



The Different Dimensions of Exascale Cost

Thomas C. Schulthess



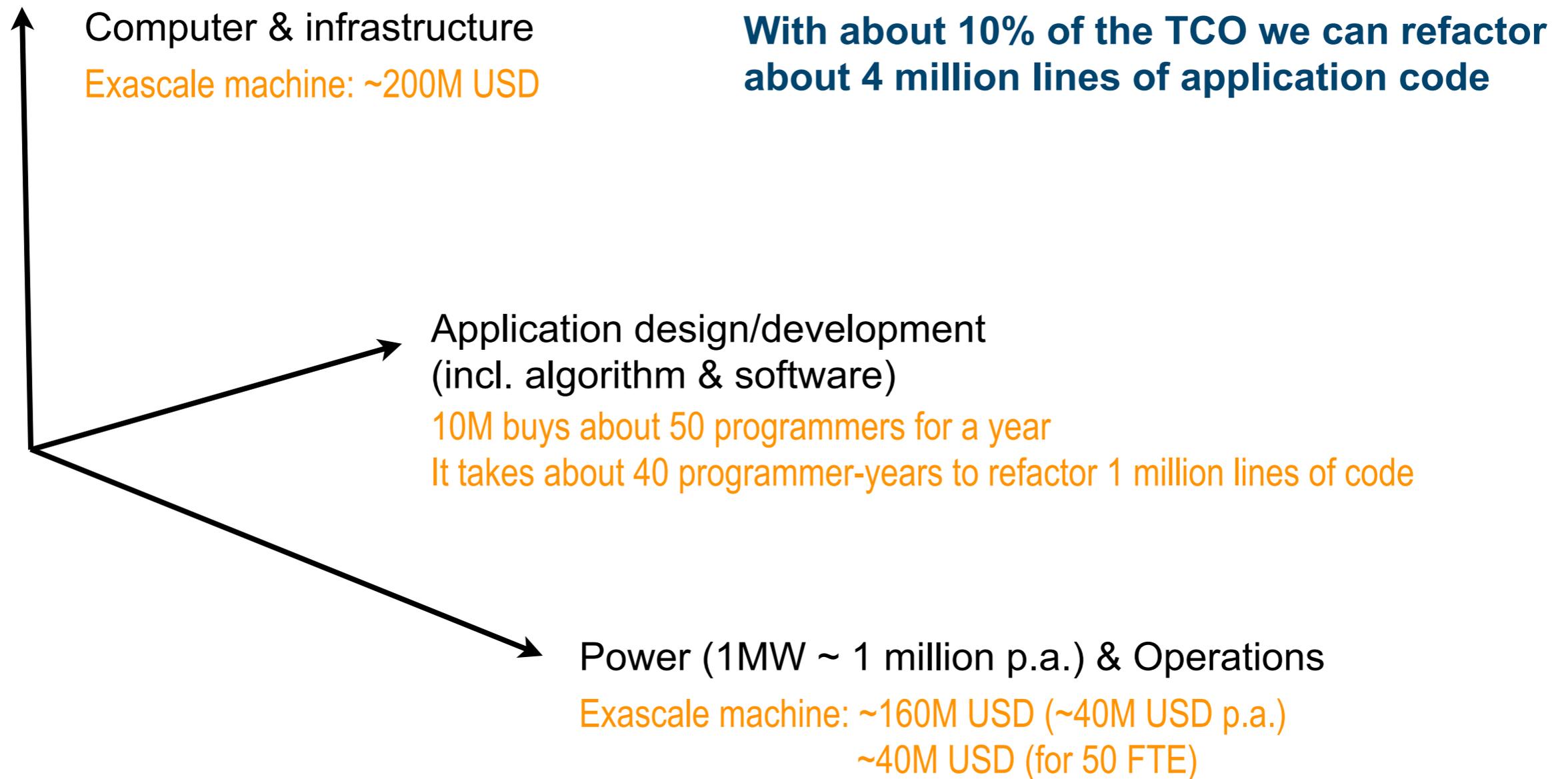


SUPERCOMPUTERS ARE EXPENSIVE, HARD TO USE, AND HAVE A SHORT LIFECYCLE – WHAT EXACTLY IS NEW ABOUT EXASCALE?

Two things have fundamentally changed

- Power consumption
 - it used to be ~100 kW
 - it is now ~1 MW (2012)
 - it will be ~10-100 MW by the time we reach exascale
- Memory, i.e. data placement & management
 - it used to be a concern only for computer architects
 - all application developers had to know is the total amount of available memory
 - it is now distributed and application developers use MPI to cope with it
 - it will be an important part of the energy/cost considerations at exascale

The different dimensions of cost **with ROM estimates**



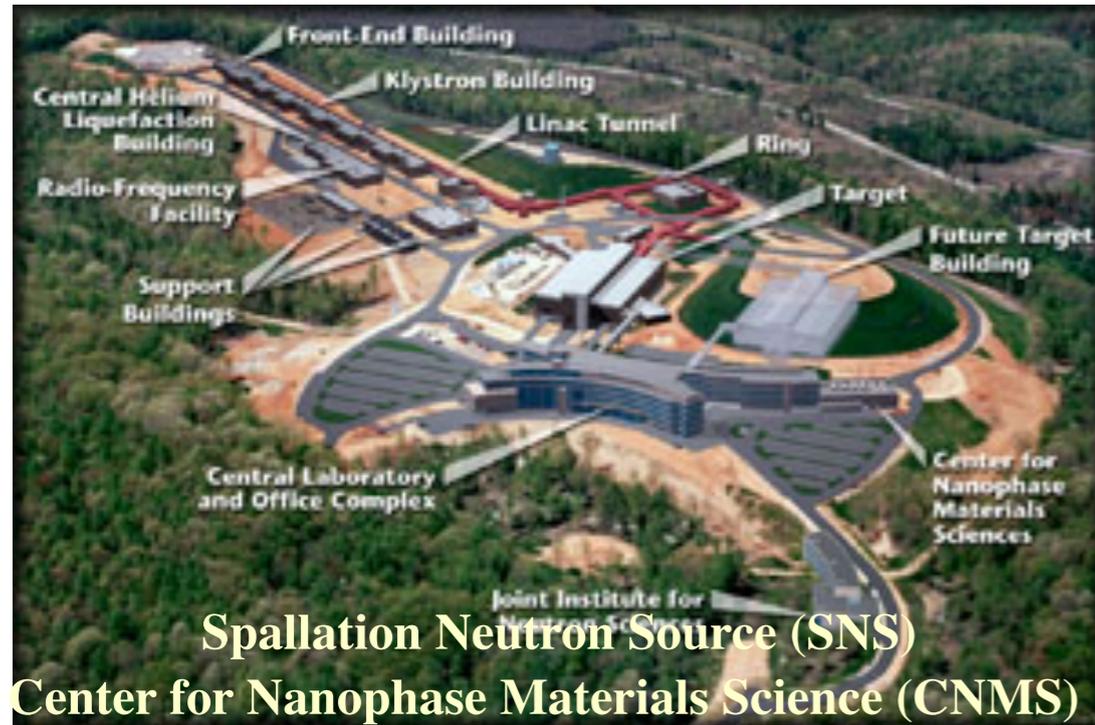


CAN YOU IMAGINE SCIENTISTS REFACTORIZING THEIR LEGACY CODES?

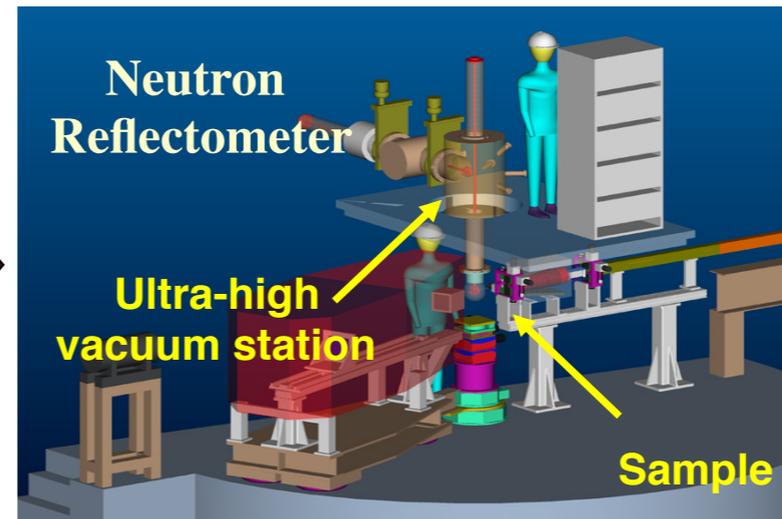


THE ANSWER IS: ABSOLUTELY YES!

New Approach: Facilities analogy



Facility



Instrumentation

User
Community



Materials Science Virtual User Center
Materials : Math : Computer Scientists

- Open Source Repository
- Object Oriented Tool Kit
- Workshops
- Education

User
Community

DOE Council on Materials Science and Engineering

December 16, 2002

From a presentation by Stocks and Harmon to the DoE Council on Materials Science and Engineering, led by Peter Flynn and David Mermin

So, ...

- We need to get serious about computational end-stations
- Application communities have to be part of co-design
- In fact, **co-design has to be science driven!**
- Many scientific user facilities in the same cost range as exascale computing facilities that are based on co-design