DynamicsManagerModel

5.0

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- jeod

  Namespace jeod.
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  Namespace er7_utils contains the state integration models used by JEOD.

6.3.1 Detailed Description

Chapter 7

Namespace Documentation

7.1 er7_utils Namespace Reference

Namespace er7_utils contains the state integration models used by JEOD.

7.1.1 Detailed Description

Namespace er7_utils contains the state integration models used by JEOD.

7.2 jeod Namespace Reference

Namespace jeod.

Data Structures

- class BaseDynManager

  The DynManager class augments the EphemManager with dynamics-related items.
- class DynamicsIntegrationGroup

  A DynamicsIntegrationGroup integrates the state of a set of DynBoby objects over time.
- class DynManager

  The DynManager class manages the dynamic elements of a simulation.
- class DynManagerInit

  This class contains data used to initialize a DynManager object.
- class DynManagerMessages

  Specifies the message IDs used in the DynManager model.

7.2.1 Detailed Description

Namespace jeod.

Chapter 8

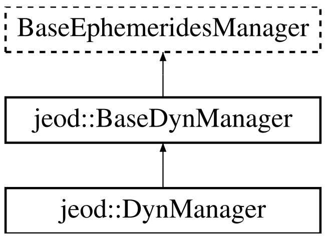
Data Structure Documentation

8.1 jeod::BaseDynManager Class Reference

The DynManager class augments the EphemManager with dynamics-related items.

```
#include <base_dyn_manager.hh>
```

Inheritance diagram for jeod::BaseDynManager:



Public Member Functions

- virtual ∼BaseDynManager ()

  Destructor.
- virtual void set_gravity_manager (GravityManager &gravity)=0

  Set the Gravity Manager.
- virtual void initialize_gravity_controls ()=0

  Initialize the gravity model controls.
- virtual void reset_gravity_controls (void)=0

  Reset the gravity model controls.
- virtual void add_mass_body (MassBody &mass_body)=0

  Add a mass body to the list of such.
- virtual void add_mass_body (MassBody ∗mass_body)=0

  Add a mass body to the list of such.
- virtual MassBody ∗ find_mass_body (const char ∗name) const =0

  Find a mass body.
- virtual bool is_mass_body_registered (const MassBody ∗mass_body) const =0

  Check if a mass body has been registered with the dynamics manager.

- virtual void add_dyn_body (DynBody &dyn_body)=0

  Add a dynamic body to the list of such.
- virtual DynBody ∗ find_dyn_body (const char ∗name) const =0

  Find a dynamic body.
- virtual std::vector< DynBody ∗ > get_dyn_bodies () const =0

  Return a copy of the list of registered dynamic bodies.
- virtual bool is_dyn_body_registered (const DynBody ∗dyn_body) const =0

  Check if a dynamic body has been registered with the dynamics manager.
- virtual void add_integ_group (DynamicsIntegrationGroup &integ_group)=0

  Add an integration group to the list of such.
- virtual bool is_integ_group_registered (const DynamicsIntegrationGroup ∗integ_group) const =0

  Check if an integration group has been registered.
- virtual void reset_integrators ()=0

  Force all integrators to reset themselves.
- virtual void reset_integrators (DynamicsIntegrationGroup &integ_group)=0

  Instruct specific integration group to reset its integrators.
- virtual double timestamp (void) const =0

  Get the time at which the manager was last updated.

Friends

- class InputProcessor
- void init_attrjeod__BaseDynManager ()

8.1.1 Detailed Description

The DynManager class augments the EphemManager with dynamics-related items.

This class defines the external interfaces to that class.

Definition at line 84 of file base_dyn_manager.hh.

8.1.2 Constructor & Destructor Documentation

8.1.2.1 ∼BaseDynManager()

```
virtual jeod::BaseDynManager::∼BaseDynManager ( )  [inline], [virtual]
```

Destructor.

Definition at line 100 of file base_dyn_manager.hh.

8.1.3 Member Function Documentation

8.1.3.1 add_dyn_body()

```
virtual void jeod::BaseDynManager::add_dyn_body (
                DynBody & dyn_body )  [pure virtual]
```

Add a dynamic body to the list of such.

Parameters

dyn_body	Body to be added to the list of dynamic bodies.

Implemented in jeod::DynManager.

8.1.3.2 add_integ_group()

```
virtual void jeod::BaseDynManager::add_integ_group (
             DynamicsIntegrationGroup & integ_group )  [pure virtual]
```

Add an integration group to the list of such.

Parameters

integ_group	Group to be added to the list of integration groups.

Implemented in jeod::DynManager.

8.1.3.3 add_mass_body() [1/2]

```
virtual void jeod::BaseDynManager::add_mass_body (
             MassBody & mass_body )  [pure virtual]
```

Add a mass body to the list of such.

Parameters

mass_body	Body to be added to the list of mass bodies.

Implemented in jeod::DynManager.

8.1.3.4 add_mass_body() [2/2]

```
virtual void jeod::BaseDynManager::add_mass_body (
             MassBody * mass_body )  [pure virtual]
```

Add a mass body to the list of such.

Parameters

mass_body	Body to be added to the list of mass bodies.

Implemented in jeod::DynManager.

8.1.3.5 find_dyn_body()

```
virtual DynBody* jeod::BaseDynManager::find_dyn_body (
             const char * name ) const  [pure virtual]
```

Find a dynamic body.

Parameters

name	Dynamic body name.

Returns

Pointer to the dynamic body with the given name.

Implemented in jeod::DynManager.

8.1.3.6 find_mass_body()

```
virtual MassBody* jeod::BaseDynManager::find_mass_body (
             const char * name ) const  [pure virtual]
```

Find a mass body.

Parameters

name	Mass body name.

Returns

Pointer to the mass body with the given name.

Implemented in jeod::DynManager.

8.1.3.7 get_dyn_bodies()

```
virtual std::vector<DynBody*> jeod::BaseDynManager::get_dyn_bodies ( ) const  [pure virtual]
```

Return a copy of the list of registered dynamic bodies.

Returns

Copy of dyn_bodies data member

Implemented in jeod::DynManager.

8.1.3.8 initialize_gravity_controls()

```
virtual void jeod::BaseDynManager::initialize_gravity_controls ( )  [pure virtual]
```

Initialize the gravity model controls.

Implemented in jeod::DynManager.

8.1.3.9 is_dyn_body_registered()

```
virtual bool jeod::BaseDynManager::is_dyn_body_registered (
            const DynBody * dyn_body ) const  [pure virtual]
```

Check if a dynamic body has been registered with the dynamics manager.

Parameters

dyn_body	Dynamic body to be checked.

Returns

True if the body is registered, false otherwise.

Implemented in jeod::DynManager.

8.1.3.10 is_integ_group_registered()

```
virtual bool jeod::BaseDynManager::is_integ_group_registered (
            const DynamicsIntegrationGroup * integ_group ) const  [pure virtual]
```

Check if an integration group has been registered.

Parameters

integ_group	Integration group to be checked.

Returns

True if the group is registered, false otherwise.

Implemented in jeod::DynManager.

8.1.3.11 is_mass_body_registered()

```
virtual bool jeod::BaseDynManager::is_mass_body_registered (
            const MassBody * mass_body ) const  [pure virtual]
```

Check if a mass body has been registered with the dynamics manager.

Parameters

mass_body	Mass body to be checked.

Returns

True if the body is registered, false otherwise.

Implemented in jeod::DynManager.

8.1.3.12 reset_gravity_controls()

```
virtual void jeod::BaseDynManager::reset_gravity_controls (
            void  )  [pure virtual]
```

Reset the gravity model controls.

Implemented in jeod::DynManager.

8.1.3.13 reset_integrators() [1/2]

```
virtual void jeod::BaseDynManager::reset_integrators ( )  [pure virtual]
```

Force all integrators to reset themselves.

Implemented in jeod::DynManager.

8.1.3.14 reset_integrators() [2/2]

```
virtual void jeod::BaseDynManager::reset_integrators (
            DynamicsIntegrationGroup & integ_group )  [pure virtual]
```

Instruct specific integration group to reset its integrators.

Parameters

integ_group	Integration group to be reset.

Implemented in jeod::DynManager.

8.1.3.15 set_gravity_manager()

```
virtual void jeod::BaseDynManager::set_gravity_manager (
             GravityManager & gravity )  [pure virtual]
```

Set the Gravity Manager.

Parameters

gravity	link to the manager of gravity model.

Implemented in jeod::DynManager.

8.1.3.16 timestamp()

```
virtual double jeod::BaseDynManager::timestamp (
             void  ) const  [pure virtual]
```

Get the time at which the manager was last updated.

Returns

Time at which the manager was last updated.

Implemented in jeod::DynManager.

8.1.4 Friends And Related Function Documentation

8.1.4.1 init_attrjeod__BaseDynManager

```
void init_attrjeod__BaseDynManager ( )  [friend]
```

8.1.4.2 InputProcessor

```
friend class InputProcessor  [friend]
```

Definition at line 87 of file base_dyn_manager.hh.

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

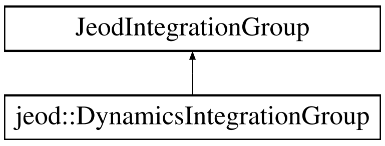
- base_dyn_manager.hh

8.2 jeod::DynamicsIntegrationGroup Class Reference

A DynamicsIntegrationGroup integrates the state of a set of DynBoby objects over time.

`#include <dynamics_integration_group.hh>`

Inheritance diagram for jeod::DynamicsIntegrationGroup:



Public Member Functions

- DynamicsIntegrationGroup ()

  DynamicsIntegrationGroup default constructor, needed for checkpoint/restart.
- DynamicsIntegrationGroup (JeodIntegrationGroupOwner &owner, er7_utils::IntegratorConstructor &integ_←
cotr, JeodIntegratorInterface &integ_inter, JeodIntegrationTime &time_mngr)

  DynamicsIntegrationGroup non-default constructor, used to create the default integration group.
- virtual ∼DynamicsIntegrationGroup ()

  DynamicsIntegrationGroup destructor.
- bool is_empty (void) const

  Query whether the group is void of registered bodies.
- virtual DynamicsIntegrationGroup ∗ create_group (JeodIntegrationGroupOwner &owner, er7_utils::←
IntegratorConstructor &integ_cotr, JeodIntegratorInterface &integ_inter, JeodIntegrationTime &time_mngr) const

  Create an integration group object that can be used as the dynamic manager's default integration group.
- virtual void register_group (DynManager &dyn_manager)

  Pre-initialize the group and register it with the dynamics manager.
- virtual void initialize_group (DynManager &dyn_manager)

  Complete the initialization of the group.
- virtual void prepare_for_integ_loop (double sim_endtime)

  Perform actions that need to be taken before entering the derivative / integration loop.
- virtual void gravitation (DynManager &dyn_manager, GravityManager &gravity_manager)

  Compute the gravitational acceleration of each root dynamic body.
- virtual void collect_derivatives (void)

  Collect the forces and torques acting on each root dynamic body.
- virtual er7_utils::IntegratorResult integrate_bodies (double cycle_dyndt, unsigned int target_stage)

  Integrate the states of the DynBody objects that comprise the group.
- virtual void add_dyn_body (DynBody &body)

  Add a DynBody to the set of bodies whose states are integrated by this group.
- virtual void delete_dyn_body (DynBody &body)

  Remove a DynBody from the set of bodies whose states are integrated by this group.

Data Fields

- bool deriv_ephem_update

  Update ephemerides at the derivative rate?

Protected Member Functions

- virtual void reset_body_integrators (void)

  Force all integrators to reset themselves.

Protected Attributes

- JeodPointerVector< DynBody >::type dyn_bodies

  List of vehicles whose state is integrated by this group.
- bool bodies_integrated_separately

  This flag is always true for JEOD integration groups.

Private Member Functions

- void register_base_contents (void)

  Register types and containers.
- DynamicsIntegrationGroup (const DynamicsIntegrationGroup &)

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

  Not implemented.

Friends

- class InputProcessor
- void init_attrjeod__DynamicsIntegrationGroup ()

8.2.1 Detailed Description

A DynamicsIntegrationGroup integrates the state of a set of DynBoby objects over time.

The class provides implementations of all virtual functions listed below and the pure virtuals defined in the base class. This class is designed for extensibility. Authors of derived classes should follow the extension notes in the source file.

Definition at line 91 of file dynamics_integration_group.hh.

8.2.2 Constructor & Destructor Documentation

8.2.2.1 DynamicsIntegrationGroup() [1/3]

```
jeod::DynamicsIntegrationGroup::DynamicsIntegrationGroup ( )
```

DynamicsIntegrationGroup default constructor, needed for checkpoint/restart.

Definition at line 55 of file dynamics_integration_group.cc.

References register_base_contents().

8.2.2.2 DynamicsIntegrationGroup() [2/3]

```
jeod::DynamicsIntegrationGroup::DynamicsIntegrationGroup (
            JeodIntegrationGroupOwner & owner,
            er7_utils::IntegratorConstructor & integ_cotr,
            JeodIntegratorInterface & integ_inter,
            JeodIntegrationTime & time_mngr )  [explicit]
```

DynamicsIntegrationGroup non-default constructor, used to create the default integration group.

Parameters

in	*owner*	The new group's owner
in	*integ_cotr*	Integrator constructor
in	*integ_inter*	Simulation engine integration interface
in	*time_mngr*	Time manager

Definition at line 74 of file dynamics_integration_group.cc.

References register_base_contents().

8.2.2.3 ∼DynamicsIntegrationGroup()

```
jeod::DynamicsIntegrationGroup::∼DynamicsIntegrationGroup ( )  [virtual]
```

DynamicsIntegrationGroup destructor.

Definition at line 103 of file dynamics_integration_group.cc.

References dyn_bodies.

8.2.2.4 DynamicsIntegrationGroup() [3/3]

```
jeod::DynamicsIntegrationGroup::DynamicsIntegrationGroup (
            const DynamicsIntegrationGroup & )  [private]
```

Not implemented.

8.2.3 Member Function Documentation

8.2.3.1 add_dyn_body()

```
void jeod::DynamicsIntegrationGroup::add_dyn_body (
            DynBody & dyn_body )  [virtual]
```

Add a DynBody to the set of bodies whose states are integrated by this group.

Parameters

dyn_body	DynBody to be added to the group.

Definition at line 191 of file dynamics_integration_group.cc.

References bodies_integrated_separately, jeod::DynManagerMessages::duplicate_entry, and dyn_bodies.

Referenced by jeod::DynManager::update_integration_group().

8.2.3.2 collect_derivatives()

```
void jeod::DynamicsIntegrationGroup::collect_derivatives (
            void  )  [virtual]
```

Collect the forces and torques acting on each root dynamic body.

Definition at line 334 of file dynamics_integration_group.cc.

References dyn_bodies.

Referenced by jeod::DynManager::compute_derivatives().

8.2.3.3 create_group()

```
DynamicsIntegrationGroup * jeod::DynamicsIntegrationGroup::create_group (
            JeodIntegrationGroupOwner & owner,
            er7_utils::IntegratorConstructor & integ_cotr,
            JeodIntegratorInterface & integ_inter,
            JeodIntegrationTime & time_mngr ) const  [virtual]
```

Create an integration group object that can be used as the dynamic manager's default integration group.

Parameters

in	*owner*	The new group's owner
in	*integ_cotr*	Integrator constructor
in	*integ_inter*	Simulation engine integration interface
in	*time_mngr*	Time manager

Returns

Created DynamicsIntegrationGroup.

Definition at line 119 of file dynamics_integration_group.cc.

Referenced by jeod::DynManager::initialize_model_internal().

8.2.3.4 delete_dyn_body()

```
void jeod::DynamicsIntegrationGroup::delete_dyn_body (
            DynBody & dyn_body )  [virtual]
```

Remove a DynBody from the set of bodies whose states are integrated by this group.

Parameters

dyn_body	DynBody to be removed from the group.

Definition at line 250 of file dynamics_integration_group.cc.

References dyn_bodies, and jeod::DynManagerMessages::inconsistent_setup.

8.2.3.5 gravitation()

```
void jeod::DynamicsIntegrationGroup::gravitation (
            DynManager & dyn_manager,
            GravityManager & gravity_manager )  [virtual]
```

Compute the gravitational acceleration of each root dynamic body.

Parameters

dyn_manager	Dynamics manager.
gravity_manager	Gravity Manager.

Definition at line 301 of file dynamics_integration_group.cc.

References deriv_ephem_update, dyn_bodies, and jeod::DynManager::gravitation().

Referenced by jeod::DynManager::gravitation().

8.2.3.6 initialize_group()

```
void jeod::DynamicsIntegrationGroup::initialize_group (
            DynManager & dyn_manager )  [virtual]
```

Complete the initialization of the group.

For overriders: This function is called by DynManager::initialize_simulation. At the point of this call, the dyn_bodies vector is populated with the bodies that are to be integrated by this group. Note well: That vector can still be empty.

Definition at line 158 of file dynamics_integration_group.cc.

References bodies_integrated_separately, dyn_bodies, and jeod::DynManagerMessages::null_pointer.

Referenced by jeod::DynManager::initialize_integ_groups().

8.2.3.7 integrate_bodies()

```
er7_utils::IntegratorResult jeod::DynamicsIntegrationGroup::integrate_bodies (
            double cycle_dyndt,
            unsigned int target_stage )  [virtual]
```

Integrate the states of the DynBody objects that comprise the group.

Parameters

in	*cycle_dyndt*	Dynamic time step, in dynamic time seconds.
in	*target_stage*	The stage of the integration process that the integrator should try to attain.

Returns

The status (time advance, pass/fail status) of the integration.

Definition at line 381 of file dynamics_integration_group.cc.

References bodies_integrated_separately, dyn_bodies, and jeod::DynManagerMessages::inconsistent_setup.

8.2.3.8 is_empty()

```
bool jeod::DynamicsIntegrationGroup::is_empty (
            void  ) const  [inline]
```

Query whether the group is void of registered bodies.

Returns

True if group is empty, false otherwise.

Definition at line 132 of file dynamics_integration_group.hh.

References dyn_bodies.

8.2.3.9 operator=()

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

Not implemented.

8.2.3.10 prepare_for_integ_loop()

```
void jeod::DynamicsIntegrationGroup::prepare_for_integ_loop (
             double sim_endtime )  [virtual]
```

Perform actions that need to be taken before entering the derivative / integration loop.

The base action is to set the time model to the time at the start of the integration loop.

Parameters

sim_endtime	End time of integration loop.

Definition at line 288 of file dynamics_integration_group.cc.

8.2.3.11 register_base_contents()

```
void jeod::DynamicsIntegrationGroup::register_base_contents (
             void  )  [private]
```

Register types and containers.

Definition at line 93 of file dynamics_integration_group.cc.

References dyn_bodies.

Referenced by DynamicsIntegrationGroup().

8.2.3.12 register_group()

```
void jeod::DynamicsIntegrationGroup::register_group (
             DynManager & dyn_manager )  [virtual]
```

Pre-initialize the group and register it with the dynamics manager.

This function is to be called early in the initialization process. Overrides should not depend on the dyn_bodies vector having any members.

Parameters

in	*dyn_manager*	Dynamics manager.

Definition at line 139 of file dynamics_integration_group.cc.

References jeod::DynManager::add_integ_group(), and jeod::DynManager::is_integ_group_registered().

8.2.3.13 reset_body_integrators()

```
void jeod::DynamicsIntegrationGroup::reset_body_integrators (
             void  )  [protected], [virtual]
```

Force all integrators to reset themselves.

Definition at line 358 of file dynamics_integration_group.cc.

References dyn_bodies.

8.2.4 Friends And Related Function Documentation

8.2.4.1 init_attrjeod__DynamicsIntegrationGroup

```
void init_attrjeod__DynamicsIntegrationGroup ( )  [friend]
```

8.2.4.2 InputProcessor

```
friend class InputProcessor  [friend]
```

Definition at line 92 of file dynamics_integration_group.hh.

8.2.5 Field Documentation

8.2.5.1 bodies_integrated_separately

```
bool jeod::DynamicsIntegrationGroup::bodies_integrated_separately [protected]
```

This flag is always true for JEOD integration groups.

Setting this flag to false results in bypassing the call in DynamicsIntegrationGroup::add_dyn_body to DynBody↩ ::create_body_integrators. This hook exists for derived classes that override DynamicsIntegrationGroup::integrate_bodies in a way that does not involve calling DynBody::integrate.trick_units(–)

Definition at line 238 of file dynamics_integration_group.hh.

Referenced by add_dyn_body(), initialize_group(), and integrate_bodies().

8.2.5.2 deriv_ephem_update

```
bool jeod::DynamicsIntegrationGroup::deriv_ephem_update
```

Update ephemerides at the derivative rate?

trick_units(–)

Definition at line 207 of file dynamics_integration_group.hh.

Referenced by jeod::DynManager::gravitation(), and gravitation().

8.2.5.3 dyn_bodies

```
JeodPointerVector<DynBody>::type jeod::DynamicsIntegrationGroup::dyn_bodies [protected]
```

List of vehicles whose state is integrated by this group.

trick_io(∗∗)

Definition at line 228 of file dynamics_integration_group.hh.

Referenced by add_dyn_body(), collect_derivatives(), delete_dyn_body(), gravitation(), initialize_group(), integrate_bodies(), is_empty(), register_base_contents(), reset_body_integrators(), and ∼DynamicsIntegration↩ Group().

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

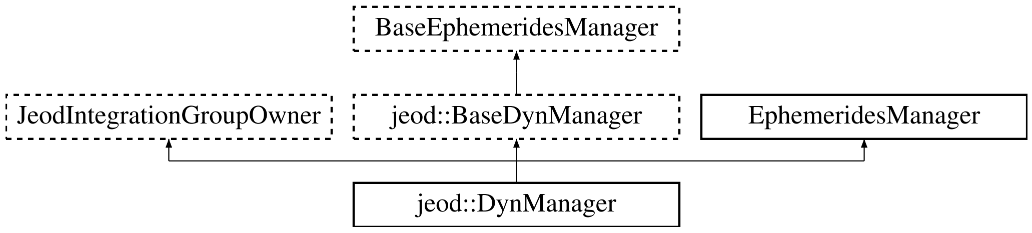
- dynamics_integration_group.hh
- dynamics_integration_group.cc

8.3 jeod::DynManager Class Reference

The DynManager class manages the dynamic elements of a simulation.

```
#include <dyn_manager.hh>
```

Inheritance diagram for jeod::DynManager:



Public Member Functions

- DynManager ()

  DynManager default constructor.
- virtual ∼DynManager ()

  DynManager destructor.
- bool is_initialized ()

  Determine if the manager has been initialized.
- void initialize_model (DynManagerInit &init, TimeManager &time_mngr)

  Begin initialization of the JEOD manager model.
- void initialize_model (JeodIntegratorInterface &integ_if, DynManagerInit &init, TimeManager &time_mngr)

  Begin initialization of the JEOD manager model.
- void initialize_simulation (void)

  Complete initialization of the JEOD manager model.
- virtual void set_gravity_manager (GravityManager &gravity)

  Set the Gravity Manager to the specified reference.
- virtual void initialize_gravity_controls (void)

  Initialize the gravity controls for each dynamic body.
- virtual void reset_gravity_controls (void)

  Reset the gravity controls for each dynamic body.
- void gravitation (void)

  Compute gravitational acceleration on each root body.
- virtual void add_mass_body (MassBody &mass_body)

  Add a mass body to the mass body registry.
- virtual void add_mass_body (MassBody ∗mass_body)

  Add a mass body to the mass body registry.
- virtual MassBody ∗ find_mass_body (const char ∗name) const

  Find the mass body with the given name.
- virtual bool is_mass_body_registered (const MassBody ∗mass_body) const

  Determine if the specified body has been registered with the DynManager.
- virtual void add_dyn_body (DynBody &dyn_body)

  Add a dynamic body to the dynamic body registry.
- virtual DynBody ∗ find_dyn_body (const char ∗name) const

Find the dynamic body with the given name.
- virtual std::vector< DynBody * > get_dyn_bodies () const

  Return a copy of the list of registered dynamic bodies.
- virtual bool is_dyn_body_registered (const DynBody *dyn_body) const

  Determine if the specified body has been registered with the DynManager.
- virtual void add_integ_group (DynamicsIntegrationGroup &integ_group)

  Add an integration group to the integration group registry.
- virtual bool is_integ_group_registered (const DynamicsIntegrationGroup *integ_group) const

  Determine if the specified group has been registered with the DynManager.
- void add_body_action (BodyAction *body_action)

  Add a body action to the list of such.
- void remove_body_action (char *action_name_in)

  Remove a body action to the list of such.
- void perform_actions (void)

  Perform dynamic body actions that are ready to be applied.
- void initialize_integ_groups (void)

  Complete initialization of the initialization groups.
- virtual void update_integration_group (JeodIntegrationGroup &group)

  Add DynBody objects to the default integration group.
- void initialize_dyn_bodies (void)

  Initialize dynamic bodies.
- void initialize_dyn_body (DynBody &body)

  Initialize a specific dynamic body.
- void compute_derivatives ()

  Collect forces and torques on each body and compute derivatives.
- virtual void reset_integrators ()

  Force all integrators to reset themselves.
- virtual void reset_integrators (DynamicsIntegrationGroup &integ_group)

  Instruct specific integrator to reset itself.
- int integrate (double to_sim_time, TimeManager &)

  Propagate all vehicles and propagate time.
- virtual double timestamp (void) const

  Return last update time.
- const char * name (void) const

  Return identifier.
- void shutdown (void)

  Shutdown the manager.

Data Fields

- bool deriv_ephem_update

  Update ephemerides at the derivative rate?
- bool gravity_off

  This flag exists primarily to support unit tests.
- DynManagerInit::EphemerisMode mode

  The ephemeris mode in which the dynamics manager operates.
- Trick::Integrator * sim_integrator

  Pointer to the integration object used by the simulation engine itself.

Protected Member Functions

- virtual void initialize_model_internal (DynManagerInit &init, TimeManager &time_mngr)

  Begin initialization of the JEOD manager model.
- void perform_mass_body_initializations (MassBody ∗body=NULL)

  Initialize all queued body actions that derive from MassBodyInit and apply those that are immediately ready to be applied.
- void perform_mass_attach_initializations (void)

  Initialize all queued body actions that derive from MassBodyAttach and apply those that are immediately ready to be applied.
- void perform_dyn_body_initializations (DynBody ∗body=NULL)

  Initialize dynamic bodies.
- void check_for_uninitialized_states (void)

  Ensure that all of the required states have been set.

Protected Attributes

- bool initialized

  Have all initializations been performed?
- GravityManager ∗ gravity_manager

  The model that encapsulates all of the gravity models.
- er7_utils::IntegratorConstructor ∗ integ_constructor

  Integrator generator.
- JeodIntegratorInterface ∗ integ_interface

  Interface with the simulation integration structure.
- DynamicsIntegrationGroup ∗ default_integ_group

  The integration group used for simple monolithic simulations.
- SinglePointEphemeris ∗ simple_ephemeris

  Simple ephemeris for use in empty space and single planet modes.
- std::vector< MassBody ∗ > mass_bodies

  List of vehicle models.
- std::vector< DynBody ∗ > dyn_bodies

  List of vehicle models.
- std::vector< DynamicsIntegrationGroup ∗ > integ_groups

  List of integration groups.
- std::list< BodyAction ∗ > body_actions

  List of body initializers.

Private Member Functions

- DynManager (const DynManager &)

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

  Not implemented.

Friends

- class InputProcessor
- void init_attrjeod__DynManager ()

8.3.1 Detailed Description

The DynManager class manages the dynamic elements of a simulation.

The primary functions of a DynManager are to:

- Dynamically determine which ephemerides are needed in a simulation.
- Initialize ephemeris models and keep them in sync with the rest of the simulation.
- Initialize mass bodies and dynamic bodies independently of the order in which these bodies are declared in the S_define file.
- Coordinate the computation of the cumulative forces and torques and gravitational effects on the dynamic bodies in a simulation.
- Coordinate the integration of time and and of dynamic body states.
- Apply asynchronous actions to bodies.

The DynManager can operate in one of three modes: empty space, single planet, and ephemeris mode. The DynManager inherits from EphemerisInterface so that when it operates in empty space or single-planet mode it can properly register itself as the owner of the reference frame tree root node.

Definition at line 115 of file dyn_manager.hh.

8.3.2 Constructor & Destructor Documentation

8.3.2.1 DynManager() [1/2]

```
jeod::DynManager::DynManager (
            void )
```

DynManager default constructor.

Definition at line 66 of file dyn_manager.cc.

8.3.2.2 ∼DynManager()

```
jeod::DynManager::∼DynManager (
            void ) [virtual]
```

DynManager destructor.

Definition at line 101 of file dyn_manager.cc.

References default_integ_group, integ_constructor, integ_interface, and simple_ephemeris.

8.3.2.3 DynManager() [2/2]

```
jeod::DynManager::DynManager (
            const DynManager & )  [private]
```

Not implemented.

8.3.3 Member Function Documentation

8.3.3.1 add_body_action()

```
void jeod::DynManager::add_body_action (
            BodyAction * body_action )
```

Add a body action to the list of such.

Parameters

in,out	*body_action*	Body action

Definition at line 207 of file dyn_manager.cc.

References body_actions, jeod::DynManagerMessages::duplicate_entry, initialized, and jeod::DynManager↩Messages::null_pointer.

8.3.3.2 add_dyn_body()

```
void jeod::DynManager::add_dyn_body (
            DynBody & dyn_body )  [virtual]
```

Add a dynamic body to the dynamic body registry.

Parameters

dyn_body	Dynamic body to be added to the registry.

Implements jeod::BaseDynManager.

Definition at line 104 of file dyn_bodies_primitives.cc.

References add_mass_body(), jeod::DynManagerMessages::duplicate_entry, dyn_bodies, find_dyn_body(), find↩_mass_body(), jeod::DynManagerMessages::invalid_name, and is_dyn_body_registered().

8.3.3.3 add_integ_group()

```
void jeod::DynManager::add_integ_group (
            DynamicsIntegrationGroup & integ_group )  [virtual]
```

Add an integration group to the integration group registry.

Parameters

integ_group	Integration group to be added.

Implements jeod::BaseDynManager.

Definition at line 69 of file integ_group_primitives.cc.

References default_integ_group, jeod::DynManagerMessages::duplicate_entry, jeod::DynManagerMessages↩ ::inconsistent_setup, initialized, integ_groups, and is_integ_group_registered().

Referenced by jeod::DynamicsIntegrationGroup::register_group().

8.3.3.4 add_mass_body() [1/2]

```
void jeod::DynManager::add_mass_body (
            MassBody & mass_body )  [virtual]
```

Add a mass body to the mass body registry.

Parameters

mass_body	Mass body to be added to the registry.

Implements jeod::BaseDynManager.

Definition at line 98 of file mass_bodies_primitives.cc.

References jeod::DynManagerMessages::duplicate_entry, find_mass_body(), is_mass_body_registered(), and mass_bodies.

Referenced by add_dyn_body(), and add_mass_body().

8.3.3.5 add_mass_body() [2/2]

```
void jeod::DynManager::add_mass_body (
            MassBody * mass_body )  [virtual]
```

Add a mass body to the mass body registry.

Parameters

mass_body	Mass body to be added to the registry.

Implements jeod::BaseDynManager.

Definition at line 137 of file mass_bodies_primitives.cc.

References add_mass_body(), and jeod::DynManagerMessages::null_pointer.

8.3.3.6 check_for_uninitialized_states()

```
void jeod::DynManager::check_for_uninitialized_states (
            void ) [protected]
```

Ensure that all of the required states have been set.

Definition at line 366 of file initialize_dyn_bodies.cc.

References dyn_bodies, and jeod::DynManagerMessages::inconsistent_setup.

Referenced by initialize_dyn_bodies().

8.3.3.7 compute_derivatives()

```
void jeod::DynManager::compute_derivatives ( ) [inline]
```

Collect forces and torques on each body and compute derivatives.

Definition at line 234 of file dyn_manager.hh.

References jeod::DynamicsIntegrationGroup::collect_derivatives(), and default_integ_group.

8.3.3.8 find_dyn_body()

```
DynBody * jeod::DynManager::find_dyn_body (
            const char * body_name ) const [virtual]
```

Find the dynamic body with the given name.

Parameters

body_name	Dynamic body name

Returns

Pointer to found DynBody; NULL if not found.

Implements jeod::BaseDynManager.

Definition at line 57 of file dyn_bodies_primitives.cc.

References dyn_bodies.

Referenced by add_dyn_body().

8.3.3.9 find_mass_body()

```
MassBody * jeod::DynManager::find_mass_body (
            const char * body_name ) const  [virtual]
```

Find the mass body with the given name.

Parameters

body_name	Mass body name

Returns

Pointer to found MassBody; NULL if not found.

Implements jeod::BaseDynManager.

Definition at line 51 of file mass_bodies_primitives.cc.

References mass_bodies.

Referenced by add_dyn_body(), and add_mass_body().

8.3.3.10 get_dyn_bodies()

```
virtual std::vector<DynBody*> jeod::DynManager::get_dyn_bodies ( ) const  [inline], [virtual]
```

Return a copy of the list of registered dynamic bodies.

Returns

Copy of dyn_bodies data member

Implements jeod::BaseDynManager.

Definition at line 190 of file dyn_manager.hh.

References dyn_bodies.

8.3.3.11 gravitation()

```
void jeod::DynManager::gravitation (
            void  )
```

Compute gravitational acceleration on each root body.

Definition at line 125 of file gravitation.cc.

References default_integ_group, jeod::DynamicsIntegrationGroup::deriv_ephem_update, deriv_ephem_update, jeod::DynamicsIntegrationGroup::gravitation(), gravity_manager, gravity_off, jeod::DynManagerMessages↩ ::inconsistent_setup, and initialized.

Referenced by jeod::DynamicsIntegrationGroup::gravitation().

8.3.3.12 initialize_dyn_bodies()

```
void jeod::DynManager::initialize_dyn_bodies (
            void  )
```

Initialize dynamic bodies.

Definition at line 57 of file initialize_dyn_bodies.cc.

References body_actions, check_for_uninitialized_states(), dyn_bodies, perform_dyn_body_initializations(), perform_mass_attach_initializations(), and perform_mass_body_initializations().

Referenced by initialize_simulation().

8.3.3.13 initialize_dyn_body()

```
void jeod::DynManager::initialize_dyn_body (
            DynBody & body )
```

Initialize a specific dynamic body.

Assumptions and Limitations

- The body in question is assumed to be an isolated body.

Parameters

`in,out`	*body*	Body to be initialized

Definition at line 109 of file initialize_dyn_bodies.cc.

References perform_dyn_body_initializations(), and perform_mass_body_initializations().

8.3.3.14 initialize_gravity_controls()

```
void jeod::DynManager::initialize_gravity_controls (
            void ) [virtual]
```

Initialize the gravity controls for each dynamic body.

Assumptions and Limitations

- Not called in empty space mode.

Implements jeod::BaseDynManager.

Definition at line 51 of file gravitation.cc.

References dyn_bodies, gravity_manager, gravity_off, and jeod::DynManagerMessages::inconsistent_setup.

Referenced by initialize_simulation().

8.3.3.15 initialize_integ_groups()

```
void jeod::DynManager::initialize_integ_groups (
            void )
```

Complete initialization of the initialization groups.

Definition at line 108 of file initialize_simulation.cc.

References default_integ_group, jeod::DynamicsIntegrationGroup::initialize_group(), and integ_groups.

Referenced by initialize_simulation().

8.3.3.16 initialize_model() [1/2]

```
void jeod::DynManager::initialize_model (
            DynManagerInit & init,
            TimeManager & time_mngr )
```

Begin initialization of the JEOD manager model.

Parameters

in,out	*init*	Initialization data
in,out	*time_mngr*	Time manager

Definition at line 63 of file initialize_model.cc.

References initialize_model_internal(), integ_interface, and sim_integrator.

8.3.3.17 initialize_model() [2/2]

```
void jeod::DynManager::initialize_model (
            JeodIntegratorInterface & integ_if,
            DynManagerInit & init,
            TimeManager & time_mngr )
```

Begin initialization of the JEOD manager model.

Parameters

in,out	*integ_if*	Integrator interface
in,out	*init*	Initialization data
in,out	*time_mngr*	Time manager

Class: (initialization)

Definition at line 84 of file initialize_model.cc.

References initialize_model_internal(), integ_interface, and sim_integrator.

8.3.3.18 initialize_model_internal()

```
void jeod::DynManager::initialize_model_internal (
            DynManagerInit & init,
            TimeManager & time_mngr ) [protected], [virtual]
```

Begin initialization of the JEOD manager model.

Assumptions and Limitations

- The user-input item selection table must have at most one selection rule for a given name. This limitation is an enforced constraint.

Parameters

in,out	*init*	Initialization data
in,out	*time_mngr*	Time manager

Definition at line 106 of file initialize_model.cc.

References jeod::DynManagerInit::central_point_name, jeod::DynamicsIntegrationGroup::create_group(), default←
_integ_group, jeod::DynManagerInit::EphemerisMode_EmptySpace, jeod::DynManagerInit::EphemerisMode_←
Ephemerides, jeod::DynManagerInit::EphemerisMode_SinglePlanet, jeod::DynManagerMessages::inconsistent_←
setup, jeod::DynManagerInit::integ_constructor, integ_constructor, jeod::DynManagerInit::integ_group_constructor, integ_groups, integ_interface, jeod::DynManagerMessages::invalid_name, jeod::DynManagerInit::jeod_integ_opt, jeod::DynManagerInit::mode, mode, jeod::DynManagerInit::sim_integ_opt, and simple_ephemeris.

Referenced by initialize_model().

8.3.3.19 initialize_simulation()

```
void jeod::DynManager::initialize_simulation (
             void  )
```

Complete initialization of the JEOD manager model.

Definition at line 49 of file initialize_simulation.cc.

References jeod::DynManagerInit::EphemerisMode_EmptySpace, gravity_manager, gravity_off, jeod::Dyn←
ManagerMessages::inconsistent_setup, initialize_dyn_bodies(), initialize_gravity_controls(), initialize_integ_←
groups(), initialized, and mode.

8.3.3.20 integrate()

```
int jeod::DynManager::integrate (
             double to_sim_time,
             TimeManager &  )  [inline]
```

Propagate all vehicles and propagate time.

Parameters

to_sim_time	Simulation time seconds of end of integration interval.

Returns

zero if complete, non-zero if incomplete.

Definition at line 258 of file dyn_manager.hh.

References default_integ_group.

8.3.3.21 is_dyn_body_registered()

```
bool jeod::DynManager::is_dyn_body_registered (
             const DynBody * dyn_body ) const  [virtual]
```

Determine if the specified body has been registered with the DynManager.

Parameters

dyn_body	Dynamic body to be found.

Returns

True if body has been registered, false otherwise.

Implements jeod::BaseDynManager.

Definition at line 90 of file dyn_bodies_primitives.cc.

References dyn_bodies.

Referenced by add_dyn_body().

8.3.3.22 is_initialized()

```
bool jeod::DynManager::is_initialized ( )  [inline]
```

Determine if the manager has been initialized.

Returns

Initialization status

Definition at line 135 of file dyn_manager.hh.

References initialized.

8.3.3.23 is_integ_group_registered()

```
bool jeod::DynManager::is_integ_group_registered (
             const DynamicsIntegrationGroup * integ_group ) const  [virtual]
```

Determine if the specified group has been registered with the DynManager.

Parameters

integ_group	Integration group to be found.

Returns

True if integ_group has been registered, false otherwise.

Implements jeod::BaseDynManager.

Definition at line 55 of file integ_group_primitives.cc.

References integ_groups.

Referenced by add_integ_group(), and jeod::DynamicsIntegrationGroup::register_group().

8.3.3.24 is_mass_body_registered()

```
bool jeod::DynManager::is_mass_body_registered (
             const MassBody * mass_body ) const  [virtual]
```

Determine if the specified body has been registered with the DynManager.

Parameters

mass_body	Mass body to be found.

Returns

True if body has been registered, false otherwise.

Implements jeod::BaseDynManager.

Definition at line 84 of file mass_bodies_primitives.cc.

References mass_bodies.

Referenced by add_mass_body().

8.3.3.25 name()

```
const char * jeod::DynManager::name (
             void  ) const
```

Return identifier.

Returns

Name

Definition at line 143 of file dyn_manager.cc.

8.3.3.26 operator=()

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

Not implemented.

8.3.3.27 perform_actions()

```
void jeod::DynManager::perform_actions (
              void  )
```

Perform dynamic body actions that are ready to be applied.

Definition at line 44 of file perform_actions.cc.

References body_actions.

8.3.3.28 perform_dyn_body_initializations()

```
void jeod::DynManager::perform_dyn_body_initializations (
              DynBody * body = NULL )   [protected]
```

Initialize dynamic bodies.

Parameters

in,out	*body*	Body to be initialized

Definition at line 243 of file initialize_dyn_bodies.cc.

References body_actions, and jeod::DynManagerMessages::inconsistent_setup.

Referenced by initialize_dyn_bodies(), and initialize_dyn_body().

8.3.3.29 perform_mass_attach_initializations()

```
void jeod::DynManager::perform_mass_attach_initializations (
              void  )  [protected]
```

Initialize all queued body actions that derive from MassBodyAttach and apply those that are immediately ready to be applied.

Definition at line 190 of file initialize_dyn_bodies.cc.

References body_actions.

Referenced by initialize_dyn_bodies().

8.3.3.30 perform_mass_body_initializations()

```
void jeod::DynManager::perform_mass_body_initializations (
            MassBody * body = NULL )  [protected]
```

Initialize all queued body actions that derive from MassBodyInit and apply those that are immediately ready to be applied.

Parameters

in,out	*body*	Body to be initialized

Definition at line 130 of file initialize_dyn_bodies.cc.

References body_actions.

Referenced by initialize_dyn_bodies(), and initialize_dyn_body().

8.3.3.31 remove_body_action()

```
void jeod::DynManager::remove_body_action (
            char * action_name_in )
```

Remove a body action to the list of such.

Parameters

in	*action_name↩ _in*	Name of the action to remove

Definition at line 253 of file dyn_manager.cc.

References body_actions.

8.3.3.32 reset_gravity_controls()

```
void jeod::DynManager::reset_gravity_controls (
            void )  [virtual]
```

Reset the gravity controls for each dynamic body.

Assumptions and Limitations

- Not called in empty space mode.

Implements jeod::BaseDynManager.

Definition at line 86 of file gravitation.cc.

References dyn_bodies, gravity_manager, gravity_off, and jeod::DynManagerMessages::inconsistent_setup.

8.3.3.33 reset_integrators() [1/2]

```
void jeod::DynManager::reset_integrators ( )  [virtual]
```

Force all integrators to reset themselves.

Implements jeod::BaseDynManager.

Definition at line 280 of file dyn_manager.cc.

References default_integ_group, and integ_groups.

8.3.3.34 reset_integrators() [2/2]

```
virtual void jeod::DynManager::reset_integrators (
            DynamicsIntegrationGroup & integ_group )  [inline], [virtual]
```

Instruct specific integrator to reset itself.

Parameters

integ_group	Integration group to be reset.

Implements jeod::BaseDynManager.

Definition at line 248 of file dyn_manager.hh.

8.3.3.35 set_gravity_manager()

```
void jeod::DynManager::set_gravity_manager (
            GravityManager & gravity )  [virtual]
```

Set the Gravity Manager to the specified reference.

Parameters

in	*gravity*	Gravity Manager

Implements jeod::BaseDynManager.

Definition at line 167 of file dyn_manager.cc.

References gravity_manager, gravity_off, jeod::DynManagerMessages::inconsistent_setup, initialized, and jeod::↩
DynManagerMessages::singleton_error.

8.3.3.36 shutdown()

```
void jeod::DynManager::shutdown (
            void )
```

Shutdown the manager.

Empty for now.

Definition at line 155 of file dyn_manager.cc.

8.3.3.37 timestamp()

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

Return last update time.

Returns

Name

Implements jeod::BaseDynManager.

Definition at line 130 of file dyn_manager.cc.

8.3.3.38 update_integration_group()

```
void jeod::DynManager::update_integration_group (
            JeodIntegrationGroup & group ) [virtual]
```

Add DynBody objects to the default integration group.

Parameters

`in,out`	*group*	Group to be updated

Definition at line 138 of file initialize_simulation.cc.

References jeod::DynamicsIntegrationGroup::add_dyn_body(), default_integ_group, dyn_bodies, and jeod::Dyn↩ManagerMessages::inconsistent_setup.

8.3.4 Friends And Related Function Documentation

8.3.4.1 init_attrjeod__DynManager

```
void init_attrjeod__DynManager ( )  [friend]
```

8.3.4.2 InputProcessor

```
friend class InputProcessor  [friend]
```

Definition at line 120 of file dyn_manager.hh.

8.3.5 Field Documentation

8.3.5.1 body_actions

```
std::list<BodyAction*> jeod::DynManager::body_actions  [protected]
```

List of body initializers.

Definition at line 367 of file dyn_manager.hh.

Referenced by add_body_action(), initialize_dyn_bodies(), perform_actions(), perform_dyn_body_initializations(), perform_mass_attach_initializations(), perform_mass_body_initializations(), and remove_body_action().

8.3.5.2 default_integ_group

```
DynamicsIntegrationGroup* jeod::DynManager::default_integ_group  [protected]
```

The integration group used for simple monolithic simulations.

trick_units(–)

Definition at line 342 of file dyn_manager.hh.

Referenced by add_integ_group(), compute_derivatives(), gravitation(), initialize_integ_groups(), initialize_model↩_internal(), integrate(), reset_integrators(), update_integration_group(), and ∼DynManager().

8.3.5.3 deriv_ephem_update

```
bool jeod::DynManager::deriv_ephem_update
```

Update ephemerides at the derivative rate?

trick_units(–)

Definition at line 281 of file dyn_manager.hh.

Referenced by gravitation().

8.3.5.4 dyn_bodies

```
std::vector<DynBody*> jeod::DynManager::dyn_bodies [protected]
```

List of vehicle models.

Definition at line 357 of file dyn_manager.hh.

Referenced by add_dyn_body(), check_for_uninitialized_states(), find_dyn_body(), get_dyn_bodies(), initialize↩
_dyn_bodies(), initialize_gravity_controls(), is_dyn_body_registered(), reset_gravity_controls(), and update_↩
integration_group().

8.3.5.5 gravity_manager

```
GravityManager* jeod::DynManager::gravity_manager [protected]
```

The model that encapsulates all of the gravity models.

trick_units(–)

Definition at line 327 of file dyn_manager.hh.

Referenced by gravitation(), initialize_gravity_controls(), initialize_simulation(), reset_gravity_controls(), and set_↩
gravity_manager().

8.3.5.6 gravity_off

```
bool jeod::DynManager::gravity_off
```

This flag exists primarily to support unit tests.

Typical simulations should not set this flag. The intent is to support simulations that use planetary ephemerides but neither need nor have a gravity model.trick_units(–)

Definition at line 288 of file dyn_manager.hh.

Referenced by gravitation(), initialize_gravity_controls(), initialize_simulation(), reset_gravity_controls(), and set_↩
gravity_manager().

8.3.5.7 initialized

```
bool jeod::DynManager::initialized  [protected]
```

Have all initializations been performed?

trick_units(--)

Definition at line 322 of file dyn_manager.hh.

Referenced by add_body_action(), add_integ_group(), gravitation(), initialize_simulation(), is_initialized(), and set↩
_gravity_manager().

8.3.5.8 integ_constructor

```
er7_utils::IntegratorConstructor* jeod::DynManager::integ_constructor  [protected]
```

Integrator generator.

trick_units(--)

Definition at line 332 of file dyn_manager.hh.

Referenced by initialize_model_internal(), and ∼DynManager().

8.3.5.9 integ_groups

```
std::vector<DynamicsIntegrationGroup*> jeod::DynManager::integ_groups  [protected]
```

List of integration groups.

Definition at line 362 of file dyn_manager.hh.

Referenced by add_integ_group(), initialize_integ_groups(), initialize_model_internal(), is_integ_group_↩
registered(), and reset_integrators().

8.3.5.10 integ_interface

```
JeodIntegratorInterface* jeod::DynManager::integ_interface  [protected]
```

Interface with the simulation integration structure.

trick_units(--)

Definition at line 337 of file dyn_manager.hh.

Referenced by initialize_model(), initialize_model_internal(), and ∼DynManager().

8.3.5.11 mass_bodies

`std::vector<MassBody*> jeod::DynManager::mass_bodies [protected]`

List of vehicle models.

Definition at line 352 of file dyn_manager.hh.

Referenced by add_mass_body(), find_mass_body(), and is_mass_body_registered().

8.3.5.12 mode

`DynManagerInit::EphemerisMode jeod::DynManager::mode`

The ephemeris mode in which the dynamics manager operates.

trick_units(–)

Definition at line 293 of file dyn_manager.hh.

Referenced by initialize_model_internal(), and initialize_simulation().

8.3.5.13 sim_integrator

`Trick::Integrator* jeod::DynManager::sim_integrator`

Pointer to the integration object used by the simulation engine itself.

trick_units(–)

Definition at line 298 of file dyn_manager.hh.

Referenced by initialize_model().

8.3.5.14 simple_ephemeris

`SinglePointEphemeris* jeod::DynManager::simple_ephemeris [protected]`

Simple ephemeris for use in empty space and single planet modes.

trick_units(–)

Definition at line 347 of file dyn_manager.hh.

Referenced by initialize_model_internal(), and ∼DynManager().

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

- dyn_manager.hh
- dyn_bodies_primitives.cc
- dyn_manager.cc
- gravitation.cc
- initialize_dyn_bodies.cc
- initialize_model.cc
- initialize_simulation.cc
- integ_group_primitives.cc
- mass_bodies_primitives.cc
- perform_actions.cc

8.4 jeod::DynManagerInit Class Reference

This class contains data used to initialize a DynManager object.

`#include <dyn_manager_init.hh>`

Public Types

- enum EphemerisMode { EphemerisMode_EmptySpace = 0, EphemerisMode_SinglePlanet = 1, EphemerisMode_Ephemerides = 2 }

  Identify modes in which the DynManager can operate.

Public Member Functions

- DynManagerInit (void)

  DynManagerInit default constructor.
- ∼DynManagerInit (void)

  DynManagerInit destructor.

Data Fields

- EphemerisMode mode

  Dynamics manager mode.
- char ∗ central_point_name

  Name of central point, used when the manager operates in empty space or single planet mode.
- DynamicsIntegrationGroup ∗ integ_group_constructor

  An integration group object used by the simulation's dynamics manager to create the default integration group.
- er7_utils::IntegratorConstructor ∗ integ_constructor

  The simulation's dynamics manager uses an integrator constructor to generate the dynamic manager's time integrator and to generate a state integrator for each dynamic body managed by the dynamics manager.
- er7_utils::Integration::Technique jeod_integ_opt

  Integrator type.
- int sim_integ_opt

  Integrator type.

Private Member Functions

- DynManagerInit (const DynManagerInit &)
- DynManagerInit & operator= (const DynManagerInit &)

8.4.1 Detailed Description

This class contains data used to initialize a DynManager object.

Definition at line 95 of file dyn_manager_init.hh.

8.4.2 Member Enumeration Documentation

8.4.2.1 EphemerisMode

`enum jeod::DynManagerInit::EphemerisMode`

Identify modes in which the DynManager can operate.

Enumerator

EphemerisMode_EmptySpace	
EphemerisMode_SinglePlanet	
EphemerisMode_Ephemerides	

Definition at line 104 of file dyn_manager_init.hh.

8.4.3 Constructor & Destructor Documentation

8.4.3.1 DynManagerInit() [1/2]

```
jeod::DynManagerInit::DynManagerInit (
            void  )
```

DynManagerInit default constructor.

Definition at line 46 of file dyn_manager_init.cc.

8.4.3.2 ∼DynManagerInit()

```
jeod::DynManagerInit::∼DynManagerInit (
            void  )
```

DynManagerInit destructor.

Definition at line 63 of file dyn_manager_init.cc.

8.4.3.3 DynManagerInit() [2/2]

```
jeod::DynManagerInit::DynManagerInit (
            const DynManagerInit &  )  [private]
```

8.4.4 Member Function Documentation

8.4.4.1 operator=()

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

8.4.5 Field Documentation

8.4.5.1 central_point_name

```
char* jeod::DynManagerInit::central_point_name
```

Name of central point, used when the manager operates in empty space or single planet mode.

trick_units(–)

Definition at line 134 of file dyn_manager_init.hh.

Referenced by jeod::DynManager::initialize_model_internal().

8.4.5.2 integ_constructor

```
er7_utils::IntegratorConstructor* jeod::DynManagerInit::integ_constructor
```

The simulation's dynamics manager uses an integrator constructor to generate the dynamic manager's time integrator and to generate a state integrator for each dynamic body managed by the dynamics manager.

The dynamics manager uses the following priority scheme to identify its integrator constructor:

- The dynamics manager uses the DynManagerInit integ_constructor data member if that member is not NULL. Note well: This is the only way by which a user-developed integration technique can be used within JEOD.
- The dynamics manager uses the IntegratorConstructorFactory::create method to create an integrator constructor. The value supplied to this method is the first of the following that specifies a valid JEOD integration technique:
- The DynManagerInit object's jeod_integ_opt data member.
- The JEOD equivalent of the Trick 7 integration structure's option member (Trick 7 only).
- The JEOD equivalent of the DynManagerInit object's sim_integ_opt data member.trick_units(–)

Definition at line 168 of file dyn_manager_init.hh.

Referenced by jeod::DynManager::initialize_model_internal().

8.4.5.3 integ_group_constructor

`DynamicsIntegrationGroup* jeod::DynManagerInit::integ_group_constructor`

An integration group object used by the simulation's dynamics manager to create the default integration group.

The integ_group_constructor does not have to be a functional integration group object; it can be created using the group's default constructor. If this object is not NULL, the dynamics manager will call this object's create_group method to create a functional integration group object to serve as the simulation's default integration group. If this object is NULL, the dynamics manager will use create the default integration group from the DynamicsIntegrationGroup class.trick_units(–)

Definition at line 147 of file dyn_manager_init.hh.

Referenced by jeod::DynManager::initialize_model_internal().

8.4.5.4 jeod_integ_opt

`er7_utils::Integration::Technique jeod::DynManagerInit::jeod_integ_opt`

Integrator type.

This data member provides an alternative means for specifying the integration technique to be used. See the integ_constructor documentation for usage.trick_units(–)

Definition at line 175 of file dyn_manager_init.hh.

Referenced by jeod::DynManager::initialize_model_internal().

8.4.5.5 mode

`EphemerisMode jeod::DynManagerInit::mode`

Dynamics manager mode.

trick_units(–)

Definition at line 128 of file dyn_manager_init.hh.

Referenced by jeod::DynManager::initialize_model_internal().

8.4.5.6 sim_integ_opt

```
int jeod::DynManagerInit::sim_integ_opt
```

Integrator type.

This data member provides yet another alternative means for specifying the integration technique to be used. See the integ_constructor documentation for usage.trick_units(–)

Definition at line 182 of file dyn_manager_init.hh.

Referenced by jeod::DynManager::initialize_model_internal().

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

- dyn_manager_init.hh
- dyn_manager_init.cc

8.5 jeod::DynManagerMessages Class Reference

Specifies the message IDs used in the DynManager model.

```
#include <dyn_manager_messages.hh>
```

Static Public Attributes

- static char const ∗ null_pointer = "dynamics/dyn_manager/" "null_pointer"

  Issued when a pointer should be non-NULL but isn't.
- static char const ∗ duplicate_entry = "dynamics/dyn_manager/" "duplicate_entry"

  Issued on request to add a pointer to a list a second time.
- static char const ∗ invalid_name = "dynamics/dyn_manager/" "invalid_name"

  Issued when a name is invalid – empty, a duplicate, ...
- static char const ∗ invalid_frame = "dynamics/dyn_manager/" "invalid_frame"

  Issued when a frame is invalid – not an integ frame, ...
- static char const ∗ invalid_type = "dynamics/dyn_manager/" "invalid_type"

  Issued when an object of an unexpected type is encountered.
- static char const ∗ inconsistent_setup = "dynamics/dyn_manager/" "inconsistent_setup"

  Issued when some conditions are inconsistent.
- static char const ∗ singleton_error = "dynamics/dyn_manager/" "singleton_error"

  Error issued when multiple instance of a class that should be a singleton are created or when no such instance exists (but should).
- static char const ∗ internal_error = "dynamics/dyn_manager/" "internal_error"

  Error issued when some internal error occurred.

Private Member Functions

- DynManagerMessages (void)

  Not implemented.
- DynManagerMessages (const DynManagerMessages &)

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

  Not implemented.

Friends

- class InputProcessor
- void init_attrjeod__DynManagerMessages ()

8.5.1 Detailed Description

Specifies the message IDs used in the DynManager model.

Definition at line 82 of file dyn_manager_messages.hh.

8.5.2 Constructor & Destructor Documentation

8.5.2.1 DynManagerMessages() [1/2]

```
jeod::DynManagerMessages::DynManagerMessages (
            void  )  [private]
```

Not implemented.

8.5.2.2 DynManagerMessages() [2/2]

```
jeod::DynManagerMessages::DynManagerMessages (
            const DynManagerMessages &  )  [private]
```

Not implemented.

8.5.3 Member Function Documentation

8.5.3.1 operator=()

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

Not implemented.

8.5.4 Friends And Related Function Documentation

8.5.4.1 init_attrjeod__DynManagerMessages

```
void init_attrjeod__DynManagerMessages ( )  [friend]
```

8.5.4.2 InputProcessor

```
friend class InputProcessor  [friend]
```

Definition at line 85 of file dyn_manager_messages.hh.

8.5.5 Field Documentation

8.5.5.1 duplicate_entry

```
char const * jeod::DynManagerMessages::duplicate_entry = "dynamics/dyn_manager/" "duplicate_←
entry"  [static]
```

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

trick_units(–)

Definition at line 99 of file dyn_manager_messages.hh.

Referenced by jeod::DynManager::add_body_action(), jeod::DynManager::add_dyn_body(), jeod::Dynamics←
IntegrationGroup::add_dyn_body(), jeod::DynManager::add_integ_group(), and jeod::DynManager::add_mass_←
body().

8.5.5.2 inconsistent_setup

```
char const * jeod::DynManagerMessages::inconsistent_setup = "dynamics/dyn_manager/" "inconsistent←
_setup"  [static]
```

Issued when some conditions are inconsistent.

trick_units(–)

Definition at line 119 of file dyn_manager_messages.hh.

Referenced by jeod::DynManager::add_integ_group(), jeod::DynManager::check_for_uninitialized_states(), jeod←
::DynamicsIntegrationGroup::delete_dyn_body(), jeod::DynManager::gravitation(), jeod::DynManager::initialize_←
gravity_controls(), jeod::DynManager::initialize_model_internal(), jeod::DynManager::initialize_simulation(), jeod←
::DynamicsIntegrationGroup::integrate_bodies(), jeod::DynManager::perform_dyn_body_initializations(), jeod←
::DynManager::reset_gravity_controls(), jeod::DynManager::set_gravity_manager(), and jeod::DynManager←
::update_integration_group().

8.5.5.3 internal_error

```
char const * jeod::DynManagerMessages::internal_error = "dynamics/dyn_manager/" "internal_↩
error" [static]
```

Error issued when some internal error occurred.

These errors should never happen.trick_units(–)

Definition at line 131 of file dyn_manager_messages.hh.

8.5.5.4 invalid_frame

```
char const * jeod::DynManagerMessages::invalid_frame = "dynamics/dyn_manager/" "invalid_frame"
[static]
```

Issued when a frame is invalid – not an integ frame, ...

trick_units(–)

Definition at line 109 of file dyn_manager_messages.hh.

8.5.5.5 invalid_name

```
char const * jeod::DynManagerMessages::invalid_name = "dynamics/dyn_manager/" "invalid_name"
[static]
```

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

trick_units(–)

Definition at line 104 of file dyn_manager_messages.hh.

Referenced by jeod::DynManager::add_dyn_body(), and jeod::DynManager::initialize_model_internal().

8.5.5.6 invalid_type

```
char const * jeod::DynManagerMessages::invalid_type = "dynamics/dyn_manager/" "invalid_type"
[static]
```

Issued when an object of an unexpected type is encountered.

trick_units(–)

Definition at line 114 of file dyn_manager_messages.hh.

8.5.5.7 null_pointer

```
char const * jeod::DynManagerMessages::null_pointer = "dynamics/dyn_manager/" "null_pointer"
[static]
```

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

trick_units(–)

Definition at line 94 of file dyn_manager_messages.hh.

Referenced by jeod::DynManager::add_body_action(), jeod::DynManager::add_mass_body(), and jeod::↩
DynamicsIntegrationGroup::initialize_group().

8.5.5.8 singleton_error

```
char const * jeod::DynManagerMessages::singleton_error = "dynamics/dyn_manager/" "singleton_↩
error" [static]
```

Error issued when multiple instance of a class that should be a singleton are created or when no such instance exists (but should).

trick_units(–)

Definition at line 125 of file dyn_manager_messages.hh.

Referenced by jeod::DynManager::set_gravity_manager().

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

- dyn_manager_messages.hh
- dyn_manager_messages.cc

Chapter 9

File Documentation

9.1 base_dyn_manager.hh File Reference

Define the BaseDynManager class, which defines the interfaces to the class DynManager.

```
#include "environment/ephemerides/ephem_manager/include/base_ephem_manager.↩
hh"
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class jeod::BaseDynManager

  The DynManager class augments the EphemManager with dynamics-related items.

Namespaces

- jeod

  Namespace jeod.

9.1.1 Detailed Description

Define the BaseDynManager class, which defines the interfaces to the class DynManager.

9.2 class_declarations.hh File Reference

Forward declarations of classes defined in dyn_manager.hh.

Namespaces

- jeod

  Namespace jeod.

9.2.1 Detailed Description

Forward declarations of classes defined in dyn_manager.hh.

9.3 dyn_bodies_primitives.cc File Reference

Define the DynManager member functions that search through and add elements to the collection of DynBody pointers.

```
#include <algorithm>
#include <cstddef>
#include "dynamics/dyn_body/include/dyn_body.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/dyn_manager.hh"
#include "../include/dyn_manager_messages.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.3.1 Detailed Description

Define the DynManager member functions that search through and add elements to the collection of DynBody pointers.

9.4 dyn_manager.cc File Reference

Define simple member functions for the DynManager and related classes.

```
#include <cstddef>
#include "dynamics/body_action/include/body_action.hh"
#include "dynamics/dyn_body/include/dyn_body.hh"
#include "dynamics/mass/include/mass.hh"
#include "environment/ephemerides/ephem_interface/include/simple_ephemerides.↩
hh"
#include "environment/ephemerides/ephem_item/include/ephem_item.hh"
#include "environment/planet/include/planet.hh"
#include "utils/integration/include/jeod_integration_group.hh"
#include "utils/message/include/message_handler.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "../include/dyn_manager.hh"
#include "../include/dyn_manager_messages.hh"
#include "../include/dynamics_integration_group.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.4.1 Detailed Description

Define simple member functions for the DynManager and related classes.

9.5 dyn_manager.hh File Reference

Define the DynManager class, which manages the planets and vehicles modeled in a JEOD-based simulation.

```
#include <list>
#include <vector>
#include "environment/ephemerides/ephem_manager/include/ephem_manager.hh"
#include "environment/planet/include/planet.hh"
#include "utils/integration/include/jeod_integration_group.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "base_dyn_manager.hh"
#include "dyn_manager_init.hh"
#include "dynamics_integration_group.hh"
#include "environment/ephemerides/ephem_interface/include/simple_ephemerides.↩
hh"
#include "er7_utils/integration/core/include/integrator_constructor_factory.↩
hh"
```

Data Structures

- class jeod::DynManager

  The DynManager class manages the dynamic elements of a simulation.

Namespaces

- jeod

  Namespace jeod.

9.5.1 Detailed Description

Define the DynManager class, which manages the planets and vehicles modeled in a JEOD-based simulation.

9.6 dyn_manager_init.cc File Reference

Define member functions for the DynManagerInit class.

```
#include <cstddef>
#include "utils/memory/include/jeod_alloc.hh"
#include "../include/dyn_manager_init.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.6.1 Detailed Description

Define member functions for the DynManagerInit class.

9.7 dyn_manager_init.hh File Reference

Define the DynManagerInit class, which contains the data used to initialize a DynManager object.

```
#include "er7_utils/integration/core/include/integration_technique.hh"
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class jeod::DynManagerInit

  This class contains data used to initialize a DynManager object.

Namespaces

- er7_utils

  Namespace er7_utils contains the state integration models used by JEOD.
- jeod

  Namespace jeod.

9.7.1 Detailed Description

Define the DynManagerInit class, which contains the data used to initialize a DynManager object.

9.8 dyn_manager_messages.cc File Reference

Implement the class DynManagerMessages.

```
#include "utils/message/include/make_message_code.hh"
#include "../include/dyn_manager_messages.hh"
```

Namespaces

- jeod

  Namespace jeod.

Macros

- #define MAKE_DYNMANAGER_MESSAGE_CODE(id) JEOD_MAKE_MESSAGE_CODE(DynManager↩
  Messages, "dynamics/dyn_manager/", id)

9.8.1 Detailed Description

Implement the class DynManagerMessages.

9.8.2 Macro Definition Documentation

9.8.2.1 MAKE_DYNMANAGER_MESSAGE_CODE

```
#define MAKE_DYNMANAGER_MESSAGE_CODE(
              id ) JEOD_MAKE_MESSAGE_CODE(DynManagerMessages, "dynamics/dyn_manager/", id)
```

Definition at line 38 of file dyn_manager_messages.cc.

9.9 dyn_manager_messages.hh File Reference

Define the class DynManagerMessages, the class that specifies the message IDs used in the DynManager model.

```
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class jeod::DynManagerMessages

  Specifies the message IDs used in the DynManager model.

Namespaces

- jeod

  Namespace jeod.

9.9.1 Detailed Description

Define the class DynManagerMessages, the class that specifies the message IDs used in the DynManager model.

9.10 dynamics_integration_group.cc File Reference

Define DynamicsIntegrationGroup methods.

```
#include <cstddef>
#include "dynamics/dyn_body/include/dyn_body.hh"
#include "environment/gravity/include/gravity_manager.hh"
#include "utils/integration/include/jeod_integration_time.hh"
#include "utils/message/include/message_handler.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/named_item/include/named_item.hh"
#include "../include/dyn_manager.hh"
#include "../include/dyn_manager_messages.hh"
#include "../include/dynamics_integration_group.hh"
```

Namespaces

- jeod

    Namespace jeod.

9.10.1 Detailed Description

Define DynamicsIntegrationGroup methods.

9.11 dynamics_integration_group.hh File Reference

Define the extensible class DynamicsIntegrationGroup, an instance of which is responsible for integrating the states of a set of DynBody objects.

```
#include "utils/sim_interface/include/jeod_class.hh"
#include "utils/container/include/pointer_vector.hh"
#include "utils/integration/include/jeod_integration_group.hh"
```

Data Structures

- class jeod::DynamicsIntegrationGroup

    A DynamicsIntegrationGroup integrates the state of a set of DynBoby objects over time.

Namespaces

- jeod

    Namespace jeod.

9.11.1 Detailed Description

Define the extensible class DynamicsIntegrationGroup, an instance of which is responsible for integrating the states of a set of DynBody objects.

9.12 gravitation.cc File Reference

Compute gravitational acceleration.

```
#include "dynamics/dyn_body/include/dyn_body.hh"
#include "environment/gravity/include/gravity_manager.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/dyn_manager.hh"
#include "../include/dyn_manager_messages.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.12.1 Detailed Description

Compute gravitational acceleration.

9.13 initialize_dyn_bodies.cc File Reference

Define DynManager::initialize_dyn_bodies.

```
#include <cstddef>
#include "dynamics/body_action/include/body_action.hh"
#include "dynamics/body_action/include/body_attach.hh"
#include "dynamics/body_action/include/mass_body_init.hh"
#include "dynamics/body_action/include/dyn_body_init.hh"
#include "dynamics/dyn_body/include/dyn_body.hh"
#include "utils/message/include/message_handler.hh"
#include "utils/ref_frames/include/ref_frame_items.hh"
#include "../include/dyn_manager.hh"
#include "../include/dyn_manager_messages.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.13.1 Detailed Description

Define DynManager::initialize_dyn_bodies.

9.14 initialize_model.cc File Reference

Define DynManager::initialize_model.

```
#include <cstddef>
#include "er7_utils/integration/core/include/integrator_constructor.hh"
#include "er7_utils/integration/core/include/integrator_constructor_factory.↩
hh"
#include "environment/ephemerides/ephem_interface/include/simple_ephemerides.↩
hh"
#include "environment/ephemerides/ephem_item/include/ephem_item.hh"
#include "environment/time/include/time_manager.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/message/include/message_handler.hh"
#include "utils/sim_interface/include/jeod_integrator_interface.hh"
#include "../include/dyn_manager.hh"
#include "../include/dyn_manager_messages.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.14.1 Detailed Description

Define DynManager::initialize_model.

9.15 initialize_simulation.cc File Reference

Define DynManager::initialize_simulation, which completes the initialization of the JEOD dynamics manager.

```
#include <cstddef>
#include "dynamics/dyn_body/include/dyn_body.hh"
#include "environment/gravity/include/gravity_manager.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/dyn_manager.hh"
#include "../include/dyn_manager_messages.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.15.1 Detailed Description

Define DynManager::initialize_simulation, which completes the initialization of the JEOD dynamics manager.

9.16 integ_group_primitives.cc File Reference

Define the DynManager member functions that search through and add elements to the collection of Dynamics↩
IntegrationGroup pointers.

```
#include <algorithm>
#include <cstddef>
#include "utils/message/include/message_handler.hh"
#include "../include/dyn_manager.hh"
#include "../include/dyn_manager_messages.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.16.1 Detailed Description

Define the DynManager member functions that search through and add elements to the collection of Dynamics↩
IntegrationGroup pointers.

9.17 mass_bodies_primitives.cc File Reference

Define the DynManager member functions that search through and add elements to the collection of MassBody pointers.

```
#include <algorithm>
#include <cstddef>
#include "dynamics/mass/include/mass.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/dyn_manager.hh"
#include "../include/dyn_manager_messages.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.17.1 Detailed Description

Define the DynManager member functions that search through and add elements to the collection of MassBody pointers.

9.18 perform_actions.cc File Reference

Define DynManager::perform_actions.

```
#include <cstdio>
#include <cstring>
#include "dynamics/body_action/include/body_action.hh"
#include "../include/dyn_manager.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.18.1 Detailed Description

Define DynManager::perform_actions.

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