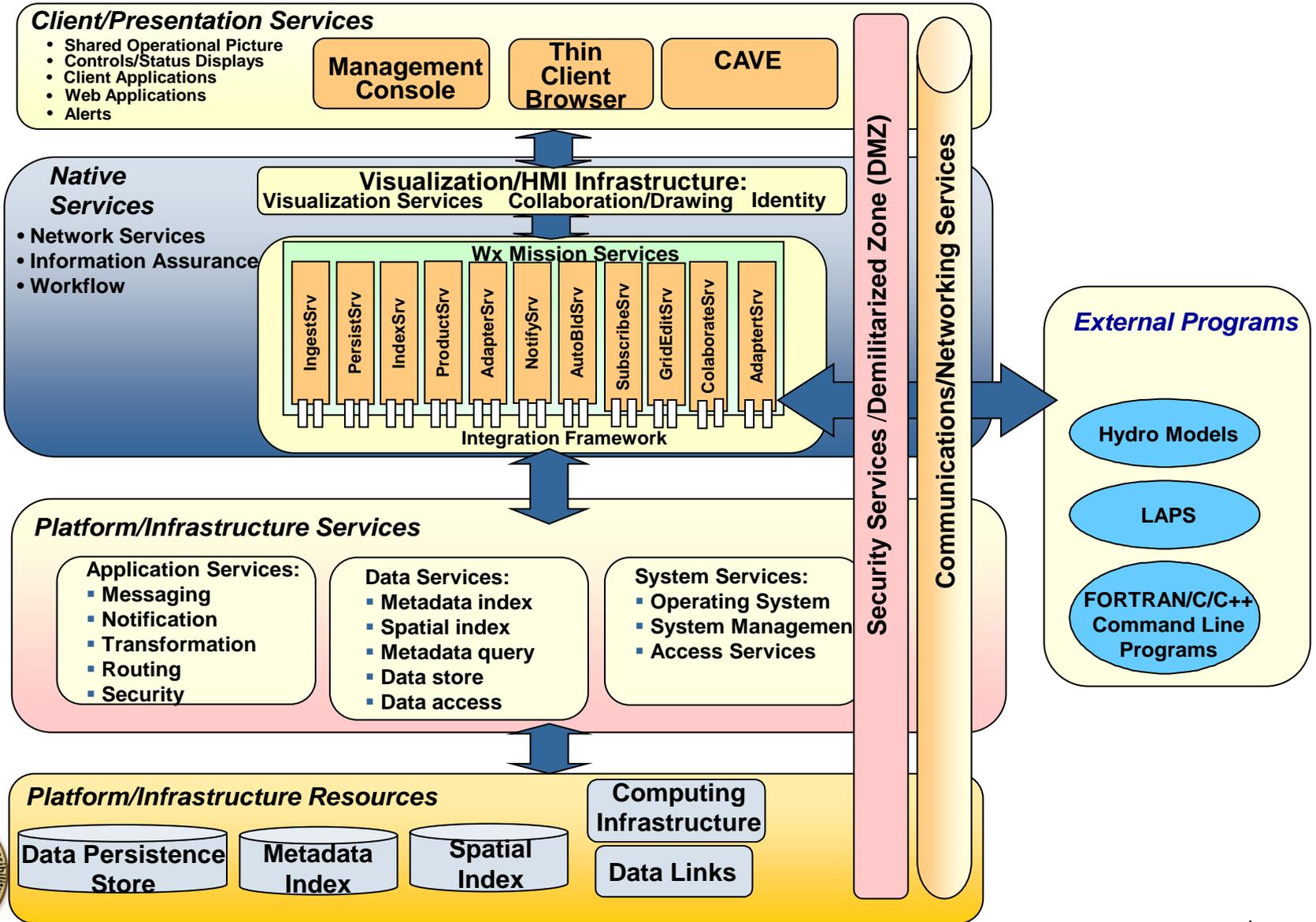
Local Data



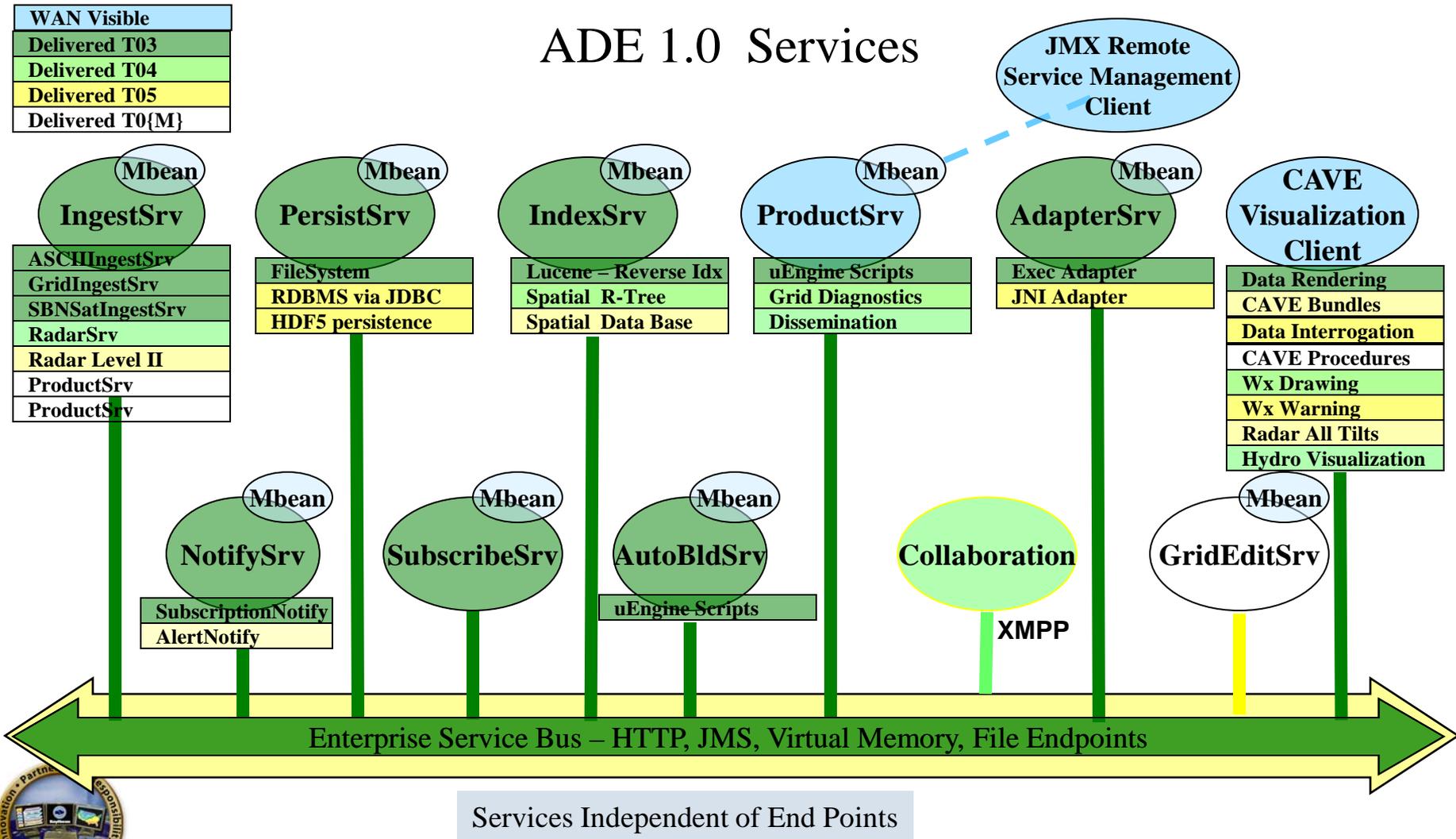
- Service Interface To Data**
- Clean separation between data and visualization
 - Canonical XML data model
 - Scriptable Interface



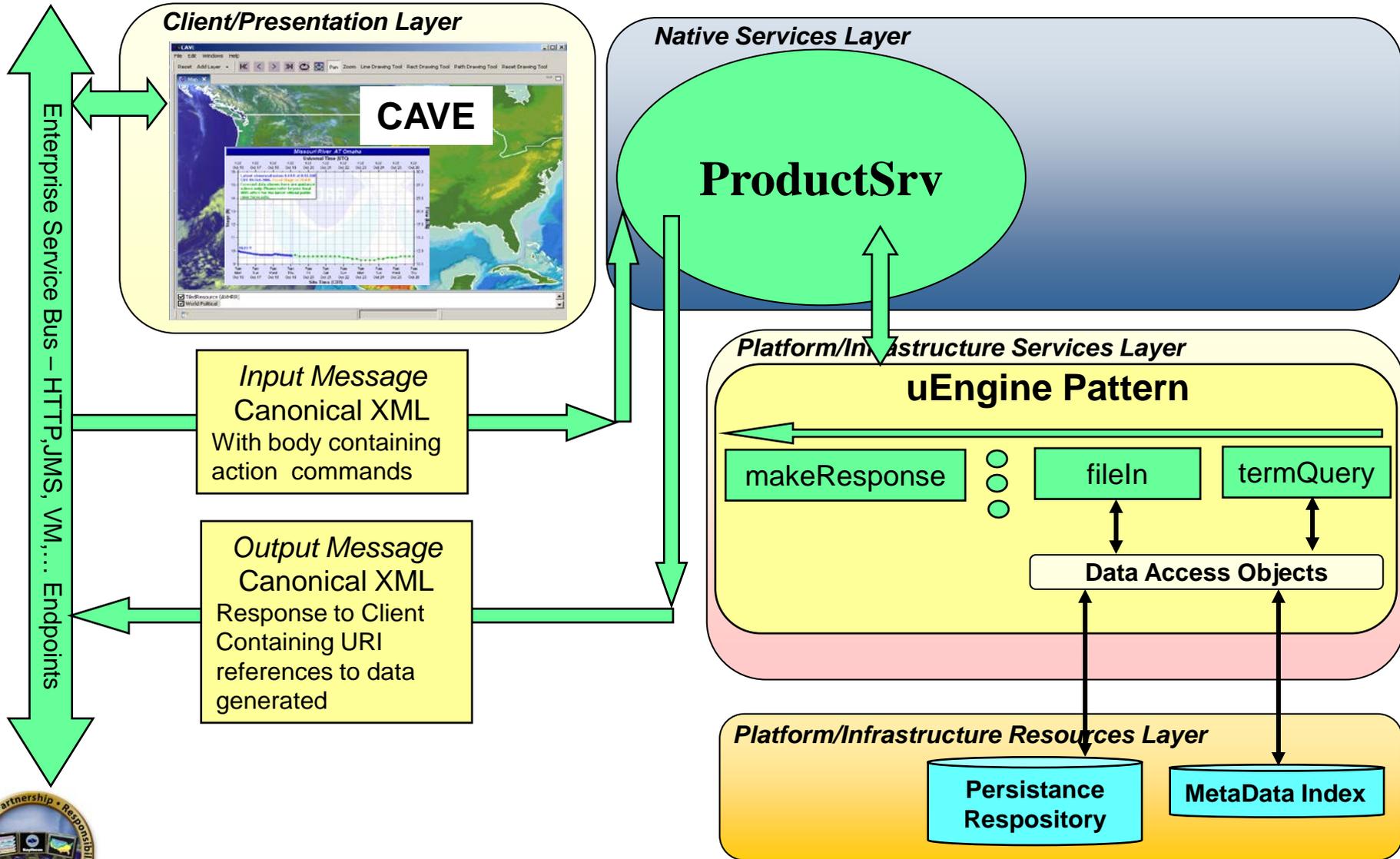
Conceptual Architecture Review: Logical Layered Viewpoint



AWIPS ADE High Level System Services – ADE SOA Services as of T04

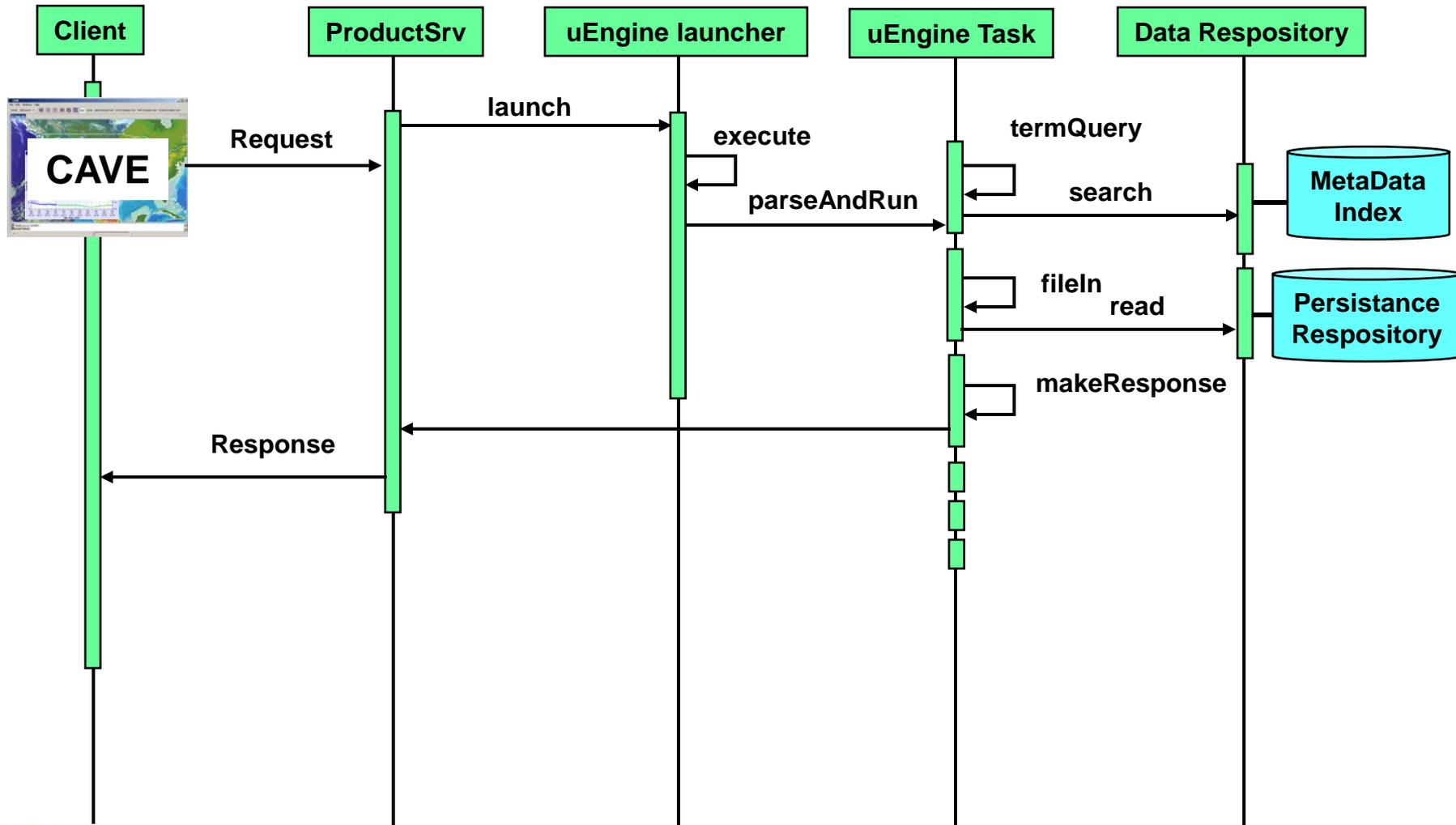


Layered View of SOA Service with Data Flow Cave Requests Data for Display as a GIS Layer

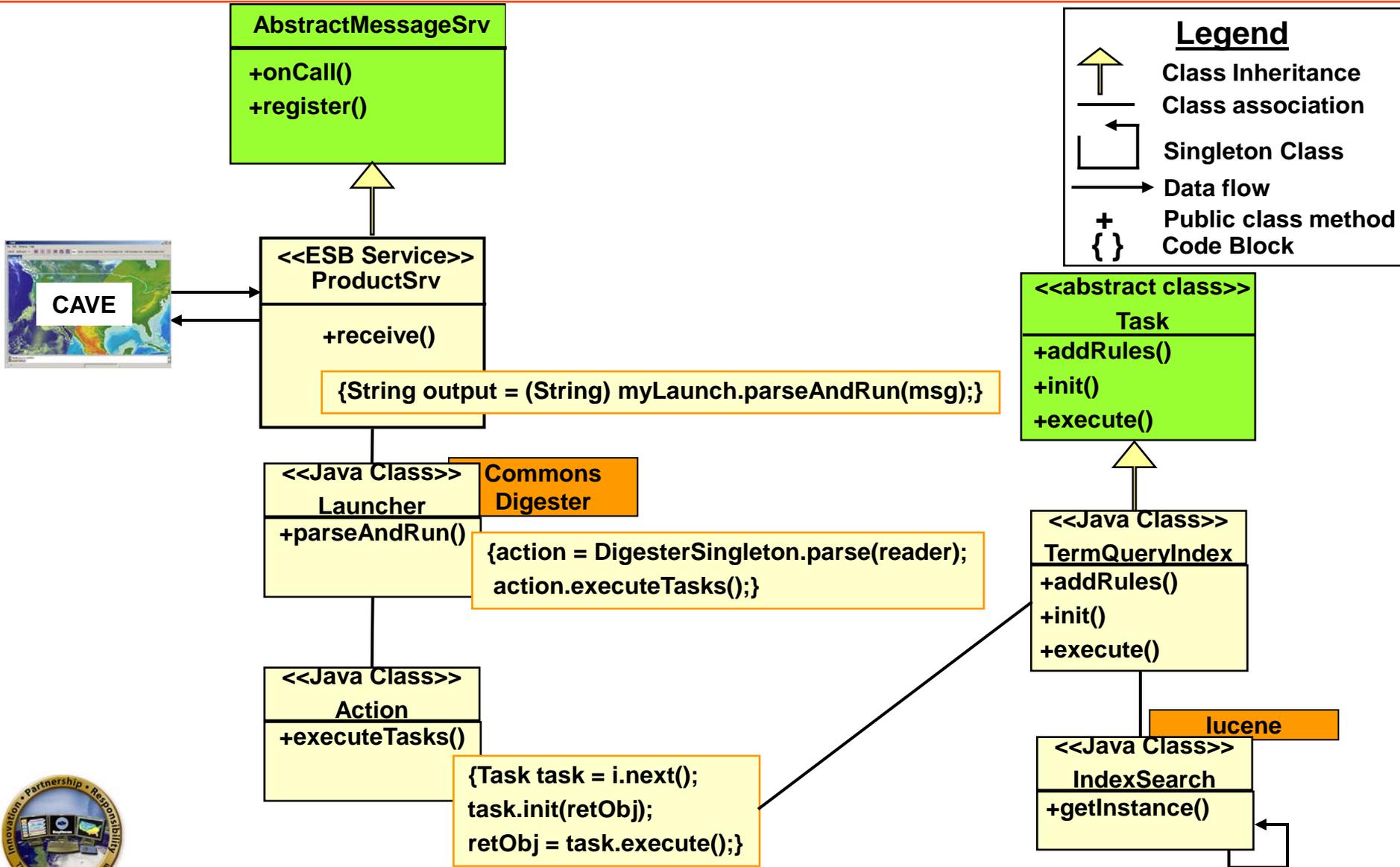


Sequence Diagram – Product Request

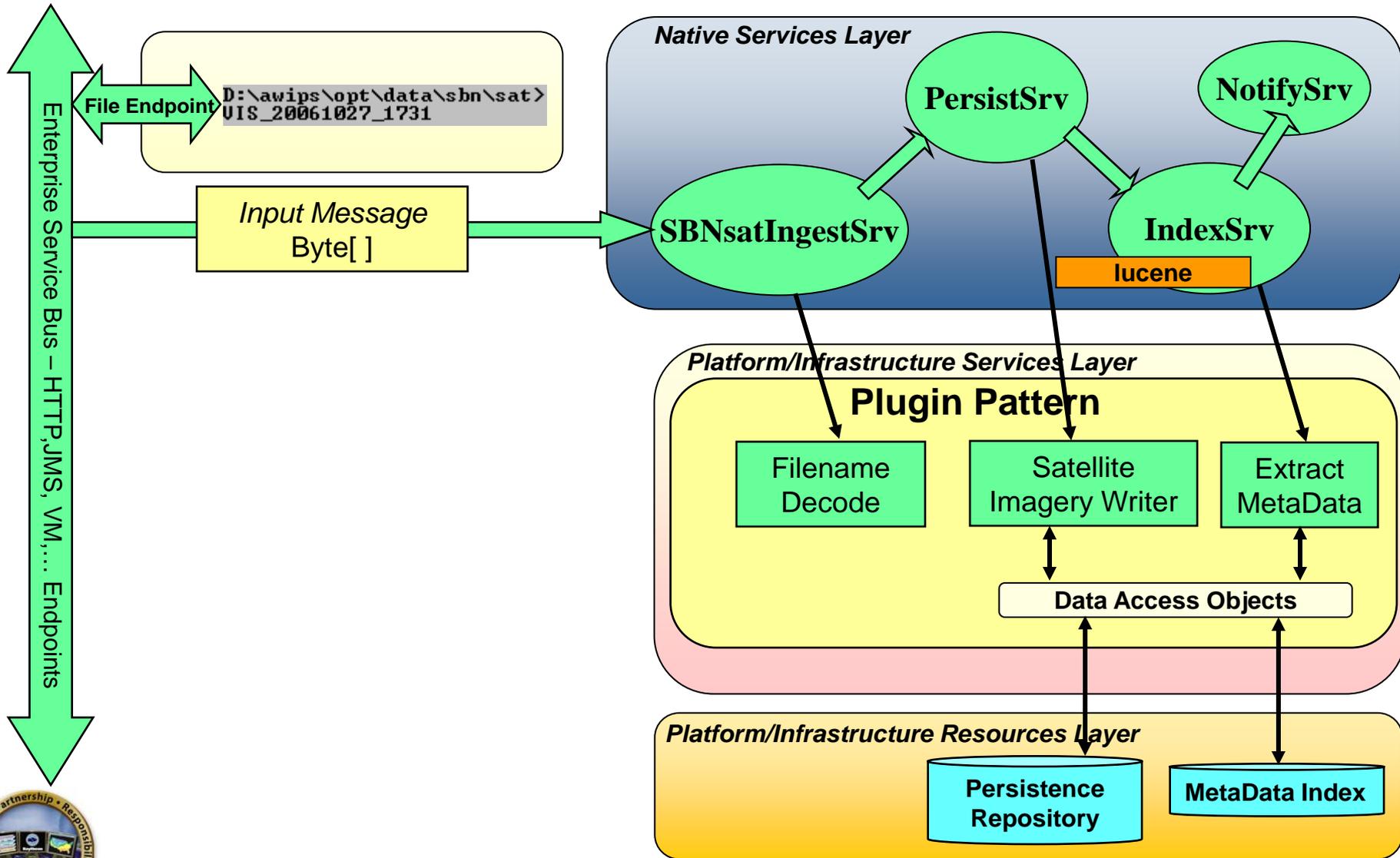
ProductSrv Uses uEngine to get at data



ProductSrv – High Level Class Structure

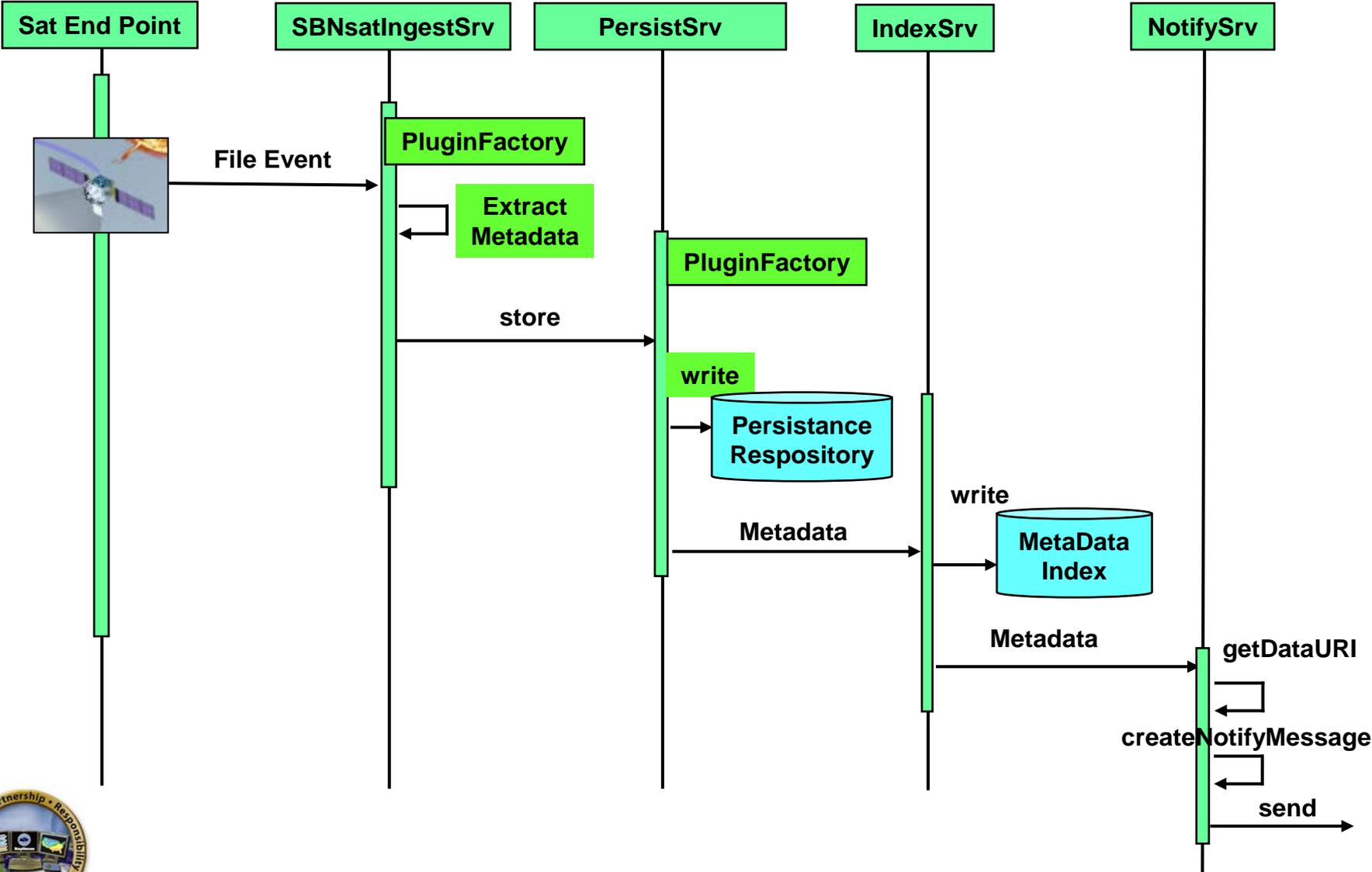


Layered View of SOA Service with Data Flow Ingest of SBN Satellite Data



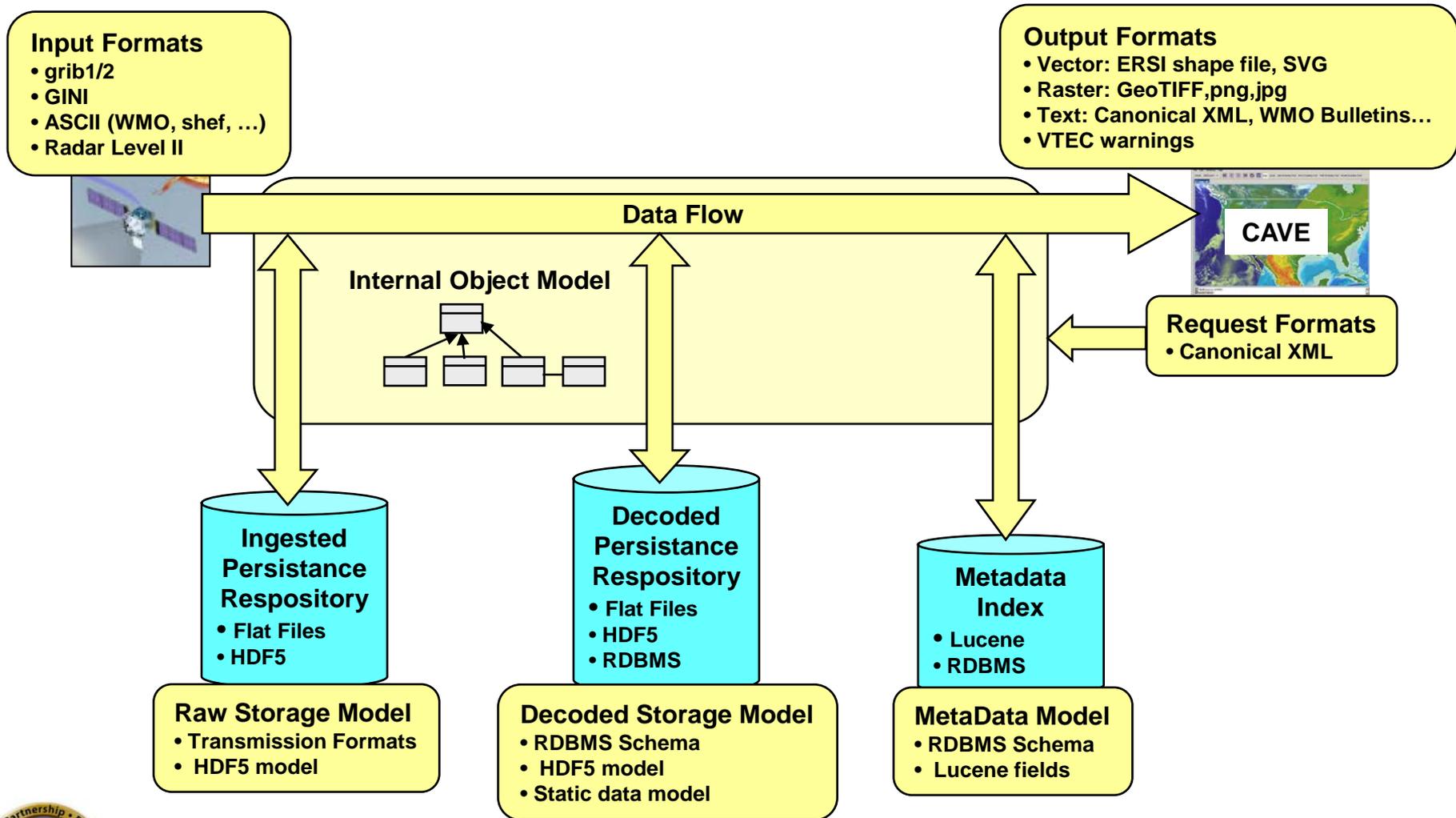
Sequence Diagram – Satellite Ingest

Example Ingest Sequence



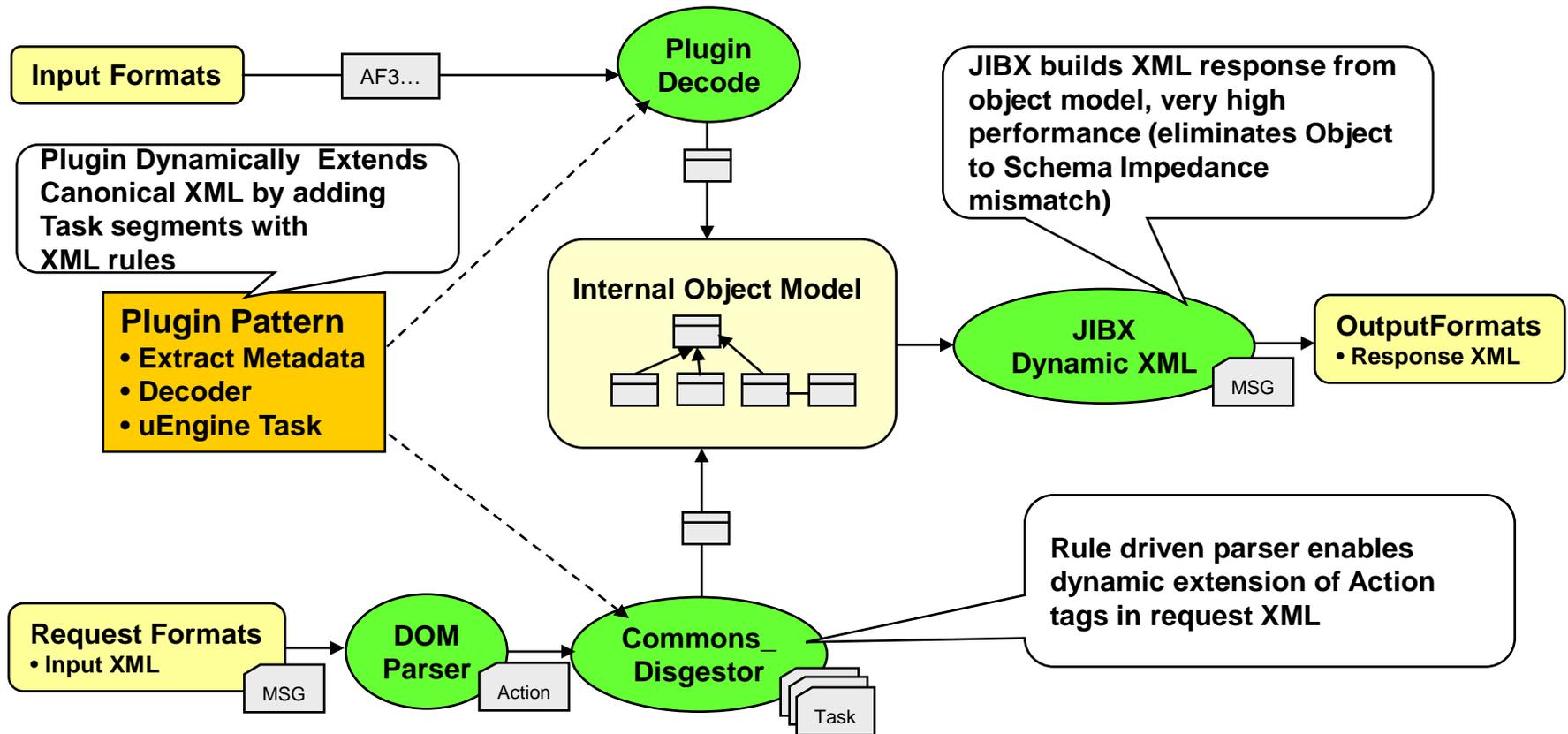
Conceptual Data Model Design

I/O Formats Follows Existing Standards



Conceptual Data Model Design

Canonical XML: Dynamically Extensible



Regression Test: Driven by RTM

Requirements Traceability Matrix (Sample entries)

Requirements Traceability Matrix (RTM) AWIPS Development Environment (ADE) Functional Requirements

Requirement Number	Requirement	Verification Method	Test Case	CSCI/ Service	Test Level	Test Type/ Class	CH
CM/Build/ Deploy Pattern							
EDEX							
ADE_TO4_002_001	AWIPS EDEX shall disseminate a subscribed product using an FTP push.	Inspection/Demonstration	ADE_TO4_EDEX2	NotifySrv	Subsystem	Functional Testing	
ADE_TO4_002_002	AWIPS EDEX shall decode MesoWest Mesonet data.	Inspection/Demonstration	ADE_TO4_EDEX2	IngestSrv	Subsystem	Functional Testing	
ADE_TO4_002_003	AWIPS EDEX shall decode Level III base reflectivity radar data.	Inspection/Demonstration	ADE_TO4_EDEX2	IngestSrv	Subsystem	Functional Testing	
ADE_TO4_002_004	AWIPS EDEX shall include a Micro Engine task providing user math function scripting.	Inspection	ADE_TO4_EDEX3	Micro Engine	Subsystem	Functional Testing	
ADE_TO4_002_005	AWIPS EDEX Micro Engine shall utilize a standardized Task tag syntax for Action scripts.	Inspection	ADE_TO4_EDEX3	Micro Engine	Subsystem	Functional Testing	
ADE_TO4_002_006	AWIPS EDEX Micro Engine shall utilize a standardized Task class structure for Action scripts.	Inspection	ADE_TO4_EDEX3	Micro Engine	Subsystem	Functional Testing	
ADE_TO4_002_007	AWIPS EDEX Micro Engine shall implement queries having multiple matches.	Demonstration	ADE_TO4_EDEX3	Micro Engine	Subsystem	Functional Testing	
ADE_TO4_002_008	AWIPS EDEX shall perform Barnes Scheme analysis to map non-gridded data to a grid.	Similarity	ADE_TO4_EDEX1	Micro Engine	Subsystem	Functional Testing	
ADE_TO4_002_009	AWIPS EDEX shall produce radar shapefiles.	Demonstration	ADE_TO4_EDEX2	Micro Engine	Subsystem	Functional Testing	



Regression Test Environment

Web Interface running in Tomcat Server

Purpose: Simple Light Interface to SOA Services to facilitate continous testing during development

Performs Catalog Queue to Refresh Menus

Allows viewing editing Canonical XML request message / response

Copies Regression Test sets to ingest endpoints

AWIPS Test Driver Interface

SATELLITE Test Driver

Location: East CONUS

Parameter: Imager 11 micron (IR)

Time: 20061227170100000

Colormap: Grey Scale

Reproject Image:

Format: PNG Format

Image Count: 1

Timeout: 1 Minute

Jython Script:

Request Product Refresh Catalog

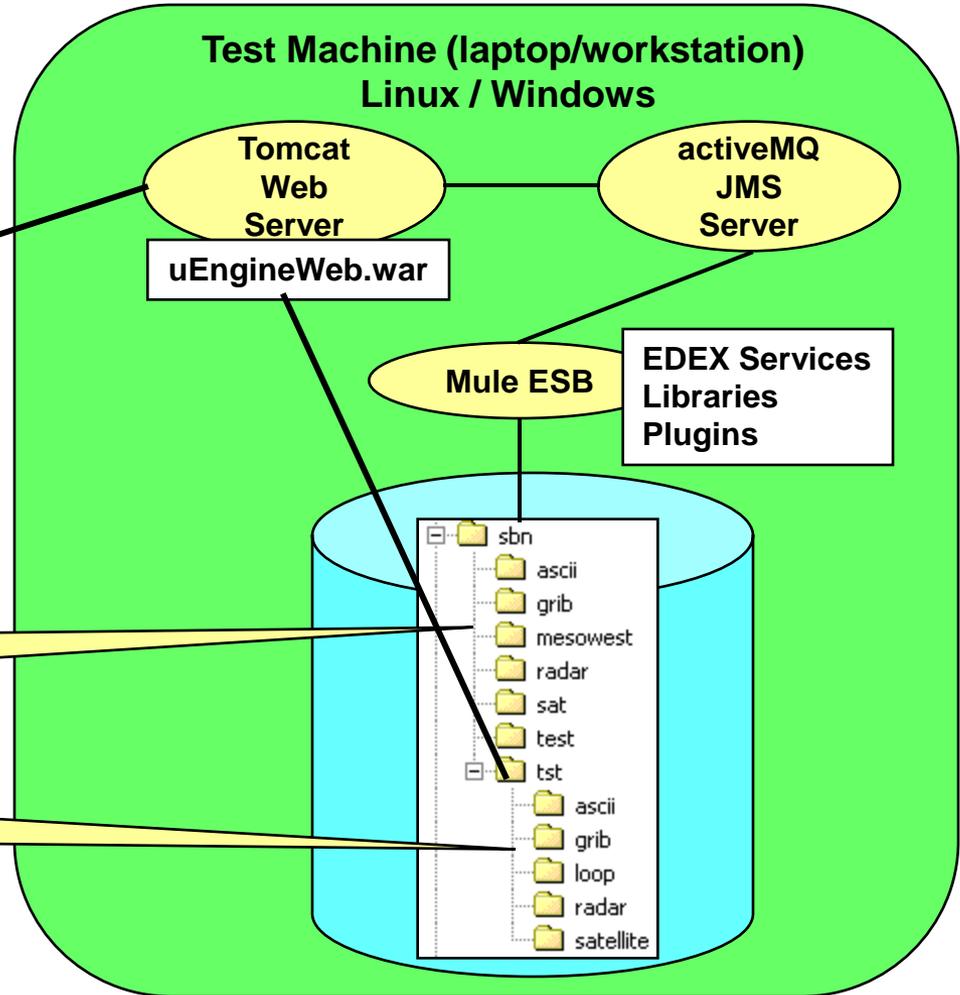
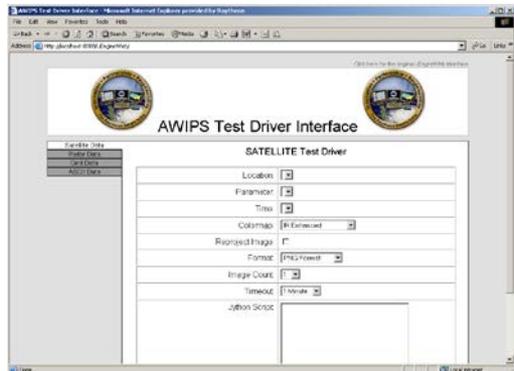
Request/Response Message

Archived Data



Regression Test Structure For Services Independent of CAVE

Test Client Web Interface



ESB Ingest File Endpoints

Regression Test Data Sets



Volume Browser Data Request Capability

Initial Manual Mechanism to retrieve data

- Dynamically Populates Select Boxes Through Catalog Queries
- Submits Request to ProductSrv to Allow Light Client Operation

Grid, Observations, Radar, Satellite

Canonical XML Message Request a Catalog of Metars

Mule ESB Service Container Log
Catalog Query ~ 0.6sec

```

<message >
<header >
<property name="id" value="Catalog" />
<property name="time" value="20070105182004" />
<property name="function" value="execute" /></header >
<body >
<action >
<catalog >
<queryType>distinctValue</queryType >
<queryField>refTime</queryField >
<constraint name="reportType" value="METAR"/>
</catalog >
</action >
</body >
</message >

INFO 2007-01-05 18:20:04,671 [ProductSrv.4] uengine.A
INFO 2007-01-05 18:20:04,718 [ProductSrv.4] util.Inde
<?xml version="1.0"? >
<responseCatalog >
<value >2006112717000000</value >
<value >2006112718200000</value >
<value >2006112718000000</value >
<value >2006112719400000</value >
<value >2006112717200000</value >
<value >2006112717400000</value >
<value >2006112719000000</value >
<value >2006112719200000</value >
<value >2006112718400000</value >
<value >2006112717000000</value >
</responseCatalog >
<fileType />
<dataURI />
<validTime >2007-01-06T00:20:05.5Z</validTime >
</responseCatalog >
    
```

Note ProductSrv Scaling



Volume Browser Retrieving Point Data Successive Disclosure – Two Mechanisms



Note: SVG prototype plot model.
Full plot model later.

D2D Style Disclosure

Pan Disclosure
Panning dynamically
brings in more data



Volume Browser Retrieving Gridded Data Transformed Into Image or Vector Field

The screenshot displays the CAVE software interface. The 'Volume Browser' window is open, showing a list of models and parameters. The 'Selected Product' window shows 'Grid - 255 2 TMP 20061027120000 GRIB'. The 'Product Type' is set to 'Contour' and the 'Colormap' is 'GribRGB'. The 'Bottom Contour' is 0.0, 'Top Contour' is 400, and 'Interval' is 2.0. A yellow callout box points to the 'Colormap' dropdown menu with the text 'Color Map Selection'. Another yellow callout box points to the 'Product Type' dropdown menu with the text 'Contour | Image Selection'. A third yellow callout box points to the 'Data Source' dropdown menu with the text 'Dynamic Selection Labels from Data Source'. The main 3D view shows a map of the United States with a color-coded overlay representing temperature data. A yellow arrow points from the 'Selected Product' window to the 3D map. The 3D map shows a color gradient from blue (cold) to red (hot) with white contour lines. The map is titled 'World Political' and 'US States'. The status bar at the bottom shows coordinates '69.16, -69.69'.

Model	Parameter	Level
255-20061027120000	SW_MR	100
255-20061113000000	S_X	1000
	TB	1025
	TCDC	1219
	TER_HT	150
	THKNS	152
	TMP	2
	TSFG	200
	TT_X	2438
	UGRD	250
	UGST	300
	USTAR	305
	VGRD	350
	VGST	400

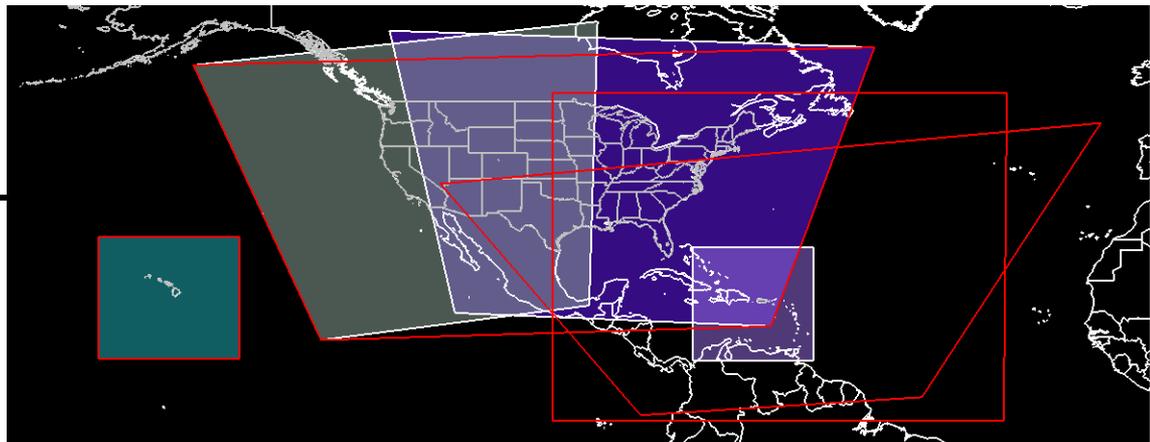
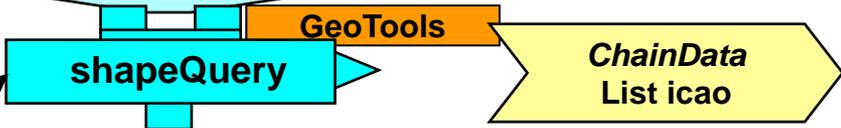
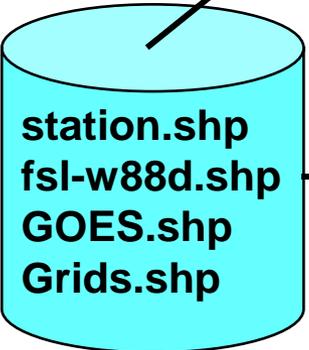
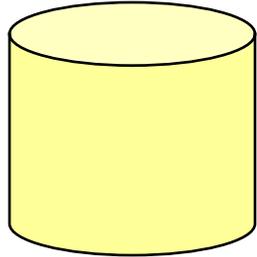


Spatial Index and Query Capability

Creates a light weight flexible GIS spatial data base

```
- <shapeQuery>  
  <shapeFile>/awips/opt/data/static/spatial/stations/stations.shp</shapeFile>  
  <attributeName>icao</attributeName>  
  <attributeName>the_geom</attributeName>  
- <BBoxFilter>  
  <maxLat>42.00</maxLat>  
  <minLon>-100.00</minLon>  
  <minLat>40.00</minLat>  
  <maxLon>-94.00</maxLon>  
</BBoxFilter>  
</shapeQuery>
```

Return List of ICAOs in bounding box



uEngine: Product Dissemination Leverage ESB Endpoint capabilities

dissemination.xml

```
<mule-descriptor name="ftptest" inboundEndpoint="file:///../../data/ftpout" implementation="org.mule.components.simple.PassThroughComponent"
  containerManaged="true" singleton="false" initialState="started">
  <inbound-router matchAll="false">
    <router className="org.mule.routing.inbound.ForwardingConsumer" enableCorrelation="IF_NOT_SET" />
  </inbound-router>
  <outbound-router matchAll="false">
    <router className="org.mule.routing.outbound.OutboundPassThroughRouter" enableCorrelation="IF_NOT_SET">
      <endpoint address="ftp://awipsdex:password@localhost" type="senderAndReceiver">
        <properties>
          <property name="filenameParser" value="org.mule.providers.file.SimpleFilenameParser" />
          <property name="outputPattern" value="{ORIGINALNAME}" />
          <property name="passive" value="true" />
          <property name="binary" value="true" />
          <property name="validateConnections" value="true" />
        </properties>
      </endpoint>
    </router>
  </outbound-router>
</mule-descriptor>
```

```
<message>
  <header>
    <property name="id" value="FTP Dissem" />
    <property name="time" value="20061111" />
    <property name="function" value="execute" />
  </header>
  <body>
    <action name="FTP Image Dissemination">
      <termQuery count="1">
        <query name="datatype" value="Images" />
        <query name="locationkey" value="East CONUS" />
        <query name="parameter" value="Imager 11 micron (IR)" />
      </termQuery>
      <fileIn />
      <decodeIndexedImage />
      <colorImage colorMap="IREnhanced" />
      <imageOut format="png" />
      <fileOut destDir="ftpout" />
      <fileOut />
      <makeResponse returnMethod="uri" />
    </action>
  </body>
</message>
```

ftpDissem.xml

Dissemination Test Action Script

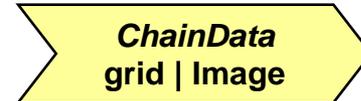
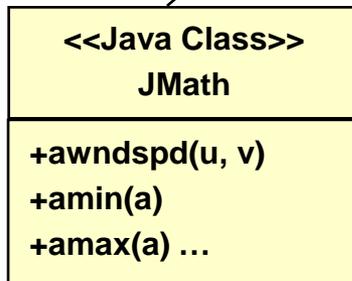
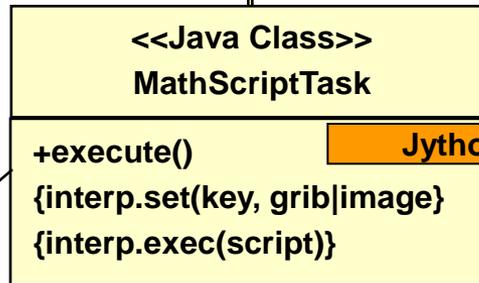
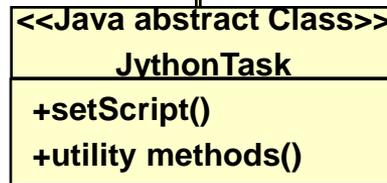
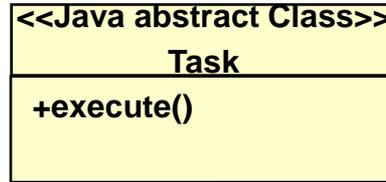
- Queries for GOES IR data
- Decodes raw data into raster
- Applies colormap
- Writes to disk at ftpout



uEngine: Math Scripting Uses Jython as a Python Interpreter

MathScriptTask XML tasks have the following format:

```
<mathScript using="...">
  <input name="..." value="..." />
  <input name="..." value="..." />
  <param name="..." value="..." />
  <param name="..." value="..." />
  <![CDATA[
import com.raytheon.edex.uengine.util.jython as utilities}
utils = utilities.JMath()
</mathScript>
```



Transformed grid | Image

Generalized scripting capability. Emulates a multi-variable function having the form
{@code y = f(a1, a2, ..., an,x1,x2,x3,...,xn)}

This allows the processing of the outputs of multiple queries to obtain a single, new query result.



uEngine Math Scripting Extension to general Jython Scripting

```
<message>
<header>
  <property name="id" value="wind Speed Analysis" />
  <property name="time" value="20060809152600" />
  <property name="function" value="execute" />
</header>
<body>
<action name="Math Demo">
  <termQuery using="windu" count="1">
    <query name="parameter_type" value="UGRD" />
    <query name="first_fixed_value" value="10"/>
    <query name="forecast_time" value="3"/>
  </termQuery>
  <termQuery using="windv" count="1">
    <query name="parameter_type" value="VGRD" />
    <query name="first_fixed_value" value="10"/>
    <query name="forecast_time" value="3"/>
  </termQuery>
  <degrib using="windu,windv" forecastTime="3" />
  <mathScript using="gribout">
    <input name="u" value="windu" />
    <input name="v" value="windv" />
    <param name="red" value="2.0" />
    <param name="yellow" value="1.0" />
    <param name="green" value="0.0" />
    <![CDATA[
import com.raytheon.edex.uengine.util.jython as utilities
utils = utilities.JMath()
STDOUT = utils.awndspd(u,v)
STDOUT = utils.astoplight(STDOUT,green,green,green,yellow,red)
]]>
  </mathScript>
  <gribMap using="gribout" scaleFactor="2" colorMap="StopLight" />
  <colorImage using="gribout" colorMap="StopLight" />
  <imageout using="gribout" format="png" />
  <fileout using="gribout" />
  <worldFileInfo using="gribout" />
  <makeResponse returnMethod="uri" using="gribout"/>
</action>
</body>
</message>
```

Get Multiple Grid Records

Degrib Multiple Records

Pass to script to compute a scalar

Apply Color Map Output as Image



Map Library Capability – GeoTools

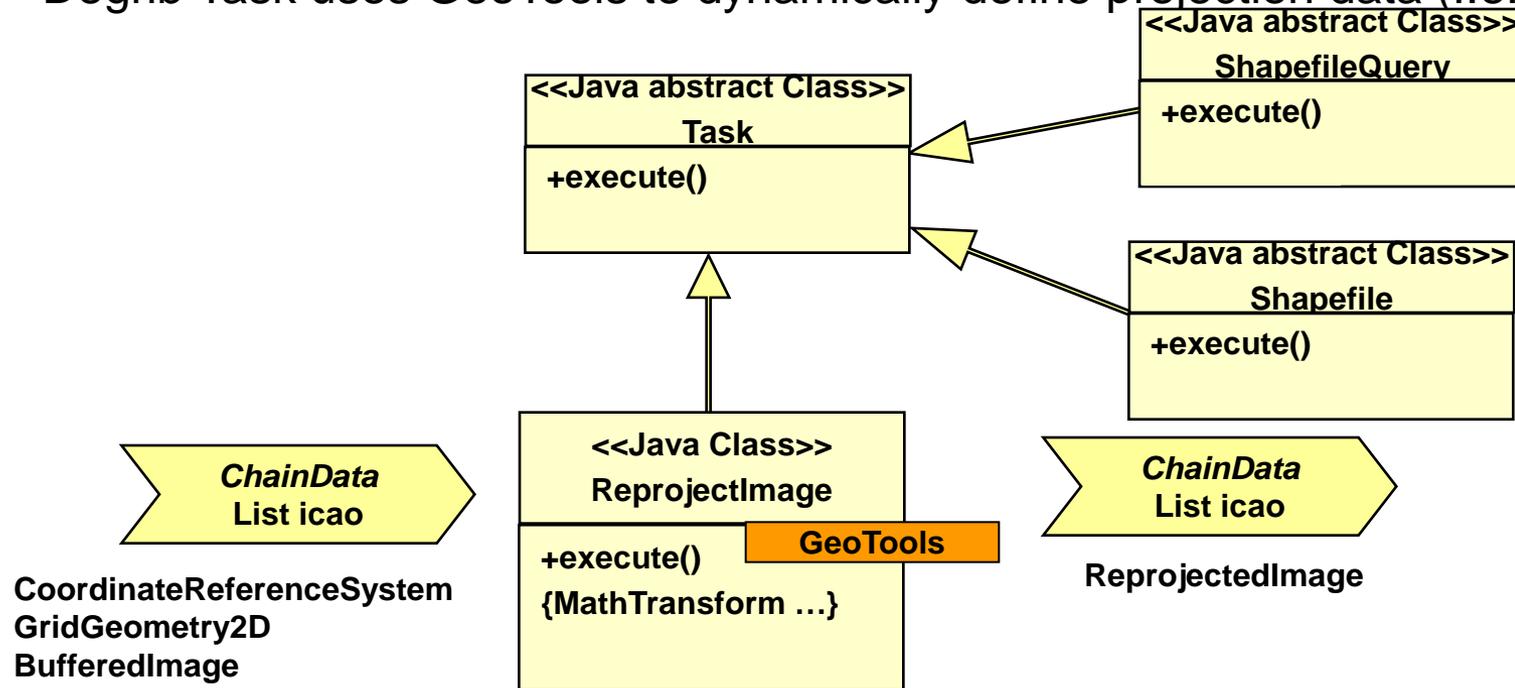
AWIPS GIS Capabilities: T04

- DataStore and Data Formats
 - ESRI Shapefile (Read/ Write)
 - WFS Web Feature Server (OGC) (Read / Write)
 - PostGIS geometric objects for PostgreSQL
 - GML Geography Markup Language
 - GeoTIFF georeferenced TIFF image
- Coordinate Transformation (OpenGIS CTS)
 - Map Projections (Mercator, Transverse Mercator, Lambert Conformal Conic, Albers Equal Area Conic, Sterographic, Orthographic, ...)
 - Math Transform



Map Library Capability – Map reprojection Transform Ingested Data to Display Projection

- GeoTools builds a transformation Matrix that gets reused in transform operations.
- The Transformation matrix can be build up through a series of transforms.
- Used In Barnes Analysis Pattern to calculate distances.
- Degrib Task uses GeoTools to dynamically define projection data (I.e. NCEP hur.)



Note: Solid warping reprojection techniques are being considered to improve performance.



Map Libraries Through GeoTools + JTS

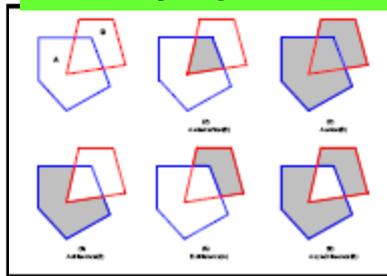
GeoTools: JTS Topology Suite Spatial Operations Java API

Computing Spatial Relationships

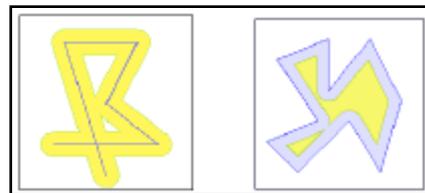
- Shape File Intersect Demonstration
- Distance Tool Demonstration

Method	Meaning
Equals	The Geometries are topologically equal
Disjoint	The Geometries have no point in common
Intersects	The Geometries have at least one point in common (the inverse of Disjoint)
Touches	The Geometries have at least one boundary point in common, but no interior points
Crosses	The Geometries share some but not all interior points, and the dimension of the intersection is less than that of at least one of the Geometries.
Within	Geometry A lies in the interior of Geometry B
Contains	Geometry B lies in the interior of Geometry A (the inverse of Within)
Overlaps	The Geometries share some but not all points in common, and the intersection has the same dimension as the Geometries themselves

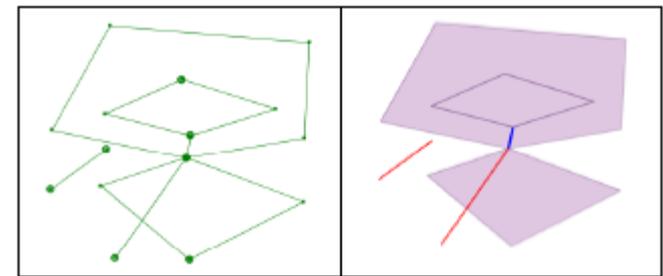
Overlay Operations



Buffer Operations



Polygonization & Quantization



Map Library Capability – Shape Files

uEngine Creates Shape File from Contoured Grids

```
<action name="GribImageDecode">  
  <termQuery count="1">  
    <query name="description" value="Turbulence (I  
    <query name="first_fixed_value" value="200" />  
  </termQuery>  
  
  <degrib />  
  
  <gribContourLine>  
    <baseLevel>0.99</baseLevel>  
    <ceiling>3.00</ceiling>  
    <interval>1.0</interval>  
  </gribContourLine>  
  
  <shapefile />  
  <makeResponse returnMethod="uri"/>  
</action>
```

GeoTools

Normal Grib Query +
Degribbing

Contouring (!T04) Task

Output Contour as a Shape
File



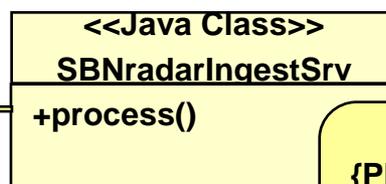
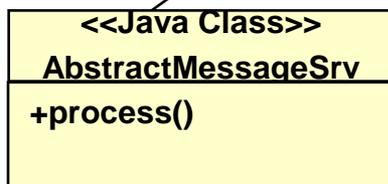
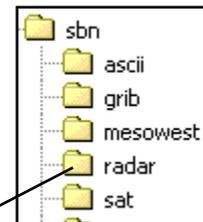
Ingest SBN Radar Data

SOA Radar Ingest Service Listening on End Point

Satellite Broadcast Network Ingest Scan Directories

Enterprise Service Bus End Point Configuration: Ingest.xml

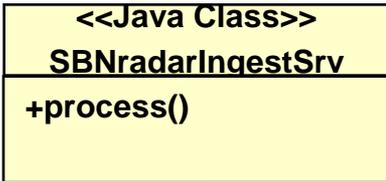
```
<mule-descriptor name="SBN-Radar-Ingest" singleton="true"
  implementation="com.raytheon.edex.services.noaa.SBNradarIngestSrv"
  outboundEndpoint="vm://persistVMQueue">
  <inbound-router>
    <endpoint
      address="file:///.../data/sbn/radar/?transformers=FileToString">
      <properties>
        <property name="pollingFrequency" value="1000" />
      </properties>
    </endpoint>
  </inbound-router>
</mule-descriptor>
```



Ingest SBN Radar Data

SOA Radar Ingest Service Multi-threaded

Note: SBN radar ingest automatically scales to 8 execution threads



Mule ESB Service Container Log4j Log File
Ingesting 64 dropped in files

INFO	2007-01-05	08:10:00,187	[SBN-Radar-Ingest.1]	noaa.SBNradarIngestSrv: register(1): Completed JMX registration - domain
INFO	2007-01-05	08:10:00,187	[SBN-Radar-Ingest.7]	noaa.SBNradarIngestSrv: RadarIngestSrv received a message with: ..\..\da
INFO	2007-01-05	08:10:00,187	[SBN-Radar-Ingest.5]	noaa.SBNradarIngestSrv: Ingesting message file: ..\..\data\sbn\radar\KMO
INFO	2007-01-05	08:10:00,187	[SBN-Radar-Ingest.8]	noaa.SBNradarIngestSrv: Ingesting message file: ..\..\data\sbn\radar\KMO
INFO	2007-01-05	08:10:00,187	[SBN-Radar-Ingest.3]	noaa.SBNradarIngestSrv: Ingesting message file: ..\..\data\sbn\radar\KMO
INFO	2007-01-05	08:10:00,187	[SBN-Radar-Ingest.1]	noaa.SBNradarIngestSrv:
INFO	2007-01-05	08:10:00,187	[SBN-Radar-Ingest.2]	noaa.SBNradarIngestSrv: Ingesting message file: ..\..\data\sbn\radar\KMO
INFO	2007-01-05	08:10:00,187	[SBN-Radar-Ingest.1]	noaa.SBNradarIngestSrv: SBNradarIngestSrv Constructor Ran
INFO	2007-01-05	08:10:00,203	[SBN-Radar-Ingest.1]	container.MultiContainerContext: Object: 'com.raytheon.edex.services.noa
INFO	2007-01-05	08:10:00,203	[SBN-Radar-Ingest.1]	noaa.SBNradarIngestSrv: RadarIngestSrv received a message with: ..\..\da
INFO	2007-01-05	08:10:00,203	[SBN-Radar-Ingest.7]	noaa.SBNradarIngestSrv: Ingesting message file: ..\..\data\sbn\radar\KMO
INFO	2007-01-05	08:10:00,218	[SBN-Radar-Ingest.4]	noaa.SBNradarIngestSrv: Ingesting message file: ..\..\data\sbn\radar\KMO
INFO	2007-01-05	08:10:00,218	[SBN-Radar-Ingest.1]	noaa.SBNradarIngestSrv: Ingesting message file: ..\..\data\sbn\radar\KMO
INFO	2007-01-05	08:10:00,218	[SBN-Radar-Ingest.4]	noaa.SBNradarIngestSrv: RadarIngestSrv received a message with: ..\..\da
INFO	2007-01-05	08:10:00,281	[SBN-Radar-Ingest.4]	noaa.SBNradarIngestSrv: Ingesting message file: ..\..\data\sbn\radar\KMO



Drawing Capability Implemented in CAVE Plugin

CAVE Menu Interface To Drawing



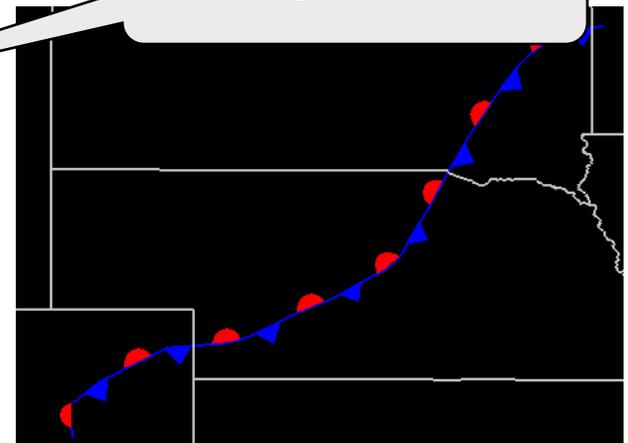
CAVE Drawing Plugin

com.raytheon.viz.drawing plugin.xml

```
<action
  class="com.raytheon.viz.drawing.WeatherSymbolTool"
  icon="icons/thunderstorm.gif"
  id="com.raytheon.viz.drawing.WeatherSymbolTool:17"
  label="Thunderstorm"
  state="false"
  style="radio"
  toolbarPath="drawing/g1"
  tooltip="Thunderstorm"/>
<!-- Fronts -->
<action
  class="com.raytheon.viz.drawing.fronts.StationaryFrontTool"
  icon="icons/stationaryFront.gif"
  id="com.raytheon.viz.drawing.fronts.StationaryFrontTool"
  label="Stationary Front"
  state="false"
  style="radio"
  toolbarPath="drawing/g1"/>
```

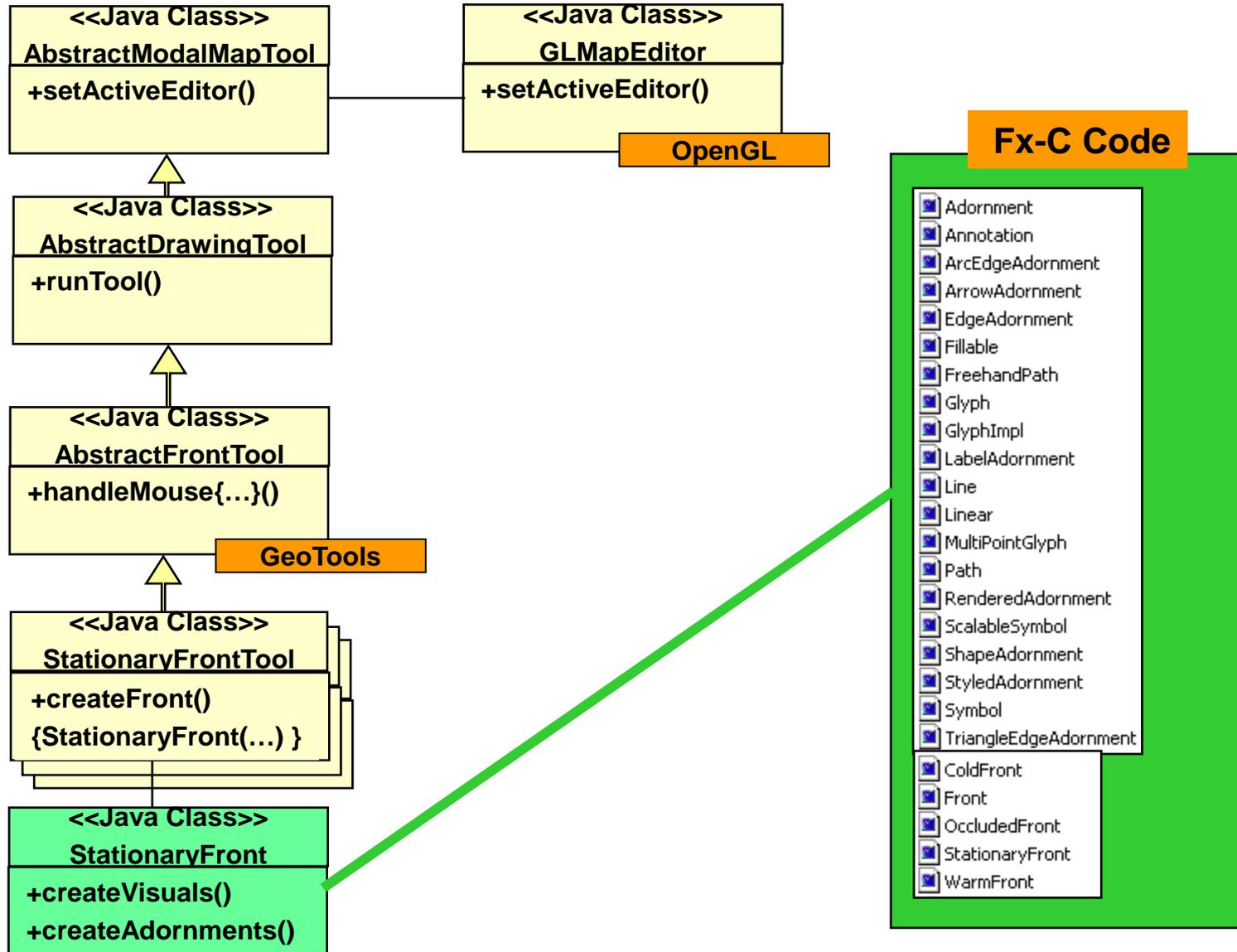
Scalable Vector Graphic
SVG map annotation

Drawing Tool Interface

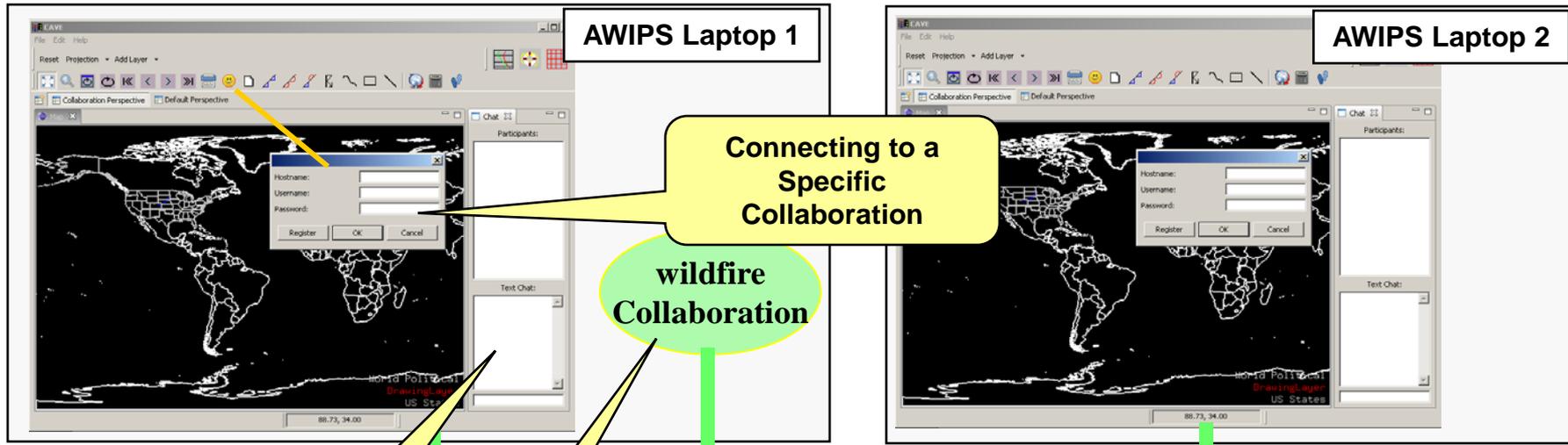


Drawing Capability

Reuse Lower Level Fx-C Front Drawing Code



Collaboration Capability Based on XMPP protocol standards



Concurrent CAVE Perspective has Chat Area

Supports VoIP through plugin

CAVE Menu Interface To Collaboration



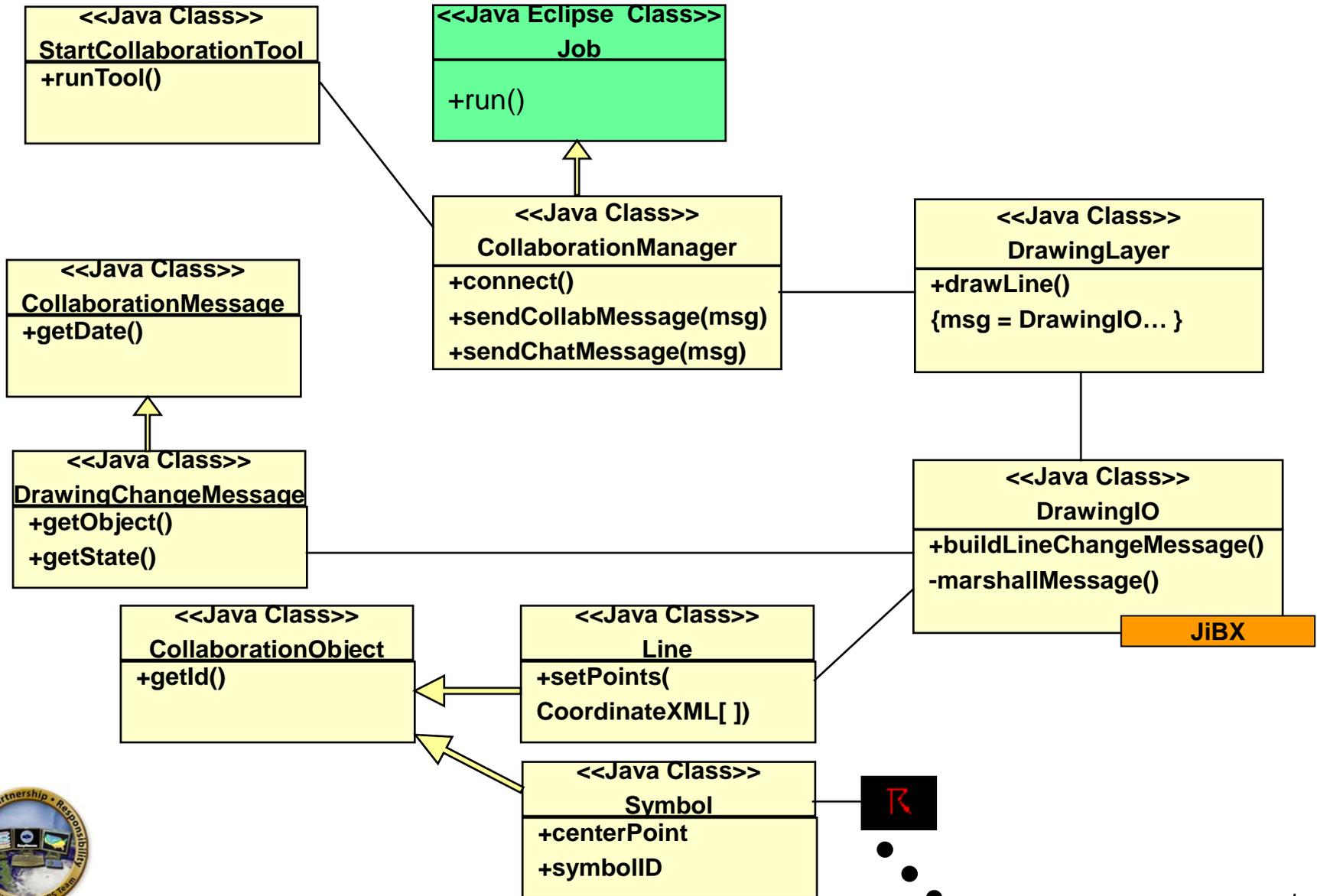
```
<<Java Class>>
StartCollaborationTool
+runTool()
```

Jabber Standard Collaboration Protocol



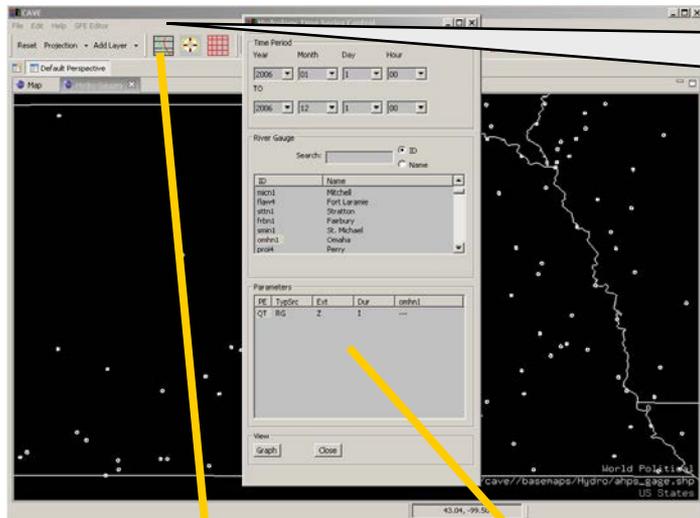
Collaboration Capability

Accurate GIS referenced Drawing and Symbols

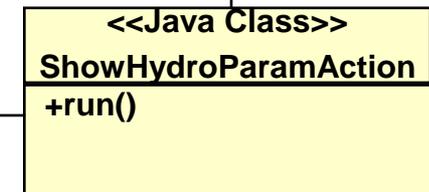
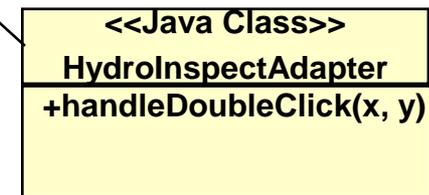
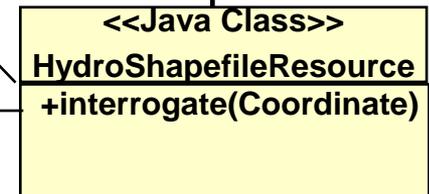
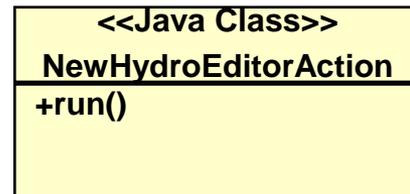
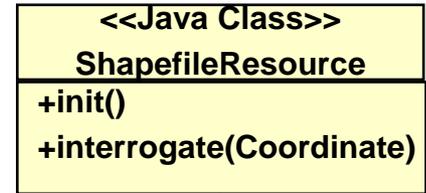


XYEditors added in T04

Initial Hydro Graph Display and Gage Select

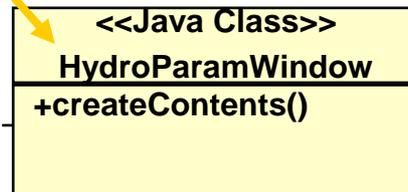
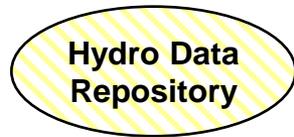


XYEditors: Skew-T, Hydro GFE, ...



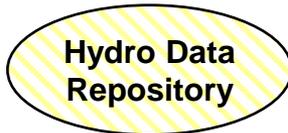
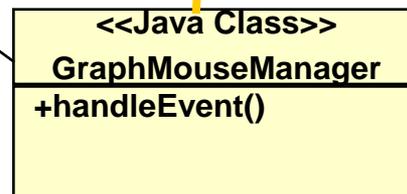
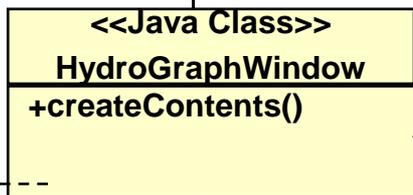
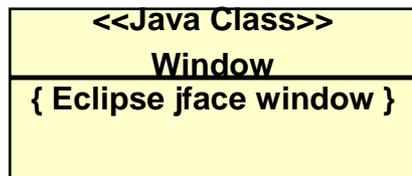
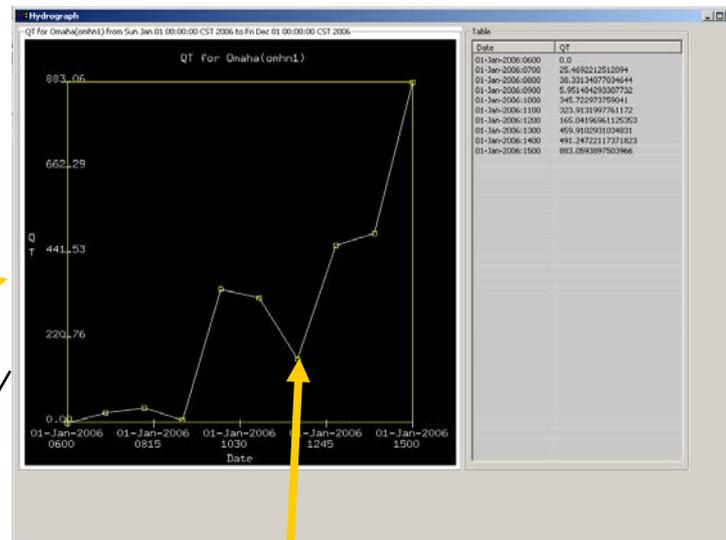
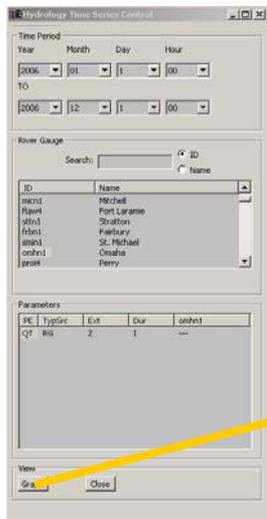
```

<action
class="com.raytheon.hydro.actions.NewHydroEditorAction"
id="com.raytheon.hydro.actions.NewHydroEditor"
label="HydroEditor"
icon="icons/hydroIcon.gif"
state="false"
style="push"
toolbarPath="Normal/additions"/>
    
```

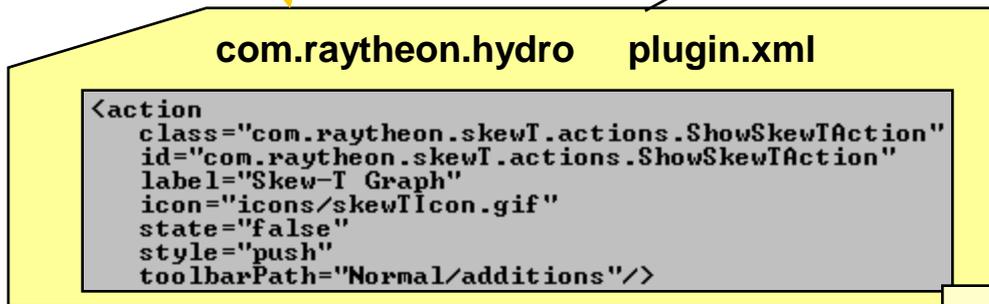
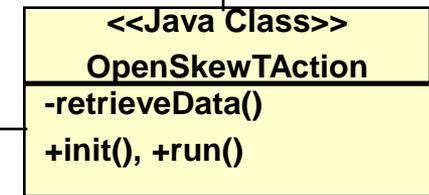
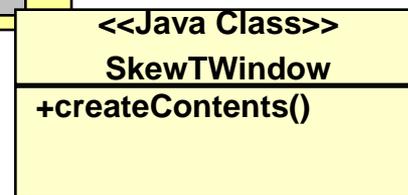
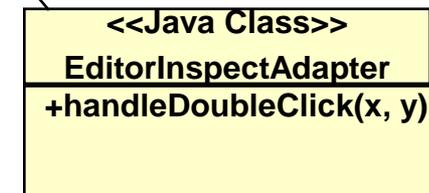
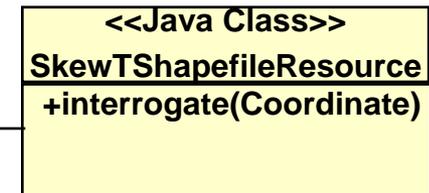
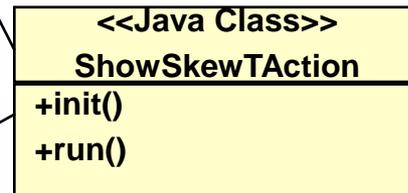
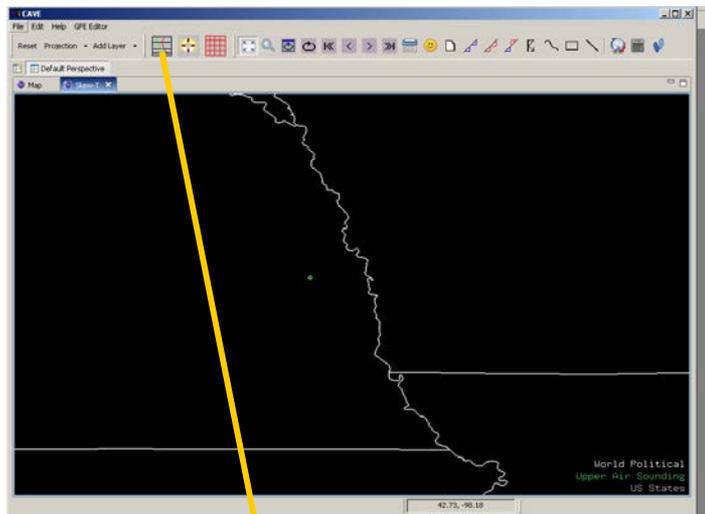


XYEditor: Initial Hydro Graph Display

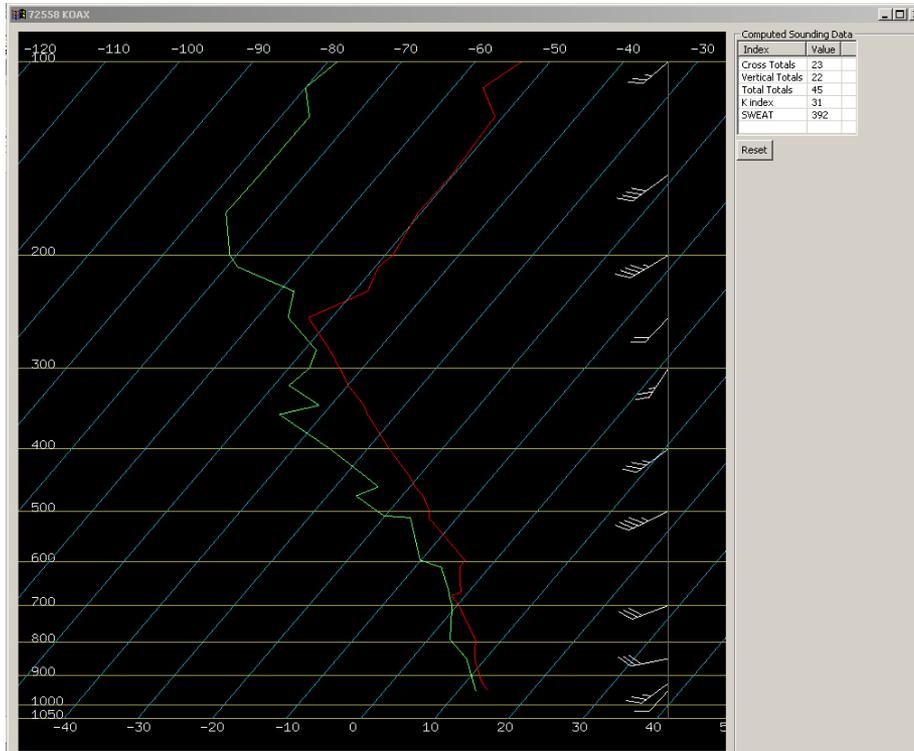
T04 uses generated canned data



XYEditor: Initial Skew-T Log P Rendering Station Selected From Map Display

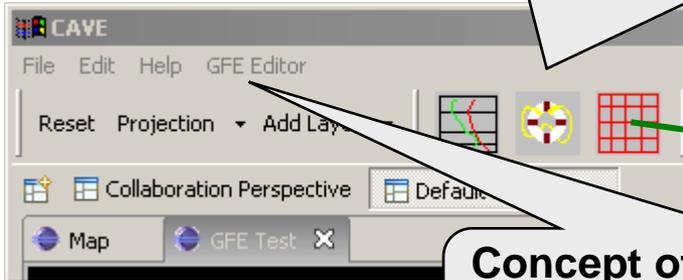


XYEditor: Initial Skew-T Log P Rendering

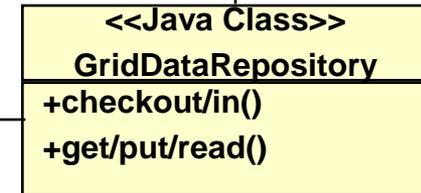
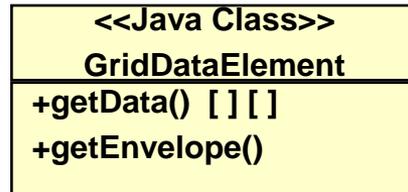
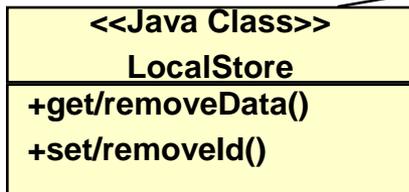
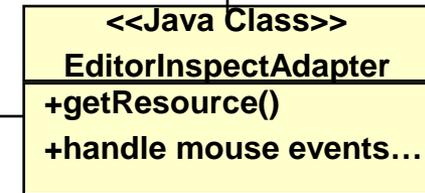
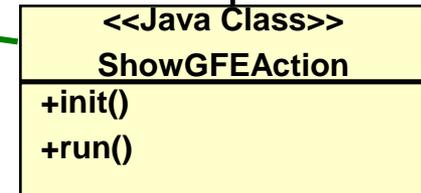
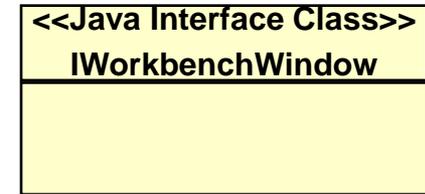
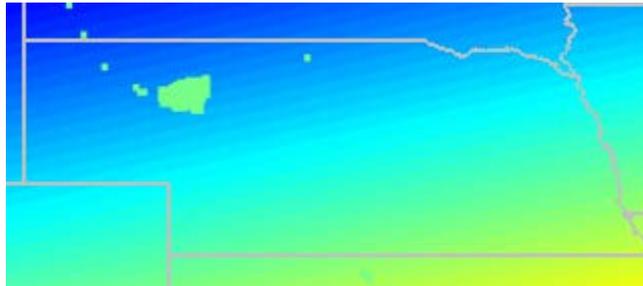


XYEditors added in T04 Continued Initial GFE editor Capability

XYEditors: Skew-T, Hydro GFE, ...

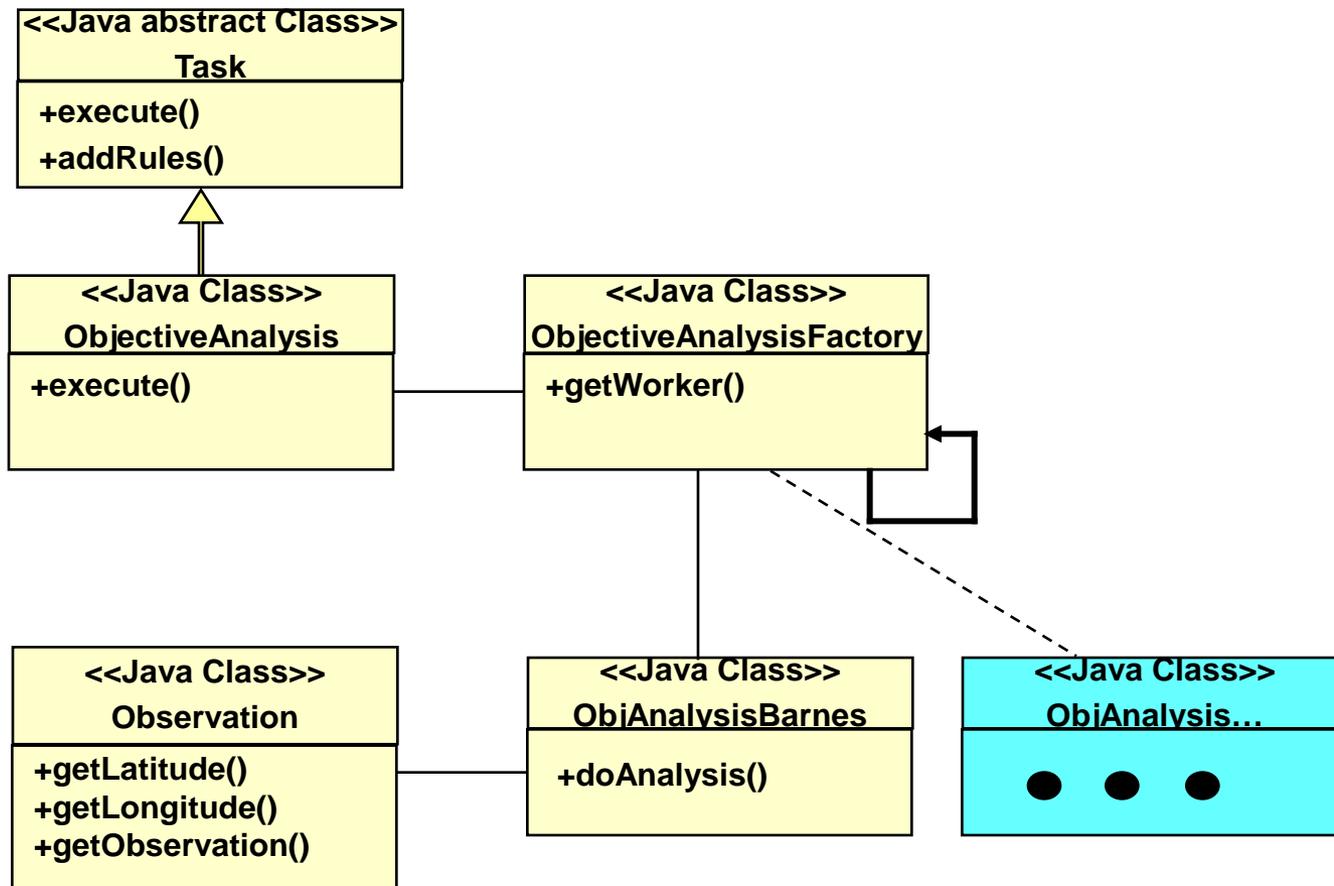


Concept of Check in/out Editing Float Grid Value with Mouse events and rendering



uEngine: Objective Analysis Pattern

Barnes first pass sample implementation



uEngine: Objective Analysis Pattern

Barnes first pass sample implementation script

```
<action name="BarnesTemperature">
  <!-- retrieve the grid record -->
  <termQuery using="tempgrid" count="1">
    <query name="parameter_type" value="TMP" />
    <query name="first_fixed_value" value="2" />
    <query name="forecast_time" value="3"/>
  </termQuery>

  <degrib using="tempgrid" forecastTime="3" />

  <!-- retrieve the METAR data - change the lat/lon values as needed -->
  <shapeQuery>
  <shapeFile>/awips/opt/data/static/spatial/stations/stations.shp</shapeFile>
  <attributeName>icao</attributeName>
  <attributeName>the_geom</attributeName>
  <BBoxFilter>
    <maxLat>42.00</maxLat>
    <minLon>-100.00</minLon>
    <minLat>40.00</minLat>
    <maxLon>-94.00</maxLon>
  </BBoxFilter>
  </shapeQuery>
  <!-- change value to the latest available reference hour -->
  <termQuery using="METAR" count="0">
    <query name="reportType" value="METAR" />
    <!--
    <query name="refHour" value = "200610271900000000" />
    -->
    <input name="stationID" value="icao" />
  </termQuery>
```

Querying + Degrib of a Grib data record (ie TMP)

Performs a Spatial Query to get list of ICAOs in Bounding box

Retrieves METARs returned by the spatial query



uEngine: Objective Analysis Pattern

Barnes first pass sample implementation script

```
<!-- change value to the latest available reference hour -->
<termQuery using="METAR" count="0">
  <query name="reportType" value="METAR" />
  <!--
  <query name="refHour" value = "200610271900000000" />
  -->
  <input name="stationID" value="icao" />
</termQuery>
<decodeAscii using="METAR" />
<mapData using="METAR" stations="icao" geometry="the_geom" parameter="temperature" />

<!-- perform the analysis -->
<objectiveAnalysis method="BARNES" using="tempgrid" inputs="METAR">
  <param name="searchRadius" value="100000.0" />
  <param name="weight" value=".50" />
  <param name="minNoStns" value="1" />
  <param name="extrapolate" value="true" />
  <param name="numPasses" value="1" />
</objectiveAnalysis>

<!-- transform and return the resulting GRIB -->

<gribMap using="tempgrid" colorMap="GribRGB" />
<colorImage using="tempgrid" colorMap="GribRGB" />
<reproject using="tempgrid"/>
<imageOut using="tempgrid" format="tiff" />
<fileOut using="tempgrid" />
<makeResponse using="tempgrid" returnMethod="uri" /></action>
</body>
```

Decode METARs and Load temperature

Run Selected Analysis With parameters as set

Apply colormap and convert to GeoTIFF for CAVE display



Security Concepts

Do not change anything significantly

- Each installation has perimeter security similar to what exists now we are not changing the security model or C&A
- Goal is to be able to use a remote service as if it is local
- Access Authentication
- Service Authorization
- Data Ingest Through Data Diode Type concept
- SOA Endpoint Security Through ESB & JMS provider



Security Concepts Continued

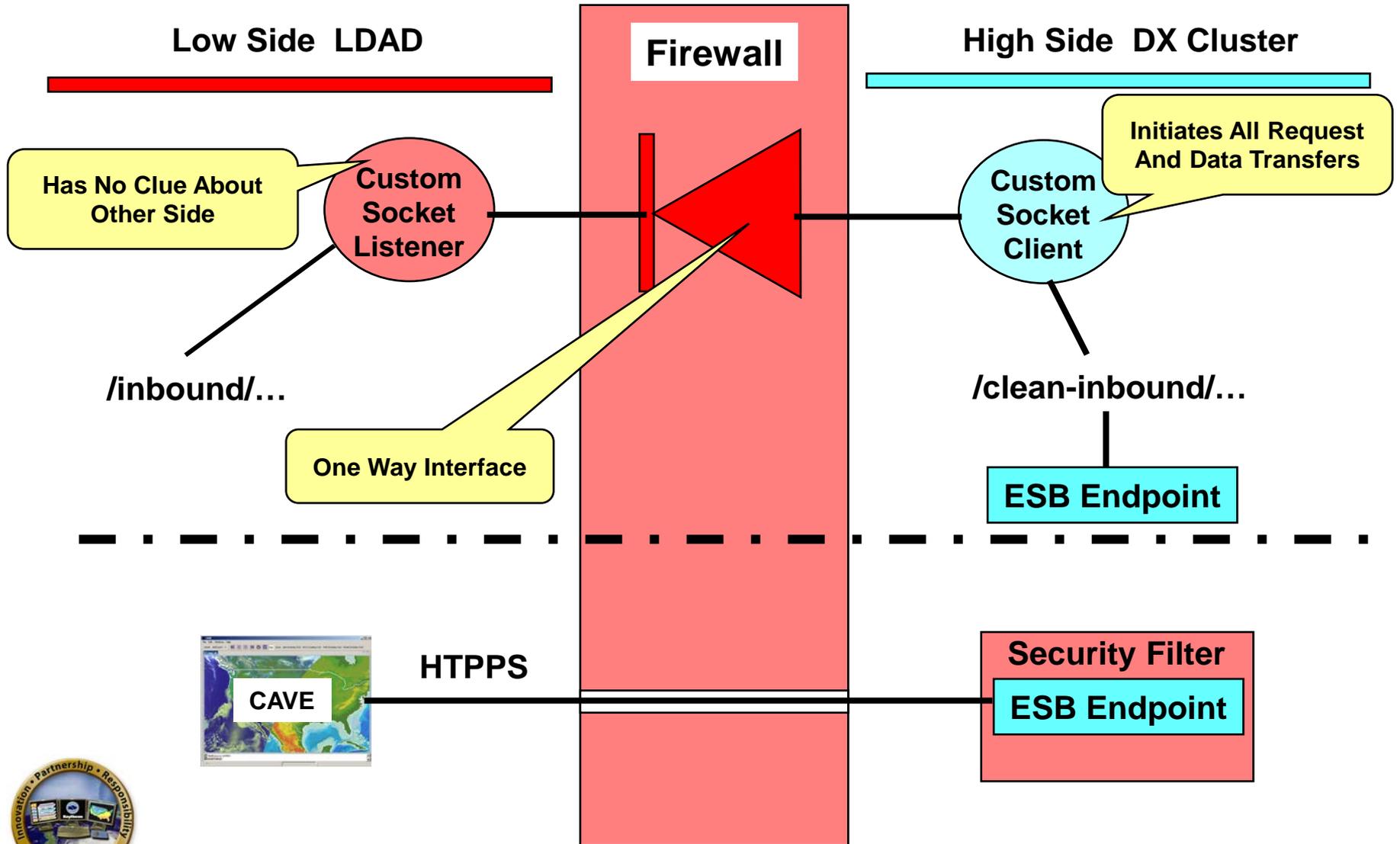
SOA infrastructure has built in capabilities

- **JMS provider:** activeMQ
 - Support JAAS as a provider for authentication
 - Default points to a “login.config” on classpath that in turn points to:
 - user.properties {has: user=password info}
 - group.properties {has: group=user1,user2... }
 - User Roles on Queues and Topics:
 - Read, Write, Admin (create)
 - Configurable message authorization policy allows each message to be content based authorized by a custom policy
- **Mule Security:** Acegi; JAAS; PGP
 - Built in configurable security manager is responsible for authenticating requests
 - Configurable encryption strategy includes transports such as SSL and HTTPS
 - JAAS security provider (Java Authentication & Authorization Service) – API in since Java 1.4
 - Mule is extendable to PGP signed encryption on endpoints for end-to-end communications



Security Architecture

Data Ingest Concept of Data Diode



New Capabilities Being Added in T05

Capability Dependency Graph

