KLAUS KDA3 - Fires and burned areas management applications

Progress Meeting 7
09 Jun. 2011
Structure

- Critical User Requirements
- System Architecture
- Implementation
- Test and Validation
- User Manual
- Future steps:
  - Performance Evaluation
  - TTO
- Delivered Items
KDA3 Pursued Approach

- Users Identification
- User Requirements Collection
- URD -> Technical Specifications
- TS -> Software implementation / Delivery to users
- Users Service usage and validation
- Service delivery to ESA

09.06.2011 KLAUS Progress Meeting 7
Critical User Requirements

[KDA3-UR 01] The service shall be accessible through a simple interface (i.e. web interface)
[KDA3-UR 04] It shall be possible to require the service on a regional basis
[KDA3-UR 05] It shall be possible to set-up the end date for the monitoring of a specific area
[KDA3-UR 06] It shall be possible to select to receive fire maps, vegetation change maps, or both
[KDA3-UR 07] The system shall provide data in a format suitable for the CFS GIS (Gauss-Boaga Geocoding)
[KDA3-UR 08] The system shall permit a test application over two Italian regions: Lazio and Calabria.
[KDA3-UR 10] The results can be provided with up to 48 hours delay
[KDA3-UR 11] The system shall be able to provide processing of a single image selected from existing catalogues.
System Architecture

• Proposed Approach

→ Two SSE Services to satisfy users needs

→ Fire detection-related KEO modules

→ Use of the MEEO SOMAFID software for fire detection

→ Use of the MEEO SOIL MAPPER® software for vegetation change maps

→ Use of the MODIS Data catalogue Service for MODIS data retrieval
Overall System Breakdown

KEO:
- Fire Detection, single day
- Vegetation change assessment (bi-temporal)

4 CLIs:
- AQUA Band 6 Recovery
- SOMAFID MODIS
- SOMAFID AATSR
- Lat-Lon to Gauss-Boaga Converter

2 FEPs
- Fire Detection for MODIS
- Fire Detection for AATSR

SSE Portal
- subscription Service
  - Area of Interest
  - Product(s)
  - Expiration
- Catalogue Image Service (fire)
  - Area of Interest
  - Date Range

MODIS TERRA/AQUA Database

Processors:
- Fire Detection, single day
- Vegetation change assessment (bi-temporal)

Expiration?
- No
- Yes
  - Service Expired
KEO Modules Implementation

Analysis on existing KEO Modules

- MODIS Calibration module available
- MODIS spectral classification module available
- Vegetation change assessment available

<table>
<thead>
<tr>
<th>Software ID</th>
<th>KEO Name</th>
<th>Short name</th>
<th>KEO Category</th>
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<tbody>
<tr>
<td>KLAUS.KEO.1</td>
<td>MODIS AQUA Band 6 Recovery v1.0 CLI Sistema @kore</td>
<td>bandLinearRecovery</td>
<td>Signal/Image Processing</td>
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<td>KLAUS.KEO.2</td>
<td>SOMAFID Algorithm for MODIS data v1.0 CLI Sistema @kore</td>
<td>somafid</td>
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<td>SOMAFID Algorithm for AATSR data v1.0 CLI Sistema @kore</td>
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<td>Lat-Lon to Gauss-Boaga Converter and Shapefile Generator v1.0 CLI Sistema @kore</td>
<td>gbShpConverter</td>
<td>Data/Format Conversion</td>
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<td>Fire Detection for MODIS data v1.0 FEP Sistema @kore</td>
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<td>Fire Detection for AATSR data v1.0 FEP Sistema @kore</td>
<td></td>
<td>Classification</td>
</tr>
</tbody>
</table>

KEO:
- Fire Detection, single day
- Vegetation change assessment (bi-temporal)
• MODIS AQUA Band 6 Recovery

`/home/sistema/modules/bandLinearRecovery/bandLinearRecovery.sh FIRSTBAND SECONDBAND OUTPUTDIR [PREFIX_FILE_NAME]`

- **FIRSTBAND**: absolute path to the bad calibrated in GeoTIFF format;
- **SECONDBAND**: absolute path to the support calibrated in GeoTIFF format;
- **OUTPUTDIR**: absolute path to directory where the elaboration results files shall be stored;
- **[PREFIX_FILE_NAME]**: optional input parameter to specify the prefix of name of output files (default is based on “FIRSTBAND”).

The output file is a GeoTIFF file containing a FIRSTBAND data recovered using a linear interpolation of SECONDBAND where FIRSTBAND values are not available.
SOMAFID Algorithm for MODIS data

- SENSOR: String to set the sensor, can be set to A-ATSR or MODIS (preset to MODIS);
- CLASSMAP absolute path to the classified map in GeoTIFF format;
- BAND-0.86 absolute path to the calibrated band near to 0.86um in GeoTIFF format;
- BAND-0.65 absolute path to the calibrated band near to 0.65um in GeoTIFF format;
- BAND-3.7 absolute path to the calibrated band near to 3.7um in GeoTIFF format;
- BAND-10.8 absolute path to the calibrated band near to 10.8um in GeoTIFF format;
- OUTPUTDIR: absolute path to directory where the elaboration results files shall be stored;
- [PREFIX_FILE_NAME]: optional input parameter to specify the prefix of name of output files (default is based on "CLASSMAP". Given a name composed as CLASSMAP [_p_proc_type].ext the output prefix file name is assumed as CLASSMAP).

The output file is a GeoTIFF file containing the georeferenced identified fires in the 9 MODIS SOMAFID classes.
Interfaces 3/4

- SOMAFID Algorithm for (A)ATSR data

```
/home/sistema/modules/somafid/somafid.sh
SENSOR CLASSMAP [PREFIX_FILE_NAME]
BAND-0.86 BAND-0.65 BAND-3.7 BAND-10.8 OUTPUTDIR
```

- SENSOR: String to set the sensor, can be set to A-ATSR or MODIS (preset to A-ATSR);
- CLASSMAP absolute path to the classified map in GeoTIFF format;
- BAND-0.86 absolute path to the calibrated band near to 0.86um in GeoTIFF format;
- BAND-0.65 absolute path to the calibrated band near to 0.65um in GeoTIFF format;
- BAND-3.7 absolute path to the calibrated band near to 3.7um in GeoTIFF format;
- BAND-10.8 absolute path to the calibrated band near to 10.8um in GeoTIFF format;
- OUTPUTDIR: absolute path to directory where the elaboration results files shall be stored;
- [PREFIX_FILE_NAME]: optional input parameter to specify the prefix of name of output files (default is based on "CLASSMAP". Given a name composed as CLASSMAP _p_proc_type_.ext the output prefix file name is assumed as CLASSMAP).

The output file is a GeoTIFF file containing the georeferenced identified fires in the 6 (A)ATSR SOMAFID classes.
• **gbShpConverter**

```
/home/sistema/modules/gbShpConverter/gbShpConverter.sh INPUTFILE GEOREFFILE REGION OUTPUTDIR [PREFIX_FILE_NAME]
```

- **INPUTFILE**: Absolute path to the classified map in GeoTIFF format;
- **GEOREFFILE**: Absolute path to the accurate georeference file in ASCII format or HDF format;
- **REGION**: Label used to get the Italian region on which clip the output results:
  - Admitted values are:
    - Lazio: Lazio region;
    - Calabria: Calabria region.
- **OUTPUTDIR**: absolute path to directory where the elaboration results files shall be stored;
- **[PREFIX_FILE_NAME]**: optional input parameter to specify the prefix of name of output

• The output is a set of files:
  - Gauss-Boaga converted GeoTIFF file
  - Gauss-Boaga converted Shapefile (zip file containing three files - dbf, shp, shx)
  - Gauss-Boaga converted ASCII file (csv)
  - WGS84 converted ASCII file (csv)
Fire Detection for MODIS data FEP Architecture
Fire Detection for MODIS data FEP

Input Parameters:
- MODISHDF: absolute path to input HDF format file;
- GEOREFFILE: absolute path to input accurate georeference HDF format file;
- REGION: String to identify Italian region;
- Output Prefix: optional input parameter to specify the prefix of name of output files (default is based on MODISHDF input filename: given a name composed as MODISHDF[_p_proc_type].ext the output prefix file name is assumed as MODISHDF).

The output file is the same of gbShpConverter (4 files).
Fire Detection for (A)ATSR data FEP Architecture
Input Parameters:
- AATSRN1: absolute path to input AATSR N1 file compressed in GZip format;
- REGION: String to identify Italian region;
- Output Prefix: optional input parameter to specify the prefix of name of output files (default is based on AATSRN1 input filename: given a name composed as AATSRN1[_p_proc_type].ext the output prefix file name is assumed as AATSRN1).

The output file is the same of gbShpConverter (4 files)
SSE Services Implementation Status

Analysis on existing SSE Services

• MODIS Data Provision
  • MODIS Data Catalogue (MEEO)
  • MODIS Level 1B data for Cat-1 users (ESA)

• Fire Detection by single image (MEEO)

• Vegetation change maps by bi-temporal images (MEEO)

• Geocoding Conversion and shapefile generation

• Dedicated Subscription Service

• Dedicated Data Catalogue Service
Implemented SSE Subscription Service
Implemented SSE Subscription Service: first search operation

Search On:
- MEED.MODIS Collection
- One day Before
- AOI selected in Order Subscription Phase
- Only Day Flag
- Only Image that completely Cover the AOI
- Most recently Image
Implemented SSE Subscription Service: first Order operation

Order Products:
- [MOD|MYD]021KM
- 03GEO
Implemented SSE Subscription Service: first Order result

The results of Order are available via FTP. Verify the status to check if all data required are present.
Implemented SSE Subscription Service: Fire Detection Step

- If [MOD|MYD]02KM1 is available the Fire Detection can be invoked, otherwise the process will be skipped.
- The Output format chosen is GeoTIFF, and will be available on FTP link.
Implemented SSE Subscription Service: second search operation

Search On:
MEEO.MODIS Collection
.Two days Before
.AOI selected in Order Subscription Phase
.Only Day Flag
.Only Image that completely Cover the AOI
.Most recently Image

If GEO03 on first search is available the Second Search, for Vegetation Change processing, can be invoked.
Implemented SSE Subscription Service: vegetation change

• If products of both Search on MDC are available the Vegetation Change can be invoked, otherwise the processing will be skipped.

← Search: Select bi temporal images

Order: select AOI where Vegetation Change will be computed: the output format is GeoTIFF and it will be available on FTP link, →
Implemented SSE Data Catalogue Service
Implemented SSE Data Catalogue Service: search operation

Search On the Modis Data Catalogue (collection can be selected)
Implemented SSE Data Catalogue Service: Order operation

Select the area on which the fire detection algorithm is applied
Implemented SSE Data Catalogue Service: Order result

The results of Order are available via FTP. Verify the status to check if all data required are present.
Advances with respect to the state of the art

- **New SSE Services** implemented to provide users with dedicated Fire Detection Services based **on automatic or semi-automatic data retrieval**

- Creation of new **KEO Modules** (some very useful for MODIS data processing)
Future Activities

• Fire Detection Algorithm tuning (30 June 2011)

• Performance Evaluation (31 July 2011)

• TTO (31 July 2011)
Delivered Items

D5.3.3
- KLAUS_D5.3.3_1.0_FD.doc KDA3 Fire Detection application – KEO FEP and SSE Services description document. Issue 1.0
- KLAUS_D5.3.3_1.0_UM.doc KDA3 Fire Detection application – KEO FEP and SSE Services User Manual. Issue 1.0
- KLAUS_D5.3.3_1.0_SP Fire Detection and Burned Areas – KEO modules and SSE Services:
  - KLAUS.KEO.1 MODIS AQUA Band 6 Recovery
  - KLAUS.KEO.2/3 SOMAFID Algorithm for MODIS and (A)ATSR data
  - KLAUS.KEO.4 Lat-Lon to Gauss-Boaga Converter and Shapefile Generator
  - Libraries

D5.3.4
- KLAUS_D5.3.4_1.0_TN.doc Fire Detection and Burned Areas Detection – KDA complete description, validation results and open issues. Issue 1.0

D5.3.5
- KLAUS_D5.3.5_1.0_STP.doc KDA3 Fire Detection application - KEO and SSE Software Test Plan. Issue 1.0
- KLAUS_D5.3.5_1.0_STR.doc KDA3 Fire Detection application - KEO and SSE Software Test Report. Issue 1.0