



U.S. DEPARTMENT OF
ENERGY

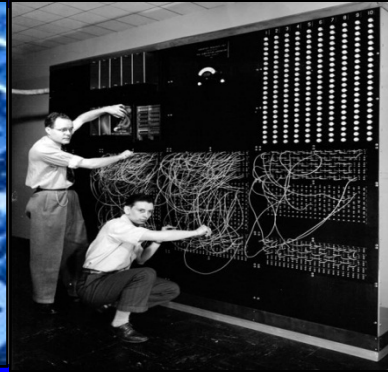
Office of
Science



Parallelism



Data Movement



Programmability



Resiliency

X-Stack PI and Coordination Meeting

Sonia R. Sachs
March 20, 2013



U.S. DEPARTMENT OF
ENERGY

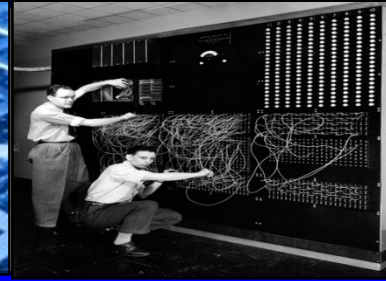
Office of
Science



Parallelism



Data Movement



Programmability



Resiliency

Organizing Committee

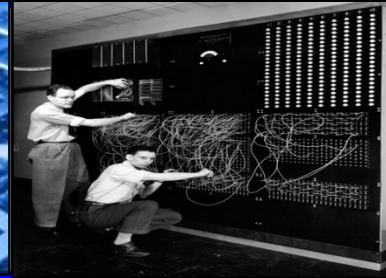
- Saman Amarasinghe
- Shekhar Borkar
- Richard Lethin
- Vivek Sarkar
- Kathy Yelick
- Andrew Chien
- Dan Quinlan



Parallelism



Data Movement



Programmability



Resiliency

Acknowledgements

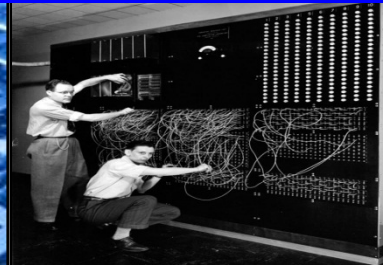
- LBNL for hosting our meeting
 - Special thanks to Kathy Yelick
- LBNL support staff for meeting logistics
 - Special thanks to Tara White
- Organizing Committee
- X-Stack PIs for all meeting materials



Parallelism



Data Movement



Programmability



Resiliency

Meeting Goals

- Review X-Stack Portfolio
- Review X-Stack Coordination
 - FOA 255-257 X-Stack (partial)
 - Execution Models
 - Evolving MPI to Exascale
 - Computing Architecture Laboratory (CAL) and
 - Beyond Simulation and Modeling (BSM)
- Understanding the extended X-Stack puzzle
- Revise Vision of X-Stack



U.S. DEPARTMENT OF
ENERGY

Office of
Science

X-Stack Portfolio



DEGAS (Kathy Yelick)

Hierarchical and resilient programming models, compilers and runtime support.



Traleika (Shekhar Borkar)

Exascale programming system, execution model and runtime, applications, and architecture explorations, with open and shared simulation infrastructure.



D-TEC (Dan Quinlan)

Complete software stack solution, from DSLs to compilers to optimized runtime systems.



XPRESS (Ron Brightwell)

Software architecture and interfaces that exploit the ParalleX execution model, prototyping several of its key components.



DynAX (Rishi Khan)

Novel programming models, dynamic adaptive execution models and runtime systems.



X-Tune (Mary Hall)

Unified autotuning framework that integrates programmer-directed and compiler-directed autotuning.

The University of Chicago



GVR (Andrew Chien)

Global view data model for architecture support for resilience.



CORVETTE (Koushik Sen)

Automated bug finding methods to eliminate non-determinism in program execution and to make concurrency bugs and floating point behavior reproducible.



SLEEC (Milind Kulkarni)

Semantics-aware, extensible optimizing compiler that treats compilation as an optimization problem.

SC12 November 15, 2012

Coordinating Projects

D-TEC: LLNL and MIT

Traleika Glacier: Intel

DEGAS: LBNL

XPRESS: Sandia

DAX (ETI):

Autotunig: U. Utah

GVR: U. Chicago

SLEEC: Purdue

CORVETTE: UCB

Co-Design Centers



CoDEX

DMD

Blackcomb

Thrifty

FOX

ExM

Virtualize

Auto-tuning

Synthesis

ZettaBricks

VAncouver

Execution Models

CAL

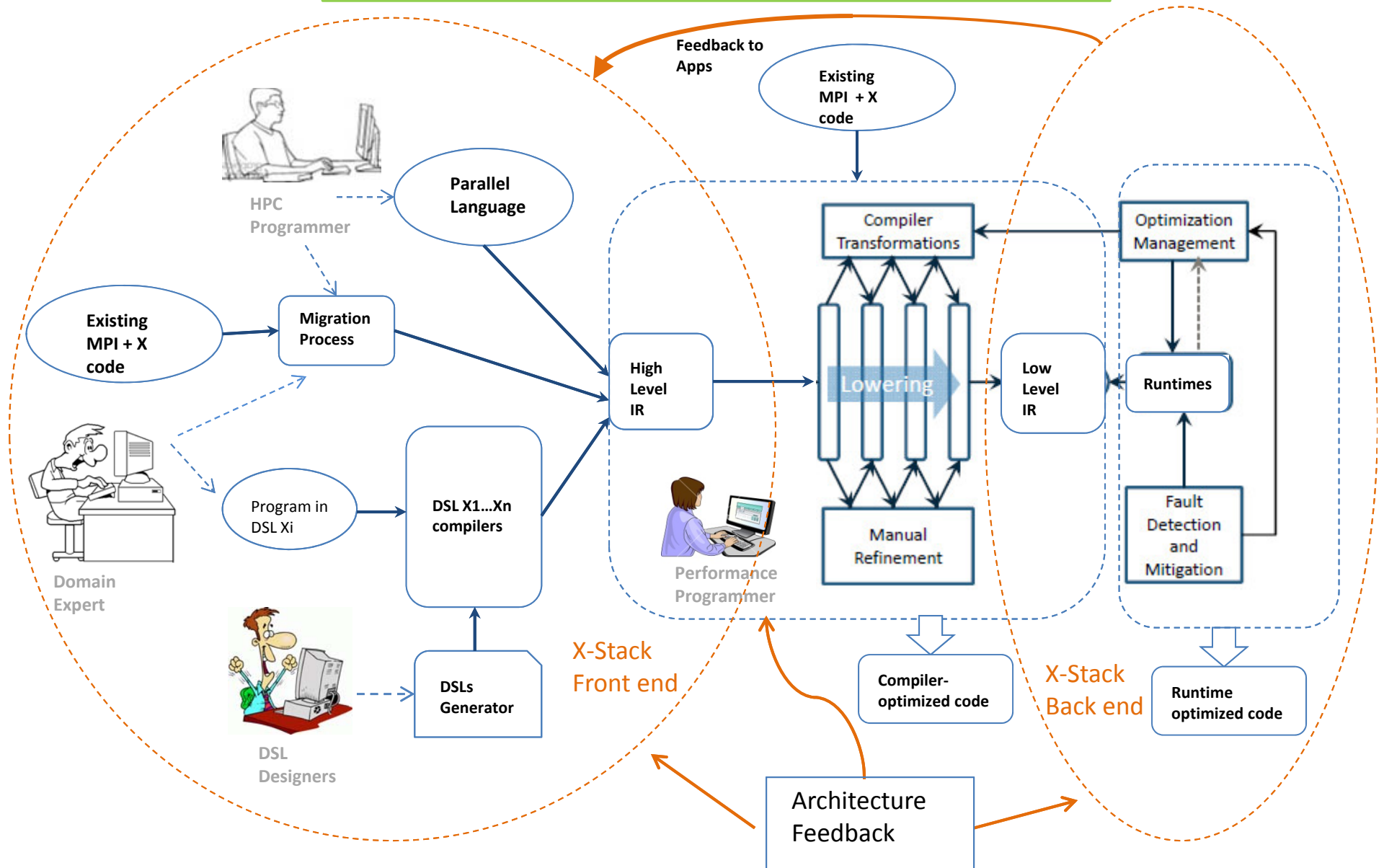
Exascale MPI

Fast Forward

BSM

X-Stack: Vision in Progress

Energy Efficiency, Resilience, Programmability, Scalability,
Performance Portability, Interoperability





X-Stack Software Vision

Aligned with the Exascale Research Initiative

- ECI Goals: Deploy exascale computers:
 - 500 to 1,000 more **performance** than today's HPC systems
 - Under **20MW** Power
 - Highly **programmable**
- ECI Strategy:
 - Conduct critical R&D efforts.
 - Develop exascale software stacks.
 - Fund computer technology vendors
 - Fund the design and development of exascale computer systems.
 - **Joint effort with NNSA.**
 - Collaboration with other government agencies and other countries.

