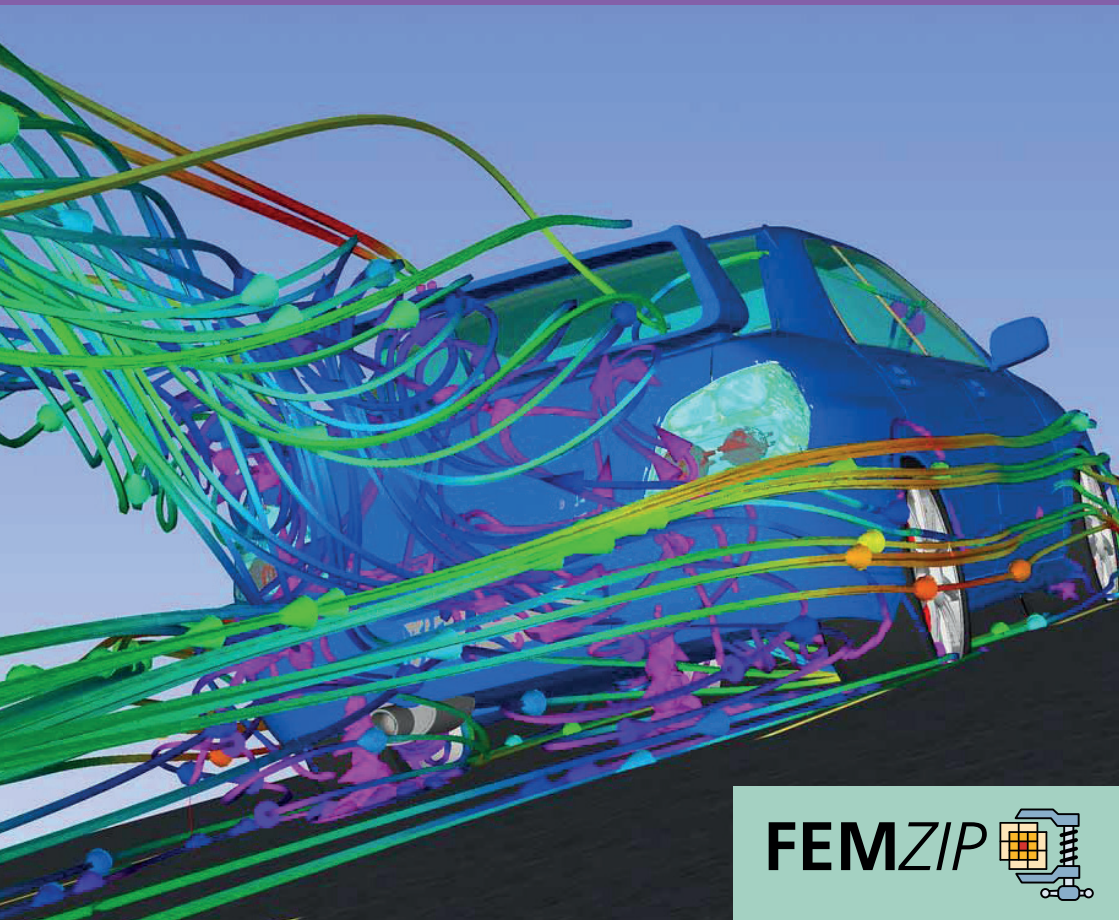
SIDACT GmbH

Simulation Data Analysis and Compression Technologies

FEMZIP: COMPRESSION OF SIMULATION RESULTS



FEMZIP

COMPRESSION WITH FEMZIP

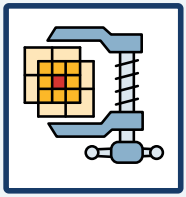
FEMZIP tools are specialized for the compression of simulation results. There are multiple versions suitable for various data formats common in the fields of crash-simulation, NVH and CFD.

CHALLENGE

Computer simulations as commonly used for product development in various industries generate a vast and growing amount of data. The growth in data is a result of larger, more detailed models and an increase in the volume of simulations performed to improve engineering design. Simulation data has to be analyzed, exchanged among engineers and archived for future reference and re-analysis. Network connections and storage space can become bottlenecks in workflows used by engineers. The challenge is to handle with large amounts of data in a time- and storage-saving manner in order to eliminate these bottlenecks.

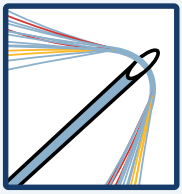
SOLUTION

The challenge can be met using the FEMZIP compression tools. The FEMZIP tools are specifically designed for the compression of simulation results and thus achieve high compression factors. The significant reduction in data volume leads to a reduction in the requirements for storage and backup resources. In addition compressed results can be exchanged faster over data networks.



Reduced Archive Size

If all simulation data is compressed only a fraction of the storage is required. Storage and backup capacities can hold more simulation results. Hence, investments in the growth of storage and archive infrastructures can be avoided.



Shorter Data Transfer Times

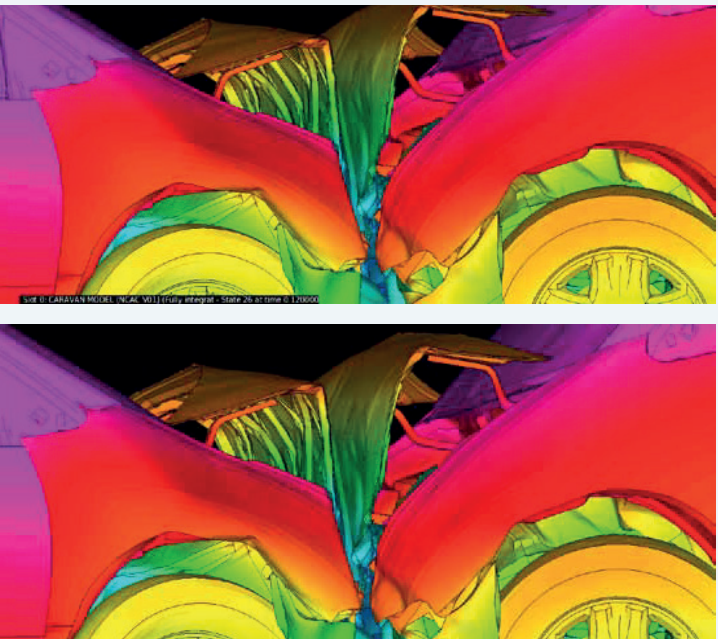
Transferring result data across computer networks can be very time consuming. Transmission speeds are limited by the available network bandwidth. Since compressed simulation results require significantly less storage they can be transferred in a fraction of the time required for transferring uncompressed results.

Quicker Data Loading

Reading data into post processors can be a time consuming task as well. If data storage is provided on file servers, compressed data can be read directly into post processors significantly quicker due to the faster data transfer. In some cases load times can even be improved when reading from a local hard drive.

FUNCTIONALITY

Simulation results are usually stored in 32- or 64-bit floating point representation. Due to numerical approximation errors and the inaccuracy in the model description itself, the 32- or 64-bit floating point representation is often unnecessarily precise compared with the effective precision of the simulation results. Therefore FEMZIP is mainly based on lossy compression. The loss is controlled by the user by means of precision settings specified for the geometry and for each variable. In addition FEMZIP supports the option to compress specific variables losslessly as well as the option to eliminate variables completely. In general, lower precision settings result in higher compression factors.

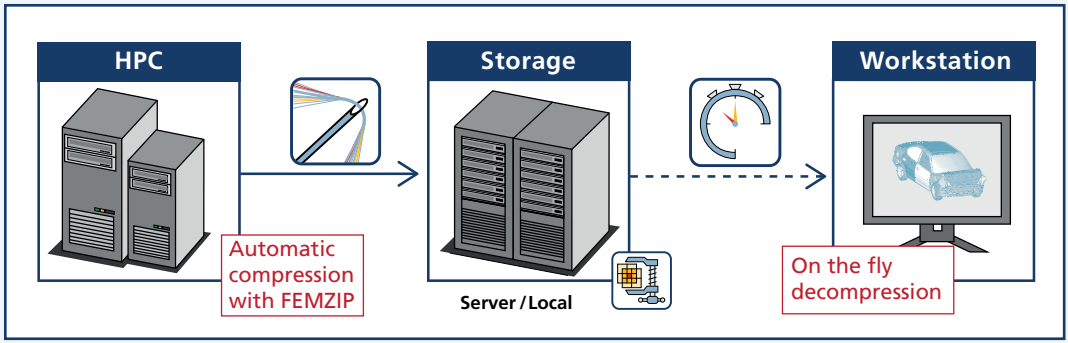


The visual appearance of the original and the compressed results is shown. While a compression factor of 8.8 was achieved no difference is noticeable. Source: topcrunch.org

PROCESS INTEGRATION

FEMZIP is made to fit into the workflow used by engineers. In order to maximize the benefit of data compression, FEMZIP is designed to be integrated into batch processes. In this way simulation results can be compressed automatically after they have been generated, reducing file sizes from the start. Although the original data formats can be retrieved by a stand-alone decompression tool, this is often not necessary. The decompression functionality of FEMZIP is integrated in common post-processing tools and enables direct access to the content of compressed files.

FEMZIP does not alter existing workflows while providing the benefits of data compression.



CRASH

Crash-simulations are a standard CAE application in the automotive industry. FEMZIP-CRASH offers specialized data compression tools for the most commonly used crash-simulation software packages.

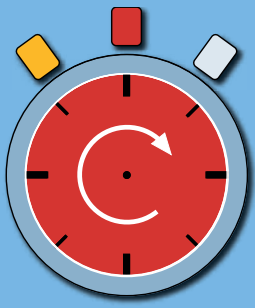
FEMZIP-CRASH products include compression solutions for result files from PAM-CRASH, LS-DYNA and RADIOSS. The support for RADIOSS was added recently with the introduction of FEMZIP-R. The high compression factors achieved with FEMZIP-CRASH products and the good integration into leading post-processors have made them popular throughout the industry.

Products:

- FEMZIP-L (LS-DYNA)
- FEMZIP-P (PAM-CRASH)
- FEMZIP-R (RADIoSS)
- FEMZIP-A4DB
- FEMZIP-ERF (PAM-CRASH ERFH5)

Supported Post-Processors:

- GNS Animator
- ESI Visual Environment
- LS-Prepost
- Altair Hyperview / Hypergraph
- BETA META
- Oasys D3PLOT

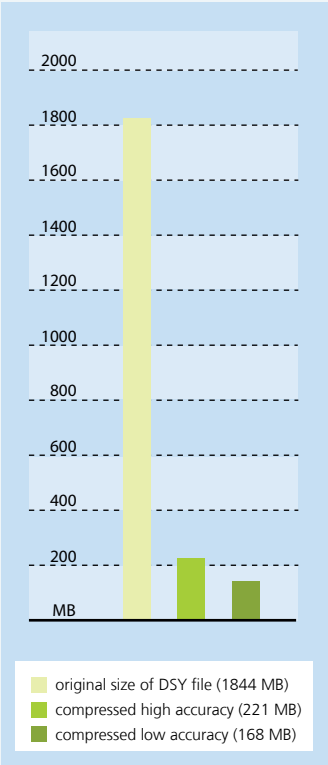


69 sec Original DSY

34 sec FEMZIP file

Import time for GNS Animator: Measurements by Volkswagen AG for PAM-CRASH output file (DSY) of a simu lation using a car model with 1031990 nodes (2x Intel Xeon CPU 3.06 GHz).

COMPRESSION RESULTS



Test results by Volkswagen AG for PAM-CRASH output file (DSY) of a simulation using a car model with 1031990 nodes.

Michael Taeschner, Volkswagen AG:
»At Volkswagen we use FEMZIP to compress most of the crash-simulation results. Compression rates of up to 10 x help us to minimize storage and archive resources. We worked with GNS and Fraunhofer SCAI to streamline the integration of FEMZIP into Animator. The result is a significant improvement of data import, allowing our engineers to spend more time analyzing results«.

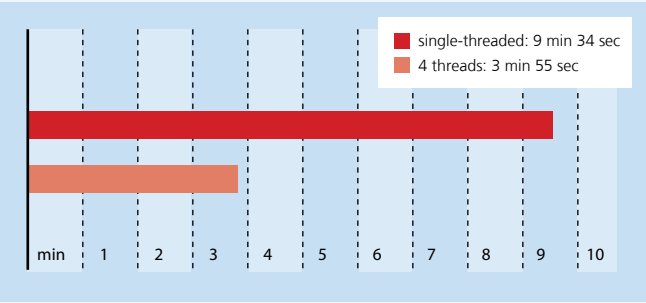
Stefan Hanson, GNS mbH:
»We integrated the decompression of FEMZIP-compressed data in our postprocessor Animator 4. The effect was a reduction of the read-in times of compressed PAM-CRASH files by more than 50%. Data compression with FEMZIP combined with built-in decompression in Animator 4 increases the productivity of our customer's engineers«.

CFD

The use of computational fluid dynamics (CFD) in engineering applications generates tremendous amounts of data. FEMZIP-CFD offers data compression tools specialized for CFD data.

FEMZIP-CFD products for the EnSight Case Gold and OpenFOAM format are in stock.

FEMZIP-CFD products are specially designed for the challenges which arise when handling extreme amounts of data. They are built on a parallel software infrastructure to fully benefit from today's multi-core processors.



Compression times for single- and multi-threaded runs of FEMZIP-ENSG on a 38 GB transient model (Intel Xeon CPU 2.93GHz)

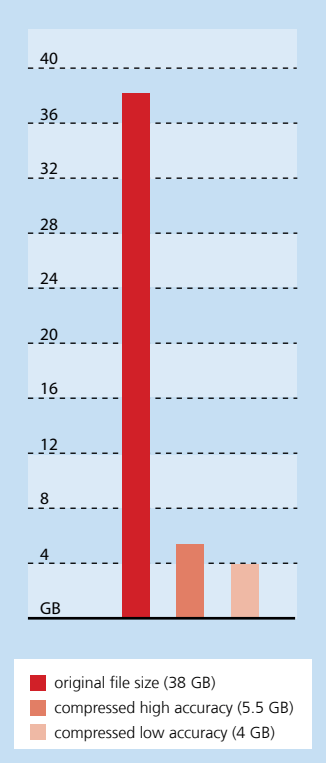
Products:

- FEMZIP-ENSG
- FEMZIP-OpenFOAM

Supported Post-Processors:

- EnSight
- BETA META
- ParaView

COMPRESSION RESULTS



Airflow simulation around a car: 6 variables, 43 million elements, 21 time steps

ENSIGHT

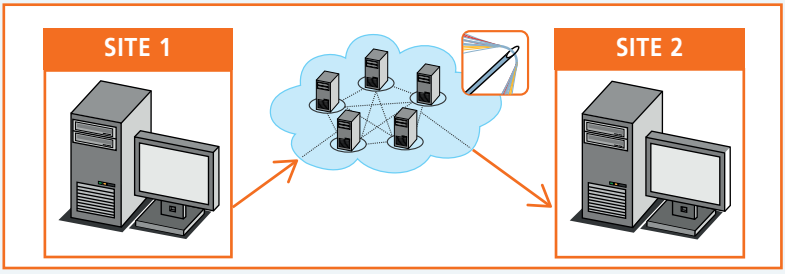
Simulation results in EnSight Case Gold format can be processed seemlessly from within EnSight since that is its native data format. In order to maintain this feature FEMZIP-ENSG is fully aligned with the EnSight Case Gold format. Accessing FEMZIP-ENSG compressed files from within EnSight is supported on Windows and Linux operating systems.

NVH

Large data sets resulting from noise vibration harshness (NVH) simulations require long transmission times when exchanged among engineers. Efficient data compression for NVH results is provided by FEMZIP-NVH.

Collaborating engineers at different sites have to exchange result data across slow telecommunication networks. Particular for models with a large number of modes this can be a very time consuming task. The resolution of simulation results is sometimes reduced so that they can be transmitted more quickly. These modifications have to be carried out by the engineer.

FEMZIP-N can achieve extremely high compression factors for such models. Transmission times are lowered from hours to minutes without the need to edit the compression results. Consequently, a more fluent collaboration is possible. FEMZIP-N supports MSC NASTRAN and RADI OSS results in the OP2 data format.

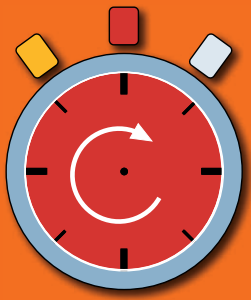


Products:

- FEMZIP-N:
  Compression of NASTRAN and
  Altair OptiStruct results in OP2 format

Supported Post-Processors:

- GNS Animator
- BETA META
- Altair Hyperview / Hypergraph

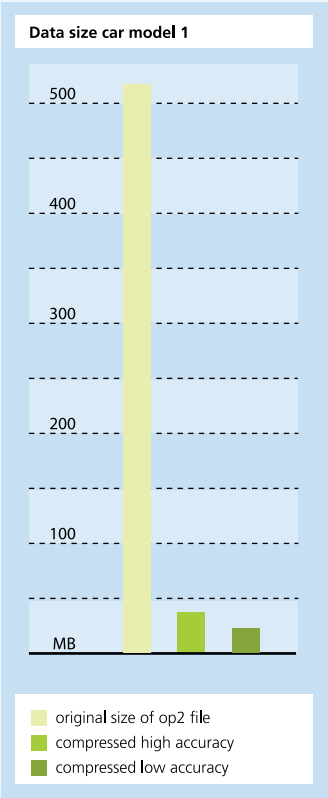


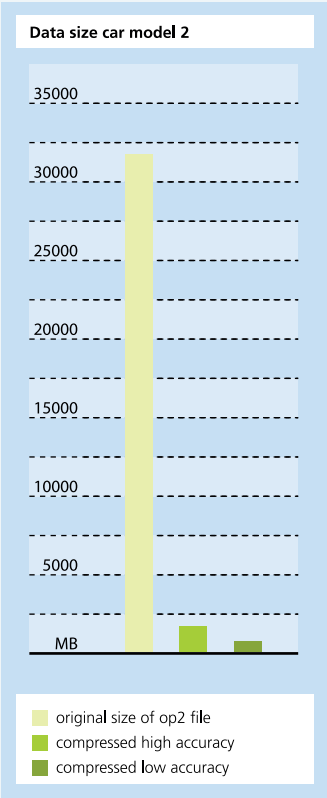
uncompressed: 9 sec

compressed: 2,8 sec

Import time for the geometry of car model 1 in GNS Animator.

COMPRESSION RESULTS





Car model 1:
884520 nodes, 15 modes, FEMZIP-N compression factor 12.9, reducing the file size from 524 MB to 41 MB.

Car model 2:
661842 nodes, 1564 modes, FEMZIP-N compression factor 43, reducing the file size from 30.9 GB to 0.7 GB.

As illustrated NVH results with a large number of modes can be compressed extremely efficient with FEMZIP-N.

FREE EVALUATION

Find out how you can benefit from FEMZIP and ask for a free evaluation license.

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