

Reference

It would be nice to be able to pull these things up "In Game" so that we don't have to go out of game to find them. If we're shooting Scene 16, it would be nice to have an asset browser that can show us artwork that was conceived for Scene 16, or Animations available for Scene 16, or the Script pages and director's notes for Scene 16. Otherwise, we have to go in and out of VR a lot while working on the movie.

DCC Pipeline

Here's where we waste a lot of money, and the quality of the overall system is determined. Film Quality Assets are slow and heavy and use proprietary tools. Game Engine Assets are the opposite. We need to streamline this pipeline as much as possible so that we aren't wasting money here, and are looking as consistent to the film assets as possible. We need all the advice we can get on this, and have discussed things like MDL for Materials, and external renderers for the game engine in order to optimize this path. Most Artists on this film will be working in Maya targeting a Renderman output. But 3DSMax, ZBrush, VRay, and a variety of other DCC tools are common.

Film Producers and even Directors hate that we're building something that doesn't progress directly into the final movie, so of this whole process, THIS is the part everyone pays attention to the most, and likes to grumble about. Because, while it informs the final creative, and is invaluable, it represents the most "throwaway work." (If someone made a system that takes film quality assets and decimates them run in real-time with a button click, they would win a technical Oscar.)

Animation Pipeline

How we can get baked or rigged animation in here efficiently will be important. To explain the different between "stepped" and "splined" animation. The animators will get a scene's layout (which just contains blocking for characters), and then need to make hero poses for those characters, and evolve that into a path of "key moments of that animation" that will jump from one to the next (maybe 30 times a second, maybe 5 times a second, maybe less) called Stepped Animation.

Stepped animation is also easier to watch and feels more comfortably like work in progress when you're doing an interim screening. It's faster to do than splined animation, but it is NOT good for "shooting" a scene with. You can block cameras, but you can't really record a camera naturally with this approach.

Splined Animation is what you need when you want to shoot, because it flows and is predictable. We're looking at **Auto-Splining** animation (in-betweening the stepped animation as a process) so that we can prep a scene to shoot with cameras, but we may need to do "throwaway work" to make the splined animation so we can get cameras that we think are good for the action. Done poorly, it can have a very uncomfortable feeling, so it shouldn't be used in screenings until it's gotten past a certain quality threshold determined by the Animation Director.

We may have to drive characters with game controllers, which you see in the chart as Game Engine Anim. So we'd have to build out that Animation Tree, and record all those actions for a scene. Might be easier for background characters, (which we'll have a lot of)

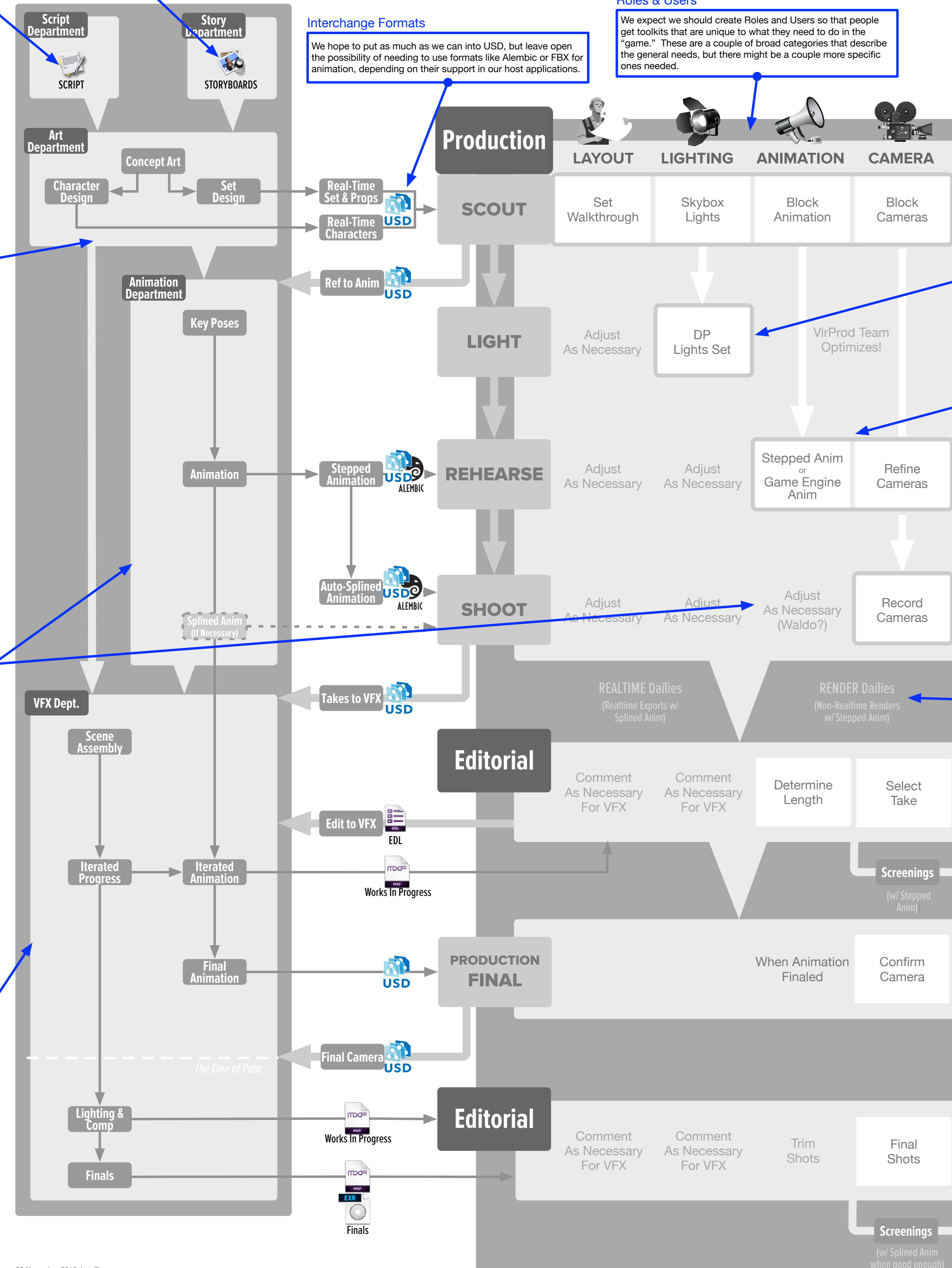
We may also have something you see there called "Waldo." If you google that word with Jim Hensen and you'll see it's a puppeteering tool. We might use this for facial performance and head direction on top of "live" or "cached animation of the bodies. A Puppeteer might put on a VR headset, become an animal walking around, and might use the "Waldo" to make their mouth move when they're talking, and point their head towards the other characters more properly so that it's easier to direct, and edit.

VFX Pipeline

What happens here isn't really very important to the game engine, as long as they've been able to get USD files of everything that happened. The only time we need to come back to Virtual Production from VFX is to finalize the camera animation when the final animation of the scene is done. (which means we'll have to try to strip it down to run in real time again if we can) We are looking into Atom Baking the scene (point cloud style, not geometry) for that.

VIRTUAL PRODUCTION - PROCESS FLOW

DEPARTMENTS | HANDOFFS | PHASES & TASKS OF PRODUCTION



Interchange Formats

We hope to put as much as we can into USD, but leave open the possibility of needing to use formats like Alembic or FBX for animation, depending on their support in our host applications.

Roles & Users

We expect we should create Roles and Users so that people get toolkits that are unique to what they need to do in the "game." These are a couple of broad categories that describe the general needs, but there might be a couple more specific ones needed.

Multiplayers "Edit the Game"

Each user is making changes which need to be shared in real-time with all other users, and we need to be able to "snapshot" each of their functions back to the server. Also need to Version the saves and name the task/user.

Users and Needs

- A **Director** Walks around and makes comments on things and marks things up with notes.
- A **Director of Photography** places cameras, and camera animation equipment and creates/adjusts lights.
- A **Production Designer** moves/rotates/scales objects (trees, rocks, buildings) and marks objects up with notes.
- An **Animation Director** loads characters into the scene and performs animation tasks through a variety of inputs (performance capture like Optitrack, game controller driving characters, "grab rigged characters and pose them." Will need to play/record individual objects animation, and save them all to the timeline so they can be adjusted, and versioned independently.

There are also Observers

There are numerous observers (asset team, continuity supervisor, producers, VFX) who need to watch what's happening, but don't need to interact. They may be using different devices to view as well. They might be watching through TV Monitors, OR ideally, VR, AR or Mixed Reality Capture.

We want to record viewpoints / cameras

Anyone in the Game should be able to record their viewpoint with commentary and save/export.

Network Multiplayer

This Phase is the most challenging for the Engine. Needs: Network Multiplayer, (Up to 4 local and 1 remote user simultaneously, using different input devices and toolkits.)

Optimization

In this phase, we're looking to "sweeten" the quality of what people are seeing. Bake lighting, optimize geo that we're not using. We essentially want to "prepare the set" so that we have maximum quality and performance in the "shoot" phase. We won't have many VIP users at this moment. mostly technicians supporting an optimizing the environment and objects.

Character Animation

"Stepped Animation" means a series of key poses of hero animation so you can see where something is going, and what it looks like when it gets there, with no in-betweening. If we don't have that, we might use Game engine controls and animation cycles to "record" the performances of characters LIVE (not for final in the movie) but as reference for the animators later. It's likely we'll need to animate a lot of things in one scene, and slip the animations around, and load/export animations while walking around in the game.

Camera Animation

Similar to Character Animation, we're going to need to have very precise control over "Hollywood camera systems" where we need access to aspect ratios, film sizes, lenses, and equipment that you'd find on a movie set. We NEED to use metaphors that filmmakers are comfortable with so the experience feels natural. We will want to record a camera animation of the scene, as a "parented hierarchy" or "layered set of animation". The "Camera Pan" is on top of "The Camera Tilt" which is on top of an axis that's offset, which is on top of a dolly that has translation, which has a predetermined path, which might have a variable speed control, and all of these things we need to record SEPARATELY so that the operator can say "I love everything about that, but I need to re-do JUST the pan" "Or keep everything the same, but move my snap-zoom a second earlier" "Or Smooth out how bumpy my animation was and show me that again."

"Takes" Animation system

Similar to traditional filmmaking, we need the ability to change anything on a "per shot" or "per camera" basis, and SAVE that change associated with JUST that shot. Everything you see in a scene in a movie isn't actually consistent and we cheat everything usually per-camera. We typically create a "Master Scene" that works for general continuity and wide shots, and then we go in when we set up cameras, and we move things around to look good from THAT camera. When we save out the takes from each camera via USD and Exported Video, we need to know that it contains ALL changes that were specific to that Take, not just "what it looked like" but where things were in space and time so we can recreate them later when we need to pull up a specific shot and re-do it. Structure works like this: Scene#(from Script)-Shot(A-Z)-Take# Then certain objects in that scene might have their own versions (The Hero Lion was animation Version 023, but the model was version 004, Lighting was version 3)

"Rendering" or "Exporting"

We have two types of needs that match traditional Hollywood filmmaking. "Video Assist" is a recording of what just happened, and is usually used when someone says "Play that back for me". In our case, we might treat this as the real-time capture from the engine that could do to editorial if it needed to by calling these "Offline Dailies." The other type in a traditional film takes a day to get because it's processing film at the lab, and it is expected to be higher quality and color corrected, and looking more fancy than what people saw on the set. In our case, we expect to "turn all the knobs to 11" and kick off a non-real time render that looks better than what people saw when they were doing it live. We might call these "Online Dailies." They would all need to ultimately go into a video format native to Avid, with Timecode(!) AND is accompanied by a sidecar file full of metadata that shows what was seen in that piece of video. (This is so that the director can say "I like everything about take 06 except the timing of the hero actor, and I want to use her performance from take 04" (from the metadata I can see he wants the Actress01 animation version 007 which was recorded in take 04)

Audio Pipeline

Ignore this for now, BUT, we'd of course need to support Audio. And want to use the headset microphones to allow the multiplayer to communicate. AND we want to record their audio (perhaps selectively) while they're recording, so we get "director's notes" attached.

