Raytheon

Customer Success Is Our Mission

AWIPS Continuous Technology Refresh (CTR)

AWIPS Software CTR

TO8: Outbrief

February 7, 2008

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T08 Outbrief Introduction

- AWIPS-II T08 Summary
- AWIPS-II Architecture Update
- AWIPS-II CAVE Summary
- AWIPS-II Workstation (CAVE) Capabilities
- AWIPS-II SOA services
- AWIPS-II Plug Ins
- AWIPS-II Library
- AWIPS-II Data
- AWIPS-II TO8 Testing

Weather System Distributed User Needs:
Drives Architecture Towards Advanced Solutions

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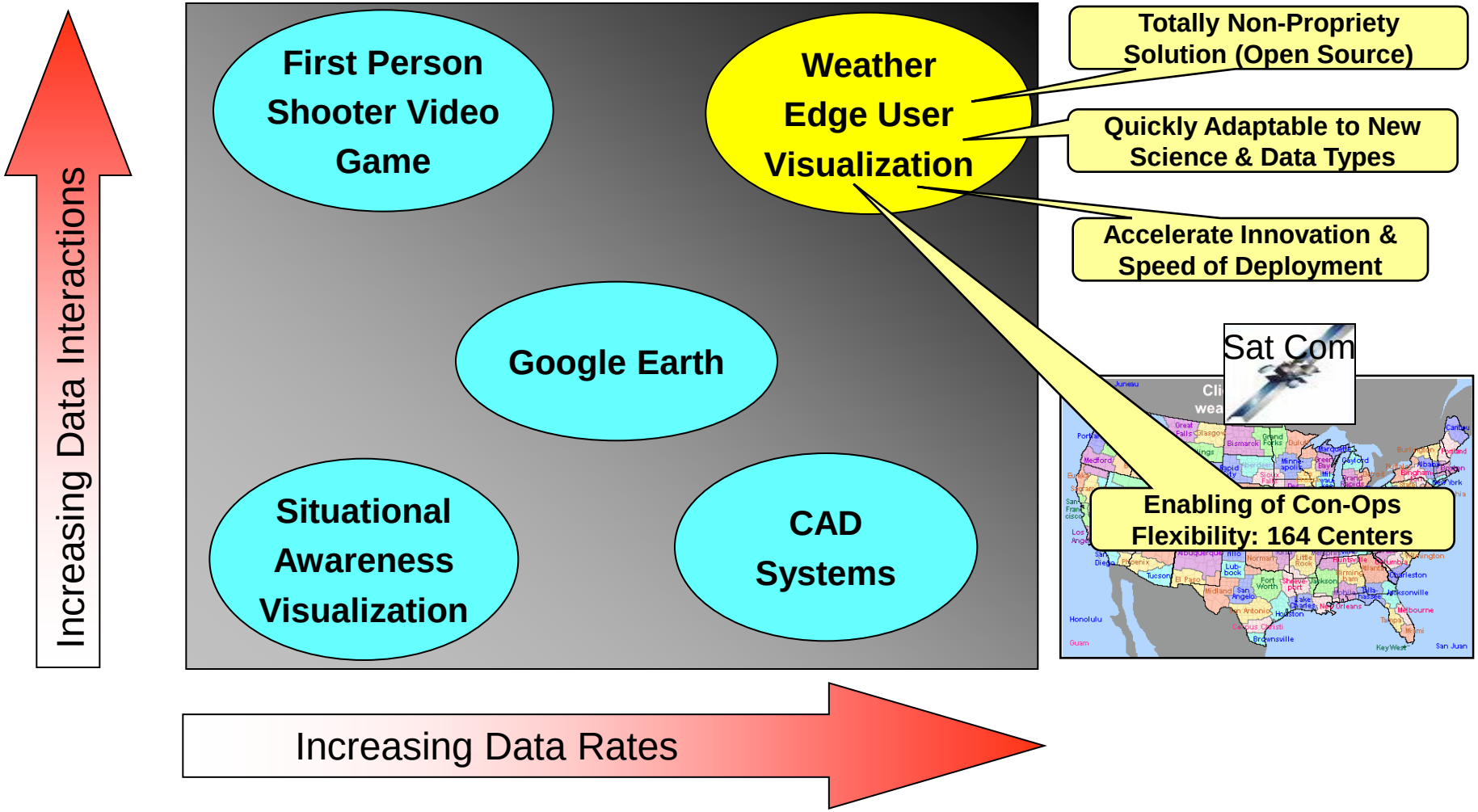
Summary



High Data Rates With Gaming Style Interaction

TO8 Task Order

- Primary task is to migrate D2D workstation capability to the new AWIPS-II developed architecture
  - Performed workstation capabilities migration
  - Performed server side migration for ingest and storage of data
- Perform risk reduction for GFE
- Perform risk reduction for Hydro

AWIPS-II Central Architectural Concept
ESB SOA Plug In Adaptable

T08 Future

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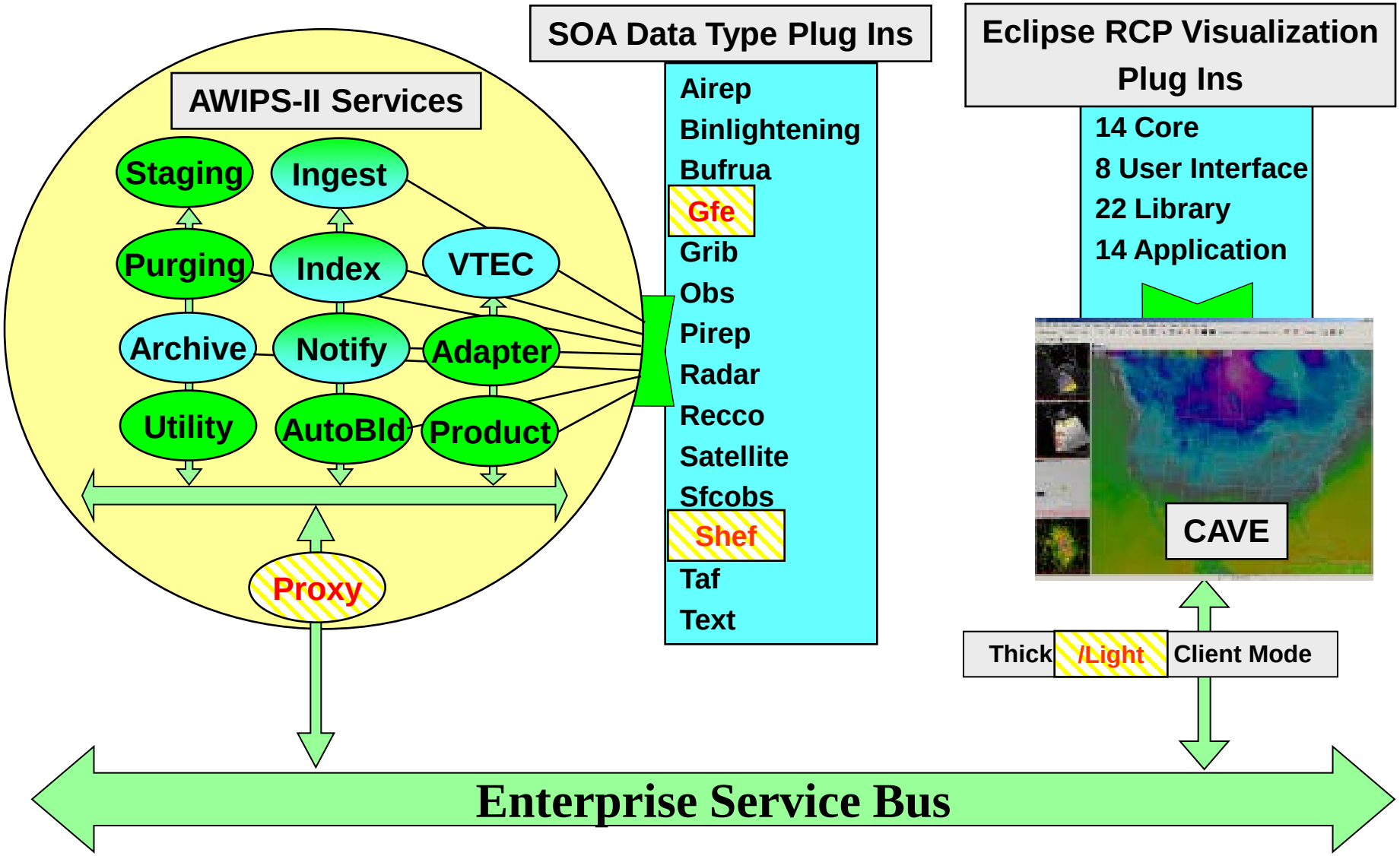
Architecture



Mule ESB + SPRING Container
Services decoupled from transport mechanisms

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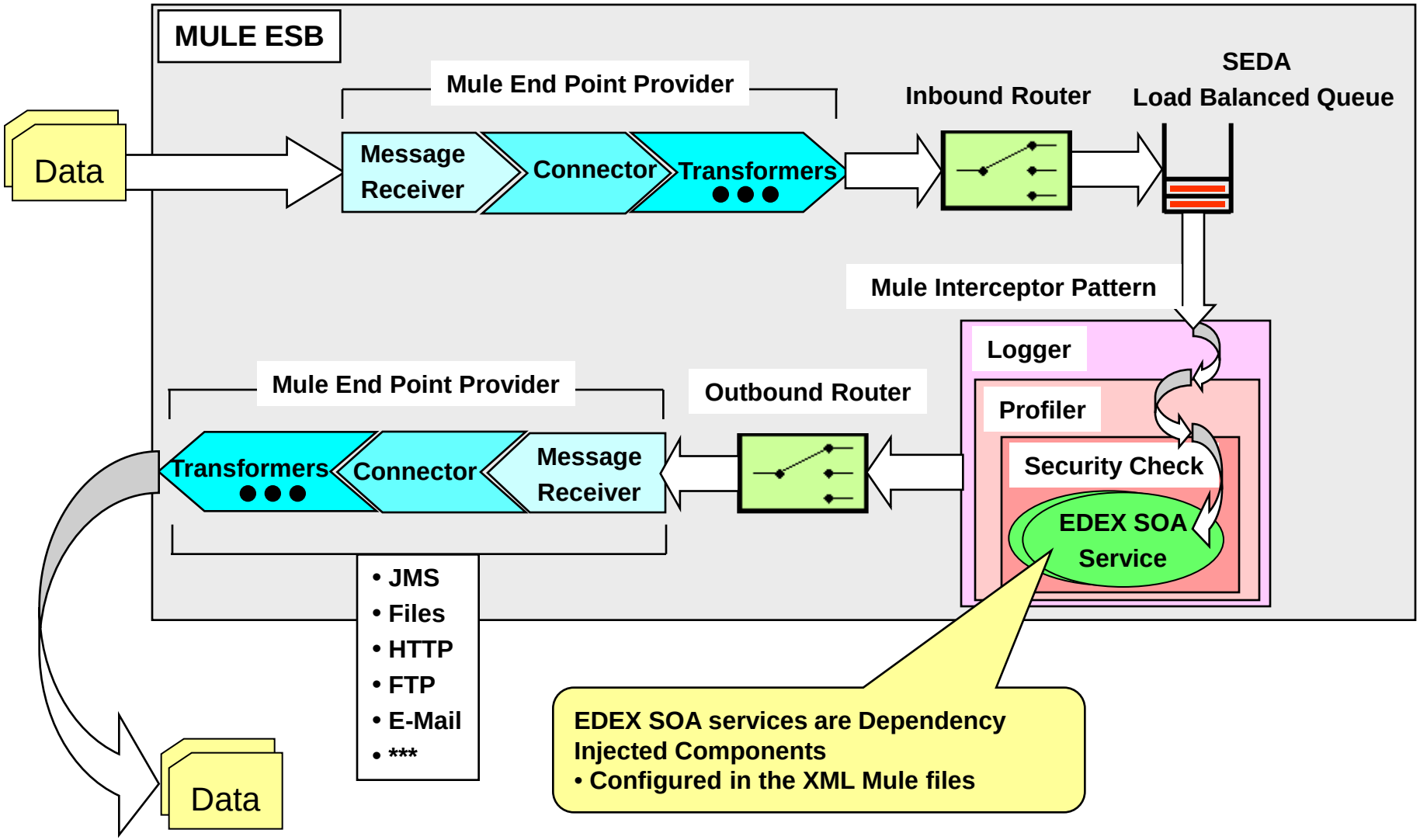
Architecture



Plug Ins Pattern Refinements

Dynamically Extends to New Data & Transforms

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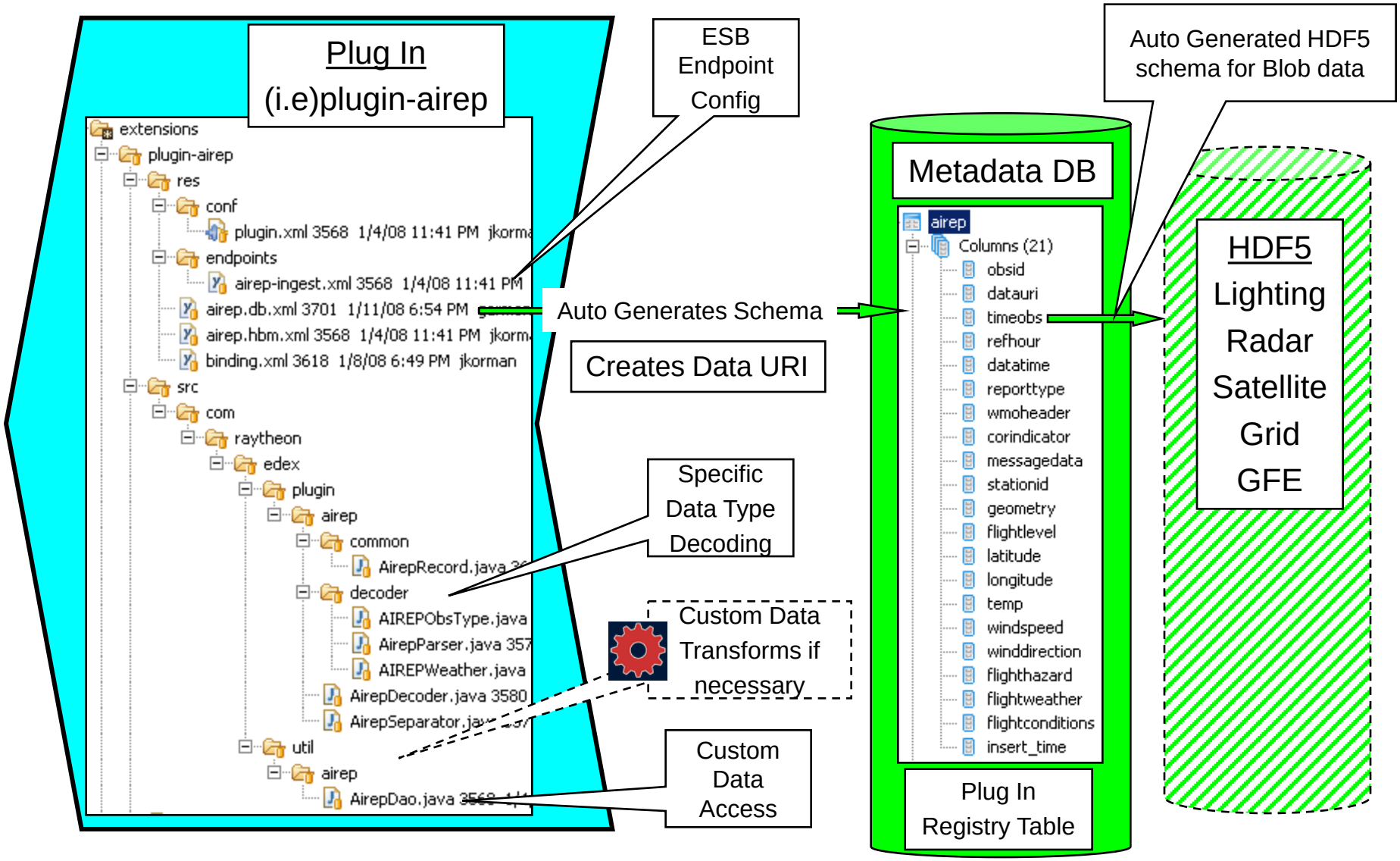
Architecture



Data Repository Maintenance Refinement

Based on a circular cycle of tables & HDF5 files

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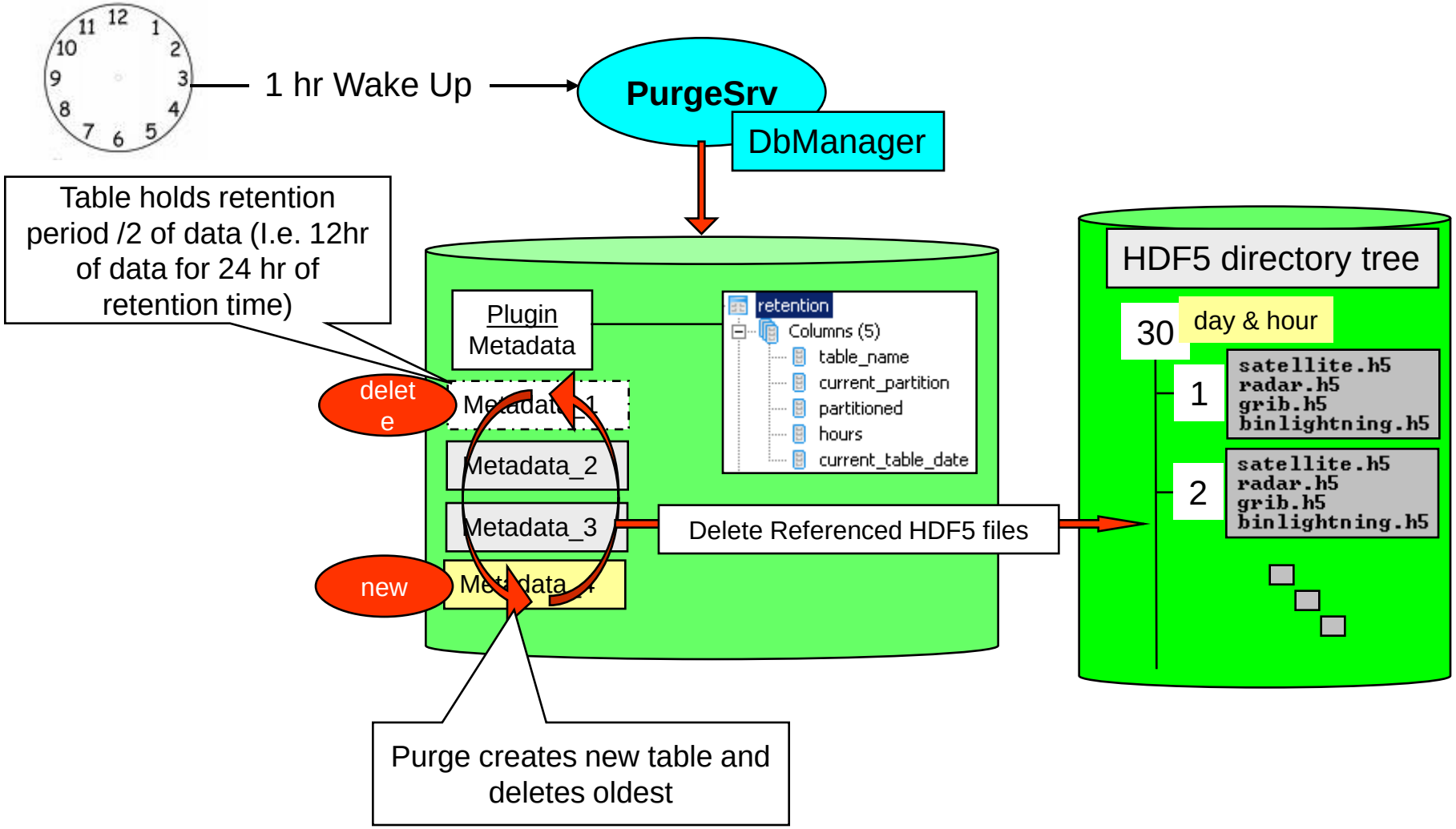
Architecture



Clustered Data Ingest Flow Refinement:
Pass References and MetaData between Services

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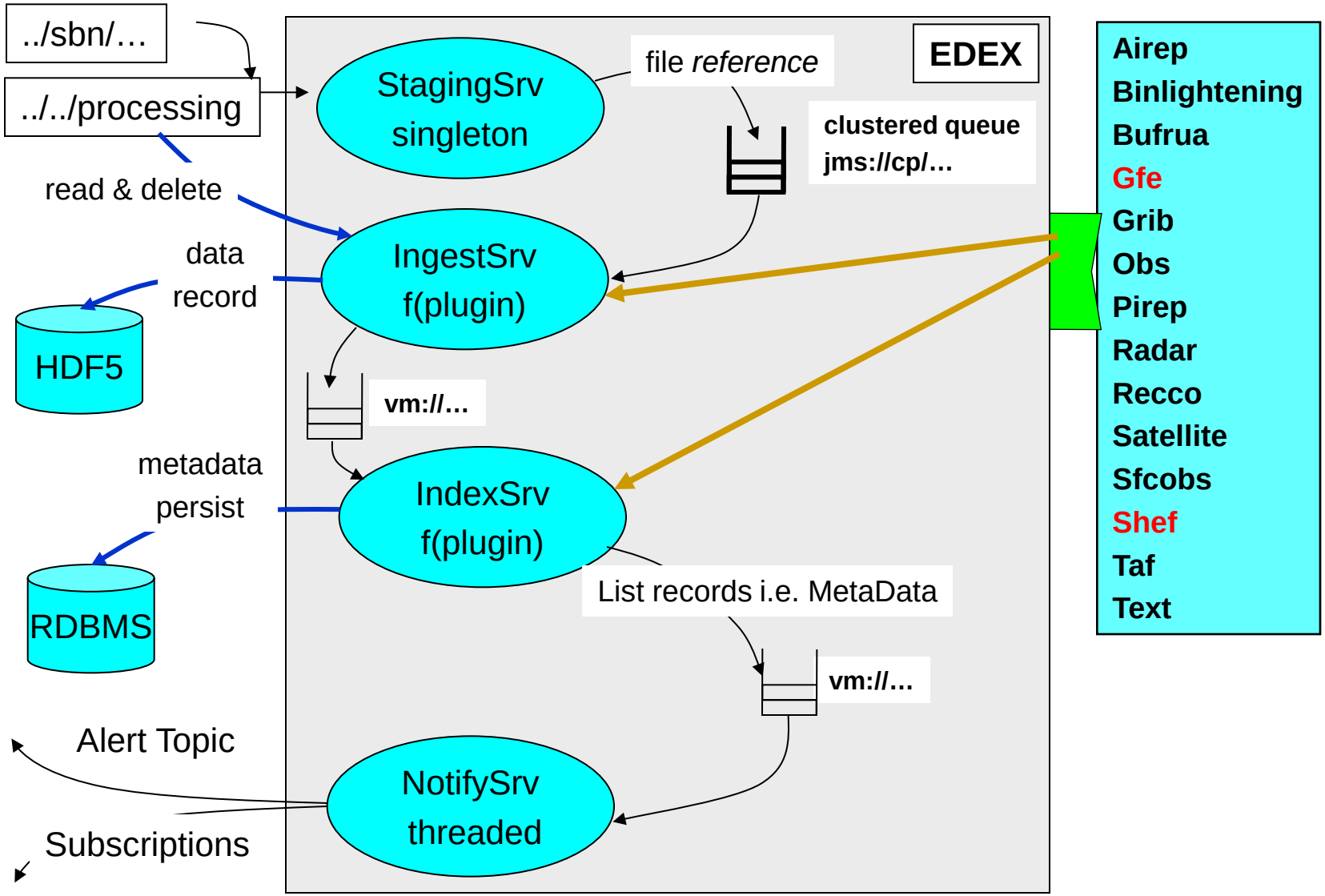
Architecture



CAVE Data Notification + Subscription

Data Matched to Menus by Optimized Decision Tree

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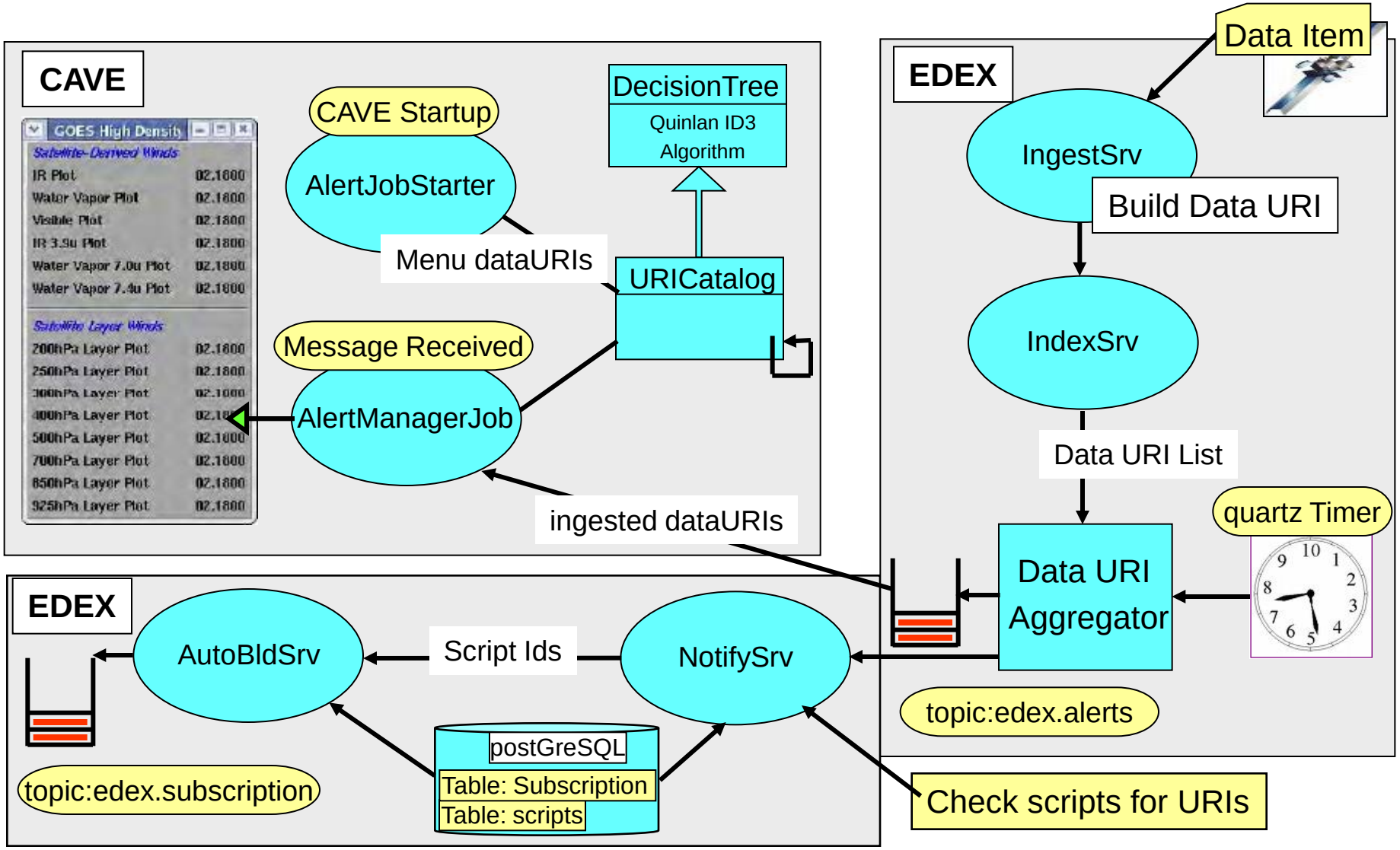
Architecture



Workstation CAVE Architecture Overview

Built from Eclipse RCP Plugins + Extensible

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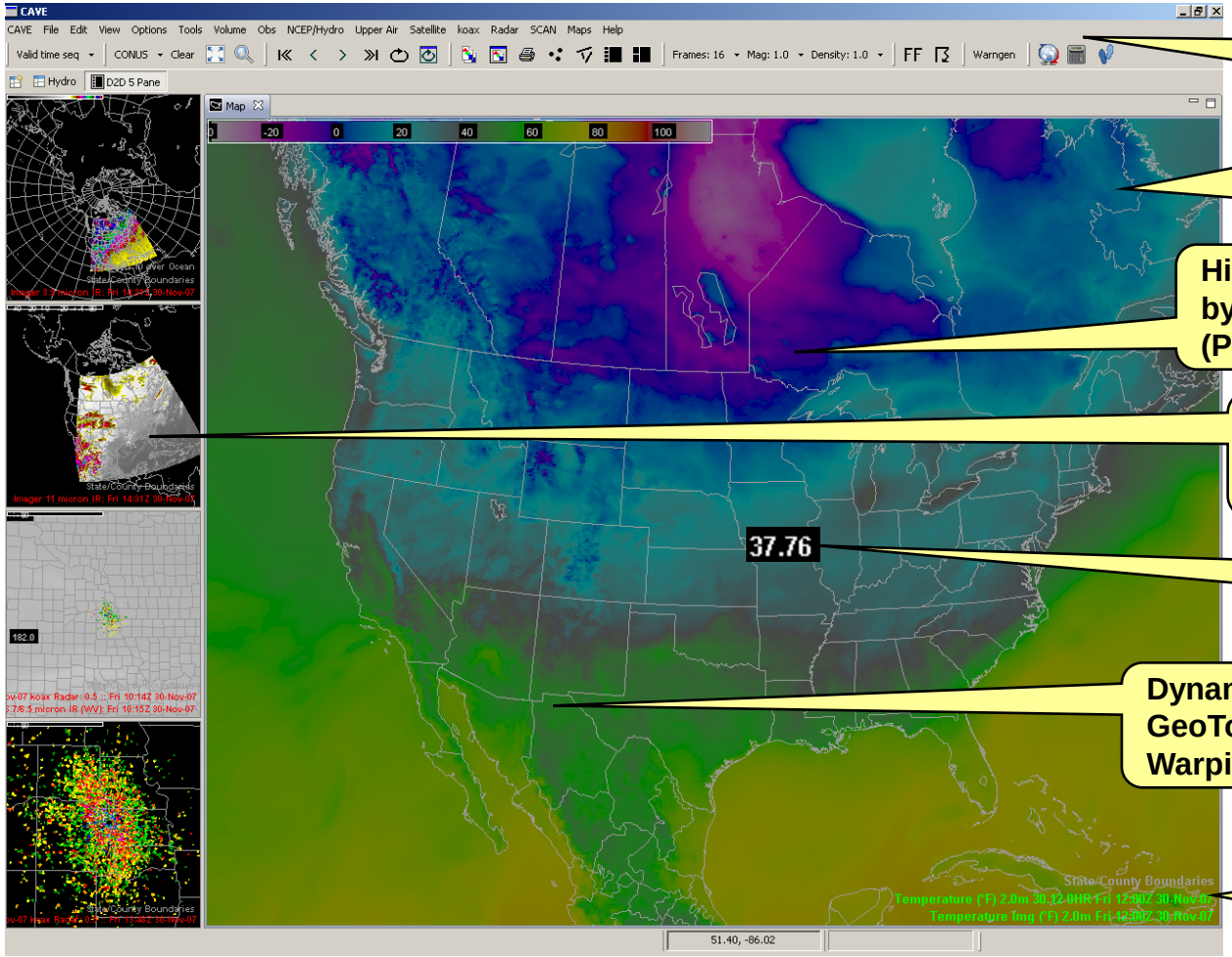
CAVE-Summary



Eclipse 3.3 XML User Customizable Menus & Tool bar

GIS Display defined by map projection and set of layers (history recallable, procedures)

High Performance Image Rendering by GPU Shader Language Controls of (Projection,Color, …)

Large raster data set rendering through Quad Tree Tilling and HDF5 chunking

Active Raster and Vector Data Interrogation

Dynamic map re-projection using GeoTools Transforms& GPU Solid Shape Warping

Auto updating Animations of all data types in all panes

Enterprise Service Bus Data Connections

ESB Connection for thin/thick client access to data

CAVE leverages Eclipse Perspectives
Enables Multiple User Interfaces

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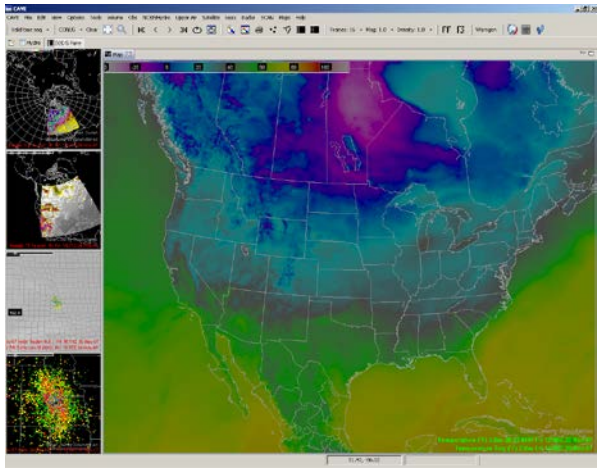
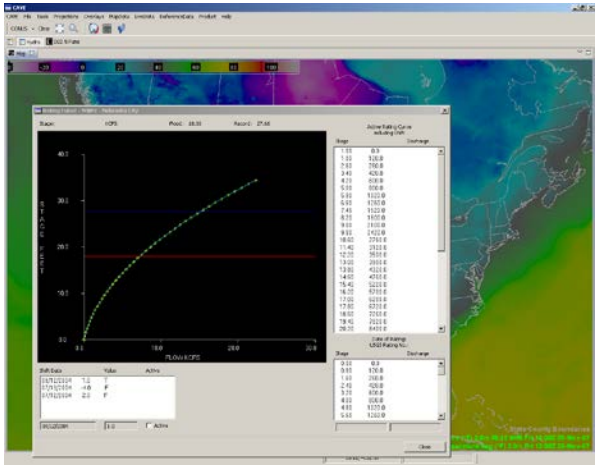
CAVE-Summary

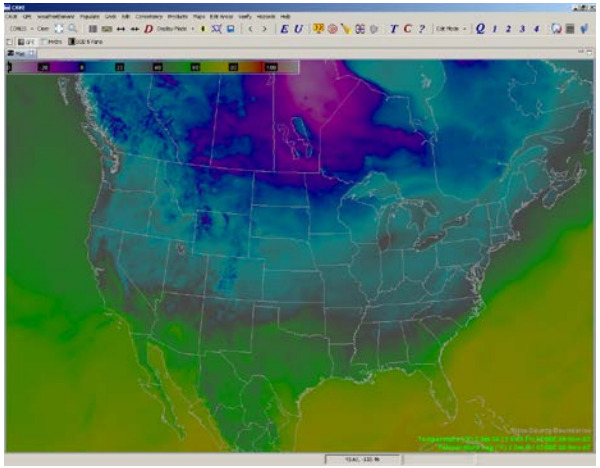
Weather Workstation



Hydrology Workstation



Graphical Forecast Editing



- Perspectives leverages entire set of CAVE eclipse plug ins
- Each perspective can have unique menus, toolbars, and dialogs
- User can actively switch back and forth between perspectives

Map Reprojection: Texture Warping
GPU Fragment Shader 50 times Faster than CPU

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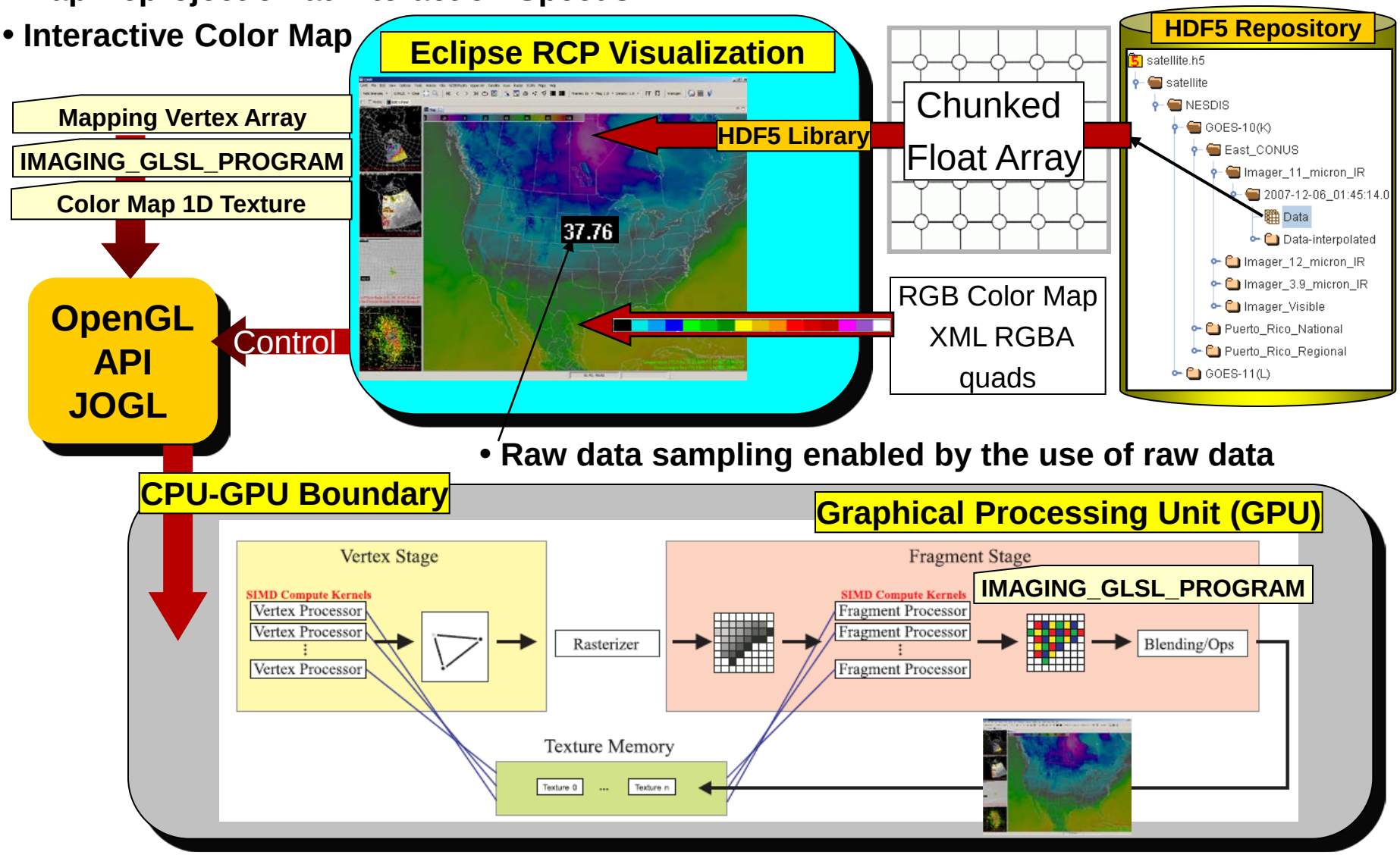
CAVE-Summary

- Map Reprojection at Interaction Speeds
- Interactive Color Map



- Raw data sampling enabled by the use of raw data

Workstation Menus / Toolbars / Rendering
XML Configurable Menus + XML Bundles

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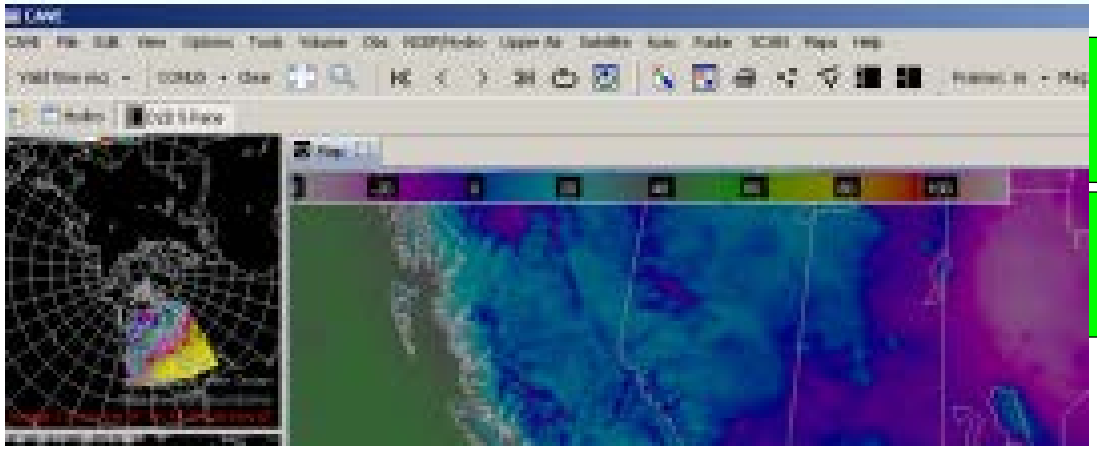
Workstation



.ui.personalitles.awips plugin.xml

.site. (from localization) plugin.xml

XML Display Resource Bundles

Commands

plugin.xml
Commands
Parameters
Menu labels

setScale

RadarDisplayControls

menuRetrieval

productURI
productName
variableList

~19 Map

~11 Plots

1 Skew-T

8 Radar

11 Models

~30 Display Resources

Workstation Configuration
XML used for most all configuration

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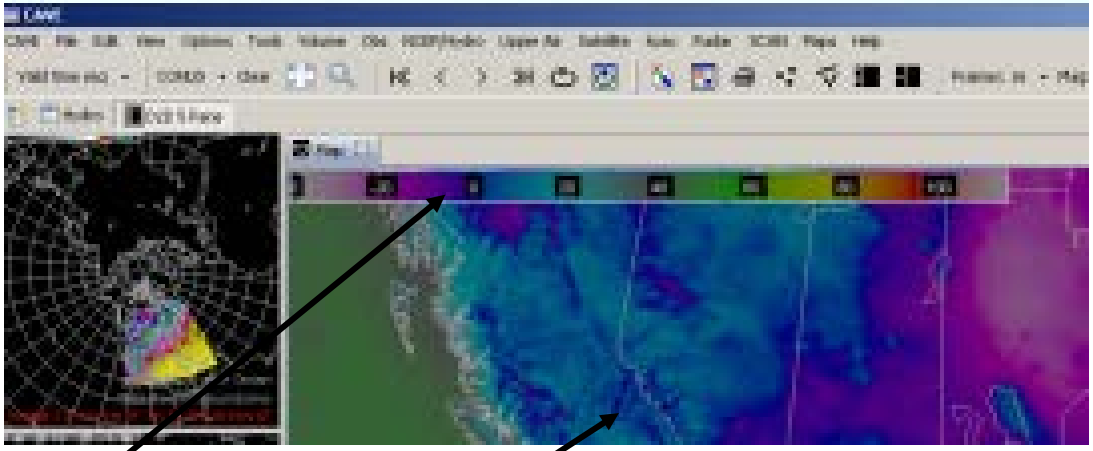
Workstation



CAVE configuration files under cave/etc

- **bundles**
- **colormaps** — 121 RGBA list unlimited
- **plotmodels** — 17 svg, 12 spi
- **volumebrowser** — XML Menus
- **warngen** — Templates + config
- **radarInfo**
- **contourStyleRules**
- **imageryStyleRules**
- **graphStyleRules**

Workstation Modes
Implemented Using Eclipse Preferences

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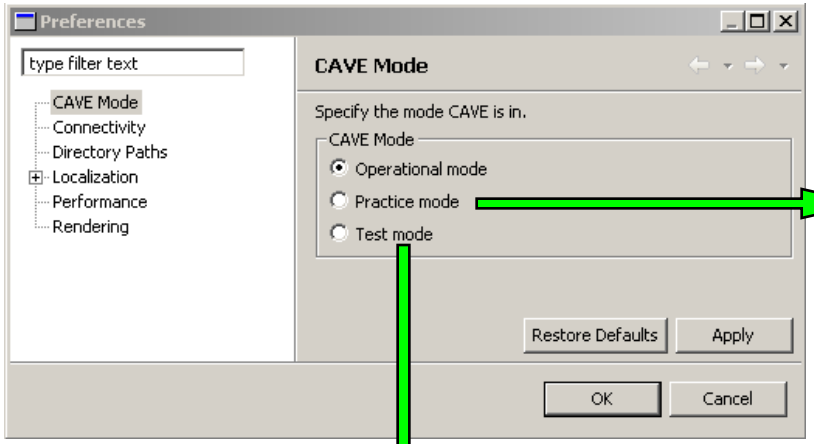
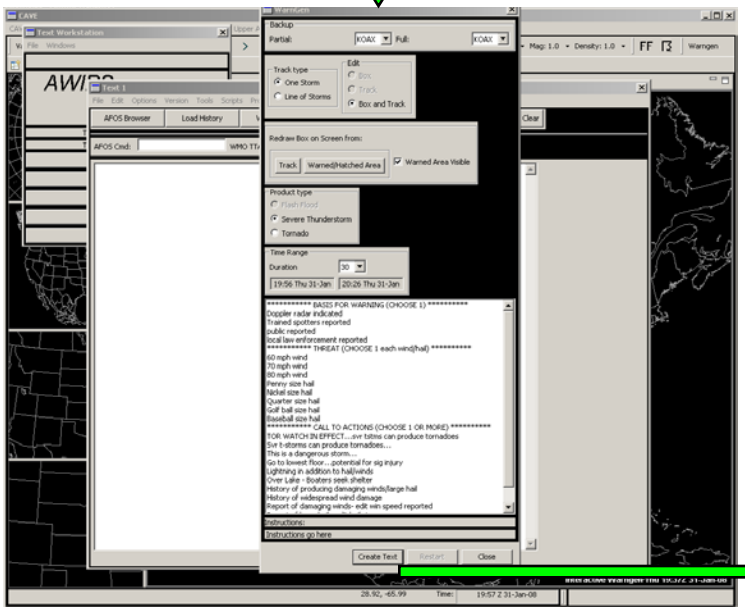
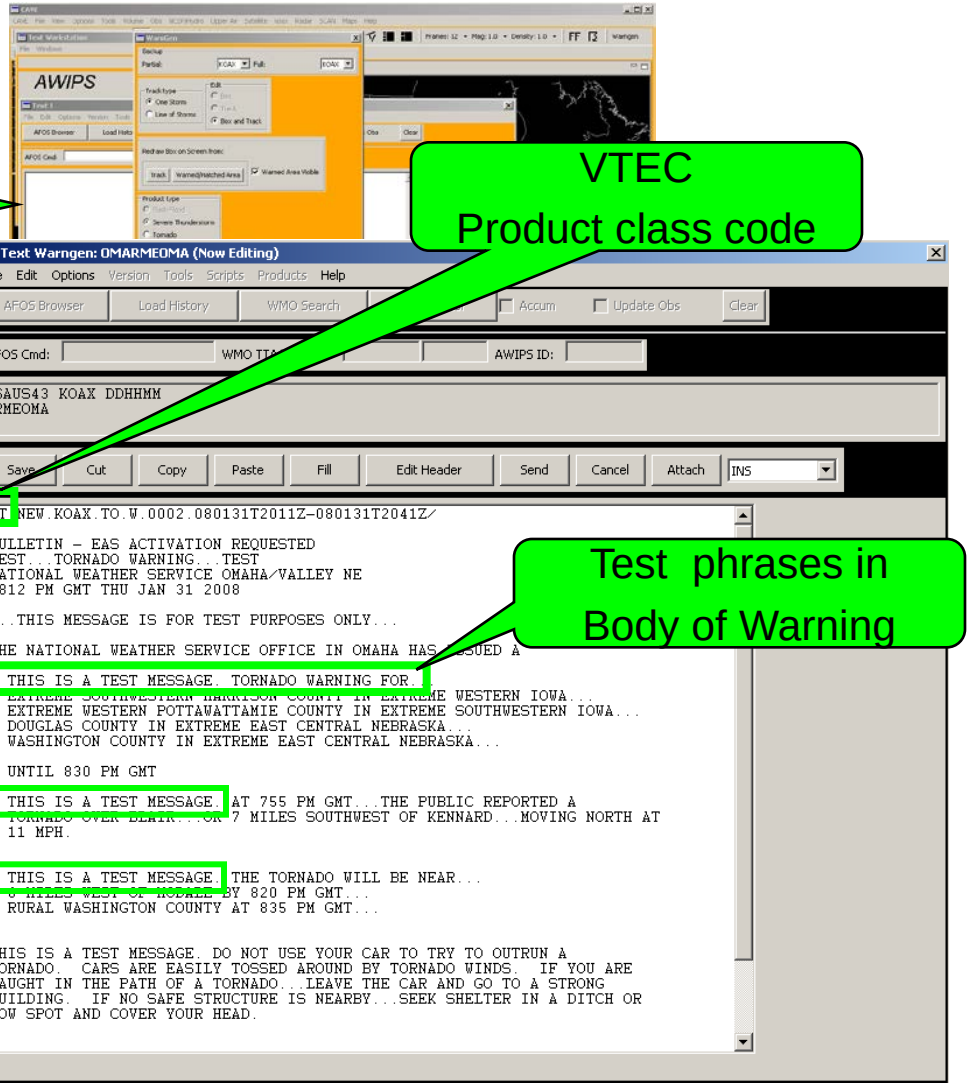
Workstation







VTEC
Product class code

Test phrases in
Body of Warning

Workstation (CAVE) Localization Pattern
Uses UtilitySrv with a HTTP interface

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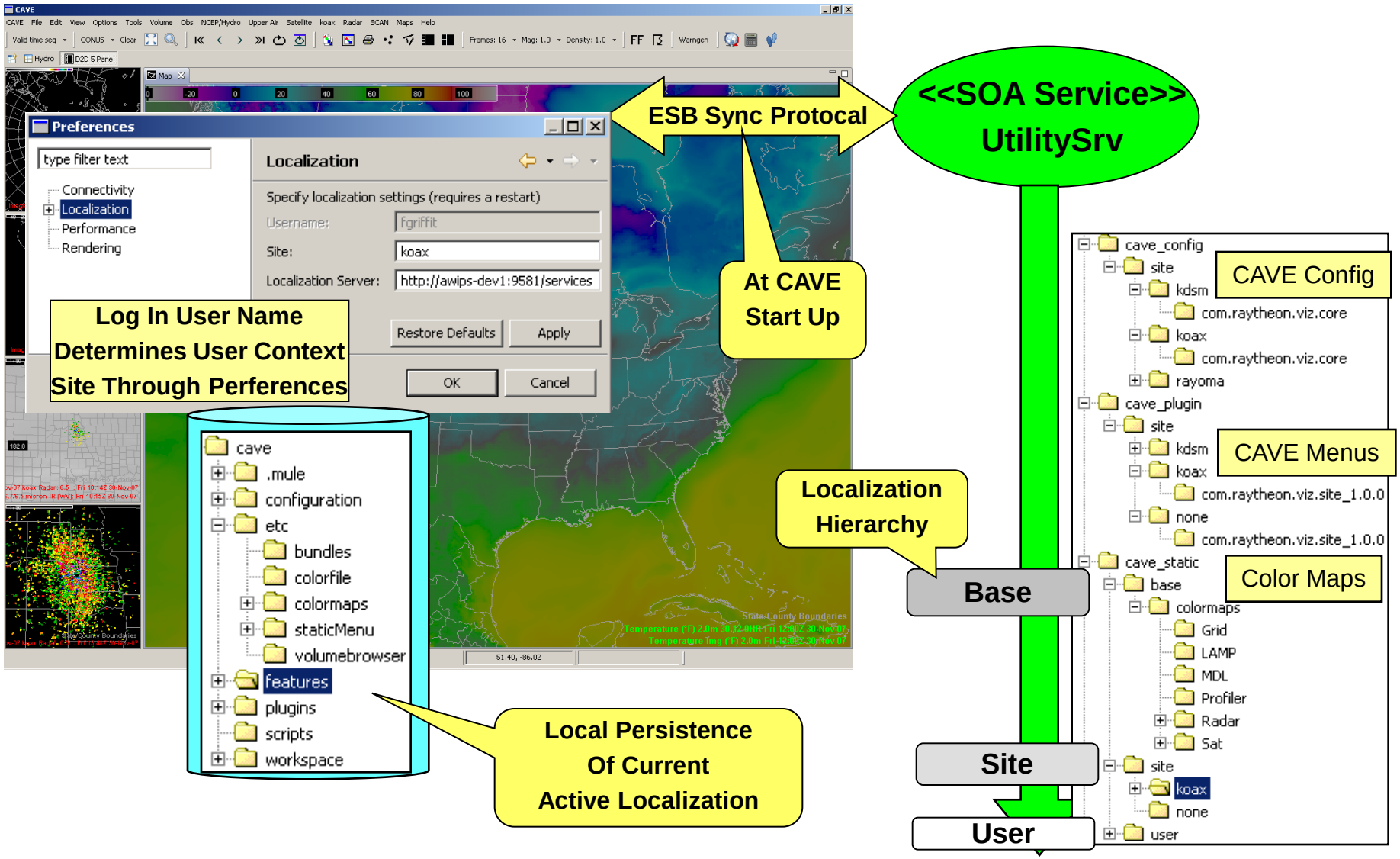
Workstation



Workstation History and Procedures
D2D Style Con-Ops (except Alter Bundle)

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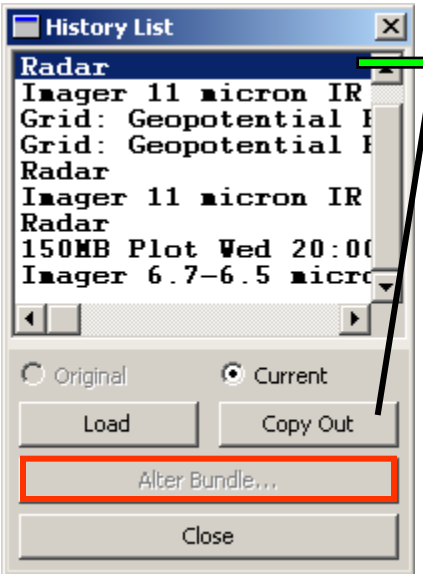
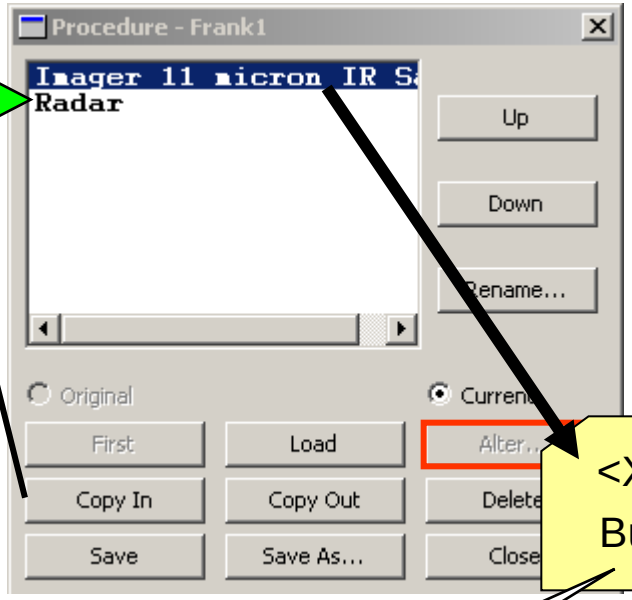
Workstation





<XML> Bundle

Bundle Components

- Map Scale Definition
- Zoom Level
- Center Point Coord.
- Map Projection
- Grid Range
- Load Mode
- Layer Definitions
  - Metadata Fields / File Name
  - Color Map
  - Display Controls

Menus Also Use Bundles

- Easy Customization of Menus
- Bundles are reuseable through the passing in of arguments

Need to add XY Components

GIS Map Display Defined by XML Bundle
Enables reuse in D2D style Menus

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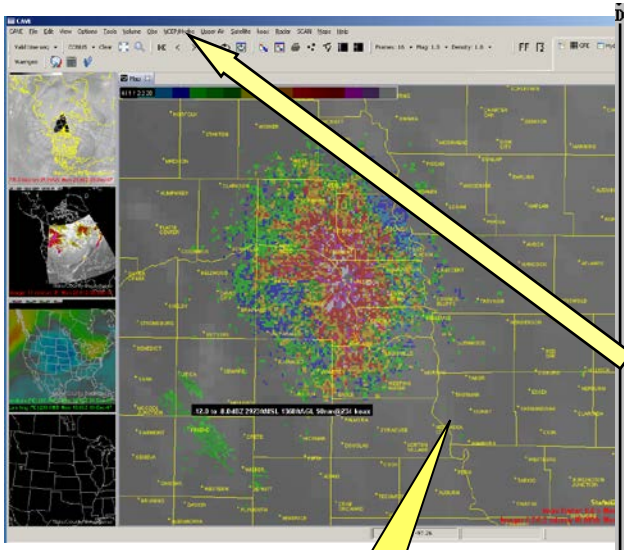
Workstation



```
D:\CAVE\ETC\BUNDLES
    15minSurfacePlot.xml
    AllTilts.xml
    cities.xml
    CONUS.xml
    corner_map.xml
    county_names.xml
    DefaultGrid.xml
    DefaultRadar.xml
    DefaultRadarAll.xml
    DefaultRadarAllTilts.xml
    DefaultRadarFourPanel.xml
    DefaultRadarTilts.xml
    DefaultRadarTiltsFourPanel.xml
    DefaultSatellite.xml
    DefaultSatelliteFourPanel.xml
    DGEX.xml
    ECMWF.xml
    GFS40.xml
    HFO-eastern.xml
    HFO-pacific.xml
    HFO-regional.xml
    HFO-state.xml
    HFO-western.xml
    IRWindow.xml
    LightningPlot15Min.xml
    LightningPlot15MinPN.xml
    LightningPlot5Min.xml
    LightningPlot60Min.xml
    LightningSeq.xml
    maritimeFixedBuoy.xml
    maritimeMAROB.xml
    maritimeMoving.xml
    N. Hemisphere.xml
    NAM12.xml
    NAM40.xml
    NAM80.xml
    NAM80FourPanel.xml
    NGM.xml
    North American.xml
    Radar19.xml
    Radar27.xml
    Regional.xml
    RUC.xml
    State(s).xml
    SurfacePlot.xml
    SynSurfacePlot.xml
    Topo.xml
    UpperAirPlot.xml
    UpperAirRaob.xml
    VisWindow.xml
    WFO.xml
    World.xml
    WVWindow.xml

    maps
        88Ds.xml
        acarsAirports.xml
        artcc.xml
        buoy.xml
        counties.xml
        CWAs.xml
        drainageBasins.xml
        fireWxZones.xml
        forecastZones.xml
        interstates.xml
        lakes.xml
        latLonOcean.xml
        metars.xml
        raob.xml
        rfcBoundaries.xml
        states.xml
        statesCounties.xml
        synoptic.xml
        twebRoutes.xml
```

<XML> Bundle

- Map Scale Definition
- Zoom Level
- Center Point Coord.
- Map Projection
- Grid Range
- Load Mode
- Layer Definitions
  - Metadata Fields / File Name
  - Color Map
  - Display Controls

Time matching control

Display Bundle is automatically built as data is selected

Map Bundles Available Under Maps Menu Pull Down

Workstation Volume Browser
Retrieves Views of Data From Grid Repository

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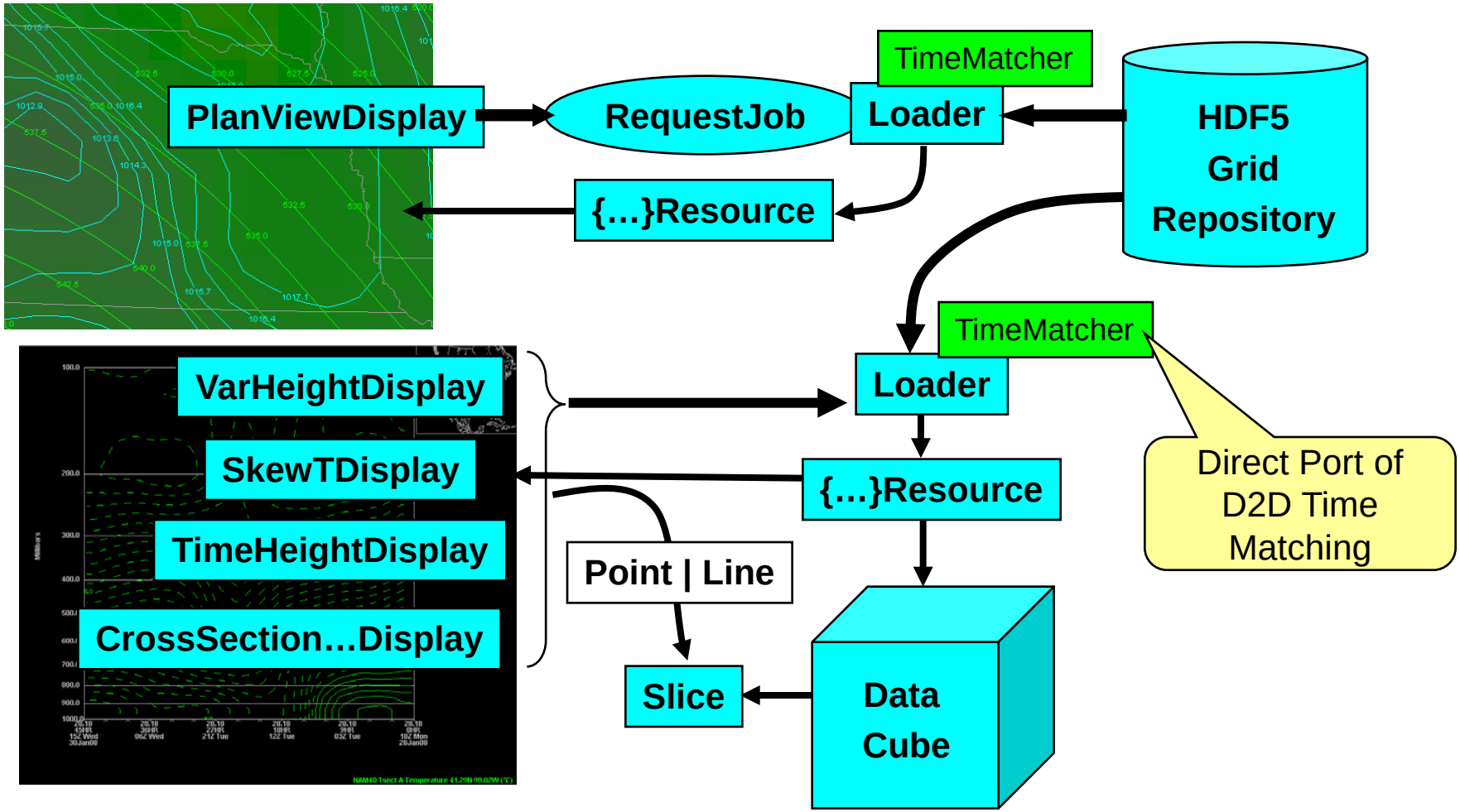
Workstation



Workstation Volume Browser Menus
KOAX menu & Basic included in installation

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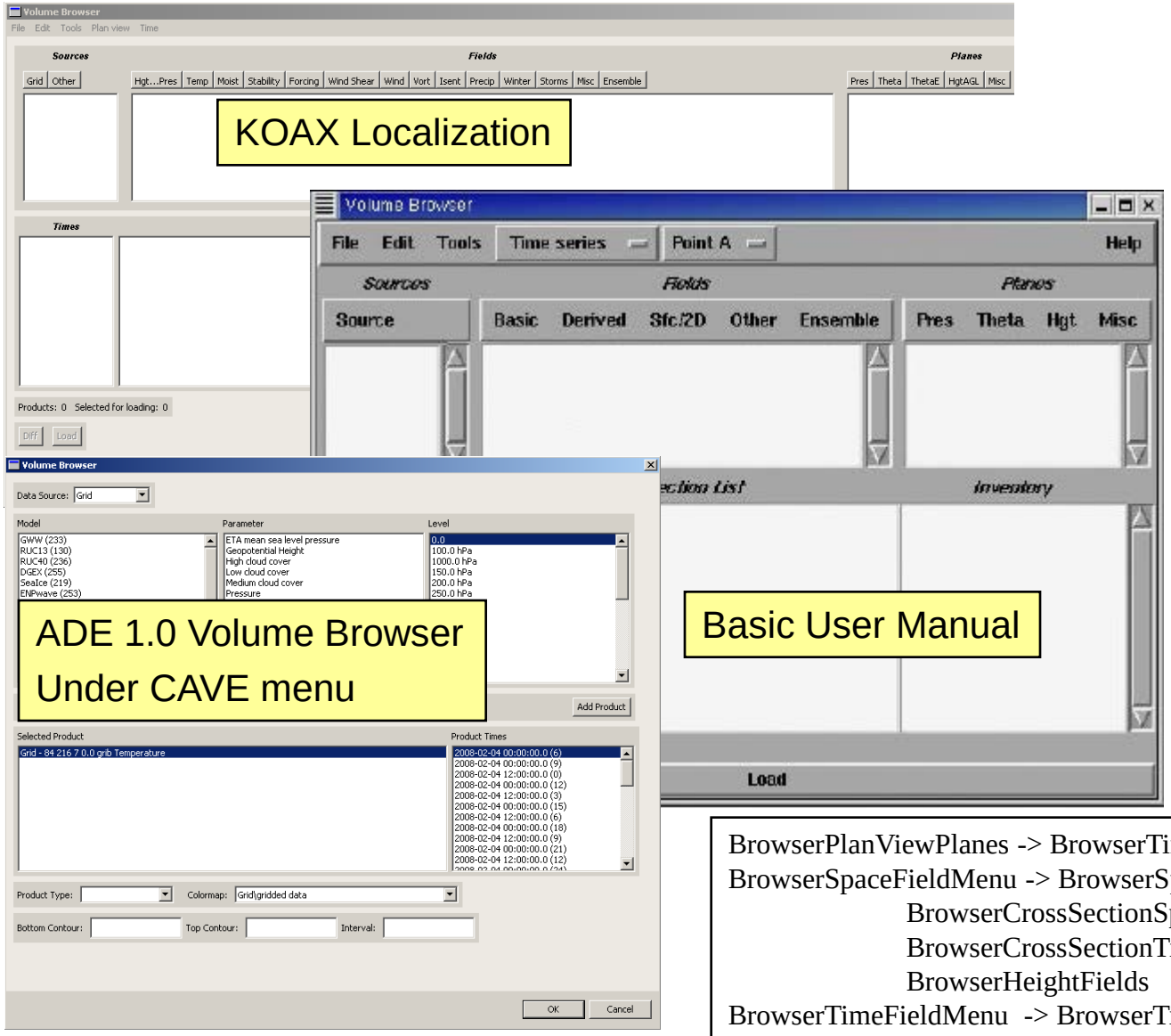
Workstation

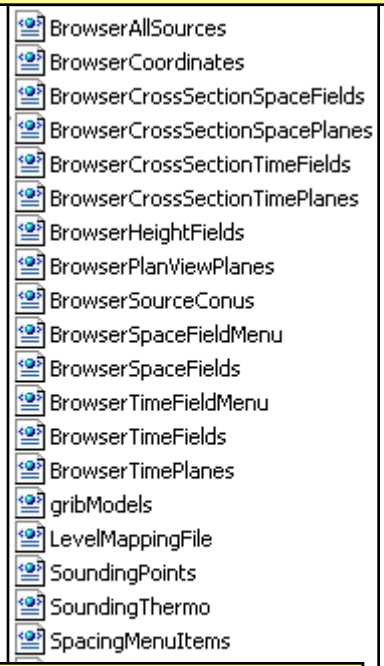


KOAX Localization

Basic User Manual

ADE 1.0 Volume Browser
Under CAVE menu

XML Menu Config
cave/etc/volumebrowser



Rename Files To
Create Basic Version

BrowserPlanViewPlanes -> BrowserTimePlanes
BrowserSpaceFieldMenu -> BrowserSpaceFields,
BrowserCrossSectionSpaceFields,
BrowserCrossSectionTimeFields,
BrowserHeightFields
BrowserTimeFieldMenu -> BrowserTimeFields
BrowserSourceConus -> BrowserAllSources

Workstation Plot Model and Maintenance
D2D Plot Vector Library Converted to SVG (XML)

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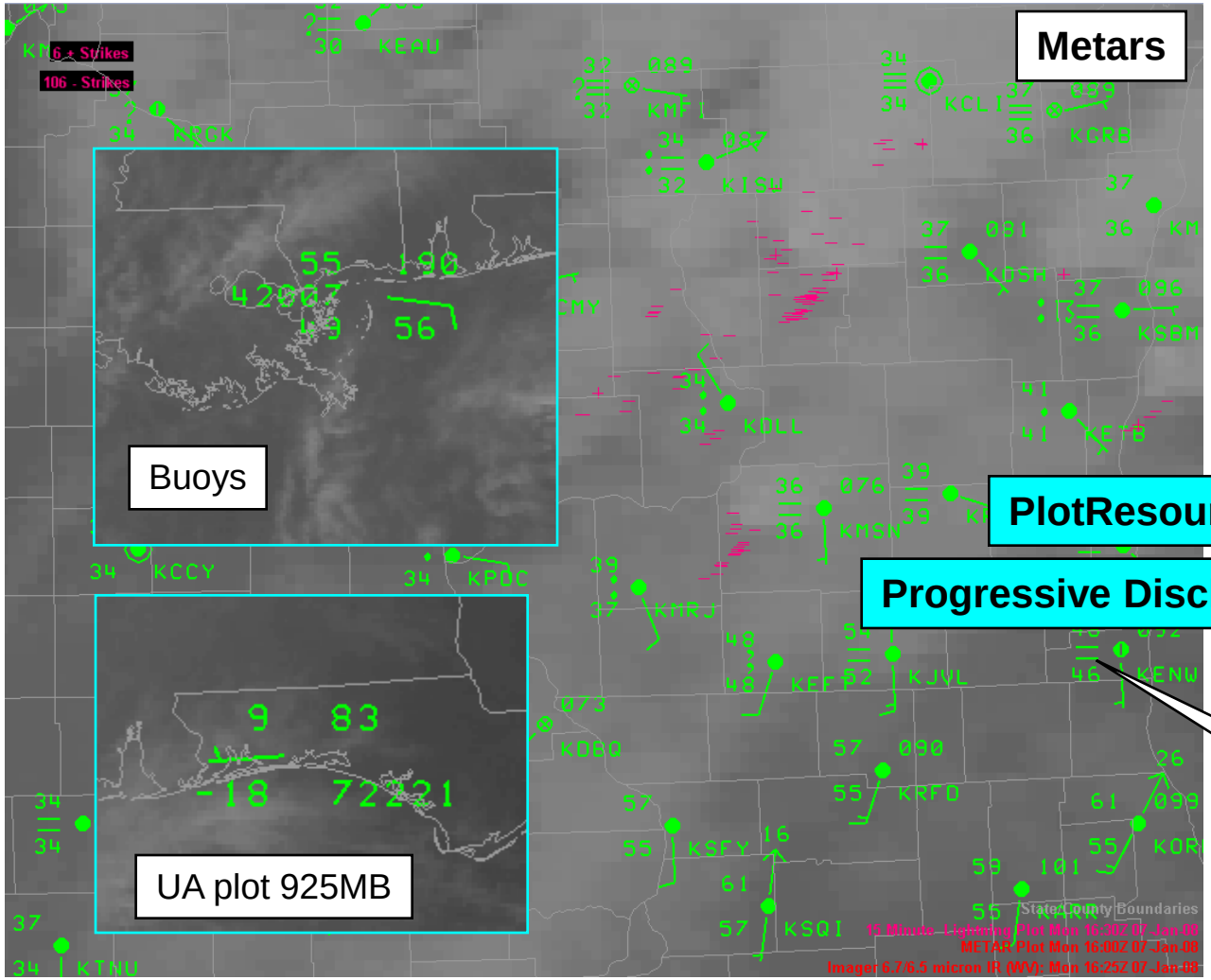
Workstation



Obs MetaData & Parsed data fields

{...} Plug In

Job

PlotModel Generator

PlotResource

Progressive Disclosure

SVG Plot Models

Entire D2D present Wx symbol set converted to SVG

Workstation Color Map Editor
Replicates D2D with transparency control

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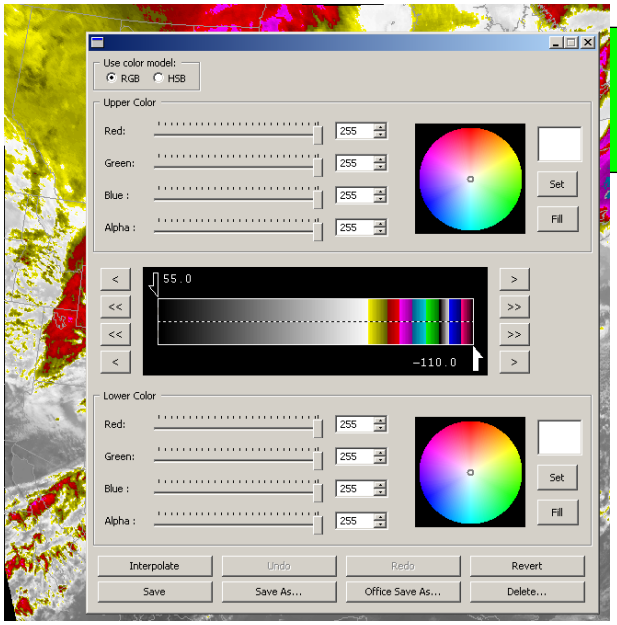
Workstation



Color Maps Stored on Server

Eclipse RCP Plug In
.viz.ui

Also, set background color dialog

SaveColorMapDialog → UtilitySrv

../cave/etc/colormaps/..

Local Storage
Initialized During Localization

Color Map XML Format
(unlimited number of colors)

```
<colorMap>
    <r>..</r>
    <g>..</g>
    <b>..</b>
    <a>..</a>
</colorMap>
```

```
../data/utility/cave_static/base/colormaps
                                ./site/colormaps/koax
                                ./user/colormaps
```

Workstation Text WS and Editor
Implemented as 2 RCP plug ins in CAVE

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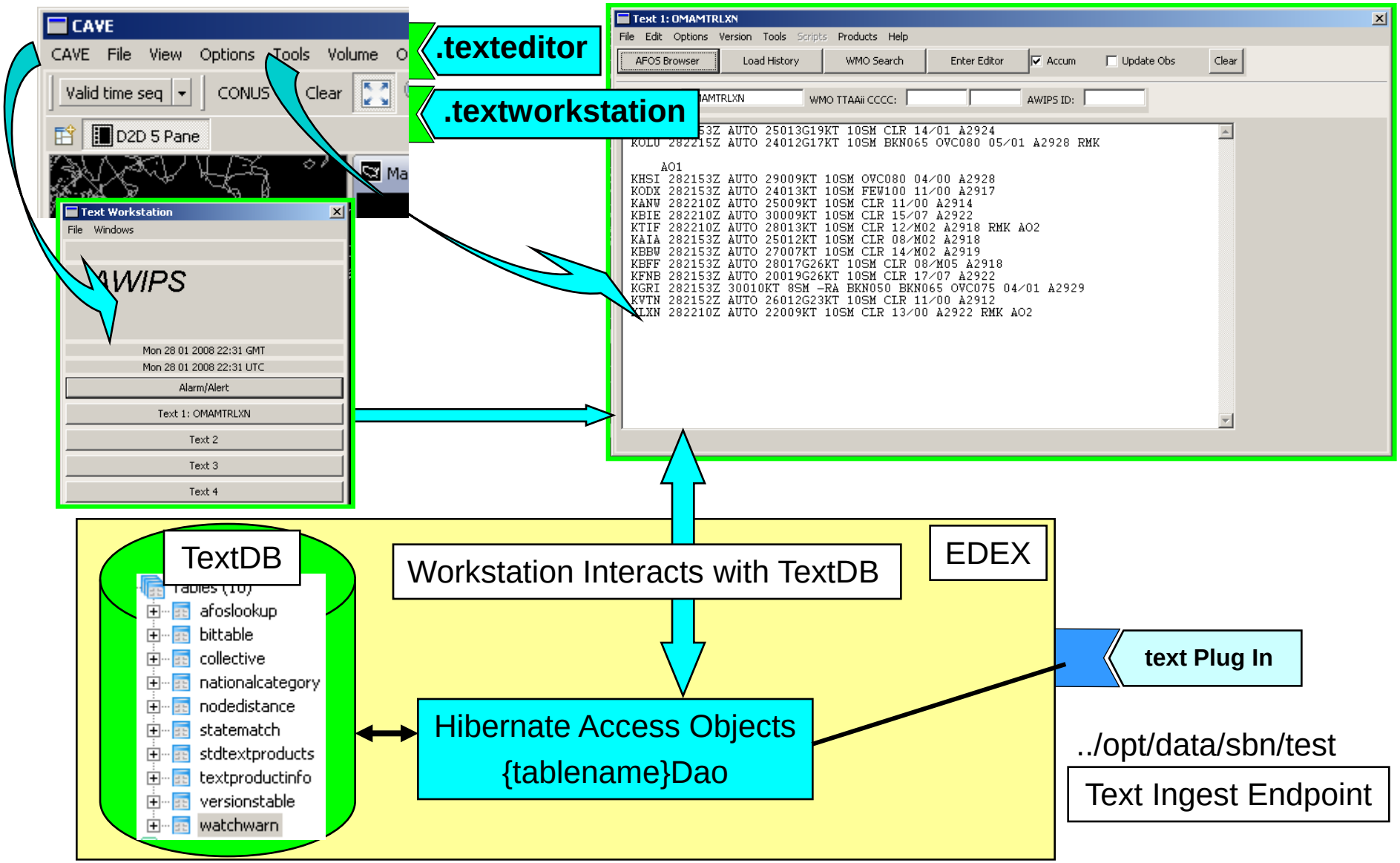
Workstation



Workstation Warning Generation

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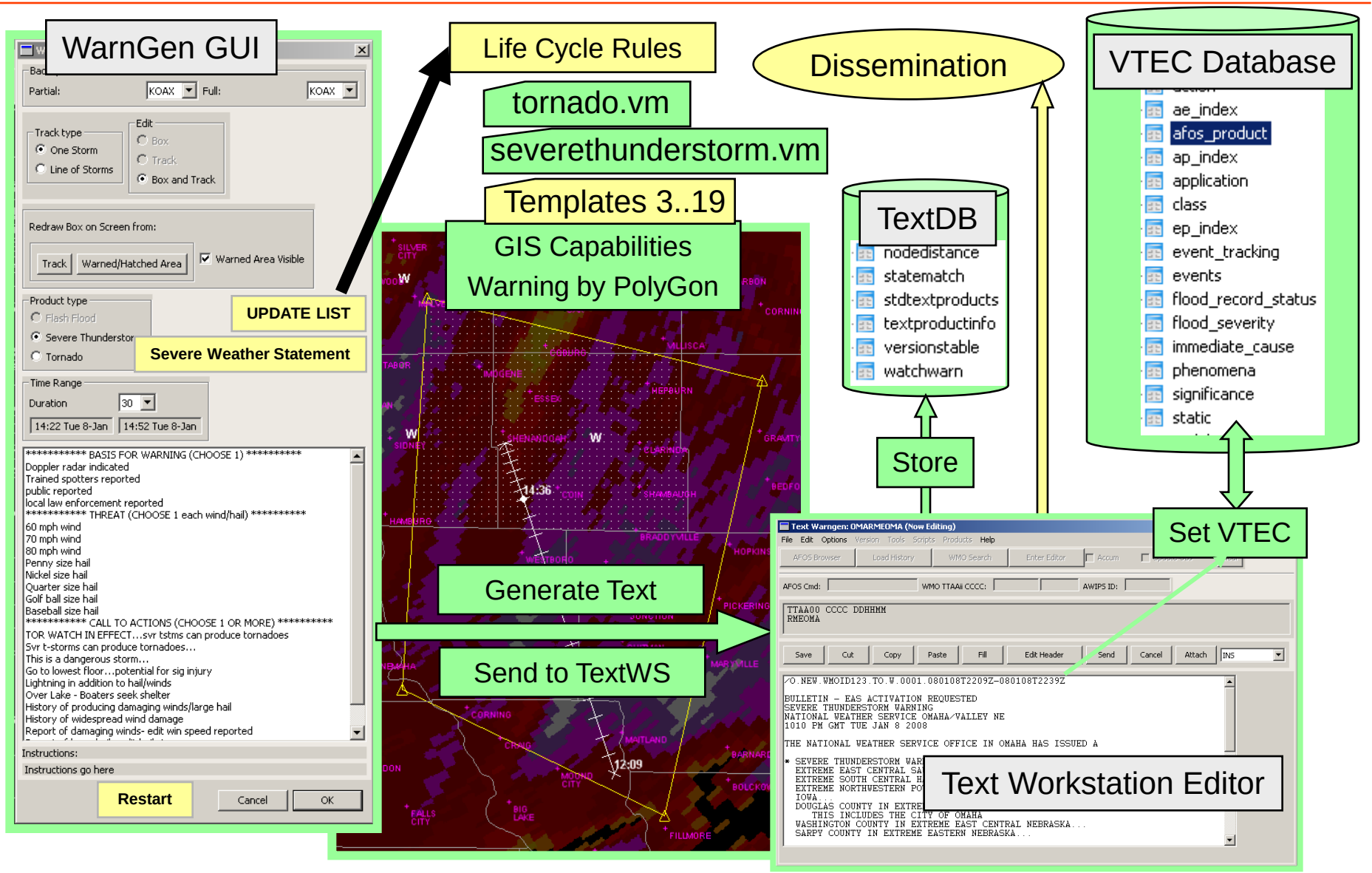
T08 Delivered

T09+ Delivered

Workstation



Workstation Radar Display

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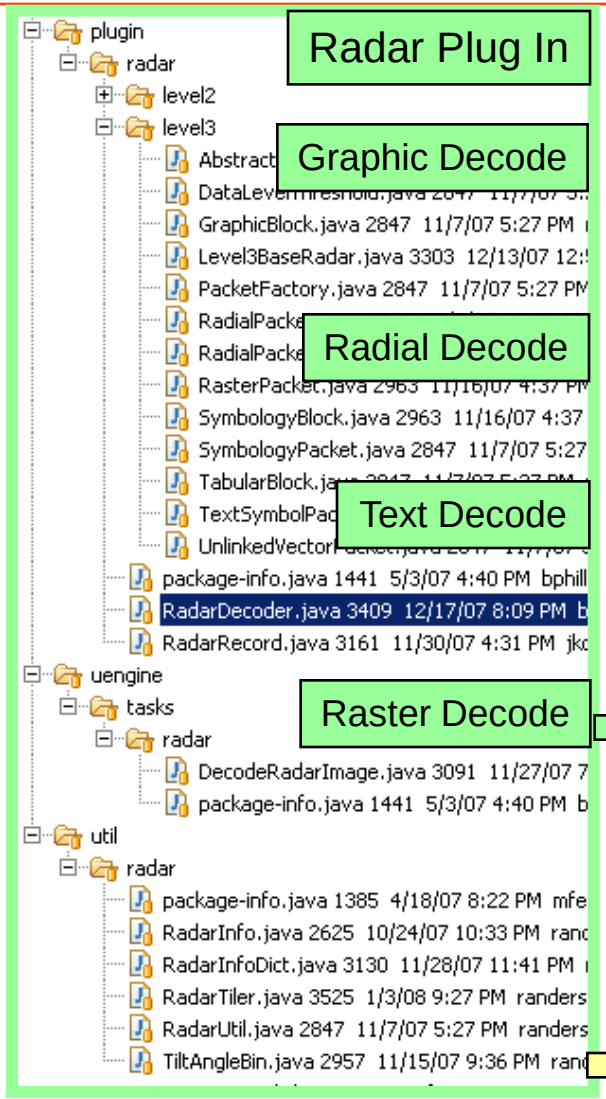
T08 Delivered

T09+ Delivered

Workstation



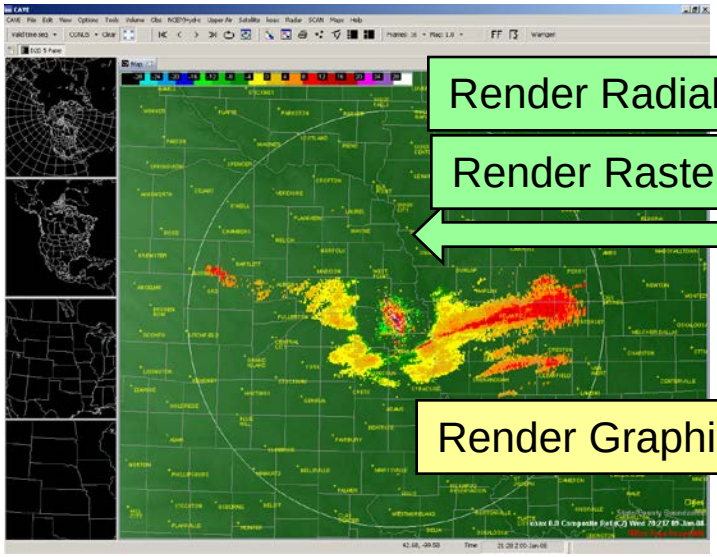
Radar Plug In

Graphic Decode

Radial Decode

Text Decode

Raster Decode



Render Radial

Render Raster

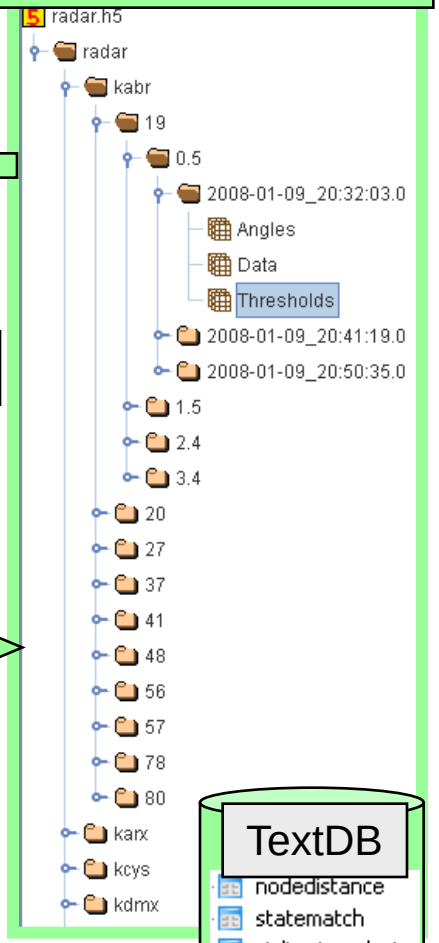
Render Graphic

Store Radar Radial Products

Store Radar Raster Products

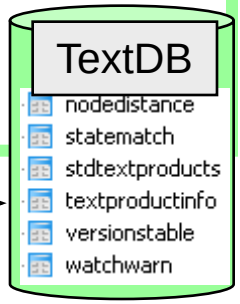
Store Radar Graphic Products

Radar HDF5 Storage



Post Radar Text Products

TextDB



Workstation Skew-T Display
Displays both UA and Model data

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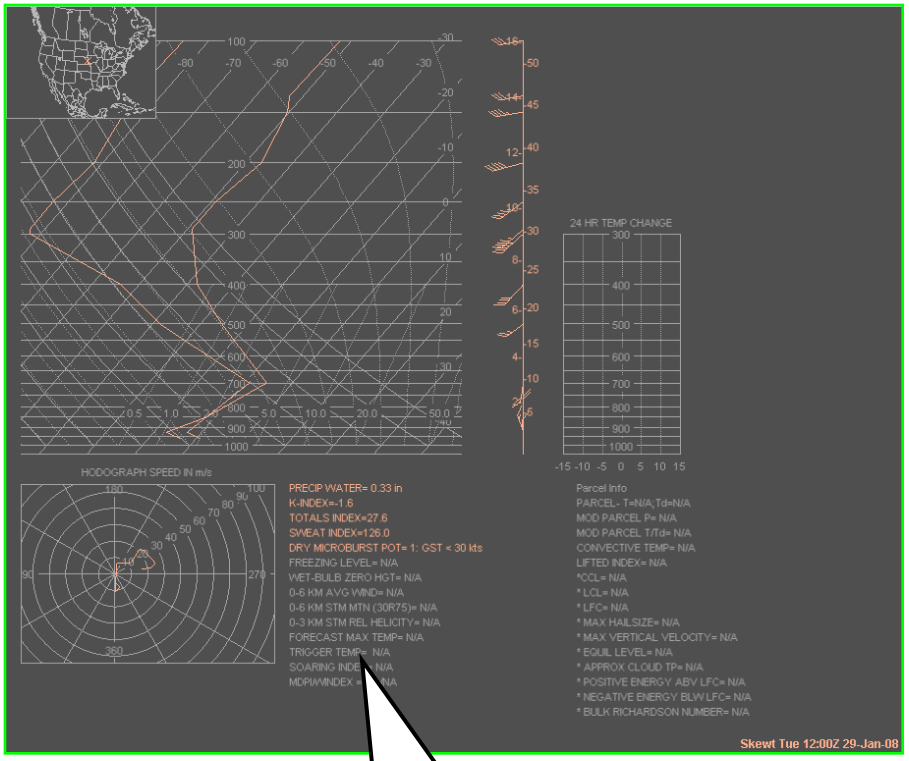
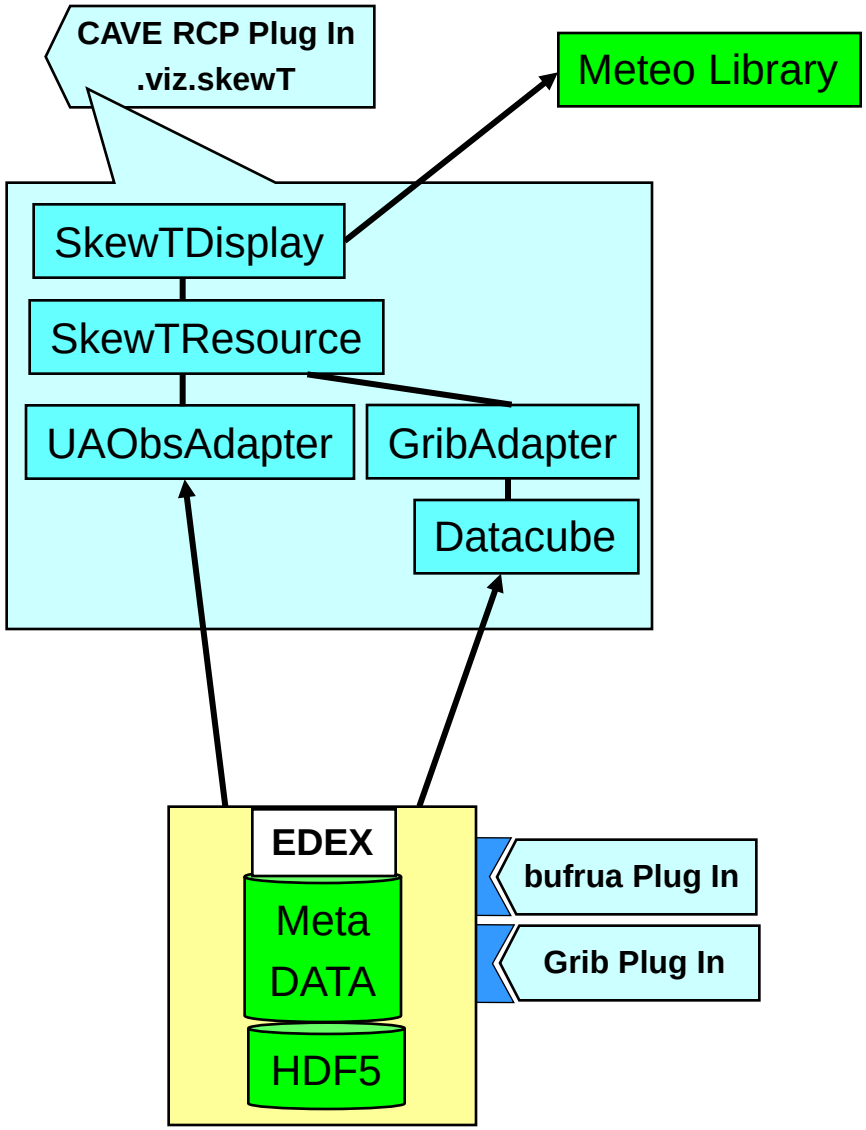
Workstation



Dependency on Fortran function with problem in JAVA interface



SOA Services
Utility, Maps, Radar Message Handler

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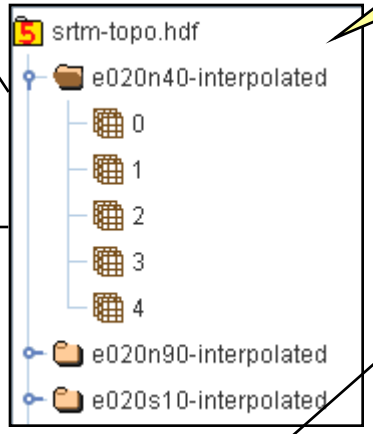
SOA

SRTM Plus from UCSD
- SRTM30 products from USGS EROS
- Ocean data from LDEO project
- 30sec resolution (~1km)

./CAVE/topo

Stored in decimated blobs to support Quad Titling

./CAVE/basemaps



TopoQuery
+getHeight()
+getTopoPoint()
+getTopoLine()
+getTopoArea()

Map Overlays Imported:
- BCD Files
- GeoTIFFs
- LPI Files
- Shapefiles
- SPI Files

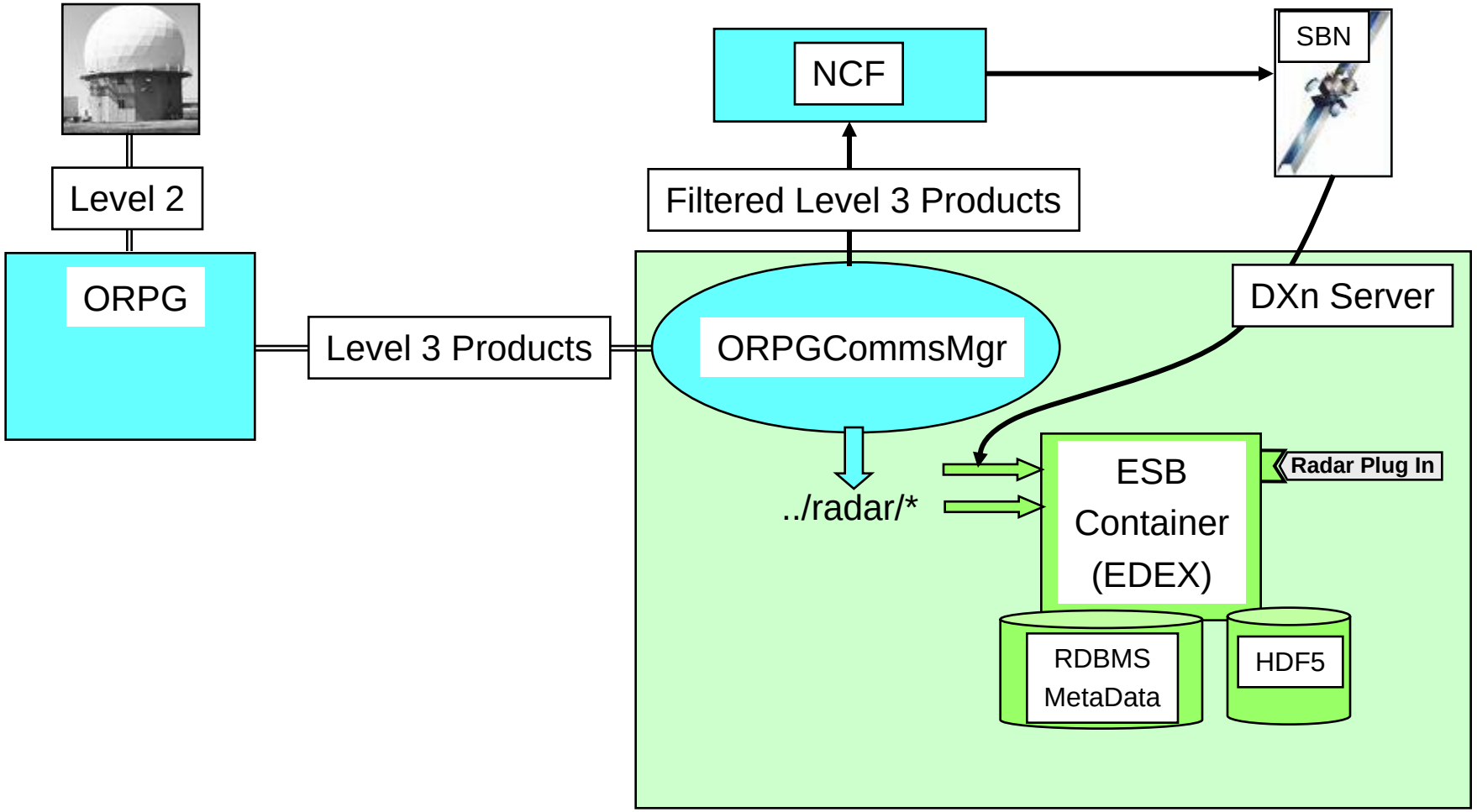
METARs
Used to support disclosure in Plot models.

T08 Radar Implementation

Reuse of AWIPS I

NEW AWIPS II

SOA



SOA Data Type Plug Ins

- Bin lighting (plugin-binlightning) → binlighting.h5
- GINI Satellite (plugin-satellite) → satellite.h5
- Grib 1 and 2 (plugin-grib) → grib.h5
- BUFR with RAOB (plugin-bufrua)
- Aircraft (plugin-airep, plugin-pirep, plugin-recco)
- Synoptic (plugin-sfcobs)
  - Buoy, Metar, CMAN, Land, MAROB, Mobile, SHIPS
- Radar (plugin-radar) → radar.h5
- TAF (plugin-taf)
- METAR (part of Synoptic)
- Text (plugin-text)
  - Collectives and StdText

Library Capabilities

- VTEC management
- Meteo Library
- Text Generation (XML)
  - Switched from ANTLR parsing of existing templates to creating new Velocity based templates
  - Output text remains the same
- Generalized Time

VTEC Management as a Service
Initial User is WarnGen Text Generation

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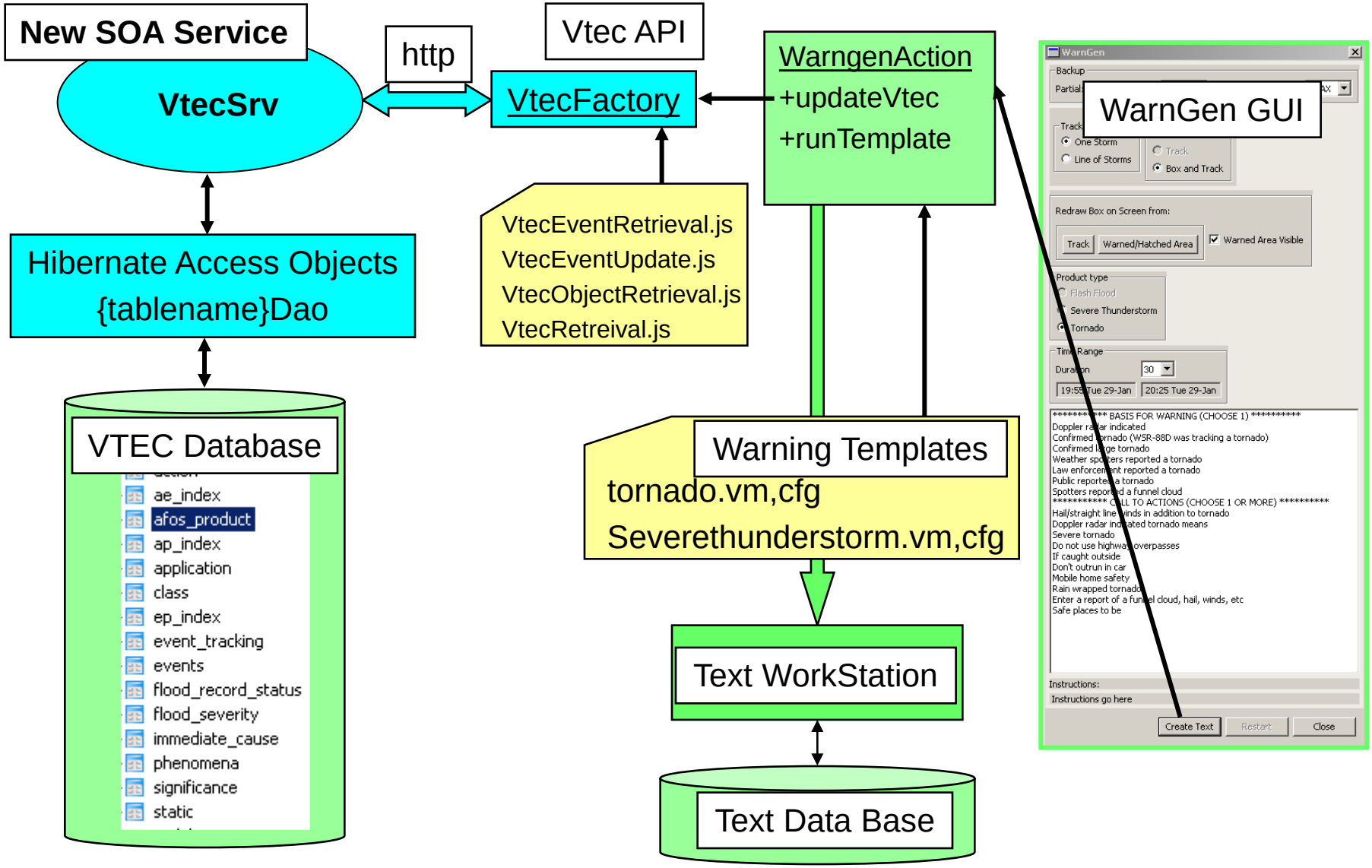
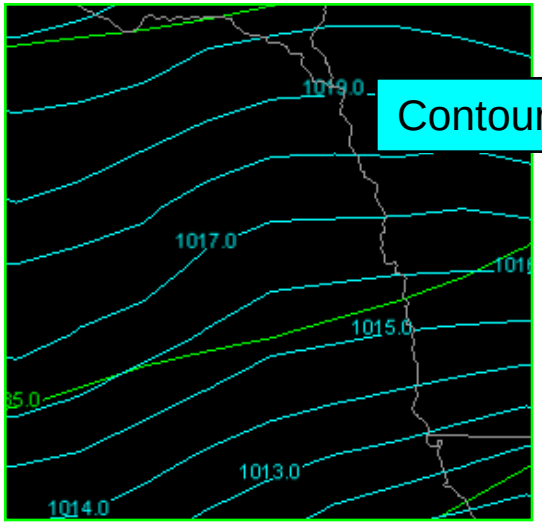
Library



D2D Meteo Library

Library



ContourSupport

T08 Component Users

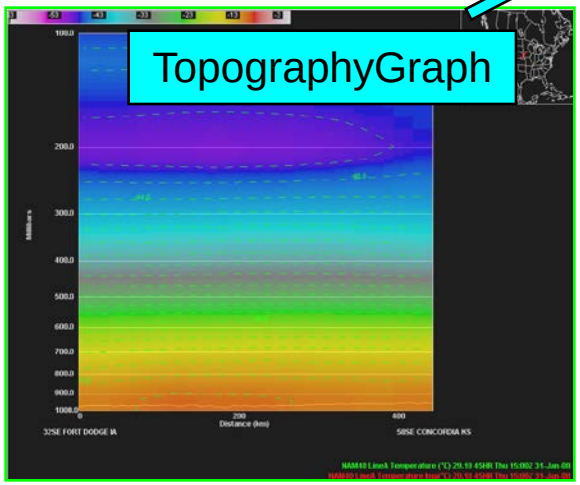
fortconfbuf()

Controller
+add_array()
****
+ztopsa()

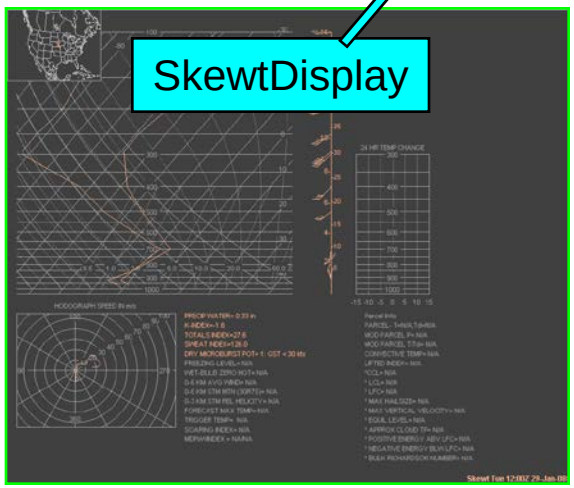
hgt2pres()

calcrh()
Mixrat()
uvcomp()

GlueGen Java
JNI Interface Code



TopographyGraph



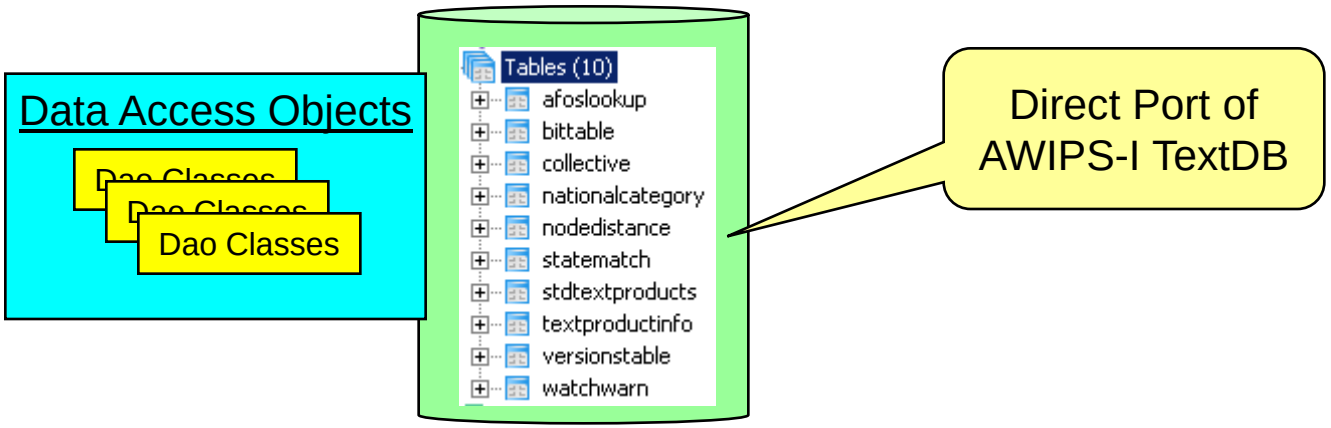
SkewtDisplay

libmeteoLib.so

127 FORTRAN Modules
17 C Modules

Data Management

- Data access refinement (4D data cube)
  - SPRING Data Base Connection Pooling (T06 ran with 1 connection)
  - DaoPool Data access object pooling for improved performance
- Data repository refinement
  - Added automatic index creation on sub tables
- Hydro IHFS repository + Object to Relational Mapping (Hibernate)
- Text Data Base + Object to Relational Mapping



Data Access Improved Performance
By managing data access objects

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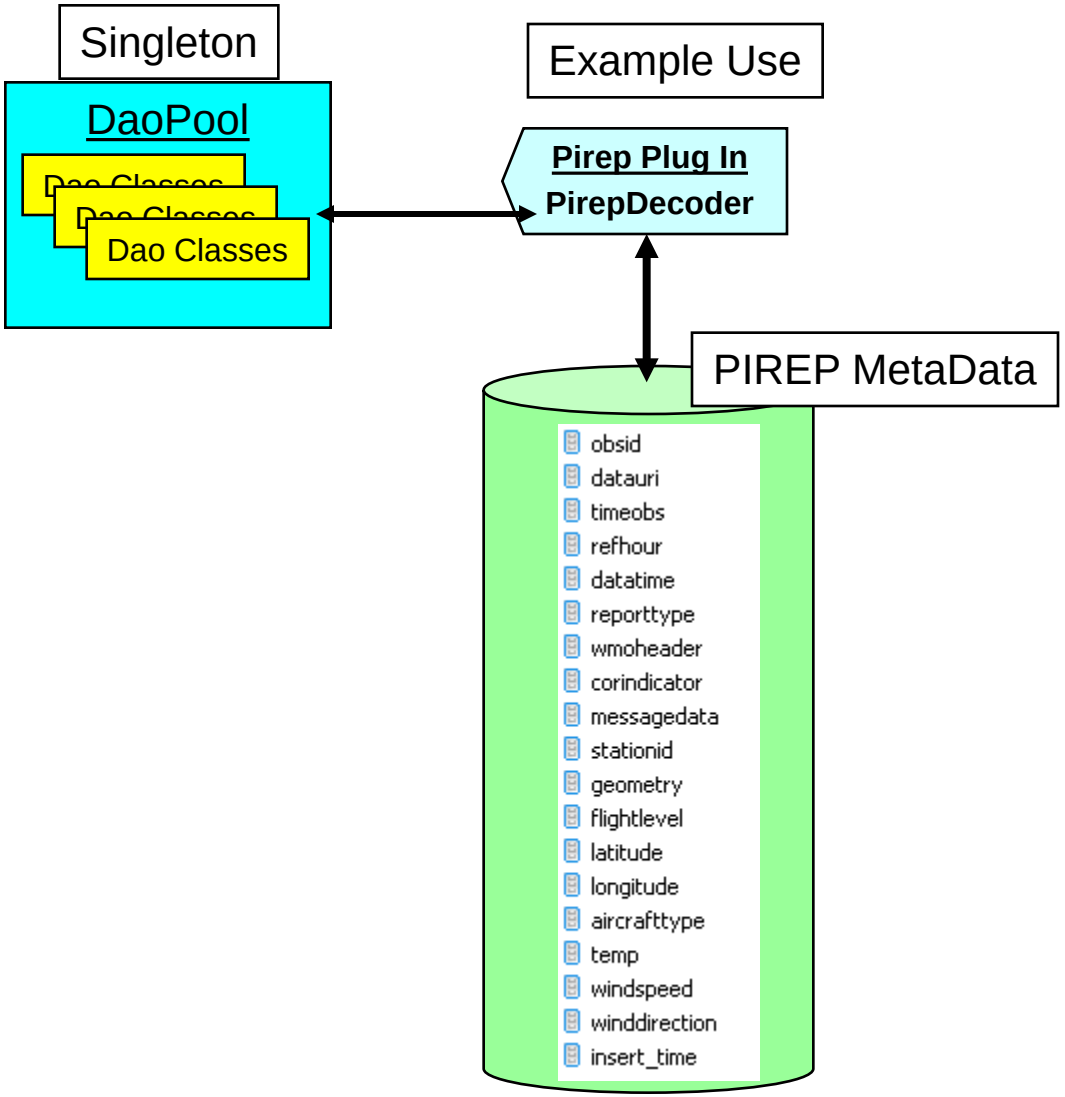
Data

Developed mid T08 to improve ingest performance where queries need to be performed before inserts



Hydro IHFS OB8.1 Data base tables

Middlegen used to auto Generate relational to object mapping files

Hibernate

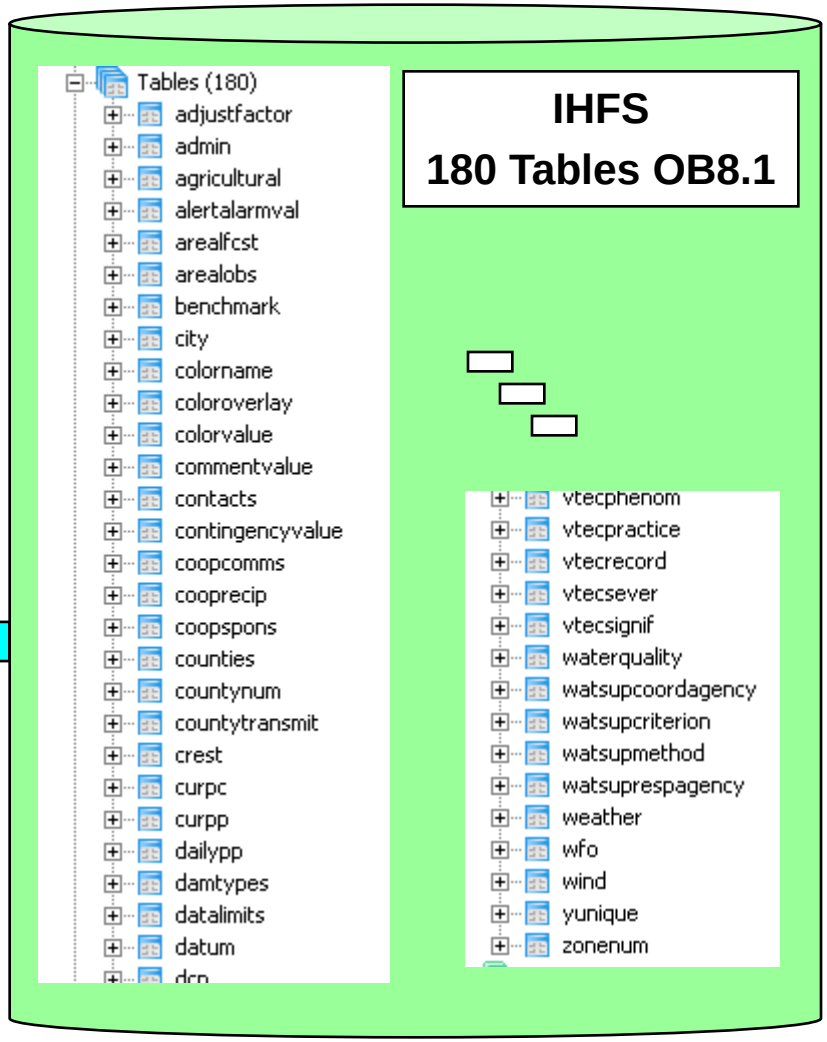
Data Access Objects

Dao Classes

Dao Classes

Dao Classes

One for each table



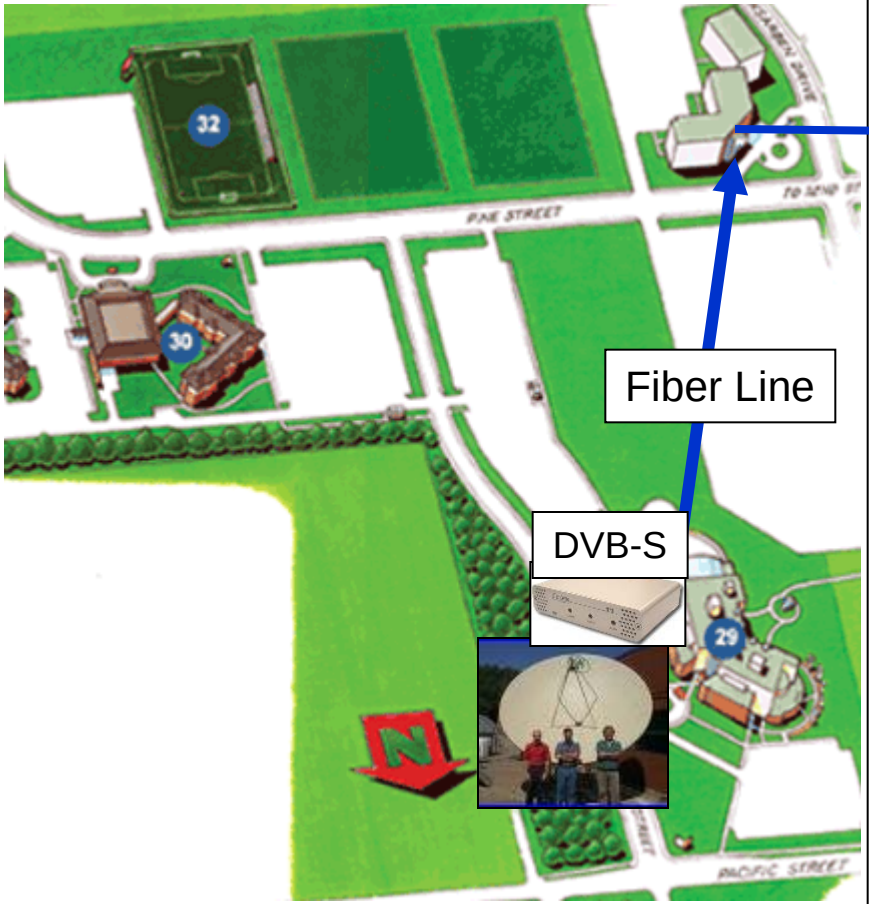
IHFS

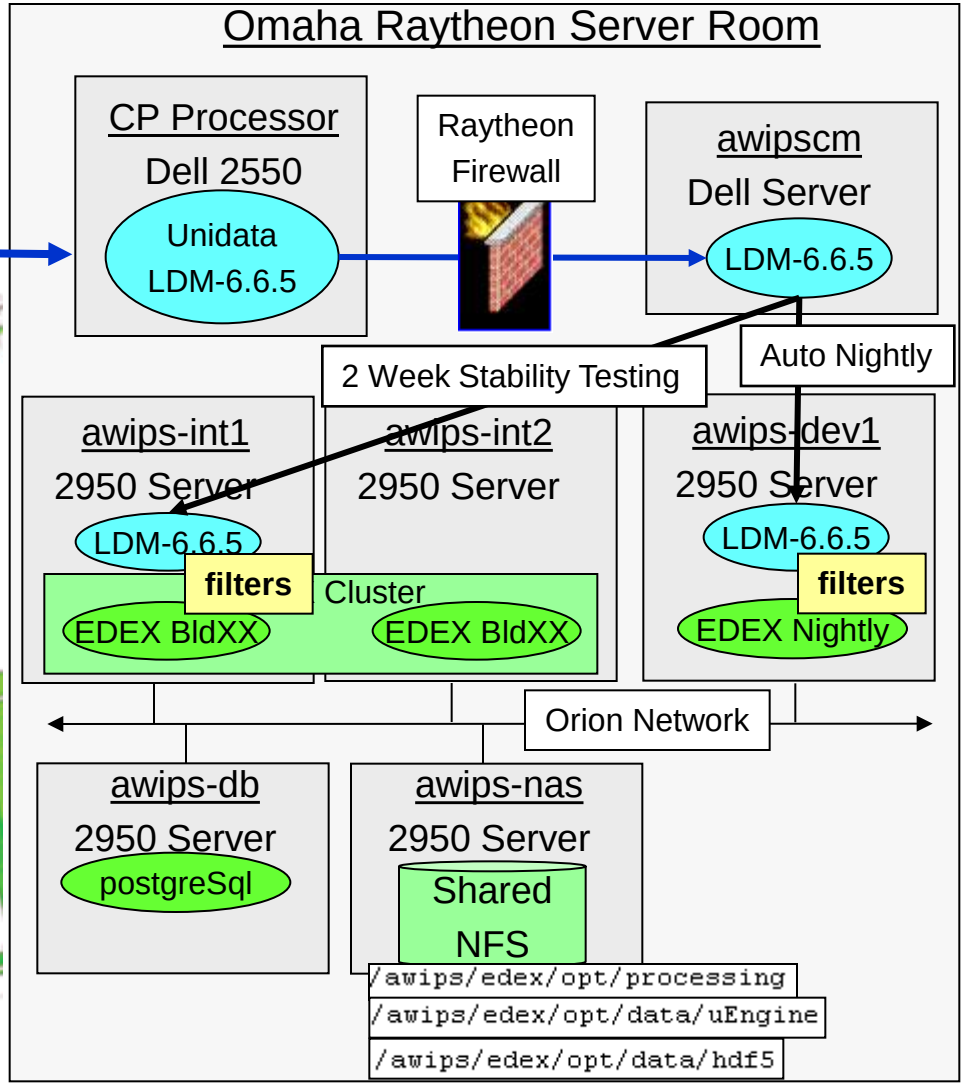
180 Tables OB8.1

T08 Omaha Test Environment
Development and Test Hardware Resources

Raytheon

Testing





T08 Integration Test Bed Metrics

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Testing

Cluster Balance

Date	Status	Staged	INT1	INT2	Back-up	INT1 - INT2	INT1/INT2
Jan 17	Started	90076.0	45034.0	44819.0	223.0	215.0	1.00479
Jan 18	Restarted	535667.0	265177.0	263039.0	7451.0	2138.0	1.00812807226
Jan 19	Restarted	459129.0	229289.0	227261.0	2579.0	2028.0	1.00892366046
Jan 20	Running	484175.0	241914.0	241107.0	1154.0	807.0	1.00334706168
Jan 21	Restarted	506309.0	252632.0	252022.0	1655.0	610.0	1.00242042361
Jan 22	Running	482750.0	241079.0	240802.0	869.0	277.0	1.00115032267
Jan 23	Running	446944.0	222608.0	222303.0	2033.0	305.0	1.00137200128
Jan 24	Running	466300.0	233036.0	232373.0	891.0	663.0	1.00285317141
Jan 25	Running	551221.0	275251.0	274434.0	1536.0	817.0	1.00297703637
Jan 26	Running	510681.0	254616.0	254012.0	2053.0	604.0	1.00237784042
Jan 27	Running	504844.0	251765.0	251350.0	1729.0	415.0	1.00165108415
Jan 28	Running	516073.0	257276.0	256608.0	2189.0	668.0	1.00260319242
Jan 29	Running	514824.0	257018.0	256455.0	1351.0	563.0	1.00219531692
Jan 30	Running	520661.0	260014.0	259117.0	1530.0	897.0	1.00346175666
Jan 31	Running	544135.0	271400.0	270993.0	1742.0	407.0	1.00150188381
Feb 01	Running	511407.0	255110.0	254210.0	2087.0	900.0	1.00354038
Feb 02	Running	509035.0	253799.0	253139.0	2097.0	660.0	1.0026072632
Feb 03	Running	510307.0	254583.0	253843.0	1881.0	740.0	1.00291518773
Feb 04	Running	523487.0	261055.0	260432.0	2000.0	623.0	1.00239217915
Feb 05	Running	321776.0	160503.0	160537.0	736.0	-34.0	0.999788210817

T08 AWIPS-II Cumulative Memory Profiles
Small Leak Noted: Working with profiling tools

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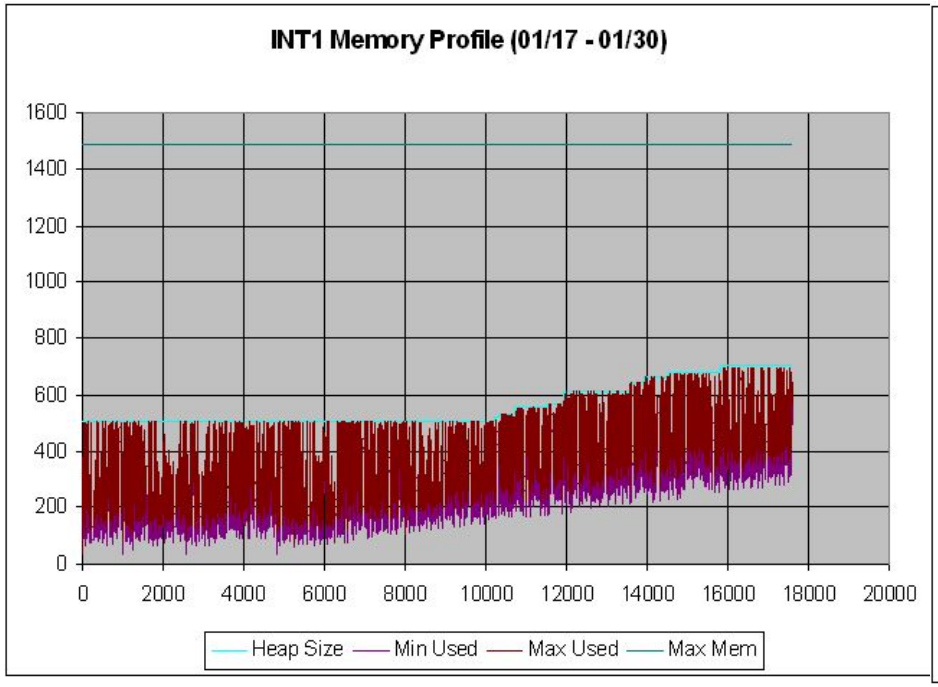
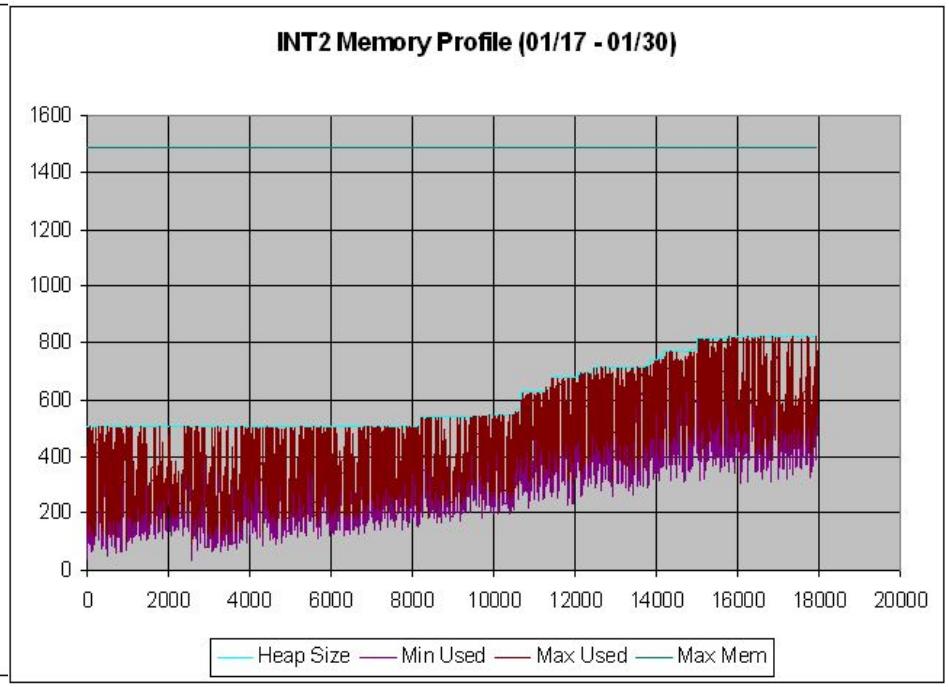
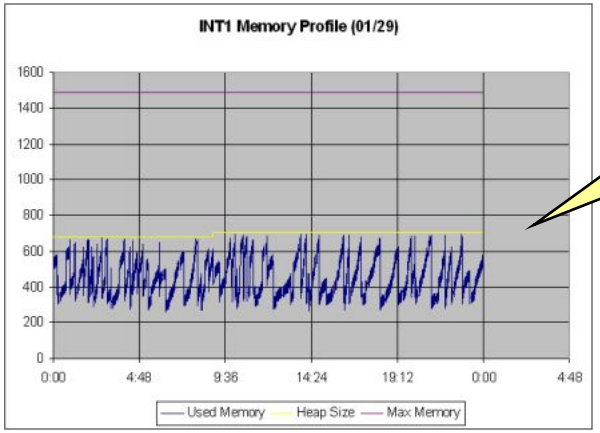
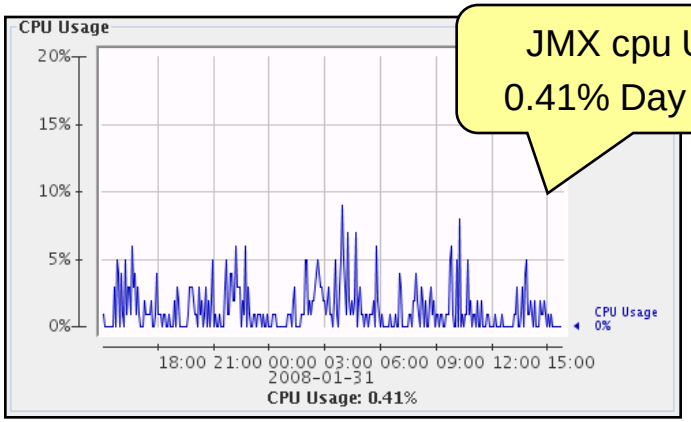
Testing







Example Daily Profile



JMX cpu Useage
0.41% Day Average