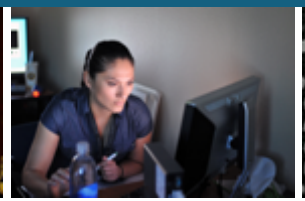
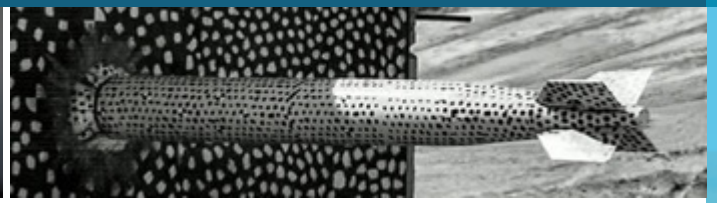
SAND2021-1902C

Sandia National Laboratories

Performance Portability in Sandia Mission Applications and Kokkos Ecosystem Updates





JOWOG34-ACS, February 22, 2021

Jonathan Hu

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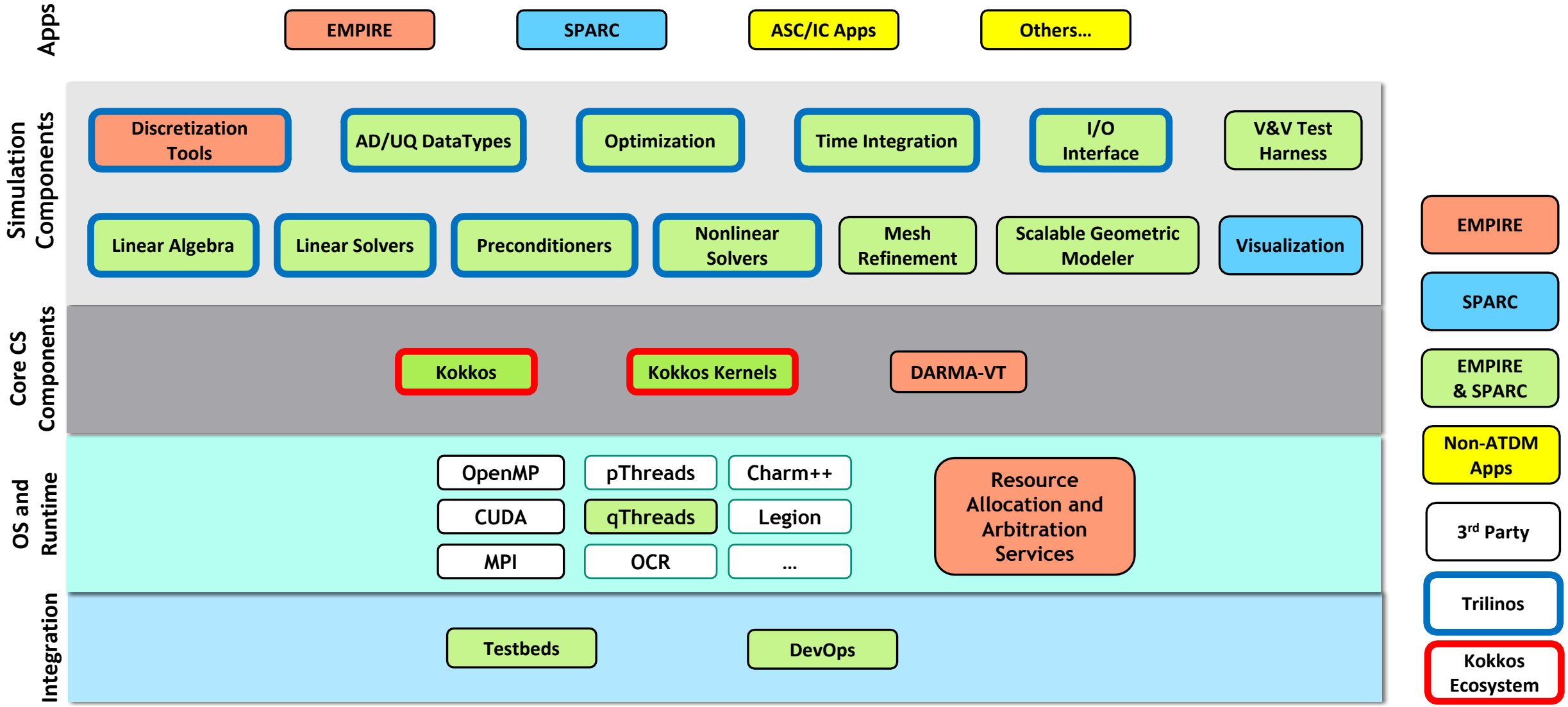
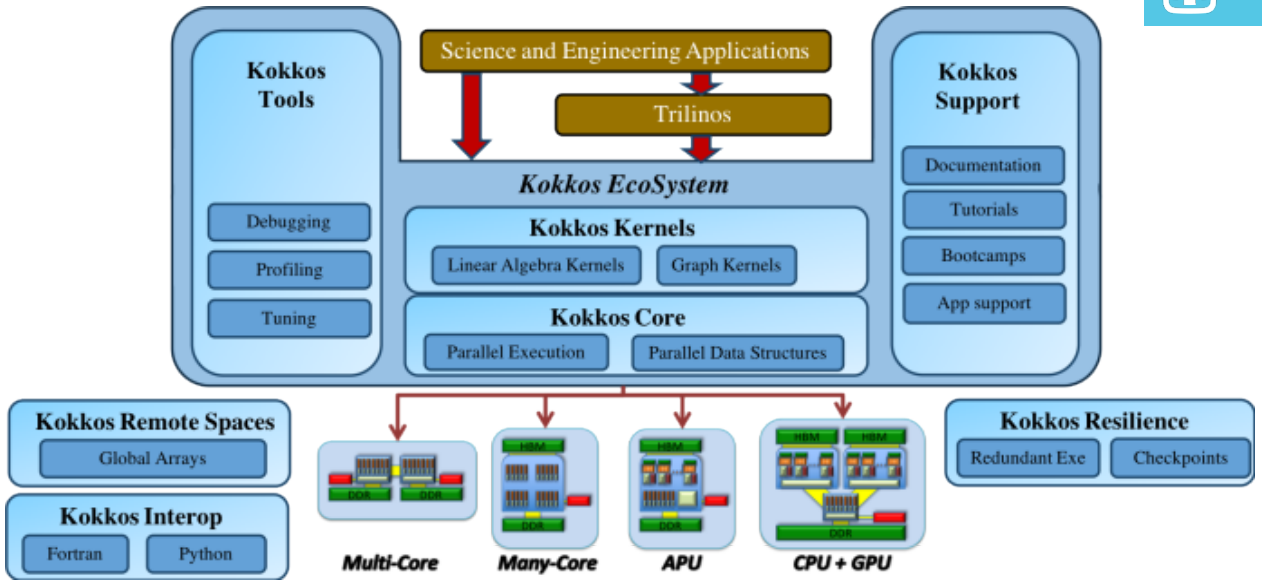
Sandia's Component Strategy



Kokkos Ecosystem

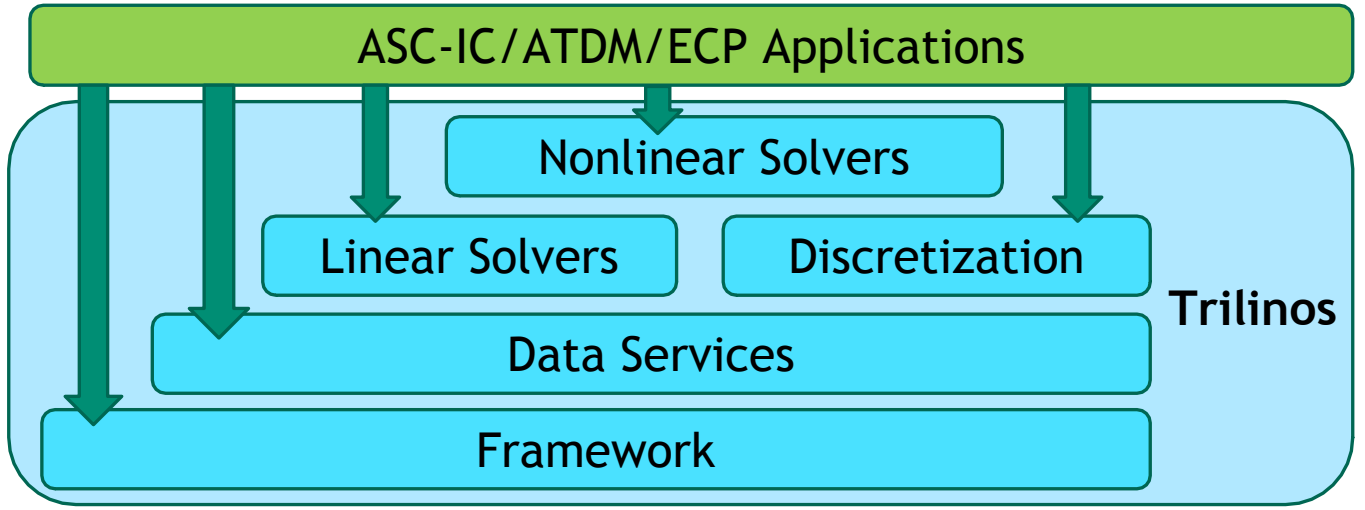
- **Kokkos Ecosystem underpins Sandia strategy for performance portability on Sierra supercomputer (ATS-2) and beyond**
  - 10+ year effort that has proved successful in many application codes.
  - For details, see 2020 JOWOG-34 presentation “Evolution of the Kokkos Ecosystem”, J. Miles et al.
- **Kokkos Ecosystem is critical for apps to run successfully on emerging AMD and Intel systems.**



Key enabling technology for Sandia mission apps to successfully exploit Sierra (ATS-2) and other GPU architectures (workstation and up)

Trilinos Components

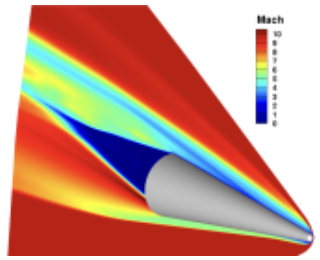
- **Trilinos project consists of many HPC numerical libraries**
  - Sparse linear algebra
  - Iterative and direct solvers and preconditioners
  - Load-balancing, mesh tools
  - Discretization, optimization, UQ
- **Trilinos libraries used widely on Sierra (ATS-2) and other HPC architectures**



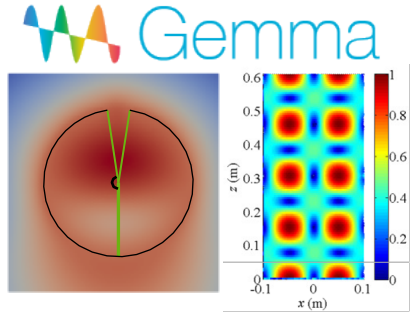
Trilinos leverages Kokkos Ecosystem for high performance share memory kernels and algorithms.

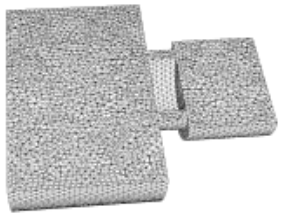
Session Focus: Application Experiences on GPU Architectures & Kokkos Roadmap

- **Application Talks**
  - "Performance Portability in EMPIRE" (M. Bettencourt)
  - "SPARC Portability Performance" (V. Brunini)
  - "Progress on Modernization of SIERRA Engineering Codes for Performance Portability" (M. Mosby)
  - "GEMMA: An Electromagnetic Code for Heterogeneous Computer Architectures" (B. Zinser)
  - "Delivering Mission Value with GPU Computing" (D. Ibanez)
  - "PLATO: Optimization-Based Design" (M. Aguiló)
- **Kokkos Ecosystem Talks**
  - "New and Future Capabilities for the Kokkos Programming Model" (D. Hollman)
  - "Kokkos Tools" (D. Poliakoff)



SPARC

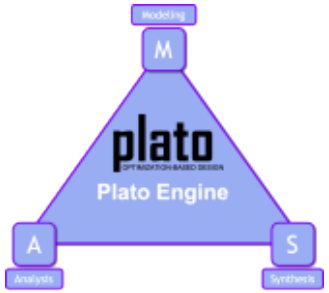




EMPIRE

SIERRA

LGR



Kokkos