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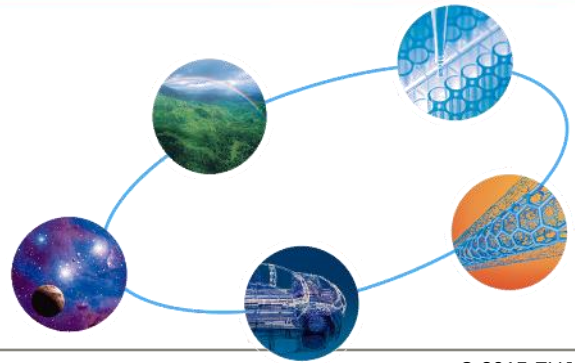
shaping tomorrow with you

FUJITSU Integrated System PRIMEFLEX for HPC

Integrated HPC Cluster Solutions

Optimized for specific Applications



Why High Performance Computing?

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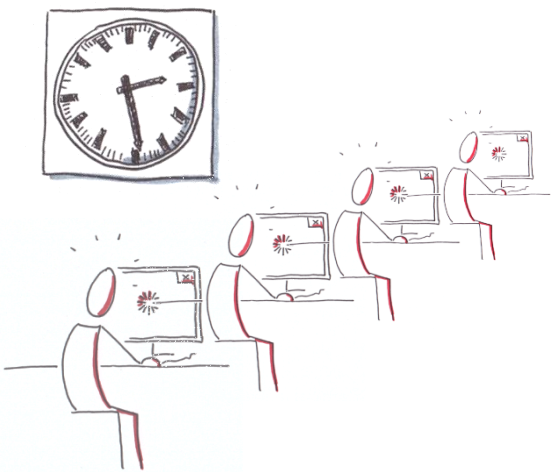
Wouldn't it be great if you could …

- …quickly validate and exploit research theories?
- …speed up product development and time-to-market through computer-based modeling?
- …sustain and spread HPC competence across your organization?



PRIMEFLEX for HPC

Agenda

1. **What is it all about**
   - Scope of HPC Applications
2. **What is the business impact**
   - Overall Benefit Analysis
3. **What is the impact on the infrastructure**
   - HPC Environment
4. **Where is the innovation**
   - HPC Simplicity
5. **How Fujitsu can help**
   - Complete HPC Ecosystem

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High Performance Computing (HPC)

What is it all about

- A fascinating scope of applications

From Academic and Research space to real-world Commercial Deployments

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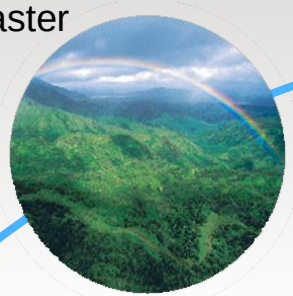
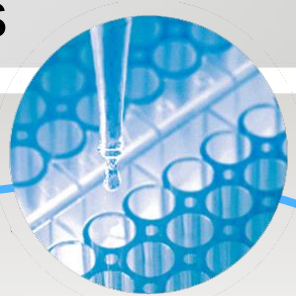
- What if we could help researchers predict global change or improve disaster prevention/reduction earlier?

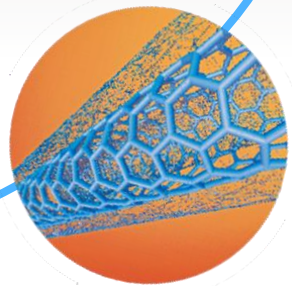




- What if we could help accelerate pharmaceutical development in the fight against cancer?

- What if we could help a scientist discover the origins of matter & the universe first?

- What if we accelerated industrial innovation?



- What if we fast tracked the availability of new materials and energy creation?

What we are achieving with High Performance Computing today

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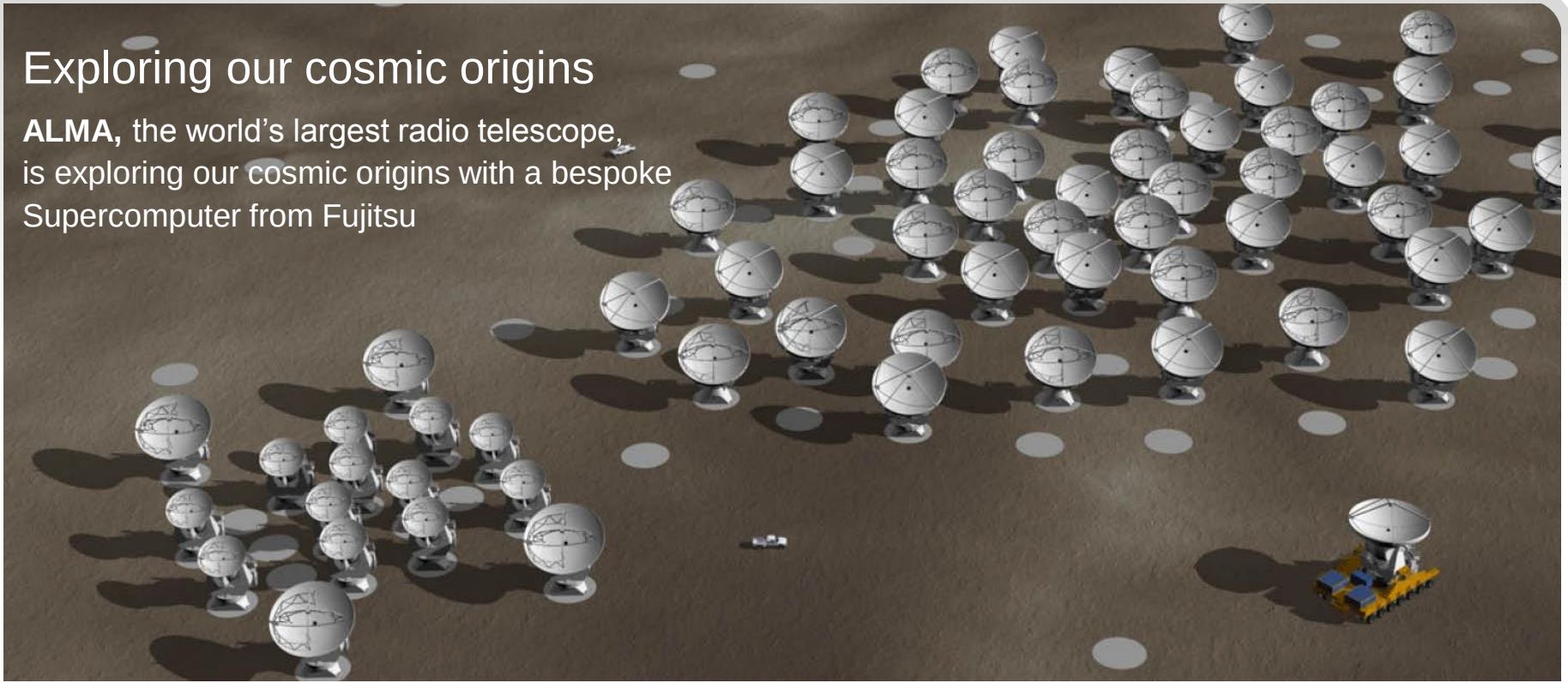

What we are achieving with High Performance Computing today

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Powering innovative research

In partnership with Fujitsu, **HPC Wales** is enabling academic and commercial projects to use high performance computing for modelling weather patterns and climate change, simulation and prototyping, health and bioscience and creative design, to name but a few

What we are achieving with High Performance Computing today

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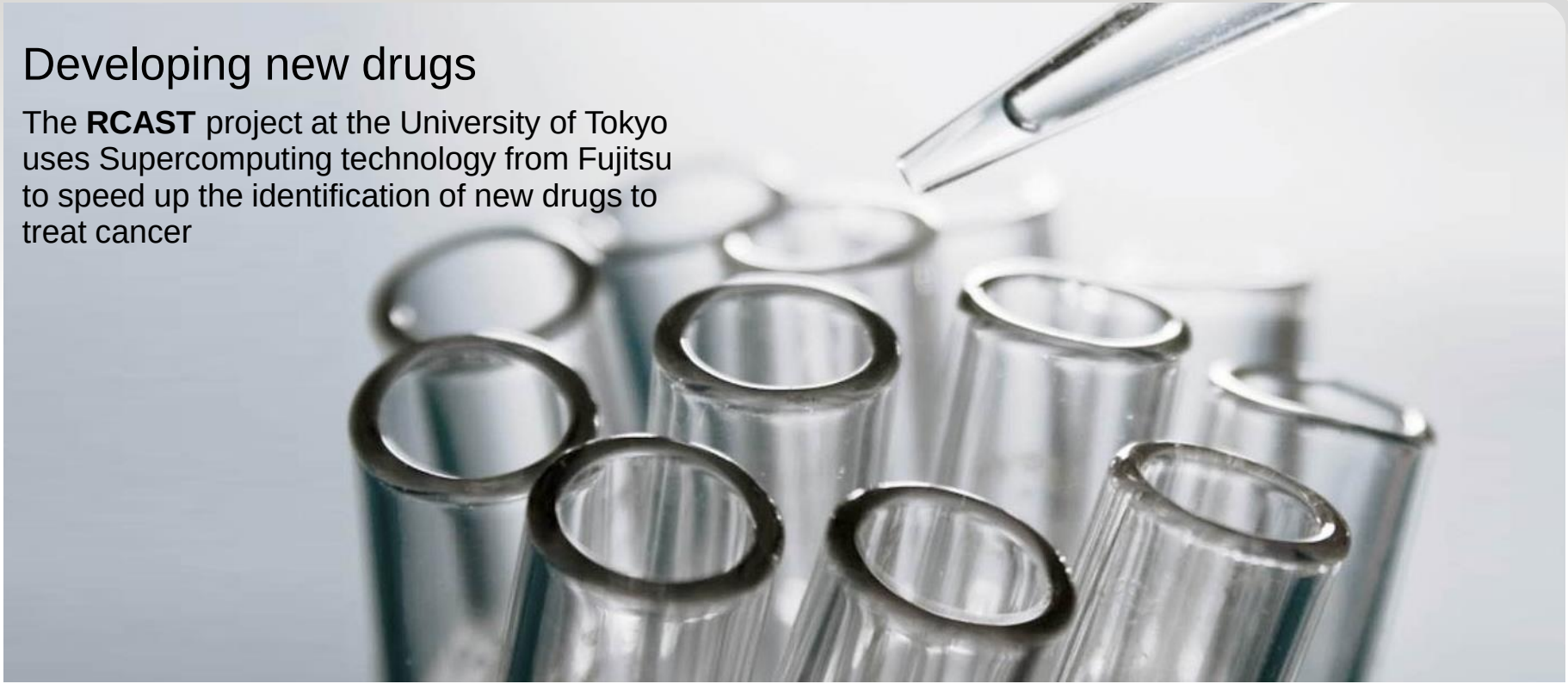
Developing new drugs

The **RCAST** project at the University of Tokyo uses Supercomputing technology from Fujitsu to speed up the identification of new drugs to treat cancer



What we are achieving with High Performance Computing today

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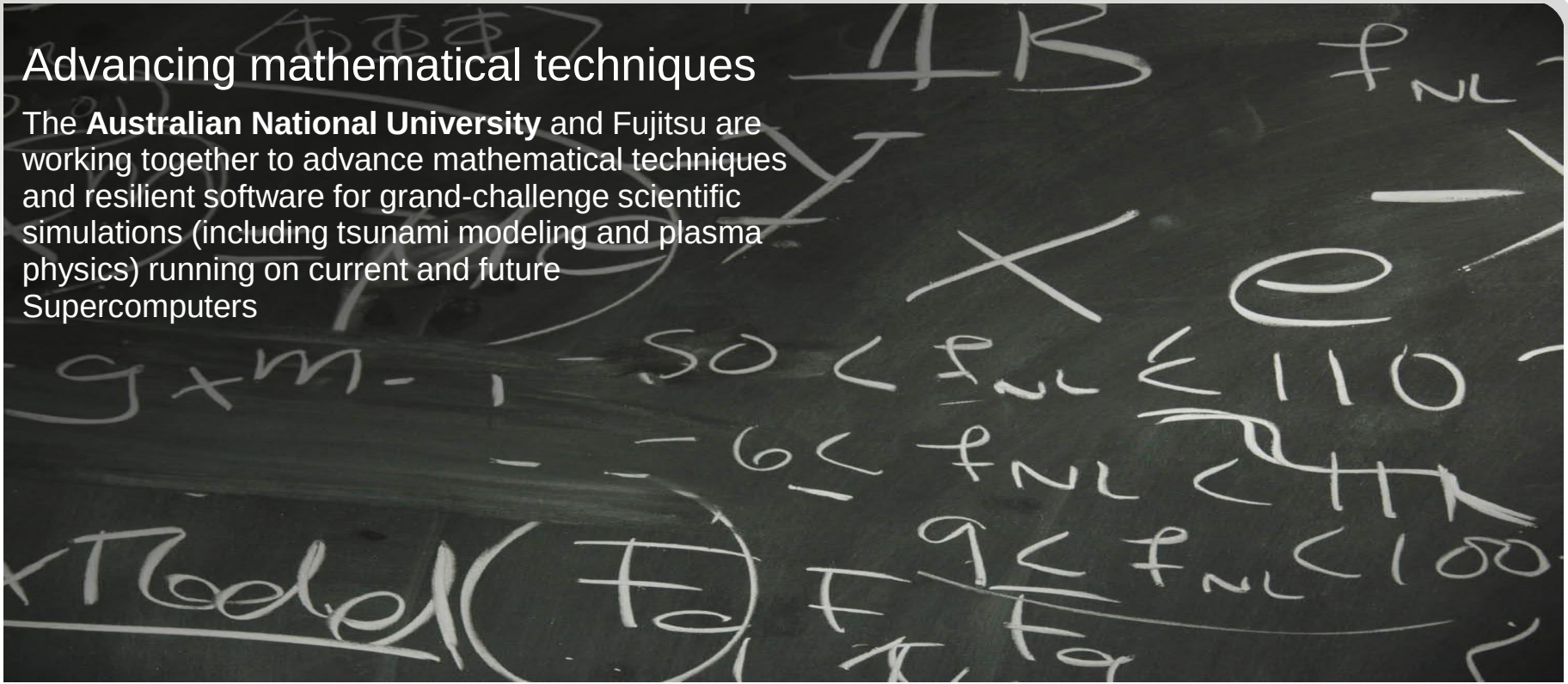

Advancing mathematical techniques

The **Australian National University** and Fujitsu are working together to advance mathematical techniques and resilient software for grand-challenge scientific simulations (including tsunami modeling and plasma physics) running on current and future Supercomputers

A definition of HPC

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> HPC applications are found in research or production environments and span industry, commerce, government, and academia. What HPC applications have in common is their linkage to top-line organizational productivity.

Research	Validate and exploit theories	Encode models to predict new discoveries Forecasting future conditions Interpolate observations to fill data gaps
Production	Optimisation and cost saving	Create models impossible to fabricate Speed up tests and meet regulation criteria Increase prototyping coverage and quality
Analysis	Identify patterns of behaviour	Migrate data for physical imaging Alignment to identify regions of similarity Filter measurements to find repeated indicators

Examples

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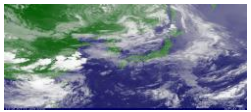
A random sample of HPC application end-use

Research	Production	Analysis
Tsunami modelling	Molecular dynamics	Genetic alignment
Heart modelling	Exhaust turbine	Particle physics
Long-range forecasting	Occupant safety	Seismic analysis
Neutron star collision with black hole	Rivet separation	
	Ship propellers	
	Reservoir simulation	

HPC - Market Segmentation

2014 worldwide HPC revenue share by segment



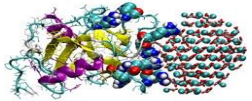
Economics / Financials

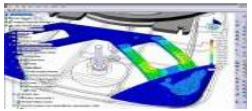
Weather

Other

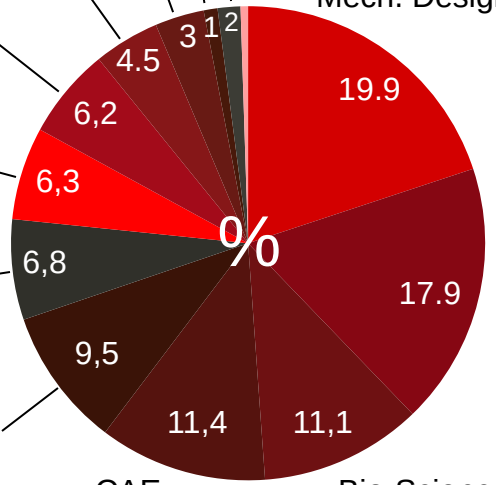
Chemical Engineering

Mech. Design and Drafting

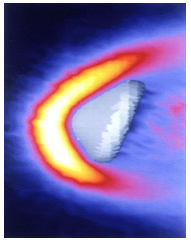




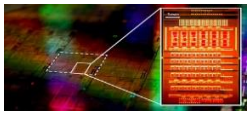
Digital content creation & Distribution



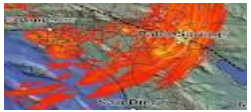
Government Lab



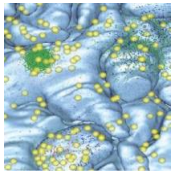
Electronic design & analysis



Geo-Science, Engineering

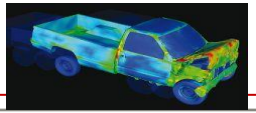


University / Academic



Defense

CAE



Bio-Science

Source: IDC, July 2015

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High Performance Computing (HPC)

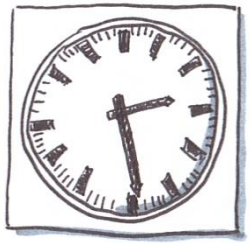
What is the business impact

- Overall Benefit Analysis

HPC - Benefit Analysis

Key Challenges

- **Quality**
- **Time & Resources**
- **Building & testing physical prototyping**

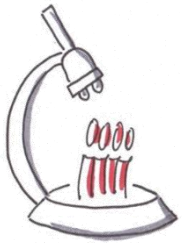


Solutions

- **Running advanced simulation**
- **Explore & validate designs**

Key HPC Benefits

- **Discards flawed designs**
- **Provides unexpected insights**
- Fosters **innovation** & **productivity**
- **Decreases** building & testing **costs**
- **Compete effectively** in your global market place



Source: Analysis of Case Studies published by the Council of Competitiveness

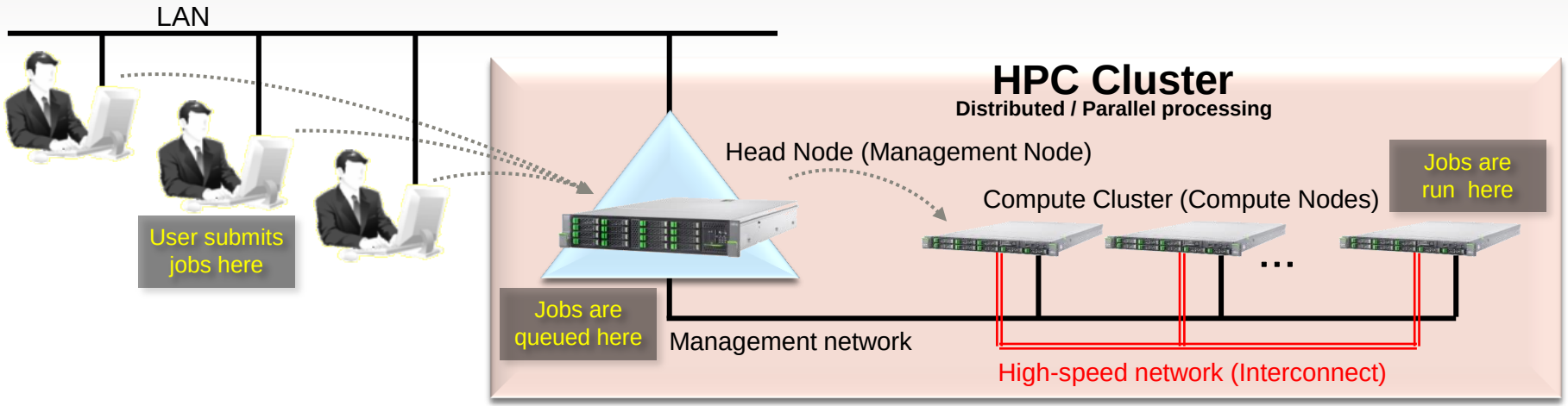
High Performance Computing (HPC)

What is the impact on the infrastructure

- HPC Environment

What is an HPC Cluster?

- Multiple x86 servers + a fast network = distributed and parallel processing
- Complex tasks are divided in jobs
  - ↳ a job consists of multiple parallel processes
  - ↳ multiple jobs are executed simultaneously
- More x86 servers ➔ raises total processing performance and allows more jobs to be run in any given time frame



HPC Cluster – User expectations

stable working environment

hide cluster complexity

more time for creativity

raising productivity

increase innovation

ease of use

eliminate waste

reliable and predictable results

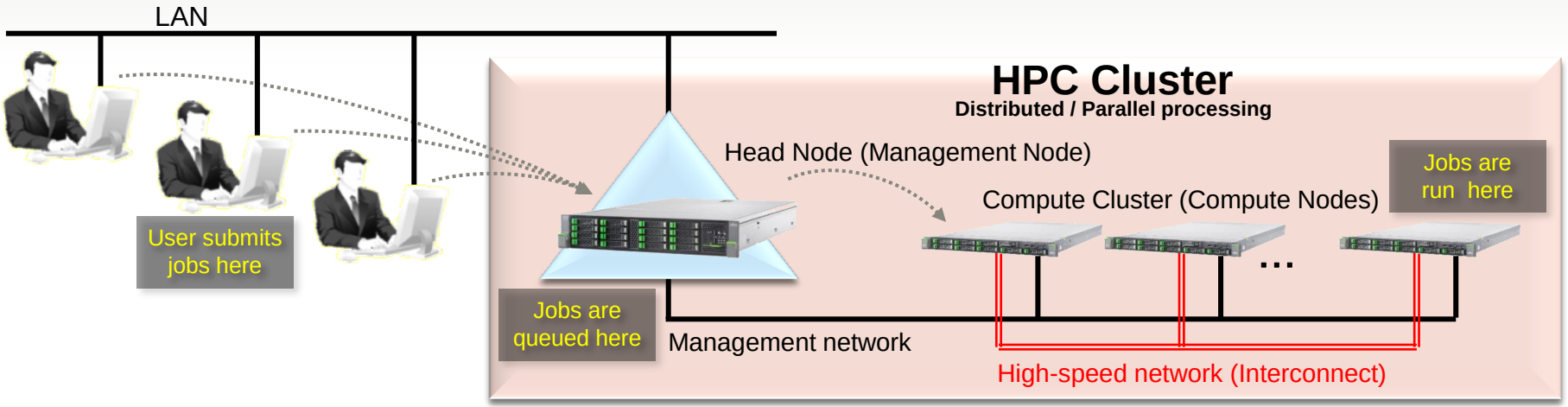
transferable best practice workflows

optimize the development process

increase project throughput

maximize application effectiveness

migrate more projects and new users into HPC



PRIMEFLEX for HPC

Application Appliance	Reference Configuration		
Integration & Support services			
Assembly, Test & Delivery			
User workplace	HPC Gateway		
	Application Catalogue		
System design	Head node	Compute nodes	Storage
	Interconnect	Rack & Power	Graphics
Management software	Batch	Operation	Administration

HPC Simplicity & Expertise

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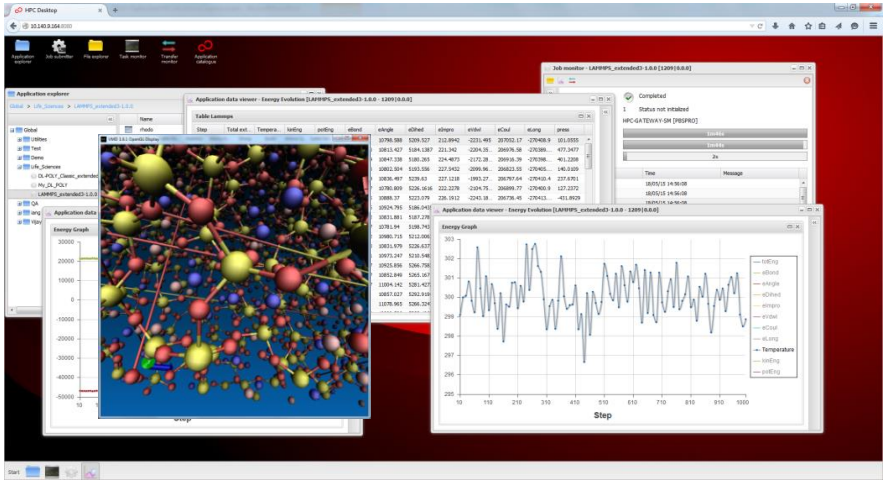
High Performance Computing (HPC)

Where is the innovation

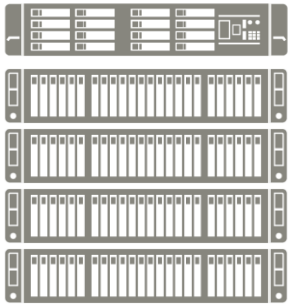
- Easy-to-use HPC solution

Fujitsu HPC Gateway – Broadening HPC access

Simplify HPC



Build in Expertise



- No more scripts – Savings measured in days and weeks from elimination of user faults
- Job setup takes seconds – Reduced from hours compared to user-developed scripts
- Productive at first login – More users can work with HPC even with little/no IT skill

PRIMEFLEX for HPC

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Dependency on IT knowledge is removed

Workflow automation of HPC processes with implicit dataflow

Making HPC easier to use

Embedding expertise

Providing a natural work interface

Increasing organizations competence

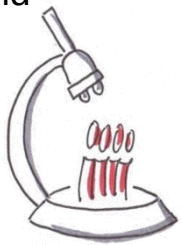
Define experiment parameters defined in end-user language

Managed environment for sharing and exchange

PRIMEFLEX for HPC – Value Proposition

Ready-to-Go & HPC Gateway & Workflow

- Increase innovation by raising productivity among engineers and researchers, and facilitate more time for creativity.

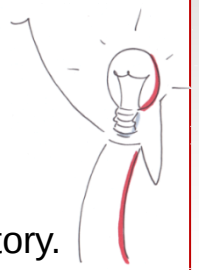


- Optimize the development process to eliminate waste, and achieve reliable and predictable outcomes.

- Increase project throughput from automation and access to tuned and tested processes.
- Maximize application effectiveness assessed by direct and comprehensive measurement.

Results

- A stable & predictable working environment, with greater operational robustness.



- Transferable best practice workflows for specific sectors, for single and combined applications, delivered through a lifecycle-maintained repository.
- Broader set of measurements around application usage, to continually assess and adapt investment costs (comm. license, installation and support).
- Migrate more projects and new users into HPC with lower risk and with shorter time to productivity.

PRIMEFLEX for HPC – Industrializing Expertise

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High Performance Computing with Fujitsu

How Fujitsu can help

- Complete HPC Ecosystem

Supercomputers since 1977, PRIMERGY in HPC for 10 Years!

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Vector Supercomputer Series

Scalar MPP Series

Scalar Supercomputer Series

Peta to Exa scale Supercomputer Series

x86 Cluster Series

Exascale

F230-75APU

Japan's First Vector (Array) Supercomputer(1977)

VP Series

VPP500

NWT* Developed with NAL

No.1 in Top500 (Nov. 1993) Gordon Bell Prize (1994, 95, 96)

AP1000

AP3000

World's Fastest Vector Processor (1999)

VPP5000

VPP300/700

PRIMEPOWER HPC2500

World's Most Scalable Supercomputer (2003)

SPARC Enterprise

PRIMEQUEST

FX1

Most Efficient Performance in Top500 (Nov. 2008)

K computer

No.1 in Top500 (June and November 2011)

FX10

FX100

next x86 generation

PRIMERGY CX400 Scale-out server

PRIMERGY BX400/900 Cluster node

HX600 Cluster node

PRIMERGY RX200 Cluster node

Japan's Largest Cluster in Top500 (July 2004)

1980 1990 1995 2000 2005 2010 2015 2020

*NWT: Numerical Wind Tunnel

World-wide Network of Partners and Resources

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FUJITSU Japan

- Global lead in High Performance Computing
- Strategy, Development, Services and Support

FUJITSU Technology Solutions

- PRIMERGY based HPC Ecosystem
- Services and Support

FUJITSU Systems Europe, ict GmbH - a FUJITSU company

- HPC application champions
- Benchmarking

FUJITSU Laboratories

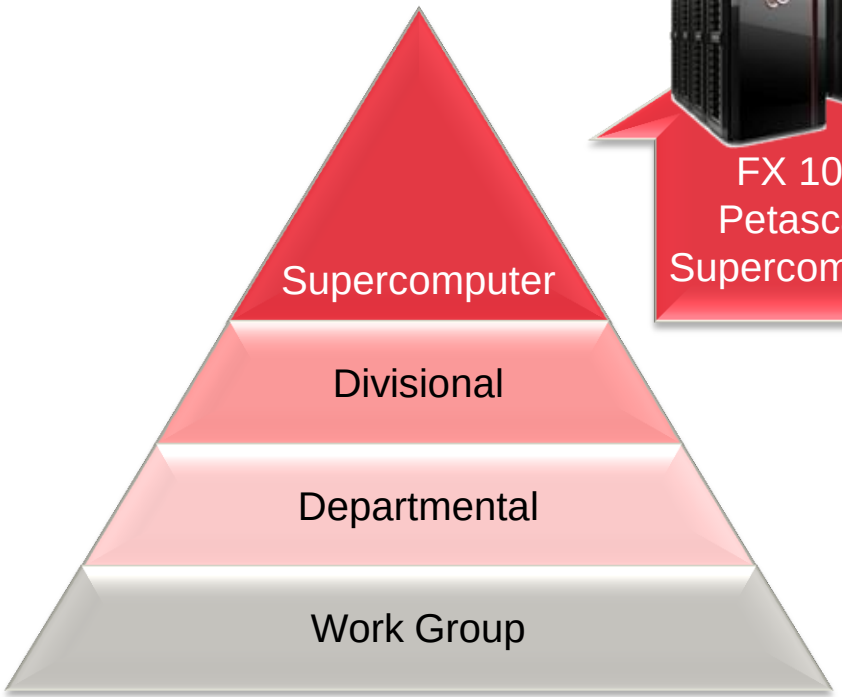
- Research & Development

e.g. Open PetaScale Libraries Network

LSTC, Exa, ANSYS, CD-adapco, SIMULIA, ESI GROUP, MSC Software, MAGMA, Platform Computing, intel, Microsoft, redhat, NVIDIA, Mellanox TECHNOLOGIES, oerc, JAIST, nag, ANU, Imperial College London

Fujitsu HPC Platforms

Tailored to Customer Needs



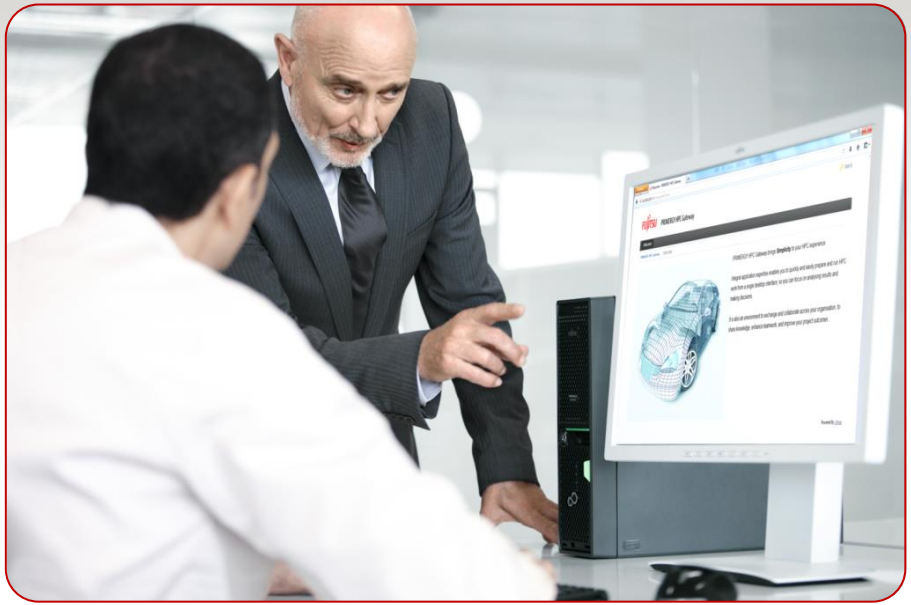
SPARC64

FX 100
Petascale
Supercomputer

PRIMEFLEX for HPC
– Ready-to-Go –

High-performance
Workstation

PRIMEFLEX for HPC – Industrializing Expertise



Expand your opportunities

At a glance

Integrated HPC Cluster Solutions
Optimized for specific Applications

- HPC cluster components balanced for optimal price-performance against segment workload.
- Validated with direct application measurement on production-sized models and full physics.
- Integrated HPC architecture including hardware, system software and user-ready middleware.
- Factory-installed user environment for instant project readiness and application usage.
- Higher user productivity from HPC Gateway pre-built workflow packages
- Intel-Cluster-Ready certified.

PRIMEFLEX for HPC – Industrializing Expertise

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Features & Benefits

What it provides	Your Benefit
HPC Solutions tuned for market segment specific workloads	- No surprise, lower risk, simplified acquisition. - Pre-sized to your operational requirements with matched up-scale options.
Import application workflow expertise	- Pre-built automated workflow packages makes HPC easier, and your team more productive. - Leverage best-practise and validated process expertise for more economic value from HPC
“Ready-to-Go” delivery	- Guarantees rapid deployment for production - Proven performance and trouble-free operation by Intel Cluster Ready certification
Complete solution support & services	- Delivery ready for operation on-site through Fujitsu SELECT Expert HPC Partner

PRIMEFLEX for HPC – Industrializing Expertise

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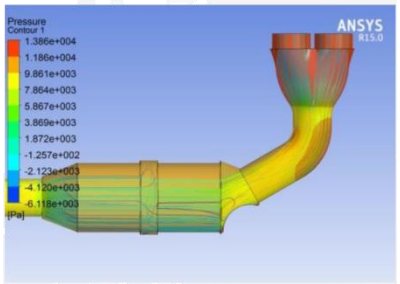
Vertical solution development approach with ISVs

ANSYS

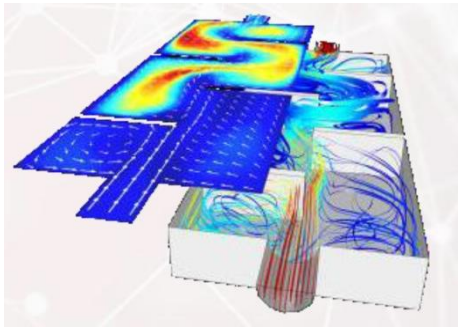


- Joint industrial whitepapers
- Application Catalogue methods
- FLUENT technology guide
- Best-practice operational guide
- Solution presentations at German and Indian user meetings

AUTODESK.

- VRED system configuration for SMEs and OEMs
- Joint presentations at events
- VRED technology guide
- Real-time visualization demonstration event

COMSOL



- Joint industrial flyers
- Application Catalogue methods
- COMSOL technology guide
- Best-practice operational guides
- Demonstration setups

Some of our HPC Customers

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PRIMEFLEX for HPC

Why HPC Solutions from Fujitsu?

ITER, Spain

- We have the capabilities, infrastructure, experience, service depth and reach to move HPC beyond the academic and research space to real-world commercial deployments
- We shape these solutions with you to unlock the full potential of High Performance Computing technology – giving you greater awareness of our world
- We seek to leverage technology and computation power, helping to solve problems previously considered insurmountable.

PRIMEFLEX for HPC

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Why PRIMEFLEX for HPC from Fujitsu?

- Benefit from
  - Supercomputing experience also in commercial deployments
  - established collaboration with leading ISVs
  - global HPC Competency Network

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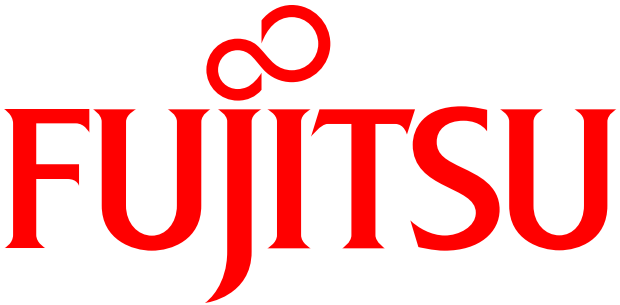
- Increase **innovation & productivity**
  with HPC Workload-Optimized Solutions from Fujitsu

- **Compete effectively**
  in your global market place
  with Fujitsu PRIMEFLEX for HPC



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