Ultra Dynamic Sky
Update History

UE5 Updates

3-26-2024

Version 8.0A Hotfix

For UE 5.1, 5.2, and 5.3

- Fixed flickering visuals on client when calling Change Weather in multiplayer
- Fixed visual bug with shadows in snow trails
- Changed warning displayed for manual weather overrides from UDS to be a warning message window instead of a screen message
- Changes to weather particle logic to preemptively correct for some niagara changes in 5.4

3-20-2024

Version 8.0

For UE 5.1, 5.2, and 5.3

General

- UDS and UDW now have the capability to run much of their active updates in the level editor. For example, properties and features affected by the player camera location will now be previewed dynamically in the level editor, using the editor viewport camera. Previously runtime-only features which now work in the editor include Interior Adjustments, Sound Occlusion, changes based on camera height within the cloud layer, Weather Override Volumes, Post Process Wind Fog, Screen Droplets, Lightning Flashes, and more.
- Added buttons to UDS and UDW categories, with shortcuts to relevant documentation entries in the readme.
- Created blueprint function libraries for UDS and UDW. These have self contained functions for globally sampling and controlling the sky and weather.
- Added an option to the Occlusion Settings class to change how occlusion is affected below the water level
- Water Level is now just controlled by the variable on UDS. The equivalent variable has been removed from UDW, and its Use Water Level setting has been renamed to Use UDS Water Level.

- Several public utility functions for getting values on UDS and UDW have been changed to pure functions.
- Some improvements to the interface in the Configuration Manager

Sky

- Created a modifier system for UDS. Modifier assets can be made which affect a wide selection of float and color properties on UDS. These modifiers can be applied/removed at runtime with smooth transitions, and layered on top of each other. See the new readme section on Sky Modifiers for info.
- The Sky Mode Scalability Map on UDS will now apply automatically if effects quality is changed at runtime
- Added an option to make auto exposure update faster on begin play, to avoid long adjustment times to starting conditions
- Added a new dispatcher to UDS called Current Hour Changed, which behaves similarly to Hourly, but without being called for hours which are skipped over when time is changed instantly.
- Added an "Every Minute" event dispatcher to UDS
- Redesigned "Use System Time" option on UDS, so that it controls the Time of Day and date values using the system clock, combined with the time zone. This allows time to be sampled the same, and time based events to work. Use System Time can now also be used to affect the non-simulation features.
- Added a Date Changed event dispatcher to UDS. This is called whenever the Year/Month/Day values change for any reason.
- Added a Feature Level setting to Basic Controls on UDS. This allows specifying the project's rendering feature level (Desktop/Console, Mobile Forward or Mobile Deferred) and the system will adapt to the limitations of the selected feature level. This replaces the existing Mobile Overrides options, but the selected Feature Level can still be determined on a platform basis by using the Platform Feature Levels map in the Mobile category.
- Added a setting to adjust daytime intensity of aurora
- Simplified control of the base cloud textures for the Volumetric Clouds and 2D Dynamic Clouds. There's now just an exposed texture variable for both, replacing the setup with the enum. The settings have also been renamed to Cloud Formation Texture to better communicate what they are.
- Changed behavior of Overall Intensity on UDS so that it affects fog as well. Fog color intensity can still be controlled independently using Fog Color Intensity Scale
- Improvements to how UDS handles world origin location being moved
- Reworked some of UDS' logic to allow the actor to be rotated on the Z axis in a way that rotates the whole sky and lights, dynamic clouds excluded.
- Added an option to move the sky light component with camera location, to allow real time capture to remain accurate to the clouds above the camera when moving around large levels.
- Added a setting to control the cubemap source angle on the UDS sky light.

- Added an option to the Volumetric Cloud Painter to rotate the painting brush.
- Renamed Sun Radius to Sun Scale, and changed both it and Moon Scale so they are entered as a direct angular diameter in degrees.
- Replaced the sky atmosphere fog influence curve with separate values for adjusting influence from sun, moon, or when neither is up.
- Changed Cloud Direction on UDS so that it uses the same value range as Wind Direction on UDW
- Combined the separate categories for sky light modes into the one Sky Light category. The cube map texture for Custom Cubemap and Dynamic Tinting modes are now just exposed as one texture (Sky Light Cubemap) shared by both modes.
- Moved settings which affect both directional lights together (Directional Balance, Dim Directional Lights, Lights Update settings) into a new Directional Light category.
- Moved Adjust for Path Tracer into a new Cinematics / Offline Rendering category. This category also has new settings for how rendering is adjusted at runtime by Cinematic/Offline Project Mode.
- Moved various general settings for scalability, like the Sky Mode Scalability Map and the Max Property Cache Period, into a new Scalability / Performance category.
- Moved the settings in the Component Selection category into the respective categories for Sun, Moon, Sky Light, and Fog Color. Changed out the feature toggle enum variables with a boolean for Render Sky Light, Render Sun Directional Light, etc. The custom actor will be used if it has a valid actor reference (It doesn't need another variable configured to tell the blueprint to use the custom actor)
- Some improvements to visuals and performance when volumetric cloud scale is decreased below default
- Renamed Angle and Inclination settings for the sun and moon to Yaw and Pitch settings, to better label what they do.
- Adjusted behavior of Sun Softness so that overall luminosity of the sun disk will be preserved as it's changed.
- Added a setting for Moon Phase Contrast, to adjust the softness/hardness of the moon's solar terminator
- Exposed volumetric fog albedo to settings for control with time of day
- Cloud Coverage, Fog, and Dust Amount variables on UDS are now handled somewhat differently. If adjusted on UDS with UDW in the level, they will apply a manual override to the specific weather state value adjusted from UDS. There are new Set public functions for each of these to adjust for this in the same way automatically when setting the variables at runtime.
- Reworked moon texture settings on UDS. The moon color and alpha is a separate texture from the moon phase normal texture, allowing a custom RGB moon texture while retaining moon phase rendering.

Weather

- Added a framework to allow individual Weather Settings assets to have their own custom blueprint logic, for applying custom effects/behavior. See the readme entry Custom Weather Behavior for info.
- Added a new actor class, Puddle Fluid Volume. This actor renders a puddle as a translucent water surface that moves up and down with rain/wetness, making it suitable for situations where water should fill an actual concave space in the ground geometry. It can also be affected by the DLWE Interaction component, creating much more lifelike fluid ripples than is possible with the material effect based puddles.
- Added a Heat Distortion post process effect to UDW. Configurable from a new Heat Distortion category.
- Added Enable Volume and Disable Volume functions to the UDS Occlusion Volume class
- Replaced snow textures used by Surface Weather Effects and Dynamic Landscape Weather Effects with new higher res textures.
- Exposed the texture objects used for snow/dust textures on Surface Weather Effects to inputs
- Replaced animated puddle ripple texture with new higher res texture
- Added a toggle to Dynamic Landscape Weather Effects and Surface Weather Effects to mask coverage below the water level from UDS
- Made the dripping mesh niagara systems kill their particles that go below water level, if enabled.
- Added a material based depth of field into the rain and snow particle materials (on high and epic material quality), for much better appearance in shots with heavy depth of field.
- UDW has new event dispatchers called State Change, which can be used to monitor specific weather state values for when they change.
- Exposed control of the thresholds for when event dispatchers on UDW (Starting Raining, Finished Snowing, etc) are called, in a new Event Dispatchers category.
- "Enable Dynamic Landscape Weather Effects" toggle removed from UDW. The logic for the effects will start automatically if called for.
- Reworked some elements of Lightning Flash niagara effect to work better for lightning strikes at closer range to the camera.
- Added an input to the Flash Lightning function to specify a manual seed for the lightning bolt shape
- Season on UDW has a new Set Season function. The Set function will apply the change to the Season variable and also run the additional logic for updating weather and material parameters.
- Controls for Random Weather Variation on UDW and Weather Override Volumes have been reworked. RWV is enabled with an enum which allows selecting multiple timing modes, including new Daily and Hourly modes. Weather Override Volumes don't have their Mode setting anymore. They use the same Random

Weather Variation mode selection that UDW does, for more consistency in how weather is configured between the two.
- Added an option to Random Weather Variation settings on UDW, to forecast multiple upcoming weather types ahead of time. This forecast can be sampled using the function Get Random Weather Forecast if it's enabled.
- Added an option to Random Weather Variation called Weather Specific Interval Multipliers. It allows shortening or lengthening the random weather interval for specific weather presets. For example you could use it to make storms last a shorter amount of time than other presets.
- Get Current Temperature on UDW now outputs in a scale determined by an input on the function, instead of outputting both scales
- Reworked settings in the Material Effects category on UDW. There are now settings for scaling the clear speed for each material state value based on context. Temperature for snow, direct sunlight for wetness, and wind for dust. Additionally, the material effects applied by Weather Override Volumes now locally apply the same dynamics to their material state. So material state can behave by the same rules in global weather and inside a WOV.
- Added an option to Random Weather Variation settings to have random weather instantly clear and restart with new weather if the Season suddenly changes past a threshold.
- Added toggles in the Manual Weather State category on UDW, to allow individual values from the manual state to be applied as manual overrides. So for example you could have weather state coming from presets or random weather, but take manual control of a specific value like cloud coverage or wind intensity.
- Moved the physical material array for enabling DLWE interactions on non-landscapes to the DLWE Interaction Settings asset.
- Added a setting to scale how fast screen droplets fade away when the camera isn't exposed to rain.
- Exposed controls in the Material Effects category on UDW to globally control the default colors for material snow and dust coverage.
- Changed several options in the DLWE category on UDW to instead be inputs on the DLWE material function.
- Added a niagara module called UDW Wind Force, which adds a simple force to niagara particles, angled with wind direction and scaled with wind intensity.
- Added settings to scale intensity of lightning flashes separately for day and night
- Added a material function, Season Color Blend, which takes a color input for each season and blends them based on the current season value on UDW.
- The rain falling effect in the lightning flashes now falls in a direction and speed that matches the wind intensity and direction.
- Improved how the dripping effect in Surface Weather Effects responds to rain intensity.

- Added an optional effect to Surface Weather Effects, called Flowing Water Turbulence, which renders a turbulent animated normal which flows from the top down the side of the mesh.
- Exposed the exposure mode applied by UDS' exposure settings to be an option.
- Added a Rain Light Sparkle shading effect for rain particles, controllable with a new setting.
- Rain splash particles/drop decals and snow particles stuck to surfaces will now move with the surface they're on, using the velocity buffer.
- Added a Local Temperature Offset variable to the Actor Weather Status, which is added to the temperature sampled from the weather, to make it easier to implement things which locally impact the actor's temperature, like a fire.
- Changed how sound occlusion queries the level for portal components, to avoid a potential performance bottleneck.

Fixes

- Fixed for GPU memory leak in sequence editor when UDW is bound to the sequence and has DLWE enabled
- Fixed Day Length and Night Length not working as intended on a dedicated server
- Fixed a bug with the Hourly event dispatcher when time is moved backwards.
- Fixed a bug with the Onscreen Controls widget, which could cause a video memory crash when adjusting manual weather value sliders
- Fixed issues with the Global Volumetric Material which could cause it to not render, based on the camera location
- Fixed an issue with 2D auroras causing artifacts behind volumetric clouds in overcast skies, in some contexts.
- Fixed custom Calendar assets with different numbers of days in a year having Season values on UDW which are offset incorrectly.
- Fixed rain particle appearance settings not applying to emitters like Dripping Mesh and Rain Drip Spline, if rain particles are disabled on UDW.
- Fixed mobile rendering issues with sun lens flare
- Fixed a visual bug with the moon rendering too large in some contexts.
- Fixed Rain Drip Spline culling incorrectly with a very long spline

10-18-2023

Version 7.9B Hotfix

For UE 5.0, 5.1, 5.2, and 5.3

- Fixed weather particles causing niagara crash when testing instanced stereo in standalone
- Fixed snow particles getting pinned in place at world origin
- Added input to Surface Weather Effects to blend underlying normal map on snow/dust
- Fixed global volumetric material extinction not updating with a change of Dust Amount in some contexts.

10-11-2023

Version 7.9A Hotfix

For UE 5.0, 5.1, 5.2, and 5.3

- Fixed Adjust for Path Tracer not automatically configuring sky light shadows
- Fixed Dripping Mesh droplet sprites appearing to orient the wrong way depending on parent velocity
- Reimplemented snow particles sticking to surfaces
- Exposed DLWE snow WPO distance falloff to a setting
- Added inputs to Surface Weather Effects to individually replace normal and position inputs

10-4-2023

Version 7.9

For UE 5.0, 5.1, 5.2, and 5.3

- Static Clouds have been completely rebuilt. There are now 3 included static clouds textures, and a new editor utility for rendering custom static clouds textures from volumetric clouds. Static Clouds can also now be used with 2D auroras.
- Added a new material function for weather effects on opaque surfaces. It's called Surface Weather Effects, and it's intended to replace Wet Weather Effects and Snow and Dust Weather Effects in functionality. The old functions are still present for legacy support, but I recommend using the new function moving forward.
- Added a setting to the Simulation category on UDS to replace the Gregorian calendar with a custom calendar asset, which can have a different number of months, lengths of months, days in a year, etc. The calendar selected will determine how the date values are interpreted and controlled.
- Added a function to UDS, Get Day of the Week. Finds the current day of the week based on the date and the calendar, outputs it as a string and an integer.
- Reworked the weather mask system on UDW, so that the Weather Mask Brush and Weather Mask Projection Box now exist as component classes. The actor classes still exist, but they now just act as simple containers for the component class.
- The DLWE Interaction component now references a DLWE Interaction Settings asset for its configuration instead of separate variables on the component. There's now also a map (empty by default) which can play general impact sounds based on the physical material of the ground, when the component isn't touching snow/dust/puddles.
- Added two new niagara systems, Dripping Static Mesh and Dripping Skeletal Mesh. When added as the child of a static mesh or skeletal mesh component, these will spawn dripping rain particles from the mesh surface, based on the weather state on UDW. See the new Readme entry Dripping Mesh Particles for more info.

- Rebuilt the player occlusion system, used on UDS for Interior Adjustments and on UDW for Sound Occlusion. Occlusion settings are now defined by a settings data asset on UDS and UDW. If both blueprints use the same occlusion settings asset, they will now share their occlusion logic, as an optimization.
- Added a component class called UDS Occlusion Portal. The occlusion system will line trace to this portal component and affect occlusion values if the path to the portal is unobstructed. This can be used to have things like open doors and windows let weather sounds more naturally into an interior space.
- Changed how Cloud Speed is controlled by UDW. UDW uses wind intensity to control a multiplier for cloud speed, but Cloud Speed is still controllable on UDS with UDW in the scene. This way, Cloud Speed on UDS now serves the same purpose Cloud Speed Multiplier on UDW did, which is now removed. Note, the value range of Cloud Speed is now different as a result.
- Split the Sky Light Casts Shadows setting into two, one for if the sky light is movable, and one for static/stationary. This is mainly so the UDS default configuration can now have Distance Field Ambient Occlusion disabled, as this is really all that's controlled by the cast shadows setting on a movable sky light, and DFAO being on by default can cause problems for projects not well prepared for it.
- 2D Dynamic Clouds now shift on the X and Y axes based on camera position, for an effect of parallax when the camera is moved over long distances.
- Changed how weather particle spawn rate is exposed on UDW settings. There's now a single spawn count variable for each weather particle type which represents the total number of visible particles spawned per second. In Shared Particle Settings, there's also CPU Particle Buffer Length, which sets the max latency of valid tested particle paths.
- Added settings to scale the rain splash droplet particles and raindrop wetness decal particles on UDW.
- Added a setting to select if the rain splash particles render as decal materials or translucent materials
- Added a setting to the Rain Drip Spline to scale how much material wetness will make drips spawn.
- Added settings to adjust how weather particle opacity scales with camera distance
- Added a setting to scale the speed of volumetric fog noise movement
- Added settings to control volumetric ground fog with the amount of rain or snow on UDW.
- Added an input to the DLWE function to replace the snow/dust normal.
- Added a random seed setting to UDW, which affects random weather variation, lightning flash placement, etc.
- Added settings to control velocity randomization on UDW weather particles.
- Improved how the Weather Override Volume will handle UDW being removed/loaded while a WOV is running.

- Changed Lightning Flash spawn settings on UDW to use a Lightning Flash Frequency value, entered in average flashes per minute, instead of the interval range used previously.
- Improved support for UDW being in a separate level from UDS
- Added a setting to adjust the fade distance of the volumetric aurora.
- Made the sun disk present in the real time sky light reflection capture, if sun radius is high enough to avoid aliasing/flickering as a result.
- Added a Use Local Parameter input to the Glass Window Rain Drips function.
- Added an option to the Onscreen Controls widget to have Time Zone and location presets change Time of Day to maintain the existing global time.
- Added an event dispatcher called Season Changed to UDW, called when the current season changes, and outputs the new season as an enum.
- General blueprint optimization on UDS and UDW
- Fixed a bug with Onscreen Controls weather dropdown, caused by a change in widget behavior in 5.3
- Fixed several bugs with the Ambient Sound (Time and Weather Controlled) class
- Fixed volumetric cloud flickering momentarily if an instant change to clear skies is followed by a gradual increase in cloud coverage.
- Fixed bug with Volumetric Cloud Painter, if Cloud Coverage Target Resolution is changed when target is already in use.
- Fixed a bug with saving and loading a weather state which could cause incorrect weather to briefly appear.
- Fixed dust and fog temperature bias values not being used as intended on UDW.

6-20-2023

Version 7.8

For UE 5.0, 5.1, and 5.2

- The Temperature system on UDW has been redesigned some. Now, instead of a single base temperature, each season has a min and max temperature, for more specific control of how cold or warm it can potentially get in each season. The final temperature value in that range is determined using bias settings which shift toward the min or the max based on weather/time/etc.
- Weather Override Volumes now have their own specific seasonal temperature settings which will be used in place of the global ranges when the player is inside them, replacing the simple temperature offset which existed previously.
- UDW now has an option to apply a climate preset, in the Random Weather Variation category. This uses new climate preset assets, the included ones populated with real world data for 23 climates. When selected, the preset is used to set the probability maps for random weather, for each season. It's also used to set the min and max temperature for each season. These climate presets can also be used on Weather Override Volumes, to configure their random weather and temperature ranges in the same way.

- Adjusted logic for Random Weather Variation, when blending probability maps between two seasons. It now normalizes the total of the probability values for each season, so the season with the higher total doesn't take disproportionate control of the random weather.
- "Avoid Repeating Weather Types" default setting is now false, in Random Weather Variation settings on UDW.
- UDS' control of volumetric fog has been expanded, with a new Volumetric Fog category. UDS now controls view distance and extinction scale with exposed settings. A global volumetric fog material can be enabled, which can add 3D noise to the volumetric fog, mask the volumetric fog using the Weather Mask targets controlled by UDW, add a layer of ground fog which forms on top of distance fields, and apply special underwater extinction and albedo values below the water level set in the Water category. The volumetric scattering settings for the sun and moon have both also been moved to the new volumetric fog category.
- Added a widget blueprint, "UDS Onscreen Controls", which can be used to add simple user friendly controls of the sky and weather to the hud. Has controls for time, date, location, and weather, each of which can be toggled on or off in the widget's details.
- Renamed "True Real World Time" option on UDS to "Use System Time" to better clarify what the option does.
- Cleaned up some issues with color banding in sky color when using Simplified Color
- Added settings to scale the aurora texture, and adjust how fast auroras change shape, relative to their movement.
- Added an option for "Random Starting Time" to the Animate Time of Day category on UDS, to randomize the Time of Day on startup.
- Made it so weather particles should render by default with the path tracer, if Adjust for Path Tracer is enabled on UDS.
- Added a material function, Sample UDW Material State, which gets the material effect parameters from UDW and samples the WOV target and Weather Mask target in the same way as the included weather effect functions.
- Added a material function, Foliage Wind Movement, which outputs simple 3 layer noise based WPO movement controlled by the state of wind on UDW.
- Screen Droplets on UDW will now make the screen fully wet when the camera emerges from below the water level, if the water level is enabled.
- Added a setting to control the brightness threshold of the sun lens flare on UDS, so the user can correct for color grading LUTs which break the effect by darkening fully bright pixels.
- Renamed the function "Change to Random Weather" on UDW to "Change to Random Weather Variation" to clarify what it's doing and avoid confusion.
- Added input to "Test Actor for Weather Exposure" function, to allow using a specific component for the bounds tested.

- Added settings to scale the source angle for the sun and moon, as calculated by Sun Radius and Moon Scale.
- Fixed "Disable Completely" option for sky light component not working correctly
- Fixed issue with using Space sky mode and Adjust for Path Tracer together
- Fixed cloud wisps going dark too early during an eclipse
- Fixed Change Sky Mode at Runtime sometimes leaving volumetric clouds visible
- Fixed several Simplified Color values not scaling correctly with Night Brightness.
- Removed the exposed settings for DFAO min occlusion and exponent in the sky light category. This was just causing confusion and the BP wasn't doing anything useful with its control of these values.
- Fixed Transition Time of Day sometimes stopping slightly short of its target time.
- Fixed Space Layer planet rings and atmosphere being broken if the UDS actor is scaled
- Rewrote and expanded the readme, and added some new navigation features to the utility.

5-12-2023

Version 7.7B Hotfix

For UE 5.0, 5.1 and 5.2

- Fixed issue with Simplified Color in 5.2, causing incorrect dark coloring
- Fixed issue with levels with painted volumetric cloud coverage opening in the editor in 5.2 to incorrect global coverage

3-15-2023

Version 7.7A Hotfix

For UE 5.0 and 5.1

- Fixed volumetric cloud rendering bug when Saturation and Volumetric Cloud Ambient Light Saturation are both increased.
- Fixed several effects of volumetric cloud layer altitude not being affected by UDS position correctly.
- Fixed volumetric cloud ambient light not scaling with Overall Intensity
- Fixed a mobile rendering bug with snow coverage from DLWE.
- Fixed a visual artifact using post process wind fog with strong depth of field
- Added an option to control how much the second cloud layer is affected by the painted cloud coverage.

2-28-2023

Version 7.7

For UE 5.0 and 5.1

- Added the ability to paint areas of cloud coverage into the volumetric cloud layer. The tool for this is the Volumetric Cloud Painter utility in the Blueprints folder. See the new Readme section "Painting Volumetric Cloud Coverage" for more information about how to use the feature.

- In order to allow the volumetric clouds to show multiple levels of cloud coverage at once, some aspects of the volumetric cloud material and its controls have been reworked. Extinction, cloud tapering, and 3D erosion scaling with height and cloud coverage are handled by a Cloud Profile LUT texture. Extinction Scale is now just one value which scales the extinction value sampled from the cloud profile.
- Volumetric clouds ambient light color is now fully adjustable using controls for intensity, saturation, and tinting by time of day. The default look is mostly the same, but now uses a somewhat cooler ambient light at sunset/sunrise, for a more natural color gradient across the clouds at those times.
- Added an option, enabled by default, to allow effects on fog/lighting due to cloud coverage to be disabled when going above the volumetric cloud layer at runtime. Also added an option, disabled by default, to turn off height fog when above the volumetric cloud layer.
- Added an option to scale volumetric cloud view samples when inside the cloud layer.
- Added a new utility function to UDS, "Check if Point is Exposed to Sun or Moon Light". Takes in a world location and outputs if the point is hit by directional light, and approximates how intense that light is in Lux.
- Added a new effect of Volumetric Cloud Light Rays, found in a new category on UDS. These light rays will be visible coming down through painted gaps in cloud coverage when the local cloud coverage is high.
- Increased the default Cloud Shadows Intensity When Sunny to 0.7.
- Improved how weather particles respond to camera movement and their particle motion blur as a result. There are two new settings in Shared Particle Settings on UDW, for controlling how much weather particles are stretched with motion, and how much their sprite velocity is affected by camera movement.
- Added a new scene component, "Wind Physics Force". This is a component which can be added as a child of a primitive component which simulates physics, to add force using UDW's current wind intensity and direction.
- Made it so on UDW if Temperature Scale is changed, all of the existing degree values will be converted automatically to the new scale.
- Added an input to the "Wet Weather Effects" and "Snow and Dust Weather Effects" material functions to use local scalar parameters for the material state instead of UDW's shared parameters. Also added an input to allow replacing the world vertex normal with a custom vector.
- Added settings to scale the overall speed (time dilation) of the snow, rain, and dust particles.
- Added a new actor component called "Actor Weather Status". This component can be added to an actor to track its exposure to weather and wind and its temperature. It can also set parameters on an array of dynamic material instances based on those weather status values. For example, you could add this component to a character to have it keep track of if the character is wet from rain,

and have that wetness set a parameter on the character material. There are also event dispatchers which fire when the actor's weather exposure changes, or when its temperature goes past adjustable thresholds for hot and cold.
- Added a category to UDW, "Weather Above Volumetric Clouds", which allows specific control for what happens to local weather when the camera goes above the volumetric cloud layer at runtime. The default setup now zeroes the weather values for rain, snow, dust, fog, and limits wind intensity above the cloud layer.
- Added an empty function to the Weather Override Volume called "Custom Volume Behavior". This function is called when UDW tests against WOV actors for local weather. It can be overridden by a child of the Weather Override Volume class to add additional functionality to the WOV actors based on where the player is inside/outside of them at runtime.
- Exposed the default Moon Masks texture on UDS to be changed out, in the advanced dropdown of the Moon category. Only to be used if you want to author a moon texture which uses its GBA channels for the moon phase in the same way the included Moon Masks asset does. Otherwise, you should use the Custom Moon Texture option.
- Added more controls for the color of Cloud Wisps on UDS.
- Saturation in basic controls on UDS now affects all sky and lighting colors, including sky atmosphere, light and clouds.
- Added a scene component "Light Day/Night Toggle", found in Blueprints/Utilities. When added as the child of a light component, it will turn the light on and off using UDS' Sunset and Sunrise events, and can animate the intensity when turning on to imitate a light powering on. Will also control a "Light Toggle" scalar parameter on an array of dynamic material instances. Has "Light Turn On" and "Light Turn Off" event dispatchers.
- Added a function to UDW, "Restart Random Weather", which can be used to manually restart the random weather variation if needed.
- Reworked controls for light shaft settings on UDS, to make them a little easier to work with and add more control for the moon. Each value for light shaft bloom scale, max brightness, and bloom threshold is now 2 values, one for when the light is high in the sky, and one for when it's nearing the horizon.
- Added a control for twilight color to Sky Atmosphere settings, which replaces sunset/sunrise color when the sun goes below the horizon. Gives more specific control of sky color during twilight.
- Fixed moon phase changes (when not using Simulate Real Moon) not adapting to Time Speed or Transition Time of Day.
- Fixed issues with rain and snow ambient light scaling
- Fixed an issue with rain and snow particle sprite occlusion
- Fixed an issue with UDW caching behavior in Cinematic/Offline mode.

12-28-2022

Version 7.6B Hotfix

For UE 5.0 and 5.1

- Fixed a snow particle material compile error
- Fixed screen droplets sometimes getting stuck on screen if disabled at runtime
- Changed workaround for Temporal Super Resolution causing snow and rain particle ghosting in 5.1

12-21-2022

Version 7.6A Hotfix

For UE 5.0 and 5.1

- Fixed texture mapping bug with new water caustics
- Fixed accessed none warning about Rainbow mesh
- Fixed "Cubemap with Dynamic Color Tinting" Sky Light Mode sometimes going black when moon is disabled or completely below the horizon at night.
- Made "Construct Space Layer" function public, so it can be called to apply changes to space layer planets/moons at runtime

12-19-2022

Version 7.6

For UE 5.0 and 5.1

- Added a new Space Layer category to UDS, where additional planets/moons can be rendered in the sky material. An unlimited number can be added, and each can have its appearance, movement and lighting behavior individually configured. Note, this rendering of additional meshes to the sky layer makes use of the Dbuffer, so dbuffer decals need to be enabled in project settings and supported by the platform. Also note, sorting of meshes in the dbuffer was only added to the engine in 5.1, so while this feature can be used in 5.0, multiple planets/moons overlapping is only going to work with consistent sorting in 5.1.
- The sun lighting and sky coloring will now be affected by a solar eclipse, when the sun either goes behind the moon, or behind one of the planets/moons in the Space Layer. The settings to disable and adjust this behavior are in the Sun category.
- Added a new sky mode, Space, which disables all atmospheric coloring, clouds, fog, etc, and extends tiling star rendering seamlessly below the horizon. Intended for use with scenes in outer space, where there is no planet/ground beneath the viewer.
- Added a "Render Moon" setting to the Moon category, to easily toggle off both the moon light and the moon rendering in the sky material completely.
- Added a new setting to UDS, called Project Mode. It has two options, "Game / Real-time" and "Cinematic / Offline". It mostly determines how the blueprint behaves at runtime. Cinematic / Offline mode will bypass many runtime optimizations which are useful in real-time contexts but aren't needed when doing offline renders. It will also automatically increase many quality settings at runtime,

so that things like volumetric clouds can use maximum quality while rendering but stay at performance friendly settings while working in the editor.

- Added an option to the Animate Time of Day category on UDS, "Lights Update Degree Threshold". This will limit how often the directional light rotation is updated as it moves. If the value is above 0, it will move in increments scaled by this value in degrees. This option can be used in combination with or in place of the Lights Update Period option. Lights Update Degree Threshold has a default value of 0.03, so it will have an effect by default, and can be disabled by being set to 0.
- Added an option to enable water caustics for the sun and moon lights. This is to help with the common problem of wanting both the cloud shadows and a water caustics effect but being limited by the engine's max of one light function per light. So UDS will use a light function that has both cloud shadows and caustics, if both are enabled. The settings for this effect can be found in a new Water category on UDS. If UDW is in the scene and it has its Water Level setting enabled, Water Level will be controlled from UDW.
- Added an option to the Rainbow settings on UDW to add strength to the rainbow effect regardless of weather state.
- UDS now directly controls the lighting channels on the sun and moon directional lights, to correct for some lighting issues in 5.1. The lighting channels for each are now exposed in the advanced dropdown of the Sun and Moon categories.
- Added options to show debugs for the traces used by interior adjustments on UDS and sound occlusion on UDW.
- Added additional lighting settings for rain and snow particles on UDW. To scale the ambient light intensity on both, and to scale the refracted light effect on the rain particles.
- Fixed weather particles not responding correctly to Minimum View Distance setting on UDW
- Fixed bug with weather mask target in 5.1, which could cause mask brushes to not be visible immediately upon starting a level
- Fixed DLWE Interaction components not working if project setting "Can Blueprints Tick by Default" is disabled.
- Fixed some parameters on UDS dependent on camera position not always updating correctly
- Fixed edges of weather mask projection boxes sometimes conflicting if overlapping
- Fixed weather particles sometimes not fully updating their movement behavior with wind intensity during a very fast change of weather
- Fixed a slight jitter/flicker which could happen when UDS changes out cloud materials with cloud coverage

11-8-2022

Version 7.5A Hotfix

For UE 5.0

- Fixed "Use Water Level" on UDW not affecting the new GPU particles for rain and snow
- Fixed random weather variation not correctly clearing material dust coverage when starting with a random weather type

11-3-2022

Version 7.5

For UE 5.0

- Rain and Snow particles now have additional GPU particle emitters, for added density. These GPU particles reuse the collision information generated by the CPU particles, allowing the system to push total particle counts much higher by default. The amount of these GPU particles are scaled by two new options, "Rain GPU Particle Spawn Multiplier" and "Snow GPU Particle Spawn Multiplier".
- Added a variable, "Weather Speed" to UDW, which can be used to globally speed up or slow down all weather changes across the whole system. Affects Change Weather, Random Weather Variation, as well as changes on Weather Override Volumes.
- Added a setting to the Volumetric Cloud settings on UDS, to control the number of High Frequency Noise samples. Can be increased for further cloud detail or decreased to 0 to disable the HF sample entirely.
- Added a new setting to UDS, Formation Change Speed, which scales how fast volumetric cloud formations change, relative to the speed they're moving.
- Added a new actor class, Weather Mask Projection Box, which captures the objects within a volume to mask snow, dust and wetness directly below. It works by making use of the same weather mask target framework that the Weather Mask Brush actor uses, so it doesn't involve any more material logic than what already exists for the mask brushes. The new class is found in Blueprints/Weather_Effects.
- Added a setting to UDS to scale volumetric clouds view sample scale down when overcast.
- Added a setting to UDS, "Extra Night Brightness when Cloudy", to boost night brightness when cloud coverage is high.
- Added a setting, Lightning Bolt Length, to UDW, to control how long the lightning bolt is during a lightning flash, in units.
- Added a new input to the Flash Lightning function on UDW, to supply a Custom Lightning Target. If a non-zero value is used for that input, the lightning bolt will end at that exact position in world space. Can be used to make lightning strike a specific point.
- Added an option to Rain Drip Spline, to close the spline loop.
- Added an option to UDW, "Blend Season Probabilities", which can be used to disable the behavior which uses a blend of the probability maps for random weather, when the Season value is between whole numbers.

- Added an option to UDW, "Season Day Offset", which can be used to adjust how the day of the year is turned into the Season value, when deriving the season from the UDS date. Additionally, the default setting of 0 offset now aligns the "peak" of each season value with the mid point between the equinox/solstice.
- Exposed more variables to cinematics on UDS and UDW. Now, everything that can be affected at runtime without additional steps is exposed by default.
- The UDS property cache period now monitors for changes in Target positions, when using Manually Position Sun or Moon Target.
- Added an option to UDS to tint the moon glow color applied in Simplified Color.
- Added a compass which shows up on UDS when any of the Simulation options are turned on, to indicate the cardinal directions of the simulation.
- Improved weather particle spawning behavior, to do a more reliable job of correcting for a very fast moving camera, to help avoid the camera "outrunning" the existing particles.
- Some refinements to rain and snow particle materials. Rain particles have an amount of world space turbulence on high material quality. Snow particles have lower opacity by default (can still be increased using Snow Flakes Alpha). Rain splash particles have had their splash animation redone and are now more nondirectional and randomized to reduce obvious repetition.
- Improved support for spawning a Weather Override Volume at runtime. The settings are exposed at spawn, and a vector array "Runtime Spline Points" can be used to define the spline shape when spawned.
- Added an option to the Weather Override Volume to have its own local Wind Direction
- Fixed an issue where DLWE interactions could create artifacts at the edges of the DLWE render target
- Changed name of "Avoid Extreme Weather Shifts" on UDW to "Avoid Extreme Cloud Coverage Shifts" to better describe what it's actually doing. Also, added an option, "Extreme Cloud Coverage Shift Threshold", to adjust the difference in cloud coverage allowed by that limiter.
- Fixed weather sound not responding correctly to sound occlusion being completely turned off.
- Fixed issues with weather override volume target when ending play in editor
- Fixed a bug with the Simulation timing which could result from specific combinations of time zone and date.
- Fixed several bugs with the "Change Sky Mode at Runtime" function on UDS.
- Adjusted the "Apply Location Preset" function on UDS, so it can be called at runtime to apply a preset, using the function input.
- Fixed a bug where sequencer could break UDS' timer for its property caching, causing properties to not recache.
- Fixed compile issues with Rain Drip Spline and Configuration Manager when brought into 5.1 preview, in advance of 5.1 support.

9-21-2022

Version 7.4A Hotfix

For UE 5.0

- Fixed an issue with the Rain Drip Spline blueprint which could cause a performance drain
- Fixed weather mask brush not updating mask target immediately when destroyed
- Fix for warning about a missing light component which could happen when opening old maps
- Adjusted moon texture brightness curve to align more directly with sun fading below horizon

9-15-2022

Version 7.4

For UE 5.0

- Weather Override Volumes now work differently by default in how they impact material effects. Instead of just affecting the global material parameters as the player enters, weather override volumes now draw their own local material state into the space outlined by the spline, so the material effects are visible from outside the volume, and the outside material state is visible from inside the volume. This new behavior is on by default, but can be turned off to revert to the old behavior from the new Weather Override Volumes category on UDW.
- Added functions to the Weather Override Volume for more control of its weather state at runtime. "Change Weather" works the same as the function of the same name on UDW, to transition to new weather settings for the volume. "Change to Random Weather" will transition the volume over to the random weather mode, from the single weather type mode. There are also functions for "Enable Volume" and "Disable Volume", to toggle the effect the WOV has on weather.
- Added a material function "Sample UDW Wind" which samples the shared parameters for wind intensity/force/direction and outputs them with descriptions and in multiple ways.
- Added an option to the advanced dropdown of Basic Controls on UDS, "Adjust for Path Tracer", which applies adjustments to help correct for the current limitations of the path tracer as well as possible.
- Added an option, enabled by default, to fade down sun light intensity below the horizon when the intensity setting is high. Useful when using very high physical lighting values to ease the transition to twilight lighting/night lighting.
- Added a new blueprint actor, UDS Occlusion Volume, which can be used to manually control the occlusion systems on UDS (for Interior Adjustments) and UDW (for Sound Occlusion) and optionally also block weather particles. There are new Occlusion Sampling Mode settings on UDS and UDW for determining the source of occlusion information (trace for collision, test for occlusion volumes, or both)
- Added a depth fade to lightning glow particle material to avoid hard intersections

- Moved the settings on UDW for water level to their own Water Level category
- Combined the two DLWE interaction render targets into one to save a texture sample and cost of drawing to both.
- Improved the look of DLWE snow trails fading over time, with the trails softening more naturally as they fade.
- DLWE Interaction components will now disable when beneath the water level, if the water level is enabled on UDW.
- Fixed slight hitch at midnight in sun/moon movement
- Fixed bug with simulate real stars orientation spinning around at certain times.
- Fixed bug with the simulted moon popping to a different orientation at certain times when the date is many centuries from the default.
- Fixed moon phase sometimes going out of date while adjusting values if using simulate real moon.
- Fixed moon phase and alignment sometimes being calculated wrong depending on the longitude.
- Fixed Sky Mode Scalability Map incorrectly changing to volumetric clouds instead of using the map as intended.
- Fixed Aurora Phase not being updated correctly at runtime
- Fixed temperature offset on Weather Override Volumes not being correctly applied
- Fixed a bug which could cause Sunset, Sunrise, and Hourly dispatchers to not fire when they should
- Fixed drop scale for Rain Drip Spline not applying on play
- Fixed several variables on UDS and UDW which weren't saving into configurations correctly.
- Fix for distant sky atmosphere rendering issues when using forward shading
- Fixed an issue where real time sky light capture could break if conflicting with effects scalability
- Fixed weather mask brush not updating mask target immediately if spawned at runtime while masks already exist in the level
- Fixed angle for lightning directional light sometimes not aligning with the direction of the lightning flash

8-2-2022

Version 7.3B - Hotfix

For UE 5.0

- Fixed DLWE interactions sometimes being blocked from triggering
- Fixed Lens Flare sometimes disabling based on camera direction when it shouldn't.
- Fixed Transition Sky Light Intensity sometimes being interrupted/stopping mid transition.

- Fixed Weather Override Volumes with Random Weather starting up with a momentary change of state
- Fixed several bugs with weather when applying a saved weather state on level startup.
- Fixed Lights Update Period not working correctly when set above 0.
- Fixed UDW Season occasionally not updating its associated material parameter and added a setting to UDW to control the season update period

7-29-2022

Version 7.3A - Hotfix

For UE 5.0

- Fixed "Clouds Move with Time of Day" option being broken by 7.3 update.
- Fixed DLWE snow depth sometimes starting up with the wrong value.

7-26-2022

Version 7.3

For UE 5.0

- Added new settings to Volumetric Clouds, which use the base clouds samples to vary the height of the cloud layer bottom. Has a significant effect on overcast skies by default. The settings are the ones for "Floor Variation" in the Volumetric Clouds category.
- Added a new Post Processing category to UDS. From there you can add any number of post process components which get their blend weight from time, cloud coverage, fog, dust, or interior occlusion. This makes it simple to add post process settings which are only applied in specific conditions like night time, foggy weather, outdoors, etc.
- Added a Location Preset setting to the Simulation category on UDS. Select from a list of 144 major cities and their Latitude, Longitude and Time Zone will be applied to the Simulation settings.
- Completely rebuilt the 2d (non volumetric) aurora effect for an improved look, a little more similar to the volumetric auroras. New settings are available in the Aurora category to scale the samples and adjust the appearance further.
- Added a setting to change the texture used for the aurora (both 2D and volumetric)
- Added a setting to Fog Color's advanced section, Fog Color Mode, which allows overriding the automatically selected source of fog colors. Useful for testing, but changing the project setting is still preferable for best results.
- Revised default settings on fog density, mostly lowered the density contribution values some.
- Small increase to default Sun Light Intensity
- Added a daytime and nighttime multiplier for fog density
- Made it possible to increase the Sky Light Color Multiplier settings above a value of 1, to selectively brighten the Sky Light with time.

- Added a setting to control the speed that 3D noise for volumetric clouds moves vertically.
- Default shadow settings on Sun and Moon directional lights have been updated to be the same as UE5's defaults for directional lights.
- Made it so by default if the Sun Lens Flare effect is enabled on UDS, the image based lens flares will be disabled to keep the effects from overlapping. This behavior can be disabled with a setting in the advanced dropdown of the Lens Flare category.
- Added a function to UDS to change Sky Mode at runtime.
- Separated View Sample Count Scale for volumetric clouds into a day and night value, with a lower default value for night, as it's possible to go lower with sample count at night with less noticeable artifacts than in the daytime.
- The Cloud Wisps layer now shades brighter around the sun and moon, imitating light scattering through the layer. The amount of this effect can be adjusted in the advanced dropdown of the Cloud Wisps category.
- Cloud Wisps Opacity is now controlled by two values, one for clear skies, and one for cloudy skies. By default, wisp opacity is now lower in a clear sky.
- Added a material function "Day to Night Color" which takes in a day input and night input and lerps between them as the sun goes up/comes down.
- Added a material function "Active Sun or Moon Vector" which outputs either the Sun or Moon forward vector, depending on which light is present.
- The setting for Rayleigh Scattering Color has been separated into a Day, Dawn/Dusk and Night setting for more control.
- Changed behavior for volumetric cloud shadow tracing distance, so it scales with the cloud coverage and sun height, to always make the best use of the shadow traces and reduce artifacts when possible.
- Some changes to default values for the night sky. Moon Light Intensity has been reduced some, Stars Intensity has been reduced, Moon Light Color is a little more saturated, Night Sky Glow has been increased and the balance of its effects have been adjusted some.
- Removed workaround for volumetric fog start distance engine bug that was fixed in 5.02.
- Added settings to the Rainbow category on UDW to allow masking the rainbow above the cloud altitude, or below the water level.
- Added a World Spawn Offset setting to Shared Particle Settings on UDW. Allows adding an arbitrary world space offset to the spawn location of weather particles. Useful for 2D / Top Down games where the camera is at a constant remove from the ideal spawn location.
- Lightning spawn height, for lightning flashes and obscured lightning, now sits at the cloud bottom level by default, and is adjustable with Lightning Height Offset on UDW.
- Lightning effect materials now mask with the volumetric cloud layer.

- Added a Lightning Effect Color setting to UDW, to allow changing the color of the lightning flashes and obscured lightning.
- Game thread optimization of DLWE Interaction component. New exposed settings for controlling max active distance and component tick interval with distance.
- Added a Sound Class to the Sound folder called UDS Outdoor Sound. It's not used by any of the included sound effects, but instead is for you to use on your own ambient sounds which you want to be non-directionally attenuated inside interiors using the UDW Sound Occlusion logic, if enabled.
- Improvements to rain and splash particle materials shading behavior
- Adjusted weather particle spawning logic to more aggressively bias spawn locations in the direction the camera is facing, to make more efficient use of the spawn rate. This can be adjusted with a new setting on UDW, Spawn Direction Forward Bias. Default max spawn rates for rain, snow and dust have been reduced.
- Added additional splash droplet elements to raindrop splashes on Epic and Cinematic effects quality.
- Added a setting to control how much thunder is delayed after a lightning flash, based on distance. Can be used for a realistic speed of sound if desired.
- Improvements to the Post Process Wind Fog effect. The 3D noise samples are more volumetric in their distribution, and their number and behavior can be adjusted with new exposed settings in the Post Process Wind Fog category.
- Reworked controls for the intensity of the Post Process Wind Fog. Intensity is now determined by separate contribution settings for Fog, Rain, Snow and Dust.
- Support for Dynamic Landscape Weather Effects being used with the Virtual Heightfield Mesh plugin. If you want to try this, make sure to read the new readme section specifically about how to set it up.
- Added a new editor utility widget, Mini Controls, found in the Blueprints folder. It contains the basic controls for time of day and weather in a compact widget. Useful to add to the editor layout while working on things like level design or lighting to quickly test different times and weather states.
- Game thread optimization for UDS and UDW. They now employ a system which periodically caches many changing properties (things like light rotations, fog colors, material parameters, etc) and interpolates between the cached values on the rest of the frames. You can change the maximum amount of time between these cache updates with a new setting in Basic Controls.
- Wrote a description for every function on UDS and UDW.
- Cleanup/organization pass on all material graphs.
- Fixed a bug with the Water Level settings on UDW not affecting player occlusion
- Fixed rare divide by zero warning with color logic for dynamic tinted sky light
- Fix for manual calls of Flash Lightning sometimes being ignored.
- Fixed bug with lightning flashes caused by weather inside weather override volumes not triggering.

- Fixed Digital Clock widget formatting 0 hours wrong with 24 hour time.
- Fixed a bug with player occlusion update timing not being set correctly.

5-18-2022

Version 7.2

For UE 5.0

- Changed the exposure settings applied by UDS by default. The setting "Use Exposure Range" has been renamed to "Apply Exposure Settings". Instead of limiting the auto exposure range, the new settings apply an exposure compensation curve, selectable in the Exposure category. It also has settings to adjust the current exposure bias up and down with time and weather.
- Fixed fog behavior when "Support Sky Atmosphere Affecting Height Fog" is enabled, to avoid moon light directional scattering popping at dawn/dusk.
- Added a new category to UDS, called Interior Adjustments. With "Apply Interior Adjustments" enabled (it's disabled by default), UDS will detect if the player is enclosed in an interior space (using the same occlusion behavior used for Sound Occlusion on UDW) and can apply a number of common adjustments useful for interior spaces, like adjusting fog start distance, intensity of the lights, or changing exposure bias in interiors.
- Added a rainbow effect to UDW. Can be enabled from a new Rainbow category.
- Added a twinkling/shimmering effect to stars, enabled on High and Epic material quality. Can be adjusted from the Stars category.
- Added an optimization to disable cast shadows on the directional lights when cloud shadows have completely occluded the light. Found in the Cloud Shadows category. Enabled by default.
- Improvements to dust effects on UDW. Added some small individual dust particles in addition to the big dust cards. Reworked material to add more variety between particles.
- Fixed selected weather preset on UDW sometimes being incorrectly cleared out on launch
- Adjusted 2D cloud color behavior, making the light cloud color dim a little more when overcast.
- Added new options to the Temperature category on UDW, to allow temperature to be affected by if the player is inside (making use of the sound occlusion values). The feature works by lerping to an Interior Temperature setting based on current occlusion, and an Interior Insulation setting determines how much the Interior Temperature will be used (so that at values between 0 and 1, the interior can partially be insulated from outside temperatures, but still be affected by them some). The function has an input (Apply Interior Temperature) to enable/disable the feature (useful for if you just want to sample the global/outside temperature).
- Added an event dispatcher to UDW called "Weather Display Name Changed" which fires when the output of "Get Display Name for Current Weather" changes.

- Fixed a bug where the random weather state on a weather override volume was not replicated correctly in some contexts
- Fixed a bug with wind debris particles not always getting a custom texture applied at runtime.

4-27-2022

Version 7.1

For UE 5.0

- Added a function to UDW called "Get Display Name for Current Weather" which outputs an enumerator and a string for a short description of the weather (Replacement for the old Get Current Weather Type function which relied on the removed Weather Type enum)
- Added a function to UDS called "Transition Time of Day". When called, the time of day will animate to the new input time over the supplied duration. It also has inputs to determine the easing function of the transition (Linear, Ease In/Out, etc).
- Fixed a bug where cloud height could fail to be updated at runtime correctly
- Renamed the setting on UDW called "Simulate Changing Material Effects with Weather State" to "Material Effects Take Time to Change" to better communicate what the setting does.
- Added a static switch parameter to the DLWE function to specifically disable the World Position Offset for snow depth.
- Added a setting to scale the color intensity of the cloud wisps
- Adjusted behavior of fog so that "Support Sky Atmosphere Affecting Height Fog" and Dim Directional Lights with Cloud Coverage can be used together by transitioning off of sky atmosphere color and over to UDS fog color logic as lights are dimmed.
- Added settings to control how much the sun and moon source angle can be scaled with cloud coverage and fog. Also added a setting to scale the source soft angle of both.
- Added a function to UDW to sample the current sound occlusion values.
- Fixed a bug where fog color could flicker with the sun and moon in certain orientations
- Made it so when Volumetric Fog is enabled, fog start distance is always 0, to correct for an engine bug with volumetric fog.

4-19-2022

Version 7.0

First Version for UE 5.0

Sky Changes:

- Added a new "Color Mode" option, beneath Sky Mode, in Basic Controls. The two options are Sky Atmosphere (still the default), and a new alternate color mode called Simplified Color. All of the Sky Modes are compatible with both color modes. Simplified Color determines sky and cloud colors by sampling a light

scattering LUT texture, combined with adjustable color settings found in the Simplified Color category. Simplified Color replaces the old Legacy Color modes from previous versions.

- Added a Fog variable to Basic Controls on UDS, to control the fogginess of the level, irrespective of the cloud coverage. Made use of by the new weather system changes, outlined below.
- Added a Dust category to UDS, which adjusts fog color and density with an adjustable amount of dust/sand in the air. Made use of by the new weather system changes, outlined below.
- Fog Color and Density logic has been reworked completely, and moved to two new separate categories, called Fog Color and Fog Density.
- Fog Color is now determined by separate contributions from the sun and the moon lights, with a color variable to adjust the tint of each contribution to fog inscattering. Those tint colors are each multiplied by a scattering curve to affect their contribution with the elevation of each light. The saturation is then adjusted with fog and cloud coverage, using settings in Fog Color, and darkened with cloud coverage using separate Overcast Brightness settings for day and night, also in Fog Color. If the project setting "Support Sky Atmosphere Affecting Height Fog" is enabled, most of this logic is replaced with the sky atmosphere contribution, the influence value of which is determined with a curve in the advanced dropdown of Fog Color, and further scaled with the Overcast Brightness settings using cloud coverage.
- Fog Density is now determined by a Base Fog Density, which is then added to by the maximum of three separate contribution values for when it's cloudy, foggy, or dusty. Height Fog Falloff is handled the same basic way. Start Distance is now handled slightly differently, being determined using the fog density directly. It uses a Start Distance When Clear variable, and a Fog Density value for when the start distance should reach 0.
- The Sky Light category now has a Sky Light Color multiplier for day, dawn/dusk, and night, which apply to all three sky light modes, for simpler tweaking of ambient light with time of day.
- The logic for the Dynamic Tinted Sky Light has been simplified. It now only uses one flat cubemap, rather than a blend of three, because the function to blend cubemaps on a sky light is broken in UE5. It also makes use of the new fog color logic to determine its tint color, instead of relying on a bunch of color curves of its own.
- The Exposure post settings applied when "Use Exposure Range" is enabled now factor in the project setting "Extend Default Luminance Range for Auto Exposure Settings" when applying the range. It also now applies an auto exposure mode (Auto Exposure Histogram) when enabled, in addition to controlling min and max.
- The Cloud Shadows light function will also attenuate the directional light with the current fog and dust, using Fog Shadows and Dust Shadows settings, found in the Cloud Shadows category.

- At runtime, the Tracing Max Distance of the volumetric clouds is now determined by if the camera is inside/outside of the cloud layer. By default, a lower max trace distance is used if inside the cloud layer, to avoid artifacts caused by the samples being spread out too far.
- Added a setting to adjust the fade distance of the volumetric clouds (the distance from the camera that clouds will reach their full extinction)
- Added a setting to distort the high frequency noise layer of the volumetric clouds
- Clouds Move with Time of Day has been disabled by default
- Sun, Moon, and Sky Light Mobility settings have been moved to their respective categories.
- Added a new Hourly event dispatcher to UDS, which fires at the top of every hour, and outputs the new hour as an integer (0 to 23).

Weather Changes:

- The weather controls have been reworked some. The Weather Type enum and its uses have been removed, in favor of unifying the system around the UDS_Weather_Settings object class. In Basic Controls on UDW, you now select a starting weather preset by directly selecting one of the weather settings objects from Blueprints/Weather_Effects/Weather_Presets. This change makes it much easier to make and use your own presets, by simply duplicating one of the existing ones in that folder and using the new preset on UDW.
- The system is now more oriented around the settings objects, but it is still possible to use a manual weather state, useful for things like directly animating weather in sequencer. To use the manual weather state, just clear the Weather variable in Basic Controls, so no preset is selected. Then make your adjustments to the settings in the Manual Weather State category.
- As the Weather Type enum is gone, the probability maps used by random weather variation are now maps of the weather settings objects directly. Again, this makes it easier to add your own presets and reference them in the probability maps, without the intermediary step of also adjusting an enum.
- The weather settings themselves have been expanded and changed for added control and variation. The full list is now Cloud Coverage, Rain, Snow, Thunder/Lightning, Wind Intensity, Fog, Dust, Material Wetness, Material Snow Coverage, and Material Dust Coverage. Because of how the system is structured now, the limiters which kept things like rain or thunder from happening under a clear sky are now removed. You're now free to manipulate these settings individually to whatever combination you need, without dealing with disabling the limiters.
- The Change Weather functions have been consolidated into one, simply called Change Weather, which takes one of the weather settings objects and transitions to that over the specified transition time. The additional inputs for transitioning back to random weather have been removed, in favor of a new separate function

called Change to Random Weather, which will transition from current settings to the random weather variation, if random weather variation is enabled.

- Lightning flashes now respond to the presence/absence of rain, eliminating the falling rain sheet element of the niagara effect, if no rain is present.
- The option for Use Sound Effects is replaced by individual options for each sound type (Enable Rain Sounds, Enable Wind Sounds, etc)
- The Season on UDW is now handled as a float value instead of an enum. This allows the seasons to blend from one to the next in their effect on random weather variation, instead of changing in steps. The value is formatted from 0 to 4, starting with Spring. So for example, 0 is Spring, 1 is Summer, 1.5 would be halfway between Summer and Autumn. This new float season value can be referenced in your materials as well, using a new material function called "Sample UDW Seasons". It outputs a 0 to 1 value for each season, allowing materials to change in response to each one. For example, you could use the autumn output to make a leaf material go red in autumn. In addition, the behavior of the season is now set in a new Season category on UDW. By default, it derives the season from UDS' current date (moving this option from where it previously existed on UDS).
- Dust/Sand weather effects have been added to UDW. There are two new weather presets (Sand Dust Calm and Sand Dust Storm) for the dust weather. Material Dust Coverage can be simulated with weather state just like material snow coverage and wetness.
- Rain, Snow, and Dust particles now have their own categories with individual settings and Enable toggles on UDW. There's also a Shared Particle Settings category with the settings which affect all weather particles.
- Rain particles now, in addition to splashes, can spawn small rain drop decal particles which affect roughness only. The resulting effect is like rain drops hitting dry surfaces and leaving a momentary wet drop. These decal particles are enabled by default, but can disabled from the Rain Particles category.
- Post Process Wind Fog now scales directly with the fog density. The options for scaling it with weather settings have been replaced with a single Intensity variable.
- The Dynamic Landscape Weather Effects material function has been reworked some because of UE5's removal of tessellation. The snow depth (if enabled) is now achieved using a parallax effect rather than any sort of geometry displacement. There's a new static switch parameter, to specifically toggle the parallax effect. The function's Displacement input and output have been removed. It now additionally outputs Pixel Depth Offset as part of the parallax effect. A new input, Modulate Coverage, can be used to replace how displacement was used to affect coverage. If used, the input for Modulate Coverage should still be derived from height data, but it should be a smaller value range, centered around 0. Positive values will increase coverage, negative values decrease. The DLWE function can now also handle dust coverage,

reusing the same material logic that snow uses. UDW will switch the look over to dust dynamically with the material effect state.

- The Snow Weather Effects function has similarly been modified slightly to serve the dual purpose of Snow and Dust, using the same material logic for both. It's been renamed for that reason, to "Snow and Dust Weather Effects".
- Added "Dust/Sand Forming" and "Dust/Sand Clearing" event dispatchers to UDW, which work the same as the existing snow and rain dispatchers.
- Added a setting to the Ambient Sound (Time and Weather Controlled) BP to scale volume with dust/sand weather.

UE4 Updates

8-16-2022

Versions Affected: 4.26 and 4.27

- Fixed weather override volumes disabling incorrectly when control point is far above/below.
- Fixed divide by zero warning for dynamic tinted sky light
- Fixed manual calls of Flash Lightning sometimes being ignored.
- Fixed Digital Clock widget formatting 0 hours wrong in 24 hour time
- Fixed weather override volumes sometimes taking 1 frame after playing the level to have an effect
- Fixed warning message about UDS reference on UDW when packaging in some configurations
- Fixed several 2D Cloud Appearance settings not always updating their effects correctly when adjusting settings
- Fixed warning about bad date/time formatting resulting from daylight savings time
- Optimized memory use/asset loading behavior of UDS and UDW
- Fixed screen droplets animation cutting off incorrectly after some fast weather transitions
- Fixed clouds moving with time of day when using true real world time and simulate real sun
- Fixed stars orientation with Simulate Real Stars sometimes not updating the hemisphere when latitude is changed.

3-16-2022

Versions Affected: 4.26 and 4.27

- Fixed 2D Dynamic Clouds compile error when using GPU Lightmass plugin.
- Fixed a rain splash particle material compile error on mobile.
- Fixed weather override volume not always removing itself correctly when the level it's in is streamed out.
- Improved 2D Dynamic Cloud colors when height fog gets colors from sky atmosphere.
- Improved cloud shadows behavior when sun is close to the horizon.
- Added an option to scale fog color when cloudy

3-2-2022

Versions Affected: 4.26 and 4.27

- Fixed 2D Dynamic Clouds broken rendering when UDS actor is very far from origin.

- Changed behavior of "Height Fog Gets Colors from Sky Atmosphere". Now it's determined by the project setting (Support Sky Atmosphere Affecting Height Fog) directly, rather than relying on a setting on UDS. This change is to avoid issues with UDS not being configured to match the project setting. In addition, the feature has been expanded, with the sky atmosphere influence on fog being determined by a curve instead of a single value, and being affected by cloud coverage as well, for better results with weather.
- Adjusted rain and snow particle materials to behave better with different lighting settings.
- Fixed an editor crash which could happen when saving configs from the configuration manager.

2-23-2022

Versions Affected: 4.26 and 4.27

- Fixed cloud formations sometimes not aligning with the editor at runtime when they should.
- Fixed volumetric cloud shadows sometimes not aligning correctly with the clouds that cast them.
- Fixed Moon texture mapping being broken when Manually Position Moon Target and Simulate Real Moon are on at the same time.
- Fixed wind debris particles not showing correctly in 4.27
- Fixed Wind Whistling Sound Volume not working correctly
- Fixed warnings caused by Flash Lightning not finding a camera
- Added a button to the readme to view the update history

2-16-2022

Versions Affected: 4.26 and 4.27

- Added a new Weather Mask Brush actor to use with Ultra Dynamic Weather. When placed, it masks out material effects (snow, wetness) using simple brush shapes. The amount each brush masks snow and wetness is individually adjustable, and the mask affects DLWE interaction sounds and particles as well. Use of this mask is enabled on the weather material functions by default, but can be disabled with the static switch parameters for "Apply Weather Mask Brushes to Wetness" and "Apply Weather Mask Brushes to Snow".
- Added an option to manually position the sun and moon using a movable target. The options are Manually Position Sun Target and Manually Position Moon Target in their respective categories. Replaces the old option for static moon rotation.
- Added a new class called AmbientSound_Time_and_Weather_Controlled. It's a child of the Ambient Sound class, with additional logic for the volume of the sound to change with day/night and weather. Can be found in Blueprints/Sound.
- Added Wind Debris to UDW. Can be enabled from a new Wind Debris category. Adds small debris particles flying through the air during heavy wind. The included

debris texture is a sheet of small leaves and twigs, but the texture can be replaced with any 4x4 sheet using a setting in the category.
- Added a new material function "WaterSurface_Rain_Ripples", for applying simple rain ripples to a water material.
- Added a new material function "GlassWindow_Rain_Drips" for adding refractive rain droplets to flat transparent glass. Uses the same textures as the screen droplets effect.
- Added a new feature for volumetric clouds called Overcast Turbulence. Renders an additional layer of 2D turbulence when the sky becomes overcast, to add more texture and interest to overcast skies. This extra layer is also used by the lightning on High and Epic quality to fake some extra illumination of the cloud layer, with the intensity of that light being adjustable from UDW.
- Changed the logic on UDW for how weather type presets are stored. They now exist in data assets in Blueprints/Weather_Effects/Weather_Presets. You can adjust which one is referenced for each type and add references to new types in the Preset Settings map found in the advanced dropdown of Basic Controls on UDW.
- Added simple widget blueprints which can display the current time on screen. UDS_Analog_Clock and UDS_Digital Clock. You can find them in the widget designer palette under Ultra Dynamic Sky Widgets.
- Default Sun Inclination increased from 15 to 30.
- Improved visuals for Low and Medium quality volumetric clouds, while reducing their performance cost further. They now make use of the high frequency noise layer which was previously specific to High and Epic quality.
- Added settings to allow volumetric cloud sample counts to be scaled with global material quality level, with High using the unscaled sample count settings. By default, it now scales down sample quality to 80% for Low materials and 90% for Medium materials, and scales up to 115% for Epic quality.
- Added an optimization to the volumetric clouds which increases the high frequency volume texture mip with distance from the camera. Can be adjusted with the variable "High Frequency Mip Increase by Distance".
- Fixed cloud movement logic to work better with world origin rebasing.
- Fixed a bug where cloud shadows could pop slightly when changing cloud coverage
- Fixed UV logic for real stars which could cause a UV seam on custom textures.
- Added a setting to make snow flakes stuck to surfaces live longer before fading out. Snow Flakes Stick Time on UDW.
- Fixed a bug where inside cloud fog could render at the wrong altitude.
- Changed many macros on UDS and UDW over to pure functions to better support modifying functionality in a child class.
- Added a control for Inside Cloud Fog Color on UDS.
- Added settings to control the minimum weather intensity and cloud coverage for lightning flashes.

- Added settings to control the range used by Dim Directional Lights with Cloud Coverage.
- Added some extra detail/sharpness to the Epic quality (128x) volume texture used for volumetric cloud detail.
- Fixed an error with lightning on dedicated servers
- Fixed a warning when using static lighting and sky mode scalability map together.
- Fixed an issue where random weather could start transitioning to a new type early without waiting the change interval.
- Added a sky mode for No Clouds using Color Curves (Legacy Mode).
- Some optimization work on sky material
- Made it so event dispatchers on UDS and UDW are called as part of construction script as well, so any actors which bind to those events as part of their own construction script can potentially be affected by them in editor.

12-17-2021

Versions Affected: 4.26 and 4.27

- Added a new Lens Flare effect to UDS. In the Lens Flare category you can enable an optical lens flare for the sun. Presets for multiple lens types included.
- Fixed a bug where weather material effects would not be updated correctly when affected in certain ways.
- Added a new function to UDS called "Transition Sky Light Intensity". It can be used to fade the sky light intensity to a new level over a specific amount of time.
- Adjusted default sample balance for volumetric clouds to reduce noise at the top of the sky.
- Added an option to the Rain Drip Spline to have it ignore the weather state.
- Adjusted range of weather intensity cutoff with cloud coverage, so rain/snow under somewhat lower cloud coverage is possible by default.
- Adjusted behavior of weather when wind intensity is at 0, to make the snow movement calmer and the sound effects a little quieter.
- Made it so "Enable Rain and Snow Particles" can be set at runtime to enable/disable particles manually.
- Added an option to have rain/snow particles be cut off as the camera goes above the volumetric clouds.
- Fixed a bug with random weather variation starting up with the wrong rain/snow value.
- Fixed a bug where cloud shadows could flicker in some scenarios.

11-25-2021 (Hotfix)

Versions Affected: 4.26 and 4.27

- Fixed an error message related to the new Screen Droplet effects.
- Fixed problems using Screen Droplets with sequencer.

- Fixed an issue with weather state sometimes not updating on instant transitions correctly.
- Fixed weather override volumes not always updating smoothly
- Added a setting for the sun directional light's max specular scale.

11-23-2021

Versions Affected: 4.26 and 4.27

- Added a Screen Droplets post processing effect, which applies rain droplets to the camera when it's exposed to rain. Disabled by default, can be enabled from a new Screen Droplets category on UDW.
- Added a setting to UDW for "Water Level" which applies a simple kill height for the rain/snow particles. Also occludes weather sound and disables screen droplets below the level.
- Added controls for Sunset/Sunrise Color to the Sky Atmosphere category, to more easily adjust the colors of the sky at sunrise/sunset, with the fog colors affected as well.
- Added a "Directional Balance" setting to UDS, to scale the contribution of directional light on the scene without affecting the brightness of the sky. Default intensity has been increased some as well. If you want to return to the old default look I'd recommend reducing Directional Balance to 0.7.
- Added an option to scale the amount of inside cloud fog for volumetric clouds.
- Changed logic for Sunrise and Sunset event dispatchers, so by default they will always happen at actual sunrise/sunset regardless of dawn/dusk time or simulation settings. The Event Time variables have been replaced with Event Offset variables, which offset the time the event is fired from the actual sunrise/sunset time.
- Changed logic for sun disk radius. The default size is the same as the old, but customized values may need to be readjusted.
- Fixed missing glow in static clouds moon lighting
- Improved blending of static clouds
- Adjusted behavior of 2D Dynamic Cloud colors to bring brightness of the overcast sky in line with the other sky modes.
- Made the default Sun Disk Intensity brighter.
- Replaced the setting for Captured Sky Light Lower Hemisphere Brightness with a color tint, for added control of the lower hemisphere color.
- Slightly decreased the saturation of the daylight fog color.
- Increased default Directional Lights Absent Brightness
- Improved accuracy of cloud shadows falloff within cloud layer
- Added a setting to scale the overall fog density resulting from all the other fog density settings.
- Changed Fog Start Distance When Clear back to 10,000
- Fixed border artifact on lightning flashes.
- Reduced default max exposure to 1.0.

- Fixed a bug with weather override volumes and nativization.
- General blueprint optimization on UDS and UDW. Added an option to UDS, enabled by default, to skip updating many active parameters unless cloud coverage is changing. Added a similar option to UDW to skip updating many parameters unless current weather state is changing.

10-19-2021

Versions Affected: 4.26 and 4.27

- Fixed weather sounds broken by 4.27.1.
  Added a "Z Disturbance" setting to the volumetric clouds, which distorts clouds on the Z axis. Not enabled on Low material quality.
- Added a "Temperature Offset" setting to Weather Override Volumes, to allow the "Get Current Temperature" output to be made arbitrarily colder/warmer inside of weather volumes.
- Added a setting to control how soft/sharp the edge of the sun disk is.
- Fixed a visual bug with the raindrops effect in the DLWE function.
- General performance improvements to weather effects.
- Improvements to compatibility with blueprint nativization.

10-5-2021

Versions Affected: 4.26 and 4.27

- Fixed broken snow trail particle material
- Added an input to the new "Test Actor For Weather Exposure" function, to allow testing only the bounds of collision components.

9-29-2021

Versions Affected: 4.26 and 4.27

- Improved how fog and cloud wisps are lit by changing moon phases.
- Adjusted DLWE base wetness behavior to make more of the surface wet before puddle coverage starts.
- Improvements to particle materials for forward shading.
- Added event dispatchers to UDW for "Started Raining", "Finished Raining, "Started Snowing", "Finished Snowing", "Getting Cloudy", and "Clouds Clearing", to make it simple to trigger blueprints using these basic weather events.
- Added an option to UDS to allow using a custom sky sphere material.
- Turned off lightning flashes contribution to volumetric scattering, to fix compatibility with "Dim Directional Lights" option on UDS.
- Added inputs to the DLWE function to customize the snow color and roughness.
- Added a new utility function to UDW called "Test Actor for Weather Exposure". The function takes in an actor reference and, based on the actor's bounds, uses line traces to approximate how directly exposed the actor is to the current rain, snow, and wind.
- Added refraction output to High and Epic material quality rain particles.

- Added logic for sound occlusion to specifically ignore the player pawn, when possible.
- Adjusted light pollution behavior to be unaffected by moon positioning.
- Added a setting to UDW to allow material snow coverage to light up the height fog color proportional to the amount of direct light present, to simulate the indirect light bouncing off of the snowy ground.
- Improved how the rain and snow particles avoid going through thin collision surfaces.
- Added an experimental version of the DLWE function which uses a custom parallax occlusion setup for the snow trails, rather than relying on tessellation. The rest of the behavior is the same, so it can be used to replace the existing function without any modification. As it's experimental, it's not exposed to the function library, to avoid confusion with the standard function. You'll have to add it manually from the Materials/Weather folder if you want to try it.
- The readme has been revised and reworked, with a new search function to make finding specific entries easier. There's also a new Common Issues section for troubleshooting.

9-3-2021 (Hotfix)

- Removed an unintended plugin dependency from the new configuration manager.

9-2-2021

Versions Affected: 4.26 and 4.27

- Added a new editor utility, the Configuration Manager, which can be used to save and apply full configurations of all settings for either UDS or UDW. The manager can be found in the Blueprints folder.
- Added two functions to UDS, to simplify saving and loading the state of the sky and weather, when creating save files or moving between levels. The functions are "Create UDS and UDW State for Saving" and "Apply Saved UDS and UDW State".
- Added a post process based effect to add fog inside clouds when not using volumetric fog. Enabled by the existing "Enable Fog Inside Clouds" option.
- Changed default settings for Volumetric clouds to reduce rendering artifacts inside cloud layer and on distant clouds.
- Added settings for Light Pollution to UDS, to simulate city lights contributing to sky glow and volumetric cloud lighting. Exists in a new category called Sky Glow.
- Night Sky Glow lights up volumetric clouds and fog, and its settings have been moved to the Sky Glow category.
- The aurora effects will now light up the volumetric clouds a little bit.
- Added a Sky Light Temperature setting, to more easily adjust the color temperature of the sky light, independent of the sky light mode.

- Added an option to UDS and UDW, enabled by default, which spreads out some of their tick behaviors over 3 frames, as a game thread optimization.
- Adjusted behavior of sound and particles on UDW to fix some issues with sequencer.
- Modified behavior of rain splash particles to create scattered duplicates of each particle, to artificially increase the density of the splashes during heavy rain. Can be controlled with two new settings in the Rain and Snow Particles category.
- Made a change to Wet Weather Effects and DLWE functions to reduce texture seam artifacts in puddles.
- By default, sound occlusion on UDW now uses the camera location. There's an option in the Sound Occlusion category to have it use the Control Point Location like before.
- Made some changes to rain/snow particle behavior to better account for a fast moving camera.
- Fixed behavior of DLWE components to work with some configurations of level streaming and world composition which were broken.
- Brought default start distance of height fog down to 0 for all weather, because height fog with start distance greater than 0 appears to be broken in 4.27.
- Reworked manual overrides for legacy colors, since they weren't well integrated with the rest of the current system. Moved them out of their old category into an advanced dropdown of the Legacy Color category.
- The 2D Dynamic Clouds Appearance and Distribution categories have been combined into one 2D Dynamic Clouds category. The distribution settings can be found in the advanced dropdown.

7-5-2021

Versions Affected: 4.26

- Fixed a bug with setting material parameters which could cause broken normals on materials using Wet Weather Effects.
- Adjusted how DLWE functions, so that it can work better with world composition/level streaming and so that the effects can be used on static meshes as well. UDW no longer requires a direct reference to the landscape actor(s) for DLWE.
- Changed implementation of rain/snow particle color settings, so that color is also multiplied over the refraction effect.
- Adjusted raindrop effect on DLWE so that it's tiled independently from the puddle interactions. The default render target area for the puddles is now much larger.
- Optimized limits of DLWE render targets, so that Interaction components can use more of the full render target space.
- Fixed DLWE render targets trying to recenter when neither dynamic snow or puddles are present.

6-24-2021 (Hotfix)

Versions Affected: 4.26

- Fixed errors caused by Ultra Dynamic Weather looking for the player pawn location when there isn't a player pawn.
- Fixed the DLWE Interaction components sometimes ticking when they shouldn't.
- Fixed an issue with the Rain Drip Spline actor which kept the collision data from updating correctly.
- Replaced several float range variables on UDW with normal floats, to fix a potential packaging error.

6-23-2021

Versions Affected: 4.26

- Added "Dynamic Landscape Weather Effects" to UDW. This is a new material function designed to add dynamic snow and puddles to landscape materials, with dynamic snow trails and ripples in puddles caused by moving objects. Please see the new readme section about these effects for a full explanation of the required setup.
- Added a new blueprint, the Weather Override Volume. This actor can force current weather to change as the player enters a region. You can customize the shape of the region and the width of the transition zone. The zone can apply a single weather type or its own local random weather stream.
- Added an option, enabled by default, which replaces the volumetric cloud material with a much faster simplified version when cloud coverage is heavily overcast/foggy. The transition to the simplified version is smooth, and the loss of detail in typical use cases is not very perceptible.
- The volumetric clouds have gotten some small visual improvements and refinements to default visual settings.
- There is now a setting to directly control the color of volumetric clouds.
- Overhauled the replication setup of UDS and UDW to be more bandwidth efficient and robust. One significant change to note here is that the "Multiplayer Weather" option no longer exists, because changes to how weather replicates and the addition of the Weather Override Volume have made it redundant. If you were using that option with the Change Weather functions to achieve local weather changes, you'll need to use Weather Override Volumes instead.
- Added a simple Sound Occlusion option to automatically dim weather audio when inside interiors. Enabled by default.
- Reworked cloud movement in both 2D and Volumetric clouds so that cloud direction can be smoothly changed at runtime. A new Wind Direction category has been added to UDW, where you can enable a simple random variation of wind direction.
- Added an option to replicate the direction of lightning flashes to all players, rather than determining them based on camera orientation.

- Added a new effect to UDW, Post Process Wind Fog, which aims to cheaply mimic the look of volumetric wind effects in heavy weather, using a post process effect.
- Simplified the behavior of Random Weather Variation, in how it transitions between types. The transition length is now controlled entirely by a single variable, Transition Length, which is entered as a fraction of the current change interval.
- Changed the behavior of UDS setting UDW season based on Simulation date, so that the seasons will be correctly reversed for latitudes in the Southern hemisphere.
- Added options to control the color of rain and snow particles.
- Added two new options for control of volumetric cloud shapes. Shift Curve and Minimum Erosion. These can adjust the way clouds are tapered and eroded from top to bottom.
- Added an option to the Cloud Shadows category to use a custom light function material in place of the included cloud shadows material.
- Added settings to the Height Fog, to control the fog start distance using cloudiness. By default, height fog now starts further from the camera in clear weather and comes in close for cloudy/foggy weather.
- Fog Color Strength is now two variables, one for daytime and one for night, to allow adjusting fog brightness specifically for either.
- Added an option to the advanced dropdown of the Height Fog category called "Height Fog Gets Colors from Sky Atmosphere". It requires the project setting "Supports Sky Atmosphere Affecting Height Fog" to be enabled.
- Adjusted the behavior of Volumetric Cloud Scale to better retain the look of the clouds as they're scaled.
- Added options to scale the moon or sun as they near the horizon.
- Added an option to dim directional light intensity down to 0 when the sky is overcast, as a workaround for limitations with raytracing and other shader effects.
- The Saturation adjustment in Basic Controls now also affects fog colors.

3-15-2021

Versions Affected: 4.26

- Added a new Simulation category. Includes options to simulate the real positions of the Sun, Moon and Stars using coordinates, date and time. See the new Readme section about this for a full breakdown of how to use these features, plus some notes on the accuracy of the calculations.
- Added an option to enable a second layer of volumetric clouds above the first. The default look for the second layer is to appear like a higher altitude cirrocumulous type layer. Of course, rendering this second layer comes at a significant performance cost, so it is disabled by default.
- Added a setting to UDW, to disable the limit which keeps rain/snow from happening when there isn't enough cloud coverage.

- Fixed the Moon texture being mirrored.
- Added an option to scale distant rain/snow particles.
- Adjusted snow particle material to be less darkened by its texture.
- Added a setting called "Stars Daytime Intensity" to easily make stars visible during the day.
- The Stars texture has been revamped.
- Separated the Moon's light color and texture/glow color into two different settings.
- The Moon texture's intensity is now controlled by a nighttime variable and a daytime variable, so they can be changed independently. The moon's intensity/visibility in the daytime has been increased to a more realistic level.
- Improvements to the look of the nighttime sky without the moon present.
- Made an adjustment to how volumetric cloud shadows work to make them more accurate.
- Added an option for the clouds to move with time of day, enabled by default. Animating Time of Day in any way will now affect cloud movement without having to use Time Speed or manipulate Cloud Speed. This option can be disabled or adjusted from the Cloud Movement category.
- Some performance improvements to 2D Dynamic clouds.
- Added a setting to 2D Dynamic Clouds to soften the clouds near the horizon.

2-5-2021

Versions Affected: 4.26

Fixes

- Fixed a crash which could be caused by some of the niagara systems in certain multiplayer configurations.

Weather

- Made improvements to volumetric fog particles (for heavy rain/snow) to keep them from coming through the other side of collisions as much.
- Added inputs to Wet Weather Effects which control the angle cutoff of the dripping effect and the puddle effect.
- Added an option to change the length of lightning flashes, defined by a customizable random range.
- Added an option to scale the intensity of the wind set on the wind directional source.
- Added an option to scale the vector parameter Wind Force, in UltraDynamicWeather_Parameters.
- Added an option to UDW called "Multiplayer Weather". Enabling this will allow each client to handle their own current weather state, allowing for individual players to experience different weather.
- Added a function to UDW called "Get Current Temperature". It uses values from a new Temperature category to generate a temperature (in Fahrenheit and Celsius) which corresponds to the current weather, season and time of day. To

clarify, this temperature value doesn't affect weather itself, its just a simple approximation to be sampled for gameplay purposes.
- Added inputs to the Flash Lightning function on UDW to allow for a custom Lightning location, so the user can now manually spawn a lightning flash at any time and place, regardless of weather.
- Exposed more UDW variables to sequencer by default.
- Changed material effects behavior on UDW so that material effects can be controlled by sequencer directly without issue.
- Added settings to clamp material wetness and material snow coverage at a maximum value.

Lighting
- Added an option to update directional light rotations at a customizable frequency. The default is still every frame.
- Capture Based Sky Light (with real time capture) is now the default sky light mode.
- Created new categories for each sky light mode, containing the specific settings for each.
- Added an option to control if the captured sky light uses real time capture, which it does by default.
- Added an option to enable/disable Time Slicing on the real time sky light capture.
- Replaced the logic for Lower Hemisphere Color on Capture Based Skylights, to use an ambient color based on the time of day, the intensity adjustable by a new variable.
- Made various changes to the sky and volumetric cloud materials to improve performance for real time sky light capture.
- Added a Light Shafts category to UDS, which exposes light shaft bloom settings for the Sun and Moon directional lights.
- Added a setting to the Sky Light category to toggle Cast Shadows on the sky light.
- Exposed DFAO controls to advanced Sky Light settings, with less intense default values.
- Added a setting to control the color of the sun light source.
- Dynamic tinted sky light now uses a blend from a selectable clear, partly cloudy, and overcast flat cubemap, instead of the two texture setup used previously. The flat textures also now have a slight color gradient to make the tinted sky light more natural looking and less monochrome.
- Dynamic tinted sky light now uses three color curves for determining its tint, for different levels of cloudiness. The curves have been adjusted to better align with the general ambient color at all weathers and times of day.

Time of Day
- Made it so Time of Day can be increased past 2400 and time will proceed logically. Useful for sequencer.

Fog

- Volumetric Fog is no longer enabled by default, because of its incompatibility with real time sky light capture. If you want to enable Volumetric Fog, I would recommend changing Sky Light Mode back to the old default, the Cubemap with Dynamic Color Tinting.
- Added a setting to scale the intensity of fog inscattering color.

Clouds

- Exposed control of the volume textures used in the volumetric clouds material, for each material quality level.
- Added a level of large scale variation to volumetric clouds, to reduce homogeneity of cloudscapes. Adjustable using the new variables "Macro Variation" and "Macro Scale". Only present on High and Epic material quality level.
- Made some changes to the volumetric cloud shader and the default volumetric cloud settings to improve performance.
- Added a setting to manually control the mip level of the base clouds texture used for volumetric clouds. Turning this up can actually get some alright looking cirrocumulus clouds.

Moon

- Added options to brighten the dark side of the moon, and adjust the amount that moon light intensity is affected by phase.
- Added a setting to use a static rotation for the moon, instead of having it move with time of day.
- Reworked the Moon Phase, so that it's incremented smoothly, instead of incrementing once per day. An overdue change since the material setup for moon phase was reworked.

Stars

- Adjusted the default intensity of stars and their implementation in the sky shader, to keep the brightest stars from casting their own light shafts when the moon has light shaft bloom enabled.

Aurora

- Added a setting to adjust the amount of the vertical lines in 2d aurora effects. Also changed the implementation of that effect to have more variation.

Mobile

- Added a Mobile category to UDS for mobile specific settings.
- Added an option to replace Volumetric Clouds with a replacement sky mode when running on mobile platforms. The default replacement is static clouds.
- Added an option to replace a real time sky light capture with a replacement sky light mode when running on mobile platforms. The default replacement is the dynamic tinted cubemap.
- Replaced the old "For Mobile Renderer" option with a new "Adjust for Mobile Renderer" option, enabled by default, which is applied on mobile platforms automatically.

- By default, all of these mobile overrides are applied when the platform is Android or IOS, but the list of platforms considered mobile can be customized as well.

Documentation

- Added new sections to the readme about using both UDS and UDW with sequencer, and using UDW with multiplayer.
- Added some new sections to the technical documentation.

1-6-2021 (Another Hotfix)

Versions Affected: 4.26

- Reverted a change to directional light behavior made in the 1-4 update which was causing performance problems in some configurations.

1-5-2021 (Hotfix)

Versions Affected: 4.26

- Changed sky light capture resolution to 128, on the Capture Based Sky Light component. A crucial change to support the real time capture, enabled in the latest update, but mistakenly left out of that update.

1-4-2021

Versions Affected: 4.26

- Added a new option to Volumetric Clouds, called "Volumetric Cloud Rendering Mode". Among other things, it determines if clouds can render in front of opaque objects, which is now disabled by default to reduce artifacts and improve quality for typical use cases. It's highly recommended you read the tooltips for each mode and choose one which fits the needs of your project.
- Removed "Initial Settings" category from UDW and improved how those settings are communicated in Random Weather Variation. There are now two settings "Use Random Weather Variation" and "Start with a Random Weather Type" in the Random Weather Variation category.
- Fixed cloud movement direction not correctly aligning with wind direction.
- The capture based sky light component now uses Real Time Capture by default.
- Added Drop Scale setting to Rain Drip Spline.
- Changed the behavior of Sky Light Intensity. Default is now 1.
- Reduced default stars intensity
- Added controls for height and altitude of volumetric aurora.
- Added an option to scale the splash particles caused by rain.
- Improved static cloud textures
- Adjusted default values for fog density
- Added settings to control height falloff for height fog.

12-5-2020

Versions Affected: 4.26

- Added support for volumetric clouds. These are now enabled by default. The 2D dynamic clouds are still fully supported, and can be used by changing the new Sky Mode variable in Basic Controls.
- Added a new weather system blueprint called Ultra Dynamic Weather. It can be found in the Blueprints folder. It can simulate rain, snow, wind, thunder and lightning with particle effects, sound, lighting and material effects. A "Weather Basics" section has been added to the readme to help getting started adding weather to your project.
- Added a Static Clouds Sky Mode. Uses a static texture for the clouds, designed to generally mimic the look of the volumetric clouds. Intended mostly for use as a minimum spec substitute for dynamic clouds.
- Added a Volumetric Aurora Sky Mode. This will render a volumetric field of full 3D aurora effects, but cloud rendering is sacrificed to make that happen. Probably only useful for very specific projects.
- Aurora colors are now controlled by 3 color variables in the Aurora section, rather than a texture.
- Cloud Density has been renamed to Cloud Coverage. The range now goes from clear sky to overcast to foggy, by default, to work better with the weather system.
- The "Animate Cloud Density Changes" section has been removed, as the function was made redundant by the weather system.
- Sections specific to the 2D dynamic clouds have been renamed to indicate as such.
- Adjusted some details of sky light and fog behavior to better align with the weather system.
- The default height fog settings now have volumetric fog enabled by default.
- Cloud Speed is now properly adjustable at runtime, meaning cloud speed can be changed/animated in game and the clouds will change their speed as expected. This is made use of by the weather system when changing wind speed based on weather.
- Added a Sky Mode to completely disable clouds.
- The Sub-UV based moon phase textures have been replaced with a setup that generates the phases using some vector math. This allows the full resolution of the Moon texture to be much higher, so the moon can now be made huge without a blurry texture.
- Update functions in the Ultra Dynamic Sky blueprint have been renamed and reorganized. There are now two functions called Update Active Variables and Update Static Variables. The first is run on tick, and controls parameters and variables which are designed to change with time of day/weather/ect. The second controls parameters and variables which are set once at launch and never supposed to be altered.
- Some variables are now marked as Advanced. This just means they are hidden by default in an extra dropdown in each section.
- Renamed "Lights and Fog" section to "Component Selection and Mobility".

7-30-2020

Versions Affected: 4.24, 4.25

- Fixed a bug which could make the moon fail to render properly on some devices.
- Added Sun Vertical Offset and Moon Vertical Offset variables. These push the sun or moon higher and lower in the sky. Can be useful in combination with inclination for recreating extreme latitudes.
- Added a Contrast setting to Basic Controls, which can boost color contrast across the entire shader.
- Added a new cloud noise type, Voronoi Diverse, and made it the new default. It incorporates more noise types and more low frequency variation to produce cloud shapes which vary more significantly in density across the sky.
- Added a new variable "Directional Lights Absent Brightness" which adds an artificial extra brightness to the sky and sky light when both the sun and moon are absent. By default, it's set to an intensity which helps smooth over the gaps where the sky could get extremely dark otherwise.
- Added an additional layer of varied high frequency noise to cloud generation. Adjustable with a setting in Cloud Appearance. Not present when material quality is set to Low.
- Fixed a minor visual artifact in cloud layering where unsightly lines could appear between clouds.
- Changed the Moon so it takes the alpha channel of the custom texture into account. The content in the alpha channel still needs to fit inside the moon's circular footprint, but it can now be an arbitrary shape within that circle.
- Made adjustments to the sun shine edge effect to appear more natural and varied.

6-25-2020

Versions Affected: 4.24, 4.25

- Added a Cloud Distribution section, enabling some basic control of the clouds' distribution across the sky. Specifically you can now control the density gradient from the horizon to the zenith as well as radial gradients around the sun and moon. For example, this could allow you to keep the cloud coverage localized to the horizon, or cut an opening in cloud coverage for the moon to shine through.
- Significant work has been done on optimization, specifically to reduce pixel shader instruction count and improve scalability. Several parts of the UDS material are now handled more efficiently at the vertex level with no noticeable reduction in quality.
- The Material Quality Level setting now affects the UDS sky material, with certain effects being disabled on lower quality levels. The most significant impact being that when Material Quality is set to Low, the sky will automatically reduce to a single dynamic cloud layer.
- All of the material graphs have been reorganized and cleaned up.

- Reorganized UDS variable sections. Split Clouds section into several since it was getting pretty big. Moved Cloud Density into Basic Controls. Split "Moon and Stars" section into two.
- Replaced the ungainly "Wisps+Stars+Moonsprites" texture with individual textures, so that it's simpler for the user to replace each with their own custom texture. I also added a texture variable to that effect for the wisps and the stars.
- Added a variable to control stars tiling.
- Created a new default set of color curves for legacy coloring which better aligns with the current version of the sky and the value range of the default sky atmosphere setup.
- Some visual improvements to the way the moon lights the clouds.
- Fixed strange circle artifact that would appear in cloud shadows.
- Fixed a minor banding issue with cloud shading.
- Fixed a sharp shading artifact which would happen at high cloud density.
- Changed the behavior of the bright shine edges on the clouds. If using two cloud layers, the alpha of the first cloud layer will now "shadow" the shine on the second cloud layer, avoiding the sometimes awkward layering that would happen around the sun or moon.
- Changed the cloud base texture selection to a more intuitive enum variable, with specific options for the included noise textures, plus a custom option.
- Added a new clouds noise texture, "Voronoi Smooth" which uses the same type of cloud shapes as default Voronoi, but without as much of the higher density noise. Results in more rounded, smoothed out cloud shapes.
- Added a specific setting to control just the brightness of the sun disk, without affecting anything else in the sky.

6-2-2020

Versions Affected: 4.24, 4.25

- Fixed "Disable Completely" option for Sky Light component
- Added a Dawn Time and Dusk Time in Basic Controls, to directly set the Time of Day when the sun comes up and goes down. The default is still 600 and 1800.
- Added new failsafe to keep moon light from sometimes unnecessarily being used when the moon is out during the day.
- Generally improved the look of the moon when visible during the day.
- Reworked logic for moon phase changes. Moon phase will only iterate when the moon is down.
- Added a function, "Get Time of Day in Real Time Format" which outputs a standard Hours/Minutes/Seconds time code.
- Added a function, "Set Time of Day using Time Code" to set the current Time of Day using an hours/minutes/seconds time code.
- Seperated the Soften Clouds variable into Soften Cloud Layer 1 and Soften Cloud Layer 2, for if you want a wispy cloud layer on top of a hard cloud layer, for example.

- Renamed "Set Solar Angle" function to "Set Sun and Moon Rotation"
- Moved the readme to a much more comfortable location for easier reading. It's in an Editor Utility Widget, located in the blueprints folder. To open it, right click on the Ultra_Dynamic_Sky_README asset and select Run Editor Utility Widget.
- Added a Technical Documentation section to the readme. Gives a brief overview of the workings of the materials and blueprints, for users who want to make modifications.

5-15-2020

Versions Affected: 4.24, 4.25

Changes:

- Fixed bug with cloud coloring at sunset, affecting 4.25.
- Added variable to Cloud settings to adjust cloud shadow softness.
- Added variables to adjust cloud shadow intensity and softness with cloud density, so the lighting can appear correct when the sky goes overcast.
- Added a variable to adjust the amount of the swirling clouds texture which appears at high cloud density. Also adjusted the default value to be more subtle.
- Changed blueprint/variable settings to work with network replication.
- Added control of mie anisotropy based on cloud density, so that sunlight appears to scatter properly when overcast.
- Added a "Soften Clouds" option. Erodes and softens the edges of the clouds, to make a more wispy, hazy appearance.

5-11-2020

Versions Affected: 4.24, 4.25

Changes:

- Reworked Height Fog integration. When using sky atmosphere, the height fog now uses more appropriate color curves to determine inscattering color and directional inscattering color, with those curves tuned to align well with the default look of the sky.
- Added a Height Fog section, with variables for the curves it uses to determine color.
- Added an option to use a curve to change fog density throughout the day. The feature is disabled by default, and the curve provided is a flat value, meant to be edited to fit the user's preference.
- Revamped the Sky Light integration. The default is now a much improved version of the old "Fast Skylight" option, now labeled as "Cubemap With Dynamic Color Tinting". A capture based sky light (the old default) is still accessible by changing

Sky Light Mode to capture based. I've also added a simple option to use a static custom cubemap texture.
- Added Sunrise and Sunset event dispatchers, controlled similarly to the existing Start Rain and Stop Rain ones. Useful for controlling lights or ambient sound. The specific times that these events are fired can be set in the Animate Time of Day category.
- Reworked the sun so it's scale independent. The default size of the sun is around the same, but Sun Radius values now scale differently.
- Added a Cloud Sharpness variable. Increasing this gives the clouds exaggerated hard edges and can give the sky a somewhat stylized look.
- Changed the default exposure range, to compensate for changes to auto-exposure made in 4.25.
- Added settings for Night Sky Glow and its associated color. Basically a soft unform glow that fills the sky at night. Previously this was connected to the starlight intensity and not easily editable. Now it's its own effect.
- Made a change to how sky atmosphere colors clouds, to make them more scale independent.
- Optimized the sky sphere mesh, particularly to use less geometry on the bottom half where the UV resolution isn't needed.
- Fixed the implementation of Night Brightness, which wasn't working as intended when using Sky Atmosphere.
- Edited the sky material to properly mask out all of the clouds, stars, moon, ect on the bottom half of the sky sphere.
- Improved the way Moon Phase affects the strength of moon lighting and colors.

4-7-2020

Versions Affected: 4.24

Changes:
- Fixed a bug which could cause flickering and breaking of volumetric fog. This involved adding a specific "cast shadows" option for the sun and the moon, in their respective categories. Shadows are enabled for both by default.

3-25-2020

Versions Affected: 4.24

Changes:
- Added mobility settings into the Lights and Fog section to make handling static lighting easier.

- Added two event dispatchers to the sky to help control weather effects. They're called "Start Rain" and "Stop Rain". The dispatchers will trigger when the cloud density hits a user set threshold. Simply bind the dispatchers to events in your weather blueprint and rain/snow can be controlled by the changes in cloud density.
- Disabled the sky mesh visibility to ray tracing by default. An apparent engine bug in 4.24 is causing the sky mesh to seemingly break RTGI without shadows being turned on for the mesh. So by default, with RT enabled, reflections will fall back to skylight/captured reflections for the sky. (Based on my own tests, this is probably a good move for RT performance anyway.)
- Changed default Disabled Brightness on the built in sun and moon components, so that distant meshes aren't as dark by default while cloud shadows are enabled.

2-18-2020

Versions Affected: 4.24

Changes:

- Changed some default settings, mainly for intensity of lights and exposure, to avoid the overexposed/washed out look that lots of new users were seeing.

1-24-2020

Versions Affected: 4.24

Changes:

- Fixed a bug which caused significant FPS drops on some projects
- Fixed directional light default settings which could cause an engine bug with bright gray flickering artifacts across the whole screen.

1-17-2020

Versions Affected: 4.24

Changes:

- Integrated Sky Atmosphere system by default
- Reorganized settings
- Added built in lighting solution, with an option to replace each component with an external actor individually
- Various bug fixes and adjustment

Notes on this document:

This formal changelog was only created in early 2020, so it's update history doesn't go back to the beginning. For a long time, these update notes only existed in a temporary form in a forum thread, so they just weren't being saved. This document will serve as an actual long term record of all the updates to UDS from here forward.