Deferred Operations (Deferreds)

It’s no secret and if fact by design, that you can’t execute methods that change a Subject’s structure when using the Solid semantics. That essentially means you can only change the state of the individual Traits themselves, but not add nor remove the Traits themselves. The main advantage of the Solid enchaining is that it provides for the concurrent Operating and it would certainly be great to have more flexibility while evaluating the multi-threaded processing.

So there come handy the deferred operations (or *Deferreds* for short). Like the naming implies, those are not executed immediately but are instead delayed for a later, more suitable occasion. Please note, that the Deferreds API is available for C++ only, since the whole Solid semantics is also C++-based and it’s not possible to Enchain into a Solid Chain in Blueprints.

Setting Traits

Say, we are implementing a real-time strategy game. A user can select multiple units and assign them orders (tasks). Send them marching to a destination point, for example. We could defer the Trait setting operation while Operating concurrently on the selected units, using the corresponding API method. Check out this exemplary snippet:

```
FVector Destination = GetUserClickedPoint(); // Retrieve the currently user-
clicked point on the map.
auto SolidChain = Mechanism->EnchainSolid(TFilter<FUnit, FSelected>()); //
Enchain all of the selected units.
SolidChain->OperateConcurrently([Destination](FSolidSubjectHandle Unit) //
Process the selected units in a parallel fashion.
{
    Unit.SetTraitDeferred(FMoveToPointOrder{Destination}); // Defer-assign a
Trait that's telling the unit to move to the needed point.
});
```

Removing Traits

Removing Traits can also be deferred in a quite similar fashion. Here’s an API usage example which removes a “buffed” status from the units, when it’s expiring:

```
SolidChain->OperateConcurrently([DeltaSeconds](FSolidSubjectHandle Unit,
FBuffed& Buffed) // Process the selected units in a parallel fashion.
{
    Buffed.Timeout -= DeltaSeconds; // Decrease the initially allocated
timeout using the current Tick's delta time period.
    if (Buffed.Timeout <= 0.0f)
```

```
    {
        Unit.RemoveTraitDeferred<FBuffed>(); // Defer-remove the Trait when
it's no longer viable.
    }
});
```

There is also a possibility to remove all the traits altogether. In a deferred fashion of course. This is just a matter of calling the corresponding method as in here:

```
Unit.RemoveAllTraitsDeferred();
```

Spawning Subjects

Not only traits can be added or removed in a deferred fashion but the whole Subjects can be spawned and despawned this way. So, if you have multiple units spawning a projectile when they’re charged, you could do it like so:

```
SolidChain->OperateConcurrently([Mechanism,
DeltaSeconds](FSolidSubjectHandle Unit, FCharging& Charging, FDamageDealer&
DamageDealer)
{
    Charging.Timeout -= DeltaSeconds;
    if (Charging.Timeout <= 0.0f)
    {
        Mechanism->SpawnDeferred(FProjectile{DamageDealer.Power}); // Spawn
a new subject with an FProjectile trait.
    }
});
```

Despawning Subjects

The process of destroying a Subject is quite analogous. Kill all units once their health is zero or below. Just do:

```
SolidChain->OperateConcurrently([](FSolidSubjectHandle Unit, FHealth&
Health)
{
    if (Health.Level <= 0.0f)
    {
        Unit.DespawnDeferred();
    }
});
```

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