

April 25, 2018

HPC Collaboration with Industry

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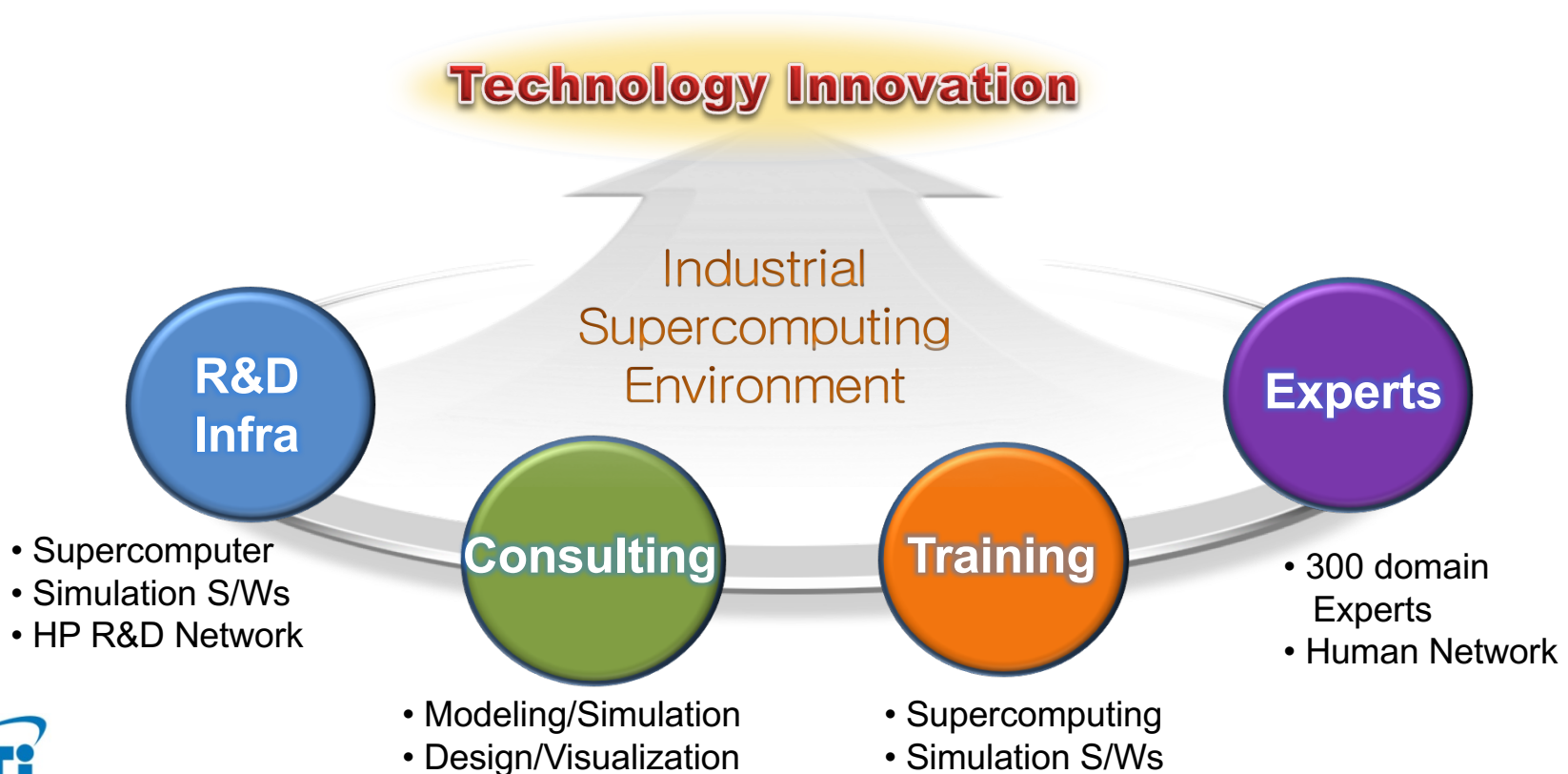
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Industrial Computing Support

■ Engineering and supercomputing technical support

- ❖ (Objective) for achievement of industrial QCD through HPC
- ❖ (Target) especially SMBs, Manufacturing industry,
- ❖ (Support) **Modeling & Simulation** ← 1 SMB : 1 domain specialist
- ❖ (Program) Korea **SMB Supercomputing** R&D Support Program
- ❖ (Budget) about \$3 MUSD/yr funded by SMBA

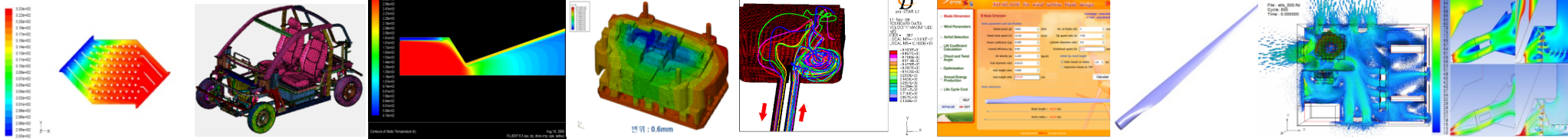


■ Engineering and supercomputing technical support

- ❖ (Project Number) Annually average 40 SMBs
- ❖ (Selection Rate) around 30%
- ❖ (Ongoing Project) about 50 SMB projects (2010~2012)

Statistics @ SMB supercomputing ('07~'09)

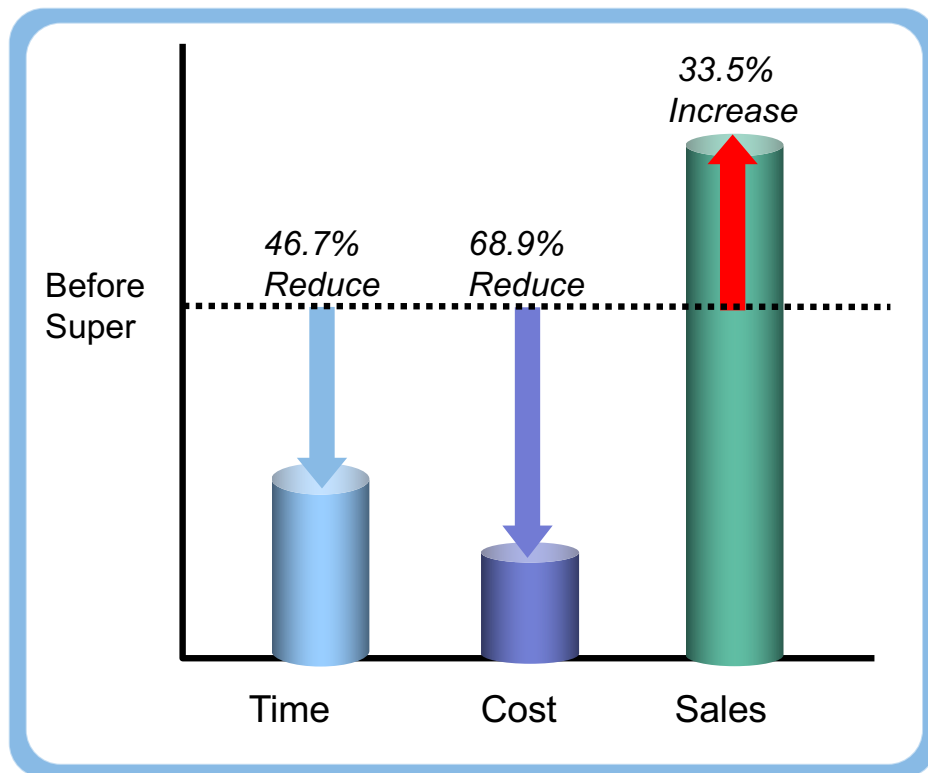
Areas	Thermo	Structure	Flow-Stru cture	IT	Life Sci.	Electronic	etc	total
Apply	118	125	20	51	25	24	53	416
Selected	43	38	10	18	8	6	2	125
Selection rate	36.4%	30.4%	50.0%	35.3%	32.0%	25.0%	3.8%	30%



▣ Economic Effects through SMB Supercomputing

❖ Epoch-making increase in R&D productivity

- Reduce effects on time/cost: average 57.8%
- Patents, CE certificates etc.: total 50
- Increasing rate of total sales: average 33.5 %



Major Improvements

Time Reduction



43 Month → 5 Month (88% reduce)

Cost Reduction



3 M US\$ → 0.3 M US\$ (90% reduce)

Sale Increase



Annually 5 MUS\$ expected

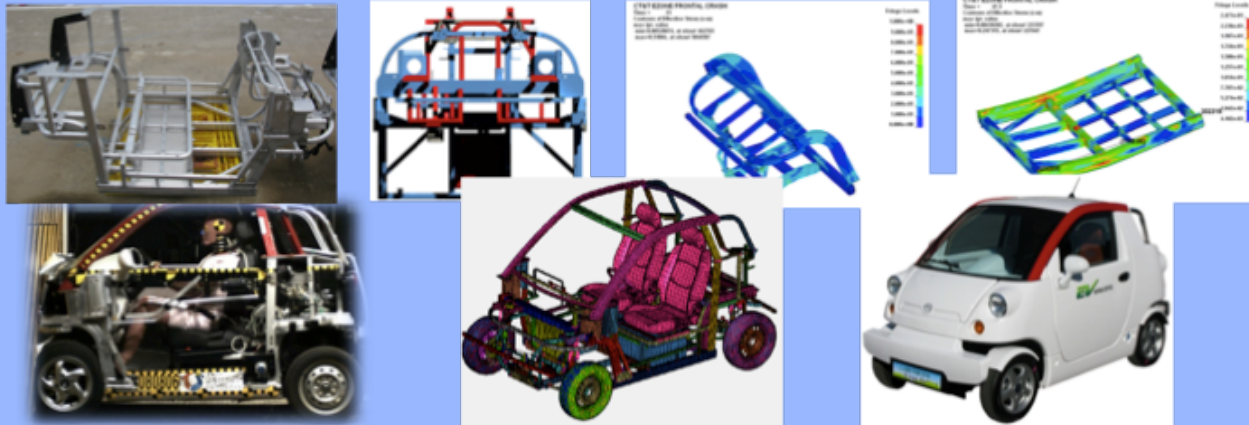
Representative Success Stories



e-Car Crash Simulations

Development Details

- Crash simulation for body frame with passengers' safety
- Optimized design for body structure with high lightweight and trial product



Effects

Time Reduce	Cost Reduce	Sales Increase	Property Right
17% (12 Month-> 10 Month)	90% (3 MUSD -> 0.3 MUSD)	50% (US 4,000 cars)	CE I

Means

- Assurance of collision safety for commercial sale (no rival)
- World first development of e-Car with crash safety

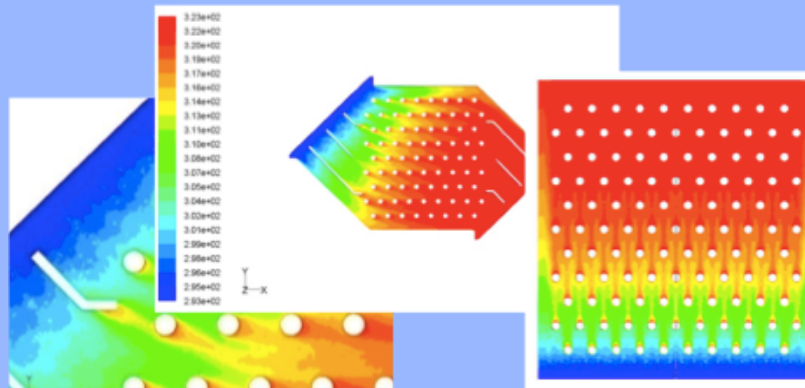
Representative Success Stories



Optimization Design for Heat Exchanger of Ventilator

Development Details

- Development of heat exchanger with **plastic** material instead of **paper** or **aluminum**
- Optimized product design resulted from fluid/heat simulations for 120 CAE models



Effects

Time Reduce	Cost Reduce	Sales Increase	Property Right
90% (10 Month-> 1 Month)	90% (1.2 MUSD -> 0.1 MUSD)	50% (~1 MUSD/year)	2 patents

Means

- High price competitiveness due to reducing cost of production
- Moving away with dependence on imports for heat exchangers

Environment for Industrial Application

② Necessity of Development of R&D Environment

❖ Limitation of direct technical R&D support

- Total number of SMB : 3M, Manufacturing SMB : 0.3 M
- SMB targeted SMB Supercomputing:
 - minimum 10% of the Manufacturing SMB: ~ 30,000 SMBs
- If SMB supercomputing will annually cover 100 SMB, we need 300 years.
- For most of SMB to take the benefits, we HAD TO develop R&D environment for SMB

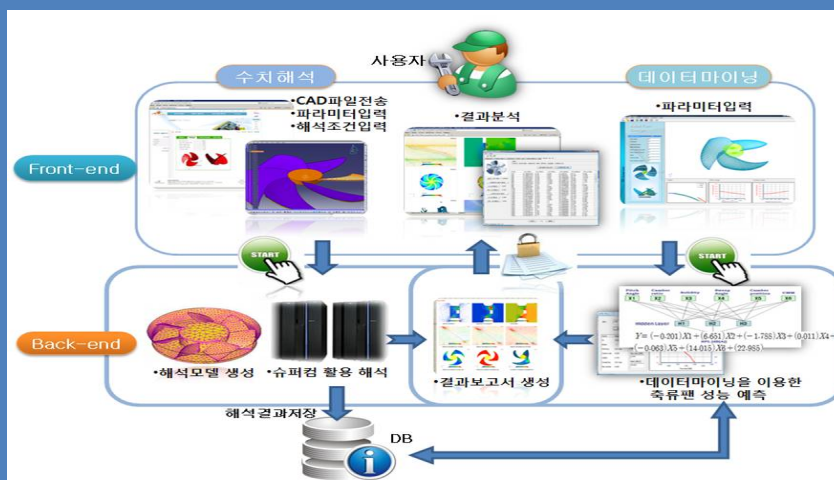
❖ Difficulty for industry people to use supercomputing

- Usually, industry has to obtain only the optimized product design
- Easy and effective R&D environment for SMB and with low cost

Automatic Product Design Platform

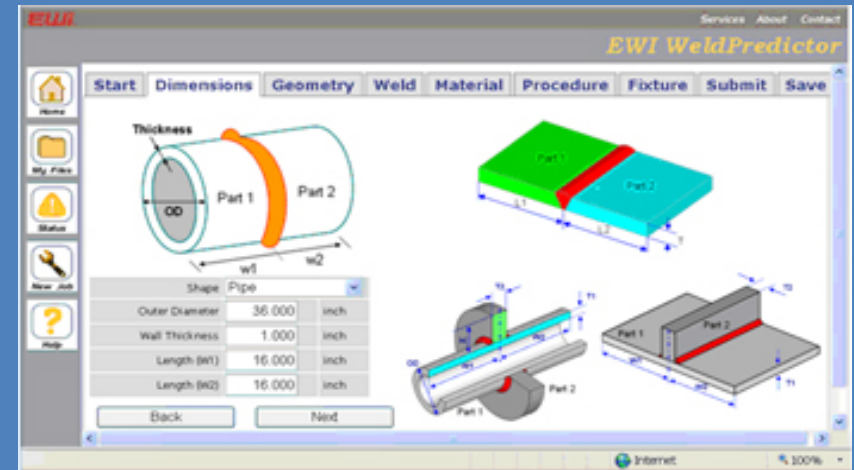
- Automatic product design with using supercomputer
- No need to know how to use supercomputer and SW
- BUT for various products, no general adaptation

FAN Simulator



- Support type: Axial, Sirocco FANs
- Performance estimation with data-mining
- Trial service: 2011. 10.

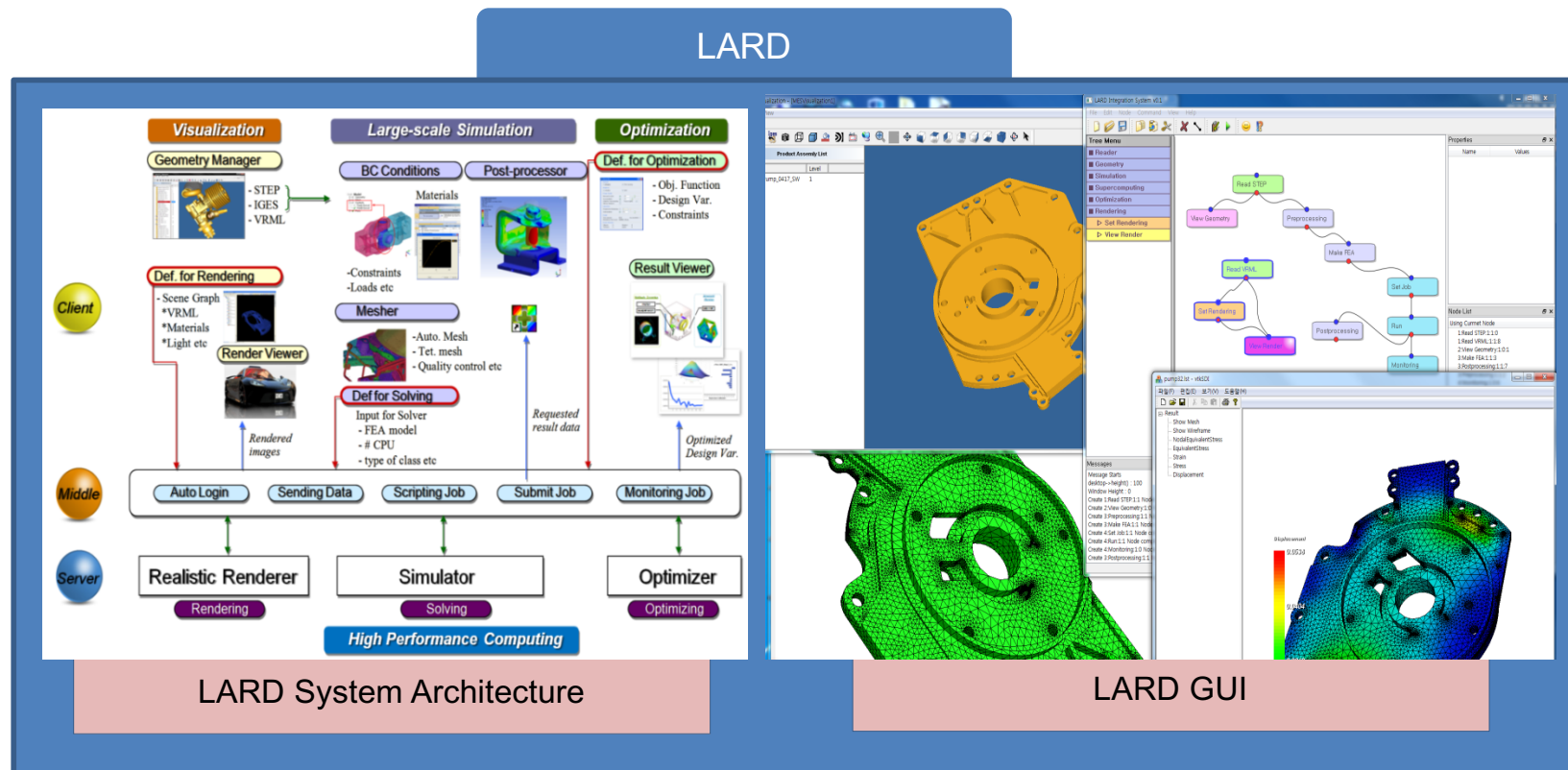
K-Weld Predictor



- Support type: Cylinder, Bar, Plate, etc.
- providing analysis report
- Trial service: 2011. 10.

▣ Large-scale Realistic Design platform(LARD)

- (Purpose) to provide practicable CAE software to SMB
- (Functions) Visualization, CAE Simulation, Optimization for Product Design
- (Application Domain) Structural Mechanics (to be extended)
- (Usefulness) very easy, highly effective and with low cost for SMB
to use supercomputer in product design process

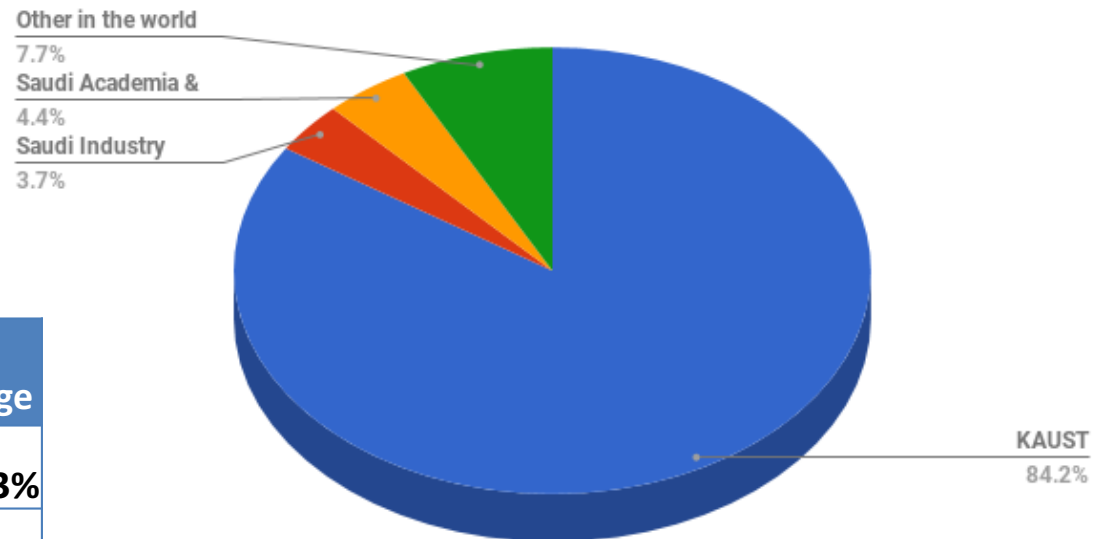


Outreach to the Kingdom

Shaheen Users and Projects

Has Supported since July 2015

- 298 Projects
- 105 Distinct Pls
- 598 Users



Institution	Project number	Percentage
KAUST	251	84.23%
Saudi Industry	11	3.69%
Saudi Academia & Agency	13	4.36%
Other in the world	23	7.72%

In-Kingdom Partners of KSL



Thank You!

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