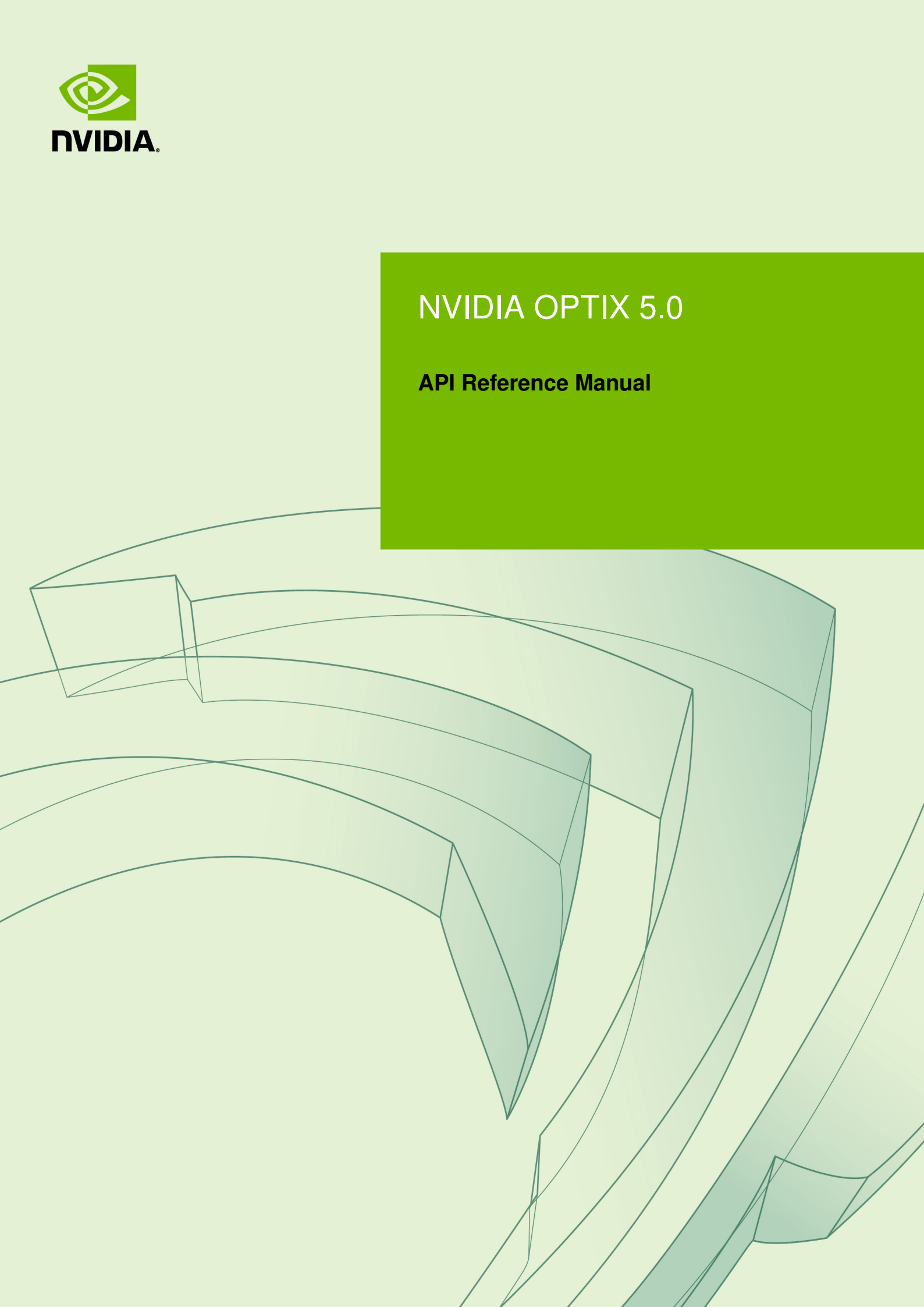


# NVIDIA OPTIX 5.0

## API Reference Manual

# Contents

# 1 OptiX Components

An extensive description of OptiX framework components and their features can be found in the document *OptiX_Programming_Guide.pdf* shipped with the SDK.

**Components API Reference**

OptiX - a scalable framework for building ray tracing applications.

> See OptiX API Reference for details .

OptiXpp - C++ wrapper around OptiX objects and handling functions.

> See OptiXpp wrapper for details .

OptiXu - simple API for performing raytracing queries using OptiX or the CPU. Also includes the rtuTraversal API subset for ray/triangle intersection.

> See CUDA C Reference and rtu API for details .

OptiX Prime - high performance API for intersecting a set of rays against a set of triangles.

> See OptiX Prime API Reference for details .

OptiX Prime++ - C++ wrapper around OptiX Prime objects and handling functions.

> See OptiX Prime++ wrapper for details .

# 2 Module Index

## 2.1 Modules

Here is a list of all modules:

# 3 Hierarchical Index

## 3.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

# 4 Class Index

## 4.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

# 5 Module Documentation

## 5.1 OptiX API Reference

**Modules**

- Context handling functions
- GeometryGroup handling functions
- GroupNode functions
- SelectorNode functions
- TransformNode functions
- Acceleration functions
- GeometryInstance functions
- Geometry functions
- Material functions
- Program functions
- Buffer functions
- TextureSampler functions
- Variable functions
- Context-free functions
- CUDA C Reference
- OptiXpp wrapper
- rtu API

### 5.1.1 Detailed Description

OptiX API functions.

## 5.2 Context handling functions

### Modules

- rtContextLaunch functions

### Functions

- RTresult RTAPI rtContextCreate (RTcontext *context)
- RTresult RTAPI rtContextDestroy (RTcontext context)
- RTresult RTAPI rtContextValidate (RTcontext context)
- void RTAPI rtContextGetErrorString (RTcontext context, RTresult code, const char **return_string)
- RTresult RTAPI rtContextSetAttribute (RTcontext context, RTcontextattribute attrib, RTsize size, void *p)
- RTresult RTAPI rtContextGetAttribute (RTcontext context, RTcontextattribute attrib, RTsize size, void *p)
- RTresult RTAPI rtContextSetDevices (RTcontext context, unsigned int count, const int *devices)
- RTresult RTAPI rtContextGetDevices (RTcontext context, int *devices)
- RTresult RTAPI rtContextGetDeviceCount (RTcontext context, unsigned int *count)
- RTresult RTAPI rtContextSetRemoteDevice (RTcontext context, RTremotedevice remote_dev)
- RTresult RTAPI rtContextSetStackSize (RTcontext context, RTsize stack_size_bytes)
- RTresult RTAPI rtContextGetStackSize (RTcontext context, RTsize *stack_size_bytes)
- RTresult RTAPI rtContextSetTimeoutCallback (RTcontext context, RTtimeoutcallback callback, double min_polling_seconds)
- RTresult RTAPI rtContextSetUsageReportCallback (RTcontext context, RTusagereportcallback callback, int verbosity, void *cbdata)
- RTresult RTAPI rtContextSetEntryPointCount (RTcontext context, unsigned int num_entry_points)
- RTresult RTAPI rtContextGetEntryPointCount (RTcontext context, unsigned int *num_entry_points)
- RTresult RTAPI rtContextSetRayGenerationProgram (RTcontext context, unsigned int entry_point_index, RTprogram program)
- RTresult RTAPI rtContextGetRayGenerationProgram (RTcontext context, unsigned int entry_point_index, RTprogram *program)
- RTresult RTAPI rtContextSetExceptionProgram (RTcontext context, unsigned int entry_point_index, RTprogram program)
- RTresult RTAPI rtContextGetExceptionProgram (RTcontext context, unsigned int entry_point_index, RTprogram *program)
- RTresult RTAPI rtContextSetExceptionEnabled (RTcontext context, RTexception exception, int enabled)
- RTresult RTAPI rtContextGetExceptionEnabled (RTcontext context, RTexception exception, int *enabled)
- RTresult RTAPI rtContextSetRayTypeCount (RTcontext context, unsigned int num_ray_types)
- RTresult RTAPI rtContextGetRayTypeCount (RTcontext context, unsigned int *num_ray_types)
- RTresult RTAPI rtContextSetMissProgram (RTcontext context, unsigned int ray_type_index, RTprogram program)
- RTresult RTAPI rtContextGetMissProgram (RTcontext context, unsigned int ray_type_index, RTprogram *program)
- RTresult RTAPI rtContextGetTextureSamplerFromId (RTcontext context, int sampler_id, RTtexturesampler *sampler)
- RTresult RTAPI rtContextGetRunningState (RTcontext context, int *running)

- RTresult RTAPI rtContextLaunchProgressive2D (RTcontext context, unsigned int entry_index, RTsize width, RTsize height, unsigned int max_subframes)
- RTresult RTAPI rtContextStopProgressive (RTcontext context)
- RTresult RTAPI rtContextSetPrintEnabled (RTcontext context, int enabled)
- RTresult RTAPI rtContextGetPrintEnabled (RTcontext context, int *enabled)
- RTresult RTAPI rtContextSetPrintBufferSize (RTcontext context, RTsize buffer_size_bytes)
- RTresult RTAPI rtContextGetPrintBufferSize (RTcontext context, RTsize *buffer_size_bytes)
- RTresult RTAPI rtContextSetPrintLaunchIndex (RTcontext context, int x, int y, int z)
- RTresult RTAPI rtContextGetPrintLaunchIndex (RTcontext context, int *x, int *y, int *z)
- RTresult RTAPI rtContextDeclareVariable (RTcontext context, const char *name, RTvariable *v)
- RTresult RTAPI rtContextQueryVariable (RTcontext context, const char *name, RTvariable *v)
- RTresult RTAPI rtContextRemoveVariable (RTcontext context, RTvariable v)
- RTresult RTAPI rtContextGetVariableCount (RTcontext context, unsigned int *count)
- RTresult RTAPI rtContextGetVariable (RTcontext context, unsigned int index, RTvariable *v)

### 5.2.1 Detailed Description

Functions related to an OptiX context.

### 5.2.2 Function Documentation

#### 5.2.2.1 RTresult RTAPI rtContextCreate ( RTcontext * *context* )

Creates a new context object.

**Description**

rtContextCreate allocates and returns a handle to a new context object. Returns RT_ERROR_INVALID_VALUE if passed a *NULL* pointer.

**Parameters**

| | | |
|---|---|---|
| out | *context* | Handle to context for return value |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_NO_DEVICE
- RT_ERROR_INVALID_VALUE

**History**

rtContextCreate was introduced in OptiX 1.0.

**See also**

#### 5.2.2.2 RTresult RTAPI rtContextDeclareVariable ( RTcontext *context*, const char * *name*, RTvariable * *v* )

Declares a new named variable associated with this context.

**Description**

rtContextDeclareVariable - Declares a new variable named *name* and associated with this context. Only a single variable of a given name can exist for a given context and any attempt to create multiple

variables with the same name will cause a failure with a return value of RT_ERROR_VARIABLE_REDECLARED. Returns RT_ERROR_INVALID_VALUE if passed a *NULL* pointer. Return RT_ERROR_ILLEGAL_SYMBOL if *name* is not syntactically valid.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context node to which the variable will be attached |
| in | *name* | The name that identifies the variable to be queried |
| out | *v* | Pointer to variable handle used to return the new object |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE
- RT_ERROR_VARIABLE_REDECLARED

**History**

rtContextDeclareVariable was introduced in OptiX 1.0.

**See also** rtGeometryDeclareVariable, rtGeometryInstanceDeclareVariable, rtMaterialDeclareVariable, rtProgramDeclareVariable, rtSelectorDeclareVariable, rtContextGetVariable, rtContextGetVariableCount, rtContextQueryVariable, rtContextRemoveVariable

#### 5.2.2.3 RTresult RTAPI rtContextDestroy ( RTcontext *context* )

Destroys a context and frees all associated resources.

**Description**

rtContextDestroy frees all resources, including OptiX objects, associated with this object. Returns RT_ERROR_INVALID_VALUE if passed a *NULL* context. RT_ERROR_LAUNCH_FAILED may be returned if a previous call to rtContextLaunch failed.

**Parameters**

| | | |
|---|---|---|
| in | *context* | Handle of the context to destroy |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE
- RT_ERROR_LAUNCH_FAILED

**History**

rtContextDestroy was introduced in OptiX 1.0.

**See also** rtContextCreate

#### 5.2.2.4 RTresult RTAPI rtContextGetAttribute ( RTcontext *context,* RTcontextattribute *attrib,* RTsize *size,* void * *p* )

Returns an attribute specific to an OptiX context.

**Description**

rtContextGetAttribute returns in *p* the value of the per context attribute specified by *attrib*.

Each attribute can have a different size. The sizes are given in the following list:

- RT_CONTEXT_ATTRIBUTE_MAX_TEXTURE_COUNT sizeof(int)
- RT_CONTEXT_ATTRIBUTE_CPU_NUM_THREADS sizeof(int)
- RT_CONTEXT_ATTRIBUTE_USED_HOST_MEMORY sizeof(RTsize)
- RT_CONTEXT_ATTRIBUTE_AVAILABLE_DEVICE_MEMORY sizeof(RTsize)

RT_CONTEXT_ATTRIBUTE_MAX_TEXTURE_COUNT queries the maximum number of textures handled by OptiX. For OptiX versions below 2.5 this value depends on the number of textures supported by CUDA.

RT_CONTEXT_ATTRIBUTE_CPU_NUM_THREADS queries the number of host CPU threads OptiX can use for various tasks.

RT_CONTEXT_ATTRIBUTE_USED_HOST_MEMORY queries the amount of host memory allocated by OptiX.

RT_CONTEXT_ATTRIBUTE_AVAILABLE_DEVICE_MEMORY queries the amount of free device memory.

Some attributes are used to get per device information. In contrast to rtDeviceGetAttribute, these attributes are determined by the context and are therefore queried through the context. This is done by adding the attribute with the OptiX device ordinal number when querying the attribute. The following are per device attributes.

RT_CONTEXT_ATTRIBUTE_AVAILABLE_DEVICE_MEMORY

**Parameters**

| | | |
|---|---|---|
| `in` | *context* | The context object to be queried |
| `in` | *attrib* | Attribute to query |
| `in` | *size* | Size of the attribute being queried. Parameter *p* must have at least this much memory allocated |
| `out` | *p* | Return pointer where the value of the attribute will be copied into. This must point to at least *size* bytes of memory |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE - Can be returned if *size* does not match the proper size of the attribute, if *p* is *NULL*, or if *attribute+ordinal* does not correspond to an OptiX device

**History**

rtContextGetAttribute was introduced in OptiX 2.0.

**See also** rtContextGetDeviceCount, rtContextSetAttribute, rtDeviceGetAttribute

### 5.2.2.5 RTresult RTAPI rtContextGetDeviceCount ( RTcontext *context,* unsigned int * *count* )

Query the number of devices currently being used.

**Description**

rtContextGetDeviceCount - Query the number of devices currently being used.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context containing the devices |
| out | *count* | Return parameter for the device count |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtContextGetDeviceCount was introduced in OptiX 2.0.

**See also** rtContextSetDevices, rtContextGetDevices

#### 5.2.2.6 RTresult RTAPI rtContextGetDevices ( RTcontext *context,* int * *devices* )

Retrieve a list of hardware devices being used by the kernel.

**Description**

rtContextGetDevices retrieves a list of hardware devices used by the context. Note that the device numbers are OptiX device ordinals, which may not be the same as CUDA device ordinals. Use rtDeviceGetAttribute with RT_DEVICE_ATTRIBUTE_CUDA_DEVICE_ORDINAL to query the CUDA device corresponding to a particular OptiX device.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context to which the hardware list is applied |
| out | *devices* | Return parameter for the list of devices. The memory must be able to hold entries numbering least the number of devices as returned by rtContextGetDeviceCount |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtContextGetDevices was introduced in OptiX 2.0.

**See also** rtContextSetDevices, rtContextGetDeviceCount

#### 5.2.2.7 RTresult RTAPI rtContextGetEntryPointCount ( RTcontext *context,* unsigned int * *num_entry_points* )

Query the number of entry points for this context.

**Description**

rtContextGetEntryPointCount passes back the number of entry points associated with this context in *num_entry_points*. Returns RT_ERROR_INVALID_VALUE if passed a *NULL* pointer.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context node to be queried |
| out | *num_entry_points* | Return parameter for passing back the entry point count |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtContextGetEntryPointCount was introduced in OptiX 1.0.

**See also** rtContextSetEntryPointCount

### 5.2.2.8 void RTAPI rtContextGetErrorString ( RTcontext *context*, RTresult *code*, const char ** *return_string* )

Returns the error string associated with a given error.

**Description**

rtContextGetErrorString return a descriptive string given an error code. If *context* is valid and additional information is available from the last OptiX failure, it will be appended to the generic error code description. *return_string* will be set to point to this string. The memory *return_string* points to will be valid until the next API call that returns a string.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context object to be queried, or *NULL* |
| in | *code* | The error code to be converted to string |
| out | *return_string* | The return parameter for the error string |

**Return values**

rtContextGetErrorString does not return a value

**History**

rtContextGetErrorString was introduced in OptiX 1.0.

**See also**

### 5.2.2.9 RTresult RTAPI rtContextGetExceptionEnabled ( RTcontext *context*, RTexception *exception*, int * *enabled* )

Query whether a specified exception is enabled.

**Description**

rtContextGetExceptionEnabled passes back *1* in *enabled* if the given exception is enabled, *0* otherwise. *exception* specifies the type of exception to be queried. For a list of available types, see rtContextSetExceptionEnabled. If *exception* is RT_EXCEPTION_ALL, *enabled* is set to *1* only if all possible exceptions are enabled.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context to be queried |
| in | *exception* | The exception of which to query the state |
| out | *enabled* | Return parameter to store whether the exception is enabled |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtContextGetExceptionEnabled was introduced in OptiX 1.1.

**See also** rtContextSetExceptionEnabled, rtContextSetExceptionProgram, rtContextGetExceptionProgram, rtGetExceptionCode, rtThrow, rtPrintExceptionDetails

#### 5.2.2.10 RTresult RTAPI rtContextGetExceptionProgram ( RTcontext *context,* unsigned int *entry_point_index,* RTprogram * *program* )

Queries the exception program associated with the given context and entry point.

**Description**

rtContextGetExceptionProgram passes back the exception program associated with the given context and entry point. This program is set via rtContextSetExceptionProgram. Returns RT_ERROR_INVALID_VALUE if given an invalid entry point index or *NULL* pointer.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context node associated with the exception program |
| in | *entry_point_index* | The entry point index for the desired exception program |
| out | *program* | Return parameter to store the exception program |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtContextGetExceptionProgram was introduced in OptiX 1.0.

**See also** rtContextSetExceptionProgram, rtContextSetEntryPointCount, rtContextSetExceptionEnabled, rtContextGetExceptionEnabled, rtGetExceptionCode, rtThrow, rtPrintExceptionDetails

#### 5.2.2.11 RTresult RTAPI rtContextGetMissProgram ( RTcontext *context,* unsigned int *ray_type_index,* RTprogram * *program* )

Queries the miss program associated with the given context and ray type.

**Description**

rtContextGetMissProgram passes back the miss program associated with the given context and ray type. This program is set via rtContextSetMissProgram. Returns RT_ERROR_INVALID_VALUE if given an invalid ray type index or a *NULL* pointer.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context node associated with the miss program |
| in | *ray_type_index* | The ray type index for the desired miss program |
| out | *program* | Return parameter to store the miss program |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtContextGetMissProgram was introduced in OptiX 1.0.

**See also** rtContextSetMissProgram, rtContextGetRayTypeCount

#### 5.2.2.12 RTresult RTAPI rtContextGetPrintBufferSize ( RTcontext *context*, RTsize * *buffer_size_bytes* )

Get the current size of the print buffer.

**Description**

rtContextGetPrintBufferSize is used to query the buffer size available to hold data generated by rtPrintf functions. Returns RT_ERROR_INVALID_VALUE if passed a *NULL* pointer.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context from which to query the print buffer size |
| out | *buffer_size_bytes* | The returned print buffer size in bytes |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtContextGetPrintBufferSize was introduced in OptiX 1.0.

**See also** rtPrintf functions, rtContextSetPrintEnabled, rtContextGetPrintEnabled, rtContextSetPrintBufferSize, rtContextSetPrintLaunchIndex, rtContextGetPrintLaunchIndex

#### 5.2.2.13 RTresult RTAPI rtContextGetPrintEnabled ( RTcontext *context*, int * *enabled* )

Query whether text printing from programs is enabled.

**Description**

rtContextGetPrintEnabled passes back *1* if text printing from programs through rtPrintf functions is currently enabled for this context; *0* otherwise. Returns RT_ERROR_INVALID_VALUE if passed a *NULL* pointer.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context to be queried |
| out | *enabled* | Return parameter to store whether printing is enabled |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtContextGetPrintEnabled was introduced in OptiX 1.0.

**See also** rtPrintf functions, rtContextSetPrintEnabled, rtContextSetPrintBufferSize, rtContextGetPrintBufferSize, rtContextSetPrintLaunchIndex, rtContextGetPrintLaunchIndex

#### 5.2.2.14 RTresult RTAPI rtContextGetPrintLaunchIndex ( RTcontext *context*, int * *x*, int * *y*, int * *z* )

Gets the active print launch index.

**Description**

rtContextGetPrintLaunchIndex is used to query for which launch indices rtPrintf functions generates output. The initial value of (x,y,z) is (*-1*,*-1*,*-1*), which generates output for all indices.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context from which to query the print launch index |
| out | *x* | Returns the launch index in the x dimension to which the output of rtPrintf functions invocations is limited. Will not be written to if a *NULL* pointer is passed |
| out | *y* | Returns the launch index in the y dimension to which the output of rtPrintf functions invocations is limited. Will not be written to if a *NULL* pointer is passed |
| out | *z* | Returns the launch index in the z dimension to which the output of rtPrintf functions invocations is limited. Will not be written to if a *NULL* pointer is passed |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtContextGetPrintLaunchIndex was introduced in OptiX 1.0.

**See also** rtPrintf functions, rtContextGetPrintEnabled, rtContextSetPrintEnabled, rtContextSetPrintBufferSize, rtContextGetPrintBufferSize, rtContextSetPrintLaunchIndex

#### 5.2.2.15 RTresult RTAPI rtContextGetRayGenerationProgram ( RTcontext *context*, unsigned int *entry_point_index*, RTprogram * *program* )

Queries the ray generation program associated with the given context and entry point.

**Description**

rtContextGetRayGenerationProgram passes back the ray generation program associated with the given context and entry point. This program is set via rtContextSetRayGenerationProgram. Returns RT_ERROR_INVALID_VALUE if given an invalid entry point index or *NULL* pointer.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context node associated with the ray generation program |
| in | *entry_point_index* | The entry point index for the desired ray generation program |
| out | *program* | Return parameter to store the ray generation program |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtContextGetRayGenerationProgram was introduced in OptiX 1.0.

**See also** rtContextSetRayGenerationProgram

#### 5.2.2.16 RTresult RTAPI rtContextGetRayTypeCount ( RTcontext *context,* unsigned int * *num_ray_types* )

Query the number of ray types associated with this context.

**Description**

rtContextGetRayTypeCount passes back the number of entry points associated with this context in *num_ray_types*. Returns RT_ERROR_INVALID_VALUE if passed a *NULL* pointer.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context node to be queried |
| out | *num_ray_types* | Return parameter to store the number of ray types |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtContextGetRayTypeCount was introduced in OptiX 1.0.

**See also** rtContextSetRayTypeCount

#### 5.2.2.17 RTresult RTAPI rtContextGetRunningState ( RTcontext *context,* int * *running* )

Query whether the given context is currently running.

**Description**

This function is currently unimplemented and it is provided as a placeholder for a future implementation.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context node to be queried |
| out | *running* | Return parameter to store the running state |

**Return values**

Since unimplemented, this function will always throw an assertion failure.

**History**

rtContextGetRunningState was introduced in OptiX 1.0.

**See also** rtContextLaunch1D, rtContextLaunch2D, rtContextLaunch3D

#### 5.2.2.18 RTresult RTAPI rtContextGetStackSize ( RTcontext *context*, RTsize * *stack_size_bytes* )

Query the stack size for this context.

**Description**

rtContextGetStackSize passes back the stack size associated with this context in *stack_size_bytes*. Returns RT_ERROR_INVALID_VALUE if passed a *NULL* pointer.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context node to be queried |
| out | *stack_size_bytes* | Return parameter to store the size of the stack |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtContextGetStackSize was introduced in OptiX 1.0.

**See also** rtContextSetStackSize

#### 5.2.2.19 RTresult RTAPI rtContextGetTextureSamplerFromId ( RTcontext *context*, int *sampler_id*, RTtexturesampler * *sampler* )

Gets an RTtexturesampler corresponding to the texture id.

**Description**

rtTextureSamplerGetId returns a handle to the texture sampler in **sampler* corresponding to the *sampler_id* supplied. If *sampler_id* does not map to a valid texture handle, **sampler* is *NULL* or if *context* is invalid, returns RT_ERROR_INVALID_VALUE.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context the sampler should be originated from |

| | | |
|---|---|---|
| in | *sampler_id* | The ID of the sampler to query |
| out | *sampler* | The return handle for the sampler object corresponding to the sampler_id |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtContextGetTextureSamplerFromId was introduced in OptiX 3.5.

**See also** rtTextureSamplerGetId

#### 5.2.2.20 RTresult RTAPI rtContextGetVariable ( RTcontext *context*, unsigned int *index*, RTvariable * *v* )

Queries an indexed variable associated with this context.

**Description**

rtContextGetVariable queries the variable at position *index* in the variable array from *context* and stores the result in the parameter *v*. A variable must be declared first with rtContextDeclareVariable and *index* must be in the range [*0*, rtContextGetVariableCount *-1*].

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context node to be queried for an indexed variable |
| in | *index* | The index that identifies the variable to be queried |
| out | *v* | Return value to store the queried variable |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtContextGetVariable was introduced in OptiX 1.0.

**See also** rtGeometryGetVariable, rtGeometryInstanceGetVariable, rtMaterialGetVariable, rtProgramGetVariable, rtSelectorGetVariable, rtContextDeclareVariable, rtContextGetVariableCount, rtContextQueryVariable, rtContextRemoveVariable

#### 5.2.2.21 RTresult RTAPI rtContextGetVariableCount ( RTcontext *context*, unsigned int * *count* )

Returns the number of variables associated with this context.

**Description**

rtContextGetVariableCount returns the number of variables that are currently attached to *context*. Returns RT_ERROR_INVALID_VALUE if passed a *NULL* pointer.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context to be queried for number of attached variables |
| out | *count* | Return parameter to store the number of variables |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtContextGetVariableCount was introduced in OptiX 1.0.

**See also** rtGeometryGetVariableCount, rtGeometryInstanceGetVariableCount, rtMaterialGetVariableCount, rtProgramGetVariableCount, rtSelectorGetVariable, rtContextDeclareVariable, rtContextGetVariable, rtContextQueryVariable, rtContextRemoveVariable

#### 5.2.2.22 RTresult RTAPI rtContextLaunchProgressive2D ( RTcontext *context,* unsigned int *entry_index,* RTsize *width,* RTsize *height,* unsigned int *max_subframes* )

Executes a Progressive Launch for a given context.

**Description**

Starts the (potentially parallel) generation of subframes for progressive rendering. If *max_subframes* is zero, there is no limit on the number of subframes generated. The generated subframes are automatically composited into a single result and streamed to the client at regular intervals, where they can be read by mapping an associated stream buffer. An application can therefore initiate a progressive launch, and then repeatedly map and display the contents of the stream buffer in order to visualize the progressive refinement of the image.

The call is nonblocking. A polling approach should be used to decide when to map and display the stream buffer contents (see rtBufferGetProgressiveUpdateReady). If a progressive launch is already in progress at the time of the call and its parameters match the initial launch, the call has no effect. Otherwise, the accumulated result will be reset and a new progressive launch will be started.

If any other OptiX function is called while a progressive launch is in progress, it will cause the launch to stop generating new subframes (however, subframes that have already been generated and are currently in flight may still arrive at the client). The only exceptions to this rule are the operations to map a stream buffer, issuing another progressive launch with unchanged parameters, and polling for an update. Those exceptions do not cause the progressive launch to stop generating subframes.

There is no guarantee that the call actually produces any subframes, especially if rtContextLaunchProgressive2D and other OptiX commands are called in short succession. For example, during an animation, Variable setters calls may be tightly interleaved with progressive launches, and when rendering remotely the server may decide to skip some of the launches in order to avoid a large backlog in the command pipeline.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context in which the launch is to be executed |
| in | *entry_index* | The initial entry point into kernel |
| in | *width* | Width of the computation grid |

| | | |
|---|---|---|
| in | *height* | Height of the computation grid |
| in | *max_-subframes* | The maximum number of subframes to be generated. Set to zero to generate an unlimited number of subframes |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_LAUNCH_FAILED

**History**

rtContextLaunchProgressive2D was introduced in OptiX 3.8.

**See also** rtContextStopProgressive rtBufferGetProgressiveUpdateReady

#### 5.2.2.23 RTresult RTAPI rtContextQueryVariable ( RTcontext *context,* const char * *name,* RTvariable * *v* )

Returns a named variable associated with this context.

**Description**

rtContextQueryVariable queries a variable identified by the string *name* from *context* and stores the result in *v. A variable must be declared with rtContextDeclareVariable before it can be queried, otherwise *v will be set to *NULL*. RT_ERROR_INVALID_VALUE will be returned if *name* or *v* is *NULL*.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context node to query a variable from |
| in | *name* | The name that identifies the variable to be queried |
| out | *v* | Return value to store the queried variable |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtContextQueryVariable was introduced in OptiX 1.0.

**See also** rtGeometryQueryVariable, rtGeometryInstanceQueryVariable, rtMaterialQueryVariable, rtProgramQueryVariable, rtSelectorQueryVariable, rtContextDeclareVariable, rtContextGetVariableCount, rtContextGetVariable, rtContextRemoveVariable

#### 5.2.2.24 RTresult RTAPI rtContextRemoveVariable ( RTcontext *context,* RTvariable *v* )

Removes a variable from the given context.

**Description**

rtContextRemoveVariable removes variable *v* from *context* if present. Returns RT_ERROR_VARIABLE_NOT_FOUND if the variable is not attached to this context. Returns RT_ERROR_INVALID_VALUE if passed an invalid variable.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context node from which to remove a variable |
| in | *v* | The variable to be removed |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE
- RT_ERROR_VARIABLE_NOT_FOUND

**History**

rtContextRemoveVariable was introduced in OptiX 1.0.

**See also** rtGeometryRemoveVariable, rtGeometryInstanceRemoveVariable, rtMaterialRemoveVariable, rtProgramRemoveVariable, rtSelectorRemoveVariable, rtContextDeclareVariable, rtContextGetVariable, rtContextGetVariableCount, rtContextQueryVariable,

#### 5.2.2.25 RTresult RTAPI rtContextSetAttribute ( RTcontext *context*, RTcontextattribute *attrib*, RTsize *size*, void * *p* )

Set an attribute specific to an OptiX context.

**Description**

rtContextSetAttribute sets *p* as the value of the per context attribute specified by *attrib*.

Each attribute can have a different size. The sizes are given in the following list:

- RT_CONTEXT_ATTRIBUTE_CPU_NUM_THREADS sizeof(int)

RT_CONTEXT_ATTRIBUTE_CPU_NUM_THREADS sets the number of host CPU threads OptiX can use for various tasks.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context object to be modified |
| in | *attrib* | Attribute to set |
| in | *size* | Size of the attribute being set |
| in | *p* | Pointer to where the value of the attribute will be copied from. This must point to at least *size* bytes of memory |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE - Can be returned if *size* does not match the proper size of the attribute, or if *p* is *NULL*

**History**

rtContextSetAttribute was introduced in OptiX 2.5.

**See also** rtContextGetAttribute

#### 5.2.2.26 RTresult RTAPI rtContextSetDevices ( RTcontext *context*, unsigned int *count*, const int * *devices* )

Specify a list of hardware devices to be used by the kernel.

### Description

rtContextSetDevices specifies a list of hardware devices to be used during execution of the subsequent trace kernels. Note that the device numbers are OptiX device ordinals, which may not be the same as CUDA device ordinals. Use rtDeviceGetAttribute with RT_DEVICE_ATTRIBUTE_CUDA_DEVICE_ORDINAL to query the CUDA device corresponding to a particular OptiX device.

### Parameters

| | | |
|---|---|---|
| in | *context* | The context to which the hardware list is applied |
| in | *count* | The number of devices in the list |
| in | *devices* | The list of devices |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_NO_DEVICE
- RT_ERROR_INVALID_DEVICE

### History

rtContextSetDevices was introduced in OptiX 1.0.

**See also** rtContextGetDevices, rtContextGetDeviceCount

#### 5.2.2.27 RTresult RTAPI rtContextSetEntryPointCount ( RTcontext *context,* unsigned int *num_entry_points* )

Set the number of entry points for a given context.

### Description

rtContextSetEntryPointCount sets the number of entry points associated with the given context to *num_entry_points*.

### Parameters

| | | |
|---|---|---|
| in | *context* | The context to be modified |
| in | *num_entry_points* | The number of entry points to use |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

### History

rtContextSetEntryPointCount was introduced in OptiX 1.0.

**See also** rtContextGetEntryPointCount

#### 5.2.2.28 RTresult RTAPI rtContextSetExceptionEnabled ( RTcontext *context,* RTexception *exception,* int *enabled* )

Enable or disable an exception.

### Description

rtContextSetExceptionEnabled is used to enable or disable specific exceptions. If an exception is enabled, the exception condition is checked for at runtime, and the exception program is invoked if the condition is met. The exception program can query the type of the caught exception by calling rtGetExceptionCode. *exception* may take one of the following values:

- RT_EXCEPTION_TEXTURE_ID_INVALID
- RT_EXCEPTION_BUFFER_ID_INVALID
- RT_EXCEPTION_INDEX_OUT_OF_BOUNDS
- RT_EXCEPTION_STACK_OVERFLOW
- RT_EXCEPTION_BUFFER_INDEX_OUT_OF_BOUNDS
- RT_EXCEPTION_INVALID_RAY
- RT_EXCEPTION_INTERNAL_ERROR
- RT_EXCEPTION_USER
- RT_EXCEPTION_ALL

RT_EXCEPTION_TEXTURE_ID_INVALID verifies that every access of a texture id is valid, including use of RT_TEXTURE_ID_NULL and IDs out of bounds.

RT_EXCEPTION_BUFFER_ID_INVALID verifies that every access of a buffer id is valid, including use of RT_BUFFER_ID_NULL and IDs out of bounds.

RT_EXCEPTION_INDEX_OUT_OF_BOUNDS checks that rtIntersectChild and rtReportIntersection are called with a valid index.

RT_EXCEPTION_STACK_OVERFLOW checks the runtime stack against overflow. The most common cause for an overflow is a too deep rtTrace recursion tree.

RT_EXCEPTION_BUFFER_INDEX_OUT_OF_BOUNDS checks every read and write access to rtBuffer objects to be within valid bounds.

RT_EXCEPTION_INVALID_RAY checks the each ray's origin and direction values against *NaNs* and *infinity* values.

RT_EXCEPTION_INTERNAL_ERROR indicates an unexpected internal error in the runtime.

RT_EXCEPTION_USER is used to enable or disable all user-defined exceptions. The reserved range of exception codes for user-defined exceptions starts at RT_EXCEPTION_USER (*0x400*) and ends at *0xFFFF*. See rtThrow for more information.

RT_EXCEPTION_ALL is a placeholder value which can be used to enable or disable all possible exceptions with a single call to rtContextSetExceptionEnabled.

By default, RT_EXCEPTION_STACK_OVERFLOW is enabled and all other exceptions are disabled.

**Parameters**

| | | |
|---|---|---|
| `in` | *context* | The context for which the exception is to be enabled or disabled |
| `in` | *exception* | The exception which is to be enabled or disabled |
| `in` | *enabled* | Nonzero to enable the exception, *0* to disable the exception |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtContextSetExceptionEnabled was introduced in OptiX 1.1.

**See also** rtContextGetExceptionEnabled, rtContextSetExceptionProgram, rtContextGetExceptionProgram, rtGetExceptionCode, rtThrow, rtPrintExceptionDetails

#### 5.2.2.29 RTresult RTAPI rtContextSetExceptionProgram ( RTcontext *context,* unsigned int *entry_point_index,* RTprogram *program* )

Specifies the exception program for a given context entry point.

**Description**

rtContextSetExceptionProgram sets *context's* exception program at entry point *entry_point_index*. RT_ERROR_INVALID_VALUE is returned if *entry_point_index* is outside of the range [*0*, rtContextGetEntryPointCount *-1*].

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context node to which the exception program will be added |
| in | *entry_point_index* | The entry point the program will be associated with |
| in | *program* | The exception program |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE
- RT_ERROR_TYPE_MISMATCH

**History**

rtContextSetExceptionProgram was introduced in OptiX 1.0.

**See also** rtContextGetEntryPointCount, rtContextGetExceptionProgram rtContextSetExceptionEnabled, rtContextGetExceptionEnabled, rtGetExceptionCode, rtThrow, rtPrintExceptionDetails

#### 5.2.2.30 RTresult RTAPI rtContextSetMissProgram ( RTcontext *context,* unsigned int *ray_type_index,* RTprogram *program* )

Specifies the miss program for a given context ray type.

**Description**

rtContextSetMissProgram sets *context's* miss program associated with ray type *ray_type_index*. RT_ERROR_INVALID_VALUE is returned if *ray_type_index* is outside of the range [*0*, rtContextGetRayTypeCount *-1*].

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context node to which the miss program will be added |
| in | *ray_type_index* | The ray type the program will be associated with |
| in | *program* | The miss program |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_TYPE_MISMATCH

**History**

rtContextSetMissProgram was introduced in OptiX 1.0.

**See also** rtContextGetRayTypeCount, rtContextGetMissProgram

#### 5.2.2.31 RTresult RTAPI rtContextSetPrintBufferSize ( RTcontext *context*, RTsize *buffer_size_bytes* )

Set the size of the print buffer.

**Description**

rtContextSetPrintBufferSize is used to set the buffer size available to hold data generated by rtPrintf functions. Returns RT_ERROR_INVALID_VALUE if it is called after the first invocation of rtContextLaunch.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context for which to set the print buffer size |
| in | *buffer_size_bytes* | The print buffer size in bytes |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtContextSetPrintBufferSize was introduced in OptiX 1.0.

**See also** rtPrintf functions, rtContextSetPrintEnabled, rtContextGetPrintEnabled, rtContextGetPrintBufferSize, rtContextSetPrintLaunchIndex, rtContextGetPrintLaunchIndex

#### 5.2.2.32 RTresult RTAPI rtContextSetPrintEnabled ( RTcontext *context*, int *enabled* )

Enable or disable text printing from programs.

**Description**

rtContextSetPrintEnabled is used to control whether text printing in programs through rtPrintf functions is currently enabled for this context.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context for which printing is to be enabled or disabled |
| in | *enabled* | Setting this parameter to a nonzero value enables printing, *0* disables printing |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtContextSetPrintEnabled was introduced in OptiX 1.0.

**See also** rtPrintf functions, rtContextGetPrintEnabled, rtContextSetPrintBufferSize, rtContextGetPrintBufferSize, rtContextSetPrintLaunchIndex, rtContextGetPrintLaunchIndex

#### 5.2.2.33 RTresult RTAPI rtContextSetPrintLaunchIndex ( RTcontext *context,* int *x,* int *y,* int *z* )

Sets the active launch index to limit text output.

**Description**

rtContextSetPrintLaunchIndex is used to control for which launch indices rtPrintf functions generates output. The initial value of (x,y,z) is (*-1*,*-1*,*-1*), which generates output for all indices.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context for which to set the print launch index |
| in | *x* | The launch index in the x dimension to which to limit the output of rtPrintf functions invocations. If set to *-1*, output is generated for all launch indices in the x dimension |
| in | *y* | The launch index in the y dimension to which to limit the output of rtPrintf functions invocations. If set to *-1*, output is generated for all launch indices in the y dimension |
| in | *z* | The launch index in the z dimension to which to limit the output of rtPrintf functions invocations. If set to *-1*, output is generated for all launch indices in the z dimension |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtContextSetPrintLaunchIndex was introduced in OptiX 1.0.

**See also** rtPrintf functions, rtContextGetPrintEnabled, rtContextSetPrintEnabled, rtContextSetPrintBufferSize, rtContextGetPrintBufferSize, rtContextGetPrintLaunchIndex

#### 5.2.2.34 RTresult RTAPI rtContextSetRayGenerationProgram ( RTcontext *context,* unsigned int *entry_point_index,* RTprogram *program* )

Specifies the ray generation program for a given context entry point.

**Description**

rtContextSetRayGenerationProgram sets *context's* ray generation program at entry point *entry_point_index*. RT_ERROR_INVALID_VALUE is returned if *entry_point_index* is outside of the range [*0*, rtContextGetEntryPointCount *-1*].

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context node to which the exception program will be added |
| in | *entry_point_index* | The entry point the program will be associated with |
| in | *program* | The ray generation program |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_TYPE_MISMATCH

### History

rtContextSetRayGenerationProgram was introduced in OptiX 1.0.

**See also** rtContextGetEntryPointCount, rtContextGetRayGenerationProgram

#### 5.2.2.35 RTresult RTAPI rtContextSetRayTypeCount ( RTcontext *context,* unsigned int *num_ray_types* )

Sets the number of ray types for a given context.

### Description

rtContextSetRayTypeCount Sets the number of ray types associated with the given context.

### Parameters

| | | |
|---|---|---|
| in | *context* | The context node |
| in | *num_ray_types* | The number of ray types to be used |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

### History

rtContextSetRayTypeCount was introduced in OptiX 1.0.

**See also** rtContextGetRayTypeCount

#### 5.2.2.36 RTresult RTAPI rtContextSetRemoteDevice ( RTcontext *context,* RTremotedevice *remote_dev* )

Enable rendering on a remote device.

### Description

Associates a context with a remote device. If successful, any further OptiX calls will be directed to the remote device and executed there. The context must be an empty, newly created context. In other words, in order to use a context remotely, the call to rtContextSetRemoteDevice should immediately follow the call to rtContextCreate.

Note that a context that was used for remote rendering cannot be re-used for local rendering by changing devices. However, the Progressive API (that is, rtContextLaunchProgressive2D, stream buffers, etc.) can be used locally by simply not creating a remote device and not calling rtContextSetRemoteDevice.

Only a single remote device can be associated with a context. Switching between different remote devices is not supported.

### Parameters

| | | |
|---|---|---|
| in | *context* | Newly created context to use on the remote device |
| in | *remote_dev* | Remote device on which rendering is to be executed |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

### History

rtContextSetRemoteDevice was introduced in OptiX 3.8.

**See also** rtRemoteDeviceCreate rtRemoteDeviceGetAttribute rtRemoteDeviceReserve rtContextLaunchProgressive2D

#### 5.2.2.37 RTresult RTAPI rtContextSetStackSize ( RTcontext *context*, RTsize *stack_size_bytes* )

Set the stack size for a given context.

### Description

rtContextSetStackSize sets the stack size for the given context to *stack_size_bytes* bytes. Returns RT_ERROR_INVALID_VALUE if context is not valid.

### Parameters

| | | |
|---|---|---|
| in | *context* | The context node to be modified |
| in | *stack_size_bytes* | The desired stack size in bytes |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

### History

rtContextSetStackSize was introduced in OptiX 1.0.

**See also** rtContextGetStackSize

#### 5.2.2.38 RTresult RTAPI rtContextSetTimeoutCallback ( RTcontext *context*, RTtimeoutcallback *callback*, double *min_polling_seconds* )

Side timeout callback function.

### Description

rtContextSetTimeoutCallback sets an application-side callback function *callback* and a time interval *min_polling_seconds* in seconds. Potentially long-running OptiX API calls such as rtContextLaunch functions call the callback function about every *min_polling_seconds* seconds. The core purpose of a timeout callback function is to give the application a chance to do whatever it might need to do frequently, such as handling GUI events.

If the callback function returns true, the API call tries to abort, leaving the context in a clean but unfinished state. Output buffers are left in an unpredictable state. In case an OptiX API call is terminated by a callback function, it returns RT_TIMEOUT_CALLBACK.

As a side effect, timeout functions also help control the OptiX kernel run-time. This can in some cases prevent OptiX kernel launches from running so long that they cause driver timeouts. For example, if *min_polling_seconds* is 0.5 seconds then once the kernel has been running for 0.5 seconds it won't start any new launch indices (calls to a ray generation program). Thus, if the driver's timeout is 2 seconds (the default on Windows), then a launch index may take up to 1.5 seconds without triggering a driver timeout.

RTtimeoutcallback is defined as *int* (∗RTtimeoutcallback)(void).

To unregister a callback function, *callback* needs to be set to *NULL* and *min_polling_seconds* to 0.

Only one timeout callback function can be specified at any time.

Returns RT_ERROR_INVALID_VALUE if *context* is not valid, if *min_polling_seconds* is negative, if *callback* is *NULL* but *min_polling_seconds* is not 0, or if *callback* is not *NULL* but *min_polling_seconds* is 0.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context node to be modified |
| in | *callback* | The function to be called |
| in | *min_polling_-seconds* | The timeout interval after which the function is called |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtContextSetTimeoutCallback was introduced in OptiX 2.5.

**See also** rtContextLaunch functions

#### 5.2.2.39 RTresult RTAPI rtContextSetUsageReportCallback ( RTcontext *context*, RTusagereportcallback *callback*, int *verbosity*, void * *cbdata* )

Set usage report callback function.

**Description**

rtContextSetUsageReportCallback sets an application-side callback function *callback* and a verbosity level *verbosity*.

RTusagereportcallback is defined as *void* (*RTusagereportcallback)(int, const char*, const char*, void*).

The provided callback will be invoked with the message's verbosity level as the first parameter. The second parameter is a descriptive tag string and the third parameter is the message itself. The fourth parameter is a pointer to user-defined data, which may be NULL. The descriptive tag will give a terse message category description (eg, 'SCENE STAT'). The messages will be unstructured and subject to change with subsequent releases. The verbosity argument specifies the granularity of these messages.

*verbosity* of 0 disables reporting. *callback* is ignored in this case.

*verbosity* of 1 enables error messages and important warnings. This verbosity level can be expected to be efficient and have no significant overhead.

*verbosity* of 2 additionally enables minor warnings, performance recommendations, and scene statistics at startup or recompilation granularity. This level may have a performance cost.

*verbosity* of 3 additionally enables informational messages and per-launch statistics and messages.

A NULL *callback* when verbosity is non-zero or a *verbosity* outside of [0, 3] will result in RT_ERROR_INVALID_VALUE return code.

Only one report callback function can be specified at any time.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context node to be modified |

| | | |
|---|---|---|
| in | *callback* | The function to be called |
| in | *verbosity* | The verbosity of report messages |
| in | *cbdata* | Pointer to user-defined data that will be sent to the callback. Can be NULL. |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtContextSetUsageReportCallback was introduced in OptiX 5.0.

**See also**

#### 5.2.2.40 RTresult RTAPI rtContextStopProgressive ( RTcontext *context* )

Stops a Progressive Launch.

**Description**

If a progressive launch is currently in progress, calling rtContextStopProgressive terminates it. Otherwise, the call has no effect. If a launch is stopped using this function, no further subframes will arrive at the client, even if they have already been generated by the server and are currently in flight.

This call should only be used if the application must guarantee that frames generated by previous progressive launches won't be accessed. Do not call rtContextStopProgressive in the main rendering loop if the goal is only to change OptiX state (e.g. rtVariable values). The call is unnecessary in that case and will degrade performance.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context associated with the progressive launch |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE
- RT_ERROR_INVALID_CONTEXT

**History**

rtContextStopProgressive was introduced in OptiX 3.8.

**See also** rtContextLaunchProgressive2D

#### 5.2.2.41 RTresult RTAPI rtContextValidate ( RTcontext *context* )

Checks the given context for valid internal state.

**Description**

rtContextValidate checks the the given context and all of its associated OptiX objects for a valid state. These checks include tests for presence of necessary programs (e.g. an intersection program for a geometry node), invalid internal state such as *NULL* children in graph nodes, and presence of variables required by all specified programs. rtContextGetErrorString can be used to retrieve a description of a validation failure.

### Parameters

| | | |
|---|---|---|
| in | *context* | The context to be validated |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_INVALID_SOURCE

### History

rtContextValidate was introduced in OptiX 1.0.

**See also** rtContextGetErrorString

## 5.3 rtContextLaunch functions

### Functions

- RTresult RTAPI rtContextLaunch1D (RTcontext context, unsigned int entry_point_index, RTsize width)
- RTresult RTAPI rtContextLaunch2D (RTcontext context, unsigned int entry_point_index, RTsize width, RTsize height)
- RTresult RTAPI rtContextLaunch3D (RTcontext context, unsigned int entry_point_index, RTsize width, RTsize height, RTsize depth)

### 5.3.1 Detailed Description

Functions designed to launch OptiX ray tracing.

### 5.3.2 Function Documentation

#### 5.3.2.1 RTresult RTAPI rtContextLaunch1D ( RTcontext *context,* unsigned int *entry_point_index,* RTsize *width* )

Executes the computation kernel for a given context.

**Description**

rtContextLaunch functions execute the computation kernel associated with the given context. If the context has not yet been compiled, or if the context has been modified since the last compile, rtContextLaunch will recompile the kernel internally. Acceleration structures of the context which are marked dirty will be updated and their dirty flags will be cleared. Similarly, validation will occur if necessary. The ray generation program specified by *entry_point_index* will be invoked once for every element (pixel or voxel) of the computation grid specified by *width*, *height*, and *depth*.

For 3D launches, the product of *width* and *depth* must be smaller than 4294967296 (2^32).

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_INVALID_SOURCE
- RT_ERROR_LAUNCH_FAILED

**History**

rtContextLaunch was introduced in OptiX 1.0.

**See also** rtContextGetRunningState, rtContextValidate

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context to be executed |
| in | *entry_point_index* | The initial entry point into kernel |
| in | *width* | Width of the computation grid |

#### 5.3.2.2 RTresult RTAPI rtContextLaunch2D ( RTcontext *context,* unsigned int *entry_point_index,* RTsize *width,* RTsize *height* )

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context to be executed |
| in | *entry_point_index* | The initial entry point into kernel |
| in | *width* | Width of the computation grid |
| in | *height* | Height of the computation grid |

#### 5.3.2.3 RTresult RTAPI rtContextLaunch3D ( RTcontext *context,* unsigned int *entry_point_index,* RTsize *width,* RTsize *height,* RTsize *depth* )

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context to be executed |
| in | *entry_point_index* | The initial entry point into kernel |
| in | *width* | Width of the computation grid |
| in | *height* | Height of the computation grid |
| in | *depth* | Depth of the computation grid |

## 5.4 GeometryGroup handling functions

### Functions

- RTresult RTAPI rtGeometryGroupCreate (RTcontext context, RTgeometrygroup *geometrygroup)
- RTresult RTAPI rtGeometryGroupDestroy (RTgeometrygroup geometrygroup)
- RTresult RTAPI rtGeometryGroupValidate (RTgeometrygroup geometrygroup)
- RTresult RTAPI rtGeometryGroupGetContext (RTgeometrygroup geometrygroup, RTcontext *context)
- RTresult RTAPI rtGeometryGroupSetAcceleration (RTgeometrygroup geometrygroup, RTacceleration acceleration)
- RTresult RTAPI rtGeometryGroupGetAcceleration (RTgeometrygroup geometrygroup, RTacceleration *acceleration)
- RTresult RTAPI rtGeometryGroupSetChildCount (RTgeometrygroup geometrygroup, unsigned int count)
- RTresult RTAPI rtGeometryGroupGetChildCount (RTgeometrygroup geometrygroup, unsigned int *count)
- RTresult RTAPI rtGeometryGroupSetChild (RTgeometrygroup geometrygroup, unsigned int index, RTgeometryinstance geometryinstance)
- RTresult RTAPI rtGeometryGroupGetChild (RTgeometrygroup geometrygroup, unsigned int index, RTgeometryinstance *geometryinstance)

### 5.4.1 Detailed Description

Functions related to an OptiX Geometry Group node.

### 5.4.2 Function Documentation

#### 5.4.2.1 RTresult RTAPI rtGeometryGroupCreate ( RTcontext *context*, RTgeometrygroup * *geometrygroup* )

Creates a new geometry group.

**Description**

rtGeometryGroupCreate creates a new geometry group within a context. *context* specifies the target context, and should be a value returned by rtContextCreate. Sets **geometrygroup* to the handle of a newly created geometry group within *context*. Returns RT_ERROR_INVALID_VALUE if *geometrygroup* is *NULL*.

**Parameters**

| | | |
|---|---|---|
| `in` | *context* | Specifies a context within which to create a new geometry group |
| `out` | *geometrygroup* | Returns a newly created geometry group |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryGroupCreate was introduced in OptiX 1.0.

**See also** rtGeometryGroupDestroy, rtContextCreate

#### 5.4.2.2 RTresult RTAPI rtGeometryGroupDestroy ( RTgeometrygroup *geometrygroup* )

Destroys a geometry group node.

**Description**

rtGeometryGroupDestroy removes *geometrygroup* from its context and deletes it. *geometrygroup* should be a value returned by rtGeometryGroupCreate. No child graph nodes are destroyed. After the call, *geometrygroup* is no longer a valid handle.

**Parameters**

| | | |
|---|---|---|
| in | *geometrygroup* | Handle of the geometry group node to destroy |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryGroupDestroy was introduced in OptiX 1.0.

**See also** rtGeometryGroupCreate

#### 5.4.2.3 RTresult RTAPI rtGeometryGroupGetAcceleration ( RTgeometrygroup *geometrygroup,* RTacceleration * *acceleration* )

Returns the acceleration structure attached to a geometry group.

**Description**

rtGeometryGroupGetAcceleration returns the acceleration structure attached to a geometry group using rtGeometryGroupSetAcceleration. If no acceleration structure has previously been set, **acceleration* is set to *NULL*.

**Parameters**

| | | |
|---|---|---|
| in | *geometrygroup* | The geometry group handle |
| out | *acceleration* | The returned acceleration structure object |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryGroupGetAcceleration was introduced in OptiX 1.0.

**See also** rtGeometryGroupSetAcceleration, rtAccelerationCreate

#### 5.4.2.4 RTresult RTAPI rtGeometryGroupGetChild ( RTgeometrygroup *geometrygroup*, unsigned int *index*, RTgeometryinstance * *geometryinstance* )

Returns a child node of a geometry group.

**Description**

rtGeometryGroupGetChild returns the child geometry instance at slot *index* of the parent *geometrygroup*. If no child has been assigned to the given slot, **geometryinstance* is set to *NULL*. Returns RT_ERROR_INVALID_VALUE if given an invalid child index or *NULL* pointer.

**Parameters**

| | | |
|---|---|---|
| in | *geometrygroup* | The parent geometry group handle |
| in | *index* | The index of the child slot to query |
| out | *geometryinstance* | The returned child geometry instance |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryGroupGetChild was introduced in OptiX 1.0.

**See also** rtGeometryGroupSetChild, rtGeometryGroupSetChildCount, rtGeometryGroupGetChildCount,

#### 5.4.2.5 RTresult RTAPI rtGeometryGroupGetChildCount ( RTgeometrygroup *geometrygroup*, unsigned int * *count* )

Returns the number of child slots for a group.

**Description**

rtGeometryGroupGetChildCount returns the number of child slots allocated using rtGeometryGroupSetChildCount. This includes empty slots which may not yet have actual children assigned by rtGeometryGroupSetChild.

**Parameters**

| | | |
|---|---|---|
| in | *geometrygroup* | The parent geometry group handle |
| out | *count* | Returned number of child slots |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryGroupGetChildCount was introduced in OptiX 1.0.

**See also** rtGeometryGroupSetChild, rtGeometryGroupGetChild, rtGeometryGroupSetChildCount

#### 5.4.2.6 RTresult RTAPI rtGeometryGroupGetContext ( RTgeometrygroup *geometrygroup,* RTcontext * *context* )

Returns the context associated with a geometry group.

**Description**

rtGeometryGroupGetContext queries a geometry group for its associated context. *geometrygroup* specifies the geometry group to query, and must be a value returned by rtGeometryGroupCreate. Sets **context* to the context associated with *geometrygroup*.

**Parameters**

| | | |
|---|---|---|
| `in` | *geometrygroup* | Specifies the geometry group to query |
| `out` | *context* | Returns the context associated with the geometry group |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryGroupGetContext was introduced in OptiX 1.0.

**See also** rtContextCreate, rtGeometryGroupCreate

#### 5.4.2.7 RTresult RTAPI rtGeometryGroupSetAcceleration ( RTgeometrygroup *geometrygroup,* RTacceleration *acceleration* )

Set the acceleration structure for a group.

**Description**

rtGeometryGroupSetAcceleration attaches an acceleration structure to a geometry group. The acceleration structure must have been previously created using rtAccelerationCreate. Every geometry group is required to have an acceleration structure assigned in order to pass validation. The acceleration structure will be built over the primitives contained in all children of the geometry group. This enables a single acceleration structure to be built over primitives of multiple geometry instances. Note that it is legal to attach a single RTacceleration object to multiple geometry groups, as long as the underlying geometry of all children is the same. This corresponds to attaching an acceleration structure to multiple groups at higher graph levels using rtGroupSetAcceleration.

**Parameters**

| | | |
|---|---|---|
| `in` | *geometrygroup* | The geometry group handle |
| `in` | *acceleration* | The acceleration structure to attach to the geometry group |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryGroupSetAcceleration was introduced in OptiX 1.0.

**See also** rtGeometryGroupGetAcceleration, rtAccelerationCreate, rtGroupSetAcceleration

#### 5.4.2.8 RTresult RTAPI rtGeometryGroupSetChild ( RTgeometrygroup *geometrygroup,* unsigned int *index,* RTgeometryinstance *geometryinstance* )

Attaches a child node to a geometry group.

**Description**

rtGeometryGroupSetChild attaches a new child node *geometryinstance* to the parent node *geometrygroup*. *index* specifies the number of the slot where the child node gets attached. The index value must be lower than the number previously set by rtGeometryGroupSetChildCount.

**Parameters**

| | | |
|---|---|---|
| in | *geometrygroup* | The parent geometry group handle |
| in | *index* | The index in the parent's child slot array |
| in | *geometryinstance* | The child node to be attached |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryGroupSetChild was introduced in OptiX 1.0.

**See also** rtGeometryGroupSetChildCount, rtGeometryGroupGetChildCount, rtGeometryGroupGetChild

#### 5.4.2.9 RTresult RTAPI rtGeometryGroupSetChildCount ( RTgeometrygroup *geometrygroup,* unsigned int *count* )

Sets the number of child nodes to be attached to the group.

**Description**

rtGeometryGroupSetChildCount specifies the number of child slots in this geometry group. Potentially existing links to children at indices greater than *count-1* are removed. If the call increases the number of slots, the newly created slots are empty and need to be filled using rtGeometryGroupSetChild before validation.

**Parameters**

| | | |
|---|---|---|
| in | *geometrygroup* | The parent geometry group handle |
| in | *count* | Number of child slots to allocate for the geometry group |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryGroupSetChildCount was introduced in OptiX 1.0.

**See also** rtGeometryGroupGetChild, rtGeometryGroupGetChildCount rtGeometryGroupSetChild

#### 5.4.2.10 RTresult RTAPI rtGeometryGroupValidate ( RTgeometrygroup *geometrygroup* )

Validates the state of the geometry group.

**Description**

rtGeometryGroupValidate checks *geometrygroup* for completeness. If *geometrygroup* or any of the objects attached to *geometrygroup* are not valid, returns RT_ERROR_INVALID_VALUE.

**Parameters**

| | | |
|---|---|---|
| `in` | *geometrygroup* | Specifies the geometry group to be validated |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryGroupValidate was introduced in OptiX 1.0.

**See also** rtGeometryGroupCreate

## 5.5 GroupNode functions

### Functions

- RTresult RTAPI rtGroupCreate (RTcontext context, RTgroup *group)
- RTresult RTAPI rtGroupDestroy (RTgroup group)
- RTresult RTAPI rtGroupValidate (RTgroup group)
- RTresult RTAPI rtGroupGetContext (RTgroup group, RTcontext *context)
- RTresult RTAPI rtGroupSetAcceleration (RTgroup group, RTacceleration acceleration)
- RTresult RTAPI rtGroupGetAcceleration (RTgroup group, RTacceleration *acceleration)
- RTresult RTAPI rtGroupSetChildCount (RTgroup group, unsigned int count)
- RTresult RTAPI rtGroupGetChildCount (RTgroup group, unsigned int *count)
- RTresult RTAPI rtGroupSetChild (RTgroup group, unsigned int index, RTobject child)
- RTresult RTAPI rtGroupGetChild (RTgroup group, unsigned int index, RTobject *child)
- RTresult RTAPI rtGroupGetChildType (RTgroup group, unsigned int index, RTobjecttype *type)

### 5.5.1 Detailed Description

Functions related to an OptiX Group node.

### 5.5.2 Function Documentation

#### 5.5.2.1 RTresult RTAPI rtGroupCreate ( RTcontext *context*, RTgroup * *group* )

Creates a new group.

**Description**

rtGroupCreate creates a new group within a context. *context* specifies the target context, and should be a value returned by rtContextCreate. Sets *group* to the handle of a newly created group within *context*. Returns RT_ERROR_INVALID_VALUE if *group* is *NULL*.

**Parameters**

| | | |
|---|---|---|
| in | *context* | Specifies a context within which to create a new group |
| out | *group* | Returns a newly created group |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtGroupCreate was introduced in OptiX 1.0.

**See also** rtGroupDestroy, rtContextCreate

#### 5.5.2.2 RTresult RTAPI rtGroupDestroy ( RTgroup *group* )

Destroys a group node.

**Description**

rtGroupDestroy removes *group* from its context and deletes it. *group* should be a value returned by rtGroupCreate. No child graph nodes are destroyed. After the call, *group* is no longer a valid handle.

**Parameters**

| | | |
|---|---|---|
| in | *group* | Handle of the group node to destroy |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtGroupDestroy was introduced in OptiX 1.0.

**See also** rtGroupCreate

#### 5.5.2.3 RTresult RTAPI rtGroupGetAcceleration ( RTgroup *group*, RTacceleration * *acceleration* )

Returns the acceleration structure attached to a group.

**Description**

rtGroupGetAcceleration returns the acceleration structure attached to a group using rtGroupSetAcceleration. If no acceleration structure has previously been set, ∗*acceleration* is set to *NULL*.

**Parameters**

| | | |
|---|---|---|
| in | *group* | The group handle |
| out | *acceleration* | The returned acceleration structure object |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtGroupGetAcceleration was introduced in OptiX 1.0.

**See also** rtGroupSetAcceleration, rtAccelerationCreate

#### 5.5.2.4 RTresult RTAPI rtGroupGetChild ( RTgroup *group*, unsigned int *index*, RTobject * *child* )

Returns a child node of a group.

**Description**

rtGroupGetChild returns the child object at slot *index* of the parent *group*. If no child has been assigned to the given slot, ∗*child* is set to *NULL*. Returns RT_ERROR_INVALID_VALUE if given an invalid child index or *NULL* pointer.

**Parameters**

| | | |
|---|---|---|
| in | *group* | The parent group handle |
| in | *index* | The index of the child slot to query |
| out | *child* | The returned child object |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtGroupGetChild was introduced in OptiX 1.0.

**See also** rtGroupSetChild, rtGroupSetChildCount, rtGroupGetChildCount, rtGroupGetChildType

#### 5.5.2.5 RTresult RTAPI rtGroupGetChildCount ( RTgroup *group,* unsigned int * *count* )

Returns the number of child slots for a group.

**Description**

rtGroupGetChildCount returns the number of child slots allocated using rtGroupSetChildCount. This includes empty slots which may not yet have actual children assigned by rtGroupSetChild. Returns RT_ERROR_INVALID_VALUE if given a *NULL* pointer.

**Parameters**

| | | |
|---|---|---|
| in | *group* | The parent group handle |
| out | *count* | Returned number of child slots |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtGroupGetChildCount was introduced in OptiX 1.0.

**See also** rtGroupSetChild, rtGroupGetChild, rtGroupSetChildCount, rtGroupGetChildType

#### 5.5.2.6 RTresult RTAPI rtGroupGetChildType ( RTgroup *group,* unsigned int *index,* RTobjecttype * *type* )

Get the type of a group child.

**Description**

rtGroupGetChildType returns the type of the group child at slot *index*. If no child is associated with the given index, **type* is set to RT_OBJECTTYPE_UNKNOWN and RT_ERROR_INVALID_VALUE is returned. Returns RT_ERROR_INVALID_VALUE if given a *NULL* pointer.

**Parameters**

| | | |
|---|---|---|
| in | *group* | The parent group handle |
| in | *index* | The index of the child slot to query |
| out | *type* | The returned child type |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtGroupGetChildType was introduced in OptiX 1.0.

**See also** rtGroupSetChild, rtGroupGetChild, rtGroupSetChildCount, rtGroupGetChildCount

#### 5.5.2.7 RTresult RTAPI rtGroupGetContext ( RTgroup *group,* RTcontext * *context* )

Returns the context associated with a group.

**Description**

rtGroupGetContext queries a group for its associated context. *group* specifies the group to query, and must be a value returned by rtGroupCreate. Sets **context* to the context associated with *group*.

**Parameters**

| | | |
|---|---|---|
| in | *group* | Specifies the group to query |
| out | *context* | Returns the context associated with the group |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtGroupGetContext was introduced in OptiX 1.0.

**See also** rtContextCreate, rtGroupCreate

#### 5.5.2.8 RTresult RTAPI rtGroupSetAcceleration ( RTgroup *group,* RTacceleration *acceleration* )

Set the acceleration structure for a group.

**Description**

rtGroupSetAcceleration attaches an acceleration structure to a group. The acceleration structure must have been previously created using rtAccelerationCreate. Every group is required to have an acceleration structure assigned in order to pass validation. The acceleration structure will be built over the children of the group. For example, if an acceleration structure is attached to a group that has a selector, a geometry group, and a transform child, the acceleration structure will be built over the bounding volumes of these three objects.

Note that it is legal to attach a single RTacceleration object to multiple groups, as long as the underlying bounds of the children are the same. For example, if another group has three children which are known to have the same bounding volumes as the ones in the example above, the two groups can share an acceleration structure, thus saving build time. This is true even if the details of the children, such as the

actual type of a node or its geometry content, differ from the first set of group children. All that is required is for a child node at a given index to have the same bounds as the other group's child node at the same index.

Sharing an acceleration structure this way corresponds to attaching an acceleration structure to multiple geometry groups at lower graph levels using rtGeometryGroupSetAcceleration.

**Parameters**

| | | |
|---|---|---|
| in | *group* | The group handle |
| in | *acceleration* | The acceleration structure to attach to the group |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtGroupSetAcceleration was introduced in OptiX 1.0.

**See also** rtGroupGetAcceleration, rtAccelerationCreate, rtGeometryGroupSetAcceleration

#### 5.5.2.9 RTresult RTAPI rtGroupSetChild ( RTgroup *group,* unsigned int *index,* RTobject *child* )

Attaches a child node to a group.

**Description**

Attaches a new child node *child* to the parent node *group*. *index* specifies the number of the slot where the child node gets attached. A sufficient number of slots must be allocated using rtGroupSetChildCount. Legal child node types are RTgroup, RTselector, RTgeometrygroup, and RTtransform.

**Parameters**

| | | |
|---|---|---|
| in | *group* | The parent group handle |
| in | *index* | The index in the parent's child slot array |
| in | *child* | The child node to be attached. Can be of type {RTgroup, RTselector, RTgeometrygroup, RTtransform} |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtGroupSetChild was introduced in OptiX 1.0.

**See also** rtGroupSetChildCount, rtGroupGetChildCount, rtGroupGetChild, rtGroupGetChildType

#### 5.5.2.10 RTresult RTAPI rtGroupSetChildCount ( RTgroup *group,* unsigned int *count* )

Sets the number of child nodes to be attached to the group.

**Description**

rtGroupSetChildCount specifies the number of child slots in this group. Potentially existing links to children at indices greater than *count-1* are removed. If the call increases the number of slots, the newly created slots are empty and need to be filled using rtGroupSetChild before validation.

**Parameters**

| | | |
|---|---|---|
| in | *group* | The parent group handle |
| in | *count* | Number of child slots to allocate for the group |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtGroupSetChildCount was introduced in OptiX 1.0.

**See also** rtGroupGetChild, rtGroupGetChildCount, rtGroupGetChildType, rtGroupSetChild

#### 5.5.2.11 RTresult RTAPI rtGroupValidate ( RTgroup *group* )

Verifies the state of the group.

**Description**

rtGroupValidate checks *group* for completeness. If *group* or any of the objects attached to *group* are not valid, returns RT_ERROR_INVALID_VALUE.

**Parameters**

| | | |
|---|---|---|
| in | *group* | Specifies the group to be validated |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtGroupValidate was introduced in OptiX 1.0.

**See also** rtGroupCreate

## 5.6 SelectorNode functions

### Functions

- RTresult RTAPI rtSelectorCreate (RTcontext context, RTselector *selector)
- RTresult RTAPI rtSelectorDestroy (RTselector selector)
- RTresult RTAPI rtSelectorValidate (RTselector selector)
- RTresult RTAPI rtSelectorGetContext (RTselector selector, RTcontext *context)
- RTresult RTAPI rtSelectorSetVisitProgram (RTselector selector, RTprogram program)
- RTresult RTAPI rtSelectorGetVisitProgram (RTselector selector, RTprogram *program)
- RTresult RTAPI rtSelectorSetChildCount (RTselector selector, unsigned int count)
- RTresult RTAPI rtSelectorGetChildCount (RTselector selector, unsigned int *count)
- RTresult RTAPI rtSelectorSetChild (RTselector selector, unsigned int index, RTobject child)
- RTresult RTAPI rtSelectorGetChild (RTselector selector, unsigned int index, RTobject *child)
- RTresult RTAPI rtSelectorGetChildType (RTselector selector, unsigned int index, RTobjecttype *type)
- RTresult RTAPI rtSelectorDeclareVariable (RTselector selector, const char *name, RTvariable *v)
- RTresult RTAPI rtSelectorQueryVariable (RTselector selector, const char *name, RTvariable *v)
- RTresult RTAPI rtSelectorRemoveVariable (RTselector selector, RTvariable v)
- RTresult RTAPI rtSelectorGetVariableCount (RTselector selector, unsigned int *count)
- RTresult RTAPI rtSelectorGetVariable (RTselector selector, unsigned int index, RTvariable *v)

### 5.6.1 Detailed Description

Functions related to an OptiX Selector node.

### 5.6.2 Function Documentation

#### 5.6.2.1 RTresult RTAPI rtSelectorCreate ( RTcontext *context*, RTselector * *selector* )

Creates a Selector node.

**Description**

Creates a new Selector node within *context*. After calling rtSelectorCreate the new node is in an invalid state. For the node to be valid, a visit program must be assigned using rtSelectorSetVisitProgram. Furthermore, a number of (zero or more) children can be attached by using rtSelectorSetChildCount and rtSelectorSetChild. Sets **selector* to the handle of a newly created selector within *context*. Returns RT_ERROR_INVALID_VALUE if *selector* is *NULL*.

**Parameters**

| | | |
|---|---|---|
| `in` | *context* | Specifies the rendering context of the Selector node |
| `out` | *selector* | New Selector node handle |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

### History

rtSelectorCreate was introduced in OptiX 1.0.

**See also** rtSelectorDestroy, rtSelectorValidate, rtSelectorGetContext, rtSelectorSetVisitProgram, rtSelectorSetChildCount, rtSelectorSetChild

#### 5.6.2.2 RTresult RTAPI rtSelectorDeclareVariable ( RTselector *selector,* const char * *name,* RTvariable * *v* )

Declares a variable associated with a Selector node.

### Description

Declares a new variable identified by *name*, and associates it with the Selector node *selector*. The new variable handle is returned in *v*. After declaration, a variable does not have a type until its value is set by an *rtVariableSet{...}* function. Once a variable type has been set, it cannot be changed, i.e., only *rtVariableSet{...}* functions of the same type can be used to change the value of the variable.

### Parameters

| | | |
|---|---|---|
| in | *selector* | Selector node handle |
| in | *name* | Variable identifier |
| out | *v* | New variable handle |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_VARIABLE_REDECLARED
- RT_ERROR_ILLEGAL_SYMBOL

### History

rtSelectorDeclareVariable was introduced in OptiX 1.0.

**See also** rtSelectorQueryVariable, rtSelectorRemoveVariable, rtSelectorGetVariableCount, rtSelectorGetVariable, Variable setters{...}

#### 5.6.2.3 RTresult RTAPI rtSelectorDestroy ( RTselector *selector* )

Destroys a selector node.

### Description

rtSelectorDestroy removes *selector* from its context and deletes it. *selector* should be a value returned by rtSelectorCreate. Associated variables declared via rtSelectorDeclareVariable are destroyed, but no child graph nodes are destroyed. After the call, *selector* is no longer a valid handle.

### Parameters

| | | |
|---|---|---|
| in | *selector* | Handle of the selector node to destroy |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT

- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtSelectorDestroy was introduced in OptiX 1.0.

**See also** rtSelectorCreate, rtSelectorValidate, rtSelectorGetContext

#### 5.6.2.4 RTresult RTAPI rtSelectorGetChild ( RTselector *selector,* unsigned int *index,* RTobject * *child* )

Returns a child node that is attached to a Selector node.

**Description**

rtSelectorGetChild returns in *child* a handle of the child node currently attached to *selector* at slot *index*. The index value must be lower than the number previously set by rtSelectorSetChildCount, thus it must be in the range from *0* to rtSelectorGetChildCount - 1. The returned pointer is of generic type RTobject and needs to be cast to the actual child type, which can be RTgroup, RTselector, RTgeometrygroup, or RTtransform. The actual type of *child* can be queried using rtSelectorGetChildType;

**Parameters**

| | | |
|---|---|---|
| in | *selector* | Selector node handle |
| in | *index* | Child node index |
| out | *child* | Child node handle. Can be {RTgroup, RTselector, RTgeometrygroup, RTtransform} |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtSelectorGetChild was introduced in OptiX 1.0.

**See also** rtSelectorSetChildCount, rtSelectorGetChildCount, rtSelectorSetChild, rtSelectorGetChildType

#### 5.6.2.5 RTresult RTAPI rtSelectorGetChildCount ( RTselector *selector,* unsigned int * *count* )

Returns the number of child node slots of a Selector node.

**Description**

rtSelectorGetChildCount returns in *count* the number of child node slots that have been previously reserved for the Selector node *selector* by rtSelectorSetChildCount. The value of *count* does not reflect the actual number of child nodes that have so far been attached to the Selector node using rtSelectorSetChild.

**Parameters**

| | | |
|---|---|---|
| in | *selector* | Selector node handle |
| out | *count* | Number of child node slots reserved for *selector* |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtSelectorGetChildCount was introduced in OptiX 1.0.

**See also** rtSelectorSetChildCount, rtSelectorSetChild, rtSelectorGetChild, rtSelectorGetChildType

#### 5.6.2.6 RTresult RTAPI rtSelectorGetChildType ( RTselector *selector,* unsigned int *index,* RTobjecttype * *type* )

Returns type information about a Selector child node.

**Description**

rtSelectorGetChildType queries the type of the child node attached to *selector* at slot *index*. If no child is associated with the given index, **type* is set to RT_OBJECTTYPE_UNKNOWN and RT_ERROR_INVALID_VALUE is returned. Returns RT_ERROR_INVALID_VALUE if given a *NULL* pointer. The returned type is one of:

RT_OBJECTTYPE_GROUP RT_OBJECTTYPE_GEOMETRY_GROUP RT_OBJECTTYPE_TRANSFORM RT_OBJECTTYPE_SELECTOR

**Parameters**

| | | |
|---|---|---|
| in | *selector* | Selector node handle |
| in | *index* | Child node index |
| out | *type* | Type of the child node |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtSelectorGetChildType was introduced in OptiX 1.0.

**See also** rtSelectorSetChildCount, rtSelectorGetChildCount, rtSelectorSetChild, rtSelectorGetChild

#### 5.6.2.7 RTresult RTAPI rtSelectorGetContext ( RTselector *selector,* RTcontext * *context* )

Returns the context of a Selector node.

**Description**

rtSelectorGetContext returns in *context* the rendering context in which the Selector node *selector* has been created.

**Parameters**

| | | |
|---|---|---|
| in | *selector* | Selector node handle |
| out | *context* | The context, *selector* belongs to |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtSelectorGetContext was introduced in OptiX 1.0.

**See also** rtSelectorCreate, rtSelectorDestroy, rtSelectorValidate

### 5.6.2.8 RTresult RTAPI rtSelectorGetVariable ( RTselector *selector,* unsigned int *index,* RTvariable * *v* )

Returns a variable associated with a Selector node.

**Description**

Returns in *v* a handle to the variable located at position *index* in the Selectors's variable array. *index* is a sequential number depending on the order of variable declarations. The index must be in the range from *0* to rtSelectorGetVariableCount - 1. The current value of a variable can be retrieved from its handle by using an appropriate *rtVariableGet{...}* function matching the variable's type.

**Parameters**

| | | |
|---|---|---|
| in | *selector* | Selector node handle |
| in | *index* | Variable index |
| out | *v* | Variable handle |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtSelectorGetVariable was introduced in OptiX 1.0.

**See also** rtSelectorDeclareVariable, rtSelectorQueryVariable, rtSelectorRemoveVariable, rtSelectorGetVariableCount, *rtVariableGet{...}*

### 5.6.2.9 RTresult RTAPI rtSelectorGetVariableCount ( RTselector *selector,* unsigned int * *count* )

Returns the number of variables attached to a Selector node.

**Description**

rtSelectorGetVariableCount returns in *count* the number of variables that are currently attached to the Selector node *selector*.

**Parameters**

| | | |
|---|---|---|
| in | *selector* | Selector node handle |
| out | *count* | Number of variables associated with *selector* |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtSelectorGetVariableCount was introduced in OptiX 1.0.

**See also** rtSelectorDeclareVariable, rtSelectorQueryVariable, rtSelectorRemoveVariable, rtSelectorGetVariable

#### 5.6.2.10 RTresult RTAPI rtSelectorGetVisitProgram ( RTselector *selector,* RTprogram * *program* )

Returns the currently assigned visit program.

**Description**

rtSelectorGetVisitProgram returns in *program* a handle of the visit program curently bound to *selector*.

**Parameters**

| | | |
|---|---|---|
| in | *selector* | Selector node handle |
| out | *program* | Current visit progam assigned to *selector* |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtSelectorGetVisitProgram was introduced in OptiX 1.0.

**See also** rtSelectorSetVisitProgram

#### 5.6.2.11 RTresult RTAPI rtSelectorQueryVariable ( RTselector *selector,* const char * *name,* RTvariable * *v* )

Returns a variable associated with a Selector node.

**Description**

Returns in *v* a handle to the variable identified by *name*, which is associated with the Selector node *selector*. The current value of a variable can be retrieved from its handle by using an appropriate *rtVariableGet{...}* function matching the variable's type.

**Parameters**

| | | |
|---|---|---|
| in | *selector* | Selector node handle |
| in | *name* | Variable identifier |
| out | *v* | Variable handle |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtSelectorQueryVariable was introduced in OptiX 1.0.

**See also** rtSelectorDeclareVariable, rtSelectorRemoveVariable, rtSelectorGetVariableCount, rtSelectorGetVariable, *rtVariableGet{...}*

#### 5.6.2.12 RTresult RTAPI rtSelectorRemoveVariable ( RTselector *selector,* RTvariable *v* )

Removes a variable from a Selector node.

**Description**

rtSelectorRemoveVariable removes the variable *v* from the Selector node *selector* and deletes it. The handle *v* must be considered invalid afterwards.

**Parameters**

| | | |
|---|---|---|
| in | *selector* | Selector node handle |
| in | *v* | Variable handle |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_VARIABLE_NOT_FOUND

**History**

rtSelectorRemoveVariable was introduced in OptiX 1.0.

**See also** rtSelectorDeclareVariable, rtSelectorQueryVariable, rtSelectorGetVariableCount, rtSelectorGetVariable

#### 5.6.2.13 RTresult RTAPI rtSelectorSetChild ( RTselector *selector,* unsigned int *index,* RTobject *child* )

Attaches a child node to a Selector node.

**Description**

Attaches a new child node *child* to the parent node *selector*. *index* specifies the number of the slot where the child node gets attached. The index value must be lower than the number previously set by

rtSelectorSetChildCount, thus it must be in the range from *0* to rtSelectorGetChildCount *-1*. Legal child node types are RTgroup, RTselector, RTgeometrygroup, and RTtransform.

**Parameters**

| | | |
|---|---|---|
| in | *selector* | Selector node handle |
| in | *index* | Index of the parent slot the node *child* gets attached to |
| in | *child* | Child node to be attached. Can be {RTgroup, RTselector, RTgeometrygroup, RTtransform} |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtSelectorSetChild was introduced in OptiX 1.0.

**See also** rtSelectorSetChildCount, rtSelectorGetChildCount, rtSelectorGetChild, rtSelectorGetChildType

#### 5.6.2.14 RTresult RTAPI rtSelectorSetChildCount ( RTselector *selector,* unsigned int *count* )

Specifies the number of child nodes to be attached to a Selector node.

**Description**

rtSelectorSetChildCount allocates a number of children slots, i.e., it pre-defines the exact number of child nodes the parent Selector node *selector* will have. Child nodes have to be attached to the Selector node using rtSelectorSetChild. Empty slots will cause a validation error.

**Parameters**

| | | |
|---|---|---|
| in | *selector* | Selector node handle |
| in | *count* | Number of child nodes to be attached to *selector* |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtSelectorSetChildCount was introduced in OptiX 1.0.

**See also** rtSelectorValidate, rtSelectorGetChildCount, rtSelectorSetChild, rtSelectorGetChild, rtSelectorGetChildType

#### 5.6.2.15 RTresult RTAPI rtSelectorSetVisitProgram ( RTselector *selector,* RTprogram *program* )

Assigns a visit program to a Selector node.

**Description**

rtSelectorSetVisitProgram specifies a visit program that is executed when the Selector node *selector* gets visited by a ray during traversal of the model graph. A visit program steers how traversal of the

Selectors's children is performed. It usually chooses only a single child to continue traversal, but is also allowed to process zero or multiple children. Programs can be created from PTX files using rtProgramCreateFromPTXFile.

**Parameters**

| | | |
|---|---|---|
| in | *selector* | Selector node handle |
| in | *program* | Program handle associated with a visit program |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_TYPE_MISMATCH

**History**

rtSelectorSetVisitProgram was introduced in OptiX 1.0.

**See also** rtSelectorGetVisitProgram, rtProgramCreateFromPTXFile

#### 5.6.2.16 RTresult RTAPI rtSelectorValidate ( RTselector *selector* )

Checks a Selector node for internal consistency.

**Description**

rtSelectorValidate recursively checks consistency of the Selector node *selector* and its children, i.e., it tries to validate the whole model sub-tree with *selector* as root. For a Selector node to be valid, it must be assigned a visit program, and the number of its children must match the number specified by rtSelectorSetChildCount.

**Parameters**

| | | |
|---|---|---|
| in | *selector* | Selector root node of a model sub-tree to be validated |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtSelectorValidate was introduced in OptiX 1.0.

**See also** rtSelectorCreate, rtSelectorDestroy, rtSelectorGetContext, rtSelectorSetVisitProgram, rtSelectorSetChildCount, rtSelectorSetChild

## 5.7 TransformNode functions

### Functions

- RTresult RTAPI rtTransformCreate (RTcontext context, RTtransform *transform)
- RTresult RTAPI rtTransformDestroy (RTtransform transform)
- RTresult RTAPI rtTransformValidate (RTtransform transform)
- RTresult RTAPI rtTransformGetContext (RTtransform transform, RTcontext *context)
- RTresult RTAPI rtTransformSetMatrix (RTtransform transform, int transpose, const float *matrix, const float *inverse_matrix)
- RTresult RTAPI rtTransformGetMatrix (RTtransform transform, int transpose, float *matrix, float *inverse_matrix)
- RTresult RTAPI rtTransformSetMotionRange (RTtransform transform, float timeBegin, float timeEnd)
- RTresult RTAPI rtTransformGetMotionRange (RTtransform transform, float *timeBegin, float *timeEnd)
- RTresult RTAPI rtTransformSetMotionBorderMode (RTtransform transform, RTmotionbordermode beginMode, RTmotionbordermode endMode)
- RTresult RTAPI rtTransformGetMotionBorderMode (RTtransform transform, RTmotionbordermode *beginMode, RTmotionbordermode *endMode)
- RTresult RTAPI rtTransformSetMotionKeys (RTtransform transform, unsigned int n, RTmotionkeytype type, const float *keys)
- RTresult RTAPI rtTransformGetMotionKeyType (RTtransform transform, RTmotionkeytype *type)
- RTresult RTAPI rtTransformGetMotionKeyCount (RTtransform transform, unsigned int *n)
- RTresult RTAPI rtTransformGetMotionKeys (RTtransform transform, float *keys)
- RTresult RTAPI rtTransformSetChild (RTtransform transform, RTobject child)
- RTresult RTAPI rtTransformGetChild (RTtransform transform, RTobject *child)
- RTresult RTAPI rtTransformGetChildType (RTtransform transform, RTobjecttype *type)

### 5.7.1 Detailed Description

Functions related to an OptiX Transform node.

### 5.7.2 Function Documentation

#### 5.7.2.1 RTresult RTAPI rtTransformCreate ( RTcontext *context*, RTtransform * *transform* )

Creates a new Transform node.

**Description**

Creates a new Transform node within the given context. For the node to be functional, a child node must be attached using rtTransformSetChild. A transformation matrix can be associated with the transform node with rtTransformSetMatrix. Sets **transform* to the handle of a newly created transform within *context*. Returns RT_ERROR_INVALID_VALUE if *transform* is *NULL*.

**Parameters**

| | | |
|---|---|---|
| in | *context* | Specifies the rendering context of the Transform node |
| out | *transform* | New Transform node handle |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtTransformCreate was introduced in OptiX 1.0.

**See also** rtTransformDestroy, rtTransformValidate, rtTransformGetContext, rtTransformSetMatrix, rtTransformGetMatrix, rtTransformSetChild, rtTransformGetChild, rtTransformGetChildType

#### 5.7.2.2 RTresult RTAPI rtTransformDestroy ( RTtransform *transform* )

Destroys a transform node.

**Description**

rtTransformDestroy removes *transform* from its context and deletes it. *transform* should be a value returned by rtTransformCreate. No child graph nodes are destroyed. After the call, *transform* is no longer a valid handle.

**Parameters**

| | | |
|---|---|---|
| in | *transform* | Handle of the transform node to destroy |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtTransformDestroy was introduced in OptiX 1.0.

**See also** rtTransformCreate, rtTransformValidate, rtTransformGetContext

#### 5.7.2.3 RTresult RTAPI rtTransformGetChild ( RTtransform *transform,* RTobject * *child* )

Returns the child node that is attached to a Transform node.

**Description**

rtTransformGetChild returns in *child* a handle of the child node currently attached to *transform*. The returned pointer is of generic type RTobject and needs to be cast to the actual child type, which can be RTgroup, RTselector, RTgeometrygroup, or RTtransform. The actual type of *child* can be queried using rtTransformGetChildType. Returns RT_ERROR_INVALID_VALUE if given a *NULL* pointer.

**Parameters**

| | | |
|---|---|---|
| in | *transform* | Transform node handle |
| out | *child* | Child node handle. Can be {RTgroup, RTselector, RTgeometrygroup, RTtransform} |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtTransformGetChild was introduced in OptiX 1.0.

**See also** rtTransformSetChild, rtTransformGetChildType

#### 5.7.2.4 RTresult RTAPI rtTransformGetChildType ( RTtransform *transform*, RTobjecttype * *type* )

Returns type information about a Transform child node.

**Description**

rtTransformGetChildType queries the type of the child node attached to *transform*. If no child is attached, **type* is set to RT_OBJECTTYPE_UNKNOWN and RT_ERROR_INVALID_VALUE is returned. Returns RT_ERROR_INVALID_VALUE if given a *NULL* pointer. The returned type is one of:

- RT_OBJECTTYPE_GROUP
- RT_OBJECTTYPE_GEOMETRY_GROUP
- RT_OBJECTTYPE_TRANSFORM
- RT_OBJECTTYPE_SELECTOR

**Parameters**

| | | |
|---|---|---|
| in | *transform* | Transform node handle |
| out | *type* | Type of the child node |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtTransformGetChildType was introduced in OptiX 1.0.

**See also** rtTransformSetChild, rtTransformGetChild

#### 5.7.2.5 RTresult RTAPI rtTransformGetContext ( RTtransform *transform*, RTcontext * *context* )

Returns the context of a Transform node.

### Description

rtTransformGetContext queries a transform node for its associated context. *transform* specifies the transform node to query, and should be a value returned by rtTransformCreate. Sets ∗*context* to the context associated with *transform*.

### Parameters

| | | |
|---|---|---|
| in | *transform* | Transform node handle |
| out | *context* | The context associated with *transform* |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

### History

rtTransformGetContext was introduced in OptiX 1.0.

**See also** rtTransformCreate, rtTransformDestroy, rtTransformValidate

#### 5.7.2.6 RTresult RTAPI rtTransformGetMatrix ( RTtransform *transform*, int *transpose*, float ∗ *matrix*, float ∗ *inverse_matrix* )

Returns the affine matrix and its inverse associated with a Transform node.

### Description

rtTransformGetMatrix returns in *matrix* the affine matrix that is currently used to perform a transformation of the geometry contained in the sub-tree with *transform* as root. The corresponding inverse matrix will be retured in *inverse_matrix*. One or both pointers are allowed to be *NULL*. If *transpose* is *0*, matrices are returned in row-major format, i.e., matrix rows are contiguously laid out in memory. If *transpose* is non-zero, matrices are returned in column-major format. If non-*NULL*, matrix pointers must point to a float array of at least 16 elements.

### Parameters

| | | |
|---|---|---|
| in | *transform* | Transform node handle |
| in | *transpose* | Flag indicating whether *matrix* and *inverse_matrix* should be transposed |
| out | *matrix* | Affine matrix (4x4 float array) |
| out | *inverse_matrix* | Inverted form of *matrix* |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

### History

rtTransformGetMatrix was introduced in OptiX 1.0.

**See also** rtTransformSetMatrix

#### 5.7.2.7 RTresult RTAPI rtTransformGetMotionBorderMode ( RTtransform *transform,* RTmotionbordermode * *beginMode,* RTmotionbordermode * *endMode* )

Returns the motion border modes of a Transform node.

**Description** TODO

**Parameters**

| | | |
|---|---|---|
| in | *transform* | Transform node handle |
| out | *beginMode* | Motion border mode at motion range begin |
| out | *endMode* | Motion border mode at motion range end |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtTransformGetMotionBorderMode was introduced in OptiX 5.0.

**See also** rtTransformSetMotionBorderMode, rtTransformGetMotionRange, rtTransformGetMotionKeyCount, rtTransformGetMotionKeyType, rtTransformGetMotionKeys,

#### 5.7.2.8 RTresult RTAPI rtTransformGetMotionKeyCount ( RTtransform *transform,* unsigned int * *n* )

Returns the number of motion keys associated with a Transform node.

**Description** TODO

**Parameters**

| | | |
|---|---|---|
| in | *transform* | Transform node handle |
| out | *n* | Number of motion steps |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtTransformGetMotionKeyCount was introduced in OptiX 5.0.

**See also** rtTransformSetMotionKeys, rtTransformGetMotionBorderMode, rtTransformGetMotionRange, rtTransformGetMotionKeyType rtTransformGetMotionKeys

#### 5.7.2.9 RTresult RTAPI rtTransformGetMotionKeys ( RTtransform *transform,* float * *keys* )

Returns the motion keys associated with a Transform node.

**Description** TODO

**Parameters**

| | | |
|---|---|---|
| in | *transform* | Transform node handle |
| out | *keys* | Motion keys associated with this Transform |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtTransformGetMotionKeys was introduced in OptiX 5.0.

**See also** rtTransformSetMotionKeys, rtTransformGetMotionBorderMode, rtTransformGetMotionRange, rtTransformGetMotionKeyCount, rtTransformGetMotionKeyType

#### 5.7.2.10 RTresult RTAPI rtTransformGetMotionKeyType ( RTtransform *transform,* RTmotionkeytype * *type* )

Returns the motion key type associated with a Transform node.

**Description** TODO

**Parameters**

| | | |
|---|---|---|
| in | *transform* | Transform node handle |
| out | *type* | Motion key type associated with this Transform |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtTransformGetMotionKeyType was introduced in OptiX 5.0.

**See also** rtTransformSetMotionKeys, rtTransformGetMotionBorderMode, rtTransformGetMotionRange, rtTransformGetMotionKeyCount, rtTransformGetMotionKeys

#### 5.7.2.11 RTresult RTAPI rtTransformGetMotionRange ( RTtransform *transform,* float * *timeBegin,* float * *timeEnd* )

Returns the motion time range associated with a Transform node.

**Description** TODO

**Parameters**

| | | |
|---|---|---|
| in | *transform* | Transform node handle |
| out | *timeBegin* | Beginning time value of range |
| out | *timeEnd* | Ending time value of range |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtTransformGetMotionRange was introduced in OptiX 5.0.

**See also** rtTransformSetMotionRange, rtTransformGetMotionBorderMode, rtTransformGetMotionKeyCount, rtTransformGetMotionKeyType, rtTransformGetMotionKeys,

#### 5.7.2.12 RTresult RTAPI rtTransformSetChild ( RTtransform *transform,* RTobject *child* )

Attaches a child node to a Transform node.

**Description**

Attaches a child node *child* to the parent node *transform*. Legal child node types are RTgroup, RTselector, RTgeometrygroup, and RTtransform. A transform node must have exactly one child. If a tranformation matrix has been attached to *transform* with rtTransformSetMatrix, it is effective on the model sub-tree with *child* as root node.

**Parameters**

| | | |
|---|---|---|
| in | *transform* | Transform node handle |
| in | *child* | Child node to be attached. Can be {RTgroup, RTselector, RTgeometrygroup, RTtransform} |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtTransformSetChild was introduced in OptiX 1.0.

**See also** rtTransformSetMatrix, rtTransformGetChild, rtTransformGetChildType

#### 5.7.2.13 RTresult RTAPI rtTransformSetMatrix ( RTtransform *transform,* int *transpose,* const float * *matrix,* const float * *inverse_matrix* )

Associates an affine transformation matrix with a Transform node.

**Description**

rtTransformSetMatrix associates a 4x4 matrix with the Transform node *transform*. The provided transformation matrix results in a corresponding affine transformation of all geometry contained in the sub-tree with *transform* as root. At least one of the pointers *matrix* and *inverse_matrix* must be non-*NULL*. If exactly one pointer is valid, the other matrix will be computed. If both are valid, the

matrices will be used as-is. If *transpose* is *0*, source matrices are expected to be in row-major format, i.e., matrix rows are contiguously laid out in memory:

float matrix[4∗4] = { a11, a12, a13, a14, a21, a22, a23, a24, a31, a32, a33, a34, a41, a42, a43, a44 };

Here, the translational elements *a14*, *a24*, and *a34* are at the 4th, 8th, and 12th position the matrix array. If the supplied matrices are in column-major format, a non-0 *transpose* flag can be used to trigger an automatic transpose of the input matrices.

Calling this function clears any motion keys previously set for the Transform.

**Parameters**

| | | |
|---|---|---|
| in | *transform* | Transform node handle |
| in | *transpose* | Flag indicating whether *matrix* and *inverse_matrix* should be transposed |
| in | *matrix* | Affine matrix (4x4 float array) |
| in | *inverse_matrix* | Inverted form of *matrix* |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtTransformSetMatrix was introduced in OptiX 1.0.

**See also** rtTransformGetMatrix

#### 5.7.2.14 RTresult RTAPI rtTransformSetMotionBorderMode ( RTtransform *transform*, RTmotionbordermode *beginMode*, RTmotionbordermode *endMode* )

Sets the motion border modes of a Transform node.

**Description** TODO

**Parameters**

| | | |
|---|---|---|
| in | *transform* | Transform node handle |
| in | *beginMode* | Motion border mode at motion range begin |
| in | *endMode* | Motion border mode at motion range end |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtTransformSetMotionBorderMode was introduced in OptiX 5.0.

**See also** rtTransformGetMotionBorderMode, rtTransformSetMotionRange, rtTransformSetMotionKeys,

#### 5.7.2.15 RTresult RTAPI rtTransformSetMotionKeys ( RTtransform *transform,* unsigned int *n,* RTmotionkeytype *type,* const float * *keys* )

Sets the motion keys associated with a Transform node.

**Description** TODO

**Parameters**

| | | |
|---|---|---|
| in | *transform* | Transform node handle |
| in | *n* | Number of motion keys |
| in | *type* | Type of motion keys |
| in | *keys* | *n* Motion keys associated with this Transform |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtTransformSetMotionKeys was introduced in OptiX 5.0.

**See also** rtTransformGetMotionKeyCount, rtTransformGetMotionKeyType, rtTransformGetMotionKeys, rtTransformSetMotionBorderMode, rtTransformSetMotionRange,

#### 5.7.2.16 RTresult RTAPI rtTransformSetMotionRange ( RTtransform *transform,* float *timeBegin,* float *timeEnd* )

Sets the motion time range for a Transform node.

**Description** Sets the motion time range [timeBegin, timeEnd] for a Transform node, where timeBegin <= timeEnd. The default time range is [0.0, 1.0].

**Parameters**

| | | |
|---|---|---|
| in | *transform* | Transform node handle |
| in | *timeBegin* | Beginning time value of range |
| in | *timeEnd* | Ending time value of range |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtTransformSetMotionRange was introduced in OptiX 5.0.

**See also** rtTransformGetMotionRange, rtTransformSetMotionBorderMode, rtTransformSetMotionKeys,

#### 5.7.2.17 RTresult RTAPI rtTransformValidate ( RTtransform *transform* )

Checks a Transform node for internal consistency.

**Description**

rtTransformValidate recursively checks consistency of the Transform node *transform* and its child, i.e., it tries to validate the whole model sub-tree with *transform* as root. For a Transform node to be valid, it must have a child node attached. It is, however, not required to explicitly set a transformation matrix. Without a specified transformation matrix, the identity matrix is applied.

### Parameters

| | | |
|---|---|---|
| `in` | *transform* | Transform root node of a model sub-tree to be validated |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

### History

rtTransformValidate was introduced in OptiX 1.0.

**See also** rtTransformCreate, rtTransformDestroy, rtTransformGetContext, rtTransformSetMatrix, rtTransformSetChild

## 5.8 Acceleration functions

### Functions

- RTresult RTAPI rtAccelerationCreate (RTcontext context, RTacceleration *acceleration)
- RTresult RTAPI rtAccelerationDestroy (RTacceleration acceleration)
- RTresult RTAPI rtAccelerationValidate (RTacceleration acceleration)
- RTresult RTAPI rtAccelerationGetContext (RTacceleration acceleration, RTcontext *context)
- RTresult RTAPI rtAccelerationSetBuilder (RTacceleration acceleration, const char *builder)
- RTresult RTAPI rtAccelerationGetBuilder (RTacceleration acceleration, const char **return_string)
- RTresult RTAPI rtAccelerationSetProperty (RTacceleration acceleration, const char *name, const char *value)
- RTresult RTAPI rtAccelerationGetProperty (RTacceleration acceleration, const char *name, const char **return_string)
- RTresult RTAPI rtAccelerationMarkDirty (RTacceleration acceleration)
- RTresult RTAPI rtAccelerationIsDirty (RTacceleration acceleration, int *dirty)

### 5.8.1 Detailed Description

Functions related to an OptiX Acceleration Structure node.

### 5.8.2 Function Documentation

#### 5.8.2.1 RTresult RTAPI rtAccelerationCreate ( RTcontext *context*, RTacceleration * *acceleration* )

Creates a new acceleration structure.

**Description**

rtAccelerationCreate creates a new ray tracing acceleration structure within a context. An acceleration structure is used by attaching it to a group or geometry group by calling rtGroupSetAcceleration or rtGeometryGroupSetAcceleration. Note that an acceleration structure can be shared by attaching it to multiple groups or geometry groups if the underlying geometric structures are the same, see rtGroupSetAcceleration and rtGeometryGroupSetAcceleration for more details. A newly created acceleration structure is initially in dirty state. Sets **acceleration* to the handle of a newly created acceleration structure within *context*. Returns RT_ERROR_INVALID_VALUE if *acceleration* is *NULL*.

**Parameters**

| | | |
|---|---|---|
| in | *context* | Specifies a context within which to create a new acceleration structure |
| out | *acceleration* | Returns the newly created acceleration structure |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtAccelerationCreate was introduced in OptiX 1.0.

**See also** rtAccelerationDestroy, rtContextCreate, rtAccelerationMarkDirty, rtAccelerationIsDirty, rtGroupSetAcceleration, rtGeometryGroupSetAcceleration

#### 5.8.2.2 RTresult RTAPI rtAccelerationDestroy ( RTacceleration *acceleration* )

Destroys an acceleration structure object.

**Description**

rtAccelerationDestroy removes *acceleration* from its context and deletes it. *acceleration* should be a value returned by rtAccelerationCreate. After the call, *acceleration* is no longer a valid handle.

**Parameters**

| | | |
|---|---|---|
| `in` | *acceleration* | Handle of the acceleration structure to destroy |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtAccelerationDestroy was introduced in OptiX 1.0.

**See also** rtAccelerationCreate

#### 5.8.2.3 RTresult RTAPI rtAccelerationGetBuilder ( RTacceleration *acceleration,* const char ** *return_string* )

Query the current builder from an acceleration structure.

**Description**

rtAccelerationGetBuilder returns the name of the builder currently used in the acceleration structure *acceleration*. If no builder has been set for *acceleration*, an empty string is returned. *return_string* will be set to point to the returned string. The memory *return_string* points to will be valid until the next API call that returns a string.

**Parameters**

| | | |
|---|---|---|
| `in` | *acceleration* | The acceleration structure handle |
| `out` | *return_string* | Return string buffer |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtAccelerationGetBuilder was introduced in OptiX 1.0.

**See also** rtAccelerationSetBuilder

#### 5.8.2.4 RTresult RTAPI rtAccelerationGetContext ( RTacceleration *acceleration,* RTcontext * *context* )

Returns the context associated with an acceleration structure.

**Description**

rtAccelerationGetContext queries an acceleration structure for its associated context. The context handle is returned in ∗*context*.

**Parameters**

| | | |
|---|---|---|
| in | *acceleration* | The acceleration structure handle |
| out | *context* | Returns the context associated with the acceleration structure |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtAccelerationGetContext was introduced in OptiX 1.0.

**See also** rtAccelerationCreate

### 5.8.2.5 RTresult RTAPI rtAccelerationGetProperty ( RTacceleration *acceleration,* const char ∗ *name,* const char ∗∗ *return_string* )

Queries an acceleration structure property.

**Description**

rtAccelerationGetProperty returns the value of the acceleration structure property *name*. See rtAccelerationSetProperty for a list of supported properties. If the property name is not found, an empty string is returned. *return_string* will be set to point to the returned string. The memory *return_string* points to will be valid until the next API call that returns a string.

**Parameters**

| | | |
|---|---|---|
| in | *acceleration* | The acceleration structure handle |
| in | *name* | The name of the property to be queried |
| out | *return_string* | Return string buffer |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtAccelerationGetProperty was introduced in OptiX 1.0.

**See also** rtAccelerationSetProperty, rtAccelerationSetBuilder,

### 5.8.2.6 RTresult RTAPI rtAccelerationIsDirty ( RTacceleration *acceleration,* int ∗ *dirty* )

Returns the dirty flag of an acceleration structure.

**Description**

rtAccelerationIsDirty returns whether the acceleration structure is currently marked dirty. If the flag is set, a nonzero value will be returned in ∗*dirty*. Otherwise, zero is returned.

Any acceleration structure which is marked dirty will be rebuilt on a call to one of the rtContextLaunch functions, and its dirty flag will be reset.

An acceleration structure which is not marked dirty will never be rebuilt, even if associated groups, geometry, properties, or any other values have changed.

Initially after creation, acceleration structures are marked dirty.

**Parameters**

| | | |
|---|---|---|
| `in` | *acceleration* | The acceleration structure handle |
| `out` | *dirty* | Returned dirty flag |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtAccelerationIsDirty was introduced in OptiX 1.0.

**See also** rtAccelerationMarkDirty, rtContextLaunch functions

#### 5.8.2.7 RTresult RTAPI rtAccelerationMarkDirty ( RTacceleration *acceleration* )

Marks an acceleration structure as dirty.

**Description**

rtAccelerationMarkDirty sets the dirty flag for *acceleration*.

Any acceleration structure which is marked dirty will be rebuilt on a call to one of the rtContextLaunch functions, and its dirty flag will be reset.

An acceleration structure which is not marked dirty will never be rebuilt, even if associated groups, geometry, properties, or any other values have changed.

Initially after creation, acceleration structures are marked dirty.

**Parameters**

| | | |
|---|---|---|
| `in` | *acceleration* | The acceleration structure handle |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtAccelerationMarkDirty was introduced in OptiX 1.0.

**See also** rtAccelerationIsDirty, rtContextLaunch functions

#### 5.8.2.8 RTresult RTAPI rtAccelerationSetBuilder ( RTacceleration *acceleration,* const char * *builder* )

Specifies the builder to be used for an acceleration structure.

**Description**

rtAccelerationSetBuilder specifies the method used to construct the ray tracing acceleration structure represented by *acceleration*. A builder must be set for the acceleration structure to pass validation. The current builder can be changed at any time, including after a call to rtContextLaunch. In this case, data

previously computed for the acceleration structure is invalidated and the acceleration will be marked dirty.

*builder* can take one of the following values:

- "NoAccel": Specifies that no acceleration structure is explicitly built. Traversal linearly loops through the list of primitives to intersect. This can be useful e.g. for higher level groups with only few children, where managing a more complex structure introduces unnecessary overhead.
- "Bvh": A standard bounding volume hierarchy, useful for most types of graph levels and geometry. Medium build speed, good ray tracing performance.
- "Sbvh": A high quality BVH variant for maximum ray tracing performance. Slower build speed and slightly higher memory footprint than "Bvh".
- "Trbvh": High quality similar to Sbvh but with fast build performance. The Trbvh builder uses about 2.5 times the size of the final BVH for scratch space. A CPU-based Trbvh builder that does not have the memory constraints is available. OptiX includes an optional automatic fallback to the CPU version when out of GPU memory. Please refer to the Programming Guide for more details.
- "MedianBvh": Deprecated in OptiX 4.0. This builder is now internally remapped to Trbvh.
- "Lbvh": Deprecated in OptiX 4.0. This builder is now internally remapped to Trbvh.
- "TriangleKdTree": Deprecated in OptiX 4.0. This builder is now internally remapped to Trbvh.

**Parameters**

| | | |
|---|---|---|
| `in` | *acceleration* | The acceleration structure handle |
| `in` | *builder* | String value specifying the builder type |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtAccelerationSetBuilder was introduced in OptiX 1.0.

**See also** rtAccelerationGetBuilder, rtAccelerationSetProperty

### 5.8.2.9 RTresult RTAPI rtAccelerationSetProperty ( RTacceleration *acceleration,* const char * *name,* const char * *value* )

Sets an acceleration structure property.

**Description**

rtAccelerationSetProperty sets a named property value for an acceleration structure. Properties can be used to fine tune the way an acceleration structure is built, in order to achieve faster build times or better ray tracing performance. Properties are evaluated and applied by the acceleration structure during build time, and different builders recognize different properties. Setting a property will never fail as long as *acceleration* is a valid handle. Properties that are not recognized by an acceleration structure will be ignored.

The following is a list of the properties used by the individual builders:

- "refit": Available in: Trbvh, Bvh If set to "1", the builder will only readjust the node bounds of the bounding volume hierarchy instead of constructing it from scratch. Refit is only effective if there is an initial BVH already in place, and the underlying geometry has undergone relatively modest deformation. In this case, the builder delivers a very fast BVH update without sacrificing too much ray tracing performance. The default is "0".
- "vertex_buffer_name": Available in: Trbvh, Sbvh The name of the buffer variable holding triangle vertex data. Each vertex consists of 3 floats. The default is "vertex_buffer".

- "vertex_buffer_stride": Available in: Trbvh, Sbvh The offset between two vertices in the vertex buffer, given in bytes. The default value is "0", which assumes the vertices are tightly packed.
- "index_buffer_name": Available in: Trbvh, Sbvh The name of the buffer variable holding vertex index data. The entries in this buffer are indices of type int, where each index refers to one entry in the vertex buffer. A sequence of three indices represents one triangle. If no index buffer is given, the vertices in the vertex buffer are assumed to be a list of triangles, i.e. every 3 vertices in a row form a triangle. The default is "index_buffer".
- "index_buffer_stride": Available in: Trbvh, Sbvh The offset between two indices in the index buffer, given in bytes. The default value is "0", which assumes the indices are tightly packed.
- "chunk_size": Available in: Trbvh Number of bytes to be used for a partitioned acceleration structure build. If no chunk size is set, or set to "0", the chunk size is chosen automatically. If set to "-1", the chunk size is unlimited. The minimum chunk size is 64MB. Please note that specifying a small chunk size reduces the peak-memory footprint of the Trbvh but can result in slower rendering performance.
- " motion_steps" Available in: Trbvh Number of motion steps to build into an acceleration structure that contains motion geometry or motion transforms. Ignored for acceleration structures built over static nodes. Gives a tradeoff between device memory and time: if the input geometry or transforms have many motion steps, then increasing the motion steps in the acceleration structure may result in faster traversal, at the cost of linear increase in memory usage. Default 2, and clamped >=1.

**Parameters**

| | | |
|---|---|---|
| in | *acceleration* | The acceleration structure handle |
| in | *name* | String value specifying the name of the property |
| in | *value* | String value specifying the value of the property |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtAccelerationSetProperty was introduced in OptiX 1.0.

**See also** rtAccelerationGetProperty, rtAccelerationSetBuilder,

#### 5.8.2.10 RTresult RTAPI rtAccelerationValidate ( RTacceleration *acceleration* )

Validates the state of an acceleration structure.

**Description**

rtAccelerationValidate checks *acceleration* for completeness. If *acceleration* is not valid, returns RT_ERROR_INVALID_VALUE.

**Parameters**

| | | |
|---|---|---|
| in | *acceleration* | The acceleration structure handle |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtAccelerationValidate was introduced in OptiX 1.0.

**See also** rtAccelerationCreate

## 5.9 GeometryInstance functions

### Functions

- RTresult RTAPI rtGeometryInstanceCreate (RTcontext context, RTgeometryinstance *geometryinstance)
- RTresult RTAPI rtGeometryInstanceDestroy (RTgeometryinstance geometryinstance)
- RTresult RTAPI rtGeometryInstanceValidate (RTgeometryinstance geometryinstance)
- RTresult RTAPI rtGeometryInstanceGetContext (RTgeometryinstance geometryinstance, RTcontext *context)
- RTresult RTAPI rtGeometryInstanceSetGeometry (RTgeometryinstance geometryinstance, RTgeometry geometry)
- RTresult RTAPI rtGeometryInstanceGetGeometry (RTgeometryinstance geometryinstance, RTgeometry *geometry)
- RTresult RTAPI rtGeometryInstanceSetMaterialCount (RTgeometryinstance geometryinstance, unsigned int count)
- RTresult RTAPI rtGeometryInstanceGetMaterialCount (RTgeometryinstance geometryinstance, unsigned int *count)
- RTresult RTAPI rtGeometryInstanceSetMaterial (RTgeometryinstance geometryinstance, unsigned int index, RTmaterial material)
- RTresult RTAPI rtGeometryInstanceGetMaterial (RTgeometryinstance geometryinstance, unsigned int index, RTmaterial *material)
- RTresult RTAPI rtGeometryInstanceDeclareVariable (RTgeometryinstance geometryinstance, const char *name, RTvariable *v)
- RTresult RTAPI rtGeometryInstanceQueryVariable (RTgeometryinstance geometryinstance, const char *name, RTvariable *v)
- RTresult RTAPI rtGeometryInstanceRemoveVariable (RTgeometryinstance geometryinstance, RTvariable v)
- RTresult RTAPI rtGeometryInstanceGetVariableCount (RTgeometryinstance geometryinstance, unsigned int *count)
- RTresult RTAPI rtGeometryInstanceGetVariable (RTgeometryinstance geometryinstance, unsigned int index, RTvariable *v)

### 5.9.1 Detailed Description

Functions related to an OptiX Geometry Instance node.

### 5.9.2 Function Documentation

#### 5.9.2.1 RTresult RTAPI rtGeometryInstanceCreate ( RTcontext *context,* RTgeometryinstance * *geometryinstance* )

Creates a new geometry instance node.

**Description**

rtGeometryInstanceCreate creates a new geometry instance node within a context. *context* specifies the target context, and should be a value returned by rtContextCreate. Sets **geometryinstance* to the handle of a newly created geometry instance within *context*. Returns RT_ERROR_INVALID_VALUE if *geometryinstance* is *NULL*.

**Parameters**

| | | |
|---|---|---|
| `in` | *context* | Specifies the rendering context of the GeometryInstance node |
| `out` | *geometryinstance* | New GeometryInstance node handle |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryInstanceCreate was introduced in OptiX 1.0.

**See also** rtGeometryInstanceDestroy, rtGeometryInstanceDestroy, rtGeometryInstanceGetContext

#### 5.9.2.2 RTresult RTAPI rtGeometryInstanceDeclareVariable ( RTgeometryinstance *geometryinstance*, const char * *name*, RTvariable * *v* )

Declares a new named variable associated with a geometry node.

**Description**

rtGeometryInstanceDeclareVariable declares a new variable associated with a geometry instance node. *geometryinstance* specifies the target geometry node, and should be a value returned by rtGeometryInstanceCreate. *name* specifies the name of the variable, and should be a *NULL-terminated* string. If there is currently no variable associated with *geometryinstance* named *name*, a new variable named *name* will be created and associated with *geometryinstance*. After the call, $*v$ will be set to the handle of the newly-created variable. Otherwise, $*v$ will be set to *NULL*. After declaration, the variable can be queried with rtGeometryInstanceQueryVariable or rtGeometryInstanceGetVariable. A declared variable does not have a type until its value is set with one of the Variable setters functions. Once a variable is set, its type cannot be changed anymore.

**Parameters**

| | | |
|---|---|---|
| `in` | *geometryinstance* | Specifies the associated GeometryInstance node |
| `in` | *name* | The name that identifies the variable |
| `out` | *v* | Returns a handle to a newly declared variable |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryInstanceDeclareVariable was introduced in OptiX 1.0.

**See also** Variable functions, rtGeometryInstanceQueryVariable, rtGeometryInstanceGetVariable, rtGeometryInstanceRemoveVariable

#### 5.9.2.3 RTresult RTAPI rtGeometryInstanceDestroy ( RTgeometryinstance *geometryinstance* )

Destroys a geometry instance node.

**Description**

rtGeometryInstanceDestroy removes *geometryinstance* from its context and deletes it. *geometryinstance* should be a value returned by rtGeometryInstanceCreate. Associated variables declared via rtGeometryInstanceDeclareVariable are destroyed, but no child graph nodes are destroyed. After the call, *geometryinstance* is no longer a valid handle.

**Parameters**

| | | |
|---|---|---|
| `in` | *geometryinstance* | Handle of the geometry instance node to destroy |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryInstanceDestroy was introduced in OptiX 1.0.

**See also** rtGeometryInstanceCreate

#### 5.9.2.4 RTresult RTAPI rtGeometryInstanceGetContext ( RTgeometryinstance *geometryinstance,* RTcontext * *context* )

Returns the context associated with a geometry instance node.

**Description**

rtGeometryInstanceGetContext queries a geometry instance node for its associated context. *geometryinstance* specifies the geometry node to query, and should be a value returned by rtGeometryInstanceCreate. Sets **context* to the context associated with *geometryinstance*.

**Parameters**

| | | |
|---|---|---|
| `in` | *geometryinstance* | Specifies the geometry instance |
| `out` | *context* | Handle for queried context |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryInstanceGetContext was introduced in OptiX 1.0.

**See also** rtGeometryInstanceGetContext

#### 5.9.2.5 RTresult RTAPI rtGeometryInstanceGetGeometry ( RTgeometryinstance *geometryinstance,* RTgeometry * *geometry* )

Returns the attached Geometry node.

**Description**

rtGeometryInstanceGetGeometry sets *geometry* to the handle of the attached Geometry node. If no Geometry node is attached, RT_ERROR_INVALID_VALUE is returned, else RT_SUCCESS.

**Parameters**

| | | |
|---|---|---|
| in | *geometryinstance* | GeometryInstance node handle to query geometry |
| out | *geometry* | Handle to attached Geometry node |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryInstanceGetGeometry was introduced in OptiX 1.0.

**See also** rtGeometryInstanceCreate, rtGeometryInstanceDestroy, rtGeometryInstanceValidate, rtGeometryInstanceSetGeometry

#### 5.9.2.6 RTresult RTAPI rtGeometryInstanceGetMaterial ( RTgeometryinstance *geometryinstance,* unsigned int *index,* RTmaterial * *material* )

Returns a material handle.

**Description**

rtGeometryInstanceGetMaterial returns handle *material* for the Material node at position *index* in the material list of *geometryinstance*. Returns RT_ERROR_INVALID_VALUE if *index* is invalid.

**Parameters**

| | | |
|---|---|---|
| in | *geometryinstance* | GeometryInstance node handle to query material |
| in | *index* | Index of material |
| out | *material* | Handle to material |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryInstanceGetMaterial was introduced in OptiX 1.0.

**See also** rtGeometryInstanceGetMaterialCount, rtGeometryInstanceSetMaterial

#### 5.9.2.7 RTresult RTAPI rtGeometryInstanceGetMaterialCount ( RTgeometryinstance *geometryinstance,* unsigned int * *count* )

Returns the number of attached materials.

**Description**

rtGeometryInstanceGetMaterialCount returns for *geometryinstance* the number of attached Material nodes *count*. The number of materies can be set with rtGeometryInstanceSetMaterialCount.

**Parameters**

| | | |
|---|---|---|
| in | *geometryinstance* | GeometryInstance node to query from the number of materials |
| out | *count* | Number of attached materials |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtGeometryInstanceGetMaterialCount was introduced in OptiX 1.0.

**See also** rtGeometryInstanceSetMaterialCount

#### 5.9.2.8 RTresult RTAPI rtGeometryInstanceGetVariable ( RTgeometryinstance *geometryinstance,* unsigned int *index,* RTvariable * *v* )

Returns a handle to an indexed variable of a geometry instance node.

**Description**

rtGeometryInstanceGetVariable queries the handle of a geometry instance's indexed variable. *geometryinstance* specifies the target geometry instance and should be a value returned by rtGeometryInstanceCreate. *index* specifies the index of the variable, and should be a value less than rtGeometryInstanceGetVariableCount. If *index* is the index of a variable attached to *geometryinstance*, returns a handle to that variable in *v*, and *NULL* otherwise. *v* must be declared first with rtGeometryInstanceDeclareVariable before it can be queried.

**Parameters**

| | | |
|---|---|---|
| in | *geometryinstance* | The GeometryInstance node from which to query a variable |
| in | *index* | The index that identifies the variable to be queried |
| out | *v* | Returns handle to indexed variable |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_VARIABLE_NOT_FOUND

**History**

rtGeometryInstanceGetVariable was introduced in OptiX 1.0.

**See also** rtGeometryDeclareVariable, rtGeometryGetVariableCount, rtGeometryRemoveVariable, rtGeometryQueryVariable

#### 5.9.2.9 RTresult RTAPI rtGeometryInstanceGetVariableCount ( RTgeometryinstance *geometryinstance,* unsigned int * *count* )

Returns the number of attached variables.

**Description**

rtGeometryInstanceGetVariableCount queries the number of variables attached to a geometry instance. *geometryinstance* specifies the geometry instance, and should be a value returned by rtGeometryInstanceCreate. After the call, the number of variables attached to *geometryinstance* is returned to **count*.

**Parameters**

| | | |
|---|---|---|
| in | *geometryinstance* | The GeometryInstance node to query from the number of attached variables |
| out | *count* | Returns the number of attached variables |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryInstanceGetVariableCount was introduced in OptiX 1.0.

**See also** rtGeometryInstanceGetVariableCount, rtGeometryInstanceDeclareVariable, rtGeometryInstanceRemoveVariable

#### 5.9.2.10 RTresult RTAPI rtGeometryInstanceQueryVariable ( RTgeometryinstance *geometryinstance,* const char * *name,* RTvariable * *v* )

Returns a handle to a named variable of a geometry node.

**Description**

rtGeometryInstanceQueryVariable queries the handle of a geometry instance node's named variable. *geometryinstance* specifies the target geometry instance node, as returned by rtGeometryInstanceCreate. *name* specifies the name of the variable, and should be a *NULL -terminated* string. If *name* is the name of a variable attached to *geometryinstance*, returns a handle to that variable in **v*, otherwise *NULL*. Geometry instance variables have to be declared with rtGeometryInstanceDeclareVariable before they can be queried.

**Parameters**

| | | |
|---|---|---|
| in | *geometryinstance* | The GeometryInstance node to query from a variable |

| | | |
|---|---|---|
| in | *name* | The name that identifies the variable to be queried |
| out | *v* | Returns the named variable |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryInstanceQueryVariable was introduced in OptiX 1.0.

**See also** rtGeometryInstanceDeclareVariable, rtGeometryInstanceRemoveVariable, rtGeometryInstanceGetVariableCount, rtGeometryInstanceGetVariable

#### 5.9.2.11 RTresult RTAPI rtGeometryInstanceRemoveVariable ( RTgeometryinstance *geometryinstance,* RTvariable *v* )

Removes a named variable from a geometry instance node.

**Description**

rtGeometryInstanceRemoveVariable removes a named variable from a geometry instance. The target geometry instance is specified by *geometryinstance*, which should be a value returned by rtGeometryInstanceCreate. The variable to be removed is specified by *v*, which should be a value returned by rtGeometryInstanceDeclareVariable. Once a variable has been removed from this geometry instance, another variable with the same name as the removed variable may be declared.

**Parameters**

| | | |
|---|---|---|
| in | *geometryinstance* | The GeometryInstance node from which to remove a variable |
| in | *v* | The variable to be removed |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_VARIABLE_NOT_FOUND

**History**

rtGeometryInstanceRemoveVariable was introduced in OptiX 1.0.

**See also** rtContextRemoveVariable, rtGeometryInstanceDeclareVariable

#### 5.9.2.12 RTresult RTAPI rtGeometryInstanceSetGeometry ( RTgeometryinstance *geometryinstance,* RTgeometry *geometry* )

Attaches a Geometry node.

**Description**

rtGeometryInstanceSetGeometry attaches a Geometry node to a GeometryInstance. Only *one* Geometry node can be attached to a GeometryInstance. However, it is at any time possible to attach a different Geometry node.

**Parameters**

| | | |
|---|---|---|
| in | *geometryinstance* | GeometryInstance node handle to attach geometry |
| in | *geometry* | Geometry handle to attach to *geometryinstance* |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryInstanceSetGeometry was introduced in OptiX 1.0.

**See also** rtGeometryInstanceGetGeometry

#### 5.9.2.13 RTresult RTAPI rtGeometryInstanceSetMaterial ( RTgeometryinstance *geometryinstance,* unsigned int *index,* RTmaterial *material* )

Sets a material.

**Description**

rtGeometryInstanceSetMaterial attaches *material* to *geometryinstance* at position *index* in its internal Material node list. *index* must be in the range *0* to rtGeometryInstanceGetMaterialCount - 1.

**Parameters**

| | | |
|---|---|---|
| in | *geometryinstance* | GeometryInstance node for which to set a material |
| in | *index* | Index into the material list |
| in | *material* | Material handle to attach to *geometryinstance* |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryInstanceSetMaterial was introduced in OptiX 1.0.

**See also** rtGeometryInstanceGetMaterialCount, rtGeometryInstanceSetMaterialCount

#### 5.9.2.14 RTresult RTAPI rtGeometryInstanceSetMaterialCount ( RTgeometryinstance *geometryinstance,* unsigned int *count* )

Sets the number of materials.

**Description**

rtGeometryInstanceSetMaterialCount sets the number of materials *count* that will be attached to *geometryinstance*. The number of attached materials can be changed at any time. Increasing the

number of materials will not modify already assigned materials. Decreasing the number of materials will not modify the remaining already assigned materials.

**Parameters**

| | | |
|---|---|---|
| in | *geometryinstance* | GeometryInstance node to set number of materials |
| in | *count* | Number of materials to be set |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryInstanceSetMaterialCount was introduced in OptiX 1.0.

**See also** rtGeometryInstanceGetMaterialCount

#### 5.9.2.15 RTresult RTAPI rtGeometryInstanceValidate ( RTgeometryinstance *geometryinstance* )

Checks a GeometryInstance node for internal consistency.

**Description**

rtGeometryInstanceValidate checks *geometryinstance* for completeness. If *geomertryinstance* or any of the objects attached to *geometry* are not valid, returns RT_ERROR_INVALID_VALUE.

**Parameters**

| | | |
|---|---|---|
| in | *geometryinstance* | GeometryInstance node of a model sub-tree to be validated |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryInstanceValidate was introduced in OptiX 1.0.

**See also** rtGeometryInstanceCreate

## 5.10 Geometry functions

### Functions

- RTresult RTAPI rtGeometryCreate (RTcontext context, RTgeometry *geometry)
- RTresult RTAPI rtGeometryDestroy (RTgeometry geometry)
- RTresult RTAPI rtGeometryValidate (RTgeometry geometry)
- RTresult RTAPI rtGeometryGetContext (RTgeometry geometry, RTcontext *context)
- RTresult RTAPI rtGeometrySetPrimitiveCount (RTgeometry geometry, unsigned int num_primitives)
- RTresult RTAPI rtGeometryGetPrimitiveCount (RTgeometry geometry, unsigned int *num_primitives)
- RTresult RTAPI rtGeometrySetPrimitiveIndexOffset (RTgeometry geometry, unsigned int index_offset)
- RTresult RTAPI rtGeometryGetPrimitiveIndexOffset (RTgeometry geometry, unsigned int *index_offset)
- RTresult RTAPI rtGeometrySetMotionRange (RTgeometry geometry, float timeBegin, float timeEnd)
- RTresult RTAPI rtGeometryGetMotionRange (RTgeometry geometry, float *timeBegin, float *timeEnd)
- RTresult RTAPI rtGeometrySetMotionBorderMode (RTgeometry geometry, RTmotionbordermode beginMode, RTmotionbordermode endMode)
- RTresult RTAPI rtGeometryGetMotionBorderMode (RTgeometry geometry, RTmotionbordermode *beginMode, RTmotionbordermode *endMode)
- RTresult RTAPI rtGeometrySetMotionSteps (RTgeometry geometry, unsigned int n)
- RTresult RTAPI rtGeometryGetMotionSteps (RTgeometry geometry, unsigned int *n)
- RTresult RTAPI rtGeometrySetBoundingBoxProgram (RTgeometry geometry, RTprogram program)
- RTresult RTAPI rtGeometryGetBoundingBoxProgram (RTgeometry geometry, RTprogram *program)
- RTresult RTAPI rtGeometrySetIntersectionProgram (RTgeometry geometry, RTprogram program)
- RTresult RTAPI rtGeometryGetIntersectionProgram (RTgeometry geometry, RTprogram *program)
- RTresult RTAPI rtGeometryDeclareVariable (RTgeometry geometry, const char *name, RTvariable *v)
- RTresult RTAPI rtGeometryQueryVariable (RTgeometry geometry, const char *name, RTvariable *v)
- RTresult RTAPI rtGeometryRemoveVariable (RTgeometry geometry, RTvariable v)
- RTresult RTAPI rtGeometryGetVariableCount (RTgeometry geometry, unsigned int *count)
- RTresult RTAPI rtGeometryGetVariable (RTgeometry geometry, unsigned int index, RTvariable *v)

### 5.10.1 Detailed Description

Functions related to an OptiX Geometry node.

### 5.10.2 Function Documentation

#### 5.10.2.1 RTresult RTAPI rtGeometryCreate ( RTcontext *context*, RTgeometry * *geometry* )

Creates a new geometry node.

### Description

rtGeometryCreate creates a new geometry node within a context. *context* specifies the target context, and should be a value returned by rtContextCreate. Sets *∗geometry* to the handle of a newly created geometry within *context*. Returns RT_ERROR_INVALID_VALUE if *geometry* is *NULL*.

### Parameters

| | | |
|---|---|---|
| in | *context* | Specifies the rendering context of the Geometry node |
| out | *geometry* | New Geometry node handle |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

### History

rtGeometryCreate was introduced in OptiX 1.0.

**See also** rtGeometryDestroy, rtGeometrySetBoundingBoxProgram, rtGeometrySetIntersectionProgram

#### 5.10.2.2 RTresult RTAPI rtGeometryDeclareVariable ( RTgeometry *geometry,* const char ∗ *name,* RTvariable ∗ *v* )

Declares a new named variable associated with a geometry instance.

### Description

rtGeometryDeclareVariable declares a new variable associated with a geometry node. *geometry* specifies the target geometry node, and should be a value returned by rtGeometryCreate. *name* specifies the name of the variable, and should be a *NULL-terminated* string. If there is currently no variable associated with *geometry* named *name*, a new variable named *name* will be created and associated with *geometry*. Returns the handle of the newly-created variable in *∗v* or *NULL* otherwise. After declaration, the variable can be queried with rtGeometryQueryVariable or rtGeometryGetVariable. A declared variable does not have a type until its value is set with one of the Variable setters functions. Once a variable is set, its type cannot be changed anymore.

### Parameters

| | | |
|---|---|---|
| in | *geometry* | Specifies the associated Geometry node |
| in | *name* | The name that identifies the variable |
| out | *v* | Returns a handle to a newly declared variable |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_VARIABLE_REDECLARED
- RT_ERROR_ILLEGAL_SYMBOL

### History

rtGeometryDeclareVariable was introduced in OptiX 1.0.

**See also** Variable functions, rtGeometryQueryVariable, rtGeometryGetVariable, rtGeometryRemoveVariable

#### 5.10.2.3 RTresult RTAPI rtGeometryDestroy ( RTgeometry *geometry* )

Destroys a geometry node.

**Description**

rtGeometryDestroy removes *geometry* from its context and deletes it. *geometry* should be a value returned by rtGeometryCreate. Associated variables declared via rtGeometryDeclareVariable are destroyed, but no child graph nodes are destroyed. After the call, *geometry* is no longer a valid handle.

**Parameters**

| | | |
|---|---|---|
| in | *geometry* | Handle of the geometry node to destroy |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryDestroy was introduced in OptiX 1.0.

**See also** rtGeometryCreate, rtGeometrySetPrimitiveCount, rtGeometryGetPrimitiveCount

#### 5.10.2.4 RTresult RTAPI rtGeometryGetBoundingBoxProgram ( RTgeometry *geometry*, RTprogram * *program* )

Returns the attached bounding box program.

**Description**

rtGeometryGetBoundingBoxProgram returns the handle *program* for the attached bounding box program of *geometry*.

**Parameters**

| | | |
|---|---|---|
| in | *geometry* | Geometry node handle from which to query program |
| out | *program* | Handle to attached bounding box program |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryGetBoundingBoxProgram was introduced in OptiX 1.0.

**See also** rtGeometrySetBoundingBoxProgram

#### 5.10.2.5 RTresult RTAPI rtGeometryGetContext ( RTgeometry *geometry,* RTcontext * *context* )

Returns the context associated with a geometry node.

**Description**

rtGeometryGetContext queries a geometry node for its associated context. *geometry* specifies the geometry node to query, and should be a value returned by rtGeometryCreate. Sets **context* to the context associated with *geometry*.

**Parameters**

| | | |
|---|---|---|
| `in` | *geometry* | Specifies the geometry to query |
| `out` | *context* | The context associated with *geometry* |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryGetContext was introduced in OptiX 1.0.

**See also** rtGeometryCreate

#### 5.10.2.6 RTresult RTAPI rtGeometryGetIntersectionProgram ( RTgeometry *geometry,* RTprogram * *program* )

Returns the attached intersection program.

**Description**

rtGeometryGetIntersectionProgram returns in *program* a handle of the attached intersection program.

**Parameters**

| | | |
|---|---|---|
| `in` | *geometry* | Geometry node handle to query program |
| `out` | *program* | Handle to attached intersection program |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryGetIntersectionProgram was introduced in OptiX 1.0.

**See also** rtGeometrySetIntersectionProgram, rtProgramCreateFromPTXFile, rtProgramCreateFromPTXString

#### 5.10.2.7 RTresult RTAPI rtGeometryGetMotionBorderMode ( RTgeometry *geometry*, RTmotionbordermode * *beginMode*, RTmotionbordermode * *endMode* )

Returns the motion border modes of a Geometry node.

**Description** TODO

**Parameters**

| | | |
|---|---|---|
| in | *geometry* | Geometry node handle |
| out | *beginMode* | Motion border mode at motion range begin |
| out | *endMode* | Motion border mode at motion range end |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtGeometryGetMotionBorderMode was introduced in OptiX 5.0.

**See also** rtGeometrySetMotionBorderMode rtGeometryGetMotionRange rtGeometryGetMotionSteps

#### 5.10.2.8 RTresult RTAPI rtGeometryGetMotionRange ( RTgeometry *geometry*, float * *timeBegin*, float * *timeEnd* )

Returns the motion time range associated with this Geometry object.

**Description** TODO

**Parameters**

| | | |
|---|---|---|
| in | *geometry* | Geometry node handle |
| out | *timeBegin* | Beginning time value of range |
| out | *timeEnd* | Ending time value of range |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtGeometryGetMotionRange was introduced in OptiX 5.0.

**See also** rtGeometrySetMotionRange rtGeometryGetMotionBorderMode rtGeometryGetMotionSteps

#### 5.10.2.9 RTresult RTAPI rtGeometryGetMotionSteps ( RTgeometry *geometry*, unsigned int * *n* )

Returns the number of motion steps associated with a Geometry.

**Description** TODO

**Parameters**

| | | |
|---|---|---|
| in | *geometry* | Geometry node handle |
| out | *n* | Number of motion steps |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtGeometryGetMotionSteps was introduced in OptiX 5.0.

**See also** rtGeometryGetMotionSteps rtGeometrySetMotionBorderMode rtGeometrySetMotionRange

#### 5.10.2.10 RTresult RTAPI rtGeometryGetPrimitiveCount ( RTgeometry *geometry,* unsigned int * *num_primitives* )

Returns the number of primitives.

**Description**

rtGeometryGetPrimitiveCount returns for *geometry* the number of set primitives. The number of primitvies can be set with rtGeometryGetPrimitiveCount.

**Parameters**

| | | |
|---|---|---|
| in | *geometry* | Geometry node to query from the number of primitives |
| out | *num_primitives* | Number of primitives |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryGetPrimitiveCount was introduced in OptiX 1.0.

**See also** rtGeometrySetPrimitiveCount

#### 5.10.2.11 RTresult RTAPI rtGeometryGetPrimitiveIndexOffset ( RTgeometry *geometry,* unsigned int * *index_offset* )

Returns the current primitive index offset.

**Description**

rtGeometryGetPrimitiveIndexOffset returns for *geometry* the primitive index offset. The primitive index offset can be set with rtGeometrySetPrimitiveIndexOffset.

**Parameters**

| | | |
|---|---|---|
| in | *geometry* | Geometry node to query for the primitive index offset |
| out | *index_offset* | Primitive index offset |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtGeometryGetPrimitiveIndexOffset was introduced in OptiX 3.5.

**See also** rtGeometrySetPrimitiveIndexOffset

#### 5.10.2.12 RTresult RTAPI rtGeometryGetVariable ( RTgeometry *geometry,* unsigned int *index,* RTvariable * *v* )

Returns a handle to an indexed variable of a geometry node.

**Description**

rtGeometryGetVariable queries the handle of a geometry node's indexed variable. *geometry* specifies the target geometry and should be a value returned by rtGeometryCreate. *index* specifies the index of the variable, and should be a value less than rtGeometryGetVariableCount. If *index* is the index of a variable attached to *geometry*, returns its handle in $*v$ or *NULL* otherwise. $*v$ must be declared first with rtGeometryDeclareVariable before it can be queried.

**Parameters**

| | | |
|---|---|---|
| in | *geometry* | The geometry node from which to query a variable |
| in | *index* | The index that identifies the variable to be queried |
| out | *v* | Returns handle to indexed variable |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_VARIABLE_NOT_FOUND

**History**

rtGeometryGetVariable was introduced in OptiX 1.0.

**See also** rtGeometryDeclareVariable, rtGeometryGetVariableCount, rtGeometryRemoveVariable, rtGeometryQueryVariable

#### 5.10.2.13 RTresult RTAPI rtGeometryGetVariableCount ( RTgeometry *geometry,* unsigned int * *count* )

Returns the number of attached variables.

**Description**

rtGeometryGetVariableCount queries the number of variables attached to a geometry node. *geometry* specifies the geometry node, and should be a value returned by rtGeometryCreate. After the call, the number of variables attached to *geometry* is returned to $*count$.

**Parameters**

| | | |
|---|---|---|
| in | *geometry* | The Geometry node to query from the number of attached variables |
| out | *count* | Returns the number of attached variables |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometryGetVariableCount was introduced in OptiX 1.0.

**See also** rtGeometryGetVariableCount, rtGeometryDeclareVariable, rtGeometryRemoveVariable

#### 5.10.2.14 RTresult RTAPI rtGeometryQueryVariable ( RTgeometry *geometry,* const char * *name,* RTvariable * *v* )

Returns a handle to a named variable of a geometry node.

**Description**

rtGeometryQueryVariable queries the handle of a geometry node's named variable. *geometry* specifies the target geometry node and should be a value returned by rtGeometryCreate. *name* specifies the name of the variable, and should be a *NULL-terminated* string. If *name* is the name of a variable attached to *geometry*, returns a handle to that variable in $*v$ or *NULL* otherwise. Geometry variables must be declared with rtGeometryDeclareVariable before they can be queried.

**Parameters**

| | | |
|---|---|---|
| in | *geometry* | The geometry node to query from a variable |
| in | *name* | The name that identifies the variable to be queried |
| out | *v* | Returns the named variable |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_VARIABLE_NOT_FOUND

**History**

rtGeometryQueryVariable was introduced in OptiX 1.0.

**See also** rtGeometryDeclareVariable, rtGeometryRemoveVariable, rtGeometryGetVariableCount, rtGeometryGetVariable

#### 5.10.2.15 RTresult RTAPI rtGeometryRemoveVariable ( RTgeometry *geometry,* RTvariable *v* )

Removes a named variable from a geometry node.

**Description**

rtGeometryRemoveVariable removes a named variable from a geometry node. The target geometry is specified by *geometry*, which should be a value returned by rtGeometryCreate. The variable to remove is specified by *v*, which should be a value returned by rtGeometryDeclareVariable. Once a variable has been removed from this geometry node, another variable with the same name as the removed variable may be declared.

**Parameters**

| | | |
|---|---|---|
| in | *geometry* | The geometry node from which to remove a variable |
| in | *v* | The variable to be removed |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_VARIABLE_NOT_FOUND

**History**

rtGeometryRemoveVariable was introduced in OptiX 1.0.

**See also** rtContextRemoveVariable

#### 5.10.2.16 RTresult RTAPI rtGeometrySetBoundingBoxProgram ( RTgeometry *geometry,* RTprogram *program* )

Sets the bounding box program.

**Description**

rtGeometrySetBoundingBoxProgram sets for *geometry* the *program* that computes an axis aligned bounding box for each attached primitive to *geometry*. RTprogram's can be either generated with rtProgramCreateFromPTXFile or rtProgramCreateFromPTXString. A bounding box program is mandatory for every geometry node.

**Parameters**

| | | |
|---|---|---|
| in | *geometry* | The geometry node for which to set the bounding box program |
| in | *program* | Handle to the bounding box program |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_TYPE_MISMATCH

**History**

rtGeometrySetBoundingBoxProgram was introduced in OptiX 1.0.

**See also** rtGeometryGetBoundingBoxProgram, rtProgramCreateFromPTXFile, rtProgramCreateFromPTXString

#### 5.10.2.17 RTresult RTAPI rtGeometrySetIntersectionProgram ( RTgeometry *geometry,* RTprogram *program* )

Sets the intersection program.

**Description**

rtGeometrySetIntersectionProgram sets for *geometry* the *program* that performs ray primitive intersections. RTprogram's can be either generated with rtProgramCreateFromPTXFile or rtProgramCreateFromPTXString. An intersection program is mandatory for every geometry node.

**Parameters**

| | | |
|---|---|---|
| in | *geometry* | The geometry node for which to set the intersection program |
| in | *program* | A handle to the ray primitive intersection program |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_TYPE_MISMATCH

**History**

rtGeometrySetIntersectionProgram was introduced in OptiX 1.0.

**See also** rtGeometryGetIntersectionProgram, rtProgramCreateFromPTXFile, rtProgramCreateFromPTXString

#### 5.10.2.18 RTresult RTAPI rtGeometrySetMotionBorderMode ( RTgeometry *geometry,* RTmotionbordermode *beginMode,* RTmotionbordermode *endMode* )

Sets the motion border modes of a Geometry node.

**Description** TODO

**Parameters**

| | | |
|---|---|---|
| in | *geometry* | Geometry node handle |
| in | *beginMode* | Motion border mode at motion range begin |
| in | *endMode* | Motion border mode at motion range end |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtGeometrySetMotionBorderMode was introduced in OptiX 5.0.

**See also** rtGeometryGetMotionBorderMode rtGeometrySetMotionRange rtGeometrySetMotionSteps

#### 5.10.2.19 RTresult RTAPI rtGeometrySetMotionRange ( RTgeometry *geometry*, float *timeBegin*, float *timeEnd* )

Sets the motion time range associated with this Geometry object.

**Description** TODO

**Parameters**

| | | |
|---|---|---|
| `in` | *geometry* | Geometry node handle |
| `out` | *timeBegin* | Beginning time value of range |
| `out` | *timeEnd* | Ending time value of range |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtGeometrySetMotionRange was introduced in OptiX 5.0.

**See also** rtGeometryGetMotionRange rtGeometrySetMotionBorderMode rtGeometrySetMotionSteps

#### 5.10.2.20 RTresult RTAPI rtGeometrySetMotionSteps ( RTgeometry *geometry*, unsigned int *n* )

Specifies the number of motion steps associated with a Geometry.

**Description** TODO

**Parameters**

| | | |
|---|---|---|
| `in` | *geometry* | Geometry node handle |
| `in` | *n* | Number of motion steps |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtGeometrySetMotionSteps was introduced in OptiX 5.0.

**See also** rtGeometryGetMotionSteps rtGeometrySetMotionBorderMode rtGeometrySetMotionRange

#### 5.10.2.21 RTresult RTAPI rtGeometrySetPrimitiveCount ( RTgeometry *geometry*, unsigned int *num_primitives* )

Sets the number of primitives.

**Description**

rtGeometrySetPrimitiveCount sets the number of primitives *num_primitives* in *geometry*.

**Parameters**

| | | |
|---|---|---|
| in | *geometry* | The geometry node for which to set the number of primitives |
| in | *num_primitives* | The number of primitives |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtGeometrySetPrimitiveCount was introduced in OptiX 1.0.

**See also** rtGeometryGetPrimitiveCount

#### 5.10.2.22 RTresult RTAPI rtGeometrySetPrimitiveIndexOffset ( RTgeometry *geometry,* unsigned int *index_offset* )

Sets the primitive index offset.

**Description**

rtGeometrySetPrimitiveIndexOffset sets the primitive index offset *index_offset* in *geometry*. In the past, a Geometry functions object's primitive index range always started at zero (e.g., a Geometry with *N* primitives would have a primitive index range of [0,N-1]). The index offset is used to allow Geometry functions objects to have primitive index ranges starting at non-zero positions (e.g., a Geometry with *N* primtives and and index offset of *M* would have a primitive index range of [M,M+N-1]). This feature enables the sharing of vertex index buffers between multiple Geometry functions objects.

**Parameters**

| | | |
|---|---|---|
| in | *geometry* | The geometry node for which to set the primitive index offset |
| in | *index_offset* | The primitive index offset |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtGeometrySetPrimitiveIndexOffset was introduced in OptiX 3.5.

**See also** rtGeometryGetPrimitiveIndexOffset

#### 5.10.2.23 RTresult RTAPI rtGeometryValidate ( RTgeometry *geometry* )

Validates the geometry nodes integrity.

**Description**

rtGeometryValidate checks *geometry* for completeness. If *geometry* or any of the objects attached to *geometry* are not valid, returns RT_ERROR_INVALID_VALUE.

### Parameters

| | | |
|---|---|---|
| `in` | *geometry* | The geometry node to be validated |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

### History

rtGeometryValidate was introduced in OptiX 1.0.

**See also** rtContextValidate

## 5.11 Material functions

### Functions

- RTresult RTAPI rtMaterialCreate (RTcontext context, RTmaterial *material)
- RTresult RTAPI rtMaterialDestroy (RTmaterial material)
- RTresult RTAPI rtMaterialValidate (RTmaterial material)
- RTresult RTAPI rtMaterialGetContext (RTmaterial material, RTcontext *context)
- RTresult RTAPI rtMaterialSetClosestHitProgram (RTmaterial material, unsigned int ray_type_index, RTprogram program)
- RTresult RTAPI rtMaterialGetClosestHitProgram (RTmaterial material, unsigned int ray_type_index, RTprogram *program)
- RTresult RTAPI rtMaterialSetAnyHitProgram (RTmaterial material, unsigned int ray_type_index, RTprogram program)
- RTresult RTAPI rtMaterialGetAnyHitProgram (RTmaterial material, unsigned int ray_type_index, RTprogram *program)
- RTresult RTAPI rtMaterialDeclareVariable (RTmaterial material, const char *name, RTvariable *v)
- RTresult RTAPI rtMaterialQueryVariable (RTmaterial material, const char *name, RTvariable *v)
- RTresult RTAPI rtMaterialRemoveVariable (RTmaterial material, RTvariable v)
- RTresult RTAPI rtMaterialGetVariableCount (RTmaterial material, unsigned int *count)
- RTresult RTAPI rtMaterialGetVariable (RTmaterial material, unsigned int index, RTvariable *v)

### 5.11.1 Detailed Description

Functions related to an OptiX Material.

### 5.11.2 Function Documentation

#### 5.11.2.1 RTresult RTAPI rtMaterialCreate ( RTcontext *context*, RTmaterial * *material* )

Creates a new material.

**Description**

rtMaterialCreate creates a new material within a context. *context* specifies the target context, as returned by rtContextCreate. Sets *material* to the handle of a newly created material within *context*. Returns RT_ERROR_INVALID_VALUE if *material* is *NULL*.

**Parameters**

| | | |
|---|---|---|
| `in` | *context* | Specifies a context within which to create a new material |
| `out` | *material* | Returns a newly created material |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtMaterialCreate was introduced in OptiX 1.0.

**See also** rtMaterialDestroy, rtContextCreate

#### 5.11.2.2 RTresult RTAPI rtMaterialDeclareVariable ( RTmaterial *material,* const char * *name,* RTvariable * *v* )

Declares a new named variable to be associated with a material.

**Description**

rtMaterialDeclareVariable declares a new variable to be associated with a material. *material* specifies the target material, and should be a value returned by rtMaterialCreate. *name* specifies the name of the variable, and should be a *NULL-terminated* string. If there is currently no variable associated with *material* named *name*, and *v* is not *NULL*, a new variable named *name* will be created and associated with *material* and **v* will be set to the handle of the newly-created variable. Otherwise, this call has no effect and returns either RT_ERROR_INVALID_VALUE if either *name* or *v* is *NULL* or RT_ERROR_VARIABLE_REDECLARED if *name* is the name of an existing variable associated with the material.

**Parameters**

| | | |
|---|---|---|
| in | *material* | Specifies the material to modify |
| in | *name* | Specifies the name of the variable |
| out | *v* | Returns a handle to a newly declared variable |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_VARIABLE_REDECLARED
- RT_ERROR_ILLEGAL_SYMBOL

**History**

rtMaterialDeclareVariable was introduced in OptiX 1.0.

**See also** rtMaterialGetVariable, rtMaterialQueryVariable, rtMaterialCreate

#### 5.11.2.3 RTresult RTAPI rtMaterialDestroy ( RTmaterial *material* )

Destroys a material object.

**Description**

rtMaterialDestroy removes *material* from its context and deletes it. *material* should be a value returned by rtMaterialCreate. Associated variables declared via rtMaterialDeclareVariable are destroyed, but no child graph nodes are destroyed. After the call, *material* is no longer a valid handle.

**Parameters**

| | | |
|---|---|---|
| in | *material* | Handle of the material node to destroy |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtMaterialDestroy was introduced in OptiX 1.0.

**See also** rtMaterialCreate

#### 5.11.2.4 RTresult RTAPI rtMaterialGetAnyHitProgram ( RTmaterial *material,* unsigned int *ray_type_index,* RTprogram * *program* )

Returns the any hit program associated with a (material, ray type) tuple.

**Description**

rtMaterialGetAnyHitProgram queries the any hit program associated with a (material, ray type) tuple. *material* specifies the material of interest and should be a value returned by rtMaterialCreate. *ray_type_index* specifies the target ray type and should be a value less than the value returned by rtContextGetRayTypeCount. if all parameters are valid, ∗*program* sets to the handle of the any hit program associated with the tuple (*material*, *ray_type_index*). Otherwise, the call has no effect and returns RT_ERROR_INVALID_VALUE.

**Parameters**

| | | |
|---|---|---|
| `in` | *material* | Specifies the material of the (material, ray type) tuple to query |
| `in` | *ray_type_index* | Specifies the type of ray of the (material, ray type) tuple to query |
| `out` | *program* | Returns the any hit program associated with the (material, ray type) tuple |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtMaterialGetAnyHitProgram was introduced in OptiX 1.0.

**See also** rtMaterialSetAnyHitProgram, rtMaterialCreate, rtContextGetRayTypeCount

#### 5.11.2.5 RTresult RTAPI rtMaterialGetClosestHitProgram ( RTmaterial *material,* unsigned int *ray_type_index,* RTprogram * *program* )

Returns the closest hit program associated with a (material, ray type) tuple.

**Description**

rtMaterialGetClosestHitProgram queries the closest hit program associated with a (material, ray type) tuple. *material* specifies the material of interest and should be a value returned by rtMaterialCreate. *ray_type_index* specifies the target ray type and should be a value less than the value returned by rtContextGetRayTypeCount. If all parameters are valid, ∗*program* sets to the handle of the any hit program associated with the tuple (*material*, *ray_type_index*). Otherwise, the call has no effect and returns RT_ERROR_INVALID_VALUE.

**Parameters**

| | | |
|---|---|---|
| `in` | *material* | Specifies the material of the (material, ray type) tuple to query |
| `in` | *ray_type_index* | Specifies the type of ray of the (material, ray type) tuple to query |

| | | |
|---|---|---|
| out | *program* | Returns the closest hit program associated with the (material, ray type) tuple |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtMaterialGetClosestHitProgram was introduced in OptiX 1.0.

**See also** rtMaterialSetClosestHitProgram, rtMaterialCreate, rtContextGetRayTypeCount

#### 5.11.2.6 RTresult RTAPI rtMaterialGetContext ( RTmaterial *material,* RTcontext * *context* )

Returns the context associated with a material.

**Description**

rtMaterialGetContext queries a material for its associated context. *material* specifies the material to query, and should be a value returned by rtMaterialCreate. If both parameters are valid, $*context$ sets to the context associated with *material*. Otherwise, the call has no effect and returns RT_ERROR_INVALID_VALUE.

**Parameters**

| | | |
|---|---|---|
| in | *material* | Specifies the material to query |
| out | *context* | Returns the context associated with the material |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtMaterialGetContext was introduced in OptiX 1.0.

**See also** rtMaterialCreate

#### 5.11.2.7 RTresult RTAPI rtMaterialGetVariable ( RTmaterial *material,* unsigned int *index,* RTvariable * *v* )

Returns a handle to an indexed variable of a material.

**Description**

rtMaterialGetVariable queries the handle of a material's indexed variable. *material* specifies the target material and should be a value returned by rtMaterialCreate. *index* specifies the index of the variable, and should be a value less than rtMaterialGetVariableCount. If *material* is a valid material and *index* is the index of a variable attached to *material*, $*v$ is set to a handle to that variable. Otherwise, $*v$ is set to *NULL* and either RT_ERROR_INVALID_VALUE or RT_ERROR_VARIABLE_NOT_FOUND is returned depending on the validity of *material*, or *index*, respectively.

**Parameters**

| | | |
|---|---|---|
| in | *material* | Specifies the material to query |
| in | *index* | Specifies the index of the variable to query |
| out | *v* | Returns the indexed variable |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE
- RT_ERROR_VARIABLE_NOT_FOUND

**History**

rtMaterialGetVariable was introduced in OptiX 1.0.

**See also** rtMaterialQueryVariable, rtMaterialGetVariableCount, rtMaterialCreate

#### 5.11.2.8 RTresult RTAPI rtMaterialGetVariableCount ( RTmaterial *material*, unsigned int * *count* )

Returns the number of variables attached to a material.

**Description**

rtMaterialGetVariableCount queries the number of variables attached to a material. *material* specifies the material, and should be a value returned by rtMaterialCreate. After the call, if both parameters are valid, the number of variables attached to *material* is returned to $*count$. Otherwise, the call has no effect and returns RT_ERROR_INVALID_VALUE.

**Parameters**

| | | |
|---|---|---|
| in | *material* | Specifies the material to query |
| out | *count* | Returns the number of variables |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtMaterialGetVariableCount was introduced in OptiX 1.0.

**See also** rtMaterialCreate

#### 5.11.2.9 RTresult RTAPI rtMaterialQueryVariable ( RTmaterial *material*, const char * *name*, RTvariable * *v* )

Queries for the existence of a named variable of a material.

**Description**

rtMaterialQueryVariable queries for the existence of a material's named variable. *material* specifies the target material and should be a value returned by rtMaterialCreate. *name* specifies the name of the variable, and should be a *NULL-terminated* string. If *material* is a valid material and *name* is the name of a variable attached to *material*, $*v$ is set to a handle to that variable after the call. Otherwise, $*v$ is set to *NULL*. If *material* is not a valid material, returns RT_ERROR_INVALID_VALUE.

**Parameters**

| | | |
|---|---|---|
| in | *material* | Specifies the material to query |
| in | *name* | Specifies the name of the variable to query |
| out | *v* | Returns a the named variable, if it exists |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtMaterialQueryVariable was introduced in OptiX 1.0.

**See also** rtMaterialGetVariable, rtMaterialCreate

#### 5.11.2.10 RTresult RTAPI rtMaterialRemoveVariable ( RTmaterial *material,* RTvariable *v* )

Removes a variable from a material.

**Description**

rtMaterialRemoveVariable removes a variable from a material. The material of interest is specified by *material*, which should be a value returned by rtMaterialCreate. The variable to remove is specified by *v*, which should be a value returned by rtMaterialDeclareVariable. Once a variable has been removed from this material, another variable with the same name as the removed variable may be declared. If *material* does not refer to a valid material, this call has no effect and returns RT_ERROR_INVALID_VALUE. If *v* is not a valid variable or does not belong to *material*, this call has no effect and returns RT_ERROR_INVALID_VALUE or RT_ERROR_VARIABLE_NOT_FOUND, respectively.

**Parameters**

| | | |
|---|---|---|
| in | *material* | Specifies the material to modify |
| in | *v* | Specifies the variable to remove |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_VARIABLE_NOT_FOUND

**History**

rtMaterialRemoveVariable was introduced in OptiX 1.0.

**See also** rtMaterialDeclareVariable, rtMaterialCreate

#### 5.11.2.11 RTresult RTAPI rtMaterialSetAnyHitProgram ( RTmaterial *material,* unsigned int *ray_type_index,* RTprogram *program* )

Sets the any hit program associated with a (material, ray type) tuple.

**Description**

rtMaterialSetAnyHitProgram specifies an any hit program to associate with a (material, ray type) tuple. *material* specifies the target material and should be a value returned by rtMaterialCreate. *ray_type_index* specifies the type of ray to which the program applies and should be a value less than the value returned by rtContextGetRayTypeCount. *program* specifies the target any hit program which applies to the tuple (*material*, *ray_type_index*) and should be a value returned by either rtProgramCreateFromPTXString or rtProgramCreateFromPTXFile.

**Parameters**

| | | |
|---|---|---|
| `in` | *material* | Specifies the material of the (material, ray type) tuple to modify |
| `in` | *ray_type_index* | Specifies the type of ray of the (material, ray type) tuple to modify |
| `in` | *program* | Specifies the any hit program to associate with the (material, ray type) tuple |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_TYPE_MISMATCH

**History**

rtMaterialSetAnyHitProgram was introduced in OptiX 1.0.

**See also** rtMaterialGetAnyHitProgram, rtMaterialCreate, rtContextGetRayTypeCount, rtProgramCreateFromPTXString, rtProgramCreateFromPTXFile

#### 5.11.2.12 RTresult RTAPI rtMaterialSetClosestHitProgram ( RTmaterial *material,* unsigned int *ray_type_index,* RTprogram *program* )

Sets the closest hit program associated with a (material, ray type) tuple.

**Description**

rtMaterialSetClosestHitProgram specifies a closest hit program to associate with a (material, ray type) tuple. *material* specifies the material of interest and should be a value returned by rtMaterialCreate. *ray_type_index* specifies the type of ray to which the program applies and should be a value less than the value returned by rtContextGetRayTypeCount. *program* specifies the target closest hit program which applies to the tuple (*material*, *ray_type_index*) and should be a value returned by either rtProgramCreateFromPTXString or rtProgramCreateFromPTXFile.

**Parameters**

| | | |
|---|---|---|
| `in` | *material* | Specifies the material of the (material, ray type) tuple to modify |
| `in` | *ray_type_index* | Specifies the ray type of the (material, ray type) tuple to modify |
| `in` | *program* | Specifies the closest hit program to associate with the (material, ray type) tuple |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

- RT_ERROR_TYPE_MISMATCH

**History**

rtMaterialSetClosestHitProgram was introduced in OptiX 1.0.

**See also** rtMaterialGetClosestHitProgram, rtMaterialCreate, rtContextGetRayTypeCount, rtProgramCreateFromPTXString, rtProgramCreateFromPTXFile

#### 5.11.2.13 RTresult RTAPI rtMaterialValidate ( RTmaterial *material* )

Verifies the state of a material.

**Description**

rtMaterialValidate checks *material* for completeness. If *material* or any of the objects attached to *material* are not valid, returns RT_ERROR_INVALID_VALUE.

**Parameters**

| | | |
|---|---|---|
| `in` | *material* | Specifies the material to be validated |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtMaterialValidate was introduced in OptiX 1.0.

**See also** rtMaterialCreate

## 5.12 Program functions

### Functions

- RTresult RTAPI rtProgramCreateFromPTXString (RTcontext context, const char *ptx, const char *program_name, RTprogram *program)
- RTresult RTAPI rtProgramCreateFromPTXFile (RTcontext context, const char *filename, const char *program_name, RTprogram *program)
- RTresult RTAPI rtProgramDestroy (RTprogram program)
- RTresult RTAPI rtProgramValidate (RTprogram program)
- RTresult RTAPI rtProgramGetContext (RTprogram program, RTcontext *context)
- RTresult RTAPI rtProgramDeclareVariable (RTprogram program, const char *name, RTvariable *v)
- RTresult RTAPI rtProgramQueryVariable (RTprogram program, const char *name, RTvariable *v)
- RTresult RTAPI rtProgramRemoveVariable (RTprogram program, RTvariable v)
- RTresult RTAPI rtProgramGetVariableCount (RTprogram program, unsigned int *count)
- RTresult RTAPI rtProgramGetVariable (RTprogram program, unsigned int index, RTvariable *v)
- RTresult RTAPI rtProgramGetId (RTprogram program, int *program_id)
- RTresult RTAPI rtContextGetProgramFromId (RTcontext context, int program_id, RTprogram *program)

### 5.12.1 Detailed Description

Functions related to an OptiX program.

### 5.12.2 Function Documentation

#### 5.12.2.1 RTresult RTAPI rtContextGetProgramFromId ( RTcontext *context*, int *program_id*, RTprogram * *program* )

Gets an RTprogram corresponding to the program id.

**Description**

rtContextGetProgramFromId returns a handle to the program in **program* corresponding to the *program_id* supplied. If *program_id* is not a valid program handle, **program* is set to *NULL*. Returns RT_ERROR_INVALID_VALUE if *context* is invalid or *program_id* is not a valid program handle.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context the program should be originated from |
| in | *program_id* | The ID of the program to query |
| out | *program* | The return handle for the program object corresponding to the program_id |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtContextGetProgramFromId was introduced in OptiX 3.6.

**See also** rtProgramGetId

#### 5.12.2.2 RTresult RTAPI rtProgramCreateFromPTXFile ( RTcontext *context*, const char * *filename*, const char * *program_name*, RTprogram * *program* )

Creates a new program object.

**Description**

rtProgramCreateFromPTXFile allocates and returns a handle to a new program object. The program is created from PTX code held in *filename* from function *program_name*.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context to create the program in |
| in | *filename* | Path to the file containing the PTX code |
| in | *program_name* | The name of the PTX function to create the program from |
| in | *program* | Handle to the program to be created |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_INVALID_SOURCE
- RT_ERROR_FILE_NOT_FOUND

**History**

rtProgramCreateFromPTXFile was introduced in OptiX 1.0.

**See also** RT_PROGRAM, rtProgramCreateFromPTXString, rtProgramDestroy

#### 5.12.2.3 RTresult RTAPI rtProgramCreateFromPTXString ( RTcontext *context*, const char * *ptx*, const char * *program_name*, RTprogram * *program* )

Creates a new program object.

**Description**

rtProgramCreateFromPTXString allocates and returns a handle to a new program object. The program is created from PTX code held in the *NULL-terminated* string *ptx* from function *program_name*.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context to create the program in |
| in | *ptx* | The string containing the PTX code |
| in | *program_name* | The name of the PTX function to create the program from |
| in | *program* | Handle to the program to be created |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_INVALID_SOURCE

**History**

rtProgramCreateFromPTXString was introduced in OptiX 1.0.

**See also** RT_PROGRAM, rtProgramCreateFromPTXFile, rtProgramDestroy

#### 5.12.2.4 RTresult RTAPI rtProgramDeclareVariable ( RTprogram *program,* const char * *name,* RTvariable * *v* )

Declares a new named variable associated with a program.

**Description**

rtProgramDeclareVariable declares a new variable, *name*, and associates it with the program. A variable can only be declared with the same name once on the program. Any attempt to declare multiple variables with the same name will cause the call to fail and return RT_ERROR_VARIABLE_REDECLARED. If *name* or *v* is *NULL* returns RT_ERROR_INVALID_VALUE.

**Parameters**

| | | |
|---|---|---|
| `in` | *program* | The program the declared variable will be attached to |
| `in` | *name* | The name of the variable to be created |
| `out` | *v* | Return handle to the variable to be created |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_VARIABLE_REDECLARED
- RT_ERROR_ILLEGAL_SYMBOL

**History**

rtProgramDeclareVariable was introduced in OptiX 1.0.

**See also** rtProgramRemoveVariable, rtProgramGetVariable, rtProgramGetVariableCount, rtProgramQueryVariable

#### 5.12.2.5 RTresult RTAPI rtProgramDestroy ( RTprogram *program* )

Destroys a program object.

**Description**

rtProgramDestroy removes *program* from its context and deletes it. *program* should be a value returned by *rtProgramCreate**. Associated variables declared via rtProgramDeclareVariable are destroyed. After the call, *program* is no longer a valid handle.

**Parameters**

| | | |
|---|---|---|
| in | *program* | Handle of the program to destroy |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtProgramDestroy was introduced in OptiX 1.0.

**See also** rtProgramCreateFromPTXFile, rtProgramCreateFromPTXString

#### 5.12.2.6 RTresult RTAPI rtProgramGetContext ( RTprogram *program*, RTcontext * *context* )

Gets the context object that created a program.

**Description**

rtProgramGetContext returns a handle to the context object that was used to create *program*. Returns RT_ERROR_INVALID_VALUE if *context* is *NULL*.

**Parameters**

| | | |
|---|---|---|
| in | *program* | The program to be queried for its context object |
| out | *context* | The return handle for the requested context object |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtProgramGetContext was introduced in OptiX 1.0.

**See also** rtContextCreate

#### 5.12.2.7 RTresult RTAPI rtProgramGetId ( RTprogram *program*, int * *program_id* )

Returns the ID for the Program object.

**Description**

rtProgramGetId returns an ID for the provided program. The returned ID is used to reference *program* from device code. If *program_id* is *NULL* or the *program* is not a valid *RTprogram*, returns RT_ERROR_INVALID_VALUE. RT_PROGRAM_ID_NULL can be used as a sentinel for a non-existent program, since this value will never be returned as a valid program id.

**Parameters**

| | | |
|---|---|---|
| in | *program* | The program to be queried for its id |
| out | *program_id* | The returned ID of the program. |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtProgramGetId was introduced in OptiX 3.6.

**See also** rtContextGetProgramFromId

#### 5.12.2.8 RTresult RTAPI rtProgramGetVariable ( RTprogram *program,* unsigned int *index,* RTvariable * *v* )

Returns a handle to a variable attached to a program by index.

**Description**

rtProgramGetVariable returns a handle to a variable in $*v$ attached to *program* with rtProgramDeclareVariable by *index*. *index* must be between 0 and one less than the value returned by rtProgramGetVariableCount. The order in which variables are enumerated is not constant and may change as variables are attached and removed from the program object.

**Parameters**

| | | |
|---|---|---|
| in | *program* | The program to be queried for the indexed variable object |
| in | *index* | The index of the variable to return |
| out | *v* | Return handle to the variable object specified by the index |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_VARIABLE_NOT_FOUND

**History**

rtProgramGetVariable was introduced in OptiX 1.0.

**See also** rtProgramDeclareVariable, rtProgramRemoveVariable, rtProgramGetVariableCount, rtProgramQueryVariable

#### 5.12.2.9 RTresult RTAPI rtProgramGetVariableCount ( RTprogram *program,* unsigned int * *count* )

Returns the number of variables attached to a program.

**Description**

rtProgramGetVariableCount returns, in $*count$, the number of variable objects that have been attached to *program*.

**Parameters**

| | | |
|---|---|---|
| in | *program* | The program to be queried for its variable count |
| out | *count* | The return handle for the number of variables attached to this program |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtProgramGetVariableCount was introduced in OptiX 1.0.

**See also** rtProgramDeclareVariable, rtProgramRemoveVariable, rtProgramGetVariable, rtProgramQueryVariable

#### 5.12.2.10 RTresult RTAPI rtProgramQueryVariable ( RTprogram *program,* const char * *name,* RTvariable * *v* )

Returns a handle to the named variable attached to a program.

**Description**

rtProgramQueryVariable returns a handle to a variable object, in $*v$, attached to *program* referenced by the *NULL-terminated* string *name*. If *name* is not the name of a variable attached to *program*, $*v$ will be *NULL* after the call.

**Parameters**

| | | |
|---|---|---|
| in | *program* | The program to be queried for the named variable |
| in | *name* | The name of the program to be queried for |
| out | *v* | The return handle to the variable object |
| | *program* | Handle to the program to be created |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtProgramQueryVariable was introduced in OptiX 1.0.

**See also** rtProgramDeclareVariable, rtProgramRemoveVariable, rtProgramGetVariable, rtProgramGetVariableCount

#### 5.12.2.11 RTresult RTAPI rtProgramRemoveVariable ( RTprogram *program,* RTvariable *v* )

Removes the named variable from a program.

**Description**

rtProgramRemoveVariable removes variable *v* from the *program* object. Once a variable has been removed from this program, another variable with the same name as the removed variable may be declared.

**Parameters**

| | | |
|---|---|---|
| in | *program* | The program to remove the variable from |
| in | *v* | The variable to remove |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_VARIABLE_NOT_FOUND

**History**

rtProgramRemoveVariable was introduced in OptiX 1.0.

**See also** rtProgramDeclareVariable, rtProgramGetVariable, rtProgramGetVariableCount, rtProgramQueryVariable

#### 5.12.2.12 RTresult RTAPI rtProgramValidate ( RTprogram *program* )

Validates the state of a program.

**Description**

rtProgramValidate checks *program* for completeness. If *program* or any of the objects attached to *program* are not valid, returns RT_ERROR_INVALID_CONTEXT.

**Parameters**

| | | |
|---|---|---|
| in | *program* | The program to be validated |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtProgramValidate was introduced in OptiX 1.0.

**See also** rtProgramCreateFromPTXFile, rtProgramCreateFromPTXString

## 5.13 Buffer functions

### Functions

- RTresult RTAPI rtBufferCreateForCUDA (RTcontext context, unsigned int bufferdesc, RTbuffer *buffer)
- RTresult RTAPI rtBufferGetDevicePointer (RTbuffer buffer, int optix_device_ordinal, void **device_pointer)
- RTresult RTAPI rtBufferMarkDirty (RTbuffer buffer)
- RTresult RTAPI rtBufferSetDevicePointer (RTbuffer buffer, int optix_device_ordinal, void *device_pointer)
- RTresult RTAPI rtBufferCreateFromGLBO (RTcontext context, unsigned int bufferdesc, unsigned int glId, RTbuffer *buffer)
- RTresult RTAPI rtTextureSamplerCreateFromGLImage (RTcontext context, unsigned int glId, RTgltarget target, RTtexturesampler *textureSampler)
- RTresult RTAPI rtBufferGetGLBOId (RTbuffer buffer, unsigned int *glId)
- RTresult RTAPI rtTextureSamplerGetGLImageId (RTtexturesampler textureSampler, unsigned int *glId)
- RTresult RTAPI rtBufferGLRegister (RTbuffer buffer)
- RTresult RTAPI rtBufferGLUnregister (RTbuffer buffer)
- RTresult RTAPI rtTextureSamplerGLRegister (RTtexturesampler textureSampler)
- RTresult RTAPI rtTextureSamplerGLUnregister (RTtexturesampler textureSampler)
- RTresult RTAPI rtDeviceGetWGLDevice (int *device, HGPUNV gpu)
- RTresult RTAPI rtBufferCreate (RTcontext context, unsigned int bufferdesc, RTbuffer *buffer)
- RTresult RTAPI rtBufferDestroy (RTbuffer buffer)
- RTresult RTAPI rtBufferValidate (RTbuffer buffer)
- RTresult RTAPI rtBufferGetContext (RTbuffer buffer, RTcontext *context)
- RTresult RTAPI rtBufferSetFormat (RTbuffer buffer, RTformat format)
- RTresult RTAPI rtBufferGetFormat (RTbuffer buffer, RTformat *format)
- RTresult RTAPI rtBufferSetElementSize (RTbuffer buffer, RTsize size_of_element)
- RTresult RTAPI rtBufferGetElementSize (RTbuffer buffer, RTsize *size_of_element)
- RTresult RTAPI rtBufferSetSize1D (RTbuffer buffer, RTsize width)
- RTresult RTAPI rtBufferGetSize1D (RTbuffer buffer, RTsize *width)
- RTresult RTAPI rtBufferSetSize2D (RTbuffer buffer, RTsize width, RTsize height)
- RTresult RTAPI rtBufferGetSize2D (RTbuffer buffer, RTsize *width, RTsize *height)
- RTresult RTAPI rtBufferSetSize3D (RTbuffer buffer, RTsize width, RTsize height, RTsize depth)
- RTresult RTAPI rtBufferSetMipLevelCount (RTbuffer buffer, unsigned int levels)
- RTresult RTAPI rtBufferGetSize3D (RTbuffer buffer, RTsize *width, RTsize *height, RTsize *depth)
- RTresult RTAPI rtBufferGetMipLevelSize1D (RTbuffer buffer, unsigned int level, RTsize *width)
- RTresult RTAPI rtBufferGetMipLevelSize2D (RTbuffer buffer, unsigned int level, RTsize *width, RTsize *height)
- RTresult RTAPI rtBufferGetMipLevelSize3D (RTbuffer buffer, unsigned int level, RTsize *width, RTsize *height, RTsize *depth)
- RTresult RTAPI rtBufferSetSizev (RTbuffer buffer, unsigned int dimensionality, const RTsize *dims)
- RTresult RTAPI rtBufferGetSizev (RTbuffer buffer, unsigned int dimensionality, RTsize *dims)
- RTresult RTAPI rtBufferGetDimensionality (RTbuffer buffer, unsigned int *dimensionality)
- RTresult RTAPI rtBufferGetMipLevelCount (RTbuffer buffer, unsigned int *level)
- RTresult RTAPI rtBufferMap (RTbuffer buffer, void **user_pointer)

- RTresult RTAPI rtBufferUnmap (RTbuffer buffer)
- RTresult RTAPI rtBufferMapEx (RTbuffer buffer, unsigned int map_flags, unsigned int level, void *user_owned, void **optix_owned)
- RTresult RTAPI rtBufferUnmapEx (RTbuffer buffer, unsigned int level)
- RTresult RTAPI rtBufferGetId (RTbuffer buffer, int *buffer_id)
- RTresult RTAPI rtContextGetBufferFromId (RTcontext context, int buffer_id, RTbuffer *buffer)
- RTresult RTAPI rtBufferGetProgressiveUpdateReady (RTbuffer buffer, int *ready, unsigned int *subframe_count, unsigned int *max_subframes)
- RTresult RTAPI rtBufferBindProgressiveStream (RTbuffer stream, RTbuffer source)
- RTresult RTAPI rtBufferSetAttribute (RTbuffer buffer, RTbufferattribute attrib, RTsize size, void *p)
- RTresult RTAPI rtBufferGetAttribute (RTbuffer buffer, RTbufferattribute attrib, RTsize size, void *p)

### 5.13.1 Detailed Description

Functions related to an OptiX Buffer.

### 5.13.2 Function Documentation

#### 5.13.2.1 RTresult RTAPI rtBufferBindProgressiveStream ( RTbuffer *stream*, RTbuffer *source* )

Bind a stream buffer to an output buffer source.

**Description**

Binds an output buffer to a progressive stream. The output buffer thereby becomes the data source for the stream. To form a valid output/stream pair, the stream buffer must be of format RT_FORMAT_UNSIGNED_BYTE4, and the output buffer must be of format RT_FORMAT_FLOAT3 or RT_FORMAT_FLOAT4. The use of RT_FORMAT_FLOAT4 is recommended for performance reasons, even if the fourth component is unused. The output buffer must be of type RT_BUFFER_OUTPUT; it may not be of type RT_BUFFER_INPUT_OUTPUT.

**Parameters**

| | | |
|---|---|---|
| in | *stream* | The stream buffer for which the source is to be specified |
| in | *source* | The output buffer to function as the stream's source |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtBufferBindProgressiveStream was introduced in OptiX 3.8.

**See also** rtBufferCreate rtBufferSetAttribute rtBufferGetAttribute

#### 5.13.2.2 RTresult RTAPI rtBufferCreate ( RTcontext *context*, unsigned int *bufferdesc*, RTbuffer * *buffer* )

Creates a new buffer object.

**Description**

rtBufferCreate allocates and returns a new handle to a new buffer object in ∗*buffer* associated with *context*. The backing storage of the buffer is managed by OptiX. A buffer is specified by a bitwise *or* combination of a *type* and *flags* in *bufferdesc*. The supported types are:

- RT_BUFFER_INPUT
- RT_BUFFER_OUTPUT
- RT_BUFFER_INPUT_OUTPUT
- RT_BUFFER_PROGRESSIVE_STREAM

The type values are used to specify the direction of data flow from the host to the OptiX devices. RT_BUFFER_INPUT specifies that the host may only write to the buffer and the device may only read from the buffer. RT_BUFFER_OUTPUT specifies the opposite, read only access on the host and write only access on the device. Devices and the host may read and write from buffers of type RT_BUFFER_INPUT_OUTPUT. Reading or writing to a buffer of the incorrect type (e.g., the host writing to a buffer of type RT_BUFFER_OUTPUT) is undefined.
RT_BUFFER_PROGRESSIVE_STREAM is used to receive stream updates generated by progressive launches (see rtContextLaunchProgressive2D).

The supported flags are:

- RT_BUFFER_GPU_LOCAL
- RT_BUFFER_COPY_ON_DIRTY
- RT_BUFFER_LAYERED
- RT_BUFFER_CUBEMAP

If RT_BUFFER_LAYERED flag is set, buffer depth specifies the number of layers, not the depth of a 3D buffer. If RT_BUFFER_CUBEMAP flag is set, buffer depth specifies the number of cube faces, not the depth of a 3D buffer. See details in rtBufferSetSize3D

Flags can be used to optimize data transfers between the host and its devices. The flag RT_BUFFER_GPU_LOCAL can only be used in combination with RT_BUFFER_INPUT_OUTPUT. RT_BUFFER_INPUT_OUTPUT and RT_BUFFER_GPU_LOCAL used together specify a buffer that allows the host to *only* write, and the device to read *and* write data. The written data will never be visible on the host side and will generally not be visible on other devices.

If rtBufferGetDevicePointer has been called for a single device for a given buffer, the user can change the buffer's content on that device through the pointer. OptiX must then synchronize the new buffer contents to all devices. These synchronization copies occur at every rtContextLaunch, unless the buffer is created with RT_BUFFER_COPY_ON_DIRTY. In this case, rtBufferMarkDirty can be used to notify OptiX that the buffer has been dirtied and must be synchronized.

Returns RT_ERROR_INVALID_VALUE if *buffer* is *NULL*.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context to create the buffer in |
| in | *bufferdesc* | Bitwise *or* combination of the *type* and *flags* of the new buffer |
| out | *buffer* | The return handle for the buffer object |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtBufferCreate was introduced in OptiX 1.0.

RT_BUFFER_GPU_LOCAL was introduced in OptiX 2.0.

**See also** rtBufferCreateFromGLBO, rtBufferDestroy, rtBufferMarkDirty rtBufferBindProgressiveStream

#### 5.13.2.3 RTresult RTAPI rtBufferCreateForCUDA ( RTcontext *context,* unsigned int *bufferdesc,* RTbuffer * *buffer* )

Creates a new buffer object that will later rely on user-side CUDA allocation.

**Description**

DEPRECATED in OptiX 4.0. Now forwards to rtBufferCreate.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context to create the buffer in |
| in | *bufferdesc* | Bitwise *or* combination of the *type* and *flags* of the new buffer |
| out | *buffer* | The return handle for the buffer object |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtBufferCreateForCUDA was introduced in OptiX 3.0.

**See also** rtBufferCreate, rtBufferSetDevicePointer, rtBufferMarkDirty, rtBufferDestroy

#### 5.13.2.4 RTresult RTAPI rtBufferCreateFromGLBO ( RTcontext *context,* unsigned int *bufferdesc,* unsigned int *glId,* RTbuffer * *buffer* )

Creates a new buffer object from an OpenGL buffer object.

**Description**

rtBufferCreateFromGLBO allocates and returns a handle to a new buffer object in **buffer* associated with *context*. Supported OpenGL buffer types are:

- Pixel Buffer Objects
- Vertex Buffer Objects

These buffers can be used to share data with OpenGL; changes of the content in *buffer*, either done by OpenGL or OptiX, will be reflected automatically in both APIs. If the size, or format, of an OpenGL buffer is changed, appropriate OptiX calls have to be used to update *buffer* accordingly. OptiX keeps only a reference to OpenGL data, when *buffer* is destroyed, the state of the *gl_id* object is unaltered.

The *type* of this buffer is specified by one of the following values in *bufferdesc:*

- RT_BUFFER_INPUT
- RT_BUFFER_OUTPUT
- RT_BUFFER_INPUT_OUTPUT

The type values are used to specify the direction of data flow from the host to the OptiX devices. RT_BUFFER_INPUT specifies that the host may only write to the buffer and the device may only read from the buffer. RT_BUFFER_OUTPUT specifies the opposite, read only access on the host and write only access on the device. Devices and the host may read and write from buffers of type

RT_BUFFER_INPUT_OUTPUT. Reading or writing to a buffer of the incorrect type (e.g., the host writing to a buffer of type RT_BUFFER_OUTPUT) is undefined.

Flags can be used to optimize data transfers between the host and it's devices. Currently no *flags* are supported for interop buffers.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context to create the buffer in |
| in | *bufferdesc* | Bitwise *or* combination of the *type* and *flags* of the new buffer |
| in | *glId* | The OpenGL image object resource handle for use in OptiX |
| out | *buffer* | The return handle for the buffer object |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtBufferCreateFromGLBO was introduced in OptiX 1.0.

**See also** rtBufferCreate, rtBufferDestroy

#### 5.13.2.5 RTresult RTAPI rtBufferDestroy ( RTbuffer *buffer* )

Destroys a buffer object.

**Description**

rtBufferDestroy removes *buffer* from its context and deletes it. *buffer* should be a value returned by rtBufferCreate. After the call, *buffer* is no longer a valid handle. Any API object that referenced *buffer* will have its reference invalidated.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | Handle of the buffer to destroy |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtBufferDestroy was introduced in OptiX 1.0.

**See also** rtBufferCreate, rtBufferCreateFromGLBO

#### 5.13.2.6 RTresult RTAPI rtBufferGetAttribute ( RTbuffer *buffer,* RTbufferattribute *attrib,* RTsize *size,* void * *p* )

Query a buffer attribute.

**Description**

rtBufferGetAttribute is used to query buffer attributes. For a list of available attributes, please refer to rtBufferSetAttribute.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer to query the attribute from |
| in | *attrib* | The attribute to query |
| in | *size* | The size of the attribute value, in bytes. For string attributes, this is the maximum buffer size the returned string will use (including a terminating null character). |
| out | *p* | Pointer to the attribute value to be filled in. Must point to valid memory of at least *size* bytes. |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtBufferGetAttribute was introduced in OptiX 3.8.

**See also** rtBufferSetAttribute

#### 5.13.2.7 RTresult RTAPI rtBufferGetContext ( RTbuffer *buffer,* RTcontext * *context* )

Returns the context object that created this buffer.

**Description**

rtBufferGetContext returns a handle to the context that created *buffer* in **context*. If **context* is *NULL*, returns RT_ERROR_INVALID_VALUE.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer to be queried for its context |
| out | *context* | The return handle for the buffer's context |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtBufferGetContext was introduced in OptiX 1.0.

**See also** rtContextCreate

#### 5.13.2.8 RTresult RTAPI rtBufferGetDevicePointer ( RTbuffer *buffer,* int *optix_device_ordinal,* void ** *device_pointer* )

Gets the pointer to the buffer's data on the given device.

**Description**

rtBufferGetDevicePointer returns the pointer to the data of *buffer* on device *optix_device_ordinal* in ***device_pointer*.

If rtBufferGetDevicePointer has been called for a single device for a given buffer, the user can change the buffer's content on that device through the pointer. OptiX must then synchronize the new buffer contents to all devices. These synchronization copies occur at every rtContextLaunch, unless the buffer is created with RT_BUFFER_COPY_ON_DIRTY. In this case, rtBufferMarkDirty can be used to notify OptiX that the buffer has been dirtied and must be synchronized.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer to be queried for its device pointer |
| in | *optix_device_ordinal* | The number assigned by OptiX to the device |
| out | *device_pointer* | The return handle to the buffer's device pointer |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtBufferGetDevicePointer was introduced in OptiX 3.0.

**See also** rtBufferMarkDirty, rtBufferSetDevicePointer

#### 5.13.2.9 RTresult RTAPI rtBufferGetDimensionality ( RTbuffer *buffer,* unsigned int * *dimensionality* )

Gets the dimensionality of this buffer object.

**Description**

rtBufferGetDimensionality returns the dimensionality of *buffer* in **dimensionality*. The value returned will be one of 1, 2 or 3, corresponding to 1D, 2D and 3D buffers, respectively.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer to be queried for its dimensionality |
| out | *dimensionality* | The return handle for the buffer's dimensionality |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtBufferGetDimensionality was introduced in OptiX 1.0.

**See also** *rtBufferSetSize{1-2-3}D*

#### 5.13.2.10 RTresult RTAPI rtBufferGetElementSize ( RTbuffer *buffer,* RTsize * *size_of_element* )

Returns the size of a buffer's individual elements.

### Description

rtBufferGetElementSize queries the size of a buffer's elements. The target buffer is specified by *buffer*, which should be a value returned by rtBufferCreate. The size, in bytes, of the buffer's individual elements is returned in ∗*element_size_return*. Returns RT_ERROR_INVALID_VALUE if given a *NULL* pointer.

### Parameters

| | | |
|---|---|---|
| in | *buffer* | Specifies the buffer to be queried |
| out | *size_of_element* | Returns the size of the buffer's individual elements |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_UNKNOWN

### History

rtBufferGetElementSize was introduced in OptiX 1.0.

**See also** rtBufferSetElementSize, rtBufferCreate

#### 5.13.2.11 RTresult RTAPI rtBufferGetFormat ( RTbuffer *buffer,* RTformat ∗ *format* )

Gets the format of this buffer.

### Description

rtBufferGetFormat returns, in ∗*format*, the format of *buffer*. See rtBufferSetFormat for a listing of RTbuffer values.

### Parameters

| | | |
|---|---|---|
| in | *buffer* | The buffer to be queried for its format |
| out | *format* | The return handle for the buffer's format |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

### History

rtBufferGetFormat was introduced in OptiX 1.0.

**See also** rtBufferSetFormat, rtBufferGetFormat

#### 5.13.2.12 RTresult RTAPI rtBufferGetGLBOId ( RTbuffer *buffer,* unsigned int ∗ *glId* )

Gets the OpenGL Buffer Object ID associated with this buffer.

### Description

rtBufferGetGLBOId stores the OpenGL buffer object id in *gl_id* if *buffer* was created with rtBufferCreateFromGLBO. If *buffer* was not created from an OpenGL Buffer Object *gl_id* will be set to 0.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer to be queried for its OpenGL buffer object id |
| in | *glId* | The return handle for the id |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtBufferGetGLBOId was introduced in OptiX 1.0.

**See also** rtBufferCreateFromGLBO

#### 5.13.2.13 RTresult RTAPI rtBufferGetId ( RTbuffer *buffer,* int * *buffer_id* )

Gets an id suitable for use with buffers of buffers.

**Description**

rtBufferGetId returns an ID for the provided buffer. The returned ID is used on the device to reference the buffer. It needs to be copied into a buffer of type RT_FORMAT_BUFFER_ID or used in a rtBufferId object.. If **buffer_id* is *NULL* or the *buffer* is not a valid RTbuffer, returns RT_ERROR_INVALID_VALUE. RT_BUFFER_ID_NULL can be used as a sentinal for a non-existent buffer, since this value will never be returned as a valid buffer id.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer to be queried for its id |
| out | *buffer_id* | The returned ID of the buffer |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtBufferGetId was introduced in OptiX 3.5.

**See also** rtContextGetBufferFromId

#### 5.13.2.14 RTresult RTAPI rtBufferGetMipLevelCount ( RTbuffer *buffer,* unsigned int * *level* )

Gets the number of mipmap levels of this buffer object.

**Description**

rtBufferGetMipLevelCount returns the number of mipmap levels. Default number of MIP levels is 1.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer to be queried for its number of mipmap levels |
| out | *level* | The return number of mipmap levels |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtBufferGetMipLevelCount was introduced in OptiX 3.9.

**See also** rtBufferSetMipLevelCount, rtBufferSetSize1D, rtBufferSetSize2D, rtBufferSetSize3D, rtBufferSetSizev, rtBufferGetMipLevelSize1D, rtBufferGetMipLevelSize2D, rtBufferGetMipLevelSize3D, rtBufferGetSize1D, rtBufferGetSize2D, rtBufferGetSize3D, rtBufferGetSizev

### 5.13.2.15 RTresult RTAPI rtBufferGetMipLevelSize1D ( RTbuffer *buffer*, unsigned int *level*, RTsize * *width* )

Gets the width of buffer specific MIP level.

**Description**

rtBufferGetMipLevelSize1D stores the width of *buffer* in **width*.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer to be queried for its dimensions |
| in | *level* | The buffer MIP level index to be queried for its dimensions |
| out | *width* | The return handle for the buffer's width **Return values** |

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtBufferGetMipLevelSize1D was introduced in OptiX 3.9.

**See also** rtBufferSetMipLevelCount, rtBufferSetSize1D, rtBufferSetSize2D, rtBufferSetSize3D, rtBufferSetSizev, rtBufferGetMipLevelSize2D, rtBufferGetMipLevelSize3D, rtBufferGetMipLevelCount, rtBufferGetSize1D, rtBufferGetSize2D, rtBufferGetSize3D, rtBufferGetSizev

### 5.13.2.16 RTresult RTAPI rtBufferGetMipLevelSize2D ( RTbuffer *buffer*, unsigned int *level*, RTsize * *width*, RTsize * *height* )

Gets the width, height of buffer specific MIP level.

**Description**

rtBufferGetMipLevelSize2D stores the width, height of *buffer* in **width* and **height* respectively.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer to be queried for its dimensions |
| in | *level* | The buffer MIP level index to be queried for its dimensions |
| out | *width* | The return handle for the buffer's width |
| out | *height* | The return handle for the buffer's height **Return values** |

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtBufferGetMipLevelSize2D was introduced in OptiX 3.9.

**See also** rtBufferSetMipLevelCount, rtBufferSetSize1D, rtBufferSetSize2D, rtBufferSetSize3D, rtBufferSetSizev, rtBufferGetMipLevelSize1D, rtBufferGetMipLevelSize3D, rtBufferGetMipLevelCount, rtBufferGetSize1D, rtBufferGetSize2D, rtBufferGetSize3D, rtBufferGetSizev

### 5.13.2.17 RTresult RTAPI rtBufferGetMipLevelSize3D ( RTbuffer *buffer*, unsigned int *level*, RTsize * *width*, RTsize * *height*, RTsize * *depth* )

Gets the width, height and depth of buffer specific MIP level.

**Description**

rtBufferGetMipLevelSize3D stores the width, height and depth of *buffer* in *width*, *height* and *depth*, respectively.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer to be queried for its dimensions |
| in | *level* | The buffer MIP level index to be queried for its dimensions |
| out | *width* | The return handle for the buffer's width |
| out | *height* | The return handle for the buffer's height |
| out | *depth* | The return handle for the buffer's depth **Return values** |

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtBufferGetMipLevelSize3D was introduced in OptiX 3.9.

**See also** rtBufferSetMipLevelCount, rtBufferSetSize1D, rtBufferSetSize2D, rtBufferSetSize3D, rtBufferSetSizev, rtBufferGetMipLevelSize1D, rtBufferGetMipLevelSize2D, rtBufferGetMipLevelCount, rtBufferGetSize1D, rtBufferGetSize2D, rtBufferGetSize3D, rtBufferGetSizev

### 5.13.2.18 RTresult RTAPI rtBufferGetProgressiveUpdateReady ( RTbuffer *buffer*, int * *ready*, unsigned int * *subframe_count*, unsigned int * *max_subframes* )

Check whether stream buffer content has been updated by a Progressive Launch.

**Description**

Returns whether or not the result of a progressive launch in *buffer* has been updated since the last time this function was called. A client application should use this call in its main render/display loop to poll for frame refreshes after initiating a progressive launch. If *subframe_count* and *max_subframes* are non-null, they will be filled with the corresponding counters if and only if *ready* returns 1.

Note that this call does not stop a progressive render.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The stream buffer to be queried |
| out | *ready* | Ready flag. Will be set to 1 if an update is available, or 0 if no update is available. |
| out | *subframe_count* | The number of subframes accumulated in the latest result |
| out | *max_subframes* | The *max_subframes* parameter as specified in the call to rtContextLaunchProgressive2D |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtBufferGetProgressiveUpdateReady was introduced in OptiX 3.8.

**See also** rtContextLaunchProgressive2D

#### 5.13.2.19 RTresult RTAPI rtBufferGetSize1D ( RTbuffer *buffer*, RTsize * *width* )

Get the width of this buffer.

**Description**

rtBufferGetSize1D stores the width of *buffer* in **width*.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer to be queried for its dimensions |
| out | *width* | The return handle for the buffer's width |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtBufferGetSize1D was introduced in OptiX 1.0.

**See also** rtBufferSetMipLevelCount, rtBufferSetSize1D, rtBufferSetSize2D, rtBufferSetSize3D, rtBufferSetSizev, rtBufferGetMipLevelSize1D, rtBufferGetMipLevelSize2D, rtBufferGetMipLevelSize3D, rtBufferGetMipLevelCount, rtBufferGetSize2D, rtBufferGetSize3D, rtBufferGetSizev

#### 5.13.2.20 RTresult RTAPI rtBufferGetSize2D ( RTbuffer *buffer*, RTsize * *width*, RTsize * *height* )

Gets the width and height of this buffer.

**Description**

rtBufferGetSize2D stores the width and height of *buffer* in **width* and **height*, respectively.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer to be queried for its dimensions |
| out | *width* | The return handle for the buffer's width |
| out | *height* | The return handle for the buffer's height |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtBufferGetSize2D was introduced in OptiX 1.0.

**See also** rtBufferSetMipLevelCount, rtBufferSetSize1D, rtBufferSetSize2D, rtBufferSetSize3D, rtBufferSetSizev, rtBufferGetMipLevelSize1D, rtBufferGetMipLevelSize2D, rtBufferGetMipLevelSize3D, rtBufferGetMipLevelCount, rtBufferGetSize1D, rtBufferGetSize3D, rtBufferGetSizev

#### 5.13.2.21 RTresult RTAPI rtBufferGetSize3D ( RTbuffer *buffer*, RTsize * *width*, RTsize * *height*, RTsize * *depth* )

Gets the width, height and depth of this buffer.

**Description**

rtBufferGetSize3D stores the width, height and depth of *buffer* in **width*, **height* and **depth*, respectively.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer to be queried for its dimensions |
| out | *width* | The return handle for the buffer's width |
| out | *height* | The return handle for the buffer's height |
| out | *depth* | The return handle for the buffer's depth |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtBufferGetSize3D was introduced in OptiX 1.0.

**See also** rtBufferSetMipLevelCount, rtBufferSetSize1D, rtBufferSetSize2D, rtBufferSetSize3D, rtBufferSetSizev, rtBufferGetMipLevelSize1D, rtBufferGetMipLevelSize2D, rtBufferGetMipLevelSize3D, rtBufferGetMipLevelCount, rtBufferGetSize1D, rtBufferGetSize2D, rtBufferGetSizev

#### 5.13.2.22 RTresult RTAPI rtBufferGetSizev ( RTbuffer *buffer,* unsigned int *dimensionality,* RTsize * *dims* )

Gets the dimensions of this buffer.

**Description**

rtBufferGetSizev stores the dimensions of *buffer* in **dims*. The number of dimensions returned is specified by *dimensionality*. The storage at *dims* must be large enough to hold the number of requested buffer dimensions.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer to be queried for its dimensions |
| in | *dimensionality* | The number of requested dimensions |
| out | *dims* | The array of dimensions to store to |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtBufferGetSizev was introduced in OptiX 1.0.

**See also** rtBufferSetMipLevelCount, rtBufferSetSize1D, rtBufferSetSize2D, rtBufferSetSize3D, rtBufferSetSizev, rtBufferGetMipLevelSize1D, rtBufferGetMipLevelSize2D, rtBufferGetMipLevelSize3D, rtBufferGetMipLevelCount, rtBufferGetSize1D, rtBufferGetSize2D, rtBufferGetSize3D

#### 5.13.2.23 RTresult RTAPI rtBufferGLRegister ( RTbuffer *buffer* )

Declares an OpenGL buffer as immutable and accessible by OptiX.

**Description**

Once registered, properties like the size of the original GL buffer cannot be modified anymore. Calls to the corresponding GL functions will return with an error code. However, the buffer data of the GL buffer can still be read and written by the appropriate GL commands. Returns *RT_ERROR_RESOURCE_ALREADY_REGISTERED* if *buffer* is already registered. A buffer object must be registered in order to be used by OptiX. If a buffer object is not registered RT_ERROR_INVALID_VALUE will be returned. An OptiX buffer in a registered state can be unregistered via rtBufferGLRegister.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The handle for the buffer object |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT

- RT_ERROR_INVALID_VALUE
- RT_ERROR_RESOURCE_ALREADY_REGISTERED

**History**

rtBufferGLRegister was introduced in OptiX 2.0.

**See also** rtBufferCreateFromGLBO, rtBufferGLUnregister

#### 5.13.2.24 RTresult RTAPI rtBufferGLUnregister ( RTbuffer *buffer* )

Declares an OpenGL buffer as mutable and inaccessible by OptiX.

**Description**

Once unregistered, properties like the size of the original GL buffer can be changed. As long as a buffer object is unregistered, OptiX will not be able to access the data and calls will fail with RT_ERROR_INVALID_VALUE. Returns *RT_ERROR_RESOURCE_NOT_REGISTERED* if *buffer* is already unregistered. An OptiX buffer in an unregistered state can be registered to OptiX again via rtBufferGLRegister.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The handle for the buffer object |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_RESOURCE_NOT_REGISTERED

**History**

rtBufferGLUnregister was introduced in OptiX 2.0.

**See also** rtBufferCreateFromGLBO, rtBufferGLRegister

#### 5.13.2.25 RTresult RTAPI rtBufferMap ( RTbuffer *buffer,* void ** *user_pointer* )

Maps a buffer object to the host.

**Description**

rtBufferMap returns a pointer, accessible by the host, in ∗*user_pointer* that contains a mapped copy of the contents of *buffer*. The memory pointed to by ∗*user_pointer* can be written to or read from, depending on the type of *buffer*. For example, this code snippet demonstrates creating and filling an input buffer with floats.

```
RTbuffer buffer;
float* data;
rtBufferCreate(context, RT_BUFFER_INPUT, &buffer);
rtBufferSetFormat(buffer, RT_FORMAT_FLOAT);
rtBufferSetSize1D(buffer, 10);
rtBufferMap(buffer, (void*)&data);
for(int i = 0; i < 10; ++i)
  data[i] = 4.f * i;
rtBufferUnmap(buffer);
```

If *buffer* has already been mapped, returns RT_ERROR_ALREADY_MAPPED. If *buffer* has size zero, the returned pointer is undefined

Note that this call does not stop a progressive render if called on a stream buffer.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer to be mapped |
| out | *user_pointer* | Return handle to a user pointer where the buffer will be mapped to |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_ALREADY_MAPPED
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtBufferMap was introduced in OptiX 1.0.

**See also** rtBufferUnmap, rtBufferMapEx, rtBufferUnmapEx

### 5.13.2.26 RTresult RTAPI rtBufferMapEx ( RTbuffer *buffer,* unsigned int *map_flags,* unsigned int *level,* void * *user_owned,* void ** *optix_owned* )

Maps mipmap level of buffer object to the host.

**Description**

rtBufferMapEx makes the buffer contents available on the host, either by returning a pointer in **optix_owned*, or by copying the contents to a memory location pointed to by *user_owned*. Calling rtBufferMapEx with proper map flags can result in better performance than using rtBufferMap, because fewer synchronization copies are required in certain situations. rtBufferMapEx with *map_flags* = RT_BUFFER_MAP_READ_WRITE and *leve* = 0 is equivalent to rtBufferMap.

Note that this call does not stop a progressive render if called on a stream buffer.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer to be mapped |
| in | *map_flags* | Map flags, see below |
| in | *level* | The mipmap level to be mapped |
| in | *user_owned* | Not yet supported. Must be NULL |
| out | *optix_owned* | Return handle to a user pointer where the buffer will be mapped to |

The following flags are supported for map_flags. They are mutually exclusive:

- RT_BUFFER_MAP_READ
- RT_BUFFER_MAP_WRITE
- RT_BUFFER_MAP_READ_WRITE
- RT_BUFFER_MAP_WRITE_DISCARD

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_ALREADY_MAPPED
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtBufferMapEx was introduced in OptiX 3.9.

**See also** rtBufferMap, rtBufferUnmap, rtBufferUnmapEx

#### 5.13.2.27 RTresult RTAPI rtBufferMarkDirty ( RTbuffer *buffer* )

Sets a buffer as dirty.

**Description**

If rtBufferSetDevicePointer or rtBufferGetDevicePointer have been called for a single device for a given buffer, the user can change the buffer's content on that device through the pointer. OptiX must then synchronize the new buffer contents to all devices. These synchronization copies occur at every rtContextLaunch functions, unless the buffer is declared with RT_BUFFER_COPY_ON_DIRTY. In this case, rtBufferMarkDirty can be used to notify OptiX that the buffer has been dirtied and must be synchronized.

Note that RT_BUFFER_COPY_ON_DIRTY currently only applies to CUDA interop buffers (buffers for which the application has a device pointer).

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer to be marked dirty |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtBufferMarkDirty was introduced in OptiX 3.0.

**See also** rtBufferGetDevicePointer, rtBufferSetDevicePointer, RT_BUFFER_COPY_ON_DIRTY

#### 5.13.2.28 RTresult RTAPI rtBufferSetAttribute ( RTbuffer *buffer,* RTbufferattribute *attrib,* RTsize *size,* void * *p* )

Set a buffer attribute.

**Description**

Sets a buffer attribute. Currently, all available attributes refer to stream buffers only, and attempting to set them on a non-stream buffer will generate an error.

Each attribute can have a different size. The sizes are given in the following list:

- RT_BUFFER_ATTRIBUTE_STREAM_FORMAT strlen(input_string)
- RT_BUFFER_ATTRIBUTE_STREAM_BITRATE sizeof(int)
- RT_BUFFER_ATTRIBUTE_STREAM_FPS sizeof(int)
- RT_BUFFER_ATTRIBUTE_STREAM_GAMMA sizeof(float)

RT_BUFFER_ATTRIBUTE_STREAM_FORMAT sets the encoding format used for streams sent over the network, specified as a string. The default is "auto". Various other common stream and image formats are available (e.g. "h264", "png"). This attribute has no effect if the progressive API is used locally.

RT_BUFFER_ATTRIBUTE_STREAM_BITRATE sets the target bitrate for streams sent over the network, if the stream format supports it. The data is specified as a 32-bit integer. The default is 5000000. This attribute has no effect if the progressive API is used locally or if the stream format does not support variable bitrates.

RT_BUFFER_ATTRIBUTE_STREAM_FPS sets the target update rate per second for streams sent over the network, if the stream format supports it. The data is specified as a 32-bit integer. The default is 30. This attribute has no effect if the progressive API is used locally or if the stream format does not support variable framerates.

RT_BUFFER_ATTRIBUTE_STREAM_GAMMA sets the gamma value for the built-in tonemapping operator. The data is specified as a 32-bit float, the default is 1.0. Tonemapping is executed before encoding the accumulated output into the stream, i.e. on the server side if remote rendering is used. See the section on Buffers below for more details.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer on which to set the attribute |
| in | *attrib* | The attribute to set |
| in | *size* | The size of the attribute value, in bytes |
| in | *p* | Pointer to the attribute value |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtBufferSetAttribute was introduced in OptiX 3.8.

**See also** rtBufferGetAttribute

### 5.13.2.29 RTresult RTAPI rtBufferSetDevicePointer ( RTbuffer *buffer*, int *optix_device_ordinal*, void * *device_pointer* )

Sets the pointer to the buffer's data on the given device.

**Description**

rtBufferSetDevicePointer sets the pointer to the data of *buffer* on device *optix_device_ordinal* to *device_pointer*.

If rtBufferSetDevicePointer has been called for a single device for a given buffer, the user can change the buffer's content on that device through the pointer. OptiX must then synchronize the new buffer contents to all devices. These synchronization copies occur at every rtContextLaunch, unless the buffer is declared with RT_BUFFER_COPY_ON_DIRTY. In this case, rtBufferMarkDirty can be used to notify OptiX that the buffer has been dirtied and must be synchronized.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer for which the device pointer is to be set |
| in | *optix_device_ordinal* | The number assigned by OptiX to the device |
| in | *device_pointer* | The pointer to the data on the specified device |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE
- RT_ERROR_INVALID_CONTEXT

**History**

rtBufferSetDevicePointer was introduced in OptiX 3.0.

**See also** rtBufferMarkDirty, rtBufferGetDevicePointer

#### 5.13.2.30 RTresult RTAPI rtBufferSetElementSize ( RTbuffer *buffer,* RTsize *size_of_element* )

Modifies the size in bytes of a buffer's individual elements.

**Description**

rtBufferSetElementSize modifies the size in bytes of a buffer's user-formatted elements. The target buffer is specified by *buffer*, which should be a value returned by rtBufferCreate and should have format RT_FORMAT_USER. The new size of the buffer's individual elements is specified by *element_size* and should not be 0. If the buffer has format RT_FORMAT_USER, and *element_size* is not 0, then the buffer's individual element size is set to *element_size* and all storage associated with the buffer is reset. Otherwise, this call has no effect and returns either RT_ERROR_TYPE_MISMATCH if the buffer does not have format RT_FORMAT_USER or RT_ERROR_INVALID_VALUE if the buffer has format RT_FORMAT_USER but *element_size* is 0.

**Parameters**

| | | |
|---|---|---|
| `in` | *buffer* | Specifies the buffer to be modified |
| `in` | *size_of_element* | Specifies the new size in bytes of the buffer's individual elements |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_TYPE_MISMATCH

**History**

rtBufferSetElementSize was introduced in OptiX 1.0.

**See also** rtBufferGetElementSize, rtBufferCreate

#### 5.13.2.31 RTresult RTAPI rtBufferSetFormat ( RTbuffer *buffer,* RTformat *format* )

Sets the format of this buffer.

**Description**

rtBufferSetFormat changes the *format* of *buffer* to the specified value. The data elements of the buffer will have the specified type and can either be vector formats, or a user-defined type whose size is specified with rtBufferSetElementSize. Possible values for *format* are:

- RT_FORMAT_HALF
- RT_FORMAT_HALF2
- RT_FORMAT_HALF3
- RT_FORMAT_HALF4
- RT_FORMAT_FLOAT
- RT_FORMAT_FLOAT2
- RT_FORMAT_FLOAT3
- RT_FORMAT_FLOAT4
- RT_FORMAT_BYTE
- RT_FORMAT_BYTE2

- RT_FORMAT_BYTE3
- RT_FORMAT_BYTE4
- RT_FORMAT_UNSIGNED_BYTE
- RT_FORMAT_UNSIGNED_BYTE2
- RT_FORMAT_UNSIGNED_BYTE3
- RT_FORMAT_UNSIGNED_BYTE4
- RT_FORMAT_SHORT
- RT_FORMAT_SHORT2
- RT_FORMAT_SHORT3
- RT_FORMAT_SHORT4
- RT_FORMAT_UNSIGNED_SHORT
- RT_FORMAT_UNSIGNED_SHORT2
- RT_FORMAT_UNSIGNED_SHORT3
- RT_FORMAT_UNSIGNED_SHORT4
- RT_FORMAT_INT
- RT_FORMAT_INT2
- RT_FORMAT_INT3
- RT_FORMAT_INT4
- RT_FORMAT_UNSIGNED_INT
- RT_FORMAT_UNSIGNED_INT2
- RT_FORMAT_UNSIGNED_INT3
- RT_FORMAT_UNSIGNED_INT4
- RT_FORMAT_USER

**Parameters**

| | | |
|---|---|---|
| `in` | *buffer* | The buffer to have its format set |
| `in` | *format* | The target format of the buffer |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtBufferSetFormat was introduced in OptiX 1.0.

**See also** rtBufferSetFormat, rtBufferGetFormat, rtBufferGetFormat, rtBufferGetElementSize, rtBufferSetElementSize

#### 5.13.2.32 RTresult RTAPI rtBufferSetMipLevelCount ( RTbuffer *buffer,* unsigned int *levels* )

Sets the MIP level count of a buffer.

**Description**

rtBufferSetMipLevelCount sets the number of MIP levels to *levels*. The default number of MIP levels is 1. Fails with RT_ERROR_ALREADY_MAPPED if called on a buffer that is mapped.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer to be resized |
| in | *width* | The width of the resized buffer |
| in | *levels* | Number of mip levels |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_ALREADY_MAPPED
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtBufferSetMipLevelCount was introduced in OptiX 3.9.

**See also** rtBufferSetSize1D, rtBufferSetSize2D, rtBufferSetSize3D, rtBufferSetSizev, rtBufferGetMipLevelSize1D, rtBufferGetMipLevelSize2D, rtBufferGetMipLevelSize3D, rtBufferGetMipLevelCount, rtBufferGetSize1D, rtBufferGetSize2D, rtBufferGetSize3D, rtBufferGetSizev

#### 5.13.2.33 RTresult RTAPI rtBufferSetSize1D ( RTbuffer *buffer*, RTsize *width* )

Sets the width and dimensionality of this buffer.

**Description**

rtBufferSetSize1D sets the dimensionality of *buffer* to 1 and sets its width to *width*. Fails with RT_ERROR_ALREADY_MAPPED if called on a buffer that is mapped.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer to be resized |
| in | *width* | The width of the resized buffer |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_ALREADY_MAPPED
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtBufferSetSize1D was introduced in OptiX 1.0.

**See also** rtBufferSetMipLevelCount, rtBufferSetSize2D, rtBufferSetSize3D, rtBufferSetSizev, rtBufferGetMipLevelSize1D, rtBufferGetMipLevelSize2D, rtBufferGetMipLevelSize3D, rtBufferGetMipLevelCount, rtBufferGetSize1D, rtBufferGetSize2D, rtBufferGetSize3D, rtBufferGetSizev

#### 5.13.2.34 RTresult RTAPI rtBufferSetSize2D ( RTbuffer *buffer*, RTsize *width*, RTsize *height* )

Sets the width, height and dimensionality of this buffer.

### Description

rtBufferSetSize2D sets the dimensionality of *buffer* to 2 and sets its width and height to *width* and *height*, respectively. If *width* or *height* is zero, they both must be zero. Fails with RT_ERROR_ALREADY_MAPPED if called on a buffer that is mapped.

### Parameters

| | | |
|---|---|---|
| in | *buffer* | The buffer to be resized |
| in | *width* | The width of the resized buffer |
| in | *height* | The height of the resized buffer |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_ALREADY_MAPPED
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

### History

rtBufferSetSize2D was introduced in OptiX 1.0.

**See also** rtBufferSetMipLevelCount, rtBufferSetSize1D, rtBufferSetSize3D, rtBufferSetSizev, rtBufferGetMipLevelSize1D, rtBufferGetMipLevelSize2D, rtBufferGetMipLevelSize3D, rtBufferGetMipLevelCount, rtBufferGetSize1D, rtBufferGetSize2D, rtBufferGetSize3D, rtBufferGetSizev

## 5.13.2.35 RTresult RTAPI rtBufferSetSize3D ( RTbuffer *buffer,* RTsize *width,* RTsize *height,* RTsize *depth* )

Sets the width, height, depth and dimensionality of a buffer.

### Description

rtBufferSetSize3D sets the dimensionality of *buffer* to 3 and sets its width, height and depth to *width*, *height* and *depth*, respectively. If *width*, *height* or *depth* is zero, they all must be zero.

A 1D layered mipmapped buffer is allocated if *height* is 1 and the RT_BUFFER_LAYERED flag was set at buffer creating. The number of layers is determined by the *depth*. A 2D layered mipmapped buffer is allocated if the RT_BUFFER_LAYERED flag was set at buffer creating. The number of layers is determined by the *depth*. A cubemap mipmapped buffer is allocated if the RT_BUFFER_CUBEMAP flag was set at buffer creating. *width* must be equal to *height* and the number of cube faces is determined by the *depth*, it must be six or a multiple of six, if the RT_BUFFER_LAYERED flag was also set. Layered, mipmapped and cubemap buffers are supported only as texture buffers.

Fails with RT_ERROR_ALREADY_MAPPED if called on a buffer that is mapped.

### Parameters

| | | |
|---|---|---|
| in | *buffer* | The buffer to be resized |
| in | *width* | The width of the resized buffer |

| | | |
|---|---|---|
| in | *height* | The height of the resized buffer |
| in | *depth* | The depth of the resized buffer |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_ALREADY_MAPPED
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtBufferSetSize3D was introduced in OptiX 1.0.

**See also** rtBufferSetMipLevelCount, rtBufferSetSize1D, rtBufferSetSize2D, rtBufferSetSizev, rtBufferGetMipLevelSize1D, rtBufferGetMipLevelSize2D, rtBufferGetMipLevelSize3D, rtBufferGetMipLevelCount, rtBufferGetSize1D, rtBufferGetSize2D, rtBufferGetSize3D, rtBufferGetSizev

### 5.13.2.36 RTresult RTAPI rtBufferSetSizev ( RTbuffer *buffer,* unsigned int *dimensionality,* const RTsize * *dims* )

Sets the dimensionality and dimensions of a buffer.

**Description**

rtBufferSetSizev sets the dimensionality of *buffer* to *dimensionality* and sets the dimensions of the buffer to the values stored at *dims*, which must contain a number of values equal to *dimensionality*. If any of values of *dims* is zero they must all be zero.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer to be resized |
| in | *dimensionality* | The dimensionality the buffer will be resized to |
| in | *dims* | The array of sizes for the dimension of the resize |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_ALREADY_MAPPED
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtBufferSetSizev was introduced in OptiX 1.0.

**See also** rtBufferSetMipLevelCount, rtBufferSetSize1D, rtBufferSetSize2D, rtBufferSetSize3D, rtBufferGetMipLevelSize1D, rtBufferGetMipLevelSize2D, rtBufferGetMipLevelSize3D, rtBufferGetMipLevelCount, rtBufferGetSize1D, rtBufferGetSize2D, rtBufferGetSize3D, rtBufferGetSizev

### 5.13.2.37 RTresult RTAPI rtBufferUnmap ( RTbuffer *buffer* )

Unmaps a buffer's storage from the host.

### Description

rtBufferUnmap unmaps a buffer from the host after a call to rtBufferMap. rtContextLaunch cannot be called while buffers are still mapped to the host. A call to rtBufferUnmap that does not follow a matching rtBufferMap call will return RT_ERROR_INVALID_VALUE.

Note that this call does not stop a progressive render if called with a stream buffer.

### Parameters

| | | |
|---|---|---|
| in | *buffer* | The buffer to unmap |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

### History

rtBufferUnmap was introduced in OptiX 1.0.

**See also** rtBufferMap, rtBufferMapEx, rtBufferUnmapEx

#### 5.13.2.38 RTresult RTAPI rtBufferUnmapEx ( RTbuffer *buffer,* unsigned int *level* )

Unmaps mipmap level storage from the host.

### Description

rtBufferUnmapEx unmaps buffer level from the host after a call to rtBufferMapEx. rtContextLaunch cannot be called while buffers are still mapped to the host. A call to rtBufferUnmapEx that does not follow a matching rtBufferMapEx call will return RT_ERROR_INVALID_VALUE. rtBufferUnmap is equivalent to rtBufferUnmapEx with *level* = 0.

Note that this call does not stop a progressive render if called with a stream buffer.

### Parameters

| | | |
|---|---|---|
| in | *buffer* | The buffer to unmap |
| in | *level* | The mipmap level to unmap |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

### History

rtBufferUnmapEx was introduced in OptiX 3.9.

**See also** rtBufferMap, rtBufferUnmap, rtBufferMapEx

#### 5.13.2.39 RTresult RTAPI rtBufferValidate ( RTbuffer *buffer* )

Validates the state of a buffer.

### Description

rtBufferValidate checks *buffer* for completeness. If *buffer* has not had its dimensionality, size or format set, this call will return RT_ERROR_INVALID_CONTEXT.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | The buffer to validate |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtBufferValidate was introduced in OptiX 1.0.

**See also** rtBufferCreate, rtBufferCreateFromGLBO rtContextValidate

### 5.13.2.40 RTresult RTAPI rtContextGetBufferFromId ( RTcontext *context*, int *buffer_id*, RTbuffer * *buffer* )

Gets an RTbuffer corresponding to the buffer id.

**Description**

rtContextGetBufferFromId returns a handle to the buffer in **buffer* corresponding to the *buffer_id* supplied. If *buffer_id* does not map to a valid buffer handle, **buffer* is *NULL* or if *context* is invalid, returns RT_ERROR_INVALID_VALUE.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context the buffer should be originated from |
| in | *buffer_id* | The ID of the buffer to query |
| out | *buffer* | The return handle for the buffer object corresponding to the buffer_id |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtContextGetBufferFromId was introduced in OptiX 3.5.

**See also** rtBufferGetId

### 5.13.2.41 RTresult RTAPI rtDeviceGetWGLDevice ( int * *device*, HGPUNV *gpu* )

returns the OptiX device number associated with the specified GPU

**Description**

rtDeviceGetWGLDevice returns in *device* the OptiX device ID of the GPU represented by *gpu*. *gpu* is returned from *WGL_NV_gpu_affinity*, an OpenGL extension. This enables OptiX to create a context on the same GPU that OpenGL commands will be sent to, improving OpenGL interoperation efficiency.

**Parameters**

| | | |
|---|---|---|
| out | *device* | A handle to the memory location where the OptiX device ordinal associated with *gpu* will be stored |
| in | *gpu* | A handle to a GPU as returned from the *WGL_NV_gpu_affinity* OpenGL extension |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtDeviceGetWGLDevice was introduced in OptiX 1.0.

**See also** rtDeviceGetDeviceCount, *WGL_NV_gpu_affinity*

#### 5.13.2.42 RTresult RTAPI rtTextureSamplerCreateFromGLImage ( RTcontext *context*, unsigned int *glId*, RTgltarget *target*, RTtexturesampler * *textureSampler* )

Creates a new texture sampler object from an OpenGL image.

**Description**

rtTextureSamplerCreateFromGLImage allocates and returns a handle to a new texture sampler object in * *texturesampler* associated with *context*. If the allocated size of the GL texture is 0, RT_ERROR_MEMORY_ALLOCATION_FAILED will be returned. Supported OpenGL image types are:

Renderbuffers

- GL_TEXTURE_2D
- GL_TEXTURE_2D_RECT
- GL_TEXTURE_3D

These types are reflected by *target:*

- RT_TARGET_GL_RENDER_BUFFER
- RT_TARGET_GL_TEXTURE_1D
- RT_TARGET_GL_TEXTURE_2D
- RT_TARGET_GL_TEXTURE_RECTANGLE
- RT_TARGET_GL_TEXTURE_3D
- RT_TARGET_GL_TEXTURE_1D_ARRAY
- RT_TARGET_GL_TEXTURE_2D_ARRAY
- RT_TARGET_GL_TEXTURE_CUBE_MAP
- RT_TARGET_GL_TEXTURE_CUBE_MAP_ARRAY

Supported attachment points for renderbuffers are:

- GL_COLOR_ATTACHMENT<NUM>

These texture samplers can be used to share data with OpenGL; changes of the content and size of *texturesampler* done by OpenGL will be reflected automatically in OptiX. Currently texture sampler data are read only in OptiX programs. OptiX keeps only a reference to OpenGL data, when *texturesampler* is destroyed, the state of the *gl_id* image is unaltered.

The array size and number of mipmap levels can't be changed for texture samplers that encapsulate a GL image. Furthermore no buffer objects can be queried.

Currently OptiX supports only a limited number of internal OpenGL texture formats. Texture formats with an internal type of float, e.g. *GL_RGBA32F*, and many integer formats are supported. Depth formats as well as multisample buffers are also currently not supported. Please refer to the OptiX Interoperability Types section for a complete list of supported texture formats.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context to create the buffer in |
| in | *glId* | The OpenGL image object resoure handle for use in OptiX |
| in | *target* | The OpenGL target |
| out | *textureSampler* | The return handle for the texture sampler object |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtTextureSamplerCreateFromGLImage was introduced in OptiX 2.0.

**See also** rtTextureSamplerCreate, rtTextureSamplerDestroy

#### 5.13.2.43 RTresult RTAPI rtTextureSamplerGetGLImageId ( RTtexturesampler *textureSampler*, unsigned int * *glId* )

Gets the OpenGL image object id associated with this texture sampler.

**Description**

rtTextureSamplerGetGLImageId stores the OpenGL image object id in *gl_id* if *textureSampler* was created with rtTextureSamplerCreateFromGLImage. If *textureSampler* was not created from an OpenGL image object *gl_id* will be set to 0.

**Parameters**

| | | |
|---|---|---|
| in | *textureSampler* | The texture sampler to be queried for its OpenGL buffer object id |
| in | *glId* | The return handle for the id |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtTextureSamplerGetGLImageId was introduced in OptiX 2.0.

**See also** rtTextureSamplerCreateFromGLImage

#### 5.13.2.44 RTresult RTAPI rtTextureSamplerGLRegister ( RTtexturesampler *textureSampler* )

Declares an OpenGL texture as immutable and accessible by OptiX.

**Description**

Registers an OpenGL texture as accessible by OptiX. Once registered, properties like the size of the original GL texture cannot be modified anymore. Calls to the corresponding GL functions will return with an error code. However, the pixel data of the GL texture can still be read and written by the

appropriate GL commands. Returns RT_ERROR_RESOURCE_ALREADY_REGISTERED if *textureSampler* is already registered. A texture sampler must be registered in order to be used by OptiX. Otherwise, RT_ERROR_INVALID_VALUE is returned. An OptiX texture sampler in a registered state can be unregistered via rtTextureSamplerGLUnregister.

**Parameters**

| | | |
|---|---|---|
| in | *textureSampler* | The handle for the texture object |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_RESOURCE_ALREADY_REGISTERED

**History**

rtTextureSamplerGLRegister was introduced in OptiX 2.0.

**See also** rtTextureSamplerCreateFromGLImage, rtTextureSamplerGLUnregister

#### 5.13.2.45 RTresult RTAPI rtTextureSamplerGLUnregister ( RTtexturesampler *textureSampler* )

Declares an OpenGL texture as mutable and inaccessible by OptiX.

**Description**

Once unregistered, properties like the size of the original GL texture can be changed. As long as a texture is unregistered, OptiX will not be able to access the pixel data and calls will fail with RT_ERROR_INVALID_VALUE. Returns *RT_ERROR_RESOURCE_NOT_REGISTERED* if *textureSampler* is already unregistered. An OptiX texture sampler in an unregistered state can be registered to OptiX again via rtTextureSamplerGLRegister.

**Parameters**

| | | |
|---|---|---|
| in | *textureSampler* | The handle for the texture object |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_RESOURCE_NOT_REGISTERED

**History**

rtTextureSamplerGLUnregister was introduced in OptiX 2.0.

**See also** rtTextureSamplerCreateFromGLImage, rtTextureSamplerGLRegister

## 5.14 TextureSampler functions

### Functions

- RTresult RTAPI rtTextureSamplerCreate (RTcontext context, RTtexturesampler *texturesampler)
- RTresult RTAPI rtTextureSamplerDestroy (RTtexturesampler texturesampler)
- RTresult RTAPI rtTextureSamplerValidate (RTtexturesampler texturesampler)
- RTresult RTAPI rtTextureSamplerGetContext (RTtexturesampler texturesampler, RTcontext *context)
- RTresult RTAPI rtTextureSamplerSetWrapMode (RTtexturesampler texturesampler, unsigned int dimension, RTwrapmode wrapmode)
- RTresult RTAPI rtTextureSamplerGetWrapMode (RTtexturesampler texturesampler, unsigned int dimension, RTwrapmode *wrapmode)
- RTresult RTAPI rtTextureSamplerSetFilteringModes (RTtexturesampler texturesampler, RTfiltermode minification, RTfiltermode magnification, RTfiltermode mipmapping)
- RTresult RTAPI rtTextureSamplerGetFilteringModes (RTtexturesampler texturesampler, RTfiltermode *minification, RTfiltermode *magnification, RTfiltermode *mipmapping)
- RTresult RTAPI rtTextureSamplerSetMaxAnisotropy (RTtexturesampler texturesampler, float value)
- RTresult RTAPI rtTextureSamplerGetMaxAnisotropy (RTtexturesampler texturesampler, float *value)
- RTresult RTAPI rtTextureSamplerSetMipLevelClamp (RTtexturesampler texturesampler, float minLevel, float maxLevel)
- RTresult RTAPI rtTextureSamplerGetMipLevelClamp (RTtexturesampler texturesampler, float *minLevel, float *maxLevel)
- RTresult RTAPI rtTextureSamplerSetMipLevelBias (RTtexturesampler texturesampler, float value)
- RTresult RTAPI rtTextureSamplerGetMipLevelBias (RTtexturesampler texturesampler, float *value)
- RTresult RTAPI rtTextureSamplerSetReadMode (RTtexturesampler texturesampler, RTtexturereadmode readmode)
- RTresult RTAPI rtTextureSamplerGetReadMode (RTtexturesampler texturesampler, RTtexturereadmode *readmode)
- RTresult RTAPI rtTextureSamplerSetIndexingMode (RTtexturesampler texturesampler, RTtextureindexmode indexmode)
- RTresult RTAPI rtTextureSamplerGetIndexingMode (RTtexturesampler texturesampler, RTtextureindexmode *indexmode)
- RTresult RTAPI rtTextureSamplerSetBuffer (RTtexturesampler texturesampler, unsigned int deprecated0, unsigned int deprecated1, RTbuffer buffer)
- RTresult RTAPI rtTextureSamplerGetBuffer (RTtexturesampler texturesampler, unsigned int deprecated0, unsigned int deprecated1, RTbuffer *buffer)
- RTresult RTAPI rtTextureSamplerGetId (RTtexturesampler texturesampler, int *texture_id)

### 5.14.1 Detailed Description

Functions related to an OptiX Texture Sampler.

### 5.14.2 Function Documentation

#### 5.14.2.1 RTresult RTAPI rtTextureSamplerCreate ( RTcontext *context,* RTtexturesampler * *texturesampler* )

Creates a new texture sampler object.

**Description**

rtTextureSamplerCreate allocates a texture sampler object. Sets ∗*texturesampler* to the handle of a newly created texture sampler within *context*. Returns RT_ERROR_INVALID_VALUE if *texturesampler* is *NULL*.

**Parameters**

| | | |
|---|---|---|
| in | *context* | The context the texture sampler object will be created in |
| out | *texturesampler* | The return handle to the new texture sampler object |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtTextureSamplerCreate was introduced in OptiX 1.0.

**See also** rtTextureSamplerDestroy

#### 5.14.2.2 RTresult RTAPI rtTextureSamplerDestroy ( RTtexturesampler *texturesampler* )

Destroys a texture sampler object.

**Description**

rtTextureSamplerDestroy removes *texturesampler* from its context and deletes it. *texturesampler* should be a value returned by rtTextureSamplerCreate. After the call, *texturesampler* is no longer a valid handle. Any API object that referenced *texturesampler* will have its reference invalidated.

**Parameters**

| | | |
|---|---|---|
| in | *texturesampler* | Handle of the texture sampler to destroy |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtTextureSamplerDestroy was introduced in OptiX 1.0.

**See also** rtTextureSamplerCreate

#### 5.14.2.3 RTresult RTAPI rtTextureSamplerGetBuffer ( RTtexturesampler *texturesampler,* unsigned int *deprecated0,* unsigned int *deprecated1,* RTbuffer ∗ *buffer* )

Gets a buffer object handle from a texture sampler.

**Description**

rtTextureSamplerGetBuffer gets a buffer object from *texturesampler* and stores it in ∗*buffer*.

**Parameters**

| | | |
|---|---|---|
| in | *texturesampler* | The texture sampler object to be queried for the buffer |
| in | *deprecated0* | Deprecated in OptiX 3.9, must be 0 |
| in | *deprecated1* | Deprecated in OptiX 3.9, must be 0 |
| out | *buffer* | The return handle to the buffer attached to the texture sampler |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtTextureSamplerGetBuffer was introduced in OptiX 1.0.

**See also** rtTextureSamplerSetBuffer

#### 5.14.2.4 RTresult RTAPI rtTextureSamplerGetContext ( RTtexturesampler *texturesampler,* RTcontext * *context* )

Gets the context object that created this texture sampler.

**Description**

rtTextureSamplerGetContext returns a handle to the context object that was used to create *texturesampler*. If *context* is *NULL*, returns RT_ERROR_INVALID_VALUE.

**Parameters**

| | | |
|---|---|---|
| in | *texturesampler* | The texture sampler object to be queried for its context |
| out | *context* | The return handle for the context object of the texture sampler |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtTextureSamplerGetContext was introduced in OptiX 1.0.

**See also** rtContextCreate

#### 5.14.2.5 RTresult RTAPI rtTextureSamplerGetFilteringModes ( RTtexturesampler *texturesampler,* RTfiltermode * *minification,* RTfiltermode * *magnification,* RTfiltermode * *mipmapping* )

Gets the filtering modes of a texture sampler.

**Description**

rtTextureSamplerGetFilteringModes gets the minification, magnification and MIP mapping filtering modes from *texturesampler* and stores them in $*$*minification*, $*$*magnification* and $*$*mipmapping*, respectively. See rtTextureSamplerSetFilteringModes for the values RTfiltermode may take.

**Parameters**

| | | |
|---|---|---|
| in | *texturesampler* | The texture sampler object to be queried |
| out | *minification* | The return handle for the minification filtering mode of the texture sampler |
| out | *magnification* | The return handle for the magnification filtering mode of the texture sampler |
| out | *mipmapping* | The return handle for the MIP mapping filtering mode of the texture sampler |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtTextureSamplerGetFilteringModes was introduced in OptiX 1.0.

**See also** rtTextureSamplerSetFilteringModes

#### 5.14.2.6 RTresult RTAPI rtTextureSamplerGetId ( RTtexturesampler *texturesampler,* int * *texture_id* )

Returns the texture ID of this texture sampler.

**Description**

rtTextureSamplerGetId returns a handle to the texture sampler *texturesampler* to be used in OptiX programs on the device to reference the associated texture. The returned ID cannot be used on the host side. If *texture_id* is *NULL*, returns RT_ERROR_INVALID_VALUE.

**Parameters**

| | | |
|---|---|---|
| in | *texturesampler* | The texture sampler object to be queried for its ID |
| out | *texture_id* | The returned device-side texture ID of the texture sampler |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtTextureSamplerGetId was introduced in OptiX 3.0.

**See also** rtTextureSamplerCreate

#### 5.14.2.7 RTresult RTAPI rtTextureSamplerGetIndexingMode ( RTtexturesampler *texturesampler,* RTtextureindexmode * *indexmode* )

Gets the indexing mode of a texture sampler.

**Description**

rtTextureSamplerGetIndexingMode gets the indexing mode of *texturesampler* and stores it in **indexmode*. See rtTextureSamplerSetIndexingMode for the values RTtextureindexmode may take.

**Parameters**

| | | |
|---|---|---|
| in | *texturesampler* | The texture sampler object to be queried |
| out | *indexmode* | The return handle for the indexing mode of the texture sampler |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtTextureSamplerGetIndexingMode was introduced in OptiX 1.0.

**See also** rtTextureSamplerSetIndexingMode

#### 5.14.2.8 RTresult RTAPI rtTextureSamplerGetMaxAnisotropy ( RTtexturesampler *texturesampler*, float * *value* )

Gets the maximum anisotropy level for a texture sampler.

**Description**

rtTextureSamplerGetMaxAnisotropy gets the maximum anisotropy level for *texturesampler* and stores it in *value*.

**Parameters**

| | | |
|---|---|---|
| in | *texturesampler* | The texture sampler object to be queried |
| out | *value* | The return handle for the maximum anisotropy level of the texture sampler |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtTextureSamplerGetMaxAnisotropy was introduced in OptiX 1.0.

**See also** rtTextureSamplerSetMaxAnisotropy

#### 5.14.2.9 RTresult RTAPI rtTextureSamplerGetMipLevelBias ( RTtexturesampler *texturesampler*, float * *value* )

Gets the mipmap offset for a texture sampler.

**Description**

rtTextureSamplerGetMipLevelBias gets the mipmap offset for *texturesampler* and stores it in *value*.

**Parameters**

| | | |
|---|---|---|
| in | *texturesampler* | The texture sampler object to be queried |
| out | *value* | The return handle for the mipmap offset of the texture sampler |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtTextureSamplerGetMipLevelBias was introduced in OptiX 3.9.

**See also** rtTextureSamplerSetMipLevelBias

#### 5.14.2.10 RTresult RTAPI rtTextureSamplerGetMipLevelClamp ( RTtexturesampler *texturesampler*, float * *minLevel*, float * *maxLevel* )

Gets the minimum and the maximum MIP level access range for a texture sampler.

**Description**

rtTextureSamplerGetMipLevelClamp gets the minimum and the maximum MIP level access range for *texturesampler* and stores it in *minLevel* and *maxLevel*.

**Parameters**

| | | |
|---|---|---|
| in | *texturesampler* | The texture sampler object to be queried |
| out | *minLevel* | The return handle for the minimum mipmap level of the texture sampler |
| out | *maxLevel* | The return handle for the maximum mipmap level of the texture sampler |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtTextureSamplerGetMipLevelClamp was introduced in OptiX 3.9.

**See also** rtTextureSamplerSetMipLevelClamp

#### 5.14.2.11 RTresult RTAPI rtTextureSamplerGetReadMode ( RTtexturesampler *texturesampler*, RTtexturereadmode * *readmode* )

Gets the read mode of a texture sampler.

**Description**

rtTextureSamplerGetReadMode gets the read mode of *texturesampler* and stores it in *readmode*. See rtTextureSamplerSetReadMode for a list of values RTtexturereadmode can take.

**Parameters**

| | | |
|---|---|---|
| in | *texturesampler* | The texture sampler object to be queried |
| out | *readmode* | The return handle for the read mode of the texture sampler |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtTextureSamplerGetReadMode was introduced in OptiX 1.0.

**See also** rtTextureSamplerSetReadMode

#### 5.14.2.12 RTresult RTAPI rtTextureSamplerGetWrapMode ( RTtexturesampler *texturesampler*, unsigned int *dimension*, RTwrapmode * *wrapmode* )

Gets the wrap mode of a texture sampler.

**Description**

rtTextureSamplerGetWrapMode gets the texture wrapping mode of *texturesampler* and stores it in *wrapmode*. See rtTextureSamplerSetWrapMode for a list of values RTwrapmode can take.

**Parameters**

| | | |
|---|---|---|
| in | *texturesampler* | The texture sampler object to be queried |
| in | *dimension* | Dimension for the wrapping |
| out | *wrapmode* | The return handle for the wrap mode of the texture sampler |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtTextureSamplerGetWrapMode was introduced in OptiX 1.0.

**See also** rtTextureSamplerSetWrapMode

#### 5.14.2.13 RTresult RTAPI rtTextureSamplerSetBuffer ( RTtexturesampler *texturesampler*, unsigned int *deprecated0*, unsigned int *deprecated1*, RTbuffer *buffer* )

Attaches a buffer object to a texture sampler.

**Description**

rtTextureSamplerSetBuffer attaches *buffer* to *texturesampler*.

**Parameters**

| | | |
|---|---|---|
| in | *texturesampler* | The texture sampler object that will contain the buffer |
| in | *deprecated0* | Deprecated in OptiX 3.9, must be 0 |
| in | *deprecated1* | Deprecated in OptiX 3.9, must be 0 |
| in | *buffer* | The buffer to be attached to the texture sampler |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtTextureSamplerSetBuffer was introduced in OptiX 1.0.

**See also** rtTextureSamplerGetBuffer

#### 5.14.2.14 RTresult RTAPI rtTextureSamplerSetFilteringModes ( RTtexturesampler *texturesampler*, RTfiltermode *minification*, RTfiltermode *magnification*, RTfiltermode *mipmapping* )

Sets the filtering modes of a texture sampler.

**Description**

rtTextureSamplerSetFilteringModes sets the minification, magnification and MIP mapping filter modes for *texturesampler*. RTfiltermode must be one of the following values:

- RT_FILTER_NEAREST
- RT_FILTER_LINEAR
- RT_FILTER_NONE

These filter modes specify how the texture sampler will interpolate buffer data that has been attached to it. *minification* and *magnification* must be one of RT_FILTER_NEAREST or RT_FILTER_LINEAR. *mipmapping* may be any of the three values but must be RT_FILTER_NONE if the texture sampler contains only a single MIP level or one of RT_FILTER_NEAREST or RT_FILTER_LINEAR if the texture sampler contains more than one MIP level.

**Parameters**

| | | |
|---|---|---|
| in | *texturesampler* | The texture sampler object to be changed |
| in | *minification* | The new minification filter mode of the texture sampler |
| in | *magnification* | The new magnification filter mode of the texture sampler |
| in | *mipmapping* | The new MIP mapping filter mode of the texture sampler |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtTextureSamplerSetFilteringModes was introduced in OptiX 1.0.

**See also** rtTextureSamplerGetFilteringModes

#### 5.14.2.15 RTresult RTAPI rtTextureSamplerSetIndexingMode ( RTtexturesampler *texturesampler*, RTtextureindexmode *indexmode* )

Sets whether texture coordinates for this texture sampler are normalized.

**Description**

rtTextureSamplerSetIndexingMode sets the indexing mode of *texturesampler* to *indexmode*. *indexmode* can take on one of the following values:

- RT_TEXTURE_INDEX_NORMALIZED_COORDINATES,
- RT_TEXTURE_INDEX_ARRAY_INDEX

These values are used to control the interpretation of texture coordinates. If the index mode is set to RT_TEXTURE_INDEX_NORMALIZED_COORDINATES, the texture is parameterized over [0,1]. If the index mode is set to RT_TEXTURE_INDEX_ARRAY_INDEX then texture coordinates are interpreted as array indices into the contents of the underlying buffer objects.

**Parameters**

| | | |
|---|---|---|
| in | *texturesampler* | The texture sampler object to be changed |
| in | *indexmode* | The new indexing mode of the texture sampler |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtTextureSamplerSetIndexingMode was introduced in OptiX 1.0.

**See also** rtTextureSamplerGetIndexingMode

#### 5.14.2.16 RTresult RTAPI rtTextureSamplerSetMaxAnisotropy ( RTtexturesampler *texturesampler*, float *value* )

Sets the maximum anisotropy of a texture sampler.

**Description**

rtTextureSamplerSetMaxAnisotropy sets the maximum anisotropy of *texturesampler* to *value*. A float value specifies the maximum anisotropy ratio to be used when doing anisotropic filtering. This value will be clamped to the range [1,16]

**Parameters**

| | | |
|---|---|---|
| in | *texturesampler* | The texture sampler object to be changed |
| in | *value* | The new maximum anisotropy level of the texture sampler |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT

- RT_ERROR_INVALID_VALUE

**History**

rtTextureSamplerSetMaxAnisotropy was introduced in OptiX 1.0.

**See also** rtTextureSamplerGetMaxAnisotropy

#### 5.14.2.17 RTresult RTAPI rtTextureSamplerSetMipLevelBias ( RTtexturesampler *texturesampler*, float *value* )

Sets the mipmap offset of a texture sampler.

**Description**

rtTextureSamplerSetMipLevelBias sets the offset to be applied to the calculated mipmap level.

**Parameters**

| | | |
|---|---|---|
| in | *texturesampler* | The texture sampler object to be changed |
| in | *value* | The new mipmap offset of the texture sampler |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtTextureSamplerSetMipLevelBias was introduced in OptiX 3.9.

**See also** rtTextureSamplerGetMipLevelBias

#### 5.14.2.18 RTresult RTAPI rtTextureSamplerSetMipLevelClamp ( RTtexturesampler *texturesampler*, float *minLevel*, float *maxLevel* )

Sets the minimum and the maximum MIP level access range of a texture sampler.

**Description**

rtTextureSamplerSetMipLevelClamp sets lower end and the upper end of the MIP level range to clamp access to.

**Parameters**

| | | |
|---|---|---|
| in | *texturesampler* | The texture sampler object to be changed |
| in | *minLevel* | The new minimum mipmap level of the texture sampler |
| in | *maxLevel* | The new maximum mipmap level of the texture sampler |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtTextureSamplerSetMipLevelClamp was introduced in OptiX 3.9.

**See also** rtTextureSamplerGetMipLevelClamp

#### 5.14.2.19 RTresult RTAPI rtTextureSamplerSetReadMode ( RTtexturesampler *texturesampler*, RTtexturereadmode *readmode* )

Sets the read mode of a texture sampler.

**Description**

rtTextureSamplerSetReadMode sets the data read mode of *texturesampler* to *readmode*. *readmode* can take one of the following values:

- RT_TEXTURE_READ_ELEMENT_TYPE
- RT_TEXTURE_READ_NORMALIZED_FLOAT
- RT_TEXTURE_READ_ELEMENT_TYPE_SRGB
- RT_TEXTURE_READ_NORMALIZED_FLOAT_SRGB

RT_TEXTURE_READ_ELEMENT_TYPE_SRGB and RT_TEXTURE_READ_NORMALIZED_FLOAT_SRGB were introduced in OptiX 3.9 and apply sRGB to linear conversion during texture read for 8-bit integer buffer formats. *readmode* controls the returned value of the texture sampler when it is used to sample textures. RT_TEXTURE_READ_ELEMENT_TYPE will return data of the type of the underlying buffer objects. RT_TEXTURE_READ_NORMALIZED_FLOAT will return floating point values normalized by the range of the underlying type. If the underlying type is floating point, RT_TEXTURE_READ_NORMALIZED_FLOAT and RT_TEXTURE_READ_ELEMENT_TYPE are equivalent, always returning the unmodified floating point value.

For example, a texture sampler that samples a buffer of type RT_FORMAT_UNSIGNED_BYTE with a read mode of RT_TEXTURE_READ_NORMALIZED_FLOAT will convert integral values from the range [0,255] to floating point values in the range [0,1] automatically as the buffer is sampled from.

**Parameters**

| | | |
|---|---|---|
| `in` | *texturesampler* | The texture sampler object to be changed |
| `in` | *readmode* | The new read mode of the texture sampler |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtTextureSamplerSetReadMode was introduced in OptiX 1.0.

**See also** rtTextureSamplerGetReadMode

#### 5.14.2.20 RTresult RTAPI rtTextureSamplerSetWrapMode ( RTtexturesampler *texturesampler*, unsigned int *dimension*, RTwrapmode *wrapmode* )

Sets the wrapping mode of a texture sampler.

**Description**

rtTextureSamplerSetWrapMode sets the wrapping mode of *texturesampler* to *wrapmode* for the texture dimension specified by *dimension*. *wrapmode* can take one of the following values:

- RT_WRAP_REPEAT
- RT_WRAP_CLAMP_TO_EDGE
- RT_WRAP_MIRROR

- RT_WRAP_CLAMP_TO_BORDER

The wrapping mode controls the behavior of the texture sampler as texture coordinates wrap around the range specified by the indexing mode. These values mirror the CUDA behavior of textures. See CUDA programming guide for details.

**Parameters**

| | | |
|---|---|---|
| in | *texturesampler* | The texture sampler object to be changed |
| in | *dimension* | Dimension of the texture |
| in | *wrapmode* | The new wrap mode of the texture sampler |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtTextureSamplerSetWrapMode was introduced in OptiX 1.0. RT_WRAP_MIRROR and RT_WRAP_CLAMP_TO_BORDER were introduced in OptiX 3.0.

**See also** rtTextureSamplerGetWrapMode

#### 5.14.2.21 RTresult RTAPI rtTextureSamplerValidate ( RTtexturesampler *texturesampler* )

Validates the state of a texture sampler.

**Description**

rtTextureSamplerValidate checks *texturesampler* for completeness. If *texturesampler* does not have buffers attached to all of its MIP levels and array slices or if the filtering modes are incompatible with the current MIP level and array slice configuration then returns RT_ERROR_INVALID_CONTEXT.

**Parameters**

| | | |
|---|---|---|
| in | *texturesampler* | The texture sampler to be validated |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtTextureSamplerValidate was introduced in OptiX 1.0.

**See also** rtContextValidate

## 5.15 Variable functions

### Modules

- Variable setters
- Variable getters

### Functions

- RTresult RTAPI rtVariableSetObject (RTvariable v, RTobject object)
- RTresult RTAPI rtVariableSetUserData (RTvariable v, RTsize size, const void *ptr)
- RTresult RTAPI rtVariableGetObject (RTvariable v, RTobject *object)
- RTresult RTAPI rtVariableGetUserData (RTvariable v, RTsize size, void *ptr)
- RTresult RTAPI rtVariableGetName (RTvariable v, const char **name_return)
- RTresult RTAPI rtVariableGetAnnotation (RTvariable v, const char **annotation_return)
- RTresult RTAPI rtVariableGetType (RTvariable v, RTobjecttype *type_return)
- RTresult RTAPI rtVariableGetContext (RTvariable v, RTcontext *context)
- RTresult RTAPI rtVariableGetSize (RTvariable v, RTsize *size)

### 5.15.1 Detailed Description

Functions related to variable handling.

### 5.15.2 Function Documentation

#### 5.15.2.1 RTresult RTAPI rtVariableGetAnnotation ( RTvariable *v*, const char ** *annotation_return* )

Queries the annotation string of a program variable.

**Description**

rtVariableGetAnnotation queries a program variable's annotation string. A pointer to the string containing the annotation is returned in **annotation_return*. If *v* is not a valid variable, this call sets **annotation_return* to *NULL* and returns RT_ERROR_INVALID_VALUE. **annotation_return* will point to valid memory until another API function that returns a string is called.

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be queried |
| out | *annotation_return* | Returns the program variable's annotation string |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

### History

rtVariableGetAnnotation was introduced in OptiX 1.0.

**See also** rtDeclareVariable, rtDeclareAnnotation

#### 5.15.2.2 RTresult RTAPI rtVariableGetContext ( RTvariable *v*, RTcontext * *context* )

Returns the context associated with a program variable.

### Description

rtVariableGetContext queries the context associated with a program variable. The target variable is specified by *v*. The context of the program variable is returned to **context* if the pointer *context* is not *NULL*. If *v* is not a valid variable, **context* is set to *NULL* and RT_ERROR_INVALID_VALUE is returned.

### Parameters

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be queried |
| out | *context* | Returns the context associated with the program variable |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

### History

rtVariableGetContext was introduced in OptiX 1.0.

**See also** rtContextDeclareVariable

#### 5.15.2.3 RTresult RTAPI rtVariableGetName ( RTvariable *v*, const char ** *name_return* )

Queries the name of a program variable.

### Description

Queries a program variable's name. The variable of interest is specified by *variable*, which should be a value returned by rtContextDeclareVariable. A pointer to the string containing the name of the variable is returned in **name_return*. If *v* is not a valid variable, this call sets **name_return* to *NULL* and returns RT_ERROR_INVALID_VALUE. **name_return* will point to valid memory until another API function that returns a string is called.

### Parameters

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be queried |
| out | *name_return* | Returns the program variable's name |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

### History

rtVariableGetName was introduced in OptiX 1.0.

**See also** rtContextDeclareVariable

#### 5.15.2.4 RTresult RTAPI rtVariableGetObject ( RTvariable *v*, RTobject * *object* )

Returns the value of a OptiX object program variable.

**Description**

rtVariableGetObject queries the value of a program variable whose data type is a OptiX object. The target variable is specified by *v*. The value of the program variable is returned in **object*. The concrete type of the program variable can be queried using rtVariableGetType, and the RTobject handle returned by rtVariableGetObject may safely be cast to an OptiX handle of corresponding type. If *v* is not a valid variable, this call sets **object* to *NULL* and returns RT_ERROR_INVALID_VALUE.

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be queried |
| out | *object* | Returns the value of the program variable |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE
- RT_ERROR_TYPE_MISMATCH

**History**

rtVariableGetObject was introduced in OptiX 1.0.

**See also** rtVariableSetObject, rtVariableGetType, rtContextDeclareVariable

#### 5.15.2.5 RTresult RTAPI rtVariableGetSize ( RTvariable *v*, RTsize * *size* )

Queries the size, in bytes, of a variable.

**Description**

rtVariableGetSize queries a declared program variable for its size in bytes. This is most often used to query the size of a variable that has a user-defined type. Builtin types (int, float, unsigned int, etc.) may be queried, but object typed variables, such as buffers, texture samplers and graph nodes, cannot be queried and will return RT_ERROR_INVALID_VALUE.

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be queried |
| out | *size* | Specifies a pointer where the size of the variable, in bytes, will be returned |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtVariableGetSize was introduced in OptiX 1.0.

**See also** rtVariableGetUserData, rtContextDeclareVariable

#### 5.15.2.6 RTresult RTAPI rtVariableGetType ( RTvariable *v*, RTobjecttype * *type_return* )

Returns type information about a program variable.

**Description**

rtVariableGetType queries a program variable's type. The variable of interest is specified by *v*. The program variable's type enumeration is returned in **type_return*, if it is not *NULL*. It is one of the following:

- RT_OBJECTTYPE_UNKNOWN
- RT_OBJECTTYPE_GROUP
- RT_OBJECTTYPE_GEOMETRY_GROUP
- RT_OBJECTTYPE_TRANSFORM
- RT_OBJECTTYPE_SELECTOR
- RT_OBJECTTYPE_GEOMETRY_INSTANCE
- RT_OBJECTTYPE_BUFFER
- RT_OBJECTTYPE_TEXTURE_SAMPLER
- RT_OBJECTTYPE_OBJECT
- RT_OBJECTTYPE_MATRIX_FLOAT2x2
- RT_OBJECTTYPE_MATRIX_FLOAT2x3
- RT_OBJECTTYPE_MATRIX_FLOAT2x4
- RT_OBJECTTYPE_MATRIX_FLOAT3x2
- RT_OBJECTTYPE_MATRIX_FLOAT3x3
- RT_OBJECTTYPE_MATRIX_FLOAT3x4
- RT_OBJECTTYPE_MATRIX_FLOAT4x2
- RT_OBJECTTYPE_MATRIX_FLOAT4x3
- RT_OBJECTTYPE_MATRIX_FLOAT4x4
- RT_OBJECTTYPE_FLOAT
- RT_OBJECTTYPE_FLOAT2
- RT_OBJECTTYPE_FLOAT3
- RT_OBJECTTYPE_FLOAT4
- RT_OBJECTTYPE_INT
- RT_OBJECTTYPE_INT2
- RT_OBJECTTYPE_INT3
- RT_OBJECTTYPE_INT4
- RT_OBJECTTYPE_UNSIGNED_INT
- RT_OBJECTTYPE_UNSIGNED_INT2
- RT_OBJECTTYPE_UNSIGNED_INT3
- RT_OBJECTTYPE_UNSIGNED_INT4
- RT_OBJECTTYPE_USER

Sets **type_return* to RT_OBJECTTYPE_UNKNOWN if *v* is not a valid variable. Returns RT_ERROR_INVALID_VALUE if given a *NULL* pointer.

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be queried |

| | | |
|---|---|---|
| out | *type_return* | Returns the type of the program variable |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtVariableGetType was introduced in OptiX 1.0.

**See also** rtContextDeclareVariable

#### 5.15.2.7 RTresult RTAPI rtVariableGetUserData ( RTvariable *v*, RTsize *size*, void * *ptr* )

Defined.

**Description**

rtVariableGetUserData queries the value of a program variable whose data type is user-defined. The variable of interest is specified by *v*. The size of the variable's value must match the value given by the parameter *size*. The value of the program variable is copied to the memory region pointed to by *ptr*. The storage at location *ptr* must be large enough to accommodate all of the program variable's value data. If *v* is not a valid variable, this call has no effect and returns RT_ERROR_INVALID_VALUE.

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be queried |
| in | *size* | Specifies the size of the program variable, in bytes |
| out | *ptr* | Location in which to store the value of the variable |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtVariableGetUserData was introduced in OptiX 1.0.

**See also** rtVariableSetUserData, rtContextDeclareVariable

#### 5.15.2.8 RTresult RTAPI rtVariableSetObject ( RTvariable *v*, RTobject *object* )

Sets a program variable value to a OptiX object.

**Description**

rtVariableSetObject sets a program variable to an OptiX object value. The target variable is specified by *v*. The new value of the program variable is specified by *object*. The concrete type of *object* can be one of RTbuffer, RTtexturesampler, RTgroup, RTprogram, RTselector, RTgeometrygroup, or RTtransform. If *v* is not a valid variable or *object* is not a valid OptiX object, this call has no effect and returns RT_ERROR_INVALID_VALUE.

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be set |
| in | *object* | Specifies the new value of the program variable |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_TYPE_MISMATCH

**History**

rtVariableSetObject was introduced in OptiX 1.0. The ability to bind an RTprogram to a variable was introduced in OptiX 3.0.

**See also** rtVariableGetObject, rtContextDeclareVariable

#### 5.15.2.9 RTresult RTAPI rtVariableSetUserData ( RTvariable *v*, RTsize *size*, const void * *ptr* )

Defined.

**Description**

rtVariableSetUserData modifies the value of a program variable whose data type is user-defined. The value copied into the variable is defined by an arbitrary region of memory, pointed to by *ptr*. The size of the memory region is given by *size*. The target variable is specified by *v*. If *v* is not a valid variable, this call has no effect and returns RT_ERROR_INVALID_VALUE.

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *size* | Specifies the size of the new value, in bytes |
| in | *ptr* | Specifies a pointer to the new value of the program variable |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED
- RT_ERROR_TYPE_MISMATCH

**History**

rtVariableSetUserData was introduced in OptiX 1.0.

**See also** rtVariableGetUserData, rtContextDeclareVariable

## 5.16 Variable setters

- RTresult RTAPI rtVariableSet1f (RTvariable v, float f1)
- RTresult RTAPI rtVariableSet2f (RTvariable v, float f1, float f2)
- RTresult RTAPI rtVariableSet3f (RTvariable v, float f1, float f2, float f3)
- RTresult RTAPI rtVariableSet4f (RTvariable v, float f1, float f2, float f3, float f4)
- RTresult RTAPI rtVariableSet1fv (RTvariable v, const float *f)
- RTresult RTAPI rtVariableSet2fv (RTvariable v, const float *f)
- RTresult RTAPI rtVariableSet3fv (RTvariable v, const float *f)
- RTresult RTAPI rtVariableSet4fv (RTvariable v, const float *f)
- RTresult RTAPI rtVariableSet1i (RTvariable v, int i1)
- RTresult RTAPI rtVariableSet2i (RTvariable v, int i1, int i2)
- RTresult RTAPI rtVariableSet3i (RTvariable v, int i1, int i2, int i3)
- RTresult RTAPI rtVariableSet4i (RTvariable v, int i1, int i2, int i3, int i4)
- RTresult RTAPI rtVariableSet1iv (RTvariable v, const int *i)
- RTresult RTAPI rtVariableSet2iv (RTvariable v, const int *i)
- RTresult RTAPI rtVariableSet3iv (RTvariable v, const int *i)
- RTresult RTAPI rtVariableSet4iv (RTvariable v, const int *i)
- RTresult RTAPI rtVariableSet1ui (RTvariable v, unsigned int u1)
- RTresult RTAPI rtVariableSet2ui (RTvariable v, unsigned int u1, unsigned int u2)
- RTresult RTAPI rtVariableSet3ui (RTvariable v, unsigned int u1, unsigned int u2, unsigned int u3)
- RTresult RTAPI rtVariableSet4ui (RTvariable v, unsigned int u1, unsigned int u2, unsigned int u3, unsigned int u4)
- RTresult RTAPI rtVariableSet1uiv (RTvariable v, const unsigned int *u)
- RTresult RTAPI rtVariableSet2uiv (RTvariable v, const unsigned int *u)
- RTresult RTAPI rtVariableSet3uiv (RTvariable v, const unsigned int *u)
- RTresult RTAPI rtVariableSet4uiv (RTvariable v, const unsigned int *u)
- RTresult RTAPI rtVariableSetMatrix2x2fv (RTvariable v, int transpose, const float *m)
- RTresult RTAPI rtVariableSetMatrix2x3fv (RTvariable v, int transpose, const float *m)
- RTresult RTAPI rtVariableSetMatrix2x4fv (RTvariable v, int transpose, const float *m)
- RTresult RTAPI rtVariableSetMatrix3x2fv (RTvariable v, int transpose, const float *m)
- RTresult RTAPI rtVariableSetMatrix3x3fv (RTvariable v, int transpose, const float *m)
- RTresult RTAPI rtVariableSetMatrix3x4fv (RTvariable v, int transpose, const float *m)
- RTresult RTAPI rtVariableSetMatrix4x2fv (RTvariable v, int transpose, const float *m)
- RTresult RTAPI rtVariableSetMatrix4x3fv (RTvariable v, int transpose, const float *m)
- RTresult RTAPI rtVariableSetMatrix4x4fv (RTvariable v, int transpose, const float *m)

### 5.16.1 Detailed Description

Functions designed to modify the value of a program variable.

### 5.16.2 Function Documentation

#### 5.16.2.1 RTresult RTAPI rtVariableSet1f ( RTvariable *v,* float *f1* )

Functions designed to modify the value of a program variable.

**Description**

Variable setters functions modify the value of a program variable or variable array. The target variable is specificed by *v*, which should be a value returned by rtContextGetVariable.

The commands *rtVariableSet{1-2-3-4}{f-i-ui}v* are used to modify the value of a program variable specified by *v* using the values passed as arguments. The number specified in the command should match the number of components in the data type of the specified program variable (e.g., 1 for float, int, unsigned int; 2 for float2, int2, uint2, etc.). The suffix *f* indicates that *v* has floating point type, the suffix *i* indicates that *v* has integral type, and the suffix *ui* indicates that that *v* has unsigned integral type. The *v* variants of this function should be used to load the program variable's value from the array specified by parameter *v*. In this case, the array *v* should contain as many elements as there are program variable components.

The commands *rtVariableSetMatrix{2-3-4}x{2-3-4}fv* are used to modify the value of a program variable whose data type is a matrix. The numbers in the command names are the number of rows and columns, respectively. For example, *2x4* indicates a matrix with 2 rows and 4 columns (i.e., 8 values). If *transpose* is *0*, the matrix is specified in row-major order, otherwise in column-major order or, equivalently, as a matrix with the number of rows and columns swapped in row-major order.

If *v* is not a valid variable, these calls have no effect and return RT_ERROR_INVALID_VALUE

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

Variable setters were introduced in OptiX 1.0.

**See also** Variable getters, Variable setters, rtDeclareVariable

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *f1* | Specifies the new float value of the program variable |

### 5.16.2.2 RTresult RTAPI rtVariableSet1fv ( RTvariable *v*, const float * *f* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *f* | Array of float values to set the variable to |

### 5.16.2.3 RTresult RTAPI rtVariableSet1i ( RTvariable *v*, int *i1* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *i1* | Specifies the new integer value of the program variable |

### 5.16.2.4 RTresult RTAPI rtVariableSet1iv ( RTvariable *v*, const int * *i* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *i* | Array of integer values to set the variable to |

#### 5.16.2.5 RTresult RTAPI rtVariableSet1ui ( RTvariable *v,* unsigned int *u1* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *u1* | Specifies the new unsigned integer value of the program variable |

#### 5.16.2.6 RTresult RTAPI rtVariableSet1uiv ( RTvariable *v,* const unsigned int * *u* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *u* | Array of unsigned integer values to set the variable to |

#### 5.16.2.7 RTresult RTAPI rtVariableSet2f ( RTvariable *v,* float *f1,* float *f2* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *f1* | Specifies the new float value of the program variable |
| in | *f2* | Specifies the new float value of the program variable |

#### 5.16.2.8 RTresult RTAPI rtVariableSet2fv ( RTvariable *v,* const float * *f* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *f* | Array of float values to set the variable to |

#### 5.16.2.9 RTresult RTAPI rtVariableSet2i ( RTvariable *v,* int *i1,* int *i2* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *i1* | Specifies the new integer value of the program variable |
| in | *i2* | Specifies the new integer value of the program variable |

#### 5.16.2.10 RTresult RTAPI rtVariableSet2iv ( RTvariable *v,* const int * *i* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *i* | Array of integer values to set the variable to |

#### 5.16.2.11 RTresult RTAPI rtVariableSet2ui ( RTvariable *v,* unsigned int *u1,* unsigned int *u2* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *u1* | Specifies the new unsigned integer value of the program variable |
| in | *u2* | Specifies the new unsigned integer value of the program variable |

#### 5.16.2.12 RTresult RTAPI rtVariableSet2uiv ( RTvariable *v,* const unsigned int * *u* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *u* | Array of unsigned integer values to set the variable to |

#### 5.16.2.13 RTresult RTAPI rtVariableSet3f ( RTvariable *v,* float *f1,* float *f2,* float *f3* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *f1* | Specifies the new float value of the program variable |
| in | *f2* | Specifies the new float value of the program variable |
| in | *f3* | Specifies the new float value of the program variable |

#### 5.16.2.14 RTresult RTAPI rtVariableSet3fv ( RTvariable *v,* const float * *f* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *f* | Array of float values to set the variable to |

#### 5.16.2.15 RTresult RTAPI rtVariableSet3i ( RTvariable *v,* int *i1,* int *i2,* int *i3* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *i1* | Specifies the new integer value of the program variable |
| in | *i2* | Specifies the new integer value of the program variable |

| | | |
|---|---|---|
| in | *i3* | Specifies the new integer value of the program variable |

#### 5.16.2.16 RTresult RTAPI rtVariableSet3iv ( RTvariable *v,* const int * *i* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *i* | Array of integer values to set the variable to |

#### 5.16.2.17 RTresult RTAPI rtVariableSet3ui ( RTvariable *v,* unsigned int *u1,* unsigned int *u2,* unsigned int *u3* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *u1* | Specifies the new unsigned integer value of the program variable |
| in | *u2* | Specifies the new unsigned integer value of the program variable |
| in | *u3* | Specifies the new unsigned integer value of the program variable |

#### 5.16.2.18 RTresult RTAPI rtVariableSet3uiv ( RTvariable *v,* const unsigned int * *u* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *u* | Array of unsigned integer values to set the variable to |

#### 5.16.2.19 RTresult RTAPI rtVariableSet4f ( RTvariable *v,* float *f1,* float *f2,* float *f3,* float *f4* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *f1* | Specifies the new float value of the program variable |
| in | *f2* | Specifies the new float value of the program variable |
| in | *f3* | Specifies the new float value of the program variable |
| in | *f4* | Specifies the new float value of the program variable |

#### 5.16.2.20 RTresult RTAPI rtVariableSet4fv ( RTvariable *v,* const float * *f* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *f* | Array of float values to set the variable to |

#### 5.16.2.21 RTresult RTAPI rtVariableSet4i ( RTvariable *v,* int *i1,* int *i2,* int *i3,* int *i4* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *i1* | Specifies the new integer value of the program variable |
| in | *i2* | Specifies the new integer value of the program variable |
| in | *i3* | Specifies the new integer value of the program variable |
| in | *i4* | Specifies the new integer value of the program variable |

#### 5.16.2.22 RTresult RTAPI rtVariableSet4iv ( RTvariable *v,* const int * *i* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *i* | Array of integer values to set the variable to |

#### 5.16.2.23 RTresult RTAPI rtVariableSet4ui ( RTvariable *v,* unsigned int *u1,* unsigned int *u2,* unsigned int *u3,* unsigned int *u4* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *u1* | Specifies the new unsigned integer value of the program variable |
| in | *u2* | Specifies the new unsigned integer value of the program variable |
| in | *u3* | Specifies the new unsigned integer value of the program variable |
| in | *u4* | Specifies the new unsigned integer value of the program variable |

#### 5.16.2.24 RTresult RTAPI rtVariableSet4uiv ( RTvariable *v,* const unsigned int * *u* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *u* | Array of unsigned integer values to set the variable to |

#### 5.16.2.25 RTresult RTAPI rtVariableSetMatrix2x2fv ( RTvariable *v,* int *transpose,* const float * *m* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *transpose* | Specifies row-major or column-major order |
| in | *m* | Array of float values to set the matrix to |

#### 5.16.2.26 RTresult RTAPI rtVariableSetMatrix2x3fv ( RTvariable *v,* int *transpose,* const float * *m* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *transpose* | Specifies row-major or column-major order |
| in | *m* | Array of float values to set the matrix to |

#### 5.16.2.27 RTresult RTAPI rtVariableSetMatrix2x4fv ( RTvariable *v,* int *transpose,* const float * *m* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *transpose* | Specifies row-major or column-major order |
| in | *m* | Array of float values to set the matrix to |

#### 5.16.2.28 RTresult RTAPI rtVariableSetMatrix3x2fv ( RTvariable *v,* int *transpose,* const float * *m* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *transpose* | Specifies row-major or column-major order |
| in | *m* | Array of float values to set the matrix to |

#### 5.16.2.29 RTresult RTAPI rtVariableSetMatrix3x3fv ( RTvariable *v,* int *transpose,* const float * *m* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *transpose* | Specifies row-major or column-major order |
| in | *m* | Array of float values to set the matrix to |

#### 5.16.2.30 RTresult RTAPI rtVariableSetMatrix3x4fv ( RTvariable *v,* int *transpose,* const float * *m* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *transpose* | Specifies row-major or column-major order |
| in | *m* | Array of float values to set the matrix to |

#### 5.16.2.31 RTresult RTAPI rtVariableSetMatrix4x2fv ( RTvariable *v,* int *transpose,* const float * *m* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *transpose* | Specifies row-major or column-major order |
| in | *m* | Array of float values to set the matrix to |

#### 5.16.2.32 RTresult RTAPI rtVariableSetMatrix4x3fv ( RTvariable *v,* int *transpose,* const float * *m* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *transpose* | Specifies row-major or column-major order |
| in | *m* | Array of float values to set the matrix to |

#### 5.16.2.33 RTresult RTAPI rtVariableSetMatrix4x4fv ( RTvariable *v,* int *transpose,* const float * *m* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable to be modified |
| in | *transpose* | Specifies row-major or column-major order |
| in | *m* | Array of float values to set the matrix to |

## 5.17 Variable getters

- RTresult RTAPI rtVariableGet1f (RTvariable v, float *f1)
- RTresult RTAPI rtVariableGet2f (RTvariable v, float *f1, float *f2)
- RTresult RTAPI rtVariableGet3f (RTvariable v, float *f1, float *f2, float *f3)
- RTresult RTAPI rtVariableGet4f (RTvariable v, float *f1, float *f2, float *f3, float *f4)
- RTresult RTAPI rtVariableGet1fv (RTvariable v, float *f)
- RTresult RTAPI rtVariableGet2fv (RTvariable v, float *f)
- RTresult RTAPI rtVariableGet3fv (RTvariable v, float *f)
- RTresult RTAPI rtVariableGet4fv (RTvariable v, float *f)
- RTresult RTAPI rtVariableGet1i (RTvariable v, int *i1)
- RTresult RTAPI rtVariableGet2i (RTvariable v, int *i1, int *i2)
- RTresult RTAPI rtVariableGet3i (RTvariable v, int *i1, int *i2, int *i3)
- RTresult RTAPI rtVariableGet4i (RTvariable v, int *i1, int *i2, int *i3, int *i4)
- RTresult RTAPI rtVariableGet1iv (RTvariable v, int *i)
- RTresult RTAPI rtVariableGet2iv (RTvariable v, int *i)
- RTresult RTAPI rtVariableGet3iv (RTvariable v, int *i)
- RTresult RTAPI rtVariableGet4iv (RTvariable v, int *i)
- RTresult RTAPI rtVariableGet1ui (RTvariable v, unsigned int *u1)
- RTresult RTAPI rtVariableGet2ui (RTvariable v, unsigned int *u1, unsigned int *u2)
- RTresult RTAPI rtVariableGet3ui (RTvariable v, unsigned int *u1, unsigned int *u2, unsigned int *u3)
- RTresult RTAPI rtVariableGet4ui (RTvariable v, unsigned int *u1, unsigned int *u2, unsigned int *u3, unsigned int *u4)
- RTresult RTAPI rtVariableGet1uiv (RTvariable v, unsigned int *u)
- RTresult RTAPI rtVariableGet2uiv (RTvariable v, unsigned int *u)
- RTresult RTAPI rtVariableGet3uiv (RTvariable v, unsigned int *u)
- RTresult RTAPI rtVariableGet4uiv (RTvariable v, unsigned int *u)
- RTresult RTAPI rtVariableGetMatrix2x2fv (RTvariable v, int transpose, float *m)
- RTresult RTAPI rtVariableGetMatrix2x3fv (RTvariable v, int transpose, float *m)
- RTresult RTAPI rtVariableGetMatrix2x4fv (RTvariable v, int transpose, float *m)
- RTresult RTAPI rtVariableGetMatrix3x2fv (RTvariable v, int transpose, float *m)
- RTresult RTAPI rtVariableGetMatrix3x3fv (RTvariable v, int transpose, float *m)
- RTresult RTAPI rtVariableGetMatrix3x4fv (RTvariable v, int transpose, float *m)
- RTresult RTAPI rtVariableGetMatrix4x2fv (RTvariable v, int transpose, float *m)
- RTresult RTAPI rtVariableGetMatrix4x3fv (RTvariable v, int transpose, float *m)
- RTresult RTAPI rtVariableGetMatrix4x4fv (RTvariable v, int transpose, float *m)

### 5.17.1 Detailed Description

Functions designed to modify the value of a program variable.

### 5.17.2 Function Documentation

#### 5.17.2.1 RTresult RTAPI rtVariableGet1f ( RTvariable *v,* float * *f1* )

Functions designed to modify the value of a program variable.

**Description**

Variable getters functions return the value of a program variable or variable array. The target variable is specificed by *v*.

The commands *rtVariableGet{1-2-3-4}{f-i-ui}v* are used to query the value of a program variable specified by *v* using the pointers passed as arguments as return locations for each component of the vector-typed variable. The number specified in the command should match the number of components in the data type of the specified program variable (e.g., 1 for float, int, unsigned int; 2 for float2, int2, uint2, etc.). The suffix *f* indicates that floating-point values are expected to be returned, the suffix *i* indicates that integer values are expected, and the suffix *ui* indicates that unsigned integer values are expected, and this type should also match the data type of the specified program variable. The *f* variants of this function should be used to query values for program variables defined as float, float2, float3, float4, or arrays of these. The *i* variants of this function should be used to query values for program variables defined as int, int2, int3, int4, or arrays of these. The *ui* variants of this function should be used to query values for program variables defined as unsigned int, uint2, uint3, uint4, or arrays of these. The *v* variants of this function should be used to return the program variable's value to the array specified by parameter *v*. In this case, the array *v* should be large enough to accommodate all of the program variable's components.

The commands *rtVariableGetMatrix{2-3-4}x{2-3-4}fv* are used to query the value of a program variable whose data type is a matrix. The numbers in the command names are interpreted as the dimensionality of the matrix. For example, *2x4* indicates a 2 x 4 matrix with 2 columns and 4 rows (i.e., 8 values). If *transpose* is *0*, the matrix is returned in row major order, otherwise in column major order.

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

Variable getters were introduced in OptiX 1.0.

**See also** Variable setters, rtVariableGetType, rtContextDeclareVariable

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *f1* | Float value to be returned |

### 5.17.2.2 RTresult RTAPI rtVariableGet1fv ( RTvariable *v*, float * *f* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *f* | Array of float value(s) to be returned |

### 5.17.2.3 RTresult RTAPI rtVariableGet1i ( RTvariable *v*, int * *i1* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *i1* | Integer value to be returned |

#### 5.17.2.4 RTresult RTAPI rtVariableGet1iv ( RTvariable *v,* int * *i* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *i* | Array of integer values to be returned |

#### 5.17.2.5 RTresult RTAPI rtVariableGet1ui ( RTvariable *v,* unsigned int * *u1* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *u1* | Unsigned integer value to be returned |

#### 5.17.2.6 RTresult RTAPI rtVariableGet1uiv ( RTvariable *v,* unsigned int * *u* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *u* | Array of unsigned integer values to be returned |

#### 5.17.2.7 RTresult RTAPI rtVariableGet2f ( RTvariable *v,* float * *f1,* float * *f2* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *f1* | Float value to be returned |
| in | *f2* | Float value to be returned |

#### 5.17.2.8 RTresult RTAPI rtVariableGet2fv ( RTvariable *v,* float * *f* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *f* | Array of float value(s) to be returned |

#### 5.17.2.9 RTresult RTAPI rtVariableGet2i ( RTvariable *v,* int * *i1,* int * *i2* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *i1* | Integer value to be returned |
| in | *i2* | Integer value to be returned |

#### 5.17.2.10 RTresult RTAPI rtVariableGet2iv ( RTvariable *v*, int * *i* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *i* | Array of integer values to be returned |

#### 5.17.2.11 RTresult RTAPI rtVariableGet2ui ( RTvariable *v*, unsigned int * *u1*, unsigned int * *u2* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *u1* | Unsigned integer value to be returned |
| in | *u2* | Unsigned integer value to be returned |

#### 5.17.2.12 RTresult RTAPI rtVariableGet2uiv ( RTvariable *v*, unsigned int * *u* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *u* | Array of unsigned integer values to be returned |

#### 5.17.2.13 RTresult RTAPI rtVariableGet3f ( RTvariable *v*, float * *f1*, float * *f2*, float * *f3* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *f1* | Float value to be returned |
| in | *f2* | Float value to be returned |
| in | *f3* | Float value to be returned |

#### 5.17.2.14 RTresult RTAPI rtVariableGet3fv ( RTvariable *v*, float * *f* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *f* | Array of float value(s) to be returned |

#### 5.17.2.15 RTresult RTAPI rtVariableGet3i ( RTvariable *v*, int * *i1*, int * *i2*, int * *i3* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *i1* | Integer value to be returned |
| in | *i2* | Integer value to be returned |
| in | *i3* | Integer value to be returned |

#### 5.17.2.16 RTresult RTAPI rtVariableGet3iv ( RTvariable *v,* int * *i* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *i* | Array of integer values to be returned |

#### 5.17.2.17 RTresult RTAPI rtVariableGet3ui ( RTvariable *v,* unsigned int * *u1,* unsigned int * *u2,* unsigned int * *u3* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *u1* | Unsigned integer value to be returned |
| in | *u2* | Unsigned integer value to be returned |
| in | *u3* | Unsigned integer value to be returned |

#### 5.17.2.18 RTresult RTAPI rtVariableGet3uiv ( RTvariable *v,* unsigned int * *u* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *u* | Array of unsigned integer values to be returned |

#### 5.17.2.19 RTresult RTAPI rtVariableGet4f ( RTvariable *v,* float * *f1,* float * *f2,* float * *f3,* float * *f4* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *f1* | Float value to be returned |
| in | *f2* | Float value to be returned |
| in | *f3* | Float value to be returned |
| in | *f4* | Float value to be returned |

#### 5.17.2.20 RTresult RTAPI rtVariableGet4fv ( RTvariable *v,* float * *f* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *f* | Array of float value(s) to be returned |

#### 5.17.2.21 RTresult RTAPI rtVariableGet4i ( RTvariable *v,* int * *i1,* int * *i2,* int * *i3,* int * *i4* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *i1* | Integer value to be returned |
| in | *i2* | Integer value to be returned |
| in | *i3* | Integer value to be returned |
| in | *i4* | Integer value to be returned |

#### 5.17.2.22 RTresult RTAPI rtVariableGet4iv ( RTvariable *v,* int * *i* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *i* | Array of integer values to be returned |

#### 5.17.2.23 RTresult RTAPI rtVariableGet4ui ( RTvariable *v,* unsigned int * *u1,* unsigned int * *u2,* unsigned int * *u3,* unsigned int * *u4* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *u1* | Unsigned integer value to be returned |
| in | *u2* | Unsigned integer value to be returned |
| in | *u3* | Unsigned integer value to be returned |
| in | *u4* | Unsigned integer value to be returned |

#### 5.17.2.24 RTresult RTAPI rtVariableGet4uiv ( RTvariable *v,* unsigned int * *u* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *u* | Array of unsigned integer values to be returned |

#### 5.17.2.25 RTresult RTAPI rtVariableGetMatrix2x2fv ( RTvariable *v,* int *transpose,* float * *m* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *transpose* | Specify(ies) row-major or column-major order |
| in | *m* | Array of float values to be returned |

#### 5.17.2.26 RTresult RTAPI rtVariableGetMatrix2x3fv ( RTvariable *v*, int *transpose*, float * *m* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *transpose* | Specify(ies) row-major or column-major order |
| in | *m* | Array of float values to be returned |

#### 5.17.2.27 RTresult RTAPI rtVariableGetMatrix2x4fv ( RTvariable *v*, int *transpose*, float * *m* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *transpose* | Specify(ies) row-major or column-major order |
| in | *m* | Array of float values to be returned |

#### 5.17.2.28 RTresult RTAPI rtVariableGetMatrix3x2fv ( RTvariable *v*, int *transpose*, float * *m* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *transpose* | Specify(ies) row-major or column-major order |
| in | *m* | Array of float values to be returned |

#### 5.17.2.29 RTresult RTAPI rtVariableGetMatrix3x3fv ( RTvariable *v*, int *transpose*, float * *m* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *transpose* | Specify(ies) row-major or column-major order |
| in | *m* | Array of float values to be returned |

#### 5.17.2.30 RTresult RTAPI rtVariableGetMatrix3x4fv ( RTvariable *v*, int *transpose*, float * *m* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *transpose* | Specify(ies) row-major or column-major order |
| in | *m* | Array of float values to be returned |

#### 5.17.2.31 RTresult RTAPI rtVariableGetMatrix4x2fv ( RTvariable *v*, int *transpose*, float * *m* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *transpose* | Specify(ies) row-major or column-major order |
| in | *m* | Array of float values to be returned |

#### 5.17.2.32 RTresult RTAPI rtVariableGetMatrix4x3fv ( RTvariable *v,* int *transpose,* float * *m* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *transpose* | Specify(ies) row-major or column-major order |
| in | *m* | Array of float values to be returned |

#### 5.17.2.33 RTresult RTAPI rtVariableGetMatrix4x4fv ( RTvariable *v,* int *transpose,* float * *m* )

**Parameters**

| | | |
|---|---|---|
| in | *v* | Specifies the program variable whose value is to be returned |
| in | *transpose* | Specify(ies) row-major or column-major order |
| in | *m* | Array of float values to be returned |

## 5.18 Context-free functions

### Functions

- RTresult RTAPI rtGetVersion (unsigned int *version)
- RTresult RTAPI rtDeviceGetDeviceCount (unsigned int *count)
- RTresult RTAPI rtDeviceGetAttribute (int ordinal, RTdeviceattribute attrib, RTsize size, void *p)

### 5.18.1 Detailed Description

Functions that don't pertain to an OptiX context to be called.

### 5.18.2 Function Documentation

#### 5.18.2.1 RTresult RTAPI rtDeviceGetAttribute ( int *ordinal*, RTdeviceattribute *attrib*, RTsize *size*, void * *p* )

Returns an attribute specific to an OptiX device.

**Description**

rtDeviceGetAttribute returns in *p* the value of the per device attribute specified by *attrib* for device *ordinal*.

Each attribute can have a different size. The sizes are given in the following list:

- RT_DEVICE_ATTRIBUTE_MAX_THREADS_PER_BLOCK sizeof(int)
- RT_DEVICE_ATTRIBUTE_CLOCK_RATE sizeof(int)
- RT_DEVICE_ATTRIBUTE_MULTIPROCESSOR_COUNT sizeof(int)
- RT_DEVICE_ATTRIBUTE_EXECUTION_TIMEOUT_ENABLED sizeof(int)
- RT_DEVICE_ATTRIBUTE_MAX_HARDWARE_TEXTURE_COUNT sizeof(int)
- RT_DEVICE_ATTRIBUTE_NAME up to size-1
- RT_DEVICE_ATTRIBUTE_COMPUTE_CAPABILITY sizeof(int2)
- RT_DEVICE_ATTRIBUTE_TOTAL_MEMORY sizeof(RTsize)
- RT_DEVICE_ATTRIBUTE_TCC_DRIVER sizeof(int)
- RT_DEVICE_ATTRIBUTE_CUDA_DEVICE_ORDINAL sizeof(int)

**Parameters**

| | | |
|---|---|---|
| in | *ordinal* | OptiX device ordinal |
| in | *attrib* | Attribute to query |
| in | *size* | Size of the attribute being queried. Parameter *p* must have at least this much memory allocated |
| out | *p* | Return pointer where the value of the attribute will be copied into. This must point to at least *size* bytes of memory |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE - Can be returned if size does not match the proper size of the attribute, if *p* is *NULL*, or if *ordinal* does not correspond to an OptiX device

### History

rtDeviceGetAttribute was introduced in OptiX 2.0. RT_DEVICE_ATTRIBUTE_TCC_DRIVER was introduced in OptiX 3.0. RT_DEVICE_ATTRIBUTE_CUDA_DEVICE_ORDINAL was introduced in OptiX 3.0.

**See also** rtDeviceGetDeviceCount, rtContextGetAttribute

#### 5.18.2.2 RTresult RTAPI rtDeviceGetDeviceCount ( unsigned int * *count* )

Returns the number of OptiX capable devices.

### Description

rtDeviceGetDeviceCount returns in *count* the number of compute devices that are available in the host system and will be used by OptiX.

### Parameters

| | | |
|---|---|---|
| `out` | *count* | Number devices available for OptiX |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

### History

rtDeviceGetDeviceCount was introduced in OptiX 1.0.

**See also** rtGetVersion

#### 5.18.2.3 RTresult RTAPI rtGetVersion ( unsigned int * *version* )

Returns the current OptiX version.

### Description

rtGetVersion returns in *version* a numerically comparable version number of the current OptiX library.

The encoding for the version number prior to OptiX 4.0.0 is major*1000 + minor*10 + micro. For versions 4.0.0 and higher, the encoding is major*10000 + minor*100 + micro. For example, for version 3.5.1 this function would return 3051, and for version 4.5.1 it would return 40501.

### Parameters

| | | |
|---|---|---|
| `out` | *version* | OptiX version number |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

### History

rtGetVersion was introduced in OptiX 1.0.

**See also** rtDeviceGetDeviceCount

## 5.19 CUDA C Reference

### Modules

- OptiX CUDA C declarations
- OptiX basic types
- OptiX CUDA C functions

### 5.19.1 Detailed Description

OptiX Functions related to host and device code.

## 5.20 OptiX CUDA C declarations

### Macros

- #define rtDeclareVariable(type, name, semantic, annotation)
- #define rtDeclareAnnotation(variable, annotation)
- #define rtCallableProgram(return_type, function_name, parameter_list)
- #define RT_PROGRAM __global__
- #define rtCallableProgramId optix::callableProgramId
- #define rtCallableProgramX optix::boundCallableProgramId

### 5.20.1 Detailed Description

Functions designed to declare programs and types used by OptiX device code.

### 5.20.2 Macro Definition Documentation

#### 5.20.2.1 #define RT_PROGRAM __global__

Define an OptiX program.

**Description**

RT_PROGRAM defines a program **program_name** with the specified arguments and return value. This function can be bound to a specific program object using rtProgramCreateFromPTXString or rtProgramCreateFromPTXFile, which will subsequently get bound to different programmable binding points.

All programs should have a "void" return type. Bounding box programs will have an argument for the primitive index and the bounding box reference return value (type **nvrt::AAbb&**). Intersection programs will have a single int primitiveIndex argument. All other programs take zero arguments.

**History**

RT_PROGRAM was introduced in OptiX 1.0.

**See also** RT_PROGRAM rtProgramCreateFromPTXFile rtProgramCreateFromPTXString

#### 5.20.2.2 #define rtCallableProgram( *return_type, function_name, parameter_list* )

**Value:**

```
namespace rti_internal_typeinfo {                                        \
    __device__ ::rti_internal_typeinfo::rti_typeinfo function_name = {
      ::rti_internal_typeinfo::_OPTIX_VARIABLE, rtCallableProgramSizeofWrapper<return_type>::value }; \
  }                                                                        \
  namespace rti_internal_typename {                                        \
    __device__ char function_name[] = #return_type;                        \
  }                                                                        \
  namespace rti_internal_semantic {                                        \
    __device__ char function_name[] = ""; /* used to be rt_call, but not needed anymore */ \
  }                                                                        \
  namespace rti_internal_annotation {                                      \
    __device__ char function_name[] = #parameter_list;                     \
  }                                                                        \
  __noinline__ __device__ return_type function_name parameter_list { typedef return_type localtype; return
      localtype(); }
```

Callable Program Declaration.

**Description**

rtCallableProgram declares callable program *name*, which will appear to be a callable function with the specified return type and list of arguments. This callable program must be matched against a variable declared on the API object using rtVariableSetObject.

Unless compatibility with SM_10 is needed, new code should #define RT_USE_TEMPLATED_RTCALLABLEPROGRAM and rely on the new templated version of rtCallableProgram.

Example(s):

```
rtCallableProgram(float3, modColor, (float3, float));
// With RT_USE_TEMPLATED_RTCALLABLEPROGRAM defined
rtDeclareVariable(rtCallableProgram<float3(float3, float)>, modColor);
```

**Parameters**

| | | |
|---|---|---|
| in | *return_type* | Return type of the callable program |
| in | *function_name* | Name of the callable program |
| in | *parameter_list* | Parameter_List of the callable program |

**History**

rtCallableProgram was introduced in OptiX 3.0.

**See also** rtDeclareVariable rtCallableProgramId rtCallableProgramX

#### 5.20.2.3 #define rtCallableProgramId optix::callableProgramId

Callable Program ID Declaration.

**Description**

rtCallableProgramId declares callable program *name*, which will appear to be a callable function with the specified return type and list of arguments. This callable program must be matched against a variable declared on the API object of type int.

Example(s):

```
rtDeclareVariable(rtCallableProgramId<float3(float3, float)>, modColor)
      ;
rtBuffer<rtCallableProgramId<float3(float3, float)>, 1> modColors;
```

**History**

rtCallableProgramId was introduced in OptiX 3.6.

**See also** rtCallableProgram rtCallableProgramX rtDeclareVariable

#### 5.20.2.4 #define rtCallableProgramX optix::boundCallableProgramId

Callable Program X Declaration.

**Description**

rtCallableProgramX declares callable program *name*, which will appear to be a callable function with the specified return type and list of arguments. This callable program must be matched against a variable declared on the API object using rtVariableSetObject.

Unless compatibility with SM_10 is needed, new code should #define RT_USE_TEMPLATED_RTCALLABLEPROGRAM and rely on the new templated version of rtCallableProgram instead of directly using rtCallableProgramX.

Example(s):

```
rtDeclareVariable(rtCallableProgramX<float3(float3, float)>, modColor);
// With RT_USE_TEMPLATED_RTCALLABLEPROGRAM defined
rtDeclareVariable(rtCallableProgram<float3(float3, float)>, modColor);
```

**History**

rtCallableProgramX was introduced in OptiX 3.6.

**See also** rtCallableProgram rtCallableProgramId rtDeclareVariable

### 5.20.2.5 #define rtDeclareAnnotation( *variable, annotation* )

**Value:**

```
namespace rti_internal_annotation { \
    __device__ char variable[] = #annotation; \
  }
```

Annotation declaration.

**Description**

rtDeclareAnnotation sets the annotation *annotation* of the given variable *name*. Typically annotations are declared using an argument to rtDeclareVariable, but variables of type rtBuffer and rtTextureSampler are declared using templates, so separate annotation attachment is required.

OptiX does not attempt to interpret the annotation in any way. It is considered metadata for the application to query and interpret in its own way.

**Valid annotations**

The macro rtDeclareAnnotation uses the C pre-processor's "stringification" feature to turn the literal text of the annotation argument into a string constant. The pre-processor will backslash-escape quotes and backslashes within the text of the annotation. Leading and trailing whitespace will be ignored, and sequences of whitespace in the middle of the text is converted to a single space character in the result. The only restriction the C-PP places on the text is that it may not contain a comma character unless it is either quoted or contained within parens: "," or (,).

Example(s):

```
rtDeclareAnnotation( tex, this is a test );
annotation = "this is a test"

rtDeclareAnnotation( tex, "this is a test" );
annotation = "\"this is a test\""

rtDeclareAnnotation( tex, float3 a = {1, 2, 3} );
--> Compile Error, no unquoted commas may be present in the annotation

rtDeclareAnnotation( tex, "float3 a = {1, 2, 3}" );
annotation = "\"float3 a = {1, 2, 3}\""

rtDeclareAnnotation( tex, string UIWidget = "slider";
                          float UIMin = 0.0;
                          float UIMax = 1.0; );
annotation = "string UIWidget = \"slider\"; float UIMin = 0.0; float UIMax = 1.0;"
```

**Parameters**

| | | |
|---|---|---|
| in | *variable* | Variable to annotate |
| in | *annotation* | Annotation metadata |

**History**

rtDeclareAnnotation was introduced in OptiX 1.0.

**See also** rtDeclareVariable, rtVariableGetAnnotation

### 5.20.2.6 #define rtDeclareVariable( *type, name, semantic, annotation* )

**Value:**

```
namespace rti_internal_typeinfo { \
    __device__ ::rti_internal_typeinfo::rti_typeinfo name = { ::rti_internal_typeinfo::_OPTIX_VARIABLE,
      sizeof(type)}; \
  } \
  namespace rti_internal_typename { \
    __device__ char name[] = #type; \
  } \
  namespace rti_internal_typeenum { \
    __device__ int name = ::rti_internal_typeinfo::rti_typeenum<type>::m_typeenum; \
  } \
  namespace rti_internal_semantic { \
    __device__ char name[] = #semantic; \
  } \
  namespace rti_internal_annotation { \
    __device__ char name[] = #annotation; \
  } \
  __device__ type name
```

Variable declaration.

**Description**

rtDeclareVariable declares variable *name* of the specified *type*. By default, the variable name will be matched against a variable declared on the API object using the lookup hierarchy for the current program. Using the semanticName, this variable can be bound to internal state, to the payload associated with a ray, or to attributes that are communicated between intersection and material programs. An additional optional annotation can be used to associate application-specific metadata with the variable as well.

*type* may be a primitive type or a user-defined struct (See rtVariableSetUserData). Except for the ray payload and attributes, the declared variable will be read-only. The variable will be visible to all of the cuda functions defined in the current file. The binding of variables to values on API objects is allowed to vary from one instance to another.

**Valid semanticNames**

- **rtLaunchIndex** - The launch invocation index. Type must be one of *unsigned* int, *uint2*, *uint3*, *int*, *int2*, *int3* and is read-only.
- **rtLaunchDim** - The size of each dimension of the launch. The values range from 1 to the launch size in that dimension. Type must be one of *unsigned* int, *uint2*, *uint3*, *int*, *int2*, *int3* and is read-only.
- **rtCurrentRay** - The currently active ray, valid only when a call to rtTrace is active. Type must be *optix::Ray* and is read-only.
- **rtIntersectionDistance** - The current closest hit distance, valid only when a call to rtTrace is active. Type must be *float* and is read-only.
- **rtRayPayload** - The struct passed into the most recent rtTrace call and is read-write.

- **attribute** *name* - A named attribute passed from the intersection program to a closest-hit or any-hit program. The types must match in both sets of programs. This variable is read-only in the closest-hit or any-hit program and is written in the intersection program.

### Parameters

| | | |
|---|---|---|
| `in` | *type* | Type of the variable |
| `in` | *name* | Name of the variable |
| `in` | *semantic* | Semantic name |
| `in` | *annotation* | Annotation for this variable |

### History

- rtDeclareVariable was introduced in OptiX 1.0.
- *rtLaunchDim* was introduced in OptiX 2.0.

**See also** rtDeclareAnnotation, rtVariableGetAnnotation, rtContextDeclareVariable, rtProgramDeclareVariable, rtSelectorDeclareVariable, rtGeometryInstanceDeclareVariable, rtGeometryDeclareVariable, rtMaterialDeclareVariable

## 5.21 OptiX basic types

### Classes

- struct Ray
- struct rtObject
- class optix::Aabb
- class optix::Matrix< M, N >
- class optix::Quaternion

### Macros

- #define rtBuffer __device__ optix::buffer
- #define rtBufferId optix::bufferId
- #define rtTextureSampler texture

### 5.21.1 Detailed Description

Basic types used in OptiX.

### 5.21.2 Macro Definition Documentation

#### 5.21.2.1 #define rtBuffer __device__ optix::buffer

Declare a reference to a buffer object.

**Description**

```
rtBuffer<Type, Dim> name;
```

rtBuffer declares a buffer of type *Type* and dimensionality *Dim*. *Dim* must be between 1 and 4 inclusive and defaults to 1 if not specified. The resulting object provides access to buffer data through the [] indexing operator, where the index is either unsigned int, uint2, uint3, or uint4 for 1, 2, 3 or 4-dimensional buffers (respectively). This operator can be used to read from or write to the resulting buffer at the specified index.

The named buffer obeys the runtime name lookup semantics as described in rtDeclareVariable. A compile error will result if the named buffer is not bound to a buffer object, or is bound to a buffer object of the incorrect type or dimension. The behavior of writing to a read-only buffer is undefined. Reading from a write-only buffer is well defined only if a value has been written previously by the same thread.

This declaration must appear at the file scope (not within a function), and will be visible to all RT_PROGRAM instances within the same compilation unit.

An annotation may be associated with the buffer variable by using the rtDeclareAnnotation macro.

**History**

rtBuffer was introduced in OptiX 1.0.

**See also** rtDeclareAnnotation, rtDeclareVariable, rtBufferCreate, rtTextureSampler, rtVariableSetObject rtBufferId

#### 5.21.2.2 #define rtBufferId optix::bufferId

A class that wraps buffer access functionality when using a buffer id.

**Description**

The rtBufferId provides an interface similar to rtBuffer when using a buffer id obtained through rtBufferGetId. Unlike rtBuffer, this class can be passed to functions or stored in other data structures such as the ray payload. It should be noted, however, doing so can limit the extent that OptiX can optimize the generated code.

There is also a version of rtBufferId that can be used by the host code, so that types can exist in both host and device code. See the documetation for rtBufferId found in the optix C++ API header.

**History**

rtBufferId was introduced in OptiX 3.5.

**See also**

rtBuffer rtBufferGetId

#### 5.21.2.3 #define rtTextureSampler texture

Declares a reference to a texture sampler object.

**Description**

rtTextureSampler declares a texture of type *Type* and dimensionality *Dim*. *Dim* must be between 1 and 3 inclusive and defaults to 1 if not specified. The resulting object provides access to texture data through the tex1D, tex2D and tex3D functions. These functions can be used only to read the data.

Texture filtering and wrapping modes, specified in *ReadMode* will be dependent on the state of the texture sampler object created with rtTextureSamplerCreate.

An annotation may be associated with the texture sampler variable by using the rtDeclareAnnotation macro.

**History**

rtTextureSampler was introduced in OptiX 1.0.

**See also** rtDeclareAnnotation, rtTextureSamplerCreate

## 5.22 OptiX CUDA C functions

### Modules

- Texture fetch functions
- rtPrintf functions

### Functions

- template<class T >
  static __device__ void rtTrace (rtObject topNode, optix::Ray ray, T &prd)
- static __device__ bool rtPotentialIntersection (float tmin)
- static __device__ bool rtReportIntersection (unsigned int material)
- static __device__ void rtIgnoreIntersection ()
- static __device__ void rtTerminateRay ()
- static __device__ void rtIntersectChild (unsigned int index)
- static __device__ float3 rtTransformPoint (RTtransformkind kind, const float3 &p)
- static __device__ float3 rtTransformVector (RTtransformkind kind, const float3 &v)
- static __device__ float3 rtTransformNormal (RTtransformkind kind, const float3 &n)
- static __device__ void rtGetTransform (RTtransformkind kind, float matrix[16])
- static __device__ void rtThrow (unsigned int code)
- static __device__ unsigned int rtGetExceptionCode ()
- static __device__ void rtPrintExceptionDetails ()

### 5.22.1 Detailed Description

OptiX Functions designed to operate on device side. Some of them can also be included explicitly in host code if desired

### 5.22.2 Function Documentation

#### 5.22.2.1 static __device__ unsigned int rtGetExceptionCode ( ) [inline], [static]

Retrieves the type of a caught exception.

**Description**

rtGetExceptionCode can be called from an exception program to query which type of exception was caught. The returned code is equivalent to one of the RTexception constants passed to rtContextSetExceptionEnabled, RT_EXCEPTION_ALL excluded. For user-defined exceptions, the code is equivalent to the argument passed to rtThrow.

**Return values**

| | |
|---|---|
| *unsigned* | int Returned exception code |

**History**

rtGetExceptionCode was introduced in OptiX 1.1.

**See also** rtContextSetExceptionEnabled, rtContextGetExceptionEnabled, rtContextSetExceptionProgram, rtContextGetExceptionProgram, rtThrow, rtPrintExceptionDetails

#### 5.22.2.2 static __device__ void rtGetTransform ( RTtransformkind *kind*, float *matrix[16]* ) [inline], [static]

Get requested transform.

**Description**

rtGetTransform returns the requested transform in the return parameter *matrix*. The type of transform to be retrieved is specified with the *kind* parameter. *kind* is an enumerated value that can be either RT_OBJECT_TO_WORLD or RT_WORLD_TO_OBJECT and must be a constant literal. During traversal, intersection and any-hit programs, the current ray will be located in object space. During ray generation, closest-hit and miss programs, the current ray will be located in world space.

There may be significant performance overhead associated with a call to rtGetTransform compared to a call to rtTransformPoint, rtTransformVector, or rtTransformNormal.

**Parameters**

| | | |
|---|---|---|
| in | *kind* | The type of transform to retrieve |
| out | *matrix* | Return parameter for the requested transform |

**Return values**

| | |
|---|---|
| *void* | void return value |

**History**

rtGetTransform was introduced in OptiX 1.0.

**See also** rtTransformCreate, rtTransformPoint, rtTransformVector, rtTransformNormal

#### 5.22.2.3 static __device__ void rtIgnoreIntersection ( ) [inline], [static]

Cancels the potential intersection with current ray.

**Description**

rtIgnoreIntersection causes the current potential intersection to be ignored. This intersection will not become the new closest hit associated with the ray. This function does not return, so values affecting the per-ray data should be applied before calling rtIgnoreIntersection. rtIgnoreIntersection is valid only within an any-hit program.

rtIgnoreIntersection can be used to implement alpha-mapped transparency by ignoring intersections that hit the geometry but are labeled as transparent in a texture. Since any-hit programs are called frequently during intersection, care should be taken to make them as efficient as possible.

**Return values**

| | |
|---|---|
| *void* | void return value |

**History**

rtIgnoreIntersection was introduced in OptiX 1.0.

**See also** rtTerminateRay, rtPotentialIntersection

#### 5.22.2.4 static __device__ void rtIntersectChild ( unsigned int *index* ) [inline], [static]

Visit child of selector.

**Description**

rtIntersectChild will perform intersection on the specified child for the current active ray. This is used in a selector visit program to traverse one of the selector's children. The *index* specifies which of the children to be visited. As the child is traversed, intersection programs will be called and any-hit

programs will be called for positive intersections. When this process is complete, rtIntersectChild will return unless one of the any-hit programs calls rtTerminateRay, in which case this function will never return. Multiple children can be visited during a single selector visit call by calling this function multiple times.

*index* matches the index used in rtSelectorSetChild on the host. rtIntersectChild is valid only within a selector visit program.

**Parameters**

| | | |
|---|---|---|
| `in` | *index* | Specifies the child to perform intersection on |

**Return values**

| | |
|---|---|
| *void* | void return value |

**History**

rtIntersectChild was introduced in OptiX 1.0.

**See also** rtSelectorSetVisitProgram, rtSelectorCreate, rtTerminateRay

#### 5.22.2.5 static __device__ bool rtPotentialIntersection ( float *tmin* ) [inline], [static]

Determine whether a computed intersection is potentially valid.

**Description**

Reporting an intersection from a geometry program is a two-stage process. If the geometry program computes that the ray intersects the geometry, it will first call rtPotentialIntersection. rtPotentialIntersection will determine whether the reported hit distance is within the valid interval associated with the ray, and return true if the intersection is valid. Subsequently, the geometry program will compute the attributes (normal, texture coordinates, etc.) associated with the intersection before calling rtReportIntersection. When rtReportIntersection is called, the any-hit program associated with the material is called. If the any-hit program does not ignore the intersection then the **t** value will stand as the new closest intersection.

If rtPotentialIntersection returns true, then rtReportIntersection should **always** be called after computing the attributes. Furthermore, attributes variables should only be written after a successful return from rtPotentialIntersection.

rtPotentialIntersection is passed the material index associated with the reported intersection. Objects with a single material should pass an index of zero.

rtReportIntersection and rtPotentialIntersection are valid only within a geometry intersection program.

**Parameters**

| | | |
|---|---|---|
| `in` | *tmin* | t value of the ray to be checked |

**Return values**

| | |
|---|---|
| *bool* | Returns whether the intersection is valid or not |

**History**

rtPotentialIntersection was introduced in OptiX 1.0.

**See also** rtGeometrySetIntersectionProgram, rtReportIntersection, rtIgnoreIntersection

#### 5.22.2.6 static __device__ void rtPrintExceptionDetails ( ) [inline], [static]

Print information on a caught exception.

**Description**

rtGetExceptionCode can be called from an exception program to provide information on the caught exception to the user. The function uses rtPrintf functions to output details depending on the type of the exception. It is necessary to have printing enabled using rtContextSetPrintEnabled for this function to have any effect.

**Return values**

| | |
|---|---|
| *void* | void return type |

**History**

rtPrintExceptionDetails was introduced in OptiX 1.1.

**See also** rtContextSetExceptionEnabled, rtContextGetExceptionEnabled, rtContextSetExceptionProgram, rtContextGetExceptionProgram, rtContextSetPrintEnabled, rtGetExceptionCode, rtThrow, rtPrintf functions

#### 5.22.2.7 static __device__ bool rtReportIntersection ( unsigned int *material* ) [inline], [static]

Report an intersection with the current object and the specified material.

**Description**

rtReportIntersection reports an intersection of the current ray with the current object, and specifies the material associated with the intersection. rtReportIntersection should only be used in conjunction with rtPotentialIntersection as described in rtPotentialIntersection.

**Parameters**

| | | |
|---|---|---|
| in | *material* | Material associated with the intersection |

**Return values**

| | |
|---|---|
| *bool* | return value, this is set to *false* if the intersection is, for some reason, ignored **History** |

rtReportIntersection was introduced in OptiX 1.0.

**See also** rtPotentialIntersection, rtIgnoreIntersection

#### 5.22.2.8 static __device__ void rtTerminateRay ( ) [inline], [static]

Terminate traversal associated with the current ray.

**Description**

rtTerminateRay causes the traversal associated with the current ray to immediately terminate. After termination, the closest-hit program associated with the ray will be called. This function does not return, so values affecting the per-ray data should be applied before calling rtTerminateRay. rtTerminateRay is valid only within an any-hit program. The value of rtIntersectionDistance is undefined when rtTerminateRay is used.

**Return values**

| | |
|---|---|
| *void* | void return value |

**History**

rtTerminateRay was introduced in OptiX 1.0.

**See also** rtIgnoreIntersection, rtPotentialIntersection

#### 5.22.2.9 static __device__ void rtThrow ( unsigned int *code* ) [inline], [static]

Throw a user exception.

**Description**

rtThrow is used to trigger user defined exceptions which behave like built-in exceptions. That is, upon invocation, ray processing for the current launch index is immediately aborted and the corresponding exception program is executed. rtThrow does not return.

The *code* passed as argument must be within the range reserved for user exceptions, which starts at RT_EXCEPTION_USER (*0x400*) and ends at *0xFFFF*. The code can be queried within the exception program using rtGetExceptionCode.

rtThrow may be called from within any program type except exception programs. Calls to rtThrow will be silently ignored unless user exceptions are enabled using rtContextSetExceptionEnabled.

**History**

rtThrow was introduced in OptiX 1.1.

**See also** rtContextSetExceptionEnabled, rtContextGetExceptionEnabled, rtContextSetExceptionProgram, rtContextGetExceptionProgram, rtGetExceptionCode, rtPrintExceptionDetails

#### 5.22.2.10 template<class T > static __device__ void rtTrace ( rtObject *topNode,* optix::Ray *ray,* T & *prd* ) [inline], [static]

Traces a ray.

**Description**

rtTrace traces *ray* against object *topNode*. A reference to *prd*, the per-ray data, will be passed to all of the closest-hit and any-hit programs that are executed during this invocation of trace. *topNode* must refer to an OptiX object of type RTgroup, RTselector, RTgeometrygroup or RTtransform.

The optional *time* argument sets the time of the ray for motion-aware traversal and shading. The ray time is available in user programs as the rtCurrentTime semantic variable. If *time* is omitted, then the ray inherits the time of the parent ray that triggered the current program. In a ray generation program where there is no parent ray, the time defaults to 0.0.

**Parameters**

| | | |
|---|---|---|
| in | *topNode* | Top node object where to start the traversal |
| in | *ray* | Ray to be traced |
| in | *time* | Time value for the ray |
| in | *prd* | Per-ray custom data |

**Return values**

| | |
|---|---|
| *void* | void return value |

**History**

- rtTrace was introduced in OptiX 1.0.
- *time* was introduced in OptiX 5.0.

**See also** rtObject rtCurrentTime Ray

#### 5.22.2.11 static __device__ float3 rtTransformNormal ( RTtransformkind *kind,* const float3 & *n* ) [inline], [static]

Apply the current transformation to a normal.

### Description

rtTransformNormal transforms *n* as a normal using the current active transformation stack (the inverse transpose). During traversal, intersection and any-hit programs, the current ray will be located in object space. During ray generation, closest-hit and miss programs, the current ray will be located in world space. This function can be used to transform values between object and world space.

*kind* is an enumerated value that can be either RT_OBJECT_TO_WORLD or RT_WORLD_TO_OBJECT and must be a constant literal. For ray generation and miss programs, the transform will always be the identity transform. For traversal, intersection, any-hit and closest-hit programs, the transform will be dependent on the set of active transform nodes for the current state.

### Parameters

| | | |
|---|---|---|
| in | *kind* | Type of the transform |
| in | *n* | Normal to transform |

### Return values

| | |
|---|---|
| *float3* | Transformed normal |

### History

rtTransformNormal was introduced in OptiX 1.0.

**See also** rtTransformCreate, rtTransformPoint, rtTransformVector

#### 5.22.2.12 static __device__ float3 rtTransformPoint ( RTtransformkind *kind*, const float3 & *p* ) [inline], [static]

Apply the current transformation to a point.

### Description

rtTransformPoint transforms *p* as a point using the current active transformation stack. During traversal, intersection and any-hit programs, the current ray will be located in object space. During ray generation, closest-hit and miss programs, the current ray will be located in world space. This function can be used to transform the ray origin and other points between object and world space.

*kind* is an enumerated value that can be either RT_OBJECT_TO_WORLD or RT_WORLD_TO_OBJECT and must be a constant literal. For ray generation and miss programs, the transform will always be the identity transform. For traversal, intersection, any-hit and closest-hit programs, the transform will be dependent on the set of active transform nodes for the current state.

### Parameters

| | | |
|---|---|---|
| in | *kind* | Type of the transform |
| in | *p* | Point to transform |

### Return values

| | |
|---|---|
| *float3* | Transformed point |

### History

rtTransformPoint was introduced in OptiX 1.0.

**See also** rtTransformCreate, rtTransformVector, rtTransformNormal

#### 5.22.2.13 static __device__ float3 rtTransformVector ( RTtransformkind *kind*, const float3 & *v* ) [inline], [static]

Apply the current transformation to a vector.

### Description

rtTransformVector transforms *v* as a vector using the current active transformation stack. During traversal, intersection and any-hit programs, the current ray will be located in object space. During ray generation, closest-hit and miss programs, the current ray will be located in world space. This function can be used to transform the ray direction and other vectors between object and world space.

*kind* is an enumerated value that can be either RT_OBJECT_TO_WORLD or RT_WORLD_TO_OBJECT and must be a constant literal. For ray generation and miss programs, the transform will always be the identity transform. For traversal, intersection, any-hit and closest-hit programs, the transform will be dependent on the set of active transform nodes for the current state.

### Parameters

| | | |
|---|---|---|
| `in` | *kind* | Type of the transform |
| `in` | *v* | Vector to transform |

### Return values

| | |
|---|---|
| *float3* | Transformed vector |

### History

rtTransformVector was introduced in OptiX 1.0.

**See also** rtTransformCreate, rtTransformPoint, rtTransformNormal

## 5.23 Texture fetch functions

- __device__ uint3 optix::rtTexSize (rtTextureId id)

### 5.23.1 Detailed Description

### 5.23.2 Function Documentation

#### 5.23.2.1 __device__ uint3 optix::rtTexSize ( rtTextureId *id* ) [inline]

Similar to CUDA C's texture functions, OptiX programs can access textures in a bindless way.

**Description**

**rtTex1D**, **rtTex2D** and **rtTex3D** fetch the texture referenced by the *id* with texture coordinate *x*, *y* and *z*. The texture sampler *id* can be obtained on the host side using rtTextureSamplerGetId function. There are also C++ template and C-style additional declarations for other texture types (char1, uchar1, char2, uchar2 ...):

To get texture size dimensions **rtTexSize** can be used.

Texture element may be fetched with integer coordinates using functions: **rtTex1DFetch**, **rtTex2DFetch** and **rtTex3DFetch**

Textures may also be sampled by providing a level of detail for mip mapping or gradients for anisotropic filtering. An integer layer number is required for layered textures (arrays of textures) using functions: **rtTex2DGather**, **rtTex1DGrad**, **rtTex2DGrad**, **rtTex3DGrad**, **rtTex1DLayeredGrad**, **rtTex2DLayeredGrad**, **rtTex1DLod**, **rtTex2DLod**, **rtTex3DLod**, **rtTex1DLayeredLod**, **rtTex2DLayeredLod**, **rtTex1DLayered**, **rtTex2DLayered**.

And cubeamp textures with **rtTexCubemap**, **rtTexCubemapLod**, **rtTexCubemapLayered** and **rtTexCubemapLayeredLod**.

```
template<> uchar2 rtTex1D(rtTextureId id, float x)
void rtTex1D(ushort2 *retVal, rtTextureId id, float x)
```

**History**

**rtTex1D**, **rtTex2D** and **rtTex3D** were introduced in OptiX 3.0.

**rtTexSize**, **rtTex1DFetch**, **rtTex2DFetch**, **rtTex3DFetch**, **rtTex2DGather**, **rtTex1DGrad**, **rtTex2DGrad**, **rtTex3DGrad**, **rtTex1DLayeredGrad**, **rtTex2DLayeredGrad**, **rtTex1DLod**, **rtTex2DLod**, **rtTex3DLod**, **rtTex1DLayeredLod**, **rtTex2DLayeredLod**, **rtTex1DLayered**, **rtTex2DLayered**, **rtTexCubemap**, **rtTexCubemapLod**, **rtTexCubemapLayered** and **rtTexCubemapLayeredLod** were introduced in OptiX 3.9.

**See also** rtTextureSamplerGetId

## 5.24 rtPrintf functions

- static __device__ void rtPrintf (const char *fmt)
- template<typename T1 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1)
- template<typename T1 , typename T2 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1, T2 arg2)
- template<typename T1 , typename T2 , typename T3 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1, T2 arg2, T3 arg3)
- template<typename T1 , typename T2 , typename T3 , typename T4 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1, T2 arg2, T3 arg3, T4 arg4)
- template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1, T2 arg2, T3 arg3, T4 arg4, T5 arg5)
- template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 , typename T6 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1, T2 arg2, T3 arg3, T4 arg4, T5 arg5, T6 arg6)
- template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 , typename T6 , typename T7 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1, T2 arg2, T3 arg3, T4 arg4, T5 arg5, T6 arg6, T7 arg7)
- template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 , typename T6 , typename T7 , typename T8 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1, T2 arg2, T3 arg3, T4 arg4, T5 arg5, T6 arg6, T7 arg7, T8 arg8)
- template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 , typename T6 , typename T7 , typename T8 , typename T9 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1, T2 arg2, T3 arg3, T4 arg4, T5 arg5, T6 arg6, T7 arg7, T8 arg8, T9 arg9)
- template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 , typename T6 , typename T7 , typename T8 , typename T9 , typename T10 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1, T2 arg2, T3 arg3, T4 arg4, T5 arg5, T6 arg6, T7 arg7, T8 arg8, T9 arg9, T10 arg10)
- template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 , typename T6 , typename T7 , typename T8 , typename T9 , typename T10 , typename T11 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1, T2 arg2, T3 arg3, T4 arg4, T5 arg5, T6 arg6, T7 arg7, T8 arg8, T9 arg9, T10 arg10, T11 arg11)
- template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 , typename T6 , typename T7 , typename T8 , typename T9 , typename T10 , typename T11 , typename T12 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1, T2 arg2, T3 arg3, T4 arg4, T5 arg5, T6 arg6, T7 arg7, T8 arg8, T9 arg9, T10 arg10, T11 arg11, T12 arg12)

### 5.24.1 Detailed Description

### 5.24.2 Function Documentation

#### 5.24.2.1 static __device__ void rtPrintf ( const char * *fmt* ) [inline], [static]

Prints text to the standard output.

**Description**

rtPrintf functions is used to output text from within user programs. Arguments are passed as for the standard C *printf* function, and the same format strings are employed. The only exception is the "%s" format specifier, which will generate an error if used. Text printed using rtPrintf functions is accumulated in a buffer and printed to the standard output when rtContextLaunch finishes. The buffer size can be configured using rtContextSetPrintBufferSize. Output can optionally be restricted to certain

launch indices using rtContextSetPrintLaunchIndex. Printing must be enabled using rtContextSetPrintEnabled, otherwise rtPrintf functions invocations will be silently ignored.

**History**

rtPrintf functions was introduced in OptiX 1.0.

**See also** rtContextSetPrintEnabled, rtContextGetPrintEnabled, rtContextSetPrintBufferSize, rtContextGetPrintBufferSize, rtContextSetPrintLaunchIndex, rtContextSetPrintLaunchIndex

#### 5.24.2.2 template<typename T1 > static __device__ void rtPrintf ( const char * *fmt,* T1 *arg1* ) [inline], [static]

Prints text to the standard output.

**Description**

rtPrintf functions is used to output text from within user programs. Arguments are passed as for the standard C *printf* function, and the same format strings are employed. The only exception is the "%s" format specifier, which will generate an error if used. Text printed using rtPrintf functions is accumulated in a buffer and printed to the standard output when rtContextLaunch finishes. The buffer size can be configured using rtContextSetPrintBufferSize. Output can optionally be restricted to certain launch indices using rtContextSetPrintLaunchIndex. Printing must be enabled using rtContextSetPrintEnabled, otherwise rtPrintf functions invocations will be silently ignored.

**History**

rtPrintf functions was introduced in OptiX 1.0.

**See also** rtContextSetPrintEnabled, rtContextGetPrintEnabled, rtContextSetPrintBufferSize, rtContextGetPrintBufferSize, rtContextSetPrintLaunchIndex, rtContextSetPrintLaunchIndex

#### 5.24.2.3 template<typename T1 , typename T2 > static __device__ void rtPrintf ( const char * *fmt,* T1 *arg1,* T2 *arg2* ) [inline], [static]

Prints text to the standard output.

**Description**

rtPrintf functions is used to output text from within user programs. Arguments are passed as for the standard C *printf* function, and the same format strings are employed. The only exception is the "%s" format specifier, which will generate an error if used. Text printed using rtPrintf functions is accumulated in a buffer and printed to the standard output when rtContextLaunch finishes. The buffer size can be configured using rtContextSetPrintBufferSize. Output can optionally be restricted to certain launch indices using rtContextSetPrintLaunchIndex. Printing must be enabled using rtContextSetPrintEnabled, otherwise rtPrintf functions invocations will be silently ignored.

**History**

rtPrintf functions was introduced in OptiX 1.0.

**See also** rtContextSetPrintEnabled, rtContextGetPrintEnabled, rtContextSetPrintBufferSize, rtContextGetPrintBufferSize, rtContextSetPrintLaunchIndex, rtContextSetPrintLaunchIndex

#### 5.24.2.4 template<typename T1 , typename T2 , typename T3 > static __device__ void rtPrintf ( const char * *fmt,* T1 *arg1,* T2 *arg2,* T3 *arg3* ) [inline], [static]

Prints text to the standard output.

**Description**

rtPrintf functions is used to output text from within user programs. Arguments are passed as for the standard C *printf* function, and the same format strings are employed. The only exception is the "%s" format specifier, which will generate an error if used. Text printed using rtPrintf functions is

accumulated in a buffer and printed to the standard output when rtContextLaunch finishes. The buffer size can be configured using rtContextSetPrintBufferSize. Output can optionally be restricted to certain launch indices using rtContextSetPrintLaunchIndex. Printing must be enabled using rtContextSetPrintEnabled, otherwise rtPrintf functions invocations will be silently ignored.

**History**

rtPrintf functions was introduced in OptiX 1.0.

**See also** rtContextSetPrintEnabled, rtContextGetPrintEnabled, rtContextSetPrintBufferSize, rtContextGetPrintBufferSize, rtContextSetPrintLaunchIndex, rtContextSetPrintLaunchIndex

#### 5.24.2.5 template<typename T1 , typename T2 , typename T3 , typename T4 > static __device__ void rtPrintf ( const char * *fmt,* T1 *arg1,* T2 *arg2,* T3 *arg3,* T4 *arg4* ) [inline], [static]

Prints text to the standard output.

**Description**

rtPrintf functions is used to output text from within user programs. Arguments are passed as for the standard C *printf* function, and the same format strings are employed. The only exception is the "%s" format specifier, which will generate an error if used. Text printed using rtPrintf functions is accumulated in a buffer and printed to the standard output when rtContextLaunch finishes. The buffer size can be configured using rtContextSetPrintBufferSize. Output can optionally be restricted to certain launch indices using rtContextSetPrintLaunchIndex. Printing must be enabled using rtContextSetPrintEnabled, otherwise rtPrintf functions invocations will be silently ignored.

**History**

rtPrintf functions was introduced in OptiX 1.0.

**See also** rtContextSetPrintEnabled, rtContextGetPrintEnabled, rtContextSetPrintBufferSize, rtContextGetPrintBufferSize, rtContextSetPrintLaunchIndex, rtContextSetPrintLaunchIndex

#### 5.24.2.6 template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 > static __device__ void rtPrintf ( const char * *fmt,* T1 *arg1,* T2 *arg2,* T3 *arg3,* T4 *arg4,* T5 *arg5* ) [inline], [static]

Prints text to the standard output.

**Description**

rtPrintf functions is used to output text from within user programs. Arguments are passed as for the standard C *printf* function, and the same format strings are employed. The only exception is the "%s" format specifier, which will generate an error if used. Text printed using rtPrintf functions is accumulated in a buffer and printed to the standard output when rtContextLaunch finishes. The buffer size can be configured using rtContextSetPrintBufferSize. Output can optionally be restricted to certain launch indices using rtContextSetPrintLaunchIndex. Printing must be enabled using rtContextSetPrintEnabled, otherwise rtPrintf functions invocations will be silently ignored.

**History**

rtPrintf functions was introduced in OptiX 1.0.

**See also** rtContextSetPrintEnabled, rtContextGetPrintEnabled, rtContextSetPrintBufferSize, rtContextGetPrintBufferSize, rtContextSetPrintLaunchIndex, rtContextSetPrintLaunchIndex

#### 5.24.2.7 template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 , typename T6 > static __device__ void rtPrintf ( const char * *fmt,* T1 *arg1,* T2 *arg2,* T3 *arg3,* T4 *arg4,* T5 *arg5,* T6 *arg6* ) [inline], [static]

Prints text to the standard output.

**Description**

rtPrintf functions is used to output text from within user programs. Arguments are passed as for the standard C *printf* function, and the same format strings are employed. The only exception is the "%s" format specifier, which will generate an error if used. Text printed using rtPrintf functions is accumulated in a buffer and printed to the standard output when rtContextLaunch finishes. The buffer size can be configured using rtContextSetPrintBufferSize. Output can optionally be restricted to certain launch indices using rtContextSetPrintLaunchIndex. Printing must be enabled using rtContextSetPrintEnabled, otherwise rtPrintf functions invocations will be silently ignored.

**History**

rtPrintf functions was introduced in OptiX 1.0.

**See also** rtContextSetPrintEnabled, rtContextGetPrintEnabled, rtContextSetPrintBufferSize, rtContextGetPrintBufferSize, rtContextSetPrintLaunchIndex, rtContextSetPrintLaunchIndex

#### 5.24.2.8 template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 , typename T6 , typename T7 > static __device__ void rtPrintf ( const char * *fmt,* T1 *arg1,* T2 *arg2,* T3 *arg3,* T4 *arg4,* T5 *arg5,* T6 *arg6,* T7 *arg7* ) [inline], [static]

Prints text to the standard output.

**Description**

rtPrintf functions is used to output text from within user programs. Arguments are passed as for the standard C *printf* function, and the same format strings are employed. The only exception is the "%s" format specifier, which will generate an error if used. Text printed using rtPrintf functions is accumulated in a buffer and printed to the standard output when rtContextLaunch finishes. The buffer size can be configured using rtContextSetPrintBufferSize. Output can optionally be restricted to certain launch indices using rtContextSetPrintLaunchIndex. Printing must be enabled using rtContextSetPrintEnabled, otherwise rtPrintf functions invocations will be silently ignored.

**History**

rtPrintf functions was introduced in OptiX 1.0.

**See also** rtContextSetPrintEnabled, rtContextGetPrintEnabled, rtContextSetPrintBufferSize, rtContextGetPrintBufferSize, rtContextSetPrintLaunchIndex, rtContextSetPrintLaunchIndex

#### 5.24.2.9 template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 , typename T6 , typename T7 , typename T8 > static __device__ void rtPrintf ( const char * *fmt,* T1 *arg1,* T2 *arg2,* T3 *arg3,* T4 *arg4,* T5 *arg5,* T6 *arg6,* T7 *arg7,* T8 *arg8* ) [inline], [static]

Prints text to the standard output.

**Description**

rtPrintf functions is used to output text from within user programs. Arguments are passed as for the standard C *printf* function, and the same format strings are employed. The only exception is the "%s" format specifier, which will generate an error if used. Text printed using rtPrintf functions is accumulated in a buffer and printed to the standard output when rtContextLaunch finishes. The buffer size can be configured using rtContextSetPrintBufferSize. Output can optionally be restricted to certain launch indices using rtContextSetPrintLaunchIndex. Printing must be enabled using

rtContextSetPrintEnabled, otherwise rtPrintf functions invocations will be silently ignored.

**History**

rtPrintf functions was introduced in OptiX 1.0.

**See also** rtContextSetPrintEnabled, rtContextGetPrintEnabled, rtContextSetPrintBufferSize, rtContextGetPrintBufferSize, rtContextSetPrintLaunchIndex, rtContextSetPrintLaunchIndex

#### 5.24.2.10 template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 , typename T6 , typename T7 , typename T8 , typename T9 > static __device__ void rtPrintf ( const char * *fmt,* T1 *arg1,* T2 *arg2,* T3 *arg3,* T4 *arg4,* T5 *arg5,* T6 *arg6,* T7 *arg7,* T8 *arg8,* T9 *arg9* ) [inline], [static]

Prints text to the standard output.

**Description**

rtPrintf functions is used to output text from within user programs. Arguments are passed as for the standard C *printf* function, and the same format strings are employed. The only exception is the "%s" format specifier, which will generate an error if used. Text printed using rtPrintf functions is accumulated in a buffer and printed to the standard output when rtContextLaunch finishes. The buffer size can be configured using rtContextSetPrintBufferSize. Output can optionally be restricted to certain launch indices using rtContextSetPrintLaunchIndex. Printing must be enabled using rtContextSetPrintEnabled, otherwise rtPrintf functions invocations will be silently ignored.

**History**

rtPrintf functions was introduced in OptiX 1.0.

**See also** rtContextSetPrintEnabled, rtContextGetPrintEnabled, rtContextSetPrintBufferSize, rtContextGetPrintBufferSize, rtContextSetPrintLaunchIndex, rtContextSetPrintLaunchIndex

#### 5.24.2.11 template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 , typename T6 , typename T7 , typename T8 , typename T9 , typename T10 > static __device__ void rtPrintf ( const char * *fmt,* T1 *arg1,* T2 *arg2,* T3 *arg3,* T4 *arg4,* T5 *arg5,* T6 *arg6,* T7 *arg7,* T8 *arg8,* T9 *arg9,* T10 *arg10* ) [inline], [static]

Prints text to the standard output.

**Description**

rtPrintf functions is used to output text from within user programs. Arguments are passed as for the standard C *printf* function, and the same format strings are employed. The only exception is the "%s" format specifier, which will generate an error if used. Text printed using rtPrintf functions is accumulated in a buffer and printed to the standard output when rtContextLaunch finishes. The buffer size can be configured using rtContextSetPrintBufferSize. Output can optionally be restricted to certain launch indices using rtContextSetPrintLaunchIndex. Printing must be enabled using rtContextSetPrintEnabled, otherwise rtPrintf functions invocations will be silently ignored.

**History**

rtPrintf functions was introduced in OptiX 1.0.

**See also** rtContextSetPrintEnabled, rtContextGetPrintEnabled, rtContextSetPrintBufferSize, rtContextGetPrintBufferSize, rtContextSetPrintLaunchIndex, rtContextSetPrintLaunchIndex

#### 5.24.2.12 template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 , typename T6 , typename T7 , typename T8 , typename T9 , typename T10 , typename T11 > static __device__ void rtPrintf ( const char * *fmt,* T1 *arg1,* T2 *arg2,* T3 *arg3,* T4 *arg4,* T5 *arg5,* T6 *arg6,* T7 *arg7,* T8 *arg8,* T9 *arg9,* T10 *arg10,* T11 *arg11* ) [inline], [static]

Prints text to the standard output.

**Description**

rtPrintf functions is used to output text from within user programs. Arguments are passed as for the standard C *printf* function, and the same format strings are employed. The only exception is the "%s" format specifier, which will generate an error if used. Text printed using rtPrintf functions is accumulated in a buffer and printed to the standard output when rtContextLaunch finishes. The buffer size can be configured using rtContextSetPrintBufferSize. Output can optionally be restricted to certain launch indices using rtContextSetPrintLaunchIndex. Printing must be enabled using rtContextSetPrintEnabled, otherwise rtPrintf functions invocations will be silently ignored.

**History**

rtPrintf functions was introduced in OptiX 1.0.

**See also** rtContextSetPrintEnabled, rtContextGetPrintEnabled, rtContextSetPrintBufferSize, rtContextGetPrintBufferSize, rtContextSetPrintLaunchIndex, rtContextSetPrintLaunchIndex

#### 5.24.2.13 template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 , typename T6 , typename T7 , typename T8 , typename T9 , typename T10 , typename T11 , typename T12 > static __device__ void rtPrintf ( const char * *fmt,* T1 *arg1,* T2 *arg2,* T3 *arg3,* T4 *arg4,* T5 *arg5,* T6 *arg6,* T7 *arg7,* T8 *arg8,* T9 *arg9,* T10 *arg10,* T11 *arg11,* T12 *arg12* ) [inline], [static]

Prints text to the standard output.

**Description**

rtPrintf functions is used to output text from within user programs. Arguments are passed as for the standard C *printf* function, and the same format strings are employed. The only exception is the "%s" format specifier, which will generate an error if used. Text printed using rtPrintf functions is accumulated in a buffer and printed to the standard output when rtContextLaunch finishes. The buffer size can be configured using rtContextSetPrintBufferSize. Output can optionally be restricted to certain launch indices using rtContextSetPrintLaunchIndex. Printing must be enabled using rtContextSetPrintEnabled, otherwise rtPrintf functions invocations will be silently ignored.

**History**

rtPrintf functions was introduced in OptiX 1.0.

**See also** rtContextSetPrintEnabled, rtContextGetPrintEnabled, rtContextSetPrintBufferSize, rtContextGetPrintBufferSize, rtContextSetPrintLaunchIndex, rtContextSetPrintLaunchIndex

## 5.25 OptiXpp wrapper

### Classes

- class optix::Handle< T >
- class optix::Exception
- class optix::APIObj
- class optix::DestroyableObj
- class optix::ScopedObj
- class optix::VariableObj
- class optix::ContextObj
- class optix::ProgramObj
- class optix::GroupObj
- class optix::GeometryGroupObj
- class optix::TransformObj
- class optix::SelectorObj
- class optix::AccelerationObj
- class optix::GeometryInstanceObj
- class optix::GeometryObj
- class optix::MaterialObj
- class optix::TextureSamplerObj
- class optix::BufferObj
- class optix::RemoteDeviceObj
- class optix::PostprocessingStageObj
- class optix::CommandListObj

- typedef Handle< AccelerationObj > optix::Acceleration
- typedef Handle< BufferObj > optix::Buffer
- typedef Handle< ContextObj > optix::Context
- typedef Handle< GeometryObj > optix::Geometry
- typedef Handle< GeometryGroupObj > optix::GeometryGroup
- typedef Handle < GeometryInstanceObj > optix::GeometryInstance
- typedef Handle< GroupObj > optix::Group
- typedef Handle< MaterialObj > optix::Material
- typedef Handle< ProgramObj > optix::Program
- typedef Handle< RemoteDeviceObj > optix::RemoteDevice
- typedef Handle< SelectorObj > optix::Selector
- typedef Handle< TextureSamplerObj > optix::TextureSampler
- typedef Handle< TransformObj > optix::Transform
- typedef Handle< VariableObj > optix::Variable
- typedef Handle < PostprocessingStageObj > optix::PostprocessingStage
- typedef Handle< CommandListObj > optix::CommandList

### 5.25.1 Detailed Description

### 5.25.2 Typedef Documentation

#### 5.25.2.1 typedef Handle<AccelerationObj> optix::Acceleration

Use this to manipulate RTacceleration objects.

#### 5.25.2.2 typedef Handle<BufferObj> optix::Buffer

Use this to manipulate RTbuffer objects.

#### 5.25.2.3 typedef Handle<CommandListObj> optix::CommandList

Use this to manipulate RTcommandlist objects.

#### 5.25.2.4 typedef Handle<ContextObj> optix::Context

Use this to manipulate RTcontext objects.

#### 5.25.2.5 typedef Handle<GeometryObj> optix::Geometry

Use this to manipulate RTgeometry objects.

#### 5.25.2.6 typedef Handle<GeometryGroupObj> optix::GeometryGroup

Use this to manipulate RTgeometrygroup objects.

#### 5.25.2.7 typedef Handle<GeometryInstanceObj> optix::GeometryInstance

Use this to manipulate RTgeometryinstance objects.

#### 5.25.2.8 typedef Handle<GroupObj> optix::Group

Use this to manipulate RTgroup objects.

#### 5.25.2.9 typedef Handle<MaterialObj> optix::Material

Use this to manipulate RTmaterial objects.

#### 5.25.2.10 typedef Handle<PostprocessingStageObj> optix::PostprocessingStage

Use this to manipulate RTpostprocessingstage objects.

#### 5.25.2.11 typedef Handle<ProgramObj> optix::Program

Use this to manipulate RTprogram objects.

#### 5.25.2.12 typedef Handle<RemoteDeviceObj> optix::RemoteDevice

Use this to manipulate RTremotedevice objects.

#### 5.25.2.13 typedef Handle<SelectorObj> optix::Selector

Use this to manipulate RTselector objects.

#### 5.25.2.14 typedef Handle<TextureSamplerObj> optix::TextureSampler

Use this to manipulate RTtexturesampler objects.

#### 5.25.2.15 typedef Handle<TransformObj> optix::Transform

Use this to manipulate RTtransform objects.

#### 5.25.2.16 typedef Handle<VariableObj> optix::Variable

Use this to manipulate RTvariable objects.

## 5.26 rtu API

### Modules

- rtu Traversal API

### Functions

- RTresult RTAPI rtuNameForType (RTobjecttype type, char *buffer, RTsize bufferSize)
- RTresult RTAPI rtuGetSizeForRTformat (RTformat format, size_t *size)
- RTresult RTAPI rtuCUDACompileString (const char *source, const char **preprocessorArguments, unsigned int numPreprocessorArguments, RTsize *resultSize, RTsize *errorSize)
- RTresult RTAPI rtuCUDACompileFile (const char *filename, const char **preprocessorArguments, unsigned int numPreprocessorArguments, RTsize *resultSize, RTsize *errorSize)
- RTresult RTAPI rtuCUDAGetCompileResult (char *result, char *error)
- RTresult RTAPI rtuCreateClusteredMesh (RTcontext context, unsigned int usePTX32InHost64, RTgeometry *mesh, unsigned int num_verts, const float *verts, unsigned int num_tris, const unsigned *indices, const unsigned *mat_indices)
- RTresult RTAPI rtuCreateClusteredMeshExt (RTcontext context, unsigned int usePTX32InHost64, RTgeometry *mesh, unsigned int num_verts, const float *verts, unsigned int num_tris, const unsigned *indices, const unsigned *mat_indices, RTbuffer norms, const unsigned *norm_indices, RTbuffer tex_coords, const unsigned *tex_indices)

- static RTresult rtuGroupAddChild (RTgroup group, RTobject child, unsigned int *index)
- static RTresult rtuSelectorAddChild (RTselector selector, RTobject child, unsigned int *index)
- static RTresult rtuGeometryGroupAddChild (RTgeometrygroup geometrygroup, RTgeometryinstance child, unsigned int *index)

- static RTresult rtuTransformSetChild (RTtransform transform, RTobject child)

- static RTresult rtuTransformGetChild (RTtransform transform, RTobject *type)
- static RTresult rtuTransformGetChildType (RTtransform transform, RTobjecttype *type)

- static RTresult rtuGroupRemoveChild (RTgroup group, RTobject child)
- static RTresult rtuSelectorRemoveChild (RTselector selector, RTobject child)
- static RTresult rtuGeometryGroupRemoveChild (RTgeometrygroup geometrygroup, RTgeometryinstance child)

- static RTresult rtuGroupRemoveChildByIndex (RTgroup group, unsigned int index)
- static RTresult rtuSelectorRemoveChildByIndex (RTselector selector, unsigned int index)
- static RTresult rtuGeometryGroupRemoveChildByIndex (RTgeometrygroup geometrygroup, unsigned int index)

- static RTresult rtuGroupGetChildIndex (RTgroup group, RTobject child, unsigned int *index)
- static RTresult rtuSelectorGetChildIndex (RTselector selector, RTobject child, unsigned int *index)
- static RTresult rtuGeometryGroupGetChildIndex (RTgeometrygroup geometrygroup, RTgeometryinstance child, unsigned int *index)

### 5.26.1 Detailed Description

The rtu API provides a simple interface for intersecting a set of rays against a set of triangles. It has been superseded by OptiX Prime.

### 5.26.2 Function Documentation

#### 5.26.2.1 RTresult RTAPI rtuCreateClusteredMesh ( RTcontext *context*, unsigned int *usePTX32InHost64*, RTgeometry * *mesh*, unsigned int *num_verts*, const float * *verts*, unsigned int *num_tris*, const unsigned * *indices*, const unsigned * *mat_indices* )

Create clustered triangle mesh for good memory coherence with paging on.

Vertex, index and material buffers are created and attached to the mesh. Cluster's bounding box and intersection programs are attached to the mesh. The intersection program has the following attributes:

- rtDeclareVariable( int, primitive_id, attribute primitive_id, );
- rtDeclareVariable(float3, texcoord, attribute texcoord, ); It is always zero
- rtDeclareVariable(float3, geometric_normal, attribute geometric_normal, );
- rtDeclareVariable(float3, shading_normal, attribute shading_normal, ); It is equal to geometric_normal

Created RTgeometry mesh expects there to be placed into a RTgeometryinstance where the mat_indices specified map into materials attached to the RTgeometryinstance

In the event of an error, please query the error string from the RTcontext.

**Parameters**

| | |
|---|---|
| *context* | Context |
| *usePTX32InHost64* | Use 32bit PTX bounding box and intersection programs in 64bit application. Takes effect only with 64bit host. |
| *mesh* | Output geometry |
| *num_verts* | Vertex count |
| *verts* | Vertices (num_verts∗float∗3) [ v1_x, v1_y, v1_z, v2.x, ... ] |
| *num_tris* | Triangle count |
| *indices* | Vertex indices (num_tris∗unsigned∗3) [ tri1_index1, tr1_index2, ... ] |
| *mat_indices* | Indices of materials (num_tris∗unsigned) [ tri1_mat_index, tri2_mat_index, ... ] |

#### 5.26.2.2 RTresult RTAPI rtuCreateClusteredMeshExt ( RTcontext *context*, unsigned int *usePTX32InHost64*, RTgeometry * *mesh*, unsigned int *num_verts*, const float * *verts*, unsigned int *num_tris*, const unsigned * *indices*, const unsigned * *mat_indices*, RTbuffer *norms*, const unsigned * *norm_indices*, RTbuffer *tex_coords*, const unsigned * *tex_indices* )

Create clustered triangle mesh for good memory coherence with paging on.

Buffers for vertices, indices, normals, indices of normals, texture coordinates, indices of texture coordinates and materials are created and attached to the mesh. Cluster's bounding box and intersection programs are attached to the mesh. The intersection program has the following attributes:

- rtDeclareVariable( int, primitive_id, attribute primitive_id, );
- rtDeclareVariable(float3, texcoord, attribute texcoord, );

- rtDeclareVariable(float3, geometric_normal, attribute geometric_normal, );
- rtDeclareVariable(float3, shading_normal, attribute shading_normal, );

Created RTgeometry mesh expects there to be placed into a RTgeometryinstance where the mat_indices specified map into materials attached to the RTgeometryinstance

Vertex, normal and texture coordinate buffers can be shared between many geometry objects

In the event of an error, please query the error string from the RTcontext.

**Parameters**

| | |
|---|---|
| *context* | Context |
| *usePTX32InHost64* | Use 32bit PTX bounding box and intersection programs in 64bit application. Takes effect only with 64bit host. |
| *mesh* | Output geometry |
| *num_verts* | Vertex count |
| *verts* | Vertices (num_verts∗float∗3) [ v1_x, v1_y, v1_z, v2.x, ... ] |
| *num_tris* | Triangle count |
| *indices* | Vertex indices (num_tris∗unsigned∗3) [ tri1_index1, tr1_index2, ... ] |
| *mat_indices* | Indices of materials (num_tris∗unsigned) [ tri1_mat_index, tri2_mat_index, ... ] |
| *norms* | Normals (num_norms∗float∗3) [ v1_x, v1_y, v1_z, v2.x, ... ] |
| *norm_indices* | Indices of vertex normals (num_tris∗unsigned∗3) [ tri1_norm_index1, tri1_norm_index2 ... ] |
| *tex_coords* | Texture uv coords (num_tex_coords∗float∗2) [ t1_u, t1_v, t2_u ... ] |
| *tex_indices* | Indices of texture uv (num_tris∗unsigned∗3) [ tri1_tex_index1, tri1_tex_index2 ... ] |

#### 5.26.2.3 RTresult RTAPI rtuCUDACompileFile ( const char ∗ *filename,* const char ∗∗ *preprocessorArguments,* unsigned int *numPreprocessorArguments,* RTsize ∗ *resultSize,* RTsize ∗ *errorSize* )

Compile a cuda source file.

**Parameters**

| | | |
|---|---|---|
| in | *filename* | source code file name |
| in | *preprocessorArguments* | list of preprocessor arguments |
| in | *numPreprocessorArguments* | number of preprocessor arguments |
| out | *resultSize* | size required to hold compiled result string |
| out | *errorSize* | size required to hold error string |

**Return values**

| | |
|---|---|
| *RTresult* | Return code |

#### 5.26.2.4 RTresult RTAPI rtuCUDACompileString ( const char * *source,* const char ** *preprocessorArguments,* unsigned int *numPreprocessorArguments,* RTsize * *resultSize,* RTsize * *errorSize* )

Compile a cuda source string.

**Parameters**

| | | |
|---|---|---|
| in | *source* | source code string |
| in | *preprocessor-Arguments* | list of preprocessor arguments |
| in | *num-Preprocessor-Arguments* | number of preprocessor arguments |
| out | *resultSize* | size required to hold compiled result string |
| out | *errorSize* | size required to hold error string |

**Return values**

| | |
|---|---|
| *RTresult* | Return code |

#### 5.26.2.5 RTresult RTAPI rtuCUDAGetCompileResult ( char * *result*, char * *error* )

Get the result of the most recent call to one of the above compile functions.

The 'result' and 'error' parameters must point to memory large enough to hold the respective strings, as returned by the compile function.

**Parameters**

| | | |
|---|---|---|
| out | *result* | compiled result string |
| out | *error* | error string |

**Return values**

| | |
|---|---|
| *RTresult* | Return code |

#### 5.26.2.6 static RTresult rtuGeometryGroupAddChild ( RTgeometrygroup *geometrygroup*, RTgeometryinstance *child*, unsigned int * *index* ) [inline], [static]

Add an entry to the end of the child array.

Fills 'index' with the index of the added child, if the pointer is non-NULL.

#### 5.26.2.7 static RTresult rtuGeometryGroupGetChildIndex ( RTgeometrygroup *geometrygroup*, RTgeometryinstance *child*, unsigned int * *index* ) [inline], [static]

Use a linear search to find the child in the child array, and return its index.

Returns RT_SUCCESS if the child was found, RT_ERROR_INVALID_VALUE otherwise.

#### 5.26.2.8 static RTresult rtuGeometryGroupRemoveChild ( RTgeometrygroup *geometrygroup*, RTgeometryinstance *child* ) [inline], [static]

Find the given child using a linear search in the child array and remove it.

If it's not the last entry in the child array, the last entry in the array will replace the deleted entry, in order to shrink the array size by one.

#### 5.26.2.9 static RTresult rtuGeometryGroupRemoveChildByIndex ( RTgeometrygroup *geometrygroup,* unsigned int *index* ) [inline], [static]

Remove the child at the given index in the child array.

If it's not the last entry in the child array, the last entry in the array will replace the deleted entry, in order to shrink the array size by one.

#### 5.26.2.10 RTresult RTAPI rtuGetSizeForRTformat ( RTformat *format,* size_t * *size* )

Return the size of a given RTformat.

RT_FORMAT_USER and RT_FORMAT_UNKNOWN return *0*. Returns RT_ERROR_INVALID_VALUE if the format isn't recognized, RT_SUCCESS otherwise.

**Parameters**

| | | |
|---|---|---|
| in | *format* | OptiX format |
| out | *size* | Size of the format |

**Return values**

| | |
|---|---|
| *RTresult* | Return code |

#### 5.26.2.11 static RTresult rtuGroupAddChild ( RTgroup *group,* RTobject *child,* unsigned int * *index* ) [inline], [static]

Add an entry to the end of the child array.

Fills 'index' with the index of the added child, if the pointer is non-NULL.

#### 5.26.2.12 static RTresult rtuGroupGetChildIndex ( RTgroup *group,* RTobject *child,* unsigned int * *index* ) [inline], [static]

Use a linear search to find the child in the child array, and return its index.

Returns RT_SUCCESS if the child was found, RT_ERROR_INVALID_VALUE otherwise.

#### 5.26.2.13 static RTresult rtuGroupRemoveChild ( RTgroup *group,* RTobject *child* ) [inline], [static]

Find the given child using a linear search in the child array and remove it.

If it's not the last entry in the child array, the last entry in the array will replace the deleted entry, in order to shrink the array size by one.

#### 5.26.2.14 static RTresult rtuGroupRemoveChildByIndex ( RTgroup *group,* unsigned int *index* ) [inline], [static]

Remove the child at the given index in the child array.

If it's not the last entry in the child array, the last entry in the array will replace the deleted entry, in order to shrink the array size by one.

#### 5.26.2.15 RTresult RTAPI rtuNameForType ( RTobjecttype *type*, char * *buffer*, RTsize *bufferSize* )

Get the name string of a given type.

See RTobjecttype for more information.

**Parameters**

| | | |
|---|---|---|
| in | *type* | Type requested |
| out | *buffer* | Buffer to output the name string |
| in | *bufferSize* | Size of the provided buffer |

**Return values**

| | |
|---|---|
| *RTresult* | Return code |

#### 5.26.2.16 static RTresult rtuSelectorAddChild ( RTselector *selector*, RTobject *child*, unsigned int * *index* ) [inline], [static]

Add an entry to the end of the child array.

Fills 'index' with the index of the added child, if the pointer is non-NULL.

#### 5.26.2.17 static RTresult rtuSelectorGetChildIndex ( RTselector *selector*, RTobject *child*, unsigned int * *index* ) [inline], [static]

Use a linear search to find the child in the child array, and return its index.

Returns RT_SUCCESS if the child was found, RT_ERROR_INVALID_VALUE otherwise.

#### 5.26.2.18 static RTresult rtuSelectorRemoveChild ( RTselector *selector*, RTobject *child* ) [inline], [static]

Find the given child using a linear search in the child array and remove it.

If it's not the last entry in the child array, the last entry in the array will replace the deleted entry, in order to shrink the array size by one.

#### 5.26.2.19 static RTresult rtuSelectorRemoveChildByIndex ( RTselector *selector*, unsigned int *index* ) [inline], [static]

Remove the child at the given index in the child array.

If it's not the last entry in the child array, the last entry in the array will replace the deleted entry, in order to shrink the array size by one.

#### 5.26.2.20 static RTresult rtuTransformGetChild ( RTtransform *transform*, RTobject * *type* ) [inline], [static]

Wrap rtTransformGetChild and rtTransformGetChildType in order to provide a type-safe version for C++.

#### 5.26.2.21 static RTresult rtuTransformGetChildType ( RTtransform *transform*, RTobjecttype * *type* ) [inline], [static]

Wrap rtTransformGetChild and rtTransformGetChildType in order to provide a type-safe version for C++.

#### 5.26.2.22 static RTresult rtuTransformSetChild ( RTtransform *transform,* RTobject *child* ) [inline], [static]

Wrap rtTransformSetChild in order to provide a type-safe version for C++.

## 5.27 rtu Traversal API

### Classes

- struct RTUtraversalresult

### Typedefs

- typedef struct RTUtraversal_api * RTUtraversal

### Enumerations

- enum RTUquerytype {
  RTU_QUERY_TYPE_ANY_HIT = 0,
  RTU_QUERY_TYPE_CLOSEST_HIT,
  RTU_QUERY_TYPE_COUNT }
- enum RTUrayformat {
  RTU_RAYFORMAT_ORIGIN_DIRECTION_TMIN_TMAX_INTERLEAVED = 0,
  RTU_RAYFORMAT_ORIGIN_DIRECTION_INTERLEAVED,
  RTU_RAYFORMAT_COUNT }
- enum RTUtriformat {
  RTU_TRIFORMAT_MESH = 0,
  RTU_TRIFORMAT_TRIANGLE_SOUP,
  RTU_TRIFORMAT_COUNT }
- enum RTUinitoptions {
  RTU_INITOPTION_NONE = 0,
  RTU_INITOPTION_GPU_ONLY = 1 << 0,
  RTU_INITOPTION_CPU_ONLY = 1 << 1,
  RTU_INITOPTION_CULL_BACKFACE = 1 << 2 }
- enum RTUoutput {
  RTU_OUTPUT_NONE = 0,
  RTU_OUTPUT_NORMAL = 1 << 0,
  RTU_OUTPUT_BARYCENTRIC = 1 << 1,
  RTU_OUTPUT_BACKFACING = 1 << 2 }
- enum RTUoption { RTU_OPTION_INT_NUM_THREADS =0 }

### Functions

- RTresult RTAPI rtuTraversalCreate (RTUtraversal *traversal, RTUquerytype query_type, RTUrayformat ray_format, RTUtriformat tri_format, unsigned int outputs, unsigned int options, RTcontext context)
- RTresult RTAPI rtuTraversalGetErrorString (RTUtraversal traversal, RTresult code, const char **return_string)
- RTresult RTAPI rtuTraversalSetOption (RTUtraversal traversal, RTUoption option, void *value)
- RTresult RTAPI rtuTraversalSetMesh (RTUtraversal traversal, unsigned int num_verts, const float *verts, unsigned int num_tris, const unsigned *indices)
- RTresult RTAPI rtuTraversalSetTriangles (RTUtraversal traversal, unsigned int num_tris, const float *tris)
- RTresult RTAPI rtuTraversalSetAccelData (RTUtraversal traversal, const void *data, RTsize data_size)
- RTresult RTAPI rtuTraversalGetAccelDataSize (RTUtraversal traversal, RTsize *data_size)
- RTresult RTAPI rtuTraversalGetAccelData (RTUtraversal traversal, void *data)

- RTresult RTAPI rtuTraversalMapRays (RTUtraversal traversal, unsigned int num_rays, float **rays)
- RTresult RTAPI rtuTraversalUnmapRays (RTUtraversal traversal)
- RTresult RTAPI rtuTraversalPreprocess (RTUtraversal traversal)
- RTresult RTAPI rtuTraversalTraverse (RTUtraversal traversal)
- RTresult RTAPI rtuTraversalMapResults (RTUtraversal traversal, RTUtraversalresult **results)
- RTresult RTAPI rtuTraversalUnmapResults (RTUtraversal traversal)
- RTresult RTAPI rtuTraversalMapOutput (RTUtraversal traversal, RTUoutput which, void **output)
- RTresult RTAPI rtuTraversalUnmapOutput (RTUtraversal traversal, RTUoutput which)
- RTresult RTAPI rtuTraversalDestroy (RTUtraversal traversal)

### 5.27.1 Detailed Description

### 5.27.2 Typedef Documentation

#### 5.27.2.1 typedef struct RTUtraversal_api* RTUtraversal

Opaque type.

Note that the *_api types should never be used directly. Only the typedef target names will be guaranteed to remain unchanged.

### 5.27.3 Enumeration Type Documentation

#### 5.27.3.1 enum RTUinitoptions

Initialization options (static across life of traversal object).

The rtuTraverse API supports both running on the CPU and GPU. When RTU_INITOPTION_NONE is specified GPU context creation is attempted. If that fails (such as when there isn't an NVIDIA GPU part present, the CPU code path is automatically chosen. Specifying RTU_INITOPTION_GPU_ONLY or RTU_INITOPTION_CPU_ONLY will only use the GPU or CPU modes without automatic transitions from one to the other.

RTU_INITOPTION_CULL_BACKFACE will enable back face culling during intersection.

Enumerator

***RTU_INITOPTION_NONE*** No option.

***RTU_INITOPTION_GPU_ONLY*** GPU only.

***RTU_INITOPTION_CPU_ONLY*** CPU only.

***RTU_INITOPTION_CULL_BACKFACE*** Back face culling.

#### 5.27.3.2 enum RTUoption

Runtime options (can be set multiple times for a given traversal object).

Enumerator

***RTU_OPTION_INT_NUM_THREADS*** Number of threads.

#### 5.27.3.3 enum RTUoutput

RTUoutput requested.

Enumerator

***RTU_OUTPUT_NONE*** Output None.
***RTU_OUTPUT_NORMAL*** float3 [x, y, z]
***RTU_OUTPUT_BARYCENTRIC*** float2 [alpha, beta] (gamma implicit)
***RTU_OUTPUT_BACKFACING*** char [1 | 0]

#### 5.27.3.4 enum RTUquerytype

The type of ray query to be performed.

See OptiX Programming Guide for explanation of any vs. closest hit queries. Note that in the case of RTU_QUERY_TYPE_ANY_HIT, the prim_id and t intersection values in RTUtraversalresult will correspond to the first successful intersection. These values may not be indicative of the closest intersection, only that there was at least one.

Enumerator

***RTU_QUERY_TYPE_ANY_HIT*** Perform any hit calculation.
***RTU_QUERY_TYPE_CLOSEST_HIT*** Perform closest hit calculation.
***RTU_QUERY_TYPE_COUNT*** Query type count.

#### 5.27.3.5 enum RTUrayformat

The input format of the ray vector.

Enumerator

***RTU_RAYFORMAT_ORIGIN_DIRECTION_TMIN_TMAX_INTERLEAVED*** Origin Direction Tmin Tmax interleaved.
***RTU_RAYFORMAT_ORIGIN_DIRECTION_INTERLEAVED*** Origin Direction interleaved.
***RTU_RAYFORMAT_COUNT*** Ray format count.

#### 5.27.3.6 enum RTUtriformat

The input format of the triangles.

TRIANGLE_SOUP implies future use of rtuTraversalSetTriangles while MESH implies use of rtuTraversalSetMesh.

Enumerator

***RTU_TRIFORMAT_MESH*** Triangle format mesh.
***RTU_TRIFORMAT_TRIANGLE_SOUP*** Triangle 'soup' format.
***RTU_TRIFORMAT_COUNT*** Triangle format count.

### 5.27.4 Function Documentation

#### 5.27.4.1 RTresult RTAPI rtuTraversalCreate ( RTUtraversal * *traversal,* RTUquerytype *query_type,* RTUrayformat *ray_format,* RTUtriformat *tri_format,* unsigned int *outputs,* unsigned int *options,* RTcontext *context* )

Create a traversal state and associate a context with it.

If context is a null pointer a new context will be created internally. The context should also not be used for any other launch commands from the OptiX host API, nor attached to multiple RTUtraversal objects at one time.

**Parameters**

| | | |
|---|---|---|
| out | *traversal* | Return pointer for traverse state handle |
| | *query_type* | Ray query type |
| | *ray_format* | Ray format |
| | *tri_format* | Triangle format |
| | *outputs* | OR'ed mask of requested RTUoutput |
| | *options* | Bit vector of or'ed RTUinitoptions |
| | *context* | RTcontext used for internal object creation |

#### 5.27.4.2 RTresult RTAPI rtuTraversalDestroy ( RTUtraversal *traversal* )

Clean up any internal memory associated with *rtuTraversal*∗ operations.

Includes destruction of result buffers returned via rtuTraversalGetErrorString. Invalidates traversal object.

**Parameters**

| | |
|---|---|
| *traversal* | Traversal state handle |

#### 5.27.4.3 RTresult RTAPI rtuTraversalGetAccelData ( RTUtraversal *traversal,* void ∗ *data* )

Retrieve acceleration data for current geometry.

Will force acceleration build if necessary. The data parameter should be preallocated and its length should match return value of rtuTraversalGetAccelDataSize.

**Parameters**

| | | |
|---|---|---|
| | *traversal* | Traversal state handle |
| out | *data* | Acceleration data |

#### 5.27.4.4 RTresult RTAPI rtuTraversalGetAccelDataSize ( RTUtraversal *traversal,* RTsize ∗ *data_size* )

Retrieve acceleration data size for current geometry.

Will force acceleration build if necessary.

**Parameters**

| | | |
|---|---|---|
| | *traversal* | Traversal state handle |
| out | *data_size* | Size of acceleration data |

#### 5.27.4.5 RTresult RTAPI rtuTraversalGetErrorString ( RTUtraversal *traversal,* RTresult *code,* const char ∗∗ *return_string* )

Returns the string associated with the error code and any additional information from the last error.

If traversal is non-NULL return_string only remains valid while traversal is live.

For a list of associated error codes that this function might inspect take a look at RTresult .

**Parameters**

| | | |
|---|---|---|
| out | *return_string* | Pointer to string with error message in it |
| | *traversal* | Traversal state handle. Can be NULL |
| | *code* | Error code from last error |

#### 5.27.4.6 RTresult RTAPI rtuTraversalMapOutput ( RTUtraversal *traversal*, RTUoutput *which*, void ** *output* )

Retrieve user-specified output from last rtuTraversalTraverse call.

Output can be copied from the pointer returned by rtuTraversalMapOutput and will have length *'num_rays'* from as prescribed from the previous call to rtuTraversalMapRays. For each RTUoutput, a single rtuTraversalMapOutput pointers can be outstanding. rtuTraversalUnmapOutput should be called when finished reading the output.

If requested output type was not turned on with a previous call to rtuTraversalCreate an error will be returned. See RTUoutput enum for description of output data formats for various outputs.

**Parameters**

| | | |
|---|---|---|
| | *traversal* | Traversal state handle |
| | *which* | Output type to be specified |
| out | *output* | Pointer to output from last traverse |

#### 5.27.4.7 RTresult RTAPI rtuTraversalMapRays ( RTUtraversal *traversal*, unsigned int *num_rays*, float ** *rays* )

Specify set of rays to be cast upon next call to rtuTraversalTraverse.

rtuTraversalMapRays obtains a pointer which can be used to copy the ray data into. Rays should be packed in the format described in rtuTraversalCreate call. When copying is completed rtuTraversalUnmapRays should be called. Note that this call invalidates any existing results buffers until rtuTraversalTraverse is called again.

**Parameters**

| | |
|---|---|
| *traversal* | Traversal state handle |
| *num_rays* | Number of rays to be traced |
| *rays* | Pointer to ray data |

#### 5.27.4.8 RTresult RTAPI rtuTraversalMapResults ( RTUtraversal *traversal*, RTUtraversalresult ** *results* )

Retrieve results of last rtuTraversal call.

Results can be copied from the pointer returned by rtuTraversalMapResults and will have length *'num_rays'* as prescribed from the previous call to rtuTraversalMapRays. rtuTraversalUnmapResults should be called when finished reading the results. Returned primitive ID of -1 indicates a ray miss.

**Parameters**

| | | |
|---|---|---|
| | *traversal* | Traversal state handle |
| `out` | *results* | Pointer to results of last traverse |

#### 5.27.4.9 RTresult RTAPI rtuTraversalPreprocess ( RTUtraversal *traversal* )

Perform any necessary preprocessing (eg, acceleration structure building, optix context compilation).

It is not necessary to call this function as rtuTraversalTraverse will call this internally as necessary.

**Parameters**

| | |
|---|---|
| *traversal* | Traversal state handle |

#### 5.27.4.10 RTresult RTAPI rtuTraversalSetAccelData ( RTUtraversal *traversal,* const void * *data,* RTsize *data_size* )

Specify acceleration data for current geometry.

Input acceleration data should be result of rtuTraversalGetAccelData or rtAccelerationGetData call.

**Parameters**

| | |
|---|---|
| *traversal* | Traversal state handle |
| *data* | Acceleration data |
| *data_size* | Size of acceleration data |

#### 5.27.4.11 RTresult RTAPI rtuTraversalSetMesh ( RTUtraversal *traversal,* unsigned int *num_verts,* const float * *verts,* unsigned int *num_tris,* const unsigned * *indices* )

Specify triangle mesh to be intersected by the next call to rtuTraversalTraverse.

Only one geometry set may be active at a time. Subsequent calls to rtuTraversalSetTriangles or rtuTraversalSetMesh will override any previously specified geometry. No internal copies of the mesh data are made. The user should ensure that the mesh data remains valid until after rtuTraversalTraverse has been called. Counter-clockwise winding is assumed for normal and backfacing computations.

**Parameters**

| | |
|---|---|
| *traversal* | Traversal state handle |
| *num_verts* | Vertex count |
| *verts* | Vertices [ v1_x, v1_y, v1_z, v2.x, ... ] |
| *num_tris* | Triangle count |
| *indices* | Indices [ tri1_index1, tr1_index2, ... ] |

#### 5.27.4.12 RTresult RTAPI rtuTraversalSetOption ( RTUtraversal *traversal,* RTUoption *option,* void * *value* )

Set a runtime option.

Unlike initialization options, these options may be set more than once for a given RTUtraversal instance.

**Parameters**

| | |
|---|---|
| *traversal* | Traversal state handle |
| *option* | The option to be set |
| *value* | Value of the option |

#### 5.27.4.13 RTresult RTAPI rtuTraversalSetTriangles ( RTUtraversal *traversal,* unsigned int *num_tris,* const float * *tris* )

Specify triangle soup to be intersected by the next call to rtuTraversalLaunch.

Only one geometry set may be active at a time. Subsequent calls to rtuTraversalSetTriangles or rtuTraversalSetMesh will override any previously specified geometry. No internal copies of the triangle data are made. The user should ensure that the triangle data remains valid until after rtuTraversalTraverse has been called. Counter-clockwise winding is assumed for normal and backfacing computations.

**Parameters**

| | |
|---|---|
| *traversal* | Traversal state handle |
| *num_tris* | Triangle count |
| *tris* | Triangles [ tri1_v1.x, tri1_v1.y, tr1_v1.z, tri1_v2.x, ... ] |

#### 5.27.4.14 RTresult RTAPI rtuTraversalTraverse ( RTUtraversal *traversal* )

Perform any necessary preprocessing (eg, acceleration structure building and kernel compilation ) and cast current rays against current geometry.

**Parameters**

| | |
|---|---|
| *traversal* | Traversal state handle |

#### 5.27.4.15 RTresult RTAPI rtuTraversalUnmapOutput ( RTUtraversal *traversal,* RTUoutput *which* )

See rtuTraversalMapOutput .

#### 5.27.4.16 RTresult RTAPI rtuTraversalUnmapRays ( RTUtraversal *traversal* )

See rtuTraversalMapRays .

#### 5.27.4.17 RTresult RTAPI rtuTraversalUnmapResults ( RTUtraversal *traversal* )

See rtuTraversalMapResults .

## 5.28 OptiX Prime API Reference

### Modules



### 5.28.1 Detailed Description

## 5.29 Context

### Functions

- RTPresult RTPAPI rtpContextCreate (RTPcontexttype type, RTPcontext *context)
- RTPresult RTPAPI rtpContextSetCudaDeviceNumbers (RTPcontext context, unsigned deviceCount, const unsigned *deviceNumbers)
- RTPresult RTPAPI rtpContextSetCpuThreads (RTPcontext context, unsigned numThreads)
- RTPresult RTPAPI rtpContextDestroy (RTPcontext context)
- RTPresult RTPAPI rtpContextGetLastErrorString (RTPcontext context, const char **return_string)

### 5.29.1 Detailed Description

### 5.29.2 Function Documentation

#### 5.29.2.1 RTPresult RTPAPI rtpContextCreate ( RTPcontexttype *type*, RTPcontext * *context* )

Creates an OptiX Prime context.

By default, a context created with type RTP_CONTEXT_TYPE_CUDA will use all available CUDA devices. Specific devices can be selected using rtpContextSetCudaDeviceNumbers. One device will be selected as the *primary device* and will be set as the current device when the function returns. If no available device has compute capability 2.0 or greater the created context will not be able to build acceleration structures.

**Parameters**

| | | |
|---|---|---|
| in | *type* | The type of context to create |
| out | *context* | Pointer to the new OptiX Prime context |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_OBJECT_CREATION_FAILED
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_MEMORY_ALLOCATION_FAILED

Example Usage:

```
RTPcontext context;
if(rtpContextCreate( RTP_CONTEXT_TYPE_CUDA, &context ) ==
      RTP_SUCCESS ) {
  int deviceNumbers[] = {0,1};
  rtpContextSetCudaDeviceNumbers( 2, deviceNumbers );
}
else
  rtpContextCreate( RTP_CONTEXT_TYPE_CPU, &context ); // Fallback to
       CPU
```

#### 5.29.2.2 RTPresult RTPAPI rtpContextDestroy ( RTPcontext *context* )

Destroys an OptiX Prime context.

Ongoing work is finished before *context* is destroyed. All OptiX Prime objects associated with *context* are aslo destroyed when *context* is destroyed.

**Parameters**

| | | |
|---|---|---|
| in | *context* | OptiX Prime context to destroy |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

#### 5.29.2.3 RTPresult RTPAPI rtpContextGetLastErrorString ( RTPcontext *context,* const char ** *return_string* )

Returns a string describing last error encountered.

This function returns an error string for the last error encountered in *context* that may contain invocation-specific details beyond the simple RTPresult error code. Note that this function may return errors from previous asynchronous launches or from calls by other threads.

**Parameters**

| | | |
|---|---|---|
| in | *context* | OptiX Prime context |
| out | *return_string* | String with error details |

**Return values**

Relevant return values:

- RTP_SUCCESS

**See also** rtpGetErrorString

#### 5.29.2.4 RTPresult RTPAPI rtpContextSetCpuThreads ( RTPcontext *context,* unsigned *numThreads* )

Sets the number of CPU threads used by a CPU context.

This function will return an error if the provided *context* is not of type RTP_CONTEXT_TYPE_CPU.

By default, one ray tracing thread is created per CPU core.

**Parameters**

| | | |
|---|---|---|
| in | *context* | OptiX Prime context |
| in | *numThreads* | Number of threads used for the CPU context |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

#### 5.29.2.5 RTPresult RTPAPI rtpContextSetCudaDeviceNumbers ( RTPcontext *context,* unsigned *deviceCount,* const unsigned * *deviceNumbers* )

Sets the CUDA devices used by a context.

The first device provided in deviceNumbers will be used as the *primary device*. Acceleration structures will be built on the primary device and copied to the others. To build the acceleration structures the primary device must be of compute capability 2.0 or greater. The current device will be set to the primary device when this function returns.

If *deviceCount==0*, then the primary device is selected automatically and all available devices are selected for use. *deviceNumbers* is ignored.

**Parameters**

| | | |
|---|---|---|
| `in` | *context* | OptiX Prime context |
| `in` | *deviceCount* | Number of devices supplied in *deviceNumbers* or 0 |
| `in` | *device-Numbers* | Array of integer device indices, or NULL if *deviceCount==0* |

This function will return an error if the provided context is not of type RTP_CONTEXT_TYPE_CUDA

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

## 5.30 Query

### Functions

- RTPresult RTPAPI rtpQueryCreate (RTPmodel model, RTPquerytype queryType, RTPquery *query)
- RTPresult RTPAPI rtpQueryGetContext (RTPquery query, RTPcontext *context)
- RTPresult RTPAPI rtpQuerySetRays (RTPquery query, RTPbufferdesc rays)
- RTPresult RTPAPI rtpQuerySetHits (RTPquery query, RTPbufferdesc hits)
- RTPresult RTPAPI rtpQueryExecute (RTPquery query, unsigned hints)
- RTPresult RTPAPI rtpQueryFinish (RTPquery query)
- RTPresult RTPAPI rtpQueryGetFinished (RTPquery query, int *isFinished)
- RTPresult RTPAPI rtpQuerySetCudaStream (RTPquery query, cudaStream_t stream)
- RTPresult RTPAPI rtpQueryDestroy (RTPquery query)

### 5.30.1 Detailed Description

### 5.30.2 Function Documentation

#### 5.30.2.1 RTPresult RTPAPI rtpQueryCreate ( RTPmodel *model*, RTPquerytype *queryType*, RTPquery * *query* )

Creates a query on a model.

If the model to which a query is bound destroyed with rtpModelDestroy() the query will be destroyed as well.

**Parameters**

| | | |
|---|---|---|
| in | *model* | Model to use for this query |
| in | *queryType* | Type of the query |
| out | *query* | Pointer to the new query |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

#### 5.30.2.2 RTPresult RTPAPI rtpQueryDestroy ( RTPquery *query* )

Destroys a query.

The query is finished before it is destroyed

**Parameters**

| | | |
|---|---|---|
| in | *query* | Query to be destroyed |

**Return values**

Relevant return values:

- RTP_SUCCESS

- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

#### 5.30.2.3 RTPresult RTPAPI rtpQueryExecute ( RTPquery *query,* unsigned *hints* )

Executes a raytracing query.

If the flag RTP_QUERY_HINT_ASYNC is specified, rtpQueryExecute may return before the query is actually finished. rtpQueryFinish can be called to block the current thread until the query is finished, or rtpQueryGetFinished can be used to poll until the query is finished.

**Parameters**

| | | |
|---|---|---|
| in | *query* | Query |
| in | *hints* | A combination of flags from RTPqueryhint |

Once the query has finished all of the hits are guaranteed to have been returned, and it is safe to modify the ray buffer.

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

Example Usage:

```
RTPquery query;
rtpQueryCreate(model, RTP_QUERY_TYPE_CLOSEST, &query);
rtpQuerySetRays(query, raysBD);
rtpQuerySetHits(hits, hitsBD);
rtpQueryExecute(query, 0);
// safe to modify ray buffer and process hits
```

#### 5.30.2.4 RTPresult RTPAPI rtpQueryFinish ( RTPquery *query* )

Blocks current thread until query is finished.

This function can be called multiple times. It will return immediately if the query has already finished.

**Parameters**

| | | |
|---|---|---|
| in | *query* | Query |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

#### 5.30.2.5 RTPresult RTPAPI rtpQueryGetContext ( RTPquery *query,* RTPcontext * *context* )

Gets the context object associated with a query.

**Parameters**

| | | |
|---|---|---|
| in | *query* | Query to obtain the context from |
| out | *context* | Returned context |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

#### 5.30.2.6 RTPresult RTPAPI rtpQueryGetFinished ( RTPquery *query,* int * *isFinished* )

Polls the status of a query.

**Parameters**

| | | |
|---|---|---|
| in | *query* | Query |
| out | *isFinished* | Returns finished status |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

#### 5.30.2.7 RTPresult RTPAPI rtpQuerySetCudaStream ( RTPquery *query,* cudaStream_t *stream* )

Sets a sync stream for a query.

Specify a Cuda stream used for synchronization. If no stream is specified, the default 0-stream is used. A stream can only be specified for contexts with type RTP_CONTEXT_TYPE_CUDA.

**Parameters**

| | | |
|---|---|---|
| in | *query* | Query |
| in | *stream* | A cuda stream |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

#### 5.30.2.8 RTPresult RTPAPI rtpQuerySetHits ( RTPquery *query,* RTPbufferdesc *hits* )

Sets the hits buffer for a query.

A hit is reported for every ray in the query. Therefore the size of the range in the hit buffer must match that of the ray buffer.

**Parameters**

| | | |
|---|---|---|
| in | *query* | Query |
| in | *hits* | Buffer descriptor for hits |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

#### 5.30.2.9 RTPresult RTPAPI rtpQuerySetRays ( RTPquery *query,* RTPbufferdesc *rays* )

Sets the rays buffer for a query.

The rays buffer is not accessed until rtpQueryExecute() is called. The ray directions must be unit length for correct results.

**Parameters**

| | | |
|---|---|---|
| in | *query* | Query |
| in | *rays* | Buffer descriptor for rays |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

## 5.31 Model

### Functions

- RTPresult RTPAPI rtpModelCreate (RTPcontext context, RTPmodel *model)
- RTPresult RTPAPI rtpModelGetContext (RTPmodel model, RTPcontext *context)
- RTPresult RTPAPI rtpModelSetTriangles (RTPmodel model, RTPbufferdesc indices, RTPbufferdesc vertices)
- RTPresult RTPAPI rtpModelSetInstances (RTPmodel model, RTPbufferdesc instances, RTPbufferdesc transforms)
- RTPresult RTPAPI rtpModelUpdate (RTPmodel model, unsigned hints)
- RTPresult RTPAPI rtpModelFinish (RTPmodel model)
- RTPresult RTPAPI rtpModelGetFinished (RTPmodel model, int *isFinished)
- RTPresult RTPAPI rtpModelCopy (RTPmodel model, RTPmodel srcModel)
- RTPresult RTPAPI rtpModelSetBuilderParameter (RTPmodel model_api, RTPbuilderparam param, RTPsize size, const void *ptr)
- RTPresult RTPAPI rtpModelDestroy (RTPmodel model)

### 5.31.1 Detailed Description

### 5.31.2 Function Documentation

#### 5.31.2.1 RTPresult RTPAPI rtpModelCopy ( RTPmodel *model,* RTPmodel *srcModel* )

Copies one model to another.

This function copies a model from one OptiX Prime context to another for user-managed multi-GPU operation where one context is allocated per device. Only triangle models can be copied, not instance models. Furthermore, when a *srcModel* has the RTP_BUILDER_PARAM_USE_CALLER_TRIANGLES build parameter set to 1, and it is intended that the triangle data is automatically transfered to the other context, the destination (*model*) should have the build parameter set to 0 before the copy call. If the destination model also has the has the build parameter set to 1, its triangles must be set by calling rtpModelSetTriangles followed by rtpModelUpdate using RTP_MODEL_HINT_USER_TRIANGLES_AFTER_COPY_SET.

**Parameters**

| | | |
|---|---|---|
| in | *model* | Destination model |
| in | *srcModel* | Source model |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

#### 5.31.2.2 RTPresult RTPAPI rtpModelCreate ( RTPcontext *context,* RTPmodel * *model* )

Creates a model.

**Parameters**

| | | |
|---|---|---|
| in | *context* | OptiX Prime context |
| out | *model* | Pointer to the new model |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

#### 5.31.2.3 RTPresult RTPAPI rtpModelDestroy ( RTPmodel *model* )

Destroys a model.

Any queries created on the model are also destroyed with the model. The queries are allowed to finish before they are destroyed.

**Parameters**

| | | |
|---|---|---|
| in | *model* | Model |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

#### 5.31.2.4 RTPresult RTPAPI rtpModelFinish ( RTPmodel *model* )

Blocks current thread until model update is finished.

This function can be called multiple times. It will return immediately if the previous update has already finished.

**Parameters**

| | | |
|---|---|---|
| in | *model* | Model |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

#### 5.31.2.5 RTPresult RTPAPI rtpModelGetContext ( RTPmodel *model*, RTPcontext * *context* )

Gets the context object associated with the model.

**Parameters**

| | | |
|---|---|---|
| in | *model* | Model to obtain the context from |
| out | *context* | Returned context |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

#### 5.31.2.6 RTPresult RTPAPI rtpModelGetFinished ( RTPmodel *model*, int * *isFinished* )

Polls the status of a model update.

**Parameters**

| | | |
|---|---|---|
| in | *model* | Model |
| out | *isFinished* | Returns finished status |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

#### 5.31.2.7 RTPresult RTPAPI rtpModelSetBuilderParameter ( RTPmodel *model_api*, RTPbuilderparam *param*, RTPsize *size*, const void * *ptr* )

Specifies a builder parameter for a model.

The following builder parameters are supported:

RTP_BUILDER_PARAM_USE_CALLER_TRIANGLES : *int*

If the value for RTP_BUILDER_PARAM_USE_CALLER_TRIANGLES is set to 0 (default), Prime uses an internal representation for triangles (which requires additional memory) to improve query performance and does not reference the user's vertex buffer during a query. If set to 1, Prime uses the provided triangle data as-is, which may result in slower query performance, but reduces memory usage.

RTP_BUILDER_PARAM_CHUNK_SIZE : *RTPsize*

Acceleration structures are built in chunks to reduce the amount of scratch memory needed. The size of the scratch memory chunk is specified in bytes by RTP_BUILDER_PARAM_CHUNK_SIZE. If set to -1, the chunk size has no limit. If set to 0 (default) the chunk size is chosen automatically, currently as 10% of the total available video memory for GPU builds and 512MB for CPU builds.

**Parameters**

| | | |
|---|---|---|
| in | *model_api* | Model |

| | | |
|---|---|---|
| in | *param* | Builder parameter to set |
| in | *size* | Size in bytes of the parameter being set |
| in | *ptr* | Pointer to where the value of the attribute will be copied from. This must point to at least *size* bytes of memory |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

#### 5.31.2.8 RTPresult RTPAPI rtpModelSetInstances ( RTPmodel *model*, RTPbufferdesc *instances*, RTPbufferdesc *transforms* )

Sets the instance data for a model.

The *instances* buffer specifies a list of model instances, and the *transforms* buffer holds a transformation matrix for each instance. The instance buffer type must be RTP_BUFFER_TYPE_HOST.

Instance buffers must be of format RTP_BUFFER_FORMAT_INSTANCE_MODEL, and transform buffers of format RTP_BUFFER_FORMAT_TRANSFORM_FLOAT4x4 or RTP_BUFFER_FORMAT_TRANSFORM_FLOAT4x3. If a stride is specified for the transformations, it must be a multiple of 16 bytes. Furthermore, the matrices must be stored in row-major order. Only affine transformations are supported, and the last row is always assumed to be [0.0, 0.0, 0.0, 1.0].

All instance models in the *instances* buffer must belong to the same context as the model itself. Additionally, the build parameter RTP_BUILDER_PARAM_USE_CALLER_TRIANGLES must be the same for all models (if applied). Setting RTP_BUILDER_PARAM_USE_CALLER_TRIANGLES for a model which contains instances has no effect.

The buffers are not used until rtpModelUpdate is called.

**Parameters**

| | | |
|---|---|---|
| in | *model* | Model |
| in | *instances* | Buffer descriptor for instances |
| in | *transforms* | Buffer descriptor for 4x4 transform matrices |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

#### 5.31.2.9 RTPresult RTPAPI rtpModelSetTriangles ( RTPmodel *model*, RTPbufferdesc *indices*, RTPbufferdesc *vertices* )

Sets the triangle data for a model.

The index buffer specifies triplet of vertex indices. If the index buffer descriptor is not specified (e.g. indices==NULL), the vertex buffer is considered to be a flat list of triangles, with every three vertices forming a triangle. The buffers are not used until rtpModelUpdate is called.

**Parameters**

| | | |
|---|---|---|
| in | *model* | Model |
| in | *indices* | Buffer descriptor for triangle vertex indices, or NULL |
| in | *vertices* | Buffer descriptor for triangle vertices |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

#### 5.31.2.10 RTPresult RTPAPI rtpModelUpdate ( RTPmodel *model,* unsigned *hints* )

Updates data, or creates an acceleration structure over triangles or instances.

Depending on the specified hints, rtpModelUpdate performs different operations:

If the flag RTP_MODEL_HINT_ASYNC is specified, some or all of the acceleration structure update may run asynchronously and rtpModelUpdate may return before the update is finished. In the case of RTP_MODEL_HINT_NONE, the acceleration structure build is blocking. It is important that buffers specified in rtpModelSetTriangles and rtpModelSetInstances not be modified until the update has finished. rtpModelFinish blocks the current thread until the update is finished. rtpModelGetFinished can be used to poll until the update is finished. Once the update has finished the input buffers can be modified.

The acceleration structure build performed by rtpModelUpdate uses a fast, high quality algorithm, but has the cost of requiring additional working memory. The amount of working memory is controlled by RTP_BUILDER_PARAM_CHUNK_SIZE.

The flag RTP_MODEL_HINT_MASK_UPDATE should be used to inform Prime when visibility mask data changed (after calling rtpModelSetTriangles with the updated values), e.g. when the indices format RTP_BUFFER_FORMAT_INDICES_INT3_MASK_INT is used. RTP_MODEL_HINT_MASK_UPDATE can be combined with RTP_MODEL_HINT_ASYNC to perform asynchronous data updates.

Hint RTP_MODEL_HINT_USER_TRIANGLES_AFTER_COPY_SET should be used when a triangle model has been copied (with the user triangle build flag set), and new user triangles have been set (by calling rtpModelSetTriangles again with the updated values).
RTP_MODEL_HINT_USER_TRIANGLES_AFTER_COPY_SET can be combined with RTP_MODEL_HINT_ASYNC to perform asynchronous data updates.

**Parameters**

| | | |
|---|---|---|
| in | *model* | Model |
| in | *hints* | A combination of flags from RTPmodelhint |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

Example Usage:

```
RTPmodel model;
rtpModelCreate(context, &model);
rtpModelSetTriangles(model, 0, vertsBD);
```

```
rtpModelUpdate(model, RTP_MODEL_HINT_ASYNC);

// ... do useful work on CPU while GPU is busy

rtpModelFinish(model);

// It is now safe to modify vertex buffer
```

## 5.32 Buffer descriptor

### Functions

- RTPresult RTPAPI rtpBufferDescCreate (RTPcontext context, RTPbufferformat format, RTPbuffertype type, void *buffer, RTPbufferdesc *desc)
- RTPresult RTPAPI rtpBufferDescGetContext (RTPbufferdesc desc, RTPcontext *context)
- RTPresult RTPAPI rtpBufferDescSetRange (RTPbufferdesc desc, RTPsize begin, RTPsize end)
- RTPresult RTPAPI rtpBufferDescSetStride (RTPbufferdesc desc, unsigned strideBytes)
- RTPresult RTPAPI rtpBufferDescSetCudaDeviceNumber (RTPbufferdesc desc, unsigned deviceNumber)
- RTPresult RTPAPI rtpBufferDescDestroy (RTPbufferdesc desc)

### 5.32.1 Detailed Description

### 5.32.2 Function Documentation

#### 5.32.2.1 RTPresult RTPAPI rtpBufferDescCreate ( RTPcontext *context,* RTPbufferformat *format,* RTPbuffertype *type,* void * *buffer,* RTPbufferdesc * *desc* )

Create a buffer descriptor.

This function creates a buffer descriptor with the specified element format and buffertype. A buffer of type RTP_BUFFER_TYPE_CUDA_LINEAR is assumed to reside on the current device. The device number can be changed by calling rtpBufferDescSetCudaDeviceNumber.

**Parameters**

| | | |
|---|---|---|
| in | *context* | OptiX Prime context |
| in | *format* | Format of the buffer |
| in | *type* | Type of the buffer |
| in | *buffer* | Pointer to buffer data |
| out | *desc* | Pointer to the new buffer descriptor |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

Example Usage:

```
RTPbufferdesc verticesBD;
rtpBufferDescCreate(context, RTP_BUFFER_FORMAT_VERTEX_FLOAT3
      , RTP_BUFFER_TYPE_HOST, vertices, &verticesBD);
```

#### 5.32.2.2 RTPresult RTPAPI rtpBufferDescDestroy ( RTPbufferdesc *desc* )

Destroys a buffer descriptor.

Buffer descriptors can be destroyed immediately after it is used as a function parameter. The buffer contents associated with a buffer descriptor, however, must remain valid until they are no longer used by any OptiX Prime objects.

**Parameters**

| | | |
|---|---|---|
| in | *desc* | Buffer descriptor |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

#### 5.32.2.3 RTPresult RTPAPI rtpBufferDescGetContext ( RTPbufferdesc *desc*, RTPcontext * *context* )

Gets the context object associated with the provided buffer descriptor.

**Parameters**

| | | |
|---|---|---|
| in | *desc* | Buffer descriptor |
| out | *context* | Returned context |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

#### 5.32.2.4 RTPresult RTPAPI rtpBufferDescSetCudaDeviceNumber ( RTPbufferdesc *desc*, unsigned *deviceNumber* )

Sets the CUDA device number for a buffer.

A buffer of type RTP_BUFFER_TYPE_CUDA_LINEAR is assumed to reside on the device that was current when its buffer descriptor was created unless otherwise specified using this function.

**Parameters**

| | | |
|---|---|---|
| in | *desc* | Buffer descriptor |
| in | *deviceNumber* | CUDA device number |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

#### 5.32.2.5 RTPresult RTPAPI rtpBufferDescSetRange ( RTPbufferdesc *desc*, RTPsize *begin*, RTPsize *end* )

Sets the element range of a buffer to use.

The range is specified in terms of number of elements. By default, the range for a buffer is 0 to the number of elements in the buffer.

**Parameters**

| | | |
|---|---|---|
| in | *desc* | Buffer descriptor |
| in | *begin* | Start index of the range |
| in | *end* | End index of the range (exclusive, one past the index of the last element) |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

#### 5.32.2.6 RTPresult RTPAPI rtpBufferDescSetStride ( RTPbufferdesc *desc,* unsigned *strideBytes* )

Sets the stride for elements in a buffer.

This function is only valid for buffers of format RTP_BUFFER_FORMAT_VERTEX_FLOAT3. This function is useful for vertex buffers that contain interleaved vertex attributes. For buffers that are transferred between the host and a device it is recommended that only buffers with default stride be used to avoid transferring data that will not be used.

**Parameters**

| | | |
|---|---|---|
| in | *desc* | Buffer descriptor |
| in | *strideBytes* | Stride in bytes. The default value of 0 indicates that elements are contiguous in memory. |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE
- RTP_ERROR_UNKNOWN

Example Usage:

```
struct Vertex {
   float3 pos, normal, color;
};
...
RTPbufferdesc vertsBD;
rtpBufferDescCreate(context, RTP_BUFFER_FORMAT_VERTEX_FLOAT3
      , RTP_BUFFER_TYPE_HOST, verts, &vertsBD);
rtpBufferDescSetRange(vertsBD, 0, numVerts);
rtpBufferDescSetStride(vertsBD, sizeof(Vertex));
```

## 5.33 Miscellaneous functions

### Functions

- RTPresult RTPAPI rtpHostBufferLock (void *buffer, RTPsize size)
- RTPresult RTPAPI rtpHostBufferUnlock (void *buffer)
- RTPresult RTPAPI rtpGetErrorString (RTPresult errorCode, const char **errorString)
- RTPresult RTPAPI rtpGetVersion (unsigned *version)
- RTPresult RTPAPI rtpGetVersionString (const char **versionString)

### 5.33.1 Detailed Description

### 5.33.2 Function Documentation

#### 5.33.2.1 RTPresult RTPAPI rtpGetErrorString ( RTPresult *errorCode,* const char ** *errorString* )

Translates an RTPresult error code to a string.

Translates an RTPresult error code to a string describing the error.

**Parameters**

| | | |
|---|---|---|
| in | *errorCode* | Error code to be translated |
| out | *errorString* | Returned error string |

**Return values**

Relevant return values:

- RTP_SUCCESS

**See also** rtpContextGetLastErrorString

#### 5.33.2.2 RTPresult RTPAPI rtpGetVersion ( unsigned * *version* )

Gets OptiX Prime version number.

The encoding for the version number prior to OptiX 4.0.0 is major*1000 + minor*10 + micro. For versions 4.0.0 and higher, the encoding is major*10000 + minor*100 + micro. For example, for version 3.5.1 this function would return 3051, and for version 4.1.2 it would return 40102.

**Parameters**

| | | |
|---|---|---|
| out | *version* | Returned version |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE

#### 5.33.2.3 RTPresult RTPAPI rtpGetVersionString ( const char ** *versionString* )

Gets OptiX Prime version string.

Returns OptiX Prime version string and other information in a human-readable format.

**Parameters**

| | | |
|---|---|---|
| in | *versionString* | Returned version information |

**Return values**

Relevant return values:

- RTP_SUCCESS

#### 5.33.2.4 RTPresult RTPAPI rtpHostBufferLock ( void * *buffer,* RTPsize *size* )

Page-locks a host buffer.

Transfers between the host and device are faster if the host buffers are page-locked. However, page-locked memory is a limited resource and should be used judiciously.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | Buffer on the host |
| in | *size* | Size of the buffer |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE

#### 5.33.2.5 RTPresult RTPAPI rtpHostBufferUnlock ( void * *buffer* )

Unlocks a previously page-locked host buffer.

Transfers between the host and device are faster if the host buffers are page-locked. However, page-locked memory is a limited resource and should be used judiciously. Use this function on buffers previous page-locked with rtpHostBufferLock.

**Parameters**

| | | |
|---|---|---|
| in | *buffer* | Buffer on the host |

**Return values**

Relevant return values:

- RTP_SUCCESS
- RTP_ERROR_INVALID_VALUE

## 5.34 OptiX Prime++ wrapper

### Classes

- class optix::prime::ContextObj
- class optix::prime::BufferDescObj
- class optix::prime::ModelObj
- class optix::prime::QueryObj
- class optix::prime::Exception

- typedef Handle< BufferDescObj > optix::prime::BufferDesc
- typedef Handle< ContextObj > optix::prime::Context
- typedef Handle< ModelObj > optix::prime::Model
- typedef Handle< QueryObj > optix::prime::Query

### 5.34.1 Detailed Description

### 5.34.2 Typedef Documentation

#### 5.34.2.1 typedef Handle<BufferDescObj> optix::prime::BufferDesc

Use this to manipulate RTPbufferdesc objects.

#### 5.34.2.2 typedef Handle<ContextObj> optix::prime::Context

Use this to manipulate RTPcontext objects.

#### 5.34.2.3 typedef Handle<ModelObj> optix::prime::Model

Use this to manipulate RTPmodel objects.

#### 5.34.2.4 typedef Handle<QueryObj> optix::prime::Query

Use this to manipulate RTPquery objects.

## 5.35 OptiX Interoperability Types

### Modules

- OpenGL Texture Formats
- DXGI Texture Formats

### 5.35.1 Detailed Description

This section lists OpenGL and Direct3D texture formats that are currently supported for interoperability with OptiX.

## 5.36 OpenGL Texture Formats

The following OpenGL texture formats are available for interoperability with OptiX.

| |
|---|
| R8I |
| R8UI |
| RG8I |
| RG8UI |
| RGBA8 |
| RGBA8I |
| RGBA8UI |
| R16I |
| R16UI |
| RG16I |
| RG16UI |
| RGBA16 |
| RGBA16I |
| RGBA16UI |
| R32I |
| R32UI |
| RG32I |
| RG32UI |
| RGBA32I |
| RGBA32UI |
| R32F |
| RG32F |
| RGBA32F |

## 5.37 DXGI Texture Formats

The following DXGI texture formats are available for interoperability with OptiX.

| |
|---|
| R8_SINT |
| R8_SNORM |
| R8_UINT |
| R8_UNORM |
| R16_SINT |
| R16_SNORM |
| R16_UINT |
| R16_UNORM |
| R32_SINT |
| R32_UINT |
| R32_FLOAT |
| R8G8_SINT |
| R8G8_SNORM |
| R8G8_UINT |
| R8G8_UNORM |
| R16G16_SINT |
| R16G16_SNORM |
| R16G16_UINT |
| R16G16_UNORM |
| R32G32_SINT |
| R32G32_UINT |
| R32G32_FLOAT |
| R8G8B8A8_SINT |
| R8G8B8A8_SNORM |
| R8G8B8A8_UINT |
| R8G8B8A8_UNORM |
| R16G16B16A16_SINT |
| R16G16B16A16_SNORM |
| R16G16B16A16_UINT |
| R16G16B16A16_UNORM |
| R32G32B32A32_SINT |
| R32G32B32A32_UINT |
| R32G32B32A32_FLOAT |

# 6 Class Documentation

## 6.1 optix::Aabb Class Reference

### Public Member Functions

- RT_HOSTDEVICE Aabb ()
- RT_HOSTDEVICE Aabb (const float3 &min, const float3 &max)
- RT_HOSTDEVICE Aabb (const float3 &v0, const float3 &v1, const float3 &v2)
- RT_HOSTDEVICE bool operator== (const Aabb &other) const
- RT_HOSTDEVICE float3 & operator[] (int i)
- RT_HOSTDEVICE const float3 & operator[] (int i) const
- RT_HOSTDEVICE void set (const float3 &min, const float3 &max)
- RT_HOSTDEVICE void set (const float3 &v0, const float3 &v1, const float3 &v2)
- RT_HOSTDEVICE void invalidate ()
- RT_HOSTDEVICE bool valid () const
- RT_HOSTDEVICE bool contains (const float3 &p) const
- RT_HOSTDEVICE bool contains (const Aabb &bb) const
- RT_HOSTDEVICE void include (const float3 &p)
- RT_HOSTDEVICE void include (const Aabb &other)
- RT_HOSTDEVICE void include (const float3 &min, const float3 &max)
- RT_HOSTDEVICE float3 center () const
- RT_HOSTDEVICE float center (int dim) const
- RT_HOSTDEVICE float3 extent () const
- RT_HOSTDEVICE float extent (int dim) const
- RT_HOSTDEVICE float volume () const
- RT_HOSTDEVICE float area () const
- RT_HOSTDEVICE float halfArea () const
- RT_HOSTDEVICE int longestAxis () const
- RT_HOSTDEVICE float maxExtent () const
- RT_HOSTDEVICE bool intersects (const Aabb &other) const
- RT_HOSTDEVICE void intersection (const Aabb &other)
- RT_HOSTDEVICE void enlarge (float amount)
- RT_HOSTDEVICE bool isFlat () const
- RT_HOSTDEVICE float distance (const float3 &x) const
- RT_HOSTDEVICE float distance2 (const float3 &x) const
- RT_HOSTDEVICE float signedDistance (const float3 &x) const

### Public Attributes

- float3 m_min
- float3 m_max

### 6.1.1 Detailed Description

Axis-aligned bounding box.

**Description**

Aabb is a utility class for computing and manipulating axis-aligned bounding boxes (aabbs). Aabb is primarily useful in the bounding box program associated with geometry objects. Aabb may also be useful in other computation and can be used in both host and device code.

**History**

Aabb was introduced in OptiX 1.0.

**See also** RT_PROGRAM, rtGeometrySetBoundingBoxProgram

### 6.1.2 Constructor & Destructor Documentation

#### 6.1.2.1 OPTIXU_INLINE RT_HOSTDEVICE optix::Aabb::Aabb ( )

Construct an invalid box.

#### 6.1.2.2 OPTIXU_INLINE RT_HOSTDEVICE optix::Aabb::Aabb ( const float3 & *min,* const float3 & *max* )

Construct from min and max vectors.

#### 6.1.2.3 OPTIXU_INLINE RT_HOSTDEVICE optix::Aabb::Aabb ( const float3 & *v0,* const float3 & *v1,* const float3 & *v2* )

Construct from three points (e.g.

triangle)

### 6.1.3 Member Function Documentation

#### 6.1.3.1 OPTIXU_INLINE RT_HOSTDEVICE float optix::Aabb::area ( ) const

Compute the surface area of the box.

#### 6.1.3.2 OPTIXU_INLINE RT_HOSTDEVICE float3 optix::Aabb::center ( ) const

Compute the box center.

#### 6.1.3.3 OPTIXU_INLINE RT_HOSTDEVICE float optix::Aabb::center ( int *dim* ) const

Compute the box center in the given dimension.

#### 6.1.3.4 OPTIXU_INLINE RT_HOSTDEVICE bool optix::Aabb::contains ( const float3 & *p* ) const

Check if the point is in the box.

#### 6.1.3.5 OPTIXU_INLINE RT_HOSTDEVICE bool optix::Aabb::contains ( const Aabb & *bb* ) const

Check if the box is fully contained in the box.

#### 6.1.3.6 OPTIXU_INLINE RT_HOSTDEVICE float optix::Aabb::distance ( const float3 & *x* ) const

Compute the minimum Euclidean distance from a point on the surface of this Aabb to the point of interest.

#### 6.1.3.7 OPTIXU_INLINE RT_HOSTDEVICE float optix::Aabb::distance2 ( const float3 & *x* ) const

Compute the minimum squared Euclidean distance from a point on the surface of this Aabb to the point of interest.

#### 6.1.3.8 OPTIXU_INLINE RT_HOSTDEVICE void optix::Aabb::enlarge ( float *amount* )

Enlarge the box by moving both min and max by 'amount'.

#### 6.1.3.9 OPTIXU_INLINE RT_HOSTDEVICE float3 optix::Aabb::extent ( ) const

Compute the box extent.

#### 6.1.3.10 OPTIXU_INLINE RT_HOSTDEVICE float optix::Aabb::extent ( int *dim* ) const

Compute the box extent in the given dimension.

#### 6.1.3.11 OPTIXU_INLINE RT_HOSTDEVICE float optix::Aabb::halfArea ( ) const

Compute half the surface area of the box.

#### 6.1.3.12 OPTIXU_INLINE RT_HOSTDEVICE void optix::Aabb::include ( const float3 & *p* )

Extend the box to include the given point.

#### 6.1.3.13 OPTIXU_INLINE RT_HOSTDEVICE void optix::Aabb::include ( const Aabb & *other* )

Extend the box to include the given box.

#### 6.1.3.14 OPTIXU_INLINE RT_HOSTDEVICE void optix::Aabb::include ( const float3 & *min,* const float3 & *max* )

Extend the box to include the given box.

#### 6.1.3.15 OPTIXU_INLINE RT_HOSTDEVICE void optix::Aabb::intersection ( const Aabb & *other* )

Make the current box be the intersection between this one and another one.

#### 6.1.3.16 OPTIXU_INLINE RT_HOSTDEVICE bool optix::Aabb::intersects ( const Aabb & *other* ) const

Check for intersection with another box.

#### 6.1.3.17 OPTIXU_INLINE RT_HOSTDEVICE void optix::Aabb::invalidate ( )

Invalidate the box.

#### 6.1.3.18 OPTIXU_INLINE RT_HOSTDEVICE bool optix::Aabb::isFlat ( ) const

Check if the box is flat in at least one dimension.

#### 6.1.3.19 OPTIXU_INLINE RT_HOSTDEVICE int optix::Aabb::longestAxis ( ) const

Get the index of the longest axis.

#### 6.1.3.20 OPTIXU_INLINE RT_HOSTDEVICE float optix::Aabb::maxExtent ( ) const

Get the extent of the longest axis.

#### 6.1.3.21 OPTIXU_INLINE RT_HOSTDEVICE bool optix::Aabb::operator== ( const Aabb & *other* ) const

Exact equality.

#### 6.1.3.22 ]

OPTIXU_INLINE RT_HOSTDEVICE float3 & optix::Aabb::operator[] ( int *i* )

Array access.

#### 6.1.3.23 ]

OPTIXU_INLINE RT_HOSTDEVICE const float3 & optix::Aabb::operator[] ( int *i* ) const

Const array access.

#### 6.1.3.24 OPTIXU_INLINE RT_HOSTDEVICE void optix::Aabb::set ( const float3 & *min,* const float3 & *max* )

Set using two vectors.

#### 6.1.3.25 OPTIXU_INLINE RT_HOSTDEVICE void optix::Aabb::set ( const float3 & *v0,* const float3 & *v1,* const float3 & *v2* )

Set using three points (e.g.

triangle)

#### 6.1.3.26 OPTIXU_INLINE RT_HOSTDEVICE float optix::Aabb::signedDistance ( const float3 & *x* ) const

Compute the minimum Euclidean distance from a point on the surface of this Aabb to the point of interest.

If the point of interest lies inside this Aabb, the result is negative

#### 6.1.3.27 OPTIXU_INLINE RT_HOSTDEVICE bool optix::Aabb::valid ( ) const

Check if the box is valid.

#### 6.1.3.28 OPTIXU_INLINE RT_HOSTDEVICE float optix::Aabb::volume ( ) const

Compute the volume of the box.

### 6.1.4 Member Data Documentation

#### 6.1.4.1 float3 optix::Aabb::m_max

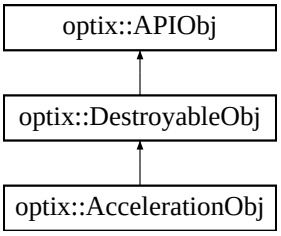
Max bound.

#### 6.1.4.2 float3 optix::Aabb::m_min

Min bound.

## 6.2 optix::AccelerationObj Class Reference

Inheritance diagram for optix::AccelerationObj:




**Public Member Functions**

- void destroy ()
- void validate ()
- Context getContext () const
- RTacceleration get ()
- void addReference ()
- int removeReference ()
- virtual void checkError (RTresult code) const

- void markDirty ()
- bool isDirty () const

- void setProperty (const **std::string** &name, const **std::string** &value)
- **std::string** getProperty (const **std::string** &name) const
- void setBuilder (const **std::string** &builder)
- **std::string** getBuilder () const
- void setTraverser (const **std::string** &traverser)
- **std::string** getTraverser () const

- RTsize getDataSize () const
- void getData (void ∗data) const
- void setData (const void ∗data, RTsize size)

### Static Public Member Functions

- static Exception makeException (RTresult code, RTcontext context)

## 6.2.1 Detailed Description

Acceleration wraps the OptiX C API RTacceleration opaque type and its associated function set.

## 6.2.2 Member Function Documentation

### 6.2.2.1 void optix::APIObj::addReference ( ) [inline], [inherited]

Increment the reference count for this object.

### 6.2.2.2 void optix::APIObj::checkError ( RTresult *code* ) const [inline], [virtual], [inherited]

Check the given result code and throw an error with appropriate message if the code is not RTsuccess.
Reimplemented in optix::ContextObj.

### 6.2.2.3 void optix::AccelerationObj::destroy ( ) [inline], [virtual]

call rt[ObjectType]Destroy on the underlying OptiX C object
Implements optix::DestroyableObj.

### 6.2.2.4 RTacceleration optix::AccelerationObj::get ( ) [inline]

Get the underlying OptiX C API RTacceleration opaque pointer.

### 6.2.2.5 std::string optix::AccelerationObj::getBuilder ( ) const [inline]

Query the acceleration structure builder. See rtAccelerationGetBuilder.

### 6.2.2.6 Context optix::AccelerationObj::getContext ( ) const [inline], [virtual]

Retrieve the context this object is associated with. See rt[ObjectType]GetContext.
Implements optix::APIObj.

### 6.2.2.7 void optix::AccelerationObj::getData ( void * *data* ) const [inline]

**Deprecated in OptiX 4.0** Get the marshalled acceleration data. See rtAccelerationGetData.

### 6.2.2.8 RTsize optix::AccelerationObj::getDataSize ( ) const [inline]

**Deprecated in OptiX 4.0** Query the size of the marshalled acceleration data. See rtAccelerationGetDataSize.

### 6.2.2.9 std::string optix::AccelerationObj::getProperty ( const std::string & *name* ) const [inline]

Query properties specifying Acceleration builder behavior.

See rtAccelerationGetProperty.

#### 6.2.2.10 std::string optix::AccelerationObj::getTraverser ( ) const [inline]

**Deprecated in OptiX 4.0** Query the acceleration structure traverser. See rtAccelerationGetTraverser.

#### 6.2.2.11 bool optix::AccelerationObj::isDirty ( ) const [inline]

Query if the acceleration needs a rebuild. See rtAccelerationIsDirty.

#### 6.2.2.12 Exception optix::APIObj::makeException ( RTresult *code*, RTcontext *context* ) [inline], [static], [inherited]

For backwards compatability. Use Exception::makeException instead.

#### 6.2.2.13 void optix::AccelerationObj::markDirty ( ) [inline]

Mark the acceleration as needing a rebuild. See rtAccelerationMarkDirty.

#### 6.2.2.14 int optix::APIObj::removeReference ( ) [inline], [inherited]

Decrement the reference count for this object.

#### 6.2.2.15 void optix::AccelerationObj::setBuilder ( const std::string & *builder* ) [inline]

Specify the acceleration structure builder. See rtAccelerationSetBuilder.

#### 6.2.2.16 void optix::AccelerationObj::setData ( const void * *data*, RTsize *size* ) [inline]

**Deprecated in OptiX 4.0** Specify the acceleration structure via marshalled acceleration data. See rtAccelerationSetData.

#### 6.2.2.17 void optix::AccelerationObj::setProperty ( const std::string & *name*, const std::string & *value* ) [inline]

Set properties specifying Acceleration builder behavior. See rtAccelerationSetProperty.

#### 6.2.2.18 void optix::AccelerationObj::setTraverser ( const std::string & *traverser* ) [inline]

**Deprecated in OptiX 4.0** Specify the acceleration structure traverser. See rtAccelerationSetTraverser.

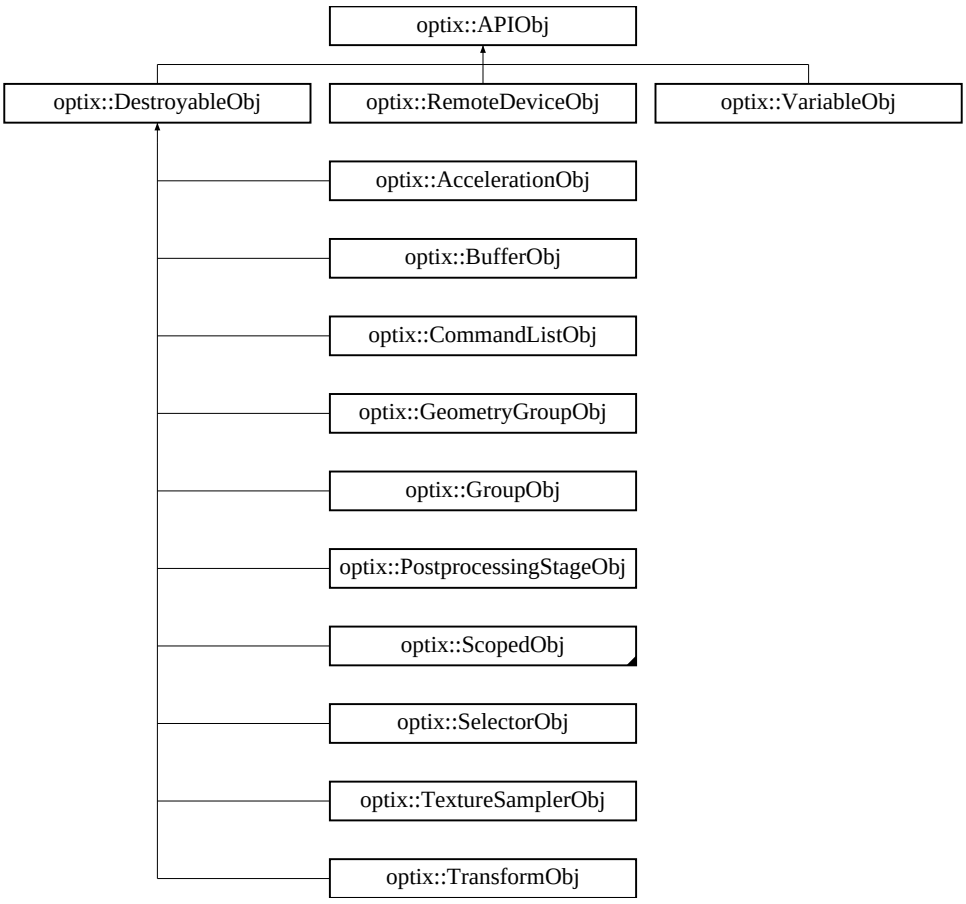
#### 6.2.2.19 void optix::AccelerationObj::validate ( ) [inline], [virtual]

call rt[ObjectType]Validate on the underlying OptiX C object

Implements optix::DestroyableObj.

## 6.3 optix::APIObj Class Reference

Inheritance diagram for optix::APIObj:




### Public Member Functions

- void addReference ()
- int removeReference ()
- virtual Context getContext () const =0
- virtual void checkError (RTresult code) const

### Static Public Member Functions

- static Exception makeException (RTresult code, RTcontext context)

### 6.3.1 Detailed Description

Base class for all reference counted wrappers around OptiX C API opaque types.

Wraps:

- RTcontext
- RTbuffer
- RTgeometry
- RTgeometryinstance
- RTgeometrygroup
- RTgroup
- RTmaterial

- RTprogram
- RTselector
- RTtexturesampler
- RTtransform
- RTvariable

### 6.3.2 Member Function Documentation

#### 6.3.2.1 void optix::APIObj::addReference ( ) [inline]

Increment the reference count for this object.

#### 6.3.2.2 void optix::APIObj::checkError ( RTresult *code* ) const [inline], [virtual]

Check the given result code and throw an error with appropriate message if the code is not RTsuccess.

Reimplemented in optix::ContextObj.

#### 6.3.2.3 virtual Context optix::APIObj::getContext ( ) const [pure virtual]

Retrieve the context this object is associated with. See rt[ObjectType]GetContext.

Implemented in optix::CommandListObj, optix::PostprocessingStageObj, optix::BufferObj, optix::TextureSamplerObj, optix::MaterialObj, optix::GeometryObj, optix::GeometryInstanceObj, optix::AccelerationObj, optix::SelectorObj, optix::TransformObj, optix::GeometryGroupObj, optix::GroupObj, optix::ProgramObj, optix::ContextObj, and optix::VariableObj.

#### 6.3.2.4 Exception optix::APIObj::makeException ( RTresult *code,* RTcontext *context* ) [inline], [static]

For backwards compatability. Use Exception::makeException instead.

#### 6.3.2.5 int optix::APIObj::removeReference ( ) [inline]

Decrement the reference count for this object.

## 6.4 optix::prime::BufferDescObj Class Reference

Inherits RefCountedObj.

### Public Member Functions

- Context getContext ()
- void setRange (RTPsize begin, RTPsize end)
- void setStride (unsigned strideBytes)
- void setCudaDeviceNumber (unsigned deviceNumber)
- RTPbufferdesc getRTPbufferdesc ()

### 6.4.1 Detailed Description

Encapsulates an OptiX Prime buffer descriptor.

The purpose of a buffer descriptor is to provide information about a buffer's type, format, and location. It also describes the region of the buffer to use.

### 6.4.2 Member Function Documentation

#### 6.4.2.1 Context optix::prime::BufferDescObj::getContext ( ) [inline]

Returns the context associated within this object.

#### 6.4.2.2 RTPbufferdesc optix::prime::BufferDescObj::getRTPbufferdesc ( ) [inline]

Returns the RTPbufferdesc descriptor stored within this object.

#### 6.4.2.3 void optix::prime::BufferDescObj::setCudaDeviceNumber ( unsigned *deviceNumber* ) [inline]

Sets the CUDA device number for a buffer. See rtpBufferDescSetCudaDeviceNumber.

#### 6.4.2.4 void optix::prime::BufferDescObj::setRange ( RTPsize *begin*, RTPsize *end* ) [inline]

Sets the range of a buffer to be used. See rtpBufferDescSetRange.

#### 6.4.2.5 void optix::prime::BufferDescObj::setStride ( unsigned *strideBytes* ) [inline]

Sets the stride for elements in a buffer. See rtpBufferDescSetStride.

## 6.5 optix::bufferId< T, Dim > Struct Template Reference

Inherits optix::buffer< T, Dim >.

### 6.5.1 Detailed Description

**template<typename T, int Dim>struct optix::bufferId< T, Dim >**

bufferId is a host version of the device side bufferId.

Use bufferId to define types that can be included from both the host and device code. This class provides a container that can be used to transport the buffer id back and forth between host and device code. The bufferId class is useful, because it can take a buffer id obtained from rtBufferGetId and provide accessors similar to the buffer class.

"bindless_type.h" used by both host and device code:

```
#include <optix_world.h>
struct BufInfo {
  int val;
  rtBufferId<int, 1> data;
};
```

Host code:

```
#include "bindless_type.h"
BufInfo input_buffer_info;
input_buffer_info.val = 0;
input_buffer_info.data = rtBufferId<int,1>(inputBuffer0->getId());
context["input_buffer_info"]->setUserData(sizeof(BufInfo), &input_buffer_info);
```

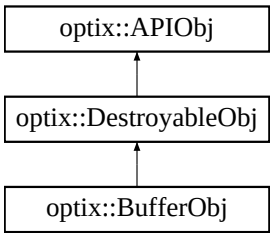
Device code:

```
#include "bindless_type.h"
rtBuffer<int,1> result;
rtDeclareVariable(BufInfo, input_buffer_info, ,);

RT_PROGRAM void bindless()
{
  int value = input_buffer_info.data[input_buffer_info.val];
  result[0] = value;
}
```

## 6.6 optix::BufferObj Class Reference

Inheritance diagram for optix::BufferObj:




### Public Member Functions

- void destroy ()
- void validate ()
- Context getContext () const
- RTbuffer get ()
- void addReference ()
- int removeReference ()
- virtual void checkError (RTresult code) const

- void setFormat (RTformat format)
- RTformat getFormat () const
- void setElementSize (RTsize size_of_element)
- RTsize getElementSize () const
- void getDevicePointer (int optix_device_ordinal, void **device_pointer)
- void * getDevicePointer (int optix_device_ordinal)
- void setDevicePointer (int optix_device_ordinal, void *device_pointer)
- void markDirty ()
- void setSize (RTsize width)
- void getSize (RTsize &width) const

- void getMipLevelSize (unsigned int level, RTsize &width) const
- void setSize (RTsize width, RTsize height)
- void getSize (RTsize &width, RTsize &height) const
- void getMipLevelSize (unsigned int level, RTsize &width, RTsize &height) const
- void setSize (RTsize width, RTsize height, RTsize depth)
- void getSize (RTsize &width, RTsize &height, RTsize &depth) const
- void getMipLevelSize (unsigned int level, RTsize &width, RTsize &height, RTsize &depth) const
- void setSize (unsigned int dimensionality, const RTsize *dims)
- void getSize (unsigned int dimensionality, RTsize *dims) const
- unsigned int getDimensionality () const
- void setMipLevelCount (unsigned int levels)
- unsigned int getMipLevelCount () const

- int getId () const

- unsigned int getGLBOId () const
- void registerGLBuffer ()
- void unregisterGLBuffer ()

- void setAttribute (RTbufferattribute attrib, RTsize size, void *p)
- void getAttribute (RTbufferattribute attrib, RTsize size, void *p)

- void * map (unsigned int level=0, unsigned int map_flags=RT_BUFFER_MAP_READ_WRITE, void *user_owned=0)
- void unmap (unsigned int level=0)

- void bindProgressiveStream (Buffer source)
- void getProgressiveUpdateReady (int *ready, unsigned int *subframe_count, unsigned int *max_subframes)
- bool getProgressiveUpdateReady ()
- bool getProgressiveUpdateReady (unsigned int &subframe_count)
- bool getProgressiveUpdateReady (unsigned int &subframe_count, unsigned int &max_subframes)

**Static Public Member Functions**

- static Exception makeException (RTresult code, RTcontext context)

### 6.6.1 Detailed Description

Buffer wraps the OptiX C API RTbuffer opaque type and its associated function set.

### 6.6.2 Member Function Documentation

#### 6.6.2.1 void optix::APIObj::addReference ( ) [inline], [inherited]

Increment the reference count for this object.

#### 6.6.2.2 void optix::BufferObj::bindProgressiveStream ( Buffer *source* ) [inline]

Bind a buffer as source for a progressive stream. See rtBufferBindProgressiveStream.

#### 6.6.2.3 void optix::APIObj::checkError ( RTresult *code* ) const [inline], [virtual], [inherited]

Check the given result code and throw an error with appropriate message if the code is not RTsuccess.
Reimplemented in optix::ContextObj.

#### 6.6.2.4 void optix::BufferObj::destroy ( ) [inline], [virtual]

call rt[ObjectType]Destroy on the underlying OptiX C object
Implements optix::DestroyableObj.

#### 6.6.2.5 RTbuffer optix::BufferObj::get ( ) [inline]

Get the underlying OptiX C API RTbuffer opaque pointer.

#### 6.6.2.6 void optix::BufferObj::getAttribute ( RTbufferattribute *attrib,* RTsize *size,* void * *p* ) [inline]

Get a Buffer Attribute. See rtBufferGetAttribute.

#### 6.6.2.7 Context optix::BufferObj::getContext ( ) const [inline], [virtual]

Retrieve the context this object is associated with. See rt[ObjectType]GetContext.
Implements optix::APIObj.

#### 6.6.2.8 void optix::BufferObj::getDevicePointer ( int *optix_device_ordinal,* void ** *device_pointer* ) [inline]

Get the pointer to buffer memory on a specific device. See rtBufferGetDevicePointer.

#### 6.6.2.9 void * optix::BufferObj::getDevicePointer ( int *optix_device_ordinal* ) [inline]

Set the data format for the buffer. See rtBufferSetFormat.

#### 6.6.2.10 unsigned int optix::BufferObj::getDimensionality ( ) const [inline]

Query dimensionality of buffer. See rtBufferGetDimensionality.

#### 6.6.2.11 RTsize optix::BufferObj::getElementSize ( ) const [inline]

Query the data element size for user format buffers. See rtBufferGetElementSize.

#### 6.6.2.12 RTformat optix::BufferObj::getFormat ( ) const [inline]

Query the data format for the buffer. See rtBufferGetFormat.

#### 6.6.2.13 unsigned int optix::BufferObj::getGLBOId ( ) const [inline]

Queries the OpenGL Buffer Object ID associated with this buffer. See rtBufferGetGLBOId.

#### 6.6.2.14 int optix::BufferObj::getId ( ) const [inline]

Queries an id suitable for referencing the buffer in an another buffer. See rtBufferGetId.

#### 6.6.2.15 unsigned int optix::BufferObj::getMipLevelCount ( ) const [inline]

Query number of mipmap levels of buffer. See rtBufferGetMipLevelCount.

#### 6.6.2.16 void optix::BufferObj::getMipLevelSize ( unsigned int *level*, RTsize & *width* ) const [inline]

Query 1D buffer dimension of specific MIP level. See rtBufferGetMipLevelSize1D.

#### 6.6.2.17 void optix::BufferObj::getMipLevelSize ( unsigned int *level*, RTsize & *width*, RTsize & *height* ) const [inline]

Query 2D buffer dimension of specific MIP level. See rtBufferGetMipLevelSize2D.

#### 6.6.2.18 void optix::BufferObj::getMipLevelSize ( unsigned int *level*, RTsize & *width*, RTsize & *height*, RTsize & *depth* ) const [inline]

Query 3D buffer dimension of specific MIP level. See rtBufferGetMipLevelSize3D.

#### 6.6.2.19 void optix::BufferObj::getProgressiveUpdateReady ( int * *ready*, unsigned int * *subframe_count*, unsigned int * *max_subframes* ) [inline]

Query updates from a progressive stream. See rtBufferGetProgressiveUpdateReady.

#### 6.6.2.20 bool optix::BufferObj::getProgressiveUpdateReady ( ) [inline]

Query updates from a progressive stream. See rtBufferGetProgressiveUpdateReady.

#### 6.6.2.21 bool optix::BufferObj::getProgressiveUpdateReady ( unsigned int & *subframe_count* ) [inline]

Query updates from a progressive stream. See rtBufferGetProgressiveUpdateReady.

#### 6.6.2.22 bool optix::BufferObj::getProgressiveUpdateReady ( unsigned int & *subframe_count*, unsigned int & *max_subframes* ) [inline]

Query updates from a progressive stream. See rtBufferGetProgressiveUpdateReady.

#### 6.6.2.23 void optix::BufferObj::getSize ( RTsize & *width* ) const [inline]

Query 1D buffer dimension. See rtBufferGetSize1D.

#### 6.6.2.24 void optix::BufferObj::getSize ( RTsize & *width*, RTsize & *height* ) const [inline]

Query 2D buffer dimension. See rtBufferGetSize2D.

#### 6.6.2.25 void optix::BufferObj::getSize ( RTsize & *width*, RTsize & *height*, RTsize & *depth* ) const [inline]

Query 3D buffer dimension. See rtBufferGetSize3D.

#### 6.6.2.26 void optix::BufferObj::getSize ( unsigned int *dimensionality*, RTsize * *dims* ) const [inline]

Query dimensions of buffer. See rtBufferGetSizev.

#### 6.6.2.27 Exception optix::APIObj::makeException ( RTresult *code*, RTcontext *context* ) [inline], [static], [inherited]

For backwards compatability. Use Exception::makeException instead.

#### 6.6.2.28 void * optix::BufferObj::map ( unsigned int *level* = *0*, unsigned int *map_flags* = RT_BUFFER_MAP_READ_WRITE, void * *user_owned* = *0* ) [inline]

Maps a buffer object for host access. See rtBufferMap and rtBufferMapEx.

#### 6.6.2.29 void optix::BufferObj::markDirty ( ) [inline]

Mark the buffer dirty.

#### 6.6.2.30 void optix::BufferObj::registerGLBuffer ( ) [inline]

Declare the buffer as mutable and inaccessible by OptiX. See rtTextureSamplerGLRegister.

#### 6.6.2.31 int optix::APIObj::removeReference ( ) [inline], [inherited]

Decrement the reference count for this object.

#### 6.6.2.32 void optix::BufferObj::setAttribute ( RTbufferattribute *attrib*, RTsize *size*, void * *p* ) [inline]

Set a Buffer Attribute. See rtBufferSetAttribute.

#### 6.6.2.33 void optix::BufferObj::setDevicePointer ( int *optix_device_ordinal*, void * *device_pointer* ) [inline]

Set the pointer to buffer memory on a specific device. See rtBufferSetDevicePointer.

#### 6.6.2.34 void optix::BufferObj::setElementSize ( RTsize *size_of_element* ) [inline]

Set the data element size for user format buffers. See rtBufferSetElementSize.

#### 6.6.2.35 void optix::BufferObj::setFormat ( RTformat *format* ) [inline]

Set the data format for the buffer. See rtBufferSetFormat.

#### 6.6.2.36 void optix::BufferObj::setMipLevelCount ( unsigned int *levels* ) [inline]

Set buffer number of MIP levels. See rtBufferSetMipLevelCount.

#### 6.6.2.37 void optix::BufferObj::setSize ( RTsize *width* ) [inline]

Set buffer dimensionality to one and buffer width to specified width. See rtBufferSetSize1D.

#### 6.6.2.38 void optix::BufferObj::setSize ( RTsize *width,* RTsize *height* ) [inline]

Set buffer dimensionality to two and buffer dimensions to specified width,height. See rtBufferSetSize2D.

#### 6.6.2.39 void optix::BufferObj::setSize ( RTsize *width,* RTsize *height,* RTsize *depth* ) [inline]

Set buffer dimensionality to three and buffer dimensions to specified width,height,depth.

See rtBufferSetSize3D.

#### 6.6.2.40 void optix::BufferObj::setSize ( unsigned int *dimensionality,* const RTsize * *dims* ) [inline]

Set buffer dimensionality and dimensions to specified values. See rtBufferSetSizev.

#### 6.6.2.41 void optix::BufferObj::unmap ( unsigned int *level = 0* ) [inline]

Unmaps a buffer object. See rtBufferUnmap and rtBufferUnmapEx.

#### 6.6.2.42 void optix::BufferObj::unregisterGLBuffer ( ) [inline]

Unregister the buffer, re-enabling OptiX operations. See rtTextureSamplerGLUnregister.

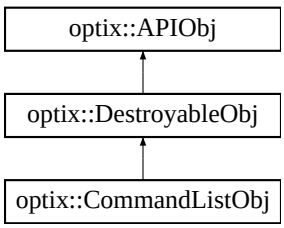
#### 6.6.2.43 void optix::BufferObj::validate ( ) [inline], [virtual]

call rt[ObjectType]Validate on the underlying OptiX C object

Implements optix::DestroyableObj.

## 6.7 optix::CommandListObj Class Reference

Inheritance diagram for optix::CommandListObj:




### Public Member Functions

- void destroy ()
- void validate ()
- Context getContext () const
- RTcommandlist get ()

- void addReference ()
- int removeReference ()
- virtual void checkError (RTresult code) const

- void appendPostprocessingStage (PostprocessingStage stage, RTsize launch_width, RTsize launch_height)
- void appendLaunch (unsigned int entryIndex, RTsize launch_width, RTsize launch_height)

- void finalize ()
- void execute ()

**Static Public Member Functions**

- static Exception makeException (RTresult code, RTcontext context)

### 6.7.1 Detailed Description

CommandList wraps the OptiX C API RTcommandlist opaque type and its associated function set.

### 6.7.2 Member Function Documentation

#### 6.7.2.1 void optix::APIObj::addReference ( ) [inline], [inherited]

Increment the reference count for this object.

#### 6.7.2.2 void optix::CommandListObj::appendLaunch ( unsigned int *entryIndex,* RTsize *launch_width,* RTsize *launch_height* ) [inline]

Append a launch2d command to the command list. See rtCommandListAppendLaunch2D.

#### 6.7.2.3 void optix::CommandListObj::appendPostprocessingStage ( PostprocessingStage *stage,* RTsize *launch_width,* RTsize *launch_height* ) [inline]

Append a postprocessing stage to the command list. See rtCommandListAppendPostprocessingStage.

#### 6.7.2.4 void optix::APIObj::checkError ( RTresult *code* ) const [inline], [virtual], [inherited]

Check the given result code and throw an error with appropriate message if the code is not RTsuccess.
Reimplemented in optix::ContextObj.

#### 6.7.2.5 void optix::CommandListObj::destroy ( ) [inline], [virtual]

call rt[ObjectType]Destroy on the underlying OptiX C object
Implements optix::DestroyableObj.

#### 6.7.2.6 void optix::CommandListObj::execute ( ) [inline]

Finalize the command list so that it can be called, later. See rtCommandListFinalize.

#### 6.7.2.7 void optix::CommandListObj::finalize ( ) [inline]

Finalize the command list so that it can be called, later. See rtCommandListFinalize.

#### 6.7.2.8 RTcommandlist optix::CommandListObj::get ( ) [inline]

Get the underlying OptiX C API RTcommandlist opaque pointer.

#### 6.7.2.9 Context optix::CommandListObj::getContext ( ) const [inline], [virtual]

Retrieve the context this object is associated with. See rt[ObjectType]GetContext.

Implements optix::APIObj.

#### 6.7.2.10 Exception optix::APIObj::makeException ( RTresult *code,* RTcontext *context* ) [inline], [static], [inherited]

For backwards compatability. Use Exception::makeException instead.

#### 6.7.2.11 int optix::APIObj::removeReference ( ) [inline], [inherited]

Decrement the reference count for this object.

#### 6.7.2.12 void optix::CommandListObj::validate ( ) [inline], [virtual]

call rt[ObjectType]Validate on the underlying OptiX C object

Implements optix::DestroyableObj.

## 6.8 optix::prime::ContextObj Class Reference

Inherits RefCountedObj.

### Public Member Functions

- BufferDesc createBufferDesc (RTPbufferformat format, RTPbuffertype type, void *buffer)
- Model createModel ()
- void setCudaDeviceNumbers (const **std::vector**< unsigned > &deviceNumbers)
- void setCudaDeviceNumbers (unsigned deviceCount, const unsigned *deviceNumbers)
- void setCpuThreads (unsigned numThreads)
- **std::string** getLastErrorString ()
- RTPcontext getRTPcontext ()

### Static Public Member Functions

- static Context create (RTPcontexttype type)

### 6.8.1 Detailed Description

Wraps the OptiX Prime C API RTPcontext opaque type and its associated function set representing an OptiX Prime context.

### 6.8.2 Member Function Documentation

#### 6.8.2.1 Context optix::prime::ContextObj::create ( RTPcontexttype *type* ) [inline], [static]

Creates a Context object. See rtpContextCreate.

#### 6.8.2.2 BufferDesc optix::prime::ContextObj::createBufferDesc ( RTPbufferformat *format*, RTPbuffertype *type*, void * *buffer* ) [inline]

Creates a BufferDesc object. See rtpBufferDescCreate.

#### 6.8.2.3 Model optix::prime::ContextObj::createModel ( ) [inline]

Creates a Model object. See rtpModelCreate.

#### 6.8.2.4 std::string optix::prime::ContextObj::getLastErrorString ( ) [inline]

Returns a string describing last error encountered. See rtpContextGetLastErrorString.

#### 6.8.2.5 RTPcontext optix::prime::ContextObj::getRTPcontext ( ) [inline]

Returns the RTPcontext context stored within this object.

#### 6.8.2.6 void optix::prime::ContextObj::setCpuThreads ( unsigned *numThreads* ) [inline]

Sets the number of CPU threads used by a CPU context. See rtpContextSetCpuThreads.

#### 6.8.2.7 void optix::prime::ContextObj::setCudaDeviceNumbers ( const std::vector< unsigned > & *deviceNumbers* ) [inline]

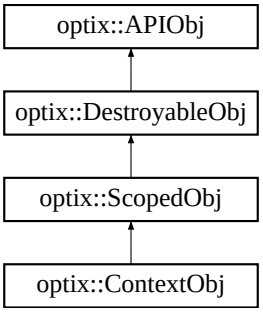
Sets the CUDA devices used by a context. See rtpContextSetCudaDeviceNumbers.

#### 6.8.2.8 void optix::prime::ContextObj::setCudaDeviceNumbers ( unsigned *deviceCount*, const unsigned * *deviceNumbers* ) [inline]

Sets the CUDA devices used by a context. See rtpContextSetCudaDeviceNumbers.

## 6.9 optix::ContextObj Class Reference

Inheritance diagram for optix::ContextObj:



### Public Member Functions

- void destroy ()
- void validate ()
- Context getContext () const
- void compile ()
- void setRemoteDevice (RemoteDevice remote_device)
- int getRunningState () const
- RTcontext get ()
- void addReference ()
- int removeReference ()

- void checkError (RTresult code) const
- **std::string** getErrorString (RTresult code) const

- Acceleration createAcceleration (const **std::string** &builder, const **std::string** &ignored="")
- Buffer createBuffer (unsigned int type)
- Buffer createBuffer (unsigned int type, RTformat format)
- Buffer createBuffer (unsigned int type, RTformat format, RTsize width)
- Buffer createMipmappedBuffer (unsigned int type, RTformat format, RTsize width, unsigned int levels)
- Buffer createBuffer (unsigned int type, RTformat format, RTsize width, RTsize height)
- Buffer createMipmappedBuffer (unsigned int type, RTformat format, RTsize width, RTsize height, unsigned int levels)
- Buffer createBuffer (unsigned int type, RTformat format, RTsize width, RTsize height, RTsize depth)
- Buffer createMipmappedBuffer (unsigned int type, RTformat format, RTsize width, RTsize height, RTsize depth, unsigned int levels)
- Buffer create1DLayeredBuffer (unsigned int type, RTformat format, RTsize width, RTsize layers, unsigned int levels)
- Buffer create2DLayeredBuffer (unsigned int type, RTformat format, RTsize width, RTsize height, RTsize layers, unsigned int levels)
- Buffer createCubeBuffer (unsigned int type, RTformat format, RTsize width, RTsize height, unsigned int levels)
- Buffer createCubeLayeredBuffer (unsigned int type, RTformat format, RTsize width, RTsize height, RTsize faces, unsigned int levels)
- Buffer createBufferForCUDA (unsigned int type)
- Buffer createBufferForCUDA (unsigned int type, RTformat format)
- Buffer createBufferForCUDA (unsigned int type, RTformat format, RTsize width)
- Buffer createBufferForCUDA (unsigned int type, RTformat format, RTsize width, RTsize height)
- Buffer createBufferForCUDA (unsigned int type, RTformat format, RTsize width, RTsize height, RTsize depth)
- Buffer createBufferFromGLBO (unsigned int type, unsigned int vbo)
- TextureSampler createTextureSamplerFromGLImage (unsigned int id, RTgltarget target)
- Buffer getBufferFromId (int buffer_id)
- Program getProgramFromId (int program_id)
- TextureSampler getTextureSamplerFromId (int sampler_id)
- Geometry createGeometry ()
- GeometryInstance createGeometryInstance ()

- template<class Iterator >
  GeometryInstance createGeometryInstance (Geometry geometry, Iterator matlbegin, Iterator matlend)
- Group createGroup ()
- template<class Iterator >
  Group createGroup (Iterator childbegin, Iterator childend)
- GeometryGroup createGeometryGroup ()
- template<class Iterator >
  GeometryGroup createGeometryGroup (Iterator childbegin, Iterator childend)
- Transform createTransform ()
- Material createMaterial ()
- Program createProgramFromPTXFile (const **std::string** &ptx, const **std::string** &program_name)
- Program createProgramFromPTXString (const **std::string** &ptx, const **std::string** &program_name)
- Selector createSelector ()
- TextureSampler createTextureSampler ()

- PostprocessingStage createBuiltinPostProcessingStage (const **std::string** &builtin_name)
- CommandList createCommandList ()

- template<class Iterator >
  void setDevices (Iterator begin, Iterator end)
- **std::vector**< int > getEnabledDevices () const
- unsigned int getEnabledDeviceCount () const

- int getMaxTextureCount () const
- int getCPUNumThreads () const
- RTsize getUsedHostMemory () const
- int getGPUPagingActive () const
- int getGPUPagingForcedOff () const
- RTsize getAvailableDeviceMemory (int ordinal) const

- void setCPUNumThreads (int cpu_num_threads)
- void setGPUPagingForcedOff (int gpu_paging_forced_off)
- template<class T >
  void setAttribute (RTcontextattribute attribute, const T &val)

- void setStackSize (RTsize stack_size_bytes)
- RTsize getStackSize () const
- void setTimeoutCallback (RTtimeoutcallback callback, double min_polling_seconds)
- void setUsageReportCallback (RTusagereportcallback callback, int verbosity, void *cbdata)
- void setEntryPointCount (unsigned int num_entry_points)
- unsigned int getEntryPointCount () const
- void setRayTypeCount (unsigned int num_ray_types)
- unsigned int getRayTypeCount () const

- void setRayGenerationProgram (unsigned int entry_point_index, Program program)
- Program getRayGenerationProgram (unsigned int entry_point_index) const

- void setExceptionProgram (unsigned int entry_point_index, Program program)
- Program getExceptionProgram (unsigned int entry_point_index) const
- void setExceptionEnabled (RTexception exception, bool enabled)
- bool getExceptionEnabled (RTexception exception) const
- void setMissProgram (unsigned int ray_type_index, Program program)
- Program getMissProgram (unsigned int ray_type_index) const

- void launch (unsigned int entry_point_index, RTsize image_width)
- void launch (unsigned int entry_point_index, RTsize image_width, RTsize image_height)
- void launch (unsigned int entry_point_index, RTsize image_width, RTsize image_height, RTsize image_depth)

- void launchProgressive (unsigned int entry_point_index, RTsize image_width, RTsize image_height, unsigned int max_subframes)
- void stopProgressive ()

- void setPrintEnabled (bool enabled)
- bool getPrintEnabled () const
- void setPrintBufferSize (RTsize buffer_size_bytes)
- RTsize getPrintBufferSize () const
- void setPrintLaunchIndex (int x, int y=-1, int z=-1)
- optix::int3 getPrintLaunchIndex () const

- Variable declareVariable (const **std::string** &name)
- Variable queryVariable (const **std::string** &name) const
- void removeVariable (Variable v)
- unsigned int getVariableCount () const
- Variable getVariable (unsigned int index) const

### Static Public Member Functions

- static unsigned int getDeviceCount ()
- static **std::string** getDeviceName (int ordinal)
- static void getDeviceAttribute (int ordinal, RTdeviceattribute attrib, RTsize size, void *p)
- static Context create ()
- static Exception makeException (RTresult code, RTcontext context)

## 6.9.1 Detailed Description

Context object wraps the OptiX C API RTcontext opaque type and its associated function set.

## 6.9.2 Member Function Documentation

### 6.9.2.1 void optix::APIObj::addReference ( ) [inline], [inherited]

Increment the reference count for this object.

#### 6.9.2.2 void optix::ContextObj::checkError ( RTresult *code* ) const [inline], [virtual]

See APIObj::checkError

Reimplemented from optix::APIObj.

#### 6.9.2.3 void optix::ContextObj::compile ( ) [inline]

**Deprecated in OptiX 4.0** See rtContextCompile

#### 6.9.2.4 Context optix::ContextObj::create ( ) [inline], [static]

Creates a Context object. See rtContextCreate.

#### 6.9.2.5 Buffer optix::ContextObj::create1DLayeredBuffer ( unsigned int *type,* RTformat *format,* RTsize *width,* RTsize *layers,* unsigned int *levels* ) [inline]

Create a 1D layered mipmapped buffer with given RTbuffertype, RTformat and dimension.

See rtBufferCreate, rtBufferSetFormat, rtBufferSetMipLevelCount, and rtBufferSetSize3D.

#### 6.9.2.6 Buffer optix::ContextObj::create2DLayeredBuffer ( unsigned int *type,* RTformat *format,* RTsize *width,* RTsize *height,* RTsize *layers,* unsigned int *levels* ) [inline]

Create a 2D layered mipmapped buffer with given RTbuffertype, RTformat and dimension.

See rtBufferCreate, rtBufferSetFormat, rtBufferSetMipLevelCount, and rtBufferSetSize3D.

#### 6.9.2.7 Acceleration optix::ContextObj::createAcceleration ( const std::string & *builder,* const std::string & *ignored* = "" ) [inline]

**traverser parameter unused in OptiX 4.0** See rtAccelerationCreate.

#### 6.9.2.8 Buffer optix::ContextObj::createBuffer ( unsigned int *type* ) [inline]

Create a buffer with given RTbuffertype. See rtBufferCreate.

#### 6.9.2.9 Buffer optix::ContextObj::createBuffer ( unsigned int *type,* RTformat *format* ) [inline]

Create a buffer with given RTbuffertype and RTformat. See rtBufferCreate, rtBufferSetFormat.

#### 6.9.2.10 Buffer optix::ContextObj::createBuffer ( unsigned int *type,* RTformat *format,* RTsize *width* ) [inline]

Create a buffer with given RTbuffertype, RTformat and dimension.

See rtBufferCreate, rtBufferSetFormat and rtBufferSetSize1D.

#### 6.9.2.11 Buffer optix::ContextObj::createBuffer ( unsigned int *type,* RTformat *format,* RTsize *width,* RTsize *height* ) [inline]

Create a buffer with given RTbuffertype, RTformat and dimension.

See rtBufferCreate, rtBufferSetFormat and rtBufferSetSize2D.

#### 6.9.2.12 Buffer optix::ContextObj::createBuffer ( unsigned int *type*, RTformat *format*, RTsize *width*, RTsize *height*, RTsize *depth* ) [inline]

Create a buffer with given RTbuffertype, RTformat and dimension.

See rtBufferCreate, rtBufferSetFormat and rtBufferSetSize3D.

#### 6.9.2.13 Buffer optix::ContextObj::createBufferForCUDA ( unsigned int *type* ) [inline]

Create a buffer for CUDA with given RTbuffertype. See rtBufferCreate.

#### 6.9.2.14 Buffer optix::ContextObj::createBufferForCUDA ( unsigned int *type*, RTformat *format* ) [inline]

Create a buffer for CUDA with given RTbuffertype and RTformat. See rtBufferCreate, rtBufferSetFormat.

#### 6.9.2.15 Buffer optix::ContextObj::createBufferForCUDA ( unsigned int *type*, RTformat *format*, RTsize *width* ) [inline]

Create a buffer for CUDA with given RTbuffertype, RTformat and dimension.

See rtBufferCreate, rtBufferSetFormat and rtBufferSetSize1D.

#### 6.9.2.16 Buffer optix::ContextObj::createBufferForCUDA ( unsigned int *type*, RTformat *format*, RTsize *width*, RTsize *height* ) [inline]

Create a buffer for CUDA with given RTbuffertype, RTformat and dimension.

See rtBufferCreate, rtBufferSetFormat and rtBufferSetSize2D.

#### 6.9.2.17 Buffer optix::ContextObj::createBufferForCUDA ( unsigned int *type*, RTformat *format*, RTsize *width*, RTsize *height*, RTsize *depth* ) [inline]

Create a buffer for CUDA with given RTbuffertype, RTformat and dimension.

See rtBufferCreate, rtBufferSetFormat and rtBufferSetSize3D.

#### 6.9.2.18 Buffer optix::ContextObj::createBufferFromGLBO ( unsigned int *type*, unsigned int *vbo* ) [inline]

Create buffer from GL buffer object. See rtBufferCreateFromGLBO.

#### 6.9.2.19 PostprocessingStage optix::ContextObj::createBuiltinPostProcessingStage ( const std::string & *builtin_name* ) [inline]

Create a builtin postprocessing stage. See rtPostProcessingStageCreateBuiltin.

#### 6.9.2.20 CommandList optix::ContextObj::createCommandList ( ) [inline]

Create a new command list. See rtCommandListCreate.

#### 6.9.2.21 Buffer optix::ContextObj::createCubeBuffer ( unsigned int *type,* RTformat *format,* RTsize *width,* RTsize *height,* unsigned int *levels* ) [inline]

Create a cube mipmapped buffer with given RTbuffertype, RTformat and dimension.

See rtBufferCreate, rtBufferSetFormat, rtBufferSetMipLevelCount, and rtBufferSetSize3D.

#### 6.9.2.22 Buffer optix::ContextObj::createCubeLayeredBuffer ( unsigned int *type,* RTformat *format,* RTsize *width,* RTsize *height,* RTsize *faces,* unsigned int *levels* ) [inline]

Create a cube layered mipmapped buffer with given RTbuffertype, RTformat and dimension.

See rtBufferCreate, rtBufferSetFormat, rtBufferSetMipLevelCount, and rtBufferSetSize3D.

#### 6.9.2.23 Geometry optix::ContextObj::createGeometry ( ) [inline]

See rtGeometryCreate.

#### 6.9.2.24 GeometryGroup optix::ContextObj::createGeometryGroup ( ) [inline]

See rtGeometryGroupCreate.

#### 6.9.2.25 template<class Iterator > GeometryGroup optix::ContextObj::createGeometryGroup ( Iterator *childbegin,* Iterator *childend* ) [inline]

Create a GeometryGroup with a set of child nodes.

See rtGeometryGroupCreate, rtGeometryGroupSetChildCount and rtGeometryGroupSetChild

#### 6.9.2.26 GeometryInstance optix::ContextObj::createGeometryInstance ( ) [inline]

See rtGeometryInstanceCreate.

#### 6.9.2.27 template<class Iterator > GeometryInstance optix::ContextObj::createGeometryInstance ( Geometry *geometry,* Iterator *matlbegin,* Iterator *matlend* )

Create a geometry instance with a Geometry object and a set of associated materials.

See rtGeometryInstanceCreate, rtGeometryInstanceSetMaterialCount, and rtGeometryInstanceSetMaterial

#### 6.9.2.28 Group optix::ContextObj::createGroup ( ) [inline]

See rtGroupCreate.

#### 6.9.2.29 template<class Iterator > Group optix::ContextObj::createGroup ( Iterator *childbegin,* Iterator *childend* ) [inline]

Create a Group with a set of child nodes.

See rtGroupCreate, rtGroupSetChildCount and rtGroupSetChild

#### 6.9.2.30 Material optix::ContextObj::createMaterial ( ) [inline]

See rtMaterialCreate.

#### 6.9.2.31 Buffer optix::ContextObj::createMipmappedBuffer ( unsigned int *type,* RTformat *format,* RTsize *width,* unsigned int *levels* ) [inline]

Create a mipmapped buffer with given RTbuffertype, RTformat and dimension.

See rtBufferCreate, rtBufferSetFormat and rtBufferSetSize1DMipmapped.

#### 6.9.2.32 Buffer optix::ContextObj::createMipmappedBuffer ( unsigned int *type,* RTformat *format,* RTsize *width,* RTsize *height,* unsigned int *levels* ) [inline]

Create a mipmapped buffer with given RTbuffertype, RTformat and dimension.

See rtBufferCreate, rtBufferSetFormat and rtBufferSetSize2DMipmapped.

#### 6.9.2.33 Buffer optix::ContextObj::createMipmappedBuffer ( unsigned int *type,* RTformat *format,* RTsize *width,* RTsize *height,* RTsize *depth,* unsigned int *levels* ) [inline]

Create a mipmapped buffer with given RTbuffertype, RTformat and dimension.

See rtBufferCreate, rtBufferSetFormat and rtBufferSetSize3DMipmapped.

#### 6.9.2.34 Program optix::ContextObj::createProgramFromPTXFile ( const std::string & *ptx,* const std::string & *program_name* ) [inline]

See rtProgramCreateFromPTXFile.

#### 6.9.2.35 Program optix::ContextObj::createProgramFromPTXString ( const std::string & *ptx,* const std::string & *program_name* ) [inline]

See rtProgramCreateFromPTXString.

#### 6.9.2.36 Selector optix::ContextObj::createSelector ( ) [inline]

See rtSelectorCreate.

#### 6.9.2.37 TextureSampler optix::ContextObj::createTextureSampler ( ) [inline]

See rtTextureSamplerCreate.

#### 6.9.2.38 TextureSampler optix::ContextObj::createTextureSamplerFromGLImage ( unsigned int *id,* RTgltarget *target* ) [inline]

Create TextureSampler from GL image. See rtTextureSamplerCreateFromGLImage.

#### 6.9.2.39 Transform optix::ContextObj::createTransform ( ) [inline]

See rtTransformCreate.

#### 6.9.2.40 Variable optix::ContextObj::declareVariable ( const std::string & *name* ) [inline], [virtual]

Declare a variable associated with this object.

See rt[ObjectType]DeclareVariable. Note that this function is wrapped by the convenience function Handle::operator[].

Implements optix::ScopedObj.

#### 6.9.2.41 void optix::ContextObj::destroy ( ) [inline], [virtual]

Destroy Context and all of its associated objects. See rtContextDestroy.

Implements optix::DestroyableObj.

#### 6.9.2.42 RTcontext optix::ContextObj::get ( ) [inline]

Return the OptiX C API RTcontext object.

#### 6.9.2.43 RTsize optix::ContextObj::getAvailableDeviceMemory ( int *ordinal* ) const [inline]

See rtContextGetAttribute.

#### 6.9.2.44 Buffer optix::ContextObj::getBufferFromId ( int *buffer_id* ) [inline]

Queries the Buffer object from a given buffer id obtained from a previous call to BufferObj::getId.

See BufferObj::getId and rtContextGetBufferFromId.

#### 6.9.2.45 Context optix::ContextObj::getContext ( ) const [inline], [virtual]

Retrieve the Context object associated with this APIObject.

In this case, simply returns itself.

Implements optix::APIObj.

#### 6.9.2.46 int optix::ContextObj::getCPUNumThreads ( ) const [inline]

See rtContextGetAttribute.

#### 6.9.2.47 void optix::ContextObj::getDeviceAttribute ( int *ordinal*, RTdeviceattribute *attrib*, RTsize *size*, void * *p* ) [inline], [static]

Call rtDeviceGetAttribute and return the desired attribute value.

#### 6.9.2.48 unsigned int optix::ContextObj::getDeviceCount ( ) [inline], [static]

Call rtDeviceGetDeviceCount and returns number of valid devices.

#### 6.9.2.49 std::string optix::ContextObj::getDeviceName ( int *ordinal* ) [inline], [static]

Call rtDeviceGetAttribute and return the name of the device.

#### 6.9.2.50 unsigned int optix::ContextObj::getEnabledDeviceCount ( ) const [inline]

See rtContextGetDeviceCount.

As opposed to getDeviceCount, this returns only the number of enabled devices.

#### 6.9.2.51 std::vector< int > optix::ContextObj::getEnabledDevices ( ) const [inline]

See rtContextGetDevices. This returns the list of currently enabled devices.

#### 6.9.2.52 unsigned int optix::ContextObj::getEntryPointCount ( ) const [inline]

See rtContextGetEntryPointCount.

#### 6.9.2.53 std::string optix::ContextObj::getErrorString ( RTresult *code* ) const [inline]

See rtContextGetErrorString.

#### 6.9.2.54 bool optix::ContextObj::getExceptionEnabled ( RTexception *exception* ) const [inline]

See rtContextGetExceptionEnabled.

#### 6.9.2.55 Program optix::ContextObj::getExceptionProgram ( unsigned int *entry_point_index* ) const [inline]

See rtContextGetExceptionProgram.

#### 6.9.2.56 int optix::ContextObj::getGPUPagingActive ( ) const [inline]

**Deprecated in OptiX 4.0** See rtContextGetAttribute

#### 6.9.2.57 int optix::ContextObj::getGPUPagingForcedOff ( ) const [inline]

**Deprecated in OptiX 4.0** See rtContextGetAttribute

#### 6.9.2.58 int optix::ContextObj::getMaxTextureCount ( ) const [inline]

See rtContextGetAttribute

#### 6.9.2.59 Program optix::ContextObj::getMissProgram ( unsigned int *ray_type_index* ) const [inline]

See rtContextGetMissProgram.

#### 6.9.2.60 RTsize optix::ContextObj::getPrintBufferSize ( ) const [inline]

See rtContextGetPrintBufferSize.

#### 6.9.2.61 bool optix::ContextObj::getPrintEnabled ( ) const [inline]

See rtContextGetPrintEnabled.

#### 6.9.2.62 optix::int3 optix::ContextObj::getPrintLaunchIndex ( ) const [inline]

See rtContextGetPrintLaunchIndex.

#### 6.9.2.63 Program optix::ContextObj::getProgramFromId ( int *program_id* ) [inline]

Queries the Program object from a given program id obtained from a previous call to ProgramObj::getId.
See ProgramObj::getId and rtContextGetProgramFromId.

#### 6.9.2.64 Program optix::ContextObj::getRayGenerationProgram ( unsigned int *entry_point_index* ) const [inline]

See rtContextGetRayGenerationProgram.

#### 6.9.2.65 unsigned int optix::ContextObj::getRayTypeCount ( ) const [inline]

See rtContextGetRayTypeCount.

#### 6.9.2.66 int optix::ContextObj::getRunningState ( ) const [inline]

See rtContextGetRunningState.

#### 6.9.2.67 RTsize optix::ContextObj::getStackSize ( ) const [inline]

See rtContextGetStackSize.

#### 6.9.2.68 TextureSampler optix::ContextObj::getTextureSamplerFromId ( int *sampler_id* ) [inline]

Queries the TextureSampler object from a given sampler id obtained from a previous call to TextureSamplerObj::getId.

See TextureSamplerObj::getId and rtContextGetTextureSamplerFromId.

#### 6.9.2.69 RTsize optix::ContextObj::getUsedHostMemory ( ) const [inline]

See rtContextGetAttribute.

#### 6.9.2.70 Variable optix::ContextObj::getVariable ( unsigned int *index* ) const [inline], [virtual]

Query variable by index. See rt[ObjectType]GetVariable.

Implements optix::ScopedObj.

#### 6.9.2.71 unsigned int optix::ContextObj::getVariableCount ( ) const [inline], [virtual]

Query the number of variables associated with this object.

Used along with ScopedObj::getVariable to iterate over variables in an object. See rt[ObjectType]GetVariableCount

Implements optix::ScopedObj.

#### 6.9.2.72 void optix::ContextObj::launch ( unsigned int *entry_point_index,* RTsize *image_width* ) [inline]

See rtContextLaunch

#### 6.9.2.73 void optix::ContextObj::launch ( unsigned int *entry_point_index,* RTsize *image_width,* RTsize *image_height* ) [inline]

See rtContextLaunch.

#### 6.9.2.74 void optix::ContextObj::launch ( unsigned int *entry_point_index,* RTsize *image_width,* RTsize *image_height,* RTsize *image_depth* ) [inline]

See rtContextLaunch.

#### 6.9.2.75 void optix::ContextObj::launchProgressive ( unsigned int *entry_point_index,* RTsize *image_width,* RTsize *image_height,* unsigned int *max_subframes* ) [inline]

See rtContextLaunchProgressive

#### 6.9.2.76 Exception optix::APIObj::makeException ( RTresult *code,* RTcontext *context* ) [inline], [static], [inherited]

For backwards compatability. Use Exception::makeException instead.

#### 6.9.2.77 Variable optix::ContextObj::queryVariable ( const std::string & *name* ) const [inline], [virtual]

Query a variable associated with this object by name.

See rt[ObjectType]QueryVariable. Note that this function is wrapped by the convenience function Handle::operator[].

Implements optix::ScopedObj.

#### 6.9.2.78 int optix::APIObj::removeReference ( ) [inline], [inherited]

Decrement the reference count for this object.

#### 6.9.2.79 void optix::ContextObj::removeVariable ( Variable *v* ) [inline], [virtual]

Remove a variable associated with this object.

Implements optix::ScopedObj.

#### 6.9.2.80 template<class T > void optix::ContextObj::setAttribute ( RTcontextattribute *attribute,* const T & *val* ) [inline]

See rtContextSetAttribute.

#### 6.9.2.81 void optix::ContextObj::setCPUNumThreads ( int *cpu_num_threads* ) [inline]

See rtContextSetAttribute

#### 6.9.2.82 template<class Iterator > void optix::ContextObj::setDevices ( Iterator *begin,* Iterator *end* ) [inline]

See rtContextSetDevices

#### 6.9.2.83 void optix::ContextObj::setEntryPointCount ( unsigned int *num_entry_points* ) [inline]

See rtContextSetEntryPointCount.

#### 6.9.2.84 void optix::ContextObj::setExceptionEnabled ( RTexception *exception,* bool *enabled* ) [inline]

See rtContextSetExceptionEnabled.

#### 6.9.2.85 void optix::ContextObj::setExceptionProgram ( unsigned int *entry_point_index,* Program *program* ) [inline]

See rtContextSetExceptionProgram.

#### 6.9.2.86 void optix::ContextObj::setGPUPagingForcedOff ( int *gpu_paging_forced_off* ) [inline]

**Deprecated in OptiX 4.0** See rtContextSetAttribute

#### 6.9.2.87 void optix::ContextObj::setMissProgram ( unsigned int *ray_type_index,* Program *program* ) [inline]

See rtContextSetMissProgram.

#### 6.9.2.88 void optix::ContextObj::setPrintBufferSize ( RTsize *buffer_size_bytes* ) [inline]

See rtContextSetPrintBufferSize.

#### 6.9.2.89 void optix::ContextObj::setPrintEnabled ( bool *enabled* ) [inline]

See rtContextSetPrintEnabled

#### 6.9.2.90 void optix::ContextObj::setPrintLaunchIndex ( int *x,* int *y = -1,* int *z = -1* ) [inline]

See rtContextSetPrintLaunchIndex.

#### 6.9.2.91 void optix::ContextObj::setRayGenerationProgram ( unsigned int *entry_point_index,* Program *program* ) [inline]

See rtContextSetRayGenerationProgram

#### 6.9.2.92 void optix::ContextObj::setRayTypeCount ( unsigned int *num_ray_types* ) [inline]

See rtContextSetRayTypeCount.

#### 6.9.2.93 void optix::ContextObj::setRemoteDevice ( RemoteDevice *remote_device* ) [inline]

See rtContextSetRemoteDevice.

#### 6.9.2.94 void optix::ContextObj::setStackSize ( RTsize *stack_size_bytes* ) [inline]

See rtContextSetStackSize

#### 6.9.2.95 void optix::ContextObj::setTimeoutCallback ( RTtimeoutcallback *callback,* double *min_polling_seconds* ) [inline]

See rtContextSetTimeoutCallback RTtimeoutcallback is defined as typedef int (∗RTtimeoutcallback)(void).

#### 6.9.2.96 void optix::ContextObj::setUsageReportCallback ( RTusagereportcallback *callback,* int *verbosity,* void ∗ *cbdata* ) [inline]

See rtContextSetUsageReportCallback RTusagereportcallback is defined as typedef void (*RTusagereportcallback)(int, const char*, const char∗, void∗).

#### 6.9.2.97 void optix::ContextObj::stopProgressive ( ) [inline]

See rtContextStopProgressive.

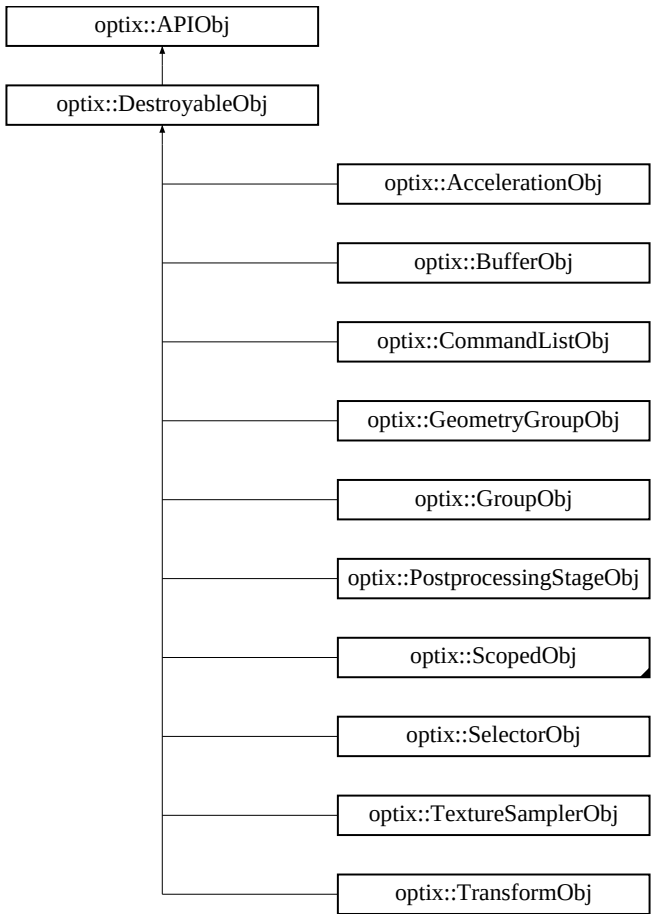
#### 6.9.2.98 void optix::ContextObj::validate ( ) [inline], [virtual]

See rtContextValidate.

Implements optix::DestroyableObj.

## 6.10 optix::DestroyableObj Class Reference

Inheritance diagram for optix::DestroyableObj:



### Public Member Functions

- virtual void destroy ()=0
- virtual void validate ()=0
- void addReference ()
- int removeReference ()
- virtual Context getContext () const =0
- virtual void checkError (RTresult code) const

### Static Public Member Functions

- static Exception makeException (RTresult code, RTcontext context)

## 6.10.1 Detailed Description

Base class for all wrapper objects which can be destroyed and validated.

Wraps:

- RTcontext
- RTgeometry
- RTgeometryinstance
- RTgeometrygroup
- RTgroup
- RTmaterial
- RTprogram
- RTselector
- RTtexturesampler
- RTtransform

## 6.10.2 Member Function Documentation

### 6.10.2.1 void optix::APIObj::addReference ( ) [inline], [inherited]

Increment the reference count for this object.

### 6.10.2.2 void optix::APIObj::checkError ( RTresult *code* ) const [inline], [virtual], [inherited]

Check the given result code and throw an error with appropriate message if the code is not RTsuccess.

Reimplemented in optix::ContextObj.

### 6.10.2.3 virtual void optix::DestroyableObj::destroy ( ) [pure virtual]

call rt[ObjectType]Destroy on the underlying OptiX C object

Implemented in optix::CommandListObj, optix::PostprocessingStageObj, optix::BufferObj, optix::TextureSamplerObj, optix::MaterialObj, optix::GeometryObj, optix::GeometryInstanceObj, optix::AccelerationObj, optix::SelectorObj, optix::TransformObj, optix::GeometryGroupObj, optix::GroupObj, optix::ProgramObj, and optix::ContextObj.

#### 6.10.2.4 virtual Context optix::APIObj::getContext ( ) const [pure virtual], [inherited]

Retrieve the context this object is associated with. See rt[ObjectType]GetContext.

Implemented in optix::CommandListObj, optix::PostprocessingStageObj, optix::BufferObj, optix::TextureSamplerObj, optix::MaterialObj, optix::GeometryObj, optix::GeometryInstanceObj, optix::AccelerationObj, optix::SelectorObj, optix::TransformObj, optix::GeometryGroupObj, optix::GroupObj, optix::ProgramObj, optix::ContextObj, and optix::VariableObj.

#### 6.10.2.5 Exception optix::APIObj::makeException ( RTresult *code*, RTcontext *context* ) [inline], [static], [inherited]

For backwards compatability. Use Exception::makeException instead.

#### 6.10.2.6 int optix::APIObj::removeReference ( ) [inline], [inherited]

Decrement the reference count for this object.

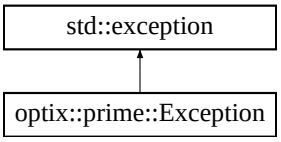
#### 6.10.2.7 virtual void optix::DestroyableObj::validate ( ) [pure virtual]

call rt[ObjectType]Validate on the underlying OptiX C object

Implemented in optix::CommandListObj, optix::PostprocessingStageObj, optix::BufferObj, optix::TextureSamplerObj, optix::MaterialObj, optix::GeometryObj, optix::GeometryInstanceObj, optix::AccelerationObj, optix::SelectorObj, optix::TransformObj, optix::GeometryGroupObj, optix::GroupObj, optix::ProgramObj, and optix::ContextObj.

## 6.11 optix::prime::Exception Class Reference

Inheritance diagram for optix::prime::Exception:




### Public Member Functions

- RTPresult getErrorCode () const
- const **std::string** & getErrorString () const

### Static Public Member Functions

- static Exception makeException (RTPresult code)
- static Exception makeException (RTPresult code, RTPcontext context)

### 6.11.1 Detailed Description

Encapsulates an OptiX Prime exception.

### 6.11.2 Member Function Documentation

#### 6.11.2.1 RTPresult optix::prime::Exception::getErrorCode ( ) const [inline]

Stores the RTPresult error code for this exception.

#### 6.11.2.2 const std::string & optix::prime::Exception::getErrorString ( ) const [inline]

Stores the human-readable error string associated with this exception.

#### 6.11.2.3 Exception optix::prime::Exception::makeException ( RTPresult *code* ) [inline], [static]

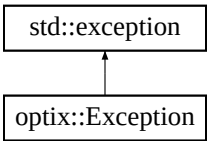
Returns a string describing last error encountered. See rtpGetErrorString.

#### 6.11.2.4 Exception optix::prime::Exception::makeException ( RTPresult *code,* RTPcontext *context* ) [inline], [static]

Returns a string describing last error encountered. See rtpContextGetLastErrorString.

## 6.12 optix::Exception Class Reference

Inheritance diagram for optix::Exception:




#### Public Member Functions

- Exception (const **std::string** &message, RTresult error_code=RT_ERROR_UNKNOWN)
- virtual ~Exception () throw ()
- const **std::string** & getErrorString () const
- RTresult getErrorCode () const
- virtual const char * what () const throw ()

#### Static Public Member Functions

- static Exception makeException (RTresult code, RTcontext context)

### 6.12.1 Detailed Description

Exception class for error reporting from the OptiXpp API.

Encapsulates an error message, often the direct result of a failed OptiX C API function call and subsequent rtContextGetErrorString call.

### 6.12.2 Constructor & Destructor Documentation

#### 6.12.2.1 optix::Exception::Exception ( const std::string & *message,* RTresult *error_code =* RT_ERROR_UNKNOWN ) [inline]

Create exception.

#### 6.12.2.2 virtual optix::Exception::~Exception ( ) throw ) [inline], [virtual]

Virtual destructor (needed for virtual function calls inherited from **std::exception**).

### 6.12.3 Member Function Documentation

#### 6.12.3.1 RTresult optix::Exception::getErrorCode ( ) const [inline]

Retrieve the error code.

#### 6.12.3.2 const std::string& optix::Exception::getErrorString ( ) const [inline]

Retrieve the error message.

#### 6.12.3.3 Exception optix::Exception::makeException ( RTresult *code,* RTcontext *context* ) [inline], [static]

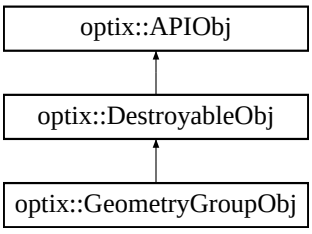
Helper for creating exceptions from an RTresult code origination from an OptiX C API function call.

#### 6.12.3.4 virtual const char* optix::Exception::what ( ) const throw ) [inline], [virtual]

From **std::exception**.

## 6.13 optix::GeometryGroupObj Class Reference

Inheritance diagram for optix::GeometryGroupObj:




**Public Member Functions**

- void destroy ()
- void validate ()
- Context getContext () const
- RTgeometrygroup get ()
- void addReference ()
- int removeReference ()

- virtual void checkError (RTresult code) const

- void setAcceleration (Acceleration acceleration)
- Acceleration getAcceleration () const

- void setChildCount (unsigned int count)
- unsigned int getChildCount () const
- void setChild (unsigned int index, GeometryInstance geometryinstance)
- GeometryInstance getChild (unsigned int index) const
- unsigned int addChild (GeometryInstance child)
- unsigned int removeChild (GeometryInstance child)
- void removeChild (int index)
- void removeChild (unsigned int index)
- unsigned int getChildIndex (GeometryInstance child) const

**Static Public Member Functions**

- static Exception makeException (RTresult code, RTcontext context)

### 6.13.1 Detailed Description

GeometryGroup wraps the OptiX C API RTgeometrygroup opaque type and its associated function set.

### 6.13.2 Member Function Documentation

#### 6.13.2.1 unsigned int optix::GeometryGroupObj::addChild ( GeometryInstance *child* ) [inline]

Set a new child in this group and return its new index. See rtGeometryGroupSetChild.

#### 6.13.2.2 void optix::APIObj::addReference ( ) [inline], [inherited]

Increment the reference count for this object.

#### 6.13.2.3 void optix::APIObj::checkError ( RTresult *code* ) const [inline], [virtual], [inherited]

Check the given result code and throw an error with appropriate message if the code is not RTsuccess.
Reimplemented in optix::ContextObj.

#### 6.13.2.4 void optix::GeometryGroupObj::destroy ( ) [inline], [virtual]

call rt[ObjectType]Destroy on the underlying OptiX C object
Implements optix::DestroyableObj.

#### 6.13.2.5 RTgeometrygroup optix::GeometryGroupObj::get ( ) [inline]

Get the underlying OptiX C API RTgeometrygroup opaque pointer.

#### 6.13.2.6 Acceleration optix::GeometryGroupObj::getAcceleration ( ) const [inline]

Query the Acceleration structure for this group. See rtGeometryGroupGetAcceleration.

#### 6.13.2.7 GeometryInstance optix::GeometryGroupObj::getChild ( unsigned int *index* ) const [inline]

Query an indexed GeometryInstance within this group. See rtGeometryGroupGetChild.

#### 6.13.2.8 unsigned int optix::GeometryGroupObj::getChildCount ( ) const [inline]

Query the number of children for this group. See rtGeometryGroupGetChildCount.

#### 6.13.2.9 unsigned int optix::GeometryGroupObj::getChildIndex ( GeometryInstance *child* ) const [inline]

Query a child in this group for its index. See rtGeometryGroupGetChild.

#### 6.13.2.10 Context optix::GeometryGroupObj::getContext ( ) const [inline], [virtual]

Retrieve the context this object is associated with. See rt[ObjectType]GetContext.

Implements optix::APIObj.

#### 6.13.2.11 Exception optix::APIObj::makeException ( RTresult *code,* RTcontext *context* ) [inline], [static], [inherited]

For backwards compatability. Use Exception::makeException instead.

#### 6.13.2.12 unsigned int optix::GeometryGroupObj::removeChild ( GeometryInstance *child* ) [inline]

Remove a child in this group.

Note: this function is not order-preserving. Returns the position of the removed element if succeeded. Throws RT_ERROR_INVALID_VALUE if the parameter is invalid.

#### 6.13.2.13 void optix::GeometryGroupObj::removeChild ( int *index* ) [inline]

Remove a child in this group.

Note: this function is not order-preserving. Throws RT_ERROR_INVALID_VALUE if the parameter is invalid.

#### 6.13.2.14 void optix::GeometryGroupObj::removeChild ( unsigned int *index* ) [inline]

Remove a child in this group.

Note: this function is not order-preserving. Throws RT_ERROR_INVALID_VALUE if the parameter is invalid.

#### 6.13.2.15 int optix::APIObj::removeReference ( ) [inline], [inherited]

Decrement the reference count for this object.

#### 6.13.2.16 void optix::GeometryGroupObj::setAcceleration ( Acceleration *acceleration* ) [inline]

Set the Acceleration structure for this group. See rtGeometryGroupSetAcceleration.

#### 6.13.2.17 void optix::GeometryGroupObj::setChild ( unsigned int *index,* GeometryInstance *geometryinstance* ) [inline]

Set an indexed GeometryInstance child of this group. See rtGeometryGroupSetChild.

#### 6.13.2.18 void optix::GeometryGroupObj::setChildCount ( unsigned int *count* ) [inline]

Set the number of children for this group. See rtGeometryGroupSetChildCount.

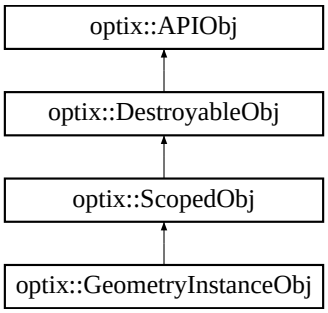
#### 6.13.2.19 void optix::GeometryGroupObj::validate ( ) [inline], [virtual]

call rt[ObjectType]Validate on the underlying OptiX C object

Implements optix::DestroyableObj.

## 6.14 optix::GeometryInstanceObj Class Reference

Inheritance diagram for optix::GeometryInstanceObj:




### Public Member Functions

- void destroy ()
- void validate ()
- Context getContext () const
- RTgeometryinstance get ()
- void addReference ()
- int removeReference ()
- virtual void checkError (RTresult code) const

- void setGeometry (Geometry geometry)
- Geometry getGeometry () const
- void setMaterialCount (unsigned int count)
- unsigned int getMaterialCount () const
- void setMaterial (unsigned int idx, Material material)
- Material getMaterial (unsigned int idx) const

- unsigned int addMaterial (Material material)

- Variable declareVariable (const **std::string** &name)
- Variable queryVariable (const **std::string** &name) const
- void removeVariable (Variable v)
- unsigned int getVariableCount () const
- Variable getVariable (unsigned int index) const

### Static Public Member Functions

- static Exception makeException (RTresult code, RTcontext context)

## 6.14.1 Detailed Description

GeometryInstance wraps the OptiX C API RTgeometryinstance acceleration opaque type and its associated function set.

## 6.14.2 Member Function Documentation

### 6.14.2.1 unsigned int optix::GeometryInstanceObj::addMaterial ( Material *material* ) [inline]

Adds the provided material and returns the index to newly added material; increases material count by one.

### 6.14.2.2 void optix::APIObj::addReference ( ) [inline], [inherited]

Increment the reference count for this object.

### 6.14.2.3 void optix::APIObj::checkError ( RTresult *code* ) const [inline], [virtual], [inherited]

Check the given result code and throw an error with appropriate message if the code is not RTsuccess.

Reimplemented in optix::ContextObj.

### 6.14.2.4 Variable optix::GeometryInstanceObj::declareVariable ( const std::string & *name* ) [inline], [virtual]

Declare a variable associated with this object.

See rt[ObjectType]DeclareVariable. Note that this function is wrapped by the convenience function Handle::operator[].

Implements optix::ScopedObj.

### 6.14.2.5 void optix::GeometryInstanceObj::destroy ( ) [inline], [virtual]

call rt[ObjectType]Destroy on the underlying OptiX C object

Implements optix::DestroyableObj.

#### 6.14.2.6 RTgeometryinstance optix::GeometryInstanceObj::get ( ) [inline]

Get the underlying OptiX C API RTgeometryinstance opaque pointer.

#### 6.14.2.7 Context optix::GeometryInstanceObj::getContext ( ) const [inline], [virtual]

Retrieve the context this object is associated with. See rt[ObjectType]GetContext.

Implements optix::APIObj.

#### 6.14.2.8 Geometry optix::GeometryInstanceObj::getGeometry ( ) const [inline]

Get the geometry object associated with this instance. See rtGeometryInstanceGetGeometry.

#### 6.14.2.9 Material optix::GeometryInstanceObj::getMaterial ( unsigned int *idx* ) const [inline]

Get the material at given index. See rtGeometryInstanceGetMaterial.

#### 6.14.2.10 unsigned int optix::GeometryInstanceObj::getMaterialCount ( ) const [inline]

Query the number of materials associated with this instance. See rtGeometryInstanceGetMaterialCount.

#### 6.14.2.11 Variable optix::GeometryInstanceObj::getVariable ( unsigned int *index* ) const [inline], [virtual]

Query variable by index. See rt[ObjectType]GetVariable.

Implements optix::ScopedObj.

#### 6.14.2.12 unsigned int optix::GeometryInstanceObj::getVariableCount ( ) const [inline], [virtual]

Query the number of variables associated with this object.

Used along with ScopedObj::getVariable to iterate over variables in an object. See rt[ObjectType]GetVariableCount

Implements optix::ScopedObj.

#### 6.14.2.13 Exception optix::APIObj::makeException ( RTresult *code*, RTcontext *context* ) [inline], [static], [inherited]

For backwards compatability. Use Exception::makeException instead.

#### 6.14.2.14 Variable optix::GeometryInstanceObj::queryVariable ( const std::string & *name* ) const [inline], [virtual]

Query a variable associated with this object by name.

See rt[ObjectType]QueryVariable. Note that this function is wrapped by the convenience function Handle::operator[].

Implements optix::ScopedObj.

#### 6.14.2.15 int optix::APIObj::removeReference ( ) [inline], [inherited]

Decrement the reference count for this object.

#### 6.14.2.16 void optix::GeometryInstanceObj::removeVariable ( Variable *v* ) [inline], [virtual]

Remove a variable associated with this object.
Implements optix::ScopedObj.

#### 6.14.2.17 void optix::GeometryInstanceObj::setGeometry ( Geometry *geometry* ) [inline]

Set the geometry object associated with this instance. See rtGeometryInstanceSetGeometry.

#### 6.14.2.18 void optix::GeometryInstanceObj::setMaterial ( unsigned int *idx,* Material *material* ) [inline]

Set the material at given index. See rtGeometryInstanceSetMaterial.

#### 6.14.2.19 void optix::GeometryInstanceObj::setMaterialCount ( unsigned int *count* ) [inline]

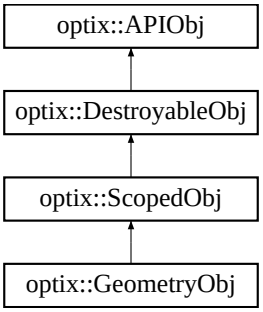
Set the number of materials associated with this instance. See rtGeometryInstanceSetMaterialCount.

#### 6.14.2.20 void optix::GeometryInstanceObj::validate ( ) [inline], [virtual]

call rt[ObjectType]Validate on the underlying OptiX C object
Implements optix::DestroyableObj.

## 6.15 optix::GeometryObj Class Reference

Inheritance diagram for optix::GeometryObj:




### Public Member Functions

- void destroy ()
- void validate ()
- Context getContext () const
- RTgeometry get ()
- void addReference ()

- int removeReference ()
- virtual void checkError (RTresult code) const

- void markDirty ()
- bool isDirty () const

- void setPrimitiveCount (unsigned int num_primitives)
- unsigned int getPrimitiveCount () const

- void setPrimitiveIndexOffset (unsigned int index_offset)
- unsigned int getPrimitiveIndexOffset () const

- void setMotionRange (float timeBegin, float timeEnd)
- void getMotionRange (float &timeBegin, float &timeEnd)
- void setMotionBorderMode (RTmotionbordermode beginMode, RTmotionbordermode endMode)
- void getMotionBorderMode (RTmotionbordermode &beginMode, RTmotionbordermode &endMode)
- void setMotionSteps (unsigned int n)
- unsigned int getMotionSteps ()

- void setBoundingBoxProgram (Program program)
- Program getBoundingBoxProgram () const
- void setIntersectionProgram (Program program)
- Program getIntersectionProgram () const

- Variable declareVariable (const **std::string** &name)
- Variable queryVariable (const **std::string** &name) const
- void removeVariable (Variable v)
- unsigned int getVariableCount () const
- Variable getVariable (unsigned int index) const

### Static Public Member Functions

- static Exception makeException (RTresult code, RTcontext context)

## 6.15.1 Detailed Description

Geometry wraps the OptiX C API RTgeometry opaque type and its associated function set.

## 6.15.2 Member Function Documentation

### 6.15.2.1 void optix::APIObj::addReference ( ) [inline], [inherited]

Increment the reference count for this object.

### 6.15.2.2 void optix::APIObj::checkError ( RTresult *code* ) const [inline], [virtual], [inherited]

Check the given result code and throw an error with appropriate message if the code is not RTsuccess.

Reimplemented in optix::ContextObj.

#### 6.15.2.3 Variable optix::GeometryObj::declareVariable ( const std::string & *name* ) [inline], [virtual]

Declare a variable associated with this object.

See rt[ObjectType]DeclareVariable. Note that this function is wrapped by the convenience function Handle::operator[].

Implements optix::ScopedObj.

#### 6.15.2.4 void optix::GeometryObj::destroy ( ) [inline], [virtual]

call rt[ObjectType]Destroy on the underlying OptiX C object

Implements optix::DestroyableObj.

#### 6.15.2.5 RTgeometry optix::GeometryObj::get ( ) [inline]

Get the underlying OptiX C API RTgeometry opaque pointer.

#### 6.15.2.6 Program optix::GeometryObj::getBoundingBoxProgram ( ) const [inline]

Get the bounding box program for this geometry. See rtGeometryGetBoundingBoxProgram.

#### 6.15.2.7 Context optix::GeometryObj::getContext ( ) const [inline], [virtual]

Retrieve the context this object is associated with. See rt[ObjectType]GetContext.

Implements optix::APIObj.

#### 6.15.2.8 Program optix::GeometryObj::getIntersectionProgram ( ) const [inline]

Get the intersection program for this geometry. See rtGeometryGetIntersectionProgram.

#### 6.15.2.9 void optix::GeometryObj::getMotionBorderMode ( RTmotionbordermode & *beginMode,* RTmotionbordermode & *endMode* ) [inline]

Query the motion border mode for this geometry object.

See rtGeometryGetMotionBorderMode

#### 6.15.2.10 void optix::GeometryObj::getMotionRange ( float & *timeBegin,* float & *timeEnd* ) [inline]

Query the motion time range for this geometry object.

See rtGeometryGetMotionRange

#### 6.15.2.11 unsigned int optix::GeometryObj::getMotionSteps ( ) [inline]

Query the number of motion steps for this geometry object.

See rtGeometryGetMotionSteps

#### 6.15.2.12 unsigned int optix::GeometryObj::getPrimitiveCount ( ) const [inline]

Query the number of primitives in this geometry object (eg, number of triangles in mesh).

See rtGeometryGetPrimitiveCount

#### 6.15.2.13 unsigned int optix::GeometryObj::getPrimitiveIndexOffset ( ) const [inline]

Query the primitive index offset for this geometry object.

See rtGeometryGetPrimitiveIndexOffset

#### 6.15.2.14 Variable optix::GeometryObj::getVariable ( unsigned int *index* ) const [inline], [virtual]

Query variable by index. See rt[ObjectType]GetVariable.

Implements optix::ScopedObj.

#### 6.15.2.15 unsigned int optix::GeometryObj::getVariableCount ( ) const [inline], [virtual]

Query the number of variables associated with this object.

Used along with ScopedObj::getVariable to iterate over variables in an object. See rt[ObjectType]GetVariableCount

Implements optix::ScopedObj.

#### 6.15.2.16 bool optix::GeometryObj::isDirty ( ) const [inline]

**Deprecated in OptiX 4.0** See rtGeometryIsDirty.

#### 6.15.2.17 Exception optix::APIObj::makeException ( RTresult *code,* RTcontext *context* ) [inline], [static], [inherited]

For backwards compatability. Use Exception::makeException instead.

#### 6.15.2.18 void optix::GeometryObj::markDirty ( ) [inline]

**Deprecated in OptiX 4.0** See rtGeometryMarkDirty.

#### 6.15.2.19 Variable optix::GeometryObj::queryVariable ( const std::string & *name* ) const [inline], [virtual]

Query a variable associated with this object by name.

See rt[ObjectType]QueryVariable. Note that this function is wrapped by the convenience function Handle::operator[].

Implements optix::ScopedObj.

#### 6.15.2.20 int optix::APIObj::removeReference ( ) [inline], [inherited]

Decrement the reference count for this object.

#### 6.15.2.21 void optix::GeometryObj::removeVariable ( Variable *v* ) [inline], [virtual]

Remove a variable associated with this object.

Implements optix::ScopedObj.

#### 6.15.2.22 void optix::GeometryObj::setBoundingBoxProgram ( Program *program* ) [inline]

Set the bounding box program for this geometry. See rtGeometrySetBoundingBoxProgram.

#### 6.15.2.23 void optix::GeometryObj::setIntersectionProgram ( Program *program* ) [inline]

Set the intersection program for this geometry. See rtGeometrySetIntersectionProgram.

#### 6.15.2.24 void optix::GeometryObj::setMotionBorderMode ( RTmotionbordermode *beginMode*, RTmotionbordermode *endMode* ) [inline]

Set motion border mode for this geometry object.
See rtGeometrySetMotionBorderMode

#### 6.15.2.25 void optix::GeometryObj::setMotionRange ( float *timeBegin*, float *timeEnd* ) [inline]

Set motion time range for this geometry object. See rtGeometrySetMotionRange

#### 6.15.2.26 void optix::GeometryObj::setMotionSteps ( unsigned int *n* ) [inline]

Set the number of motion steps for this geometry object.
See rtGeometrySetMotionSteps

#### 6.15.2.27 void optix::GeometryObj::setPrimitiveCount ( unsigned int *num_primitives* ) [inline]

Set the number of primitives in this geometry object (eg, number of triangles in mesh). See rtGeometrySetPrimitiveCount

#### 6.15.2.28 void optix::GeometryObj::setPrimitiveIndexOffset ( unsigned int *index_offset* ) [inline]

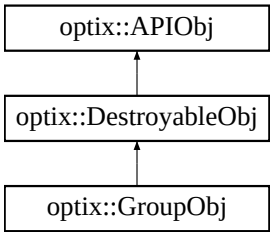
Set the primitive index offset for this geometry object. See rtGeometrySetPrimitiveIndexOffset

#### 6.15.2.29 void optix::GeometryObj::validate ( ) [inline], [virtual]

call rt[ObjectType]Validate on the underlying OptiX C object
Implements optix::DestroyableObj.

## 6.16 optix::GroupObj Class Reference

Inheritance diagram for optix::GroupObj:



### Public Member Functions

- void destroy ()
- void validate ()
- Context getContext () const
- RTgroup get ()
- void addReference ()
- int removeReference ()
- virtual void checkError (RTresult code) const

- void setAcceleration (Acceleration acceleration)
- Acceleration getAcceleration () const

- void setChildCount (unsigned int count)
- unsigned int getChildCount () const
- template<typename T >
  void setChild (unsigned int index, T child)
- template<typename T >
  T getChild (unsigned int index) const
- RTobjecttype getChildType (unsigned int index) const
- template<typename T >
  unsigned int addChild (T child)
- template<typename T >
  unsigned int removeChild (T child)
- void removeChild (int index)
- void removeChild (unsigned int index)
- template<typename T >
  unsigned int getChildIndex (T child) const

### Static Public Member Functions

- static Exception makeException (RTresult code, RTcontext context)

## 6.16.1 Detailed Description

Group wraps the OptiX C API RTgroup opaque type and its associated function set.

## 6.16.2 Member Function Documentation

### 6.16.2.1 template<typename T > unsigned int optix::GroupObj::addChild ( T *child* ) [inline]

Set a new child in this group and returns its new index. See rtGroupSetChild.

### 6.16.2.2 void optix::APIObj::addReference ( ) [inline], [inherited]

Increment the reference count for this object.

#### 6.16.2.3 void optix::APIObj::checkError ( RTresult *code* ) const [inline], [virtual], [inherited]

Check the given result code and throw an error with appropriate message if the code is not RTsuccess.
Reimplemented in optix::ContextObj.

#### 6.16.2.4 void optix::GroupObj::destroy ( ) [inline], [virtual]

call rt[ObjectType]Destroy on the underlying OptiX C object
Implements optix::DestroyableObj.

#### 6.16.2.5 RTgroup optix::GroupObj::get ( ) [inline]

Get the underlying OptiX C API RTgroup opaque pointer.

#### 6.16.2.6 Acceleration optix::GroupObj::getAcceleration ( ) const [inline]

Query the Acceleration structure for this group. See rtGroupGetAcceleration.

#### 6.16.2.7 template<typename T > T optix::GroupObj::getChild ( unsigned int *index* ) const [inline]

Query an indexed child within this group. See rtGroupGetChild.

#### 6.16.2.8 unsigned int optix::GroupObj::getChildCount ( ) const [inline]

Query the number of children for this group. See rtGroupGetChildCount.

#### 6.16.2.9 template<typename T > unsigned int optix::GroupObj::getChildIndex ( T *child* ) const [inline]

Query a child in this group for its index. See rtGroupGetChild.

#### 6.16.2.10 RTobjecttype optix::GroupObj::getChildType ( unsigned int *index* ) const [inline]

Query indexed child's type. See rtGroupGetChildType.

#### 6.16.2.11 Context optix::GroupObj::getContext ( ) const [inline], [virtual]

Retrieve the context this object is associated with. See rt[ObjectType]GetContext.
Implements optix::APIObj.

#### 6.16.2.12 Exception optix::APIObj::makeException ( RTresult *code,* RTcontext *context* ) [inline], [static], [inherited]

For backwards compatability. Use Exception::makeException instead.

#### 6.16.2.13 template<typename T > unsigned int optix::GroupObj::removeChild ( T *child* ) [inline]

Remove a child in this group.

Note: this function is not order-preserving. Returns the position of the removed element if succeeded. Throws RT_ERROR_INVALID_VALUE if the parameter is invalid.

#### 6.16.2.14 void optix::GroupObj::removeChild ( int *index* ) [inline]

Remove a child in this group.

Note: this function is not order-preserving. Throws RT_ERROR_INVALID_VALUE if the parameter is invalid.

#### 6.16.2.15 void optix::GroupObj::removeChild ( unsigned int *index* ) [inline]

Remove a child in this group.

Note: this function is not order-preserving. Throws RT_ERROR_INVALID_VALUE if the parameter is invalid.

#### 6.16.2.16 int optix::APIObj::removeReference ( ) [inline], [inherited]

Decrement the reference count for this object.

#### 6.16.2.17 void optix::GroupObj::setAcceleration ( Acceleration *acceleration* ) [inline]

Set the Acceleration structure for this group. See rtGroupSetAcceleration.

#### 6.16.2.18 template<typename T > void optix::GroupObj::setChild ( unsigned int *index*, T *child* ) [inline]

Set an indexed child within this group. See rtGroupSetChild.

#### 6.16.2.19 void optix::GroupObj::setChildCount ( unsigned int *count* ) [inline]

Set the number of children for this group. See rtGroupSetChildCount.

#### 6.16.2.20 void optix::GroupObj::validate ( ) [inline], [virtual]

call rt[ObjectType]Validate on the underlying OptiX C object

Implements optix::DestroyableObj.

## 6.17 optix::Handle< T > Class Template Reference

### Public Member Functions

- Handle ()
- Handle (T *ptr)
- template<class U >
  Handle (U *ptr)
- Handle (const Handle< T > &copy)
- template<class U >
  Handle (const Handle< U > &copy)
- Handle< T > & operator= (const Handle< T > &copy)
- template<class U >
  Handle< T > & operator= (const Handle< U > &copy)
- ~Handle ()

- T * operator-> ()
- T * get ()
- operator bool () const
- Handle< VariableObj > operator[] (const **std::string** &varname)
- Handle< VariableObj > operator[] (const char *varname)

### Static Public Member Functions

- static Handle< T > take (typename T::api_t p)
- static Handle< T > take (RTobject p)
- static Handle< T > create ()
- static Handle< T > create (const **std::string** &a, const **std::string** &b, const **std::string** &c)
- static unsigned int getDeviceCount ()

## 6.17.1 Detailed Description

**template<class T>class optix::Handle< T >**

The Handle class is a reference counted handle class used to manipulate API objects.

All interaction with API objects should be done via these handles and the associated typedefs rather than direct usage of the objects.

## 6.17.2 Constructor & Destructor Documentation

### 6.17.2.1 template<class T> optix::Handle< T >::Handle ( ) [inline]

Default constructor initializes handle to null pointer.

### 6.17.2.2 template<class T> optix::Handle< T >::Handle ( T * *ptr* ) [inline]

Takes a raw pointer to an API object and creates a handle.

### 6.17.2.3 template<class T> template<class U > optix::Handle< T >::Handle ( U * *ptr* ) [inline]

Takes a raw pointer of arbitrary type and creates a handle.

### 6.17.2.4 template<class T> optix::Handle< T >::Handle ( const Handle< T > & *copy* ) [inline]

Takes a handle of the same type and creates a handle.

### 6.17.2.5 template<class T> template<class U > optix::Handle< T >::Handle ( const Handle< U > & *copy* ) [inline]

Takes a handle of some other type and creates a handle.

### 6.17.2.6 template<class T> optix::Handle< T >::~Handle ( ) [inline]

Decrements reference count on the handled object.

### 6.17.3 Member Function Documentation

#### 6.17.3.1 template<class T> static Handle<T> optix::Handle< T >::create ( ) [inline], [static]

Static object creation. Only valid for contexts.

#### 6.17.3.2 template<class T> static Handle<T> optix::Handle< T >::create ( const std::string & *a,* const std::string & *b,* const std::string & *c* ) [inline], [static]

Static RemoteDevice creation. Only valid for remote devices.

#### 6.17.3.3 template<class T> T* optix::Handle< T >::get ( ) [inline]

Retrieve the handled object.

#### 6.17.3.4 template<class T> static unsigned int optix::Handle< T >::getDeviceCount ( ) [inline], [static]

Query the machine device count. Only valid for contexts.

#### 6.17.3.5 template<class T> optix::Handle< T >::operator bool ( ) const [inline]

implicit bool cast based on NULLness of wrapped pointer

#### 6.17.3.6 template<class T> T* optix::Handle< T >::operator-> ( ) [inline]

Dereferences the handle.

#### 6.17.3.7 template<class T> Handle<T>& optix::Handle< T >::operator= ( const Handle< T > & *copy* ) [inline]

Assignment of handle with same underlying object type.

#### 6.17.3.8 template<class T> template<class U > Handle<T>& optix::Handle< T >::operator= ( const Handle< U > & *copy* ) [inline]

Assignment of handle with different underlying object type.

#### 6.17.3.9 ]

template<class T > **Handle**< **VariableObj** > **optix::Handle**< T >::operator[] ( const **std::string** & *varname* )

Variable access operator.

This operator will query the API object for a variable with the given name, creating a new variable instance if necessary. Only valid for ScopedObjs.

#### 6.17.3.10 ]

template<class T > **Handle**< **VariableObj** > **optix::Handle**< T >::operator[] ( const char * *varname* )

Variable access operator.

Identical to operator[](const std::string& varname)

Explicitly define char* version to avoid ambiguities between builtin operator[](int, char*) and Handle::operator[]( std::string ). The problem lies in that a Handle can be cast to a bool then to an int which implies that:

```
Context context;
context["var"];
```

can be interpreted as either

```
1["var"]; // Strange but legal way to index into a string (same as "var"[1] )
```

or

```
context[ std::string("var") ];
```

#### 6.17.3.11 template<class T> static Handle<T> optix::Handle< T >::take ( typename T::api_t *p* ) [inline], [static]

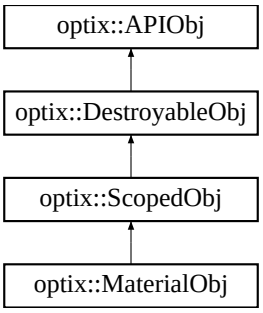
Takes a base optix api opaque type and creates a handle to optixpp wrapper type.

#### 6.17.3.12 template<class T> static Handle<T> optix::Handle< T >::take ( RTobject *p* ) [inline], [static]

Special version that takes an RTobject which must be cast up to the appropriate OptiX API opaque type.

## 6.18 optix::MaterialObj Class Reference

Inheritance diagram for optix::MaterialObj:




### Public Member Functions

- void destroy ()
- void validate ()
- Context getContext () const
- RTmaterial get ()
- void addReference ()
- int removeReference ()
- virtual void checkError (RTresult code) const

- void setClosestHitProgram (unsigned int ray_type_index, Program program)
- Program getClosestHitProgram (unsigned int ray_type_index) const
- void setAnyHitProgram (unsigned int ray_type_index, Program program)
- Program getAnyHitProgram (unsigned int ray_type_index) const

- Variable declareVariable (const **std::string** &name)
- Variable queryVariable (const **std::string** &name) const
- void removeVariable (Variable v)
- unsigned int getVariableCount () const
- Variable getVariable (unsigned int index) const

**Static Public Member Functions**

- static Exception makeException (RTresult code, RTcontext context)

### 6.18.1 Detailed Description

Material wraps the OptiX C API RTmaterial opaque type and its associated function set.

### 6.18.2 Member Function Documentation

#### 6.18.2.1 void optix::APIObj::addReference ( ) [inline], [inherited]

Increment the reference count for this object.

#### 6.18.2.2 void optix::APIObj::checkError ( RTresult *code* ) const [inline], [virtual], [inherited]

Check the given result code and throw an error with appropriate message if the code is not RTsuccess.

Reimplemented in optix::ContextObj.

#### 6.18.2.3 Variable optix::MaterialObj::declareVariable ( const std::string & *name* ) [inline], [virtual]

Declare a variable associated with this object.

See rt[ObjectType]DeclareVariable. Note that this function is wrapped by the convenience function Handle::operator[].

Implements optix::ScopedObj.

#### 6.18.2.4 void optix::MaterialObj::destroy ( ) [inline], [virtual]

call rt[ObjectType]Destroy on the underlying OptiX C object

Implements optix::DestroyableObj.

#### 6.18.2.5 RTmaterial optix::MaterialObj::get ( ) [inline]

Get the underlying OptiX C API RTmaterial opaque pointer.

#### 6.18.2.6 Program optix::MaterialObj::getAnyHitProgram ( unsigned int *ray_type_index* ) const [inline]

Get any hit program for this material at the given *ray_type* index. See rtMaterialGetAnyHitProgram.

#### 6.18.2.7 Program optix::MaterialObj::getClosestHitProgram ( unsigned int *ray_type_index* ) const [inline]

Get closest hit program for this material at the given *ray_type* index. See rtMaterialGetClosestHitProgram.

#### 6.18.2.8 Context optix::MaterialObj::getContext ( ) const [inline], [virtual]

Retrieve the context this object is associated with. See rt[ObjectType]GetContext.

Implements optix::APIObj.

#### 6.18.2.9 Variable optix::MaterialObj::getVariable ( unsigned int *index* ) const [inline], [virtual]

Query variable by index. See rt[ObjectType]GetVariable.

Implements optix::ScopedObj.

#### 6.18.2.10 unsigned int optix::MaterialObj::getVariableCount ( ) const [inline], [virtual]

Query the number of variables associated with this object.

Used along with ScopedObj::getVariable to iterate over variables in an object. See rt[ObjectType]GetVariableCount

Implements optix::ScopedObj.

#### 6.18.2.11 Exception optix::APIObj::makeException ( RTresult *code*, RTcontext *context* ) [inline], [static], [inherited]

For backwards compatability. Use Exception::makeException instead.

#### 6.18.2.12 Variable optix::MaterialObj::queryVariable ( const std::string & *name* ) const [inline], [virtual]

Query a variable associated with this object by name.

See rt[ObjectType]QueryVariable. Note that this function is wrapped by the convenience function Handle::operator[].

Implements optix::ScopedObj.

#### 6.18.2.13 int optix::APIObj::removeReference ( ) [inline], [inherited]

Decrement the reference count for this object.

#### 6.18.2.14 void optix::MaterialObj::removeVariable ( Variable *v* ) [inline], [virtual]

Remove a variable associated with this object.

Implements optix::ScopedObj.

#### 6.18.2.15 void optix::MaterialObj::setAnyHitProgram ( unsigned int *ray_type_index,* Program *program* ) [inline]

Set any hit program for this material at the given *ray_type* index. See rtMaterialSetAnyHitProgram.

#### 6.18.2.16 void optix::MaterialObj::setClosestHitProgram ( unsigned int *ray_type_index,* Program *program* ) [inline]

Set closest hit program for this material at the given *ray_type* index. See rtMaterialSetClosestHitProgram.

#### 6.18.2.17 void optix::MaterialObj::validate ( ) [inline], [virtual]

call rt[ObjectType]Validate on the underlying OptiX C object

Implements optix::DestroyableObj.

## 6.19 optix::Matrix< M, N > Class Template Reference

### Public Types

- typedef VectorDim< M >::VectorType floatM

### Public Member Functions

- RT_HOSTDEVICE Matrix ()
- RT_HOSTDEVICE Matrix (const float data[M *N])
- RT_HOSTDEVICE Matrix (const Matrix &m)
- RT_HOSTDEVICE Matrix & operator= (const Matrix &b)
- RT_HOSTDEVICE float operator[] (unsigned int i) const
- RT_HOSTDEVICE float & operator[] (unsigned int i)
- RT_HOSTDEVICE floatN getRow (unsigned int m) const
- RT_HOSTDEVICE floatM getCol (unsigned int n) const
- RT_HOSTDEVICE float * getData ()
- RT_HOSTDEVICE const float * getData () const
- RT_HOSTDEVICE void setRow (unsigned int m, const floatN &r)
- RT_HOSTDEVICE void setCol (unsigned int n, const floatM &c)
- RT_HOSTDEVICE Matrix< N, M > transpose () const
- RT_HOSTDEVICE Matrix< 4, 4 > inverse () const
- RT_HOSTDEVICE float det () const
- RT_HOSTDEVICE bool operator< (const Matrix< M, N > &rhs) const

### Static Public Member Functions

- static RT_HOSTDEVICE Matrix< 4, 4 > rotate (const float radians, const float3 &axis)
- static RT_HOSTDEVICE Matrix< 4, 4 > translate (const float3 &vec)
- static RT_HOSTDEVICE Matrix< 4, 4 > scale (const float3 &vec)
- static RT_HOSTDEVICE Matrix< 4, 4 > fromBasis (const float3 &u, const float3 &v, const float3 &w, const float3 &c)
- static RT_HOSTDEVICE Matrix< N, N > identity ()

### 6.19.1 Detailed Description

**template<unsigned int M, unsigned int N>class optix::Matrix< M, N >**

A matrix with M rows and N columns.

**Description**

Matrix provides a utility class for small-dimension floating-point matrices, such as transformation matrices. Matrix may also be useful in other computation and can be used in both host and device code. Typedefs are provided for 2x2 through 4x4 matrices.

**History**

Matrix was introduced in OptiX 1.0.

**See also** *rtVariableSetMatrix∗*

### 6.19.2 Member Typedef Documentation

#### 6.19.2.1 template<unsigned int M, unsigned int N> typedef VectorDim<M>::VectorType optix::Matrix< M, N >::floatM

A row of the matrix.

### 6.19.3 Constructor & Destructor Documentation

#### 6.19.3.1 template<unsigned int M, unsigned int N> OPTIXU_INLINE RT_HOSTDEVICE optix::Matrix< M, N >::Matrix ( )

A column of the matrix.

Create an unitialized matrix

#### 6.19.3.2 template<unsigned int M, unsigned int N> RT_HOSTDEVICE optix::Matrix< M, N >::Matrix ( const float *data[M ∗N]* ) `[inline]`, `[explicit]`

Create a matrix from the specified float array.

#### 6.19.3.3 template<unsigned int M, unsigned int N> OPTIXU_INLINE RT_HOSTDEVICE optix::Matrix< M, N >::Matrix ( const Matrix< M, N > & *m* )

Copy the matrix.

### 6.19.4 Member Function Documentation

#### 6.19.4.1 template<unsigned int M, unsigned int N> RT_HOSTDEVICE float optix::Matrix< M, N >::det ( ) const

Returns the determinant of the matrix.

#### 6.19.4.2 template<unsigned int M, unsigned int N> static RT_HOSTDEVICE Matrix<4,4> optix::Matrix< M, N >::fromBasis ( const float3 & *u,* const float3 & *v,* const float3 & *w,* const float3 & *c* ) [static]

Creates a matrix from an ONB and center point.

#### 6.19.4.3 template<unsigned int M, unsigned int N> OPTIXU_INLINE RT_HOSTDEVICE Matrix< M, N >::floatM optix::Matrix< M, N >::getCol ( unsigned int *n* ) const

Access the specified column 0..N.

Returns float, float2, float3 or float4 depending on the matrix size

#### 6.19.4.4 template<unsigned int M, unsigned int N> OPTIXU_INLINE RT_HOSTDEVICE float * optix::Matrix< M, N >::getData ( )

Returns a pointer to the internal data array.

The data array is stored in row-major order.

#### 6.19.4.5 template<unsigned int M, unsigned int N> OPTIXU_INLINE RT_HOSTDEVICE const float * optix::Matrix< M, N >::getData ( ) const

Returns a const pointer to the internal data array.

The data array is stored in row-major order.

#### 6.19.4.6 template<unsigned int M, unsigned int N> OPTIXU_INLINE RT_HOSTDEVICE Matrix< M, N >::floatN optix::Matrix< M, N >::getRow ( unsigned int *m* ) const

Access the specified row 0..M.

Returns float, float2, float3 or float4 depending on the matrix size

#### 6.19.4.7 template<unsigned int M, unsigned int N> OPTIXU_INLINE RT_HOSTDEVICE Matrix< N, N > optix::Matrix< M, N >::identity ( ) [static]

Returns the identity matrix.

#### 6.19.4.8 template<unsigned int M, unsigned int N> RT_HOSTDEVICE Matrix<4,4> optix::Matrix< M, N >::inverse ( ) const

Returns the inverse of the matrix.

#### 6.19.4.9 template<unsigned int M, unsigned int N> OPTIXU_INLINE RT_HOSTDEVICE bool optix::Matrix< M, N >::operator< ( const Matrix< M, N > & *rhs* ) const

Ordered comparison operator so that the matrix can be used in an STL container.

#### 6.19.4.10 template<unsigned int M, unsigned int N> OPTIXU_INLINE RT_HOSTDEVICE Matrix< M, N > & optix::Matrix< M, N >::operator= ( const Matrix< M, N > & *b* )

Assignment operator.

#### 6.19.4.11 ]

template<unsigned int M, unsigned int N> RT_HOSTDEVICE float **optix::Matrix**< M, N >::operator[] ( unsigned int *i* ) const `[inline]`

Access the specified element 0..N*M-1.

#### 6.19.4.12 ]

template<unsigned int M, unsigned int N> RT_HOSTDEVICE float& **optix::Matrix**< M, N >::operator[] ( unsigned int *i* ) `[inline]`

Access the specified element 0..N*M-1.

#### 6.19.4.13 template<unsigned int M, unsigned int N> static RT_HOSTDEVICE Matrix<4,4> optix::Matrix< M, N >::rotate ( const float *radians,* const float3 & *axis* ) `[static]`

Returns a rotation matrix.

#### 6.19.4.14 template<unsigned int M, unsigned int N> static RT_HOSTDEVICE Matrix<4,4> optix::Matrix< M, N >::scale ( const float3 & *vec* ) `[static]`

Returns a scale matrix.

#### 6.19.4.15 template<unsigned int M, unsigned int N> OPTIXU_INLINE RT_HOSTDEVICE void optix::Matrix< M, N >::setCol ( unsigned int *n,* const floatM & *c* )

Assign the specified column 0..N.

Takes a float, float2, float3 or float4 depending on the matrix size

#### 6.19.4.16 template<unsigned int M, unsigned int N> OPTIXU_INLINE RT_HOSTDEVICE void optix::Matrix< M, N >::setRow ( unsigned int *m,* const floatN & *r* )

Assign the specified row 0..M.

Takes a float, float2, float3 or float4 depending on the matrix size

#### 6.19.4.17 template<unsigned int M, unsigned int N> static RT_HOSTDEVICE Matrix<4,4> optix::Matrix< M, N >::translate ( const float3 & *vec* ) `[static]`

Returns a translation matrix.

#### 6.19.4.18 template<unsigned int M, unsigned int N> OPTIXU_INLINE RT_HOSTDEVICE Matrix< N, M > optix::Matrix< M, N >::transpose ( ) const

Returns the transpose of the matrix.

## 6.20 optix::prime::ModelObj Class Reference

Inherits RefCountedObj.

### Public Member Functions

- Query createQuery (RTPquerytype queryType)
- Context getContext ()
- void finish ()
- int isFinished ()
- void update (unsigned hints)
- void copy (const Model &srcModel)
- void setTriangles (RTPsize triCount, RTPbuffertype type, const void *vertPtr, unsigned stride=0)
- void setTriangles (RTPsize triCount, RTPbuffertype type, const void *indexPtr, RTPsize vertCount, RTPbuffertype vertType, const void *vertPtr, unsigned stride=0)
- void setTriangles (const BufferDesc &vertices)
- void setTriangles (const BufferDesc &indices, const BufferDesc &vertices)
- void setInstances (RTPsize count, RTPbuffertype instanceType, const RTPmodel *instanceList, RTPbufferformat transformFormat, RTPbuffertype transformType, const void *transformList)
- void setInstances (const BufferDesc &instances, const BufferDesc &transforms)
- void setBuilderParameter (RTPbuilderparam param, RTPsize size, const void *p)
- template<typename T >
  void setBuilderParameter (RTPbuilderparam param, const T &val)
- RTPmodel getRTPmodel ()

#### 6.20.1 Detailed Description

Encapsulates an OptiX Prime model.

The purpose of a model is to represent a set of triangles and an acceleration structure.

#### 6.20.2 Member Function Documentation

##### 6.20.2.1 void optix::prime::ModelObj::copy ( const Model & *srcModel* ) [inline]

Copies one model to another. See rtpModelCopy.

##### 6.20.2.2 Query optix::prime::ModelObj::createQuery ( RTPquerytype *queryType* ) [inline]

Creates a Query object. See rtpQueryCreate.

##### 6.20.2.3 void optix::prime::ModelObj::finish ( ) [inline]

Blocks current thread until model update is finished. See rtpModelFinish.

##### 6.20.2.4 Context optix::prime::ModelObj::getContext ( ) [inline]

Returns the context associated within this object.

##### 6.20.2.5 RTPmodel optix::prime::ModelObj::getRTPmodel ( ) [inline]

Returns the RTPmodel model stored within this object.

##### 6.20.2.6 int optix::prime::ModelObj::isFinished ( ) [inline]

Polls the status of a model update. See rtpModelGetFinished.

#### 6.20.2.7 void optix::prime::ModelObj::setBuilderParameter ( RTPbuilderparam *param,* RTPsize *size,* const void * *p* ) [inline]

Sets a model build parameter See rtpModelSetBuilderParameter for additional information.

#### 6.20.2.8 template<typename T > void optix::prime::ModelObj::setBuilderParameter ( RTPbuilderparam *param,* const T & *val* )

Sets a model build parameter See rtpModelSetBuilderParameter for additional information.

#### 6.20.2.9 void optix::prime::ModelObj::setInstances ( RTPsize *count,* RTPbuffertype *instanceType,* const RTPmodel * *instanceList,* RTPbufferformat *transformFormat,* RTPbuffertype *transformType,* const void * *transformList* ) [inline]

Sets the instance data for a model.

This function creates buffer descriptors of the specified types and formats, populates them with the supplied data and assigns them to the model. See rtpModelSetInstances for additional information

#### 6.20.2.10 void optix::prime::ModelObj::setInstances ( const BufferDesc & *instances,* const BufferDesc & *transforms* ) [inline]

Sets the instance data for a model using the supplied buffer descriptors.

See rtpModelSetInstances for additional information

#### 6.20.2.11 void optix::prime::ModelObj::setTriangles ( RTPsize *triCount,* RTPbuffertype *type,* const void * *vertPtr,* unsigned *stride = 0* ) [inline]

Sets the triangle data for a model.

This function creates a buffer descriptor of the specified type, populates it with the supplied data and assigns it to the model. The list of vertices is assumed to be a flat list of triangles and each three vertices form a single triangle. See rtpModelSetTriangles for additional information

#### 6.20.2.12 void optix::prime::ModelObj::setTriangles ( RTPsize *triCount,* RTPbuffertype *type,* const void * *indexPtr,* RTPsize *vertCount,* RTPbuffertype *vertType,* const void * *vertPtr,* unsigned *stride = 0* ) [inline]

Sets the triangle data for a model.

This function creates buffer descriptors of the specified types, populates them with the supplied data and assigns them to the model. The list of vertices uses the indices list to determine the triangles. See rtpModelSetTriangles for additional information

#### 6.20.2.13 void optix::prime::ModelObj::setTriangles ( const BufferDesc & *vertices* ) [inline]

Sets the triangle data for a model using the supplied buffer descriptor of vertices.

The list of vertices is assumed to be a flat list of triangles and each three vertices shape a single triangle. See rtpModelSetTriangles for additional information

#### 6.20.2.14 void optix::prime::ModelObj::setTriangles ( const BufferDesc & *indices,* const BufferDesc & *vertices* ) [inline]

Sets the triangle data for a model using the supplied buffer descriptor of vertices.

The list of vertices uses the indices list to determine the triangles. See rtpModelSetTriangles for additional information

#### 6.20.2.15 void optix::prime::ModelObj::update ( unsigned *hints* ) [inline]

Creates the acceleration structure over the triangles. See rtpModelUpdate.

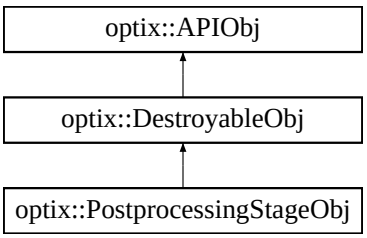
## 6.21 optix::Onb Struct Reference

### 6.21.1 Detailed Description

Orthonormal basis.

## 6.22 optix::PostprocessingStageObj Class Reference

Inheritance diagram for optix::PostprocessingStageObj:




### Public Member Functions

- void destroy ()
- void validate ()
- Context getContext () const
- RTpostprocessingstage get ()
- void addReference ()
- int removeReference ()
- virtual void checkError (RTresult code) const

### Static Public Member Functions

- static Exception makeException (RTresult code, RTcontext context)

### 6.22.1 Detailed Description

PostProcessingStage wraps the OptiX C API RTpostprocessingstage opaque type and its associated function set.

### 6.22.2 Member Function Documentation

#### 6.22.2.1 void optix::APIObj::addReference ( ) [inline], [inherited]

Increment the reference count for this object.

#### 6.22.2.2 void optix::APIObj::checkError ( RTresult *code* ) const [inline], [virtual], [inherited]

Check the given result code and throw an error with appropriate message if the code is not RTsuccess.
Reimplemented in optix::ContextObj.

#### 6.22.2.3 void optix::PostprocessingStageObj::destroy ( ) [inline], [virtual]

call rt[ObjectType]Destroy on the underlying OptiX C object
Implements optix::DestroyableObj.

#### 6.22.2.4 RTpostprocessingstage optix::PostprocessingStageObj::get ( ) [inline]

Get the underlying OptiX C API RTpostprocessingstage opaque pointer.

#### 6.22.2.5 Context optix::PostprocessingStageObj::getContext ( ) const [inline], [virtual]

Retrieve the context this object is associated with. See rt[ObjectType]GetContext.
Implements optix::APIObj.

#### 6.22.2.6 Exception optix::APIObj::makeException ( RTresult *code,* RTcontext *context* ) [inline], [static], [inherited]

For backwards compatability. Use Exception::makeException instead.

#### 6.22.2.7 int optix::APIObj::removeReference ( ) [inline], [inherited]

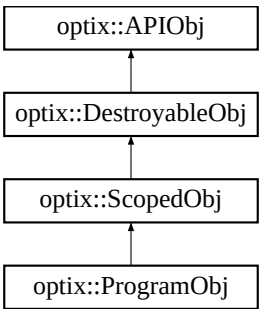
Decrement the reference count for this object.

#### 6.22.2.8 void optix::PostprocessingStageObj::validate ( ) [inline], [virtual]

call rt[ObjectType]Validate on the underlying OptiX C object
Implements optix::DestroyableObj.

## 6.23 optix::ProgramObj Class Reference

Inheritance diagram for optix::ProgramObj:




### Public Member Functions

- void destroy ()
- void validate ()
- Context getContext () const
- Variable declareVariable (const **std::string** &name)
- Variable queryVariable (const **std::string** &name) const
- void removeVariable (Variable v)
- unsigned int getVariableCount () const
- Variable getVariable (unsigned int index) const
- void addReference ()
- int removeReference ()
- virtual void checkError (RTresult code) const

- int getId () const

### Static Public Member Functions

- static Exception makeException (RTresult code, RTcontext context)

#### 6.23.1 Detailed Description

Program object wraps the OptiX C API RTprogram opaque type and its associated function set.

#### 6.23.2 Member Function Documentation

##### 6.23.2.1 void optix::APIObj::addReference ( ) [inline], [inherited]

Increment the reference count for this object.

##### 6.23.2.2 void optix::APIObj::checkError ( RTresult *code* ) const [inline], [virtual], [inherited]

Check the given result code and throw an error with appropriate message if the code is not RTsuccess.

Reimplemented in optix::ContextObj.

#### 6.23.2.3 Variable optix::ProgramObj::declareVariable ( const std::string & *name* ) [inline], [virtual]

Declare a variable associated with this object.

See rt[ObjectType]DeclareVariable. Note that this function is wrapped by the convenience function Handle::operator[].

Implements optix::ScopedObj.

#### 6.23.2.4 void optix::ProgramObj::destroy ( ) [inline], [virtual]

call rt[ObjectType]Destroy on the underlying OptiX C object

Implements optix::DestroyableObj.

#### 6.23.2.5 Context optix::ProgramObj::getContext ( ) const [inline], [virtual]

Retrieve the context this object is associated with. See rt[ObjectType]GetContext.

Implements optix::APIObj.

#### 6.23.2.6 int optix::ProgramObj::getId ( ) const [inline]

Returns the device-side ID of this program object. See rtProgramGetId

#### 6.23.2.7 Variable optix::ProgramObj::getVariable ( unsigned int *index* ) const [inline], [virtual]

Query variable by index. See rt[ObjectType]GetVariable.

Implements optix::ScopedObj.

#### 6.23.2.8 unsigned int optix::ProgramObj::getVariableCount ( ) const [inline], [virtual]

Query the number of variables associated with this object.

Used along with ScopedObj::getVariable to iterate over variables in an object. See rt[ObjectType]GetVariableCount

Implements optix::ScopedObj.

#### 6.23.2.9 Exception optix::APIObj::makeException ( RTresult *code,* RTcontext *context* ) [inline], [static], [inherited]

For backwards compatability. Use Exception::makeException instead.

#### 6.23.2.10 Variable optix::ProgramObj::queryVariable ( const std::string & *name* ) const [inline], [virtual]

Query a variable associated with this object by name.

See rt[ObjectType]QueryVariable. Note that this function is wrapped by the convenience function Handle::operator[].

Implements optix::ScopedObj.

#### 6.23.2.11 int optix::APIObj::removeReference ( ) [inline], [inherited]

Decrement the reference count for this object.

#### 6.23.2.12 void optix::ProgramObj::removeVariable ( Variable *v* ) [inline], [virtual]

Remove a variable associated with this object.

Implements optix::ScopedObj.

#### 6.23.2.13 void optix::ProgramObj::validate ( ) [inline], [virtual]

call rt[ObjectType]Validate on the underlying OptiX C object

Implements optix::DestroyableObj.

## 6.24 optix::Quaternion Class Reference

### Public Member Functions

- RT_HOSTDEVICE Quaternion ()
- RT_HOSTDEVICE Quaternion (float x, float y, float z, float w)
- RT_HOSTDEVICE Quaternion (float4 v)
- RT_HOSTDEVICE Quaternion (const Quaternion &other)
- RT_HOSTDEVICE Quaternion (const float3 &axis, float angle)
- RT_HOSTDEVICE void toMatrix (float m[16]) const

### Public Attributes

- float4 m_q

### 6.24.1 Detailed Description

Quaternion.

**Description**

Quaternion is a utility class for handling quaternions which are primarily useful for representing directions and rotations.

**History**

Quaternion was introduced in OptiX 5.0.

### 6.24.2 Constructor & Destructor Documentation

#### 6.24.2.1 OPTIXU_INLINE RT_HOSTDEVICE optix::Quaternion::Quaternion ( )

Construct identity quaternion.

#### 6.24.2.2 OPTIXU_INLINE RT_HOSTDEVICE optix::Quaternion::Quaternion ( float *x*, float *y*, float *z*, float *w* )

Construct from coordinates x, y, z, w.

#### 6.24.2.3 OPTIXU_INLINE RT_HOSTDEVICE optix::Quaternion::Quaternion ( float4 *v* )

Construct from float4.

#### 6.24.2.4 OPTIXU_INLINE RT_HOSTDEVICE optix::Quaternion::Quaternion ( const Quaternion & *other* )

Copy constructor.

#### 6.24.2.5 OPTIXU_INLINE RT_HOSTDEVICE optix::Quaternion::Quaternion ( const float3 & *axis,* float *angle* )

Construct from axis and angle (in degrees)

### 6.24.3 Member Function Documentation

#### 6.24.3.1 OPTIXU_INLINE RT_HOSTDEVICE void optix::Quaternion::toMatrix ( float *m[16]* ) const

From quaternion to rotation matrix.

### 6.24.4 Member Data Documentation

#### 6.24.4.1 float4 optix::Quaternion::m_q

quaternion x, y, z, w

## 6.25 optix::prime::QueryObj Class Reference

Inherits RefCountedObj.

### Public Member Functions

- Context getContext ()
- void finish ()
- int isFinished ()
- void setCudaStream (cudaStream_t stream)
- void setRays (RTPsize count, RTPbufferformat format, RTPbuffertype type, void ∗rays)
- void setRays (const BufferDesc &rays)
- void setHits (RTPsize count, RTPbufferformat format, RTPbuffertype type, void ∗hits)
- void setHits (const BufferDesc &hits)
- void execute (unsigned hint)
- RTPquery getRTPquery ()

### 6.25.1 Detailed Description

Encapsulates an OptiX Prime query.

The purpose of a query is to coordinate the intersection of rays with a model.

### 6.25.2 Member Function Documentation

#### 6.25.2.1 void optix::prime::QueryObj::execute ( unsigned *hint* ) [inline]

Executes a raytracing query. See rtpQueryExecute.

#### 6.25.2.2 void optix::prime::QueryObj::finish ( ) [inline]

Blocks current thread until query is finished. See rtpQueryFinish.

#### 6.25.2.3 Context optix::prime::QueryObj::getContext ( ) [inline]

Returns the context associated within this object.

#### 6.25.2.4 RTPquery optix::prime::QueryObj::getRTPquery ( ) [inline]

Returns the RTPquery query stored within this object.

#### 6.25.2.5 int optix::prime::QueryObj::isFinished ( ) [inline]

Polls the status of a query. See rtpQueryGetFinished.

#### 6.25.2.6 void optix::prime::QueryObj::setCudaStream ( cudaStream_t *stream* ) [inline]

Sets a stream for a query. See rtpQuerySetCudaStream.

#### 6.25.2.7 void optix::prime::QueryObj::setHits ( RTPsize *count*, RTPbufferformat *format*, RTPbuffertype *type*, void * *hits* ) [inline]

Sets a hit buffer for the query. See rtpQuerySetHits.

#### 6.25.2.8 void optix::prime::QueryObj::setHits ( const BufferDesc & *hits* ) [inline]

Sets a hit buffer for the query from a buffer description. See rtpQuerySetHits.

#### 6.25.2.9 void optix::prime::QueryObj::setRays ( RTPsize *count*, RTPbufferformat *format*, RTPbuffertype *type*, void * *rays* ) [inline]

Creates a buffer descriptor and sets the rays of a query. See rtpQuerySetRays.

#### 6.25.2.10 void optix::prime::QueryObj::setRays ( const BufferDesc & *rays* ) [inline]

Sets the rays of a query from a buffer descriptor. See rtpQuerySetRays.

## 6.26 Ray Struct Reference

### Public Attributes

- float3 origin
- float3 direction
- unsigned int ray_type
- float tmin
- float tmax

### 6.26.1 Detailed Description

Ray class.

#### Description

Ray is an encapsulation of a ray mathematical entity. The origin and direction members specify the ray, while the ray_type member specifies which closest-hit/any-hit pair will be used when the ray hits a geometry object. The tmin/tmax members specify the interval over which the ray is valid.

To avoid numerical range problems, the value RT_DEFAULT_MAX can be used to specify an infinite extent.

During C++ compilation, Ray is contained within the *optix*:: namespace but has global scope during C compilation. Ray's constructors are not available during C compilation.

#### Members

```
// The origin of the ray
float3 origin;

// The direction of the ray
float3 direction;

// The ray type associated with this ray
unsigned int ray_type;

// The min and max extents associated with this ray
float tmin;
float tmax;
```

#### Constructors

```
// Create a Ray with undefined member values
Ray( void );

// Create a Ray copied from an exemplar
Ray( const Ray &r );

// Create a ray with a specified origin, direction, ray_type, and min/max extents.
// When tmax is not given, it defaults to @ref RT_DEFAULT_MAX.
Ray( float3 origin, float3 direction, unsigned int ray_type,
     float tmin, float tmax = RT_DEFAULT_MAX);
```

#### Functions

```
// Create a ray with a specified origin, direction, ray type, and min/max extents.
Ray make_Ray( float3 origin,
          float3 direction,
          unsigned int ray_type,
          float tmin,
          float tmax );
```

#### History

Ray was introduced in OptiX 1.0.

**See also** rtContextSetRayTypeCount, rtMaterialSetAnyHitProgram, rtMaterialSetClosestHitProgram

### 6.26.2 Member Data Documentation

#### 6.26.2.1 float3 Ray::direction

The direction of the ray.

#### 6.26.2.2 float3 Ray::origin

The origin of the ray.

#### 6.26.2.3 unsigned int Ray::ray_type

The ray type associated with this ray.

#### 6.26.2.4 float Ray::tmax

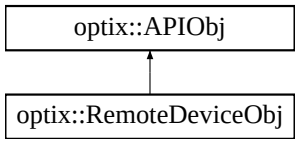
The max extent associated with this ray.

#### 6.26.2.5 float Ray::tmin

The min extent associated with this ray.

## 6.27 optix::RemoteDeviceObj Class Reference

Inheritance diagram for optix::RemoteDeviceObj:




#### Public Member Functions

- RTremotedevice get ()
- void addReference ()
- int removeReference ()
- virtual void checkError (RTresult code) const

#### Static Public Member Functions

- static Exception makeException (RTresult code, RTcontext context)

### 6.27.1 Detailed Description

RemoteDevice wraps the OptiX C API RTremotedevice opaque type and its associated function set.

### 6.27.2 Member Function Documentation

#### 6.27.2.1 void optix::APIObj::addReference ( ) [inline], [inherited]

Increment the reference count for this object.

#### 6.27.2.2 void optix::APIObj::checkError ( RTresult *code* ) const [inline], [virtual], [inherited]

Check the given result code and throw an error with appropriate message if the code is not RTsuccess.

Reimplemented in optix::ContextObj.

#### 6.27.2.3 RTremotedevice optix::RemoteDeviceObj::get ( ) [inline]

Return the OptiX C API RTremotedevice object.

#### 6.27.2.4 Exception optix::APIObj::makeException ( RTresult *code,* RTcontext *context* ) [inline], [static], [inherited]

For backwards compatability. Use Exception::makeException instead.

#### 6.27.2.5 int optix::APIObj::removeReference ( ) [inline], [inherited]

Decrement the reference count for this object.

## 6.28 rtObject Struct Reference

### 6.28.1 Detailed Description

Opaque handle to a OptiX object.

**Description**

rtObject is an opaque handle to an OptiX object of any type. To set or query the variable value, use rtVariableSetObject and rtVariableGetObject.

Depending on how exacly the variable is used, only certain concrete types may make sense. For example, when used as an argument to rtTrace, the variable must be set to any OptiX type of RTgroup, RTselector, RTgeometrygroup, or RTtransform.

Note that for certain OptiX types, there are more specialized handles available to access a variable. For example, to access an OptiX object of type RTtexturesampler, a handle of type rtTextureSampler provides more functionality than one of the generic type rtObject.

**History**

rtObject was introduced in OptiX 1.0.

**See also** rtVariableSetObject, rtVariableGetObject, rtTrace, rtTextureSampler, rtBuffer

## 6.29 RTUtraversalresult Struct Reference

**Public Attributes**

- int prim_id
- float t

### 6.29.1 Detailed Description

Traversal API allowing batch raycasting queries utilizing either OptiX or the CPU.

The OptiX traversal API is demonstrated in the traversal sample within the OptiX SDK.

Structure encapsulating the result of a single ray query

### 6.29.2 Member Data Documentation

#### 6.29.2.1 int RTUtraversalresult::prim_id

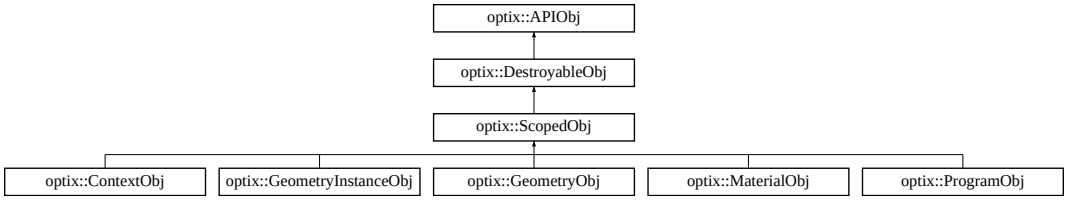
Index of the interesected triangle, -1 for miss.

#### 6.29.2.2 float RTUtraversalresult::t

Ray t parameter of hit point.

## 6.30 optix::ScopedObj Class Reference

Inheritance diagram for optix::ScopedObj:




### Public Member Functions

- virtual Variable declareVariable (const **std::string** &name)=0
- virtual Variable queryVariable (const **std::string** &name) const =0
- virtual void removeVariable (Variable v)=0
- virtual unsigned int getVariableCount () const =0
- virtual Variable getVariable (unsigned int index) const =0
- virtual void destroy ()=0
- virtual void validate ()=0
- void addReference ()
- int removeReference ()
- virtual Context getContext () const =0
- virtual void checkError (RTresult code) const

### Static Public Member Functions

- static Exception makeException (RTresult code, RTcontext context)

### 6.30.1 Detailed Description

Base class for all objects which are OptiX variable containers.

Wraps:

- RTcontext
- RTgeometry
- RTgeometryinstance
- RTmaterial
- RTprogram

### 6.30.2 Member Function Documentation

#### 6.30.2.1 void optix::APIObj::addReference ( ) [inline], [inherited]

Increment the reference count for this object.

#### 6.30.2.2 void optix::APIObj::checkError ( RTresult *code* ) const [inline], [virtual], [inherited]

Check the given result code and throw an error with appropriate message if the code is not RTsuccess.

Reimplemented in optix::ContextObj.

#### 6.30.2.3 virtual Variable optix::ScopedObj::declareVariable ( const std::string & *name* ) [pure virtual]

Declare a variable associated with this object.

See rt[ObjectType]DeclareVariable. Note that this function is wrapped by the convenience function Handle::operator[].

Implemented in optix::MaterialObj, optix::GeometryObj, optix::GeometryInstanceObj, optix::ProgramObj, and optix::ContextObj.

#### 6.30.2.4 virtual void optix::DestroyableObj::destroy ( ) [pure virtual], [inherited]

call rt[ObjectType]Destroy on the underlying OptiX C object

Implemented in optix::CommandListObj, optix::PostprocessingStageObj, optix::BufferObj, optix::TextureSamplerObj, optix::MaterialObj, optix::GeometryObj, optix::GeometryInstanceObj, optix::AccelerationObj, optix::SelectorObj, optix::TransformObj, optix::GeometryGroupObj, optix::GroupObj, optix::ProgramObj, and optix::ContextObj.

#### 6.30.2.5 virtual Context optix::APIObj::getContext ( ) const [pure virtual], [inherited]

Retrieve the context this object is associated with. See rt[ObjectType]GetContext.

Implemented in optix::CommandListObj, optix::PostprocessingStageObj, optix::BufferObj, optix::TextureSamplerObj, optix::MaterialObj, optix::GeometryObj, optix::GeometryInstanceObj, optix::AccelerationObj, optix::SelectorObj, optix::TransformObj, optix::GeometryGroupObj, optix::GroupObj, optix::ProgramObj, optix::ContextObj, and optix::VariableObj.

#### 6.30.2.6 virtual Variable optix::ScopedObj::getVariable ( unsigned int *index* ) const [pure virtual]

Query variable by index. See rt[ObjectType]GetVariable.

Implemented in optix::MaterialObj, optix::GeometryObj, optix::GeometryInstanceObj, optix::ProgramObj, and optix::ContextObj.

#### 6.30.2.7 virtual unsigned int optix::ScopedObj::getVariableCount ( ) const [pure virtual]

Query the number of variables associated with this object.

Used along with ScopedObj::getVariable to iterate over variables in an object. See rt[ObjectType]GetVariableCount

Implemented in optix::MaterialObj, optix::GeometryObj, optix::GeometryInstanceObj, optix::ProgramObj, and optix::ContextObj.

#### 6.30.2.8 Exception optix::APIObj::makeException ( RTresult *code,* RTcontext *context* ) [inline], [static], [inherited]

For backwards compatability. Use Exception::makeException instead.

#### 6.30.2.9 virtual Variable optix::ScopedObj::queryVariable ( const std::string & *name* ) const [pure virtual]

Query a variable associated with this object by name.

See rt[ObjectType]QueryVariable. Note that this function is wrapped by the convenience function Handle::operator[].

Implemented in optix::MaterialObj, optix::GeometryObj, optix::GeometryInstanceObj, optix::ProgramObj, and optix::ContextObj.

#### 6.30.2.10 int optix::APIObj::removeReference ( ) [inline], [inherited]

Decrement the reference count for this object.

#### 6.30.2.11 virtual void optix::ScopedObj::removeVariable ( Variable *v* ) [pure virtual]

Remove a variable associated with this object.

Implemented in optix::MaterialObj, optix::GeometryObj, optix::GeometryInstanceObj, optix::ProgramObj, and optix::ContextObj.

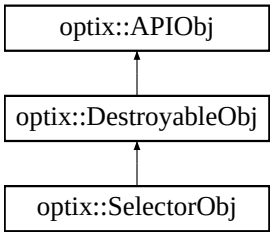
#### 6.30.2.12 virtual void optix::DestroyableObj::validate ( ) [pure virtual], [inherited]

call rt[ObjectType]Validate on the underlying OptiX C object

Implemented in optix::CommandListObj, optix::PostprocessingStageObj, optix::BufferObj, optix::TextureSamplerObj, optix::MaterialObj, optix::GeometryObj, optix::GeometryInstanceObj, optix::AccelerationObj, optix::SelectorObj, optix::TransformObj, optix::GeometryGroupObj, optix::GroupObj, optix::ProgramObj, and optix::ContextObj.

## 6.31 optix::SelectorObj Class Reference

Inheritance diagram for optix::SelectorObj:




### Public Member Functions

- void destroy ()
- void validate ()
- Context getContext () const
- RTselector get ()
- void addReference ()
- int removeReference ()
- virtual void checkError (RTresult code) const

- void setVisitProgram (Program program)
- Program getVisitProgram () const

- void setChildCount (unsigned int count)
- unsigned int getChildCount () const
- template<typename T >
  void setChild (unsigned int index, T child)
- template<typename T >
  T getChild (unsigned int index) const
- RTobjecttype getChildType (unsigned int index) const
- template<typename T >
  unsigned int addChild (T child)
- template<typename T >
  unsigned int removeChild (T child)
- void removeChild (int index)
- void removeChild (unsigned int index)
- template<typename T >
  unsigned int getChildIndex (T child) const

### Static Public Member Functions

- static Exception makeException (RTresult code, RTcontext context)

#### 6.31.1 Detailed Description

Selector wraps the OptiX C API RTselector opaque type and its associated function set.

### 6.31.2 Member Function Documentation

#### 6.31.2.1 template<typename T > unsigned int optix::SelectorObj::addChild ( T *child* ) [inline]

Set a new child in this group and returns its new index. See rtSelectorSetChild.

#### 6.31.2.2 void optix::APIObj::addReference ( ) [inline], [inherited]

Increment the reference count for this object.

#### 6.31.2.3 void optix::APIObj::checkError ( RTresult *code* ) const [inline], [virtual], [inherited]

Check the given result code and throw an error with appropriate message if the code is not RTsuccess.
Reimplemented in optix::ContextObj.

#### 6.31.2.4 void optix::SelectorObj::destroy ( ) [inline], [virtual]

call rt[ObjectType]Destroy on the underlying OptiX C object
Implements optix::DestroyableObj.

#### 6.31.2.5 RTselector optix::SelectorObj::get ( ) [inline]

Get the underlying OptiX C API RTselector opaque pointer.

#### 6.31.2.6 template<typename T > T optix::SelectorObj::getChild ( unsigned int *index* ) const [inline]

Query an indexed child within this group. See rtSelectorGetChild.

#### 6.31.2.7 unsigned int optix::SelectorObj::getChildCount ( ) const [inline]

Query the number of children for this group. See rtSelectorGetChildCount.

#### 6.31.2.8 template<typename T > unsigned int optix::SelectorObj::getChildIndex ( T *child* ) const [inline]

Query a child in this group for its index. See rtSelectorGetChild.

#### 6.31.2.9 RTobjecttype optix::SelectorObj::getChildType ( unsigned int *index* ) const [inline]

Query indexed child's type. See rtSelectorGetChildType.

#### 6.31.2.10 Context optix::SelectorObj::getContext ( ) const [inline], [virtual]

Retrieve the context this object is associated with. See rt[ObjectType]GetContext.
Implements optix::APIObj.

#### 6.31.2.11 Program optix::SelectorObj::getVisitProgram ( ) const [inline]

Get the visitor program for this selector. See rtSelectorGetVisitProgram.

#### 6.31.2.12 Exception optix::APIObj::makeException ( RTresult *code*, RTcontext *context* ) [inline], [static], [inherited]

For backwards compatability. Use Exception::makeException instead.

#### 6.31.2.13 template<typename T > unsigned int optix::SelectorObj::removeChild ( T *child* ) [inline]

Remove a child in this group and returns the index to the deleted element in case of success.

Throws RT_ERROR_INVALID_VALUE if the parameter is invalid. Note: this function shifts down all the elements next to the removed one.

#### 6.31.2.14 void optix::SelectorObj::removeChild ( int *index* ) [inline]

Remove a child in this group by its index.

Throws RT_ERROR_INVALID_VALUE if the parameter is invalid. Note: this function shifts down all the elements next to the removed one.

#### 6.31.2.15 void optix::SelectorObj::removeChild ( unsigned int *index* ) [inline]

Remove a child in this group by its index.

Throws RT_ERROR_INVALID_VALUE if the parameter is invalid. Note: this function shifts down all the elements next to the removed one.

#### 6.31.2.16 int optix::APIObj::removeReference ( ) [inline], [inherited]

Decrement the reference count for this object.

#### 6.31.2.17 template<typename T > void optix::SelectorObj::setChild ( unsigned int *index*, T *child* ) [inline]

Set an indexed child child of this group. See rtSelectorSetChild.

#### 6.31.2.18 void optix::SelectorObj::setChildCount ( unsigned int *count* ) [inline]

Set the number of children for this group. See rtSelectorSetChildCount.

#### 6.31.2.19 void optix::SelectorObj::setVisitProgram ( Program *program* ) [inline]

Set the visitor program for this selector. See rtSelectorSetVisitProgram

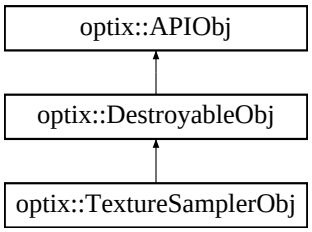
#### 6.31.2.20 void optix::SelectorObj::validate ( ) [inline], [virtual]

call rt[ObjectType]Validate on the underlying OptiX C object

Implements optix::DestroyableObj.

## 6.32 optix::TextureSamplerObj Class Reference

Inheritance diagram for optix::TextureSamplerObj:




### Public Member Functions

- void destroy ()
- void validate ()
- Context getContext () const
- RTtexturesampler get ()
- void addReference ()
- int removeReference ()
- virtual void checkError (RTresult code) const

- void setMipLevelCount (unsigned int num_mip_levels)
- unsigned int getMipLevelCount () const
- void setArraySize (unsigned int num_textures_in_array)
- unsigned int getArraySize () const
- void setWrapMode (unsigned int dim, RTwrapmode wrapmode)
- RTwrapmode getWrapMode (unsigned int dim) const
- void setFilteringModes (RTfiltermode minification, RTfiltermode magnification, RTfiltermode mipmapping)
- void getFilteringModes (RTfiltermode &minification, RTfiltermode &magnification, RTfiltermode &mipmapping) const
- void setMaxAnisotropy (float value)
- float getMaxAnisotropy () const
- void setMipLevelClamp (float minLevel, float maxLevel)
- void getMipLevelClamp (float &minLevel, float &maxLevel) const
- void setMipLevelBias (float value)
- float getMipLevelBias () const
- void setReadMode (RTtexturereadmode readmode)
- RTtexturereadmode getReadMode () const
- void setIndexingMode (RTtextureindexmode indexmode)
- RTtextureindexmode getIndexingMode () const

- int getId () const

- void setBuffer (unsigned int texture_array_idx, unsigned int mip_level, Buffer buffer)
- Buffer getBuffer (unsigned int texture_array_idx, unsigned int mip_level) const
- void setBuffer (Buffer buffer)
- Buffer getBuffer () const

- void registerGLTexture ()
- void unregisterGLTexture ()

### Static Public Member Functions

- static Exception makeException (RTresult code, RTcontext context)

## 6.32.1 Detailed Description

TextureSampler wraps the OptiX C API RTtexturesampler opaque type and its associated function set.

## 6.32.2 Member Function Documentation

### 6.32.2.1 void optix::APIObj::addReference ( ) [inline], [inherited]

Increment the reference count for this object.

### 6.32.2.2 void optix::APIObj::checkError ( RTresult *code* ) const [inline], [virtual], [inherited]

Check the given result code and throw an error with appropriate message if the code is not RTsuccess.

Reimplemented in optix::ContextObj.

### 6.32.2.3 void optix::TextureSamplerObj::destroy ( ) [inline], [virtual]

call rt[ObjectType]Destroy on the underlying OptiX C object

Implements optix::DestroyableObj.

### 6.32.2.4 RTtexturesampler optix::TextureSamplerObj::get ( ) [inline]

Get the underlying OptiX C API RTtexturesampler opaque pointer.

### 6.32.2.5 unsigned int optix::TextureSamplerObj::getArraySize ( ) const [inline]

**Deprecated in OptiX 4.0** Query the texture array size for this sampler. See rtTextureSamplerGetArraySize

### 6.32.2.6 Buffer optix::TextureSamplerObj::getBuffer ( unsigned int *texture_array_idx*, unsigned int *mip_level* ) const [inline]

**Deprecated in OptiX 4.0** Get the underlying buffer used for texture storage. See rtTextureSamplerGetBuffer.

### 6.32.2.7 Buffer optix::TextureSamplerObj::getBuffer ( ) const [inline]

Get the underlying buffer used for texture storage. See rtTextureSamplerGetBuffer.

### 6.32.2.8 Context optix::TextureSamplerObj::getContext ( ) const [inline], [virtual]

Retrieve the context this object is associated with. See rt[ObjectType]GetContext.

Implements optix::APIObj.

#### 6.32.2.9 void optix::TextureSamplerObj::getFilteringModes ( RTfiltermode & *minification,* RTfiltermode & *magnification,* RTfiltermode & *mipmapping* ) const [inline]

Query filtering modes for this sampler. See rtTextureSamplerGetFilteringModes.

#### 6.32.2.10 int optix::TextureSamplerObj::getId ( ) const [inline]

Returns the device-side ID of this sampler. See rtTextureSamplerGetId

#### 6.32.2.11 RTtextureindexmode optix::TextureSamplerObj::getIndexingMode ( ) const [inline]

Query texture indexing mode for this sampler. See rtTextureSamplerGetIndexingMode.

#### 6.32.2.12 float optix::TextureSamplerObj::getMaxAnisotropy ( ) const [inline]

Query maximum anisotropy for this sampler. See rtTextureSamplerGetMaxAnisotropy.

#### 6.32.2.13 float optix::TextureSamplerObj::getMipLevelBias ( ) const [inline]

Query mipmap offset for this sampler. See rtTextureSamplerGetMipLevelBias.

#### 6.32.2.14 void optix::TextureSamplerObj::getMipLevelClamp ( float & *minLevel,* float & *maxLevel* ) const [inline]

Query minimum and maxnimum mipmap levels for this sampler. See rtTextureSamplerGetMipLevelClamp.

#### 6.32.2.15 unsigned int optix::TextureSamplerObj::getMipLevelCount ( ) const [inline]

**Deprecated in OptiX 4.0** Query the number of mip levels for this sampler. See rtTextureSamplerGetMipLevelCount.

#### 6.32.2.16 RTtexturereadmode optix::TextureSamplerObj::getReadMode ( ) const [inline]

Query texture read mode for this sampler. See rtTextureSamplerGetReadMode.

#### 6.32.2.17 RTwrapmode optix::TextureSamplerObj::getWrapMode ( unsigned int *dim* ) const [inline]

Query the texture wrap mode for this sampler. See rtTextureSamplerGetWrapMode.

#### 6.32.2.18 Exception optix::APIObj::makeException ( RTresult *code,* RTcontext *context* ) [inline], [static], [inherited]

For backwards compatability. Use Exception::makeException instead.

#### 6.32.2.19 void optix::TextureSamplerObj::registerGLTexture ( ) [inline]

Declare the texture's buffer as immutable and accessible by OptiX. See rtTextureSamplerGLRegister.

#### 6.32.2.20 int optix::APIObj::removeReference ( ) [inline], [inherited]

Decrement the reference count for this object.

#### 6.32.2.21 void optix::TextureSamplerObj::setArraySize ( unsigned int *num_textures_in_array* ) [inline]

**Deprecated in OptiX 4.0** Set the texture array size for this sampler. See rtTextureSamplerSetArraySize

#### 6.32.2.22 void optix::TextureSamplerObj::setBuffer ( unsigned int *texture_array_idx,* unsigned int *mip_level,* Buffer *buffer* ) [inline]

**Deprecated in OptiX 4.0** Set the underlying buffer used for texture storage. See rtTextureSamplerSetBuffer.

#### 6.32.2.23 void optix::TextureSamplerObj::setBuffer ( Buffer *buffer* ) [inline]

Set the underlying buffer used for texture storage. See rtTextureSamplerSetBuffer.

#### 6.32.2.24 void optix::TextureSamplerObj::setFilteringModes ( RTfiltermode *minification,* RTfiltermode *magnification,* RTfiltermode *mipmapping* ) [inline]

Set filtering modes for this sampler. See rtTextureSamplerSetFilteringModes.

#### 6.32.2.25 void optix::TextureSamplerObj::setIndexingMode ( RTtextureindexmode *indexmode* ) [inline]

Set texture indexing mode for this sampler. See rtTextureSamplerSetIndexingMode.

#### 6.32.2.26 void optix::TextureSamplerObj::setMaxAnisotropy ( float *value* ) [inline]

Set maximum anisotropy for this sampler. See rtTextureSamplerSetMaxAnisotropy.

#### 6.32.2.27 void optix::TextureSamplerObj::setMipLevelBias ( float *value* ) [inline]

Set mipmap offset for this sampler. See rtTextureSamplerSetMipLevelBias.

#### 6.32.2.28 void optix::TextureSamplerObj::setMipLevelClamp ( float *minLevel,* float *maxLevel* ) [inline]

Set minimum and maxnimum mipmap levels for this sampler. See rtTextureSamplerSetMipLevelClamp.

#### 6.32.2.29 void optix::TextureSamplerObj::setMipLevelCount ( unsigned int *num_mip_levels* ) [inline]

**Deprecated in OptiX 4.0** Set the number of mip levels for this sampler. See rtTextureSamplerSetMipLevelCount.

#### 6.32.2.30 void optix::TextureSamplerObj::setReadMode ( RTtexturereadmode *readmode* ) [inline]

Set texture read mode for this sampler. See rtTextureSamplerSetReadMode.

#### 6.32.2.31 void optix::TextureSamplerObj::setWrapMode ( unsigned int *dim,* RTwrapmode *wrapmode* ) [inline]

Set the texture wrap mode for this sampler. See rtTextureSamplerSetWrapMode.

#### 6.32.2.32 void optix::TextureSamplerObj::unregisterGLTexture ( ) [inline]

Declare the texture's buffer as mutable and inaccessible by OptiX. See rtTextureSamplerGLUnregister.

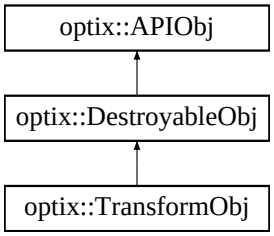
#### 6.32.2.33 void optix::TextureSamplerObj::validate ( ) [inline], [virtual]

call rt[ObjectType]Validate on the underlying OptiX C object

Implements optix::DestroyableObj.

## 6.33 optix::TransformObj Class Reference

Inheritance diagram for optix::TransformObj:




### Public Member Functions

- void destroy ()
- void validate ()
- Context getContext () const
- RTtransform get ()
- void addReference ()
- int removeReference ()
- virtual void checkError (RTresult code) const

- template<typename T >
  void setChild (T child)
- template<typename T >
  T getChild () const
- RTobjecttype getChildType () const

- void setMatrix (bool transpose, const float *matrix, const float *inverse_matrix)
- void getMatrix (bool transpose, float *matrix, float *inverse_matrix) const

- void setMotionRange (float timeBegin, float timeEnd)
- void getMotionRange (float &timeBegin, float &timeEnd)
- void setMotionBorderMode (RTmotionbordermode beginMode, RTmotionbordermode endMode)
- void getMotionBorderMode (RTmotionbordermode &beginMode, RTmotionbordermode &endMode)
- void setMotionKeys (unsigned int n, RTmotionkeytype type, const float *keys)
- unsigned int getMotionKeyCount ()
- RTmotionkeytype getMotionKeyType ()
- void getMotionKeys (float *keys)

### Static Public Member Functions

- static Exception makeException (RTresult code, RTcontext context)

## 6.33.1 Detailed Description

Transform wraps the OptiX C API RTtransform opaque type and its associated function set.

## 6.33.2 Member Function Documentation

### 6.33.2.1 void optix::APIObj::addReference ( ) [inline], [inherited]

Increment the reference count for this object.

### 6.33.2.2 void optix::APIObj::checkError ( RTresult *code* ) const [inline], [virtual], [inherited]

Check the given result code and throw an error with appropriate message if the code is not RTsuccess.
Reimplemented in optix::ContextObj.

### 6.33.2.3 void optix::TransformObj::destroy ( ) [inline], [virtual]

call rt[ObjectType]Destroy on the underlying OptiX C object
Implements optix::DestroyableObj.

### 6.33.2.4 RTtransform optix::TransformObj::get ( ) [inline]

Get the underlying OptiX C API RTtransform opaque pointer.

### 6.33.2.5 template<typename T > T optix::TransformObj::getChild ( ) const [inline]

Set the child node of this transform. See rtTransformGetChild.

### 6.33.2.6 RTobjecttype optix::TransformObj::getChildType ( ) const [inline]

Query child's type. See rtTransformGetChildType.

### 6.33.2.7 Context optix::TransformObj::getContext ( ) const [inline], [virtual]

Retrieve the context this object is associated with. See rt[ObjectType]GetContext.
Implements optix::APIObj.

### 6.33.2.8 void optix::TransformObj::getMatrix ( bool *transpose*, float * *matrix*, float * *inverse_matrix* ) const [inline]

Get the transform matrix for this node. See rtTransformGetMatrix.

### 6.33.2.9 void optix::TransformObj::getMotionBorderMode ( RTmotionbordermode & *beginMode*, RTmotionbordermode & *endMode* ) [inline]

Query the motion border mode for this transform. See rtTransformGetMotionBorderMode.

#### 6.33.2.10 unsigned int optix::TransformObj::getMotionKeyCount ( ) [inline]

Query the number of motion keys for this transform. See rtTransformGetMotionKeyCount.

#### 6.33.2.11 void optix::TransformObj::getMotionKeys ( float * *keys* ) [inline]

Query the motion keys for this transform. See rtTransformGetMotionKeys.

#### 6.33.2.12 RTmotionkeytype optix::TransformObj::getMotionKeyType ( ) [inline]

Query the motion key type for this transform. See rtTransformGetMotionKeyType.

#### 6.33.2.13 void optix::TransformObj::getMotionRange ( float & *timeBegin*, float & *timeEnd* ) [inline]

Query the motion time range for this transform. See rtTransformGetMotionRange.

#### 6.33.2.14 Exception optix::APIObj::makeException ( RTresult *code*, RTcontext *context* ) [inline], [static], [inherited]

For backwards compatability. Use Exception::makeException instead.

#### 6.33.2.15 int optix::APIObj::removeReference ( ) [inline], [inherited]

Decrement the reference count for this object.

#### 6.33.2.16 template<typename T > void optix::TransformObj::setChild ( T *child* ) [inline]

Set the child node of this transform. See rtTransformSetChild.

#### 6.33.2.17 void optix::TransformObj::setMatrix ( bool *transpose*, const float * *matrix*, const float * *inverse_matrix* ) [inline]

Set the transform matrix for this node. See rtTransformSetMatrix.

#### 6.33.2.18 void optix::TransformObj::setMotionBorderMode ( RTmotionbordermode *beginMode*, RTmotionbordermode *endMode* ) [inline]

Set the motion border mode for this transform. See rtTransformSetMotionBorderMode.

#### 6.33.2.19 void optix::TransformObj::setMotionKeys ( unsigned int *n*, RTmotionkeytype *type*, const float * *keys* ) [inline]

Set the motion keys for this transform. See rtTransformSetMotionKeys.

#### 6.33.2.20 void optix::TransformObj::setMotionRange ( float *timeBegin*, float *timeEnd* ) [inline]

Set the motion time range for this transform. See rtTransformSetMotionRange.

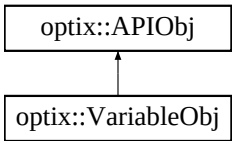
#### 6.33.2.21 void optix::TransformObj::validate ( ) [inline], [virtual]

call rt[ObjectType]Validate on the underlying OptiX C object

Implements optix::DestroyableObj.

## 6.34 optix::VariableObj Class Reference

Inheritance diagram for optix::VariableObj:




### Public Member Functions

- Context getContext () const
- **std::string** getName () const
- **std::string** getAnnotation () const
- RTobjecttype getType () const
- RTvariable get ()
- RTsize getSize () const
- void addReference ()
- int removeReference ()
- virtual void checkError (RTresult code) const

#### Float setters

*Set variable to have a float value.*

- void setFloat (float f1)
- void setFloat (optix::float2 f)
- void setFloat (float f1, float f2)
- void setFloat (optix::float3 f)
- void setFloat (float f1, float f2, float f3)
- void setFloat (optix::float4 f)
- void setFloat (float f1, float f2, float f3, float f4)
- void set1fv (const float *f)
- void set2fv (const float *f)
- void set3fv (const float *f)
- void set4fv (const float *f)

#### Int setters

*Set variable to have an int value.*

- void **setInt** (int i1)
- void **setInt** (int i1, int i2)
- void **setInt** (optix::int2 i)
- void **setInt** (int i1, int i2, int i3)
- void **setInt** (optix::int3 i)
- void **setInt** (int i1, int i2, int i3, int i4)
- void **setInt** (optix::int4 i)
- void **set1iv** (const int *i)
- void **set2iv** (const int *i)
- void **set3iv** (const int *i)
- void **set4iv** (const int *i)

### Unsigned int setters

*Set variable to have an unsigned int value.*

- void **setUint** (unsigned int u1)
- void **setUint** (unsigned int u1, unsigned int u2)
- void **setUint** (unsigned int u1, unsigned int u2, unsigned int u3)
- void **setUint** (unsigned int u1, unsigned int u2, unsigned int u3, unsigned int u4)
- void **setUint** (optix::uint2 u)
- void **setUint** (optix::uint3 u)
- void **setUint** (optix::uint4 u)
- void **set1uiv** (const unsigned int ∗u)
- void **set2uiv** (const unsigned int ∗u)
- void **set3uiv** (const unsigned int ∗u)
- void **set4uiv** (const unsigned int ∗u)

### Matrix setters

*Set variable to have a Matrix value*

- void **setMatrix2x2fv** (bool transpose, const float ∗m)
- void **setMatrix2x3fv** (bool transpose, const float ∗m)
- void **setMatrix2x4fv** (bool transpose, const float ∗m)
- void **setMatrix3x2fv** (bool transpose, const float ∗m)
- void **setMatrix3x3fv** (bool transpose, const float ∗m)
- void **setMatrix3x4fv** (bool transpose, const float ∗m)
- void **setMatrix4x2fv** (bool transpose, const float ∗m)
- void **setMatrix4x3fv** (bool transpose, const float ∗m)
- void **setMatrix4x4fv** (bool transpose, const float ∗m)

### Numeric value getters

*Query value of a variable with numeric value*

- float **getFloat** () const
- optix::float2 **getFloat2** () const
- optix::float3 **getFloat3** () const
- optix::float4 **getFloat4** () const
- void **getFloat** (float &f1) const
- void **getFloat** (float &f1, float &f2) const
- void **getFloat** (float &f1, float &f2, float &f3) const
- void **getFloat** (float &f1, float &f2, float &f3, float &f4) const
- unsigned **getUint** () const
- optix::uint2 **getUint2** () const
- optix::uint3 **getUint3** () const
- optix::uint4 **getUint4** () const
- void **getUint** (unsigned &u1) const
- void **getUint** (unsigned &u1, unsigned &u2) const
- void **getUint** (unsigned &u1, unsigned &u2, unsigned &u3) const
- void **getUint** (unsigned &u1, unsigned &u2, unsigned &u3, unsigned &u4) const
- int **getInt** () const
- optix::int2 **getInt2** () const
- optix::int3 **getInt3** () const
- optix::int4 **getInt4** () const
- void **getInt** (int &i1) const
- void **getInt** (int &i1, int &i2) const
- void **getInt** (int &i1, int &i2, int &i3) const
- void **getInt** (int &i1, int &i2, int &i3, int &i4) const
- void **getMatrix2x2** (bool transpose, float ∗m) const
- void **getMatrix2x3** (bool transpose, float ∗m) const

- void **getMatrix2x4** (bool transpose, float *m) const
- void **getMatrix3x2** (bool transpose, float *m) const
- void **getMatrix3x3** (bool transpose, float *m) const
- void **getMatrix3x4** (bool transpose, float *m) const
- void **getMatrix4x2** (bool transpose, float *m) const
- void **getMatrix4x3** (bool transpose, float *m) const
- void **getMatrix4x4** (bool transpose, float *m) const

**OptiX API object setters**

*Set variable to have an OptiX API object as its value*

- void **setBuffer** (Buffer buffer)
- void **set** (Buffer buffer)
- void **setTextureSampler** (TextureSampler texturesample)
- void **set** (TextureSampler texturesample)
- void **set** (GeometryGroup group)
- void **set** (Group group)
- void **set** (Program program)
- void **setProgramId** (Program program)
- void **set** (Selector selector)
- void **set** (Transform transform)

**OptiX API object getters**

*Reitrieve OptiX API object value from a variable*

- Buffer **getBuffer** () const
- GeometryGroup **getGeometryGroup** () const
- GeometryInstance **getGeometryInstance** () const
- Group **getGroup** () const
- Program **getProgram** () const
- Selector **getSelector** () const
- TextureSampler **getTextureSampler** () const
- Transform **getTransform** () const

**User data variable accessors**

- void setUserData (RTsize size, const void *ptr)
- void getUserData (RTsize size, void *ptr) const

### Static Public Member Functions

- static Exception makeException (RTresult code, RTcontext context)

### 6.34.1 Detailed Description

Variable object wraps OptiX C API RTvariable type and its related function set.

See the OptiX Programming Guide for a complete description of the usage and behavior of RTvariable objects. Creation and querying of Variables can be performed via the Handle::operator[] function of the scope object associated with the variable. For example:

```
my_context["new_variable"]->setFloat( 1.0f );
```

will create a variable named `new_variable` on the object `my_context` if it does not already exist. It will then set the value of that variable to be a float 1.0f.

### 6.34.2 Member Function Documentation

#### 6.34.2.1 void optix::APIObj::addReference ( ) [inline], [inherited]

Increment the reference count for this object.

#### 6.34.2.2 void optix::APIObj::checkError ( RTresult *code* ) const [inline], [virtual], [inherited]

Check the given result code and throw an error with appropriate message if the code is not RTsuccess.
Reimplemented in optix::ContextObj.

#### 6.34.2.3 RTvariable optix::VariableObj::get ( ) [inline]

Get the OptiX C API object wrapped by this instance.

#### 6.34.2.4 std::string optix::VariableObj::getAnnotation ( ) const [inline]

Retrieve the annotation associated with the variable.

#### 6.34.2.5 Context optix::VariableObj::getContext ( ) const [inline], [virtual]

Retrieve the context this object is associated with. See rt[ObjectType]GetContext.
Implements optix::APIObj.

#### 6.34.2.6 std::string optix::VariableObj::getName ( ) const [inline]

Retrieve the name of the variable.

#### 6.34.2.7 RTsize optix::VariableObj::getSize ( ) const [inline]

Get the size of the variable data in bytes (eg, float4 returns 4∗sizeof(float) )

#### 6.34.2.8 RTobjecttype optix::VariableObj::getType ( ) const [inline]

Query the object type of the variable.

#### 6.34.2.9 void optix::VariableObj::getUserData ( RTsize *size*, void ∗ *ptr* ) const [inline]

Retrieve a user defined type given the sizeof the user object.

#### 6.34.2.10 Exception optix::APIObj::makeException ( RTresult *code*, RTcontext *context* ) [inline], [static], [inherited]

For backwards compatability. Use Exception::makeException instead.

#### 6.34.2.11 int optix::APIObj::removeReference ( ) [inline], [inherited]

Decrement the reference count for this object.

#### 6.34.2.12 void optix::VariableObj::set1fv ( const float ∗ *f* ) [inline]

Set variable value to a scalar float.

#### 6.34.2.13 void optix::VariableObj::set2fv ( const float * *f* ) [inline]

Set variable value to a float2.

#### 6.34.2.14 void optix::VariableObj::set3fv ( const float * *f* ) [inline]

Set variable value to a float3.

#### 6.34.2.15 void optix::VariableObj::set4fv ( const float * *f* ) [inline]

Set variable value to a float4.

#### 6.34.2.16 void optix::VariableObj::setFloat ( float *f1* ) [inline]

Set variable value to a scalar float.

#### 6.34.2.17 void optix::VariableObj::setFloat ( optix::float2 *f* ) [inline]

Set variable value to a float2.

#### 6.34.2.18 void optix::VariableObj::setFloat ( float *f1,* float *f2* ) [inline]

Set variable value to a float2.

#### 6.34.2.19 void optix::VariableObj::setFloat ( optix::float3 *f* ) [inline]

Set variable value to a float3.

#### 6.34.2.20 void optix::VariableObj::setFloat ( float *f1,* float *f2,* float *f3* ) [inline]

Set variable value to a float3.

#### 6.34.2.21 void optix::VariableObj::setFloat ( optix::float4 *f* ) [inline]

Set variable value to a float4.

#### 6.34.2.22 void optix::VariableObj::setFloat ( float *f1,* float *f2,* float *f3,* float *f4* ) [inline]

Set variable value to a float4.

#### 6.34.2.23 void optix::VariableObj::setUserData ( RTsize *size,* const void * *ptr* ) [inline]

Set the variable to a user defined type given the sizeof the user object.

# 7 File Documentation

## 7.1 optix.h File Reference

### 7.1.1 Detailed Description

OptiX public API header.

Author

NVIDIA Corporation Includes the host api if compiling host code, includes the cuda api if compiling device code. For the math library routines include optix_math.h

## 7.2 optix_cuda_interop.h File Reference

### Functions

- RTresult RTAPI rtBufferCreateForCUDA (RTcontext context, unsigned int bufferdesc, RTbuffer *buffer)
- RTresult RTAPI rtBufferGetDevicePointer (RTbuffer buffer, int optix_device_ordinal, void **device_pointer)
- RTresult RTAPI rtBufferMarkDirty (RTbuffer buffer)
- RTresult RTAPI rtBufferSetDevicePointer (RTbuffer buffer, int optix_device_ordinal, void *device_pointer)

### 7.2.1 Detailed Description

OptiX public API declarations CUDAInterop.

Author

NVIDIA Corporation OptiX public API declarations for CUDA interoperability

## 7.3 optix_datatypes.h File Reference

### Classes

- struct Ray

### Macros

- #define RT_DEFAULT_MAX 1.e27f

### 7.3.1 Detailed Description

OptiX public API.

Author

NVIDIA Corporation OptiX public API Reference - Datatypes

### 7.3.2 Macro Definition Documentation

#### 7.3.2.1 #define RT_DEFAULT_MAX 1.e27f

Max t for a ray.

## 7.4 optix_declarations.h File Reference

### Enumerations

- enum RTformat {
  RT_FORMAT_UNKNOWN = 0x100,
  RT_FORMAT_FLOAT,
  RT_FORMAT_FLOAT2,
  RT_FORMAT_FLOAT3,
  RT_FORMAT_FLOAT4,
  RT_FORMAT_BYTE,
  RT_FORMAT_BYTE2,
  RT_FORMAT_BYTE3,
  RT_FORMAT_BYTE4,
  RT_FORMAT_UNSIGNED_BYTE,
  RT_FORMAT_UNSIGNED_BYTE2,
  RT_FORMAT_UNSIGNED_BYTE3,
  RT_FORMAT_UNSIGNED_BYTE4,
  RT_FORMAT_SHORT,
  RT_FORMAT_SHORT2,
  RT_FORMAT_SHORT3,
  RT_FORMAT_SHORT4,
  RT_FORMAT_UNSIGNED_SHORT,
  RT_FORMAT_UNSIGNED_SHORT2,
  RT_FORMAT_UNSIGNED_SHORT3,
  RT_FORMAT_UNSIGNED_SHORT4,
  RT_FORMAT_INT,
  RT_FORMAT_INT2,
  RT_FORMAT_INT3,
  RT_FORMAT_INT4,
  RT_FORMAT_UNSIGNED_INT,
  RT_FORMAT_UNSIGNED_INT2,
  RT_FORMAT_UNSIGNED_INT3,
  RT_FORMAT_UNSIGNED_INT4,
  RT_FORMAT_USER,
  RT_FORMAT_BUFFER_ID,
  RT_FORMAT_PROGRAM_ID,
  RT_FORMAT_HALF,
  RT_FORMAT_HALF2,
  RT_FORMAT_HALF3,
  RT_FORMAT_HALF4 }

- enum RTobjecttype {
  RT_OBJECTTYPE_UNKNOWN = 0x200,
  RT_OBJECTTYPE_GROUP,
  RT_OBJECTTYPE_GEOMETRY_GROUP,
  RT_OBJECTTYPE_TRANSFORM,
  RT_OBJECTTYPE_SELECTOR,
  RT_OBJECTTYPE_GEOMETRY_INSTANCE,
  RT_OBJECTTYPE_BUFFER,
  RT_OBJECTTYPE_TEXTURE_SAMPLER,
  RT_OBJECTTYPE_OBJECT,
  RT_OBJECTTYPE_MATRIX_FLOAT2x2,
  RT_OBJECTTYPE_MATRIX_FLOAT2x3,
  RT_OBJECTTYPE_MATRIX_FLOAT2x4,
  RT_OBJECTTYPE_MATRIX_FLOAT3x2,
  RT_OBJECTTYPE_MATRIX_FLOAT3x3,
  RT_OBJECTTYPE_MATRIX_FLOAT3x4,
  RT_OBJECTTYPE_MATRIX_FLOAT4x2,
  RT_OBJECTTYPE_MATRIX_FLOAT4x3,
  RT_OBJECTTYPE_MATRIX_FLOAT4x4,
  RT_OBJECTTYPE_FLOAT,
  RT_OBJECTTYPE_FLOAT2,
  RT_OBJECTTYPE_FLOAT3,
  RT_OBJECTTYPE_FLOAT4,
  RT_OBJECTTYPE_INT,
  RT_OBJECTTYPE_INT2,
  RT_OBJECTTYPE_INT3,
  RT_OBJECTTYPE_INT4,
  RT_OBJECTTYPE_UNSIGNED_INT,
  RT_OBJECTTYPE_UNSIGNED_INT2,
  RT_OBJECTTYPE_UNSIGNED_INT3,
  RT_OBJECTTYPE_UNSIGNED_INT4,
  RT_OBJECTTYPE_USER,
  RT_OBJECTTYPE_PROGRAM,
  RT_OBJECTTYPE_COMMANDLIST,
  RT_OBJECTTYPE_POSTPROCESSINGSTAGE }
- enum RTwrapmode {
  RT_WRAP_REPEAT,
  RT_WRAP_CLAMP_TO_EDGE,
  RT_WRAP_MIRROR,
  RT_WRAP_CLAMP_TO_BORDER }
- enum RTfiltermode {
  RT_FILTER_NEAREST,
  RT_FILTER_LINEAR,
  RT_FILTER_NONE }
- enum RTtexturereadmode {
  RT_TEXTURE_READ_ELEMENT_TYPE = 0,
  RT_TEXTURE_READ_NORMALIZED_FLOAT = 1,
  RT_TEXTURE_READ_ELEMENT_TYPE_SRGB = 2,
  RT_TEXTURE_READ_NORMALIZED_FLOAT_SRGB = 3 }

- enum RTgltarget {
  RT_TARGET_GL_TEXTURE_2D,
  RT_TARGET_GL_TEXTURE_RECTANGLE,
  RT_TARGET_GL_TEXTURE_3D,
  RT_TARGET_GL_RENDER_BUFFER,
  RT_TARGET_GL_TEXTURE_1D,
  RT_TARGET_GL_TEXTURE_1D_ARRAY,
  RT_TARGET_GL_TEXTURE_2D_ARRAY,
  RT_TARGET_GL_TEXTURE_CUBE_MAP,
  RT_TARGET_GL_TEXTURE_CUBE_MAP_ARRAY }
- enum RTtextureindexmode {
  RT_TEXTURE_INDEX_NORMALIZED_COORDINATES,
  RT_TEXTURE_INDEX_ARRAY_INDEX }
- enum RTbuffertype {
  RT_BUFFER_INPUT = 0x1,
  RT_BUFFER_OUTPUT = 0x2,
  RT_BUFFER_INPUT_OUTPUT = RT_BUFFER_INPUT | RT_BUFFER_OUTPUT,
  RT_BUFFER_PROGRESSIVE_STREAM = 0x10 }
- enum RTbufferflag {
  RT_BUFFER_GPU_LOCAL = 0x4,
  RT_BUFFER_COPY_ON_DIRTY = 0x8,
  RT_BUFFER_LAYERED = 0x200000,
  RT_BUFFER_CUBEMAP = 0x400000 }
- enum RTbuffermapflag {
  RT_BUFFER_MAP_READ = 0x1,
  RT_BUFFER_MAP_READ_WRITE = 0x2,
  RT_BUFFER_MAP_WRITE = 0x4,
  RT_BUFFER_MAP_WRITE_DISCARD = 0x8 }
- enum RTexception {
  RT_EXCEPTION_PROGRAM_ID_INVALID = 0x3EE,
  RT_EXCEPTION_TEXTURE_ID_INVALID = 0x3EF,
  RT_EXCEPTION_BUFFER_ID_INVALID = 0x3FA,
  RT_EXCEPTION_INDEX_OUT_OF_BOUNDS = 0x3FB,
  RT_EXCEPTION_STACK_OVERFLOW = 0x3FC,
  RT_EXCEPTION_BUFFER_INDEX_OUT_OF_BOUNDS = 0x3FD,
  RT_EXCEPTION_INVALID_RAY = 0x3FE,
  RT_EXCEPTION_INTERNAL_ERROR = 0x3FF,
  RT_EXCEPTION_USER = 0x400,
  RT_EXCEPTION_ALL = 0x7FFFFFFF }

- enum RTresult {
  RT_SUCCESS = 0,
  RT_TIMEOUT_CALLBACK = 0x100,
  RT_ERROR_INVALID_CONTEXT = 0x500,
  RT_ERROR_INVALID_VALUE = 0x501,
  RT_ERROR_MEMORY_ALLOCATION_FAILED = 0x502,
  RT_ERROR_TYPE_MISMATCH = 0x503,
  RT_ERROR_VARIABLE_NOT_FOUND = 0x504,
  RT_ERROR_VARIABLE_REDECLARED = 0x505,
  RT_ERROR_ILLEGAL_SYMBOL = 0x506,
  RT_ERROR_INVALID_SOURCE = 0x507,
  RT_ERROR_VERSION_MISMATCH = 0x508,
  RT_ERROR_OBJECT_CREATION_FAILED = 0x600,
  RT_ERROR_NO_DEVICE = 0x601,
  RT_ERROR_INVALID_DEVICE = 0x602,
  RT_ERROR_INVALID_IMAGE = 0x603,
  RT_ERROR_FILE_NOT_FOUND = 0x604,
  RT_ERROR_ALREADY_MAPPED = 0x605,
  RT_ERROR_INVALID_DRIVER_VERSION = 0x606,
  RT_ERROR_CONTEXT_CREATION_FAILED = 0x607,
  RT_ERROR_RESOURCE_NOT_REGISTERED = 0x608,
  RT_ERROR_RESOURCE_ALREADY_REGISTERED = 0x609,
  RT_ERROR_LAUNCH_FAILED = 0x900,
  RT_ERROR_NOT_SUPPORTED = 0xA00,
  RT_ERROR_CONNECTION_FAILED = 0xB00,
  RT_ERROR_AUTHENTICATION_FAILED = 0xB01,
  RT_ERROR_CONNECTION_ALREADY_EXISTS = 0xB02,
  RT_ERROR_NETWORK_LOAD_FAILED = 0xB03,
  RT_ERROR_NETWORK_INIT_FAILED = 0xB04,
  RT_ERROR_CLUSTER_NOT_RUNNING = 0xB06,
  RT_ERROR_CLUSTER_ALREADY_RUNNING = 0xB07,
  RT_ERROR_INSUFFICIENT_FREE_NODES = 0xB08,
  RT_ERROR_UNKNOWN = ~0 }
- enum RTdeviceattribute {
  RT_DEVICE_ATTRIBUTE_MAX_THREADS_PER_BLOCK,
  RT_DEVICE_ATTRIBUTE_CLOCK_RATE,
  RT_DEVICE_ATTRIBUTE_MULTIPROCESSOR_COUNT,
  RT_DEVICE_ATTRIBUTE_EXECUTION_TIMEOUT_ENABLED,
  RT_DEVICE_ATTRIBUTE_MAX_HARDWARE_TEXTURE_COUNT,
  RT_DEVICE_ATTRIBUTE_NAME,
  RT_DEVICE_ATTRIBUTE_COMPUTE_CAPABILITY,
  RT_DEVICE_ATTRIBUTE_TOTAL_MEMORY,
  RT_DEVICE_ATTRIBUTE_TCC_DRIVER,
  RT_DEVICE_ATTRIBUTE_CUDA_DEVICE_ORDINAL }
- enum RTremotedeviceattribute {
  RT_REMOTEDEVICE_ATTRIBUTE_CLUSTER_URL,
  RT_REMOTEDEVICE_ATTRIBUTE_HEAD_NODE_URL,
  RT_REMOTEDEVICE_ATTRIBUTE_NUM_CONFIGURATIONS,
  RT_REMOTEDEVICE_ATTRIBUTE_STATUS,
  RT_REMOTEDEVICE_ATTRIBUTE_NUM_TOTAL_NODES,
  RT_REMOTEDEVICE_ATTRIBUTE_NUM_FREE_NODES,
  RT_REMOTEDEVICE_ATTRIBUTE_NUM_RESERVED_NODES,
  RT_REMOTEDEVICE_ATTRIBUTE_NAME,
  RT_REMOTEDEVICE_ATTRIBUTE_NUM_GPUS,
  RT_REMOTEDEVICE_ATTRIBUTE_GPU_TOTAL_MEMORY,
  RT_REMOTEDEVICE_ATTRIBUTE_CONFIGURATIONS =0x040000000 }

- enum RTremotedevicestatus {
  RT_REMOTEDEVICE_STATUS_READY,
  RT_REMOTEDEVICE_STATUS_CONNECTED,
  RT_REMOTEDEVICE_STATUS_RESERVED,
  RT_REMOTEDEVICE_STATUS_DISCONNECTED = ~0 }
- enum RTcontextattribute {
  RT_CONTEXT_ATTRIBUTE_MAX_TEXTURE_COUNT,
  RT_CONTEXT_ATTRIBUTE_CPU_NUM_THREADS,
  RT_CONTEXT_ATTRIBUTE_USED_HOST_MEMORY,
  RT_CONTEXT_ATTRIBUTE_GPU_PAGING_ACTIVE,
  RT_CONTEXT_ATTRIBUTE_GPU_PAGING_FORCED_OFF,
  RT_CONTEXT_ATTRIBUTE_AVAILABLE_DEVICE_MEMORY = 0x10000000 }
- enum RTbufferattribute {
  RT_BUFFER_ATTRIBUTE_STREAM_FORMAT,
  RT_BUFFER_ATTRIBUTE_STREAM_BITRATE,
  RT_BUFFER_ATTRIBUTE_STREAM_FPS,
  RT_BUFFER_ATTRIBUTE_STREAM_GAMMA }
- enum RTmotionbordermode {
  RT_MOTIONBORDERMODE_CLAMP,
  RT_MOTIONBORDERMODE_VANISH }
- enum RTmotionkeytype {
  RT_MOTIONKEYTYPE_MATRIX_FLOAT12,
  RT_MOTIONKEYTYPE_SRT_FLOAT16 }
- enum RTbufferidnull { RT_BUFFER_ID_NULL = 0 }
- enum RTprogramidnull { RT_PROGRAM_ID_NULL = 0 }
- enum RTtextureidnull { RT_TEXTURE_ID_NULL = 0 }
- enum RTcommandlistidnull { RT_COMMAND_LIST_ID_NULL = 0 }
- enum RTpostprocessingstagenull { RT_POSTPROCESSING_STAGE_ID_NULL = 0 }

### 7.4.1 Detailed Description

OptiX public API declarations.

Author

NVIDIA Corporation OptiX public API declarations

### 7.4.2 Enumeration Type Documentation

#### 7.4.2.1 enum RTbufferattribute

Buffer attributes.

Enumerator

***RT_BUFFER_ATTRIBUTE_STREAM_FORMAT*** Format string.

***RT_BUFFER_ATTRIBUTE_STREAM_BITRATE*** sizeof(int)

***RT_BUFFER_ATTRIBUTE_STREAM_FPS*** sizeof(int)

***RT_BUFFER_ATTRIBUTE_STREAM_GAMMA*** sizeof(float)

#### 7.4.2.2 enum RTbufferflag

Buffer flags.

Enumerator

***RT_BUFFER_GPU_LOCAL*** An RT_BUFFER_INPUT_OUTPUT has separate copies on each device that are not synchronized.

***RT_BUFFER_COPY_ON_DIRTY*** A CUDA Interop buffer will only be synchronized across devices when dirtied by rtBufferMap or rtBufferMarkDirty.

***RT_BUFFER_LAYERED*** Depth specifies the number of layers, not the depth of a 3D array.

***RT_BUFFER_CUBEMAP*** Enables creation of cubemaps. If this flag is set, Width must be equal to Height, and Depth must be six. If the RT_BUFFER_LAYERED flag is also set, then Depth must be a multiple of six

#### 7.4.2.3 enum RTbufferidnull

Sentinel values.

Enumerator

***RT_BUFFER_ID_NULL*** sentinel for describing a non-existent buffer id

#### 7.4.2.4 enum RTbuffermapflag

Buffer mapping flags.

Enumerator

***RT_BUFFER_MAP_READ*** Map buffer memory for reading.

***RT_BUFFER_MAP_READ_WRITE*** Map buffer memory for both reading and writing.

***RT_BUFFER_MAP_WRITE*** Map buffer memory for writing.

***RT_BUFFER_MAP_WRITE_DISCARD*** Map buffer memory for writing, with the previous contents being undefined.

#### 7.4.2.5 enum RTbuffertype

Buffer type.

Enumerator

***RT_BUFFER_INPUT*** Input buffer for the GPU.

***RT_BUFFER_OUTPUT*** Output buffer for the GPU.

***RT_BUFFER_INPUT_OUTPUT*** Ouput/Input buffer for the GPU.

***RT_BUFFER_PROGRESSIVE_STREAM*** Progressive stream buffer.

#### 7.4.2.6 enum RTcommandlistidnull

Enumerator

***RT_COMMAND_LIST_ID_NULL*** sentinel for describing a non-existent command list id

#### 7.4.2.7 enum RTcontextattribute

Context attributes.

Enumerator

***RT_CONTEXT_ATTRIBUTE_MAX_TEXTURE_COUNT*** sizeof(int)
***RT_CONTEXT_ATTRIBUTE_CPU_NUM_THREADS*** sizeof(int)
***RT_CONTEXT_ATTRIBUTE_USED_HOST_MEMORY*** sizeof(RTsize)
***RT_CONTEXT_ATTRIBUTE_GPU_PAGING_ACTIVE*** sizeof(int)
***RT_CONTEXT_ATTRIBUTE_GPU_PAGING_FORCED_OFF*** sizeof(int)
***RT_CONTEXT_ATTRIBUTE_AVAILABLE_DEVICE_MEMORY*** sizeof(RTsize)

#### 7.4.2.8 enum RTdeviceattribute

Device attributes.

Enumerator

***RT_DEVICE_ATTRIBUTE_MAX_THREADS_PER_BLOCK*** Max Threads per Block.
***RT_DEVICE_ATTRIBUTE_CLOCK_RATE*** Clock rate.
***RT_DEVICE_ATTRIBUTE_MULTIPROCESSOR_COUNT*** Multiprocessor count.
***RT_DEVICE_ATTRIBUTE_EXECUTION_TIMEOUT_ENABLED*** Execution timeout enabled.
***RT_DEVICE_ATTRIBUTE_MAX_HARDWARE_TEXTURE_COUNT*** Hardware Texture count.
***RT_DEVICE_ATTRIBUTE_NAME*** Attribute Name.
***RT_DEVICE_ATTRIBUTE_COMPUTE_CAPABILITY*** Compute Capabilities.
***RT_DEVICE_ATTRIBUTE_TOTAL_MEMORY*** Total Memory.
***RT_DEVICE_ATTRIBUTE_TCC_DRIVER*** sizeof(int)
***RT_DEVICE_ATTRIBUTE_CUDA_DEVICE_ORDINAL*** sizeof(int)

#### 7.4.2.9 enum RTexception

Exceptions.

Enumerator

***RT_EXCEPTION_PROGRAM_ID_INVALID*** Program ID not valid.
***RT_EXCEPTION_TEXTURE_ID_INVALID*** Texture ID not valid.
***RT_EXCEPTION_BUFFER_ID_INVALID*** Buffer ID not valid.
***RT_EXCEPTION_INDEX_OUT_OF_BOUNDS*** Index out of bounds.
***RT_EXCEPTION_STACK_OVERFLOW*** Stack overflow.
***RT_EXCEPTION_BUFFER_INDEX_OUT_OF_BOUNDS*** Buffer index out of bounds.
***RT_EXCEPTION_INVALID_RAY*** Invalid ray.
***RT_EXCEPTION_INTERNAL_ERROR*** Internal error.
***RT_EXCEPTION_USER*** User exception.
***RT_EXCEPTION_ALL*** All exceptions.

#### 7.4.2.10 enum RTfiltermode

Filter mode.

Enumerator

***RT_FILTER_NEAREST*** Nearest.
***RT_FILTER_LINEAR*** Linear.
***RT_FILTER_NONE*** No filter.

#### 7.4.2.11 enum RTformat

OptiX formats.

Enumerator

***RT_FORMAT_UNKNOWN*** Format unknown.
***RT_FORMAT_FLOAT*** Float.
***RT_FORMAT_FLOAT2*** sizeof(float)∗2
***RT_FORMAT_FLOAT3*** sizeof(float)∗3
***RT_FORMAT_FLOAT4*** sizeof(float)∗4
***RT_FORMAT_BYTE*** BYTE.
***RT_FORMAT_BYTE2*** sizeof(CHAR)∗2
***RT_FORMAT_BYTE3*** sizeof(CHAR)∗3
***RT_FORMAT_BYTE4*** sizeof(CHAR)∗4
***RT_FORMAT_UNSIGNED_BYTE*** UCHAR.
***RT_FORMAT_UNSIGNED_BYTE2*** sizeof(UCHAR)∗2
***RT_FORMAT_UNSIGNED_BYTE3*** sizeof(UCHAR)∗3
***RT_FORMAT_UNSIGNED_BYTE4*** sizeof(UCHAR)∗4
***RT_FORMAT_SHORT*** SHORT.
***RT_FORMAT_SHORT2*** sizeof(SHORT)∗2
***RT_FORMAT_SHORT3*** sizeof(SHORT)∗3
***RT_FORMAT_SHORT4*** sizeof(SHORT)∗4
***RT_FORMAT_UNSIGNED_SHORT*** USHORT.
***RT_FORMAT_UNSIGNED_SHORT2*** sizeof(USHORT)∗2
***RT_FORMAT_UNSIGNED_SHORT3*** sizeof(USHORT)∗3
***RT_FORMAT_UNSIGNED_SHORT4*** sizeof(USHORT)∗4
***RT_FORMAT_INT*** INT.
***RT_FORMAT_INT2*** sizeof(INT)∗2
***RT_FORMAT_INT3*** sizeof(INT)∗3
***RT_FORMAT_INT4*** sizeof(INT)∗4
***RT_FORMAT_UNSIGNED_INT*** sizeof(UINT)
***RT_FORMAT_UNSIGNED_INT2*** sizeof(UINT)∗2
***RT_FORMAT_UNSIGNED_INT3*** sizeof(UINT)∗3
***RT_FORMAT_UNSIGNED_INT4*** sizeof(UINT)∗4
***RT_FORMAT_USER*** User Format.
***RT_FORMAT_BUFFER_ID*** Buffer Id.
***RT_FORMAT_PROGRAM_ID*** Program Id.
***RT_FORMAT_HALF*** half float
***RT_FORMAT_HALF2*** sizeof(half float)∗2
***RT_FORMAT_HALF3*** sizeof(half float)∗3
***RT_FORMAT_HALF4*** sizeof(half float)∗4

#### 7.4.2.12 enum RTgltarget

GL Target.

Enumerator

***RT_TARGET_GL_TEXTURE_2D*** GL texture 2D.
***RT_TARGET_GL_TEXTURE_RECTANGLE*** GL texture rectangle.
***RT_TARGET_GL_TEXTURE_3D*** GL texture 3D.
***RT_TARGET_GL_RENDER_BUFFER*** GL render buffer.
***RT_TARGET_GL_TEXTURE_1D*** GL texture 1D.
***RT_TARGET_GL_TEXTURE_1D_ARRAY*** GL array of 1D textures.
***RT_TARGET_GL_TEXTURE_2D_ARRAY*** GL array of 2D textures.
***RT_TARGET_GL_TEXTURE_CUBE_MAP*** GL cube map texture.
***RT_TARGET_GL_TEXTURE_CUBE_MAP_ARRAY*** GL array of cube maps.

#### 7.4.2.13 enum RTmotionbordermode

Motion border modes.

Enumerator

***RT_MOTIONBORDERMODE_CLAMP*** Clamp outside of bounds.
***RT_MOTIONBORDERMODE_VANISH*** Vanish outside of bounds.

#### 7.4.2.14 enum RTmotionkeytype

Motion key type.

Enumerator

***RT_MOTIONKEYTYPE_MATRIX_FLOAT12*** Affine matrix format - 12 floats.
***RT_MOTIONKEYTYPE_SRT_FLOAT16*** SRT format - 16 floats.

#### 7.4.2.15 enum RTobjecttype

OptiX Object Types.

Enumerator

***RT_OBJECTTYPE_UNKNOWN*** Object Type Unknown.
***RT_OBJECTTYPE_GROUP*** Group Type.
***RT_OBJECTTYPE_GEOMETRY_GROUP*** Geometry Group Type.
***RT_OBJECTTYPE_TRANSFORM*** Transform Type.
***RT_OBJECTTYPE_SELECTOR*** Selector Type.
***RT_OBJECTTYPE_GEOMETRY_INSTANCE*** Geometry Instance Type.
***RT_OBJECTTYPE_BUFFER*** Buffer Type.
***RT_OBJECTTYPE_TEXTURE_SAMPLER*** Texture Sampler Type.
***RT_OBJECTTYPE_OBJECT*** Object Type.
***RT_OBJECTTYPE_MATRIX_FLOAT2x2*** Matrix Float 2x2.
***RT_OBJECTTYPE_MATRIX_FLOAT2x3*** Matrix Float 2x3.

***RT_OBJECTTYPE_MATRIX_FLOAT2x4*** Matrix Float 2x4.

***RT_OBJECTTYPE_MATRIX_FLOAT3x2*** Matrix Float 3x2.

***RT_OBJECTTYPE_MATRIX_FLOAT3x3*** Matrix Float 3x3.

***RT_OBJECTTYPE_MATRIX_FLOAT3x4*** Matrix Float 3x4.

***RT_OBJECTTYPE_MATRIX_FLOAT4x2*** Matrix Float 4x2.

***RT_OBJECTTYPE_MATRIX_FLOAT4x3*** Matrix Float 4x3.

***RT_OBJECTTYPE_MATRIX_FLOAT4x4*** Matrix Float 4x4.

***RT_OBJECTTYPE_FLOAT*** Float Type.

***RT_OBJECTTYPE_FLOAT2*** Float2 Type.

***RT_OBJECTTYPE_FLOAT3*** Float3 Type.

***RT_OBJECTTYPE_FLOAT4*** Float4 Type.

***RT_OBJECTTYPE_INT*** Integer Type.

***RT_OBJECTTYPE_INT2*** Integer2 Type.

***RT_OBJECTTYPE_INT3*** Integer3 Type.

***RT_OBJECTTYPE_INT4*** Integer4 Type.

***RT_OBJECTTYPE_UNSIGNED_INT*** Unsigned Integer Type.

***RT_OBJECTTYPE_UNSIGNED_INT2*** Unsigned Integer2 Type.

***RT_OBJECTTYPE_UNSIGNED_INT3*** Unsigned Integer3 Type.

***RT_OBJECTTYPE_UNSIGNED_INT4*** Unsigned Integer4 Type.

***RT_OBJECTTYPE_USER*** User Object Type.

***RT_OBJECTTYPE_PROGRAM*** Object Type Program - Added in OptiX 3.0.

***RT_OBJECTTYPE_COMMANDLIST*** Object Type Command List - Added in OptiX 5.0.

***RT_OBJECTTYPE_POSTPROCESSINGSTAGE*** Object Type Postprocessing Stage - Added in OptiX 5.0.

#### 7.4.2.16 enum RTpostprocessingstagenull

Enumerator

***RT_POSTPROCESSING_STAGE_ID_NULL*** sentinel for describing a non-existent post-processing stage id

#### 7.4.2.17 enum RTprogramidnull

Enumerator

***RT_PROGRAM_ID_NULL*** sentinel for describing a non-existent program id

#### 7.4.2.18 enum RTremotedeviceattribute

RemoteDevice attributes.

Enumerator

***RT_REMOTEDEVICE_ATTRIBUTE_CLUSTER_URL*** URL for the Cluster Manager.

***RT_REMOTEDEVICE_ATTRIBUTE_HEAD_NODE_URL*** URL for the Head Node.

***RT_REMOTEDEVICE_ATTRIBUTE_NUM_CONFIGURATIONS*** Number of available configurations.

***RT_REMOTEDEVICE_ATTRIBUTE_STATUS*** Status.

***RT_REMOTEDEVICE_ATTRIBUTE_NUM_TOTAL_NODES*** Number of total nodes.

***RT_REMOTEDEVICE_ATTRIBUTE_NUM_FREE_NODES*** Number of free nodes.

***RT_REMOTEDEVICE_ATTRIBUTE_NUM_RESERVED_NODES*** Number of reserved nodes.

***RT_REMOTEDEVICE_ATTRIBUTE_NAME*** Name.

***RT_REMOTEDEVICE_ATTRIBUTE_NUM_GPUS*** Number of GPUs.

***RT_REMOTEDEVICE_ATTRIBUTE_GPU_TOTAL_MEMORY*** Total Memory (per GPU, in bytes)

***RT_REMOTEDEVICE_ATTRIBUTE_CONFIGURATIONS*** List of descriptions for the available configurations.

#### 7.4.2.19 enum RTremotedevicestatus

Enumerator

***RT_REMOTEDEVICE_STATUS_READY*** RemoteDevice Status Ready.

***RT_REMOTEDEVICE_STATUS_CONNECTED*** RemoteDevice Status Connected.

***RT_REMOTEDEVICE_STATUS_RESERVED*** RemoteDevice Status Reserved.

***RT_REMOTEDEVICE_STATUS_DISCONNECTED*** RemoteDevice Status Disconnected.

#### 7.4.2.20 enum RTresult

Result.

Enumerator

***RT_SUCCESS*** Success.

***RT_TIMEOUT_CALLBACK*** Timeout callback.

***RT_ERROR_INVALID_CONTEXT*** Invalid Context.

***RT_ERROR_INVALID_VALUE*** Invalid Value.

***RT_ERROR_MEMORY_ALLOCATION_FAILED*** Timeout callback.

***RT_ERROR_TYPE_MISMATCH*** Type Mismatch.

***RT_ERROR_VARIABLE_NOT_FOUND*** Variable not found.

***RT_ERROR_VARIABLE_REDECLARED*** Variable redeclared.

***RT_ERROR_ILLEGAL_SYMBOL*** Illegal symbol.

***RT_ERROR_INVALID_SOURCE*** Invalid source.

***RT_ERROR_VERSION_MISMATCH*** Version mismatch.

***RT_ERROR_OBJECT_CREATION_FAILED*** Object creation failed.

***RT_ERROR_NO_DEVICE*** No device.

***RT_ERROR_INVALID_DEVICE*** Invalid device.

***RT_ERROR_INVALID_IMAGE*** Invalid image.

***RT_ERROR_FILE_NOT_FOUND*** File not found.

***RT_ERROR_ALREADY_MAPPED*** Already mapped.

***RT_ERROR_INVALID_DRIVER_VERSION*** Invalid driver version.

***RT_ERROR_CONTEXT_CREATION_FAILED*** Context creation failed.

***RT_ERROR_RESOURCE_NOT_REGISTERED*** Resource not registered.

***RT_ERROR_RESOURCE_ALREADY_REGISTERED*** Resource already registered.

***RT_ERROR_LAUNCH_FAILED*** Launch failed.

***RT_ERROR_NOT_SUPPORTED*** Not supported.

***RT_ERROR_CONNECTION_FAILED*** Connection failed.

***RT_ERROR_AUTHENTICATION_FAILED*** Authentication failed.

***RT_ERROR_CONNECTION_ALREADY_EXISTS*** Connection already exists.

***RT_ERROR_NETWORK_LOAD_FAILED*** Network component failed to load.

***RT_ERROR_NETWORK_INIT_FAILED*** Network initialization failed.

***RT_ERROR_CLUSTER_NOT_RUNNING*** No cluster is running.

***RT_ERROR_CLUSTER_ALREADY_RUNNING*** Cluster is already running.

***RT_ERROR_INSUFFICIENT_FREE_NODES*** Not enough free nodes.

***RT_ERROR_UNKNOWN*** Error unknown.

#### 7.4.2.21 enum RTtextureidnull

Enumerator

***RT_TEXTURE_ID_NULL*** sentinel for describing a non-existent texture id

#### 7.4.2.22 enum RTtextureindexmode

Texture index mode.

Enumerator

***RT_TEXTURE_INDEX_NORMALIZED_COORDINATES*** Texture Index normalized coordinates.

***RT_TEXTURE_INDEX_ARRAY_INDEX*** Texture Index Array.

#### 7.4.2.23 enum RTtexturereadmode

Texture read mode.

Enumerator

***RT_TEXTURE_READ_ELEMENT_TYPE*** Read element type.

***RT_TEXTURE_READ_NORMALIZED_FLOAT*** Read normalized float.

***RT_TEXTURE_READ_ELEMENT_TYPE_SRGB*** Read element type and apply sRGB to linear conversion during texture read for 8-bit integer buffer formats.

***RT_TEXTURE_READ_NORMALIZED_FLOAT_SRGB*** Read normalized float and apply sRGB to linear conversion during texture read for 8-bit integer buffer formats.

#### 7.4.2.24 enum RTwrapmode

Wrap mode.

Enumerator

***RT_WRAP_REPEAT*** Wrap repeat.

***RT_WRAP_CLAMP_TO_EDGE*** Clamp to edge.

***RT_WRAP_MIRROR*** Mirror.

***RT_WRAP_CLAMP_TO_BORDER*** Clamp to border.

## 7.5 optix_defines.h File Reference

### Enumerations

- enum RTtransformkind { RT_WORLD_TO_OBJECT = 0xf00, RT_OBJECT_TO_WORLD }
- enum RTtransformflags { RT_INTERNAL_INVERSE_TRANSPOSE = 0x1000 }

### 7.5.1 Detailed Description

OptiX public API.

Author

NVIDIA Corporation OptiX public API Reference - Definitions

### 7.5.2 Enumeration Type Documentation

#### 7.5.2.1 enum RTtransformflags

Transform flags.

Enumerator

***RT_INTERNAL_INVERSE_TRANSPOSE*** Inverse transpose flag.

#### 7.5.2.2 enum RTtransformkind

Transform type.

Enumerator

***RT_WORLD_TO_OBJECT*** World to Object transformation.

***RT_OBJECT_TO_WORLD*** Object to World transformation.

## 7.6 optix_device.h File Reference

### Classes

- struct rtObject
- struct optix::bufferId< T, Dim >
- struct optix::bufferId< T, Dim >

### Macros

- #define rtDeclareVariable(type, name, semantic, annotation)
- #define rtDeclareAnnotation(variable, annotation)
- #define rtCallableProgram(return_type, function_name, parameter_list)
- #define rtBuffer __device__ optix::buffer

- #define rtBufferId optix::bufferId
- #define rtTextureSampler texture
- #define RT_PROGRAM __global__
- #define rtCallableProgramId optix::callableProgramId
- #define rtCallableProgramX optix::boundCallableProgramId

### Functions

- template<class T >
  static __device__ void rtTrace (rtObject topNode, optix::Ray ray, T &prd)
- static __device__ bool rtPotentialIntersection (float tmin)
- static __device__ bool rtReportIntersection (unsigned int material)
- static __device__ void rtIgnoreIntersection ()
- static __device__ void rtTerminateRay ()
- static __device__ void rtIntersectChild (unsigned int index)
- static __device__ float3 rtTransformPoint (RTtransformkind kind, const float3 &p)
- static __device__ float3 rtTransformVector (RTtransformkind kind, const float3 &v)
- static __device__ float3 rtTransformNormal (RTtransformkind kind, const float3 &n)
- static __device__ void rtGetTransform (RTtransformkind kind, float matrix[16])
- static __device__ void rtThrow (unsigned int code)
- static __device__ unsigned int rtGetExceptionCode ()
- static __device__ void rtPrintExceptionDetails ()

- static __device__ void rtPrintf (const char *fmt)
- template<typename T1 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1)
- template<typename T1 , typename T2 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1, T2 arg2)
- template<typename T1 , typename T2 , typename T3 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1, T2 arg2, T3 arg3)
- template<typename T1 , typename T2 , typename T3 , typename T4 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1, T2 arg2, T3 arg3, T4 arg4)
- template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1, T2 arg2, T3 arg3, T4 arg4, T5 arg5)
- template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 , typename T6 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1, T2 arg2, T3 arg3, T4 arg4, T5 arg5, T6 arg6)
- template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 , typename T6 , typename T7 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1, T2 arg2, T3 arg3, T4 arg4, T5 arg5, T6 arg6, T7 arg7)
- template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 , typename T6 , typename T7 , typename T8 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1, T2 arg2, T3 arg3, T4 arg4, T5 arg5, T6 arg6, T7 arg7, T8 arg8)
- template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 , typename T6 , typename T7 , typename T8 , typename T9 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1, T2 arg2, T3 arg3, T4 arg4, T5 arg5, T6 arg6, T7 arg7, T8 arg8, T9 arg9)
- template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 , typename T6 , typename T7 , typename T8 , typename T9 , typename T10 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1, T2 arg2, T3 arg3, T4 arg4, T5 arg5, T6 arg6, T7 arg7, T8 arg8, T9 arg9, T10 arg10)

- template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 , typename T6 , typename T7 , typename T8 , typename T9 , typename T10 , typename T11 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1, T2 arg2, T3 arg3, T4 arg4, T5 arg5, T6 arg6, T7 arg7, T8 arg8, T9 arg9, T10 arg10, T11 arg11)
- template<typename T1 , typename T2 , typename T3 , typename T4 , typename T5 , typename T6 , typename T7 , typename T8 , typename T9 , typename T10 , typename T11 , typename T12 >
  static __device__ void rtPrintf (const char *fmt, T1 arg1, T2 arg2, T3 arg3, T4 arg4, T5 arg5, T6 arg6, T7 arg7, T8 arg8, T9 arg9, T10 arg10, T11 arg11, T12 arg12)

- rtTextureId **optix::id**
- rtTextureId float **optix::x**
- * **optix::retVal** = tmp
- rtTextureId float float **optix::y**
- rtTextureId float float float **optix::z**
- rtTextureId float float int **optix::comp**
- rtTextureId float float **optix::dPdx**
- rtTextureId float float float **optix::dPdy**
- rtTextureId float int **optix::layer**
- rtTextureId float float **optix::level**
- __device__ uint3 optix::rtTexSize (rtTextureId id)
- template<typename T >
  __device__ T **optix::rtTex1D** (rtTextureId id, float x)
- template<>
  __device__ float4 **optix::rtTex1D** (rtTextureId id, float x)
- template<>
  __device__ int4 **optix::rtTex1D** (rtTextureId id, float x)
- template<>
  __device__ uint4 **optix::rtTex1D** (rtTextureId id, float x)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTex1D,(rtTextureId id, float x),(id, x)) template< typename T > inline __device__ void rtTex1D(T *retVal
- template<typename T >
  __device__ T **optix::rtTex1DFetch** (rtTextureId id, int x)
- template<>
  __device__ float4 **optix::rtTex1DFetch** (rtTextureId id, int x)
- template<>
  __device__ int4 **optix::rtTex1DFetch** (rtTextureId id, int x)
- template<>
  __device__ uint4 **optix::rtTex1DFetch** (rtTextureId id, int x)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTex1DFetch,(rtTextureId id, int x),(id, x)) template< typename T > inline __device__ void rtTex1DFetch(T *retVal
- template<typename T >
  __device__ T **optix::rtTex2D** (rtTextureId id, float x, float y)
- template<>
  __device__ float4 **optix::rtTex2D** (rtTextureId id, float x, float y)
- template<>
  __device__ int4 **optix::rtTex2D** (rtTextureId id, float x, float y)
- template<>
  __device__ uint4 **optix::rtTex2D** (rtTextureId id, float x, float y)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTex2D,(rtTextureId id, float x, float y),(id, x, y)) template< typename T > inline __device__ void rtTex2D(T *retVal
- template<typename T >
  __device__ T **optix::rtTex2DFetch** (rtTextureId id, int x, int y)

- template<>
  __device__ float4 **optix::rtTex2DFetch** (rtTextureId id, int x, int y)
- template<>
  __device__ int4 **optix::rtTex2DFetch** (rtTextureId id, int x, int y)
- template<>
  __device__ uint4 **optix::rtTex2DFetch** (rtTextureId id, int x, int y)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTex2DFetch,(rtTextureId id, int x, int y),(id, x, y)) template< typename T > inline __device__ void rtTex2DFetch(T *retVal
- template<typename T >
  __device__ T **optix::rtTex3D** (rtTextureId id, float x, float y, float z)
- template<>
  __device__ float4 **optix::rtTex3D** (rtTextureId id, float x, float y, float z)
- template<>
  __device__ int4 **optix::rtTex3D** (rtTextureId id, float x, float y, float z)
- template<>
  __device__ uint4 **optix::rtTex3D** (rtTextureId id, float x, float y, float z)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTex3D,(rtTextureId id, float x, float y, float z),(id, x, y, z)) template< typename T > inline __device__ void rtTex3D(T *retVal
- template<typename T >
  __device__ T **optix::rtTex3DFetch** (rtTextureId id, int x, int y, int z)
- template<>
  __device__ float4 **optix::rtTex3DFetch** (rtTextureId id, int x, int y, int z)
- template<>
  __device__ int4 **optix::rtTex3DFetch** (rtTextureId id, int x, int y, int z)
- template<>
  __device__ uint4 **optix::rtTex3DFetch** (rtTextureId id, int x, int y, int z)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTex3DFetch,(rtTextureId id, int x, int y, int z),(id, x, y, z)) template< typename T > inline __device__ void rtTex3DFetch(T *retVal
- template<typename T >
  __device__ T **optix::rtTex2DGather** (rtTextureId id, float x, float y, int comp=0)
- template<>
  __device__ float4 **optix::rtTex2DGather** (rtTextureId id, float x, float y, int comp)
- template<>
  __device__ int4 **optix::rtTex2DGather** (rtTextureId id, float x, float y, int comp)
- template<>
  __device__ uint4 **optix::rtTex2DGather** (rtTextureId id, float x, float y, int comp)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTex2DGather,(rtTextureId id, float x, float y, int comp),(id, x, y, comp)) template< typename T > inline __device__ void rtTex2DGather(T *retVal
- template<>
  __device__ float4 **optix::rtTex1DGrad** (rtTextureId id, float x, float dPdx, float dPdy)
- template<>
  __device__ int4 **optix::rtTex1DGrad** (rtTextureId id, float x, float dPdx, float dPdy)
- template<>
  __device__ uint4 **optix::rtTex1DGrad** (rtTextureId id, float x, float dPdx, float dPdy)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTex1DGrad,(rtTextureId id, float x, float dPdx, float dPdy),(id, x, dPdx, dPdy)) template< typename T > inline __device__ void rtTex1DGrad(T *retVal
- template<typename T >
  __device__ T **optix::rtTex2DGrad** (rtTextureId id, float x, float y, float2 dPdx, float2 dPdy)
- template<>
  __device__ float4 **optix::rtTex2DGrad** (rtTextureId id, float x, float y, float2 dPdx, float2 dPdy)
- template<>
  __device__ int4 **optix::rtTex2DGrad** (rtTextureId id, float x, float y, float2 dPdx, float2 dPdy)

- template<>
  __device__ uint4 **optix::rtTex2DGrad** (rtTextureId id, float x, float y, float2 dPdx, float2 dPdy)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTex2DGrad,(rtTextureId id, float x, float y, float2 dPdx, float2 dPdy),(id, x, y, dPdx, dPdy)) template< typename T > inline __device__ void rtTex2DGrad(T *retVal
- template<typename T >
  __device__ T **optix::rtTex3DGrad** (rtTextureId id, float x, float y, float z, float4 dPdx, float4 dPdy)
- template<>
  __device__ float4 **optix::rtTex3DGrad** (rtTextureId id, float x, float y, float z, float4 dPdx, float4 dPdy)
- template<>
  __device__ int4 **optix::rtTex3DGrad** (rtTextureId id, float x, float y, float z, float4 dPdx, float4 dPdy)
- template<>
  __device__ uint4 **optix::rtTex3DGrad** (rtTextureId id, float x, float y, float z, float4 dPdx, float4 dPdy)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTex3DGrad,(rtTextureId id, float x, float y, float z, float4 dPdx, float4 dPdy),(id, x, y, z, dPdx, dPdy)) template< typename T > inline __device__ void rtTex3DGrad(T *retVal
- template<typename T >
  __device__ T **optix::rtTex1DLayeredGrad** (rtTextureId id, float x, int layer, float dPdx, float dPdy)
- template<>
  __device__ float4 **optix::rtTex1DLayeredGrad** (rtTextureId id, float x, int layer, float dPdx, float dPdy)
- template<>
  __device__ int4 **optix::rtTex1DLayeredGrad** (rtTextureId id, float x, int layer, float dPdx, float dPdy)
- template<>
  __device__ uint4 **optix::rtTex1DLayeredGrad** (rtTextureId id, float x, int layer, float dPdx, float dPdy)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTex1DLayeredGrad,(rtTextureId id, float x, int layer, float dPdx, float dPdy),(id, x, layer, dPdx, dPdy)) template< typename T > inline __device__ void rtTex1DLayeredGrad(T *retVal
- template<typename T >
  __device__ T **optix::rtTex2DLayeredGrad** (rtTextureId id, float x, float y, int layer, float2 dPdx, float2 dPdy)
- template<>
  __device__ float4 **optix::rtTex2DLayeredGrad** (rtTextureId id, float x, float y, int layer, float2 dPdx, float2 dPdy)
- template<>
  __device__ int4 **optix::rtTex2DLayeredGrad** (rtTextureId id, float x, float y, int layer, float2 dPdx, float2 dPdy)
- template<>
  __device__ uint4 **optix::rtTex2DLayeredGrad** (rtTextureId id, float x, float y, int layer, float2 dPdx, float2 dPdy)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTex2DLayeredGrad,(rtTextureId id, float x, float y, int layer, float2 dPdx, float2 dPdy),(id, x, y, layer, dPdx, dPdy)) template< typename T > inline __device__ void rtTex2DLayeredGrad(T *retVal
- template<typename T >
  __device__ T **optix::rtTex1DLod** (rtTextureId id, float x, float level)
- template<>
  __device__ float4 **optix::rtTex1DLod** (rtTextureId id, float x, float level)
- template<>
  __device__ int4 **optix::rtTex1DLod** (rtTextureId id, float x, float level)

- template<>
  __device__ uint4 **optix::rtTex1DLod** (rtTextureId id, float x, float level)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTex1DLod,(rtTextureId id, float x, float level),(id, x, level)) template< typename T > inline __device__ void rtTex1DLod(T *retVal
- template<typename T >
  __device__ T **optix::rtTex2DLod** (rtTextureId id, float x, float y, float level)
- template<>
  __device__ float4 **optix::rtTex2DLod** (rtTextureId id, float x, float y, float level)
- template<>
  __device__ int4 **optix::rtTex2DLod** (rtTextureId id, float x, float y, float level)
- template<>
  __device__ uint4 **optix::rtTex2DLod** (rtTextureId id, float x, float y, float level)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTex2DLod,(rtTextureId id, float x, float y, float level),(id, x, y, level)) template< typename T > inline __device__ void rtTex2DLod(T *retVal
- template<typename T >
  __device__ T **optix::rtTex3DLod** (rtTextureId id, float x, float y, float z, float level)
- template<>
  __device__ float4 **optix::rtTex3DLod** (rtTextureId id, float x, float y, float z, float level)
- template<>
  __device__ int4 **optix::rtTex3DLod** (rtTextureId id, float x, float y, float z, float level)
- template<>
  __device__ uint4 **optix::rtTex3DLod** (rtTextureId id, float x, float y, float z, float level)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTex3DLod,(rtTextureId id, float x, float y, float z, float level),(id, x, y, z, level)) template< typename T > inline __device__ void rtTex3DLod(T *retVal
- template<typename T >
  __device__ T **optix::rtTex1DLayeredLod** (rtTextureId id, float x, int layer, float level)
- template<>
  __device__ float4 **optix::rtTex1DLayeredLod** (rtTextureId id, float x, int layer, float level)
- template<>
  __device__ int4 **optix::rtTex1DLayeredLod** (rtTextureId id, float x, int layer, float level)
- template<>
  __device__ uint4 **optix::rtTex1DLayeredLod** (rtTextureId id, float x, int layer, float level)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTex1DLayeredLod,(rtTextureId id, float x, int layer, float level),(id, x, layer, level)) template< typename T > inline __device__ void rtTex1DLayeredLod(T *retVal
- template<typename T >
  __device__ T **optix::rtTex2DLayeredLod** (rtTextureId id, float x, float y, int layer, float level)
- template<>
  __device__ float4 **optix::rtTex2DLayeredLod** (rtTextureId id, float x, float y, int layer, float level)
- template<>
  __device__ int4 **optix::rtTex2DLayeredLod** (rtTextureId id, float x, float y, int layer, float level)
- template<>
  __device__ uint4 **optix::rtTex2DLayeredLod** (rtTextureId id, float x, float y, int layer, float level)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTex2DLayeredLod,(rtTextureId id, float x, float y, int layer, float level),(id, x, y, layer, level)) template< typename T > inline __device__ void rtTex2DLayeredLod(T *retVal
- template<typename T >
  __device__ T **optix::rtTex1DLayered** (rtTextureId id, float x, int layer)
- template<>
  __device__ float4 **optix::rtTex1DLayered** (rtTextureId id, float x, int layer)
- template<>
  __device__ int4 **optix::rtTex1DLayered** (rtTextureId id, float x, int layer)

- template<>
  __device__ uint4 **optix::rtTex1DLayered** (rtTextureId id, float x, int layer)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTex1DLayered,(rtTextureId id, float x, int layer),(id, x, layer)) template< typename T > inline __device__ void rtTex1DLayered(T *retVal
- template<typename T >
  __device__ T **optix::rtTex2DLayered** (rtTextureId id, float x, float y, int layer)
- template<>
  __device__ float4 **optix::rtTex2DLayered** (rtTextureId id, float x, float y, int layer)
- template<>
  __device__ int4 **optix::rtTex2DLayered** (rtTextureId id, float x, float y, int layer)
- template<>
  __device__ uint4 **optix::rtTex2DLayered** (rtTextureId id, float x, float y, int layer)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTex2DLayered,(rtTextureId id, float x, float y, int layer),(id, x, y, layer)) template< typename T > inline __device__ void rtTex2DLayered(T *retVal
- template<typename T >
  __device__ T **optix::rtTexCubemap** (rtTextureId id, float x, float y, float z)
- template<>
  __device__ float4 **optix::rtTexCubemap** (rtTextureId id, float x, float y, float z)
- template<>
  __device__ int4 **optix::rtTexCubemap** (rtTextureId id, float x, float y, float z)
- template<>
  __device__ uint4 **optix::rtTexCubemap** (rtTextureId id, float x, float y, float z)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTexCubemap,(rtTextureId id, float x, float y, float z),(id, x, y, z)) template< typename T > inline __device__ void rtTexCubemap(T *retVal
- template<typename T >
  __device__ T **optix::rtTexCubemapLayered** (rtTextureId id, float x, float y, float z, int layer)
- template<>
  __device__ float4 **optix::rtTexCubemapLayered** (rtTextureId id, float x, float y, float z, int layer)
- template<>
  __device__ int4 **optix::rtTexCubemapLayered** (rtTextureId id, float x, float y, float z, int layer)
- template<>
  __device__ uint4 **optix::rtTexCubemapLayered** (rtTextureId id, float x, float y, float z, int layer)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTexCubemapLayered,(rtTextureId id, float x, float y, float z, int layer),(id, x, y, z, layer)) template< typename T > inline __device__ void rtTexCubemapLayered(T *retVal
- template<typename T >
  __device__ T **optix::rtTexCubemapLod** (rtTextureId id, float x, float y, float z, float level)
- template<>
  __device__ float4 **optix::rtTexCubemapLod** (rtTextureId id, float x, float y, float z, float level)
- template<>
  __device__ int4 **optix::rtTexCubemapLod** (rtTextureId id, float x, float y, float z, float level)
- template<>
  __device__ uint4 **optix::rtTexCubemapLod** (rtTextureId id, float x, float y, float z, float level)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTexCubemapLod,(rtTextureId id, float x, float y, float z, float level),(id, x, y, z, level)) template< typename T > inline __device__ void rtTexCubemapLod(T *retVal
- template<typename T >
  __device__ T **optix::rtTexCubemapLayeredLod** (rtTextureId id, float x, float y, float z, int layer, float level)
- template<>
  __device__ float4 **optix::rtTexCubemapLayeredLod** (rtTextureId id, float x, float y, float z, int layer, float level)

- template<>
  __device__ int4 **optix::rtTexCubemapLayeredLod** (rtTextureId id, float x, float y, float z, int layer, float level)
- template<>
  __device__ uint4 **optix::rtTexCubemapLayeredLod** (rtTextureId id, float x, float y, float z, int layer, float level)
- **optix::_OPTIX_TEX_FUNC_DECLARE_** (rtTexCubemapLayeredLod,(rtTextureId id, float x, float y, float z, int layer, float level),(id, x, y, z, layer, level)) template< typename T > inline __device__ void rtTexCubemapLayeredLod(T *retVal

### 7.6.1 Detailed Description

OptiX public API.

Author

NVIDIA Corporation OptiX public API Reference - Host/Device side

## 7.7 optix_gl_interop.h File Reference

### Functions

- RTresult RTAPI rtBufferCreateFromGLBO (RTcontext context, unsigned int bufferdesc, unsigned int glId, RTbuffer *buffer)
- RTresult RTAPI rtTextureSamplerCreateFromGLImage (RTcontext context, unsigned int glId, RTgltarget target, RTtexturesampler *textureSampler)
- RTresult RTAPI rtBufferGetGLBOId (RTbuffer buffer, unsigned int *glId)
- RTresult RTAPI rtTextureSamplerGetGLImageId (RTtexturesampler textureSampler, unsigned int *glId)
- RTresult RTAPI rtBufferGLRegister (RTbuffer buffer)
- RTresult RTAPI rtBufferGLUnregister (RTbuffer buffer)
- RTresult RTAPI rtTextureSamplerGLRegister (RTtexturesampler textureSampler)
- RTresult RTAPI rtTextureSamplerGLUnregister (RTtexturesampler textureSampler)
- RTresult RTAPI rtDeviceGetWGLDevice (int *device, HGPUNV gpu)

### 7.7.1 Detailed Description

OptiX public API declarations GLInterop.

Author

NVIDIA Corporation OptiX public API declarations for GL interoperability

## 7.8 optix_host.h File Reference

### Typedefs

- typedef struct RTacceleration_api * RTacceleration
- typedef struct RTbuffer_api * RTbuffer

- typedef struct RTcontext_api * RTcontext
- typedef struct RTgeometry_api * RTgeometry
- typedef struct RTgeometryinstance_api * RTgeometryinstance
- typedef struct RTgeometrygroup_api * RTgeometrygroup
- typedef struct RTgroup_api * RTgroup
- typedef struct RTmaterial_api * RTmaterial
- typedef struct RTprogram_api * RTprogram
- typedef struct RTselector_api * RTselector
- typedef struct RTtexturesampler_api * RTtexturesampler
- typedef struct RTtransform_api * RTtransform
- typedef struct RTvariable_api * RTvariable
- typedef void * RTobject
- typedef struct RTremotedevice_api * RTremotedevice
- typedef struct RTpostprocessingstage_api * RTpostprocessingstage
- typedef struct RTcommandlist_api * RTcommandlist
- typedef int(* RTtimeoutcallback )(void)
- typedef void(* RTusagereportcallback )(int, const char *, const char *, void *)

### Functions

- RTresult RTAPI rtGetVersion (unsigned int *version)
- RTresult RTAPI rtDeviceGetDeviceCount (unsigned int *count)
- RTresult RTAPI rtDeviceGetAttribute (int ordinal, RTdeviceattribute attrib, RTsize size, void *p)
- RTresult RTAPI rtVariableSetObject (RTvariable v, RTobject object)
- RTresult RTAPI rtVariableSetUserData (RTvariable v, RTsize size, const void *ptr)
- RTresult RTAPI rtVariableGetObject (RTvariable v, RTobject *object)
- RTresult RTAPI rtVariableGetUserData (RTvariable v, RTsize size, void *ptr)
- RTresult RTAPI rtVariableGetName (RTvariable v, const char **name_return)
- RTresult RTAPI rtVariableGetAnnotation (RTvariable v, const char **annotation_return)
- RTresult RTAPI rtVariableGetType (RTvariable v, RTobjecttype *type_return)
- RTresult RTAPI rtVariableGetContext (RTvariable v, RTcontext *context)
- RTresult RTAPI rtVariableGetSize (RTvariable v, RTsize *size)
- RTresult RTAPI rtContextCreate (RTcontext *context)
- RTresult RTAPI rtContextDestroy (RTcontext context)
- RTresult RTAPI rtContextValidate (RTcontext context)
- void RTAPI rtContextGetErrorString (RTcontext context, RTresult code, const char **return_string)
- RTresult RTAPI rtContextSetAttribute (RTcontext context, RTcontextattribute attrib, RTsize size, void *p)
- RTresult RTAPI rtContextGetAttribute (RTcontext context, RTcontextattribute attrib, RTsize size, void *p)
- RTresult RTAPI rtContextSetDevices (RTcontext context, unsigned int count, const int *devices)
- RTresult RTAPI rtContextGetDevices (RTcontext context, int *devices)
- RTresult RTAPI rtContextGetDeviceCount (RTcontext context, unsigned int *count)
- RTresult RTAPI rtContextSetRemoteDevice (RTcontext context, RTremotedevice remote_dev)

- RTresult RTAPI rtContextSetStackSize (RTcontext context, RTsize stack_size_bytes)
- RTresult RTAPI rtContextGetStackSize (RTcontext context, RTsize *stack_size_bytes)
- RTresult RTAPI rtContextSetTimeoutCallback (RTcontext context, RTtimeoutcallback callback, double min_polling_seconds)
- RTresult RTAPI rtContextSetUsageReportCallback (RTcontext context, RTusagereportcallback callback, int verbosity, void *cbdata)
- RTresult RTAPI rtContextSetEntryPointCount (RTcontext context, unsigned int num_entry_points)
- RTresult RTAPI rtContextGetEntryPointCount (RTcontext context, unsigned int *num_entry_points)
- RTresult RTAPI rtContextSetRayGenerationProgram (RTcontext context, unsigned int entry_point_index, RTprogram program)
- RTresult RTAPI rtContextGetRayGenerationProgram (RTcontext context, unsigned int entry_point_index, RTprogram *program)
- RTresult RTAPI rtContextSetExceptionProgram (RTcontext context, unsigned int entry_point_index, RTprogram program)
- RTresult RTAPI rtContextGetExceptionProgram (RTcontext context, unsigned int entry_point_index, RTprogram *program)
- RTresult RTAPI rtContextSetExceptionEnabled (RTcontext context, RTexception exception, int enabled)
- RTresult RTAPI rtContextGetExceptionEnabled (RTcontext context, RTexception exception, int *enabled)
- RTresult RTAPI rtContextSetRayTypeCount (RTcontext context, unsigned int num_ray_types)
- RTresult RTAPI rtContextGetRayTypeCount (RTcontext context, unsigned int *num_ray_types)
- RTresult RTAPI rtContextSetMissProgram (RTcontext context, unsigned int ray_type_index, RTprogram program)
- RTresult RTAPI rtContextGetMissProgram (RTcontext context, unsigned int ray_type_index, RTprogram *program)
- RTresult RTAPI rtContextGetTextureSamplerFromId (RTcontext context, int sampler_id, RTtexturesampler *sampler)
- RTresult RTAPI rtContextCompile (RTcontext context)
- RTresult RTAPI rtContextLaunch1D (RTcontext context, unsigned int entry_point_index, RTsize width)
- RTresult RTAPI rtContextLaunch2D (RTcontext context, unsigned int entry_point_index, RTsize width, RTsize height)
- RTresult RTAPI rtContextLaunch3D (RTcontext context, unsigned int entry_point_index, RTsize width, RTsize height, RTsize depth)
- RTresult RTAPI rtContextGetRunningState (RTcontext context, int *running)
- RTresult RTAPI rtContextLaunchProgressive2D (RTcontext context, unsigned int entry_index, RTsize width, RTsize height, unsigned int max_subframes)
- RTresult RTAPI rtContextStopProgressive (RTcontext context)
- RTresult RTAPI rtContextSetPrintEnabled (RTcontext context, int enabled)
- RTresult RTAPI rtContextGetPrintEnabled (RTcontext context, int *enabled)
- RTresult RTAPI rtContextSetPrintBufferSize (RTcontext context, RTsize buffer_size_bytes)
- RTresult RTAPI rtContextGetPrintBufferSize (RTcontext context, RTsize *buffer_size_bytes)
- RTresult RTAPI rtContextSetPrintLaunchIndex (RTcontext context, int x, int y, int z)
- RTresult RTAPI rtContextGetPrintLaunchIndex (RTcontext context, int *x, int *y, int *z)
- RTresult RTAPI rtContextDeclareVariable (RTcontext context, const char *name, RTvariable *v)
- RTresult RTAPI rtContextQueryVariable (RTcontext context, const char *name, RTvariable *v)
- RTresult RTAPI rtContextRemoveVariable (RTcontext context, RTvariable v)
- RTresult RTAPI rtContextGetVariableCount (RTcontext context, unsigned int *count)

- RTresult RTAPI rtContextGetVariable (RTcontext context, unsigned int index, RTvariable *v)
- RTresult RTAPI rtProgramCreateFromPTXString (RTcontext context, const char *ptx, const char *program_name, RTprogram *program)
- RTresult RTAPI rtProgramCreateFromPTXFile (RTcontext context, const char *filename, const char *program_name, RTprogram *program)
- RTresult RTAPI rtProgramDestroy (RTprogram program)
- RTresult RTAPI rtProgramValidate (RTprogram program)
- RTresult RTAPI rtProgramGetContext (RTprogram program, RTcontext *context)
- RTresult RTAPI rtProgramDeclareVariable (RTprogram program, const char *name, RTvariable *v)
- RTresult RTAPI rtProgramQueryVariable (RTprogram program, const char *name, RTvariable *v)
- RTresult RTAPI rtProgramRemoveVariable (RTprogram program, RTvariable v)
- RTresult RTAPI rtProgramGetVariableCount (RTprogram program, unsigned int *count)
- RTresult RTAPI rtProgramGetVariable (RTprogram program, unsigned int index, RTvariable *v)
- RTresult RTAPI rtProgramGetId (RTprogram program, int *program_id)
- RTresult RTAPI rtContextGetProgramFromId (RTcontext context, int program_id, RTprogram *program)
- RTresult RTAPI rtGroupCreate (RTcontext context, RTgroup *group)
- RTresult RTAPI rtGroupDestroy (RTgroup group)
- RTresult RTAPI rtGroupValidate (RTgroup group)
- RTresult RTAPI rtGroupGetContext (RTgroup group, RTcontext *context)
- RTresult RTAPI rtGroupSetAcceleration (RTgroup group, RTacceleration acceleration)
- RTresult RTAPI rtGroupGetAcceleration (RTgroup group, RTacceleration *acceleration)
- RTresult RTAPI rtGroupSetChildCount (RTgroup group, unsigned int count)
- RTresult RTAPI rtGroupGetChildCount (RTgroup group, unsigned int *count)
- RTresult RTAPI rtGroupSetChild (RTgroup group, unsigned int index, RTobject child)
- RTresult RTAPI rtGroupGetChild (RTgroup group, unsigned int index, RTobject *child)
- RTresult RTAPI rtGroupGetChildType (RTgroup group, unsigned int index, RTobjecttype *type)
- RTresult RTAPI rtSelectorCreate (RTcontext context, RTselector *selector)
- RTresult RTAPI rtSelectorDestroy (RTselector selector)
- RTresult RTAPI rtSelectorValidate (RTselector selector)
- RTresult RTAPI rtSelectorGetContext (RTselector selector, RTcontext *context)
- RTresult RTAPI rtSelectorSetVisitProgram (RTselector selector, RTprogram program)
- RTresult RTAPI rtSelectorGetVisitProgram (RTselector selector, RTprogram *program)
- RTresult RTAPI rtSelectorSetChildCount (RTselector selector, unsigned int count)
- RTresult RTAPI rtSelectorGetChildCount (RTselector selector, unsigned int *count)
- RTresult RTAPI rtSelectorSetChild (RTselector selector, unsigned int index, RTobject child)
- RTresult RTAPI rtSelectorGetChild (RTselector selector, unsigned int index, RTobject *child)
- RTresult RTAPI rtSelectorGetChildType (RTselector selector, unsigned int index, RTobjecttype *type)
- RTresult RTAPI rtSelectorDeclareVariable (RTselector selector, const char *name, RTvariable *v)
- RTresult RTAPI rtSelectorQueryVariable (RTselector selector, const char *name, RTvariable *v)
- RTresult RTAPI rtSelectorRemoveVariable (RTselector selector, RTvariable v)
- RTresult RTAPI rtSelectorGetVariableCount (RTselector selector, unsigned int *count)
- RTresult RTAPI rtSelectorGetVariable (RTselector selector, unsigned int index, RTvariable *v)
- RTresult RTAPI rtTransformCreate (RTcontext context, RTtransform *transform)
- RTresult RTAPI rtTransformDestroy (RTtransform transform)
- RTresult RTAPI rtTransformValidate (RTtransform transform)

- RTresult RTAPI rtTransformGetContext (RTtransform transform, RTcontext *context)
- RTresult RTAPI rtTransformSetMatrix (RTtransform transform, int transpose, const float *matrix, const float *inverse_matrix)
- RTresult RTAPI rtTransformGetMatrix (RTtransform transform, int transpose, float *matrix, float *inverse_matrix)
- RTresult RTAPI rtTransformSetMotionRange (RTtransform transform, float timeBegin, float timeEnd)
- RTresult RTAPI rtTransformGetMotionRange (RTtransform transform, float *timeBegin, float *timeEnd)
- RTresult RTAPI rtTransformSetMotionBorderMode (RTtransform transform, RTmotionbordermode beginMode, RTmotionbordermode endMode)
- RTresult RTAPI rtTransformGetMotionBorderMode (RTtransform transform, RTmotionbordermode *beginMode, RTmotionbordermode *endMode)
- RTresult RTAPI rtTransformSetMotionKeys (RTtransform transform, unsigned int n, RTmotionkeytype type, const float *keys)
- RTresult RTAPI rtTransformGetMotionKeyType (RTtransform transform, RTmotionkeytype *type)
- RTresult RTAPI rtTransformGetMotionKeyCount (RTtransform transform, unsigned int *n)
- RTresult RTAPI rtTransformGetMotionKeys (RTtransform transform, float *keys)
- RTresult RTAPI rtTransformSetChild (RTtransform transform, RTobject child)
- RTresult RTAPI rtTransformGetChild (RTtransform transform, RTobject *child)
- RTresult RTAPI rtTransformGetChildType (RTtransform transform, RTobjecttype *type)
- RTresult RTAPI rtGeometryGroupCreate (RTcontext context, RTgeometrygroup *geometrygroup)
- RTresult RTAPI rtGeometryGroupDestroy (RTgeometrygroup geometrygroup)
- RTresult RTAPI rtGeometryGroupValidate (RTgeometrygroup geometrygroup)
- RTresult RTAPI rtGeometryGroupGetContext (RTgeometrygroup geometrygroup, RTcontext *context)
- RTresult RTAPI rtGeometryGroupSetAcceleration (RTgeometrygroup geometrygroup, RTacceleration acceleration)
- RTresult RTAPI rtGeometryGroupGetAcceleration (RTgeometrygroup geometrygroup, RTacceleration *acceleration)
- RTresult RTAPI rtGeometryGroupSetChildCount (RTgeometrygroup geometrygroup, unsigned int count)
- RTresult RTAPI rtGeometryGroupGetChildCount (RTgeometrygroup geometrygroup, unsigned int *count)
- RTresult RTAPI rtGeometryGroupSetChild (RTgeometrygroup geometrygroup, unsigned int index, RTgeometryinstance geometryinstance)
- RTresult RTAPI rtGeometryGroupGetChild (RTgeometrygroup geometrygroup, unsigned int index, RTgeometryinstance *geometryinstance)
- RTresult RTAPI rtAccelerationCreate (RTcontext context, RTacceleration *acceleration)
- RTresult RTAPI rtAccelerationDestroy (RTacceleration acceleration)
- RTresult RTAPI rtAccelerationValidate (RTacceleration acceleration)
- RTresult RTAPI rtAccelerationGetContext (RTacceleration acceleration, RTcontext *context)
- RTresult RTAPI rtAccelerationSetBuilder (RTacceleration acceleration, const char *builder)
- RTresult RTAPI rtAccelerationGetBuilder (RTacceleration acceleration, const char **return_string)
- RTresult RTAPI rtAccelerationSetTraverser (RTacceleration acceleration, const char *traverser)
- RTresult RTAPI rtAccelerationGetTraverser (RTacceleration acceleration, const char **return_string)
- RTresult RTAPI rtAccelerationSetProperty (RTacceleration acceleration, const char *name, const char *value)

- RTresult RTAPI rtAccelerationGetProperty (RTacceleration acceleration, const char *name, const char **return_string)
- RTresult RTAPI rtAccelerationGetDataSize (RTacceleration acceleration, RTsize *size)
- RTresult RTAPI rtAccelerationGetData (RTacceleration acceleration, void *data)
- RTresult RTAPI rtAccelerationSetData (RTacceleration acceleration, const void *data, RTsize size)
- RTresult RTAPI rtAccelerationMarkDirty (RTacceleration acceleration)
- RTresult RTAPI rtAccelerationIsDirty (RTacceleration acceleration, int *dirty)
- RTresult RTAPI rtGeometryInstanceCreate (RTcontext context, RTgeometryinstance *geometryinstance)
- RTresult RTAPI rtGeometryInstanceDestroy (RTgeometryinstance geometryinstance)
- RTresult RTAPI rtGeometryInstanceValidate (RTgeometryinstance geometryinstance)
- RTresult RTAPI rtGeometryInstanceGetContext (RTgeometryinstance geometryinstance, RTcontext *context)
- RTresult RTAPI rtGeometryInstanceSetGeometry (RTgeometryinstance geometryinstance, RTgeometry geometry)
- RTresult RTAPI rtGeometryInstanceGetGeometry (RTgeometryinstance geometryinstance, RTgeometry *geometry)
- RTresult RTAPI rtGeometryInstanceSetMaterialCount (RTgeometryinstance geometryinstance, unsigned int count)
- RTresult RTAPI rtGeometryInstanceGetMaterialCount (RTgeometryinstance geometryinstance, unsigned int *count)
- RTresult RTAPI rtGeometryInstanceSetMaterial (RTgeometryinstance geometryinstance, unsigned int index, RTmaterial material)
- RTresult RTAPI rtGeometryInstanceGetMaterial (RTgeometryinstance geometryinstance, unsigned int index, RTmaterial *material)
- RTresult RTAPI rtGeometryInstanceDeclareVariable (RTgeometryinstance geometryinstance, const char *name, RTvariable *v)
- RTresult RTAPI rtGeometryInstanceQueryVariable (RTgeometryinstance geometryinstance, const char *name, RTvariable *v)
- RTresult RTAPI rtGeometryInstanceRemoveVariable (RTgeometryinstance geometryinstance, RTvariable v)
- RTresult RTAPI rtGeometryInstanceGetVariableCount (RTgeometryinstance geometryinstance, unsigned int *count)
- RTresult RTAPI rtGeometryInstanceGetVariable (RTgeometryinstance geometryinstance, unsigned int index, RTvariable *v)
- RTresult RTAPI rtGeometryCreate (RTcontext context, RTgeometry *geometry)
- RTresult RTAPI rtGeometryDestroy (RTgeometry geometry)
- RTresult RTAPI rtGeometryValidate (RTgeometry geometry)
- RTresult RTAPI rtGeometryGetContext (RTgeometry geometry, RTcontext *context)
- RTresult RTAPI rtGeometrySetPrimitiveCount (RTgeometry geometry, unsigned int num_primitives)
- RTresult RTAPI rtGeometryGetPrimitiveCount (RTgeometry geometry, unsigned int *num_primitives)
- RTresult RTAPI rtGeometrySetPrimitiveIndexOffset (RTgeometry geometry, unsigned int index_offset)
- RTresult RTAPI rtGeometryGetPrimitiveIndexOffset (RTgeometry geometry, unsigned int *index_offset)
- RTresult RTAPI rtGeometrySetMotionRange (RTgeometry geometry, float timeBegin, float timeEnd)
- RTresult RTAPI rtGeometryGetMotionRange (RTgeometry geometry, float *timeBegin, float *timeEnd)

- RTresult RTAPI rtGeometrySetMotionBorderMode (RTgeometry geometry, RTmotionbordermode beginMode, RTmotionbordermode endMode)
- RTresult RTAPI rtGeometryGetMotionBorderMode (RTgeometry geometry, RTmotionbordermode *beginMode, RTmotionbordermode *endMode)
- RTresult RTAPI rtGeometrySetMotionSteps (RTgeometry geometry, unsigned int n)
- RTresult RTAPI rtGeometryGetMotionSteps (RTgeometry geometry, unsigned int *n)
- RTresult RTAPI rtGeometrySetBoundingBoxProgram (RTgeometry geometry, RTprogram program)
- RTresult RTAPI rtGeometryGetBoundingBoxProgram (RTgeometry geometry, RTprogram *program)
- RTresult RTAPI rtGeometrySetIntersectionProgram (RTgeometry geometry, RTprogram program)
- RTresult RTAPI rtGeometryGetIntersectionProgram (RTgeometry geometry, RTprogram *program)
- RTresult RTAPI rtGeometryMarkDirty (RTgeometry geometry)
- RTresult RTAPI rtGeometryIsDirty (RTgeometry geometry, int *dirty)
- RTresult RTAPI rtGeometryDeclareVariable (RTgeometry geometry, const char *name, RTvariable *v)
- RTresult RTAPI rtGeometryQueryVariable (RTgeometry geometry, const char *name, RTvariable *v)
- RTresult RTAPI rtGeometryRemoveVariable (RTgeometry geometry, RTvariable v)
- RTresult RTAPI rtGeometryGetVariableCount (RTgeometry geometry, unsigned int *count)
- RTresult RTAPI rtGeometryGetVariable (RTgeometry geometry, unsigned int index, RTvariable *v)
- RTresult RTAPI rtMaterialCreate (RTcontext context, RTmaterial *material)
- RTresult RTAPI rtMaterialDestroy (RTmaterial material)
- RTresult RTAPI rtMaterialValidate (RTmaterial material)
- RTresult RTAPI rtMaterialGetContext (RTmaterial material, RTcontext *context)
- RTresult RTAPI rtMaterialSetClosestHitProgram (RTmaterial material, unsigned int ray_type_index, RTprogram program)
- RTresult RTAPI rtMaterialGetClosestHitProgram (RTmaterial material, unsigned int ray_type_index, RTprogram *program)
- RTresult RTAPI rtMaterialSetAnyHitProgram (RTmaterial material, unsigned int ray_type_index, RTprogram program)
- RTresult RTAPI rtMaterialGetAnyHitProgram (RTmaterial material, unsigned int ray_type_index, RTprogram *program)
- RTresult RTAPI rtMaterialDeclareVariable (RTmaterial material, const char *name, RTvariable *v)
- RTresult RTAPI rtMaterialQueryVariable (RTmaterial material, const char *name, RTvariable *v)
- RTresult RTAPI rtMaterialRemoveVariable (RTmaterial material, RTvariable v)
- RTresult RTAPI rtMaterialGetVariableCount (RTmaterial material, unsigned int *count)
- RTresult RTAPI rtMaterialGetVariable (RTmaterial material, unsigned int index, RTvariable *v)
- RTresult RTAPI rtTextureSamplerCreate (RTcontext context, RTtexturesampler *texturesampler)
- RTresult RTAPI rtTextureSamplerDestroy (RTtexturesampler texturesampler)
- RTresult RTAPI rtTextureSamplerValidate (RTtexturesampler texturesampler)
- RTresult RTAPI rtTextureSamplerGetContext (RTtexturesampler texturesampler, RTcontext *context)
- RTresult RTAPI rtTextureSamplerSetMipLevelCount (RTtexturesampler texturesampler, unsigned int num_mip_levels)
- RTresult RTAPI rtTextureSamplerGetMipLevelCount (RTtexturesampler texturesampler, unsigned int *num_mip_levels)
- RTresult RTAPI rtTextureSamplerSetArraySize (RTtexturesampler texturesampler, unsigned int num_textures_in_array)

- RTresult RTAPI rtTextureSamplerGetArraySize (RTtexturesampler texturesampler, unsigned int *num_textures_in_array)
- RTresult RTAPI rtTextureSamplerSetWrapMode (RTtexturesampler texturesampler, unsigned int dimension, RTwrapmode wrapmode)
- RTresult RTAPI rtTextureSamplerGetWrapMode (RTtexturesampler texturesampler, unsigned int dimension, RTwrapmode *wrapmode)
- RTresult RTAPI rtTextureSamplerSetFilteringModes (RTtexturesampler texturesampler, RTfiltermode minification, RTfiltermode magnification, RTfiltermode mipmapping)
- RTresult RTAPI rtTextureSamplerGetFilteringModes (RTtexturesampler texturesampler, RTfiltermode *minification, RTfiltermode *magnification, RTfiltermode *mipmapping)
- RTresult RTAPI rtTextureSamplerSetMaxAnisotropy (RTtexturesampler texturesampler, float value)
- RTresult RTAPI rtTextureSamplerGetMaxAnisotropy (RTtexturesampler texturesampler, float *value)
- RTresult RTAPI rtTextureSamplerSetMipLevelClamp (RTtexturesampler texturesampler, float minLevel, float maxLevel)
- RTresult RTAPI rtTextureSamplerGetMipLevelClamp (RTtexturesampler texturesampler, float *minLevel, float *maxLevel)
- RTresult RTAPI rtTextureSamplerSetMipLevelBias (RTtexturesampler texturesampler, float value)
- RTresult RTAPI rtTextureSamplerGetMipLevelBias (RTtexturesampler texturesampler, float *value)
- RTresult RTAPI rtTextureSamplerSetReadMode (RTtexturesampler texturesampler, RTtexturereadmode readmode)
- RTresult RTAPI rtTextureSamplerGetReadMode (RTtexturesampler texturesampler, RTtexturereadmode *readmode)
- RTresult RTAPI rtTextureSamplerSetIndexingMode (RTtexturesampler texturesampler, RTtextureindexmode indexmode)
- RTresult RTAPI rtTextureSamplerGetIndexingMode (RTtexturesampler texturesampler, RTtextureindexmode *indexmode)
- RTresult RTAPI rtTextureSamplerSetBuffer (RTtexturesampler texturesampler, unsigned int deprecated0, unsigned int deprecated1, RTbuffer buffer)
- RTresult RTAPI rtTextureSamplerGetBuffer (RTtexturesampler texturesampler, unsigned int deprecated0, unsigned int deprecated1, RTbuffer *buffer)
- RTresult RTAPI rtTextureSamplerGetId (RTtexturesampler texturesampler, int *texture_id)
- RTresult RTAPI rtBufferCreate (RTcontext context, unsigned int bufferdesc, RTbuffer *buffer)
- RTresult RTAPI rtBufferDestroy (RTbuffer buffer)
- RTresult RTAPI rtBufferValidate (RTbuffer buffer)
- RTresult RTAPI rtBufferGetContext (RTbuffer buffer, RTcontext *context)
- RTresult RTAPI rtBufferSetFormat (RTbuffer buffer, RTformat format)
- RTresult RTAPI rtBufferGetFormat (RTbuffer buffer, RTformat *format)
- RTresult RTAPI rtBufferSetElementSize (RTbuffer buffer, RTsize size_of_element)
- RTresult RTAPI rtBufferGetElementSize (RTbuffer buffer, RTsize *size_of_element)
- RTresult RTAPI rtBufferSetSize1D (RTbuffer buffer, RTsize width)
- RTresult RTAPI rtBufferGetSize1D (RTbuffer buffer, RTsize *width)
- RTresult RTAPI rtBufferSetSize2D (RTbuffer buffer, RTsize width, RTsize height)
- RTresult RTAPI rtBufferGetSize2D (RTbuffer buffer, RTsize *width, RTsize *height)
- RTresult RTAPI rtBufferSetSize3D (RTbuffer buffer, RTsize width, RTsize height, RTsize depth)
- RTresult RTAPI rtBufferSetMipLevelCount (RTbuffer buffer, unsigned int levels)
- RTresult RTAPI rtBufferGetSize3D (RTbuffer buffer, RTsize *width, RTsize *height, RTsize *depth)

- RTresult RTAPI rtBufferGetMipLevelSize1D (RTbuffer buffer, unsigned int level, RTsize *width)
- RTresult RTAPI rtBufferGetMipLevelSize2D (RTbuffer buffer, unsigned int level, RTsize *width, RTsize *height)
- RTresult RTAPI rtBufferGetMipLevelSize3D (RTbuffer buffer, unsigned int level, RTsize *width, RTsize *height, RTsize *depth)
- RTresult RTAPI rtBufferSetSizev (RTbuffer buffer, unsigned int dimensionality, const RTsize *dims)
- RTresult RTAPI rtBufferGetSizev (RTbuffer buffer, unsigned int dimensionality, RTsize *dims)
- RTresult RTAPI rtBufferGetDimensionality (RTbuffer buffer, unsigned int *dimensionality)
- RTresult RTAPI rtBufferGetMipLevelCount (RTbuffer buffer, unsigned int *level)
- RTresult RTAPI rtBufferMap (RTbuffer buffer, void **user_pointer)
- RTresult RTAPI rtBufferUnmap (RTbuffer buffer)
- RTresult RTAPI rtBufferMapEx (RTbuffer buffer, unsigned int map_flags, unsigned int level, void *user_owned, void **optix_owned)
- RTresult RTAPI rtBufferUnmapEx (RTbuffer buffer, unsigned int level)
- RTresult RTAPI rtBufferGetId (RTbuffer buffer, int *buffer_id)
- RTresult RTAPI rtContextGetBufferFromId (RTcontext context, int buffer_id, RTbuffer *buffer)
- RTresult RTAPI rtBufferGetProgressiveUpdateReady (RTbuffer buffer, int *ready, unsigned int *subframe_count, unsigned int *max_subframes)
- RTresult RTAPI rtBufferBindProgressiveStream (RTbuffer stream, RTbuffer source)
- RTresult RTAPI rtBufferSetAttribute (RTbuffer buffer, RTbufferattribute attrib, RTsize size, void *p)
- RTresult RTAPI rtBufferGetAttribute (RTbuffer buffer, RTbufferattribute attrib, RTsize size, void *p)
- RTresult RTAPI rtRemoteDeviceCreate (const char *url, const char *username, const char *password, RTremotedevice *remote_dev)
- RTresult RTAPI rtRemoteDeviceDestroy (RTremotedevice remote_dev)
- RTresult RTAPI rtRemoteDeviceGetAttribute (RTremotedevice remote_dev, RTremotedeviceattribute attrib, RTsize size, void *p)
- RTresult RTAPI rtRemoteDeviceReserve (RTremotedevice remote_dev, unsigned int num_nodes, unsigned int configuration)
- RTresult RTAPI rtRemoteDeviceRelease (RTremotedevice remote_dev)
- RTresult RTAPI rtPostProcessingStageCreateBuiltin (RTcontext context, const char *builtin_name, RTpostprocessingstage *stage)
- RTresult RTAPI rtPostProcessingStageDestroy (RTpostprocessingstage stage)
- RTresult RTAPI rtPostProcessingStageDeclareVariable (RTpostprocessingstage stage, const char *name, RTvariable *v)
- RTresult RTAPI rtPostProcessingStageGetContext (RTpostprocessingstage stage, RTcontext *context)
- RTresult RTAPI rtPostProcessingStageQueryVariable (RTpostprocessingstage stage, const char *name, RTvariable *variable)
- RTresult RTAPI rtPostProcessingStageGetVariableCount (RTpostprocessingstage stage, unsigned int *count)
- RTresult RTAPI rtPostProcessingStageGetVariable (RTpostprocessingstage stage, unsigned int index, RTvariable *variable)
- RTresult RTAPI rtCommandListCreate (RTcontext context, RTcommandlist *list)
- RTresult RTAPI rtCommandListDestroy (RTcommandlist list)
- RTresult RTAPI rtCommandListAppendPostprocessingStage (RTcommandlist list, RTpostprocessingstage stage, RTsize launch_width, RTsize launch_height)
- RTresult RTAPI rtCommandListAppendLaunch2D (RTcommandlist list, unsigned int entry_point_index, RTsize launch_width, RTsize launch_height)
- RTresult RTAPI rtCommandListFinalize (RTcommandlist list)

- RTresult RTAPI rtCommandListExecute (RTcommandlist list)
- RTresult RTAPI rtCommandListGetContext (RTcommandlist list, RTcontext *context)

- RTresult RTAPI rtVariableSet1f (RTvariable v, float f1)
- RTresult RTAPI rtVariableSet2f (RTvariable v, float f1, float f2)
- RTresult RTAPI rtVariableSet3f (RTvariable v, float f1, float f2, float f3)
- RTresult RTAPI rtVariableSet4f (RTvariable v, float f1, float f2, float f3, float f4)
- RTresult RTAPI rtVariableSet1fv (RTvariable v, const float *f)
- RTresult RTAPI rtVariableSet2fv (RTvariable v, const float *f)
- RTresult RTAPI rtVariableSet3fv (RTvariable v, const float *f)
- RTresult RTAPI rtVariableSet4fv (RTvariable v, const float *f)
- RTresult RTAPI rtVariableSet1i (RTvariable v, int i1)
- RTresult RTAPI rtVariableSet2i (RTvariable v, int i1, int i2)
- RTresult RTAPI rtVariableSet3i (RTvariable v, int i1, int i2, int i3)
- RTresult RTAPI rtVariableSet4i (RTvariable v, int i1, int i2, int i3, int i4)
- RTresult RTAPI rtVariableSet1iv (RTvariable v, const int *i)
- RTresult RTAPI rtVariableSet2iv (RTvariable v, const int *i)
- RTresult RTAPI rtVariableSet3iv (RTvariable v, const int *i)
- RTresult RTAPI rtVariableSet4iv (RTvariable v, const int *i)
- RTresult RTAPI rtVariableSet1ui (RTvariable v, unsigned int u1)
- RTresult RTAPI rtVariableSet2ui (RTvariable v, unsigned int u1, unsigned int u2)
- RTresult RTAPI rtVariableSet3ui (RTvariable v, unsigned int u1, unsigned int u2, unsigned int u3)
- RTresult RTAPI rtVariableSet4ui (RTvariable v, unsigned int u1, unsigned int u2, unsigned int u3, unsigned int u4)
- RTresult RTAPI rtVariableSet1uiv (RTvariable v, const unsigned int *u)
- RTresult RTAPI rtVariableSet2uiv (RTvariable v, const unsigned int *u)
- RTresult RTAPI rtVariableSet3uiv (RTvariable v, const unsigned int *u)
- RTresult RTAPI rtVariableSet4uiv (RTvariable v, const unsigned int *u)
- RTresult RTAPI rtVariableSetMatrix2x2fv (RTvariable v, int transpose, const float *m)
- RTresult RTAPI rtVariableSetMatrix2x3fv (RTvariable v, int transpose, const float *m)
- RTresult RTAPI rtVariableSetMatrix2x4fv (RTvariable v, int transpose, const float *m)
- RTresult RTAPI rtVariableSetMatrix3x2fv (RTvariable v, int transpose, const float *m)
- RTresult RTAPI rtVariableSetMatrix3x3fv (RTvariable v, int transpose, const float *m)
- RTresult RTAPI rtVariableSetMatrix3x4fv (RTvariable v, int transpose, const float *m)
- RTresult RTAPI rtVariableSetMatrix4x2fv (RTvariable v, int transpose, const float *m)
- RTresult RTAPI rtVariableSetMatrix4x3fv (RTvariable v, int transpose, const float *m)
- RTresult RTAPI rtVariableSetMatrix4x4fv (RTvariable v, int transpose, const float *m)

- RTresult RTAPI rtVariableGet1f (RTvariable v, float *f1)
- RTresult RTAPI rtVariableGet2f (RTvariable v, float *f1, float *f2)
- RTresult RTAPI rtVariableGet3f (RTvariable v, float *f1, float *f2, float *f3)
- RTresult RTAPI rtVariableGet4f (RTvariable v, float *f1, float *f2, float *f3, float *f4)
- RTresult RTAPI rtVariableGet1fv (RTvariable v, float *f)
- RTresult RTAPI rtVariableGet2fv (RTvariable v, float *f)
- RTresult RTAPI rtVariableGet3fv (RTvariable v, float *f)
- RTresult RTAPI rtVariableGet4fv (RTvariable v, float *f)
- RTresult RTAPI rtVariableGet1i (RTvariable v, int *i1)
- RTresult RTAPI rtVariableGet2i (RTvariable v, int *i1, int *i2)

- RTresult RTAPI rtVariableGet3i (RTvariable v, int *i1, int *i2, int *i3)
- RTresult RTAPI rtVariableGet4i (RTvariable v, int *i1, int *i2, int *i3, int *i4)
- RTresult RTAPI rtVariableGet1iv (RTvariable v, int *i)
- RTresult RTAPI rtVariableGet2iv (RTvariable v, int *i)
- RTresult RTAPI rtVariableGet3iv (RTvariable v, int *i)
- RTresult RTAPI rtVariableGet4iv (RTvariable v, int *i)
- RTresult RTAPI rtVariableGet1ui (RTvariable v, unsigned int *u1)
- RTresult RTAPI rtVariableGet2ui (RTvariable v, unsigned int *u1, unsigned int *u2)
- RTresult RTAPI rtVariableGet3ui (RTvariable v, unsigned int *u1, unsigned int *u2, unsigned int *u3)
- RTresult RTAPI rtVariableGet4ui (RTvariable v, unsigned int *u1, unsigned int *u2, unsigned int *u3, unsigned int *u4)
- RTresult RTAPI rtVariableGet1uiv (RTvariable v, unsigned int *u)
- RTresult RTAPI rtVariableGet2uiv (RTvariable v, unsigned int *u)
- RTresult RTAPI rtVariableGet3uiv (RTvariable v, unsigned int *u)
- RTresult RTAPI rtVariableGet4uiv (RTvariable v, unsigned int *u)
- RTresult RTAPI rtVariableGetMatrix2x2fv (RTvariable v, int transpose, float *m)
- RTresult RTAPI rtVariableGetMatrix2x3fv (RTvariable v, int transpose, float *m)
- RTresult RTAPI rtVariableGetMatrix2x4fv (RTvariable v, int transpose, float *m)
- RTresult RTAPI rtVariableGetMatrix3x2fv (RTvariable v, int transpose, float *m)
- RTresult RTAPI rtVariableGetMatrix3x3fv (RTvariable v, int transpose, float *m)
- RTresult RTAPI rtVariableGetMatrix3x4fv (RTvariable v, int transpose, float *m)
- RTresult RTAPI rtVariableGetMatrix4x2fv (RTvariable v, int transpose, float *m)
- RTresult RTAPI rtVariableGetMatrix4x3fv (RTvariable v, int transpose, float *m)
- RTresult RTAPI rtVariableGetMatrix4x4fv (RTvariable v, int transpose, float *m)

### 7.8.1 Detailed Description

OptiX public API.

Author

NVIDIA Corporation OptiX public API Reference - Host side

### 7.8.2 Typedef Documentation

#### 7.8.2.1 typedef struct RTacceleration_api* RTacceleration

Opaque type to handle Acceleration Structures - Note that the *_api type should never be used directly.
Only the typedef target name will be guaranteed to remain unchanged

#### 7.8.2.2 typedef struct RTbuffer_api* RTbuffer

Opaque type to handle Buffers - Note that the *_api type should never be used directly.
Only the typedef target name will be guaranteed to remain unchanged

#### 7.8.2.3 typedef struct RTcommandlist_api* RTcommandlist

Opaque type to handle CommandList - Note that the *_api type should never be used directly.
Only the typedef target name will be guaranteed to remain unchanged

#### 7.8.2.4 typedef struct RTcontext_api* RTcontext

Opaque type to handle Contexts - Note that the *_api type should never be used directly.
Only the typedef target name will be guaranteed to remain unchanged

#### 7.8.2.5 typedef struct RTgeometry_api* RTgeometry

Opaque type to handle Geometry - Note that the *_api type should never be used directly.
Only the typedef target name will be guaranteed to remain unchanged

#### 7.8.2.6 typedef struct RTgeometrygroup_api* RTgeometrygroup

Opaque type to handle Geometry Group - Note that the *_api type should never be used directly.
Only the typedef target name will be guaranteed to remain unchanged

#### 7.8.2.7 typedef struct RTgeometryinstance_api* RTgeometryinstance

Opaque type to handle Geometry Instance - Note that the *_api type should never be used directly.
Only the typedef target name will be guaranteed to remain unchanged

#### 7.8.2.8 typedef struct RTgroup_api* RTgroup

Opaque type to handle Group - Note that the *_api type should never be used directly.
Only the typedef target name will be guaranteed to remain unchanged

#### 7.8.2.9 typedef struct RTmaterial_api* RTmaterial

Opaque type to handle Material - Note that the *_api type should never be used directly.
Only the typedef target name will be guaranteed to remain unchanged

#### 7.8.2.10 typedef void* RTobject

Opaque type to handle Object - Note that the *_api type should never be used directly.
Only the typedef target name will be guaranteed to remain unchanged

#### 7.8.2.11 typedef struct RTpostprocessingstage_api* RTpostprocessingstage

Opaque type to handle PostprocessingStage - Note that the *_api type should never be used directly.
Only the typedef target name will be guaranteed to remain unchanged

#### 7.8.2.12 typedef struct RTprogram_api* RTprogram

Opaque type to handle Program - Note that the *_api type should never be used directly.
Only the typedef target name will be guaranteed to remain unchanged

#### 7.8.2.13 typedef struct RTremotedevice_api* RTremotedevice

Opaque type to handle RemoteDevice - Note that the *_api type should never be used directly.
Only the typedef target name will be guaranteed to remain unchanged

#### 7.8.2.14 typedef struct RTselector_api* RTselector

Opaque type to handle Selector - Note that the *_api type should never be used directly.
Only the typedef target name will be guaranteed to remain unchanged

#### 7.8.2.15 typedef struct RTtexturesampler_api* RTtexturesampler

Opaque type to handle Texture Sampler - Note that the *_api type should never be used directly.
Only the typedef target name will be guaranteed to remain unchanged

#### 7.8.2.16 typedef int(* RTtimeoutcallback)(void)

Callback signature for use with rtContextSetTimeoutCallback.
Return 1 to ask for abort, 0 to continue.

#### 7.8.2.17 typedef struct RTtransform_api* RTtransform

Opaque type to handle Transform - Note that the *_api type should never be used directly.
Only the typedef target name will be guaranteed to remain unchanged

#### 7.8.2.18 typedef void(* RTusagereportcallback)(int, const char *, const char *, void *)

Callback signature for use with rtContextSetUsageReportCallback.

#### 7.8.2.19 typedef struct RTvariable_api* RTvariable

Opaque type to handle Variable - Note that the *_api type should never be used directly.
Only the typedef target name will be guaranteed to remain unchanged

### 7.8.3 Function Documentation

#### 7.8.3.1 RTresult RTAPI rtAccelerationGetData ( RTacceleration *acceleration,* void * *data* )

Deprecated in OptiX 4.0.
Should not be called.

#### 7.8.3.2 RTresult RTAPI rtAccelerationGetDataSize ( RTacceleration *acceleration,* RTsize * *size* )

Deprecated in OptiX 4.0.
Should not be called.

#### 7.8.3.3 RTresult RTAPI rtAccelerationGetTraverser ( RTacceleration *acceleration,* const char ** *return_string* )

Deprecated in OptiX 4.0.

#### 7.8.3.4 RTresult RTAPI rtAccelerationSetData ( RTacceleration *acceleration*, const void * *data*, RTsize *size* )

Deprecated in OptiX 4.0.

Should not be called.

#### 7.8.3.5 RTresult RTAPI rtAccelerationSetTraverser ( RTacceleration *acceleration*, const char * *traverser* )

Deprecated in OptiX 4.0.

Setting a traverser is no longer necessary and will be ignored.

#### 7.8.3.6 RTresult RTAPI rtCommandListAppendLaunch2D ( RTcommandlist *list*, unsigned int *entry_point_index*, RTsize *launch_width*, RTsize *launch_height* )

Append a launch to the command list *list*.

**Description**

rtCommandListAppendLaunch2D appends a context launch to the command list *list*. It is invalid to call rtCommandListAppendLaunch2D after calling rtCommandListFinalize.

**Parameters**

| | | |
|---|---|---|
| in | *list* | Handle of the command list to append to |
| in | *entry_point_index* | The initial entry point into the kernel |
| in | *launch_width* | Width of the computation grid |
| in | *launch_height* | Height of the computation grid |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtCommandListAppendLaunch2D was introduced in OptiX 5.0.

**See also** rtCommandListCreate, rtCommandListDestroy, rtCommandListAppendPostprocessingStage, rtCommandListFinalize, rtCommandListExecute

#### 7.8.3.7 RTresult RTAPI rtCommandListAppendPostprocessingStage ( RTcommandlist *list*, RTpostprocessingstage *stage*, RTsize *launch_width*, RTsize *launch_height* )

Append a post-processing stage to the command list *list*.

**Description**

rtCommandListAppendPostprocessingStage appends a post-processing stage to the command list *list*. The command list must have been created from the same context as the the post-processing stage. The launch_width and launch_height specify the launch dimensions and may be different than the input or output buffers associated with each post-processing stage depending on the requirements of the post-processing stage appended. It is invalid to call rtCommandListAppendPostprocessingStage after calling rtCommandListFinalize.

NOTE: A post-processing stage can be added to multiple command lists or added to the same command list multiple times. Also note that destroying a post-processing stage will invalidate all

command lists it was added to.

**Parameters**

| | | |
|---|---|---|
| in | *list* | Handle of the command list to append to |
| in | *stage* | The post-processing stage to append to the command list |
| in | *launch_width* | This is a hint for the width of the launch dimensions to use for this stage. The stage can ignore this and use a suitable launch width instead. |
| in | *launch_width* | This is a hint for the height of the launch dimensions to use for this stage. The stage can ignore this and use a suitable launch height instead. |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtCommandListAppendPostprocessingStage was introduced in OptiX 5.0.

**See also** rtCommandListCreate, rtCommandListDestroy, rtCommandListAppendLaunch2D, rtCommandListFinalize, rtCommandListExecute rtPostProcessingStageCreateBuiltin,

#### 7.8.3.8 RTresult RTAPI rtCommandListCreate ( RTcontext *context,* RTcommandlist * *list* )

Creates a new command list.

**Description**

rtCommandListCreate creates a new command list. The *context* specifies the target context, and should be a value returned by rtContextCreate. The call sets **list* to the handle of a newly created list within *context*. Returns RT_ERROR_INVALID_VALUE if *list* is *NULL*.

A command list can be used to assemble a list of different types of commands and execute them later. At this point, commands can be built-in post-processing stages or context launches. Those are appended to the list using rtCommandListAppendPostprocessingStage, and rtCommandListAppendLaunch2D, respectively. Commands will be executed in the order they have been appended to the list. Thus later commands can use the results of earlier commands. Note that all commands added to the created list must be associated with the same *context*. It is invalid to mix commands from different contexts.

**Parameters**

| | | |
|---|---|---|
| in | *context* | Specifies the rendering context of the command list |
| out | *list* | New command list handle |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtCommandListCreate was introduced in OptiX 5.0.

**See also** rtCommandListDestroy, rtCommandListAppendPostprocessingStage, rtCommandListAppendLaunch2D, rtCommandListFinalize, rtCommandListExecute

#### 7.8.3.9 RTresult RTAPI rtCommandListDestroy ( RTcommandlist *list* )

Destroy a command list.

**Description**

rtCommandListDestroy destroys a command list from its context and deletes it. After the call, *list* is no longer a valid handle. Any stages associated with the command list are not destroyed.

**Parameters**

| | | |
|---|---|---|
| in | *list* | Handle of the command list to destroy |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtCommandListDestroy was introduced in OptiX 5.0.

**See also** rtCommandListCreate, rtCommandListAppendPostprocessingStage, rtCommandListAppendLaunch2D, rtCommandListFinalize, rtCommandListExecute

#### 7.8.3.10 RTresult RTAPI rtCommandListExecute ( RTcommandlist *list* )

Execute the command list.

**Description**

rtCommandListExecute executes the command list. All added commands will be executed in the order in which they were added. Commands can access the results of earlier executed commands. This must be called after calling , otherwise an error will be returned and the command list is not executed. rtCommandListExecute can be called multiple times, but only one call may be active at the same time. Overlapping calls from multiple threads will result in undefined behavior.

**Parameters**

| | | |
|---|---|---|
| in | *list* | Handle of the command list to execute |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtCommandListExecute was introduced in OptiX 5.0.

**See also** rtCommandListCreate, rtCommandListDestroy, rtCommandListAppendPostprocessingStage, rtCommandListAppendLaunch2D, rtCommandListFinalize,

#### 7.8.3.11 RTresult RTAPI rtCommandListFinalize ( RTcommandlist *list* )

Finalize the command list.

This must be done before executing the command list.

**Description**

rtCommandListFinalize finalizes the command list. This will do all work necessary to prepare the command list for execution. Specificially it will do all work which can be shared between subsequent

calls to rtCommandListExecute. It is invalid to call rtCommandListExecute before calling rtCommandListFinalize. It is invalid to call rtCommandListAppendPostprocessingStage or rtCommandListAppendLaunch2D after calling finalize and will result in an error. Also rtCommandListFinalize can only be called once on each command list.

**Parameters**

| | | |
|---|---|---|
| in | *list* | Handle of the command list to finalize |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtCommandListFinalize was introduced in OptiX 5.0.

**See also** rtCommandListCreate, rtCommandListDestroy, rtCommandListAppendPostprocessingStage, rtCommandListAppendLaunch2D, rtCommandListExecute

#### 7.8.3.12 RTresult RTAPI rtCommandListGetContext ( RTcommandlist *list*, RTcontext * *context* )

Returns the context associated with a command list.

**Description**

rtCommandListGetContext queries the context associated with a command list. The target command list is specified by *list*. The context of the command list is returned to **context* if the pointer *context* is not *NULL*. If *list* is not a valid command list, **context* is set to *NULL* and RT_ERROR_INVALID_VALUE is returned.

**Parameters**

| | | |
|---|---|---|
| in | *list* | Specifies the command list to be queried |
| out | *context* | Returns the context associated with the command list |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtCommandListGetContext was introduced in OptiX 5.0.

**See also** rtContextDeclareVariable

#### 7.8.3.13 RTresult RTAPI rtContextCompile ( RTcontext *context* )

Deprecated in OptiX 4.0.

Calling this function has no effect. The kernel is automatically compiled at launch if needed.

#### 7.8.3.14 RTresult RTAPI rtGeometryIsDirty ( RTgeometry *geometry*, int * *dirty* )

Deprecated in OptiX 4.0.

Calling this function has no effect.

#### 7.8.3.15 RTresult RTAPI rtGeometryMarkDirty ( RTgeometry *geometry* )

Deprecated in OptiX 4.0.

Calling this function has no effect.

#### 7.8.3.16 RTresult RTAPI rtPostProcessingStageCreateBuiltin ( RTcontext *context*, const char * *builtin_name*, RTpostprocessingstage * *stage* )

Creates a new post-processing stage.

**Description**

rtPostProcessingStageCreateBuiltin creates a new post-processing stage selected from a list of pre-defined post-processing stages. The *context* specifies the target context, and should be a value returned by rtContextCreate. Sets **stage* to the handle of a newly created stage within *context*.

**Parameters**

| | | |
|---|---|---|
| in | *context* | Specifies the rendering context to which the post-processing stage belongs |
| in | *builtin_name* | The name of the built-in stage to instantiate |
| out | *stage* | New post-processing stage handle |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtPostProcessingStageCreateBuiltin was introduced in OptiX 5.0.

**See also** rtPostProcessingStageDestroy, rtPostProcessingStageGetContext, rtPostProcessingStageQueryVariable, rtPostProcessingStageGetVariableCount rtPostProcessingStageGetVariable

#### 7.8.3.17 RTresult RTAPI rtPostProcessingStageDeclareVariable ( RTpostprocessingstage *stage*, const char * *name*, RTvariable * *v* )

Declares a new named variable associated with a PostprocessingStage.

**Description**

rtPostProcessingStageDeclareVariable declares a new variable associated with a postprocessing stage. *stage* specifies the post-processing stage, and should be a value returned by rtPostProcessingStageCreateBuiltin. *name* specifies the name of the variable, and should be a *NULL-terminated* string. If there is currently no variable associated with *stage* named *name*, a new variable named *name* will be created and associated with *stage*. After the call, **v* will be set to the handle of the newly-created variable. Otherwise, **v* will be set to *NULL*. After declaration, the variable can be queried with rtPostProcessingStageQueryVariable or rtPostProcessingStageGetVariable. A declared variable does not have a type until its value is set with one of the Variable setters functions. Once a variable is set, its type cannot be changed anymore.

**Parameters**

| | | |
|---|---|---|
| in | *stage* | Specifies the associated postprocessing stage |
| in | *name* | The name that identifies the variable |
| out | *v* | Returns a handle to a newly declared variable |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE
- RT_ERROR_MEMORY_ALLOCATION_FAILED

**History**

rtPostProcessingStageDeclareVariable was introduced in OptiX 5.0.

**See also** Variable functions, rtPostProcessingStageQueryVariable, rtPostProcessingStageGetVariable

#### 7.8.3.18 RTresult RTAPI rtPostProcessingStageDestroy ( RTpostprocessingstage *stage* )

Destroy a post-processing stage.

**Description**

rtPostProcessingStageDestroy destroys a post-processing stage from its context and deletes it. The variables built into the stage are destroyed. After the call, *stage* is no longer a valid handle. After a post-processing stage was destroyed all command lists containing that stage are invalidated and can no longer be used.

**Parameters**

| | | |
|---|---|---|
| in | *stage* | Handle of the post-processing stage to destroy |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtPostProcessingStageDestroy was introduced in OptiX 5.0.

**See also** rtPostProcessingStageCreateBuiltin, rtPostProcessingStageGetContext, rtPostProcessingStageQueryVariable, rtPostProcessingStageGetVariableCount rtPostProcessingStageGetVariable

#### 7.8.3.19 RTresult RTAPI rtPostProcessingStageGetContext ( RTpostprocessingstage *stage*, RTcontext * *context* )

Returns the context associated with a post-processing stage.

**Description**

rtPostProcessingStageGetContext queries a stage for its associated context. *stage* specifies the post-processing stage to query, and should be a value returned by rtPostProcessingStageCreateBuiltin. If both parameters are valid, **context* is set to the context associated with *stage*. Otherwise, the call has no effect and returns RT_ERROR_INVALID_VALUE.

**Parameters**

| | | |
|---|---|---|
| in | *stage* | Specifies the post-processing stage to query |
| out | *context* | Returns the context associated with the material |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_CONTEXT
- RT_ERROR_INVALID_VALUE

**History**

rtPostProcessingStageGetContext was introduced in OptiX 5.0.

**See also** rtPostProcessingStageCreateBuiltin, rtPostProcessingStageDestroy, rtPostProcessingStageQueryVariable, rtPostProcessingStageGetVariableCount rtPostProcessingStageGetVariable

#### 7.8.3.20 RTresult RTAPI rtPostProcessingStageGetVariable ( RTpostprocessingstage *stage,* unsigned int *index,* RTvariable * *variable* )

Returns a handle to a variable of a post-processing stage.

The variable is defined by index.

**Description**

rtPostProcessingStageGetVariable queries the handle of a post-processing stage's variable which is identified by its index . *stage* specifies the source post-processing stage, as returned by rtPostProcessingStageCreateBuiltin. *index* specifies the index of the variable, and should be a less than the value return by rtPostProcessingStageGetVariableCount. If *index* is in the valid range, the call returns a handle to that variable in **variable*, otherwise *NULL*.

**Parameters**

| | | |
|---|---|---|
| in | *stage* | The post-processing stage to query the variable from |
| in | *index* | The index identifying the variable to be returned |
| out | *variable* | Returns the variable |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtPostProcessingStageGetVariable was introduced in OptiX 5.0.

**See also** rtPostProcessingStageCreateBuiltin, rtPostProcessingStageDestroy, rtPostProcessingStageGetContext, rtPostProcessingStageQueryVariable, rtPostProcessingStageGetVariableCount

#### 7.8.3.21 RTresult RTAPI rtPostProcessingStageGetVariableCount ( RTpostprocessingstage *stage,* unsigned int * *count* )

Returns the number of variables pre-defined in a post-processing stage.

**Description**

rtPostProcessingStageGetVariableCount returns the number of variables which are pre-defined in a post-processing stage. This can be used to iterate over the variables. Sets ∗*count* to the number.

**Parameters**

| | | |
|---|---|---|
| in | *stage* | The post-processing stage to query the number of variables from |
| out | *count* | Returns the number of pre-defined variables |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtPostProcessingStageGetVariableCount was introduced in OptiX 5.0.

**See also** rtPostProcessingStageCreateBuiltin, rtPostProcessingStageDestroy, rtPostProcessingStageGetContext, rtPostProcessingStageQueryVariable, rtPostProcessingStageGetVariable

#### 7.8.3.22 RTresult RTAPI rtPostProcessingStageQueryVariable ( RTpostprocessingstage *stage*, const char ∗ *name*, RTvariable ∗ *variable* )

Returns a handle to a named variable of a post-processing stage.

**Description**

rtPostProcessingStageQueryVariable queries the handle of a post-processing stage's named variable. *stage* specifies the source post-processing stage, as returned by rtPostProcessingStageCreateBuiltin. *name* specifies the name of the variable, and should be a *NULL* -terminated string. If *name* is the name of a variable attached to *stage*, the call returns a handle to that variable in ∗*variable*, otherwise *NULL*. Only pre-defined variables of that built-in stage type can be queried. It is not possible to add or remove variables.

**Parameters**

| | | |
|---|---|---|
| in | *stage* | The post-processing stage to query the variable from |
| in | *name* | The name that identifies the variable to be queried |
| out | *variable* | Returns the named variable |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtPostProcessingStageQueryVariable was introduced in OptiX 5.0.

**See also** rtPostProcessingStageCreateBuiltin, rtPostProcessingStageDestroy, rtPostProcessingStageGetContext, rtPostProcessingStageGetVariableCount rtPostProcessingStageGetVariable

#### 7.8.3.23 RTresult RTAPI rtRemoteDeviceCreate ( const char ∗ *url*, const char ∗ *username*, const char ∗ *password*, RTremotedevice ∗ *remote_dev* )

Create a device for remote rendering on VCAs.

### Description

Establishes a connection to a remote OptiX device, e.g. a VCA or cluster of VCAs. This opens a connection to the cluster manager software running at *address*, using username and password as authentication strings. *address* is a WebSocket URL of the form "ws://localhost:80" or "wss://localhost:443", *username* and *password* as plain text strings for authenticating on the remote device. If successful, it initializes a new RTremotedevice object.

In order to use this newly created remote device, a rendering instance needs to be configured by selecting a software configuration and reserving a number of nodes in the VCA. See rtRemoteDeviceReserve for more details.

After a rendering instance is properly initialized, a remote device must be associated with a context to be used. Calling rtContextSetDevices creates this association. Any further OptiX calls will be directed to the remote device.

### Parameters

| | | |
|---|---|---|
| `in` | *url* | The WebSocket URL to connect to |
| `in` | *username* | Username in plain text |
| `in` | *password* | Password in plain text |
| `out` | *remote_dev* | A handle to the new remote device object |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE
- RT_ERROR_CONNECTION_FAILED
- RT_ERROR_AUTHENTICATION_FAILED

### History

rtRemoteDeviceCreate was introduced in OptiX 3.8.

**See also** rtRemoteDeviceDestroy rtRemoteDeviceGetAttribute rtRemoteDeviceReserve rtRemoteDeviceRelease rtContextSetRemoteDevice

#### 7.8.3.24 RTresult RTAPI rtRemoteDeviceDestroy ( RTremotedevice *remote_dev* )

Destroys a remote device.

### Description

Closes the network connection to the remote device and destroys the corresponding RTremotedevice object.

### Parameters

| | | |
|---|---|---|
| `in` | *remote_dev* | The remote device object to destroy |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

### History

rtRemoteDeviceDestroy was introduced in OptiX 3.8.

**See also** rtRemoteDeviceCreate rtRemoteDeviceGetAttribute rtRemoteDeviceReserve rtRemoteDeviceRelease rtContextSetRemoteDevice

#### 7.8.3.25 RTresult RTAPI rtRemoteDeviceGetAttribute ( RTremotedevice *remote_dev*, RTremotedeviceattribute *attrib*, RTsize *size*, void * *p* )

Queries attributes of a remote device.

**Description**

In order to gather information about a remote device, several attributes can be queried through rtRemoteDeviceGetAttribute.

Each attribute can have a different size. The sizes are given in the following list:

- RT_REMOTEDEVICE_ATTRIBUTE_CLUSTER_URL size of provided destination buffer
- RT_REMOTEDEVICE_ATTRIBUTE_HEAD_NODE_URL size of provided destination buffer
- RT_REMOTEDEVICE_ATTRIBUTE_NUM_CONFIGURATIONS sizeof(int)
- RT_REMOTEDEVICE_ATTRIBUTE_CONFIGURATIONS size of provided destination buffer
- RT_REMOTEDEVICE_ATTRIBUTE_STATUS sizeof(RTremotedevicestatus)
- RT_REMOTEDEVICE_ATTRIBUTE_NUM_TOTAL_NODES sizeof(int)
- RT_REMOTEDEVICE_ATTRIBUTE_NUM_FREE_NODES sizeof(int)
- RT_REMOTEDEVICE_ATTRIBUTE_NUM_RESERVED_NODES sizeof(int)
- RT_REMOTEDEVICE_ATTRIBUTE_NAME size of provided destination buffer
- RT_REMOTEDEVICE_ATTRIBUTE_NUM_GPUS sizeof(int)
- RT_REMOTEDEVICE_ATTRIBUTE_GPU_TOTAL_MEMORY sizeof(RTsize)

The following attributes can be queried when a remote device is connected:

- RT_REMOTEDEVICE_ATTRIBUTE_CLUSTER_URL
- RT_REMOTEDEVICE_ATTRIBUTE_NUM_CONFIGURATIONS
- RT_REMOTEDEVICE_ATTRIBUTE_CONFIGURATIONS
- RT_REMOTEDEVICE_ATTRIBUTE_STATUS
- RT_REMOTEDEVICE_ATTRIBUTE_NUM_TOTAL_NODES
- RT_REMOTEDEVICE_ATTRIBUTE_NUM_FREE_NODES
- RT_REMOTEDEVICE_ATTRIBUTE_NAME
- RT_REMOTEDEVICE_ATTRIBUTE_GPU_TOTAL_MEMORY

The following attributes require a valid reservation to be queried:

- RT_REMOTEDEVICE_ATTRIBUTE_HEAD_NODE_URL
- RT_REMOTEDEVICE_ATTRIBUTE_NUM_RESERVED_NODES
- RT_REMOTEDEVICE_ATTRIBUTE_NUM_GPUS

RT_REMOTEDEVICE_ATTRIBUTE_CLUSTER_URL The URL of the Cluster Manager associated with this remote device.

RT_REMOTEDEVICE_ATTRIBUTE_HEAD_NODE_URL The URL of the rendering instance being used, once it has been reserved and initialized.

RT_REMOTEDEVICE_ATTRIBUTE_NUM_CONFIGURATIONS Number of compatible software configurations available in the remote device.

RT_REMOTEDEVICE_ATTRIBUTE_CONFIGURATIONS Base entry for a list of compatible software configurations in the device. A configuration is a text description for a software package installed in the remote device, intended as a guide to the user in selecting from the pool of compatible configurations. This list is already filtered and it only contains entries on the remote device compatible with the client library being used. Each entry can be accessed as the attribute (RT_REMOTEDEVICE_ATTRIBUTE_CONFIGURATIONS + index), with index being zero-based. The configuration description for the given index is copied into the destination buffer. A suggested size for the destination buffer is 256 characters. The number of entries in the list is given by the value of

RT_REMOTEDEVICE_ATTRIBUTE_NUM_CONFIGURATIONS. Only configurations compatible with the client version being used are listed.

RT_REMOTEDEVICE_ATTRIBUTE_STATUS Returns the current status of the remote device, as one of the following:

- RT_REMOTEDEVICE_STATUS_READY The remote device is ready for use.
- RT_REMOTEDEVICE_STATUS_CONNECTED The remote device is connected to a cluster manager, but no reservation exists.
- RT_REMOTEDEVICE_STATUS_RESERVED The remote device has a rendering instance reserved, but it is not yet ready.
- RT_REMOTEDEVICE_STATUS_DISCONNECTED The remote device has disconnected.

RT_REMOTEDEVICE_ATTRIBUTE_NUM_TOTAL_NODES Total number of nodes in the cluster of VCAs.

RT_REMOTEDEVICE_ATTRIBUTE_NUM_FREE_NODES Number of free nodes available.

RT_REMOTEDEVICE_ATTRIBUTE_NUM_RESERVED_NODES Number of nodes used by the current reservation.

RT_REMOTEDEVICE_ATTRIBUTE_NUM_GPUS Number of GPUs used by the current reservation.

RT_REMOTEDEVICE_ATTRIBUTE_NAME Common name assigned the Remote Device.

RT_REMOTEDEVICE_ATTRIBUTE_GPU_TOTAL_MEMORY Total amount of memory on each GPU, in bytes.

**Parameters**

| | | |
|---|---|---|
| in | *remote_dev* | The remote device to query |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

**History**

rtRemoteDeviceGetAttribute was introduced in OptiX 3.8.

**See also** rtRemoteDeviceCreate rtRemoteDeviceReserve rtRemoteDeviceRelease rtContextSetRemoteDevice

#### 7.8.3.26 RTresult RTAPI rtRemoteDeviceRelease ( RTremotedevice *remote_dev* )

Release reserved nodes on a remote device.

**Description**

Releases an existing reservation on the remote device. The rendering instance on the remote device is destroyed, and all its remote context information is lost. Further OptiX calls will no longer be directed to the device. A new reservation can take place.

**Parameters**

| | | |
|---|---|---|
| in | *remote_dev* | The remote device on which the reservation was made |

**Return values**

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

### History

rtRemoteDeviceRelease was introduced in OptiX 3.8.

**See also** rtRemoteDeviceCreate rtRemoteDeviceGetAttribute rtRemoteDeviceReserve rtContextSetRemoteDevice

#### 7.8.3.27 RTresult RTAPI rtRemoteDeviceReserve ( RTremotedevice *remote_dev,* unsigned int *num_nodes,* unsigned int *configuration* )

Reserve nodes for rendering on a remote device.

### Description

Reserves nodes in the remote device to form a rendering instance. Receives *num_nodes* as the number of nodes to reserve, and *configuration* as the index of the software package to use for the created instance. Both the number of available nodes and the list of available configurations in a remote device can be retrieved by rtRemoteDeviceGetAttribute.

After successfully reserving the nodes, the RT_REMOTEDEVICE_ATTRIBUTE_STATUS attribute should be polled repeatedly. The rendering instance is ready for use when that attribute is set to RT_REMOTE_DEVICE_STATUS_READY.

Only a single reservation per remote device and user can exist at any given time (i.e. a user can have only one rendering instance per remote device). This includes reservations performed through other means, like previous runs that were not properly released, or manual reservations over the cluster manager web interface.

### Parameters

| | | |
|---|---|---|
| in | *remote_dev* | The remote device on which to reserve nodes |
| in | *num_nodes* | The number of nodes to reserve |
| in | *configuration* | The index of the software configuration to use |

### Return values

Relevant return values:

- RT_SUCCESS
- RT_ERROR_INVALID_VALUE

### History

rtRemoteDeviceReserve was introduced in OptiX 3.8.

**See also** rtRemoteDeviceCreate rtRemoteDeviceGetAttribute rtRemoteDeviceRelease rtContextSetRemoteDevice

#### 7.8.3.28 RTresult RTAPI rtTextureSamplerGetArraySize ( RTtexturesampler *texturesampler,* unsigned int * *num_textures_in_array* )

Deprecated in OptiX 3.9.

Use texture samplers with layered buffers instead. See rtBufferCreate.

#### 7.8.3.29 RTresult RTAPI rtTextureSamplerGetMipLevelCount ( RTtexturesampler *texturesampler,* unsigned int * *num_mip_levels* )

Deprecated in OptiX 3.9.

Use rtBufferGetMipLevelCount instead.

#### 7.8.3.30 RTresult RTAPI rtTextureSamplerSetArraySize ( RTtexturesampler *texturesampler,* unsigned int *num_textures_in_array* )

Deprecated in OptiX 3.9.

Use texture samplers with layered buffers instead. See rtBufferCreate.

#### 7.8.3.31 RTresult RTAPI rtTextureSamplerSetMipLevelCount ( RTtexturesampler *texturesampler,* unsigned int *num_mip_levels* )

Deprecated in OptiX 3.9.

Use rtBufferSetMipLevelCount instead.

## 7.9 optix_prime.h File Reference

### Typedefs

- typedef struct RTPcontext_api * RTPcontext
- typedef struct RTPmodel_api * RTPmodel
- typedef struct RTPquery_api * RTPquery
- typedef struct RTPbufferdesc_api * RTPbufferdesc

### Functions

- RTPresult RTPAPI rtpContextCreate (RTPcontexttype type, RTPcontext *context)
- RTPresult RTPAPI rtpContextSetCudaDeviceNumbers (RTPcontext context, unsigned deviceCount, const unsigned *deviceNumbers)
- RTPresult RTPAPI rtpContextSetCpuThreads (RTPcontext context, unsigned numThreads)
- RTPresult RTPAPI rtpContextDestroy (RTPcontext context)
- RTPresult RTPAPI rtpContextGetLastErrorString (RTPcontext context, const char **return_string)
- RTPresult RTPAPI rtpBufferDescCreate (RTPcontext context, RTPbufferformat format, RTPbuffertype type, void *buffer, RTPbufferdesc *desc)
- RTPresult RTPAPI rtpBufferDescGetContext (RTPbufferdesc desc, RTPcontext *context)
- RTPresult RTPAPI rtpBufferDescSetRange (RTPbufferdesc desc, RTPsize begin, RTPsize end)
- RTPresult RTPAPI rtpBufferDescSetStride (RTPbufferdesc desc, unsigned strideBytes)
- RTPresult RTPAPI rtpBufferDescSetCudaDeviceNumber (RTPbufferdesc desc, unsigned deviceNumber)
- RTPresult RTPAPI rtpBufferDescDestroy (RTPbufferdesc desc)
- RTPresult RTPAPI rtpModelCreate (RTPcontext context, RTPmodel *model)
- RTPresult RTPAPI rtpModelGetContext (RTPmodel model, RTPcontext *context)
- RTPresult RTPAPI rtpModelSetTriangles (RTPmodel model, RTPbufferdesc indices, RTPbufferdesc vertices)
- RTPresult RTPAPI rtpModelSetInstances (RTPmodel model, RTPbufferdesc instances, RTPbufferdesc transforms)
- RTPresult RTPAPI rtpModelUpdate (RTPmodel model, unsigned hints)
- RTPresult RTPAPI rtpModelFinish (RTPmodel model)
- RTPresult RTPAPI rtpModelGetFinished (RTPmodel model, int *isFinished)
- RTPresult RTPAPI rtpModelCopy (RTPmodel model, RTPmodel srcModel)

- RTPresult RTPAPI rtpModelSetBuilderParameter (RTPmodel model_api, RTPbuilderparam param, RTPsize size, const void *ptr)
- RTPresult RTPAPI rtpModelDestroy (RTPmodel model)
- RTPresult RTPAPI rtpQueryCreate (RTPmodel model, RTPquerytype queryType, RTPquery *query)
- RTPresult RTPAPI rtpQueryGetContext (RTPquery query, RTPcontext *context)
- RTPresult RTPAPI rtpQuerySetRays (RTPquery query, RTPbufferdesc rays)
- RTPresult RTPAPI rtpQuerySetHits (RTPquery query, RTPbufferdesc hits)
- RTPresult RTPAPI rtpQueryExecute (RTPquery query, unsigned hints)
- RTPresult RTPAPI rtpQueryFinish (RTPquery query)
- RTPresult RTPAPI rtpQueryGetFinished (RTPquery query, int *isFinished)
- RTPresult RTPAPI rtpQuerySetCudaStream (RTPquery query, cudaStream_t stream)
- RTPresult RTPAPI rtpQueryDestroy (RTPquery query)
- RTPresult RTPAPI rtpHostBufferLock (void *buffer, RTPsize size)
- RTPresult RTPAPI rtpHostBufferUnlock (void *buffer)
- RTPresult RTPAPI rtpGetErrorString (RTPresult errorCode, const char **errorString)
- RTPresult RTPAPI rtpGetVersion (unsigned *version)
- RTPresult RTPAPI rtpGetVersionString (const char **versionString)

### 7.9.1 Detailed Description

OptiX Prime public API.

Author

NVIDIA Corporation OptiX Prime public API

### 7.9.2 Typedef Documentation

#### 7.9.2.1 typedef struct RTPbufferdesc_api* RTPbufferdesc

Opaque type.

Note that the *_api type should never be used directly. Only the typedef target name will be guaranteed to remain unchanged.

#### 7.9.2.2 typedef struct RTPcontext_api* RTPcontext

Opaque type.

Note that the *_api type should never be used directly. Only the typedef target name will be guaranteed to remain unchanged.

#### 7.9.2.3 typedef struct RTPmodel_api* RTPmodel

Opaque type.

Note that the *_api type should never be used directly. Only the typedef target name will be guaranteed to remain unchanged.

#### 7.9.2.4 typedef struct RTPquery_api* RTPquery

Opaque type.

Note that the *_api type should never be used directly. Only the typedef target name will be guaranteed to remain unchanged.

## 7.10 optix_prime_declarations.h File Reference

### Enumerations

- enum RTPresult {
  RTP_SUCCESS = 0,
  RTP_ERROR_INVALID_VALUE = 1,
  RTP_ERROR_OUT_OF_MEMORY = 2,
  RTP_ERROR_INVALID_HANDLE = 3,
  RTP_ERROR_NOT_SUPPORTED = 4,
  RTP_ERROR_OBJECT_CREATION_FAILED = 5,
  RTP_ERROR_MEMORY_ALLOCATION_FAILED = 6,
  RTP_ERROR_INVALID_CONTEXT = 7,
  RTP_ERROR_VALIDATION_ERROR = 8,
  RTP_ERROR_INVALID_OPERATION = 9,
  RTP_ERROR_UNKNOWN = 999 }
- enum RTPcontexttype {
  RTP_CONTEXT_TYPE_CPU = 0x100,
  RTP_CONTEXT_TYPE_CUDA = 0x101 }
- enum RTPbuffertype {
  RTP_BUFFER_TYPE_HOST = 0x200,
  RTP_BUFFER_TYPE_CUDA_LINEAR = 0x201 }
- enum RTPbufferformat {
  RTP_BUFFER_FORMAT_INDICES_INT3 = 0x400,
  RTP_BUFFER_FORMAT_INDICES_INT3_MASK_INT = 0x401,
  RTP_BUFFER_FORMAT_VERTEX_FLOAT3 = 0x420,
  RTP_BUFFER_FORMAT_VERTEX_FLOAT4 = 0x421,
  RTP_BUFFER_FORMAT_RAY_ORIGIN_DIRECTION = 0x440,
  RTP_BUFFER_FORMAT_RAY_ORIGIN_TMIN_DIRECTION_TMAX = 0x441,
  RTP_BUFFER_FORMAT_RAY_ORIGIN_MASK_DIRECTION_TMAX = 0x442,
  RTP_BUFFER_FORMAT_HIT_BITMASK = 0x460,
  RTP_BUFFER_FORMAT_HIT_T = 0x461,
  RTP_BUFFER_FORMAT_HIT_T_TRIID = 0x462,
  RTP_BUFFER_FORMAT_HIT_T_TRIID_U_V = 0x463,
  RTP_BUFFER_FORMAT_HIT_T_TRIID_INSTID = 0x464,
  RTP_BUFFER_FORMAT_HIT_T_TRIID_INSTID_U_V = 0x465,
  RTP_BUFFER_FORMAT_INSTANCE_MODEL = 0x480,
  RTP_BUFFER_FORMAT_TRANSFORM_FLOAT4x4 = 0x490,
  RTP_BUFFER_FORMAT_TRANSFORM_FLOAT4x3 = 0x491 }
- enum RTPquerytype {
  RTP_QUERY_TYPE_ANY = 0x1000,
  RTP_QUERY_TYPE_CLOSEST = 0x1001 }
- enum RTPmodelhint {
  RTP_MODEL_HINT_NONE = 0x0000,
  RTP_MODEL_HINT_ASYNC = 0x2001,
  RTP_MODEL_HINT_MASK_UPDATE = 0x2002,
  RTP_MODEL_HINT_USER_TRIANGLES_AFTER_COPY_SET = 0x2004 }

- enum RTPqueryhint {
  RTP_QUERY_HINT_NONE = 0x0000,
  RTP_QUERY_HINT_ASYNC = 0x4001,
  RTP_QUERY_HINT_WATERTIGHT = 0x4002 }
- enum RTPbuilderparam {
  RTP_BUILDER_PARAM_CHUNK_SIZE = 0x800,
  RTP_BUILDER_PARAM_USE_CALLER_TRIANGLES = 0x801 }

### 7.10.1 Detailed Description

OptiX Prime public API declarations.

Author

NVIDIA Corporation OptiX Prime public API declarations

### 7.10.2 Enumeration Type Documentation

#### 7.10.2.1 enum RTPbufferformat

Buffer formats.

Enumerator

***RTP_BUFFER_FORMAT_INDICES_INT3*** Index buffer with 3 integer vertex indices per triangle.

***RTP_BUFFER_FORMAT_INDICES_INT3_MASK_INT*** Index buffer with 3 integer vertex indices per triangle, and an integer visibility mask.

***RTP_BUFFER_FORMAT_VERTEX_FLOAT3*** Vertex buffer with 3 floats per vertex position.

***RTP_BUFFER_FORMAT_VERTEX_FLOAT4*** Vertex buffer with 4 floats per vertex position.

***RTP_BUFFER_FORMAT_RAY_ORIGIN_DIRECTION*** float3:origin float3:direction

***RTP_BUFFER_FORMAT_RAY_ORIGIN_TMIN_DIRECTION_TMAX*** float3:origin, float:tmin, float3:direction, float:tmax

***RTP_BUFFER_FORMAT_RAY_ORIGIN_MASK_DIRECTION_TMAX*** float3:origin, int:mask, float3:direction, float:tmax. If used, buffer format RTP_BUFFER_FORMAT_INDICES_INT3_MASK_INT is required!

***RTP_BUFFER_FORMAT_HIT_BITMASK*** one bit per ray 0=miss, 1=hit

***RTP_BUFFER_FORMAT_HIT_T*** float:ray distance (t $<$ 0 for miss)

***RTP_BUFFER_FORMAT_HIT_T_TRIID*** float:ray distance (t $<$ 0 for miss), int:triangle id

***RTP_BUFFER_FORMAT_HIT_T_TRIID_U_V*** float:ray distance (t $<$ 0 for miss), int:triangle id, float2:barycentric coordinates u,v (w=1-u-v)

***RTP_BUFFER_FORMAT_HIT_T_TRIID_INSTID*** float:ray distance (t $<$ 0 for miss), int:triangle id, int:instance position in list

***RTP_BUFFER_FORMAT_HIT_T_TRIID_INSTID_U_V*** float:ray distance (t $<$ 0 for miss), int:triangle id, int:instance position in list, float2:barycentric coordinates u,v (w=1-u-v)

***RTP_BUFFER_FORMAT_INSTANCE_MODEL*** RTPmodel:objects of type RTPmodel.

***RTP_BUFFER_FORMAT_TRANSFORM_FLOAT4x4*** float:row major 4x4 affine matrix (it is assumed that the last row has the entries 0.0f, 0.0f, 0.0f, 1.0f, and will be ignored)

***RTP_BUFFER_FORMAT_TRANSFORM_FLOAT4x3*** float:row major 4x3 affine matrix

#### 7.10.2.2 enum RTPbuffertype

Buffer types.

Enumerator

***RTP_BUFFER_TYPE_HOST*** Buffer in host memory.
***RTP_BUFFER_TYPE_CUDA_LINEAR*** Linear buffer in device memory on a cuda device.

#### 7.10.2.3 enum RTPbuilderparam

Enumerator

***RTP_BUILDER_PARAM_CHUNK_SIZE*** Number of bytes used for a chunk of the acceleration structure build.
***RTP_BUILDER_PARAM_USE_CALLER_TRIANGLES*** A hint to specify which data should be used for the intersection test.

#### 7.10.2.4 enum RTPcontexttype

Context types.

Enumerator

***RTP_CONTEXT_TYPE_CPU*** CPU context.
***RTP_CONTEXT_TYPE_CUDA*** CUDA context.

#### 7.10.2.5 enum RTPmodelhint

Model hints.

Enumerator

***RTP_MODEL_HINT_NONE*** No hints. Use default settings.
***RTP_MODEL_HINT_ASYNC*** Asynchronous model updating.
***RTP_MODEL_HINT_MASK_UPDATE*** Upload buffer with mask data again.
***RTP_MODEL_HINT_USER_TRIANGLES_AFTER_COPY_SET*** Clear dirty flag of triangles.

#### 7.10.2.6 enum RTPqueryhint

Query hints.

Enumerator

***RTP_QUERY_HINT_NONE*** No hints. Use default settings.
***RTP_QUERY_HINT_ASYNC*** Asynchronous query execution.
***RTP_QUERY_HINT_WATERTIGHT*** Use watertight ray-triangle intersection, but only if the RTP_BUILDER_PARAM_USE_CALLER_TRIANGLES builder parameter is also set.

#### 7.10.2.7 enum RTPquerytype

Query types.

Enumerator

***RTP_QUERY_TYPE_ANY*** Return any hit along a ray.
***RTP_QUERY_TYPE_CLOSEST*** Return only the closest hit along a ray.

#### 7.10.2.8 enum RTPresult

Return value for OptiX Prime APIs.

Enumerator

***RTP_SUCCESS*** Success.
***RTP_ERROR_INVALID_VALUE*** An invalid value was provided.
***RTP_ERROR_OUT_OF_MEMORY*** Out of memory.
***RTP_ERROR_INVALID_HANDLE*** An invalid handle was supplied.
***RTP_ERROR_NOT_SUPPORTED*** An unsupported function was requested.
***RTP_ERROR_OBJECT_CREATION_FAILED*** Object creation failed.
***RTP_ERROR_MEMORY_ALLOCATION_FAILED*** Memory allocation failed.
***RTP_ERROR_INVALID_CONTEXT*** An invalid context was provided.
***RTP_ERROR_VALIDATION_ERROR*** A validation error occurred.
***RTP_ERROR_INVALID_OPERATION*** An invalid operation was performed.
***RTP_ERROR_UNKNOWN*** Unknown error.

## 7.11 optix_primepp.h File Reference

### Classes

- class optix::prime::ContextObj
- class optix::prime::BufferDescObj
- class optix::prime::ModelObj
- class optix::prime::QueryObj
- class optix::prime::Exception

### Typedefs

- typedef Handle< BufferDescObj > optix::prime::BufferDesc
- typedef Handle< ContextObj > optix::prime::Context
- typedef Handle< ModelObj > optix::prime::Model
- typedef Handle< QueryObj > optix::prime::Query

### Functions

- **std::string optix::prime::getVersionString** ()

### 7.11.1 Detailed Description

A C++ wrapper around the OptiX Prime API.

## 7.12 optix_world.h File Reference

### 7.12.1 Detailed Description

OptiX public API C and C++ API.

Author

NVIDIA Corporation This header is designed to be included by both host and device code providing access to the C-API along with the C++ API found in optixpp_namespaces.h. In addition various helper classes and file will also be included when compiling C++ compatible code.

Note that the CUDA vector types will be defined in the optix:: namespace.

## 7.13 optixpp_namespace.h File Reference

### Classes

- class optix::Handle< T >
- class optix::Exception
- class optix::APIObj
- class optix::DestroyableObj
- class optix::ScopedObj
- class optix::VariableObj
- class optix::ContextObj
- class optix::ProgramObj
- class optix::GroupObj
- class optix::GeometryGroupObj
- class optix::TransformObj
- class optix::SelectorObj
- class optix::AccelerationObj
- class optix::GeometryInstanceObj
- class optix::GeometryObj
- class optix::MaterialObj
- class optix::TextureSamplerObj
- class optix::BufferObj
- struct optix::bufferId< T, Dim >
- class optix::RemoteDeviceObj
- class optix::PostprocessingStageObj
- class optix::CommandListObj

### Macros

- #define RT_INTERNAL_CALLABLE_PROGRAM_DEFS()

### Typedefs

- typedef Handle< AccelerationObj > optix::Acceleration
- typedef Handle< BufferObj > optix::Buffer
- typedef Handle< ContextObj > optix::Context
- typedef Handle< GeometryObj > optix::Geometry
- typedef Handle< GeometryGroupObj > optix::GeometryGroup
- typedef Handle < GeometryInstanceObj > optix::GeometryInstance
- typedef Handle< GroupObj > optix::Group
- typedef Handle< MaterialObj > optix::Material
- typedef Handle< ProgramObj > optix::Program
- typedef Handle< RemoteDeviceObj > optix::RemoteDevice
- typedef Handle< SelectorObj > optix::Selector
- typedef Handle< TextureSamplerObj > optix::TextureSampler
- typedef Handle< TransformObj > optix::Transform
- typedef Handle< VariableObj > optix::Variable
- typedef Handle < PostprocessingStageObj > optix::PostprocessingStage
- typedef Handle< CommandListObj > optix::CommandList

#### 7.13.1 Detailed Description

A C++ wrapper around the OptiX API.

#### 7.13.2 Macro Definition Documentation

##### 7.13.2.1 #define RT_INTERNAL_CALLABLE_PROGRAM_DEFS( )

**Value:**

```
{                                          \
  public:                                  \
    callableProgramId() {}                 \
    callableProgramId(int id) : m_id(id) {}  \
    int getId() const { return m_id; }     \
  private:                                 \
    int m_id;                              \
  }
```

callableProgramId is a host version of the device side callableProgramId.

Use callableProgramId to define types that can be included from both the host and device code. This class provides a container that can be used to transport the program id back and forth between host and device code. The callableProgramId class is useful, because it can take a program id obtained from rtProgramGetId and provide accessors for calling the program corresponding to the program id.

"bindless_type.h" used by both host and device code:

```
#include <optix_world.h>
struct ProgramInfo {
  int val;
  rtProgramId<int(int)> program;
};
```

Host code:

```
#include "bindless_type.h"
ProgramInfo input_program_info;
input_program_info.val = 0;
input_program_info.program = rtCallableProgramId<int(int)>(inputProgram0->getId());
context["input_program_info"]->setUserData(sizeof(ProgramInfo), &input_program_info);
```

Device code:

```
#include "bindless_type.h"
rtBuffer<int,1> result;
rtDeclareVariable(ProgramInfo, input_program_info, ,);

RT_PROGRAM void bindless()
{
  int value = input_program_info.program(input_program_info.val);
  result[0] = value;
}
```

## 7.14 optixu.h File Reference

### Functions

- RTresult RTAPI rtuNameForType (RTobjecttype type, char *buffer, RTsize bufferSize)
- RTresult RTAPI rtuGetSizeForRTformat (RTformat format, size_t *size)
- RTresult RTAPI rtuCUDACompileString (const char *source, const char **preprocessorArguments, unsigned int numPreprocessorArguments, RTsize *resultSize, RTsize *errorSize)
- RTresult RTAPI rtuCUDACompileFile (const char *filename, const char **preprocessorArguments, unsigned int numPreprocessorArguments, RTsize *resultSize, RTsize *errorSize)
- RTresult RTAPI rtuCUDAGetCompileResult (char *result, char *error)
- RTresult RTAPI rtuCreateClusteredMesh (RTcontext context, unsigned int usePTX32InHost64, RTgeometry *mesh, unsigned int num_verts, const float *verts, unsigned int num_tris, const unsigned *indices, const unsigned *mat_indices)
- RTresult RTAPI rtuCreateClusteredMeshExt (RTcontext context, unsigned int usePTX32InHost64, RTgeometry *mesh, unsigned int num_verts, const float *verts, unsigned int num_tris, const unsigned *indices, const unsigned *mat_indices, RTbuffer norms, const unsigned *norm_indices, RTbuffer tex_coords, const unsigned *tex_indices)

- static RTresult rtuGroupAddChild (RTgroup group, RTobject child, unsigned int *index)
- static RTresult rtuSelectorAddChild (RTselector selector, RTobject child, unsigned int *index)
- static RTresult rtuGeometryGroupAddChild (RTgeometrygroup geometrygroup, RTgeometryinstance child, unsigned int *index)

- static RTresult rtuTransformSetChild (RTtransform transform, RTobject child)

- static RTresult rtuTransformGetChild (RTtransform transform, RTobject *type)
- static RTresult rtuTransformGetChildType (RTtransform transform, RTobjecttype *type)

- static RTresult rtuGroupRemoveChild (RTgroup group, RTobject child)

- static RTresult rtuSelectorRemoveChild (RTselector selector, RTobject child)
- static RTresult rtuGeometryGroupRemoveChild (RTgeometrygroup geometrygroup, RTgeometryinstance child)

- static RTresult rtuGroupRemoveChildByIndex (RTgroup group, unsigned int index)
- static RTresult rtuSelectorRemoveChildByIndex (RTselector selector, unsigned int index)
- static RTresult rtuGeometryGroupRemoveChildByIndex (RTgeometrygroup geometrygroup, unsigned int index)

- static RTresult rtuGroupGetChildIndex (RTgroup group, RTobject child, unsigned int *index)
- static RTresult rtuSelectorGetChildIndex (RTselector selector, RTobject child, unsigned int *index)
- static RTresult rtuGeometryGroupGetChildIndex (RTgeometrygroup geometrygroup, RTgeometryinstance child, unsigned int *index)

### 7.14.1 Detailed Description

Convenience functions for the OptiX API.

## 7.15 optixu_aabb_namespace.h File Reference

### Classes

- class optix::Aabb

### 7.15.1 Detailed Description

OptiX public API.

Author

NVIDIA Corporation OptiX public API Reference - Public AABB namespace

## 7.16 optixu_math_namespace.h File Reference

### Classes

- struct optix::Onb

### Functions

- OPTIXU_INLINE float **optix::copysignf** (const float dst, const float src)
- OPTIXU_INLINE int **optix::float_as_int** (const float f)
- OPTIXU_INLINE float **optix::int_as_float** (int i)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::lerp** (const float a, const float b, const float t)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::bilerp** (const float x00, const float x10, const float x01, const float x11, const float u, const float v)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::clamp** (const float f, const float a, const float b)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::getByIndex** (const float1 &v, int i)

- OPTIXU_INLINE RT_HOSTDEVICE void **optix::setByIndex** (float1 &v, int i, float x)
- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::operator-** (const float2 &a)
- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::lerp** (const float2 &a, const float2 &b, const float t)
- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::bilerp** (const float2 &x00, const float2 &x10, const float2 &x01, const float2 &x11, const float u, const float v)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::dot** (const float2 &a, const float2 &b)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::length** (const float2 &v)
- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::normalize** (const float2 &v)
- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::floor** (const float2 &v)
- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::reflect** (const float2 &i, const float2 &n)
- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::faceforward** (const float2 &n, const float2 &i, const float2 &nref)
- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::expf** (const float2 &v)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::getByIndex** (const float2 &v, int i)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::setByIndex** (float2 &v, int i, float x)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::operator-** (const float3 &a)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::lerp** (const float3 &a, const float3 &b, const float t)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::bilerp** (const float3 &x00, const float3 &x10, const float3 &x01, const float3 &x11, const float u, const float v)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::dot** (const float3 &a, const float3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::cross** (const float3 &a, const float3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::length** (const float3 &v)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::normalize** (const float3 &v)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::floor** (const float3 &v)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::reflect** (const float3 &i, const float3 &n)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::faceforward** (const float3 &n, const float3 &i, const float3 &nref)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::expf** (const float3 &v)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::getByIndex** (const float3 &v, int i)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::setByIndex** (float3 &v, int i, float x)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::operator-** (const float4 &a)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::lerp** (const float4 &a, const float4 &b, const float t)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::bilerp** (const float4 &x00, const float4 &x10, const float4 &x01, const float4 &x11, const float u, const float v)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::dot** (const float4 &a, const float4 &b)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::length** (const float4 &r)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::normalize** (const float4 &v)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::floor** (const float4 &v)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::reflect** (const float4 &i, const float4 &n)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::faceforward** (const float4 &n, const float4 &i, const float4 &nref)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::expf** (const float4 &v)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::getByIndex** (const float4 &v, int i)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::setByIndex** (float4 &v, int i, float x)
- OPTIXU_INLINE RT_HOSTDEVICE int **optix::clamp** (const int f, const int a, const int b)
- OPTIXU_INLINE RT_HOSTDEVICE int **optix::getByIndex** (const int1 &v, int i)

- OPTIXU_INLINE RT_HOSTDEVICE void **optix::setByIndex** (int1 &v, int i, int x)
- OPTIXU_INLINE RT_HOSTDEVICE int2 **optix::operator-** (const int2 &a)
- OPTIXU_INLINE RT_HOSTDEVICE int2 **optix::min** (const int2 &a, const int2 &b)
- OPTIXU_INLINE RT_HOSTDEVICE int2 **optix::max** (const int2 &a, const int2 &b)
- OPTIXU_INLINE RT_HOSTDEVICE int **optix::getByIndex** (const int2 &v, int i)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::setByIndex** (int2 &v, int i, int x)
- OPTIXU_INLINE RT_HOSTDEVICE int3 **optix::operator-** (const int3 &a)
- OPTIXU_INLINE RT_HOSTDEVICE int3 **optix::min** (const int3 &a, const int3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE int3 **optix::max** (const int3 &a, const int3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE int **optix::getByIndex** (const int3 &v, int i)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::setByIndex** (int3 &v, int i, int x)
- OPTIXU_INLINE RT_HOSTDEVICE int4 **optix::operator-** (const int4 &a)
- OPTIXU_INLINE RT_HOSTDEVICE int4 **optix::min** (const int4 &a, const int4 &b)
- OPTIXU_INLINE RT_HOSTDEVICE int4 **optix::max** (const int4 &a, const int4 &b)
- OPTIXU_INLINE RT_HOSTDEVICE int **optix::getByIndex** (const int4 &v, int i)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::setByIndex** (int4 &v, int i, int x)
- OPTIXU_INLINE RT_HOSTDEVICE
  unsigned int **optix::clamp** (const unsigned int f, const unsigned int a, const unsigned int b)
- OPTIXU_INLINE RT_HOSTDEVICE
  unsigned int **optix::getByIndex** (const uint1 &v, unsigned int i)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::setByIndex** (uint1 &v, int i, unsigned int x)
- OPTIXU_INLINE RT_HOSTDEVICE uint2 **optix::min** (const uint2 &a, const uint2 &b)
- OPTIXU_INLINE RT_HOSTDEVICE uint2 **optix::max** (const uint2 &a, const uint2 &b)
- OPTIXU_INLINE RT_HOSTDEVICE
  unsigned int **optix::getByIndex** (const uint2 &v, unsigned int i)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::setByIndex** (uint2 &v, int i, unsigned int x)
- OPTIXU_INLINE RT_HOSTDEVICE uint3 **optix::min** (const uint3 &a, const uint3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE uint3 **optix::max** (const uint3 &a, const uint3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE
  unsigned int **optix::getByIndex** (const uint3 &v, unsigned int i)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::setByIndex** (uint3 &v, int i, unsigned int x)
- OPTIXU_INLINE RT_HOSTDEVICE
  unsigned int **optix::getByIndex** (const uint4 &v, unsigned int i)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::setByIndex** (uint4 &v, int i, unsigned int x)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::smoothstep** (const float edge0, const float edge1, const float x)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::temperature** (const float t)
- OPTIXU_INLINE RT_HOSTDEVICE bool **optix::intersect_triangle_branchless** (const Ray &ray, const float3 &p0, const float3 &p1, const float3 &p2, float3 &n, float &t, float &beta, float &gamma)
- OPTIXU_INLINE RT_HOSTDEVICE bool **optix::intersect_triangle_earlyexit** (const Ray &ray, const float3 &p0, const float3 &p1, const float3 &p2, float3 &n, float &t, float &beta, float &gamma)
- OPTIXU_INLINE RT_HOSTDEVICE bool **optix::intersect_triangle** (const Ray &ray, const float3 &p0, const float3 &p1, const float3 &p2, float3 &n, float &t, float &beta, float &gamma)
- OPTIXU_INLINE RT_HOSTDEVICE bool **optix::refract** (float3 &r, const float3 &i, const float3 &n, const float ior)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::fresnel_schlick** (const float cos_theta, const float exponent=5.0f, const float minimum=0.0f, const float maximum=1.0f)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::luminance** (const float3 &rgb)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::luminanceCIE** (const float3 &rgb)

- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::square_to_disk** (const float2 &sample)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::cart_to_pol** (const float3 &v)

- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::make_float2** (const float s)
- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::make_float2** (const int2 &a)
- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::make_float2** (const uint2 &a)

- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::fminf** (const float2 &a, const float2 &b)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::fminf** (const float2 &a)

- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::fmaxf** (const float2 &a, const float2 &b)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::fmaxf** (const float2 &a)

- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::operator+** (const float2 &a, const float2 &b)
- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::operator+** (const float2 &a, const float b)
- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::operator+** (const float a, const float2 &b)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator+=** (float2 &a, const float2 &b)

- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::operator-** (const float2 &a, const float2 &b)
- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::operator-** (const float2 &a, const float b)
- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::operator-** (const float a, const float2 &b)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator-=** (float2 &a, const float2 &b)

- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::operator**∗ (const float2 &a, const float2 &b)
- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::operator**∗ (const float2 &a, const float s)
- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::operator**∗ (const float s, const float2 &a)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator∗=** (float2 &a, const float2 &s)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator∗=** (float2 &a, const float s)

- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::operator**/ (const float2 &a, const float2 &b)
- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::operator**/ (const float2 &a, const float s)
- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::operator**/ (const float s, const float2 &a)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator/=** (float2 &a, const float s)

- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::clamp** (const float2 &v, const float a, const float b)
- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::clamp** (const float2 &v, const float2 &a, const float2 &b)

- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::make_float3** (const float s)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::make_float3** (const float2 &a)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::make_float3** (const int3 &a)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::make_float3** (const uint3 &a)

- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::fminf** (const float3 &a, const float3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::fminf** (const float3 &a)

- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::fmaxf** (const float3 &a, const float3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::fmaxf** (const float3 &a)

- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::operator+** (const float3 &a, const float3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::operator+** (const float3 &a, const float b)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::operator+** (const float a, const float3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator+=** (float3 &a, const float3 &b)

- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::operator-** (const float3 &a, const float3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::operator-** (const float3 &a, const float b)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::operator-** (const float a, const float3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator-=** (float3 &a, const float3 &b)

- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::operator**∗ (const float3 &a, const float3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::operator**∗ (const float3 &a, const float s)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::operator**∗ (const float s, const float3 &a)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator∗=** (float3 &a, const float3 &s)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator∗=** (float3 &a, const float s)

- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::operator**/ (const float3 &a, const float3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::operator**/ (const float3 &a, const float s)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::operator**/ (const float s, const float3 &a)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator/=** (float3 &a, const float s)

- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::clamp** (const float3 &v, const float a, const float b)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::clamp** (const float3 &v, const float3 &a, const float3 &b)

- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::make_float4** (const float s)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::make_float4** (const float3 &a)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::make_float4** (const int4 &a)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::make_float4** (const uint4 &a)

- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::fminf** (const float4 &a, const float4 &b)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::fminf** (const float4 &a)

- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::fmaxf** (const float4 &a, const float4 &b)
- OPTIXU_INLINE RT_HOSTDEVICE float **optix::fmaxf** (const float4 &a)

- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::operator+** (const float4 &a, const float4 &b)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::operator+** (const float4 &a, const float b)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::operator+** (const float a, const float4 &b)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator+=** (float4 &a, const float4 &b)

- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::operator-** (const float4 &a, const float4 &b)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::operator-** (const float4 &a, const float b)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::operator-** (const float a, const float4 &b)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator-=** (float4 &a, const float4 &b)

- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::operator**∗ (const float4 &a, const float4 &s)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::operator**∗ (const float4 &a, const float s)

- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::operator∗** (const float s, const float4 &a)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator∗=** (float4 &a, const float4 &s)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator∗=** (float4 &a, const float s)

- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::operator/** (const float4 &a, const float4 &b)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::operator/** (const float4 &a, const float s)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::operator/** (const float s, const float4 &a)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator/=** (float4 &a, const float s)

- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::clamp** (const float4 &v, const float a, const float b)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::clamp** (const float4 &v, const float4 &a, const float4 &b)

- OPTIXU_INLINE RT_HOSTDEVICE int2 **optix::make_int2** (const int s)
- OPTIXU_INLINE RT_HOSTDEVICE int2 **optix::make_int2** (const float2 &a)

- OPTIXU_INLINE RT_HOSTDEVICE int2 **optix::operator+** (const int2 &a, const int2 &b)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator+=** (int2 &a, const int2 &b)

- OPTIXU_INLINE RT_HOSTDEVICE int2 **optix::operator-** (const int2 &a, const int2 &b)
- OPTIXU_INLINE RT_HOSTDEVICE int2 **optix::operator-** (const int2 &a, const int b)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator-=** (int2 &a, const int2 &b)

- OPTIXU_INLINE RT_HOSTDEVICE int2 **optix::operator∗** (const int2 &a, const int2 &b)
- OPTIXU_INLINE RT_HOSTDEVICE int2 **optix::operator∗** (const int2 &a, const int s)
- OPTIXU_INLINE RT_HOSTDEVICE int2 **optix::operator∗** (const int s, const int2 &a)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator∗=** (int2 &a, const int s)

- OPTIXU_INLINE RT_HOSTDEVICE int2 **optix::clamp** (const int2 &v, const int a, const int b)
- OPTIXU_INLINE RT_HOSTDEVICE int2 **optix::clamp** (const int2 &v, const int2 &a, const int2 &b)

- OPTIXU_INLINE RT_HOSTDEVICE bool **optix::operator==** (const int2 &a, const int2 &b)
- OPTIXU_INLINE RT_HOSTDEVICE bool **optix::operator!=** (const int2 &a, const int2 &b)

- OPTIXU_INLINE RT_HOSTDEVICE int3 **optix::make_int3** (const int s)
- OPTIXU_INLINE RT_HOSTDEVICE int3 **optix::make_int3** (const float3 &a)

- OPTIXU_INLINE RT_HOSTDEVICE int3 **optix::operator+** (const int3 &a, const int3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator+=** (int3 &a, const int3 &b)

- OPTIXU_INLINE RT_HOSTDEVICE int3 **optix::operator-** (const int3 &a, const int3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator-=** (int3 &a, const int3 &b)

- OPTIXU_INLINE RT_HOSTDEVICE int3 **optix::operator∗** (const int3 &a, const int3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE int3 **optix::operator∗** (const int3 &a, const int s)
- OPTIXU_INLINE RT_HOSTDEVICE int3 **optix::operator∗** (const int s, const int3 &a)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator∗=** (int3 &a, const int s)

- OPTIXU_INLINE RT_HOSTDEVICE int3 **optix::operator/** (const int3 &a, const int3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE int3 **optix::operator/** (const int3 &a, const int s)
- OPTIXU_INLINE RT_HOSTDEVICE int3 **optix::operator/** (const int s, const int3 &a)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator/=** (int3 &a, const int s)

- OPTIXU_INLINE RT_HOSTDEVICE int3 **optix::clamp** (const int3 &v, const int a, const int b)
- OPTIXU_INLINE RT_HOSTDEVICE int3 **optix::clamp** (const int3 &v, const int3 &a, const int3 &b)

- OPTIXU_INLINE RT_HOSTDEVICE bool **optix::operator==** (const int3 &a, const int3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE bool **optix::operator!=** (const int3 &a, const int3 &b)

- OPTIXU_INLINE RT_HOSTDEVICE int4 **optix::make_int4** (const int s)
- OPTIXU_INLINE RT_HOSTDEVICE int4 **optix::make_int4** (const float4 &a)

- OPTIXU_INLINE RT_HOSTDEVICE int4 **optix::operator+** (const int4 &a, const int4 &b)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator+=** (int4 &a, const int4 &b)

- OPTIXU_INLINE RT_HOSTDEVICE int4 **optix::operator-** (const int4 &a, const int4 &b)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator-=** (int4 &a, const int4 &b)

- OPTIXU_INLINE RT_HOSTDEVICE int4 **optix::operator*** (const int4 &a, const int4 &b)
- OPTIXU_INLINE RT_HOSTDEVICE int4 **optix::operator*** (const int4 &a, const int s)
- OPTIXU_INLINE RT_HOSTDEVICE int4 **optix::operator*** (const int s, const int4 &a)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator*=** (int4 &a, const int s)

- OPTIXU_INLINE RT_HOSTDEVICE int4 **optix::operator/** (const int4 &a, const int4 &b)
- OPTIXU_INLINE RT_HOSTDEVICE int4 **optix::operator/** (const int4 &a, const int s)
- OPTIXU_INLINE RT_HOSTDEVICE int4 **optix::operator/** (const int s, const int4 &a)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator/=** (int4 &a, const int s)

- OPTIXU_INLINE RT_HOSTDEVICE int4 **optix::clamp** (const int4 &v, const int a, const int b)
- OPTIXU_INLINE RT_HOSTDEVICE int4 **optix::clamp** (const int4 &v, const int4 &a, const int4 &b)

- OPTIXU_INLINE RT_HOSTDEVICE bool **optix::operator==** (const int4 &a, const int4 &b)
- OPTIXU_INLINE RT_HOSTDEVICE bool **optix::operator!=** (const int4 &a, const int4 &b)

- OPTIXU_INLINE RT_HOSTDEVICE uint2 **optix::make_uint2** (const unsigned int s)
- OPTIXU_INLINE RT_HOSTDEVICE uint2 **optix::make_uint2** (const float2 &a)

- OPTIXU_INLINE RT_HOSTDEVICE uint2 **optix::operator+** (const uint2 &a, const uint2 &b)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator+=** (uint2 &a, const uint2 &b)

- OPTIXU_INLINE RT_HOSTDEVICE uint2 **optix::operator-** (const uint2 &a, const uint2 &b)
- OPTIXU_INLINE RT_HOSTDEVICE uint2 **optix::operator-** (const uint2 &a, const unsigned int b)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator-=** (uint2 &a, const uint2 &b)

- OPTIXU_INLINE RT_HOSTDEVICE uint2 **optix::operator*** (const uint2 &a, const uint2 &b)

- OPTIXU_INLINE RT_HOSTDEVICE uint2 **optix::operator*** (const uint2 &a, const unsigned int s)
- OPTIXU_INLINE RT_HOSTDEVICE uint2 **optix::operator*** (const unsigned int s, const uint2 &a)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator*=** (uint2 &a, const unsigned int s)

- OPTIXU_INLINE RT_HOSTDEVICE uint2 **optix::clamp** (const uint2 &v, const unsigned int a, const unsigned int b)
- OPTIXU_INLINE RT_HOSTDEVICE uint2 **optix::clamp** (const uint2 &v, const uint2 &a, const uint2 &b)

- OPTIXU_INLINE RT_HOSTDEVICE bool **optix::operator==** (const uint2 &a, const uint2 &b)
- OPTIXU_INLINE RT_HOSTDEVICE bool **optix::operator!=** (const uint2 &a, const uint2 &b)

- OPTIXU_INLINE RT_HOSTDEVICE uint3 **optix::make_uint3** (const unsigned int s)
- OPTIXU_INLINE RT_HOSTDEVICE uint3 **optix::make_uint3** (const float3 &a)

- OPTIXU_INLINE RT_HOSTDEVICE uint3 **optix::operator+** (const uint3 &a, const uint3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator+=** (uint3 &a, const uint3 &b)

- OPTIXU_INLINE RT_HOSTDEVICE uint3 **optix::operator-** (const uint3 &a, const uint3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator-=** (uint3 &a, const uint3 &b)

- OPTIXU_INLINE RT_HOSTDEVICE uint3 **optix::operator*** (const uint3 &a, const uint3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE uint3 **optix::operator*** (const uint3 &a, const unsigned int s)
- OPTIXU_INLINE RT_HOSTDEVICE uint3 **optix::operator*** (const unsigned int s, const uint3 &a)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator*=** (uint3 &a, const unsigned int s)

- OPTIXU_INLINE RT_HOSTDEVICE uint3 **optix::operator/** (const uint3 &a, const uint3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE uint3 **optix::operator/** (const uint3 &a, const unsigned int s)
- OPTIXU_INLINE RT_HOSTDEVICE uint3 **optix::operator/** (const unsigned int s, const uint3 &a)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator/=** (uint3 &a, const unsigned int s)

- OPTIXU_INLINE RT_HOSTDEVICE uint3 **optix::clamp** (const uint3 &v, const unsigned int a, const unsigned int b)
- OPTIXU_INLINE RT_HOSTDEVICE uint3 **optix::clamp** (const uint3 &v, const uint3 &a, const uint3 &b)

- OPTIXU_INLINE RT_HOSTDEVICE bool **optix::operator==** (const uint3 &a, const uint3 &b)
- OPTIXU_INLINE RT_HOSTDEVICE bool **optix::operator!=** (const uint3 &a, const uint3 &b)

- OPTIXU_INLINE RT_HOSTDEVICE uint4 **optix::make_uint4** (const unsigned int s)
- OPTIXU_INLINE RT_HOSTDEVICE uint4 **optix::make_uint4** (const float4 &a)

- OPTIXU_INLINE RT_HOSTDEVICE uint4 **optix::min** (const uint4 &a, const uint4 &b)

- OPTIXU_INLINE RT_HOSTDEVICE uint4 **optix::max** (const uint4 &a, const uint4 &b)

- OPTIXU_INLINE RT_HOSTDEVICE uint4 **optix::operator+** (const uint4 &a, const uint4 &b)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator+=** (uint4 &a, const uint4 &b)

- OPTIXU_INLINE RT_HOSTDEVICE uint4 **optix::operator-** (const uint4 &a, const uint4 &b)

- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator-=** (uint4 &a, const uint4 &b)

- OPTIXU_INLINE RT_HOSTDEVICE uint4 **optix::operator∗** (const uint4 &a, const uint4 &b)
- OPTIXU_INLINE RT_HOSTDEVICE uint4 **optix::operator∗** (const uint4 &a, const unsigned int s)
- OPTIXU_INLINE RT_HOSTDEVICE uint4 **optix::operator∗** (const unsigned int s, const uint4 &a)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator∗=** (uint4 &a, const unsigned int s)

- OPTIXU_INLINE RT_HOSTDEVICE uint4 **optix::operator/** (const uint4 &a, const uint4 &b)
- OPTIXU_INLINE RT_HOSTDEVICE uint4 **optix::operator/** (const uint4 &a, const unsigned int s)
- OPTIXU_INLINE RT_HOSTDEVICE uint4 **optix::operator/** (const unsigned int s, const uint4 &a)
- OPTIXU_INLINE RT_HOSTDEVICE void **optix::operator/=** (uint4 &a, const unsigned int s)

- OPTIXU_INLINE RT_HOSTDEVICE uint4 **optix::clamp** (const uint4 &v, const unsigned int a, const unsigned int b)
- OPTIXU_INLINE RT_HOSTDEVICE uint4 **optix::clamp** (const uint4 &v, const uint4 &a, const uint4 &b)

- OPTIXU_INLINE RT_HOSTDEVICE bool **optix::operator==** (const uint4 &a, const uint4 &b)
- OPTIXU_INLINE RT_HOSTDEVICE bool **optix::operator!=** (const uint4 &a, const uint4 &b)

- OPTIXU_INLINE RT_HOSTDEVICE int2 **optix::make_int2** (const int3 &v0)
- OPTIXU_INLINE RT_HOSTDEVICE int2 **optix::make_int2** (const int4 &v0)
- OPTIXU_INLINE RT_HOSTDEVICE int3 **optix::make_int3** (const int4 &v0)
- OPTIXU_INLINE RT_HOSTDEVICE uint2 **optix::make_uint2** (const uint3 &v0)
- OPTIXU_INLINE RT_HOSTDEVICE uint2 **optix::make_uint2** (const uint4 &v0)
- OPTIXU_INLINE RT_HOSTDEVICE uint3 **optix::make_uint3** (const uint4 &v0)
- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::make_float2** (const float3 &v0)
- OPTIXU_INLINE RT_HOSTDEVICE float2 **optix::make_float2** (const float4 &v0)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::make_float3** (const float4 &v0)

- OPTIXU_INLINE RT_HOSTDEVICE int3 **optix::make_int3** (const int v0, const int2 &v1)
- OPTIXU_INLINE RT_HOSTDEVICE int3 **optix::make_int3** (const int2 &v0, const int v1)
- OPTIXU_INLINE RT_HOSTDEVICE int4 **optix::make_int4** (const int v0, const int v1, const int2 &v2)
- OPTIXU_INLINE RT_HOSTDEVICE int4 **optix::make_int4** (const int v0, const int2 &v1, const int v2)
- OPTIXU_INLINE RT_HOSTDEVICE int4 **optix::make_int4** (const int2 &v0, const int v1, const int v2)
- OPTIXU_INLINE RT_HOSTDEVICE int4 **optix::make_int4** (const int v0, const int3 &v1)
- OPTIXU_INLINE RT_HOSTDEVICE int4 **optix::make_int4** (const int3 &v0, const int v1)
- OPTIXU_INLINE RT_HOSTDEVICE int4 **optix::make_int4** (const int2 &v0, const int2 &v1)
- OPTIXU_INLINE RT_HOSTDEVICE uint3 **optix::make_uint3** (const unsigned int v0, const uint2 &v1)
- OPTIXU_INLINE RT_HOSTDEVICE uint3 **optix::make_uint3** (const uint2 &v0, const unsigned int v1)
- OPTIXU_INLINE RT_HOSTDEVICE uint4 **optix::make_uint4** (const unsigned int v0, const unsigned int v1, const uint2 &v2)
- OPTIXU_INLINE RT_HOSTDEVICE uint4 **optix::make_uint4** (const unsigned int v0, const uint2 &v1, const unsigned int v2)

- OPTIXU_INLINE RT_HOSTDEVICE uint4 **optix::make_uint4** (const uint2 &v0, const unsigned int v1, const unsigned int v2)
- OPTIXU_INLINE RT_HOSTDEVICE uint4 **optix::make_uint4** (const unsigned int v0, const uint3 &v1)
- OPTIXU_INLINE RT_HOSTDEVICE uint4 **optix::make_uint4** (const uint3 &v0, const unsigned int v1)
- OPTIXU_INLINE RT_HOSTDEVICE uint4 **optix::make_uint4** (const uint2 &v0, const uint2 &v1)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::make_float3** (const float2 &v0, const float v1)
- OPTIXU_INLINE RT_HOSTDEVICE float3 **optix::make_float3** (const float v0, const float2 &v1)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::make_float4** (const float v0, const float v1, const float2 &v2)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::make_float4** (const float v0, const float2 &v1, const float v2)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::make_float4** (const float2 &v0, const float v1, const float v2)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::make_float4** (const float v0, const float3 &v1)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::make_float4** (const float3 &v0, const float v1)
- OPTIXU_INLINE RT_HOSTDEVICE float4 **optix::make_float4** (const float2 &v0, const float2 &v1)

### 7.16.1 Detailed Description

OptiX public API.

Author

NVIDIA Corporation This file implements common mathematical operations on vector types (float3, float4 etc.) since these are not provided as standard by CUDA.

The syntax is modelled on the Cg standard library.

This file has also been modified from the original cutil_math.h file. cutil_math.h is a subset of this file, and you should use this file in place of any cutil_math.h file you wish to use.

## 7.17 optixu_math_stream_namespace.h File Reference

### Functions

- **std::ostream** & **optix::operator**<< (**std::ostream** &os, const optix::Aabb &aabb)

- **std::ostream** & **optix::operator**<< (**std::ostream** &os, const optix::float4 &v)
- **std::istream** & **optix::operator**>> (**std::istream** &is, optix::float4 &v)
- **std::ostream** & **optix::operator**<< (**std::ostream** &os, const optix::float3 &v)
- **std::istream** & **optix::operator**>> (**std::istream** &is, optix::float3 &v)
- **std::ostream** & **optix::operator**<< (**std::ostream** &os, const optix::float2 &v)
- **std::istream** & **optix::operator**>> (**std::istream** &is, optix::float2 &v)

- **std::ostream** & **optix::operator**<< (**std::ostream** &os, const optix::int4 &v)
- **std::istream** & **optix::operator**>> (**std::istream** &is, optix::int4 &v)
- **std::ostream** & **optix::operator**<< (**std::ostream** &os, const optix::int3 &v)
- **std::istream** & **optix::operator**>> (**std::istream** &is, optix::int3 &v)

- **std::ostream** & **optix::operator**<< (**std::ostream** &os, const optix::int2 &v)
- **std::istream** & **optix::operator**>> (**std::istream** &is, optix::int2 &v)

- **std::ostream** & **optix::operator**<< (**std::ostream** &os, const optix::uint4 &v)
- **std::istream** & **optix::operator**>> (**std::istream** &is, optix::uint4 &v)
- **std::ostream** & **optix::operator**<< (**std::ostream** &os, const optix::uint3 &v)
- **std::istream** & **optix::operator**>> (**std::istream** &is, optix::uint3 &v)
- **std::ostream** & **optix::operator**<< (**std::ostream** &os, const optix::uint2 &v)
- **std::istream** & **optix::operator**>> (**std::istream** &is, optix::uint2 &v)

- template<unsigned int M, unsigned int N>
  **std::ostream** & **optix::operator**<< (**std::ostream** &os, const optix::Matrix< M, N > &m)
- template<unsigned int M, unsigned int N>
  **std::istream** & **optix::operator**>> (**std::istream** &is, optix::Matrix< M, N > &m)

### 7.17.1 Detailed Description

OptiX public API.

Author

NVIDIA Corporation Stream operators for CUDA vector types

## 7.18 optixu_matrix_namespace.h File Reference

### Classes

- class optix::Matrix< M, N >
- class optix::Matrix< M, N >

### 7.18.1 Detailed Description

OptiX public API.

Author

NVIDIA Corporation OptiX public API Reference - Public Matrix namespace

## 7.19 optixu_quaternion_namespace.h File Reference

### Classes

- class optix::Quaternion

### 7.19.1 Detailed Description

OptiX public API.

Author

NVIDIA Corporation OptiX public API Reference - Public QUATERNION namespace

## 7.20 optixu_traversal.h File Reference

### Classes

- struct RTUtraversalresult

### Typedefs

- typedef struct RTUtraversal_api * RTUtraversal

### Enumerations

- enum RTUquerytype {
  RTU_QUERY_TYPE_ANY_HIT = 0,
  RTU_QUERY_TYPE_CLOSEST_HIT,
  RTU_QUERY_TYPE_COUNT }
- enum RTUrayformat {
  RTU_RAYFORMAT_ORIGIN_DIRECTION_TMIN_TMAX_INTERLEAVED = 0,
  RTU_RAYFORMAT_ORIGIN_DIRECTION_INTERLEAVED,
  RTU_RAYFORMAT_COUNT }
- enum RTUtriformat {
  RTU_TRIFORMAT_MESH = 0,
  RTU_TRIFORMAT_TRIANGLE_SOUP,
  RTU_TRIFORMAT_COUNT }
- enum RTUinitoptions {
  RTU_INITOPTION_NONE = 0,
  RTU_INITOPTION_GPU_ONLY = 1 << 0,
  RTU_INITOPTION_CPU_ONLY = 1 << 1,
  RTU_INITOPTION_CULL_BACKFACE = 1 << 2 }
- enum RTUoutput {
  RTU_OUTPUT_NONE = 0,
  RTU_OUTPUT_NORMAL = 1 << 0,
  RTU_OUTPUT_BARYCENTRIC = 1 << 1,
  RTU_OUTPUT_BACKFACING = 1 << 2 }
- enum RTUoption { RTU_OPTION_INT_NUM_THREADS =0 }

### Functions

- RTresult RTAPI rtuTraversalCreate (RTUtraversal *traversal, RTUquerytype query_type, RTUrayformat ray_format, RTUtriformat tri_format, unsigned int outputs, unsigned int options, RTcontext context)
- RTresult RTAPI rtuTraversalGetErrorString (RTUtraversal traversal, RTresult code, const char **return_string)
- RTresult RTAPI rtuTraversalSetOption (RTUtraversal traversal, RTUoption option, void *value)
- RTresult RTAPI rtuTraversalSetMesh (RTUtraversal traversal, unsigned int num_verts, const float *verts, unsigned int num_tris, const unsigned *indices)
- RTresult RTAPI rtuTraversalSetTriangles (RTUtraversal traversal, unsigned int num_tris, const float *tris)
- RTresult RTAPI rtuTraversalSetAccelData (RTUtraversal traversal, const void *data, RTsize data_size)
- RTresult RTAPI rtuTraversalGetAccelDataSize (RTUtraversal traversal, RTsize *data_size)
- RTresult RTAPI rtuTraversalGetAccelData (RTUtraversal traversal, void *data)

- RTresult RTAPI rtuTraversalMapRays (RTUtraversal traversal, unsigned int num_rays, float **rays)
- RTresult RTAPI rtuTraversalUnmapRays (RTUtraversal traversal)
- RTresult RTAPI rtuTraversalPreprocess (RTUtraversal traversal)
- RTresult RTAPI rtuTraversalTraverse (RTUtraversal traversal)
- RTresult RTAPI rtuTraversalMapResults (RTUtraversal traversal, RTUtraversalresult **results)
- RTresult RTAPI rtuTraversalUnmapResults (RTUtraversal traversal)
- RTresult RTAPI rtuTraversalMapOutput (RTUtraversal traversal, RTUoutput which, void **output)
- RTresult RTAPI rtuTraversalUnmapOutput (RTUtraversal traversal, RTUoutput which)
- RTresult RTAPI rtuTraversalDestroy (RTUtraversal traversal)

### 7.20.1 Detailed Description

Simple API for performing raytracing queries using OptiX or the CPU.

# Index