IBM Deep Computing Group

How to Make LS-DYNA Run Faster

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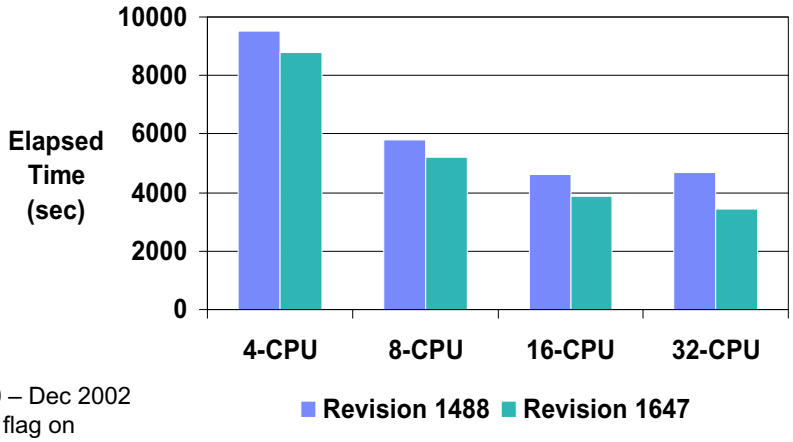
Topics

- pSeries POWER4 Performance Topics
  - Recent SMP Optimization
  - Effect of Parallel Repeatability Flag
  - Effect of Parallel Force Assembly
  - Version 970 tuning
- xSeries IA-32 Xeon Performance Topics
  - Faster Processors
  - Faster Frontside Bus
  - Version 970 Tuning
  - Interconnect Options
- Comparisons and Summary

IBM pSeries Performance

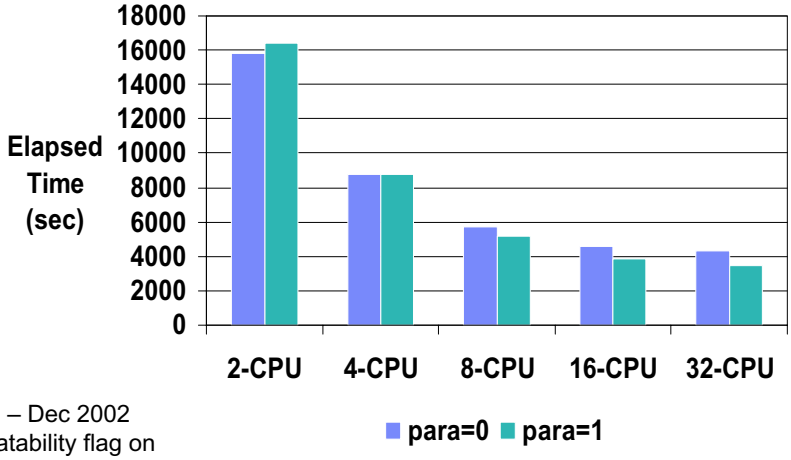
- POWER4 and AIX product line
- Clusters of individual SMP nodes
- SP Switch 2 high performance interconnect
- Individual nodes range up to an SMP of 32 processors
- Entire product line in transition from POWER4 to POWER4+ processor
- Interconnect Option: Gigabit Ethernet

Recent Optimization of version 960 SMP LS-DYNA



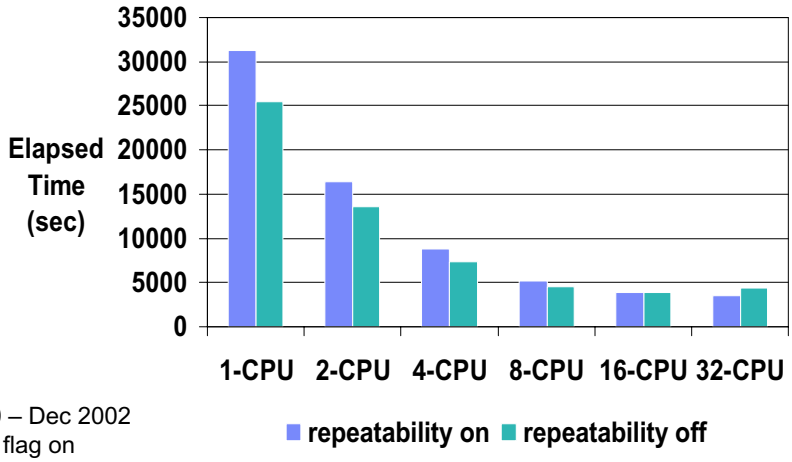
p690 – Dec 2002
para flag on
repeatability flag on
refined Neon-535k elements

Improved Performance from use of the PARA Flag



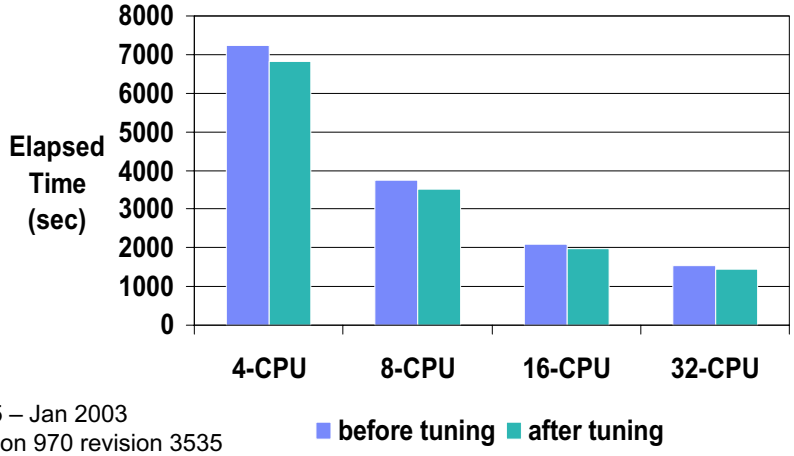
p690 – Dec 2002
repeatability flag on
refined Neon-535k elements

Effect of the Repeatability Flag



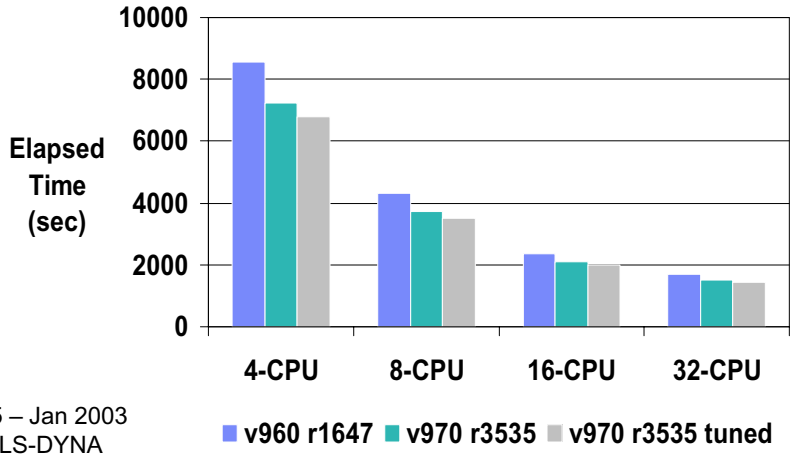
p690 – Dec 2002
para flag on
refined Neon-535k elements

Recent MPI LS-DYNA Optimization



p655 – Jan 2003
version 970 revision 3535
refined Neon-535k elements

Comparison of v960 and v970 Performance

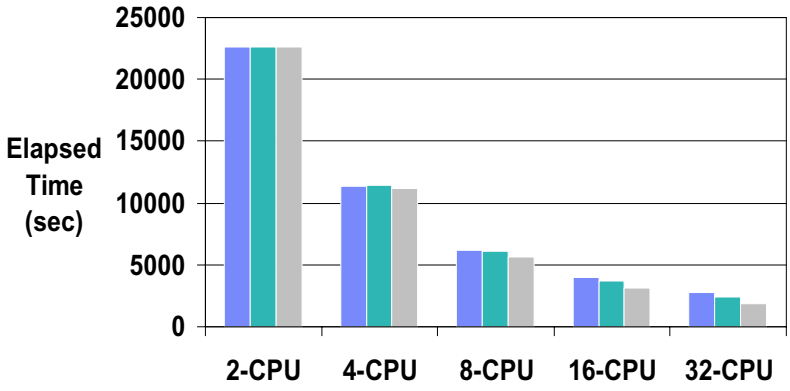


p655 – Jan 2003
MPI LS-DYNA
refined Neon-535k elements

IBM xSeries Performance

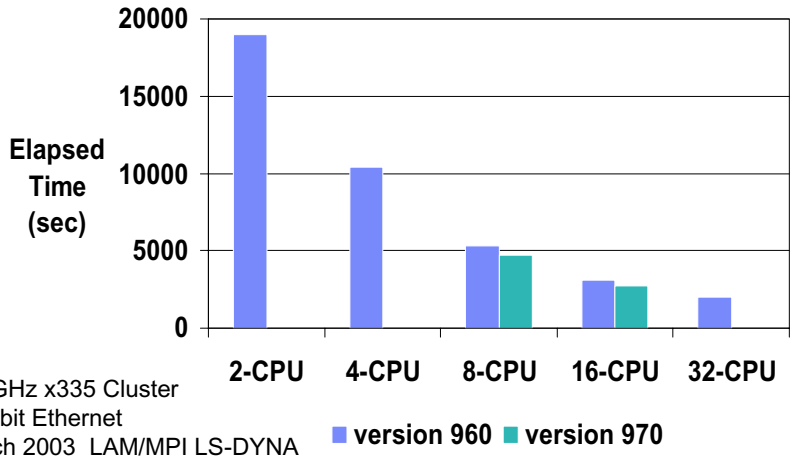
- Linux clusters
- One or two processor nodes (Intel IA-32 Xeon)
- Interconnect Options: Gigabit Ethernet or Myrinet
- Several decisions regarding LS-DYNA (LAM/MPI, MPICH, …)

Interconnect – Effect on Performance



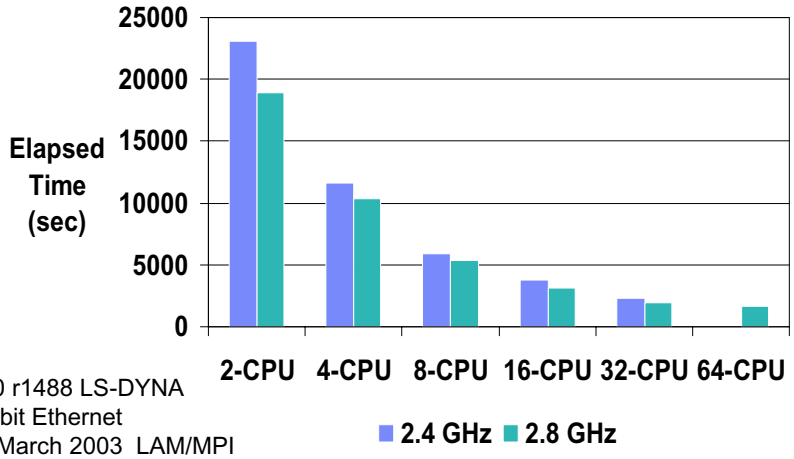
2.2 GHz IntelliStation Cluster
June 2002 MPI LS-DYNA
refined Neon-535k elements

Performance Improvement with Version 970



2.8 GHz x335 Cluster
Gigabit Ethernet
March 2003 LAM/MPI LS-DYNA
refined Neon-535k elements

Performance Improvement with Faster Processors



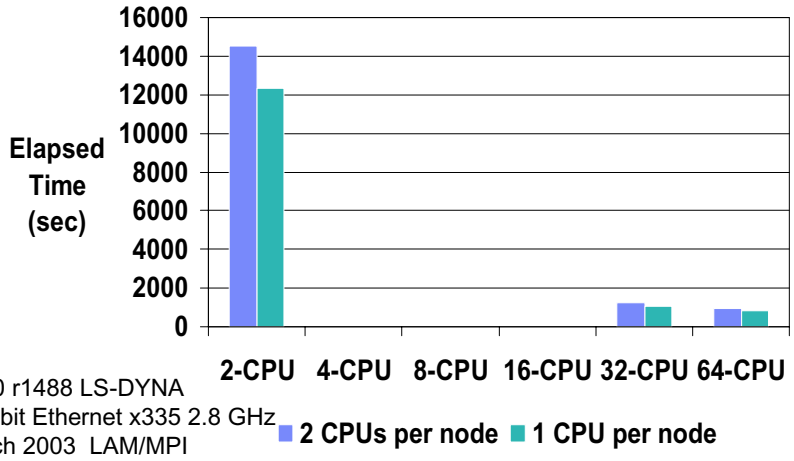
V960 r1488 LS-DYNA
Gigabit Ethernet
Jan-March 2003 LAM/MPI
refined Neon-535k elements

Speedup from Faster 533 MHz Frontside Bus

Model Size (elements)	Speedup: 400MHz to 533 MHz Frontside Bus
12000	1.10
32000	1.08
155000	1.20
430000	1.18

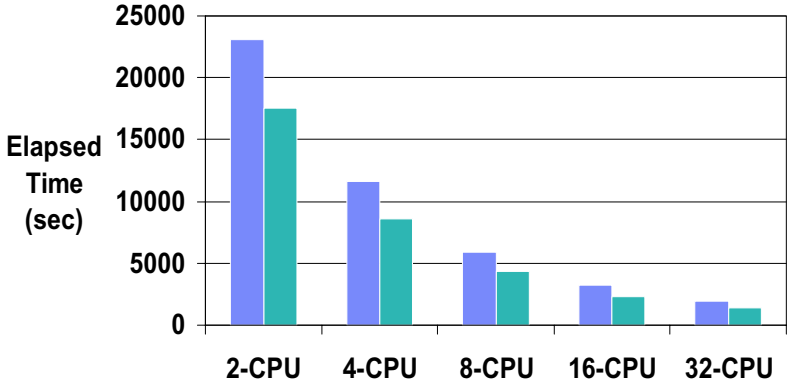
V960 r1488 LS-DYNA
March 2003 LAM/MPI
2.8 GHz x335 node – 2 processor runs

Configuring Each Node with One Processor



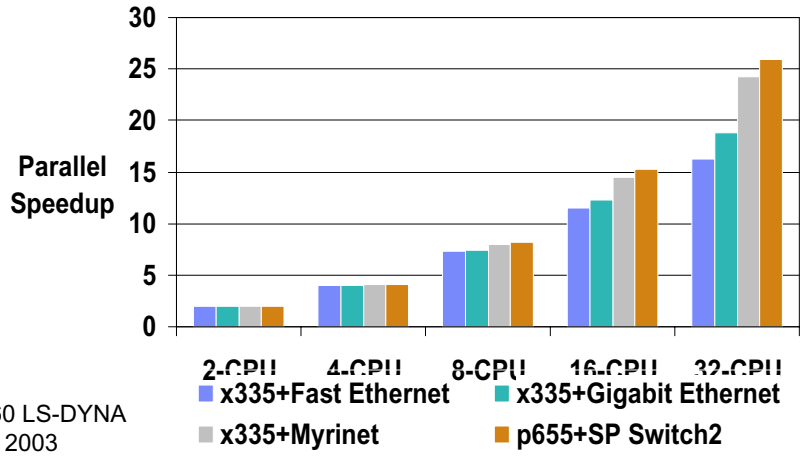
V960 r1488 LS-DYNA
Gigabit Ethernet x335 2.8 GHz
March 2003 LAM/MPI
Front crash model 430k elements

POWER4 and IA-32 Xeon Performance Compared



V960 LS-DYNA
Jan 2003
Refined Neon 535k Elements

Interconnect Performance Compared



V960 LS-DYNA
Jan 2003
Refined Neon 535k Elements

Summary

- IBM Continues to work with LSTC on improving the performance of LS-DYNA
- IBM pSeries still provides top performance and the advantages of the AIX user environment
- IBM xSeries platforms offer a very cost effective Linux Cluster solutions for LS-DYNA customers
- Users today can customize their system in order to pick the features which serve them best
  - Processors
  - Operating system
  - Interconnect