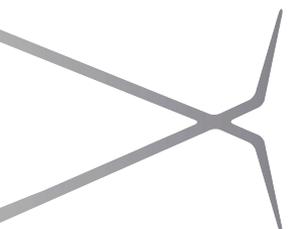


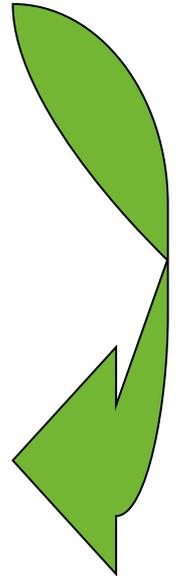
Exascale questions

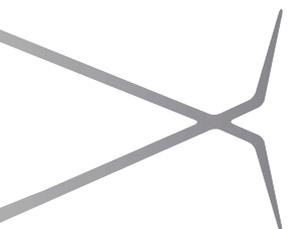
IESP Workshop, October 18th, 2010



Questions asked by Pete Beckman

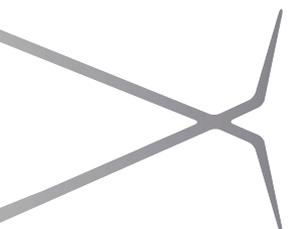
- Overview of activities and investments in exascale
- From your perspective, the key challenges for achieving exascale
- Thoughts on the co-design process
- Important issues for working with open source software community





Roadmap to Exascale

- No exactly a roadmap but rather a journey with different issues to be addressed while travelling
- No date for achieving the Exaflops but the first milestones are already defined
- Challenges are not only technical problems but also economical sustainability
 - How to take advantage of investments coming from other markets
 - How to reuse high end technologies for value/\$ HPC market
 - How to increase Rol of high end systems



Technical challenges

■ Power

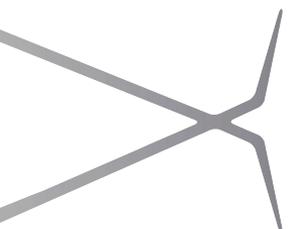
- Bull not involved in nanoelectronics technologies
- Use or design ASIC with existing technologies
- Seen as a constraint : never build a more than 20MW system

■ Data movement and handling

- Innovation will be key to work around today and upcoming bottlenecks
- New architectures for both system and IO are required

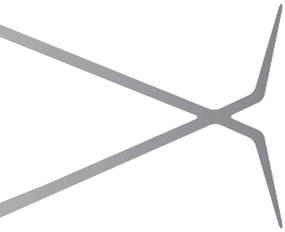
■ Resilience

- Some technologies can help
- Main difficulty is integration of all aspects (HW+SW) in an efficient way



Co-design

- Welcome to co-design meaning application, algorithm, software, hardware teams working together
 - Interaction needed to find the trade-off
 - Common understanding help to invest in the right direction for each domain
- For the time being, no interest for co-design meaning a specific system for a specific (set of) application(s)
 - No valid business model yet found for exascale neither from a custom nor from society demand
 - No able to say for one application how much and when for the exaflops

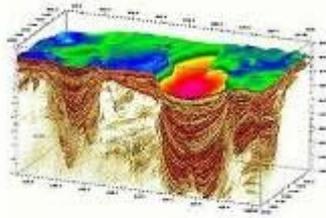
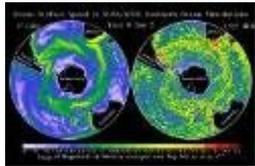


Extreme Computing Lab



Architect of an Open World™

Extreme Computing Lab



■ Objective

Master the technologies involved in HPC

■ Themes

- Large system architecture
- Software scalability
- TCO control
- Interconnect network
- Infrastructure



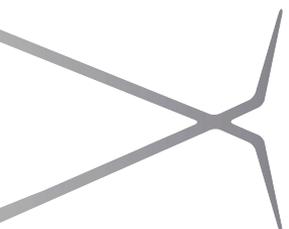
Architect of an Open World™

Extreme Computing Lab

- Collaboration as a key method
 - Joint effort of CEA and Bull to develop solutions answering technical challenges of large systems
 - Involved in the dynamism of eco-system
 - Competiveness cluster
 - Simulation
 - Open to collaborative R&D projects



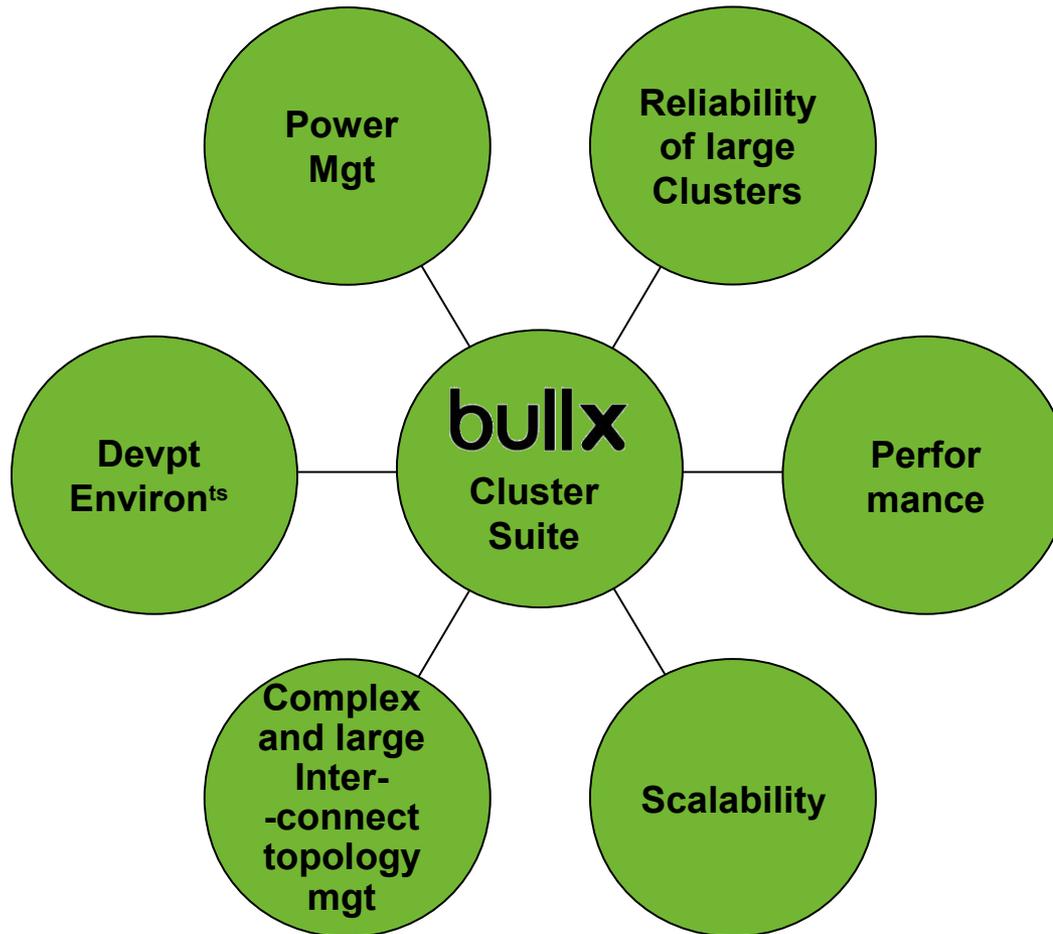
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Architecture & packaging

- System architecture
 - Integration of standard CPU, hybrid computing, low power options, resilience
- Interconnect architecture
 - Low latency, new topology, low power, resilience
- IO architecture
 - Architecture, resilience
- Integration and cooling
 - Dense packaging, memory stacking, cooling solutions

Software innovations



Bull involved in collaborative R&D initiatives

- Common laboratory



- Projects at European level



INFORMATION TECHNOLOGY FOR EUROPEAN ADVANCEMENT



- Project in French ecosystem



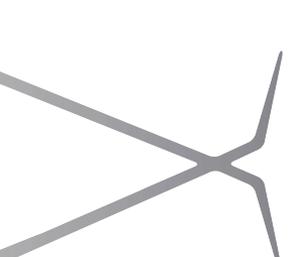
PARIS REGION SYSTEMS & ICT CLUSTER



- Research institutions

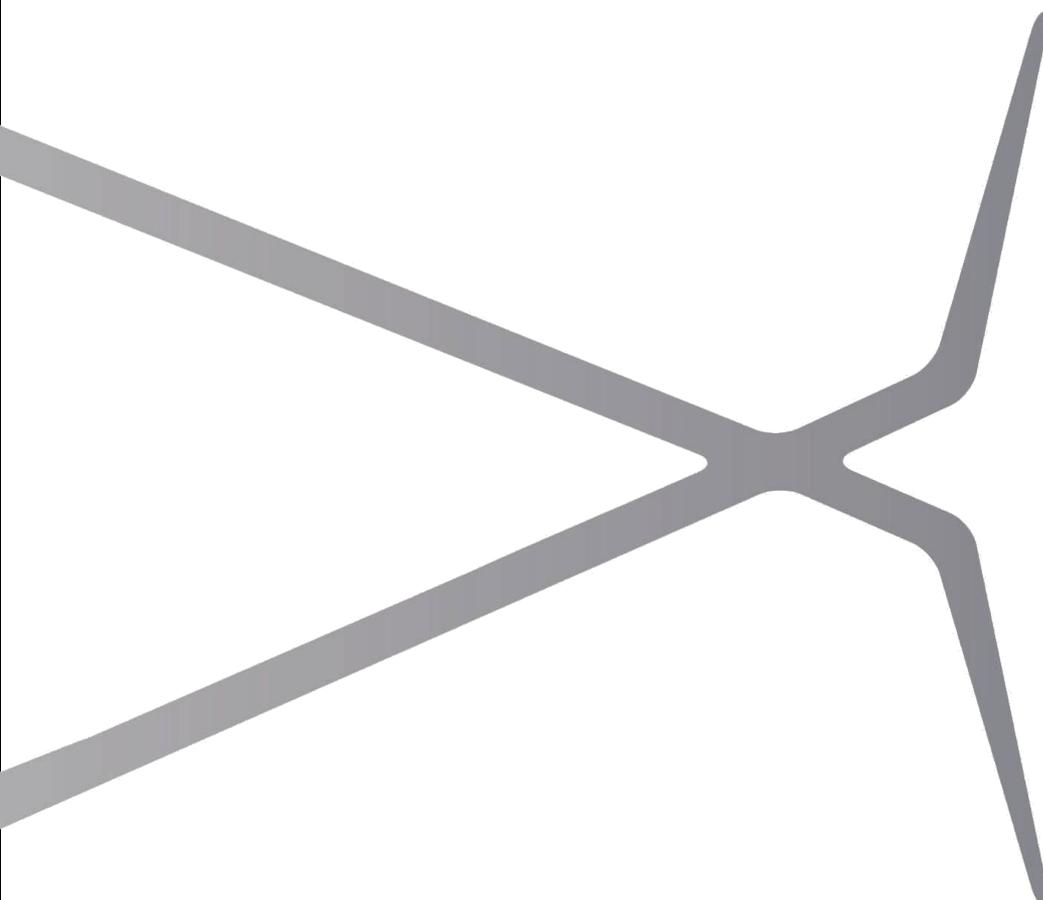


- Technology partners : Intel, IBM, Mellanox, Voltaire, DDN, LSI, NEC



Open Source

- Bull SW strategy based on Open Source plus added value
- Bull is contributing in numerous communities (code and test contributions)
 - OFED, OpenMPI, Slurm, Lustre, Shine, Papi, HPCToolkit, Perfmon, Kernel.org, ...
- Key-points
 - Efficient relationship with communities
 - Dynamicity of communities
 - Governance laws of communities
 - In house expertise on components delivered to end users
 - In house capability to analyze defects, fix them or back-port existing fixes
 - Licenses : BSD, MIT or Apache preferred
- Some concerns if
 - Communities not concerned by support
 - Communities are not quality minded enough



bullx

instruments for innovation

