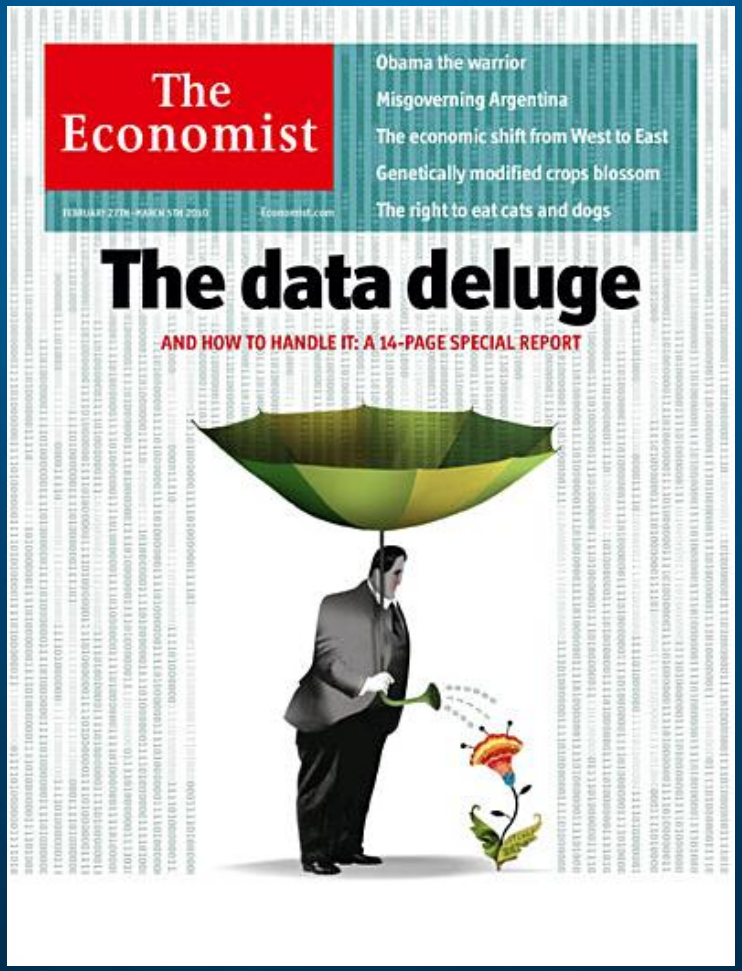
Presented at the COMSOL Conference 2010 Boston

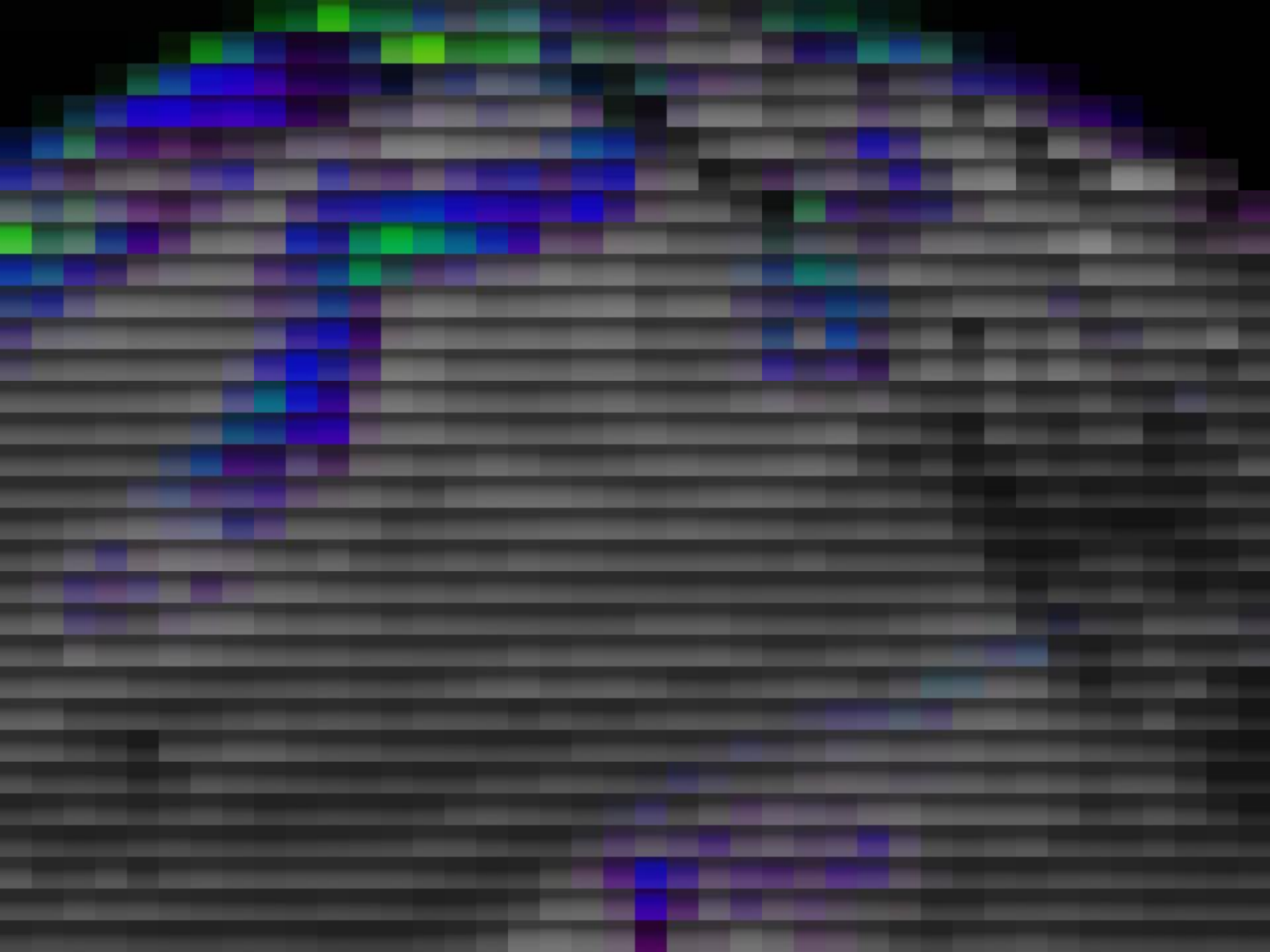
Microsoft Technical Computing

The Advancement of Parallelism

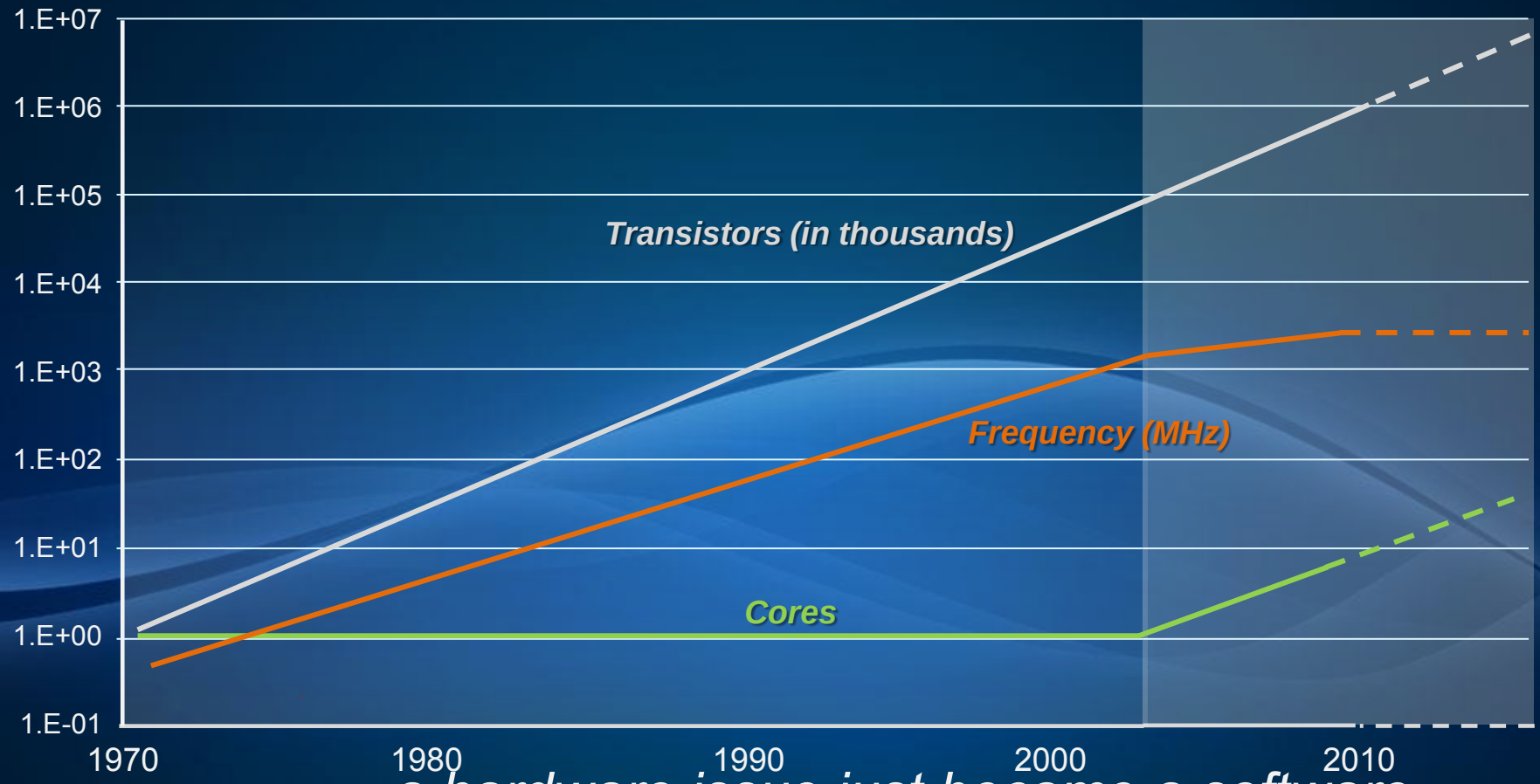
Tom Quinn, Technical Computing Partner Manager

1.2×10^{21}
New Bytes of Information in 2010
Source: IDC, as reported in The Economist, Feb 25, 2010


The Economist
Obama the warrior
Misgoverning Argentina
The economic shift from West to East
Genetically modified crops blossom
The right to eat cats and dogs
FEBRUARY 27TH–MARCH 5TH 2010
Economist.com
The data deluge
AND HOW TO HANDLE IT: A 14-PAGE SPECIAL REPORT



Moore's Law...



…a hardware issue just became a software problem

"The era of single processor systems is over; the multi- and many-core systems world is here. If you're not ready for this change, there's an IT train wreck in your future. - HPC Wire

Source: Jack Dongarra, Kunle Olukotun, Lance Hammond, Herb Sutter, Burton Smith, Chris Batten, Krste Asanovic, and Kathy Yelick

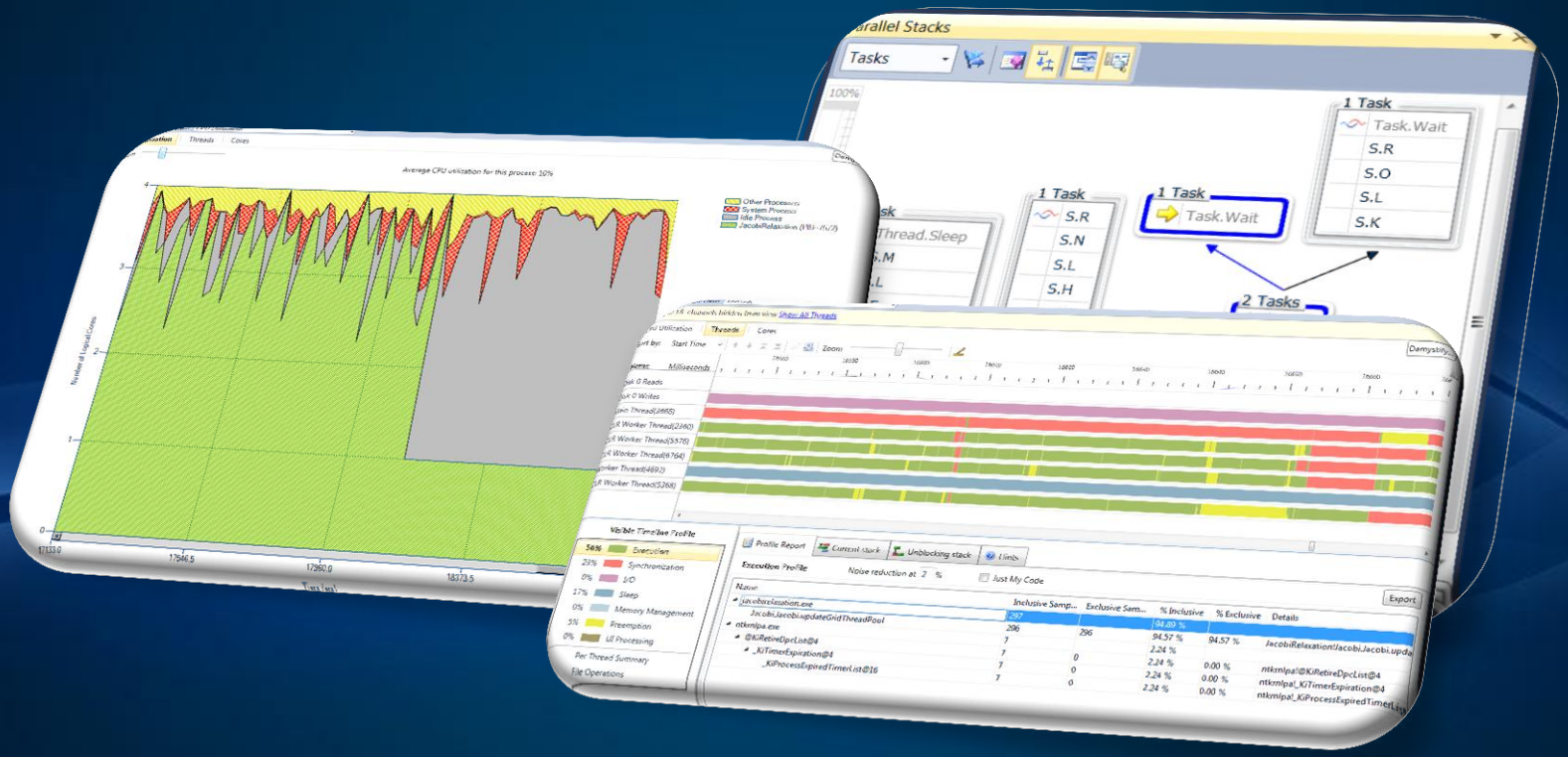
Client	Cluster	Cloud
single node shared memory	multiple nodes distributed memory	multiple node distributed memory on demand capacity

Microsoft Technical Computing

Client

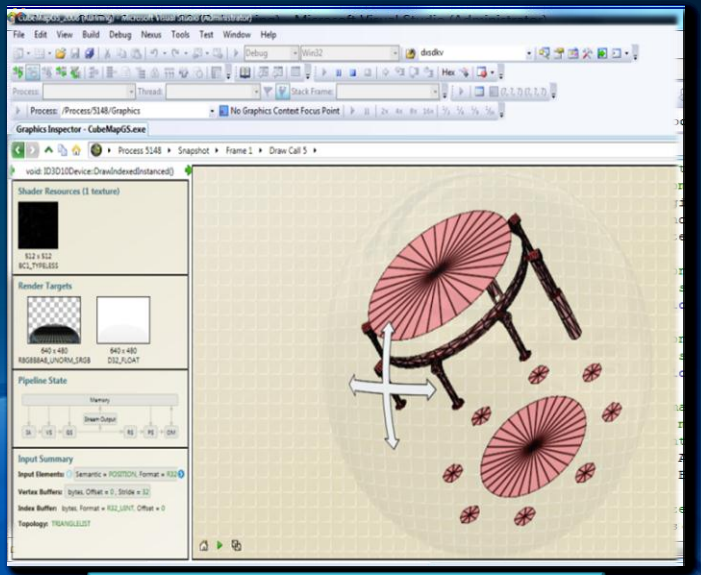
single node
shared
memory

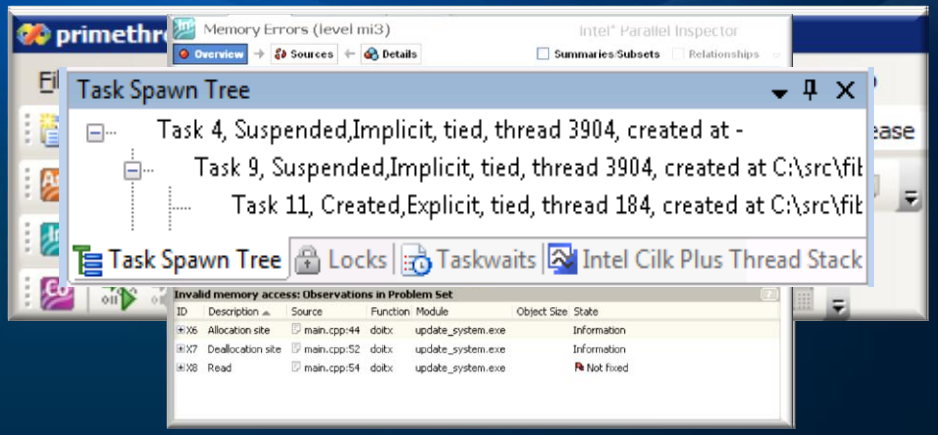
Parallel Development on Windows



Microsoft® Visual Studio® 2010

Parallel Development on Windows





Microsoft® Visual Studio® 2010

Cluster

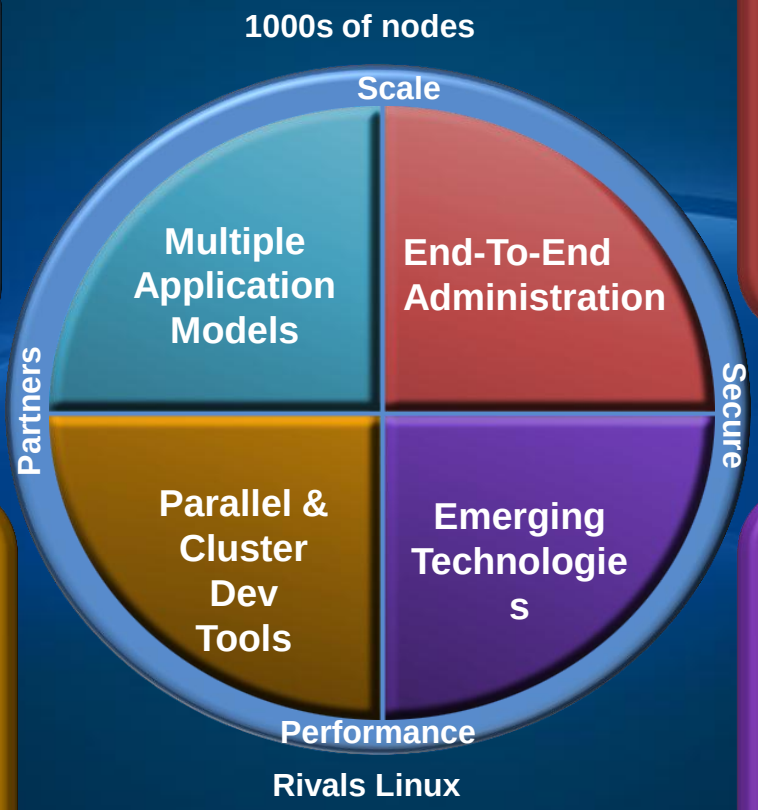
multiple nodes
distributed memory

Microsoft Technical Computing

Windows HPC Server 2008 R2

Complete. Integrated. Forward Looking.

- MPI
- Long running batch
- Low latency interactive
- Parametric Sweep
- Embarrassingly Parallel
- Business Critical SOA
- Excel and ISV apps
- Job Scheduling Policies



- Deployment
- Configuration
- Monitoring
- Diagnostics
- Trouble Shooting
- Diskless & Dual-boot
- Reporting
- Performance Tuning

- Integrated IDE
- MPI Debugger
- MPI Profiler
- SOA debugger
- Task Parallel Library, PLINQ
- Integrated GPU support

- Private clouds
- Public clouds
- HPC as a service
- Big Data Analytics
- Visualization
- Integrated Workflow

Windows HPC Server 2008 R2 Suite

Excel | **Cluster SOA** | **HPC Applications** | **MPI** | **ISV / OSS Applications**

Job Scheduling | Systems Management | **HPC Middleware Pack** | Networking & MPI | SOA

Microsoft System Center

HPC Edition

Windows Server 2008 R2

Web | Virtualization | Management | Better Together with Windows 7

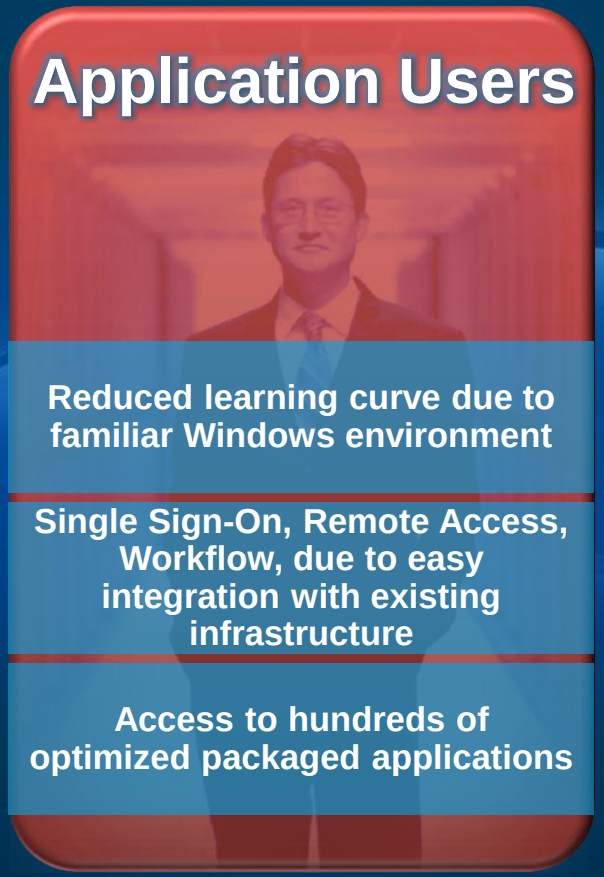
Operating Systems

intel Xeon® 5500 | AMD Opteron 64 | **Clusters of Commodity Hardware** | Performance Accelerated InfiniBand Adapters | NVIDIA TESLA

Windows HPC Server 2008 R2 - Benefits

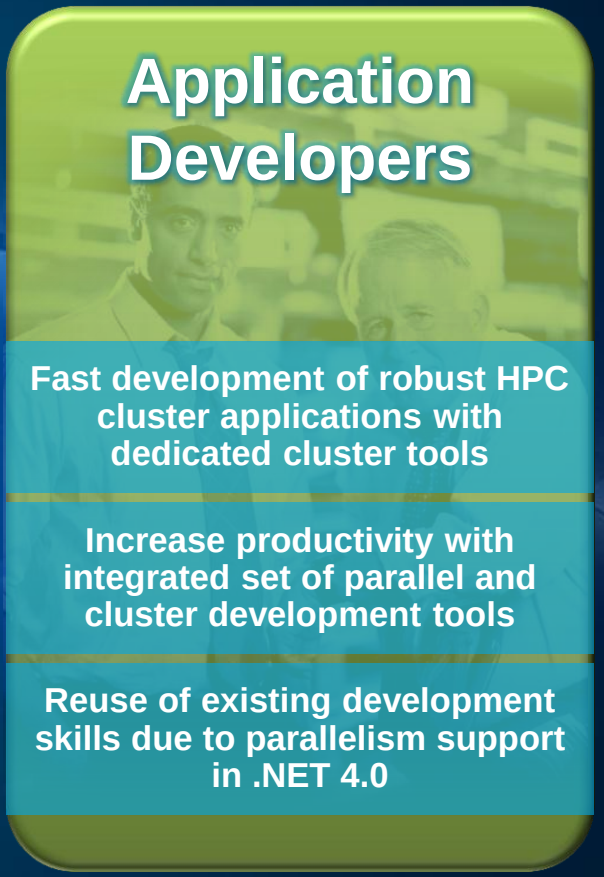
Systems Administrators

- Simplified, easy administration due to comprehensive, integrated management tools
- Rapid deployment to very large clusters
- Reuse of existing Windows Server administration skills



Application Users

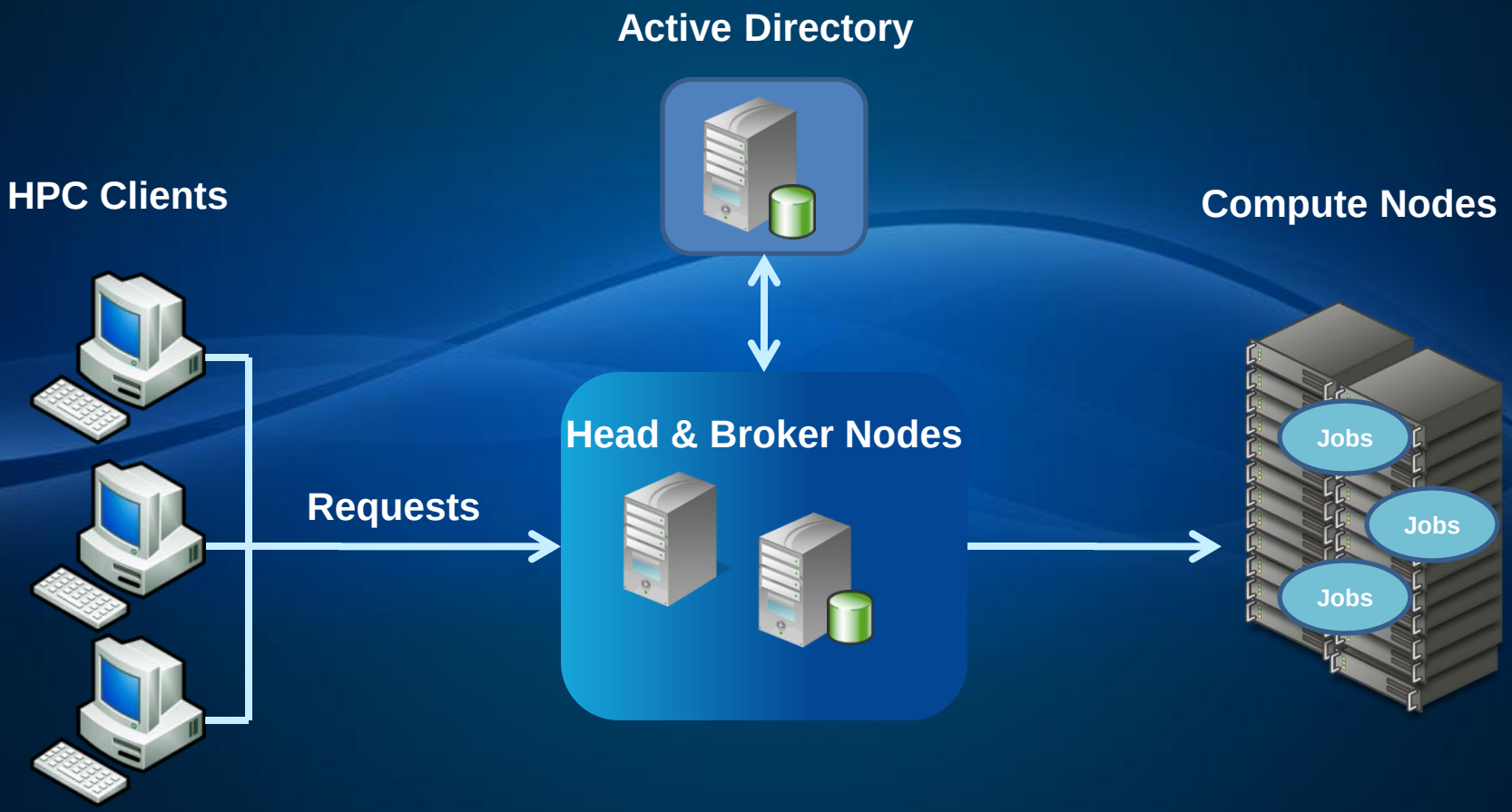
- Reduced learning curve due to familiar Windows environment
- Single Sign-On, Remote Access, Workflow, due to easy integration with existing infrastructure
- Access to hundreds of optimized packaged applications



Application Developers

- Fast development of robust HPC cluster applications with dedicated cluster tools
- Increase productivity with integrated set of parallel and cluster development tools
- Reuse of existing development skills due to parallelism support in .NET 4.0

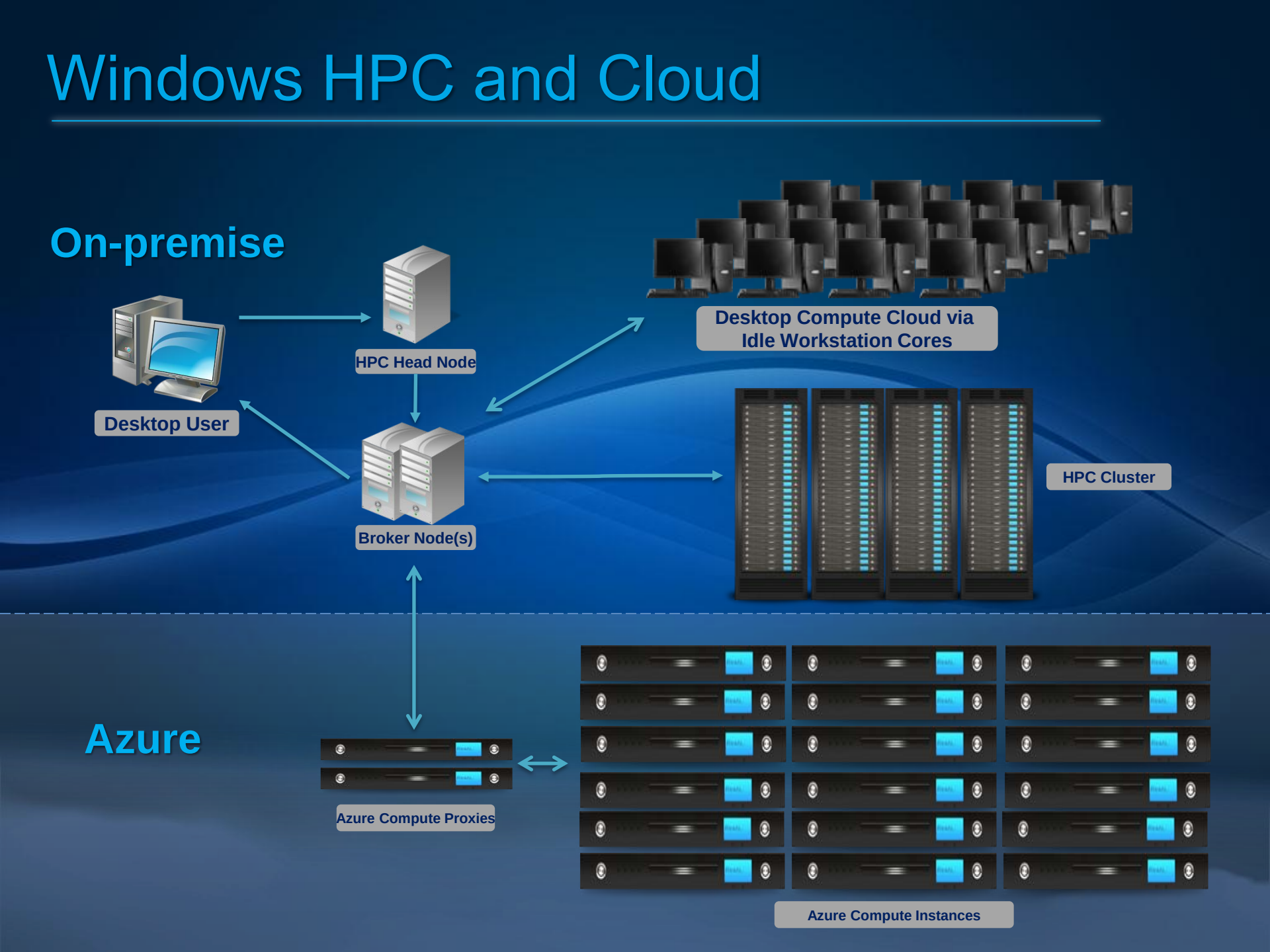
Basic HPC Cluster Topology



Cloud

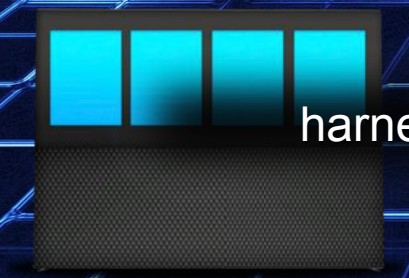
multiple node
distributed memory
on demand capacity

Windows HPC and Cloud



Benefits of Technical Computing For Simulation and Engineering

Calculation Bottlenecks:	HPC Provides:
Geometric simplifications and reduced physics to keep model sizes small	More detailed computations with high fidelity between analysis and reality (Memory – RAM)
Long calculation turnaround, inability to get results in time to affect business decisions	Faster turnaround time, ability to affect technical computing process (Processors)
Single-point simulations, inability to consider parametric studies or design optimization	Ability to consider multiple design options for comprehensive insight (Capacity)



harnessing parallelism across client, cluster & cloud

Client

single node
shared
memory

Cluster

multiple nodes
distributed memory

Cloud

multiple node
distributed memory
on demand capacity

Microsoft Technical Computing

© 2010 Microsoft Corporation. All rights reserved. Microsoft, Windows, Windows Vista and other product names are or may be registered trademarks and/or trademarks in the U.S. and/or other countries.
The information herein is for informational purposes only and represents the current view of Microsoft Corporation as of the date of this presentation. Because Microsoft must respond to changing market conditions, it should not be interpreted to be a commitment on the part of Microsoft, and Microsoft cannot guarantee the accuracy of any information provided after the date of this presentation.
MICROSOFT MAKES NO WARRANTIES, EXPRESS, IMPLIED OR STATUTORY, AS TO THE INFORMATION IN THIS PRESENTATION.