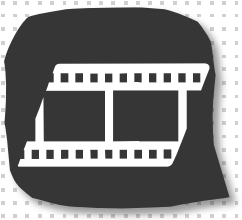
TECHNOLOGY GROUP

GDC 12



# PASSENGER

## Story of a convergent pipeline

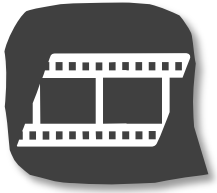

**Thomas Felix**
TG - Passenger
Ubisoft Montréal

**Pierre Blaizeau**
TWINE
Ubisoft Montréal



GAME DEVELOPERS CONFERENCE
SAN FRANCISCO, CA
MARCH 5-9, 2012
EXPO DATES: MARCH 7-9
2012

# TECHNOLOGY GROUP



# PASSENGER

HOW TO EXPAND YOUR GAME UNIVERSE?

HOW TO BRIDGE GAME AND CG TECHNOLOGY?

HOW TO EMPOWER GAME CONTENT CREATORS?

# EXPAND?

# HOW TO EXPAND YOUR GAME UNIVERSE?

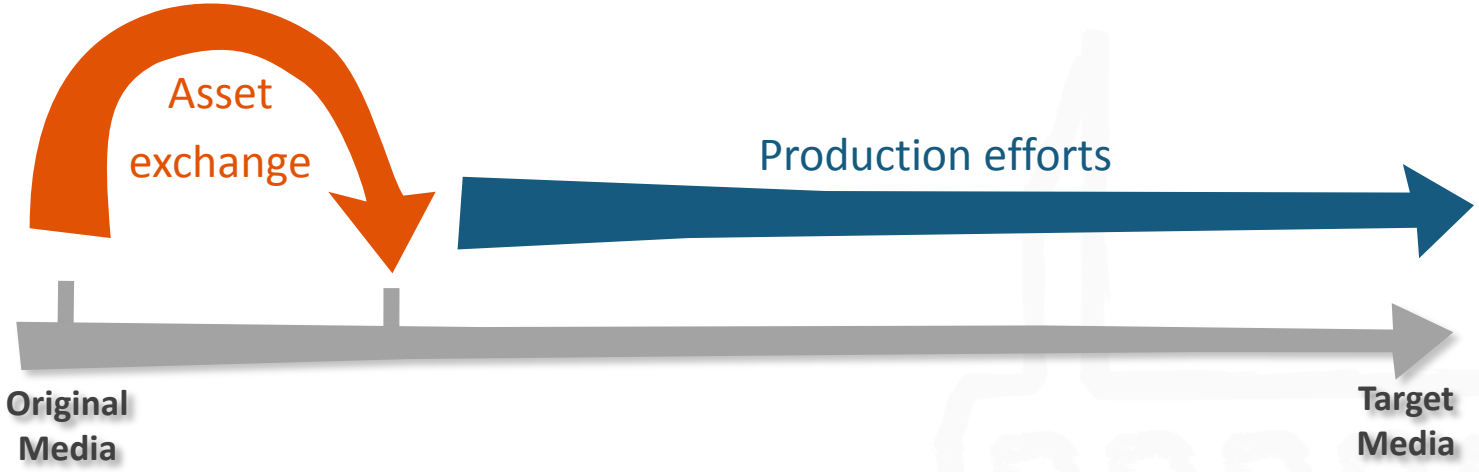
Tell stories around the story

Reach surrounding media

Be consistent

Be efficient!

# HOW TO EXPAND YOUR GAME UNIVERSE?



# HOW TO EXPAND YOUR GAME UNIVERSE?

# HOW TO EXPAND YOUR GAME UNIVERSE?

Game

No additional constraints

Bring the Game

to the CG studio

CG

CG-based products made with CG tools

# ASSASSIN'S CREED LINEAGE

# HOW TO EXPAND YOUR GAME UNIVERSE?

## Project & Context

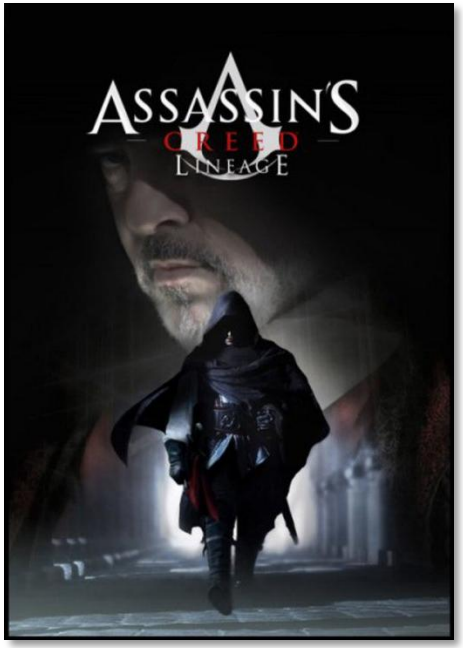
Assassin's Creed II

Use the Game

Recycle assets

Collaborate with CG Studios

# LINEAGE A PROOF OF CONCEPT




## Proof of concept

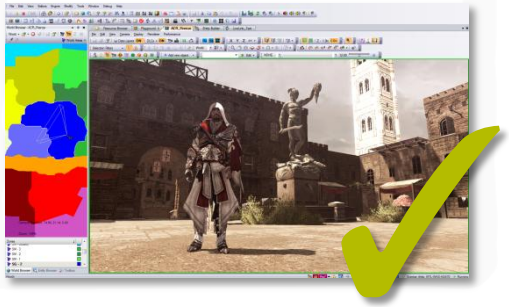
- Catch existing opportunities
- Timing constraints
- Minimum custom dev

# LINEAGE A PROOF OF CONCEPT

## Where do we start?

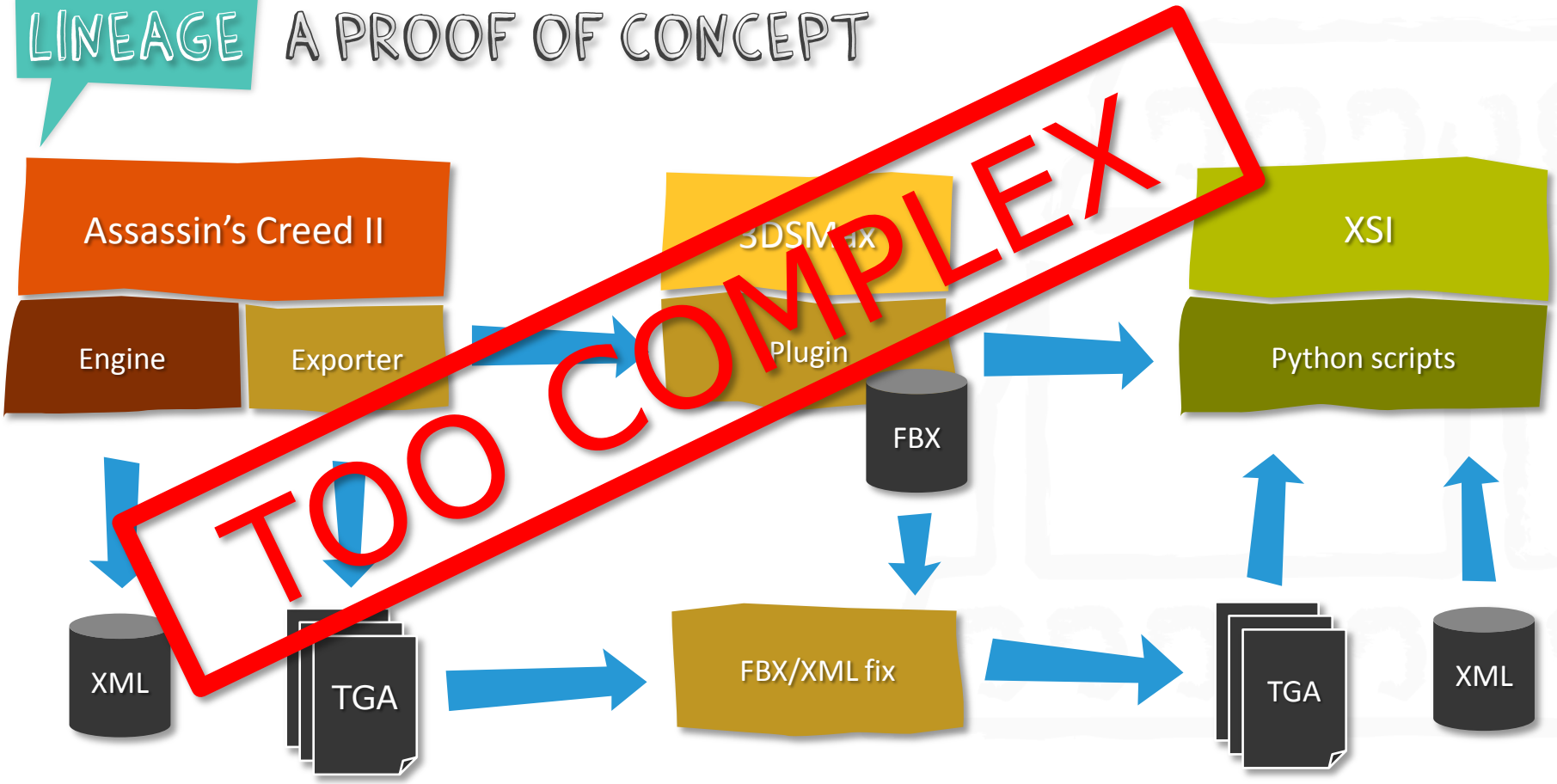
Source files

Fragmented Assets



Instanciated Assets

# LINEAGE A PROOF OF CONCEPT



# LINEAGE A PROOF OF CONCEPT

- ✓ Concept proven
- ✓ Used in pre-production

- ✗ High maintenance pipeline
- ✗ Cut off?

# LINEAGE A PROOF OF CONCEPT

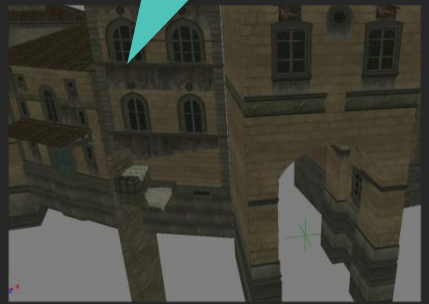
# LINEAGE A PROOF OF CONCEPT

| | |
|---|---|
| Connectivity | Too many intermediary components |
| Static asset exchange | Some types are supported<br>Key features are missing |
| Dynamic asset exchange | N/A |
| Cross Engine / Cross DCC* | Anvil / XSI only |
| Content production | Used in pre-production |

*Digital Content Creation tool

UNIFY + ABSTRACT + SOLIDIFY

# BRIDGE?



# HOW TO BRIDGE GAME AND CG TECHNOLOGY?

## Technical context

Maintain granularity of information

Scene graph communication and conformation

No constraints over existing engine / pipeline

Beyond 1 engine / 1 DCC

# HOW TO BRIDGE GAME AND CG TECHNOLOGY?

## Our approach

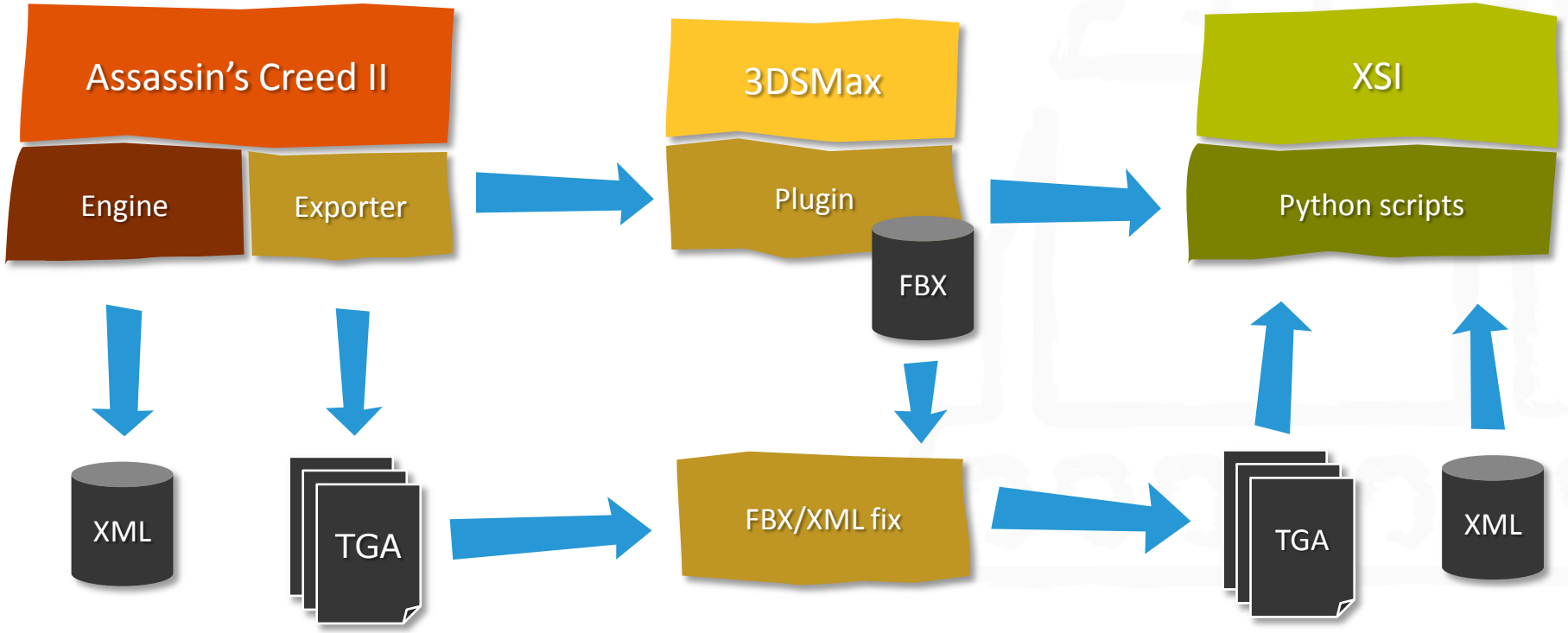
Client / Server architecture

No file exchange

Live communication and conformation

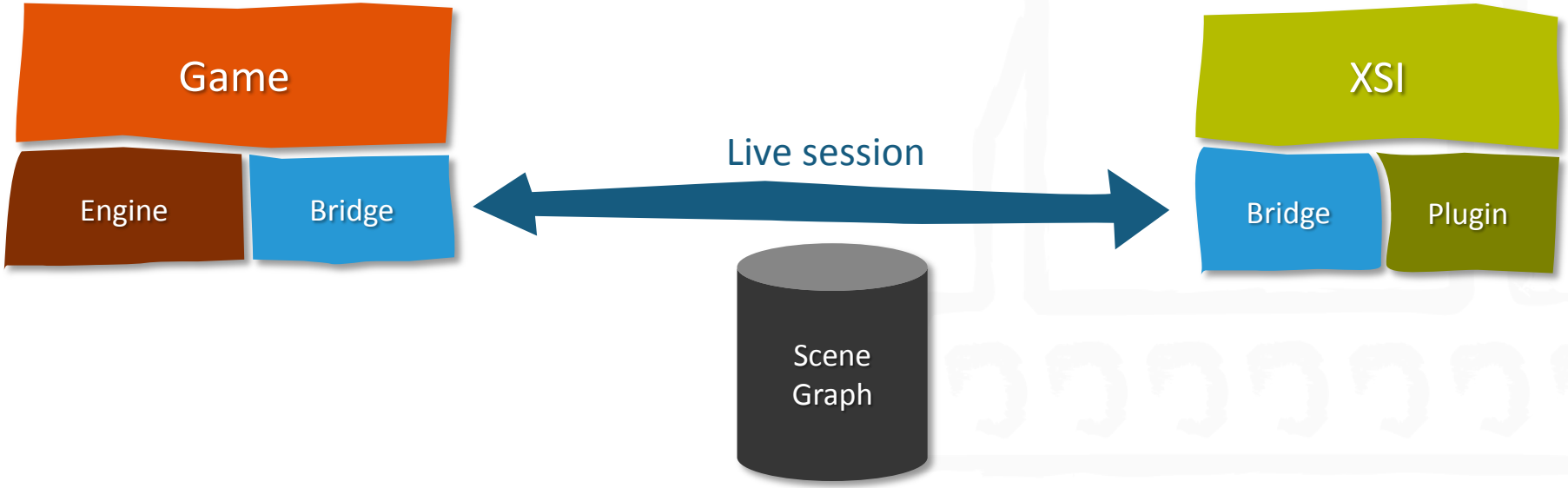
Tools & UI on Client side: *Game as a monitor*

# HOW TO BRIDGE GAME AND CG TECHNOLOGY?



# HOW TO BRIDGE GAME AND CG TECHNOLOGY?

A new and simplified architecture…



# HOW TO BRIDGE GAME AND CG TECHNOLOGY?

We need a data abstraction layer

- Framework & scene graph representation
- Homogeneous Client & Server

We need a communication layer

- Native serialization
- Handle tiny & massive transactions

# HOW TO BRIDGE GAME AND CG TECHNOLOGY?

Build a flexible technology

- Easy to integrate
- Easy to iterate on

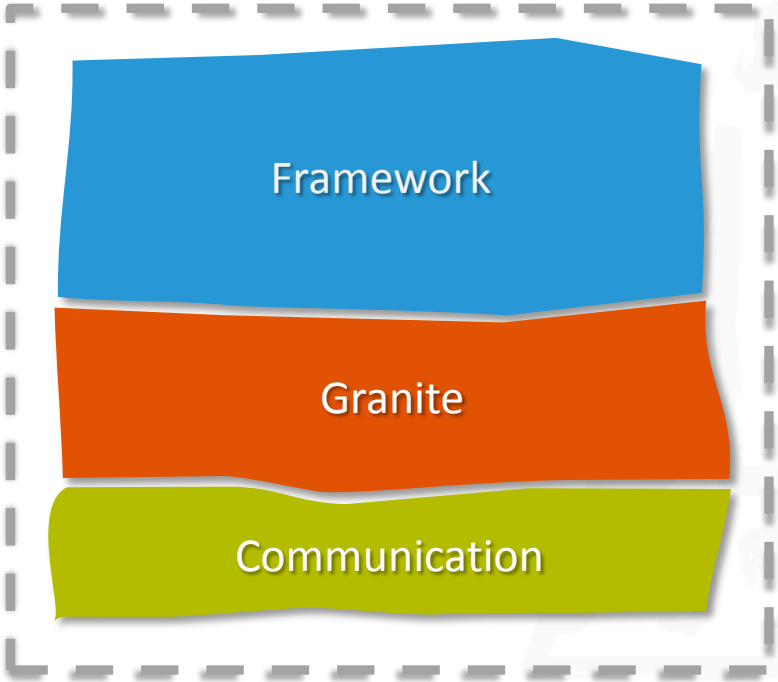
Abstraction + Communication + Flexibility

- Reflection
- Remoting

# HOW TO BRIDGE GAME AND CG TECHNOLOGY?

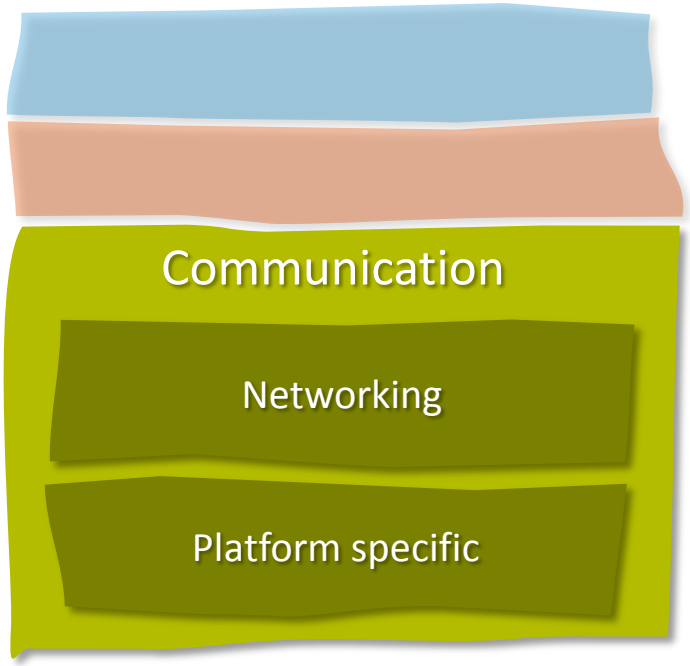
We call it

**GamEx**



GamExUser

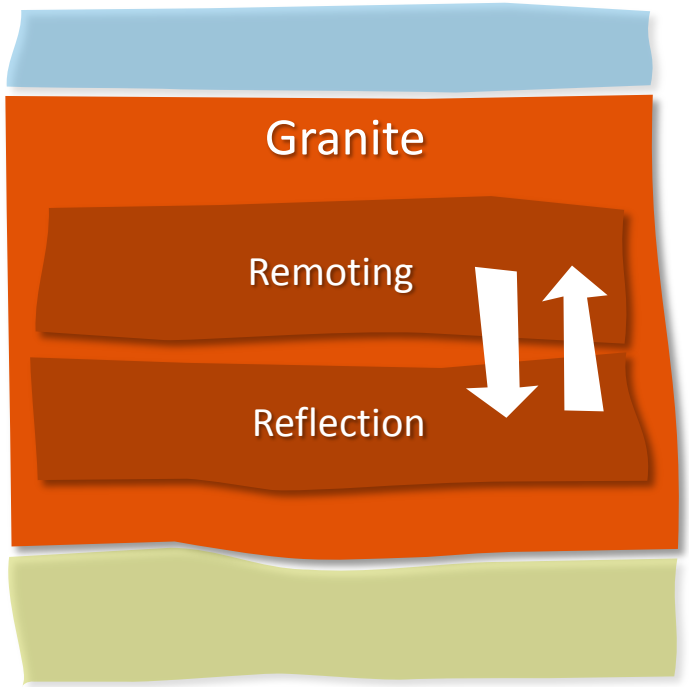
# HOW TO BRIDGE GAME AND CG TECHNOLOGY?




## Efficient Networking layer

- TCP/IP based protocol
- Multi-Client connectivity
- Optimal:
  - Memory allocation
  - Memory copy

# HOW TO BRIDGE GAME AND CG TECHNOLOGY?




## Reflection

C++ reflection & dynamic binding

Self contained

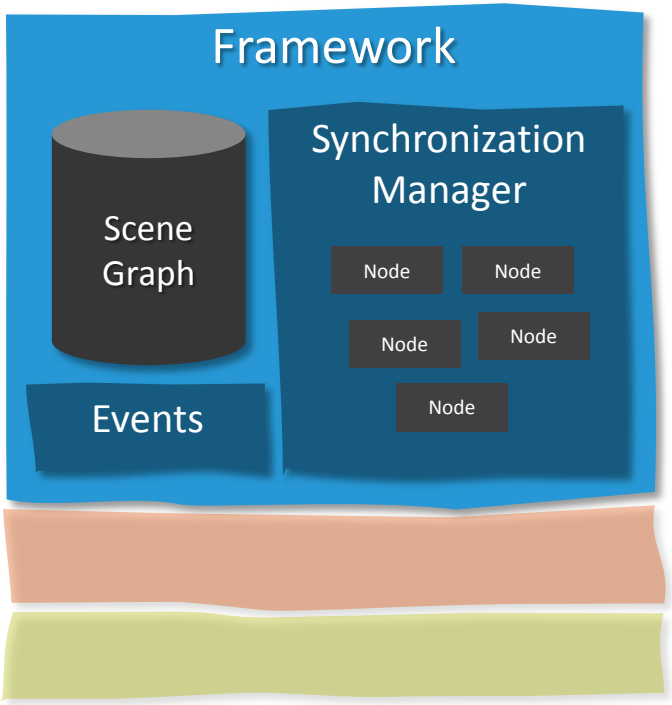
Tag based

## Remoting

Intuitive RPC system

Generated proxies

# HOW TO BRIDGE GAME AND CG TECHNOLOGY?




## Framework as an application layer

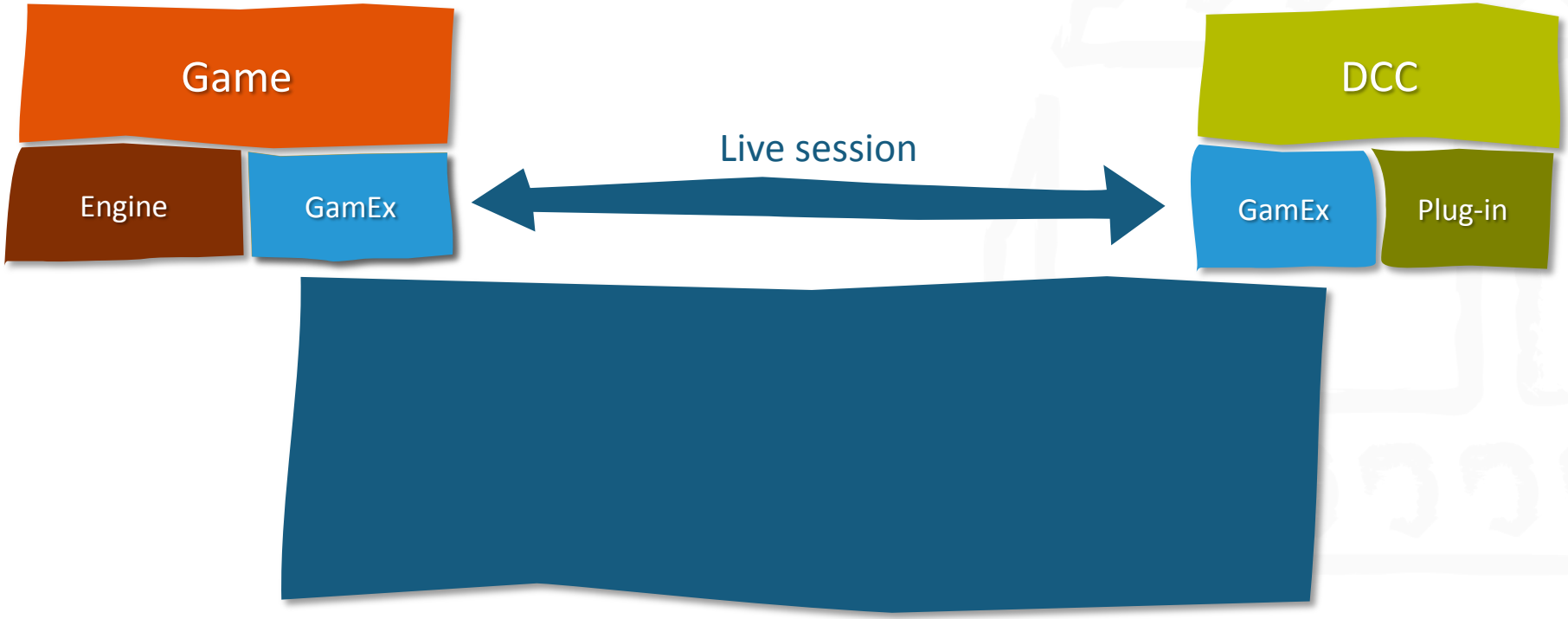
Data representation

- Scene Graph
- Assets & Metadata

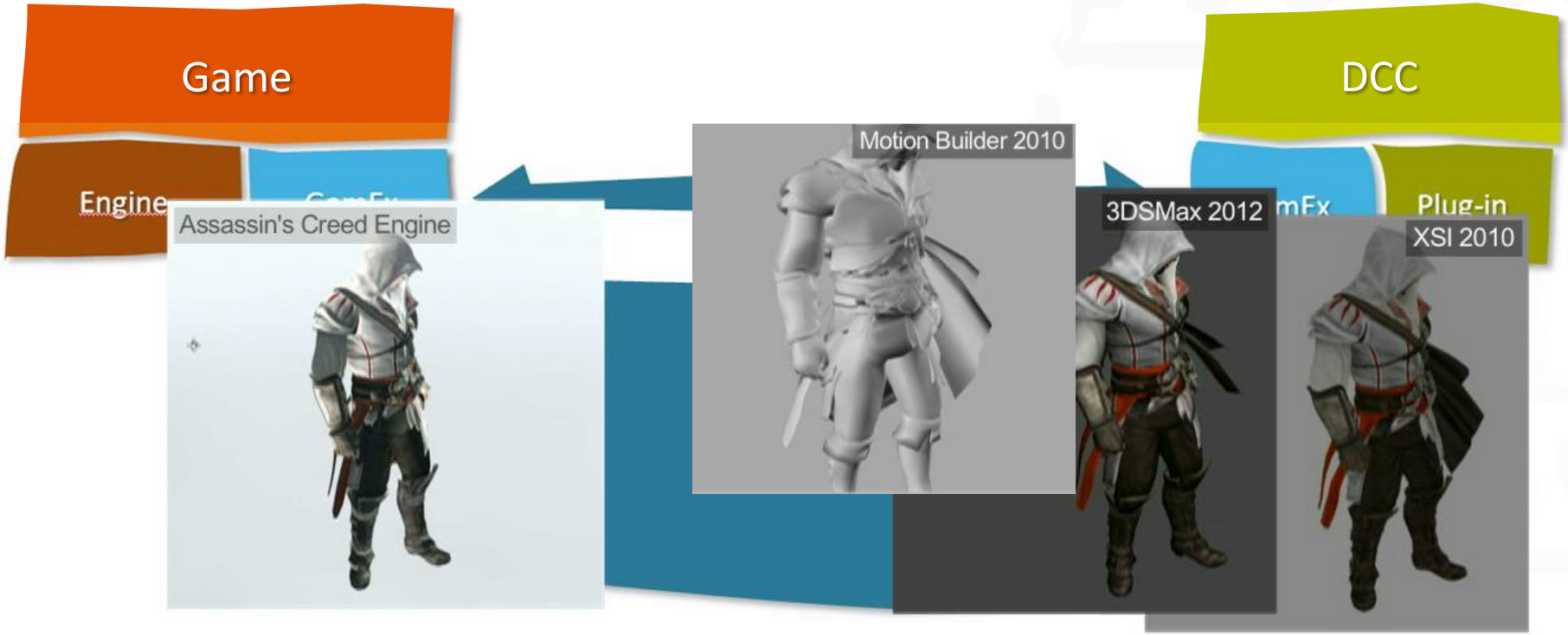
Live link

- Synchronization Manager
- Events

# HOW TO BRIDGE GAME AND CG TECHNOLOGY?

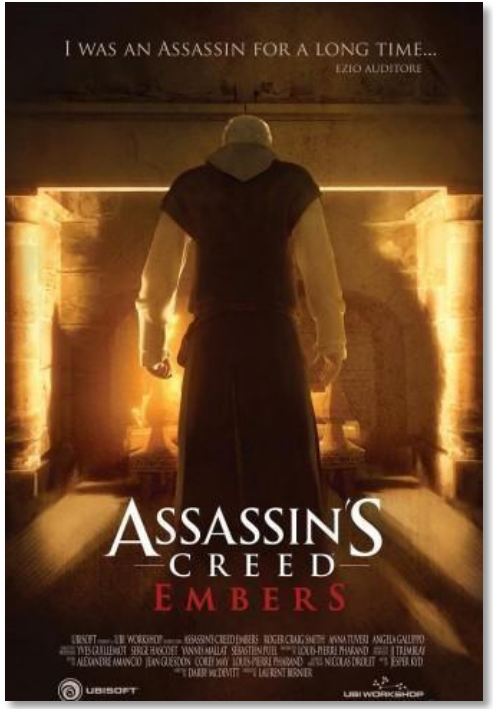


# HOW TO BRIDGE GAME AND CG TECHNOLOGY?



# ASSASSIN'S CREED EMBERS

# HOW TO BRIDGE GAME AND CG TECHNOLOGY?



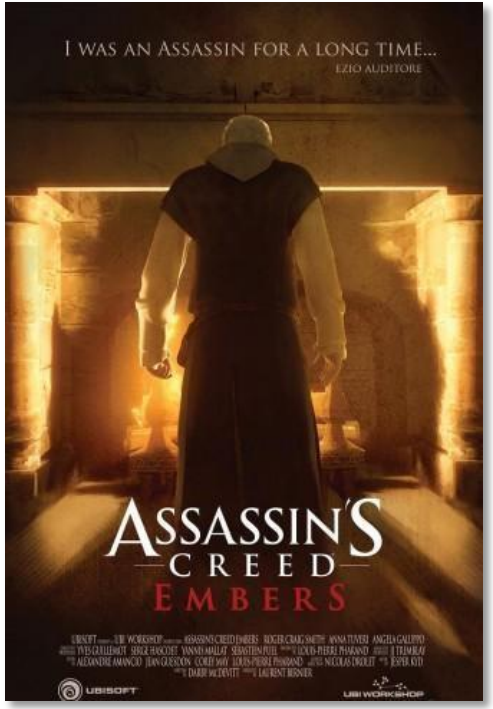

## Project & Context

Assassin's Creed Brotherhood

High quality expectations

Small amount of resources

# EMBERS AN ANIMATED FILM




## New Challenges!

Export & Conform materials

Export crowd animations

EMBERS AN ANIMATED FILM

## Material issues: *How to…*

Deal with Real-time shaders and CG materials?

Target eclectic renderers? *(Vray, Arnold, etc.)*

Be artist friendly?

→ Road to GamEx Material Templates

# EMBERS AN ANIMATED FILM

# EMBERS AN ANIMATED FILM

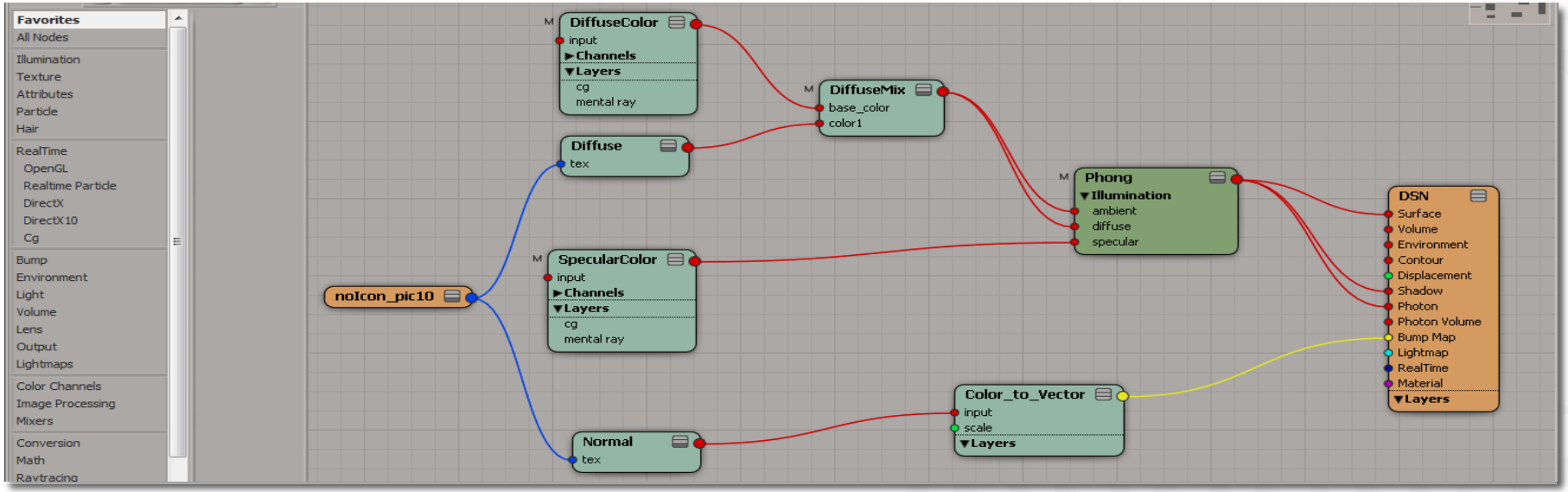
?

EMBERS AN ANIMATED FILM

```
// Get material and assign a preset
Material* pGamExMaterial = GetFramework()->GetLibraryMaterials()->Get( iMaterialID );
pGamExMaterial->SetShader( "DNS" );

// Expose shader parameters
pGamExMaterial->AddSamplerParameter( "Diffuse", pGamExImageDiffuse );
pGamExMaterial->AddSamplerParameter( "Normal", pGamExImageNormal );
pGamExMaterial->AddSamplerParameter( "Specular", pGamExImageSpecular );

pGamExMaterial->AddVectorParameter( "DiffuseColor", kDiffuseColor );
pGamExMaterial->AddVectorParameter( "SpecularColor",  kSpecularColor );
pGamExMaterial->AddVectorParameter( "AlphaTestEnabled",  kAlphaTest );
```

**Step1:** Extract in-game parameters

# EMBERS AN ANIMATED FILM



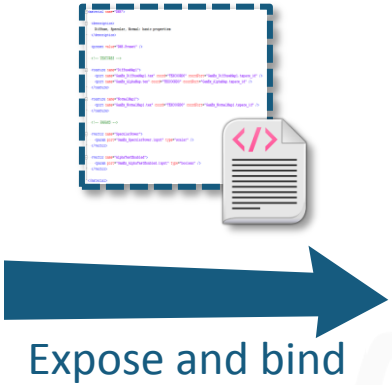

**Step2:** Define specific CG preset

EMBERS AN ANIMATED FILM

```
<material name="DNS">

  <description>
    Diffuse, Specular, Normal: basic properties
  </description>

  <preset value="DNS.Preset" />

  <!-- TEXTURES -->

  <texture name="DiffuseMap1">
    <port name="GamEx_DiffuseMap1.tex" coord="TEXCOORD0" coordPort="GamEx_DiffuseMap1.tspace_id" />
    <port name="GamEx_AlphaMap.tex" coord="TEXCOORD0" coordPort="GamEx_AlphaMap.tspace_id" />
  </texture>

  <texture name="NormalMap1">
    <port name="GamEx_NormalMap1.tex" coord="TEXCOORD0" coordPort="GamEx_NormalMap1.tspace_id" />
  </texture>
```

**Step3:** Bind parameters to material

# EMBERS AN ANIMATED FILM



EMBERS AN ANIMATED FILM

## Animation issues: *How to…*

Bring complex animation sequences to DCC?

Edit imported animations?

Handle in-game skeletons *vs* custom Rigs?

EMBERS AN ANIMATED FILM

## Sync & Export Animations

- Use case for the Synchronization Manager
- Recording in DCC to generate key-frames

## From in-game skeletons to editable Rigs

- Rig retargeting for second-layer animation
- Python scripts to handle post-process

# EMBERS AN ANIMATED FILM

- ✓ *GamEx* in film production
- ✓ Used by artists & CG supervisors
- ✓ Benefit from a shipped Game

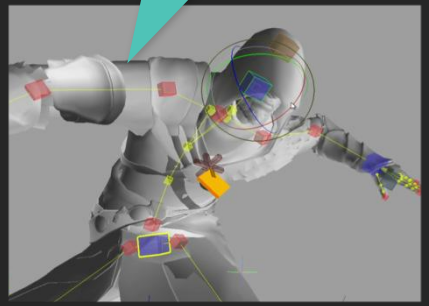
- ✗ Game editor is still needed
- ✗ Build stability
- ✗ Assets updates not supported

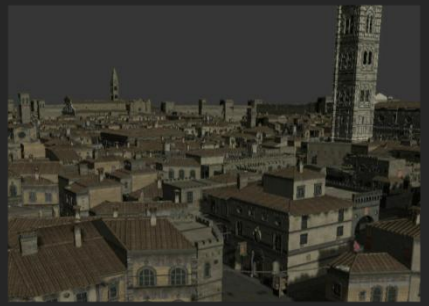
# EMBERS AN ANIMATED FILM

# EMBERS AN ANIMATED FILM

| | |
|---|---|
| Connectivity | **Client / Server** architecture |
| Static asset exchange | Most **types supported**<br>Easy to add new types |
| Dynamic asset exchange | Animation acquisition through synchronization |
| Cross Engine / Cross DCC | **YES!** |
| Content production | **Assassin's Creed Embers**<br>(Numerous trailers) |

# EMPOWER?





# HOW TO EMPOWER GAME CONTENT CREATORS?

Exploit *GamEx* feature set…

- Asset exchange
- Live synchronization

…in Game production!

- Connect to surrounding pipelines
- Push the tech forward

# CONNECT + COLLABORATE?

# HOW TO EMPOWER GAME CONTENT CREATORS?

## Assassin's Creed Revelations

Linear AI / Navigation system issues

- Hard to prototype
- Strong code dependency
- Iteration time
- Quality?

**In-game AI sequence** → **In-game cinematic**

# HOW TO EMPOWER GAME CONTENT CREATORS?

## Complement cinematic pipeline

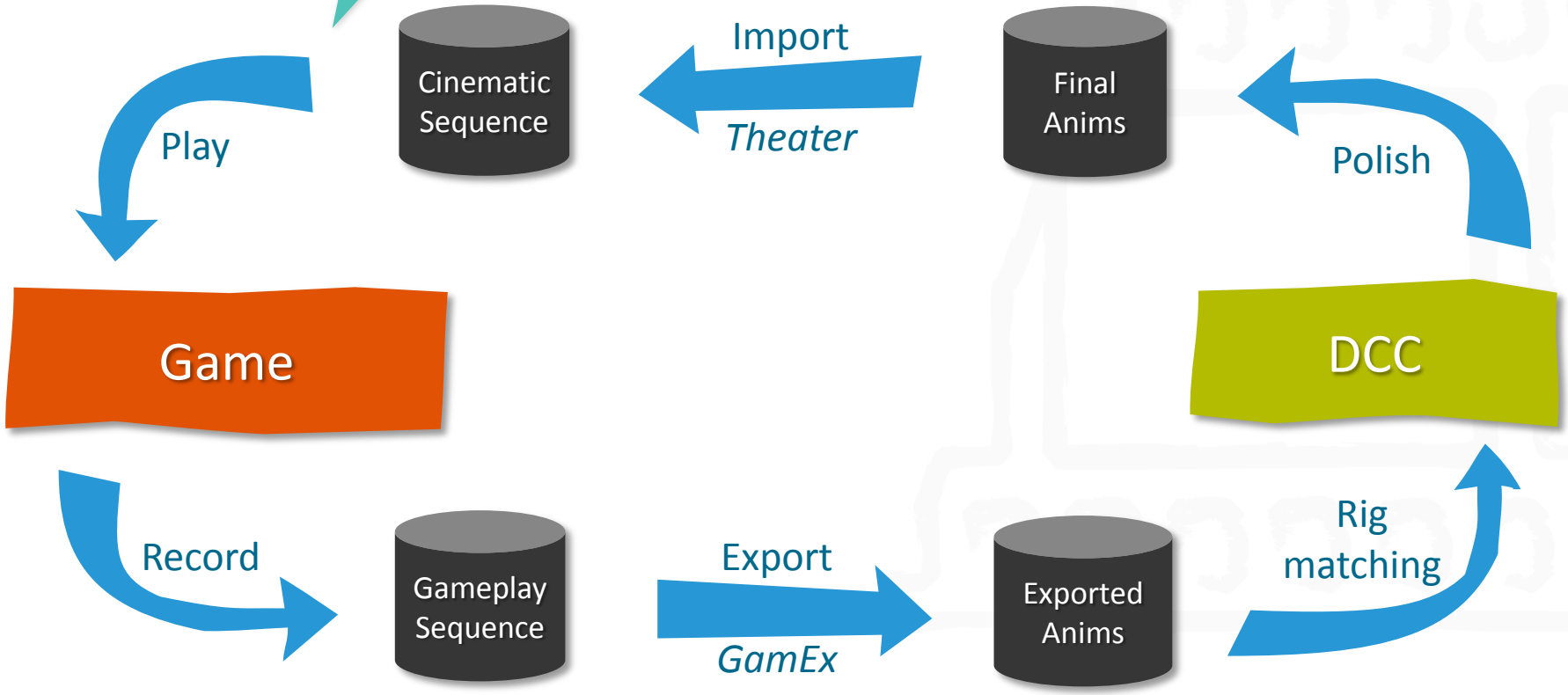
- *Theatre*: in-house cinematic editor
- Used on Assassin's Creed games

## Produce better narrative content

- Storyboarding
- Cinematic
- Mission prototyping

Recorded Characters
Playable Character

# HOW TO EMPOWER GAME CONTENT CREATORS?



# HOW TO EMPOWER GAME CONTENT CREATORS?

- ✓ Iterate faster
- ✓ High quality blended animations for free
- ✓ No dependencies on other departments

- ✗ Large animation sequences hard to handle
- ✗ CPU usage *vs* memory
- ✗ Conflict with versatile environments

# LIVE + PUSH THE TECH?

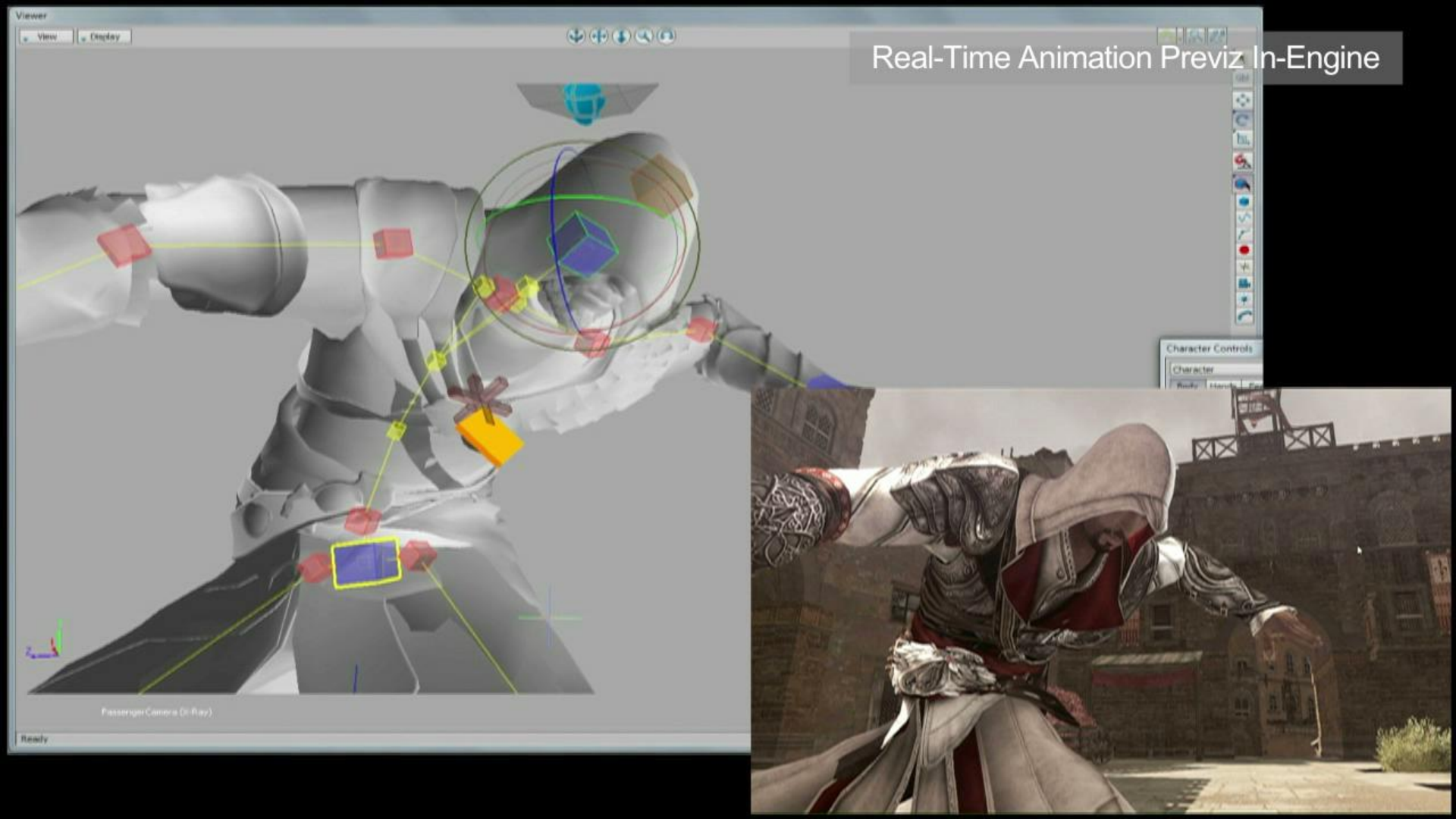
# HOW TO EMPOWER GAME CONTENT CREATORS?

## What can we do live?

- Take control over original assets
  - Camera
  - Skeletons / Bones
  - Proprietary technologies
- Game as a monitor

**Live Link** → **Real-time Previz!**

# Real-Time Animation Previz In-Engine



Motion Capture Session with Real-Time Previz In-Engine

# HOW TO EMPOWER GAME CONTENT CREATORS?

## In-game previz big wins

- Body animation
- Facial animation *(bones + wrinkle maps)*
- Virtual Stage & Live in-engine MoCap
- Iteration time!

# HOW TO EMPOWER GAME CONTENT CREATORS?

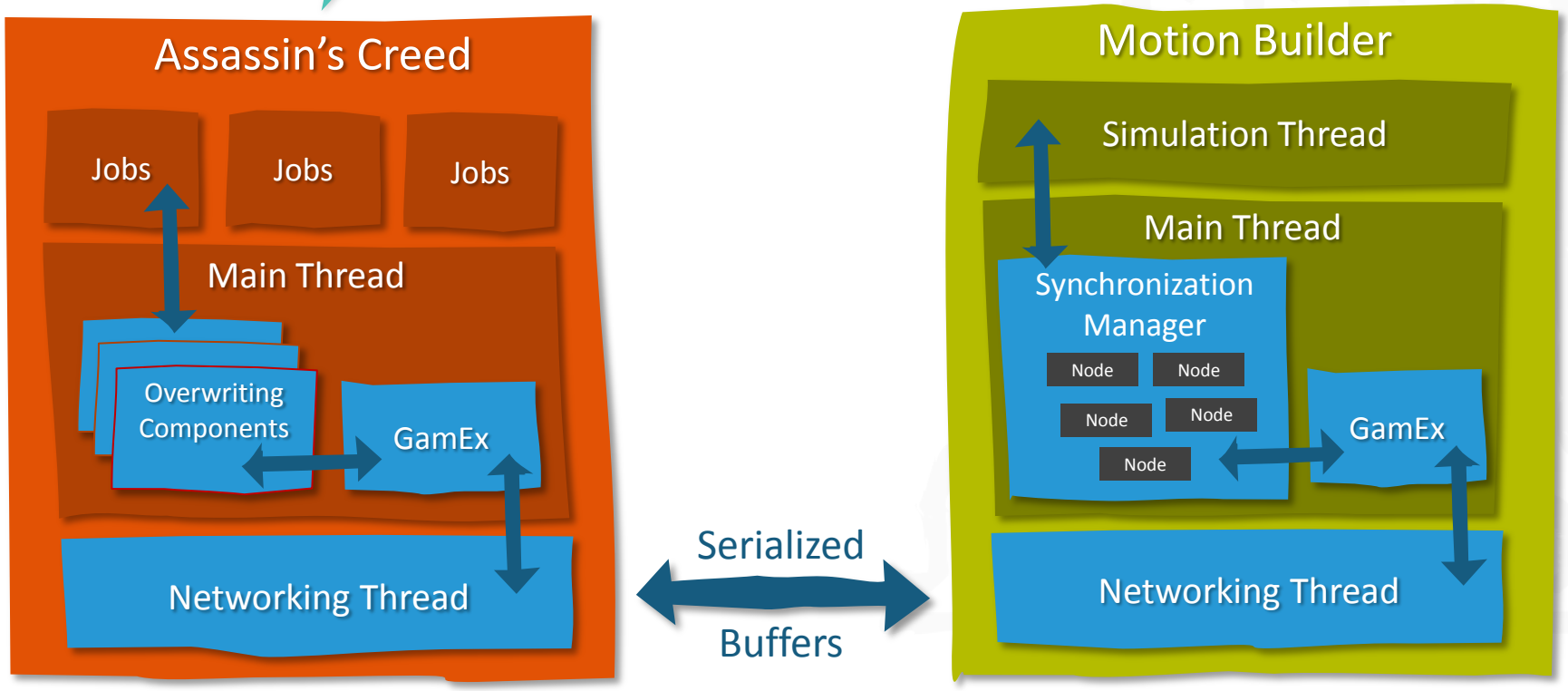
We need to optimize data transfer!

Reflection *vs* Serialization

- No more iterations on data structures
- Target performances

**Reflection** → **Serialization-based transfers**

# HOW TO EMPOWER GAME CONTENT CREATORS?



# HOW TO EMPOWER GAME CONTENT CREATORS?

We need to expose a binding interface

PyGamEx

- Python interface for Motion Builder
- In the hands of TAs
- Flexible, reusable…

# HOW TO EMPOWER GAME CONTENT CREATORS?

- ✓ Massively reduce iteration time for artists
- ✓ Complete feedback from engine
- ✓ Game and CG share Virtual Stage

- ✗ Strong dependencies on proprietary tech
  - Rig change compromises stability
  - Extreme proximity with animation pipeline
- ✗ Lack of maturity

# WRAP IT UP!

From A.C. Brotherhood to A.C. Embers
...Back to A.C. Revelations

From Game production to Transmedia
...Back to Game production

2 industries, 1 convergent approach

Bridge technologies

Empower artists in their context

# WHAT'S NEXT?

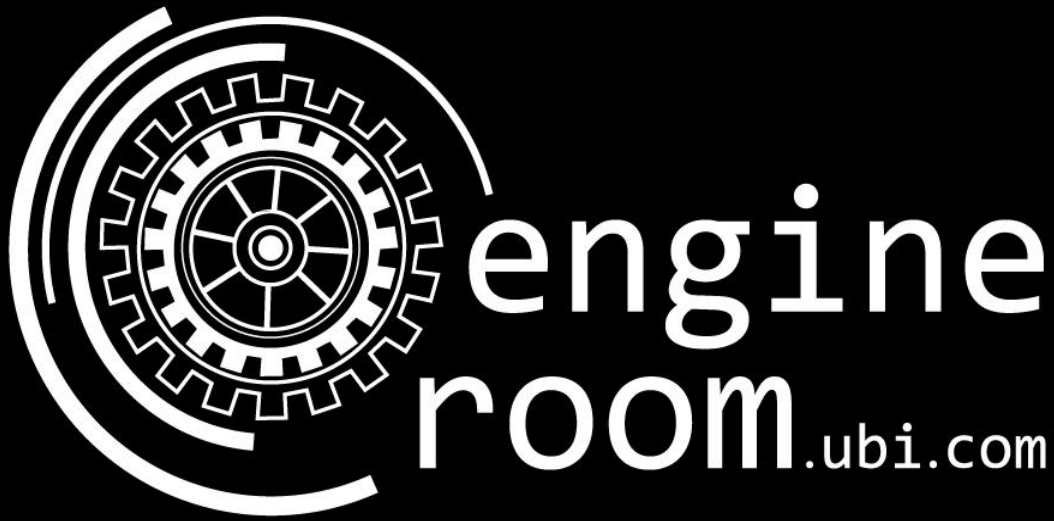
Pursue the quest: Next Gen?

- Bring surrounding industries to Game production
- Help thinking top-down

Bridge new/other pipelines

- Empower new kind of artists
- Writers, directors, editors, compositors, etc.

Involve the **Film industry** in **Game production**

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YOUR ONE-STOP IN-DEPTH TECH BLOG

# QUESTIONS?