GPI – Global Address Space Programming Interface
Efficient – Scalable – Multicore

What is GPI?

- GPI is an industry-quality API for PGAS (PGAS = Partitioned Global Address Space)
- GPI is not a new language, it is an API supporting Fortran, C, and C++
- GPI is threadsafe and multicore ready
- GPI works with POSIX threads, OpenMP or with the optimized MCTP package
- GPI is fault tolerant

Advantages of GPI

- Communication at wire speed
- Scalable for multicore clusters
- Single programming model
- Robust and industry proven
- Zero-copy communication between NVIDIA Tesla or Intel® Xeon Phi™
- Support for Infiniband, and CRAY Gemini

Customer Votes

Our parallel seismic imaging code is based on GPI, since it requires random access to distributed data. We are really satisfied with the performance, the multicore scalability and the robustness of GPI.

Åre Osen, Statoil AS

For the scalable parallel version of DLR’s TAU code we used GPI since MPI did not deliver the required scalability on our large multicore cluster.

Christian Simmendinger, T-Systems
**What is PGAS?**

The Partitioned Global Address Space (PGAS) is a programming model for parallel applications. It provides a global memory address space that is partitioned such that a portion of the memory is local to each processor. Locality information is encoded into addresses within the global memory: Locations within the global memory are addressed by giving the number of the portion and an offset within that portion. These information can be exploited to schedule the tasks to the data and not vice versa.

Data exchange between regions of the global memory is based on one-sided, non-blocking, truly asynchronous and zero-copy communication and thus form a very good basis for scalable applications: Perfect communication hiding and decoupling of communication and synchronization are key requirements for full utilization of large machines.

**GPI is superior to MPI in performance and scalability**

**Strong Scalability**

![FFT Benchmark](image)

- 2D-FFT: $N=2^d$ (Xeon E5148, 8 GiB, DDR Infiniband)

**Perfect communication hiding**

![BQCD efficiency](image)

- BQCD (24 x 24 x 24 x 48): covariant derivative $D$, overlap efficiency (HLRS, Xeon E5440, 16 GiB, DDR Infiniband)

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**GPI**: Efficient – Scalable – Multicore