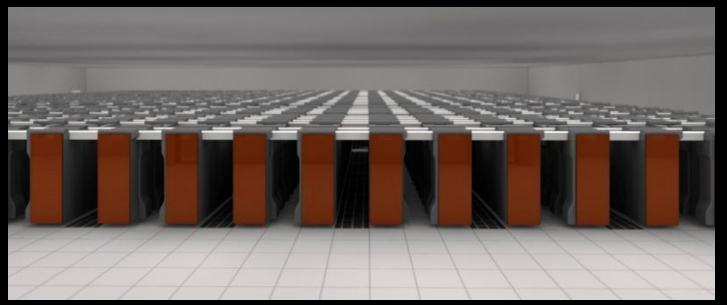
FUJITSU

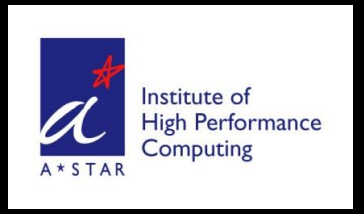
OPEN PETASCALE LIBRARIES

openpetascale LIBRARIES

Advancing the development of numerical software for the new generation of highly parallel computers



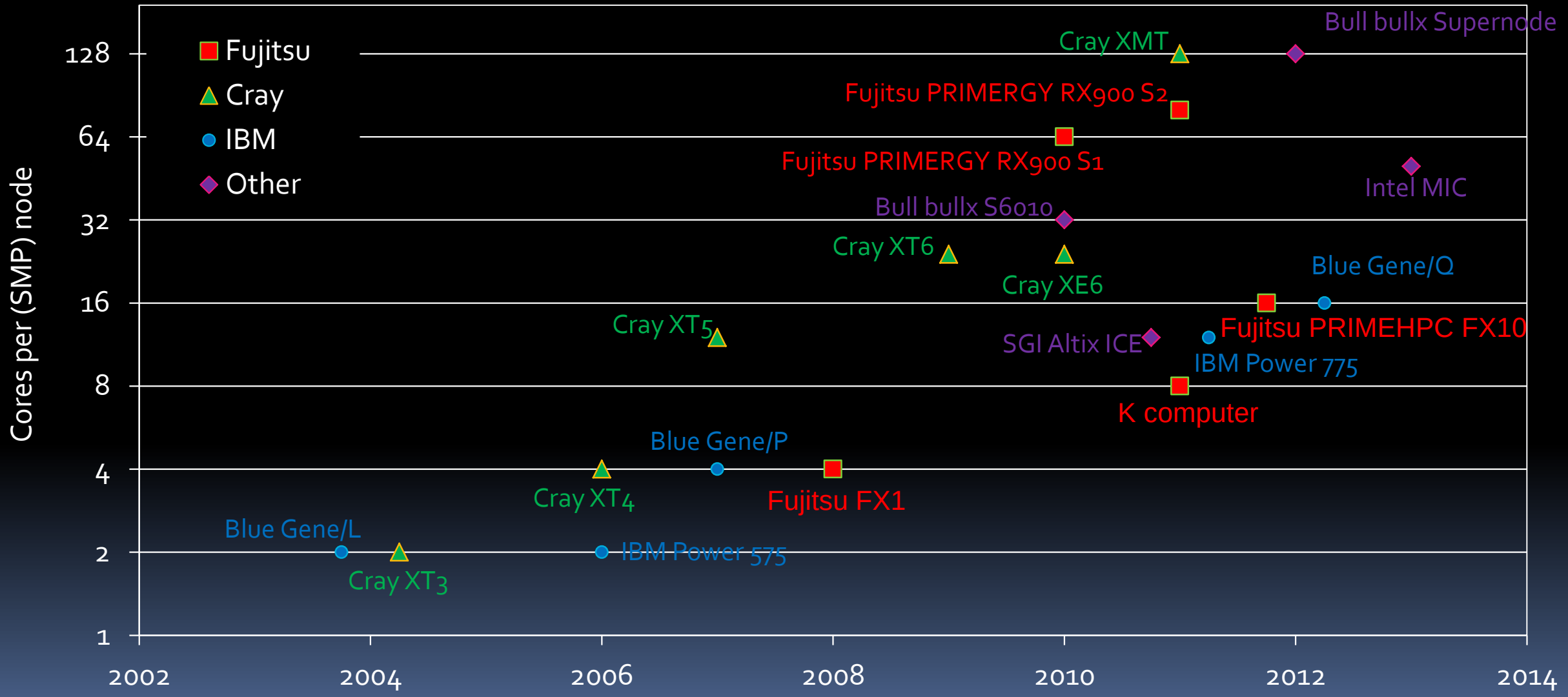
A global collaboration…



…contributing to the computational science community

Open Petascale Libraries membership

Increasing cores per node

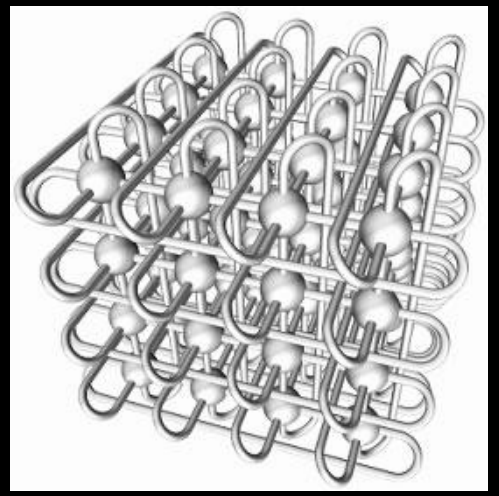


Assumed exascale architectures

System attributes	2011	"2015"		"2018"		Difference 2011 & 2018
System peak	8.7 Pflop/s	200 Pflop/s		1 Eflop/sec		O(100) 115
Power	10 MW	15 MW		~20 MW		
System memory	1.6 PB	5 PB		32-64 PB		O(10) 20
Node performance	128 GF	0.5 TF	7 TF	1 TF	10 TF	O(10) – O(100)
Node memory BW	64 GB/s	0.1 TB/sec	1 TB/sec	0.4 TB/sec	4 TB/sec	O(100) 62
Node concurrency	8	O(100)	O(1,000)	O(1,000)	O(10,000)	O(100) – O(1000)
Total Concurrency	548,352	$O(10^8)$		$O(10^9)$		O(1000) 1823
Total Node Interconnect BW	20 GB/s	20 GB/sec		200 GB/sec		O(10)
MTTI	days	O(1day)		O(1 day)		- O(10)

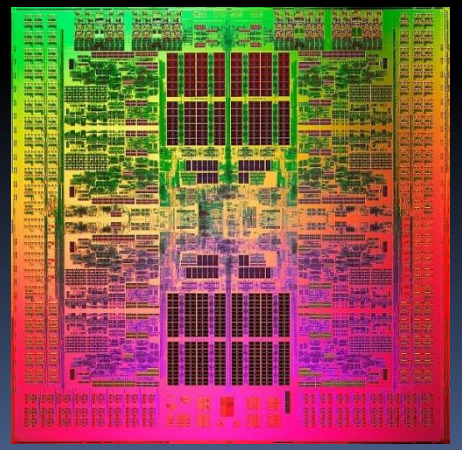
Source: Dongarra, 'What Can You Expect From Exascale Computing', ISC'11

Employing a hybrid programming model



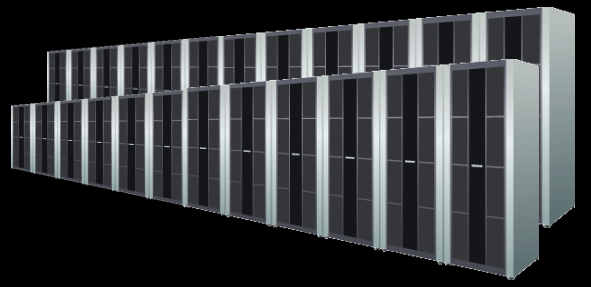
Message passing between nodes

Thread parallelism within a node



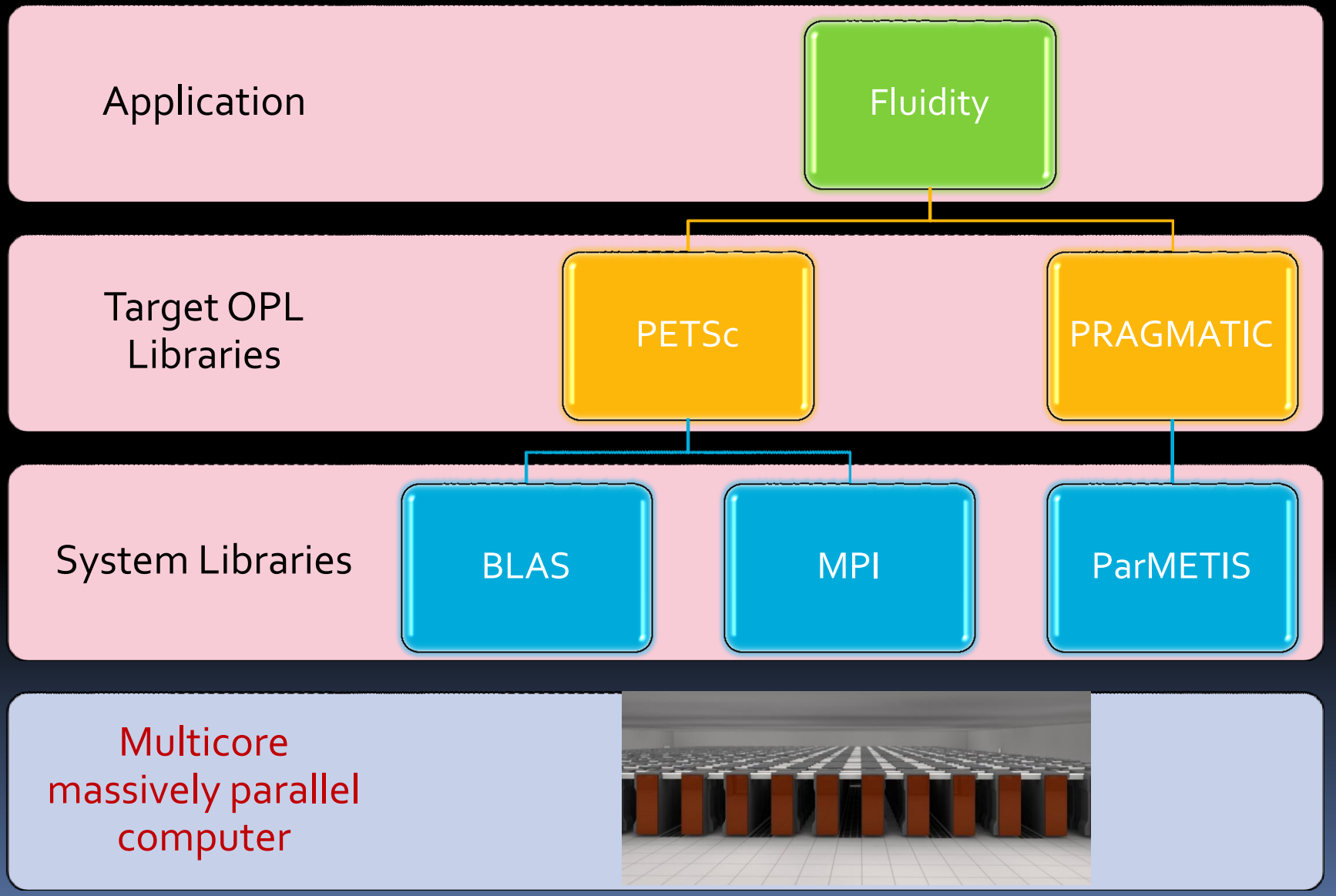
Generic software

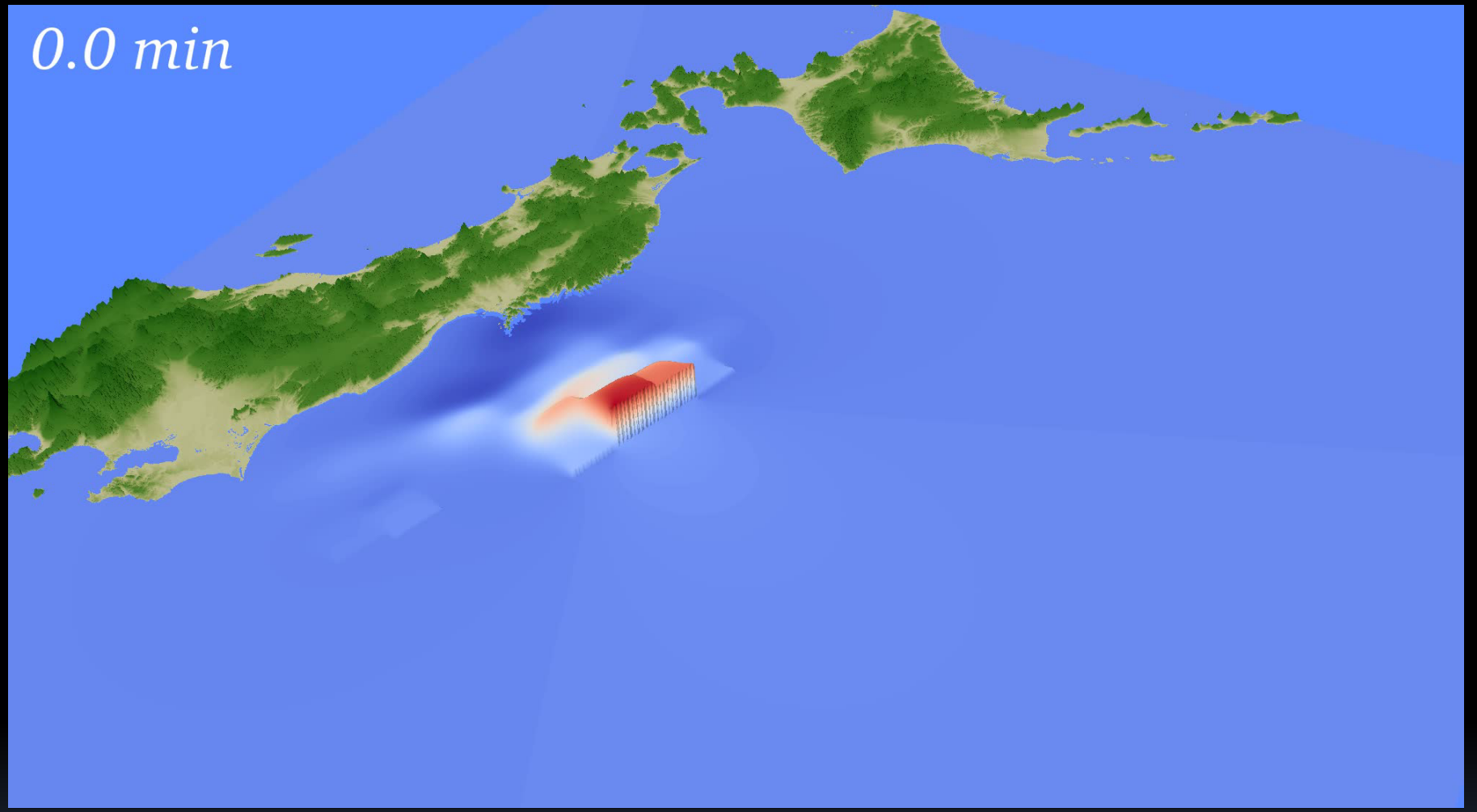
For platforms ranging from x86 clusters…



…to the K computer and PRIMEHPC FX10

An example: Ocean modelling





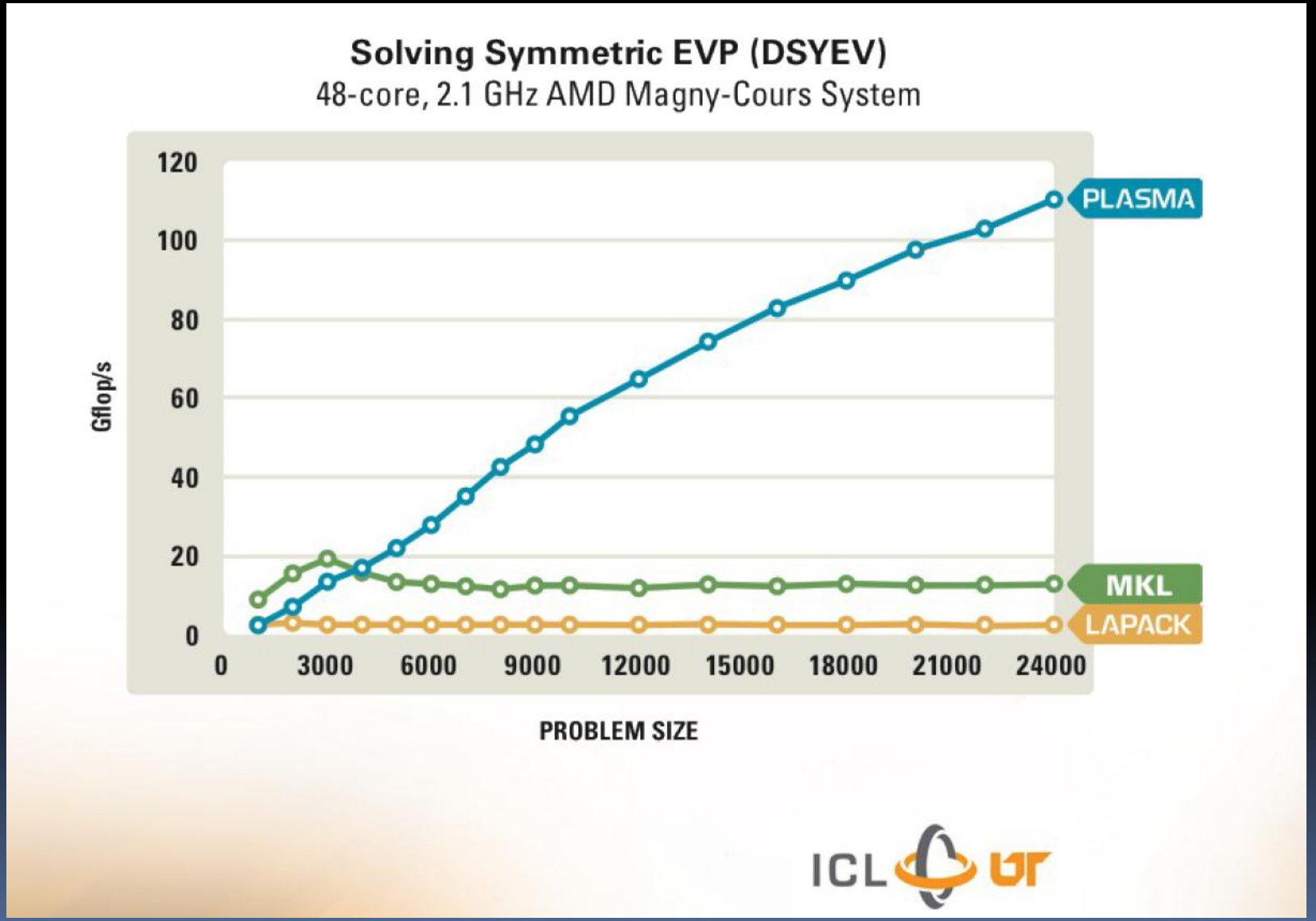
Providing a software platform to accelerate applications running on massively parallel multicore supercomputers

Initial software release…

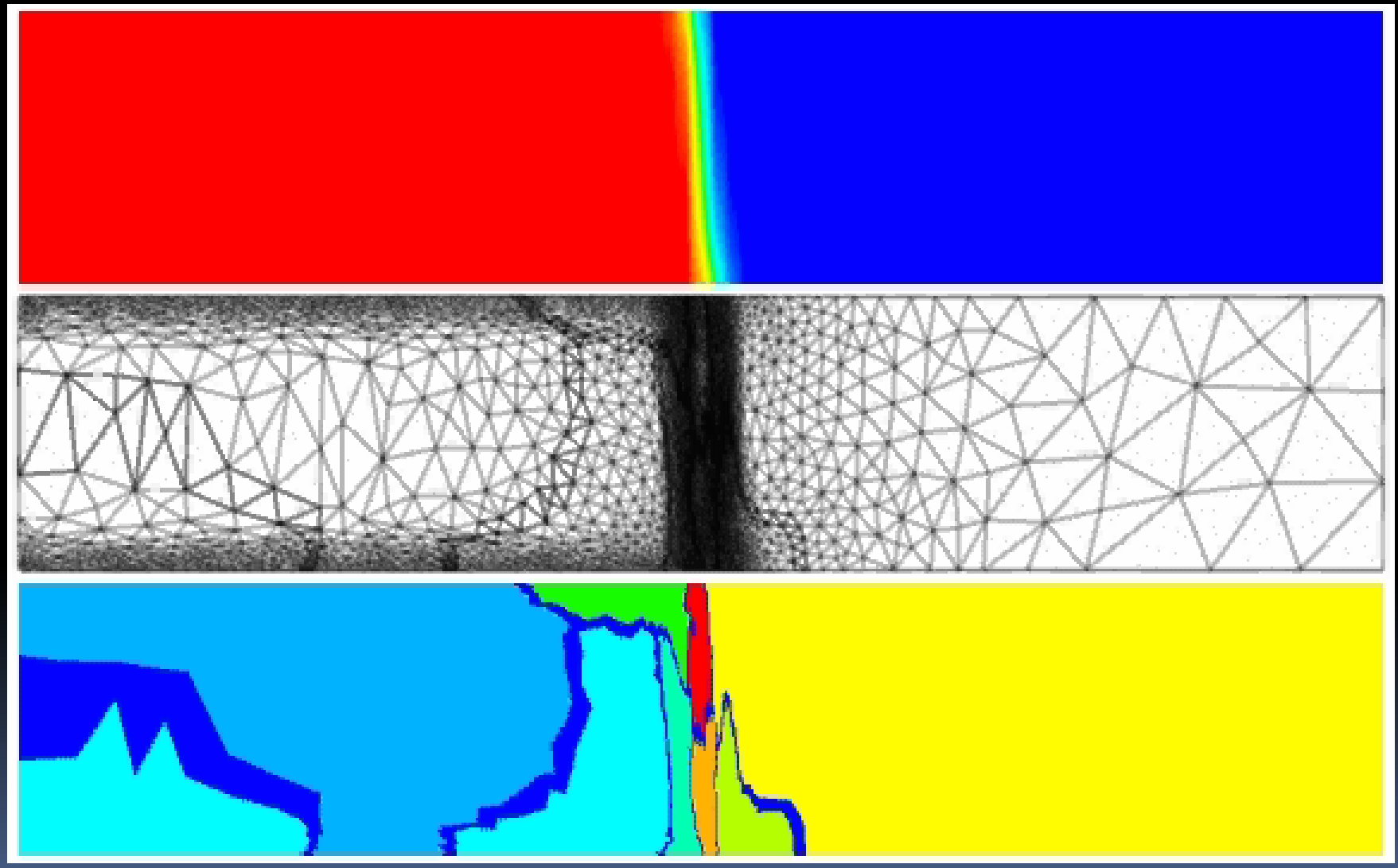
- PLASMA (dense linear algebra)
- PETSc (sparse solvers)
- FFTE
- 2DECOMP&FFT
- spBLAS (sparse BLAS library)

www.openpetascale.org/index.php/public/page/download

PLASMA: minimizing synchronisation



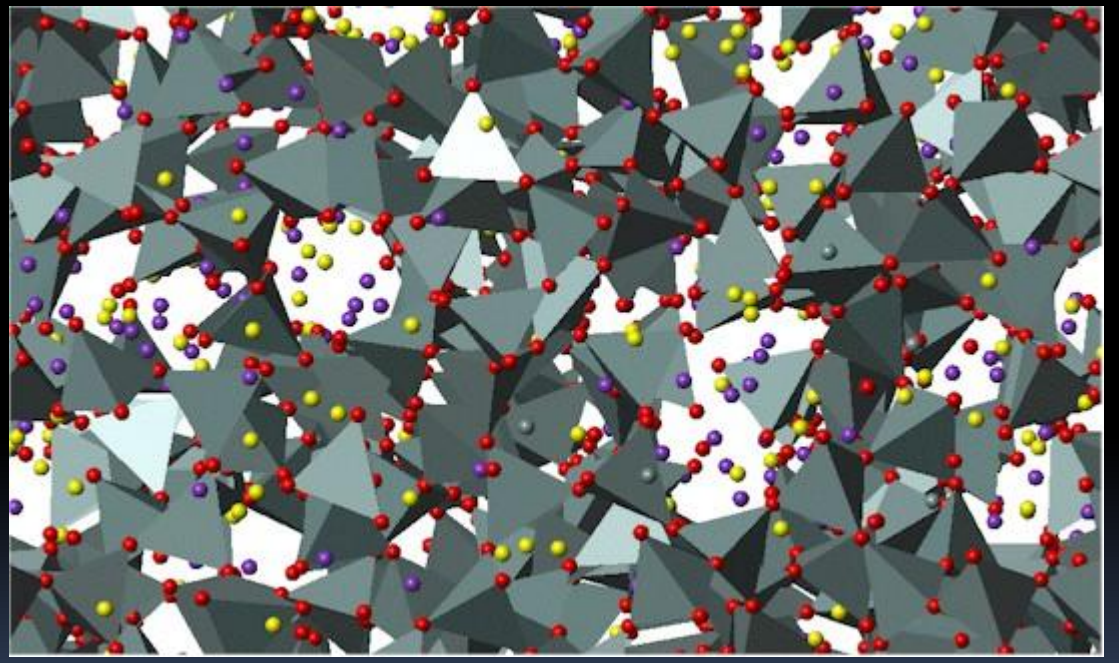
PRAGMATIC: adaptive meshing



Imperial College London

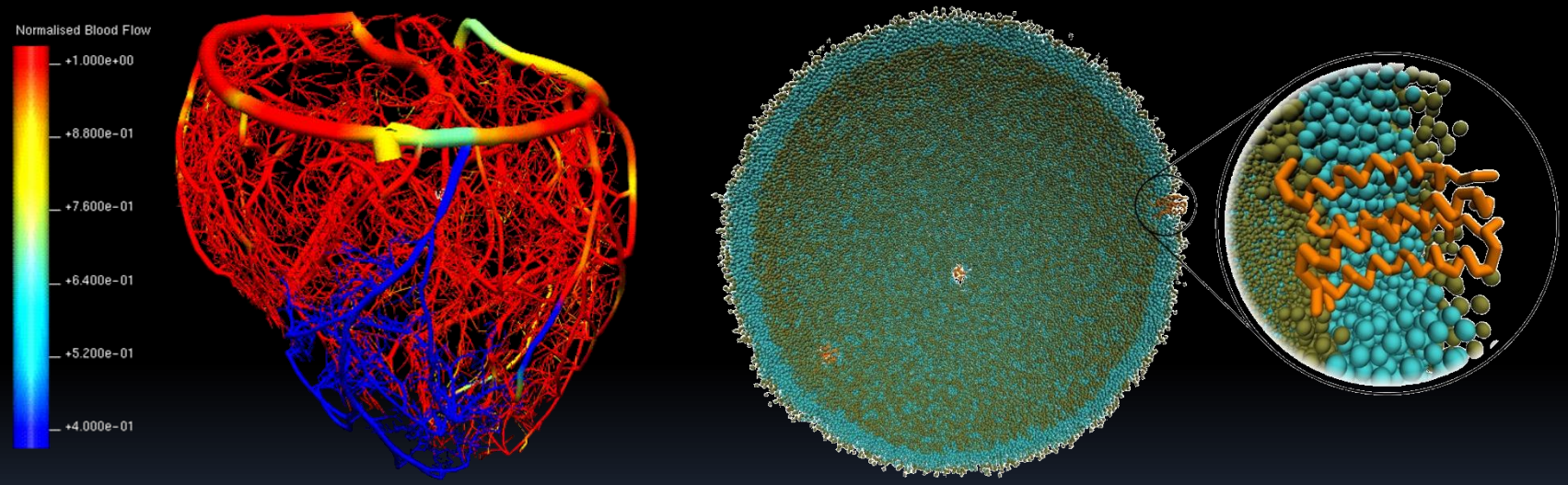
Contributing to many application areas

New materials



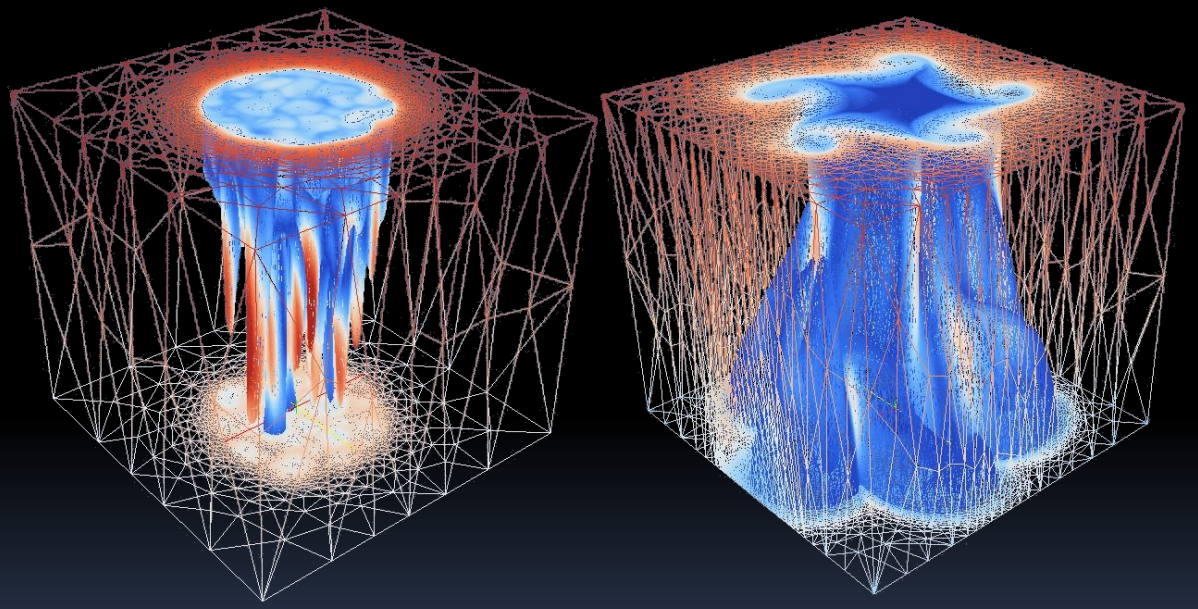
Contributing to many application areas

Life sciences



Contributing to many application areas

The environment



Dr Kimihiko Hirao

Director of the RIKEN Advanced Institute for Computational Science:

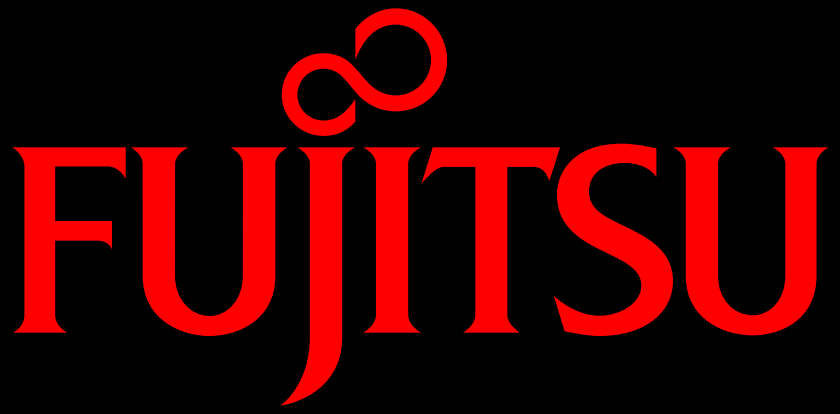
"Science in the 21st century needs to contribute to the sustainability of human society and produce technologies that support individuals. Supercomputing today is an invaluable foundation for advancing science and technology, and the scientific and technological achievements and knowledge gained through supercomputing will benefit humanity on many fronts. International collaboration is also increasingly important. This project follows this direction, and we aim to participate actively and produce meaningful results."

Professor Jack Dongarra
The University of Tennessee:

"The OPL project is an important step in the right direction. Open software initiatives like this succeed at developing high-quality, standardised software and building new partnerships. Fujitsu's initiatives should be recognised as a significant advancement in the development process of petascale software and, more importantly, in collaborative communities to facilitate this development."

For more information…

www.openpetascale.org



shaping tomorrow with you