GDC | March 20-24, 2023
San Francisco, CA

# Testing with Building Blocks

## A Modular Approach to Quality Assurance

Chris Rios (he/him) – Test Lead @ Bungie

#GDC23

# Who am I?

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- Involved in activities and player rewards testing

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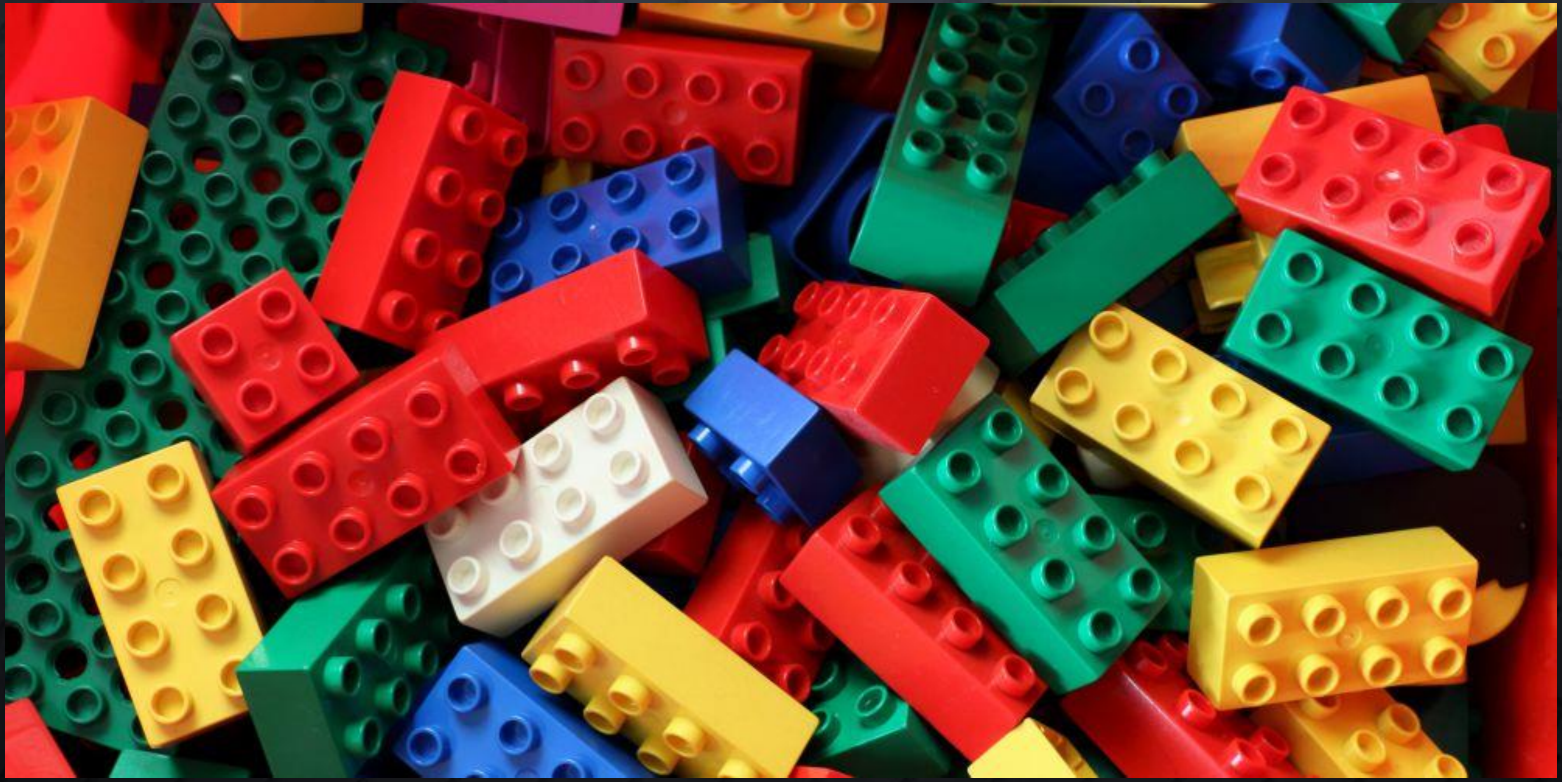
- Systems are often complex.
- Difficult to cost bespoke systems early on.
- Features are always changing.
- Undocumented knowledge can be difficult to share.

# So, what can we do to address these pain points?

# Let’s make it fun and impactful – with Building Blocks!



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- A creative mindset to ***discover***
- A way to ***interact*** with systems
- A way to ***create*** use cases
- …all the things we use building blocks for!

# How to Use Building Blocks for Testing

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# Implementing a Building Blocks Testing Approach

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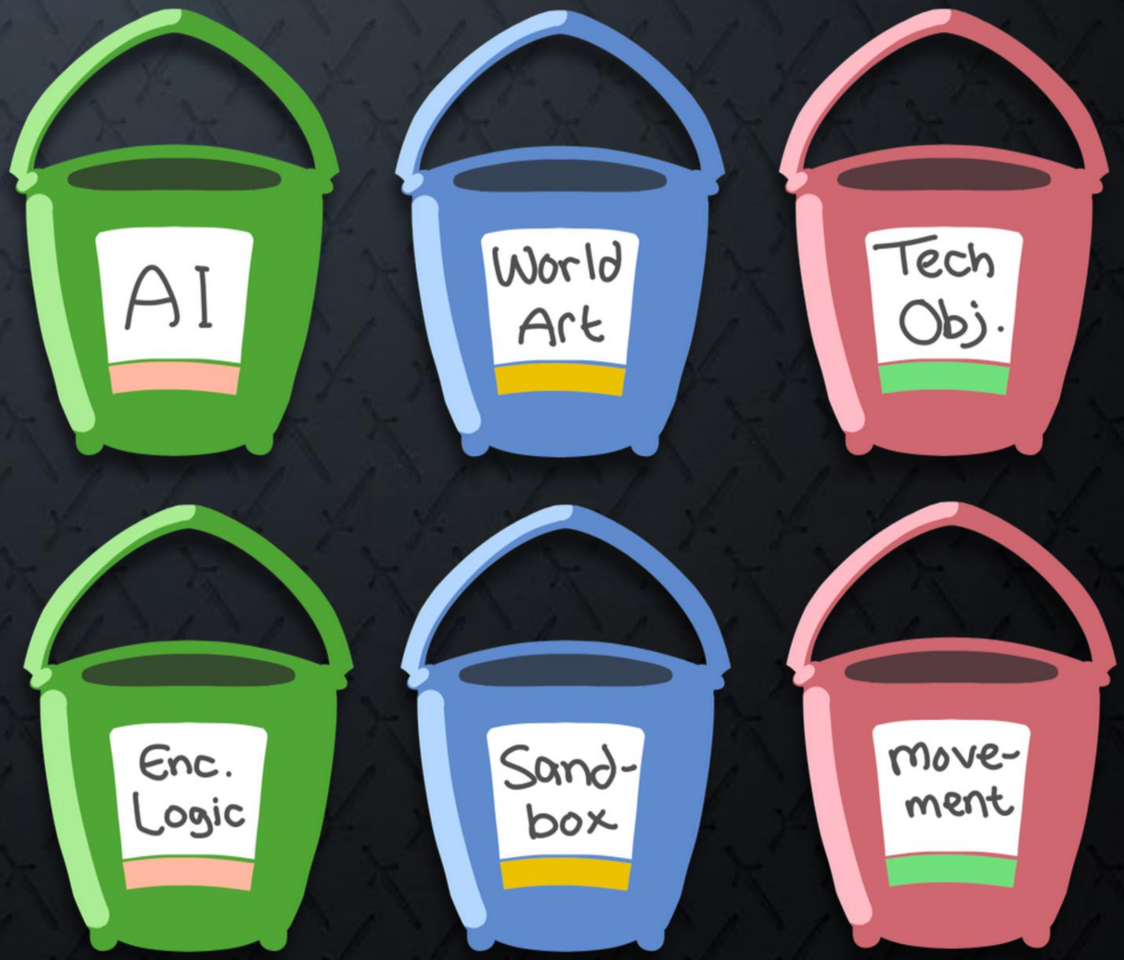

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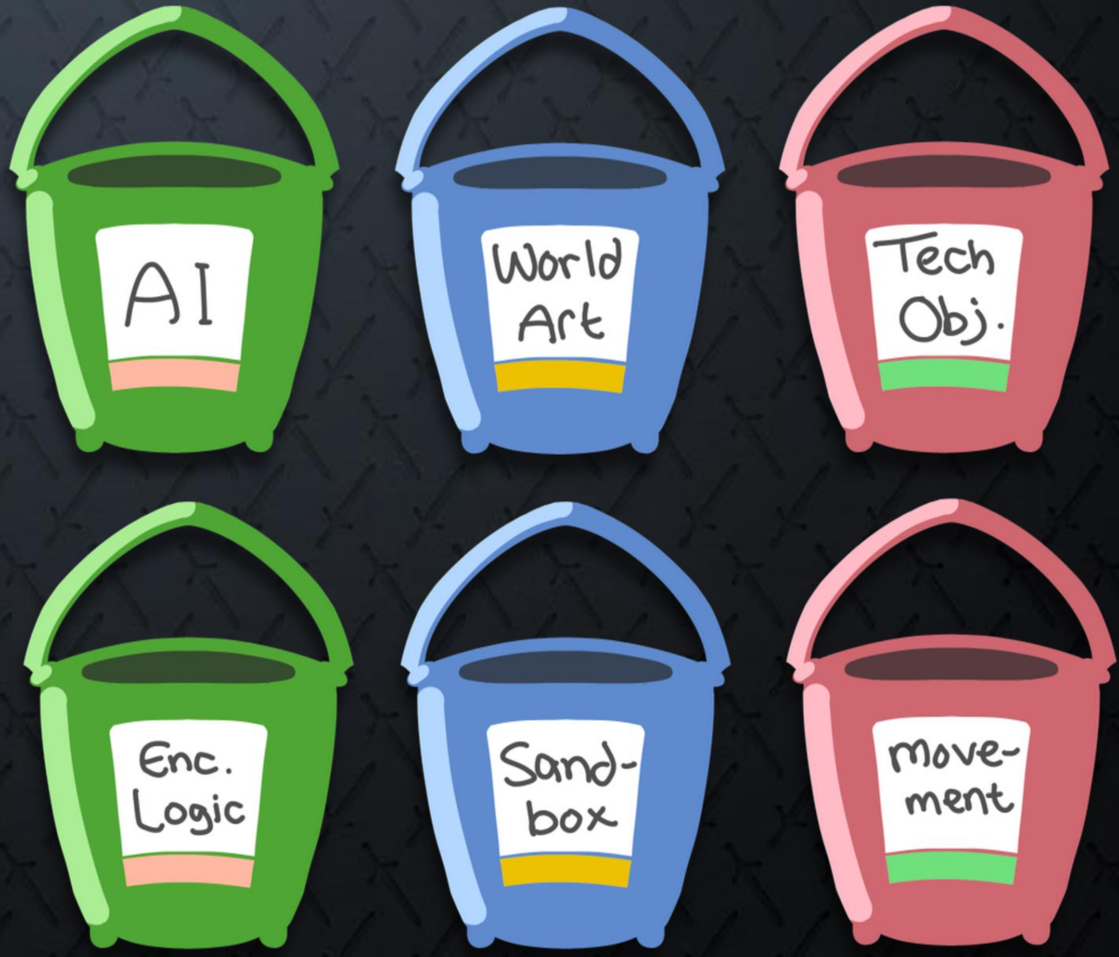

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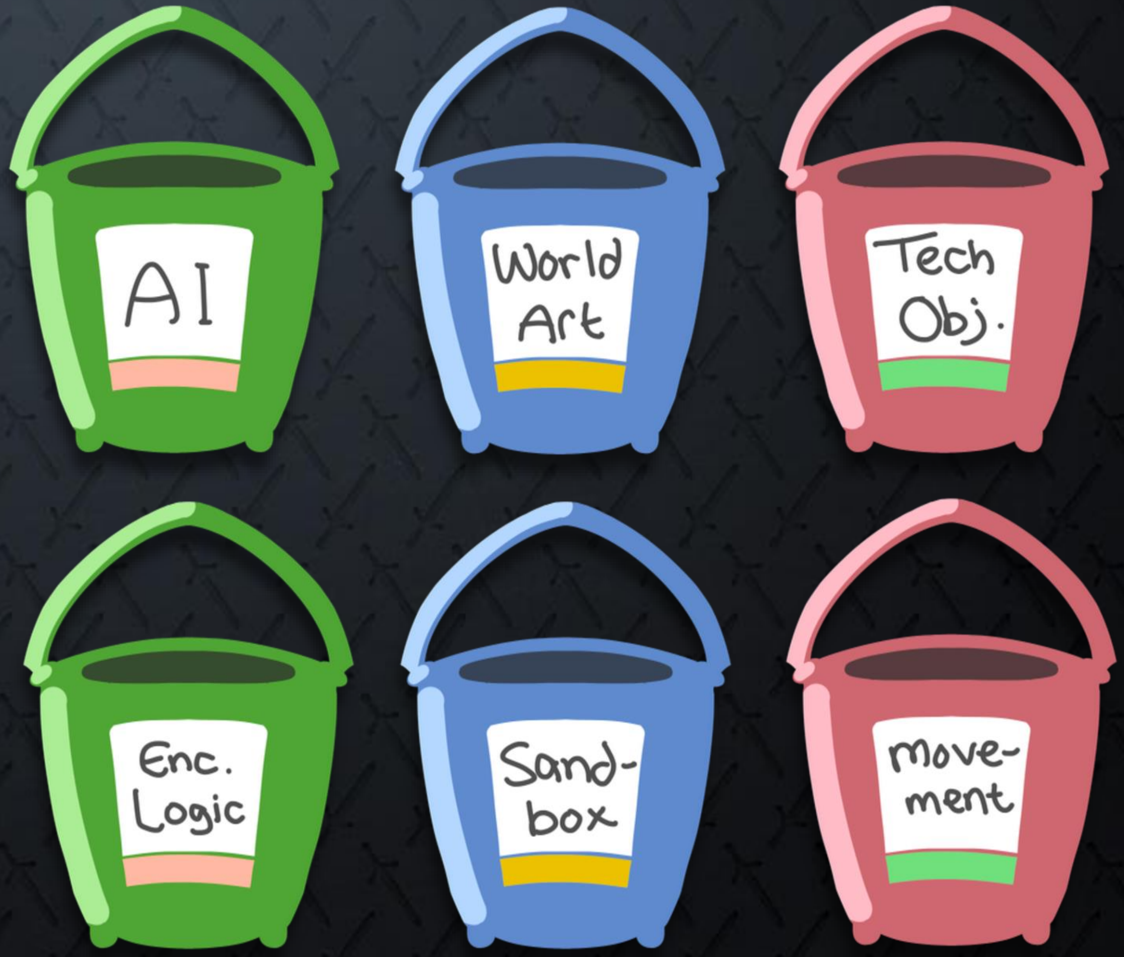

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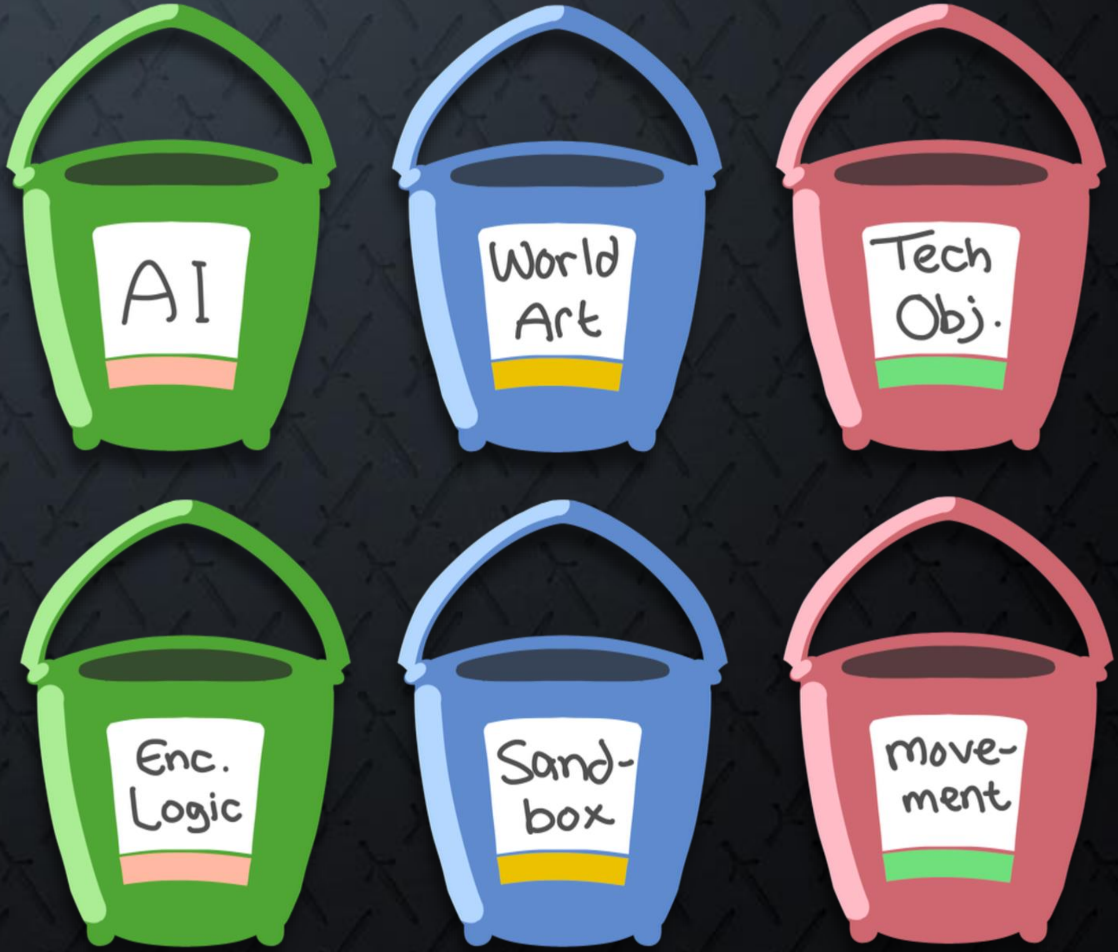

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# Implementing a Building Blocks Testing Approach

**Step 2 - CREATE** Your Building Blocks

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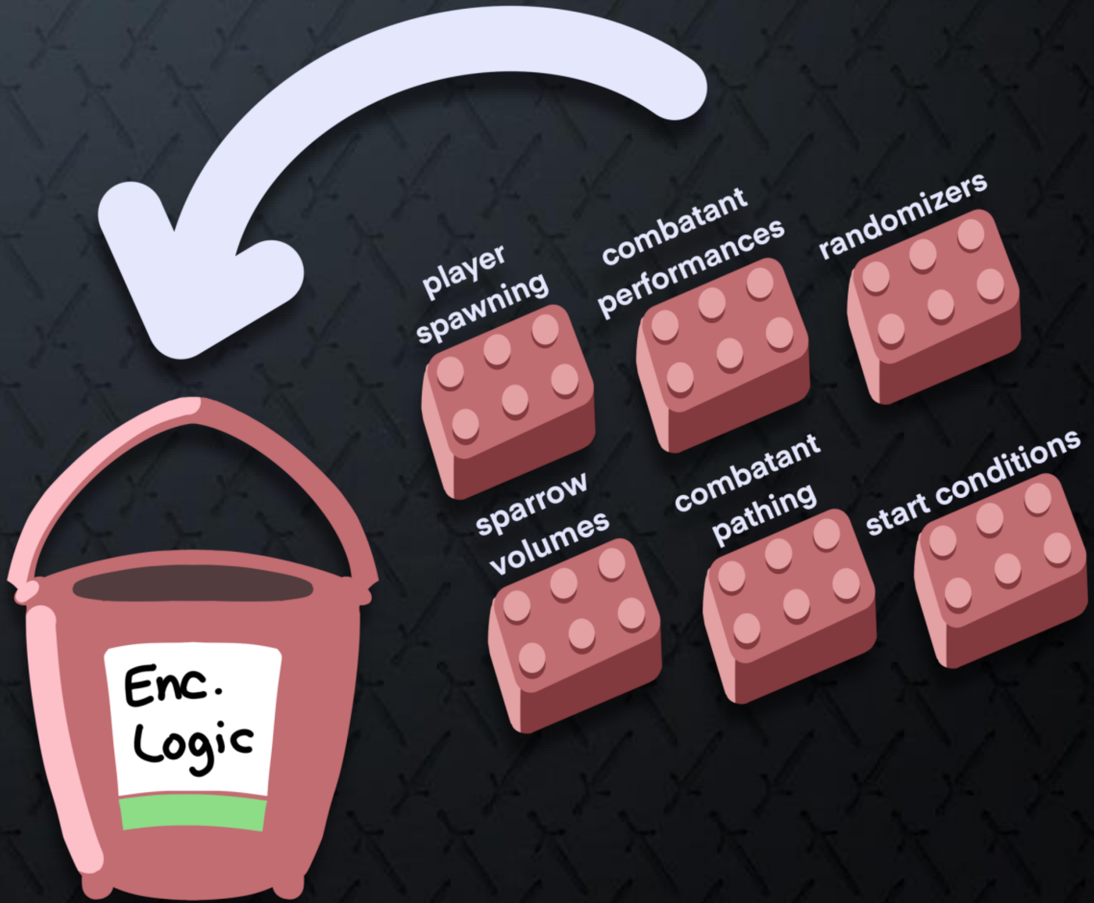

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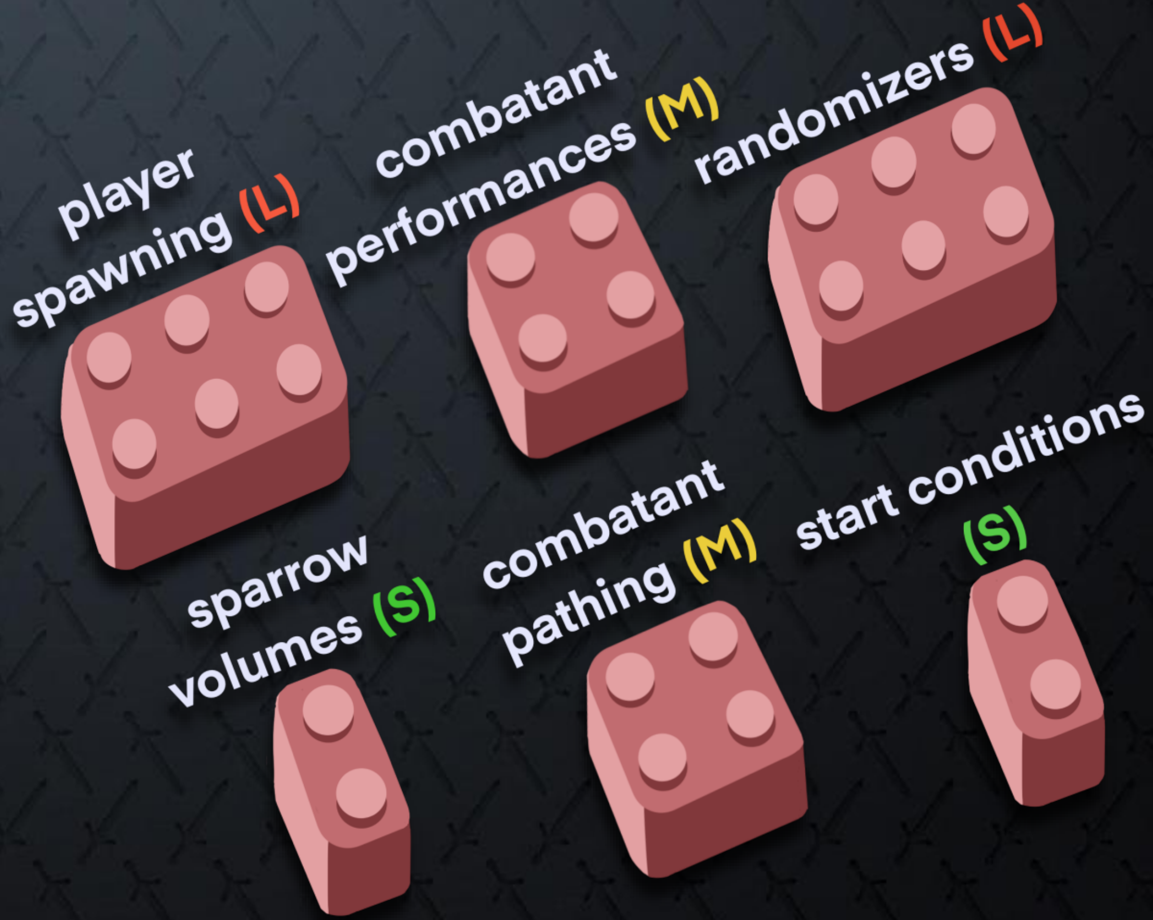

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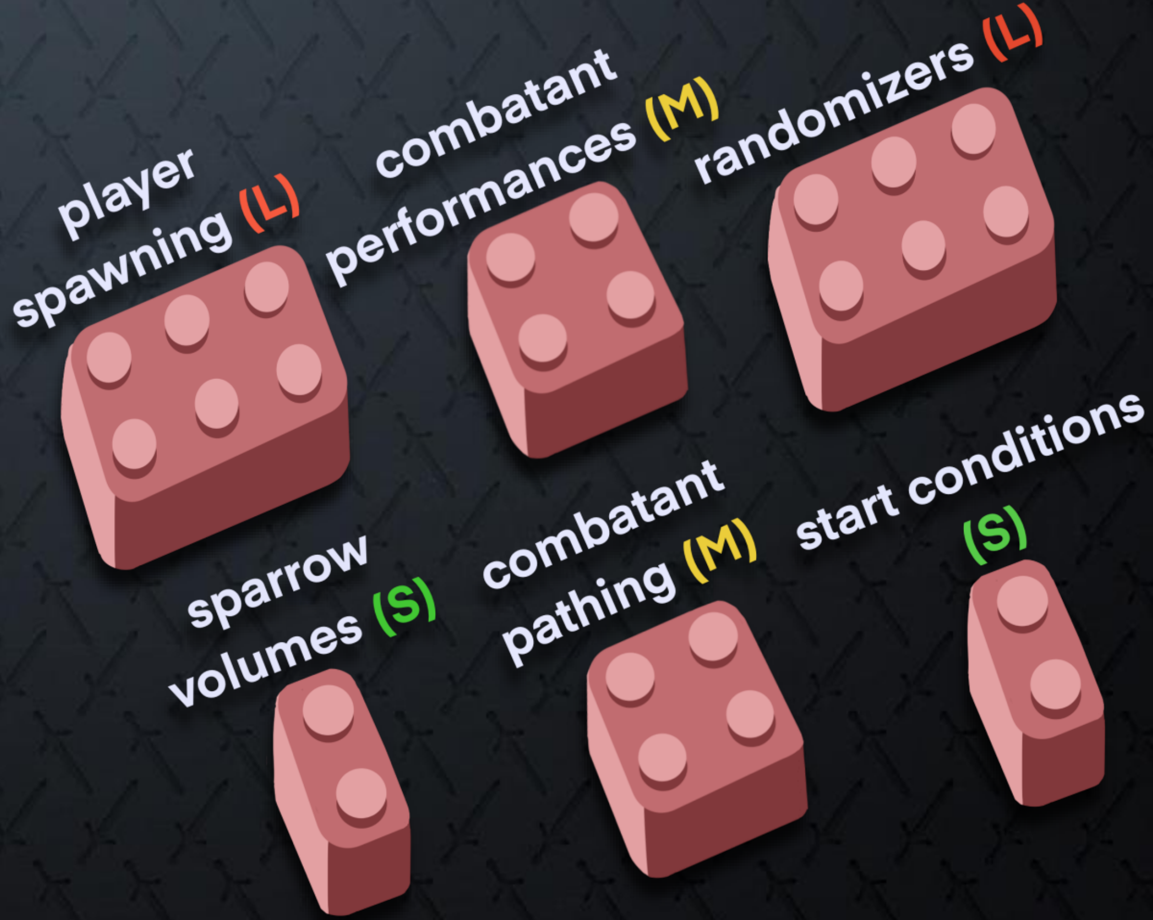
# Step 2.B - Create Your Building Blocks: Sizing

- Sizes of building blocks: small, medium, and large
- Size correlates to bug **vulnerability** and **intended user experience**
- How likely are you to find bugs, and how dangerous is it?



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Three primary ways to combine building blocks:

1. Goal & Value Driven Testing (Directed Ad-Hoc)
2. Planning and Costing
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# Combine Building Blocks: Directed Ad-Hoc

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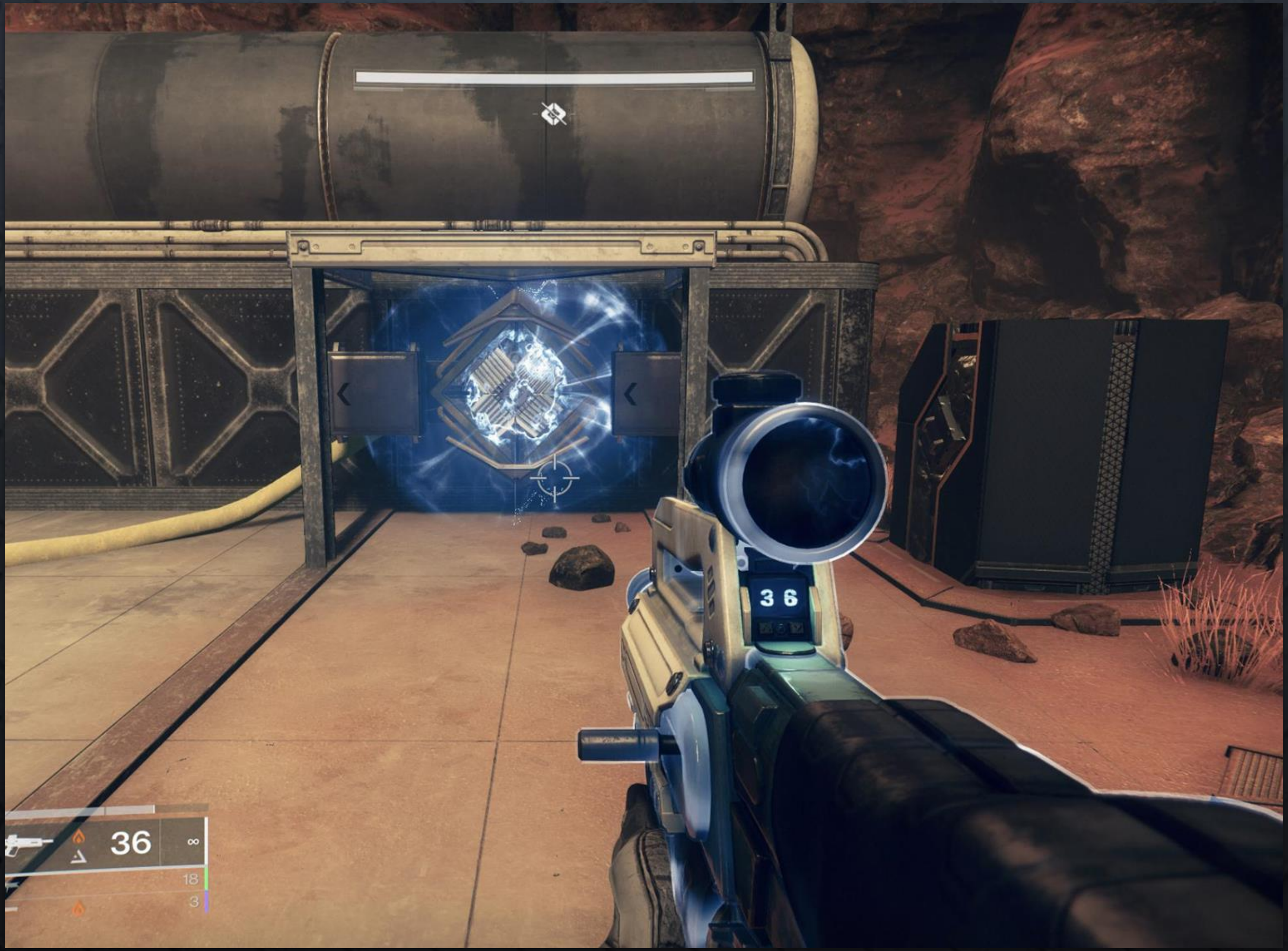
- Create “what happens when…” question
- Utilize 2-3 buckets you’ve made
- Use conditional statements to string the pieces together
  - and, not, if, while…



***Let's use an example from the Spire of the Watcher (Destiny 2 – The Witch Queen)!***

Simply put: These are ***objects*** you can ***shoot*** to change their ***state***

# Use Case: Directed Ad-Hoc

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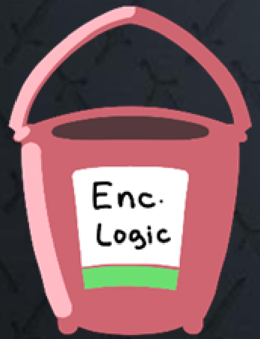

# Use Case: Directed Ad-Hoc

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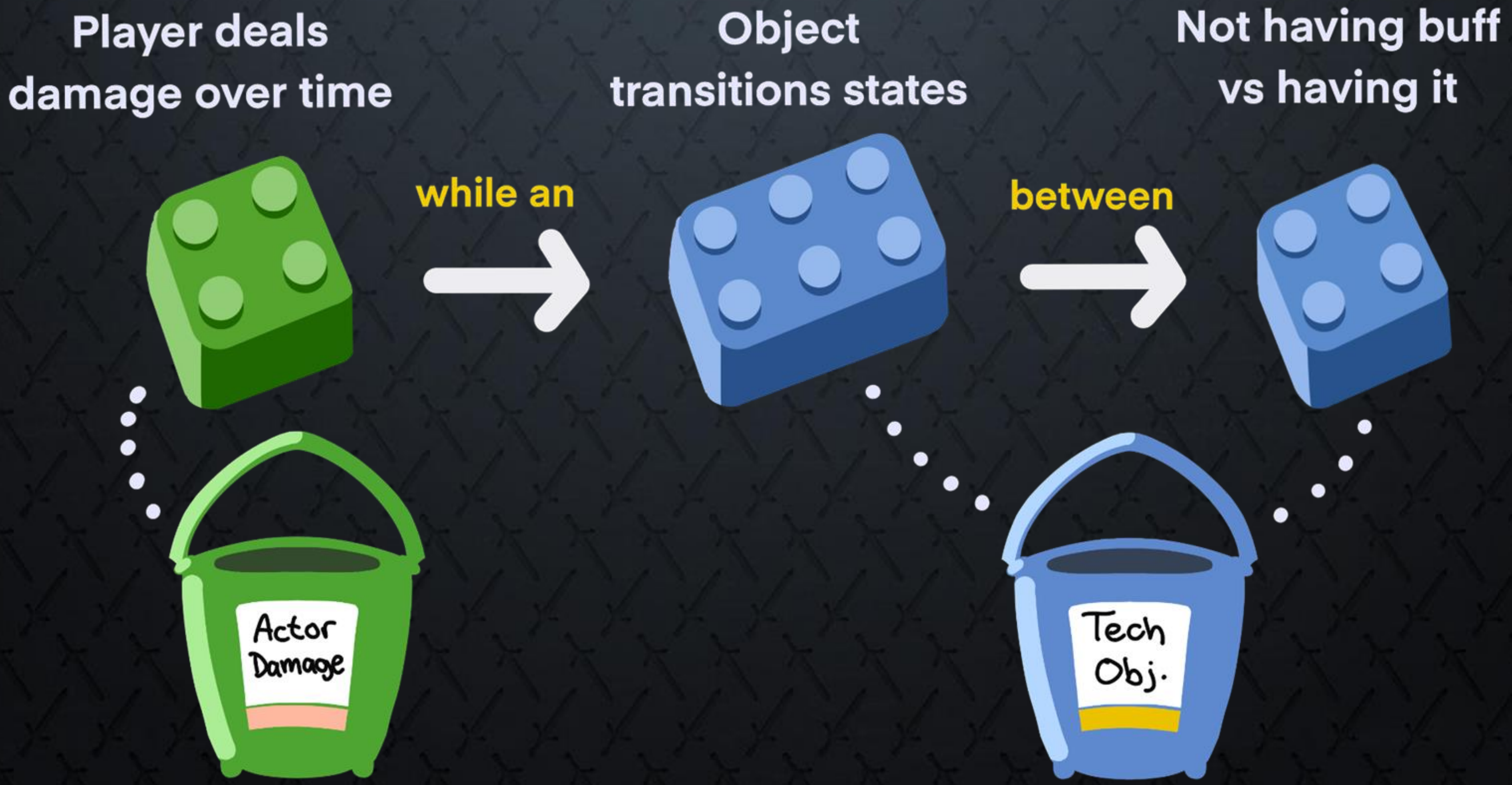

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2. What happens when…

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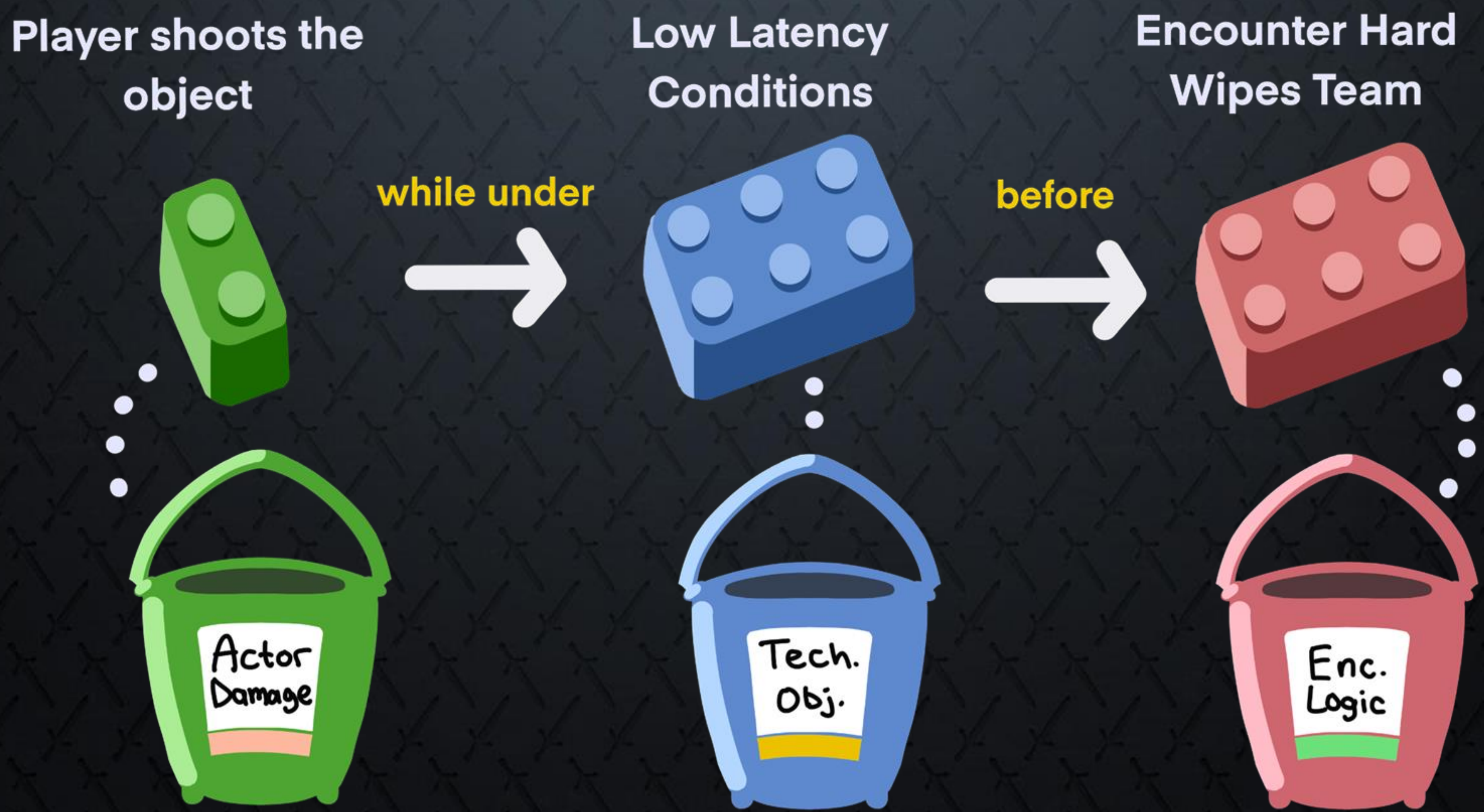

Player shoots the object

while under

Low Latency Conditions

before

Encounter Hard Wipes Team

# Takeaways:
# Directed Ad-Hoc Summary

- Ad hoc leads **discovery**.
- Building blocks represent a guide to that discovery and value.
- Sometimes a bug will appear, and sometimes it won’t.

# Combine Building Blocks: Costing & Planning

# * Quick Recap *

- We’ve made our reusable buckets and building blocks

- We’ve individually combined the building blocks for discovery (ad-hoc)

- …now it’s time to make larger creations!

# Building Blocks vs Creations

Individual Building Blocks

Building Block Creations

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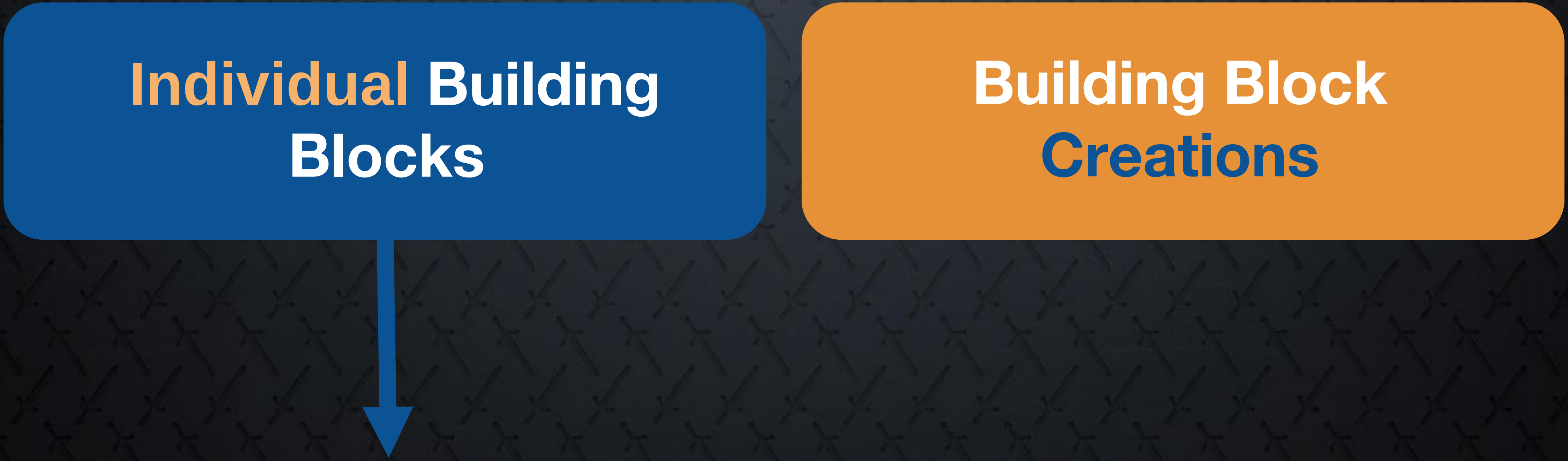
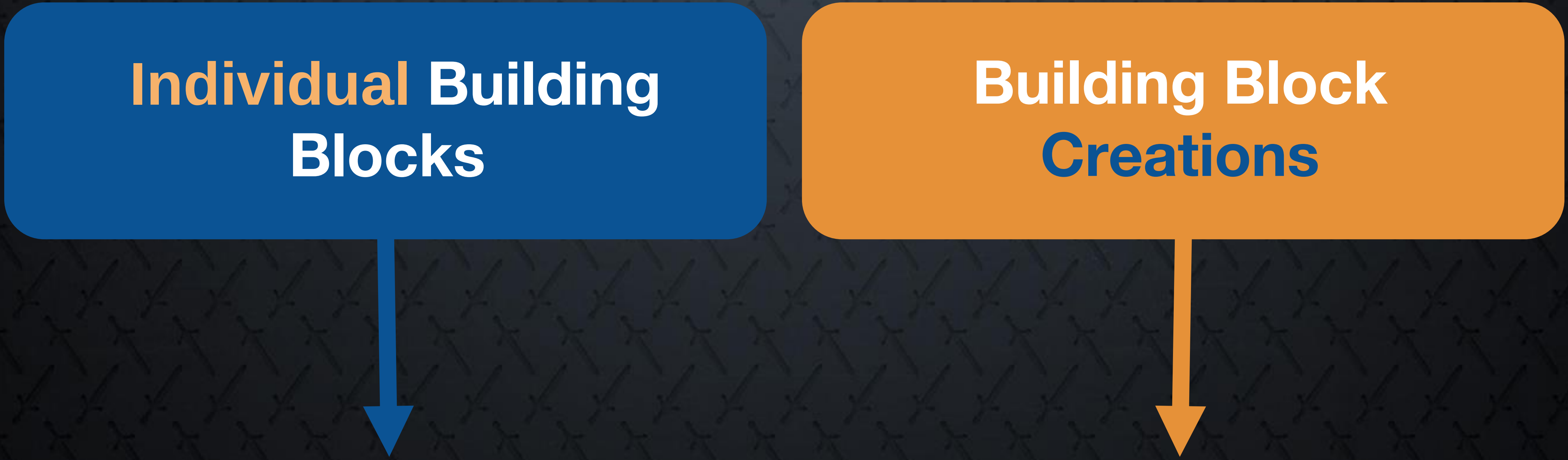


Individual Building Blocks

Building Block Creations

Focuses on the vulnerability of individual components

# Building Blocks vs Creations



## Individual Building Blocks

Focuses on the vulnerability of individual components

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Focuses on the combined vulnerability of a system/feature

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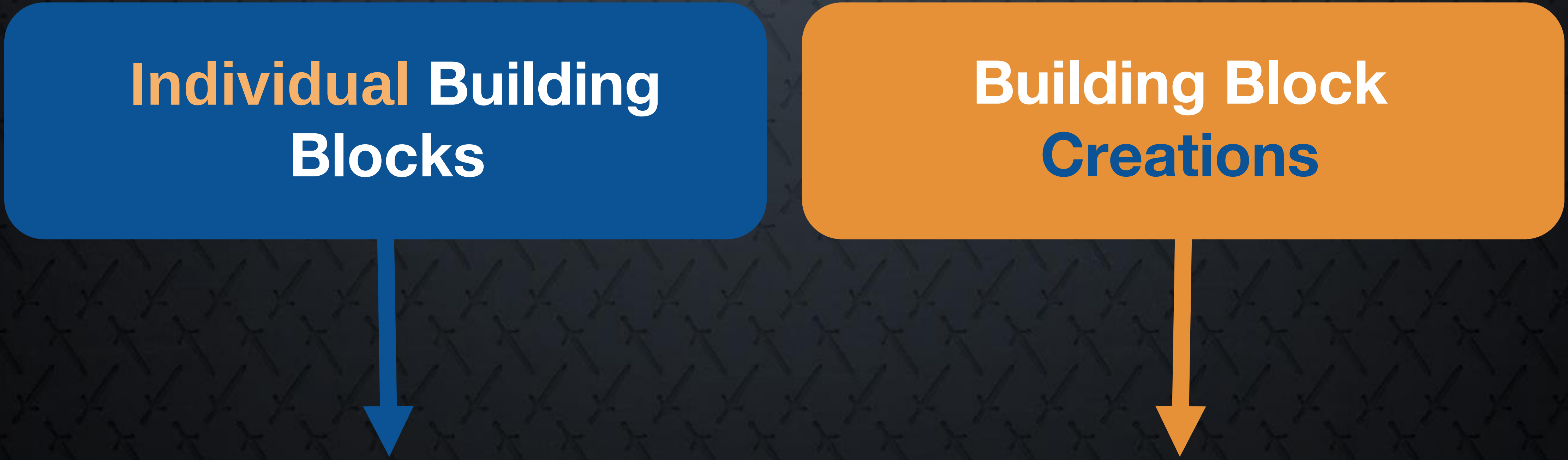

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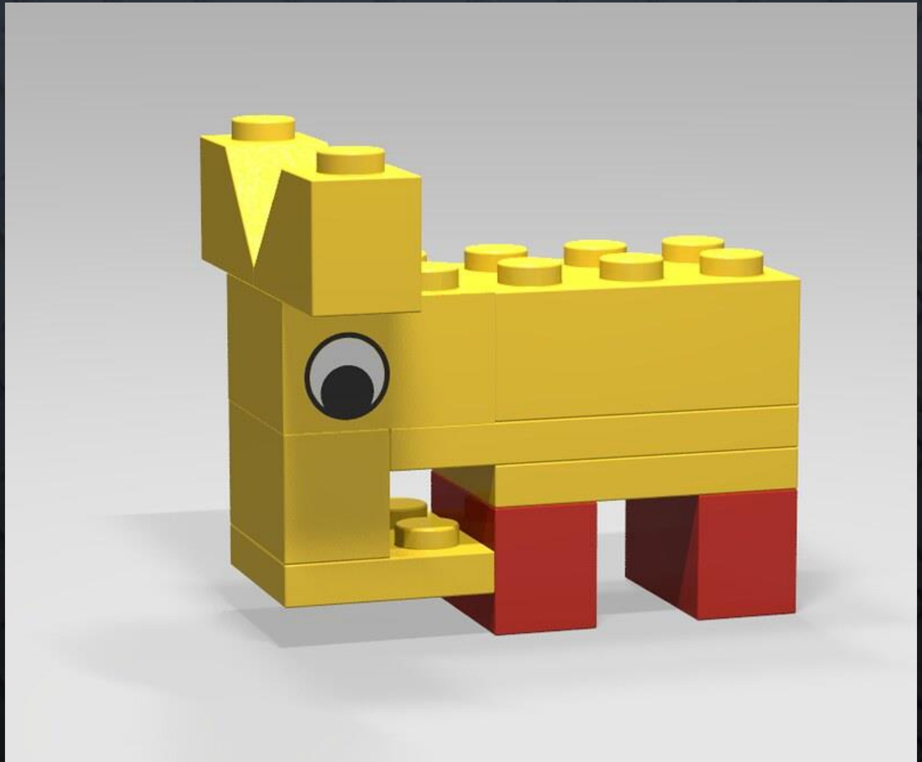
# Save. Your. Creations!

(We use User Stories and Documentation)



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- Collaborate with feature leads
- Identify bug database trends
- Analyze the types of bugs that occur and strategize bug prevention

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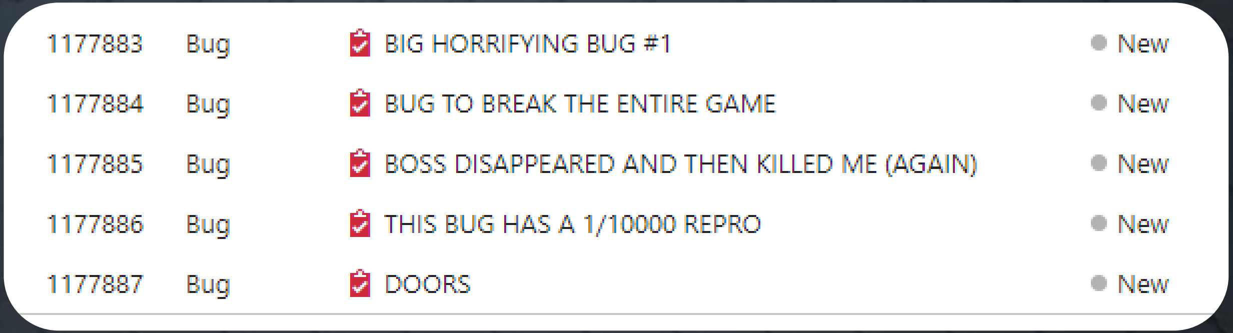
**Building the Creation:**

- Identify commonly built features (e.g. Destiny bosses)
- Combine building blocks to determine your vulnerability and value scale
- Reuse creations for rapid iteration



| | | | |
|---|---|---|---|
| 1177883 | Bug | BIG HORRIFYING BUG #1 | ● New |
| 1177884 | Bug | BUG TO BREAK THE ENTIRE GAME | ● New |
| 1177885 | Bug | BOSS DISAPPEARED AND THEN KILLED ME (AGAIN) | ● New |
| 1177886 | Bug | THIS BUG HAS A 1/10000 REPRO | ● New |
| 1177887 | Bug | DOORS | ● New |

We think of a base creation...

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And then use it as our foundation to add on top of it for newer creations!

# Step 3.B - Combine pieces: Planning & Costing (Example Template)

| **User Story:** [REDACTED] Testing Final Raid Boss Encounter | |
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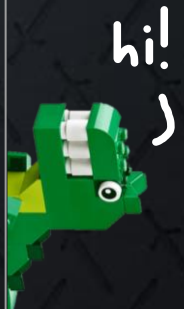

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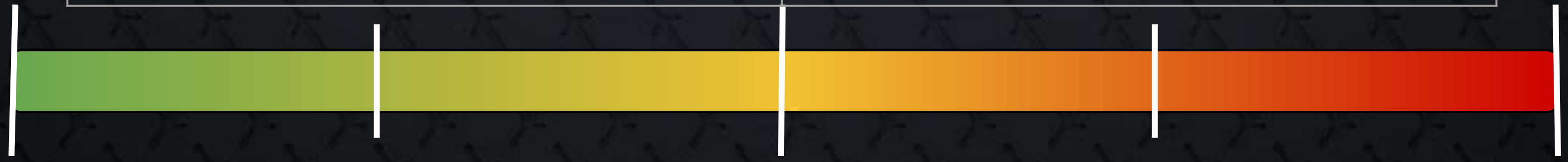

**Very Low Vulnerability**
**< 5 Bugs**

**Low Vulnerability**
**>= 5 Bugs**

**Medium Vulnerability**
**>= 20 Bugs**

**High Vulnerability**
**>= 35 Bugs**

**Very High Vulnerability**
**>= 50 Bugs**

***Bug numbers are scaled according to your project!***

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**Very Low Vulnerability**
**Mostly small sized building blocks**

**Medium Vulnerability**
**Even split in building block sizes**

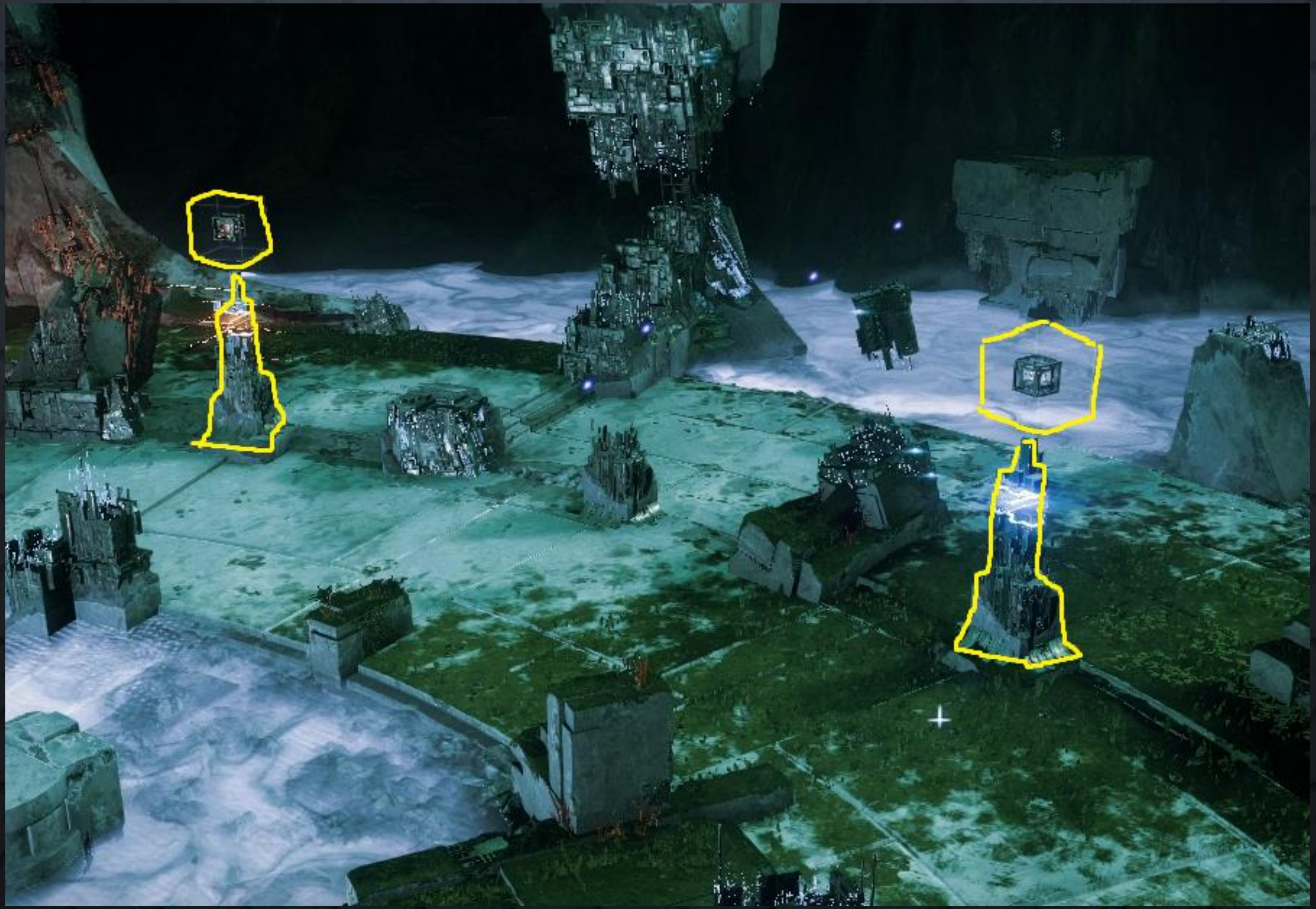
**Very High Vulnerability**
**Mostly large sized building blocks**

***Scale by identifying value over pure bug counts***

# Takeaways:
# Planning & Costing Summary

- Streamline costing and planning by building creations.
- Focus scaling cost by vulnerability and player value.
- Use building block creations as a knowledge base

# Combine Building Blocks: Live Investigation

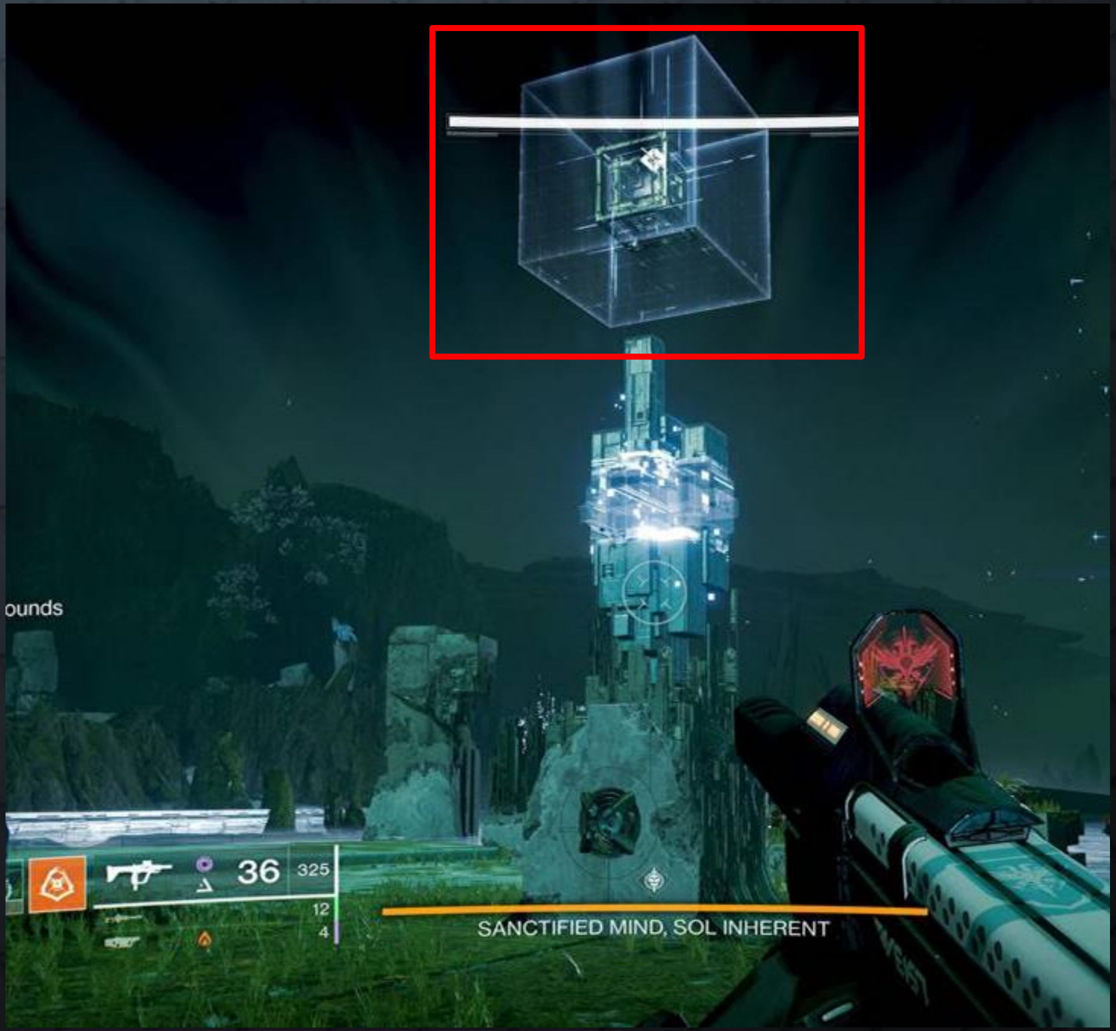


*Example featuring Garden of Salvation (Destiny 2 – Shadowkeep)*

# Use Case – Live Bug Investigation

**Live report:** Sometimes players say shooting the box returns “Immune” when they expect it to be damaged.

Repro steps are unknown.



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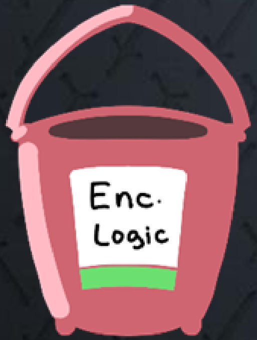
- We knew that the box goes through different states.

# Step 2: Identify Buckets and Building Blocks



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| Enc. Logic | Tech Obj. | Actor Dmg. |
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| Randomizers, Combatant Blockers , Race Conditions | Low Latency, Buff Application, Object Loops | Weapon Procs, Damage Multipliers, Perk Activation/Deactivation |
| Multiple prefab placements, Encounter Loops | Box State (On/Off toggle), Line of sight, Tower State (Uncharged/Charged), | Damage Over Time, Explosive Damage |
| Sparrow volumes, start conditions | Object Health Pools | Automatic Fire |

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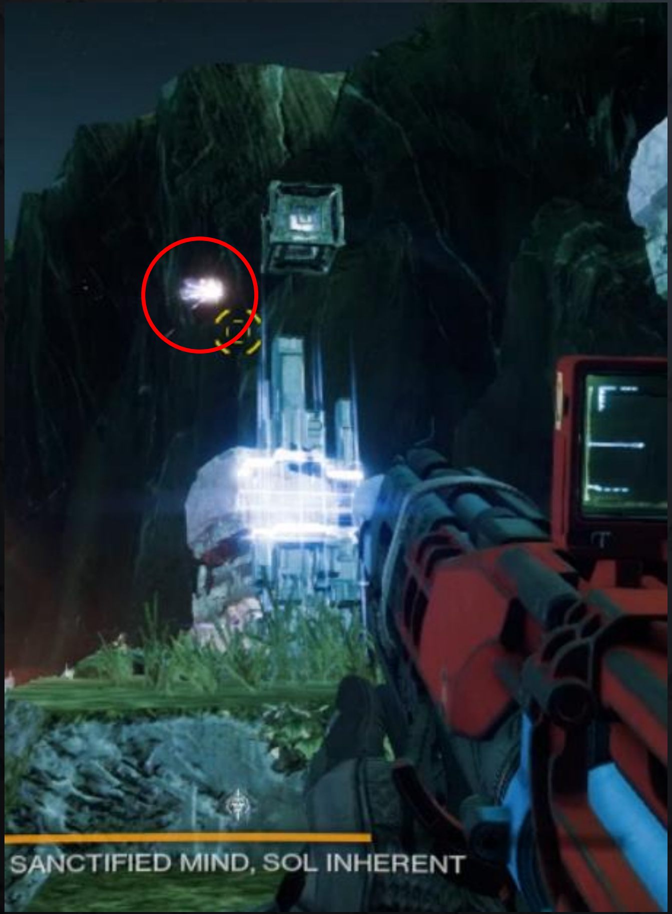
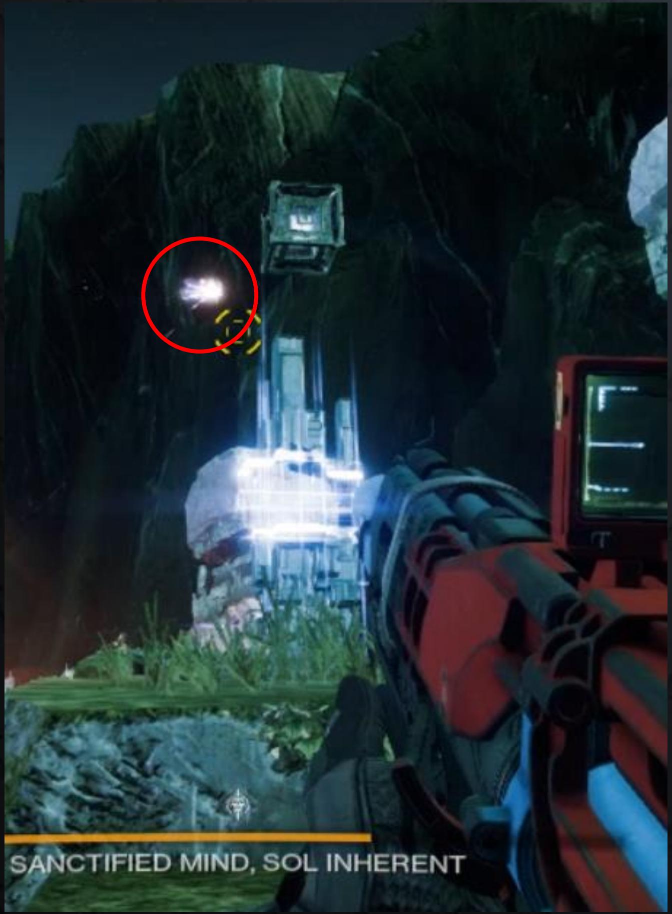
# Step 2: Identify Buckets and Building Blocks

*What's the bullet hitting?*

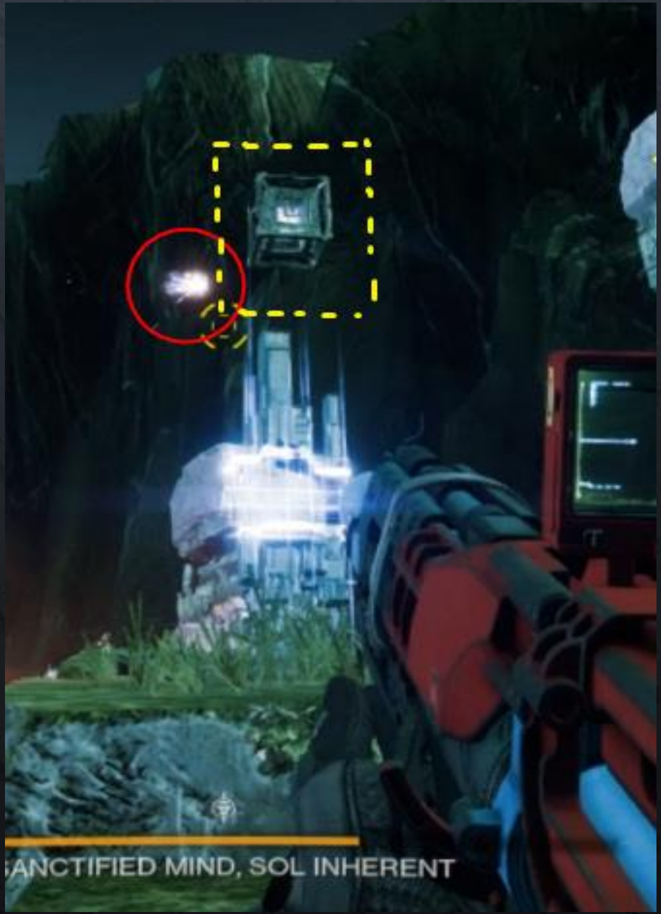


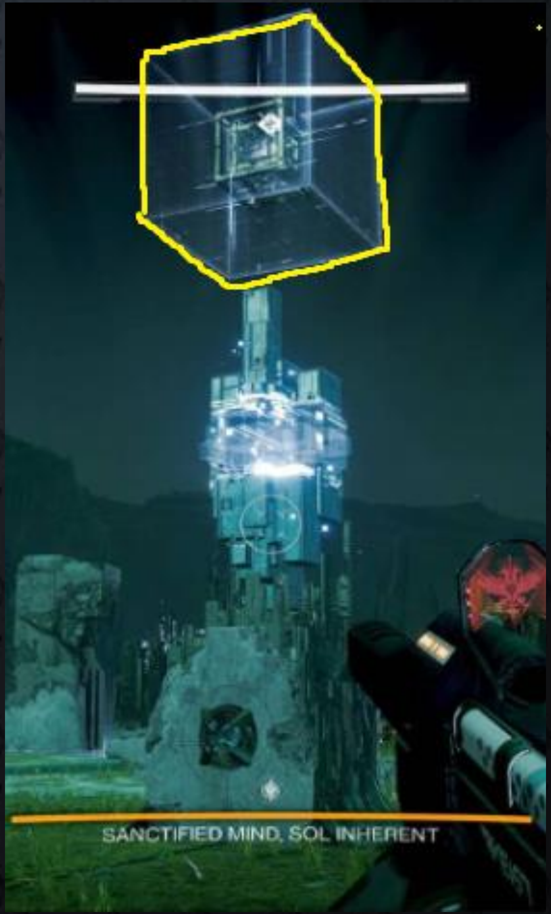
# Step 2: Identify Buckets and Building Blocks

*What’s the bullet hitting?*



*...ah!!*





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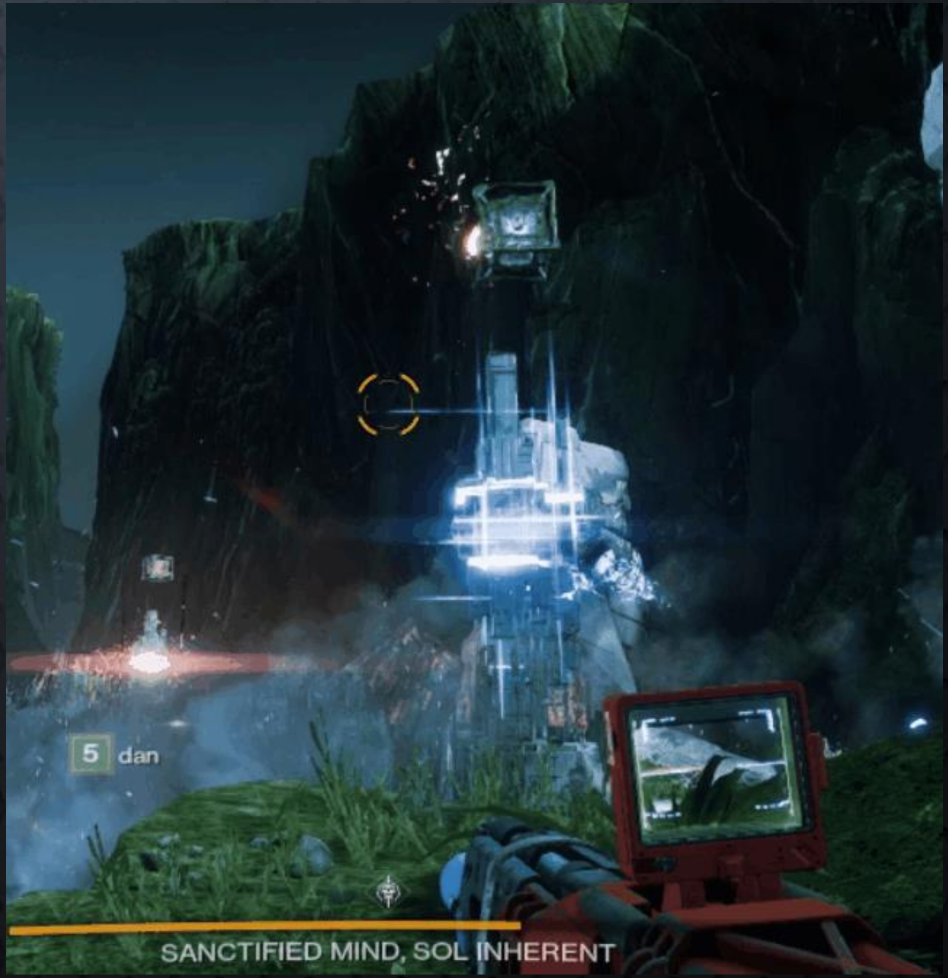
# Bam! Issue Reproduced!

- Discovered by combination of building blocks
- Invisible geometry was formed around cube
- Encounter wasn't getting rid of the invisible geometry



# Takeaway: Live Ingestigation Summary

- Isolate problems with building blocks
- Visual checklist of repro attempts
- Lead us to future bug prevention!

# Takeaways from Presentation

We've learned...

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- How to Identify > Create > Combine!

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# Takeaways from Presentation

We've learned...

- How to Identify > Create > Combine!
- Guidelines to explore your own game's buckets and building blocks.
- Modularity of building blocks and how they retain value throughout projects.
- Boxes are a pain.

# Get to Building!

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