HPC and IT Issues

Session Agenda

Deployment of Simulation (Trends and Issues Impacting IT)
  – Discussion

Mapping HPC to Performance (Scaling, Technology Advances)
  – Discussion

Optimizing IT for Remote Access (Private / Public Cloud Computing)
  – Discussion

Break

Let’s Talk about Hardware (Specifying HW for ANSYS)
  – Discussion

ANSYS Roadmap (Toward aligned IT Planning)

Tomorrow

1:1 Meeting Time
Let’s Talk About Hardware
ANSYS Deployment Guidelines

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Agenda

- Introduction - Diana L. Collier – Lead Systems Support Specialist
- Information you need to provide ANSYS before you make your hardware purchases
- Hardware Considerations
- Sizing Guidelines for ANSYS Applications
- Vendor Solutions and Benchmark links on ANSYS.com
- Contacting ANSYS for Technical Support or Hardware Advice
- Take Home Points / Discussion
Hardware Considerations

PROCESSORS
• Performance scales with clock speed – go for the fastest processor
• Performance also depends on balance – number of cores vs. memory access
• Intel “Westmere” processors (Xeon 5600 series)
  ● Dominant today - fastest clock speed, good memory access
• AMD processors also supported
  ● Lower performance per core – but good Total Cost of Ownership (power, cooling)

MEMORY
Minimum of 4 - 8 GB RAM per core. (1333 MHz or faster)

HYPER THREADING now called Simultaneous multi-threading or SMT.
• ANSYS Fluids - While some improvement is possible, the extra performance from the virtual threads is not cost-effective with the additional license costs (which are per process).“
• ANSYS Mechanical - Mechanical does not benefit much from SMT enabled and it is not worth purchasing the extra HPC licenses for the small gain that might be realized.

GPU COMPUTING
• ANSYS Mechanical 13 can use a single GPU when the SMP solver is invoked.
• Expanded scope in R14 ("D-ANSYS" distributed solver, FLUENT radiation model)
Hard Drive Specifications

**FLUENT/CFX**
- No special hard drive configuration is required as FLUIDS do very little Disk Read/Write.
- SATA drives are fine

**Mechanical - RAID 0 Recommend**
- RAID 0 uses a method called striping. Striping takes a single chunk of data and spreads that data across multiple drives. The advantage that striping has is in improved performance. Twice the amount of data can be written in a given time frame to the two drives compared to that same data being written to a single drive.
- Maximum performance is obtained when the Mechanical simulation is run on a RAID 0 array of 4 or more disks that is a separate disk partition from other system file activity, for example, the operating system is on a separate disk from the data.
- That being said, multiple SAS/SDD hard drives striped with RAID 0, 15,000 RPM or better is recommended.
- RAID 5 / 10
High Speed Interconnects

Gigabit or Infiniband
• In general if you have fewer than 4 nodes (8 cores per node) Gigabit is sufficient.
• We recommend, that if running on 4 or more nodes, a high speed switch such as Infiniband be utilized.
• (Please visit our benchmark page for more information)

FLUIDS
• FLUIDS scale well on large number of cores.

Mechanical
• For Distributed ANSYS performance, it is often wiser to invest in more memory and faster local I/O than to add expensive interconnects. Distributed ANSYS jobs often do not require more than 16 cores.

Supported Interconnects
• http://www.ansys.com/Support/Platform+Support/ANSYS+13.0+Supported+Interconnects

10GigE
• We do not have any posted data for 10GigE performance but we have seen very good performance.
Operating Systems

ANSYS supports:

Windows XP, Vista and 7 - 32 and 64-bit
Red Hat and SUSE Enterprise - 32 and 64-bit

NOTE: Support for Linux 32-bit, HP-UX Itanium 64-bit, Sun Solaris 64-bit, IBM AIX 64-bit will be dropped for Release 14
We test and certify the following two graphic card series
- nVIDIA Quadro and Quadro FX
- ATI FirePro and FireGL

Remote Visualization / Access
- Running any ANSYS application using remote access software is a viable – but often problematic - option using many of the popular remote visualization applications (Exceed 3D VNC, etc).
- WHY? Server class systems are designed for number crunching in the ANSYS Solve world. Generally these number crunching servers DO NOT have a PCIx16 slot to be able to use a workstation class graphics card. Visualization will be poor or non existent.
- We recommend that your pre/post applications be run on a local workstation with a workstation class graphics card and submit your solve jobs to the server/cluster from the local workstation
Why Clusters for ANSYS?

Workstations
• Good solution for single user, running modest/medium model sizes, without need for job queues
  ● 2011 desktops typically include two quad-core (8-core) or two hex-core processors (12-core) and up to 96 GB RAM

Clusters
• Scalable solution for accelerating multiple jobs from multiple users, controlled via job queue
  ● Probably most affordable way to scale up memory and processors
Cluster Sizing Guidelines

Entry Level Cluster - 4 Nodes - 32 cores, 128 GB RAM

Capacity for:

Several simultaneous ANSYS fluid dynamics simulation models in the size range of 2M to 3M cells

or

Several simultaneous ANSYS Mechanical simulations in the range of 1M to 2M DOF

or,

Single ANSYS fluid simulation model size up to 30-40M cells or ANSYS Mechanical model sizes up to 50 MDOF.

• Depending on solution type
Cluster Sizing Guidelines

Departmental Cluster - 16 Nodes – 128 cores – 512 GB RAM

Capacity for

6-10 simultaneous ANSYS fluid dynamics simulation models in the size range of 2M to 3M cells – or 1-2M DOF ANSYS mechanical models

• Or several simulations in the size range of 10M cells / 10M DOF
• Or single fluid simulation models sized up to 100M cells.
• Or single mechanical models sized up to 100M cells (depending on solver type)
Vendor Solutions

http://www.ansys.com/About%20ANSYS/Partner%20Programs/

Benchmarks

http://ansys.com/Support/Platform+Support/Benchmarks+Overview

ANSYS Platform Support

http://www.ansys.com/Support/Platform+Support
Installing ANSYS Solvers

Download ANSYS from the Customer Portal
https://www1.ansys.com/customer

• Getting Started Guide  Getting Started with ANSYS 13
  http://www1.ansys.com/customer/content/ANSYS_13FAQs.pdf

Install on the head node

Export the file system so that all of the nodes have ANSYS available.

Make sure that you can "ssh" between nodes without a password.

Make sure that your home or working directory is shared so that all nodes can access it.
Batch Submission
- Using input and output files

Remote Solve Manager (RSM)
- Three-tiered architecture
  - Client, solve manager, compute server
- Third-party scheduler aware
  - LSF, PBS, Windows HPC Server

FLUENT Launcher
- Third-party scheduler aware
  - LSF, PBS, SGE
  - Windows HPC Server
Benefits of RSM

• WorkBench integrates RSM with different solvers closely. Once a solver job or a component update or a design point update is submitted to RSM from WorkBench, the computer can be turned off or can be used to continue work on a different project.

• Later, the user will be able to reconnect to the jobs managed by RSM. If the job has finished, the user will be notified, and the results will be automatically downloaded, merged into the project and made them available to the users. To the user it seems as if all these are done locally to the end user when working from WorkBench.
Contacting ANSYS for Technical Support or Hardware Advice

http://www.ansys.com/customerportal

ANSYS Technical Support

ANSYS Technical Support is available to all customers who have purchased TECS (Technology Enhancements and Customer Support).

Search the Knowledge Resources

Type keywords or solution number  Family: all

Online Support Request

Submit/Update technical support requests

Technical Support Contact Information

Telephone and FAX Support

ANSYS Technical Support is available via telephone or FAX at the number below. Please provide your individual ID when contacting ANSYS Technical Support. Your individual ID can be found under My Account.

Toll Free Phone: 1-800-711-7199
Phone: 724-514-3600
FAX: 724-514-5095
Purchasing the wrong hardware

Customer A purchases system to run ANSYS FLUENT
- Needs faster simulation time so...
  - Purchases 4 parallel licenses and
  - Purchases a new PC with 2 dual cores
- Gets system delivered... Runs FLUENT... Is very disappointed with the performance and graphics. Contacts ANSYS

Comments
- Customer has purchased an ideal system for running video games

Resolution
- Customer returned the system... bought a recommended Workstation and was happy with the solver and graphics performance.
“Measure Twice, Cut Once” – Planning is key

Contact ANSYS before you buy

ANSYS is here to help you configure your next hardware upgrade.

Ideal configuration will depend on your specific workload and workflow, budget, infrastructure, etc.