

GDC

Fighting With Data

Ian Holstead

Gameplay Programmer, Ubisoft Montréal







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IAN HOLSTEAD
(he/him/they)

GAMEPLAY PROGRAMMER

3 YEARS AT UBISOFT MONTREAL

COMPUTER ENGINEERING
UNIVERSITY OF WATERLOO

—
ASSASSIN'S CREED VALHALLA



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MANDATE



FIGHT



ISSUES



LEARNINGS



VALHALLA MANDATE

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THE BENCHMARK VIKING EXPERIENCE



MEMORABLE ENEMIES

25 UNIQUE ARCHETYPES

MORE DYNAMIC THAN EVER



BOSS FIGHTS

PEAKS IN THE EXPERIENCE

SKILL TREE 2.0

PUSHING THE CHARACTER
BUILD TO THE NEXT LEVEL

10

SKILL POINT

POWER
203


200



136



185

1

SPECIAL
SKILL POINT



DUAL-WIELDING

ULTIMATE PLAYER CHOICE



DON'T REINVENT THE WHEEL

HOW DID WE DO?

—
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HOW DID WE DO?



84

Top Critic
Average

91%

Critics
Recommend

⊖ Bugs

Many critics noted annoying or distracting bugs they experienced while playing.

FIGHT SYSTEMS OVERVIEW

ASSASSIN'S CREED VALHALLA



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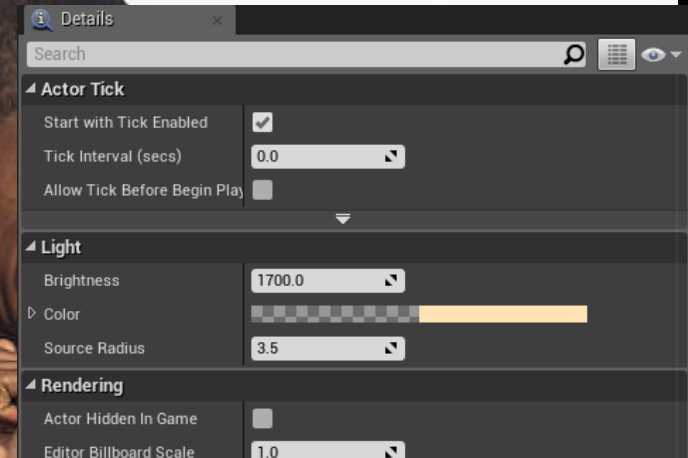
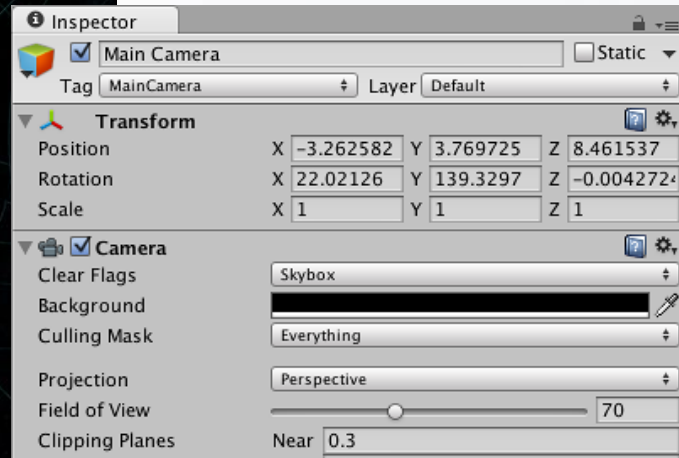
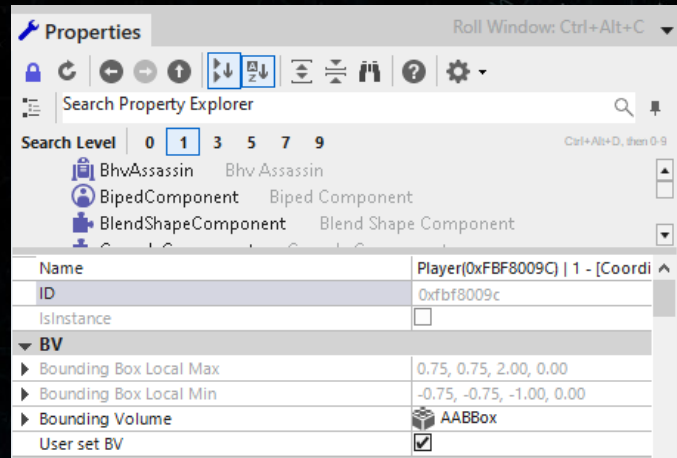
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FIGHT ON ASSASSIN'S CREED

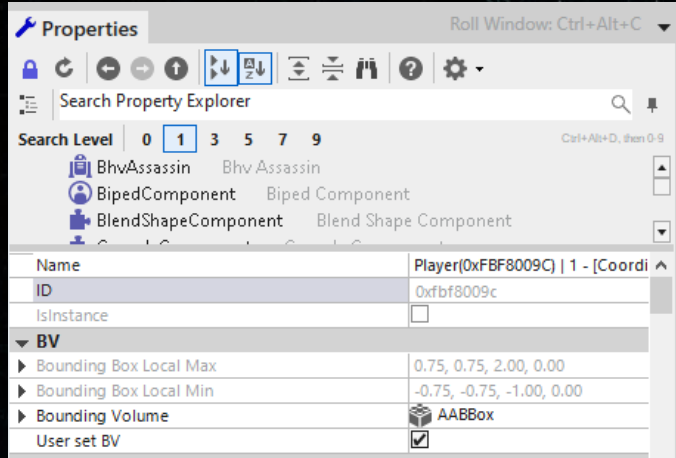
- Third person, hitbox-based combat
- Data driven
- Anvil
- No Meta AI



PROPERTY GRID



PROPERTY GRID



Properties Properties Properties Properties Properties

Search Property Explorer

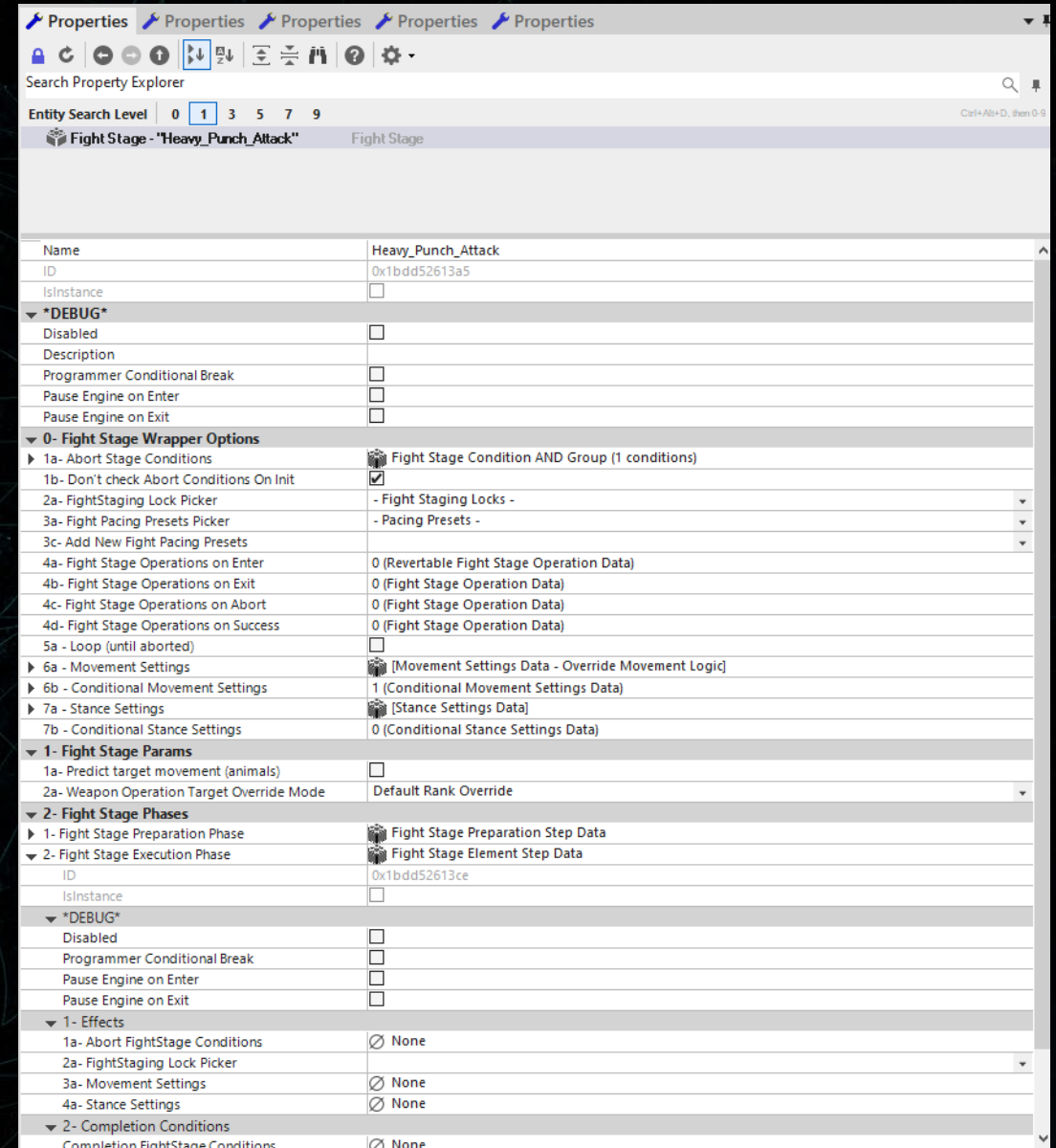
Search Level 0 1 3 5 7 9 Ctrl+Alt+D, Item 0-9

Kinsmen - Run Together and Mancatcher Attack - Together to Together [600+/-] ✓ GOAPA

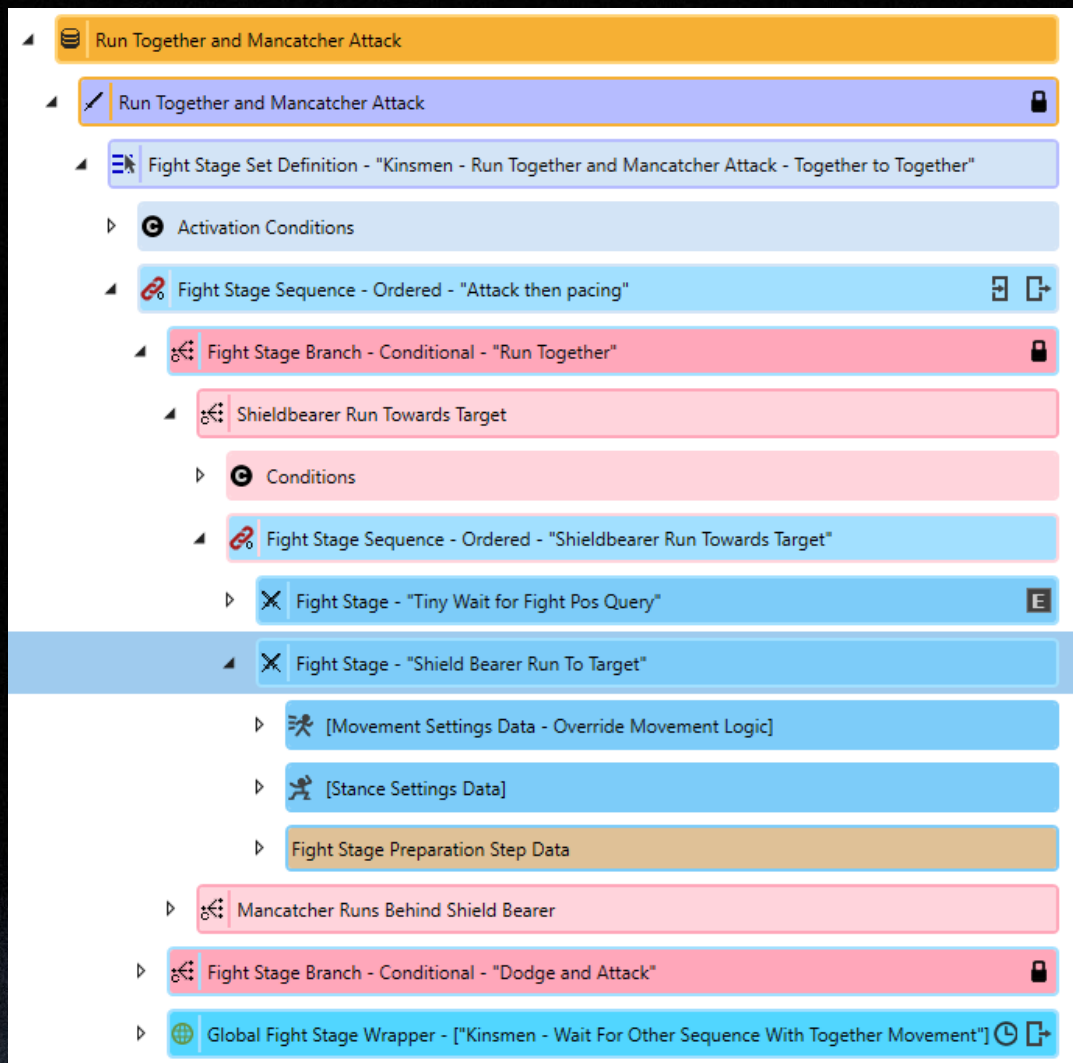
Name	Kinsmen - Run Together and Mancatcher Attack - Together
ID	0x1c0899afe32
IsInstance	<input type="checkbox"/>
▼ - Action -	
Base cost	600
Cost modifiers	1 (GOAP Cost Modifier)
Runtime actions	1 (GOAP Runtime Action)
Data providers	0 (GOAP Data Provider)
▼ - Debug -	
Disabled (Exclude from planning)	<input type="checkbox"/>
Description	
▼ - Interruption -	
Can interrupt other actions	<input type="checkbox"/>
Is interruptible	<input checked="" type="checkbox"/>
Max interruption cost	3.40282347E+38
Max interruption goal priority	50
▼ - Planner -	
Preconditions	1 (GOAP Condition)
Effects	1 (GOAP Effect)
Validation conditions	2 (GOAP Condition)
▼ AIActions	
AI actions on success	None
AI actions on failed	None
AI actions on abort	None
▼ Cooldowns	
Cooldown time on success	0 s
Cooldown time on failed	0 s
Cooldown time on abort	0 s
▼ Tag Data	
Tag selectors	0 (Planner Action Tag Selector)

PROPERTY GRID

- Lots of clicking...
- Easy to understand
- Good data manipulation
- Minimal tool team support



VIEWERS



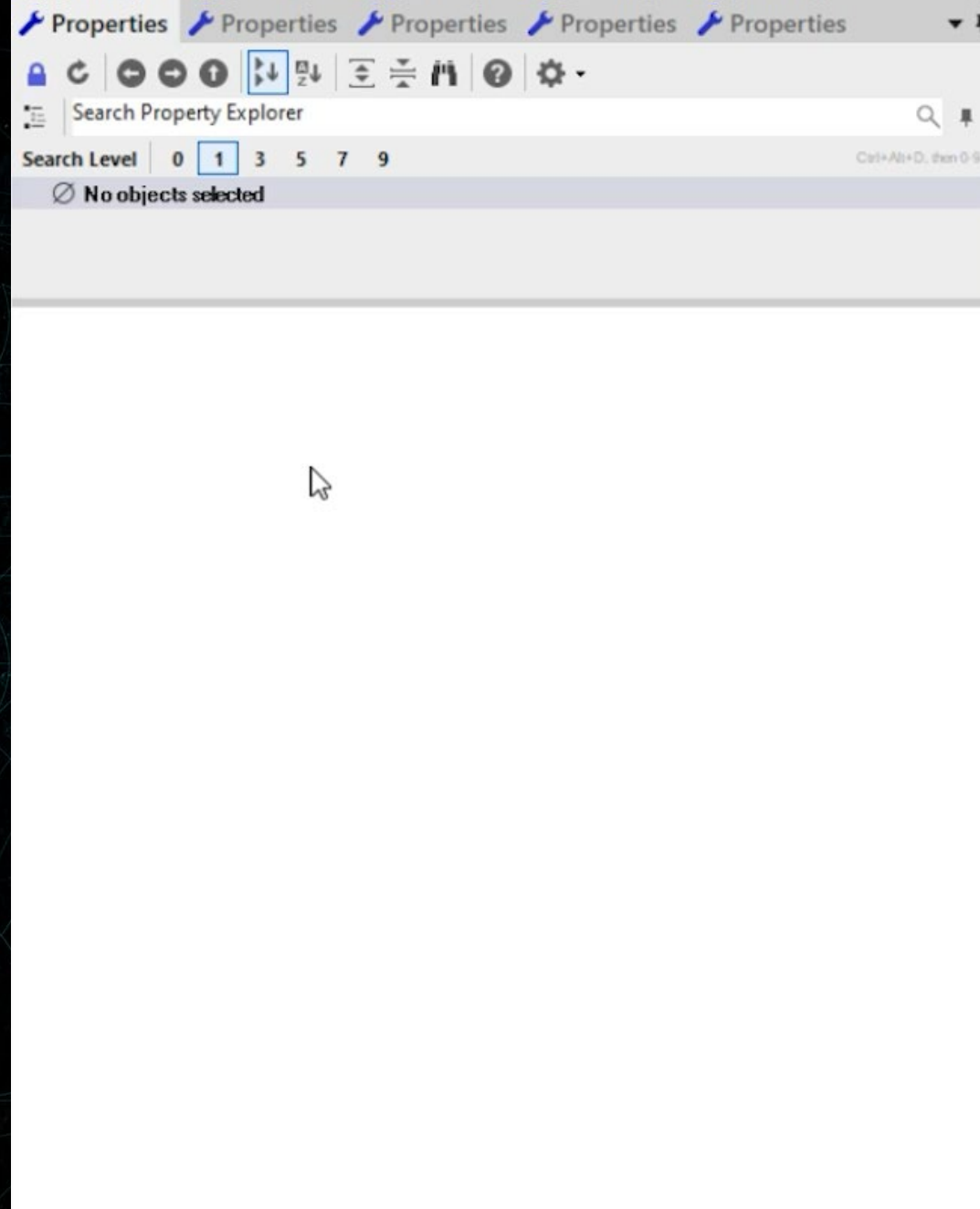
▼ 0- Fight Stage Wrapper Options	
1a- Abort Stage Conditions	⊘ None
2a- FightStaging Lock Picker	- Fight Staging Locks - ▼
3a- Fight Pacing Presets Picker	- Pacing Presets - ▼
3c- Add New Fight Pacing Presets	▼
4a- Fight Stage Operations on Enter	0 (Revertable Fight Stage Operation Data)
4b- Fight Stage Operations on Exit	0 (Fight Stage Operation Data)
4c- Fight Stage Operations on Abort	0 (Fight Stage Operation Data)
4d- Fight Stage Operations on Success	0 (Fight Stage Operation Data)
5a - Loop (until aborted)	<input type="checkbox"/>
▶ 6a - Movement Settings	[Movement Settings Data - Override Movement Logic]
6b - Conditional Movement Settings	0 (Conditional Movement Settings Data)
▶ 7a - Stance Settings	[Stance Settings Data]
7b - Conditional Stance Settings	0 (Conditional Stance Settings Data)
▼ 1- Fight Stage Params	
1a- Predict target movement (animals)	<input type="checkbox"/>
2a- Weapon Operation Target Override Mode	Default Rank Override ▼
▼ 2- Fight Stage Phases	
▼ 1- Fight Stage Preparation Phase	Fight Stage Preparation Step Data
ID	0x1c0899b42a8
IsInstance	<input type="checkbox"/>
▼ *DEBUG*	
Disabled	<input type="checkbox"/>
Programmer Conditional Break	<input type="checkbox"/>
Pause Engine on Enter	<input type="checkbox"/>
Pause Engine on Exit	<input type="checkbox"/>
▼ 1- Effects	
1a- Abort FightStage Conditions	⊘ None
2a- FightStaging Lock Picker	▼
3a- Movement Settings	⊘ None
4a- Stance Settings	⊘ None
▼ 2- Completion Conditions	
▶ Completion FightStage Conditions	Fight Stage Condition AND Group (1 conditions)

PROPERTY GRID

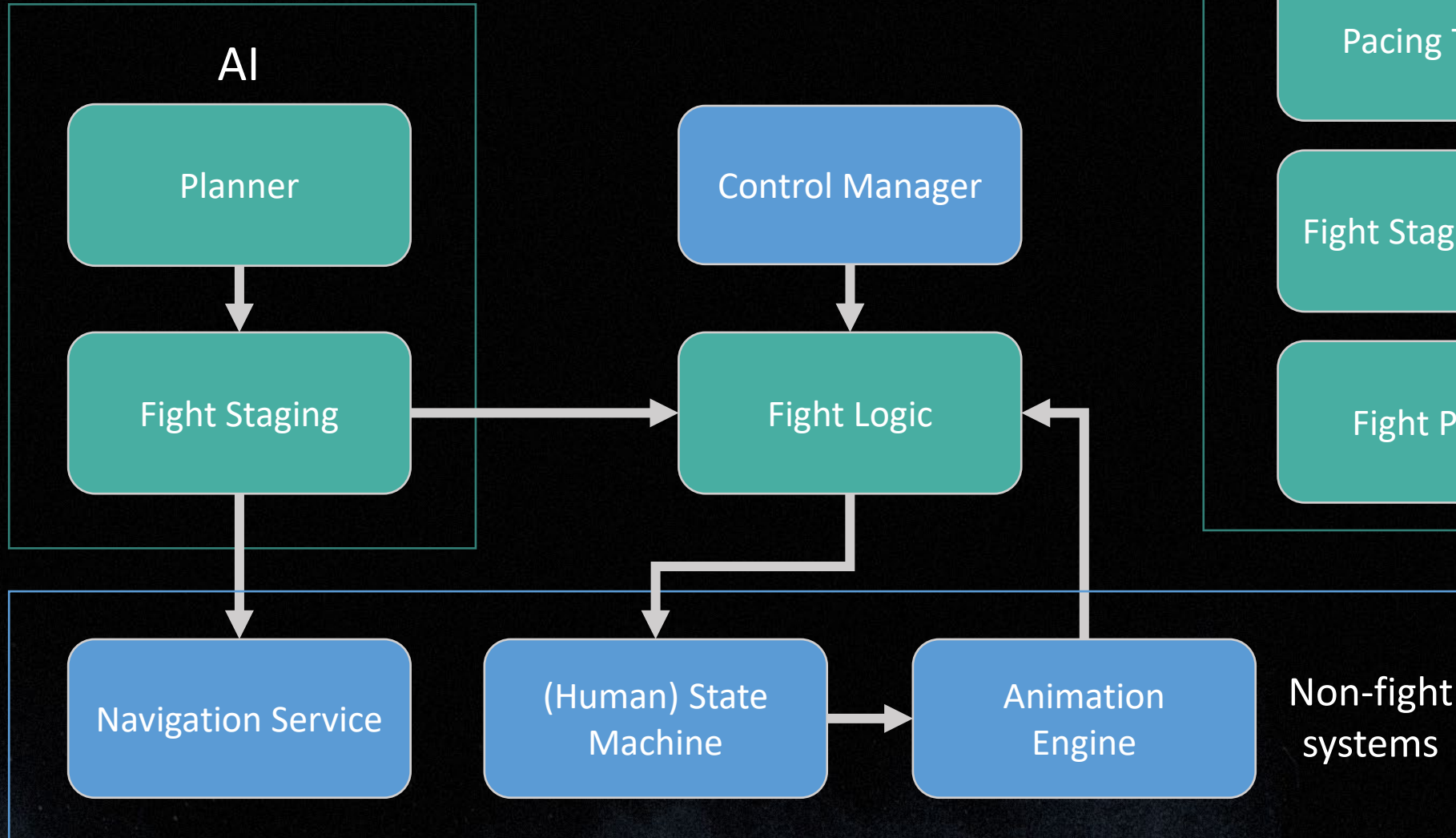
- Object IDs (GUID)
- Hidden properties

```
[RefreshOnSet, Private]
[DisplayName("5a - Loop (until aborted)")]
ubiBool Loop = false;

[Owner, AllowAddNew, Private]
[HiddenIf("Loop", false)]
[DisplayName("5b - Loop Sequence Conditions")]
[Description("The FightStageWrapperData will only loop if the
FightStageAndGroupCondition* LoopConditions;
```



FIGHT SYSTEMS OVERVIEW



Generic Systems

Pacing Timers

Fight Staging Locks

Fight Phases

FIGHT LOGIC

- Created on Origins
- Used for attacks, hit reactions, paired actions, etc.
- Handles 'timing'
- Expensive (but optimized)

The screenshot displays the 'Fight Logic Mini Viewer' window, which is used for configuring fight logic. The window title is 'Fight Logic Mini Viewer' and it includes a 'Roll Window: Ctrl+Alt+C' button. The main content area is titled 'Regular Attack Hero 1' and shows the 'Action State Attack' configuration. The configuration is organized into several sections:

- Time and Events:** This section shows a timeline from 0s to 4s. The 'Inputs' section is highlighted, showing 'Markup' and 'Hit Reactions'.
- Hitboxes:** This section shows a list of hitboxes, including 'Weapon [Right Hand]', 'Human Right Hand [Global]', 'Weapon [Left hand]', 'Human Left Hand [Global]', 'Weapon [Right Hand]', 'Human Right Hand [Global]', 'Flail First Sphere Hitbox [Right Hand] ...', 'Flail First Sphere Hitbox [Right Hand] ...', and 'Flail First Sphere Hitbox [Left hand] ...'.
- State Operations:** This section shows a list of state operations, including 'Activate Sound #1', 'StopStamina', and 'Perfect Attack - Reset Sequence Failed'.
- Conditional Operations:** This section shows a list of conditional operations, including 'IK Right Hand (needs to be enabled in kino)', 'ACK - Clear Input On Kill', 'ACK - Stop Sync Target if target is an object or rolling', and 'ACK Turning Speed Fast Player Only DEFAULT'.

FIGHT STAGING

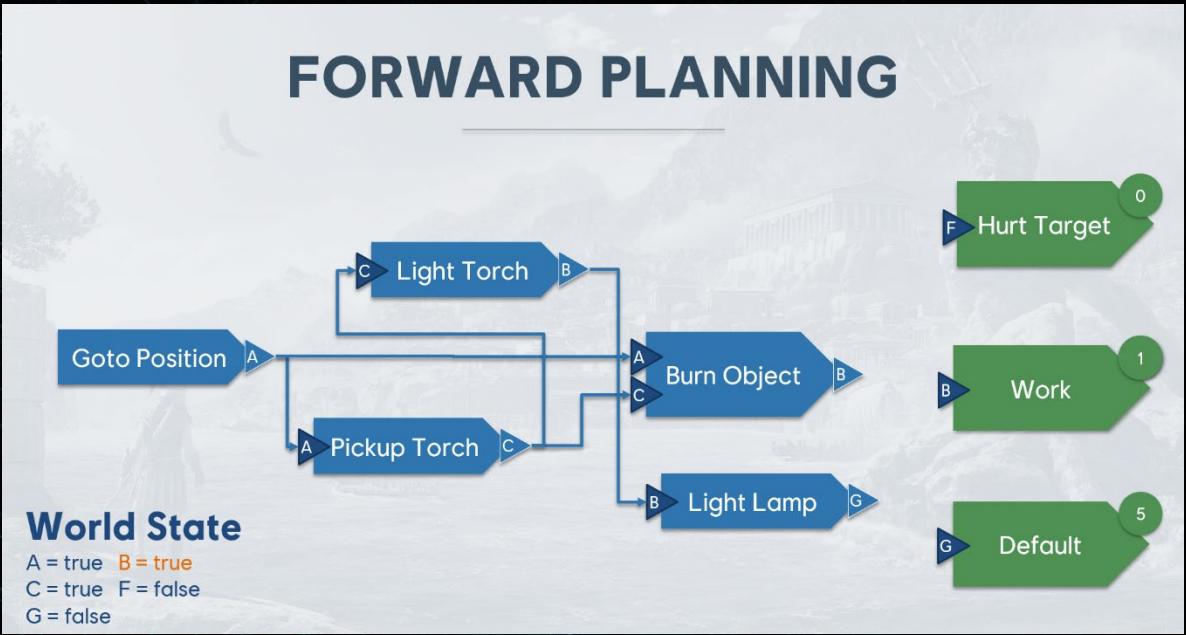
- Created on Origins
- Low level decision making
 - Mostly behavior logic
- Behavior tree



PLANNER

- Created on Odyssey
- Handles high level decision making
- Goal Oriented Action Planner





ULTRA-GENERIC SYSTEMS

ASSASSIN'S CREED VALHALLA



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WHAT IS AN ULTRA-GENERIC SYSTEM?

- Systems or tools which achieve nothing on their own



FIGHT STAGING LOCKS

- Not a programming lock
- Apply on any entity
- Checked with a condition
- Melee Active Lock



EXAMPLES

- Fight Staging Locks
- Pacing Timers
- Fight Phases
- Generic Categories

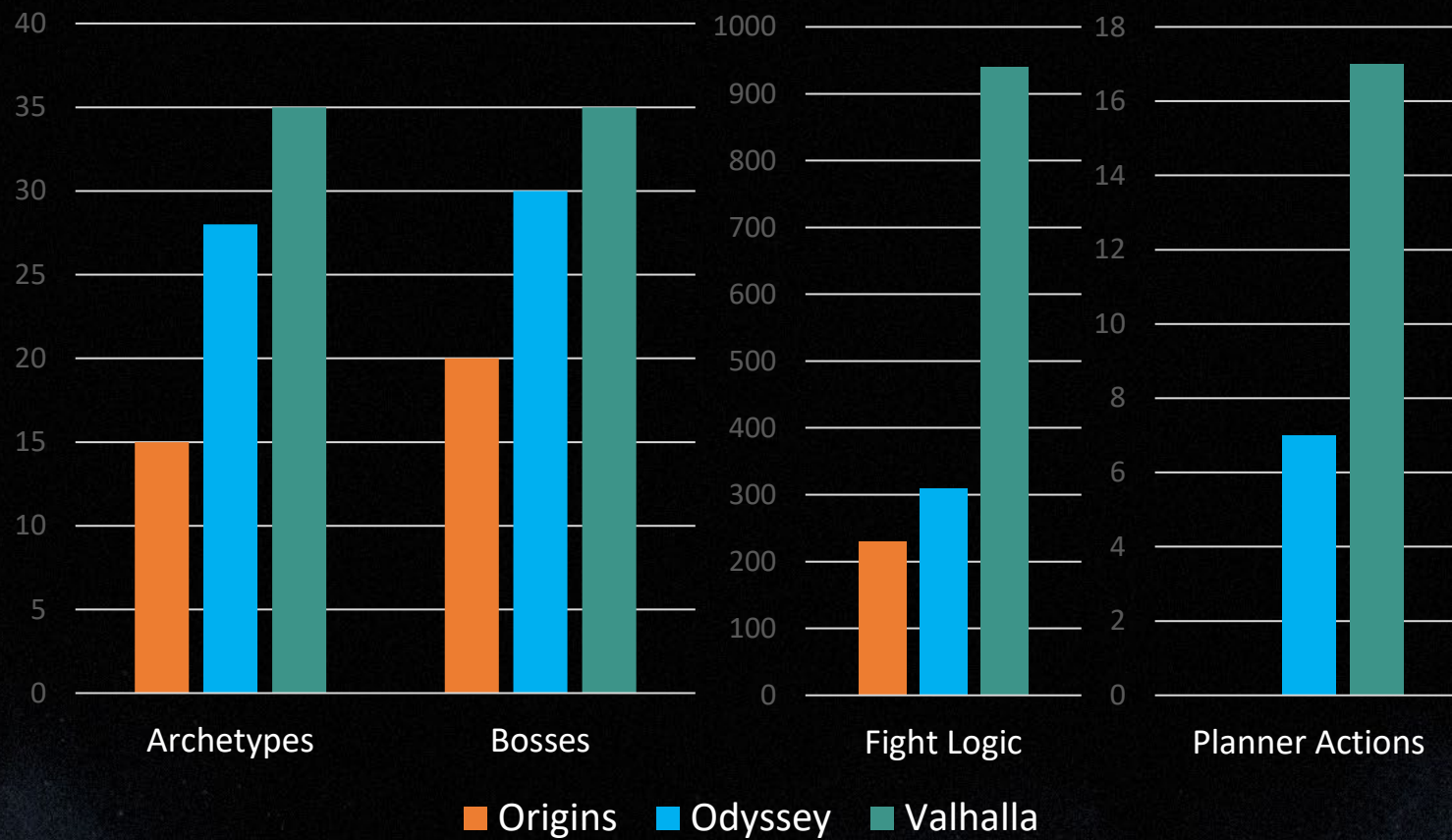
▶ Fight staging locks[0]	Melee Active
▶ Fight staging locks[1]	Melee Inactive
▶ Fight staging locks[2]	Range Active
▶ Fight staging locks[3]	Target Exclusivity Required
▶ Fight staging locks[4]	In Pursuit

▶ Pacing Gameplay Timers[3]	ACK Immunity Timer
▶ Pacing Gameplay Timers[4]	ACK Recently Out of Hit reaction
▶ Pacing Gameplay Timers[5]	Post Attack Timer
▶ Pacing Gameplay Timers[6]	Post Shoot Timer
▶ Pacing Gameplay Timers[7]	Post Counter Timer

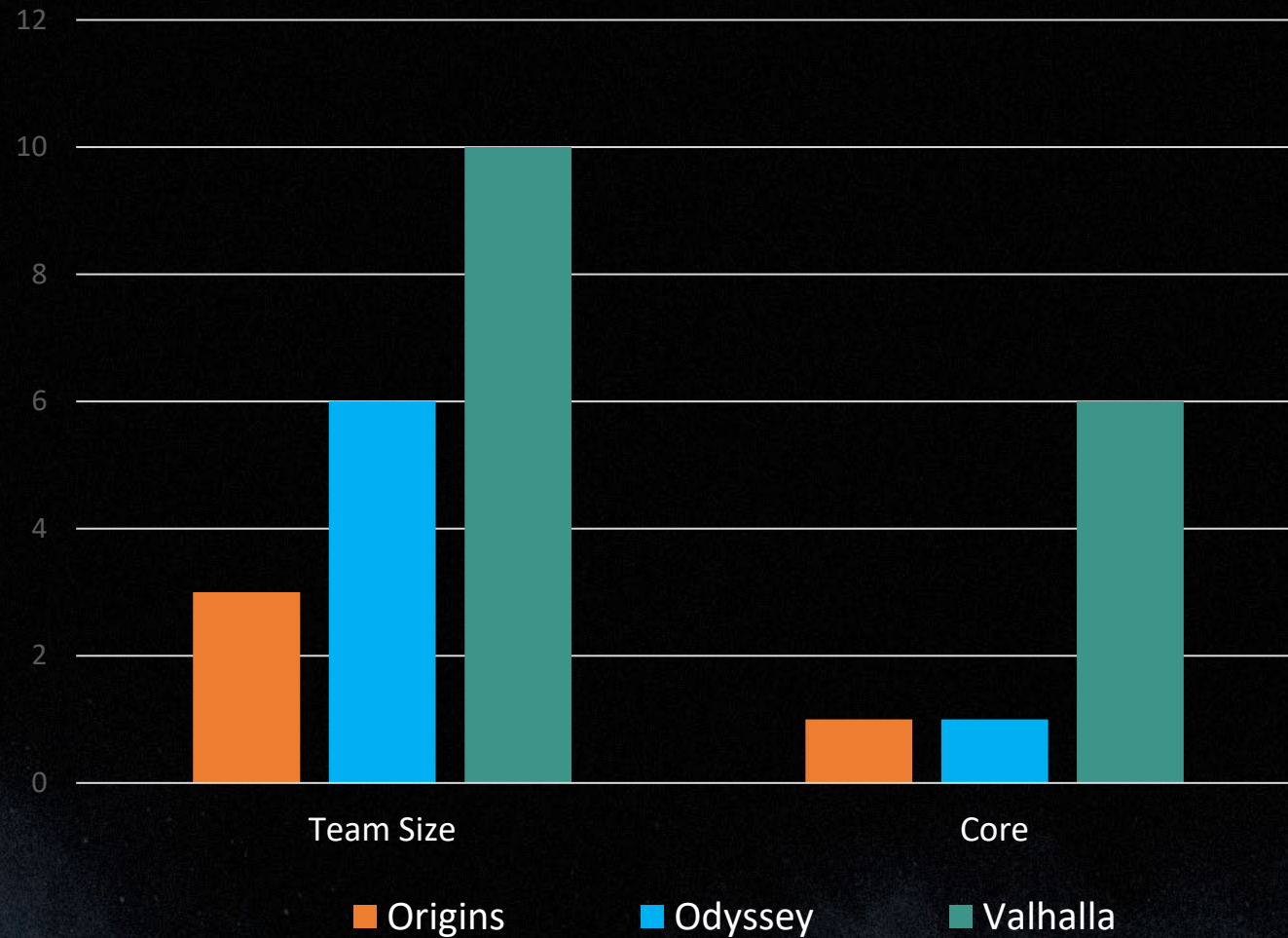
Name	-Ringleader- Learn to avoid Parry Stance
ID	0x1bdd52c4685
IsInstance	<input type="checkbox"/>
Fight Staging Phases	4 (Fight Staging Phase Data)
▶ Fight Staging Phases[0]	Init
▶ Fight Staging Phases[1]	Idle
▶ Fight Staging Phases[2]	Waiting for Idle
▶ Fight Staging Phases[3]	Learn to avoid Parry Stance
Initial Phase	[1] Idle

▶ Fight Logic Generic Category Repository[2]	ACK Immunity and Exclusivity Status
▶ Fight Logic Generic Category Repository[2]	ACK - Parry - Shield Layered
▼ Fight Logic Generic Category Repository[2]	ACK - NPC Attack Type
Name	ACK - NPC Attack Type
ID	0x1cdb8d82f58
IsInstance	<input type="checkbox"/>
▼ Category Values	3 (Fight Generic Category Value)
▶ Category Values[0]	Basic
▶ Category Values[1]	Heavy
▶ Category Values[2]	Bypass
▶ Fight Logic Generic Category Repository[2]	ACK - PLAYER Attack Type
▶ Fight Logic Generic Category Repository[2]	ACK - Is Stun State

WHAT HAPPENED ON VALHALLA?



WHAT HAPPENED ON VALHALLA?



BUILDING DATA DRIVEN SYSTEMS

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WHY USE DATA DRIVEN?

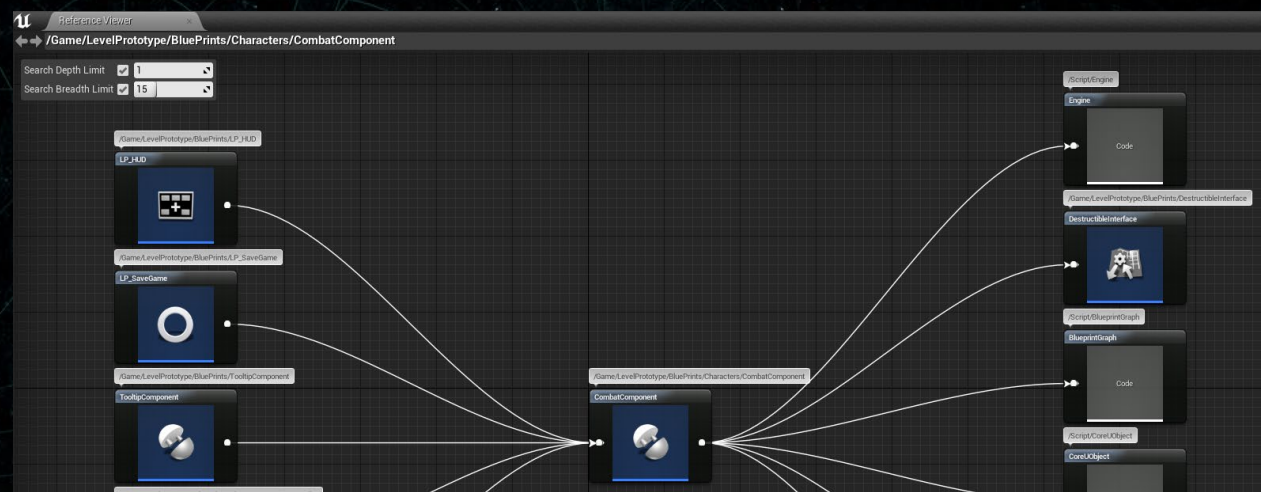
- Low programmer dependency
- Fast iteration
- Sweeping changes are low risk



DATA TOOL KIT

- Dependency Viewer

Original						
✓	Kinsmen - Shield Push And Ju...	GOAP Action Definition	9 KB	12/1/2020 6:16:24 PM		
Reference						
✖	ACK_Kinsmen_DefensiveInFront	Global Fight Stage Condi...	1 KB	5/10/2019 3:02:39 PM	✖	0x1B9F362EB91...
✖	Shared_Shield Push	Global Fight Stage Wrapp...	3 KB	8/21/2020 10:31:49 A...	✖	0x1B9F362EB91...
✖	FightLogicInputDefinitionSet...	Fight Logic Input Definitio...	23 KB	10/7/2020 8:25:45 AM	✖	0x1B9F362EB91...
✖	IsFightStarted	Variable Definition	0.3 KB	5/15/2017 11:10:33 A...	✖	0x1B9F362EB91...



DATA TOOL KIT

- Dependency Viewer
- Diff tool
- Revision History
- (Searching)

Original					
✓	Kinsmen - Shield Push And Jump	GOAP Action Definition	9 KB	12/1/2020 6:16:24 PM	
Reference					
✖	ACK_Kinsmen_DefensiveInFront	Global Fight Stage Condition	1 KB	5/10/2019 3:02:39 PM	0x1B9F362EB91...
✖	Shared_Shield Push	Global Fight Stage Wrapper	3 KB	8/21/2020 10:31:49 AM	0x1B9F362EB91...
✖	FightLogicInputDefinitionSet	Fight Logic Input Definition	23 KB	10/7/2020 8:25:45 AM	0x1B9F362EB91...
✖	IsFightStarted	Variable Definition	0.3 KB	5/15/2017 11:10:33 AM	0x1B9F362EB91...

Original				Reference			
▼	Fight stage sequence	2 (Fight Stage Wrapper Data)		▼	Fight stage sequence	2 (Fight Stage Wrapper Data)	
▼	Fight stage sequence[0]	Fight Stage Branch - Conditiona		▼	Fight stage sequence[0]	Fight Stage Branch - Conditiona	
ID	0x1b9f362ebca			ID	0x1b9f362ebca		
IsInstance	<input type="checkbox"/>			IsInstance	<input type="checkbox"/>		
Disabled	<input type="checkbox"/>			Disabled	<input type="checkbox"/>		
Description				Description			
Abort stage fight stage conditions	<input checked="" type="checkbox"/> None			Abort stage fight stage conditions	<input checked="" type="checkbox"/> None		
Dont check abort conditions on ini	<input type="checkbox"/>			Dont check abort conditions on ini	<input type="checkbox"/>		
▼	Fight staging lock applications	0 (Fight Staging Lock Application)		▼	Fight staging lock applications	1 (Fight Staging Lock Application)	
▶	Fight staging lock applications[0]	ACK Kinsmen - Other need to wa		▶	Fight staging lock applications[0]	ACK Kinsmen - Other need to wa	
Fight pacing presets on exit	0 (Fight Pacing Preset)			Fight pacing presets on exit	0 (Fight Pacing Preset)		

Kinsmen - Shield Push And Jump - Close - Together to Together					
Changelist	Revisor	Date	User	Description	
▲ 4129565	6*	9/3/2020 6:54:44 PM	iholstead	Kinsmen fixes - Made kinsmen try and stay together when fighting NPCs - M	
▲ 4033802	5	8/20/2020 1:38:18 PM			
▲ 4020667	4	8/18/2020 8:33:22 PM			
▲ 4014780	3	8/18/2020 12:46:43 AM			
▲ 4003812	2	8/16/2020 1:01:47 AM			
▲ 3443869	1	4/29/2020 9:21:50 PM			
▲ 3393691	14	4/17/2020 1:52:59 AM			
▲ 3270460	13	3/10/2020 8:35:52 PM			

TAKE AWAY:

TREAT YOUR DATA LIKE CODE

DIFF TOOL

- Verifying changes
- Peer reviews
- Tracking down bugs

Soldier Sword BA Leftward RH	Have Revision	Soldier Sword BA Leftward RH	Local Revision
Is interruptible	<input checked="" type="checkbox"/>	Is interruptible	<input checked="" type="checkbox"/>
Max interruption cost	3.40282347E+38	Max interruption cost	3.40282347E+38
Max interruption goal priority	19	Max interruption goal priority	19
Base cost	100	Base cost	100
▼ Cost modifiers	2 (GOAP Cost Modifier)	▼ Cost modifiers	2 (GOAP Cost Modifier)
▼ Cost modifiers[0]	Random -5 : 5 - GOAPCost	▼ Cost modifiers[0]	Random -5 : 5 - GOAPCost
ID	0x1d4564b04f8	ID	0x1d4564b04f8
IsInstance	<input type="checkbox"/>	IsInstance	<input type="checkbox"/>
Disabled	<input type="checkbox"/>	Disabled	<input type="checkbox"/>
Display name	Random 0-10	Display name	Random -5 : 5
Minimum modifier value	1	Minimum modifier value	-5
Maximum modifier value	10	Maximum modifier value	5
► Cost modifiers[1]	Cost for 10 seconds of bei	► Cost modifiers[1]	Cost for 10 seconds of bei
▼ Runtime actions	1 (GOAP Runtime Action)	▼ Runtime actions	1 (GOAP Runtime Action)
▼ Runtime actions[0]	Soldier Sword BA Leftward	▼ Runtime actions[0]	Soldier Sword BA Leftward
ID	0x1c635815582	ID	0x1c635815582
IsInstance	<input type="checkbox"/>	IsInstance	<input type="checkbox"/>
Preprocessor data list	0 (GOAP Runtime Action Prep	Preprocessor data list	0 (GOAP Runtime Action Prep
AI locks	0 (AI Lock)	AI locks	0 (AI Lock)
▼ Fight stage	Soldier Sword BA Leftward	▼ Fight stage	Soldier Sword BA Leftward
ID	0x1c635815583	ID	0x1c635815583
IsInstance	<input type="checkbox"/>	IsInstance	<input type="checkbox"/>
Owner fight stage set collection	None	Owner fight stage set collection	None
Disabled	<input type="checkbox"/>	Disabled	<input type="checkbox"/>
► Fight staging lock applications	1 (Fight Staging Lock Applac	► Fight staging lock applications	1 (Fight Staging Lock Applac
Dont abort if unsatisfied	<input type="checkbox"/>	Dont abort if unsatisfied	<input type="checkbox"/>
Can interrupt others rule type	Only Lower Priority	Can interrupt others rule type	Only Lower Priority
Can interrupt others exception list	0 (Fight Stage Set)	Can interrupt others exception list	0 (Fight Stage Set)
Can be interrupted by others rule typ	Only Higher Priority	Can be interrupted by others rule typ	Only Higher Priority
Can be interrupt by others exception I	0 (Fight Stage Set)	Can be interrupt by others exception I	0 (Fight Stage Set)
▼ Fight stage set definition wrapper	Fight Stage Set Definition	▼ Fight stage set definition wrapper	Fight Stage Set Definition
ID	0x1c635815584	ID	0x1c635815584
IsInstance	<input type="checkbox"/>	IsInstance	<input type="checkbox"/>
► Fight stage set activation condition	Fight Stage Condition ANI	► Fight stage set activation condition	Fight Stage Condition ANI
Define fight stage set stay active c	<input type="checkbox"/>	Define fight stage set stay active c	<input type="checkbox"/>
Fight stage set stay active conditio	None	Fight stage set stay active conditio	None
▼ Fight stage wrapper	Fight Stage Sequence - Or	▼ Fight stage wrapper	Fight Stage Sequence - Or
ID	0x1c635815586	ID	0x1c635815586
IsInstance	<input type="checkbox"/>	IsInstance	<input type="checkbox"/>
Disabled	<input type="checkbox"/>	Disabled	<input type="checkbox"/>
Description		Description	

WHY NOT SCRIPTING?

- Easier to reuse existing systems
- Not only designers working on data



GOALS

- Achieves objectives
- Supports quick building of data
- Debuggable
- Easy to learn
- Minimize errors
- Scalable
- Compatible with a large team



ACHIEVING OBJECTIVES



SUPPORTING QUICK BUILDING OF DATA

- Edit while running
- Mass data editing
- Generic building blocks
 - AI Conditions, AI Actions and Entity Providers
- Quality of Life

▼ Conditions	[ubiS32] Ringleader Learn To Abort Before Ligh
ID	0x1cf71adce3d
IsInstance	<input type="checkbox"/>
▼ Logic	
Negated	<input type="checkbox"/>
▼ Misc	
Condition Resolving	Any
▼ Conditions	2 (AI Condition Data)
▶ Conditions[0]	[ubiS32] Ringleader Learn To Abort Before Ligh
▶ Conditions[1]	Entity1 life ratio <= 30% AND [ubiS32] Ringlea

Name	Increment Learn Count
ID	0x1cf71adce2d
IsInstance	<input type="checkbox"/>
▼ *DEBUG*	
Disabled	<input type="checkbox"/>
▼ Misc	
Do revert	<input type="checkbox"/>
▼ Operation	
▼ AI Action	[ubiS32] Ringleader Learn To Abort Before Ligh
ID	0x1cf71adce2e
IsInstance	<input type="checkbox"/>
Type	Reversible
Type	Irreversible
▶ Key selector	[ubiS32] Ringleader Learn To Abort Before Ligh
Operation	Addition
Value	1
▶ Entity Provider - Entity 1	Owner Entity Provider
▶ Entity Provider - Entity 2	Fight Target

QUALITY OF LIFE (QoL)

- Naming objects
- Clean organization
- Minimizing clicks
- Disabling

▼ Fight Logic Conditions[0]	AI Cond. About to be Shot
ID	0xf00f6981
IsInstance	<input type="checkbox"/>
▼ Debug	
Disabled	<input type="checkbox"/>
▼ Misc	
▶ AI Condition	About to be Shot
▶ Primary Entity Provider	Owner Provider
▶ Secondary Entity Provider	Melee Target Provider

▼ State Operations	3 (Fight Logic State Conditional Operation)
▶ [0] Filtered Operation [1 OperationData] [0 Init. Cond]	Activate Sound #1
▶ [1] Filtered Operation [1 OperationData] [0 Init. Cond]	StopStamina
▼ [2] Filtered Operation [1 OperationData] [0 Init. Cond]	Perfect Attack - Reset Sequence Failed
Name	Perfect Attack - Reset Sequence Failed
ID	0x1cd340b693a
IsInstance	<input type="checkbox"/>
▼ Conditions	
▶ 1. Initial Filtering Fight Logic Conditions	AND Group [0 valid condition]
▼ Debug	
Disabled	<input type="checkbox"/>
▼ [1] Action State (Attack) : ACK Regular Attack Hero 1	ACK Regular Attack Hero 1
Name	ACK Regular Attack Hero 1
ID	0x783acd886a
IsInstance	<input type="checkbox"/>
▼ 1- Conditional Settings	
▶ Conditional Override Settings	18 (Fight Logic State Conditional)
▼ 2- Transitions	
▶ Conditional Transitions	12 (Fight Logic State Conditional)
▼ 3- Operations	
▶ Conditional Operations	7 (Fight Logic State Conditional)
▶ State Operations	3 (Fight Logic State Conditional)
▶ Operations on Exit	4 (Fight Logic State Conditional)
▼ 4- Hitbox Actions	
Action Attack Hitbox Entries	0 (Action Attack Hitbox Entry)
Entity Hit Mode	Once per hit box activation
▼ 5- Windows	
Reference Frame Count	150
▶ State Fight Windows	30 (Fight Logic Window)

DISABLED

- “Commenting out code”
- Both for debugging and testing



Logical operation	Or
▼ Conditions	2 (GOAP Condition)
▼ Conditions[0]	FS: AI: [Not Player] And Enemy Rank is [ACK_Kinsmen Split]
ID	0x1b9a55f4bb3
IsInstance	<input type="checkbox"/>
Disabled	<input type="checkbox"/>
Description	
Logical operation	And
▼ Conditions	6 (GOAP Condition)
► Conditions[0]	FS: AI: [Not Player] And Enemy Rank is [ACK_Kinsmen Split]
▼ Conditions[1]	FS: Global - \"ACK_Kinsmen Split\"
ID	0x1b9a55f4bba
IsInstance	<input type="checkbox"/>
Disabled	<input type="checkbox"/>
► Condition	Global - \"ACK_Kinsmen Split\"
► Conditions[2]	FS: AI: Is In Phase : [Kinsmen Desired State : Split]
► Conditions[3]	Angle Between [Self to Linked] and [Self To Target] is
► Conditions[4]	NOT [[Kinsmen Action] Kinsmen Shieldbearer Action]
► Conditions[5]	NOT [[Kinsmen Action] Kinsmen Shieldbearer Action]
► Conditions[1]	FS: AI: [Not Player] And Enemy Rank is [ACK_Kinsmen Split]

BUILDING DEBUGGABLE SYSTEMS

- Debugging in code sucks
- Need to always know:
 - WHAT is currently happening
 - WHY something just happened
- Quicker and easier this can be answered, the better the system
 - Having a history makes this MUCH faster

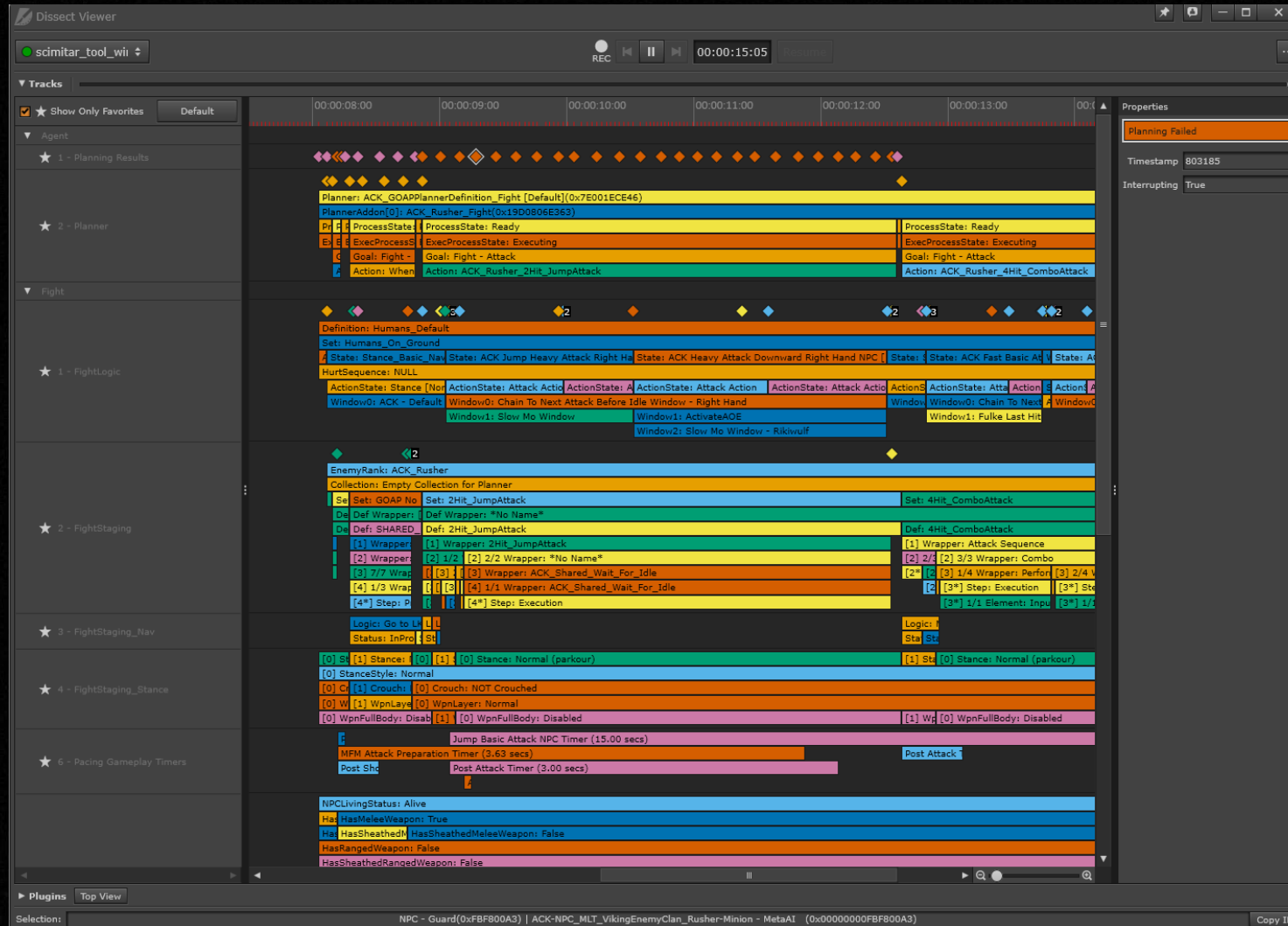




Planner Issue Bingo

Runtime action messed up	Things are real broke	Had to talk to the AI Team	Akward...
Made the most common mistake	Welp!	Something spooky	We've all been there
Used <u>cooldowns</u> in fight	Fixing required (free square)	Broke the flow chart	You're not the first
NPC was wrong	Had bad planner logic	It's not you, it's me (not an issue with the planner)	Had to double check your data
...	Uhhhhh....	Had an issue no one has seen before	Had to debug the planner in code

DISSECT



OLD FIGHT DEBUG DISPLAYS

DISSECT

Dissect Viewer

ACK_Dissect_Toc

REC 00:00:21:08

Tracks

- Show Only Favorites
- Agent
 - 1 - Planning Results
 - 2 - Planner
- Fight
 - 1 - FightLogic
 - 2 - FightStaging
 - 3 - FightStaging_Nav
 - 4 - FightStaging_Stance
 - 5 - FightStaging_PhaseSeq

Properties

Planner: ACK_GOAPPlannerDefinition_Fight [Default] (0x7E001ECE46)

PlannerAddOn[0]: ACK_Soldier_Fight (0x106FB1A0131)

ProcessState: Ready

ExecProcessState: Executing

Goal: Fight - Attack

Action: Soldier Sword BA Upward RH

Definition: Humans_Default

Set: Humans_On_Ground

State: Stance_Defensive [1]

State: ACK Basic Attack Upward Right Hand NPC [1]

Window0: Par

State: ACK Basic Attack Leftward Right H

HurtSequence: NULL

ActionState: Stance [Defensive (Strafe)]

ActionState: Attack Action

ActionState: Attack Action->HIT

Window1: Blo

ActionState: Attack Action

ActionS

State: Stance

Window0: Chain To Next Attack Before Id

Window1: Dodge Early

Window2: Allowed to Plan During Action

EnemyRank: ACK_Shield_Soldier

Collection: Empty Collection for Planner

Set: Soldier Sword BA Upward RH

Set: Post Attack W

Set: Soldier Sword BA Leftward RH

Def Wrapper: *No Name*

Def: Soldier Sword BA Upward RH

Def: *No Name*

Def: Soldier Sword BA Leftward RH

[1] Wrapper: Soldier Sword BA Upward RH

[2] 1/2 Wrapper: *No Name*

[2] 2/2 Wrapper: *No Name*

[3] Wrapper: Shared_Basic Attack Upward

[3] Wrapper: ACK_Wait_For_Allowed_to_Plan_Before_Idle

[3] Wrapper: ACK_Wait_For_Allowed_to_Plan_Before_Idle

[3*] Steps: Preparation

[3*] [4] 1/1 Wrapper: ACK_Wait_For_Allowed_to_Plan_Before_Idle

[3*] [4*] Steps: Execution

[2*] [4*] Steps: Execution

Status: InProgress

[1] [2] Stance: Defensive (Normal Nav)

[1] Stance: Defensive (Strafe)

[2] Stance: Defensive (Strafe)

[0] StanceStyle: Normal

[1] [2] Crouchi: NOT Crouched

[1] Crouchi: NOT Crouched

[2] Crouchi: NOT Crouched

[0] WpnLayer: Normal

[1] [2] WpnFullBody: BasicAttack_Upward

[1] WpnFullBody: Disabled

[2] WpnFullBody: Disabled

Sequence: "Soldier" Phase: "Default"

Sequence: "Sheathe Pick Up Weapon AI Action Manager" Phase: "Regular Weapon in Hands"

Post Attack Timer (0.5)

Plugins

Top View

Selection: NPC - Guard (0xBF80021) | ACK-NPC_MLT_SaxonMercia_Soldier-Minion - MetaAI (0x00000000BF80021)

Copy ID

EnemyRank: ACK_Shield_Soldier

Collection: Empty Collection for Planner

Set: Soldier Sword BA Upward RH

Def Wrapper: *No Name*

Def: Soldier Sword BA Upward RH

[1] Wrapper: Soldier Sword BA Upward RH

[2] 2/2 Wrapper: *No Name*

[3] Wrapper: ACK_Wait_For_Allowed_to_Plan_Before_Idle

[4] 1/1 Wrapper: ACK_Wait_For_Allowed_to_Plan_Before_Idle

[4*] Step: Execution

[1] Wrapper: Soldier Sword BA Upward RH

Name: Soldier Sword BA Upward RH

ObjectID: 0x1C635815611

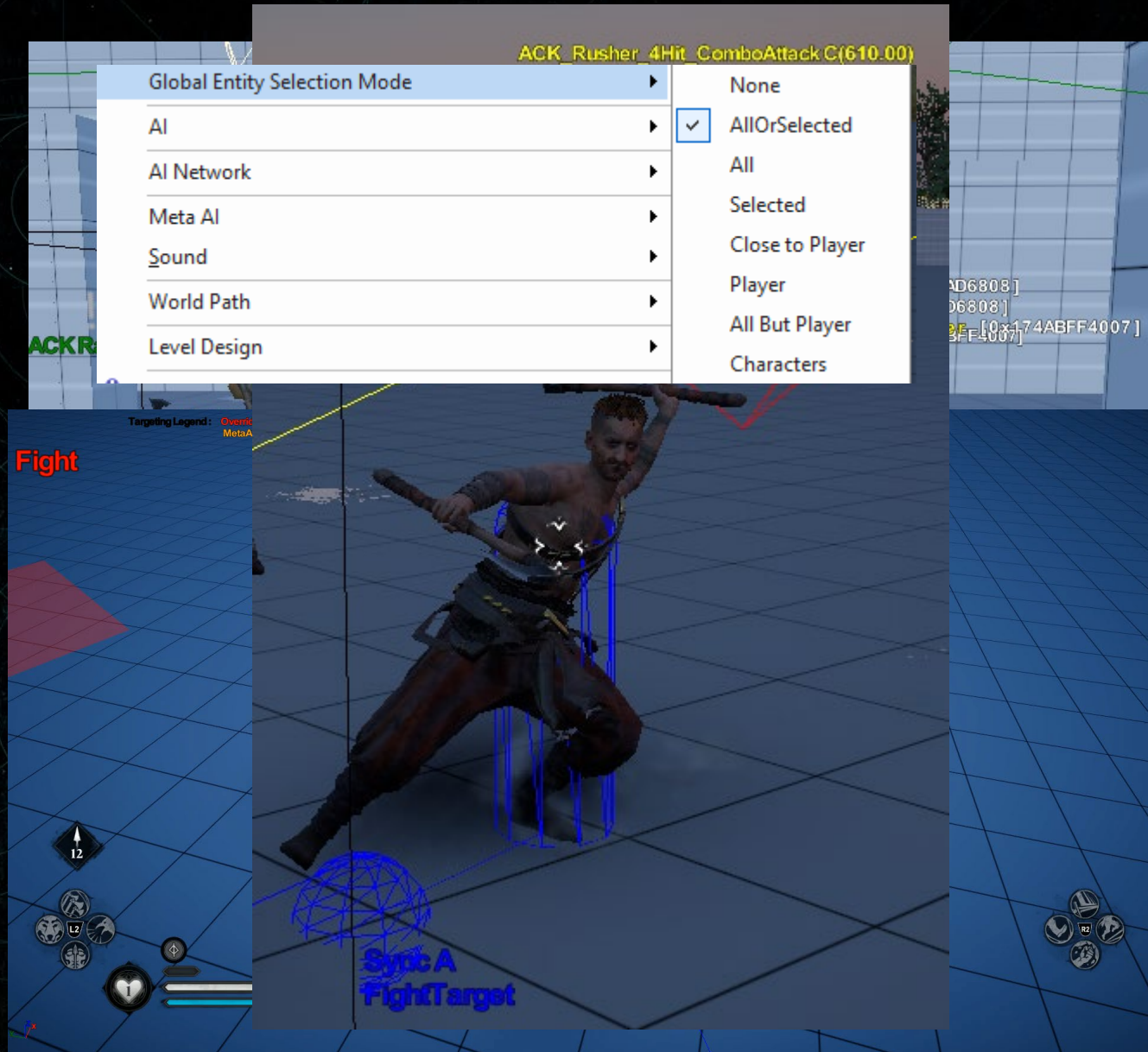
DebugPauseEngine: False

Loop: False

Type: Ordered Sequence

DEBUG DISPLAYS

- Spatial info
- Stuff always shown
- Deep dive
- Global Entity Selection Mode



03:15
00:00:09:00
00:00:09:15
00:00:10

Planning Failed

Timestamp 803699

Interrupting True

ACK_GOAPPlannerDefinition_Fight [Default](0x7E001ECE46)

trAddon[0]: ACK_Rusher_Fight(0x19D0806E363)

ProcessState: Ready

ExecProcessState: Executing

Goal: Fight - Attack

Action: ACK_Rusher_2Hit_JumpAttack

(Primary) - Planning history of NF
+

F:/ACK/bin/editor/planning_Primary_0xfbf800a3.html

Planning history of NPC - Guard(0xFBF800A3) | ACK-NPC_MLT_VikingEnemyClan_Rusher-Minion - MetaAI(0xFBF800A3)
Current Time 809045

Successfully executed plans

Fight - Attack = ACK_Rusher_4Hit_ComboAttack
Time 806498ms (0ms)

Fight - Attack = ACK_Rusher_2Hit_JumpAttack
Time 802726ms (0ms)

Fight - Priority Actions = When LKP Is Created
Time 802156ms (0ms)

Fight - Priority Actions = Initial Pacing on Conflict Start
Time 802021ms (0ms)

Enter Fight = Enter Fight
Time 801978ms (0ms)

All non-interrupting plans

Unable to find solvable Goal (See Goal Evaluations)
Time 809045ms (0ms)

Unable to find solvable Goal (See Goal Evaluations)
Time 809012ms (0ms)

Unable to find solvable Goal (See Goal Evaluations)
Time 808976ms (0ms)

Unable to find solvable Goal (See Goal Evaluations)
Time 808941ms (0ms)

NPC - Guard(0xFBF800A3) | ACK-NPC_MLT_VikingEnemyClan_Rusher-Minion - MetaAI(0xFBF800A3)

Kino
Kino Component

AnimusPulseComponent
Animus Pulse Component

BhuGenexMPC
Bhu Genex MPC

Bip

Copy
Ctrl+C

Remove Component(s)

Replace Component(s)

Advanced

Clear All Patrol Points...

Component

Dump Planning History

Dump SpeedTable

Force Replan

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← → ↻ 🏠 ⓘ File | F:/ACK/bin/editor/planning_Primary_0xfb800a3.html 🔍 ☆ /re/ ⚙️ 👤

▶ Unable to find solvable Goal (See Goal Evaluations) 803699 1/1 ^ v × Time 803838ms (0ms)

▼ Unable to find solvable Goal (See Goal Evaluations) Time 803699ms (0ms)

▼ Plan Request

▶ Available Goals ▶ Invalid Goals ▶ Discarded Goals ▶ Available Actions

▶ Invalid Actions ▶ Discarded Actions ▶ World State

▼ Goal Evaluations

▼ Discarded Actions

ACK_Rusher_DeathAttack - Validation Condition 'AI: Entity1 life ratio <= 10%' failed at index 0

ACK_Rusher_Exhausted - Validation Condition 'FS: Is Fight Logic in Idle' failed at index 0

Fight Realization - Point - Validation Condition '[ubiBool] DoingFightRealization == True' failed at index 3

ACK_Rusher_Axe_Fury - Validation Condition 'AI: Fight Staging Generic Category' failed at index 2

In Fight Sheath Melee Weapon - Validation Condition 'FS: Is Fight Logic in Idle' failed at index 0

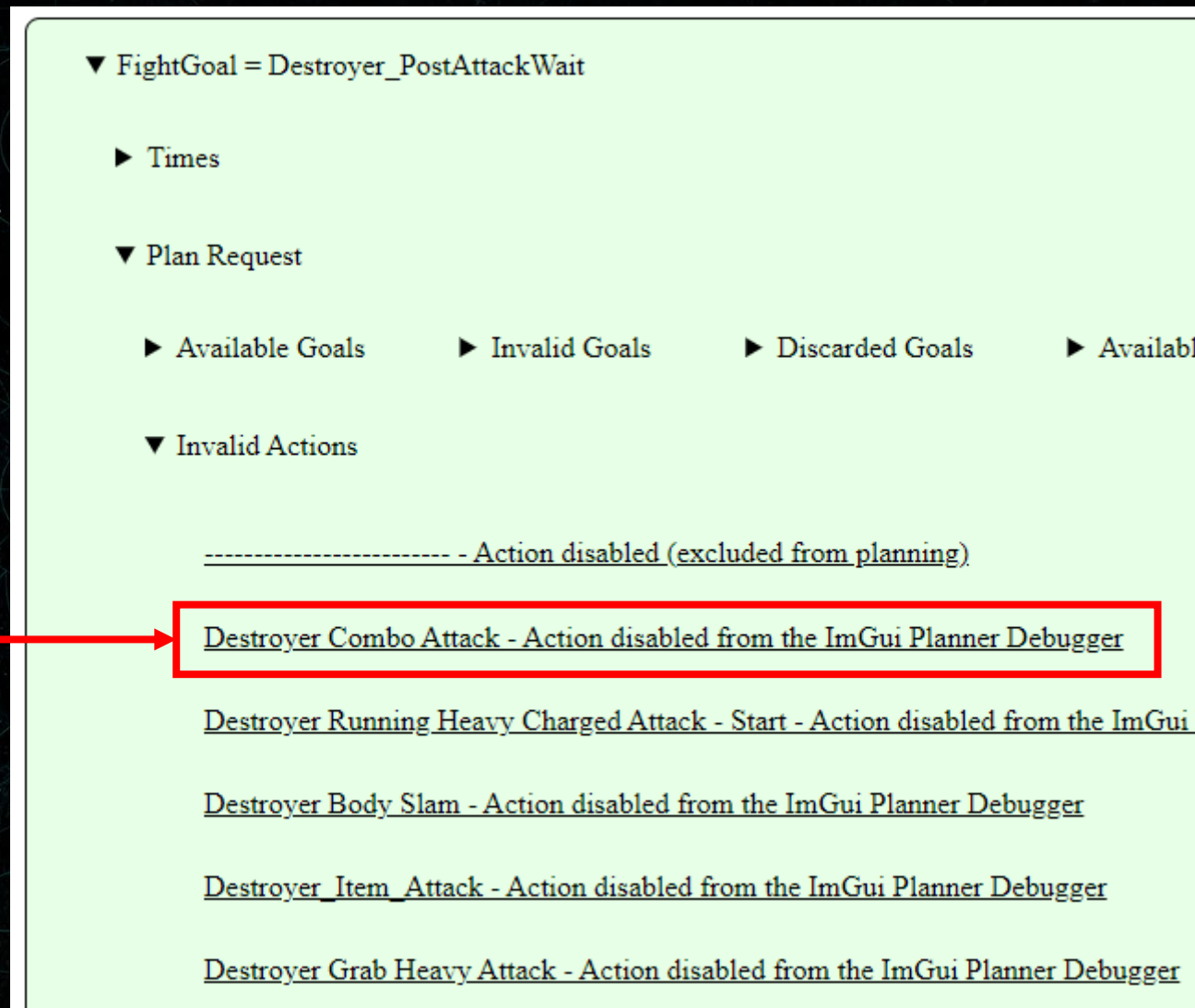
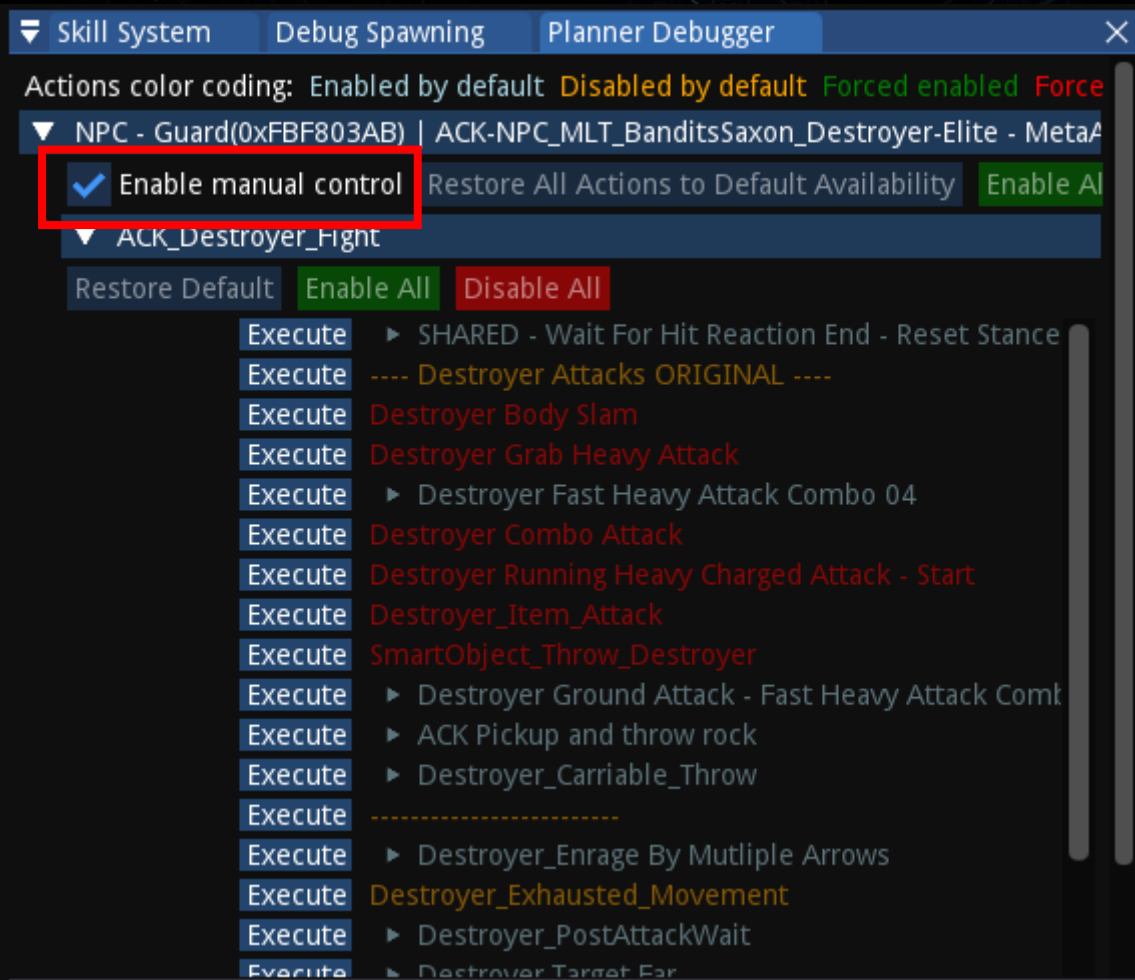
In Fight Unsheathe Melee Weapon and Set Stance - Validation Condition 'FS: AI: Weapon Selection Condition' failed at



TAKE AWAY:

HAVING HISTORY WILL
HELP YOU DEBUG FASTER

PLANNER DEBUGGER



WHY YOU NO FIGHT??

▼ Skill System Debug Spawning Planner Debugger Why You No Fight??

▼ Entity [fbf80025] / NPC - Guard(0xFBFB80025) | ACK-NPC_MLT_VikingEnemyClan_Rush

Current Agent Context: **NPCContext_Fight**
Has Base Fight Planner: **ACK_GOAPPlannerDefinition_Fight [Default]**
Has Fight Planner Addons: **ACK_Rusher_Fight,**
Fight Planner Addon Has Moves: **14**
Current Planner Action: **ACK_Rusher_4Hit_ComboAttack**
Is Fight Started Key Status: **True**
Current CL: **CLFight**
Current Planning State **Executing**
Movement Status: **Completed**
Conflict Restricted Zone: **No Zone**
Conflict Forced Position: **None**
NPC is T-Posing: **No**
Fight Logic State: **Stance_Basic_Nav**
Fight Logic Stuck: **No**
Doing Emergency Wait: **No**
Not Allowed To Go Into Melee: **No**
Post Attack Timer: **0.000000**
Faction: **ACK-NPC_VikingEnemyClan**
Faction Relation To Player: **Enemy**
Fight Relation To Player: **Hostile**
CommunityMember: **ACK - MLT VikingEnemyClan Rusher Minion (0x1BB5C2345FA)**
 ▶ With Specific NPCs
 ▶ With Factions

[Dump Planning History](#)

▼ Skill System Debug Spawning Planner Debugger W

▼ Entity [fbf80025] / NPC - Guard(0xFBFB80025) | ACK-NPC_MLT_V

Current Agent Context: **NPCContext_Default**
Has Base Fight Planner: **GOAPPlannerDefinition_Default**
Has Fight Planner Addons: **NONE!**
Current Planner Action: **None!**
Is Fight Started Key Status: **UNSET!**
Current CL: **NONE!**
Current Planning State **Planning for 5.327!**
Movement Status: **Completed**
Conflict Restricted Zone: **No Zone**
Conflict Forced Position: **None**
NPC is T-Posing: **No**
Fight Logic State: **Stance_Basic_Nav**
Fight Logic Stuck: **No**
Post Attack Timer: **0.000000**
Faction: **ACK-NPC_VikingEnemyClan**
Faction Relation To Player: **Enemy**
Fight Relation To Player: **Not Hostile**
CommunityMember: **ACK - MLT VikingEnemyClan Rusher Mini**
 ▶ With Specific NPCs
 ▶ With Factions

[Dump Planning History](#)

WHY YOU NO FIGHT??

Who to ask if there's an issue with an NPC:

- Current Agent Context: either the AI team or the Quest team if the NPC is doing a specific quest behavior
- Has Base Fight Planner: Ford, or who ever made the NPC in the build table
- Has Planner Addons: Ford, or who ever made the NPC in the build table. Occasionally you'll need to ask the fight team
- Fight Planner Addon Has Moves: Fight team
- Current Planner Action: just for debugging
- Is Fight Started Key Status: Unset means it didn't get initialized for that context. Talk to the AI team.
- Current CL: This is more for debugging than a stand alone issue.
- Current Planning status: Either the fight team or the AI team
- Movement status: First double check that the NPC is on nav mesh, then ask the fight team
- Conflict Restricted Zone: If they're doing a special activity (like the brawl or duel), make sure that the area is setup correctly and that they're in it! Then ask the owner of the activity (i.e. AI content)
- Conflict Forced Position: More for debugging
- Fight logic state: this is just for debugging
- Fight logic stuck: fight team
- Doing Emergency Wait: Should disappear in a moment, should only happen when player is using an ability or in a paired action. Fight team if it exists while the player can move
- Not Allowed To Go Into Melee: This isn't a bug per se. Only a limited number of enemies are allowed to fight the player at once. If this is orange and you feel the NPC should be fighting, contact the fight team
- Post Attack Time: Fight team
- Faction: Just for debugging
- Is Entity Hostile to player: This indicated if their faction is hostile to the player (quest) and if fight sees them as hostile to the player. Not that this is ONLY true if they're in fight, so if they're not in fight, disregard this
- Community member: Just for debugging
- Faction Relations: Just for debugging

BUILDING LEARNABLE SYSTEMS

—
ASSASSIN'S CREED VALHALLA

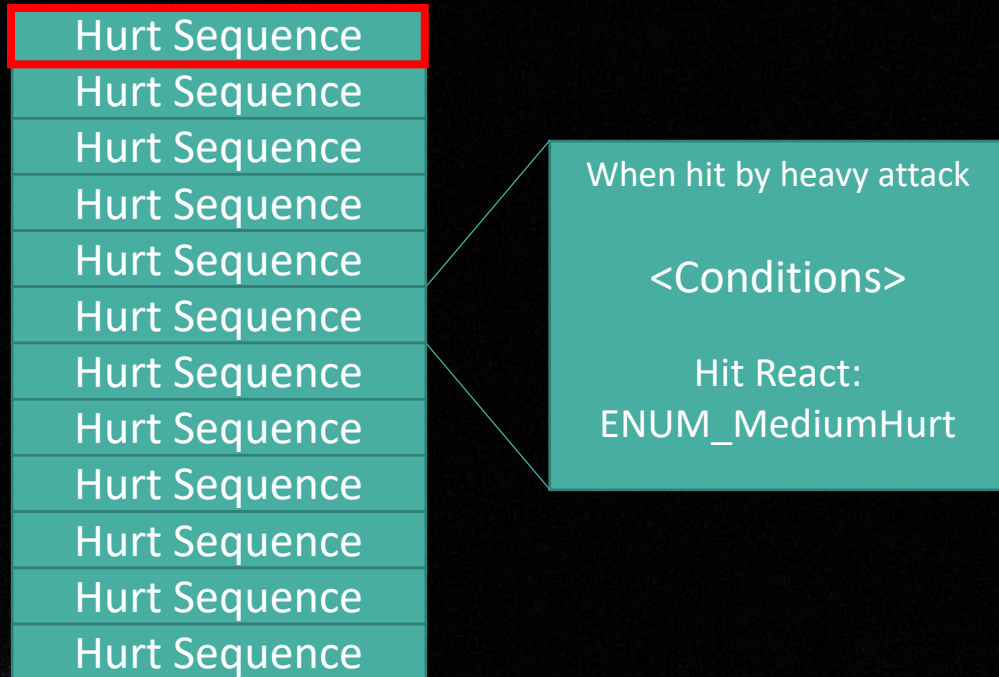


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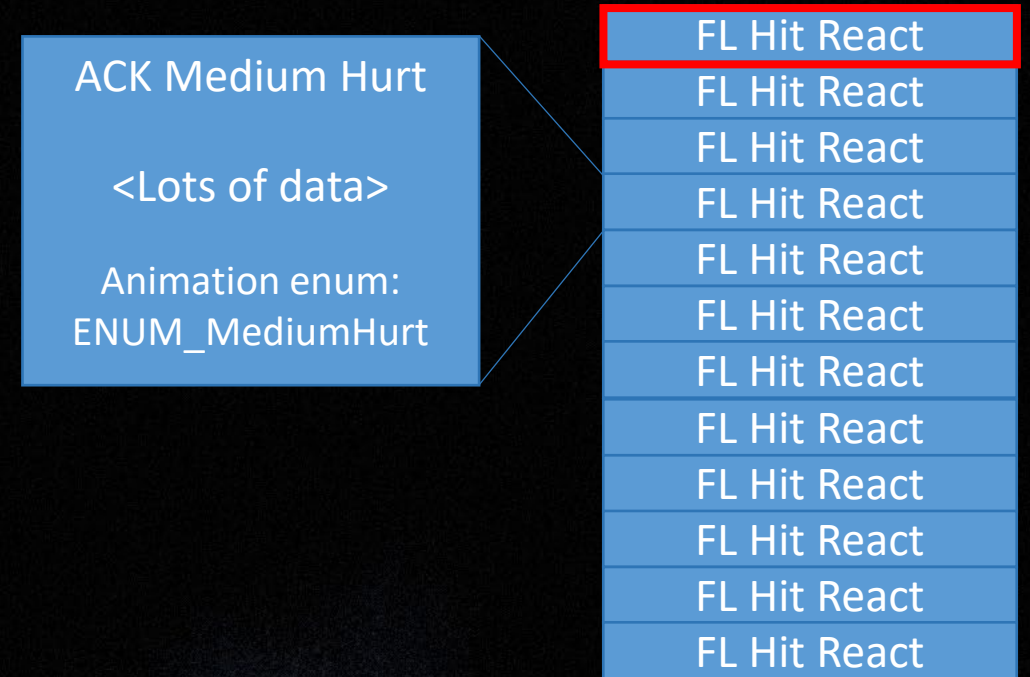
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HIT REACTS ON AC

Hurt Sequence Mapping



Fight Logic Set



NEW TEAM MEMBERS

2018

2019

2020

APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

CONCEPTION

PREPROD

PRODUCTION

KOM
Sep 2018

FPP
May 2019

ALPHA
Dec 2019

BETA
May 2020

RELEASE
Nov 2020

MONTREAL

BARCELONA

BORDEAUX

BUILDING LEARNABLE SYSTEMS

- Clear dependencies
- Avoid relying on external documentation
- Settings shouldn't be buried
- Clear why someone did something

▼ 1- Conditional Settings	
Conditional Override Settings	0 (Fight Logic State Conditional Override Setting)
▼ 2- Transitions	
▶ Conditional Transitions	11 (Fight Logic State Conditional Transition Abstra
▼ 3- Operations	
▼ Conditional Operations	1 (Fight Logic State Conditional Operation)
▶ [0] - Conditional Operation	Sound Event
State Operations	0 (Fight Logic State Conditional Operation)
Operations on Exit	0 (Fight Logic State Validated Operation)

▶ Allow Stance Layers	Stance Weapon Layer Setting
▶ Reset Stance Layer Timers	Stance Weapon Layer Setting
Reset Speed During Action	<input checked="" type="checkbox"/>
Use Code Driven Orientation	<input type="checkbox"/>
Choose Target From Input	<input type="checkbox"/>
Override distance RTCs relative to Atta	<input type="checkbox"/>
▶ Target Preference Provider	Melee Target Provider
▶ Capsule Override Parameters	Capsule Override Parameters
▼ Sync Targets	1 (Fight Logic Sync Target Provider Data)
▶ Sync	Sync Fight Target
▶ Fight Logic Action State Data	Fight Logic Action State Fight Logic Action S
▼ Target Prediction Settings	

▼ Fight Logic Action State Data	
ID	0x1a675a6950b
IsInstance	<input type="checkbox"/>
Disable Sticking	<input checked="" type="checkbox"/>
Disable Gravity	<input checked="" type="checkbox"/>
Force 2D Edge Clamping	<input type="checkbox"/>
Use Code Driven Inputs	<input type="checkbox"/>

MINIMIZING ISSUES

- Preventing errors
- Catching errors
- Good default values

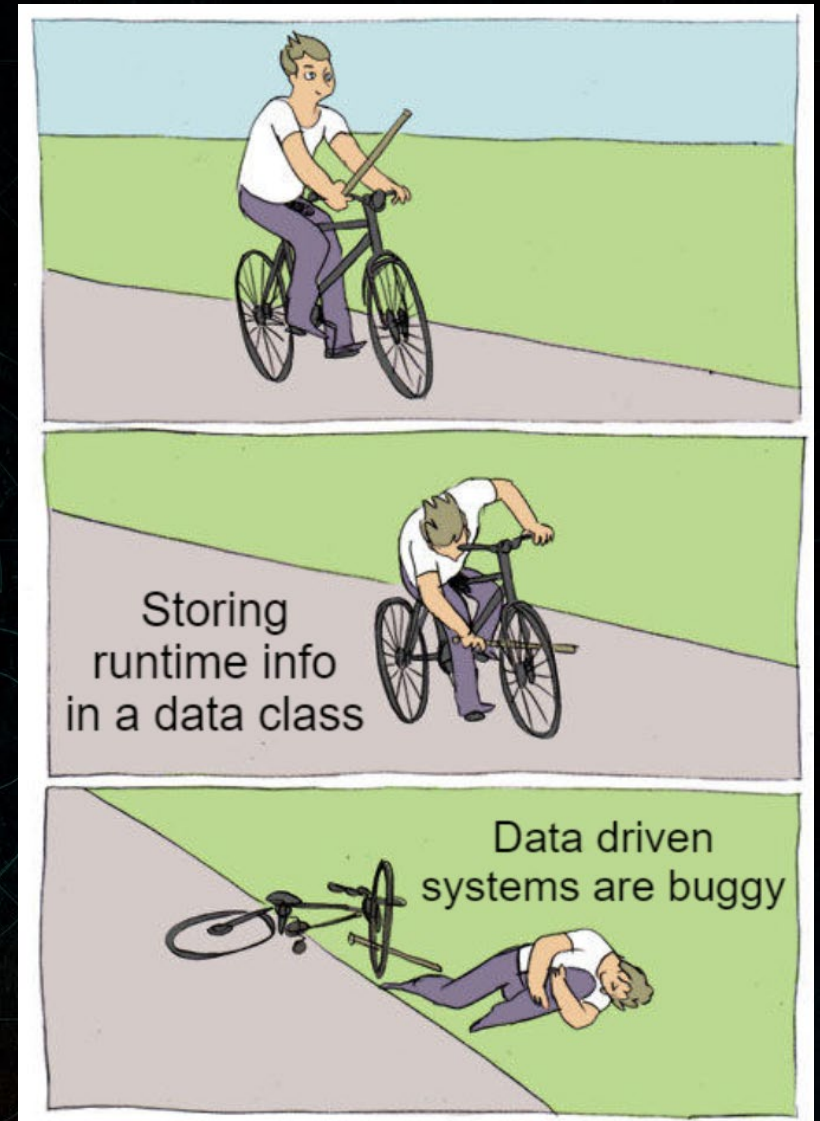


TAKE AWAY:

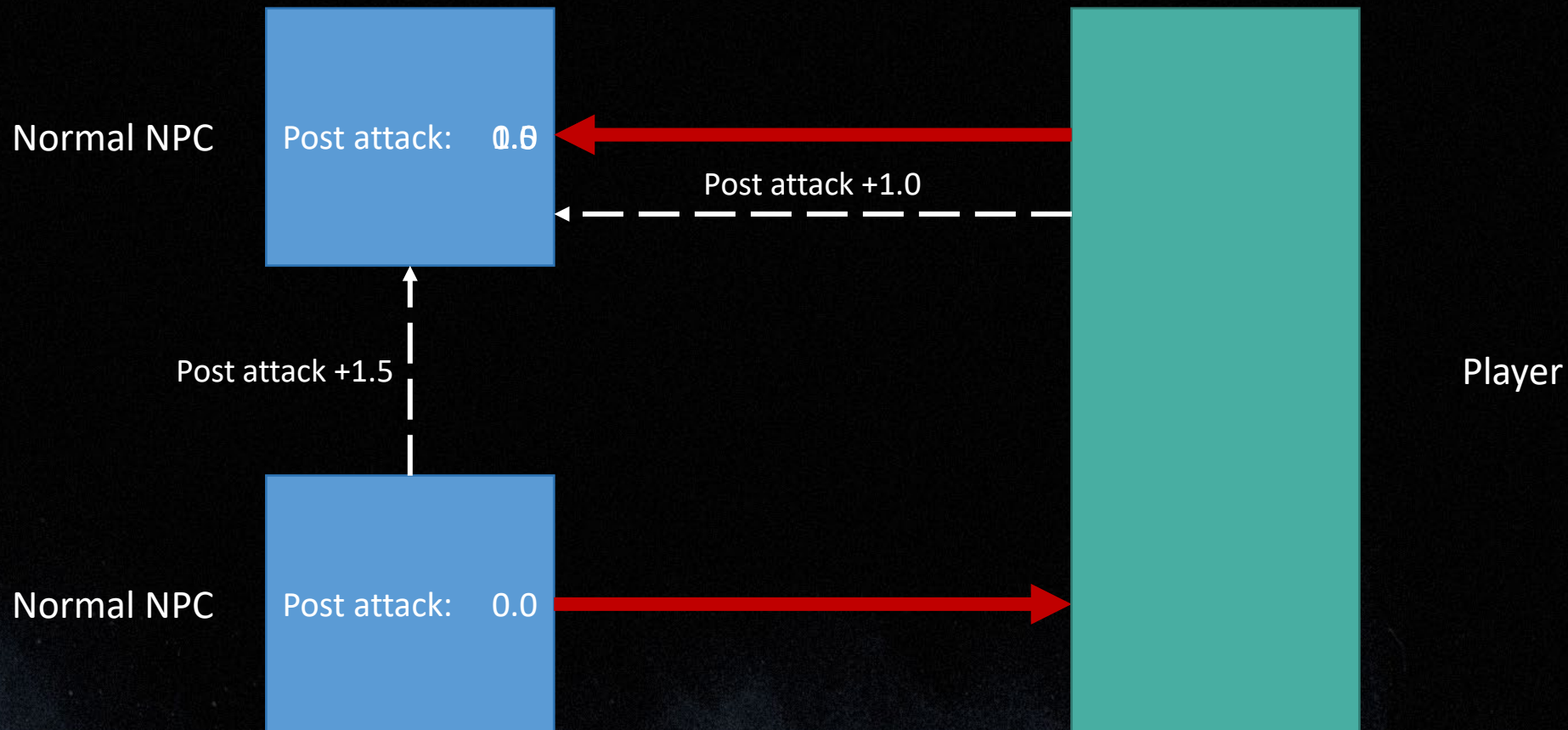
GOOD DEFAULT VALUES ARE THE FIRST LINE OF
DEFENSE AGAINST BAD DATA

SPLIT RUNTIME FROM DATA

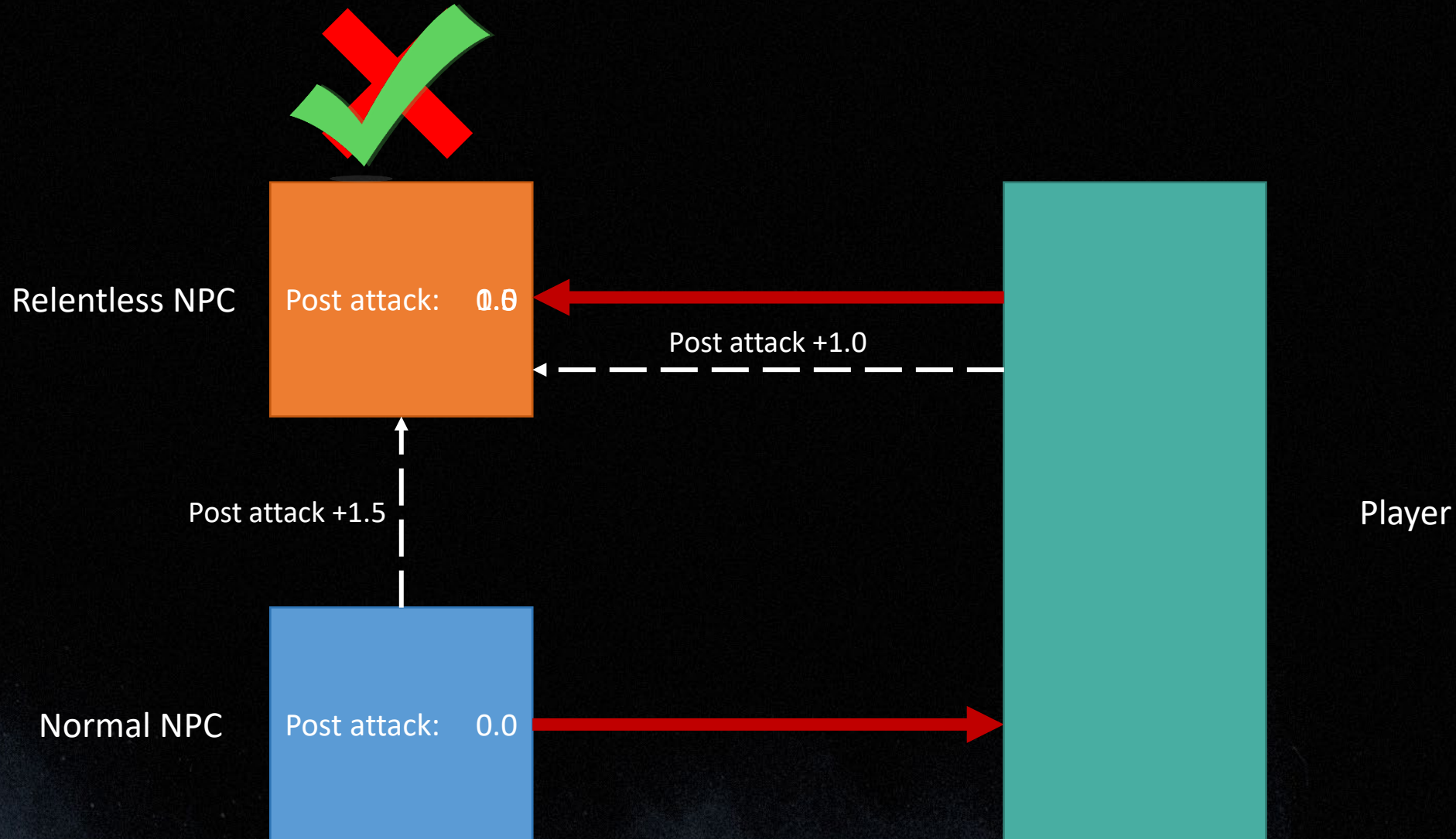
- Major data reuse issues
- Edit and deleting data while running
- Serialization issues when saving while running



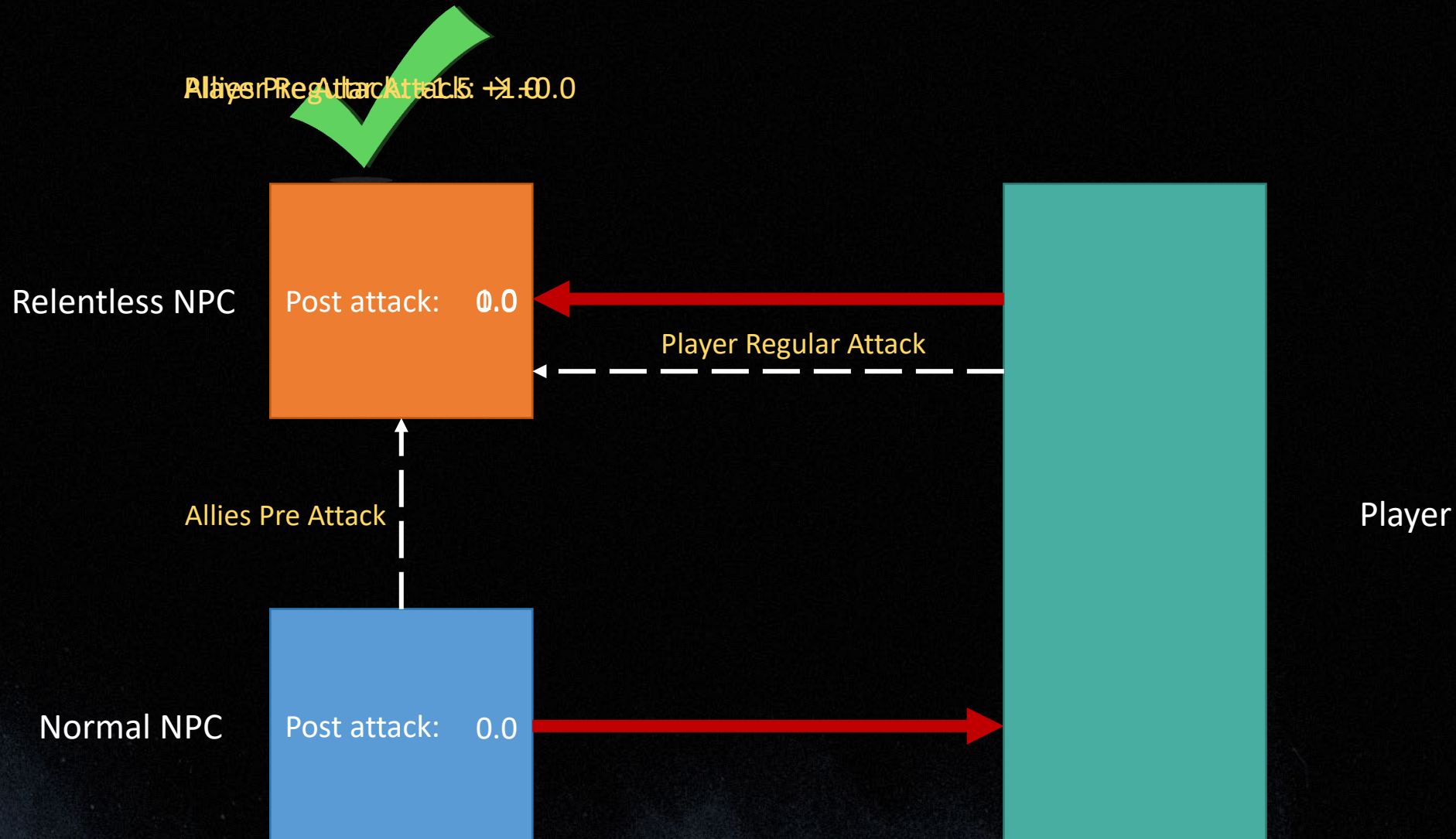
POST ATTACK WAIT - OLD



POST ATTACK WAIT - OLD



POST ATTACK WAIT - PACING PRESETS



“KEEP IT TO YOURSELF”

(encapsulation)

- Easier to design
- Prevents very rare bugs



VALIDATION

- Good defense against error prone systems
- Edit time feedback
- Keeping validation errors at 0



DATA DEPRECATION

- Going to be needed
- Extremely risky
- Understand the deprecation pipeline
- Determine what data will be effected
- TEST!



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SCALABLE SYSTEMS

- More data = More errors
- Performance concerns
 - Precompute and cache expensive conditions
 - Clearly state expensive conditions
 - Simple design optimizations
 - Runtime condition reordering

```
void FighterNPC::UpdateCachedData_Internal(Entity* ownerEntityPtr, Entity* targetEntityPtr)
{
    popAssert(ownerEntityPtr != nullptr, "FighterNPC::UpdateCachedData");

    if (targetEntityPtr != nullptr)
    {
        UpdateCachedData_PositionData(ownerEntityPtr, targetEntityPtr);
        UpdateCachedData_TargetBehaviorFlags(ownerEntityPtr, targetEntityPtr);
        UpdateCachedData_ClearPathToTarget(ownerEntityPtr, targetEntityPtr);
        UpdateCachedData_PathToTargetObstructed(ownerEntityPtr, targetEntityPtr);
        UpdateCachedData_TargetAtSpecificCrossbowDistance(ownerEntityPtr, targetEntityPtr);
        UpdateCachedData_HealthBar(ownerEntityPtr, targetEntityPtr);
    }

    UpdateUnreachableCrossbows();
    UpdateCachedData_BestMountableEntity(ownerEntityPtr);
    ubiBool newPotential = UpdateCachedData_BestPotentialCrossbowEntity(ownerEntityPtr);
    UpdateCachedData_BestReachableCrossbowEntity(ownerEntityPtr, newPotential);
    UpdateCachedData_SeenByCamera(ownerEntityPtr);
}
```

Is Entity Near Floor Condition

Condition that gets satisfied when the entity and the nearest floor is close enough based on a threshold. THIS IS EXPENSIVE TO USE. USE SPARINGLY

Name	To Javelin
ID	0x1cf02c14d71
IsInstance	<input type="checkbox"/>
Initial Filtering AI Conditions	None
► Conditions	Weapon Selection Condition
Target Phase	[1] Javelin

SYSTEMS WHICH WORK WITH LARGE TEAMS

- Why?
- Exclusive checkout
- Repositories

Fight Staging Locks Repository






✓  FightStagingLocksRepository_ACK

Fight Staging Phase Sequence Repository

•  FightStagingPhaseSequenceRepository_ACK

Gameplay Pacing Timer Repository

•  GameplayPacingTimerRepository_ACK

FightLogicInputDefinitionRepository_Default		* Fight Logic Input Definition Repository
Name	FightLogicInputDefinitionRepository_Default	
ID	0x1c5f07c6b46	
IsInstance	<input type="checkbox"/>	
▼ Misc		
▼ Fight Logic Input Definitions	5 (Fight Logic Input Definition Set)	
▼ Fight Logic Input Definitions[0]	* 	FightLogicInputDefinitionSet_Default
Name	FightLogicInputDefinitionSet_Default	
ID	0x1cb2e752676	
IsInstance	<input type="checkbox"/>	
► Fight logic input definitions	1238 (Fight Logic Input Definition)	
▼ Fight Logic Input Definitions[1]	* 	Fight Logic Input Set 2
Name	Fight Logic Input Set 2	
ID	0x1cc6a5dbf2e	
IsInstance	<input type="checkbox"/>	
► Fight logic input definitions	27 (Fight Logic Input Definition)	
► Fight Logic Input Definitions[2]	* 	Fight Logic Input Set 3
► Fight Logic Input Definitions[3]	* 	Fight Logic Input Set 4
► Fight Logic Input Definitions[4]	* 	Fight Logic Input Set 5

TAKE AWAY:

SPLIT UP POPULAR FILES

INHERITING OLD DATA

- Generic systems knowledge transfer
- Is this a bug or intentional?
- Hard to clean-up



TAKE AWAY:

INHERITING DATA EXAGGERATES UNDERLYING ISSUES

GOALS




- Achieves objectives
- Supports quick building of data
- Debuggable
- Easy to learn
- Minimize errors
- Scalable
- Compatible with a large team



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SKAL

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