

Digital Waterfall | LED screens: Salesforce Lobby, San Francisco



*How'd they DO that?*

It's taken the internet by storm. Millions of viewers have effused delight, wonder, and disdain at the waterfall in [Salesforce's](#) downtown San Francisco lobby. Disdain? Yep, many believe this is a real waterfall and a decadent waste of water during California's epic drought. And that's the highest compliment you can pay an fx artist. Is it real? Or is it CG? So what's the story behind [this computer-generated installation](#)? How'd they *do* that?

San Francisco creative studio, [Obscura Digital](#) - world masters of projection installations - reached out to Fusion CIS to bring their exquisite designs to life. Specializing in dynamic fx, Fusion CIS has more than a decade of experience in motion pictures, tv, commercials, games and installations. We've set oceans raging, parted the Red Sea, and exploded helicopters out of the air in blazing glory – all from the comfort of our computer screens. Dynamics is a technically challenging area of visual effects and we've spent years honing the art, so we're a perfect complement to creative studios who focus on other skills. But even with our vast experience, this 106' + waterfall created unique challenges.

It's one of those “awesome not awesome” scenarios. The computer-generated waterfall is front and center. Not background, not part of the scene, it *IS* the scene. That puts intense pressure on the realism of the simulation and renders, not to mention the planning/design/creative

direction from Obscura Digital. On top of that, the huge physical dimension of the display wall - stretching 106'+ by 15' - required a massive image size - 8112 x 960 pixels. Typically we're asked to deliver rendered HD images, 1920x1080, which for giant VFX elements still means long, grinding simulation and render times. So this project definitely cranked the bar to new heights. In VFX, the bigger the element the longer the render *and* the greater the detail you have to pack in to 'sell it' as real. So this had to be planned with meticulous care.

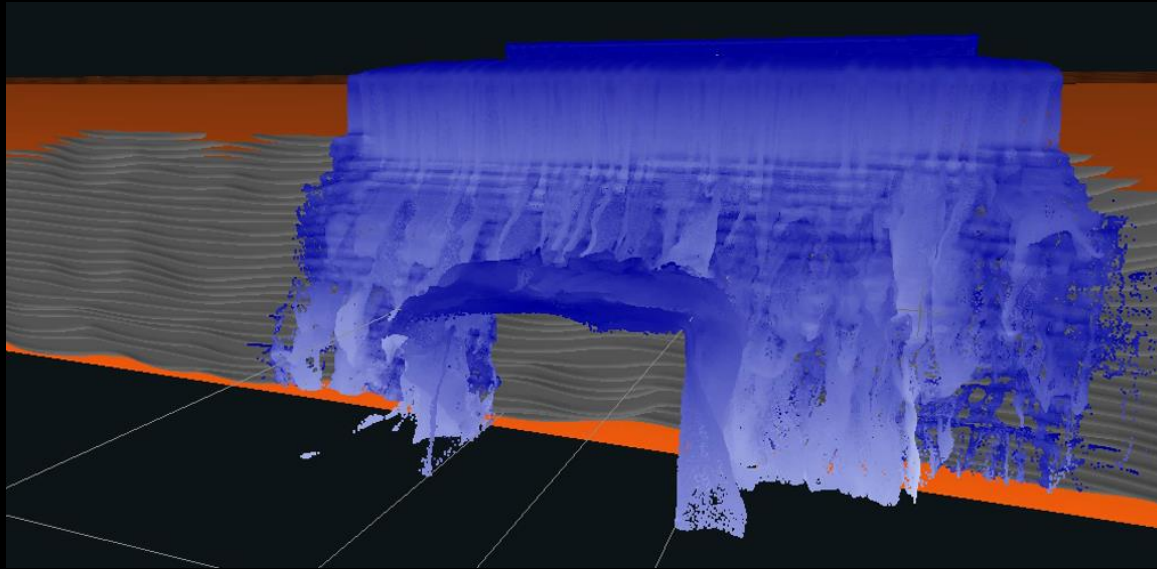
Then there was shot length. The majority of our project shots are for commercials and movies, with shot lengths around 30 to 250 frames. To achieve the zen-like feel that Salesforce desired, the waterfall needed to be 1100 frames. And! We needed 2 different types of waterfalls. The perfect storm.

The key to dealing with such mind-numbing requirements is to partner with groups who have the right experience and resources to handle the different components. Obscura Digital's highly skilled team is well experienced with long shots and this type of creative, so they fully understood the technical challenges. Fusion CIS has handled plenty of deeply challenging VFX. Renderstorm handled the physical rendering with their robust render farm, so Fusion CIS could focus on the rigors of the simulations and lighting.

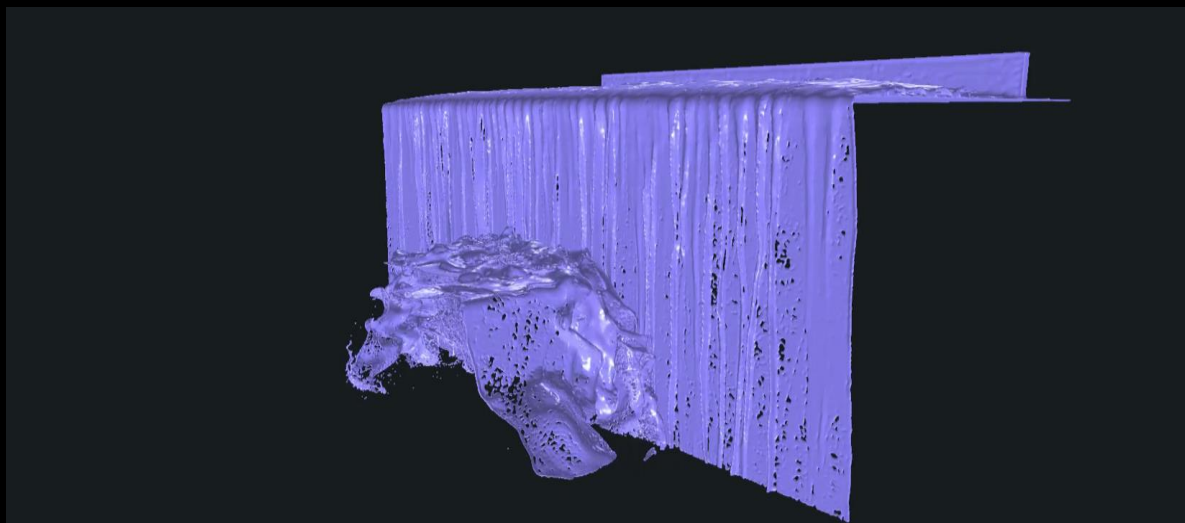
We used [RealFlow](#) (Next Limit Technologies). It allows VFX artists to create a wide range of dynamic, physical simulations. Fusion CIS has developed a deep library of methods & tools that extend RealFlow's capabilities, controlling and manipulating it to achieve custom results. Here, 2 waterfalls had to be designed: a basic version that starts flowing gradually, develops into a full waterfall that splashes against the lobby doorways, then gradually trickles to a stop. The second was more involved, starting with the fully flowing waterfall that then interacts with a continuously deforming set of tiers or steps that push gradually out of the wall, then recede back.

Obscura Digital provided a protruding wall layout as a digital file, with dimensions set to match the lobby wall, and also created the deforming tiered geometry for the second waterfall. After refining the tiered geometry so it would work best for the fluid behavior, Fusion CIS designed a digital waterfall system made of 4 overlapping panels, which could be put together in a lighting file to create the full waterfall. Each panel could then be simulated separately, allowing 4x more detail in the water than would have been possible if the waterfall was done as a single unit. The water in the simulation pours over an edge and down a vertical face. Fusion CIS also designed a dynamically moving array of tiny cubes at the lip of the cliff, so the water would develop little internal, sinuous channels that would shift and evolve, thus avoiding a featureless flat wall of water but avoiding anything too violent that would break the zen-like feel. Finally, we created a set of forces around the lobby doorways that would allow the water to flow in a natural, dynamic way, but would still separate and not become overly splashy and distracting. The simulation time for each panel of the basic waterfall was about 48 hours for 1100 frames, running on a high-end workstation. For the more complex waterfall interacting with the tiered geometry, this time increased to around 5 days. The number of particles in each panel of simulation was 20 to 30 million. Here's a 3/4 angle on one panel of the deforming tier waterfall showing the raw simulation data as particles (below):

[preview](#)



While the simulations ran on multiple machines, the Fusion CIS team generated the "surfaced" versions through a process called meshing. To render the simulations as water, you first have to take the raw particle data and calculate a polygonal surface that smoothly coats the particles and ends up representing the free surface of the water. Each panel of water generated 50 to 100 million polygon meshes per frame, so that the total waterfall was made up of 200 to 400 million polygons. The meshing alone took about 4 days to complete per waterfall panel. Here's a [preview movie](#) showing half the action of one panel of the meshes for the waterfall:



While the 8 panels of simulation and 8 panels of meshes were calculated, Fusion CIS worked in parallel on lighting the meshes, submitting still frames and short sections of the rendered look to

Obscura Digital for feedback. We used Maxwell Render (another software tool created by Next Limit Technologies) for the lighting. It is able to create highly realistic renders and is also highly optimized to handle scenes with huge detail levels, so it was a perfect fit for this project.

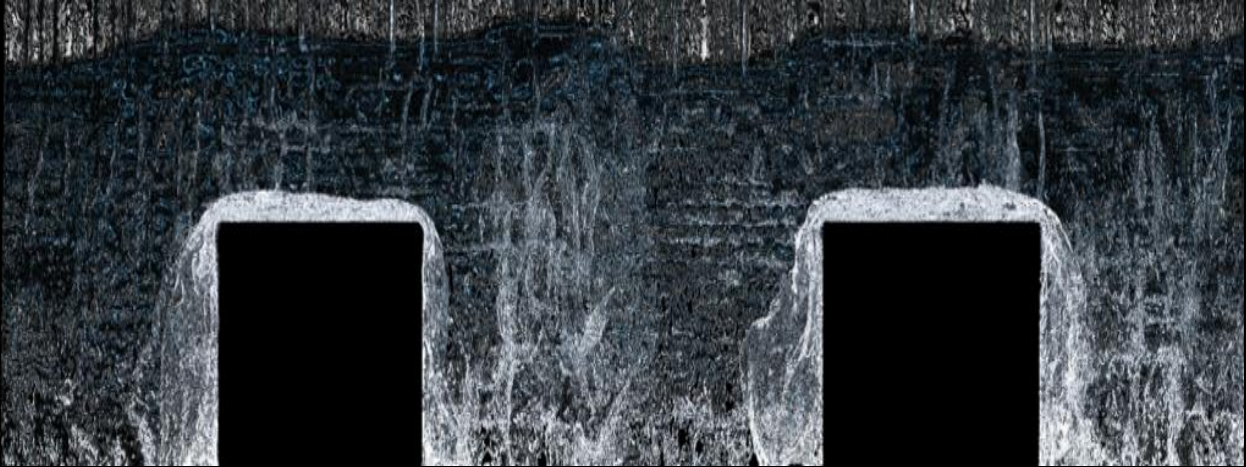
Fusion CIS created an architectural style lighting rig made of an array of 40 soft spotlights with a bias toward a cool blue tone. We used a small network of machines to keep the lighting work going while the simulations and meshes were running. Here's a turn-table style view showing a section of [the waterfall](#) allowing a good feel for the dynamics and lit look:



Here's small format versions of final lighting:



[Waterfall Final Lighting](#)



### Tiered Waterfall

With final approval on the waterfalls' behavior and lighting, we sent all the data to render farm RenderStorm and worked with them to manage the heavy task of rendering 2200 giant frames. With render times 10 to 12 hours per frame, it took 80-100 machines about 2 weeks to get the imagery completed. Obscura Digital's artists adjusted color/brightness and added in layers of mist to complete the overall look.

Fusion CIS whole-heartedly thanks all the teams who contributed to this outstanding project:

Salesforce: [www.salesforce.com](http://www.salesforce.com)

Obscura Digital: [www.obscuradigital.com](http://www.obscuradigital.com)

Sansi: [www.snallc.com](http://www.snallc.com)

RenderStorm: [www.render-storm.com](http://www.render-storm.com)

When you're in downtown San Francisco, we highly recommend a Zen-style picnic lunch in the Salesforce lobby!