

## Response to Reviews of “High-Performance Decoupling of Tightly Coupled Data Flows,” Tom Peterka, PI, Argonne National Laboratory

### Reviewer 1:

The reviewer did not ask for any further clarification.

### Reviewer 2:

The review was overall very encouraging. The only technical suggestion was to dive more deeply into specific exascale challenges such as network bottlenecks resulting from NUMA architectures. We plan to mitigate and leverage architectural characteristics through system software abstractions developed in other nexus/plexus efforts such as OS/R, data management, and programming models. Our strong collaboration with these groups will be beneficial for the Decaf project. In some cases (below), our PIs are also members of these groups.

In terms of project management, the reviewer suggests more clearly indicating individual PI responsibilities and coordination with other ASCR projects. Space permitted only a high-level summary in the proposal text, but these roles are clearly delineated in our day-to-day project operation. Peterka leads the data description and dataflow efforts and coordinates with HACC, Nek5000, and GL applications. Lofstead leads the transport layer and coordinates with SNAP, LAMMPS, and GTC applications. Cappello leads the fault tolerance effort. Peterka is a member of the SciDAC SDAV project. Peterka and Cappello are active in the CESAR co-design project. Cappello is a member of Argo, and Lofstead is a member of the Hobbes project.

### Reviewer 3:

Reviewer 3 was also positive and suggested two areas of improvement. Regarding the evaluation plan, it is true that evaluation by domain scientists is not part of our plan. We will self-test numerous science codes in our research, but distinct from a SciDAC project, our research will not be ready in the 3-year time frame for evaluation by outside science teams. The evaluation metrics we will employ will be driven by conference and journal paper submissions to the systems software and data analysis/visualization communities. Publication in these venues is quite competitive and will require significant improvements over the state of the art in order to be accepted.

Regarding the design and implementation of the transport layer, we have deep experience with both MPI and NNTI transport layers. Cappello’s inclusion in the project will help to inject resilience into these layers. Peterka’s experience with DIY will drive coupling using MPI. Similarly, Lofstead’s experience with Nessie with drive coupling over NNTI.

Reviewer 4:

Reviewer 4 was also extremely positive. The only concern is the timeline, specifically whether the resilience thread is too dependent on the other threads and will need to wait for the other layers. In fact, we have already generated exciting early results in soft error detection using a mockup of a cosmology – tessellation – density estimation pipeline, demonstrating that it is possible to conduct early resilience research without a full implementation of the other research areas.

We sincerely thank the reviewers for their time and feedback.