

AWIPS Continuous Technology Refresh (CTR)

AWIPS Software CTR

TO9: Outbrief

September 4, 2008



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T09 Outbrief Introduction

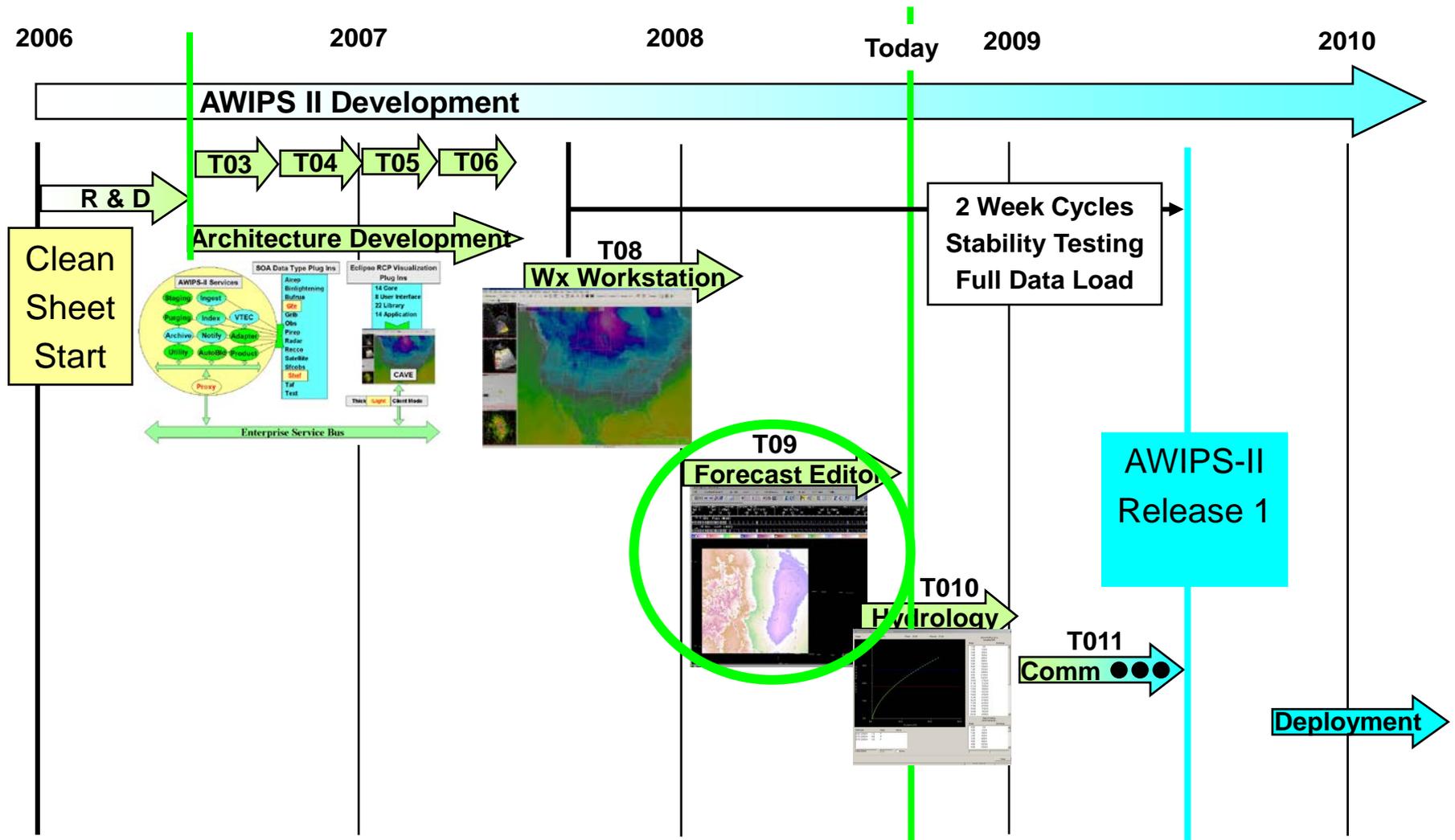
- AWIPS-II T09 Summary
- AWIPS-II Architecture Update
- AWIPS-II GFE Architecture
- AWIPS-II Workstation (CAVE) Capabilities
- AWIPS-II Hydro (Advanced Development)
- AWIPS-II Stability Testing
- AWIPS-II Architecture Evolution
- AWIPS-II Demo Scenario
- AWIPS-II T09 Delivery ReadMe

- Primary task is to migrate Graphic Forecast Editing (GFE) capability to the new AWIPS-II developed architecture
 - Performed GFE workstation capabilities migration
 - Performed server side migration to replace IFPServer
 - Text production generation infrastructure
 - SmartTool and SmartInit interfaces
- Add data ingest capabilities for BUFR, RedBook, and Text Warnings
- Added python based derived parameter capability
- Migrated AvnFPS application into AWIPS-II
- Performed additional risk reduction for Hydro
 - Hydro View Perspective, SHEF Plug In with live data testing, limited time series display (Initial end-to-end shef ingest to IHFS to timeseries)
- Limited T08 DR fixes and numerous infrastructure improvements

T09 Made Infrastructure Improvements

- Added Python as uEngine scripting language
 - Developed a JAVA bridge to Python's "numpy" (Jepp+)
 - Linked to BLAS for high performance matrix operations
- Added Velocity Templates for automatic uEngine script generation (enables both Javascript & Python)
- Performed 4D data cube optimization
 - Improved Grid Tree Data Structure for performance improvements
- Improved Localization infrastructure
 - GFE uses localization dynamically which is a shift from AWIPS-I
- Improved CAVE alerting (notification) pattern with a new observer API
- Changed CAVE communication to HTTP from JMS for requests
- Added a HTTP data retrieve capability for light client operations (Note: IRAD prototype)

AWIPS-II: Development Sequence, T09 is GFE+ 3 to 6 month fixed price task orders



Spiral Development with Interim Deliveries

AWIPS-II T09 Services and Plug Ins

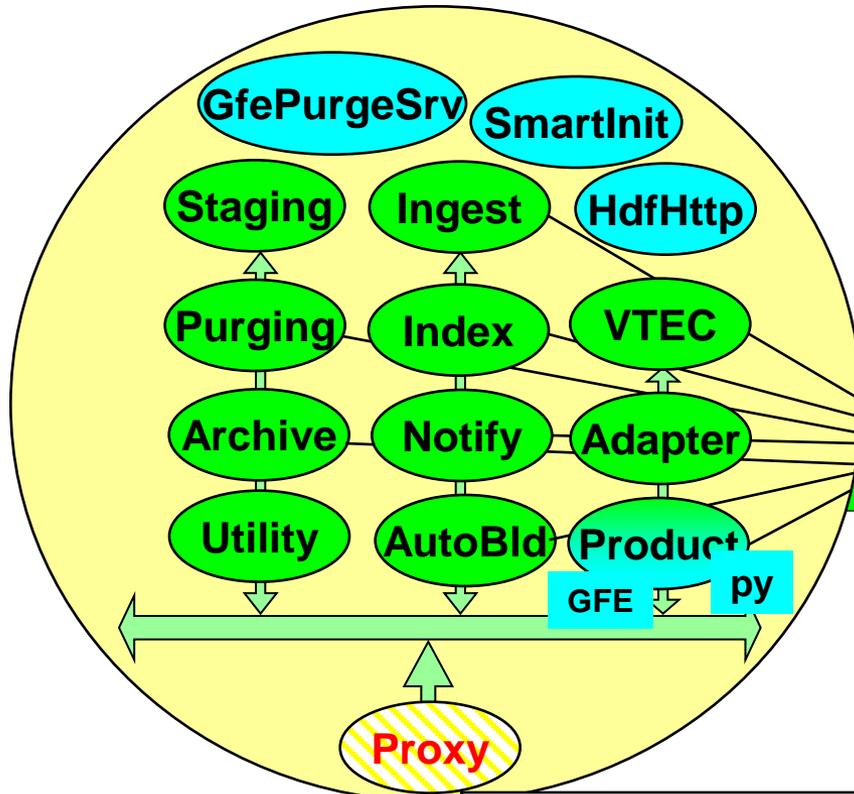
ESB SOA Plug In Adaptable

T010 Improve

T09

Future

Architecture



AWIPS-II Services

- Airep (22 total)
- Binlightening
- Bufmos 801
- Bufrua
- ccfp 268
- Gfe 10808
- Goessounding 547
- Grib
- modelsounding 846
- Obs
- Pirep
- poessounding 598
- profiler 560
- Radar
- Recco
- redbook 730
- Satellite
- Sfcobs
- shef 3973
- Taf
- Text 678
- warning 1115

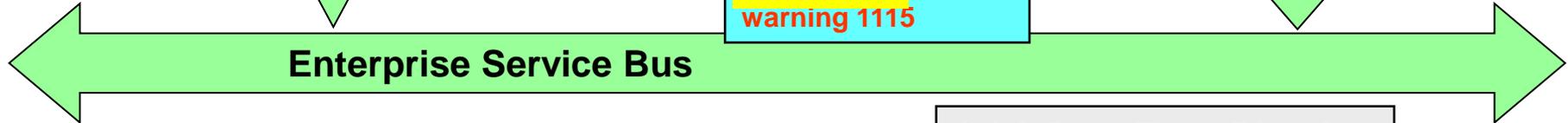
Eclipse RCP Visualization Plug Ins

14 Core	GFE 26944
8 User Interface	Redbook 619
22 Library	Python Editor 122
14 Application	Hydro 10039
	aviation(avnFPS) 11539



CAVE

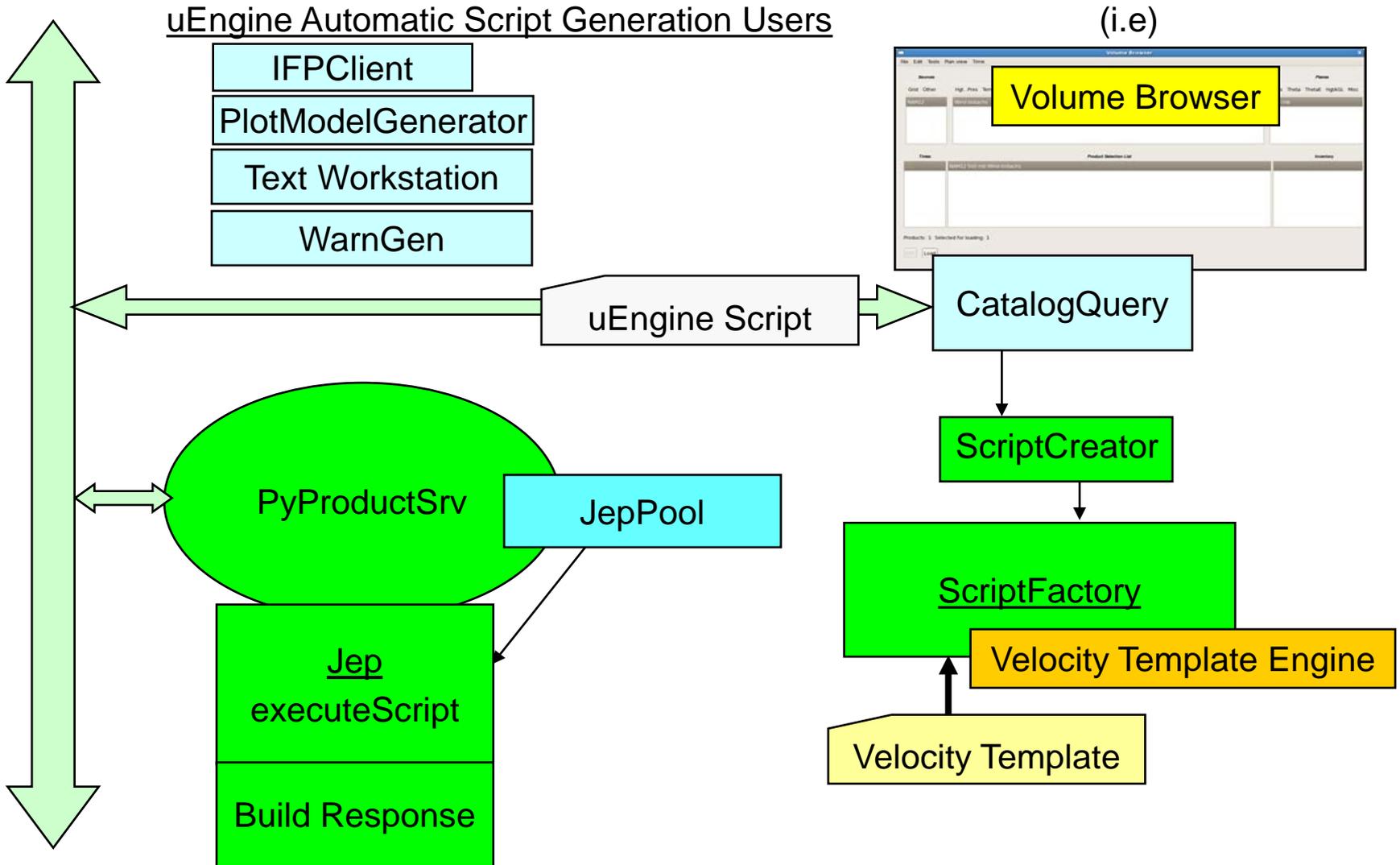
Thick /Light Client Mode



SOA Data Type Plug Ins

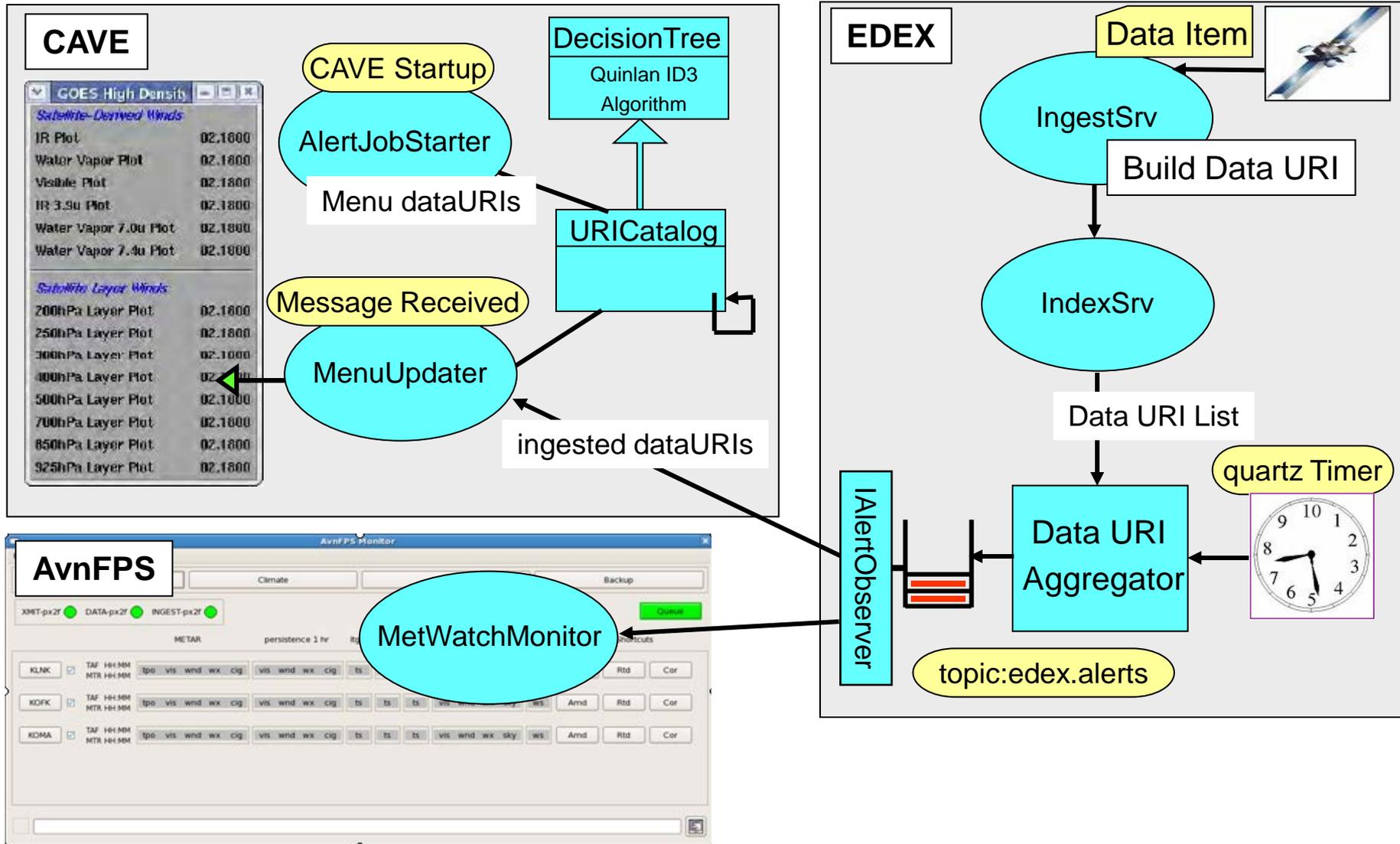
uEngine Scripting Changed to Python

Enables common scripting language, and numpy benefits



T09 Alerting Pattern Update

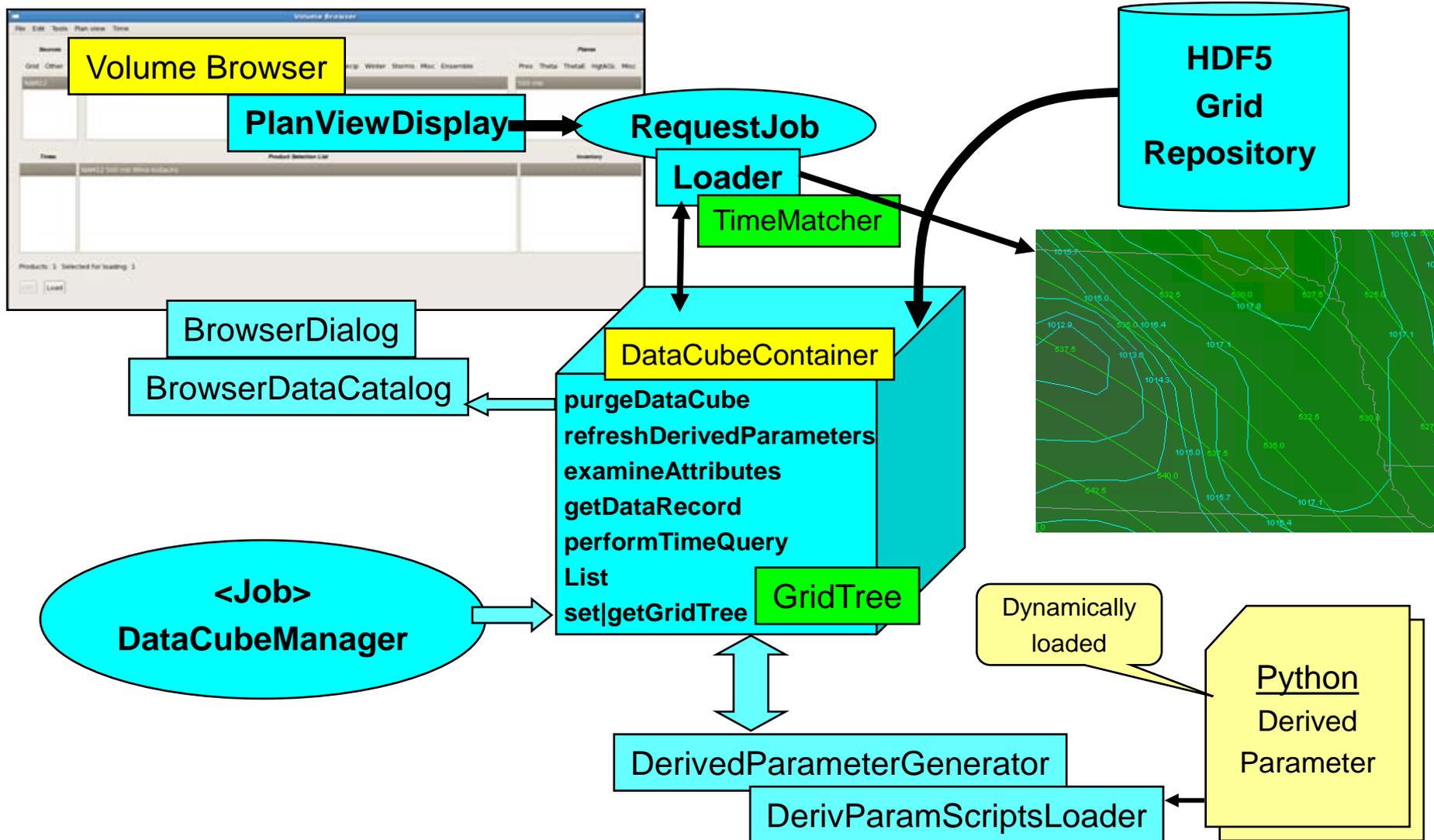
Added Observer Interface to enable multiple users



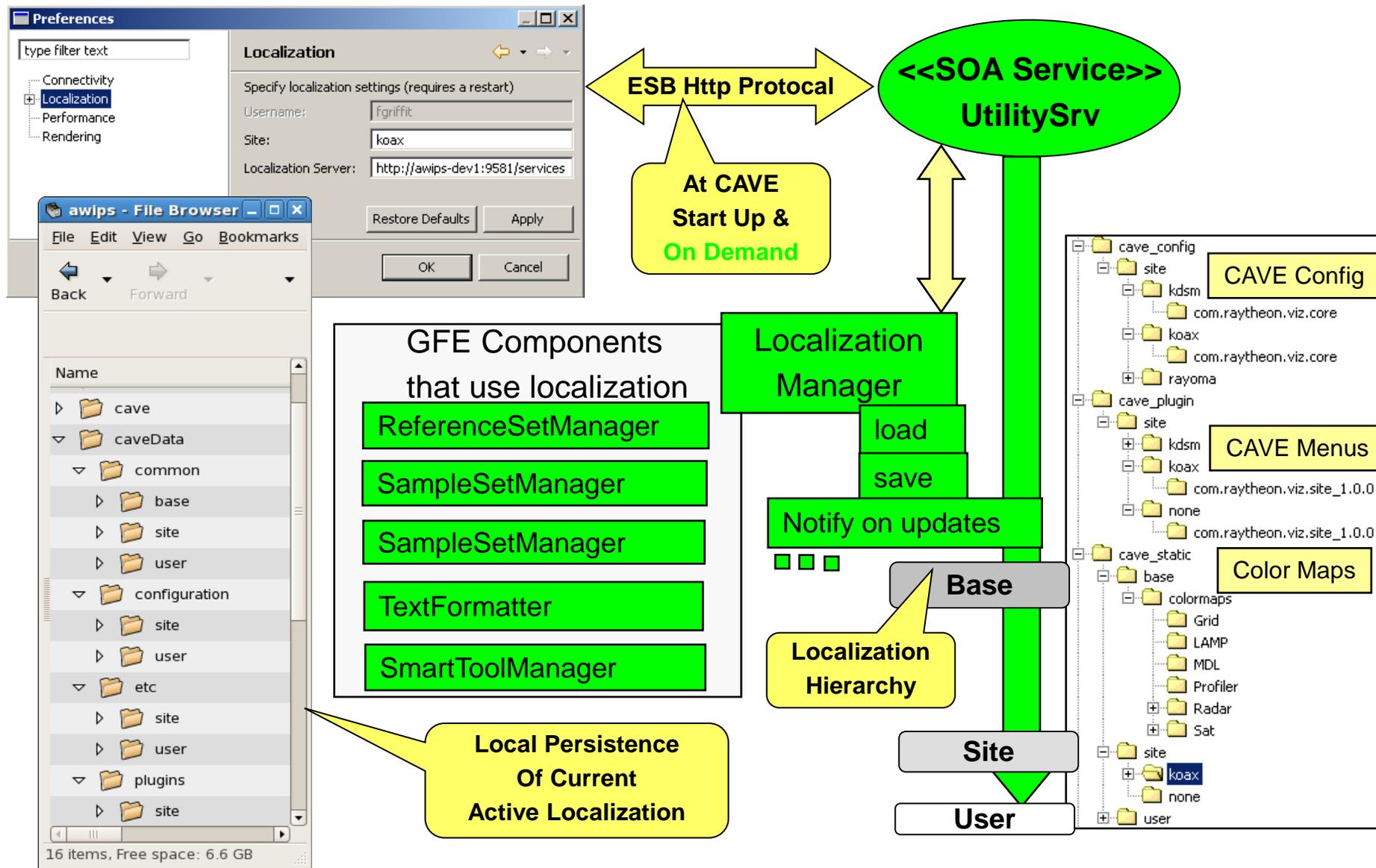
T09 Data Cube Enhancements

Redesigned data cube to enhance performance & flexibility

Architecture

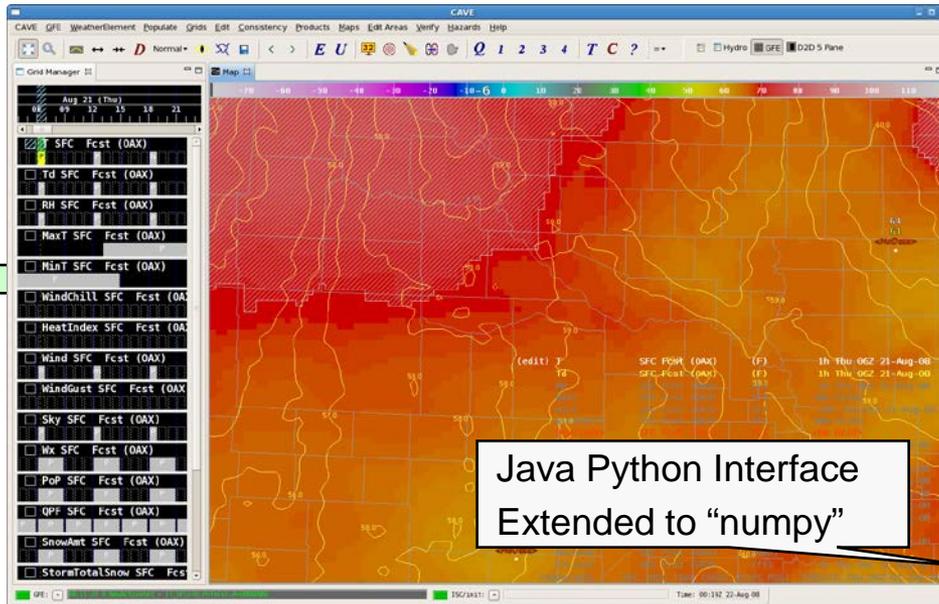


CAVE Localization Enhancements Uses UtilitySrv with a HTTP interface



GFE High Level Implementation Approach

Plugins and Python with Java Bridge



Java Python Interface
Extended to "numpy"

- GFE Eclipse RCP Plug In**
- Dialogs (60)
 - Actions (60)
 - Grid Edit Tools
 - GridManager
 - Interpolation
 - Display Resource
 - Sampler
 - Smart Tool Interface
 - Text Formatter Launcher
 - Color Bar
- Perspective
Query
Core
(51 classes)
Python Ed

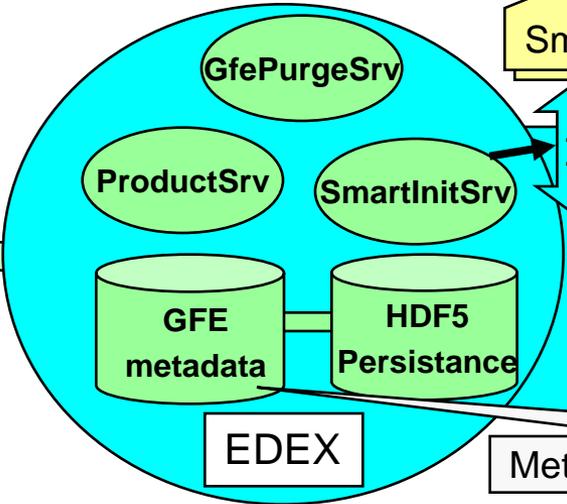
Jepp +

307 Java Classes
26944Lines

SmartInit

SmartTools

TextFormatters



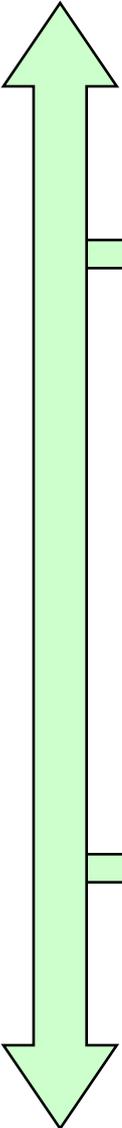
EDEX

Jepp +

- GFE SOA Plug In**
- Services
 - Smart Init
 - uEngine Tasks
 - Locking
 - notification
 - Db access
 - Data Types
 - History
 - Purging

114 Java Classes
10808Lines

Metadata pattern extended to non-partitioned tables



T09 GFE Perspective in CAVE

GFE Menus & tool bar

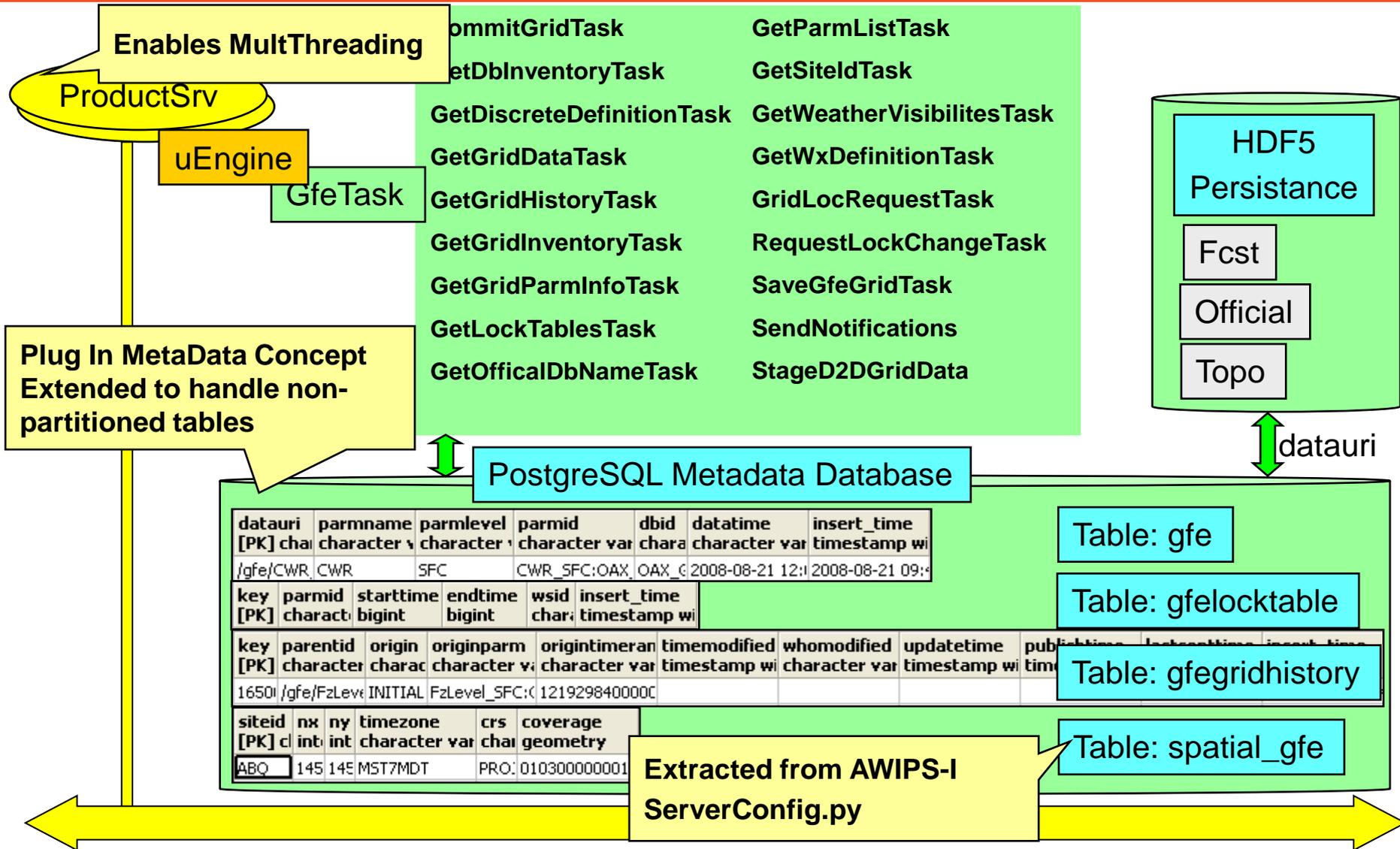
The screenshot displays the CAVE software interface with several callout boxes highlighting key features:

- Grid Manager Implemented as Eclipse View:** Points to the left-hand sidebar containing a list of weather variables such as SFC, Td SFC, MinT SFC, WindChill SFC, HeatIndex SFC, Wind SFC, WindGust SFC, Sky SFC, Wx SFC, PoP SFC, QPF SFC, SnowAmt SFC, and StormTotalSnow SFC.
- Sample Sets as XML files. Managed by localization:** Points to the top menu bar, specifically the 'Edit Areas' and 'Verify' options.
- Edit Areas stored as XML files. Managed by localization:** Points to the 'Edit Areas' menu item.
- Pydev Editor in Eclipse Perspective:** Points to the top right corner of the interface.
- Notification Pattern enables the updates:** Points to the 'GFE' button in the top toolbar.
- Spatial Editor Leverages GIS rendering capability of CAVE:** Points to the main map area, which shows a weather map with various data overlays and a color scale at the top.

T09 GFE Server (IFPServer reengineer)

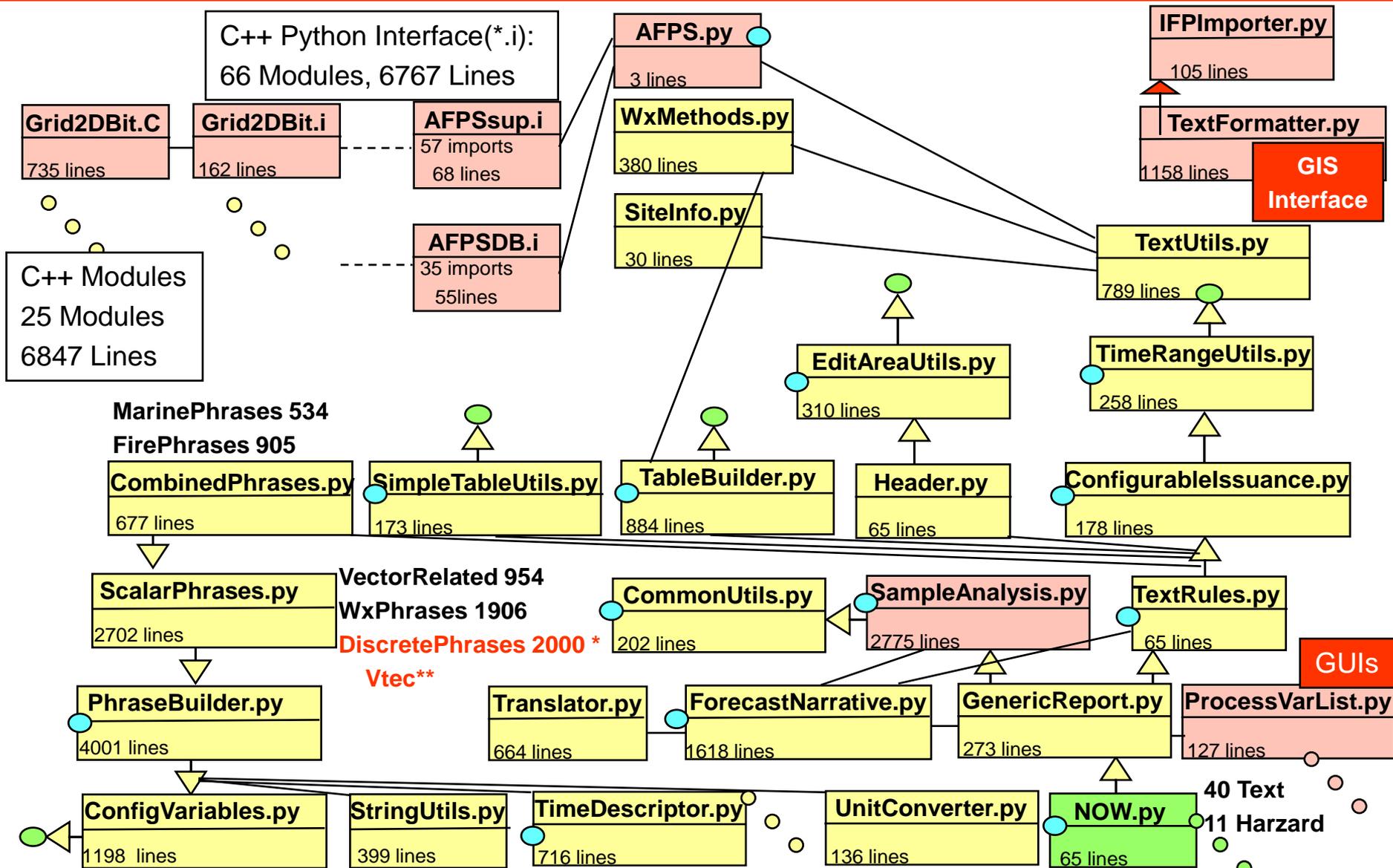
Use uEngine by developing a set of GFE tasks

GFE



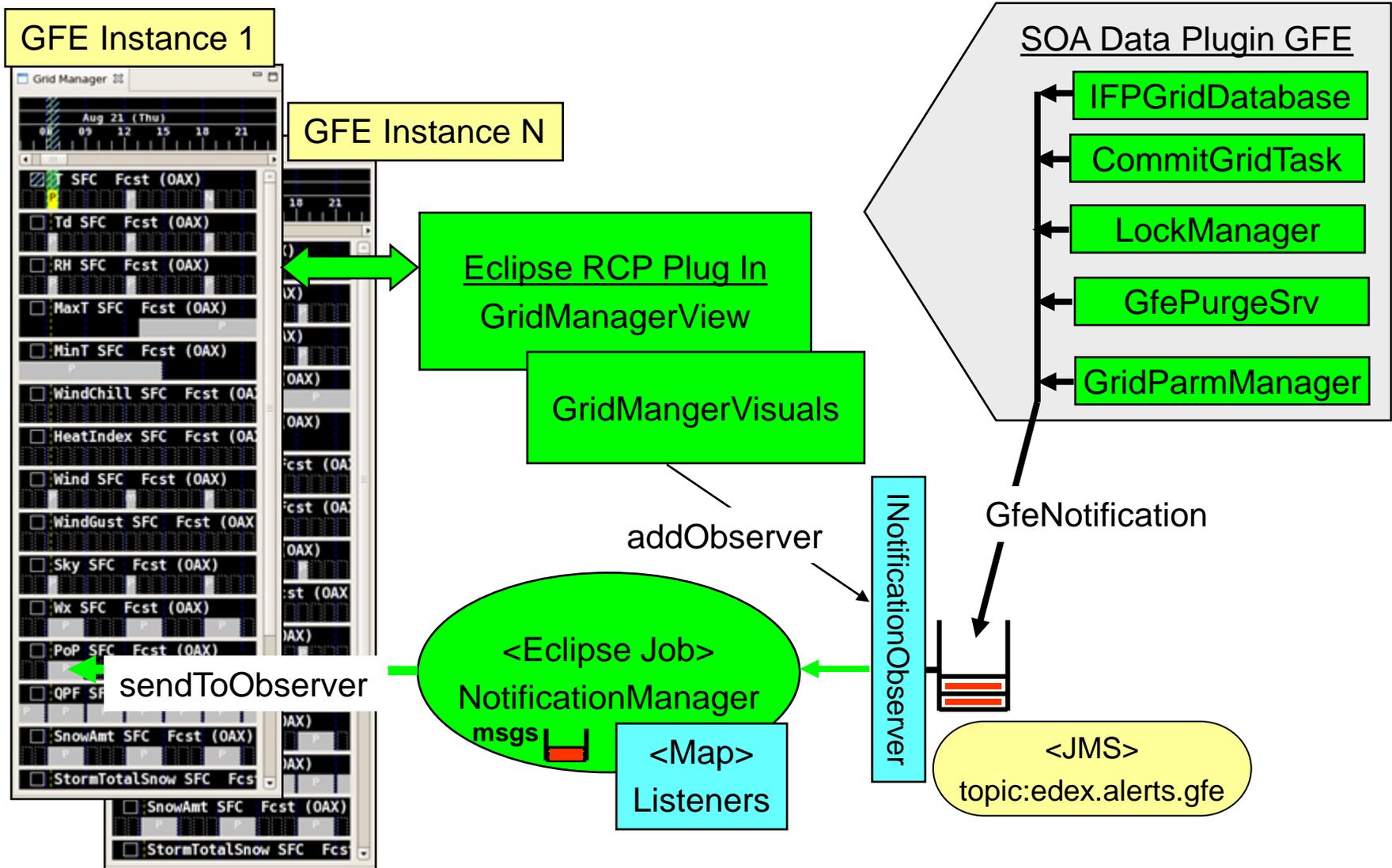
T09 TextFormatters: All AWIPS-I integrated

Major Reeng
TextFormatter
Minor Mods
● Replace AWIPS-I Interface
GFE



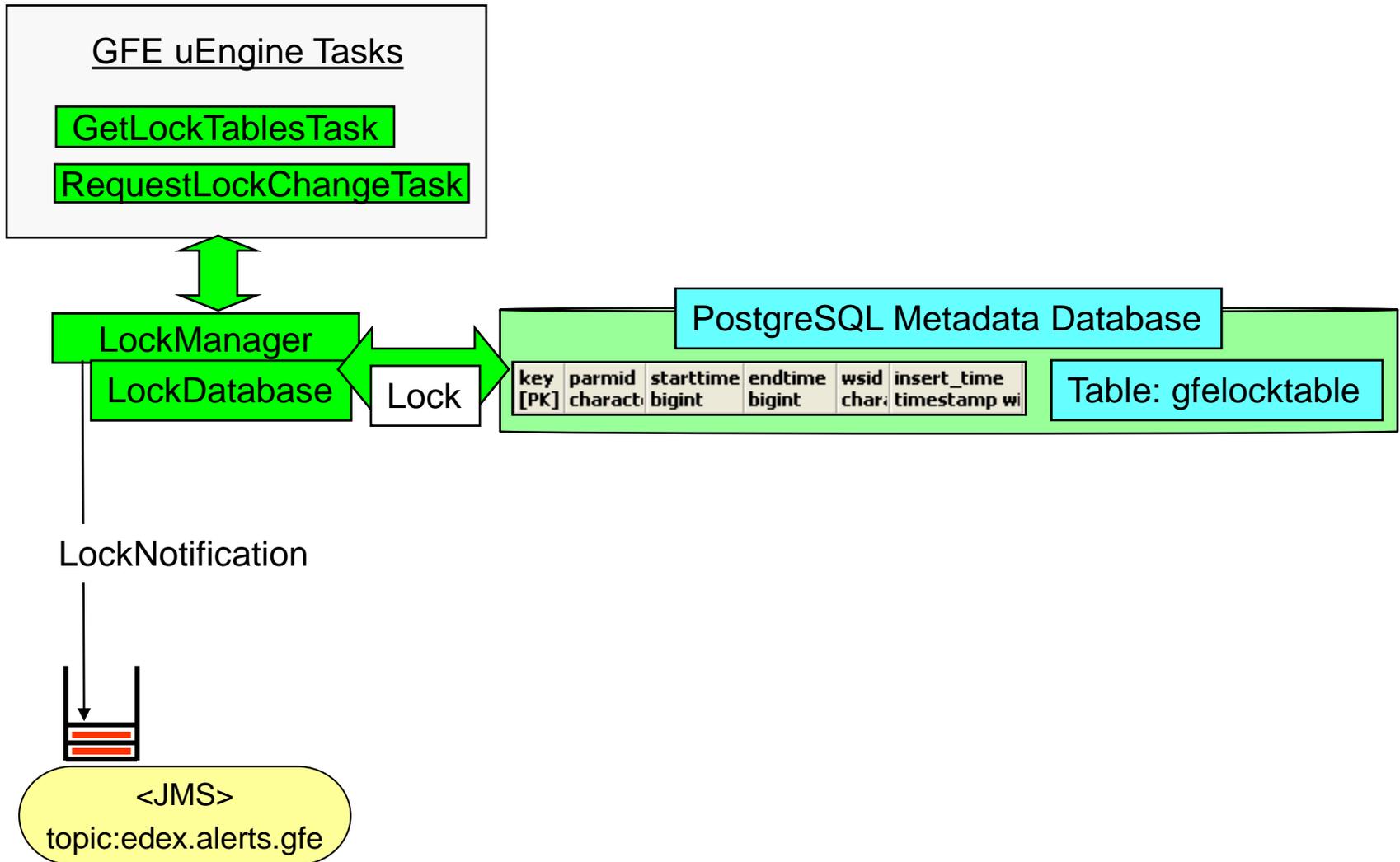
T09 GFE notification design

Enables notifications with minimal impact on performance



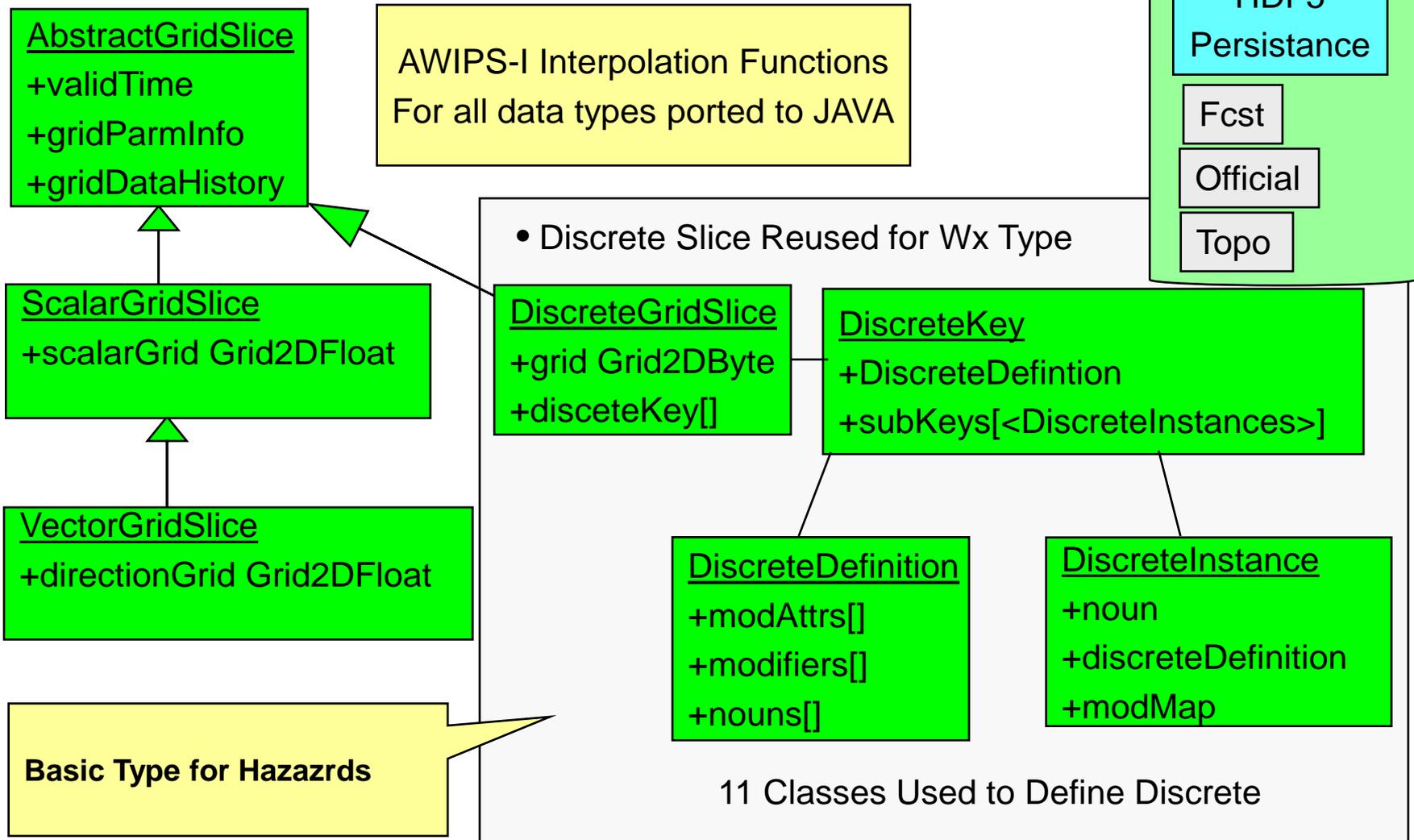
T09 GFE Parm Locking Design

Leverages RDBMS to improve lock management



T09 GFE Data Type Implementations

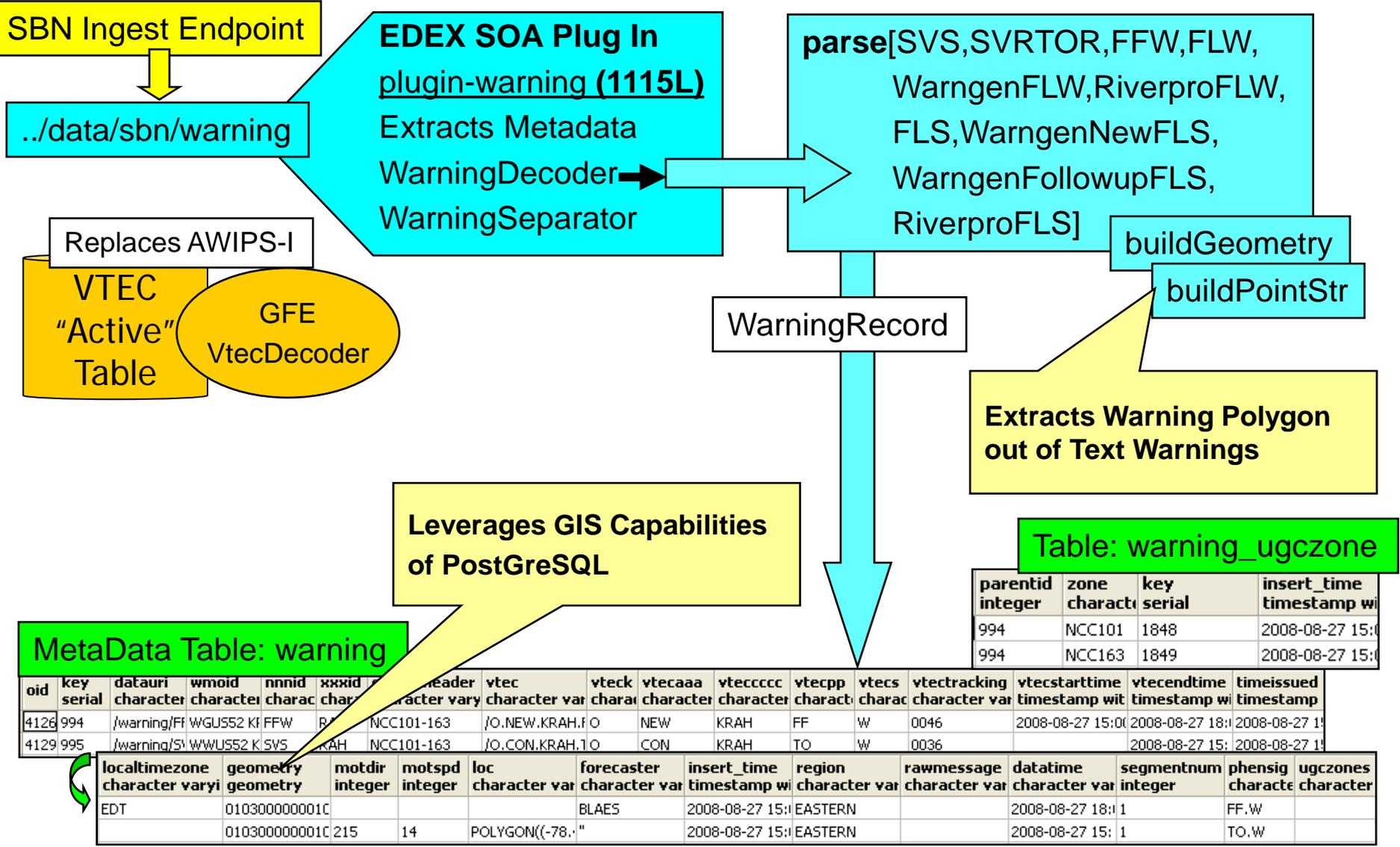
Capabilities of AWIPS-I data types ported into JAVA



T09 Warning Plug-In Enables GHGMonitor

Leverages Warning Plug In MetaData to enable sharing

GFE

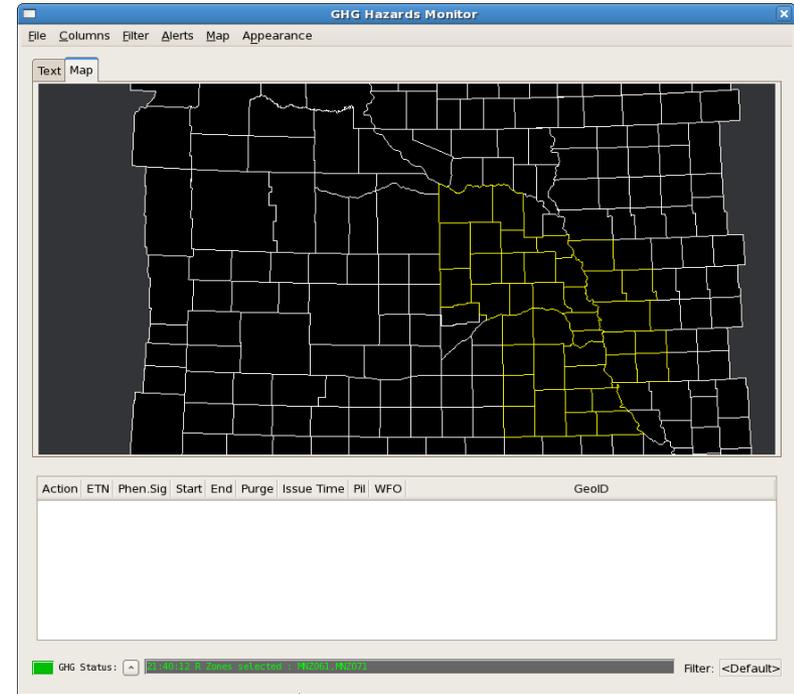


T09 GHG Monitor Design

Leverages Warning Plug In MetaData to enable sharing

GFE

- Common warning repository feeds both D2D and GHG.
- VTEC elements are Stored as DB columns



MetaData Table: warning

oid	key serial	datauri character	wmoid character	nnnid charac	xxxid chara	countyheader character vary	vtec character var	vteck charac	vtecaaa character	vtecccc character	vtecpp charact	vtecs charac	vtectracking character var	vtecstarttime timestamp wit	vtecentime timestamp w	timeissued timestamp
4128	994	/warning/FF	WGUS52 K	FFW	RAH	NCC101-163	/O.NEW.KRAH.FO	NEW	KRAH	FF	W	0046	2008-08-27 15:00	2008-08-27 18:00	2008-08-27 18:00	
4129	995	/warning/SV	WWUS52 K	SVS	RAH	NCC101-163	/O.CON.KRAH.TO	CON	KRAH	TO	W	0036	2008-08-27 15:00	2008-08-27 15:00	2008-08-27 15:00	
localtimezone	geometry	motdir	motspd	loc	forecaster	insert_time	region	rawmessage	datetime	segmentnum	phensig	ugczones				
EDT	0103000000001C				BLAES	2008-08-27 15:00	EASTERN		2008-08-27 18:00	1	FF.W					
	0103000000001C	215	14	POLYGON((-78.0		2008-08-27 15:00	EASTERN		2008-08-27 15:00	1	TO.W					

T09 Redbook Graphics Capability

Two New Plug-Ins (EDEX+CAVE)

SBN Ingest Endpoint

../data/sbn/redbook

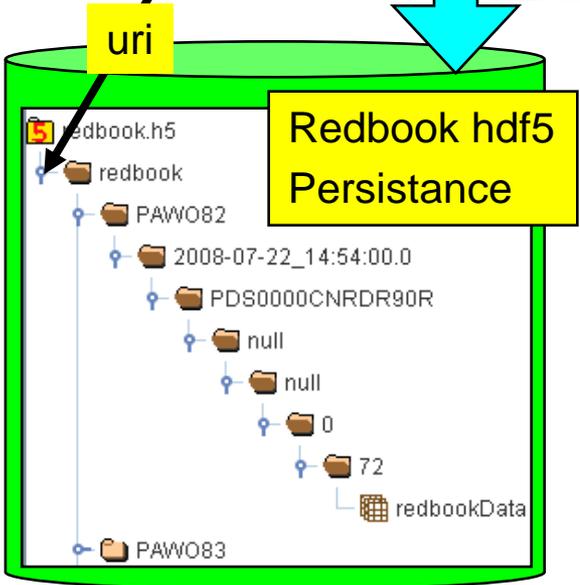
EDEX
plugin-redbook (890L)
 Extracts Metadata
 Decoder***
 Message separating



CAVE
../viz/redbook (652L)
 Visualization resource
 Special Legend Handling
 Block parsing
 Rendering

metadata												
obsid	datauri	timeobs	wmottaaii	datatime	productid	wmoccoctd	corindicator	originatorid	fcsthours	retentionhours	fileid	insert_time
serial	character	timestamp	character var	character	character v	character var	character var	character var	integer	integer	integer	timestamp

../viz.ui.personalities.awips



Menu XML
 Adding a
 Redbook
 item

```

<menu
  label="SPC Convective Outlooks">
  <command
    commandId="com.raytheon.viz.ui.menuRetrieval"
    label="Day 1 Convective Outlook"
    style="push">
    <parameter
      name="productURI"
      value="/redbook/PGWE46/*">
    </parameter>
    <parameter
      name="productName"
      value="Day 1 Convective Outlook">
    </parameter>
    <parameter
      name="bundleLocation"
      value="etc/bundles/Redbook.xml"/>
    <parameter name="variableList" value="{wmo=PGWE46}"/>
  </command>
  
```

**CAVE Bundle
 redbook.xml**

T09 Grid Derived Parameter Pattern

New Pattern based on Python Scripts

The image shows a Python script editor window titled 'DpD.py' with the following code:

```
#####  
# -----  
# Calculate D  
# Humidity(0 t  
# -----  
#####  
from numpy import  
from numpy import  
from numpy import  
from functions.na import nan_filled  
from functions.na import nan_greater  
from functions.co stants import bad  
from functions.co stants import ourNaN  
import DpT  
  
variableId = "DpD"  
variableName = "Dew point depression"  
variableUnit = "Celsius"  
  
parameters1 = "|T|RH"  
  
class DerivedParameter():  
  
    ##  
    # Calculate dewpoint depression (in degrees  
    # (degrees K) and relative humidity(0 to 100  
    # This function can operate on numpy arrays  
    #  
    # @param T: Temperature in degrees K  
    # @param RH: relative humidity from 0 to 100  
    # @return: dewpoint depression in degrees K  
    # @rtype: numpy array of Python floats or Python float  
    def execute1(self, T, RH):  
        "Calculate dewpoint depression(K) from Temperature(K) and \  
        relative humidity(0 to 100)"  
        DpTCalc = DpT.DerivedParameter()  
        val = DpTCalc.execute1(T,RH)  
        DpD = T - val  
        DpD = nan_filled(DpD, ourNaN)  
        return DpD
```

A yellow callout box points to the variable definitions: **Python Variables Set: Id, Name, Units**

A yellow callout box points to the class definition: **Core MetLib FORTRAN ported to py**

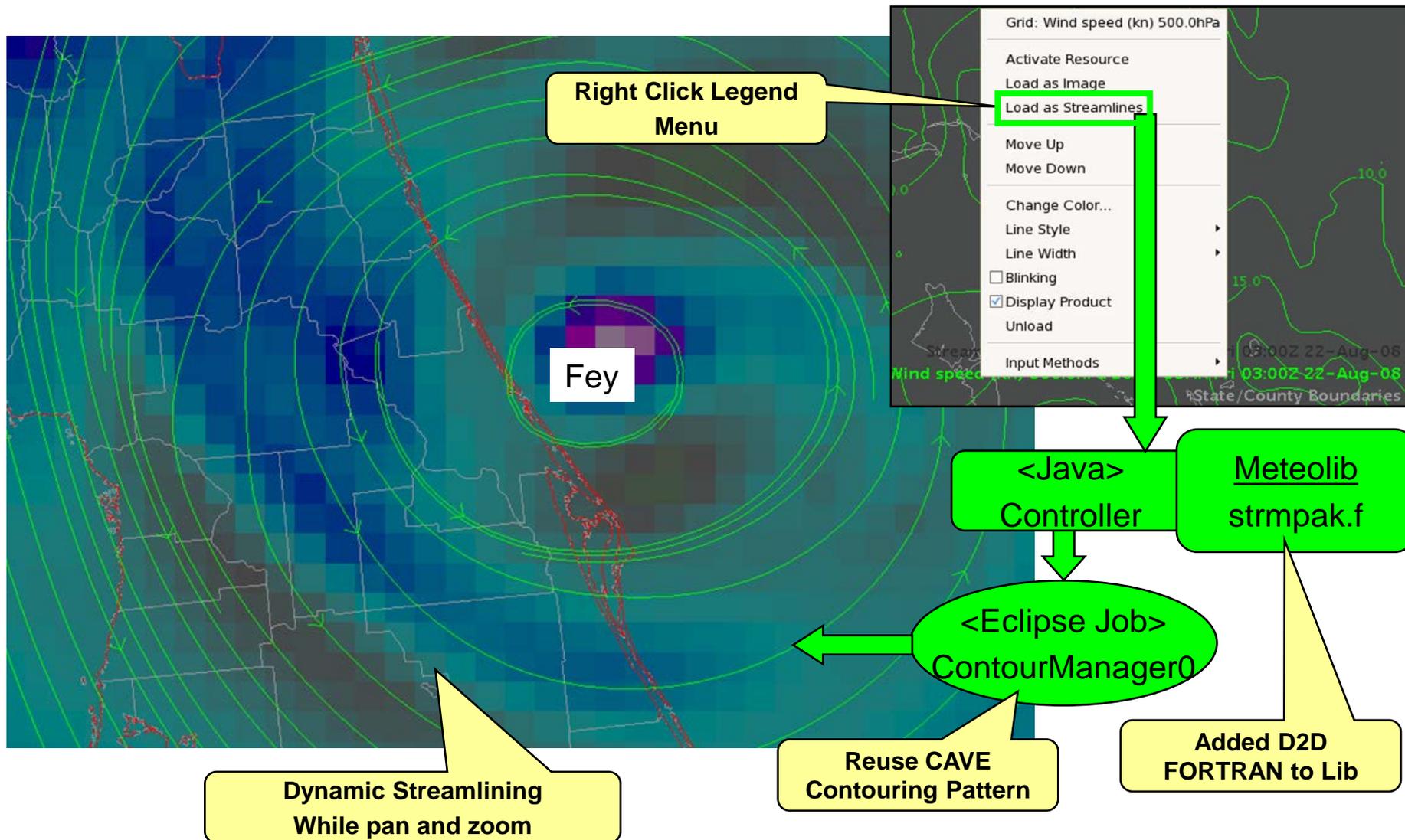
A green arrow points from a window above to a file browser window below. The file browser shows a directory structure with 'functions' highlighted in green. A green arrow points from the 'functions' directory to the Python script editor.

A green arrow points from the file browser to the text: **Derived Parameters Python Scripts**

The background of the script editor shows a contour plot with values like 19.0, 16.0, 10.0, and 8.0.

T09 Added Streamline Capability

Port D2D Fortran into AWIPS-II MeteoLib



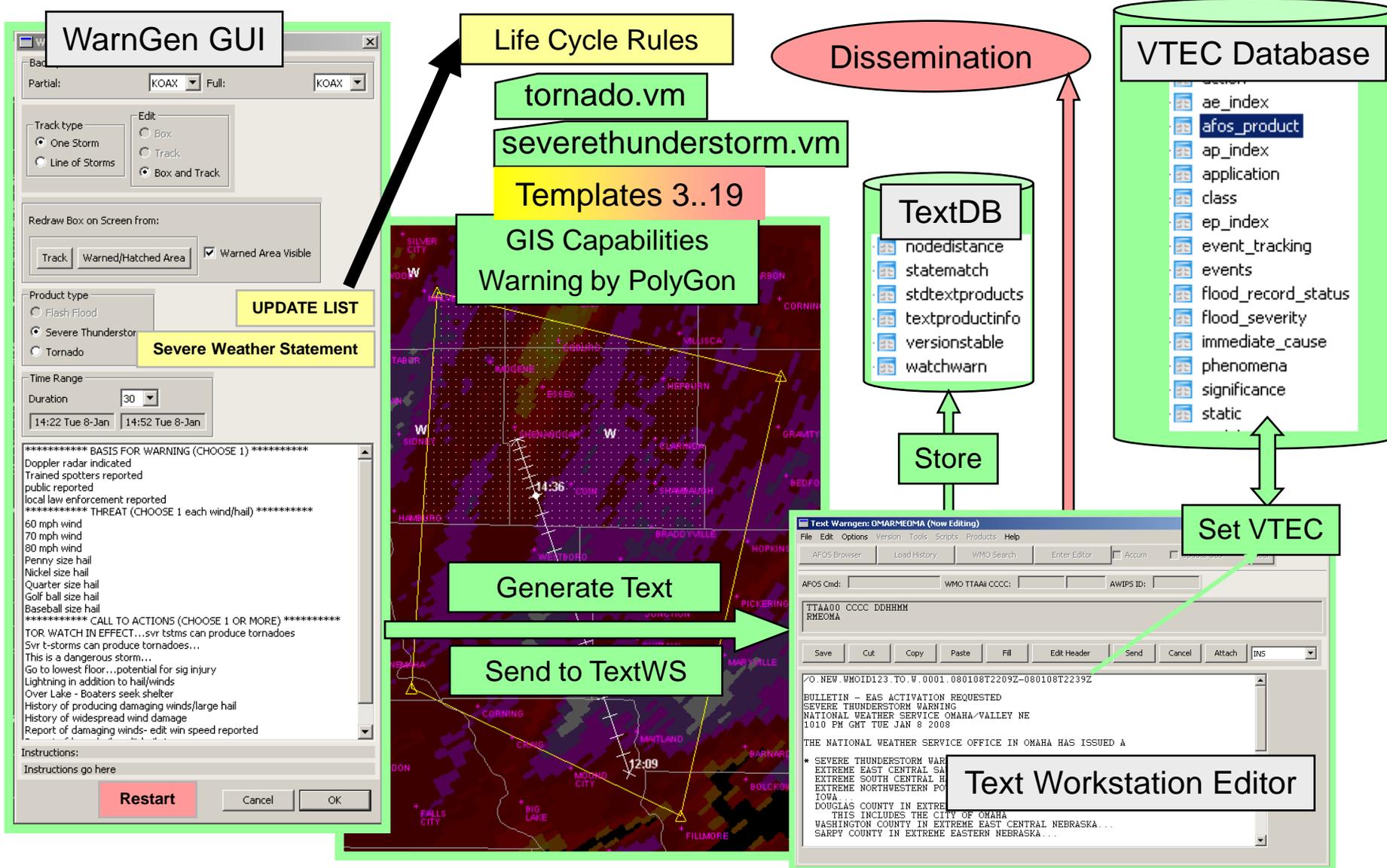
Workstation Warning Generation

T08 Delivered

T09 Delivered

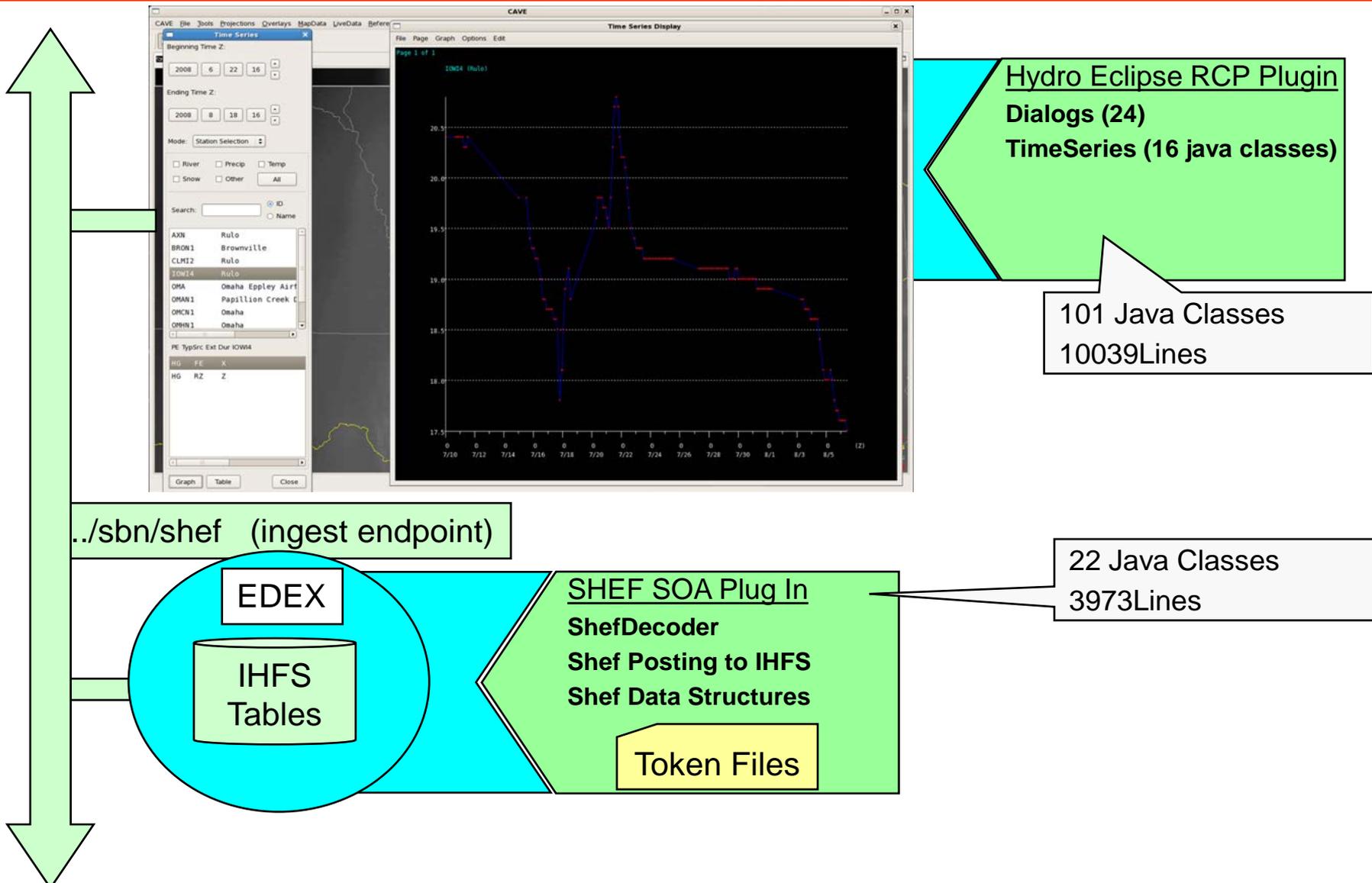
T010+ Delivered

D2D

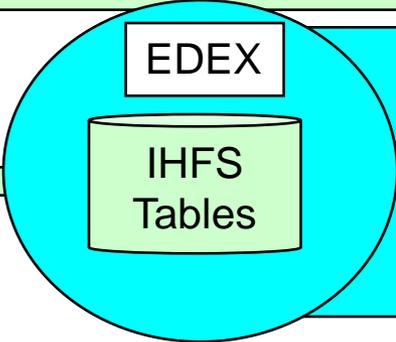


T09 Hydro Advanced Development End to End Thread from SHEF ingest to TimeSeries

Hydro



../sbn/shef (ingest endpoint)



Hydro Eclipse RCP Plugin
Dialogs (24)
TimeSeries (16 java classes)

101 Java Classes
10039 Lines

22 Java Classes
3973 Lines

SHEF SOA Plug In
ShefDecoder
Shef Posting to IHFS
Shef Data Structures

Token Files

T09 Integration Test Bed Cluster Metrics

SEDA Load Balancing Performing Well

Testing

		CLUSTER								
		Aug 7	to	Aug 22						
Date	Status	Files	Volume	Files	Files	Files	Files	Files	Volume	Volume
		Staged	Staged (MB)	INT1	INT2	Back-up	INT1 - INT2	INT1/INT2	INT1 (MB)	INT2 (MB)
Aug 7	Started	130696.0	3093.4	54009.0	47946.0	28741.0	6063.0	1.12645476161	1678.126	1415.274
Aug 8	Running	584607.0	17615.915	293788.0	290818.0	1.0	2970.0	1.01021257281	8484.845	9131.07
Aug 9	Restarted	609646.0	17895.758	306777.0	302865.0	4.0	3912.0	1.01291664603	8823.529	9072.229
Aug 10	Running	603861.0	17582.296	303760.0	300101.0	0.0	2970.0	1.01219256184	8577.375	9004.921
Aug 11	Running	599954.0	17454.416	301999.0	297955.0			1.01357251934	8573.291	8881.125
Aug 12	Running	605628.0	17050.195	304879.0	300743.0			1.01375260605	8361.034	8689.161
Aug 13	Running	634971.0	19063.62	319755.0	315221.0			1.01438355947	9318.905	9744.715
Aug 14	Running	620197.0	17422.077	312271.0	307927.0			1.0141072397	8511.581	8910.496
Aug 15	Running	608858.0	18376.436	306489.0	302369.0	0.0	4120.0	1.01362573544	9016.342	9360.094
Aug 16	Running	587007.0	18199.871	295421.0	291582.0	4.0	3839.0	1.01316610765	8850.259	9349.612
Aug 17	Running	594736.0	19138.496	299346.0	295386.0	4.0	3960.0	1.01340618716	9319.541	9818.955
Aug 18	Running	580218.0	18607.035	291996.0	288230.0	-8.0	3766.0	1.01306595427	9391.496	9215.539
Aug 19	Running	580425.0	18627.943	292018.0	288407.0	0.0	3611.0	1.01252050054	9178.712	9449.231
Aug 20	Running	599371.0	18613.349	301347.0	298024.0	0.0	3323.0	1.01115010872	9370.309	9243.04
Aug 21	Running	588617.0	17348.982	297030.0	291587.0	0.0	5443.0	1.01866681299	8602.145	8746.837
Aug 22	Running	298828.0	8455.475	150353.0	148392.0	83.0	1961.0	1.01321499811	4212.09	4243.385
Aug XX										
Total		8827620.0	264545.264	4431238.0	4367553.0					
Average	N/A	579794.933333	17430.1242667	291815.266667	287973.8	5.86666666667	3841.46666667	1.01333027401	8572.7636	8857.36066667

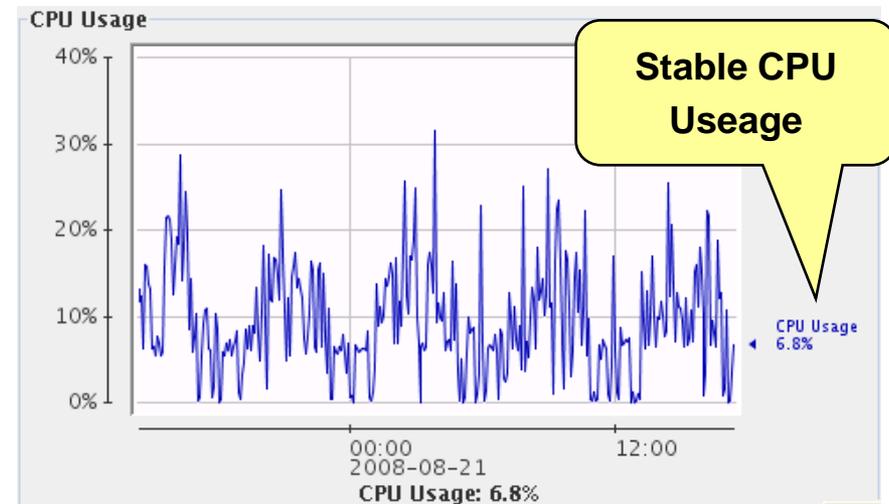
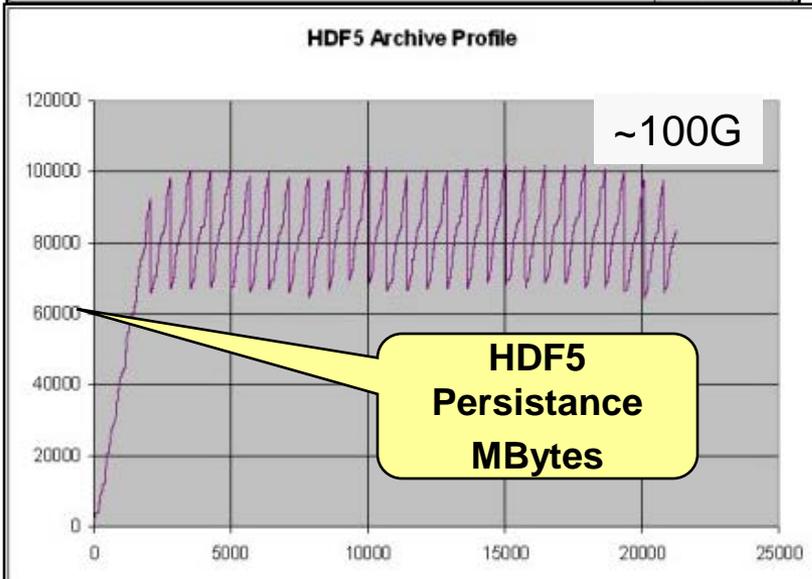
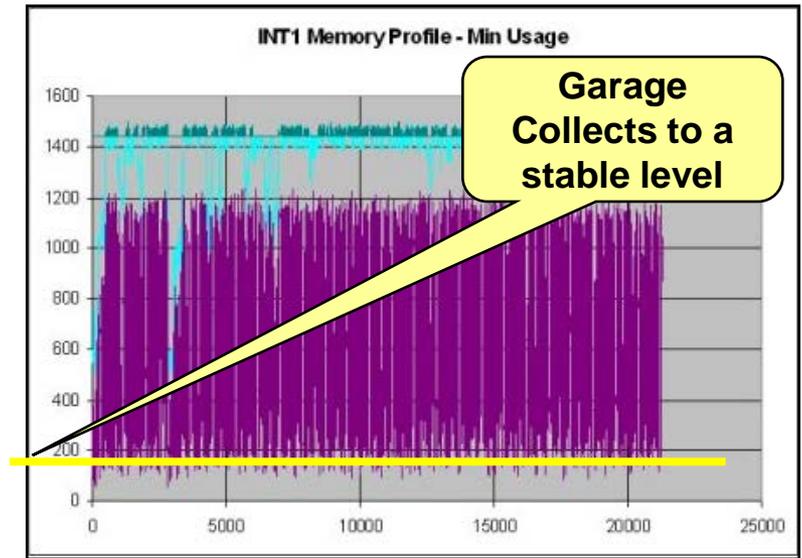
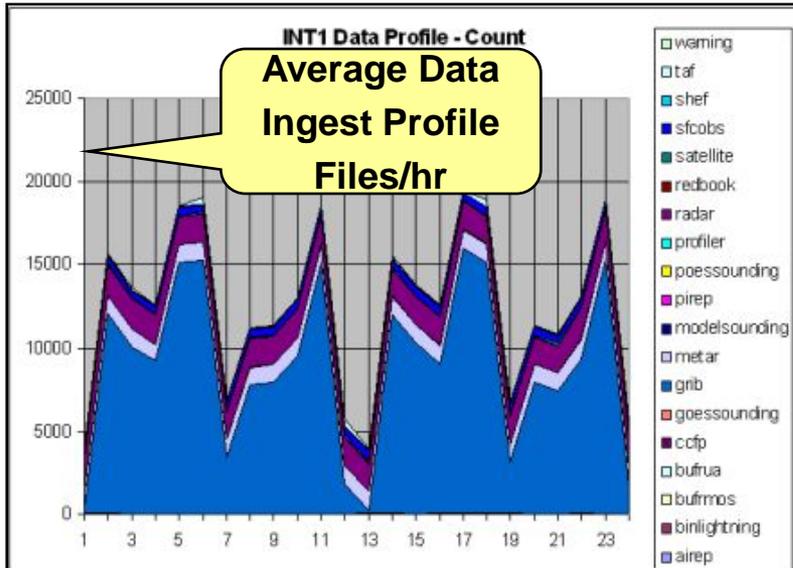
Cluster Balance

Remaining Cluster Stability Issues are Network Related and are being worked

T09 AWIPS-II Stability Run Results

Build 15, 07-Aug to 21-Aug JVM 1.6.0_05

Stability



T010/11 AWIPS-II Infrastructure Improvements in Progress

- Improve object serialization (Transition to JAXB and THRIFT)
 - Improve performance of request/response interactions
 - Improve persistence of binary objects to HDF5
 - Eliminates NFS for data access and enables “light client mode”
- Consider Migrating to a pure “C” Grib1/2 Decoder from the Unidata One
 - GRIB2 decoding using J2000 is inadequate
 - Use GLUEGEN to generate JAVA interface to “C” decoder
- Upgrade ESB and improve ingest performance
- Improve HDF5 locking under high transaction rates
- SOA Data Plug In Pattern upgraded to use “annotations” (JPA) for MetaData definitions
 - Eliminates Two XML files from plugin pattern, simplifies development
- Raytheon Investment:
 - Improve separation between EDEX core and Data plugins
 - Lowers maintenance cost and facilitates partial deployment
 - Improve build process so that only selected set of plugins can be built and deployed
 - Improve separation of CAVE core plug ins from application level plug ins

T09 Demo Scenario

Features that illustrate the architecture

■ D2D Features

- Wind Streamlines (Zoom and Pan)
- Redbook Graphics
- Derived Parameters (Adding {i.e. DpD.py}, modifying)

■ GFE Features

- GridManager (Show eclipse “ViewPart” features)
- Running Smart Tools and editing, interpolation
- Formatter Launcher (NOW product), Make Hazards

■ Hydro Perspective

- Timeseries from ingested SHEF data

T09 Delivery ReadMe

- If installing on Linux Fedora 6, the library installed by (yum install compat_lib2c-34) is required for Python module "numpy".
- If trying to run disconnected from a network, activemq multicast must be turned off.
 - Remove the XML element <transportConnector name="discovery"... from activemq.xml in ./activemq/conf
- Ready for end to end testing
 - End-to-end testing will be available in T011
- T09 Complete functionality
 - GFE: Spatial Editor, Color Legend Menus, Status Bar
 - GFE: Grid Manager, Interpolation
 - GFE: Edit Areas, Weather Element Browser, Data Pick Values
 - GFE: Pencil Tool, Sample Tool, Sample Sets
 - GFE: Smart Tools, Smart Init
 - D2D: Streamline rendering for Wind parameters
 - D2D: WarnGen (Note: TRRs from delivery testing)
- Partial implementation
 - GFE: Formatter Launcher (Products: NOW, PNS, RFD, SPS, ESF)
 - GFE: GHG Monitor (Requires live warnings to be ingested)
 - GFE: MakeHazard GUI (Run Button is in T010)
 - D2D: Derived parameters (dZ, RH, wSp, DpD, DpT, SHx, EPT, PoT, mixRat, and TW) Note: Testing the adding of new derived parameters by just writing Python Scripts and adding them to the CAVE derived parameter folder
 - D2D: Profiler data, Model Sounding Data, Satellite Sounding, MOS, Redbook Graphics ingest
 - D2D: Redbook rendering (selected items under the NCEP/Hydro menu)
 - AvnFPS: Ceiling Vis Dist, Configuration, Metars, Wind Rose GUI, TAFs, Weather Plot GUI

T09 Delivery ReadMe

- Advanced development
 - Hydro Perspective, Shef Ingest, Time Series (partial)
- Do not test
 - Anything that is comm related
 - GFE: ISC and Verify
 - GFE: Items under Hazard Menu except MakeHazards GUI
- Issue:
 - HDF5 locking performance in cluster for high transaction rates (fix identified and part of T010)
 - Affects ingest of BUFR MOS