

CFD2000 Software System

64-bit Computing – Windows x64



A D A P T I V E R E S E A R C H

Introduction

“Some operating systems reserve portions of process address space for OS use, effectively reducing the total address space available for mapping memory for user programs. For instance, Windows XP DLLs and other user mode OS components are mapped into each process's address space, leaving only 2 to 3 GB (depending on the settings) address space available. This restriction is not present in 64-bit operating systems.”¹

“Today, 64-bit processors have become the standard for systems ranging from the most scalable servers to desktop PCs. The way to take full advantage of these systems is with 64-bit editions of Microsoft Windows products.

The 64-bit systems offer direct access to more virtual and physical memory than 32-bit systems and process more data per clock cycle, enabling more scalable, higher performing computing solutions. There are two 64-bit Windows platforms: x64-based and Itanium-based.

x64 solutions are the direct descendants of x86 32-bit products, and are the natural choice for most server application deployments—small or large. Itanium-based systems offer alternative system designs and a processor architecture best suited to extremely large database and custom application solutions.

x64 Platform: x64 technologies are based on 64-bit extensions to the industry-standard x86 32-bit architectures from AMD and Intel. x64 processors allow a choice between running 32-bit and 64-bit editions of Microsoft Windows Server, but only Windows Server x64 provides a platform for scalable and high-performing native x64 applications while still supporting most legacy 32-bit applications without emulation on the same system.”²



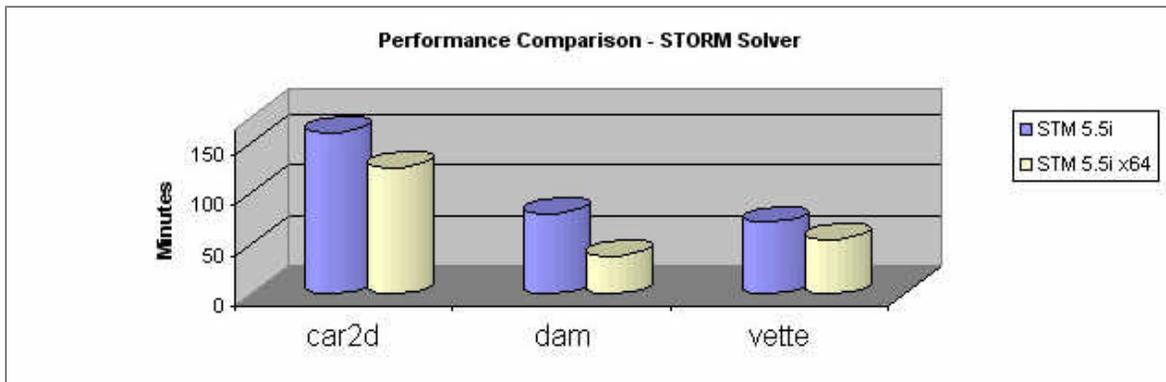
The graphic features a perspective view of a road leading to a bright horizon. On the left, the text 'Microsoft 64-bit computing' is displayed above a 'ROUTE 64' shield. On the right, a dark panel contains the text: 'Have you shifted gears yet? Get in the fast lane with Microsoft 64-bit technology'. Below this, it states 'Microsoft's 64-bit solutions deliver superior' followed by a bulleted list: 'Scalability', 'Performance', and '32-bit Compatibility'. At the bottom right of the panel, it says 'The future is here today' and 'Learn more' with a small icon of three overlapping squares.

1. www.wikipedia.org
2. www.microsoft.com/servers/64bit/x64/overview.mspx

64-bit STORM Solver

A 64-bit version of the STORM flow solver is now available. This version of STORM has been developed using the Intel Fortran 64-bit compiler (and related development tools). Now CFD2000 models can be executed in native 64-bit mode on Windows x64 platforms (e.g., Vista 64), and are not restricted to the typical 2-3 GB memory limit. CFD2000 is now capable of executing CFD models with very large computation domains (e.g., tens of millions of computational cells).

Computational performance is also increased. The 64-bit STORM flow solver executes between 25-50% faster than the 32-bit flow solver for the same CFD model.



Compatibility

All CFD model files are compatible between 32-bit and 64-bit installations (including output to the data visualization program FIELDVIEW-STORM).

Requirements

The STORM 64-bit flow solver must be executed on either MS Windows XP x64 or Vista64. At least 4 GB of RAM memory should be available (16 GB recommended). In order to generate customized STORM flow solver executables, the following two development programs are required:

- Intel Visual Fortran 9.1 (or higher) for 64-bit platforms
- MS Visual Studio 2005 or higher

Example Case

To demonstrate the 64-bit STORM flow solver's computing capability, the VETDUST model from the example library has been selected and modified. Both a 32-bit and 64-bit case is presented for comparison.

32-Bit Case

The VETDUST example library model was modified (mesh only) to the following conditions:

Mesh size: 213 x 47 x 96
 961,056 cells

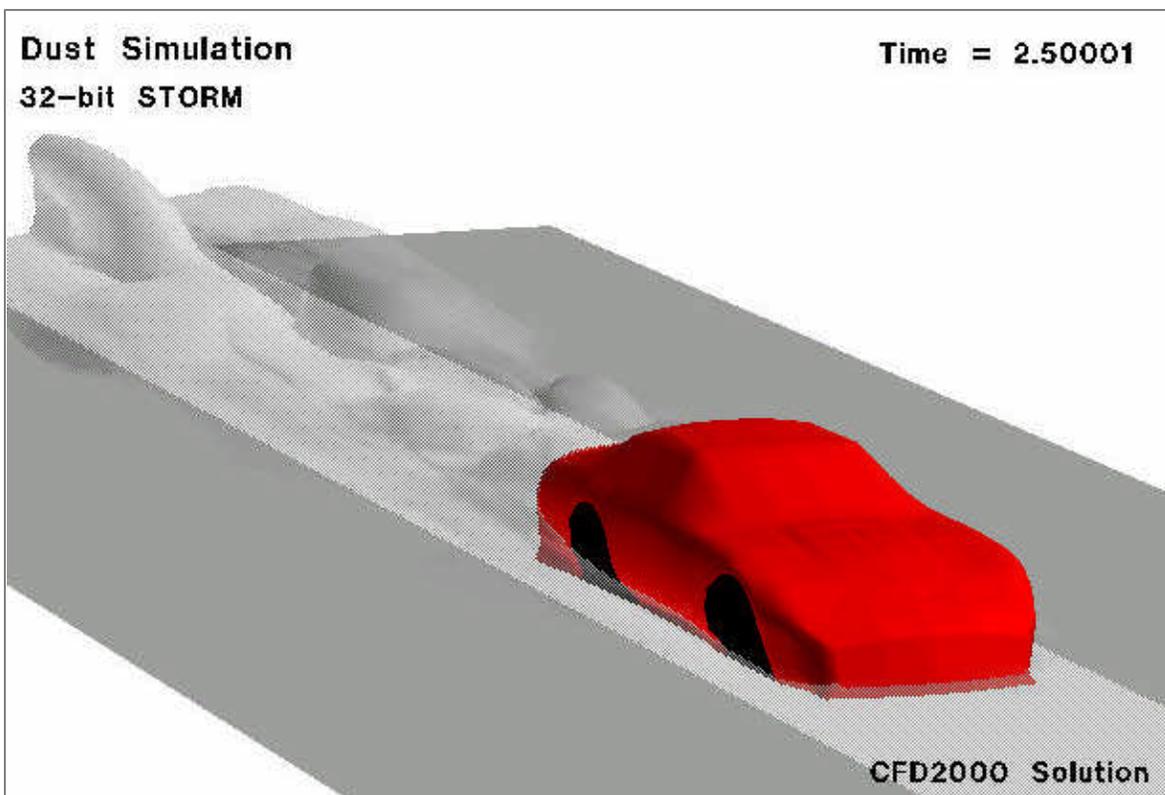
End time: 4 seconds

DT: 0.005 seconds

Computer: HP 2.66 GHz

CPU Time: 7 hours 36 min

RAM used: 430 MB



Example Case (continued)

64-Bit Case

The VETDUST example library model was modified to the following conditions:

Mesh size: 555 x 74 x 162
 6,653,340 cells

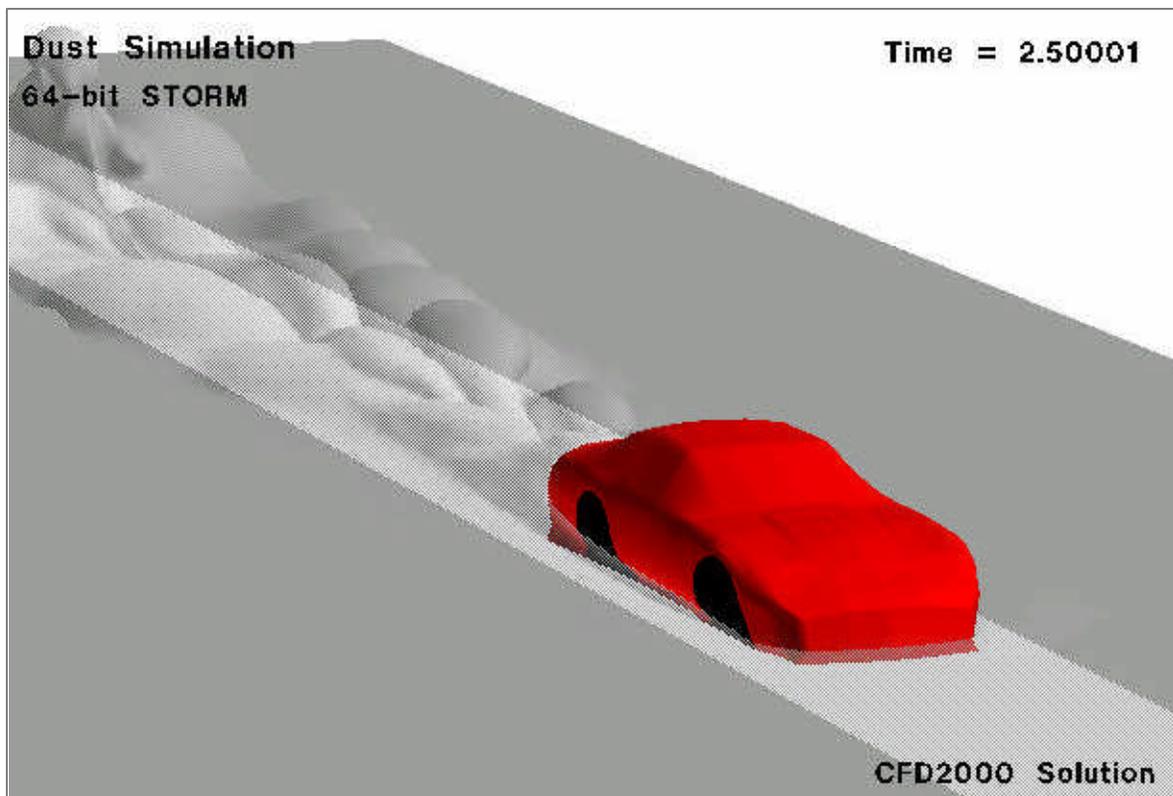
End time: 4 seconds

DT: 0.005 seconds

Computer: ASUS 2.13 GHz

CPU Time: 34 hours 01 min

RAM used: 2912 MB



Note that both the 32-bit and 64-bit cases were executed in single-processor mode (i.e., the parallel version of the STORM solver was not used). Performance on quad-core computers will be significantly increased executing the parallel version of STORM.

Future Development – x64

The next release of CFD2000 will include a parallel version of the 64-bit STORM flow solver, in order to maximize performance on dual/quad core CPU x64 computers (Windows). In addition, for CFD models requiring large computational domains (total cell count above 15 million), a 64-bit CFD2000 model setup program will also be made available.

More Information

Please contact a CFD2000 sales representative for more information on capabilities and licensing.