NOTES:
BUILDING THE IESP ROADMAP

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Purpose

- The IESP software roadmap is a planning instrument designed to enable the international HPC community to improve, coordinate and leverage their collective investments and development efforts.

- After we determine what needs to be accomplished, our task will be to construct the organizational structures suitable to accomplish the work

Key Trends

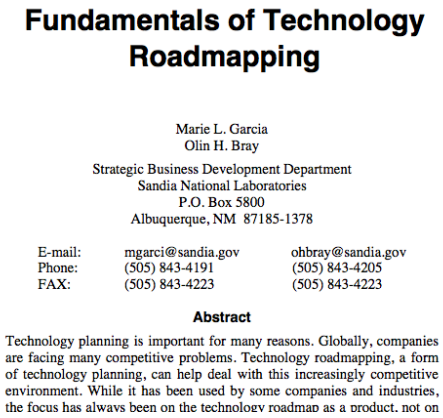
- Increasing Concurrency
- Reliability Challenging
- Power dominating designs
- Heterogeneity in a node
- I/O and Memory: ratios and breakthroughs

Requirements on X-Stack

- Programming models, applications, and tools must address concurrency
- Software and tools must manage power directly
- Software must be resilient
- Software must address change to heterogeneous nodes
- Software must be optimized for new Memory ratios and need to solve parallel I/O bottleneck

Four Goals for IESP

- **Strategy for determining requirements**
  - clarity in scope is the issue
- **Comprehensive software roadmap**
  - goals, challenges, barriers and options
- **Resource estimate and schedule**
  - scale and risk relative to hardware and applications
- **A governance and project coordination model**
  - Is the community ready for a project of this scale, complexity and importance?
  - Can we be trusted to pull this off?



Fundamentals of Technology Roadmapping

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Abstract

Technology planning is important for many reasons. Globally, companies are facing many competitive problems. Technology roadmapping, a form of technology planning, can help deal with this increasingly competitive environment. While it has been used by some companies and industries, the focus has always been on the technology roadmap as a product, not on

Goals for IESP

- **Develop a comprehensive community software roadmap for Exascale systems**
  - Identify those software capabilities that will be needed for fully functional exascale systems, what are the barriers and how can we overcome them
  - Determine which elements will occur naturally and which elements need R+D investment
  - Determine those components that have solid starting points and which that need *ab initio* efforts
  - Determine which components are suitable for an open community development model

Goals for IESP

- **Develop an estimate of the resources required and timeline needed to develop the required software**
  - Need to put the software element of exascale in appropriate budget and schedule context
  - Need to understand the risks (technical, schedule and organizational)
  - Need to distinguish between the applications software efforts and the systems software
  - The software timeline should be aligned with that of the hardware (and precede it where possible)

Priority Research Direction (one for each component)

Key challenges	Summary of research direction
Brief overview of the barriers and gaps	**What will you do to address the challenges?**

Potential impact on software component	Potential impact on usability, capability, and breadth of community
What capabilities will result? **What new methods and components will be developed?**	**How will this impact the range of applications that may benefit from exascale systems?** **What's the timescale in which that impact may be felt?**

4.x <component>

- Technology drivers
- Alternative R&D strategies
- Recommended research agenda
- Cross-cutting considerations

Roadmap Components

Co-Design Vehicles

- Requirements:
  - Terascale today. Demonstrated need for exascale
  - Can achieve significant scientific impact in an important area such as climate, eng., lifesci, materials, physics
  - A realistic and productive development pathway to exascale can be mapped out over 10 years
  - Community has demonstrated experience in algorithm, software and/or hardware developments and willing to engage in the exascale co-design process

Next Steps

- Revise and extend initial draft
- Build management and collaboration plans
- Work with funding agencies to plan research activities
- Next workshop in the spring