

oxygendoc

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# Chapter 1

## Namespace Index

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# Hierarchical Index

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## Chapter 3

# Class Index

### 3.1 Class List

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| <a href="#">oxygen::SingletonBase&lt; CRTPTType &gt;</a>  |     |
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| <a href="#">oxygen::SingletonHolder&lt; SingletonsStruct &gt;</a>   |     |
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| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/EnvPushComponent/EnvPushComponent.cc           | 149 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/EnvPushComponent/EnvPushComponent.h            | 149 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/HealthComponent/HealthComponent.cc             | 150 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/HealthComponent/HealthComponent.h              | 151 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/HullComponent/HullComponent.cc                 | 152 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/HullComponent/HullComponent.h .                | 152 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/Pawn/Pawn.cc . . . . .                         | 154 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/Pawn/Pawn.h . . . . .                          | 155 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/PickupComponent/PickupComponent.cc             | 156 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/ProjectileComponent/ProjectileComponent.cc     | 157 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/ProjectileComponent/ProjectileComponent.h      | 157 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/StaticMeshComponent/StaticMeshComponent.cc     | 158 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/StaticMeshComponent/StaticMeshComponent.h      | 159 |

|  |     |
|--|-----|
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/WeaponComponent/WeaponComponent.cc    | 159 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/WeaponComponent/WeaponComponent.h     | 160 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Containers/SPSCQueue.h                          | 162 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Entity/Entity.cc                                | 163 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Entity/Entity.h                                 | 163 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/GameManager/GameManager.cc                      | 166 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/GameManager/GameManager.h                       | 166 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Gfx/GfxRenderer.cc                              | 168 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Gfx/GfxRenderer.h                               | 168 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Gfx/GfxSoftwareRasterize.inl                    | 171 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Input/InputManager.cc                           | 175 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Input/InputManager.h                            | 175 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Math/Defs.h                                     | 177 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Math/Hash.h                                     | 193 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Math/Random.h                                   | 195 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Net/NetSystem.cc                                | 196 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Net/NetSystem.h                                 | 196 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Object/ManagedObject.h                          | 199 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Object/Object.h                                 | 199 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Object/ObjectManager.cc                         | 202 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Object/ObjectManager.h                          | 202 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Platform/InternalPCHBase.h                      | 214 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Platform/Platform.h                             | 215 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Platform/PlatformWin64/Platform.cc              | 217 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Platform/PlatformWin64/PrivateMembers.h         | 221 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Platform/PlatformWin64/PrecompiledHeaders/PCH.h | 219 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Resources/AnimatedMeshResource.h                | 223 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Resources/ResourceManager.cc                    | 223 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Resources/ResourceManager.h                     | 223 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Resources/StaticMeshResource.h                  | 224 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Singleton/EngineSingletons.h                    | 225 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Singleton/Singleton.h                           | 226 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/UI/UIManager.cc                                 | 227 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/UI/UIManager.h                                  | 228 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/BSP.cc                                    | 229 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/BSP.h                                     | 229 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/World.cc                                  | 235 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/World.h                                   | 235 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/WorldLoader.cc                            | 237 |
| C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/WorldLoader.h                             | 238 |

## Chapter 5

# Namespace Documentation

### 5.1 oxygen Namespace Reference

#### Namespaces

- namespace [AudioAbstraction](#)
- namespace [BSPDefines](#)
- namespace [GfxSoftwareRasterizer](#)
- namespace [GraphicsAbstraction](#)
- namespace [InputAbstraction](#)
- namespace [Math](#)
- namespace [NetworkAbstraction](#)

#### Classes

- struct [AnimatedMeshComponent](#)
- struct [AnimatedMeshResource](#)
- struct [AnimationInfo](#)
- struct [BSPWorldData](#)
- struct [CallbackList](#)
- struct [CameraComponent](#)
- struct [Component](#)
- struct [Entity](#)
- struct [EntityHierarchy](#)
- struct [EnvPushComponent](#)
- struct [GameManager](#)
- struct [GfxRenderer](#)
- struct [GfxTexture](#)
- struct [GfxTri](#)
- struct [GfxVertex](#)
- struct [HealthComponent](#)
- struct [HullComponent](#)
- struct [InputManager](#)
- struct [InternalEngineSingletonsOrder](#)
- struct [InternalFileMapWinX64](#)
- struct [ManagedObject](#)
- struct [NetConnection](#)

- struct [NetSystem](#)
- struct [NonCopyable](#)

*A non-copyable type to be inherited from. Expresses clearly that a type cannot be copied.*

- struct [Object](#)
- struct [ObjectDescription](#)
- struct [ObjectManager](#)
- struct [Pawn](#)
- struct [ProjectileComponent](#)
- struct [ResourceManager](#)
- struct [SingletonBase](#)

*Singleton base class. All singletons should inherit from this class. Uses the curiously recurring template pattern and provides the [GetInstance\(\)](#) static method to access the singleton.*

- struct [SingletonHolder](#)

*Storage of a group of singletons. Used to explicitly construct and destruct singletons.*

- struct [SingletonInstance](#)

*Singleton instance, should only be in an object templated to [SingletonHolder](#). Contains the actual storage buffer for the type T.*

- struct [SPSCQueue](#)
- struct [StaticMeshComponent](#)
- struct [StaticMeshPointDef](#)
- struct [StaticMeshResource](#)
- struct [StaticMeshTri](#)
- struct [StaticMeshVertex](#)
- struct [UIManager](#)
- struct [WeaponComponent](#)
- struct [World](#)

## Typedefs

- using [EngineSingletons](#) = [SingletonHolder](#)<[InternalEngineSingletonsOrder](#)>

## Enumerations

- enum [PawnState](#) { [PawnState\\_Ground](#) , [PawnState\\_Void](#) }
- enum [PawnStance](#) { [PawnStance\\_Stand](#) , [PawnStance\\_Crouch](#) , [PawnStance\\_Prone](#) }
- enum [EntityFlags](#) : oxyU32 {  
[EntityFlags\\_Disabled](#) = 1 << 0 , [EntityFlags\\_Static](#) = 1 << 1 , [EntityFlags\\_Dynamic](#) = 1 << 2 ,  
[EntityFlags\\_Renderable](#) = 1 << 3 ,  
[EntityFlags\\_HasHull](#) = 1 << 4 , [EntityFlags\\_HasCamera](#) = 1 << 5 , [EntityFlags\\_Replicated](#) = 1 << 6 ,  
[EntityFlags\\_IsLocalPlayer](#) = 1 << 7 ,  
[EntityFlags\\_EnableTransformReplication](#) = 1 << 8 , [EntityFlags\\_EnableTransformInterpolation](#) = 1 << 9 }
- enum [GfxRenderStrategy](#) : oxyU8 { [GfxRenderStrategy\\_DirectToGPU](#) = 0 , [GfxRenderStrategy\\_SoftwareDepthRasterizePreSorted](#) , [GfxRenderStrategy\\_SoftwareDepthRasterizePreSortedOverlay](#) , [GfxRenderStrategy\\_SoftwareDepthRasterize](#) }
- enum [GfxCullType](#) { [GfxCullType\\_None](#) = 0 , [GfxCullType\\_Backface](#) = 1 , [GfxCullType\\_Frontface](#) = 2 }
- enum [ControllerButton](#) : oxyU8 {  
[ControllerButton\\_LeftThumb](#) , [ControllerButton\\_RightThumb](#) , [ControllerButton\\_LeftShoulder](#) , [ControllerButton\\_RightShoulder](#) ,  
[ControllerButton\\_South](#) , [ControllerButton\\_East](#) , [ControllerButton\\_West](#) , [ControllerButton\\_North](#) ,  
[ControllerButton\\_StartSelect](#) , [ControllerButton\\_BackShare](#) , [ControllerButton\\_DPadUp](#) , [ControllerButton\\_DPadDown](#) ,  
[ControllerButton\\_DPadLeft](#) , [ControllerButton\\_DPadRight](#) , [ControllerButton\\_Count](#) }

- enum [ControllerAxis](#) : oxyU8 {  
[ControllerAxis\\_LeftThumbX](#) , [ControllerAxis\\_LeftThumbY](#) , [ControllerAxis\\_RightThumbX](#) , [ControllerAxis\\_RightThumbY](#)  
, [ControllerAxis\\_LeftTrigger](#) , [ControllerAxis\\_RightTrigger](#) , [ControllerAxis\\_Count](#) }
- enum [MouseButton](#) : oxyU8 {  
[MouseButton\\_Left](#) , [MouseButton\\_Right](#) , [MouseButton\\_Middle](#) , [MouseButton\\_X1](#) ,  
[MouseButton\\_X2](#) , [MouseButton\\_Count](#) }
- enum [KeyboardButton](#) : oxyU8 {  
[KeyboardButton\\_A](#) , [KeyboardButton\\_B](#) , [KeyboardButton\\_C](#) , [KeyboardButton\\_D](#) ,  
[KeyboardButton\\_E](#) , [KeyboardButton\\_F](#) , [KeyboardButton\\_G](#) , [KeyboardButton\\_H](#) ,  
[KeyboardButton\\_I](#) , [KeyboardButton\\_J](#) , [KeyboardButton\\_K](#) , [KeyboardButton\\_L](#) ,  
[KeyboardButton\\_M](#) , [KeyboardButton\\_N](#) , [KeyboardButton\\_O](#) , [KeyboardButton\\_P](#) ,  
[KeyboardButton\\_Q](#) , [KeyboardButton\\_R](#) , [KeyboardButton\\_S](#) , [KeyboardButton\\_T](#) ,  
[KeyboardButton\\_U](#) , [KeyboardButton\\_V](#) , [KeyboardButton\\_W](#) , [KeyboardButton\\_X](#) ,  
[KeyboardButton\\_Y](#) , [KeyboardButton\\_Z](#) , [KeyboardButton\\_0](#) , [KeyboardButton\\_1](#) ,  
[KeyboardButton\\_2](#) , [KeyboardButton\\_3](#) , [KeyboardButton\\_4](#) , [KeyboardButton\\_5](#) ,  
[KeyboardButton\\_6](#) , [KeyboardButton\\_7](#) , [KeyboardButton\\_8](#) , [KeyboardButton\\_9](#) ,  
[KeyboardButton\\_F1](#) , [KeyboardButton\\_F2](#) , [KeyboardButton\\_F3](#) , [KeyboardButton\\_F4](#) ,  
[KeyboardButton\\_F5](#) , [KeyboardButton\\_F6](#) , [KeyboardButton\\_F7](#) , [KeyboardButton\\_F8](#) ,  
[KeyboardButton\\_F9](#) , [KeyboardButton\\_F10](#) , [KeyboardButton\\_F11](#) , [KeyboardButton\\_F12](#) ,  
[KeyboardButton\\_F13](#) , [KeyboardButton\\_F14](#) , [KeyboardButton\\_F15](#) , [KeyboardButton\\_F16](#) ,  
[KeyboardButton\\_F17](#) , [KeyboardButton\\_F18](#) , [KeyboardButton\\_F19](#) , [KeyboardButton\\_F20](#) ,  
[KeyboardButton\\_F21](#) , [KeyboardButton\\_F22](#) , [KeyboardButton\\_F23](#) , [KeyboardButton\\_F24](#) ,  
[KeyboardButton\\_Numpad0](#) , [KeyboardButton\\_Numpad1](#) , [KeyboardButton\\_Numpad2](#) , [KeyboardButton\\_Numpad3](#)  
, [KeyboardButton\\_Numpad4](#) , [KeyboardButton\\_Numpad5](#) , [KeyboardButton\\_Numpad6](#) , [KeyboardButton\\_Numpad7](#)  
, [KeyboardButton\\_Numpad8](#) , [KeyboardButton\\_Numpad9](#) , [KeyboardButton\\_NumpadDecimal](#) , [KeyboardButton\\_NumpadEnter](#)  
, [KeyboardButton\\_NumpadAdd](#) , [KeyboardButton\\_NumpadSubtract](#) , [KeyboardButton\\_NumpadMultiply](#) ,  
[KeyboardButton\\_NumpadDivide](#) ,  
[KeyboardButton\\_NumpadLock](#) , [KeyboardButton\\_Left](#) , [KeyboardButton\\_Right](#) , [KeyboardButton\\_Up](#) ,  
[KeyboardButton\\_Down](#) , [KeyboardButton\\_Home](#) , [KeyboardButton\\_End](#) , [KeyboardButton\\_PageUp](#) ,  
[KeyboardButton\\_PageDown](#) , [KeyboardButton\\_Insert](#) , [KeyboardButton\\_Delete](#) , [KeyboardButton\\_Pause](#) ,  
[KeyboardButton\\_PrintScreen](#) , [KeyboardButton\\_ScrollLock](#) , [KeyboardButton\\_Escape](#) , [KeyboardButton\\_Backtick](#)  
, [KeyboardButton\\_Tab](#) , [KeyboardButton\\_CapsLock](#) , [KeyboardButton\\_LeftShift](#) , [KeyboardButton\\_LeftControl](#)  
, [KeyboardButton\\_LeftWindows](#) , [KeyboardButton\\_LeftAlt](#) , [KeyboardButton\\_Space](#) , [KeyboardButton\\_RightAlt](#)  
, [KeyboardButton\\_RightFunction](#) , [KeyboardButton\\_RightMenu](#) , [KeyboardButton\\_RightControl](#) , [KeyboardButton\\_RightShift](#)  
, [KeyboardButton\\_Enter](#) , [KeyboardButton\\_Backspace](#) , [KeyboardButton\\_Comma](#) , [KeyboardButton\\_Period](#) ,  
[KeyboardButton\\_Slash](#) , [KeyboardButton\\_Semicolon](#) , [KeyboardButton\\_Apostrophe](#) , [KeyboardButton\\_LeftBracket](#)  
, [KeyboardButton\\_RightBracket](#) , [KeyboardButton\\_Backslash](#) , [KeyboardButton\\_Hyphen](#) , [KeyboardButton\\_Equals](#)  
, [KeyboardButton\\_Count](#) }
- enum [CollisionHull](#) : oxyU8 {  
[CollisionHull\\_None](#) = 0xFF , [CollisionHull\\_Point](#) = 0 , [CollisionHull\\_Player](#) , [CollisionHull\\_PlayerCrouched](#) ,  
[CollisionHull\\_Grenade](#) }
- enum [CollisionResponseType](#) : oxyU8 { [CollisionResponseType\\_None](#) , [CollisionResponseType\\_Slide](#) ,  
[CollisionResponseType\\_Bounce](#) }
- enum [EntitySummonType](#) : oxyU8 { [EntitySummonType\\_Player](#) , [EntitySummonType\\_Count](#) }
- enum [AnimationHash](#) : oxyU32 {  
[AnimationHash\\_Idle](#) = 0x7c161a2b , [AnimationHash\\_RunForward](#) = 0x947ec374 , [AnimationHash\\_RunBackward](#)  
= 0x144ff8d , [AnimationHash\\_Dying](#) = 0x12c8a4ff ,  
[AnimationHash\\_Throw](#) = 0x8e526e33 }

- enum [EntitySpawnType](#) : oxyU8 {  
[EntitySpawnType\\_Player](#) , [EntitySpawnType\\_Golfclub](#) , [EntitySpawnType\\_GolfclubLauncher](#) , [EntitySpawnType\\_Golfball](#)  
, [EntitySpawntype\\_GolfballLauncher](#) , [EntitySpawnType\\_Count](#) }
- enum [NetProtoMsgType](#) : oxyU16 {  
[NetProtoMsgType\\_AnyPing](#) = 0 , [NetProtoMsgType\\_SrvWelcome](#) , [NetProtoMsgType\\_SrvChangeLevel](#) ,  
[NetProtoMsgType\\_SrvSetLocalPlayer](#) ,  
[NetProtoMsgType\\_SrvEntitySpawn](#) , [NetProtoMsgType\\_SrvEntityDestroy](#) , [NetProtoMsgType\\_SrvEntityTransformRepl](#)  
, [NetProtoMsgType\\_SrvHealthComponentChange](#) ,  
[NetProtoMsgType\\_SrvPawnPickupWeapon](#) , [NetProtoMsgType\\_SrvPawnDropWeapon](#) , [NetProtoMsgType\\_CliLocalPlayerEntiti](#)  
, [NetProtoMsgType\\_CliPawnDropWeapon](#) ,  
[NetProtoMsgType\\_CliLocalPlayerFireWeapon](#) }
- enum [PickupType](#) : oxyU8 { [PickupType\\_Health](#) , [PickupType\\_Ammo](#) , [PickupType\\_Weapon](#) ,  
[PickupType\\_Count](#) }
- enum [WeaponFireType](#) : oxyU8 { [WeaponFireType\\_Bullets](#) , [WeaponFireType\\_GolfClub](#) , [WeaponFireType\\_GolfBall](#)  
, [WeaponFireType\\_Count](#) }
- enum [HealthState](#) : oxyU8 { [HealthState\\_Alive](#) , [HealthState\\_Invulnerable](#) , [HealthState\\_Dead](#) }
- enum [DamageType](#) : oxyU8 {  
[DamageType\\_None](#) , [DamageType\\_Explosive](#) , [DamageType\\_Bullet](#) , [DamageType\\_Melee](#) ,  
[DamageType\\_FallDamage](#) , [DamageType\\_Count](#) }

## Functions

- auto [CullBackfaceTri](#) (const [GfxTri](#) &tri) -> bool
- auto [CullFrontfaceTri](#) (const [GfxTri](#) &tri) -> bool
- constexpr auto [CRC64Eval](#) (const oxyU8 \*data, oxySize size) -> oxyU64
- auto [RandomS32](#) (oxyS32 minInclusive, oxyS32 maxInclusive) -> oxyS32
- auto [RandomU32](#) (oxyU32 minInclusive, oxyU32 maxInclusive) -> oxyU32
- auto [RandomS64](#) (oxyS64 minInclusive, oxyS64 maxInclusive) -> oxyS64
- auto [RandomU64](#) (oxyU64 minInclusive, oxyU64 maxInclusive) -> oxyU64
- auto [RandomF32](#) (oxyF32 minInclusive, oxyF32 maxInclusive) -> oxyF32
- auto [RandomF64](#) (oxyF64 minInclusive, oxyF64 maxInclusive) -> oxyF64
- auto [RandomBool](#) () -> oxyBool
- auto [GetObjectDescriptionMap](#) () -> std::unordered\_map< oxyU64, const [ObjectDescription](#) \* > &
- auto [GetExecutableDirectory](#) () -> std::string\_view
- auto [GetLaunchArguments](#) () -> std::span< const std::string >
- auto [LogMessage](#) (const char \*str) -> void
- auto [ReadFileContents](#) (std::string\_view absolutePath) -> std::vector< oxyU8 >
- auto [CreateFileMap](#) (std::string\_view path, oxyBool write, oxySize requestSize) -> UniqueFileMap
- auto [Win64PlatformInit](#) () -> void
- auto [Win64PlatformRender](#) () -> void
- auto [Win64PlatformUpdate](#) (float deltaTimeSeconds) -> void
- auto [Win64PlatformShutdown](#) () -> void
- auto [LoadWorld](#) (std::string\_view name) -> std::shared\_ptr< [World](#) >

## Variables

- constexpr oxyU64 [g\\_CRC64Table](#) []
- std::random\_device [g\\_randomDevice](#)
- std::mt19937\_64 [g\\_randomEngine](#) {[g\\_randomDevice](#)()}
- constexpr oxyVec3 [k\\_collisionHullMins](#) []
- constexpr oxyVec3 [k\\_collisionHullMaxs](#) []

## 5.1.1 Typedef Documentation

### 5.1.1.1 EngineSingletons

```
using oxygen::EngineSingletons = SingletonHolder<InternalEngineSingletonsOrder>
```

## 5.1.2 Enumeration Type Documentation

### 5.1.2.1 AnimationHash

```
enum oxygen::AnimationHash : oxyU32
```

#### Enumerator

|                           |  |
|---------------------------|--|
| AnimationHash_Idle        |  |
| AnimationHash_RunForward  |  |
| AnimationHash_RunBackward |  |
| AnimationHash_Dying       |  |
| AnimationHash_Throw       |  |

### 5.1.2.2 CollisionHull

```
enum oxygen::CollisionHull : oxyU8
```

#### Enumerator

|                              |  |
|------------------------------|--|
| CollisionHull_None           |  |
| CollisionHull_Point          |  |
| CollisionHull_Player         |  |
| CollisionHull_PlayerCrouched |  |
| CollisionHull_Grenade        |  |

### 5.1.2.3 CollisionResponseType

```
enum oxygen::CollisionResponseType : oxyU8
```

#### Enumerator

|                              |  |
|------------------------------|--|
| CollisionResponseType_None   |  |
| CollisionResponseType_Slide  |  |
| CollisionResponseType_Bounce |  |

### 5.1.2.4 ControllerAxis

```
enum oxygen::ControllerAxis : oxyU8
```

**Enumerator**

|                             |  |
|-----------------------------|--|
| ControllerAxis_LeftThumbX   |  |
| ControllerAxis_LeftThumbY   |  |
| ControllerAxis_RightThumbX  |  |
| ControllerAxis_RightThumbY  |  |
| ControllerAxis_LeftTrigger  |  |
| ControllerAxis_RightTrigger |  |
| ControllerAxis_Count        |  |

**5.1.2.5 ControllerButton**

```
enum oxygen::ControllerButton : oxyU8
```

**Enumerator**

|                                |  |
|--------------------------------|--|
| ControllerButton_LeftThumb     |  |
| ControllerButton_RightThumb    |  |
| ControllerButton_LeftShoulder  |  |
| ControllerButton_RightShoulder |  |
| ControllerButton_South         |  |
| ControllerButton_East          |  |
| ControllerButton_West          |  |
| ControllerButton_North         |  |
| ControllerButton_StartSelect   |  |
| ControllerButton_BackShare     |  |
| ControllerButton_DPadUp        |  |
| ControllerButton_DPadDown      |  |
| ControllerButton_DPadLeft      |  |
| ControllerButton_DPadRight     |  |
| ControllerButton_Count         |  |

**5.1.2.6 DamageType**

```
enum oxygen::DamageType : oxyU8
```

**Enumerator**

|                       |  |
|-----------------------|--|
| DamageType_None       |  |
| DamageType_Explosive  |  |
| DamageType_Bullet     |  |
| DamageType_Melee      |  |
| DamageType_FallDamage |  |
| DamageType_Count      |  |

**5.1.2.7 EntityFlags**

```
enum oxygen::EntityFlags : oxyU32
```



## Enumerator

|  |  |
|--|--|
| EntityFlags_Disabled                     |  |
| EntityFlags_Static                       |  |
| EntityFlags_Dynamic                      |  |
| EntityFlags_Renderable                   |  |
| EntityFlags_HasHull                      |  |
| EntityFlags_HasCamera                    |  |
| EntityFlags_Replicated                   |  |
| EntityFlags_IsLocalPlayer                |  |
| EntityFlags_EnableTransformReplication   |  |
| EntityFlags_EnableTransformInterpolation |  |

## 5.1.2.8 EntitySpawnType

```
enum oxygen::EntitySpawnType : oxyU8
```

## Enumerator

|                                  |  |
|----------------------------------|--|
| EntitySpawnType_Player           |  |
| EntitySpawnType_Golfclub         |  |
| EntitySpawnType_GolfclubLauncher |  |
| EntitySpawnType_Golfball         |  |
| EntitySpawntype_GolfballLauncher |  |
| EntitySpawnType_Count            |  |

## 5.1.2.9 EntitySummonType

```
enum oxygen::EntitySummonType : oxyU8
```

## Enumerator

|                         |  |
|-------------------------|--|
| EntitySummonType_Player |  |
| EntitySummonType_Count  |  |

## 5.1.2.10 GfxCullType

```
enum oxygen::GfxCullType
```

## Enumerator

|                       |  |
|-----------------------|--|
| GfxCullType_None      |  |
| GfxCullType_Backface  |  |
| GfxCullType_Frontface |  |

## 5.1.2.11 GfxRenderStrategy

```
enum oxygen::GfxRenderStrategy : oxyU8
```

## Enumerator

|  |  |
|--|--|
| GfxRenderStrategy_DirectToGPU                            |  |
| GfxRenderStrategy_SoftwareDepthRasterizePreSorted        |  |
| GfxRenderStrategy_SoftwareDepthRasterizePreSortedOverlay |  |
| GfxRenderStrategy_SoftwareDepthRasterize                 |  |

## 5.1.2.12 HealthState

```
enum oxygen::HealthState : oxyU8
```

## Enumerator

|                          |  |
|--------------------------|--|
| HealthState_Alive        |  |
| HealthState_Invulnerable |  |
| HealthState_Dead         |  |

## 5.1.2.13 KeyboardButton

```
enum oxygen::KeyboardButton : oxyU8
```

## Enumerator

|                  |  |
|------------------|--|
| KeyboardButton_A |  |
| KeyboardButton_B |  |
| KeyboardButton_C |  |
| KeyboardButton_D |  |
| KeyboardButton_E |  |
| KeyboardButton_F |  |
| KeyboardButton_G |  |
| KeyboardButton_H |  |
| KeyboardButton_I |  |
| KeyboardButton_J |  |
| KeyboardButton_K |  |
| KeyboardButton_L |  |
| KeyboardButton_M |  |
| KeyboardButton_N |  |
| KeyboardButton_O |  |
| KeyboardButton_P |  |
| KeyboardButton_Q |  |
| KeyboardButton_R |  |
| KeyboardButton_S |  |
| KeyboardButton_T |  |
| KeyboardButton_U |  |
| KeyboardButton_V |  |
| KeyboardButton_W |  |
| KeyboardButton_X |  |

## Enumerator

|                              |  |
|------------------------------|--|
| KeyboardButton_Y             |  |
| KeyboardButton_Z             |  |
| KeyboardButton_0             |  |
| KeyboardButton_1             |  |
| KeyboardButton_2             |  |
| KeyboardButton_3             |  |
| KeyboardButton_4             |  |
| KeyboardButton_5             |  |
| KeyboardButton_6             |  |
| KeyboardButton_7             |  |
| KeyboardButton_8             |  |
| KeyboardButton_9             |  |
| KeyboardButton_F1            |  |
| KeyboardButton_F2            |  |
| KeyboardButton_F3            |  |
| KeyboardButton_F4            |  |
| KeyboardButton_F5            |  |
| KeyboardButton_F6            |  |
| KeyboardButton_F7            |  |
| KeyboardButton_F8            |  |
| KeyboardButton_F9            |  |
| KeyboardButton_F10           |  |
| KeyboardButton_F11           |  |
| KeyboardButton_F12           |  |
| KeyboardButton_F13           |  |
| KeyboardButton_F14           |  |
| KeyboardButton_F15           |  |
| KeyboardButton_F16           |  |
| KeyboardButton_F17           |  |
| KeyboardButton_F18           |  |
| KeyboardButton_F19           |  |
| KeyboardButton_F20           |  |
| KeyboardButton_F21           |  |
| KeyboardButton_F22           |  |
| KeyboardButton_F23           |  |
| KeyboardButton_F24           |  |
| KeyboardButton_Numpad0       |  |
| KeyboardButton_Numpad1       |  |
| KeyboardButton_Numpad2       |  |
| KeyboardButton_Numpad3       |  |
| KeyboardButton_Numpad4       |  |
| KeyboardButton_Numpad5       |  |
| KeyboardButton_Numpad6       |  |
| KeyboardButton_Numpad7       |  |
| KeyboardButton_Numpad8       |  |
| KeyboardButton_Numpad9       |  |
| KeyboardButton_NumpadDecimal |  |

## Enumerator

|                               |  |
|-------------------------------|--|
| KeyboardButton_NumPadEnter    |  |
| KeyboardButton_NumPadAdd      |  |
| KeyboardButton_NumPadSubtract |  |
| KeyboardButton_NumPadMultiply |  |
| KeyboardButton_NumPadDivide   |  |
| KeyboardButton_NumPadLock     |  |
| KeyboardButton_Left           |  |
| KeyboardButton_Right          |  |
| KeyboardButton_Up             |  |
| KeyboardButton_Down           |  |
| KeyboardButton_Home           |  |
| KeyboardButton_End            |  |
| KeyboardButton_PageUp         |  |
| KeyboardButton_PageDown       |  |
| KeyboardButton_Insert         |  |
| KeyboardButton_Delete         |  |
| KeyboardButton_Pause          |  |
| KeyboardButton_PrintScreen    |  |
| KeyboardButton_ScrollLock     |  |
| KeyboardButton_Escape         |  |
| KeyboardButton_Backtick       |  |
| KeyboardButton_Tab            |  |
| KeyboardButton_CapsLock       |  |
| KeyboardButton_LeftShift      |  |
| KeyboardButton_LeftControl    |  |
| KeyboardButton_LeftWindows    |  |
| KeyboardButton_LeftAlt        |  |
| KeyboardButton_Space          |  |
| KeyboardButton_RightAlt       |  |
| KeyboardButton_RightFunction  |  |
| KeyboardButton_RightMenu      |  |
| KeyboardButton_RightControl   |  |
| KeyboardButton_RightShift     |  |
| KeyboardButton_Enter          |  |
| KeyboardButton_Backspace      |  |
| KeyboardButton_Comma          |  |
| KeyboardButton_Period         |  |
| KeyboardButton_Slash          |  |
| KeyboardButton_Semicolon      |  |
| KeyboardButton_Apostrophe     |  |
| KeyboardButton_LeftBracket    |  |
| KeyboardButton_RightBracket   |  |
| KeyboardButton_Backslash      |  |
| KeyboardButton_Hyphen         |  |
| KeyboardButton_Equals         |  |
| KeyboardButton_Count          |  |

### 5.1.2.14 MouseButton

```
enum oxygen::MouseButton : oxyU8
```

#### Enumerator

|                    |  |
|--------------------|--|
| MouseButton_Left   |  |
| MouseButton_Right  |  |
| MouseButton_Middle |  |
| MouseButton_X1     |  |
| MouseButton_X2     |  |
| MouseButton_Count  |  |

### 5.1.2.15 NetProtoMsgType

```
enum oxygen::NetProtoMsgType : oxyU16
```

#### Enumerator

|  |  |
|--|--|
| NetProtoMsgType_AnyPing                  |  |
| NetProtoMsgType_SrvWelcome               |  |
| NetProtoMsgType_SrvChangeLevel           |  |
| NetProtoMsgType_SrvSetLocalPlayer        |  |
| NetProtoMsgType_SrvEntitySpawn           |  |
| NetProtoMsgType_SrvEntityDestroy         |  |
| NetProtoMsgType_SrvEntityTransformRepl   |  |
| NetProtoMsgType_SrvHealhComponentChange  |  |
| NetProtoMsgType_SrvPawnPickupWeapon      |  |
| NetProtoMsgType_SrvPawnDropWeapon        |  |
| NetProtoMsgType_CliLocalPlayerEntityMove |  |
| NetProtoMsgType_CliPawnDropWeapon        |  |
| NetProtoMsgType_CliLocalPlayerFireWeapon |  |

### 5.1.2.16 PawnStance

```
enum oxygen::PawnStance
```

#### Enumerator

|                   |  |
|-------------------|--|
| PawnStance_Stand  |  |
| PawnStance_Crouch |  |
| PawnStance_Prone  |  |

### 5.1.2.17 PawnState

```
enum oxygen::PawnState
```

**Enumerator**

|                  |  |
|------------------|--|
| PawnState_Ground |  |
| PawnState_Void   |  |

**5.1.2.18 PickupType**

```
enum oxygen::PickupType : oxyU8
```

**Enumerator**

|                   |  |
|-------------------|--|
| PickupType_Health |  |
| PickupType_Ammo   |  |
| PickupType_Weapon |  |
| PickupType_Count  |  |

**5.1.2.19 WeaponFireType**

```
enum oxygen::WeaponFireType : oxyU8
```

**Enumerator**

|                         |  |
|-------------------------|--|
| WeaponFireType_Bullets  |  |
| WeaponFireType_GolfClub |  |
| WeaponFireType_GolfBall |  |
| WeaponFireType_Count    |  |

**5.1.3 Function Documentation****5.1.3.1 CRC64Eval()**

```
auto oxygen::CRC64Eval (
    const oxyU8 * data,
    oxySize size) -> oxyU64    [inline], [constexpr]
```

**5.1.3.2 CreateFileMap()**

```
auto oxygen::CreateFileMap (
    std::string_view path,
    oxyBool write,
    oxySize requestSize) -> UniqueFileMap
```

**5.1.3.3 CullBackfaceTri()**

```
auto oxygen::CullBackfaceTri (
    const GfxTri & tri) -> bool    [inline]
```

#### 5.1.3.4 CullFrontfaceTri()

```
auto oxygen::CullFrontfaceTri (
    const GfxTri & tri) -> bool    [inline]
```

#### 5.1.3.5 GetExecutableDirectory()

```
auto oxygen::GetExecutableDirectory () -> std::string_view
```

#### 5.1.3.6 GetLaunchArguments()

```
auto oxygen::GetLaunchArguments () -> std::span<const std::string>
```

#### 5.1.3.7 GetObjectDescriptionMap()

```
auto oxygen::GetObjectDescriptionMap () -> std::unordered_map<oxyU64, const ObjectDescription*>&
[inline]
```

#### 5.1.3.8 LoadWorld()

```
auto oxygen::LoadWorld (
    std::string_view name) -> std::shared_ptr<World>
```

#### 5.1.3.9 LogMessage()

```
auto oxygen::LogMessage (
    const char * str) -> void
```

#### 5.1.3.10 RandomBool()

```
auto oxygen::RandomBool () -> oxyBool    [inline]
```

#### 5.1.3.11 RandomF32()

```
auto oxygen::RandomF32 (
    oxyF32 minInclusive,
    oxyF32 maxInclusive) -> oxyF32    [inline]
```

#### 5.1.3.12 RandomF64()

```
auto oxygen::RandomF64 (
    oxyF64 minInclusive,
    oxyF64 maxInclusive) -> oxyF64    [inline]
```

#### 5.1.3.13 RandomS32()

```
auto oxygen::RandomS32 (  
    oxyS32 minInclusive,  
    oxyS32 maxInclusive) -> oxyS32    [inline]
```

#### 5.1.3.14 RandomS64()

```
auto oxygen::RandomS64 (  
    oxyS64 minInclusive,  
    oxyS64 maxInclusive) -> oxyS64    [inline]
```

#### 5.1.3.15 RandomU32()

```
auto oxygen::RandomU32 (  
    oxyU32 minInclusive,  
    oxyU32 maxInclusive) -> oxyU32    [inline]
```

#### 5.1.3.16 RandomU64()

```
auto oxygen::RandomU64 (  
    oxyU64 minInclusive,  
    oxyU64 maxInclusive) -> oxyU64    [inline]
```

#### 5.1.3.17 ReadFileContents()

```
auto oxygen::ReadFileContents (  
    std::string_view absolutePath) -> std::vector<oxyU8>
```

#### 5.1.3.18 Win64PlatformInit()

```
auto oxygen::Win64PlatformInit () -> void
```

#### 5.1.3.19 Win64PlatformRender()

```
auto oxygen::Win64PlatformRender () -> void
```

#### 5.1.3.20 Win64PlatformShutdown()

```
auto oxygen::Win64PlatformShutdown () -> void
```

#### 5.1.3.21 Win64PlatformUpdate()

```
auto oxygen::Win64PlatformUpdate (  
    float deltaTimeSeconds) -> void
```



### 5.1.4 Variable Documentation

#### 5.1.4.1 g\_CRC64Table

`oxyU64` oxygen::g\_CRC64Table[] [inline], [constexpr]

#### 5.1.4.2 g\_randomDevice

`std::random_device` oxygen::g\_randomDevice [inline]

#### 5.1.4.3 g\_randomEngine

`std::mt19937_64` oxygen::g\_randomEngine {`g_randomDevice()`} [inline]

#### 5.1.4.4 k\_collisionHullMaxs

`oxyVec3` oxygen::k\_collisionHullMaxs[] [inline], [constexpr]

**Initial value:**

```
= {
    oxyVec3{0.f, 0.f, 0.f},
    oxyVec3{24.f, 24.f, 48.f},
    oxyVec3{24.f, 24.f, 48.f},
    oxyVec3{12.f, 12.f, 12.f},
}
```

#### 5.1.4.5 k\_collisionHullMins

`oxyVec3` oxygen::k\_collisionHullMins[] [inline], [constexpr]

**Initial value:**

```
= {
    oxyVec3{0.f, 0.f, 0.f},
    oxyVec3{-24.f, -24.f, -48.f},
    oxyVec3{-24.f, -24.f, -48.f},
    oxyVec3{-12.f, -12.f, -12.f},
}
```

## 5.2 oxygen::AudioAbstraction Namespace Reference

## 5.3 oxygen::BSPDefines Namespace Reference

### Classes

- struct [ClipNode](#)
- struct [Edge](#)
- struct [Face](#)
- struct [Header](#)
- struct [Leaf](#)
- struct [Lump](#)
- struct [MipTex](#)
- struct [MipTexLump](#)
- struct [Model](#)
- struct [Node](#)
- struct [Plane](#)
- struct [TexInfo](#)
- struct [Vertex](#)

## Enumerations

- enum [Contents](#) {  
[Contents\\_Empty](#) = -1 , [Contents\\_Solid](#) = -2 , [Contents\\_Water](#) = -3 , [Contents\\_Slime](#) = -4 ,  
[Contents\\_Lava](#) = -5 , [Contents\\_Sky](#) = -6 , [Contents\\_Origin](#) = -7 , [Contents\\_Clip](#) = -8 ,  
[Contents\\_Current0](#) = -9 , [Contents\\_Current90](#) = -10 , [Contents\\_Current180](#) = -11 , [Contents\\_Current270](#) =  
-12 ,  
[Contents\\_CurrentUp](#) = -13 , [Contents\\_CurrentDown](#) = -14 , [Contents\\_Translucent](#) = -15 }
- enum [LumplIndex](#) {  
[LumplIndex\\_Entities](#) = 0 , [LumplIndex\\_Planes](#) , [LumplIndex\\_Textures](#) , [LumplIndex\\_Vertexes](#) ,  
[LumplIndex\\_Visibility](#) , [LumplIndex\\_Nodes](#) , [LumplIndex\\_TexInfo](#) , [LumplIndex\\_Faces](#) ,  
[LumplIndex\\_Lighting](#) , [LumplIndex\\_ClipNodes](#) , [LumplIndex\\_Leafs](#) , [LumplIndex\\_MarkSurfaces](#) ,  
[LumplIndex\\_Edges](#) , [LumplIndex\\_SurfEdges](#) , [LumplIndex\\_Models](#) , [LumplIndex\\_Count](#) }
- enum [PlaneType](#) {  
[Plane\\_X](#) = 0 , [Plane\\_Y](#) , [Plane\\_Z](#) , [Plane\\_AnyX](#) ,  
[Plane\\_AnyY](#) , [Plane\\_AnyZ](#) }

## Variables

- constexpr auto [k\\_BSPVersion](#) = oxyS32{30}
- constexpr auto [k\\_ToolVersion](#) = oxyS32{2}
- constexpr auto [k\\_MaxMapHulls](#) = oxySize{4}
- constexpr auto [k\\_MaxMapModels](#) = oxySize{400}
- constexpr auto [k\\_MaxMapBrushes](#) = oxySize{4096}
- constexpr auto [k\\_MaxMapEntityString](#) = oxySize{128 \* 1024}
- constexpr auto [k\\_MaxMapPlanes](#) = oxySize{32767}
- constexpr auto [k\\_MaxMapNodes](#) = oxySize{32767}
- constexpr auto [k\\_MaxMapClipNodes](#) = oxySize{32767}
- constexpr auto [k\\_MaxMapLeafs](#) = oxySize{8192}
- constexpr auto [k\\_MaxMapVertices](#) = oxySize{65535}
- constexpr auto [k\\_MaxMapFaces](#) = oxySize{65535}
- constexpr auto [k\\_MaxMapMarkSurfaces](#) = oxySize{65535}
- constexpr auto [k\\_MaxMapTexInfo](#) = oxySize{8192}
- constexpr auto [k\\_MaxMapEdges](#) = oxySize{256000}
- constexpr auto [k\\_MaxMapSurfEdges](#) = oxySize{512000}
- constexpr auto [k\\_MaxMapTextures](#) = oxySize{512}
- constexpr auto [k\\_MaxMapMipTex](#) = oxySize{0x200000}
- constexpr auto [k\\_MaxMapLighting](#) = oxySize{0x200000}
- constexpr auto [k\\_MaxMapVis](#) = oxySize{0x200000}
- constexpr auto [k\\_MaxMapPortals](#) = oxySize{65536}
- constexpr auto [k\\_NumMipLevels](#) = 4
- constexpr auto [k\\_TexSpecial](#)
- constexpr auto [k\\_MaxLightMaps](#) = 4
- constexpr auto [k\\_NumAmbients](#) = 4

## 5.3.1 Enumeration Type Documentation

### 5.3.1.1 Contents

```
enum oxygen::BSPDefines::Contents
```

## Enumerator

|                      |  |
|----------------------|--|
| Contents_Empty       |  |
| Contents_Solid       |  |
| Contents_Water       |  |
| Contents_Slime       |  |
| Contents_Lava        |  |
| Contents_Sky         |  |
| Contents-Origin      |  |
| Contents_Clip        |  |
| Contents_Current0    |  |
| Contents_Current90   |  |
| Contents_Current180  |  |
| Contents_Current270  |  |
| Contents_CurrentUp   |  |
| Contents_CurrentDown |  |
| Contents_Translucent |  |

## 5.3.1.2 LumpIndex

```
enum oxygen::BSPDefines::LumpIndex
```

## Enumerator

|                        |  |
|------------------------|--|
| LumpIndex_Entities     |  |
| LumpIndex_Planes       |  |
| LumpIndex_Textures     |  |
| LumpIndex_Vertexes     |  |
| LumpIndex_Visibility   |  |
| LumpIndex_Nodes        |  |
| LumpIndex_TexInfo      |  |
| LumpIndex_Faces        |  |
| LumpIndex_Lighting     |  |
| LumpIndex_ClipNodes    |  |
| LumpIndex_Leafs        |  |
| LumpIndex_MarkSurfaces |  |
| LumpIndex_Edges        |  |
| LumpIndex_SurfEdges    |  |
| LumpIndex_Models       |  |
| LumpIndex_Count        |  |

## 5.3.1.3 PlaneType

```
enum oxygen::BSPDefines::PlaneType
```

## Enumerator

|            |  |
|------------|--|
| Plane_X    |  |
| Plane_Y    |  |
| Plane_Z    |  |
| Plane_AnyX |  |
| Plane_AnyY |  |
| Plane_AnyZ |  |

## 5.3.2 Variable Documentation

### 5.3.2.1 k\_BSPVersion

```
auto oxygen::BSPDefines::k_BSPVersion = oxyS32{30} [inline], [constexpr]
```

### 5.3.2.2 k\_MaxLightMaps

```
auto oxygen::BSPDefines::k_MaxLightMaps = 4 [inline], [constexpr]
```

### 5.3.2.3 k\_MaxMapBrushes

```
auto oxygen::BSPDefines::k_MaxMapBrushes = oxySize{4096} [inline], [constexpr]
```

### 5.3.2.4 k\_MaxMapClipNodes

```
auto oxygen::BSPDefines::k_MaxMapClipNodes = oxySize{32767} [inline], [constexpr]
```

### 5.3.2.5 k\_MaxMapEdges

```
auto oxygen::BSPDefines::k_MaxMapEdges = oxySize{256000} [inline], [constexpr]
```

### 5.3.2.6 k\_MaxMapEntityString

```
auto oxygen::BSPDefines::k_MaxMapEntityString = oxySize{128 * 1024} [inline], [constexpr]
```

### 5.3.2.7 k\_MaxMapFaces

```
auto oxygen::BSPDefines::k_MaxMapFaces = oxySize{65535} [inline], [constexpr]
```

### 5.3.2.8 k\_MaxMapHulls

```
auto oxygen::BSPDefines::k_MaxMapHulls = oxySize{4} [inline], [constexpr]
```

#### 5.3.2.9 k\_MaxMapLeafs

```
auto oxygen::BSPDefines::k_MaxMapLeafs = oxySize{8192} [inline], [constexpr]
```

#### 5.3.2.10 k\_MaxMapLighting

```
auto oxygen::BSPDefines::k_MaxMapLighting = oxySize{0x200000} [inline], [constexpr]
```

#### 5.3.2.11 k\_MaxMapMarkSurfaces

```
auto oxygen::BSPDefines::k_MaxMapMarkSurfaces = oxySize{65535} [inline], [constexpr]
```

#### 5.3.2.12 k\_MaxMapMipTex

```
auto oxygen::BSPDefines::k_MaxMapMipTex = oxySize{0x200000} [inline], [constexpr]
```

#### 5.3.2.13 k\_MaxMapModels

```
auto oxygen::BSPDefines::k_MaxMapModels = oxySize{400} [inline], [constexpr]
```

#### 5.3.2.14 k\_MaxMapNodes

```
auto oxygen::BSPDefines::k_MaxMapNodes = oxySize{32767} [inline], [constexpr]
```

#### 5.3.2.15 k\_MaxMapPlanes

```
auto oxygen::BSPDefines::k_MaxMapPlanes = oxySize{32767} [inline], [constexpr]
```

#### 5.3.2.16 k\_MaxMapPortals

```
auto oxygen::BSPDefines::k_MaxMapPortals = oxySize{65536} [inline], [constexpr]
```

#### 5.3.2.17 k\_MaxMapSurfEdges

```
auto oxygen::BSPDefines::k_MaxMapSurfEdges = oxySize{512000} [inline], [constexpr]
```

#### 5.3.2.18 k\_MaxMapTexInfo

```
auto oxygen::BSPDefines::k_MaxMapTexInfo = oxySize{8192} [inline], [constexpr]
```

### 5.3.2.19 k\_MaxMapTextures

```
auto oxygen::BSPDefines::k_MaxMapTextures = oxySize{512} [inline], [constexpr]
```

### 5.3.2.20 k\_MaxMapVertices

```
auto oxygen::BSPDefines::k_MaxMapVertices = oxySize{65535} [inline], [constexpr]
```

### 5.3.2.21 k\_MaxMapVis

```
auto oxygen::BSPDefines::k_MaxMapVis = oxySize{0x200000} [inline], [constexpr]
```

### 5.3.2.22 k\_NumAmbients

```
auto oxygen::BSPDefines::k_NumAmbients = 4 [inline], [constexpr]
```

### 5.3.2.23 k\_NumMipLevels

```
auto oxygen::BSPDefines::k_NumMipLevels = 4 [inline], [constexpr]
```

### 5.3.2.24 k\_TexSpecial

```
auto oxygen::BSPDefines::k_TexSpecial [inline], [constexpr]
```

**Initial value:**

```
=
    1
```

### 5.3.2.25 k\_ToolVersion

```
auto oxygen::BSPDefines::k_ToolVersion = oxyS32{2} [inline], [constexpr]
```

## 5.4 oxygen::GfxSoftwareRasterizer Namespace Reference

### Classes

- struct [CountingIterator](#)

### Functions

- auto [RasterTriDepthTest](#) (const [GfxTri](#) &tri, [oxyS16](#) triID, [oxyU32](#) width, [oxyU32](#) height, [oxyF32](#) \*zbuffer, [oxyS16](#) \*tribuffer, [oxyU32](#) divminx, [oxyU32](#) divminy, [oxyU32](#) divmaxx, [oxyU32](#) divmaxy) -> [oxyBool](#)
- auto [RasterTriNoDepthCompare](#) (const [GfxTri](#) &tri, [oxyU32](#) width, [oxyU32](#) height, [oxyF32](#) \*zbuffer, [oxyU32](#) divminx, [oxyU32](#) divminy, [oxyU32](#) divmaxx, [oxyU32](#) divmaxy) -> void

## 5.4.1 Function Documentation

### 5.4.1.1 RasterTriDepthTest()

```
auto oxygen::GfxSoftwareRasterizer::RasterTriDepthTest (
    const GfxTri & tri,
    oxyS16 triID,
    oxyU32 width,
    oxyU32 height,
    oxyF32 * zbuffer,
    oxyS16 * tribuffer,
    oxyU32 divminx,
    oxyU32 divminy,
    oxyU32 divmaxx,
    oxyU32 divmaxy) -> oxyBool    [inline]
```

### 5.4.1.2 RasterTriNoDepthCompare()

```
auto oxygen::GfxSoftwareRasterizer::RasterTriNoDepthCompare (
    const GfxTri & tri,
    oxyU32 width,
    oxyU32 height,
    oxyF32 * zbuffer,
    oxyU32 divminx,
    oxyU32 divminy,
    oxyU32 divmaxx,
    oxyU32 divmaxy) -> void    [inline]
```

## 5.5 oxygen::GraphicsAbstraction Namespace Reference

### Functions

- auto [GetWindowSize](#) (oxyS32 &width, oxyS32 &height) -> void
- auto [LoadTexture](#) (const char \*absolutePath) -> std::shared\_ptr< const Texture >
- auto [DrawTexturedQuad](#) (const TexturedQuad &quad) -> void

## 5.5.1 Function Documentation

### 5.5.1.1 DrawTexturedQuad()

```
auto oxygen::GraphicsAbstraction::DrawTexturedQuad (
    const TexturedQuad & quad) -> void
```

### 5.5.1.2 GetWindowSize()

```
auto oxygen::GraphicsAbstraction::GetWindowSize (
    oxyS32 & width,
    oxyS32 & height) -> void
```

### 5.5.1.3 LoadTexture()

```
auto oxygen::GraphicsAbstraction::LoadTexture (
    const char * absolutePath) -> std::shared_ptr<const Texture>
```

## 5.6 oxygen::InputAbstraction Namespace Reference

### Functions

- auto [IsForeground](#) () -> [oxyBool](#)
- auto [HideAndLockCursor](#) ([oxyBool](#) lock) -> void
- auto [GetMousePosition](#) ([oxyF32](#) &x, [oxyF32](#) &y) -> void
- auto [GetMouseStates](#) (std::bitset< [MouseButton\\_Count](#) > &buttons) -> void
- auto [GetKeyStates](#) (std::bitset< [KeyboardButton\\_Count](#) > &keys) -> void
- auto [GetControllerConnected](#) (int index) -> [oxyBool](#)
- auto [GetControllerStates](#) (int index, std::bitset< [ControllerButton\\_Count](#) > &buttons) -> void
- auto [GetControllerAxisStates](#) (int index, std::span< [oxyF32](#), [ControllerAxis\\_Count](#) > axes) -> void

### 5.6.1 Function Documentation

#### 5.6.1.1 GetControllerAxisStates()

```
auto oxygen::InputAbstraction::GetControllerAxisStates (
    int index,
    std::span< oxyF32, ControllerAxis\_Count > axes) -> void
```

#### 5.6.1.2 GetControllerConnected()

```
auto oxygen::InputAbstraction::GetControllerConnected (
    int index) -> oxyBool
```

#### 5.6.1.3 GetControllerStates()

```
auto oxygen::InputAbstraction::GetControllerStates (
    int index,
    std::bitset< ControllerButton\_Count > & buttons) -> void
```

#### 5.6.1.4 GetKeyStates()

```
auto oxygen::InputAbstraction::GetKeyStates (
    std::bitset< KeyboardButton\_Count > & keys) -> void
```

#### 5.6.1.5 GetMousePosition()

```
auto oxygen::InputAbstraction::GetMousePosition (
    oxyF32 & x,
    oxyF32 & y) -> void
```



### 5.6.1.6 GetMouseStates()

```
auto oxygen::InputAbstraction::GetMouseStates (
    std::bitset< MouseButton_Count > & buttons) -> void
```

### 5.6.1.7 HideAndLockCursor()

```
auto oxygen::InputAbstraction::HideAndLockCursor (
    oxyBool lock) -> void
```

### 5.6.1.8 IsForeground()

```
auto oxygen::InputAbstraction::IsForeground () -> oxyBool
```

## 5.7 oxygen::Math Namespace Reference

### Functions

- constexpr auto Translate (const oxyMat4x4 &m, const oxyVec3 &v) -> oxyMat4x4
- constexpr auto Rotate (const oxyMat4x4 &m, const oxyQuat &q) -> oxyMat4x4
- auto Rotate (const oxyMat4x4 &m, oxyF32 angle, const oxyVec3 &axis) -> oxyMat4x4
- constexpr auto Scale (const oxyMat4x4 &m, const oxyVec3 &v) -> oxyMat4x4
- auto LookAt (const oxyVec3 &eye, const oxyVec3 &center, const oxyVec3 &up) -> oxyMat4x4
- auto Perspective (oxyF32 fovy, oxyF32 aspect, oxyF32 near, oxyF32 far) -> oxyMat4x4
- auto InverseMatrix (const oxyMat4x4 &m) -> oxyMat4x4
- auto RotationMatrixToEuler (const oxyMat4x4 &m) -> oxyVec3
- auto Slerp (const oxyQuat &a, const oxyQuat &b, oxyF32 t) -> oxyQuat
- auto AngleAxisToQuat (const oxyF32 angle, const oxyVec3 &axis) -> oxyQuat
- auto QuatToEulerAngles (const oxyQuat &q) -> oxyVec3
- auto EulerAnglesToQuat (const oxyVec3 &v) -> oxyQuat
- auto QuatLookAt (const oxyVec3 &position, const oxyVec3 &where) -> oxyQuat
- auto EulerForward (const oxyVec3 &euler) -> oxyVec3
- auto ToHalfFloat (oxyF32 x) -> oxyU16
- auto FromHalfFloat (oxyU16 x) -> oxyF32

### 5.7.1 Function Documentation

#### 5.7.1.1 AngleAxisToQuat()

```
auto oxygen::Math::AngleAxisToQuat (
    const oxyF32 angle,
    const oxyVec3 & axis) -> oxyQuat    [inline]
```

#### 5.7.1.2 EulerAnglesToQuat()

```
auto oxygen::Math::EulerAnglesToQuat (
    const oxyVec3 & v) -> oxyQuat    [inline]
```

### 5.7.1.3 EulerForward()

```
auto oxygen::Math::EulerForward (
    const oxyVec3 & euler) -> oxyVec3    [inline]
```

### 5.7.1.4 FromHalfFloat()

```
auto oxygen::Math::FromHalfFloat (
    oxyU16 x) -> oxyF32    [inline]
```

### 5.7.1.5 InverseMatrix()

```
auto oxygen::Math::InverseMatrix (
    const oxyMat4x4 & m) -> oxyMat4x4    [inline]
```

### 5.7.1.6 LookAt()

```
auto oxygen::Math::LookAt (
    const oxyVec3 & eye,
    const oxyVec3 & center,
    const oxyVec3 & up) -> oxyMat4x4    [inline]
```

### 5.7.1.7 Perspective()

```
auto oxygen::Math::Perspective (
    oxyF32 fovy,
    oxyF32 aspect,
    oxyF32 near,
    oxyF32 far) -> oxyMat4x4    [inline]
```

### 5.7.1.8 QuatLookAt()

```
auto oxygen::Math::QuatLookAt (
    const oxyVec3 & position,
    const oxyVec3 & where) -> oxyQuat    [inline]
```

### 5.7.1.9 QuatToEulerAngles()

```
auto oxygen::Math::QuatToEulerAngles (
    const oxyQuat & q) -> oxyVec3    [inline]
```

### 5.7.1.10 Rotate() [1/2]

```
auto oxygen::Math::Rotate (
    const oxyMat4x4 & m,
    const oxyQuat & q) -> oxyMat4x4    [inline], [constexpr]
```

#### 5.7.1.11 Rotate() [2/2]

```
auto oxygen::Math::Rotate (
    const oxyMat4x4 & m,
    oxyF32 angle,
    const oxyVec3 & axis) -> oxyMat4x4    [inline]
```

#### 5.7.1.12 RotationMatrixToEuler()

```
auto oxygen::Math::RotationMatrixToEuler (
    const oxyMat4x4 & m) -> oxyVec3    [inline]
```

#### 5.7.1.13 Scale()

```
auto oxygen::Math::Scale (
    const oxyMat4x4 & m,
    const oxyVec3 & v) -> oxyMat4x4    [inline], [constexpr]
```

#### 5.7.1.14 Slerp()

```
auto oxygen::Math::Slerp (
    const oxyQuat & a,
    const oxyQuat & b,
    oxyF32 t) -> oxyQuat    [inline]
```

#### 5.7.1.15 ToHalfFloat()

```
auto oxygen::Math::ToHalfFloat (
    oxyF32 x) -> oxyU16    [inline]
```

#### 5.7.1.16 Translate()

```
auto oxygen::Math::Translate (
    const oxyMat4x4 & m,
    const oxyVec3 & v) -> oxyMat4x4    [inline], [constexpr]
```

## 5.8 oxygen::NetworkAbstraction Namespace Reference

### Functions

- auto [ConnectToHost](#) (const char \*host, oxyU16 port) -> std::unique\_ptr< NetworkSocket >
- auto [HostServer](#) (oxyU16 port) -> std::unique\_ptr< NetworkSocket >
- auto [CreateBroadcastSendSocket](#) (oxyU16 port) -> std::unique\_ptr< NetworkSocket >
- auto [CreateBroadcastListenSocket](#) (oxyU16 port) -> std::unique\_ptr< NetworkSocket >

## 5.8.1 Function Documentation

### 5.8.1.1 ConnectToHost()

```
auto oxygen::NetworkAbstraction::ConnectToHost (
    const char * host,
    oxyU16 port) -> std::unique_ptr<NetworkSocket>
```

### 5.8.1.2 CreateBroadcastListenSocket()

```
auto oxygen::NetworkAbstraction::CreateBroadcastListenSocket (
    oxyU16 port) -> std::unique_ptr<NetworkSocket>
```

### 5.8.1.3 CreateBroadcastSendSocket()

```
auto oxygen::NetworkAbstraction::CreateBroadcastSendSocket (
    oxyU16 port) -> std::unique_ptr<NetworkSocket>
```

### 5.8.1.4 HostServer()

```
auto oxygen::NetworkAbstraction::HostServer (
    oxyU16 port) -> std::unique_ptr<NetworkSocket>
```

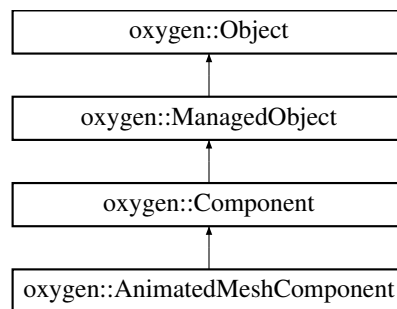
## Chapter 6

# Class Documentation

### 6.1 oxygen::AnimatedMeshComponent Struct Reference

```
#include <AnimatedMeshComponent.h>
```

Inheritance diagram for oxygen::AnimatedMeshComponent:



#### Public Member Functions

- `OXYGENOBJECT` (`AnimatedMeshComponent`, `Component`)
- auto `LoadByName` (`std::string_view` name) -> `oxyBool`
- auto `BeginAnimation` (`oxyU32` animHash, `oxyBool` loop=true) -> void
- auto `GetCurrentntAnimationHash` () const -> `oxyU32`
- auto `SetLocalOffset` (const `oxyVec3` &offset) -> void
- auto `SetLocalRotation` (const `oxyQuat` &rotation) -> void

#### Public Member Functions inherited from `oxygen::Component`

- `OXYGENOBJECT` (`Component`, `ManagedObject`)
- auto `GetEntity` () const -> `std::shared_ptr< Entity >`
- auto `IsEnabled` () const -> `oxyBool`
- auto `SetEnabled` (`oxyBool` enabled) -> void

## Public Member Functions inherited from [oxygen::ManagedObject](#)

- [OXYGENOBJECT](#) ([ManagedObject](#), [Object](#))
- auto [GetObjectID](#) () const -> [oxyObjectID](#)
- template<typename RefType>  
requires std::is\_base\_of\_v<[ManagedObject](#), RefType>  
auto [GetHardRef](#) () const -> std::shared\_ptr< RefType >

## Public Member Functions inherited from [oxygen::Object](#)

- [Object](#) ()=default
- virtual [~Object](#) ()=default
- virtual auto [GetDescription](#) () const -> const [ObjectDescription](#) &
- auto [IsA](#) (const [ObjectDescription](#) &desc) const -> bool
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [IsA](#) () const -> bool
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [Cast](#) () -> T \*
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [Cast](#) () const -> const T \*

## Protected Member Functions

- auto [Update](#) (float deltaTimeSeconds) -> void override
- auto [Render](#) () const -> void override

## Additional Inherited Members

## Public Types inherited from [oxygen::Object](#)

- using [SelfType](#) = [Object](#)
- using [Super](#) = [Object](#)

## Static Public Member Functions inherited from [oxygen::Object](#)

- static auto [GetStaticDescription](#) () -> const [ObjectDescription](#) &

## 6.1.1 Member Function Documentation

### 6.1.1.1 BeginAnimation()

```
auto oxygen::AnimatedMeshComponent::BeginAnimation (
    oxyU32 animHash,
    oxyBool loop = true) -> void
```

### 6.1.1.2 GetCurrentntAnimationHash()

```
auto oxygen::AnimatedMeshComponent::GetCurrentntAnimationHash () const -> oxyU32 [inline]
```

### 6.1.1.3 LoadByName()

```
auto oxygen::AnimatedMeshComponent::LoadByName (
    std::string_view name) -> oxyBool
```

### 6.1.1.4 OXYGENOBJECT()

```
oxygen::AnimatedMeshComponent::OXYGENOBJECT (
    AnimatedMeshComponent ,
    Component )
```

### 6.1.1.5 Render()

```
auto oxygen::AnimatedMeshComponent::Render () const -> void [override], [protected], [virtual]
```

Reimplemented from [oxygen::Component](#).

### 6.1.1.6 SetLocalOffset()

```
auto oxygen::AnimatedMeshComponent::SetLocalOffset (
    const oxyVec3 & offset) -> void [inline]
```

### 6.1.1.7 SetLocalRotation()

```
auto oxygen::AnimatedMeshComponent::SetLocalRotation (
    const oxyQuat & rotation) -> void [inline]
```

### 6.1.1.8 Update()

```
auto oxygen::AnimatedMeshComponent::Update (
    float deltaTimeSeconds) -> void [override], [protected], [virtual]
```

Reimplemented from [oxygen::Component](#).

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/AnimatedMeshComponent/[AnimatedMeshComponent.h](#)
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/AnimatedMeshComponent/[AnimatedMeshComponent.cc](#)

## 6.2 oxygen::AnimatedMeshResource Struct Reference

```
#include <AnimatedMeshResource.h>
```

### Public Attributes

- std::shared\_ptr< const struct [StaticMeshResource](#) > [m\\_rootPose](#)
- std::unordered\_map< [oxyU32](#), [AnimationInfo](#) > [m\\_animations](#)

### 6.2.1 Member Data Documentation

#### 6.2.1.1 m\_animations

```
std::unordered_map<oxyU32, AnimationInfo> oxygen::AnimatedMeshResource::m_animations
```

#### 6.2.1.2 m\_rootPose

```
std::shared_ptr<const struct StaticMeshResource> oxygen::AnimatedMeshResource::m_rootPose
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Resources/[AnimatedMeshResource.h](#)

## 6.3 oxygen::AnimationInfo Struct Reference

```
#include <AnimatedMeshResource.h>
```

### Public Attributes

- std::vector< std::vector< [oxyVec3](#) > > [m\\_frames](#)

### 6.3.1 Member Data Documentation

#### 6.3.1.1 m\_frames

```
std::vector<std::vector<oxyVec3> > oxygen::AnimationInfo::m_frames
```

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

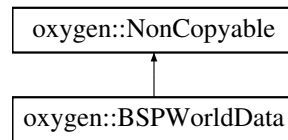
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Resources/[AnimatedMeshResource.h](#)



## 6.4 oxygen::BSPWorldData Struct Reference

```
#include <BSP.h>
```

Inheritance diagram for oxygen::BSPWorldData:



### Public Member Functions

- auto [Load](#) (std::string\_view mapname) -> [oxyBool](#)

### Public Member Functions inherited from [oxygen::NonCopyable](#)

- [NonCopyable](#) ()=default
- [NonCopyable](#) (const [NonCopyable](#) &)=delete
- [NonCopyable](#) & [operator=](#) (const [NonCopyable](#) &)=delete

### Public Attributes

- std::vector< std::unordered\_map< std::string, std::string > > [m\\_entitiesText](#)
- std::vector< [BSPDefines::Plane](#) > [m\\_planes](#)
- std::vector< [BSPDefines::MipTex](#) > [m\\_miptex](#)
- std::vector< [BSPDefines::Vertex](#) > [m\\_vertices](#)
- std::vector< [oxyU8](#) > [m\\_visibility](#)
- std::vector< [BSPDefines::Node](#) > [m\\_nodes](#)
- std::vector< [BSPDefines::TexInfo](#) > [m\\_texinfo](#)
- std::vector< [BSPDefines::Face](#) > [m\\_faces](#)
- std::vector< [BSPDefines::ClipNode](#) > [m\\_clipNodes](#)
- std::vector< [BSPDefines::Leaf](#) > [m\\_leaves](#)
- std::vector< [oxyU16](#) > [m\\_marksurfaces](#)
- std::vector< [BSPDefines::Edge](#) > [m\\_edges](#)
- std::vector< [oxyS32](#) > [m\\_surfedges](#)
- std::vector< [BSPDefines::Model](#) > [m\\_models](#)

## 6.4.1 Member Function Documentation

### 6.4.1.1 Load()

```
auto oxygen::BSPWorldData::Load (
    std::string_view mapname) -> oxyBool
```

## 6.4.2 Member Data Documentation

### 6.4.2.1 m\_clipNodes

`std::vector<BSPDefines::ClipNode> oxygen::BSPWorldData::m_clipNodes`

### 6.4.2.2 m\_edges

`std::vector<BSPDefines::Edge> oxygen::BSPWorldData::m_edges`

### 6.4.2.3 m\_entitiesText

`std::vector<std::unordered_map<std::string, std::string> > oxygen::BSPWorldData::m_entities↵  
Text`

### 6.4.2.4 m\_faces

`std::vector<BSPDefines::Face> oxygen::BSPWorldData::m_faces`

### 6.4.2.5 m\_leaves

`std::vector<BSPDefines::Leaf> oxygen::BSPWorldData::m_leaves`

### 6.4.2.6 m\_marksurfaces

`std::vector<oxyU16> oxygen::BSPWorldData::m_marksurfaces`

### 6.4.2.7 m\_miptex

`std::vector<BSPDefines::MipTex> oxygen::BSPWorldData::m_miptex`

### 6.4.2.8 m\_models

`std::vector<BSPDefines::Model> oxygen::BSPWorldData::m_models`

### 6.4.2.9 m\_nodes

`std::vector<BSPDefines::Node> oxygen::BSPWorldData::m_nodes`

### 6.4.2.10 m\_planes

`std::vector<BSPDefines::Plane> oxygen::BSPWorldData::m_planes`

#### 6.4.2.11 m\_surfedges

```
std::vector<oxyS32> oxygen::BSPWorldData::m_surfedges
```

#### 6.4.2.12 m\_texinfo

```
std::vector<BSPDefines::TexInfo> oxygen::BSPWorldData::m_texinfo
```

#### 6.4.2.13 m\_vertices

```
std::vector<BSPDefines::Vertex> oxygen::BSPWorldData::m_vertices
```

#### 6.4.2.14 m\_visibility

```
std::vector<oxyU8> oxygen::BSPWorldData::m_visibility
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/BSP.h
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/BSP.cc

## 6.5 oxygen::CallbackList< TRet, TArgs > Struct Template Reference

```
#include <OxygenTypes.h>
```

### Public Types

- using [fnptr\\_type](#) = TRet (\*)(void\*, TArgs...)

### Public Member Functions

- auto [AddCallback](#) (std::weak\_ptr< void > obj, [fnptr\\_type](#) fn) -> void
- template<typename TFun>  
auto [IterateCallbacks](#) (TFun &&fun, TArgs... args) -> void requires(not std::same\_as< void, TRet >)
- template<typename TFun>  
auto [IterateCallbacks](#) (TFun &&fun, TArgs... args) -> void

## 6.5.1 Member Typedef Documentation

### 6.5.1.1 fnptr\_type

```
template<typename TRet, typename... TArgs>
using oxygen::CallbackList< TRet, TArgs >::fnptr_type = TRet (*)(void*, TArgs...)
```

## 6.5.2 Member Function Documentation

### 6.5.2.1 AddCallback()

```
template<typename TRet, typename... TArgs>
auto oxygen::CallbackList< TRet, TArgs >::AddCallback (
    std::weak_ptr< void > obj,
    fnptr_type fn) -> void    [inline]
```

### 6.5.2.2 IterateCallbacks() [1/2]

```
template<typename TRet, typename... TArgs>
template<typename TFun>
auto oxygen::CallbackList< TRet, TArgs >::IterateCallbacks (
    TFun && fun,
    TArgs... args) -> void    [inline]
```

### 6.5.2.3 IterateCallbacks() [2/2]

```
template<typename TRet, typename... TArgs>
template<typename TFun>
auto oxygen::CallbackList< TRet, TArgs >::IterateCallbacks (
    TFun && fun,
    TArgs... args) -> void requires(not std::same_as<void, TRet>)    [inline]
```

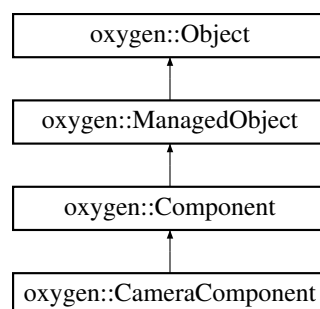
The documentation for this struct was generated from the following file:

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/[OxygenTypes.h](#)

## 6.6 oxygen::CameraComponent Struct Reference

```
#include <CameraComponent.h>
```

Inheritance diagram for oxygen::CameraComponent:



**Public Member Functions**

- [OXYGENOBJECT](#) ([CameraComponent](#), [Component](#))
- auto [GetCameraLocalOffset](#) () const -> const [oxyVec3](#) &
- auto [GetEuler](#) () const -> const [oxyVec3](#) &
- auto [GetCameraForward](#) () const -> const [oxyVec3](#) &
- auto [GetCameraUp](#) () const -> const [oxyVec3](#) &
- auto [GetCameraRight](#) () const -> const [oxyVec3](#) &
- auto [GetVerticalFov](#) () const -> [oxyF32](#)
- auto [GetNearClip](#) () const -> [oxyF32](#)
- auto [GetFarClip](#) () const -> [oxyF32](#)
- auto [GetViewMatrix](#) () const -> const [oxyMat4x4](#) &
- auto [GetProjectionMatrix](#) () const -> const [oxyMat4x4](#) &
- auto [GetViewProjectionMatrix](#) () const -> const [oxyMat4x4](#) &
- auto [SetEuler](#) (const [oxyVec3](#) &euler) -> void
- auto [SetLocalOffset](#) (const [oxyVec3](#) &localOffset) -> void
- auto [SetNearClip](#) ([oxyF32](#) nearClip) -> void
- auto [SetFarClip](#) ([oxyF32](#) farClip) -> void

**Public Member Functions inherited from [oxygen::Component](#)**

- [OXYGENOBJECT](#) ([Component](#), [ManagedObject](#))
- auto [GetEntity](#) () const -> std::shared\_ptr< [Entity](#) >
- auto [IsEnabled](#) () const -> [oxyBool](#)
- auto [SetEnabled](#) ([oxyBool](#) enabled) -> void

**Public Member Functions inherited from [oxygen::ManagedObject](#)**

- [OXYGENOBJECT](#) ([ManagedObject](#), [Object](#))
- auto [GetObjectID](#) () const -> [oxyObjectID](#)
- template<typename RefType>  
requires std::is\_base\_of\_v<[ManagedObject](#), RefType>  
auto [GetHardRef](#) () const -> std::shared\_ptr< RefType >

**Public Member Functions inherited from [oxygen::Object](#)**

- [Object](#) ()=default
- virtual [~Object](#) ()=default
- virtual auto [GetDescription](#) () const -> const [ObjectDescription](#) &
- auto [IsA](#) (const [ObjectDescription](#) &desc) const -> bool
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [IsA](#) () const -> bool
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [Cast](#) () -> T \*
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [Cast](#) () const -> const T \*

### Protected Member Functions

- auto [Update](#) ([oxyF32](#) deltaTimeSeconds) -> void override

### Protected Member Functions inherited from [oxygen::Component](#)

- virtual auto [Render](#) () const -> void

### Additional Inherited Members

### Public Types inherited from [oxygen::Object](#)

- using [SelfType](#) = [Object](#)
- using [Super](#) = [Object](#)

### Static Public Member Functions inherited from [oxygen::Object](#)

- static auto [GetStaticDescription](#) () -> const [ObjectDescription](#) &

## 6.6.1 Member Function Documentation

### 6.6.1.1 GetCameraForward()

```
auto oxygen::CameraComponent::GetCameraForward () const -> const oxyVec3&    [inline]
```

### 6.6.1.2 GetCameraLocalOffset()

```
auto oxygen::CameraComponent::GetCameraLocalOffset () const -> const oxyVec3&    [inline]
```

### 6.6.1.3 GetCameraRight()

```
auto oxygen::CameraComponent::GetCameraRight () const -> const oxyVec3&    [inline]
```

### 6.6.1.4 GetCameraUp()

```
auto oxygen::CameraComponent::GetCameraUp () const -> const oxyVec3&    [inline]
```

### 6.6.1.5 GetEuler()

```
auto oxygen::CameraComponent::GetEuler () const -> const oxyVec3&    [inline]
```

#### 6.6.1.6 GetFarClip()

```
auto oxygen::CameraComponent::GetFarClip () const -> oxyF32 [inline]
```

#### 6.6.1.7 GetNearClip()

```
auto oxygen::CameraComponent::GetNearClip () const -> oxyF32 [inline]
```

#### 6.6.1.8 GetProjectionMatrix()

```
auto oxygen::CameraComponent::GetProjectionMatrix () const -> const oxyMat4x4& [inline]
```

#### 6.6.1.9 GetVerticalFov()

```
auto oxygen::CameraComponent::GetVerticalFov () const -> oxyF32 [inline]
```

#### 6.6.1.10 GetViewMatrix()

```
auto oxygen::CameraComponent::GetViewMatrix () const -> const oxyMat4x4& [inline]
```

#### 6.6.1.11 GetViewProjectionMatrix()

```
auto oxygen::CameraComponent::GetViewProjectionMatrix () const -> const oxyMat4x4& [inline]
```

#### 6.6.1.12 OXYGENOBJECT()

```
oxygen::CameraComponent::OXYGENOBJECT (  
    CameraComponent ,  
    Component )
```

#### 6.6.1.13 SetEuler()

```
auto oxygen::CameraComponent::SetEuler (  
    const oxyVec3 & euler) -> void [inline]
```

#### 6.6.1.14 SetFarClip()

```
auto oxygen::CameraComponent::SetFarClip (  
    oxyF32 farClip) -> void [inline]
```

#### 6.6.1.15 SetLocalOffset()

```
auto oxygen::CameraComponent::SetLocalOffset (
    const oxyVec3 & localOffset) -> void    [inline]
```

#### 6.6.1.16 SetNearClip()

```
auto oxygen::CameraComponent::SetNearClip (
    oxyF32 nearClip) -> void    [inline]
```

#### 6.6.1.17 Update()

```
auto oxygen::CameraComponent::Update (
    oxyF32 deltaTimeSeconds) -> void    [override], [protected], [virtual]
```

Reimplemented from [oxygen::Component](#).

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/CameraComponent/[CameraComponent.h](#)
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/CameraComponent/[CameraComponent.cc](#)

## 6.7 oxygen::BSPDefines::ClipNode Struct Reference

```
#include <BSP.h>
```

### Public Attributes

- [oxyU32 m\\_planeIndex](#)
- [oxyS16 m\\_children](#) [2]

### 6.7.1 Member Data Documentation

#### 6.7.1.1 m\_children

```
oxyS16 oxygen::BSPDefines::ClipNode::m_children[2]
```

#### 6.7.1.2 m\_planeIndex

```
oxyU32 oxygen::BSPDefines::ClipNode::m_planeIndex
```

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

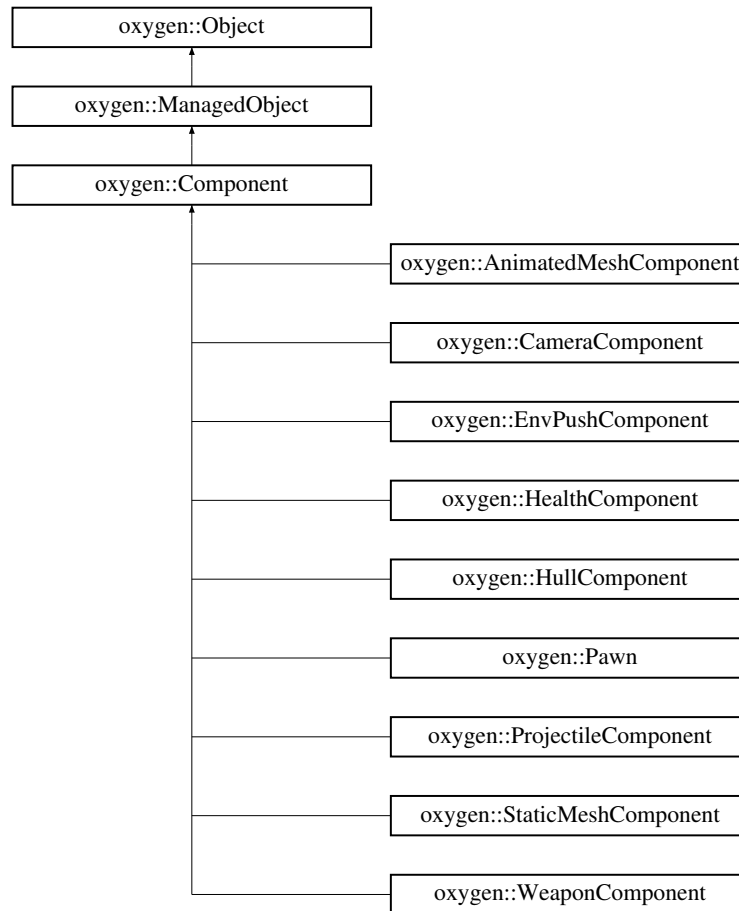
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/[BSP.h](#)



## 6.8 oxygen::Component Struct Reference

```
#include <Component.h>
```

Inheritance diagram for oxygen::Component:



### Public Member Functions

- [OXYGENOBJECT](#) ([Component](#), [ManagedObject](#))
- auto [GetEntity](#) () const -> std::shared\_ptr< [Entity](#) >
- auto [IsEnabled](#) () const -> [oxyBool](#)
- auto [SetEnabled](#) ([oxyBool](#) enabled) -> void

### Public Member Functions inherited from [oxygen::ManagedObject](#)

- [OXYGENOBJECT](#) ([ManagedObject](#), [Object](#))
- auto [GetObjectID](#) () const -> [oxyObjectID](#)
- template<typename RefType>  
requires std::is\_base\_of\_v<[ManagedObject](#), RefType>  
auto [GetHardRef](#) () const -> std::shared\_ptr< RefType >

## Public Member Functions inherited from `oxygen::Object`

- `Object ()=default`
- `virtual ~Object ()=default`
- `virtual auto GetDescription () const -> const ObjectDescription &`
- `auto IsA (const ObjectDescription &desc) const -> bool`
- `template<typename T>`  
`requires std::is_base_of_v<Object, T>`  
`auto IsA () const -> bool`
- `template<typename T>`  
`requires std::is_base_of_v<Object, T>`  
`auto Cast () -> T *`
- `template<typename T>`  
`requires std::is_base_of_v<Object, T>`  
`auto Cast () const -> const T *`

## Protected Member Functions

- `virtual auto Update (oxyF32 deltaTimeSeconds) -> void`
- `virtual auto Render () const -> void`

## Friends

- `struct Entity`

## Additional Inherited Members

## Public Types inherited from `oxygen::Object`

- `using SelfType = Object`
- `using Super = Object`

## Static Public Member Functions inherited from `oxygen::Object`

- `static auto GetStaticDescription () -> const ObjectDescription &`

## 6.8.1 Member Function Documentation

### 6.8.1.1 GetEntity()

```
auto oxygen::Component::GetEntity () const -> std::shared_ptr<Entity> [inline]
```

### 6.8.1.2 IsEnabled()

```
auto oxygen::Component::IsEnabled () const -> oxyBool [inline]
```

### 6.8.1.3 OXYGENOBJECT()

```
oxygen::Component::OXYGENOBJECT (
    Component ,
    ManagedObject )
```

### 6.8.1.4 Render()

```
virtual auto oxygen::Component::Render () const -> void [inline], [protected], [virtual]
```

Reimplemented in [oxygen::AnimatedMeshComponent](#), [oxygen::Pawn](#), and [oxygen::StaticMeshComponent](#).

### 6.8.1.5 SetEnabled()

```
auto oxygen::Component::SetEnabled (
    oxyBool enabled) -> void [inline]
```

### 6.8.1.6 Update()

```
virtual auto oxygen::Component::Update (
    oxyF32 deltaTimeSeconds) -> void [inline], [protected], [virtual]
```

Reimplemented in [oxygen::AnimatedMeshComponent](#), [oxygen::CameraComponent](#), [oxygen::EnvPushComponent](#), [oxygen::HullComponent](#), [oxygen::Pawn](#), [oxygen::ProjectileComponent](#), and [oxygen::WeaponComponent](#).

## 6.8.2 Friends And Related Symbol Documentation

### 6.8.2.1 Entity

```
friend struct Entity [friend]
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/[Component.h](#)

## 6.9 oxygen::GfxSoftwareRasterizer::CountingIterator< T > Struct Template Reference

### Public Types

- using [iterator\\_category](#) = std::random\_access\_iterator\_tag
- using [value\\_type](#) = T
- using [difference\\_type](#) = T
- using [pointer](#) = T\*
- using [reference](#) = T&

## Public Member Functions

- const T & [operator\\*](#) () const
- [CountingIterator](#) & [operator++](#) ()
- [CountingIterator](#) [operator++](#) (int)
- [CountingIterator](#) & [operator--](#) ()
- [CountingIterator](#) [operator--](#) (int)
- [CountingIterator](#) & [operator+=](#) (const T &lhs)
- [CountingIterator](#) & [operator-=](#) (const T &lhs)
- [CountingIterator](#) [operator+](#) (const T &lhs) const
- [CountingIterator](#) [operator-](#) (const T &lhs) const
- bool [operator==](#) (const [CountingIterator](#) &lhs) const
- bool [operator!=](#) (const [CountingIterator](#) &lhs) const
- const T [operator+](#) (const [CountingIterator](#) &lhs) const
- T [operator-](#) (const [CountingIterator](#) &lhs) const

## Public Attributes

- T [m\\_value](#)

## 6.9.1 Member Typedef Documentation

### 6.9.1.1 difference\_type

```
template<typename T>
using oxygen::GfxSoftwareRasterizer::CountingIterator< T >::difference_type = T
```

### 6.9.1.2 iterator\_category

```
template<typename T>
using oxygen::GfxSoftwareRasterizer::CountingIterator< T >::iterator_category = std::random_↵
access_iterator_tag
```

### 6.9.1.3 pointer

```
template<typename T>
using oxygen::GfxSoftwareRasterizer::CountingIterator< T >::pointer = T*
```

### 6.9.1.4 reference

```
template<typename T>
using oxygen::GfxSoftwareRasterizer::CountingIterator< T >::reference = T&
```

### 6.9.1.5 value\_type

```
template<typename T>
using oxygen::GfxSoftwareRasterizer::CountingIterator< T >::value_type = T
```

## 6.9.2 Member Function Documentation

### 6.9.2.1 operator!=(())

```
template<typename T>
bool oxygen::GfxSoftwareRasterizer::CountingIterator< T >::operator!= (
    const CountingIterator< T > & lhs) const [inline]
```

### 6.9.2.2 operator\*()

```
template<typename T>
const T & oxygen::GfxSoftwareRasterizer::CountingIterator< T >::operator* () const [inline]
```

### 6.9.2.3 operator+() [1/2]

```
template<typename T>
const T oxygen::GfxSoftwareRasterizer::CountingIterator< T >::operator+ (
    const CountingIterator< T > & lhs) const [inline]
```

### 6.9.2.4 operator+() [2/2]

```
template<typename T>
CountingIterator oxygen::GfxSoftwareRasterizer::CountingIterator< T >::operator+ (
    const T & lhs) const [inline]
```

### 6.9.2.5 operator++() [1/2]

```
template<typename T>
CountingIterator & oxygen::GfxSoftwareRasterizer::CountingIterator< T >::operator++ () [inline]
```

### 6.9.2.6 operator++() [2/2]

```
template<typename T>
CountingIterator oxygen::GfxSoftwareRasterizer::CountingIterator< T >::operator++ (
    int ) [inline]
```

### 6.9.2.7 operator+=(())

```
template<typename T>
CountingIterator & oxygen::GfxSoftwareRasterizer::CountingIterator< T >::operator+= (
    const T & lhs) [inline]
```

### 6.9.2.8 operator-() [1/2]

```
template<typename T>
T oxygen::GfxSoftwareRasterizer::CountingIterator< T >::operator- (
    const CountingIterator< T > & lhs) const [inline]
```

**6.9.2.9 operator-() [2/2]**

```
template<typename T>
CountingIterator oxygen::GfxSoftwareRasterizer::CountingIterator< T >::operator- (
    const T & lhs) const [inline]
```

**6.9.2.10 operator--() [1/2]**

```
template<typename T>
CountingIterator & oxygen::GfxSoftwareRasterizer::CountingIterator< T >::operator-- () [inline]
```

**6.9.2.11 operator--() [2/2]**

```
template<typename T>
CountingIterator oxygen::GfxSoftwareRasterizer::CountingIterator< T >::operator-- (
    int ) [inline]
```

**6.9.2.12 operator-=()**

```
template<typename T>
CountingIterator & oxygen::GfxSoftwareRasterizer::CountingIterator< T >::operator-= (
    const T & lhs) [inline]
```

**6.9.2.13 operator==()**

```
template<typename T>
bool oxygen::GfxSoftwareRasterizer::CountingIterator< T >::operator== (
    const CountingIterator< T > & lhs) const [inline]
```

**6.9.3 Member Data Documentation****6.9.3.1 m\_value**

```
template<typename T>
T oxygen::GfxSoftwareRasterizer::CountingIterator< T >::m_value
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Gfx/[GfxSoftwareRasterize.inl](#)

**6.10 oxygen::BSPDefines::Edge Struct Reference**

```
#include <BSP.h>
```

## Public Attributes

- [oxyU16 m\\_vertexIndices](#) [2]

## 6.10.1 Member Data Documentation

### 6.10.1.1 m\_vertexIndices

`oxyU16 oxygen::BSPDefines::Edge::m_vertexIndices[2]`

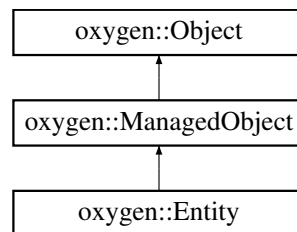
The documentation for this struct was generated from the following file:

- `C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/BSP.h`

## 6.11 oxygen::Entity Struct Reference

```
#include <Entity.h>
```

Inheritance diagram for oxygen::Entity:



## Public Member Functions

- `OXYGENOBJECT (Entity, ManagedObject)`
- `auto GetLocalPosition () const -> const oxyVec3 &`
- `auto GetLocalRotation () const -> const oxyQuat &`
- `auto GetLocalScale () const -> const oxyVec3 &`
- `auto GetWorldPosition () const -> oxyVec3`
- `auto GetWorldRotation () const -> oxyQuat`
- `auto GetWorldScale () const -> oxyVec3`
- `auto GetWorldTransformMatrix () const -> oxyMat4x4`
- `auto GetFlag (EntityFlags flag) const -> oxyBool`
- `auto GetWorld () const -> std::shared_ptr< struct World >`
- `auto GetParent () const -> std::shared_ptr< Entity >`
- `auto GetRenderOcclusionMin () const -> const oxyVec3 &`
- `auto GetRenderOcclusionMax () const -> const oxyVec3 &`
- `auto SetLocalPosition (const oxyVec3 &position) -> void`
- `auto SetLocalRotation (const oxyQuat &rotation) -> void`
- `auto SetLocalScale (const oxyVec3 &scale) -> void`
- `auto SetWorldPosition (const oxyVec3 &position) -> void`
- `auto SetWorldRotation (const oxyQuat &rotation) -> void`
- `auto SetWorldScale (const oxyVec3 &scale) -> void`

- auto [SetFlag](#) ([EntityFlags](#) flag, [oxyBool](#) state) -> void
- auto [SetRenderOcclusionMin](#) (const [oxyVec3](#) &min) -> void
- auto [SetRenderOcclusionMax](#) (const [oxyVec3](#) &max) -> void
- template<typename T>  
auto [AddComponent](#) ([oxyObjectID](#) id=0) -> std::shared\_ptr< T >
- template<typename T>  
auto [GetComponent](#) () const -> std::shared\_ptr< T >
- auto [Destroy](#) () -> void
- auto [SetParent](#) (std::shared\_ptr< [Entity](#) > parent) -> void
- auto [Update](#) ([oxyF32](#) deltaTimeSeconds) -> void
- auto [Render](#) () const -> void

## Public Member Functions inherited from [oxygen::ManagedObject](#)

- [OXYGENOBJECT](#) ([ManagedObject](#), [Object](#))
- auto [GetObjectID](#) () const -> [oxyObjectID](#)
- template<typename RefType>  
requires std::is\_base\_of\_v<[ManagedObject](#), RefType>  
auto [GetHardRef](#) () const -> std::shared\_ptr< RefType >

## Public Member Functions inherited from [oxygen::Object](#)

- [Object](#) ()=default
- virtual [~Object](#) ()=default
- virtual auto [GetDescription](#) () const -> const [ObjectDescription](#) &
- auto [IsA](#) (const [ObjectDescription](#) &desc) const -> bool
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [IsA](#) () const -> bool
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [Cast](#) () -> T \*
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [Cast](#) () const -> const T \*

## Friends

- struct [World](#)

## Additional Inherited Members

## Public Types inherited from [oxygen::Object](#)

- using [SelfType](#) = [Object](#)
- using [Super](#) = [Object](#)

## Static Public Member Functions inherited from [oxygen::Object](#)

- static auto [GetStaticDescription](#) () -> const [ObjectDescription](#) &



## 6.11.1 Member Function Documentation

### 6.11.1.1 AddComponent()

```
template<typename T>
auto oxygen::Entity::AddComponent (
    oxyObjectID id = 0) -> std::shared_ptr<T>    [inline]
```

### 6.11.1.2 Destroy()

```
auto oxygen::Entity::Destroy () -> void
```

### 6.11.1.3 GetComponent()

```
template<typename T>
auto oxygen::Entity::GetComponent () const -> std::shared_ptr<T>    [inline]
```

### 6.11.1.4 GetFlag()

```
auto oxygen::Entity::GetFlag (
    EntityFlags flag) const -> oxyBool    [inline]
```

### 6.11.1.5 GetLocalPosition()

```
auto oxygen::Entity::GetLocalPosition () const -> const oxyVec3&    [inline]
```

### 6.11.1.6 GetLocalRotation()

```
auto oxygen::Entity::GetLocalRotation () const -> const oxyQuat&    [inline]
```

### 6.11.1.7 GetLocalScale()

```
auto oxygen::Entity::GetLocalScale () const -> const oxyVec3&    [inline]
```

### 6.11.1.8 GetParent()

```
auto oxygen::Entity::GetParent () const -> std::shared_ptr<Entity>    [inline]
```

### 6.11.1.9 GetRenderOcclusionMax()

```
auto oxygen::Entity::GetRenderOcclusionMax () const -> const oxyVec3&    [inline]
```

#### 6.11.1.10 GetRenderOcclusionMin()

```
auto oxygen::Entity::GetRenderOcclusionMin () const -> const oxyVec3& [inline]
```

#### 6.11.1.11 GetWorld()

```
auto oxygen::Entity::GetWorld () const -> std::shared_ptr<struct World> [inline]
```

#### 6.11.1.12 GetWorldPosition()

```
auto oxygen::Entity::GetWorldPosition () const -> oxyVec3
```

#### 6.11.1.13 GetWorldRotation()

```
auto oxygen::Entity::GetWorldRotation () const -> oxyQuat
```

#### 6.11.1.14 GetWorldScale()

```
auto oxygen::Entity::GetWorldScale () const -> oxyVec3
```

#### 6.11.1.15 GetWorldTransformMatrix()

```
auto oxygen::Entity::GetWorldTransformMatrix () const -> oxyMat4x4
```

#### 6.11.1.16 OXYGENOBJECT()

```
oxygen::Entity::OXYGENOBJECT (
    Entity ,
    ManagedObject )
```

#### 6.11.1.17 Render()

```
auto oxygen::Entity::Render () const -> void
```

#### 6.11.1.18 SetFlag()

```
auto oxygen::Entity::SetFlag (
    EntityFlags flag,
    oxyBool state) -> void [inline]
```

#### 6.11.1.19 SetLocalPosition()

```
auto oxygen::Entity::SetLocalPosition (
    const oxyVec3 & position) -> void    [inline]
```

#### 6.11.1.20 SetLocalRotation()

```
auto oxygen::Entity::SetLocalRotation (
    const oxyQuat & rotation) -> void    [inline]
```

#### 6.11.1.21 SetLocalScale()

```
auto oxygen::Entity::SetLocalScale (
    const oxyVec3 & scale) -> void    [inline]
```

#### 6.11.1.22 SetParent()

```
auto oxygen::Entity::SetParent (
    std::shared_ptr< Entity > parent) -> void
```

#### 6.11.1.23 SetRenderOcclusionMax()

```
auto oxygen::Entity::SetRenderOcclusionMax (
    const oxyVec3 & max) -> void    [inline]
```

#### 6.11.1.24 SetRenderOcclusionMin()

```
auto oxygen::Entity::SetRenderOcclusionMin (
    const oxyVec3 & min) -> void    [inline]
```

#### 6.11.1.25 SetWorldPosition()

```
auto oxygen::Entity::SetWorldPosition (
    const oxyVec3 & position) -> void
```

#### 6.11.1.26 SetWorldRotation()

```
auto oxygen::Entity::SetWorldRotation (
    const oxyQuat & rotation) -> void
```

#### 6.11.1.27 SetWorldScale()

```
auto oxygen::Entity::SetWorldScale (
    const oxyVec3 & scale) -> void
```

### 6.11.1.28 Update()

```
auto oxygen::Entity::Update (
    oxyF32 deltaTimeSeconds) -> void
```

## 6.11.2 Friends And Related Symbol Documentation

### 6.11.2.1 World

```
friend struct World [friend]
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Entity/[Entity.h](#)
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Entity/[Entity.cc](#)

## 6.12 oxygen::EntityHierarchy Struct Reference

```
#include <Entity.h>
```

### Public Attributes

- std::shared\_ptr< struct [Entity](#) > [m\\_parent](#) {}
- std::vector< std::shared\_ptr< struct [Entity](#) > > [m\\_children](#)
- std::weak\_ptr< struct [Entity](#) > [m\\_self](#) {}

### 6.12.1 Member Data Documentation

#### 6.12.1.1 m\_children

```
std::vector<std::shared_ptr<struct Entity> > oxygen::EntityHierarchy::m_children
```

#### 6.12.1.2 m\_parent

```
std::shared_ptr<struct Entity> oxygen::EntityHierarchy::m_parent {}
```

#### 6.12.1.3 m\_self

```
std::weak_ptr<struct Entity> oxygen::EntityHierarchy::m_self {}
```

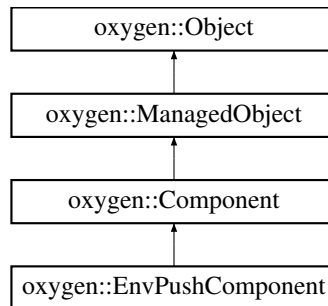
The documentation for this struct was generated from the following file:

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Entity/[Entity.h](#)

## 6.13 oxygen::EnvPushComponent Struct Reference

```
#include <EnvPushComponent.h>
```

Inheritance diagram for oxygen::EnvPushComponent:



### Public Member Functions

- [OXYGENOBJECT](#) ([EnvPushComponent](#), [Component](#))
- auto [GetVelocity](#) () const -> const [oxyVec3](#) &
- auto [GetRadius](#) () const -> [oxyF32](#)
- auto [SetVelocity](#) (const [oxyVec3](#) &velocity) -> void
- auto [SetRadius](#) ([oxyF32](#) radius) -> void

### Public Member Functions inherited from [oxygen::Component](#)

- [OXYGENOBJECT](#) ([Component](#), [ManagedObject](#))
- auto [GetEntity](#) () const -> std::shared\_ptr< [Entity](#) >
- auto [IsEnabled](#) () const -> [oxyBool](#)
- auto [SetEnabled](#) ([oxyBool](#) enabled) -> void

### Public Member Functions inherited from [oxygen::ManagedObject](#)

- [OXYGENOBJECT](#) ([ManagedObject](#), [Object](#))
- auto [GetObjectID](#) () const -> [oxyObjectID](#)
- template<typename RefType>  
requires std::is\_base\_of\_v<[ManagedObject](#), RefType>  
auto [GetHardRef](#) () const -> std::shared\_ptr< RefType >

### Public Member Functions inherited from [oxygen::Object](#)

- [Object](#) ()=default
- virtual [~Object](#) ()=default
- virtual auto [GetDescription](#) () const -> const [ObjectDescription](#) &
- auto [IsA](#) (const [ObjectDescription](#) &desc) const -> bool
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [IsA](#) () const -> bool
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [Cast](#) () -> T \*
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [Cast](#) () const -> const T \*

### Protected Member Functions

- auto [Update](#) ([oxyF32](#) deltaTimeSeconds) -> void override

### Protected Member Functions inherited from [oxygen::Component](#)

- virtual auto [Render](#) () const -> void

### Additional Inherited Members

### Public Types inherited from [oxygen::Object](#)

- using [SelfType](#) = [Object](#)
- using [Super](#) = [Object](#)

### Static Public Member Functions inherited from [oxygen::Object](#)

- static auto [GetStaticDescription](#) () -> const [ObjectDescription](#) &

## 6.13.1 Member Function Documentation

### 6.13.1.1 GetRadius()

```
auto oxygen::EnvPushComponent::GetRadius () const -> oxyF32 [inline]
```

### 6.13.1.2 GetVelocity()

```
auto oxygen::EnvPushComponent::GetVelocity () const -> const oxyVec3& [inline]
```

### 6.13.1.3 OXYGENOBJECT()

```
oxygen::EnvPushComponent::OXYGENOBJECT (
    EnvPushComponent ,
    Component )
```

### 6.13.1.4 SetRadius()

```
auto oxygen::EnvPushComponent::SetRadius (
    oxyF32 radius) -> void [inline]
```

### 6.13.1.5 SetVelocity()

```
auto oxygen::EnvPushComponent::SetVelocity (
    const oxyVec3 & velocity) -> void [inline]
```

### 6.13.1.6 Update()

```
auto oxygen::EnvPushComponent::Update (  
    oxyF32 deltaTimeSeconds) -> void [override], [protected], [virtual]
```

Reimplemented from [oxygen::Component](#).

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/EnvPushComponent/[EnvPushComponent.h](#)
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/EnvPushComponent/[EnvPushComponent.cc](#)

## 6.14 oxygen::BSPDefines::Face Struct Reference

```
#include <BSP.h>
```

### Public Attributes

- [oxyU16 m\\_planeIndex](#)
- [oxyU16 m\\_side](#)
- [oxyU32 m\\_firstEdgeIndex](#)
- [oxyU16 m\\_edgeCount](#)
- [oxyU16 m\\_texInfoIndex](#)
- [oxyU8 m\\_lightStyles \[k\\_MaxLightMaps\]](#)
- [oxyU32 m\\_lightMapOffset](#)

### 6.14.1 Member Data Documentation

#### 6.14.1.1 m\_edgeCount

[oxyU16](#) oxygen::BSPDefines::Face::m\_edgeCount

#### 6.14.1.2 m\_firstEdgeIndex

[oxyU32](#) oxygen::BSPDefines::Face::m\_firstEdgeIndex

#### 6.14.1.3 m\_lightMapOffset

[oxyU32](#) oxygen::BSPDefines::Face::m\_lightMapOffset

#### 6.14.1.4 m\_lightStyles

[oxyU8](#) oxygen::BSPDefines::Face::m\_lightStyles[k\_MaxLightMaps]

#### 6.14.1.5 m\_planeIndex

`oxyU16 oxygen::BSPDefines::Face::m_planeIndex`

#### 6.14.1.6 m\_side

`oxyU16 oxygen::BSPDefines::Face::m_side`

#### 6.14.1.7 m\_texInfoIndex

`oxyU16 oxygen::BSPDefines::Face::m_texInfoIndex`

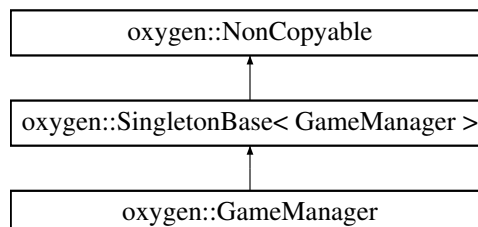
The documentation for this struct was generated from the following file:

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/BSP.h

### 6.15 oxygen::GameManager Struct Reference

```
#include <GameManager.h>
```

Inheritance diagram for oxygen::GameManager:



#### Public Member Functions

- [GameManager](#) ()
- auto [Render](#) () -> void
- auto [Update](#) (float deltaTimeSeconds) -> void
- auto [HostSummonEntity](#) ([EntitySpawnType](#) type, const [oxyVec3](#) &pos, const [oxyQuat](#) &rot) -> std::shared\_ptr< struct [Entity](#) >
- auto [HostGame](#) (std::string worldName) -> void

#### Public Member Functions inherited from [oxygen::SingletonBase< GameManager >](#)

- [SingletonBase](#) ()
- [~SingletonBase](#) ()



**Public Member Functions inherited from [oxygen::NonCopyable](#)**

- [NonCopyable](#) ()=default
- [NonCopyable](#) (const [NonCopyable](#) &)=delete
- [NonCopyable](#) & [operator=](#) (const [NonCopyable](#) &)=delete

**Friends**

- struct [NetSystem](#)

**Additional Inherited Members****Static Public Member Functions inherited from [oxygen::SingletonBase](#)< [GameManager](#) >**

- static auto [GetInstance](#) () -> [GameManager](#) &

**6.15.1 Constructor & Destructor Documentation****6.15.1.1 GameManager()**

```
oxygen::GameManager::GameManager ()
```

**6.15.2 Member Function Documentation****6.15.2.1 HostGame()**

```
auto oxygen::GameManager::HostGame (
    std::string worldName) -> void
```

**6.15.2.2 HostSummonEntity()**

```
auto oxygen::GameManager::HostSummonEntity (
    EntitySpawnType type,
    const oxyVec3 & pos,
    const oxyQuat & rot) -> std::shared_ptr<struct Entity>
```

**6.15.2.3 Render()**

```
auto oxygen::GameManager::Render () -> void
```

**6.15.2.4 Update()**

```
auto oxygen::GameManager::Update (
    float deltaTimeSeconds) -> void
```

### 6.15.3 Friends And Related Symbol Documentation

#### 6.15.3.1 NetSystem

```
friend struct NetSystem [friend]
```

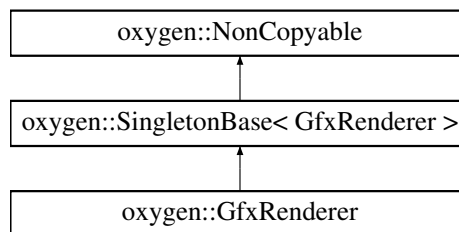
The documentation for this struct was generated from the following files:

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/GameManager/GameManager.h
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/GameManager/GameManager.cc

## 6.16 oxygen::GfxRenderer Struct Reference

```
#include <GfxRenderer.h>
```

Inheritance diagram for oxygen::GfxRenderer:



#### Public Member Functions

- [GfxRenderer](#) ()
- auto [SetViewProjectionMatrix](#) (const [oxyMat4x4](#) &viewProjectionMatrix) -> void
- auto [GetViewProjectionMatrix](#) () const -> const [oxyMat4x4](#) &
- auto [GetWidth](#) () const -> [oxyS32](#)
- auto [GetHeight](#) () const -> [oxyS32](#)
- auto [LoadTexture](#) (std::string\_view texturePath) -> std::shared\_ptr< const [GfxTexture](#) >
- auto [OverlayText](#) (std::string\_view text, [oxyF32](#) blxndc, [oxyF32](#) blyndc, const [oxyVec3](#) &colour, [oxyF32](#) spacing, [oxyF32](#) size, [oxyBool](#) center) -> void
- auto [OverlayRect](#) (const [oxyVec3](#) &col, const [oxyVec2](#) &minndc, const [oxyVec2](#) &maxndc) -> void
- auto [BeginFrame](#) ([oxyS32](#) w, [oxyS32](#) h) -> void
- auto [EndFrame](#) () -> void
- auto [SubmitTriToQueue](#) (const [GfxTri](#) &tri, [GfxRenderStrategy](#) mode, [oxyF32](#) zmult=1.0f) -> void

#### Public Member Functions inherited from [oxygen::SingletonBase< GfxRenderer >](#)

- [SingletonBase](#) ()
- [~SingletonBase](#) ()

#### Public Member Functions inherited from [oxygen::NonCopyable](#)

- [NonCopyable](#) ()=default
- [NonCopyable](#) (const [NonCopyable](#) &)=delete
- [NonCopyable](#) & [operator=](#) (const [NonCopyable](#) &)=delete

## Additional Inherited Members

### Static Public Member Functions inherited from [oxygen::SingletonBase< GfxRenderer >](#)

- static auto [GetInstance](#) () -> [GfxRenderer](#) &

## 6.16.1 Constructor & Destructor Documentation

### 6.16.1.1 GfxRenderer()

```
oxygen::GfxRenderer::GfxRenderer ()
```

## 6.16.2 Member Function Documentation

### 6.16.2.1 BeginFrame()

```
auto oxygen::GfxRenderer::BeginFrame (  
    oxyS32 w,  
    oxyS32 h) -> void
```

### 6.16.2.2 EndFrame()

```
auto oxygen::GfxRenderer::EndFrame () -> void
```

### 6.16.2.3 GetHeight()

```
auto oxygen::GfxRenderer::GetHeight () const -> oxyS32 [inline]
```

### 6.16.2.4 GetViewProjectionMatrix()

```
auto oxygen::GfxRenderer::GetViewProjectionMatrix () const -> const oxyMat4x4& [inline]
```

### 6.16.2.5 GetWidth()

```
auto oxygen::GfxRenderer::GetWidth () const -> oxyS32 [inline]
```

### 6.16.2.6 LoadTexture()

```
auto oxygen::GfxRenderer::LoadTexture (  
    std::string_view texturePath) -> std::shared_ptr<const GfxTexture>
```

### 6.16.2.7 OverlayRect()

```
auto oxygen::GfxRenderer::OverlayRect (
    const oxyVec3 & col,
    const oxyVec2 & minndc,
    const oxyVec2 & maxndc) -> void
```

### 6.16.2.8 OverlayText()

```
auto oxygen::GfxRenderer::OverlayText (
    std::string_view text,
    oxyF32 blxndc,
    oxyF32 blyndc,
    const oxyVec3 & colour,
    oxyF32 spacing,
    oxyF32 size,
    oxyBool center) -> void
```

### 6.16.2.9 SetViewProjectionMatrix()

```
auto oxygen::GfxRenderer::SetViewProjectionMatrix (
    const oxyMat4x4 & viewProjectionMatrix) -> void [inline]
```

### 6.16.2.10 SubmitTriToQueue()

```
auto oxygen::GfxRenderer::SubmitTriToQueue (
    const GfxTri & tri,
    GfxRenderStrategy mode,
    oxyF32 zmult = 1.0f) -> void
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Gfx/[GfxRenderer.h](#)
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Gfx/[GfxRenderer.cc](#)

## 6.17 oxygen::GfxTexture Struct Reference

```
#include <GfxRenderer.h>
```

### Public Attributes

- [oxyU32 m\\_width](#)
- [oxyU32 m\\_height](#)
- [std::string m\\_texturePath](#)
- [std::shared\\_ptr< const GraphicsAbstraction::Texture > m\\_texture](#)

### 6.17.1 Member Data Documentation

#### 6.17.1.1 m\_height

[oxyU32](#) oxygen::GfxTexture::m\_height

#### 6.17.1.2 m\_texture

std::shared\_ptr<const GraphicsAbstraction::Texture> oxygen::GfxTexture::m\_texture

#### 6.17.1.3 m\_texturePath

std::string oxygen::GfxTexture::m\_texturePath

#### 6.17.1.4 m\_width

[oxyU32](#) oxygen::GfxTexture::m\_width

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Gfx/[GfxRenderer.h](#)

## 6.18 oxygen::GfxTri Struct Reference

```
#include <GfxRenderer.h>
```

### Public Attributes

- [GfxVertex](#) m\_vertices [3]
- [oxyVec3](#) m\_colour
- const [GfxTexture](#) \* m\_texture {}
- [GfxCullType](#) m\_cullType

### 6.18.1 Member Data Documentation

#### 6.18.1.1 m\_colour

[oxyVec3](#) oxygen::GfxTri::m\_colour

#### 6.18.1.2 m\_cullType

[GfxCullType](#) oxygen::GfxTri::m\_cullType

### 6.18.1.3 m\_texture

```
const GfxTexture* oxygen::GfxTri::m_texture {}
```

### 6.18.1.4 m\_vertices

```
GfxVertex oxygen::GfxTri::m_vertices[3]
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Gfx/[GfxRenderer.h](#)

## 6.19 oxygen::GfxVertex Struct Reference

```
#include <GfxRenderer.h>
```

### Public Attributes

- [oxyVec4 m\\_position](#)
- [oxyVec2 m\\_uv](#)

### 6.19.1 Member Data Documentation

#### 6.19.1.1 m\_position

```
oxyVec4 oxygen::GfxVertex::m_position
```

#### 6.19.1.2 m\_uv

```
oxyVec2 oxygen::GfxVertex::m_uv
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Gfx/[GfxRenderer.h](#)

## 6.20 oxygen::BSPDefines::Header Struct Reference

```
#include <BSP.h>
```

### Public Attributes

- [oxyS32 m\\_version](#)
- [Lump m\\_lumps \[LumpIndex\\_Count\]](#)

## 6.20.1 Member Data Documentation

### 6.20.1.1 m\_lumps

`Lump` oxygen::BSPDefines::Header::m\_lumps[LumpIndex\_Count]

### 6.20.1.2 m\_version

`oxyS32` oxygen::BSPDefines::Header::m\_version

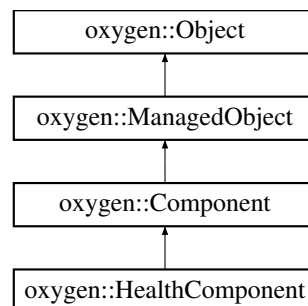
The documentation for this struct was generated from the following file:

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/BSP.h

## 6.21 oxygen::HealthComponent Struct Reference

```
#include <HealthComponent.h>
```

Inheritance diagram for oxygen::HealthComponent:



### Public Member Functions

- `OXYGENOBJECT` (`HealthComponent`, `Component`)
- `template<typename... TArgs>`  
`auto AddHealthStateChangedEvent (TArgs &&... args) -> void`
- `template<typename... TArgs>`  
`auto AddHealedEvent (TArgs &&... args) -> void`
- `template<typename... TArgs>`  
`auto AddDamagedEvent (TArgs &&... args) -> void`
- `auto Heal (oxyS32 amount) -> void`
- `auto Damage (oxyS32 amount, DamageType type) -> void`
- `auto SetHealth (oxyU32 health) -> void`
- `auto SetMaxHealth (oxyU32 maxHealth) -> void`
- `auto GetHealth () const -> oxyU32`
- `auto GetMaxHealth () const -> oxyU32`
- `auto GetState () const -> HealthState`

## Public Member Functions inherited from [oxygen::Component](#)

- [OXYGENOBJECT](#) ([Component](#), [ManagedObject](#))
- auto [GetEntity](#) () const -> std::shared\_ptr< [Entity](#) >
- auto [IsEnabled](#) () const -> [oxyBool](#)
- auto [SetEnabled](#) ([oxyBool](#) enabled) -> void

## Public Member Functions inherited from [oxygen::ManagedObject](#)

- [OXYGENOBJECT](#) ([ManagedObject](#), [Object](#))
- auto [GetObjectID](#) () const -> [oxyObjectID](#)
- template<typename RefType>  
requires std::is\_base\_of\_v<[ManagedObject](#), RefType>  
auto [GetHardRef](#) () const -> std::shared\_ptr< RefType >

## Public Member Functions inherited from [oxygen::Object](#)

- [Object](#) ()=default
- virtual [~Object](#) ()=default
- virtual auto [GetDescription](#) () const -> const [ObjectDescription](#) &
- auto [IsA](#) (const [ObjectDescription](#) &desc) const -> bool
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [IsA](#) () const -> bool
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [Cast](#) () -> T \*
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [Cast](#) () const -> const T \*

## Friends

- struct [GameManager](#)

## Additional Inherited Members

## Public Types inherited from [oxygen::Object](#)

- using [SelfType](#) = [Object](#)
- using [Super](#) = [Object](#)

## Static Public Member Functions inherited from [oxygen::Object](#)

- static auto [GetStaticDescription](#) () -> const [ObjectDescription](#) &

## Protected Member Functions inherited from [oxygen::Component](#)

- virtual auto [Update](#) ([oxyF32](#) deltaTimeSeconds) -> void
- virtual auto [Render](#) () const -> void



## 6.21.1 Member Function Documentation

### 6.21.1.1 AddDamagedEvent()

```
template<typename... TArgs>
auto oxygen::HealthComponent::AddDamagedEvent (
    TArgs &&... args) -> void    [inline]
```

### 6.21.1.2 AddHealedEvent()

```
template<typename... TArgs>
auto oxygen::HealthComponent::AddHealedEvent (
    TArgs &&... args) -> void    [inline]
```

### 6.21.1.3 AddHealthStateChangedEvent()

```
template<typename... TArgs>
auto oxygen::HealthComponent::AddHealthStateChangedEvent (
    TArgs &&... args) -> void    [inline]
```

### 6.21.1.4 Damage()

```
auto oxygen::HealthComponent::Damage (
    oxyS32 amount,
    DamageType type) -> void
```

### 6.21.1.5 GetHealth()

```
auto oxygen::HealthComponent::GetHealth () const -> oxyU32    [inline]
```

### 6.21.1.6 GetMaxHealth()

```
auto oxygen::HealthComponent::GetMaxHealth () const -> oxyU32    [inline]
```

### 6.21.1.7 GetState()

```
auto oxygen::HealthComponent::GetState () const -> HealthState    [inline]
```

### 6.21.1.8 Heal()

```
auto oxygen::HealthComponent::Heal (
    oxyS32 amount) -> void
```

### 6.21.1.9 OXYGENOBJECT()

```
oxygen::HealthComponent::OXYGENOBJECT (
    HealthComponent ,
    Component )
```

### 6.21.1.10 SetHealth()

```
auto oxygen::HealthComponent::SetHealth (
    oxyU32 health) -> void    [inline]
```

### 6.21.1.11 SetMaxHealth()

```
auto oxygen::HealthComponent::SetMaxHealth (
    oxyU32 maxHealth) -> void    [inline]
```

## 6.21.2 Friends And Related Symbol Documentation

### 6.21.2.1 GameManager

```
friend struct GameManager [friend]
```

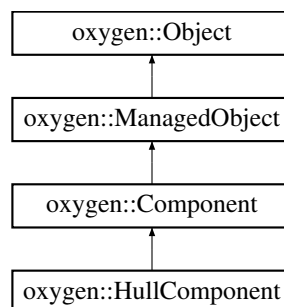
The documentation for this struct was generated from the following files:

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/HealthComponent/HealthComponent.h
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/HealthComponent/HealthComponent.cc

## 6.22 oxygen::HullComponent Struct Reference

```
#include <HullComponent.h>
```

Inheritance diagram for oxygen::HullComponent:



**Public Member Functions**

- **OXYGENOBJECT** (**HullComponent**, **Component**)
- `template<typename... TArgs>`  
`auto AddCollideEvent (TArgs &&... args) -> void`
- `template<typename... TArgs>`  
`auto AddBounceEvent (TArgs &&... args) -> void`
- `auto TraceLine (const oxyVec3 &start, const oxyVec3 &end, oxyVec3 &outPosition, oxyVec3 &outNormal)`  
`const -> oxyBool`
- `auto CollidesWithHull (const oxyVec3 &otherHullWorldPosition, CollisionHull otherHull, oxyVec3 &outPosition,`  
`oxyVec3 &outNormal) const -> oxyBool`
- `auto IsWithinRadius (const oxyVec3 &position, oxyF32 radius) const -> oxyBool`
- `auto DoesIgnoreEntity (const struct Entity *entity) const -> oxyBool`
- `auto GetHull () const -> CollisionHull`
- `auto GetVelocity () const -> const oxyVec3 &`
- `auto GetGravityPerSecond () const -> oxyF32`
- `auto GetDrag () const -> oxyF32`
- `auto GetSolidToOtherHulls () const -> oxyBool`
- `auto GetBounceVelocityMultiplier () const -> oxyF32`
- `auto GetResponseType () const -> oxyBool`
- `auto SetHull (CollisionHull hull) -> void`
- `auto SetVelocity (const oxyVec3 &velocity) -> void`
- `auto SetGravityPerSecond (oxyF32 gravityPerSecond) -> void`
- `auto SetDrag (oxyF32 drag) -> void`
- `auto SetSolidToOtherHulls (oxyBool solid) -> void`
- `auto SetBounceVelocityMultiplier (oxyF32 bounceVelocityMultiplier) -> void`
- `auto SetResponse (CollisionResponseType response) -> void`
- `auto AddToIgnoreList (const std::shared_ptr< struct Entity > &entity) -> void`

**Public Member Functions inherited from oxygen::Component**

- **OXYGENOBJECT** (**Component**, **ManagedObject**)
- `auto GetEntity () const -> std::shared_ptr< Entity >`
- `auto IsEnabled () const -> oxyBool`
- `auto SetEnabled (oxyBool enabled) -> void`

**Public Member Functions inherited from oxygen::ManagedObject**

- **OXYGENOBJECT** (**ManagedObject**, **Object**)
- `auto GetObjectID () const -> oxyObjectID`
- `template<typename RefType>`  
`requires std::is_base_of_v<ManagedObject, RefType>`  
`auto GetHardRef () const -> std::shared_ptr< RefType >`

**Public Member Functions inherited from oxygen::Object**

- `Object ()=default`
- `virtual ~Object ()=default`
- `virtual auto GetDescription () const -> const ObjectDescription &`
- `auto IsA (const ObjectDescription &desc) const -> bool`
- `template<typename T>`  
`requires std::is_base_of_v<Object, T>`  
`auto IsA () const -> bool`
- `template<typename T>`  
`requires std::is_base_of_v<Object, T>`  
`auto Cast () -> T *`
- `template<typename T>`  
`requires std::is_base_of_v<Object, T>`  
`auto Cast () const -> const T *`

### Protected Member Functions

- auto [Update](#) ([oxyF32](#) deltaTimeSeconds) -> void override

### Protected Member Functions inherited from [oxygen::Component](#)

- virtual auto [Render](#) () const -> void

### Additional Inherited Members

### Public Types inherited from [oxygen::Object](#)

- using [SelfType](#) = [Object](#)
- using [Super](#) = [Object](#)

### Static Public Member Functions inherited from [oxygen::Object](#)

- static auto [GetStaticDescription](#) () -> const [ObjectDescription](#) &

## 6.22.1 Member Function Documentation

### 6.22.1.1 AddBounceEvent()

```
template<typename... TArgs>
auto oxygen::HullComponent::AddBounceEvent (
    TArgs &&... args) -> void    [inline]
```

### 6.22.1.2 AddCollideEvent()

```
template<typename... TArgs>
auto oxygen::HullComponent::AddCollideEvent (
    TArgs &&... args) -> void    [inline]
```

### 6.22.1.3 AddToIgnoreList()

```
auto oxygen::HullComponent::AddToIgnoreList (
    const std::shared_ptr< struct Entity > & entity) -> void
```

### 6.22.1.4 CollidesWithHull()

```
auto oxygen::HullComponent::CollidesWithHull (
    const oxyVec3 & otherHullWorldPosition,
    CollisionHull otherHull,
    oxyVec3 & outPosition,
    oxyVec3 & outNormal) const -> oxyBool
```

#### 6.22.1.5 DoesIgnoreEntity()

```
auto oxygen::HullComponent::DoesIgnoreEntity (
    const struct Entity * entity) const -> oxyBool
```

#### 6.22.1.6 GetBounceVelocityMultiplier()

```
auto oxygen::HullComponent::GetBounceVelocityMultiplier () const -> oxyF32    [inline]
```

#### 6.22.1.7 GetDrag()

```
auto oxygen::HullComponent::GetDrag () const -> oxyF32    [inline]
```

#### 6.22.1.8 GetGravityPerSecond()

```
auto oxygen::HullComponent::GetGravityPerSecond () const -> oxyF32    [inline]
```

#### 6.22.1.9 GetHull()

```
auto oxygen::HullComponent::GetHull () const -> CollisionHull    [inline]
```

#### 6.22.1.10 GetResponseType()

```
auto oxygen::HullComponent::GetResponseType () const -> oxyBool    [inline]
```

#### 6.22.1.11 GetSolidToOtherHulls()

```
auto oxygen::HullComponent::GetSolidToOtherHulls () const -> oxyBool    [inline]
```

#### 6.22.1.12 GetVelocity()

```
auto oxygen::HullComponent::GetVelocity () const -> const oxyVec3&    [inline]
```

#### 6.22.1.13 IsWithinRadius()

```
auto oxygen::HullComponent::IsWithinRadius (
    const oxyVec3 & position,
    oxyF32 radius) const -> oxyBool
```

#### 6.22.1.14 OXYGENOBJECT()

```
oxygen::HullComponent::OXYGENOBJECT (  
    HullComponent ,  
    Component )
```

#### 6.22.1.15 SetBounceVelocityMultiplier()

```
auto oxygen::HullComponent::SetBounceVelocityMultiplier (  
    oxyF32 bounceVelocityMultiplier) -> void    [inline]
```

#### 6.22.1.16 SetDrag()

```
auto oxygen::HullComponent::SetDrag (  
    oxyF32 drag) -> void    [inline]
```

#### 6.22.1.17 SetGravityPerSecond()

```
auto oxygen::HullComponent::SetGravityPerSecond (  
    oxyF32 gravityPerSecond) -> void    [inline]
```

#### 6.22.1.18 SetHull()

```
auto oxygen::HullComponent::SetHull (  
    CollisionHull hull) -> void    [inline]
```

#### 6.22.1.19 SetResponse()

```
auto oxygen::HullComponent::SetResponse (  
    CollisionResponseType response) -> void    [inline]
```

#### 6.22.1.20 SetSolidToOtherHulls()

```
auto oxygen::HullComponent::SetSolidToOtherHulls (  
    oxyBool solid) -> void    [inline]
```

#### 6.22.1.21 SetVelocity()

```
auto oxygen::HullComponent::SetVelocity (  
    const oxyVec3 & velocity) -> void    [inline]
```

## 6.22.1.22 TraceLine()

```
auto oxygen::HullComponent::TraceLine (
    const oxyVec3 & start,
    const oxyVec3 & end,
    oxyVec3 & outPosition,
    oxyVec3 & outNormal) const -> oxyBool
```

## 6.22.1.23 Update()

```
auto oxygen::HullComponent::Update (
    oxyF32 deltaTimeSeconds) -> void [override], [protected], [virtual]
```

Reimplemented from [oxygen::Component](#).

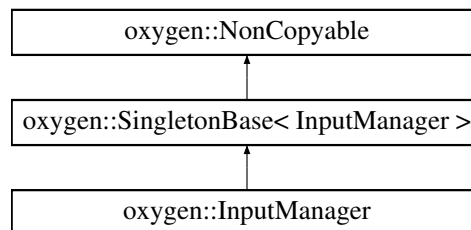
The documentation for this struct was generated from the following files:

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/HullComponent/[HullComponent.h](#)
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/HullComponent/[HullComponent.cc](#)

## 6.23 oxygen::InputManager Struct Reference

```
#include <InputManager.h>
```

Inheritance diagram for oxygen::InputManager:



## Public Member Functions

- auto [GetMousePosition](#) () const -> const oxyVec2
- auto [GetMouseDelta](#) () const -> const oxyVec2
- auto [IsKeyDown](#) ([KeyboardButton](#) key) const -> oxyBool
- auto [WasKeyDown](#) ([KeyboardButton](#) key) const -> oxyBool
- auto [IsMouseButtonDown](#) ([MouseButton](#) button) const -> oxyBool
- auto [WasMouseButtonDown](#) ([MouseButton](#) button) const -> oxyBool
- auto [IsControllerConnected](#) (oxyU8 controller) const -> oxyBool
- auto [IsControllerButtonDown](#) (oxyU8 controller, [ControllerButton](#) button) const -> oxyBool
- auto [WasControllerButtonDown](#) (oxyU8 controller, [ControllerButton](#) button) const -> oxyBool
- auto [GetControllerAxis](#) (oxyU8 controller, [ControllerAxis](#) axis) const -> oxyF32
- auto [GetPreviousControllerAxis](#) (oxyU8 controller, [ControllerAxis](#) axis) const -> oxyF32
- auto [SetCursorLock](#) (oxyBool lock) -> void
- auto [Update](#) () -> void

## Public Member Functions inherited from [oxygen::SingletonBase< InputManager >](#)

- [SingletonBase](#) ()
- [~SingletonBase](#) ()

## Public Member Functions inherited from [oxygen::NonCopyable](#)

- [NonCopyable](#) ()=default
- [NonCopyable](#) (const [NonCopyable](#) &)=delete
- [NonCopyable](#) & [operator=](#) (const [NonCopyable](#) &)=delete

## Additional Inherited Members

## Static Public Member Functions inherited from [oxygen::SingletonBase< InputManager >](#)

- static auto [GetInstance](#) () -> [InputManager](#) &

## 6.23.1 Member Function Documentation

### 6.23.1.1 GetControllerAxis()

```
auto oxygen::InputManager::GetControllerAxis (
    oxyU8 controller,
    ControllerAxis axis) const -> oxyF32    [inline]
```

### 6.23.1.2 GetMouseDelta()

```
auto oxygen::InputManager::GetMouseDelta () const -> const oxyVec2    [inline]
```

### 6.23.1.3 GetMousePosition()

```
auto oxygen::InputManager::GetMousePosition () const -> const oxyVec2    [inline]
```

### 6.23.1.4 GetPreviousControllerAxis()

```
auto oxygen::InputManager::GetPreviousControllerAxis (
    oxyU8 controller,
    ControllerAxis axis) const -> oxyF32    [inline]
```

### 6.23.1.5 IsControllerButtonDown()

```
auto oxygen::InputManager::IsControllerButtonDown (
    oxyU8 controller,
    ControllerButton button) const -> oxyBool    [inline]
```



#### 6.23.1.6 IsControllerConnected()

```
auto oxygen::InputManager::IsControllerConnected (
    oxyU8 controller) const -> oxyBool    [inline]
```

#### 6.23.1.7 IsKeyDown()

```
auto oxygen::InputManager::IsKeyDown (
    KeyboardButton key) const -> oxyBool    [inline]
```

#### 6.23.1.8 IsMouseButtonDown()

```
auto oxygen::InputManager::IsMouseButtonDown (
    MouseButton button) const -> oxyBool    [inline]
```

#### 6.23.1.9 SetCursorLock()

```
auto oxygen::InputManager::SetCursorLock (
    oxyBool lock) -> void    [inline]
```

#### 6.23.1.10 Update()

```
auto oxygen::InputManager::Update () -> void
```

#### 6.23.1.11 WasControllerButtonDown()

```
auto oxygen::InputManager::WasControllerButtonDown (
    oxyU8 controller,
    ControllerButton button) const -> oxyBool    [inline]
```

#### 6.23.1.12 WasKeyDown()

```
auto oxygen::InputManager::WasKeyDown (
    KeyboardButton key) const -> oxyBool    [inline]
```

#### 6.23.1.13 WasMouseButtonDown()

```
auto oxygen::InputManager::WasMouseButtonDown (
    MouseButton button) const -> oxyBool    [inline]
```

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

- [C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Input/InputManager.h](#)
- [C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Input/InputManager.cc](#)

## 6.24 oxygen::InternalEngineSingletonsOrder Struct Reference

```
#include <EngineSingletons.h>
```

### Public Attributes

- [SingletonInstance< ObjectManager > m\\_objectManagerInstance](#) {}
- [SingletonInstance< InputManager > m\\_inputManagerInstance](#) {}
- [SingletonInstance< GfxRenderer > m\\_gfxRendererInstance](#) {}
- [SingletonInstance< ResourceManager > m\\_resourceManagerInstance](#) {}
- [SingletonInstance< UIManager > m\\_uiManagerInstance](#) {}
- [SingletonInstance< NetSystem > m\\_netSystemInstance](#) {}
- [SingletonInstance< GameManager > m\\_gameManagerInstance](#) {}

### 6.24.1 Member Data Documentation

#### 6.24.1.1 m\_gameManagerInstance

```
SingletonInstance<GameManager> oxygen::InternalEngineSingletonsOrder::m_gameManagerInstance {}
```

#### 6.24.1.2 m\_gfxRendererInstance

```
SingletonInstance<GfxRenderer> oxygen::InternalEngineSingletonsOrder::m_gfxRendererInstance {}
```

#### 6.24.1.3 m\_inputManagerInstance

```
SingletonInstance<InputManager> oxygen::InternalEngineSingletonsOrder::m_inputManagerInstance {}
```

#### 6.24.1.4 m\_netSystemInstance

```
SingletonInstance<NetSystem> oxygen::InternalEngineSingletonsOrder::m_netSystemInstance {}
```

#### 6.24.1.5 m\_objectManagerInstance

```
SingletonInstance<ObjectManager> oxygen::InternalEngineSingletonsOrder::m_objectManager↔  
Instance {}
```

#### 6.24.1.6 m\_resourceManagerInstance

```
SingletonInstance<ResourceManager> oxygen::InternalEngineSingletonsOrder::m_resourceManager↔  
Instance {}
```

### 6.24.1.7 m\_uiManagerInstance

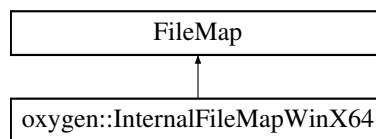
```
SingletonInstance<UIManager> oxygen::InternalEngineSingletonsOrder::m_uiManagerInstance {}
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Singleton/[EngineSingletons.h](#)

## 6.25 oxygen::InternalFileMapWinX64 Struct Reference

Inheritance diagram for oxygen::InternalFileMapWinX64:



### Friends

- struct [InternalFileMapDeleter](#)
- auto [CreateFileMap](#) (std::string\_view path, [oxyBool](#) write, [oxySize](#) requestSize) -> UniqueFileMap

## 6.25.1 Friends And Related Symbol Documentation

### 6.25.1.1 CreateFileMap

```
auto CreateFileMap (
    std::string_view path,
    oxyBool write,
    oxySize requestSize) -> UniqueFileMap [friend]
```

### 6.25.1.2 InternalFileMapDeleter

```
friend struct InternalFileMapDeleter [friend]
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Platform/PlatformWin64/[Platform.cc](#)

## 6.26 oxygen::BSPDefines::Leaf Struct Reference

```
#include <BSP.h>
```

## Public Attributes

- [oxyS32 m\\_contents](#)
- [oxyS32 m\\_visOffset](#)
- [oxyS16 m\\_mins](#) [3]
- [oxyS16 m\\_maxs](#) [3]
- [oxyU16 m\\_firstMarkSurfaceIndex](#)
- [oxyU16 m\\_markSurfaceCount](#)
- [oxyU8 m\\_ambientLevels](#) [[k\\_NumAmbients](#)]

## 6.26.1 Member Data Documentation

### 6.26.1.1 m\_ambientLevels

[oxyU8](#) `oxygen::BSPDefines::Leaf::m_ambientLevels` [[k\\_NumAmbients](#)]

### 6.26.1.2 m\_contents

[oxyS32](#) `oxygen::BSPDefines::Leaf::m_contents`

### 6.26.1.3 m\_firstMarkSurfaceIndex

[oxyU16](#) `oxygen::BSPDefines::Leaf::m_firstMarkSurfaceIndex`

### 6.26.1.4 m\_markSurfaceCount

[oxyU16](#) `oxygen::BSPDefines::Leaf::m_markSurfaceCount`

### 6.26.1.5 m\_maxs

[oxyS16](#) `oxygen::BSPDefines::Leaf::m_maxs` [3]

### 6.26.1.6 m\_mins

[oxyS16](#) `oxygen::BSPDefines::Leaf::m_mins` [3]

### 6.26.1.7 m\_visOffset

[oxyS32](#) `oxygen::BSPDefines::Leaf::m_visOffset`

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

- `C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/BSP.h`

## 6.27 oxygen::World::LineTraceResult Struct Reference

```
#include <World.h>
```

### Public Attributes

- [oxyBool](#) [m\\_allSolid](#) {}
- [oxyBool](#) [m\\_startSolid](#) {}
- [oxyF32](#) [m\\_fraction](#) {}
- [oxyVec3](#) [m\\_endPos](#) {}
- [oxyVec3](#) [m\\_planeNormal](#) {}
- [oxyF32](#) [m\\_planeDist](#) {}
- `std::shared_ptr< struct Entity > m\_hitEntity` {}

### 6.27.1 Member Data Documentation

#### 6.27.1.1 m\_allSolid

```
oxyBool oxygen::World::LineTraceResult::m_allSolid {}
```

#### 6.27.1.2 m\_endPos

```
oxyVec3 oxygen::World::LineTraceResult::m_endPos {}
```

#### 6.27.1.3 m\_fraction

```
oxyF32 oxygen::World::LineTraceResult::m_fraction {}
```

#### 6.27.1.4 m\_hitEntity

```
std::shared_ptr<struct Entity> oxygen::World::LineTraceResult::m_hitEntity {}
```

#### 6.27.1.5 m\_planeDist

```
oxyF32 oxygen::World::LineTraceResult::m_planeDist {}
```

#### 6.27.1.6 m\_planeNormal

```
oxyVec3 oxygen::World::LineTraceResult::m_planeNormal {}
```

### 6.27.1.7 m\_startSolid

```
oxyBool oxygen::World::LineTraceResult::m_startSolid {}
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/[World.h](#)

## 6.28 oxygen::BSPDefines::Lump Struct Reference

```
#include <BSP.h>
```

### Public Attributes

- [oxyU32 m\\_fileOffset](#)
- [oxyU32 m\\_length](#)

### 6.28.1 Member Data Documentation

#### 6.28.1.1 m\_fileOffset

```
oxyU32 oxygen::BSPDefines::Lump::m_fileOffset
```

#### 6.28.1.2 m\_length

```
oxyU32 oxygen::BSPDefines::Lump::m_length
```

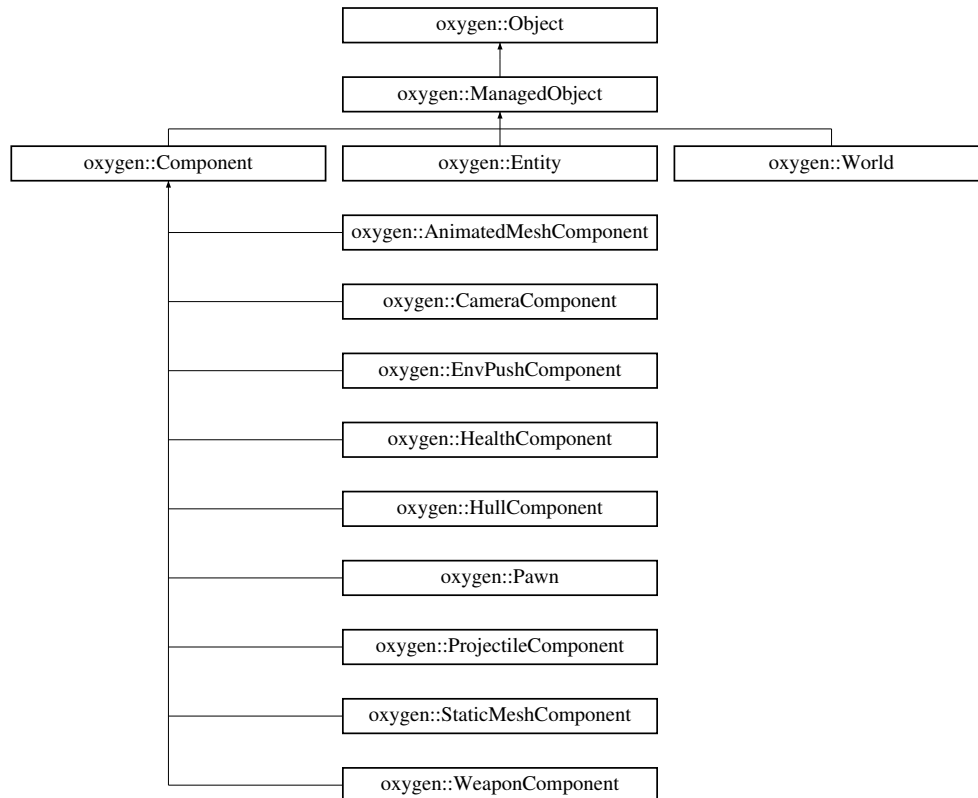
The documentation for this struct was generated from the following file:

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/[BSP.h](#)

## 6.29 oxygen::ManagedObject Struct Reference

```
#include <ManagedObject.h>
```

Inheritance diagram for oxygen::ManagedObject:



### Public Member Functions

- [OXYGENOBJECT](#) ([ManagedObject](#), [Object](#))
- auto [GetObjectID](#) () const -> [oxyObjectID](#)
- template<typename RefType>  
requires std::is\_base\_of\_v<[ManagedObject](#), RefType>  
auto [GetHardRef](#) () const -> std::shared\_ptr< RefType >

### Public Member Functions inherited from [oxygen::Object](#)

- [Object](#) ()=default
- virtual [~Object](#) ()=default
- virtual auto [GetDescription](#) () const -> const [ObjectDescription](#) &
- auto [IsA](#) (const [ObjectDescription](#) &desc) const -> bool
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [IsA](#) () const -> bool
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [Cast](#) () -> T \*
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [Cast](#) () const -> const T \*

## Friends

- struct [ObjectManager](#)

## Additional Inherited Members

## Public Types inherited from [oxygen::Object](#)

- using [SelfType](#) = [Object](#)
- using [Super](#) = [Object](#)

## Static Public Member Functions inherited from [oxygen::Object](#)

- static auto [GetStaticDescription](#) () -> const [ObjectDescription](#) &

## 6.29.1 Member Function Documentation

### 6.29.1.1 GetHardRef()

```
template<typename RefType>
requires std::is_base_of_v<ManagedObject, RefType>
auto oxygen::ManagedObject::GetHardRef () const -> std::shared_ptr<RefType>    [inline]
```

### 6.29.1.2 GetObjectID()

```
auto oxygen::ManagedObject::GetObjectID () const -> oxyObjectID    [inline]
```

### 6.29.1.3 OXYGENOBJECT()

```
oxygen::ManagedObject::OXYGENOBJECT (
    ManagedObject ,
    Object )
```

## 6.29.2 Friends And Related Symbol Documentation

### 6.29.2.1 ObjectManager

```
friend struct ObjectManager    [friend]
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Object/[ManagedObject.h](#)



## 6.30 oxygen::BSPDefines::MipTex Struct Reference

```
#include <BSP.h>
```

### Public Attributes

- [oxyChar m\\_name](#) [16]
- [oxyU32 m\\_width](#)
- [oxyU32 m\\_height](#)
- [oxyU32 m\\_offsets](#) [[k\\_NumMipLevels](#)]

### 6.30.1 Member Data Documentation

#### 6.30.1.1 m\_height

[oxyU32](#) oxygen::BSPDefines::MipTex::m\_height

#### 6.30.1.2 m\_name

[oxyChar](#) oxygen::BSPDefines::MipTex::m\_name[16]

#### 6.30.1.3 m\_offsets

[oxyU32](#) oxygen::BSPDefines::MipTex::m\_offsets [[k\\_NumMipLevels](#)]

#### 6.30.1.4 m\_width

[oxyU32](#) oxygen::BSPDefines::MipTex::m\_width

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/[BSP.h](#)

## 6.31 oxygen::BSPDefines::MipTexLump Struct Reference

```
#include <BSP.h>
```

### Public Attributes

- [oxyU32 m\\_numMipTex](#)
- [oxyU32 m\\_dataOffsets](#) [4]

## 6.31.1 Member Data Documentation

### 6.31.1.1 m\_dataOffsets

`oxyU32` `oxygen::BSPDefines::MipTexLump::m_dataOffsets[4]`

### 6.31.1.2 m\_numMipTex

`oxyU32` `oxygen::BSPDefines::MipTexLump::m_numMipTex`

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/[BSP.h](#)

## 6.32 oxygen::BSPDefines::Model Struct Reference

```
#include <BSP.h>
```

### Public Attributes

- `oxyF32` `m_mins` [3]
- `oxyF32` `m_maxs` [3]
- `oxyF32` `m_origin` [3]
- `oxyU32` `m_headNodes` [`k_MaxMapHulls`]
- `oxyU32` `m_visLeafs`
- `oxyU32` `m_firstFaceIndex`
- `oxyU32` `m_faceCount`

## 6.32.1 Member Data Documentation

### 6.32.1.1 m\_faceCount

`oxyU32` `oxygen::BSPDefines::Model::m_faceCount`

### 6.32.1.2 m\_firstFaceIndex

`oxyU32` `oxygen::BSPDefines::Model::m_firstFaceIndex`

### 6.32.1.3 m\_headNodes

`oxyU32` `oxygen::BSPDefines::Model::m_headNodes` [`k_MaxMapHulls`]

#### 6.32.1.4 m\_maxs

`oxyF32 oxygen::BSPDefines::Model::m_maxs[3]`

#### 6.32.1.5 m\_mins

`oxyF32 oxygen::BSPDefines::Model::m_mins[3]`

#### 6.32.1.6 m\_origin

`oxyF32 oxygen::BSPDefines::Model::m_origin[3]`

#### 6.32.1.7 m\_visLeafs

`oxyU32 oxygen::BSPDefines::Model::m_visLeafs`

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/BSP.h

## 6.33 oxygen::NetConnection Struct Reference

```
#include <NetSystem.h>
```

### Public Member Functions

- auto [WriteData](#) ([oxyU16](#) type, std::span< const [oxyU8](#) > data) -> void
- auto [GetUniqueID](#) () const -> [oxyU64](#)

### Friends

- struct [NetSystem](#)

### 6.33.1 Member Function Documentation

#### 6.33.1.1 GetUniqueID()

```
auto oxygen::NetConnection::GetUniqueID () const -> oxyU64 [inline]
```

#### 6.33.1.2 WriteData()

```
auto oxygen::NetConnection::WriteData (
    oxyU16 type,
    std::span< const oxyU8 > data) -> void
```

## 6.33.2 Friends And Related Symbol Documentation

### 6.33.2.1 NetSystem

```
friend struct NetSystem [friend]
```

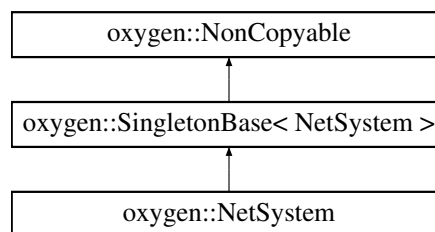
The documentation for this struct was generated from the following files:

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Net/NetSystem.h
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Net/NetSystem.cc

## 6.34 oxygen::NetSystem Struct Reference

```
#include <NetSystem.h>
```

Inheritance diagram for oxygen::NetSystem:



### Public Member Functions

- [NetSystem](#) ()
- [~NetSystem](#) ()
- auto [Update](#) (oxyF32 deltaTimeSeconds) -> void
- auto [StartHost](#) () -> void
- auto [ConnectToHost](#) (const std::string &ip) -> oxyBool
- auto [KillConnections](#) () -> void
- auto [HostSendToAll](#) (oxyU16 type, const std::span< oxyU8 > &data) -> void
- auto [HostSendToAllExcept](#) (oxyU64 excludeClientID, oxyU16 type, const std::span< oxyU8 > &data) -> void
- auto [CliSendToHost](#) (oxyU16 type, const std::span< oxyU8 > &data) -> void
- auto [CliDiscoverHosts](#) () -> void
- auto [CliGetDiscoveredHosts](#) () const -> std::span< const std::string >
- auto [CliIsDiscoveringHosts](#) () const -> oxyBool
- auto [GetNewNetObjID](#) () -> oxyObjectID
- auto [IsHost](#) () const -> oxyBool
- auto [IsClient](#) () const -> oxyBool

### Public Member Functions inherited from [oxygen::SingletonBase< NetSystem >](#)

- [SingletonBase](#) ()
- [~SingletonBase](#) ()

## Public Member Functions inherited from [oxygen::NonCopyable](#)

- [NonCopyable](#) ()=default
- [NonCopyable](#) (const [NonCopyable](#) &)=delete
- [NonCopyable](#) & [operator=](#) (const [NonCopyable](#) &)=delete

## Static Public Attributes

- static constexpr auto [k\\_enginePort](#) = 28672
- static constexpr auto [k\\_engineBroadcastPort](#) = 28678
- static constexpr auto [k\\_timeBetweenPing](#) = 4.0f
- static constexpr auto [k\\_netSessionDefaultMinObjid](#)

## Additional Inherited Members

## Static Public Member Functions inherited from [oxygen::SingletonBase< NetSystem >](#)

- static auto [GetInstance](#) () -> [NetSystem](#) &

## 6.34.1 Constructor & Destructor Documentation

### 6.34.1.1 NetSystem()

```
oxygen::NetSystem::NetSystem ()
```

### 6.34.1.2 ~NetSystem()

```
oxygen::NetSystem::~~NetSystem ()
```

## 6.34.2 Member Function Documentation

### 6.34.2.1 CliDiscoverHosts()

```
auto oxygen::NetSystem::CliDiscoverHosts () -> void
```

### 6.34.2.2 CliGetDiscoveredHosts()

```
auto oxygen::NetSystem::CliGetDiscoveredHosts () const -> std::span<const std::string> [inline]
```

### 6.34.2.3 ClilsDiscoveringHosts()

```
auto oxygen::NetSystem::CliIsDiscoveringHosts () const -> oxyBool [inline]
```

#### 6.34.2.4 CliSendToHost()

```
auto oxygen::NetSystem::CliSendToHost (
    oxyU16 type,
    const std::span< oxyU8 > & data) -> void
```

#### 6.34.2.5 ConnectToHost()

```
auto oxygen::NetSystem::ConnectToHost (
    const std::string & ip) -> oxyBool
```

#### 6.34.2.6 GetNewNetObjID()

```
auto oxygen::NetSystem::GetNewNetObjID () -> oxyObjectID [inline]
```

#### 6.34.2.7 HostSendToAll()

```
auto oxygen::NetSystem::HostSendToAll (
    oxyU16 type,
    const std::span< oxyU8 > & data) -> void
```

#### 6.34.2.8 HostSendToAllExcept()

```
auto oxygen::NetSystem::HostSendToAllExcept (
    oxyU64 excludeClientID,
    oxyU16 type,
    const std::span< oxyU8 > & data) -> void
```

#### 6.34.2.9 IsClient()

```
auto oxygen::NetSystem::IsClient () const -> oxyBool [inline]
```

#### 6.34.2.10 IsHost()

```
auto oxygen::NetSystem::IsHost () const -> oxyBool [inline]
```

#### 6.34.2.11 KillConnections()

```
auto oxygen::NetSystem::KillConnections () -> void
```

#### 6.34.2.12 StartHost()

```
auto oxygen::NetSystem::StartHost () -> void
```

### 6.34.2.13 Update()

```
auto oxygen::NetSystem::Update (
    oxyF32 deltaTimeSeconds) -> void
```

## 6.34.3 Member Data Documentation

### 6.34.3.1 k\_engineBroadcastPort

```
auto oxygen::NetSystem::k_engineBroadcastPort = 28678 [inline], [static], [constexpr]
```

### 6.34.3.2 k\_enginePort

```
auto oxygen::NetSystem::k_enginePort = 28672 [inline], [static], [constexpr]
```

### 6.34.3.3 k\_netSessionDefaultMinObjid

```
auto oxygen::NetSystem::k_netSessionDefaultMinObjid [inline], [static], [constexpr]
```

#### Initial value:

```
=
    oxyObjectID{0xC0000001}
```

### 6.34.3.4 k\_timeBetweenPing

```
auto oxygen::NetSystem::k_timeBetweenPing = 4.0f [inline], [static], [constexpr]
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Net/[NetSystem.h](#)
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Net/[NetSystem.cc](#)

## 6.35 oxygen::BSPDefines::Node Struct Reference

```
#include <BSP.h>
```

#### Public Attributes

- [oxyU32 m\\_planeIndex](#)
- [oxyS16 m\\_children \[2\]](#)
- [oxyS16 m\\_mins \[3\]](#)
- [oxyS16 m\\_maxs \[3\]](#)
- [oxyU16 m\\_firstFaceIndex](#)
- [oxyU16 m\\_faceCount](#)

## 6.35.1 Member Data Documentation

### 6.35.1.1 m\_children

`oxyS16` oxygen::BSPDefines::Node::m\_children[2]

### 6.35.1.2 m\_faceCount

`oxyU16` oxygen::BSPDefines::Node::m\_faceCount

### 6.35.1.3 m\_firstFaceIndex

`oxyU16` oxygen::BSPDefines::Node::m\_firstFaceIndex

### 6.35.1.4 m\_maxs

`oxyS16` oxygen::BSPDefines::Node::m\_maxs[3]

### 6.35.1.5 m\_mins

`oxyS16` oxygen::BSPDefines::Node::m\_mins[3]

### 6.35.1.6 m\_planeIndex

`oxyU32` oxygen::BSPDefines::Node::m\_planeIndex

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/[BSP.h](#)

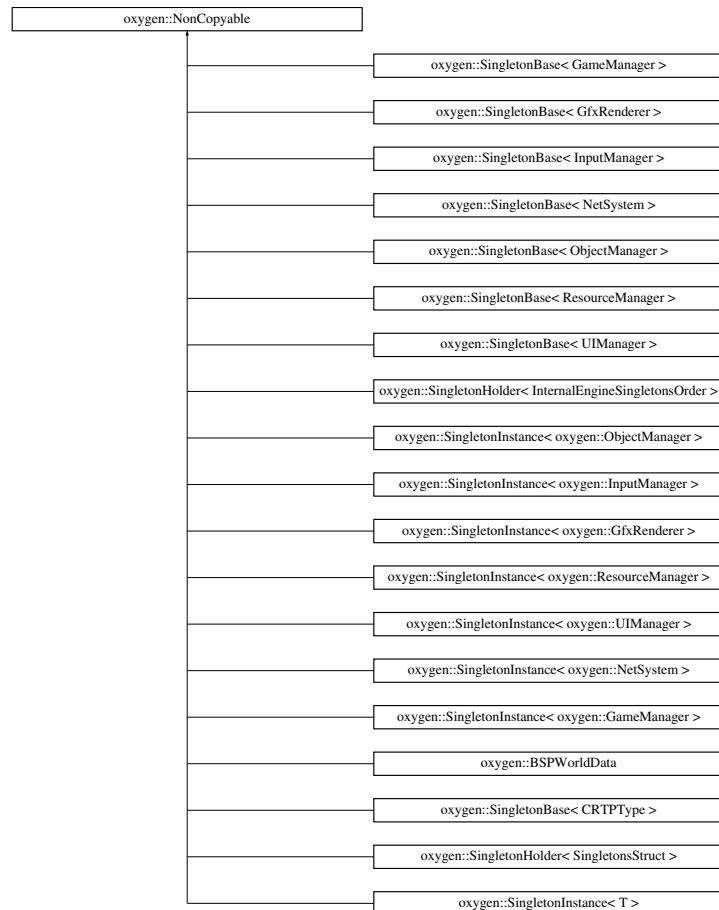


## 6.36 oxygen::NonCopyable Struct Reference

A non-copyable type to be inherited from. Expresses clearly that a type cannot be copied.

```
#include <OxygenTypes.h>
```

Inheritance diagram for oxygen::NonCopyable:



### Public Member Functions

- [NonCopyable](#) ()=default
- [NonCopyable](#) (const [NonCopyable](#) &)=delete
- [NonCopyable](#) & operator= (const [NonCopyable](#) &)=delete

### 6.36.1 Detailed Description

A non-copyable type to be inherited from. Expresses clearly that a type cannot be copied.

### 6.36.2 Constructor & Destructor Documentation

#### 6.36.2.1 NonCopyable() [1/2]

```
oxygen::NonCopyable::NonCopyable () [default]
```

### 6.36.2.2 NonCopyable() [2/2]

```
oxygen::NonCopyable::NonCopyable (
    const NonCopyable & ) [delete]
```

## 6.36.3 Member Function Documentation

### 6.36.3.1 operator=()

```
NonCopyable & oxygen::NonCopyable::operator= (
    const NonCopyable & ) [delete]
```

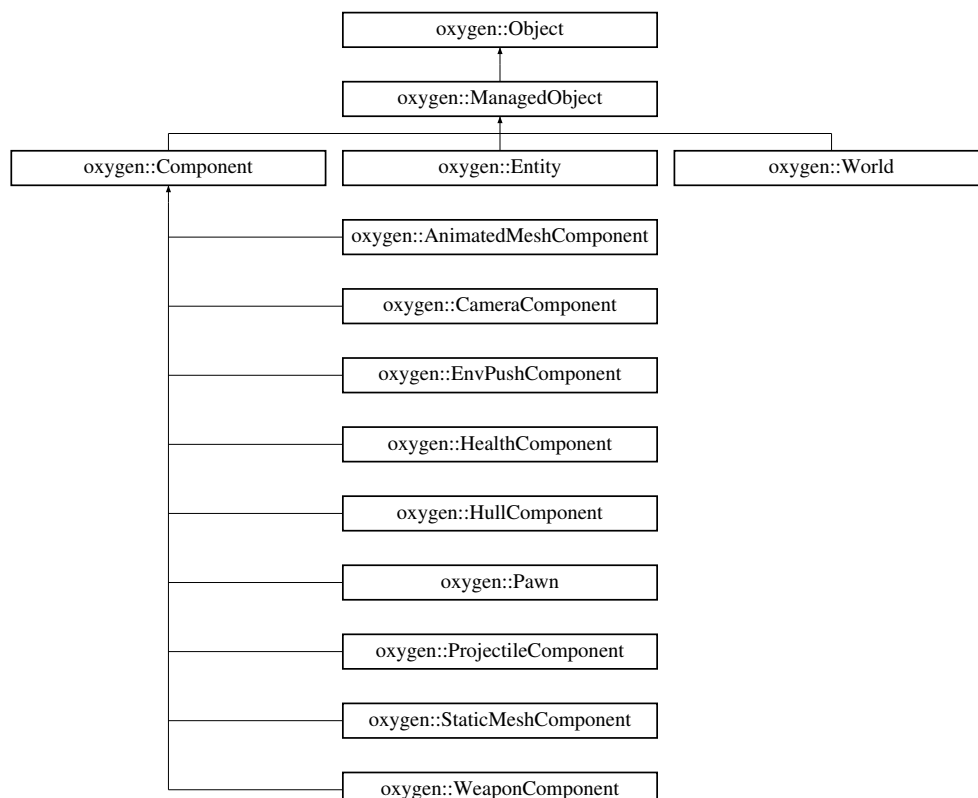
The documentation for this struct was generated from the following file:

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/[OxygenTypes.h](#)

## 6.37 oxygen::Object Struct Reference

```
#include <Object.h>
```

Inheritance diagram for oxygen::Object:



### Public Types

- using [SelfType](#) = [Object](#)
- using [Super](#) = [Object](#)

## Public Member Functions

- `Object ()`=default
- `virtual ~Object ()`=default
- `virtual auto GetDescription () const -> const ObjectDescription &`
- `auto IsA (const ObjectDescription &desc) const -> bool`
- `template<typename T>`  
requires `std::is_base_of_v<Object, T>`  
`auto IsA () const -> bool`
- `template<typename T>`  
requires `std::is_base_of_v<Object, T>`  
`auto Cast () -> T *`
- `template<typename T>`  
requires `std::is_base_of_v<Object, T>`  
`auto Cast () const -> const T *`

## Static Public Member Functions

- `static auto GetStaticDescription () -> const ObjectDescription &`

## 6.37.1 Member Typedef Documentation

### 6.37.1.1 SelfType

```
using oxygen::Object::SelfType = Object
```

### 6.37.1.2 Super

```
using oxygen::Object::Super = Object
```

## 6.37.2 Constructor & Destructor Documentation

### 6.37.2.1 Object()

```
oxygen::Object::Object () [default]
```

### 6.37.2.2 ~Object()

```
virtual oxygen::Object::~~Object () [virtual], [default]
```

## 6.37.3 Member Function Documentation

### 6.37.3.1 Cast() [1/2]

```
template<typename T>
requires std::is_base_of_v<Object, T>
auto oxygen::Object::Cast () -> T* [inline]
```

**6.37.3.2 Cast() [2/2]**

```
template<typename T>
requires std::is_base_of_v<Object, T>
auto oxygen::Object::Cast () const -> const T*    [inline]
```

**6.37.3.3 GetDescription()**

```
virtual auto oxygen::Object::GetDescription () const -> const ObjectDescription&    [inline],
[virtual]
```

**6.37.3.4 GetStaticDescription()**

```
static auto oxygen::Object::GetStaticDescription () -> const ObjectDescription&    [inline],
[static]
```

**6.37.3.5 IsA() [1/2]**

```
template<typename T>
requires std::is_base_of_v<Object, T>
auto oxygen::Object::IsA () const -> bool    [inline]
```

**6.37.3.6 IsA() [2/2]**

```
auto oxygen::Object::IsA (
    const ObjectDescription & desc) const -> bool    [inline]
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Object/[Object.h](#)

**6.38 oxygen::ObjectDescription Struct Reference**

```
#include <Object.h>
```

**Public Types**

- using [constructor\\_t](#) = [Object\\*](#) (\*) (void\* p)

**Public Attributes**

- const [ObjectDescription](#) \* [m\\_parent](#) {}
- std::string\_view [m\\_name](#) {}
- [oxyU64](#) [m\\_id](#) {}
- [oxySize](#) [m\\_size](#) {}
- [oxySize](#) [m\\_align](#) {}
- [constructor\\_t](#) [m\\_constructor](#) {}

## 6.38.1 Member Typedef Documentation

### 6.38.1.1 constructor\_t

using `oxygen::ObjectDescription::constructor_t` = `Object*` (\*) (void\* p)

## 6.38.2 Member Data Documentation

### 6.38.2.1 m\_align

`oxySize` `oxygen::ObjectDescription::m_align` {}

### 6.38.2.2 m\_constructor

`constructor_t` `oxygen::ObjectDescription::m_constructor` {}

### 6.38.2.3 m\_id

`oxyU64` `oxygen::ObjectDescription::m_id` {}

### 6.38.2.4 m\_name

`std::string_view` `oxygen::ObjectDescription::m_name` {}

### 6.38.2.5 m\_parent

const `ObjectDescription*` `oxygen::ObjectDescription::m_parent` {}

### 6.38.2.6 m\_size

`oxySize` `oxygen::ObjectDescription::m_size` {}

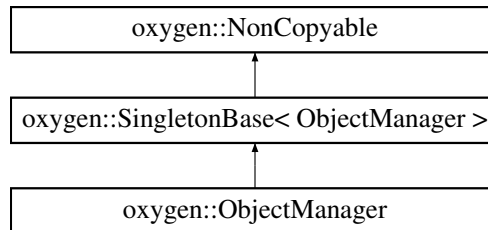
The documentation for this struct was generated from the following file:

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Object/[Object.h](#)

## 6.39 oxygen::ObjectManager Struct Reference

```
#include <ObjectManager.h>
```

Inheritance diagram for oxygen::ObjectManager:



### Public Member Functions

- [~ObjectManager](#) ()
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T> && std::is\_same\_v<typename T::SelfType, T>  
auto [NewObject](#) ([oxyObjectID](#) id=0) -> T \*
- auto [NewObject](#) (const [ObjectDescription](#) &desc, [oxyObjectID](#) id=0) -> [Object](#) \*
- auto [DeleteObject](#) ([Object](#) \*obj, [oxyObjectID](#) id=0) -> void
- template<typename T>  
requires std::is\_base\_of\_v<[ManagedObject](#), T> && std::is\_same\_v<typename T::SelfType, T>  
auto [CreateManagedObject](#) ([oxyObjectID](#) id=0) -> std::shared\_ptr< T >
- auto [CreateManagedObject](#) (const [ObjectDescription](#) &desc, [oxyObjectID](#) id=0) -> std::shared\_ptr< [ManagedObject](#) >
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [GetObjectPtr](#) ([oxyObjectID](#) id) const -> T \*
- auto [GetObjectPtr](#) ([oxyObjectID](#) id) const -> [Object](#) \*
- auto [GetObjectID](#) ([Object](#) \*obj) const -> [oxyObjectID](#)
- template<typename T>  
requires std::is\_base\_of\_v<[ManagedObject](#), T>  
auto [GetManagedRef](#) ([oxyObjectID](#) id) const -> std::shared\_ptr< T >
- auto [GetManagedRef](#) ([oxyObjectID](#) id) const -> std::shared\_ptr< [ManagedObject](#) >

### Public Member Functions inherited from [oxygen::SingletonBase< ObjectManager >](#)

- [SingletonBase](#) ()
- [~SingletonBase](#) ()

### Public Member Functions inherited from [oxygen::NonCopyable](#)

- [NonCopyable](#) ()=default
- [NonCopyable](#) (const [NonCopyable](#) &)=delete
- [NonCopyable](#) & operator= (const [NonCopyable](#) &)=delete

## Additional Inherited Members

### Static Public Member Functions inherited from [oxygen::SingletonBase< ObjectManager >](#)

- static auto [GetInstance](#) () -> [ObjectManager](#) &

## 6.39.1 Constructor & Destructor Documentation

### 6.39.1.1 ~ObjectManager()

```
oxygen::ObjectManager::~~ObjectManager ()
```

## 6.39.2 Member Function Documentation

### 6.39.2.1 CreateManagedObject() [1/2]

```
auto oxygen::ObjectManager::CreateManagedObject (
    const ObjectDescription & desc,
    oxyObjectID id = 0) -> std::shared_ptr<ManagedObject>
```

### 6.39.2.2 CreateManagedObject() [2/2]

```
template<typename T>
requires std::is_base_of_v<ManagedObject, T> && std::is_same_v<typename T::SelfType, T>
auto oxygen::ObjectManager::CreateManagedObject (
    oxyObjectID id = 0) -> std::shared_ptr<T>
```

### 6.39.2.3 DeleteObject()

```
auto oxygen::ObjectManager::DeleteObject (
    Object * obj,
    oxyObjectID id = 0) -> void
```

### 6.39.2.4 GetManagedRef() [1/2]

```
auto oxygen::ObjectManager::GetManagedRef (
    oxyObjectID id) const -> std::shared_ptr<ManagedObject>
```

### 6.39.2.5 GetManagedRef() [2/2]

```
template<typename T>
requires std::is_base_of_v<ManagedObject, T>
auto oxygen::ObjectManager::GetManagedRef (
    oxyObjectID id) const -> std::shared_ptr<T>
```

### 6.39.2.6 GetObjectID()

```
auto oxygen::ObjectManager::GetObjectID (
    Object * obj) const -> oxyObjectID
```

### 6.39.2.7 GetObjectPtr() [1/2]

```
auto oxygen::ObjectManager::GetObjectPtr (
    oxyObjectID id) const -> Object*
```

### 6.39.2.8 GetObjectPtr() [2/2]

```
template<typename T>
requires std::is_base_of_v<Object, T>
auto oxygen::ObjectManager::GetObjectPtr (
    oxyObjectID id) const -> T*
```

### 6.39.2.9 NewObject() [1/2]

```
auto oxygen::ObjectManager::NewObject (
    const ObjectDescription & desc,
    oxyObjectID id = 0) -> Object*
```

### 6.39.2.10 NewObject() [2/2]

```
template<typename T>
requires std::is_base_of_v<Object, T> && std::is_same_v<typename T::SelfType, T>
auto oxygen::ObjectManager::NewObject (
    oxyObjectID id = 0) -> T*
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Object/[ObjectManager.h](#)
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Object/[ObjectManager.cc](#)

## 6.40 oxyMat4x4 Struct Reference

```
#include <Defs.h>
```

### Public Member Functions

- constexpr auto [Determinant](#) () const -> oxyF32
- constexpr auto [Transposed](#) () const -> oxyMat4x4
- constexpr auto [Transpose](#) () -> oxyMat4x4 &
- constexpr auto [operator\[\]](#) (int i) -> oxyF32 \*
- constexpr auto [operator\[\]](#) (int i) const -> const oxyF32 \*
- constexpr auto [operator\\*=](#) (const oxyMat4x4 &other) -> oxyMat4x4 &



## Static Public Member Functions

- static constexpr auto [Identity](#) () -> [oxyMat4x4](#)

## Public Attributes

- [oxyF32](#) [m](#) [4][4]

## 6.40.1 Member Function Documentation

### 6.40.1.1 Determinant()

```
auto oxyMat4x4::Determinant () const -> oxyF32    [inline], [constexpr]
```

### 6.40.1.2 Identity()

```
static constexpr auto oxyMat4x4::Identity () -> oxyMat4x4    [inline], [static], [constexpr]
```

### 6.40.1.3 operator\*=( )

```
auto oxyMat4x4::operator*= (
    const oxyMat4x4 & other) -> oxyMat4x4&    [inline], [constexpr]
```

### 6.40.1.4 operator[]() [1/2]

```
auto oxyMat4x4::operator[] (
    int i) -> oxyF32*    [inline], [constexpr]
```

### 6.40.1.5 operator[]() [2/2]

```
auto oxyMat4x4::operator[] (
    int i) const -> const oxyF32*    [inline], [constexpr]
```

### 6.40.1.6 Transpose()

```
auto oxyMat4x4::Transpose () -> oxyMat4x4&    [inline], [constexpr]
```

### 6.40.1.7 Transposed()

```
auto oxyMat4x4::Transposed () const -> oxyMat4x4    [inline], [constexpr]
```

## 6.40.2 Member Data Documentation

### 6.40.2.1 m

`oxyF32 oxyMat4x4::m[4][4]`

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Math/[Defs.h](#)

## 6.41 oxyQuat Struct Reference

```
#include <Defs.h>
```

### Public Member Functions

- constexpr auto [MagnitudeSquared](#) () const -> [oxyF32](#)
- auto [Magnitude](#) () const -> [oxyF32](#)
- auto [Normalized](#) () const -> [oxyQuat](#)
- auto [Normalize](#) () -> [oxyQuat](#) &
- constexpr auto [DotProduct](#) (const [oxyQuat](#) &other) const -> [oxyF32](#)
- constexpr auto [Conjugate](#) () const -> [oxyQuat](#)
- auto [Inversed](#) () const -> [oxyQuat](#)
- auto [Inverse](#) () -> [oxyQuat](#) &
- constexpr auto [operator\\*="](#) (const [oxyQuat](#) &other) -> [oxyQuat](#) &

### Public Attributes

- [oxyF32](#) x {0.0f}
- [oxyF32](#) y {0.0f}
- [oxyF32](#) z {0.0f}
- [oxyF32](#) w {1.0f}

## 6.41.1 Member Function Documentation

### 6.41.1.1 Conjugate()

```
auto oxyQuat::Conjugate () const -> oxyQuat [inline], [constexpr]
```

### 6.41.1.2 DotProduct()

```
auto oxyQuat::DotProduct (
    const oxyQuat & other) const -> oxyF32 [inline], [constexpr]
```

#### 6.41.1.3 Inverse()

```
auto oxyQuat::Inverse () -> oxyQuat&    [inline]
```

#### 6.41.1.4 Inversed()

```
auto oxyQuat::Inversed () const -> oxyQuat    [inline]
```

#### 6.41.1.5 Magnitude()

```
auto oxyQuat::Magnitude () const -> oxyF32    [inline]
```

#### 6.41.1.6 MagnitudeSquared()

```
auto oxyQuat::MagnitudeSquared () const -> oxyF32    [inline], [constexpr]
```

#### 6.41.1.7 Normalize()

```
auto oxyQuat::Normalize () -> oxyQuat&    [inline]
```

#### 6.41.1.8 Normalized()

```
auto oxyQuat::Normalized () const -> oxyQuat    [inline]
```

#### 6.41.1.9 operator\*=( )

```
auto oxyQuat::operator*= (
    const oxyQuat & other) -> oxyQuat&    [inline], [constexpr]
```

### 6.41.2 Member Data Documentation

#### 6.41.2.1 w

```
oxyF32 oxyQuat::w {1.0f}
```

#### 6.41.2.2 x

```
oxyF32 oxyQuat::x {0.0f}
```

#### 6.41.2.3 y

```
oxyF32 oxyQuat::y {0.0f}
```

#### 6.41.2.4 z

```
oxyF32 oxyQuat::z {0.0f}
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Math/Defs.h

## 6.42 oxyVec2 Struct Reference

```
#include <Defs.h>
```

### Public Member Functions

- constexpr [oxyVec2](#) ()
- constexpr [oxyVec2](#) ([oxyF32](#) x, [oxyF32](#) y)
- constexpr auto [MagnitudeSquared](#) () const -> [oxyF32](#)
- auto [Magnitude](#) () const -> [oxyF32](#)
- auto [Normalized](#) () const -> [oxyVec2](#)
- auto [Normalize](#) () -> [oxyVec2](#) &
- constexpr auto [DotProduct](#) (const [oxyVec2](#) &other) const -> [oxyF32](#)
- constexpr auto [CrossProduct](#) (const [oxyVec2](#) &other) const -> [oxyF32](#)
- constexpr auto [Conjugate](#) () const -> [oxyVec2](#)
- constexpr auto [Inversed](#) () const -> [oxyVec2](#)
- constexpr auto [Inverse](#) () -> [oxyVec2](#) &
- constexpr auto [operator+=](#) (const [oxyVec2](#) &other) -> [oxyVec2](#) &
- constexpr auto [operator-=](#) (const [oxyVec2](#) &other) -> [oxyVec2](#) &
- constexpr auto [operator\\*=](#) (const [oxyVec2](#) &other) -> [oxyVec2](#) &
- constexpr auto [operator/=](#) (const [oxyVec2](#) &other) -> [oxyVec2](#) &
- constexpr auto [operator\\*=](#) ([oxyF32](#) other) -> [oxyVec2](#) &
- constexpr auto [operator/=](#) ([oxyF32](#) other) -> [oxyVec2](#) &

### Public Attributes

- [oxyF32](#) x
- [oxyF32](#) y

## 6.42.1 Constructor & Destructor Documentation

### 6.42.1.1 oxyVec2() [1/2]

```
oxyVec2::oxyVec2 () [inline], [constexpr]
```

### 6.42.1.2 oxyVec2() [2/2]

```
oxyVec2::oxyVec2 (
    oxyF32 x,
    oxyF32 y) [inline], [constexpr]
```

## 6.42.2 Member Function Documentation

### 6.42.2.1 Conjugate()

```
auto oxyVec2::Conjugate () const -> oxyVec2    [inline], [constexpr]
```

### 6.42.2.2 CrossProduct()

```
auto oxyVec2::CrossProduct (
    const oxyVec2 & other) const -> oxyF32    [inline], [constexpr]
```

### 6.42.2.3 DotProduct()

```
auto oxyVec2::DotProduct (
    const oxyVec2 & other) const -> oxyF32    [inline], [constexpr]
```

### 6.42.2.4 Inverse()

```
auto oxyVec2::Inverse () -> oxyVec2&    [inline], [constexpr]
```

### 6.42.2.5 Inversed()

```
auto oxyVec2::Inversed () const -> oxyVec2    [inline], [constexpr]
```

### 6.42.2.6 Magnitude()

```
auto oxyVec2::Magnitude () const -> oxyF32    [inline]
```

### 6.42.2.7 MagnitudeSquared()

```
auto oxyVec2::MagnitudeSquared () const -> oxyF32    [inline], [constexpr]
```

### 6.42.2.8 Normalize()

```
auto oxyVec2::Normalize () -> oxyVec2&    [inline]
```

### 6.42.2.9 Normalized()

```
auto oxyVec2::Normalized () const -> oxyVec2    [inline]
```

**6.42.2.10 operator\*=( ) [1/2]**

```
auto oxyVec2::operator*= (
    const oxyVec2 & other) -> oxyVec2&    [inline], [constexpr]
```

**6.42.2.11 operator\*=( ) [2/2]**

```
auto oxyVec2::operator*= (
    oxyF32 other) -> oxyVec2&    [inline], [constexpr]
```

**6.42.2.12 operator+=( )**

```
auto oxyVec2::operator+= (
    const oxyVec2 & other) -> oxyVec2&    [inline], [constexpr]
```

**6.42.2.13 operator-=( )**

```
auto oxyVec2::operator-= (
    const oxyVec2 & other) -> oxyVec2&    [inline], [constexpr]
```

**6.42.2.14 operator/=( ) [1/2]**

```
auto oxyVec2::operator/= (
    const oxyVec2 & other) -> oxyVec2&    [inline], [constexpr]
```

**6.42.2.15 operator/=( ) [2/2]**

```
auto oxyVec2::operator/= (
    oxyF32 other) -> oxyVec2&    [inline], [constexpr]
```

**6.42.3 Member Data Documentation****6.42.3.1 x**

```
oxyF32 oxyVec2::x
```

**6.42.3.2 y**

```
oxyF32 oxyVec2::y
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Math/Defs.h

## 6.43 oxyVec3 Struct Reference

```
#include <Defs.h>
```

### Public Member Functions

- constexpr [oxyVec3](#) ()
- constexpr [oxyVec3](#) ([oxyF32](#) x, [oxyF32](#) y, [oxyF32](#) z)
- constexpr [oxyVec3](#) (const [oxyVec2](#) &v, [oxyF32](#) z)
- [operator oxyVec2](#) () const
- constexpr auto [MagnitudeSquared](#) () const -> [oxyF32](#)
- auto [Magnitude](#) () const -> [oxyF32](#)
- auto [Normalized](#) () const -> [oxyVec3](#)
- auto [Normalize](#) () -> [oxyVec3](#) &
- constexpr auto [DotProduct](#) (const [oxyVec3](#) &other) const -> [oxyF32](#)
- constexpr auto [CrossProduct](#) (const [oxyVec3](#) &other) const -> [oxyVec3](#)
- constexpr auto [Conjugate](#) () const -> [oxyVec3](#)
- constexpr auto [Inversed](#) () const -> [oxyVec3](#)
- constexpr auto [Inverse](#) () -> [oxyVec3](#) &
- constexpr auto [operator+=](#) (const [oxyVec3](#) &other) -> [oxyVec3](#) &
- constexpr auto [operator-=](#) (const [oxyVec3](#) &other) -> [oxyVec3](#) &
- constexpr auto [operator\\*=](#) (const [oxyVec3](#) &other) -> [oxyVec3](#) &
- constexpr auto [operator/=](#) (const [oxyVec3](#) &other) -> [oxyVec3](#) &
- constexpr auto [operator\\*=](#) ([oxyF32](#) other) -> [oxyVec3](#) &
- constexpr auto [operator/=](#) ([oxyF32](#) other) -> [oxyVec3](#) &

### Public Attributes

- [oxyF32](#) x
- [oxyF32](#) y
- [oxyF32](#) z

### 6.43.1 Constructor & Destructor Documentation

#### 6.43.1.1 oxyVec3() [1/3]

```
oxyVec3::oxyVec3 () [inline], [constexpr]
```

#### 6.43.1.2 oxyVec3() [2/3]

```
oxyVec3::oxyVec3 (
    oxyF32 x,
    oxyF32 y,
    oxyF32 z) [inline], [constexpr]
```

#### 6.43.1.3 oxyVec3() [3/3]

```
oxyVec3::oxyVec3 (
    const oxyVec2 & v,
    oxyF32 z) [inline], [constexpr]
```

## 6.43.2 Member Function Documentation

### 6.43.2.1 Conjugate()

```
auto oxyVec3::Conjugate () const -> oxyVec3    [inline], [constexpr]
```

### 6.43.2.2 CrossProduct()

```
auto oxyVec3::CrossProduct (
    const oxyVec3 & other) const -> oxyVec3    [inline], [constexpr]
```

### 6.43.2.3 DotProduct()

```
auto oxyVec3::DotProduct (
    const oxyVec3 & other) const -> oxyF32     [inline], [constexpr]
```

### 6.43.2.4 Inverse()

```
auto oxyVec3::Inverse () -> oxyVec3&         [inline], [constexpr]
```

### 6.43.2.5 Inversed()

```
auto oxyVec3::Inversed () const -> oxyVec3    [inline], [constexpr]
```

### 6.43.2.6 Magnitude()

```
auto oxyVec3::Magnitude () const -> oxyF32     [inline]
```

### 6.43.2.7 MagnitudeSquared()

```
auto oxyVec3::MagnitudeSquared () const -> oxyF32    [inline], [constexpr]
```

### 6.43.2.8 Normalize()

```
auto oxyVec3::Normalize () -> oxyVec3&         [inline]
```

### 6.43.2.9 Normalized()

```
auto oxyVec3::Normalized () const -> oxyVec3    [inline]
```



#### 6.43.2.10 operator oxyVec2()

```
oxyVec3::operator oxyVec2 () const [inline]
```

#### 6.43.2.11 operator\*=( ) [1/2]

```
auto oxyVec3::operator*= (
    const oxyVec3 & other) -> oxyVec3& [inline], [constexpr]
```

#### 6.43.2.12 operator\*=( ) [2/2]

```
auto oxyVec3::operator*= (
    oxyF32 other) -> oxyVec3& [inline], [constexpr]
```

#### 6.43.2.13 operator+=( )

```
auto oxyVec3::operator+= (
    const oxyVec3 & other) -> oxyVec3& [inline], [constexpr]
```

#### 6.43.2.14 operator-=( )

```
auto oxyVec3::operator-= (
    const oxyVec3 & other) -> oxyVec3& [inline], [constexpr]
```

#### 6.43.2.15 operator/=( ) [1/2]

```
auto oxyVec3::operator/= (
    const oxyVec3 & other) -> oxyVec3& [inline], [constexpr]
```

#### 6.43.2.16 operator/=( ) [2/2]

```
auto oxyVec3::operator/= (
    oxyF32 other) -> oxyVec3& [inline], [constexpr]
```

### 6.43.3 Member Data Documentation

#### 6.43.3.1 x

```
oxyF32 oxyVec3::x
```

#### 6.43.3.2 y

```
oxyF32 oxyVec3::y
```

### 6.43.3.3 z

`oxyF32 oxyVec3::z`

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Math/[Defs.h](#)

## 6.44 oxyVec4 Struct Reference

```
#include <Defs.h>
```

### Public Member Functions

- constexpr `oxyVec4` ()
- constexpr `oxyVec4` (`oxyF32 x`, `oxyF32 y`, `oxyF32 z`, `oxyF32 w`)
- constexpr `oxyVec4` (const `oxyVec3` &`v`, `oxyF32 w`)
- constexpr `oxyVec4` (const `oxyVec2` &`v`, `oxyF32 z`, `oxyF32 w`)
- `operator oxyVec3` () const
- `operator oxyVec2` () const
- constexpr auto `MagnitudeSquared` () const -> `oxyF32`
- auto `Magnitude` () const -> `oxyF32`
- auto `Normalized` () const -> `oxyVec4`
- auto `Normalize` () -> `oxyVec4` &
- constexpr auto `DotProduct` (const `oxyVec4` &`other`) const -> `oxyF32`
- constexpr auto `Conjugate` () const -> `oxyVec4`
- constexpr auto `Inversed` () const -> `oxyVec4`
- constexpr auto `Inverse` () -> `oxyVec4` &
- constexpr auto `CrossProduct` (const `oxyVec4` &`other`) const -> `oxyVec4`
- constexpr auto `operator+=` (const `oxyVec4` &`other`) -> `oxyVec4` &
- constexpr auto `operator-=` (const `oxyVec4` &`other`) -> `oxyVec4` &
- constexpr auto `operator*=` (const `oxyVec4` &`other`) -> `oxyVec4` &
- constexpr auto `operator/=` (const `oxyVec4` &`other`) -> `oxyVec4` &
- constexpr auto `operator*=` (`oxyF32 other`) -> `oxyVec4` &
- constexpr auto `operator/=` (`oxyF32 other`) -> `oxyVec4` &

### Public Attributes

- `oxyF32 x`
- `oxyF32 y`
- `oxyF32 z`
- `oxyF32 w`

## 6.44.1 Constructor & Destructor Documentation

### 6.44.1.1 oxyVec4() [1/4]

```
oxyVec4::oxyVec4 () [inline], [constexpr]
```

**6.44.1.2 oxyVec4() [2/4]**

```
oxyVec4::oxyVec4 (
    oxyF32 x,
    oxyF32 y,
    oxyF32 z,
    oxyF32 w) [inline], [constexpr]
```

**6.44.1.3 oxyVec4() [3/4]**

```
oxyVec4::oxyVec4 (
    const oxyVec3 & v,
    oxyF32 w) [inline], [constexpr]
```

**6.44.1.4 oxyVec4() [4/4]**

```
oxyVec4::oxyVec4 (
    const oxyVec2 & v,
    oxyF32 z,
    oxyF32 w) [inline], [constexpr]
```

**6.44.2 Member Function Documentation****6.44.2.1 Conjugate()**

```
auto oxyVec4::Conjugate () const -> oxyVec4 [inline], [constexpr]
```

**6.44.2.2 CrossProduct()**

```
auto oxyVec4::CrossProduct (
    const oxyVec4 & other) const -> oxyVec4 [inline], [constexpr]
```

**6.44.2.3 DotProduct()**

```
auto oxyVec4::DotProduct (
    const oxyVec4 & other) const -> oxyF32 [inline], [constexpr]
```

**6.44.2.4 Inverse()**

```
auto oxyVec4::Inverse () -> oxyVec4& [inline], [constexpr]
```

**6.44.2.5 Inversed()**

```
auto oxyVec4::Inversed () const -> oxyVec4 [inline], [constexpr]
```

#### 6.44.2.6 Magnitude()

```
auto oxyVec4::Magnitude () const -> oxyF32 [inline]
```

#### 6.44.2.7 MagnitudeSquared()

```
auto oxyVec4::MagnitudeSquared () const -> oxyF32 [inline], [constexpr]
```

#### 6.44.2.8 Normalize()

```
auto oxyVec4::Normalize () -> oxyVec4& [inline]
```

#### 6.44.2.9 Normalized()

```
auto oxyVec4::Normalized () const -> oxyVec4 [inline]
```

#### 6.44.2.10 operator oxyVec2()

```
oxyVec4::operator oxyVec2 () const [inline]
```

#### 6.44.2.11 operator oxyVec3()

```
oxyVec4::operator oxyVec3 () const [inline]
```

#### 6.44.2.12 operator\*=() [1/2]

```
auto oxyVec4::operator*= (
    const oxyVec4 & other) -> oxyVec4& [inline], [constexpr]
```

#### 6.44.2.13 operator\*=() [2/2]

```
auto oxyVec4::operator*= (
    oxyF32 other) -> oxyVec4& [inline], [constexpr]
```

#### 6.44.2.14 operator+=()

```
auto oxyVec4::operator+= (
    const oxyVec4 & other) -> oxyVec4& [inline], [constexpr]
```

#### 6.44.2.15 operator-=()

```
auto oxyVec4::operator-= (
    const oxyVec4 & other) -> oxyVec4& [inline], [constexpr]
```

**6.44.2.16 operator/=( ) [1/2]**

```
auto oxyVec4::operator/= (
    const oxyVec4 & other) -> oxyVec4&    [inline], [constexpr]
```

**6.44.2.17 operator/=( ) [2/2]**

```
auto oxyVec4::operator/= (
    oxyF32 other) -> oxyVec4&    [inline], [constexpr]
```

**6.44.3 Member Data Documentation****6.44.3.1 w**

```
oxyF32 oxyVec4::w
```

**6.44.3.2 x**

```
oxyF32 oxyVec4::x
```

**6.44.3.3 y**

```
oxyF32 oxyVec4::y
```

**6.44.3.4 z**

```
oxyF32 oxyVec4::z
```

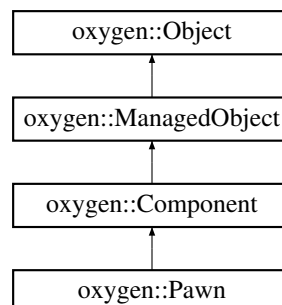
The documentation for this struct was generated from the following file:

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Math/[Defs.h](#)

**6.45 oxygen::Pawn Struct Reference**

```
#include <Pawn.h>
```

Inheritance diagram for oxygen::Pawn:



## Public Member Functions

- [OXYGENOBJECT](#) ([Pawn](#), [Component](#))
- auto [GetState](#) () const -> [PawnState](#)
- auto [GetStance](#) () const -> [PawnStance](#)
- auto [GetEquippedWeapon](#) () const -> const std::shared\_ptr< struct [WeaponComponent](#) > &
- auto [GetEquippedRightHandedWeapon](#) () const -> const std::shared\_ptr< struct [WeaponComponent](#) > &

## Public Member Functions inherited from [oxygen::Component](#)

- [OXYGENOBJECT](#) ([Component](#), [ManagedObject](#))
- auto [GetEntity](#) () const -> std::shared\_ptr< [Entity](#) >
- auto [IsEnabled](#) () const -> [oxyBool](#)
- auto [SetEnabled](#) ([oxyBool](#) enabled) -> void

## Public Member Functions inherited from [oxygen::ManagedObject](#)

- [OXYGENOBJECT](#) ([ManagedObject](#), [Object](#))
- auto [GetObjectID](#) () const -> [oxyObjectID](#)
- template<typename RefType>  
requires std::is\_base\_of\_v<[ManagedObject](#), RefType>  
auto [GetHardRef](#) () const -> std::shared\_ptr< RefType >

## Public Member Functions inherited from [oxygen::Object](#)

- [Object](#) ()=default
- virtual [~Object](#) ()=default
- virtual auto [GetDescription](#) () const -> const [ObjectDescription](#) &
- auto [IsA](#) (const [ObjectDescription](#) &desc) const -> bool
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [IsA](#) () const -> bool
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [Cast](#) () -> T \*
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [Cast](#) () const -> const T \*

## Protected Member Functions

- auto [Update](#) ([oxyF32](#) deltaTimeSeconds) -> void override
- auto [Render](#) () const -> void override

## Friends

- struct [GameManager](#)
- struct [WeaponComponent](#)

## Additional Inherited Members

### Public Types inherited from [oxygen::Object](#)

- using [SelfType](#) = [Object](#)
- using [Super](#) = [Object](#)

### Static Public Member Functions inherited from [oxygen::Object](#)

- static auto [GetStaticDescription](#) () -> const [ObjectDescription](#) &

## 6.45.1 Member Function Documentation

### 6.45.1.1 GetEquippedRightHandedWeapon()

```
auto oxygen::Pawn::GetEquippedRightHandedWeapon () const -> const std::shared_ptr<struct WeaponComponent>&    [inline]
```

### 6.45.1.2 GetEquippedWeapon()

```
auto oxygen::Pawn::GetEquippedWeapon () const -> const std::shared_ptr<struct WeaponComponent>&    [inline]
```

### 6.45.1.3 GetStance()

```
auto oxygen::Pawn::GetStance () const -> PawnStance    [inline]
```

### 6.45.1.4 GetState()

```
auto oxygen::Pawn::GetState () const -> PawnState    [inline]
```

### 6.45.1.5 OXYGENOBJECT()

```
oxygen::Pawn::OXYGENOBJECT (
    Pawn ,
    Component )
```

### 6.45.1.6 Render()

```
auto oxygen::Pawn::Render () const -> void    [override], [protected], [virtual]
```

Reimplemented from [oxygen::Component](#).

### 6.45.1.7 Update()

```
auto oxygen::Pawn::Update (
    oxyF32 deltaTimeSeconds) -> void [override], [protected], [virtual]
```

Reimplemented from [oxygen::Component](#).

## 6.45.2 Friends And Related Symbol Documentation

### 6.45.2.1 GameManager

```
friend struct GameManager [friend]
```

### 6.45.2.2 WeaponComponent

```
friend struct WeaponComponent [friend]
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/Pawn/[Pawn.h](#)
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/Pawn/[Pawn.cc](#)

## 6.46 oxygen::BSPDefines::Plane Struct Reference

```
#include <BSP.h>
```

### Public Attributes

- [oxyF32 m\\_normal](#) [3]
- [oxyF32 m\\_dist](#)
- [oxyU32 m\\_type](#)

### 6.46.1 Member Data Documentation

#### 6.46.1.1 m\_dist

```
oxyF32 oxygen::BSPDefines::Plane::m_dist
```

#### 6.46.1.2 m\_normal

```
oxyF32 oxygen::BSPDefines::Plane::m_normal[3]
```



### 6.46.1.3 m\_type

[oxyU32](#) oxygen::BSPDefines::Plane::m\_type

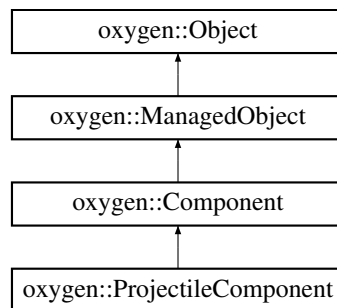
The documentation for this struct was generated from the following file:

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/BSP.h

## 6.47 oxygen::ProjectileComponent Struct Reference

```
#include <ProjectileComponent.h>
```

Inheritance diagram for oxygen::ProjectileComponent:



### Public Member Functions

- [OXYGENOBJECT](#) ([ProjectileComponent](#), [Component](#))
- auto [SetBouncesLeft](#) ([oxyS32](#) bounces) -> void
- auto [SetDamage](#) ([oxyF32](#) damage) -> void
- auto [SetDamageRadius](#) ([oxyF32](#) radius) -> void

### Public Member Functions inherited from [oxygen::Component](#)

- [OXYGENOBJECT](#) ([Component](#), [ManagedObject](#))
- auto [GetEntity](#) () const -> std::shared\_ptr< [Entity](#) >
- auto [IsEnabled](#) () const -> [oxyBool](#)
- auto [SetEnabled](#) ([oxyBool](#) enabled) -> void

### Public Member Functions inherited from [oxygen::ManagedObject](#)

- [OXYGENOBJECT](#) ([ManagedObject](#), [Object](#))
- auto [GetObjectID](#) () const -> [oxyObjectID](#)
- template<typename RefType>  
requires std::is\_base\_of\_v<[ManagedObject](#), RefType>  
auto [GetHardRef](#) () const -> std::shared\_ptr< RefType >

## Public Member Functions inherited from [oxygen::Object](#)

- [Object](#) ()=default
- virtual [~Object](#) ()=default
- virtual auto [GetDescription](#) () const -> const [ObjectDescription](#) &
- auto [IsA](#) (const [ObjectDescription](#) &desc) const -> bool
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [IsA](#) () const -> bool
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [Cast](#) () -> T \*
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [Cast](#) () const -> const T \*

## Protected Member Functions

- auto [Update](#) ([oxyF32](#) deltaTimeSeconds) -> void override

## Protected Member Functions inherited from [oxygen::Component](#)

- virtual auto [Render](#) () const -> void

## Friends

- struct [GameManager](#)

## Additional Inherited Members

## Public Types inherited from [oxygen::Object](#)

- using [SelfType](#) = [Object](#)
- using [Super](#) = [Object](#)

## Static Public Member Functions inherited from [oxygen::Object](#)

- static auto [GetStaticDescription](#) () -> const [ObjectDescription](#) &

## 6.47.1 Member Function Documentation

### 6.47.1.1 OXYGENOBJECT()

```
oxygen::ProjectileComponent::OXYGENOBJECT (
    ProjectileComponent ,
    Component )
```

### 6.47.1.2 SetBouncesLeft()

```
auto oxygen::ProjectileComponent::SetBouncesLeft (
    oxyS32 bounces) -> void    [inline]
```

### 6.47.1.3 SetDamage()

```
auto oxygen::ProjectileComponent::SetDamage (
    oxyF32 damage) -> void    [inline]
```

### 6.47.1.4 SetDamageRadius()

```
auto oxygen::ProjectileComponent::SetDamageRadius (
    oxyF32 radius) -> void    [inline]
```

### 6.47.1.5 Update()

```
auto oxygen::ProjectileComponent::Update (
    oxyF32 deltaTimeSeconds) -> void    [override], [protected], [virtual]
```

Reimplemented from [oxygen::Component](#).

## 6.47.2 Friends And Related Symbol Documentation

### 6.47.2.1 GameManager

```
friend struct GameManager    [friend]
```

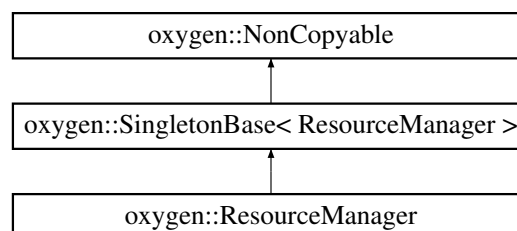
The documentation for this struct was generated from the following files:

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/ProjectileComponent/[ProjectileComponent.h](#)
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/ProjectileComponent/[ProjectileComponent.cc](#)

## 6.48 oxygen::ResourceManager Struct Reference

```
#include <ResourceManager.h>
```

Inheritance diagram for oxygen::ResourceManager:



**Public Member Functions**

- auto [LoadStaticMesh](#) (std::string\_view name) -> std::shared\_ptr< const [StaticMeshResource](#) >
- auto [LoadAnimatedMesh](#) (std::string\_view name) -> std::shared\_ptr< const [AnimatedMeshResource](#) >

**Public Member Functions inherited from [oxygen::SingletonBase](#)< [ResourceManager](#) >**

- [SingletonBase](#) ()
- [~SingletonBase](#) ()

**Public Member Functions inherited from [oxygen::NonCopyable](#)**

- [NonCopyable](#) ()=default
- [NonCopyable](#) (const [NonCopyable](#) &)=delete
- [NonCopyable](#) & [operator=](#) (const [NonCopyable](#) &)=delete

**Additional Inherited Members****Static Public Member Functions inherited from [oxygen::SingletonBase](#)< [ResourceManager](#) >**

- static auto [GetInstance](#) () -> [ResourceManager](#) &

**6.48.1 Member Function Documentation****6.48.1.1 [LoadAnimatedMesh](#)()**

```
auto oxygen::ResourceManager::LoadAnimatedMesh (
    std::string_view name) -> std::shared_ptr<const AnimatedMeshResource>
```

**6.48.1.2 [LoadStaticMesh](#)()**

```
auto oxygen::ResourceManager::LoadStaticMesh (
    std::string_view name) -> std::shared_ptr<const StaticMeshResource>
```

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

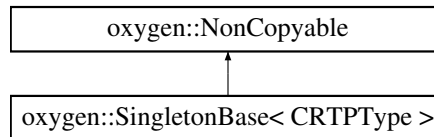
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Resources/[ResourceManager.h](#)
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Resources/[ResourceManager.cc](#)

## 6.49 oxygen::SingletonBase< CRTPTType > Struct Template Reference

Singleton base class. All singletons should inherit from this class. Uses the curiously recurring template pattern and provides the [GetInstance\(\)](#) static method to access the singleton.

```
#include <Singleton.h>
```

Inheritance diagram for oxygen::SingletonBase< CRTPTType >:



### Public Member Functions

- [SingletonBase](#) ()
- [~SingletonBase](#) ()

### Public Member Functions inherited from [oxygen::NonCopyable](#)

- [NonCopyable](#) ()=default
- [NonCopyable](#) (const [NonCopyable](#) &)=delete
- [NonCopyable](#) & [operator=](#) (const [NonCopyable](#) &)=delete

### Static Public Member Functions

- static auto [GetInstance](#) () -> CRTPTType &

#### 6.49.1 Detailed Description

```
template<typename CRTPTType>
struct oxygen::SingletonBase< CRTPTType >
```

Singleton base class. All singletons should inherit from this class. Uses the curiously recurring template pattern and provides the [GetInstance\(\)](#) static method to access the singleton.

#### Template Parameters

|                  |                            |
|------------------|----------------------------|
| <i>CRTPTType</i> | The type of the singleton. |
|------------------|----------------------------|

#### 6.49.2 Constructor & Destructor Documentation

##### 6.49.2.1 SingletonBase()

```
template<typename CRTPTType>
oxygen::SingletonBase< CRTPTType >::SingletonBase () [inline]
```

### 6.49.2.2 ~SingletonBase()

```
template<typename CRTPTType>
oxygen::SingletonBase< CRTPTType >::~~SingletonBase () [inline]
```

## 6.49.3 Member Function Documentation

### 6.49.3.1 GetInstance()

```
template<typename CRTPTType>
static auto oxygen::SingletonBase< CRTPTType >::GetInstance () -> CRTPTType& [inline], [static]
```

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

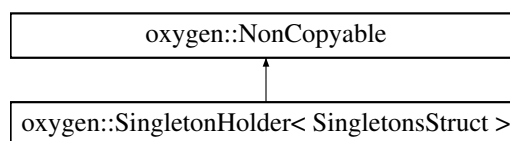
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Singleton/Singleton.h

## 6.50 oxygen::SingletonHolder< SingletonsStruct > Struct Template Reference

Storage of a group of singletons. Used to explicitly construct and destruct singletons.

```
#include <Singleton.h>
```

Inheritance diagram for oxygen::SingletonHolder< SingletonsStruct >:



### Static Public Member Functions

- static auto [Construct](#) () -> void
- static auto [Destruct](#) () -> void

### Additional Inherited Members

### Public Member Functions inherited from [oxygen::NonCopyable](#)

- [NonCopyable](#) ()=default
- [NonCopyable](#) (const [NonCopyable](#) &)=delete
- [NonCopyable](#) & [operator=](#) (const [NonCopyable](#) &)=delete

### 6.50.1 Detailed Description

```
template<typename SingletonsStruct>
struct oxygen::SingletonHolder< SingletonsStruct >
```

Storage of a group of singletons. Used to explicitly construct and destruct singletons.

## Template Parameters

|                         |  |
|-------------------------|--|
| <i>SingletonsStruct</i> | A struct containing <a href="#">SingletonInstance</a> objects. |
|-------------------------|--|

## 6.50.2 Member Function Documentation

### 6.50.2.1 Construct()

```
template<typename SingletonsStruct>
static auto oxygen::SingletonHolder< SingletonsStruct >::Construct () -> void    [inline],
[static]
```

### 6.50.2.2 Destruct()

```
template<typename SingletonsStruct>
static auto oxygen::SingletonHolder< SingletonsStruct >::Destruct () -> void    [inline],
[static]
```

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

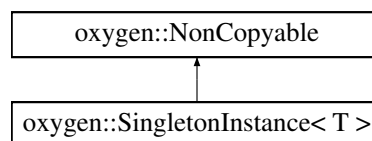
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Singleton/[Singleton.h](#)

## 6.51 oxygen::SingletonInstance< T > Struct Template Reference

Singleton instance, should only be in an object templated to [SingletonHolder](#). Contains the actual storage buffer for the type T.

```
#include <Singleton.h>
```

Inheritance diagram for oxygen::SingletonInstance< T >:



### Public Member Functions

- template<typename... Args>  
    [SingletonInstance](#) (Args &&... args)
- [~SingletonInstance](#) ()

### Public Member Functions inherited from [oxygen::NonCopyable](#)

- [NonCopyable](#) ()=default
- [NonCopyable](#) (const [NonCopyable](#) &)=delete
- [NonCopyable](#) & [operator=](#) (const [NonCopyable](#) &)=delete

## Static Public Member Functions

- static auto [GetInstance](#) () -> T &

### 6.51.1 Detailed Description

```
template<typename T>
struct oxygen::SingletonInstance< T >
```

Singleton instance, should only be in an object templated to [SingletonHolder](#). Contains the actual storage buffer for the type T.

#### Template Parameters

|          |                            |
|----------|----------------------------|
| <i>T</i> | The type of the singleton. |
|----------|----------------------------|

### 6.51.2 Constructor & Destructor Documentation

#### 6.51.2.1 SingletonInstance()

```
template<typename T>
template<typename... Args>
oxygen::SingletonInstance< T >::SingletonInstance (
    Args &&... args) [inline]
```

#### 6.51.2.2 ~SingletonInstance()

```
template<typename T>
oxygen::SingletonInstance< T >::~~SingletonInstance () [inline]
```

### 6.51.3 Member Function Documentation

#### 6.51.3.1 GetInstance()

```
template<typename T>
static auto oxygen::SingletonInstance< T >::GetInstance () -> T& [inline], [static]
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Singleton/[Singleton.h](#)

## 6.52 oxygen::SPSCQueue< T, N > Struct Template Reference

```
#include <SPSCQueue.h>
```



**Public Member Functions**

- [SPSCQueue](#) ()
- `template<typename T>`  
  `auto TryPush (T &&value) -> bool`
- `auto TryPop (T &valueOut) -> bool`

**6.52.1 Constructor & Destructor Documentation****6.52.1.1 SPSCQueue()**

```
template<typename T, int N>
oxygen::SPSCQueue< T, N >::SPSCQueue () [inline]
```

**6.52.2 Member Function Documentation****6.52.2.1 TryPop()**

```
template<typename T, int N>
auto oxygen::SPSCQueue< T, N >::TryPop (
    T & valueOut) -> bool [inline]
```

**6.52.2.2 TryPush()**

```
template<typename T, int N>
template<typename T>
auto oxygen::SPSCQueue< T, N >::TryPush (
    T && value) -> bool [inline]
```

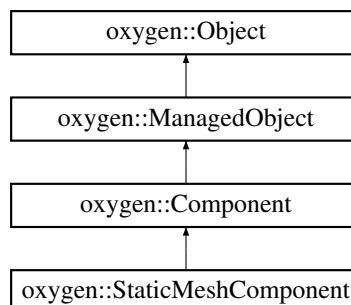
The documentation for this struct was generated from the following file:

- `C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Containers/SPSCQueue.h`

**6.53 oxygen::StaticMeshComponent Struct Reference**

```
#include <StaticMeshComponent.h>
```

Inheritance diagram for oxygen::StaticMeshComponent:



### Public Member Functions

- [OXYGENOBJECT](#) ([StaticMeshComponent](#), [Component](#))
- auto [LoadByName](#) (std::string\_view name) -> [oxyBool](#)
- auto [SetLocalOffset](#) (const [oxyVec3](#) &offset) -> void

### Public Member Functions inherited from [oxygen::Component](#)

- [OXYGENOBJECT](#) ([Component](#), [ManagedObject](#))
- auto [GetEntity](#) () const -> std::shared\_ptr< [Entity](#) >
- auto [IsEnabled](#) () const -> [oxyBool](#)
- auto [SetEnabled](#) ([oxyBool](#) enabled) -> void

### Public Member Functions inherited from [oxygen::ManagedObject](#)

- [OXYGENOBJECT](#) ([ManagedObject](#), [Object](#))
- auto [GetObjectID](#) () const -> [oxyObjectID](#)
- template<typename RefType>  
requires std::is\_base\_of\_v<[ManagedObject](#), RefType>  
auto [GetHardRef](#) () const -> std::shared\_ptr< RefType >

### Public Member Functions inherited from [oxygen::Object](#)

- [Object](#) ()=default
- virtual [~Object](#) ()=default
- virtual auto [GetDescription](#) () const -> const [ObjectDescription](#) &
- auto [IsA](#) (const [ObjectDescription](#) &desc) const -> bool
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [IsA](#) () const -> bool
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [Cast](#) () -> T \*
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [Cast](#) () const -> const T \*

### Protected Member Functions

- auto [Render](#) () const -> void override

### Protected Member Functions inherited from [oxygen::Component](#)

- virtual auto [Update](#) ([oxyF32](#) deltaTimeSeconds) -> void

### Additional Inherited Members

### Public Types inherited from [oxygen::Object](#)

- using [SelfType](#) = [Object](#)
- using [Super](#) = [Object](#)

## Static Public Member Functions inherited from [oxygen::Object](#)

- static auto [GetStaticDescription](#) () -> const [ObjectDescription](#) &

### 6.53.1 Member Function Documentation

#### 6.53.1.1 LoadByName()

```
auto oxygen::StaticMeshComponent::LoadByName (
    std::string_view name) -> oxyBool
```

#### 6.53.1.2 OXYGENOBJECT()

```
oxygen::StaticMeshComponent::OXYGENOBJECT (
    StaticMeshComponent ,
    Component )
```

#### 6.53.1.3 Render()

```
auto oxygen::StaticMeshComponent::Render () const -> void [override], [protected], [virtual]
```

Reimplemented from [oxygen::Component](#).

#### 6.53.1.4 SetLocalOffset()

```
auto oxygen::StaticMeshComponent::SetLocalOffset (
    const oxyVec3 & offset) -> void [inline]
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/StaticMeshComponent/[StaticMeshComponent.h](#)
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/StaticMeshComponent/[StaticMeshComponent.cc](#)

## 6.54 oxygen::StaticMeshPointDef Struct Reference

```
#include <StaticMeshResource.h>
```

### Public Attributes

- [oxyU32 m\\_hash](#)
- [oxyVec3 m\\_position](#)

### 6.54.1 Member Data Documentation

#### 6.54.1.1 m\_hash

`oxyU32` `oxygen::StaticMeshPointDef::m_hash`

#### 6.54.1.2 m\_position

`oxyVec3` `oxygen::StaticMeshPointDef::m_position`

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Resources/[StaticMeshResource.h](#)

## 6.55 oxygen::StaticMeshResource Struct Reference

```
#include <StaticMeshResource.h>
```

### Public Attributes

- `std::vector< StaticMeshPointDef > m_points`
- `std::vector< StaticMeshTri > m_tris`
- `std::string m_texname`

### 6.55.1 Member Data Documentation

#### 6.55.1.1 m\_points

`std::vector<StaticMeshPointDef>` `oxygen::StaticMeshResource::m_points`

#### 6.55.1.2 m\_texname

`std::string` `oxygen::StaticMeshResource::m_texname`

#### 6.55.1.3 m\_tris

`std::vector<StaticMeshTri>` `oxygen::StaticMeshResource::m_tris`

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Resources/[StaticMeshResource.h](#)

## 6.56 oxygen::StaticMeshTri Struct Reference

```
#include <StaticMeshResource.h>
```

### Public Attributes

- [StaticMeshVertex m\\_vertices](#) [3]

### 6.56.1 Member Data Documentation

#### 6.56.1.1 m\_vertices

```
StaticMeshVertex oxygen::StaticMeshTri::m_vertices[3]
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Resources/[StaticMeshResource.h](#)

## 6.57 oxygen::StaticMeshVertex Struct Reference

```
#include <StaticMeshResource.h>
```

### Public Attributes

- [oxyVec3 m\\_position](#)
- [oxyVec2 m\\_uv](#)

### 6.57.1 Member Data Documentation

#### 6.57.1.1 m\_position

```
oxyVec3 oxygen::StaticMeshVertex::m_position
```

#### 6.57.1.2 m\_uv

```
oxyVec2 oxygen::StaticMeshVertex::m_uv
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Resources/[StaticMeshResource.h](#)

## 6.58 oxygen::BSPDefines::TexInfo Struct Reference

```
#include <BSP.h>
```

### Public Attributes

- [oxyF32 m\\_vecs](#) [2][4]
- [oxyS32 m\\_mipTexIndex](#)
- [oxyS32 m\\_flags](#)

### 6.58.1 Member Data Documentation

#### 6.58.1.1 m\_flags

[oxyS32](#) [oxygen::BSPDefines::TexInfo::m\\_flags](#)

#### 6.58.1.2 m\_mipTexIndex

[oxyS32](#) [oxygen::BSPDefines::TexInfo::m\\_mipTexIndex](#)

#### 6.58.1.3 m\_vecs

[oxyF32](#) [oxygen::BSPDefines::TexInfo::m\\_vecs](#) [2] [4]

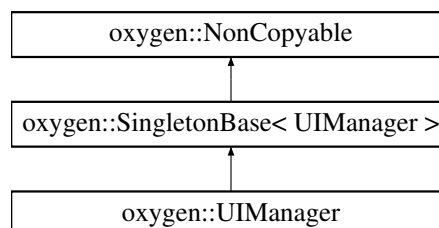
The documentation for this struct was generated from the following file:

- [C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/BSP.h](#)

## 6.59 oxygen::UIManager Struct Reference

```
#include <UIManager.h>
```

Inheritance diagram for [oxygen::UIManager](#):



### Public Member Functions

- auto [Render](#) () const -> void
- auto [Update](#) () -> void
- auto [DisplayPopup](#) (std::string message) -> void

### Public Member Functions inherited from [oxygen::SingletonBase< UIManager >](#)

- [SingletonBase](#) ()
- [~SingletonBase](#) ()

### Public Member Functions inherited from [oxygen::NonCopyable](#)

- [NonCopyable](#) ()=default
- [NonCopyable](#) (const [NonCopyable](#) &)=delete
- [NonCopyable](#) & [operator=](#) (const [NonCopyable](#) &)=delete

### Additional Inherited Members

### Static Public Member Functions inherited from [oxygen::SingletonBase< UIManager >](#)

- static auto [GetInstance](#) () -> [UIManager](#) &

## 6.59.1 Member Function Documentation

### 6.59.1.1 DisplayPopup()

```
auto oxygen::UIManager::DisplayPopup (  
    std::string message) -> void
```

### 6.59.1.2 Render()

```
auto oxygen::UIManager::Render () const -> void
```

### 6.59.1.3 Update()

```
auto oxygen::UIManager::Update () -> void
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/UI/[UIManager.h](#)
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/UI/[UIManager.cc](#)

## 6.60 oxygen::BSPDefines::Vertex Struct Reference

```
#include <BSP.h>
```

### Public Attributes

- [oxyF32 m\\_position](#) [3]

### 6.60.1 Member Data Documentation

#### 6.60.1.1 m\_position

[oxyF32](#) oxygen::BSPDefines::Vertex::m\_position[3]

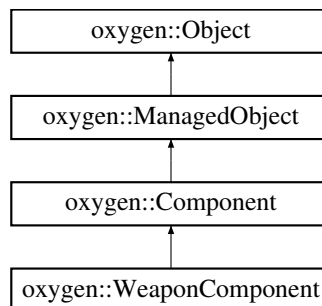
The documentation for this struct was generated from the following file:

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/[BSP.h](#)

## 6.61 oxygen::WeaponComponent Struct Reference

```
#include <WeaponComponent.h>
```

Inheritance diagram for oxygen::WeaponComponent:



### Public Member Functions

- [OXYGENOBJECT](#) ([WeaponComponent](#), [Component](#))
- auto [HasInfiniteReserve](#) () const -> [oxyBool](#)
- auto [HasInfiniteClip](#) () const -> [oxyBool](#)
- auto [GetReserveAmmo](#) () const -> [oxyU32](#)
- auto [GetClipAmmo](#) () const -> [oxyU32](#)
- auto [GetMaxClipAmmo](#) () const -> [oxyU32](#)
- auto [GetMaxReserveAmmo](#) () const -> [oxyU32](#)
- auto [GetBulletsPerShot](#) () const -> [oxyU32](#)
- auto [GetRPM](#) () const -> [oxyU32](#)
- auto [GetTimeToReload](#) () const -> [oxyF32](#)
- auto [GetSpreadRadians](#) () const -> [oxyVec2](#)



- auto [GetFireType](#) () const -> [WeaponFireType](#)
- auto [GetDestroyOnFire](#) () const -> [oxyBool](#)
- auto [GetRightHanded](#) () const -> [oxyBool](#)
- auto [GetCanDrop](#) () const -> [oxyBool](#)
- auto [SetInfiniteReserve](#) ([oxyBool](#) infinite) -> void
- auto [SetInfiniteClip](#) ([oxyBool](#) infinite) -> void
- auto [SetReserveAmmo](#) ([oxyU32](#) ammo) -> void
- auto [SetClipAmmo](#) ([oxyU32](#) ammo) -> void
- auto [SetMaxClipAmmo](#) ([oxyU32](#) ammo) -> void
- auto [SetMaxReserveAmmo](#) ([oxyU32](#) ammo) -> void
- auto [SetBulletsPerShot](#) ([oxyU32](#) bullets) -> void
- auto [SetRPM](#) ([oxyU32](#) rpm) -> void
- auto [SetTimeToReload](#) ([oxyF32](#) time) -> void
- auto [SetSpreadRadians](#) ([oxyVec2](#) spread) -> void
- auto [SetFireType](#) ([WeaponFireType](#) type) -> void
- auto [SetDestroyOnFire](#) ([oxyBool](#) destroy) -> void
- auto [SetRightHanded](#) ([oxyBool](#) right) -> void
- auto [SetCanDrop](#) ([oxyBool](#) canDrop) -> void

### Public Member Functions inherited from [oxygen::Component](#)

- [OXYGENOBJECT](#) ([Component](#), [ManagedObject](#))
- auto [GetEntity](#) () const -> std::shared\_ptr< [Entity](#) >
- auto [IsEnabled](#) () const -> [oxyBool](#)
- auto [SetEnabled](#) ([oxyBool](#) enabled) -> void

### Public Member Functions inherited from [oxygen::ManagedObject](#)

- [OXYGENOBJECT](#) ([ManagedObject](#), [Object](#))
- auto [GetObjectID](#) () const -> [oxyObjectID](#)
- template<typename RefType>  
requires std::is\_base\_of\_v<[ManagedObject](#), RefType>  
auto [GetHardRef](#) () const -> std::shared\_ptr< RefType >

### Public Member Functions inherited from [oxygen::Object](#)

- [Object](#) ()=default
- virtual [~Object](#) ()=default
- virtual auto [GetDescription](#) () const -> const [ObjectDescription](#) &
- auto [IsA](#) (const [ObjectDescription](#) &desc) const -> bool
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [IsA](#) () const -> bool
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [Cast](#) () -> T \*
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [Cast](#) () const -> const T \*

### Protected Member Functions

- auto [Update](#) ([oxyF32](#) deltaTimeSeconds) -> void override

### Protected Member Functions inherited from [oxygen::Component](#)

- virtual auto [Render](#) () const -> void

### Friends

- struct [Pawn](#)
- struct [GameManager](#)

### Additional Inherited Members

### Public Types inherited from [oxygen::Object](#)

- using [SelfType](#) = [Object](#)
- using [Super](#) = [Object](#)

### Static Public Member Functions inherited from [oxygen::Object](#)

- static auto [GetStaticDescription](#) () -> const [ObjectDescription](#) &

## 6.61.1 Member Function Documentation

### 6.61.1.1 GetBulletsPerShot()

```
auto oxygen::WeaponComponent::GetBulletsPerShot () const -> oxyU32 [inline]
```

### 6.61.1.2 GetCanDrop()

```
auto oxygen::WeaponComponent::GetCanDrop () const -> oxyBool [inline]
```

### 6.61.1.3 GetClipAmmo()

```
auto oxygen::WeaponComponent::GetClipAmmo () const -> oxyU32 [inline]
```

### 6.61.1.4 GetDestroyOnFire()

```
auto oxygen::WeaponComponent::GetDestroyOnFire () const -> oxyBool [inline]
```

#### 6.61.1.5 GetFireType()

```
auto oxygen::WeaponComponent::GetFireType () const -> WeaponFireType [inline]
```

#### 6.61.1.6 GetMaxClipAmmo()

```
auto oxygen::WeaponComponent::GetMaxClipAmmo () const -> oxyU32 [inline]
```

#### 6.61.1.7 GetMaxReserveAmmo()

```
auto oxygen::WeaponComponent::GetMaxReserveAmmo () const -> oxyU32 [inline]
```

#### 6.61.1.8 GetReserveAmmo()

```
auto oxygen::WeaponComponent::GetReserveAmmo () const -> oxyU32 [inline]
```

#### 6.61.1.9 GetRightHanded()

```
auto oxygen::WeaponComponent::GetRightHanded () const -> oxyBool [inline]
```

#### 6.61.1.10 GetRPM()

```
auto oxygen::WeaponComponent::GetRPM () const -> oxyU32 [inline]
```

#### 6.61.1.11 GetSpreadRadians()

```
auto oxygen::WeaponComponent::GetSpreadRadians () const -> oxyVec2 [inline]
```

#### 6.61.1.12 GetTimeToReload()

```
auto oxygen::WeaponComponent::GetTimeToReload () const -> oxyF32 [inline]
```

#### 6.61.1.13 HasInfiniteClip()

```
auto oxygen::WeaponComponent::HasInfiniteClip () const -> oxyBool [inline]
```

#### 6.61.1.14 HasInfiniteReserve()

```
auto oxygen::WeaponComponent::HasInfiniteReserve () const -> oxyBool [inline]
```

#### 6.61.1.15 OXYGENOBJECT()

```
oxygen::WeaponComponent::OXYGENOBJECT (  
    WeaponComponent ,  
    Component )
```

#### 6.61.1.16 SetBulletsPerShot()

```
auto oxygen::WeaponComponent::SetBulletsPerShot (  
    oxyU32 bullets) -> void    [inline]
```

#### 6.61.1.17 SetCanDrop()

```
auto oxygen::WeaponComponent::SetCanDrop (  
    oxyBool canDrop) -> void    [inline]
```

#### 6.61.1.18 SetClipAmmo()

```
auto oxygen::WeaponComponent::SetClipAmmo (  
    oxyU32 ammo) -> void    [inline]
```

#### 6.61.1.19 SetDestroyOnFire()

```
auto oxygen::WeaponComponent::SetDestroyOnFire (  
    oxyBool destroy) -> void    [inline]
```

#### 6.61.1.20 SetFireType()

```
auto oxygen::WeaponComponent::SetFireType (  
    WeaponFireType type) -> void    [inline]
```

#### 6.61.1.21 SetInfiniteClip()

```
auto oxygen::WeaponComponent::SetInfiniteClip (  
    oxyBool infinite) -> void    [inline]
```

#### 6.61.1.22 SetInfiniteReserve()

```
auto oxygen::WeaponComponent::SetInfiniteReserve (  
    oxyBool infinite) -> void    [inline]
```

#### 6.61.1.23 SetMaxClipAmmo()

```
auto oxygen::WeaponComponent::SetMaxClipAmmo (  
    oxyU32 ammo) -> void    [inline]
```

#### 6.61.1.24 SetMaxReserveAmmo()

```
auto oxygen::WeaponComponent::SetMaxReserveAmmo (  
    oxyU32 ammo) -> void    [inline]
```

#### 6.61.1.25 SetReserveAmmo()

```
auto oxygen::WeaponComponent::SetReserveAmmo (  
    oxyU32 ammo) -> void    [inline]
```

#### 6.61.1.26 SetRightHanded()

```
auto oxygen::WeaponComponent::SetRightHanded (  
    oxyBool right) -> void    [inline]
```

#### 6.61.1.27 SetRPM()

```
auto oxygen::WeaponComponent::SetRPM (  
    oxyU32 rpm) -> void    [inline]
```

#### 6.61.1.28 SetSpreadRadians()

```
auto oxygen::WeaponComponent::SetSpreadRadians (  
    oxyVec2 spread) -> void    [inline]
```

#### 6.61.1.29 SetTimeToReload()

```
auto oxygen::WeaponComponent::SetTimeToReload (  
    oxyF32 time) -> void    [inline]
```

#### 6.61.1.30 Update()

```
auto oxygen::WeaponComponent::Update (  
    oxyF32 deltaTimeSeconds) -> void    [override], [protected], [virtual]
```

Reimplemented from [oxygen::Component](#).

### 6.61.2 Friends And Related Symbol Documentation

#### 6.61.2.1 GameManager

```
friend struct GameManager    [friend]
```

### 6.61.2.2 Pawn

```
friend struct Pawn [friend]
```

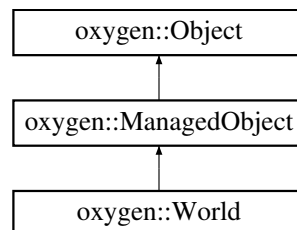
The documentation for this struct was generated from the following files:

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/WeaponComponent/WeaponComponent.h
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/WeaponComponent/WeaponComponent.cc

## 6.62 oxygen::World Struct Reference

```
#include <World.h>
```

Inheritance diagram for oxygen::World:



### Classes

- struct [LineTraceResult](#)

### Public Member Functions

- [OXYGENOBJECT](#) ([World](#), [ManagedObject](#))
- auto [GetEntityList](#) () const -> const std::vector< std::shared\_ptr< struct [Entity](#) > > &
- auto [RandomPlayerSpawn](#) () const -> [oxyVec3](#)
- auto [FindLeaf](#) (const [oxyVec3](#) &position, [oxySize](#) modelIndex) const -> const [BSPDefines::Leaf](#) \*
- auto [HullTrace](#) ([CollisionHull](#) hull, const [oxyVec3](#) &start, const [oxyVec3](#) &end, [LineTraceResult](#) &result) const -> [oxyBool](#)
- auto [LineTrace](#) (const [oxyVec3](#) &start, const [oxyVec3](#) &end, const struct [Entity](#) \*self, [LineTraceResult](#) &result) const -> [oxyBool](#)
- auto [CalculateHullSlideMovement](#) ([CollisionHull](#) hull, const [oxyVec3](#) &position, const [oxyVec3](#) &distance) -> [oxyVec3](#)
- auto [SpawnEntity](#) ([oxyObjectID](#) id=0) -> std::shared\_ptr< [Entity](#) >
- auto [RemoveEntity](#) (struct [Entity](#) \*ent) -> void
- auto [GetLocalPlayer](#) () const -> std::weak\_ptr< [Entity](#) >
- auto [SetLocalPlayer](#) (std::shared\_ptr< [Entity](#) > player) -> void

### Public Member Functions inherited from [oxygen::ManagedObject](#)

- [OXYGENOBJECT](#) ([ManagedObject](#), [Object](#))
- auto [GetObjectID](#) () const -> [oxyObjectID](#)
- template<typename RefType>  
requires std::is\_base\_of\_v<[ManagedObject](#), RefType>  
auto [GetHardRef](#) () const -> std::shared\_ptr< RefType >

## Public Member Functions inherited from oxygen::Object

- [Object](#) ()=default
- virtual [~Object](#) ()=default
- virtual auto [GetDescription](#) () const -> const [ObjectDescription](#) &
- auto [IsA](#) (const [ObjectDescription](#) &desc) const -> bool
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [IsA](#) () const -> bool
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [Cast](#) () -> T \*
- template<typename T>  
requires std::is\_base\_of\_v<[Object](#), T>  
auto [Cast](#) () const -> const T \*

## Public Attributes

- std::unique\_ptr< const [BSPWorldData](#) > [m\\_bspData](#) {}

## Friends

- struct [GameManager](#)
- auto [LoadWorld](#) (std::string\_view name) -> std::shared\_ptr< [World](#) >

## Additional Inherited Members

## Public Types inherited from oxygen::Object

- using [SelfType](#) = [Object](#)
- using [Super](#) = [Object](#)

## Static Public Member Functions inherited from oxygen::Object

- static auto [GetStaticDescription](#) () -> const [ObjectDescription](#) &

### 6.62.1 Member Function Documentation

#### 6.62.1.1 CalculateHullSlideMovement()

```
auto oxygen::World::CalculateHullSlideMovement (
    CollisionHull hull,
    const oxyVec3 & position,
    const oxyVec3 & distance) -> oxyVec3
```

#### 6.62.1.2 FindLeaf()

```
auto oxygen::World::FindLeaf (
    const oxyVec3 & position,
    oxySize modelIndex) const -> const BSPDefines::Leaf*
```

### 6.62.1.3 GetEntityList()

```
auto oxygen::World::GetEntityList () const -> const std::vector<std::shared_ptr<struct Entity>>&
[inline]
```

### 6.62.1.4 GetLocalPlayer()

```
auto oxygen::World::GetLocalPlayer () const -> std::weak_ptr<Entity> [inline]
```

### 6.62.1.5 HullTrace()

```
auto oxygen::World::HullTrace (
    CollisionHull hull,
    const oxyVec3 & start,
    const oxyVec3 & end,
    LineTraceResult & result) const -> oxyBool
```

### 6.62.1.6 LineTrace()

```
auto oxygen::World::LineTrace (
    const oxyVec3 & start,
    const oxyVec3 & end,
    const struct Entity * self,
    LineTraceResult & result) const -> oxyBool
```

### 6.62.1.7 OXYGENOBJECT()

```
oxygen::World::OXYGENOBJECT (
    World ,
    ManagedObject )
```

### 6.62.1.8 RandomPlayerSpawn()

```
auto oxygen::World::RandomPlayerSpawn () const -> oxyVec3
```

### 6.62.1.9 RemoveEntity()

```
auto oxygen::World::RemoveEntity (
    struct Entity * ent) -> void
```

### 6.62.1.10 SetLocalPlayer()

```
auto oxygen::World::SetLocalPlayer (
    std::shared_ptr< Entity > player) -> void
```



### 6.62.1.11 SpawnEntity()

```
auto oxygen::World::SpawnEntity (
    oxyObjectID id = 0) -> std::shared_ptr<Entity>
```

## 6.62.2 Friends And Related Symbol Documentation

### 6.62.2.1 GameManager

```
friend struct GameManager [friend]
```

### 6.62.2.2 LoadWorld

```
auto LoadWorld (
    std::string_view name) -> std::shared_ptr<World> [friend]
```

## 6.62.3 Member Data Documentation

### 6.62.3.1 m\_bspData

```
std::unique_ptr<const BSPWorldData> oxygen::World::m_bspData {}
```

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

- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/[World.h](#)
- C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/[World.cc](#)



## Chapter 7

# File Documentation

### 7.1 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/↵ Component/AnimatedMeshComponent/AnimatedMesh↵ Component.cc File Reference

```
#include <OxygenPCH.h>
#include "AnimatedMeshComponent.h"
#include "Entity/Entity.h"
#include "Resources/ResourceManager.h"
#include "Resources/AnimatedMeshResource.h"
#include "Resources/StaticMeshResource.h"
#include "Gfx/GfxRenderer.h"
#include "Platform/Platform.h"
```

#### Namespaces

- namespace [oxygen](#)

### 7.2 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/↵ Component/AnimatedMeshComponent/AnimatedMeshComponent.h File Reference

```
#include "Component/Component.h"
```

#### Classes

- struct [oxygen::AnimatedMeshComponent](#)

#### Namespaces

- namespace [oxygen](#)

## 7.3 AnimatedMeshComponent.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002
00003 #include "Component/Component.h"
00004
00005 namespace oxygen
00006 {
00007     struct AnimatedMeshResource;
00008     struct AnimatedMeshComponent final : Component
00009     {
00010         OXYGENOBJECT(AnimatedMeshComponent, Component);
00011
00012         auto LoadByName(std::string_view name) -> oxyBool;
00013
00014         auto BeginAnimation(oxyU32 animHash, oxyBool loop = true) -> void;
00015
00016         auto GetCurrentntAnimationHash() const -> oxyU32
00017         {
00018             return m_animHash;
00019         }
00020
00021         auto SetLocalOffset(const oxyVec3& offset) -> void
00022         {
00023             m_localOffset = offset;
00024         }
00025
00026         auto SetLocalRotation(const oxyQuat& rotation) -> void
00027         {
00028             m_localRotation = rotation;
00029         }
00030
00031     protected:
00032         auto Update(float deltaTimeSeconds) -> void override;
00033         auto Render() const -> void override;
00034
00035     private:
00036         oxyU32 m_animHash{};
00037         oxyF32 m_animTotalTime{};
00038         oxyF32 m_animCurrentFrameTime{};
00039         oxyF32 m_animLerpAlpha{};
00040         oxyBool m_loopAnim{};
00041         oxyVec3 m_localOffset{};
00042         oxyQuat m_localRotation{};
00043         const std::vector<oxyVec3>* m_currentFrame{};
00044         const std::vector<oxyVec3>* m_nextFrame{};
00045         std::shared_ptr<const AnimatedMeshResource> m_resource;
00046         std::shared_ptr<const struct GfxTexture> m_texture;
00047     };
00048 } // namespace oxygen

```

## 7.4 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/↵ Component/CameraComponent/CameraComponent.cc File Reference

```

#include "OxygenPCH.h"
#include "CameraComponent.h"
#include "Entity/Entity.h"
#include "Gfx/GfxRenderer.h"

```

### Namespaces

- namespace [oxygen](#)

## 7.5 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/CameraComponent/CameraComponent.h File Reference

```
#include "Component/Component.h"
```

### Classes

- struct [oxygen::CameraComponent](#)

### Namespaces

- namespace [oxygen](#)

## 7.6 CameraComponent.h

[Go to the documentation of this file.](#)

```
00001 #pragma once
00002
00003 #include "Component/Component.h"
00004
00005 namespace oxygen
00006 {
00007     struct CameraComponent final : Component
00008     {
00009         OXYGENOBJECT(CameraComponent, Component);
00010
00011         auto GetCameraLocalOffset() const -> const oxyVec3&
00012         {
00013             return m_cameraLocalOffset;
00014         }
00015         auto GetEuler() const -> const oxyVec3&
00016         {
00017             return m_cameraEuler;
00018         }
00019         auto GetCameraForward() const -> const oxyVec3&
00020         {
00021             return m_cameraForward;
00022         }
00023         auto GetCameraUp() const -> const oxyVec3&
00024         {
00025             return m_cameraUp;
00026         }
00027         auto GetCameraRight() const -> const oxyVec3&
00028         {
00029             return m_cameraRight;
00030         }
00031         auto GetVerticalFov() const -> oxyF32
00032         {
00033             return m_verticalFovRad;
00034         }
00035         auto GetNearClip() const -> oxyF32
00036         {
00037             return m_nearClip;
00038         }
00039         auto GetFarClip() const -> oxyF32
00040         {
00041             return m_farClip;
00042         }
00043         auto GetViewMatrix() const -> const oxyMat4x4&
00044         {
00045             return m_viewMatrix;
00046         }
00047         auto GetProjectionMatrix() const -> const oxyMat4x4&
00048         {
00049             return m_projectionMatrix;
00050         }
00051         auto GetViewProjectionMatrix() const -> const oxyMat4x4&
00052         {
```

```

00053         return m_viewProjectionMatrix;
00054     }
00055
00056     auto SetEuler(const oxyVec3& euler) -> void
00057     {
00058         m_cameraEuler = euler;
00059     }
00060     auto SetLocalOffset(const oxyVec3& localOffset) -> void
00061     {
00062         m_cameraLocalOffset = localOffset;
00063     }
00064     auto SetNearClip(oxyF32 nearClip) -> void
00065     {
00066         m_nearClip = nearClip;
00067     }
00068     auto SetFarClip(oxyF32 farClip) -> void
00069     {
00070         m_farClip = farClip;
00071     }
00072
00073 protected:
00074     auto Update(oxyF32 deltaTimeSeconds) -> void override;
00075
00076 private:
00077     oxyVec3 m_cameraLocalOffset{};
00078     oxyVec3 m_cameraEuler{};
00079     oxyVec3 m_cameraForward{1.f, 0.f, 0.f};
00080     oxyVec3 m_cameraUp{0.f, 0.f, 1.f};
00081     oxyVec3 m_cameraRight{0.f, 1.f, 0.f};
00082     oxyF32 m_verticalFovRad{90.0f * Math::k_degToRad};
00083     oxyF32 m_nearClip{4.f};
00084     oxyF32 m_farClip{4000.f};
00085     oxyMat4x4 m_viewMatrix{};
00086     oxyMat4x4 m_projectionMatrix{};
00087     oxyMat4x4 m_viewProjectionMatrix{};
00088
00089     oxyBool m_updateEntityYaw{true};
00090 };
00091 }; // namespace oxygen

```

## 7.7 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/↵ Component/Component.cc File Reference

```

#include "OxygenPCH.h"
#include "Component.h"

```

## 7.8 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/↵ Component/Component.h File Reference

### Classes

- struct [oxygen::Component](#)

### Namespaces

- namespace [oxygen](#)

## 7.9 Component.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002
00003 namespace oxygen
00004 {
00005     struct Entity;
00006     struct Component : ManagedObject
00007     {
00008         OXYGENOBJECT(Component, ManagedObject);
00009
00010         auto GetEntity() const -> std::shared_ptr<Entity>
00011         {
00012             return m_entity.lock();
00013         }
00014
00015         auto IsEnabled() const -> oxyBool
00016         {
00017             return m_enabled;
00018         }
00019         auto SetEnabled(oxyBool enabled) -> void
00020         {
00021             m_enabled = enabled;
00022         }
00023
00024     protected:
00025         virtual auto Update(oxyF32 deltaTimeSeconds) -> void{};
00026         virtual auto Render() const -> void{};
00027
00028     private:
00029         std::weak_ptr<Entity> m_entity{};
00030         oxyBool m_enabled{true};
00031
00032         friend struct Entity;
00033     };
00034 }; // namespace oxygen

```

## 7.10 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/↵ Component/EnvPushComponent/EnvPushComponent.cc File Reference

```

#include "OxygenPCH.h"
#include "EnvPushComponent.h"
#include "World/World.h"
#include "Entity/Entity.h"
#include "Component/HullComponent/HullComponent.h"

```

### Namespaces

- namespace [oxygen](#)

## 7.11 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/↵ Component/EnvPushComponent/EnvPushComponent.h File Reference

```

#include "Component/Component.h"

```

## Classes

- struct [oxygen::EnvPushComponent](#)

## Namespaces

- namespace [oxygen](#)

## 7.12 EnvPushComponent.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002
00003 #include "Component/Component.h"
00004
00005 namespace oxygen
00006 {
00007     struct EnvPushComponent final : Component
00008     {
00009         OXYGENOBJECT(EnvPushComponent, Component);
00010
00011         auto GetVelocity() const -> const oxyVec3&
00012         {
00013             return m_velocity;
00014         }
00015         auto GetRadius() const -> oxyF32
00016         {
00017             return m_radius;
00018         }
00019
00020         auto SetVelocity(const oxyVec3& velocity) -> void
00021         {
00022             m_velocity = velocity;
00023         }
00024         auto SetRadius(oxyF32 radius) -> void
00025         {
00026             m_radius = radius;
00027         }
00028
00029     protected:
00030         auto Update(oxyF32 deltaTimeSeconds) -> void override;
00031
00032     private:
00033         oxyVec3 m_velocity{};
00034         oxyF32 m_radius{};
00035         oxyBool m_isPushing{};
00036     };
00037 } // namespace oxygen

```

## 7.13 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/↵ Component/HealthComponent/HealthComponent.cc File Reference

```

#include "OxygenPCH.h"
#include "HealthComponent.h"
#include "Net/NetSystem.h"

```

## Namespaces

- namespace [oxygen](#)



## 7.14 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/HealthComponent/HealthComponent.h File Reference

```
#include "Component/Component.h"
```

### Classes

- struct [oxygen::HealthComponent](#)

### Namespaces

- namespace [oxygen](#)

## 7.15 HealthComponent.h

[Go to the documentation of this file.](#)

```
00001 #pragma once
00002
00003 #include "Component/Component.h"
00004
00005 namespace oxygen
00006 {
00007     struct HealthComponent : Component
00008     {
00009         OXYGENOBJECT(HealthComponent, Component);
00010
00011         template <typename... TArgs>
00012         auto AddHealthStateChangedEvent(TArgs&&... args) -> void
00013         {
00014             m_healthStateChangedEvent.AddCallback(std::forward<TArgs>(args)...);
00015         }
00016
00017         template <typename... TArgs>
00018         auto AddHealedEvent(TArgs&&... args) -> void
00019         {
00020             m_healedEvent.AddCallback(std::forward<TArgs>(args)...);
00021         }
00022
00023         template <typename... TArgs>
00024         auto AddDamagedEvent(TArgs&&... args) -> void
00025         {
00026             m_damagedEvent.AddCallback(std::forward<TArgs>(args)...);
00027         }
00028
00029         auto Heal(oxyS32 amount) -> void;
00030         auto Damage(oxyS32 amount, DamageType type) -> void;
00031
00032         auto SetHealth(oxyU32 health) -> void
00033         {
00034             m_health = health;
00035         }
00036         auto SetMaxHealth(oxyU32 maxHealth) -> void
00037         {
00038             m_maxHealth = maxHealth;
00039         }
00040
00041         auto GetHealth() const -> oxyU32
00042         {
00043             return m_health;
00044         }
00045         auto GetMaxHealth() const -> oxyU32
00046         {
00047             return m_maxHealth;
00048         }
00049
00050         auto GetState() const -> HealthState
00051         {
00052             return m_state;
00053         }
00054     };
00055 }
```

```

00053     }
00054
00055     private:
00056         oxyS32 m_health{};
00057         oxyS32 m_maxHealth{};
00058         HealthState m_state{};
00059
00060         // HealthComponent* this
00061         // Entity* owner entity
00062         // HealthState new state
00063         CallbackList<void, HealthComponent*, struct Entity*, HealthState>
00064             m_healthStateChangedEvent;
00065
00066         // HealthComponent* this
00067         // Entity* owner entity
00068         // oxyU32 amount of healing
00069         CallbackList<void, HealthComponent*, struct Entity*, oxyS32>
00070             m_healedEvent;
00071
00072         // HealthComponent* this
00073         // Entity* owner entity
00074         // oxyU32 amount of damage
00075         CallbackList<void, HealthComponent*, struct Entity*, oxyS32>
00076             m_damagedEvent;
00077
00078         auto HostSendHealthStateChange() -> void;
00079         auto ClientReceiveHealthStateChange(oxyS32 newhealth, oxyS32 newmax,
00080                                             HealthState newstate)
00081             -> void;
00082         friend struct GameManager; // ^^^^
00083
00084     };
00085 } // namespace oxygen

```

## 7.16 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/↵ Component/HullComponent/HullComponent.cc File Reference

```

#include "OxygenPCH.h"
#include "HullComponent.h"
#include "Entity/Entity.h"
#include "World/World.h"

```

### Namespaces

- namespace [oxygen](#)

## 7.17 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/↵ Component/HullComponent/HullComponent.h File Reference

```

#include "Component/Component.h"

```

### Classes

- struct [oxygen::HullComponent](#)

### Namespaces

- namespace [oxygen](#)

## 7.18 HullComponent.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002
00003 #include "Component/Component.h"
00004
00005 namespace oxygen
00006 {
00007     struct HullComponent final : Component
00008     {
00009         OXYGENOBJECT(HullComponent, Component);
00010
00011         template <typename... TArgs>
00012         auto AddCollideEvent(TArgs&&... args) -> void
00013         {
00014             m_onCollideEvent.AddCallback(std::forward<TArgs>(args)...);
00015         }
00016         template <typename... TArgs>
00017         auto AddBounceEvent(TArgs&&... args) -> void
00018         {
00019             m_onBounceEvent.AddCallback(std::forward<TArgs>(args)...);
00020         }
00021
00022         auto TraceLine(const oxyVec3& start, const oxyVec3& end,
00023             oxyVec3& outPosition,
00024             oxyVec3& outNormal) const -> oxyBool;
00025         auto CollidesWithHull(const oxyVec3& otherHullWorldPosition,
00026             CollisionHull otherHull, oxyVec3& outPosition,
00027             oxyVec3& outNormal) const -> oxyBool;
00028         auto IsWithinRadius(const oxyVec3& position,
00029             oxyF32 radius) const -> oxyBool;
00030
00031         auto DoesIgnoreEntity(const struct Entity* entity) const -> oxyBool;
00032
00033         auto GetHull() const -> CollisionHull
00034         {
00035             return m_hull;
00036         }
00037         auto GetVelocity() const -> const oxyVec3&
00038         {
00039             return m_velocity;
00040         }
00041         auto GetGravityPerSecond() const -> oxyF32
00042         {
00043             return m_gravityPerSecond;
00044         }
00045         auto GetDrag() const -> oxyF32
00046         {
00047             return m_drag;
00048         }
00049         auto GetSolidToOtherHulls() const -> oxyBool
00050         {
00051             return m_solid;
00052         }
00053         auto GetBounceVelocityMultiplier() const -> oxyF32
00054         {
00055             return m_bounceVelocityMultiplier;
00056         }
00057         auto GetResponseType() const -> oxyBool
00058         {
00059             return m_response;
00060         }
00061
00062         auto SetHull(CollisionHull hull) -> void
00063         {
00064             m_hull = hull;
00065         }
00066         auto SetVelocity(const oxyVec3& velocity) -> void
00067         {
00068             m_velocity = velocity;
00069         }
00070         auto SetGravityPerSecond(oxyF32 gravityPerSecond) -> void
00071         {
00072             m_gravityPerSecond = gravityPerSecond;
00073         }
00074         auto SetDrag(oxyF32 drag) -> void
00075         {
00076             m_drag = drag;
00077         }
00078         auto SetSolidToOtherHulls(oxyBool solid) -> void
00079         {
00080             m_solid = solid;
00081         }
00082         auto

```

```

00083         SetBounceVelocityMultiplier(oxyF32 bounceVelocityMultiplier) -> void
00084     {
00085         m_bounceVelocityMultiplier = bounceVelocityMultiplier;
00086     }
00087     auto SetResponse(CollisionResponseType response) -> void
00088     {
00089         m_response = response;
00090     }
00091     auto
00092     AddToIgnoreList(const std::shared_ptr<struct Entity>& entity) -> void;
00093
00094 protected:
00095     auto Update(oxyF32 deltaTimeSeconds) -> void override;
00096     //auto Render() const -> void override;
00097
00098 private:
00099     auto UpdateSlide(oxyF32 deltaTimeSeconds) -> void;
00100     auto UpdateBounce(oxyF32 deltaTimeSeconds) -> void;
00101
00102     auto ClipToHullsAndUpdateWorldPosition(
00103         const oxyVec3& position, const oxyVec3& newPosition,
00104         const struct World* world, struct Entity* self) -> void;
00105
00106     // HullComponent* this hull
00107     // Entity* other hull entity
00108     // const oxyVec3& position of the collision
00109     // const oxyVec3& normal of the collision (magnitude equal to
00110     // penetration distance)
00111     CallbackList<void, HullComponent*, struct Entity*, const oxyVec3&,
00112         const oxyVec3&>
00113         m_onCollideEvent;
00114     // HullComponent* this hull
00115     // Entity* other hull entity
00116     // const oxyVec3& position of the bounce
00117     CallbackList<void, HullComponent*, struct Entity*, const oxyVec3&>
00118         m_onBounceEvent;
00119
00120     CollisionHull m_hull;
00121     oxyVec3 m_velocity{};
00122     oxyF32 m_gravityPerSecond{};
00123     oxyF32 m_drag{};
00124     oxyBool m_solid{true};
00125     oxyF32 m_bounceVelocityMultiplier{1.f};
00126     CollisionResponseType m_response{
00127         CollisionResponseType::CollisionResponseType_Bounce};
00128     std::vector<std::weak_ptr<const struct Entity>> m_ignoreEntities;
00129 };
00130 }; // namespace oxygen

```

## 7.19 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/↵ Component/Pawn/Pawn.cc File Reference

```

#include "OxygenPCH.h"
#include "Pawn.h"
#include "World/World.h"
#include "Entity/Entity.h"
#include "Component/HullComponent/HullComponent.h"
#include "Component/CameraComponent/CameraComponent.h"
#include "Component/AnimatedMeshComponent/AnimatedMeshComponent.h"
#include "Component/WeaponComponent/WeaponComponent.h"
#include "Component/HealthComponent/HealthComponent.h"
#include "Net/NetSystem.h"
#include "Input/InputManager.h"
#include "Gfx/GfxRenderer.h"
#include "Platform/Platform.h"

```

### Namespaces

- namespace [oxygen](#)

## 7.20 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/Pawn/Pawn.h File Reference

```
#include "Component/Component.h"
```

### Classes

- struct [oxygen::Pawn](#)

### Namespaces

- namespace [oxygen](#)

### Enumerations

- enum [oxygen::PawnState](#) { [oxygen::PawnState\\_Ground](#) , [oxygen::PawnState\\_Void](#) }
- enum [oxygen::PawnStance](#) { [oxygen::PawnStance\\_Stand](#) , [oxygen::PawnStance\\_Crouch](#) , [oxygen::PawnStance\\_Prone](#) }

## 7.21 Pawn.h

[Go to the documentation of this file.](#)

```
00001 #pragma once
00002
00003 #include "Component/Component.h"
00004
00005 namespace oxygen
00006 {
00007     enum PawnState
00008     {
00009         PawnState_Ground,
00010         PawnState_Void,
00011     };
00012
00013     enum PawnStance
00014     {
00015         PawnStance_Stand,
00016         PawnStance_Crouch,
00017         PawnStance_Prone,
00018     };
00019
00020     struct Pawn final : Component
00021     {
00022         OXYGENOBJECT(Pawn, Component);
00023
00024         auto GetState() const -> PawnState
00025         {
00026             return m_state;
00027         }
00028         auto GetStance() const -> PawnStance
00029         {
00030             return m_stance;
00031         }
00032
00033         auto GetEquippedWeapon() const
00034             -> const std::shared_ptr<struct WeaponComponent>&
00035         {
00036             return m_equippedWeapon;
00037         }
00038
00039         auto GetEquippedRightHandedWeapon() const
00040             -> const std::shared_ptr<struct WeaponComponent>&
00041         {
```

```

00042         return m_rightHandEquippedWeapon;
00043     }
00044
00045 protected:
00046     auto Update(oxyF32 deltaTimeSeconds) -> void override;
00047     auto Render() const -> void override;
00048
00049 private:
00050     auto SetState(PawnState state) -> void
00051     {
00052         m_state = state;
00053     }
00054     auto SetStance(PawnStance stance) -> void
00055     {
00056         m_stance = stance;
00057     }
00058
00059     auto ParseInput() -> void;
00060
00061     auto GroundStateUpdate(oxyF32 deltaTimeSeconds,
00062                             struct Entity& ent) -> void;
00063     auto VoidStateUpdate(oxyF32 deltaTimeSeconds,
00064                           struct Entity& ent) -> void;
00065
00066     auto GetStanceVelocity() const -> oxyF32;
00067
00068     auto HealthStateChanged(struct HealthComponent* comp,
00069                             struct Entity* ent, HealthState state) -> void;
00070
00071     oxyBool m_localControl{};
00072     oxyVec2 m_moveVector{};
00073     oxyVec2 m_lookVector{};
00074     oxyBool m_dropInputPressed{};
00075     oxyBool m_fireInputDown{};
00076     oxyBool m_fire2InputDown{};
00077     oxyBool m_reloadInputDown{};
00078     oxyF32 m_timeDead{};
00079
00080     PawnState m_state{PawnState_Ground};
00081     PawnStance m_stance{PawnStance_Stand};
00082
00083     std::shared_ptr<struct WeaponComponent> m_equippedWeapon;
00084     std::shared_ptr<struct WeaponComponent> m_rightHandEquippedWeapon;
00085     std::shared_ptr<struct WeaponComponent> m_lastDroppedWeapon;
00086     oxyF32 m_weaponDropHistoryClearTimer{};
00087     oxyVec3 m_lastGroundStateUpdatePosition{};
00088
00089     std::shared_ptr<struct AnimatedMeshComponent> m_thirdPersonMesh;
00090     std::shared_ptr<struct AnimatedMeshComponent> m_firstPersonMesh;
00091
00092     std::shared_ptr<struct HullComponent> m_hull;
00093     std::shared_ptr<struct CameraComponent> m_camera;
00094     std::shared_ptr<struct HealthComponent> m_health;
00095
00096     auto
00097     PickupWeapon(std::shared_ptr<struct WeaponComponent> weapon) -> void;
00098     auto DropWeaponNetWrap() -> void;
00099     auto DropWeaponImpl() -> void;
00100
00101     auto HostHullCollideEvent(HullComponent* hull, Entity* other,
00102                               const oxyVec3& position,
00103                               const oxyVec3& normal) -> void;
00104
00105     friend struct GameManager;
00106     friend struct WeaponComponent;
00107 };
00108 }; // namespace oxygen

```

## 7.22 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/↵ Component/PickupComponent/PickupComponent.cc File Reference

```

#include "OxygenPCH.h"
#include "PickupComponent.h"
#include "Entity/Entity.h"
#include "Component/Pawn/Pawn.h"
#include "Component/HullComponent/HullComponent.h"

```

```
#include "Net/NetSystem.h"
```

#### Namespaces

- namespace [oxygen](#)

### 7.23 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/ProjectileComponent/ProjectileComponent.cc File Reference

```
#include "OxygenPCH.h"
#include "ProjectileComponent.h"
#include "Entity/Entity.h"
#include "World/World.h"
#include "Component/HullComponent/HullComponent.h"
#include "Component/HealthComponent/HealthComponent.h"
#include "Net/NetSystem.h"
```

#### Namespaces

- namespace [oxygen](#)

### 7.24 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/ProjectileComponent/ProjectileComponent.h File Reference

```
#include "Component/Component.h"
```

#### Classes

- struct [oxygen::ProjectileComponent](#)

#### Namespaces

- namespace [oxygen](#)

## 7.25 ProjectileComponent.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002
00003 #include "Component/Component.h"
00004
00005 namespace oxygen
00006 {
00007     struct ProjectileComponent final : Component
00008     {
00009         OXYGENOBJECT(ProjectileComponent, Component);
00010
00011         auto SetBouncesLeft(oxyS32 bounces) -> void
00012         {
00013             m_bouncesRemaining = bounces;
00014         }
00015         auto SetDamage(oxyF32 damage) -> void
00016         {
00017             m_damage = damage;
00018         }
00019         auto SetDamageRadius(oxyF32 radius) -> void
00020         {
00021             m_damageRadius = radius;
00022         }
00023
00024     protected:
00025         auto Update(oxyF32 deltaTimeSeconds) -> void override;
00026
00027     private:
00028         auto SetHull(std::shared_ptr<struct HullComponent> hull) -> void;
00029         friend struct GameManager; // ^^^^
00030
00031         auto OnBounce(struct HullComponent* hull, struct Entity* other,
00032             const oxyVec3& position) -> void;
00033
00034         auto Explode() -> void;
00035
00036         std::shared_ptr<struct HullComponent> m_hull;
00037         oxyS32 m_bouncesRemaining;
00038         oxyF32 m_damage;
00039         oxyF32 m_damageRadius;
00040         oxyVec3 m_spinEuler{10.f, 0.f, 0.f};
00041     };
00042 } // namespace oxygen

```

## 7.26 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/↵ Component/StaticMeshComponent/StaticMeshComponent.cc File Reference

```

#include "OxygenPCH.h"
#include "StaticMeshComponent.h"
#include "Entity/Entity.h"
#include "Resources/ResourceManager.h"
#include "Resources/StaticMeshResource.h"
#include "Gfx/GfxRenderer.h"
#include "Platform/Platform.h"

```

### Namespaces

- namespace [oxygen](#)



## 7.27 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/StaticMeshComponent/StaticMeshComponent.h File Reference

```
#include "Component/Component.h"
```

### Classes

- struct [oxygen::StaticMeshComponent](#)

### Namespaces

- namespace [oxygen](#)

## 7.28 StaticMeshComponent.h

[Go to the documentation of this file.](#)

```
00001 #pragma once
00002
00003 #include "Component/Component.h"
00004
00005 namespace oxygen
00006 {
00007     struct StaticMeshResource;
00008
00009     struct StaticMeshComponent final : Component
00010     {
00011         OXYGENOBJECT(StaticMeshComponent, Component);
00012
00013         auto LoadByName(std::string_view name) -> oxyBool;
00014
00015         auto SetLocalOffset(const oxyVec3& offset) -> void
00016         {
00017             m_localOffset = offset;
00018         }
00019
00020     protected:
00021         auto Render() const -> void override;
00022
00023     private:
00024         oxyVec3 m_localOffset{};
00025         std::shared_ptr<const StaticMeshResource> m_resource;
00026         std::shared_ptr<const struct GfxTexture> m_texture;
00027     };
00028 }; // namespace oxygen
```

## 7.29 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Component/WeaponComponent/WeaponComponent.cc File Reference

```
#include "OxygenPCH.h"
#include "WeaponComponent.h"
#include "Entity/Entity.h"
#include "Component/Pawn/Pawn.h"
#include "Component/HullComponent/HullComponent.h"
#include "Component/CameraComponent/CameraComponent.h"
#include "GameManager/GameManager.h"
#include "Net/NetSystem.h"
```

## Namespaces

- namespace [oxygen](#)

## 7.30 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/↵ Component/WeaponComponent/WeaponComponent.h File Reference

```
#include "Component/Component.h"
```

## Classes

- struct [oxygen::WeaponComponent](#)

## Namespaces

- namespace [oxygen](#)

## 7.31 WeaponComponent.h

[Go to the documentation of this file.](#)

```
00001 #pragma once
00002
00003 #include "Component/Component.h"
00004
00005 namespace oxygen
00006 {
00007     struct WeaponComponent final : Component
00008     {
00009         OXYGENOBJECT(WeaponComponent, Component);
00010
00011         auto HasInfiniteReserve() const -> oxyBool
00012         {
00013             return m_infiniteReserve;
00014         }
00015         auto HasInfiniteClip() const -> oxyBool
00016         {
00017             return m_infiniteClip;
00018         }
00019         auto GetReserveAmmo() const -> oxyU32
00020         {
00021             return m_reserveAmmo;
00022         }
00023         auto GetClipAmmo() const -> oxyU32
00024         {
00025             return m_clipAmmo;
00026         }
00027         auto GetMaxClipAmmo() const -> oxyU32
00028         {
00029             return m_maxClipAmmo;
00030         }
00031         auto GetMaxReserveAmmo() const -> oxyU32
00032         {
00033             return m_maxReserveAmmo;
00034         }
00035         auto GetBulletsPerShot() const -> oxyU32
00036         {
00037             return m_bulletsPerShot;
00038         }
00039         auto GetRPM() const -> oxyU32
00040         {
00041             return m_rpm;
```

```

00042     }
00043     auto GetTimeToReload() const -> oxyF32
00044     {
00045         return m_timeToReload;
00046     }
00047     auto GetSpreadRadians() const -> oxyVec2
00048     {
00049         return m_spreadRadians;
00050     }
00051     auto GetFireType() const -> WeaponFireType
00052     {
00053         return m_fireType;
00054     }
00055     auto GetDestroyOnFire() const -> oxyBool
00056     {
00057         return m_destroyOnFire;
00058     }
00059     auto GetRightHanded() const -> oxyBool
00060     {
00061         return m_rightHanded;
00062     }
00063     auto GetCanDrop() const -> oxyBool
00064     {
00065         return m_canDrop;
00066     }
00067
00068     auto SetInfiniteReserve(oxyBool infinite) -> void
00069     {
00070         m_infiniteReserve = infinite;
00071     }
00072     auto SetInfiniteClip(oxyBool infinite) -> void
00073     {
00074         m_infiniteClip = infinite;
00075     }
00076     auto SetReserveAmmo(oxyU32 ammo) -> void
00077     {
00078         m_reserveAmmo = ammo;
00079     }
00080     auto SetClipAmmo(oxyU32 ammo) -> void
00081     {
00082         m_clipAmmo = ammo;
00083     }
00084     auto SetMaxClipAmmo(oxyU32 ammo) -> void
00085     {
00086         m_maxClipAmmo = ammo;
00087     }
00088     auto SetMaxReserveAmmo(oxyU32 ammo) -> void
00089     {
00090         m_maxReserveAmmo = ammo;
00091     }
00092     auto SetBulletsPerShot(oxyU32 bullets) -> void
00093     {
00094         m_bulletsPerShot = bullets;
00095     }
00096     auto SetRPM(oxyU32 rpm) -> void
00097     {
00098         m_rpm = rpm;
00099     }
00100     auto SetTimeToReload(oxyF32 time) -> void
00101     {
00102         m_timeToReload = time;
00103     }
00104     auto SetSpreadRadians(oxyVec2 spread) -> void
00105     {
00106         m_spreadRadians = spread;
00107     }
00108     auto SetFireType(WeaponFireType type) -> void
00109     {
00110         m_fireType = type;
00111     }
00112     auto SetDestroyOnFire(oxyBool destroy) -> void
00113     {
00114         m_destroyOnFire = destroy;
00115     }
00116     auto SetRightHanded(oxyBool right) -> void
00117     {
00118         m_rightHanded = right;
00119     }
00120     auto SetCanDrop(oxyBool canDrop) -> void
00121     {
00122         m_canDrop = canDrop;
00123     }
00124
00125 protected:
00126     auto Update(oxyF32 deltaTimeSeconds) -> void override;
00127
00128 private:

```

```

00129         oxyBool m_infiniteReserve{false};
00130         oxyBool m_infiniteClip{false};
00131         oxyU32 m_reserveAmmo{0};
00132         oxyU32 m_clipAmmo{0};
00133         oxyU32 m_maxClipAmmo{0};
00134         oxyU32 m_maxReserveAmmo{0};
00135         oxyU32 m_bulletsPerShot{1};
00136         oxyU32 m_rpm{60};
00137         oxyF32 m_timeToReload{};
00138         oxyVec2 m_spreadRadians{};
00139         WeaponFireType m_fireType{WeaponFireType_Count};
00140         oxyBool m_destroyOnFire{};
00141         oxyBool m_rightHanded{};
00142         oxyBool m_canDrop{};
00143
00144         std::weak_ptr<struct Pawn> m_owner;
00145
00146         oxyBool m_fireInputDown{};
00147         oxyBool m_fire2InputDown{};
00148         oxyBool m_reloadInputDown{};
00149
00150         oxyF32 m_timeSinceLastShot{};
00151         oxyF32 m_reloadTimer{};
00152
00153         oxyBool m_reloading{};
00154
00155
00156
00157         oxyVec3 m_weaponFireDirectionEuler{};
00158
00159         auto OnPickedUp(std::shared_ptr<struct Pawn> pawn) -> void;
00160         auto OnDropped() -> void;
00161         auto SetFireInputDown(oxyBool pressed) -> void;
00162         auto SetFire2InputDown(oxyBool pressed) -> void;
00163         auto SetReloadInputDown(oxyBool pressed) -> void;
00164         friend struct Pawn; // ^^
00165
00166         auto FireInDirectionFromPos(const oxyVec3& euler, const oxyVec3& pos) -> void;
00167
00168         auto Fire() -> void;
00169         friend struct GameManager; // ^^
00170         // ugh there's a lot of friends everywhere!!!!!!!
00171
00172         auto RandomSpreadAngles() const -> oxyVec2;
00173
00174         auto BeginReload() -> void;
00175         auto ReloadEnded() -> void;
00176
00177         auto ResetStateAndTimers() -> void;
00178     };
00179 }; // namespace oxygen

```

## 7.32 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Containers/SPSCQueue.h File Reference

### Classes

- struct `oxygen::SPSCQueue< T, N >`

### Namespaces

- namespace `oxygen`

## 7.33 SPSCQueue.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002
00003 namespace oxygen

```

```

00004 {
00005     template <typename T, int N> struct SPSCQueue
00006     {
00007         static_assert(N > 0, "Queue size must be greater than 0");
00008
00009         SPSCQueue() : m_writePosition(0), m_readPosition(0)
00010         {
00011         }
00012
00013         template <typename T> auto TryPush(T&& value) -> bool
00014         {
00015             const auto writeIndex =
00016                 m_writePosition.load(std::memory_order_relaxed);
00017             const auto nextWriteIndex = (writeIndex + 1) % N;
00018
00019             if (nextWriteIndex ==
00020                 m_readPosition.load(std::memory_order_acquire))
00021                 return false;
00022
00023             m_items[writeIndex] = std::forward<T>(value);
00024             m_writePosition.store(nextWriteIndex, std::memory_order_release);
00025             return true;
00026         }
00027
00028         auto TryPop(T& valueOut) -> bool
00029         {
00030             const auto readIndex =
00031                 m_readPosition.load(std::memory_order_relaxed);
00032
00033             if (readIndex == m_writePosition.load(std::memory_order_acquire))
00034                 return false;
00035
00036             // IMPORTANT:
00037             // This pop CANNOT modify any data in the items array
00038             // god forbid there is a mutable member...
00039             valueOut = T{static_cast<const T&>(m_items[readIndex])};
00040             m_readPosition.store((readIndex + 1) % N,
00041                                 std::memory_order_release);
00042             return true;
00043         }
00044
00045     private:
00046         alignas(128) std::array<T, N> m_items;
00047         std::atomic<int> m_writePosition;
00048         std::atomic<int> m_readPosition;
00049         oxyU8 m_padding[128];
00050     };
00051 }; // namespace oxygen

```

## 7.34 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Entity/Entity.cc File Reference ↩

```

#include "OxygenPCH.h"
#include "Entity.h"
#include "Component/Component.h"
#include "World/World.h"

```

### Namespaces

- namespace [oxygen](#)

## 7.35 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Entity/Entity.h File Reference ↩

### Classes

- struct [oxygen::EntityHierarchy](#)
- struct [oxygen::Entity](#)

## Namespaces

- namespace [oxygen](#)

## Enumerations

- enum [oxygen::EntityFlags](#) : oxyU32 {  
[oxygen::EntityFlags\\_Disabled](#) = 1 << 0, [oxygen::EntityFlags\\_Static](#) = 1 << 1, [oxygen::EntityFlags\\_Dynamic](#) = 1 << 2, [oxygen::EntityFlags\\_Renderable](#) = 1 << 3,  
[oxygen::EntityFlags\\_HasHull](#) = 1 << 4, [oxygen::EntityFlags\\_HasCamera](#) = 1 << 5, [oxygen::EntityFlags\\_Replicated](#) = 1 << 6, [oxygen::EntityFlags\\_IsLocalPlayer](#) = 1 << 7,  
[oxygen::EntityFlags\\_EnableTransformReplication](#) = 1 << 8, [oxygen::EntityFlags\\_EnableTransformInterpolation](#) = 1 << 9 }

## 7.36 Entity.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002
00003 namespace oxygen
00004 {
00005     enum EntityFlags : oxyU32
00006     {
00007         EntityFlags_Disabled = 1 << 0,
00008         EntityFlags_Static = 1 << 1,
00009         EntityFlags_Dynamic = 1 << 2,
00010         EntityFlags_Renderable = 1 << 3,
00011         EntityFlags_HasHull = 1 << 4,
00012         EntityFlags_HasCamera = 1 << 5,
00013         EntityFlags_Replicated = 1 << 6,
00014         EntityFlags_IsLocalPlayer = 1 << 7,
00015         EntityFlags_EnableTransformReplication = 1 << 8,
00016         EntityFlags_EnableTransformInterpolation = 1 << 9,
00017     };
00018
00019     struct EntityHierarchy
00020     {
00021         std::shared_ptr<struct Entity> m_parent{};
00022         std::vector<std::shared_ptr<struct Entity>> m_children;
00023         std::weak_ptr<struct Entity> m_self{};
00024     };
00025
00026     struct Component;
00027     struct Entity final : ManagedObject
00028     {
00029         OXYGENOBJECT(Entity, ManagedObject);
00030
00031         auto GetLocalPosition() const -> const oxyVec3&
00032         {
00033             return m_localPosition;
00034         }
00035         auto GetLocalRotation() const -> const oxyQuat&
00036         {
00037             return m_localRotation;
00038         }
00039         auto GetLocalScale() const -> const oxyVec3&
00040         {
00041             return m_localScale;
00042         }
00043         auto GetWorldPosition() const -> oxyVec3;
00044         auto GetWorldRotation() const -> oxyQuat;
00045         auto GetWorldScale() const -> oxyVec3;
00046         auto GetWorldTransformMatrix() const -> oxyMat4x4;
00047         auto GetFlag(EntityFlags flag) const -> oxyBool
00048         {
00049             return static_cast<std::underlying_type_t<EntityFlags>>(m_flags) &
00050                    static_cast<std::underlying_type_t<EntityFlags>>(flag);
00051         }
00052         auto GetWorld() const -> std::shared_ptr<struct World>
00053         {
00054             return m_world.lock();
00055         }
00056         auto GetParent() const -> std::shared_ptr<Entity>

```

```

00057     {
00058         return m_hierarchy.m_parent;
00059     }
00060     auto GetRenderOcclusionMin() const -> const oxyVec3&
00061     {
00062         return m_renderOcclusionMin;
00063     }
00064     auto GetRenderOcclusionMax() const -> const oxyVec3&
00065     {
00066         return m_renderOcclusionMax;
00067     }
00068     auto SetLocalPosition(const oxyVec3& position) -> void
00069     {
00070         m_localPosition = position;
00071     }
00072     auto SetLocalRotation(const oxyQuat& rotation) -> void
00073     {
00074         m_localRotation = rotation;
00075     }
00076     auto SetLocalScale(const oxyVec3& scale) -> void
00077     {
00078         m_localScale = scale;
00079     }
00080     auto SetWorldPosition(const oxyVec3& position) -> void;
00081     auto SetWorldRotation(const oxyQuat& rotation) -> void;
00082     auto SetWorldScale(const oxyVec3& scale) -> void;
00083     auto SetFlag(EntityFlags flag, oxyBool state) -> void
00084     {
00085         if (state)
00086             m_flags = static_cast<EntityFlags>(
00087                 static_cast<std::underlying_type_t<EntityFlags>>(m_flags) |
00088                 static_cast<std::underlying_type_t<EntityFlags>>(flag));
00089         else
00090             m_flags = static_cast<EntityFlags>(
00091                 static_cast<std::underlying_type_t<EntityFlags>>(m_flags) &
00092                 ~static_cast<std::underlying_type_t<EntityFlags>>(flag));
00093     }
00094     auto SetRenderOcclusionMin(const oxyVec3& min) -> void
00095     {
00096         m_renderOcclusionMin = min;
00097     }
00098     auto SetRenderOcclusionMax(const oxyVec3& max) -> void
00099     {
00100         m_renderOcclusionMax = max;
00101     }
00102
00103     template <typename T>
00104     auto AddComponent(oxyObjectID id = 0) -> std::shared_ptr<T>
00105     {
00106         auto component =
00107             ObjectManager::GetInstance().CreateManagedObject<T>(id);
00108         component->m_entity = GetHardRef<Entity>();
00109         m_components.push_back(component);
00110
00111         return component;
00112     }
00113     template <typename T> auto GetComponent() const -> std::shared_ptr<T>
00114     {
00115         for (auto& component : m_components)
00116         {
00117             if (component->IsA<T>())
00118             {
00119                 return std::static_pointer_cast<T>(component);
00120             }
00121         }
00122         return nullptr;
00123     }
00124
00125     auto Destroy() -> void;
00126
00127     auto SetParent(std::shared_ptr<Entity> parent) -> void;
00128
00129     auto Update(oxyF32 deltaTimeSeconds) -> void;
00130     auto Render() const -> void;
00131
00132 private:
00133     oxyVec3 m_localPosition{};
00134     oxyQuat m_localRotation{0.f, 0.f, 0.f, 1.f};
00135     oxyVec3 m_localScale{1.f, 1.f, 1.f};
00136     EntityHierarchy m_hierarchy{};
00137     EntityFlags m_flags{};
00138     std::weak_ptr<struct World> m_world{};
00139     std::vector<std::shared_ptr<Component>> m_components{};
00140     oxyVec3 m_renderOcclusionMin{};
00141     oxyVec3 m_renderOcclusionMax{};
00142
00143     friend struct World;

```

```
00144     };  
00145 }; // namespace oxygen
```

### 7.37 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/GameManager/GameManager.cc File Reference

```
#include "OxygenPCH.h"  
#include "GameManager.h"  
#include "World/World.h"  
#include "World/WorldLoader.h"  
#include "Entity/Entity.h"  
#include "Component/Pawn/Pawn.h"  
#include "Component/AnimatedMeshComponent/AnimatedMeshComponent.h"  
#include "Component/StaticMeshComponent/StaticMeshComponent.h"  
#include "Component/WeaponComponent/WeaponComponent.h"  
#include "Component/HullComponent/HullComponent.h"  
#include "Component/CameraComponent/CameraComponent.h"  
#include "Component/ProjectileComponent/ProjectileComponent.h"  
#include "Component/HealthComponent/HealthComponent.h"  
#include "Net/NetSystem.h"  
#include "UI/UIManager.h"  
#include "Platform/Platform.h"
```

#### Namespaces

- namespace [oxygen](#)

### 7.38 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/GameManager/GameManager.h File Reference

```
#include "Singleton/Singleton.h"
```

#### Classes

- struct [oxygen::GameManager](#)

#### Namespaces

- namespace [oxygen](#)



## 7.39 GameManager.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002
00003 #include "Singleton/Singleton.h"
00004
00005 namespace oxygen
00006 {
00007     struct World;
00008     struct GameManager : SingletonBase<GameManager>
00009     {
00010         GameManager();
00011
00012         auto Render() -> void;
00013         auto Update(float deltaTimeSeconds) -> void;
00014
00015         auto HostSummonEntity(EntitySpawnType type, const oxyVec3& pos,
00016                               const oxyQuat& rot) -> std::shared_ptr<struct Entity>;
00017
00018         auto HostGame(std::string worldName) -> void;
00019
00020     private:
00021         friend struct NetSystem;
00022         auto HandlePacket(struct NetConnection& conn, oxyU16 type,
00023                           std::span<const oxyU8> data) -> void;
00024
00025         auto HostHandlePacket(struct NetConnection& conn, oxyU16 type,
00026                               std::span<const oxyU8> data) -> void;
00027         auto ClientHandlePacket(struct NetConnection& conn, oxyU16 type,
00028                                 std::span<const oxyU8> data) -> void;
00029
00030         auto ClientDisconnectedFromHost() -> void;
00031
00032         auto HostNewPeerConnected(struct NetConnection& conn) -> void;
00033         auto HostPeerDisconnected(struct NetConnection& conn) -> void;
00034
00035         auto SpawnEntityInWorld(
00036             EntitySpawnType type, const oxyVec3& pos, const oxyQuat& rot,
00037             std::vector<oxyObjectID>& ids) -> std::shared_ptr<struct Entity>;
00038
00039         auto SendPeerEntityHistory(struct NetConnection& conn) -> void;
00040
00041         auto HostSendEntityTransforms() -> void;
00042         auto ClientSendEntityTransforms() -> void;
00043
00044         auto InterpolateEntityTransforms(float deltaTimeSeconds) -> void;
00045
00046         struct PeerData
00047         {
00048             oxyBool m_loadedIn{};
00049             std::weak_ptr<struct Entity> m_localPlayer;
00050         };
00051         std::unordered_map<oxyU64, PeerData> m_peers;
00052
00053         struct InterpolateEntityTransformData
00054         {
00055             std::weak_ptr<struct Entity> m_entity;
00056             oxyVec3 m_latestPosition;
00057             oxyQuat m_latestRotation;
00058             oxyF32 m_timeSinceReceived{};
00059
00060             };
00061
00062             std::vector<InterpolateEntityTransformData>
00063             m_interpolateEntityTransforms;
00064
00065             std::string m_worldName;
00066             std::shared_ptr<World> m_world;
00067
00068             std::vector<std::tuple<EntitySpawnType, std::vector<oxyObjectID>, std::weak_ptr<struct
00069 Entity>>>
00070                 m_entitySpawnHistory;
00071
00072             oxyF32 m_timeUntilNextGolfclubSpawn{3.0f};
00073         };
00074     }; // namespace oxygen

```

## 7.40 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Gfx/Gfx↵ Renderer.cc File Reference

```
#include "OxygenPCH.h"
#include "GfxRenderer.h"
#include "GfxSoftwareRasterize.inl"
#include "GameManager/GameManager.h"
#include "UI/UIManager.h"
#include "Platform/Platform.h"
```

### Namespaces

- namespace [oxygen](#)

## 7.41 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Gfx/Gfx↵ Renderer.h File Reference

```
#include "Singleton/Singleton.h"
```

### Classes

- struct [oxygen::GfxTexture](#)
- struct [oxygen::GfxVertex](#)
- struct [oxygen::GfxTri](#)
- struct [oxygen::GfxRenderer](#)

### Namespaces

- namespace [oxygen](#)
- namespace [oxygen::GraphicsAbstraction](#)

### Enumerations

- enum [oxygen::GfxRenderStrategy](#) : oxyU8 { [oxygen::GfxRenderStrategy\\_DirectToGPU](#) = 0 , [oxygen::GfxRenderStrategy\\_SoftwareDepthRasterizePreSortedOverlay](#) , [oxygen::GfxRenderStrategy\\_SoftwareDepthRasterizePreSortedOverlay](#) }
- enum [oxygen::GfxCullType](#) { [oxygen::GfxCullType\\_None](#) = 0 , [oxygen::GfxCullType\\_Backface](#) = 1 , [oxygen::GfxCullType\\_Frontface](#) = 2 }

### Functions

- auto [oxygen::CullBackfaceTri](#) (const [GfxTri](#) &tri) -> bool
- auto [oxygen::CullFrontfaceTri](#) (const [GfxTri](#) &tri) -> bool

## 7.42 GfxRenderer.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002
00003 #include "Singleton/Singleton.h"
00004
00005 namespace oxygen
00006 {
00007     namespace GraphicsAbstraction
00008     {
00009         struct Texture;
00010     }; // namespace GraphicsAbstraction
00011
00012     struct GfxTexture
00013     {
00014         oxyU32 m_width;
00015         oxyU32 m_height;
00016         std::string m_texturePath;
00017         std::shared_ptr<const GraphicsAbstraction::Texture> m_texture;
00018     };
00019
00020     struct GfxVertex
00021     {
00022         oxyVec4 m_position;
00023         oxyVec2 m_uv;
00024     };
00025     enum GfxRenderStrategy : oxyU8
00026     {
00027         // Submit straight to the GPU, 2D only, no depth writes or tests, no
00028         // clipping, drawn after all 3d geometry, in the order submitted
00029         // Usage: 2D sprites, UI elements
00030         GfxRenderStrategy_DirectToGPU = 0,
00031         // Submit to GPU, write depth buffer w/o test,
00032         // clips against all six planes
00033         // Usage: BSP sorted 3D geometry
00034         GfxRenderStrategy_SoftwareDepthRasterizePreSorted,
00035
00036         // Submit to GPU immediately after paired PreSorted
00037         // clips against all six planes
00038         // Usage: BSP sorted 3D geometry
00039         GfxRenderStrategy_SoftwareDepthRasterizePreSortedOverlay,
00040
00041         // Write depth buffer w/ test,
00042         // submit to gpu in spans at the end of the frame,
00043         // clips against near and far planes
00044         // Usage: dynamic 3D geometry
00045         GfxRenderStrategy_SoftwareDepthRasterize,
00046     };
00047     enum GfxCullType
00048     {
00049         GfxCullType_None = 0,
00050         GfxCullType_Backface = 1,
00051         GfxCullType_Frontface = 2,
00052     };
00053     struct GfxTri
00054     {
00055         GfxVertex m_vertices[3];
00056         oxyVec3 m_colour;
00057         const GfxTexture* m_texture{};
00058         GfxCullType m_cullType;
00059     };
00060
00061     inline auto CullBackfaceTri(const GfxTri& tri) -> bool
00062     {
00063         return (tri.m_vertices[1].m_position - tri.m_vertices[0].m_position)
00064             .CrossProduct(tri.m_vertices[2].m_position -
00065                 tri.m_vertices[0].m_position)
00066             .z < 0;
00067     }
00068     inline auto CullFrontfaceTri(const GfxTri& tri) -> bool
00069     {
00070         return (tri.m_vertices[1].m_position - tri.m_vertices[0].m_position)
00071             .CrossProduct(tri.m_vertices[2].m_position -
00072                 tri.m_vertices[0].m_position)
00073             .z > 0;
00074     }
00075
00076     struct GfxRenderer : SingletonBase<GfxRenderer>
00077     {
00078         GfxRenderer();
00079         auto SetViewProjectionMatrix(const oxyMat4x4& viewProjectionMatrix)
00080             -> void
00081         {
00082             m_viewProjectionMatrix = viewProjectionMatrix;

```

```

00083     }
00084     auto GetViewProjectionMatrix() const -> const oxyMat4x4&
00085     {
00086         return m_viewProjectionMatrix;
00087     }
00088
00089     auto GetWidth() const -> oxyS32
00090     {
00091         return m_width;
00092     }
00093     auto GetHeight() const -> oxyS32
00094     {
00095         return m_height;
00096     }
00097
00098     auto LoadTexture(std::string_view texturePath)
00099         -> std::shared_ptr<const GfxTexture>;
00100
00101     auto OverlayText(std::string_view text, oxyF32 blxndc, oxyF32 blyndc,
00102                     const oxyVec3& colour, oxyF32 spacing, oxyF32 size, oxyBool center) -> void;
00103     auto OverlayRect(const oxyVec3& col, const oxyVec2& minndc,
00104                     const oxyVec2& maxndc) -> void;
00105
00106     auto BeginFrame(oxyS32 w, oxyS32 h) -> void;
00107     auto EndFrame() -> void;
00108
00109     auto SubmitTriToQueue(const GfxTri& tri, GfxRenderStrategy mode, oxyF32 zmult = 1.0f)
00110         -> void;
00111 private:
00112     enum ClipCode
00113     {
00114         ClipCode_None = 0,
00115         ClipCode_Near = 1,
00116         ClipCode_Far = 2,
00117         ClipCode_Left = 4,
00118         ClipCode_Right = 8,
00119         ClipCode_Top = 16,
00120         ClipCode_Bottom = 32,
00121     };
00122     template <typename Fun>
00123     static auto ClipTri(const GfxTri& tri, ClipCode clipcode, Fun&& cb)
00124         -> void;
00125
00126     auto CullClipSpaceTri(const GfxTri& tri) -> bool;
00127
00128     auto ConvertTriToNDCAndCull(GfxTri& tri) -> bool;
00129
00130     auto DrawPreSortedTri(const GfxTri& tri) -> void;
00131
00132     auto DrawSpans(oxyU16 width, oxyU16 height) -> void;
00133     auto GetTriFromID(oxyS16 id) -> const GfxTri*;
00134     auto DrawSpan(const GfxTri& tri, oxyS32 y, oxyS32 x0, oxyS32 x1, oxyU16 fbwidth, oxyU16
fbheight)
00135         -> void;
00136
00137     auto HandleResize(oxyS32 w, oxyS32 h) -> void;
00138     oxyS32 m_width;
00139     oxyS32 m_height;
00140
00141     oxyS32 m_softwareWidth;
00142     oxyS32 m_softwareHeight;
00143
00144     oxyU64 m_frameCounter{};
00145
00146     std::unique_ptr<oxyF32[]> m_zbuffer;
00147     std::unique_ptr<oxyS16[]> m_tribuffer;
00148
00149     oxyMat4x4 m_viewProjectionMatrix;
00150
00151     std::unordered_map<std::size_t, std::weak_ptr<const GfxTexture>
m_textures;
00152
00153     std::shared_ptr<const GfxTexture> m_errorTexture;
00154     std::shared_ptr<const GfxTexture> m_whiteSolidTexture;
00155     std::shared_ptr<const GfxTexture> m_fontAtlasTexture;
00156     static inline constexpr auto k_fontAtlasBeginASCII = 32;
00157     static inline constexpr auto k_fontAtlasEndASCII = 127;
00158     static inline constexpr auto k_fontAtlasColumns = 16;
00159     static inline constexpr auto k_fontAtlasRows = 6;
00160
00161
00162     std::vector<GfxTri> m_triQueueSoftwareDepthRasterizePreSorted;
00163     std::vector<GfxTri> m_triQueueSoftwareDepthRasterizePreSortedOverlay;
00164     std::vector<GfxTri> m_triQueueSoftwareDepthRasterize;
00165     std::vector<GfxTri> m_triQueueDirectToGPU;
00166
00167     struct BBox
00168

```

```

00169     {
00170         oxyS32 m_x0;
00171         oxyS32 m_y0;
00172         oxyS32 m_x1;
00173         oxyS32 m_y1;
00174         oxyF32 m_maxDepth;
00175
00176         auto Overlaps(const BBox& other) const -> oxyBool;
00177         auto Expand(const BBox& other) -> oxyBool;
00178     };
00179
00180     auto NDCTriToBBox(const GfxTri& tri) -> BBox;
00181 };
00182 }; // namespace oxygen

```

## 7.43 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Gfx/GfxSoftwareRasterize.inl File Reference

### Classes

- struct [oxygen::GfxSoftwareRasterizer::CountingIterator< T >](#)

### Namespaces

- namespace [oxygen](#)
- namespace [oxygen::GfxSoftwareRasterizer](#)

### Functions

- auto [oxygen::GfxSoftwareRasterizer::RasterTriDepthTest](#) (const [GfxTri](#) &tri, [oxyS16](#) triID, [oxyU32](#) width, [oxyU32](#) height, [oxyF32](#) \*zbuffer, [oxyS16](#) \*tribuffer, [oxyU32](#) divminx, [oxyU32](#) divminy, [oxyU32](#) divmaxx, [oxyU32](#) divmaxy) -> [oxyBool](#)
- auto [oxygen::GfxSoftwareRasterizer::RasterTriNoDepthCompare](#) (const [GfxTri](#) &tri, [oxyU32](#) width, [oxyU32](#) height, [oxyF32](#) \*zbuffer, [oxyU32](#) divminx, [oxyU32](#) divminy, [oxyU32](#) divmaxx, [oxyU32](#) divmaxy) -> void

## 7.44 GfxSoftwareRasterize.inl

[Go to the documentation of this file.](#)

```

00001 namespace oxygen
00002 {
00003     namespace GfxSoftwareRasterizer
00004     {
00005         template <typename T> struct CountingIterator
00006         {
00007             using iterator_category = std::random_access_iterator_tag;
00008             using value_type = T;
00009             using difference_type = T;
00010             using pointer = T*;
00011             using reference = T&;
00012             const T& operator*() const
00013             {
00014                 return m_value;
00015             }
00016             CountingIterator& operator++()
00017             {
00018                 ++m_value;
00019                 return *this;
00020             }
00021             CountingIterator operator++(int)
00022             {
00023                 auto temp = *this;
00024                 ++*this;

```

```

00025         return temp;
00026     }
00027     CountingIterator& operator--()
00028     {
00029         --m_value;
00030         return *this;
00031     }
00032     CountingIterator operator--(int)
00033     {
00034         auto temp = *this;
00035         --*this;
00036         return temp;
00037     }
00038     CountingIterator& operator+=(const T& lhs)
00039     {
00040         m_value += lhs;
00041         return *this;
00042     }
00043     CountingIterator& operator-=(const T& lhs)
00044     {
00045         m_value -= lhs;
00046         return *this;
00047     }
00048     CountingIterator operator+(const T& lhs) const
00049     {
00050         auto temp = *this;
00051         temp += lhs;
00052         return temp;
00053     }
00054     CountingIterator operator-(const T& lhs) const
00055     {
00056         auto temp = *this;
00057         temp -= lhs;
00058         return temp;
00059     }
00060     bool operator==(const CountingIterator& lhs) const
00061     {
00062         return m_value == lhs.m_value;
00063     }
00064     bool operator!=(const CountingIterator& lhs) const
00065     {
00066         return m_value != lhs.m_value;
00067     }
00068     const T operator+(const CountingIterator& lhs) const
00069     {
00070         return m_value + lhs.m_value;
00071     }
00072     T operator-(const CountingIterator& lhs) const
00073     {
00074         return m_value - lhs.m_value;
00075     }
00076     T m_value;
00077 };
00078
00079 inline auto RasterTriDepthTest(const GfxTri& tri, oxyS16 triID,
00080                               oxyU32 width, oxyU32 height,
00081                               oxyF32* zbuffer, oxyS16* tribuffer, oxyU32 divminx, oxyU32
divminy, oxyU32 divmaxx, oxyU32 divmaxy)
00082     -> oxyBool
00083     {
00084         oxyBool rasteredany{};
00085         oxyVec2 screenSpaceVerts[3];
00086         for (auto i = 0; i < 3; ++i)
00087         {
00088             const auto& vert = tri.m_vertices[i];
00089             const auto x = (vert.m_position.x + 1.f) * 0.5f * width;
00090             const auto y = (1.f - vert.m_position.y) * 0.5f * height;
00091             screenSpaceVerts[i] = {std::ceilf(x), std::ceilf(y)};
00092         }
00093
00094         auto minx = std::max<oxyS16>(
00095             std::min<oxyS16>({static_cast<oxyS16>(screenSpaceVerts[0].x),
00096                 static_cast<oxyS16>(screenSpaceVerts[1].x),
00097                 static_cast<oxyS16>(screenSpaceVerts[2].x)}),
00098             0);
00099         auto maxx = std::min<oxyS16>(
00100             std::max<oxyS16>({static_cast<oxyS16>(screenSpaceVerts[0].x),
00101                 static_cast<oxyS16>(screenSpaceVerts[1].x),
00102                 static_cast<oxyS16>(screenSpaceVerts[2].x)}),
00103             width - 1);
00104         auto miny = std::max<oxyS16>(
00105             std::min<oxyS16>({static_cast<oxyS16>(screenSpaceVerts[0].y),
00106                 static_cast<oxyS16>(screenSpaceVerts[1].y),
00107                 static_cast<oxyS16>(screenSpaceVerts[2].y)}),
00108             0);
00109         auto maxy = std::min<oxyS16>(
00110             std::max<oxyS16>({static_cast<oxyS16>(screenSpaceVerts[0].y),

```

```

00111                                     static_cast<oxyS16>(screenSpaceVerts[1].y),
00112                                     static_cast<oxyS16>(screenSpaceVerts[2].y)),
00113             height);
00114
00115         if ((maxx - minx) <= 0 || (maxy - miny) <= 0)
00116             return false;
00117
00118         // Clamp by divide region
00119
00120         if (minx >= static_cast<oxyS16>(divmaxx))
00121             return false;
00122         if (miny >= static_cast<oxyS16>(divmaxy))
00123             return false;
00124         if (maxx <= static_cast<oxyS16>(divminx))
00125             return false;
00126         if (maxy <= static_cast<oxyS16>(divminy))
00127             return false;
00128         minx = std::max<oxyS16>(minx, divminx);
00129         miny = std::max<oxyS16>(miny, divminy);
00130         maxx = std::min<oxyS16>(maxx, divmaxx);
00131         maxy = std::min<oxyS16>(maxy, divmaxy);
00132
00133
00134         const auto x10 = screenSpaceVerts[1].x - screenSpaceVerts[0].x;
00135         const auto x21 = screenSpaceVerts[2].x - screenSpaceVerts[1].x;
00136         const auto x02 = screenSpaceVerts[0].x - screenSpaceVerts[2].x;
00137         const auto y10 = screenSpaceVerts[1].y - screenSpaceVerts[0].y;
00138         const auto y21 = screenSpaceVerts[2].y - screenSpaceVerts[1].y;
00139         const auto y02 = screenSpaceVerts[0].y - screenSpaceVerts[2].y;
00140
00141         const auto area = x21 * y02 - x02 * y21;
00142         const auto invArea = 1.f / area;
00143
00144         std::for_each(
00145             std::execution::par_unseq, CountingIterator<int>(miny),
00146             CountingIterator<int>(maxy), [&](auto y) {
00147                 for (auto x = minx; x <= maxx; ++x)
00148                 {
00149                     const auto bw0cross =
00150                         x21 * (y - screenSpaceVerts[2].y) -
00151                         (x - screenSpaceVerts[2].x) * y21;
00152                     const auto bw1cross =
00153                         x02 * (y - screenSpaceVerts[0].y) -
00154                         (x - screenSpaceVerts[0].x) * y02;
00155                     const auto bw2cross =
00156                         x10 * (y - screenSpaceVerts[1].y) -
00157                         (x - screenSpaceVerts[1].x) * y10;
00158
00159                     const auto bw0crossbits =
00160                         std::bit_cast<oxyU32>(bw0cross);
00161                     const auto bw1crossbits =
00162                         std::bit_cast<oxyU32>(bw1cross);
00163                     const auto bw2crossbits =
00164                         std::bit_cast<oxyU32>(bw2cross);
00165
00166                     // If all sign bits are equal
00167                     if ((bw0crossbits & 0x80000000) ==
00168                         (bw1crossbits & 0x80000000) &&
00169                         (bw1crossbits & 0x80000000) ==
00170                         (bw2crossbits & 0x80000000))
00171                     {
00172                         const auto w0 = bw0cross * invArea;
00173                         const auto w1 = bw1cross * invArea;
00174                         const auto w2 = bw2cross * invArea;
00175
00176                         const auto z = w0 * tri.m_vertices[0].m_position.z +
00177                             w1 * tri.m_vertices[1].m_position.z +
00178                             w2 * tri.m_vertices[2].m_position.z;
00179                         const auto index = y * width + x;
00180                         if (zbuffer[index] > z)
00181                         {
00182                             zbuffer[index] = z;
00183                             tribuffer[index] = triID;
00184                             rasteredany = true;
00185                         }
00186                     }
00187                 }
00188             });
00189         return rasteredany;
00190     }
00191     inline auto RasterTriNoDepthCompare(const GfxTri& tri, oxyU32 width,
00192                                         oxyU32 height, oxyF32* zbuffer,
00193                                         oxyU32 divminx, oxyU32 divminy,
00194                                         oxyU32 divmaxx, oxyU32 divmaxy)
00195     -> void
00196     {
00197         oxyVec2 screenSpaceVerts[3];

```

```

00198     for (auto i = 0; i < 3; ++i)
00199     {
00200         const auto& vert = tri.m_vertices[i];
00201         const auto x = (vert.m_position.x + 1.f) * 0.5f * width;
00202         const auto y = (1.f - vert.m_position.y) * 0.5f * height;
00203         screenSpaceVerts[i] = {std::ceilf(x), std::ceilf(y)};
00204     }
00205
00206     auto minx = std::max<oxyS16>({
00207         std::min<oxyS16>({static_cast<oxyS16>(screenSpaceVerts[0].x),
00208             static_cast<oxyS16>(screenSpaceVerts[1].x),
00209             static_cast<oxyS16>(screenSpaceVerts[2].x)}),
00210         0);
00211     auto maxx = std::min<oxyS16>({
00212         std::max<oxyS16>({static_cast<oxyS16>(screenSpaceVerts[0].x),
00213             static_cast<oxyS16>(screenSpaceVerts[1].x),
00214             static_cast<oxyS16>(screenSpaceVerts[2].x)}),
00215         width - 1);
00216     auto miny = std::max<oxyS16>({
00217         std::min<oxyS16>({static_cast<oxyS16>(screenSpaceVerts[0].y),
00218             static_cast<oxyS16>(screenSpaceVerts[1].y),
00219             static_cast<oxyS16>(screenSpaceVerts[2].y)}),
00220         0);
00221     auto maxy = std::min<oxyS16>({
00222         std::max<oxyS16>({static_cast<oxyS16>(screenSpaceVerts[0].y),
00223             static_cast<oxyS16>(screenSpaceVerts[1].y),
00224             static_cast<oxyS16>(screenSpaceVerts[2].y)}),
00225         height);
00226
00227     if ((maxx - minx) <= 0 || (maxy - miny) <= 0)
00228         return;
00229
00230     // Clamp by divide region
00231
00232     if (minx >= static_cast<oxyS16>(divmaxx))
00233         return;
00234     if (miny >= static_cast<oxyS16>(divmaxy))
00235         return;
00236     if (maxx <= static_cast<oxyS16>(divminx))
00237         return;
00238     if (maxy <= static_cast<oxyS16>(divminy))
00239         return;
00240     minx = std::max<oxyS16>(minx, divminx);
00241     miny = std::max<oxyS16>(miny, divminy);
00242     maxx = std::min<oxyS16>(maxx, divmaxx);
00243     maxy = std::min<oxyS16>(maxy, divmaxy);
00244
00245     const auto x10 = screenSpaceVerts[1].x - screenSpaceVerts[0].x;
00246     const auto x21 = screenSpaceVerts[2].x - screenSpaceVerts[1].x;
00247     const auto x02 = screenSpaceVerts[0].x - screenSpaceVerts[2].x;
00248     const auto y10 = screenSpaceVerts[1].y - screenSpaceVerts[0].y;
00249     const auto y21 = screenSpaceVerts[2].y - screenSpaceVerts[1].y;
00250     const auto y02 = screenSpaceVerts[0].y - screenSpaceVerts[2].y;
00251
00252     const auto area = x21 * y02 - x02 * y21;
00253     const auto invArea = 1.f / area;
00254
00255     std::for_each(
00256         std::execution::par_unseq, CountingIterator<int>(miny),
00257         CountingIterator<int>(maxy), [&](auto y) {
00258         for (auto x = minx; x <= maxx; ++x)
00259         {
00260             const auto bw0cross =
00261                 x21 * (y - screenSpaceVerts[2].y) -
00262                 (x - screenSpaceVerts[2].x) * y21;
00263             const auto bw1cross =
00264                 x02 * (y - screenSpaceVerts[0].y) -
00265                 (x - screenSpaceVerts[0].x) * y02;
00266             const auto bw2cross =
00267                 x10 * (y - screenSpaceVerts[1].y) -
00268                 (x - screenSpaceVerts[1].x) * y10;
00269
00270             const auto bw0crossbits =
00271                 std::bit_cast<oxyU32>(bw0cross);
00272             const auto bw1crossbits =
00273                 std::bit_cast<oxyU32>(bw1cross);
00274             const auto bw2crossbits =
00275                 std::bit_cast<oxyU32>(bw2cross);
00276
00277             // If all sign bits are equal
00278             if ((bw0crossbits & 0x80000000) ==
00279                 (bw1crossbits & 0x80000000) &&
00280                 (bw1crossbits & 0x80000000) ==
00281                 (bw2crossbits & 0x80000000))
00282             {
00283                 const auto w0 = bw0cross * invArea;
00284                 const auto w1 = bw1cross * invArea;

```



```
00285             const auto w2 = bw2cross * invArea;
00286
00287             const auto z = w0 * tri.m_vertices[0].m_position.z +
00288                 w1 * tri.m_vertices[1].m_position.z +
00289                 w2 * tri.m_vertices[2].m_position.z;
00290             const auto index = y * width + x;
00291             zbuffer[index] = z;
00292         }
00293     }
00294     });
00295 }
00296 }; // namespace GfxSoftwareRasterizer
00297 }; // namespace oxygen
```

## 7.45 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Input/↵ InputManager.cc File Reference

```
#include "OxygenPCH.h"
#include "InputManager.h"
#include "Platform/Platform.h"
```

### Namespaces

- namespace [oxygen](#)

## 7.46 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Input/↵ InputManager.h File Reference

```
#include "Singleton/Singleton.h"
```

### Classes

- struct [oxygen::InputManager](#)

### Namespaces

- namespace [oxygen](#)

## 7.47 InputManager.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002
00003 #include "Singleton/Singleton.h"
00004
00005 namespace oxygen
00006 {
00007     struct InputManager : SingletonBase<InputManager>
00008     {
00009         auto GetMousePosition() const -> const oxyVec2
00010         {
00011             return {m_mouseX, m_mouseY};
00012         }
00013         auto GetMouseDelta() const -> const oxyVec2
00014         {
00015             return {m_mouseDeltaX, m_mouseDeltaY};
00016         }
00017         auto IsKeyDown(KeyboardButton key) const -> oxyBool
00018         {
00019             return m_currentKeyStates[static_cast<size_t>(key)];
00020         }
00021         auto WasKeyDown(KeyboardButton key) const -> oxyBool
00022         {
00023             return m_previousKeyStates[static_cast<size_t>(key)];
00024         }
00025         auto IsMouseButtonDown(MouseButton button) const -> oxyBool
00026         {
00027             return m_currentMouseStates[static_cast<size_t>(button)];
00028         }
00029         auto WasMouseButtonDown(MouseButton button) const -> oxyBool
00030         {
00031             return m_previousMouseStates[static_cast<size_t>(button)];
00032         }
00033
00034         auto IsControllerConnected(oxyU8 controller) const -> oxyBool
00035         {
00036             OXYCHECK(controller < k_maxControllers);
00037             return m_controllerConnected[controller];
00038         }
00039
00040         auto IsControllerButtonDown(oxyU8 controller,
00041                                     ControllerButton button) const -> oxyBool
00042         {
00043             OXYCHECK(controller < k_maxControllers);
00044             return m_currentControllerStates[controller]
00045                 [static_cast<size_t>(button)];
00046         }
00047         auto WasControllerButtonDown(oxyU8 controller,
00048                                     ControllerButton button) const -> oxyBool
00049         {
00050             OXYCHECK(controller < k_maxControllers);
00051             return m_previousControllerStates[controller]
00052                 [static_cast<size_t>(button)];
00053         }
00054         auto GetControllerAxis(oxyU8 controller, ControllerAxis axis) const
00055             -> oxyF32
00056         {
00057             OXYCHECK(controller < k_maxControllers);
00058             return m_controllerAxisStates[controller]
00059                 [static_cast<size_t>(axis)];
00060         }
00061         auto GetPreviousControllerAxis(oxyU8 controller,
00062                                       ControllerAxis axis) const -> oxyF32
00063         {
00064             OXYCHECK(controller < k_maxControllers);
00065             return m_previousControllerAxisStates[controller]
00066                 [static_cast<size_t>(axis)];
00067         }
00068
00069         auto SetCursorLock(oxyBool lock) -> void
00070         {
00071             m_lockCursor = lock;
00072         }
00073
00074         auto Update() -> void;
00075
00076     private:
00077         std::bitset<KeyboardButton_Count> m_currentKeyStates;
00078         std::bitset<KeyboardButton_Count> m_previousKeyStates;
00079         std::bitset<MouseButton_Count> m_currentMouseStates;
00080         std::bitset<MouseButton_Count> m_previousMouseStates;
00081         oxyF32 m_mouseX{};
00082         oxyF32 m_mouseY{};

```

```

00083         oxyF32 m_mouseDeltaX{};
00084         oxyF32 m_mouseDeltaY{};
00085
00086         bool m_lockCursor{false};
00087
00088         static constexpr auto k_maxControllers{4};
00089         std::array<std::bitset<ControllerButton_Count>, k_maxControllers>
00090             m_currentControllerStates;
00091         std::array<std::bitset<ControllerButton_Count>, k_maxControllers>
00092             m_previousControllerStates;
00093         std::array<std::array<oxyF32, ControllerAxis_Count>, k_maxControllers>
00094             m_controllerAxisStates;
00095         std::array<std::array<oxyF32, ControllerAxis_Count>, k_maxControllers>
00096             m_previousControllerAxisStates;
00097         std::array<oxyBool, k_maxControllers> m_controllerConnected;
00098     };
00099 }; // namespace oxygen

```

## 7.48 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Math/Defs.h File Reference

### Classes

- struct [oxyVec2](#)
- struct [oxyVec3](#)
- struct [oxyVec4](#)
- struct [oxyMat4x4](#)
- struct [oxyQuat](#)

### Namespaces

- namespace [oxygen](#)
- namespace [oxygen::Math](#)

### Functions

- constexpr auto [operator-](#) (const [oxyVec2](#) &a) -> [oxyVec2](#)
- constexpr auto [operator+](#) (const [oxyVec2](#) &a, const [oxyVec2](#) &b) -> [oxyVec2](#)
- constexpr auto [operator-](#) (const [oxyVec2](#) &a, const [oxyVec2](#) &b) -> [oxyVec2](#)
- constexpr auto [operator\\*](#) (const [oxyVec2](#) &a, const [oxyVec2](#) &b) -> [oxyVec2](#)
- constexpr auto [operator/](#) (const [oxyVec2](#) &a, const [oxyVec2](#) &b) -> [oxyVec2](#)
- constexpr auto [operator\\*](#) (const [oxyVec2](#) &a, [oxyF32](#) b) -> [oxyVec2](#)
- constexpr auto [operator/](#) (const [oxyVec2](#) &a, [oxyF32](#) b) -> [oxyVec2](#)
- constexpr auto [operator-](#) (const [oxyVec3](#) &a) -> [oxyVec3](#)
- constexpr auto [operator+](#) (const [oxyVec3](#) &a, const [oxyVec3](#) &b) -> [oxyVec3](#)
- constexpr auto [operator-](#) (const [oxyVec3](#) &a, const [oxyVec3](#) &b) -> [oxyVec3](#)
- constexpr auto [operator\\*](#) (const [oxyVec3](#) &a, const [oxyVec3](#) &b) -> [oxyVec3](#)
- constexpr auto [operator/](#) (const [oxyVec3](#) &a, const [oxyVec3](#) &b) -> [oxyVec3](#)
- constexpr auto [operator\\*](#) (const [oxyVec3](#) &a, [oxyF32](#) b) -> [oxyVec3](#)
- constexpr auto [operator/](#) (const [oxyVec3](#) &a, [oxyF32](#) b) -> [oxyVec3](#)
- constexpr auto [operator-](#) (const [oxyVec4](#) &a) -> [oxyVec4](#)
- constexpr auto [operator+](#) (const [oxyVec4](#) &a, const [oxyVec4](#) &b) -> [oxyVec4](#)
- constexpr auto [operator-](#) (const [oxyVec4](#) &a, const [oxyVec4](#) &b) -> [oxyVec4](#)
- constexpr auto [operator\\*](#) (const [oxyVec4](#) &a, const [oxyVec4](#) &b) -> [oxyVec4](#)
- constexpr auto [operator/](#) (const [oxyVec4](#) &a, const [oxyVec4](#) &b) -> [oxyVec4](#)
- constexpr auto [operator\\*](#) (const [oxyVec4](#) &a, [oxyF32](#) b) -> [oxyVec4](#)

- constexpr auto [operator/](#) (const [oxyVec4](#) &a, [oxyF32](#) b) -> [oxyVec4](#)
- constexpr auto [operator\\*](#) (const [oxyVec4](#) &a, const [oxyMat4x4](#) &b) -> [oxyVec4](#)
- constexpr auto [operator\\*](#) (const [oxyMat4x4](#) &a, const [oxyMat4x4](#) &b) -> [oxyMat4x4](#)
- constexpr auto [operator\\*](#) (const [oxyMat4x4](#) &a, [oxyF32](#) b) -> [oxyMat4x4](#)
- constexpr auto [operator\\*](#) (const [oxyMat4x4](#) &a, const [oxyVec4](#) &b) -> [oxyVec4](#)
- constexpr auto [operator\\*](#) (const [oxyQuat](#) &a, const [oxyQuat](#) &b) -> [oxyQuat](#)
- constexpr auto [operator\\*](#) (const [oxyQuat](#) &a, const [oxyVec3](#) &b) -> [oxyVec3](#)
- constexpr auto [operator\\*](#) (const [oxyQuat](#) &a, [oxyF32](#) b) -> [oxyQuat](#)
- constexpr auto [operator-](#) (const [oxyQuat](#) &a) -> [oxyQuat](#)
- constexpr auto [operator\\*](#) (const [oxyQuat](#) &a, const [oxyMat4x4](#) &b) -> [oxyMat4x4](#)
- constexpr auto [oxygen::Math::Translate](#) (const [oxyMat4x4](#) &m, const [oxyVec3](#) &v) -> [oxyMat4x4](#)
- constexpr auto [oxygen::Math::Rotate](#) (const [oxyMat4x4](#) &m, const [oxyQuat](#) &q) -> [oxyMat4x4](#)
- auto [oxygen::Math::Rotate](#) (const [oxyMat4x4](#) &m, [oxyF32](#) angle, const [oxyVec3](#) &axis) -> [oxyMat4x4](#)
- constexpr auto [oxygen::Math::Scale](#) (const [oxyMat4x4](#) &m, const [oxyVec3](#) &v) -> [oxyMat4x4](#)
- auto [oxygen::Math::LookAt](#) (const [oxyVec3](#) &eye, const [oxyVec3](#) &center, const [oxyVec3](#) &up) -> [oxyMat4x4](#)
- auto [oxygen::Math::Perspective](#) ([oxyF32](#) fovy, [oxyF32](#) aspect, [oxyF32](#) near, [oxyF32](#) far) -> [oxyMat4x4](#)
- auto [oxygen::Math::InverseMatrix](#) (const [oxyMat4x4](#) &m) -> [oxyMat4x4](#)
- auto [oxygen::Math::RotationMatrixToEuler](#) (const [oxyMat4x4](#) &m) -> [oxyVec3](#)
- auto [oxygen::Math::Slerp](#) (const [oxyQuat](#) &a, const [oxyQuat](#) &b, [oxyF32](#) t) -> [oxyQuat](#)
- auto [oxygen::Math::AngleAxisToQuat](#) (const [oxyF32](#) angle, const [oxyVec3](#) &axis) -> [oxyQuat](#)
- auto [oxygen::Math::QuatToEulerAngles](#) (const [oxyQuat](#) &q) -> [oxyVec3](#)
- auto [oxygen::Math::EulerAnglesToQuat](#) (const [oxyVec3](#) &v) -> [oxyQuat](#)
- auto [oxygen::Math::QuatLookAt](#) (const [oxyVec3](#) &position, const [oxyVec3](#) &where) -> [oxyQuat](#)
- auto [oxygen::Math::EulerForward](#) (const [oxyVec3](#) &euler) -> [oxyVec3](#)
- auto [oxygen::Math::ToHalfFloat](#) ([oxyF32](#) x) -> [oxyU16](#)
- auto [oxygen::Math::FromHalfFloat](#) ([oxyU16](#) x) -> [oxyF32](#)

## 7.48.1 Function Documentation

### 7.48.1.1 [operator\\*\(\)](#) [1/14]

```
auto operator* (
    const oxyMat4x4 & a,
    const oxyMat4x4 & b) -> oxyMat4x4 [inline], [constexpr]
```

### 7.48.1.2 [operator\\*\(\)](#) [2/14]

```
auto operator* (
    const oxyMat4x4 & a,
    const oxyVec4 & b) -> oxyVec4 [inline], [constexpr]
```

### 7.48.1.3 [operator\\*\(\)](#) [3/14]

```
auto operator* (
    const oxyMat4x4 & a,
    oxyF32 b) -> oxyMat4x4 [inline], [constexpr]
```

**7.48.1.4 operator\*() [4/14]**

```
auto operator* (  
    const oxyQuat & a,  
    const oxyMat4x4 & b) -> oxyMat4x4 [inline], [constexpr]
```

**7.48.1.5 operator\*() [5/14]**

```
auto operator* (  
    const oxyQuat & a,  
    const oxyQuat & b) -> oxyQuat [inline], [constexpr]
```

**7.48.1.6 operator\*() [6/14]**

```
auto operator* (  
    const oxyQuat & a,  
    const oxyVec3 & b) -> oxyVec3 [inline], [constexpr]
```

**7.48.1.7 operator\*() [7/14]**

```
auto operator* (  
    const oxyQuat & a,  
    oxyF32 b) -> oxyQuat [inline], [constexpr]
```

**7.48.1.8 operator\*() [8/14]**

```
auto operator* (  
    const oxyVec2 & a,  
    const oxyVec2 & b) -> oxyVec2 [inline], [constexpr]
```

**7.48.1.9 operator\*() [9/14]**

```
auto operator* (  
    const oxyVec2 & a,  
    oxyF32 b) -> oxyVec2 [inline], [constexpr]
```

**7.48.1.10 operator\*() [10/14]**

```
auto operator* (  
    const oxyVec3 & a,  
    const oxyVec3 & b) -> oxyVec3 [inline], [constexpr]
```

**7.48.1.11 operator\*() [11/14]**

```
auto operator* (  
    const oxyVec3 & a,  
    oxyF32 b) -> oxyVec3 [inline], [constexpr]
```

**7.48.1.12 operator\*() [12/14]**

```
auto operator* (
    const oxyVec4 & a,
    const oxyMat4x4 & b) -> oxyVec4 [inline], [constexpr]
```

**7.48.1.13 operator\*() [13/14]**

```
auto operator* (
    const oxyVec4 & a,
    const oxyVec4 & b) -> oxyVec4 [inline], [constexpr]
```

**7.48.1.14 operator\*() [14/14]**

```
auto operator* (
    const oxyVec4 & a,
    oxyF32 b) -> oxyVec4 [inline], [constexpr]
```

**7.48.1.15 operator+() [1/3]**

```
auto operator+ (
    const oxyVec2 & a,
    const oxyVec2 & b) -> oxyVec2 [inline], [constexpr]
```

**7.48.1.16 operator+() [2/3]**

```
auto operator+ (
    const oxyVec3 & a,
    const oxyVec3 & b) -> oxyVec3 [inline], [constexpr]
```

**7.48.1.17 operator+() [3/3]**

```
auto operator+ (
    const oxyVec4 & a,
    const oxyVec4 & b) -> oxyVec4 [inline], [constexpr]
```

**7.48.1.18 operator-() [1/7]**

```
auto operator- (
    const oxyQuat & a) -> oxyQuat [inline], [constexpr]
```

**7.48.1.19 operator-() [2/7]**

```
auto operator- (
    const oxyVec2 & a) -> oxyVec2 [inline], [constexpr]
```

**7.48.1.20 operator-() [3/7]**

```
auto operator- (
    const oxyVec2 & a,
    const oxyVec2 & b) -> oxyVec2 [inline], [constexpr]
```

**7.48.1.21 operator-() [4/7]**

```
auto operator- (
    const oxyVec3 & a) -> oxyVec3 [inline], [constexpr]
```

**7.48.1.22 operator-() [5/7]**

```
auto operator- (
    const oxyVec3 & a,
    const oxyVec3 & b) -> oxyVec3 [inline], [constexpr]
```

**7.48.1.23 operator-() [6/7]**

```
auto operator- (
    const oxyVec4 & a) -> oxyVec4 [inline], [constexpr]
```

**7.48.1.24 operator-() [7/7]**

```
auto operator- (
    const oxyVec4 & a,
    const oxyVec4 & b) -> oxyVec4 [inline], [constexpr]
```

**7.48.1.25 operator/() [1/6]**

```
auto operator/ (
    const oxyVec2 & a,
    const oxyVec2 & b) -> oxyVec2 [inline], [constexpr]
```

**7.48.1.26 operator/() [2/6]**

```
auto operator/ (
    const oxyVec2 & a,
    oxyF32 b) -> oxyVec2 [inline], [constexpr]
```

**7.48.1.27 operator/() [3/6]**

```
auto operator/ (
    const oxyVec3 & a,
    const oxyVec3 & b) -> oxyVec3 [inline], [constexpr]
```

**7.48.1.28 operator/() [4/6]**

```
auto operator/ (
    const oxyVec3 & a,
    oxyF32 b) -> oxyVec3 [inline], [constexpr]
```

**7.48.1.29 operator/() [5/6]**

```
auto operator/ (
    const oxyVec4 & a,
    const oxyVec4 & b) -> oxyVec4 [inline], [constexpr]
```

**7.48.1.30 operator/() [6/6]**

```
auto operator/ (
    const oxyVec4 & a,
    oxyF32 b) -> oxyVec4 [inline], [constexpr]
```

**7.49 Defs.h**

[Go to the documentation of this file.](#)

```
00001 #pragma once
00002
00003 struct oxyVec2;
00004 struct oxyVec3;
00005 struct oxyVec4;
00006 struct oxyQuat;
00007 struct oxyMat4x4;
00008
00009 namespace oxygen
00010 {
00011     namespace Math
00012     {
00013         static inline constexpr auto k_pi = 3.14159265358979323846f;
00014         static inline constexpr auto k_twoPi = 2.0f * k_pi;
00015         static inline constexpr auto k_halfPi = 0.5f * k_pi;
00016
00017         static inline constexpr auto k_radToDeg = 180.0f / k_pi;
00018         static inline constexpr auto k_degToRad = k_pi / 180.0f;
00019     }; // namespace Math
00020 }; // namespace oxygen
00021
00022 inline constexpr auto operator-(const oxyVec2& a) -> oxyVec2;
00023 inline constexpr auto operator+(const oxyVec2& a, const oxyVec2& b) -> oxyVec2;
00024 inline constexpr auto operator-(const oxyVec2& a, const oxyVec2& b) -> oxyVec2;
00025 inline constexpr auto operator*(const oxyVec2& a, const oxyVec2& b) -> oxyVec2;
00026 inline constexpr auto operator/(const oxyVec2& a, const oxyVec2& b) -> oxyVec2;
00027 inline constexpr auto operator*(const oxyVec2& a, oxyF32 b) -> oxyVec2;
00028 inline constexpr auto operator/(const oxyVec2& a, oxyF32 b) -> oxyVec2;
00029
00030 inline constexpr auto operator-(const oxyVec3& a) -> oxyVec3;
00031 inline constexpr auto operator+(const oxyVec3& a, const oxyVec3& b) -> oxyVec3;
00032 inline constexpr auto operator-(const oxyVec3& a, const oxyVec3& b) -> oxyVec3;
00033 inline constexpr auto operator*(const oxyVec3& a, const oxyVec3& b) -> oxyVec3;
00034 inline constexpr auto operator/(const oxyVec3& a, const oxyVec3& b) -> oxyVec3;
00035 inline constexpr auto operator*(const oxyVec3& a, oxyF32 b) -> oxyVec3;
00036 inline constexpr auto operator/(const oxyVec3& a, oxyF32 b) -> oxyVec3;
00037
00038 inline constexpr auto operator-(const oxyVec4& a) -> oxyVec4;
00039 inline constexpr auto operator+(const oxyVec4& a, const oxyVec4& b) -> oxyVec4;
00040 inline constexpr auto operator-(const oxyVec4& a, const oxyVec4& b) -> oxyVec4;
00041 inline constexpr auto operator*(const oxyVec4& a, const oxyVec4& b) -> oxyVec4;
00042 inline constexpr auto operator/(const oxyVec4& a, const oxyVec4& b) -> oxyVec4;
00043 inline constexpr auto operator*(const oxyVec4& a, oxyF32 b) -> oxyVec4;
00044 inline constexpr auto operator/(const oxyVec4& a, oxyF32 b) -> oxyVec4;
00045 inline constexpr auto operator*(const oxyVec4& a,
00046                                const oxyMat4x4& b) -> oxyVec4;
```



```

00047
00048 inline constexpr auto operator*(const oxyMat4x4& a,
00049                                 const oxyMat4x4& b) -> oxyMat4x4;
00050 inline constexpr auto operator*(const oxyMat4x4& a, oxyF32 b) -> oxyMat4x4;
00051 inline constexpr auto operator*(const oxyMat4x4& a,
00052                                 const oxyVec4& b) -> oxyVec4;
00053
00054 inline constexpr auto operator*(const oxyQuat& a, const oxyQuat& b) -> oxyQuat;
00055 inline constexpr auto operator*(const oxyQuat& a, const oxyVec3& b) -> oxyVec3;
00056 inline constexpr auto operator*(const oxyQuat& a, oxyF32 b) -> oxyQuat;
00057 inline constexpr auto operator-(const oxyQuat& a) -> oxyQuat;
00058 inline constexpr auto operator*(const oxyQuat& a,
00059                                 const oxyMat4x4& b) -> oxyMat4x4;
00060
00061 struct oxyVec2
00062 {
00063     constexpr oxyVec2() : x(0), y(0)
00064     {
00065     }
00066     constexpr oxyVec2(oxyF32 x, oxyF32 y) : x(x), y(y)
00067     {
00068     }
00069
00070     oxyF32 x, y;
00071
00072     constexpr auto MagnitudeSquared() const -> oxyF32
00073     {
00074         return x * x + y * y;
00075     }
00076     auto Magnitude() const -> oxyF32
00077     {
00078         return std::sqrtf(x * x + y * y);
00079     }
00080
00081     auto Normalized() const -> oxyVec2
00082     {
00083         oxyF32 mag = Magnitude();
00084         return {x / mag, y / mag};
00085     }
00086     auto Normalize() -> oxyVec2&
00087     {
00088         oxyF32 mag = Magnitude();
00089         x /= mag;
00090         y /= mag;
00091         return *this;
00092     }
00093
00094     constexpr auto DotProduct(const oxyVec2& other) const -> oxyF32
00095     {
00096         return x * other.x + y * other.y;
00097     }
00098
00099     constexpr auto CrossProduct(const oxyVec2& other) const -> oxyF32
00100     {
00101         return x * other.y - y * other.x;
00102     }
00103
00104     constexpr auto Conjugate() const -> oxyVec2
00105     {
00106         return {-x, -y};
00107     }
00108
00109     constexpr auto Inversed() const -> oxyVec2
00110     {
00111         return Conjugate() / (x * x + y * y);
00112     }
00113     constexpr auto Inverse() -> oxyVec2&
00114     {
00115         *this = Inversed();
00116         return *this;
00117     }
00118
00119     constexpr auto operator+=(const oxyVec2& other) -> oxyVec2&
00120     {
00121         *this = *this + other;
00122         return *this;
00123     }
00124     constexpr auto operator-=(const oxyVec2& other) -> oxyVec2&
00125     {
00126         *this = *this - other;
00127         return *this;
00128     }
00129     constexpr auto operator*=(const oxyVec2& other) -> oxyVec2&
00130     {
00131         *this = *this * other;
00132         return *this;
00133     }

```

```

00134     constexpr auto operator/=(const oxyVec2& other) -> oxyVec2&
00135     {
00136         *this = *this / other;
00137         return *this;
00138     }
00139     constexpr auto operator*=(oxyF32 other) -> oxyVec2&
00140     {
00141         *this = *this * other;
00142         return *this;
00143     }
00144     constexpr auto operator/=(oxyF32 other) -> oxyVec2&
00145     {
00146         *this = *this / other;
00147         return *this;
00148     }
00149 };
00150
00151 struct oxyVec3
00152 {
00153     constexpr oxyVec3() : x(0), y(0), z(0)
00154     {
00155     }
00156     constexpr oxyVec3(oxyF32 x, oxyF32 y, oxyF32 z) : x(x), y(y), z(z)
00157     {
00158     }
00159     constexpr oxyVec3(const oxyVec2& v, oxyF32 z) : x(v.x), y(v.y), z(z)
00160     {
00161     }
00162     oxyF32 x, y, z;
00163
00164     operator oxyVec2() const
00165     {
00166         return {x, y};
00167     }
00168
00169     constexpr auto MagnitudeSquared() const -> oxyF32
00170     {
00171         return x * x + y * y + z * z;
00172     }
00173     auto Magnitude() const -> oxyF32
00174     {
00175         return std::sqrtf(x * x + y * y + z * z);
00176     }
00177
00178     auto Normalized() const -> oxyVec3
00179     {
00180         const auto mag = Magnitude();
00181         return {x / mag, y / mag, z / mag};
00182     }
00183     auto Normalize() -> oxyVec3&
00184     {
00185         const auto mag = Magnitude();
00186         x /= mag;
00187         y /= mag;
00188         z /= mag;
00189         return *this;
00190     }
00191
00192     constexpr auto DotProduct(const oxyVec3& other) const -> oxyF32
00193     {
00194         return x * other.x + y * other.y + z * other.z;
00195     }
00196
00197     constexpr auto CrossProduct(const oxyVec3& other) const -> oxyVec3
00198     {
00199         return {y * other.z - z * other.y, z * other.x - x * other.z,
00200             x * other.y - y * other.x};
00201     }
00202
00203     constexpr auto Conjugate() const -> oxyVec3
00204     {
00205         return {-x, -y, z};
00206     }
00207
00208     constexpr auto Inversed() const -> oxyVec3
00209     {
00210         return Conjugate() / (x * x + y * y + z * z);
00211     }
00212     constexpr auto Inverse() -> oxyVec3&
00213     {
00214         *this = Inversed();
00215         return *this;
00216     }
00217
00218     constexpr auto operator+=(const oxyVec3& other) -> oxyVec3&
00219     {
00220         *this = *this + other;

```

```

00221         return *this;
00222     }
00223     constexpr auto operator--(const oxyVec3& other) -> oxyVec3&
00224     {
00225         *this = *this - other;
00226         return *this;
00227     }
00228     constexpr auto operator*=(const oxyVec3& other) -> oxyVec3&
00229     {
00230         *this = *this * other;
00231         return *this;
00232     }
00233     constexpr auto operator/=(const oxyVec3& other) -> oxyVec3&
00234     {
00235         *this = *this / other;
00236         return *this;
00237     }
00238     constexpr auto operator*=(oxyF32 other) -> oxyVec3&
00239     {
00240         *this = *this * other;
00241         return *this;
00242     }
00243     constexpr auto operator/=(oxyF32 other) -> oxyVec3&
00244     {
00245         *this = *this / other;
00246         return *this;
00247     }
00248 };
00249
00250 struct oxyVec4
00251 {
00252     constexpr oxyVec4() : x(0), y(0), z(0), w(0)
00253     {
00254     }
00255     constexpr oxyVec4(oxyF32 x, oxyF32 y, oxyF32 z, oxyF32 w)
00256         : x(x), y(y), z(z), w(w)
00257     {
00258     }
00259     constexpr oxyVec4(const oxyVec3& v, oxyF32 w) : x(v.x), y(v.y), z(v.z), w(w)
00260     {
00261     }
00262     constexpr oxyVec4(const oxyVec2& v, oxyF32 z, oxyF32 w)
00263         : x(v.x), y(v.y), z(z), w(w)
00264     {
00265     }
00266     oxyF32 x, y, z, w;
00267
00268     operator oxyVec3() const
00269     {
00270         return {x, y, z};
00271     }
00272     operator oxyVec2() const
00273     {
00274         return {x, y};
00275     }
00276
00277     constexpr auto MagnitudeSquared() const -> oxyF32
00278     {
00279         return x * x + y * y + z * z + w * w;
00280     }
00281     auto Magnitude() const -> oxyF32
00282     {
00283         return std::sqrtf(x * x + y * y + z * z + w * w);
00284     }
00285
00286     auto Normalized() const -> oxyVec4
00287     {
00288         const auto mag = Magnitude();
00289         return {x / mag, y / mag, z / mag, w / mag};
00290     }
00291     auto Normalize() -> oxyVec4&
00292     {
00293         const auto mag = Magnitude();
00294         x /= mag;
00295         y /= mag;
00296         z /= mag;
00297         w /= mag;
00298         return *this;
00299     }
00300
00301     constexpr auto DotProduct(const oxyVec4& other) const -> oxyF32
00302     {
00303         return x * other.x + y * other.y + z * other.z + w * other.w;
00304     }
00305
00306     constexpr auto Conjugate() const -> oxyVec4
00307     {

```

```

00308         return {-x, -y, -z, w};
00309     }
00310
00311     constexpr auto Inversed() const -> oxyVec4
00312     {
00313         return Conjugate() / (x * x + y * y + z * z + w * w);
00314     }
00315     constexpr auto Inverse() -> oxyVec4&
00316     {
00317         *this = Inversed();
00318         return *this;
00319     }
00320     constexpr auto CrossProduct(const oxyVec4& other) const -> oxyVec4
00321     {
00322         return {y * other.z - z * other.y, z * other.x - x * other.z,
00323             x * other.y - y * other.x, 0};
00324     }
00325
00326     constexpr auto operator+=(const oxyVec4& other) -> oxyVec4&
00327     {
00328         *this = *this + other;
00329         return *this;
00330     }
00331     constexpr auto operator-=(const oxyVec4& other) -> oxyVec4&
00332     {
00333         *this = *this - other;
00334         return *this;
00335     }
00336     constexpr auto operator*=(const oxyVec4& other) -> oxyVec4&
00337     {
00338         *this = *this * other;
00339         return *this;
00340     }
00341     constexpr auto operator/=(const oxyVec4& other) -> oxyVec4&
00342     {
00343         *this = *this / other;
00344         return *this;
00345     }
00346     constexpr auto operator*=(oxyF32 other) -> oxyVec4&
00347     {
00348         *this = *this * other;
00349         return *this;
00350     }
00351     constexpr auto operator/=(oxyF32 other) -> oxyVec4&
00352     {
00353         *this = *this / other;
00354         return *this;
00355     }
00356 };
00357
00358 struct oxyMat4x4
00359 {
00360     oxyF32 m[4][4];
00361
00362     constexpr auto Determinant() const -> oxyF32
00363     {
00364         return m[0][0] * m[1][1] * m[2][2] * m[3][3] +
00365             m[0][0] * m[1][2] * m[2][3] * m[3][1] +
00366             m[0][0] * m[1][3] * m[2][1] * m[3][2] +
00367             m[0][1] * m[1][0] * m[2][3] * m[3][2] +
00368             m[0][1] * m[1][2] * m[2][0] * m[3][3] +
00369             m[0][1] * m[1][3] * m[2][2] * m[3][0] +
00370             m[0][2] * m[1][0] * m[2][1] * m[3][3] +
00371             m[0][2] * m[1][1] * m[2][3] * m[3][0] +
00372             m[0][2] * m[1][3] * m[2][0] * m[3][1] +
00373             m[0][3] * m[1][0] * m[2][2] * m[3][1] +
00374             m[0][3] * m[1][1] * m[2][0] * m[3][2] +
00375             m[0][3] * m[1][2] * m[2][1] * m[3][0] -
00376             m[0][0] * m[1][1] * m[2][3] * m[3][2] -
00377             m[0][0] * m[1][2] * m[2][1] * m[3][3] -
00378             m[0][0] * m[1][3] * m[2][2] * m[3][1] -
00379             m[0][1] * m[1][0] * m[2][2] * m[3][3] -
00380             m[0][1] * m[1][2] * m[2][3] * m[3][0] -
00381             m[0][1] * m[1][3] * m[2][0] * m[3][2] -
00382             m[0][2] * m[1][0] * m[2][3] * m[3][1] -
00383             m[0][2] * m[1][1] * m[2][0] * m[3][3] -
00384             m[0][2] * m[1][3] * m[2][1] * m[3][0] -
00385             m[0][3] * m[1][0] * m[2][1] * m[3][2] -
00386             m[0][3] * m[1][1] * m[2][2] * m[3][0] -
00387             m[0][3] * m[1][2] * m[2][0] * m[3][1];
00388     }
00389
00390     constexpr auto Transposed() const -> oxyMat4x4
00391     {
00392         oxyMat4x4 result;
00393         for (int i = 0; i < 4; i++)
00394     
```

```

00395         for (int j = 0; j < 4; j++)
00396         {
00397             result.m[i][j] = m[j][i];
00398         }
00399     }
00400     return result;
00401 }
00402 constexpr auto Transpose() -> oxyMat4x4&
00403 {
00404     *this = Transposed();
00405     return *this;
00406 }
00407
00408 constexpr auto operator[](int i) -> oxyF32*
00409 {
00410     return m[i];
00411 }
00412 constexpr auto operator[](int i) const -> const oxyF32*
00413 {
00414     return m[i];
00415 }
00416
00417 constexpr auto operator*=(const oxyMat4x4& other) -> oxyMat4x4&
00418 {
00419     *this = *this * other;
00420     return *this;
00421 }
00422
00423 static inline constexpr auto Identity() -> oxyMat4x4
00424 {
00425     oxyMat4x4 result{};
00426     result.m[0][0] = 1;
00427     result.m[1][1] = 1;
00428     result.m[2][2] = 1;
00429     result.m[3][3] = 1;
00430     return result;
00431 }
00432 };
00433
00434 struct oxyQuat
00435 {
00436     oxyF32 x{0.0f}, y{0.0f}, z{0.0f}, w{1.0f};
00437
00438     constexpr auto MagnitudeSquared() const -> oxyF32
00439     {
00440         return x * x + y * y + z * z + w * w;
00441     }
00442     auto Magnitude() const -> oxyF32
00443     {
00444         return std::sqrtf(x * x + y * y + z * z + w * w);
00445     }
00446
00447     auto Normalized() const -> oxyQuat
00448     {
00449         const auto mag = Magnitude();
00450         return {x / mag, y / mag, z / mag, w / mag};
00451     }
00452     auto Normalize() -> oxyQuat&
00453     {
00454         const auto mag = Magnitude();
00455         x /= mag;
00456         y /= mag;
00457         z /= mag;
00458         w /= mag;
00459         return *this;
00460     }
00461
00462     constexpr auto DotProduct(const oxyQuat& other) const -> oxyF32
00463     {
00464         return x * other.x + y * other.y + z * other.z + w * other.w;
00465     }
00466
00467     constexpr auto Conjugate() const -> oxyQuat
00468     {
00469         return {-x, -y, -z, w};
00470     }
00471
00472     auto Inversed() const -> oxyQuat
00473     {
00474         const auto conj = Conjugate();
00475         const auto magsq = MagnitudeSquared();
00476         return {conj.x / magsq, conj.y / magsq, conj.z / magsq, conj.w / magsq};
00477     }
00478     auto Inverse() -> oxyQuat&
00479     {
00480         *this = Inversed();
00481         return *this;

```

```

00482     }
00483
00484     constexpr auto operator*=(const oxyQuat& other) -> oxyQuat&
00485     {
00486         *this = *this * other;
00487         return *this;
00488     }
00489 };
00490
00491 inline constexpr auto operator-(const oxyVec2& a) -> oxyVec2
00492 {
00493     return {-a.x, -a.y};
00494 }
00495 inline constexpr auto operator+(const oxyVec2& a, const oxyVec2& b) -> oxyVec2
00496 {
00497     return {a.x + b.x, a.y + b.y};
00498 }
00499 inline constexpr auto operator-(const oxyVec2& a, const oxyVec2& b) -> oxyVec2
00500 {
00501     return {a.x - b.x, a.y - b.y};
00502 }
00503 inline constexpr auto operator*(const oxyVec2& a, const oxyVec2& b) -> oxyVec2
00504 {
00505     return {a.x * b.x, a.y * b.y};
00506 }
00507 inline constexpr auto operator/(const oxyVec2& a, const oxyVec2& b) -> oxyVec2
00508 {
00509     return {a.x / b.x, a.y / b.y};
00510 }
00511 inline constexpr auto operator*(const oxyVec2& a, oxyF32 b) -> oxyVec2
00512 {
00513     return {a.x * b, a.y * b};
00514 }
00515 inline constexpr auto operator/(const oxyVec2& a, oxyF32 b) -> oxyVec2
00516 {
00517     return {a.x / b, a.y / b};
00518 }
00519
00520 inline constexpr auto operator-(const oxyVec3& a) -> oxyVec3
00521 {
00522     return {-a.x, -a.y, -a.z};
00523 }
00524 inline constexpr auto operator+(const oxyVec3& a, const oxyVec3& b) -> oxyVec3
00525 {
00526     return {a.x + b.x, a.y + b.y, a.z + b.z};
00527 }
00528 inline constexpr auto operator-(const oxyVec3& a, const oxyVec3& b) -> oxyVec3
00529 {
00530     return {a.x - b.x, a.y - b.y, a.z - b.z};
00531 }
00532 inline constexpr auto operator*(const oxyVec3& a, const oxyVec3& b) -> oxyVec3
00533 {
00534     return {a.x * b.x, a.y * b.y, a.z * b.z};
00535 }
00536 inline constexpr auto operator/(const oxyVec3& a, const oxyVec3& b) -> oxyVec3
00537 {
00538     return {a.x / b.x, a.y / b.y, a.z / b.z};
00539 }
00540 inline constexpr auto operator*(const oxyVec3& a, oxyF32 b) -> oxyVec3
00541 {
00542     return {a.x * b, a.y * b, a.z * b};
00543 }
00544 inline constexpr auto operator/(const oxyVec3& a, oxyF32 b) -> oxyVec3
00545 {
00546     return {a.x / b, a.y / b, a.z / b};
00547 }
00548
00549 inline constexpr auto operator-(const oxyVec4& a) -> oxyVec4
00550 {
00551     return {-a.x, -a.y, -a.z, -a.w};
00552 }
00553 inline constexpr auto operator+(const oxyVec4& a, const oxyVec4& b) -> oxyVec4
00554 {
00555     return {a.x + b.x, a.y + b.y, a.z + b.z, a.w + b.w};
00556 }
00557 inline constexpr auto operator-(const oxyVec4& a, const oxyVec4& b) -> oxyVec4
00558 {
00559     return {a.x - b.x, a.y - b.y, a.z - b.z, a.w - b.w};
00560 }
00561 inline constexpr auto operator*(const oxyVec4& a, const oxyVec4& b) -> oxyVec4
00562 {
00563     return {a.x * b.x, a.y * b.y, a.z * b.z, a.w * b.w};
00564 }
00565 inline constexpr auto operator/(const oxyVec4& a, const oxyVec4& b) -> oxyVec4
00566 {
00567     return {a.x / b.x, a.y / b.y, a.z / b.z, a.w / b.w};
00568 }

```

```

00569 inline constexpr auto operator*(const oxyVec4& a, oxyF32 b) -> oxyVec4
00570 {
00571     return {a.x * b, a.y * b, a.z * b, a.w * b};
00572 }
00573 inline constexpr auto operator/(const oxyVec4& a, oxyF32 b) -> oxyVec4
00574 {
00575     return {a.x / b, a.y / b, a.z / b, a.w / b};
00576 }
00577 inline constexpr auto operator*(const oxyVec4& a, const oxyMat4x4& b) -> oxyVec4
00578 {
00579     return {
00580         a.x * b.m[0][0] + a.y * b.m[1][0] + a.z * b.m[2][0] + a.w * b.m[3][0],
00581         a.x * b.m[0][1] + a.y * b.m[1][1] + a.z * b.m[2][1] + a.w * b.m[3][1],
00582         a.x * b.m[0][2] + a.y * b.m[1][2] + a.z * b.m[2][2] + a.w * b.m[3][2],
00583         a.x * b.m[0][3] + a.y * b.m[1][3] + a.z * b.m[2][3] + a.w * b.m[3][3]};
00584 }
00585
00586 inline constexpr auto operator*(const oxyMat4x4& a,
00587                                 const oxyMat4x4& b) -> oxyMat4x4
00588 {
00589     oxyMat4x4 result;
00590     for (int i = 0; i < 4; i++)
00591     {
00592         for (int j = 0; j < 4; j++)
00593         {
00594             result.m[i][j] = a.m[i][0] * b.m[0][j] + a.m[i][1] * b.m[1][j] +
00595                             a.m[i][2] * b.m[2][j] + a.m[i][3] * b.m[3][j];
00596         }
00597     }
00598     return result;
00599 }
00600 inline constexpr auto operator*(const oxyMat4x4& a, oxyF32 b) -> oxyMat4x4
00601 {
00602     oxyMat4x4 result = a;
00603     for (int i = 0; i < 4; i++)
00604     {
00605         for (int j = 0; j < 4; j++)
00606         {
00607             result.m[i][j] *= b;
00608         }
00609     }
00610     return result;
00611 }
00612 inline constexpr auto operator*(const oxyMat4x4& a, const oxyVec4& b) -> oxyVec4
00613 {
00614     oxyVec4 result;
00615     for (int i = 0; i < 4; i++)
00616     {
00617         result.x += a.m[i][0] * b.x;
00618         result.y += a.m[i][1] * b.y;
00619         result.z += a.m[i][2] * b.z;
00620         result.w += a.m[i][3] * b.w;
00621     }
00622     return result;
00623 }
00624
00625 inline constexpr auto operator*(const oxyQuat& a, const oxyQuat& b) -> oxyQuat
00626 {
00627     return {a.w * b.x + a.x * b.w + a.y * b.z - a.z * b.y,
00628         a.w * b.y - a.x * b.z + a.y * b.w + a.z * b.x,
00629         a.w * b.z + a.x * b.y - a.y * b.x + a.z * b.w,
00630         a.w * b.w - a.x * b.x - a.y * b.y - a.z * b.z};
00631 }
00632 inline constexpr auto operator*(const oxyQuat& a, const oxyVec3& b) -> oxyVec3
00633 {
00634     oxyQuat v = {b.x, b.y, b.z, 0};
00635     oxyQuat result = a * v * a.Conjugate();
00636     return {result.x, result.y, result.z};
00637 }
00638 inline constexpr auto operator*(const oxyQuat& a, oxyF32 b) -> oxyQuat
00639 {
00640     return {a.x * b, a.y * b, a.z * b, a.w * b};
00641 }
00642 inline constexpr auto operator-(const oxyQuat& a) -> oxyQuat
00643 {
00644     return {-a.x, -a.y, -a.z, -a.w};
00645 }
00646 inline constexpr auto operator*(const oxyQuat& a,
00647                                 const oxyMat4x4& b) -> oxyMat4x4
00648 {
00649     oxyMat4x4 result;
00650     result.m[0][0] = 1 - 2 * a.y * a.y - 2 * a.z * a.z;
00651     result.m[0][1] = 2 * a.x * a.y - 2 * a.z * a.w;
00652     result.m[0][2] = 2 * a.x * a.z + 2 * a.y * a.w;
00653     result.m[0][3] = 0;
00654     result.m[1][0] = 2 * a.x * a.y + 2 * a.z * a.w;
00655     result.m[1][1] = 1 - 2 * a.x * a.x - 2 * a.z * a.z;

```

```

00656     result.m[1][2] = 2 * a.y * a.z - 2 * a.x * a.w;
00657     result.m[1][3] = 0;
00658     result.m[2][0] = 2 * a.x * a.z - 2 * a.y * a.w;
00659     result.m[2][1] = 2 * a.y * a.z + 2 * a.x * a.w;
00660     result.m[2][2] = 1 - 2 * a.x * a.x - 2 * a.y * a.y;
00661     result.m[2][3] = 0;
00662     result.m[3][0] = 0;
00663     result.m[3][1] = 0;
00664     result.m[3][2] = 0;
00665     result.m[3][3] = 1;
00666     return result * b;
00667 }
00668
00669 namespace oxygen
00670 {
00671     namespace Math
00672     {
00673         inline constexpr auto Translate(const oxyMat4x4& m,
00674                                         const oxyVec3& v) -> oxyMat4x4
00675         {
00676             oxyMat4x4 result = m;
00677             result.m[3][0] += v.x;
00678             result.m[3][1] += v.y;
00679             result.m[3][2] += v.z;
00680             return result;
00681         }
00682         inline constexpr auto Rotate(const oxyMat4x4& m,
00683                                     const oxyQuat& q) -> oxyMat4x4
00684         {
00685             oxyMat4x4 result;
00686             result.m[0][0] = 1 - 2 * q.y * q.y - 2 * q.z * q.z;
00687             result.m[0][1] = 2 * q.x * q.y - 2 * q.z * q.w;
00688             result.m[0][2] = 2 * q.x * q.z + 2 * q.y * q.w;
00689             result.m[0][3] = 0;
00690             result.m[1][0] = 2 * q.x * q.y + 2 * q.z * q.w;
00691             result.m[1][1] = 1 - 2 * q.x * q.x - 2 * q.z * q.z;
00692             result.m[1][2] = 2 * q.y * q.z - 2 * q.x * q.w;
00693             result.m[1][3] = 0;
00694             result.m[2][0] = 2 * q.x * q.z - 2 * q.y * q.w;
00695             result.m[2][1] = 2 * q.y * q.z + 2 * q.x * q.w;
00696             result.m[2][2] = 1 - 2 * q.x * q.x - 2 * q.y * q.y;
00697             result.m[2][3] = 0;
00698             result.m[3][0] = 0;
00699             result.m[3][1] = 0;
00700             result.m[3][2] = 0;
00701             result.m[3][3] = 1;
00702             return result * m;
00703         }
00704         inline auto Rotate(const oxyMat4x4& m, oxyF32 angle,
00705                           const oxyVec3& axis) -> oxyMat4x4
00706         {
00707             const auto halfAngle = angle / 2;
00708             const auto s = std::sinf(halfAngle);
00709             const auto q = oxyQuat{axis.x * s, axis.y * s, axis.z * s,
00710                                   std::cosf(halfAngle)};
00711             return Rotate(m, q);
00712         }
00713         inline constexpr auto Scale(const oxyMat4x4& m,
00714                                    const oxyVec3& v) -> oxyMat4x4
00715         {
00716             oxyMat4x4 result = m;
00717             result.m[0][0] *= v.x;
00718             result.m[1][1] *= v.y;
00719             result.m[2][2] *= v.z;
00720             return result;
00721         }
00722         inline auto LookAt(const oxyVec3& eye, const oxyVec3& center,
00723                           const oxyVec3& up) -> oxyMat4x4
00724         {
00725             const auto f = (center - eye).Normalized();
00726             const auto s = up.CrossProduct(f).Normalized();
00727             const auto u = f.CrossProduct(s);
00728             oxyMat4x4 result{};
00729             result[0][0] = s.x;
00730             result[1][0] = s.y;
00731             result[2][0] = s.z;
00732             result[0][1] = u.x;
00733             result[1][1] = u.y;
00734             result[2][1] = u.z;
00735             result[0][2] = f.x;
00736             result[1][2] = f.y;
00737             result[2][2] = f.z;
00738             result[3][0] = -s.DotProduct(eye);
00739             result[3][1] = -u.DotProduct(eye);
00740             result[3][2] = -f.DotProduct(eye);
00741             result[3][3] = 1;
00742             return result;

```



```

00743     }
00744     inline auto Perspective(oxyF32 fovy, oxyF32 aspect, oxyF32 near,
00745                             oxyF32 far) -> oxyMat4x4
00746     {
00747         const auto tanHalfFovy = std::tanf(fovy / 2.f);
00748         oxyMat4x4 result{};
00749         result[0][0] = 1.f / (aspect * tanHalfFovy);
00750         result[1][1] = 1.f / tanHalfFovy;
00751         result[2][2] = far / (far - near);
00752         result[2][3] = 1.f;
00753         result[3][2] = -(far * near) / (far - near);
00754         return result;
00755     }
00756     inline auto InverseMatrix(const oxyMat4x4& m) -> oxyMat4x4
00757     {
00758         oxyMat4x4 result;
00759         const auto det = m.Determinant();
00760         if (det == 0)
00761             return result;
00762         const auto invDet = 1 / det;
00763         result[0][0] =
00764             invDet *
00765             (m[1][1] * m[2][2] * m[3][3] + m[1][2] * m[2][3] * m[3][1] +
00766             m[1][3] * m[2][1] * m[3][2] - m[1][1] * m[2][3] * m[3][2] -
00767             m[1][2] * m[2][1] * m[3][3] - m[1][3] * m[2][2] * m[3][1]);
00768         result[0][1] =
00769             invDet *
00770             (m[0][1] * m[2][3] * m[3][2] + m[0][2] * m[2][1] * m[3][3] +
00771             m[0][3] * m[2][2] * m[3][1] - m[0][1] * m[2][2] * m[3][3] -
00772             m[0][2] * m[2][3] * m[3][1] - m[0][3] * m[2][1] * m[3][2]);
00773         result[0][2] =
00774             invDet *
00775             (m[0][1] * m[1][2] * m[3][3] + m[0][2] * m[1][3] * m[3][1] +
00776             m[0][3] * m[1][1] * m[3][2] - m[0][1] * m[1][3] * m[3][2] -
00777             m[0][2] * m[1][1] * m[3][3] - m[0][3] * m[1][2] * m[3][1]);
00778         result[0][3] =
00779             invDet *
00780             (m[0][1] * m[1][3] * m[2][2] + m[0][2] * m[1][1] * m[2][3] +
00781             m[0][3] * m[1][2] * m[2][1] - m[0][1] * m[1][2] * m[2][3] -
00782             m[0][2] * m[1][3] * m[2][1] - m[0][3] * m[1][1] * m[2][2]);
00783
00784         result[1][0] =
00785             invDet *
00786             (m[1][0] * m[2][3] * m[3][2] + m[1][2] * m[2][0] * m[3][3] +
00787             m[1][3] * m[2][2] * m[3][0] - m[1][0] * m[2][2] * m[3][3] -
00788             m[1][2] * m[2][3] * m[3][0] - m[1][3] * m[2][0] * m[3][2]);
00789         result[1][1] =
00790             invDet *
00791             (m[0][0] * m[2][2] * m[3][3] + m[0][2] * m[2][3] * m[3][0] +
00792             m[0][3] * m[2][0] * m[3][2] - m[0][0] * m[2][3] * m[3][2] -
00793             m[0][2] * m[2][0] * m[3][3] - m[0][3] * m[2][2] * m[3][0]);
00794         result[1][2] =
00795             invDet *
00796             (m[0][0] * m[1][3] * m[3][2] + m[0][2] * m[1][0] * m[3][3] +
00797             m[0][3] * m[1][2] * m[3][0] - m[0][0] * m[1][2] * m[3][3] -
00798             m[0][2] * m[1][3] * m[3][0] - m[0][3] * m[1][0] * m[3][2]);
00799         result[1][3] =
00800             invDet *
00801             (m[0][0] * m[1][2] * m[2][3] + m[0][1] * m[1][3] * m[2][0] +
00802             m[0][3] * m[1][0] * m[2][2] - m[0][0] * m[1][3] * m[2][2] -
00803             m[0][1] * m[1][0] * m[2][3] - m[0][3] * m[1][2] * m[2][0]);
00804
00805         result[2][0] =
00806             invDet *
00807             (m[1][0] * m[2][3] * m[3][1] + m[1][1] * m[2][0] * m[3][3] +
00808             m[1][3] * m[2][1] * m[3][0] - m[1][0] * m[2][1] * m[3][3] -
00809             m[1][1] * m[2][3] * m[3][0] - m[1][3] * m[2][0] * m[3][1]);
00810         result[2][1] =
00811             invDet *
00812             (m[0][0] * m[2][1] * m[3][3] + m[0][1] * m[2][3] * m[3][0] +
00813             m[0][3] * m[2][0] * m[3][1] - m[0][0] * m[2][3] * m[3][1] -
00814             m[0][1] * m[2][0] * m[3][3] - m[0][3] * m[2][1] * m[3][0]);
00815         result[2][2] =
00816             invDet *
00817             (m[0][0] * m[1][1] * m[3][3] + m[0][1] * m[1][3] * m[3][0] +
00818             m[0][3] * m[1][0] * m[3][1] - m[0][0] * m[1][3] * m[3][1] -
00819             m[0][1] * m[1][0] * m[3][3] - m[0][3] * m[1][1] * m[3][0]);
00820         result[2][3] =
00821             invDet *
00822             (m[0][0] * m[1][1] * m[2][3] + m[0][1] * m[1][3] * m[2][0] +
00823             m[0][2] * m[1][0] * m[2][1] - m[0][0] * m[1][3] * m[2][1] -
00824             m[0][1] * m[1][0] * m[2][3] - m[0][2] * m[1][1] * m[2][0]);
00825
00826         result[3][0] =
00827             invDet *
00828             (m[1][0] * m[2][1] * m[3][2] + m[1][1] * m[2][2] * m[3][0] +
00829             m[1][2] * m[2][0] * m[3][1] - m[1][0] * m[2][2] * m[3][1] -

```

```

00830         m[1][1] * m[2][0] * m[3][2] - m[1][2] * m[2][1] * m[3][0]);
00831     result[3][1] =
00832         invDet *
00833         (m[0][0] * m[2][2] * m[3][1] + m[0][1] * m[2][0] * m[3][2] +
00834         m[0][2] * m[2][1] * m[3][0] - m[0][0] * m[2][1] * m[3][2] -
00835         m[0][1] * m[2][2] * m[3][0] - m[0][2] * m[2][0] * m[3][1]);
00836     result[3][2] =
00837         invDet *
00838         (m[0][0] * m[1][1] * m[3][0] + m[0][1] * m[1][0] * m[3][2] +
00839         m[0][2] * m[1][2] * m[3][1] - m[0][0] * m[1][2] * m[3][1] -
00840         m[0][1] * m[1][2] * m[3][0] - m[0][2] * m[1][0] * m[3][1]);
00841     result[3][3] =
00842         invDet *
00843         (m[0][0] * m[1][1] * m[2][0] + m[0][1] * m[1][0] * m[2][1] +
00844         m[0][2] * m[1][1] * m[2][2] - m[0][0] * m[1][1] * m[2][1] -
00845         m[0][1] * m[1][2] * m[2][0] - m[0][2] * m[1][0] * m[2][1]);
00846     return result;
00847 }
00848 inline auto RotationMatrixToEuler(const oxyMat4x4& m) -> oxyVec3
00849 {
00850     oxyVec3 result;
00851     result.y = std::asin(-m[2][0]);
00852     if (std::cos(result.y) != 0)
00853     {
00854         result.x = std::atan2(m[2][1], m[2][2]);
00855         result.z = std::atan2(m[1][0], m[0][0]);
00856     }
00857     else
00858     {
00859         result.x = 0;
00860         result.z = std::atan2(-m[0][1], m[1][1]);
00861     }
00862     return result;
00863 }
00864 inline auto Slerp(const oxyQuat& a, const oxyQuat& b,
00865                 oxyF32 t) -> oxyQuat
00866 {
00867     const auto dot = a.DotProduct(b);
00868     const auto angle = std::acosf(dot);
00869     const auto denom = std::sinf(angle);
00870     if (denom == 0)
00871         return a;
00872     const auto s0 = std::sinf((1 - t) * angle) / denom;
00873     const auto s1 = std::sinf(t * angle) / denom;
00874     const auto sa = a * s0;
00875     const auto sb = b * s1;
00876     return oxyQuat{sa.x + sb.x, sa.y + sb.y, sa.z + sb.z, sa.w + sb.w};
00877 }
00878 inline auto AngleAxisToQuat(const oxyF32 angle,
00879                             const oxyVec3& axis) -> oxyQuat
00880 {
00881     const auto halfAngle = angle / 2;
00882     const auto s = std::sinf(halfAngle);
00883     return {axis.x * s, axis.y * s, axis.z * s, std::cos(halfAngle)};
00884 }
00885 inline auto QuatToEulerAngles(const oxyQuat& q) -> oxyVec3
00886 {
00887     oxyVec3 result;
00888     result.x = std::atan2(2 * (q.w * q.x + q.y * q.z),
00889                         1 - 2 * (q.x * q.x + q.y * q.y));
00889     result.y = std::asin(2 * (q.w * q.y - q.z * q.x));
00890     result.z = std::atan2(2 * (q.w * q.z + q.x * q.y),
00891                         1 - 2 * (q.y * q.y + q.z * q.z));
00892     return result;
00893 }
00894 inline auto EulerAnglesToQuat(const oxyVec3& v) -> oxyQuat
00895 {
00896     const auto pitch = AngleAxisToQuat(v.x, {1, 0, 0});
00897     const auto yaw = AngleAxisToQuat(v.y, {0, 1, 0});
00898     const auto roll = AngleAxisToQuat(v.z, {0, 0, 1});
00899     return pitch * yaw * roll;
00900 }
00901 inline auto QuatLookAt(const oxyVec3& position,
00902                       const oxyVec3& where) -> oxyQuat
00903 {
00904     const auto direction = (where - position).Normalized();
00905     const auto forward = oxyVec3{0, 0, 1};
00906     const auto axis = forward.CrossProduct(direction);
00907     const auto angle = std::acosf(forward.DotProduct(direction));
00908     return AngleAxisToQuat(angle, axis);
00909 }
00910 inline auto EulerForward(const oxyVec3& euler) -> oxyVec3
00911 {
00912     return oxyVec3{std::cosf(euler.z) * std::cosf(euler.x),
00913                   std::sinf(euler.z) * std::cosf(euler.x),
00914                   std::sinf(euler.x)};
00915 }
00916

```

```

00917     inline auto ToHalfFloat(oxyF32 x) -> oxyU16
00918     {
00919         uint32_t i = std::bit_cast<uint32_t>(x);
00920         uint16_t bits = (i >> 16) & 0x8000;
00921         uint16_t m = (i >> 12) & 0x7fff;
00922         uint16_t e = ((i >> 23) & 0xff) - 127;
00923         if (e > 30)
00924         {
00925             bits |= 0x7c00;
00926         }
00927         else if (e > 15)
00928         {
00929             m |= 0x800;
00930             bits |= (e << 10) | (m >> 1);
00931         }
00932         else if (e > -15)
00933         {
00934             bits |= ((e + 15) << 10) | (m >> 1);
00935         }
00936         else if (e > -25)
00937         {
00938             m |= 0x800;
00939             bits |= ((e + 15) << 10) | (m >> 1);
00940         }
00941         else
00942         {
00943             bits |= 0;
00944         }
00945         return bits;
00946     }
00947     inline auto FromHalfFloat(oxyU16 x) -> oxyF32
00948     {
00949         uint32_t mantissa = x & 0x3fff;
00950         uint32_t exponent = x & 0x7c00;
00951         if (exponent == 0x7c00)
00952         {
00953             exponent = 0x8f << 23;
00954         }
00955         else if (exponent == 0)
00956         {
00957             if (mantissa != 0)
00958             {
00959                 exponent = 0x71 << 23;
00960                 while ((mantissa & 0x400) == 0)
00961                 {
00962                     mantissa <<= 1;
00963                     exponent -= 0x8000000;
00964                 }
00965                 mantissa &= 0x3fff;
00966             }
00967         }
00968         else
00969         {
00970             exponent = (exponent >> 10) + 0x70;
00971         }
00972         uint32_t result = (x & 0x8000) << 16;
00973         result |= (exponent << 23);
00974         result |= (mantissa << 13);
00975         return std::bit_cast<float>(result);
00976     }
00977
00978 }; // namespace Math
00979 }; // namespace oxygen

```

## 7.50 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Math/Hash.h File Reference

### Namespaces

- namespace [oxygen](#)

### Functions

- constexpr auto [oxygen::CRC64Eval](#) (const [oxyU8](#) \*data, [oxySize](#) size) -> [oxyU64](#)

## Variables

- `constexpr oxyU64 oxygen::g_CRC64Table []`

## 7.51 Hash.h

[Go to the documentation of this file.](#)

```
00001 #pragma once
00002
00003 namespace oxygen
00004 {
00005     inline constexpr oxyU64 g_CRC64Table[] {
00006         0x0000000000000000ULL, 0x42f0e1eba9ea3693ULL, 0x85e1c3d753d46d26ULL, 0x0bc387aea7a8da4cULL,
00007         0xc711223cfa3e5bb5ULL, 0x493366450e42ecd5ULL, 0x0bc387aea7a8da4cULL, 0x9266cc8a1c85d9beULL,
00008         0xccd2a592d89681f9ULL, 0x8e224479f47cb76aULL, 0x9266cc8a1c85d9beULL, 0x5577eeb6e6bb820bULL,
00009         0xd0962d61b56fef2dULL, 0x17870f5d4f51b498ULL, 0x5577eeb6e6bb820bULL, 0x5eb4691841135847ULL,
00010         0xdb55aacf12c73561ULL, 0x99a54b24bb2d03f2ULL, 0x5eb4691841135847ULL, 0x24cd9914390bb37cULL,
00011         0x1c4488f3e8f96ed4ULL, 0x663d78ff90e185efULL, 0x24cd9914390bb37cULL, 0x2f0e1eba9ea36930ULL,
00012         0xe3dcb28c335e8c9ULL, 0xa12c5ac36adfde5aULL, 0x2f0e1eba9ea36930ULL, 0xe81f3c86649d3285ULL,
00013         0x6dfef5137495fa3ULL, 0xaaefdd6dcd770416ULL, 0xe81f3c86649d3285ULL, 0x71ba77a2dfb03177ULL,
00014         0xf45bb4758c645c51ULL, 0xb6ab559e258e6ac2ULL, 0x71ba77a2dfb03177ULL, 0xf9833db2bcc861dULL,
00015         0x334a9649765a07e4ULL, 0xbd68d2308226b08eULL, 0xf9833db2bcc861dULL, 0xcc7af1ff21c30bdeULL,
00016         0x388911e7d1f2dda8ULL, 0x7a79f00c7818eb3bULL, 0xcc7af1ff21c30bdeULL, 0x0b6bd3c3dbfd506bULL,
00017         0x8e8a101488293d4dULL, 0x499b3228721766f8ULL, 0x0b6bd3c3dbfd506bULL, 0x00a8546d7c558a27ULL,
00018         0x854997ba2f81e701ULL, 0xc7b97651866bd192ULL, 0x00a8546d7c558a27ULL, 0x1cecdc9e94ace4f3ULL,
00019         0x4258b586d5bfcb4ULL, 0x5e1c3d753d46d260ULL, 0x1cecdc9e94ace4f3ULL, 0x172f5b3033043ebfULL,
00020         0xdbdfdea26e92bf46ULL, 0x990d1f49c77889d5ULL, 0x172f5b3033043ebfULL, 0xd03e790cc93a650aULL,
00021         0x55dfbadb9aee082cULL, 0x92ce98e760d05399ULL, 0xd03e790cc93a650aULL, 0x2fa64ad7e2f6e317ULL,
00022         0xaa478900b1228e31ULL, 0xe8b768eb18c8b8a2ULL, 0x2fa64ad7e2f6e317ULL, 0xa1840eae168a547dULL,
00023         0x656ab3c4b1cd584ULL, 0xe374ef45bf6062eeULL, 0xa1840eae168a547dULL, 0x3821458ada7578fULL,
00024         0x66952c92ecb40fc8ULL, 0x2465cd79455e395bULL, 0x3821458ada7578fULL, 0xff3067b657990c3aULL,
00025         0x7ad1a461044d611cULL, 0xbdc0865dfe733aa9ULL, 0xff3067b657990c3aULL, 0xf4f3e018f031d676ULL,
00026         0x711223cfa3e5bb50ULL, 0x33e2c2240a0f8dc3ULL, 0xf4f3e018f031d676ULL, 0x98f5e3fe438617bcULL,
00027         0xb60301f359dbe0e5ULL, 0xda050215ea6c212fULL, 0x98f5e3fe438617bcULL, 0x93366450e42ecd0ULL,
00028         0x5fe4c1c2b9b84c09ULL, 0x1d14202910527a9aULL, 0x93366450e42ecd0ULL, 0x5427466c1e109645ULL,
00029         0xd1c685bb4dc4fb63ULL, 0x16d7a787b7faa0d6ULL, 0x5427466c1e109645ULL, 0xcd820d48a53d95b7ULL,
00030         0x4863ce9ff6e9f891ULL, 0x0a932f745f03ce02ULL, 0xcd820d48a53d95b7ULL, 0x43a04931514122ddULL,
00031         0x8f72eca30cd7a324ULL, 0x0150a8daf8ab144eULL, 0x43a04931514122ddULL, 0xb387aea7a8da4c0ULL,
00032         0x84b16b0dab7f7968ULL, 0xc6418ae602954ffbULL, 0xb387aea7a8da4c0ULL, 0x7b2958d680b3ff75ULL,
00033         0xfec89b01d3679253ULL, 0x39d9b93d2959c9e6ULL, 0x7b2958d680b3ff75ULL, 0x70eadf78271b2539ULL,
00034         0xf50b1caf74cf481fULL, 0xb7fbfd44dd257e8cULL, 0x70eadf78271b2539ULL, 0x6cae578bce24bedULL,
00035         0x321a3e93bef113aaULL, 0x2e5eb66066087d7eULL, 0x6cae578bce24bedULL, 0x676dd025684a91a1ULL,
00036         0xabbf75b735dc1058ULL, 0xe94f945c9c3626cbULL, 0x676dd025684a91a1ULL, 0xa07cf2199274ca14ULL,
00037         0x259d31ceca10a732ULL, 0xe28c13f23b9efc87ULL, 0xa07cf2199274ca14ULL, 0x939e303d987b47d7ULL,
00038         0x167ff3eacbf2af1ULL, 0x548f120162451c62ULL, 0x939e303d987b47d7ULL, 0x1dbc74446c07f0bdULL,
00039         0xd16ed1d631917144ULL, 0x5f4c95afc5edc62eULL, 0x1dbc74446c07f0bdULL, 0x84193f60d72af34fULL,
00040         0xdaad56789639ab08ULL, 0x985db7933fd39d9bULL, 0x84193f60d72af34fULL, 0x43081d5c2d14a8faULL,
00041         0xc6e9de8b7ec0c5dcULL, 0x01f8fcb784fe9e69ULL, 0x43081d5c2d14a8faULL, 0x48cb9af28abc72b6ULL,
00042         0xcd2a5925d9681f90ULL, 0x8fdab8ce70822903ULL, 0x48cb9af28abc72b6ULL, 0x32b26afe72a4998dULL,
00043         0x0a3b7b1923564425ULL, 0x70428b155b4eaf1eULL, 0x32b26afe72a4998dULL, 0x3971ed50550c43c1ULL,
00044         0xf5a348c2089ac238ULL, 0xb753a929a170f4abULL, 0x3971ed50550c43c1ULL, 0xf60cf6caf321874ULL,
00045         0x7b810cbbf6e67552ULL, 0xbc902e8706d82ee7ULL, 0xf60cf6caf321874ULL, 0x67c58448141f1b86ULL,
00046         0xe224479f47cb76a0ULL, 0xa0d4a674ee214033ULL, 0x67c58448141f1b86ULL, 0xe9e7c031e063acacULL,
00047         0x25365a3bdf52d15ULL, 0xab1721da49899a7fULL, 0xe9e7c031e063acacULL, 0xf6fae5c07d3274cdULL,
00048         0x2ef6e20d1a5df759ULL, 0x6c0603e6b3b7c1caULL, 0xf6fae5c07d3274cdULL, 0x31ebc7fc870c2f78ULL,
00049         0xb40a042bd4d8425eULL, 0x731b26172ee619ebULL, 0x31ebc7fc870c2f78ULL, 0x3a28405220a4f534ULL,
00050         0xbfc8138573709812ULL, 0xfd39626eda9ae81ULL, 0x3a28405220a4f534ULL, 0x266cc8a1c85d9be0ULL,
00051         0x78d8a1b9894ec3a7ULL, 0x649c294a61b7ad73ULL, 0x266cc8a1c85d9be0ULL, 0x2daf4f0f6ff541acULL,
00052         0xe17dea9d3263c055ULL, 0xa38d0b769b89f6c6ULL, 0x2daf4f0f6ff541acULL, 0xeabe6d3395cb1a19ULL,
00053         0x6f5faee4c61f773fULL, 0xa84e8cd83c212c8aULL, 0xeabe6d3395cb1a19ULL, 0x15265ee8be079c04ULL,
00054         0x90c79d3fedd3f122ULL, 0xd2377cd44439c7b1ULL, 0x15265ee8be079c04ULL, 0x9b041a914a7b2b6eULL,
00055         0x57d6bf0317edaa97ULL, 0xd9f4fb7ae3911dfdULL, 0x9b041a914a7b2b6eULL, 0x02a151b5f156289cULL,
00056         0x5c1538adb04570dbULL, 0x1ee5d94619af4648ULL, 0x02a151b5f156289cULL, 0xc5b073890b687329ULL,
00057         0x4051b05e58bc1e0fULL, 0x87409262a28245baULL, 0xc5b073890b687329ULL, 0xc73f427acc0a965ULL,
00058         0x4b9237f0ff14c443ULL, 0x0962d61b56fef2d0ULL, 0xc73f427acc0a965ULL, 0x7870f5d4f51b4980ULL,
00059         0x8c8315cc052a9ff6ULL, 0x3a80143f5cf17f13ULL, 0x7870f5d4f51b4980ULL, 0x73b3727a52b393ccULL,
00060         0xbf61d7e80f251235ULL, 0xfd913603a6cf24a6ULL, 0x73b3727a52b393ccULL, 0xb4a25046a88dc879ULL,
00061         0x31439391fb59a55fULL, 0xf652blad0167feeaULL, 0xb4a25046a88dc879ULL, 0x2d071b6213a0cb8bULL,
00062         0xa8e6d8b54074a6adULL, 0xea16395ee99e903eULL, 0x2d071b6213a0cb8bULL, 0xa3255f1be7dc7ce1ULL,
00063         0x6ff7fa89ba4afd18ULL, 0xe1d5bef04e364a72ULL, 0xa3255f1be7dc7ce1ULL, 0x5cbd6cc0cc10fafcULL,
00064         0x64347d271de22754ULL, 0x26c49cccb40811c7ULL, 0x5cbd6cc0cc10fafcULL, 0x9bac4efc362ea149ULL,
00065         0x1e4d8d2b65facc6FULL, 0xd95caf179fc497daULL, 0x9bac4efc362ea149ULL, 0x906fc95291867b05ULL,
00066         0x158e0a85c2521623ULL, 0x577eeb6e6bb820b0ULL, 0x906fc95291867b05ULL, 0x8c2b41a1797f15d1ULL,
00067         0xd29f28b9386c4d96ULL, 0xcdba04ad0952342ULL, 0x8c2b41a1797f15d1ULL, 0x87e8c60fded7cf9dULL,
00068         0x4b3a639d83414e64ULL, 0x09ca82762aab78f7ULL, 0x87e8c60fded7cf9dULL, 0x40f9e43324e99428ULL,
00069         0xc51827e4773df90eULL, 0x020905d88d03a2bbULL, 0x40f9e43324e99428ULL, 0xa91e2402c48a38c4ULL,
00070         0x2cffe7d5975e55e2ULL, 0xe0f063e3eb46371ULL, 0xa91e2402c48a38c4ULL, 0x273c607b30f68faeULL,
00071         0xebeec5e96d600e57ULL, 0x65cc8190991cb93dULL, 0x273c607b30f68faeULL, 0xb992b5f8bdb8c5cULL,
00072         0xe02d4247cac8d41bULL, 0xa2dda3ac6322e288ULL, 0xb992b5f8bdb8c5cULL, 0x7988096371e5d7e9ULL,
00073         0xfc69cab42231bacfULL, 0x3b78e888d80fe17aULL, 0x7988096371e5d7e9ULL,
```

```

00074      0xf7aa4d1a85996083ULL, 0xb55aacf12c735610ULL, 0x724b8ecdd64d0da5ULL,
00075      0x30bb6f267fa73b36ULL, 0x4ac29f2a07bfd00dULL, 0x08327ec1ae55e69eULL,
00076      0xc235cfd546bbd2bULL, 0x8dd3bd16fd818bb8ULL, 0x03f1f96f09fd3cd2ULL,
00077      0x41011884a0170a41ULL, 0x86103ab85a2951f4ULL, 0xc4e0db53f3c36767ULL,
00078      0xd8a453a01b3a09b3ULL, 0x9a54b24bb2d03f20ULL, 0x5d45907748ee6495ULL,
00079      0x1fb5719ce1045206ULL, 0x919735e51578e56cULL, 0xd367d40ebc92d3ffULL,
00080      0x1476f63246ac884aULL, 0x568617d9ef46bed9ULL, 0xe085162ab69d5e3cULL,
00081      0xa275f7c11f7768afULL, 0x6564d5fde549331aULL, 0x279434164ca30589ULL,
00082      0xa9b6706fb8dfb2e3ULL, 0xeb46918411358470ULL, 0x2c57b3b8eb0bdfc5ULL,
00083      0x6ea7525342e1e956ULL, 0x72e3daa0aa188782ULL, 0x30133b4b03f2b111ULL,
00084      0xf7021977f9ccea4ULL, 0xb5f2f89c5026dc37ULL, 0x3bd0bce5a45a6b5dULL,
00085      0x79205d0e0db05dceULL, 0xbe317f32f78e067bULL, 0xfcc19ed95e6430e8ULL,
00086      0x86b86ed5267cbbd3ULL, 0xc4488f3e8f96ed40ULL, 0x0359ad0275a8b6f5ULL,
00087      0x41a94ce9dc428066ULL, 0xcf8b0890283e370cULL, 0x8d7be97b81d4019fULL,
00088      0x4a6acb477bea5a2aULL, 0x089a2aacd2006cb9ULL, 0x14dea25f3af9026dULL,
00089      0x562e43b4931334feULL, 0x913f6188692d6f4bULL, 0xd3cf8063c0c759d8ULL,
00090      0x5dedc41a34bbeeb2ULL, 0x1f1d25f19d51d821ULL, 0xd80c07cd676f8394ULL,
00091      0x9afce626ce85b507ULL,
00092  };
00093
00094  inline constexpr auto CRC64Eval(const oxyU8* data, oxySize size) -> oxyU64
00095  {
00096      uint64_t crc{};
00097      uintmax_t i{};
00098      for (; i < size; i++)
00099      {
00100          uint64_t t = (crc >> 0x38) ^ data[i];
00101          crc = g_CRC64Table[t & 0xff] ^ (crc << 8);
00102      }
00103      return crc;
00104  }
00105  }; // namespace oxygen

```

## 7.52 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Math/Random.h File Reference

### Namespaces

- namespace [oxygen](#)

### Functions

- auto [oxygen::RandomS32](#) (oxyS32 minInclusive, oxyS32 maxInclusive) -> [oxyS32](#)
- auto [oxygen::RandomU32](#) (oxyU32 minInclusive, oxyU32 maxInclusive) -> [oxyU32](#)
- auto [oxygen::RandomS64](#) (oxyS64 minInclusive, oxyS64 maxInclusive) -> [oxyS64](#)
- auto [oxygen::RandomU64](#) (oxyU64 minInclusive, oxyU64 maxInclusive) -> [oxyU64](#)
- auto [oxygen::RandomF32](#) (oxyF32 minInclusive, oxyF32 maxInclusive) -> [oxyF32](#)
- auto [oxygen::RandomF64](#) (oxyF64 minInclusive, oxyF64 maxInclusive) -> [oxyF64](#)
- auto [oxygen::RandomBool](#) () -> [oxyBool](#)

### Variables

- std::random\_device [oxygen::g\\_randomDevice](#)
- std::mt19937\_64 [oxygen::g\\_randomEngine](#) {[g\\_randomDevice](#)()}

## 7.53 Random.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002
00003
00004
00005 namespace oxygen
00006 {
00007     inline std::random_device g_randomDevice;
00008     inline std::mt19937_64 g_randomEngine{g_randomDevice()};
00009     inline auto RandomS32(oxyS32 minInclusive, oxyS32 maxInclusive) -> oxyS32
00010     {
00011         std::uniform_int_distribution<oxyS32> dist{minInclusive, maxInclusive};
00012         return dist(g_randomEngine);
00013     }
00014     inline auto RandomU32(oxyU32 minInclusive, oxyU32 maxInclusive) -> oxyU32
00015     {
00016         std::uniform_int_distribution<oxyU32> dist{minInclusive, maxInclusive};
00017         return dist(g_randomEngine);
00018     }
00019     inline auto RandomS64(oxyS64 minInclusive, oxyS64 maxInclusive) -> oxyS64
00020     {
00021         std::uniform_int_distribution<oxyS64> dist{minInclusive, maxInclusive};
00022         return dist(g_randomEngine);
00023     }
00024     inline auto RandomU64(oxyU64 minInclusive, oxyU64 maxInclusive) -> oxyU64
00025     {
00026         std::uniform_int_distribution<oxyU64> dist{minInclusive, maxInclusive};
00027         return dist(g_randomEngine);
00028     }
00029     inline auto RandomF32(oxyF32 minInclusive, oxyF32 maxInclusive) -> oxyF32
00030     {
00031         std::uniform_real_distribution<oxyF32> dist{minInclusive, maxInclusive};
00032         return dist(g_randomEngine);
00033     }
00034     inline auto RandomF64(oxyF64 minInclusive, oxyF64 maxInclusive) -> oxyF64
00035     {
00036         std::uniform_real_distribution<oxyF64> dist{minInclusive, maxInclusive};
00037         return dist(g_randomEngine);
00038     }
00039     inline auto RandomBool() -> oxyBool
00040     {
00041         std::bernoulli_distribution dist;
00042         return dist(g_randomEngine);
00043     }
00044 }
00045 }; // namespace oxygen

```

## 7.54 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Net/NetSystem.cc File Reference

```

#include "OxygenPCH.h"
#include "NetSystem.h"
#include "GameManager/GameManager.h"

```

### Namespaces

- namespace [oxygen](#)

## 7.55 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Net/NetSystem.h File Reference

```

#include "Singleton/Singleton.h"
#include "Platform/Platform.h"

```

**Classes**

- struct `oxygen::NetConnection`
- struct `oxygen::NetSystem`

**Namespaces**

- namespace `oxygen`

**7.56 NetSystem.h**

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002
00003 #include "Singleton/Singleton.h"
00004
00005 // this is lazy
00006 #include "Platform/Platform.h"
00007
00008 namespace oxygen
00009 {
00010     struct NetConnection
00011     {
00012         auto WriteData(oxyU16 type, std::span<const oxyU8> data) -> void;
00013
00014         auto GetUniqueID() const -> oxyU64
00015         {
00016             return m_uniqueID;
00017         }
00018
00019     private:
00020         oxyU64 m_uniqueID{};
00021         std::unique_ptr<NetworkAbstraction::NetworkSocket> m_socket{};
00022         std::thread m_receiveThread{};
00023         std::thread m_sendThread{};
00024         struct MessageHeader
00025         {
00026             oxyU16 m_type{};
00027             oxyU16 m_size{};
00028         };
00029
00030         static inline constexpr auto k_queueSize = 1024;
00031         oxyBool m_connected{};
00032
00033         // TODO:
00034         // SPSCQueue is BUSTED
00035         // I'm going to use a mutex for now
00036         // watch this later: https://www.youtube.com/watch?v=K3P_Lmq6pw0
00037
00038         SPSCQueue<std::vector<oxyU8>, k_queueSize>
00039             m_sendQueue{};
00040         SPSCQueue<std::vector<oxyU8>, k_queueSize>
00041             m_receiveQueue{};
00042         // std::queue<std::vector<oxyU8> m_sendQueue{};
00043         // std::queue<std::vector<oxyU8> m_receiveQueue{};
00044         // std::mutex m_sendMutex{};
00045         // std::mutex m_receiveMutex{};
00046
00047     friend struct NetSystem;
00048 };
00049
00050 struct NetSystem : SingletonBase<NetSystem>
00051 {
00052     NetSystem();
00053     ~NetSystem();
00054
00055     auto Update(oxyF32 deltaTimeSeconds) -> void;
00056
00057     auto StartHost() -> void;
00058     auto ConnectToHost(const std::string& ip) -> oxyBool;
00059
00060     auto KillConnections() -> void;
00061
00062     auto HostSendToAll(oxyU16 type, const std::span<oxyU8>& data) -> void;
00063     auto HostSendToAllExcept(oxyU64 excludeClientID, oxyU16 type,

```

```

00068             const std::span<oxyU8>& data) -> void;
00069
00070     auto CliSendToHost(oxyU16 type, const std::span<oxyU8>& data) -> void;
00071
00072     auto CliDiscoverHosts() -> void;
00073     auto CliGetDiscoveredHosts() const -> std::span<const std::string>
00074     {
00075         return m_discoveredHosts;
00076     }
00077     auto CliIsDiscoveringHosts() const -> oxyBool
00078     {
00079         return m_broadcastDiscoveryRunning;
00080     }
00081
00082     auto GetNewNetObjID() -> oxyObjectID
00083     {
00084         return m_nextNetObjID++;
00085     }
00086
00087     auto IsHost() const -> oxyBool
00088     {
00089         return m_isHost;
00090     }
00091
00092     auto IsClient() const -> oxyBool
00093     {
00094         return m_isClient;
00095     }
00096
00097     static inline constexpr auto k_enginePort = 28672;
00098     static inline constexpr auto k_engineBroadcastPort = 28678;
00099     static inline constexpr auto k_timeBetweenPing = 4.0f;
00100     static inline constexpr auto k_netSessionDefaultMinObjid =
00101         oxyObjectID{0xC0000001};
00102
00103 private:
00104     auto PingAll() -> void;
00105
00106     auto ServerAcceptPeers() -> void;
00107
00108     auto GenNewUniqueID() -> oxyU64;
00109
00110     auto
00111     ReceiveAllFromNetworkSocket(NetworkAbstraction::NetworkSocket& sock)
00112         -> std::optional<std::vector<oxyU8>>;
00113     auto SendAllToNetworkSocket(NetworkAbstraction::NetworkSocket& sock,
00114                                const std::span<oxyU8>& data) -> oxyBool;
00115
00116     auto ProcessReceivedMessage(NetConnection& conn,
00117                                std::span<const oxyU8> data) -> void;
00118
00119     auto NetConnectionReceiveThread(NetConnection& connection) -> void;
00120     auto NetConnectionSendThread(NetConnection& connection) -> void;
00121
00122     auto ClientBroadcastSendThread() -> void;
00123     auto ServerBroadcastListenThread() -> void;
00124
00125     // (if client)
00126     // client->server
00127     NetConnection m_clientHostSocket{};
00128     std::unique_ptr<NetworkAbstraction::NetworkSocket>
00129         m_clientBroadcastSendSocket{};
00130     std::thread m_clientBroadcastSendThread{};
00131     oxyBool m_broadcastDiscoveryRunning{};
00132     // broadcast thread out:
00133     std::vector<std::string> m_broadcastDiscoveredHosts{};
00134     std::mutex m_broadcastDiscoveredHostsMutex{};
00135     // for update/main thread:
00136     std::vector<std::string> m_discoveredHosts{};
00137
00138     // (if host)
00139     // server listen socket
00140     std::unique_ptr<NetworkAbstraction::NetworkSocket> m_serverSocket{};
00141     std::unique_ptr<NetworkAbstraction::NetworkSocket>
00142         m_serverBroadcastListenSocket{};
00143     std::thread m_serverBroadcastListenThread{};
00144     std::vector<std::unique_ptr<NetConnection>> m_clients{};
00145
00146     oxyBool m_isHost{};
00147     oxyBool m_isClient{};
00148     oxyBool m_requestShutdown{};
00149
00150     oxyF32 m_timeSinceLastPing{};
00151     oxyObjectID m_nextNetObjID{k_netSessionDefaultMinObjid};
00152 };
00153 }; // namespace oxygen

```



## 7.57 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Object/ManagedObject.h File Reference

### Classes

- struct [oxygen::ManagedObject](#)

### Namespaces

- namespace [oxygen](#)

## 7.58 ManagedObject.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002
00003 namespace oxygen
00004 {
00005     struct ManagedObject : Object
00006     {
00007         OXYGENOBJECT(ManagedObject, Object);
00008
00009         auto GetObjectID() const -> oxyObjectID
00010         {
00011             return m_id;
00012         }
00013
00014         template <typename RefType>
00015         auto GetHardRef() const -> std::shared_ptr<RefType>
00016             requires std::is_base_of_v<ManagedObject, RefType>
00017         {
00018             const auto sptr = m_self.lock();
00019             if (sptr)
00020                 return std::static_pointer_cast<RefType>(std::move(sptr));
00021             return nullptr;
00022         }
00023
00024     private:
00025         oxyObjectID m_id{};
00026         std::weak_ptr<ManagedObject> m_self{};
00027
00028         friend struct ObjectManager;
00029     };
00030 }; // namespace oxygen

```

## 7.59 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Object/Object.h File Reference

### Classes

- struct [oxygen::ObjectDescription](#)
- struct [oxygen::Object](#)

### Namespaces

- namespace [oxygen](#)

## Macros

- `#define OXYGENOBJECT`(Name, Parent)

## Functions

- `auto oxygen::GetObjectDescriptionMap () -> std::unordered_map< oxyU64, const ObjectDescription * > &`

## 7.59.1 Macro Definition Documentation

### 7.59.1.1 OXYGENOBJECT

```
#define OXYGENOBJECT(
    Name,
    Parent)
```

## 7.60 Object.h

[Go to the documentation of this file.](#)

```
00001 #pragma once
00002
00003 namespace oxygen
00004 {
00005     struct Object;
00006     struct ObjectDescription
00007     {
00008         const ObjectDescription* m_parent{};
00009         std::string_view m_name{};
00010         oxyU64 m_id{};
00011         oxySize m_size{};
00012         oxySize m_align{};
00013         using constructor_t = Object* (*)(void* p);
00014         constructor_t m_constructor{};
00015     };
00016
00017     inline auto GetObjectDescriptionMap()
00018     -> std::unordered_map<oxyU64, const ObjectDescription*>&
00019     {
00020         static std::unordered_map<oxyU64, const ObjectDescription*> map{};
00021         return map;
00022     }
00023
00024 #define OXYGENOBJECT(Name, Parent)
00025     Name() = default;
00026     ~Name() = default;
00027     using SelfType = Name;
00028     using Super = Parent;
00029     static inline auto GetStaticDescription() -> const ObjectDescription&
00030     {
00031         return ObjectInternalDef::g_staticDescriptor;
00032     }
00033     virtual auto GetDescription() const -> const ObjectDescription& override
00034     {
00035         return GetStaticDescription();
00036     }
00037
00038 private:
00039     struct ObjectInternalDef
00040     {
00041         static auto GetStaticDescription() -> const ObjectDescription&
00042         {
00043             static_assert(std::is_base_of_v<Object, Parent>,
00044                 "Parent must be a subclass of Object");
00045             static_assert(std::is_base_of_v<Parent, Name>,
00046                 "Name must be a subclass of Parent");
00047             static ObjectDescription desc{
00048                 .m_parent = &Parent::GetStaticDescription(),
00049                 .m_name = #Name,
```

```

00050         .m_id = CRC64Eval(reinterpret_cast<const oxyU8*>(#Name),
00051                             sizeof(#Name) - 1),
00052         .m_size = sizeof(Name),
00053         .m_align = alignof(Name),
00054         .m_constructor =
00055             [](void* p) {
00056                 return static_cast<Object*>(::new (p) Name{});
00057             },
00058     };
00059     const auto mm = reinterpret_cast<Name*>(GetStaticDescription);
00060     OXYCHECK((void*)static_cast<Object*>(mm) == (void*)mm);
00061     return desc;
00062 }
00063 static inline const ObjectDescription& g_staticDescriptor{
00064     GetStaticDescription()};
00065 static inline oxyChar g_staticDescriptorInit = []() {
00066     GetObjectDescriptionMap().emplace(GetStaticDescription().m_id,
00067                                       &g_staticDescriptor);
00068     return 0;
00069 }();
00070 };
00071
00072 public:
00073
00074     struct Object
00075     {
00076         using SelfType = Object;
00077         using Super = Object;
00078
00079         Object() = default;
00080         virtual ~Object() = default;
00081
00082         static inline auto GetStaticDescription() -> const ObjectDescription&
00083         {
00084             return ObjectInternalDef::g_staticDescriptor;
00085         }
00086         virtual auto GetDescription() const -> const ObjectDescription&
00087         {
00088             return GetStaticDescription();
00089         }
00090
00091         auto IsA(const ObjectDescription& desc) const -> bool
00092         {
00093             auto* p = &GetDescription();
00094             while (p)
00095             {
00096                 if (p->m_id == desc.m_id)
00097                     return true;
00098                 p = p->m_parent;
00099             }
00100             return false;
00101         }
00102         template <typename T>
00103         auto IsA() const -> bool
00104             requires std::is_base_of_v<Object, T>
00105         {
00106             return IsA(T::GetStaticDescription());
00107         }
00108         template <typename T>
00109         auto Cast() -> T*
00110             requires std::is_base_of_v<Object, T>
00111         {
00112             return IsA<T>() ? static_cast<T*>(this) : nullptr;
00113         }
00114         template <typename T>
00115         auto Cast() const -> const T*
00116             requires std::is_base_of_v<Object, T>
00117         {
00118             return IsA<T>() ? static_cast<const T*>(this) : nullptr;
00119         }
00120
00121     private:
00122         struct ObjectInternalDef
00123         {
00124             static auto GetStaticDescription() -> const ObjectDescription&
00125             {
00126                 static ObjectDescription desc{
00127                     .m_parent = nullptr,
00128                     .m_name = "Object",
00129                     .m_id = CRC64Eval(reinterpret_cast<const oxyU8*>("Object"),
00130                                     sizeof("Object") - 1),
00131                     .m_size = sizeof(Object),
00132                     .m_align = alignof(Object),
00133                     .m_constructor = [](void* p) { return ::new (p) Object{}; },
00134                 };
00135                 return desc;
00136             }
00137         }

```

```

00137         static inline const ObjectDescription& g_staticDescriptor{
00138             GetStaticDescription();
00139         static inline oxyChar g_staticDescriptorInit = []() {
00140             GetObjectDescriptionMap().emplace(GetStaticDescription().m_id,
00141                                               &g_staticDescriptor);
00142             return 1;
00143         }();
00144     };
00145 };
00146
00147 }; // namespace oxygen

```

## 7.61 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Object/↵ ObjectManager.cc File Reference

```

#include "OxygenPCH.h"
#include "ObjectManager.h"

```

### Namespaces

- namespace [oxygen](#)

## 7.62 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Object/↵ ObjectManager.h File Reference

```

#include "Singleton/Singleton.h"

```

### Classes

- struct [oxygen::ObjectManager](#)

### Namespaces

- namespace [oxygen](#)

## 7.63 ObjectManager.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002
00003 #include "Singleton/Singleton.h"
00004
00005 namespace oxygen
00006 {
00007     struct ObjectManager : SingletonBase<ObjectManager>
00008     {
00009         ~ObjectManager();
00010
00011         template <typename T>
00012         auto NewObject(oxyObjectID id = 0) -> T*
00013             requires std::is_base_of_v<Object, T> &&

```

```

00014         std::is_same_v<typename T::SelfType, T>;
00015     auto NewObject(const ObjectDescription& desc,
00016                   oxyObjectID id = 0) -> Object*;
00017     auto DeleteObject(Object* obj, oxyObjectID id = 0) -> void;
00018
00019     template <typename T>
00020     auto CreateManagedObject(oxyObjectID id = 0) -> std::shared_ptr<T>
00021         requires std::is_base_of_v<ManagedObject, T> &&
00022             std::is_same_v<typename T::SelfType, T>;
00023     auto CreateManagedObject(const ObjectDescription& desc,
00024                               oxyObjectID id = 0)
00025         -> std::shared_ptr<ManagedObject>;
00026
00027     template <typename T>
00028     auto GetObjectPtr(oxyObjectID id) const -> T*
00029         requires std::is_base_of_v<Object, T>;
00030     auto GetObjectPtr(oxyObjectID id) const -> Object*;
00031
00032     auto GetObjectID(Object* obj) const -> oxyObjectID;
00033
00034     template <typename T>
00035     auto GetManagedRef(oxyObjectID id) const -> std::shared_ptr<T>
00036         requires std::is_base_of_v<ManagedObject, T>;
00037     auto
00038     GetManagedRef(oxyObjectID id) const -> std::shared_ptr<ManagedObject>;
00039
00040 private:
00041     oxyObjectID m_nextDynamicID{0x40000001};
00042     std::unordered_map<oxyObjectID, Object*> m_objects{};
00043     std::unordered_map<Object*, oxyObjectID> m_objectIDs{};
00044
00045     oxyObjectID m_nextManagedID{0x80000001};
00046     std::unordered_map<oxyObjectID, std::weak_ptr<ManagedObject>
00047         m_managedObjects{};
00048     struct ManagedObjectDeleter
00049     {
00050         auto operator() (ManagedObject* obj) -> void;
00051     };
00052 };
00053
00054 template <typename T>
00055 auto ObjectManager::NewObject(oxyObjectID id) -> T*
00056     requires std::is_base_of_v<Object, T> &&
00057         std::is_same_v<typename T::SelfType, T>
00058 {
00059     if (!id)
00060         id = ++m_nextDynamicID;
00061     else
00062     {
00063         const auto it = m_objects.find(id);
00064         if (it != m_objects.end())
00065             return static_cast<T*>(it->second);
00066     }
00067     const auto storage =
00068         ::operator new[](sizeof(T), std::align_val_t{alignof(T)});
00069     const auto obj = new (storage) T{};
00070     OXYCHECK(storage == obj);
00071     m_objects.emplace(id, obj);
00072     m_objectIDs.emplace(obj, id);
00073     return obj;
00074 }
00075
00076 template <typename T>
00077 auto
00078 ObjectManager::CreateManagedObject(oxyObjectID id) -> std::shared_ptr<T>
00079     requires std::is_base_of_v<ManagedObject, T> &&
00080         std::is_same_v<typename T::SelfType, T>
00081 {
00082     if (!id)
00083         id = ++m_nextManagedID;
00084     else
00085     {
00086         const auto it = m_managedObjects.find(id);
00087         if (it != m_managedObjects.end())
00088         {
00089             auto sptr = it->second.lock();
00090             if (sptr)
00091                 return std::static_pointer_cast<T>(std::move(sptr));
00092             return nullptr;
00093         }
00094     }
00095     const auto ptr = NewObject<T>(id);
00096     auto sptr = std::shared_ptr<T>(ptr, ManagedObjectDeleter{});
00097     ptr->m_id = id;
00098     ptr->m_self = sptr;
00099     m_managedObjects.emplace(id, sptr);
00100     return sptr;

```

```

00101     }
00102
00103     template <typename T>
00104     auto ObjectManager::GetObjectPtr(oxyObjectID id) const -> T*
00105         requires std::is_base_of_v<Object, T>
00106     {
00107         return static_cast<T*>(GetObjectPtr(id));
00108     }
00109
00110     template <typename T>
00111     auto
00112     ObjectManager::GetManagedRef(oxyObjectID id) const -> std::shared_ptr<T>
00113         requires std::is_base_of_v<ManagedObject, T>
00114     {
00115         auto ref = std::static_pointer_cast<T>(GetManagedRef(id));
00116         if (ref)
00117         {
00118             if (!ref->IsA<T>())
00119                 ref = {};
00120         }
00121         return ref;
00122     }
00123 }; // namespace oxygen

```

## 7.64 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/OxygenPCH.cc File Reference

```
#include "OxygenPCH.h"
```

## 7.65 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/OxygenPCH.h File Reference

```
#include "Platform/InternalPCHBase.h"
```

## 7.66 OxygenPCH.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002
00003 #if defined(_WIN32) && defined(_WIN64) && defined(_MSC_VER)
00004 #include "Platform/PlatformWin64/PrecompiledHeaders/PCH.h"
00005 #else
00006 #error "Unsupported platform"
00007 #endif
00008
00009 #include "Platform/InternalPCHBase.h"

```

## 7.67 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/OxygenTypes.h File Reference

```

#include <cstdint>
#include "Math/Defs.h"
#include "Math/Hash.h"
#include "Math/Random.h"
#include "Containers/SPSCQueue.h"

```

## Classes

- struct [oxygen::NonCopyable](#)  
A non-copyable type to be inherited from. Expresses clearly that a type cannot be copied.
- struct [oxygen::CallbackList< TRet, TArgs >](#)

## Namespaces

- namespace [oxygen](#)

## Typedefs

- using [oxyU8](#) = std::uint8\_t
- using [oxyU16](#) = std::uint16\_t
- using [oxyU32](#) = std::uint32\_t
- using [oxyU64](#) = std::uint64\_t
- using [oxyS8](#) = std::int8\_t
- using [oxyS16](#) = std::int16\_t
- using [oxyS32](#) = std::int32\_t
- using [oxyS64](#) = std::int64\_t
- using [oxyF32](#) = float
- using [oxyF64](#) = double
- using [oxyBool](#) = bool
- using [oxyChar](#) = char
- using [oxyWChar](#) = wchar\_t
- using [oxySize](#) = size\_t
- using [oxySSize](#) = ptrdiff\_t
- using [oxyObjectID](#) = oxyU64

## Enumerations

- enum [oxygen::ControllerButton](#) : oxyU8 {  
[oxygen::ControllerButton\\_LeftThumb](#) , [oxygen::ControllerButton\\_RightThumb](#) , [oxygen::ControllerButton\\_LeftShoulder](#) ,  
[oxygen::ControllerButton\\_RightShoulder](#) ,  
[oxygen::ControllerButton\\_South](#) , [oxygen::ControllerButton\\_East](#) , [oxygen::ControllerButton\\_West](#) ,  
[oxygen::ControllerButton\\_North](#) ,  
[oxygen::ControllerButton\\_StartSelect](#) , [oxygen::ControllerButton\\_BackShare](#) , [oxygen::ControllerButton\\_DPadUp](#) ,  
[oxygen::ControllerButton\\_DPadDown](#) ,  
[oxygen::ControllerButton\\_DPadLeft](#) , [oxygen::ControllerButton\\_DPadRight](#) , [oxygen::ControllerButton\\_Count](#)  
}
- enum [oxygen::ControllerAxis](#) : oxyU8 {  
[oxygen::ControllerAxis\\_LeftThumbX](#) , [oxygen::ControllerAxis\\_LeftThumbY](#) , [oxygen::ControllerAxis\\_RightThumbX](#) ,  
[oxygen::ControllerAxis\\_RightThumbY](#) ,  
[oxygen::ControllerAxis\\_LeftTrigger](#) , [oxygen::ControllerAxis\\_RightTrigger](#) , [oxygen::ControllerAxis\\_Count](#) }
- enum [oxygen::MouseButton](#) : oxyU8 {  
[oxygen::MouseButton\\_Left](#) , [oxygen::MouseButton\\_Right](#) , [oxygen::MouseButton\\_Middle](#) , [oxygen::MouseButton\\_X1](#) ,  
[oxygen::MouseButton\\_X2](#) , [oxygen::MouseButton\\_Count](#) }

```

• enum oxygen::KeyboardButton : oxyU8 {
    oxygen::KeyboardButton_A , oxygen::KeyboardButton_B , oxygen::KeyboardButton_C , oxygen::KeyboardButton_D
    ,
    oxygen::KeyboardButton_E , oxygen::KeyboardButton_F , oxygen::KeyboardButton_G , oxygen::KeyboardButton_H
    ,
    oxygen::KeyboardButton_I , oxygen::KeyboardButton_J , oxygen::KeyboardButton_K , oxygen::KeyboardButton_L
    ,
    oxygen::KeyboardButton_M , oxygen::KeyboardButton_N , oxygen::KeyboardButton_O , oxygen::KeyboardButton_P
    ,
    oxygen::KeyboardButton_Q , oxygen::KeyboardButton_R , oxygen::KeyboardButton_S , oxygen::KeyboardButton_T
    ,
    oxygen::KeyboardButton_U , oxygen::KeyboardButton_V , oxygen::KeyboardButton_W , oxygen::KeyboardButton_X
    ,
    oxygen::KeyboardButton_Y , oxygen::KeyboardButton_Z , oxygen::KeyboardButton_0 , oxygen::KeyboardButton_1
    ,
    oxygen::KeyboardButton_2 , oxygen::KeyboardButton_3 , oxygen::KeyboardButton_4 , oxygen::KeyboardButton_5
    ,
    oxygen::KeyboardButton_6 , oxygen::KeyboardButton_7 , oxygen::KeyboardButton_8 , oxygen::KeyboardButton_9
    ,
    oxygen::KeyboardButton_F1 , oxygen::KeyboardButton_F2 , oxygen::KeyboardButton_F3 , oxygen::KeyboardButton_F4
    ,
    oxygen::KeyboardButton_F5 , oxygen::KeyboardButton_F6 , oxygen::KeyboardButton_F7 , oxygen::KeyboardButton_F8
    ,
    oxygen::KeyboardButton_F9 , oxygen::KeyboardButton_F10 , oxygen::KeyboardButton_F11 , oxygen::KeyboardButton_F12
    ,
    oxygen::KeyboardButton_F13 , oxygen::KeyboardButton_F14 , oxygen::KeyboardButton_F15 , oxygen::KeyboardButton_F16
    ,
    oxygen::KeyboardButton_F17 , oxygen::KeyboardButton_F18 , oxygen::KeyboardButton_F19 , oxygen::KeyboardButton_F20
    ,
    oxygen::KeyboardButton_F21 , oxygen::KeyboardButton_F22 , oxygen::KeyboardButton_F23 , oxygen::KeyboardButton_F24
    ,
    oxygen::KeyboardButton_Numpad0 , oxygen::KeyboardButton_Numpad1 , oxygen::KeyboardButton_Numpad2
    , oxygen::KeyboardButton_Numpad3 ,
    oxygen::KeyboardButton_Numpad4 , oxygen::KeyboardButton_Numpad5 , oxygen::KeyboardButton_Numpad6
    , oxygen::KeyboardButton_Numpad7 ,
    oxygen::KeyboardButton_Numpad8 , oxygen::KeyboardButton_Numpad9 , oxygen::KeyboardButton_NumpadDecimal
    , oxygen::KeyboardButton_NumpadEnter ,
    oxygen::KeyboardButton_NumpadAdd , oxygen::KeyboardButton_NumpadSubtract , oxygen::KeyboardButton_NumpadMultipl
    , oxygen::KeyboardButton_NumpadDivide ,
    oxygen::KeyboardButton_NumpadLock , oxygen::KeyboardButton_Left , oxygen::KeyboardButton_Right ,
    oxygen::KeyboardButton_Up ,
    oxygen::KeyboardButton_Down , oxygen::KeyboardButton_Home , oxygen::KeyboardButton_End ,
    oxygen::KeyboardButton_PageUp ,
    oxygen::KeyboardButton_PageDown , oxygen::KeyboardButton_Insert , oxygen::KeyboardButton_Delete ,
    oxygen::KeyboardButton_Pause ,
    oxygen::KeyboardButton_PrintScreen , oxygen::KeyboardButton_ScrollLock , oxygen::KeyboardButton_Escape
    , oxygen::KeyboardButton_Backtick ,
    oxygen::KeyboardButton_Tab , oxygen::KeyboardButton_CapsLock , oxygen::KeyboardButton_LeftShift ,
    oxygen::KeyboardButton_LeftControl ,
    oxygen::KeyboardButton_LeftWindows , oxygen::KeyboardButton_LeftAlt , oxygen::KeyboardButton_Space ,
    oxygen::KeyboardButton_RightAlt ,
    oxygen::KeyboardButton_RightFunction , oxygen::KeyboardButton_RightMenu , oxygen::KeyboardButton_RightControl
    , oxygen::KeyboardButton_RightShift ,
    oxygen::KeyboardButton_Enter , oxygen::KeyboardButton_Backspace , oxygen::KeyboardButton_Comma ,
    oxygen::KeyboardButton_Period ,
    oxygen::KeyboardButton_Slash , oxygen::KeyboardButton_Semicolon , oxygen::KeyboardButton_Apostrophe
    , oxygen::KeyboardButton_LeftBracket ,
    oxygen::KeyboardButton_RightBracket , oxygen::KeyboardButton_Backslash , oxygen::KeyboardButton_Hyphen

```



```

, oxygen::KeyboardButton_Equals ,
oxygen::KeyboardButton_Count }
• enum oxygen::CollisionHull : oxyU8 {
oxygen::CollisionHull_None = 0xFF , oxygen::CollisionHull_Point = 0 , oxygen::CollisionHull_Player ,
oxygen::CollisionHull_PlayerCrouched ,
oxygen::CollisionHull_Grenade }
• enum oxygen::CollisionResponseType : oxyU8 { oxygen::CollisionResponseType_None , oxygen::CollisionResponseType_Slide
, oxygen::CollisionResponseType_Bounce }
• enum oxygen::EntitySummonType : oxyU8 { oxygen::EntitySummonType_Player , oxygen::EntitySummonType_Count
}
• enum oxygen::AnimationHash : oxyU32 {
oxygen::AnimationHash_Idle = 0x7c161a2b , oxygen::AnimationHash_RunForward = 0x947ec374 ,
oxygen::AnimationHash_RunBackward = 0x144ff8d , oxygen::AnimationHash_Dying = 0x12c8a4ff ,
oxygen::AnimationHash_Throw = 0x8e526e33 }
• enum oxygen::EntitySpawnType : oxyU8 {
oxygen::EntitySpawnType_Player , oxygen::EntitySpawnType_Golfclub , oxygen::EntitySpawnType_GolfclubLauncher
, oxygen::EntitySpawnType_Golfball ,
oxygen::EntitySpawnType_GolfballLauncher , oxygen::EntitySpawnType_Count }
• enum oxygen::NetProtoMsgType : oxyU16 {
oxygen::NetProtoMsgType_AnyPing = 0 , oxygen::NetProtoMsgType_SrvWelcome , oxygen::NetProtoMsgType_SrvChangeLev
, oxygen::NetProtoMsgType_SrvSetLocalPlayer ,
oxygen::NetProtoMsgType_SrvEntitySpawn , oxygen::NetProtoMsgType_SrvEntityDestroy , oxygen::NetProtoMsgType_SrvEnt
, oxygen::NetProtoMsgType_SrvHealhComponentChange ,
oxygen::NetProtoMsgType_SrvPawnPickupWeapon , oxygen::NetProtoMsgType_SrvPawnDropWeapon ,
oxygen::NetProtoMsgType_CliLocalPlayerEntityMove , oxygen::NetProtoMsgType_CliPawnDropWeapon ,
oxygen::NetProtoMsgType_CliLocalPlayerFireWeapon }
• enum oxygen::PickupType : oxyU8 { oxygen::PickupType_Health , oxygen::PickupType_Ammo ,
oxygen::PickupType_Weapon , oxygen::PickupType_Count }
• enum oxygen::WeaponFireType : oxyU8 { oxygen::WeaponFireType_Bullets , oxygen::WeaponFireType_GolfClub
, oxygen::WeaponFireType_GolfBall , oxygen::WeaponFireType_Count }
• enum oxygen::HealthState : oxyU8 { oxygen::HealthState_Alive , oxygen::HealthState_Invulnerable ,
oxygen::HealthState_Dead }
• enum oxygen::DamageType : oxyU8 {
oxygen::DamageType_None , oxygen::DamageType_Explosive , oxygen::DamageType_Bullet , oxygen::DamageType_Melee
,
oxygen::DamageType_FallDamage , oxygen::DamageType_Count }

```

## Variables

- constexpr oxyVec3 oxygen::k\_collisionHullMins []
- constexpr oxyVec3 oxygen::k\_collisionHullMaxs []

## 7.67.1 Typedef Documentation

### 7.67.1.1 oxyBool

```
using oxyBool = bool
```

### 7.67.1.2 oxyChar

```
using oxyChar = char
```

#### 7.67.1.3 oxyF32

```
using oxyF32 = float
```

#### 7.67.1.4 oxyF64

```
using oxyF64 = double
```

#### 7.67.1.5 oxyObjectID

```
using oxyObjectID = oxyU64
```

#### 7.67.1.6 oxyS16

```
using oxyS16 = std::int16_t
```

#### 7.67.1.7 oxyS32

```
using oxyS32 = std::int32_t
```

#### 7.67.1.8 oxyS64

```
using oxyS64 = std::int64_t
```

#### 7.67.1.9 oxyS8

```
using oxyS8 = std::int8_t
```

#### 7.67.1.10 oxySize

```
using oxySize = size_t
```

#### 7.67.1.11 oxySSize

```
using oxySSize = ptrdiff_t
```

#### 7.67.1.12 oxyU16

```
using oxyU16 = std::uint16_t
```

**7.67.1.13 oxyU32**

```
using oxyU32 = std::uint32_t
```

**7.67.1.14 oxyU64**

```
using oxyU64 = std::uint64_t
```

**7.67.1.15 oxyU8**

```
using oxyU8 = std::uint8_t
```

**7.67.1.16 oxyWChar**

```
using oxyWChar = wchar_t
```

**7.68 OxygenTypes.h**

[Go to the documentation of this file.](#)

```
00001 #pragma once
00002
00003 #include <cstdint>
00004
00005 using oxyU8 = std::uint8_t;
00006 using oxyU16 = std::uint16_t;
00007 using oxyU32 = std::uint32_t;
00008 using oxyU64 = std::uint64_t;
00009 using oxyS8 = std::int8_t;
00010 using oxyS16 = std::int16_t;
00011 using oxyS32 = std::int32_t;
00012 using oxyS64 = std::int64_t;
00013 using oxyF32 = float;
00014 using oxyF64 = double;
00015
00016 using oxyBool = bool;
00017
00018 using oxyChar = char;
00019 using oxyWChar = wchar_t;
00020
00021 using oxySize = size_t;
00022 using oxySSize = ptrdiff_t;
00023
00024 using oxyObjectID = oxyU64;
00025
00026 #include "Math/Defs.h"
00027 #include "Math/Hash.h"
00028 #include "Math/Random.h"
00029
00030 #include "Containers/SPSCQueue.h"
00031
00032 namespace oxygen
00033 {
00034     struct NonCopyable
00035     {
00036         NonCopyable() = default;
00037         NonCopyable(const NonCopyable&) = delete;
00038         NonCopyable& operator=(const NonCopyable&) = delete;
00039     };
00040
00041     enum ControllerButton : oxyU8
00042     {
00043         ControllerButton_LeftThumb,
00044         ControllerButton_RightThumb,
00045         ControllerButton_LeftShoulder,
00046         ControllerButton_RightShoulder,
00047     };
00048 }
```

```
00052         ControllerButton_South,
00053         ControllerButton_East,
00054         ControllerButton_West,
00055         ControllerButton_North,
00056         ControllerButton_StartSelect,
00057         ControllerButton_BackShare,
00058         ControllerButton_DPadUp,
00059         ControllerButton_DPadDown,
00060         ControllerButton_DPadLeft,
00061         ControllerButton_DPadRight,
00062         ControllerButton_Count
00063     };
00064
00065     enum ControllerAxis : oxyU8
00066     {
00067         ControllerAxis_LeftThumbX,
00068         ControllerAxis_LeftThumbY,
00069         ControllerAxis_RightThumbX,
00070         ControllerAxis_RightThumbY,
00071         ControllerAxis_LeftTrigger,
00072         ControllerAxis_RightTrigger,
00073         ControllerAxis_Count
00074     };
00075
00076     enum MouseButton : oxyU8
00077     {
00078         MouseButton_Left,
00079         MouseButton_Right,
00080         MouseButton_Middle,
00081         MouseButton_X1,
00082         MouseButton_X2,
00083         MouseButton_Count
00084     };
00085
00086     enum KeyboardButton : oxyU8
00087     {
00088         // A-Z
00089         KeyboardButton_A,
00090         KeyboardButton_B,
00091         KeyboardButton_C,
00092         KeyboardButton_D,
00093         KeyboardButton_E,
00094         KeyboardButton_F,
00095         KeyboardButton_G,
00096         KeyboardButton_H,
00097         KeyboardButton_I,
00098         KeyboardButton_J,
00099         KeyboardButton_K,
00100         KeyboardButton_L,
00101         KeyboardButton_M,
00102         KeyboardButton_N,
00103         KeyboardButton_O,
00104         KeyboardButton_P,
00105         KeyboardButton_Q,
00106         KeyboardButton_R,
00107         KeyboardButton_S,
00108         KeyboardButton_T,
00109         KeyboardButton_U,
00110         KeyboardButton_V,
00111         KeyboardButton_W,
00112         KeyboardButton_X,
00113         KeyboardButton_Y,
00114         KeyboardButton_Z,
00115
00116         // 0-9
00117         KeyboardButton_0,
00118         KeyboardButton_1,
00119         KeyboardButton_2,
00120         KeyboardButton_3,
00121         KeyboardButton_4,
00122         KeyboardButton_5,
00123         KeyboardButton_6,
00124         KeyboardButton_7,
00125         KeyboardButton_8,
00126         KeyboardButton_9,
00127
00128         // F1-F24
00129         KeyboardButton_F1,
00130         KeyboardButton_F2,
00131         KeyboardButton_F3,
00132         KeyboardButton_F4,
00133         KeyboardButton_F5,
00134         KeyboardButton_F6,
00135         KeyboardButton_F7,
00136         KeyboardButton_F8,
00137         KeyboardButton_F9,
00138         KeyboardButton_F10,
```

```
00139     KeyboardButton_F11,
00140     KeyboardButton_F12,
00141     KeyboardButton_F13,
00142     KeyboardButton_F14,
00143     KeyboardButton_F15,
00144     KeyboardButton_F16,
00145     KeyboardButton_F17,
00146     KeyboardButton_F18,
00147     KeyboardButton_F19,
00148     KeyboardButton_F20,
00149     KeyboardButton_F21,
00150     KeyboardButton_F22,
00151     KeyboardButton_F23,
00152     KeyboardButton_F24,
00153
00154     // Numpad 0-9
00155     KeyboardButton_Numpad0,
00156     KeyboardButton_Numpad1,
00157     KeyboardButton_Numpad2,
00158     KeyboardButton_Numpad3,
00159     KeyboardButton_Numpad4,
00160     KeyboardButton_Numpad5,
00161     KeyboardButton_Numpad6,
00162     KeyboardButton_Numpad7,
00163     KeyboardButton_Numpad8,
00164     KeyboardButton_Numpad9,
00165
00166     // Numpad etc
00167     KeyboardButton_NumpadDecimal,
00168     KeyboardButton_NumpadEnter,
00169     KeyboardButton_NumpadAdd,
00170     KeyboardButton_NumpadSubtract,
00171     KeyboardButton_NumpadMultiply,
00172     KeyboardButton_NumpadDivide,
00173     KeyboardButton_NumpadLock,
00174
00175     // Arrow keys
00176     KeyboardButton_Left,
00177     KeyboardButton_Right,
00178     KeyboardButton_Up,
00179     KeyboardButton_Down,
00180
00181     // Home/End, Page Up/Down, Insert/Delete
00182     KeyboardButton_Home,
00183     KeyboardButton_End,
00184     KeyboardButton_PageUp,
00185     KeyboardButton_PageDown,
00186     KeyboardButton_Insert,
00187     KeyboardButton_Delete,
00188
00189     // Pause/Break, Print Screen, Scroll Lock
00190     KeyboardButton_Pause,
00191     KeyboardButton_PrintScreen,
00192     KeyboardButton_ScrollLock,
00193
00194     // Escape, Backtick, Tab, Caps Lock, Left Shift, Left Control, Left
00195     // Windows, Left Alt
00196     KeyboardButton_Escape,
00197     KeyboardButton_Backtick,
00198     KeyboardButton_Tab,
00199     KeyboardButton_CapsLock,
00200     KeyboardButton_LeftShift,
00201     KeyboardButton_LeftControl,
00202     KeyboardButton_LeftWindows,
00203     KeyboardButton_LeftAlt,
00204
00205     // Space
00206     KeyboardButton_Space,
00207
00208     // Right Alt, Right Function, Right Menu, Right Control, Right Shift,
00209     // Enter, Backspace
00210     KeyboardButton_RightAlt,
00211     KeyboardButton_RightFunction,
00212     KeyboardButton_RightMenu,
00213     KeyboardButton_RightControl,
00214     KeyboardButton_RightShift,
00215     KeyboardButton_Enter,
00216     KeyboardButton_Backspace,
00217
00218     // Comma, Period, Slash, Semicolon, Apostrophe, Left Bracket, Right
00219     // Bracket, Backslash, Hyphen, Equals
00220     KeyboardButton_Comma,
00221     KeyboardButton_Period,
00222     KeyboardButton_Slash,
00223     KeyboardButton_Semicolon,
00224     KeyboardButton_Apostrophe,
00225     KeyboardButton_LeftBracket,
```

```

00226     KeyboardButton_RightBracket,
00227     KeyboardButton_Backslash,
00228     KeyboardButton_Hyphen,
00229     KeyboardButton_Equals,
00230
00231     KeyboardButton_Count
00232 };
00233
00234 enum CollisionHull : oxyU8
00235 {
00236     CollisionHull_None = 0xFF,
00237     CollisionHull_Point = 0,
00238     CollisionHull_Player,
00239     CollisionHull_PlayerCrouched,
00240     CollisionHull_Grenade,
00241 };
00242
00243 inline constexpr oxyVec3 k_collisionHullMins[] = {
00244     oxyVec3{0.f, 0.f, 0.f}, // CollisionHull_Point
00245     oxyVec3{-24.f, -24.f, -48.f}, // CollisionHull_Player
00246     oxyVec3{-24.f, -24.f, -48.f}, // CollisionHull_PlayerCrouched
00247     oxyVec3{-12.f, -12.f, -12.f}, // CollisionHull_Grenade
00248 };
00249 inline constexpr oxyVec3 k_collisionHullMaxs[] = {
00250     oxyVec3{0.f, 0.f, 0.f}, // CollisionHull_Point
00251     oxyVec3{24.f, 24.f, 48.f}, // CollisionHull_Player
00252     oxyVec3{24.f, 24.f, 48.f}, // CollisionHull_PlayerCrouched
00253     oxyVec3{12.f, 12.f, 12.f}, // CollisionHull_Grenade
00254 };
00255
00256 enum CollisionResponseType : oxyU8
00257 {
00258     CollisionResponseType_None,
00259     CollisionResponseType_Slide,
00260     CollisionResponseType_Bounce,
00261 };
00262
00263 enum EntitySummonType : oxyU8
00264 {
00265     EntitySummonType_Player,
00266     EntitySummonType_Count
00267 };
00268
00269 enum AnimationHash : oxyU32
00270 {
00271     AnimationHash_Idle = 0x7c161a2b,
00272     AnimationHash_RunForward = 0x947ec374,
00273     AnimationHash_RunBackward = 0x144ff8d,
00274     AnimationHash_Dying = 0x12c8a4ff,
00275     AnimationHash_Throw = 0x8e526e33,
00276 };
00277
00278 enum EntitySpawnType : oxyU8
00279 {
00280     EntitySpawnType_Player,
00281     EntitySpawnType_Golfclub,
00282     EntitySpawnType_GolfclubLauncher,
00283     EntitySpawnType_Golfball,
00284     EntitySpawnType_GolfballLauncher,
00285     EntitySpawnType_Count
00286 };
00287
00288 enum NetProtoMsgType : oxyU16
00289 {
00290     NetProtoMsgType_AnyPing = 0,
00291
00292     // srv->cl
00293     // oxyU64: unique client id (only the client and host know this, not
00294     // other peers)
00295     NetProtoMsgType_SrvWelcome,
00296
00297     // [utf8 string]: world name
00298     NetProtoMsgType_SrvChangeLevel,
00299
00300     // oxyObjectID: entity id to possess
00301     NetProtoMsgType_SrvSetLocalPlayer,
00302     // oxyU16: EntitySpawnType
00303     // oxyVec3: position
00304     // oxyQuat: rotation
00305     // oxyU16: count of object ids
00306     // for each object id:
00307     // oxyObjectID: entity (if idx 0), or component id for spawning
00308     NetProtoMsgType_SrvEntitySpawn,
00309
00310     // oxyObjectID: entity id
00311     NetProtoMsgType_SrvEntityDestroy,
00312

```

```

00313         // oxyU16: count of entities in msg
00314         // for each entity:
00315         // oxyObjectID: entity id
00316         // oxyVec3: position
00317         // oxyQuat: rotation
00318         NetProtoMsgType_SrvEntityTransformRepl,
00319
00320         // oxyObjectID: health component id
00321         // oxyS32: health
00322         // oxyS32: max health
00323         // oxyU8: health state
00324         NetProtoMsgType_SrvHealhComponentChange,
00325
00326         // oxyObjectID: pawn component id
00327         // oxyObjectID: weapon component id
00328         NetProtoMsgType_SrvPawnPickupWeapon,
00329
00330         // oxyObjectID: pawn component id
00331         NetProtoMsgType_SrvPawnDropWeapon,
00332
00333         // client->srv
00334         // oxyVec3: position
00335         // oxyQuat: rotation
00336         NetProtoMsgType_CliLocalPlayerEntityMove,
00337
00338         // oxyObjectID: pawn component id
00339         NetProtoMsgType_CliPawnDropWeapon,
00340
00341         // oxyVec3: euler
00342         // oxyVec3: position
00343         // oxyU8: righthanded
00344         NetProtoMsgType_CliLocalPlayerFireWeapon,
00345
00346     };
00347
00348     enum PickupType : oxyU8
00349     {
00350         PickupType_Health,
00351         PickupType_Ammo,
00352         PickupType_Weapon,
00353         PickupType_Count
00354     };
00355
00356     enum WeaponFireType : oxyU8
00357     {
00358         WeaponFireType_Bullets,
00359         WeaponFireType_GolfClub,
00360         WeaponFireType_GolfBall,
00361         WeaponFireType_Count
00362     };
00363
00364     enum HealthState : oxyU8
00365     {
00366         HealthState_Alive,
00367         HealthState_Invulnerable,
00368         HealthState_Dead,
00369     };
00370
00371     enum DamageType : oxyU8
00372     {
00373         DamageType_None,
00374         DamageType_Explosive,
00375         DamageType_Bullet,
00376         DamageType_Melee,
00377         DamageType_FallDamage,
00378         DamageType_Count,
00379     };
00380
00381     template <typename TRet, typename... TArgs> struct CallbackList
00382     {
00383         using fnptr_type = TRet (*)(void*, TArgs...);
00384
00385         auto AddCallback(std::weak_ptr<void> obj, fnptr_type fn) -> void
00386         {
00387             m_callbacks.emplace_back(std::move(obj), fn);
00388         }
00389
00390         template <typename TFun>
00391         auto IterateCallbacks(TFun&& fun, TArgs... args)
00392
00393             -> void
00394             requires(not std::same_as<void, TRet>)
00395         {
00396             for (auto it = m_callbacks.begin(); it != m_callbacks.end(); )
00397             {
00398                 auto& [obj, fn] = *it;
00399                 if (auto sp = obj.lock())

```

```

00400         {
00401             fun(fn(sp, std::forward<TArgs>(args)...));
00402             ++it;
00403         }
00404         else
00405         {
00406             it = m_callbacks.erase(it);
00407         }
00408     }
00409 }
00410
00411 template <typename TFun>
00412 auto IterateCallbacks(TFun&& fun, TArgs... args)
00413
00414     -> void
00415 {
00416     for (auto it = m_callbacks.begin(); it != m_callbacks.end(); )
00417     {
00418         auto& [obj, fn] = *it;
00419         if (auto sp = obj.lock())
00420         {
00421             fn(sp.get(), std::forward<TArgs>(args)...);
00422             fun();
00423             ++it;
00424         }
00425         else
00426         {
00427             it = m_callbacks.erase(it);
00428         }
00429     }
00430 }
00431
00432 private:
00433     std::vector<std::pair<std::weak_ptr<void>, fnptr_type>> m_callbacks;
00434 };
00435
00436 }; // namespace oxygen

```

## 7.69 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Platform/InternalPCHBase.h File Reference

```

#include <memory>
#include <memory_resource>
#include <utility>
#include <execution>
#include <thread>
#include <future>
#include <atomic>
#include <algorithm>
#include <ranges>
#include <mutex>
#include <optional>
#include <variant>
#include <array>
#include <string>
#include <vector>
#include <unordered_map>
#include <bitset>
#include <string_view>
#include <span>
#include <format>
#include <cmath>
#include <random>
#include "OxygenTypes.h"
#include "Object/Object.h"
#include "Object/ManagedObject.h"
#include "Object/ObjectManager.h"

```



## 7.70 InternalPCHBase.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002
00003 // memory
00004 // #include <new> // transitive include from <memory>
00005 #include <memory>
00006 #include <memory_resource>
00007
00008 // util
00009 #include <utility>
00010
00011 // execution
00012 #include <execution>
00013
00014 // threading
00015 #include <thread>
00016 #include <future>
00017 #include <atomic>
00018
00019 // algorithm/ranges
00020 #include <algorithm>
00021 #include <ranges>
00022
00023 // threading
00024 #include <thread>
00025 #include <future>
00026 #include <atomic>
00027 #include <mutex> // deeply ashamed of this one
00028
00029 // containers
00030 #include <optional>
00031 #include <variant>
00032 #include <array>
00033 #include <string>
00034 #include <vector>
00035 #include <unordered_map>
00036 #include <bitset>
00037
00038 // spans
00039 #include <string_view>
00040 #include <span>
00041
00042 // formatting
00043 #include <format>
00044
00045 // math
00046 #include <cmath>
00047
00048 // random
00049 #include <random>
00050
00051 // engine types
00052 #include "OxygenTypes.h"
00053 #include "Object/Object.h"
00054 #include "Object/ManagedObject.h"
00055 #include "Object/ObjectManager.h"

```

## 7.71 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Platform/Platform.h File Reference

## 7.72 Platform.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002 #pragma once
00003
00004 namespace oxygen
00005 {
00006     auto GetExecutableDirectory() -> std::string_view;
00007
00008     auto GetLaunchArguments() -> std::span<const std::string>;
00009

```

```

00010     auto LogMessage(const char* str) -> void;
00011
00012     auto ReadFileContents(std::string_view absolutePath) -> std::vector<oxyU8>;
00013
00014     struct FileMap : NonCopyable
00015     {
00016         auto GetMap() const -> void*
00017         {
00018             return m_data;
00019         }
00020         auto GetSize() const -> oxySize
00021         {
00022             return m_size;
00023         }
00024         auto ValidateRange(const void* ptr, oxySize sz) const -> bool
00025         {
00026             return reinterpret_cast<const oxyU8*>(ptr) >=
00027                 reinterpret_cast<const oxyU8*>(m_data) &&
00028                 (reinterpret_cast<const oxyU8*>(ptr) + sz) <=
00029                 (reinterpret_cast<const oxyU8*>(m_data) + m_size) &&
00030                 sz && m_data;
00031         }
00032
00033     protected:
00034         FileMap() = default;
00035         ~FileMap() = default;
00036         void* m_data{};
00037         oxySize m_size{};
00038     };
00039     struct InternalFileMapDeleter
00040     {
00041         auto operator()(FileMap* ptr) const -> void;
00042     };
00043     using UniqueFileMap = std::unique_ptr<FileMap, InternalFileMapDeleter>;
00044     auto CreateFileMap(std::string_view path, oxyBool write = false,
00045                       oxySize requestSize = 0) -> UniqueFileMap;
00046
00047     namespace GraphicsAbstraction
00048     {
00049         auto GetWindowSize(oxyS32& width, oxyS32& height) -> void;
00050
00051         struct Texture
00052         {
00053             oxyU32 m_width;
00054             oxyU32 m_height;
00055             void* m_internalPlatformHandle;
00056         };
00057         auto
00058         LoadTexture(const char* absolutePath) -> std::shared_ptr<const Texture>;
00059
00060         struct TexturedQuad
00061         {
00062             // NDC, -1 to +1
00063             oxyVec2 m_vertices[4];
00064             // OpenGL style uvs
00065             oxyVec2 m_textureCoords[4];
00066             // RGB
00067             oxyVec3 m_colour;
00068             // Sample texture
00069             const Texture* m_texture;
00070         };
00071         auto DrawTexturedQuad(const TexturedQuad& quad) -> void;
00072     }; // namespace GraphicsAbstraction
00073
00074     namespace AudioAbstraction
00075     {
00076     };
00077
00078     namespace InputAbstraction
00079     {
00080         auto HideAndLockCursor(oxyBool lock) -> void;
00081         auto GetMousePosition(oxyF32& x, oxyF32& y) -> void;
00082         auto GetMouseStates(std::bitset<MouseButton_Count>& buttons) -> void;
00083         auto GetKeyStates(std::bitset<KeyboardButton_Count>& keys) -> void;
00084         auto GetControllerConnected(int index) -> oxyBool;
00085         auto GetControllerStates(
00086             int index, std::bitset<ControllerButton_Count>& buttons) -> void;
00087         auto GetControllerAxisStates(
00088             int index, std::span<oxyF32, ControllerAxis_Count> axes) -> void;
00089     }; // namespace InputAbstraction
00090
00091     namespace NetworkAbstraction
00092     {
00093         struct NetworkSocket
00094         {
00095         }
00096     }

```

```

00097         ~NetworkSocket();
00098
00099         auto Send(const void* data, oxySize size) -> oxySSize;
00100         auto Receive(void* data, oxySize size) -> oxySSize;
00101
00102         auto Accept() -> std::unique_ptr<NetworkSocket>;
00103
00104         auto BroadcastMessage(const void* data, oxySize size) -> std::vector<std::string>;
00105         auto RespondToBroadcasts(const void* data, oxySize size) -> void;
00106
00107     private:
00108         OXYSOCKETDESCRIPTORTYPE
00109         m_descriptor{}; // might need to be changed, unix uses signed
00110         oxyU32 m_address{};
00111         oxyU16 m_port{};
00112
00113         friend auto ConnectToHost(const char* host, oxyU16 port)
00114             -> std::unique_ptr<NetworkSocket>;
00115         friend auto
00116         HostServer(oxyU16 port) -> std::unique_ptr<NetworkSocket>;
00117         friend auto CreateBroadcastSendSocket(oxyU16 port)
00118             -> std::unique_ptr<NetworkSocket>;
00119         friend auto CreateBroadcastListenSocket(oxyU16 port)
00120             -> std::unique_ptr<NetworkSocket>;
00121     };
00122     auto ConnectToHost(const char* host,
00123                       oxyU16 port) -> std::unique_ptr<NetworkSocket>;
00124     auto HostServer(oxyU16 port) -> std::unique_ptr<NetworkSocket>;
00125     auto
00126     CreateBroadcastSendSocket(oxyU16 port) -> std::unique_ptr<NetworkSocket>;
00127     auto CreateBroadcastListenSocket(oxyU16 port)
00128         -> std::unique_ptr<NetworkSocket>;
00129
00130 }; // namespace NetworkAbstraction
00131
00132 }; // namespace oxygen

```

## 7.73 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Platform/PlatformWin64/Platform.cc File Reference

```

#include "OxygenPCH.h"
#include "Platform/Platform.h"
#include "Singleton/EngineSingletons.h"
#include "App/app.h"
#include "PrivateMembers.h"

```

### Classes

- struct [oxygen::InternalFileMapWinX64](#)

### Namespaces

- namespace [oxygen](#)
- namespace [oxygen::GraphicsAbstraction](#)
- namespace [oxygen::AudioAbstraction](#)
- namespace [oxygen::InputAbstraction](#)
- namespace [oxygen::NetworkAbstraction](#)

### Macros

- #define [SETBTNDOWN](#)(idx, appParam)
- #define [SETKEYDOWN](#)(idx, appParam)

## Functions

- auto [oxygen::GetExecutableDirectory](#) () -> std::string\_view
- auto [oxygen::GetLaunchArguments](#) () -> std::span< const std::string >
- auto [oxygen::LogMessage](#) (const char \*str) -> void
- auto [oxygen::ReadFileContents](#) (std::string\_view absolutePath) -> std::vector< [oxyU8](#) >
- auto [oxygen::CreateFileMap](#) (std::string\_view path, [oxyBool](#) write, [oxySize](#) requestSize) -> UniqueFileMap
- auto [oxygen::Win64PlatformInit](#) () -> void
- auto [oxygen::Win64PlatformRender](#) () -> void
- auto [oxygen::Win64PlatformUpdate](#) (float deltaTimeSeconds) -> void
- auto [oxygen::Win64PlatformShutdown](#) () -> void
- auto [oxygen::GraphicsAbstraction::GetWindowSize](#) ([oxyS32](#) &width, [oxyS32](#) &height) -> void
- auto [oxygen::GraphicsAbstraction::LoadTexture](#) (const char \*absolutePath) -> std::shared\_ptr< const Texture >
- auto [oxygen::GraphicsAbstraction::DrawTexturedQuad](#) (const TexturedQuad &quad) -> void
- auto [oxygen::InputAbstraction::IsForeground](#) () -> [oxyBool](#)
- auto [oxygen::InputAbstraction::HideAndLockCursor](#) ([oxyBool](#) lock) -> void
- auto [oxygen::InputAbstraction::GetMousePosition](#) ([oxyF32](#) &x, [oxyF32](#) &y) -> void
- auto [oxygen::InputAbstraction::GetMouseStates](#) (std::bitset< [MouseButton\\_Count](#) > &buttons) -> void
- auto [oxygen::InputAbstraction::GetKeyStates](#) (std::bitset< [KeyboardButton\\_Count](#) > &keys) -> void
- auto [oxygen::InputAbstraction::GetControllerConnected](#) (int index) -> [oxyBool](#)
- auto [oxygen::InputAbstraction::GetControllerStates](#) (int index, std::bitset< [ControllerButton\\_Count](#) > &buttons) -> void
- auto [oxygen::InputAbstraction::GetControllerAxisStates](#) (int index, std::span< [oxyF32](#), [ControllerAxis\\_Count](#) > axes) -> void
- auto [oxygen::NetworkAbstraction::ConnectToHost](#) (const char \*host, [oxyU16](#) port) -> std::unique\_ptr< NetworkSocket >
- auto [oxygen::NetworkAbstraction::HostServer](#) ([oxyU16](#) port) -> std::unique\_ptr< NetworkSocket >
- auto [oxygen::NetworkAbstraction::CreateBroadcastSendSocket](#) ([oxyU16](#) port) -> std::unique\_ptr< NetworkSocket >
- auto [oxygen::NetworkAbstraction::CreateBroadcastListenSocket](#) ([oxyU16](#) port) -> std::unique\_ptr< NetworkSocket >

## Variables

- int [WINDOW\\_WIDTH](#)
- int [WINDOW\\_HEIGHT](#)
- HWND [MAIN\\_WINDOW\\_HANDLE](#)

## 7.73.1 Macro Definition Documentation

### 7.73.1.1 SETBTNDOWN

```
#define SETBTNDOWN(  
    idx,  
    appParam)
```

#### Value:

```
buttons[idx] = App::IsKeyPressed(appParam);
```

### 7.73.1.2 SETKEYDOWN

```
#define SETKEYDOWN(  
    idx,  
    appParam)
```

#### Value:

```
keys[idx] = App::IsKeyPressed(appParam);
```

## 7.73.2 Variable Documentation

### 7.73.2.1 MAIN\_WINDOW\_HANDLE

```
HWND MAIN_WINDOW_HANDLE [extern]
```

### 7.73.2.2 WINDOW\_HEIGHT

```
int WINDOW_HEIGHT [extern]
```

### 7.73.2.3 WINDOW\_WIDTH

```
int WINDOW_WIDTH [extern]
```

## 7.74 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Platform/PlatformWin64/PrecompiledHeaders/PCH.h File Reference

```
#include <intrin.h>
```

### Macros

- #define OXYGEN\_PLATFORM\_WIN64
- #define OXYENDIANLITTLE
- #define OXYSOCKETDESCRIPTORTYPE oxyU64
- #define OXYDEBUGBREAK()
- #define OXYCHECK(x)
- #define OXYVERIFY(x)

## 7.74.1 Macro Definition Documentation

### 7.74.1.1 OXYCHECK

```
#define OXYCHECK(  
    x)
```

#### Value:

```
do  
{  
} while (0)
```

```
\  
\  

```

### 7.74.1.2 OXYDEBUGBREAK

```
#define OXYDEBUGBREAK()
```

#### Value:

```
__writeeflags(__readeflags() | 0x100)
```

### 7.74.1.3 OXYENDIANLITTLE

```
#define OXYENDIANLITTLE
```

### 7.74.1.4 OXYGEN\_PLATFORM\_WIN64

```
#define OXYGEN_PLATFORM_WIN64
```

### 7.74.1.5 OXYCKETDESCRIPTORTYPE

```
#define OXYCKETDESCRIPTORTYPE oxyU64
```

### 7.74.1.6 OXYVERIFY

```
#define OXYVERIFY(  
    x)
```

#### Value:

```
do  
{  
    x;  
} while (0)
```

```
\\  
\\  
\\
```

## 7.75 PCH.h

[Go to the documentation of this file.](#)

```
00001 #define OXYGEN_PLATFORM_WIN64
00002
00003 #include <intrin.h>
00004
00005 #define OXYENDIANLITTLE
00006
00007 #define OXYCKETDESCRIPTORTYPE oxyU64
00008
00009 //
00010 // engine macros
00011 //
00012 // OXYDEBUGBREAK
00013 // Switches the thread into single-step mode, allowing you to debug code
00014 // line-by-line and continue execution if needed
00015 #define OXYDEBUGBREAK() __writeeflags(__readeflags() | 0x100)
00016
00017 // OXYCHECK asserts in debug builds, but does not evaluate or execute in release
00018 #ifdef OXYBUILDDDEBUG
00019 #define OXYCHECK(x)
00020     do
00021     {
00022         if (! (x))
00023         {
00024             OXYDEBUGBREAK();
```

```
\\  
\\  
\\  
\\  
\\
```

```

00025         }
00026     } while (0)
00027 #else
00028 #define OXYCHECK(x)
00029     do
00030     {
00031     } while (0)
00032 #endif
00033 // OXYVERIFY
00034 // OXYVERIFY asserts only in debug builds, but still evaluates and executes in
00035 // release
00036 #ifndef OXYBUILDDDEBUG
00037 #define OXYVERIFY(x)
00038     do
00039     {
00040         if (!(x))
00041         {
00042             OXYDEBUGBREAK();
00043         }
00044     } while (0)
00045 #else
00046 #define OXYVERIFY(x)
00047     do
00048     {
00049         x;
00050     } while (0)
00051 #endif

```

## 7.76 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Platform/PlatformWin64/PrivateMembers.h File Reference

```
#include "App/app.h"
```

### Namespaces

- namespace [oxygen](#)
- namespace [oxygen::GraphicsAbstraction](#)
- namespace [oxygen::InputAbstraction](#)

## 7.77 PrivateMembers.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002 #include "App/app.h"
00003
00004 //
00005 // https://web.archive.org/web/20120401132446/http://bloglittb.blogspot.com/2011/12/access-to-private-members-safer.html
00006 // This technique was invented by littb in 2010, long before
00007 // templates were supercharged in C++17. Inspired by this method, I have
00008 // reimplemented it using more modern C++ features.
00009 // https://www.youtube.com/watch?v=SmlLdd1Q2V8
00010 /*
00011 14.7.2p8 The usual access checking rules do not apply to names used to specify
00012 explicit instantiations. [Note: In particular, the template arguments and names
00013 used in the function declarator (including parameter types, return types and
00014 exception specifications) may be private types or objects which would normally
00015 not be accessible and the template may be a member template or member function
00016 which would not normally be accessible.]
00017 */
00018 namespace oxygen
00019 {
00020     namespace
00021     {
00022
00023         // When explicitly instantiated, this assigns a
00024         // non-type-template-parameter value to a reference during global

```

```

00025         // initialization
00026         template <auto& Where, auto What>
00027             requires std::convertible_to<decltype(Where), decltype(What)>
00028             struct NTTPAssigner
00029             {
00030                 static inline decltype(auto) s_assignmentReturnResult{Where = What};
00031             };
00032
00033         // int PrivateClass::*g_privateClassBPointer{};
00034         // template struct NTTPAssigner<g_privateClassBPointer,
00035         // &PrivateClass::b>;
00036         // Effectively, this is roughly equivalent to:
00037         // int PrivateClass::*g_privateClassBPointer = &PrivateClass::b;
00038     }; // namespace
00039 namespace GraphicsAbstraction
00040 {
00041     // CSimpleSprite:
00042     // float m_xpos;
00043     static inline float CSimpleSprite::*g_CSimpleSpriteMemberPointerMXPos{};
00044     template struct NTTPAssigner<g_CSimpleSpriteMemberPointerMXPos,
00045                                 &CSimpleSprite::m_xpos>;
00046
00047     // float m_ypos;
00048     static inline float CSimpleSprite::*g_CSimpleSpriteMemberPointerMYPos{};
00049     template struct NTTPAssigner<g_CSimpleSpriteMemberPointerMYPos,
00050                                 &CSimpleSprite::m_ypos>;
00051
00052     // int m_texWidth;
00053     static inline int CSimpleSprite::*
00054         g_CSimpleSpriteMemberPointerMTexWidth{};
00055     template struct NTTPAssigner<g_CSimpleSpriteMemberPointerMTexWidth,
00056                                 &CSimpleSprite::m_texWidth>;
00057
00058     // int m_texHeight;
00059     static inline int CSimpleSprite::*
00060         g_CSimpleSpriteMemberPointerMTexHeight{};
00061     template struct NTTPAssigner<g_CSimpleSpriteMemberPointerMTexHeight,
00062                                 &CSimpleSprite::m_texHeight>;
00063
00064     // float m_angle;
00065     static inline float CSimpleSprite::*
00066         g_CSimpleSpriteMemberPointerMAngle{};
00067     template struct NTTPAssigner<g_CSimpleSpriteMemberPointerMAngle,
00068                                 &CSimpleSprite::m_angle>;
00069
00070     // float m_scale;
00071     static inline float CSimpleSprite::*
00072         g_CSimpleSpriteMemberPointerMScale{};
00073     template struct NTTPAssigner<g_CSimpleSpriteMemberPointerMScale,
00074                                 &CSimpleSprite::m_scale>;
00075
00076     // float m_points[8];
00077     static inline float (
00078         CSimpleSprite::*g_CSimpleSpriteMemberPointerMPoints)[8]{};
00079     template struct NTTPAssigner<g_CSimpleSpriteMemberPointerMPoints,
00080                                 &CSimpleSprite::m_points>;
00081
00082     // float m_uvcoords[8];
00083     static inline float (
00084         CSimpleSprite::*g_CSimpleSpriteMemberPointerMUVCoords)[8]{};
00085     template struct NTTPAssigner<g_CSimpleSpriteMemberPointerMUVCoords,
00086                                 &CSimpleSprite::m_uvcoords>;
00087
00088     // float m_red;
00089     static inline float CSimpleSprite::*g_CSimpleSpriteMemberPointerMRed{};
00090     template struct NTTPAssigner<g_CSimpleSpriteMemberPointerMRed,
00091                                 &CSimpleSprite::m_red>;
00092
00093     // float m_green;
00094     static inline float CSimpleSprite::*
00095         g_CSimpleSpriteMemberPointerMGreen{};
00096     template struct NTTPAssigner<g_CSimpleSpriteMemberPointerMGreen,
00097                                 &CSimpleSprite::m_green>;
00098
00099     // float m_blue;
00100     static inline float CSimpleSprite::*g_CSimpleSpriteMemberPointerMBlue{};
00101     template struct NTTPAssigner<g_CSimpleSpriteMemberPointerMBlue,
00102                                 &CSimpleSprite::m_blue>;
00103 }; // namespace GraphicsAbstraction
00104
00105 namespace InputAbstraction
00106 {
00107     // bool m_bConnected = false;
00108     static inline bool CController::*g_CControllerMemberPointerMConnected{};
00109     template struct NTTPAssigner<g_CControllerMemberPointerMConnected,
00110                                 &CController::m_bConnected>;
00111 }; // namespace InputAbstraction
00112 }; // namespace oxygen

```



## 7.78 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/↵ Resources/AnimatedMeshResource.h File Reference

### Classes

- struct [oxygen::AnimationInfo](#)
- struct [oxygen::AnimatedMeshResource](#)

### Namespaces

- namespace [oxygen](#)

## 7.79 AnimatedMeshResource.h

[Go to the documentation of this file.](#)

```
00001 #pragma once
00002
00003 namespace oxygen
00004 {
00005     struct AnimationInfo
00006     {
00007         std::vector<std::vector<oxyVec3>> m_frames;
00008     };
00009     struct AnimatedMeshResource
00010     {
00011         std::shared_ptr<const struct StaticMeshResource> m_rootPose;
00012         std::unordered_map<oxyU32, AnimationInfo> m_animations;
00013     };
00014 };
```

## 7.80 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/↵ Resources/ResourceManager.cc File Reference

```
#include "OxygenPCH.h"
#include "ResourceManager.h"
#include "Platform/Platform.h"
#include "StaticMeshResource.h"
#include "AnimatedMeshResource.h"
```

### Namespaces

- namespace [oxygen](#)

## 7.81 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/↵ Resources/ResourceManager.h File Reference

```
#include "Singleton/Singleton.h"
```

## Classes

- struct [oxygen::ResourceManager](#)

## Namespaces

- namespace [oxygen](#)

## 7.82 ResourceManager.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002
00003 #include "Singleton/Singleton.h"
00004
00005 namespace oxygen
00006 {
00007     struct StaticMeshResource;
00008     struct AnimatedMeshResource;
00009
00010     struct ResourceManager : SingletonBase<ResourceManager>
00011     {
00012         auto LoadStaticMesh(std::string_view name)
00013             -> std::shared_ptr<const StaticMeshResource>;
00014         auto LoadAnimatedMesh(std::string_view name)
00015             -> std::shared_ptr<const AnimatedMeshResource>;
00016
00017     private:
00018         std::unordered_map<std::size_t, std::weak_ptr<const StaticMeshResource>
00019             m_staticMeshes;
00020         std::unordered_map<std::size_t,
00021             std::weak_ptr<const AnimatedMeshResource>
00022             m_AnimatedMeshes;
00023     };
00024 }; // namespace oxygen

```

## 7.83 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/↵ Resources/StaticMeshResource.h File Reference

## Classes

- struct [oxygen::StaticMeshVertex](#)
- struct [oxygen::StaticMeshTri](#)
- struct [oxygen::StaticMeshPointDef](#)
- struct [oxygen::StaticMeshResource](#)

## Namespaces

- namespace [oxygen](#)

## 7.84 StaticMeshResource.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002
00003 namespace oxygen
00004 {
00005     struct StaticMeshVertex
00006     {
00007         oxyVec3 m_position;
00008         oxyVec2 m_uv;
00009     };
00010
00011     struct StaticMeshTri
00012     {
00013         StaticMeshVertex m_vertices[3];
00014     };
00015
00016     struct StaticMeshPointDef
00017     {
00018         oxyU32 m_hash;
00019         oxyVec3 m_position;
00020     };
00021
00022     struct StaticMeshResource
00023     {
00024         std::vector<StaticMeshPointDef> m_points;
00025         std::vector<StaticMeshTri> m_tris;
00026         std::string m_textname;
00027     };
00028 };

```

## 7.85 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Singleton/↵ EngineSingletons.h File Reference

```

#include "Singleton.h"
#include "Object/ObjectManager.h"
#include "Input/InputManager.h"
#include "Gfx/GfxRenderer.h"
#include "Resources/ResourceManager.h"
#include "UI/UIManager.h"
#include "Net/NetSystem.h"
#include "GameManager/GameManager.h"

```

### Classes

- struct [oxygen::InternalEngineSingletonsOrder](#)

### Namespaces

- namespace [oxygen](#)

### Typedefs

- using [oxygen::EngineSingletons](#) = [SingletonHolder](#)<[InternalEngineSingletonsOrder](#)>

## 7.86 EngineSingletons.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002
00003 #include "Singleton.h"
00004 #include "Object/ObjectManager.h"
00005 #include "Input/InputManager.h"
00006 #include "Gfx/GfxRenderer.h"
00007 #include "Resources/ResourceManager.h"
00008 #include "UI/UIManager.h"
00009 #include "Net/NetSystem.h"
00010 #include "GameManager/GameManager.h"
00011
00012 namespace oxygen
00013 {
00014     struct InternalEngineSingletonsOrder
00015     {
00016         SingletonInstance<ObjectManager> m_objectManagerInstance{};
00017         SingletonInstance<InputManager> m_inputManagerInstance{};
00018         SingletonInstance<GfxRenderer> m_gfxRendererInstance{};
00019         SingletonInstance<ResourceManager> m_resourceManagerInstance{};
00020         SingletonInstance<UIManager> m_uiManagerInstance{};
00021         SingletonInstance<NetSystem> m_netSystemInstance{};
00022         SingletonInstance<GameManager> m_gameManagerInstance{};
00023     };
00024
00025     using EngineSingletons = SingletonHolder<InternalEngineSingletonsOrder>;
00026 }; // namespace oxygen

```

## 7.87 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/Singleton/↔ Singleton.h File Reference

### Classes

- struct [oxygen::SingletonInstance< T >](#)  
*Singleton instance, should only be in an object templated to [SingletonHolder](#). Contains the actual storage buffer for the type T.*
- struct [oxygen::SingletonBase< CRTPTType >](#)  
*Singleton base class. All singletons should inherit from this class. Uses the curiously recurring template pattern and provides the [GetInstance\(\)](#) static method to access the singleton.*
- struct [oxygen::SingletonHolder< SingletonsStruct >](#)  
*Storage of a group of singletons. Used to explicitly construct and destruct singletons.*

### Namespaces

- namespace [oxygen](#)

## 7.88 Singleton.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002
00003 namespace oxygen
00004 {
00010     template <typename T> struct SingletonInstance : NonCopyable
00011     {
00012         template <typename... Args> SingletonInstance(Args&&... args)
00013         {
00014             if (!s_inLifeTime)
00015             {

```

```

00016         new (s_singletonBuffer) T(std::forward<Args>(args)...);
00017         s_inLifeTime = true;
00018     }
00019 }
00020 ~SingletonInstance()
00021 {
00022     if (s_inLifeTime)
00023     {
00024         reinterpret_cast<T*>(s_singletonBuffer)->~T();
00025         s_inLifeTime = false;
00026     }
00027 }
00028 static auto GetInstance() -> T&
00029 {
00030     return *reinterpret_cast<T*>(s_singletonBuffer);
00031 }
00032
00033 private:
00034     static inline bool s_inLifeTime{};
00035     static inline alignas(T) unsigned char s_singletonBuffer[sizeof(T)]{};
00036 };
00037
00044 template <typename CRTPTType> struct SingletonBase : NonCopyable
00045 {
00046     SingletonBase()
00047     {
00048         OXYCHECK(!s_instance);
00049         s_instance = static_cast<CRTPTType*>(this);
00050     }
00051     ~SingletonBase()
00052     {
00053         s_instance = nullptr;
00054     }
00055     static auto GetInstance() -> CRTPTType&
00056     {
00057         return SingletonInstance<CRTPTType>::GetInstance();
00058     }
00059
00060 private:
00061     // Purely for debugging:
00062     static inline CRTPTType* s_instance{};
00063 };
00064
00070 template <typename SingletonsStruct> struct SingletonHolder : NonCopyable
00071 {
00072     static auto Construct() -> void
00073     {
00074         if (!m_storage.has_value())
00075         {
00076             m_storage.emplace();
00077         }
00078     }
00079     static auto Destruct() -> void
00080     {
00081         m_storage.reset();
00082     }
00083
00084 private:
00085     // The global optional will have its own atexit destructor guaranteed.
00086     // Thus, all singletons are also guaranteed to be destructed.
00087     static inline std::optional<SingletonsStruct> m_storage{};
00088 };
00089 } // namespace oxygen

```

## 7.89 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/UI/UIManager.cc File Reference

```

#include "OxygenPCH.h"
#include "UIManager.h"
#include "Gfx/GfxRenderer.h"
#include "Input/InputManager.h"
#include "Net/NetSystem.h"
#include "GameManager/GameManager.h"

```

## Namespaces

- namespace [oxygen](#)

## 7.90 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/UI/↵ UIManager.h File Reference

```
#include "Singleton/Singleton.h"
```

## Classes

- struct [oxygen::UIManager](#)

## Namespaces

- namespace [oxygen](#)

## 7.91 UIManager.h

[Go to the documentation of this file.](#)

```
00001 #pragma once
00002
00003 #include "Singleton/Singleton.h"
00004
00005 namespace oxygen
00006 {
00007     struct UIManager : SingletonBase<UIManager>
00008     {
00009         auto Render() const -> void;
00010         auto Update() -> void;
00011
00012         auto DisplayPopup(std::string message) -> void;
00013
00014     private:
00015         enum SelectableUIElements
00016         {
00017             SelectableUIElements_None,
00018             SelectableUIElements_Back,
00019             SelectableUIElements_Host,
00020             SelectableUIElements_Join,
00021             SelectableUIElements_Options,
00022             SelectableUIElements_Quit,
00023
00024             SelectableUIElements_HostListSelection,
00025
00026             SelectableUIElements_Count,
00027         };
00028
00029         oxyS32 m_width{};
00030         oxyS32 m_height{};
00031
00032         oxyBool m_mainMenuOpen{true};
00033         std::vector<std::string> m_popups{};
00034
00035         int m_hoverHostSelectionIndex{-1};
00036         SelectableUIElements m_hoverItem{SelectableUIElements_None};
00037         std::bitset<SelectableUIElements_Count> m_selectedItems{};
00038
00039         auto MousePosNDC() const -> oxyVec2;
00040
00041         auto DrawMainMenu() const -> void;
00042
00043         auto RefreshHostList() -> void;
```

```

00044
00045     auto MainMenuItemSelected() const -> oxyBool
00046     {
00047         return m_selectedItems.test(SelectableUIElements_Host) ||
00048                m_selectedItems.test(SelectableUIElements_Join) ||
00049                m_selectedItems.test(SelectableUIElements_Options) ||
00050                m_selectedItems.test(SelectableUIElements_Quit);
00051     }
00052
00053     auto HoverTextColour(SelectableUIElements expect) const -> oxyVec3;
00054 };
00055 } // namespace oxygen

```

## 7.92 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/BSP.cc File Reference

```

#include "OxygenPCH.h"
#include "BSP.h"
#include "Platform/Platform.h"

```

### Namespaces

- namespace `oxygen`

## 7.93 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/BSP.h File Reference

### Classes

- struct `oxygen::BSPDefines::Lump`
- struct `oxygen::BSPDefines::Header`
- struct `oxygen::BSPDefines::Plane`
- struct `oxygen::BSPDefines::MipTexLump`
- struct `oxygen::BSPDefines::MipTex`
- struct `oxygen::BSPDefines::Vertex`
- struct `oxygen::BSPDefines::Node`
- struct `oxygen::BSPDefines::TexInfo`
- struct `oxygen::BSPDefines::Face`
- struct `oxygen::BSPDefines::ClipNode`
- struct `oxygen::BSPDefines::Leaf`
- struct `oxygen::BSPDefines::Edge`
- struct `oxygen::BSPDefines::Model`
- struct `oxygen::BSPWorldData`

### Namespaces

- namespace `oxygen`
- namespace `oxygen::BSPDefines`

## Enumerations

- enum `oxygen::BSPDefines::Contents` {  
`oxygen::BSPDefines::Contents_Empty` = -1 , `oxygen::BSPDefines::Contents_Solid` = -2 , `oxygen::BSPDefines::Contents_Water`  
= -3 , `oxygen::BSPDefines::Contents_Slime` = -4 ,  
`oxygen::BSPDefines::Contents_Lava` = -5 , `oxygen::BSPDefines::Contents_Sky` = -6 , `oxygen::BSPDefines::Contents_Origin`  
= -7 , `oxygen::BSPDefines::Contents_Clip` = -8 ,  
`oxygen::BSPDefines::Contents_Current0` = -9 , `oxygen::BSPDefines::Contents_Current90` = -10 ,  
`oxygen::BSPDefines::Contents_Current180` = -11 , `oxygen::BSPDefines::Contents_Current270` = -12 ,  
`oxygen::BSPDefines::Contents_CurrentUp` = -13 , `oxygen::BSPDefines::Contents_CurrentDown` = -14 ,  
`oxygen::BSPDefines::Contents_Translucent` = -15 }
- enum `oxygen::BSPDefines::LumpIndex` {  
`oxygen::BSPDefines::LumpIndex_Entities` = 0 , `oxygen::BSPDefines::LumpIndex_Planes` , `oxygen::BSPDefines::LumpIndex_Te`  
, `oxygen::BSPDefines::LumpIndex_Vertexes` ,  
`oxygen::BSPDefines::LumpIndex_Visibility` , `oxygen::BSPDefines::LumpIndex_Nodes` , `oxygen::BSPDefines::LumpIndex_TexIn`  
, `oxygen::BSPDefines::LumpIndex_Faces` ,  
`oxygen::BSPDefines::LumpIndex_Lighting` , `oxygen::BSPDefines::LumpIndex_ClipNodes` , `oxygen::BSPDefines::LumpIndex_L`  
, `oxygen::BSPDefines::LumpIndex_MarkSurfaces` ,  
`oxygen::BSPDefines::LumpIndex_Edges` , `oxygen::BSPDefines::LumpIndex_SurfEdges` , `oxygen::BSPDefines::LumpIndex_Mo`  
, `oxygen::BSPDefines::LumpIndex_Count` }
- enum `oxygen::BSPDefines::PlaneType` {  
`oxygen::BSPDefines::Plane_X` = 0 , `oxygen::BSPDefines::Plane_Y` , `oxygen::BSPDefines::Plane_Z` ,  
`oxygen::BSPDefines::Plane_AnyX` ,  
`oxygen::BSPDefines::Plane_AnyY` , `oxygen::BSPDefines::Plane_AnyZ` }

## Variables

- constexpr auto `oxygen::BSPDefines::k_BSPVersion` = `oxyS32`{30}
- constexpr auto `oxygen::BSPDefines::k_ToolVersion` = `oxyS32`{2}
- constexpr auto `oxygen::BSPDefines::k_MaxMapHulls` = `oxySize`{4}
- constexpr auto `oxygen::BSPDefines::k_MaxMapModels` = `oxySize`{400}
- constexpr auto `oxygen::BSPDefines::k_MaxMapBrushes` = `oxySize`{4096}
- constexpr auto `oxygen::BSPDefines::k_MaxMapEntityString` = `oxySize`{128 \* 1024}
- constexpr auto `oxygen::BSPDefines::k_MaxMapPlanes` = `oxySize`{32767}
- constexpr auto `oxygen::BSPDefines::k_MaxMapNodes` = `oxySize`{32767}
- constexpr auto `oxygen::BSPDefines::k_MaxMapClipNodes` = `oxySize`{32767}
- constexpr auto `oxygen::BSPDefines::k_MaxMapLeafs` = `oxySize`{8192}
- constexpr auto `oxygen::BSPDefines::k_MaxMapVertices` = `oxySize`{65535}
- constexpr auto `oxygen::BSPDefines::k_MaxMapFaces` = `oxySize`{65535}
- constexpr auto `oxygen::BSPDefines::k_MaxMapMarkSurfaces` = `oxySize`{65535}
- constexpr auto `oxygen::BSPDefines::k_MaxMapTexInfo` = `oxySize`{8192}
- constexpr auto `oxygen::BSPDefines::k_MaxMapEdges` = `oxySize`{256000}
- constexpr auto `oxygen::BSPDefines::k_MaxMapSurfEdges` = `oxySize`{512000}
- constexpr auto `oxygen::BSPDefines::k_MaxMapTextures` = `oxySize`{512}
- constexpr auto `oxygen::BSPDefines::k_MaxMapMipTex` = `oxySize`{0x200000}
- constexpr auto `oxygen::BSPDefines::k_MaxMapLighting` = `oxySize`{0x200000}
- constexpr auto `oxygen::BSPDefines::k_MaxMapVis` = `oxySize`{0x200000}
- constexpr auto `oxygen::BSPDefines::k_MaxMapPortals` = `oxySize`{65536}
- constexpr auto `oxygen::BSPDefines::k_NumMipLevels` = 4
- constexpr auto `oxygen::BSPDefines::k_TexSpecial`
- constexpr auto `oxygen::BSPDefines::k_MaxLightMaps` = 4
- constexpr auto `oxygen::BSPDefines::k_NumAmbients` = 4



## 7.94 BSP.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002
00003 namespace oxygen
00004 {
00005     namespace BSPDefines
00006     {
00007         inline constexpr auto k_BSPVersion = oxyS32{30};
00008         inline constexpr auto k_ToolVersion = oxyS32{2};
00009
00010         inline constexpr auto k_MaxMapHulls = oxySize{4};
00011         inline constexpr auto k_MaxMapModels = oxySize{400};
00012         inline constexpr auto k_MaxMapBrushes = oxySize{4096};
00013         inline constexpr auto k_MaxMapEntityString = oxySize{128 * 1024};
00014         inline constexpr auto k_MaxMapPlanes = oxySize{32767};
00015         inline constexpr auto k_MaxMapNodes = oxySize{32767};
00016         inline constexpr auto k_MaxMapClipNodes = oxySize{32767};
00017         inline constexpr auto k_MaxMapLeafs = oxySize{8192};
00018         inline constexpr auto k_MaxMapVertices = oxySize{65535};
00019         inline constexpr auto k_MaxMapFaces = oxySize{65535};
00020         inline constexpr auto k_MaxMapMarkSurfaces = oxySize{65535};
00021         inline constexpr auto k_MaxMapTexInfo = oxySize{8192};
00022         inline constexpr auto k_MaxMapEdges = oxySize{256000};
00023         inline constexpr auto k_MaxMapSurfEdges = oxySize{512000};
00024         inline constexpr auto k_MaxMapTextures = oxySize{512};
00025         inline constexpr auto k_MaxMapMipTex = oxySize{0x200000};
00026         inline constexpr auto k_MaxMapLighting = oxySize{0x200000};
00027         inline constexpr auto k_MaxMapVis = oxySize{0x200000};
00028         inline constexpr auto k_MaxMapPortals = oxySize{65536};
00029
00030         inline constexpr auto k_NumMipLevels = 4;
00031         inline constexpr auto k_TexSpecial =
00032             1; // "sky or slime, no lightmap or 256 subdivision"
00033         inline constexpr auto k_MaxLightMaps = 4;
00034         inline constexpr auto k_NumAmbients = 4;
00035
00036         enum Contents
00037         {
00038             Contents_Empty = -1,
00039             Contents_Solid = -2,
00040             Contents_Water = -3,
00041             Contents_Slime = -4,
00042             Contents_Lava = -5,
00043             Contents_Sky = -6,
00044             Contents_Origin = -7, // CSG brush (removed during build)
00045             Contents_Clip = -8,   // Legacy (changed to Solid)
00046             Contents_Current0 = -9,
00047             Contents_Current90 = -10,
00048             Contents_Current180 = -11,
00049             Contents_Current270 = -12,
00050             Contents_CurrentUp = -13,
00051             Contents_CurrentDown = -14,
00052             Contents_Translucent = -15,
00053         };
00054
00055         struct Lump
00056         {
00057             oxyU32 m_fileOffset;
00058             oxyU32 m_length;
00059         };
00060         static_assert(sizeof(Lump) == 8, "Lump struct size is not 8 bytes");
00061         static_assert(alignof(Lump) == 4, "Lump struct alignment is not 4 bytes");
00062         static_assert(std::is_trivial_v<Lump>, "Lump struct is not a trivial type");
00063         static_assert(offsetof(Lump, m_fileOffset) == 0, "Lump struct m_fileOffset offset is not 0");
00064         static_assert(offsetof(Lump, m_length) == 4, "Lump struct m_length offset is not 4");
00065
00066         enum LumpIndex
00067         {
00068             LumpIndex_Entities = 0,
00069             LumpIndex_Planes,
00070             LumpIndex_Textures,
00071             LumpIndex_Vertexes,
00072             LumpIndex_Visibility,
00073             LumpIndex_Nodes,
00074             LumpIndex_TexInfo,
00075             LumpIndex_Faces,
00076             LumpIndex_Lighting,
00077             LumpIndex_ClipNodes,
00078             LumpIndex_Leafs,
00079         }
00080     }
00081 }
00082

```

```

00083         LumpIndex_MarkSurfaces,
00084         LumpIndex_Edges,
00085         LumpIndex_SurfEdges,
00086         LumpIndex_Models,
00087         LumpIndex_Count
00088     };
00089
00090     struct Header
00091     {
00092         oxyS32 m_version;
00093         Lump m_lumps[LumpIndex_Count];
00094     };
00095     static_assert(sizeof(Header) == 124,
00096         "Header struct size is not 124 bytes");
00097     static_assert(alignof(Header) == 4,
00098         "Header struct alignment is not 4 bytes");
00099     static_assert(std::is_trivial_v<Header>,
00100         "Header struct is not a trivial type");
00101     static_assert(offsetof(Header, m_version) == 0,
00102         "Header struct m_version offset is not 0");
00103     static_assert(offsetof(Header, m_lumps) == 4,
00104         "Header struct m_lumps offset is not 4");
00105
00106     enum PlaneType
00107     {
00108         Plane_X = 0,
00109         Plane_Y,
00110         Plane_Z,
00111         Plane_AnyX,
00112         Plane_AnyY,
00113         Plane_AnyZ
00114     };
00115
00116     struct Plane
00117     {
00118         oxyF32 m_normal[3];
00119         oxyF32 m_dist;
00120         oxyU32 m_type;
00121     };
00122     static_assert(sizeof(Plane) == 20, "Plane struct size is not 20 bytes");
00123     static_assert(alignof(Plane) == 4,
00124         "Plane struct alignment is not 4 bytes");
00125     static_assert(std::is_trivial_v<Plane>,
00126         "Plane struct is not a trivial type");
00127     static_assert(offsetof(Plane, m_normal) == 0,
00128         "Plane struct m_normal offset is not 0");
00129     static_assert(offsetof(Plane, m_dist) == 12,
00130         "Plane struct m_dist offset is not 12");
00131     static_assert(offsetof(Plane, m_type) == 16,
00132         "Plane struct m_type offset is not 16");
00133
00134     struct MipTexLump
00135     {
00136         oxyU32 m_numMipTex;
00137         oxyU32 m_dataOffsets[4]; // [m_numMipTex]
00138     };
00139     static_assert(sizeof(MipTexLump) == 20,
00140         "MipTexLump struct size is not 20 bytes");
00141     static_assert(alignof(MipTexLump) == 4,
00142         "MipTexLump struct alignment is not 4 bytes");
00143     static_assert(std::is_trivial_v<MipTexLump>,
00144         "MipTexLump struct is not a trivial type");
00145     static_assert(offsetof(MipTexLump, m_numMipTex) == 0,
00146         "MipTexLump struct m_numMipTex offset is not 0");
00147     static_assert(offsetof(MipTexLump, m_dataOffsets) == 4,
00148         "MipTexLump struct m_dataOffsets offset is not 4");
00149
00150     struct MipTex
00151     {
00152         oxyChar m_name[16];
00153         oxyU32 m_width;
00154         oxyU32 m_height;
00155         oxyU32 m_offsets[k_NumMipLevels];
00156     };
00157     static_assert(sizeof(MipTex) == 40,
00158         "MipTex struct size is not 40 bytes");
00159     static_assert(alignof(MipTex) == 4,
00160         "MipTex struct alignment is not 4 bytes");
00161     static_assert(std::is_trivial_v<MipTex>,
00162         "MipTex struct is not a trivial type");
00163     static_assert(offsetof(MipTex, m_name) == 0,
00164         "MipTex struct m_name offset is not 0");
00165     static_assert(offsetof(MipTex, m_width) == 16,
00166         "MipTex struct m_width offset is not 16");
00167     static_assert(offsetof(MipTex, m_height) == 20,
00168         "MipTex struct m_height offset is not 20");
00169     static_assert(offsetof(MipTex, m_offsets) == 24,

```

```

00170         "MipTex struct m_offsets offset is not 24");
00171
00172     struct Vertex
00173     {
00174         oxyF32 m_position[3];
00175     };
00176     static_assert(sizeof(Vertex) == 12,
00177         "Vertex struct size is not 12 bytes");
00178     static_assert(alignof(Vertex) == 4,
00179         "Vertex struct alignment is not 4 bytes");
00180     static_assert(std::is_trivial_v<Vertex>,
00181         "Vertex struct is not a trivial type");
00182     static_assert(offsetof(Vertex, m_position) == 0,
00183         "Vertex struct m_position offset is not 0");
00184
00185     struct Node
00186     {
00187         oxyU32 m_planeIndex;
00188         oxyS16 m_children[2]; // Negative numbers are -(leafs+1)
00189         oxyS16 m_mins[3];
00190         oxyS16 m_maxs[3];
00191         oxyU16 m_firstFaceIndex;
00192         oxyU16 m_faceCount;
00193     };
00194     static_assert(sizeof(Node) == 24, "Node struct size is not 32 bytes");
00195     static_assert(alignof(Node) == 4,
00196         "Node struct alignment is not 4 bytes");
00197     static_assert(std::is_trivial_v<Node>,
00198         "Node struct is not a trivial type");
00199     static_assert(offsetof(Node, m_planeIndex) == 0,
00200         "Node struct m_planeIndex offset is not 0");
00201     static_assert(offsetof(Node, m_children) == 4,
00202         "Node struct m_children offset is not 4");
00203     static_assert(offsetof(Node, m_mins) == 8,
00204         "Node struct m_mins offset is not 8");
00205     static_assert(offsetof(Node, m_maxs) == 14,
00206         "Node struct m_maxs offset is not 14");
00207     static_assert(offsetof(Node, m_firstFaceIndex) == 20,
00208         "Node struct m_firstFaceIndex offset is not 20");
00209     static_assert(offsetof(Node, m_faceCount) == 22,
00210         "Node struct m_faceCount offset is not 22");
00211
00212     struct TexInfo
00213     {
00214         oxyF32 m_vecs[2][4]; // [s/t][xyz offset]
00215         oxyS32 m_mipTexIndex;
00216         oxyS32 m_flags;
00217     };
00218     static_assert(sizeof(TexInfo) == 40,
00219         "TexInfo struct size is not 40 bytes");
00220     static_assert(alignof(TexInfo) == 4,
00221         "TexInfo struct alignment is not 4 bytes");
00222     static_assert(std::is_trivial_v<TexInfo>,
00223         "TexInfo struct is not a trivial type");
00224     static_assert(offsetof(TexInfo, m_vecs) == 0,
00225         "TexInfo struct m_vecs offset is not 0");
00226     static_assert(offsetof(TexInfo, m_mipTexIndex) == 32,
00227         "TexInfo struct m_mipTexIndex offset is not 32");
00228     static_assert(offsetof(TexInfo, m_flags) == 36,
00229         "TexInfo struct m_flags offset is not 36");
00230
00231     struct Face
00232     {
00233         oxyU16 m_planeIndex;
00234         oxyU16 m_side;
00235         oxyU32 m_firstEdgeIndex;
00236         oxyU16 m_edgeCount;
00237         oxyU16 m_texInfoIndex;
00238         oxyU8 m_lightStyles[k_MaxLightMaps];
00239         oxyU32 m_lightMapOffset;
00240     };
00241     static_assert(sizeof(Face) == 20, "Face struct size is not 20 bytes");
00242     static_assert(alignof(Face) == 4,
00243         "Face struct alignment is not 4 bytes");
00244     static_assert(std::is_trivial_v<Face>,
00245         "Face struct is not a trivial type");
00246     static_assert(offsetof(Face, m_planeIndex) == 0,
00247         "Face struct m_planeIndex offset is not 0");
00248     static_assert(offsetof(Face, m_side) == 2,
00249         "Face struct m_side offset is not 2");
00250     static_assert(offsetof(Face, m_firstEdgeIndex) == 4,
00251         "Face struct m_firstEdgeIndex offset is not 4");
00252     static_assert(offsetof(Face, m_edgeCount) == 8,
00253         "Face struct m_edgeCount offset is not 8");
00254     static_assert(offsetof(Face, m_texInfoIndex) == 10,
00255         "Face struct m_texInfoIndex offset is not 10");
00256     static_assert(offsetof(Face, m_lightStyles) == 12,

```

```

00257         "Face struct m_lightStyles offset is not 12");
00258     static_assert(offsetof(Face, m_lightMapOffset) == 16,
00259         "Face struct m_lightMapOffset offset is not 16");
00260
00261     struct ClipNode
00262     {
00263         oxyU32 m_planeIndex;
00264         oxyS16 m_children[2]; // Negatives are contents
00265     };
00266     static_assert(sizeof(ClipNode) == 8,
00267         "ClipNode struct size is not 8 bytes");
00268     static_assert(alignof(ClipNode) == 4,
00269         "ClipNode struct alignment is not 4 bytes");
00270     static_assert(std::is_trivial_v<ClipNode>,
00271         "ClipNode struct is not a trivial type");
00272     static_assert(offsetof(ClipNode, m_planeIndex) == 0,
00273         "ClipNode struct m_planeIndex offset is not 0");
00274     static_assert(offsetof(ClipNode, m_children) == 4,
00275         "ClipNode struct m_children offset is not 4");
00276
00277     // "Leaf 0 is the generic CONTENTS_SOLID leaf"
00278     struct Leaf
00279     {
00280         oxyS32 m_contents;
00281         oxyS32 m_visOffset; // -1 = none
00282         oxyS16 m_mins[3]; // "for frustum culling"
00283         oxyS16 m_maxs[3];
00284         oxyU16 m_firstMarkSurfaceIndex;
00285         oxyU16 m_markSurfaceCount;
00286         oxyU8 m_ambientLevels[k_NumAmbients];
00287     };
00288     static_assert(sizeof(Leaf) == 28, "Leaf struct size is not 28 bytes");
00289     static_assert(alignof(Leaf) == 4,
00290         "Leaf struct alignment is not 4 bytes");
00291     static_assert(std::is_trivial_v<Leaf>,
00292         "Leaf struct is not a trivial type");
00293     static_assert(offsetof(Leaf, m_contents) == 0,
00294         "Leaf struct m_contents offset is not 0");
00295     static_assert(offsetof(Leaf, m_visOffset) == 4,
00296         "Leaf struct m_visOffset offset is not 4");
00297     static_assert(offsetof(Leaf, m_mins) == 8,
00298         "Leaf struct m_mins offset is not 8");
00299     static_assert(offsetof(Leaf, m_maxs) == 14,
00300         "Leaf struct m_maxs offset is not 14");
00301     static_assert(offsetof(Leaf, m_firstMarkSurfaceIndex) == 20,
00302         "Leaf struct m_firstMarkSurfaceIndex offset is not 20");
00303     static_assert(offsetof(Leaf, m_markSurfaceCount) == 22,
00304         "Leaf struct m_markSurfaceCount offset is not 22");
00305     static_assert(offsetof(Leaf, m_ambientLevels) == 24,
00306         "Leaf struct m_ambientLevels offset is not 24");
00307
00308     struct Edge
00309     {
00310         oxyU16 m_vertexIndices[2];
00311     };
00312     static_assert(sizeof(Edge) == 4, "Edge struct size is not 4 bytes");
00313     static_assert(alignof(Edge) == 2,
00314         "Edge struct alignment is not 2 bytes");
00315     static_assert(std::is_trivial_v<Edge>,
00316         "Edge struct is not a trivial type");
00317     static_assert(offsetof(Edge, m_vertexIndices) == 0,
00318         "Edge struct m_vertexIndices offset is not 0");
00319
00320     struct Model
00321     {
00322         oxyF32 m_mins[3];
00323         oxyF32 m_maxs[3];
00324         oxyF32 m_origin[3];
00325         oxyU32 m_headNodes[k_MaxMapHulls];
00326         oxyU32 m_visLeafs; // "not including the solid leaf 0"
00327         oxyU32 m_firstFaceIndex;
00328         oxyU32 m_faceCount;
00329     };
00330     static_assert(sizeof(Model) == 64, "Model struct size is not 64 bytes");
00331     static_assert(alignof(Model) == 4,
00332         "Model struct alignment is not 4 bytes");
00333     static_assert(std::is_trivial_v<Model>,
00334         "Model struct is not a trivial type");
00335     static_assert(offsetof(Model, m_mins) == 0,
00336         "Model struct m_mins offset is not 0");
00337     static_assert(offsetof(Model, m_maxs) == 12,
00338         "Model struct m_maxs offset is not 12");
00339     static_assert(offsetof(Model, m_origin) == 24,
00340         "Model struct m_origin offset is not 24");
00341     static_assert(offsetof(Model, m_headNodes) == 36,
00342         "Model struct m_headNodes offset is not 36");
00343     static_assert(offsetof(Model, m_visLeafs) == 52,

```

```

00344         "Model struct m_visLeafs offset is not 52");
00345     static_assert(offsetof(Model, m_firstFaceIndex) == 56,
00346         "Model struct m_firstFaceIndex offset is not 56");
00347     static_assert(offsetof(Model, m_faceCount) == 60,
00348         "Model struct m_faceCount offset is not 60");
00349
00350 }; // namespace BSPDefines
00351
00352 struct BSPWorldData : NonCopyable
00353 {
00354     std::vector<std::unordered_map<std::string, std::string> m_entitiesText;
00355     std::vector<BSPDefines::Plane> m_planes;
00356     std::vector<BSPDefines::MipTex> m_miptex;
00357     std::vector<BSPDefines::Vertex> m_vertices;
00358     std::vector<oxyU8> m_visibility;
00359     std::vector<BSPDefines::Node> m_nodes;
00360     std::vector<BSPDefines::TexInfo> m_texinfo;
00361     std::vector<BSPDefines::Face> m_faces;
00362     std::vector<BSPDefines::ClipNode> m_clipNodes;
00363     std::vector<BSPDefines::Leaf> m_leaves;
00364     std::vector<oxyU16> m_marksurfaces;
00365     std::vector<BSPDefines::Edge> m_edges;
00366     std::vector<oxyS32> m_surfedges;
00367     std::vector<BSPDefines::Model> m_models;
00368
00369     auto Load(std::string_view mapname) -> oxyBool;
00370 };
00371
00372 }; // namespace oxygen

```

## 7.95 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/World.cc File Reference

```

#include "OxygenPCH.h"
#include "World.h"
#include "Entity/Entity.h"
#include "Component/HullComponent/HullComponent.h"
#include "Component/CameraComponent/CameraComponent.h"
#include "Component/EnvPushComponent/EnvPushComponent.h"
#include "Gfx/GfxRenderer.h"
#include "Input/InputManager.h"
#include "Platform/Platform.h"

```

### Namespaces

- namespace [oxygen](#)

## 7.96 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/World.h File Reference

```

#include "BSP.h"

```

### Classes

- struct [oxygen::World](#)
- struct [oxygen::World::LineTraceResult](#)

## Namespaces

- namespace [oxygen](#)

## 7.97 World.h

[Go to the documentation of this file.](#)

```

00001 #pragma once
00002
00003 #include "BSP.h"
00004
00005 namespace oxygen
00006 {
00007     struct World final : ManagedObject
00008     {
00009         OXYGENOBJECT(World, ManagedObject);
00010
00011         std::unique_ptr<const BSPWorldData> m_bspData{};
00012
00013         auto
00014         GetEntityList() const -> const std::vector<std::shared_ptr<struct Entity>&
00015         {
00016             return m_entities;
00017         }
00018
00019         auto RandomPlayerSpawn() const -> oxyVec3;
00020
00021         auto FindLeaf(const oxyVec3& position,
00022                     oxySize modelIndex) const -> const BSPDefines::Leaf*;
00023
00024         struct LineTraceResult
00025         {
00026             oxyBool m_allSolid{};
00027             oxyBool m_startSolid{};
00028             oxyF32 m_fraction{};
00029             oxyVec3 m_endPos{};
00030             oxyVec3 m_planeNormal{};
00031             oxyF32 m_planeDist{};
00032             std::shared_ptr<struct Entity> m_hitEntity{};
00033         };
00034         auto HullTrace(CollisionHull hull, const oxyVec3& start,
00035                     const oxyVec3& end,
00036                     LineTraceResult& result) const -> oxyBool;
00037         auto LineTrace(const oxyVec3& start, const oxyVec3& end,
00038                     const struct Entity* self,
00039                     LineTraceResult& result) const -> oxyBool;
00040
00041         auto CalculateHullSlideMovement(CollisionHull hull,
00042                     const oxyVec3& position,
00043                     const oxyVec3& distance) -> oxyVec3;
00044
00045         auto SpawnEntity(oxyObjectID id = 0) -> std::shared_ptr<Entity>;
00046
00047         auto RemoveEntity(struct Entity* ent) -> void;
00048
00049         auto GetLocalPlayer() const -> std::weak_ptr<Entity>
00050         {
00051             return m_localPlayer;
00052         }
00053         auto SetLocalPlayer(std::shared_ptr<Entity> player) -> void;
00054
00055     private:
00056         friend struct GameManager;
00057         friend auto LoadWorld(std::string_view name) -> std::shared_ptr<World>;
00058         auto SubmitBSPFacesToRenderQueue() -> void;
00059
00060         oxyVec3 m_renderCameraPosition{};
00061
00062         std::weak_ptr<struct Entity> m_localPlayer{};
00063         std::vector<std::shared_ptr<struct Entity>> m_entities;
00064
00065         std::vector<std::shared_ptr<const struct GfxTexture>> m_bspTextures;
00066         std::shared_ptr<const struct GfxTexture> m_lightmapTexture;
00067         std::vector<std::array<oxyU32, 4>> m_lightmapRects;
00068         oxyU32 m_lightmapSampleSize{};
00069         oxyU32 m_lightmapBlockWidth{};
00070         oxyU32 m_lightmapBlockHeight{};
00071         oxyU32 m_lightmapNumRects{};
00072         struct WorldTri
00073         {

```

```

00074         oxyVec3 m_vertices[3];
00075         oxyVec2 m_texcoords[3];
00076         oxyVec2 m_lmtexcoords[3];
00077         oxyU32 m_textureIndex{};
00078     };
00079     std::vector<std::vector<WorldTri> m_bspFaces;
00080     std::vector<oxyVec3> m_playerStarts;
00081     std::vector<oxyU8> m_cameraPVS;
00082     std::vector<oxyS16> m_bspNodeParents;
00083     std::vector<oxyS16> m_bspLeafParents;
00084     std::bitset<BSPDefines::k_MaxMapNodes> m_nodesMarkedForRender;
00085     std::bitset<BSPDefines::k_MaxMapFaces> m_facesMarkedForRender;
00086
00087     //auto SummonPlayer(const EntitySummonParams& params)
00088     // -> std::shared_ptr<Entity>;
00089     //auto SummonGrenadeProjectile(const EntitySummonParams& params)
00090     // -> std::shared_ptr<Entity>;
00091     //auto SummonDebugCube(const EntitySummonParams& params)
00092     // -> std::shared_ptr<Entity>;
00093
00094     auto CreateEntitiesFromBSP() -> void;
00095
00096     auto
00097     TestBoundsIntersectVisibleNodes(const oxyVec3& mins,
00098                                     const oxyVec3& maxs) const -> oxyBool;
00099
00100     auto RenderTraverseBSPNode(oxyS32 nodeIndex,
00101                               const oxyVec3& origin) -> void;
00102     auto RenderBSPLeaf(const BSPDefines::Leaf& leaf,
00103                       const oxyVec3& origin) -> void;
00104     auto RenderBSPFace(struct GfxRenderer& gfx, oxySize faceindex,
00105                       const oxyVec3& origin) -> void;
00106
00107     auto ComputeTriFaces() -> void;
00108
00109     auto MarkPVSNodesFromLeaf(const BSPDefines::Leaf* leaf,
00110                              oxySize modelIndex) -> void;
00111
00112     auto RecursiveClipNodeLineTrace(oxyS32 clipNodeIndex,
00113                                     const oxyVec3& start,
00114                                     const oxyVec3& end,
00115                                     LineTraceResult& result) const -> bool;
00116     auto RecursiveNodeLineTrace(oxyS32 nodeIndex, const oxyVec3& start,
00117                                const oxyVec3& end,
00118                                LineTraceResult& result) const -> bool;
00119     auto RecursiveSlideHull(oxyS32 rootClipNode, const oxyVec3& position,
00120                            const oxyVec3& offset, int depth) -> oxyVec3;
00121     auto Update(float deltaTimeSeconds) -> void;
00122 };
00123 }; // namespace oxygen

```

## 7.98 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/WorldLoader.cc File Reference

```

#include "OxygenPCH.h"
#include "WorldLoader.h"
#include "World.h"
#include "BSP.h"
#include "Gfx/GfxRenderer.h"
#include "Platform/Platform.h"

```

### Namespaces

- namespace [oxygen](#)

### Functions

- auto [oxygen::LoadWorld](#) (std::string\_view name) -> std::shared\_ptr< [World](#) >

## 7.99 C:/Users/a/Desktop/arihawe-oxygen2/oxygen/codebase/World/↵ WorldLoader.h File Reference

### Namespaces

- namespace [oxygen](#)

### Functions

- auto [oxygen::LoadWorld](#) (std::string\_view name) -> std::shared\_ptr< [World](#) >

## 7.100 WorldLoader.h

[Go to the documentation of this file.](#)

```
00001 #pragma once
00002
00003 namespace oxygen
00004 {
00005     auto LoadWorld(std::string_view name) -> std::shared_ptr<struct World>;
00006 }; // namespace oxygen
```



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