

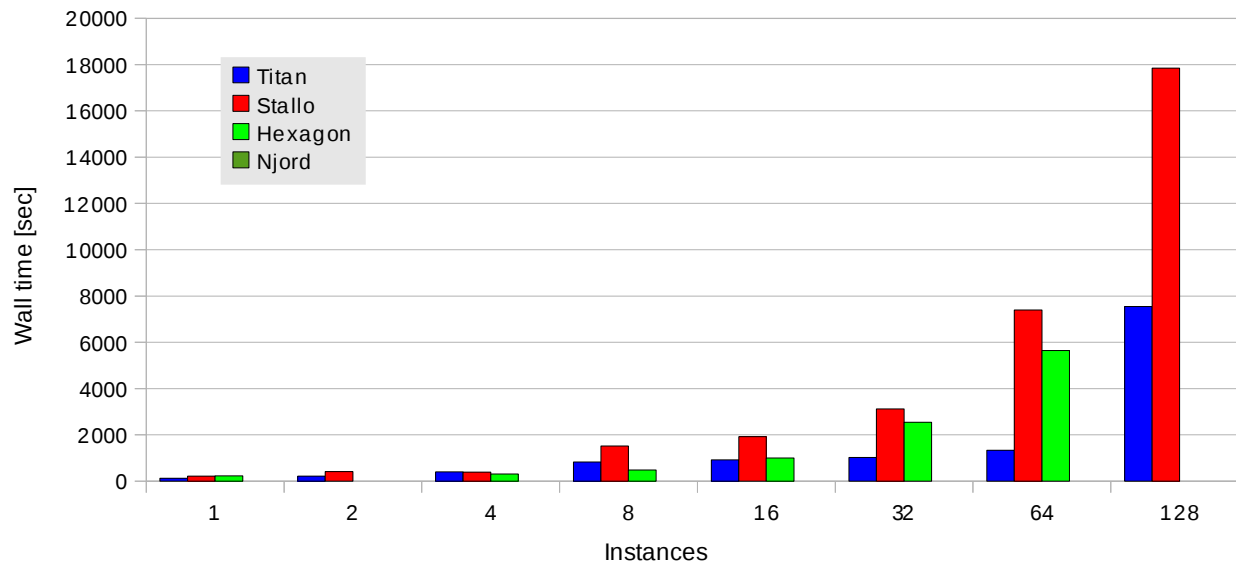
Kernel Metadata

Meta data benchmark, unpacking, touching and removing a linux kernel source three (tar xf; find -exec touch;rm -rf).

| Instances | Titan | Stallo | Hexagon | Njord |
|-----------|---------|---------|---------|-------|
| 1 | 131,21 | 223,96 | 232,7 | |
| 2 | 218,17 | 420,32 | | |
| 4 | 403,5 | 386,92 | 307,02 | |
| 8 | 828,3 | 1524,26 | 484,19 | |
| 16 | 924,86 | 1924,3 | 1000,47 | |
| 32 | 1030,68 | 3121,18 | 2546,63 | |
| 64 | 1340,33 | 7392,23 | 5648,92 | |
| 128 | 7541,05 | 17851,8 | | |

Meta data benchmark

Unpacking, counting and removal of linux kernel src.



HPCC

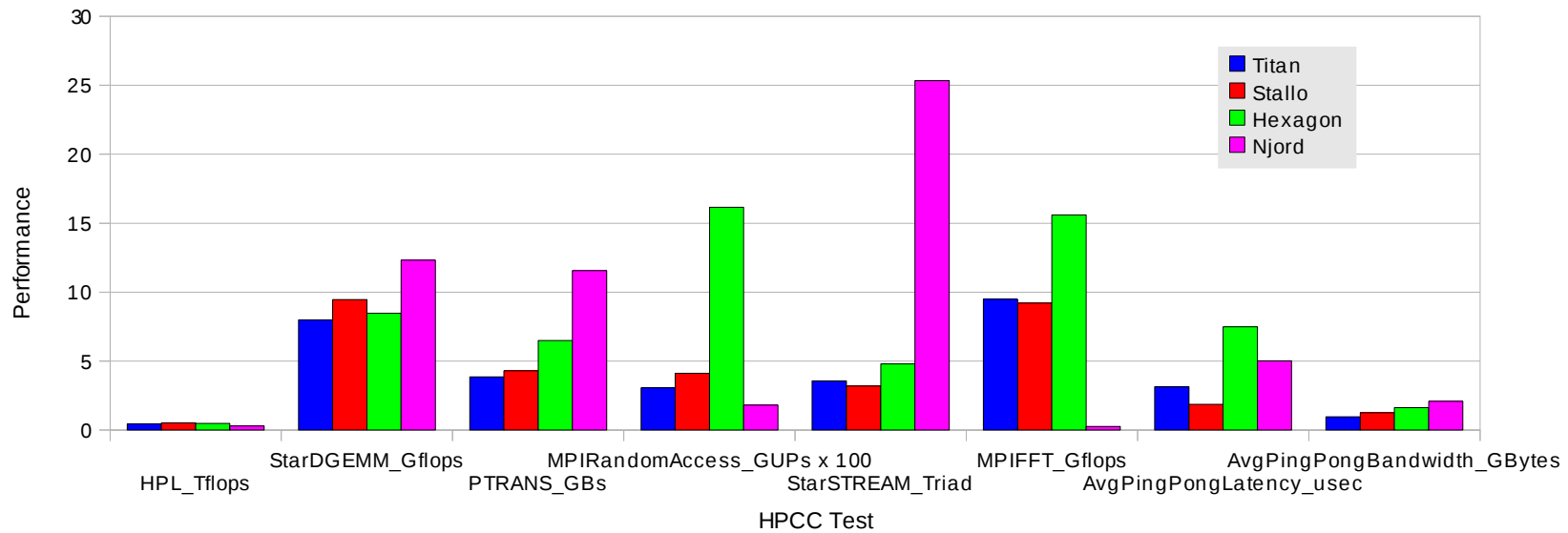
High Performance Computing Challenge v1,4,0

Highlights

| | 64 cpus Titan | 64 cpus Stallo | 64 cpus Hexagon | 64 cpus Njord |
|-----------------------------|-------------------------|--------------------------|---------------------------|-------------------------|
| HPL_Tflops | 0,43 | 0,51 | 0,49 | 0,29 |
| StarDGEMM_Gflops | 7,99 | 9,45 | 8,47 | 12,32 |
| PTRANS_GBs | 3,85 | 4,29 | 6,49 | 11,55 |
| MPIRandomAccess_GUPs x 100 | 3,05 | 4,11 | 16,16 | 1,81 |
| StarSTREAM_Triad | 3,55 | 3,18 | 4,79 | 25,33 |
| MPIFFT_Gflops | 9,48 | 9,2 | 15,61 | 0,26 |
| AvgPingPongLatency_usec | 3,14 | 1,87 | 7,49 | 5,03 |
| AvgPingPongBandwidth_GBytes | 0,96 | 1,26 | 1,62 | 2,1 |

HPCC 64 cpus

Subset of data



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Raw data :

| Metric | 64 cpus Titan | 64 cpus Stallo | 64 cpus Hexagon | 64 cpus Njord |
|-----------------------------|------------------|-------------------|--------------------|------------------|
| VersionMajor | 1 | 1 | 1 | 1 |
| VersionMinor | 4 | 4 | 4 | 4 |
| VersionMicro | 0 | 0 | 0 | 1 |
| VersionRelease | f | f | f | f |
| LANG | C | C | C | C |
| Success | 1 | 1 | 1 | 1 |
| sizeof_char | 1 | 1 | 1 | 1 |
| sizeof_short | 2 | 2 | 2 | 2 |
| sizeof_int | 4 | 4 | 4 | 4 |
| sizeof_long | 8 | 8 | 8 | 8 |
| sizeof_void_ptr | 8 | 8 | 8 | 8 |
| sizeof_size_t | 8 | 8 | 8 | 8 |
| sizeof_float | 4 | 4 | 4 | 4 |
| sizeof_double | 8 | 8 | 8 | 8 |
| sizeof_s64Int | 8 | 8 | 8 | 8 |
| sizeof_u64Int | 8 | 8 | 8 | 8 |
| sizeof_struct_double_double | 16 | 16 | 16 | 16 |
| CommWorldProcs | 64 | 64 | 64 | 64 |
| MPI_Wtick | 1,00E-006 | 1,00E-006 | 1,00E-006 | 1,34E-007 |
| HPL_Tflops | 0,43 | 0,51 | 0,49 | 0,29 |
| HPL_time | 1534,9 | 1310,86 | 1372,13 | 1673,09 |
| HPL_eps | 2,22E-016 | 2,22E-016 | 1,11E-016 | 1,11E-016 |
| HPL_Rnorml | 7,85E-010 | 8,36E-010 | 7,85E-010 | 1,74E-010 |

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|-----------------|---------------|------------|------------|------------|
| HPL_Anorm1 | 25196,2 | 25196,2 | 25196,2 | 22690,8 |
| HPL_Anorml | 25192,5 | 25192,5 | 25192,5 | 22694,8 |
| HPL_Xnorm1 | 116098 | 116098 | 116098 | 27394,6 |
| HPL_Xnorml | 7,7 | 7,7 | 7,7 | 2,07 |
| HPL_Bnorml | 0,5 | 0,5 | 0,5 | 0,5 |
| HPL_N | 100000 | 100000 | 100000 | 90000 |
| HPL_NB | 160 | 160 | 160 | 320 |
| HPL_nprow | 8 | 8 | 8 | 8 |
| HPL_npcol | 8 | 8 | 8 | 8 |
| HPL_depth | 1 | 1 | 1 | 1 |
| HPL_nbdiv | 3 | 3 | 3 | 3 |
| HPL_nbmin | 4 | 4 | 4 | 4 |
| HPL_cpfact | L | L | L | L |
| HPL_crfact | R | R | R | R |
| HPL_ctop | 1 | 1 | 1 | 1 |
| HPL_order | C | C | C | C |
| HPL_dMACH_EPS | 2,22E-016 | 2,22E-016 | 1,11E-016 | 1,11E-016 |
| HPL_dMACH_SFMIN | 2,225074e-308 | 0 | 0 | 0 |
| HPL_dMACH_BASE | 2,00E+000 | 2,00E+000 | 2,00E+000 | 2,00E+000 |
| HPL_dMACH_PREC | 4,44E-016 | 4,44E-016 | 2,22E-016 | 2,22E-016 |
| HPL_dMACH_MLEN | 5,30E+001 | 5,30E+001 | 5,30E+001 | 5,30E+001 |
| HPL_dMACH_RND | 0,00E+000 | 0,00E+000 | 1,00E+000 | 1,00E+000 |
| HPL_dMACH_EMIN | -1,02E+003 | -1,02E+003 | -1,02E+003 | -1,02E+003 |
| HPL_dMACH_RMIN | 2,225074e-308 | 0 | 0 | 0 |
| HPL_dMACH_EMAX | 1,03E+003 | 1,03E+003 | 1,02E+003 | 1,02E+003 |
| HPL_dMACH_RMAX | inf | inf | 1,80E+308 | 1,80E+308 |
| HPL_sMACH_EPS | 1,19E-007 | 1,19E-007 | 5,96E-008 | 5,96E-008 |
| HPL_sMACH_SFMIN | 1,18E-038 | 1,18E-038 | 1,18E-038 | 1,18E-038 |
| HPL_sMACH_BASE | 2,00E+000 | 2,00E+000 | 2,00E+000 | 2,00E+000 |
| HPL_sMACH_PREC | 2,38E-007 | 2,38E-007 | 1,19E-007 | 1,19E-007 |
| HPL_sMACH_MLEN | 2,40E+001 | 2,40E+001 | 2,40E+001 | 2,40E+001 |
| HPL_sMACH_RND | 0,00E+000 | 0,00E+000 | 1,00E+000 | 1,00E+000 |
| HPL_sMACH_EMIN | -1,25E+002 | -1,25E+002 | -1,25E+002 | -1,25E+002 |
| HPL_sMACH_RMIN | 1,18E-038 | 1,18E-038 | 1,18E-038 | 1,18E-038 |
| HPL_sMACH_EMAX | 1,29E+002 | 1,29E+002 | 1,28E+002 | 1,28E+002 |
| HPL_sMACH_RMAX | inf | inf | 3,40E+038 | 3,40E+038 |
| dweeps | 1,11E-016 | 1,11E-016 | 1,11E-016 | 1,11E-016 |

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|------------------------------------|-------------|-------------|-------------|-------------|
| sweps | 5,96E-008 | 5,96E-008 | 5,96E-008 | 5,96E-008 |
| HPLMaxProcs | 64 | 64 | 64 | 64 |
| HPLMinProcs | 64 | 64 | 64 | 64 |
| DGEMM_N | 7216 | 7216 | 7216 | 6494 |
| StarDGEMM_Gflops | 7,99 | 9,45 | 8,47 | 12,32 |
| SingleDGEMM_Gflops | 8,07 | 10 | 8,59 | 58,96 |
| PTRANS_GBs | 3,85 | 4,29 | 6,49 | 11,55 |
| PTRANS_time | 0,05 | 2,76 | 0,03 | 0 |
| PTRANS_residual | 0 | 0 | 0 | 0 |
| PTRANS_n | 5000 | 40000 | 5000 | 2500 |
| PTRANS_nb | 160 | 100 | 100 | 32 |
| PTRANS_nprow | 8 | 8 | 8 | 8 |
| PTRANS_npcol | 8 | 8 | 8 | 8 |
| MPIRandomAccess_LCG_N | 8589934592 | 8589934592 | 8589934592 | 4294967296 |
| MPIRandomAccess_LCG_time | 1121,67 | 832,76 | 568,01 | 943,23 |
| MPIRandomAccess_LCG_CheckTime | 163,65 | 244,96 | 118,08 | 69,08 |
| MPIRandomAccess_LCG_Errors | 0 | 0 | 0 | 0 |
| MPIRandomAccess_LCG_ErrorsFraction | 0 | 0 | 0 | 0 |
| MPIRandomAccess_LCG_ExeUpdates | 34359738368 | 34359738368 | 34359738368 | 17179869184 |
| MPIRandomAccess_LCG_GUPs | 0,03 | 0,04 | 0,06 | 0,02 |
| MPIRandomAccess_LCG_TimeBound | -1 | -1 | -1 | -1 |
| MPIRandomAccess_LCG_Algorithm | 0 | 0 | 1 | 0 |
| MPIRandomAccess_N | 8589934592 | 8589934592 | 8589934592 | 4294967296 |
| MPIRandomAccess_time | 1124,84 | 835,82 | 212,63 | 948,34 |
| MPIRandomAccess_CheckTime | 182,79 | 246,95 | 119,25 | 60,26 |
| MPIRandomAccess_Errors | 106 | 0 | 0 | 0 |
| MPIRandomAccess_ErrorsFraction | 1,23E-008 | 0 | 0 | 0 |
| MPIRandomAccess_ExeUpdates | 34359738368 | 34359738368 | 34359738368 | 17179869184 |
| MPIRandomAccess_GUPs | 0,03 | 0,04 | 0,16 | 0,02 |
| MPIRandomAccess_TimeBound | -1 | -1 | -1 | -1 |
| MPIRandomAccess_Algorithm | 0 | 0 | 1 | 0 |
| RandomAccess_LCG_N | 134217728 | 134217728 | 134217728 | 67108864 |
| StarRandomAccess_LCG_GUPs | 0,01 | 0 | 0,01 | 8,56E-005 |
| SingleRandomAccess_LCG_GUPs | 0,01 | 0,01 | 0,01 | 0,01 |
| RandomAccess_N | 134217728 | 134217728 | 134217728 | 67108864 |
| StarRandomAccess_GUPs | 0,01 | 0 | 0,01 | 7,13E-005 |
| SingleRandomAccess_GUPs | 0,01 | 0,01 | 0,01 | 0,01 |

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|--------------------------------------|------------|------------|------------|-----------|
| STREAM_VectorSize | 52083333 | 52083333 | 52083333 | 42187500 |
| STREAM_Threads | 1 | 1 | 1 | 16 |
| StarSTREAM_Copy | 1,93 | 0,91 | 2,43 | 9,94 |
| StarSTREAM_Scale | 1,17 | 0,61 | 1,34 | 10,16 |
| StarSTREAM_Add | 1,31 | 0,68 | 1,58 | 10,22 |
| StarSTREAM_Triad | 1,32 | 0,68 | 1,59 | 10,78 |
| SingleSTREAM_Copy | 5,74 | 4,11 | 6,93 | 26,24 |
| SingleSTREAM_Scale | 3,32 | 2,94 | 4,53 | 26,65 |
| SingleSTREAM_Add | 3,55 | 3,18 | 4,78 | 25,16 |
| SingleSTREAM_Triad | 3,55 | 3,18 | 4,79 | 25,33 |
| FFT_N | 33554432 | 33554432 | 33554432 | 16777216 |
| StarFFT_Gflops | 0,44 | 0,39 | 0,39 | 0,7 |
| SingleFFT_Gflops | 0,63 | 1,14 | 0,43 | 5,56 |
| MPIFFT_N | 1073741824 | 1073741824 | 1073741824 | 536870912 |
| MPIFFT_Gflops | 9,48 | 9,2 | 15,61 | 0,26 |
| MPIFFT_maxErr | 3,14E-015 | 3,14E-015 | 2,36E-015 | 2,47E-015 |
| MPIFFT_Procs | 64 | 64 | 64 | 64 |
| MaxPingPongLatency_usec | 4,25 | 2,92 | 8,33 | 5,57 |
| RandomlyOrderedRingLatency_usec | 8,21 | 6,94 | 19,11 | 7,56 |
| MinPingPongBandwidth_GBytes | 0,58 | 0,81 | 1,41 | 1,74 |
| NaturallyOrderedRingBandwidth_GBytes | 0,26 | 0,2 | 0,55 | 1,85 |
| RandomlyOrderedRingBandwidth_GBytes | 0,09 | 0,12 | 0,19 | 0,27 |
| MinPingPongLatency_usec | 1,06 | 0,51 | 0,38 | 2 |
| AvgPingPongLatency_usec | 3,14 | 1,87 | 7,49 | 5,03 |
| MaxPingPongBandwidth_GBytes | 1,4 | 2,21 | 1,68 | 6,02 |
| AvgPingPongBandwidth_GBytes | 0,96 | 1,26 | 1,62 | 2,1 |
| NaturallyOrderedRingLatency_usec | 3 | 2,5 | 8,39 | 6,6 |
| FFTEblk | 16 | 16 | 16 | 16 |
| FFTEnp | 8 | 8 | 4 | 8 |
| FFTEI2size | 1048576 | 1048576 | 1048576 | 1048576 |
| M_OPENMP | -1 | -1 | -1 | 200805 |
| omp_get_num_threads | 0 | 0 | 0 | 16 |
| omp_get_max_threads | 0 | 0 | 0 | 16 |
| omp_get_num_procs | 0 | 0 | 0 | 16 |
| MemProc | -1 | -1 | -1 | -1 |
| MemSpec | -1 | -1 | -1 | -1 |
| MemVal | -1 | -1 | -1 | -1 |

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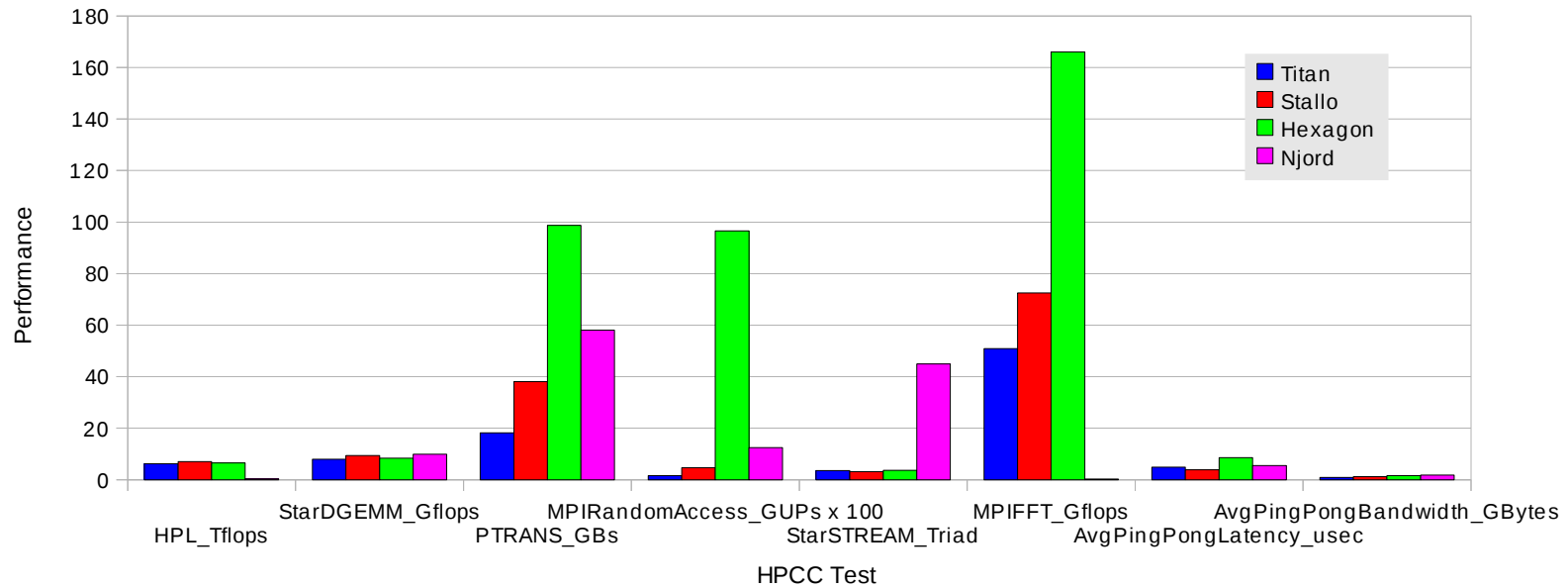
| | | | | |
|-----------------------------|-----------|-----------|-----------|-----------|
| MPIFFT_time0 | 3,10E-006 | 4,05E-006 | 4,05E-006 | 4,05E-006 |
| MPIFFT_time1 | 3,24 | 3,03 | 1,6 | 1,7 |
| MPIFFT_time2 | 1,88 | 1,44 | 1,73 | 0,43 |
| MPIFFT_time3 | 2,69 | 2,29 | 1,07 | 242,28 |
| MPIFFT_time4 | 4,37 | 7,01 | 3,79 | 1,12 |
| MPIFFT_time5 | 4,57 | 3,04 | 1,73 | 56,36 |
| MPIFFT_time6 | 2,15E-006 | 5,01E-006 | 5,96E-006 | 9,54E-007 |
| CPS_HPCC_FFT_235 | 0 | 0 | 0 | 0 |
| CPS_HPCC_FFTW_ESTIMATE | 0 | 0 | 0 | 0 |
| CPS_HPCC_MEMALLCTR | 0 | 0 | 0 | 0 |
| CPS_HPL_USE_GETPROCESSTIMES | 0 | 0 | 0 | 0 |
| CPS_RA_SANDIA_NOPT | 0 | 0 | 1 | 0 |
| CPS_RA_SANDIA_OPT2 | 0 | 0 | 0 | 0 |
| CPS_USING_FFTW | 0 | 0 | 0 | 0 |

HPCC

| 1024 cpus Titan | 1024 cpus Stallo | 1024 cpus Hexagon | 1024 cpus Njord |
|--------------------|---------------------|----------------------|--------------------|
| 6,26 | 7,03 | 6,53 | 0,39 |
| 7,97 | 9,42 | 8,33 | 9,95 |
| 18,2 | 38,11 | 98,76 | 58,09 |
| 1,59 | 4,68 | 96,58 | 12,46 |
| 3,58 | 3,17 | 3,67 | 44,98 |
| 50,9 | 72,54 | 166,1 | 0,31 |
| 4,89 | 3,87 | 8,57 | 5,48 |
| 0,91 | 1,23 | 1,62 | 1,81 |

HPCC 1024 cpus

Subset



HPCC

| | 1024 cpus Titan | 1024 cpus Stallo | 1024 cpus Hexagon | 1024 cpus Njord |
|---|---------------------------|----------------------------|-----------------------------|---------------------------|
| | 1 | 1 | 1 | 1 |
| | 4 | 4 | 4 | 4 |
| | 0 | 0 | 0 | 1 |
| f | f | f | | f |
| C | C | C | | C |
| | 1 | 1 | 1 | 0 |
| | 1 | 1 | 1 | 1 |
| | 2 | 2 | 2 | 2 |
| | 4 | 4 | 4 | 4 |
| | 8 | 8 | 8 | 8 |
| | 8 | 8 | 8 | 8 |
| | 8 | 8 | 8 | 8 |
| | 4 | 4 | 4 | 4 |
| | 8 | 8 | 8 | 8 |
| | 8 | 8 | 8 | 8 |
| | 8 | 8 | 8 | 8 |
| | 16 | 16 | 16 | 16 |
| | 1024 | 1024 | 1024 | 1024 |
| | 1,00E-006 | 1,00E-006 | 1,00E-006 | 1,34E-007 |
| | 6,26 | 7,03 | 6,53 | 0,39 |
| | 4568,07 | 4421,59 | 816,65 | 13819,4 |
| | 2,22E-016 | 2,22E-016 | 1,11E-016 | 1,11E-016 |
| | 3,81E-009 | 5,99E-009 | 2,47E-009 | 2,61E-009 |

HPCC

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|-----|-----------------|------------|------------|------------|
| | 87866,8 | 90391,2 | 50301,7 | 50301,7 |
| | 87921,2 | 90406,7 | 50284,3 | 50284,3 |
| | 298052 | 424783 | 246470 | 246470 |
| | 5,19 | 6,33 | 6,72 | 6,72 |
| | 0,5 | 0,5 | 0,5 | 0,5 |
| | 350000 | 360000 | 200000 | 200000 |
| | 140 | 160 | 160 | 320 |
| | 32 | 32 | 32 | 32 |
| | 32 | 32 | 32 | 32 |
| | 1 | 1 | 1 | 1 |
| | 3 | 3 | 3 | 3 |
| | 4 | 4 | 4 | 4 |
| L | L | L | | L |
| R | R | R | | R |
| | 1 | 1 | 1 | 1 |
| R | R | R | | C |
| | 2,22E-016 | 2,22E-016 | 1,11E-016 | 1,11E-016 |
| | 0 2,225074e-308 | | 0 | 0 |
| | 2,00E+000 | 2,00E+000 | 2,00E+000 | 2,00E+000 |
| | 4,44E-016 | 4,44E-016 | 2,22E-016 | 2,22E-016 |
| | 5,30E+001 | 5,30E+001 | 5,30E+001 | 5,30E+001 |
| | 0,00E+000 | 0,00E+000 | 1,00E+000 | 1,00E+000 |
| | -1,02E+003 | -1,02E+003 | -1,02E+003 | -1,02E+003 |
| | 0 2,225074e-308 | | 0 | 0 |
| | 1,03E+003 | 1,03E+003 | 1,02E+003 | 1,02E+003 |
| inf | inf | | 1,80E+308 | 1,80E+308 |
| | 1,19E-007 | 1,19E-007 | 5,96E-008 | 5,96E-008 |
| | 1,18E-038 | 1,18E-038 | 1,18E-038 | 1,18E-038 |
| | 2,00E+000 | 2,00E+000 | 2,00E+000 | 2,00E+000 |
| | 2,38E-007 | 2,38E-007 | 1,19E-007 | 1,19E-007 |
| | 2,40E+001 | 2,40E+001 | 2,40E+001 | 2,40E+001 |
| | 0,00E+000 | 0,00E+000 | 1,00E+000 | 1,00E+000 |
| | -1,25E+002 | -1,25E+002 | -1,25E+002 | -1,25E+002 |
| | 1,18E-038 | 1,18E-038 | 1,18E-038 | 1,18E-038 |
| | 1,29E+002 | 1,29E+002 | 1,28E+002 | 1,28E+002 |
| inf | inf | | 3,40E+038 | 3,40E+038 |
| | 1,11E-016 | 1,11E-016 | 1,11E-016 | 1,11E-016 |

HPCC

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|--------------|--------------|--------------|--------------|
| 5,96E-008 | 5,96E-008 | 5,96E-008 | 5,96E-008 |
| 1024 | 1024 | 1024 | 1024 |
| 1024 | 1024 | 1024 | 1024 |
| 6494 | 6494 | 3607 | 3607 |
| 7,97 | 9,42 | 8,33 | 9,95 |
| 8,66 | 9,99 | 8,51 | 57,3 |
| 18,2 | 38,11 | 98,76 | 58,09 |
| 8,58 | 6,8 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 140000 | 180000 | 5000 | 5000 |
| 40 | 40 | 160 | 32 |
| 32 | 32 | 32 | 32 |
| 32 | 32 | 32 | 32 |
| 68719476736 | 68719476736 | 34359738368 | 34359738368 |
| 12941,8 | 4221,48 | 1522,39 | 1097,69 |
| 216,51 | 184,7 | 36,07 | 52,8 |
| 0 | 642 | 0 | 0 |
| 0 | 9,34E-009 | 0 | 0 |
| 274877906944 | 274877906944 | 137438953472 | 137438953472 |
| 0,02 | 0,07 | 0,09 | 0,13 |
| -1 | -1 | -1 | -1 |
| 0 | 0 | 1 | 0 |
| 68719476736 | 68719476736 | 34359738368 | 34359738368 |
| 17291,1 | 5869,45 | 142,31 | 1102,69 |
| 285,47 | 228,57 | 47,27 | 62,24 |
| 19 | 590 | 0 | 0 |
| 2,76E-010 | 8,59E-009 | 0 | 0 |
| 274877906944 | 274877906944 | 137438953472 | 137438953472 |
| 0,02 | 0,05 | 0,97 | 0,12 |
| -1 | -1 | -1 | -1 |
| 0 | 0 | 1 | 0 |
| 67108864 | 67108864 | 33554432 | 33554432 |
| 0,01 | 0 | 0,01 | 4,36E-005 |
| 0,01 | 0,02 | 0,02 | 0 |
| 67108864 | 67108864 | 33554432 | 33554432 |
| 0,01 | 0 | 0,01 | 3,10E-005 |
| 0,01 | 0,02 | 0,02 | 0 |

HPCC

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|------------|------------|------------|------------|
| 42187500 | 42187500 | 13020833 | 13020833 |
| 1 | 1 | 1 | 16 |
| 1,95 | 0,91 | 2,43 | 7,21 |
| 1,17 | 0,61 | 1,28 | 7,07 |
| 1,31 | 0,69 | 1,41 | 7,58 |
| 1,34 | 0,68 | 1,43 | 7,97 |
| 5,7 | 4,08E+000 | 6,94 | 72,44 |
| 3,34 | 2,92 | 4,42 | 81,47 |
| 3,57 | 3,16 | 3,7 | 50,58 |
| 3,58 | 3,17 | 3,67 | 44,98 |
| 16777216 | 16777216 | 8388608 | 8388608 |
| 0,5 | 0,39 | 0,42 | 0,44 |
| 0,79 | 1,13 | 0,28 | 5,44 |
| 8589934592 | 8589934592 | 4294967296 | 4294967296 |
| 50,9 | 72,54 | 166,1 | 0,31 |
| 2,80E-015 | 2,80E-015 | 2,11E-015 | 2,59E-015 |
| 1024 | 1024 | 1024 | 1024 |
| 5,57 | 4,56 | 9,31 | 5,87 |
| 24,94 | 24,11 | 21,72 | 15,56 |
| 0,47 | 0,84 | 1,33 | 1,33 |
| 0,16 | 0,17 | 0,51 | 0,81 |
| 0,02 | 0,06 | 0,16 | 0,06 |
| 3,62 | 0,5 | 6,69 | 2 |
| 4,89 | 3,87 | 8,57 | 5,48 |
| 0,94 | 1,27 | 1,69 | 5,97 |
| 0,91 | 1,23 | 1,62 | 1,81 |
| 10,2 | 9,2 | 10,3 | 7,51 |
| 16 | 16 | 16 | 16 |
| 8 | 8,00E+000 | 4 | 8 |
| 1048576 | 1048576 | 1048576 | 1048576 |
| -1 | -1 | -1 | 200805 |
| 0 | 0 | 0 | 16 |
| 0 | 0 | 0 | 16 |
| 0 | 0 | 0 | 16 |
| -1 | -1,00E+000 | -1 | -1 |
| -1 | -1 | -1 | -1 |
| -1 | -1 | -1 | -1 |

HPCC

| | | | |
|-----------|-----------|-----------|-----------|
| 1,91E-006 | 2,15E-006 | 1,91E-006 | 4,05E-006 |
| 7,69 | 4,09 | 0,69 | 1,64 |
| 1,59 | 2,49 | 0,86 | 1,9 |
| 7,4 | 4,64 | 0,5 | 2151,35 |
| 3,13 | 3,72 | 1,24 | 4,06 |
| 7,88 | 4,25 | 0,73 | 28,7 |
| 1,91E-006 | 5,96E-006 | 5,96E-006 | 9,54E-007 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |

IMB

Intel MPI Benchmark (former Palas MPI benchmark)

16 ranks / 16 nodes run with 1 process per node.

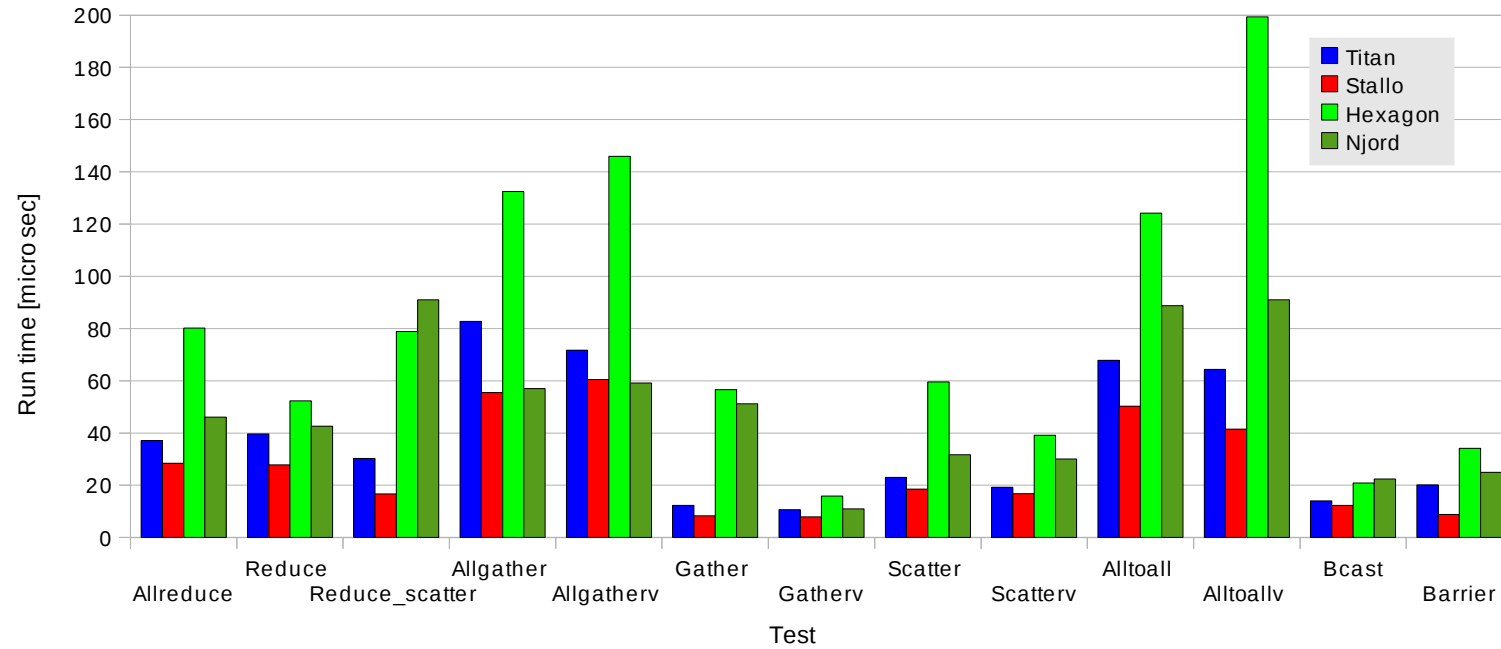
| | Titan | Stallo | Hexagon | Njord |
|-------------------------------------|--------------|---------------|----------------|--------------|
| PingPong latency (0 byte) [us] | 1,84 | 1,15 | 6,25 | 4,91 |
| PingPing Bandwidth (4M byte) [MB/s] | 935,02 | 1333,47 | 1553,25 | 1688,02 |
| Sendrecv (4M byte) [MB/s] | 885,91 | 2507,82 | 1963,28 | 2134,36 |
| Exchange (4M byte) [MB/s] | 975,1 | 2347,11 | 1571,96 | 2194,36 |
| Allreduce | 37,06 | 28,4 | 80,18 | 46,08 |
| Reduce | 39,66 | 27,74 | 52,32 | 42,63 |
| Reduce_scatter | 30,27 | 16,67 | 78,91 | 90,96 |
| Allgather | 82,7 | 55,51 | 132,43 | 57 |
| Allgatherv | 71,67 | 60,46 | 145,95 | 59,12 |
| Gather | 12,32 | 8,26 | 56,54 | 51,19 |
| Gatherv | 10,62 | 7,85 | 15,86 | 10,89 |
| Scatter | 22,97 | 18,45 | 59,56 | 31,65 |
| Scatterv | 19,23 | 16,8 | 39,12 | 30,1 |
| Alltoall | 67,78 | 50,2 | 124,16 | 88,8 |
| Alltoallv | 64,4 | 41,52 | 199,41 | 91,05 |
| Bcast | 14 | 12,23 | 20,89 | 22,41 |
| Barrier | 20,15 | 8,84 | 34,08 | 24,93 |

Message size 1k for collectives, numbers are in microseconds.

All tests with 16 ranks, except PingPong which is 2 ranks.

Intel MPI Benchmark

Collective routines, 16 ranks 1 ppn 1k message size for collectives.



IMB

128 ranks / 128 nodes run with 1 process per node.

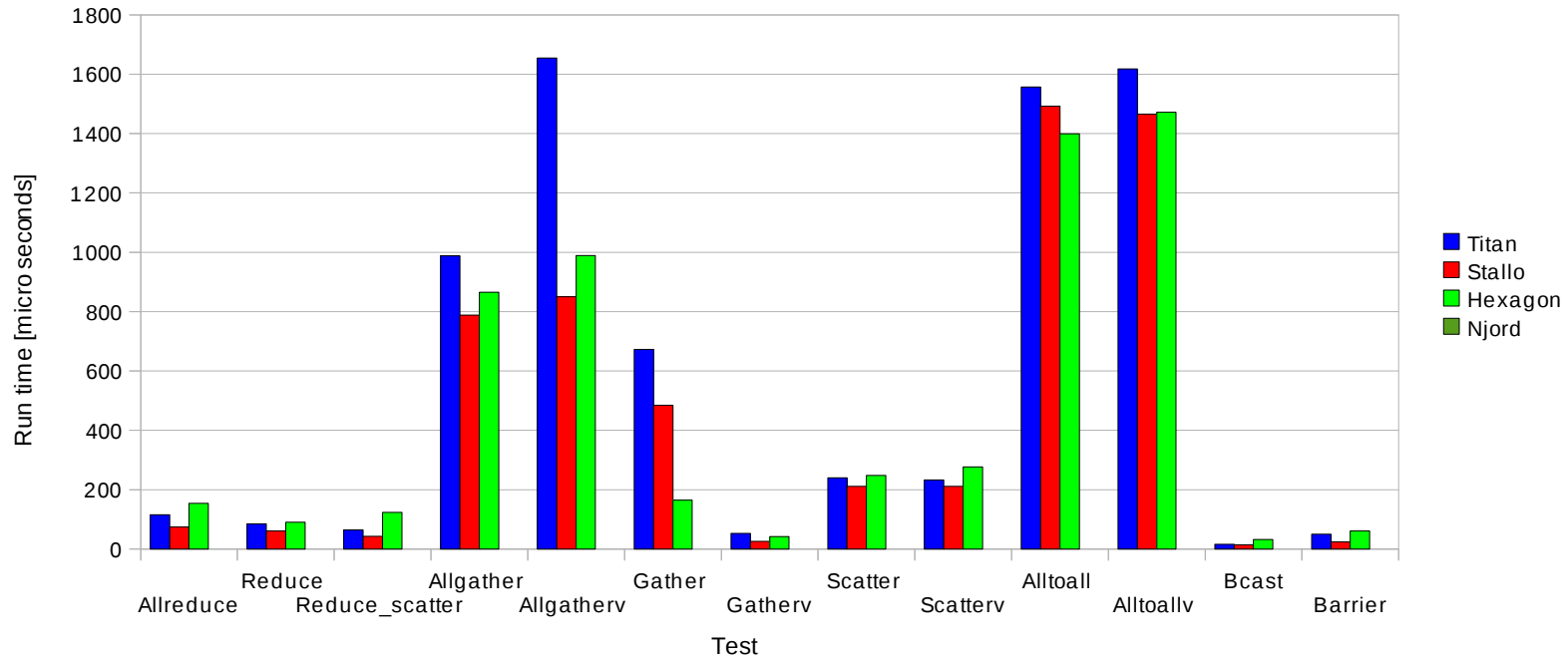
| | Titan | Stallo | Hexagon | Njord |
|-------------------------------------|--------------|---------------|----------------|--------------|
| PingPong latency (0 byte) [us] | 2,66 | 1,41 | 6,22 | |
| PingPing Bandwidth (4M byte) [MB/s] | 914,66 | 1338,8 | 1551,62 | |
| Sendrecv (4M byte) [MB/s] | 721,01 | 1858,79 | 1695,52 | |
| Exchange (4M byte) [MB/s] | 815,08 | 1844,99 | 1561,87 | |
| Allreduce | 115,82 | 74,85 | 153,84 | |
| Reduce | 84,84 | 60,68 | 90,42 | |
| Reduce_scatter | 64,67 | 43 | 123,82 | |
| Allgather | 987,6 | 788,01 | 864,92 | |
| Allgatherv | 1654,94 | 849,86 | 988,87 | |
| Gather | 672,79 | 484,88 | 164,66 | |
| Gatherv | 52,82 | 26,05 | 41,78 | |
| Scatter | 240,41 | 211,04 | 248,52 | |
| Scatterv | 233,05 | 211,74 | 276,77 | |
| Alltoall | 1557,09 | 1492,23 | 1399,17 | |
| Alltoallv | 1617,22 | 1465,37 | 1472,18 | |
| Bcast | 15,91 | 14,18 | 31,76 | |
| Barrier | 49,99 | 23,93 | 61,23 | |

Message size 1k for collectives, numbers are in microseconds.

All tests with 128 ranks, except PingPong which is 2 ranks.

Intel MPI Benchmark

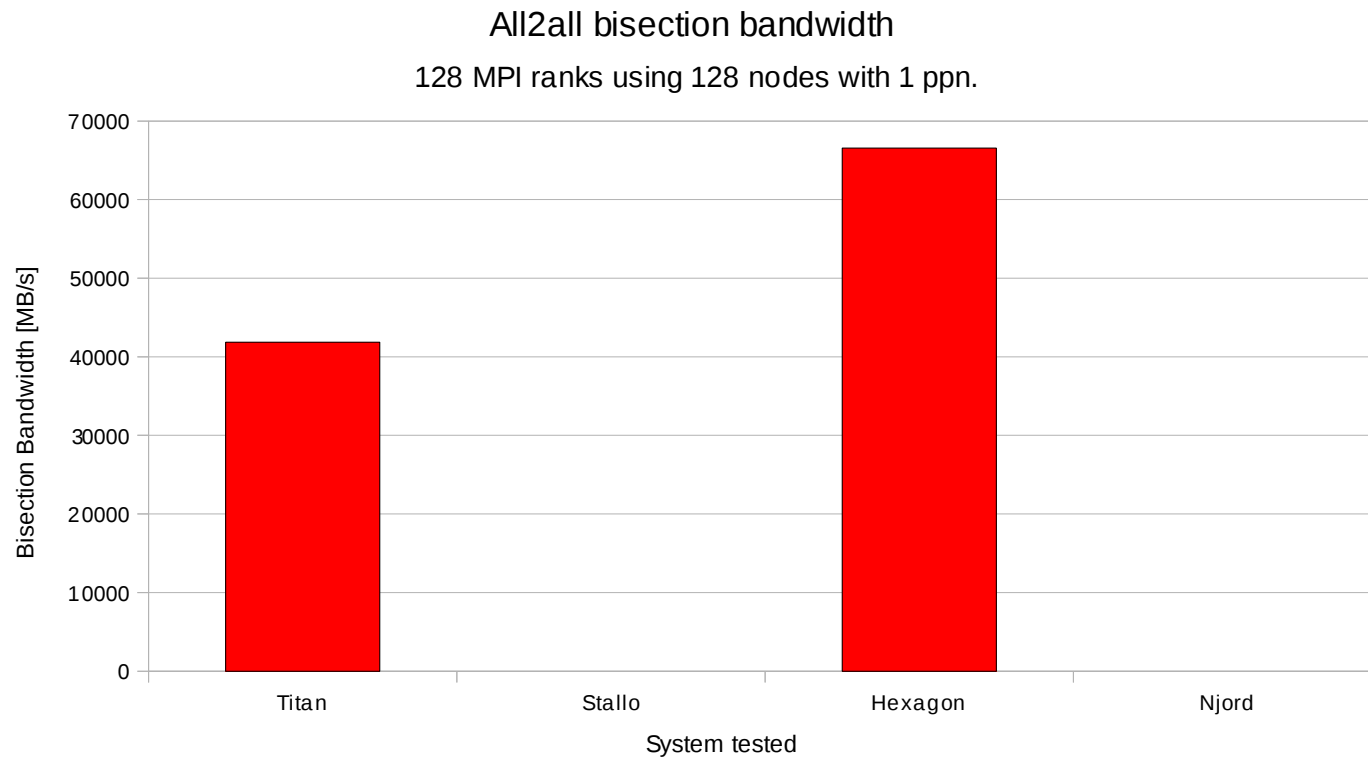
Collective routines, 128 ranks 1 ppn 1k message size for collectives



Scali all2all benchmark

Bisection bandwidth with 128 ranks on 128 nodes using 1 process per node.

| Nodes | Titan | Stallo | Hexagon | Njord |
|-------|----------|--------|----------|-------|
| 128 | 41855,12 | | 66553,64 | |



all2all

Difference is not dramatic for 128 node tests, but hexagon continues to scale far beyond this node count.

Reference for Hexagon. From 128 nodes and above it still keep up performance.

MPI
MPI performance Hexagon

| Noder | BW nodes | BW bisec | Barrier |
|-------|----------|----------|---------|
| 2 | 848,59 | 1697,17 | 7,31 |
| 4 | 870,8 | 3483,19 | 14,59 |
| 6 | 688,69 | 4132,14 | 23,61 |
| 8 | 827,53 | 6620,23 | 22,87 |
| 12 | 749,24 | 8990,85 | 30,91 |
| 16 | 741,88 | 11870,08 | 31,31 |
| 24 | 660,06 | 15841,35 | 39,72 |
| 28 | 634,43 | 17764,07 | 40,34 |
| 32 | 623,14 | 19940,33 | 40,99 |
| 36 | 624,4 | 22478,54 | 50,45 |
| 48 | 637,1 | 30580,56 | 49,73 |
| 52 | 636,61 | 33103,93 | 49,53 |
| 56 | 593,96 | 33261,49 | 55,85 |
| 64 | 555,1 | 35526,22 | 55,99 |
| 72 | 602,25 | 43362,11 | 66,65 |
| 75 | 570,55 | 42791,39 | 65,64 |
| 80 | 560,52 | 44841,91 | 68,04 |
| 85 | 472,2 | 40136,58 | 69,74 |
| 90 | 488,6 | 43974,12 | 67,92 |
| 92 | 501,23 | 46113,37 | 71,99 |
| 96 | 510,36 | 48994,36 | 72,14 |

all2all

| | | | |
|------|--------|-----------|--------|
| 100 | 524,14 | 52414,2 | 75,09 |
| 112 | 547,06 | 61270,77 | 73,95 |
| 128 | 519,95 | 66553,64 | 73,74 |
| 144 | 464,17 | 66840,2 | 83,31 |
| 160 | 517,58 | 82813,35 | 80,96 |
| 200 | 520,82 | 104164,76 | 83,31 |
| 256 | 470,99 | 120572,68 | 83,22 |
| 288 | 495,47 | 142696,43 | 95,2 |
| 360 | 496,84 | 178861,11 | 95,41 |
| 480 | 517,89 | 248586,33 | 106,12 |
| 512 | 446,45 | 228583,05 | 103,54 |
| 600 | 479,91 | 287948,06 | 114,22 |
| 800 | 470,97 | 376773 | 82,12 |
| 1000 | 458,29 | 458285,08 | 82,09 |
| 1200 | 423,27 | 507923,12 | 92,74 |

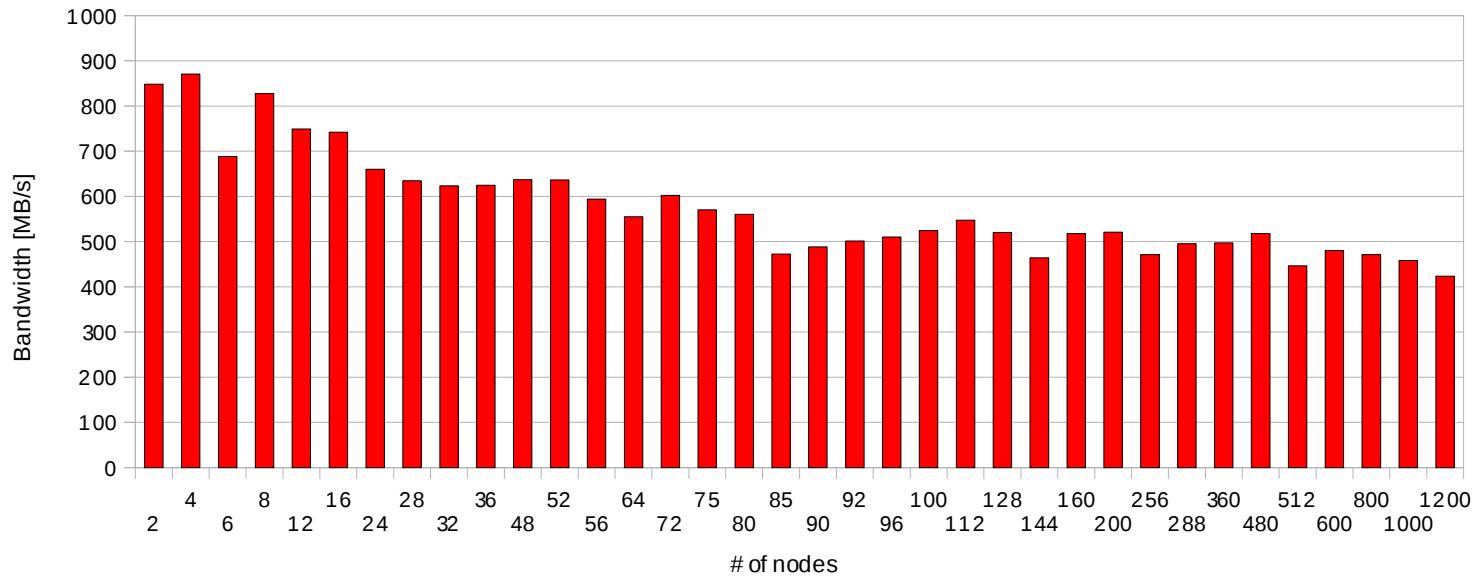
all2all

all2all

all2all

All2all bandwidth per node

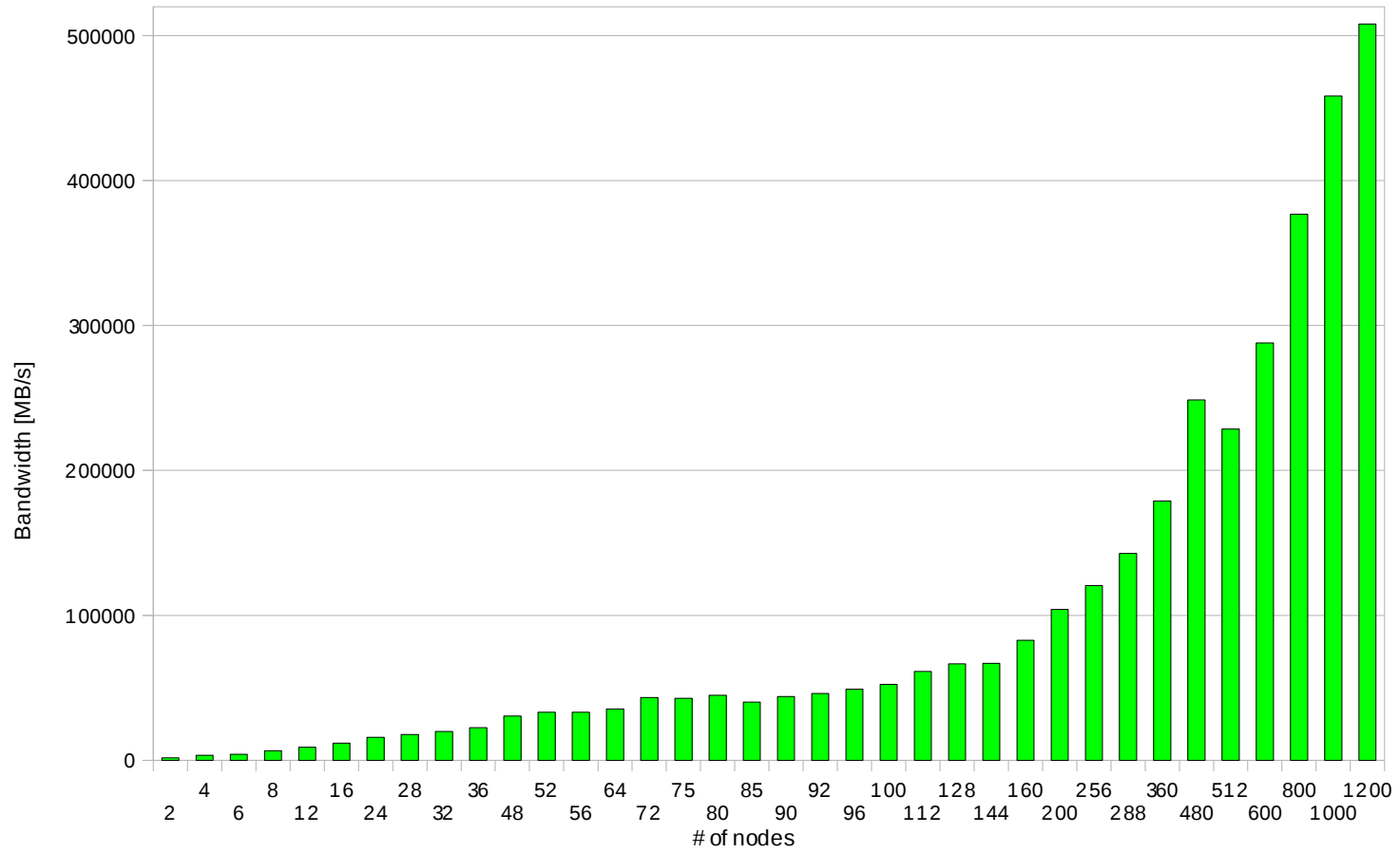
Hexagon std. mpi



all2all

All2all bandwidth bisection

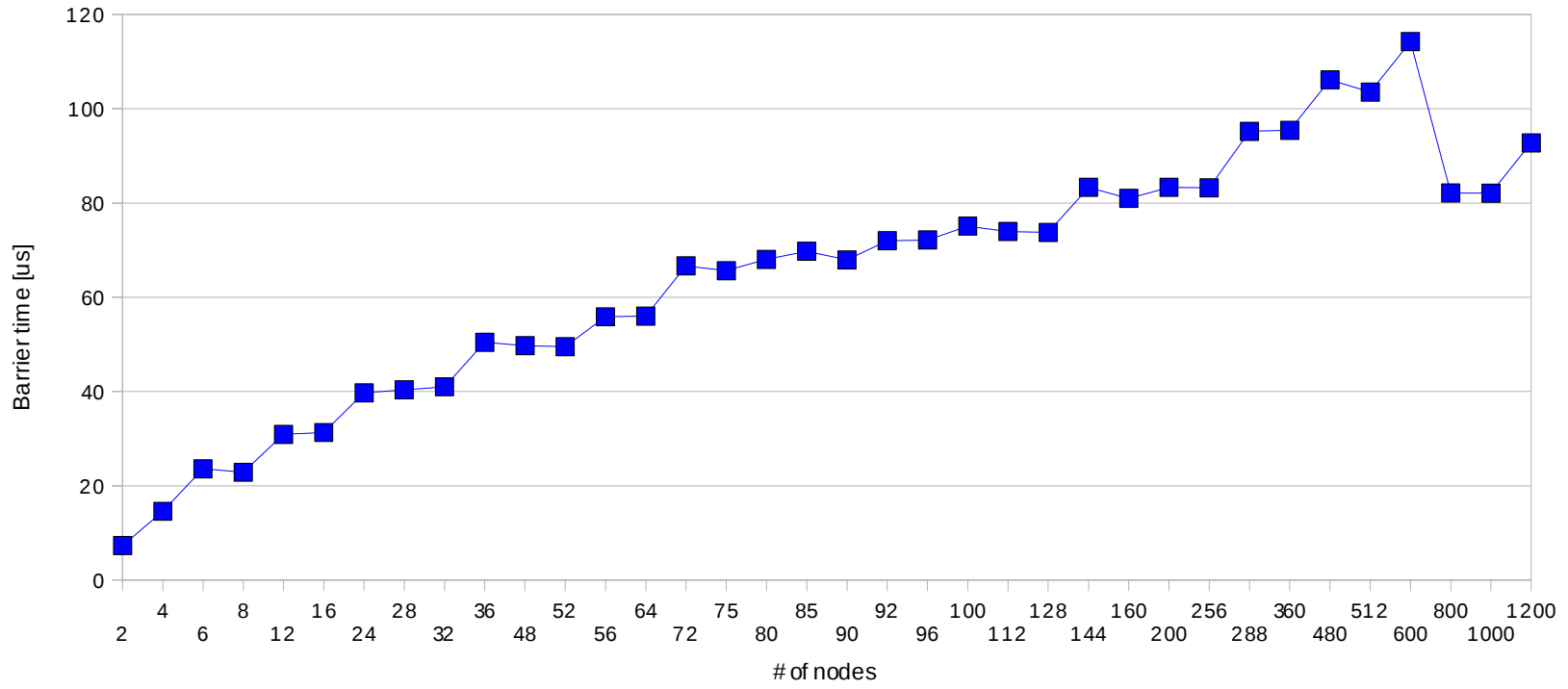
Hexagon std. mpi



all2all

Barrier

Hexagon std. mpi



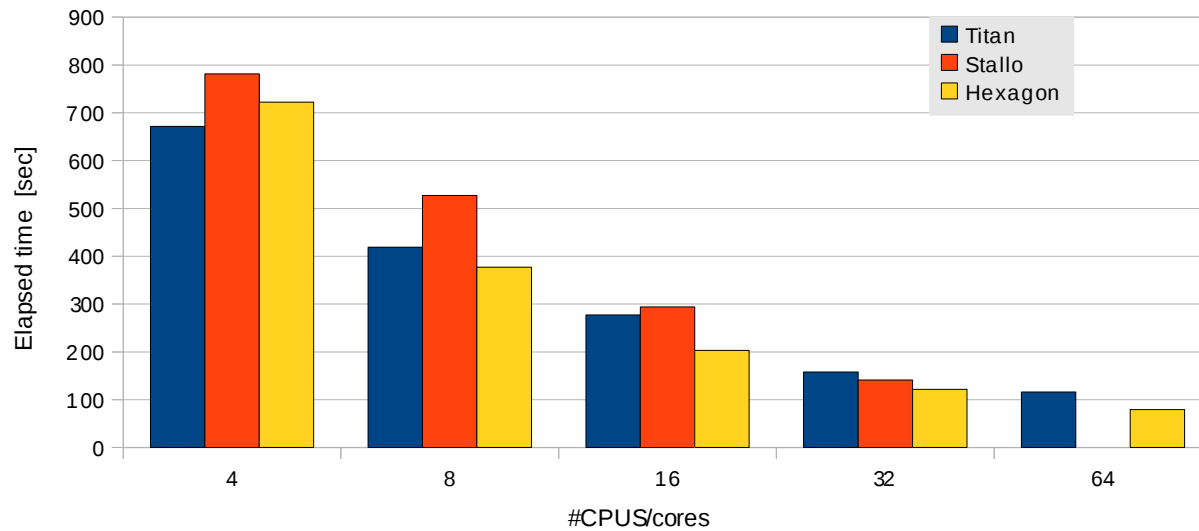
Vasp

VASP

| CPUs | Titan | Stallo | Hexagon |
|------|--------|--------|---------|
| 4 | 671,46 | 781,23 | 722,43 |
| 8 | 419,04 | 527,14 | 377,27 |
| 16 | 277,55 | 294,06 | 203,28 |
| 32 | 157,96 | 141,3 | 121,92 |
| 64 | 116,05 | | 79,04 |

All cores used except for 4 cores when only 4 cores are used, most machines have 8 cores, Hexagon have 4.

VASP benchmarking
All cores utilized per node



Vasp

For reference the Nehalem (Intel X5550) nodes (not Notur nodes) in titan:

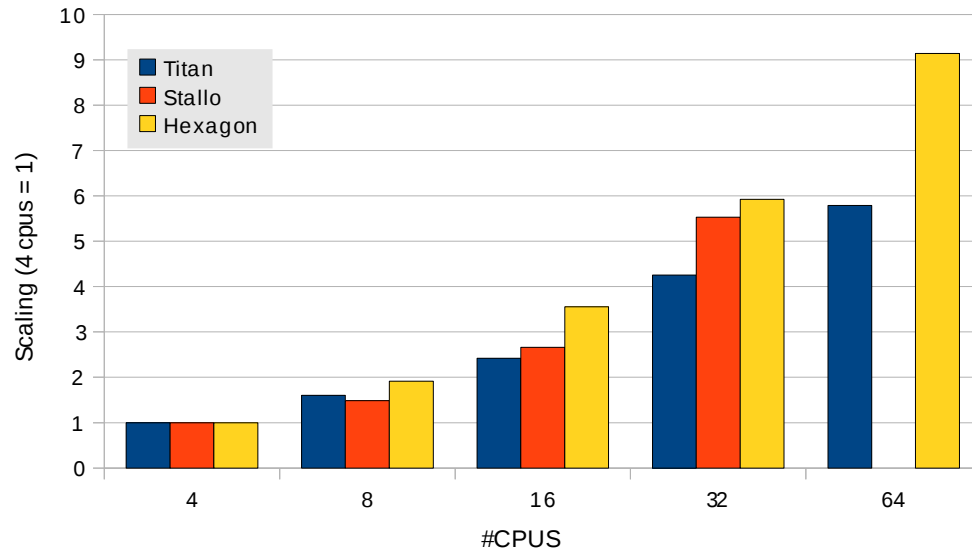
| CPUs | Titan |
|------|--------|
| 4 | 355,03 |
| 8 | 223,45 |
| 16 | 143,56 |
| 32 | 87,89 |
| 64 | 74,02 |

Vasp

| CPUs | Titan | Stallo | Hexagon |
|------|-------|--------|---------|
| 4 | 1 | 1 | 1 |
| 8 | 1,6 | 1,48 | 1,91 |
| 16 | 2,42 | 2,66 | 3,55 |
| 32 | 4,25 | 5,53 | 5,93 |
| 64 | 5,79 | | 9,14 |

VASP benchmarking

Scaling, all cores utilized per node



Vasp