



Paris, France, 15 March, 2012

ESI is the pioneer and world-leading solution provider in virtual prototyping.

Market Data

Listed in compartment C of NYSE Euronext Paris

[ISIN FR 0004110310](#)

Contact

[ESI Group](#)

Céline Gallerne

T: +33 (0)1 41 73 58 46

Celine.Gallerne@esi-group.com

Visit our Press Room
www.esi-group.com/newsroom

Connect with ESI



ESI announces pilot version of Adjoint Solver for design optimization

Intel applauds advances made with the help of its Fortran 90 compiler

Paris, France – 15 March, 2012 – [ESI Group](#), pioneer and world-leading solution provider in [virtual prototyping](#) for manufacturing industries, announces the launch of the pilot version of its Adjoint Optimization Solver, developed over the past 2 years thanks to a close collaboration between ESI and Intel. This mutually beneficial project brings the Intel [Fortran 90](#) compiler to a unique level of performance, allowing the use of adjoint-based optimization methods across a wide range of industry sectors.

Numerical optimization has proved to be an essential technology to achieve some ever-increasing requirements of the automotive sector. Optimizing the shape of a vehicle allows industrials to achieve greater fuel efficiency while using innovative, lighter materials. Numerical simulation can be implemented at each and every step of product design to predict the aerodynamics, aero-acoustics or even the aero-thermal performance levels resulting from a specific product design.

Standard CFD solvers versus adjoint-based optimization method

Computational fluid dynamics (CFD) analyses are very demanding at an industrial level because of the number and duration of the computations they require. Further-more, the genetic algorithms traditionally used in structural optimization are not suited for CFD optimization. Gradient-based methods, which converge to the optimum in many fewer iterations, require the computation of the cost function's gradient, which is not provided by standard industrial CFD solvers.

Addressing these problems, the adjoint-based optimization method has progressively emerged as a preferred method for CFD calculations. This method has been recognized as most reliable by major aerospace companies over the past decade and is now being adopted by the automotive sector.

A synergy of programming technological advances now allows the use of the adjoint-based optimization method on an industrial scale

In an effort to make this method accessible to various industries, and to ease up code maintenance, [ESI](#) has recently worked towards an independent

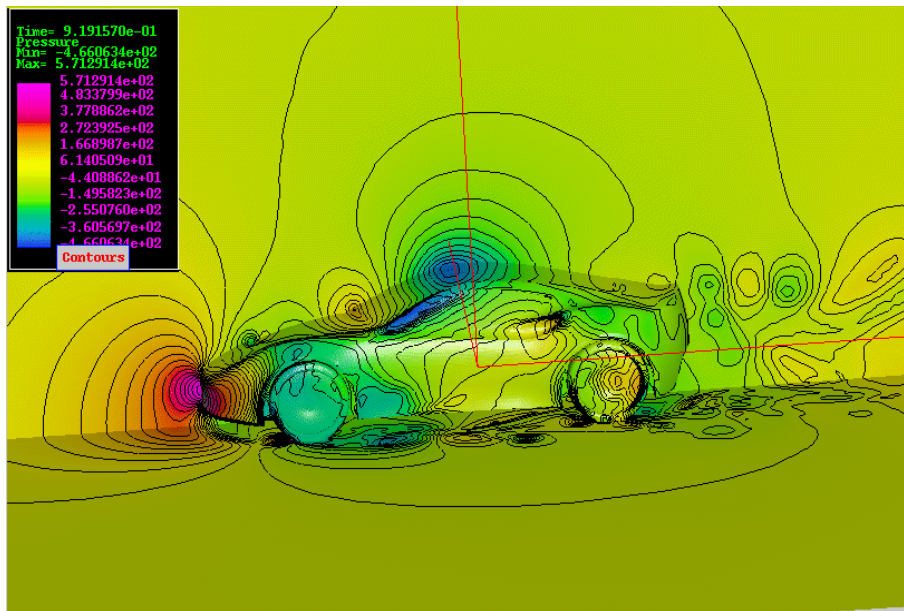


discrete adjoint solver that takes the form of a dynamic library coded in advanced Fortran 90.

This library aims to abstract all the derivative machinery required for assembling and solving the adjoint system, irrespective of any discretization scheme of the application code. It has been fully validated within [ACE+ Suite](#), ESI's multiphysics software.

In support of this project, ESI and Intel have engaged in a fruitful collaboration over the last 2 years, bringing the Intel F90 compiler to a unique level of performance with respect to most advanced F90 features.

"Intel was delighted to help ESI build their advanced solver with the Intel Fortran Compiler. This is a nice illustration of benefits of Intel's long-standing enabling engagement in code optimization with ESI. This collaboration gave ESI the added performance they wanted and helped improve the Intel compiler for all customers," says **Laurent Duhem**, Software Application Engineer at Intel.



*Image: Validation example of ESI's Adjoint Optimization Solver.
In this example, the solver helped reduce the vehicle drag by 13% after a single optimization cycle.*

For more ESI news, visit: www.esi-group.com/newsroom

About Intel

[Intel](#) (NASDAQ: INTC) is a world leader in computing innovation. The company designs and builds the essential technologies that serve as the foundation for the world's computing devices. Additional information about Intel is available at newsroom.intel.com and blogs.intel.com. Intel is a trademark of Intel Corporation in the United States and other countries.

About ESI Group

[ESI](#) is a pioneer and world-leading solution provider in virtual prototyping for manufacturing industries that takes into account the physics of materials. [ESI](#) has developed an extensive suite of coherent, industry-oriented applications to realistically simulate a product's behavior during testing, to fine-tune manufacturing processes in accordance with desired product performance, and to evaluate the environment's impact on performance. [ESI Group](#) is listed in compartment C of NYSE Euronext Paris.



Connect with ESI on [Twitter](#), [Facebook](#), and [YouTube](#)

ESI Group – Media Relations

[Céline Gallerne](#)

T: +33 (0)1 41 73 58 46