

# ASC Software Sustainability Survey

December 2022 Data Summary



- **Thank you** for providing spreadsheets and information
  - This is a huge part of us trying to get data-driven in how we approach a software sustainability plan for ASC (and contribute to broader DOE, ASCR)
  - We understand this is a lot of work
- We received approx. 50 spreadsheets and information on almost an extra 100 software packages
  - Not all are included in this initial data collection (several packages are on list but have no listed users)
- Broad range in how packages were rated for criticality
  - Reflects expected distribution of software risks/software use across ASC

- HQ has tried to group packages into categories
  - Mainly to help break up process into more manageable chunks
  - Helps parts of our community see the results in their sphere of development/use
- Packages in each category are laid out on a **risk-impact vs risk-likelihood** scale
  - **Risk-impact** is driven by level of criticality states for packages and number of times packages appear in each criticality level (higher criticality and higher frequency increases the risk-impact level).
  - **Risk-likelihood** is driven by a more subjective assessment of whether functionality can be found elsewhere (even if work is required to use alternative), whether there are vendor/industry or community equivalents and how ASC/HPC-specific packages are in their development/use.
- This is **not** a fully quantitative metric and needs review by ASC community
  - Please help provide constructive feedback to the risk assessments included in this presentation. What are we missing? Miscapturing? What did we get wrong?

- Placement on risk matrices is not an indication of potential funding status or decisions about project importance
  - ASC wants a healthy range of projects at all risk levels and TRLs
  - Not an assessment on software quality or developers
- Risk assessments are placed before ASC, ECP, or ASCR project funding levels are considered
  - i.e. in project management they are pre-residual (in the absence of funding levels etc., how much risk do we have in specific packages?)
- Need to understand where packages will be placed by DOE/SC facilities and ASCR equivalent exercises (on-going)

# Product Categories

INNOVATE. COLLABORATE. DELIVER.

- Solver Libraries
- Compilers, Runtimes and Programming Languages
- IO, Storage and Data Management
- Visualization and Analysis
- Build, Development and Software Engineering Tools
- System Imaging, Resource Monitoring and Management
- Math, Meshing, Discretization & Decomposition
- Miscellaneous

# Risk Assessments





# Solver Libraries

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		Impact of not having software product/tool/library available			
		Very High	High	Medium	Low
Likelihood of Risk	Very High	Trilinos, HYPRE, MFEM Solvers			
	High	Kokkos Kernels, SUNDIALS, SuperLU, Zoltan/Zoltan2	Krino	ForTrilinos, PETSc, ROL, SuperLU-Dist	
	Medium			MAGMA, SparsePack, SPARSKIT, SuiteSparse	
	Low	BLAS, LAPACK, FFTW		EIGEN, ARPACK, NumPy, SciPy, PyMatLib	PARDISO, STRUMPACK

# IO, Storage and Data Management

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		Impact of not having software product/tool/library available			
		Very High	High	Medium	Low
Likelihood of Risk	Very High	HDF5/Parallel-HDF5			
	High	NetCDF, pNetCDF, SEACAS		UnifyFS	ZFP
	Medium		HPSS, MarFS, SILO, Exodus, yamlcpp	GUFi, HIO, SCR, Sina/Kosh	
	Low		CGNS, libz	DB2, Matio	ADIOS, szip/AEC



# Compilers, Runtimes and Languages

INNOVATE. COLLABORATE. DELIVER.

		Impact of not having software product/tool/library available			
		Very High	High	Medium	Low
Likelihood of Risk	Very High	Kokkos, RAJA Suite, FleCSI		Flang	
	High		MPICH, OpenMPI, Legion	PyKokkos	Kokkos Remote Memory Spaces
	Medium	Fortran, MPI			
	Low	C, C++, GCC, HIP, CUDA, Python, OpenMP	Intel Compiler Suite, LLVM, Perl, PyTorch, TensorFlow, Boost	Intel MPI, Sandia OpenSHMEM	HPX, OpenACC, ROSE, CLACC

# Build, Development and Software Eng.

INNOVATE. COLLABORATE. DELIVER.

		Impact of not having software product/tool/library available			
		Very High	High	Medium	Low
Likelihood of Risk	Very High		Spack		
	High		BLT, PAPI	Caliper, SPOT, Kokkos Tools	
	Medium	CMake, Ninja	TotalView, Allinea Forge	CDash, STAT, TAU	Archer
	Low	Autoconf/Automake, gdb, git, Gitlab, git-lfs, Valgrind		Cray PerfTools, GoogleTest, Intel VTune	HPCToolkit

# Math, Meshing, Discretization & Decomposition

INNOVATE. COLLABORATE. DELIVER.

		Impact of not having software product/tool/library available			
		Very High	High	Medium	Low
Likelihood of Risk	Very High	SAMRAI, STK, MFEM			
	High	UMR	Portage, Tangram, Axom, Overlink		
	Medium		METIS, ParMETIS	Sculpt	
	Low				libigl

# Visualization and Analysis

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		Impact of not having software product/tool/library available			
		Very High	High	Medium	Low
Likelihood of Risk	Very High		VTK/VTKm		
	High		Catalyst, Visit, ParaView, Conduit		
	Medium			Cinema, Ascent	
	Low				

# System Imaging, Resource Mon. & Mgmt

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		Impact of not having software product/tool/library available			
		Very High	High	Medium	Low
Likelihood of Risk	Very High				
	High		CharlieCloud, LDMS	Flux	SICM
	Medium			AppSysFusion, GMI, Maestro/Merlin	
	Low		Splunk, SLURM	VmWare, LSF	

# Miscellaneous

INNOVATE. COLLABORATE. DELIVER.

		Impact of not having software product/tool/library available			
		Very High	High	Medium	Low
Likelihood of Risk	Very High				
	High				SST, Mantevo-DF
	Medium			LBANN	
	Low			Confluence, LaTeX	



