Review of SC13;
Look Ahead to HPC in 2014

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New at Intersect360 Research

- HPC500 user organization, www.hpc500.com
  - Demographically balanced (verticals, geos, budgets)
  - Free access to research
  - Members-only calls on topics of interest
- New podcast: “This Week in HPC”
  at intersect360.com, insidehpc.com, @ThisWeekInHPC
- U.S. Council on Competitiveness project to assess impact of Exascale for industry
- Newsletter announcing research, articles, podcasts, etc.: Sign up at intersect360.com

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Total WW HPC Revenue

Table 1: 2012 vs. 2011 Comparison – Total HPC Market Revenue ($, millions) by Product Class

Product Class	2011	2012	Change	Growth
Servers	9,915	10,381	466	4.7%
Storage	3,832	4,837	1,005	26.2%
Services	3,180	3,328	147	4.6%
Software	6,456	6,651	195	3.0%
Networks	1,987	2,121	134	6.7%
Other	1,786	1,842	56	3.1%
Total	27,156	29,159	2,003	7.4%

Source: Intersect360 Research, 2013

Storage revenue was significantly affected by flooding in Southeast Asia in the second half of 2011, causing storage-related revenue to be deferred from late 2011 and recognized in early 2012.

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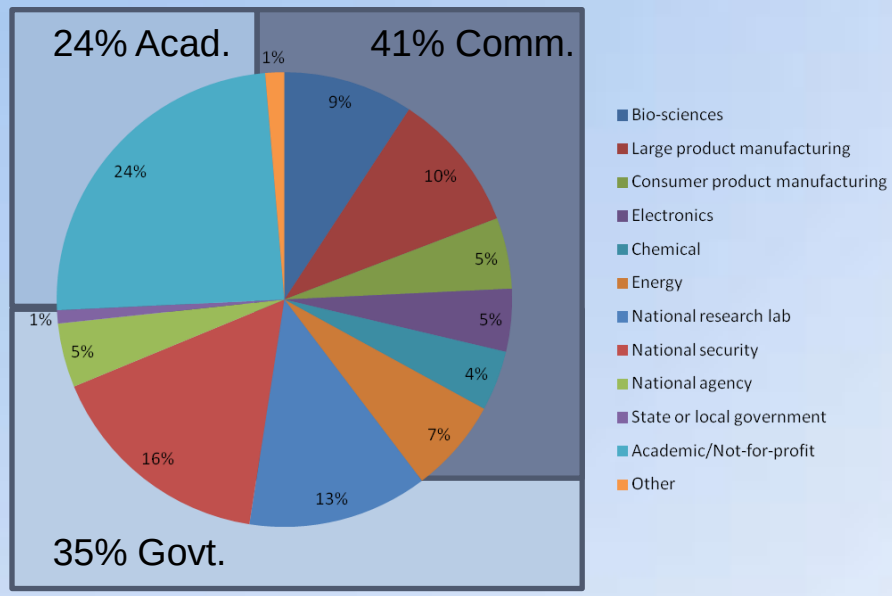
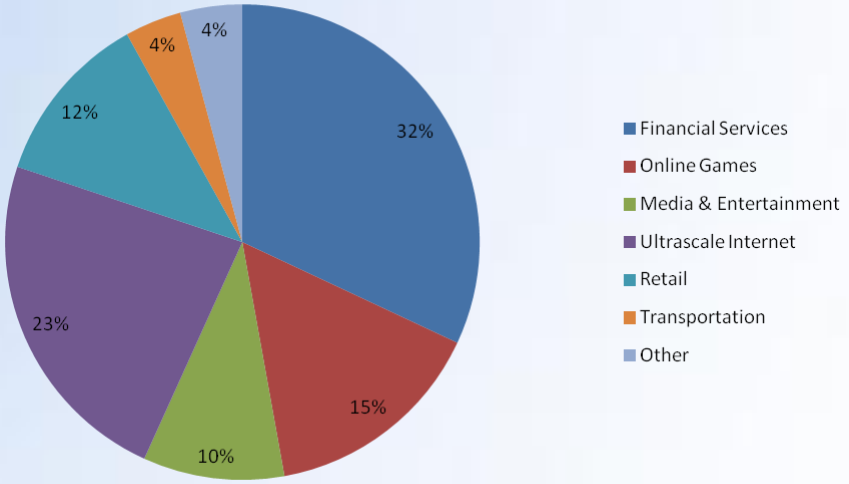
HPTC and HPBC Vertical Markets

HPTC Total Market (2012 rev., 68%) by Vertical



HPBC Total Market (2012 rev., 32%) by Vertical



- Financial services and manufacturing (auto/aero plus consumer) are about equal
- HPBC is >95% commercial (exceptions: Fannie Mae, Federal Reserve Bank, …)
- Worldwide, private sector is growing faster than public sector

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A Caution About Forecasting

"When you create a forecast, it has to be bound by what is realistic, whereas reality itself has no such limitations."

– Chris Willard
Chief Research Officer
Intersect360 Research

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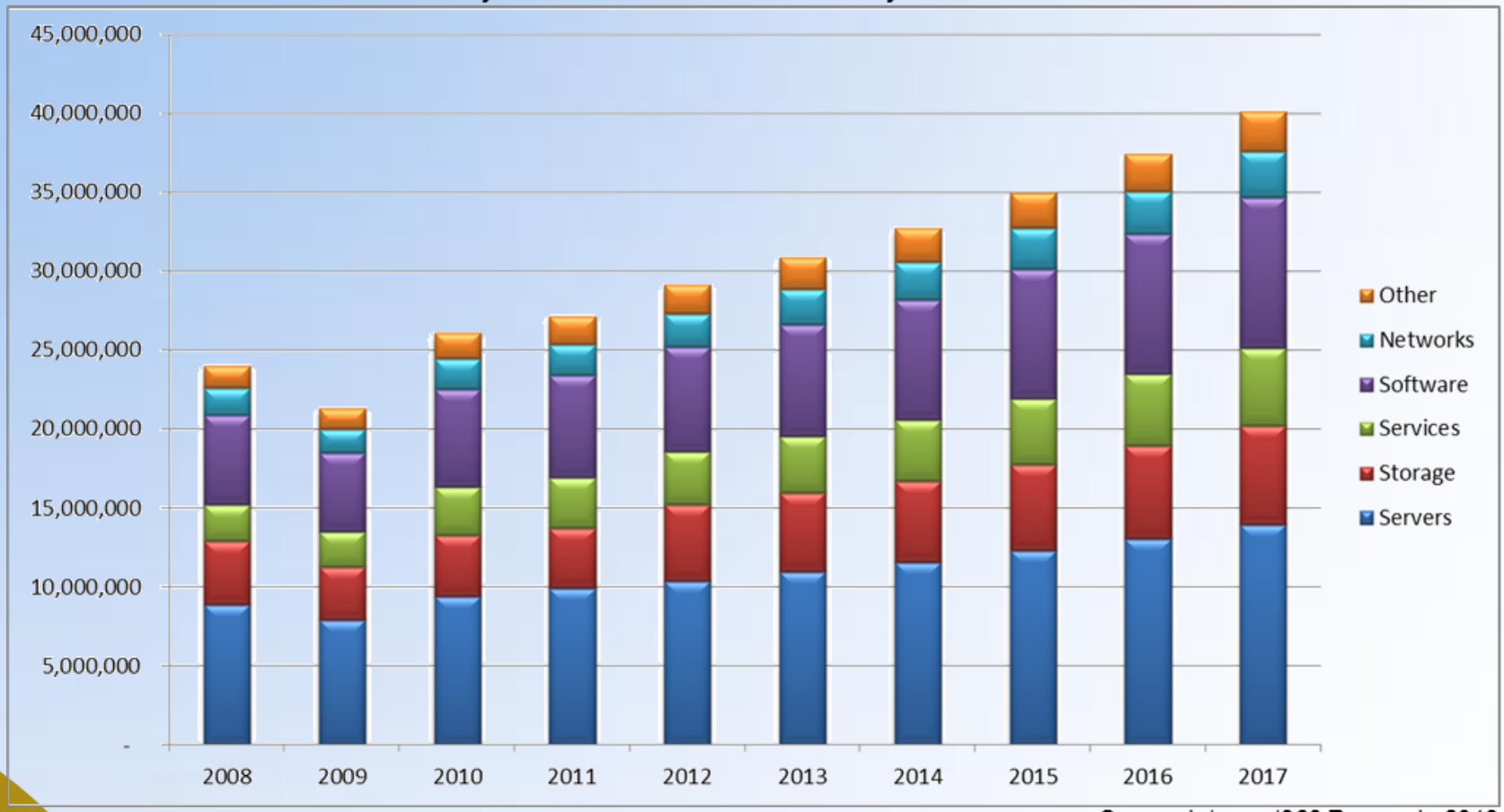
WW HPC Forecast

Figure 1: Total HPC Market (combined HPTC and HPBC) Revenue History and Forecast 2008 – 2016 by Product Class



Source: Intersect360 Research, 2013

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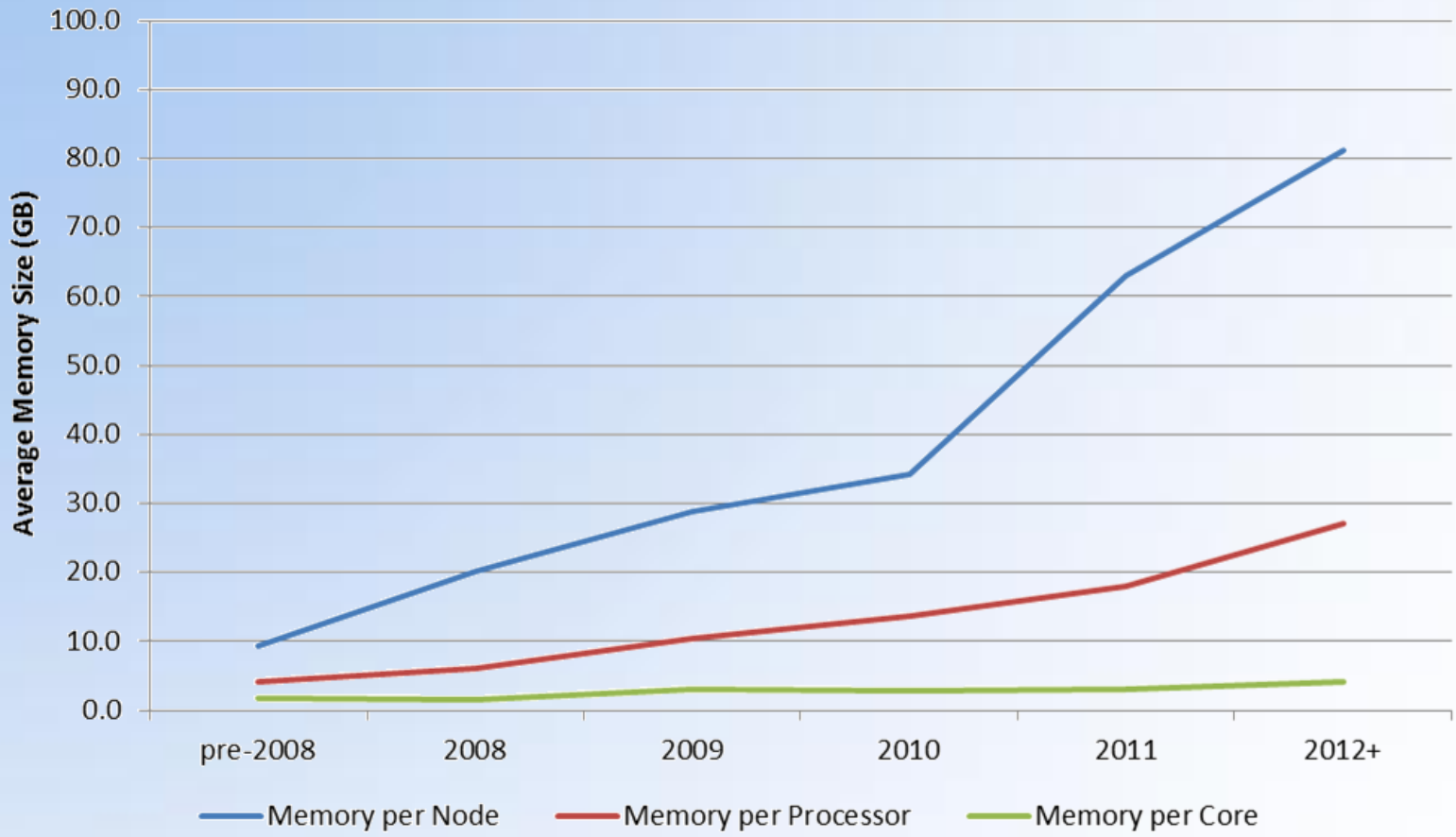
From HPC User Site Census

The primary challenges for users are:

- How to plan the balance between processors per node, cores per processor, memory per node, I/O and interconnect on node, total nodes, etc.
- How to adapt applications for node parallelism and on-chip (i.e., multi-core) parallelism.
- How to organize the overall job mix. Smaller nodes may be a better fit for processing large numbers of small jobs or large set of jobs with a broad range of requirements. Larger nodes may work best with a job mix skewed to larger problems.

Memory Configuration



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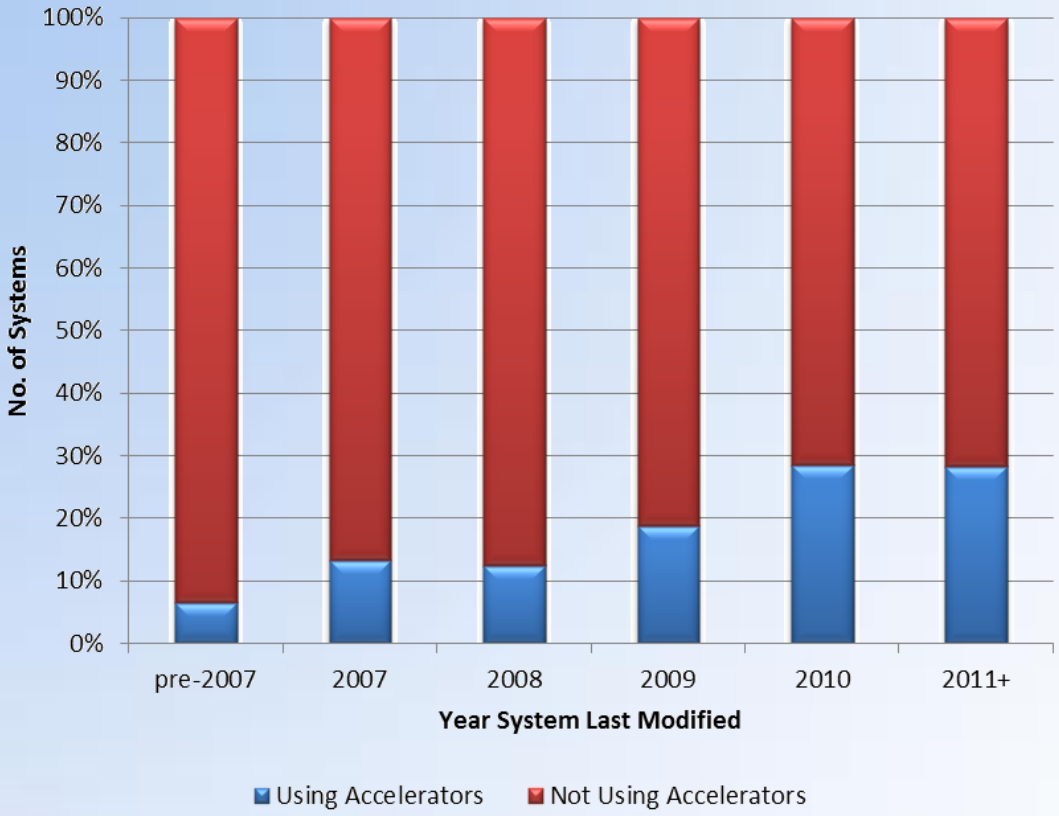
Accelerators (Mostly NVIDIA GPUs)



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Challenges of Architecture Trends

- Power consumption
- Cost of memory
- New models of parallelization
- Languages and programming models, especially for accelerated solutions
- System efficiency
- Personnel for administration, optimization, programming services, etc.

Notes from SC13: Compute

- No major systems from top vendors
  - Only one new TOP10 system: Piz Daint (#6)
  - RSC: “Petaflop in a Rack”
  - D-Wave attracting HPC talent
  - One other “secret” company that’s interesting
- Processing was bigger news
  - NVIDIA Kepler K40 (dominated Green500)
  - Details on future of Intel Xeon Phi
  - Micron Automata chip
- Also: Liquid cooling

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Notes from SC13: Data

- Significant new announcements in storage
  - NetApp (top HPC storage vendor by revenue) E2700: performance of E5400 in smaller form factor
  - Xyratex ClusterStor 9000 (2x perf of previous gen); mgmt features incl. Grid RAID, CIFS/NFS gateway
  - DDN, Infinite Memory Engine “burst buffer” of NVM
- Big Data was a major theme
  - This is appropriate; huge opportunity for HPC
  - But maybe too much at SC13; I missed traditional supercomputing themes
- Also: Object storage

Looking Ahead: HPC in "the Cloud"

- Cloud usage at some level is common, but generally low-volume
- HPC Cloud Forecast:
  - ~$600M in 2012 (>50% was "raw cycles")
  - Growing at same rate as market
  - Public sector bigger users than commercial
  - Might adjust upward based on new data: Most recent Budget Map survey (Oct. 2013) does show an increase in cloud spending: ~3.4% of budget (prelim.)

Cloud Conclusions

- There is a market for public cloud in HPC, but
  - Not as large as many vendors think
  - Barriers in HPC and Big Data are more significant than in enterprise
  - Overcompeted for size of market
  - Not showing growth as percent of market
- Public cloud can be a vehicle for new adoption of HPC (especially coupled with consulting)
- Private cloud is better adopted. Intersect360 Research recommends offering hybrid solutions.

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Looking Ahead: HPC and Big Data

- The hazards of “forecasting” Big Data
- New survey data in 2013
- Insight #1: Big Data = Big Opportunity
- Insight #2: Not Just Hadoop
- Insight #3: Performance Matters

Watch the full presentation from SDC:
http://bit.ly/18YfoOe

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Looking Ahead: The Lenovo Deal

- Lenovo immediately becomes an HPC server heavyweight; will vie for #1 revenue position
- IBM continues to compete with application-centric viewpoint
- New competitive picture: IBM vs. Intel
- HP and Dell must consider how they differentiate
- Opportunity for Cray, SGI, Bull
- Opportunity for AMD and NVIDIA
- Evolutions in storage

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Looking Ahead: Other Stuff

- My opinion: Exascale arrives in 2020, first in Japan or China (and if I have to bet, Japan)
- Accelerated architectures will be the future for the volume of HPC
  - But most use cases haven't been proven out yet
  - Xeon Phi will get the same amount of trial as GPU
  - ARM will play a role
- There is room, and a market need, for a new architecture to do the "other stuff"
- Watch out for shifting OEM alliances

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