Achieving and Maintaining Real-time Rigs

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ABSTRACT

Our characters have a lot of moving parts. This complexity makes achieving and maintaining real-time performance a challenge. Our journey of bringing our rigs to 24 fps consisted of many different milestones. We aggressively adopted cutting edge technology during active production and developed a system to continuously monitor asset "health" performance metrics. New applications were created for production to monitor asset health using Blue Sky's next generation pipeline, Conduit.

CCS CONCEPTS

• **Computing methodologies** → **Animation**; • **Information systems** → *Data management systems*;

KEYWORDS

Real-time, rigs, animation, pipeline, health

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1 MIGRATION TO A PARALLEL SCENE GRAPH

Because of schedule and resource constraints, rebuilding the rigs from scratch was not an option. With a Maya-based animation pipeline, we looked towards Autodesk's new Evaluation Manager as a foundation to achieve >24 fps performance. During the production of "Ferdinand", we investigated how the new dependency graph worked and identified a set of rules needed for rig conversion. Rig nodes needed to meet new criteria for thread safety and python related plug-ins required conversion to C++. The primary goal during this phase of the project was to maintain compatibility and stability with the conversion to the Evaluation Manager - performance improvements would come next. While we were able to reach feature parity and rig compatibility on "Ferdinand", we missed our original 24 fps playback target. With our new foundation in place, focus then shifted to the performance requirements for "Spies in Disguise" and all future productions.

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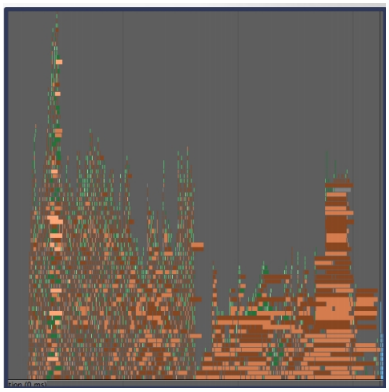

Figure 1: Evaluation Manager Results

2 STABILITY, NOW ACCELERATE

Utilizing the Maya profiler tools and vTune, we analyzed the primary character's performance and targeted two areas for development: optimizing the character's rig for multithreading and the fur rig network. We applied some of the lessons demonstrated from Dreamworks Animation's Premo multithreading[Gong et al. 2014] and developed a new in-house Chop Rig System to auto-optimize the rigs with minimal TD interaction. Furthermore, we advanced this auto-optimize process to target the Fur Rig performance. Having achieved maximum parallelization across both the rig and fur networks, we developed an automatic rig testing suite to determine the ideal hardware configuration to take advantage of the parallelism. For the first time in production and without any loss to rig functionality, Blue Sky Animators were no longer forced to playblast and could interactively see 24 fps. However, achieving real-time performance was only the start.

3 GATHERING METRICS

To ensure rigs maintained performance specs, we introduced a health-centric perspective on assets in our pipeline. Each time an asset is published, our system gathers a range of health metrics, such as: fps, file-size, load time, and a set of rendered images after each department's build cycle. Running the suite of tests on "Health machines" with calibrated specs, jobs are launched as an independent process to capture any "infection" introduced into the system. Conduit, Blue Sky's next generation pipeline platform, powers the Asset Health system. Conduit stores information in a highly available Cassandra database and provides quick search results through ElasticSearch.

4 ASSET CHECKUPS

The Asset Health system provides production alerts as well as graphs on historical trends. Using the React Web Framework, we

Figure 2: Checkup Interface

built a modular website where production can easily monitor asset health in real-time. In addition to metrics, we also introduced an Asset Achievement system. Traditional QC tests provide artists with pass/fail results. Blue Sky's Achievement system captures Achievements for when an asset has "earned" a health milestone (e.g. fur is attached and optimized, real-time performance, is renderable). This allows production to continuously deliver in-development assets with both performance and functional metrics. With each publish, TDs can pinpoint which department's contribution is responsible for improving or degrading asset health.

5 CONCLUSION & FUTURE WORK

With the above developments, we were able to reach our target goal of 24 fps without breaking rig compatibility. Using Maya's EM as a foundation has helped supplement our in-house R&D efforts to focus on distinguishing technology. Developments continue to improve multi-character scenarios and environments. Meanwhile, we are expanding the Asset Health framework to provide similar information to shot-based departments to ensure an overall healthy pipeline.

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