

# NEC High Performance Computing Solutions

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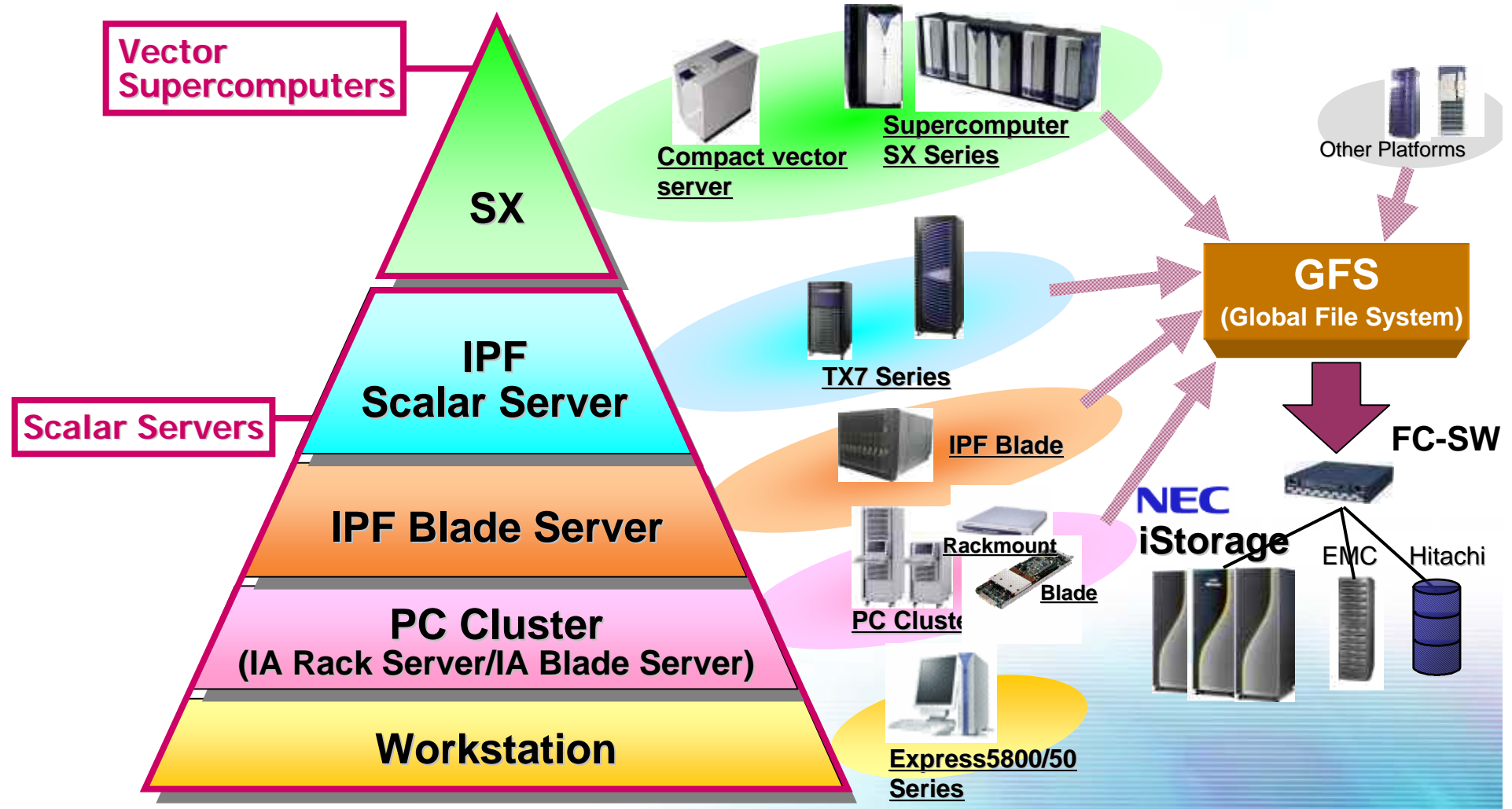
NEC High Performance Computing Europe

# Talk Outline

- NEC HPC Hardware lineup
- The SX-8 Vector Supercomputer
- Solutions & System Integration
- Future Directions
- Customer Sites

# HPC Hardware Lineup

# HPC Product Lineup



# SX Series and SX-8

## SX Series Design Philosophy

- Tailor made computer systems for scientific and engineering users.
- Target the capability market, tackle grand challenge problems.
- Always among the world's most powerful machines.
- The vector architecture allows for easy programming and highly efficient programs.
- Upward compatible between generations, customer investment in software development is preserved.
- Customers include universities, research centres, meteorological services, aerospace and automotive industry.

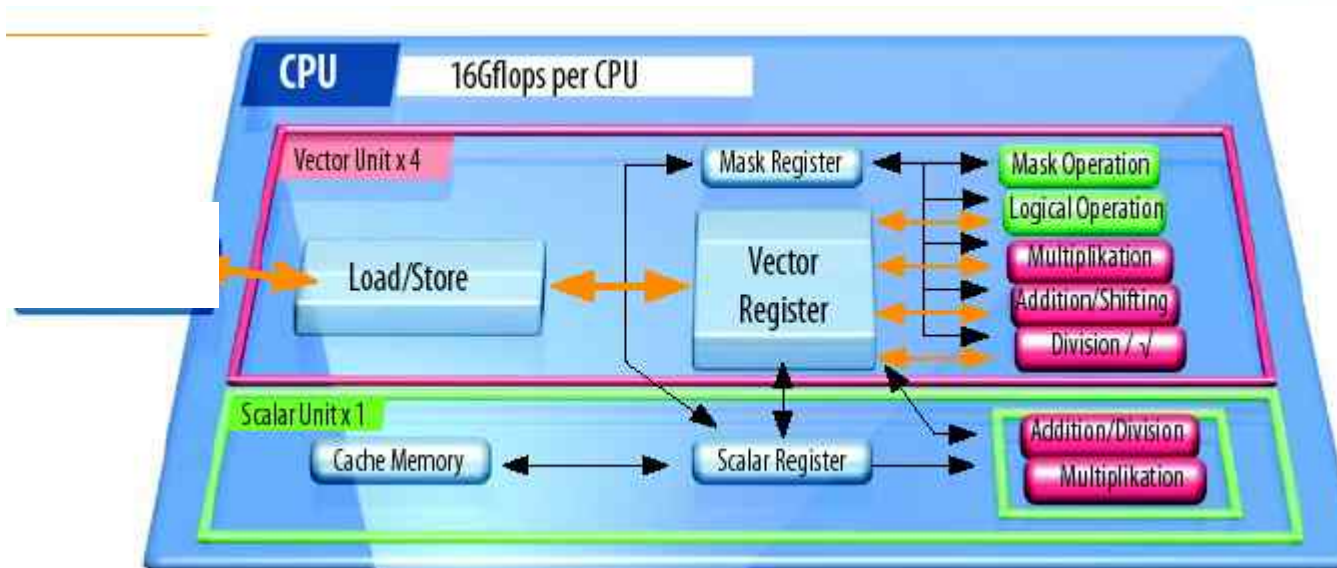


## SX-8 specifications

- 16 GF / CPU (vector)
- 64GB/s memory bandwidth per CPU
- 8 CPUs / node
- 512 GB/s memory bandwidth per node
- Maximum 512 nodes
- Maximum 4096 CPUs, max 65 TFLOPS
- Internode crossbar Switch
- 16 GB/s (bi-directional) interconnect bandwidth per node
- Maximum size SX-8 is among the most powerful computers in the world

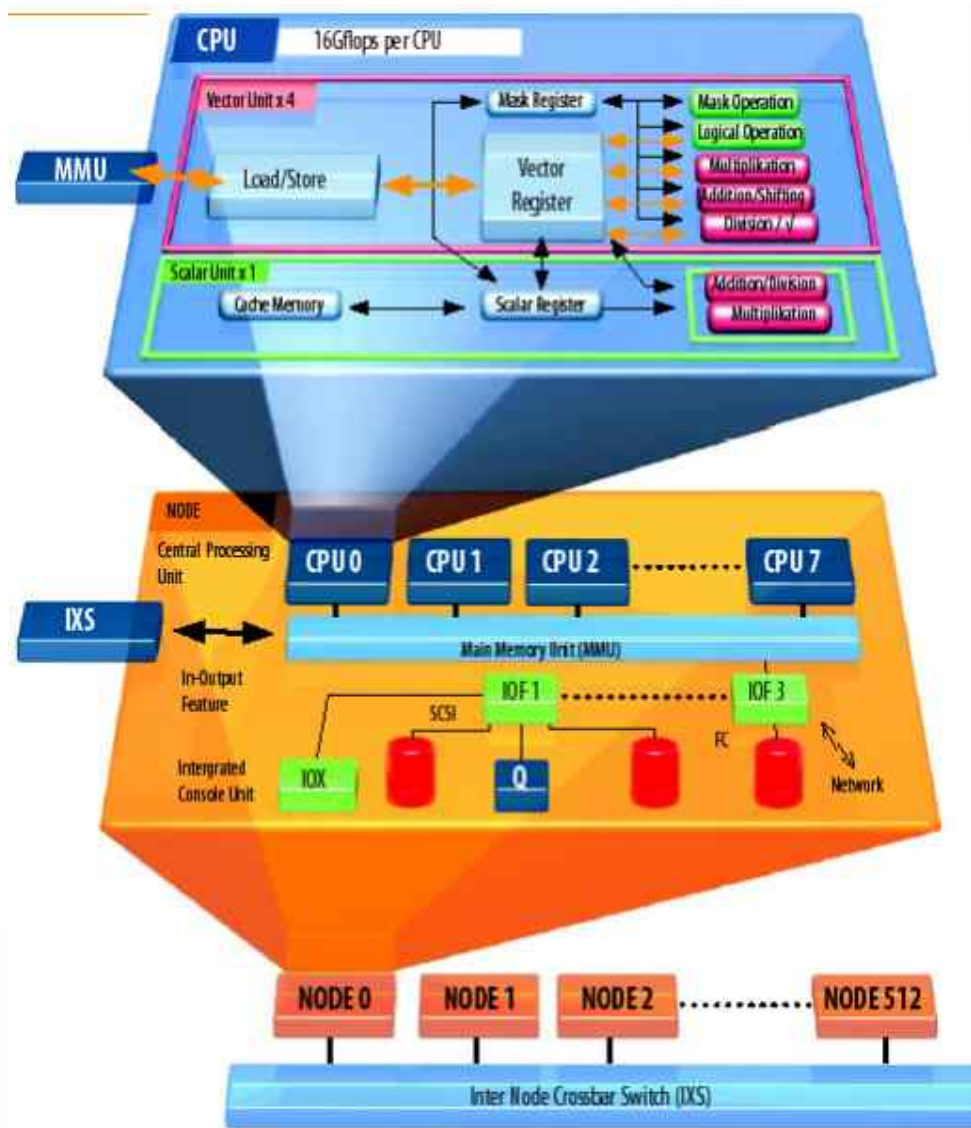


# SX-8 CPU Block Diagram



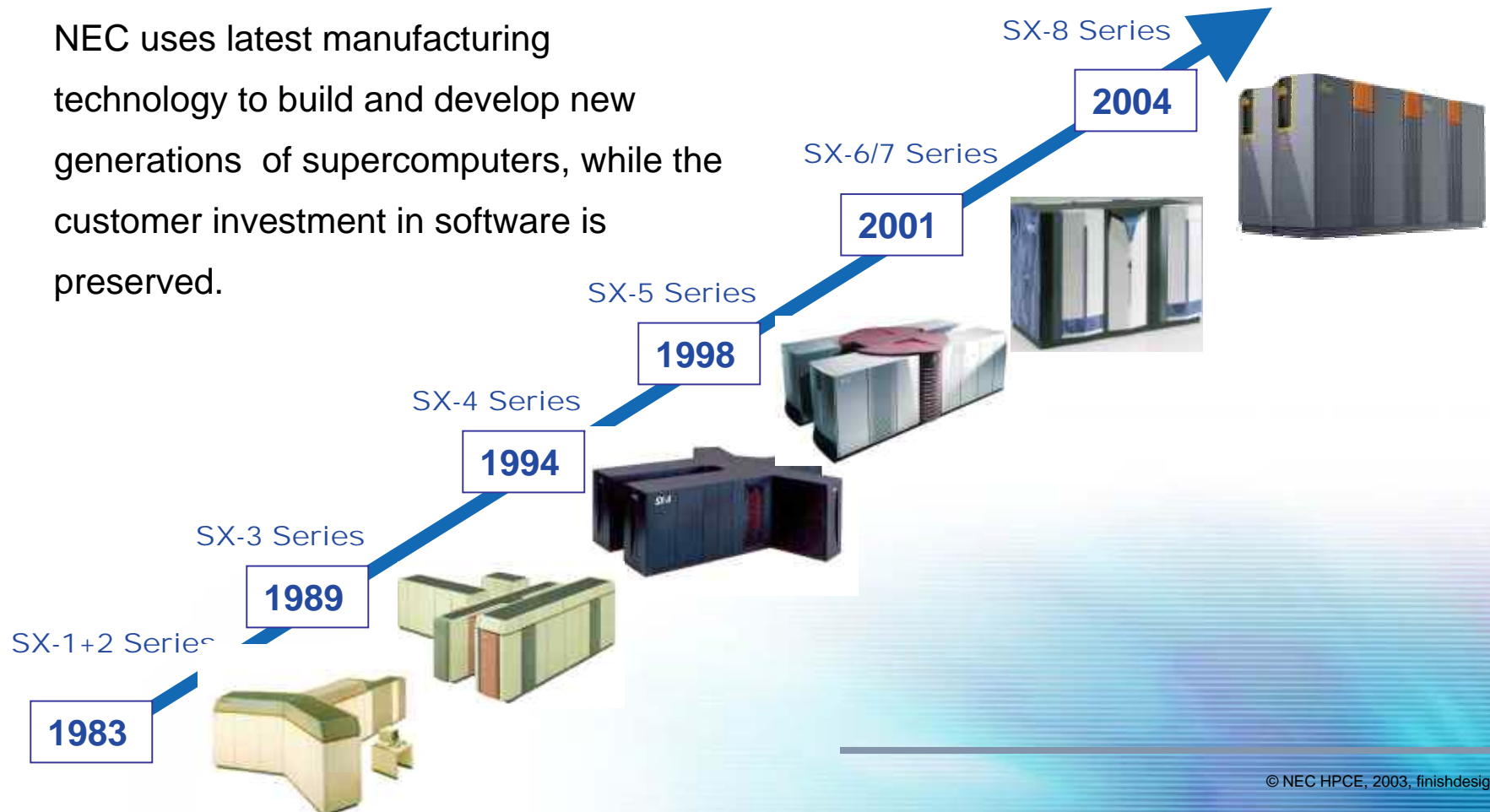
	Results/Cycle	Peak Vector	Peak
<b>Vector Add</b>	<b>4</b>	<b>8 GF</b>	<b>8 GF</b>
<b>Vector Mult.</b>	<b>4</b>	<b>8 GF</b>	<b>8 GF</b>
<b>Vector Div,</b>	<b>2</b>		<b>4 GF</b>
<b>Scalar</b>	<b>1</b>		<b>2 GF</b>
		<b>16 GF</b>	<b>22 GF</b>

# SX-8 System Architecture



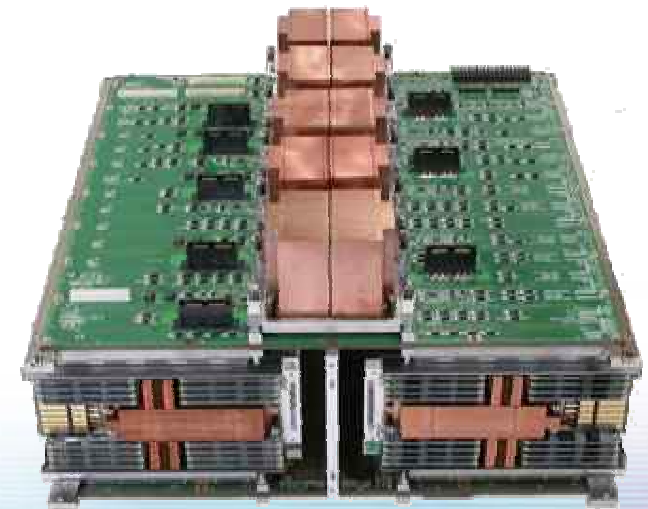
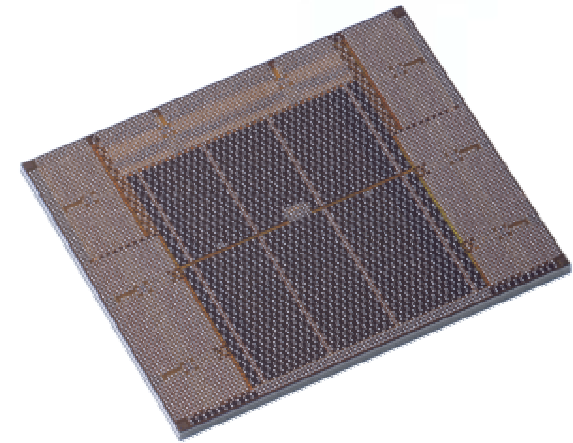
# NEC's SX-Series is a consistent innovation driver and today's leading high performance platform

NEC uses latest manufacturing technology to build and develop new generations of supercomputers, while the customer investment in software is preserved.



# SX-8 Technology

- Hardware dedicated to scientific and engineering applications.
- CPU: 2 GHZ frequency, 90nm-CU technology
- 8000 I/O per CPU chip
- hardware vector square root
- serial signalling technology to memory, about 2000 transmitters work in parallel
- 64 GB/s memory bandwidth per CPU
- Multilayer, low-loss PCB board, replaces 20000 cables
- Optical cabling used for internode connections
- Very compact packaging.



## Innovation & Customer Benefit

<b>Technology</b>	<b>Leads to</b>	<b>Customer Benefit</b>
Advanced Vector Architecture	Exploitation of fine grain parallelism	Efficient Programs, Easy Programming
Advanced LSI, 90nm CU, 8000 pins	High density packaging	Low operational and investment cost, about half the power consumption of SX-6
Optical Interconnect Cabling	Easy Installation and Maintenance	Low operational and investment cost, six times less parts than SX-6
Low Loss PCB technology, serial signalling to memory	High packing density, easy manufacturing	Low operational and investment cost, 4 times less space than SX-6

Empowered by Innovation

**NEC**

# HPC Solutions

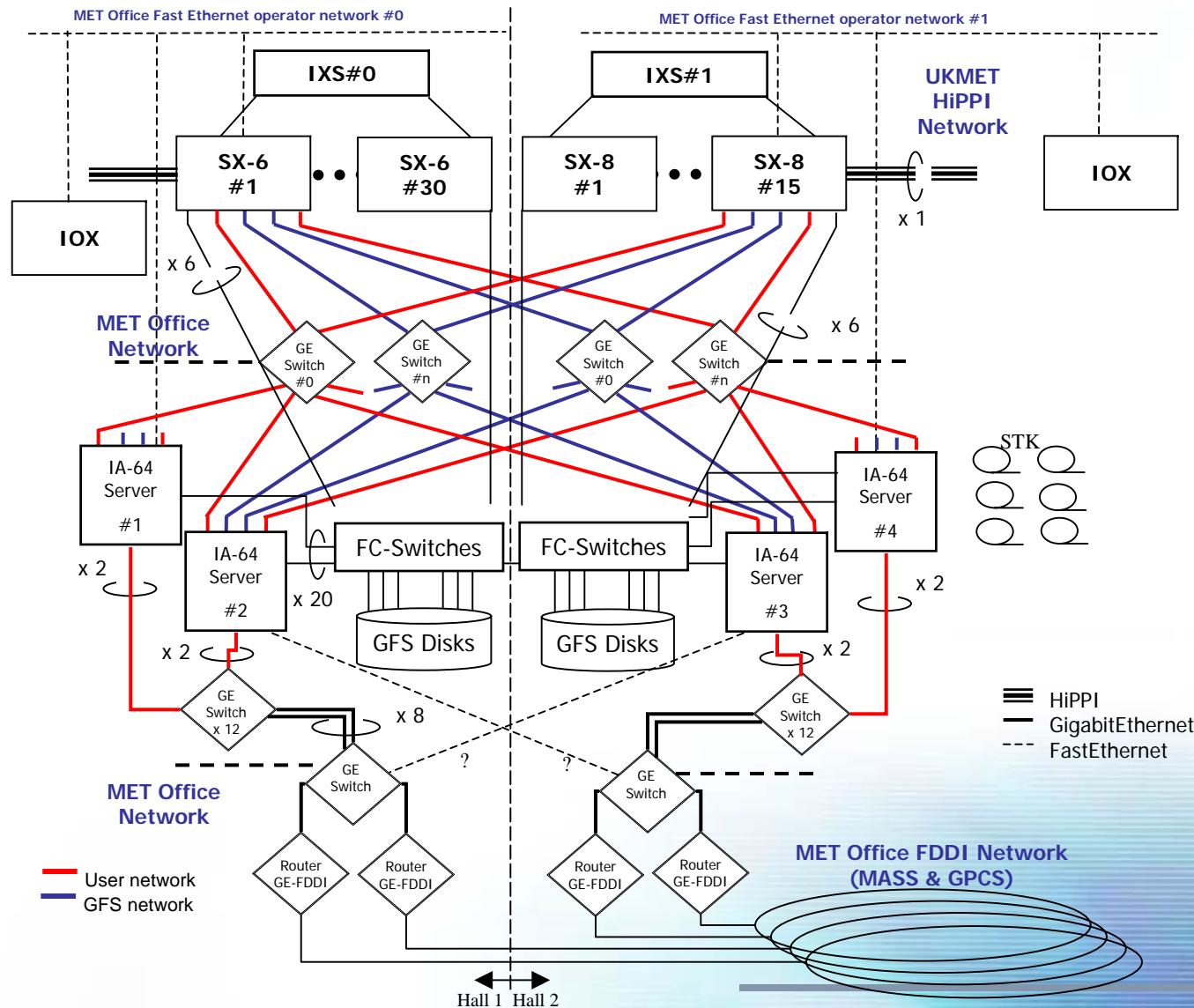
## Providing Complete Solutions

**IT solutions are built by tightly integrating heterogeneous hardware- and software systems.**

**System integration services is a major topic for high performance computer vendors.**

**Supercomputers no longer stand alone, they deliver their power as part of an overall system architecture.**

# Example: Weather Centre



# LINUX COMPETENCE CENTRE

Our team of Linux experts has the in-depth knowledge to allow a mission-critical usage of Linux together with IA-32 or IA-64 hardware.

Superior efficiency at operational level is reached by actively contributing to the Linux platform, creating tailor made solutions by customised packaging and maintaining a very close cooperation with the community.



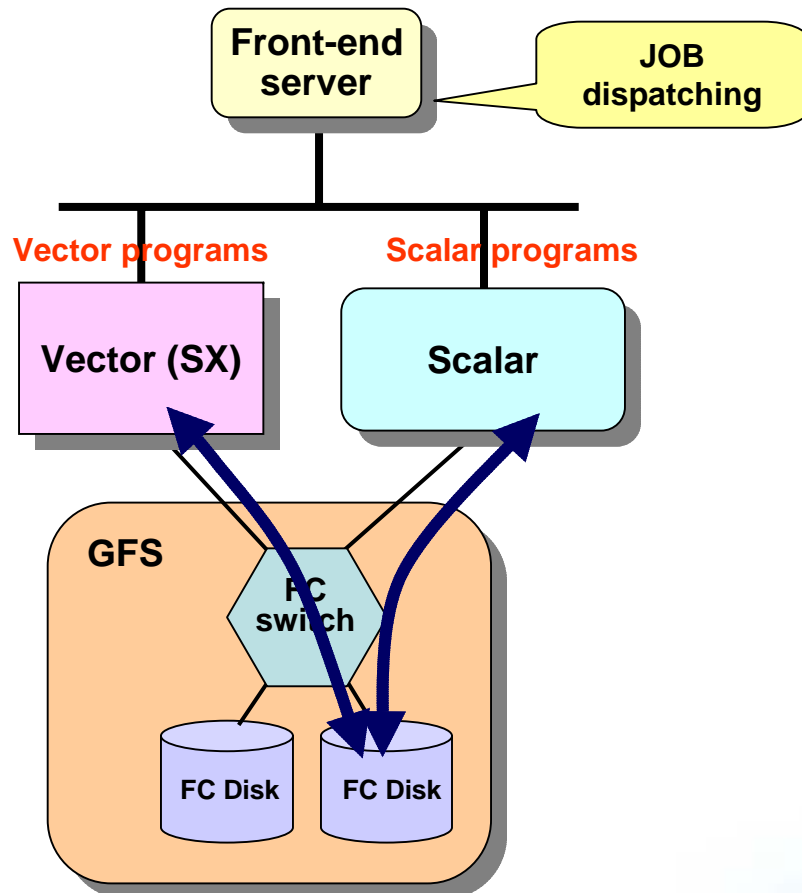
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# Future Directions

# New Concept: Hybrid System

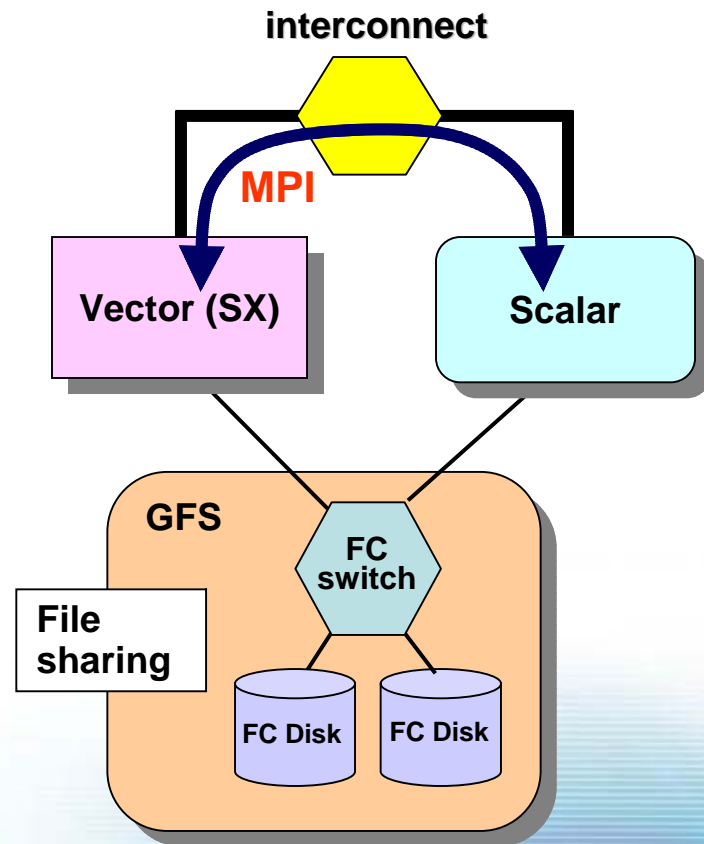
## File sharing type



GFS: Global File System

- A program is executed on the suitable system, either vector or scalar

## Loosely coupled type



- Vector processes suitable parts of a program for vector systems
- Scalar processes suitable parts of a program for scalar systems

ex) Multi-physics applications  
Multi-scale applications

# Next Japanese National Project

- Japanese Governemnt started project to create a Petaflop class machine by 2011
- The Project is currently in the fundatmental technology research stage
- NEC was choosen to study new CPU/memory interconnect technology
  - Electrical signalling will be replaced by optical transmission
  - Research Goal is bandwidth of 20TB/s per CPU

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# Customer Sites

# UK Met Office Exeter

First SX-8 world wide: 16 nodes, 128 CPUs

- SX-8 announcement October 2004
- SX-8 accepted on March 23rd
- First production forecast on April 12th



# HLRS Stuttgart



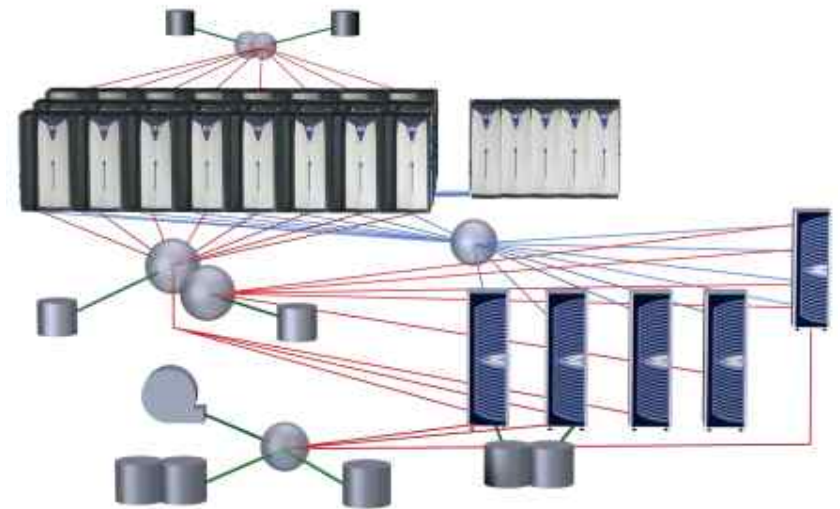
Largest SX-8 world wide  
72 nodes, 576 CPUs

## Summary

- NEC manufactures and develops the leading vector systems worldwide.
- NEC is committed to the vector concept.

### **But NEC offers more:**

- Complete solutions based on a comprehensive product portfolio.
- Complex system integration



# Thank you for your attention

Production terminated

New components

Available soon.

Computing innovation since  
the 1950s:

