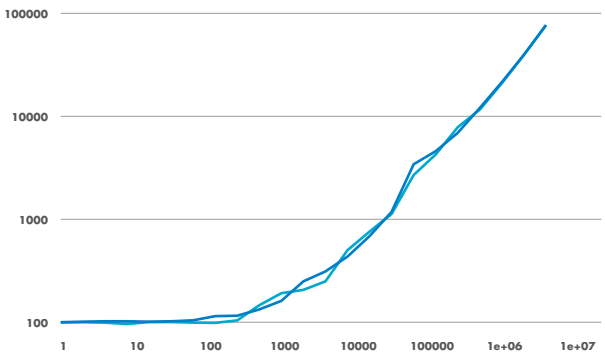
SIMGRID AS AN MPI SIMULATOR

Don't have a supercomputer at hand but still want to study your MPI application?
Want to extrapolate the behavior of your application?
Want to get objective hints to provision your next cluster?
Need to teach/learn parallel programming but don't want to deal with batch scheduling?

- **Single node simulation**
- **Implements a comprehensive subset of the MPI 1.1 standard, including most of the collective communications**
- **Implementation closely patterned after OpenMPI internals**
- **Uses an empirically validated piece-wise linear network model**
- **Runs unmodified legacy C or Fortran applications**
- **Same code for design, testing and production usage**
- **Optimized to reduce simulation time and memory footprint**
- **Built-in instrumentation for post-mortem visualization**

Accurate point-to-point communication modeling



P2P

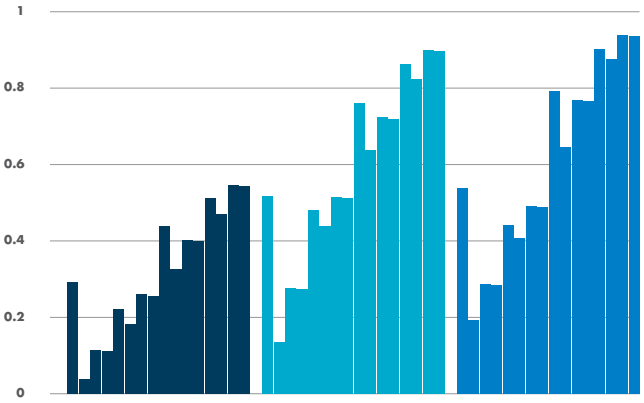
x. Message Size (in Bytes)
y. Communication Time (in microseconds)

SMPI
Open MPI

References

P.-N. Clauss, M. Stillwell, S. Genaud, F. Suter, H. Casanova, and M. Quinson.
Single Node On-Line Simulation of MPI Applications with SMPI.
In Proceedings of the 25th IEEE International Parallel and Distributed Processing Symposium (IPDPS), pages 661 - 672, Anchorage, AK, May 2011.

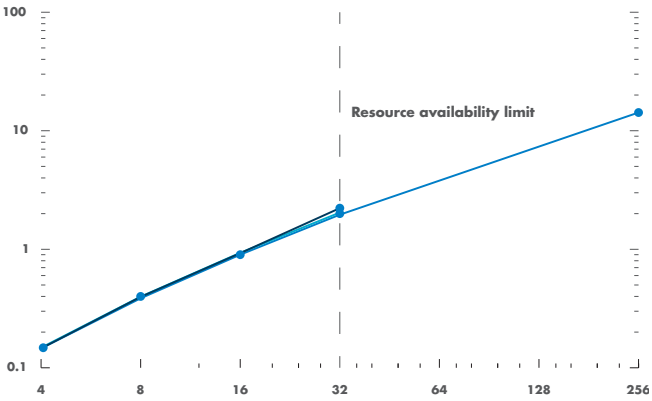
Contention aware network model



x. Process rank
y. Time (in sec.)

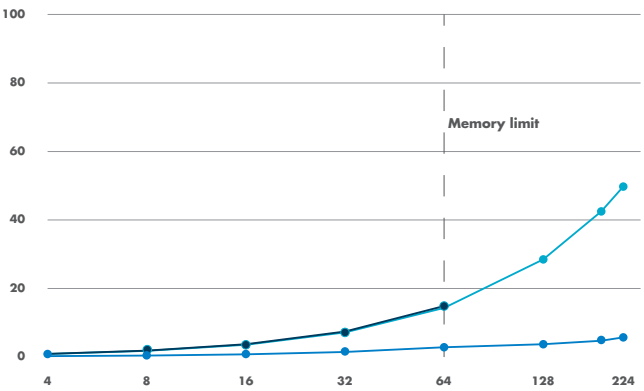
- Other simulators
- SimGrid
- Real MPI

Pushing scalability and memory limits



x. Number of processes
y. Time (in sec.)

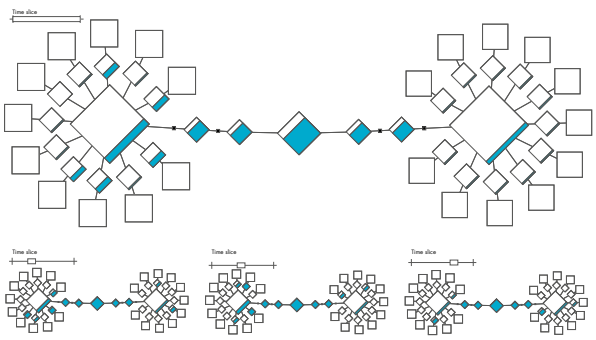
- SMPI
- OpenMPI
- MPICH2



x. Message size (in MiB)
y. Time (in sec.)

- SMPI (Simulation time)
- SMPI (Simulated execution time)
- OpenMPI

Time-integrated resource usage visualization with Triva



```
bob:~$ smpicc my_C_app.c \
 -o my_C_app
bob:~$ smpirun -np 8 \
 -platform target_platform.xml \
 -hostfile process_mapping \
 my_C_app

bob:~$ smpiff my_Fortran_app.f \
 -o my_Fortran_app
bob:~$ smpirun -np 8 \
 -platform target_platform.xml \
 -hostfile process_mapping \
 my_Fortran_app
```

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