

DE4xxSolarSystemEphemerides
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Chapter 6

Module Documentation

6.1 Models

Modules

- [Environment](#)

6.1.1 Detailed Description

6.2 Environment

Modules

- [Ephemerides](#)

6.2.1 Detailed Description

6.3 Ephemerides

Modules

- [De4xxEphem](#)
- [EphemInterface](#)
- [EphemItem](#)
- [EphemManager](#)
- [PropagatedPlanet](#)

6.3.1 Detailed Description

6.4 De4xxEphem

Files

- file [de4xx_ephem/include/class_declarations.hh](#)
Forward declarations of classes defined in the DE4xx model.
- file [de4xx_base.hh](#)
Define data types for JPL ephemeris model.
- file [de4xx_ephem.hh](#)
Define class for the De4xx ephemeris model.
- file [de4xx_file.hh](#)
Define the class responsible for reading the DE4xx ephemeris file.
- file [de4xx_ephem.cc](#)
Define the methods of the classes defined in [de4xx_ephem.hh](#).
- file [de4xx_ephem_dynmanager.cc](#)
Wall off dependencies on the dynamics manager.
- file [de4xx_file.cc](#)
This file defines several utility functions used to read a binary JPL DE405 ephemeris file.
- file [de4xx_file_init.cc](#)
Define De4xx initialization methods.
- file [de4xx_file_update.cc](#)
Define De4xxFile::update.

Namespaces

- [jeod](#)
Namespace jeod.

Macros

- `#define __STDC_LIMIT_MACROS`

6.4.1 Detailed Description

6.4.2 Macro Definition Documentation

6.4.2.1 `#define __STDC_LIMIT_MACROS`

Definition at line 60 of file [de4xx_file.cc](#).

6.5 EphemInterface

Files

- file [ephem_interface/include/class_declarations.hh](#)
Forward declarations of classes defined in models/environment/ephemerides/ephem_interface files.
- file [ephem_interface.hh](#)
Define base class for all ephemeris interface models.
- file [ephem_messages.hh](#)
Define the class EphemeridesMessages, the class that specifies the message IDs used in the JEOD ephemerides model.
- file [ephem_ref_frame.hh](#)
Define the class EphemerisRefFrame.
- file [simple_ephemerides.hh](#)
Define classes that define simple ephemeris models.
- file [ephem_messages.cc](#)
Implement the class EphemeridesMessages.
- file [ephem_ref_frame.cc](#)
Define non-inlined member functions for the EphemRefFrame class.
- file [simple_ephemerides.cc](#)
Define member functions for the SinglePointEphemeris class and subclasses.

Namespaces

- [jeod](#)
Namespace jeod.

6.5.1 Detailed Description

6.6 EphemItem

Files

- file [ephem_item/include/class_declarations.hh](#)
Forward declarations of classes defined in models/environment/ephemerides/ephem_item files.
- file [ephem_item.hh](#)
Define classes for items represented in some ephemeris model.
- file [ephem_item_inline.hh](#)
Define inline methods for the EphemerisItem class.
- file [ephem_orient.hh](#)
Define class EphemerisOrientation.
- file [ephem_orient_zxz.hh](#)
Define classes for items represented in some ephemeris model.
- file [ephem_point.hh](#)
Define class EphemerisPoint.
- file [ephem_item.cc](#)
Define member functions for the EphemItem class and subclasses.
- file [ephem_orient.cc](#)
Define member functions for the EphemItem class and subclasses.
- file [ephem_orient_zxz.cc](#)
Define member functions for the EphemItem class and subclasses.
- file [ephem_point.cc](#)
Define member functions for the EphemPoint class.

Namespaces

- [jeod](#)
Namespace jeod.

Macros

- `#define EPSILON_TIME 1e-12`
- `#define TAYLOR_CUTOFF 0.00786`

6.6.1 Detailed Description

6.6.2 Macro Definition Documentation

6.6.2.1 `#define EPSILON_TIME 1e-12`

Definition at line 62 of file `ephem_orient_zxz.cc`.

Referenced by `jeod::EphemerisZXZOrientation::propagate()`.

6.6.2.2 `#define TAYLOR_CUTOFF 0.00786`

Definition at line 72 of file `ephem_orient_zxz.cc`.

Referenced by `jeod::EphemerisZXZOrientation::propagate()`.

6.7 EphemManager

Files

- file [base_ephem_manager.hh](#)
Define the BaseEphemManager class, which defines the interfaces to the class EphemManager.
- file [ephem_manager.hh](#)
Define the EphemManager class, which manages the ephemeris models in a JEOD-based simulation.
- file [ephem_manager.cc](#)
Define EphemeridesManager methods.
- file [find_planet.cc](#)
Define EphemeridesManager::find_planet.

Namespaces

- [jeod](#)
Namespace jeod.

6.7.1 Detailed Description

6.8 PropagatedPlanet

Files

- file [propagated_planet.hh](#)
Define the classes needed to propagate a planet.
- file [propagated_planet.cc](#)
Define the methods of the classes defined in [propagated_planet.hh](#).

Namespaces

- [jeod](#)
Namespace jeod.

6.8.1 Detailed Description

Chapter 7

Namespace Documentation

7.1 jeod Namespace Reference

Namespace jeod.

Namespaces

- [De4xxBase](#)
Defines enumerations used in the DE4xx ephemeris model.

Data Structures

- class [De4xxEphemItem](#)
Describes a point modeled in a DE4xx ephemeris file.
- class [De4xxEphemeris](#)
The S_define-level class that provides planetary ephemerides.
- struct [EphemerisDataSetMeta](#)
Container for the metadata from the DE model header.
- struct [EphemerisDataItemMeta](#)
Structure containing the header metadata for sizing/locating the data entries with the data segments.
- struct [EphemerisDataSegmentMeta](#)
Metadata implied from each data segment.
- class [De4xxFileSpec](#)
Specifies which file to use (user input initialization-time data).
- class [De4xxFileIO](#)
Contains data used directly for reading the ephemeris file.
- class [De4xxFileHeader](#)
Contains data extracted from the ephemeris file header.
- class [De4xxFileItem](#)
Contains data regarding one of the items in a DE ephemeris file.
- class [De4xxFileRefTime](#)
Contains timing reference data.
- class [De4xxFileCoef](#)
Contains Chebychev polynomial coefficients and terms.
- class [De4xxFileRestart](#)
The FILE pointer in a [De4xxFileIO](#) cannot be restored by Trick.
- class [De4xxFile](#)

Provides the ability to read and interpret a DE4xx ephemeris file.

- class [EphemerisInterface](#)

Interface class that specifies minimal functionality of an ephemeris model.

- class [EphemeridesMessages](#)

Specifies the message IDs used in the Ephemerides model.

- class [EphemerisRefFrame](#)

An [EphemerisRefFrame](#) is a [RefFrame](#) whose state is set by an ephemeris model.

- class [SinglePointEphemeris](#)

A [SinglePointEphemeris](#) has one ephemeris point.

- class [EmptySpaceEphemeris](#)

Empty space has one ephemeris point.

- class [SinglePlanetEphemeris](#)

A space with one gravitation body has one ephemeris point.

- class [EphemerisItem](#)

The [EphemerisItem](#) class is the base class for representing an item that is modeled in an ephemeris model.

- class [EphemerisOrientation](#)

An [EphemerisOrientation](#) object updates the rotational state of an ephemeris reference frame.

- class [EphemerisZXZOrientation](#)

The [EphemerisZXZOrientation](#) is an [EphemerisOrientation](#) subclass that updates orientation based on an Z-X-Z Euler sequence and the time derivatives of this sequence.

- class [EphemerisPoint](#)

An [EphemerisPoint](#) object updates the translational state of an ephemeris reference frame.

- class [BaseEphemeridesManager](#)

The [EphemManager](#) class augments the [RefFrameManager](#) with ephemeris-related items.

- class [EphemeridesManager](#)

The [EphemeridesManager](#) class manages the ephemeris models in a simulation.

- class [PropagatedEphemerisPlanet](#)

A [PropagatedEphemerisPlanet](#) is an [EphemerisPoint](#) whose state is coupled with the translational state of a [DynBody](#) reference frame.

- class [PropagatedEphemerisOrientation](#)

A [PropagatedEphemerisOrientation](#) is an [EphemerisOrientation](#) whose state is coupled with the rotational state of a [DynBody](#) reference frame.

- class [PropagatedPlanet](#)

The [PropagatedPlanet](#) ephemeris model provides planetary state via a [DynBody](#) object whose state is propagated using the JEOD state integration techniques.

Functions

- void [process_mem_usage](#) (double &vm_usage, double &resident_set)
- static double [l1_point](#) (double b1b2_mass_ratio)

Calculate the location of the L1 point as a ratio.

7.1.1 Detailed Description

Namespace jeod.

7.1.2 Function Documentation

7.1.2.1 static double jeod::l1_point (double *b1b2_mass_ratio*) [static]

Calculate the location of the L1 point as a ratio.

Returns

Ratio of body1 to L1-point distance to body1 to body2 distance

Parameters

in	<i>b1b2_mass_ratio</i>	Body1 to body2 mass ratio
----	------------------------	---------------------------

Definition at line 288 of file de4xx_file_init.cc.

Referenced by jeod::De4xxFile::initialize().

7.1.2.2 void jeod::process_mem_usage (double & *vm_usage*, double & *resident_set*)

Definition at line 519 of file de4xx_file.cc.

Referenced by jeod::De4xxFile::capture_mem_stats().

7.2 jeod::De4xxBase Namespace Reference

Defines enumerations used in the DE4xx ephemeris model.

Enumerations

- enum [De4xxFileEntries](#) {
[De4xx_File_Mercury](#) = 0, [De4xx_File_Venus](#) = 1, [De4xx_File_EMbary](#) = 2, [De4xx_File_Mars](#) = 3,
[De4xx_File_Jupiter](#) = 4, [De4xx_File_Saturn](#) = 5, [De4xx_File_Uranus](#) = 6, [De4xx_File_Neptune](#) = 7,
[De4xx_File_Pluto](#) = 8, [De4xx_File_Moon](#) = 9, [De4xx_File_Sun](#) = 10, [De4xx_File_ENutation](#) = 11,
[De4xx_File_LLibration](#) = 12, [De4xx_File_LAngVel](#) = 13, [De4xx_File_tt_tdb](#) = 14, [De4xx_File_MaxEntries](#) }
Defines names for planetary body descriptors in the ephemeris file.
- enum [De4xxEphemConsts](#) {
[De4xx_Const_DENUM](#) = 0, [De4xx_Const_LENUM](#), [De4xx_Const_AU](#), [De4xx_Const_EMRA](#),
[De4xx_Const_CLIGHT](#), [De4xx_Const_GM1](#), [De4xx_Const_GM2](#), [De4xx_Const_GMB](#),
[De4xx_Const_GM4](#), [De4xx_Const_GM5](#), [De4xx_Const_GM6](#), [De4xx_Const_GM7](#),
[De4xx_Const_GM8](#), [De4xx_Const_GM9](#), [De4xx_Const_GMS](#), [De4xx_Const_MaxConsts](#) }
Index aliases for the constants listed in the DE header that are used by JEOD.
- enum [De4xxEphemBodies](#) {
[De4xx_Ephem_Sun](#) = 0, [De4xx_Ephem_Mercury](#) = 1, [De4xx_Ephem_Venus](#) = 2, [De4xx_Ephem_Earth](#) = 3,
[De4xx_Ephem_Mars](#) = 4, [De4xx_Ephem_Jupiter](#) = 5, [De4xx_Ephem_Saturn](#) = 6, [De4xx_Ephem_Uranus](#) =
7,
[De4xx_Ephem_Neptune](#) = 8, [De4xx_Ephem_Pluto](#) = 9, [De4xx_Ephem_Moon](#) = 10, [De4xx_Ephem_EMbary](#)
= 11,
[De4xx_Ephem_SSbary](#) = 12, [De4xx_Ephem_EML1](#) = 13, [De4xx_Ephem_ENutation](#) = 14, [De4xx_Ephem_-](#)
[LLibration](#) = 15,
[De4xx_Ephem_MaxBodies](#) }
Defines names for ephemeris items as represented in the JEOD DE4xx model.

Functions

- static const char *point_names[32] [__attribute__](#) ((unused))
- static uint32_t [number_jeod_items](#) (int de_version_num)
Total number of items in the JEOD ephemeris.
- static uint32_t [number_trans_points](#) (int de_version_num)
Total number of translational states in the JEOD ephemeris.
- static uint32_t [number_grav_models](#) (int de_version_num)
Number of gravity models in the JEOD ephemeris (Mercury to Sun + implied Earth) Currently only one possibility, but written for extensibility.
- static uint32_t [number_physical_bodies](#) (int de_version_num)
Number of bodies in the JEOD ephemeris (Planets + Pluto + Moon + Sun) Currently only one possibility, but written for extensibility.

7.2.1 Detailed Description

Defines enumerations used in the DE4xx ephemeris model.

7.2.2 Enumeration Type Documentation

7.2.2.1 enum jeod::De4xxBase::De4xxEphemBodies

Defines names for ephemeris items as represented in the JEOD DE4xx model.

NOTA BENE: The Earth-moon barycenter follows the massive bodies as the barycenter is not itself a massive body.

Enumerator

De4xx_Ephem_Sun Sun.

De4xx_Ephem_Mercury Mercury.

De4xx_Ephem_Venus Venus.

De4xx_Ephem_Earth Earth.

De4xx_Ephem_Mars Mars.

De4xx_Ephem_Jupiter Jupiter.

De4xx_Ephem_Saturn Saturn.

De4xx_Ephem_Uranus Uranus.

De4xx_Ephem_Neptune Neptune.

De4xx_Ephem_Pluto Pluto.

De4xx_Ephem_Moon Moon.

De4xx_Ephem_EMbary Earth-moon barycenter.

De4xx_Ephem_SSbary Solar system barycenter.

De4xx_Ephem_EML1 Earth-moon L1 point (disabled)

De4xx_Ephem_ENutation Nutations (disabled)

De4xx_Ephem_LLibration Librations.

De4xx_Ephem_MaxBodies

Definition at line 122 of file de4xx_base.hh.

7.2.2.2 enum jeod::De4xxBase::De4xxEphemConsts

Index aliases for the constants listed in the DE header that are used by JEOD.

This is an incomplete subset of the constants provided by DE, but all of these constants must be present for JEOD ephemeris to perform.

Enumerator

De4xx_Const_DENUM
De4xx_Const_LENUM
De4xx_Const_AU
De4xx_Const_EMERAT
De4xx_Const_CLIGHT
De4xx_Const_GM1
De4xx_Const_GM2
De4xx_Const_GMB
De4xx_Const_GM4
De4xx_Const_GM5
De4xx_Const_GM6
De4xx_Const_GM7
De4xx_Const_GM8
De4xx_Const_GM9
De4xx_Const_GMS
De4xx_Const_MaxConsts

Definition at line 96 of file de4xx_base.hh.

7.2.2.3 enum jeod::De4xxBase::De4xxFileEntries

Defines names for planetary body descriptors in the ephemeris file.

This enum defines names for the bodies as they are represented in the ephemeris file.

Enumerator

De4xx_File_Mercury Mercury XYZ [km].
De4xx_File_Venus Venus XYZ.
De4xx_File_EMBary Earth-moon barycenter XYZ.
De4xx_File_Mars Mars XYZ.
De4xx_File_Jupiter Jupiter XYZ.
De4xx_File_Saturn Saturn XYZ.
De4xx_File_Uranus Uranus XYZ.
De4xx_File_Neptune Neptune XYZ.
De4xx_File_Pluto Pluto XYZ.
De4xx_File_Moon Moon, geocentric coords. XYZ.
De4xx_File_Sun Sun XYZ.
De4xx_File_ENutation Earth Nutations d(psi), d(eps) [rad].
De4xx_File_LLibration Lun mantle Libratns phi,tht,psi [rad].
De4xx_File_LAngVel Lun mantle ang vel omg_{xyz} [rad/day].
De4xx_File_tt_tdb TDB to TT offset @ geocenter [s].
De4xx_File_MaxEntries

Definition at line 69 of file de4xx_base.hh.

7.2.3 Function Documentation

7.2.3.1 `static const char* point_names [32] jeod::De4xxBase::__attribute__ (unused) [static]`

7.2.3.2 `static uint32_t jeod::De4xxBase::number_grav_models (int de_version_num) [inline],[static]`

Number of gravity models in the JEOD ephemeris (Mercury to Sun + implied Earth) Currently only one possibility, but written for extensibility.

Definition at line 191 of file `de4xx_base.hh`.

Referenced by `jeod::De4xxFileHeader::De4xxFileHeader()`, and `jeod::De4xxFile::initialize()`.

7.2.3.3 `static uint32_t jeod::De4xxBase::number_jeod_items (int de_version_num) [inline],[static]`

Total number of items in the JEOD ephemeris.

Refer to `De4xxEphemBodies` for identities of each item. Currently only one possibility, but written for extensibility

Definition at line 171 of file `de4xx_base.hh`.

Referenced by `jeod::De4xxEphemeris::activate_nodes()`, `jeod::De4xxEphemeris::De4xxEphemeris()`, `jeod::De4xxEphemeris::ephem_activate()`, `jeod::De4xxEphemeris::ephem_initialize()`, and `jeod::De4xxEphemeris::initialize_items()`.

7.2.3.4 `static uint32_t jeod::De4xxBase::number_physical_bodies (int de_version_num) [inline],[static]`

Number of bodies in the JEOD ephemeris (Planets + Pluto + Moon + Sun) Currently only one possibility, but written for extensibility.

Definition at line 200 of file `de4xx_base.hh`.

7.2.3.5 `static uint32_t jeod::De4xxBase::number_trans_points (int de_version_num) [inline],[static]`

Total number of translational states in the JEOD ephemeris.

(Sun, Mercury to Pluto, EMBary, SSbary) Currently excludes EML1 Currently only one possibility, but written for extensibility

Definition at line 181 of file `de4xx_base.hh`.

Referenced by `jeod::De4xxEphemeris::activate_nodes()`, `jeod::De4xxEphemeris::De4xxEphemeris()`, `jeod::De4xxEphemeris::determine_root_node()`, `jeod::De4xxEphemeris::ephem_build_tree()`, and `jeod::De4xxEphemeris::initialize_items()`.

Chapter 8

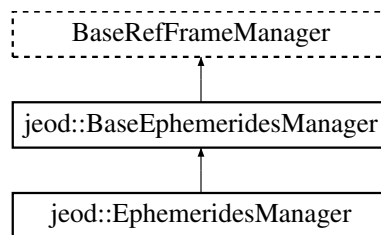
Data Structure Documentation

8.1 jeod::BaseEphemeridesManager Class Reference

The EphemManager class augments the RefFrameManager with ephemeris-related items.

```
#include <base_ephem_manager.hh>
```

Inheritance diagram for jeod::BaseEphemeridesManager:



Public Member Functions

- virtual `~BaseEphemeridesManager()`
Destructor.
- virtual void `ephem_note_tree_status_change()`=0
Denote that the tree needs to be rebuilt.
- virtual void `add_planet(BasePlanet &planet)`=0
Add a planet to the list of such.
- virtual void `add_planet(Planet &planet)`=0
Add a planet to the list of such.
- virtual `BasePlanet * find_base_planet(const char *name) const` =0
Find a planet.
- virtual `Planet * find_planet(const char *name) const` =0
Find a planet.
- virtual unsigned int `get_num_planets(void) const` =0
Return number of registered planets.
- virtual void `add_ephemeris(EphemerisInterface &ephem_if)`=0
Add an ephemeris model to the list of such.
- virtual void `clear_added_ephemerides(void)`=0
Deactivate all registered ephemeris models.
- virtual void `disable_add_ephemeris(void)`=0

- Disable registration of new ephemeris models.*
- virtual void `add_ephem_item` (`EphemerisItem` &ephem_item)=0
Add an ephemeris item to the list of such.
- virtual `EphemerisItem` * `find_ephem_item` (const char *name) const =0
Find an ephemeris item.
- virtual `EphemerisOrientation` * `find_ephem_angle` (const char *name) const =0
Find an ephemeris orientation.
- virtual `EphemerisPoint` * `find_ephem_point` (const char *name) const =0
Find an ephemeris point.
- virtual void `add_integ_frame` (`EphemerisRefFrame` &ref_frame)=0
Add an integration frame to the list of such.
- virtual `EphemerisRefFrame` * `find_integ_frame` (const char *name) const =0
Find an integration frame.
- virtual bool `is_integ_frame` (const `RefFrame` &ref_frame) const =0
Check whether a reference frame is an integration frame.
- virtual unsigned int `find_integ_frame_index` (const `EphemerisRefFrame` &ref_frame) const =0
Find a reference frame's index in the list of integration frames.
- virtual const std::vector
 < `EphemerisRefFrame` * > & `get_integ_frames` (void) const =0
Get the vector of integration frames.

Friends

- class `InputProcessor`
- void `init_attrjeod__BaseEphemeridesManager` ()

8.1.1 Detailed Description

The EphemManager class augments the RefFrameManager with ephemeris-related items.

This class defines the external interfaces to that class.

Definition at line 61 of file base_ephem_manager.hh.

8.1.2 Constructor & Destructor Documentation

8.1.2.1 virtual `jeod::BaseEphemeridesManager::~BaseEphemeridesManager` () [inline],[virtual]

Destructor.

Definition at line 75 of file base_ephem_manager.hh.

8.1.3 Member Function Documentation

8.1.3.1 virtual void `jeod::BaseEphemeridesManager::add_ephem_item` (`EphemerisItem` & *ephem_item*) [pure virtual]

Add an ephemeris item to the list of such.

Parameters

<i>ephem_item</i>	Item to be added.
-------------------	-------------------

Implemented in [jeod::EphemeridesManager](#).

8.1.3.2 `virtual void jeod::BaseEphemeridesManager::add_ephemeris (EphemerisInterface & ephem_if) [pure virtual]`

Add an ephemeris model to the list of such.

Parameters

<i>ephem_if</i>	Ephemeris model to be added.
-----------------	------------------------------

Implemented in [jeod::EphemeridesManager](#).

8.1.3.3 `virtual void jeod::BaseEphemeridesManager::add_integ_frame (EphemerisRefFrame & ref_frame) [pure virtual]`

Add an integration frame to the list of such.

Parameters

<i>ref_frame</i>	Frame to be added.
------------------	--------------------

Implemented in [jeod::EphemeridesManager](#).

8.1.3.4 `virtual void jeod::BaseEphemeridesManager::add_planet (BasePlanet & planet) [pure virtual]`

Add a planet to the list of such.

Parameters

<i>planet</i>	Planet to be added.
---------------	---------------------

Implemented in [jeod::EphemeridesManager](#).

8.1.3.5 `virtual void jeod::BaseEphemeridesManager::add_planet (Planet & planet) [pure virtual]`

Add a planet to the list of such.

Parameters

<i>planet</i>	Planet to be added.
---------------	---------------------

Implemented in [jeod::EphemeridesManager](#).

8.1.3.6 `virtual void jeod::BaseEphemeridesManager::clear_added_ephemerides (void) [pure virtual]`

Deactivate all registered ephemeris models.

Implemented in [jeod::EphemeridesManager](#).

8.1.3.7 `virtual void jeod::BaseEphemeridesManager::disable_add_ephemeris (void) [pure virtual]`

Disable registration of new ephemeris models.

Implemented in [jeod::EphemeridesManager](#).

8.1.3.8 `virtual void jeod::BaseEphemeridesManager::ephem_note_tree_status_change () [pure virtual]`

Denote that the tree needs to be rebuilt.

Implemented in [jeod::EphemeridesManager](#).

Referenced by `jeod::EphemerisItem::disable()`, `jeod::EphemerisItem::enable()`, and `jeod::EphemerisRefFrame::set_active_status()`.

8.1.3.9 `virtual BasePlanet* jeod::BaseEphemeridesManager::find_base_planet (const char * name) const [pure virtual]`

Find a planet.

Parameters

<i>name</i>	Planet name.
-------------	--------------

Returns

Pointer to found planet.

Implemented in [jeod::EphemeridesManager](#).

8.1.3.10 `virtual EphemerisOrientation* jeod::BaseEphemeridesManager::find_ephem_angle (const char * name) const [pure virtual]`

Find an ephemeris orientation.

Parameters

<i>name</i>	Item to be found.
-------------	-------------------

Returns

Found item.

Implemented in [jeod::EphemeridesManager](#).

8.1.3.11 `virtual EphemerisItem* jeod::BaseEphemeridesManager::find_ephem_item (const char * name) const [pure virtual]`

Find an ephemeris item.

Parameters

<i>name</i>	Item to be found.
-------------	-------------------

Returns

Found item.

Implemented in [jeod::EphemeridesManager](#).

8.1.3.12 `virtual EphemerisPoint* jeod::BaseEphemeridesManager::find_ephem_point (const char * name) const [pure virtual]`

Find an ephemeris point.

Parameters

<i>name</i>	Item to be found.
-------------	-------------------

Returns

Found item.

Implemented in [jeod::EphemeridesManager](#).

8.1.3.13 `virtual EphemerisRefFrame* jeod::BaseEphemeridesManager::find_integ_frame (const char * name) const`
`[pure virtual]`

Find an integration frame.

Parameters

<i>name</i>	Frame to be found.
-------------	--------------------

Returns

Found frame.

Implemented in [jeod::EphemeridesManager](#).

8.1.3.14 `virtual unsigned int jeod::BaseEphemeridesManager::find_integ_frame_index (const EphemerisRefFrame & ref_frame) const`
`[pure virtual]`

Find a reference frame's index in the list of integration frames.

Parameters

<i>ref_frame</i>	Frame to be checked.
------------------	----------------------

Returns

Frame index.

Implemented in [jeod::EphemeridesManager](#).

8.1.3.15 `virtual Planet* jeod::BaseEphemeridesManager::find_planet (const char * name) const` `[pure virtual]`

Find a planet.

Parameters

<i>name</i>	Planet name.
-------------	--------------

Returns

Pointer to found planet.

Implemented in [jeod::EphemeridesManager](#).

8.1.3.16 `virtual const std::vector<EphemerisRefFrame*> & jeod::BaseEphemeridesManager::get_integ_frames (void) const`
`[pure virtual]`

Get the vector of integration frames.

Returns

Vector of reference frame pointers.

Implemented in [jeod::EphemeridesManager](#).

8.1.3.17 `virtual unsigned int jeod::BaseEphemeridesManager::get_num_planets (void) const` `[pure virtual]`

Return number of registered planets.

Returns

Number of planets.

Implemented in [jeod::EphemeridesManager](#).

8.1.3.18 `virtual bool jeod::BaseEphemeridesManager::is_integ_frame (const RefFrame & ref_frame) const` `[pure virtual]`

Check whether a reference frame is an integration frame.

Parameters

<i>ref_frame</i>	Frame to be checked.
------------------	----------------------

Returns

True if *ref_frame* is an integration frame, false otherwise.

Implemented in [jeod::EphemeridesManager](#).

Referenced by [jeod::EphemerisItem::set_target_frame\(\)](#).

8.1.4 Friends And Related Function Documentation

8.1.4.1 `void init_attrjeod__BaseEphemeridesManager ()` `[friend]`

8.1.4.2 `friend class InputProcessor` `[friend]`

Definition at line 64 of file `base_ephem_manager.hh`.

The documentation for this class was generated from the following file:

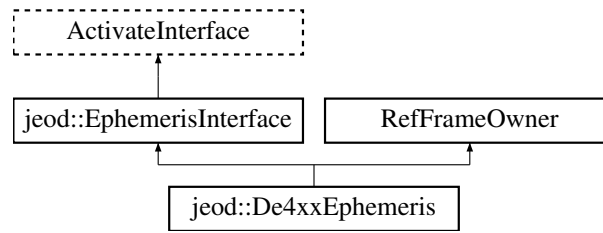
- [base_ephem_manager.hh](#)

8.2 jeod::De4xxEphemeris Class Reference

The S_define-level class that provides planetary ephemerides.

```
#include <de4xx_ephem.hh>
```

Inheritance diagram for `jeod::De4xxEphemeris`:



Public Member Functions

- [De4xxEphemeris](#) (void)
De4xxEphemeris default constructor.
- [~De4xxEphemeris](#) (void)
De4xxEphemeris destructor.
- void [initialize_model](#) (const TimeManager &time_manager, DynManager &dyn_manager, std::string time_type="TT")
Initialize the De4xxEphemeris model.
- void [initialize_model](#) (const TimeManager &time_manager, [EphemeridesManager](#) &ephem_manager, std::string time_type="TT")
Initialize the De4xxEphemeris model.
- void [propagate_lunar_rnp](#) (void)
Propagate the lunar orientation to the current time.
- void [shutdown](#) (void)
Free resources allocated by the De4xxEphemeris model.
- void [activate](#) (void)
Nominally, activate the object.
- void [deactivate](#) (void)
Deactivate the De4xxEphemeris object.
- double [timestamp](#) (void) const
Return time of last update.
- const char * [get_name](#) (void) const
Return model name.
- void [ephem_initialize](#) ([EphemeridesManager](#) &ephem_manager)
Complete the initialization process.
- void [ephem_activate](#) ([EphemeridesManager](#) &ephem_manager)
Mark appropriate items in the model as active.
- void [ephem_build_tree](#) ([EphemeridesManager](#) &ephem_manager)
Construct the ephemeris model portions of the reference frame tree.
- void [ephem_update](#) (void)
Update ephemerides for subscribed items.
- bool [time_is_in_range](#) (void) const
Check whether the specified time is represented in the JPL ephemeris file.
- void [set_model_number](#) (int denum_in)
Set ephemeris model number.
- uint32_t [get_model_number](#) ()
Get Ephemeris model number.
- const [De4xxFileHeader](#) & [get_header_data](#) ()

Data Fields

- bool [active](#)
Is the model active? This is set to true by the constructor.
- bool * [selected_items](#)
Used at initialization time only to selectively enable/disable portions of the model.

Protected Attributes

- [De4xxFile](#) file
The ephemeris file model.
- bool [force_update](#)
Is an update needed even if the time hasn't changed?
- unsigned int [nactive_items](#)
Number of items that are currently active.
- [De4xxEphemItem](#) * [item_data](#)
Data pertaining to the points for which translational states are calculated.
- char * [ident](#)
Identifier for this model, computed from the supplied file.
- double [update_time](#)
Time of last update, dynamic time seconds.
- [EphemerisPoint](#) * [points](#)
The planets and barycenter points, in De4xxEphemBodies FileBodies order.
- [EphemerisZXZOrientation](#) [lunar_orientation](#)
Lunar orientation.
- [EphemerisRefFrame](#) [earth_moon_barycenter_frame](#)
Earth-Moon barycenter reference frame.
- [EphemerisRefFrame](#) [solar_system_barycenter_frame](#)
Solar system barycenter reference frame.
- [De4xxEphemItem](#) * [root_item](#)
The root point in the reference frame tree.
- const TimeStandard * [time_tt](#)
The source of ephemeris time information.
- const TimeDyn * [time_dyn](#)
The source of dynamic time information.
- int * [body_to_file_idx](#)
Mapping from De4xxEphemBodies numbers to De4xxFileBodies numbers.

Private Member Functions

- void [initialize_time](#) (const TimeManager &time_manager, std::string time_type)
Initialize [De4xxEphemeris](#) timing.
- void [initialize_file](#) (void)
Initialize the [De4xxEphemeris](#) file.
- void [initialize_items](#) ([EphemeridesManager](#) &ephem_manager)
Initialize the [De4xxEphemeris](#) item data.
- unsigned int [activate_nodes](#) (void)
Mark appropriate items in the model as active.
- unsigned int [activate_em_nodes](#) (unsigned int tot_active)
Adjust Earth, Moon, and Earth-Moon barycenter activity.

- void [determine_root_node](#) (void)
Determine which item should be the root of the ref frame tree.
- [De4xxEphemeris](#) (const [De4xxEphemeris](#) &)
Not implemented.
- [De4xxEphemeris](#) & [operator=](#) (const [De4xxEphemeris](#) &)
Not implemented.

Friends

- class [InputProcessor](#)
- void [init_attrjeod__De4xxEphemeris](#) ()

8.2.1 Detailed Description

The S_define-level class that provides planetary ephemerides.

The [De4xxEphemeris](#) class constructs the ephemeris reference frame tree and updates the states of the planets based on data from a DE4xx ephemeris model.

Definition at line 169 of file `de4xx_ephem.hh`.

8.2.2 Constructor & Destructor Documentation

8.2.2.1 `jeod::De4xxEphemeris::De4xxEphemeris (void)`

[De4xxEphemeris](#) default constructor.

Definition at line 128 of file `de4xx_ephem.cc`.

References `body_to_file_idx`, `jeod::De4xxBase::De4xx_Ephem_Earth`, `jeod::De4xxBase::De4xx_Ephem_EMbary`, `jeod::De4xxBase::De4xx_Ephem_EML1`, `jeod::De4xxBase::De4xx_Ephem_ENutation`, `jeod::De4xxBase::De4xx_Ephem_Jupiter`, `jeod::De4xxBase::De4xx_Ephem_LLibration`, `jeod::De4xxBase::De4xx_Ephem_Mars`, `jeod::De4xxBase::De4xx_Ephem_Mercury`, `jeod::De4xxBase::De4xx_Ephem_Moon`, `jeod::De4xxBase::De4xx_Ephem_Neptune`, `jeod::De4xxBase::De4xx_Ephem_Pluto`, `jeod::De4xxBase::De4xx_Ephem_Saturn`, `jeod::De4xxBase::De4xx_Ephem_SSbary`, `jeod::De4xxBase::De4xx_Ephem_Sun`, `jeod::De4xxBase::De4xx_Ephem_Uranus`, `jeod::De4xxBase::De4xx_Ephem_Venus`, `jeod::De4xxBase::De4xx_File_EMbary`, `jeod::De4xxBase::De4xx_File_ENutation`, `jeod::De4xxBase::De4xx_File_Jupiter`, `jeod::De4xxBase::De4xx_File_LLibration`, `jeod::De4xxBase::De4xx_File_Mars`, `jeod::De4xxBase::De4xx_File_MaxEntries`, `jeod::De4xxBase::De4xx_File_Mercury`, `jeod::De4xxBase::De4xx_File_Moon`, `jeod::De4xxBase::De4xx_File_Neptune`, `jeod::De4xxBase::De4xx_File_Pluto`, `jeod::De4xxBase::De4xx_File_Saturn`, `jeod::De4xxBase::De4xx_File_Sun`, `jeod::De4xxBase::De4xx_File_Uranus`, `jeod::De4xxBase::De4xx_File_Venus`, `earth_moon_barycenter_frame`, `jeod::EphemerisOrientation::enable()`, `jeod::EphemerisItem::enable()`, `jeod::EphemerisItem::get_name()`, `jeod::De4xxEphemItem::index`, `jeod::De4xxEphemItem::item`, `item_data`, `lunar_orientation`, `jeod::De4xxEphemItem::name`, `jeod::De4xxBase::number_jeod_items()`, `jeod::De4xxBase::number_trans_points()`, `points`, `selected_items`, `jeod::EphemerisItem::set_name()`, `jeod::EphemerisItem::set_owner()`, and `solar_system_barycenter_frame`.

8.2.2.2 `jeod::De4xxEphemeris::~~De4xxEphemeris (void)`

[De4xxEphemeris](#) destructor.

Definition at line 227 of file `de4xx_ephem.cc`.

References `body_to_file_idx`, `item_data`, `points`, `selected_items`, and `shutdown()`.

8.2.2.3 `jeod::De4xxEphemeris::De4xxEphemeris (const De4xxEphemeris &) [private]`

Not implemented.

8.2.3 Member Function Documentation

8.2.3.1 void jeod::De4xxEphemeris::activate (void)

Nominally, activate the object.

In the case of a [De4xxEphemeris](#) object, an inactive object cannot be activated.

Definition at line 260 of file `de4xx_ephem.cc`.

References `active`, and `jeod::EphemeridesMessages::internal_error`.

8.2.3.2 unsigned int jeod::De4xxEphemeris::activate_em_nodes (unsigned int *tot_active*) [private]

Adjust Earth, Moon, and Earth-Moon barycenter activity.

Returns

Void

Parameters

<i>in</i>	<i>tot_active</i>	Number active translation nodes
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Definition at line 587 of file `de4xx_ephem.cc`.

References `jeod::EphemerisItem::activate()`, `jeod::De4xxEphemItem::Active`, `jeod::De4xxBase::De4xx_Ephem_Earth`, `jeod::De4xxBase::De4xx_Ephem_EMbary`, `jeod::De4xxBase::De4xx_Ephem_Moon`, `jeod::De4xxEphemItem::Deselected`, `jeod::EphemerisItem::enable()`, `jeod::De4xxEphemItem::enabled_item`, `jeod::De4xxEphemItem::Inactive`, `jeod::EphemeridesMessages::inconsistent_setup`, `jeod::De4xxEphemItem::InTree`, `jeod::De4xxEphemItem::item`, `item_data`, `nactive_items`, `jeod::De4xxEphemItem::name`, and `jeod::De4xxEphemItem::status`.

Referenced by `ephem_activate()`.

8.2.3.3 unsigned int jeod::De4xxEphemeris::activate_nodes (void) [private]

Mark appropriate items in the model as active.

Returns

Void

Definition at line 543 of file `de4xx_ephem.cc`.

References `jeod::De4xxEphemItem::Active`, `jeod::De4xxEphemItem::Deselected`, `jeod::De4xxEphemItem::enabled_item`, `file`, `jeod::De4xxFile::file_spec`, `jeod::EphemerisItem::get_enabled_item()`, `jeod::De4xxFileSpec::get_model_number()`, `jeod::De4xxEphemItem::Inactive`, `jeod::De4xxEphemItem::InTree`, `jeod::EphemerisItem::is_active()`, `jeod::De4xxEphemItem::item`, `item_data`, `nactive_items`, `jeod::De4xxBase::number_jeod_items()`, `jeod::De4xxBase::number_trans_points()`, and `jeod::De4xxEphemItem::status`.

Referenced by `ephem_activate()`.

8.2.3.4 void jeod::De4xxEphemeris::deactivate (void)

Deactivate the [De4xxEphemeris](#) object.

Definition at line 277 of file `de4xx_ephem.cc`.

References `active`.

8.2.3.5 void jeod::De4xxEphemeris::determine_root_node (void) [private]

Determine which item should be the root of the ref frame tree.

Definition at line 655 of file de4xx_ephem.cc.

References jeod::De4xxBase::De4xx_Ephem_Earth, jeod::De4xxBase::De4xx_Ephem_EMbary, jeod::De4xxBase::De4xx_Ephem_Moon, jeod::De4xxBase::De4xx_Ephem_SSbary, jeod::De4xxEphemItem::enabled_item, file, jeod::De4xxFile::file_spec, jeod::De4xxFileSpec::get_model_number(), jeod::De4xxEphemItem::Inactive, jeod::De4xxEphemItem::IsRoot, jeod::De4xxEphemItem::item, item_data, nactive_items, jeod::De4xxBase::number_trans_points(), root_item, and jeod::De4xxEphemItem::status.

Referenced by ephemer_activate().

8.2.3.6 void jeod::De4xxEphemeris::ephemer_activate (EphemeridesManager & ephemer_manager) [virtual]

Mark appropriate items in the model as active.

Parameters

in, out	<i>ephemer_manager</i>	Ephemerides manager
---------	------------------------	---------------------

Implements [jeod::EphemerisInterface](#).

Definition at line 721 of file de4xx_ephem.cc.

References activate_em_nodes(), activate_nodes(), jeod::De4xxEphemItem::Active, active, jeod::De4xxFileItem::active, body_to_file_idx, jeod::De4xxBase::De4xx_Ephem_EMbary, jeod::De4xxBase::De4xx_Ephem_LLibration, jeod::De4xxBase::De4xx_Ephem_Sun, jeod::De4xxBase::De4xx_File_ENutation, jeod::De4xxBase::De4xx_File_LLibration, determine_root_node(), file, jeod::De4xxFile::file_spec, force_update, jeod::De4xxFileSpec::get_model_number(), jeod::De4xxFile::item, item_data, nactive_items, jeod::De4xxBase::number_jeod_items(), and jeod::De4xxEphemItem::status.

8.2.3.7 void jeod::De4xxEphemeris::ephemer_build_tree (EphemeridesManager & ephemer_manager) [virtual]

Construct the ephemeris model portions of the reference frame tree.

Parameters

in, out	<i>ephemer_manager</i>	Ephemerides manager
---------	------------------------	---------------------

Implements [jeod::EphemerisInterface](#).

Definition at line 780 of file de4xx_ephem.cc.

References jeod::De4xxEphemItem::Active, active, jeod::De4xxBase::De4xx_Ephem_Earth, jeod::De4xxBase::De4xx_Ephem_EMbary, jeod::De4xxBase::De4xx_Ephem_Moon, jeod::De4xxBase::De4xx_Ephem_SSbary, jeod::De4xxEphemItem::Deselected, jeod::De4xxEphemItem::enabled_item, file, jeod::De4xxFile::file_spec, jeod::De4xxEphemItem::frame, jeod::De4xxFileSpec::get_model_number(), jeod::EphemeridesMessages::inconsistent_setup, jeod::De4xxEphemItem::item, item_data, jeod::De4xxEphemItem::name, jeod::De4xxBase::number_trans_points(), root_item, and jeod::De4xxEphemItem::status.

8.2.3.8 void jeod::De4xxEphemeris::ephemer_initialize (EphemeridesManager & ephemer_manager) [virtual]

Complete the initialization process.

This method should be called after all other ephemeris models have completed their basic initialization and after all planets have registered themselves with the ephemeris manager.

Parameters

<code>in, out</code>	<code>ephem_manager</code>	Ephemerides manager
----------------------	----------------------------	---------------------

Implements [jeod::EphemerisInterface](#).

Definition at line 503 of file `de4xx_ephem.cc`.

References `active`, `jeod::De4xxEphemItem::Deselected`, `file`, `jeod::De4xxFile::file_spec`, `jeod::De4xxEphemItem::frame`, `jeod::De4xxFileSpec::get_model_number()`, `jeod::EphemerisItem::get_target_frame()`, `jeod::De4xxEphemItem::item`, `item_data`, `jeod::De4xxBase::number_jeod_items()`, and `jeod::De4xxEphemItem::status`.

8.2.3.9 void jeod::De4xxEphemeris::ephem_update (void) [virtual]

Update ephemerides for subscribed items.

Implements [jeod::EphemerisInterface](#).

Definition at line 840 of file `de4xx_ephem.cc`.

References `jeod::De4xxEphemItem::Active`, `active`, `jeod::De4xxFileHeader::be_em_dist_ratio`, `jeod::De4xxFileHeader::bm_em_dist_ratio`, `body_to_file_idx`, `jeod::De4xxBase::De4xx_Ephem_Earth`, `jeod::De4xxBase::De4xx_Ephem_EMbary`, `jeod::De4xxBase::De4xx_Ephem_LLibration`, `jeod::De4xxBase::De4xx_Ephem_Moon`, `jeod::De4xxBase::De4xx_Ephem_Sun`, `jeod::De4xxBase::De4xx_File_LLibration`, `jeod::De4xxEphemItem::enabled_item`, `file`, `force_update`, `jeod::De4xxFile::header`, `jeod::De4xxEphemItem::item`, `jeod::De4xxFile::item`, `item_data`, `lunar_orientation`, `nactive_items`, `points`, `root_item`, `jeod::De4xxFileItem::state`, `time_dyn`, `time_tt`, `jeod::EphemerisPoint::update()`, `jeod::EphemerisZXZOrientation::update()`, `jeod::De4xxFile::update()`, `jeod::EphemerisPoint::update_scaled()`, and `update_time`.

8.2.3.10 const De4xxFileHeader& jeod::De4xxEphemeris::get_header_data () [inline]

Definition at line 241 of file `de4xx_ephem.hh`.

References `file`, and `jeod::De4xxFile::header`.

8.2.3.11 uint32_t jeod::De4xxEphemeris::get_model_number () [inline]

Get Ephemeris model number.

This number is used to specify the de file to use the pathname is of the form `PWD/build/de4xx_lib/libde<denumln>.so`

Definition at line 237 of file `de4xx_ephem.hh`.

References `file`, `jeod::De4xxFile::file_spec`, and `jeod::De4xxFileSpec::get_model_number()`.

8.2.3.12 const char * jeod::De4xxEphemeris::get_name (void) const [virtual]

Return model name.

Returns

Name

Implements [jeod::EphemerisInterface](#).

Definition at line 304 of file `de4xx_ephem.cc`.

References `ident`.

8.2.3.13 void jeod::De4xxEphemeris::initialize_file (void) [private]

Initialize the [De4xxEphemeris](#) file.

Definition at line 392 of file `de4xx_ephem.cc`.

References `jeod::De4xxBase::De4xx_Const_DENUM`, `jeod::De4xxBase::De4xx_Const_LENUM`, `jeod::Ephemeris-DataSetMeta::de_constants`, `file`, `ident`, `jeod::De4xxFile::initialize()`, `jeod::De4xxFile::io`, `jeod::De4xxFileIO::meta-Data`, and `time_tt`.

Referenced by `initialize_model()`.

8.2.3.14 void jeod::De4xxEphemeris::initialize_items (EphemeridesManager & *ephem_manager*) [private]

Initialize the [De4xxEphemeris](#) item data.

Parameters

<i>in, out</i>	<i>ephem_manager</i>	Ephemerides manager
----------------	----------------------	---------------------

Definition at line 428 of file `de4xx_ephem.cc`.

References `jeod::EphemeridesManager::add_ephem_item()`, `jeod::EphemeridesManager::add_integ_frame()`, `jeod::De4xxBase::De4xx_Ephem_Earth`, `jeod::De4xxBase::De4xx_Ephem_EMbary`, `jeod::De4xxBase::De4xx_Ephem_LLibration`, `jeod::De4xxBase::De4xx_Ephem_Moon`, `jeod::De4xxBase::De4xx_Ephem_SSbary`, `jeod::De4xxEphemItem::Deselected`, `jeod::EphemerisItem::disable()`, `earth_moon_barycenter_frame`, `file`, `jeod::De4xxFile::file_spec`, `jeod::De4xxFileSpec::get_model_number()`, `jeod::De4xxEphemItem::Inactive`, `jeod::EphemeridesMessages::inconsistent_setup`, `jeod::De4xxEphemItem::item`, `item_data`, `lunar_orientation`, `jeod::De4xxBase::number_jeod_items()`, `jeod::De4xxBase::number_trans_points()`, `points`, `selected_items`, `solar_system_barycenter_frame`, and `jeod::De4xxEphemItem::status`.

Referenced by `initialize_model()`.

8.2.3.15 void jeod::De4xxEphemeris::initialize_model (const TimeManager & *time_manager*, DynManager & *dyn_manager*, std::string *time_type* = "TT")

Initialize the [De4xxEphemeris](#) model.

Parameters

<i>in</i>	<i>time_manager</i>	Time manager
<i>in, out</i>	<i>dyn_manager</i>	Dynamics manager
<i>in</i>	<i>time_type</i>	time type

Definition at line 53 of file `de4xx_ephem_dynmanager.cc`.

8.2.3.16 void jeod::De4xxEphemeris::initialize_model (const TimeManager & *time_manager*, EphemeridesManager & *ephem_manager*, std::string *time_type* = "TT")

Initialize the [De4xxEphemeris](#) model.

This method is called before the planets have been registered with the reference frame manager, so we don't know whether the ephemeris items should be enabled or disabled.

Parameters

<i>in</i>	<i>time_manager</i>	Time manager
<i>in, out</i>	<i>ephem_manager</i>	Ephemerides manager

<i>in</i>	<i>time_type</i>	optional "tt" "tdb" "tt" default manager
-----------	------------------	--

Definition at line 322 of file `de4xx_ephem.cc`.

References `active`, `jeod::EphemeridesManager::add_ephemeris()`, `initialize_file()`, `initialize_items()`, and `initialize_time()`.

8.2.3.17 `void jeod::De4xxEphemeris::initialize_time (const TimeManager & time_manager, std::string time_type)`
[private]

Initialize [De4xxEphemeris](#) timing.

Parameters

<i>in</i>	<i>time_manager</i>	Time manager
<i>in</i>	<i>time_type</i>	time type

Definition at line 353 of file `de4xx_ephem.cc`.

References `jeod::EphemeridesMessages::inconsistent_setup`, `time_dyn`, and `time_tt`.

Referenced by `initialize_model()`.

8.2.3.18 `De4xxEphemeris& jeod::De4xxEphemeris::operator= (const De4xxEphemeris &)` [private]

Not implemented.

8.2.3.19 `void jeod::De4xxEphemeris::propagate_lunar_rnp (void)`

Propagate the lunar orientation to the current time.

Definition at line 942 of file `de4xx_ephem.cc`.

References `jeod::De4xxEphemItem::Active`, `active`, `jeod::De4xxBase::De4xx_Ephem_LLibration`, `item_data`, `lunar_orientation`, `jeod::EphemerisZXZOrientation::propagate()`, and `time_dyn`.

8.2.3.20 `void jeod::De4xxEphemeris::set_model_number (int denum_in)` [inline]

Set ephemeris model number.

This number is used to specify the de file to use the pathname is of the form `PWD/build/de4xx_lib/libde<denum-ln>.so`

Definition at line 228 of file `de4xx_ephem.hh`.

References `file`, `jeod::De4xxFile::file_spec`, and `jeod::De4xxFileSpec::set_model_number()`.

8.2.3.21 `void jeod::De4xxEphemeris::shutdown (void)`

Free resources allocated by the [De4xxEphemeris](#) model.

Definition at line 242 of file `de4xx_ephem.cc`.

References `file`, `ident`, and `jeod::De4xxFile::shutdown()`.

Referenced by `~De4xxEphemeris()`.

8.2.3.22 `bool jeod::De4xxEphemeris::time_is_in_range (void) const`

Check whether the specified time is represented in the JPL ephemeris file.

Assumptions and Limitations

- Ephemeris file is open for input
- Ephemeris file is blocked per value set in the ephemeris_file structure

Returns

True if time is in file

Definition at line 930 of file de4xx_ephem.cc.

References file, jeod::De4xxFile::time_is_in_range(), and time_tt.

8.2.3.23 `double jeod::De4xxEphemeris::timestamp (void) const` `[virtual]`

Return time of last update.

Returns

Timestamp

Units: day

Implements [jeod::EphemerisInterface](#).

Definition at line 291 of file de4xx_ephem.cc.

References update_time.

8.2.4 Friends And Related Function Documentation

8.2.4.1 `void init_attrjeod__De4xxEphemeris ()` `[friend]`

8.2.4.2 `friend class InputProcessor` `[friend]`

Definition at line 171 of file de4xx_ephem.hh.

8.2.5 Field Documentation

8.2.5.1 `bool jeod::De4xxEphemeris::active`

Is the model active? This is set to true by the constructor.

Setting this flag to false prior to initialization time will result in the model never doing anything. Setting this flag to false after the model has been active for some time is not supported. `trick_units(-)`

Definition at line 255 of file de4xx_ephem.hh.

Referenced by `activate()`, `deactivate()`, `ephem_activate()`, `ephem_build_tree()`, `ephem_initialize()`, `ephem_update()`, `initialize_model()`, and `propagate_lunar_rnp()`.

8.2.5.2 `int* jeod::De4xxEphemeris::body_to_file_idx` `[protected]`

Mapping from De4xxEphemBodies numbers to De4xxFileBodies numbers.

`trick_units(-)`

Definition at line 349 of file de4xx_ephem.hh.

Referenced by `De4xxEphemeris()`, `ephem_activate()`, `ephem_update()`, and `~De4xxEphemeris()`.

8.2.5.3 EphemerisRefFrame jeod::De4xxEphemeris::earth_moon_barycenter_frame [protected]

Earth-Moon barycenter reference frame.

trick_units(-)

Definition at line 324 of file de4xx_ephem.hh.

Referenced by De4xxEphemeris(), and initialize_items().

8.2.5.4 De4xxFile jeod::De4xxEphemeris::file [protected]

The ephemeris file model.

The items of interest to the typical user are the data members file.file_spec.ephem_file_name and file.file_spec.denum. The former specifies the name of the file while the latter serves as a sanity check that the right file is being read.trick_units(-)

Definition at line 283 of file de4xx_ephem.hh.

Referenced by activate_nodes(), determine_root_node(), ephemer_activate(), ephemer_build_tree(), ephemer_initialize(), ephemer_update(), get_header_data(), get_model_number(), initialize_file(), initialize_items(), set_model_number(), shutdown(), and time_is_in_range().

8.2.5.5 bool jeod::De4xxEphemeris::force_update [protected]

Is an update needed even if the time hasn't changed?

trick_units(-)

Definition at line 288 of file de4xx_ephem.hh.

Referenced by ephemer_activate(), and ephemer_update().

8.2.5.6 char* jeod::De4xxEphemeris::ident [protected]

Identifier for this model, computed from the supplied file.

trick_units(-)

Definition at line 304 of file de4xx_ephem.hh.

Referenced by get_name(), initialize_file(), and shutdown().

8.2.5.7 De4xxEphemItem* jeod::De4xxEphemeris::item_data [protected]

Data pertaining to the points for which translational states are calculated.

trick_units(-)

Definition at line 299 of file de4xx_ephem.hh.

Referenced by activate_em_nodes(), activate_nodes(), De4xxEphemeris(), determine_root_node(), ephemer_activate(), ephemer_build_tree(), ephemer_initialize(), ephemer_update(), initialize_items(), propagate_lunar_rnp(), and ~De4xxEphemeris().

8.2.5.8 EphemerisZXZOrientation jeod::De4xxEphemeris::lunar_orientation [protected]

Lunar orientation.

trick_units(-)

Definition at line 319 of file de4xx_ephem.hh.

Referenced by De4xxEphemeris(), ephemeris_update(), initialize_items(), and propagate_lunar_rnp().

8.2.5.9 unsigned int jeod::De4xxEphemeris::nactive_items [protected]

Number of items that are currently active.

trick_units(–)

Definition at line 293 of file de4xx_ephem.hh.

Referenced by activate_em_nodes(), activate_nodes(), determine_root_node(), ephemeris_activate(), and ephemeris_update().

8.2.5.10 EphemerisPoint* jeod::De4xxEphemeris::points [protected]

The planets and barycenter points, in De4xxEphemBodies FileBodies order.

trick_units(–)

Definition at line 314 of file de4xx_ephem.hh.

Referenced by De4xxEphemeris(), ephemeris_update(), initialize_items(), and ~De4xxEphemeris().

8.2.5.11 De4xxEphemItem* jeod::De4xxEphemeris::root_item [protected]

The root point in the reference frame tree.

trick_units(–)

Definition at line 334 of file de4xx_ephem.hh.

Referenced by determine_root_node(), ephemeris_build_tree(), and ephemeris_update().

8.2.5.12 bool* jeod::De4xxEphemeris::selected_items

Used at initialization time only to selectively enable/disable portions of the model.

The constructor initializes all elements of this array to true. Users can set selected elements to false to disable the corresponding ephemeris items. The intent is to enable the use of multiple ephemeris models. Typical users of the model can leave this member as-is. NOTE: while the container is of length 16, Nutations and lunar librations are not currently supported by JEODtrick_units(–)

Definition at line 267 of file de4xx_ephem.hh.

Referenced by De4xxEphemeris(), initialize_items(), and ~De4xxEphemeris().

8.2.5.13 EphemerisRefFrame jeod::De4xxEphemeris::solar_system_barycenter_frame [protected]

Solar system barycenter reference frame.

trick_units(–)

Definition at line 329 of file de4xx_ephem.hh.

Referenced by De4xxEphemeris(), and initialize_items().

8.2.5.14 const TimeDyn* jeod::De4xxEphemeris::time_dyn [protected]

The source of dynamic time information.

trick_units(–)

Definition at line 344 of file de4xx_ephem.hh.

Referenced by `ephem_update()`, `initialize_time()`, and `propagate_lunar_rnp()`.

8.2.5.15 `const TimeStandard* jeod::De4xxEphemeris::time_tt` [protected]

The source of ephemeris time information.

`trick_units(-)`

Definition at line 339 of file `de4xx_ephem.hh`.

Referenced by `ephem_update()`, `initialize_file()`, `initialize_time()`, and `time_is_in_range()`.

8.2.5.16 `double jeod::De4xxEphemeris::update_time` [protected]

Time of last update, dynamic time seconds.

`trick_units(s)`

Definition at line 309 of file `de4xx_ephem.hh`.

Referenced by `ephem_update()`, and `timestamp()`.

The documentation for this class was generated from the following files:

- [de4xx_ephem.hh](#)
- [de4xx_ephem.cc](#)
- [de4xx_ephem_dynmanager.cc](#)

8.3 `jeod::De4xxEphemItem` Class Reference

Describes a point modeled in a DE4xx ephemeris file.

```
#include <de4xx_ephem.hh>
```

Public Types

- enum `Status` {
`Deselected` = 0, `Inactive` = 1, `IsRoot` = 2, `InTree` = 3,
`Active` = 4 }

Enumerates the status values of a `De4xxEphemItem`.

Public Member Functions

- `De4xxEphemItem` (void)
`De4xxEphemItem` default constructor.
- `~De4xxEphemItem` (void)
`De4xxEphemItem` destructor.

Protected Attributes

- `EphemerisItem * item`
The ephemeris item for this item from this model.
- `EphemerisItem * enabled_item`
The enabled ephemeris item for this item, not necessarily from this model.
- `EphemerisRefFrame * frame`

The reference frame whose state is set by this item.

- const char * [name](#)

Item name; used for reporting errors.

- [Status status](#)

The status for this item.

- unsigned int [index](#)

The node index number, per the De4xxEphemBodies numbering scheme.

Private Member Functions

- [De4xxEphemItem](#) (const [De4xxEphemItem](#) &)

Not implemented.

- [De4xxEphemItem](#) & [operator=](#) (const [De4xxEphemItem](#) &)

Not implemented.

Friends

- class [InputProcessor](#)
- class [De4xxEphemeris](#)
- void [init_attrjeod__De4xxEphemItem](#) ()

8.3.1 Detailed Description

Describes a point modeled in a DE4xx ephemeris file.

This class is only used inside the [De4xxEphemeris](#) class as the type of the protected item_data data member.

Definition at line 70 of file de4xx_ephem.hh.

8.3.2 Member Enumeration Documentation

8.3.2.1 enum jeod::De4xxEphemItem::Status

Enumerates the status values of a De4xEphemItem.

Enumerator

Deselected The item is marked as deselected or the corresponding reference frame is not present in the simulation. The corresponding ephemeris item is permanently disabled under such circumstances.

Inactive The item has not been deselected and the corresponding reference frame is present but is inactive.

IsRoot The item has not been deselected and the corresponding reference frame is present and active. However, the item in question is the root of the reference frame tree and hence its state is the trivial state.

InTree The item has not been deselected and the corresponding reference frame is present and active. However, the ephemeris item that updates this frame is not a part of this model.

Active The item has not been deselected, the corresponding reference frame is present and active, and the ephemeris item that updates this frame belongs to this model.

Definition at line 82 of file de4xx_ephem.hh.

8.3.3 Constructor & Destructor Documentation

8.3.3.1 `jeod::De4xxEphemItem::De4xxEphemItem (void)`

[De4xxEphemItem](#) default constructor.

Definition at line 100 of file `de4xx_ephem.cc`.

8.3.3.2 `jeod::De4xxEphemItem::~~De4xxEphemItem (void)`

[De4xxEphemItem](#) destructor.

Definition at line 117 of file `de4xx_ephem.cc`.

8.3.3.3 `jeod::De4xxEphemItem::De4xxEphemItem (const De4xxEphemItem &)` `[private]`

Not implemented.

8.3.4 Member Function Documentation

8.3.4.1 `De4xxEphemItem& jeod::De4xxEphemItem::operator= (const De4xxEphemItem &)` `[private]`

Not implemented.

8.3.5 Friends And Related Function Documentation

8.3.5.1 `friend class De4xxEphemeris` `[friend]`

Definition at line 73 of file `de4xx_ephem.hh`.

8.3.5.2 `void init_attrjeod__De4xxEphemItem ()` `[friend]`

8.3.5.3 `friend class InputProcessor` `[friend]`

Definition at line 71 of file `de4xx_ephem.hh`.

8.3.6 Field Documentation

8.3.6.1 `EphemerisItem* jeod::De4xxEphemItem::enabled_item` `[protected]`

The enabled ephemeris item for this item, not necessarily from this model.

`trick_units(-)`

Definition at line 126 of file `de4xx_ephem.hh`.

Referenced by `jeod::De4xxEphemeris::activate_em_nodes()`, `jeod::De4xxEphemeris::activate_nodes()`, `jeod::De4xxEphemeris::determine_root_node()`, `jeod::De4xxEphemeris::ephem_build_tree()`, and `jeod::De4xxEphemeris::ephem_update()`.

8.3.6.2 `EphemerisRefFrame* jeod::De4xxEphemItem::frame` `[protected]`

The reference frame whose state is set by this item.

`trick_units(-)`

Definition at line 131 of file de4xx_ephem.hh.

Referenced by jeod::De4xxEphemeris::ephem_build_tree(), and jeod::De4xxEphemeris::ephem_initialize().

8.3.6.3 unsigned int jeod::De4xxEphemItem::index [protected]

The node index number, per the De4xxEphemBodies numbering scheme.

trick_units(-)

Definition at line 146 of file de4xx_ephem.hh.

Referenced by jeod::De4xxEphemeris::De4xxEphemeris().

8.3.6.4 EphemerisItem* jeod::De4xxEphemItem::item [protected]

The ephemeris item for this item from this model.

trick_units(-)

Definition at line 120 of file de4xx_ephem.hh.

Referenced by jeod::De4xxEphemeris::activate_em_nodes(), jeod::De4xxEphemeris::activate_nodes(), jeod::De4xxEphemeris::De4xxEphemeris(), jeod::De4xxEphemeris::determine_root_node(), jeod::De4xxEphemeris::ephem_build_tree(), jeod::De4xxEphemeris::ephem_initialize(), jeod::De4xxEphemeris::ephem_update(), and jeod::De4xxEphemeris::initialize_items().

8.3.6.5 const char* jeod::De4xxEphemItem::name [protected]

Item name; used for reporting errors.

trick_units(-)

Definition at line 136 of file de4xx_ephem.hh.

Referenced by jeod::De4xxEphemeris::activate_em_nodes(), jeod::De4xxEphemeris::De4xxEphemeris(), and jeod::De4xxEphemeris::ephem_build_tree().

8.3.6.6 Status jeod::De4xxEphemItem::status [protected]

The status for this item.

trick_units(-)

Definition at line 141 of file de4xx_ephem.hh.

Referenced by jeod::De4xxEphemeris::activate_em_nodes(), jeod::De4xxEphemeris::activate_nodes(), jeod::De4xxEphemeris::determine_root_node(), jeod::De4xxEphemeris::ephem_activate(), jeod::De4xxEphemeris::ephem_build_tree(), jeod::De4xxEphemeris::ephem_initialize(), and jeod::De4xxEphemeris::initialize_items().

The documentation for this class was generated from the following files:

- [de4xx_ephem.hh](#)
- [de4xx_ephem.cc](#)

8.4 jeod::De4xxFile Class Reference

Provides the ability to read and interpret a DE4xx ephemeris file.

```
#include <de4xx_file.hh>
```

Public Member Functions

- [De4xxFile](#) (void)
Construct the JPL ephemeris file.
- [~De4xxFile](#) (void)
Destroy the JPL ephemeris file.
- void [pre_initialize](#) (void)
Pre-initialize a DE4xxFile instance.
- void [initialize](#) (double epoch_time, double del_day, double time_offset, double init_time)
Initialize a DE4xxFile instance.
- bool [time_is_in_range](#) (double time) const
Check whether the specified time is represented in the JPL ephemeris file.
- void [update](#) (double time)
Calculate the position and velocity states of selected planetary bodies at some point in time.
- void [shutdown](#) ()
Shutdown the JPL ephemeris file.

Data Fields

- [De4xxFileSpec](#) file_spec
File specification.
- [De4xxFileHeader](#) header
File header.
- [De4xxFileItem](#) * item
Item data.
- [De4xxFileIO](#) io
File descriptor.
- [De4xxFileRefTime](#) ref_time
Reference time.
- [De4xxFileCoef](#) coef
Chebyshev coeffs.
- [De4xxFileRestart](#) restart
Restart handler.
- double [update_time](#)
Time of last update.

Private Member Functions

- void [open](#) (void)
Open the JPL ephemeris file.
- void [reopen](#) (void)
Open the JPL ephemeris file on restart.
- void [close](#) (void)
Close the JPL ephemeris file.
- void [interpolate](#) (double time, double fblk)
Calculate the position and velocity states of selected planetary bodies at some point in time.
- [De4xxFile](#) (const [De4xxFile](#) &)
Not implemented.
- [De4xxFile](#) & [operator=](#) (const [De4xxFile](#) &)
Not implemented.
- void [capture_mem_stats](#) ()

Friends

- class [InputProcessor](#)
- class [De4xxFileRestart](#)
- void [init_attrjeod__De4xxFile](#) ()

8.4.1 Detailed Description

Provides the ability to read and interpret a DE4xx ephemeris file.

Definition at line 593 of file `de4xx_file.hh`.

8.4.2 Constructor & Destructor Documentation

8.4.2.1 jeod::De4xxFile::De4xxFile (void)

Construct the JPL ephemeris file.

Definition at line 265 of file `de4xx_file.cc`.

References `jeod::De4xxBase::De4xx_File_ENutation`, `jeod::De4xxBase::De4xx_File_LLibration`, `jeod::De4xxBase::De4xx_File_MaxEntries`, `jeod::De4xxBase::De4xx_File_tt_tdb`, `item`, `jeod::De4xxFileItem::nitems`, `jeod::De4xxFileItem::pscale`, and `restart`.

8.4.2.2 jeod::De4xxFile::~De4xxFile (void)

Destroy the JPL ephemeris file.

Definition at line 305 of file `de4xx_file.cc`.

References `close()`, `item`, and `restart`.

8.4.2.3 jeod::De4xxFile::De4xxFile (const De4xxFile &) [private]

Not implemented.

8.4.3 Member Function Documentation

8.4.3.1 void jeod::De4xxFile::capture_mem_stats () [private]

Definition at line 556 of file `de4xx_file.cc`.

References `jeod::process_mem_usage()`.

8.4.3.2 void jeod::De4xxFile::close (void) [private]

Close the JPL ephemeris file.

Assumptions and Limitations

- Ephemeris file is open for input
- Errors are fatal

Definition at line 457 of file `de4xx_file.cc`.

References `jeod::De4xxFileCoef::chebyderiv`, `jeod::De4xxFileCoef::chebypoly`, `coef`, `jeod::De4xxFileIO::file`, `jeod::EphemeridesMessages::file_error`, `io`, and `jeod::De4xxFileIO::metaData`.

Referenced by shutdown(), and ~De4xxFile().

8.4.3.3 void jeod::De4xxFile::initialize (double epoch_time, double del_day, double time_offset, double init_time)

Initialize a DE4xxFile instance.

Parameters

in	<i>epoch_time</i>	Julian date Units: day
in	<i>del_day</i>	Days from epoch Units: day
in	<i>time_offset</i>	Terrestrial Time offset Units: s
in	<i>init_time</i>	Seconds from epoch Units: s

Definition at line 190 of file de4xx_file_init.cc.

References jeod::De4xxFileHeader::au, jeod::De4xxFileHeader::b1_em_dist_ratio, jeod::De4xxFileHeader::be_em_dist_ratio, jeod::De4xxFileRefTime::block_no, jeod::De4xxFileHeader::bm_em_dist_ratio, jeod::De4xxFileCoef::chebyderiv, jeod::De4xxFileCoef::chebypoly, coef, jeod::De4xxBase::De4xx_Const_AU, jeod::De4xxBase::De4xx_Const_CLIGHT, jeod::De4xxBase::De4xx_Const_EMERAT, jeod::De4xxBase::De4xx_Const_GM1, jeod::De4xxBase::De4xx_Const_GM2, jeod::De4xxBase::De4xx_Const_GM4, jeod::De4xxBase::De4xx_Const_GM5, jeod::De4xxBase::De4xx_Const_GM6, jeod::De4xxBase::De4xx_Const_GM7, jeod::De4xxBase::De4xx_Const_GM8, jeod::De4xxBase::De4xx_Const_GM9, jeod::De4xxBase::De4xx_Const_GMB, jeod::De4xxBase::De4xx_Const_GMS, jeod::De4xxBase::De4xx_Ephem_Earth, jeod::De4xxBase::De4xx_Ephem_EMBary, jeod::De4xxBase::De4xx_Ephem_Jupiter, jeod::De4xxBase::De4xx_Ephem_Mars, jeod::De4xxBase::De4xx_Ephem_Mercury, jeod::De4xxBase::De4xx_Ephem_Moon, jeod::De4xxBase::De4xx_Ephem_Neptune, jeod::De4xxBase::De4xx_Ephem_Pluto, jeod::De4xxBase::De4xx_Ephem_Saturn, jeod::De4xxBase::De4xx_Ephem_Sun, jeod::De4xxBase::De4xx_Ephem_Uranus, jeod::De4xxBase::De4xx_Ephem_Venus, jeod::EphemerisDataSetMeta::de_constants, jeod::EphemerisDataSetMeta::delta_epoch, jeod::De4xxFileSpec::denum, jeod::De4xxFileHeader::e1_em_dist_ratio, jeod::De4xxFileHeader::em_mass_ratio, jeod::De4xxFileRefTime::epoch_date, jeod::De4xxFileRefTime::fdate, file_spec, jeod::De4xxFileHeader::gmbody, header, jeod::De4xxFileRefTime::init_time, io, jeod::l1_point(), jeod::De4xxFileIO::max_terms, jeod::De4xxFileIO::metaData, jeod::De4xxBase::number_grav_models(), pre_initialize(), ref_time, jeod::De4xxFileIO::segmentData, jeod::EphemerisDataSegmentMeta::start_epoch, jeod::EphemeridesMessages::time_not_in_range, jeod::De4xxFileIO::total_num_recs, update_time, and jeod::De4xxFileHeader::vlight.

Referenced by jeod::De4xxEphemeris::initialize_file().

8.4.3.4 void jeod::De4xxFile::interpolate (double time, double fblk) [private]

Calculate the position and velocity states of selected planetary bodies at some point in time.

Parameters

in	<i>time</i>	Time since reference Units: s
in	<i>fblk</i>	Fractional block

Definition at line 278 of file de4xx_file_update.cc.

References jeod::De4xxFileItem::active, jeod::De4xxFileCoef::chebyderiv, jeod::De4xxFileCoef::chebypoly, jeod::De4xxFileCoef::chebyterms, jeod::De4xxFileCoef::chebyx, jeod::De4xxFileCoef::coef, coef, jeod::EphemerisDataSetMeta::delta_epoch, io, item, jeod::De4xxFileItem::item_idx, itemData, jeod::De4xxFileIO::itemData, jeod::De4xxFileIO::metaData, jeod::De4xxFileItem::nitems, jeod::EphemerisDataItemMeta::npoly, jeod::EphemerisDataItemMeta::nterms, jeod::EphemerisDataSetMeta::number_file_items, jeod::EphemerisDataItemMeta::offset, jeod::De4xxFileItem::pscale, jeod::De4xxFileItem::state, and jeod::De4xxFileItem::update_time.

Referenced by update().

8.4.3.5 void jeod::De4xxFile::open (void) [private]

Open the JPL ephemeris file.

Assumptions and Limitations

- Errors are fatal

Returns

Void

Definition at line 334 of file de4xx_file.cc.

References jeod::De4xxBase::De4xx_File_MaxEntries, jeod::EphemeridesMessages::debug, jeod::De4xxFileSpec::ephem_file_dir, jeod::De4xxFileSpec::ephem_file_name, jeod::De4xxFileIO::file, jeod::EphemeridesMessages::file_error, file_spec, io, jeod::De4xxFileIO::itemData, jeod::De4xxFileIO::metaData, jeod::EphemerisDataSetMeta::number_file_items, jeod::De4xxFileSpec::pathname, and jeod::De4xxFileIO::segmentData.

Referenced by pre_initialize().

8.4.3.6 De4xxFile& jeod::De4xxFile::operator= (const De4xxFile &) [private]

Not implemented.

8.4.3.7 void jeod::De4xxFile::pre_initialize (void)

Pre-initialize a DE4xxFile instance.

Definition at line 83 of file de4xx_file_init.cc.

References jeod::De4xxFileItem::avail, jeod::De4xxFileCoef::coef, coef, jeod::De4xxFileIO::coeffs_segment_starting_addr, jeod::De4xxFileIO::current_record_starting_addr, jeod::De4xxBase::De4xx_Const_DENUM, jeod::De4xxBase::De4xx_File_MaxEntries, jeod::EphemerisDataSetMeta::de_constants, jeod::De4xxFileSpec::denum, jeod::De4xxFileIO::file, jeod::EphemeridesMessages::file_error, file_spec, jeod::EphemeridesMessages::garbage_file, jeod::EphemeridesMessages::internal_error, io, item, jeod::De4xxFileItem::item_idx, itemData, jeod::De4xxFileIO::itemData, jeod::De4xxFileIO::max_terms, jeod::De4xxFileIO::metaData, jeod::EphemerisDataItemMeta::nterms, jeod::EphemerisDataSegmentMeta::num_recs, jeod::EphemerisDataSetMeta::number_file_items, jeod::EphemerisDataSetMeta::number_segments, jeod::EphemerisDataItemMeta::offset, open(), jeod::De4xxFileSpec::pathname, jeod::De4xxFileIO::recno, jeod::De4xxFileIO::segment_index, jeod::De4xxFileIO::segment_recno, jeod::De4xxFileIO::segmentData, jeod::EphemerisDataSegmentMeta::start_epoch, jeod::EphemerisDataSegmentMeta::stop_epoch, and jeod::De4xxFileIO::total_num_recs.

Referenced by initialize(), and reopen().

8.4.3.8 void jeod::De4xxFile::reopen (void) [private]

Open the JPL ephemeris file on restart.

Assumptions and Limitations

- File spec has been reloaded.
- Data has been allocated
- Errors are fatal

Definition at line 435 of file de4xx_file.cc.

References jeod::De4xxFileIO::file, io, and pre_initialize().

Referenced by jeod::De4xxFileRestart::simple_restore().

8.4.3.9 void jeod::De4xxFile::shutdown (void)

Shutdown the JPL ephemeris file.

Definition at line 319 of file de4xx_file.cc.

References close().

Referenced by jeod::De4xxEphemeris::shutdown().

8.4.3.10 bool jeod::De4xxFile::time_is_in_range (double time) const

Check whether the specified time is represented in the JPL ephemeris file.

Assumptions and Limitations

- Ephemeris file is open for input
- Ephemeris file is blocked per value set in the ephem_file structure

Returns

True if time is in file

Parameters

in	time	Time since reference Units: s
----	------	----------------------------------

Definition at line 500 of file de4xx_file.cc.

References jeod::De4xxFileRefTime::block_no, jeod::EphemerisDataSetMeta::delta_epoch, jeod::De4xxFileRefTime::init_time, io, jeod::De4xxFileIO::metaData, ref_time, and jeod::De4xxFileIO::total_num_recs.

Referenced by jeod::De4xxEphemeris::time_is_in_range().

8.4.3.11 void jeod::De4xxFile::update (double time)

Calculate the position and velocity states of selected planetary bodies at some point in time.

The EphemeridesState structure embedded in the Ephemerides structure contains an update indicator and state for each body. The state for a body is updated if the body's indicator indicates that a state update is needed.

Body selection – The 'active_bodies' array in the EphemeridesState structure indicates which planets' states are to be updated. The function updates the position and velocity for the selected bodies.

Time specification – Four input variables are available for specifying the time.

- tt_offset is the offset between the remaining input times and Terrestrial Time (aka Terrestrial Dynamic Time, or TDT). Set this to zero if the other input times are already expressed in Terrestrial Time.
- For highest precision, set epoch_time to the Julian date at midnight of the time point of interest and set either del_day or del_time to the difference between the time point of interest and the epoch_time.
- An alternative that retains full precession is to pass the time at the start of the simulation in epoch_time and del_day and the time into the simulation in del_time. In this approach, epoch_time represents the Julian date at the midnight preceding the start of the simulation and del_day represents the time between the epoch time and simulation start.
- For ease of use, set epoch_time to the Julian date representing the the time point of interest and set both del_day and del_time to 0.0. Note that this approach has a machine granularity of about 0.2 msec.
- An intermediate alternative is to set the epoch_time to the start time of the simulation, del_day to zero and del_time to the simulation time in seconds. This approach will result in a small temporal bias due to the precision loss in the epoch time.

Outputs – Positions and velocities are expressed in the ICRF coordinate system. The states of the Sun and planets, including Earth-Moon barycenter, are expressed with respect to the solar system barycenter. Lunar states are expressed with respect to the center of the Earth.

NOTA BENE – The states of unselected bodies may or may not be changed.

Assumptions and Limitations

- Assumption 1. Ephemeris file is open.
- Assumption 2. Offset times in `del_day` and `del_time` are small. See description above.
- Assumption 3. The caller will not reference the states of bodies not requested in the `active_bodies` array. The unselected body states are fair game and may or may not be modified by this function.
- Limitation 1. No light speed time-of-travel corrections. Such corrections must be made by the caller if needed.
- Limitation 2. No relativistic time corrections for the difference between Terrestrial and Barycenter Dynamic Time.
- Limitation 3. The states of the sun and the major planets are expressed in ICRF coordinates relative to the Solar System barycenter. The state of the Moon is expressed in ICRF coordinates relative to the center of the Earth.

Parameters

<code>in</code>	<code>time</code>	Time since reference Units: s
-----------------	-------------------	----------------------------------

Definition at line 121 of file `de4xx_file_update.cc`.

References `jeod::De4xxFileItem::active`, `jeod::De4xxFileItem::avail`, `jeod::De4xxFileRefTime::block_no`, `jeod::De4xxFileCoef::coef`, `coef`, `jeod::De4xxFileIO::coeffs_segment_starting_addr`, `jeod::De4xxFileIO::current_record_starting_addr`, `jeod::EphemerisDataSetMeta::delta_epoch`, `jeod::De4xxFileIO::file`, `jeod::EphemeridesMessages::file_error`, `file_spec`, `jeod::De4xxFileRefTime::init_time`, `jeod::EphemeridesMessages::internal_error`, `interpolate()`, `io`, `item`, `jeod::EphemeridesMessages::item_not_in_file`, `jeod::De4xxFileIO::metaData`, `jeod::EphemerisDataSetMeta::ncoeff`, `jeod::EphemerisDataSetMeta::num_recs`, `jeod::EphemerisDataSetMeta::number_file_items`, `jeod::EphemerisDataSetMeta::number_segments`, `jeod::De4xxFileSpec::pathname`, `jeod::De4xxFileIO::recno`, `ref_time`, `jeod::De4xxFileIO::segment_index`, `jeod::De4xxFileIO::segment_recno`, `jeod::De4xxFileIO::segmentData`, `jeod::EphemeridesMessages::time_not_in_range`, `jeod::De4xxFileIO::total_num_recs`, and `update_time`.

Referenced by `jeod::De4xxEphemeris::ephem_update()`.

8.4.4 Friends And Related Function Documentation

8.4.4.1 friend class `De4xxFileRestart` [[friend](#)]

Definition at line 596 of file `de4xx_file.hh`.

8.4.4.2 `void init_attrjeod_De4xxFile()` [[friend](#)]

8.4.4.3 friend class `InputProcessor` [[friend](#)]

Definition at line 594 of file `de4xx_file.hh`.

8.4.5 Field Documentation

8.4.5.1 `De4xxFileCoef` `jeod::De4xxFile::coef`

Chebyshev coeffs.

trick_units(—)

Definition at line 656 of file de4xx_file.hh.

Referenced by close(), initialize(), interpolate(), pre_initialize(), and update().

8.4.5.2 De4xxFileSpec jeod::De4xxFile::file_spec

File specification.

trick_units(—)

Definition at line 631 of file de4xx_file.hh.

Referenced by jeod::De4xxEphemeris::activate_nodes(), jeod::De4xxEphemeris::determine_root_node(), jeod::De4xxEphemeris::ephem_activate(), jeod::De4xxEphemeris::ephem_build_tree(), jeod::De4xxEphemeris::ephem_initialize(), jeod::De4xxEphemeris::get_model_number(), initialize(), jeod::De4xxEphemeris::initialize_items(), open(), pre_initialize(), jeod::De4xxEphemeris::set_model_number(), and update().

8.4.5.3 De4xxFileHeader jeod::De4xxFile::header

File header.

trick_units(—)

Definition at line 636 of file de4xx_file.hh.

Referenced by jeod::De4xxEphemeris::ephem_update(), jeod::De4xxEphemeris::get_header_data(), and initialize().

8.4.5.4 De4xxFileIO jeod::De4xxFile::io

File descriptor.

trick_units(—)

Definition at line 646 of file de4xx_file.hh.

Referenced by close(), initialize(), jeod::De4xxEphemeris::initialize_file(), interpolate(), open(), pre_initialize(), reopen(), time_is_in_range(), and update().

8.4.5.5 De4xxFileItem* jeod::De4xxFile::item

Item data.

Sized to fit number of entries in most recent DE4xx release

trick_units(—)

Definition at line 641 of file de4xx_file.hh.

Referenced by De4xxFile(), jeod::De4xxEphemeris::ephem_activate(), jeod::De4xxEphemeris::ephem_update(), interpolate(), pre_initialize(), update(), and ~De4xxFile().

8.4.5.6 De4xxFileRefTime jeod::De4xxFile::ref_time

Reference time.

trick_units(—)

Definition at line 651 of file de4xx_file.hh.

Referenced by initialize(), time_is_in_range(), and update().

8.4.5.7 De4xxFileRestart jeod::De4xxFile::restart

Restart handler.

trick_io(**)

Definition at line 661 of file de4xx_file.hh.

Referenced by De4xxFile(), and ~De4xxFile().

8.4.5.8 double jeod::De4xxFile::update_time

Time of last update.

trick_units(s)

Definition at line 666 of file de4xx_file.hh.

Referenced by initialize(), and update().

The documentation for this class was generated from the following files:

- [de4xx_file.hh](#)
- [de4xx_file.cc](#)
- [de4xx_file_init.cc](#)
- [de4xx_file_update.cc](#)

8.5 jeod::De4xxFileCoef Class Reference

Contains Chebychev polynomial coefficients and terms.

```
#include <de4xx_file.hh>
```

Public Member Functions

- [De4xxFileCoef](#) (void)
Construct a De4xxFileFileCoef object.

Protected Attributes

- size_t [chebyterms](#)
No.
- double [chebyx](#)
Chebychev x value.
- double * [chebypoly](#)
Chebychev polynomial coeffs.
- double * [chebyderiv](#)
Derivative of chebypoly.
- double * [coef](#)
Current block contents.

Private Member Functions

- [De4xxFileCoef](#) (const [De4xxFileCoef](#) &)
- [De4xxFileCoef](#) & [operator=](#) (const [De4xxFileCoef](#) &)

Friends

- class [InputProcessor](#)
- class [De4xxFile](#)
- void [init_attrjeod__De4xxFileCoef](#) ()

8.5.1 Detailed Description

Contains Chebychev polynomial coefficients and terms.

Definition at line 516 of file `de4xx_file.hh`.

8.5.2 Constructor & Destructor Documentation

8.5.2.1 `jeod::De4xxFileCoef::De4xxFileCoef (const De4xxFileCoef &) [private]`

8.5.2.2 `jeod::De4xxFileCoef::De4xxFileCoef (void)`

Construct a `De4xxFileFileCoef` object.

Definition at line 214 of file `de4xx_file.cc`.

8.5.3 Member Function Documentation

8.5.3.1 `De4xxFileCoef& jeod::De4xxFileCoef::operator= (const De4xxFileCoef &) [private]`

8.5.4 Friends And Related Function Documentation

8.5.4.1 `friend class De4xxFile [friend]`

Definition at line 520 of file `de4xx_file.hh`.

8.5.4.2 `void init_attrjeod__De4xxFileCoef () [friend]`

8.5.4.3 `friend class InputProcessor [friend]`

Definition at line 518 of file `de4xx_file.hh`.

8.5.5 Field Documentation

8.5.5.1 `double* jeod::De4xxFileCoef::chebyderiv [protected]`

Derivative of `chebypoly`.

`trick_units(-)`

Definition at line 544 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::close()`, `jeod::De4xxFile::initialize()`, and `jeod::De4xxFile::interpolate()`.

8.5.5.2 `double* jeod::De4xxFileCoef::chebypoly [protected]`

Chebychev polynomial coeffs.

`trick_units(-)`

Definition at line 539 of file de4xx_file.hh.

Referenced by jeod::De4xxFile::close(), jeod::De4xxFile::initialize(), and jeod::De4xxFile::interpolate().

8.5.5.3 size_t jeod::De4xxFileCoef::chebyterms [protected]

No.

Chebyshev polynomials termstrick_units(–)

Definition at line 529 of file de4xx_file.hh.

Referenced by jeod::De4xxFile::interpolate().

8.5.5.4 double jeod::De4xxFileCoef::chebyx [protected]

Chebyshev x value.

trick_units(–)

Definition at line 534 of file de4xx_file.hh.

Referenced by jeod::De4xxFile::interpolate().

8.5.5.5 double* jeod::De4xxFileCoef::coef [protected]

Current block contents.

trick_units(–) trick_io(**)

Definition at line 549 of file de4xx_file.hh.

Referenced by jeod::De4xxFile::interpolate(), jeod::De4xxFile::pre_initialize(), and jeod::De4xxFile::update().

The documentation for this class was generated from the following files:

- [de4xx_file.hh](#)
- [de4xx_file.cc](#)

8.6 jeod::De4xxFileHeader Class Reference

Contains data extracted from the ephemeris file header.

```
#include <de4xx_file.hh>
```

Public Member Functions

- [De4xxFileHeader](#) (void)
Construct a [De4xxFileHeader](#) object.
- [~De4xxFileHeader](#) (void)
Destruct a [De4xxFileHeader](#) object.

Data Fields

- double [au](#)
Astronomical unit in meters.
- double [vlight](#)
Speed of light.

- double [em_mass_ratio](#)
Earth: Moon mass ratio.
- double [be_em_dist_ratio](#)
Ratio of Earth-to-barycenter and Earth-to-Moon distances Note: Also equal to the ratio of Moon and Earth+Moon masses.
- double [bm_em_dist_ratio](#)
Ratio of Barycenter-to-Moon and Earth-to-Moon distances Note: Also equal to the ratio of Earth and Earth+Moon masses.
- double [e1_em_dist_ratio](#)
Ratio of Earth to Earth-moon L1 point and Earth-to-Moon distances.
- double [b1_em_dist_ratio](#)
Ratio of Earth-Moon barycenter to L1 point and Earth-to-Moon distances.
- double * [gmbody](#)
Body gravitational constants.

Private Member Functions

- [De4xxFileHeader](#) (const [De4xxFileHeader](#) &)
- [De4xxFileHeader](#) & [operator=](#) (const [De4xxFileHeader](#) &)

Friends

- class [InputProcessor](#)
- class [De4xxFile](#)
- void [init_attrjeod__De4xxFileHeader](#) ()

8.6.1 Detailed Description

Contains data extracted from the ephemeris file header.

Definition at line 334 of file [de4xx_file.hh](#).

8.6.2 Constructor & Destructor Documentation

8.6.2.1 [jeod::De4xxFileHeader::De4xxFileHeader](#) (const [De4xxFileHeader](#) &) [[private](#)]

8.6.2.2 [jeod::De4xxFileHeader::De4xxFileHeader](#) (void)

Construct a [De4xxFileHeader](#) object.

Definition at line 143 of file [de4xx_file.cc](#).

References [gmbody](#), and [jeod::De4xxBase::number_grav_models\(\)](#).

8.6.2.3 [jeod::De4xxFileHeader::~~De4xxFileHeader](#) (void)

Destruct a [De4xxFileHeader](#) object.

Definition at line 164 of file [de4xx_file.cc](#).

References [gmbody](#).

8.6.3 Member Function Documentation

8.6.3.1 `De4xxFileHeader& jeod::De4xxFileHeader::operator= (const De4xxFileHeader &)` [private]

8.6.4 Friends And Related Function Documentation

8.6.4.1 `friend class De4xxFile` [friend]

Definition at line 338 of file `de4xx_file.hh`.

8.6.4.2 `void init_attrjeod__De4xxFileHeader ()` [friend]

8.6.4.3 `friend class InputProcessor` [friend]

Definition at line 336 of file `de4xx_file.hh`.

8.6.5 Field Documentation

8.6.5.1 `double jeod::De4xxFileHeader::au`

Astronomical unit in meters.

`trick_units(m)`

Definition at line 346 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::initialize()`.

8.6.5.2 `double jeod::De4xxFileHeader::b1_em_dist_ratio`

Ratio of Earth-Moon barycenter to L1 point and Earth-to-Moon distances.

`trick_units(-)`

Definition at line 378 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::initialize()`.

8.6.5.3 `double jeod::De4xxFileHeader::be_em_dist_ratio`

Ratio of Earth-to-barycenter and Earth-to-Moon distances Note: Also equal to the ratio of Moon and Earth+Moon masses.

`trick_units(-)`

Definition at line 362 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxEphemeris::ephem_update()`, and `jeod::De4xxFile::initialize()`.

8.6.5.4 `double jeod::De4xxFileHeader::bm_em_dist_ratio`

Ratio of Barycenter-to-Moon and Earth-to-Moon distances Note: Also equal to the ratio of Earth and Earth+Moon masses.

`trick_units(-)`

Definition at line 368 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxEphemeris::ephem_update()`, and `jeod::De4xxFile::initialize()`.

8.6.5.5 `double jeod::De4xxFileHeader::e1_em_dist_ratio`

Ratio of Earth to Earth-moon L1 point and Earth-to-Moon distances.

`trick_units(-)`

Definition at line 373 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::initialize()`.

8.6.5.6 `double jeod::De4xxFileHeader::em_mass_ratio`

Earth:Moon mass ratio.

`trick_units(-)`

Definition at line 356 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::initialize()`.

8.6.5.7 `double* jeod::De4xxFileHeader::gmbody`

Body gravitational constants.

`trick_units(m3/s2)`

Definition at line 383 of file `de4xx_file.hh`.

Referenced by `De4xxFileHeader()`, `jeod::De4xxFile::initialize()`, and `~De4xxFileHeader()`.

8.6.5.8 `double jeod::De4xxFileHeader::vlight`

Speed of light.

`trick_units(m/s)`

Definition at line 351 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::initialize()`.

The documentation for this class was generated from the following files:

- [de4xx_file.hh](#)
- [de4xx_file.cc](#)

8.7 `jeod::De4xxFileIO` Class Reference

Contains data used directly for reading the ephemeris file.

```
#include <de4xx_file.hh>
```

Public Member Functions

- [De4xxFileIO](#) (void)
Construct a [De4xxFileIO](#) object.

Data Fields

- [EphemerisDataSetMeta](#) * `metaData`

- Metadata (e.g., sizing) regarding the selected DE ephemeris data set.*

 - [EphemerisDataItemMeta](#) * [itemData](#)

Metadata (e.g., number of terms) regarding each ephemeris item (e.g., Mercury) contained in the JPL data.

 - [EphemerisDataSegmentMeta](#) * [segmentData](#)

Metadata (e.g., number of records) regarding each polynomial segment of the JPL data.

 - double * [coeffs_segment_starting_addr](#)

Pointer to first value in the segment.

 - double * [current_record_starting_addr](#)

Pointer to first value in the record.

 - uint32_t [recno](#)

The current record number.

 - uint32_t [segment_index](#)

The current segment number.

 - uint32_t [segment_recno](#)

The current segment record number.

 - uint32_t [total_num_recs](#)

The number of records in the dataset.

 - uint32_t [max_terms](#)

The maximum number of Chebychev terms in the file.

Protected Attributes

- void * [file](#)
- The dl handle for the ephemeris shared object.*

Private Member Functions

- [De4xxFileIO](#) (const [De4xxFileIO](#) &)
- [De4xxFileIO](#) & operator= (const [De4xxFileIO](#) &)

Friends

- class [InputProcessor](#)
- class [De4xxFile](#)
- void [init_attrjeod__De4xxFileIO](#) ()

8.7.1 Detailed Description

Contains data used directly for reading the ephemeris file.

Definition at line 247 of file [de4xx_file.hh](#).

8.7.2 Constructor & Destructor Documentation

8.7.2.1 [jeod::De4xxFileIO::De4xxFileIO](#) (const [De4xxFileIO](#) &) `[private]`

8.7.2.2 [jeod::De4xxFileIO::De4xxFileIO](#) (void)

Construct a [De4xxFileIO](#) object.

Definition at line 121 of file [de4xx_file.cc](#).

8.7.3 Member Function Documentation

8.7.3.1 `De4xxFileIO& jeod::De4xxFileIO::operator= (const De4xxFileIO &)` `[private]`

8.7.4 Friends And Related Function Documentation

8.7.4.1 `friend class De4xxFile` `[friend]`

Definition at line 251 of file `de4xx_file.hh`.

8.7.4.2 `void init_attrjeod__De4xxFileIO ()` `[friend]`

8.7.4.3 `friend class InputProcessor` `[friend]`

Definition at line 249 of file `de4xx_file.hh`.

8.7.5 Field Documentation

8.7.5.1 `double* jeod::De4xxFileIO::coeffs_segment_starting_addr`

Pointer to first value in the segment.

`trick_units(-) trick_io(**)`

Definition at line 276 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::pre_initialize()`, and `jeod::De4xxFile::update()`.

8.7.5.2 `double* jeod::De4xxFileIO::current_record_starting_addr`

Pointer to first value in the record.

`trick_units(-) trick_io(**)`

Definition at line 281 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::pre_initialize()`, and `jeod::De4xxFile::update()`.

8.7.5.3 `void* jeod::De4xxFileIO::file` `[protected]`

The dl handle for the ephemeris shared object.

`trick_units(-) trick_io(**)`

Definition at line 313 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::close()`, `jeod::De4xxFile::open()`, `jeod::De4xxFile::pre_initialize()`, `jeod::De4xxFile::reopen()`, and `jeod::De4xxFile::update()`.

8.7.5.4 `EphemerisDataItemMeta* jeod::De4xxFileIO::itemData`

Metadata (e.g., number of terms) regarding each ephemeris item (e.g., Mercury) contained in the JPL data.

`trick_units(-) trick_io(**)`

Definition at line 265 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::interpolate()`, `jeod::De4xxFile::open()`, and `jeod::De4xxFile::pre_initialize()`.

8.7.5.5 uint32_t jeod::De4xxFileIO::max_terms

The maximum number of Chebychev terms in the file.

trick_units(–)

Definition at line 307 of file de4xx_file.hh.

Referenced by jeod::De4xxFile::initialize(), and jeod::De4xxFile::pre_initialize().

8.7.5.6 EphemerisDataSetMeta* jeod::De4xxFileIO::metaData

Metadata (e.g., sizing) regarding the selected DE ephemeris data set.

trick_units(–) trick_io(**)

Definition at line 259 of file de4xx_file.hh.

Referenced by jeod::De4xxFile::close(), jeod::De4xxFile::initialize(), jeod::De4xxEphemeris::initialize_file(), jeod::De4xxFile::interpolate(), jeod::De4xxFile::open(), jeod::De4xxFile::pre_initialize(), jeod::De4xxFile::time_is_in_range(), and jeod::De4xxFile::update().

8.7.5.7 uint32_t jeod::De4xxFileIO::recno

The current record number.

trick_units(–)

Definition at line 287 of file de4xx_file.hh.

Referenced by jeod::De4xxFile::pre_initialize(), and jeod::De4xxFile::update().

8.7.5.8 uint32_t jeod::De4xxFileIO::segment_index

The current segment number.

trick_units(–)

Definition at line 292 of file de4xx_file.hh.

Referenced by jeod::De4xxFile::pre_initialize(), and jeod::De4xxFile::update().

8.7.5.9 uint32_t jeod::De4xxFileIO::segment_recno

The current segment record number.

trick_units(–)

Definition at line 297 of file de4xx_file.hh.

Referenced by jeod::De4xxFile::pre_initialize(), and jeod::De4xxFile::update().

8.7.5.10 EphemerisDataSegmentMeta* jeod::De4xxFileIO::segmentData

Metadata (e.g., number of records) regarding each polynomial segment of the JPL data.

trick_units(–) trick_io(**)

Definition at line 271 of file de4xx_file.hh.

Referenced by jeod::De4xxFile::initialize(), jeod::De4xxFile::open(), jeod::De4xxFile::pre_initialize(), and jeod::De4xxFile::update().

8.7.5.11 uint32_t jeod::De4xxFileIO::total_num_recs

The number of records in the dataset.

trick_units(-)

Definition at line 302 of file de4xx_file.hh.

Referenced by jeod::De4xxFile::initialize(), jeod::De4xxFile::pre_initialize(), jeod::De4xxFile::time_is_in_range(), and jeod::De4xxFile::update().

The documentation for this class was generated from the following files:

- [de4xx_file.hh](#)
- [de4xx_file.cc](#)

8.8 jeod::De4xxFileItem Class Reference

Contains data regarding one of the items in a DE ephemeris file.

```
#include <de4xx_file.hh>
```

Public Member Functions

- [De4xxFileItem](#) (void)
Construct a [De4xxFileItem](#) object.

Data Fields

- bool [active](#)
Is this item's state to be computed? (external input)
- bool [avail](#)
Is this item represented in the ephemeris file?
- uint32_t [item_idx](#)
trick_units(-)
- int32_t [nitems](#)
Vector size.
- double [pscale](#)
Zeroth derivative scale factor.
- double [update_time](#)
Update time (simulation time)
- double [state](#) [2][3]
State data (zeroth, first derivative)

Private Member Functions

- [De4xxFileItem](#) (const [De4xxFileItem](#) &)
- [De4xxFileItem](#) & [operator=](#) (const [De4xxFileItem](#) &)

Friends

- class [InputProcessor](#)
- class [De4xxFile](#)
- void [init_attrjeod__De4xxFileItem](#) ()

8.8.1 Detailed Description

Contains data regarding one of the items in a DE ephemeris file.

Definition at line 404 of file de4xx_file.hh.

8.8.2 Constructor & Destructor Documentation

8.8.2.1 `jeod::De4xxFileItem::De4xxFileItem (const De4xxFileItem &)` `[private]`

8.8.2.2 `jeod::De4xxFileItem::De4xxFileItem (void)`

Construct a [De4xxFileItem](#) object.

As most ephemeris file items are position vectors in kilometers, this constructor sets the scale to 1000 and the number of items to three.

Definition at line 177 of file de4xx_file.cc.

References state.

8.8.3 Member Function Documentation

8.8.3.1 `De4xxFileItem& jeod::De4xxFileItem::operator= (const De4xxFileItem &)` `[private]`

8.8.4 Friends And Related Function Documentation

8.8.4.1 `friend class De4xxFile` `[friend]`

Definition at line 408 of file de4xx_file.hh.

8.8.4.2 `void init_attrjeod__De4xxFileItem ()` `[friend]`

8.8.4.3 `friend class InputProcessor` `[friend]`

Definition at line 406 of file de4xx_file.hh.

8.8.5 Field Documentation

8.8.5.1 `bool jeod::De4xxFileItem::active`

Is this item's state to be computed? (external input)

`trick_units(-)`

Definition at line 416 of file de4xx_file.hh.

Referenced by `jeod::De4xxEphemeris::ephem_activate()`, `jeod::De4xxFile::interpolate()`, and `jeod::De4xxFile::update()`.

8.8.5.2 `bool jeod::De4xxFileItem::avail`

Is this item represented in the ephemeris file?

`trick_units(-)`

Definition at line 421 of file de4xx_file.hh.

Referenced by `jeod::De4xxFile::pre_initialize()`, and `jeod::De4xxFile::update()`.

8.8.5.3 `uint32_t jeod::De4xxFileItem::item_idx`

`trick_units(-)`

Definition at line 424 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::interpolate()`, and `jeod::De4xxFile::pre_initialize()`.

8.8.5.4 `int32_t jeod::De4xxFileItem::nitems`

Vector size.

`trick_units(-)`

Definition at line 429 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::De4xxFile()`, and `jeod::De4xxFile::interpolate()`.

8.8.5.5 `double jeod::De4xxFileItem::pscale`

Zeroth derivative scale factor.

`trick_units(-)`

Definition at line 434 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::De4xxFile()`, and `jeod::De4xxFile::interpolate()`.

8.8.5.6 `double jeod::De4xxFileItem::state[2][3]`

State data (zeroth, first derivative)

`trick_units(-)`

Definition at line 444 of file `de4xx_file.hh`.

Referenced by `De4xxFileItem()`, `jeod::De4xxEphemeris::ephem_update()`, and `jeod::De4xxFile::interpolate()`.

8.8.5.7 `double jeod::De4xxFileItem::update_time`

Update time (simulation time)

`trick_units(s)`

Definition at line 439 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::interpolate()`.

The documentation for this class was generated from the following files:

- [de4xx_file.hh](#)
- [de4xx_file.cc](#)

8.9 `jeod::De4xxFileRefTime` Class Reference

Contains timing reference data.

```
#include <de4xx_file.hh>
```

Public Member Functions

- [De4xxFileRefTime](#) (void)
Construct a [De4xxFileRefTime](#) object.

Data Fields

- double [epoch_date](#)
Julian date of midnight preceding reference time point.
- double [fdate](#)
Fractional days past epoch date of reference time point.
- double [time_offset](#)
Time offset, Typically, Terrestrial Time offset.
- double [init_time](#)
Initialization time (seconds from reference, typically zero).
- double [block_no](#)
File block number corresponding to reference time.

Private Member Functions

- [De4xxFileRefTime](#) (const [De4xxFileRefTime](#) &)
- [De4xxFileRefTime](#) & [operator=](#) (const [De4xxFileRefTime](#) &)

Friends

- class [InputProcessor](#)
- class [De4xxFile](#)
- void [init_attrjeod__De4xxFileRefTime](#) ()

8.9.1 Detailed Description

Contains timing reference data.

Definition at line 464 of file `de4xx_file.hh`.

8.9.2 Constructor & Destructor Documentation

8.9.2.1 `jeod::De4xxFileRefTime::De4xxFileRefTime (const De4xxFileRefTime &)` `[private]`

8.9.2.2 `jeod::De4xxFileRefTime::De4xxFileRefTime (void)`

Construct a [De4xxFileRefTime](#) object.

Definition at line 198 of file `de4xx_file.cc`.

8.9.3 Member Function Documentation

8.9.3.1 `De4xxFileRefTime& jeod::De4xxFileRefTime::operator= (const De4xxFileRefTime &)` `[private]`

8.9.4 Friends And Related Function Documentation

8.9.4.1 friend class De4xxFile [friend]

Definition at line 468 of file de4xx_file.hh.

8.9.4.2 void init_attrjeod__De4xxFileRefTime() [friend]

8.9.4.3 friend class InputProcessor [friend]

Definition at line 466 of file de4xx_file.hh.

8.9.5 Field Documentation

8.9.5.1 double jeod::De4xxFileRefTime::block_no

File block number corresponding to reference time.

trick_units(-)

Definition at line 496 of file de4xx_file.hh.

Referenced by jeod::De4xxFile::initialize(), jeod::De4xxFile::time_is_in_range(), and jeod::De4xxFile::update().

8.9.5.2 double jeod::De4xxFileRefTime::epoch_date

Julian date of midnight preceding reference time point.

trick_units(day)

Definition at line 476 of file de4xx_file.hh.

Referenced by jeod::De4xxFile::initialize().

8.9.5.3 double jeod::De4xxFileRefTime::fdate

Fractional days past epoch date of reference time point.

trick_units(day)

Definition at line 481 of file de4xx_file.hh.

Referenced by jeod::De4xxFile::initialize().

8.9.5.4 double jeod::De4xxFileRefTime::init_time

Initialization time (seconds from reference, typically zero).

trick_units(s)

Definition at line 489 of file de4xx_file.hh.

Referenced by jeod::De4xxFile::initialize(), jeod::De4xxFile::time_is_in_range(), and jeod::De4xxFile::update().

8.9.5.5 double jeod::De4xxFileRefTime::time_offset

Time offset, Typically, Terrestrial Time offset.

trick_units(s)

Definition at line 485 of file de4xx_file.hh.

The documentation for this class was generated from the following files:

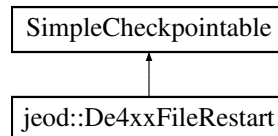
- [de4xx_file.hh](#)
- [de4xx_file.cc](#)

8.10 jeod::De4xxFileRestart Class Reference

The FILE pointer in a [De4xxFileIO](#) cannot be restored by Trick.

```
#include <de4xx_file.hh>
```

Inheritance diagram for jeod::De4xxFileRestart:



Public Member Functions

- [De4xxFileRestart](#) ([De4xxFile](#) &in)
Construct a [De4xxFileRestart](#) object.
- virtual [~De4xxFileRestart](#) (void)
Destroy a [De4xxFileRestart](#) object.
- virtual void [simple_restore](#) (void)
Reopen the [De4xx](#) file for a restart.

Protected Attributes

- [De4xxFile](#) & [de4xx_file](#)
The [De4xxFile](#) object to be restored.

Private Member Functions

- [De4xxFileRestart](#) (const [De4xxFileRestart](#) &)
- [De4xxFileRestart](#) & [operator=](#) (const [De4xxFileRestart](#) &)

8.10.1 Detailed Description

The FILE pointer in a [De4xxFileIO](#) cannot be restored by Trick.

This class provides that essential restart mechanism.

Definition at line 570 of file [de4xx_file.hh](#).

8.10.2 Constructor & Destructor Documentation

8.10.2.1 jeod::De4xxFileRestart::De4xxFileRestart ([De4xxFile](#) & in) [explicit]

Construct a [De4xxFileRestart](#) object.

Parameters

<code>in, out</code>	<code>in</code>	The De4xxFile object
----------------------	-----------------	--------------------------------------

Definition at line 232 of file `de4xx_file.cc`.

8.10.2.2 `jeod::De4xxFileRestart::~De4xxFileRestart (void) [virtual]`

Destroy a [De4xxFileRestart](#) object.

Definition at line 244 of file `de4xx_file.cc`.

8.10.2.3 `jeod::De4xxFileRestart::De4xxFileRestart (const De4xxFileRestart &) [private]`

8.10.3 Member Function Documentation

8.10.3.1 `De4xxFileRestart& jeod::De4xxFileRestart::operator= (const De4xxFileRestart &) [private]`

8.10.3.2 `void jeod::De4xxFileRestart::simple_restore (void) [virtual]`

Reopen the De4xx file for a restart.

Definition at line 255 of file `de4xx_file.cc`.

References `de4xx_file`, and `jeod::De4xxFile::reopen()`.

8.10.4 Field Documentation

8.10.4.1 `De4xxFile& jeod::De4xxFileRestart::de4xx_file [protected]`

The [De4xxFile](#) object to be restored.

`trick_io(**)`

Definition at line 582 of file `de4xx_file.hh`.

Referenced by `simple_restore()`.

The documentation for this class was generated from the following files:

- [de4xx_file.hh](#)
- [de4xx_file.cc](#)

8.11 `jeod::De4xxFileSpec` Class Reference

Specifies which file to use (user input initialization-time data).

```
#include <de4xx_file.hh>
```

Public Member Functions

- [De4xxFileSpec](#) (void)
Construct a [De4xxFileSpec](#) object.
- void [set_model_number](#) (int denum_in)
Set ephemeris model number.
- uint32_t [get_model_number](#) ()
Get Ephemeris model number.

Protected Attributes

- `uint32_t denum`
Ephemeris model number.
- `char ephem_file_dir [256]`
Ephemeris file directory.
- `char ephem_file_name [256]`
Ephemeris file name.
- `char pathname [256]`
Ephemeris file path name.

Private Member Functions

- `De4xxFileSpec (const De4xxFileSpec &)`
Not implemented.
- `De4xxFileSpec & operator= (const De4xxFileSpec &)`
Not implemented.

Friends

- class `InputProcessor`
- class `De4xxFile`
- void `init_attrjeod__De4xxFileSpec ()`

8.11.1 Detailed Description

Specifies which file to use (user input initialization-time data).

Definition at line 169 of file `de4xx_file.hh`.

8.11.2 Constructor & Destructor Documentation

8.11.2.1 `jeod::De4xxFileSpec::De4xxFileSpec (void)`

Construct a `De4xxFileSpec` object.

Definition at line 96 of file `de4xx_file.cc`.

References `ephem_file_dir`, and `set_model_number()`.

8.11.2.2 `jeod::De4xxFileSpec::De4xxFileSpec (const De4xxFileSpec &) [private]`

Not implemented.

8.11.3 Member Function Documentation

8.11.3.1 `uint32_t jeod::De4xxFileSpec::get_model_number () [inline]`

Get Ephemeris model number.

This number is used to specify the de file to use the pathname is of the form `PWD/build/de4xx_lib/libde<denum-In>.so`

Definition at line 194 of file `de4xx_file.hh`.

References denum.

Referenced by jeod::De4xxEphemeris::activate_nodes(), jeod::De4xxEphemeris::determine_root_node(), jeod::De4xxEphemeris::ephem_activate(), jeod::De4xxEphemeris::ephem_build_tree(), jeod::De4xxEphemeris::ephem_initialize(), jeod::De4xxEphemeris::get_model_number(), and jeod::De4xxEphemeris::initialize_items().

8.11.3.2 De4xxFileSpec& jeod::De4xxFileSpec::operator= (const De4xxFileSpec &) [private]

Not implemented.

8.11.3.3 void jeod::De4xxFileSpec::set_model_number (int denum_in)

Set ephemeris model number.

This number is used to specify the de file to use the pathname is of the form PWD/build/de4xx_lib/libde<denum-In>.so

Definition at line 108 of file de4xx_file.cc.

References denum, ephem_file_dir, ephem_file_name, and pathname.

Referenced by De4xxFileSpec(), and jeod::De4xxEphemeris::set_model_number().

8.11.4 Friends And Related Function Documentation

8.11.4.1 friend class De4xxFile [friend]

Definition at line 172 of file de4xx_file.hh.

8.11.4.2 void init_attrjeod__De4xxFileSpec () [friend]

8.11.4.3 friend class InputProcessor [friend]

Definition at line 170 of file de4xx_file.hh.

8.11.5 Field Documentation

8.11.5.1 uint32_t jeod::De4xxFileSpec::denum [protected]

Ephemeris model number.

This must match the DE number in the data file; a sanity checktrick_units(-)

Definition at line 207 of file de4xx_file.hh.

Referenced by get_model_number(), jeod::De4xxFile::initialize(), jeod::De4xxFile::pre_initialize(), and set_model_number().

8.11.5.2 char jeod::De4xxFileSpec::ephem_file_dir[256] [protected]

Ephemeris file directory.

trick_units(-)

Definition at line 212 of file de4xx_file.hh.

Referenced by De4xxFileSpec(), jeod::De4xxFile::open(), and set_model_number().

8.11.5.3 char jeod::De4xxFileSpec::ephem_file_name[256] [protected]

Ephemeris file name.

trick_units(—)

Definition at line 217 of file de4xx_file.hh.

Referenced by jeod::De4xxFile::open(), and set_model_number().

8.11.5.4 char jeod::De4xxFileSpec::pathname[256] [protected]

Ephemeris file path name.

trick_io(*o) trick_units(—)

Definition at line 223 of file de4xx_file.hh.

Referenced by jeod::De4xxFile::open(), jeod::De4xxFile::pre_initialize(), set_model_number(), and jeod::De4xxFile::update().

The documentation for this class was generated from the following files:

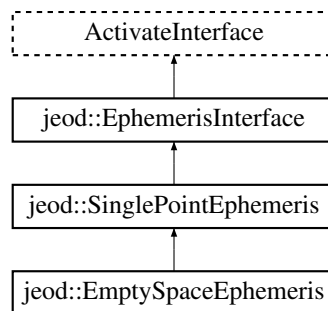
- [de4xx_file.hh](#)
- [de4xx_file.cc](#)

8.12 jeod::EmptySpaceEphemeris Class Reference

Empty space has one ephemeris point.

```
#include <simple_ephemerides.hh>
```

Inheritance diagram for jeod::EmptySpaceEphemeris:



Public Member Functions

- [EmptySpaceEphemeris](#) (void)
Construct an [EmptySpaceEphemeris](#) object.
- virtual [~EmptySpaceEphemeris](#) (void)
Destruct an [EmptySpaceEphemeris](#) object.
- virtual void [set_name](#) (const char *frame_name)
Set the name of an [EmptySpaceEphemeris](#) object.
- virtual void [initialize_model](#) ([EphemeridesManager](#) &ephem_manager)
Initialize an [EmptySpaceEphemeris](#) object.
- virtual void [ephem_initialize](#) ([EphemeridesManager](#) &ephem_manager)
Initialize an [EmptySpaceEphemeris](#) object.

- virtual void [ephem_activate](#) ([EphemeridesManager](#) &ephem_manager)
Activate an [EmptySpaceEphemeris](#) object.
- virtual void [ephem_build_tree](#) ([EphemeridesManager](#) &ephem_manager)
Build the reference frame tree with the central frame as the root.

Protected Attributes

- [EphemerisPoint](#) central_point
The [EphemerisPoint](#) that represents the center of an empty universe.
- [EphemerisRefFrame](#) central_frame
The sole ephemeris frame for this model.

Private Member Functions

- [EmptySpaceEphemeris](#) (const [EmptySpaceEphemeris](#) &)
Not implemented.
- [EmptySpaceEphemeris](#) & operator= (const [EmptySpaceEphemeris](#) &)
Not implemented.

Friends

- class [InputProcessor](#)
- void [init_attrjeod__EmptySpaceEphemeris](#) ()

8.12.1 Detailed Description

Empty space has one ephemeris point.

Definition at line 169 of file simple_ephemerides.hh.

8.12.2 Constructor & Destructor Documentation

8.12.2.1 `jeod::EmptySpaceEphemeris::EmptySpaceEphemeris (void)`

Construct an [EmptySpaceEphemeris](#) object.

Definition at line 156 of file simple_ephemerides.cc.

References [central_point](#), [jeod::EphemerisItem::enable\(\)](#), and [jeod::EphemerisItem::set_owner\(\)](#).

8.12.2.2 `jeod::EmptySpaceEphemeris::~~EmptySpaceEphemeris (void) [virtual]`

Destruct an [EmptySpaceEphemeris](#) object.

Definition at line 167 of file simple_ephemerides.cc.

8.12.2.3 `jeod::EmptySpaceEphemeris::EmptySpaceEphemeris (const EmptySpaceEphemeris &) [private]`

Not implemented.

8.12.3 Member Function Documentation

8.12.3.1 void jeod::EmptySpaceEphemeris::ephem_activate (EphemeridesManager & *ephem_manager*) [virtual]

Activate an [EmptySpaceEphemeris](#) object.

Parameters

<i>in, out</i>	<i>ephem_manager</i>	Ephemerides manager
----------------	----------------------	---------------------

Implements [jeod::SinglePointEphemeris](#).

Definition at line 249 of file simple_ephemerides.cc.

8.12.3.2 `void jeod::EmptySpaceEphemeris::ephem_build_tree (EphemeridesManager & ephem_manager)`
[virtual]

Build the reference frame tree with the central frame as the root.

Parameters

<i>in, out</i>	<i>ephem_manager</i>	Ephemerides manager
----------------	----------------------	---------------------

Implements [jeod::SinglePointEphemeris](#).

Definition at line 261 of file simple_ephemerides.cc.

References [jeod::SinglePointEphemeris::active](#), and [central_frame](#).

8.12.3.3 `void jeod::EmptySpaceEphemeris::ephem_initialize (EphemeridesManager & ephem_manager)` [virtual]

Initialize an [EmptySpaceEphemeris](#) object.

Parameters

<i>in, out</i>	<i>ephem_manager</i>	Ephemerides manager
----------------	----------------------	---------------------

Implements [jeod::SinglePointEphemeris](#).

Definition at line 226 of file simple_ephemerides.cc.

References [central_point](#), [jeod::SinglePointEphemeris::deactivate\(\)](#), [jeod::EphemerisItem::disable\(\)](#), [jeod::EphemerisItem::get_target_frame\(\)](#), [jeod::SinglePointEphemeris::identifier](#), and [jeod::EphemeridesMessages::inconsistent_setup](#).

8.12.3.4 `void jeod::EmptySpaceEphemeris::initialize_model (EphemeridesManager & ephem_manager)` [virtual]

Initialize an [EmptySpaceEphemeris](#) object.

Parameters

<i>in, out</i>	<i>ephem_manager</i>	Ephemerides manager
----------------	----------------------	---------------------

Implements [jeod::SinglePointEphemeris](#).

Definition at line 206 of file simple_ephemerides.cc.

References [jeod::SinglePointEphemeris::active](#), [jeod::EphemeridesManager::add_ephem_item\(\)](#), [jeod::EphemeridesManager::add_ephemeris\(\)](#), [jeod::EphemeridesManager::add_integ_frame\(\)](#), [central_frame](#), and [central_point](#).

8.12.3.5 `EmptySpaceEphemeris& jeod::EmptySpaceEphemeris::operator= (const EmptySpaceEphemeris &)`
[private]

Not implemented.

8.12.3.6 `void jeod::EmptySpaceEphemeris::set_name (const char * new_name)` [virtual]

Set the name of an [EmptySpaceEphemeris](#) object.

Parameters

<i>in, out</i>	<i>new_name</i>	Ephemeris name
----------------	-----------------	----------------

Reimplemented from [jeod::SinglePointEphemeris](#).

Definition at line 179 of file `simple_ephemerides.cc`.

References `central_frame`, `central_point`, `jeod::SinglePointEphemeris::set_name()`, and `jeod::EphemerisItem::set_name()`.

8.12.4 Friends And Related Function Documentation

8.12.4.1 `void init_attrjeod__EmptySpaceEphemeris ()` `[friend]`

8.12.4.2 `friend class InputProcessor` `[friend]`

Definition at line 171 of file `simple_ephemerides.hh`.

8.12.5 Field Documentation

8.12.5.1 **EphemerisRefFrame** `jeod::EmptySpaceEphemeris::central_frame` `[protected]`

The sole ephemeris frame for this model.

`trick_units(-)`

Definition at line 205 of file `simple_ephemerides.hh`.

Referenced by `ephem_build_tree()`, `initialize_model()`, and `set_name()`.

8.12.5.2 **EphemerisPoint** `jeod::EmptySpaceEphemeris::central_point` `[protected]`

The [EphemerisPoint](#) that represents the center of an empty universe.

`trick_units(-)`

Definition at line 200 of file `simple_ephemerides.hh`.

Referenced by `EmptySpaceEphemeris()`, `ephem_initialize()`, `initialize_model()`, and `set_name()`.

The documentation for this class was generated from the following files:

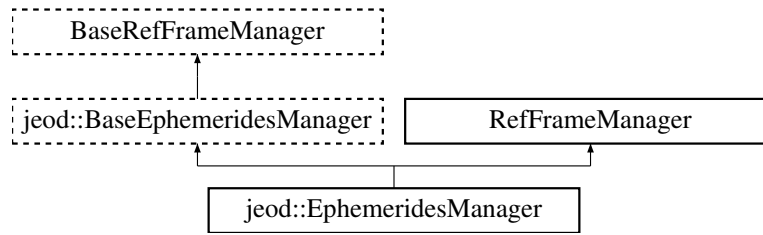
- [simple_ephemerides.hh](#)
- [simple_ephemerides.cc](#)

8.13 jeod::EphemeridesManager Class Reference

The [EphemeridesManager](#) class manages the ephemeris models in a simulation.

`#include <ephem_manager.hh>`

Inheritance diagram for `jeod::EphemeridesManager`:



Public Member Functions

- [EphemeridesManager](#) ()
EphemeridesManager default constructor.
- [~EphemeridesManager](#) ()
EphemeridesManager destructor.
- bool [ref_frame_tree_needs_rebuild](#) () const
Query if the reference frame tree needs to be rebuilt.
- virtual void [ephem_note_tree_status_change](#) ()
Denote that the reference frame tree needs to be rebuilt.
- virtual void [add_planet](#) (BasePlanet &planet)
Add a planet to the planets registry.
- virtual void [add_planet](#) (Planet &planet)
Add a planet to the registry.
- virtual BasePlanet * [find_base_planet](#) (const char *name) const
Find the planet with the given name.
- virtual Planet * [find_planet](#) (const char *name) const
Find the planet with the given name.
- virtual unsigned int [get_num_planets](#) (void) const
Return number of registered planets.
- virtual void [add_ephemeris](#) (EphemerisInterface &ephem_if)
Add an ephemeris model to the list of managed models.
- virtual void [clear_added_ephemerides](#) (void)
Deactivate any registered ephemeris items and remove them from the list.
- virtual void [disable_add_ephemeris](#) (void)
Make subsequent calls to [add_ephemeris](#) deactivate the specified ephemeris model instead of adding it to the list of managed models.
- virtual void [add_ephem_item](#) (EphemerisItem &ephem_item)
Add an ephemeris item to the set of ephemeris items known to the ephemerides manager.
- virtual EphemerisItem * [find_ephem_item](#) (const char *name) const
Find the first registered *EphemerisItem* with the given name.
- virtual EphemerisOrientation * [find_ephem_angle](#) (const char *name) const
Find the *EphemerisOrientation* with the given name.
- virtual EphemerisPoint * [find_ephem_point](#) (const char *name) const
Find the *EphemerisPoint* with the given name.
- virtual void [add_integ_frame](#) (EphemerisRefFrame &ref_frame)
Add a frame to the reference frame and integration frame lists.
- virtual EphemerisRefFrame * [find_integ_frame](#) (const char *name) const
Find the integration frame with the given name.
- virtual bool [is_integ_frame](#) (const RefFrame &ref_frame) const
Determine if supplied frame is an integration frame.
- virtual unsigned int [find_integ_frame_index](#) (const EphemerisRefFrame &ref_frame) const

- Find the index of provided frame in the integration frames vector.*

 - virtual const std::vector
< EphemerisRefFrame * > & get_integ_frames (void) const

Get a copy of the vector of integration frames.
- virtual void add_ref_frame (RefFrame &ref_frame)

Add a reference frame to the reference frame registry.
- void set_target_frame (RefFrame &ref_frame)

Set the target-frame reference for the ref-frame and all known EphemItems with similar target-frame names.
- void initialize_ephemerides (void)

Initialize the ephemeris models.
- void activate_ephemerides (void)

Activate ephemeris items based on frame subscription status, activate ephemeris models, and build the reference frame tree.
- void update_ephemerides (void)

Update each ephemeris model.

Protected Attributes

- bool single_ephem_mode

Set via a call to disable_add_ephemeris, typically to allow a simple ephemeris model to be active with all other models made inactive.
- bool regenerate_ref_frame_tree

Set when the reference frame tree needs to be regenerated.
- double update_time

Time of last update.
- JeodPointerVector< BasePlanet >
::type planets

The planets in a simulation, typically defined at the S_define level.
- JeodPointerVector
< EphemerisInterface >::type ephemerides

The ephemerides models managed by this EphemeridesManager.
- JeodPointerVector
< EphemerisItem >::type ephem_items

The heads of the ephemeris item lists.
- JeodPointerVector
< EphemerisRefFrame >::type integ_frames

List of reference frames that are not rotating with respect to the root node of the reference frame tree.

Private Member Functions

- EphemeridesManager (const EphemeridesManager &)

Not implemented.
- EphemeridesManager & operator= (const EphemeridesManager &)

Not implemented.

Friends

- class InputProcessor
- void init_attrjeod__EphemeridesManager ()

8.13.1 Detailed Description

The [EphemeridesManager](#) class manages the ephemeris models in a simulation.

The primary functions of a [EphemeridesManager](#) are to:

- Maintain lists of planets, ephemeris models, ephemeris items, and integration frames, and to provide lookup methods for these lists.
- Dynamically determine which ephemerides are needed in a simulation.
- Initialize ephemeris models and keep them in sync with the rest of the simulation.

Definition at line 62 of file `ephem_manager.hh`.

8.13.2 Constructor & Destructor Documentation

8.13.2.1 `jeod::EphemeridesManager::EphemeridesManager (void)`

[EphemeridesManager](#) default constructor.

Definition at line 67 of file `ephem_manager.cc`.

References `ephem_items`, `ephemerides`, `integ_frames`, and `planets`.

8.13.2.2 `jeod::EphemeridesManager::~~EphemeridesManager (void)`

[EphemeridesManager](#) destructor.

Definition at line 91 of file `ephem_manager.cc`.

References `ephem_items`, `ephemerides`, `integ_frames`, and `planets`.

8.13.2.3 `jeod::EphemeridesManager::EphemeridesManager (const EphemeridesManager &) [private]`

Not implemented.

8.13.3 Member Function Documentation

8.13.3.1 `void jeod::EphemeridesManager::activate_ephemerides (void)`

Activate ephemeris items based on frame subscription status, activate ephemeris models, and build the reference frame tree.

Definition at line 715 of file `ephem_manager.cc`.

References `jeod::EphemerisItem::disconnect_from_tree()`, `jeod::EphemerisInterface::ephem_activate()`, `jeod::EphemerisInterface::ephem_build_tree()`, `ephem_items`, `ephemerides`, and `regenerate_ref_frame_tree`.

Referenced by `update_ephemerides()`.

8.13.3.2 `void jeod::EphemeridesManager::add_ephem_item (EphemerisItem & ephem_item) [virtual]`

Add an ephemeris item to the set of ephemeris items known to the ephemerides manager.

Each ephemeris model calls this method for each ephemeris item represented by that ephemeris model. The provided item is added to

- The `ephem_items` list if the provided item's name is unique or

- The tail of the list of items with the same name if an item with the provided item's name is already in the `ephem_items` list.

Multiple ephemerides models might represent the same conceptual item. The `ephem_items` list contains only items with unique names. These head items link to other items with the same name via the items' next data members, which form a singly-linked list of commonly-named items.

Assumptions and limitations:

- The item must have a valid name.
- Only one item with a given name can be enabled.

Parameters

<i>ephem_item</i>	Ephemeris item to be added to the registry.
-------------------	---

Implements [jeod::BaseEphemeridesManager](#).

Definition at line 304 of file `ephem_manager.cc`.

References `jeod::EphemerisItem::disable()`, `jeod::EphemeridesMessages::duplicate_entry`, `ephem_items`, `find_ -ephem_item()`, `jeod::EphemerisItem::get_enabled_item()`, `jeod::EphemerisInterface::get_name()`, `jeod::EphemerisItem::get_name()`, `jeod::EphemerisItem::get_next()`, `jeod::EphemerisItem::get_owner()`, `jeod::EphemeridesMessages::inconsistent_setup`, `jeod::EphemeridesMessages::internal_error`, `jeod::EphemerisItem::is_enabled()`, `jeod::EphemerisItem::set_head()`, `jeod::EphemerisItem::set_manager()`, `jeod::EphemerisItem::set_next()`, `jeod::EphemerisItem::set_target_frame()`, `jeod::EphemeridesMessages::single_ephem_mode`, `single_ephem_mode`, `jeod::EphemerisItem::Translation`, and `jeod::EphemerisItem::updates_what()`.

Referenced by `jeod::De4xxEphemeris::initialize_items()`, `jeod::EmptySpaceEphemeris::initialize_model()`, and `jeod::SinglePlanetEphemeris::initialize_model()`.

8.13.3.3 void jeod::EphemeridesManager::add_ephemeris (EphemerisInterface & *ephem_if*) [virtual]

Add an ephemeris model to the list of managed models.

Assumptions and limitations:

- Ephemeris models must be registered with the ephemerides manager in dependency order: Models with no dependencies are registered first, followed by models that depend on these base models, and so on.

Parameters

<i>ephem_if</i>	Ephemeris model to be added to the registry.
-----------------	--

Implements [jeod::BaseEphemeridesManager](#).

Definition at line 240 of file `ephem_manager.cc`.

References `ephemerides`.

Referenced by `jeod::EmptySpaceEphemeris::initialize_model()`, `jeod::De4xxEphemeris::initialize_model()`, and `jeod::SinglePlanetEphemeris::initialize_model()`.

8.13.3.4 void jeod::EphemeridesManager::add_integ_frame (EphemerisRefFrame & *ref_frame*) [virtual]

Add a frame to the reference frame and integration frame lists.

Parameters

<i>ref_frame</i>	Integration frame to be added to the registries
------------------	---

Implements [jeod::BaseEphemeridesManager](#).

Definition at line 475 of file ephemer_manager.cc.

References `add_ref_frame()`, and `integ_frames`.

Referenced by `jeod::De4xxEphemeris::initialize_items()`, and `jeod::EmptySpaceEphemeris::initialize_model()`.

8.13.3.5 void jeod::EphemeridesManager::add_planet (BasePlanet & *planet*) [virtual]

Add a planet to the planets registry.

Parameters

<i>planet</i>	Planet to be added to the registry.
---------------	-------------------------------------

Implements [jeod::BaseEphemeridesManager](#).

Definition at line 128 of file ephemer_manager.cc.

References `jeod::EphemeridesMessages::duplicate_entry`, `find_base_planet()`, and `planets`.

Referenced by `add_planet()`.

8.13.3.6 void jeod::EphemeridesManager::add_planet (Planet & *planet*) [virtual]

Add a planet to the registry.

Parameters

<i>planet</i>	Planet to be added to the registry.
---------------	-------------------------------------

Implements [jeod::BaseEphemeridesManager](#).

Definition at line 90 of file find_planet.cc.

References `add_planet()`.

8.13.3.7 void jeod::EphemeridesManager::add_ref_frame (RefFrame & *ref_frame*) [virtual]

Add a reference frame to the reference frame registry.

Parameters

<i>ref_frame</i>	Reference frame to be added to the registry
------------------	---

Definition at line 602 of file ephemer_manager.cc.

References `set_target_frame()`.

Referenced by `add_integ_frame()`.

8.13.3.8 void jeod::EphemeridesManager::clear_added_ephemerides (void) [virtual]

Deactivate any registered ephemeris items and remove them from the list.

Implements [jeod::BaseEphemeridesManager](#).

Definition at line 253 of file ephemer_manager.cc.

References `jeod::EphemerisItem::disable()`, `ephem_items`, `ephemerides`, and `jeod::EphemeridesMessages::single_ephem_mode`.

8.13.3.9 void jeod::EphemeridesManager::disable_add_ephemeris (void) [virtual]

Make subsequent calls to add_ephemeris deactivate the specified ephemeris model instead of adding it to the list of managed models.

Note

This is an irrevocable act.

Assumptions and limitations:

- This method is typically used after clearing the ephemerides model list and then adding the one allowed ephemerides model:

```
EphemeridesManager::clear_added_ephemerides();
EphemeridesManager::add_ephemeris (model);
EphemeridesManager::add_ephem_item (item);
EphemeridesManager::disable_add_ephemeris ();
```

Implements [jeod::BaseEphemeridesManager](#).

Definition at line 222 of file ephemer_manager.cc.

References single_ephem_mode.

8.13.3.10 void jeod::EphemeridesManager::ephem_note_tree_status_change (void) [virtual]

Denote that the reference frame tree needs to be rebuilt.

Implements [jeod::BaseEphemeridesManager](#).

Definition at line 110 of file ephemer_manager.cc.

References regenerate_ref_frame_tree.

8.13.3.11 BasePlanet * jeod::EphemeridesManager::find_base_planet (const char * name) const [virtual]

Find the planet with the given name.

Parameters

<i>name</i>	Planet name.
-------------	--------------

Returns

Found planet; NULL if not found.

Implements [jeod::BaseEphemeridesManager](#).

Definition at line 167 of file ephemer_manager.cc.

References planets.

Referenced by add_planet(), jeod::SinglePlanetEphemeris::ephemer_initialize(), jeod::PropagatedPlanet::ephemer_initialize(), and find_planet().

8.13.3.12 EphemerisOrientation * jeod::EphemeridesManager::find_ephem_angle (const char * name) const [virtual]

Find the [EphemerisOrientation](#) with the given name.

Parameters

<i>name</i>	Ephemeris angle name
-------------	----------------------

Returns

Found ephemeris angle

Implements [jeod::BaseEphemeridesManager](#).

Definition at line 421 of file `ephem_manager.cc`.

References `find_ephem_item()`, and `jeod::EphemeridesMessages::invalid_item`.

8.13.3.13 `EphemerisItem * jeod::EphemeridesManager::find_ephem_item (const char * name) const` `[virtual]`

Find the first registered [EphemerisItem](#) with the given name.

Parameters

<i>name</i>	Ephemeris item name
-------------	---------------------

Returns

Found ephemeris item

Implements [jeod::BaseEphemeridesManager](#).

Definition at line 396 of file `ephem_manager.cc`.

References `ephem_items`, and `jeod::EphemerisItem::get_name()`.

Referenced by `add_ephem_item()`, `find_ephem_angle()`, `find_ephem_point()`, and `set_target_frame()`.

8.13.3.14 `EphemerisPoint * jeod::EphemeridesManager::find_ephem_point (const char * name) const` `[virtual]`

Find the [EphemerisPoint](#) with the given name.

Parameters

<i>name</i>	Ephemeris point name
-------------	----------------------

Returns

Found ephemeris point

Implements [jeod::BaseEphemeridesManager](#).

Definition at line 446 of file `ephem_manager.cc`.

References `find_ephem_item()`, and `jeod::EphemeridesMessages::invalid_item`.

8.13.3.15 `EphemerisRefFrame * jeod::EphemeridesManager::find_integ_frame (const char * name) const` `[virtual]`

Find the integration frame with the given name.

Parameters

<i>name</i>	Integration frame name
-------------	------------------------

Returns

Found integration frame

Implements [jeod::BaseEphemeridesManager](#).

Definition at line 494 of file ephem_manager.cc.

References integ_frames.

8.13.3.16 `unsigned int jeod::EphemeridesManager::find_integ_frame_index (const EphemerisRefFrame & ref_frame) const [virtual]`

Find the index of provided frame in the integration frames vector.

Parameters

<i>ref_frame</i>	Reference to be found
------------------	-----------------------

Returns

Index of found frame

Implements [jeod::BaseEphemeridesManager](#).

Definition at line 559 of file ephem_manager.cc.

References integ_frames, and jeod::EphemeridesMessages::invalid_item.

8.13.3.17 `Planet * jeod::EphemeridesManager::find_planet (const char * name) const [virtual]`

Find the planet with the given name.

Parameters

<i>name</i>	Planet name
-------------	-------------

Returns

Found planet, as a Planet rather than a BasePlanet

Implements [jeod::BaseEphemeridesManager](#).

Definition at line 54 of file find_planet.cc.

References find_base_planet(), and jeod::EphemeridesMessages::invalid_item.

8.13.3.18 `const std::vector< EphemerisRefFrame * > & jeod::EphemeridesManager::get_integ_frames (void) const [virtual]`

Get a copy of the vector of integration frames.

Returns

Copy of integration frames vector

Implements [jeod::BaseEphemeridesManager](#).

Definition at line 519 of file ephem_manager.cc.

References integ_frames.

8.13.3.19 `unsigned int jeod::EphemeridesManager::get_num_planets (void) const` `[virtual]`

Return number of registered planets.

Returns

: Number of registered planets.

Implements [jeod::BaseEphemeridesManager](#).

Definition at line 194 of file `ephem_manager.cc`.

References `planets`.

Referenced by `jeod::SinglePlanetEphemeris::ephem_initialize()`.

8.13.3.20 `void jeod::EphemeridesManager::initialize_ephemerides (void)`

Initialize the ephemeris models.

Definition at line 668 of file `ephem_manager.cc`.

References `jeod::EphemerisInterface::ephem_initialize()`, `ephemerides`, and `regenerate_ref_frame_tree`.

8.13.3.21 `bool jeod::EphemeridesManager::is_integ_frame (const RefFrame & ref_frame) const` `[virtual]`

Determine if supplied frame is an integration frame.

Parameters

<i>ref_frame</i>	Reference frame to test
------------------	-------------------------

Returns

True if the frame is a registered integration frame, false otherwise

Implements [jeod::BaseEphemeridesManager](#).

Definition at line 533 of file `ephem_manager.cc`.

References `integ_frames`.

8.13.3.22 `EphemeridesManager& jeod::EphemeridesManager::operator= (const EphemeridesManager &)`
`[private]`

Not implemented.

8.13.3.23 `bool jeod::EphemeridesManager::ref_frame_tree_needs_rebuild () const` `[inline]`

Query if the reference frame tree needs to be rebuilt.

Returns

`regenerate_ref_frame_tree` data member.

Definition at line 87 of file `ephem_manager.hh`.

References `regenerate_ref_frame_tree`.

8.13.3.24 `void jeod::EphemeridesManager::set_target_frame (RefFrame & ref_frame)`

Set the target-frame reference for the ref-frame and all known EphemlItems with similar target-frame names.

Parameters

<i>ref_frame</i>	Reference frame to be used as the target-frame.
------------------	---

Definition at line 617 of file `ephem_manager.cc`.

References `find_ephem_item()`, `jeod::EphemeridesMessages::inconsistent_setup`, `jeod::EphemerisRefFrame::set_ephem_manager()`, and `jeod::EphemerisItem::set_target_frame()`.

Referenced by `add_ref_frame()`, and `jeod::PropagatedPlanet::ephem_initialize()`.

8.13.3.25 void jeod::EphemeridesManager::update_ephemerides (void)

Update each ephemeris model.

Definition at line 689 of file `ephem_manager.cc`.

References `activate_ephemerides()`, `jeod::EphemerisInterface::ephem_update()`, `ephemerides`, and `regenerate_ref_frame_tree`.

8.13.4 Friends And Related Function Documentation

8.13.4.1 void init_attrjeod__EphemeridesManager () [friend]

8.13.4.2 friend class InputProcessor [friend]

Definition at line 66 of file `ephem_manager.hh`.

8.13.5 Field Documentation

8.13.5.1 JeodPointerVector<EphemerisItem>::type jeod::EphemeridesManager::ephem_items [protected]

The heads of the ephemeris item lists.

All items in one of these sublists share the same name. The members of the `ephem_items` list have distinct names.-
`trick_io(**)`

Definition at line 217 of file `ephem_manager.hh`.

Referenced by `activate_ephemerides()`, `add_ephem_item()`, `clear_added_ephemerides()`, `EphemeridesManager()`, `find_ephem_item()`, and `~EphemeridesManager()`.

8.13.5.2 JeodPointerVector<EphemerisInterface>::type jeod::EphemeridesManager::ephemerides [protected]

The ephemerides models managed by this [EphemeridesManager](#).

`trick_io(**)`

Definition at line 210 of file `ephem_manager.hh`.

Referenced by `activate_ephemerides()`, `add_ephemeris()`, `clear_added_ephemerides()`, `EphemeridesManager()`, `initialize_ephemerides()`, `update_ephemerides()`, and `~EphemeridesManager()`.

8.13.5.3 JeodPointerVector<EphemerisRefFrame>::type jeod::EphemeridesManager::integ_frames [protected]

List of reference frames that are not rotating with respect to the root node of the reference frame tree.

`trick_io(**)`

Definition at line 223 of file `ephem_manager.hh`.

Referenced by `add_integ_frame()`, `EphemeridesManager()`, `find_integ_frame()`, `find_integ_frame_index()`, `get_integ_frames()`, `is_integ_frame()`, and `~EphemeridesManager()`.

8.13.5.4 `JeodPointerVector<BasePlanet>::type jeod::EphemeridesManager::planets` [protected]

The planets in a simulation, typically defined at the `S_define` level.

`trick_io(**)`

Definition at line 205 of file `ephem_manager.hh`.

Referenced by `add_planet()`, `EphemeridesManager()`, `find_base_planet()`, `get_num_planets()`, and `~EphemeridesManager()`.

8.13.5.5 `bool jeod::EphemeridesManager::regenerate_ref_frame_tree` [protected]

Set when the reference frame tree needs to be regenerated.

`trick_units(-)`

Definition at line 195 of file `ephem_manager.hh`.

Referenced by `activate_ephemerides()`, `ephem_note_tree_status_change()`, `initialize_ephemerides()`, `ref_frame_tree_needs_rebuild()`, and `update_ephemerides()`.

8.13.5.6 `bool jeod::EphemeridesManager::single_ephem_mode` [protected]

Set via a call to `disable_add_ephemeris`, typically to allow a simple ephemeris model to be active with all other models made inactive.

`trick_units(-)`

Definition at line 190 of file `ephem_manager.hh`.

Referenced by `add_ephem_item()`, and `disable_add_ephemeris()`.

8.13.5.7 `double jeod::EphemeridesManager::update_time` [protected]

Time of last update.

`trick_units(s)`

Definition at line 200 of file `ephem_manager.hh`.

The documentation for this class was generated from the following files:

- [ephem_manager.hh](#)
- [ephem_manager.cc](#)
- [find_planet.cc](#)

8.14 `jeod::EphemeridesMessages` Class Reference

Specifies the message IDs used in the Ephemerides model.

```
#include <ephem_messages.hh>
```

Static Public Attributes

- static char const * `inconsistent_setup` = "environment/ephemerides/" "inconsistent_setup"

- Error issued when the ephemeris model configuration is inconsistent.*
- static char const * [file_error](#) = "environment/ephemerides/" "file_error"
Error issued when the ephemeris file cannot be opened for input.
- static char const * [unsupported_architecture](#) = "environment/ephemerides/" "unsupported_architecture"
Error issued for machine architectures that do not conform to the architecture assumptions:
- static char const * [garbage_file](#) = "environment/ephemerides/" "garbage_file"
Error issued when the ephemeris file appears to be garbage.
- static char const * [time_not_in_range](#) = "environment/ephemerides/" "time_not_in_range"
Error issued when the ephemeris file does not contain data for the requested time.
- static char const * [item_not_in_file](#) = "environment/ephemerides/" "item_not_in_file"
Error issued when the ephemeris file does not contain data for the requested item.
- static char const * [null_pointer](#) = "environment/ephemerides/" "null_pointer"
Issued when a pointer should be non-NULL but isn't.
- static char const * [duplicate_entry](#) = "environment/ephemerides/" "duplicate_entry"
Issued on request to add a pointer to a list a second time.
- static char const * [invalid_name](#) = "environment/ephemerides/" "invalid_name"
Issued when a name is invalid – empty, a duplicate, ...
- static char const * [invalid_item](#) = "environment/ephemerides/" "invalid_item"
Issued when something other than a name is invalid.
- static char const * [single_ephem_mode](#) = "environment/ephemerides/" "single_ephem_mode"
Issued when the ephemeris manager is rejecting add_ephemeris calls.
- static char const * [internal_error](#) = "environment/ephemerides/" "internal_error"
Issued when some internal error occurred.
- static char const * [debug](#) = "environment/ephemerides/" "debug"
Used to send a message about a non-error condition.

Private Member Functions

- [EphemeridesMessages](#) (void)
Not implemented.
- [EphemeridesMessages](#) (const [EphemeridesMessages](#) &)
Not implemented.
- [EphemeridesMessages](#) & operator= (const [EphemeridesMessages](#) &)
Not implemented.

Friends

- class [InputProcessor](#)
- void [init_attrjeod__EphemeridesMessages](#) ()

8.14.1 Detailed Description

Specifies the message IDs used in the Ephemerides model.

Assumptions and Limitations

- This is a complete catalog of the messages sent by the ephemerides model.
- This is not an exhaustive list of all the things that can go awry.

Definition at line 51 of file `ephem_messages.hh`.

8.14.2 Constructor & Destructor Documentation

8.14.2.1 `jeod::EphemeridesMessages::EphemeridesMessages (void) [private]`

Not implemented.

8.14.2.2 `jeod::EphemeridesMessages::EphemeridesMessages (const EphemeridesMessages &) [private]`

Not implemented.

8.14.3 Member Function Documentation

8.14.3.1 `EphemeridesMessages& jeod::EphemeridesMessages::operator= (const EphemeridesMessages &) [private]`

Not implemented.

8.14.4 Friends And Related Function Documentation

8.14.4.1 `void init_attrjeod__EphemeridesMessages () [friend]`

8.14.4.2 `friend class InputProcessor [friend]`

Definition at line 52 of file `ephem_messages.hh`.

8.14.5 Field Documentation

8.14.5.1 `char const * jeod::EphemeridesMessages::debug = "environment/ephemerides/" "debug" [static]`

Used to send a message about a non-error condition.

`trick_units(-)`

Definition at line 129 of file `ephem_messages.hh`.

Referenced by `jeod::De4xxFile::open()`.

8.14.5.2 `char const * jeod::EphemeridesMessages::duplicate_entry = "environment/ephemerides/" "duplicate_entry" [static]`

Issued on request to add a pointer to a list a second time.

`trick_units(-)`

Definition at line 102 of file `ephem_messages.hh`.

Referenced by `jeod::EphemeridesManager::add_ephem_item()`, and `jeod::EphemeridesManager::add_planet()`.

8.14.5.3 `char const * jeod::EphemeridesMessages::file_error = "environment/ephemerides/" "file_error" [static]`

Error issued when the ephemeris file cannot be opened for input.

`trick_units(-)`

Definition at line 66 of file `ephem_messages.hh`.

Referenced by `jeod::De4xxFile::close()`, `jeod::De4xxFile::open()`, `jeod::De4xxFile::pre_initialize()`, and `jeod::De4xxFile::update()`.

8.14.5.4 `char const * jeod::EphemeridesMessages::garbage_file = "environment/ephemerides/" "garbage_file" [static]`

Error issued when the ephemeris file appears to be garbage.

trick_units(–)

Definition at line 80 of file ephem_messages.hh.

Referenced by jeod::De4xxFile::pre_initialize().

8.14.5.5 `char const * jeod::EphemeridesMessages::inconsistent_setup = "environment/ephemerides/" "inconsistent_setup" [static]`

Error issued when the ephemeris model configuration is inconsistent.

trick_units(–)

Definition at line 61 of file ephem_messages.hh.

Referenced by jeod::De4xxEphemeris::activate_em_nodes(), jeod::EphemeridesManager::add_ephem_item(), jeod::De4xxEphemeris::ephem_build_tree(), jeod::EmptySpaceEphemeris::ephem_initialize(), jeod::SinglePlanetEphemeris::ephem_initialize(), jeod::PropagatedPlanet::ephem_initialize(), jeod::De4xxEphemeris::initialize_items(), jeod::PropagatedPlanet::initialize_model(), jeod::De4xxEphemeris::initialize_time(), jeod::EphemerisRefFrame::set_active_status(), jeod::PropagatedPlanet::set_mode(), jeod::SinglePointEphemeris::set_name(), and jeod::EphemeridesManager::set_target_frame().

8.14.5.6 `char const * jeod::EphemeridesMessages::internal_error = "environment/ephemerides/" "internal_error" [static]`

Issued when some internal error occurred.

These errors should never happen.trick_units(–)

Definition at line 123 of file ephem_messages.hh.

Referenced by jeod::SinglePointEphemeris::activate(), jeod::De4xxEphemeris::activate(), jeod::PropagatedPlanet::activate(), jeod::EphemeridesManager::add_ephem_item(), jeod::EphemerisOrientation::note_frame_status_change(), jeod::EphemerisPoint::note_frame_status_change(), jeod::De4xxFile::pre_initialize(), and jeod::De4xxFile::update().

8.14.5.7 `char const * jeod::EphemeridesMessages::invalid_item = "environment/ephemerides/" "invalid_item" [static]`

Issued when something other than a name is invalid.

trick_units(–)

Definition at line 112 of file ephem_messages.hh.

Referenced by jeod::EphemerisItem::activate(), jeod::EphemeridesManager::find_ephem_angle(), jeod::EphemeridesManager::find_ephem_point(), jeod::EphemeridesManager::find_integ_frame_index(), jeod::EphemeridesManager::find_planet(), and jeod::EphemerisItem::set_target_frame().

8.14.5.8 `char const * jeod::EphemeridesMessages::invalid_name = "environment/ephemerides/" "invalid_name" [static]`

Issued when a name is invalid – empty, a duplicate, ...

trick_units(–)

Definition at line 107 of file ephem_messages.hh.

Referenced by jeod::EphemerisItem::set_name(), and jeod::EphemerisItem::validate_name().

8.14.5.9 `char const * jeod::EphemeridesMessages::item_not_in_file = "environment/ephemerides/" "item_not_in_file"`
`[static]`

Error issued when the ephemeris file does not contain data for the requested item.

`trick_units(-)`

Definition at line 92 of file `ephem_messages.hh`.

Referenced by `jeod::De4xxFile::update()`.

8.14.5.10 `char const * jeod::EphemeridesMessages::null_pointer = "environment/ephemerides/" "null_pointer"` `[static]`

Issued when a pointer should be non-NULL but isn't.

`trick_units(-)`

Definition at line 97 of file `ephem_messages.hh`.

8.14.5.11 `char const * jeod::EphemeridesMessages::single_ephem_mode = "environment/ephemerides/" "single_ephem_mode"`
`[static]`

Issued when the ephemeris manager is rejecting `add_ephemeris` calls.

`trick_units(-)`

Definition at line 117 of file `ephem_messages.hh`.

Referenced by `jeod::EphemeridesManager::add_ephem_item()`, and `jeod::EphemeridesManager::clear_added_ephemerides()`.

8.14.5.12 `char const * jeod::EphemeridesMessages::time_not_in_range = "environment/ephemerides/" "time_not_in_range"`
`[static]`

Error issued when the ephemeris file does not contain data for the requested time.

`trick_units(-)`

Definition at line 86 of file `ephem_messages.hh`.

Referenced by `jeod::De4xxFile::initialize()`, and `jeod::De4xxFile::update()`.

8.14.5.13 `char const * jeod::EphemeridesMessages::unsupported_architecture = "environment/ephemerides/" "unsupported_architecture"` `[static]`

Error issued for machine architectures that do not conform to the architecture assumptions:

- `char` = 8 bits
- `int32_t` = 4 bytes (32 bits)
- `double` = 8 bytes (64 bits)

Definition at line 75 of file `ephem_messages.hh`.

The documentation for this class was generated from the following files:

- [ephem_messages.hh](#)
- [ephem_messages.cc](#)

8.15 jeod::EphemerisDataItemMeta Struct Reference

Structure containing the header metadata for sizing/locating the data entries with the data segments.

```
#include <de4xx_file.hh>
```

Data Fields

- [uint32_t offset](#)
Offsets into coeffs array.
- [uint32_t nterms](#)
Chebyshev polynomial terms.
- [uint32_t npoly](#)
Number polynomials per data block.

8.15.1 Detailed Description

Structure containing the header metadata for sizing/locating the data entries with the data segments.

Definition at line 121 of file `de4xx_file.hh`.

8.15.2 Field Documentation

8.15.2.1 `uint32_t jeod::EphemerisDataItemMeta::npoly`

Number polynomials per data block.

`trick_units(-)`

Definition at line 136 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::interpolate()`.

8.15.2.2 `uint32_t jeod::EphemerisDataItemMeta::nterms`

Chebyshev polynomial terms.

`trick_units(-)`

Definition at line 131 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::interpolate()`, and `jeod::De4xxFile::pre_initialize()`.

8.15.2.3 `uint32_t jeod::EphemerisDataItemMeta::offset`

Offsets into coeffs array.

`trick_units(-)`

Definition at line 126 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::interpolate()`, and `jeod::De4xxFile::pre_initialize()`.

The documentation for this struct was generated from the following file:

- [de4xx_file.hh](#)

8.16 jeod::EphemerisDataSegmentMeta Struct Reference

Metadata implied from each data segment.

```
#include <de4xx_file.hh>
```

Data Fields

- `uint32_t num_recs`
The number of records in the file.
- `double start_epoch`
Julian date of start of file.
- `double stop_epoch`
Julian date of end of file.

8.16.1 Detailed Description

Metadata implied from each data segment.

Definition at line 143 of file `de4xx_file.hh`.

8.16.2 Field Documentation

8.16.2.1 `uint32_t jeod::EphemerisDataSegmentMeta::num_recs`

The number of records in the file.

`trick_units(-)`

Definition at line 148 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::pre_initialize()`, and `jeod::De4xxFile::update()`.

8.16.2.2 `double jeod::EphemerisDataSegmentMeta::start_epoch`

Julian date of start of file.

`trick_units(day)`

Definition at line 153 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::initialize()`, and `jeod::De4xxFile::pre_initialize()`.

8.16.2.3 `double jeod::EphemerisDataSegmentMeta::stop_epoch`

Julian date of end of file.

`trick_units(day)`

Definition at line 158 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::pre_initialize()`.

The documentation for this struct was generated from the following file:

- [de4xx_file.hh](#)

8.17 jeod::EphemerisDataSetMeta Struct Reference

Container for the metadata from the DE model header.

```
#include <de4xx_file.hh>
```

Data Fields

- `uint32_t` [number_file_items](#)
Return the number of ephemeris items provided in DE data.
- `double` [start_epoch](#)
Julian date of start of dataset.
- `double` [stop_epoch](#)
Julian date of end of dataset.
- `double` [delta_epoch](#)
Julian period length of each segment.
- `uint32_t` [number_segments](#)
Number of ascp files (segments) provided by DE model.
- `uint32_t` [ncoeff](#)
Size of each data record throughout the dataset.
- `double` [de_constants](#) [[De4xxBase::De4xx_Const_MaxConsts](#)]
Array of supplied constants required by JEOD.

8.17.1 Detailed Description

Container for the metadata from the DE model header.

Definition at line 77 of file `de4xx_file.hh`.

8.17.2 Field Documentation

8.17.2.1 `double jeod::EphemerisDataSetMeta::de_constants[De4xxBase::De4xx_Const_MaxConsts]`

Array of supplied constants required by JEOD.

Definition at line 113 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::initialize()`, `jeod::De4xxEphemeris::initialize_file()`, and `jeod::De4xxFile::pre_initialize()`.

8.17.2.2 `double jeod::EphemerisDataSetMeta::delta_epoch`

Julian period length of each segment.

`trick_units(day)`

Definition at line 98 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::initialize()`, `jeod::De4xxFile::interpolate()`, `jeod::De4xxFile::time_is_in_range()`, and `jeod::De4xxFile::update()`.

8.17.2.3 `uint32_t jeod::EphemerisDataSetMeta::ncoeff`

Size of each data record throughout the dataset.

`trick_units(-)`

Definition at line 108 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::update()`.

8.17.2.4 `uint32_t jeod::EphemerisDataSetMeta::number_file_items`

Return the number of ephemeris items provided in DE data.

(e.g., 13 for DE405/421, 15 for DE440)

Definition at line 83 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::interpolate()`, `jeod::De4xxFile::open()`, `jeod::De4xxFile::pre_initialize()`, and `jeod::De4xxFile::update()`.

8.17.2.5 `uint32_t jeod::EphemerisDataSetMeta::number_segments`

Number of ascp files (segments) provided by DE model.

`trick_units(-)`

Definition at line 103 of file `de4xx_file.hh`.

Referenced by `jeod::De4xxFile::pre_initialize()`, and `jeod::De4xxFile::update()`.

8.17.2.6 `double jeod::EphemerisDataSetMeta::start_epoch`

Julian date of start of dataset.

`trick_units(day)`

Definition at line 88 of file `de4xx_file.hh`.

8.17.2.7 `double jeod::EphemerisDataSetMeta::stop_epoch`

Julian date of end of dataset.

`trick_units(day)`

Definition at line 93 of file `de4xx_file.hh`.

The documentation for this struct was generated from the following file:

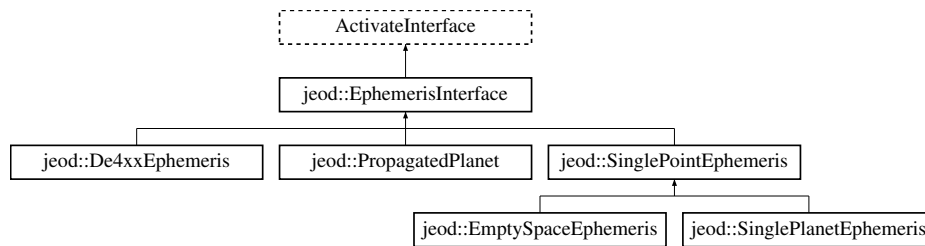
- [de4xx_file.hh](#)

8.18 `jeod::EphemerisInterface` Class Reference

Interface class that specifies minimal functionality of an ephemeris model.

```
#include <ephem_interface.hh>
```

Inheritance diagram for `jeod::EphemerisInterface`:



Public Member Functions

- virtual `~EphemerisInterface` (void)
Destructor; there is nothing to destroy here.
- virtual double `timestamp` (void) const =0
Indicates when class was last updated.
- virtual const char * `get_name` (void) const =0
Identify the model.
- virtual void `ephem_initialize` (EphemeridesManager &manager)=0
Initialize the model.
- virtual void `ephem_activate` (EphemeridesManager &manager)=0
Activate the model.
- virtual void `ephem_build_tree` (EphemeridesManager &manager)=0
Build the model's contribution to the reference frame tree.
- virtual void `ephem_update` (void)=0
Update the model.

Friends

- class `InputProcessor`
- void `init_attrjeod__EphemerisInterface` ()

8.18.1 Detailed Description

Interface class that specifies minimal functionality of an ephemeris model.

Definition at line 47 of file `ephem_interface.hh`.

8.18.2 Constructor & Destructor Documentation

8.18.2.1 `jeod::EphemerisInterface::~EphemerisInterface (void)` `[inline]`, `[virtual]`

Destructor; there is nothing to destroy here.

Definition at line 129 of file `ephem_interface.hh`.

8.18.3 Member Function Documentation

8.18.3.1 `virtual void jeod::EphemerisInterface::ephem_activate (EphemeridesManager & manager)` `[pure virtual]`

Activate the model.

Parameters

<i>in, out</i>	<i>manager</i>	Ephemerides manager
----------------	----------------	---------------------

Implemented in [jeod::PropagatedPlanet](#), [jeod::SinglePlanetEphemeris](#), [jeod::De4xxEphemeris](#), [jeod::EmptySpaceEphemeris](#), and [jeod::SinglePointEphemeris](#).

Referenced by [jeod::EphemeridesManager::activate_ephemerides\(\)](#).

8.18.3.2 `virtual void jeod::EphemerisInterface::ephem_build_tree (EphemeridesManager & manager)` [pure virtual]

Build the model's contribution to the reference frame tree.

Parameters

<i>in, out</i>	<i>manager</i>	Ephemerides manager
----------------	----------------	---------------------

Implemented in [jeod::PropagatedPlanet](#), [jeod::SinglePlanetEphemeris](#), [jeod::De4xxEphemeris](#), [jeod::EmptySpaceEphemeris](#), and [jeod::SinglePointEphemeris](#).

Referenced by [jeod::EphemeridesManager::activate_ephemerides\(\)](#).

8.18.3.3 `virtual void jeod::EphemerisInterface::ephem_initialize (EphemeridesManager & manager)` [pure virtual]

Initialize the model.

Parameters

<i>in, out</i>	<i>manager</i>	Ephemerides manager
----------------	----------------	---------------------

Implemented in [jeod::PropagatedPlanet](#), [jeod::SinglePlanetEphemeris](#), [jeod::De4xxEphemeris](#), [jeod::EmptySpaceEphemeris](#), and [jeod::SinglePointEphemeris](#).

Referenced by [jeod::EphemeridesManager::initialize_ephemerides\(\)](#).

8.18.3.4 `virtual void jeod::EphemerisInterface::ephem_update (void)` [pure virtual]

Update the model.

Implemented in [jeod::PropagatedPlanet](#), [jeod::De4xxEphemeris](#), and [jeod::SinglePointEphemeris](#).

Referenced by [jeod::EphemeridesManager::update_ephemerides\(\)](#).

8.18.3.5 `virtual const char* jeod::EphemerisInterface::get_name (void) const` [pure virtual]

Identify the model.

Returns

Model name

Implemented in [jeod::PropagatedPlanet](#), [jeod::De4xxEphemeris](#), and [jeod::SinglePointEphemeris](#).

Referenced by [jeod::EphemeridesManager::add_ephem_item\(\)](#).

8.18.3.6 `virtual double jeod::EphemerisInterface::timestamp (void) const` [pure virtual]

Indicates when class was last updated.

Returns

Time of last update
Units: s

Implemented in [jeod::PropagatedPlanet](#), [jeod::De4xxEphemeris](#), and [jeod::SinglePointEphemeris](#).

8.18.4 Friends And Related Function Documentation

8.18.4.1 void init_attrjeod__EphemerisInterface () [friend]

8.18.4.2 friend class InputProcessor [friend]

Definition at line 48 of file ephemeris_interface.hh.

The documentation for this class was generated from the following file:

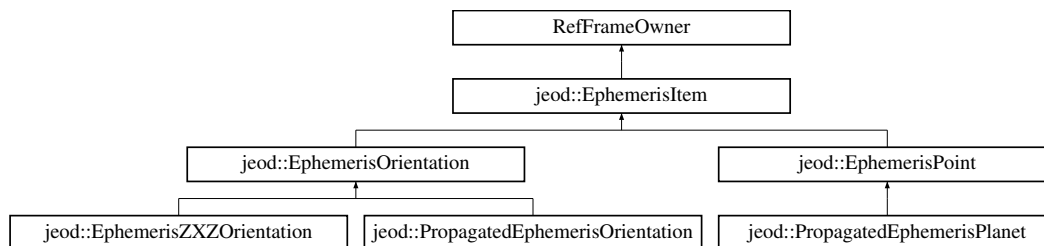
- [ephemeris_interface.hh](#)

8.19 jeod::EphemerisItem Class Reference

The [EphemerisItem](#) class is the base class for representing an item that is modeled in an ephemeris model.

```
#include <ephemeris_item.hh>
```

Inheritance diagram for jeod::EphemerisItem:



Public Types

- enum [TargetAspect](#) { [Translation](#) = 0, [Rotation](#) = 1 }
- Defines the aspect of the target frame that will be modified by the [EphemerisItem](#) object.*

Public Member Functions

- [EphemerisItem](#) ()
Construct an ephemeris item.
- virtual [~EphemerisItem](#) ()
Destroy an ephemeris item.
- virtual void [set_name](#) (const char *new_name)
Name an ephemeris item.
- virtual void [set_name](#) (const char *pname, const char *fname)
Name an ephemeris item.
- const char * [get_name](#) () const
Return the name.
- virtual void [set_timestamp](#) (double time)

- Set the update time of this item.*

 - double `timestamp` (void) const

Return the update time of this item.
- virtual void `set_owner` (`EphemerisInterface` *new_owner)

Set the owner of this item.
- `EphemerisInterface` * `get_owner` () const

Return the owner of this item.
- virtual void `set_manager` (`BaseEphemeridesManager` *new_manager)

Set the manager of this item.
- `BaseEphemeridesManager` * `get_manager` () const

Return the manager of this item.
- virtual void `set_next` (`EphemerisItem` *next_item)

Set the next item.
- `EphemerisItem` * `get_next` () const

Get the next item.
- virtual void `set_head` (`EphemerisItem` *head_item)

Set the head item.
- `EphemerisItem` * `get_head` () const

Get the head item.
- virtual void `set_target_frame` (`EphemerisRefFrame` &frame)

Set the target frame.
- `EphemerisRefFrame` * `get_target_frame` () const

Get the target frame.
- virtual void `enable` ()

Enable an `EphemerisItem` object.
- virtual void `disable` ()

Disable an `EphemerisItem` object.
- bool `is_enabled` () const

Return enabled status.
- `EphemerisItem` * `get_enabled_item` (void) const

Get the item marked as enabled, if any.
- virtual void `activate` ()

Activate a `EphemerisItem` object.
- virtual void `deactivate` ()

Deactivate a `EphemerisItem` object.
- bool `is_active` () const

Return activity status.
- bool `is_activatable` () const

Is the item activatable?
- void `validate_name` (const char *file, unsigned int line, const char *new_value, const char *old_value, const char *variable_name)

Name an ephemeris item.
- virtual `TargetAspect` `updates_what` (void) const =0

Identifies which part of the target frame does the object updates.
- virtual const char * `default_suffix` (void) const =0

The default suffix for the item.
- virtual void `disconnect_from_tree` (void)=0

Disconnect the item from the reference frame tree.

Protected Member Functions

- virtual void [set_name_internal](#) (char *new_name)
Name an ephemeris item.

Protected Attributes

- char * [name](#)
The name of the item.
- [EphemerisInterface](#) * [owner](#)
The ephemeris model that owns this object.
- [BaseEphemeridesManager](#) * [manager](#)
The ephemeris manager that manages this object.
- [EphemerisRefFrame](#) * [target_frame](#)
The reference frame whose non-constant state is set by this object.
- [EphemerisItem](#) * [head](#)
The first ephemeris item with the same name as this item.
- [EphemerisItem](#) * [next](#)
The next ephemeris item with the same name as this item.
- double [update_time](#)
Time of last update, dynamic time seconds.
- bool [enabled](#)
Is the item enabled?
- bool [active](#)
Is the item active?

Private Member Functions

- [EphemerisItem](#) (const [EphemerisItem](#) &)
Not implemented.
- [EphemerisItem](#) & operator= (const [EphemerisItem](#) &)
Not implemented.

Friends

- class [InputProcessor](#)
- void [init_attrjeod__EphemerisItem](#) ()

8.19.1 Detailed Description

The [EphemerisItem](#) class is the base class for representing an item that is modeled in an ephemeris model.

Ephemeris items form the bridge between the reference frame model and the ephemeris models. An [EphemerisItem](#)

- Has a name, which is not necessarily unique. Ephemeris items with the same name are linked to one another to form a linked list.
- Has a target reference frame. This is the ephemeris reference frame which has the same name as the ephemeris item.

- Can be enabled or disabled. At most one item of a set of commonly-named items can be enabled, and only if a correspondingly-named ephemeris reference frame exists. Ownership of the correspondingly-named ephemeris reference frame transfers to the enabled ephemeris item. When an ephemeris item is disabled, the ephemeris model that owns the ephemeris item should not operate on the correspondingly-named reference frame.
- Can be active or inactive. Disabled items must always be inactive. The activity level of the enabled item for a set of commonly-named items is automatically maintained to be the same as that of the target frame.

The ephemeris model that owns an active ephemeris item is responsible for ensuring that the correspondingly-named ephemeris reference frame is a part of the active reference frame tree and for updating that reference frame's state.

Definition at line 75 of file `ephem_item.hh`.

8.19.2 Member Enumeration Documentation

8.19.2.1 `enum jeod::EphemerisItem::TargetAspect`

Defines the aspect of the target frame that will be modified by the [EphemerisItem](#) object.

Enumerator

Translation

Rotation

Definition at line 86 of file `ephem_item.hh`.

8.19.3 Constructor & Destructor Documentation

8.19.3.1 `jeod::EphemerisItem::EphemerisItem (void)`

Construct an ephemeris item.

Definition at line 70 of file `ephem_item.cc`.

8.19.3.2 `jeod::EphemerisItem::~EphemerisItem (void) [virtual]`

Destroy an ephemeris item.

Definition at line 91 of file `ephem_item.cc`.

References name.

8.19.3.3 `jeod::EphemerisItem::EphemerisItem (const EphemerisItem &) [private]`

Not implemented.

8.19.4 Member Function Documentation

8.19.4.1 `void jeod::EphemerisItem::activate (void) [virtual]`

Activate a [EphemerisItem](#) object.

Definition at line 344 of file `ephem_item.cc`.

References active, `jeod::EphemeridesMessages::invalid_item`, `is_activatable()`, and name.

Referenced by `jeod::De4xxEphemeris::activate_em_nodes()`, `jeod::EphemerisOrientation::note_frame_status_change()`, `jeod::EphemerisPoint::note_frame_status_change()`, and `set_target_frame()`.

8.19.4.2 `void jeod::EphemerisItem::deactivate (void) [inline],[virtual]`

Deactivate a [EphemerisItem](#) object.

Definition at line 97 of file `ephem_item_inline.hh`.

References `active`.

Referenced by `jeod::EphemerisOrientation::note_frame_status_change()`, and `jeod::EphemerisPoint::note_frame_status_change()`.

8.19.4.3 `virtual const char* jeod::EphemerisItem::default_suffix (void) const [pure virtual]`

The default suffix for the item.

Implemented in [jeod::EphemerisOrientation](#), and [jeod::EphemerisPoint](#).

Referenced by `set_name()`.

8.19.4.4 `void jeod::EphemerisItem::disable (void) [inline],[virtual]`

Disable an [EphemerisItem](#) object.

Definition at line 315 of file `ephem_item.cc`.

References `active`, `enabled`, `jeod::BaseEphemeridesManager::ephem_note_tree_status_change()`, `manager`, and `target_frame`.

Referenced by `jeod::EphemeridesManager::add_ephem_item()`, `jeod::EphemeridesManager::clear_added_ephemerides()`, `enable()`, `jeod::EmptySpaceEphemeris::ephem_initialize()`, `jeod::SinglePlanetEphemeris::ephem_initialize()`, `jeod::De4xxEphemeris::initialize_items()`, and `jeod::PropagatedPlanet::set_mode()`.

8.19.4.5 `virtual void jeod::EphemerisItem::disconnect_from_tree (void) [pure virtual]`

Disconnect the item from the reference frame tree.

Implemented in [jeod::EphemerisOrientation](#), and [jeod::EphemerisPoint](#).

Referenced by `jeod::EphemeridesManager::activate_ephemerides()`.

8.19.4.6 `void jeod::EphemerisItem::enable (void) [virtual]`

Enable an [EphemerisItem](#) object.

Reimplemented in [jeod::EphemerisOrientation](#).

Definition at line 278 of file `ephem_item.cc`.

References `active`, `disable()`, `enabled`, `jeod::BaseEphemeridesManager::ephem_note_tree_status_change()`, `get_enabled_item()`, `manager`, and `target_frame`.

Referenced by `jeod::De4xxEphemeris::activate_em_nodes()`, `jeod::De4xxEphemeris::De4xxEphemeris()`, `jeod::EmptySpaceEphemeris::EmptySpaceEphemeris()`, `jeod::EphemerisOrientation::enable()`, `jeod::PropagatedPlanet::set_mode()`, and `jeod::SinglePlanetEphemeris::SinglePlanetEphemeris()`.

8.19.4.7 `EphemerisItem * jeod::EphemerisItem::get_enabled_item (void) const [inline]`

Get the item marked as enabled, if any.

Returns

Enabled item

Definition at line 239 of file `ephem_item_inline.hh`.

References `enabled`, `head`, and `next`.

Referenced by `jeod::De4xxEphemeris::activate_nodes()`, `jeod::EphemeridesManager::add_ephem_item()`, `jeod::EphemerisOrientation::enable()`, `enable()`, and `set_target_frame()`.

8.19.4.8 **EphemerisItem * jeod::EphemerisItem::get_head (void) const** `[inline]`

Get the head item.

Returns

Root item

Definition at line 187 of file `ephem_item_inline.hh`.

References `head`.

8.19.4.9 **BaseEphemeridesManager * jeod::EphemerisItem::get_manager (void) const** `[inline]`

Return the manager of this item.

Returns

Object manager

Definition at line 161 of file `ephem_item_inline.hh`.

References `manager`.

8.19.4.10 **const char * jeod::EphemerisItem::get_name (void) const** `[inline]`

Return the name.

Returns

Void

Definition at line 46 of file `ephem_item_inline.hh`.

References `name`.

Referenced by `jeod::EphemeridesManager::add_ephem_item()`, `jeod::De4xxEphemeris::De4xxEphemeris()`, and `jeod::EphemeridesManager::find_ephem_item()`.

8.19.4.11 **EphemerisItem * jeod::EphemerisItem::get_next (void) const** `[inline]`

Get the next item.

Returns

Next item

Definition at line 213 of file `ephem_item_inline.hh`.

References `next`.

Referenced by `jeod::EphemeridesManager::add_ephem_item()`.

8.19.4.12 EphemerisInterface * jeod::EphemerisItem::get_owner (void) const [inline]

Return the owner of this item.

Returns

Frame owner

Definition at line 135 of file `ephem_item_inline.hh`.

References `owner`.

Referenced by `jeod::EphemeridesManager::add_ephem_item()`.

8.19.4.13 EphemerisRefFrame * jeod::EphemerisItem::get_target_frame (void) const [inline]

Get the target frame.

Returns

Target frame

Definition at line 226 of file `ephem_item_inline.hh`.

References `target_frame`.

Referenced by `jeod::SinglePlanetEphemeris::ephem_build_tree()`, `jeod::EmptySpaceEphemeris::ephem_initialize()`, `jeod::De4xxEphemeris::ephem_initialize()`, `jeod::SinglePlanetEphemeris::ephem_initialize()`, and `jeod::PropagatedPlanet::ephem_initialize()`.

8.19.4.14 bool jeod::EphemerisItem::is_activatable (void) const

Is the item activatable?

Returns

True if item can be activated.

Definition at line 364 of file `ephem_item.cc`.

References `active`, `enabled`, `head`, and `next`.

Referenced by `activate()`.

8.19.4.15 bool jeod::EphemerisItem::is_active (void) const [inline]

Return activity status.

Returns

Is item active?

Definition at line 110 of file `ephem_item_inline.hh`.

References `active`.

Referenced by `jeod::De4xxEphemeris::activate_nodes()`.

8.19.4.16 `bool jeod::EphemerisItem::is_enabled (void) const [inline]`

Return enabled status.

Returns

Is item enabled?

Definition at line 85 of file `ephem_item_inline.hh`.

References `enabled`.

Referenced by `jeod::EphemeridesManager::add_ephem_item()`.

8.19.4.17 `EphemerisItem& jeod::EphemerisItem::operator= (const EphemerisItem &) [private]`

Not implemented.

8.19.4.18 `void jeod::EphemerisItem::set_head (EphemerisItem * head_item) [inline],[virtual]`

Set the head item.

Parameters

<code>in, out</code>	<code>head_item</code>	Root item
----------------------	------------------------	-----------

Definition at line 174 of file `ephem_item_inline.hh`.

References `head`.

Referenced by `jeod::EphemeridesManager::add_ephem_item()`.

8.19.4.19 `void jeod::EphemerisItem::set_manager (BaseEphemeridesManager * new_manager) [inline],[virtual]`

Set the manager of this item.

Parameters

<code>in</code>	<code>new_manager</code>	New owner
-----------------	--------------------------	-----------

Definition at line 148 of file `ephem_item_inline.hh`.

References `manager`.

Referenced by `jeod::EphemeridesManager::add_ephem_item()`.

8.19.4.20 `void jeod::EphemerisItem::set_name (const char * new_name) [virtual]`

Name an ephemeris item.

Parameters

<code>in</code>	<code>new_name</code>	New name
-----------------	-----------------------	----------

Definition at line 159 of file `ephem_item.cc`.

References `default_suffix()`, `jeod::EphemeridesMessages::invalid_name`, `name`, `set_name_internal()`, and `validate_name()`.

Referenced by `jeod::De4xxEphemeris::De4xxEphemeris()`, `jeod::PropagatedPlanet::initialize_model()`, `jeod::EmptySpaceEphemeris::set_name()`, and `jeod::SinglePlanetEphemeris::set_name()`.

8.19.4.21 void jeod::EphemerisItem::set_name (const char * *pname*, const char * *fname*) [virtual]

Name an ephemeris item.

Parameters

in	<i>pname</i>	Planet name
in	<i>fname</i>	Frame name

Definition at line 140 of file `ephem_item.cc`.

References `name`, `set_name_internal()`, and `validate_name()`.

8.19.4.22 `void jeod::EphemerisItem::set_name_internal(char * new_name)` `[protected]`, `[virtual]`

Name an ephemeris item.

Parameters

in	<i>new_name</i>	New name
----	-----------------	----------

Definition at line 191 of file `ephem_item.cc`.

References `name`.

Referenced by `set_name()`.

8.19.4.23 `void jeod::EphemerisItem::set_next(EphemerisItem * next_item)` `[inline]`, `[virtual]`

Set the next item.

Parameters

in, out	<i>next_item</i>	Next item
---------	------------------	-----------

Definition at line 200 of file `ephem_item_inline.hh`.

References `next`.

Referenced by `jeod::EphemeridesManager::add_ephem_item()`.

8.19.4.24 `void jeod::EphemerisItem::set_owner(EphemerisInterface * new_owner)` `[inline]`, `[virtual]`

Set the owner of this item.

Parameters

in	<i>new_owner</i>	New owner
----	------------------	-----------

Definition at line 123 of file `ephem_item_inline.hh`.

References `owner`.

Referenced by `jeod::De4xxEphemeris::De4xxEphemeris()`, `jeod::EmptySpaceEphemeris::EmptySpaceEphemeris()`, `jeod::PropagatedPlanet::PropagatedPlanet()`, and `jeod::SinglePlanetEphemeris::SinglePlanetEphemeris()`.

8.19.4.25 `void jeod::EphemerisItem::set_target_frame(EphemerisRefFrame & frame)` `[virtual]`

Set the target frame.

All ephemeris items that share a common name must point to the same target frame.

Parameters

in	<i>frame</i>	Target frame
----	--------------	--------------

Definition at line 212 of file `ephem_item.cc`.

References `activate()`, `get_enabled_item()`, `head`, `jeod::EphemeridesMessages::invalid_item`, `jeod::BaseEphemeridesManager::is_integ_frame()`, `manager`, `name`, `next`, `set_target_frame()`, `target_frame`, `Translation`,

and `updates_what()`.

Referenced by `jeod::EphemeridesManager::add_ephem_item()`, `set_target_frame()`, and `jeod::EphemeridesManager::set_target_frame()`.

8.19.4.26 `void jeod::EphemerisItem::set_timestamp (double time)` `[inline]`, `[virtual]`

Set the update time of this item.

Parameters

<i>in</i>	<i>time</i>	Time Units: s
-----------	-------------	------------------

Definition at line 59 of file `ephem_item_inline.hh`.

References `update_time`.

8.19.4.27 `double jeod::EphemerisItem::timestamp (void) const` `[inline]`

Return the update time of this item.

Returns

Time of last update
Units: s

Definition at line 72 of file `ephem_item_inline.hh`.

References `update_time`.

8.19.4.28 `virtual TargetAspect jeod::EphemerisItem::updates_what (void) const` `[pure virtual]`

Identifies which part of the target frame does the object updates.

Implemented in [jeod::EphemerisOrientation](#), and [jeod::EphemerisPoint](#).

Referenced by `jeod::EphemeridesManager::add_ephem_item()`, and `set_target_frame()`.

8.19.4.29 `void jeod::EphemerisItem::validate_name (const char * file, unsigned int line, const char * new_value, const char * old_value, const char * variable_name)`

Name an ephemeris item.

Parameters

<i>in</i>	<i>file</i>	Usually FILE
<i>in</i>	<i>line</i>	Usually LINE
<i>in</i>	<i>new_value</i>	Value to check
<i>in</i>	<i>old_value</i>	Current value
<i>in</i>	<i>variable_name</i>	Variable name

Definition at line 110 of file `ephem_item.cc`.

References `jeod::EphemeridesMessages::invalid_name`, and `manager`.

Referenced by `set_name()`.

8.19.5 Friends And Related Function Documentation

8.19.5.1 `void init_attrjeod__EphemerisItem () [friend]`

8.19.5.2 `friend class InputProcessor [friend]`

Definition at line 76 of file `ephem_item.hh`.

8.19.6 Field Documentation

8.19.6.1 `bool jeod::EphemerisItem::active [protected]`

Is the item active?

- An item can be activated only if it is enabled. The enable and activate methods assure that this is the case.
- Activity is determined by the activity of the target frame, which is in turn determined by the reference frame subscription model.trick_units(–)

Definition at line 241 of file `ephem_item.hh`.

Referenced by `activate()`, `deactivate()`, `disable()`, `jeod::EphemerisPoint::disconnect_from_tree()`, `enable()`, `is_activatable()`, and `is_active()`.

8.19.6.2 `bool jeod::EphemerisItem::enabled [protected]`

Is the item enabled?

- An item can be enabled only if the data associated with the item such as the translational state of a planet exist somewhere in the simulation.
- Only one of a set of ephemeris items that share the same name can be enabled. The enable method ensures that this is the case.
- Exactly one of a set of ephemeris items that share same name should be enabled if some other simulation agent depends on the data associated with an ephemeris item. Ensuring that this is the case is the responsibility of the ephemeris models and the users of those models.trick_units(–)

Definition at line 232 of file `ephem_item.hh`.

Referenced by `disable()`, `jeod::EphemerisOrientation::enable()`, `enable()`, `get_enabled_item()`, `is_activatable()`, `is_enabled()`, `jeod::PropagatedEphemerisPlanet::update()`, and `jeod::PropagatedEphemerisOrientation::update()`.

8.19.6.3 `EphemerisItem* jeod::EphemerisItem::head [protected]`

The first ephemeris item with the same name as this item.

`trick_units(–)`

Definition at line 209 of file `ephem_item.hh`.

Referenced by `get_enabled_item()`, `get_head()`, `is_activatable()`, `set_head()`, and `set_target_frame()`.

8.19.6.4 `BaseEphemeridesManager* jeod::EphemerisItem::manager [protected]`

The ephemeris manager that manages this object.

`trick_units(–)`

Definition at line 199 of file `ephem_item.hh`.

Referenced by `disable()`, `enable()`, `get_manager()`, `set_manager()`, `set_target_frame()`, and `validate_name()`.

8.19.6.5 `char* jeod::EphemerisItem::name` `[protected]`

The name of the item.

`trick_units(-)`

Definition at line 189 of file `ephem_item.hh`.

Referenced by `activate()`, `get_name()`, `set_name()`, `set_name_internal()`, `set_target_frame()`, and `~EphemerisItem()`.

8.19.6.6 `EphemerisItem* jeod::EphemerisItem::next` `[protected]`

The next ephemeris item with the same name as this item.

`trick_units(-)`

Definition at line 214 of file `ephem_item.hh`.

Referenced by `get_enabled_item()`, `get_next()`, `is_activatable()`, `set_next()`, and `set_target_frame()`.

8.19.6.7 `EphemerisInterface* jeod::EphemerisItem::owner` `[protected]`

The ephemeris model that owns this object.

`trick_units(-)`

Definition at line 194 of file `ephem_item.hh`.

Referenced by `get_owner()`, and `set_owner()`.

8.19.6.8 `EphemerisRefFrame* jeod::EphemerisItem::target_frame` `[protected]`

The reference frame whose non-constant state is set by this object.

`trick_units(-)`

Definition at line 204 of file `ephem_item.hh`.

Referenced by `disable()`, `jeod::EphemerisPoint::disconnect_from_tree()`, `enable()`, `get_target_frame()`, `jeod::EphemerisPoint::initialize_state()`, `jeod::EphemerisOrientation::note_frame_status_change()`, `jeod::EphemerisPoint::note_frame_status_change()`, `jeod::EphemerisZXZOrientation::propagate()`, `set_target_frame()`, `jeod::EphemerisPoint::update()`, `jeod::EphemerisZXZOrientation::update()`, `jeod::PropagatedEphemerisPlanet::update()`, `jeod::PropagatedEphemerisOrientation::update()`, and `jeod::EphemerisPoint::update_scaled()`.

8.19.6.9 `double jeod::EphemerisItem::update_time` `[protected]`

Time of last update, dynamic time seconds.

`trick_units(s)`

Definition at line 219 of file `ephem_item.hh`.

Referenced by `jeod::EphemerisZXZOrientation::propagate()`, `set_timestamp()`, `timestamp()`, `jeod::EphemerisPoint::update()`, `jeod::EphemerisZXZOrientation::update()`, `jeod::PropagatedEphemerisPlanet::update()`, `jeod::PropagatedEphemerisOrientation::update()`, and `jeod::EphemerisPoint::update_scaled()`.

The documentation for this class was generated from the following files:

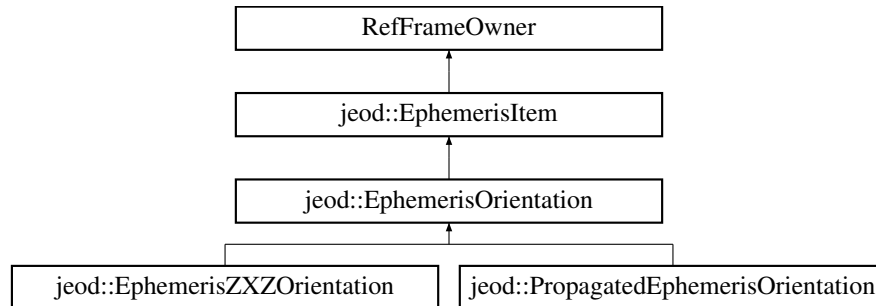
- [ephem_item.hh](#)
- [ephem_item_inline.hh](#)
- [ephem_item.cc](#)

8.20 jeod::EphemerisOrientation Class Reference

An [EphemerisOrientation](#) object updates the rotational state of an ephemeris reference frame.

```
#include <ephem_orient.hh>
```

Inheritance diagram for jeod::EphemerisOrientation:



Public Member Functions

- [EphemerisOrientation](#) ()
Construct an ephemeris angle.
- virtual [~EphemerisOrientation](#) ()
Destroy an ephemeris angle.
- virtual [TargetAspect updates_what](#) (void) const
Specify the aspect of the target frame updated by the object.
- virtual void [enable](#) ()
Enable a [EphemerisItem](#) object.
- virtual void [note_frame_status_change](#) (RefFrame *frame)
Null implementation.
- virtual const char * [default_suffix](#) () const
Return the default suffix for this item class, i.e., "pfix".
- virtual void [disconnect_from_tree](#) ()
Disconnect the item from the tree; this is a no-op for an [EphemerisOrientation](#).

Protected Attributes

- bool [subscribed_to_inertial](#)
A subscription to the planet's inertial frame is issued whenever the planet's planet-fixed frame is active to ensure that the planet-fixed frame is a part of the ref frame tree.

Private Member Functions

- [EphemerisOrientation](#) (const [EphemerisOrientation](#) &)
Not implemented.
- [EphemerisOrientation](#) & [operator=](#) (const [EphemerisOrientation](#) &)
Not implemented.

Friends

- class [InputProcessor](#)
- void [init_attrjeod__EphemerisOrientation](#) ()

Additional Inherited Members

8.20.1 Detailed Description

An [EphemerisOrientation](#) object updates the rotational state of an ephemeris reference frame.

Definition at line 55 of file ephemeris_orient.hh.

8.20.2 Constructor & Destructor Documentation

8.20.2.1 jeod::EphemerisOrientation::EphemerisOrientation (void)

Construct an ephemeris angle.

Definition at line 61 of file ephemeris_orient.cc.

8.20.2.2 jeod::EphemerisOrientation::~~EphemerisOrientation (void) [virtual]

Destroy an ephemeris angle.

Definition at line 73 of file ephemeris_orient.cc.

8.20.2.3 jeod::EphemerisOrientation::EphemerisOrientation (const EphemerisOrientation &) [private]

Not implemented.

8.20.3 Member Function Documentation

8.20.3.1 const char * jeod::EphemerisOrientation::default_suffix (void) const [virtual]

Return the default suffix for this item class, i.e., "pfix".

Returns

Default suffix

Implements [jeod::EphemerisItem](#).

Definition at line 168 of file ephemeris_orient.cc.

8.20.3.2 void jeod::EphemerisOrientation::disconnect_from_tree (void) [virtual]

Disconnect the item from the tree; this is a no-op for an [EphemerisOrientation](#).

Implements [jeod::EphemerisItem](#).

Definition at line 181 of file ephemeris_orient.cc.

8.20.3.3 void jeod::EphemerisOrientation::enable (void) [virtual]

Enable a [EphemerisItem](#) object.

Reimplemented from [jeod::EphemerisItem](#).

Definition at line 98 of file ephemeris_orient.cc.

References [jeod::EphemerisItem::enable\(\)](#), [jeod::EphemerisItem::enabled](#), [jeod::EphemerisItem::get_enabled_item\(\)](#), and [subscribed_to_inertial](#).

Referenced by `jeod::De4xxEphemeris::De4xxEphemeris()`, and `jeod::PropagatedPlanet::set_mode()`.

8.20.3.4 `void jeod::EphemerisOrientation::note_frame_status_change (RefFrame * frame)` `[virtual]`

Null implementation.

Parameters

<code>in</code>	<code><i>frame</i></code>	Frame whose status has changed
-----------------	---------------------------	--------------------------------

Definition at line 124 of file `ephem_orient.cc`.

References `jeod::EphemerisItem::activate()`, `jeod::EphemerisItem::deactivate()`, `jeod::EphemeridesMessages::internal_error`, `subscribed_to_inertial`, and `jeod::EphemerisItem::target_frame`.

8.20.3.5 `EphemerisOrientation& jeod::EphemerisOrientation::operator= (const EphemerisOrientation &)`
`[private]`

Not implemented.

8.20.3.6 `EphemerisItem::TargetAspect jeod::EphemerisOrientation::updates_what (void) const` `[virtual]`

Specify the aspect of the target frame updated by the object.

[EphemerisOrientation](#) objects update the rotational state.

Returns

Target of object

Implements [jeod::EphemerisItem](#).

Definition at line 86 of file `ephem_orient.cc`.

References `jeod::EphemerisItem::Rotation`.

8.20.4 Friends And Related Function Documentation

8.20.4.1 `void init_attrjeod__EphemerisOrientation ()` `[friend]`

8.20.4.2 `friend class InputProcessor` `[friend]`

Definition at line 56 of file `ephem_orient.hh`.

8.20.5 Field Documentation

8.20.5.1 `bool jeod::EphemerisOrientation::subscribed_to_inertial` `[protected]`

A subscription to the planet's inertial frame is issued whenever the planet's planet-fixed frame is active to ensure that the the planet-fixed frame is a part of the ref frame tree.

This flag is set when such a subscription is made.`trick_units(-)`

Definition at line 93 of file `ephem_orient.hh`.

Referenced by `enable()`, and `note_frame_status_change()`.

The documentation for this class was generated from the following files:

- [ephem_orient.hh](#)

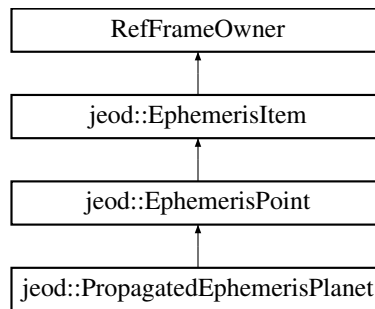
- [ephem_orient.cc](#)

8.21 jeod::EphemerisPoint Class Reference

An [EphemerisPoint](#) object updates the translational state of an ephemeris reference frame.

```
#include <ephem_point.hh>
```

Inheritance diagram for jeod::EphemerisPoint:



Public Member Functions

- [EphemerisPoint](#) ()
Construct an ephemeris point.
- virtual [~EphemerisPoint](#) ()
Destroy an ephemeris point.
- virtual [TargetAspect updates_what](#) (void) const
Specify the aspect of the target frame updated by the object.
- virtual const char * [default_suffix](#) () const
Return the default suffix for this item class, i.e., "inertial".
- virtual void [disconnect_from_tree](#) ()
Disconnect the associated inertial frame from the tree.
- virtual void [note_frame_status_change](#) (RefFrame *frame)
Set active status to correspond with that of the inertial frame.
- virtual void [initialize_state](#) ()
Zero-out the inertial frame's translational state.
- virtual void [update](#) (const double *pos, const double *vel, double time)
Update the inertial frame's translational state.
- virtual void [update_scaled](#) (const double *pos, const double *vel, double scale, double time)
Update the inertial frame's translational state.

Private Member Functions

- [EphemerisPoint](#) (const [EphemerisPoint](#) &)
Not implemented.
- [EphemerisPoint](#) & [operator=](#) (const [EphemerisPoint](#) &)
Not implemented.

Friends

- class [InputProcessor](#)
- void [init_attrjeod__EphemerisPoint](#) ()

Additional Inherited Members

8.21.1 Detailed Description

An [EphemerisPoint](#) object updates the translational state of an ephemeris reference frame.

Definition at line 52 of file `ephem_point.hh`.

8.21.2 Constructor & Destructor Documentation

8.21.2.1 `jeod::EphemerisPoint::EphemerisPoint (void)`

Construct an ephemeris point.

Definition at line 61 of file `ephem_point.cc`.

8.21.2.2 `jeod::EphemerisPoint::~EphemerisPoint (void) [virtual]`

Destroy an ephemeris point.

Definition at line 73 of file `ephem_point.cc`.

8.21.2.3 `jeod::EphemerisPoint::EphemerisPoint (const EphemerisPoint &) [private]`

Not implemented.

8.21.3 Member Function Documentation

8.21.3.1 `const char * jeod::EphemerisPoint::default_suffix (void) const [virtual]`

Return the default suffix for this item class, i.e., "inertial".

Returns

Default suffix

Implements [jeod::EphemerisItem](#).

Definition at line 112 of file `ephem_point.cc`.

8.21.3.2 `void jeod::EphemerisPoint::disconnect_from_tree (void) [virtual]`

Disconnect the associated inertial frame from the tree.

Implements [jeod::EphemerisItem](#).

Definition at line 124 of file `ephem_point.cc`.

References `jeod::EphemerisItem::active`, and `jeod::EphemerisItem::target_frame`.

8.21.3.3 `void jeod::EphemerisPoint::initialize_state (void) [inline], [virtual]`

Zero-out the inertial frame's translational state.

Definition at line 139 of file `ephem_point.cc`.

References `jeod::EphemerisItem::target_frame`.

8.21.3.4 void jeod::EphemerisPoint::note_frame_status_change (RefFrame * *frame*) [virtual]

Set active status to correspond with that of the inertial frame.

Parameters

<i>in</i>	<i>frame</i>	Frame whose status has changed
-----------	--------------	--------------------------------

Definition at line 85 of file `ephem_point.cc`.

References `jeod::EphemerisItem::activate()`, `jeod::EphemerisItem::deactivate()`, `jeod::EphemeridesMessages::internal_error`, and `jeod::EphemerisItem::target_frame`.

8.21.3.5 `EphemerisPoint& jeod::EphemerisPoint::operator= (const EphemerisPoint &)` `[private]`

Not implemented.

8.21.3.6 `void jeod::EphemerisPoint::update (const double * position, const double * velocity, double time)` `[virtual]`

Update the inertial frame's translational state.

Parameters

<i>in</i>	<i>position</i>	Position wrt parent Units: M
<i>in</i>	<i>velocity</i>	Velocity wrt parent Units: M/s
<i>in</i>	<i>time</i>	Timestamp Units: s

Definition at line 156 of file `ephem_point.cc`.

References `jeod::EphemerisItem::target_frame`, and `jeod::EphemerisItem::update_time`.

Referenced by `jeod::De4xxEphemeris::ephem_update()`.

8.21.3.7 `void jeod::EphemerisPoint::update_scaled (const double * position, const double * velocity, double scale, double time)` `[virtual]`

Update the inertial frame's translational state.

Parameters

<i>in</i>	<i>position</i>	Position wrt parent Units: M
<i>in</i>	<i>velocity</i>	Velocity wrt parent Units: M/s
<i>in</i>	<i>scale</i>	Scale factor
<i>in</i>	<i>time</i>	Timestamp Units: s

Definition at line 178 of file `ephem_point.cc`.

References `jeod::EphemerisItem::target_frame`, and `jeod::EphemerisItem::update_time`.

Referenced by `jeod::De4xxEphemeris::ephem_update()`.

8.21.3.8 `EphemerisItem::TargetAspect jeod::EphemerisPoint::updates_what (void) const` `[virtual]`

Specify the aspect of the target frame updated by the object.

[EphemerisPoint](#) objects update the translational state.

Returns

Target of object

Implements [jeod::EphemerisItem](#).

Definition at line 199 of file `ephem_point.cc`.

References [jeod::EphemerisItem::Translation](#).

8.21.4 Friends And Related Function Documentation

8.21.4.1 `void init_attrjeod__EphemerisPoint ()` [[friend](#)]

8.21.4.2 `friend class InputProcessor` [[friend](#)]

Definition at line 53 of file `ephem_point.hh`.

The documentation for this class was generated from the following files:

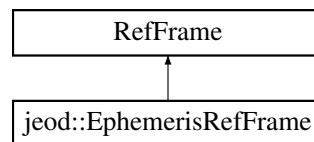
- [ephem_point.hh](#)
- [ephem_point.cc](#)

8.22 jeod::EphemerisRefFrame Class Reference

An [EphemerisRefFrame](#) is a [RefFrame](#) whose state is set by an ephemeris model.

```
#include <ephem_ref_frame.hh>
```

Inheritance diagram for `jeod::EphemerisRefFrame`:

**Public Member Functions**

- [EphemerisRefFrame](#) ()
Construct an [EphemerisRefFrame](#).
- virtual `~EphemerisRefFrame` ()
Destruct an [EphemerisRefFrame](#).
- virtual void `set_ephem_manager` ([BaseEphemeridesManager](#) *manager)
Set the [EphemerisRefFrame](#)'s owner.

Protected Member Functions

- virtual void `set_active_status` (bool new_status)
Augment [RefFrame::set_active_status](#) by notifying the ephemerides manager that the tree might need to be rebuilt.

Protected Attributes

- [BaseEphemeridesManager](#) * `ephem_manager`
The ephemerides manager to which notifications of changes in ephemeris reference frame activity status are sent.

Private Member Functions

- [EphemerisRefFrame](#) (const [EphemerisRefFrame](#) &)
Not implemented.
- [EphemerisRefFrame](#) & operator= (const [EphemerisRefFrame](#) &)
Not implemented.

Friends

- class [InputProcessor](#)
- void [init_attrjeod__EphemerisRefFrame](#) ()

8.22.1 Detailed Description

An [EphemerisRefFrame](#) is a [RefFrame](#) whose state is set by an ephemeris model.

Ephemeris reference frames come in three basic flavors:

- Planet-centered inertial frames. These are non-rotating frames whose origin is the center of mass of some planet (the Sun is a planet) and whose translational motion is (for now) assumed to be due to gravitation only. The orientation with respect to inertial is the identity transformation.
- Barycenter inertial frames. These are non-rotating frames whose origin is the center of mass of two or more planets.
- Planet-fixed frames. These are rotating frames whose origin is the center of mass of some planet (see ISSUE) and that rotate with the planet in question. The parent is always a planet-centered inertial frame with a zero translation offset between the planet-centered inertial and planet-fixed frames.

Only planet-centered inertial and barycenter inertial frames can serve as integration frames or as the root of the reference frame tree.

Definition at line 66 of file `ephem_ref_frame.hh`.

8.22.2 Constructor & Destructor Documentation

8.22.2.1 `jeod::EphemerisRefFrame::EphemerisRefFrame (void)`

Construct an [EphemerisRefFrame](#).

Definition at line 55 of file `ephem_ref_frame.cc`.

8.22.2.2 `jeod::EphemerisRefFrame::~~EphemerisRefFrame (void) [virtual]`

Destruct an [EphemerisRefFrame](#).

Definition at line 65 of file `ephem_ref_frame.cc`.

8.22.2.3 `jeod::EphemerisRefFrame::EphemerisRefFrame (const EphemerisRefFrame &) [private]`

Not implemented.

8.22.3 Member Function Documentation

8.22.3.1 EphemerisRefFrame& jeod::EphemerisRefFrame::operator= (const EphemerisRefFrame &) [private]

Not implemented.

8.22.3.2 void jeod::EphemerisRefFrame::set_active_status (bool *new_status*) [protected],[virtual]

Augment RefFrame::set_active_status by notifying the ephemerides manager that the tree might need to be rebuilt.

Parameters

<i>in</i>	<i>new_status</i>	Active status
-----------	-------------------	---------------

Definition at line 88 of file ephemeris_ref_frame.cc.

References ephemeris_manager, jeod::BaseEphemeridesManager::ephemeris_note_tree_status_change(), and jeod::EphemeridesMessages::inconsistent_setup.

8.22.3.3 void jeod::EphemerisRefFrame::set_ephem_manager (BaseEphemeridesManager * *manager*) [virtual]

Set the [EphemerisRefFrame](#)'s owner.

Parameters

<i>in, out</i>	<i>manager</i>	Ephemeris manager
----------------	----------------	-------------------

Definition at line 75 of file ephemeris_ref_frame.cc.

References ephemeris_manager.

Referenced by jeod::EphemeridesManager::set_target_frame().

8.22.4 Friends And Related Function Documentation

8.22.4.1 void init_attrjeod__EphemerisRefFrame () [friend]

8.22.4.2 friend class InputProcessor [friend]

Definition at line 67 of file ephemeris_ref_frame.hh.

8.22.5 Field Documentation

8.22.5.1 BaseEphemeridesManager* jeod::EphemerisRefFrame::ephemeris_manager [protected]

The ephemerides manager to which notifications of changes in ephemeris reference frame activity status are sent.

trick_units(-)

Definition at line 95 of file ephemeris_ref_frame.hh.

Referenced by set_active_status(), and set_ephem_manager().

The documentation for this class was generated from the following files:

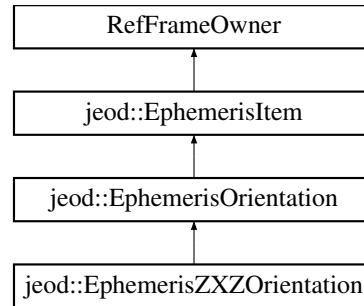
- [ephemeris_ref_frame.hh](#)
- [ephemeris_ref_frame.cc](#)

8.23 jeod::EphemerisZXZOrientation Class Reference

The [EphemerisZXZOrientation](#) is an [EphemerisOrientation](#) subclass that updates orientation based on an Z-X-Z Euler sequence and the time derivatives of this sequence.

```
#include <ephem_orient_zxz.hh>
```

Inheritance diagram for jeod::EphemerisZXZOrientation:



Public Member Functions

- [EphemerisZXZOrientation](#) ()
Construct an ephemeris angle.
- virtual [~EphemerisZXZOrientation](#) ()
Destroy an ephemeris angle.
- const double * [get_euler_angles](#) () const
Return the Euler angles.
- void [get_euler_angles](#) (double *angles) const
Return the Euler angles.
- const double * [get_euler_rates](#) () const
Return the Euler rates.
- void [get_euler_rates](#) (double *rates) const
Return the Euler angles.
- virtual void [update](#) (const double *angles, const double *derivs, double time)
Compute a JEOD rotational state given a 3-1-3 inertial-to-planet-fixed Euler sequence and the time derivatives of the Euler angles.
- virtual void [propagate](#) (double to_time)
Propagate the orientation to the current time.

Protected Attributes

- double [euler_angle_313](#) [3]
Astronomical (zxz) Euler angles.
- double [euler_rate_313](#) [3]
Time derivatives of the zyz Euler angles.

Private Member Functions

- [EphemerisZXZOrientation](#) (const [EphemerisZXZOrientation](#) &)
Not implemented.
- [EphemerisZXZOrientation](#) & [operator=](#) (const [EphemerisZXZOrientation](#) &)
Not implemented.

Friends

- class [InputProcessor](#)
- void [init_attrjeod__EphemerisZXZOrientation](#) ()

Additional Inherited Members

8.23.1 Detailed Description

The [EphemerisZXZOrientation](#) is an [EphemerisOrientation](#) subclass that updates orientation based on an Z-X-Z Euler sequence and the time derivatives of this sequence.

Definition at line 56 of file `ephem_orient_zxz.hh`.

8.23.2 Constructor & Destructor Documentation

8.23.2.1 `jeod::EphemerisZXZOrientation::EphemerisZXZOrientation (void)`

Construct an ephemeris angle.

Definition at line 82 of file `ephem_orient_zxz.cc`.

References `euler_angle_313`, and `euler_rate_313`.

8.23.2.2 `jeod::EphemerisZXZOrientation::~~EphemerisZXZOrientation (void)` `[virtual]`

Destroy an ephemeris angle.

Definition at line 95 of file `ephem_orient_zxz.cc`.

8.23.2.3 `jeod::EphemerisZXZOrientation::EphemerisZXZOrientation (const EphemerisZXZOrientation &)` `[private]`

Not implemented.

8.23.3 Member Function Documentation

8.23.3.1 `const double * jeod::EphemerisZXZOrientation::get_euler_angles (void) const`

Return the Euler angles.

Returns

Euler angles

Definition at line 107 of file `ephem_orient_zxz.cc`.

References `euler_angle_313`.

8.23.3.2 `void jeod::EphemerisZXZOrientation::get_euler_angles (double * angles) const`

Return the Euler angles.

Parameters

<i>out</i>	<i>angles</i>	Euler angles Units: r
------------	---------------	--------------------------

Definition at line 120 of file `ephem_orient_zxz.cc`.

References `euler_angle_313`.

8.23.3.3 `const double * jeod::EphemerisZXZOrientation::get_euler_rates (void) const`

Return the Euler rates.

Returns

Euler rates

Definition at line 137 of file `ephem_orient_zxz.cc`.

References `euler_rate_313`.

8.23.3.4 `void jeod::EphemerisZXZOrientation::get_euler_rates (double * rates) const`

Return the Euler angles.

Parameters

<i>out</i>	<i>rates</i>	Euler rates Units: r/s
------------	--------------	---------------------------

Definition at line 150 of file `ephem_orient_zxz.cc`.

References `euler_rate_313`.

8.23.3.5 `EphemerisZXZOrientation& jeod::EphemerisZXZOrientation::operator= (const EphemerisZXZOrientation &) [private]`

Not implemented.

8.23.3.6 `void jeod::EphemerisZXZOrientation::propagate (double to_time) [virtual]`

Propagate the orientation to the current time.

Assumptions and Limitations

- The orientation has been computed.
- Rotation is constant during the update interval.

Parameters

<i>in</i>	<i>to_time</i>	Target dynamic time Units: s
-----------	----------------	---------------------------------

Definition at line 169 of file `ephem_orient_zxz.cc`.

References `EPSILON_TIME`, `jeod::EphemerisItem::target_frame`, `TAYLOR_CUTOFF`, and `jeod::EphemerisItem::update_time`.

Referenced by `jeod::De4xxEphemeris::propagate_lunar_rnp()`.

8.23.3.7 void jeod::EphemerisZXZOrientation::update (const double * *angles*, const double * *derivs*, double *time*)
[virtual]

Compute a JEOD rotational state given a 3-1-3 inertial-to-planet-fixed Euler sequence and the time derivatives of the Euler angles.

Parameters

in	<i>angles</i>	zxz Euler angles Units: r
in	<i>derivs</i>	zxz Euler angle time derivatives Units: r/s
in	<i>time</i>	Update time Units: s

Definition at line 232 of file `ephem_orient_zxz.cc`.

References `euler_angle_313`, `euler_rate_313`, `jeod::EphemerisItem::target_frame`, and `jeod::EphemerisItem::update_time`.

Referenced by `jeod::De4xxEphemeris::ephem_update()`.

8.23.4 Friends And Related Function Documentation

8.23.4.1 `void init_attrjeod__EphemerisZXZOrientation ()` `[friend]`

8.23.4.2 `friend class InputProcessor` `[friend]`

Definition at line 57 of file `ephem_orient_zxz.hh`.

8.23.5 Field Documentation

8.23.5.1 `double jeod::EphemerisZXZOrientation::euler_angle_313[3]` `[protected]`

Astronomical (zxz) Euler angles.

`trick_units(radian)`

Definition at line 96 of file `ephem_orient_zxz.hh`.

Referenced by `EphemerisZXZOrientation()`, `get_euler_angles()`, and `update()`.

8.23.5.2 `double jeod::EphemerisZXZOrientation::euler_rate_313[3]` `[protected]`

Time derivatives of the zyz Euler angles.

`trick_units(radian/s)`

Definition at line 101 of file `ephem_orient_zxz.hh`.

Referenced by `EphemerisZXZOrientation()`, `get_euler_rates()`, and `update()`.

The documentation for this class was generated from the following files:

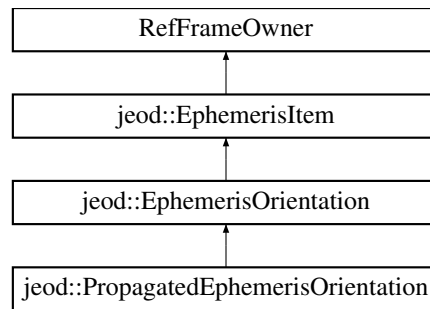
- [ephem_orient_zxz.hh](#)
- [ephem_orient_zxz.cc](#)

8.24 jeod::PropagatedEphemerisOrientation Class Reference

A [PropagatedEphemerisOrientation](#) is an [EphemerisOrientation](#) whose state is coupled with the rotational state of a `DynBody` reference frame.

```
#include <propagated_planet.hh>
```

Inheritance diagram for `jeod::PropagatedEphemerisOrientation`:



Public Member Functions

- [PropagatedEphemerisOrientation](#) (DynBody &dyn_body, BodyRefFrame &frame)
PropagatedEphemerisOrientation non-default constructor.
- [~PropagatedEphemerisOrientation](#) (void)
PropagatedEphemerisOrientation destructor.
- virtual void [update](#) (double time)
Copy rotational state from/to the body reference frame.

Protected Attributes

- DynBody & [body](#)
The dynamic body whose state is tied to that of the planet.
- BodyRefFrame & [body_ref_frame](#)
The body reference frame whose rotational state is coupled with that of the planet's planet-fixed frame.

Private Member Functions

- [PropagatedEphemerisOrientation](#) (const [PropagatedEphemerisOrientation](#) &)
Not implemented.
- [PropagatedEphemerisOrientation](#) & [operator=](#) (const [PropagatedEphemerisOrientation](#) &)
Not implemented.

Friends

- class [InputProcessor](#)
- void [init_attrjeod__PropagatedEphemerisOrientation](#) ()

Additional Inherited Members

8.24.1 Detailed Description

A [PropagatedEphemerisOrientation](#) is an [EphemerisOrientation](#) whose state is coupled with the rotational state of a DynBody reference frame.

This class is intended for use by the [PropagatedPlanet](#) class. Use outside of the [PropagatedPlanet](#) is not sanctioned.

The class acts analogously to the class [PropagatedEphemerisPlanet](#), but for rotation rather than translation. See [PropagatedEphemerisPlanet](#) for a description of the behavior of the class.

Definition at line 146 of file `propagated_planet.hh`.

8.24.2 Constructor & Destructor Documentation

8.24.2.1 `jeod::PropagatedEphemerisOrientation::PropagatedEphemerisOrientation (DynBody & dyn_body, BodyRefFrame & frame)`

[PropagatedEphemerisOrientation](#) non-default constructor.

Parameters

<i>in, out</i>	<i>dyn_body</i>	The DynBody that represents the planet
<i>in, out</i>	<i>frame</i>	The body reference frame

Definition at line 129 of file `propagated_planet.cc`.

8.24.2.2 `jeod::PropagatedEphemerisOrientation::~~PropagatedEphemerisOrientation (void)`

[PropagatedEphemerisOrientation](#) destructor.

Definition at line 144 of file `propagated_planet.cc`.

8.24.2.3 `jeod::PropagatedEphemerisOrientation::PropagatedEphemerisOrientation (const PropagatedEphemerisOrientation &) [private]`

Not implemented.

8.24.3 Member Function Documentation

8.24.3.1 `PropagatedEphemerisOrientation& jeod::PropagatedEphemerisOrientation::operator= (const PropagatedEphemerisOrientation &) [private]`

Not implemented.

8.24.3.2 `void jeod::PropagatedEphemerisOrientation::update (double dyn_time) [virtual]`

Copy rotational state from/to the body reference frame.

Parameters

<i>in</i>	<i>dyn_time</i>	Dynamic time seconds Units: s
-----------	-----------------	----------------------------------

Definition at line 156 of file `propagated_planet.cc`.

References `body`, `body_ref_frame`, `jeod::EphemerisItem::enabled`, `jeod::EphemerisItem::target_frame`, and `jeod::EphemerisItem::update_time`.

Referenced by `jeod::PropagatedPlanet::ephem_update()`.

8.24.4 Friends And Related Function Documentation

8.24.4.1 `void init_attrjeod__PropagatedEphemerisOrientation () [friend]`

8.24.4.2 `friend class InputProcessor [friend]`

Definition at line 147 of file `propagated_planet.hh`.

8.24.5 Field Documentation

8.24.5.1 DynBody& jeod::PropagatedEphemerisOrientation::body [protected]

The dynamic body whose state is tied to that of the planet.

trick_units(–)

Definition at line 175 of file propagated_planet.hh.

Referenced by update().

8.24.5.2 BodyRefFrame& jeod::PropagatedEphemerisOrientation::body_ref_frame [protected]

The body reference frame whose rotational state is coupled with that of the planet's planet-fixed frame.

trick_units(–)

Definition at line 181 of file propagated_planet.hh.

Referenced by update().

The documentation for this class was generated from the following files:

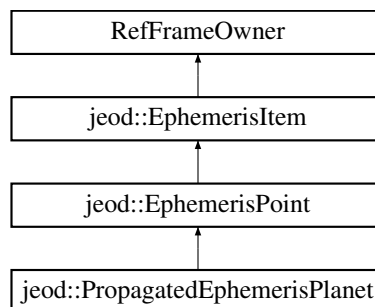
- [propagated_planet.hh](#)
- [propagated_planet.cc](#)

8.25 jeod::PropagatedEphemerisPlanet Class Reference

A [PropagatedEphemerisPlanet](#) is an [EphemerisPoint](#) whose state is coupled with the translational state of a Dyn-Body reference frame.

```
#include <propagated_planet.hh>
```

Inheritance diagram for jeod::PropagatedEphemerisPlanet:



Public Member Functions

- [PropagatedEphemerisPlanet](#) (DynBody &dyn_body, BodyRefFrame &frame)
PropagatedEphemerisPlanet non-default constructor.
- [~PropagatedEphemerisPlanet](#) (void)
PropagatedEphemerisPlanet destructor.
- virtual void [update](#) (double time)
Copy rotational state from/to the body reference frame.

Protected Attributes

- DynBody & [body](#)

The dynamic body whose state is tied to that of the planet.

- BodyRefFrame & [body_ref_frame](#)

The body reference frame whose translational state is coupled with that of the planet's inertial frame.

Private Member Functions

- [PropagatedEphemerisPlanet](#) (const [PropagatedEphemerisPlanet](#) &)

Not implemented.

- [PropagatedEphemerisPlanet](#) & operator= (const [PropagatedEphemerisPlanet](#) &)

Not implemented.

Friends

- class [InputProcessor](#)
- void [init_attrjeod__PropagatedEphemerisPlanet](#) ()

Additional Inherited Members

8.25.1 Detailed Description

A [PropagatedEphemerisPlanet](#) is an [EphemerisPoint](#) whose state is coupled with the translational state of a DynBody reference frame.

This class is intended for use by the [PropagatedPlanet](#) class. Use outside of the [PropagatedPlanet](#) is not sanctioned.

The inherited enabled flag takes on an additional meaning in this derived class. The base class meaning of this flag is that the ephemeris item, or the ephemeris model that owns the item, is responsible for maintaining the translational state of the target frame when the item is enabled but not when the item is disabled.

For this class, when the enabled flag is set still means that the item is responsible for maintaining the translational state of the target ephemeris reference frame. The dynamic body serves as the source of this state. When the enabled flag is clear, some other model is assumed to be responsible for maintaining the target frame state. The target frame state serves as the source of the dynamic body's state when the enabled flag is clear. A [PropagatedEphemerisPlanet](#) is an [EphemerisPoint](#) whose state is coupled with the translational state of a DynBody reference frame.

This class is intended for use by the [PropagatedPlanet](#) class. Use outside of the [PropagatedPlanet](#) is not sanctioned.

The class acts analogously to the class [PropagatedEphemerisOrientation](#), but for translation rather than rotation. See [PropagatedEphemerisOrientation](#) for a description of the behavior of the class.

Definition at line 86 of file `propagated_planet.hh`.

8.25.2 Constructor & Destructor Documentation

8.25.2.1 `jeod::PropagatedEphemerisPlanet::PropagatedEphemerisPlanet (DynBody & dyn_body, BodyRefFrame & frame)`

[PropagatedEphemerisPlanet](#) non-default constructor.

Parameters

<i>in, out</i>	<i>dyn_body</i>	The DynBody that represents the planet
<i>in, out</i>	<i>frame</i>	The body reference frame

Definition at line 190 of file propagated_planet.cc.

8.25.2.2 jeod::PropagatedEphemerisPlanet::~~PropagatedEphemerisPlanet (void)

[PropagatedEphemerisPlanet](#) destructor.

Definition at line 83 of file propagated_planet.cc.

8.25.2.3 jeod::PropagatedEphemerisPlanet::PropagatedEphemerisPlanet (const PropagatedEphemerisPlanet &)
[private]

Not implemented.

8.25.3 Member Function Documentation

8.25.3.1 PropagatedEphemerisPlanet& jeod::PropagatedEphemerisPlanet::operator= (const PropagatedEphemerisPlanet &) [private]

Not implemented.

8.25.3.2 void jeod::PropagatedEphemerisPlanet::update (double *dyn_time*) [virtual]

Copy rotational state from/to the body reference frame.

Parameters

<i>in</i>	<i>dyn_time</i>	Dynamic time seconds Units: s
-----------	-----------------	----------------------------------

Definition at line 95 of file propagated_planet.cc.

References [body](#), [body_ref_frame](#), [jeod::EphemerisItem::enabled](#), [jeod::EphemerisItem::target_frame](#), and [jeod::EphemerisItem::update_time](#).

Referenced by [jeod::PropagatedPlanet::ephem_update\(\)](#).

8.25.4 Friends And Related Function Documentation

8.25.4.1 void init_attrjeod__PropagatedEphemerisPlanet () [friend]

8.25.4.2 friend class InputProcessor [friend]

Definition at line 87 of file propagated_planet.hh.

8.25.5 Field Documentation

8.25.5.1 DynBody& jeod::PropagatedEphemerisPlanet::body [protected]

The dynamic body whose state is tied to that of the planet.

[trick_units\(-\)](#)

Definition at line 124 of file propagated_planet.hh.

Referenced by update().

8.25.5.2 BodyRefFrame& jeod::PropagatedEphemerisPlanet::body_ref_frame [protected]

The body reference frame whose translational state is coupled with that of the planet's inertial frame.

trick_units(–)

Definition at line 130 of file propagated_planet.hh.

Referenced by update().

The documentation for this class was generated from the following files:

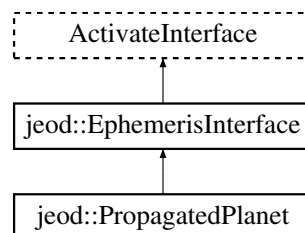
- [propagated_planet.hh](#)
- [propagated_planet.cc](#)

8.26 jeod::PropagatedPlanet Class Reference

The [PropagatedPlanet](#) ephemeris model provides planetary state via a DynBody object whose state is propagated using the JEOD state integration techniques.

```
#include <propagated_planet.hh>
```

Inheritance diagram for jeod::PropagatedPlanet:



Public Types

- enum [Mode](#) { [TransFromPlanet_RotFromPlanet](#) = 0, [TransFromPlanet_RotFromBody](#) = 1, [TransFromBody_RotFromPlanet](#) = 2, [TransFromBody_RotFromBody](#) = 3 }

Defines the modes in which an active [PropagatedPlanet](#) object operates.

Public Member Functions

- [PropagatedPlanet](#) (void)
[PropagatedPlanet](#) default constructor.
- [~PropagatedPlanet](#) (void)
[PropagatedPlanet](#) destructor.
- void [initialize_model](#) (const TimeManager &time_manager, DynManager &dyn_manager)
Initialize a [PropagatedPlanet](#) model.
- void [shutdown](#) (void)
Free resources allocated by the [PropagatedPlanet](#) model.
- void [activate](#) (void)
Nominally, activate the object.
- void [deactivate](#) (void)

- *Deactivate the [PropagatedPlanet](#) object.*
- double [timestamp](#) (void) const
Return time of last update.
- const char * [get_name](#) (void) const
Return model name.
- void [ephem_initialize](#) ([EphemeridesManager](#) &ephem_manager)
Mark appropriate items in the model as active.
- void [ephem_activate](#) ([EphemeridesManager](#) &ephem_manager)
Activate ephemerides.
- void [ephem_build_tree](#) ([EphemeridesManager](#) &ephem_manager)
Construct the ephemeris model portions of the reference frame tree.
- void [ephem_update](#) (void)
Update ephemerides for subscribed items.
- void [set_commanded_mode](#) ([Mode](#) new_mode)
Setter for the commanded mode.

Data Fields

- char * [planet_name](#)
The name of the planet.
- char * [parent_name](#)
The name of the parent frame.
- DynBody [body](#)
The dynamic body whose state is tied to that of the planet.
- [Mode](#) [commanded_mode](#)
The mode in which the model should operate.

Protected Member Functions

- void [set_mode](#) (void)
Change the behavior of a [PropagatedPlanet](#).

Protected Attributes

- bool [initialized](#)
Has the model been initialized?
- [Mode](#) [mode](#)
The mode in which the model is operating.
- char * [ident](#)
Model name; used for reporting errors.
- bool [active](#)
Is the planet present and marked as active?
- double [update_time](#)
Time of last update, dynamic time seconds.
- BasePlanet * [planet](#)
The planet tied to the body.
- [EphemerisRefFrame](#) * [parent_frame](#)
The parent of the planet.
- DynManager * [dyn_manager](#)
The dynamics manager.

- `const TimeDyn * time_dyn`
The source of dynamic time information.
- `PropagatedEphemerisPlanet ephem_planet`
The ephemeris item that couples the translational states of the body's composite body frame and the planet's inertial frame.
- `PropagatedEphemerisOrientation ephem_orient`
The ephemeris item that couples the rotational states of the body's composite body frame and the planet's planet-fixed frame.

Private Member Functions

- `PropagatedPlanet (const PropagatedPlanet &)`
Not implemented.
- `PropagatedPlanet & operator= (const PropagatedPlanet &)`
Not implemented.

Friends

- class `InputProcessor`
- void `init_attrjeod__PropagatedPlanet ()`

8.26.1 Detailed Description

The `PropagatedPlanet` ephemeris model provides planetary state via a `DynBody` object whose state is propagated using the JEOD state integration techniques.

Scenarios in which a simulation will use a `PropagatedPlanet` object include:

- An object such as an asteroid for which an ephemeris model is not readily available.
- An object such as a planet that is represented in some other ephemeris model but the simulation developer wants the planet to be propagated to ensure that the planet and the vehicles operating in the vicinity of the planet obey the same laws of physics.

The `PropagatedPlanet` model provides mechanisms that accommodate these scenarios. The class defines multiple modes in which a propagated planet object operates. In all modes, the model ensures consistency between the translational states of the dynamic body's composite frame and the planet's planet-centered frame and between the rotational states of the dynamic body's composite frame and the planet's planet-fixed frame.

Definition at line 213 of file `propagated_planet.hh`.

8.26.2 Member Enumeration Documentation

8.26.2.1 `enum jeod::PropagatedPlanet::Mode`

Defines the modes in which an active `PropagatedPlanet` object operates.

A `PropagatedPlanet` contains a `BasePlanet` pointer `PropagatedPlanet::planet` and a `DynBody` `PropagatedPlanet::body`. The translational states of the planet-centered inertial frame and the body's composite_body frame are tied to one another, as are the rotational states of the planet-fixed frame and the the body's composite_body frame. This enum identifies which of the planet or the body is the source of translational and the the rotational parts of the state.

Enumerator

TransFromPlanet_RotFromPlanet
TransFromPlanet_RotFromBody

*TransFromBody_RotFromPlanet**TransFromBody_RotFromBody*

Definition at line 230 of file propagated_planet.hh.

8.26.3 Constructor & Destructor Documentation

8.26.3.1 jeod::PropagatedPlanet::PropagatedPlanet (void)

[PropagatedPlanet](#) default constructor.

Definition at line 205 of file propagated_planet.cc.

References `ephem_orient`, `ephem_planet`, and `jeod::EphemerisItem::set_owner()`.

8.26.3.2 jeod::PropagatedPlanet::~~PropagatedPlanet (void)

[PropagatedPlanet](#) destructor.

Definition at line 232 of file propagated_planet.cc.

References `shutdown()`.

8.26.3.3 jeod::PropagatedPlanet::PropagatedPlanet (const PropagatedPlanet &) [private]

Not implemented.

8.26.4 Member Function Documentation

8.26.4.1 void jeod::PropagatedPlanet::activate (void)

Nominally, activate the object.

In the case of a [PropagatedPlanet](#) object, an inactive object cannot be activated.

Definition at line 260 of file propagated_planet.cc.

References `active`, and `jeod::EphemeridesMessages::internal_error`.

8.26.4.2 void jeod::PropagatedPlanet::deactivate (void)

Deactivate the [PropagatedPlanet](#) object.

Definition at line 277 of file propagated_planet.cc.

References `active`.

8.26.4.3 void jeod::PropagatedPlanet::ephem_activate (EphemeridesManager & ephem_manager) [virtual]

Activate ephemerides.

Parameters

<i>in, out</i>	<i>ephem_manager</i>	Ephemerides manager
----------------	----------------------	---------------------

Implements [jeod::EphemerisInterface](#).

Definition at line 514 of file propagated_planet.cc.

References `body`, `mode`, `TransFromBody_RotFromBody`, `TransFromBody_RotFromPlanet`, and `TransFromPlanet_RotFromBody`.

8.26.4.4 `void jeod::PropagatedPlanet::ephem_build_tree (EphemeridesManager & ephem_manager)` [virtual]

Construct the ephemeris model portions of the reference frame tree.

Parameters

<code>in, out</code>	<code><i>ephem_manager</i></code>	Ephemerides manager
----------------------	-----------------------------------	---------------------

Implements [jeod::EphemerisInterface](#).

Definition at line 536 of file `propagated_planet.cc`.

References `active`, `parent_frame`, and `planet`.

8.26.4.5 `void jeod::PropagatedPlanet::ephem_initialize (EphemeridesManager & ephem_manager)` [virtual]

Mark appropriate items in the model as active.

Parameters

<code>in, out</code>	<code><i>ephem_manager</i></code>	Ephemerides manager
----------------------	-----------------------------------	---------------------

Implements [jeod::EphemerisInterface](#).

Definition at line 398 of file `propagated_planet.cc`.

References `active`, `ephem_orient`, `ephem_planet`, `jeod::EphemeridesManager::find_base_planet()`, `jeod::EphemerisItem::get_target_frame()`, `jeod::EphemeridesMessages::inconsistent_setup`, `planet`, `planet_name`, `set_mode()`, and `jeod::EphemeridesManager::set_target_frame()`.

8.26.4.6 `void jeod::PropagatedPlanet::ephem_update (void)` [virtual]

Update ephemerides for subscribed items.

Implements [jeod::EphemerisInterface](#).

Definition at line 557 of file `propagated_planet.cc`.

References `active`, `body`, `commanded_mode`, `dyn_manager`, `ephem_orient`, `ephem_planet`, `initialized`, `mode`, `set_mode()`, `time_dyn`, `TransFromBody_RotFromBody`, `jeod::PropagatedEphemerisPlanet::update()`, `jeod::PropagatedEphemerisOrientation::update()`, and `update_time`.

8.26.4.7 `const char * jeod::PropagatedPlanet::get_name (void) const` [virtual]

Return model name.

Returns

Name

Implements [jeod::EphemerisInterface](#).

Definition at line 304 of file `propagated_planet.cc`.

References `ident`.

8.26.4.8 `void jeod::PropagatedPlanet::initialize_model (const TimeManager & time_manager, DynManager & dyn_manager_ref)`

Initialize a [PropagatedPlanet](#) model.

Assumptions and Limitations

- This method must be called after the ephemeris model that defines the parent frame has been initialized.

Parameters

in	<i>time_manager</i>	Time manager
in, out	<i>dyn_manager_ref</i>	Dynamics manager

Definition at line 322 of file propagated_planet.cc.

References `active`, `body`, `dyn_manager`, `ephem_orient`, `ephem_planet`, `ident`, `jeod::EphemeridesMessages::inconsistent_setup`, `parent_frame`, `parent_name`, `planet_name`, `jeod::EphemerisItem::set_name()`, and `time_dyn`.

8.26.4.9 `PropagatedPlanet& jeod::PropagatedPlanet::operator=(const PropagatedPlanet &) [private]`

Not implemented.

8.26.4.10 `void jeod::PropagatedPlanet::set_commanded_mode (PropagatedPlanet::Mode new_mode)`

Setter for the commanded mode.

Parameters

in	<i>new_mode</i>	New commanded mode
----	-----------------	--------------------

Definition at line 455 of file propagated_planet.cc.

References `commanded_mode`.

8.26.4.11 `void jeod::PropagatedPlanet::set_mode (void) [protected]`

Change the behavior of a [PropagatedPlanet](#).

Definition at line 466 of file propagated_planet.cc.

References `commanded_mode`, `jeod::EphemerisItem::disable()`, `dyn_manager`, `jeod::EphemerisOrientation::enable()`, `jeod::EphemerisItem::enable()`, `ephem_orient`, `ephem_planet`, `jeod::EphemeridesMessages::inconsistent_setup`, `mode`, `TransFromBody_RotFromBody`, `TransFromBody_RotFromPlanet`, `TransFromPlanet_RotFromBody`, and `TransFromPlanet_RotFromPlanet`.

Referenced by `ephem_initialize()`, and `ephem_update()`.

8.26.4.12 `void jeod::PropagatedPlanet::shutdown (void)`

Free resources allocated by the [PropagatedPlanet](#) model.

Definition at line 243 of file propagated_planet.cc.

References `ident`.

Referenced by `~PropagatedPlanet()`.

8.26.4.13 `double jeod::PropagatedPlanet::timestamp (void) const [virtual]`

Return time of last update.

Returns

Timestamp
Units: day

Implements [jeod::EphemerisInterface](#).

Definition at line 291 of file propagated_planet.cc.

References update_time.

8.26.5 Friends And Related Function Documentation

8.26.5.1 void init_attrjeod__PropagatedPlanet () [friend]

8.26.5.2 friend class InputProcessor [friend]

Definition at line 214 of file propagated_planet.hh.

8.26.6 Field Documentation

8.26.6.1 bool jeod::PropagatedPlanet::active [protected]

Is the planet present and marked as active?

trick_units(-)

Definition at line 345 of file propagated_planet.hh.

Referenced by activate(), deactivate(), ephem_build_tree(), ephem_initialize(), ephem_update(), and initialize_model().

8.26.6.2 DynBody jeod::PropagatedPlanet::body

The dynamic body whose state is tied to that of the planet.

trick_units(-)

Definition at line 309 of file propagated_planet.hh.

Referenced by ephem_activate(), ephem_update(), and initialize_model().

8.26.6.3 Mode jeod::PropagatedPlanet::commanded_mode

The mode in which the model should operate.

trick_units(-)

Definition at line 314 of file propagated_planet.hh.

Referenced by ephem_update(), set_commanded_mode(), and set_mode().

8.26.6.4 DynManager* jeod::PropagatedPlanet::dyn_manager [protected]

The dynamics manager.

trick_units(-)

Definition at line 365 of file propagated_planet.hh.

Referenced by ephem_update(), initialize_model(), and set_mode().

8.26.6.5 PropagatedEphemerisOrientation `jeod::PropagatedPlanet::ephem_orient` `[protected]`

The ephemeris item that couples the rotational states of the body's composite body frame and the planet's planet-fixed frame.

`trick_units(-)`

Definition at line 382 of file `propagated_planet.hh`.

Referenced by `ephem_initialize()`, `ephem_update()`, `initialize_model()`, `PropagatedPlanet()`, and `set_mode()`.

8.26.6.6 PropagatedEphemerisPlanet `jeod::PropagatedPlanet::ephem_planet` `[protected]`

The ephemeris item that couples the translational states of the body's composite body frame and the planet's inertial frame.

`trick_units(-)`

Definition at line 376 of file `propagated_planet.hh`.

Referenced by `ephem_initialize()`, `ephem_update()`, `initialize_model()`, `PropagatedPlanet()`, and `set_mode()`.

8.26.6.7 char* `jeod::PropagatedPlanet::ident` `[protected]`

Model name; used for reporting errors.

`trick_units(-)`

Definition at line 340 of file `propagated_planet.hh`.

Referenced by `get_name()`, `initialize_model()`, and `shutdown()`.

8.26.6.8 bool `jeod::PropagatedPlanet::initialized` `[protected]`

Has the model been initialized?

`trick_units(-)`

Definition at line 330 of file `propagated_planet.hh`.

Referenced by `ephem_update()`.

8.26.6.9 Mode `jeod::PropagatedPlanet::mode` `[protected]`

The mode in which the model is operating.

`trick_units(-)`

Definition at line 335 of file `propagated_planet.hh`.

Referenced by `ephem_activate()`, `ephem_update()`, and `set_mode()`.

8.26.6.10 EphemerisRefFrame* `jeod::PropagatedPlanet::parent_frame` `[protected]`

The parent of the planet.

`trick_units(-)`

Definition at line 360 of file `propagated_planet.hh`.

Referenced by `ephem_build_tree()`, and `initialize_model()`.

8.26.6.11 char* jeod::PropagatedPlanet::parent_name

The name of the parent frame.

This is used at initialization time only.`trick_units(-)`

Definition at line 304 of file `propagated_planet.hh`.

Referenced by `initialize_model()`.

8.26.6.12 BasePlanet* jeod::PropagatedPlanet::planet [protected]

The planet tied to the body.

`trick_units(-)`

Definition at line 355 of file `propagated_planet.hh`.

Referenced by `ephem_build_tree()`, and `ephem_initialize()`.

8.26.6.13 char* jeod::PropagatedPlanet::planet_name

The name of the planet.

This is used at initialization time only.`trick_units(-)`

Definition at line 298 of file `propagated_planet.hh`.

Referenced by `ephem_initialize()`, and `initialize_model()`.

8.26.6.14 const TimeDyn* jeod::PropagatedPlanet::time_dyn [protected]

The source of dynamic time information.

`trick_units(-)`

Definition at line 370 of file `propagated_planet.hh`.

Referenced by `ephem_update()`, and `initialize_model()`.

8.26.6.15 double jeod::PropagatedPlanet::update_time [protected]

Time of last update, dynamic time seconds.

`trick_units(s)`

Definition at line 350 of file `propagated_planet.hh`.

Referenced by `ephem_update()`, and `timestamp()`.

The documentation for this class was generated from the following files:

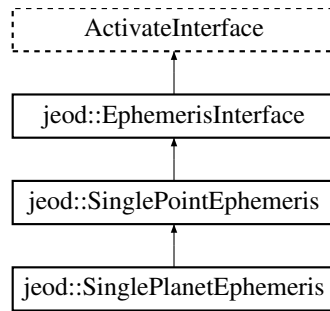
- [propagated_planet.hh](#)
- [propagated_planet.cc](#)

8.27 jeod::SinglePlanetEphemeris Class Reference

A space with one gravitation body has one ephemeris point.

```
#include <simple_ephemerides.hh>
```

Inheritance diagram for `jeod::SinglePlanetEphemeris`:



Public Member Functions

- [SinglePlanetEphemeris](#) (void)
Construct an [SinglePlanetEphemeris](#) object.
- virtual [~SinglePlanetEphemeris](#) (void)
Destruct an [SinglePlanetEphemeris](#) object.
- virtual void [set_name](#) (const char *frame_name)
Set the name of a [SinglePlanetEphemeris](#) object.
- virtual void [initialize_model](#) ([EphemeridesManager](#) &ephem_manager)
Initialize a [SinglePlanetEphemeris](#) object.
- virtual void [ephem_initialize](#) ([EphemeridesManager](#) &ephem_manager)
Initialize a [SinglePlanetEphemeris](#) object.
- virtual void [ephem_activate](#) ([EphemeridesManager](#) &ephem_manager)
Activate a [SinglePlanetEphemeris](#) object.
- virtual void [ephem_build_tree](#) ([EphemeridesManager](#) &ephem_manager)
Build the reference frame tree with the central frame as the root.

Protected Attributes

- [EphemerisPoint](#) `central_point`
The [EphemerisPoint](#) that represents the center of a simple universe.

Private Member Functions

- [SinglePlanetEphemeris](#) (const [SinglePlanetEphemeris](#) &)
Not implemented.
- [SinglePlanetEphemeris](#) & `operator=` (const [SinglePlanetEphemeris](#) &)
Not implemented.

Friends

- class [InputProcessor](#)
- void [init_attrjeod__SinglePlanetEphemeris](#) ()

8.27.1 Detailed Description

A space with one gravitation body has one ephemeris point.

Note well: A [SinglePlanetEphemeris](#) does not contain a Planet object. The planet must be specified elsewhere.

Definition at line 223 of file `simple_ephemerides.hh`.

8.27.2 Constructor & Destructor Documentation

8.27.2.1 `jeod::SinglePlanetEphemeris::SinglePlanetEphemeris (void)`

Construct an [SinglePlanetEphemeris](#) object.

Definition at line 288 of file `simple_ephemerides.cc`.

References `central_point`, `jeod::EphemerisItem::enable()`, and `jeod::EphemerisItem::set_owner()`.

8.27.2.2 `jeod::SinglePlanetEphemeris::~~SinglePlanetEphemeris (void) [virtual]`

Destruct an [SinglePlanetEphemeris](#) object.

Definition at line 299 of file `simple_ephemerides.cc`.

8.27.2.3 `jeod::SinglePlanetEphemeris::SinglePlanetEphemeris (const SinglePlanetEphemeris &) [private]`

Not implemented.

8.27.3 Member Function Documentation

8.27.3.1 `void jeod::SinglePlanetEphemeris::ephem_activate (EphemeridesManager & ephem_manager) [virtual]`

Activate a [SinglePlanetEphemeris](#) object.

Parameters

<code>in, out</code>	<code>ephem_manager</code>	Ephemerides manager
----------------------	----------------------------	---------------------

Implements [jeod::SinglePointEphemeris](#).

Definition at line 400 of file `simple_ephemerides.cc`.

8.27.3.2 `void jeod::SinglePlanetEphemeris::ephem_build_tree (EphemeridesManager & ephem_manager) [virtual]`

Build the reference frame tree with the central frame as the root.

Parameters

<code>in, out</code>	<code>ephem_manager</code>	Ephemerides manager
----------------------	----------------------------	---------------------

Implements [jeod::SinglePointEphemeris](#).

Definition at line 412 of file `simple_ephemerides.cc`.

References `jeod::SinglePointEphemeris::active`, `central_point`, and `jeod::EphemerisItem::get_target_frame()`.

8.27.3.3 `void jeod::SinglePlanetEphemeris::ephem_initialize (EphemeridesManager & ephem_manager) [virtual]`

Initialize a [SinglePlanetEphemeris](#) object.

Parameters

<code>in, out</code>	<code>ephem_manager</code>	Ephemerides manager
----------------------	----------------------------	---------------------

Implements [jeod::SinglePointEphemeris](#).

Definition at line 355 of file `simple_ephemerides.cc`.

References [jeod::SinglePointEphemeris::active](#), [central_point](#), [jeod::SinglePointEphemeris::deactivate\(\)](#), [jeod::EphemerisItem::disable\(\)](#), [jeod::EphemeridesManager::find_base_planet\(\)](#), [jeod::EphemeridesManager::get_num_planets\(\)](#), [jeod::EphemerisItem::get_target_frame\(\)](#), [jeod::SinglePointEphemeris::identifier](#), and [jeod::EphemeridesMessages::inconsistent_setup](#).

8.27.3.4 `void jeod::SinglePlanetEphemeris::initialize_model (EphemeridesManager & ephem_manager)` `[virtual]`

Initialize a [SinglePlanetEphemeris](#) object.

Parameters

<i>in, out</i>	<i>ephem_manager</i>	Ephemerides manager
----------------	----------------------	---------------------

Implements [jeod::SinglePointEphemeris](#).

Definition at line 336 of file `simple_ephemerides.cc`.

References [jeod::SinglePointEphemeris::active](#), [jeod::EphemeridesManager::add_ephem_item\(\)](#), [jeod::EphemeridesManager::add_ephemeris\(\)](#), and [central_point](#).

8.27.3.5 `SinglePlanetEphemeris& jeod::SinglePlanetEphemeris::operator= (const SinglePlanetEphemeris &)`
`[private]`

Not implemented.

8.27.3.6 `void jeod::SinglePlanetEphemeris::set_name (const char * new_name)` `[virtual]`

Set the name of a [SinglePlanetEphemeris](#) object.

Parameters

<i>in, out</i>	<i>new_name</i>	Central point name
----------------	-----------------	--------------------

Reimplemented from [jeod::SinglePointEphemeris](#).

Definition at line 311 of file `simple_ephemerides.cc`.

References [central_point](#), [jeod::SinglePointEphemeris::set_name\(\)](#), and [jeod::EphemerisItem::set_name\(\)](#).

8.27.4 Friends And Related Function Documentation

8.27.4.1 `void init_attrjeod__SinglePlanetEphemeris ()` `[friend]`

8.27.4.2 `friend class InputProcessor` `[friend]`

Definition at line 225 of file `simple_ephemerides.hh`.

8.27.5 Field Documentation

8.27.5.1 `EphemerisPoint jeod::SinglePlanetEphemeris::central_point` `[protected]`

The [EphemerisPoint](#) that represents the center of a simple universe.

`trick_units(-)`

Definition at line 254 of file `simple_ephemerides.hh`.

Referenced by [ephem_build_tree\(\)](#), [ephem_initialize\(\)](#), [initialize_model\(\)](#), [set_name\(\)](#), and [SinglePlanetEphemeris\(\)](#).

The documentation for this class was generated from the following files:

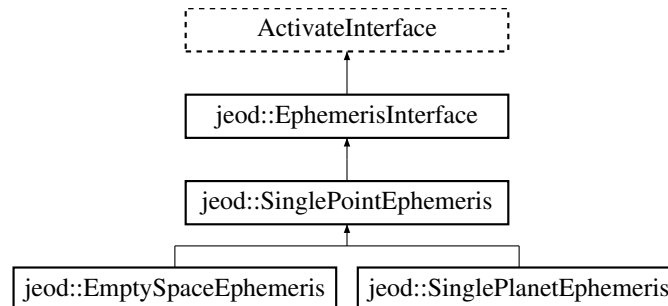
- [simple_ephemerides.hh](#)
- [simple_ephemerides.cc](#)

8.28 jeod::SinglePointEphemeris Class Reference

A [SinglePointEphemeris](#) has one ephemeris point.

```
#include <simple_ephemerides.hh>
```

Inheritance diagram for jeod::SinglePointEphemeris:



Public Member Functions

- [SinglePointEphemeris](#) (void)
Construct a [SinglePointEphemeris](#) object.
- virtual [~SinglePointEphemeris](#) (void)
Destruct a [SinglePointEphemeris](#) object.
- virtual void [set_name](#) (const char *new_name)
Set the name of a [SinglePointEphemeris](#) object.
- virtual void [activate](#) (void)
Nominally, activate the model.
- virtual void [deactivate](#) (void)
Deactivate the model.
- virtual double [timestamp](#) (void) const
Retrieve the timestamp.
- virtual const char * [get_name](#) (void) const
Retrieve the identifier.
- virtual void [ephem_update](#) (void)
Update the ephemerides, which in this case is a no-op.
- virtual void [initialize_model](#) ([EphemeridesManager](#) &manager)=0
Register the model and its ephemeris points.
- virtual void [ephem_initialize](#) ([EphemeridesManager](#) &manager)=0
Initialize the ephemerides.
- virtual void [ephem_activate](#) ([EphemeridesManager](#) &manager)=0
Activate the model.
- virtual void [ephem_build_tree](#) ([EphemeridesManager](#) &manager)=0
Build the model's contribution to the reference frame tree.

Protected Attributes

- char * [identifier](#)
Identifier for this model.
- double [update_time](#)
Time of last update, dynamic time seconds.
- bool [active](#)
Is the model active?

Private Member Functions

- [SinglePointEphemeris](#) (const [SinglePointEphemeris](#) &)
Not implemented.
- [SinglePointEphemeris](#) & operator= (const [SinglePointEphemeris](#) &)
Not implemented.

Friends

- class [InputProcessor](#)
- void [init_attrjeod__SinglePointEphemeris](#) ()

8.28.1 Detailed Description

A [SinglePointEphemeris](#) has one ephemeris point.
Definition at line 51 of file `simple_ephemerides.hh`.

8.28.2 Constructor & Destructor Documentation

8.28.2.1 `jeod::SinglePointEphemeris::SinglePointEphemeris (void)`

Construct a [SinglePointEphemeris](#) object.
Definition at line 67 of file `simple_ephemerides.cc`.

8.28.2.2 `jeod::SinglePointEphemeris::~~SinglePointEphemeris (void) [virtual]`

Destruct a [SinglePointEphemeris](#) object.
Definition at line 81 of file `simple_ephemerides.cc`.
References `identifier`.

8.28.2.3 `jeod::SinglePointEphemeris::SinglePointEphemeris (const SinglePointEphemeris &) [private]`

Not implemented.

8.28.3 Member Function Documentation

8.28.3.1 `void jeod::SinglePointEphemeris::activate (void) [virtual]`

Nominally, activate the model.

Here, reject the request.

Definition at line 94 of file `simple_ephemerides.cc`.

References active, and `jeod::EphemeridesMessages::internal_error`.

8.28.3.2 `void jeod::SinglePointEphemeris::deactivate (void) [virtual]`

Deactivate the model.

Definition at line 109 of file `simple_ephemerides.cc`.

References active.

Referenced by `jeod::EmptySpaceEphemeris::ephem_initialize()`, and `jeod::SinglePlanetEphemeris::ephem_initialize()`.

8.28.3.3 `virtual void jeod::SinglePointEphemeris::ephem_activate (EphemeridesManager & manager) [pure virtual]`

Activate the model.

Parameters

<code>in, out</code>	<code>manager</code>	Ephemerides manager
----------------------	----------------------	---------------------

Implements [jeod::EphemerisInterface](#).

Implemented in [jeod::SinglePlanetEphemeris](#), and [jeod::EmptySpaceEphemeris](#).

8.28.3.4 `virtual void jeod::SinglePointEphemeris::ephem_build_tree (EphemeridesManager & manager) [pure virtual]`

Build the model's contribution to the reference frame tree.

Parameters

<code>in, out</code>	<code>manager</code>	Ephemerides manager
----------------------	----------------------	---------------------

Implements [jeod::EphemerisInterface](#).

Implemented in [jeod::SinglePlanetEphemeris](#), and [jeod::EmptySpaceEphemeris](#).

8.28.3.5 `virtual void jeod::SinglePointEphemeris::ephem_initialize (EphemeridesManager & manager) [pure virtual]`

Initialize the ephemerides.

Parameters

<code>in, out</code>	<code>manager</code>	Ephemerides manager
----------------------	----------------------	---------------------

Implements [jeod::EphemerisInterface](#).

Implemented in [jeod::SinglePlanetEphemeris](#), and [jeod::EmptySpaceEphemeris](#).

8.28.3.6 `void jeod::SinglePointEphemeris::ephem_update (void) [inline],[virtual]`

Update the ephemerides, which in this case is a no-op.

Implements [jeod::EphemerisInterface](#).

Definition at line 297 of file `simple_ephemerides.hh`.

8.28.3.7 `const char * jeod::SinglePointEphemeris::get_name (void) const` `[inline], [virtual]`

Retrieve the identifier.

Returns

Identifier

Implements [jeod::EphemerisInterface](#).

Definition at line 285 of file `simple_ephemerides.hh`.

References `identifier`.

8.28.3.8 `virtual void jeod::SinglePointEphemeris::initialize_model (EphemeridesManager & manager)` `[pure virtual]`

Register the model and its ephemeris points.

Parameters

<code>in, out</code>	<code>manager</code>	Ephemerides manager
----------------------	----------------------	---------------------

Implemented in [jeod::SinglePlanetEphemeris](#), and [jeod::EmptySpaceEphemeris](#).

8.28.3.9 `SinglePointEphemeris& jeod::SinglePointEphemeris::operator= (const SinglePointEphemeris &)` `[private]`

Not implemented.

8.28.3.10 `void jeod::SinglePointEphemeris::set_name (const char * new_name)` `[virtual]`

Set the name of a [SinglePointEphemeris](#) object.

Parameters

<code>in, out</code>	<code>new_name</code>	Central point name
----------------------	-----------------------	--------------------

Reimplemented in [jeod::SinglePlanetEphemeris](#), and [jeod::EmptySpaceEphemeris](#).

Definition at line 122 of file `simple_ephemerides.cc`.

References `identifier`, and `jeod::EphemeridesMessages::inconsistent_setup`.

Referenced by `jeod::EmptySpaceEphemeris::set_name()`, and `jeod::SinglePlanetEphemeris::set_name()`.

8.28.3.11 `double jeod::SinglePointEphemeris::timestamp (void) const` `[inline], [virtual]`

Retrieve the timestamp.

Returns

Timestamp

Units: s

Implements [jeod::EphemerisInterface](#).

Definition at line 272 of file `simple_ephemerides.hh`.

References `update_time`.

8.28.4 Friends And Related Function Documentation

8.28.4.1 `void init_attrjeod__SinglePointEphemeris ()` [*friend*]

8.28.4.2 `friend class InputProcessor` [*friend*]

Definition at line 53 of file `simple_ephemerides.hh`.

8.28.5 Field Documentation

8.28.5.1 `bool jeod::SinglePointEphemeris::active` [*protected*]

Is the model active?

`trick_units(-)`

Definition at line 153 of file `simple_ephemerides.hh`.

Referenced by `activate()`, `deactivate()`, `jeod::EmptySpaceEphemeris::ephem_build_tree()`, `jeod::SinglePlanetEphemeris::ephem_build_tree()`, `jeod::SinglePlanetEphemeris::ephem_initialize()`, `jeod::EmptySpaceEphemeris::initialize_model()`, and `jeod::SinglePlanetEphemeris::initialize_model()`.

8.28.5.2 `char* jeod::SinglePointEphemeris::identifier` [*protected*]

Identifier for this model.

`trick_units(-)`

Definition at line 143 of file `simple_ephemerides.hh`.

Referenced by `jeod::EmptySpaceEphemeris::ephem_initialize()`, `jeod::SinglePlanetEphemeris::ephem_initialize()`, `get_name()`, `set_name()`, and `~SinglePointEphemeris()`.

8.28.5.3 `double jeod::SinglePointEphemeris::update_time` [*protected*]

Time of last update, dynamic time seconds.

`trick_units(s)`

Definition at line 148 of file `simple_ephemerides.hh`.

Referenced by `timestamp()`.

The documentation for this class was generated from the following files:

- [simple_ephemerides.hh](#)
- [simple_ephemerides.cc](#)

Chapter 9

File Documentation

9.1 `base_ephem_manager.hh` File Reference

Define the BaseEphemManager class, which defines the interfaces to the class EphemManager.

```
#include <vector>
#include "utils/ref_frames/include/base_ref_frame_manager.hh"
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class [jeod::BaseEphemeridesManager](#)

The EphemManager class augments the RefFrameManager with ephemeris-related items.

Namespaces

- [jeod](#)

Namespace jeod.

9.1.1 Detailed Description

Define the BaseEphemManager class, which defines the interfaces to the class EphemManager.

Definition in file [base_ephem_manager.hh](#).

9.2 `class_declarations.hh` File Reference

Forward declarations of classes defined in the DE4xx model.

Namespaces

- [jeod](#)

Namespace jeod.

9.2.1 Detailed Description

Forward declarations of classes defined in the DE4xx model.

Definition in file [de4xx_ephem/include/class_declarations.hh](#).

9.3 class_declarations.hh File Reference

Forward declarations of classes defined in models/environment/ephemerides/ephem_interface files.

Namespaces

- [jeod](#)

Namespace jeod.

9.3.1 Detailed Description

Forward declarations of classes defined in models/environment/ephemerides/ephem_interface files.

Definition in file [ephem_interface/include/class_declarations.hh](#).

9.4 class_declarations.hh File Reference

Forward declarations of classes defined in models/environment/ephemerides/ephem_item files.

Namespaces

- [jeod](#)

Namespace jeod.

9.4.1 Detailed Description

Forward declarations of classes defined in models/environment/ephemerides/ephem_item files.

Definition in file [ephem_item/include/class_declarations.hh](#).

9.5 de405_0.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- [jeod::EphemerisDataSetMeta metaData](#)
- [jeod::EphemerisDataItemMeta itemData](#) [13]
- [jeod::EphemerisDataSegmentMeta segmentData](#) [31]
- double [segment_coeffs_0](#) [229][1018]

9.5.1 Variable Documentation

9.5.1.1 jeod::EphemerisDataItemMeta itemData[13]

Definition at line 44 of file de405_0.cc.

Referenced by jeod::De4xxFile::interpolate(), and jeod::De4xxFile::pre_initialize().

9.5.1.2 jeod::EphemerisDataSetMeta metaData

Initial value:

```
= {
    .number_file_items = 13,
    .start_epoch = 2305424.50,
    .stop_epoch = 2525008.50,
    .delta_epoch = 32,
    .number_segments = 31,
    .ncoeff = 1018,
    .de_constants = {
        0.405000000000000000E+03,
        0.405000000000000000E+03,
        0.149597870691000015E+09,
        0.813005600000000004E+02,
        0.299792457999999984E+06,
        0.491254745145081187E-10,
        0.724345248616270270E-09,
        0.899701134671249882E-09,
        0.954953510577925806E-10,
        0.282534590952422643E-06,
        0.845971518568065874E-07,
        0.129202491678196939E-07,
        0.152435890078427628E-07,
        0.218869976542596968E-11,
        0.295912208285591095E-03
    }
}
```

Definition at line 17 of file de405_0.cc.

9.5.1.3 double segment_coeffs_0[229][1018]

Definition at line 275 of file de405_0.cc.

9.5.1.4 jeod::EphemerisDataSegmentMeta segmentData[31]

Definition at line 112 of file de405_0.cc.

9.6 de405_1.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_1](#) [229][1018]

9.6.1 Variable Documentation

9.6.1.1 double segment_coeffs_1[229][1018]

Definition at line 17 of file de405_1.cc.

9.7 de405_10.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_10](#) [229][1018]

9.7.1 Variable Documentation

9.7.1.1 double segment_coeffs_10[229][1018]

Definition at line 17 of file de405_10.cc.

9.8 de405_11.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_11](#) [230][1018]

9.8.1 Variable Documentation

9.8.1.1 double segment_coeffs_11[230][1018]

Definition at line 17 of file de405_11.cc.

9.9 de405_12.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_12](#) [229][1018]

9.9.1 Variable Documentation

9.9.1.1 double segment_coeffs_12[229][1018]

Definition at line 17 of file de405_12.cc.

9.10 de405_13.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_13](#) [229][1018]

9.10.1 Variable Documentation

9.10.1.1 double [segment_coeffs_13](#)[229][1018]

Definition at line 17 of file de405_13.cc.

9.11 de405_14.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_14](#) [229][1018]

9.11.1 Variable Documentation

9.11.1.1 double [segment_coeffs_14](#)[229][1018]

Definition at line 17 of file de405_14.cc.

9.12 de405_15.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_15](#) [230][1018]

9.12.1 Variable Documentation

9.12.1.1 double [segment_coeffs_15](#)[230][1018]

Definition at line 17 of file de405_15.cc.

9.13 de405_16.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_16](#) [229][1018]

9.13.1 Variable Documentation

9.13.1.1 double [segment_coeffs_16](#)[229][1018]

Definition at line 17 of file de405_16.cc.

9.14 de405_17.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_17](#) [229][1018]

9.14.1 Variable Documentation

9.14.1.1 double [segment_coeffs_17](#)[229][1018]

Definition at line 17 of file de405_17.cc.

9.15 de405_18.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_18](#) [229][1018]

9.15.1 Variable Documentation

9.15.1.1 double [segment_coeffs_18](#)[229][1018]

Definition at line 17 of file de405_18.cc.

9.16 de405_19.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_19](#) [230][1018]

9.16.1 Variable Documentation

9.16.1.1 double [segment_coeffs_19](#)[230][1018]

Definition at line 17 of file de405_19.cc.

9.17 de405_2.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_2](#) [229][1018]

9.17.1 Variable Documentation

9.17.1.1 double [segment_coeffs_2](#)[229][1018]

Definition at line 17 of file de405_2.cc.

9.18 de405_20.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_20](#) [229][1018]

9.18.1 Variable Documentation

9.18.1.1 double [segment_coeffs_20](#)[229][1018]

Definition at line 17 of file de405_20.cc.

9.19 de405_21.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_21](#) [229][1018]

9.19.1 Variable Documentation

9.19.1.1 double [segment_coeffs_21](#)[229][1018]

Definition at line 17 of file de405_21.cc.

9.20 de405_22.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_22](#) [230][1018]

9.20.1 Variable Documentation

9.20.1.1 double [segment_coeffs_22](#)[230][1018]

Definition at line 17 of file de405_22.cc.

9.21 de405_23.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_23](#) [229][1018]

9.21.1 Variable Documentation

9.21.1.1 double [segment_coeffs_23](#)[229][1018]

Definition at line 17 of file de405_23.cc.

9.22 de405_24.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_24](#) [229][1018]

9.22.1 Variable Documentation

9.22.1.1 double [segment_coeffs_24](#)[229][1018]

Definition at line 17 of file de405_24.cc.

9.23 de405_25.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_25](#) [229][1018]

9.23.1 Variable Documentation

9.23.1.1 double [segment_coeffs_25](#)[229][1018]

Definition at line 17 of file de405_25.cc.

9.24 de405_26.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_26](#) [230][1018]

9.24.1 Variable Documentation

9.24.1.1 double [segment_coeffs_26](#)[230][1018]

Definition at line 17 of file de405_26.cc.

9.25 de405_27.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_27](#) [229][1018]

9.25.1 Variable Documentation

9.25.1.1 double [segment_coeffs_27](#)[229][1018]

Definition at line 17 of file de405_27.cc.

9.26 de405_28.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_28](#) [229][1018]

9.26.1 Variable Documentation

9.26.1.1 double [segment_coeffs_28](#)[229][1018]

Definition at line 17 of file de405_28.cc.

9.27 de405_29.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_29](#) [230][1018]

9.27.1 Variable Documentation

9.27.1.1 double [segment_coeffs_29](#)[230][1018]

Definition at line 17 of file de405_29.cc.

9.28 de405_3.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_3](#) [229][1018]

9.28.1 Variable Documentation

9.28.1.1 double [segment_coeffs_3](#)[229][1018]

Definition at line 17 of file de405_3.cc.

9.29 de405_30.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_30](#) [13][1018]

9.29.1 Variable Documentation

9.29.1.1 double [segment_coeffs_30](#)[13][1018]

Definition at line 17 of file de405_30.cc.

9.30 de405_4.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_4](#) [230][1018]

9.30.1 Variable Documentation

9.30.1.1 double [segment_coeffs_4](#)[230][1018]

Definition at line 17 of file de405_4.cc.

9.31 de405_5.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_5](#) [229][1018]

9.31.1 Variable Documentation

9.31.1.1 double [segment_coeffs_5](#)[229][1018]

Definition at line 17 of file de405_5.cc.

9.32 de405_6.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_6](#) [229][1018]

9.32.1 Variable Documentation

9.32.1.1 double [segment_coeffs_6](#)[229][1018]

Definition at line 17 of file de405_6.cc.

9.33 de405_7.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_7](#) [229][1018]

9.33.1 Variable Documentation

9.33.1.1 double [segment_coeffs_7](#)[229][1018]

Definition at line 17 of file de405_7.cc.

9.34 de405_8.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_8](#) [230][1018]

9.34.1 Variable Documentation

9.34.1.1 double [segment_coeffs_8](#)[230][1018]

Definition at line 17 of file de405_8.cc.

9.35 de405_9.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_9](#) [229][1018]

9.35.1 Variable Documentation

9.35.1.1 double [segment_coeffs_9](#)[229][1018]

Definition at line 17 of file de405_9.cc.

9.36 de421_0.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- [jeod::EphemerisDataSetMeta](#) [metaData](#)
- [jeod::EphemerisDataItemMeta](#) [itemData](#) [13]
- [jeod::EphemerisDataSegmentMeta](#) [segmentData](#) [2]
- double [segment_coeffs_0](#) [1713][1018]

9.36.1 Variable Documentation

9.36.1.1 [jeod::EphemerisDataItemMeta](#) [itemData](#)[13]

Definition at line 44 of file de421_0.cc.

9.36.1.2 jeod::EphemerisDataSetMeta metaData

Initial value:

```
= {
    .number_file_items = 13,
    .start_epoch = 2414992.50,
    .stop_epoch = 2524624.50,
    .delta_epoch = 32,
    .number_segments = 2,
    .ncoeff = 1018,
    .de_constants = {
        0.421000000000000000E+03,
        0.421000000000000000E+03,
        0.149597870699626200E+09,
        0.813005690699153000E+02,
        0.299792458000000000E+06,
        0.491254957186794000E-10,
        0.724345233269844100E-09,
        0.899701140826804900E-09,
        0.954954869562239000E-10,
        0.282534584085505000E-06,
        0.845970607330847800E-07,
        0.129202482579265000E-07,
        0.152435910924974000E-07,
        0.217844105199052000E-11,
        0.295912208285591100E-03
    }
}
```

Definition at line 17 of file de421_0.cc.

9.36.1.3 double segment_coeffs_0[1713][1018]

Definition at line 130 of file de421_0.cc.

9.36.1.4 jeod::EphemerisDataSegmentMeta segmentData[2]

Initial value:

```
= {
    {
        .num_recs = 1713,
        .start_epoch = 2.414992500000000000E+06,
        .stop_epoch = 2.469808500000000000E+06
    },
    {
        .num_recs = 1714,
        .start_epoch = 0.246977650000000000E+07,
        .stop_epoch = 0.252462450000000000E+07
    }
}
```

Definition at line 112 of file de421_0.cc.

9.37 de421_1.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_1](#) [1714][1018]

9.37.1 Variable Documentation

9.37.1.1 double segment_coeffs_1[1714][1018]

Definition at line 17 of file de421_1.cc.

9.38 de440_0.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- [jeod::EphemerisDataSetMeta metaData](#)
- [jeod::EphemerisDataItemMeta itemData](#) [15]
- [jeod::EphemerisDataSegmentMeta segmentData](#) [11]
- double [segment_coeffs_0](#) [1142][1018]

9.38.1 Variable Documentation

9.38.1.1 jeod::EphemerisDataItemMeta itemData[15]

Definition at line 44 of file de440_0.cc.

9.38.1.2 jeod::EphemerisDataSetMeta metaData

Initial value:

```
= {
    .number_file_items = 15,
    .start_epoch = 2287184.50,
    .stop_epoch = 2688976.50,
    .delta_epoch = 32,
    .number_segments = 11,
    .ncoeff = 1018,
    .de_constants = {
        0.440000000000000000E+03,
        0.440000000000000000E+03,
        0.149597870699999988E+09,
        0.813005682214972154E+02,
        0.299792457999999984E+06,
        0.491250019488931818E-10,
        0.724345233264411869E-09,
        0.899701139294734660E-09,
        0.954954882972581189E-10,
        0.282534582522579175E-06,
        0.845970599337629027E-07,
        0.129202656496823994E-07,
        0.152435734788519386E-07,
        0.217509646489335811E-11,
        0.295912208284119561E-03
    }
}
```

Definition at line 17 of file de440_0.cc.

9.38.1.3 double segment_coeffs_0[1142][1018]

Definition at line 185 of file de440_0.cc.

9.38.1.4 jeod::EphemerisDataSegmentMeta segmentData[11]

Definition at line 122 of file de440_0.cc.

9.39 de440_1.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_1](#) [1142][1018]

9.39.1 Variable Documentation

9.39.1.1 double [segment_coeffs_1](#)[1142][1018]

Definition at line 17 of file de440_1.cc.

9.40 de440_10.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_10](#) [1143][1018]

9.40.1 Variable Documentation

9.40.1.1 double [segment_coeffs_10](#)[1143][1018]

Definition at line 17 of file de440_10.cc.

9.41 de440_2.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_2](#) [1143][1018]

9.41.1 Variable Documentation

9.41.1.1 double [segment_coeffs_2](#)[1143][1018]

Definition at line 17 of file de440_2.cc.

9.42 de440_3.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_3](#) [1142][1018]

9.42.1 Variable Documentation

9.42.1.1 double [segment_coeffs_3](#)[1142][1018]

Definition at line 17 of file de440_3.cc.

9.43 de440_4.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_4](#) [1142][1018]

9.43.1 Variable Documentation

9.43.1.1 double [segment_coeffs_4](#)[1142][1018]

Definition at line 17 of file de440_4.cc.

9.44 de440_5.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_5](#) [1143][1018]

9.44.1 Variable Documentation

9.44.1.1 double [segment_coeffs_5](#)[1143][1018]

Definition at line 17 of file de440_5.cc.

9.45 de440_6.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_6](#) [1142][1018]

9.45.1 Variable Documentation

9.45.1.1 double [segment_coeffs_6](#)[1142][1018]

Definition at line 17 of file de440_6.cc.

9.46 de440_7.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_7](#) [1143][1018]

9.46.1 Variable Documentation

9.46.1.1 double [segment_coeffs_7](#)[1143][1018]

Definition at line 17 of file de440_7.cc.

9.47 de440_8.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_8](#) [1142][1018]

9.47.1 Variable Documentation

9.47.1.1 double [segment_coeffs_8](#)[1142][1018]

Definition at line 17 of file de440_8.cc.

9.48 de440_9.cc File Reference

```
#include "environment/ephemerides/de4xx_ephem/include/de4xx_file.hh"
```

Variables

- double [segment_coeffs_9](#) [1142][1018]

9.48.1 Variable Documentation

9.48.1.1 double segment_coeffs_9[1142][1018]

Definition at line 17 of file de440_9.cc.

9.49 de4xx_base.hh File Reference

Define data types for JPL ephemeris model.

```
#include <stdint>
#include "utils/sim_interface/include/jeod_class.hh"
```

Namespaces

- [jeod](#)
Namespace jeod.
- [jeod::De4xxBase](#)
Defines enumerations used in the DE4xx ephemeris model.

Enumerations

- enum [jeod::De4xxBase::De4xxFileEntries](#) {
[jeod::De4xxBase::De4xx_File_Mercury](#) = 0, [jeod::De4xxBase::De4xx_File_Venus](#) = 1, [jeod::De4xxBase::De4xx_File_EMbary](#) = 2, [jeod::De4xxBase::De4xx_File_Mars](#) = 3,
[jeod::De4xxBase::De4xx_File_Jupiter](#) = 4, [jeod::De4xxBase::De4xx_File_Saturn](#) = 5, [jeod::De4xxBase::De4xx_File_Uranus](#) = 6, [jeod::De4xxBase::De4xx_File_Neptune](#) = 7,
[jeod::De4xxBase::De4xx_File_Pluto](#) = 8, [jeod::De4xxBase::De4xx_File_Moon](#) = 9, [jeod::De4xxBase::De4xx_File_Sun](#) = 10, [jeod::De4xxBase::De4xx_File_ENutation](#) = 11,
[jeod::De4xxBase::De4xx_File_LLibration](#) = 12, [jeod::De4xxBase::De4xx_File_LAngVel](#) = 13, [jeod::De4xxBase::De4xx_File_tt_tdb](#) = 14, [jeod::De4xxBase::De4xx_File_MaxEntries](#) }
Defines names for planetary body descriptors in the ephemeris file.
- enum [jeod::De4xxBase::De4xxEphemConsts](#) {
[jeod::De4xxBase::De4xx_Const_DENUM](#) = 0, [jeod::De4xxBase::De4xx_Const_LENUM](#), [jeod::De4xxBase::De4xx_Const_AU](#), [jeod::De4xxBase::De4xx_Const_EMRAT](#),
[jeod::De4xxBase::De4xx_Const_CLIGHT](#), [jeod::De4xxBase::De4xx_Const_GM1](#), [jeod::De4xxBase::De4xx_Const_GM2](#), [jeod::De4xxBase::De4xx_Const_GMB](#),
[jeod::De4xxBase::De4xx_Const_GM4](#), [jeod::De4xxBase::De4xx_Const_GM5](#), [jeod::De4xxBase::De4xx_Const_GM6](#), [jeod::De4xxBase::De4xx_Const_GM7](#),
[jeod::De4xxBase::De4xx_Const_GM8](#), [jeod::De4xxBase::De4xx_Const_GM9](#), [jeod::De4xxBase::De4xx_Const_GMS](#), [jeod::De4xxBase::De4xx_Const_MaxConsts](#) }
Index aliases for the constants listed in the DE header that are used by JEOD.

- enum `jeod::De4xxBase::De4xxEphemBodies` {
`jeod::De4xxBase::De4xx_Ephem_Sun` = 0, `jeod::De4xxBase::De4xx_Ephem_Mercury` = 1, `jeod::De4xxBase::De4xx_Ephem_Venus` = 2, `jeod::De4xxBase::De4xx_Ephem_Earth` = 3,
`jeod::De4xxBase::De4xx_Ephem_Mars` = 4, `jeod::De4xxBase::De4xx_Ephem_Jupiter` = 5, `jeod::De4xxBase::De4xx_Ephem_Saturn` = 6, `jeod::De4xxBase::De4xx_Ephem_Uranus` = 7,
`jeod::De4xxBase::De4xx_Ephem_Neptune` = 8, `jeod::De4xxBase::De4xx_Ephem_Pluto` = 9, `jeod::De4xxBase::De4xx_Ephem_Moon` = 10, `jeod::De4xxBase::De4xx_Ephem_EMBary` = 11,
`jeod::De4xxBase::De4xx_Ephem_SSbary` = 12, `jeod::De4xxBase::De4xx_Ephem_EML1` = 13, `jeod::De4xxBase::De4xx_Ephem_ENutation` = 14, `jeod::De4xxBase::De4xx_Ephem_LLibration` = 15,
`jeod::De4xxBase::De4xx_Ephem_MaxBodies` }

Defines names for ephemeris items as represented in the JEOD DE4xx model.

Functions

- static const char *point_names[32] `jeod::De4xxBase::__attribute__` ((unused))
- static uint32_t `jeod::De4xxBase::number_jeod_items` (int de_version_num)
Total number of items in the JEOD ephemeris.
- static uint32_t `jeod::De4xxBase::number_trans_points` (int de_version_num)
Total number of translational states in the JEOD ephemeris.
- static uint32_t `jeod::De4xxBase::number_grav_models` (int de_version_num)
Number of gravity models in the JEOD ephemeris (Mercury to Sun + implied Earth) Currently only one possibility, but written for extensibility.
- static uint32_t `jeod::De4xxBase::number_physical_bodies` (int de_version_num)
Number of bodies in the JEOD ephemeris (Planets + Pluto + Moon + Sun) Currently only one possibility, but written for extensibility.

9.49.1 Detailed Description

Define data types for JPL ephemeris model.

Definition in file [de4xx_base.hh](#).

9.50 de4xx_ephem.cc File Reference

Define the methods of the classes defined in [de4xx_ephem.hh](#).

```
#include <cstddef>
#include <cstdio>
#include <climits>
#include "environment/ephemerides/ephem_interface/include/ephem_messages.-
hh"
#include "environment/ephemerides/ephem_manager/include/ephem_manager.hh"
#include "environment/planet/include/base_planet.hh"
#include "environment/time/include/time_manager.hh"
#include "environment/time/include/time_tt.hh"
#include "environment/time/include/time_dyn.hh"
#include "utils/named_item/include/named_item.hh"
#include "utils/math/include/vector3.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/de4xx_ephem.hh"
```

Namespaces

- [jeod](#)

Namespace jeod.

9.50.1 Detailed Description

Define the methods of the classes defined in [de4xx_ephem.hh](#).

Definition in file [de4xx_ephem.cc](#).

9.51 de4xx_ephem.hh File Reference

Define class for the De4xx ephemeris model.

```
#include <string>
#include "environment/ephemerides/ephem_interface/include/ephem_interface.-
hh"
#include "environment/ephemerides/ephem_interface/include/ephem_ref_frame.-
hh"
#include "environment/ephemerides/ephem_item/include/ephem_item.hh"
#include "environment/ephemerides/ephem_item/include/ephem_orient_zxz.hh"
#include "environment/ephemerides/ephem_item/include/ephem_point.hh"
#include "environment/time/include/class_declarations.hh"
#include "utils/ref_frames/include/ref_frame_interface.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "class_declarations.hh"
#include "de4xx_base.hh"
#include "de4xx_file.hh"
```

Data Structures

- class [jeod::De4xxEphemItem](#)
Describes a point modeled in a DE4xx ephemeris file.
- class [jeod::De4xxEphemeris](#)
The S_define-level class that provides planetary ephemerides.

Namespaces

- [jeod](#)

Namespace jeod.

9.51.1 Detailed Description

Define class for the De4xx ephemeris model.

Definition in file [de4xx_ephem.hh](#).

9.52 de4xx_ephem_dynmanager.cc File Reference

Wall off dependencies on the dynamics manager.

```
#include "dynamics/dyn_manager/include/dyn_manager.hh"
#include "environment/ephemerides/ephem_manager/include/ephem_manager.hh"
#include "environment/time/include/time_manager.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/de4xx_ephem.hh"
```

Namespaces

- [jeod](#)

Namespace jeod.

9.52.1 Detailed Description

Wall off dependencies on the dynamics manager.

Definition in file [de4xx_ephem_dynmanager.cc](#).

9.53 de4xx_file.cc File Reference

This file defines several utility functions used to read a binary JPL DE405 ephemeris file.

```
#include <cerrno>
#include <cstdint>
#include <cstdlib>
#include <cstdio>
#include <cstring>
#include <limits>
#include <unistd.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <dlfcn.h>
#include <ios>
#include <iostream>
#include <fstream>
#include <string>
#include "environment/ephemerides/ephem_interface/include/ephem_messages.-
hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/de4xx_file.hh"
```

Namespaces

- [jeod](#)

Namespace jeod.

Macros

- [#define __STDC_LIMIT_MACROS](#)

Functions

- void [jeod::process_mem_usage](#) (double &vm_usage, double &resident_set)

9.53.1 Detailed Description

This file defines several utility functions used to read a binary JPL DE405 ephemeris file. The functions are

open - Open an ephemeris file for input
 close - Close a previously open ephemeris file
 read_record - Read a record from the ephemeris file
 get_string - Get a string from the current data record
 get_int - Get integer array from the current data record
 get_double - Get double array from the current data record

NOTA BENE – The functions defined in this file are intended for use by the top-level ephemeris functions only.

Definition in file [de4xx_file.cc](#).

9.54 de4xx_file.hh File Reference

Define the class responsible for reading the DE4xx ephemeris file.

```
#include <cstdio>
#include <cstdlib>
#include <stdint.h>
#include "utils/container/include/simple_checkpointable.hh"
#include "utils/sim_interface/include/config.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "de4xx_base.hh"
```

Data Structures

- struct [jeod::EphemerisDataSetMeta](#)
Container for the metadata from the DE model header.
- struct [jeod::EphemerisDataItemMeta](#)
Structure containing the header metadata for sizing/locating the data entries with the data segments.
- struct [jeod::EphemerisDataSegmentMeta](#)
Metadata implied from each data segment.
- class [jeod::De4xxFileSpec](#)
Specifies which file to use (user input initialization-time data).
- class [jeod::De4xxFileIO](#)
Contains data used directly for reading the ephemeris file.
- class [jeod::De4xxFileHeader](#)
Contains data extracted from the ephemeris file header.
- class [jeod::De4xxFileItem](#)
Contains data regarding one of the items in a DE ephemeris file.
- class [jeod::De4xxFileRefTime](#)
Contains timing reference data.
- class [jeod::De4xxFileCoef](#)
Contains Chebychev polynomial coefficients and terms.
- class [jeod::De4xxFileRestart](#)
The FILE pointer in a [De4xxFileIO](#) cannot be restored by Trick.
- class [jeod::De4xxFile](#)
Provides the ability to read and interpret a DE4xx ephemeris file.

Namespaces

- [jeod](#)

Namespace jeod.

9.54.1 Detailed Description

Define the class responsible for reading the DE4xx ephemeris file.

Definition in file [de4xx_file.hh](#).

9.55 de4xx_file_init.cc File Reference

Define De4xx initialization methods.

```
#include <cerrno>
#include <climits>
#include <cmath>
#include <cstddef>
#include <cstring>
#include <sys/types.h>
#include <sys/stat.h>
#include <unistd.h>
#include <dlfcn.h>
#include "environment/ephemerides/ephem_interface/include/ephem_messages.-
hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/de4xx_file.hh"
```

Namespaces

- [jeod](#)

Namespace jeod.

Functions

- static double [jeod::l1_point](#) (double b1b2_mass_ratio)

Calculate the location of the L1 point as a ratio.

9.55.1 Detailed Description

Define De4xx initialization methods.

Definition in file [de4xx_file_init.cc](#).

9.56 de4xx_file_update.cc File Reference

Define De4xxFile::update.

```
#include <cstdint>
#include <limits>
#include <stdint>
#include <dlfcn.h>
#include "environment/ephemerides/ephemer_interface/include/ephemer_messages.-
hh"
#include "utils/message/include/message_handler.hh"
#include "../include/de4xx_file.hh"
```

Namespaces

- [jeod](#)

Namespace jeod.

9.56.1 Detailed Description

Define De4xxFile::update.

Definition in file [de4xx_file_update.cc](#).

9.57 ephemer_interface.hh File Reference

Define base class for all ephemeris interface models.

```
#include "utils/ref_frames/include/subscription.hh"
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class [jeod::EphemerisInterface](#)

Interface class that specifies minimal functionality of an ephemeris model.

Namespaces

- [jeod](#)

Namespace jeod.

9.57.1 Detailed Description

Define base class for all ephemeris interface models.

Definition in file [ephemer_interface.hh](#).

9.58 ephemer_item.cc File Reference

Define member functions for the EphemerItem class and subclasses.

```
#include <cstdint>
#include "environment/ephemerides/ephem_interface/include/ephem_interface.-
hh"
#include "environment/ephemerides/ephem_interface/include/ephem_messages.-
hh"
#include "environment/ephemerides/ephem_manager/include/base_ephem_manager.-
hh"
#include "environment/planet/include/base_planet.hh"
#include "utils/math/include/vector3.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/message/include/message_handler.hh"
#include "utils/named_item/include/named_item.hh"
#include "../include/ephem_item.hh"
```

Namespaces

- [jeod](#)

Namespace jeod.

9.58.1 Detailed Description

Define member functions for the EphemerItem class and subclasses.

Definition in file [ephem_item.cc](#).

9.59 ephem_item.hh File Reference

Define classes for items represented in some ephemeris model.

```
#include "environment/ephemerides/ephem_interface/include/ephem_interface.-
hh"
#include "environment/ephemerides/ephem_interface/include/ephem_ref_frame.-
hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "class_declarations.hh"
#include "ephem_item_inline.hh"
```

Data Structures

- class [jeod::EphemerisItem](#)

The [EphemerisItem](#) class is the base class for representing an item that is modeled in an ephemeris model.

Namespaces

- [jeod](#)

Namespace jeod.

9.59.1 Detailed Description

Define classes for items represented in some ephemeris model.

Definition in file [ephem_item.hh](#).

9.60 `ephem_item_inline.hh` File Reference

Define inline methods for the `EphemerisItem` class.

```
#include "ephem_item.hh"
```

Namespaces

- [jeod](#)

Namespace jeod.

9.60.1 Detailed Description

Define inline methods for the `EphemerisItem` class.

Definition in file [ephem_item_inline.hh](#).

9.61 `ephem_manager.cc` File Reference

Define `EphemeridesManager` methods.

```
#include <algorithm>
#include <cstdlib>
#include "environment/ephemerides/ephem_interface/include/ephem_messages.-
hh"
#include "environment/ephemerides/ephem_interface/include/ephem_ref_frame.-
hh"
#include "environment/ephemerides/ephem_item/include/ephem_item.hh"
#include "environment/ephemerides/ephem_item/include/ephem_orient.hh"
#include "environment/ephemerides/ephem_item/include/ephem_point.hh"
#include "environment/planet/include/base_planet.hh"
#include "utils/message/include/message_handler.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/ref_frames/include/ref_frame.hh"
#include "../include/ephem_manager.hh"
```

Namespaces

- [jeod](#)

Namespace jeod.

9.61.1 Detailed Description

Define `EphemeridesManager` methods.

Definition in file [ephem_manager.cc](#).

9.62 `ephem_manager.hh` File Reference

Define the `EphemManager` class, which manages the ephemeris models in a JEOD-based simulation.

```
#include "utils/ref_frames/include/ref_frame_manager.hh"
#include "utils/container/include/pointer_vector.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "base_ephem_manager.hh"
```

Data Structures

- class [jeod::EphemeridesManager](#)

The [EphemeridesManager](#) class manages the ephemeris models in a simulation.

Namespaces

- [jeod](#)

Namespace [jeod](#).

9.62.1 Detailed Description

Define the EphemManager class, which manages the ephemeris models in a JEOD-based simulation.

Definition in file [ephem_manager.hh](#).

9.63 ephem_messages.cc File Reference

Implement the class EphemeridesMessages.

```
#include "utils/message/include/make_message_code.hh"
#include "../include/ephem_messages.hh"
```

Namespaces

- [jeod](#)

Namespace [jeod](#).

Macros

- #define [MAKE_EPHEMERIDES_MESSAGE_CODE](#)(id) JEOD_MAKE_MESSAGE_CODE(EphemeridesMessages, "environment/ephemerides/", id)

9.63.1 Detailed Description

Implement the class EphemeridesMessages.

Definition in file [ephem_messages.cc](#).

9.63.2 Macro Definition Documentation

9.63.2.1 #define [MAKE_EPHEMERIDES_MESSAGE_CODE](#)(id) JEOD_MAKE_MESSAGE_CODE(EphemeridesMessages, "environment/ephemerides/", id)

Definition at line 44 of file [ephem_messages.cc](#).

9.64 `ephem_messages.hh` File Reference

Define the class `EphemeridesMessages`, the class that specifies the message IDs used in the JEOD ephemerides model.

```
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class [jeod::EphemeridesMessages](#)
Specifies the message IDs used in the Ephemerides model.

Namespaces

- [jeod](#)
Namespace `jeod`.

9.64.1 Detailed Description

Define the class `EphemeridesMessages`, the class that specifies the message IDs used in the JEOD ephemerides model.

Definition in file [ephem_messages.hh](#).

9.65 `ephem_orient.cc` File Reference

Define member functions for the `EphemItem` class and subclasses.

```
#include <cstdint>
#include "environment/ephemerides/ephem_interface/include/ephem_interface.-
hh"
#include "environment/ephemerides/ephem_interface/include/ephem_messages.-
hh"
#include "environment/ephemerides/ephem_manager/include/ephem_manager.hh"
#include "environment/planet/include/base_planet.hh"
#include "utils/math/include/vector3.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/message/include/message_handler.hh"
#include "utils/named_item/include/named_item.hh"
#include "../include/ephem_orient.hh"
```

Namespaces

- [jeod](#)
Namespace `jeod`.

9.65.1 Detailed Description

Define member functions for the `EphemItem` class and subclasses.

Definition in file [ephem_orient.cc](#).

9.66 ephemeris.orient.hh File Reference

Define class EphemerisOrientation.

```
#include "environment/ephemerides/ephem_interface/include/ephem_interface.-
hh"
#include "environment/ephemerides/ephem_interface/include/ephem_ref_frame.-
hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "class_declarations.hh"
#include "ephem_item.hh"
```

Data Structures

- class [jeod::EphemerisOrientation](#)

An [EphemerisOrientation](#) object updates the rotational state of an ephemeris reference frame.

Namespaces

- [jeod](#)

Namespace [jeod](#).

9.66.1 Detailed Description

Define class EphemerisOrientation.

Definition in file [ephemeris.orient.hh](#).

9.67 ephemeris.orient_zxz.cc File Reference

Define member functions for the EphemerisItem class and subclasses.

```
#include <cmath>
#include <cstdlib>
#include "environment/ephemerides/ephem_interface/include/ephem_interface.-
hh"
#include "environment/ephemerides/ephem_interface/include/ephem_messages.-
hh"
#include "environment/ephemerides/ephem_manager/include/ephem_manager.hh"
#include "environment/planet/include/base_planet.hh"
#include "utils/math/include/vector3.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/message/include/message_handler.hh"
#include "utils/named_item/include/named_item.hh"
#include "utils/quaternion/include/quat.hh"
#include "../include/ephemeris.orient_zxz.hh"
```

Namespaces

- [jeod](#)

Namespace [jeod](#).

Macros

- `#define EPSILON_TIME 1e-12`
- `#define TAYLOR_CUTOFF 0.00786`

9.67.1 Detailed Description

Define member functions for the EphemerItem class and subclasses.

Definition in file [ephemer_orient_zxz.cc](#).

9.68 ephemer_orient_zxz.hh File Reference

Define classes for items represented in some ephemeris model.

```
#include "environment/ephemerides/ephemer_interface/include/ephemer_interface.-
hh"
#include "environment/ephemerides/ephemer_interface/include/ephemer_ref_frame.-
hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "class_declarations.hh"
#include "ephemer_orient.hh"
```

Data Structures

- class [jeod::EphemerisZXZOrientation](#)

The [EphemerisZXZOrientation](#) is an [EphemerisOrientation](#) subclass that updates orientation based on an Z-X-Z Euler sequence and the time derivatives of this sequence.

Namespaces

- [jeod](#)

Namespace jeod.

9.68.1 Detailed Description

Define classes for items represented in some ephemeris model.

Definition in file [ephemer_orient_zxz.hh](#).

9.69 ephemer_point.cc File Reference

Define member functions for the EphemerPoint class.

```
#include <cstdint>
#include "environment/ephemerides/ephemer_interface/include/ephemer_interface.-
hh"
#include "environment/ephemerides/ephemer_interface/include/ephemer_messages.-
```

```
hh"
#include "environment/ephemerides/ephem_manager/include/ephem_manager.hh"
#include "environment/planet/include/base_planet.hh"
#include "utils/math/include/vector3.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/message/include/message_handler.hh"
#include "utils/named_item/include/named_item.hh"
#include "../include/ephem_point.hh"
```

Namespaces

- [jeod](#)

Namespace jeod.

9.69.1 Detailed Description

Define member functions for the EphemPoint class.

Definition in file [ephem_point.cc](#).

9.70 ephem_point.hh File Reference

Define class EphemerisPoint.

```
#include "utils/sim_interface/include/jeod_class.hh"
#include "class_declarations.hh"
#include "ephem_item.hh"
```

Data Structures

- class [jeod::EphemerisPoint](#)

An [EphemerisPoint](#) object updates the translational state of an ephemeris reference frame.

Namespaces

- [jeod](#)

Namespace jeod.

9.70.1 Detailed Description

Define class EphemerisPoint.

Definition in file [ephem_point.hh](#).

9.71 ephem_ref_frame.cc File Reference

Define non-inlined member functions for the EphemRefFrame class.

```
#include <cstdint>
#include "environment/ephemerides/ephem_manager/include/base_ephem_manager.-
hh"
#include "utils/message/include/message_handler.hh"
#include "../include/ephem_interface.hh"
#include "../include/ephem_messages.hh"
#include "../include/ephemer_ref_frame.hh"
```

Namespaces

- [jeod](#)

Namespace jeod.

9.71.1 Detailed Description

Define non-inlined member functions for the EphemerRefFrame class.

Definition in file [ephemer_ref_frame.cc](#).

9.72 ephemer_ref_frame.hh File Reference

Define the class EphemerisRefFrame.

```
#include <cstdint>
#include "utils/ref_frames/include/ref_frame.hh"
#include "utils/ref_frames/include/ref_frame_interface.hh"
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class [jeod::EphemerisRefFrame](#)

An [EphemerisRefFrame](#) is a [RefFrame](#) whose state is set by an ephemeris model.

Namespaces

- [jeod](#)

Namespace jeod.

9.72.1 Detailed Description

Define the class EphemerisRefFrame.

Definition in file [ephemer_ref_frame.hh](#).

9.73 find_planet.cc File Reference

Define EphemeridesManager::find_planet.

```
#include <cstdint>
#include "environment/ephemerides/ephem_interface/include/ephem_messages.-
hh"
#include "environment/planet/include/base_planet.hh"
#include "environment/planet/include/planet.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/ephem_manager.hh"
```

Namespaces

- [jeod](#)

Namespace jeod.

9.73.1 Detailed Description

Define EphemeridesManager::find_planet. This method is isolated from the other EphemeridesManager methods because the object file drags in a whole lot of stuff.

Definition in file [find_planet.cc](#).

9.74 propagated_planet.cc File Reference

Define the methods of the classes defined in [propagated_planet.hh](#).

```
#include <cstdint>
#include <cstdio>
#include <climits>
#include "dynamics/dyn_manager/include/dyn_manager.hh"
#include "environment/ephemerides/ephem_interface/include/ephem_messages.-
hh"
#include "environment/ephemerides/ephem_manager/include/ephem_manager.hh"
#include "environment/planet/include/base_planet.hh"
#include "environment/time/include/time_manager.hh"
#include "environment/time/include/time_tt.hh"
#include "environment/time/include/time_dyn.hh"
#include "utils/named_item/include/named_item.hh"
#include "utils/math/include/vector3.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/propagated_planet.hh"
```

Namespaces

- [jeod](#)

Namespace jeod.

9.74.1 Detailed Description

Define the methods of the classes defined in [propagated_planet.hh](#).

Definition in file [propagated_planet.cc](#).

9.75 propagated_planet.hh File Reference

Define the classes needed to propagate a planet.

```
#include "dynamics/dyn_body/include/dyn_body.hh"
#include "environment/ephemerides/ephem_interface/include/ephem_interface.-
hh"
#include "environment/ephemerides/ephem_item/include/ephem_item.hh"
#include "environment/ephemerides/ephem_item/include/ephem_orient.hh"
#include "environment/ephemerides/ephem_item/include/ephem_point.hh"
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class [jeod::PropagatedEphemerisPlanet](#)
A [PropagatedEphemerisPlanet](#) is an [EphemerisPoint](#) whose state is coupled with the translational state of a *DynBody* reference frame.
- class [jeod::PropagatedEphemerisOrientation](#)
A [PropagatedEphemerisOrientation](#) is an [EphemerisOrientation](#) whose state is coupled with the rotational state of a *DynBody* reference frame.
- class [jeod::PropagatedPlanet](#)
The [PropagatedPlanet](#) ephemeris model provides planetary state via a *DynBody* object whose state is propagated using the JEOD state integration techniques.

Namespaces

- [jeod](#)
Namespace *jeod*.

9.75.1 Detailed Description

Define the classes needed to propagate a planet.

Definition in file [propagated_planet.hh](#).

9.76 simple_ephemerides.cc File Reference

Define member functions for the SinglePointEphemeris class and subclasses.

```
#include <cstdint>
#include "environment/ephemerides/ephem_manager/include/ephem_manager.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/ephem_messages.hh"
#include "../include/simple_ephemerides.hh"
```

Namespaces

- [jeod](#)
Namespace *jeod*.

9.76.1 Detailed Description

Define member functions for the SinglePointEphemeris class and subclasses.

Definition in file [simple_ephemerides.cc](#).

9.77 simple_ephemerides.hh File Reference

Define classes that define simple ephemeris models.

```
#include "environment/ephemerides/ephem_item/include/ephem_point.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "ephem_interface.hh"
#include "ephem_ref_frame.hh"
```

Data Structures

- class [jeod::SinglePointEphemeris](#)
A [SinglePointEphemeris](#) has one ephemeris point.
- class [jeod::EmptySpaceEphemeris](#)
Empty space has one ephemeris point.
- class [jeod::SinglePlanetEphemeris](#)
A space with one gravitation body has one ephemeris point.

Namespaces

- [jeod](#)
Namespace jeod.

9.77.1 Detailed Description

Define classes that define simple ephemeris models.

Definition in file [simple_ephemerides.hh](#).

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