

FIELDVIEW

What's New in FieldView 13

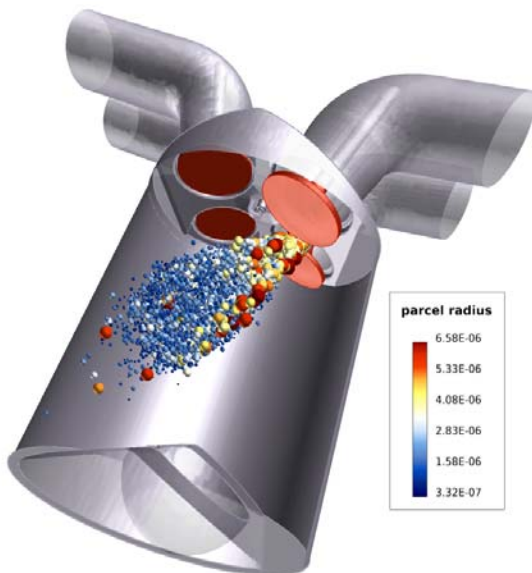
FieldView 13 is a major release designed to improve your productivity with breakthrough improvements in CFD data management and graphics performance. A new user interface, common for all platforms, with dock-able toolbars and personal preferences allows you to customize **FieldView** to best fit your working environment.

SUMMARY OF NEW FEATURES

- Increase overall productivity with CFD Data Management via XDB workflows
- Manipulate your large data effortlessly with improved graphics performance
- New customizable GUI combines the best of LINUX and Windows
- Interact with your transient data in full 3D via sweep caching
- Make great looking images & animations with GPU-based high quality transparency
- Run in True Batch (LINUX & Windows) without X-displays on laptops and clusters
- Easily navigate with new file browsers that recall previous locations
- Effortlessly migrate to FieldView 13 with 100% backward compatibility
- FVX scripts, now saved with RESTARTS, help you learn and use automation
- Probe and plot surface-based data
- Read datasets with up to 50,000 grids

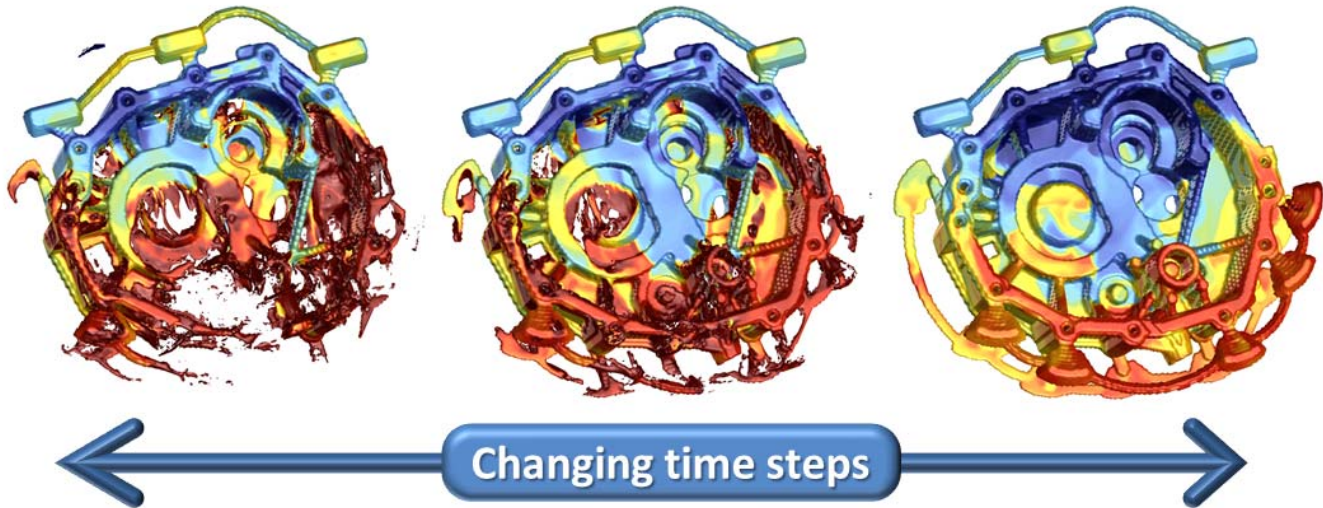
Data Management via XDB Workflows

In a typical CFD postprocessing work session, you read a volume dataset and then create postprocessing objects such as boundary surfaces, cutting planes, streamlines and iso-surfaces. Next, you carry out tasks like integrating forces, probing & plotting values, creating images and animations. XDB files, written from **FieldView**, are a highly compact representation of your postprocessing objects. With **FieldView 13**, XDB files can be directly imported in place of the much larger volume datasets that they were derived from.



To demonstrate the benefits of working with XDB data, we run **FieldView** in batch to create an XDB dataset for the in-cylinder combustion case shown at left, saving the surfaces and variables for the inlet/exhaust ports, and the moving pistons and cylinder. In an interactive **FieldView** session, we then read the transient XDB dataset in place of the volume dataset and add the spray parcel data in the same session.

Because the XDB dataset only contains the surfaces, reading and sweeping through the time steps is much faster than sweeping through the entire volume data, giving us a practical and interactive method to examine the combustion process.



A casting case illustrated above contains 170 time steps, and the original dataset is over 50GB in size. The XDB dataset, created by saving the iso-surface representing the filling material, is 1.5GB (32X smaller). After reading the XDB dataset, the molded part can be interactively rotated and transformed while you advance forward or backward in time through the mold-filling process.

XDB datasets can be managed the same as any other dataset: They can be scaled, duplicated and transformed; surfaces can be transformed; surfaces can be plotted on, probed and integrated with the same numerical fidelity as the volume datasets. XDB datasets tend to be much smaller, with a reduction in file size of 10X to 40X. Finally, the time to read XDB files is dramatically less compared to reading the volume data. By working with XDB datasets, you save time and require less compute resources during your interactive sessions, you need less disk storage for archival and you do not need to make compromises on numerical accuracy.

Making the creation of XDB files easier has also been addressed in this release by providing a more direct method for specifying the scalars and vectors that are saved. XDB files created with **FieldView** 13 preserve surface normals, letting you calculate normal-based integrals which can be used to directly resolve forces such as lift and drag.

Sweep Caching

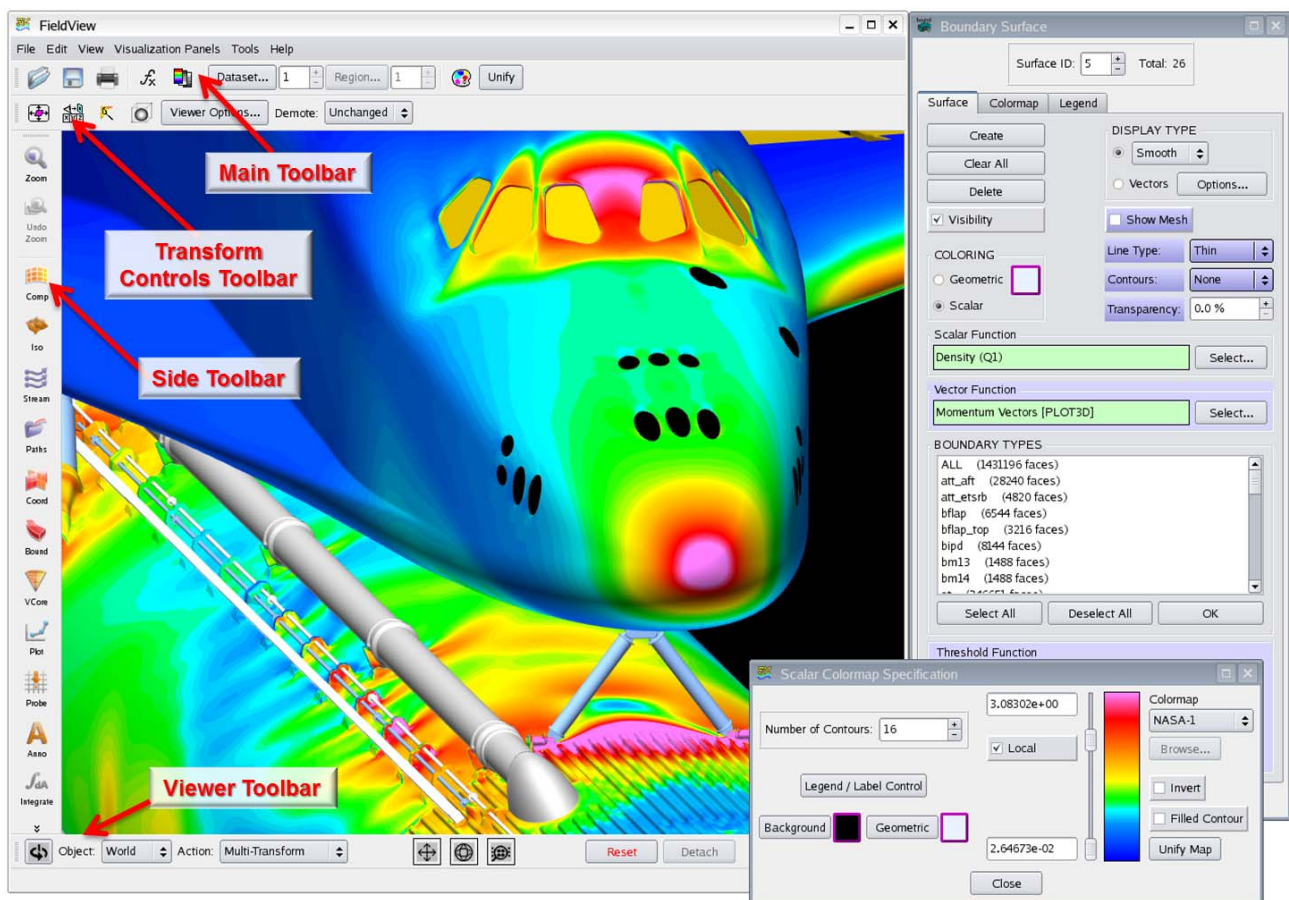
Sweep caching is a display operation in **FieldView** designed to dramatically speed up the sweeping of any surface, the animate operation for nearly all streamline/particle path displays and all transient sweeps. When you hit the sweep or animate button on any panel within **FieldView** that supports sweeping, the postprocessing objects for each step in memory are stored in a cache during the first sweep. Once the sweep has completed, the saved cache is played back. This delivers two important benefits:

1. Sweep operations, once cached, play back at greatly increased frame rates,
2. You can interact with your dataset and postprocessing objects (zoom, rotate and translate) **during** a sweep cache playback.

Transient sweep caching also works with transient XDBs, giving you an unprecedented ability to understand your transient flow problems. Transient sweep caches also feature the additional benefit of letting you navigate, using forward/back buttons, the slider, or by directly selecting any time step within the sweep cache without having to regenerate it.

FieldView 13 Graphical User Interface

The **FieldView** 13 graphical user interface combines the best of LINUX & Windows, featuring four toolbars that you use to navigate to any visualization panels or menus of interest. The **main toolbar** gives you direct access to RESTARTS (reading and saving), the function selector, the scalar colormap specification panel, Dataset and Region controls. The **Viewer** and **Transform controls toolbars** give you control over managing the placement of your dataset in the main graphics window. The **Side toolbar** contains icons that let you quickly navigate to any one of the visualization panels for surfaces and rakes. You'll also find icons to take you directly to the Integration Control panel or the Clip Group Definition panel where you can create Dynamic Clip groups. The size and location of the main window, the



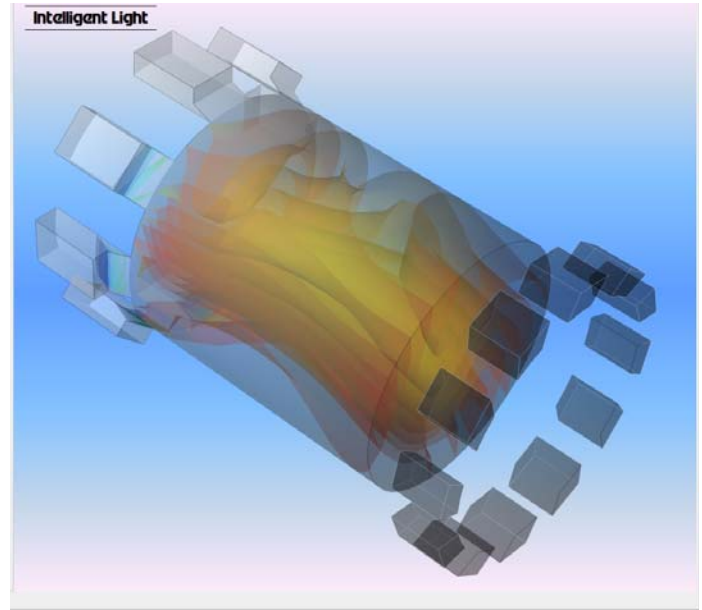
state and location of the toolbars, and the location for all of the other panels in **FieldView** are saved as a personal user preference on exit. This lets you customize your **FieldView** Interface to fit best with your graphical resources.

Within the newly re-designed panels, color-coding is used to highlight the changes. Fields with **green backgrounds**, typically used for read-only content, can be cut and pasted to other applications. This is particularly useful for capturing results from integrations. The layout for the slider fields to perform subsetting and thresholding are highlighted in **light blue**. All type-in fields have white backgrounds. The **Calculate** button is bright blue to make it easy to find.

Fast, High Quality Transparency

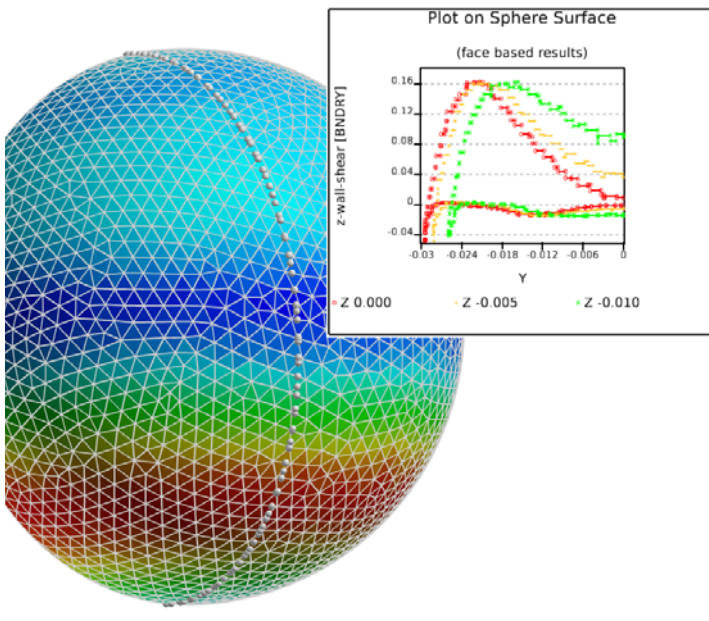
The new **FieldView** 'Standard Transparency' is a hardware-accelerated implementation of what previous versions of **FieldView** called 'Precise Transparency'. By using the GPU for computations, high quality, accurate images of overlapping transparent objects are produced at interactive frame rates. Quick transparency is still supported and is backward compatible with RESTARTS from previous **FieldView** releases. It is provided as an alternative to the standard, high quality method.

For systems with reduced functionality graphics hardware, **FieldView** Standard Transparency is not available and Quick Transparency is the only available option.



Probing and Plotting Improvements

Surface probing is changed to return the results of the functions stored with the surface. This differs from our previous approach where returned probe results were based on an interpolation of the volume-based results 'near' the surface being probed. Benefits of this approach are increased accuracy and reliability - this resolves instances where the volume interpolation was in poor agreement with known results at a surface.



Probing now returns face-based results on Boundary surfaces. It also returns the distance, and the difference in the scalar function, from the previous point probed.

Plotting has been changed similar to probing to return the results of functions stored on a surface. Plotting of face-based results is also possible. To work with 'surface-only' datasets, like XDB files, a new type of 2D plot path, Line Path (surface), has been added. This plot path option permits you to create line plots on X, Y or Z coordinate surfaces stored in XDB datasets.

High Performance Rendering

FieldView 13 delivers a completely new graphics core. Using many-core GPU hardware, along with parallel multi-threading we are able to deliver up to 40X performance improvements. The graphics speed-ups will scale from laptops to multi-core systems to clusters, and is fully compatible with multi-screen displays. By default, we use Frame Buffered Objects or FBOs to deliver the best performance on systems with the latest graphics cards and up-to-date drivers. However, **FieldView** can be run on systems with 'reduced functionality' graphics using Frames Buffers (FB) only. This rendering option is turned on by setting an environment variable: **FV_RF_GRAPHICS**. For those of you with integrated

graphics chipsets or drivers/cards older than 2006, we recommend that you run **FieldView** using the 'reduced functionality' option.

Other Important Improvements

- The previous **grid limit** of 10000 for a single dataset has been increased to **50000** for 64-bit versions. The image at right is for a dataset with ~14000 grids and 670M grid points.
- Several new **high quality fonts** will improve the look of your legends and annotations.
- Saving either a Complete or Current Restart, **creates & saves an FVX program** at the same time. This **FVX** program contains the **FVX** commands needed to re-create the surfaces, rakes and other post-processing objects.
- A **WINDOWS 64-bit client** is now provided. Other clients in this release are WINDOWS 32-bit and LINUX 32/64-bit. MAC 64-bit support will closely follow this release
- The **Microsoft HPC 2008 files**, needed to run **FieldView** for WINDOWS **parallel** servers are now automatically installed. Local basic and licensed parallel is **automatically configured**.
- A new **demotion mode** called '**simple**' uses the minimum number of transparency layers (2) to render the objects in the graphics window. This demotion mode is now the current default.
- A new optimization, enabled by setting the environment variable, **FV_ALT_LOOKUP**, should be used when working with large datasets and for datasets with many regions.
- The **dependence** on X services such as installed X fonts and VNC (batch X-server) has been **removed**. The X11 windowing system is no longer used for graphics drawing. Therefore, the -x mode of operating **FieldView** 13 is no longer needed and has been removed.
- When **FieldView** is run in **batch mode** from the command line using the **-batch** switch, it no longer requires an X-server to run.
- The **resizing** behavior of presentation rendered elements such as spheres, arrows and streamline tubes has **changed**. A '**Rescale**' button added to the Streamline, Particle path and Vortex Core/Surface Flows panels gives you additional control over these display types.
- New **scalar coloring interpolation** for surfaces is **fast** and more **accurate**.
- Legacy fonts have poorer quality compared with previous **FieldView** releases. Since this also affects legends generated from RESTARTS (which are based on the legacy fonts), **FieldView** automatically **substitutes** new **high quality** fonts on-the-fly for **legends only**.
- **Stereo display** is not supported with **FieldView** 13 but is scheduled for completion in a later point release.
- **Magenta** coloring of surfaces with **Inf/Nan values** is currently disabled. However, a message is sent to the console window to indicate when Inf/Nan values are encountered on a surface.

