



Distributed Analyses with ICEE Framework

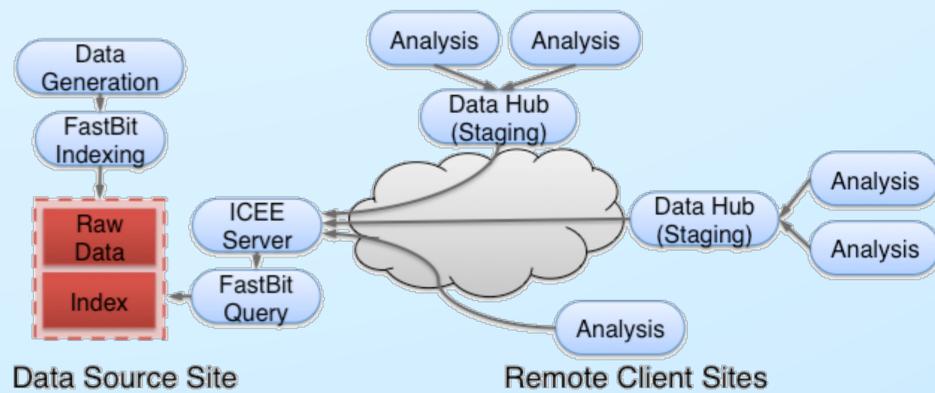
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Background

- Large-scale collaborations produce challenging distributed workflows
- Application example: Fusion
 - Both simulation and experiment are producing terabytes of data in a short period of time
 - Some analysis tasks require near-real-time feedback in order to adjust the next experimental settings
- Challenges
 - Analyses are spread over multiple continents, need to access data remotely
 - Need to reduce data movement to maintain response time
 - Need to accommodate a variety of data access clients, including mobile devices

ICEE Framework

- Integrating I/O system with workflows
 - To provide seamless end-to-end data access pipeline
 - To support stream-based scientific data process
- A plug-in for the Adaptable IO System (ADIOS)
- Provide a remote staging capability to couple remote analysis applications through a wide area network (WAN)
- Support flexible *ad hoc* workflow compositions and executions for scientific data analysis

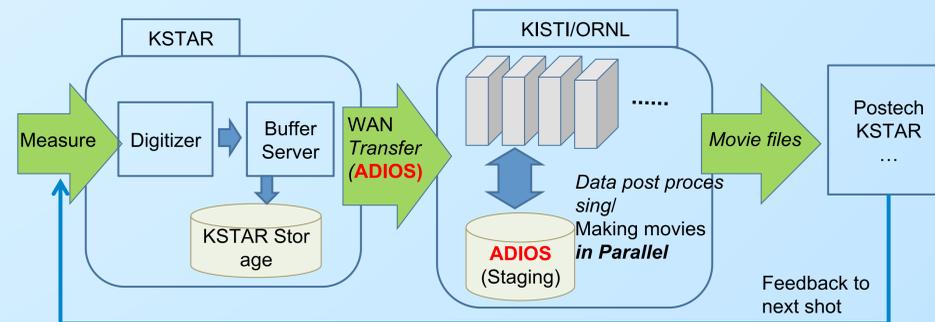
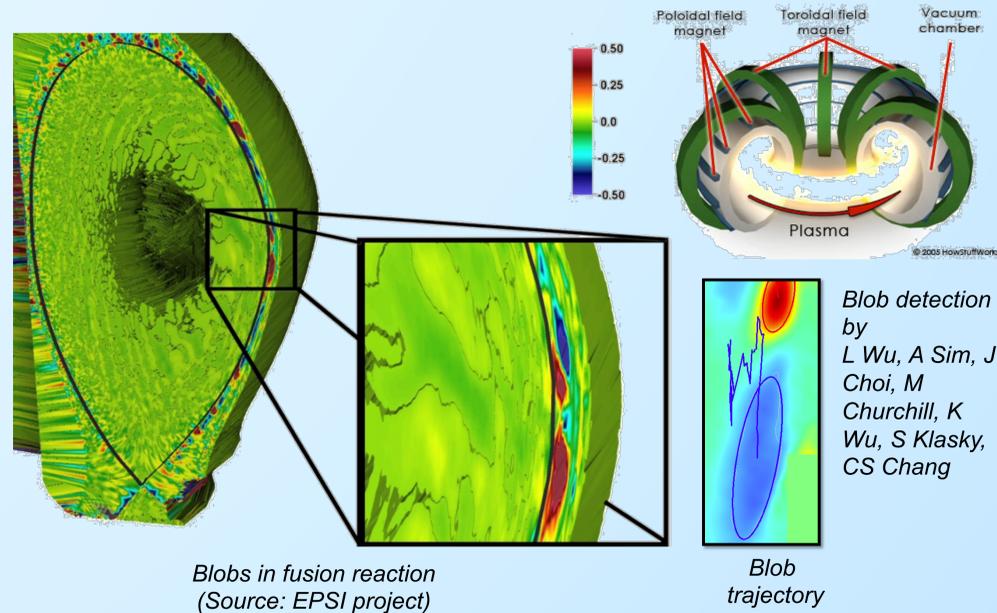


Application I: Fusion Blob Detection

What is a blob and why is it important?

- Tokamak demands steady-state plasma confinement, but blobs and other phenomenon disrupt confinement
- Blobs carry energy and plasma towards the wall
- Which removes heat, degrades plasma confinement, and damages the wall.

Three separate SC14 demos with different data sets: ECEI images, Gas Puff Images, XGC1 simulations

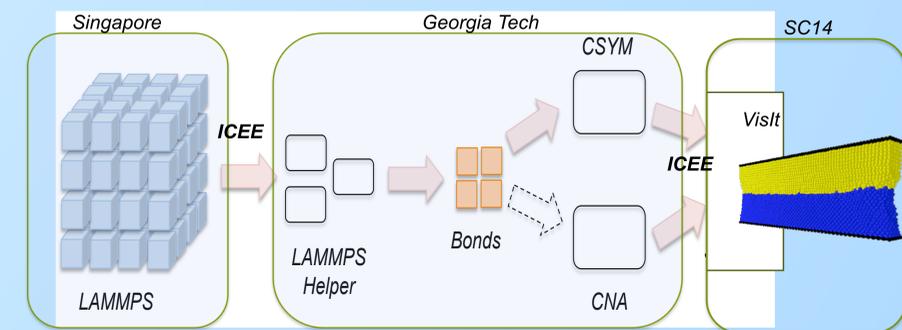
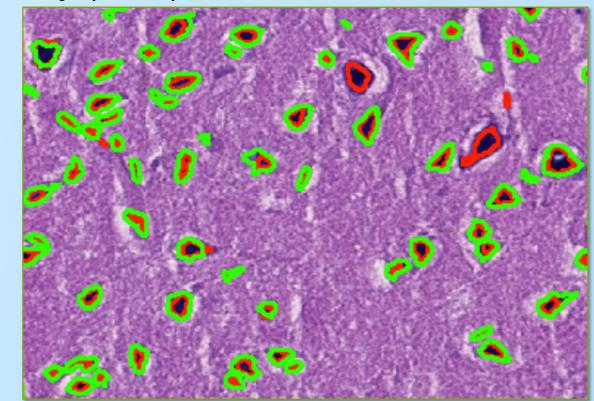


KSTAR demo provided by Eun-Kyu Byun and Soonwook Hwang, KISTI, Korea

Schematics of fusion applications with ICEE

Application II: Microscopy Image Analysis

- Understanding of disease morphology at micro-anatomic level to improve diagnoses
- Challenge: large images (up to 120Kx120K pixels) requiring extensive compute resources for analyses
- Distributed analysis with ICEE enables real-time analysis
- SC14 demo provided by Tahsin Kurc, Stony Brook University (SBU)



Application III: Design of Materials

- Simulation to illustrate the formation of microfractures
- Uses real-time analysis results to trigger computational steering
- SC14 demo provided by Matthew Wolf, Jai Dayal, and Greg Eisenhauer from Georgia Tech