

The "DHIT" test for "Qi-Ming" and "Tai-Yi"

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To compare the software "DHIT" performance running on cluster "Qi-Ming" and "Tai-Yi", I will show the hardware and Linpack performance for the two clusters firstly. "Qi-Ming" has two E5-2690v3 CPUs (2.6 GHz and 12 cores) and 64 GB memory in each blade nodes. The Linpack Rmax for each blade nodes is about **799 GFlops**, i.e. **33 GFlops/core**. "Tai-Yi" has two Skylake Gold 6148 CPUs (2.4 GHz and 20 cores) and 192 GB memory in each blade nodes. The Linpack Rmax for each blade nodes is about **2150 GFlops**, i.e. **54 GFlops/core**. Therefore, the computing capability per node of "Tai-Yi" is about **2.7 times** stronger than "Qi-Ming", and the computing capability per core of "Tai-Yi" is about **1.64 times** stronger than "Qi-Ming".

Table I. The test results of "DHIT" in "Qi-Ming" and "Tai-Yi" clusters

cluster	mpi	nodes	cores	nprocY	nprocZ	isteps	time	second/step	steps/s
Qi-Ming	impi	1	16	4	4	1000	2294 s	2.294 s	0.436/s
Qi-Ming	impi	3	64	8	8	10000	7721 s	0.772 s	1.295/s
Tai-Yi	impi	1	16	4	4	1000	1747 s	1.747 s	0.572/s
Tai-Yi	impi	1	16	4	4	5000	8509 s	1.702 s	0.588/s
Tai-Yi	impi	2	64	8	8	10000	6797 s	0.679 s	1.473/s
Tai-Yi	impi	7	256	16	16	10000	1648 s	0.165 s	6.068/s
Tai-Yi	openmpi	1	16	4	4	1000	1574 s	1.574 s	0.635/s
Tai-Yi	openmpi	1	16	4	4	5000	7721 s	1.544 s	0.648/s
Tai-Yi	openmpi	2	64	8	8	10000	6811 s	0.681 s	1.468/s
Tai-Yi	openmpi	7	256	16	16	10000	1658 s	0.166 s	6.024/s
Tai-Yi	openmpi	26	1024	32	32	10000	301 s	0.030 s	33.333/s
Tai-Yi	openmpi	26	1024	32	32	50000	1432 s	0.029 s	34.916/s
Tai-Yi	mvapich2	1	16	4	4	1000	2310 s	2.310 s	0.433/s
Tai-Yi	mvapich2	2	64	8	8	10000	6803 s	0.680 s	1.470/s
Tai-Yi	mvapich2	7	256	16	16	10000	N/A	N/A	N/A
Tai-Yi	mvapich2	26	1024	32	32	10000	N/A	N/A	N/A
Tai-Yi	mpich	1	16	4	4	2000	3111 s	1.556 s	0.643/s
Tai-Yi	mpich	2	64	8	8	10000	14407 s	1.441 s	0.694/s

I present the test results of "DHIT" in "Qi-Ming" and "Tai-Yi" in Table I. The results show that "Tai-Yi" is about **1.14 ~ 1.31 times** faster than "Qi-Ming".

According to the “impi” results, the efficiency for "Qi-Ming" and "Tai-Yi" are 0.74 and 0.64, respectively. All of the test results are in the "Tai-Yi" directory of **/share/test/DHIT**.

In my tests, the compiler and parallel software are:

- a) "Qi-Ming": Intel compiler 2015.1.133 and Intel mpi 5.0.2.044.
- b) "Tai-Yi": Intel compiler 2018.5.274, the mpi included Intel compiler 2018.5.274, the openmpi 4.0.0, mvapich2 2.3 and mpich 3.3.