5 Steps to Stress-Free, Large-Scale Data Management

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1) Stop worrying about Flops

*build a balanced SC architecture*

- Current machines are designed to provide high Flop performance on benchmarks
- Overall performance for real apps is the important metric
- Need to consider storage and data transfer costs and design systems that provide a holistic solution

**ORNL HPSS storage size**

*Courtesy of Scott Klasky (ORNL)*

**BG/L**

- 65,536 nodes, 131,072 CPUs, 512MB ram, 367TFlops/sec
- 1,204 I/O nodes, 806Tb disk
2) Get the data where you need it

address data movement and integration issues

- It takes a significant amount of time to move data off of a SC
- Remote collaborations are hamstrung by data transfer capabilities
- Data integration still poses significant challenges
- Grid-like technology has promise but so far has not provided enhanced user capabilities

Need to pull together multi-modal information from distributed, heterogeneous sources
3) Figure out what data you care about

* create indices and query multi-modal data

- Simulation and experimental data is being acquired faster than we can process it

- Need to perform quick filtering to eliminate data that we know we don’t want to look at
4) Gain insight from your data

**perform multi-modal data analysis**

- Identifying most interesting information requires complex analysis
- Need automated and semi-automated tools to identify interesting information quickly
- Data comes in a wide variety of formats (simulations, text, images, sensors, GIS) and analysis techniques need to be useable on all of them
5) Automate record keeping

*use workflows, provenance, and metadata*

- Simulations and experiments generate tremendous amounts of data
- Need a way to automatically keep track of this information in a way that makes it retrievable
  - Where did a data set come from
  - What are the values of key parameters within it
  - How does this compare to other data sets

Fusion workflow courtesy of Bertram Ludaescher, UC Davis
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