

Building Blocks for Petascale Computing

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Intel and HPC: The Challenge

- Big volume drives big investments in R&D
- “big volume” isn’t HPC ..
- The best ideas need such monetary backing
- The challenge: Leverage ‘big volume’ (COTS), yet build high performance systems
- What makes sense to use from COTS:
 - Memory (of course)
 - Processor
 - Interconnect fabric (as a foundation at least)
 - A whole lot of software ..
- Differentiators – at the platform level

In other words ..

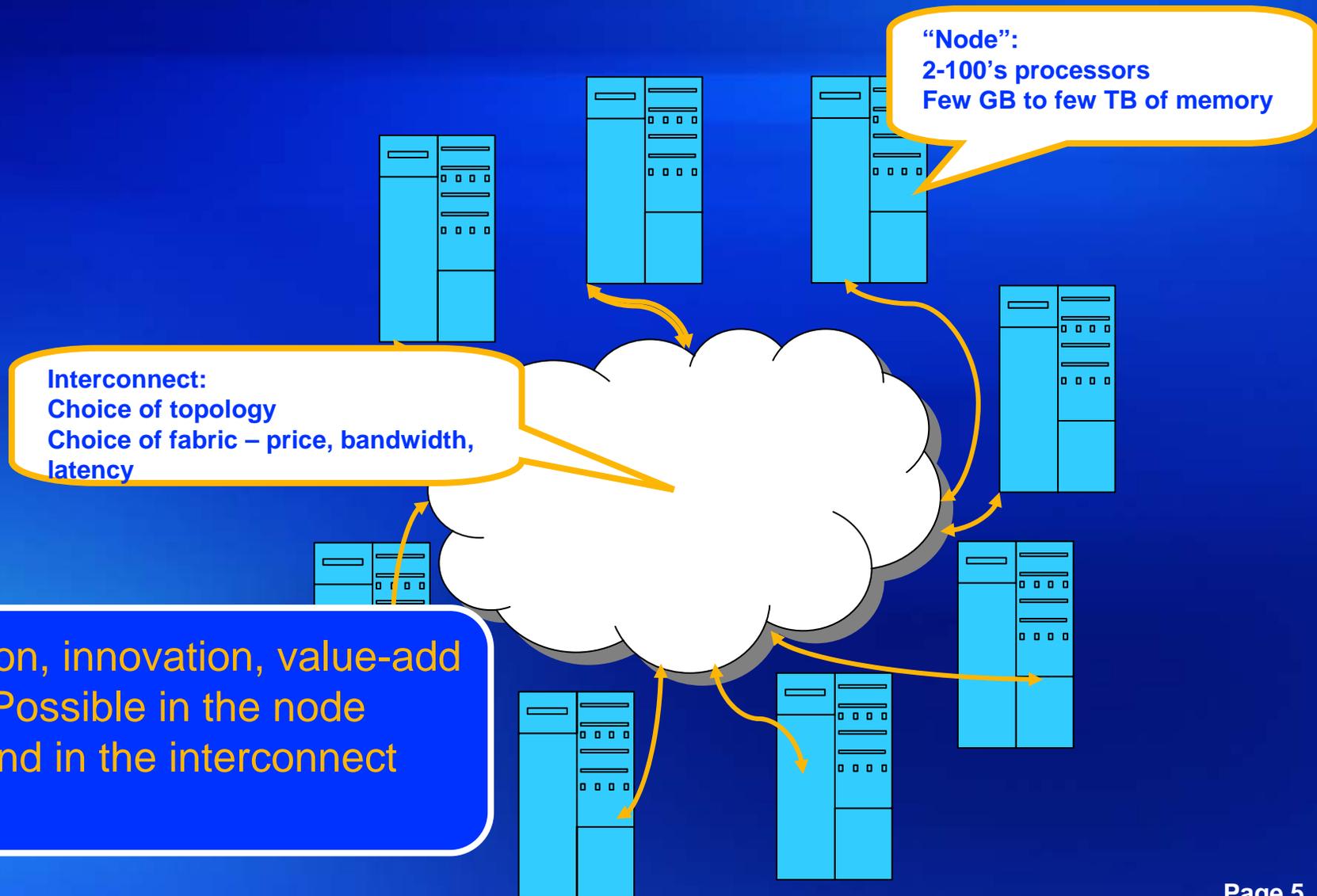
How to get the highest computational performance with much greater data bandwidth (and low latency) ..

While maximizing use of commodity parts.

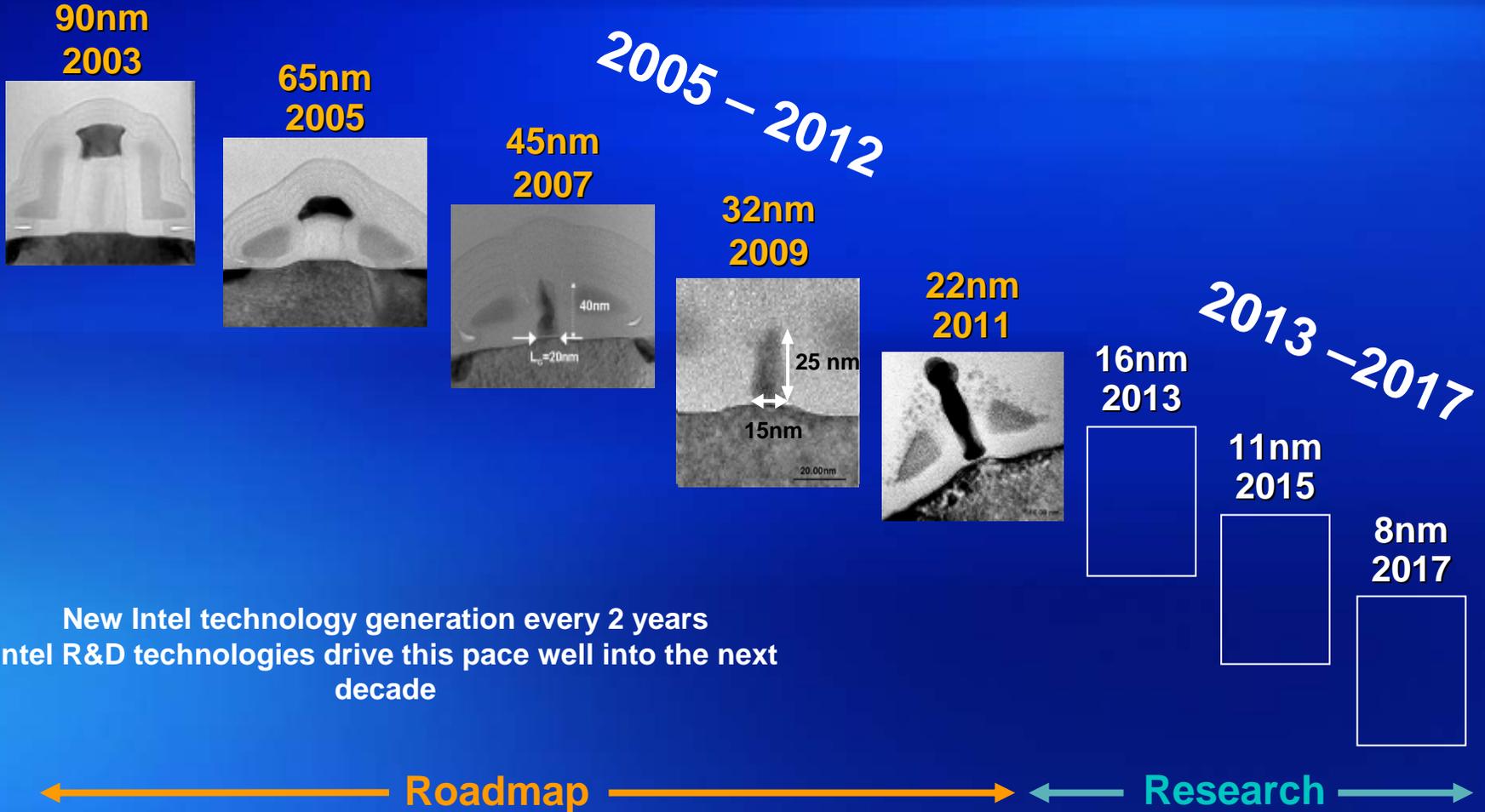
HPC Differentiators

- Early technologies – first to use (marginal)
- System house (OEM) adds value
 - From marginal (e.g., chipset) to substantial (e.g., internal interconnect)
- Special features. Examples:
 - Features on chips integrated onto the board
 - Attached accelerators
 - Node to node interconnect
- Tools and skills and algorithms for scaling apps (and system software)

All Petascale machine will look like this:

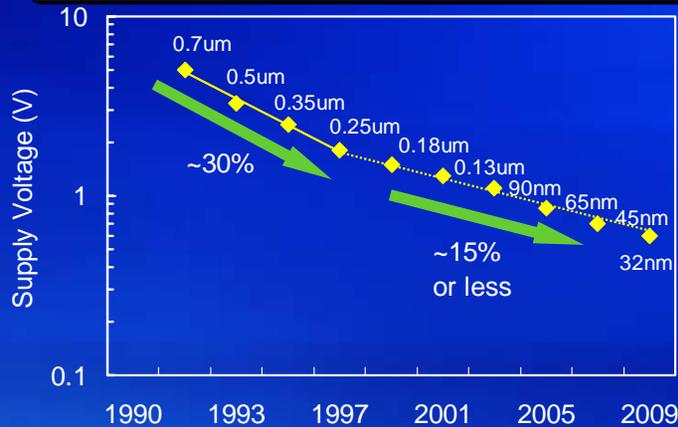


Moore's Law into the Future

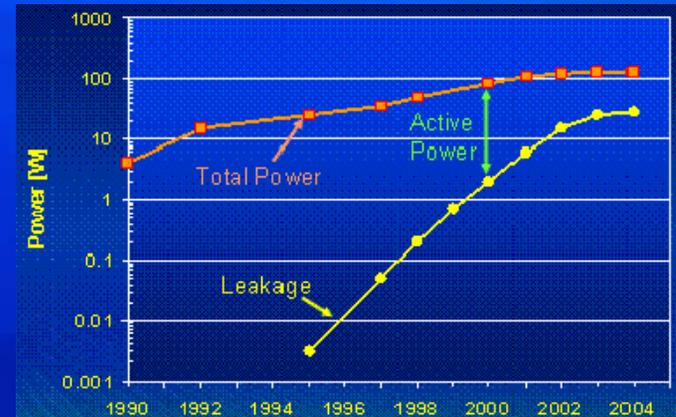


FYI – Why multicore isn't a choice

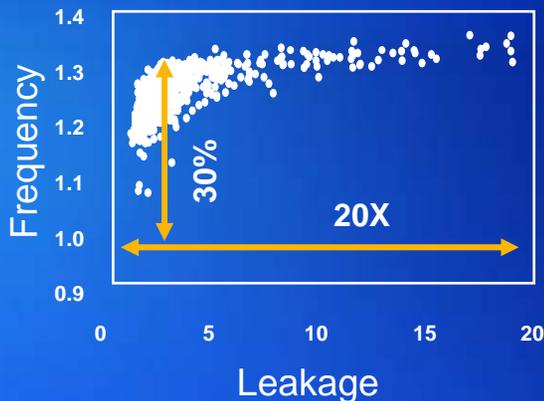
Voltage scaling diminishes



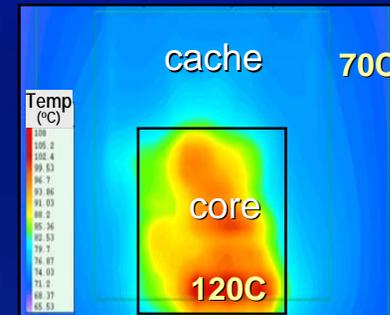
Active power budget shrinks



Variations become problematic



Power problem grows



Areas for Collaboration

- Transition to multicore – tools and programming model
- Scaling of apps
 - In the past you got 2x on same app run; from now on you'll get 2x perf only by doubling # of threads (even if you also increase/double your problem size)
- Ideas for features and techniques that, when mature, can be passed down to mainstream computing..

In Closing,

- **“Standard” HPC can be done anywhere**
- **Accelerated rate of adoption of HPC technologies by Enterprise**
- **COTS allows rapid deployment**
- **High-end (next milestone is PF) requires a differentiator**
- **For optimum of performance and productivity build standard parts into innovative system design**
 - **Possible ‘specials’ for compute, interconnect, ..**

Thank You!

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