

# Dytran™ 2007 r1

## Release Guide

## Corporate

MSC Software Corporation  
2 MacArthur Place  
Santa Ana, CA 92707  
Telephone: (800) 345-2078  
FAX: (714) 784-4056

## Europe

MSC Software GmbH  
Am Moosfeld 13  
81829 Munich  
GERMANY  
Telephone: (49) (89) 43 19 87 0  
Fax: (49) (89) 43 61 71 6

## Asia Pacific

MSC Software Japan Ltd.  
Shinjuku First West 8F  
23-7 Nishi Shinjuku  
1-Chome, Shinjuku-Ku  
Tokyo 160-0023, JAPAN  
Telephone: (81) (3)-6911-1200  
Fax: (81) (3)-6911-1201

## Worldwide Web

[www.mscsoftware.com](http://www.mscsoftware.com)

User Documentation: Copyright © 2007 MSC Software Corporation. Printed in U.S.A. All Rights Reserved.

This document, and the software described in it, are furnished under license and may be used or copied only in accordance with the terms of such license. Any reproduction or distribution of this document, in whole or in part, without the prior written authorization of MSC Software Corporation is strictly prohibited.

MSC Software Corporation reserves the right to make changes in specifications and other information contained in this document without prior notice. The concepts, methods, and examples presented in this document are for illustrative and educational purposes only and are not intended to be exhaustive or to apply to any particular engineering problem or design. THIS DOCUMENT IS PROVIDED ON AN "AS-IS" BASIS AND ALL EXPRESS AND IMPLIED CONDITIONS, REPRESENTATIONS AND WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE DISCLAIMED, EXCEPT TO THE EXTENT THAT SUCH DISCLAIMERS ARE HELD TO BE LEGALLY INVALID.

MSC Software logo, MSC, MSC., MD, Adams, Dytran, Marc, Mentat, and Patran are trademarks or registered trademarks of MSC Software Corporation or its subsidiaries in the United States and/or other countries.

NASTRAN is a registered trademark of NASA. LS-DYNA is a trademark of Livermore Software Technology Corporation. All other trademarks are the property of their respective owners.

LAM/MPI Copyright (c) 2001-2004 The Trustees of Indiana University. All rights reserved. Copyright (c) 1998-2001 University of Notre Dame. All rights reserved. Copyright (c) 1994-1998 The Ohio State University. All rights reserved. This product includes software developed at the Ohio Supercomputer Center at The Ohio State University, the University of Notre Dame and the Pervasive Technology Labs at Indiana University with original ideas contributed from Cornell University. For technical information contact Andrew Lumsdaine at the Pervasive Technology Labs at Indiana University. For administrative and license questions contact the Advanced Research and Technology Institute at 1100 Waterway Blvd. Indianapolis, Indiana 46202, phone 317-274-5905, fax 317-274-5902. MPICH Copyright 1993, University of Chicago and Mississippi State University.

Use, duplication, or disclosure by the U.S. Government is subject to restrictions as set forth in FAR 12.212 (Commercial Computer Software) and DFARS 227.7202 (Commercial Computer Software and Commercial Computer Software Documentation), as applicable.

# Contents

## Dytran Release Guide

### 1 Introduction

### 2 Eulerian and Fluid-Structure Interaction (FSI)

Import of Euler Archives	8
Graded Meshes	9
2-D Axi-symmetry	9
Nonuniform Euler with MESH,BOX	10
Hydrostatic Boundary Conditions	11
Skin Friction	11
Robustness of the Multi-material Euler Solver	12
New Models	12
Automatic Skipping for Stationary Coupling Surfaces	13
Other Enhancements and Bug Fixes	13

### 3 System Information

Software Installation	16
Licensing	16
Release Platforms	16
MPI for Dytran LS-DYNA	17
Memory Requirements	18
Performance	19

## 4 Using Dytran

Running Dytran on Windows	26
Running Dytran on Unix and Linux	26
Postprocessing Dytran Results	26
Postprocessing Dytran Results of Windows on UNIX	27

# 1 Introduction

---

Dytran™ 2007 r1 is the most significant and comprehensive version of Dytran released by MSC.Software, bringing new simulation technology and faster solutions.

Dytran 2007 r1 is available on UNIX (HP RISC 2.0, HP-UX Itanium2, SGI, IBM, HP Alpha, Sun SPARC Solaris), Intel Linux (Red Hat 9), Linux Itanium2 IA64 (Red Hat AS 3), Linux EMT64 X86-64 (Red Hat Enterprise Linux WS3), Windows 32 bit (2000, and XP) and Windows 64 bit (XP) platforms.

Dytran 2007 r1 has many new powerful meshing technologies and capabilities in several key areas, resulting in higher degrees of robustness, performance, and ease-of-use. These include:

- Graded and nonuniform Eulerian meshes to dramatically increase the computational performance of Eulerian solver. These capabilities will benefit important FSI applications such as blast waves, sloshing, airbags and UNDEX (Under Water Shock Explosion) simulations.
- Multi-Stage and Resize capability to import the Euler results from a previous run with fine mesh in to a new run with coarse mesh to significantly improve the simulation time.
- Speed up of coupling surface computations by automatically detecting and skipping stationary coupling surfaces resulting in 2X to 3X performance improvements in applications such as pipe flow problems, tank filling, sloshing, and airbags without the adaptive euler.
- Speed up of axi-symmetric mesh models through time step determination based on the axial and radial directions;
- Shipping and UNDEX applications can now use a special boundary treatment defined based on hydrostatic pressure profile;
- For bottle manufacturing, a new capability is introduced to model the gauge pressure in hot filling of bottles. When the fluid cools down the bottle contracts due to loading by negative gauge pressure.
- Capability to model pre-stressed concrete structures prior to blast or other type of dynamic loadings.
- Capability to model a Boundary Layer for viscous problems by using skin friction.

The Dytran 2007 r1 online documentation is available in PDF format on all platforms. The online documentation includes the *Reference Manual*, *Theory Manual*, *User's Guide*, *Example Problem Manual*, *Release Guide* and the *Installation Instructions*.

Dytran 2007 r1 does not include or support USA (Underwater Shock Analysis) code.

Dytran uses the Macrovision FLEXlm™ licensing system. If you already have an MSC.Dytran 2005 r3 license, you will not need to obtain a new authorization code to activate Dytran 2007 r1 on your computer. However, you will need to install the latest FLEXlm 10.8 license server available on Dytran installation CD. The enclosed *Dytran 2007 r1 Installation Instructions* describe how to install Dytran 2007 r1 on your computer.

If you need assistance while installing Dytran 2007 r1, please call the MSC Technical Support Hotline at 1-800-732-7284, or E-mail your support questions to [mscdytran.support@mscsoftware.com](mailto:mscdytran.support@mscsoftware.com).

## 2 Eulerian and Fluid-Structure Interaction (FSI)

---

Many new powerful features have been introduced in this release, resulting in higher levels of robustness, performance and ease-of-use. A major emphasis in the Dytran 2007 r1 release is to dramatically increase the performance of the FSI solver. In addition the enhanced robustness of the Multi-Material Euler Solver with strength will offer a unique and unprecedented technology to solve complex applications such as the ballistic example as shown below. With Dytran 2007 r1, simulating these new and complex FSI applications become a reality while existing applications can be predicted with much more fidelity.

## Import of Euler Archives

In many cases, reading the Eulerian results can significantly reduce the simulation time by importing the Eulerian archives of an initial run. Moreover, results can be mapped onto a coarser or finer mesh. For example, the initial stage of a blast wave requires a fine mesh. After the wave front has become less steep, the run can be terminated and results can be imported in a new run. The results of the fine mesh are then mapped onto a coarser mesh. The mapping does not have an adverse impact on the integrity of the solution because it conserves momentum, mass, and internal energy. Since the new run is not a restart run, it is possible to add a coupling surface or to remodel items. For example, to simulate the impact on several structures in different positions, the propagation of the blast wave from ignition point to the vicinity of the structures only need to be done once.

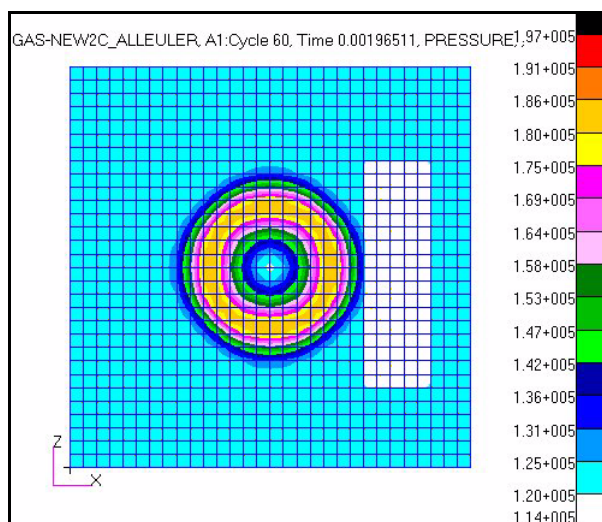


Figure 2-1 First Cycle of Run that uses Euler Archive Import



## Graded Meshes

In simulations with Euler and coupling surfaces, it is preferred to use orthogonal meshes. In addition, a non-uniform euler mesh can speed-up the simulation. The only non-uniform meshes that Dytran accepts are those created by Patran. But the non-uniform orthogonal meshes generated by Patran have drawbacks. The small mesh-sizes propagate to the boundary. So even at the boundary there are elements that have at least one small dimension. To obtain really coarse elements at the boundary, block structured meshes can be used. A block of fine elements is then glued into a block of coarse elements. This allows for orthogonal meshes that consist of really coarse and really fine elements. These graded meshes are useful in applications such as blast wave simulations.

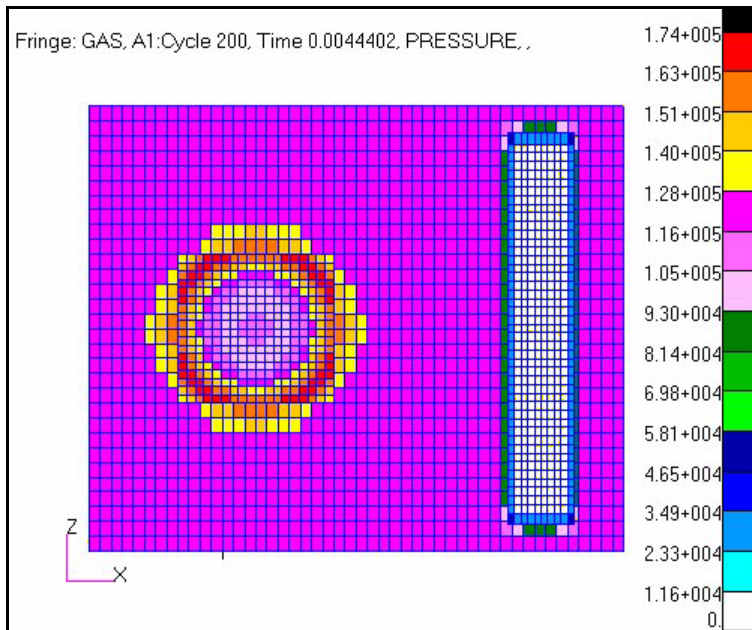


Figure 2-2 Graded Mesh

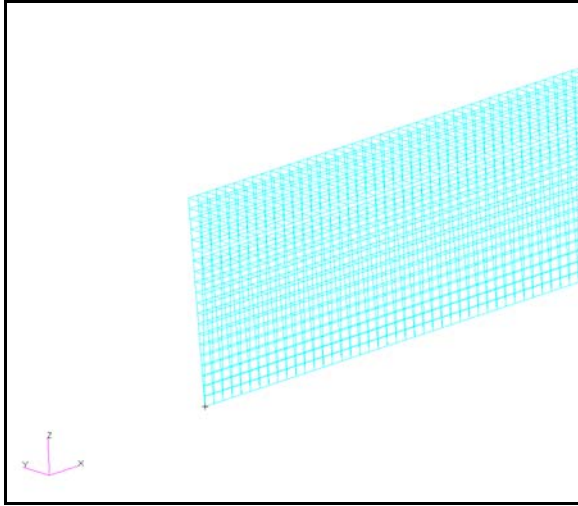
## 2-D Axi-symmetry

Dytran does not have a 2-D axi-symmetric solver. Instead, a pie-shaped model of small angle and consisting of one layer of elements can be used. For sufficiently small angles, this is a good approximation to a real 2-D axi-symmetric simulation. Because of the small angle, the element size in circumferential direction is small resulting in very small time steps. Since the combined hoop stresses result in a radial force, there should be no dynamics in the circumferential direction. Therefore, the time step computation can leave out the circumferential direction resulting in much shorter run times. But pie meshes created by Patran are written out in single precision. This leads to small errors in normals and causing dynamics in the circumferential direction. To avoid these errors, two approaches have become available and are activated by `PARAM,AXIALSYM`:

- Create a rectangular mesh. Dytran transforms it into a pie.

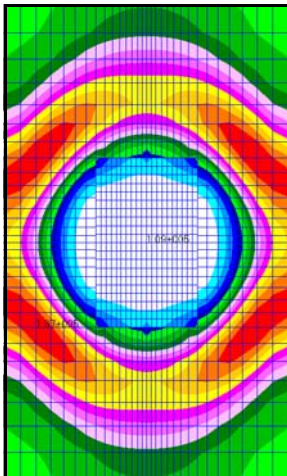
- Create a pie mesh with Patran and Dytran aligns the normals such that dynamics in circumferential direction is avoided.

This allows leaving out the circumferential direction from time step considerations.



## Nonuniform Euler with MESH,BOX

With `MESH,BOX`, a bias can be specified for each coordinate direction. The ratio between the smallest and largest element size is the required input. The growth in element size can either start at the reference point of the `MESH` or at the center. To generate elements with constant element size in the center region, a second mesh of constant mesh-size can be defined and glued into the biased mesh by using the graded mesh functionality.



## Hydrostatic Boundary Conditions

To simulate bubble collapse in UNDEX simulations, it is essential to have boundary conditions that resemble a hydrostatic pressure profile. This can be done by many distinct **FLOW** or **PORFLOW** entries but this is cumbersome. With the new **PORHYDST** and a new option for **FLOW**, this can be done automatically. These boundary definitions use a **HYDSYTAT** entry to prescribe a matching hydrostatic boundary condition. An example illustrating the use of these new definitions is shown in figure 3. A weak blast wave is ignited in the ocean. After initial expansion it starts to collapse and after the collapse it starts to expand again.

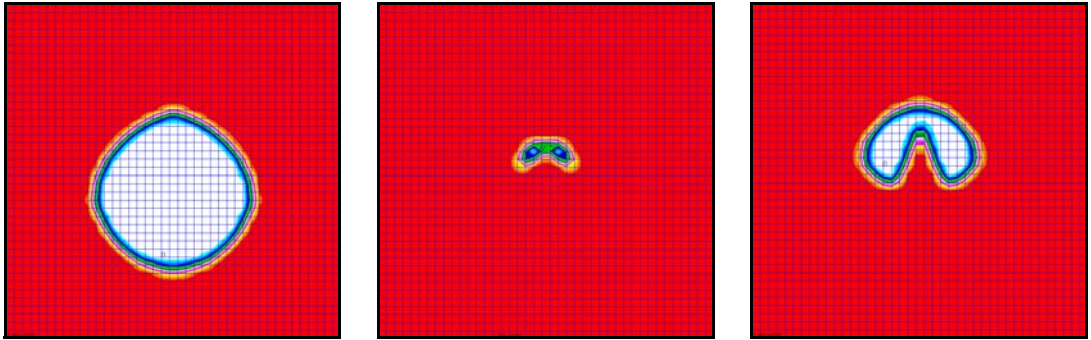


Figure 2-3 FMAT of Water at Maximum Expansion, Maximum Compression, and Second Blast Wave

## Skin Friction

In many flow simulations, fluid moves along a wall or structures. Often the viscous effects are limited to a quite small region along structure surfaces, forming a boundary layer. If the size of this boundary layer is smaller than an Euler element, the shear forces from the viscous fluid on the structure can not be accurately computed. In Dytran 2007 r1, an empirical law is used to calculate the shear forces. Coefficient of skin friction is available either in literature or from experimental studies.

Moreover, the skin friction can account to some degree for turbulence and roughness of the structural surface. Figure 2-4 shows air flow past a cylinder. Flow conditions are such that the Reynolds number is large. According to experiment, vortex shedding takes place. Using only viscosity will not show this, but by using skin friction this occurs as shown in Figure 2-4.

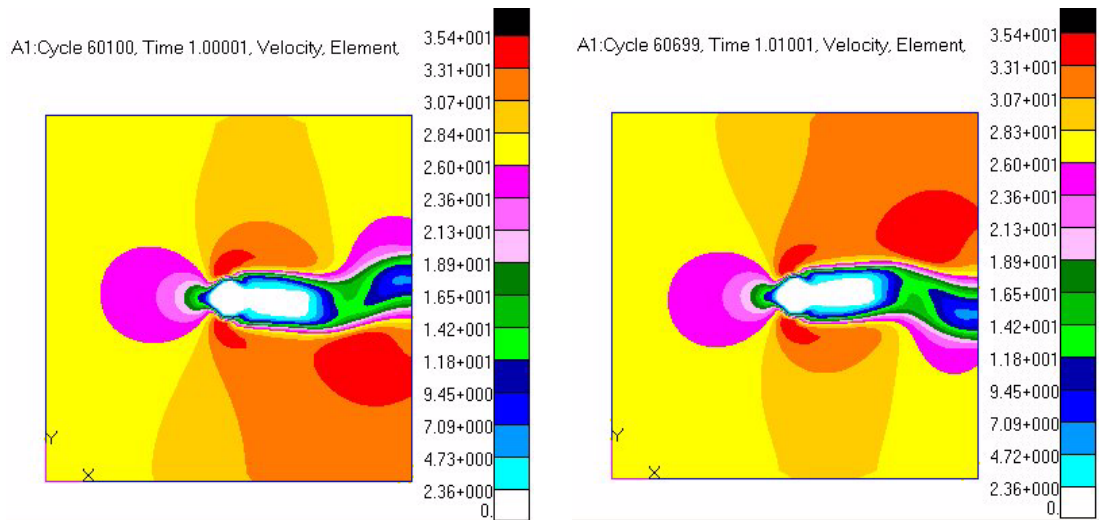


Figure 2-4 Vortex Shedding with Skinfriction

## Robustness of the Multi-material Euler Solver

The multi-material solver with strength has been made more robust. In particular:

- The removal of small masses could sometimes lead to zeroing out of the stress tensor
- VELMAX,NO did not work properly for multi-material clumps

## New Models

User-defined variables such as EXUSR1 cannot be used in the user-defined material models of Eulerian models such as EXEOS. To allow material models based on additional user-defined variables, the following material models have been added:

- The EXEOS1
- The EXYLD1 for Eulerian materials
- The FAILEX2 for the multi-material Euler solver with strength

These models allow two user-defined variables.

## Automatic Skipping for Stationary Coupling Surfaces

The coupling surface computation needed for the interaction between Euler meshes and Lagrange structures is very CPU intensive, taking about 20% to 50% of total run time. A lot of CPU time is wasted for stationary coupling surfaces that do not move. In the past, [COSUBMAX](#) had to be added to avoid this situation. Dytran 2007 r1 automatically detects whether a coupling surface moves or is stationary. It does not redo the computation as long as the coupling surface is stationary.

Areas of application where stationary coupling surface regularly occur are tank filling, pipe flow, and sloshing. In an example of outflow of water from a bottle into a container, it took only 7 hours 22 minutes with Dytran 2007 r1 compared to 21 hours 45 minutes by Dytran 2005r3 without using coupling surface subcycling, giving a speedup of 2.9X.

In general, speedups between 2X and 3X apply to tank filling and pipe flow problems with stationary coupling surfaces where [COSUBCYC](#) had not been added.

## Other Enhancements and Bug Fixes

- 1-22315081 Mesh card does not work correctly with CTETRA elements.
- 1-23529951 Dytran SET=ALLLAGSOLID output no result in TETRA elements.
- 1-52062451 WALL cannot recognize truncated SetID.
- 1-24132136 ALLCONTACTS creates %F when RCONN is present.
- 1-24379041 PLOAD4 on CPENTA gets an error.
- 1-24871891 Output file corrupted when using Tet4 elements.
- 1-24379041 Problem with CFACE1.
- 1-45435977 limit of five Euler materials for multi-material Euler solver has been increased to 10.
- 1-25870971 Dytran Computing Time increases with No. of Points of Stress-Strain Curve.
- 1-44696882 Errors in DETSPH format. If multiple DESTSPHs are used and some fields are left blank then only the first DETSPH is processed correctly.
- 1-18620441 MATRIG summary shows double the mass and relocation of C.G when combined with prestress run.
- 1-44044341 The total distortional energy per material is not computed for Eulerian materials modeled by the multi-material solver.
- Cold gas Inflator.
- Hot filling with FFCONTR.
- For multi-material Euler problems with several materials, the material interfaces can easily be visualized in one plot by using the new HMAT variable. HMAT is the material with the largest volume fraction inside an element. The material ID used for HMAT is the internal material ID.
- Reversal does not always work correctly for quads.

- Handle dummy shells in COUP1FL.
- Bugs in dymat25: iteration criterion, effective stress output.
- Generalization of PORFLCPL and PORGBG for use in MD Nastran SOL700. PORFLCPL can also be used to couple GBAGs. Both a PORFLCPL and a PORGBG are allowed on a porous subsurface. Makes it easier to use with from CFD to GBAG.

# 3 System Information

---

- Software Installation 16
- Licensing 16
- Release Platforms 16
- MPI for Dytran LS-DYNA 17
- Memory Requirements 18
- Performance

## Software Installation

On the Windows platforms, Dytran 2007 r1 can easily be installed from CD-ROM as it uses the standard Windows Installation Wizard. On Unix and Linux platforms, the MSC.Software standard installation script can be used to install the software on your system. Dytran 2007 r1 is the successor of MSC.Dytran 2005r3.

## Licensing

Dytran uses the FLEXlm license manager as the licensing system for nodelock and network licensing. To run Dytran, you need an authorization code from MSC.Software Corporation. If you already have a license for MSC.Dytran 2005, you will not need to obtain a new license for Dytran 2007 r1.

However, in all cases, you do need a new installation of the license server software. Specifically, the FlexFM license server needs to be at level 10 or higher. For this purpose, an installation of FlexLM v10.8.0 is part of this release on all supported platforms. The previous release of FlexLM was V9.2

It is noted that Dytran 2007 r1 is not able to check out licenses when the FlexLM server is lower than version 10.

On Windows and Linux computers, Dytran requires an Ethernet card on your computer, even if your computer is not connected to a network. The FLEXlm licensing mechanism uses the Ethernet card to create the unique system identification encrypted in the license information file.

## Release Platforms

Dytran 2007 r1 was built and tested on the following hardware with the listed software installed as given in [Table 3-1](#).

Table 3-1 Supported Hardware Configuration

Platform	Operating System	Compiler Version	OpenMP Parallel Support	OpenMP Parallel Support	Remarks
Intel Pentium III	Windows 2000-SP4	Intel 9.1*	Yes	Yes	Ethernet Card
Intel Pentium III	Windows XP-SP2	Intel 9.1*	Yes	Yes	Ethernet Card
Intel EM64T	Windows 64-bit XP-SP2	Intel 9.1**	Yes	Yes	Ethernet Card
* For correct operation of the Intel Fortran compiler, MS Visual Studio .NET 2003 must be installed prior to installing the Intel 9.1 compiler. ** For correct operation of Intel Fortran Compiler, MS Visual Studio .NET 2005 must be installed prior to installing the Intel 9.1 Compiler. *** Solaris 10 is also supported.					



Table 3-1 Supported Hardware Configuration (continued)

Platform	Operating System	Compiler Version	OpenMP Parallel Support	OpenMP Parallel Support	Remarks
SGI R10K/R12K	IRIX64 6.5.22m	MIPSpro f90 7.4	Yes	Yes	N.A.
HP-UX – PA RISC 2.0	HPUX B.11.00	HP F90 V2.7	Yes	Yes	N.A.
HP-UX Itanium2	HPUX B.11.23	HP F90 V2.8.7	Yes	Yes	N.A.
HP Alpha	Tru64 Unix v5.1/1885	DF 90 V5.5-2602	Yes	Yes	N.A.
Sun Sparc Solaris	Solaris 8*** (= SunOS 5.8 )	Sun Studio 10 (FORTRAN 95 8.1)	Yes	Yes	N.A.
IBM RS/6000	AIX 5.1	XL Fortran 9.1	Yes	Yes	N.A.
Linux Itanium2 IA64	RedHat Advanced Server 3	Intel 8.1	Yes	No	Ethernet Card
Linux EM64T x86 64	RedHat Enterprise Linux WS 3	Intel 8.1	Yes	Yes	Ethernet Card
Intel Linux	Red Hat Linux release 9	Intel 8.1	Yes	Yes	Ethernet Card
* For correct operation of the Intel Fortran compiler, MS Visual Studio .NET 2003 must be installed prior to installing the Intel 9.1 compiler. ** For correct operation of Intel Fortran Compiler, MS Visual Studio .NET 2005 must be installed prior to installing the Intel 9.1 Compiler. *** Solaris 10 is also supported.					

## MPI for Dytran LS-DYNA

Dytran LS-DYNA requires MPI to be installed on every machine used. This is true even for single processor machines.

Dytran LS-DYNA expects hardware-specific native MPI to have been installed at default locations. When MPI is not properly installed on your Unix/Linux machine or is not installed at the expected default location, a job submission will exit with an error message to this effect. See [Table 3-2](#) for details.

Table 3-2 MPI Version and Expected Location

Platform	Operating System	MPI Version	MPI Location
Intel Pentium III	Windows 2000-SP4	MPIch V.1.2.5	<sup>1</sup>
Intel Pentium III	Windows XP-SP2	MPIch V.1.2.5	<sup>1</sup>
Intel EM64T	Windows 64-bit XP SP2	MS-CCP	C:\Program Files\Microsoft Compute Cluster Pack
SGI R10K/R12K	IRIX64 6.5.22m	SGI MPT 1.3	/usr/bin, /usr/lib <sup>2</sup>
HP-UX – PA RISC 2.0	HPUX B.11.00	HP MPI 1.08	<sup>3</sup>
HP-UX Itanium2	HPUX B.11.23	HP MPI 1.08	<sup>3</sup>
HP Alpha	Tru64 Unix v5.1/1885	Compaq dmpirun 1.9.6	/usr/opt/MPI196
Sun Sparc Solaris	Solaris 8, 64-bit ( = SunOS 5.8 )	SUN HPC mprun 5.0	/opt/SUNWhpc/HPC5.0
IBM RS/6000	AIX 5.1	POE 3.2	/usr/lpp/ppe.poe
Linux Itanium2 IA64	RedHat Advanced Server 3	LAM 6.5.9	<sup>3</sup>
Linux EM64T x86_64	RedHat Enterprise Linux WS 3	LAM 6.5.9	<sup>3</sup>
Intel Linux	Red Hat 9	LAM 6.5.9	<sup>3</sup>
<sup>1</sup> Exact location not important as long as it is installed. Install location will be picked up from the registry.			
<sup>2</sup> Proper install will provide soft links to /usr/bin, /usr/lib.			
<sup>3</sup> MPI is part of the release, and is automatically installed in \$installdir/bin/exe/mpi.			

## Memory Requirements

In general, the size of the memory required by Dytran depends on the size of the engineering problem you wish to solve. The default memory size is set to approximately 30MB. This default size is appropriate for smaller problems.

You can change the preset default in the Dytran Explorer so that it fits your personal needs. In addition, you can define the minimum and maximum memory size and use the slider in the front panel to select the desired memory size. On Unix and Linux platforms you can use the command-line option (size=small/medium/large) or you can enter the MEMORY-SIZE definition in the input file.

Dytran traces the usage of memory and prints a summary at the end of the output file of each analysis. The memory size listed in the summary is exact. It reflects the memory required for storing the model in core memory after one integration step. Additional memory required during the analysis is automatically allocated and de-allocated.

When you change the memory setting for an analysis through the Dytran Explorer, the settings will be stored to be used the next time that you run the analysis.

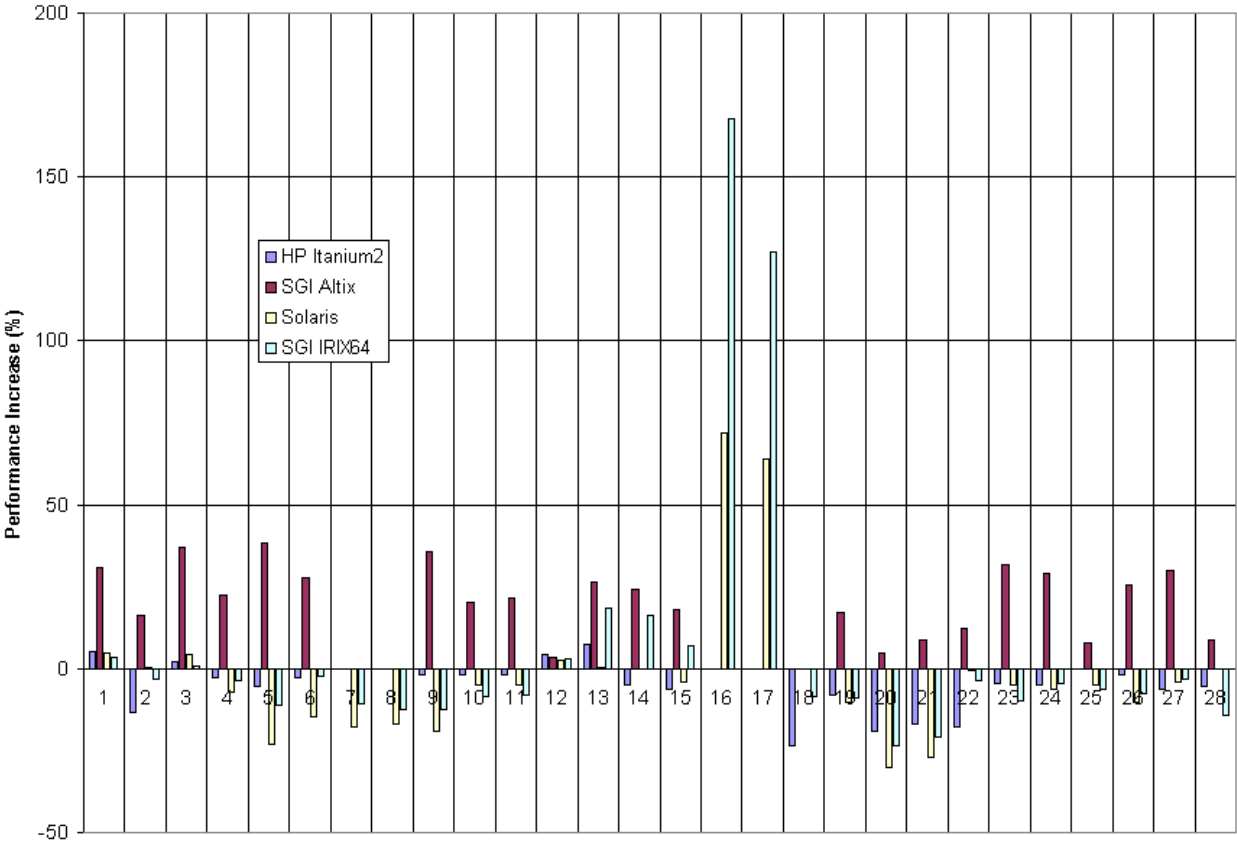
Under certain conditions, Dytran may stop and issue a message that it cannot allocate the required memory. Since the memory allocation in Dytran is dynamic, the system may require additional memory during an analysis. If the memory is available, it will be allocated and de-allocated when it is no longer needed. When your computer runs out of memory, the Dytran analysis may stop when it needs more memory to continue. You may solve this problem by closing applications on your computer that you do not need, or you can decrease the size of the core memory that Dytran allocates for the analysis if you are using substantially more than the analysis requires. You can find the information on the memory size requirements of the analysis in the memory summary at the end of the analysis. We recommend to use Dytran on a computer that has at least 256 MB of RAM.

## Performance

### Single CPU (Dytran)

Dytran 2007 r1 performance on single processor was evaluated on all the supported platforms and for some machines is compared to the previous release, MSC.Dytran 2005. Please refer to [Table 3-3](#).

Table 3-3      Performance of MSC.Dytran 2005 and Dytran 2007 r1 on Single Processor



The performance between the two versions in general is comparable. Some performance improvement can be seen for SGI Altix, due to a platform specific compiler related enhancement. (This improved option did not compromise the quality of the results on this platform.) Also should be noted that for two models the code has improved performance for numbers 16 and 17. These models specifically have a very large number of composite property definitions and therefore these models show evidence that the code has become more efficient.

**SMP (Dytran)**

Dytran supports Shared Memory Parallel (SMP) on multi-CPU hardware. The percentage of functionality that runs in SMP mode has been increased with respect to the previous release (see [Tables 3-4](#) and [3-5](#)).

Table 3-4 Performance of Dytran 2007 r1 on Single and Dual Processors

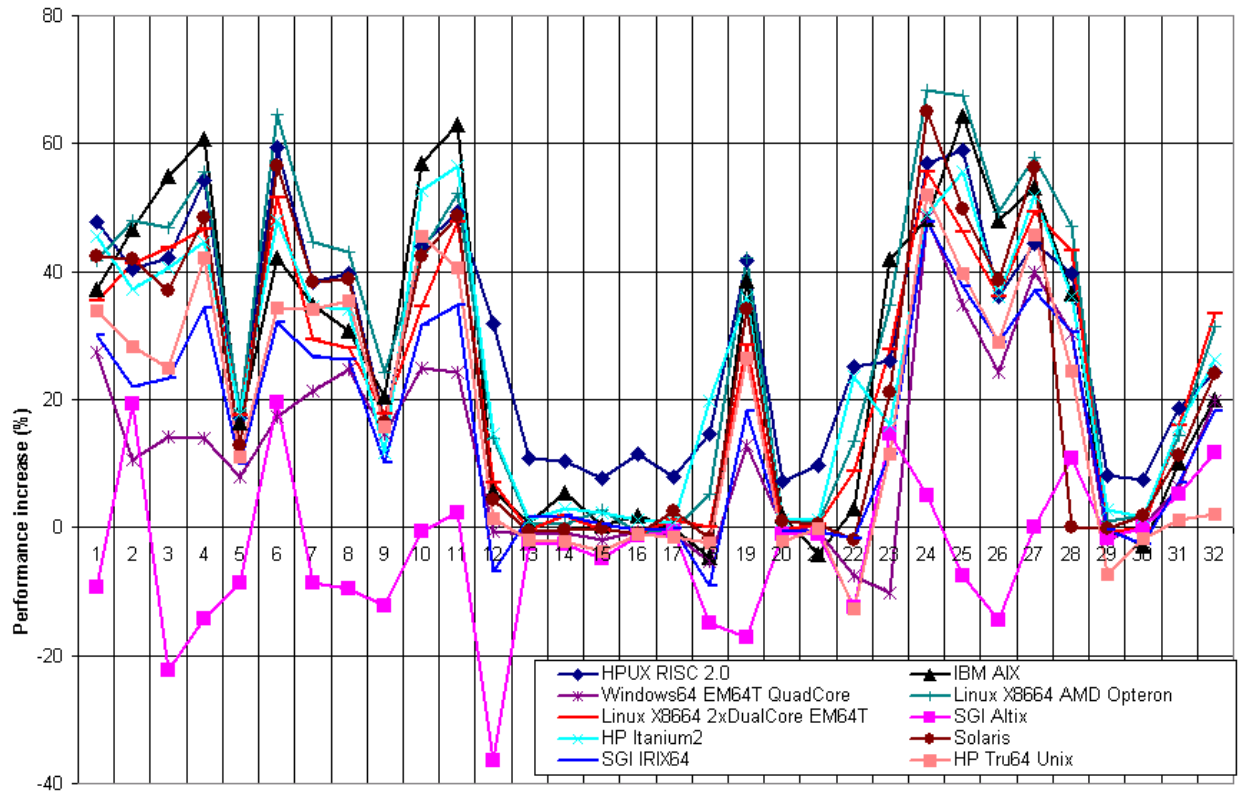
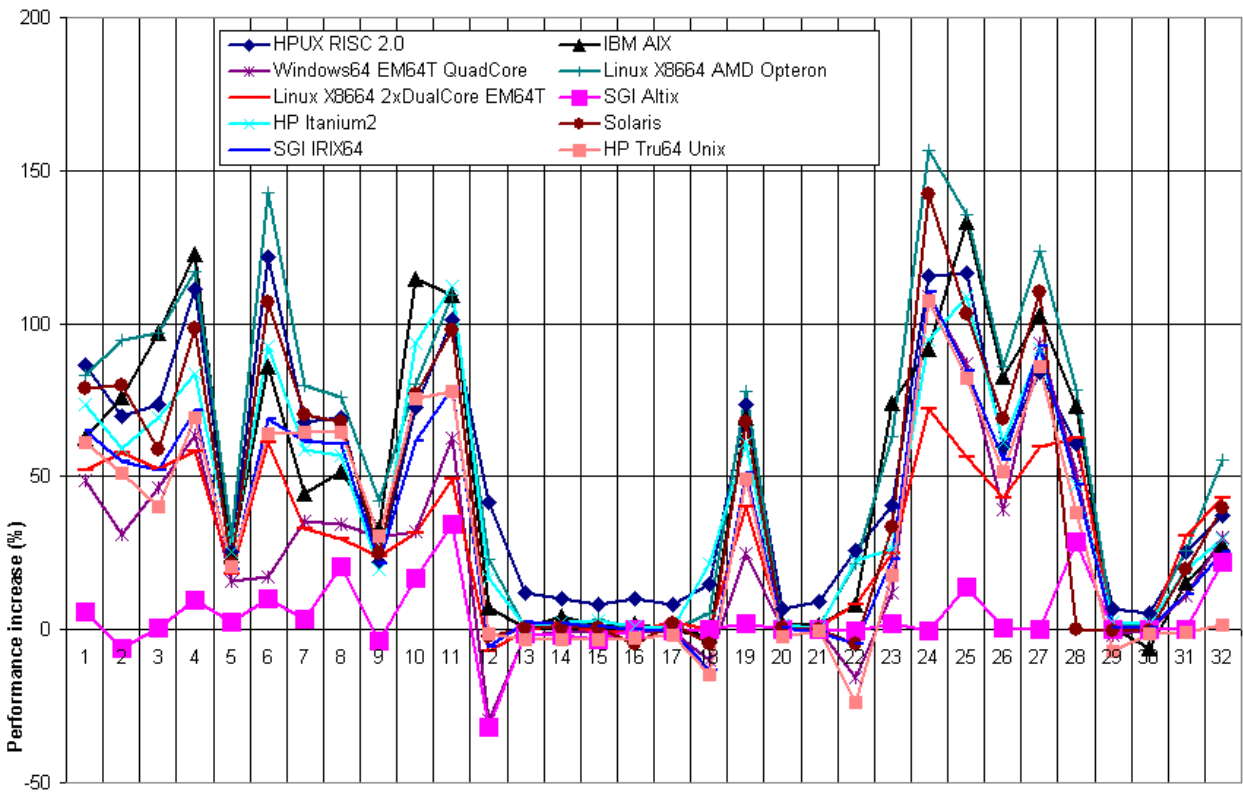


Table 3-5 Performance of Dytran 2007 r1 on Single and Quad Processors



In the tables above, a value of 0 means that there was no performance increase are decrease. If the number is 100%, the performance was doubled and if negative the performance was decreased (= longer elapsed CPU time).

The platforms used for this study:

Platform	CPU Specifications
HPUNIX RISC 2.0	550 MHz, pa-risc 2.0
Windows64 EM64T QuadCore	EM64T Family 6 Model 15 Stepping 4 GenuineIntel ~2667 MHz
Linux X8664 2xDualCore EM64T	Intel(R) Xeon(TM) CPU 3.60GHz
HP Itanium2	Intel(R) Itanium 2 Family Processors 900 MHz
SGI IRIX64	500 MHZ IP35 Processors
IBM AIX	PowerPC_POWER4 1453000000 Hz
Linux X8664 AMD Opteron	Dual Core AMD Opteron(tm) Processor 280 2411.119 MHz
SGI Altix	1400 MHz Itanium 2 Rev. 5 Processor
Solaris	Sparcv9 processor 900 MHz
HP Tru64 Unix	Alpha EV6.8CB (21264C) 1000 MHz

# 4 Using Dytran

---

- Running Dytran on Windows 26
- Running Dytran on Unix and Linux 26
- Postprocessing Dytran Results 26
- Postprocessing Dytran Results of Windows on UNIX 27

## Running Dytran on Windows

On Windows, submit a Dytran analysis by double-clicking the Dytran icon. The icon should be available on your desktop. Alternatively, you can use the **Start Menu** to locate Dytran under the **Programs Folder**. Once you picked either the icon or the menu entry, the Dytran user environment appears on your screen.

The .Dytran Explorer provides an on-line help system that contains information about the functionality of the Dytran Explorer. The Dytran Explorer provides some basic postprocessing and animation tools.

## Running Dytran on Unix and Linux

On Unix and Linux platform you would use the command line interface like:

- `dytran jid=xxx` to submit Dytran
- `dytrandmp jid=xxx` to submit Dytran LS-DYNA

Note that the `dytrandmp` job submission script expects MPI to be properly installed.

Before running a `dytrandmp` job, it is required to insert the following line as the first line in the input deck:

```
*dytran
```

## Postprocessing Dytran Results

Dytran results can be postprocessed with Patran. With MSC.Patran 2005, the Direct Result Access (DRA) method is available for both regular Dytran output files (ARC,THS) as well as for the `d3plot` file which is generated by the LS-DYNA option.

In addition, on Windows, you can use the VisualVrml postprocessing, animation and Visual Time History tool. The tool is built-in inside the Dytran Explorer and offers web-based postprocessing capabilities. When using the LS-DYNA option, a conversion tool of the `d3plot` file to regular Dytran ARC files is available by right-clicking on the file inside Dytran Explorer.



## Postprocessing Dytran Results of Windows on UNIX

If you wish, you can postprocess the analysis results obtained from a Windows platform on a UNIX computer. In this case, you need to convert the binary result files ( . ARC and/or . THS) files to a UNIX format. You can perform this conversion by using the right-mouse button menu in the Dytran Explorer. Point your mouse at the file that you wish to convert, click the right mouse button, and select the **Convert to binary...** menu item. The converted files will have the `sb_` prefix. For Compaq Alpha workstations, the native Windows result files can be used directly without conversion.

Alternatively, when running on windows, you can select the option to output result files in UNIX format by default. To set this option, select the **Preferences** from the **Options** menu. Choose **Formats** and select **Convert output files automatically to UNIX-format**. If you select this option, the regular Windows result files and the converted UNIX-format files are written at the end of the analysis. You can recognize the UNIX-format files by the `UX` prefix.

