Plugins in Unreal Engine 4

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Kingsmen

What kind of game are we creating?

- Turn based tactics
- Units could move around the level up to a max movement range
- Units could take cover behind the environment
- Units could climb up the environment

Navigation Requirements

- Units should move in a grid
- Automatic Navigation grid building.
- Special Grid nodes for Ladders
- Varied terrain height

Does it already exist?

- Unreal Engine Nav Mesh
  - Already Exists
  - Automatically generates
  - Actors can path across it

Where do we begin?

What is a plugin?

- Self contained set of Modules
- Expand Unreal Engine Functionality
- Create Custom Tools

Why create a plugin?

- Plugins stand separate from your game
- Makes the engine easy to update
- Reuse across multiple games

What will our plugin require?

- Offline Navigation Grid
- Save as part of the level
- Easy for level designers
- Integrate into existing workflow

Lets see it in action…

What is a Grid Node?

- Represents a location in the grid where an actor can stand / move through
- Location
- Link to neighbouring nodes
- The actor that is occupying this node

Creating The Grid

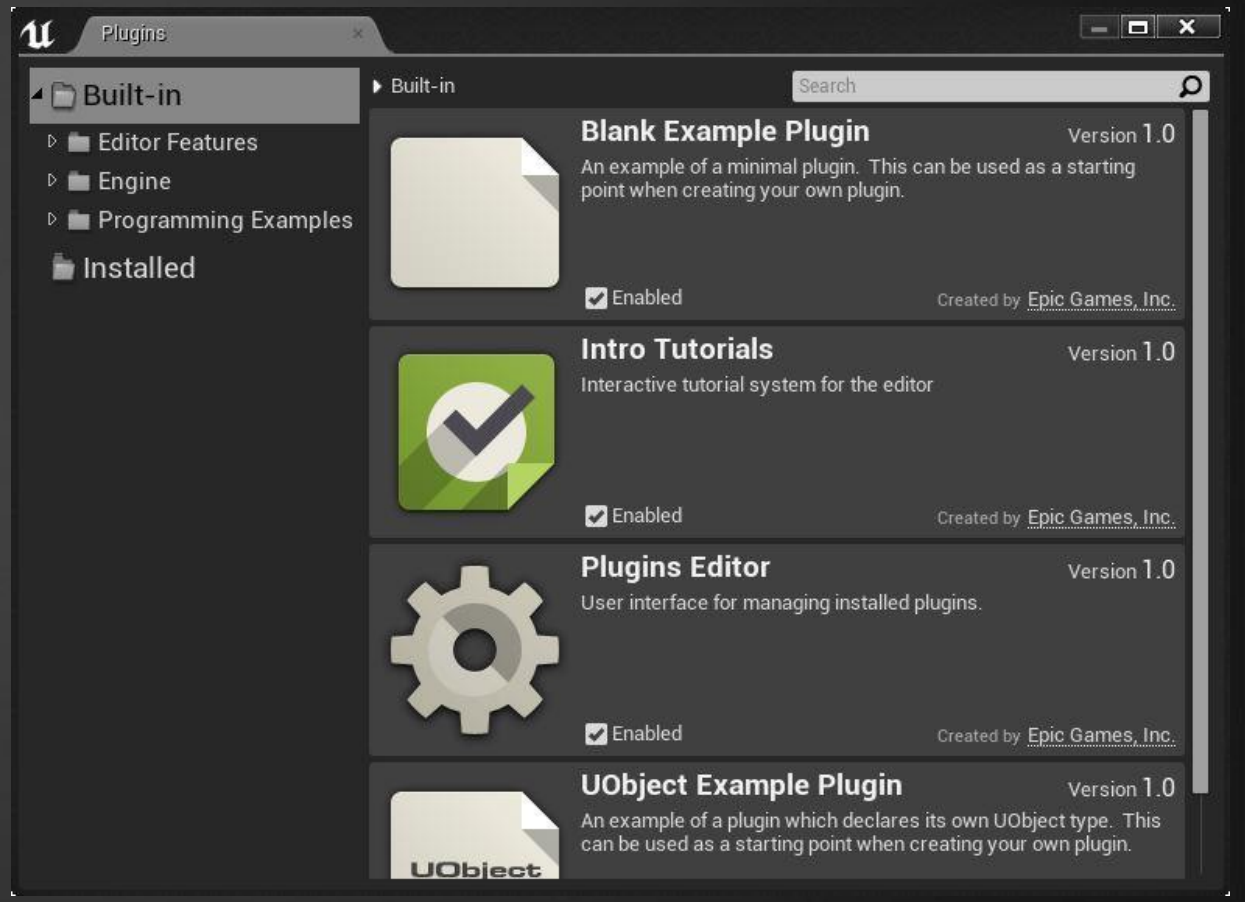
- Initial Start Node
- Tracing out and up into the world the max height change
- Traces down to find the location in the world
- Creates a new GridNode

- Use Variance Equality in Vector Comparison
- Can’t touch the world from another thread

So lets get started!

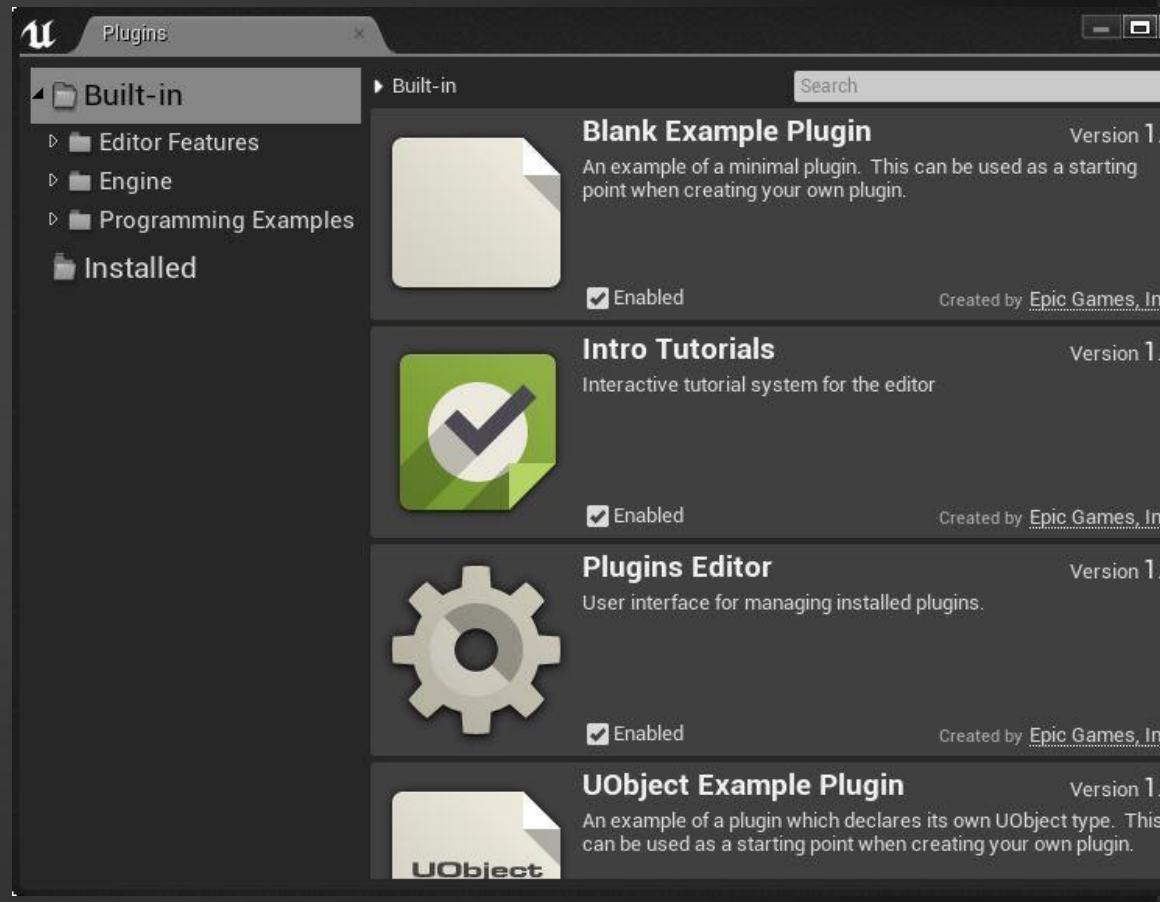
Structure of a Plugin

- Can have Content
- Can have multiple code modules
- .uplugin file descriptors
- Public / Private / Classes



Types of plugins

- Engine vs Installed
  - /UE4 root/Engine/Plugins/My Engine Plugin/
  - /My project/Plugins/My Game Plugin/
- Game Plugins



Where to start?

- Use sample that already exist in the Unreal Engine Folder
  - BlankPlugin
  - UObjectPlugin
- Look at existing plugins
  - /engine/plugins/

Plugin File Descriptors (.uplugin)

```
{
    "FileVersion" : 3,
    "FriendlyName" : "UObject Example Plugin",
    "Version" : 1,
    "VersionName" : "1.0",
    "EngineVersion" : 1579795,
    "Description" : "An example of a plugin which declares its own UObject type.",
    "Category" : "Programming Examples.Plugins",
    "CanContainContent" : "true“,

    "Modules" :
    [
        {
            "Name" : "UObjectPlugin",
            "Type" : "Developer“
        }
    ]
}
```

IModule Interface

```
class IGridNavigation : public IModuleInterface
{
public:
    static inline IGridNavigation& Get()
    {
        return FModuleManager::LoadModuleChecked< IGridNavigation >("GridNavigation");
    }

    static inline bool IsAvailable()
    {
        return FModuleManager::Get().IsModuleLoaded( "GridNavigation" );
    }
};
```

Module Implementation

```
#include "IGridNavigationPlugin.h"

class FGridNavigationPlugin : public IGridNavigation
{
    /** IModuleInterface implementation */
    virtual void StartupModule() override;
    virtual void ShutdownModule() override;
};

IMPLEMENT_MODULE(FGridNavigationPlugin, GridNavigationPlugin)

void FGridNavigationPlugin::StartupModule()
{
}

void FGridNavigationPlugin::ShutdownModule()
{
}
```

Working with UE4

- Pop up Notifications
- Settings Menu
- Extend Menus

Creating Notification Popups


```
FNotificationInfo Info("Generating Grid");
Info.bFireAndForget = false;
Info.FadeOutDuration = 4.0f;
Info.ExpireDuration = 0.0f;
```

Adding Buttons To Notification Popups


```
// Add a Cancel Button
Info.ButtonDetails.Add(
FNotificationButtonInfo("Cancel",
                        FText::GetEmpty(),
                        FSimpleDelegate::CreateUObject(this, &AGridDebug::Clear)));

// Register with Notification Manager
TWeakPtr<SNotificationItem> GridGenerationNotification
    = FSlateNotificationManager::Get().AddNotification(Info);
```

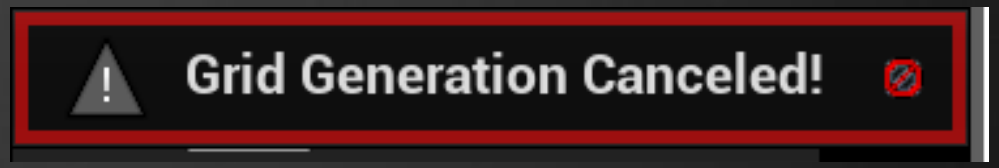
Setting Completion States

```
GridGenerationNotification.Pin()->SetCompletionState(SNotificationItem::CS_Pending);
```

CS_Pending

CS_Success

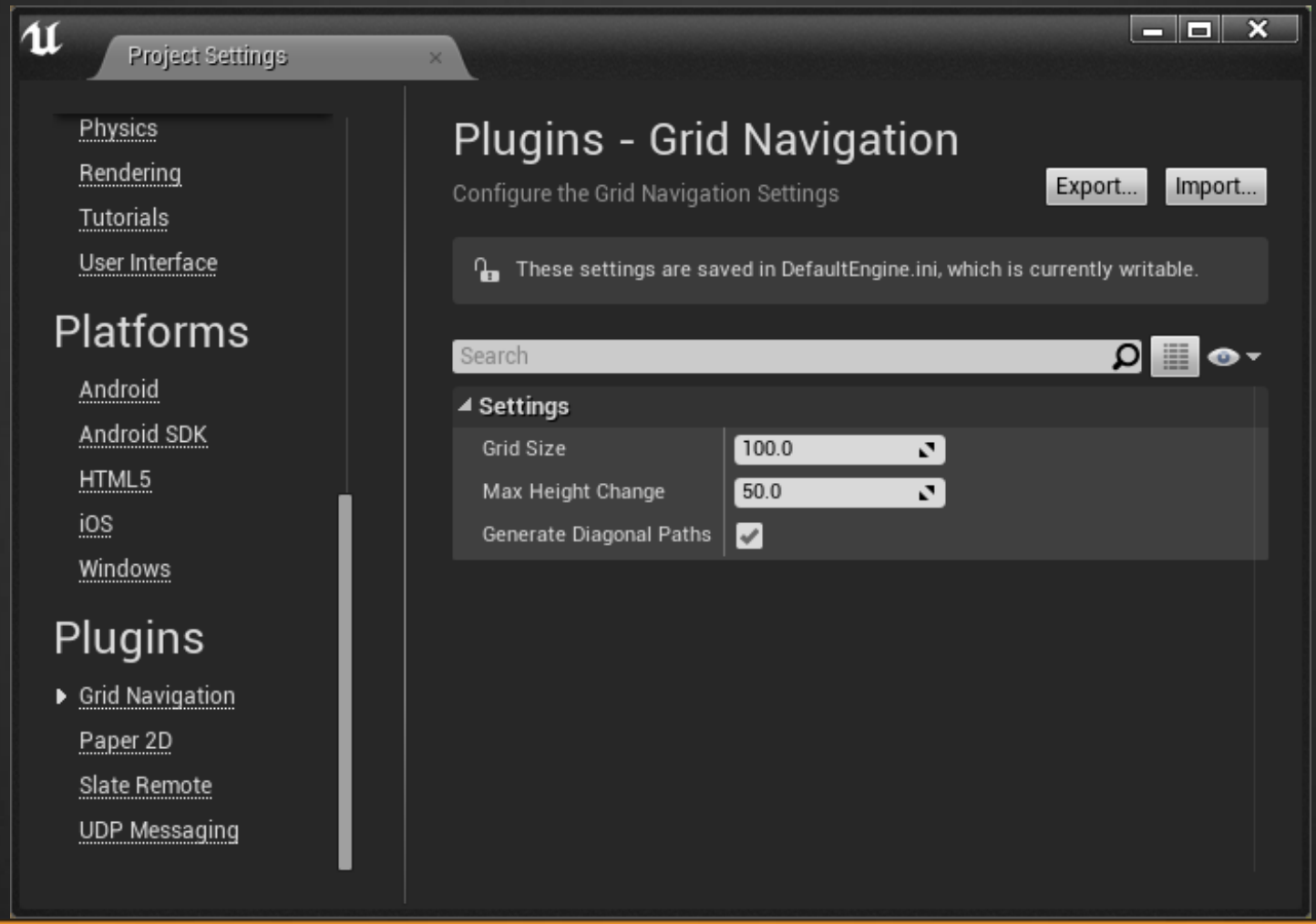
CS_Fail



Clearing the Notification

```
NotificationItem->SetText("Grid Finished Generating!");
NotificationItem->SetCompletionState(SNotificationItem::CS_Success);
NotificationItem->ExpireAndFadeout();
```

Plugin Settings



Creating Your Own Plugin Settings

```
UCLASS(config = Engine, defaultconfig)
class UGridNavigationSettings : public UObject
{
// Member Variables
public:
    // The Size of each grid node
    UPROPERTY(GlobalConfig, EditAnywhere, Category = Settings)
    float GridSize;
    // How steep the grid is allowed to generate up.
    UPROPERTY(GlobalConfig, EditAnywhere, Category = Settings)
    float MaxHeightChange;
    // If true grids will have diagonal Paths added to them
    UPROPERTY(GlobalConfig, EditAnywhere, Category = Settings)
    bool GenerateDiagonalPaths;
```

Registering with the Settings Module

```
ISettingsModule* SettingsModule = FModuleManager::Get().GetModulePtr<ISettingsModule>("Settings");
SettingsModule->RegisterSettings("Project",
                                 "Plugins",
                                 "Grid Navigation",
                                 "Grid Navigation",
                                 "Configure the Grid Navigation Settings",
                                 GetMutableDefault<UGridNavigationSettings>()
                                 );
```

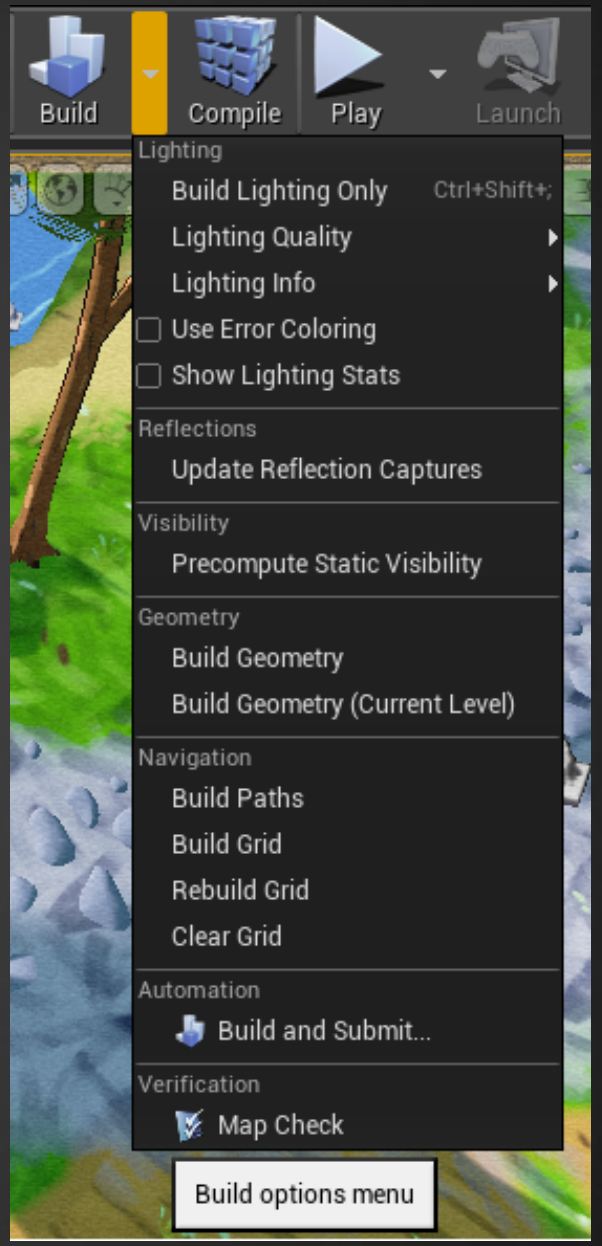
Unregistering with the Settings Menu

```
ISettingsModule* SettingsModule = FModuleManager::Get().GetModulePtr<ISettingsModule>("Settings");
SettingsModule->UnregisterSettings("Project", "Plugins", "Grid Navigation");
```

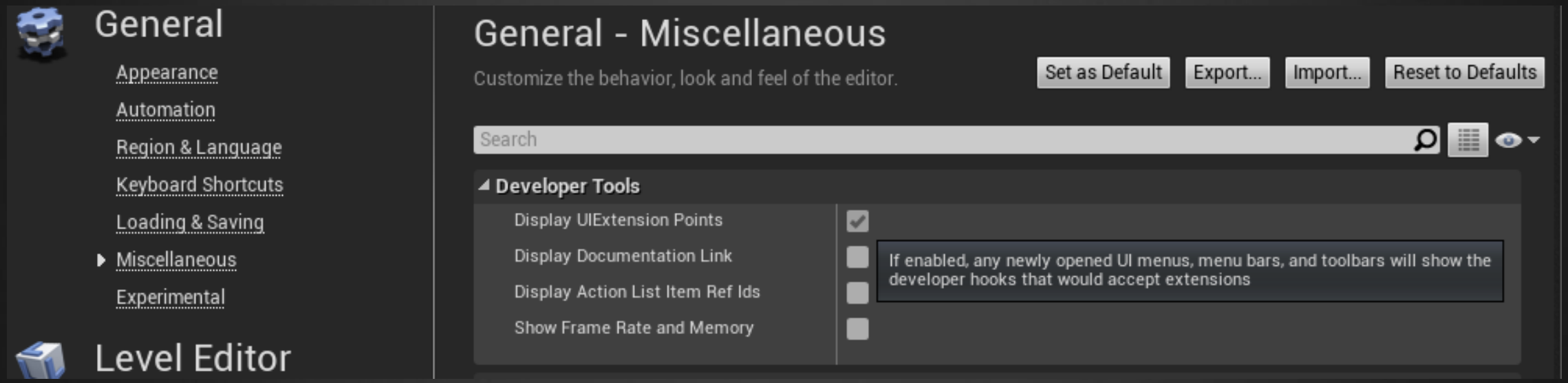
Reading you Settings

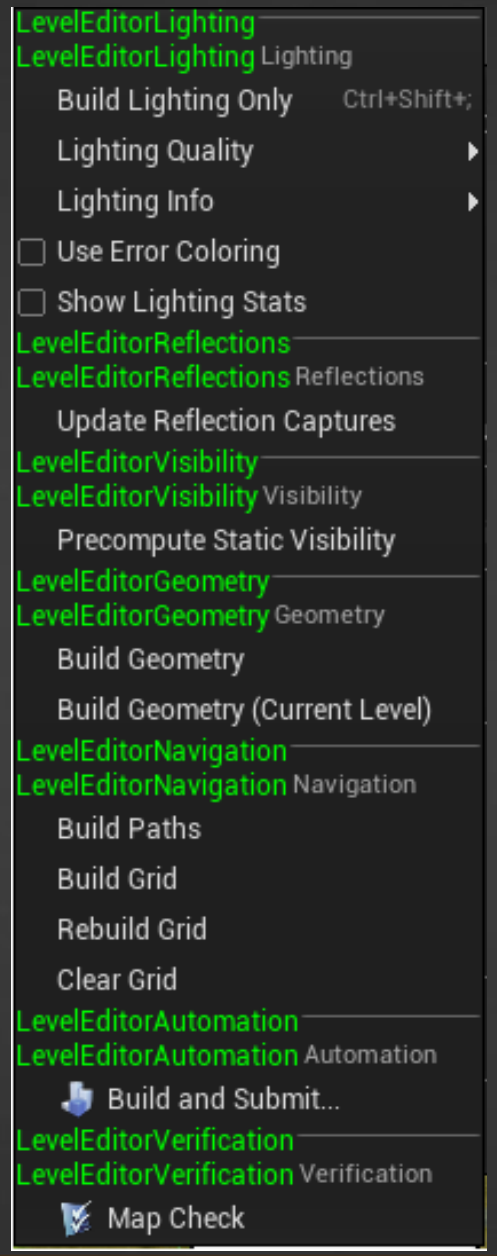
```
float MaxHeightChange
    = GetDefault<UGridNavigationSettings>->MaxHeightChange;
```

Extending Editor Menus

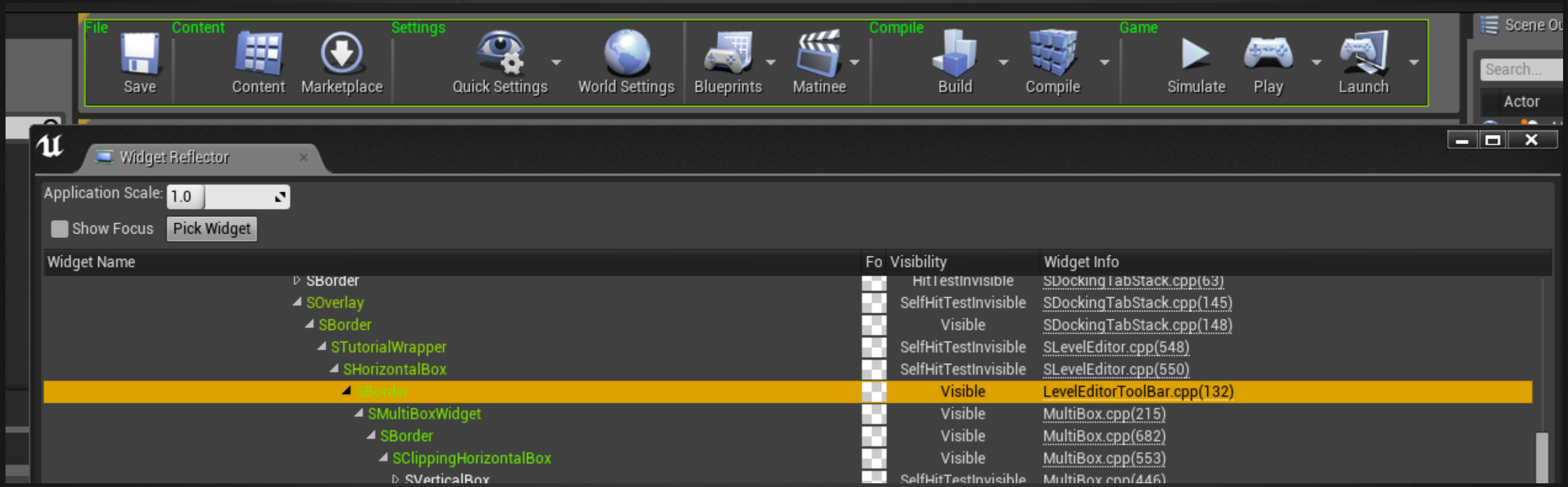


Extending Editor Menus - Setup




LevelEditorLighting
LevelEditorLighting Lighting
Build Lighting Only Ctrl+Shift+;
Lighting Quality
Lighting Info
Use Error Coloring
Show Lighting Stats
LevelEditorReflections
LevelEditorReflections Reflections
Update Reflection Captures
LevelEditorVisibility
LevelEditorVisibility Visibility
Precompute Static Visibility
LevelEditorGeometry
LevelEditorGeometry Geometry
Build Geometry
Build Geometry (Current Level)
LevelEditorNavigation
LevelEditorNavigation Navigation
Build Paths
Build Grid
Rebuild Grid
Clear Grid
LevelEditorAutomation
LevelEditorAutomation Automation
Build and Submit...
LevelEditorVerification
LevelEditorVerification Verification
Map Check

Extending Editor Menus - Widget Reflector



Extending Editor Menus

```
FLevelEditorModule& LevelEditor =
    FModuleManager::GetModuleChecked<FLevelEditorModule>("LevelEditor");

// Register the extension with the Level Editor - Build Menu
BuildMenuExtender =
    FLevelEditorModule::FLevelEditorMenuExtender::CreateRaw(this,
        &FGridNavigationEditorPlugin::OnExtendLevelEditorBuildMenu);

LevelEditor.GetAllLevelEditorToolbarBuildMenuExtenders().Add(BuildMenuExtender);
```

Extending Editor Menus

```
TSharedRef<FExtender>
FGridNavigationEditorPlugin::OnExtendLevelEditorBuildMenu(const TSharedRef<FUICommandList> CommandList)
{
    TSharedRef<FExtender> Extender(new FExtender());

    Extender->AddMenuExtension(
        "LevelEditorNavigation",
        EExtensionHook::After,
        NULL,
        FMenuExtensionDelegate::CreateRaw(this, &FGridNavigationEditorPlugin::CreateBuildMenu));

    return Extender;
}
```

Extending Editor Menus

```
void FGridNavigationEditorPlugin::CreateBuildMenu(FMenuBuilder& Builder)
{
    FUIAction Action_BuildGrid(
        FExecuteAction::CreateRaw(this, &FGridNavigationEditorPlugin::BuildGrid),
        FCanExecuteAction::CreateRaw(this, &FGridNavigationEditorPlugin::IsReadyToBuild));

    Builder.AddMenuEntry(
        "Build Grid",
        "Build the Grid, Updates existing Nodes if Possible.",
        FSlateIcon(),
        Action_BuildGrid,
        NAME_None,
        EUserInterfaceActionType::Button);
```

What plugins already exist

- Scripting Languages
- Custom Rendering Plugins
- Source Control
- Custom Input Devices
- Editor Functionality

Plugins on the Marketplace

- Phased release of plugins into the marketplace
- Likely in 4.8

Questions?

Thank You!

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