Adoption of Less Synchronous Modes of Computation in Linear and Nonlinear Preconditioners

Amani AlOnazi
PhD student

Professor David Keyes
Director of ECRC

Extreme Computing Research Center, KAUST, Saudi Arabia
Big Picture: Asynchronous Model

- Scalable Solvers
  - ASPIN
  - AMG
- Hardware Constraints
  - Cores performance + count
  - Memory constraints
- Less synchronous parallel model
  - Hybridization
  - Asynchronous execution

- Avoiding message passing within node/socket
- Load balancing without explicit data movement and complex implementation
- Overlapping computation and communication
- Adapting to many-core emerging architecture

Performance Model → Implementation + Profiling → Experimental Results and Performance Analysis
Asynchronous AMG

Performance Model → Implementation + Profiling → Experimental Results and Performance Analysis
Thanks!

Special thanks:
- Hatem Ltaief
- Lulu Liu
- Stefano Zampini
- Lisandro Dalcin

Email: amani.alonazi@kaust.edu.sa