IDC's Top 10 HPC Market Predictions for 2010

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Introduction

- Each each year IDC analysts consider the trends and the potential disruptions in their respective markets, and offer insights into how these drivers could change the markets being tracked by the IDC analyst community.

- In this Webcast we present IDC's Top 10 predictions for the worldwide HPC market in 2010.

- This Webcast is based on the document: *Worldwide Technical Computing Market 2010 Top 10 Predictions,* by the same authors listed on this slide deck.

IDC Top 10 HPC Predictions for 2010

1. The HPC Market Will Resume Growth in Mid-2010

2. The Race For Global Leadership Will Turbo-Charge the Supercomputers Segment

3. In 2010 Evolutionary Change Will Trump Revolutionary Change

4. Commoditization Will Increasingly Level the Playing Field For HPC Competition

5. The Highly Parallel Programming Challenge Will Increase

6. X86 Processors Will Dominate, But GPGPUs Will Gain Traction As x86 Hits the Wall

7. Infiniband Will Continue To Gain HPC Market Share

8. HPC Storage Will Outpace the HPC Server Market Recovery

9. Power and Cooling Efficiency Will Become More Important, But Is Not Far Along Today

10. Cloud Computing May Be Coming To A Neighborhood Near You

- 2009 HPC server revenue will be about $8.25 billion, down 15.5% from 2008.

- Our latest forecast has revenue growing 5% to 7% in 2010, reaching $10.5 billion by 2013.

Worldwide Technical Server Revenue ($M) Forecast, 2008 - 2013

1. HPC Segments Will Recover Unequally

- The high end of the market is showing the greatest strength.

- Some automotive and financial services firms will continue guarding capex even in mission-critical areas, including HPC.

- In leading oil and gas companies, and in some entertainment and consumer product firms, HPC growth plans will be healthy.

- Government and academia will be bright spots in the HPC market recovery.

- In the U.S. and elsewhere, HPC will compete for funding with other pressing priorities.

- Increased focus on cost-effectiveness will make standards-based clusters even more appealing.

- Products that boost the efficiency of existing HPC resources will also do well.

- Capex-free HPC cycles delivered via service-oriented clouds and grids will become more appealing to new users and for periodic, overflow work.

2. The Race For Global Leadership Will Turbo-Charge the Supercomputers Segment

- The $500K and up Supercomputers segment did very well in 2009 at about $2.6B.

    - IDC predicts it will grow 17% to $3.1B in 2010 and to $4.1B in 2013.

    - The $3M+ segment grew a whopping 65% in 2009 to reach $1.0B and we expect it to grow to $1.4B in 2013.

- The race for HPC leadership might turbo-charge the Supercomputers segment possibly for a decade to come.

- Industries such as oil and gas will also soon buy petascale or near-petascale systems.

- Although the Petascale Era is just dawning, governments around the world are already exploring exascale computing.

- Developments at the very high end (e.g., DARPA HPCS, *Keisoku*) are turning out less revolutionary/disruptive than first envisioned – and that's not a bad thing.

- Most of the biggest, baddest supercomputers are architectural clusters or x86 MPPs, with bulked-up interconnects and support for MPI and PGAS languages.

- Only a few users appear ready to move to PGAS or rewrite codes for novel architectures.

- Revolutionary change may still be on the horizon, because evolutionary change is not addressing fundamental issues, such as how to program machines that will soon have 1M or more cores.

- 25 years ago (1985): HPC competition was between U.S. and Japanese "muscle cars."

- Today: "It's not the size of your muscles that counts, it's the size of your wallet" (A. Schwarzenegger). With commoditization, any nation/region with enough funding can aspire to build and operate petascale systems.

- Upsides: Commoditization has made HPC accessible to many more users and has increased standardization, productivity and collaboration.

- A downside: Commoditization makes it harder to adopt a new paradigm when the old one begins hitting a wall.

- **Hardware parallelism from burgeoning core counts and system sizes is racing ahead of programming paradigms and the time available to programmers.**

  - Manycore processors and heterogeneity add to the programming challenge.

- **The parallel performance "wall" will reshape the nature of HPC code design and system usage.**

- **New DARPA HPCS languages could transform highly parallel programming starting a few years from now.**

  - But many mainstream users resist disruptive changes.

- x86 processors went from near-zero to hero in HPC in the past decade, largely replacing RISC.

- x86 will continue to dominate, but GPGPUs will start making their presence felt more in 2010.

- Multiple Large HPC procurements have substantial GPGPU content.

  - GPGPUs play a crucial role in ORNL's planned exascale system.

- GPGPUs provide more peak/Linpack flops per dollar for politics and will inevitably provide more sustained flops for suitable applications.

- In 2010, some ISVs will announce plans to redesign their apps with GPGPUs in mind.

7. Infiniband Will Continue To Gain HPC Market Share

- Infiniband's share grew substantially, 2005-2009, at the expense of proprietary interconnects, while Ethernet's share remained constant.
- IDC forecasts that by 2013, the HPC interconnect market will grow to about $2.25B from $2.0B in 2009.
- It will take a while for 10 GigE to work its way through the HPC market.
- IDC predicts that both IB and Ethernet will be the two major interconnect choices in HPC.

2005

39%
49%
12%

☐ Ethernet ■ Infiniband ☐ Proprietary

2009

21%
49%
30%

☐ Ethernet ■ Infiniband ☐ Proprietary

2013 (Forecast)

13%
50%
37%

☐ Ethernet ■ Infiniband ☐ Proprietary

- **2008-2009, the HPC server market dropped 15.5% while the HPC storage market declined slightly less at 14.3%.**

- **In 2010, IDC predicts the HPC storage market will expand about 8% to $3.1B. By 2013, we expect storage to grow to $4.1B or 39% of HPC server revenue, compared with 35.5% in 2010.**

- **The HPC storage market will continue to be fairly fragmented as some large storage vendors fail to target HPC specifically, leaving openings for smaller storage vendors and hardware system OEMs.**

- **In 2010, flash/SSD will begin to demonstrate impressive speedups on some critical HPC applications.**

- **Flash/SSD has major advantages but will continue to be used judiciously until costs drop further.**

The Data Explosion

9. Power and Cooling Efficiency Will Become More Important, But Is Not Far Along Today

- A recent IDC-Avetec study found HPC and commercial data centers are more alike than different when it comes to energy efficiency.

- Many data centers don't see or pay their own power bills.

- Few (~20%) have strong internal mandates to improve energy efficiency – electricity is simply "part of the cost of doing business."

- Only 31% use specific metrics (e.g., PUE) to measure/report energy efficiency today.

- Only 29% have formal roadmaps to improve energy efficiency.

- Yet 75% of the HPC centers rated "green" design criteria as "very important" or "critically important."

- 65% of the HPC centers plan to expand their data center or build a new one in the next 2-3 years.
  - *Two-thirds of these sites have approved budgets for this, averaging $6.87 million.*

- Clouds offer the ability to quickly add resources, and a way to try before buying.

  - Clusters/grids handle static demand. Clouds are aimed at fluctuating, elastic demand.

- CERN is developing what may be the world's biggest private cloud, to distribute data, applications and computing resources to scientists around the world.

- NASA is building a private cloud to enable researchers to run climate models on remote systems provided by NASA. This saves NASA from having to help users build the complex models on their local systems.

- NSF and Microsoft just announced a cloud arrangement.

- While most of the action is in private clouds today, multiple HPC vendors offer or will soon offer public cloud services.

European Organization for Nuclear Research

Private Clouds

- Leverage existing IT infrastructure & personnel
- Dynamically handle workloads
- Distribute data, applications and computing environments (e.g., VMs)
- Balance workloads to efficiently exploit IT resources
- Pre-production testing
- Enforce data privacy, policies and directives

Public Clouds

- Dynamically handle workloads without communications dependencies
- Distribute data, applications and computing environments (e.g., VMs)
- Offload "surge" work
- Avoid capex IT investments, including SMEs (HW, SW, personnel)

The Cloud

What End Users See

Utility Computing

Chargeback/Billing
Runbook/Process Automation
Application Lifecycle Management
Configuration Management
Application Streaming
OS Provisioning
Virtualization
GRID/HPC

What IT / Service Providers See

Essential Guidance: General

- 2010 will be a year of continuing evolutionary rather than revolutionary change.
    - *With growth starting in mid-year*
- Existing major challenges will remain inadequately addressed:
    - *Weak application performance improvements*
    - *Highly parallel programming*
    - *System imbalance (the "memory wall")*
    - *Power and space usage*
    - *Software licensing costs*
    - *Ease-of-use – dealing with the growing system complexity*

Essential Guidance: HPC User/Buyers

- In the difficult economy, vendors will compete more fiercely for your business.

  - This will present opportunities to drive harder bargains that may no longer be available as the HPC market begins to recover in mid 2010 and onward.

- Users whose capex is under greater pressure in 2010 than their opex should consider sending overflow work to utility computing providers or cloud service providers.

  - Some of these providers offer ISV applications and expertise as well as cycles.

- User's greatest challenge will be matching their applications to new hardware and finding ways to make their codes more parallel.

Essential Guidance: HPC Vendors

- Clusters will continue to put pressure on profits and challenge vendors to find new ways to differentiate and deliver added value.

- Stronger growth in the high-end Supercomputers segment will make this a more attractive selling space for both mega-clusters and "purpose-built" HPC systems.

- IDC expects government and university HPC purchasing to be bright spots as the market begins to recover.

- National security and homeland defense operations will continue to develop additional requirements for HPC systems.

- New applications areas for HPC may be developed based on database and pattern matching requirements.

- IDC expects R&D for alternative energy sources, as well as nuclear, coal, climate modeling, and oil/gas to be strong growth segments.

Conclusions

- 2010 will be a year of continuing evolutionary rather than revolutionary change in the worldwide HPC market.
  - Incremental advances will help, but not resolve persistent issues, such as highly parallel programming challenges, power and cooling costs, and software licensing costs.

- IDC predicts the HPC market will resume growth in mid-2010 and grow 5% to 7% in 2010.
  - And then will gradually rebuild to $10.5 billion in 2013.

- The recovery will benefit HPC segments unevenly:
  - With hard-hit verticals such as automotive and financial services recovering more slowly than oil and gas, or government and academia.
  - The Supercomputer segment growth will remain turbo-charged by government spending aimed at HPC leadership and "petaflop club" membership.

Conclusions

- x86 processors will advance and continue their domination.

    - But GPGPUs will gain ground for political reasons (peak/Linpack flops per dollar) and practical reasons (sustained flops on suitable codes).

- Infiniband will continue gaining market share at the expense of proprietary interconnects.

- Driven by the data explosion, HPC storage will continue growing faster than HPC server revenue.

- Energy efficiency in many cases will be more about staying within a data center's power envelope than saving money.

- As an early adopter market, cloud computing will make modest inroads into HPC.

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Questions?

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