Technology Leadership & Strategy Initiative

HPC Advisory Committee Re-launch Meeting

Meeting Minutes and Report
March 21, 2011

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HPC Advisory Committee Re-launch Meeting
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Executive Summary

The Council on Competitiveness HPC Advisory Committee was re-launched on March 21, 2011, with a meeting held at Lawrence Livermore National Laboratory (LLNL). Approximately 40 attendees spent the day engaged in dialogue, with a short mid-day break for a tour of the National Ignition Facility at LLNL.

Opening

Tomas Diaz de la Rubia (HPC Advisory co-chair) and Deborah Wince-Smith (CEO & president of the Council) opened the meeting by setting the stage for the expectations both for today and the future for this group. Tomas spoke of the deep culture of HPC at LLNL, and how that now has resulted in HPC being used by every major program at the lab. He also gave brief introductions to his HPC co-chairs Michael McQuade and Robert Buhrman, who could not attend the meeting. Deborah talked of the history of the HPC Advisory and its past accomplishments, and spoke of how the HPC Advisory will now be part of the Technology Leadership & Strategy Initiative (TLSI), and a contributor to the Council's U.S. Manufacturing Competitiveness Initiative. Members of the TLSI, which consists of many of industry's top CTOs and technology leaders from academia and national laboratories, are co-chairing the HPC Advisory Committee as a working group of the TLSI. She encouraged participants to think bold and big. The opening concluded with each participant saying a few words about themselves.

NDEMC Overview

Cynthia McIntyre gave an overview of the Council's latest HPC success story, the imminent launch of the National Digital Engineering and Manufacturing Consortium (NDEMC), also known by its 18-month EDA-supported pilot name "The Midwest Project." This is

a public-private partnership aimed at increasing the usage of modeling and simulation and HPC in small and medium sized manufacturers. A recent White House ceremony gathered high-level representatives from private sector and government to sign a five-year MOU establishing NDEMC.

Strategic Dialogue No. 1

The first moderated dialogue of the day was on the topic of "Virtual Product Development for Manufacturing," moderated by Chad Evans and Cynthia McIntyre of the Council. Dave Turek (IBM) opened with remarks outlining the current lay of the land, with some interesting commentary on how some of our international competitors have worked in this space, currently China, and in past Japan. While U.S. leadership is key, we must share what we learn with the supply chain—which by definition implies crossing international borders. Steve Rottler from Sandia National Laboratory then spoke of several examples he's witnessed. The first was how modeling and simulation brought Goodyear back to competitiveness through a long term and integrated plan within the company to use HPC. The design time for a new

tire went from three to five years to 18 months, and Goodyear is now a true success story. The second was of the Encanto Supercomputer, designed to provide small businesses throughout New Mexico with high tech resources. The program is struggling largely due to the lack of investment in expertise—companies were not able to adequately use the resources.

Subsequent Q&A and discussion brought to light key takeaways from Virtual Product Development Dialogue:

- Need a complete study on the Return on Investment (ROI) for HPC (later comments from IDC noted that their recently launched innovation awards are collecting ROI).
- Need to develop sustainable workforce development strategy for HPC, starting in K-12 and community colleges which are way underserved. Lots of expertise in HPC is in the older generation of the workforce.
- Development of middleware infrastructure to make HPC easier is important
- Material modeling is a common infrastructure piece that would be useful, although many companies treat those models as highly sensitive IP and might not be willing to share.
- A change to virtual product design will require a cultural change as much as technology enablement
- A suggestion to have Zach Lemnios speak on DARPA System 2020 at a future meeting

Strategic Dialogue No. 2

The second moderated dialogue of the day was on "Industrial Access to HPC," and was moderated by Dona Crawford of LLNL. Dona noted the long history of the HPCAC addressing this topic, with successes in INCITE and NDEMC. Paul Fussell opened the dialogue with comments on how Boeing views code development on HPC, breaking it down into running, developing, scaling up, and experimenting. Lack of access to any one or more of those four stages can have profound effect. Ray Bair from Argonne then spoke of the niche that INCITE fills, being the leading edge of scaling for exploratory purposes. Other needs might fall under large scale access to capacity computing for studying the parameter space. The labs (Argonne specifically) are also recognizing that they have room to improve their responsiveness to issues like agreements, IP, and proposals.

Subsequent Q&A and discussion brought to light key takeaways from Industrial Computing Access:

- Democratization of HPC requires addressing more than just access to lots of cycles. In particular it requires good human-computer interfaces
- We need to identify who our target audience is in these discussions because the solutions will be drastically different. It is a complex space. The Alliance for High Performance Digital Manufacturing has been working to identify these categories and approaches.
- Bringing new HPC users "up" must be met by bringing HPC capabilities "down" to their level.
- Universities are a critical role in the development of an HPC ecosystem.
- U.S. industrial policy is lacking, there are things the market alone can't address, and other governments have no qualms about supporting their local industries to compete with the United States. We can't do this piecemeal.

NIF Talk and Tour

Dr. Ed Moses from LLNL's NIF and Photon Science Directorate gave a lunchtime talk on the National Ignition Facility, and its role in defining a clean energy future. NIF is a proof-of-concept experiment, with subsequent iterations and designs (e.g. LIFE) bringing us closer to creating a reactor for energy production. We then toured the NIF facility, and came away with a great appreciation and admiration for the science and engineering involved.

Ron Bloom Keynote

Ron Bloom, Assistant to the President for Manufacturing Policy, provided the keynote address in the LLNL main auditorium with a large turnout from the laboratory population. He talked about his role in the auto industry restructuring as a background, then addressed how this country began to let manufacturing slip away and didn't see it as a problem. We now realize that the innovators and designers will soon follow to where things are built, and must now address this with a pro-manufacturing policy in government. Where government should play a strong role is in building the infrastructure needed to make the United States the place to build things. Infrastructure means moving goods, energy, information, and people efficiently, as well as providing robust educational and financial systems. He cited the example of the Council's HPC NDEMC Midwest Project as an example of effective public-private partnerships.

Breakout Session Report on International Competition (Rapporteur: Dona Crawford)

Their group stressed the importance for the United States to continue our leadership in HPC as a way to maintain a broader position of innovation leadership. We want to be competitive, but that doesn't mean we can't also collaborate. Top issues they identified: 1) Education (e.g. we graduate 16 percent of students in S&T, China is at 48 percent). 2) Intellectual Property, and whether it's "theft" when companies are global. Innovating faster than the rest of the world has been our historical response, but it's getting harder (see item No. 1). They felt that a white paper on the issue, with the Council perhaps organizing an event on Capitol Hill.

Breakout Session Report on Computation Science Education (Rapporteur: Vijay Agarwala)

He addressed the previous group's question of increasing STEM graduates by noting there's room to grow in existing institutions without significant investment. They focused on computational science (vs. computer science) as a way to broadly grow innovation capacity. Leaving graduate level intact, and K-12 for another day, they focused on undergraduate concerns. Cross-disciplinary education, perhaps supported by a fifth year to focus on computational fundamentals and application is one idea, which engendered some significant follow-up discussion in the room vis-à-vis incentives, internships, etc…

Breakout Session Report on Exascale Computing Funding

(Rapporteur: David Dean)

The current environment makes it very hard to get new money for an exascale effort, and there's not a lot of incentive for vendors to lead at the top end (they make their money in midrange). A roadmap for industrial need for exascale is needed, much like has been developed for science and national security, something the Council and this group could lead. The need to quantify our dependence on computing in the economy is needed (back to ROI point brought up in the morning). The compelling industrial use is lacking, other than the "flow down" case of having affordable petascale. U.S. industrial policy came up again vis-à-vis Europe and China, and how they are "eating our lunch" in software and perhaps soon hardware. Need to focus on how to sell this on the Hill, and perhaps exascale mattering to industry is a missed opportunity.

Breakout Session Report on Industrial Access to HPC (Rapporteur: Rick Arthur)

This was a large and passionate group, and lots of interest in creating a working group. There was also a desire to have a two-day focused meeting on what the Council on Competitiveness could do in this area. Some of the short term achievable goals revolved around the commercial software industry, and how one might help them with issues of scaling and licensing to broaden the market. Not surprisingly, the group identified a number of places where gaps exist between the needs and providers, and that public-private partnerships are a way to drive market forces.

Conclusions

Cynthia began wrapping up the day with a special thanks for those to came to help re-launch this HPC Advisory Committee.

Tomas then recapped the day with a few key points, many of them recurring: China, ISVs, industrial requirements…He came back to the need to begin any process with requirements, using stockpile stewardship as an example, and stressing the need for a similar comprehensive strategy for HPC in the private sector. This is not just a gov't mission though, the gov't role is to lower barriers to adoption. He talked of how LLNL is playing in this space through the HPC Innovation Center under development in the Livermore Valley Open Campus, and is hosting a two-day summit on the application of HPC to Clean Energy solutions in Washington, D.C., on May 16-17, which everyone will receive an invitation to.

Deborah concluded the day with how the HPC initiative fits into the Council mission. "One Council, one mission" is intended to better integrate the various initiatives. She laid out examples of the USMCI meetings occurring this year, many of which have a technology and computing angle. Invitations to CTOs to join the TLSI and continue participation in the HPC Advisory Committee will be sent out this spring.

NOTE: A complete written transcript (or audio transcript, for those who prefer) of the meeting is available to our attendees and members upon request. Likewise, a DVD of Ron Bloom's keynote address is available. Please email hpc@compete.org with your request.

Summary of Discussions

Opening Remarks

This summary contains paraphrased versions of the discussion. Complete transcripts are available upon request.

Tomas Diaz de la Rubia opened the meeting with some overview remarks:

- HPC is in the culture of everything we do here at LLNL
- Ernest Lawrence, inventor of cyclotron, created "big science" and along with Edward Teller brought the concept of supercomputing to LLNL
- In the early 90's, Pres Clinton made decision to abide by the Comprehensive Test Ban Treaty (CTBT). With bipartisan support in Congress over past two decades we have built the stockpile stewardship program to use HPC in concert with experimental facilities (like NIF) to remain true to the CTBT
- Today's meeting is about simulation, and taking that through the entire economy
- There is a changed environment in HPC—china, etc…but my sense: we have six decades of experience in doing this, and it is about the teams that come together to solve problems using HPC. It's not just about who has the fastest hardware. This is our competitive advantage.
- Relayed Michael McQuade's statement about his vision for the HPCAC:
  1. I am delighted to be participating in the relaunch of the HPC initiative. I believe that modeling, simulation and analysis capability must be as common a part of how we do science and engineering in the new century as the theoretical analysis and prototyping paradigms we have used in the last. We must identify and overcome the barriers to deployment throughout the entire HPC ecosystem if we are to achieve this cost-effectively and ubiquitously.
  2. While a company like United Technologies may have the resources and historical examples to understand this, in a very selfish way it is crucial for our success that the entire supply chain be vested partners with us in accomplishing the innovation and efficiency we need.
  3. I am especially pleased to join Robert and Tomas as the new co-chairs for this initiative, both for the expertise and leadership they have demonstrated and for the important role that national laboratory, university and industry collaboration must play in driving U.S. competitiveness in HPC.
- And intro of Bob Buhrmann at Cornell, who will bring not only perspective from the academic education side, but also the value of HPC access to university to enable the breakthrough research that leads to a robust innovation infrastructure in this country.

Deborah Wince-Smith from the Council on Competitiveness continues with the opening remarks:

- Notes this is the Council's 25th anniversary, and they were born here in CA
- Harnessing technology to create transformational value
- "Time to insight and time to solution" was a framing concept from HPC inception from LLNL's Dona Crawford, as well as Tony Tether's note about productivity

- Note that Ron Bloom will be with us to share vision of how HPC can impact U.S. manufacturing
- Talks briefly about NDEMC (presented later)
- Discusses initiative cycle at the council—2004 with national innovation initiative, then over the horizon issues: energy security/sustainability and manufacturing transformation…ESIS, and now USMCI
- Encourages room to think big, think bold today.
- What we do will be integrated into our national manufacturing strategy and 25th anniversary events
- Closes with remarks about the beauty of the various scientific visualization graphics hanging in the room, suggests getting HPC visualization at MOMA.

Introductions

Everyone in the room is then invited to introduce themselves with a brief statement (greatly paraphrased here) about what they hope to achieve from the meeting.

Cynthia McIntyre (Council on Competitiveness): HPC Initiative and NDEMC lead

David Tennenhouse (New Venture Partners): Long interest in HPC, extending back to DARPA IT office

Jon Riley (NCMS): Interest is leveraging HPC tools to help U.S. mfgs remain competitive

Jan Hesthaven (Brown University): Developed statewide program for collab. based on computing

Jim Myers (RPI): Director of Nanotech Innovation center, strong component for industrial competitiveness

Paul Fussell (Boeing): Looking for clear strategic stand of use of HPC technology

Ray Bair (Argonne): Involved in computation science planning, strategy, and implementation

Mel Bernstein (Northeastern): Part of five-university consortium to build HPC center in Mass.

Rick Arthur (GE): Broad interest at GE in pushing the state of the art in HPC

Bob Graybill (Nimbis): Started new company to help small and medium sized businesses lower barriers to HPC

Lalitha Subramanian (Accelrys): Representing software providers, looking to support supply chain

Merle Giles (NCSA): Regularly engaged with academic and industrial users in big data and computing

Earl Joseph (IDC): Here to improve U.S. industrial competitiveness and scientific leadership

Stephen Wheat (Intel): Chair of AHPDM working for democratization of HPC in mfg segment

Don Lamb (U Chicago): Work with Council via Obama transition team, looking for next steps

Addison Snell (Intersect360): Market research focused exclusively on HPC, with studies on mfg available on web site

John Grosh (LLNL): Understand and advance issues of HPC adoption in industry

Keven Hoffstetter (Caterpillar): Sponsoring CAT's HPC strategy to cost-effectively develop optimized products

Brad Spiers (Bank of America): In charge of non-x86 silicon initiatives including cloud computing and big data.

Peter Siegel (UC Davis): Strong interest in partnership with industry

Lindsay Holden (Baruch): Associate of Tom Baruch, who holds portfolio of companies where HPC may apply

Rochelle Blaustein (DOE): Understand industry's HPC needs, drive lab HPC tech into industry, and leverage NIST MEP

Steve Rottler (Sandia): HPC is major enabler at Sandia. Working to democratize HPC in industry

Steve Ashby (PNNL): Part of TLSI Accelerating Innovation WG, and looking to broaden base of HPC users

David Dean (DOE): Large interest in exascale, and how simulation can help industry

Al Harms (UCF): Interest in getting curriculum right, and representing Institute for Simulation and Training

Earl Dodd (RMSC): Working to make technology relevant, and STEM edu for workforce development

Lane Arthur (DuPont/Pioneer): Looking to drive HPC from just R&D into product dev and mfg

Tom Halbouty (Pioneer): How mid-sized companies can engage with labs and external groups

Mike Rosenfield (IBM): One big focus is how to widen the aperture for scalable HPC in industry

Dave Turek (IBM): Mfg is central to IBM Smarter Planet and Deep Computing efforts

Debra Goldfarb (Microsoft): How to draw correlations between HPC and economic development

Pradeep Raj (Lockheed Martin): Application of HPC in modeling and simulation, physics and otherwise

Dona Crawford (LLNL): Concerned about U.S. leadership in HPC, building base while pushing the tip

Rob Neely (CoC/LLNL): How to translate successes of HPC in ASC program to industry

Chad Evans (CoC): TLSI lead, holding dialogues to create recommendations for nat'l mfg strategy

Midwest Project for SME-OEM Use of Modeling and Simulation

National Digital Engineering & Manufacturing Consortium

Cynthia McIntyre presents the public-private partnership recently announced that is a direct culmination of prior work done with the HPC Advisory Committee.

- Presents a timeline of events from 2008 to the present
  - 2008, Energy crisis, financial crisis, Obama elected
  - 2009, Transition team visits CoC, enthused about HPC
  - 2009, Initial white papers on value of HPC for manufacturing developed
  - 2009-2010, Outreach to a number of USG sources
  - 2010, Feb summit to gather end users
  - 2010, Aug workshop to lay groundwork for implementation
  - 2010, Dec EDA grant submitted with CoC as lead entity alongside NCMS, U of I, Purdue, and OSC
  - 2011, White House Ceremony with MOU signing for five-year program
- Goal of PPP is to promote adoption of modeling and simulation in the small and medium sized manufacturing supply chain.
- Focus on enabling the SMEs, which in turn will improve the OEM production cycle
- Initial phase focused on
  - Getting educators into the field to work hands-on with the SMEs
  - Building a shared infrastructure for HPC and application access

- Approximately $5M budget
- Private sector: Procter & Gamble, Lockheed Martin, General Electric, Deere & Co.
- Public sector: EDA (Commerce) funding initial 18-month Midwest pilot, MOU signed by DOE, NIST, NASA, OSTP, NSF
- Formally announced on March 2 at the White House in an MOU signing ceremony. (See page 36 for the press release.)

Virtual Product Development for Manufacturing

Moderated Dialogue #1

Chad Evans: We want to come out of his dialogue with a set of recommendations we can present to the USMCI.

Dave Turek's (IBM) opening remarks:

- The state of where we are today: first, manufacturing is international by definition; every supply chain has international dependencies, so we need to be crisp in understanding and defining competition
- For IBM, our supply chain needs to be extremely integrated and global;
- With whom are we competing? And what is a competitive play?
- Quite significant dichotomy when going around world. China has long term strategic ambition to deeply deploy HPC in their economy, training 1,000,000 people in HPC capabilities. This is significant.
- China has begun to deploy an infrastructure for HPC, similar to NDMEC, and these have sales ops, etc…
- Contrast with Japan which wakes up once a decade to start an ambitious program but at the very high end, with no good integration with industry, supply chains, etc.. This was the wrong approach.
- Japan focused too much on high end with an assumption of trickle down (but no infrastructure to allow this). E.g. $200M building requiring 16 megawatts to run. But this is the consequence of building on obsolete technology (SPARC processor). A comparable system from IBM and others over same time will have twice compute power, 1/10th cost, 1/8th energy needs.
- Whatever we do innovatively must be shared with supply chain—and this means international cascading beyond borders
- Competitive has to support notion that you can play against and with companies from other geographies
- We need to understand these macro level issues—as much as understanding the technical issues. A lot to be gained by attaining leadership in USA, and must be aware of competitors, and perhaps run different plays in different geographies

Steve Rottler (Sandia) opening remarks:

- Bringing perspective of someone from an economically challenged region of the country that is struggling with role of technology in driving economic development
- Two stories, one that turned out well and one that may not meet original expectations
- First story: Goodyear example.
  - Goodyear made commitment in 1990s to use computation and simulation as a way of doing business to remain competitive. They were struggling in marketplace as the sole remaining U.S. manufacturer of tires.
  - In 1990s, visionary CEO and leadership team recognized that to out compete, they'd have to change way to do business, and committed to HPC investment.

- Recognized need to integrate deeply into the company, which was a nearly 20 year journey costing tens of millions of dollars within the company—hundreds of millions even more broadly
- At the start Goodyear had to go outside the org and bring expertise into company.
- Today, Goodyear is globally competitive…and they have changed the way they do work, the way they hire people
- Today's prod dev has dropped from 3-5 years (when at the time in Europe and Japan was 1.5-2.5 years) to less than a year from concept to market (Assurance tire)
- Goodyear used HPC in the conceptual design space—a competitive breakthrough and differentiation. Investment in hardware, software, and talent, with gov't partnership, has been the seeds of success.
- For past 15 years, Goodyear has been paying for this with their own funds, but gov't was a helper at beginning

• Second story.
- New Mexico is the land of enchantment and land of contrasts.
- 2.5M people in New Mexico. Most of state owned by feds and Native Americans. Albuquerque greater metropolitan area is 750k people. Next largest city has 90K…then down to several 20-40K communities.
- Great wealth in the state—wealthiest counties in the country, and great poverty (some of the poorest counties in the nation are in NM)
- Small businesses drive economic engine in NM, struggling with profitability
- Gov't Richardson made a commitment to bring economic development into state. Encanto is a supercomputer bought by the State government under Gov. Richardson's leadership. At the time, one of the world's fastest, and invested in infrastructure to make it accessible across the state via portals.
- Every major community has a branch campus and portal (high speed interconnects, access points, high end video/displays, etc)
- A lot of money spent for hardware, but little investment in the human resources to bring the program to fruition.
- Three years later, the center is looking for stable funding.
- Center is struggling, small businesses in NM were not capable of using, so this was a case of "build it and they will NOT come"
- The current state admin is also visionary and committed, but has no money.
- BUT perhaps the CoC model for pilot can be something for NM to look into…

• NM Small Biz Assistance Program granted to Sandia and Los Alamos a tax credit equal to max of $2.4M to support needs of NM small businesses. This is an exciting step forward.
• You would think this tax credit would be cut by the government, but luckily, it has not been put up for cuts.
• I know a small company owned by a couple in Hatch, NM. They make green chile, local farmers. A lot of innovative work going on. E.g. machinery to sort green chiles, significantly cutting down on harvesting and getting to market, etc

- But, though a nice product, it was shown not to be a robust design. They asked Sandia to provide tech support to help them out—$3-$4K of labor from Sandia, but for the company and its 8 employees was huge as well as for the industry in the state of New Mexico.
- So, our region can be visionary…but we have challenges regarding the investment side.
- Let us put a focus on software, public-private partnerships—as well as on the hardware side.

Discussion

Lalitha Subramanian/Accelrys: Dave and Steve, you've given interesting points of good and the bad, looking at making the United States competitive and making U.S.-based SME's competitive, how do you implement the lessons you've observed?

Dave Turek: A trap we fall into is talking about HPC from a technologist perspective leaving out the management dimension. Outreach to inform senior management doesn't take place. But there has never been a comprehensive ROI study on HPC to economy at large. There is an abundance of anecdotal stories. We need the academic study to document this.

Tomas de la Rubia: This question of expertise at LLNL, we're working with investor owned utilities and PUC, to show that HPC and simulation could be a planning tool. Immediately the utilities talked about workforce, and about creating the environment to train workforce of the future. How do we develop a sustainable training and workforce development strategy from K-12, to community colleges, to the high end research institutions?

Steve Rottler: I agree with everything that has been said. At University of NM and NM State University, and branch campuses, etc—a good number of the students stay in NM, so this is an opportunity. Investing in the workforce that exists and the workforce that will come.

Tom Halbouty/Pioneer: Educating SME on problem solving is also needed. The relationship that SME co's tend to have with researchers, universities, labs, etc is sparse. They don't have internal capability to pose the hypothesis that needs to be posed in visualizing a problem. It isn't just education, we need "toolkits" for SMEs.

Dave Turek: I agree, we too quickly go to mathematics in HPC. We're looking at changing the nature of how people conceptualize HPC taking into account the new kinds of things coming out of analytic space. Watson is not a toy; the implications are about interpretation of natural language, etc… this amalgamation of natural language recognition, machine language and HPC is key. And people compute differently now. In Africa, you need to be talking about cell phones—don't talk about PC's, servers, etc… There is a social evolution going on under us, requiring us to think beyond U.S. borders.

Jon Riley/NCMS: Know your audience. In our country, we have people with incredible capabilities. We need a middle layer, infrastructure that serves as a translator for SMEs, with tools written in their language. They don't need to know HPC—we need an "HPC grid".

Cynthia McIntyre: Re: infrastructure—perhaps there are gaps that exist that if closed could help improve the virtual produce development process? For example, is it important to have better material modeling or materials libraries in order to inform design of new materials? Would this be of help?

John Riley: Yes

Brad Spiers/Bank of America: We seem to have a missing element: small companies. Their ability to have these conversations is lacking. We are looking for the HPC APPLIANCE (like Google Appliance). So, how can we include smaller companies? How will we learn the patterns of what SMEs really need (as their needs are likely to be different than large companies)?

Paul Fussel/Boeing: Materials for an airplane company is critical. Innovating materials, developing them and characterizing them is at heart of our research. So, we might be cautious about sharing that information, as it is at heart of competitive advantage.

Rick Arthur/GE: Yes, certain materials are proprietary and comp. differentiators…but there is need for work with labs to get some fundamental research done and into hands of U.S. firms…model validation is a big gap—we need to use models and completely replace tests.

Pradeep Raj/Lockheed: In my mind, virtual product development has been focused on physics base. But its relationship to affordability has been disconnected. We need cost of product to be lower and more affordable

Kevin Hoffstetter/Caterpillar: We have a workable design process set by marketing—not set by other considerations. Product design will design the way it has always worked because they are afraid of lost revenue from warranties, etc. We need a CULTURE CHANGE that is above and beyond hardware and software. I have a design decision to be made and I how do I use HPC to do this?

Debra Goldfarb/Microsoft: What is your role as an OEM to work not just with Tier 1 and Tier 2…but also Tier 3, 4, 5? This just can't be a specification…

Stephen Wheat/Intel: Additional lessons from Encanto. It was a public-private partnership, without a definition of success, we missed an opportunity.

Bob Graybill/Nimbis Services: A good example from DARPA is System 2020. Concept, design, manufacturing…Zach Lemnios would be a good speaker. LLNL and Sandia are working on how to role out expertise to SMEs through micro-consulting and Nimbis won a contract to investigate this with them.

Earl Dodd/RMSC: There are only small businesses in Montana. No medium, no large. Another missing middle: lots of manufacturers and engineers who are really old—and then some really young kids. No one in between to map these generations.

Industrial Access to HPC: What's Needed Next?

Moderated Dialogue #2

Dona Crawford/LLNL (Moderator)

- Industrial usage has been at core of Council work in HPC
- Now, how do we broaden the base?

Paul Fussel (Boeing) opening remarks:

- Four things
  1. we run big codes;
  2. time to do development and maintenance;
  3. need to know how to scale up code;
  4. be able to do experimentation
- Any of these four dimensions offer challenges in the HPC space
- Boeing does no big science, but we do phenomenon and use that understanding to guide design processes which in turn are used to produce products…"design space" is what we call it at Boeing
- Design space—explore where interesting designs might reside. It can be done manually, udder guidance, or automatically

Ray Bair (Argonne) opening remark:

- ANL workspan from basic to applied—and problems that span both of these are most interesting

- National labs have been in the business for providing resources for a large time…photon, neurton sources, nano material centers, etc…industry has been integral part of the user community for these facilities
- INCITE is special and fills an important gap: providing cycles for large high impact projects that cannot be done with lesser computing resources.
- Mapped onto what we're discussing today, that is only one set of problems we might be able to help industry resolve—what are the other classes of problems?
- E.g. Large scale; high capacity problems—where the problem isn't so big—but big for a particular company or locality;
- Applications and models for simulation—e.g. in manufacturing—a lot of models are available and each has a certain range of applicability. So to use in manufacturing it needs to be validated for a particular problem, after having selected the right model. This is a contact sport—connecting of expertise to selecting models, starting study, leading to validations to allow for use in production sense.
- The other major learning—some of industrial problems on which we work have a very long term focus, perhaps more of a research problem; whereas some issues are short term—within weeks/months.
- National labs are having to learn how to be more responsive…how can we be even quicker re: user agreements, IP, proposal processes, etc?

Discussion

Dona Crawford/LLNL: Industrial access to HPC—HPC is high performance COMPUTING not COMPUTERS…and what elements do we include in each?

Deb Goldfarb/Microsoft: 1) INCITE is a good model, but captures only a small part of the problem. 2) Human interface is key as democratization of HPC hinges on this—as have all major breakthroughs in the computing space. We need the "easy button" that breaks down the ease-of-use barriers to HPC.

Addison Snell/Intersect360: Whom specifically are we targeting? Barriers and drivers depend on what we're trying to accomplish. What is the definition of an SME?

Stephen Wheat/Intel: The Alliance for High Performance Digital Manufacturing meets weekly to address these sorts of issues that Addison raises. Anyone can join.

Steve Ashby/PNNL: Who is our target? What is our audience? I don't see us aiming at democratizing HPC. We aren't at the time of the "easy button"—we're at the time of the "who wants it" button. We have a range of companies, and therefore a range of audiences and responses. This advisory committee has to decide on the audience and how to scope. I would say that there are those mid to large range who have not seen the ROI because they are a better "cultural" fit for those already engaged …

Rick Arthur/GE: As a technophile, I appreciate the work at the high end, aspirational end. But they are a luxury being built on a successful economy. Industrial problems may not meet this mold, but they are the foundation of what supports the high end. Small vs. large—small is part of Darwinian cycle. The ones that don't embrace new tech will fail, and those that do embrace, they don't have large co bulwark that even makes that easy. So, an opportunity for small companies to do something new, there is a different ecosystem at the supplier end than at the OEM level.

Jim Myers/RPI: We keep saying how do we make others change THEIR culture and move up.

Vijay Agarwala/PSU: We need to increase ease of use, but we can't change physics. We have to walk with the SMEs through the difficulties. Intermediation is better done at Universities. If HPC can do so much good, why over the past 20 years, has our manufacturing base shrunk? What will we do differently over next 5 years? We need to create an ecosystem that includes universities that help SME's pick the right kind of codes, etc... This will also serve to incentivize students and faculty to do some more applied work. Also, there has been a distribution problem—codes from ISV's, codes from National Labs—people in USA who employ need some sort of access advantage to this tax payer supporter code work

Tom Halbouty/Pioneer: We're a mid-sized company. Council is good because it is broad. HPC is a way to solve problems. I would argue that something that has affected corporate competitiveness—engaging in problem-solving can't be done with an MBC/portfolio perspective—you need technical competency. One aspect of leveraging HPC is to re-educate company leaders that if you re-insource competency, you have the ability to understand what third parties are doing for you. There's no such thing as an "easy button". Organizations need a formula to get questions formulated, get the right people on staff, and then how to go execute against the ideas they generate.

Merle Giles/NCSA: We need more CPAs and MBAs who know how to spell HPC. (1) industrial is more than manufacturing—all users that build or solve or make or cure are industrialists. We have been overly focused on the power users (DOE, DOD, large co's) (2) Companies consider HPC as IT, and an expense to be lowered and not something in which we need to invest. (3) Are ISVs the barrier? I say "no"—bigger challenge is culture. Technologists need to be able to do customer service, more than just an allocation committee. Most of three agency supported HPC houses understand HPC and technology, but most don't understand the client very well. NDEMC excites me because it is bigger than supplier, bigger than choice of client—it represents a cultural change. Economic development is making this a game-changer.

Lalitha Subramanian/Accelrys: Two comments (1) Addison really summarized the problem—lots of audiences, demands. Get the ROI from companies who've used HPC successfully. (2) Looking at India, China, Germany, France—all of these government agencies fund ISVs. What is gov't doing to fund ISVs? India funds software ISVs at $1B.

Don Lamb/U Chicago: In the past, USA has always had a vibrant industrial policy, but today, we have a dominant view in this country that we should have no industrial policy. This is why SMEs aren't engaged in this space. Organizations are trying to deal with this—the Alliance [AHPDM], the Council's NDMEC, et al… Lastly—EDA stepping forward is a good sign—we should build on this.

Kevin Hoffstetter/Caterpillar: At what point are in-house resources not enough? We don't know at CAT. w/in CAT we have product groups, IT dept. Product groups want infinite resources, but if asked to pay, then they say they are fine with where they are. But we need some sort of business case. We are tying to implement an internal INCITE program where groups compete for HPC access.

Earl Joseph/IDC: We're (IDC) trying to step up on the ROI question. We're trying to collect a bunch of success stories and promoting it broadly. But we also need a solid macroeconomic model.

Mel Bernstein/NEU: This talent issue is more than just HPC—this is a national issue. There used to be closer discussions between industry and universities about talent development. We will succeed competitively when we address the scope of talent.

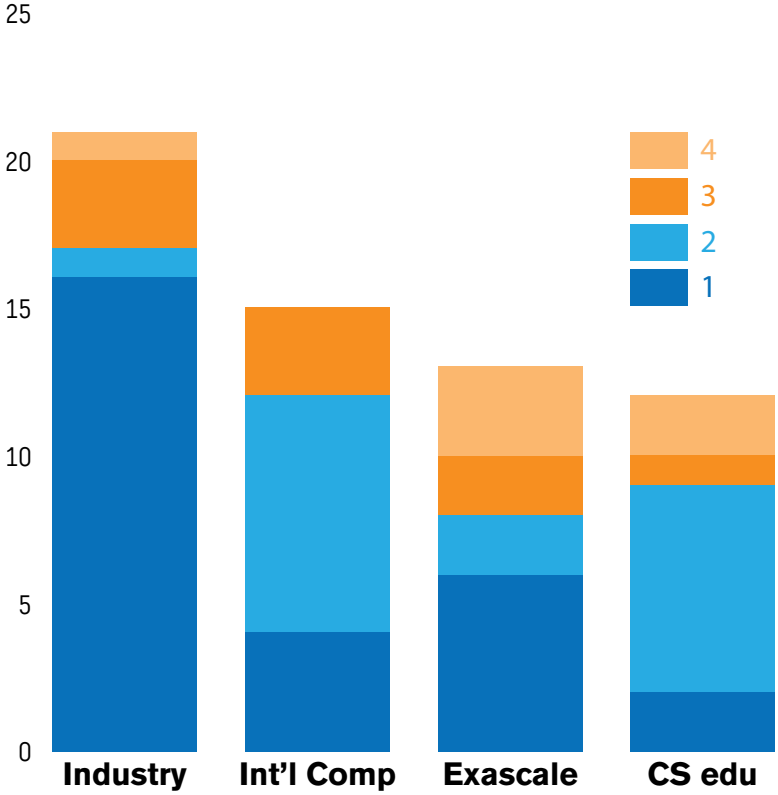
Paul Fussel/Boeing: Wrap up/summary of the conversation.

Ray Bair/ANL: Wrap up/summary of the conversation. One more possible gap to consider: for a particular set of targets, we ought to look at the health of the software industry in that sector.

Lunch

- Announcement for SciDAC industrial outreach meeting (occurred March 30, 2011)
- Results of informal survey of participants

Figure 1. Results of informal survey done prior to meeting



Attendees were asked to rate their interests from four predefined categories (28 responses)

Other Suggested Topics

- HPC research opportunities
- Community and K-12 outreach
- Trans-national collaborations
- Ubiquity of big-iron capability
- Integrate hybrid resources
- Software gap (scalability, licensing, open source consortiums, etc.)
- How to help U.S. HPC vendors succeed
- HPC beyond Moore's Law

National Ignition Facility Talk and Tour

Dr. Ed Moses, Principal Associate Director for NIF and Photon Science, LLNL

Laser Fusion Energy Future

- NIF is the world's biggest laser
  1. 1 bldg
  2. 5 hectare
  3. 30 year life
  4. NIF is 50 times more energetic than any previous laser
  5. 192 beams
  6. 1.8 MJ energy
  7. 500 TW Power
  8. 351nm wavelength
- Scaled for gigawatt cities—san fran, dc, boston
- A major goal for NIF: demonstrate the route to fusion energy
- What do next 10,000 years look like? Carbon catastrophe or clean energy future? Next 50 years we'll sort of figure this out (or not) …
- Demographic challenge—the famous "hockey stick"
- U.S. energy consumption—today 3 trillion watts… over 100 quadrillion BTUs
- U.S. energy modalities—wood to coal, to oil to gas to hydro, nuclear, renewables
- After 1930s, we just keep adding modalities. I takes about 50 years to displace embedded energy infrastructure.
- For the first time humankind is acting as a force of nature.
- New build electrical gene ratio is required to fill the generation gap. We are continuing to electrify. 250+ GW of clean energy by 2050 is needed to do this.
- Two nuclei of interest—uranium and hydrogen.
- Could we build a miniature sun earth? Can we capture it in a reactor to put energy on the grid?
- Looking for five cents per kilowatt hour.
- LIFE (Laser Inerital Fusion Energy) is economically vial be over a range of structures
- 2050 fleet incorporated (2020 LIFE prototype), 2030 (LIFE commercial)
- Your role: Friends for LIFE

Note: For lots more information on NIF, LIFE, and the possibility of carbon-free energy, go to http://lasers.llnl.gov, or search "National Ignition Facility" on YouTube.

Ron Bloom: Winning the Future through Advanced Manufacturing

Note: The following is a summary of Ron Bloom's comments with significant paraphrasing and editing. LLNL has provided a professionally produced DVD of this talk, which we can make available to our membership upon request. We are also looking at making it available on the web.

Will talk about manufacturing and my responsibilities to the president.

My journey to DC—came two years ago to dealing with auto restructuring. Recession exacerbated the problem, but the problems were long in coming. Autos are now in a relatively good spot—have helped preserved an industry critical to the United States. And we've pulled back our investments, as it's not the role of gov't to own companies. I have now moved to the White House, responsible to look broadly across gov't to look for coherence and partnering with private sector.

For a significant period of time in this country, we believed two things: 1) The decline of manufacturing in the United States was inevitable, and 2) we thought it was OK. We would rather be innovators. Government policies didn't focus on manufacturing.

The Great Recession made us question—maybe manufacturing does matter, and we need it to compete, and with the proper policies we can indeed compete. Short but telling phrase: "Manufacturing Matters". The President believes this. After our period of indifference, we began to think that manufacturing actually does matter because we started to see that there was a small amount of innovation departing with the departing manufacturing.

But as we try to reinvent this new "manufacturing matters" theory, what does this mean? What are our core beliefs? Pro manufacturing policy in America needs to be shaped by where we are.

We like to pay our people good wages. That is why we have a middle class! We like to pay and expect to get more per dollar value—pay a smaller workforce (more $) who is more skilled and productive rather than pay less per person to a large workforce.

So, we decided to let go of the rudimentary, low value manufacturing processes—we began outsourcing this. We then started to recognize that innovation was departing with this outsourcing. Some loss was okay, but where do you draw the line? The policies we want will support manufacturing activities that rely on innovation. The United States is the best at innovation! But we now also see that we will have a hard time innovating if there is no manufacturing to innovate around—the gravitational pull will move innovation toward the manufacturing process. Putting the engineer near the people making and repairing things—everyone learns more. Our policies are to build those linkages.

Second point to think about: infrastructure. What is the gov't doing to make this country the most hospitable place to build things? Infrastructure = moving goods, energy, information, people. This is a fundamental role for government, as are support for education and financial systems. This infrastructure support provides the incentive for manufacturing to happen here.

A lot of people in Washington, D.C., adopt an attitude of weariness that our country's best days are behind us, and in some corners this passes for sophistication! This is nonsense! I like to measure a country by this ratio: people who want to come here/people who want to leave here. The United States has a higher ratio, by at least two orders of magnitude, than any other country in the world. We remain the most desired place to make a better life in the world, and this has not changed, and is a fundamental differentiator. Where else in the world could you have such an absurd idea like NIF come to fruition? It is that characteristic of invention that makes this country great.

Q&A for Ron Bloom

Q: Why no commercialization-ARPA? Other countries seem to do something along those lines.

A: A belief that this was not in government purview. We haven't gone DARPA route because we are still exploring the line of where gov't should or shouldn't intervene. It's a work in progress, we're experimenting (ARRA, loan program, grants, etc…). There is no consensus at the moment in the nation. We need to be thoughtful in constructing an American response, and not just copy Germany, Japan, China. Need to harness our core competencies—use gov't to lift things up without pushing them down—delicate balance. To be honest we don't have a lot of data on this as opposed to R&D. The NDEMC partnership is an experiment in this regard—small gov't investment to bring together private sector for greater good.

Q: You mention infrastructure—with regard to innovation what might this be going forward?

A: If you look at lame duck session of congress you can see it on display. In 2011 we allowed for 2011 full depreciation of capital equipment. We are going to compete where investment in innovation is critical and capital is deployed efficiently. Looking at Presidents budget: reauthorization of service transportation act, e.g. high speed rail ($53B), classic interplay of good for environment, consumers, manufacturing,

and economy. Support for STEM Education is investment in another key infrastructure. Support for R&D tax credit. Exports. And patent reform. These examples don't explicitly directly target manufacturing, but the President's agenda disproportionately supports manufacturing.

Q: Re: education, how do we have best workforce?

A: Business has been very supportive on broad initiatives on education reform. Sometimes government doesn't have to do, it just has to bring together. So we are sitting down regionally and locally to assess the situation and help to get the workforce of the future ready. Part of this is definitely about resources, often it is just as much about focus.

Q: You only had to help with restructuring two of the big three. Are there lessons from Ford that is a lesson for manufacturing writ large?

A: Huge admiration for Ford. 1) There was an element of luck—nothing wrong with that: Luck favors the prepared mind. 2) Ford would have failed had we not helped GM and Chrysler, because their supply chain would have failed. We saved two companies but in truth we saved an industry. But Ford does deserve real credit; Ford did understand how the world had changed and a new business model needed, and how much all of its stakeholders needed to come together to make big change.

Breakout Session Reports

International Competition

(Dona Crawford)

- We are leaders in the USA
- But trends, intent of others important to consider
- We're in danger of losing leadership
- Doesn't mean we can't collaborate
- We know a tech disruption is on us now
- The country that owns the new ecosystem will have the edge for years/decades to come in innovation capacity
- Tough issues: education (we graduate 16 percent of population in s&e; china more than 40 percent), intellectual property (not necessarily "theft" in this globally dispersed supply chain; is the answer just to innovate faster—if so, how?
- Worth time to draft a white paper on pros/cons of collaboration/cooperation/competition
- The Council could have tech seminars on the Hill staffed by HPC Adv Comm members

Computing and Science Education

(Vijay Agarwala)

- How do we increase numbers of scientists and engineers? I think we're structured now to produce more at U.S. universities—in mathematics, physics, etc. …Typically a 5000 student university has a math dept with 50 staff, and graduates 50 students. Room to grow without significant additional investment.
- Computer science vs. computational science—a differentiation. What kinds of skills to have in a graduate that will make a difference in innovation?
- We have to go beyond computer science…there isn't a whole lot that needs to be done in graduate education…K-12 left for another day…

- Re: undergrad education, we need more cross-disciplinary education; and we need to move undergrads beyond the expectation of easy answers; we need more gov't and/or industry funded internships to see how computational techniques are being put into practice.
- We need to add a 5th year to undergrad education for computational education—dual degree of bachelor's / master's/.

Exascale Funding
(David Dean)

- Although there is a proposed budget, dollars are tight, and we need an optimal path for exascale
- Playing in exascale case is a tricky game for vendors
- Vendors make money in mid range, not top end
- A roadmap for industrial need for exascale doesn't exist like it does for science and national security.
- Are we adequately exploring current technology? Even if we're at petascale, we are operating at terascale
- Do we have a compelling case for exascale? Not clear.
- Issue with China: a gravitational pull on software and hardware designers
- We are worried about pipeline of labs/univs to commercial products
- Industrial policy is important to get right in this area. Europe and China eating our lunch on software and hardware—it's important to make sure vendor/gov't partnerships work
- Need a systems approach, including hardware, software and integration
- Are we explaining this correctly on the Hill? Maybe green energy and "computing our way out of" the energy resources flow issue is one approach?

Industrial Access to HPC
(Rick Arthur)

- Short answer: we need a separate 2-day session to work through the topic
- Licensing terms are a hurdle
- Short term achievable goals: other ways to access lab resources …
- Idea of being able to access a pool of software licenses at labs or shared facilities
- Long term goals—need better applications for some fields, like multiphysics; consolidate user community to unify what ISVs see as their customer base; re, gov't policy: NSF could be of more help to industry, DOE evaluation of success need to change
- A definite timeframe to solve some problem/mission.
- We need to quantify how dependent on computing in the economy. We think we are—but are we really?

Conclusions

Tomas Diaz de la Rubia

Reflection: stockpile stewardship offers a lesson—public private partnership, advocacy and bipartisan support, industrial champion(s), defined mission… but I think our challenge today is harder than it was in the 1990s due to today's economy and changed world…more than gov't drive will be needed—we will need deep partnerships between public and private sectors

Our Open Campus will create the environment where SMEs and large co's can come in and take advantage of 60 years of LLNL experience in HPC, modeling and simulation

High Performance Computing Summit for Energy—May Summit in DC—to accelerate clean energy transformation. You will be receiving notices.

Deborah Wince-Smith

Thanks to everyone. This has been a rich and diverse day with lots to synthesize. Going forward, we're focusing on "one council, one mission". USMCI is a piece of this—and we have a full set agenda of dialogues planned under that initiative. The HPC Advisory Committee will be an integral component of that work.

Moving forward, invitations to CTOs to join TLSI will be coming out, and future HPC meetings will occur with TLSI meetings, scheduled this year for July 14 and Oct 24. My takeaway message is that we are integrating HPC with everything we're doing at the Council, and this group will play a critical role in getting modeling and simulation at the forefront of the agenda.

Attendees

Dr. Tomás Díaz de la Rubia (Chair)
Deputy Director for Science and Technology
LLNL
TLSI Member

Vijay Agarwala
Sr. Director, Research Computing and CI
Penn State University

Lane Arthur
Chief Information Officer
Pioneer

Richard Arthur
Manager—Advanced Computing Lab, Software Sciences & Analytics
GE Global Research

Steven Ashby
Deputy Director for Science and Technology
Pacific Northwest Laboratory
TLSI Member, chair: Accelerating Innovation Working Group

Ray Bair
Chief Computational Scientist
Argonne National Laboratory

Melvin Bernstein
Vice Provost for Research
Northeastern University
TLSI Member, chair: Talent Working Group

Rochelle Blaustein
Senior Advisor for Technology Transfer
DOE
TLSI Member

Dona Crawford
Associate Director of Computation
LLNL

David Dean
Senior Advisor, Office of the Under Secretary for Science
DOE

Earl Dodd
President & CEO
Rocky Mountain Supercomputing Center

Chad Evans
Senior Vice President
Council on Competitiveness

Paul Fussell
Sr. Manager, Mathematical Modeling
Boeing

Merle Giles
Director, NCSA Business & Economic Development
National Center for Supercomputing Applications

Debra Goldfarb
Sr. Director, Strategy
Microsoft

Robert Graybill
President & CEO
Nimbis Services

Thomas Halbouty
CIO-CTO
Pioneer Natural Resources
TLSI Member

Alfred Harms
VP for Strategy, Marketing, Communications and Admissions & Special Asst. to the President
University of Central Florida

Jan Hesthaven
Director of Center for Computation and Visualization (CCV) & Associate Director of ICERM
Brown University

Keven Hofstetter
Research Program Manager
Caterpillar

Lindsay Holden
Associate
Baruch Future Ventures

Earl Joseph
Program Vice President, Executive Director HPC
IDC

Donald Lamb
Professor of Astronomy & Astrophysics
University of Chicago

Cynthia McIntyre
Senior Vice President
Council on Competitiveness

Jim Myers
Director, CCNI
Rensselaer Polytechnic Institute

Rob Neely
Computer Scientist In-Residence
Council on Competitiveness / LLNL

Pradeep Raj
Deputy Director, Technology Development
Lockheed-Martin Corporation

Jon Riley
Executive Director, Design & Engineering Programs
National Center for Manufacturing Sciences

Michael Rosenfield
Director, Deep Computing Systems
IBM
Science and Technology Policy Institute

Steve Rottler
Chief Technical Officer and Vice President for Science, Technology & Research Foundations
Sandia National Laboratory
TLSI Member

Peter Siegel
CIO and Vice Provost, Information and Educational Technology
UC Davis
TLSI Member

Horst Simon
Associate Laboratory Director
Lawrence Berkeley National Laboratory

Addison Snell
Chief Executive Officer
Intersect360

Brad Spiers
Senior Vice President
Bank of America

Lalitha Subramanian
Senior Director & Fellow
Accelrys

David Tennenhouse
Partner
New Venture Partners LLC

David Turek
Vice President , Deep Computing
IBM

Stephen Wheat
Senior Director, HPC Platform Program
Intel Corp

Deborah L. Wince-Smith
President & CEO
Council on Competitiveness

Original Agenda

SUNDAY, MARCH 20

Opening Dinner

Uncle Yu's at the Vineyard
39 South Livermore Avenue
Livermore, CA, 94550
(925) 449-7000
http://www.uncleyuatthevineyard.com

Directions: From points west (e.g. Airports, Pleasanton, Dublin, …)

- Take I-580 E Toward Stockton
- Take N Livermore Ave. exit
- Turn right on N Livermore towards Downtown.
- Proceed straight for 1.3 miles
- Go through the underpass and cross Railroad Ave (N Livermore Ave becomes S. Livermore Ave)
- Turn right into parking lot prior to building with the clock tower
- Restaurant entrance is at 39 S Livermore

6:40 p.m. Shuttle leaves Sheraton (optional)

For our guests staying at the Four Point Sheraton in Pleasanton, a complementary shuttle to and from dinner will be provided.

7:00 p.m. Dinner (Buffet / Family Style)

Hosted by LLNL. Uncle Yu's has upscale Asian Cuisine. A cash bar is available. http://www.uncleyuatthevineyard.com

9:00 p.m. Shuttle departs for Sheraton

MONDAY, MARCH 21

7:00 a.m. Shuttle pickup at Sheraton Four Points (optional)

7:30 a.m. Badging for visitors at Westgate Badge Office

For those driving themselves to LLNL (not taking the shuttle):

Directions to the Westgate Badge Office and entrance are included in the llnl_directions.pdf attachment.

Those with a valid HPSD-12 badge can proceed straight to the guard booth at the Westgate entrance, and follow the directions to B453.

When arriving, state that you are with the Council on Competitiveness HPC Advisory group. Please have your photo ID ready.

Directions from West Badge office to B453 meeting site:

- Take Westgate drive east into the lab, through guard booth (show badge)
- Continue straight (east) for ~1/3 mile
- Follow traffic circle ¼ way around, heading south on "West Inner Loop"
- Continue straight through stop sign
- Follow road as it curves left / eastward
- Park on either side of street, B453 will be on your left (behind B4525 which is easy to spot from the road)

Opening and Keynote

8:00 a.m. Coffee, light breakfast

R1012 (Black Diamond Room) is off the lobby of B453.

8:30 a.m. Welcome and Opening Remarks

Tomas Diaz de la Rubia
Deputy Director for Science and Technology, LLNL and Council on Competitiveness TLSI HPC Advisory co-chair

Deborah L. Wince-Smith
President & CEO, Council on Competitiveness

9:00 a.m. Introductions

9:30 a.m. Midwest Project for SME-OEM Use of Modeling and Simulation: National Digital Engineering & Manufacturing Consortium

Speaker: Cynthia McIntyre, Council on Competitiveness

An overview of a recent Council-led initiative to develop a public-private partnership to spur the use of modeling & simulation and HPC in small and medium sized manufacturers in the Midwest

Moderated Dialogues

10:00 a.m. Virtual Product Development for Manufacturing

Moderators

Chad Evans, Senior Vice President, Council on Competitiveness

Cynthia McIntyre, Senior Vice President, Council on Competitiveness

Discussion Leaders

Dave Turek, IBM

Steve Rottler, Sandia National Laboratory

Kick-off Questions

1. How would you characterize the prevailing product development process in the United States—and what does this nation really want and need to compete going forward in the 21st century? What is the role of HPC, modeling and simulation?
2. How does the United States develop scalable HPC platforms, virtual product development capabilities that are relevant both to the Fortune 100 company and the smaller firms that make up the nation's supply chains and manufacturing ecosystem?

10:45 a.m. Break

11:00 a.m. Industrial Access to HPC. What's Needed Next?

Moderator

Tomas Diaz de la Rubia, LLNL Deputy Director for Science & Technology & HPCAC Co-chair

Discussion Leaders

Paul Fussell, Boeing

Ray Bair, Argonne National Laboratory

Kick-off Questions

1. At what point are in-house HPC resources not practical for you to maximize your use of HPC? How would you anticipate filling that gap given existing resources?
2. One of this HPC Advisory Committee's recommendations in the past (which was implemented) was for DOE INCITE to open up access to industrial partners. What has been the impact on these industrial users? What are the pros and cons of the INCITE model? Do we need to recommend extending the existing INCITE program to better address industry needs? Or, do we need to recommend a new program aimed first and foremost at supporting the goals of industry partners?

Lunch

11:45 a.m. Boxed lunch provided
Black Diamond Room

A short (5-10 minute) overview of the results of our informal "interest survey" that was sent prior to the meeting will be presented. This will both act as a lead-in to the afternoon breakout sessions, as well as give members a chance to provide feedback on other topics of interest for this group to discuss in future meetings.

National Ignition Facility

12:15 p.m. The National Ignition Facility: Mission Driven Need for HPC
B453 Auditorium

Speaker

Dr. Edward Moses, Principal Associate Director for NIF and Photon Science, LLNL

12:45 p.m. Transportation to NIF Facility

1:00 p.m. NIF Tour

Important information regarding your tour of NIF:

1. You will be walking on various surfaces so clothing restrictions apply. No sleeveless shirts, tank tops, shorts, capri or cropped pants, skirts, or dresses. Sturdy shoes enclosing the entire foot must be worn. Tennis shoes and loafers are acceptable. No footwear with open toes, open backs, moccasins, sandals or high heels.
2. Guests will be required to view a safety video and sign a ledger prior to touring the facility.
3. Necessary safety equipment will be provided (hardhat protective eyewear with side shields).

2:00 p.m. Transportation to B123

Keynote Speaker

2:15 p.m. Winning the Future Through Advanced Manufacturing
B123 Auditorium

Ron Bloom, Assistant to the President for Manufacturing Policy

Introduction by: Deborah Wince-Smith, Council on Competitiveness

3:15 p.m. Transportation back to B453

Breakout Sessions

3:30 p.m. Breakout Sessions

A chance for members to do a "deep dive" on several topics, with a goal of recommending next steps for the HPCAC and the Council.

Topic	Room	Leader / Moderator
Industrial Access to HPC	Black Diamond Room	Rick Arthur GE Research
Exascale Funding	R1010 Dry Creek Room	David Dean Office of the Undersecretary for Science, DOE
International Competition	B451 White Room	Dona Crawford LLNL
Computing and Science Education	Black Diamond Room (rear)	Vijay Agarwala Penn State University

4:15 p.m. Report back on breakout sessions

Each breakout session will be asked to designate a representative who will give a 5 minute report back to the group.

Questions to address:

- What are the top issues and concerns related to your topic? Are they technical? Policy?
- What are some short term achievable goals?
- What are some longer term strategic goals?
- Should a working group form to continue your discussion between now and the next meeting?
- What can the Council on Competitiveness do as part of its larger initiatives (TLSI, USMCI) to help?

Conclusions and Wrap-up

4:45 p.m. Next steps

Deborah Wince-Smith

Tomas Diaz de la Rubia

Cynthia McIntyre

5:00 p.m. Reception in B453 Lobby

5:15 p.m. Tour of the LLNL Terascale Facility (optional)

Advanced registration required.

6:15 p.m. Shuttle departs for Pleasanton Sheraton Four Points

No-host dinner.

A list of local restaurants is provided for both Livermore and Pleasanton in your folders.

Photos

HPC Advisory Committee Mission Statement

The Council on Competitiveness' High Performance Computing (HPC) Advisory Committee aims to stimulate and facilitate wider usage of HPC across the private sector in order to propel productivity, innovation and competitiveness. This effort will convene top HPC thought leaders from across multiple sectors to promote discussion, interaction, and most important—action, on retaining U.S. global leadership in HPC, and leveraging government investment in HPC R&D to provide U.S. public and private sectors with the competitive advantage to out-innovate the rest of the world. *To Out-compute is to Out-compete.*

Goals

- Develop and deliver the message of how HPC can act as a technological foundation for national competitiveness, innovation, and security.
- Provide high-level recommendations to policy makers on how public and private investments in HPC can have maximum impact on our common goal of maintaining U.S. leadership in science, education, and industry.
- Advocate for national policies that maximize the economic return on U.S. public investment in HPC and promote adoption and use of HPC technologies by the U.S. private sector through publications, press releases, ongoing major Council initiatives and the public forum.
- Lower the barriers of adoption of HPC in industry by developing and promoting a national strategy and recommended implementation that systematically identifies and addresses obstructions.
- Increase access to HPC advanced modeling and simulation technologies and expertise, allowing firms of all sizes to quickly innovate, design, test and reduce costs throughout every stage of the product life-cycle from inception to disposal.
- Be the preeminent body of HPC expertise in the United States, spanning the entire HPC ecosystem, including:
  - Industry partners who can spawn a new generation of American innovation and ingenuity using HPC;
  - Government science and research institutions demonstrating the benefits of leading-edge computing;
  - HPC vendors providing the technology and know-how; and
  - Top universities educating our next generation of computer scientists and HPC users.

Leadership

The HPC Advisory Committee is a Foundational Technology Working Group of the Technology Leadership and Strategy Initiative (TLSI) at the Council. The TLSI comprises industry's top CTOs, and technology leaders from academia and the national laboratories, and is itself a cross-cutting Initiative at the Council with ties into the other topic-focused initiatives such as the U.S. Manufacturing Competitiveness Initiative (USMCI). The leadership will provide strategic vision for the group, and direct ties to the TLSI efforts.

Meetings and Time Commitments

The HPC Advisory Committee will have one-day meetings twice a year. The meetings will be progressive and build on discussions from prior meetings, current events, and the hosting organization. Working groups with volunteer participation may form to continue moving efforts forward in between formal meetings.

Membership

Membership in the HPC Advisory Committee is by invitation only, with financial support. TLSI members are invited to attend meetings. Members may substitute representatives from their organizations to attend meetings on their behalf in the event of a conflict.

NDEMC Talk

Compete.

National Digital Engineering and Manufacturing Consortium (NDEMC)

Cynthia R. McIntyre, Ph.D.
Senior Vice President
Council on Competitiveness

J. Robert Neely
Computer Scientist In-residence
Lawrence Livermore National Laboratory
Council on Competitiveness

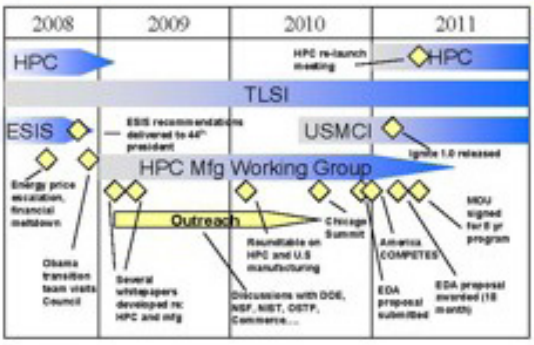
Council Mission

The Council on Competitiveness is the only group of corporate CEOs, university presidents and labor leaders committed to:

- future prosperity of all Americans
- enhanced U.S. global competitiveness
- creation of high-value economic activity in the United States.

Midwest Project for SME-OEM Use of Modeling and Simulation

Timeline



Midwest Project for SME-OEM Use of Modeling and Simulation

HPC & US Manufacturing Working Group

- Keven Hofstetter
  - Caterpillar
- Richard Arthur
  - General Electric
- Tom Lange
  - The Proctor & Gamble Company
- Paul Fussell
  - Boeing
- Don Lamb
  - University of Chicago
- Merle Giles
  - NCSA

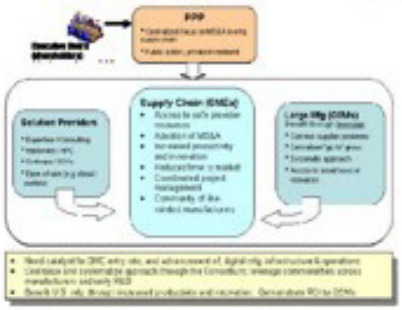
Midwest Project for SME-OEM Use of Modeling and Simulation

Midwest Project for SME – OEM Use of Modeling and Simulation

- **Goal: Improve SME competitiveness & innovation through modeling, simulation, and analytics (MS&A)**
  - Improved product **quality**
  - Better **customization** of products
  - Enhanced **workforce** technical skills
  - Job retention and **growth**
- Start with Midwest
  - Extensive manufacturing base (OEMs, SMEs)
  - Economic impact
  - Leverage universities, state HPC centers, manufacturing resources
  - **M**anufacturing **E**xtension **P**artnership in Midwest

The National Digital Engineering and Manufacturing Consortium (NDEMC) focuses on enabling SME's

- Lowers barriers
- Enables collaboration
- Demonstrates USG commitment to process



Phase I gets modeling expertise into the field

- Teams of experts provide **specialized training** in MS&A
  - **Deployed** to SME sites for personalized training
  - **Based** at institutions with manufacturing expertise

- On-line manufacturing **portal** for computation
  - Access to **broad** base of expertise
  - On-line interactive professional **education**
  - Cloud-based computing **resources**
  - Easy web-based **access** to engineering and manufacturing software

Deployed field trainers will be key toward ensuring these two thrusts complement, and are informed by, each other

NDEMC is designed to accommodate the broad MS&A needs of SMEs

- **Common issues / leveraging**
  - SMEs can **share** solutions and influence 3rd party development
  - Domain application portals **simplify** usage of codes
  - Needs served by **existing** commercial codes and readily available hardware resources

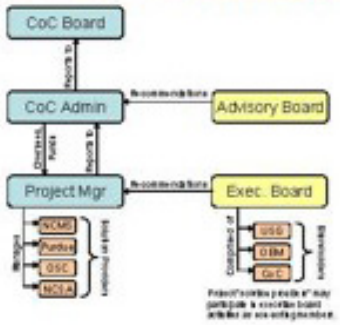
VS.

- **Highly customized needs and requirements**
  - SMEs require **specialized** capabilities not currently available in commercial software
  - **Collaboration** with external R&D may be needed (universities and/or national laboratories)
- **In both cases, *community promotes efficiency***

Benefits of NDEMC

- **OEMs**
  - Increased collaboration with supply chain
  - More innovative, integrated, and efficient supply chain
  - Access to large community of MS&A/HPC expertise and influence
- **Solution Providers**
  - Increased market penetration of products
  - First-hand access to requirements for product development roadmaps
- **SMEs**
  - Reduced time to market
  - Enhanced throughput
  - Reduced waste
  - Increased safety and sustainability
  - Reveals critical information to inform decision-making
- **U.S. Government**
  - Highly skilled U.S. workforce
  - Increased global competitiveness

The Proposed Governance Model provides outside recommendations, and internal oversight



Budget Overview

- **Contributions (to date)**
- **EDA**
  - **$2.02M grant**
- **OEM**
  - **$1.15M cash**
  - **$750k in-kind**
- **Ohio**
  - **$500k capital**
  - **$442k in-kind***
- **Purdue**
  - **$90k in-kind**

~$1.5M	6 field trainers (personnel, salary, training, travel…)
~$1.25M	additional staff (portal dev, local mgmt, secretariat)
$623k	OEM in-kind staff
$600k	dedicated cluster
$390k	project manager (18 mo, $150k base)
$230k	certification development
$90k	Meetings/workshops
$93k	Travel (sol'n partners)
$84k	Publications, marketing
$65k	OEM software contrib
$28k	laptops / desktops
$25k	web presence (int/ext)
$11k	discretionary
TOTAL:	$4,957,411

Not explicitly budgeted:
Application portal / cloud services

Organizations Committed to Midwest Project

- **OEMs**
  - The Procter & Gamble Company
  - Lockheed Martin
  - General Electric
  - Deere & Co.
- **Solution Partners**
  - Ohio Supercomputer Center
  - National Center for Supercomputing Applications (U. of Illinois)
  - Purdue University
  - National Center for Manufacturing Sciences
  - Council on Competitiveness
- **State Governments**
  - State of Ohio
- **Federal Government**
  - Dept of Commerce (EDA)
- **Other MOU signees**
  - DOE
  - NIST
  - NASA
  - OSTP

Formal Announcement of Consortium by White House on March 2, 2011

- **MOU Signing at White House Conference Center**
  - Corresponding announcement of EDA grant
  - http://www.eda.gov/NewsEvents/PressReleases/20110302_CouncilonComp.xml
- **Official start of project in April**
  - Planning underway now

Contact the Council HPC Team

Cynthia McIntyre, Senior VP

cmcintyre@compete.org

Rob Neely (LLNL), Computer Scientist In-Residence

rneely@compete.org

1500 K Street, NW, Suite 650

Washington, D.C. 20005

202-662-4292 (phone)

202-662-3150 (fax)

See: http://www.compete.org/hpc/

for more information and access to all our HPC publications

NDEMC Press Release

Council on Competitiveness Awarded EDA Grant to Support Small to Medium-Sized Manufacturers

Council Creates Public-Private Partnership to Make Small Businesses More Competitive Through Game Changing Technology

March 04, 2011

The U.S. Department of Commerce announced a $2 million grant to the Council on Competitiveness today to create a public-private partnership that will help small and medium sized manufacturers in the Midwest compete in the global economy through the use of "game changing" modeling and simulation technology. The announcement was made by Assistant Secretary of Commerce for Economic Development John Fernandez following a meeting with small businesses and manufacturing leaders at the White House.

The grant from the Commerce Department's Economic Development Administration is being matched by $2.5 million in private sector funding from General Electric, John Deere, Lockheed Martin, Procter & Gamble and Purdue University. The partnership will launch the National Digital Engineering and Manufacturing Consortium (NDEMC), a national public-private initiative that will focus on educating and training small to medium-sized businesses on modeling and simulation technology.

"This pilot project exemplifies the potential for public-private partnerships to play a pivotal role in the growth of the U.S. economy. Through this investment, the Administration is joining with the private sector in recognizing the importance of modeling and simulation to the competitiveness of our small businesses and the health of our manufacturing base," said Council president & CEO Deborah Wince-Smith.

The goals of the project are to lower the barriers for small and medium-sized manufacturers for adopting modeling and simulation and high performance computing for purposes of increasing their design and innovation capacity, shortening time-to-market for products, manufacturing safer products, and increasing quality while lowering costs.

The National Digital Engineering and Manufacturing Consortium is being coordinated by the Council on Competitiveness in collaboration with the National Center for Manufacturing Sciences, Inc., the National Center for Supercomputing Applications in Illinois, and the Ohio Supercomputing Center. In addition to the U.S. Department of Commerce, interagency partners include the Departments of Defense and Energy, NASA, the National Science Foundation, and the Small Business Administration.

Council on Competitiveness
1500 K Street, NW, Suite 850, Washington, D.C. 20005 T 202 682 4292
Compete.org