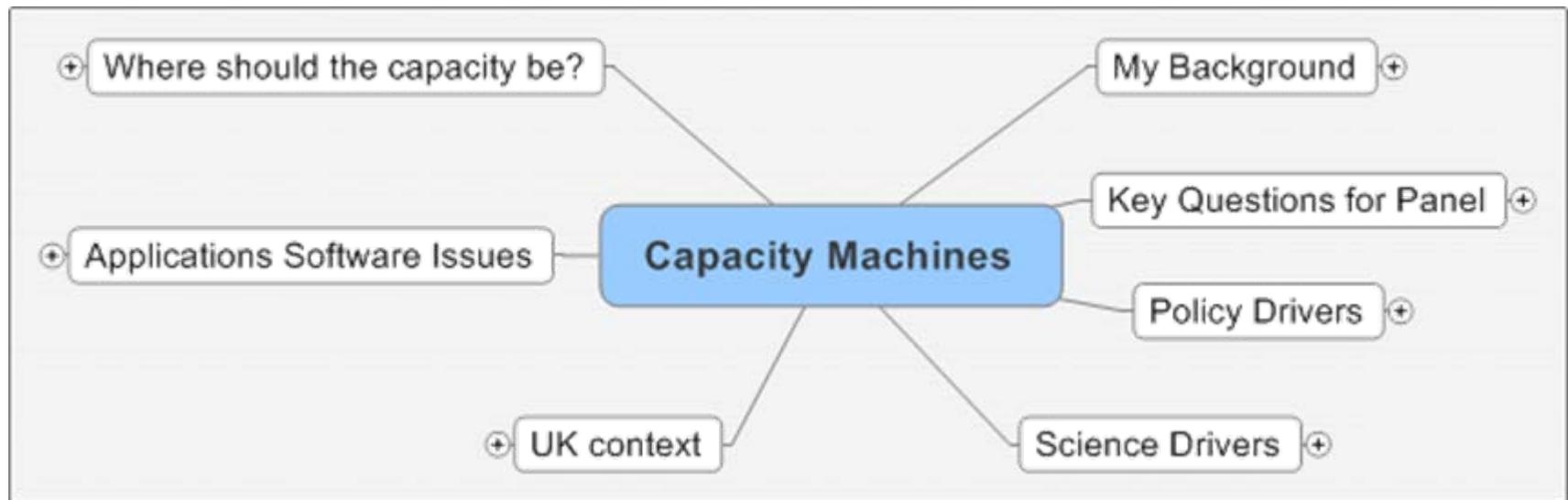




Capacity Machines



My Background

- **Our department does and supports computational science and engineering in the UK academic research community**
- **We also operate, with our partners at the University of Edinburgh, the UK's national supercomputing service, HPCx, for which we do porting of user codes, tuning, optimising and all that**
- **The balance of our work is towards collaborative developing and supporting applications codes on all types of platforms.**
- **I chair a panel for all the UK research councils looking at HPC strategy from the applications perspective - capability/capacity balance is identified as a critical issue for the community**

Key Questions for Panel

- **Distinguishing features - what are capacity machines (or capability computing)?**
 - policy drivers
- **Role & impact in science**
 - science drivers
 - UK context: capability computing needs capacity computing
- **Technical challenges for growth in performance**
 - Applications software issues
- **Future directions for capacity computing & systems**
- **Will the capacity/capability boundary change in the future?**
 - Where should capacity be located?

Policy Drivers

- **Capability machines are expensive**
- **Capacity machines are cheaper**
- **Large budgets are assembled on the back of capability promises**
- **If you don't need capability machines you shouldn't (be allowed to) use them**
- **But then, where do the capability users come from?**
- **It's in the interests of capability "suppliers" of all kinds to nurture capacity computing**

Science Drivers

- **Lots of good computational science doesn't reach into the capability regime**
- **To a scientist, having his own quasi-dedicated machine means independence, availability and status**
- **Capability users often have lots of capacity projects running at the same time**
- **Capability users often need to run lots of capacity jobs in the build up to capability jobs - on the same machine.**
- **Capability users need development resources**
- **Don't (most) real computational projects require all levels of the HPC pyramid?**

UK context

- **Funding structures**
 - Research Councils - fund research and high-end national facilities
 - Universities & SRIF - fund infrastructure
 - Pressure on university researchers to bring funding for systems into their own institutions
 - Little joined-up thinking across these funding structures yet.
 - On-going funding for mid-range machines in doubt - "initiative" syndrome
- **What the community says it needs**
 - User surveys by T&OP and HPCx; 2005 Simon Review
 - Concern and uncertainty as to mid-range provision - will we end up with peta-scale national facilities , laptops and nothing in between? Who is going to grip this problem?
- **Capability Computing needs Capacity Computing**
 - Capability usage on HPCx
 - Barriers to capability usage

Applications Software Issues

- **Applications support?**
 - Single processor performance
 - Scaling
- **Is performance important anyway? Isn't part of the point of capacity computing, especially on local dedicated systems, to get on with science, not to worry about efficiency?**
 - If there's an inefficient code running on my dedicated system, who's going to know (or care, if the science output is OK)?
- **Need for rapid migration between different platforms, capacity and capability**

Where should the capacity be?

- **Central or local capacity computing?**
 - Universities and departments want their own machines - reward systems push in this direction
 - The rise of "computational nomads"
 - Central computing sites need to have a capability focus - can they support capacity usage as well?
- **The Grid?**
 - Should help - the "utility" model
 - Is it a practical, robust grid solution for capacity computing yet?

Summary

From my perspective, key issues include:

- **Impact on demographics of the computational research community**
- **Funding an on-going capacity computing infrastructure**
 - to nurture a healthy computational research computing
 - to bring on future users and ideas for capability computing

