

## 4.0.5.2

### Milestone 4.0.5

#### Enhancements

- **Multi-threaded ray accel build for deformation motion blur:** Similar to the 4.0.3 release (#2653) that added support for building non-motion blurred objects in parallel, we now allow for multiple render threads to build a motion blurred object's ray accel in parallel. On a 12 core machine this lets us build the accel structure for a hair object 9.5x faster. (#2755)
- **Miscellaneous ray accel and subdivision optimizations:** The ray accel structure for deformation motion blurred objects now uses 7% less memory. Ray accel structure builds, especially when using many threads, will now be a percent or two faster. Triangulation is now roughly 2x faster; as this is also used at the end of the Catmull-Clark subdivision process (which generates quads that need to be triangulated), subdivision will also be slightly faster, around 10-15% faster overall. (#2816, #2811, #2817)
- **Multi-threaded .ass loading:** The .ass parsing code has been rewritten and made thread-safe, which allows multiple .ass-based procedurals to be processed in parallel, as it already happened with DSO and funcptr procedurals. If needed, parallel loading can be disabled with `options.enable_threaded_procedurals`. (#2113)
- **Oriented curves:** The curves node now has an additional mode oriented that allows the specification of orientations via the orientations vector array. It behaves similar to the ribbon mode, except curves can face away from the camera or incoming ray according to the orientations; curves also get thinner when they face away. Uses include grass, wider ribbons, or even leaves. Orientations are specified per-point, the same number as there are control points. (#797, #2824)
- **Accurate memory reporting on Linux:** The memory usage on Linux is now correctly reported. The older code was reporting virtual memory which is significantly larger than what is really being used. The new code reports both the memory being used on physical RAM (resident memory) as well as the memory in swap. This enhanced reporting has some overhead on older Linux distros, so scenes with thousands of objects and/or log messages might take a few hundred milliseconds longer. On at least Linux kernel 2.6.34 or RHEL6/CentOS6 and newer there is no overhead. (#2602)
- **Checkpointing renders:** EXR and TIFF drivers now support render checkpointing (or "append mode"). By setting the corresponding output driver's `.append` attribute to true Arnold will preserve previously rendered tiles and only work on the missing ones, appending them to the output files. If no image is present the render will proceed as normal creating a new image. If image specifications do not match the render will be aborted. (#2417)
- **Deferred .ass parsing time in log stats:** The .ass parsing time reported in the log statistics is now split into two categories: parsing when loading the main scene prior to rendering, and parsing of deferred-loading .ass procedurals during rendering. (#2795)
- **Enhanced backtrace dumps:** Backtrace dumps for crashes in debug builds are now cleaner and show more helpful information, along with colored output and time of the crash. If available, it will also report the pixel location where the crash occurred. (#2716, #2717, #2831, #2832)
- **Added console colors to log messages in Windows:** The log output sent to the console will now use colors to highlight warnings in yellow and errors in red. This feature was already available in Linux/OSX but was missing in Windows. (#2830)

#### API additions

#### Incompatible changes

#### Bug fixes

Ticket	Summary	Component	Owner	Priority	Version	Created
#2602	Cleanup Linux memory reporting	arnold	thiago	major	3.3	5 months
#2797	Running out of memory with high ray depth	arnold	thiago	major	3.3	6 weeks
#2798	Crash writing bump2d to .ass with a value set to the "shader" parameter	arnold	angel	major	3.3	6 weeks
#2800	Bug in Python API functions returning a pointer	arnold	angel	major	3.3	5 weeks
#2812	OIO failed assertion with accumulated error messages	arnold	ramon	major	3.3	5 weeks
#2818	memory leak when closing plugin file handle on linux/os x	arnold	thiago	major	3.3	4 weeks
#2820	NaNs in Ward-Duer BRDF with <code>subdiv_smooth_derivs</code> enabled	arnold	alan	major	3.3	4 weeks
#2821	rare crash in Ward-Duer BRDF when used with <code>volume_scattering</code>	arnold	alan	major	3.3	4 weeks
#2718	Long multi-paths are cut out with "kick -l"	arnold	oscar	minor	3.3	3 months
#2803	"included" .ass files should be taken into account in ".ass parsing" time	arnold	oscar	minor	3.3	5 weeks

Ticket	Summary	Keywords	Component	Owner	Priority	Milestone
#2844	Wrong gamma correction on binary encoded arrays	4.0.5.1	arnold	angel	major	4.0.6
#2854	UV-based displacement combined with deformation motion blur broken	4.0.5.1	arnold	mike	major	4.0.6

<b>Ticket</b>	<b>Summary</b>	<b>Keywords</b>	<b>Component</b>	<b>Owner</b>	<b>Priority</b>	<b>Milestone</b>
#2838	popping artifacts in multi-threaded displacement	framestore, 4.0.5.2	arnold	oscar	major	4.0.6