Intel® Cluster Ready Support for LS-DYNA®/MPP

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Abstract

The Intel® Cluster Ready program enables LS DYNA®/MPP users to buy, install, and use clusters more effectively. It includes a joint Intel and cluster supplier certification process to ensure the cluster the LS-DYNA user purchases is designed and built to specification. Intel supplied software tools support verification of initial and ongoing operation and performance of the cluster.

Intel® Cluster Ready Overview

The Intel® Cluster Ready program provides a framework to assure system suppliers and purchasing customers of a working system ready to run LS-DYNA/MPP and other registered applications. An Intel® Cluster Ready certified cluster comes with a specified list of hardware and software components, as well as tools to verify correct operation and diagnose deficiencies. Intel® Cluster Ready validates systems from a single box desk side personal cluster, up to 128 node enterprise data center systems.

The website www.intel.com/go/cluster maintains a list of vendors offering Intel® Cluster Ready certified systems and applications supported on these systems. Participation is open to all vendors complying with certification requirements. Intel® Cluster Ready validation relieves the customer and the application vendor of much time and effort required in the past to solve problems in cluster support.

Ensuring Correct Cluster Operation

Intel® Cluster Checker is a software tool developed specifically to verify correct operation under Intel® Cluster Ready. It checks compliance of the cluster hardware and software combinations with Intel® Cluster Ready specifications, enabling verification of initial setup and continuing correct function and performance, including remote diagnosis of deficiencies. Cluster providers and software vendors, including LSTC, can determine the nature of customer problems, whether they pertain to the cluster provider, software installation, or the application. Backup assistance is available from the Intel® Cluster Tools team.

Cluster Health Checks

Intel® Cluster Checker performs approximately 100 individual tests and cluster suppliers may add their own tests. Health checks assure that Intel® MPI is running with expected performance across all nodes and with the necessary permissions – and they also insure that all Intel® Cluster Tools run-time libraries available while matching software revisions. Additionally, stale files or runaway processes are caught. Any problems are diagnosed for quick solution, with remote help if necessary.

Included Software Tools

Intel® Cluster Ready includes an installation of Intel® Cluster Tools, covering free run-time support for the libraries used to build LS-DYNA (Intel® MPI, Intel® Visual Fortran, Intel® Math Kernel Library, and BLAS library), and limited time demonstration installations of Intel compilers, MPI development libraries, and Intel® Trace Analyzer MPI performance analysis. An Intel® Cluster Ready packaged installation of cluster software and Intel® Cluster Tools saves significant additional effort and commitment for support by customers who might have undertaken this integration in the past. LS-DYNA/MPP takes full advantage of the Intel® MPI libraries and OFED support for InfiniBand provided on an Intel® Cluster Ready system, and is ready to run on such a system.

Support for LS-DYNA Usermat

In order to take advantage of the usermat facility, the Intel® Fortran Compiler should be licensed. If the customer compilation does not require the use of MPI header files, the free run-time license is sufficient for linking with Intel® MPI. The Intel® MKL run-time libraries included with Intel® Cluster Ready may be used, or the Intel® Fortran Compiler professional license may be preferred, as it includes the full Intel® MKL development libraries. Full development license for Intel® MPI is available separately, or as part of the full Intel® Cluster Tools package.

Performance

Intel® Cluster Ready systems include basic performance checks with Intel® Cluster Checker, to assure that the cluster continues to achieve expected performance. Intel® MPI benchmarks are included, along with the mpitune utility which automatically sets Intel® MPI default tuning parameters to optimize performance of these benchmarks. These benchmarks, as well as application testing, have been used to tune Intel® Cluster Ready components and assure competitive performance. LS-DYNA performance quotations for examples of many systems may be found on topcrunch. These include Intel® MPI results representing performance of similar Intel® Cluster Ready systems.

Supported Hardware

Specific hardware to be tested and certified is determined by the Intel® Cluster Ready partners. All Intel® Xeon processors on single and dual socket platforms are represented, with both dual

and quad core processors. Following is a very brief summary of characteristics of current motherboard platforms:

Sockets	RAM slots	FSB speed MT/s
1	4 DDR2	1066,1333
2	8,12,16 FBD	1333,1600

FSB rating is more significant for LS-DYNA performance than CPU clock speed or RAM speed rating.   CPU clock speed involves a trade-off between performance, price, and power consumption. 2GB RAM per core is plenty for most LS-DYNA explicit cases, including topcrunch benchmarks. Both DDR2 and FB-DIMM are currently most cost effective in 2GB sticks, with 4GB sticks selected by a few system vendors to leave room for upgrades. Higher RAM capacity per core may be important for LS-DYNA implicit. Current Intel® Core™ 2 Quad processors with corresponding increases in installed RAM, generally give about 40% more overall performance for LS-DYNA than corresponding dual core processors, on the recommended single or dual socket platforms. The current quad core licensing policy of LSTC improves value of quad core.

Summary

The Intel® Cluster Ready program provides a means for LS-DYNA/MPP customers to acquire a Linux cluster certified ready to run by the vendor. Intel® Cluster Ready tools support continued assurance of correct operation.

References

Intel® Cluster Ready partners:
http://softwarecommunity.intel.com/articles/eng/1314.htm

Intel® Cluster Toolkit Compiler Edition:
http://www.intel.com/cd/software/products/asmo-na/eng/375500.htm

Intel® Fortran Compiler:
http://www.intel.com/cd/software/products/asmo-na/eng/compilers/flin/282048.htm#features

Intel® MPI:
http://www.intel.com/cd/software/products/asmo-na/eng/308295.htm
http://softwarecommunity.intel.com/isn/Community/en-US/forums/post/30244004.aspx

Intel® Math Kernel Library:
http://www.intel.com/cd/software/products/asmo-na/eng/307757.htm

Intel® Trace Analyzer and Collector:
http://cache-www.intel.com/cd/00/00/32/74/327401_327401.pdf

OpenFabrics Alliance:
http://www.openfabrics.org/

TopCrunch benchmark quotations:
http://www.topcrunch.org/