



Intersect360
R E S E A R C H

HPC Trends in 2010

Actionable Market Intelligence for High Performance
Computing

Intersect360 Research

- Advisory service, research and consulting for HPC
- Founded in 2007 as Tabor Research, a division of Tabor Communications, publishers of HPCwire
- Enduring partnership with Tabor Communications
 - Exclusive market research partnership drives user-based research methodology
 - Weekly podcast: “HPCwire Soundbite”
- Inclusive views methodologies for both technology and usage cases

Topics

- Top-level HPC market dynamics
- Traditional vs. Edge HPC
- Technology areas to watch
 - Cloud computing
 - Accelerators (GPU computing)
 - Parallel file systems
 - Choices in processors, interconnects, and (gasp!) operating systems
- Enabling new HPC usage

HPC Market Overview

- 2009 sucked: Traditional HPC (science and engineering) revenue down 20%: \$19.0B to \$15.2B
 - Most of decline was due to lengthening sales cycles
 - Short-term market effects have to do with how fast people buy, not how much
 - Areas of relative strength (less loss): Government, Supercomputers, Storage, Software
- Also tracking “Edge HPC” – areas outside science, engineering: complex event processing, virtual environments, business process optimization, ultrascale business computing

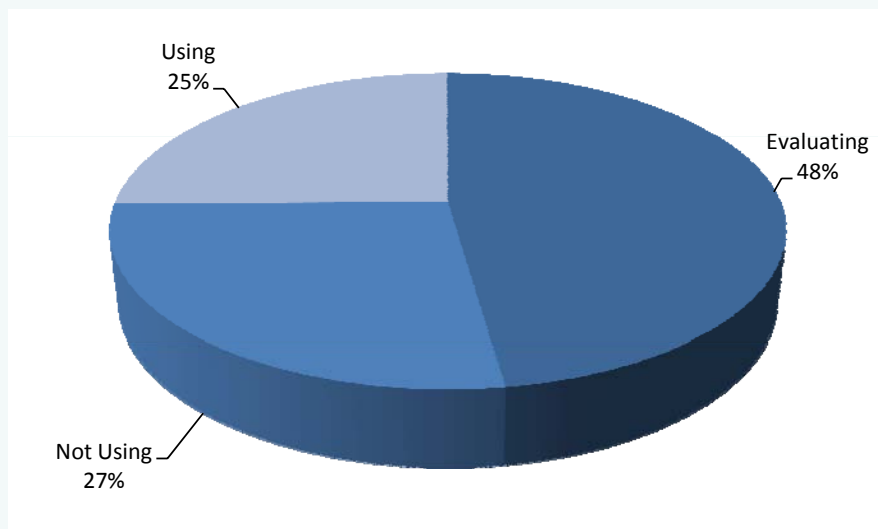
Cloud: Usage Model View

- First of all, take it easy. This is an *evolution* from grid, utility, etc., and utility models aren't new
- Cloud is not an application or a market in itself, but rather an access or usage model
- Cloud: Outsourcing part of your IT infrastructure or workflow through a web (or web-like) interface.
- Top system purchase criteria: *performance*, *reliability*. How will cloud provide it?
- Top challenges with cloud: security, data transfer



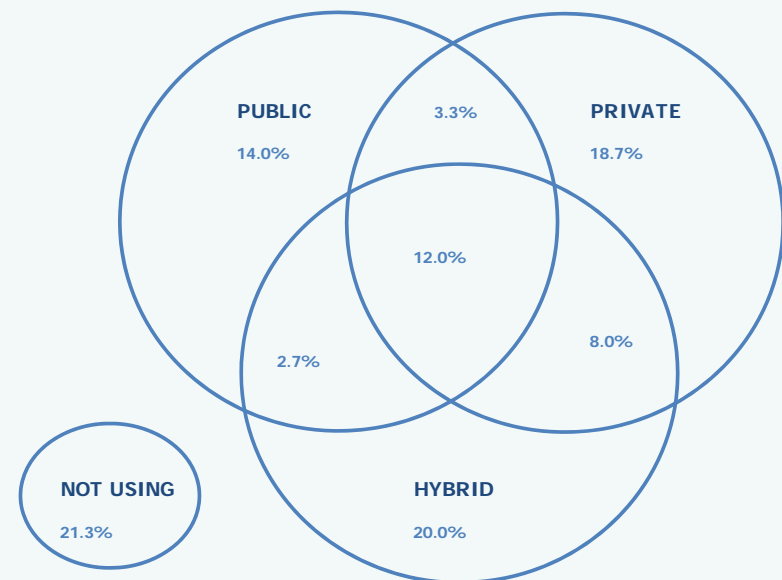
Preview of Cloud Study

Figure 1: HPC Cloud Usage Status
(Among All Survey Respondents)



Source: Intersect360 Research, Cloud Adoption Survey, 2010

Figure 2: Type of Cloud In Use or Evaluation
(Among Those Who Have Considered/Adopted)



Source: Intersect360 Research, Cloud Adoption Survey, 2010

Releasing this month, www.intersect360.com

Selected User Comments on Cloud

- Until I'm given clear instruction on how to handle IP issues and assurances that if there are breaches of security that I won't be held responsible for them, I'm not planning on doing anything in this area.
- Between issues of bandwidth and IP protection, we've yet to see a solution that we thought made enough of a value statement to us to bother to launch into one of them just yet.
- Not too many [barriers], since we're not a pharma we don't have the problems of worrying about our data security. Local encryption is plenty for what we're after.
- Assuming that the cloud had a facility for executing C++ type compiled code and it has a file system on it so I can upload something to it, etc., gosh I would be ready in a few days!
- It really hinges on cost, to a certain extent. No matter what solution they could leverage in IT, they want a business case and a spreadsheet.



Accelerators

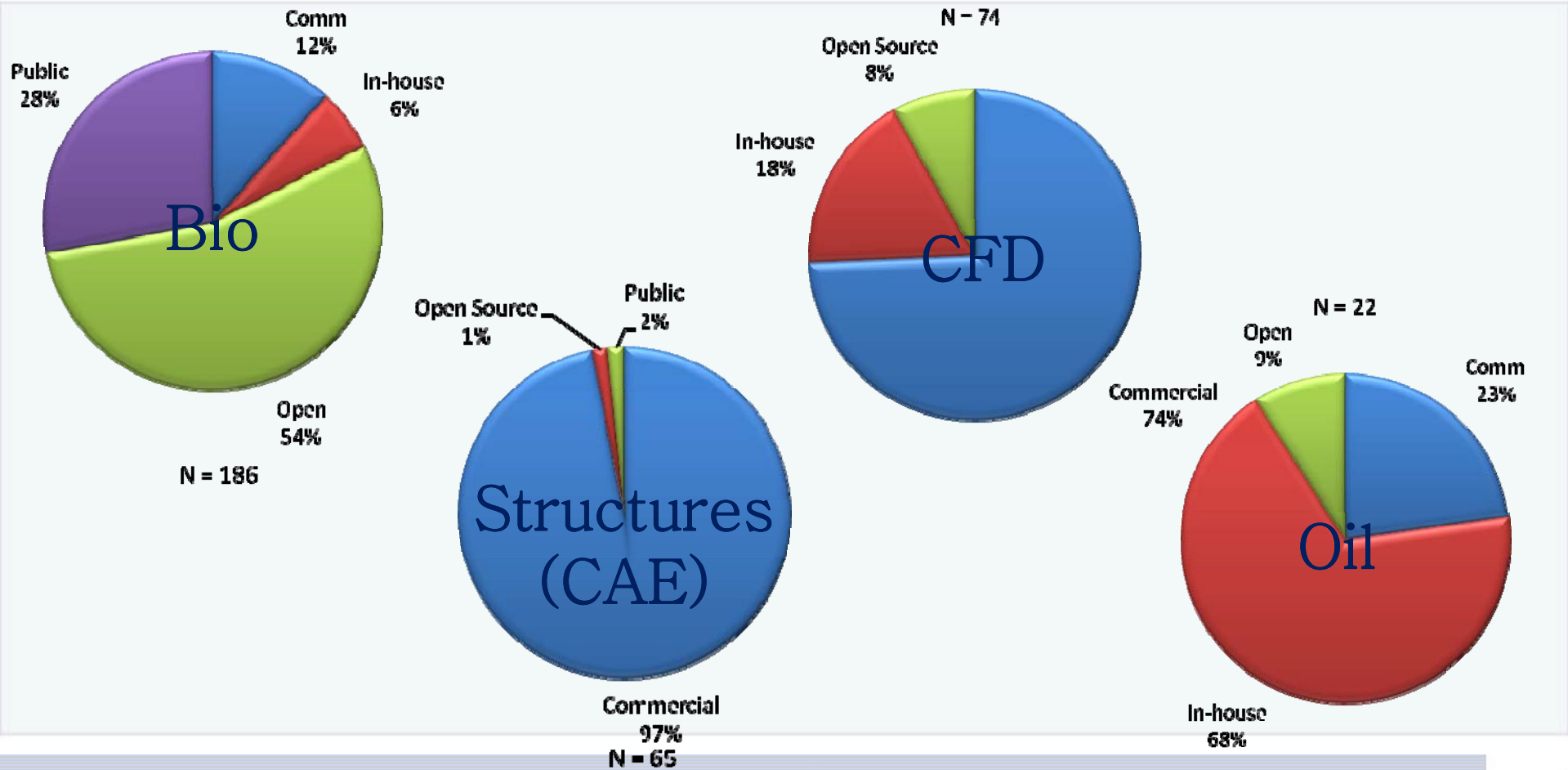
- Lots of experimentation (20% of systems in latest census), but little large-scale deployment (yet)
- Traditional barriers are programming, latency, ISV support, maintaining pace of development
- NVIDIA has ignited this space via CUDA and high-profile wins (and is a PR machine)
- Might still be a role for embedded FPGA
- Exciting battle for 2012: NVIDIA Tesla vs. Intel MIC (Larrabee)

In Defense of ISVs

- Who here thinks they should pay *more* for software?
- But consider, industry trends have made things tougher for ISVs:
 - SMPs to clusters
 - Unix to Linux to Windows
 - Multi-core; how are the cores being used?
 - Accelerators
- Nevertheless, we see ISVs responding
 - New licensing models
 - SaaS



Different Software Approaches



File Systems in HPC

- This has been a highly fragmented market
- An early Tabor Research study found 17 different file systems installed at only 38 sites. (Quick, name 12.)
- The emergence of clustered, parallel file systems provides touchpoints for continued consolidation:
 - GPFS
 - Lustre (future unclear for HPC)
 - pNFS (late)
 - Panasas

- New trend: Active archives. “Lost in the archive”?



Other Technology Choices

- **Microprocessors:** Intel has a growing market share lead. AMD chips look good but getting outflanked on software, compilers, tools.
- **Interconnects:** Infiniband is the most common cluster interconnect, growing as storage interconnect. Ethernet is still strong in finance, bio, university.
- **Operating systems:** Windows (yes, Windows) is growing in HPC (12% of installed systems in 2009), especially in commercial segments. Bio-science and university segments are strongly aligned to Linux.



New HPC Adoption



- Concept of “Missing Middle” is a misnomer
- HPC is not “pyramid-shaped,” but “tree-shaped”
- More extreme in industry than in university

Table 2: Digital Manufacturing Usage among Commercial Respondents, by Number of Employees¹
 Source: Intersect360 Research, NCMS, 2010

Employees	Mod/Sim HPC		Mod/Sim Desktop		3D Tools		2D Tools		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
1-20	4	6.1%	15	20.8%	17	25.0%	23	56.1%	63	24.4%
21-100	5	7.6%	11	15.3%	22	32.4%	12	29.3%	51	19.8%
101-500	5	7.6%	15	20.8%	12	17.6%	3	7.3%	35	13.6%
501-2000	9	13.6%	8	11.1%	6	8.8%	0	0.0%	24	9.3%
2001-10000	6	9.1%	6	8.3%	7	10.3%	1	2.4%	20	7.8%
10001 or more	37	56.1%	17	23.6%	4	5.9%	2	4.9%	65	25.2%
Total	66	100.0%	72	100.0%	68	100.0%	41	100.0%	258	100.0%

¹ Total column is not an exact sum of other columns due to a small number of respondents who did not specify a level of technology usage.

Overview

In partnership with Intersect360 Research, NCMS conducted a broad-based survey of U.S. manufacturers to assess adoption of “digital manufacturing” techniques.



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- Limitations to design and production
- Levels of advanced computing adopted
- Drivers and barriers for more advanced computation
- Possible partnerships to drive adoption

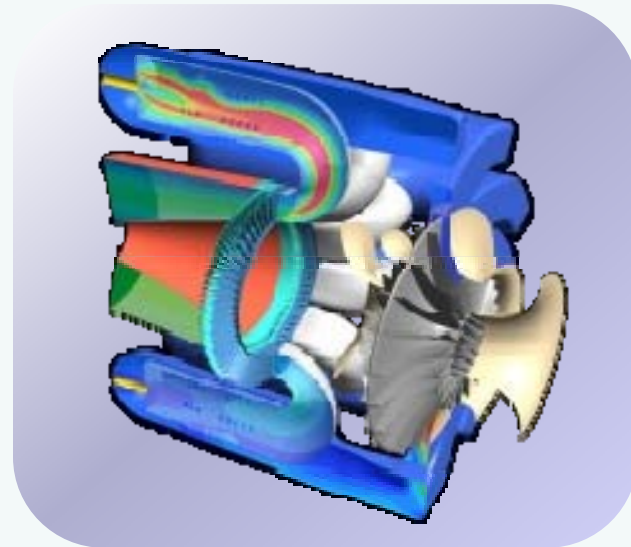


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“Digital Manufacturing”



- The use of advanced computing technologies for simulations to guide engineering and production
 - Structural analysis
 - Aerodynamics
 - Crashworthiness
 - Environment testing
 - Stress testing
 - Process engineering
 - Manufacturability
- Improve quality, faster time-to-market, lower costs



NCMS / Intersect360 Research Study

- 321 qualified respondents
- Across range of industries (80%) and supporting academic, government and trade organizations (20%)
- Executive summary released today
- Full report available

Table 1: Survey Participants by Industry / Sector
Source: Intersect360 Research, NCMS, 2010

Industry / Sector	Count
Aerospace	47
Automotive	31
Consumer Products	5
Defense / Homeland security contractor	49
Health Care / Pharmaceuticals	2
IT and electronics	14
Other (industry)	110
Total industry	258
Academic	12
Government agency	30
Other (non-industry)	11
Trade or industry association	10
Total non-industry	63
TOTAL	321

Have vs. Have-Not

Table 2: Digital Manufacturing Usage among Commercial Respondents, by Number of Employees¹
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- “Mod/Sim HPC” are doing modeling and simulation on HPC systems.
- “Mod/Sim Desktop” are running those applications, but desktop only.
- “3D Tools” are running 3D drawing tools (computer-aided design) on PCs.
- “2D Tools” are running 2D drawing only, or nothing at all.

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- 56% of the HPC usage is at companies with over 10,000 employees.
- 56% of those maxed out at 2D drawing have 20 or fewer employees.
- 61% of companies with over 10,000 employees are using HPC.
- Only 8% of companies with under 100 employees are using HPC.

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Drivers and Barriers for Non-Adopters

- Among companies using 2D tools only:
- There is a need:
 - “High product quality” is most critical factor to strategy
 - “Long development cycle” is most common limitation to development and production
- But also significant barriers:
 - Cost of hardware and software
 - Lack of expertise internally and externally
 - Need to coordinate physical and digital results



What It Takes to Do More

- Among companies doing modeling and simulation, but only at the desktop level:
- 72% say increased adoption of digital manufacturing would be a competitive advantage
- 82% feel they need more opportunity to test new technologies at reduced cost and risk
- Ranked “not-for-profit” manufacturing centers as the most preferred potential partner for helping adoption



Study Conclusions

- To improve U.S. manufacturing competitiveness, government programs should find ways to reach out to small and medium size manufacturers
- Reduce cost and risk of technology adoption
- Give access to technology resources, facilitate partnerships, provide expertise

Full report and data set from Intersect360
Research.

www.intersect360.com

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If I Were the King (HPCC, March 2010)

- I'd build a program to link university engineering courses with local companies:
 - Creation of that scalable digital models of companies' products is part of the coursework
 - Students must test the models; corroborate data
 - Start on multi-core PCs; scalable resources via "grid"
 - Coursework includes a subsidized internship
 - Companies get to use the results
 - Creates a talent pool. Give a bonus to students who go to work for those companies full time after school.



Conclusions and Free Marketing Advice

- HPC, at all levels, is about leadership
- Do not think of entry-level users as small: To them this is the biggest system they've ever bough
- A supercomputer without an application is an expensive space heater
- An application without data is only a nice theory
- How do your users (not only supercomputing level) exemplify leadership?



Research Studies

- Annual syndicated studies:
 - HPC market model and forecast (Traditional and Edge)
 - Site Census: Servers, Processors, Storage, Interconnects, Operating Systems, Applications, ...
 - Budget Map: Spending, including staffing, facilities, ...
- Comprehensive Research Studies
 - Software Environments in HPC
 - Adoption of Digital Manufacturing
 - Cloud Computing in HPC

For more information: www.intersect360.com



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