

= Luminous Studio =

Luminous Studio ( ????? ? ????, Ruminasu Sutajio ) is a multi @-@ platform game engine developed and used internally by Square Enix . The engine was developed for and targeted at eighth @-@ generation hardware and DirectX 11 @-@ compatible platforms , such as Xbox One , the PlayStation 4 , and versions of Microsoft Windows . It was conceived during the development of Final Fantasy XIII @-@ 2 to be compatible with next generation consoles that their existing platform , Crystal Tools , could not handle .

The engine powered the Agni 's Philosophy and Witch Chapter 0 tech demos and now centers on Final Fantasy XV , a title in the Final Fantasy series for eighth @-@ generation consoles . Critics praised the engine 's two tech demos , citing their graphics and real time rendering and declaring the engine as representative of the future of gaming .

= = Development = =

= = = Origins = = =

According to Julien Merceron , the Worldwide Technology Director for Square Enix in the early 2010 's , the concept for the new engine was born in 2011 while he was in the final stages of working on Final Fantasy XIII @-@ 2 . This was a difficult period for Square Enix : the project then known as Final Fantasy Versus XIII was hitting technical barriers as it transitioned to open world environments its original Crystal Tools engine could not handle , and Final Fantasy XIV had met with a disastrous launch due to development and technical problems . Faced with these issues , Square Enix decided to bring in former developers from Sega to create new engines for their products , including Luminous Studio . Talking about sharing the engine , Merceron said that he advised the company to avoid sharing between companies or internally between games until the engine had been finalized with the released game : this resulted in Luminous Studio being restricted to what would become Final Fantasy XV during development , while other major next @-@ generation titles would use other outsourced engines .

The construction of Luminous was similar in concept to Epic Games ' Unreal Engine or the Unity engine from Unity Technologies in that it incorporated all the development tools needed from asset editing onward , as well as being " high quality , easy to use , flexible , high speed , compact , and supporting both manual and automatic [ game development methods ] . " The development team drew inspiration for this concept and approach from Unreal Engine and CryTek 's CryEngine . The name " Luminous " was chosen to reflect the crystal theme of the Final Fantasy series . There were many major factors that the team considered while building the engine , as they wanted to insure the highest possible quality for high @-@ end games . Some of the environmental factors included lighting , shading and modeling . A core feature of the gameplay was the artificial intelligence ( AI ) , which had previous been liable to become unstable or poor under certain conditions or with poor programming due to the large amount of individual codes needed . For Luminous , the team created a single unifying flexible framework to control the scale of the AI while also making it intuitive . It was intended to be used in @-@ house rather than licensed out to other developers , but that western subsidiaries of the company would have access to it . In addition , they also built in the ability to blend graphical assets designed for CG scenery with highly advanced real @-@ time animation , making the two graphically similar . Luminous Studio was publicly revealed in 2011 .

The head of the project was Yoshihisa Hashimoto , Square Enix 's Chief Technology Officer , who had moved over to the company from Sonic Team in 2009 and became involved with development in 2011 . Other key Square Enix staff members working on Luminous Studio include Takeshi Nozue , Akira Iwata and Hiroshi Iwasaki . While ground work was being laid for Luminous , members of the team traveled to look at engine technology being developed by IO Interactive , Crystal Dynamics and Eidos Montreal , western video game developers who became subsidiaries after the company bought out Eidos Interactive . Square Enix 's western subsidiaries shared information about game

engine development from their experience developing the CDC and Glacier 2 game engines and shared their source code with the Luminous Studio team . During 2012 , one third of the final development team was from western subsidiaries of the company . Luminous was developed based on high @-@ end DirectX 11 technology . While designed for eighth @-@ generation video games , it was said to also be compatible with any console and hardware that could handle shaders , such as PlayStation 3 and Xbox 360 . Its compatibility with Nintendo 's seventh @-@ gen hardware such as the Wii and Nintendo 3DS was doubted , as those consoles did not support shaders . During this early stage , they were looking into the possibility of adjusting the engine for use on Wii U. The company were hoping to promote Luminous as a kind of brand , showing off the logo and tech demo when they were ready .

= = = Agni 's Philosophy = = =

Agni 's Philosophy is a tech demo created by Square Enix to show off the capacities of Luminous Studio . The demo was a collaboration between the cinematic Visual Works division -- a section of the company generally associated with CGI movie production for the company 's video games -- and Square Enix 's R & D department , Advanced Technology Division , with a goal to create a real @-@ time graphics tech demo that has a quality coming as close as possible to pre @-@ rendered CGI . Development of the demo took approximately half a year . Unlike previous technology demos created by the company , which were based on pre @-@ existing games , Square Enix decided to create something completely original . The demo was themed around the Final Fantasy series : during discussions , the team asked the question " What is Final Fantasy ? " , broke down its basic components and used them , along with added unusual elements , in the demo . A focus during the demo 's development was the creation of Agni , the central character . For the demo , as it was a work @-@ in @-@ progress , they optimized it for graphical performance . While the story and themes were created by the Japanese staff , many of the character designs were done by staff from their western subsidiaries . The technology to create the demo was all sourced from then @-@ existing high @-@ end PCs . An initial mock up of Agni 's hair was created using a mannequin and wig styled by a professional make @-@ up artist . Each character 's face was constructed around mo @-@ capped footage of live actors , then tweaked and expanded in post @-@ production . The entire development process , from conception through development , took approximately a year . Agni 's Philosophy was first shown at E3 2012 as part of a special presentation by Square Enix . As part of the presentation , guest speakers paused the demo and adjusted elements of the characters on the fly to show off the engine 's customization features . It was also shown at SIGGRAPH 2012 .

The Agni 's Philosophy tech demo was running at 60 frames per second , used 1 @.@ 8 GB of texture data per frame , and pushed ten million polygons per frame , with approximately 300 @,@ 000 to 400 @,@ 000 polygons for each character model . The entire city in the demo was tessellated . There is a scene where 100 @,@ 000 illuminated firefly @-@ like insects appear on screen , each one a full polygon mesh model with body and wings , which proceed to merge to generate a summoned monster . Production for the demo began in June 2011 , and was initially produced as pre @-@ rendered CGI animation by Visual Works before Square Enix attempted to reproduce it entirely in real @-@ time with the Luminous Studio engine , using the same assets as the CGI version .

= = = Final Fantasy XV = = =

Prior to its rebranding and full move onto eighth @-@ generation consoles , Final Fantasy XV ( then called Final Fantasy Versus XIII ) , used lighting technology from Luminous along with a purpose @-@ built proprietary gameplay engine . For its E3 2013 re @-@ reveal under its new title , the company used a specially @-@ created engine environment named Ebony . In July 2014 , Hashimoto left the company , citing personal reasons . While still working as an advisor for Luminous Studio , his position as project leader was filled by Remi Driancourt , a senior engineer who had worked with games featuring Luminous technology . The version of XV shown off at Tokyo

Game Show and Jump Festa that year ran on Luminous 1 @.@ 4 , which combined Luminous with components created for Ebony . The Episode Duscae game demo is planned to run on 1 @.@ 5 . The developers are planning for the final game to run on version 2 @.@ 0 .

With Luminous Studio , real @-@ time scenes in XV have five million polygons per frame , with character models made up of about 100 @,@ 000 polygons each . Character models for XV were constructed with 600 bones , estimated as roughly 10 @-@ 12 times more than seventh generation hardware . About 150 bones are used for the face , 300 for the hair and clothes , and 150 for the body . For the characters ' hair , the team used the same technique as with the characters in Agni 's Philosophy . The inner hair for each character uses about 20 @,@ 000 polygons , five times more than seventh generation hardware . The data capacity for textures is also much greater than before . Each character uses 30 MB of texture data , and ten levels of detail . While seventh @-@ generation games used 50 to 100 MB of texture data for a scene , Final Fantasy XV can use about sixteen times this amount on the PlayStation 4 console . 2048 × 2048 and 4096 × 4096 texels are used for the HD textures .

= = = Witch Chapter 0 = = =

In April 2015 , Square Enix announced that the engine will support DirectX 12 , and Nvidia revealed a new real @-@ time tech demo developed by Square Enix for the engine , called Witch Chapter 0 [ cry ] , featuring the character Agni from the earlier Agni 's Philosophy demo . The demo renders over 63 million polygons per frame , uses " 8K by 8K " resolution textures , and her hair is rendered with over 50 shaders , with each strand of hair rendered as a polygon . It also portrays human crying with a high level of detail , and the quality of the real @-@ time graphics have been compared to pre @-@ rendered CGI animation . The tech demo took a year to produce , and was running on a PC with four GeForce GTX Titan X graphics cards .

= = Features = =

= = Reception = =

The existence of the gaming engine surprised many critics when it was unveiled in E3 2012 . Kotaku described the graphics of the game engine preview as " jaw dropping " and " stunning " , and called it a real competitor to Unreal Engine 4 . VG24 / 7 called the graphics " drop dead gorgeous " . IGN cited the technology as a " hurdling leap into the future " , and other reviews emphasised realistic 3D modeling of the human eye and real time rendering of graphics .