Last update: 04/08/2021
Version: Corona 7
plugin: Cinema 4D

RENDERER FEATURES

RENDER ENGINE

- **Biased** and **Unbiased** solution
- **Path Tracing:** unbiased solution
- **UHD and 4K (experimental) cache:** two options for faster biased cached solution for interiors
- **Denoising**
  - Reduces the number of passes needed to get a noise-free image, with render time reductions of 50 to 70%
  - **NVIDIA AI GPU-based denoising** can be used for final renders at the user's discretion (requires a compatible NVIDIA GPU)
  - **Intel AI denoising** can be used for final renders. CPU-only, and works with any CPU (not just Intel)
  - Interactive amount adjustment
  - Checkbox to enable/disable the result in the VFB
- **Fast Caustics Solver:**
  - Easy to use, and fast to render
  - Includes caustics from reflection, refraction, and dispersion (splitting light into separate colors)
  - Enable or disable for specific light sources
  - Works with LightMix
  - Separate render element available for compositing caustics in post processing for even greater control
  - Works correctly with motion blur
- **Adaptive Image Sampling**
  - Balances out the rendering calculations over the image to focus more processing power on tricky areas
- **High Quality Image filtering**, gives a more natural and "less CGI" look to noise, making it less noticeable to the eye
- Progressive rendering
- Max Sample Intensity (MSI): automatically removes fireflies - accuracy/render speed tradeoff
- Proudly CPU based

INTERACTIVE LIGHTMIX

- **Adjust color and intensity of lights, during and after rendering**
- **Single-click** set up (by instances, groups or individual lights, with memory requirements reported)
- **Supports multiple suns and multiple environments** for different times of day from one render (see Corona Sky and Corona Sun in the **Lights** section)
- Manual set up if required
- Controlled from the VFB
- **Results can be pushed to the scene**
- Can be used for anything from subtle adjustments, to turning day into night, without re-rendering
- Each light select pass can be denoised independently
- Can select the light objects in a scene for a particular LightSelect layer, directly from the LightMix tab in the VFB
- LightMix result can be saved to a CXR file and then adjusted in the Corona Image Editor, or saved for compositing in other post-processing software

INTERACTIVE RENDERING

- **100% the same render engine** as for the final frame
- **All final frame rendering features supported,** including Interactive LightMix, post-production effects such as bloom & glare, LUTs, etc.
- **NVIDIA AI GPU-based denoising**, for denoising during Interactive Rendering (requires a compatible NVIDIA GPU)
- **Pick objects directly** in the docked viewport, and use the standard Cinema 4D transform widgets on them

INTERACTIVE RENDERING (contd.)

- **Image upscaling factor** to allow rendering to a smaller resolution and upscaling (ideal for HighDPI displays)
- While zooming-in in the IR, rendering is focused on visible area only
- Subsampling lowers initial resolution at the beginning of rendering, for virtually real-time performance
- Blue Noise Dithering to give visually pleasing results in the first few passes, for quick assessment of a scene when using Interactive Rendering
- Results shown in Corona VFB or **docked viewport**

MATERIALS

- **Corona Physical Material**
  - Default material since Corona 7
  - Base Layer for diffuse, reflection, bump, and translucency controls
  - Base layer uses Oren-Nayar shading model
  - **Clearcoat** Layer for adding a layer of varnish, lacquer, etc., featuring separate bump from the Base Layer
  - **Sheen** for creating realistic fabrics
  - **Choice of Roughness or Glossiness** workflow, both per-material and as scene default
  - **Choice of IOR or Disney Specular** workflow, both per-material and as scene default
  - **Metalness** workflow, where Metalness can be mapped
  - Metals can be controlled by simple **Edge Color**, or by **Complex IOR**
  - UI interactively enables or disables parameters based on whether a material is Metal or Non-Metal
  - **35 presets** built-in to the material, as starting points, or to 'reverse engineer' to learn in creating your own materials
  - Refraction, including dispersion, caustics, and thin absorption (for Thin Mode)
  - Anisotropy correctly affects both Refractions and Reflection (both correctly affect caustics)
  - Thin mode for glass correctly blurs reflections and refractions
  - Opacity
  - Adaptive displacement with low memory requirements
  - Vector displacement
  - SSS mode for wax, marble, and other materials that do not use Thin Mode or full Refraction
  - Volumetric scattering and absorption mode for fog, mist, and for colored glass, liquids and other materials that use Refraction without Thin Mode
  - Self-illumination
- **Corona Legacy Material**
  - Uses Lambertian shading model
  - Legacy material, to preserve identical results from scenes created in earlier versions of Corona Renderer
- **Corona Select Material**
  - Store multiple materials for one object, and select between them via radio buttons
  - Current Index parameter can be keyframed
- **Corona Skin Material**
  - Dedicated material for skin
  - Three independent Subsurface Scattering layers
  - Two independent Reflection layers
- **Corona Hair Material**
  - Dedicated material for hair and fur
  - Colored and Colorless reflection layers
  - Color controls via melanin amounts, or directly
  - Adjustable random Glints
  - Usable alone or in combination with Cinema 4D Hair Material for Cinema 4D's native control over the hair growth properties
- **Corona Layered Material**
  - Alternative to Cinema 4D Texture Tags layering
  - Combines **multiple materials**
  - Individual layers can be toggled on/off
- **Corona Light Material**
  - Identical performance to Corona Light
  - Various non-physical settings
  - Textured emission (useful for backplates)
- **Corona Ray Switcher Material**
  - Uses different material for different ray types: direct, GI, reflections, refractions

MATERIALS (contd.)

- **Corona Shadow Catcher Material**
  - Use custom backplate texture or show the environment map behind
  - Supports glossy surfaces
  - Bump mapping
  - Lights work additively (illuminators) or subtractively
- **Corona Volume Material**
  - Simplified material for volumetric scattering and absorption
  - "Inside Mode" allows for true 3D volumetric materials
- **Cinema 4D Materials**
  - Cinema 4D Material
  - Cinema 4D PBR Material

MATERIAL LIBRARY

- **Over 520** ready-to-use high quality materials
- Drag-and-drop from the Library to an object in the Object Manager, viewport, Corona Node Material Editor, and Material Manager
- Triplanar mapping used where possible, to reduce tiling and give expected scaling
- Materials organized by category
- Set favorites, with display favorites only option
- Sort by name, favorites, or most used
- Select all objects in the scene that use a particular material
- Resizable material previews
- Open standalone large preview windows for materials

CORONA NODE MATERIAL EDITOR

- Global/World view of shaders and materials and how they are connected
- Use views to organize materials and shaders by type, category, etc.
- Handles **all Corona and most Cinema 4D shaders and materials**; also works with Substance shaders
- Connect one shader to **any number of channels, or materials**
- Works with native Cinema 4D Layer shader
- Switch at any time between the Corona Node Material Editor, or the native Cinema 4D editor
- Select by selection box
- CTRL + Drag to copy selected nodes
- Option to turn Corona Shared Shaders into regular shaders on saving the scene
- Indepedent of Cinema 4D version – **works in all versions of Cinema 4D supported by Corona Renderer (R14-S24)**

SHADERS

- **Corona Distance Shader**
  - Gradient based on distance to other objects, including Cameras
  - Supports textures
  - List of objects to calculate distance from
  - Can be used with Cinema 4D Effectors to control placement of scattered objects
  - Wide range of other creative uses, e.g. ripples on water around objects, controlling light intensity and color, etc.
  - Supports splines
  - Works as an input to bump mapping, displacement, etc.
- **Corona Mixture**
  - Advanced mix shader
  - Texture or color inputs, different blending modes
  - Works as an input to bump mapping
- **Corona Multi Shader**
  - Randomly assigns colors/shaders to instances or mesh elements
  - Frequency spinners
  - Hue and Gamma randomization
  - Features advanced blending modes
  - Global blur multiplier to affect all multi shader elements
  - Supports up to 100 inputs
  - Can be used with just one input, applying gamma and hue randomization
- **Corona UVW Randomizer**
  - Apply random offset / rotation / scale to shaders by instance, material id, mesh element, etc.
  - Options to allow randomization of seamless textures, e.g. to avoid visibly obvious tiling

SHADERS (contd.)

- **Corona Select Shader**
  - Store multiple shaders, and select between them via radio buttons
  - Current Index parameter can be keyframed
- **CoronaSky**
  - Duplicates the functionality of the Corona Sky object (see the **Lights** section), except for the Volume Effect.
- **Corona AO**
  - Ambient occlusion shader
  - Supports textures
  - Includes/Excludes
  - Additional controls: spread, directionality, inverted mode, etc.
- Cinema 4D Normal Direction
  - This supported native Cinema 4D shader fully replaces the CoronaFrontBack texmap from the 3ds Max version
- **Corona Color Correct**
  - Adjust brightness, saturation etc. of a texture map (and still have it affected by VFB post-processing)
  - Unique tone mapping capabilities (not present on other output nodes), including LUTs, gamma, green-magenta tint, etc.
  - Cinema 4D Filter Shader is supported and can be used as an equivalent for other tone mapping capabilities such as gamma, curves, etc.
- **Corona Tonemap Control**
  - Specify whether a texture map should be affected by VFB Exposure, Tone Mapping, etc.
- **Corona Color Mix**
  - Adds the Cinema 4D native color mixing settings to the shaders which normally don't have them
- **Corona Ray Switch**
  - Same as RaySwitch material, but on shader instead of material level
- Cinema 4D Color
  - This supported native Cinema 4D shader fully replaces the 3ds Max version's CoronaColor texmap
- **Corona Wire**
  - Wire shader
  - Allows to set edge/vertex size in world or screen coordinates
  - Includes Falloff option
  - Can be used as an input to bump mapping
- **Corona Bitmap**
  - UV Tiling, Crop / Placement, Channel outputs
- **Corona RoundEdges**
  - Rounded corners shader
  - Works as an input to bump mapping and other material slots
- Cinema 4D Variation
  - This supported native Cinema 4D shader fully replaces the CoronaMultiMap known from the 3ds Max version
- **Corona Triplanar**
  - Apply textures without explicit UV mapping, with no stretching or seams thanks to the in-built blending
- **Corona Normal**
  - Automatic detection of incorrect input gamma

LIGHTS

- **Corona Sky Object**
  - **New PRG Clear Sky** model based on atmospheric data
  - **"Aerial Perspective"** via Volume Effect
  - Altitude sets the height of the observer
  - Turbidity controls whether sky is clear or overcast
  - Artistic control over Horizon Blur
  - Can be linked to a Corona Sun, allowing different times of day
  - Supports dawn/twilight with the Corona Sun as low as -2.85 degrees (approximately 5.4 sun diameters) below the horizon
  - Allows changing of the ground color
  - Also offers Hošek & Wilkie, Preetham et al., and Rawa-fake sky models
  - Multiple skies are supported, and each one can be paired with specific Corona Suns, for use in **LightMix**
  - In-built controls for Visible directly, in reflections, etc.
- **Corona Sun**
  - Standalone object that can be combined with the Corona Sky Object for complete realistic outdoor lighting
  - Multiple Suns are supported, and each one can be paired with specific Corona Skies, for use in **LightMix**
  - Allows non-physical properties (changing size, color, disabling visibility in reflections, ...)

LIGHTS (contd.)

- **Corona Light**
  - Shapes: sphere, rectangle, disk, cylinder
  - IES profiles
  - Directionality
  - Physical units
  - Color (RGB input, Kelvin temperature, texmap)
  - Non-physical settings: disabling shadows, includes/excludes, disabling visibility in reflections, preventing black appearance for lights with directionality
- **Corona Light Material**
  - Turns any object into a light
  - No render time differences compared to using a CoronaLight
- **Cinema 4D native lights**
- Corona Sky Tag (for compatibility only)
  - Tag that can be applied onto Cinema 4D Sky Object for procedural sky light emission
  - **For compatibility with old scenes only**; the Corona Sky Object should be used in Corona Renderer 5 and newer

ENVIRONMENT

- Use a Corona Sky Object, or drag and drop a Corona Light Material with any shader or an environment map into the Scene environment slot in the Scene environment tab in Render Settings
- Adaptive Environment Sampler ensures fast and accurate sampling of HDRI and Sky environments, without the need for portals
- Importance sampling speeds up rendering
- Direct/Reflect/Refract overrides in Render Settings
- Global material for volumetric effects such as fog (also see Volume Effect under Corona Sky for an “aerial perspective” instead)

CORONA VIRTUAL FRAME BUFFER

- An optional, feature-rich replacement for the Cinema 4D Picture Viewer
- Can be set to use the same color space as the native Cinema 4D Picture Viewer
- **Integrated Interactive LightMix,** allows changing color and intensity of lights without re-rendering
- **Integrated lens effects** offering a high degree of realism and creativity for bloom & glare effects affected by lens scratches, dirt, etc.
- **Integrated post-processing effects,** including vignette, sharpening/blurring, histogram, curves, etc.
- **Integrated color mapping controls,** including exposure, filmic tone mapping, LUTs, green-magenta tint, etc.
- Save and load post-processing and LightMix configurations, and exchange those to and from the Corona Image Editor
- **Pick objects directly** in the VFB
- **Set DOF focus point directly** in the VFB (for Corona Cameras)
- **VFB History and Comparison**, with ability to toggle between using the current post-processing, or the post-processing at the time of saving the image to history
- Statistics: render time, remaining time, performance, polycount, tooltip explanations, atc.
- Displaying/saving Multi-Pass layers
- Pixel color probe on right mouse button
- Controls: start render/stop render, resume last render, resume rendering from file, save/clone/copy image, etc.
- Optional stamp with scene info at the bottom of rendered image
- Customizable information in the title bar
- Interactive and Multiple Render Regions
- Fuzzy render regions
- Zoom buttons for use when accessing a machine remotely

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CORONA IMAGE EDITOR

- Runs outside of any 3D software
- All the familiar controls from the Corona VFB
- Adjust lighting in the rendered image using the full range of LightMix controls (on Corona EXRs)
- Apply Denoising (on Corona EXRs)
- Apply all the Corona post-processing options (on any EXR)
- Save and load LightMix and post-processing configurations, and exchange those to and from the Corona VFB
- Bloom & Glare virtual element which can be viewed or saved separately
- Save up to eleven formats (EXR, PNG, JPG, BMP ...)

POST-PROCESSING EFFECTS

- Controlled from render settings, Corona Camera, or VFB
- All settings are **adjustable during/after rendering**
- Image **updated in real time**
- **Bloom & Glare**
  - Both controlled independently
  - Threshold
  - Color intensity & shift to adjust colors
  - Glare ray count, blurriness and rotation
  - Lens Effects for scratches, dirt, etc.

CORONA CAMERA

- Corona Camera is a tag allowing to use all the standard Cinema 4D camera controls plus all Corona controls such as exposure, DOF, LUTs etc.
- Focus distance can be set using the native Cinema 4D Focus Object functionality
- Tone mapping parameters respond immediately in Interactive Rendering without restarts
- Render to fisheye, orthographic, perspective, spherical, cylindrical or cubemap projections

CAMERA EFFECTS

- High quality (raytraced) **depth of field and motion blur** effects
- Photographic controls (optional): shutter speed + ISO + f-stop
- **Fisheye** lens effects
- **Bokeh shape**
  - Circular
  - N-gonal (bladed aperture)
  - Custom image
  - Center Bias
  - Vignetting
  - Anisotropy
- Multi-segment (curved) motion blur
- Virtual Reality Camera

EXPOSURE AND COLOR MAPPING

- Controlled from render settings, Corona Camera Tag, VFB, or Picture Viewer
- All settings are **adjustable during/after rendering**
- Image **updated in real time**
- **Two exposure control modes**
  - Photographic exposure: shutter speed + ISO + f-stop
  - Simple exposure: single EV value
- **Additional settings**
  - Contrast
  - Highlight compression
  - Filmic Highlights
  - Filmic Shadows
  - Color tint
  - Saturation
  - White balance
  - Green-magenta tint
  - LUTs with opacity adjustment
  - Custom curves for overall brightness, and individual RGB
  - Sharpening/Blurring (both can be used at the same time, to reduce “pixel-perfect” noise)

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GEOMETRY

- **Corona Proxy**
  - Cross-platform proxy format: .cgeo
  - Faster save/load/display of large scenes
  - Compressed format to save disk space
  - Supports animated meshes
  - **Duplicate to mesh** functionality, which lets you create a separate, regular polygonal model that you can edit using the C4D modeling tools
- **Corona Volume Grid**
  - Allows loading and rendering of OpenVDB files
  - Useful for importing simulations such as clouds, smoke, fire, liquids, etc.

DISTRIBUTED RENDERING

- Support for Cinema 4D Team Render of both animations and single frame
- Pass, Time and Noise Level limits can be used

MULTI-PASS

- Arbitrary number of passes
- Optional anti-aliasing of passes
- Optional Denoising of passes (where relevant)
- Beauty pass, with independent Denoise amount
- Alpha pass
- **Beauty composition passes**
  - Direct, indirect, reflect, refract, translucency, emission, caustics, volumetrics
- **Geometry passes**
  - Geometry normals, shading normals, primitive coordinates, UVW coordinates, world position, z-depth
- **Masking passes**
  - Wire color
  - Primitive/Material/Object ID
  - Option to propagate masks through reflection, refraction, both, none, or never
  - Mask propagation can now be enabled or disabled for Mask, ID, ZDepth, WireColor and Texmap multi-passes
  - Custom mask
    - Object selection
    - Material ID
    - Object buffer ID
- **Shading passes**
  - Albedo, individual direct/indirect BRDF components, raw components, source colors, shadows, bloom & glare
- **Informational passes**
  - RenderStamp, SamplingFocus
- **Arbitrary texmap elements**
  - Corona AO shader
  - Corona Wire shader

SUPPORTED CINEMA 4D FEATURES

- **Most native and 3rd party shaders**
  - Evaluated directly from the Corona rendering pipeline
  - Including the Cinema 4D shaders Beat, Bitmap, Brick, Checkerboard, Cloud, Color, Color(MoGraph), Colorizer, Cyclone, Display Color, Distorter, Earth, Falloff, Filter, Fire, Flame, Formula, Fresnel, Fusion, Galaxy, Gradient, Layer, Lens Distortion, Marble, Metal, Multi, Noise, Normal Direction, Pavement, Pixel, Planet, Polygon Hair, Posterizer, Projector, Proximal, Ripple, Rust, Simple Noise, Simple Turbolence, Spline, Starfield, Stars, Substance Shader, Sunburst, Thin Film, Tiles, Variation, Venus, Vertex Map, Water, Weathering, Wood
- **Cinema 4D native material layering**
- **Cinema 4D native lights**
  - Including turning off shadows or non-physical falloff properties
- **Cinema 4D render options**
  - Render region, viewport render region, interactive render region, render view
- **Cinema 4D Background Object support**
- **Native Team Render support**
- **Render takes**
- **XREF object in non-generator mode**

VR

- Corona Camera can render to spherical or cubemap format, **supporting a wide range of VR apps**
- Easy setup, defaults handle 99% of cases
- Conventional stereo rendering (non-360)
- Bloom & Glare supported for spherical VR images

MISC

- **2.5 D Displacement**
  - New default displacement calculation method, which saves significant memory and parsing times
- **Tooltips** added for Corona Materials
- **Material and light conversion**
  - Cinema 4D lights and basic materials are rendered out-of-the-box using implicit conversion inside Corona without user interaction
  - Basic implicit support for V-Ray Advanced, Standard, Displacement and 2-Sided materials
  - Basic implicit support for V-Ray Physical Sun + Sky light and Area lights
  - Other V-Ray lights which use Cinema 4D objects as their base are rendered using the Cinema 4D light's properties
  - Explicit user-initiated conversion, which converts the supported Cinema 4D materials, V-Ray lights and V-Ray materials to their Corona counterparts to allow further tweaking and changes in Corona
- **Advanced "Render Selected"**
  - Render mask by an include list, object ID, or viewport selection
- **Improved material editor scene**
  - More representative previews
- **Hair support**
  - Cinema 4D native Hair Object
  - Cinema 4D native Hair Material in the Cinema 4D Hair Tag
  - Corona Hair Material can be used in addition to Cinema 4D Hair Material for realistic hair appearance
- **Stacked materials** work as expected with displacement
- **Override material option** (with excludes/includes for objects and/or materials; options to preserve displacement, light materials, glass materials, portals, and unsupported materials; also works with complex generators, e.g. Extrude)
- **Save and resume**
  - Ability to save VFB and resume rendering later (even on a different computer)
- **Render only masks**
  - Computes render masks in seconds without doing shading
- **Autosave**
  - Optionally saving the VFB every few minutes and after rendering. Rendering can be resumed from these backups
- **Bundled LUTs**
  - Over 70 LUTs included with the install
- **Bundled IES profiles**
  - Sample IES files included
- **UI supports HiDPI monitors**