

SC08 FOR EXECUTIVES

	MORNING				EVENING	
Sunday	S02 Application Supercomputing and the Many-Core Paradigm Shift					
	Power Efficiency and the Path to Exascale Computing					
	S01: Parallel Computing 101					
Monday	Petascale Data Storage Workshop					
	Workshop on Many-task Computing on Grids and Super-computers			Workflows in Support of Large-scale Science		
Tuesday	Michael Dell Keynote	HPC Systems Paper Session	Grid Resource Management Paper Session	Workflows Paper Session		
		Humanities Scholarship in the Petabyte Age		Can parallel application development be easy(er)?		
				HPC in the Financials: Where Rocket Science Meets "The Street" Presentation on HPC in Finance		
Wednesday	Developing an Interoperable IT Framework to Enable Personalized Medicine	Parallel Computing Landscape: A View from Berkeley	Panel: Will Electric Utilities Give Away Supercomputers with the Purchase of a Power Contract?	Visit the exhibit floor		HPC in Cancer Therapy Personalization
						Computational in Genomic Medicine
						Programming Models Papers Session
						Process-Level Fault Tolerance for Job Healing in HPC Environments
Thursday	HPC and the Energy Challenge	Simulation at the Petascale and Beyond for Fusion Energy Science	Proactive Process-Level Live Migration in HPC Environments	Large-Scale Data Management and Distribution	Data Center Productivity	Save Energy Now in Computer Centers
				Grid Virtualization and Overlays paper session		Disruptive Technologies
				Zero-emission Datacenters		
Friday	My Cloud, Your Cloud, Everybody's Cloud		Exa- and Yotta-Scale Data—Are We Ready?			

Introduction to the guide Making the most of SC08

The annual SC conference is the most important gathering of high performance computing professionals in the United States. You'd like to make sure that your time there is well spent, but SC can easily overwhelm attendees. It is all too easy to end up wandering the show floor for three days with the vague sense that you're missing something.

There is certainly a lot to be learned by visiting the hundreds of university, commercial, and government exhibitors on the show floor. But the conference offers many more experiences that will expose you to new people, new ideas, and new relationships with the potential to transform the way you think about high performance computing. So how do you avoid missing out on what's important to you?

We've created the HPCwire Executive Guide to SC08 to help you make sense of the myriad technical tracks, meetings, briefings, and activities that all compete for your attention during this busy week.

This guide is not a Cliff's Notes version of the SC08 Program Guide: you won't find everything here that the conference has to offer. The HPCwire team has studied the conference technical program, and used our understanding of the trends and technology that are shaping the industry to highlight what we feel are the key sessions, talks, and events to attend to get a better understanding of HPC today.

The attendees at SC are as diverse as the topics covered, and we know that not all of what we've picked out will be rele-

vant to you. You'll no doubt have meetings to attend, and other topics will grab your interest. None of this is a problem, because the recommendations in this guide are independent.

Have a free hour on Tuesday? Drop in on the Michael Dell keynote session. Want to get a handle on the issues driving today's concerns about computational support infrastructure? You'll find sessions and panels during the week in the guide that will help grow your understanding.

Picking out the trends four key SC08 themes you need to follow

SC08 is a study in diversity. At this conference you'll find researchers working on tomorrow's new programming language, vendors selling today's latest hardware, and the world's largest providers of supercomputing resources hunting for ways to do a better job for their users.

There is certainly something for everyone at SC. But we've tried to look past the dizzying variety of supercomputing and see larger patterns in the conference—the themes that will help you understand HPC today, and where it is headed tomorrow.

There are four key themes in this year's conference that bind together much of what is happening in the technical program. Whether you are a technical manager or a senior executive with HPC in your portfolio, these are the trends that you'll need to understand as you move forward throughout this next year.

Computing at Scale. From vacuum tubes to transistors, and from Cray to Dell, it seems like the only constant in supercomputing is change.

But this isn't quite true. All of the evolution over the past sixty or so years in HPC has been focused on providing access to more resources for the scientists and engineers working at the leading edge of society and technology.

Today large computing centers deploy machines with tens of teraflops, and the largest system in the world provides more than 1 petaflops of computation for its users.

Following the Computing at Scale theme in this year's conference program will give you valuable insights into how the largest machines on the planet today are used, how they perform, and what you can expect from your supercomputers in the near future.

Computational Infrastructure.

While there is no end in sight to the growth of supercomputers, we are already well past the point where their size is beginning to test the limits of our ability to use them effectively and, in many cases, to simply keep them turned on and cooled down.

Computing at Scale

Learn from the experiences of those deploying today's largest computers. How do they perform now, and how can they be made to perform better?

Computational Infrastructure

The software and physical infrastructure that supports today's mammoth computers are showing their age. See the best practices and cutting edge research that will help you rise to the challenge of tomorrow's machines.

Expanded Access

New applications and cheaper hardware has opened up the potential of HPC to many new communities. Find out how new interfaces are ensuring HPC is relevant to them.

Application Horizons

Glimpse the new applications of today with the potential to change the shape of our culture, and the dynamics of the HPC market, tomorrow.

As application developers search for reasonable mechanisms to express parallel work, HPC researchers are struggling to find effective development tools. Meanwhile, center operators are facing power and cooling demands beyond the limits of their physical plant, and are actively supporting research into ways to deploy and operate large scale computers.

Sessions in the Computational Infrastructure theme will expose you to evolving best practices and cutting edge research that will help you rise to the challenge of tomorrow's machines.

Expanded Access. Computation is now recognized with theory and experiment as the triplet of disciplines that form the foundations of modern scientific thought.

Dan Reed, emphasizing HPC's ability to reach across all disciplines—a reach that is unique among modern scientific instruments—referred to supercomputing as a “universal intellectual amplifier.” This realization carries with it the burden of a professional imperative: we must take every reasonable step to increase access to HPC and to ensure its effective use in all areas of human endeavor for the benefit of mankind.

Elements of the technical program that we have identified with the Expanded Access theme will focus on the technologies supercomputing providers are using to ensure that the broadest possible audience has access to, and can effectively use, HPC. In these sessions you'll learn about workflows, grid technologies,

and new interfaces that are designed to tame the unnecessary complexity of today's supercomputing interface.

Application Horizons. Throughout the week the conference will be hosting panels, Masterworks sessions, and invited talks designed to educate you about the new disciplines that have already begun to take advantage of supercomputing, and the ways in which those disciplines are being transformed by technology.

Advances in the intersection of HPC and medicine, biology, the arts, cultural studies, business, and finance all have the potential to fundamentally alter our society and our understanding of our place in the world, and are among the fascinating new applications highlighted at this year's conference.

Sessions in the Application Horizons theme will give you a glimpse of these new applications, and show you the potential of supercomputing to change our world. Studying the patterns of computation emerging from these disciplines will also give you a rare opportunity to think strategically about how these areas may fundamentally reshape HPC itself.

Perspectives on HPC and the SC series of conferences



Dan Reed
Director of Scalable and Multi-core Computing Strategy at Microsoft

The SC conference continues to grow in scale, scope and diversity, with a diverse set of workshops, plenary speakers, technical program sessions and, of

course, the massive exhibit floor. In addition to the public program, there are a seemingly endless series of sidebar meetings and lots of technical socializing.

Take advantage of the fact that you can talk to almost anyone connected to high-performance computing during the conference, but remember that you can overdo it and never be seen at any of the official venues!

Undoubtedly, one of the great hallway discussion topics will be the effect of the economic downturn on HPC research, infrastructure acquisitions and vendor finances. It is quite possible that some startups and smaller companies may not survive. For those in the U.S., the Presidential transition and the implications for research funding will also be hot topics.

Finally, I suspect two other discussions will center on the relationship between academic Grids and commercial clouds and the relationship between trans-petascale (exascale) options and the design of extremely large data centers. The latter is deeply connected to eco-friendly computing system design and energy efficiency. Answers these questions will affect the future of large-scale computing, our research investments, user communities and the types of applications we can support efficiently.

Remember – bring your running shoes. Your feet will thank you later.



Pete Ungaro
President and CEO of Cray Inc.

Without a doubt, SC is the most important conference of the year for our community.

This year marks the 20th anniversary of the

conference but even more interesting is that this year's event will officially kick off the start of a new era in HPC—the petascale era.

There will be a lot going on at the conference around petascale computing – vendors and customers highlighting their capabilities as well as end-users contemplating what will now be possible with this new-found power. A related and important theme will be green computing, especially how can petascale systems be built in a way that minimizes their impact on the environment. Cray, of course, is no exception—we are very excited about bringing petascale computing to our customers through our scalable system designs and innovative power and cooling technologies. We believe that the petascale era promises to

enable significant technological breakthroughs as scientists and engineers are able to tackle larger problems with higher fidelity.

Be sure to take a few minutes to stop by our booth to see how we're tackling the petascale challenge as well as bringing Cray supercomputing technology to individual users. Have a great conference!



Debra Goldfarb
President and CEO of Tabor Communications

Being an industry observer, I have seen a lot of change. Undoubtedly, we are entering an exciting innovation cycle in

terms of technology, usage

models and access. This year I have a few "rules of the road" which will guide my week in Austin:

Spend time on the periphery. there is a lot of interesting stuff to see which is not in the main hall, but rather in the small

booths which sit out on the edges. This is where you can often get a window into "what's next." I will be looking for technology which enables productivity such as: appliances (application as well as infrastructure); development tools; application frameworks; energy efficiency concepts; and more adaptive access models (such as cloud or other web-service models).

Explore "Edge" HPC. Tabor Research is researching the use of HPC technologies and concepts outside of science and engineering. These include virtual worlds, ultra-scale infrastructure (such as search), complex event processing, and business optimization (such as real-time data mining). My goal is to better under-

stand requirements, application evolution, and most importantly, what is in the "envelope" and what falls out.

The politics of science. Timing is everything and given the recent (and quite extraordinary) change in administration, it will be fascinating to get a read on what this means to this community. And, by the way, it should mean a lot in terms of priorities—in science, technology, industry and education.



Jack Dongarra
Distinguished Professor of
EECS at the University of
Tennessee

I have attended all of the SC meetings, and won't miss it for the world; it represents "Homecoming Week" for High Performance Computing.

This is truly an awesome time for high performance computing and computational science research, with a number of systems achieved performance exceeding the PFlop/s mark. There are a number of interesting problems that will need to be overcome as we are faced with systems with greater than a million threads of execution. Advancing to the next stage of growth for computational simulation and modeling will require us to solve basic research problems in Computer Science and Applied Mathematics at the same time as we create and promulgate a new paradigm for the development of scientific software.

To make progress on both fronts simultaneously will require a level of sustained, interdisciplinary collaboration among the core research communities that, in the past, has only been achieved by forming and supporting research centers dedicated to such a common purpose.

I see five important areas that will need attention; effective use of manycore and hybrid architectures, exploiting mixed precision in the algorithms, self adapting and auto tuning of software, fault tolerant algorithms, and communication avoiding algorithms.



William Feiereisen
Director DoD High Performance
Computing, Lockheed Martin

I have attended most of the Supercomputing conferences since the 1980s. They always been one of the central opportunities to gather with

virtually the entire scientific computing community and to see the latest developments in the spectrum of technologies that interact to make the field of supercomputing.

All of this is available in one place each year, everything from the applications and the important problems that they solve to the latest hardware upon which they run. There is a flavor of computational sciences which has always been my motivation and excitement about the field, but I also confess to not being immune to the latest raw hardware speed breakthroughs presented by each of the manufacturers.

I always plan my week around three things: the technical sessions and tutorials; the exhibits on the show floor; and increasingly in recent years, everyone else who attends and the possibility of much personal interaction. When I started my career, the technical sessions and tutorials dominated my time at SC, however I find much rewarding time is now spent in conversation over convention center coffee. Over the years I believe that many connections and ideas have been hatched at SC in just this way. There is a critical mass that gathers here each year and supports this atmosphere.

It's for these reasons that I keep coming back each year and I look forward again this year to spending the week in Austin.



Marc Snir
Co-director, Universal Parallel
Computing Research Center,
University of Illinois

Moore's law does not mean, anymore, ever increasing processor performance; instead, it now means an ever increasing number of processors on

a chip. Just waiting for processor performance to catch up to your needs is not an option, anymore; the only way to increase application performance, is to parallelize the application and scale it to an increasing number of processors.

This is a major new challenge. On the positive side, parallel programming is moving from being an esoteric art practiced by few experts into a mainstream occupation. It becomes a major concern of large companies, such as Microsoft and Intel (see, for example, their investment in the Universal Parallel Computing Research Centers at Illinois and Berkeley).

This is an opportunity for the HPC community: Rather than building support for parallelism on top of sequential languages and programming environments, it becomes now possible to scale-up languages and environments that are build up-front to support parallelism and that are supported by massive investments.

Sunday and Monday

Strengthen your understanding of the fundamentals

Sunday and Monday during the conference feature a wide range of informative tutorials and thought provoking workshops. These days before the conference begins in earnest can be a good time to settle in and make the transition from everyday work into a frame of mind where you can do something that is increasingly a rare activity: thinking strategically about how supercomputing and HPC fit into your business.

Tutorials.

We've selected two tutorials on Sunday that deal with fundamental concepts in HPC.

If you are relatively new to HPC, or have come from the business side of a supercomputing center to a position of broader responsibility, *S01: Parallel Computing 101* is the tutorial for you. One tutorial isn't enough time to become a ninja parallel coder, but S01 will provide the background you need to participate more meaningfully in conversations with your staff and colleagues. With 75% introductory material and 25% intermediate, the tutorial is aimed at students, managers, and new practitioners who need a broad view of the techniques and technologies central to parallel computing from a user's perspective.

Those with some time in HPC are no doubt thinking...and worrying...a lot these days about the transition to multicore. If you're in that boat, *S02: Application Supercomputing and the Many-Core Paradigm Shift*, is a tutorial you'll want to make plans to attend. At 50% introductory, 25% intermediate, and 25% advanced material, this tutorial isn't for every executive, but those with at least some technical background will benefit the discussion of current and upcoming architectures, terminology, parallel languages, and development tools.

Workshops.

We've selected four workshops that tie in with this year's major themes.

On Sunday is the all-day workshop *Power Efficiency and the Path to Exascale Computing*. This workshop deals with two of our key themes, Computational Infrastructure and Computing at Scale, and will get you in touch with the thinking in the community today about building the facilities needed as technology moves beyond teraflops to petaflops and beyond.

Tying in closely with large-scale computational support is the product of computation: large data. The *Petascale Data Storage Workshop* on Monday will highlight new contributions in storage architecture, APIs, parallel file systems, and more for supporting the large amounts of data generated in today's supercomputing centers.

The half-day *Workshop on Many-task Computing on Grids and Supercomputers* focuses on management and execution of large-scale jobs. Organizers are building discussion around a new class of applications, which they call Many-Task Computing, characterized by computations involving multiple, distinct activities coupled by file systems or message passing.

If you are new to the idea of workflows, or find yourself thinking about how to improve the productivity of your user community, you will be interested in attending the *The 3rd Workshop on Workflows in Support of Large-scale Science (WORKS08)*. This workshop will get you tuned up and ready to attend the workflow-related sessions later in the week if you plan to explore the Expanded Access theme.

	SUNDAY	MONDAY
	S01: Parallel Computing 101	
	S02: Application Supercomputing and the Many-Core Paradigm Shift	
Computational Infrastructure	Power Efficiency and the Path to Exascale Computing	Petascale Data Storage Workshop
Computing at Scale		Many-task Computing on Grids and Supercomputers
Expanded Access		Workflows in Support of Large-scale Science

Tuesday

The world's largest systems, and the changing face of HPC

Tuesday marks the first full day of the conference technical program. This year's conference keynote will be given by Michael Dell, chairman and CEO of Dell, Inc. Dell's selection reflects both the changing face of the industry, and the conference's location – Dell is headquartered about 20 miles north of Austin in Round Rock, Tx.

Computing at Scale.

There are many sessions on Tuesday that address the programming and operational challenges faced by managers of large computing systems today.

The *HPC Systems* paper session includes presentations on the performance characteristics of Roadrunner, the largest system on the June TOP500 list, developing performance-optimal algorithms for multicore systems, and a comparison of the performance characteristics of several common HPC platforms.

The *Grid Resource Management* papers session addresses many of the issues that arise in providing services over large scale, often distributed, computational resources. The session includes presentations on management of resources for massively multiplayer online games, strategies for predictable execution of jobs on shared computers, and auction-based grid reservations.

Late in the day is a panel focused on an important issue that stands between users and effective use of very large scale parallel computers. *Can Developing Applications for Massively Parallel Systems with Heterogeneous Processors Be Made Easy(er)?* will feature some of today's most recognized voices in this area: David Patterson, Marc Snir, David Bader, Vivek Sarkar, and John Shalf.

Application Horizons.

Tuesday features three Masterworks sessions on emerging HPC applications that have the potential to reshape our cultural understanding and how the business of business gets done.

If you're new to SC, the Masterworks sessions will be a real treat for you. They focus on the intersection of the real world and HPC, and provide an opportunity to learn from the people at the leading edge of the application of HPC to real world problems in business, finance, energy, the arts, and more.

Humanities Scholarship in the Petabyte Age explores the transformation happening in the humanities as the artifacts of study—books, sculpture, recordings, and so on—are digitized and for the first time become available to the whole world for further study.

The marriage of HPC and finance is explored in two sessions late in the day. *High Performance Computing in the Financials: Where Rocket Science Meets 'The Street'* will begin with an introduction on how banks use HPC today, and then discuss their unique computational requirements, and Golden Tree Asset Management will discuss the uses of HPC in finance.

Expanded Access.

The final group of papers sessions in the technical program on Tuesday includes *Workflows*. Papers in this session will review the state of the art in domain-based workflow composition, methods for leveraging workflow systems in solution of large problems, and double auctions for workflow scheduling in grid environments.

TUESDAY				
	Keynote: Michael Dell			
Computing at Scale		HPC Systems Papers Session	Grid Resource Management Papers Session	Panel: Can Developing Applications for Massively Parallel Systems with Heterogeneous Processors Be Made Easy(er)?
Application Horizons		Humanities Scholarship in the Petabyte Age		Where Rocket Science Meets 'The Street' HPC in Finance
Expanded Access				Workflows Papers Session

Wednesday

From super supers to expanded access, this day has it all.

Computing at Scale.

Wednesday morning starts off looking at one of the most talked about visions of the HPC future to come on the scene in the recent past: *Parallel Computing Landscape: A View from Berkeley*. David Patterson, one of the report's principal authors, discusses *A View* in this invited talk.

The *Programming Models* paper session looks at the role of MPI in application development time, an adaptive cut-off for task parallel frameworks, and studies the software environment on the Intel 80-core terascale processor.

Finally, the Doctoral Research Showcase highlights the work of Chao Wang in developing a mechanism for process-level fault tolerance for job healing in HPC, a topic relevant not only to tomorrow's very large scale computers, but also to the creation of a more robust computational support infrastructure.

Computational Infrastructure.

Wednesday's activities related to the computational infrastructure theme start off with a panel discussion. The provocatively named *Will Electric Utilities Give Away Supercomputers with the Purchase of a Power Contract?* panel explores the crunch datacenter budgets are feeling right now as falling computer prices push their power distribution systems to their limits.

Chao Wang's paper on process-level fault tolerance, discussed above, also points to key new tech-

nologies of interest for future computational infrastructure developments.

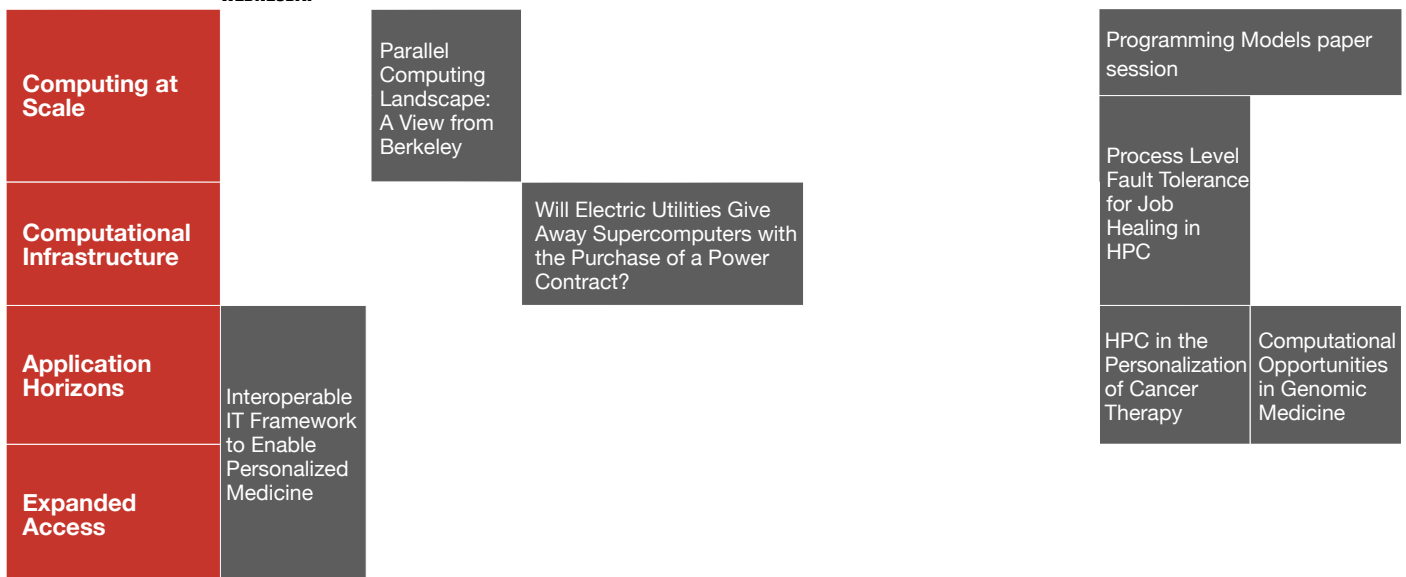
Application Horizons.

Wednesday's application horizons-themed activities focus on opportunities for HPC in medicine and biology.

First up is invited speaker Kenneth H. Buetow from the National Cancer Institute with discussion of the issues involved in developing a framework that will enable personalized medicine. A framework in this application area will involve bringing together many different communities and standards of practice, topics closely related to the expanded access theme as well.

Later in the day SC08 presents two Masterworks sessions related to HPC and the biosciences. *HPC in the "Personalization" of Cancer Therapy: Genomics, Proteomics, and Bioinformatics* examine the technologies needed to tailor therapy to the molecular profile of an individual patient's disease. *Computational Opportunities in Genomic Medicine* describes some of the challenging computational problems in basic biology and medicine, and outlines the software infrastructure that is needed to support this highly interdisciplinary field.

WEDNESDAY



Thursday

Data management, energy science, and green datacenters

Computing at Scale.

Thursday's examination of the large scale computations and technologies needed to support fusion science in *Simulation at the Petascale and Beyond for Fusion Energy Science* falls into both the Computing at Scale and Application Horizons themes and provides a view into one of the most pressing research areas of our time.

Big compute usually means big data, and data management is receiving increased focus as petabyte-sized data stores become commonplace. The BitDew environment is discussed in the *Visualization and Data Management* session after lunch, highlighting the features that make it an interesting solution for automatic and transparent data management on computational grids.

Finally, the panel *Disruptive Technologies: Weapons of Mass Disruption* looks at the potential accelerative effects of quantum computing, flash storage, cheap and low power optical communications, and 3D chip stacking with an eye toward the possible goal of reaching an exascale system by 2020.

Computational Infrastructure.

Both the physical and software infrastructure needed to support supercomputing get a lot of attention on Thursday.

Proactive Process-Level Live Migration in HPC Environments examines the use of health monitoring to anticipate node failures before they happen, and then transparently migrate processors away from those nodes before a computation is interrupted.

The *Grid Virtualization and Overlays* papers session early in the afternoon presents papers on the use of overlays for efficient wide-area data transfers, examines the cost of doing science in the cloud, and using

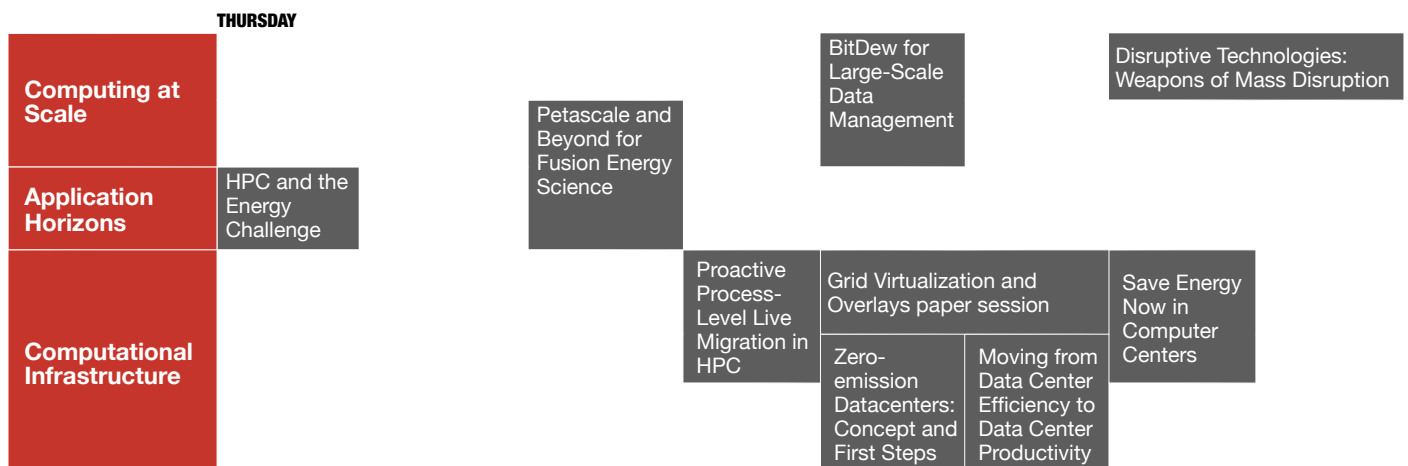
server-storage virtualization for integration and load balancing in datacenters.

Thursday also looks at the physical side of computation support infrastructure. *Zero-emission Datacenters: Concept and First Steps*, compares three approaches to cooling datacenters and provides evidence that a novel approach studied by the authors cuts energy use by almost a factor of two.

Moving from Data Center Efficiency to Data Center Productivity looks at the evolution of attitudes as we move from managing power and cooling for efficiency and learn to manage datacenters for productivity. Finally, the Masterworks session *Save Energy Now in Computer Centers* presents the practical steps and real world results that Lawrence Berkeley National Lab has experienced on its path to more responsible energy use in its datacenters.

Application Horizons.

HPC and the Energy Challenge: Issues and Opportunities features Jeffrey Wadsworth and a discussion of how petascale computing will enable a revolution in the way we provide for the energy needs of a growing world population.



Friday

Wrapping up the week with some great conversation

Although the final day of the conference is always a half-day, it's often a half-day not to be missed, and this year is no exception.

Computing at Scale.

Friday looks beyond the today's issues with petascale data management to exa-, zeta-, and yotta-scale data with the panel discussion, *Exa and Yotta Scale Data—Are We Ready?* This panel is led by Lawrence Berkeley National Lab's Bill Kramer, and includes such notables as Garth Gibson. Specific topics such as reliability, lifecycle management, and simply finding data in such mammoth data stores will be discussed.

Computational Infrastructure.

Infrastructure demands at the high end and a growing market with little experience in HPC at the low end have the potential to entice many current HPC customers to put their computations in the cloud.

My Cloud, Your Cloud, Everybody's Cloud features panelists such as Ian Foster and Thomas Sterling considering the basic questions: what is a cloud, how would HPC work in the cloud, what are the major issues we'll face adopting cloud computing as part of our infrastructure.

FRIDAY

<p>Computing at Scale</p>		<p>Exa and Yotta Scale Data—Are We Ready?</p>
<p>Computational Infrastructure</p>	<p>My Cloud, Your Cloud, Everybody's Cloud</p>	