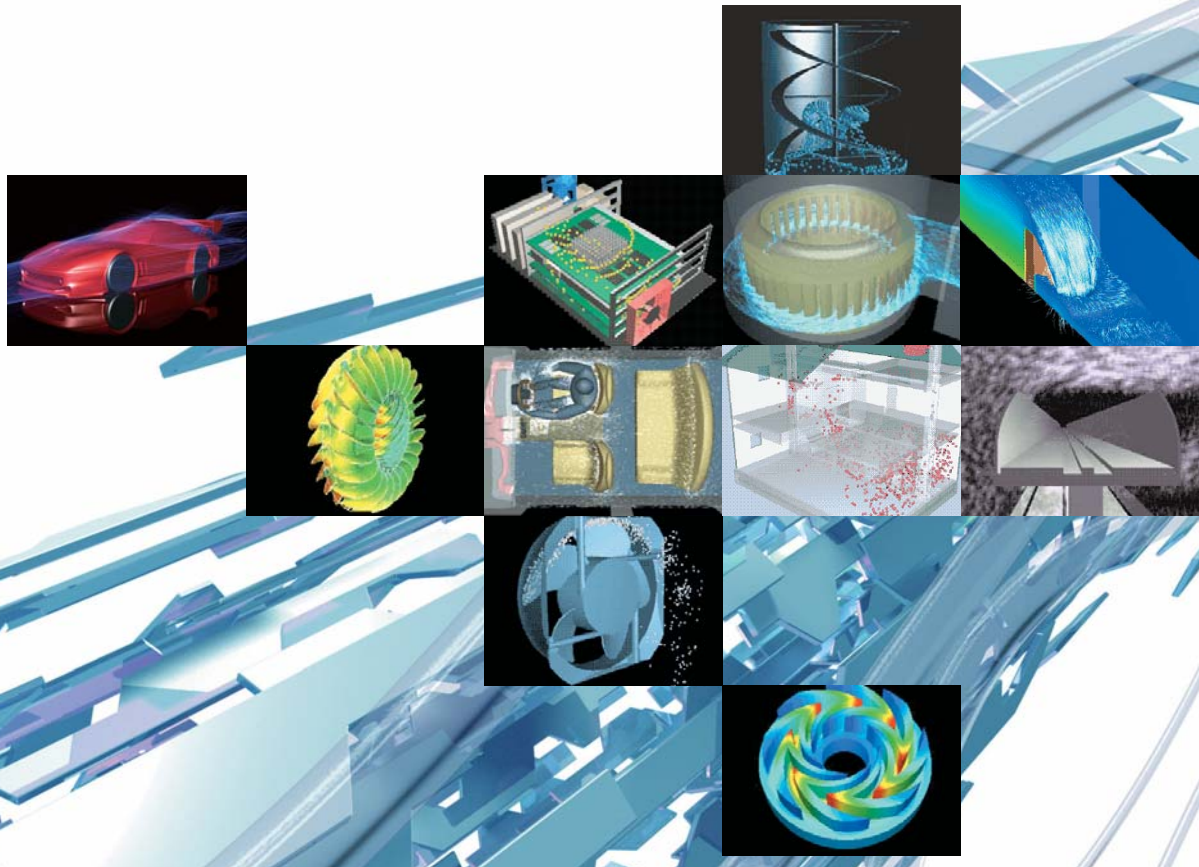
PRODUCTS GUIDE

CFD
Computational Fluid Dynamics

(English)

POLYCAE solutions

Thermofluid Analysis System



CRADLE

CFD
Computational Fluid Dynamics

Thermofluid Analysis System

Philosophy

Since the establishment and starting the sales of STREAM in 1984, Software Cradle has been dedicated to developing the practical CFD software and providing total services including sales, customer support, training, seminars, customizing and engineering services. We can provide the best suited program from our suite of products, custom tailored training, and customized program to better meet the needs of specific applications. We are dedicated to not only providing the software but also providing the solution that can bring benefits to a customer using our products.

Mission

We can help you to go to the next level of CFD simulation.

Today's advancement of hardware performance is outstanding. Therefore, we are dedicated to providing the software which can maximize the performance of the hardware, which can be used with confidence, and which can be used by a wide variety of people such as design engineers as well as CFD experts and researchers as a practical and useful tool.

Products

For engineers in construction, architects, civil, electronics and electrical appliances industry

Structured mesh (Cartesian and cylindrical coordinates)
STREAM
Windows and Linux

For electronics cooling (Cartesian Coordinate)
HEAT Designer
Windows

A part and its material property are managed as one component for the intuitive usability. With the advantages of using a structured mesh and solver, STREAM and HEAT Designer can provide extraordinary performance in meshing speed, computation speed, stability, memory consumption, and accuracy. In addition to flow and temperature simulation, complicated phenomena such as chemical reaction, multi-phase, solidification, and more can be simulated.

For engineers in automotive, machinery, turbo-machinery, aerospace, power plants, and chemical industry

Unstructured Mesh (Tetrahedron, pentahedron and hexahedron)
SC/Tetra
Windows and Linux

SC/Tetra can precisely handle curvature using a hybrid mesh. Advantages of SC/Tetra are the ability to handle a complicated geometry with robust and flexible mesh control and a moving object having an active or reactive motion in addition to computation speed and low memory usage. SC/Tetra can also simulate chemical reaction, multi-phase, solidification, aero acoustics, thermoregulation of a human body, linear stress analysis and more.

For engineers who wants to utilize CAD data for CFD

CAD-CFD data translator
CADthru
Windows

CADthru takes your CAD data, translates it, cleans it up and makes it ready for CFD simulation.

CFD
Computational Fluid Dynamics

Unstructured Mesh
(Tetrahedron, pentahedron and hexahedron)

SC/Tetra

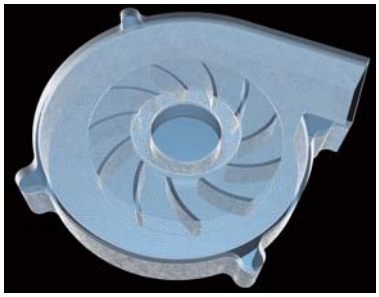
Windows and Linux

What is SC/Tetra?

SC/Tetra is an all-in-one package CFD (Computational Fluid Dynamics) software using unstructured mesh (tetrahedron, pentahedron and hexahedron). It was developed in 1998 with the concept as "Enabling the calculation of a complex geometry easily".

[Features]

❶Practical use of CAD data

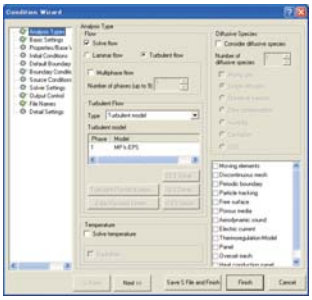


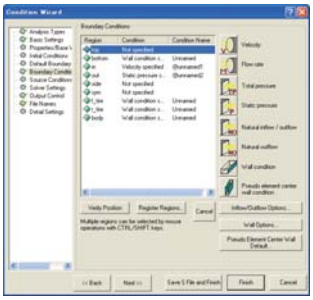
Assuming that the CAD data for the product design will be directly used as the analysis model, SC/Tetra has many useful functions for repairing and wrapping the geometry and checking the CAD data for any errors or detects. Simple geometries such as the computational domain can also be made directly in SC/Tetra.

❷Robust Auto-mesh generation function

The robust auto mesh generator can handle any kind of complex geometry. The prism mesh will be fitted automatically to improve calculation accuracy. In addition, the adaptive mesh refinement function automatically generates adaptive mesh by repeating the simulation and considering the previous analysis result.

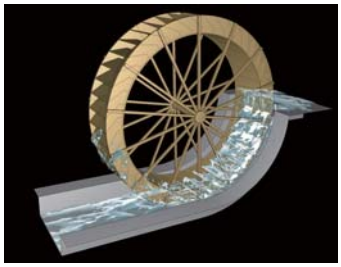
❸Interactive wizard for analysis condition settings



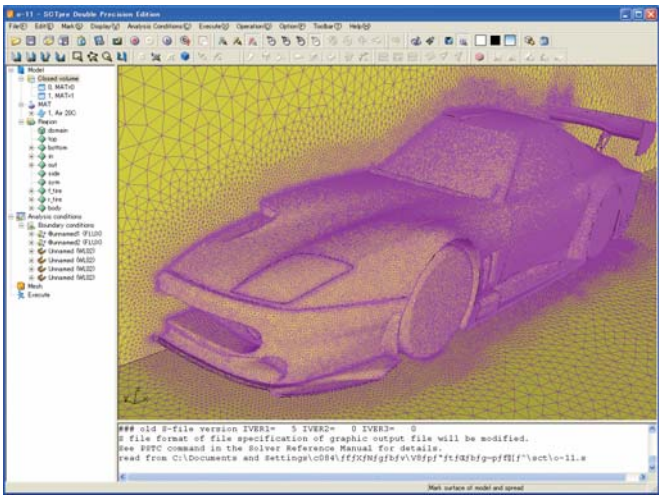


The steps you need to take is shown as tree bar in the wizard. Therefore, the setting can be done smoothly and it prevents data input omission.

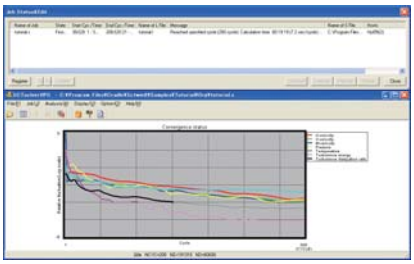
❹Ample of analysis functions



SC/Tetra can solve not only flow or temperature analysis, but also the analysis for diffusive species, free surface, chemical reaction, particle tracking, and rotation / translation of an object considering the fluid effects. Furthermore, it is able to evaluate the aero acoustic problem and physiological factors of human body.



❺Low memory usage and high computational speed



SC/Tetra achieves low memory usage and high speed computations by using the cell vertex based scheme, FVM (Finite Volume Method). With this, even a Windows PC with 64 GB of RAM memory can handle more than 300 million elements. The calculation is controlled by a JOB status & edit window which allow you to check the calculation status and to execute the batch processing, interruption and restarting the calculation.

❻Cutting edge visualization

Postprocessor enables you to visualize the simulated data as well as extracting predicted physical values. Since sharing simulation results with colleagues and customers is an important design process, it enables to create high quality images and animations. In addition, utility tools are equipped to handle extremely large files, to quickly visualize and to share your 3D data using a license-free viewer.

[Applications]

●Automotive industry
Vehicle body aerodynamics
Cabin climate control
Thermofluid analysis of engine rooms
Internal flow analysis in engine cylinders
Intake and exhaust efficiency assessment
Disc brake cooling analysis
Torque converter performance evaluation
Hydrodynamic analysis in water jackets

●Machinery industry
Performance evaluation of rotating equipments
(fan, pump, turbine)
Internal flow through turbine rotor blades
Temperature and concentration analysis in a mixing tank
Heat radiation analysis in a reverberatory furnace
Performance investigation of CVD device

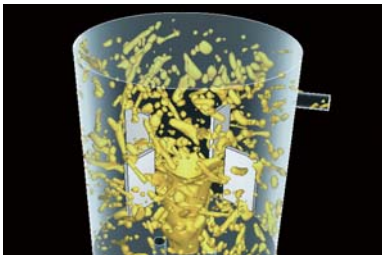
●Electrical and precision equipment
Heat dissipation analysis of the liquid crystal projector
Cooling design of electronic devices
Thermal analysis of power units and circulation in
an electronic chassis
Natural and forced convection in an electrical components

●Construction and civil engineering
Estimation of wind turbulence around skyscrapers
and assessment of urban planning
Wind loading effects on buildings

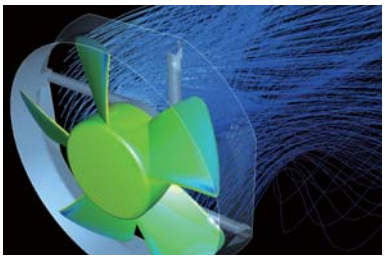
●Environment and facilities
Indoor air conditioning and environmental assessment
Temperature distribution in a hot water storage tank
Lift and drag force estimation of a propeller blade

●Cabin climate control

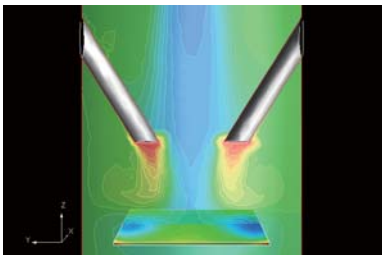
●Mixing tank



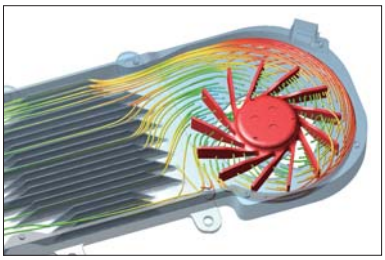
●Fan



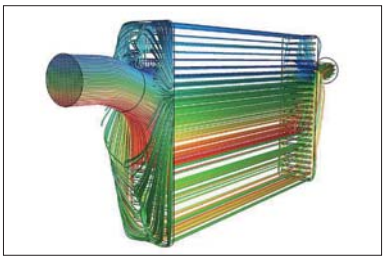
●CVD



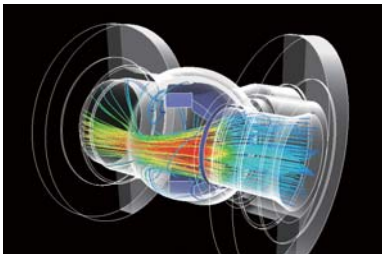
●Dissipation Fin with Fan



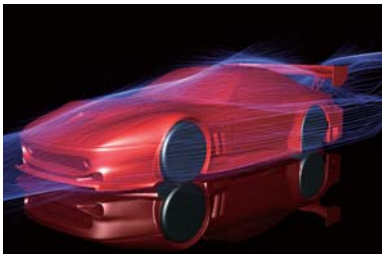
●Heat exchanger



●Valve



●Vehicle body aerodynamics



Utility Tools

●LFileView
Real-time graphical output of the values listed from Solver. Arithmetic operations are implemented for listed parameters.Arithmetic operation is flexibly executed using any parameters listed from Solver.
●FLDutil
Data mapping to structual analysis system such as ABAQUS, ANSYS I-DEAS, NASTRAN.
●CradleViewer : Free results viewer

Items included in the Package

●SC/Tetra installation DVD
●User's guide
• Basics of CFD Analysis
• Reference Preprocessor / Solver / Postprocessor
• Operation Manual • Exercise

System Requirements

●Windows
• XP Professional, XP Professional x64 Edition
Vista Business (32bit,64bit)
Vista Ultimate (32bit,64bit)
Windows 7 Professional (32bit,64bit)
Windows 7 Ultimate (32bit,64bit)
(Open GL compliant graphics board is recommended)
• Intel compatible CPU
●Linux
• RedHat Linux Enterprise 4 and 5
• SuSE Linux Enterprise Server 9 and10
●Required spec. for 1 million mesh analysis
300MB memory
40MB disk capacity/1file for post file

Products

Platforms \ Package	PRE/SOL/POST	SOL	PRE/POST
Windows (Standard)	○	○	○
Windows (HPC)	—	○	○
Linux (Standard / HPC)	—	○	—

●Contract Type: Rental / Lump Sum.
●License Type: Node Locked / Floating

Options

●CAD-CFD geometry data translator
• CADthru

CFD
Computational Fluid Dynamics

Thermofluid Analysis System

Specification

Following programs (pre, solver and post processors) can be controlled with Visual Basic.

Functions

			STREAM	HEAT Designer	SC/Tetra
Preprocessor	Modeling	CAD data interface (import)	Parasolid XT, STEP, STL, DXF (2D, 3D-face), XGL, NASTRAN, IDF, SHAPE, Gerber data (RS-274D, RS-274X) *1	Parasolid XT, STEP, STL, XGL, IDF, Gerber data (RS-274D, RS-274X) *1	Parasolid XT, STEP, STL, DXF (3D-face), ABAQUS (.inp), ANSYS (.cdb), I-DEAS (.unv), Design Space (.dat), NASTRAN (.nas)
		CAD data interface (export)	Parasolid XT, STL	Parasolid XT, STL	STL, ANSYS (.cdb), NASTRAN (.nas)
		Primitives	Cuboid, Hexagon, Cylinder, Cone, Sphere, Slanted Plate, Point, Panel (Orthogonal, Quadrilateral, Slanted), 2.5D solid part, Fan, Anemostat model, Pipe, Electronics (case, PCB, fin)	Cuboid, Hexagon, Cylinder, Cone, Slanted Plate, Point, Panel (Orthogonal, Quadrilateral, Slanted), 2.5D solid part, Fan, Pipe, Electronics (case, PCB, fin)	Cuboid, Cylinder, Panel
		Geometry modification	Boolean operation (Sum, Subtract, Multiply, Cutting), Shape simplification (Deformer, Filling hole, Projection deletion, R fillet deletion), Copy, Mirror copy	Boolean operation (Sum, Subtract, Multiply, Cutting), Shape simplification (Deformer, Filling hole, Projection deletion, R fillet deletion), Copy, Mirror copy	Detection/modification of face overlap/ face intersection/edge isolation/ fractional edges and faces, Swept elements generation, Wrapping
		Registration of parts library	●	●	
	Mesh generation	Tetrahedron			●
		Pentahedron (Prism, Pyramid)			●
		Hexahedron	○(In the case of cylindrical coordinate system)		○(Manual setting)
		Cuboid	●	●	●(In the case of creating hexahedron elements internally)
	Conditions	Easy set-up through wizard	●	●	●
		Default condition setting	●	●	
		Navigated wizard to set conditions	●	●	●
		Settings of undefined region	●	●	●
		Material property library (creatable)	●	●	●
		Creation of laminated materials	●	●	
	Operation and control environment	VB interface	●	●	●
		Consecutive execution			●
		Macro for operations (history function)			●
		Customizable keyboard mapping			●
		Selectable mouse operation mode	●	●	●
Solver	Mesh	Structured mesh	●(Cartesian or cylindrical coordinate)	●(Cartesian coordinate)	
		Unstructured mesh			●
		Overset mesh			●
		Discontinuous mesh interface			●
		Mesh adaptation			●
		Moving objects	●		
		ALE (Stretch, Rotation and Translation)			●
		Dynamical moving objects			●
		Multiblock	●	●	
		Zooming	●		●
	Numerical scheme	Finite volume method	●	●	●
		Finite element method	○(Moving objects)		
		Pressure correction	SIMPLEC	SIMPLEC	SIMPLEC
		Convection term accuracy	1st/3rd order (QUICK) upwind scheme	1st/3rd order (QUICK) upwind scheme	1st/2nd order (MUSCL) upwind scheme
		Matrix solver	JACOBI , SOR , MICCG , ILUCR , ILUCGS , FMGCG	MICCG , ILUCR , ILUCGS	MILUCG-STAB, AMG (multigrid), AMGCG-STAB
		Steady-state/Transient analyses	●	●	●
	Flow types	Incompressible fluid	●	●	●
		Compressible fluid	●		●
		Non-Newtonian fluid	●		●
		Buoyancy (Boussinesq approximation)	●	●	●
		Multiple fluids	●		●
		Gas mixing	●		●
		Foaming resin model	●		
	Turbulence models	High Reynolds Number k-ε model	Standard, RNG, MP	Standard	Standard, RNG, MP
		Low Reynolds number (linear) k-ε model	AKN	AKN	AKN , MPAKN , GPC
		Low Reynolds number (nonlinear) k-ε model	AKN		BGC
		Two-equation heat transfer model	NK , AKN		
		Realizable k-ε model			●
		SST k-ω model			●
		One-equation model			Spalart-Allmaras
		LES (Smagorinsky model)			●
		Hybrid turbulent model of RANS and LES			VLES , DES
	Thermal analysis	Heat conduction (fluid/solid)	●	●	●
		Heat transfer (Convective/Turbulent heat transfer)	●	●	●
		Heat transfer (Boiling heat transfer)			●
		Heat radiation (view factor)	●	●	●
		Heat radiation (flux method)	●		●
		Heat conduction panel, Heat transfer, Heat radiation	●	●	●
		Insolation	●		●
		Joule heat	●		●
		Space distribution of mean radiation temperature (MRT)	●		
	Diffusion analysis	Diffusivity	●		●
		Sedimentation rate	●		●
		SORET effect	●		
	Index for ventilation efficiency	Age of air, Life expectancy of air, Inlet contribution rate	●		
	Thermal comfort models	PMV / SET*	●		
	Humidity/ Dew condensation analysis	Relative humidity/Absolute humidity	●		●
		Dew condensation	●		●
		Vapour pressure under humidity analysis			●
	Reaction analysis	Chemical reaction	●		●
		Combustion	●Eddy-dissipation model		●Eddy-dissipation model
		Solidification/Melting analysis	●		
		Thermal CVD analysis			●
	Particle analysis	Marker particle	●		●
		Mass particle	●		●
		Chemical reaction for particles	●		●
		Spray model	●		●
	Multiphase flow analysis	Free surface	●(VOF method, MARS method)		●(VOF method, improved MAC method)
		Dispersed multiphase flow			●
		Cavitation			●
	Aerodynamic noise analysis	Ffowcs Williams & Hawkings' equation			●
		Weak compressible flow model			●
		Sound source detection method			●
	Thermoregulation-Model	JOS			●
	Thermal circuit model	Two-resistor model	●	●	
	Flow conditions	Velocity	●	●	●
		Volume flow rate	●	●	
		Mass flow rate			●
		Pressure	●	●	●

			STREAM	HEAT Designer	SC/Tetra
Solver	Flow conditions	Air conditioner model	●		
		Fan model	●	●	●
	Heat conditions	Fixed temperature	●	●	●
		Amount of heat generation	●	●	●
		Heat transfer coefficient	●	●	●
		Contact heat transfer coefficient	●	●	
	Wall conditions	No-slip (Stationary wall)	●	●	●
		Free-slip (symmetry wall)	●	●	●
		Log-law condition	●	●	●
		Power-low condition	●		
		Surface roughness	●		●
	Pressure conditions	Fixed pressure	●	●	●
		Pressure loss	●	●	●
		Porous media	●	●(Fin model)	●
	User-defined conditions	Variables table	●	●	●
		User-defined function (compiling is necessary)	●		●
	Calculation control environment	Job management	●	●	●
		Monitoring the calculation status	●	●	●
		E-mail notification of the calculation completion	●	●	●
		VB interface	●	●	●
		Relaxation coefficient	●	●	●
	Output post files		Cradle post files (FLD, iFLD)	Cradle post files (FLD, iFLD)	Cradle post files (FLD, iFLD), Field View, AVS, EnSight
	Output for third-party software				NASTRAN , ANSYS ,ABAQUS , I-DEAS ,SYSNOISE , KULI
	Simplified structural analysis				●
Postprocessor	Drawing functions	Mesh, Vector, Contour plots	●		
		Isosurface, Streamline	●		
		Geometry display	●(Neutral file, STL file)		
		2D graph	●		
		Mirror/Periodical copy	●		
	Geometrical data handling	Arbitrary plane, Surface, Entire volume, Cylinder	●		
		Streamline, Isosurface	●		
		Arbitrary scaling	●		
		Specify by value or picking	●(Scalar/Vector value)		
	Special effects	Oil flow	●(On plane/surface)		
		Texture mapping	●(On plane/surface)		
		Lighting, Luster, Gradation	●(Preset, Arbitrary)		
		Transparency, Water-like expression	●		
	Animation	Vector animation	●		
		Plane automove	●		
		Marker particle	●(Turbulent diffusion effect)		
		Automatic translation of view point	●(View/Focus points can be set)		
		Key-frame animation	●		
		Animation interpolated between cycles	●		
	Analysis of the result	Variable registration	●		
		Integration function	●(Scalar/Vector integration)		
		Comparative visualization	●		
		Projected area calculation	●		
		Automatic search of the local Max/Min positions	●		
		Import of CSV data	●		
		Automatic change of color bar	●(Preset, Arbitrary)		
	Data image output	BMP , JPG	●(Size, Resolution adjustable)		
		CradleViewer	●(Support steady-state/transient animation, Attach to Office applications)		
		AVI	●		
		VRML	●		
	Operation and control environment	Load partially trimmed FLD file	●		
		Selectable help function	●		
		OpenGL emulation	●		
		VB interface	●		
		Selectable mouse operation modes	●		

*1) Please use the CAD supported

[System Configuration]

			STREAM	HEAT Designer	SC/Tetra
Operation & License	Platforms	One package (PRE/SOLVER/POST)	Windows XP, Windows Vista, Windows 7		
		PRE/POST	Windows XP, Windows Vista, Windows 7		Windows XP, Windows Vista, Windows 7
		SOLVER	Windows XP, Windows Vista, Windows 7, Linux(RedHat/SuSE)		Windows XP, Windows Vista, Windows 7, Linux(RedHat/SuSE)
		HPC (Node-locked)	Windows XP, Windows Vista, Windows 7		Windows XP, Windows Vista, Windows 7
		HPC (Floating)	Windows XP, Windows Vista, Windows 7, Linux(RedHat/SuSE)		Windows XP, Windows Vista, Windows 7, Linux(RedHat/SuSE)
	License Type	Node-locked	Windows XP, Windows Vista, Windows 7		
		Floating	Windows XP, Windows Vista, Windows 7, Linux(RedHat/SuSE)		

- Windows XP — Windows XP Professional(32bit/64bit)
- Windows Vista — Windows Vista Business / Ultimate(32bit/64bit)
- Windows 7 — Windows 7 Professional / Ultimate(32bit/64bit)
- Linux(RedHat/SuSE) — RedHat Linux(64bit) , SuSE Linux(64bit)

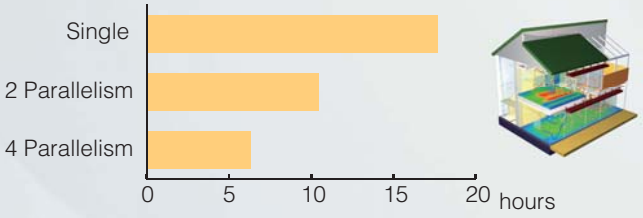
CFD
Computational Fluid Dynamics

Parallel Computing

High speed parallel computing for large-scale analysis

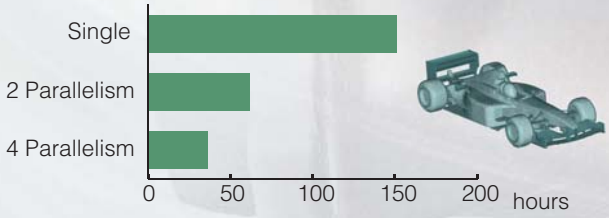
[Analysis of air-conditioning system]

Number of elements : around 20,000,000
Calculation cycle : 1,000 cycles
Processor : AMD Opteron 885 (2.6GHz)
DualCore × 4Way × 1node



[Aerodynamic analysis of formula car]

Number of elements : around 15,000,000
Calculation cycle : 1,000 cycles
Processor : AMD Opteron 885 (2.6GHz)
DualCore × 4Way × 1node



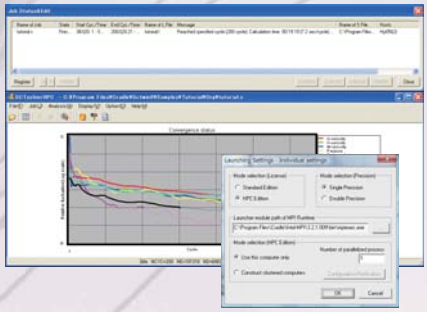
[HPC edition (parallel computing) line-up]

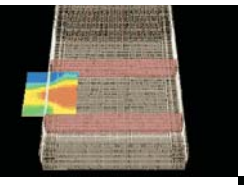
Max. parallelism	Max. # of Jobs	Floating	Supported OS	Solver	PrePost
4	1	●	Windows XP(32bit,64bit) Windows Vista(32bit,64bit) Windows 7(32bit,64bit) RedHat Linux(64bit) SuSE Linux(64bit) HP-UX11(Itanium2) AIX5(Power4)	●	●*1
8	1	●		●	●*1
16	2	●		●	●*1
24	3	●		●	●*1
32	4	●		●	●*1
40	5	●		●	●*1
48	6	●		●	●*1
56	7	●		●	●*1
64	8	●		●	●*1
Can be increased by 8 parallelism per job					

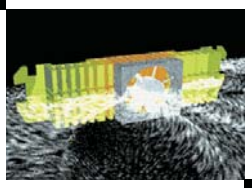
Note: There are a few physical functions for which HPC solver cannot be used.
The parallel efficiency depends on the model geometry and the analysis conditions.
*1) Windows OS and 1 node SMP type only

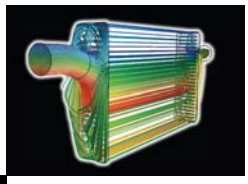
[Simple machine setting and operational environment]

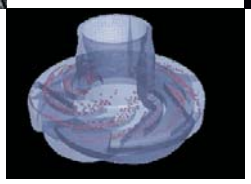
In parallel computing on Windows, the same dialog of JOB Status & Edit as the standard edition can be used. Analysis execution, parallelism setting and registration of the host machine can be done by the dialog.











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