MPP in Stamping Simulations with LS-DYNA

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Abstract

With the continuous improvement of MPI protocols, for example, Lam-MPI, MPICH, etc.., even fast computer hardware and network connections, the applications of MPP technologies in multi-stage stamping simulations for auto industries becomes more and more attractive, not only because of their scalability, but also for their ability to re-use the older equipments without sacrifice the speed of simulations. In this paper, we will present our study results on the MPP version of LS-DYNA in our stamping simulations and our ultimate goal with this technology.

Nowadays, in order to reduce operation costs and maintain high quality of products, FEA simulations of stamping processes become de-facto in the auto industries. With the continuous improvement of FEA technology and computer hardware, numerical simulations of multi-stage stamping operations have become a reality. Because the deliverability of simulations is one of our five major quality measurements, we need even faster simulation speed to catch up with new product style changes.

Part	LS-DYNA970 (SMP)	MPP970 – rev.6763.169			
		LAM 659		LAM 711	
FENDER OTR (1) (Real Beads)	19hrs 7mins 402,000 element	11hrs 44mins 430,000 elements	1.6x (1.07x)		
FENDER OTR (2) (Real Beads)	21hrs 2mins 483,000 elements	14hrs 5mins 551,000 elements	1.5x (1.14x)		
Rear Door OTR (element# 16 & 5 IP)	7hrs 27min 313,000 elements	7hrs 52mins 414,000 elements	0.95x (1.32x)		
Front Door OTR (Real Beads)	9hrs 24mins 404,000 elements	6hrs 35mins 449,000 elements	1.5x (1.11x)		
BSA INNER (1)	6hrs 27mins 575,000 elements	6hrs 2mins 642,000 elements	1.1x (1.1x)		
BSA INNER(2)	17hrs 30mins 394,000 elements	11hrs 57mins 436,000 elements	1.5x (1.11x)		
BSA OTR	14hrs 11mins 529,000 elements	Failed		10hrs 21mins 576,000 elements	1.4x (1.09x)
DECLID INNER – Al (element#16 & 5 IP)	12hrs 3mins 263,000 elements	Failed		10hrs 1min 273,000 elements	1.2x (1.04x)
Numisheet 05 Declid Inner – BH180	12hrs 45mins 250,000 elements	11hrs 24mins 275,000 elements	1.1x (1.1x)	11hrs 23mins 275,000 elements	1.1x (1.1x)

Table 1: Comparison of CPU time and number of elements for SMP vs. MPP of LS-DYNA for selected panels.

In our previous published paper, we demonstrated the possibility of using the MPP/LS-DYNA in our multi-stages stamping simulations. With the continuous improvement of MPI technology with Lam-MPI, MPICH, and great efforts from LSTC, many obstacles have been resolved during the course. We are ready to apply this technology in our daily stamping simulations. In this paper, we will demonstrate the advantages of the LS-DYNA in stamping operations from selected tests which show good simulation quality. LS-DYNA/MPP gives even faster CPU speed in comparison with LS-DYNA/SMP and due to its higher scalability to allow reuse the older equipments without sacrifice the quality and speed of simulations.

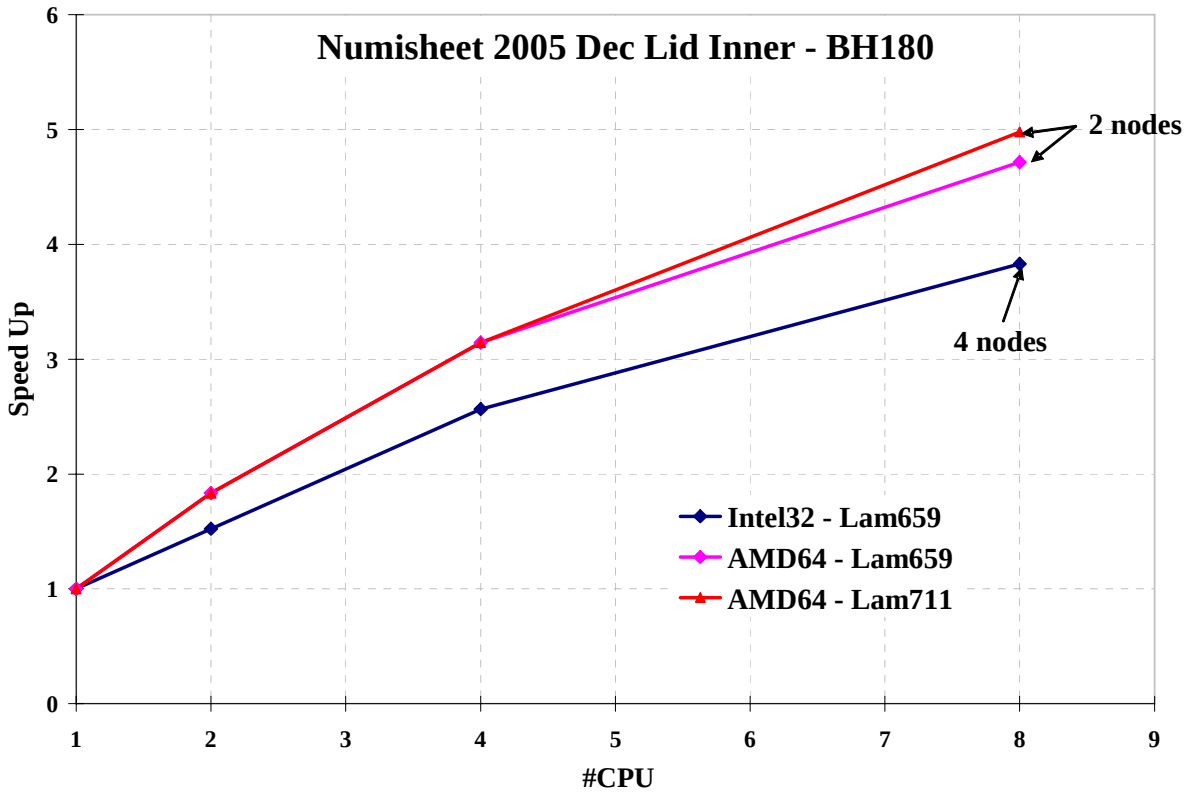

Figure 1: Comparison of the scalability of MPP with different chips: Xeon (32bit) vs. AMD (64bit) with different MPI protocol – lam659 and lam711.