Future Outlooks for Enabling Interactive Supercomputing Frameworks

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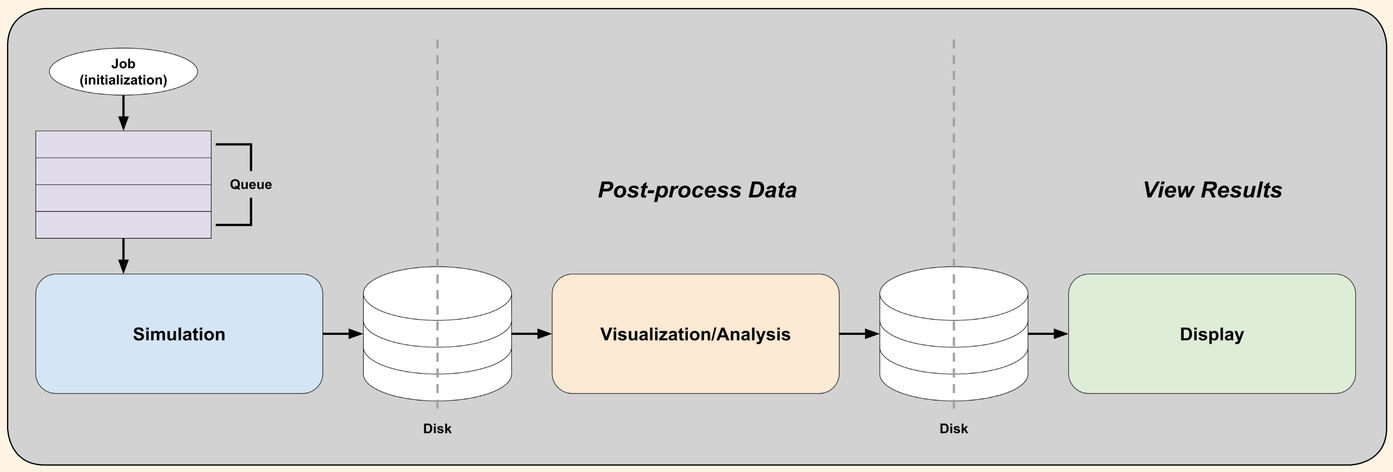
Basic Job Queue Paradigm

- Computational Simulation
  - Submit job
  - Wait in queue
  - Simulation runs to completion
  - Results saved to disk
- Post-processing of Data
  - Read data from disk
  - Analyze and visualize data
  - Save resulting images / video to disk
- Viewing the Results
  - Read images / video from disk
  - View and explore the results

Modify Parameters and Submit New Job

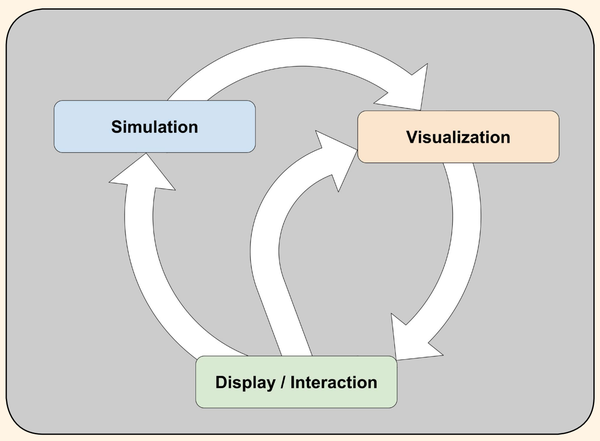


Interactive Paradigm

- In-situ Visualization/Analysis and Display/Interaction of Simulation
- Data streamed between services in real-time
- Feedback loop
  - Users view current state of the simulation
  - Users can update parameters of simulation or visualization
  - Simulation and visualization dynamically update based on user input

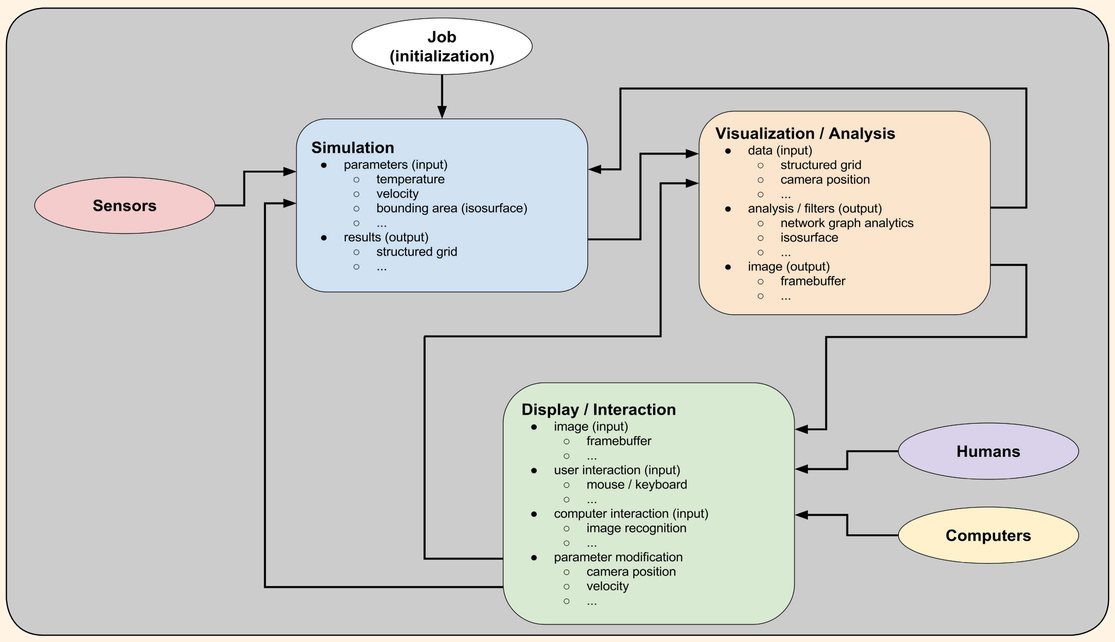
New Possibilities / Benefits

- Real-time analysis
- Reduced time-to-discovery
- Checkpointing and event logging for reproducibility
- Intuitive use (look and feel of a desktop application)
- Necessary for exascale



Interactive Data Flow

Connections between the various interactive supercomputing services. These services are not necessarily tied to physical computing resources.



Example Implementations

Argonne National Laboratory:

Mira: 786K nodes, 768 TB memory

Cooley: 252 GPUs, 48 TB memory

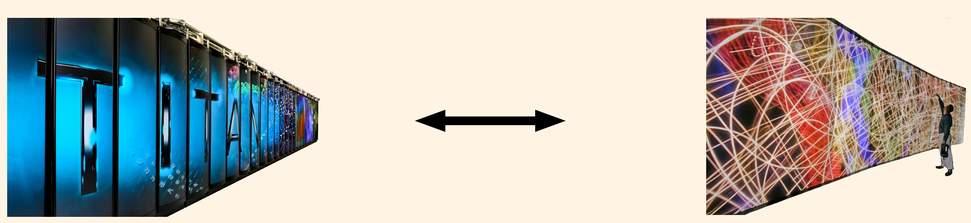
Active Mural: 8.19m x 2.31m, 66 Mpixel display

Simulation — Visualization/Analysis — Display/Interaction

Oak Ridge National Laboratory:

Titan: 299K nodes, 710 TB memory, 18K GPUs

EVEREST: 9.30m x 2.59m, 37 Mpixel display



Simulation & Visualization/Analysis — Display/Interaction

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