

A More-Common Operating Environment

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Why are we here?

- “The purpose of the workshop is to explore the elements of a common operating environment.”
- “The goal is to help users solve problems, rather than perform fused multiply adds...”
- ***Near-term impact (1-2 years)***

Outside our immediate scope

- New programming models
- New programming languages
- Advanced runtime systems
- System-initiated checkpoint/restart
- New filesystems

User pain within our scope

- Where is *<software package>* installed? What version is it?
- How do I link to *<library>*?
- Where is my working directory?
- How much space do I have in my home directory? Working directory? Archive?
- When will my job run?
- Why isn't my job running?
- Why did my job fail?
- What's the maximum time limit on a job? Processor limit?
- How will resource requests affect my batch wait time?
- How do I debug interactively?
- How do I get decent turnaround on development runs?

Pain reliever: Intuition portability

- Many users access multiple supercomputing centers
- How portable is user intuition across centers?
- “Every center does things differently”
 - Different systems... or not
 - Different agencies... or not
 - Different user bases... or not

Diagnosis

- Operating environments are strongly affected by **minutia** of computer-center infrastructure
- High-level requirements are remarkably common across centers
- Minutia are all different!
- Centers don't share experiences at the minutia level
 - When decisions on minutia get made, a single center doesn't know the existing solutions
 - After the decisions are implemented, change is costly

Examples of “critical minutia”

- Method for linking to ScaLAPACK
- Garbage-collection algorithm for working directories
- Default quota on home and work directories
- Default memory limits on batch jobs
- Default resource limits for interactive jobs
- Paths to multiple versions of NetCDF
- Default number of OpenMP threads
- How default “include” paths are defined
- Regular system-maintenance times

Common Operating Environment

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Consistent Critical Minutia

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Intuition Portability

But how?

- Standards!

But how?

- Standards! Not.

But how?

- Establish best practices, consensus, culture
 - “Let’s use DoD’s environment-variable names.”
- **Use** Group?
 - Workshops on center-infrastructure design
 - Document good ideas
 - Mailing lists?
 - “Good Supercomputing” seal of approval?
 - “Howto” articles
- How is Linux/GNU culture established?

Vendors aren't off the hook

- Compiler configuration
- Batch systems
- ...

Compiler configuration

- Default paths for libraries, includes, modules
 - Well supported for vendor paths
 - Need same support for site-specific paths
- Automatic adjustment of paths based on compilation options
 - 32 vs. 64 bits
 - Threaded or not
 - “-g” or not

Batch systems

- Inadequate integration with parallel runtime and architecture-specific resources
- Slow to move from time-sharing to space-sharing paradigms
- “Every site implements different scheduling policies”
 - Not because they have different requirements!
 - Batch systems have the wrong knobs!
- Why can't we see the scheduler decision process?
- Why can't users get estimates on when jobs will run?
- Why is this so hard?

WITSH hunt

- **Why Is This So Hard?**
- Batch systems
- Build scripts for scientific applications
- Regressions tests
- Source-code revision control
- Parallel I/O
- Avoiding the impending fob epidemic

Summary

- Improving the consistency of the critical minutia of supercomputer centers could significantly improve the portability of user intuition.
- A Use Group could be the vehicle for such consistency improvement.
- Investments pay off in 1-2 years.

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