



# Fighting Sequelitis: Creating Combat NPCs for 'Tom Clancy's The Division 2'

Drew Rechner

Lead AI Designer @ Massive Entertainment – a Ubisoft Studio

Philip Dunstan

Lead AI Programmer @ Massive Entertainment – a Ubisoft Studio

# GDC

**GAME DEVELOPERS CONFERENCE**

MARCH 18–22, 2019 | #GDC19

# About Us

Drew Rechner

Lead AI Designer

Philip Dunstan

Lead AI Programmer

# MASSIVE

MASSIVE ENTERTAINMENT | A **UBISOFT** STUDIO

# TOM CLANCY'S THE DIVISION 2

- Online
- Shooter/RPG
- AI Systems: Detection, Threat, Scripted Control, Dynamic Objective Handling
- Behavior Tree architecture
- Server-side behavior

POWERED BY  
**snowdrop**<sup>TM</sup>

# Reception to the AI



## Positive

I'm actually pretty surprised how smart/aggressive the AI is in this game.

yeah the NPCs are terrifying enemies, I play solo and you *cannot* get lazy and stand in one place, they will flank and gank your ass so fast, i'm hustling *allatime* playing solo because they change tactics as you do. impressive and intimidating.

Best AI ever - period

I thought the AI in the Division was very good and believable personally, and how it effected the combat of the different factions.

Have you played against Hunters and Legendary LMB? They're probably the best AI that exists up to date in gaming.

TLDR: Hunter AI is frankly amazing.



# Reception to the AI



## Negative

### Bullet sponge enemies

I hate when NON-tanky looking guys in hoodies and shit rush at you with their golden HP and abuse it to kill you and dont even try to cover.

### Terrible AI

#### Just get rid of Bullet sponge and you'll fix your game

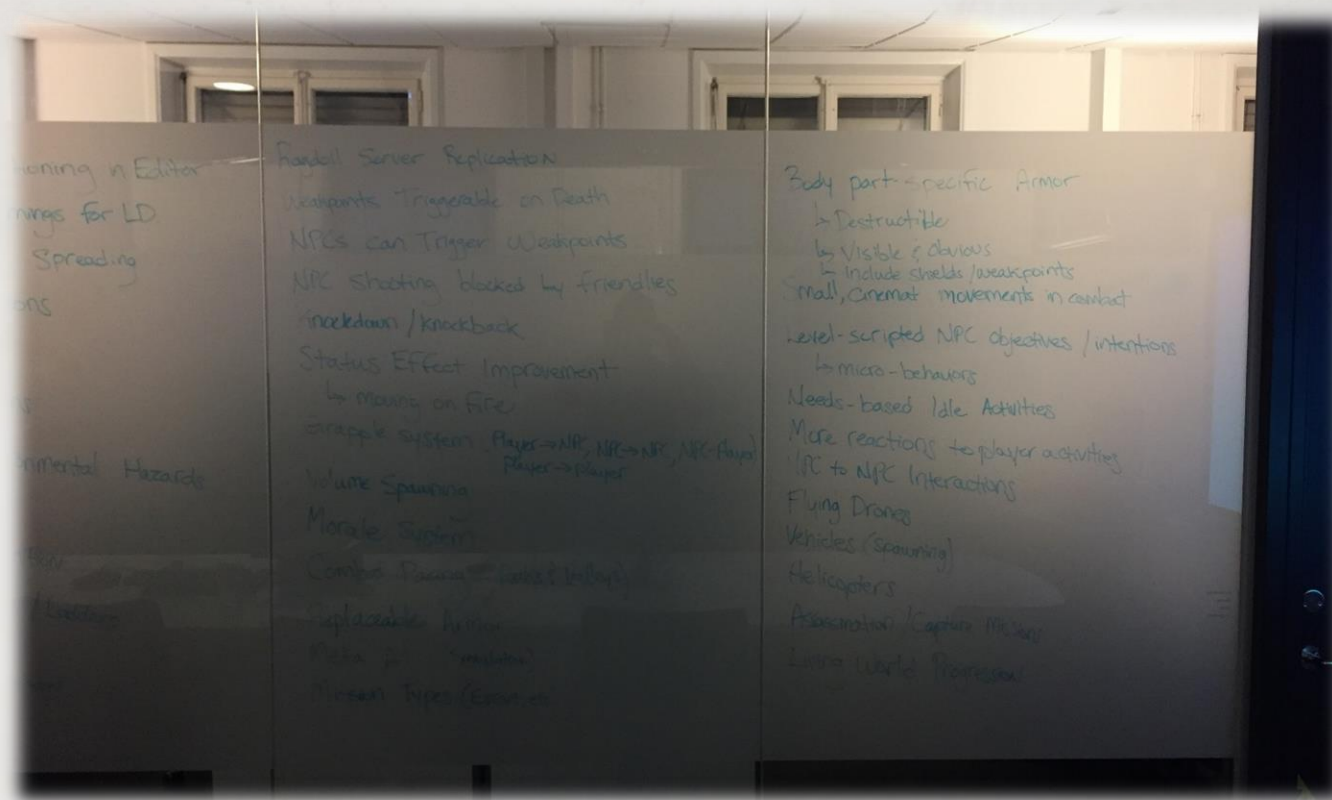
It's really truly that simple theres no other way to put it.

The Ai is terrible and easily exploitable.

Massive's idea of difficult is giving the NPC's too much toughness, and making them aimbots.

# AI Team Retrospective

- Focused on gameplay-only
- Celebrate what we did well
- Critique what needed improvement
- Identify new features



The logo for Tom Clancy's The Division 2. It features a black silhouette of a soldier in a combat stance on the left. To its right, the text "TOM CLANCY'S" is in a bold, black, sans-serif font. Below this, the word "THE" is in a smaller, orange, sans-serif font. The word "DIVISION" is in a large, bold, orange, sans-serif font. To the right of "DIVISION" is a large, bold, black number "2" which is partially enclosed by a thick orange circular arc. A small registered trademark symbol (®) is located just before the "2".

# TOM CLANCY'S THE DIVISION 2

Areas of Improvement  
Planning the AI for The Division 2

# Faction Differentiation



Factions were too similar



Amplify differences between factions



# Faction Differentiation

## Faction Traits

- Aggression
- Organization
- Training
- Tech

Trait	Permutation	True Sons	Outcasts	Hyenas	Black Tusk
Aggression	Aggressive		X	X	
	Defensive	X			X
Organization	Organized	X			X
	Unorganized		X	X	X
Training	Untrained			X	
	Trained	X	X		
	Highly Trained				X
Tech	Low		X		
	Medium	X			
	High			X	
	Very High				X

# Faction Traits

## Aggression

- Aggressive
- Defensive



# Aggression

## Aggressive

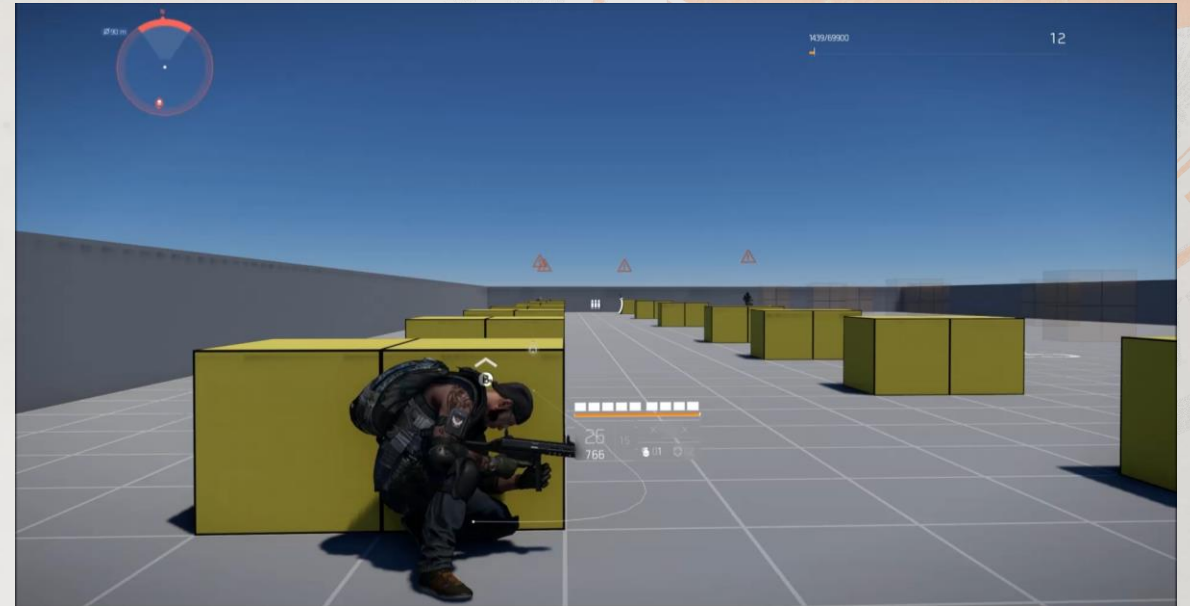
- Max Target Distance and Optimal Distance from target decreases over time
- Quicker repositioning/advancing
- Longer, uninterrupted shoot patterns
- Circle around target when within close range
- “Narrow”



# Aggression

## Defensive

- Preference to stay at optimal distance from target
- Desired distance from ally increases over time
- Repositioning less frequently
- Shorter shoot sequences that can be interrupted on damage
- “Wide”





# Faction Traits

## Organization

- Organized
- Disorganized



# Organization

## Organized

- Barks reflect hierarchy and order
- Hand signaling and other non-verbal “communication”

## Disorganized

- Barks reflect lack of hierarchy and relative disorder
- Almost no hand signaling or other non-verbal “communication”

# Faction Traits

## Training

- Untrained
- Trained
- Highly Trained



# Training

## Untrained

- No cover fire
- Very little team-ordered flanking
- Slower wind-ups
- Poor accuracy
- Slower animation transitions
- Animation style reflects little/poor training





# Training

## Trained

- Cover fire
- Occasional team-ordered flanking
- Normal wind-ups
- Normal accuracy
- Normal animation transitions
- Animation style reflects moderate training



# Training

## Highly Trained

- Cover fire
- Aggressive team-ordered and individual flanking
- Slightly faster wind-ups
- Slightly improved accuracy
- Quicker animation transitions
- Animation style reflects elite training



# Faction Traits

## Tech

- Low
  - Melee weapons, homemade explosives, etc.
- Medium
  - Standard weaponry
- High
  - Remote controlled bombs, grenade launchers, ballistic shields, etc.
- Very High
  - Flying drones, mini tanks, airburst grenades, etc.

# Faction Traits Example: True Sons





# Faction Traits Example: Outcasts



# Faction Traits Example: Hyenas



# Faction Traits Example: Black Tusk



# Faction Hierarchy



Not all factions relevant at endgame



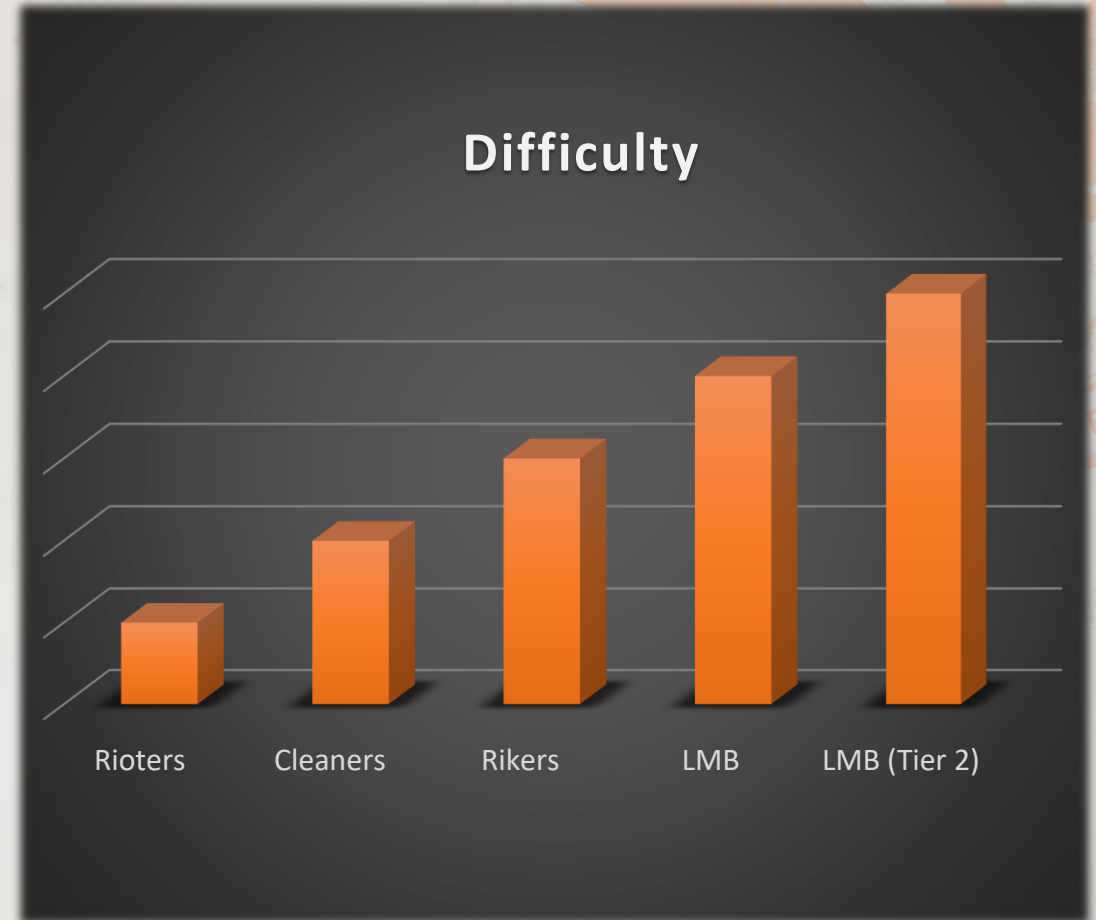
Make all factions relevant at endgame



# Faction Trait Balance



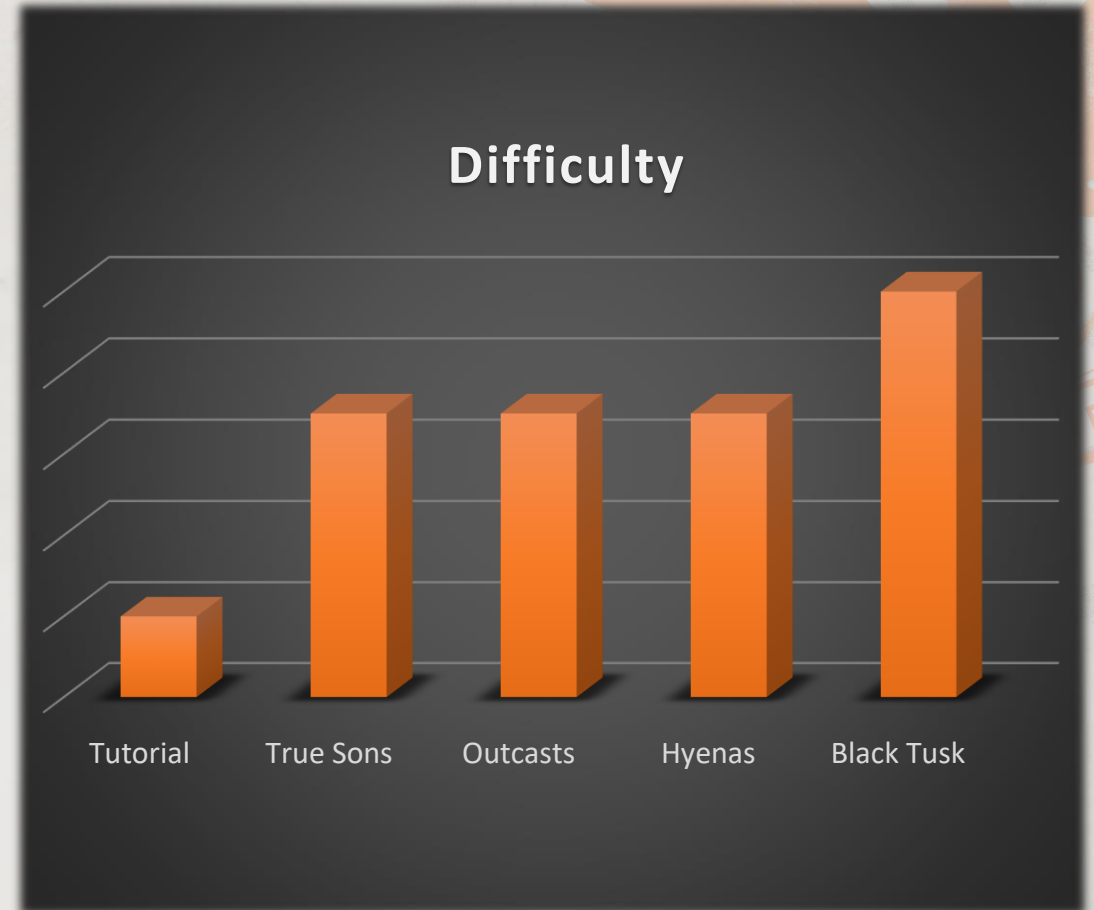
- Each faction was a tier of difficulty
- Good for teaching the mechanics and continually challenging the player
- Not very useful for endgame



# Faction Trait Balance



- All major factions used at Endgame
- Endgame-only and highest challenge faction for cadenced events
- Tutorial-specific hidden “faction”
  - Used in first several encounters and mission
  - Less complexity and allow ample learning time for player
  - Removed from game afterwards



# Archetype Differentiation



Archetypes in different factions were too similar to one another



Keep core archetype challenges, but differentiation as much as possible

# Archetype Differentiation

- Deconstruct core gameplay challenges
  - Target Prioritization
  - Target Ordering
  - Repositioning
  - Positioning
  - Exposure Minimization
  - Endurance
- 64 completely unique behaviors
  - Difficult to make them all different



# Sniper Comparison



## True Sons

- Long wind-up with signaling
- High impact damage
- Marksman Rifle
- Can go prone

## Outcasts

- Long wind-up with signaling
- High impact damage
- Bow with Explosive Arrow
- Projectile arrows
- Fused damage AoE



# Sniper Comparison: True Sons



# Sniper Comparison: Outcasts





# Behavior Maintenance



Behavior Trees difficult to maintain  
due to large number



Share more elements of Behavior  
Trees for multiple NPCs

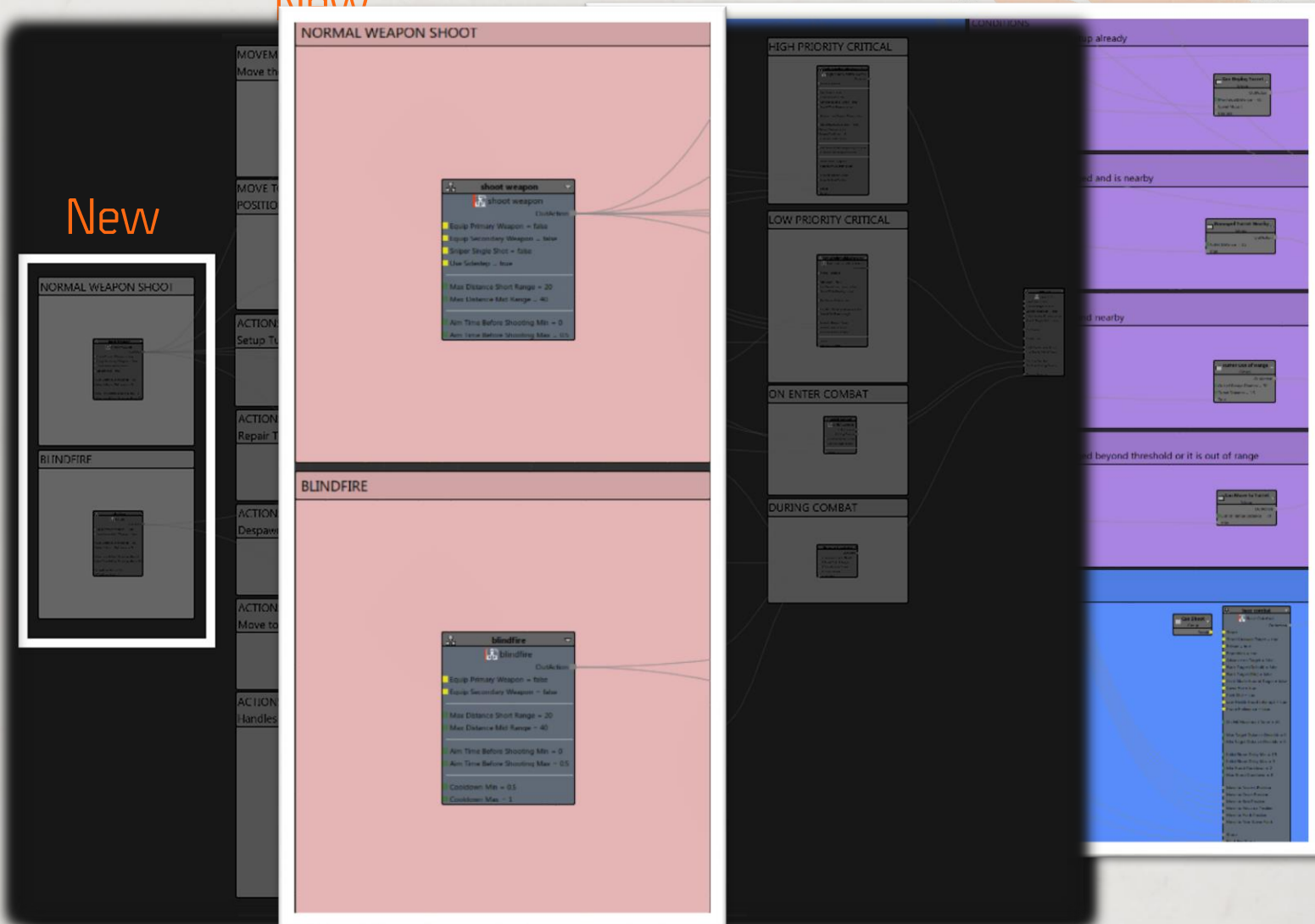


# Behavior Maintenance

## Refining the Behavior Tree

- Shared most elements of behaviors
- Re-engineered Behavior Trees (a bit) to share:
  - Movement
  - Shooting

# Behavior Tree Example



# Hit Reactions



Hit reactions unrewarding



Add more pronounced hit reactions

# Hit Reactions

## Improvements

- Hit reactions concepts kept, but pronounced as much as possible
  - Flinches
    - Client-side (cosmetic)
    - Does not affect gameplay
  - Stagger
    - Server-side
    - Affects gameplay
- Body part-specific death animations





# Aim Challenge



Not enough skill required to hit enemies



Make enemies more difficult to hit

# Aim Challenge

## Dodging and Ducking

- Attempting to avoid the player's shots
- Client-side
  - After being shot at for a brief duration
  - Uses larger, simple "Detection" hitbox



# Aim Challenge

## Destructible Armor Plating

- Better contextualization of high-health enemies
- Body-part specific
  - Head
  - Torso
  - Each arm
  - Each leg
- Additional tactics/aim challenge
- Satisfying!





# Destructible Armor Plating Example





# Aim Challenge

## Weakpoints

- Weakpoints added to most enemies
  - Additional aim challenge
  - Effects/types diversified
  - Tied to a particular NPC ability
    - Destroying weakpoint removes ability



# Combat Difficulty



Did not challenge player's third-person shooter skills enough



Increase shooter challenge of PvE combat

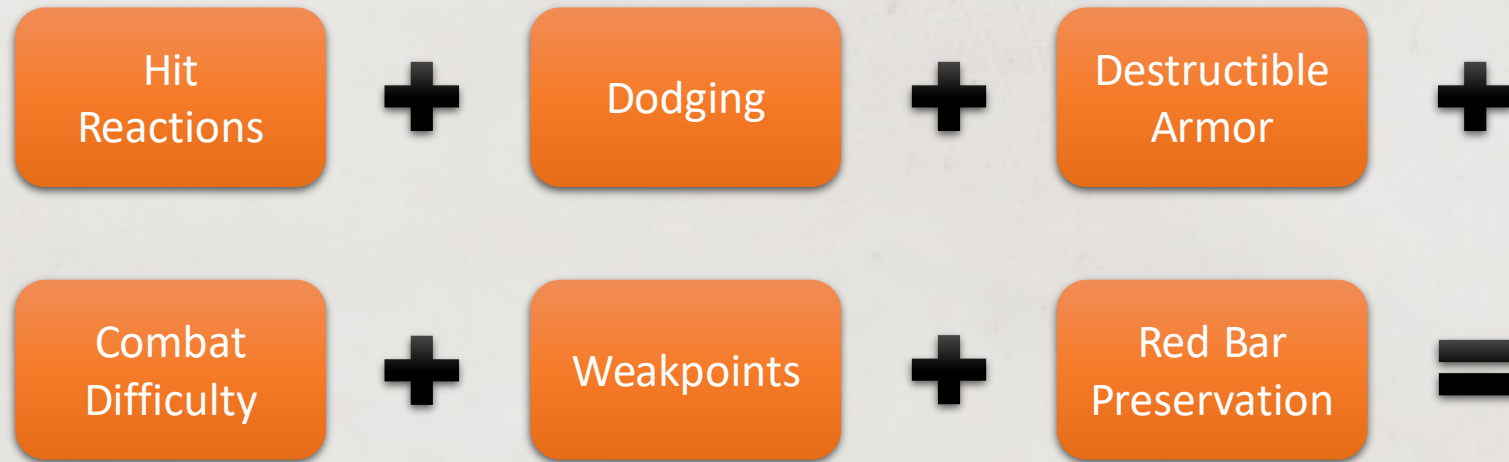
# Combat Difficulty

## Increasing Difficulty

- Increased overall challenge of NPCs in combat and decision-making
- Post-launch references:
  - Hunter AI from Survival
  - Legendary difficulty LMB archetypes AI



# Addressing “Bullet Sponge”



Faster Time to Kill!



A cinematic scene from the game 'The Division 2' showing three tactical agents from behind, standing in a dark, debris-filled opening. They are looking out onto a bright, hazy Washington D.C. skyline. The U.S. Capitol dome is on the left, the Washington Monument is in the center, and the Reflecting Pool is in the foreground. The sky is filled with dark, dramatic clouds and a few birds are flying. The agents are wearing tactical gear, including vests, helmets, and carrying various firearms.

# TOM CLANCY'S THE DIVISION 2

Philip Dunstan  
Lead AI Programmer

# Technology Goals for The Division 2

1. Conservative changes to core behavior systems
2. Fix the largest time sinks from The Division
3. Iterate on systems for new game features
4. Significant improvements to a handful of particular systems



# Contextualizing NPCs

What are the NPCs' motivations?

What information do they have about their environment?

How do we use that information to improve the player experience?

# NPC Contextualization in The Division



# Sequences

*Interruptible animation with multiple NPCs*



# Sequences

## *Interruptible animation with multiple NPCs*

### Advantages

- NPCs look tightly connected to their environment
- Direct link to level designer and narrative intentions

### Disadvantages

- Lack of replayability
- Lack of variety
- No context for behaviors when interrupted



# Roaming NPCs

*Groups of NPCs following a path*



Footage captured from Tom Clancy's The Division

# Roaming NPCs

*Groups of NPCs following a path*

## Advantages

- Adds variation
- Sets up emergent behaviors

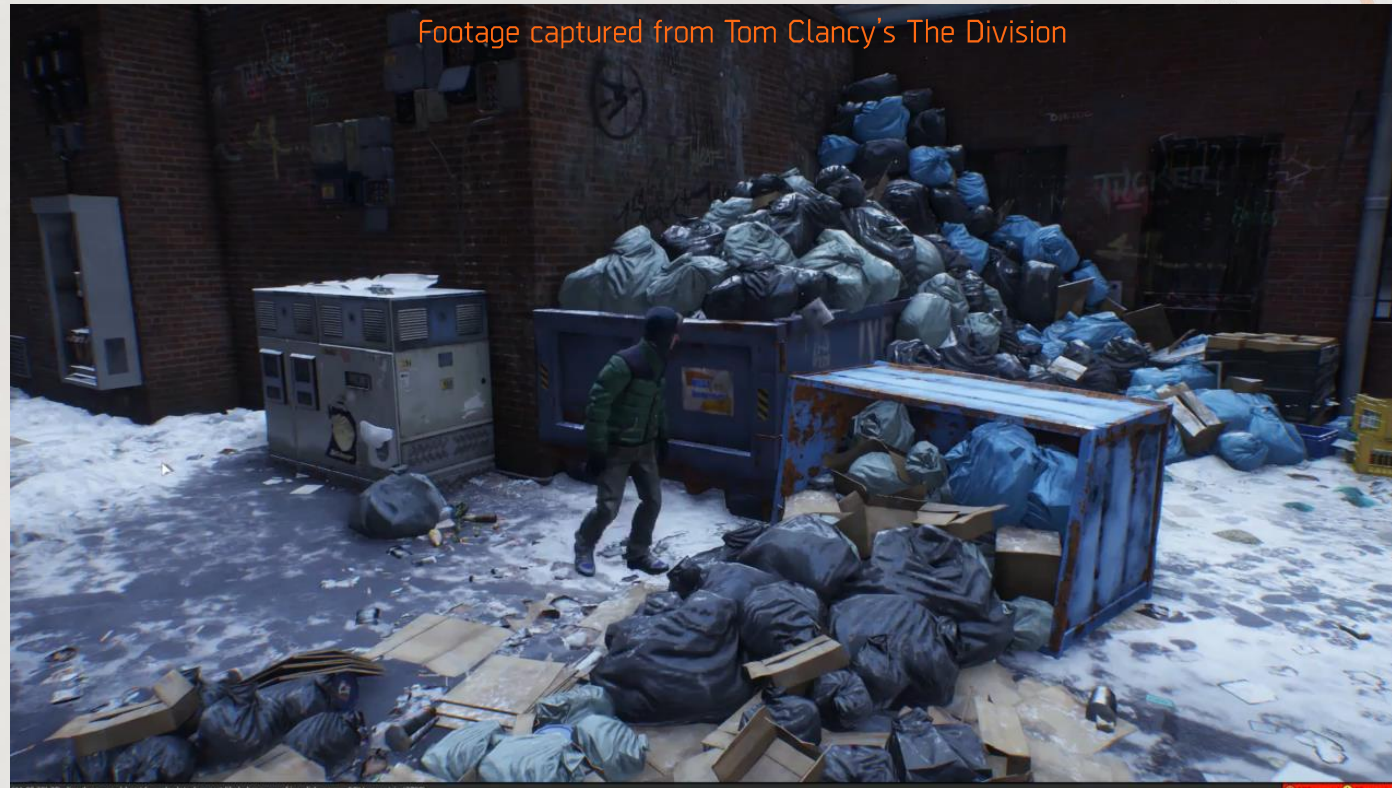
## Disadvantages

- No context for behaviors when interrupted



# Contextual Action Points (CAPs)

*Animations placed on Props*



# Contextual Action Points (CAPs)

*Animations placed on Props*

## Advantages

- More variation than a single sequence

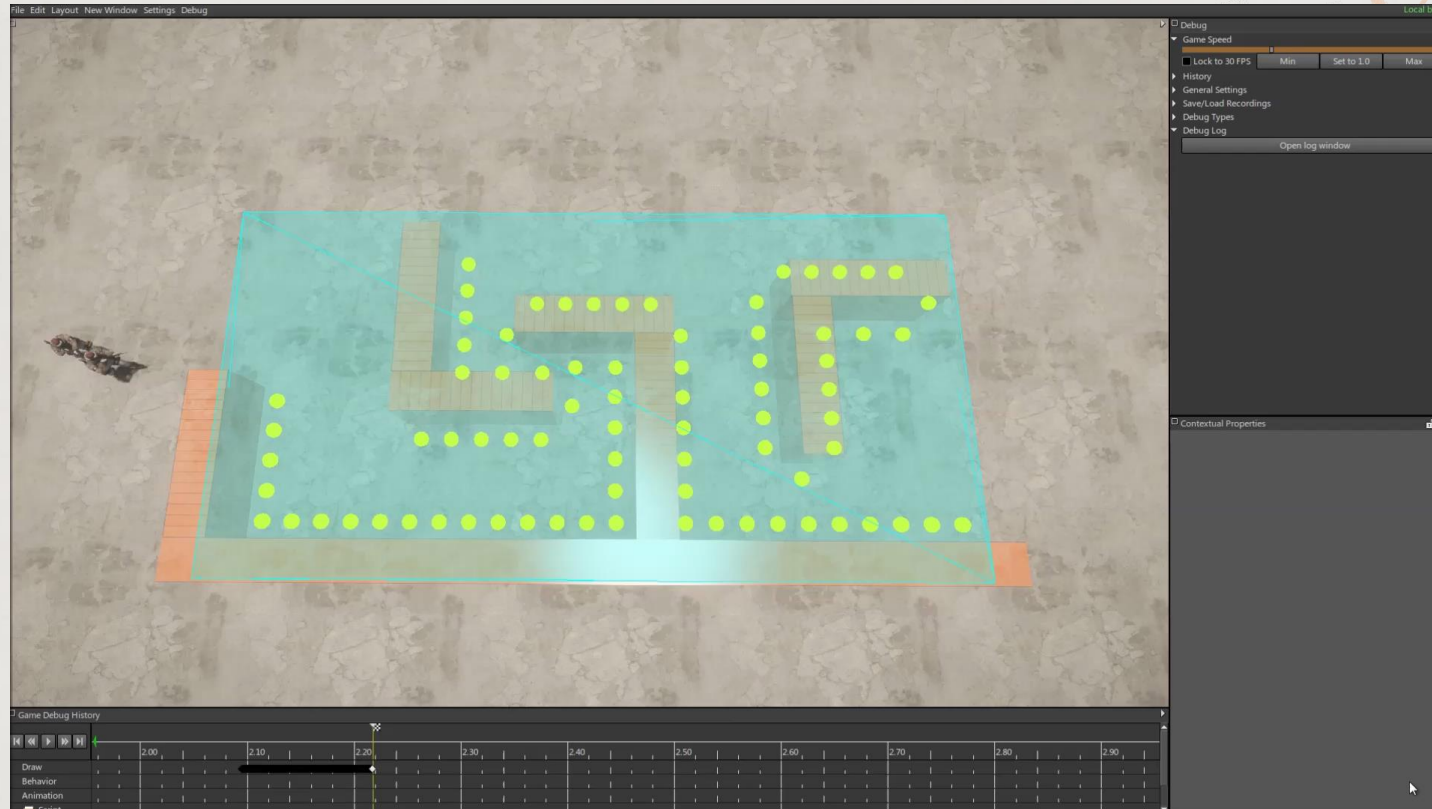
## Disadvantages

- Lacks coherency
- No context for behaviors when interrupted



# NPC Objectives

## *Scripted Objective for an NPC Group*



# NPC Objectives

## *Scripted Objective for an NPC Group*

### Advantages

- Modifies systemic behaviors

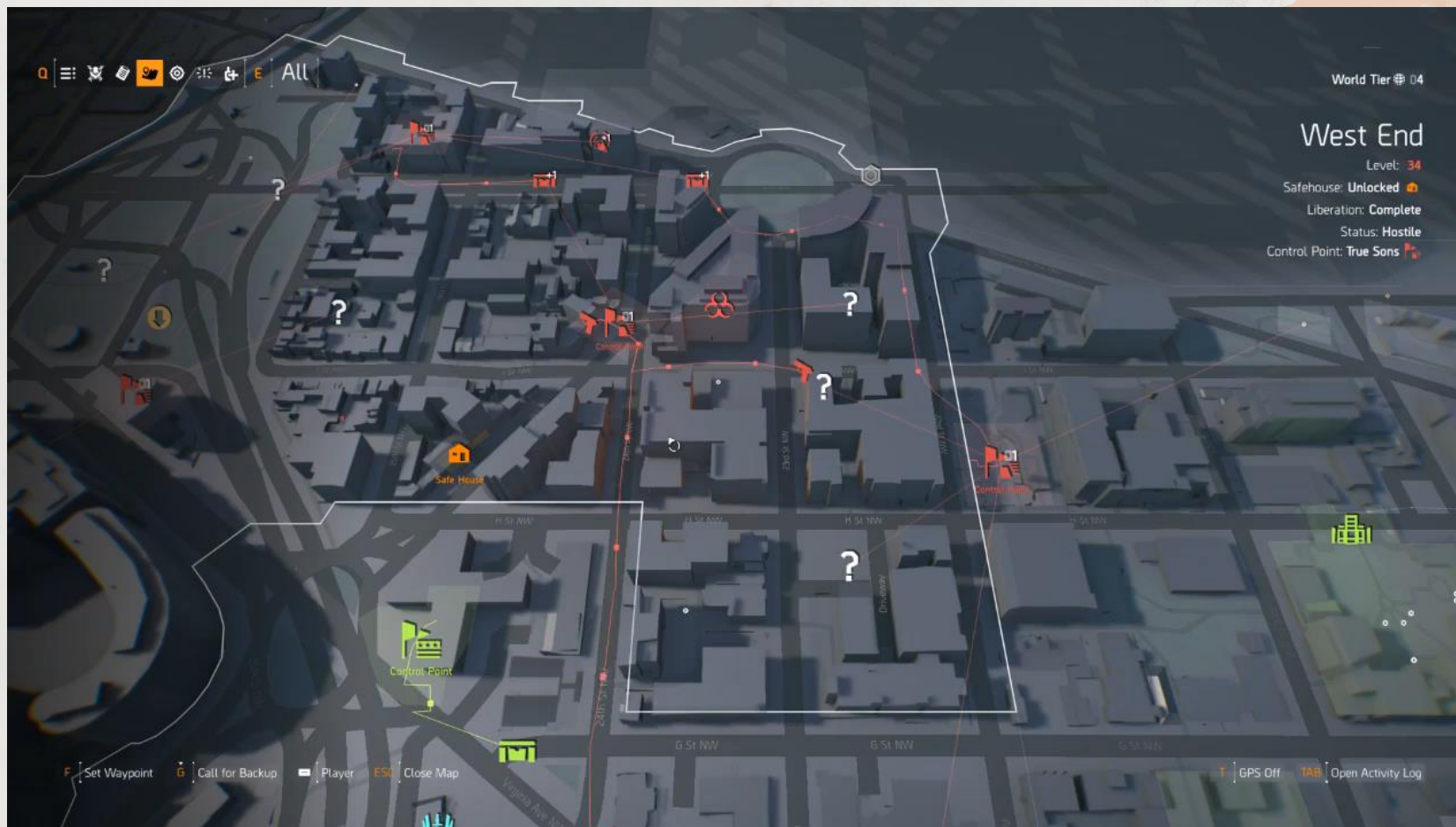
### Disadvantages

- Limited to combat scenarios
- No motivation for individuals



# Providing Purpose in The Division 2

# Living World Activities

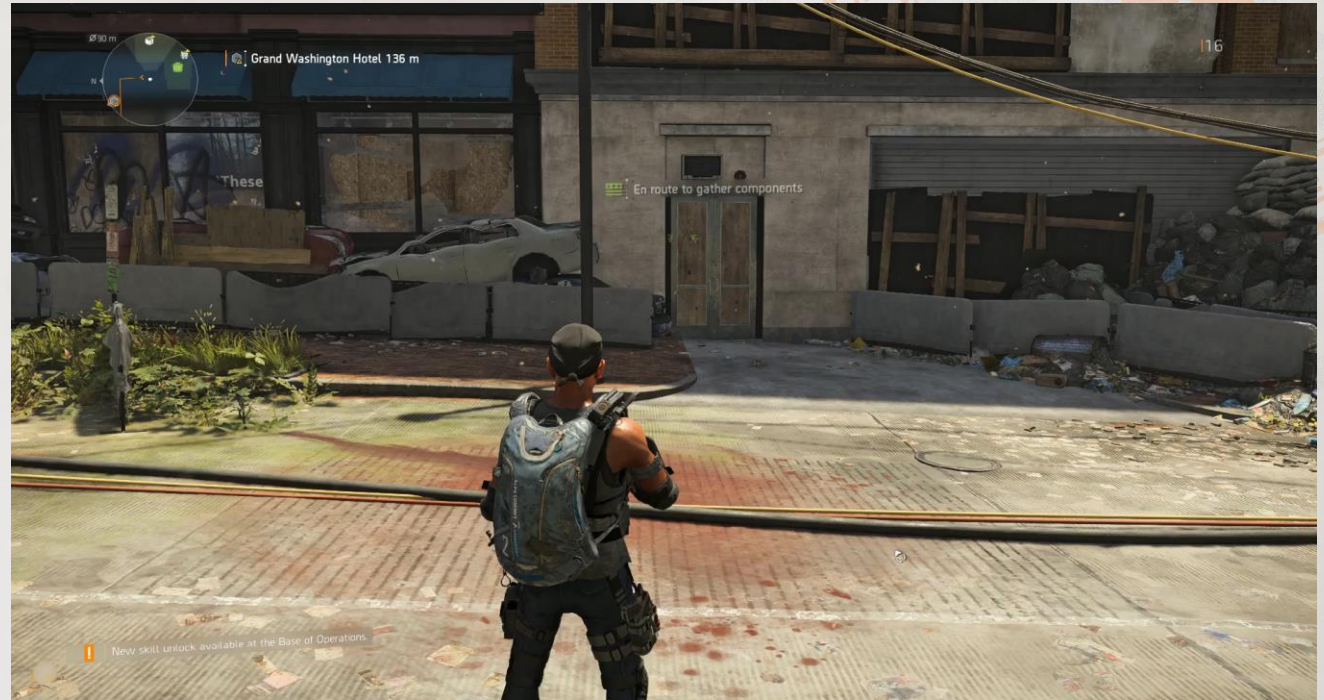




# Living World Activities

*Activities are built as a sequence of NPC Objectives*

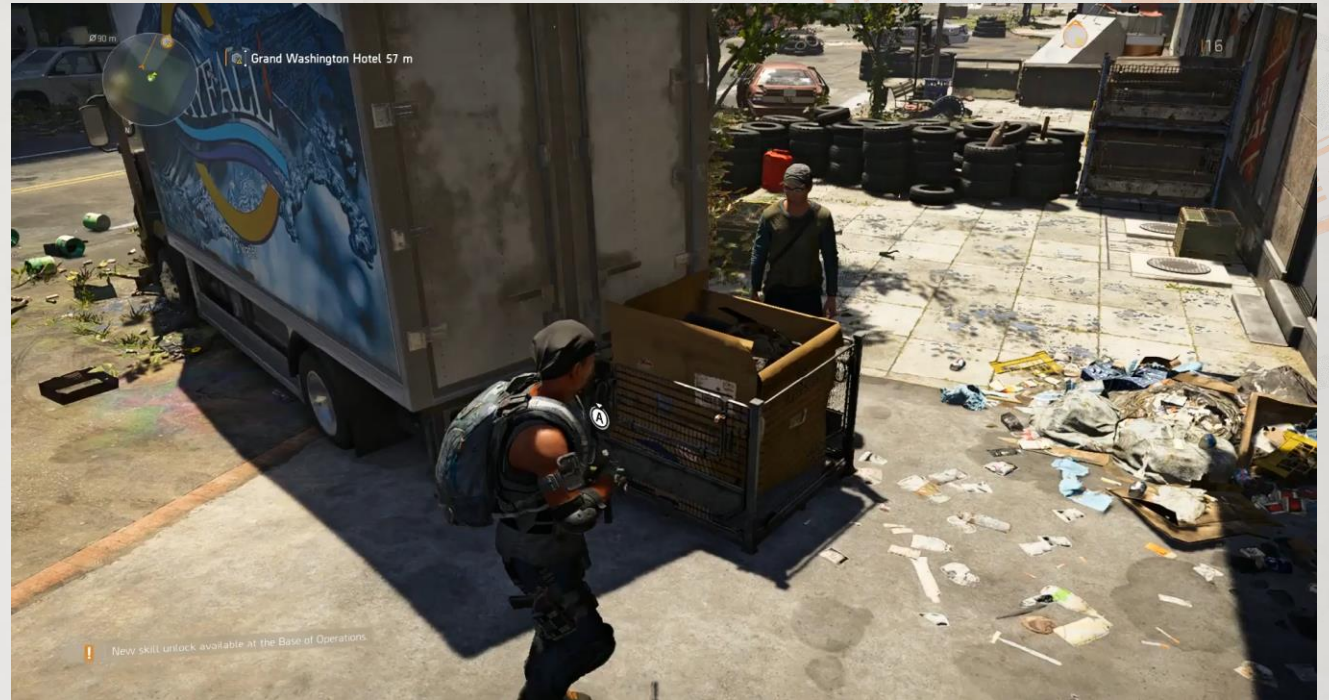
- e.g. Gather Resources Activity
  - Travel Through Open World
  - Approach Site
  - Gather Resources
  - Travel
  - Despawn



# Living World Activities

*Activities are built as a sequence of NPC Objectives*

- e.g. Gather Resources Activity
  - Travel Through Open World
  - Approach Site
  - Gather Resources
  - Travel
  - Despawn





# Living World Activities

*Activities are built as a sequence of NPC Objectives*

- e.g. Gather Resources Activity
  - Travel Through Open World
  - Approach Site
  - Gather Resources
  - Travel
  - Despawn



# NPC Duty

*A role in an activity*

Special role – assigned at the start of an activity

e.g. Resource Gatherer

Unscripted role – assigned ad hoc during an objective

e.g. Overwatch, Guard, Mounted Weapon

# NPC Posts

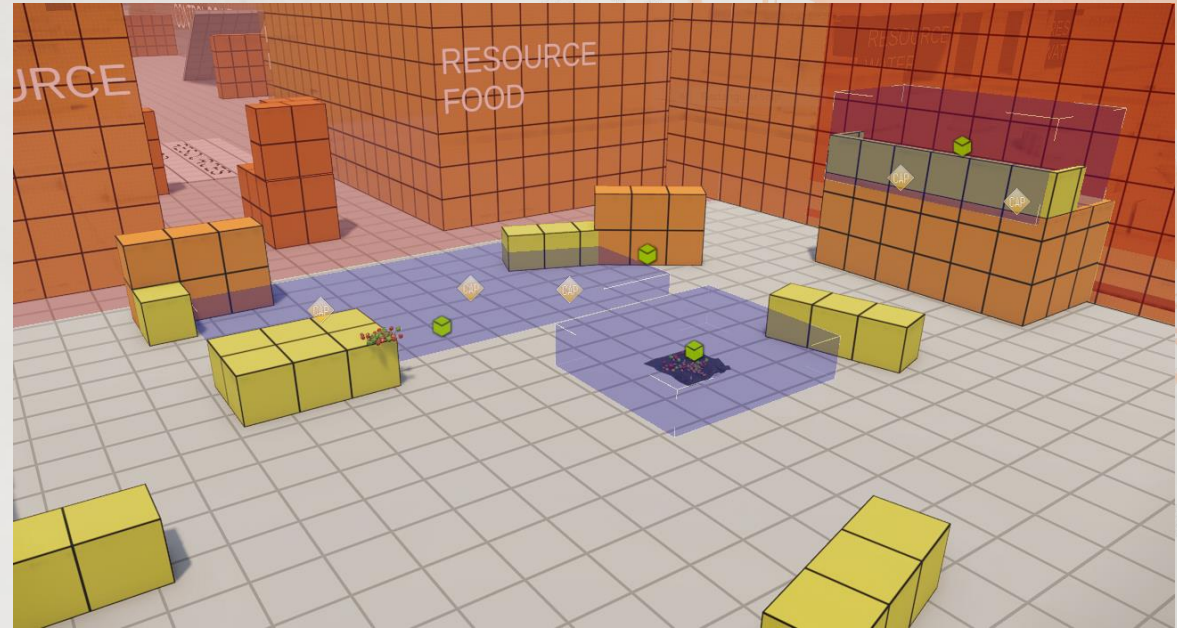
*A location where an NPC can perform a duty*

- Objectives link to all Posts that are available
  - Volume - gather resources duty, overwatch or guard duty
  - Waypoint Path - patrol duty
  - Mounted Weapon prop - mounted weapon duty
- NPC Posts specify
  - the supported NPC Duties
  - the location that Duty can be performed
  - the minimum number of NPCs required



# NPC Assignment

- Assign special duties for the activity
- Whenever the objective changes
  - Try to assign NPCs that already have an NPC Duty
  - Fill any mandatory NPC Posts
  - Assign NPCs to unfulfilled Posts.



This is an Optimization problem!



# NPC Posts During Combat

- Maintain continuity between Out of Combat and Combat behaviors
- NPC Posts specify if they should be used during combat
- Behavior can release an NPC from a Post
- Continuity also between Combat and Out of Combat behaviors

# Takeaways from Duties and Posts

## Advantages

- Provides group and individual purpose
- Connects information from Level Designer to the systemic behaviors
- Continuity between Out of Combat and Combat behaviors

## Disadvantages

- The interaction between NPC Duties and NPC Posts can be confusing

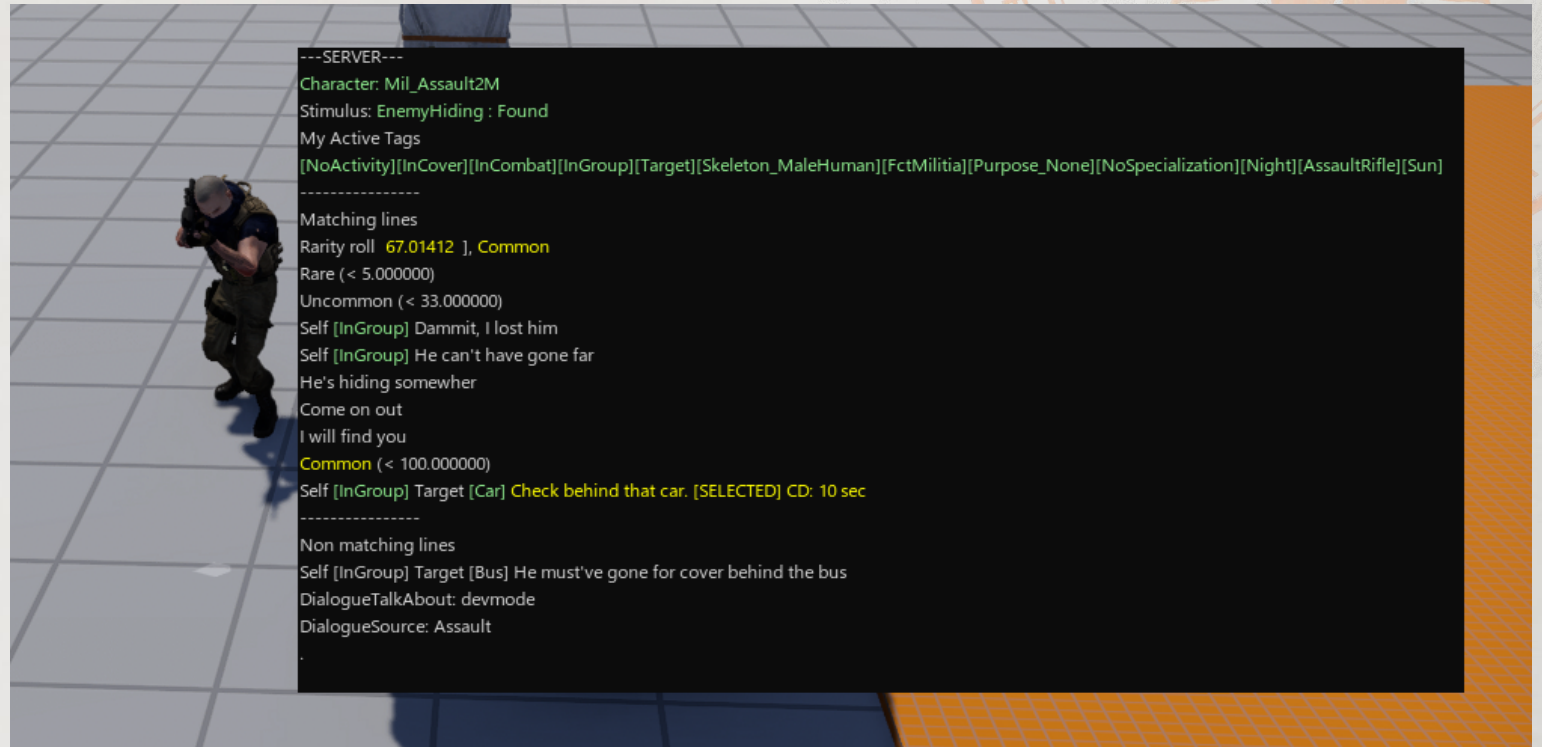


# Contextualizing the NPCs



# Tag Matching for Barks

- AI-driven Dynamic Dialog through Fuzzy Pattern Matching  
Elan Ruskin GDC 2012
- We chose tag matching instead of arbitrary rules



# Why Tag Matching?

## Advantages

- Easy to understand by designers
- Significantly easier to author and debug
- Inherently fast

## Disadvantages

- Rules can be more powerful
- Might need very specific tags

# Tags Details

- Tags on an Agent (Player or NPC)
  - *archetype, faction, activity, solo/group, gear*
- Each agent also inherits tag from their environment
  - From the prop when in cover = *cover\_type*
  - From volumes in the world = *landmarks*
  - From the world = *time\_of\_day, weather*



# Requesting a Bark line

*Behavior requests a bark with a stimulus*

- Match lines based on self agent tags and target agent tags
  - Choose randomly from the lines with the most matching tags

Character	Section 3	Master Text	Group	Tag_Target_1 ↓	Conversation Response
Bla_Sniper3F	FlankEnemy	Making a move from behind the bus!	Group_InGroup	Cover_Bus	CoverAllyRespond
Bla_Assault6M	FlankEnemy	Going to surprise them from behind the bus!	Group_InGroup	Cover_Bus	CoverAllyRespond
Bla_Assault6M	FlankEnemy	Sneaking up on them from behind the barrier!	Group_InGroup	Cover_Barrier	CoverAllyRespond
Bla_Thrower3F	FlankEnemy	Sneaking up on them from the ambulance!	Group_InGroup	Cover_Ambulance	CoverAllyRespond
Bla_Medic1F	FlankEnemy	Sneaking up on them from the ambulance!	Group_InGroup	Cover_Ambulance	CoverAllyRespond
Bla_Controller1F	FlankEnemy	Put 'em under pressure!	Group_InGroup		CoverAllyRespond
Bla_Shield2M	FlankEnemy	Moving on their position!	Group_InGroup		CoverAllyRespond
Bla_Assault3M	FlankEnemy	Gonna take 'em by surprise!	Group_InGroup		CoverAllyRespond

# Takeaways from Tag Matching for Barks and CAPs

## Advantages

- Easy to create tools for authoring and debugging
- Easier to understand
- Easy to reuse for other features
- Inherently fast

## Disadvantages

- “most matching tags” policy is not sufficient on its own
- Bark lines with a narrow set of tags are cool, but rarely heard
- Tags were miss-used as an information store

# Takeaways

- Addition of clear Faction Traits
- Better Archetype Differentiation
- Shorter Time to Kill
- Improved NPC Contextualization in the Open World



A promotional image for the video game Tom Clancy's The Division 2. Three agents in tactical gear are seen from behind, looking out over a city with the US Capitol dome in the distance. The sky is filled with smoke and birds. The game's title is prominently displayed in the upper right.

# TOM CLANCY'S THE DIVISION 2

**Special Thanks to the teams at  
Massive Entertainment and Ubisoft Anncy**



# THE UBISOFT LOUNGE / GDC 2019

WEST HALL 2ND FLOOR

	MONDAY, MARCH 18	TUESDAY, MARCH 19	WEDNESDAY, MARCH 20	THURSDAY, MARCH 21	FRIDAY, MARCH 22
10.30am				<b>WORLDS AND WORDS: LEVEL DESIGN AND NARRATIVE IN CAHOOTS</b> Kaitlin Tremblay & Justin Schram	
11am		11.30	11.30	11.30	<b>HOW TO GROW AS A GAME DESIGNER – Q&amp;A WITH GAME DIRECTOR</b> Richard Carrillo
12pm		<b>PERSISTENT WORLD CHANGES IN SHARED ONLINE UNIVERSES – A SNOWDROP TECHNOLOGY FOR TOM CLANCY'S THE DIVISION 2</b> Frieder Erdmann	<b>UBISOFT LA FORGE – 3 YEARS OF LIGHTNING IN MANY BOTTLES</b> Yves Jacquier & Olivier Pomarez	<b>THE DIVISION 2: A WORLD OF MATERIAL</b> Jon Lauf & Andrew Dixon	
1pm		12.30	12.30		
2pm					
2.30pm	2.30	<b>NON-LINEAR CINEMATIC DIALOGUES: A TECHNICAL PRIMER</b> François Paradis	<b>TEN TOOLS TIPS: HOW UBISOFT USES HUMAN BIOLOGY TO DESIGN BETTER TOOLS</b> David Lightbown	<b>BEHIND THE NPCs OF TOM CLANCY'S THE DIVISION 2 – AN AI TOOLS LIVE DEMO</b> Philip Dunstan & Drew Rechner	
3pm	<b>TRANSFORMING FROM PEER-TO-PEER TO DEDICATED SERVERS ON A LIVE GAME – HOW CONNECTIVITY WAS FIXED ON FOR HONOR</b> Laurent Chouinard				
3.30pm	3.30	3.30	3.30	3.30	
4pm		<b>ASSASSIN'S CREED ODYSSEY – CREATING IMMERSIVE AUDIO FOR THE WORLD OF ANCIENT GREECE</b> Lydia Andrew & Simon Paris	<b>DISCOVER SNOWDROP, AN ENGINE THAT EMPOWERS OUR DEVELOPMENT TEAMS – PANEL WITH EXPERTS</b> Ola Holmdahl, Frieder Erdmann, Hiro Kobota & Michael Wasilewski	<b>CLOUD GAMING: A GLIMPSE INTO THE FUTURE</b> Carl Dionne	
5pm		4.30	4.30	4.15	
6pm			<b>UBISOFT'S EXPERIENCE DEVELOPING WITH VULKAN</b> Jean-Noé Morissette	<b>THE CUTTING EDGE: ASSASSIN'S CREED ODYSSEY ON PROJECT STREAM</b> Marc Parenteau & Narimane Nabahi	

This planning is subject to change. For the latest updates, head to the Ubisoft Lounge or to [blog.ubi.com](http://blog.ubi.com)



# ARE YOU READY TO CREATE THE UNKNOWN?

[jobs.ubisoft.com](https://jobs.ubisoft.com)

**LEARN MORE AT OUR BOOTH!**

WEST HALL - FLOOR 2



UBISOFT