JTLS-2015-12485 Allow WHIP To Display GEO-TIFF Background

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1.0 Summary of Model Change Request

Compressed ARC Digitized Raster Graphics (CADRG) maps are no longer used for many purposes and it is becoming more difficult to obtain these maps for use with JTLS. Geo-referenced Tagged Image File Format (GeoTIFF) maps are more commonly available. This Engineer Change Proposal (ECP) will allow the Web Hosted Interface Program (WHIP) and Database Development System Client (DDSC) to use a GeoTIFF background in addition to the existing CADRG background.

2.0 Design Summary

One of the challenges of this design is that the standard for GeoTIFF files allows flexibility in the meta-data needed to correctly display the graphics. To simplify the design, the user will be required to provide a hand-generated data file with the needed geo-referencing data needed by the WHIP to properly display a GeoTIFF file. The WHIP will not attempt to obtain this data from the meta-data associated with the actual image file. The tools needed to obtain the required geo-referencing data will be provided with JTLS.

Once the problem with obtaining geo-referencing data was solved, the approach selected makes use of capabilities in the existing OpenMap libraries and the Java ImageIO package currently used by the WHIP. In addition the WHIP will now need access to the of Java Advanced Imaging (JAI) ImageIO Core libraries.

3.0 Detailed Design

3.1 Files

The first step to displaying Geo-TFF files is to obtain the image files and place them on the system where they can be found by the WHIP and DDSC. There are two types of TIFF files that can be found on the internet:

- A location specific TIFF file, which can be obtained from the Internet or an organization's Geographic Information System (GIS) office. These files have a file extension of ".tif"

- The TIFF World File. This file can also be obtained from various Internet sites or the user's GIS office. This file has a file extension of ".tfw". This design does not support ".tfw" files.

As mentioned the meta-data that is a part of each .tif file, describing the geo-referencing information needed to properly display the GeoTIFF file, is flexible and not consistently formatted. This makes it difficultfor the WHIP and DDSC to properly display the image background. For this reason, the Design Team has opted to require the user to hand-create a file that provides the needed referencing data in a standard format.

gdal gdalinfo

Each TIFF file will require a separate file to indicate the location of the upper left corner (north-west) and the lower right (south-east) corner of the TIFF image. The file will have the same base name as the .tif file with the extension of .tfb. The file will be a standard Java properties file containing the decimal latitude and longitude of the north-west and south-east corners of the image in the Tiff file. For example:

```
north=36.638733
west=-121.89001
south=36.479378
east=-121.73507
```

Similar to the current capability for displaying CADRG files, the following locations will be searched for a "GeoTiff" directory:

Linux:

- The users home directory

- /usr/share

- /mnt/cdrom

- /media

Windows:

- The users home directory

- Drives C: through Z:

3.2 Supporting Software

3.2.1 OpenMap

OpenMap is the mapping toolkit currently used by JTLS for display of geographic data.

3.2.2 Java Advanced Imaging (JAI) ImageIO Core

JAI ImageIO Core is an open source replacement for the original Sun/Oracle JAI. It supplies the functionality to load and render the Tiff files. It is used by Openmap and the Java Image package.

There are currently 2 open issues with use with Java 9. Both are expected to be resolved soon in a future release.

3.3 Considered Design Alternatives

For those readers familiar with the display of GeoTIFF files, it may be of interest to know what design alternatives were also considered and rejected for various reasons. This section provides this added information.

3.3.1 Java Advanced Imaging (JAI) Oracle/Sun Version

The last release was of this version of the JAI was in 2006. There appears to be no active development. There may also be an issue with it working with Java 9 and later. There does not appear to be an intention to fix this issue. It has been replaced by the selected design option of using JAI ImageIO Core, discussed in .

3.3.1.1 Apache Commons Logging

An open source imaging library. No stable version since 2009.

3.3.1.2 GeoTools

GeoTools is an open source java library that provides geospatial data tools. Has a large number of dependencies, including on the obsolete version of JAI.Projection Method

The image is generated using Java's ImageIO package. The image is then manually added to the ImageFileLayer using corner points provided by a manually created file. Note that this method will not work for images that are rotated.

3.4 Potential Future Improvements

- When zooming in to where the image is distorted, the image is not hidden like it is for CADRG.

- There is no logic to pick the image with the scale closest to the current projection scale, like there is for CADRG.

4.0 Data Changes

No data changes are required for this ECP.

5.0 Order Changes

No order changes are required for this ECP.

6.0 JODA Changes

No JODA Data System parameter, structure, or protocol changes are required to implement this design.

7.0 Test Plan

Text [*Describe the basic test objectives and procedures. This Test Plan section may be published as a separate document.*]

7.1 Test 1 Title

Purpose: [*Describe the specific feature, function, or behavior to be tested or measured.*]

Step 1: Text

Step 2: Text

Expected Results: [*Describe the specific model behavior to be observed.*]

7.2 Test 2 Title

Purpose: [*Describe the specific feature, function, or behavior to be tested or measured.*]

Step 1: Text

Step 2: Text

[*Describe the specific model behavior to be observed.*]

1Copy the test TIFF SKLN_RNC_025p0_Ed2.tif along with its tbf file to $JTLSHOME/GeoTiff (A training chart
 Sea supplied by NATO JWC)

2Start the WHIP and switch to the CADRG projection.

Note 1   Locations of lights for the Baltic sea were obtained from http://wlol.arlhs.com

3Use find on map to go to 60-43N 021-01E. Zoom in and verify that Isokari light is shown at that location.

4Use find on map to go to 65-23N 024-06E and verify that Kemi light is shown at that location.

5Use find on map to go to 57-18N 011-54E and verify that Nidingen light is shown at that location.

Note 2   Location of lights on the US Pacific coast are from USGC Light List Volume 6 2018

6Copy the test TIFF TC_NG_SFBay_US_Geo.tif along with its tbf file to $JTLSHOME/GeoTiff (San Fransisco b

7Restart the whip and switch to the CADRG projection.

8Use the find on map to go to 37-48-51.6N 122-28-39.86W and verify that the south pier of the Golden Ga
 that location. (See GGBridgeChart.png)

9Use the find on map to go to 37-49-31.61N 122-28-41.78W and verify that Lime Point Light (FL W 4s) is at
 (See GGBridgeChart.png)

10Use the find on map to go to 37-48-38.26N 122-25-25.1W and verify that the Aquatic Park Entrance (FL G
 location. (See AquaticPark.png)

Note 3   Locations of US airports and aeronautical navaids are from www.airnav.com

11Copy the test TIFF "Baltimore-Washington TAC 96.tif with its tbf file to $JTLSHOME/GeoTiff (Baltimore-Wa
 Terminal Area Chart) From www.faa.gov. Note that this chart is a Lambert Conformal Conic projection an
 some distortion. However, given the resolution of the chart, the accuracy appears satisfactory.

12Restart the whip and switch to the CADRG projection.

13Use the find on map to go to 38-51-08.2N 77-02-15.8W and verify that the location is near Reagan Nation
 (DCA).

14Use the find on map to go to 39-23-08.06N 77-50-54.08W and verify that the location is near the Martinsl

15Use the find on map to go to 39-10-32.62N 76-40-08.37W and verify that the location is near Baltimore W
 International Airport (BWI)

16Copy the test TIFF 18685.tif along with its tbf file to $JTLSHOME/GeoTiff (Montery Bay nautical chart from
 www.charts.noaa.gov, converted to tiff format.)

17Restart the whip and switch to the CADRG projection.

18Use the find on map to go to 36-38-00.15W 121-56-01.38W and verify that the Point Pinos (Oc 4s) light is
 location.

19Use the find on map to go to 36-57-05.34N 122-07-36.36W and verify that the Santa Cruz light (Fl W 5s) li
 location