UNITY VISION ON RENDERING FUTURE
OR:
HOW WE MADE THIS ONE DEMO

Aras Pranckevičius, Renaldas Zioma
Unity Technologies

HIGH-END GRAPHICS

- Games
- VR
- Cinematics

High-end graphics is one of the corner-stones of today's Unity strategy. High-end graphics are necessity for modern games. Graphics is what will make or break VR immersion. And we see more and more convergence between realtime graphics and traditional CG.

In the future all games made with Unity will look like Adam. This talk will cover how we made Adam and briefly will touch technology that enables creation of projects like Adam.

By working on realtime shorts like Adam we understand better how high quality content of offline movies comes to be. That enables us to learn from traditional CG. More and more practices from traditional CG "leaks" into game development and realtime graphics. At the same time realtime elements of our engine and tools allows us to go further and improve on traditional CG workflows - such as much faster feedback loop between asset production and creative direction.

UNITY VISION

- Speed
- Flexibility

UNITY VISUAL EVOLUTION

Starting as preferable choice for indie development on Mac, Unity evolved into considerable choice for high-end graphics today.

SHADOWGUN

unity

Probably the first visually impressive Unity powered game on mobile (circa 2011)

THE CHASE

unity

More content on mobile.

First realtime animated short powered by Unity. Collaboration with Passion Pictures - traditional offline CG studio.

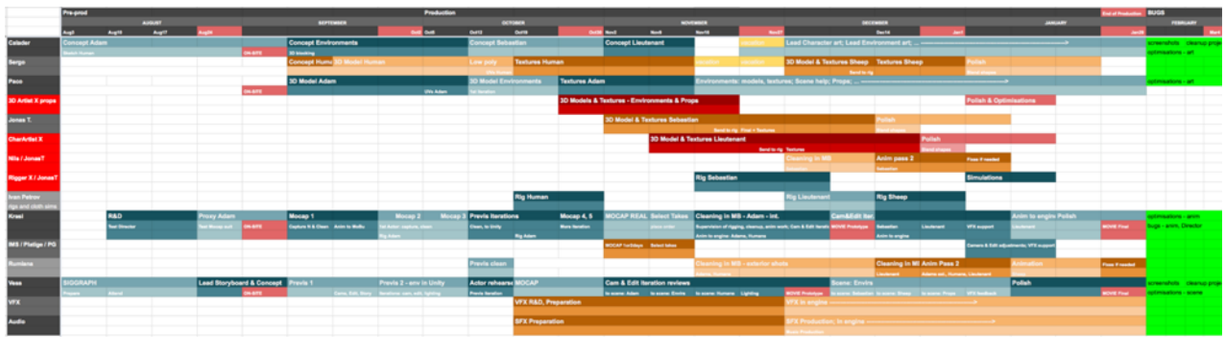
Big scenes, exploration of Physically Based Shading.

Physically Based Shading. Realtime lighting.

Realtime Global Illumination. Visual quality acceptable for Arch Viz. 2015

Blacksmith - first full in-house made realtime animated short. 2015.

Adam is our latest baby.
Lets talk about how we made it and what technology improvements made it happen.



PROJECT AT A GLANCE

Producer’s overview of Adam development.

We work in a manner which is recognizable for any traditional CG studio. Brief, creative-treatment, pre-production, production, followed by additional bug-fixing and maintenance steps due to real-time nature of the demo.
However it is really a **hybrid approach** - it combine elements of **CG** and **game-dev** production

Typical for CG:
* linear planning, waterfalled from deadline
* pre-production stage: script, storyboarding, character design, *(here is the difference)* AND **PROTOTYPING** i.e. we build project straight in Unity
. the outcome is a movie

Typical for game-dev:
. iterative approach and prototyping
. the realtime goodies

For traditional CG approach Adam had relatively long pre-production phase, for instance it included part of motion-capture (using our in-house Neuron setup) to ensure the desired impact on the audience early on.

TEAM OF 8
+ PRODUCER

+ Actors & Art Contractors

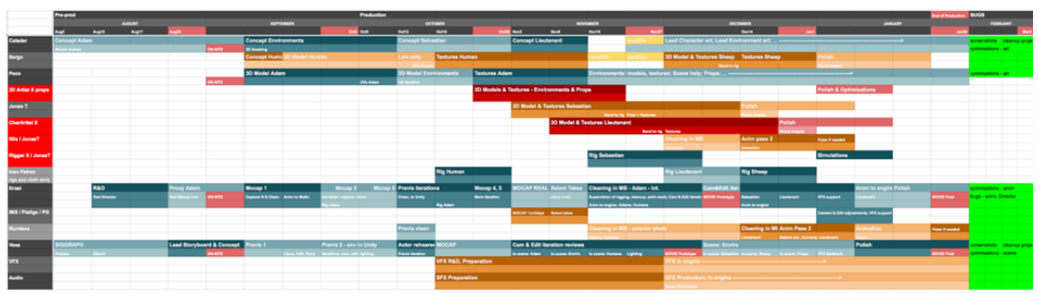
8 full-time members = CreativeDirector|Generalist, ArtDirector|ConceptArtist, TechnicalDirector, Animator, Modeler|Generalist, VFX artist, GraphicsProgrammer, JuniorProgrammer
Plus Producer - *she is taking the picture :)*

Team is **distributed** (Sweden and Bulgaria, and one person each in Denmark, UK and Lithuania) and work **remotely** meeting only couple of times during the whole production. This adds certain strains, but **opens up new possibilities like access to wider pool of art and acting talent**.
Team is culturally diverse: 4 nationalities - Norway, Poland, Bulgaria, Lithuania (yeah, nationalities don’t match with countries the team is located - XXI century, people move)

Actors = **Proper theatrical actors + 1 stunt actor**
Art contractors = character and environmental modeling, rigging, motion-capture.

SCOPE

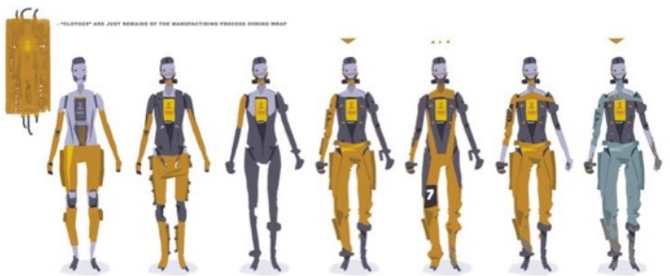
Preproduction - **2** months
Production - **4** months (part 1) and **2** months (part 2)



We split production into 2 parts to make it easy on ourselves and to service different public events. Preproduction dealt with the whole movie as one.
Boundaries of Part 1 and 2 where determined roughly half-way through production.

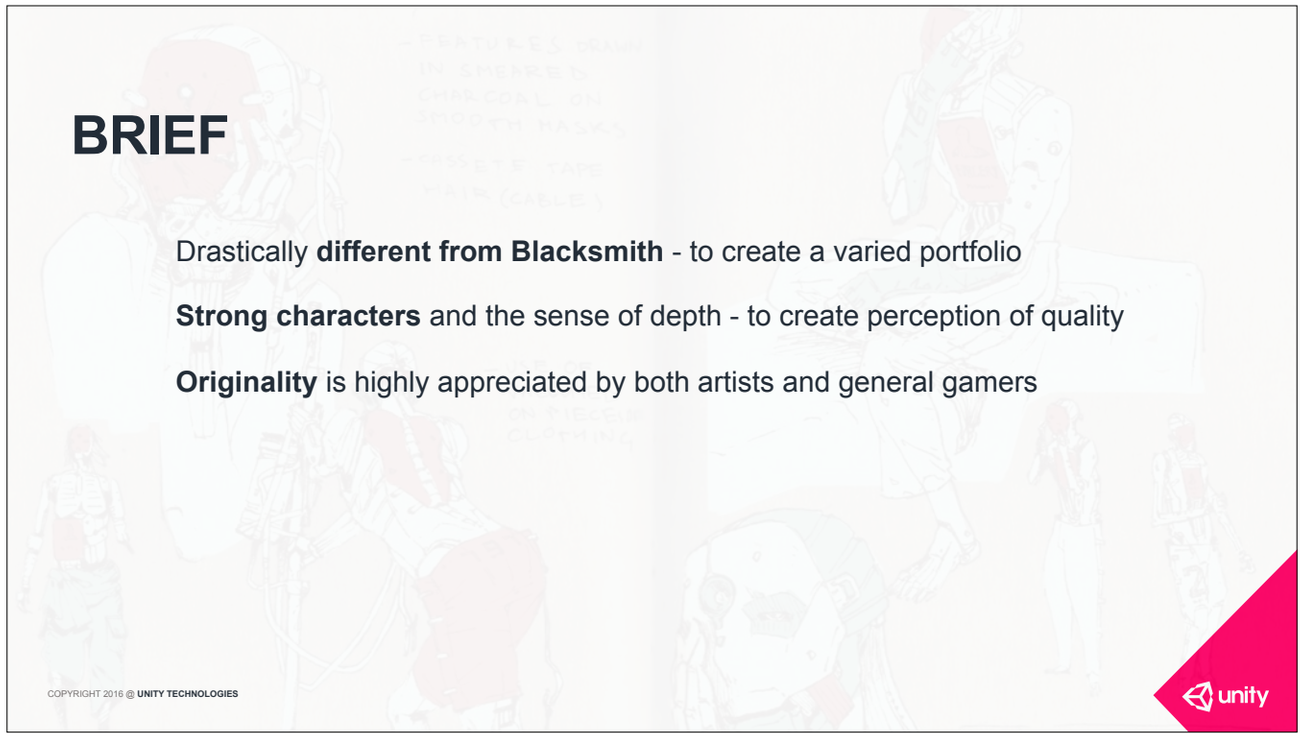
Consequences of using **hybrid approach:**
* do not overdo / polish each stage before going to the next one. Back-and-forth is possible during the entire project.
* no locks! (script is not locked to the end; there is no concept of edit lock - cameras change until the last day; this is possible because realtime - every change is non-destructive, you always have your film)

(quoting Producer here)
Because you are able to go back and change, you can have various areas influence each other constantly => you make the best of your creative people, everyone can contribute; creative decisions are not locked to the first stage, but continue throughout => empowered creatives!
=> flexibility allows saves / mitigate risk: e.g. if something doesn't work as expected, you can change decisions around it and still have your film in time. (Compare to film: if you don't get your coverage during shoot, you're fucked in the editing room and there's no going back or it costs a lot of time and money. Compare to CG: if you missed something, a lot of work goes to waste while you start from scratch and long building, rendering, and compositing times await before you can fill the gap.)



PREPRODUCTION

Preproduction for us is all about experimentation and fleshing out the ideas. Because of realtime capabilities of the editor line between preproduction and production is somewhat blurred - and Creative Director can change shot really late in the process to achieve even better results. No locks!



Here are some quotes from the original Brief.

Importance of the strong character, perception of the quality and staying different - where identified early on and acted as the main goalposts.

CREATIVE TREATMENT

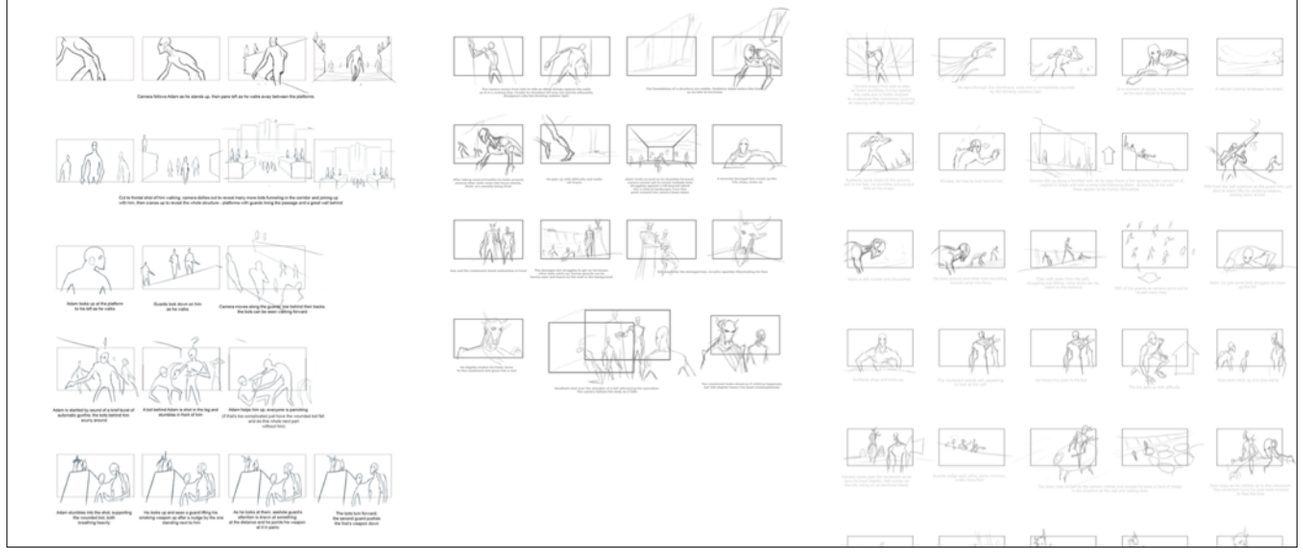
Story
Glimpse into a world which is different in some way from ours.
Aim for the setting to be considered intriguing, logical, and convincing.

Character
The manifestations of human nature through deeply unnatural limitations.

Character design
Main carrier of the information about the characters' background and way of thinking, and even carry hints to the general background of the world.

Several stories were written based on the treatment.

ROUGH STORYBOARD



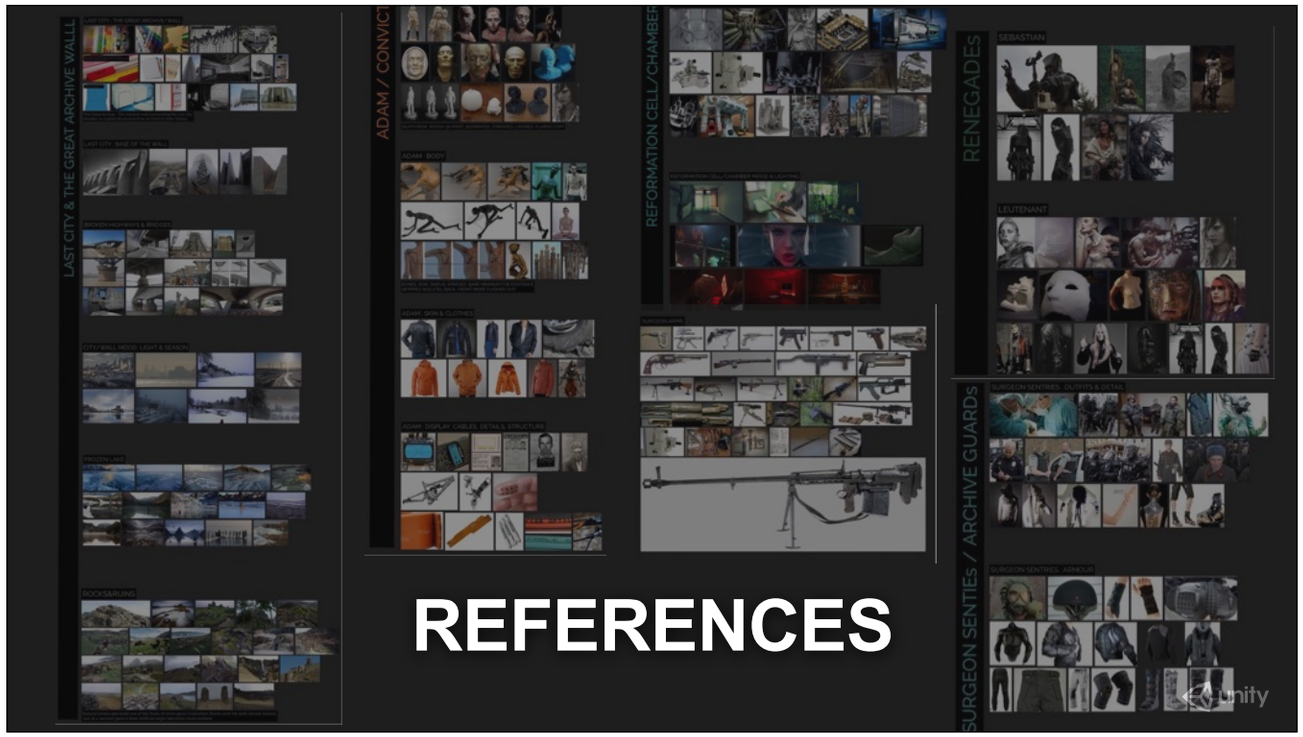
One of them got fleshed out as storyboard.

However for us storyboard was just a starting point. It proved to be an experimentation ground for idea about the shot composition and action.

Then we go to Unity, build blackout scenes and decide how to frame shots in the best way.

STORYBOARD

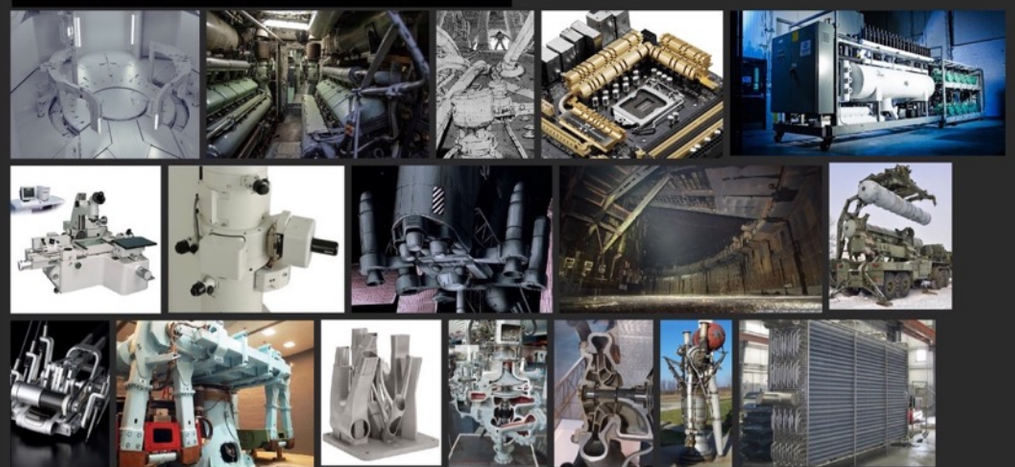
Theses are neither just concepts, nor exact shots. More of an exploration of the idea.



Team is distributed and works extensively with external art contractors - that calls for extra effort gathering visual references.

Though story is fantastic, visuals should be grounded in reality. Good way to communicate idea along with sketches.

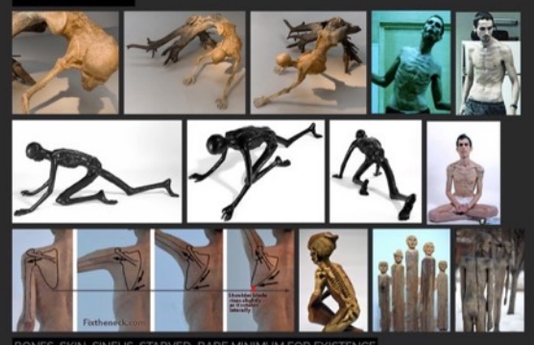
REFORMATION CELL/CHAMBER : SPACE & ELEMENTS



ADAM : FACE

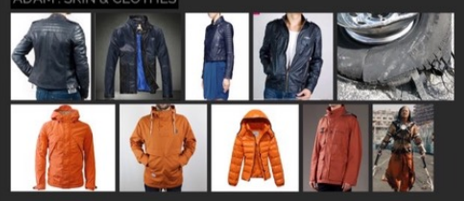
DEATH MASK. ROUGH 3D PRINT. SEGMENTED. STREAKED. LAYERED. FLAWED COPY

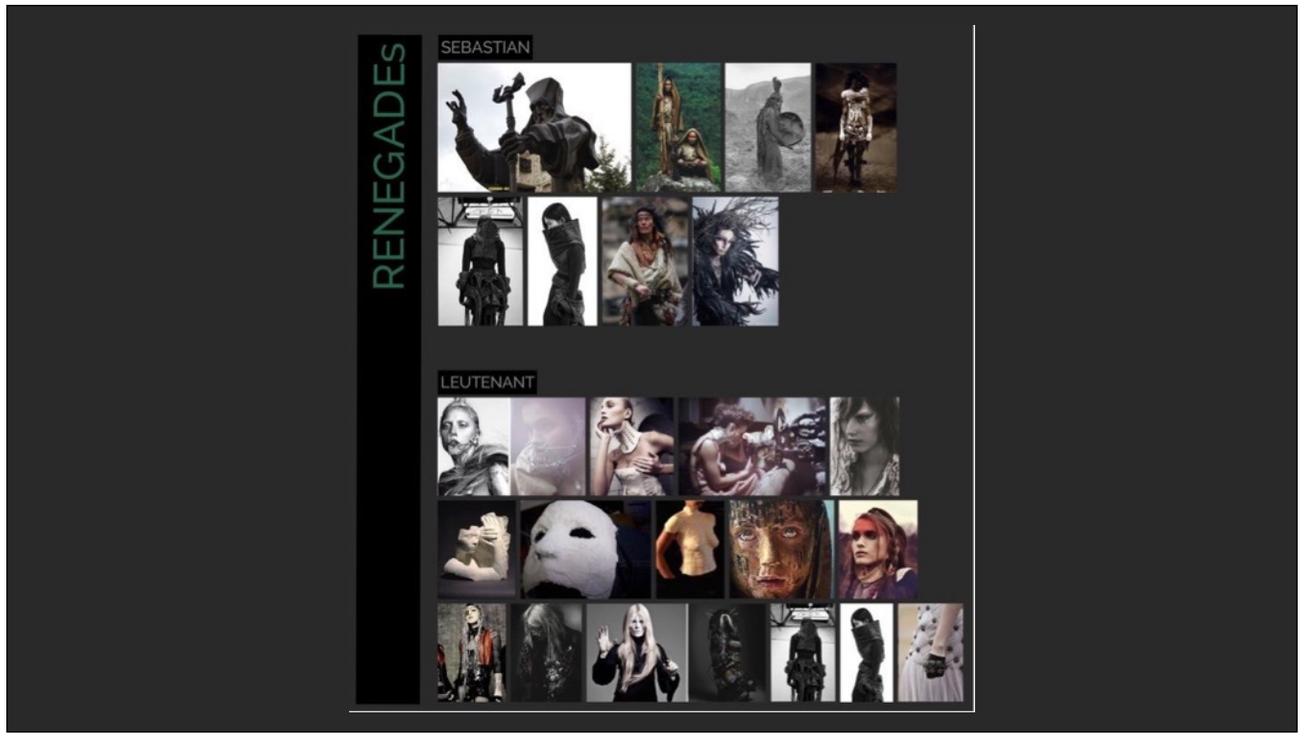
ADAM : BODY



BONES. SKIN. SINEUS. STARVED. BARE MINIMUM FOR EXISTENCE
SRTIPPED SKELETAL BACK. FRONT MORE FLESHED OUT

ADAM : SKIN & CLOTHES

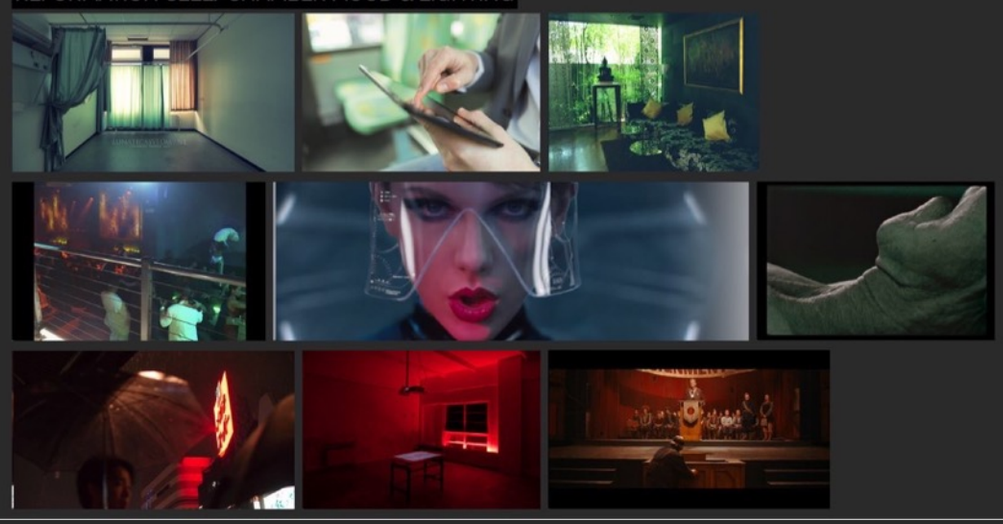


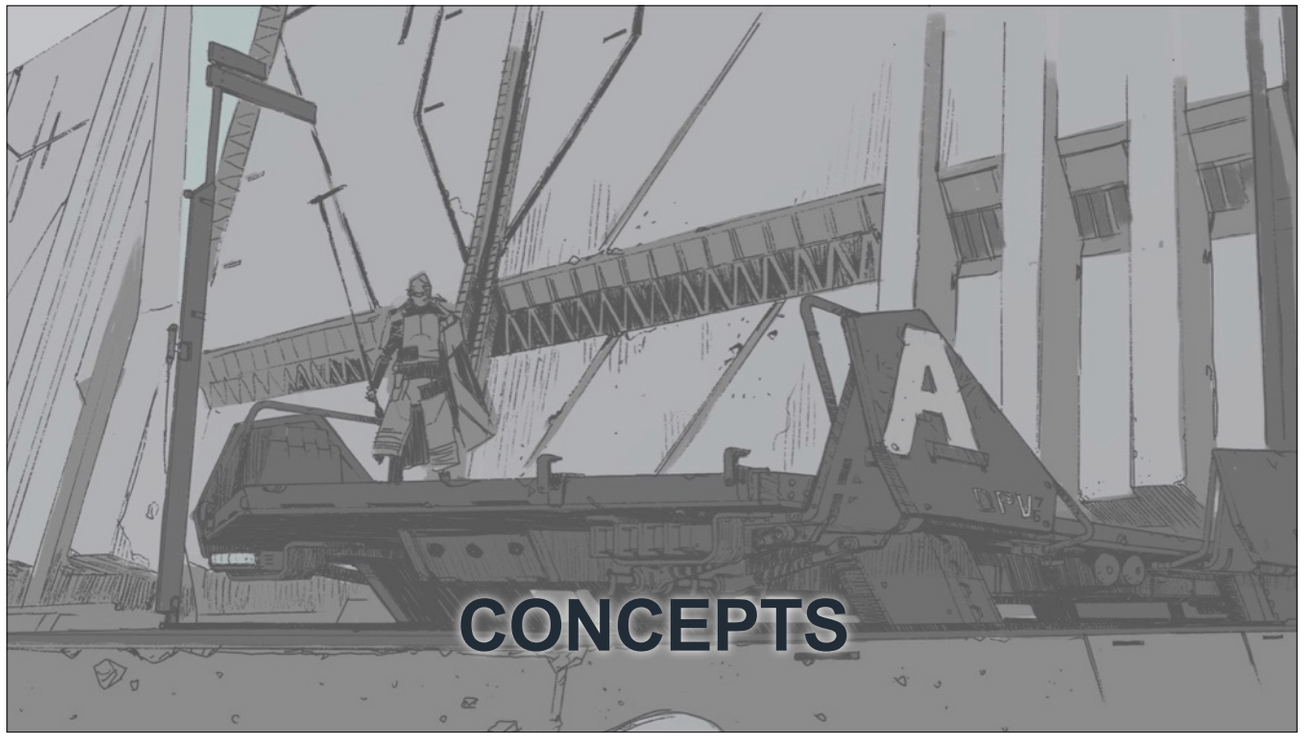

RENEGADEs
SEBASTIAN
LEUTENANT

LAST CITY : BASE OF THE WALL

BROKEN HIGHWAYS & BRIDGES

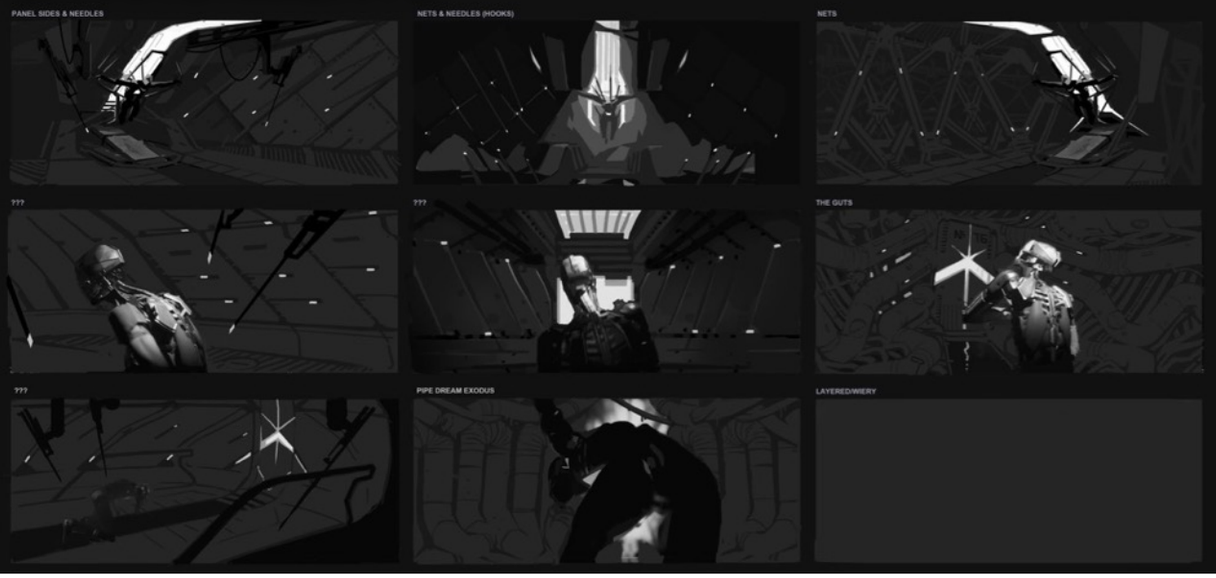
REFORMATION CELL/CHAMBER MOOD & LIGHTING



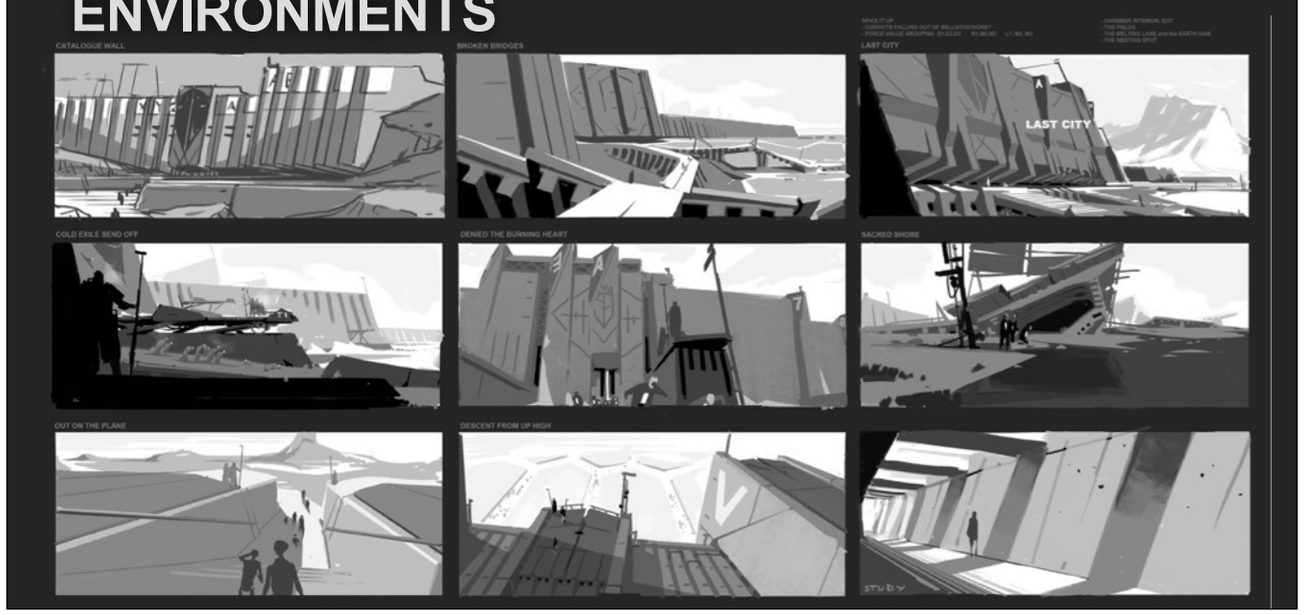


Next, lets look at concept art.

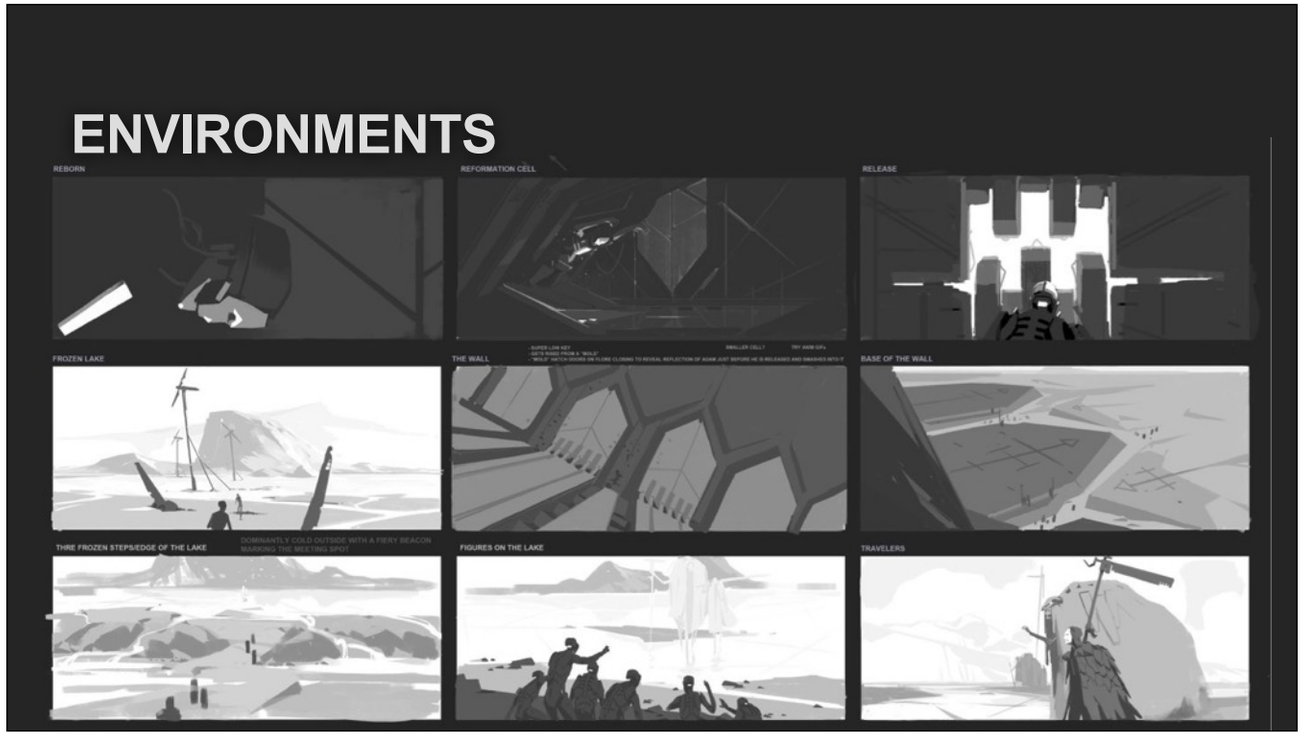
ENVIRONMENTS

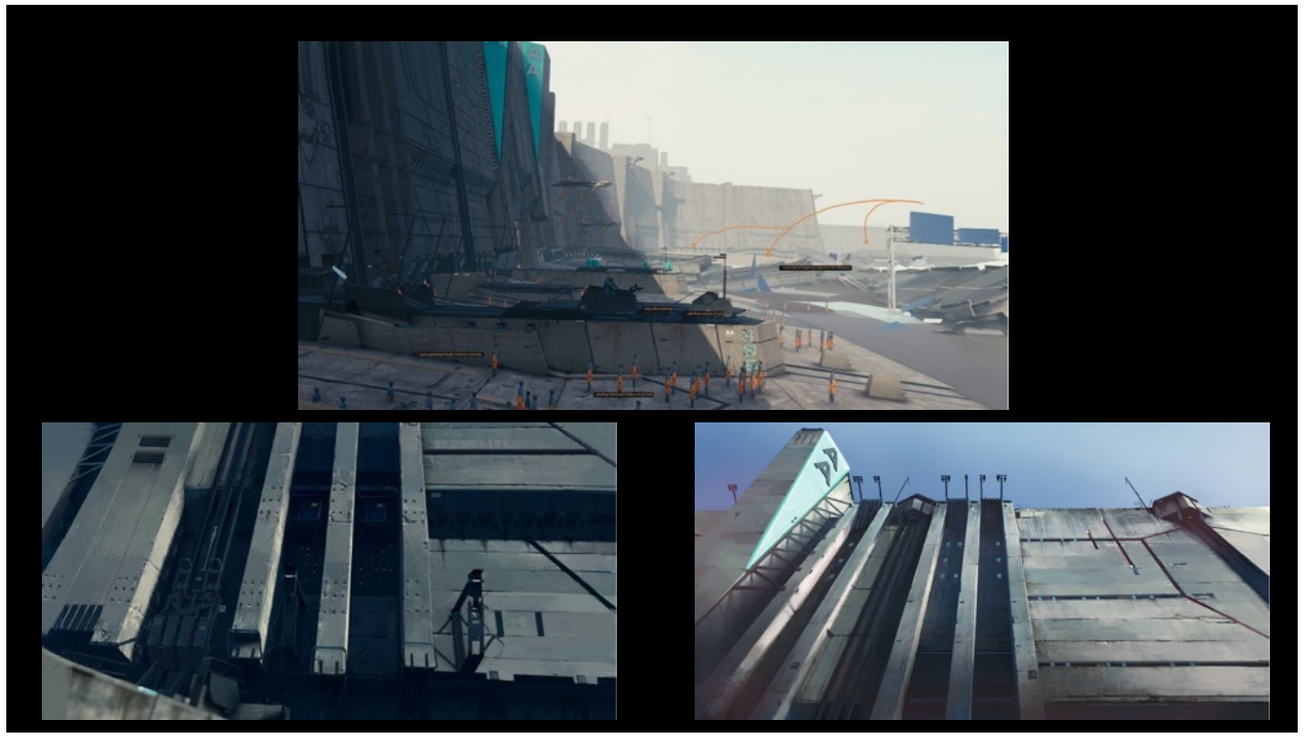


ENVIRONMENTS



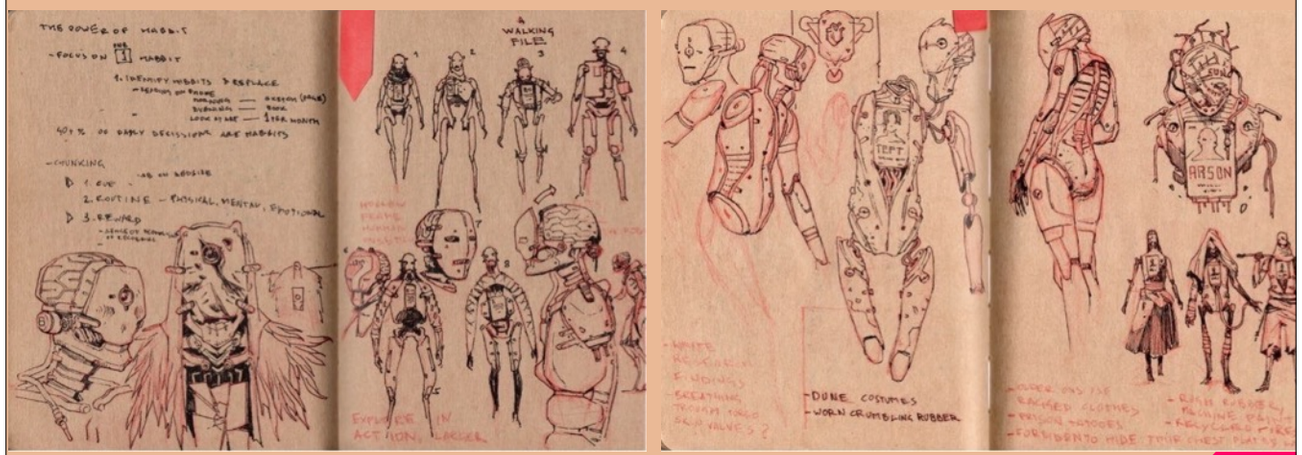
ENVIRONMENTS





You can recognize the environment from the final movie. Most of the action outdoors happens in Part 2.

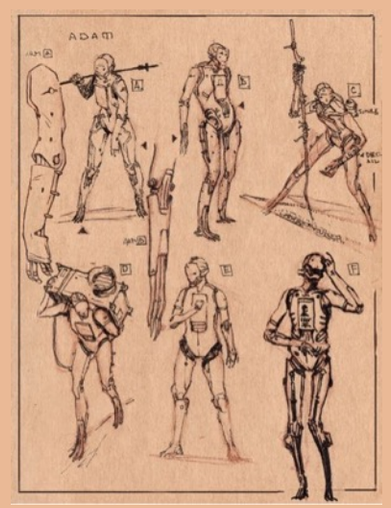
CHARACTERS

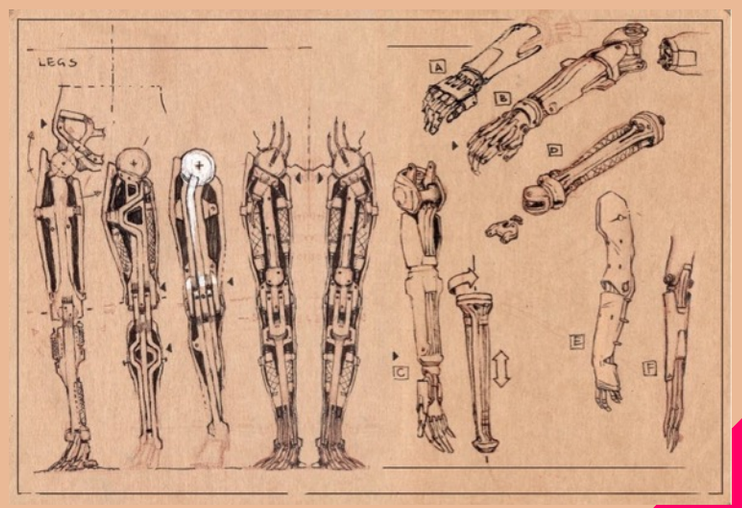


Many characters that you see in the demo have mechanical bodies.

CHARACTERS

CHARACTERS



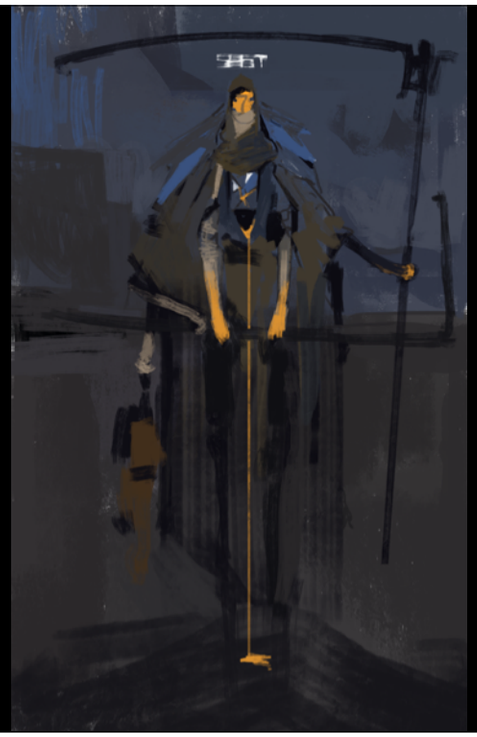


Lots of thinking and experimentation was necessary to make them “work” and avoid constraints on actor performance.

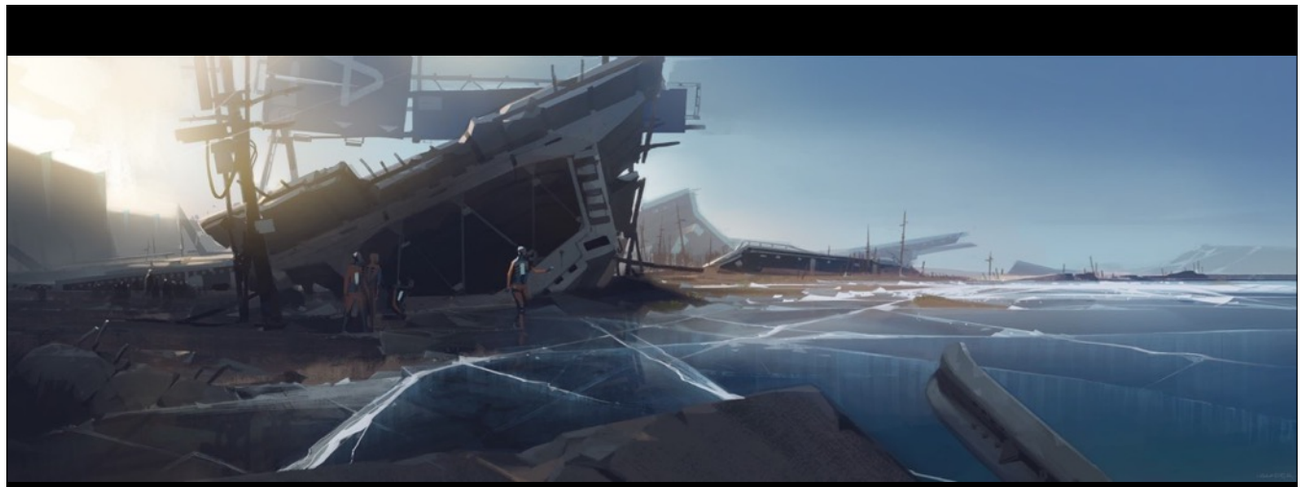
Our protagonist.


FACE
BACK
SIDE
FRONT
STRUCTURE
ADAM
(CONVICT)
CONCEPT SHEET
DISPLAY GFX
DECALS
FEET DETAIL
PERSONALIZATION
00
01
02
03

? ;)



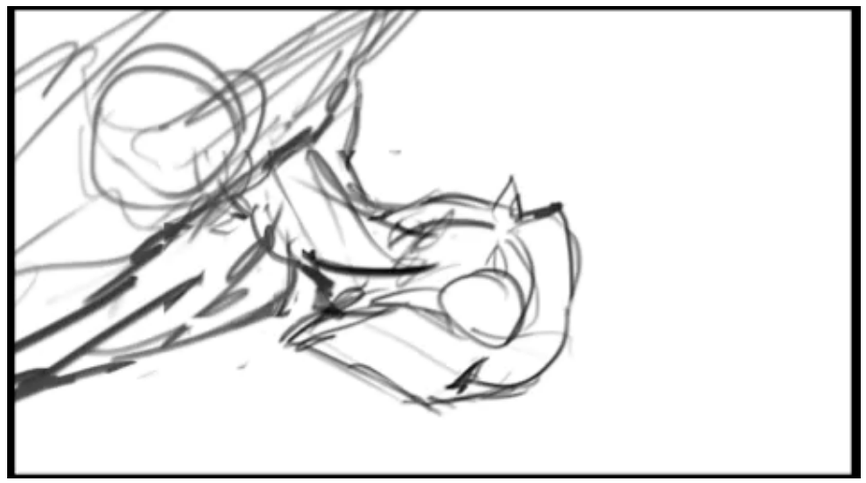
unity



MOODBOARDS

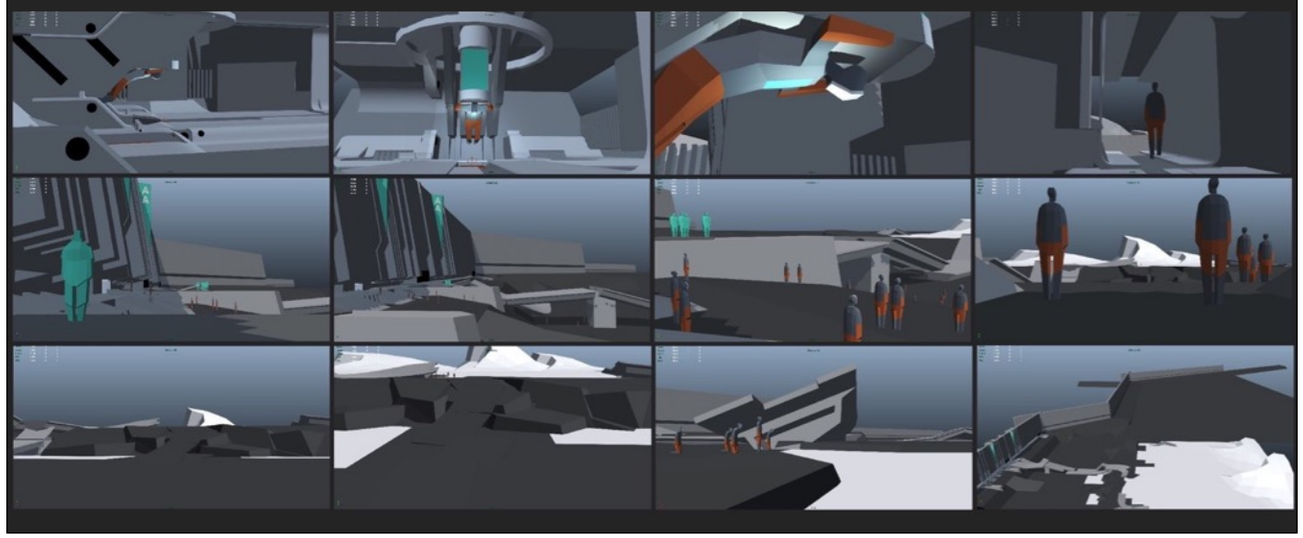
Moodboards were used to iterate with ideas on possible lighting, color palette and shot composition.

ANIMATIC

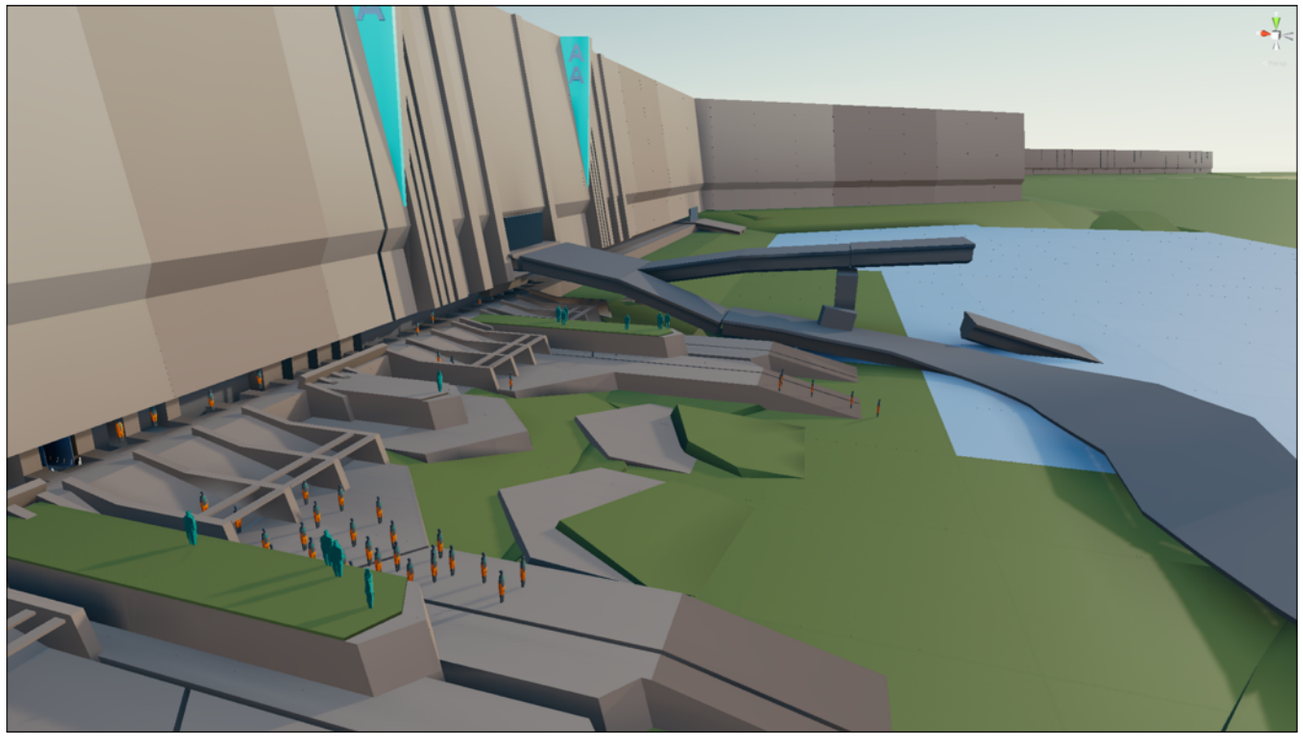


First animated version of the demo.

SCENE BLOCKOUT IN UNITY



All scenes from day one were assembled in Unity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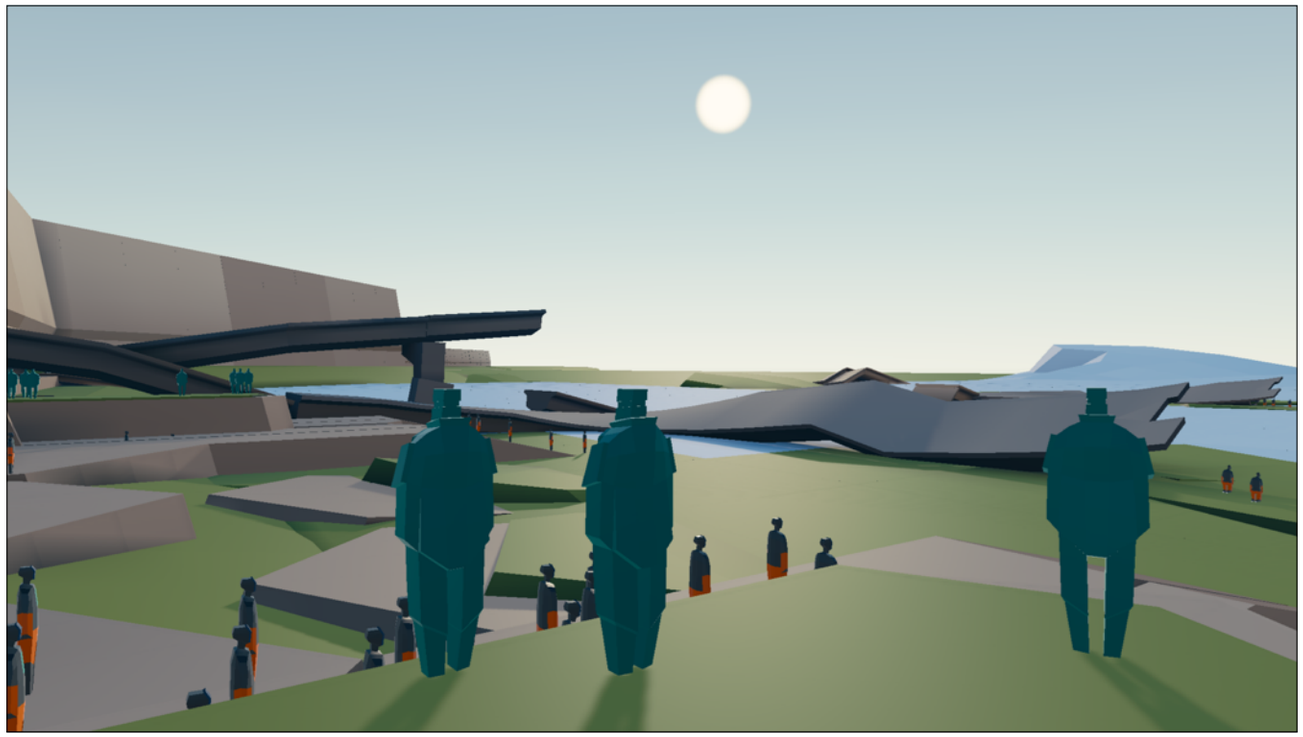
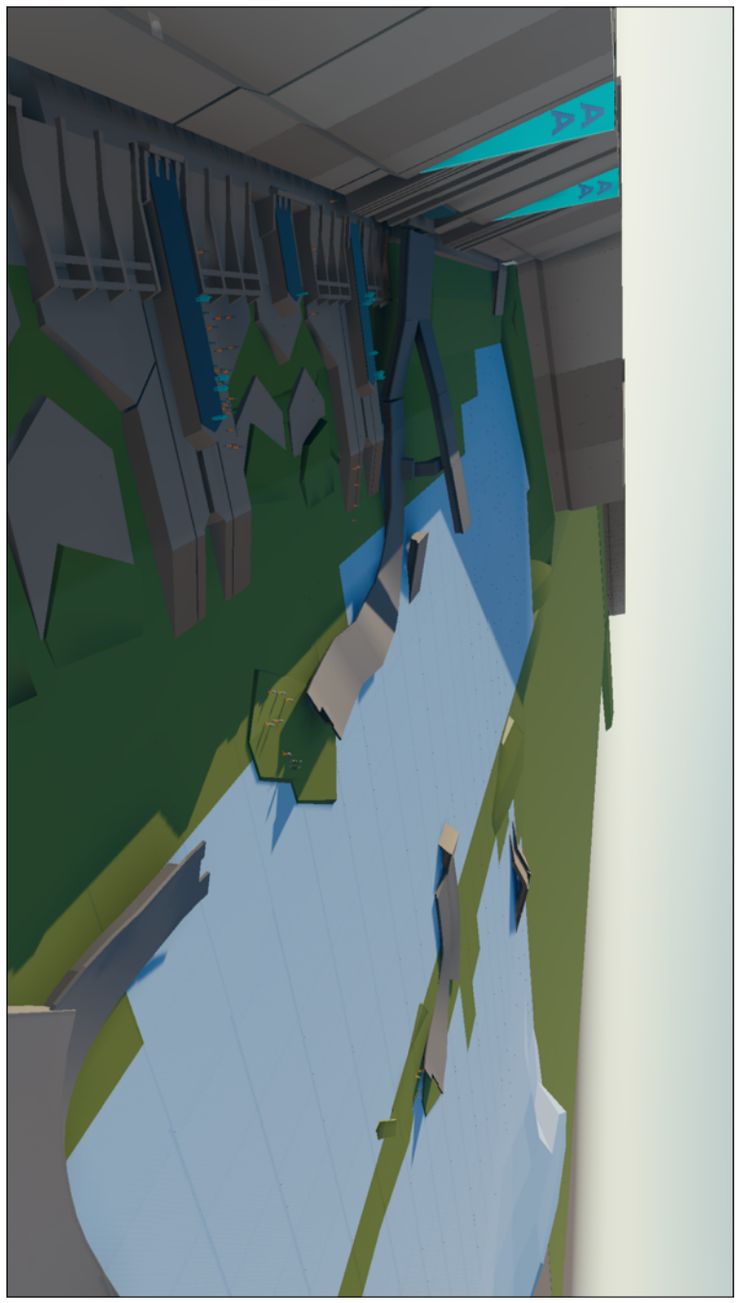




PREVIZ IN UNITY

Easy to introduce elements step by step in Unity

Pre-viz - it would be stupid **not** to do it in Unity :) Many directors don’t like previz, because it is not easy to make judgements when all you see is grey boxes. But when working in Unity you can see shading and lighting exactly right. Adjusting camera shots becomes easy and meaningful.

Introducing new elements (new models, animations, materials) into pre-vis as they come is easy and allows for fruitful prototyping which leads to better quality of the final movie.

PREVIZ WITH LIGHTING & CAMERA

Next step - lighting, camera motion and focal points.

PREVIZ MOCAP
1ST PASS WITH NEURON

unity

Our in-house cheap (but relatively low quality) mo-cap setup with Neuron.
In the end we used Neuron data for Adam, Guards, and Crowd animations.

In-house setup allows for fast iteration and multiple re-takes were done adjusting to slight changes in the direction.

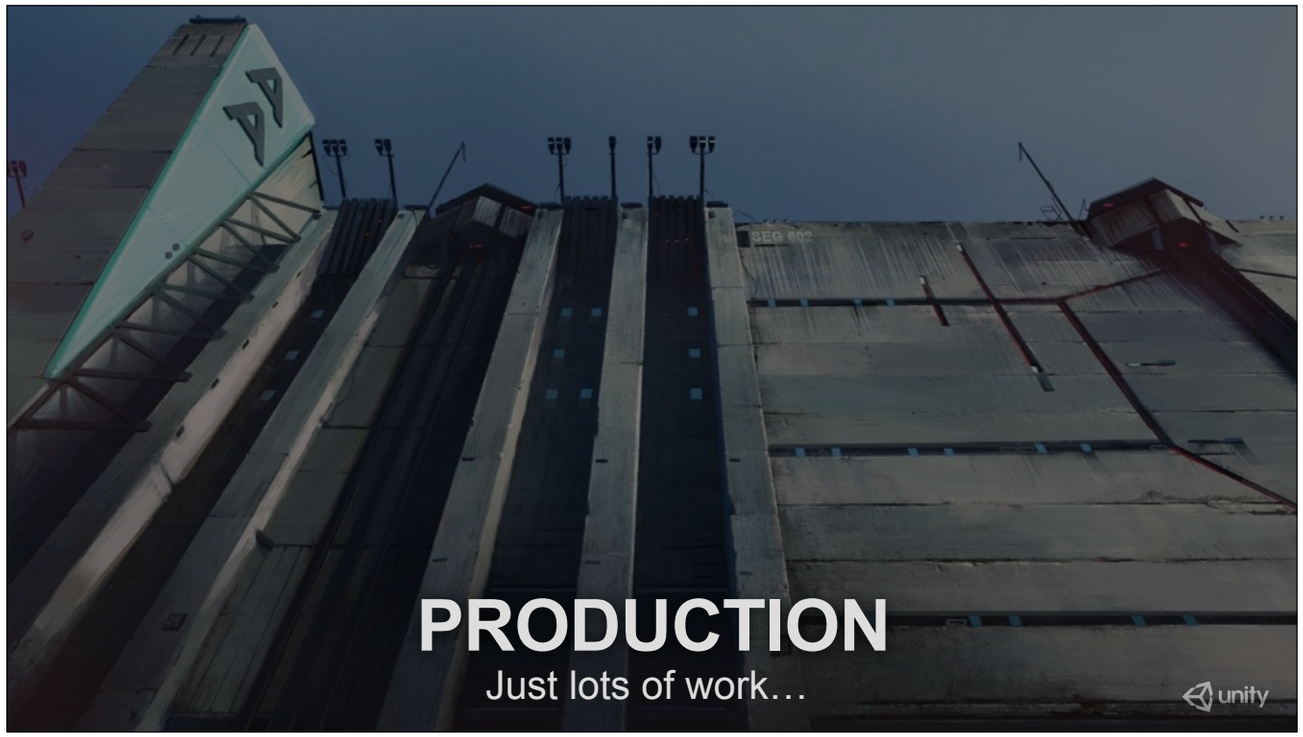
PREVIZ WITH SHADING & MO-CAP

You see early proxy model for the main character here (built by animator). Used for shot explarations early on.
Proxy model was later used as a reference for modeling actual character mesh.

PREVIZ WITH POST PROCESSING

First block-out of the space. Quickly built for shot experimentation. Good enough to test ideas.
It is not white-box, but has representative materials and shading.

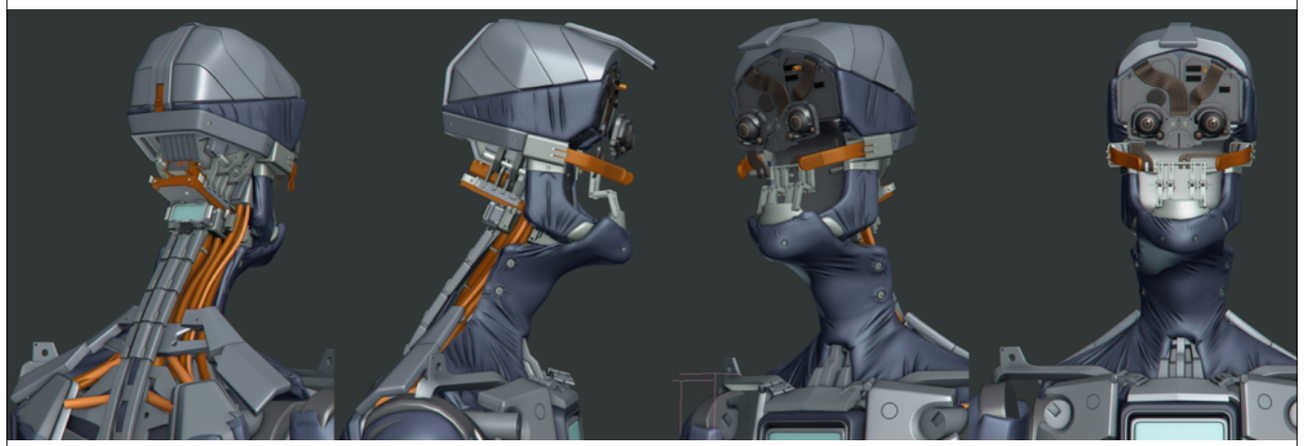
You can see first iteration of the project specific technology here as well - such as volumetrics. This allows director to feedback early on and influence implementation.


PRODUCTION
Just lots of work…
unity

It was very important for us to use **real actors** and cameraman.

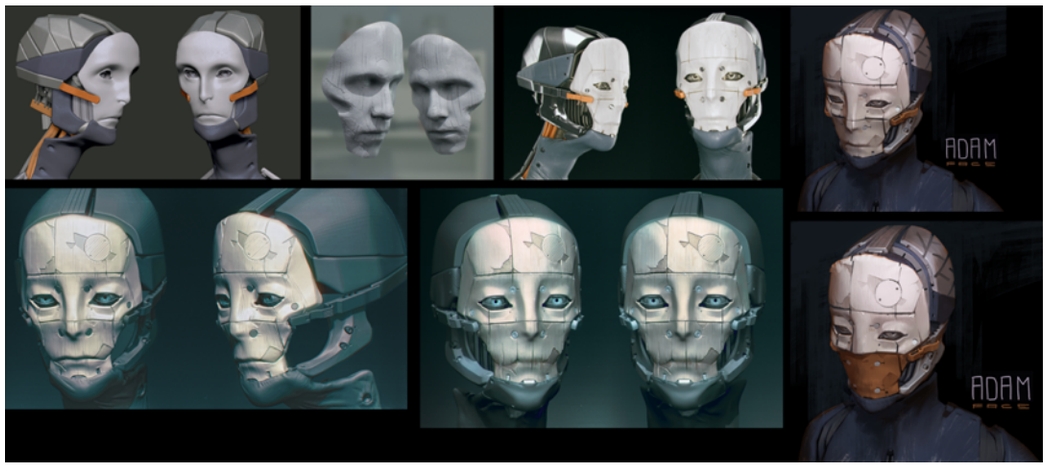
Important for perception of quality:
* human performance — actor interprets and brings out the character in a more believable way than animators could (unless we're looking for stylisation)
* human cameraman — the camera's motion is perceivably more realistic as you feel the person's weight, delays while following the action, the shake is natural, etc.

Animators have a big role too, but actors and cameramen bring in their level of professionalism for a great symbiosis that boosts the quality.

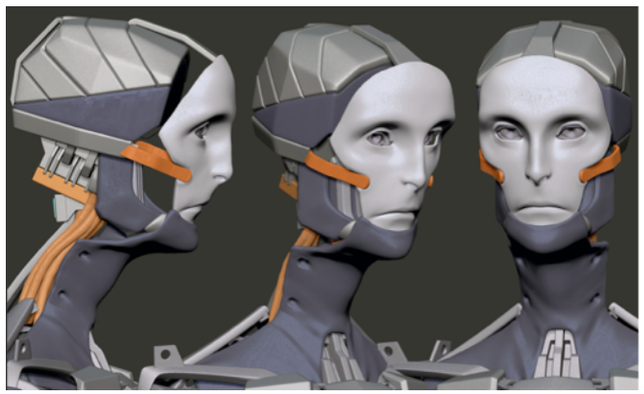


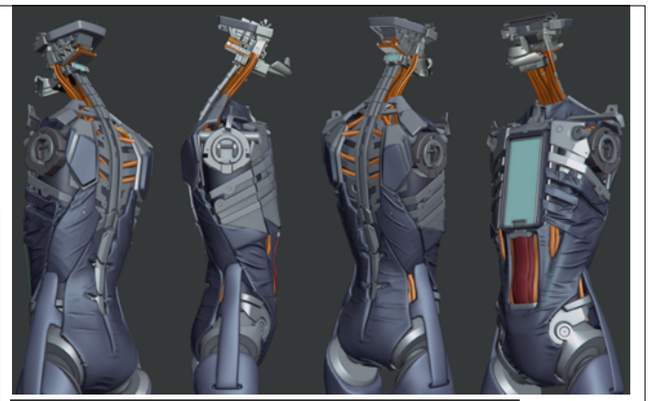
WIP ASSETS

ADAM FACE



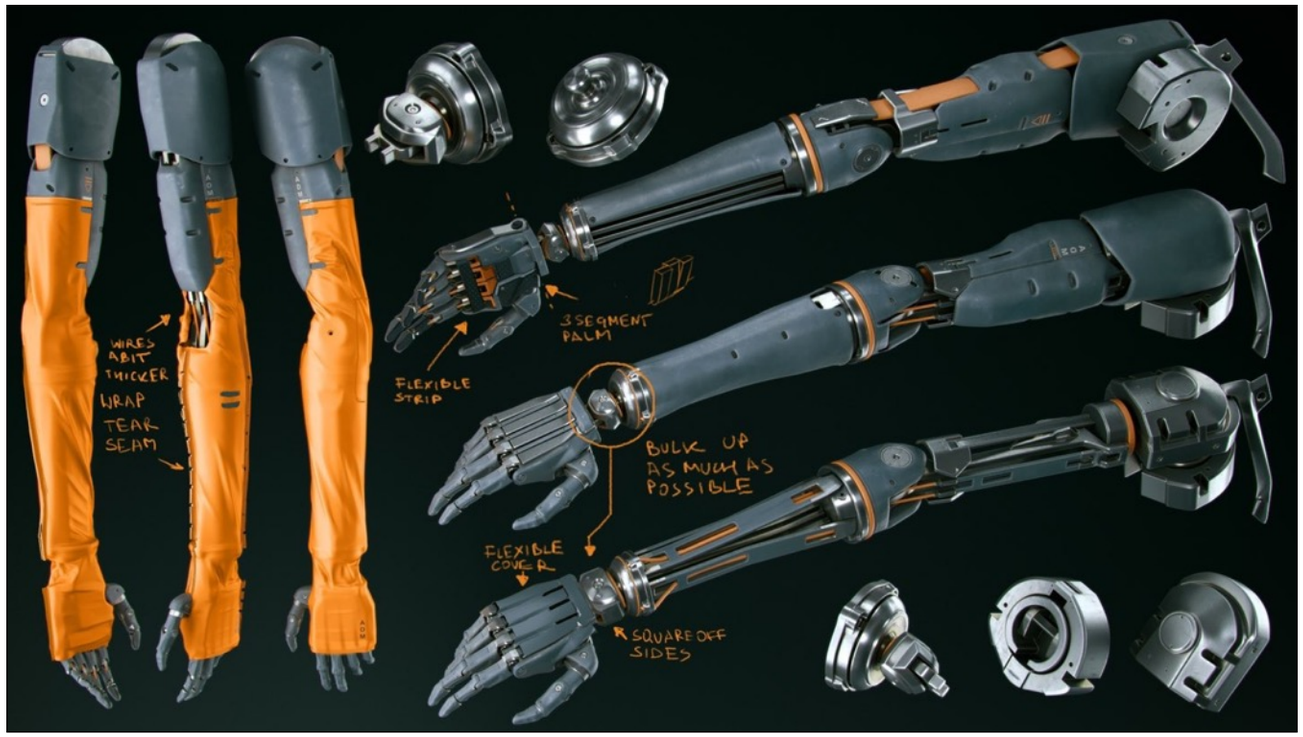
ADAM



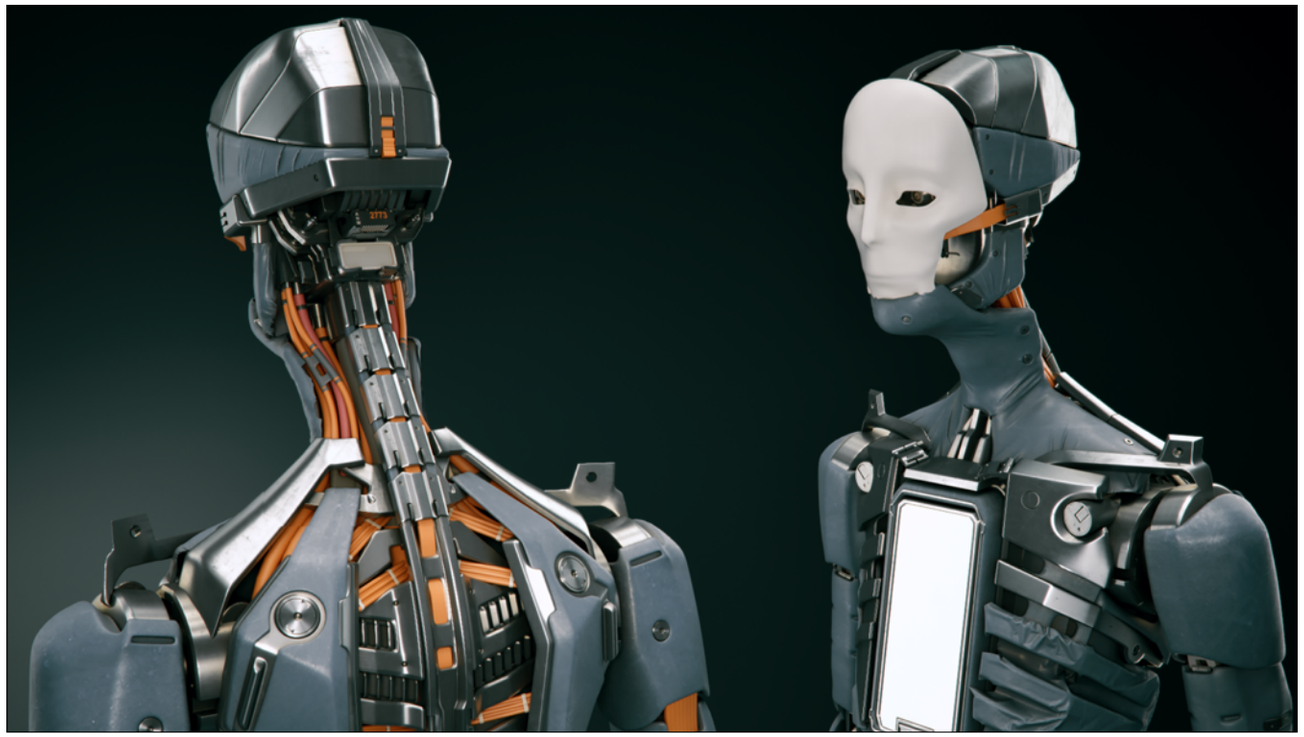


Many iterations needed to make Adam. Adam character is very flexible - he can move like human, but his body is mechanical. His performance is very expressive, so we didn’t want him to be restricted by design of his physical body.

Embarrassing amount of time went to make it happen :)

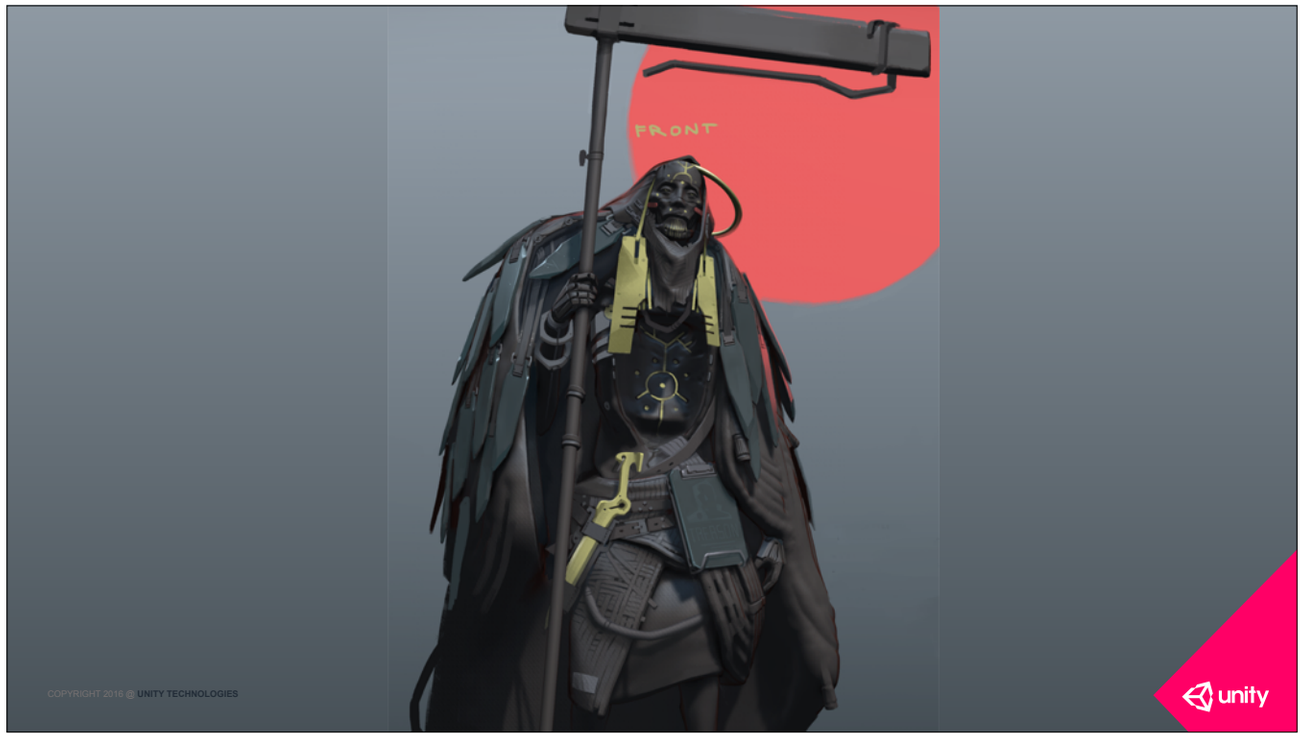


Multiple layers to it - skeleton, casing, plastic wrap on top.
Joints had to be designed to be mechanically plausible, but not restrict motions, etc.



Look at the amount of details in Adam.

Yet not the final iteration of the model here.



You will see this guy in part 2 :)

WIP ANIMATIONS & FRACTURE

Work in progress animations and custom fracture system.

WIP EYES

Making believable eyes that translate actor performance to mechanical body was a challenge ;)

We put headmounted camera on the actor and video-recorded his eye movement while performing the same piece. Then the animator used that as reference for hand-animating Adam's eyes. (We couldn't capture them because the actor couldn't carry the HMC while doing the body capture, because it was in the way of his movement, e.g. head bouncing in floor.)

Traditional film pipelines are compatible with Unity based to numerous extensions made by and for film/CG people.
To name a few:

* live import of mocap
* alembic support (Unity Japan)
* rendering of EXR's for offline compositing in their compositing software of choice
* high-quality physics sim (CaronteFX)

SUMMARY: if you wish to plug Unity in an existing pipe, it's possible and many studios have done that already!


IMPROVED SHADING
UNITY 5.3

IMPROVED **SHADING**
UNITY 5.3

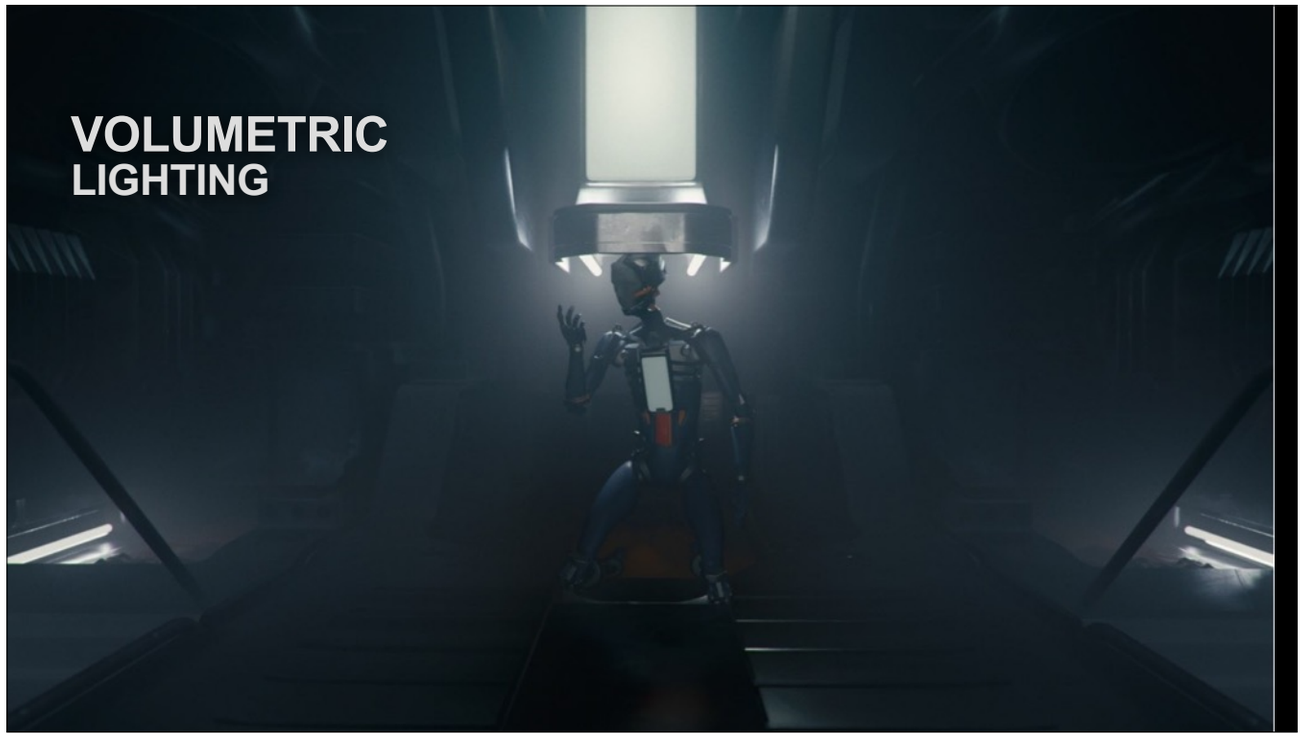

SCREEN SPACE REFLECTIONS


MOTION BLUR


MUCH BETTER
ANTIALIASING


IMPROVED RENDERING PERFORMANCE
UNITY 5.4

REALTIME **AREA LIGHTS**


VOLUMETRIC
LIGHTING


TRANSLUCENCY
(CUSTOM SHADER)


TRANSLUCENCY
(CUSTOM SHADER)

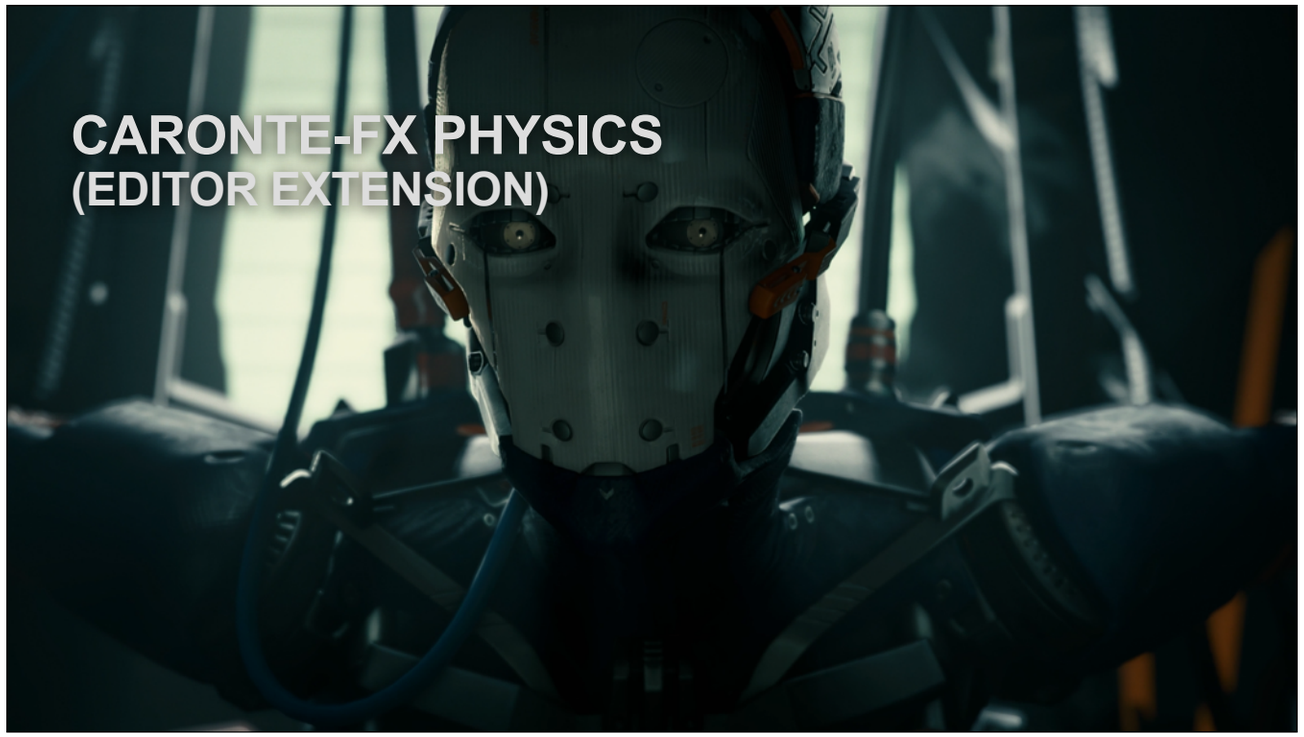
Sleeve is done in 3DS Max and uses the Alembic importer from Unity Japan (available publicly on GitHub)

CROWD SIM
(CUSTOM EDITOR EXTENSION)

<<<Approved leak here>>>

So you can see our crowd simulation in the action here.
You know, you’re actually the first people to see this footage! Captured from the monitor of our Creative Director is a glimpse from Part 2. That is NOT tweetable! :)

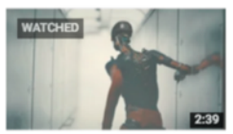
We will be releasing Adam part 2 in just couple of days



Caronte is used for Adam disconnecting cables and for the Guards clothing.

Overview at 1 month

15th March - 15th April 2016



846,326 video views
(combined YT, FB and CGBros)

(Expected: 300K)

1:34 mins average view length (60%)

(Expected: 1m)

1,212 Facebook shares

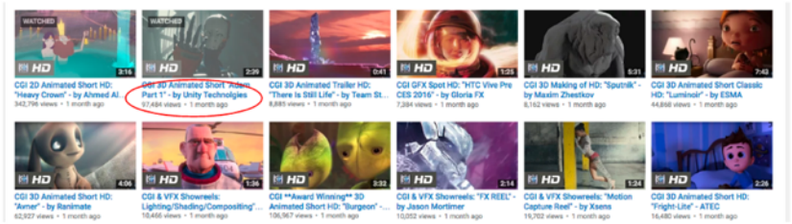
(Expected: 200)

466 retweets

(Expected: 100)

99,968 unique pageviews

(Expected: 60K **but** bounce rate is 80% so room for improvement)



Second most popular video overall on **CGBros** from same timeframe and most popular 3D video

sources: Google Analytics (unique pageviews), YouTube Analytics (video views and view length), Facebook Insights and Twitter Analytics, see here for more stats and the Measurement section of this plan

Summary of Adam reception - made 1 month after it’s release.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