Korean Grand Plan for Industrial SuperComputing

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Background

Current State of Korean SMB (SME, SMM)

- Companies: 99%
- Employees: 88%
- Innovation Level: ~70%
  (~40% in product design, ~95% in manufacturing)

⇒ K-SMB: very important position in Korean economy

⇒ But they need to level up new technology & new innovation level
Background

Global Trend & Efforts

America (US)
- Digital Manufacturing (2011~)

Europe
- PRACE/e-infrastructure (2007~)

Korea
- SMB Supercomputing (2007~)

Japan
- FOCUS (2011~)
Historical Review on Industrial Supercomputing in Korea

M&SA Technology support Effects

Center & Business

2007 Inno- biz

2008 Inno- biz

2009 SMB

2010 SMB/ASTI

2011 SMB/ASTI

SMB Support

SMB Support using Supercomputing

SMB Support using Supercomputing

M&SA Environment

Roadmap

Build development direction for LARD

Develop prototype

Supply demonstration

Develop Convenience environment using supercomputer

Developed axial-flow fan simulator

Build development direction for LARD

Develop LARD environment by remote control

Develop & apply 3D visualization environment

Develop 3D visualization environment

Develop FANSIM

Develop K-Weld

Complete FANSIM

Complete K-Weld

Build & apply 3D visualization environment

3D visualization environment by remote control

Develop LARD development

Support LARD demonstration

Supported SMB Blue Ocean

Technical development using supercomputer Platform of design supporting for c-MES

Supported SMB M&S Environment Platform of design supporting for c-MES

SMB Support using Supercomputing

Technical development using supercomputer Platform of design supporting for c-MES

Development of axial-flow fan simulator

Developed FANSIM

Developed K-Weld

Complete FANSIM

Complete K-Weld

Develop convenience environment using supercomputer

Develop 3D visualization environment

Develop FANSIM

Develop K-Weld

Complete FANSIM

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Develop convenience environment using supercomputer

Developed axial-flow fan simulator

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Complete FANSIM

Complete K-Weld

Develop convenience environment using supercomputer
Historical Review on Industrial Supercomputing in Korea

Objectives:
- Share HPC service model, policy and HPC technology

Participants:
- NCSA, OSC, TACC, Oak Ridge (US), HLRS, EPCC, CINECA (EU), SSC (CN), iHPC (SG), Kei-SC, Univ. of Tokyo (JP), KISTI (KO)

Events:
- Daejeon KOREA (KISTI, May 2010)
- Stuttgart Germany (HLRS, May 2011)
- Urbana-Champaign United State (NCSA, June 2012)
Economic Effects on SMB through SMB supercomputing

Inno-QCT: Quality, Cost, Time

- **Q**: Optimizing Quality
- **C**: Minimizing Cost
- **T**: Minimizing Time

New Value Creation

- Time to produce
- Time to market
- Time to Delivery
Economic Effects on SMB through SMB Supercomputing

Overall Effects

- **Reduce of time**
  - 43 Month → 5 Month (88% reduction)

- **Reduce of cost**
  - 3 B won → 0.3 B won (90% reduction)

- **Increase of total sales**
  - Expecting to increase 5 B won per year
Economic Effects on SMB through SMB Supercomputing

Main Supports on SMB Product Development

Product Design Simulation
- 3D Product Design & Engineering Supports based on Supercomputing
- Reduction of Cost and Time through Adapting Virtual Design Technology

Air Condition  Cast Analysis  Heat Exchange  New Renewable Energy

Industrial Design/Visualization
- Industrial Design for New Products
- Photo-realistic visualization & Simulation Visualization

Industrial Design for New Products  VR/AR Visualization
A Korean Grand Plan for Industrial Supercomputing

Technology Innovation

R&D Infra
- Supercomputer
- Simulation S/Ws
- HP R&D Network

Consulting
- Modeling/Simulation
- Design/Visualization

Training
- Supercomputing
- Simulation S/Ws

Experts
- 300 domain Experts
- Human Network

NATIONAL-WIDE SUPPORTING PLATFORM

- Headquarter: KISTI
  - Large-scale Applications
- 7 Regional Centers
  - Small/Medium-scale Applications
Policy Suggestions for SMB HPC M&S Invigoration

SMB Innovation
National Competitiveness

HPC M&S: Innovation tool for product development in SMB

Changing Mind

Promotion for Utilizing HPC M&S by SMB

Expanding investment

Success Factors
- Research & Development
- HPC Environment
- Training the expert
- Systematize a service
- Professional organization
Securement of Global Competiveness through HPC M&S

Over 95% Products produced by Digital Manufacturing based on HPC

Innovative Improvement of QCD
* QCD: Quality, Cost, Delivery

- Production Innovation
- Process Innovation
- Design Innovation
Establishment of easy and effective HPC Environment

Physical Center: SMB M&S Cloud Computing Center

- 1 Step (12~13) : Build the HPC cloud computing center using supercomputer (KISTI)

- 2 Step (14~15) : HPC Cloud Center (KISTI) + DDIC (SMBA) + Local Centers (PLSI)

R&D Environment: HPC S/W Environment

- Safely providing commercial M&S software
- Providing web portal services
- Expansion of open source software
Structure of Digital Manufacturing Service for SMB

Research & Development
- Product Innovation
- Process Innovation
- Design Innovation

Institute- University- company

HPC Platform : KISTI
- KISTI S/W : e-spline, BioWorks
- Foreign S/W : e-Weld, Adventure...
- Commercial S/W : FLUENT, ANSYS...

Use

Functional intension

Training Developer

Training User
- School of HPC user

Networking
- Symposium, Workshop...

Out Reach
- Expansion of users

Co-Open Innovation System using HPC

SMBA DDIC PLSI KITECH Center in local

National HPC Cloud Computing Center
Build Co-Working Group at KISTI (HPC Platform)

- Benchmark NCMS Model
  * NCMS: National Center for Manufacturing Science (US)

- Operation of SIG (Strategic Interest Group) & 3 KSF
  - Talent: Skill, Expert, Knowledge
  - Investment: Budget for R&D
  - Infrastructure: Facilities, Resource, Tools

K-NCMS + DDIC
Conclusion Remark

We will make a **Backbone Program** - **Super-DM Initiative**- fully supported by government to establish Korean-Style HPC M&SA environment for SMB.
Thank you very much!

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