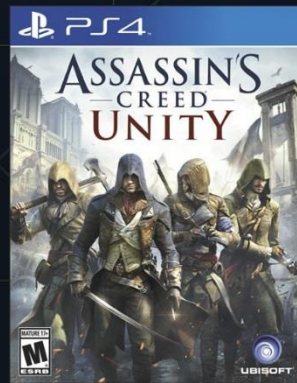
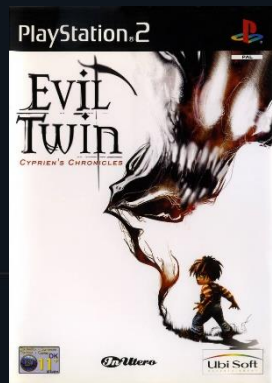




Virtual insanity: Meta AI on Assassins Creed Origins

Speaker

- Charles Lefebvre
- Technical Architect
- 15 years in games





[–] **mmecca** 11 points il y a 2 mois



Have you ever followed a Phylake on patrol? They stop in at Garrisons, they camp and sleep by the roadside sometimes, and once I saw one hop off their horse, walk over to the water and stare out over the Nile.



[–] **TheDanteEX** 5 points il y a 2 mois



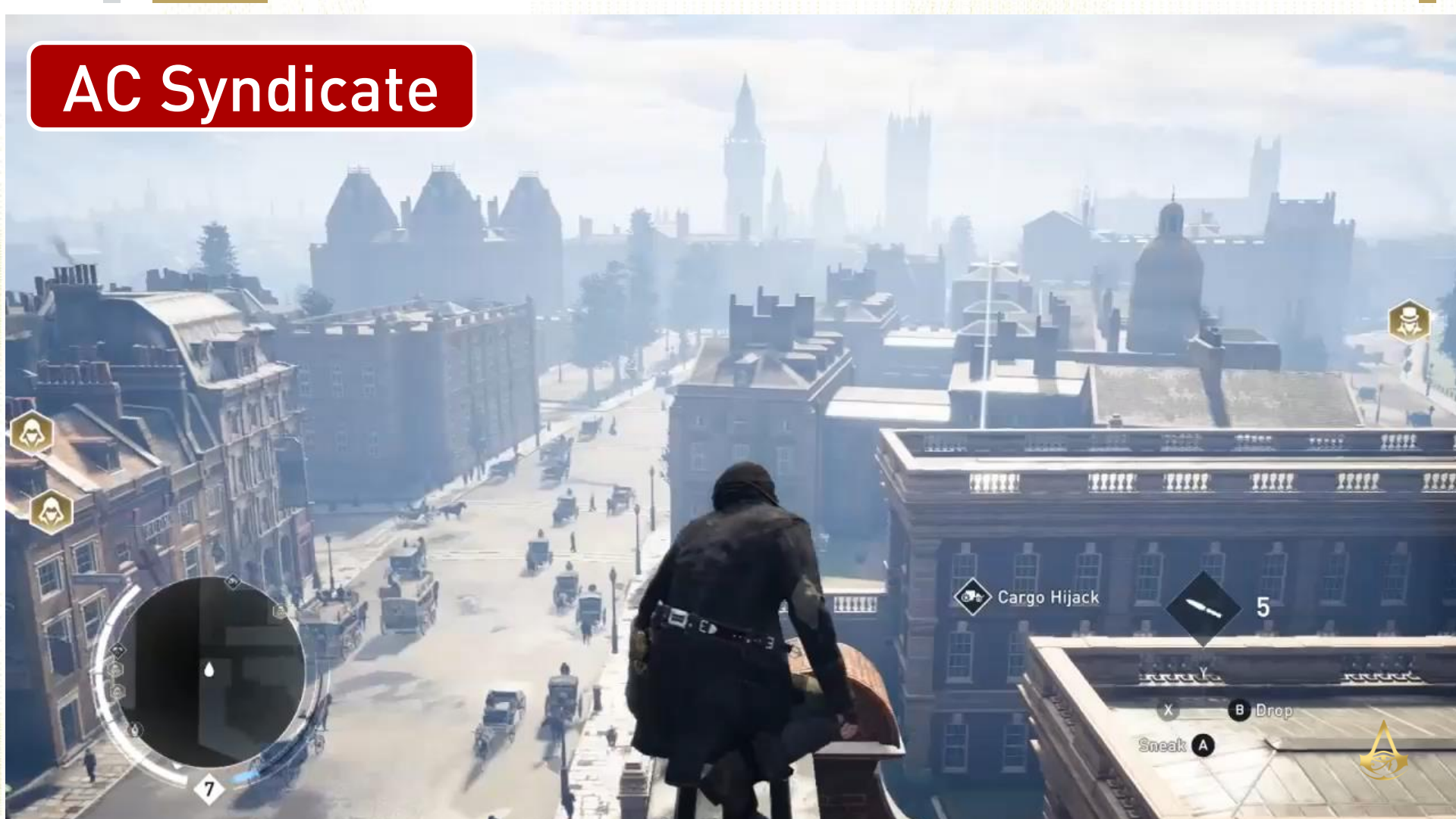
I'm just impressed NPCs almost never "despawn".



INTRODUCTION TO META AI



AC Syndicate



Why we changed?

- RPG Ingredient



Why we changed?

- RPG Ingredient
- Eagle



? ?
200 m

Resting

144 m

Material



4

Hard Leather



Set Marker



Hover Mode



Boost

Why we changed?

- RPG Ingredient
- Eagle
- Long range navigation



Why we changed?

- RPG Ingredient
- Eagle
- Long range navigation
- Quests system





What is the Meta AI ?

- Virtual tracking system
 - Static objects
 - Dynamic objects
- Spawning system
- Behavior system



Static objects



50.000 static objects
15 MB

1 km

5 km

Player

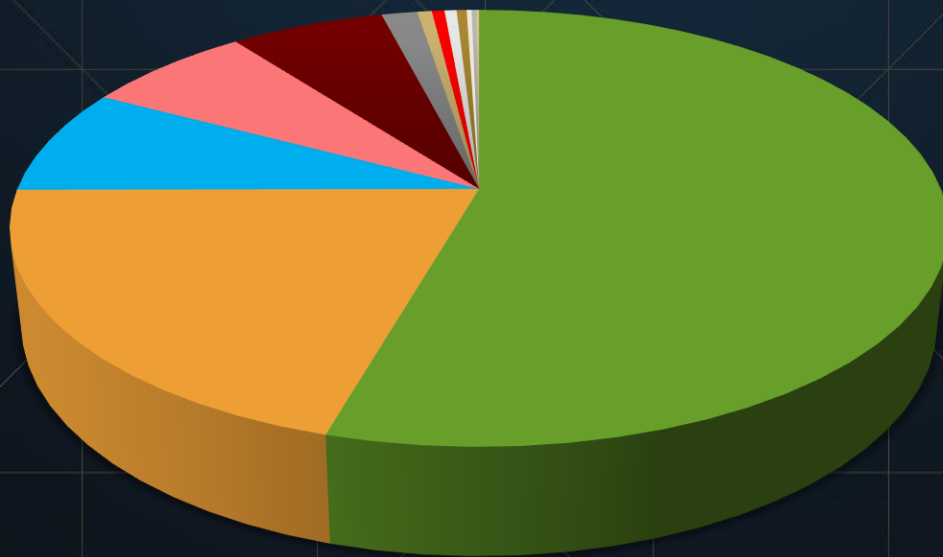


Player



5 km





- | | | |
|---------------------|--------------------|-------------|
| ■ Locations | ■ Animal locations | ■ Spawners |
| ■ Animal Spawners | ■ Resources | ■ Bases |
| ■ Vehicle garages | ■ Warehouses | ■ Cages |
| ■ Water guard posts | ■ Docks | ■ Ballistas |
| ■ Braziers | | |



Spawners

SPN_NPC_Civilian_Generic
UnspawnAtDistance_Refilling
NumSpawnPos: 20 SpawnTime Start: 3.00 End: 21.00
NextSpawnIn: 0.240997
NPC_Civilian_LC_Farmer_Lvl: 1 (Min lvl: 1 Max lvl: 1) Refilling Min: 10 Max: 10 Count: 10

Spawn positions

N
390 m

40

SPN_NPC_Civilian_Generic
UnspawnAtDistance_Refilling
NumSpawnPos: 20 SpawnTime Start: 3.00 End: 21.00
NextSpawnIn: 0.240997
NPC_Civilian_LC_Farmer_Lvl: 1 (Min Lvl: 1 Max Lvl: 1) Refilling Min: 10 Max: 10 Count: 10

Spawned objects

SPN_NPC_Civilian_Generic
UnspawnAtDistance_Refilling
NumSpawnPos: 20 SpawnTime Start: 3.00 End: 21.00
NextSpawnIn: 0.240997
NPC_Civilian_LC_Farmer_Lvl: 1 (Min Lvl: 1 Max Lvl: 1) Refilling Min: 10 Max: 10 Count: 10

Dynamic objects



Virtual



Bulk



Real



AI State



Type: NPC_Civilian_LC_Kid_F
Labels: NPC_Civilian
NPC_LowClass
NPC_Female
NPC_Kid
SCH_LowClass

Human
NPC_Civilian_LC_Kid_F
NPC_Civilian
NPC_LowClass
NPC_Female
NPC_Kid
SCH_LowClass

Human
NPC_Civilian_LC_Kid_M
NPC_Civilian
NPC_LowClass
NPC_Male
NPC_Kid
SCH_LowClass

40





12.000 dynamic objects
40 MB

1 km

5 km

Dynamic objectives

Range: unlimited

Entities (124)

Entities hidden (0)

Bulks (449)

Bulks hidden (58)

Not essential (1475)

Affinity (2296)

Cage (227)

Motion (3996)

Permeability (0)

Size (1000)

Temperature (123)

Solidity (123)

Toughness (123)

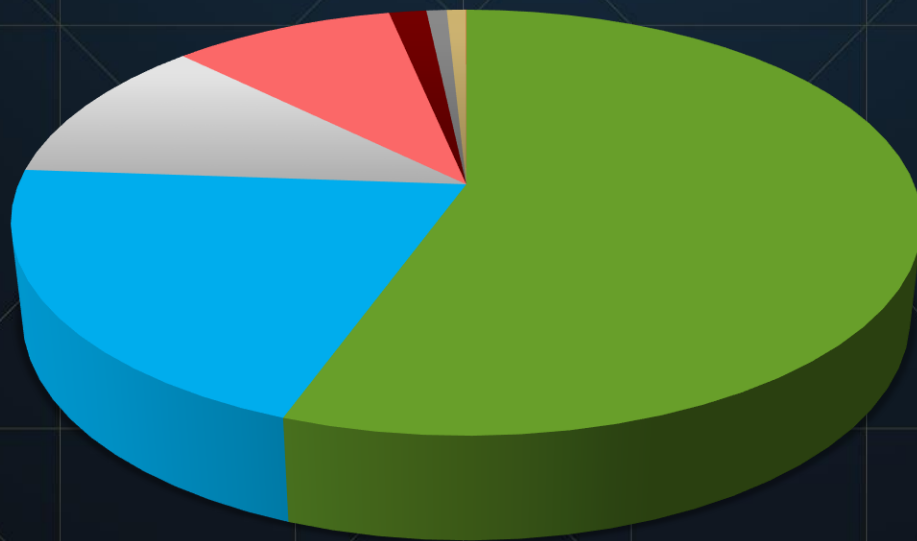
Volume (400)

Vehicle (100)

Volumetric mass (37)

Weight (100)





■ Humans

■ Rideable animal

■ Vehicles

■ Animals

■ Objects

■ Player

■ Small water vehicles

■ Big water vehicles



Long range navigation



Nodes



Links



Lanes



480.000 nodes
520.000 links
100 MB





 Cancel Follow Road



Virtual state

Position



Virtual state



Virtual state



Virtual state



Virtual state



Virtual state

- Updated every:
 - 15 seconds by default
 - 5 seconds if close to the player



Bulk state

250 m



2 km



500 m



Alexandria

?? N

?
380 m

40



Bulk state

- Around 1000 bulks (in cities)
- Updated every:
 - 2 frames when visible
 - 1 second when not visible

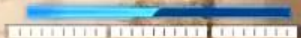


Real state



Akra Garrison

40



Alexandria

?
173 m

Maximum 200

40



Player object



Virtual behaviors

- Give a role to the object
- Simple gameplay loop
- 1 main behavior + 1 reaction behavior
- Only on the root object
- Drives the AI of the spawned entity

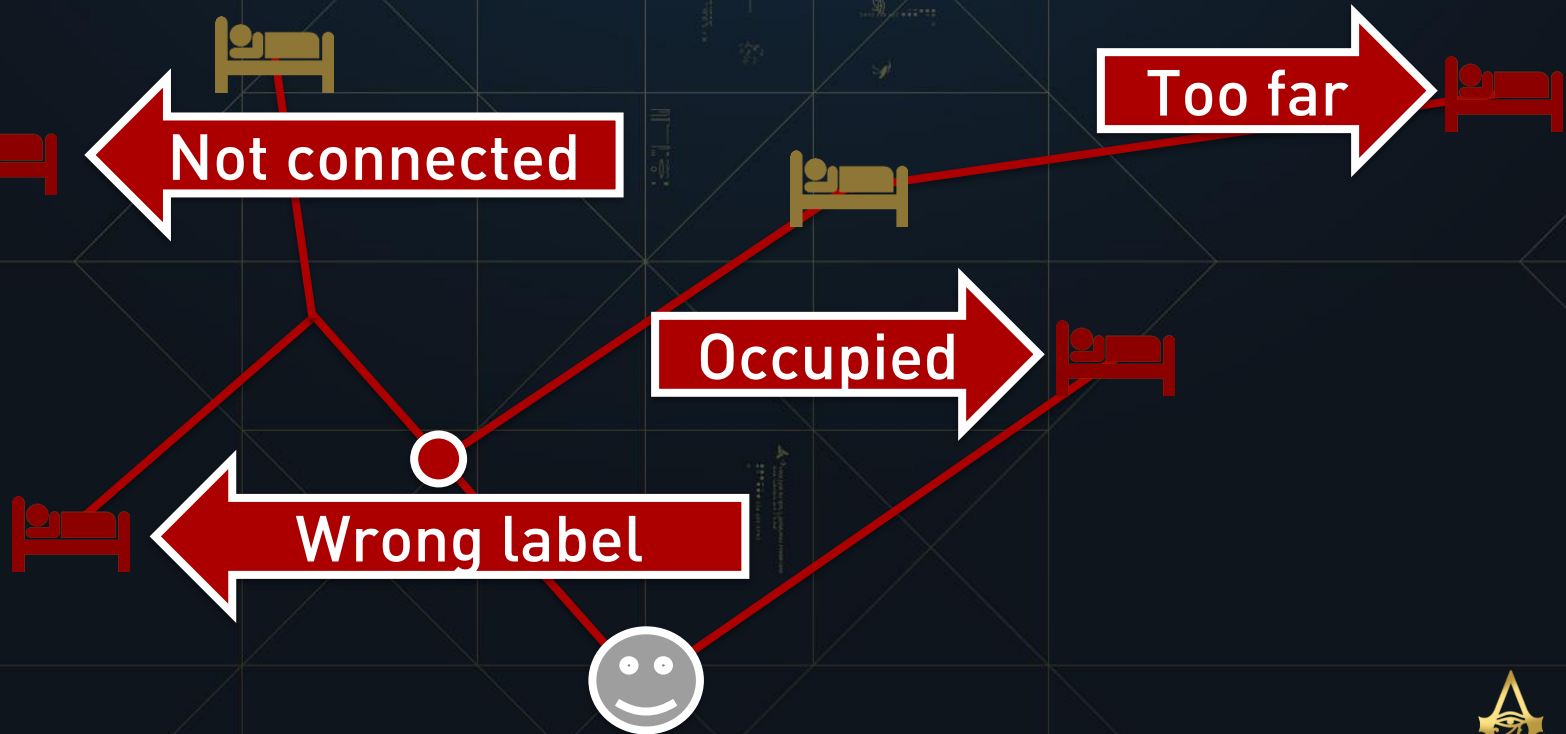


Virtual behaviors

Behavior: Goto
Range: 150m
Label: LOC_Sleep_LC



Virtual behaviors



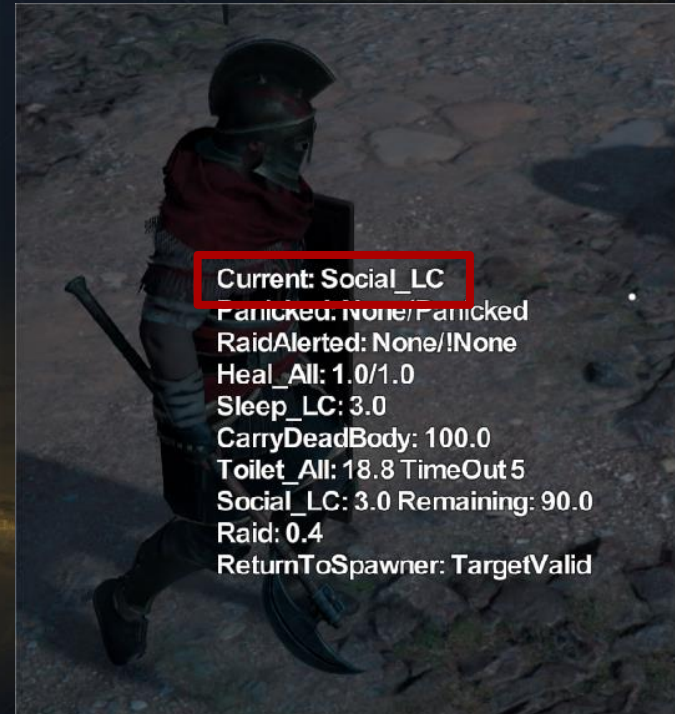
Virtual behaviors



Needs



Needs



Nikiou Fort

18

Current: Eat_HC
Alerted: None/!None
Heal_All: 1.0/1.0
Toilet_All: 11.0
Eat_HC: 12.4 Remaining: 6.3
Social_HC: 3.6
ReturnToSpawner: TargetValid

Current: Defend
Panicked: None/Panicked
Alerted: None/!None
Heal_All: 1.0/1.0
CarryDeadBody: 100.0 TimeOut 3
TalkWithPatrol (24h): 100.0 TimeOut 4
Eat: 0.3 TimeOut 5
Defend: 0.0 Remaining: 0.0
ReturnToSpawner: TargetValid



Location objectives

Y Cheats



Nikiou Fort

40

Current: Toilet_All
Alerted: None/!None
Heal_All: 1.0/1.0
Toilet_All: 11.1 Remaining: 90.0
Eat_HC: 0.1
Social_HC: 5.9
ReturnToSpawner: TargetValid



Location objectives

Y Cheats



Nikiou Fort

404 m

18

Current: Toilet_All
Alerted: None/None
Heal_All: 1.0/1.0
Toilet_All: 11.1 Remaining: 86.3
Eat_HC: 2.3
Social_HC: 7.0
ReturnToSpawner: TargetValid



Location objectives

Cheats



Nikiou Fort

404 m

40

18

Current: Social_HC
Alerted: None/!None
Heal_All: 1.0/1.0
Toilet_All: 0.0
Social_HC: 8.0 Remaining: 90.0
ReturnToSpawner: TargetValid



Location objectives

Cheats



4 active guards

?
264 m



40



7 active guards





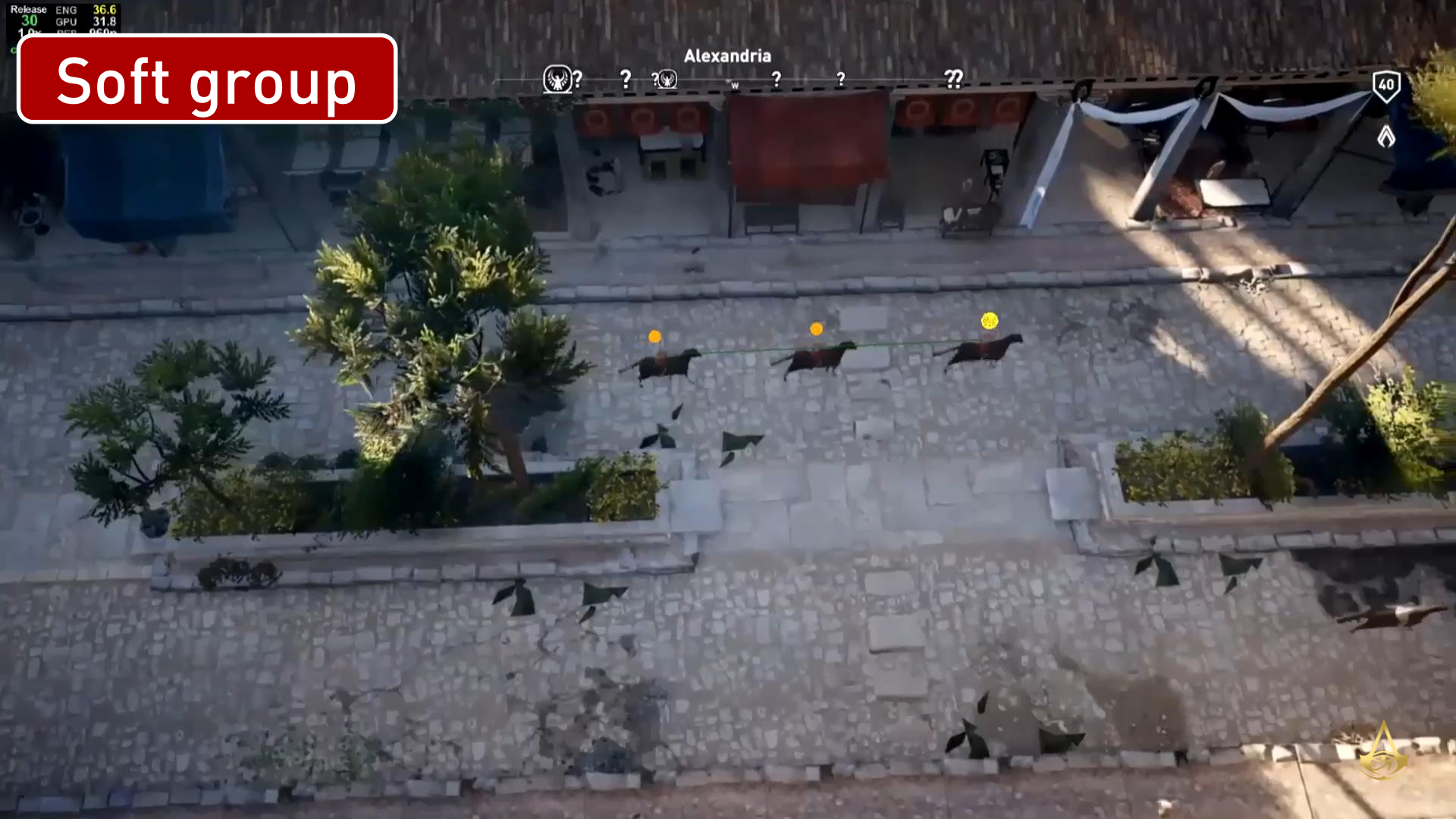
Groups



Hard group



Soft group



Meta AI

- 50.000 static objects
- 12.000 dynamic objects
 - Move on the AI network
 - Virtual, real or bulk
 - Needs push virtual behaviors



PERFORMANCES AND TROUBLESHOOTING




Preroll

Waiting for MetaAI PreRoll (8 frames left): 0:00 seconds

Weapon Parameters

Press **T** in the Gear page to view a detailed description of all weapons parameters.

 Cycle hints



Update

Groups,
avoidance



Spawned
units



Path requests (async)



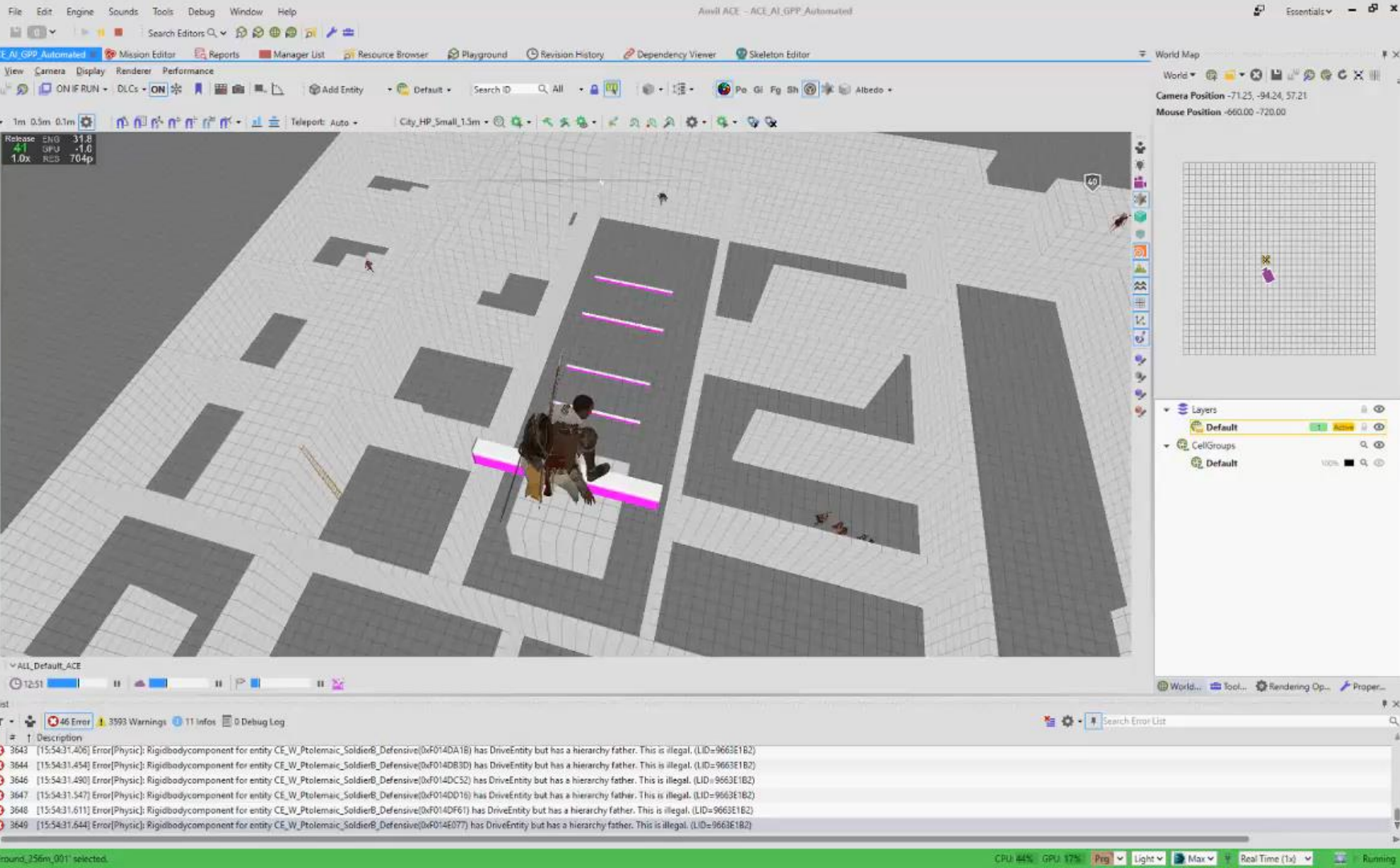
Meta AI Objects
(time sliced)



Debugging tools

- Automated smoke tests



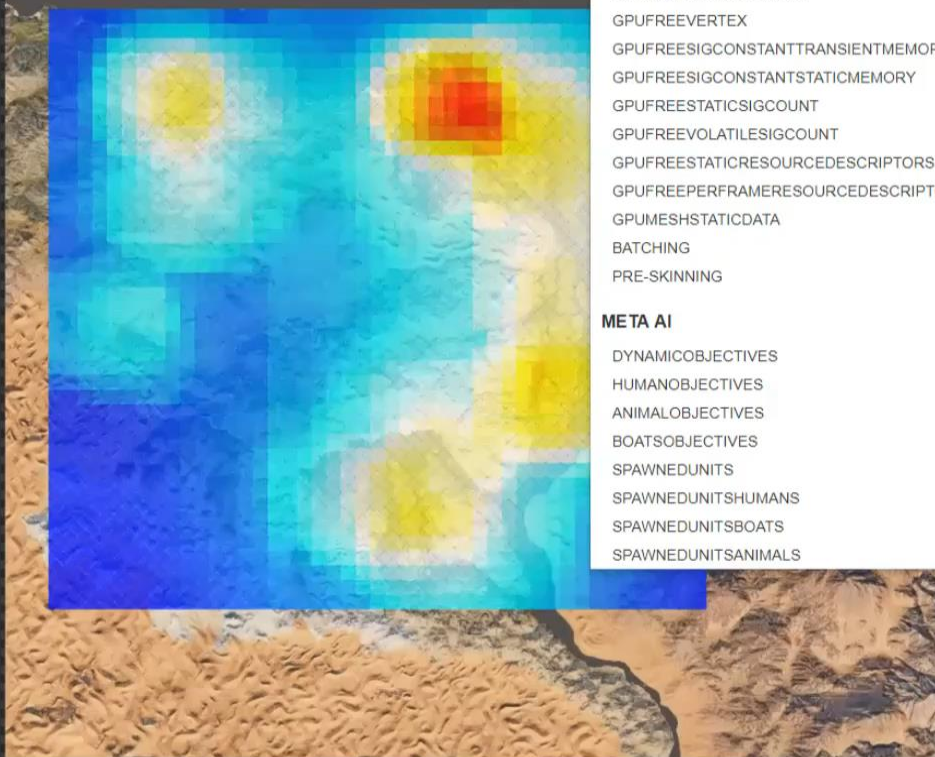


Debugging tools

- Automated smoke tests
- Telemetry

	Date	Playtime	Username	Studio	Platform	Game Version	Branch	Target	Map	Files	FPS %...	FPS %...	FPS %...	FPS %...	Final Mem...	Gear St...
				Select Fi	Select	Select Filter	Select Fi	Select Fi								
1	2059-09-01 10:32:21 ...	00:52:28	c2445711_d154404...	Bucharest	PS4NEO	C2445711_D1544045_S8...	Sub2	QCFinal	ACE_Egypt	0	0.11	0.14	0.26	78.73	0	☀
2	2059-09-01 10:27:26 ...	00:04:28	c2445711_d154404...	Bucharest	PS4NEO	C2445711_D1544045_S8...	Sub2	QCFinal	ACE_Egypt	0	0	0.04	0.22	40.77	0	☀
3	2059-09-01 6:38:11 P...	03:48:49	c2445711_d154404...	Bucharest	PS4NEO	C2445711_D1544045_S8...	Sub2	QCFinal	ACE_Egypt	0	0.15	0.16	0.56	76.64	0	☀
4	2059-09-01 6:01:10 P...	00:34:25	c2445711_d154404...	Bucharest	PS4NEO	C2445711_D1544045_S8...	Sub2	QCFinal	ACE_Egypt	0	0.16	0.18	0.49	75.56	0	☀
5	2018-02-05 1:41:47 P...	00:03:35	compilassassin	Montreal	WIN64	C2715930_D1776653_S9...	Main	Profile	ACE_Egypt	0	0	0	0	90.19	52.77 GB	☀
6	2018-02-05 1:38:31 P...	00:03:14	compilassassin	Montreal	WIN64	C2715930_D1776653_S9...	Main	Profile	ACE_Egypt	0	0	0	0	88.52	52.88 GB	☀
7	2018-02-05 1:35:06 P...	00:03:23	compilassassin	Montreal	WIN64	C2715930_D1776653_S9...	Main	Profile	ACE_Egypt	0	0	0	0	89.61	52.99 GB	☀
8	2018-02-05 1:31:51 P...	00:03:13	compilassassin	Montreal	WIN64	C2715930_D1776653_S9...	Main	Profile	ACE_Egypt	0	0	0	0	90.76	53.10 GB	☀
9	2018-02-05 1:28:15 P...	00:03:35	compilassassin	Montreal	WIN64	C2715930_D1776653_S9...	Main	Profile	ACE_Egypt	0	0	0	0.07	92.46	52.83 GB	☀
10	2018-02-05 1:25:11 P...	00:01:04	jlpedneault	Montreal	PS4NEO	C2713341_D1774504_S9...	Main	Profile	BOOTSTRAP,TitleScreen	0	0.17	0.17	1.16	89.02	3.03 GB	☀





META AI

DYNAMICOBJECTIVES
HUMANOBJECTIVES
ANIMALOBJECTIVES
BOATSOBJECTIVES
SPAWNEDUNITS
SPAWNEDUNITSHUMANS
SPAWNEDUNITSBOATS
SPAWNEDUNITSANIMALS

Heatmap options:

Cell stat max ▾

Opacity 75% ▾

Gradient 256 ▾

Mouse position:
Cell ID:

Min limit:
1061
(1061)



Max limit:
9423
(9423)

Cell Properties

Looking: south
Min: 21.13
Avg: 25.21
Median: 25.49
Max: 31.98
Count: 32



Session ID and Command lines ▾

Choose FAP(s) to download:

2017.12.04-12.09.59_South_walkthrough_Profile_PS4
2017.12.04-12.10.04_West_walkthrough_Profile_PS4

[Download](#)[Copy Link](#)

Debugging tools

- Automated smoke tests
- Telemetry
- Performance walkthrough
- Nightly reports



Meta AI Reports

ACE_Egypt

Nightly Ai Network Sanity Check

(2017/10/11 | 02:42)

Report Type	Total Errors	Excel	Invalid Count by Teams					OUTSIDE REGION PAINT
			SIWA (MTL)	GIZA (MTL)	NILE (MTL)	FAYM (SGP)	CYRN (SOF)	
TwoWayPrecisePath	0	MTL SIN SOF	0	0	0	0	0	0
OneWayButTwoWays	0	ibid	0	0	0	0	0	0
UnconnectedLocationNodes	1	ibid	0	0	0	0	0	1
UnconnectedChildNodes	0	ibid	0	0	0	0	0	0
DisabledLocationNodes	0	ibid	0	0	0	0	0	0
TunnelCaveNodes	65	ibid	17	17	25	0	0	6
TunnelCaveAboveGroundNodes	783	ibid	115	365	70	170	62	1
AnimalLargeOverDeepWater	283	ibid	22	46	209	0	0	6

To check this data on a map, please check [Atlas Web](#), the results are in the Meta Ai Reports folder.

For more information about this email, please see the [following page](#) on Confluence.



Debugging tools

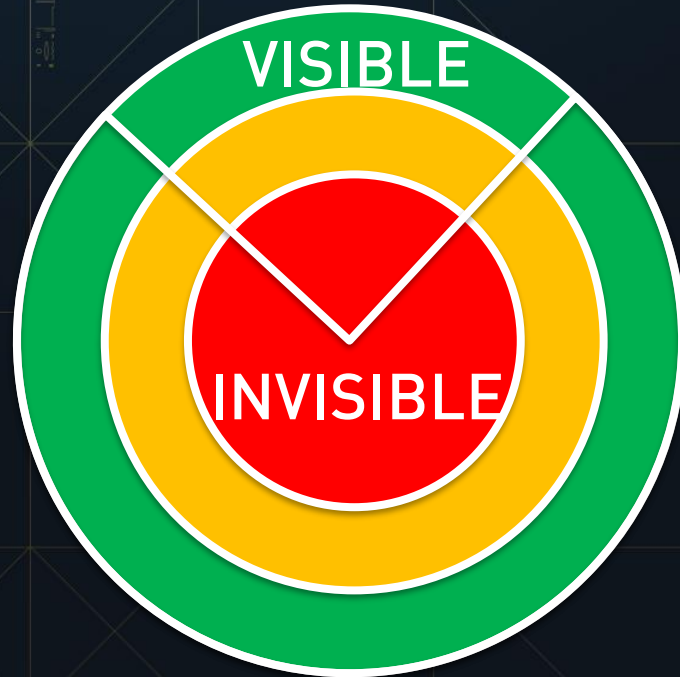
*'Assassin's Creed Origins': Monitoring
and Validation of World Design Data*

Nicholas Routhier (Design Technical
Director, Ubisoft Montreal)



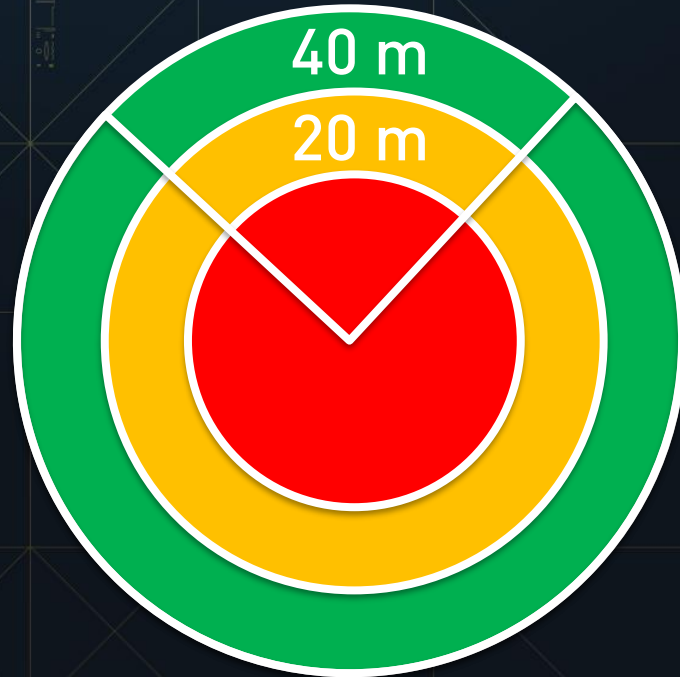
Performances

- Switching from less than 100 to 200 NPCs
- New tech:
 - Component LOD



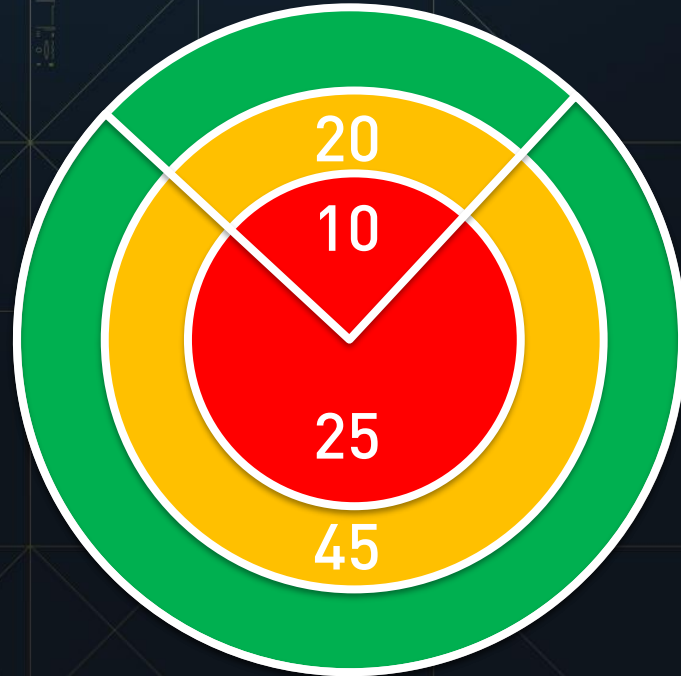
Performances

- Switching from less than 100 to 200 NPCs
- New tech:
 - Component LOD



Performances

- Switching from less than 100 to 200 NPCs
- New tech:
 - Component LOD



Performances

- Switching from less than 100 to 200 NPCs
- New tech:
 - Component LOD
 - Bulk animation



REAL ANIM



BULK ANIM



WHAT SHOULD BE
IMPROVED

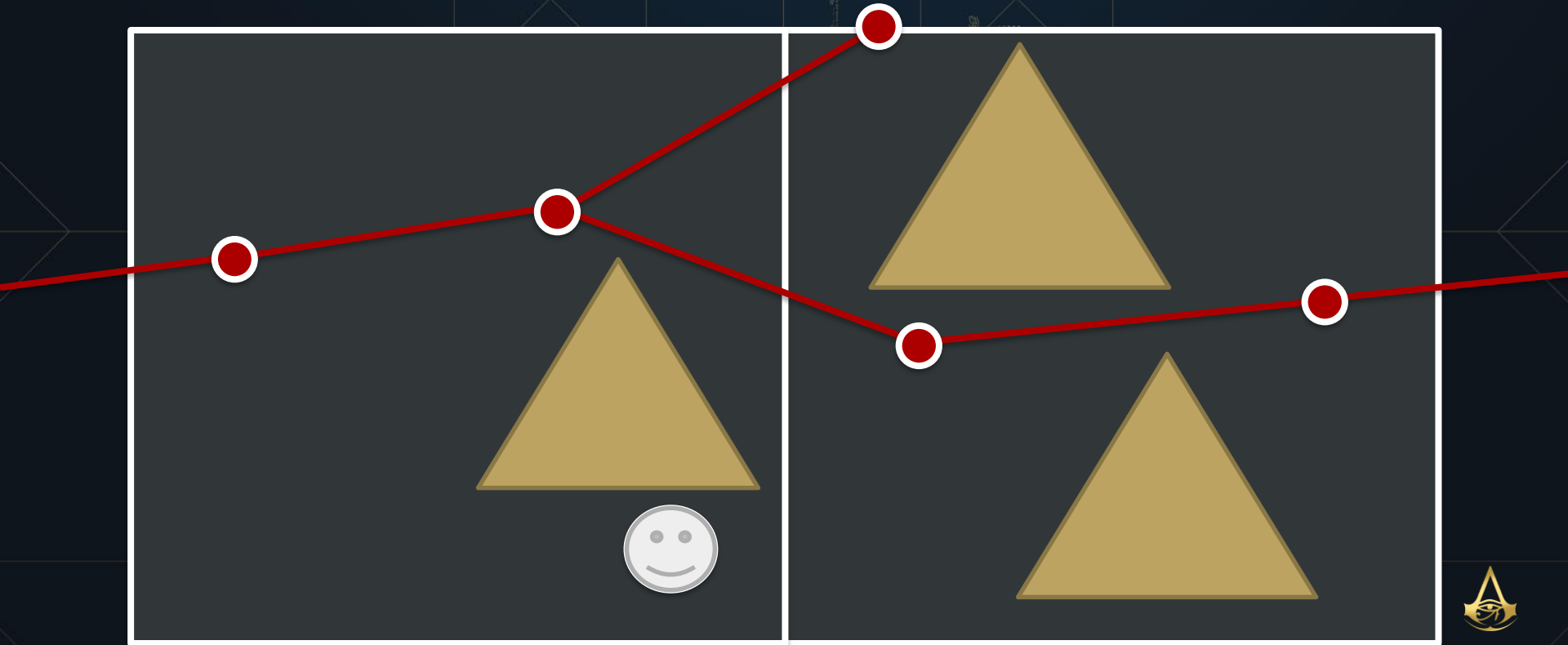


2 navigation services

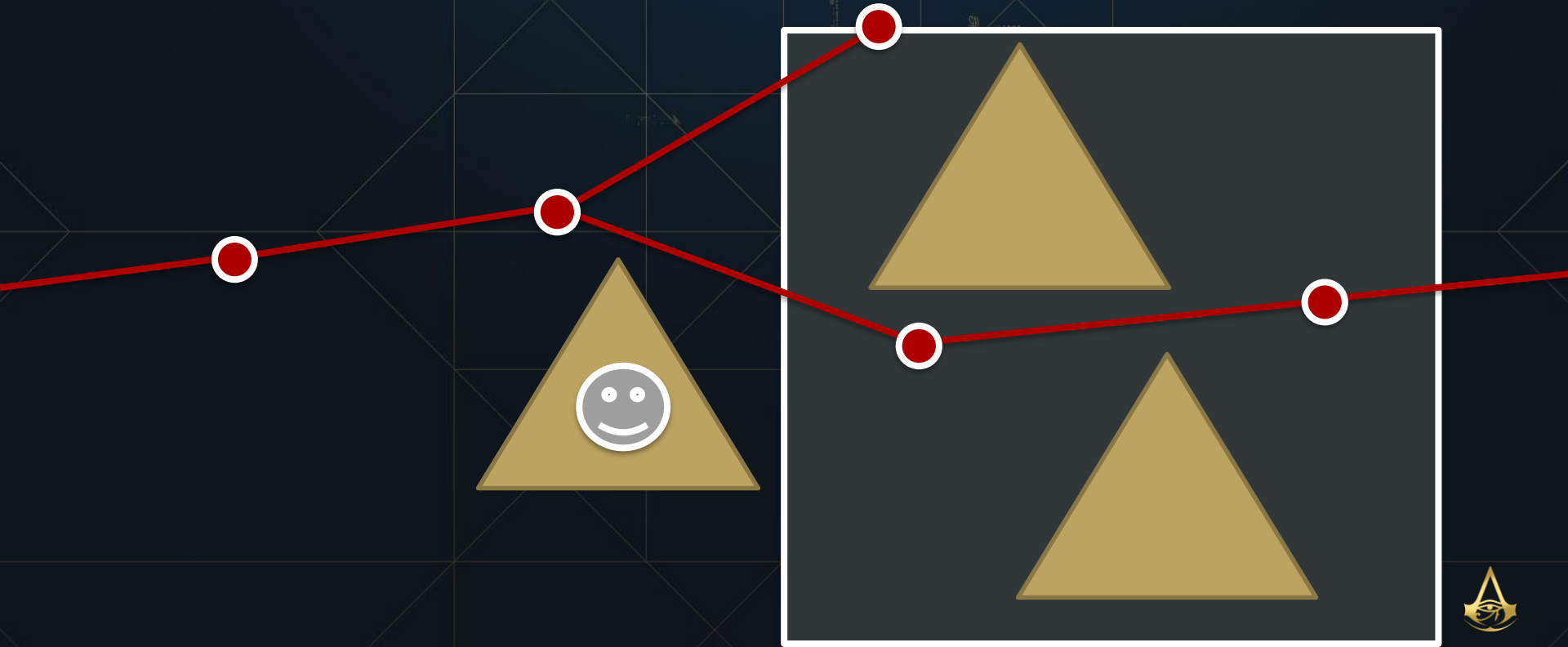
- One for spawned space
 - Along navmesh
- One for bulk/virtual
 - Along world path



2 navigation services



2 navigation services



2 navigation services



Density



Density



Emotion management

- Objects do not know if a cinematic is playing





QUESTS AND META AI



Quests



Quests

- New scripting operators
- New virtual conditions
- Specific behaviors for quests
 - Stand still
 - Scripted go to



When Night Falls

Escort Suphia and the rebel contact to the ruined fort

336 m

Rebel

Goal: Go to ruined fort
Can use a horse

Suphia

Goal: Follow rebel
Must wait for player

An attack on a nearby encampment. The soldiers than we thought. Lost a lot

Bayek

Goal: Escort Suphia
Opponent to bandits



When Night Falls

Escort Suphia and the rebel contact to the
ruined fort

479 m

?

23

REBELS



Quests

*Going Off-Script: Refactoring the NPC
Mission System in 'Assassin's Creed: Origins'*

Jean-Marie Santoni-Costantini

(Gameplay Programmer, Ubisoft Montréal)



THANK YOU !
QUESTIONS ?

charles.lefebvre@ubisoft.com



@FrozenInMTL

