



Performance Analysis of OpenSHMEM Applications with TAU Commander

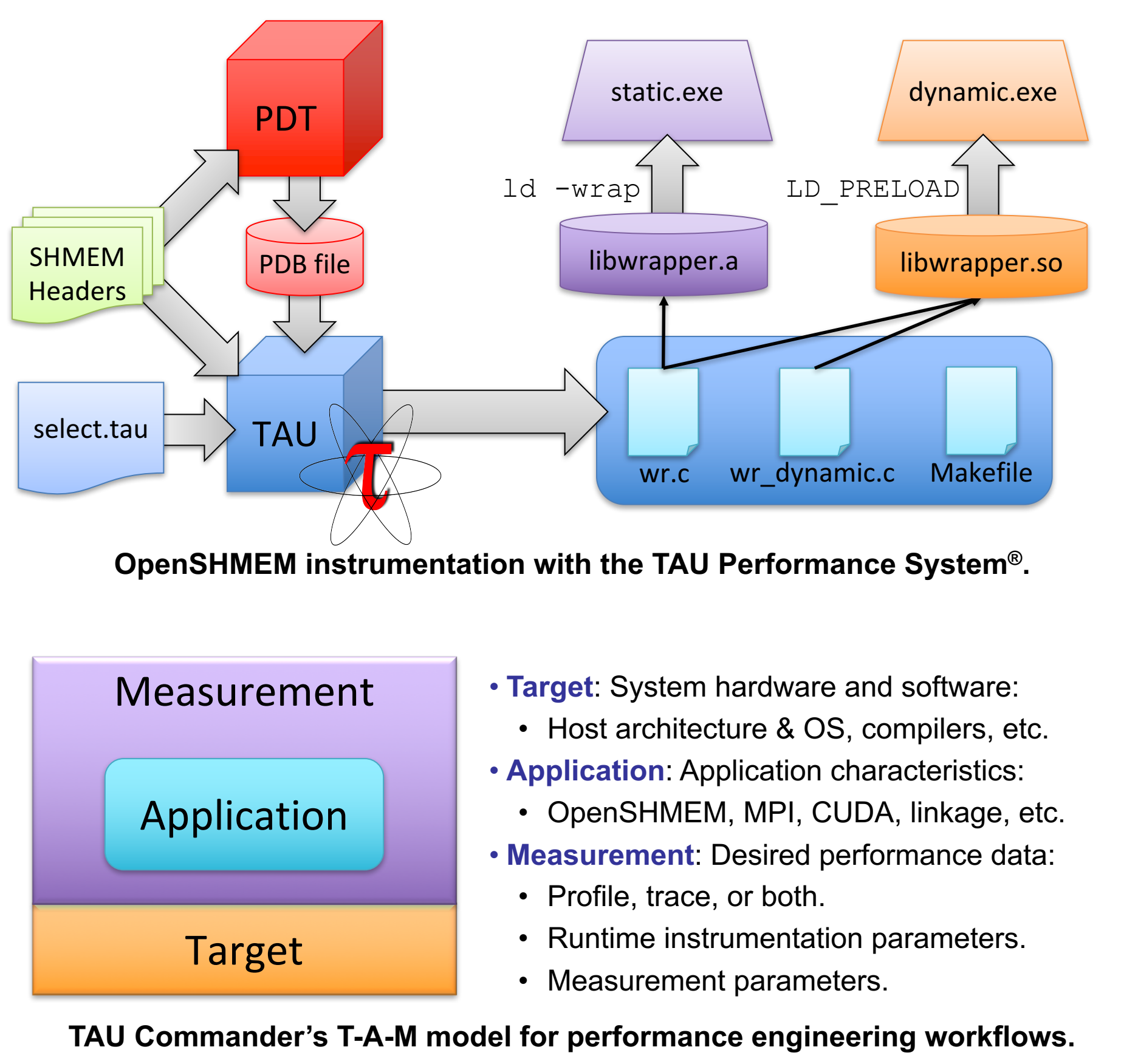


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Goal: Easily characterize the performance of OpenSHMEM applications operating at extreme scales without modifying the application or relying on tool interfaces like PSHMEM.

- Approach:** Implement support for callsites, OTF2 traces, and merged profiles in TAU Commander / TAU Performance System®:
- Callsites show where each OpenSHMEM API call occurred in the unmodified application binary,
 - Native OTF2 trace generation reduces software dependencies to highlight one-sided communication bottlenecks,
 - Merged profiles minimize I/O overhead at extreme scales,
 - TAU Commander simplifies instrumentation and analysis.

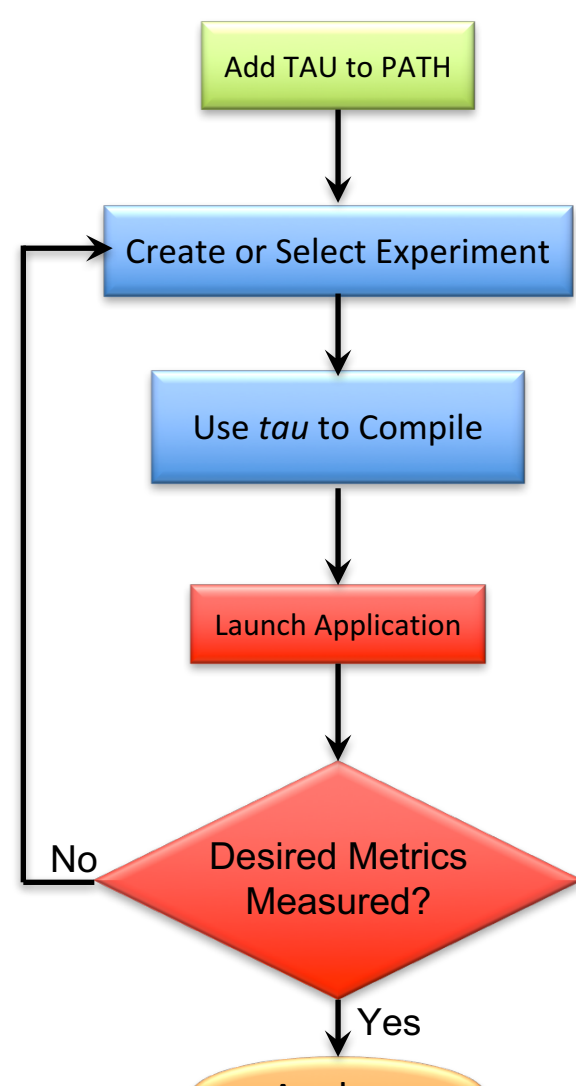
Results: TAU Commander supports SHMEM applications for easy and intuitive application profiling at scale. The performance of production OpenSHMEM applications executing on dramatically different systems may be directly compared.



SHMEM Support in TAU Commander

TAU Commander observes the context of a user's actions to simplify tasks and provide helpful feedback in case of error. It is built around a declarative compatibility engine that models user requirements and available resources to determine the most sensible course of action. To support OpenSHMEM, we updated this system to include TAU's OpenSHMEM instrumentation features.

Specify the desired result, not step-by-step directions.



```
jlinford@cori09 ~/workspace/openshmem17/applications/ISx $ tau target create cori.S05 --shmem-compilers=OpenSHMEM
[TAU] Cray C++ compiler '/opt/cray/pe/craype/2.5.7/bin/cc' wraps
[TAU] /opt/intel/compilers_and_libraries_2017.2.174/linux/bin/intel64/icpc'
[TAU] Cray Fortran compiler '/opt/cray/pe/craype/2.5.7/bin/ftn' wraps
[TAU] /opt/intel/compilers_and_libraries_2017.2.174/linux/bin/intel64/iftor'
[TAU] Cray C compiler '/opt/cray/pe/craype/2.5.7/bin/cc' wraps
[TAU] /opt/intel/compilers_and_libraries_2017.2.174/linux/bin/intel64/icc'
[TAU] Cray MPI C compiler '/opt/cray/pe/craype/2.5.7/bin/cc' wraps
[TAU] /opt/intel/compilers_and_libraries_2017.2.174/linux/bin/intel64/icc'
[TAU] Cray MPI C++ compiler '/opt/cray/pe/craype/2.5.7/bin/cc' wraps
[TAU] /opt/intel/compilers_and_libraries_2017.2.174/linux/bin/intel64/icpc'
[TAU] Cray MPI Fortran compiler '/opt/cray/pe/craype/2.5.7/bin/ftn' wraps
[TAU] /opt/intel/compilers_and_libraries_2017.2.174/linux/bin/intel64/iftor'
[TAU] Cray SHMEM C compiler '/opt/cray/pe/craype/2.5.7/bin/cc' wraps
[TAU] /opt/intel/compilers_and_libraries_2017.2.174/linux/bin/intel64/icc'
[TAU] Cray SHMEM C++ compiler '/opt/cray/pe/craype/2.5.7/bin/cc' wraps
[TAU] /opt/intel/compilers_and_libraries_2017.2.174/linux/bin/intel64/icpc'
[TAU] Cray SHMEM Fortran compiler '/opt/cray/pe/craype/2.5.7/bin/ftn' wraps
[TAU] /opt/intel/compilers_and_libraries_2017.2.174/linux/bin/intel64/iftor'
[TAU] Added target 'cori.S05' to project configuration 'ISx'.
jlinford@cori09 ~/workspace/openshmem17/applications/ISx $ tau target list
== Target Configurations (/global/project/projectdirs/m88/jlinford/openshmem17/applications/ISx/.tau/project.json) ==
```

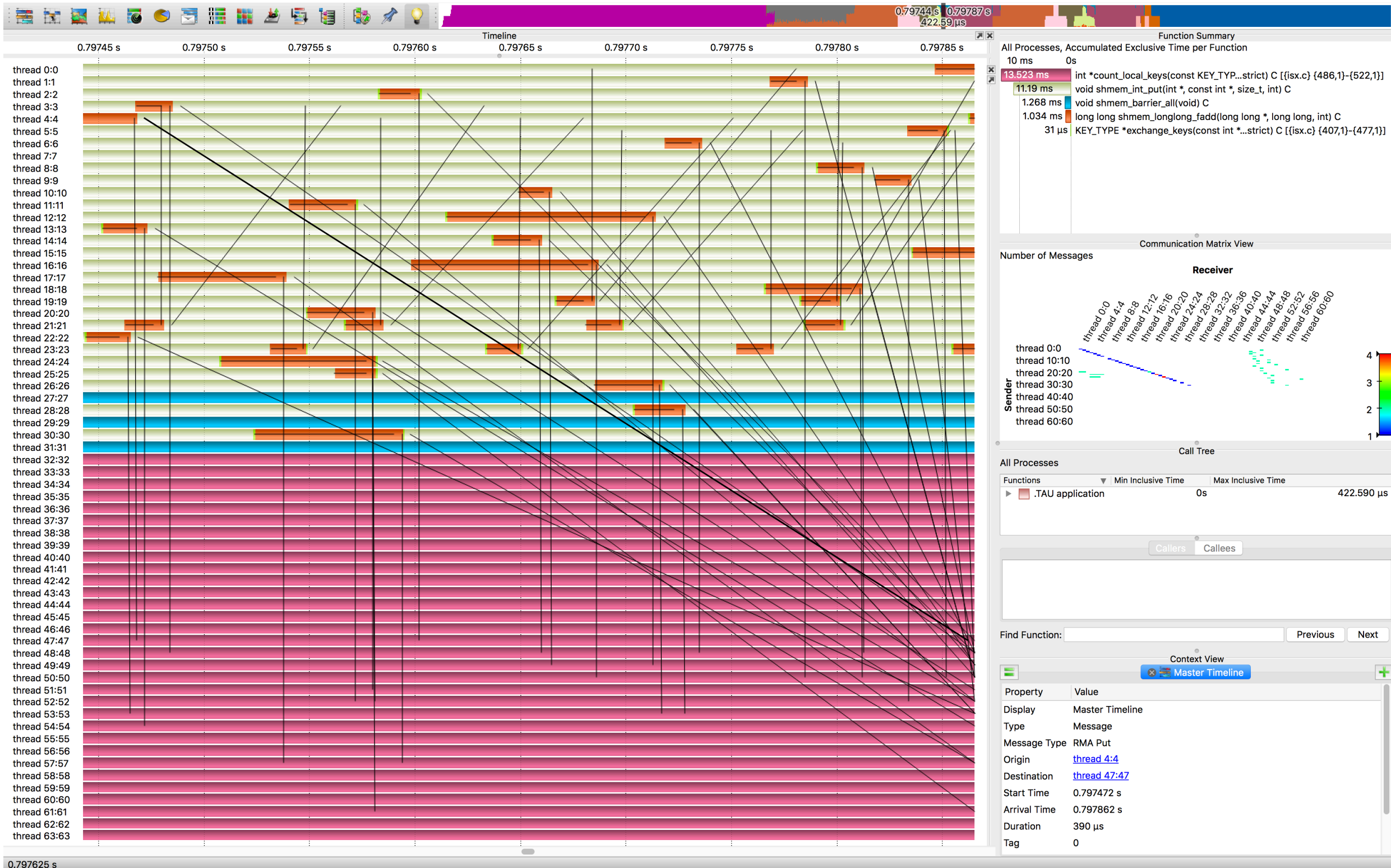
Name	Host OS	Host Arch	Host Compilers	MPI Compilers	SHMEM Compilers
cori09	CNL	x86_64	Cray	Cray	Cray
cori.S05	CNL	x86_64	Cray	Cray	OpenSHMEM

```
jlinford@cori09 ~/workspace/openshmem17/applications/ISx $
```

Automatic compiler detection maintains compatibility between TAU libraries and application binaries.

Support includes Cray, SOS, and the reference implementation.

ISx OpenSHMEM Profile on Cori KNL and Xeon



OTF2 trace of ISx on Cori and visualized in Vampir.



Runtime profile of ISx on Cori KNL using Sandia OpenSHMEM.

Acknowledgement
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