







ASSASSIN'S CREED ORIGINS

**Monitoring and Validation of
World Design Data**

- Nicholas Routhier
- Design Technical Director
- 15+ years in games



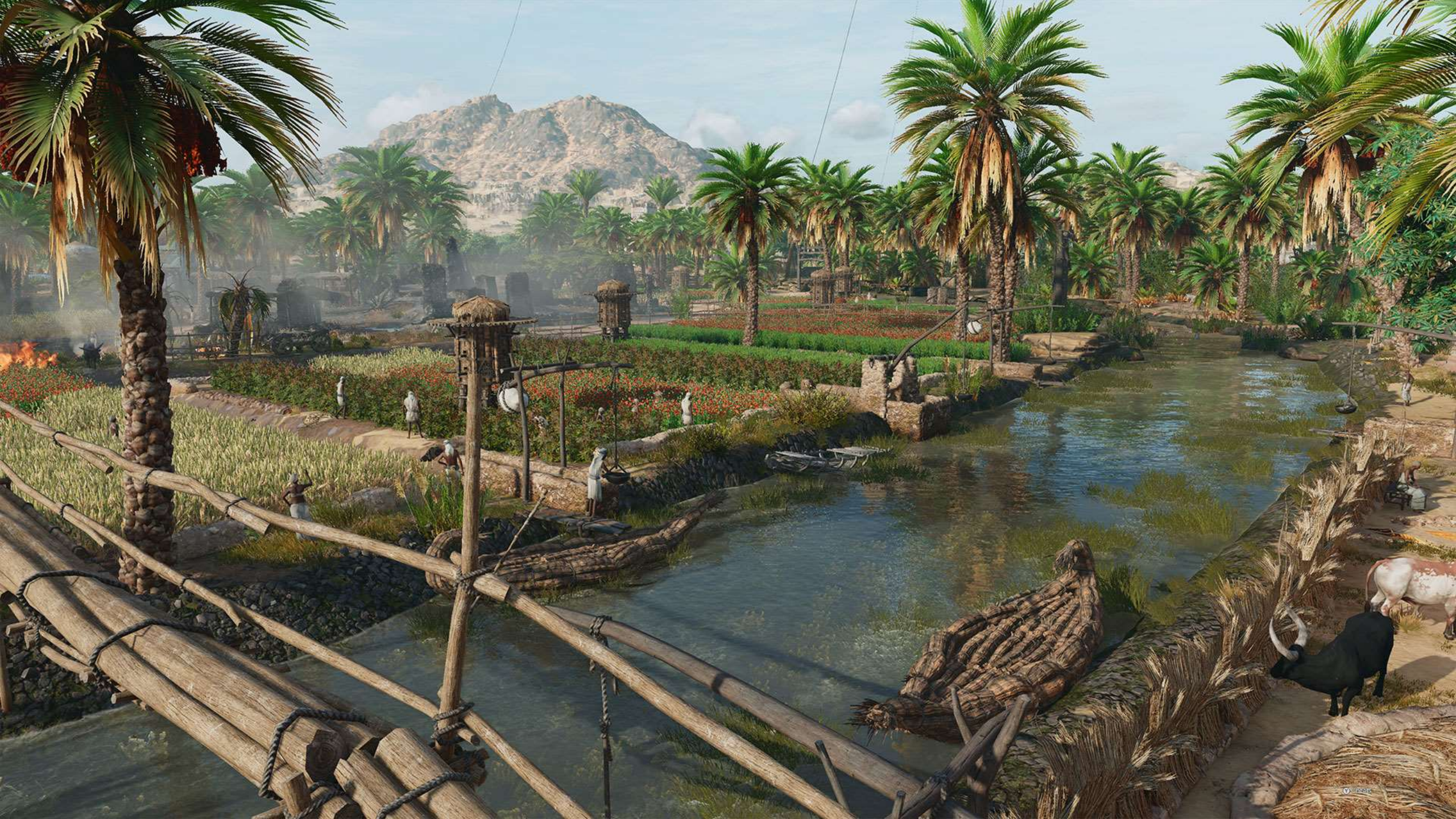
PROBLEM















INSANE amount of data!

New Tech

Procedural



How can things get broken?

Example #1

Zipline





Sapi-Res Ruins

?
323 m

N



Location objectives











How can things get broken?

Example #2

Meta AI

Meta AI

What should NPC do?

AI Network

Where to go?

Navmesh

How to get there?

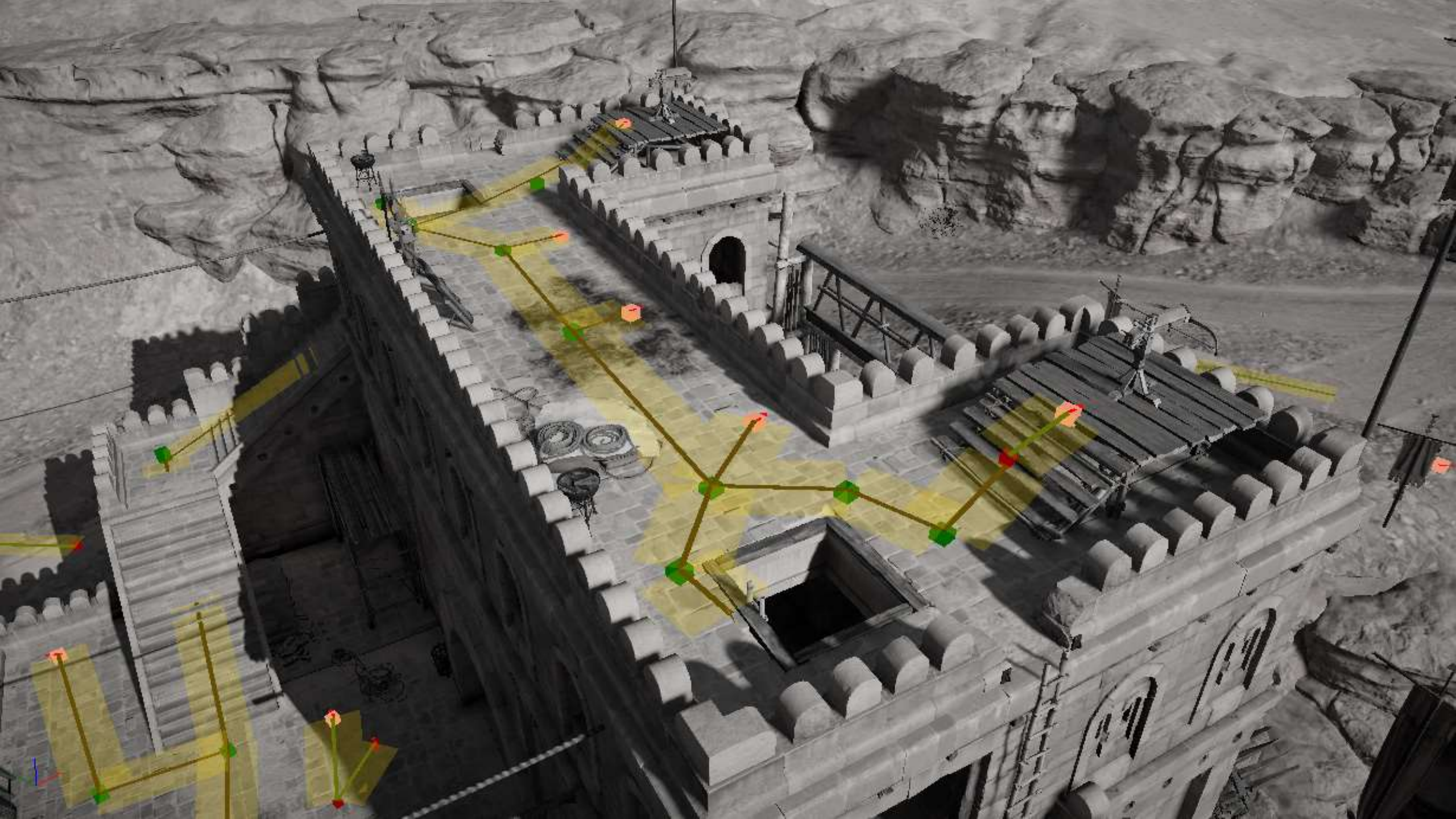
Virtual Insanity:

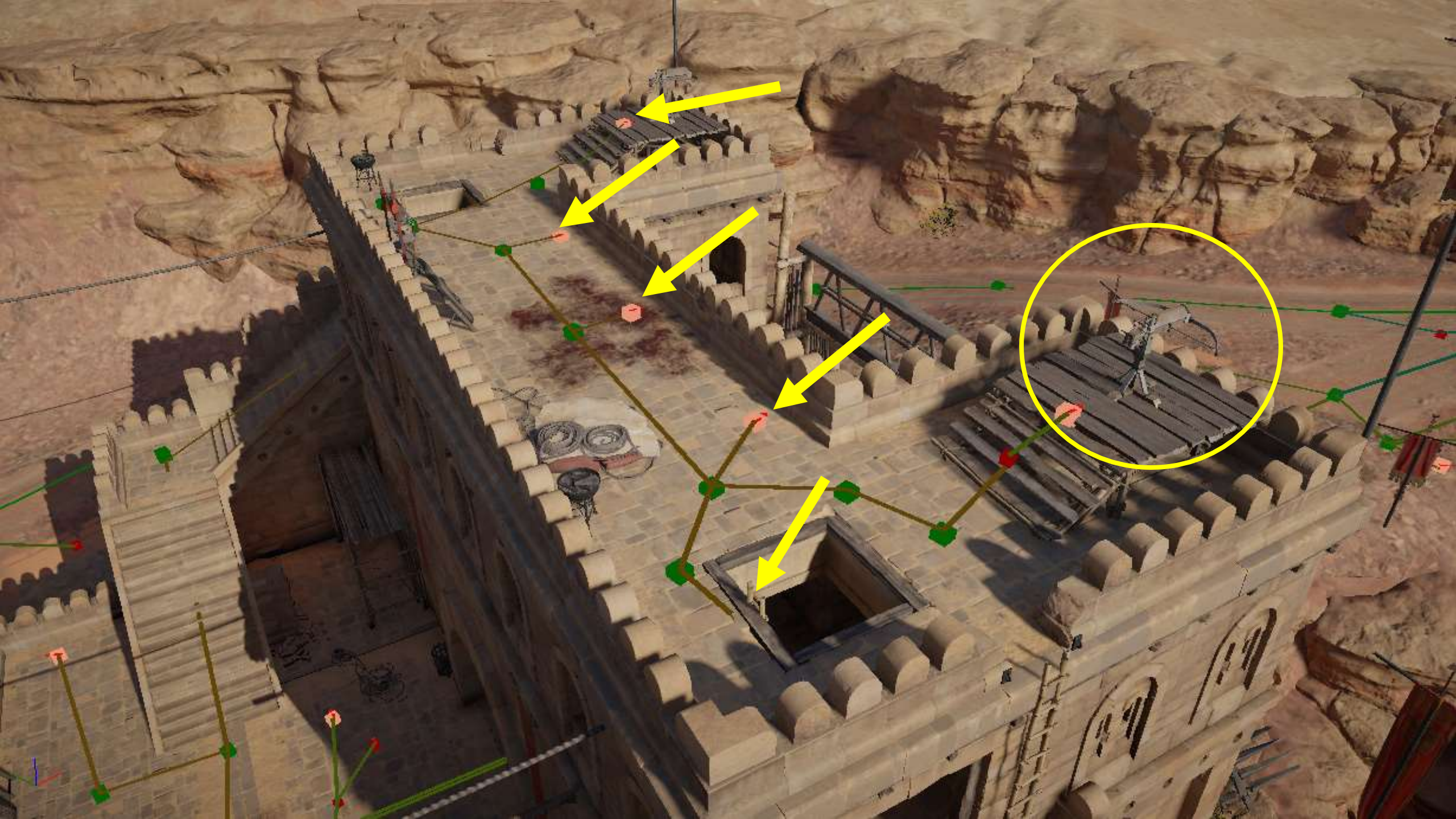
Meta AI on “Assassin's Creed: Origins”

By **Charles Lefebvre**

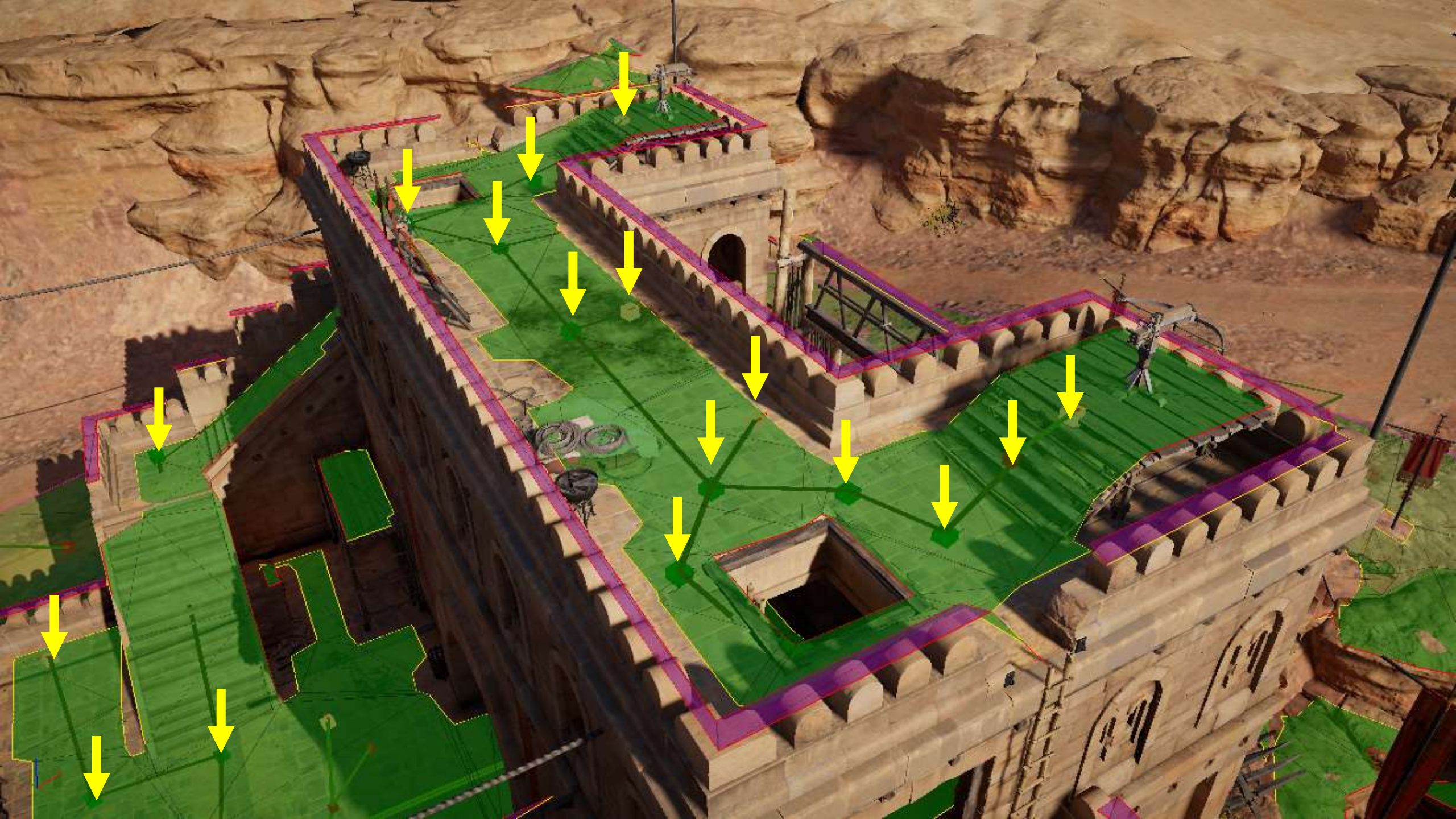
Friday March 23rd 10:00 am

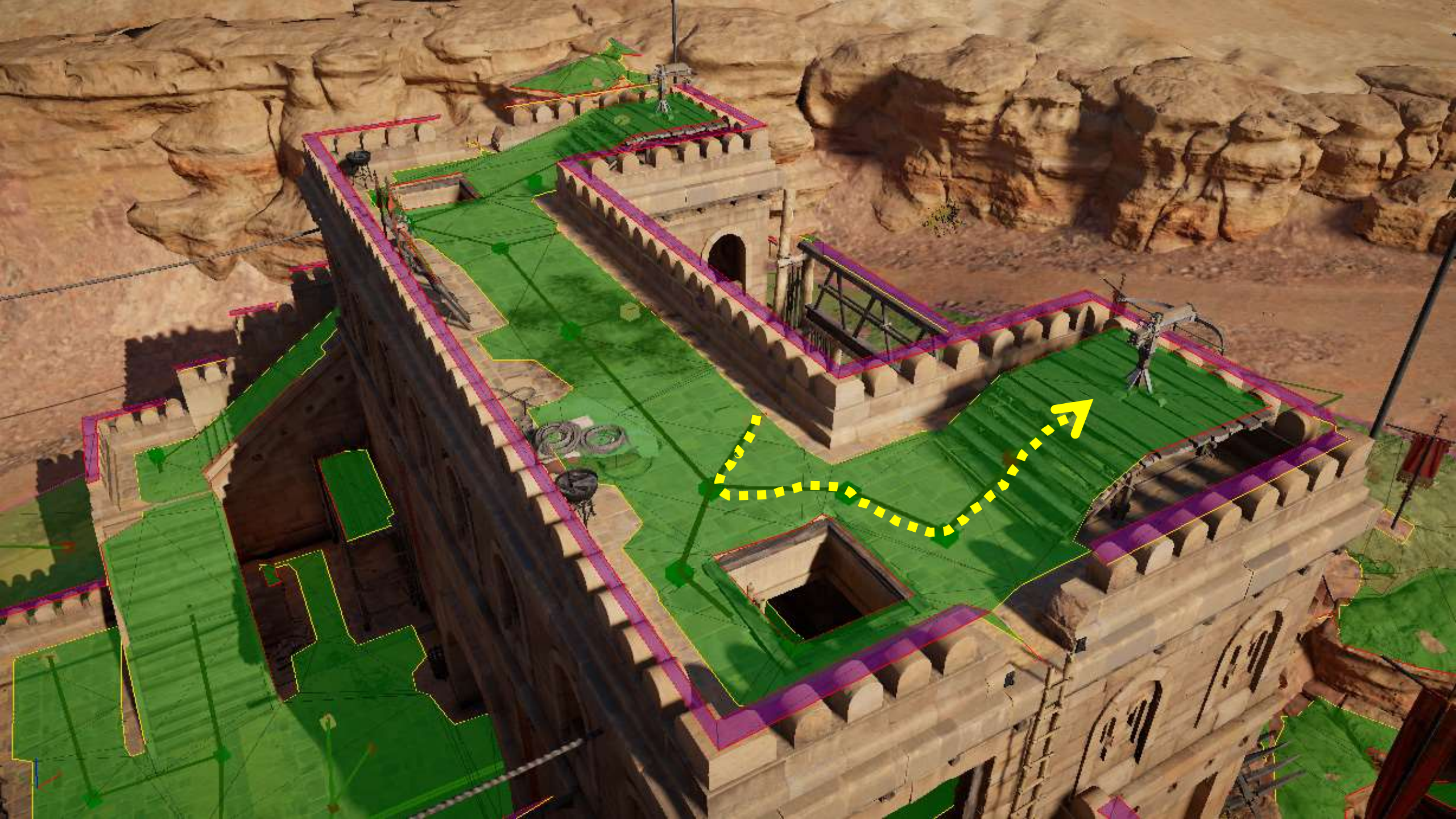
Room 2016, West Hall

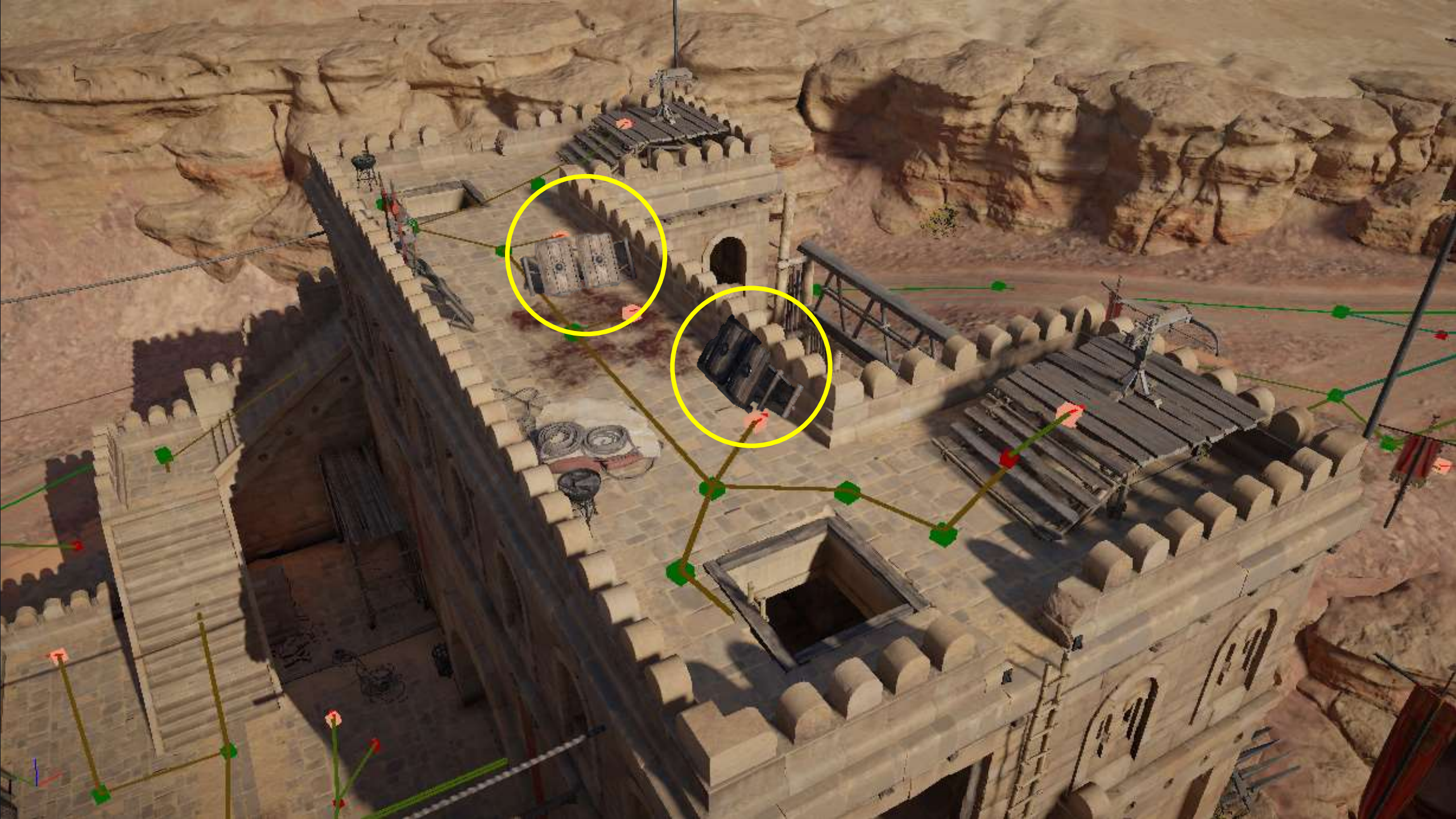




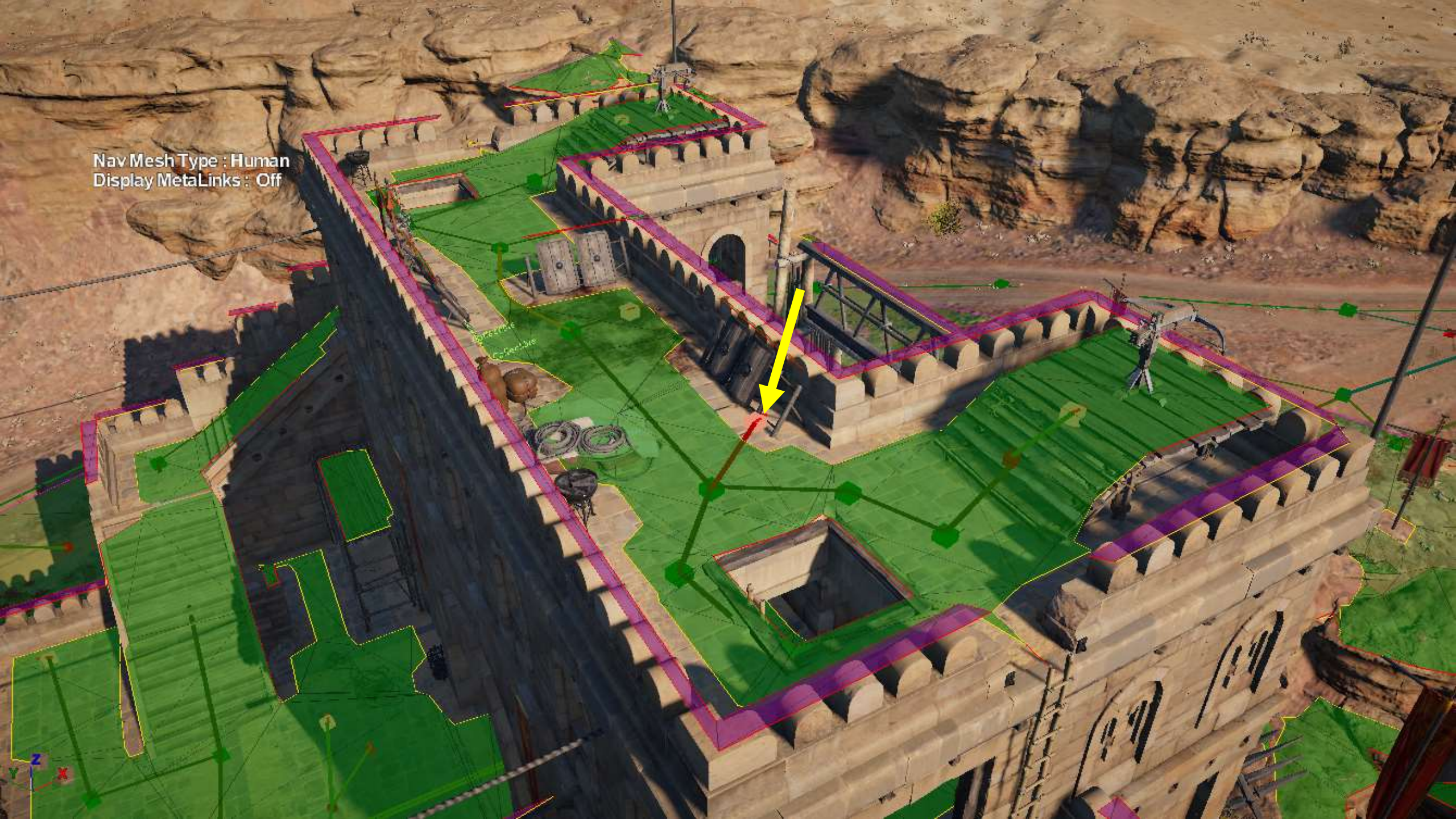


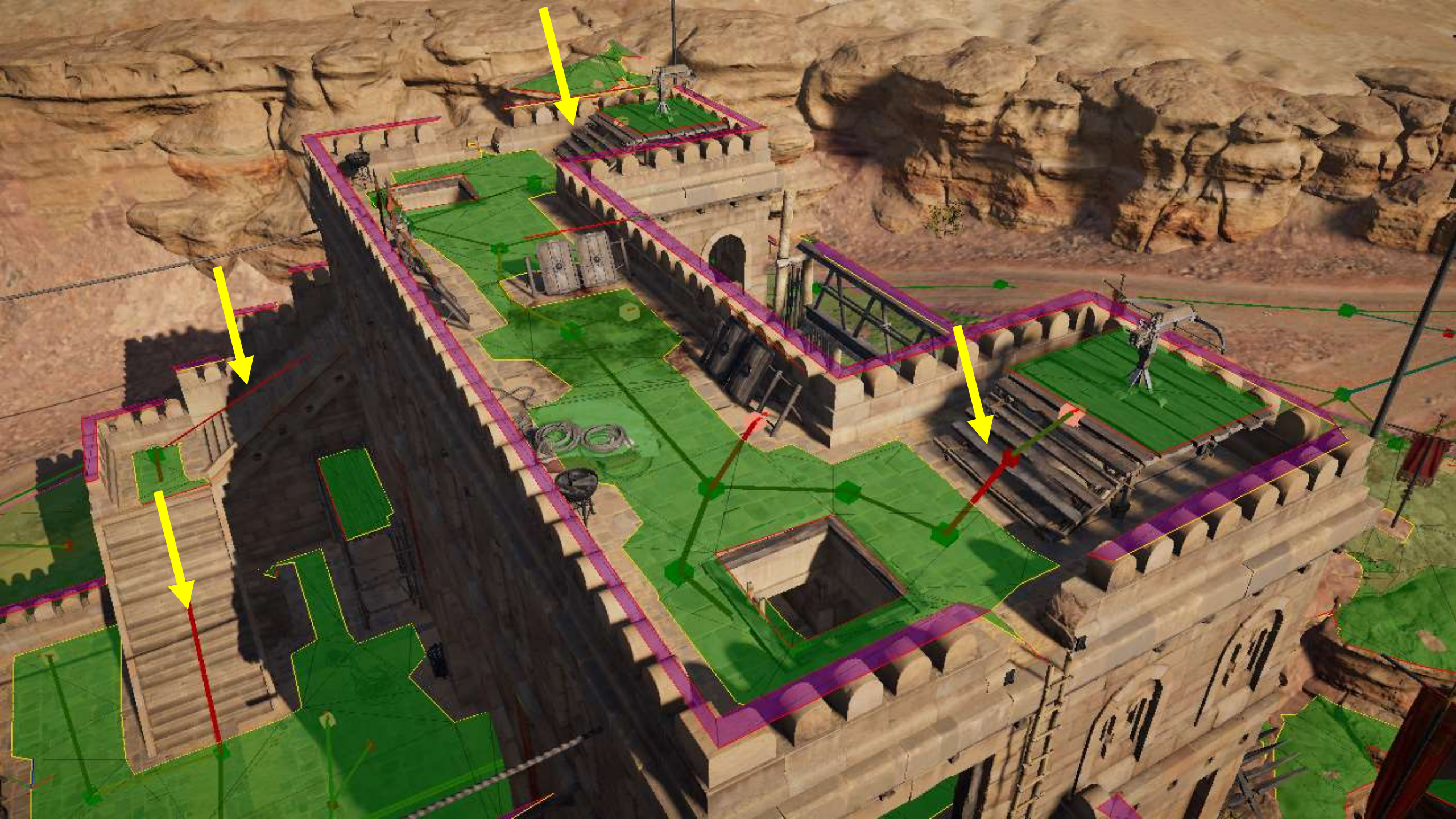






Nav Mesh Type : Human
Display MetaLinks : Off





How can things get broken?

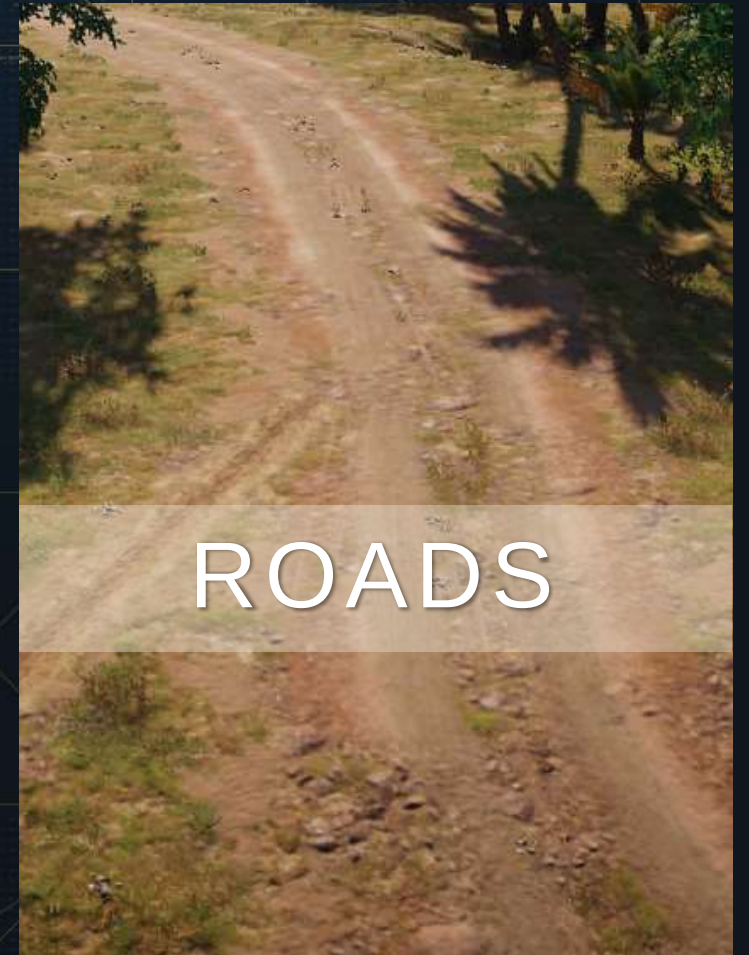
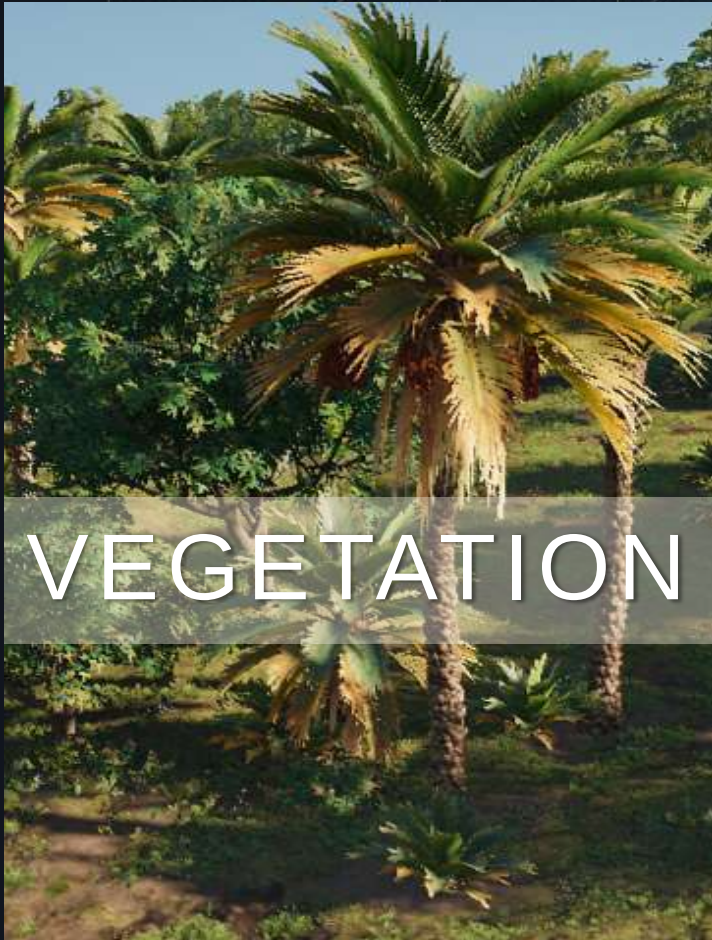
Example #3

Procedural

Procedural asset placement

Houdini
ENGINE  **TM**

Procedural asset placement





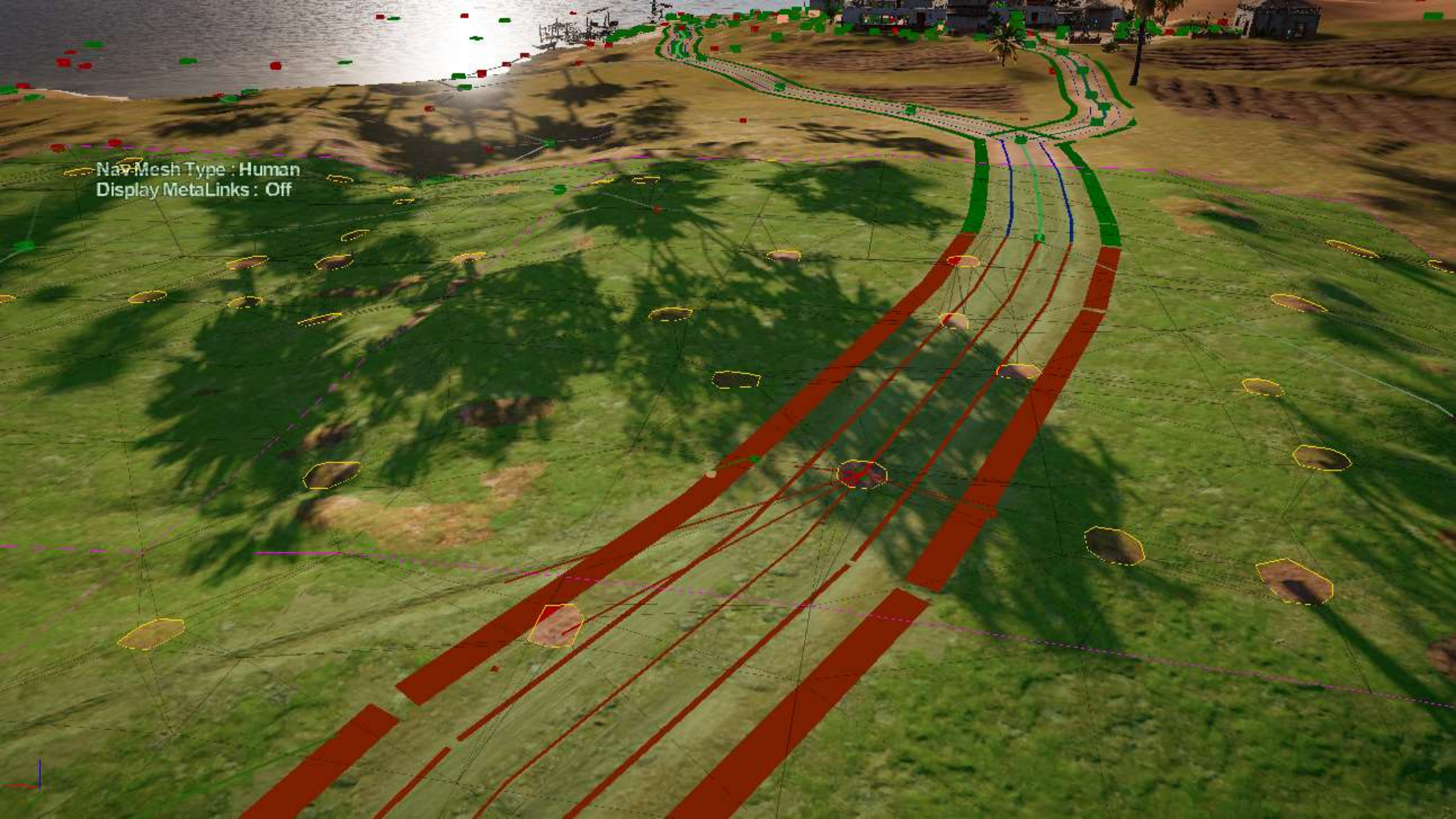
Nav Mesh Type : Human
Display MetaLinks : Off



Nav Mesh Type : Human
Display MetaLinks : Off



Nav Mesh Type : Human
Display MetaLinks : Off





Who breaks things?

- Content creators
- Programmers
- Procedural system

Usual way to debug







AC Syndicate
12 km²



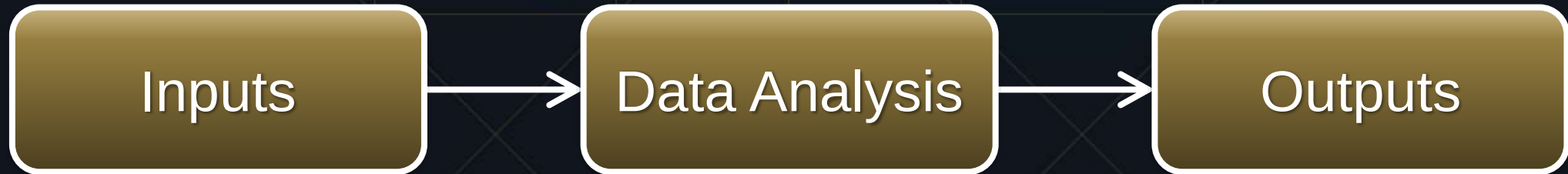
AC Origins
120 km²





Daily automated testing

of world design data



Inputs



Data Analysis



Outputs

- **World Data**
 - Hand-placed
 - Procedural
 - Navmesh





- World Data
- Code
 - Gameplay
 - Engine

Inputs



Data Analysis



Outputs

- World Data
- Code
- Design Intentions



Inputs

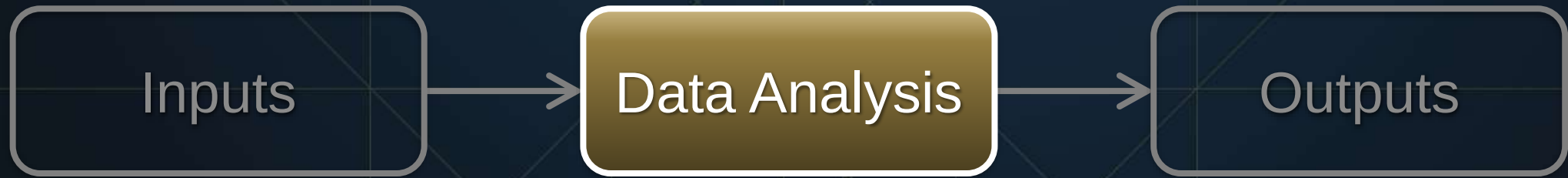


Data Analysis



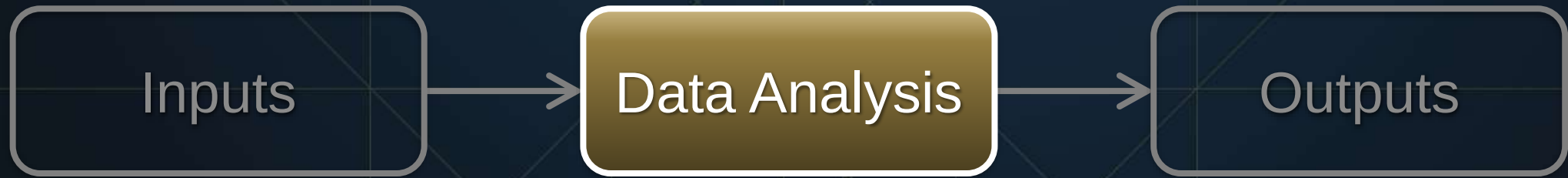
Outputs





Anvilscript

- C# scripts run inside the game editor
- Query game object database
- Access all editor and most game engine features



Anvilscript

```
List<Object.ID> allCollectibles = GetAllCollectibleInstances();
foreach (Entity locationIcon in locationIconList)
{
    List<TriggerZone> footprint = GetFootprint(locationIcon);
    List<Entity> locationLoot = FindInTriggerZones(allCollectibles, footprint);
    ValidateCollectibleTypes(locationLoot, locationIcon.Type);
}
```




Test Types

- Placement Metrics
- Ai Network Tests
- Location Tests



Test type #1

Placement Metrics











Placement Metrics

NAVIGATION

- Ziplines
- Ladders
- Haystacks

INTERACTION

- Chests
- Ammo Racks
- Ballistae

SPAWNERS

- Player
- Boats
- Crowd Stations

22 object types tested

Human Testing?

228
ziplines

x

2
min

=

8 hours



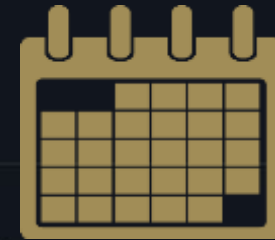
ONCE!

210,689
ingredients

v

2
min

=

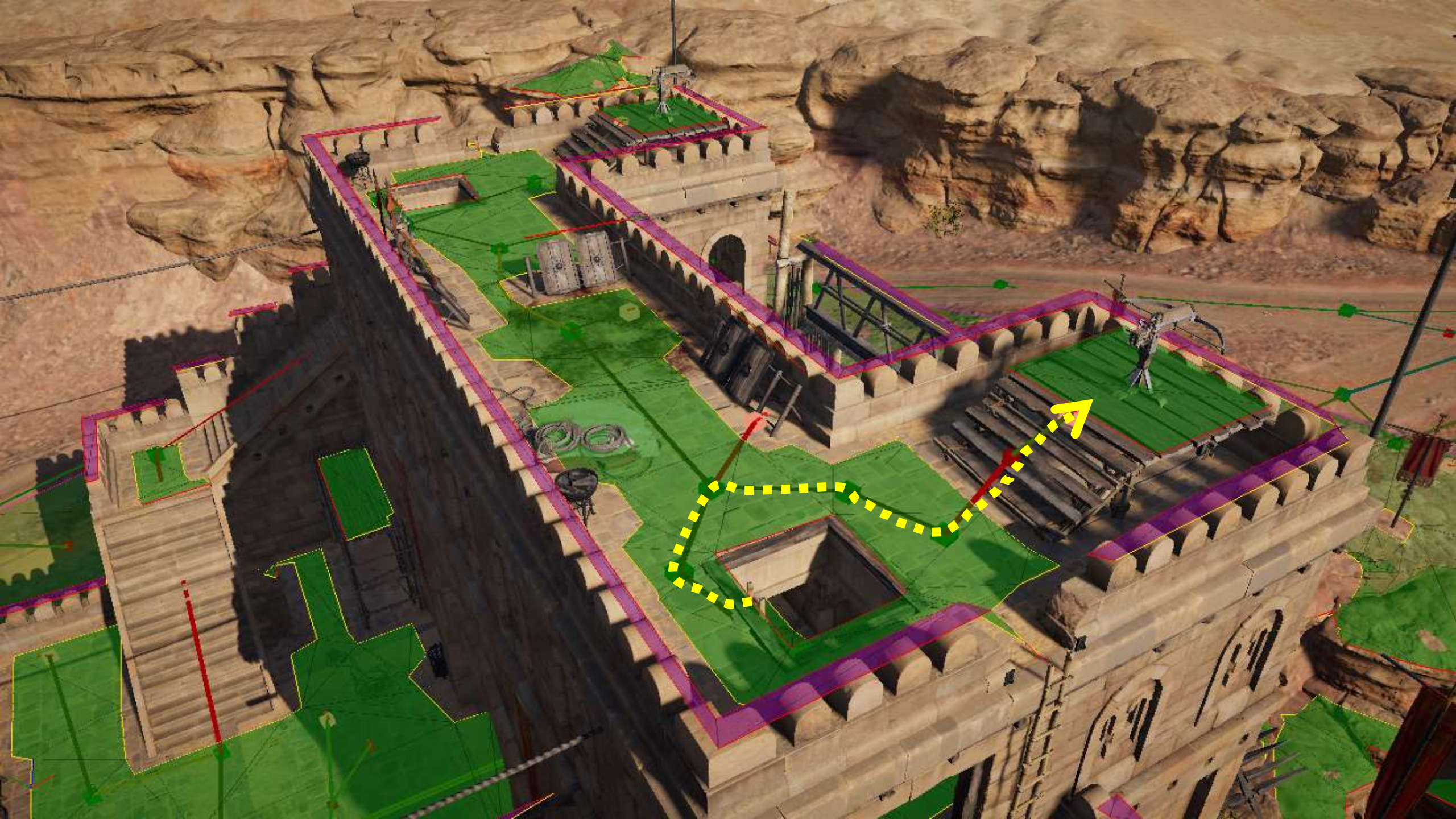


Test Type #2

AI Network







Test type #3

Location Tests



Restricted Collect – Small (High): Expected 1 High items. Found 0.
Restricted Collect – Small (High): Expected 0 Rare items. Found 1.



Inputs



Data Analysis



Outputs



Inputs



Data Analysis



Outputs



Inputs



Data Analysis



Outputs

Name	Entity ID	Valid ?	Errors	Goto Anvil
Zipline_138	0x12182e4500b	Yes		Link
Zipline_030	0x8ce8b38c5a	No	Rope too steep Collision on path	Link
Zipline_202	0x1470c5f70dd	Yes		Link
Zipline_005	0xa867eeb5ff	Yes		Link
Zipline_141	0xa867eeb5f7	No	Bad landing zone	Link

Inputs



Data Analysis



Outputs



+ Summary =





Nightly Placement Metrics Validation

2016/12/2 | 10:17

Report Type	Total	Valid	Invalid	Excel
Corners	49	19	30	Link
Ladders	989	243	746	Link
WallSnaps	208	205	3	Link
Ziplines	131	60	71	Link

Inputs

Data Analysis

Outputs

Nightly Placement Metrics Validation

2017/06/07 | 01:23

Report Type	Total		Valid		Invalid		Excel	SIWA (MTL)		GIZA (MTL)		NILE (MTL)		FAYM (SGP)		CYRN (SOF)	
AmmoRacks	732		711	-19	21	+19	Link	3	+1	0		0		0		18	+18
Ballistas	96		96		0		Link	0		0		0		0		0	
BoatSpawners	1003		994	+3	9	-3	Link	1		4		0		3	-3	0	
Braziers	61		59		2		Link	1		0		0		0		0	
Collectibles	4640	-3	4552	+7	88	-10	Link	20		31	-4	0		32	-10	5	+5
CornerSwings	45		45		0		Link	0		0		0		0		0	
CrowdLifeStations	0		0		0		Link	0		0		0		0		0	
Elevators	76		74	-2	2	+2	Link	0		0		0		0		2	+2
HideSpots	917	+1	917	+1	0		Link	0		0		0		0		0	
Ladders	1315	-2	1308	-5	7	+3	Link	0		0		0	-1	1	-2	6	+6
Not Set	45		45		0		Link	0		0		0		0		0	
RHPs	56		56		0		Link	0		0		0		0		0	
Rocks	74054	+10	74051	+10	3		Link	3		0		0		0		0	
Ropes	604		597	+3	7	-3	Link	2		2		0		1	-3	0	
StalkingZones	78322	+26	78277	+53	45	-27	Link	30	-1	6	-15	0		7	-11	2	+1
V-Shape	235	-3	143	+28	92	-31	Link	8	+5	18	+1	11	-14	40	-18	15	-5
WallSnaps	505	+1	503	+1	2		Link	1		0		0		1		0	
Ziplines	216		216	+1	0	-1	Link	0		0		0		0	-1	0	



- “Google maps” for our game world
- Web-based, in-house



mongoDB®

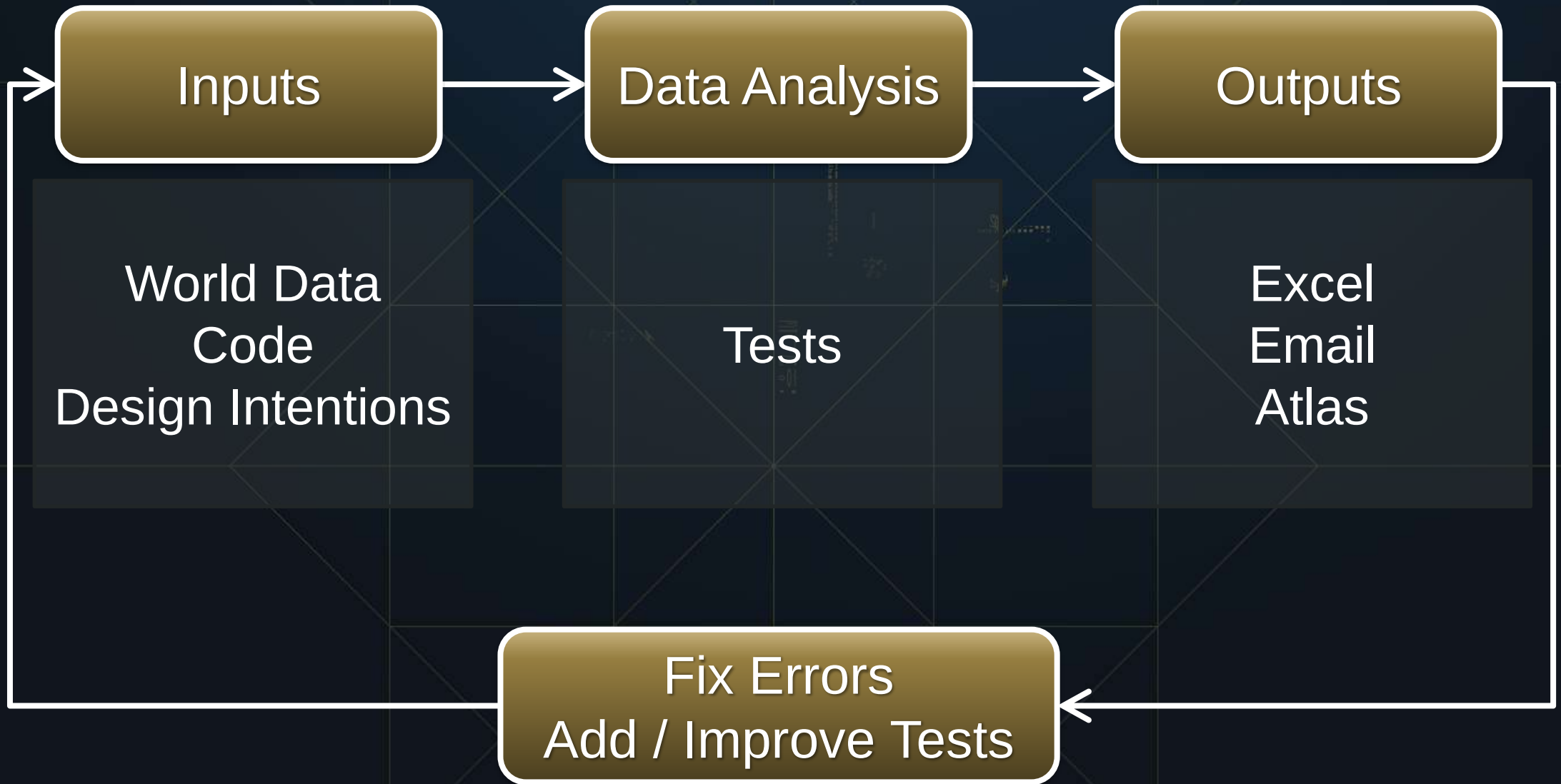
Inputs



Data Analysis



Outputs



Daily Validations

1 Build Machine

3 Hours

12 Reports

520 Locations

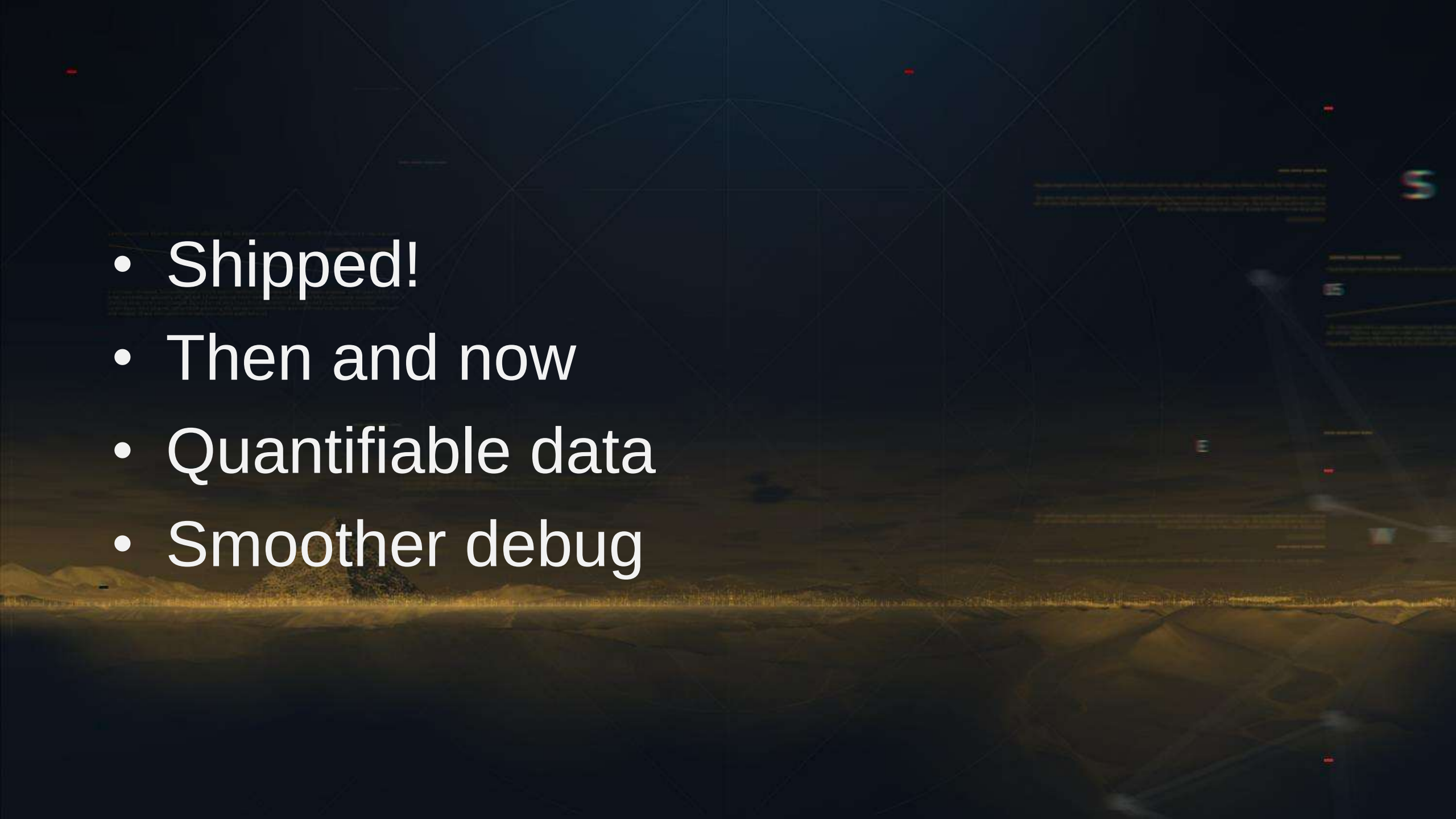
155,932 Paths

210,689 Gameplay Ingredients

1,000,000 AI Network Nodes and Edges

5,000,000 Procedural Objects



- 
- The background of the slide is a dark, atmospheric landscape. It features a grid of lines that recede into the distance, creating a sense of depth. A bright, glowing horizon line is visible, suggesting a sunset or sunrise. The overall color palette is dark, with shades of blue, black, and brown, accented by the bright light on the horizon.
- Shipped!
 - Then and now
 - Quantifiable data
 - Smoother debug

Regressions

Then

Discovered “at some point”

Scope unknown

Reactive

Now

Daily report by email

Scope known

Proactive

Data Lock vs. Iteration

Then

Fixed number of QC passes

Data Lock

Now

Daily automated tests

More iteration time for
content creators

Iteration → Quality

Finding bugs



Quantifiable Data

What gets quantified gets managed



Smoother Debug



Smoother Debug



Lessons Learned

- Earlier in production!
- Danger of false positives
- Too many emails!



Next Steps

- Add Velocity chart
- Prevent errors at creation
- Create more tests!

Key Contributors

- Kevin Coughlan
- Roland Levesque
- Rémi Toupin-Gaudet



Takeaway



Thanks! Questions?



Nicholas.Routhier@ubisoft.com

Kevin.Coughlan@ubisoft.com



@NyksterR