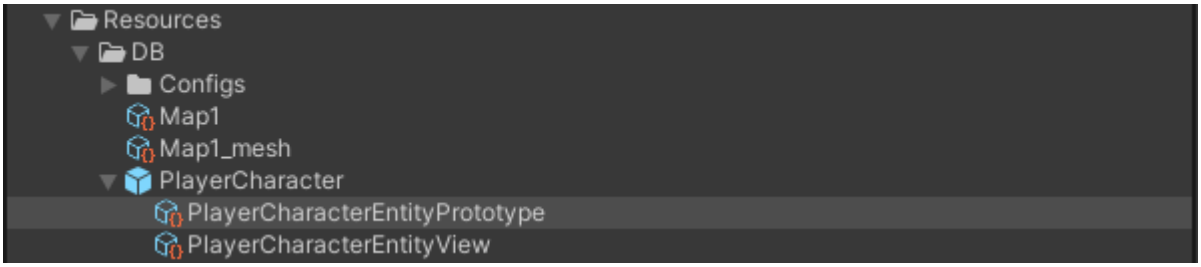
Quantum 104 - Player Spawning

Overview

With the player character entity created the next steps are spawning a player character for each player that joins the game and linking up the input of the player to the entity.

Player Character Prefab

Currently, the character is a scene object. Quantum can spawn entities at runtime similar to how prefabs can be spawned at runtime in a single player Unity game. Create a `PlayerCharacter` prefab by dragging the `PlayerCharacter` GameObject from the scene into the `Resources/DB` folder. After doing so, delete the `PlayerCharacter` from the scene.



Note how a `EntityPrototype` and a `EntityView` file have been created under the prefab. These are used by Quantum to spawn the entity and link it up to the Unity view.

IMPORTANT: All Quantum Prefabs need to be inside the `Resources/DB` folder or a subfolder of it. Prefabs outside won't have an `EntityPrototype` file created.

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Player Link Component

Quantum has a concept of a player. Each client can have one or multiple players. However, Quantum does not have a built-in concept of a player object/avatar. Each player that is connected to the game is given a unique ID. This ID is called a `PlayerRef`. To link an entity to a specific player we will create a PlayerLink component that contains the `PlayerRef` of the owner.

Create a `PlayerLink.qtn` file in the `Platformer` folder of the `quantum-code` project and add the following code to it:

C#

```
component PlayerLink
{
    player_ref Player;
}
```

Player Data

To dynamically spawn a character we need to let the gameplay code know what entity to create. Quantum has a player data concept. Player data allows each player to pass information into the simulation on connection. This can be information such as what character a player is playing or what skin they are using or anything else.

The player data can be found in the `RuntimePlayer.User` file. Open the `RuntimePlayer.User` file in the `quantum_code` project and replace its content with:

C#

```
using Photon.Deterministic;
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
```

```
{
    partial class RuntimePlayer
    {
        public AssetRefEntityPrototype CharacterPrototype;

        partial void SerializeUserData(BitStream stream)
        {
            stream.Serialize(ref CharacterPrototype);
        }
    }
}
```

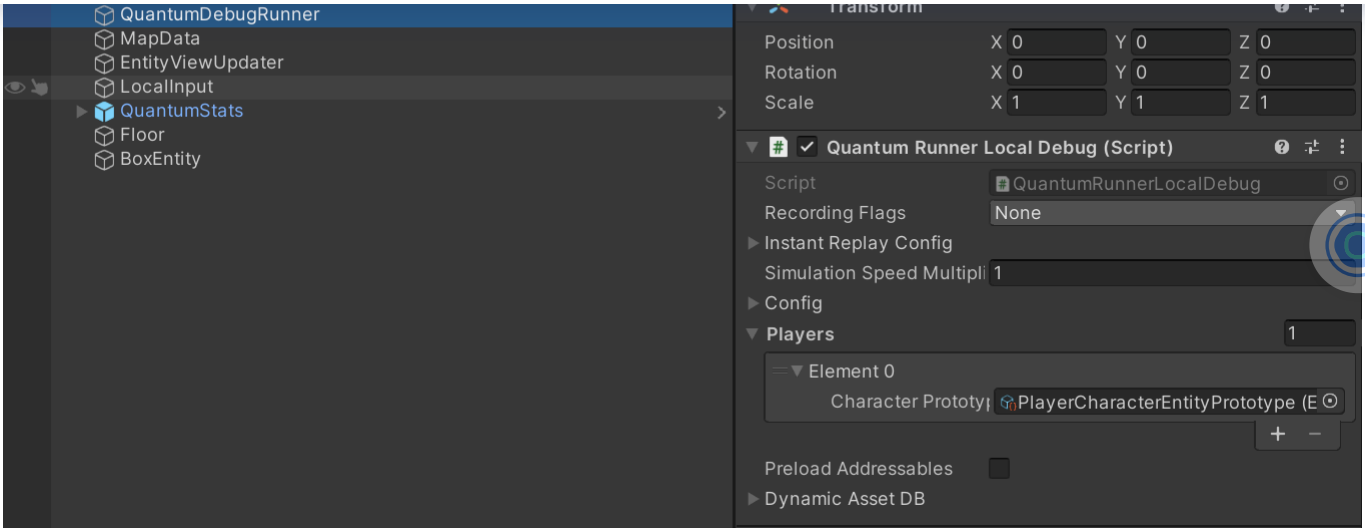
Press build (`ctrl + shift + b`).

This code adds a `AssetRefEntityPrototype` to the player data which is the Quantum equivalent to a prefab. This will later be used to spawn the player character entity.

IMPORTANT: All data added to the `RuntimePlayer` class must be serialized in the `SerializeUserData` function. The `BitStream` provides serialization for all basic types.

When entering play mode the Quantum simulation automatically runs. This is driven by the `QuantumLocalRunnerDebug` component on the `QuantumRunnerDebug` GameObject in the `Game` scene in Unity. This component is used to debug run a single player version of the `Game` locally for development purposes.

The `QuantumLocalRunnerDebug` allows to simulate any numbers of local players. In the `QuantumLocalRunnerDebug` under `Players` add a new entry to the list. The entry contains a `CharacterPrototype` field which is the field that was added to the player data before. Drag and drop the `PlayerCharacterEntityPrototype` file that can be found under the `PlayerCharacter` prefab into the field.



Now that the prefab is linked up to the player data all that is left is to write code to spawn the entity when a player joins.

Spawning Player Objects

Create a new `PlayerSpawnsystem.cs` class. Add the following code:

C#

```
namespace Quantum.Game
{
    unsafe class PlayerSpawnSystem : SystemSignalsOnly, ISignalOn
    {
        public void OnPlayerDataSet(Frame frame, PlayerRef player
        {
            var data = frame.GetPlayerData(player);

            // resolve the reference to the avatar prototype.
            var prototype = frame.FindAsset<EntityPrototype>(data

            // Create a new entity for the player based on the pr
            var entity = frame.Create(prototype);

            // Create a PlayerLink component. Initialize it with
            var playerLink = new PlayerLink()
```

```
                };
                frame.Add(entity, playerLink);

                // Offset the instantiated object in the world, based
                if (frame.Unsafe.TryGetPointer<Transform3D>(entity, o
                {
                    transform->Position.X = (int)player;
                }
            }
        }
    }
```

This code creates the character entity when a player joins and links it up to the player by adding a PlayerLink component to it.

Signals are similar to events in C#. They are used by Quantum systems to communicate with each other. Quantum comes with a lot of existing signals such as the `ISignalOnPlayerDataSet` which gets called after a player has joined the session and shared their player data.

SystemSignalsOnly is a special type of system that doesn't do anything on its own. It allows for the implementation of a system that just listens to signals.

Add the PlayerSpawnSystem to the list of systems in the `SystemSetup.cs` after the `MovementSystem`.

Update MovementSystem

Until now the MovementSystem always moved using inputs from the 0 player using the following code:

C#

```
var input = *f.GetPlayerInput(0);
```

C#

```
Input input = default;
if(f.Unsafe.TryGetPointer(filter.Entity, out PlayerLink* playerLi
{
    input = *f.GetPlayerInput(playerLink->Player);
}
```

Note that the filter has not been adjusted so the system will still filter for entities with a CharacterController but no PlayerLink component. In this case it will use the `default` value for the input. This results in no movement besides gravity being applied.

Getting a component using `TryGet` in Quantum is very fast O(n) because Quantum uses a sparse set ECS.

Press build (`ctrl + shift + b`) and switch to Unity and enter play mode. A player character will be spawned in addition to the character that is already in the scene and it reacts to keyboard inputs.

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