EARTH OBSERVATION MISSION CFI SOFTWARE

Release Notes – Version 4.21

This document describes the changes introduced in this release of the Earth Observation Mission CFI Software.

Visit us at http://eop-cfi.esa.int/index.php/mission-cfi-software/eocfi-software for more.

1 USER SUPPORT

For any question related to the usage of the EOCFI or to report a problem, please contact:

EOCFI Software Support Team

e-mail: cfi@eopp.esa.int

2 NEW FEATURES & IMPROVEMENTS

Ref./EOCFI-ANR-	Description
624	Optimisation of EOCFI library size *(significant reduction of the distribution package size)* *- EOCFI C reduced from ~1.5GB to ~210MB* *- EOCFI C++/JAVA reduced from ~150MB to ~60MB*
667	Optimisation of precise propagator runtime performance *- runtime improved by 100x*
877	Enabled use of custom SP3 satellite identifiers
881	Optimisation of memory used by DEM tile cache depending on height type *- only the strictly necessary memory is used for int16, int32, int64, float32, float64 pixel size*
895	Enabled loading of overlapping Attitude data files *(i.e. make loading Attitude data behaviour same as for Orbit data)*
905	Optimisation of loading orbit data with time/orbit number filtering in xd_read_orbit_file/xo_orbit_init_file
909	Enabled Model parameters specification using both numerical and textual values in Attitude and Swath definition files

3 SOLVED PROBLEMS

Ref./EOCFI-ANR-	Description
795	Corrected calculation of Target-to-Sun visibility flag
880	Corrected “maximum iterations reached” error in xo_position_on_orbit_to_time
883	Corrected memory leaks when loading IERS bulletins in xl_time_ref_init_file
887	Corrected failure to compute valid solution in xp_target_range
891	Corrected memory leaks when using precise propagation in xo_osv_compute
892	Corrected internal memory management that caused EOCFI Java examples to crash on Windows
893	Corrected LoS intersection with DEM calculation that resulted in occasional positive/negative height spikes
894	Corrected memory leaks related to copy constructors/destructors in EOCFI C++
895	Corrected calculation of absolute orbit number when initializing orbit with EOM file
897	Corrected handling of Fixed Header in EOCFI Java *(i.e. ensure all fields where properly set)*
903	Corrected rotation matrix to quaternions calculation that returned NaN
910	Corrected critical failure when calling xv_timesegments_compute_* function with uninitialized Orbit Id
912	Corrected handling of *-fit_mode* and *-tstep* options in gen_tle tool

4 RELEASE DESCRIPTION

4.1 Software

Earth Observation Mission CFI Software 4.21 is composed of the following libraries:

Library Name	Version	Issue Date
File Handling	4.21	30/06/2021
Data Handling		
Lib		
Orbit		
Pointing		
Visibility		
EECommon (*)		

(*) only C++ and JAVA APIs

The core API of the above libraries is written in C and provides an API for C, C++ and Java.

The libraries installation packages are available for download at the following URL (registration required):

http://eop-cfi.esa.int/index.php/mission-cfi-software/eocfi-software/branch-4-x/eocfi-v4x-download

4.2 Documentation

The following documents are available:

Type	Document Name	Version
General	Mission Conventions Document	4.21
	General Software User Manual	
C API	Quick Start Guide	
	File Handling Software User Manual	
	Data Handling Software User Manual	
	Lib Software User Manual	
	Orbit Software User Manual	
	Pointing Software User Manual	
	Visibility Software User Manual	

The documentation is available for download (with C++ and Java APIs also available on-line) at the following URL:

http://eop-cfi.esa.int/index.php/mission-cfi-software/eocfi-software/branch-4-x/eocfi-v4x-documentation

The Earth Observation Mission CFI Software file formats are specified in the EO Mission Software File Format Specification document, which is available at the following URL:

http://eop-cfi.esa.int/Repo/PUBLIC/DOCUMENTATION/SYSTEM_SUPPORT_DOCS/PE-ID-ESA-GS-584-1.6-EO_Mission_SW_File_Format_Specs.pdf

Note: In Section 3.2 of EO CFI File Format Specification (Orbit Scenario File), the element <ANX_Longitude_Drift> and its contents are not supported by the latest EOCFI SW version.

4.3 Supported platforms

The following platforms are supported by this release of the CFI (the following are requirements for the **C API**):

Designation	Platform/ Architecture	Minimum Platform Requirements	Software Requirements
LINUX64_LEGACY	Linux 64-bit	x86_64 based PC Linux Operating System (Kernel version 2.6.x)	GCC compiler version 4.5.x glibc (C Library) version 2.12 (*)
LINUX64	Linux 64-bit	x86_64 based PC Linux Operating System (Kernel version 4.10.x)	GCC compiler version 6.3.x glibc (C Library) version 2.24
WINDOWS64	Windows 64-bit	x86_64 based PC Microsoft Windows 7	Microsoft Visual C++ Compiler (Visual Studio 2017 Express or Professional edition, 64-bit)
MACIN64	MacOS/Intel 64-bit	x86_64 based Mac Computer Mac OS X version 10.12.x (Sierra)	Xcode 9.2/Clang compiler frontend

(*) According to gcc documentation, forward compatibility is ensured up to gcc/g++ version 4.9.x.

NOTE for MACIN64 distribution:
As of version 5 of Xcode the default compiler is Clang (see http://clang.llvm.org/). Clang is a compiler front end for C and C++ and can build an application linking against the EOCFI C/C++ libraries. The gcc and g++ program provided within Xcode are aliases for clang.
OpenMP is not supported in AppleClang. Therefore, the –fopenmp compiler option cannot not be used. Functions using parallelized computations, e.g. xp_target_list... functions will operate in single-threading mode.

The following are additional requirements for the **C++ API** (a C++ compiler is required):

- g++ compiler version 4.5.x for LINUX64_LEGACY (*)
  (in MACIN64, g++ is an alias for clang) and g++ compiler version 6.3.x for LINUX64 (*)
- Microsoft Visual C++ Compiler (Visual Studio 2017 Express or Professional edition) for WINDOWS

The following are additional requirements for the **JAVA API** (a JAVA SDK is required):

- Java Standard Edition (SE) version 8 for all platforms

4.4 Distribution Packages

The Earth Observation Mission CFI Software libraries are provided as Zip archives:

API	Package Name	MD5 Checksum
C	EOCFI-4.21-CLIB-LINUX64.zip	32f742d607471cab2537692509a1a431
C	EOCFI-4.21-CLIB-LINUX64_LEGACY.zip	897d589c3b771e6ae57d6e0c0f18951a
C	EOCFI-4.21-CLIB-MACIN64.zip	d6522724bd31600985814d2b0c6e1dbb
C	EOCFI-4.21-CLIB-WINDOWS64.zip	1009b323228f8ac4d34f3256f6b36a60
C++	EOCFI-4.21-CPPLIB-LINUX64.zip	0e230e515ad4d985dec38f696bff15ee
C++	EOCFI-4.21-CPPLIB-LINUX64_LEGACY.zip	c614c800988255a79fac4c0f7eed7b17
C++	EOCFI-4.21-CPPLIB-MACIN64.zip	b2291470ee42b1d48b3c57060006b279
C++	EOCFI-4.21-CPPLIB-WINDOWS64_DLL.zip (*)	cac996b1ffde56608b997cf6b27fa1ba
C++	EOCFI-4.21-CPPLIB-WINDOWS64_STA.zip (**)	6f8e05ba428a9a4c68f6c23cca005c9b
JAVA	EOCFI-4.21-JAVALIB-LINUX64.zip	56cc8423f2d0d06439f88c270a1d491d
JAVA	EOCFI-4.21-JAVALIB-LINUX64_LEGACY.zip	350026b082bad255a46b8ad45e802bd0
JAVA	EOCFI-4.21-JAVALIB-MACIN64.zip	60f0fe73f8c23d189c774684effe4d9a
JAVA	EOCFI-4.21-JAVALIB-WINDOWS64.zip	f577fca40a16ef694bb835a102d8db32

(*) Dynamic libraries (DLLs) / (**) Static libraries

Information on how to get and use the supported DEM datasets can be found at the following URL:

http://eop-cfi.esa.int/index.php/mission-cfi-software/eocfi-software/support-files

4.5 Installation Hints

To install Earth Observation Mission CFI Software libraries, simply extract the contents of the distribution package in the desired installation directory. More information on how to install and use the libraries can be found on:

- Section 6 “CFI LIBRARIES INSTALLATION” of the General SUM;
- Section 6 “LIBRARY USAGE” of each Library User Manual.

The Earth Observation Mission CFI Software makes use of the following third-party libraries:

- pthreads (POSIX threads): this library is normally pre-installed in Linux and Mac OS X systems.
  For Windows, the library is provided in the cfi_tools directory within the distribution package.
  Pthreads is covered by the GNU Lesser General Public License.
  (see https://www.sourceware.org/pthreads-win32/copying.html).
- libxml2 (see http://xmlsoft.org/): for reading and writing XML files.
- libgeotiff (see https://trac.osgeo.org/geotiff/)
- libtiff (see http://www.libtiff.org/)
- libproj (see https://proj.org/): for reading ASTER GDEM files.

Terms and conditions for usage of such libraries are detailed in the text file (included in the distribution package) TERMS_AND_CONDITIONS.TXT.

The libraries libxml2, libgeotiff, libtiff and libproj are provided:

- in the C API distribution packages: as separated static libraries (see Section 6 of each User Manual for instruction on how to link them to the application program).
- in the C++ / Java APIs distribution packages: as separated dynamic libraries (see Section 6 of each User Manual for instruction on how to link them to the application program). In the Java API for MAC OS X platform, due to incompatibilities with system libraries, they are instead embedded in the EOCFI libraries.

User applications using the Pointing library need to be built with OpenMP support (adding –fopenmp switch in gcc, see Section 6 of the Pointing User Manual).

OpenMP is not supported in AppleClang (Mac OS X) and Visual C++ (Windows), therefore no additional switch is required. In these platforms the library will operate in single-threading mode.

The XML validation function and tool in the Data Handling library uses the libxml2 library. For Windows platforms, it is required to link the user application with the ws2_32.lib.

5 KNOWN PROBLEMS

The updated list of known issues that will be resolved in a future release can be found at the following URL:

http://eop-cfi.esa.int/index.php/mission-cfi-software/eocfi-software/branch-4-x/known-issues-branch-4