

# Overview of Capability Transfer

David E. Bernholdt, ORNL

with...

Jay Billings, ORNL

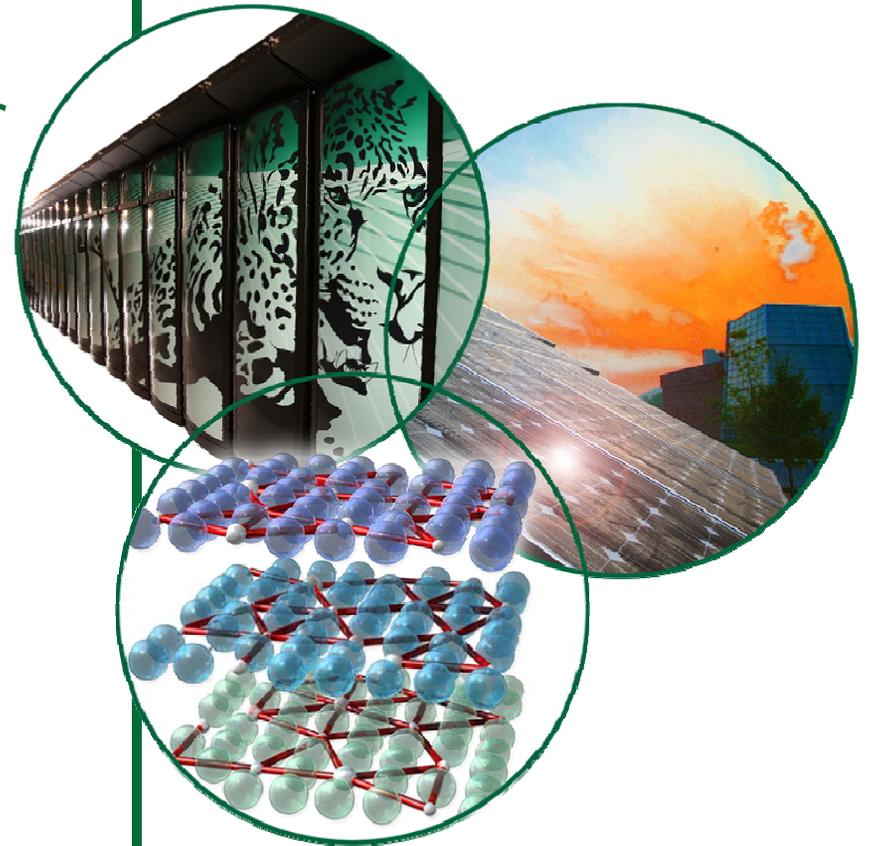
John Hetrick, IBM

Alex McCaskey, UTK

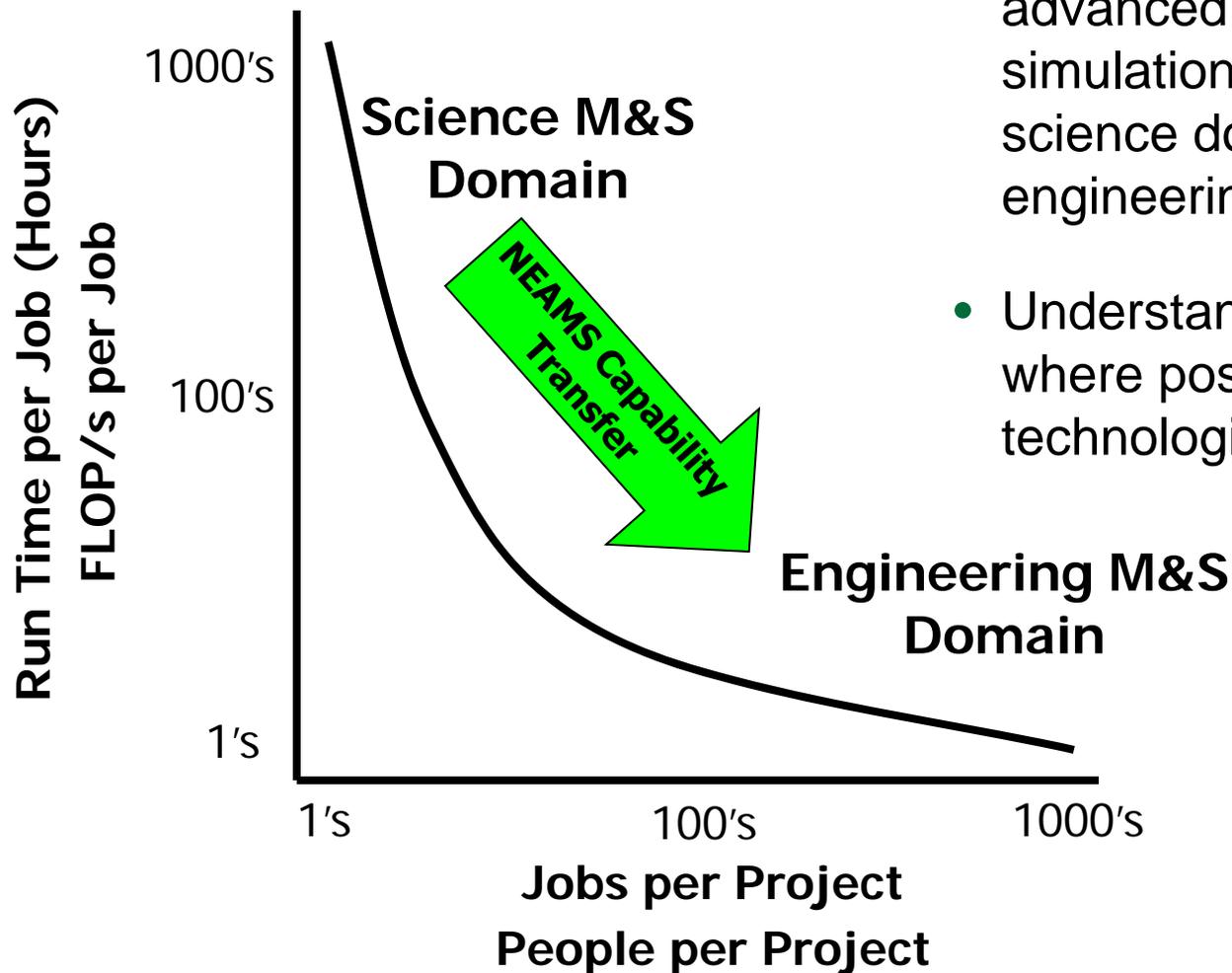
Adrian Sanchez, UTK

Jess Gehin, ORNL

Gil Weigand, ORNL



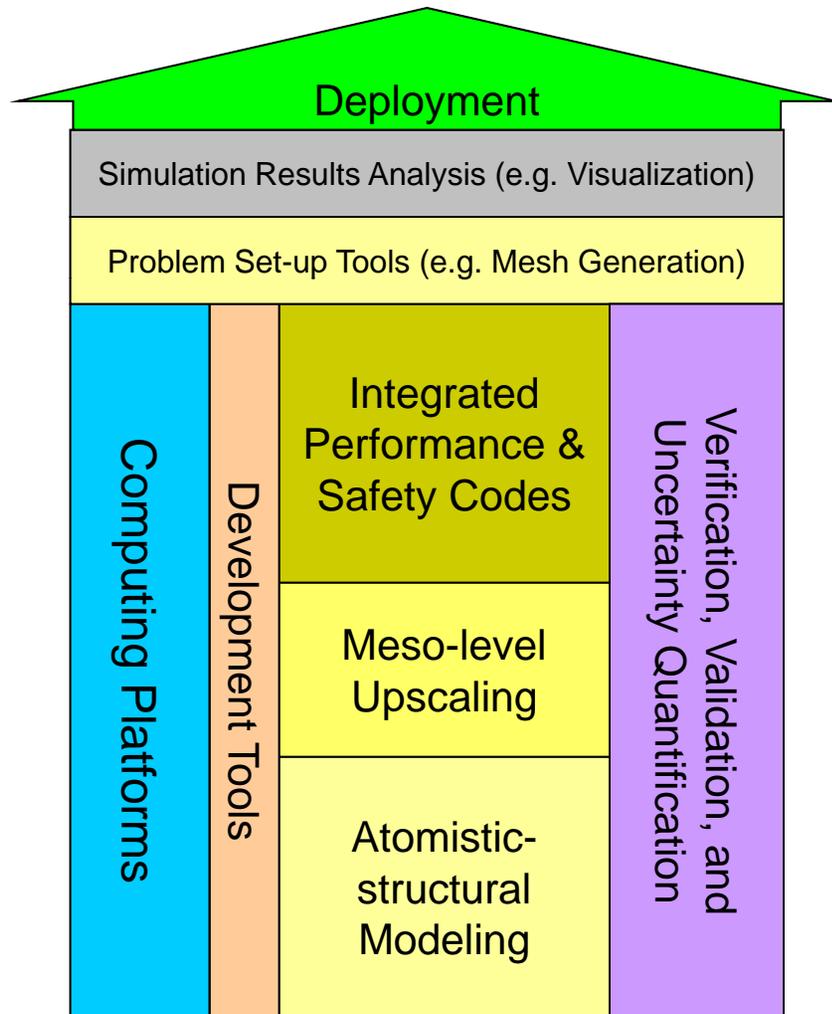
# Scope



- Enable the efficient transfer of advanced modeling and simulation capabilities from the science domain to the industry engineering domain
- Understand the roadblocks and where possible provide technologies to overcome them

# NEAMS Users

## Users



- Research and Development
  - To make discoveries and obtain insight into the physical behavior of nuclear energy technologies (e.g. reactors, fuels, waste)
- Technology Designers
  - To conduct design studies for new nuclear energy technologies to understand performance, safety, and cost with the potential of a design of a system submitted for licensing.
- Regulators
  - To evaluate submitted designs and supporting analysis to determine if the technologies will meet the requirements to protect human health and the environment
- Utilities & Operators
  - To understand and optimize the operations of nuclear energy technologies

# Current State of Capability Transfer in Nuclear M&S

- Ad Hoc
  - Slow
  - Relies on serendipity
- Underfunded for years
- Legal Issues
  - Intellectual Property
  - Export Control
  - Licensing
- Limited (in many cases “no”) abilities that allow easy integration of existing and newly developed modeling and simulation capabilities

# A Vision for Capability Transfer

- Initial focus on technological (software) aspects to help make NEAMS software more readily transferrable
  - A unified “computational environment” for nuclear modeling & simulation: common suite of tools for model creation, job setup & execution, user “workflow”
  - Software architecture and development processes to promote modularity, composability, and reusability
  - Help identify and abstract common functionality across program elements to promote interoperability and reuse
  - *Carried out in close collaboration with ECT*
- Transitioning to an emphasis on user outreach & actual technology transfer
  - Helping IPSCs collect and track user requirements
  - Helping IPSCs demonstrate capabilities through Challenge Problems
  - Organizing and providing training, “level 1” support

# Realigning CT and ECT: The Transition Years (FY10-FY11)

- CT and ECT both have an interest in common software infrastructure, “framework”, user interfaces, etc.
  - CT focuses on integration across NEAMS code developments, user-facing aspects
  - ECT focuses on software quality, technology needs of code teams, computer resources for development
  - Origins are historical
  - Completely collaborative, *no duplication of effort*
  - *But hard for others to understand*
- CT software infrastructure activities are being moved to ECT
- CT shifting focus to more “traditional” technology transfer
  - FY10 reorganization of NE (creation of AMSO) and Hub competition clouded the “user” landscape for a while
  - Will develop CT roadmap in FY11

# Desired Attributes of NEAMS Software Products: CT's View

- Standardized interfaces for common capabilities
- Integration of
  - Research and development modules
  - Existing modules
  - Proprietary modules
  - Modules under export control
- Common modules
  - Setup and results analysis
  - Open source engineering, physics and chemistry modules
  - Libraries, solvers and databases
  - Non-proprietary material properties
- Support for developers and users
  - Documentation
  - Technical support commercially available

# FY10 Activities: Ongoing Technological Development for Capability Transfer (1/2)

- **Technology transfer brainstorming and information gathering**
  - **David Bernholdt, Jess Gehin, Gil Weigand**
  - In preparation for FY11 roadmap development activities
  - Initial discussions with all four IPSCs
- **Software architecture, design and development process consultation**
  - **Jay Billings, John Hetrick**
  - Fuels IPSC (FY09+), Safeguards & Separations IPSC (FY10+)
  - Assisting Fuels IPSC in improving development processes
  - SafeSeps design workshop, leading Fuels lessons learned analysis
  - Identified key abstractions to simplify design of Reprocessing Plant Toolkit (SafeSeps)
  - *Continues under ECT in FY11*

# FY10 Activities: Ongoing Technological Development for Capability Transfer (2/2)

- **NEAMS Integrated Computational Environment (NiCE)**

- *Talk to follow*
- **Jay Billings, John Hetrick, Alex McCaskey, Adrian Sanchez**
- Fuels IPSC (FY09+), *basic* requirements from all four IPSCs
- Remote launch of AMP on supercomputers
  - Larry Ott: “When can I have it?”
- Prototypes for model setup work flows, starting on analysis work flows, improving user interface
- *Continues under ECT in FY11*

# CT Session Organization

- Overview of Capability Transfer, David Bernholdt
- An Update on the NEAMS Integrated Computational Environment, Jay Billings
  - Q&A
- Looking Ahead: Plans for FY11 (and Beyond), David Bernholdt
  - Q&A

*Also...*

- Short “birds of a feather” session for potential “NEAMS users”
  - During lunch, after you’ve had a chance to eat
  - Meet in Lobby