

UK HPC Technology Opportunities in Horizon 2020

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Background

- 2009/2010 A working group was setup within the EU to investigate HPC and its relevance to research, innovation and societal benefit for the EU
- A subsequent report identified that HPC was not only a tool for achieving greater insight but was also a driver for innovation and growth
- This led to HPC being identified as a key technology area for Research and Innovation.
 - A number of HPC primer projects happened in FP7
 - Ratification of HPC Work Programmes in H2020
 - The establishment of a ETP for HPC which would define a strategic research agenda for HPC and provide a mechanism for PPI

Horizon 2020

- Commission proposal for a 80 billion euro research and innovation funding programme (2014-20)
- Part of proposals for next EU budget, complementing Structural Funds, education, etc.
- A core part of Europe 2020, Innovation Union & European Research Area:
 - **Responding to the economic crisis** to invest in future jobs and growth
 - **Addressing peoples' concerns** about their livelihoods, safety and environment.
 - **Strengthening the EU's global position** in research, innovation and technology

Why do it?

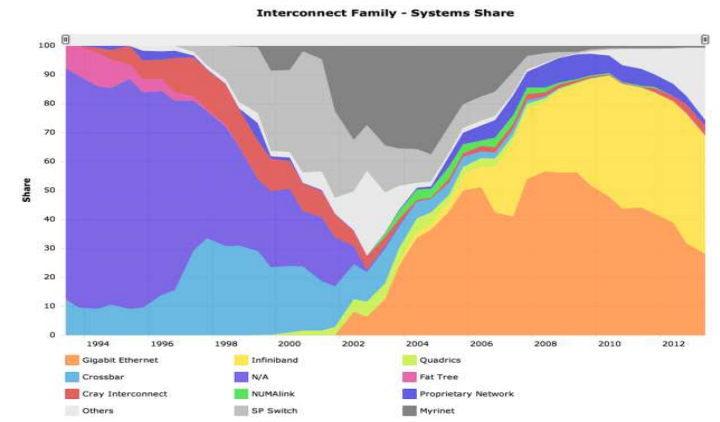
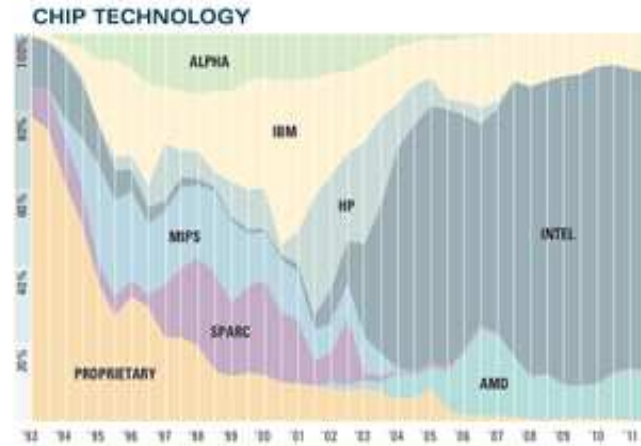
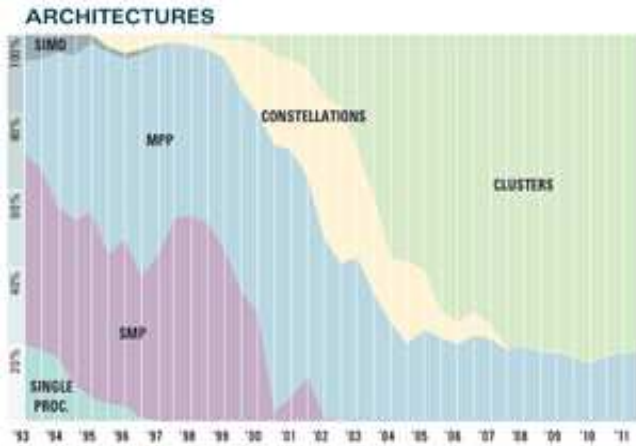
- Classical Supercomputing Applications
 - CFD, Climate/Weather, Nuclear Stockpile Stewardship, Oil and Gas
- New application areas
 - Big Data, Life Sciences, Social Media, Data Analytics, Medicine and Healthcare
- Innovation in core technologies
 - Create employment and growth

HPC Landscape



#1 EXAFLOP
0.5GW??

#500
10PFLOP@
1MW??



How

- Which every way we look at it, it's going to be difficult
- This is one way (The ASCAC Subcommittee on Exascale Computing, Fall 2010).

	2010	2018	Factor
System Peak	2 Pf/s	1 Ef/s	500
Power	6 MW	20 MW	3
System Memory	0.3 PB	10 PB	33
Node Performance	0.125 Gf/s	10 Tf/s	80
Node Memory B/W	25 GB/s	400 GB/s	16
Node Concurrency	12 cores	1000 core	83
Interconnect BW	1.5 GB/s	50 GB/s	33
System Size	20K	100K	50
Total Concurrency	225K	100M	444
Storage	15 PB	300 PB	20
Input/Output BW	0.2 TB/s	20 TB/s	100

HPC Dimensions

- System Architecture, Programming Models, Run-Time and Software
- Accessibility, Usability, Affordability and People
- Usage – HPCaaS, Big Data
- System Environmental Challenges

Opportunities for Co-design

- HPC system architecture
 - Processors – Intel, ARM, MIPS
 - Accelerator Technology
 - Network on Chip, Silicon Photonics
- System software and management
- Programming environment, algorithm development and methods
- Energy and resiliency
- Balanced compute, I/O and storage performance

Horizon 2020 – Objectives and structure

