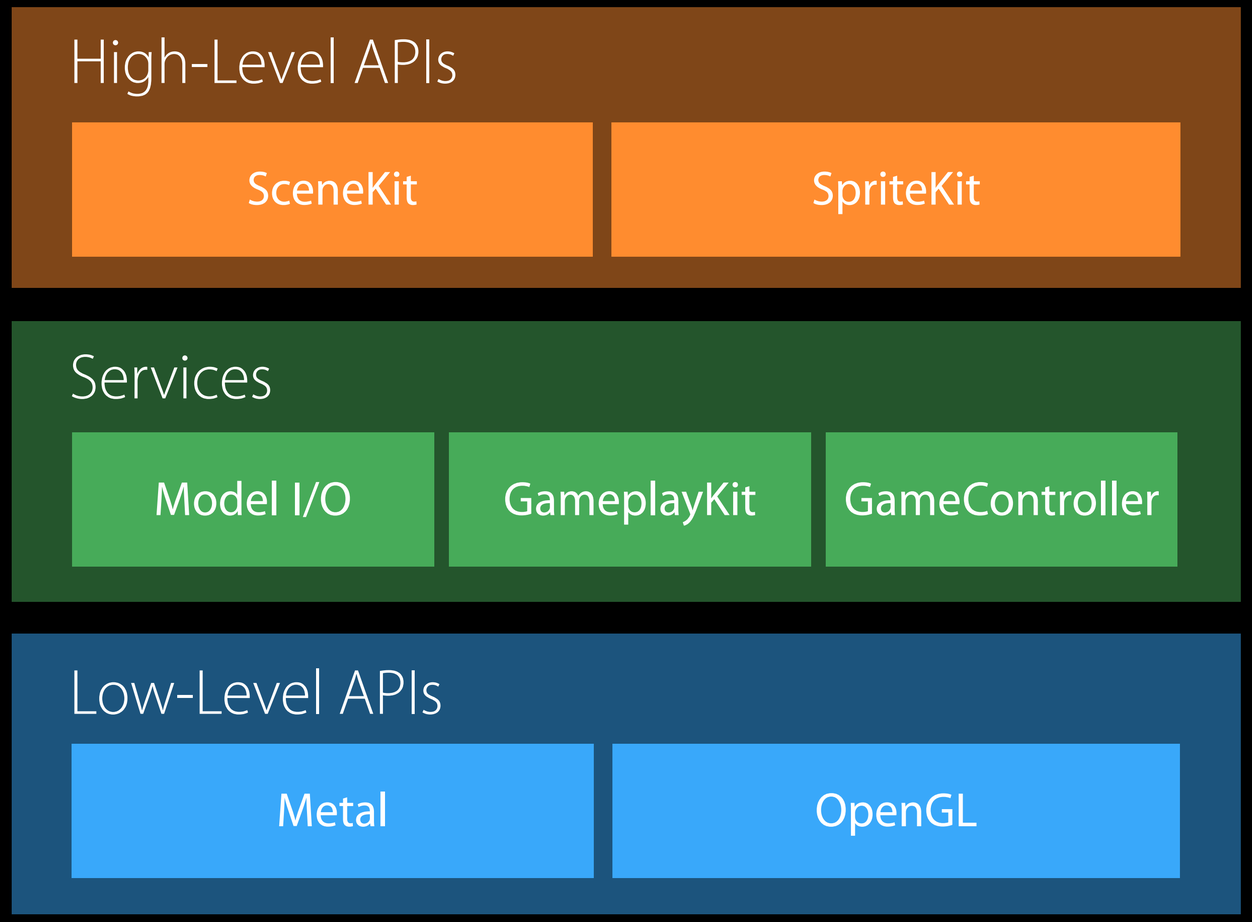
Enhancements to SceneKit

Session 606

Thomas Goossens
Amaury Balliet
Sébastien Métrot

GameKit APIs

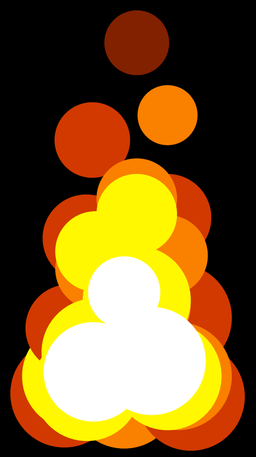


SceneKit

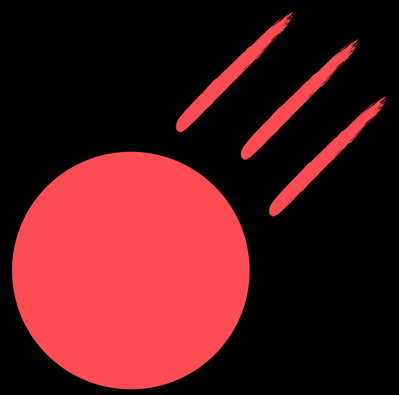
Since Mountain Lion

Since iOS 8

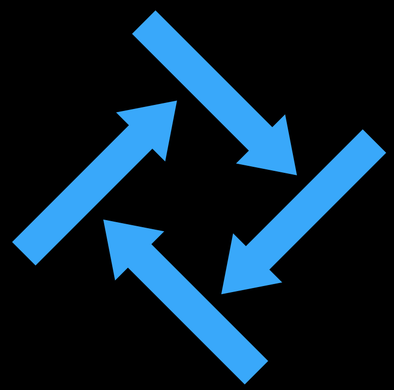
SceneKit



Particles



Physics



Physics Fields

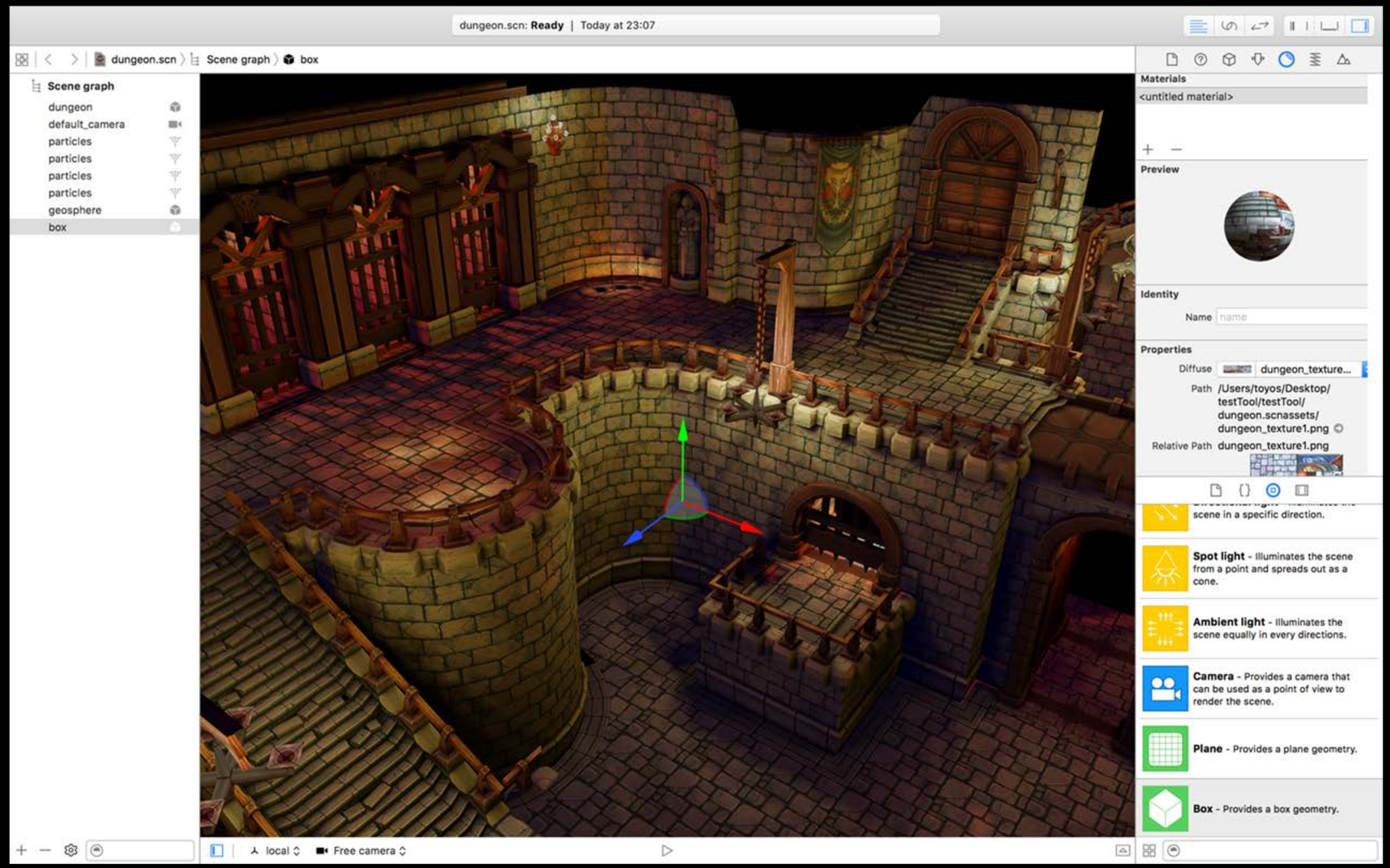
SpriteKit


XCODE

Scene Editor

Scene Editor

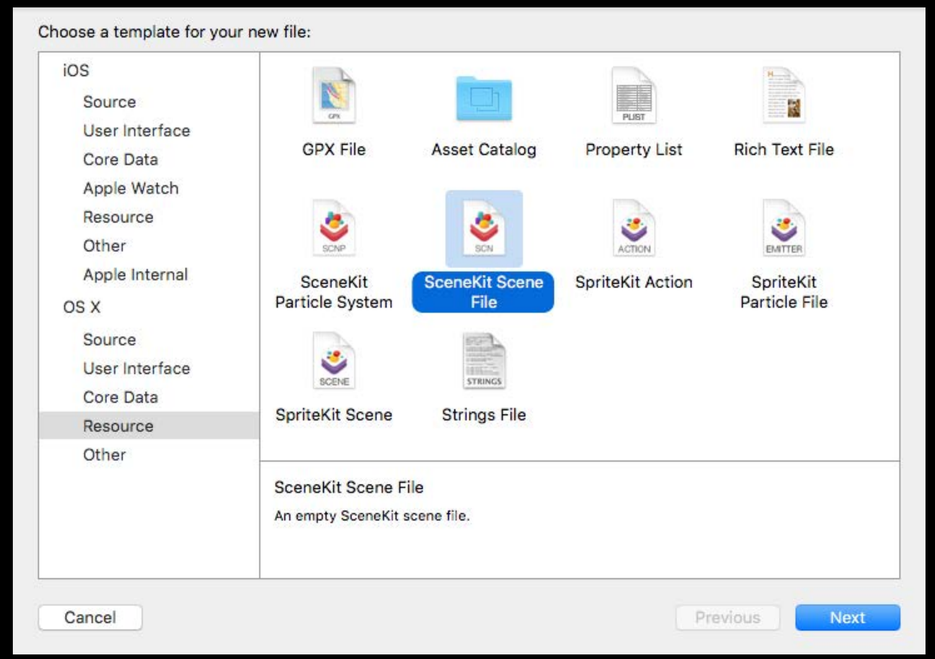
Available in Xcode 7



Scene Editor

Can open and edit DAE, OBJ, Alembic, STL, and PLY files

New native file format (SceneKit archives)



Scene Editor

SceneKit file format

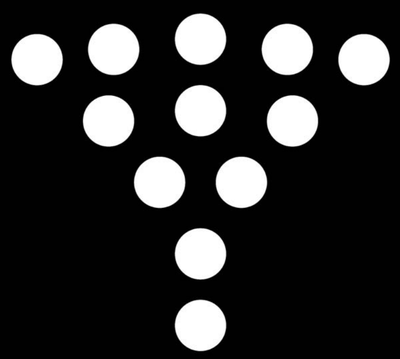
SCNScene archived with NSKeyedArchiver

```
NSKeyedArchiver.archiveRootObject(scnScene, toFile: aFile)
```

Scene Editor

Build your game levels

Scene Editor



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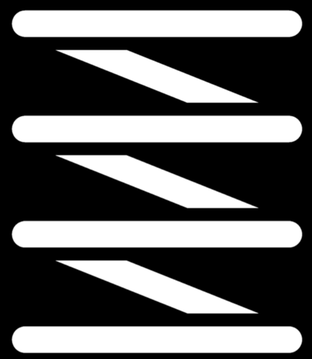
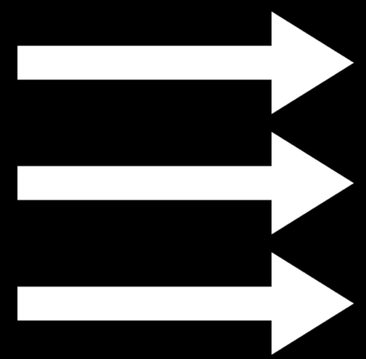
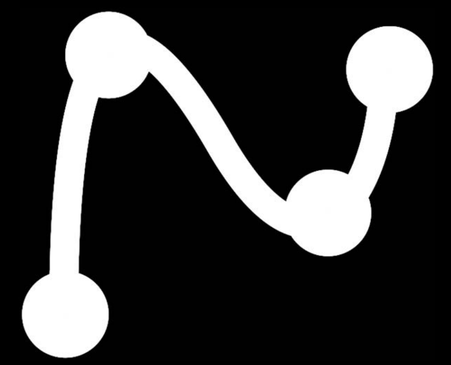


Physics

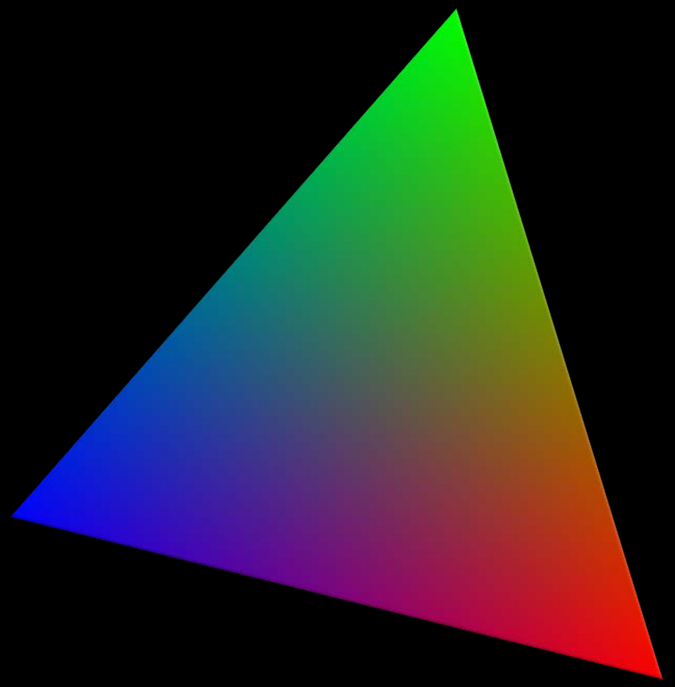


Physics Fields

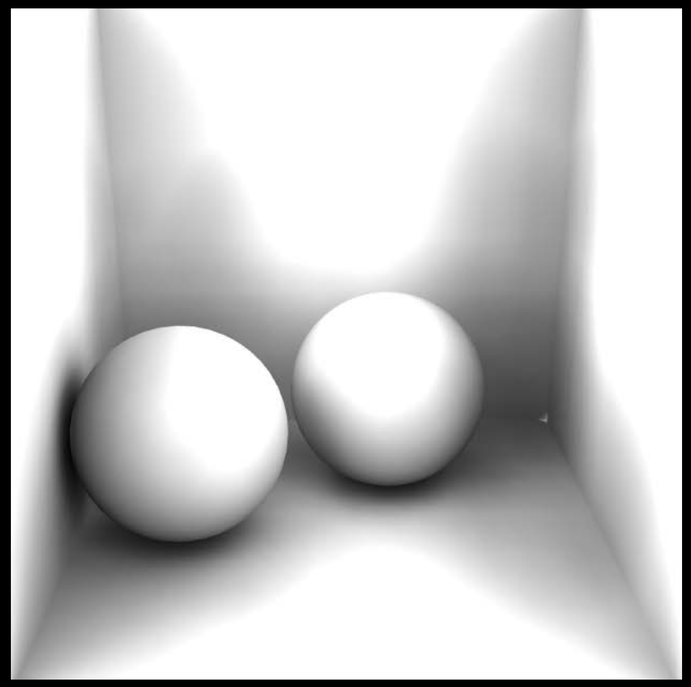


Actions

Scene Editor



Shader Modifiers



Ambient Occlusion

Demo

Scene Editor

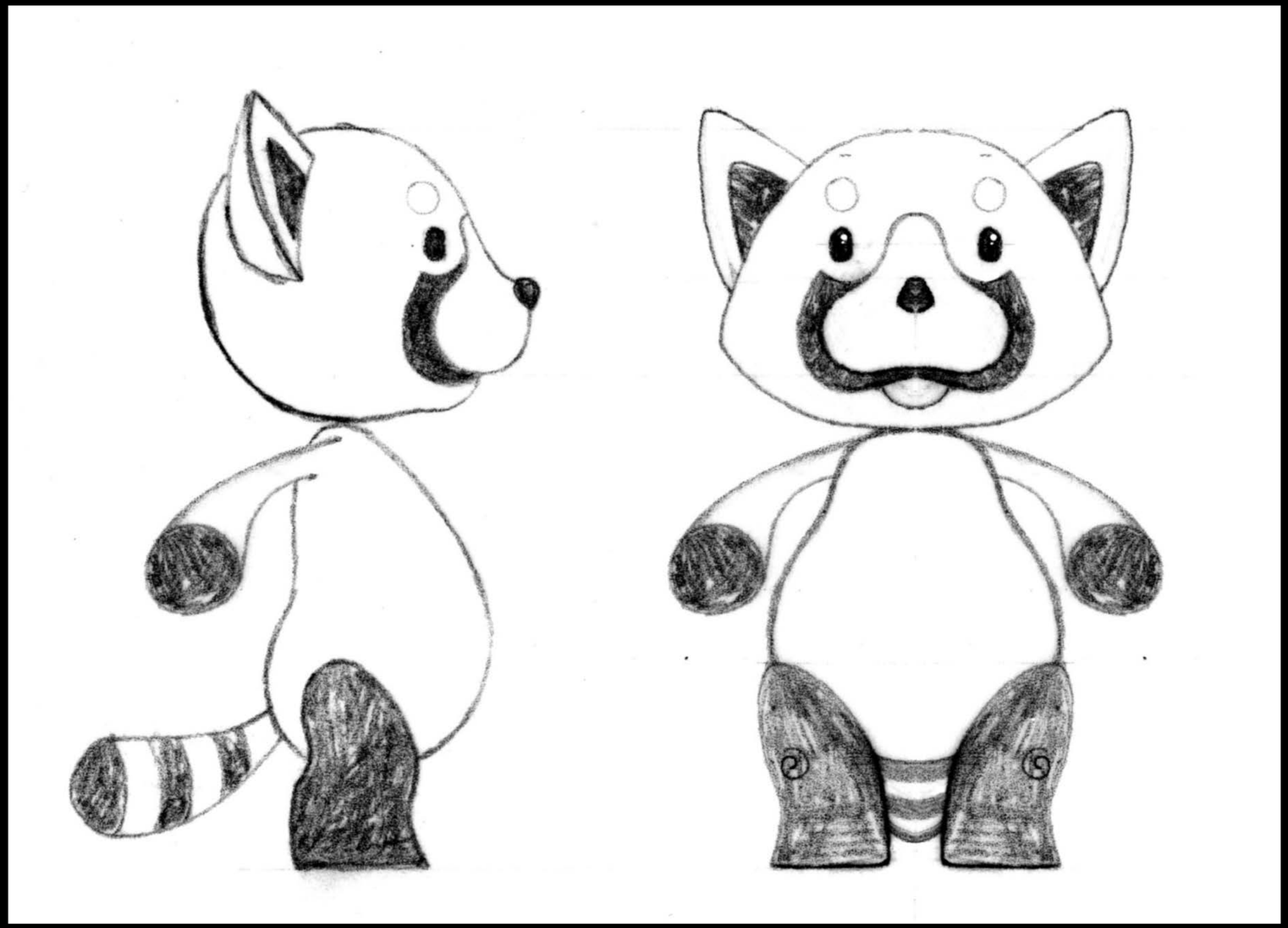
Amaury Balliet

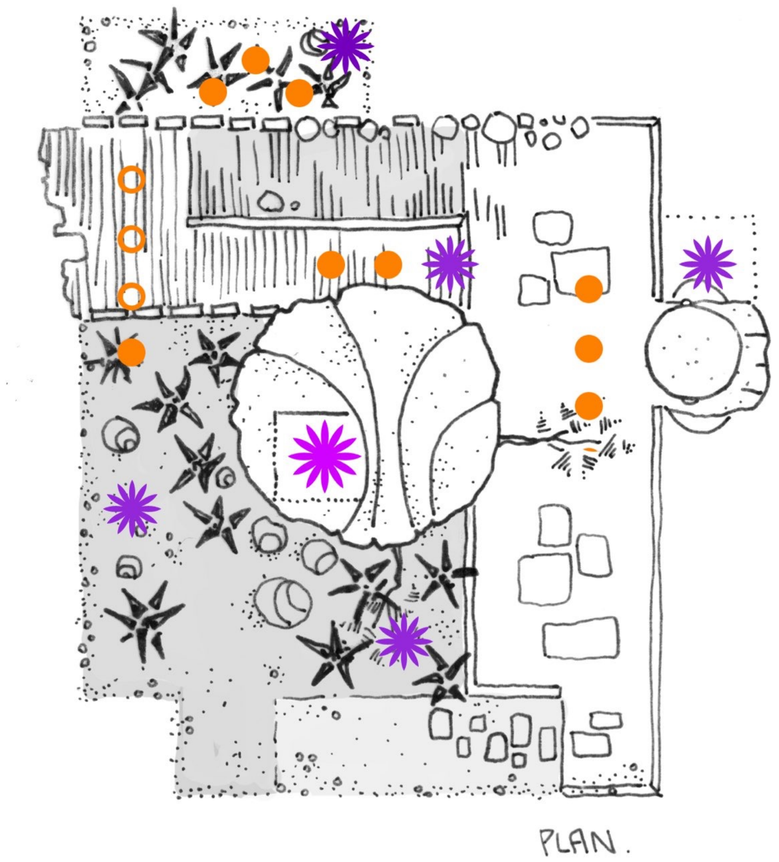
Behind the Scene

Thomas Goossens

Behind the Scene

Concept phase



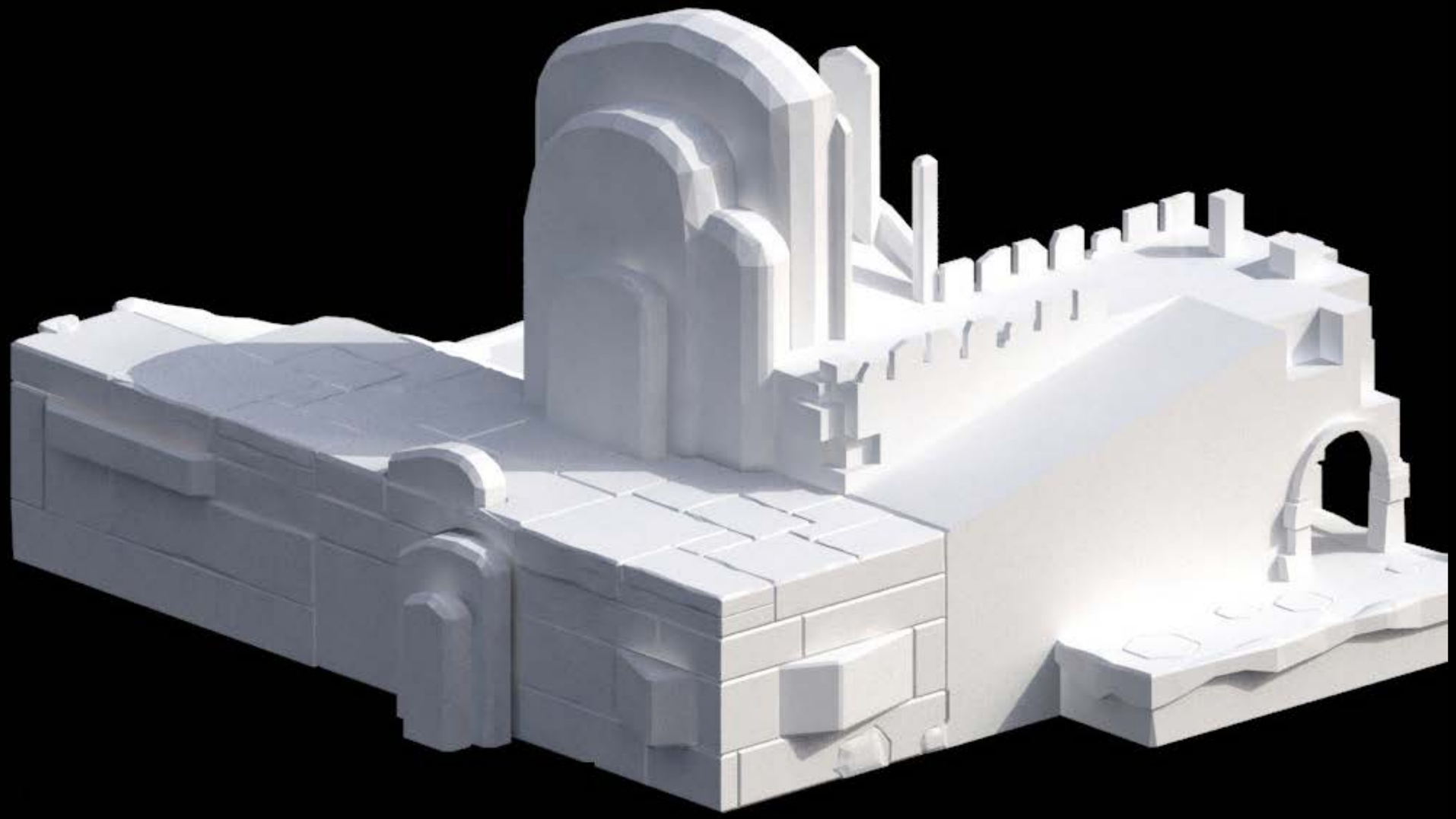


= main item

= collectable

Behind the Scene

3D modeling



Behind the Scene

Production

- Final models
- Textures
- Lighting
- Skinned character

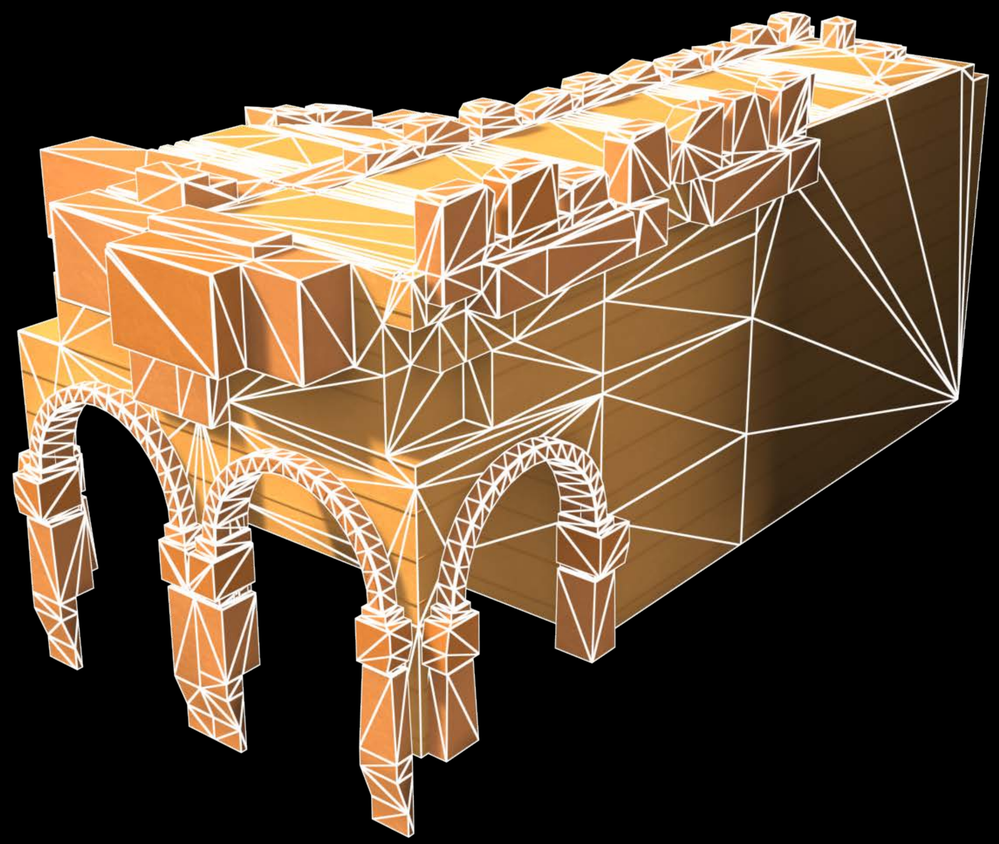
Behind the Scene

Make it awesome

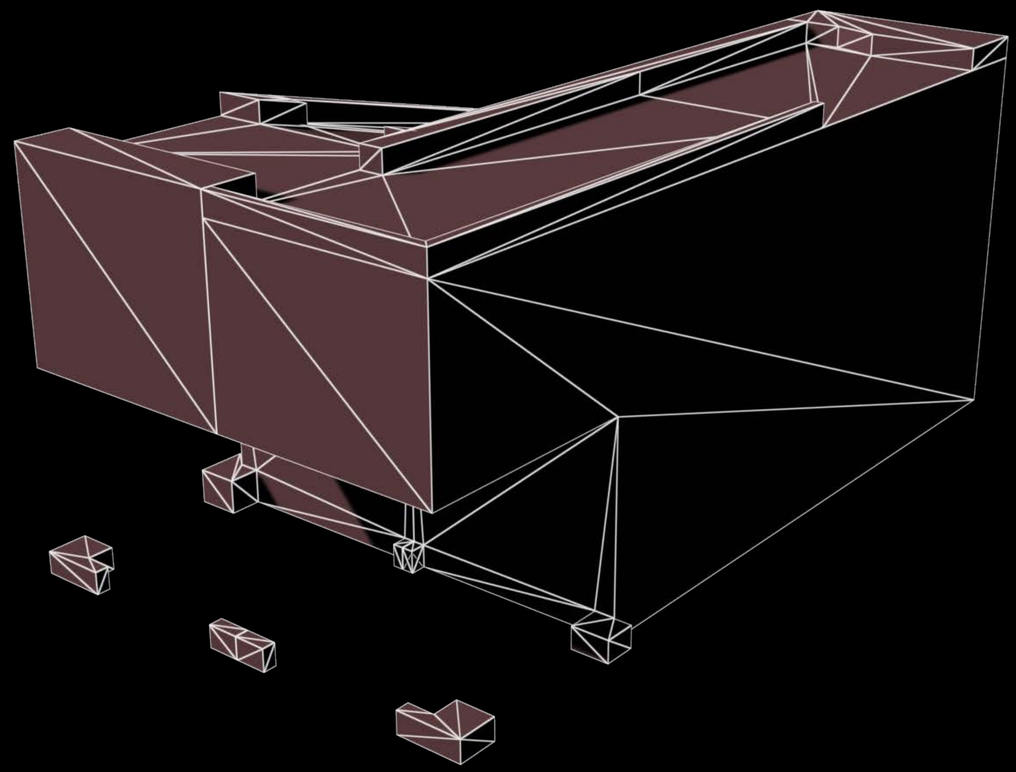
- Particles
- 2D overlays
- Vegetation
- Fog

Game Sample

Collisions with walls

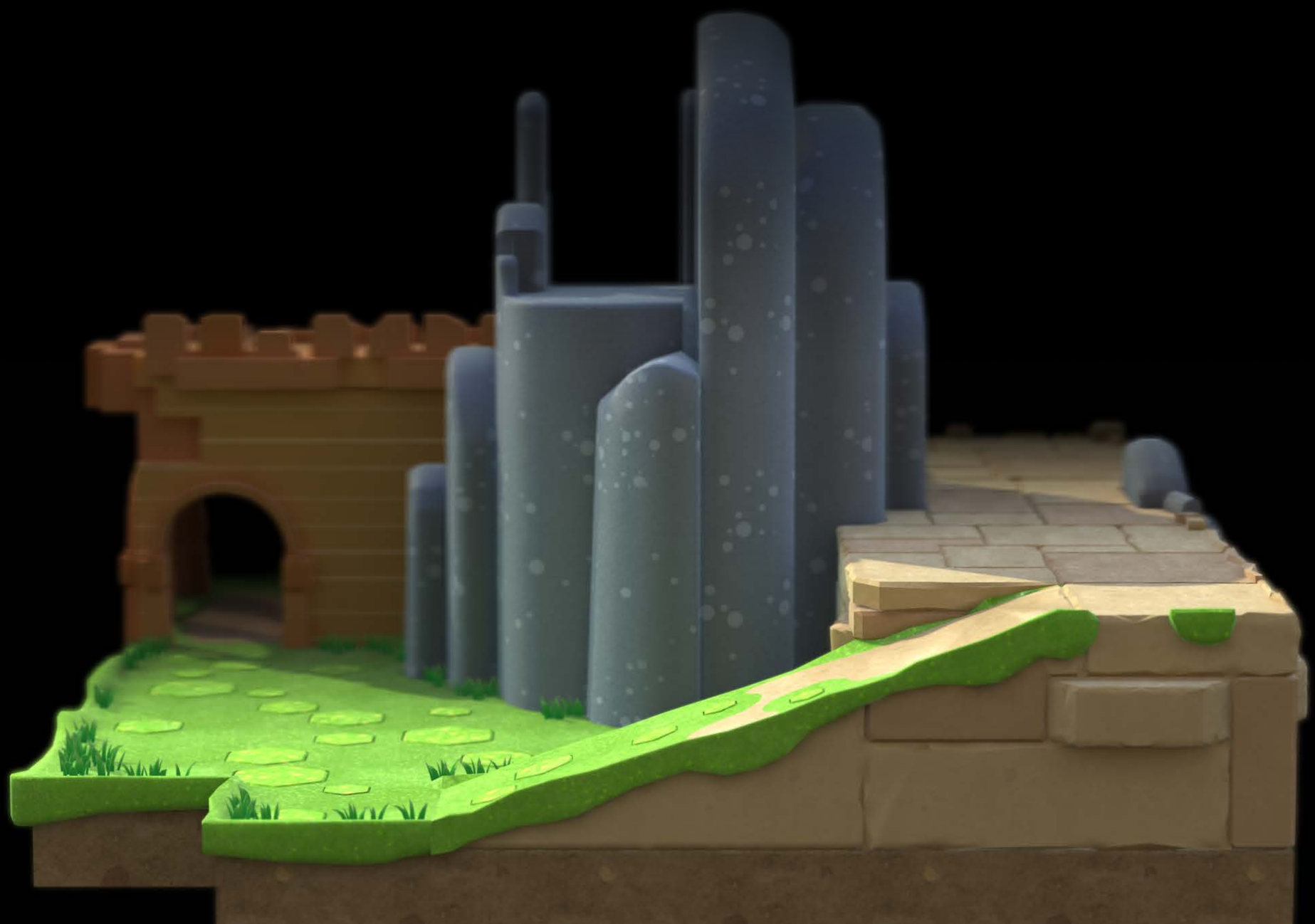


Rendered Mesh

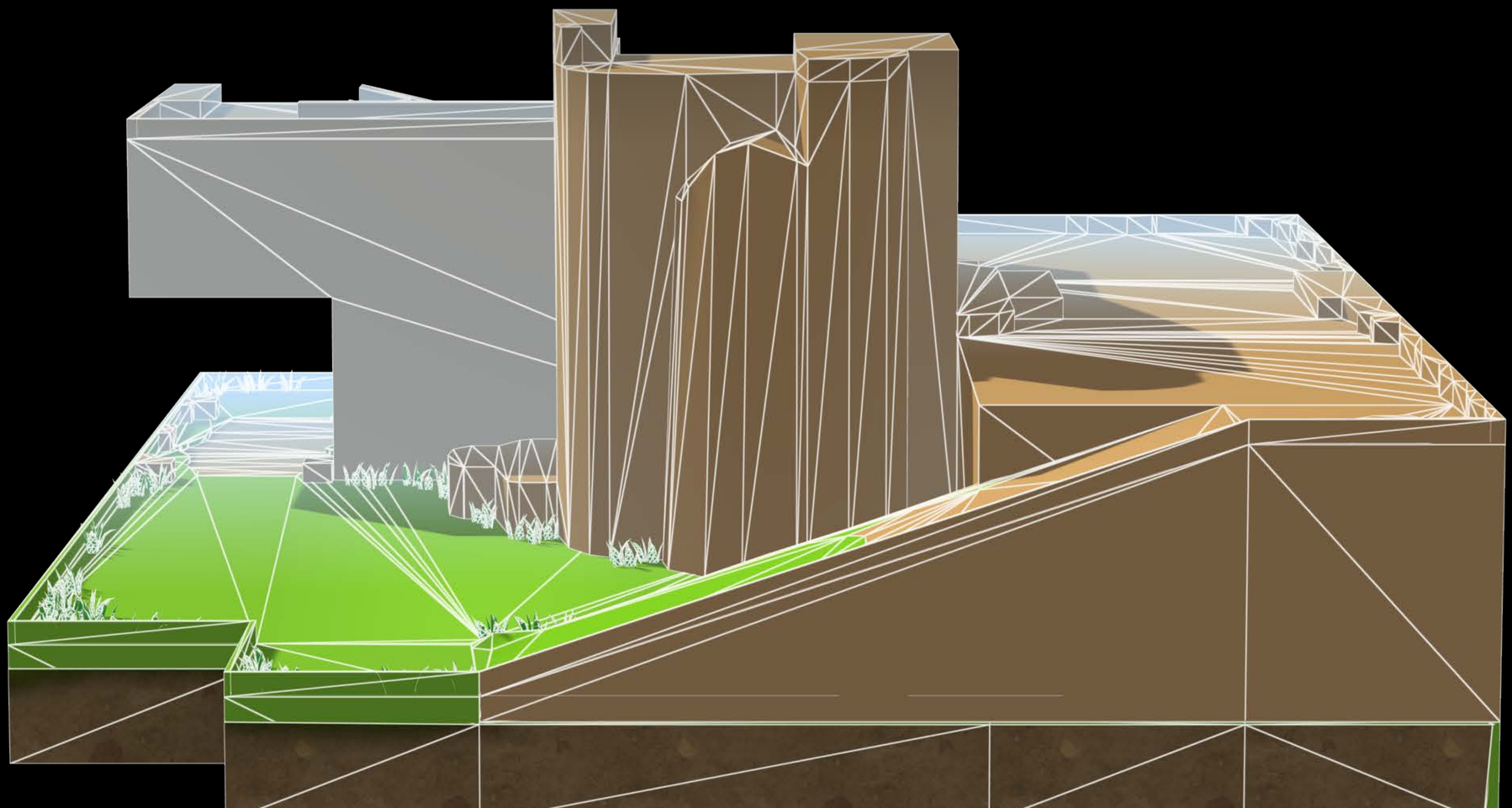


Collision Mesh

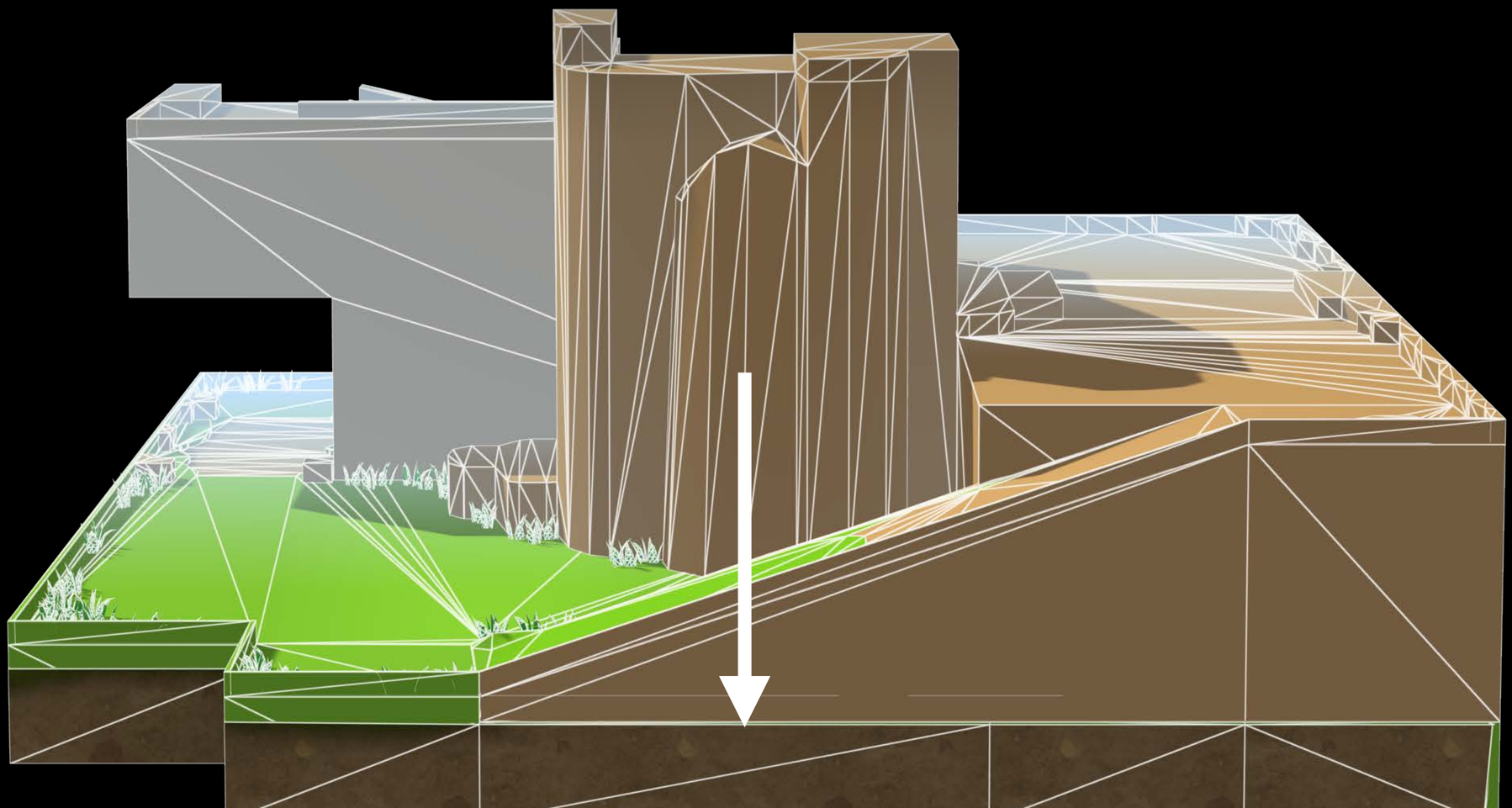
Collisions with the Ground



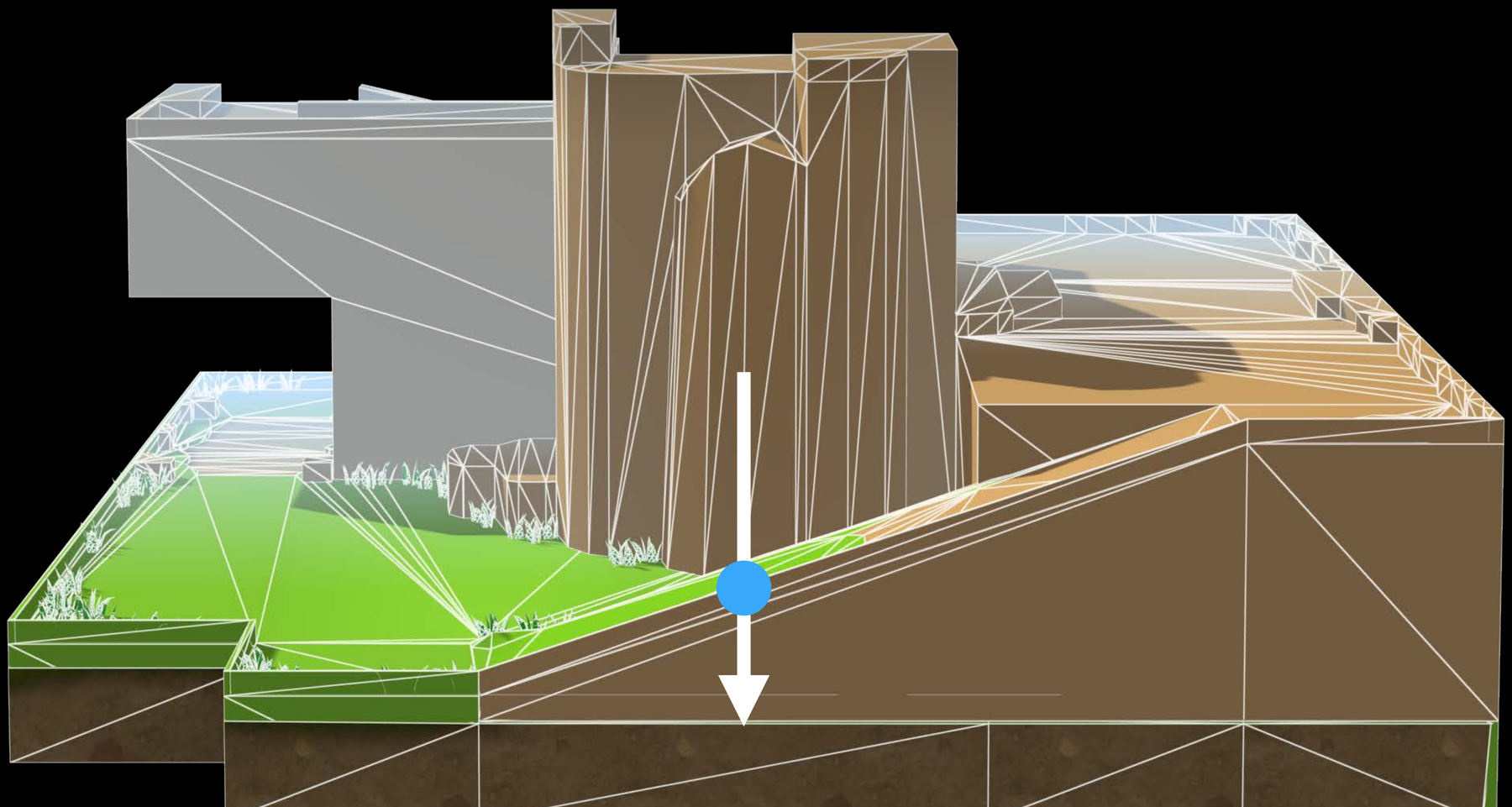
Collisions with the Ground



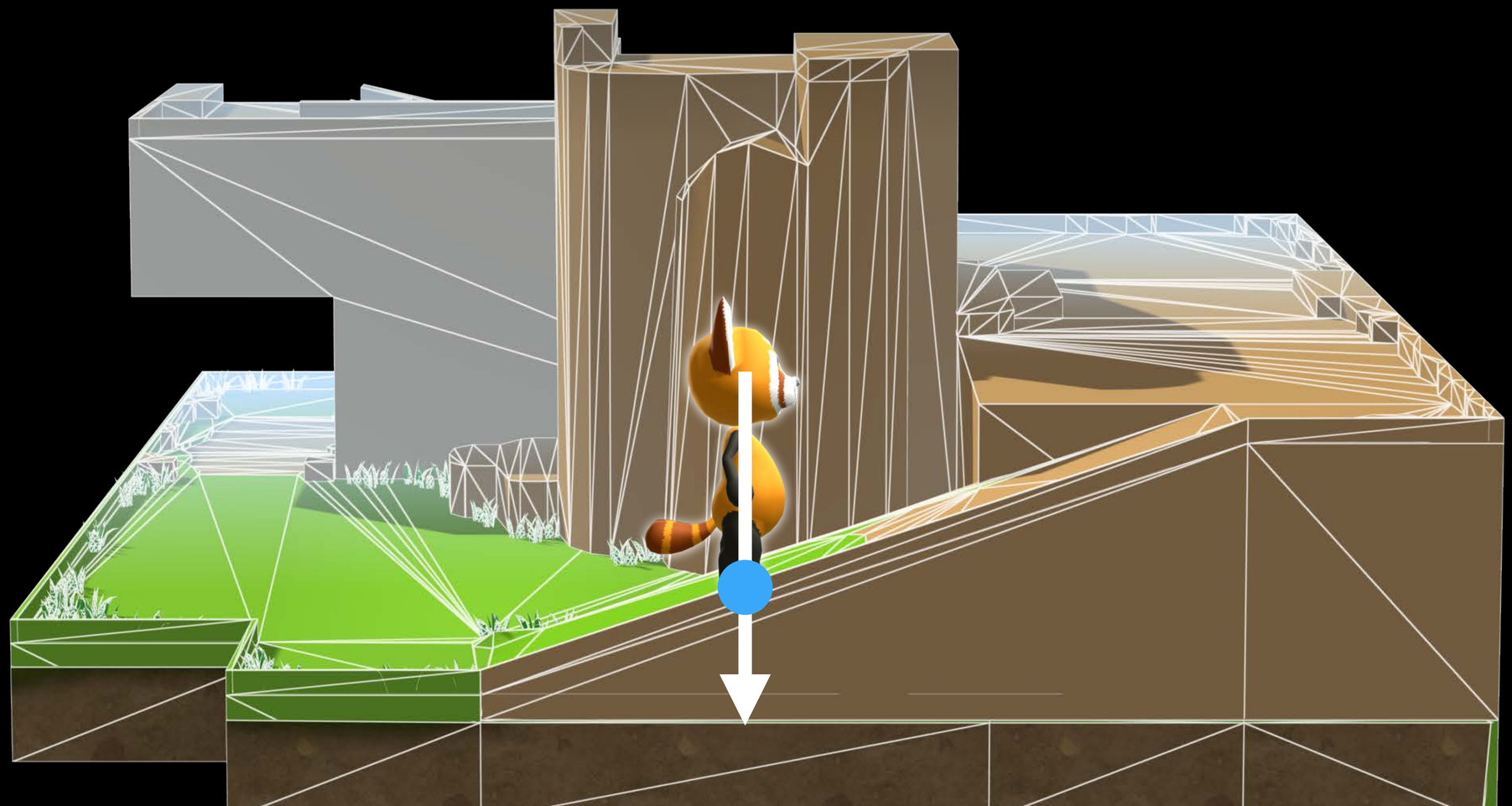
Collisions with the Ground



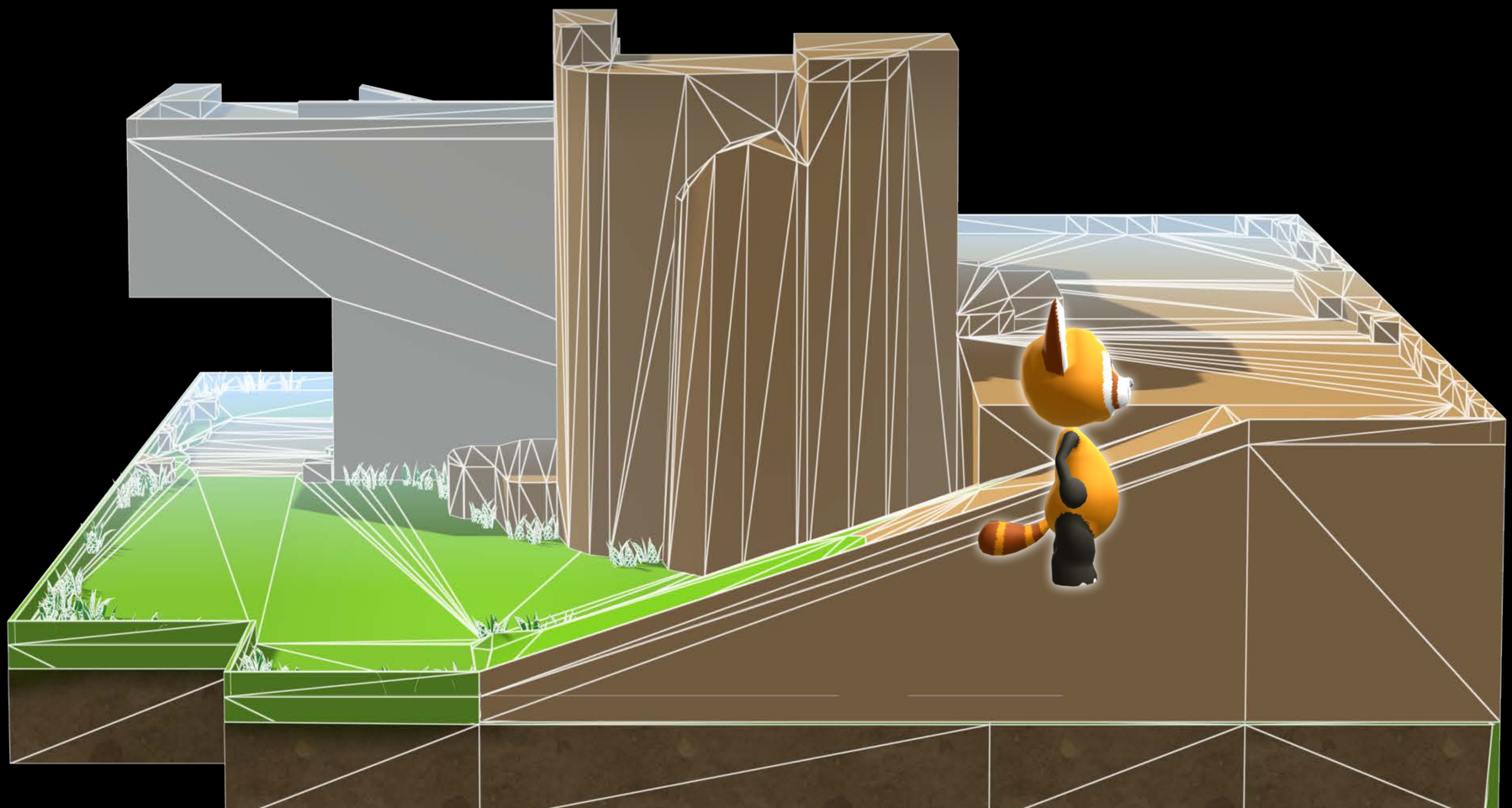
Collisions with the Ground



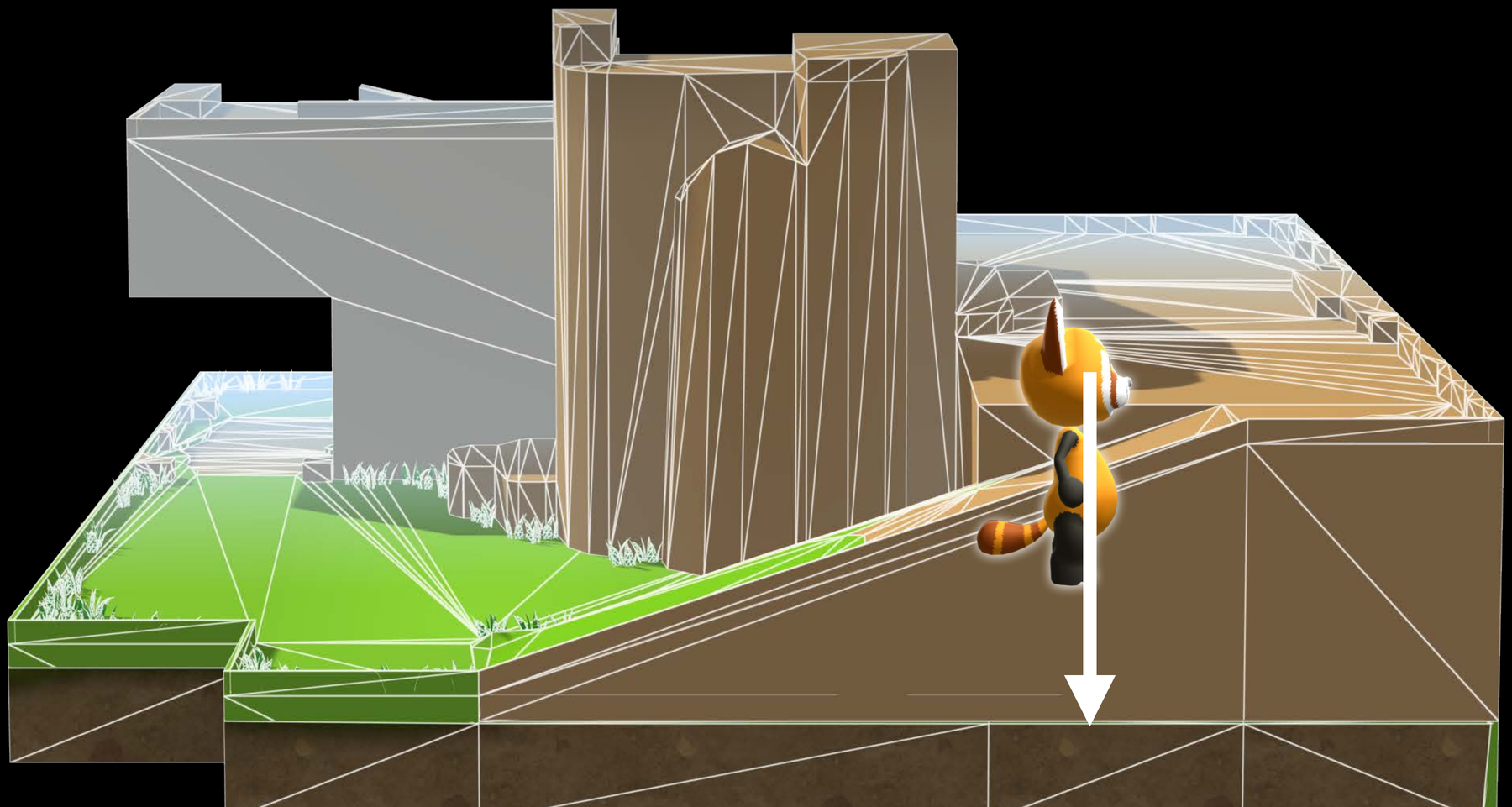
Collisions with the Ground



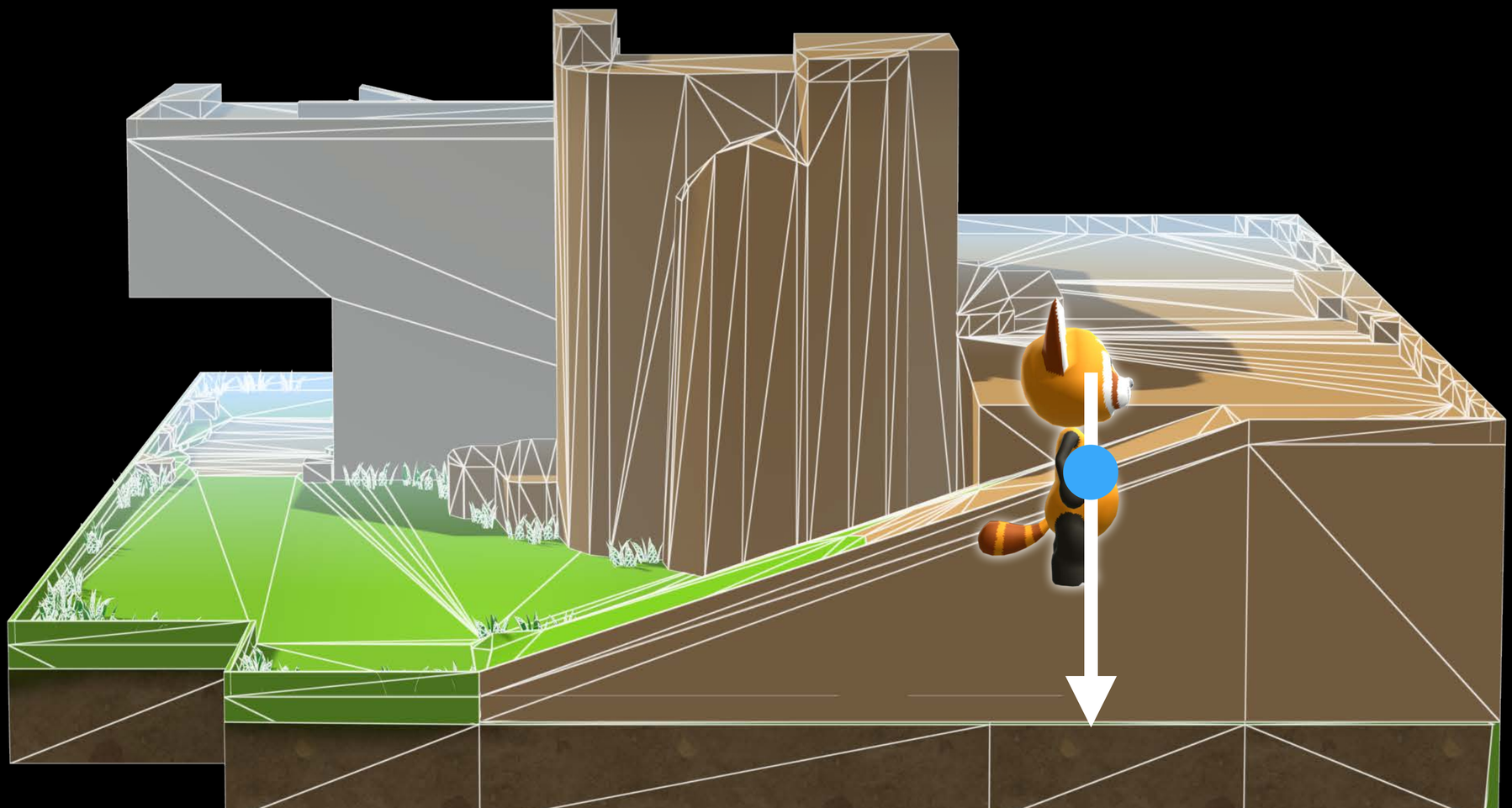
Collisions with the Ground



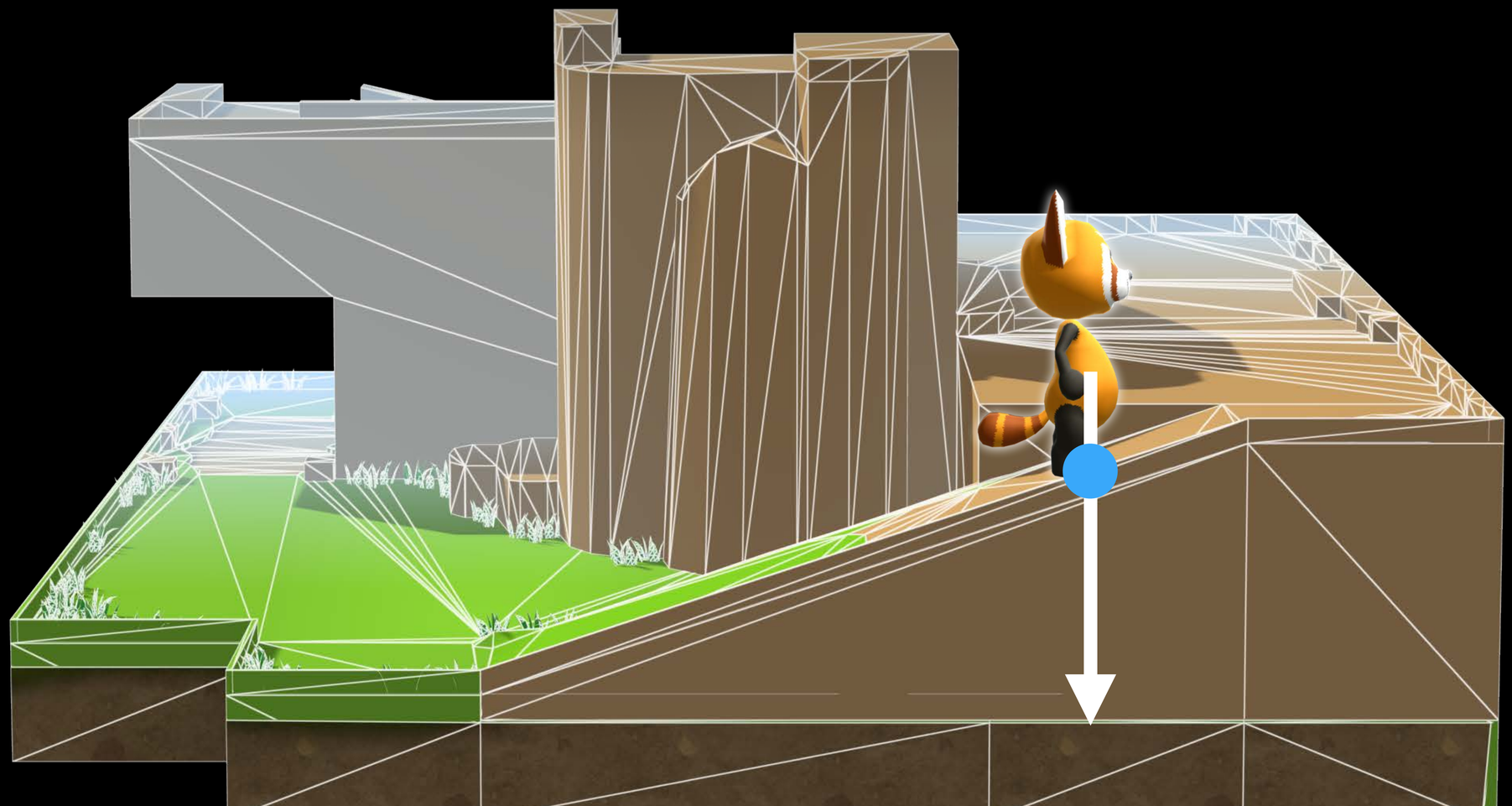
Collisions with the Ground



Collisions with the Ground



Collisions with the Ground



Collisions with the Ground

Animations

Animations

Game Sample

Animated elements

Skinning

Skinning

Shader Modifier

Game Sample

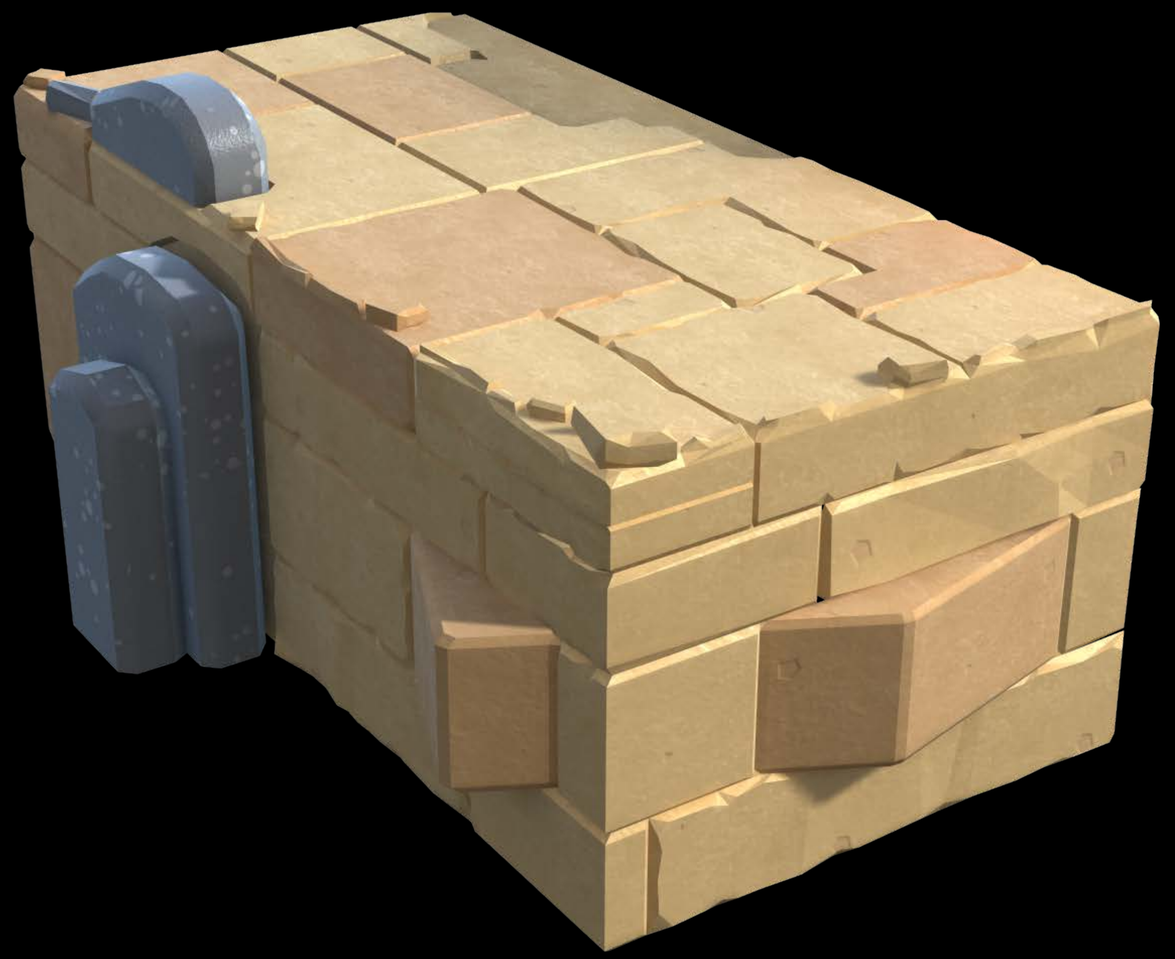
Particles

Game Sample

Particles

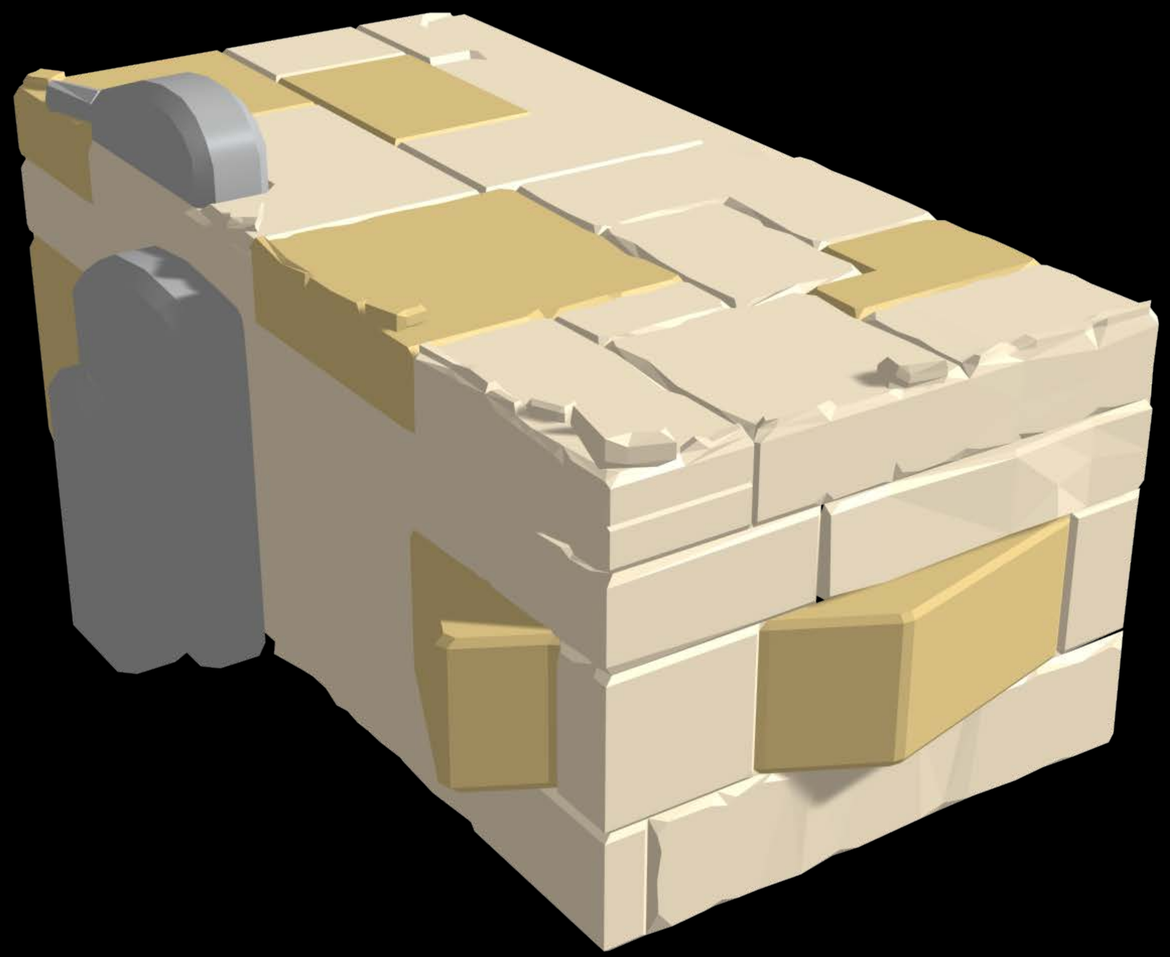
Game Sample

Configuring materials



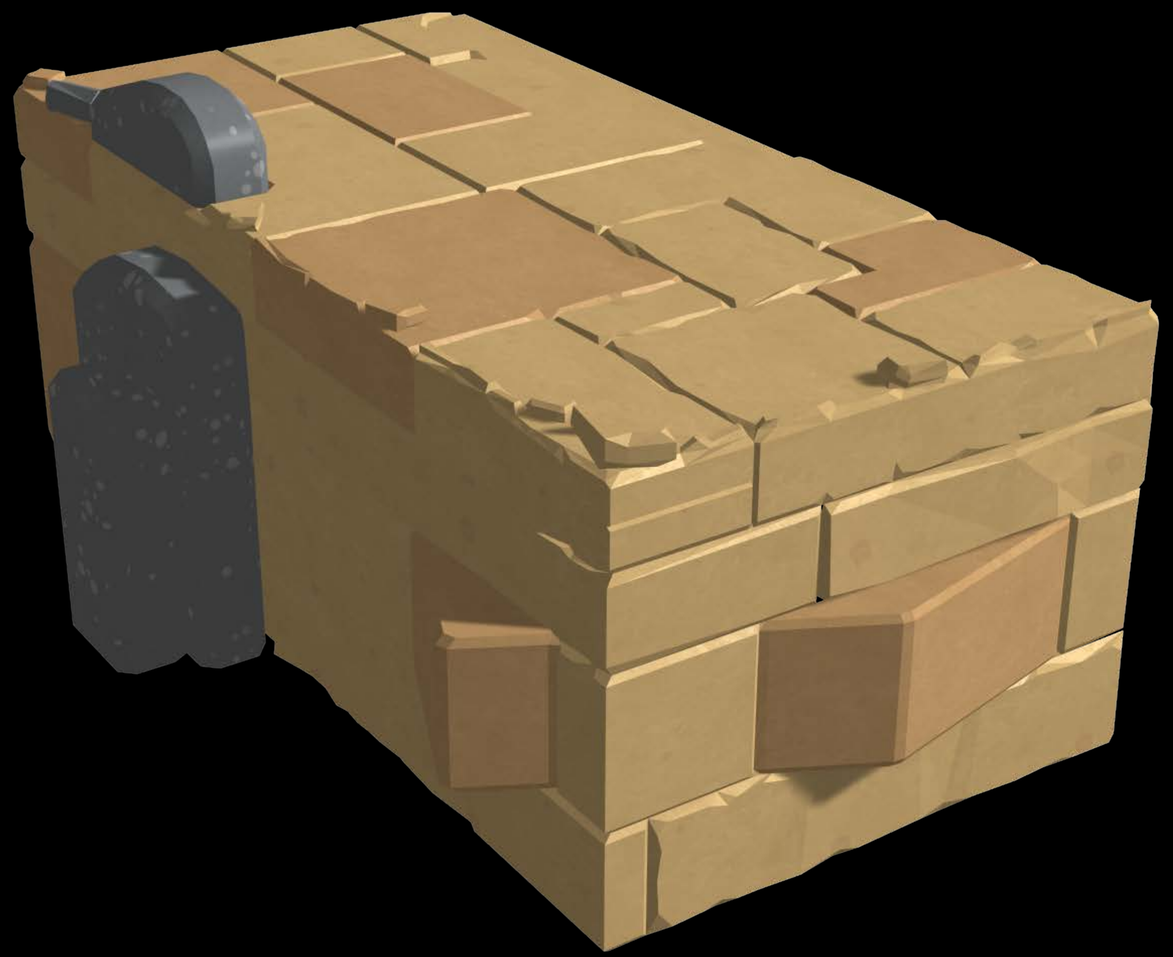
Configuring Materials

Untextured



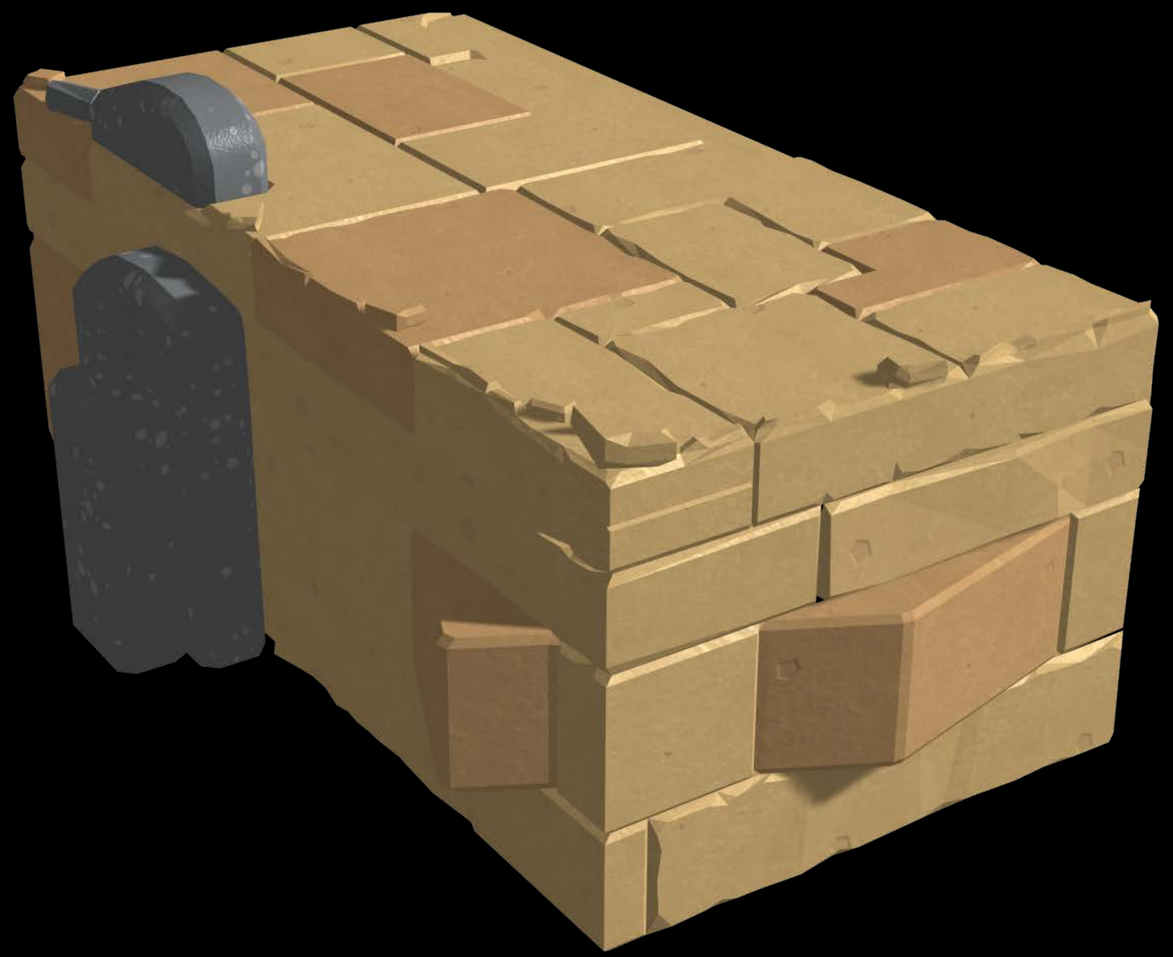
Configuring Materials

Diffuse texture



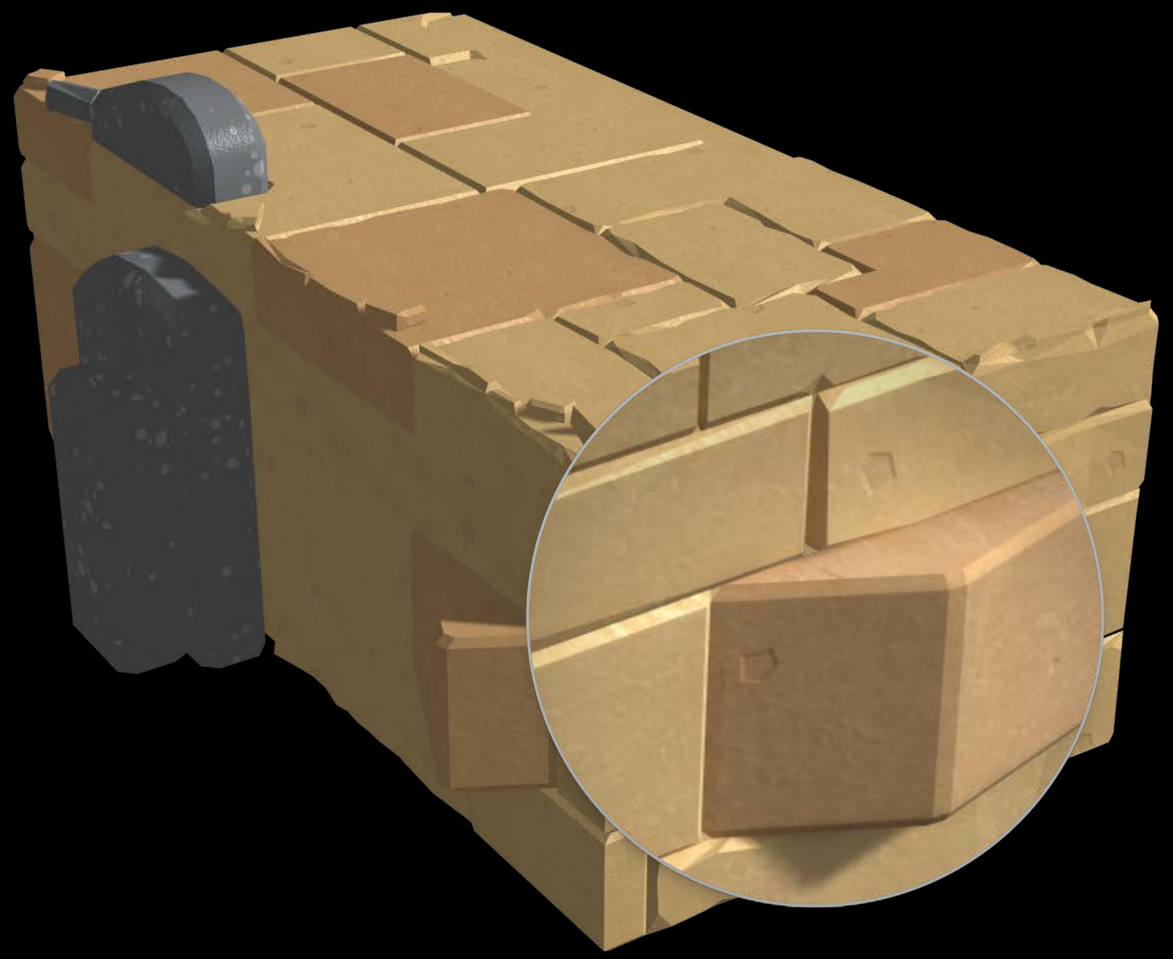
Configuring Materials

Normal map



Configuring Materials

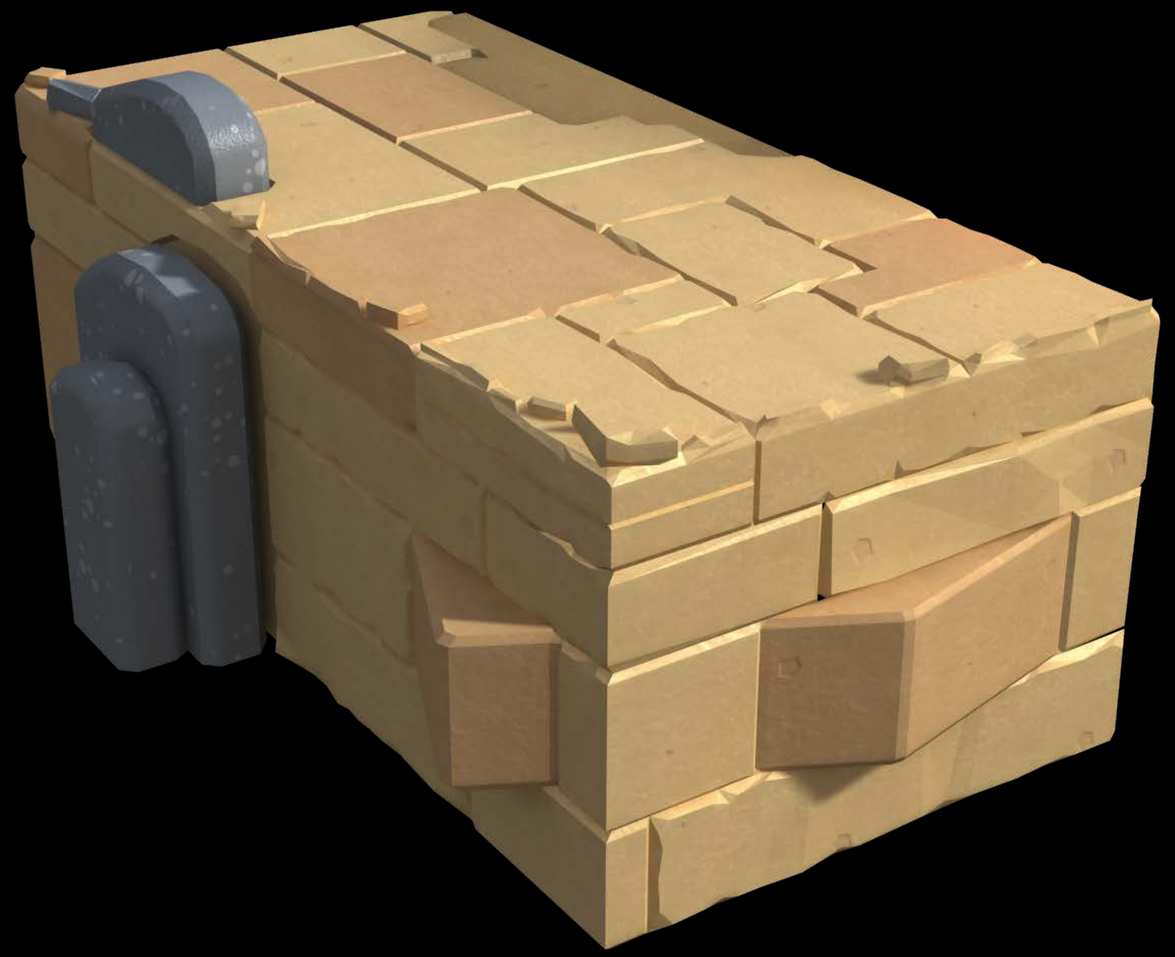
Normal map



Configuring Materials

Self-illumination texture

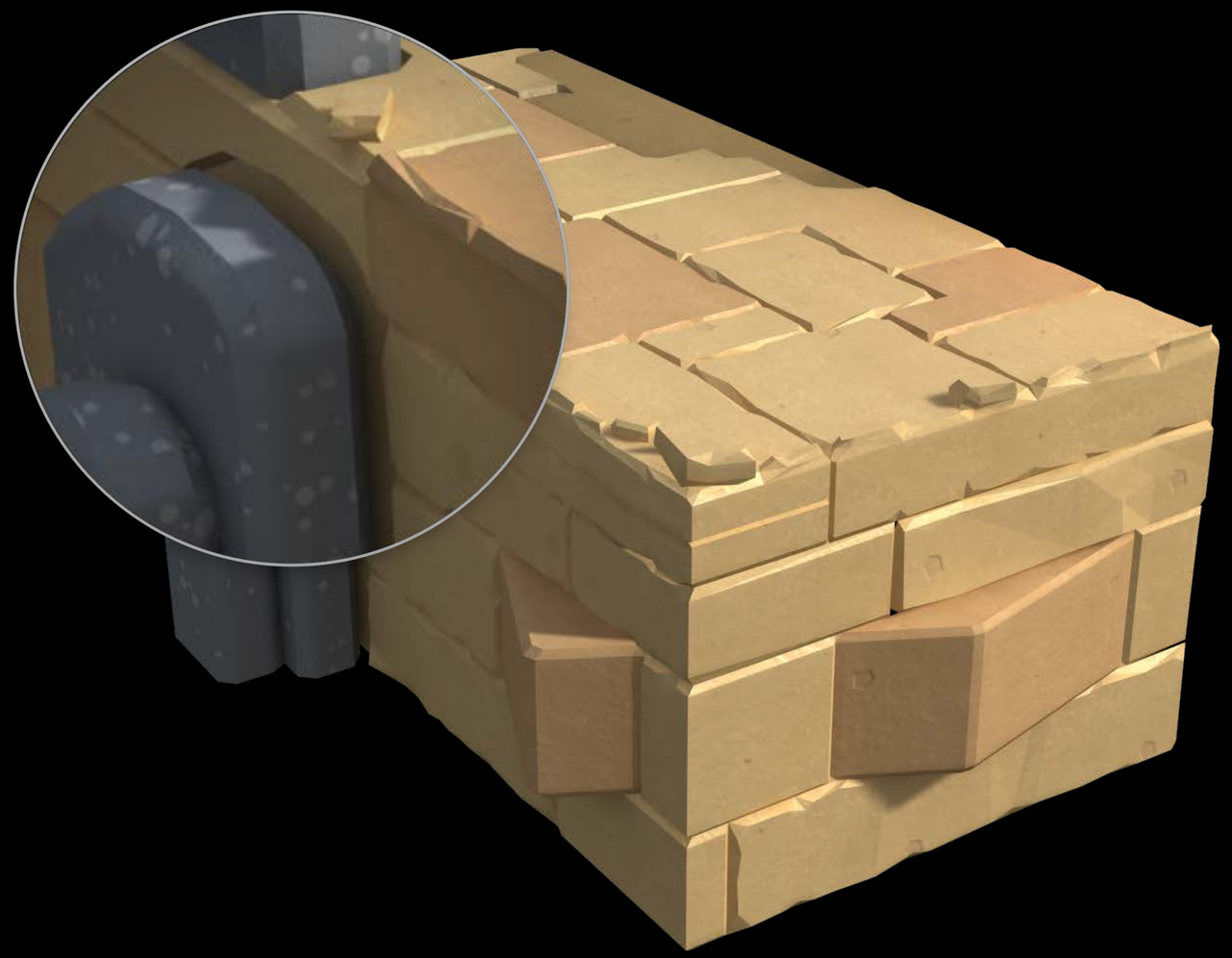
NEW



Configuring Materials

Self-illumination texture

NEW

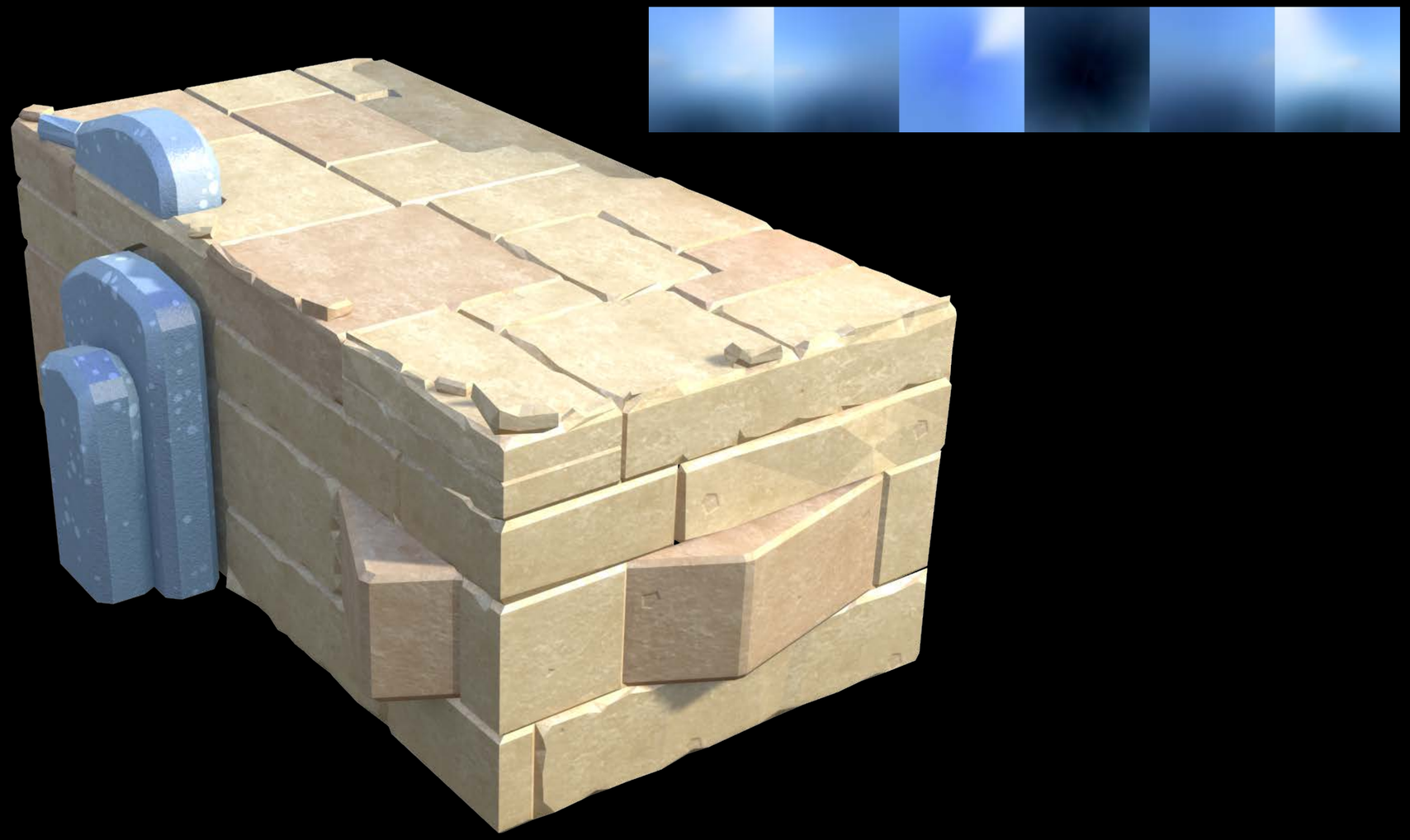


Configuring Materials

Reflective cube map

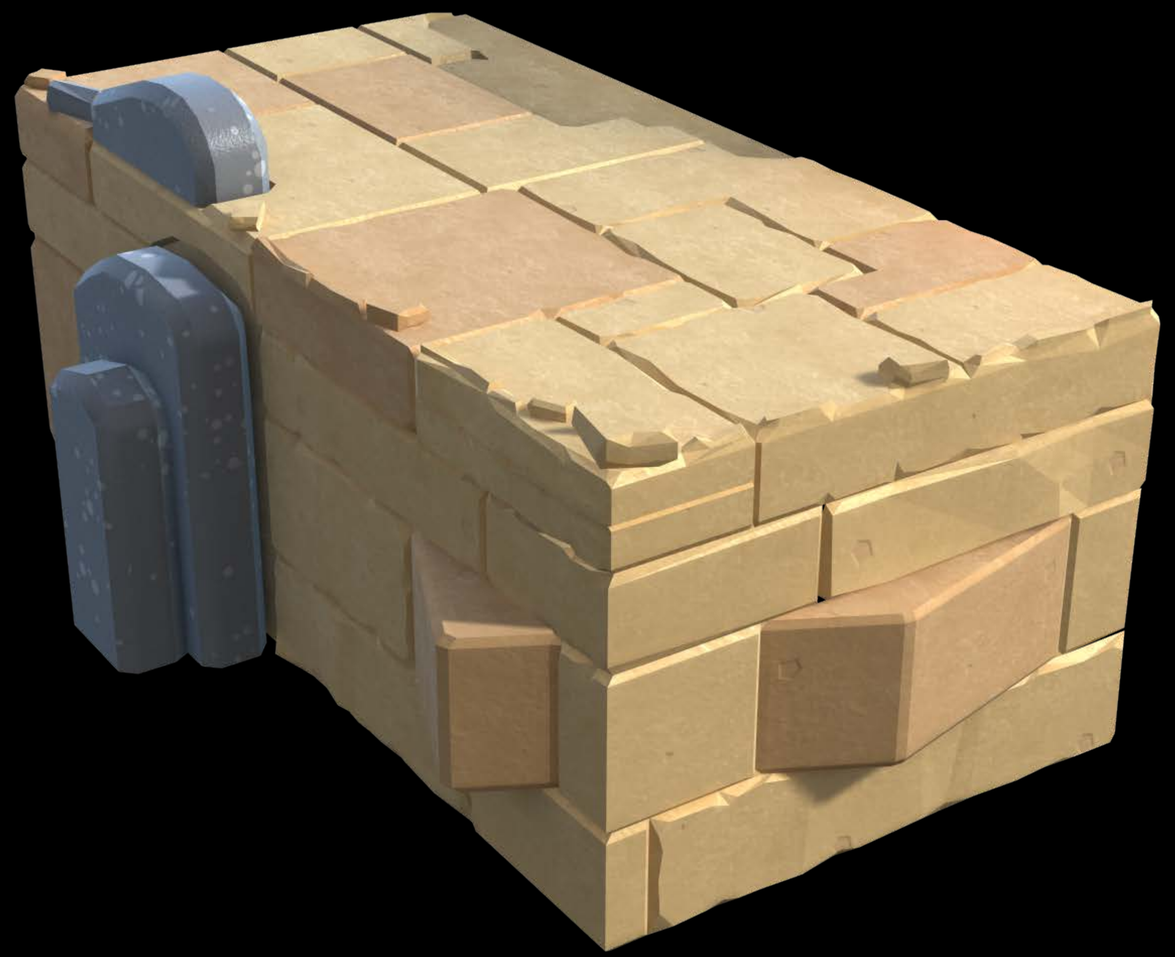
Configuring Materials

Reflective cube map



Configuring Materials

Fresnel



Transition to Metal

Sébastien Métrot

Transition to Metal

Better performance

Modern API

It just works

Transition to Metal

Available with Metal

Compute shaders

- `SCNGeometrySource` backed by `MTLBuffer`
- Use `MTLTexture` as a contents of a material property

Automatic batching

Demo

Metal renderer

Transition to Metal

Adoption

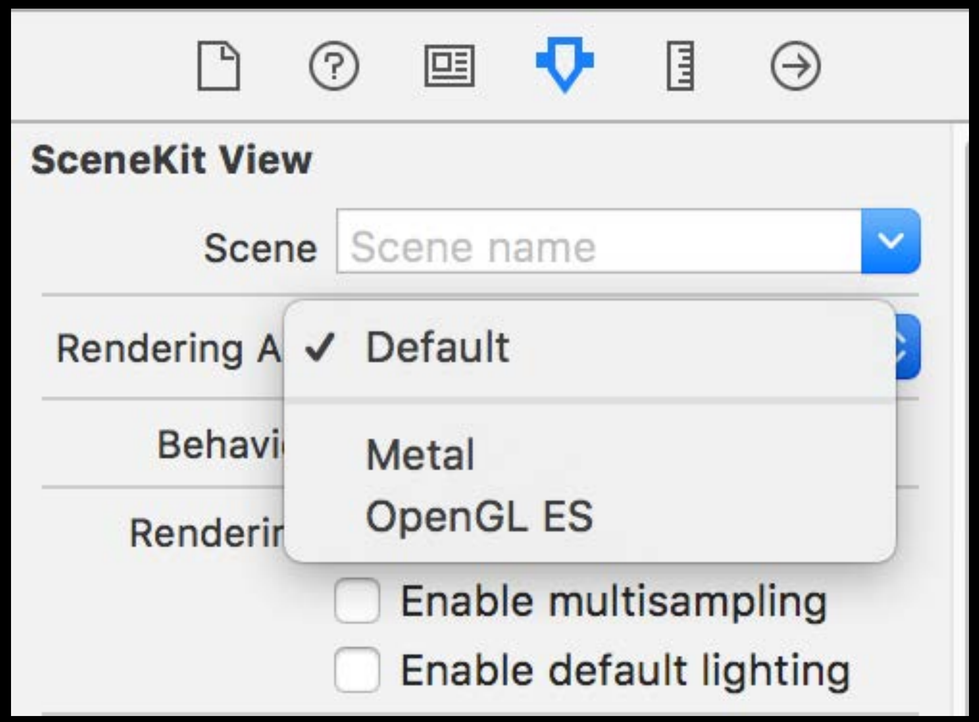
Default on iOS 9

Backward-compatibility ensured

OpenGL can be opted-in

Choosing the Rendering API

Interface Builder



Choosing the Rendering API

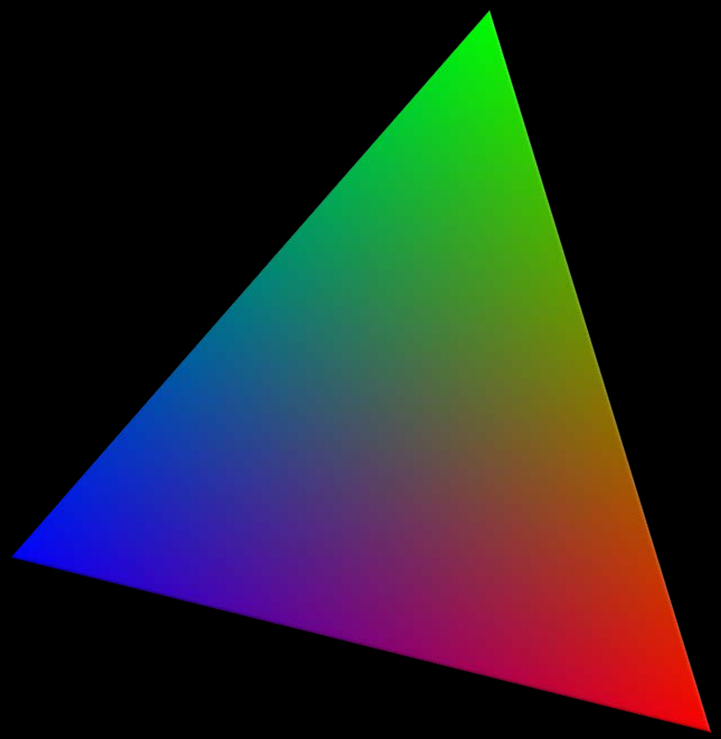
Programmatically

```
let options = [SCNPreferredRenderingAPIKey : SCNRenderingAPI.Metal.rawValue]

aView = SCNView(frame: aFrame, options: options)
```

Transition to Metal

Dealing with shaders



Metal Shader Modifiers

	OpenGL	Metal
GLSL	✓	✓ Translated
Metal	✗ Ignored	✓

Metal SCNProgram

No automatic translation

GLSL and Metal

Compiled offline (recommended)

- Only `vertexFunctionName` and `fragmentFunctionName`

Compiled at runtime

- Source code, `vertexFunctionName`, and `fragmentFunctionName`

Metal Shader Declaration

```
#include <metal_stdlib>
using namespace metal;
#include <SceneKit/scn_metal>

struct custom_vertex_t {
    float3 position [[attribute(SCNVertexSemanticPosition)]];
};

struct custom_node_t {
    float4x4 modelViewProjectionTransform;
};

struct MyStruct {
    float3 direction;
float scale;
};
vertex float4 custom_vert(custom_vertex_t in [[ stage_in ]],
                          constant custom_node_t& scn_node [[buffer(1)]],
                          constant MyStruct& myArgument [[buffer(0)]])
{
 return float4(in.position * myArgument.scale, 1.0) * scn_node.modelViewProjectionTransform;
}
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}
```

SCNProgram

Instantiation

```
struct MyStruct {
   var direction: float3
   var scale: float
}
```

```
let program = SCNProgram()
program.vertexFunctionName = "custom_vert"
program.fragmentFunctionName = "custom_frag"

aMaterial.program = program

var ms = MyStruct( … );
material.setValue(NSData(bytes:&ms, length:sizeof(MyStruct)),
                  forKey:"myArgument")
```

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```
let program = SCNProgram()
program.vertexFunctionName = "custom_vert"
program.fragmentFunctionName = "custom_frag"

aMaterial.program = program
```

```
var ms = MyStruct( … );
material.setValue(NSData(bytes:&ms, length:sizeof(MyStruct)),
                  forKey:"myArgument")
```

Techniques

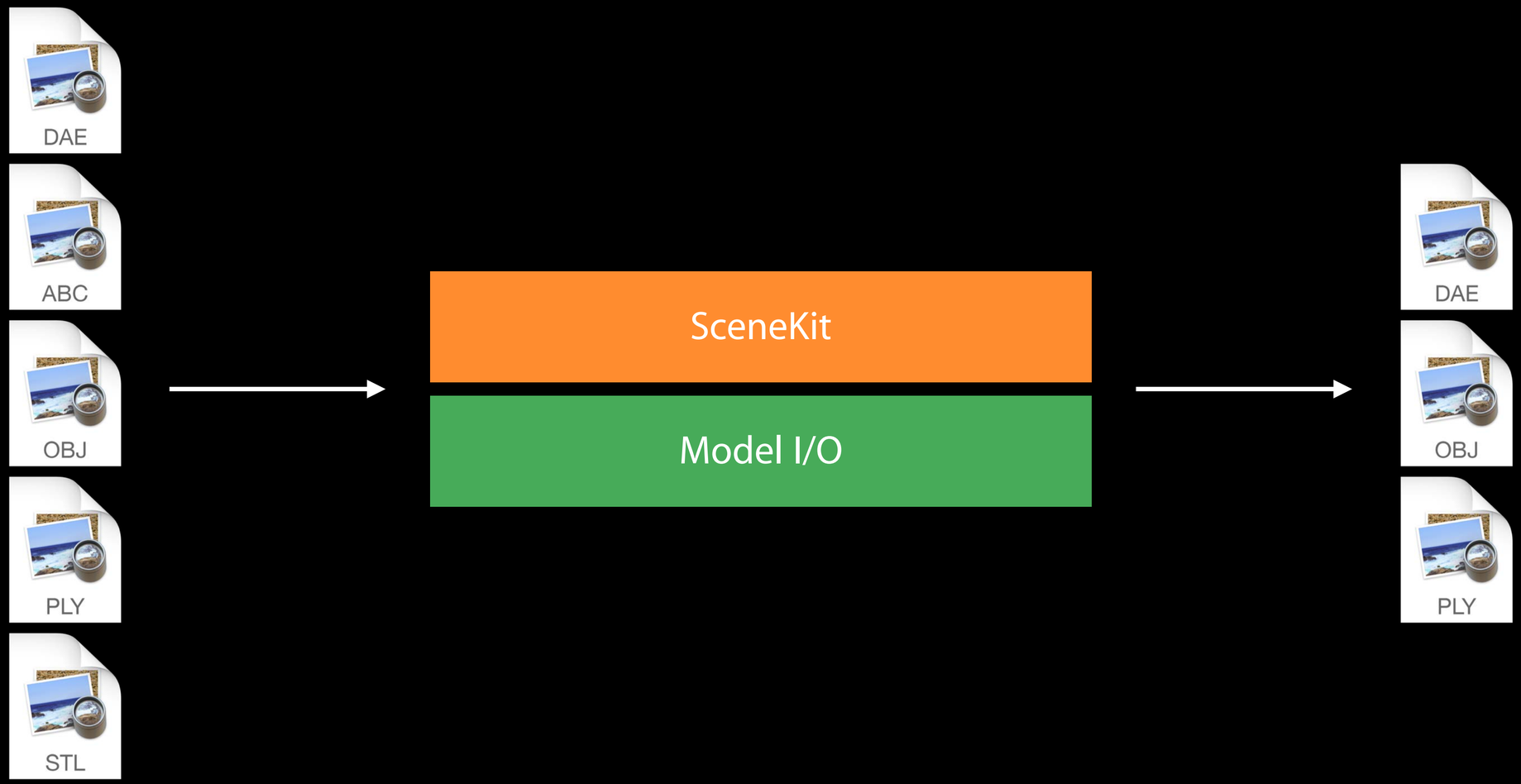
SCNTechnique

Pass description additions

- `metalVertexShader`
- `metalFragmentShader`

New Features

Integration with Model I/O



File Formats

	Geometry	Materials	Animations	Export
DAE	✓	✓	✓	✓
ABC	✓			
PLY	✓		Not Applicable	
STL	✓	Not Applicable	Not Applicable	✓
OBJ	✓	✓	Not Applicable	✓

Scene Transitions

```
aSCNView.presentScene(aScene, withTransition:aSKTransition,
incomingPointOfView:nil, completionHandler:nil)
```

Scene Transitions

```
aSCNView.presentScene(aScene, withTransition:aSKTransition,
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```
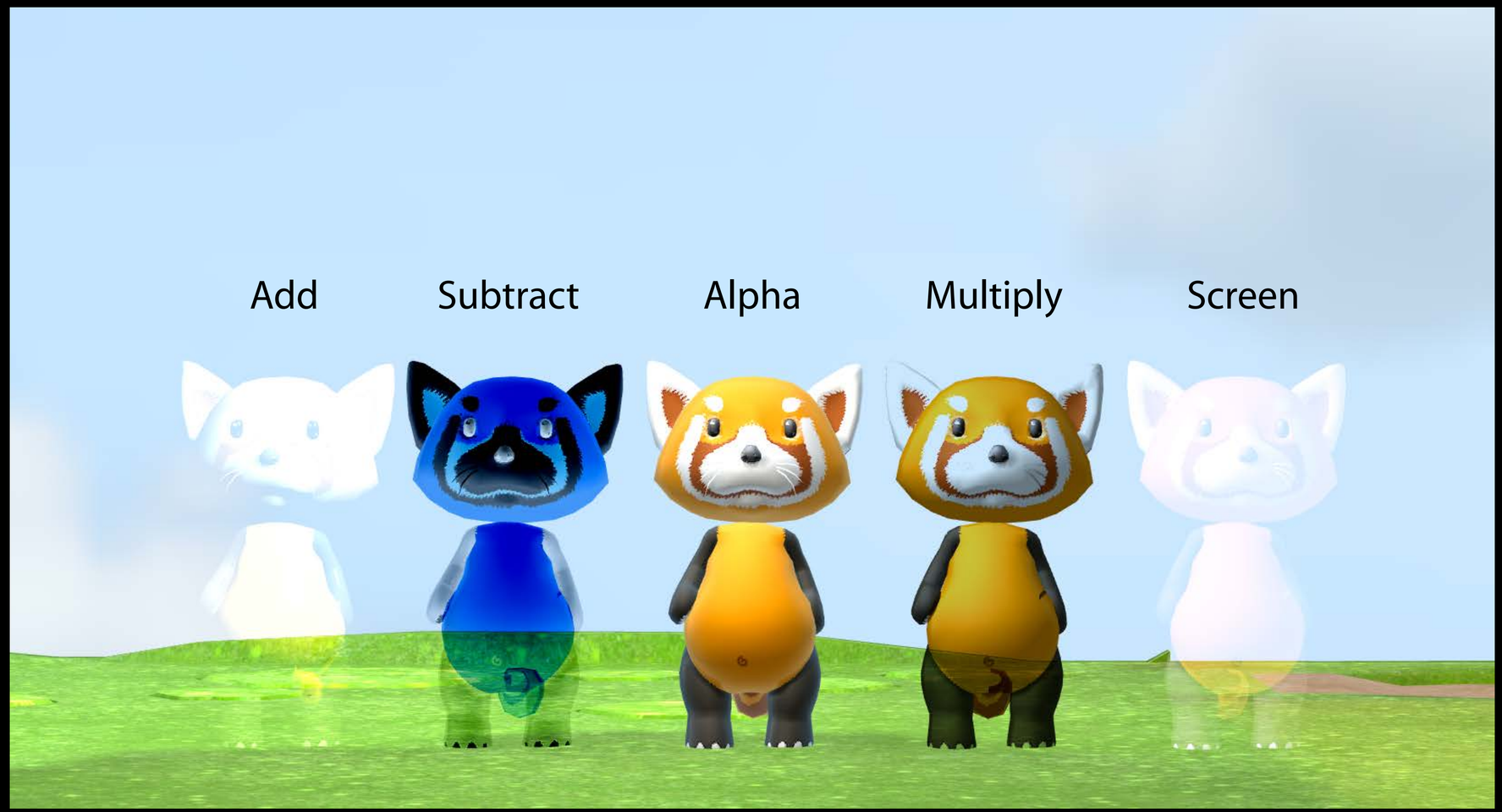

Debug Options

```
aSCNView.debugOptions = .ShowBoundingBoxes | .ShowPhysicsShapes
```

Blend Modes

```
aSCNMaterial.blendMode = .Add
```



Audio Nodes

Sounds move with nodes in 3D

Ambience and music

Listener on the camera by default

AVAudioNode extensible

SCNAction to play sound

Audio Nodes

3D sounds

```
let source = SCNAudioSource(named: "sound.caf")
let player = SCNAudioPlayer(source: source)

node.addAudioPlayer(player);
```

Ambience and music

```
source.positional = false
source.loops = true
```

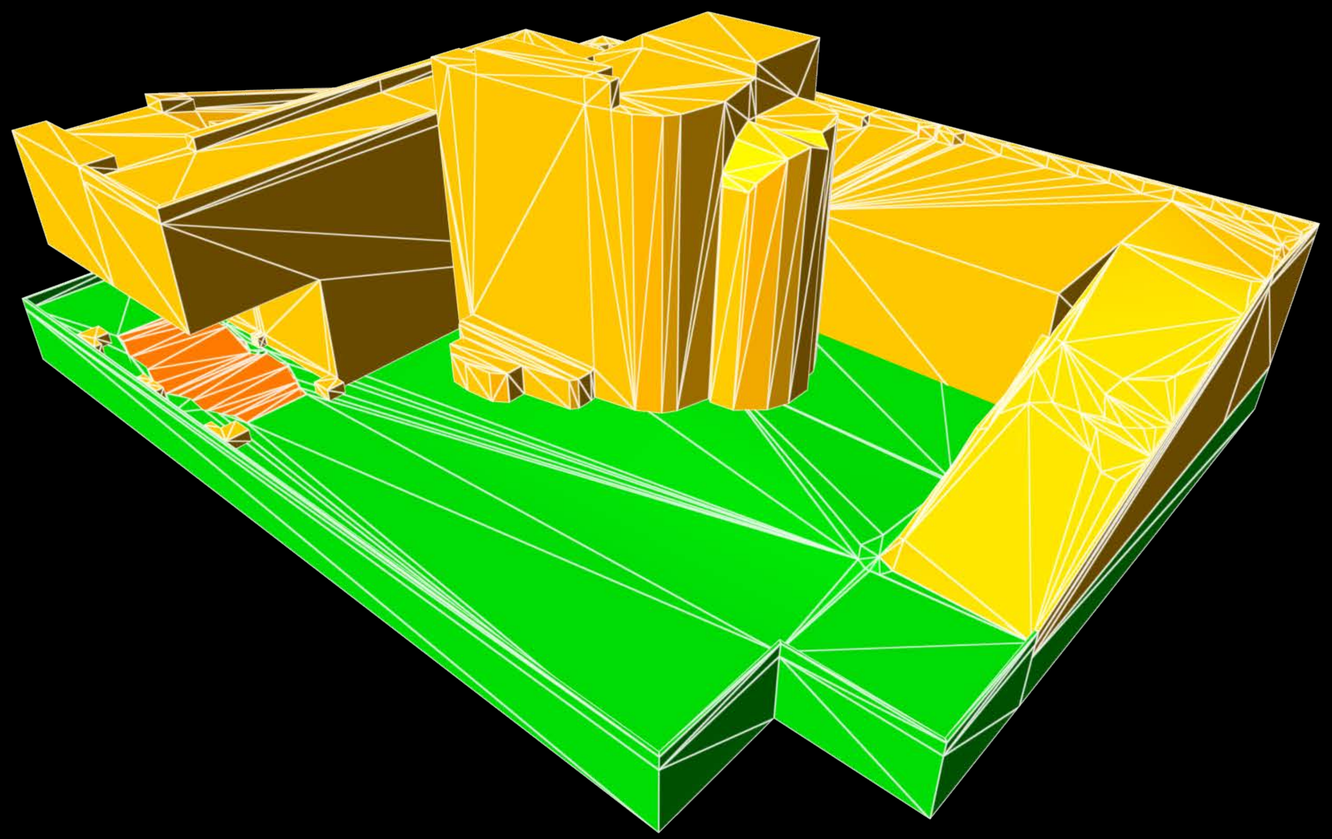
Play with SCNAction

```
let action = SCNAction.playAudioSource(source, waitForCompletion: true)
node.runAction(action)
```

Audio Nodes

Game sample

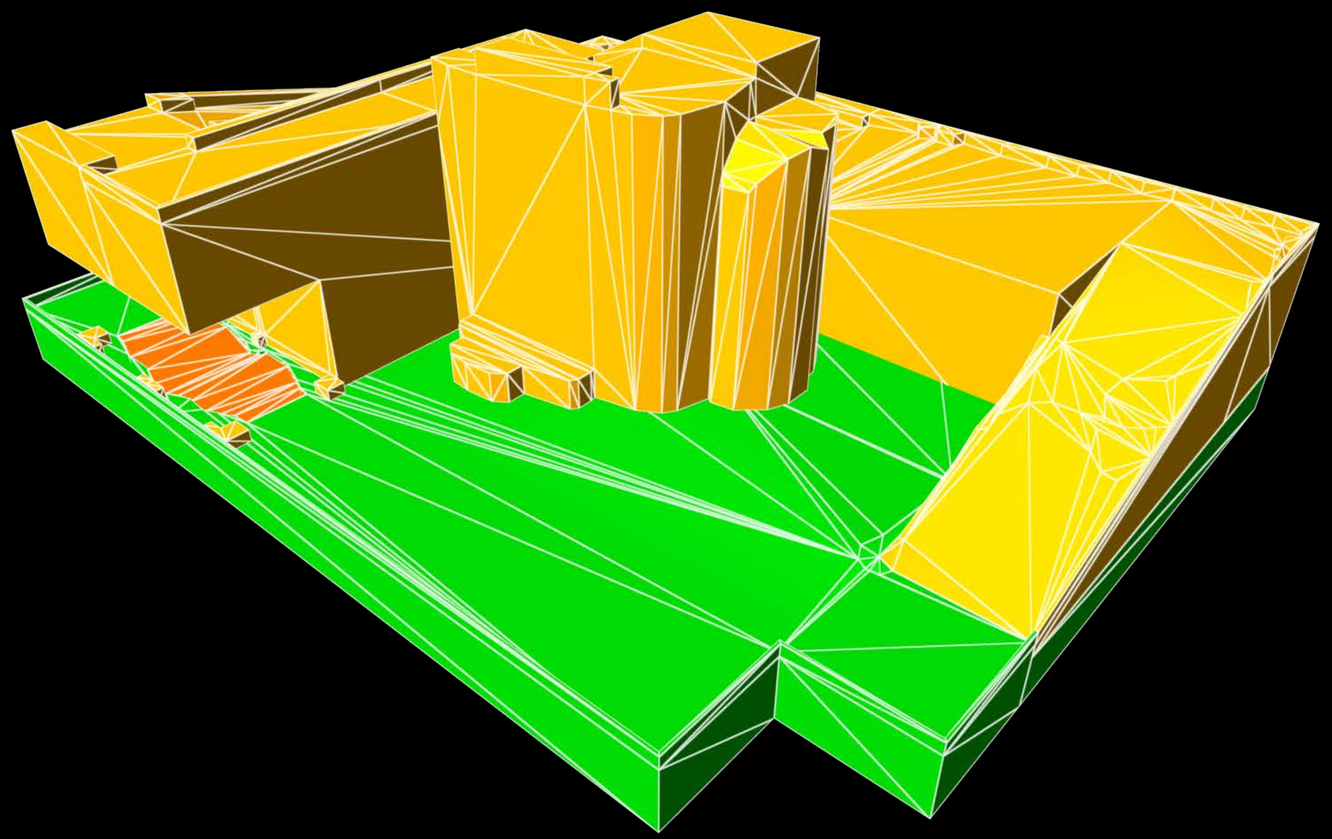
Play the right step sound based on the type of ground



Audio Nodes

Game sample

Play the right step sound based on the type of ground



Audio Nodes

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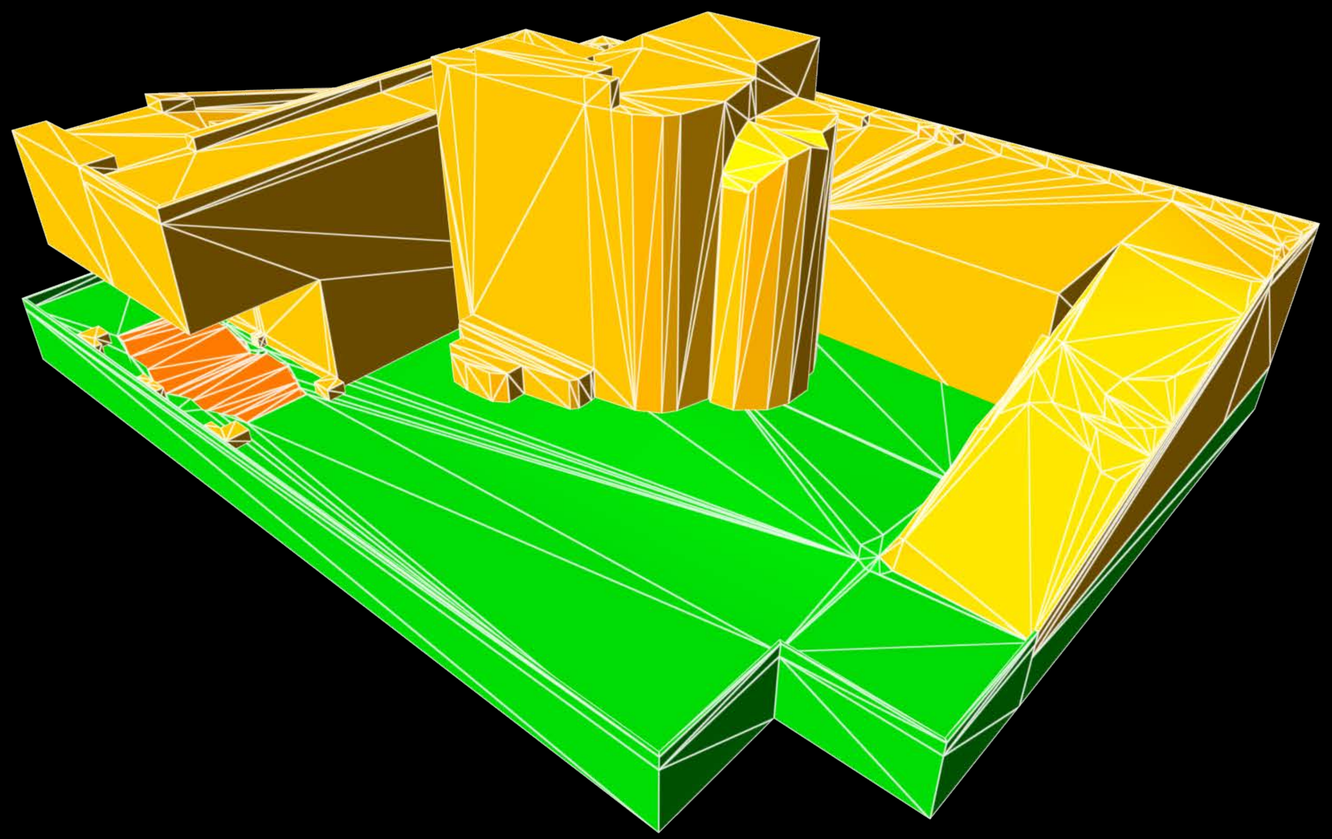

Enhancements to SceneKit

More Information

SceneKit Documentation and Videos
http://developer.apple.com/scenekit

Apple Developer Forums
http://developer.apple.com/forums

Developer Technical Support
http://developer.apple.com/support/technical

General Inquiries
Allan Schaffer, Game Technologies Evangelist
aschaffer@apple.com

Related Sessions

Managing 3D Assets with Model I/O	Mission	Tuesday 2:30PM
What's New in SpriteKit	Mission	Wednesday 10:00AM

Labs

SceneKit Lab	Graphics, Games, and Media Lab C	Wednesday 3:30PM
SceneKit Lab	Graphics, Games, and Media Lab B	Thursday 2:30PM

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