Microsoft

Microsoft Technical Computing

Modeling the world with greater fidelity

Bill Hilf, General Manager

Industry trends & challenges

“I've loved the stars too fondly to be fearful of the night.“

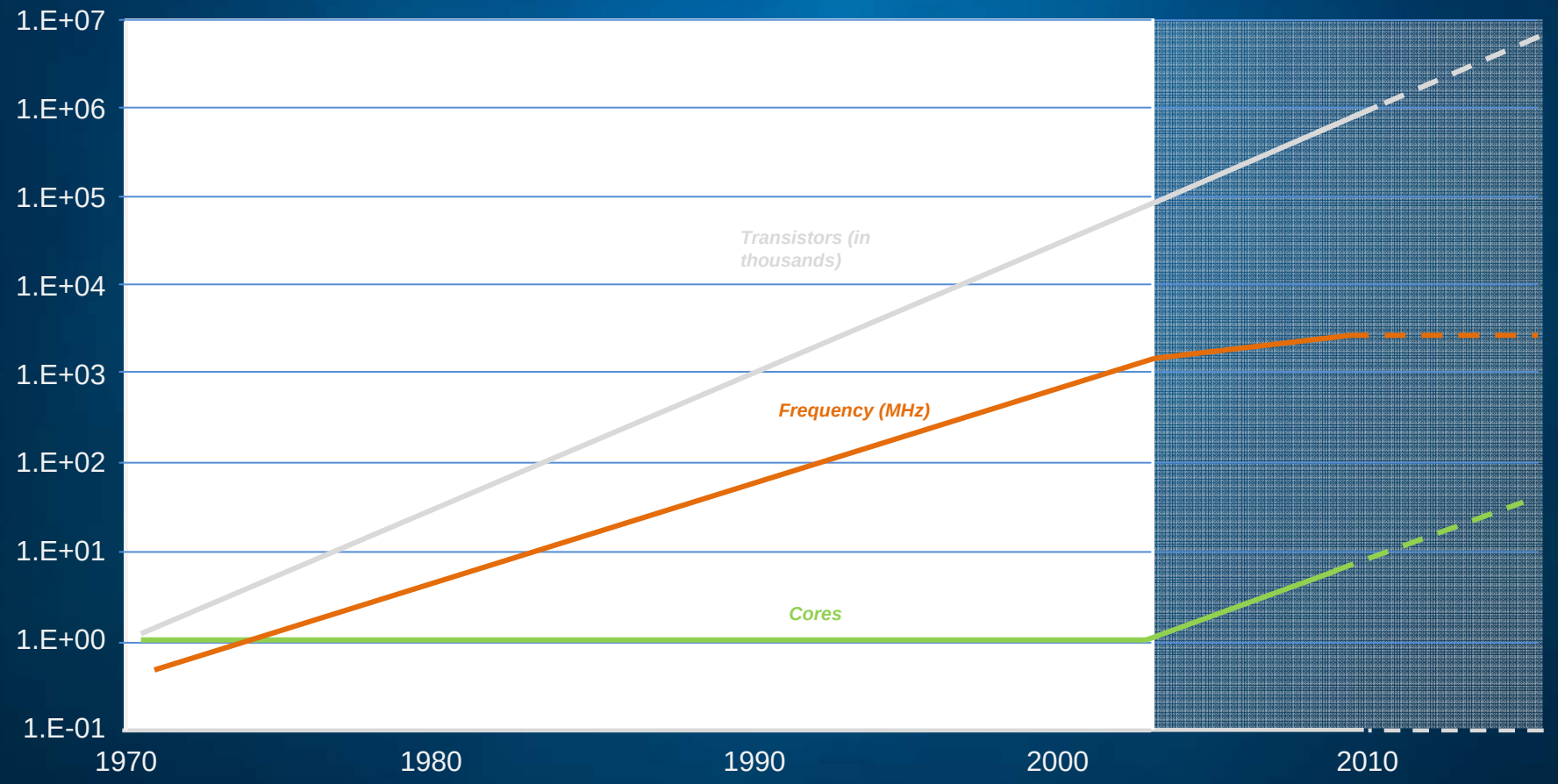
- Galileo Galilei


1.2 x 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
The data deluge
AND HOW TO HANDLE IT: A 14-PAGE SPECIAL REPORT

Sources: The Economist, Feb '10; DBMS2; Microsoft Corp

Moore's Law...



…a hardware issue just became a software problem

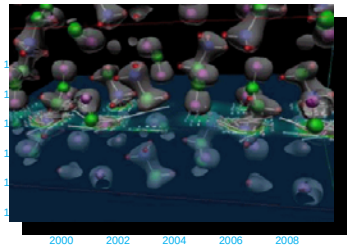
Source: Jack Dongarra, Kunle Olukotun, Lance Hammond, Herb Sutter, Burton Smith, Chris Batten, Krste Asanovic, and Kathy Yelick


Collaboration and Visualization
Dissemination, Sharing, Preservation
Data Acquisition and Modeling
Analysis and Data Mining

The time from Math to Model to Results often takes too long

Financial Services example

Materials Science example



Schrödinger equation

Black-Scholes formula

Parallelized FLAPW
(full-potential linearized augmented plane-wave)

Options pricing model coded

Materials Science application simulation

Options pricing

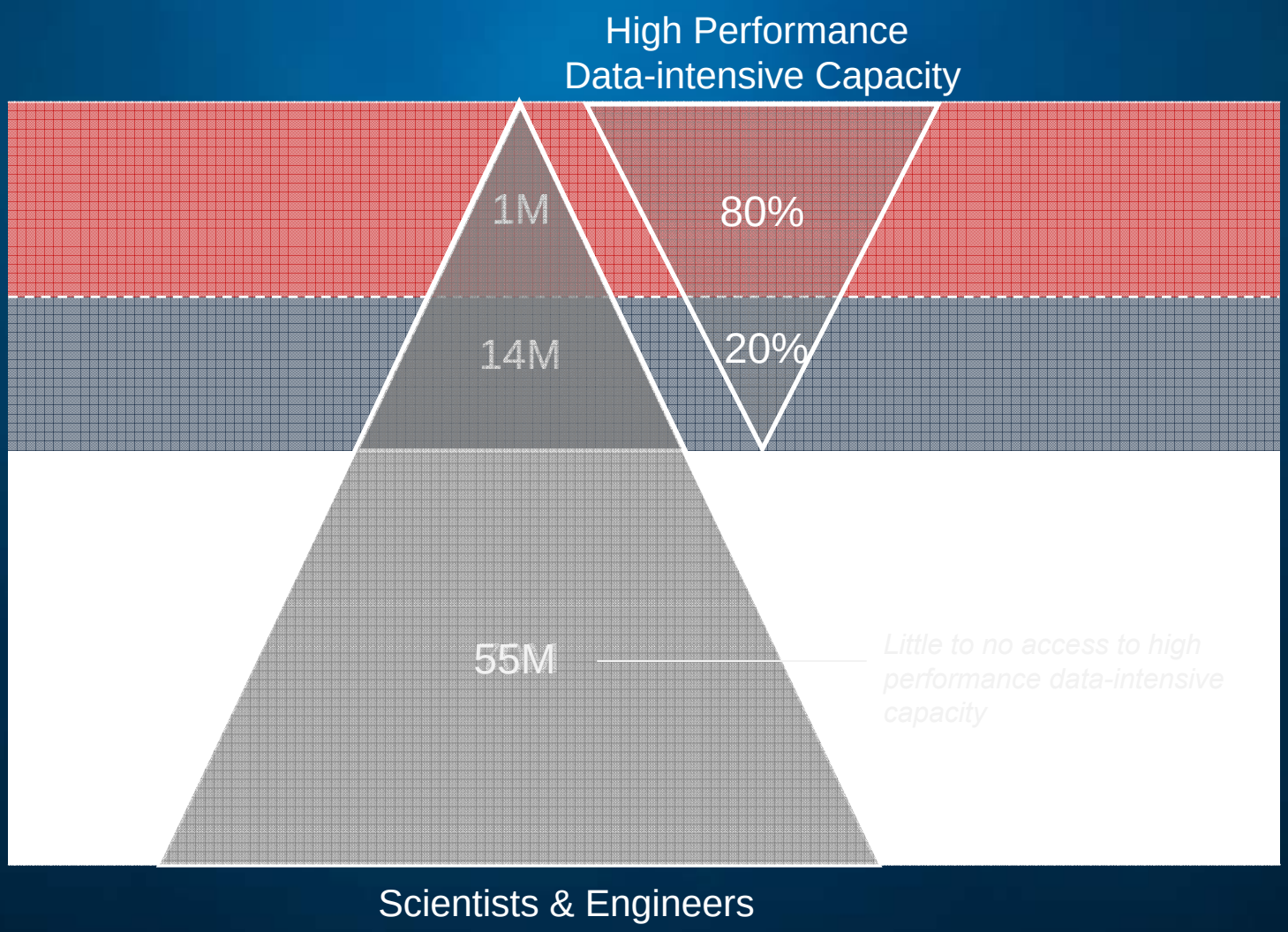
"Our tech guys take a week to rebuild the Excel model in our risk management software, which imperfectly captures the model."

"I have to wait my turn for central IT to execute my job."

- Researcher, Major Technology Firm

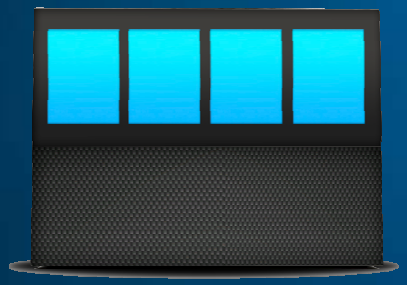
- HPC Director, Global Financial Institution

Lack of Broad Access



Microsoft Technical Computing

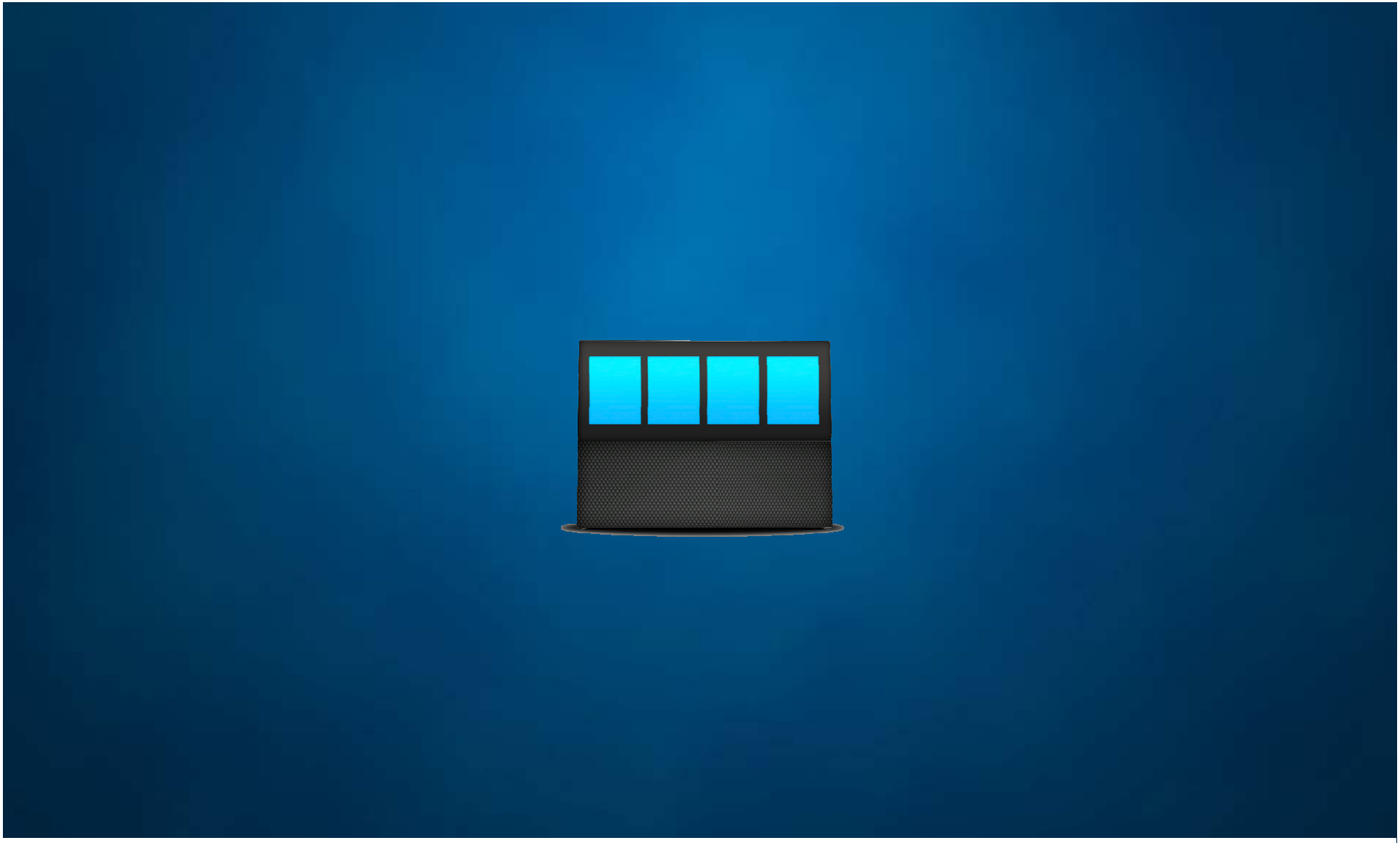
"Our technical computing initiative reflects the best of Microsoft's heritage."
-Bob Muglia, President Microsoft Corp.



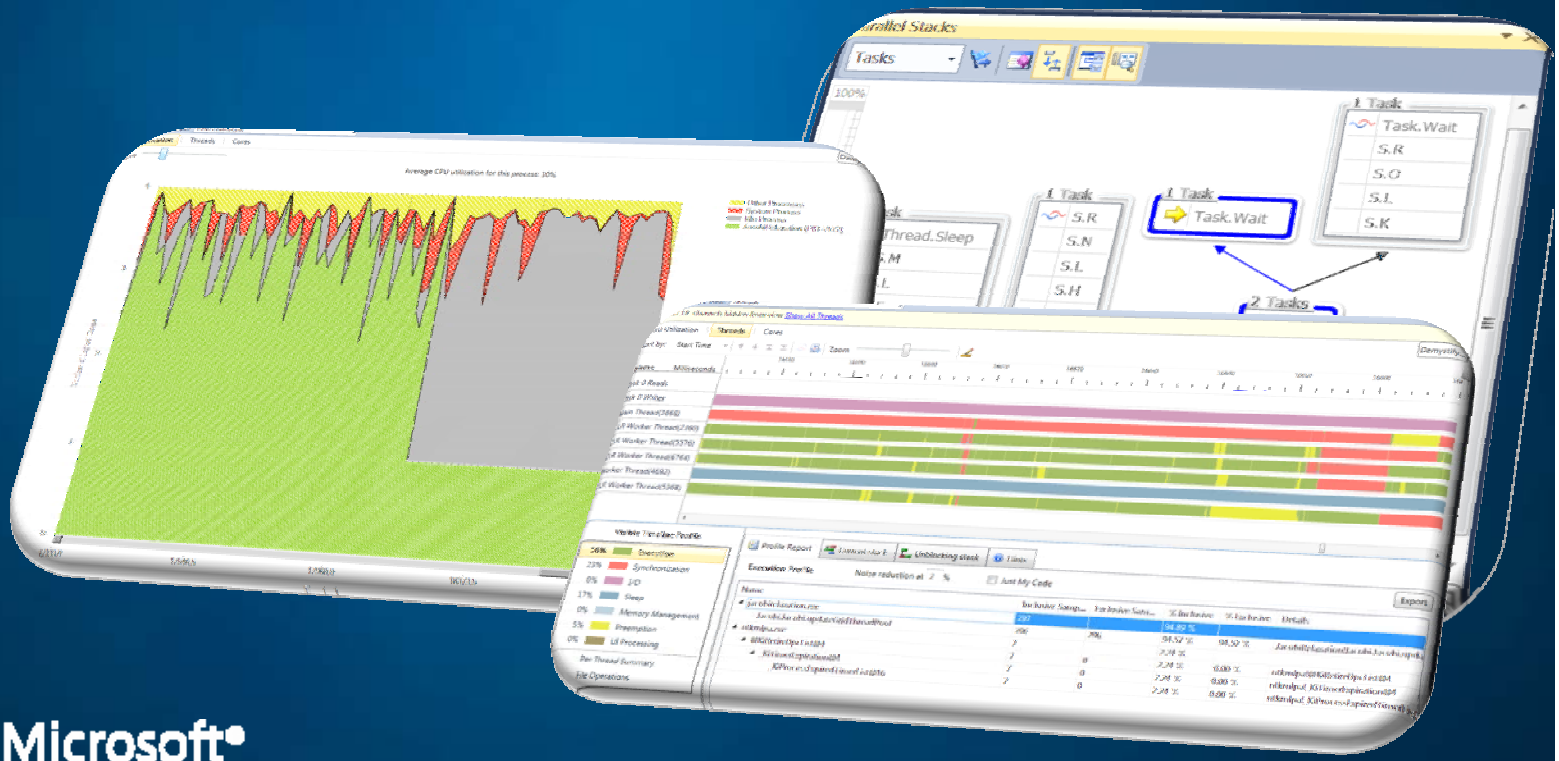
Client

Cluster

Cloud



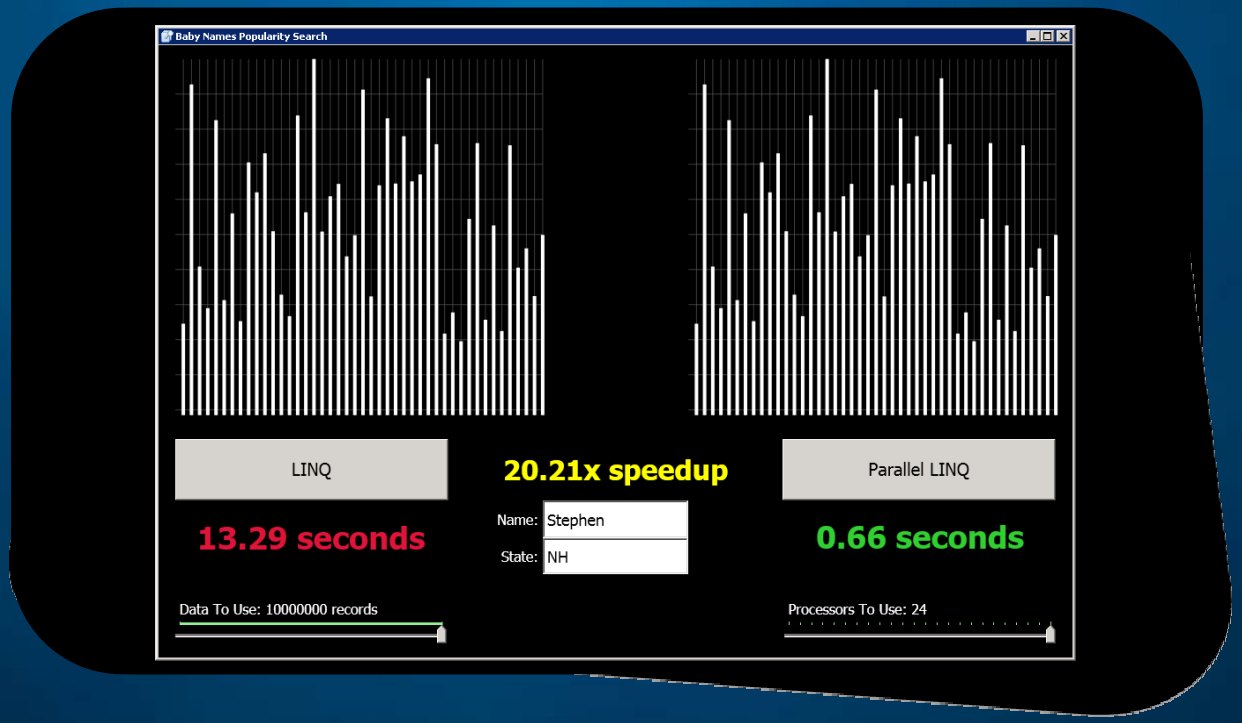
Parallel Development



Microsoft Visual Studio 2010

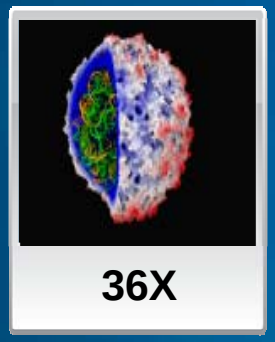
PLINQ

(Parallel Language Integrated Query)



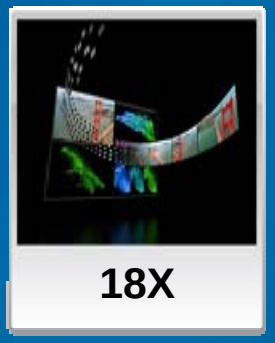
146X

Medical Imaging
U of Utah



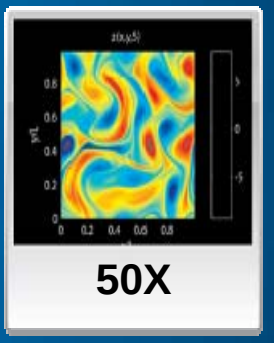
36X

Molecular Dynamics
U of Illinois, Urbana



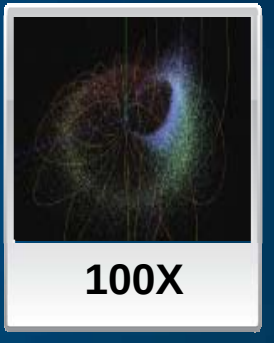
18X

Video Transcoding
Elemental Tech



50X

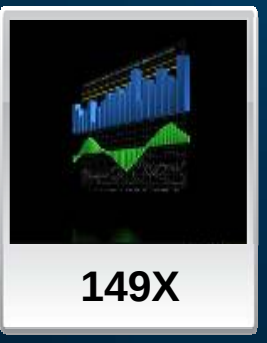
Matlab Computing
AccelerEyes



100X

Astrophysics
RIKEN

50x – 150x



149X

Financial simulation
Oxford

47X

Linear Algebra
Universidad Jaime

20X

3D Ultrasound
Techniscan

130X

Quantum Chemistry
U of Illinois, Urbana

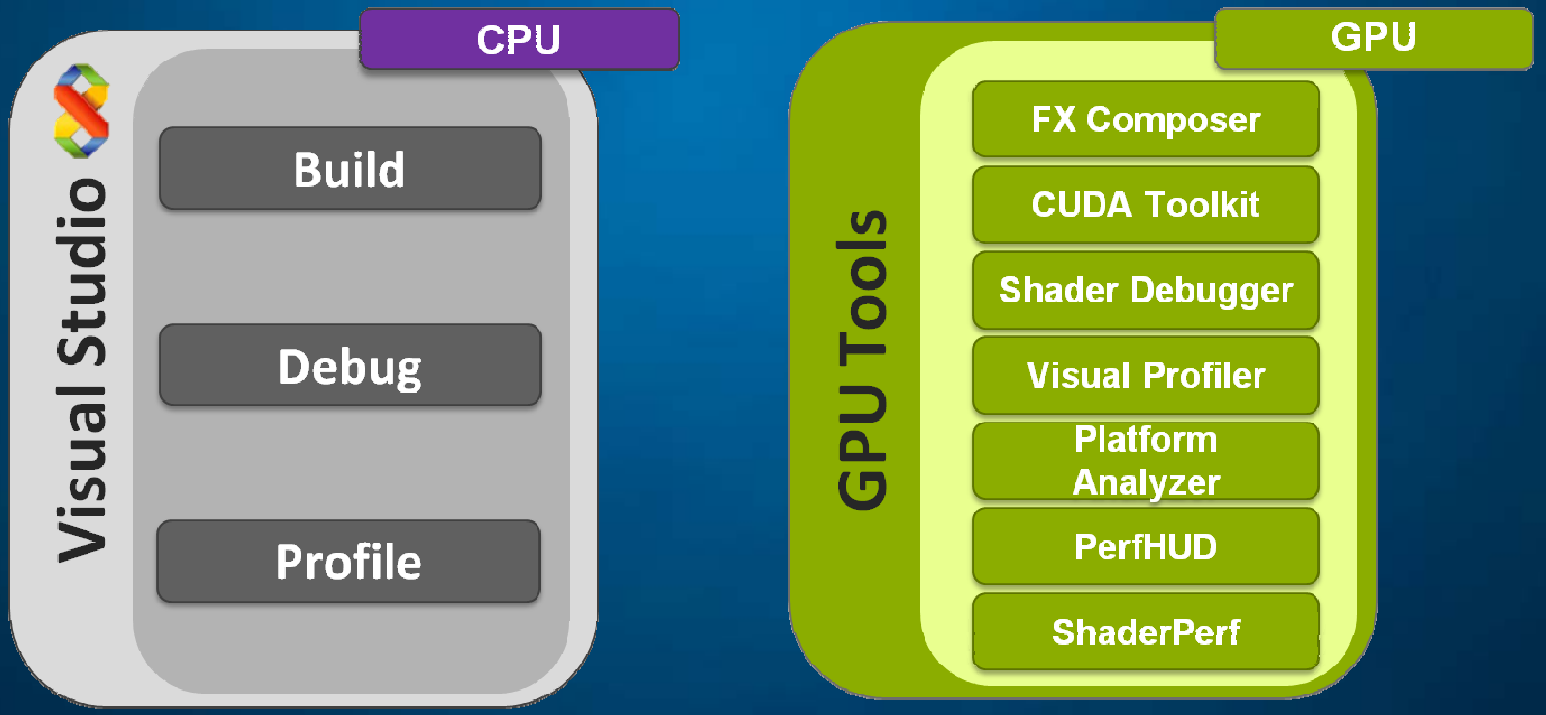
30X

Gene Sequencing
U of Maryland

Source: NVIDIA

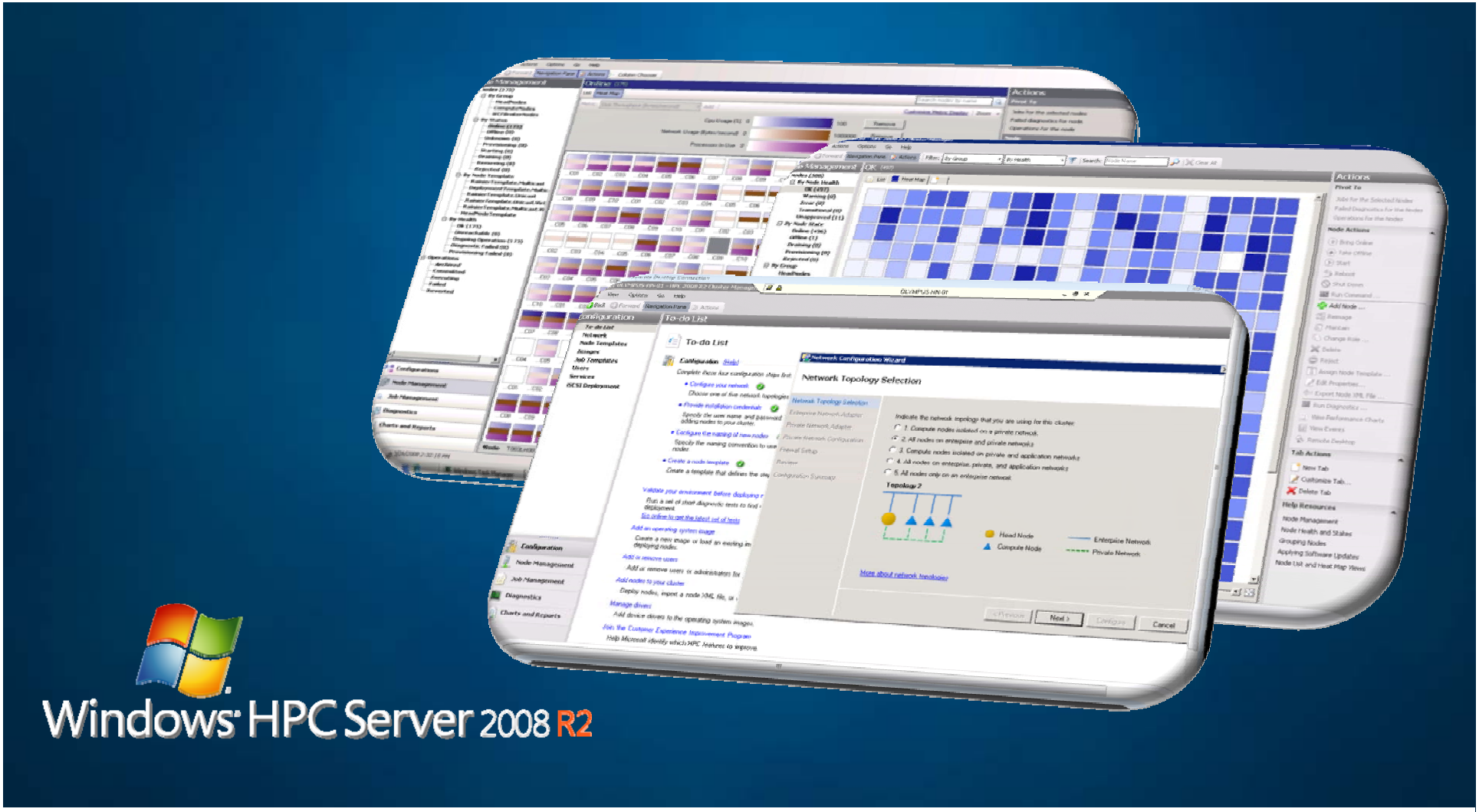
GPGPU development in Visual Studio

Windows Development with Parallel Nsight

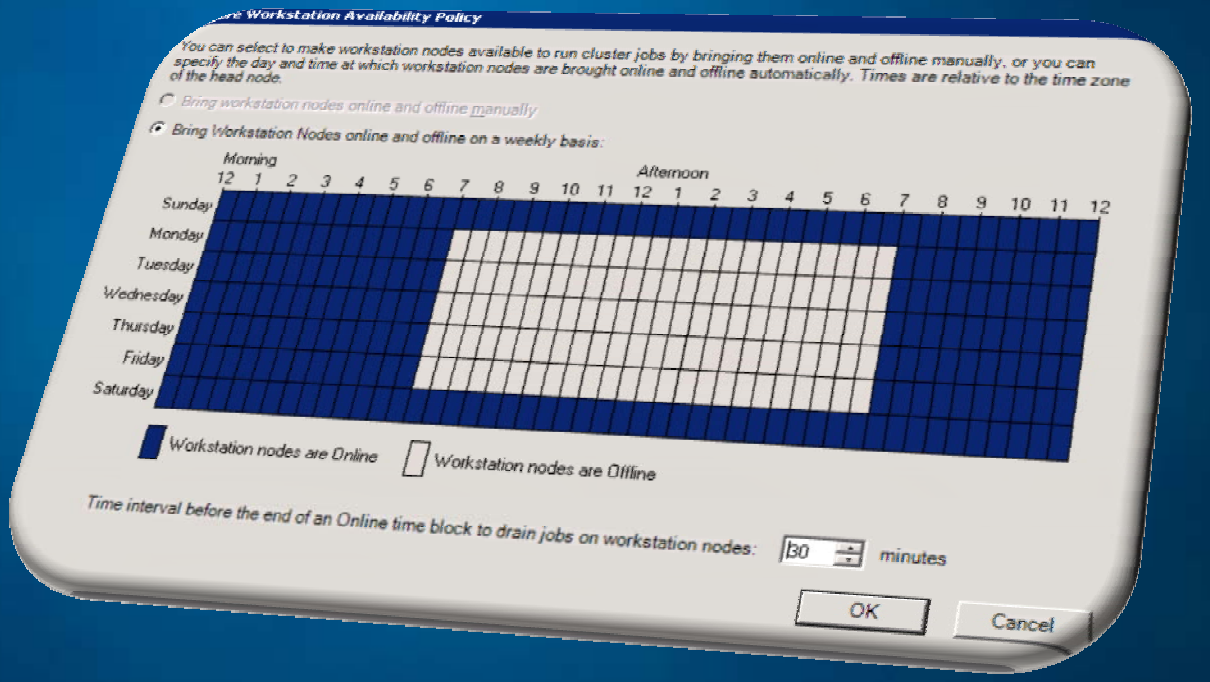


Parallel Nsight

www.nvidia.com/nsight

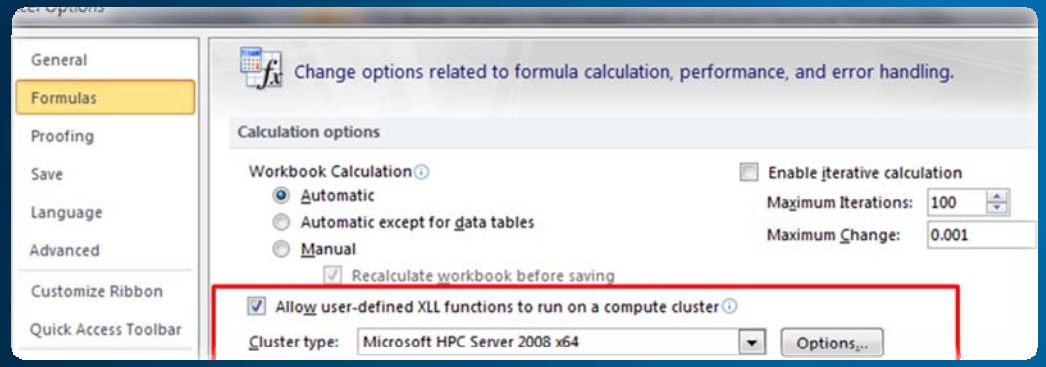


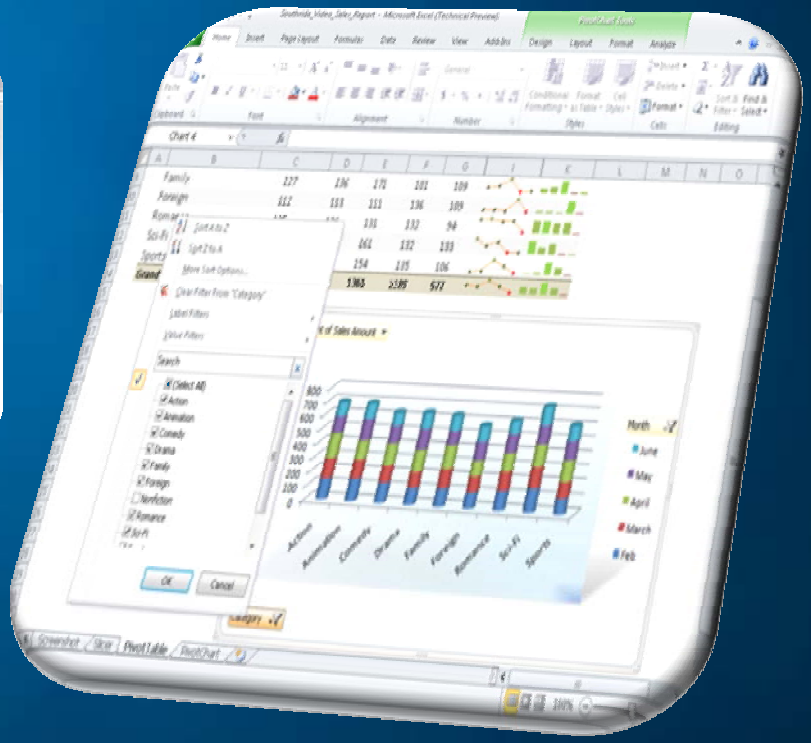
World Class Performance.
Scale to thousands of nodes.
Easy to use with existing skills.



Windows HPC Server 2008 R2

Cluster of Workstations





Microsoft® Excel 2010

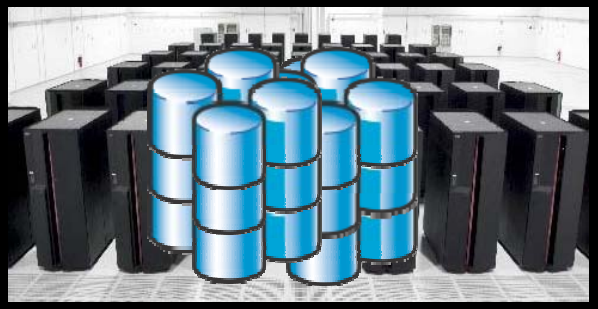
Windows HPC Server 2008 R2

HPC Services for Excel 2010: Performance by design

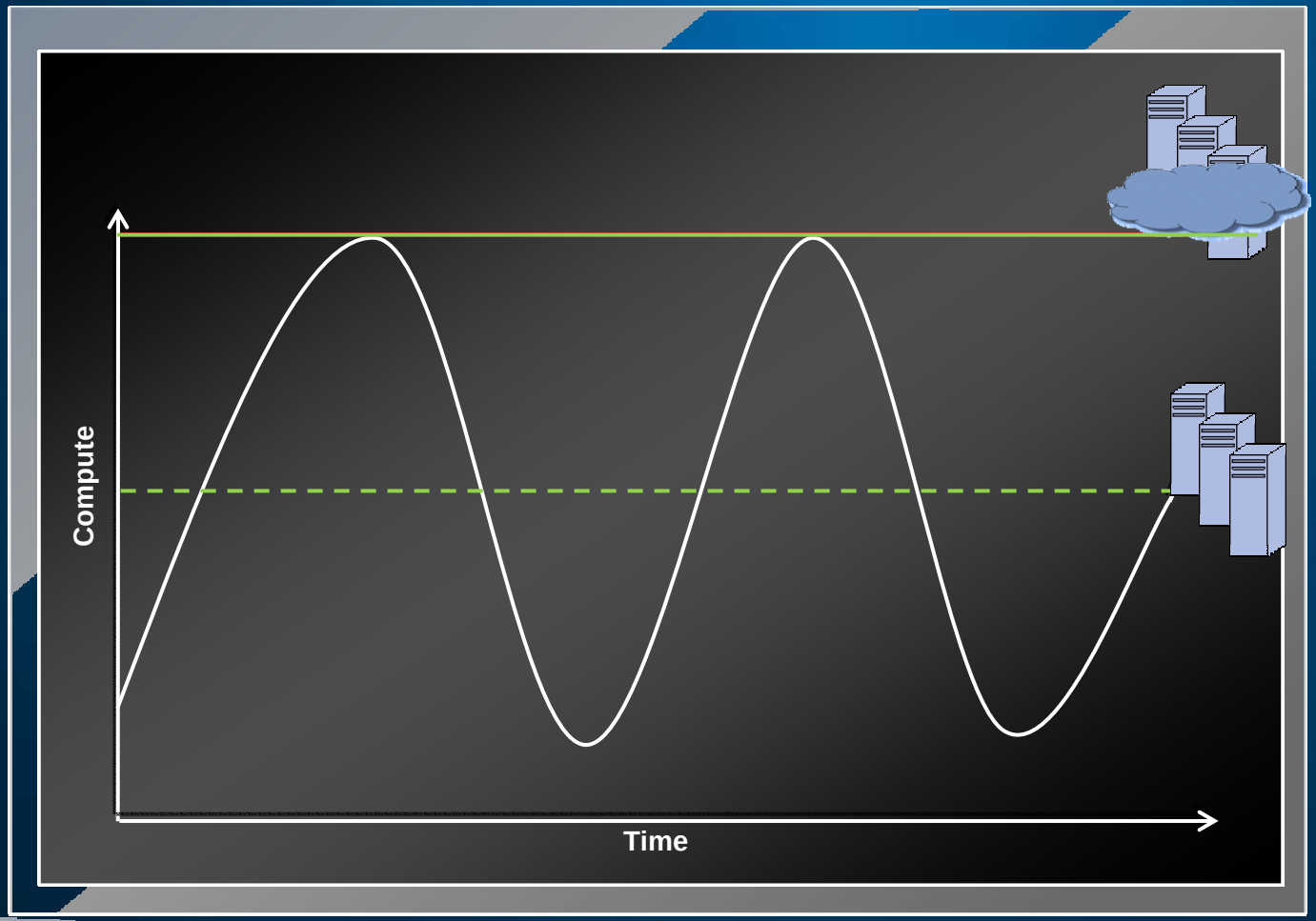
DryadLINQ

```
PartitionedTable<Baby> babies =  PartitionedTable.Get<Baby>(pathToStore);

var results = from baby in babies
      where baby.Name == queryName &&
            baby.State == queryState &&
            baby.Year >= yearStart &&
            baby.Year <= yearEnd
       orderby baby.Year ascending
       select baby;
```



Cloud Economics



On-premise + cloud resources:only:
Paying for "bursts" as needed

Paying full-time rate for peak utilization

Paying full-time rate for average utilization

Microsoft's Datacenter Evolution

2005 2006 2007 2008 2009 2010

Datacenter Co-Location Generation 1

Quincy and San Antonio Generation 2

Chicago and Dublin Generation 3

Modular Datacenter Generation 4

Deployment Scale Unit

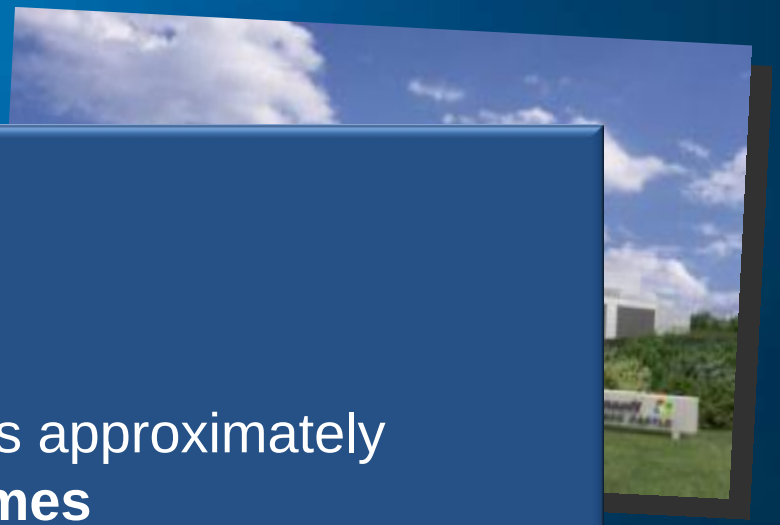
Capacity

Density and Deployment

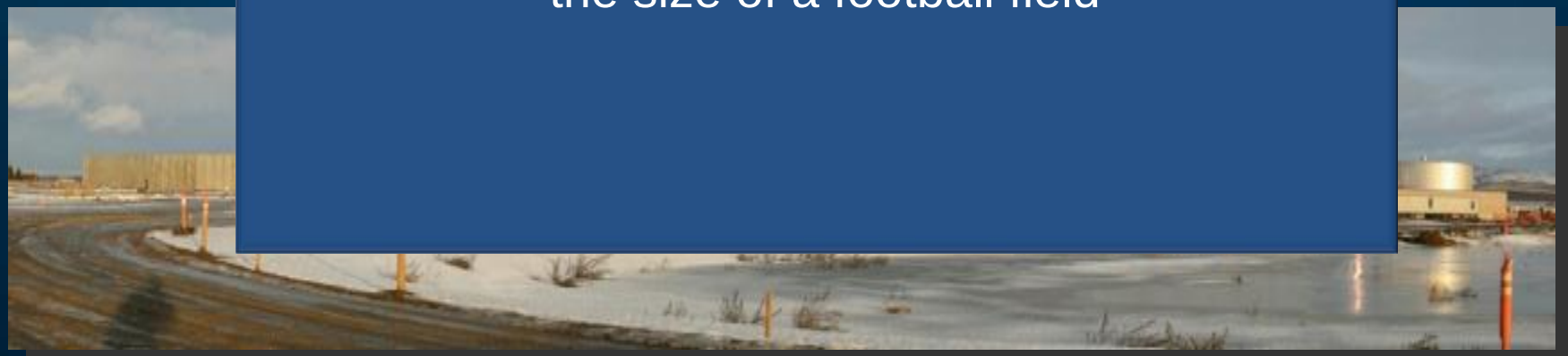
Scalability and …Sustainability

Time to Market
Lower TCO

Generation 2/3 – Data Centers



Each data center is approximately
11.5 times
the size of a football field



Generation 3 - Chicago Data Center

$500M+ investment

1.5 million person hours-of-labor

300

707

2400

Each data center is approximately
17 times
the size of a football field
and uses containers

7.5 miles of chilled water piping

26,000 cubic yards of concrete

Cloud platform

Windows Azure

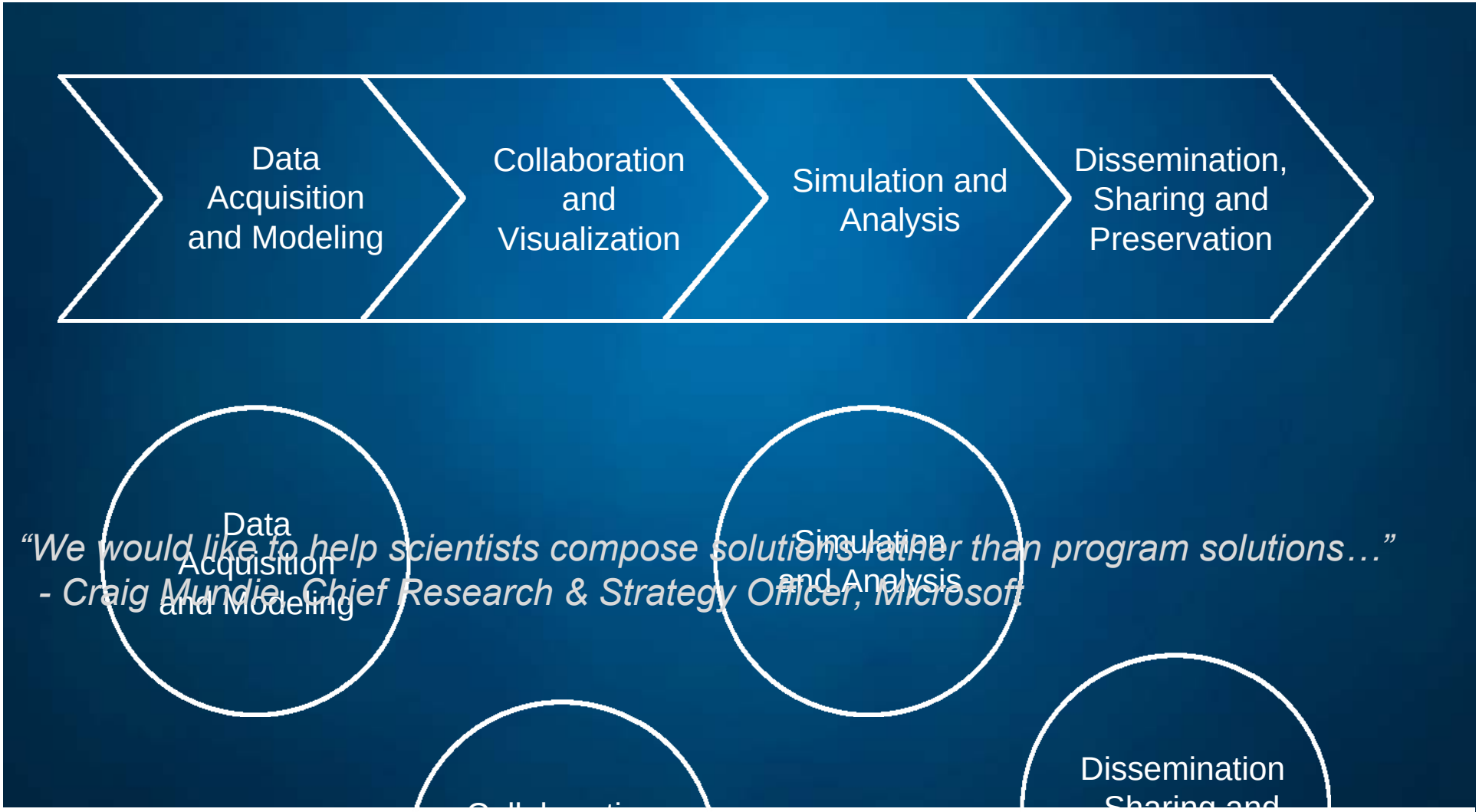
- Scalable compute and storage
- Automated service management
- Familiar tools, technologies, language

SQL Azure

- Relational storage for the cloud
- Consistent development model
- Automated database management

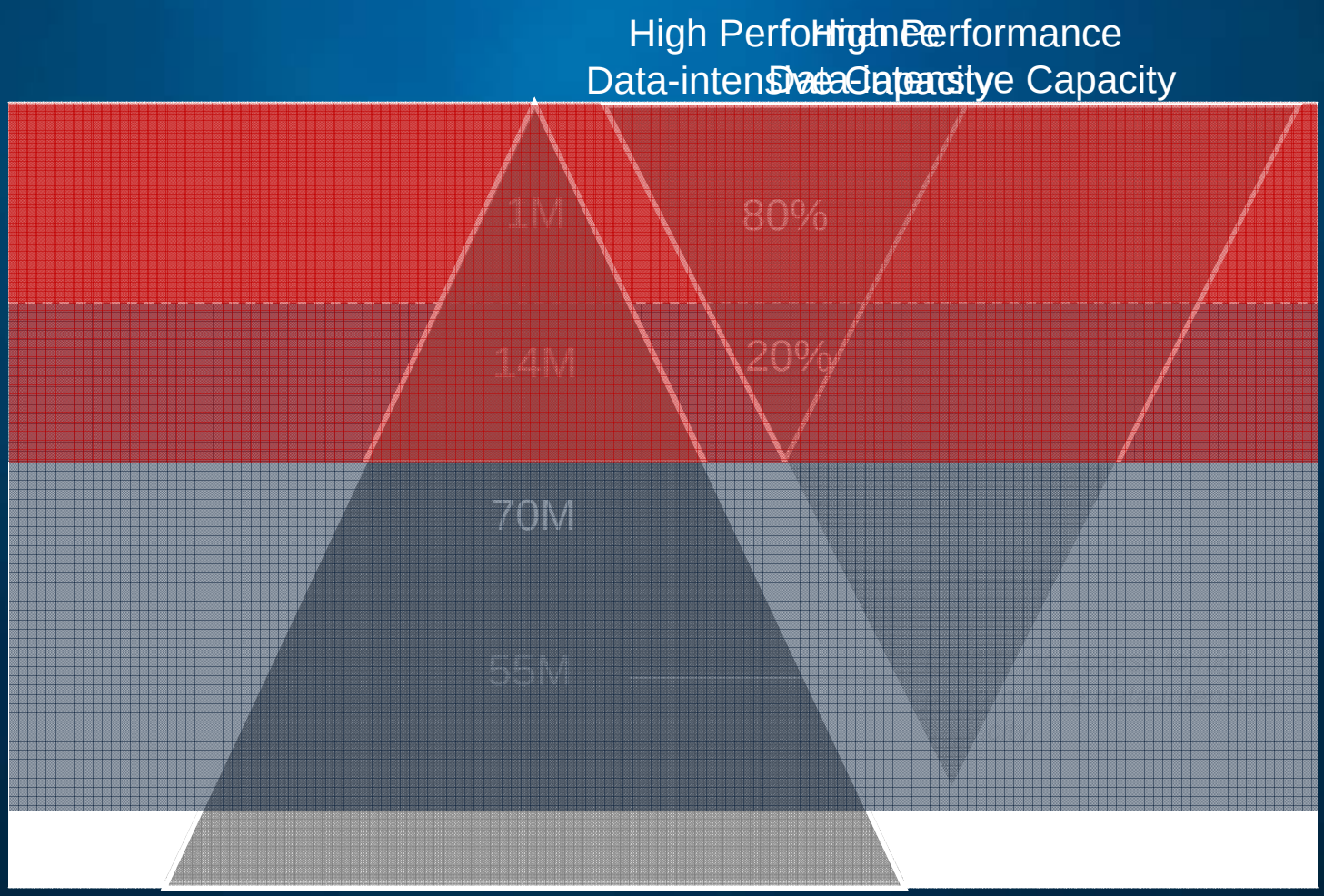
Windows Azure platform AppFabric

- Connect existing apps to the cloud
- Access control service
- Service bus capability



"We would like to help scientists compose solutions rather than program solutions…"
- Craig Mundie, Chief Research & Strategy Officer, Microsoft

Wide Spread Data Demand Access



Advances in Archaeology: Portus Project

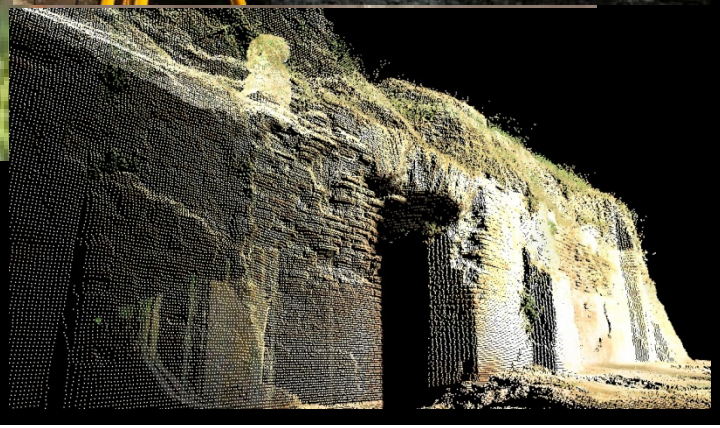
UNIVERSITY OF Southampton
School of Engineering Sciences

UNIVERSITY OF CAMBRIDGE
THE BRITISH SCHOOL AT ROME

MiBAC

http://www.portusproject.org

Advances in Archaeology...



UNIVERSITY OF Southampton
School of Engineering Sciences
UNIVERSITY OF CAMBRIDGE
THE BRITISH SCHOOL AT ROME
ACCADEMIA BRITANNICA DI ARCHEOLOGIA, STORIA E BELLE ARTI
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Advances in Archaeology...

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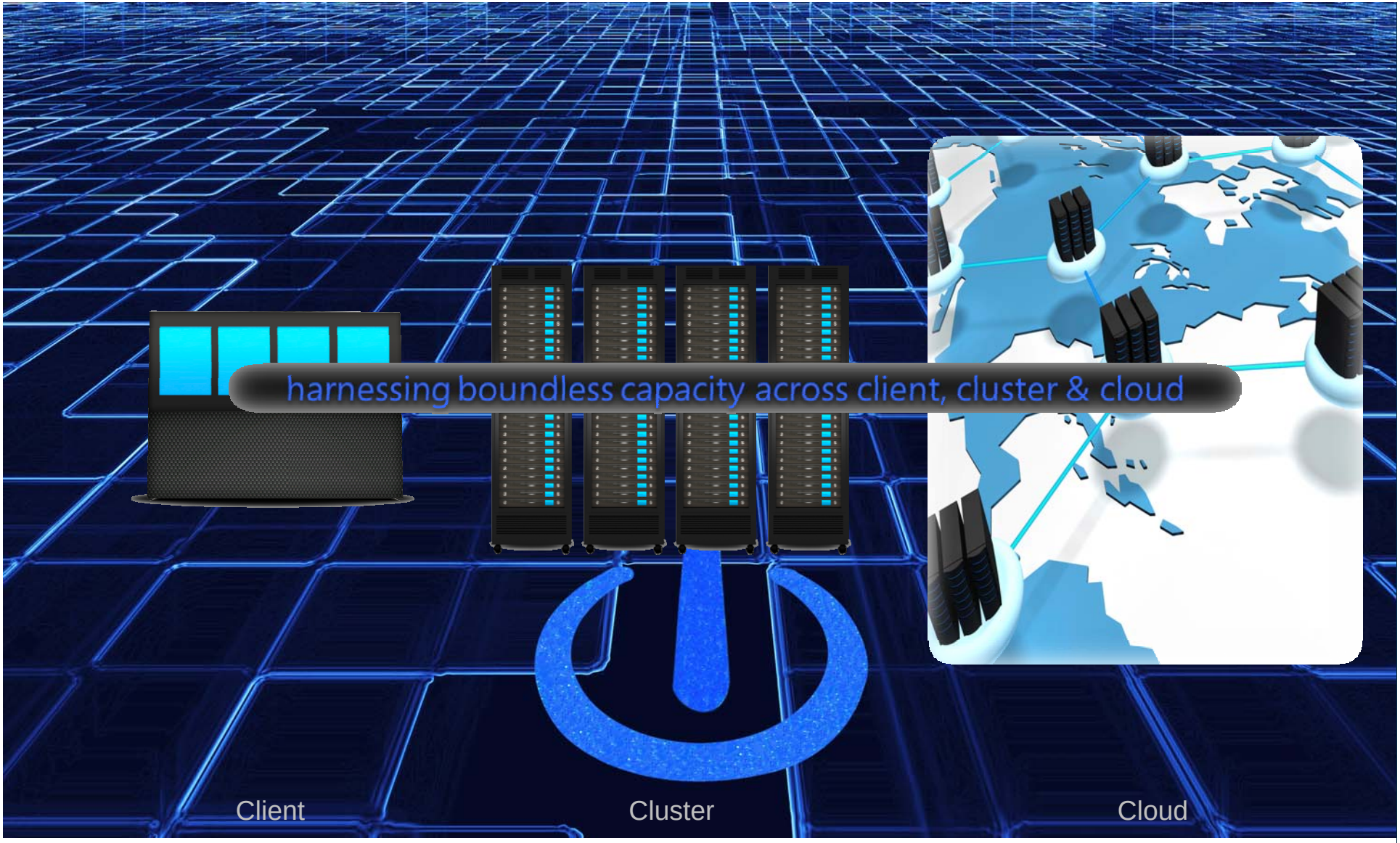
harnessing boundless capacity across client, cluster & cloud
Client
Cluster
Cloud


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Your potential. Our passion.™