The Focus
A Publication for ANSYS Users

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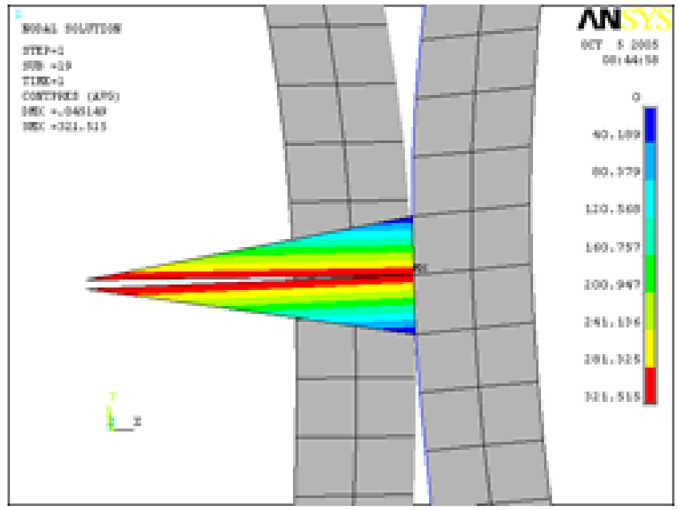

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Top 10 Reasons to Use Workbench

by Eric Miller

While preparing for a recent user group meeting in California, someone who was attending asked if we could present some good reasons for him to use Workbench more. After some thought and discussion, we came up with the follow list of reasons why PADT uses Workbench, and why we recommend it to our users.

10: Shorter and Shallower Learning Curve

People just seem to learn Workbench faster and are more productive sooner. This is especially true for younger engineers who are new to FE analysis and have a strong background with modern parametric CAD packages such as SolidWorks or Solid Edge.

9: Significant Say in Growth

Workbench is developing and growing every day. For many in the user community, this is the first time that they can participate in guiding the development of a code that, in our opinion, will soon dominate the CAE market. This is everyone’s opportunity to speak up and make an impact.

8: Automatic Report Creation

The process of creating reports for an analysis can sometimes take longer than the analysis. On occaision, schedules are so tight that no report is created at all, or only the results are captured. Both of these issues are addressed with the powerful automatic report generation feature in WB. Using this tool, companies can set up standardized reports, force the capture and retention of key pieces of information, and drastically reduce the amount of time required to make a report.

7: Built-in Process Standardization

When you start up WB, you may have noticed some stuff over on the right side of the screen. This is where wizards live. The product ships with some basic step-by-step guides. Many users see these as tools for helping low-end users do analysis, which they are in fact good for. But you can also create your own very sophisticated wizards that can lock down standard processes and ensure that key steps are carried out.

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6: New Stuff is Going into WB

The cold, hard reality is that many of the new pre- and post-processing features that ANSYS, Inc. is creating to meet user requests are going into WB.

- Virtual topology
- Advanced solid modeling
- “Engineering” loads
- GAP meshing for field problems
- New meshing technology

5: Less “Reinventing the Wheel”

Over the years, ANSYS users have gotten very good at writing macros to automate processes and do some pretty fancy things. Most of us enjoy this and it is a large part of our job satisfaction. But if you look at it honestly, hundreds of users around the world are “reinventing the wheel,” doing the same thing over and over again. With WB many of these common tasks are being built into the code from the ground up. It also includes tools like the Engineering Data tab that allow you to save things like material properties and time-dependent loads and share them with other users through a library.

4: Not a Technology that You Get Stuck In

One of the greatest fears that keeps users from trying Workbench is a concern that if they start a job in WB, they will have to stay in WB until they are done. Thanks to some open-minded planning by ANSYS, Inc. developers, you can jump out of WB at any point after you have meshed and finish up your job in ANSYS. The only downside is that geometry does not go with you, but we have not found that to be a serious drawback. For example, one can specify a group of surfaces as a named component in WB, and thus all associated nodes of the underlying WB mesh are grouped into a component on the ANSYS import for easy reference.

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3: Setting Stuff Up Is Faster

PADT's experience is that it’s just a lot faster to set stuff up in Workbench. There are a lot of reasons for this, but some of the key ones that we have seen are:

- Consolidation: many tasks have been combined into one
- CAD associativity and parametrics
- Object paradigm (you click on something in the tree then operate on it)
- Context sensitive menus and icons reduce clutter and “hunting” for commands
- Simplified processes
- Automatic Contact Detection

2: Robust Meshing

Far and away the most common reason for PADT to use Workbench is to mesh poor geometry. Our single largest productivity hit in doing analyses was dealing with geometry that had gaps or slivers in it. Workbench is much better with this sort of thing, and the robust mesher has grown to have many of the controls that users have asked for, and even more can be added.

1: CAD Associativity

Just edging out “Robust Meshing” is that Workbench models can be associative to CAD models. This can be a huge savings and is really the one thing that Workbench does so much better than any other solution out there. It not only delivers huge savings in time and effort, but also allows you to easily do studies that you would never have considered before.

Next month: “Meshing Techniques your Man Wants from You but is too Embarrassed to Ask For”.

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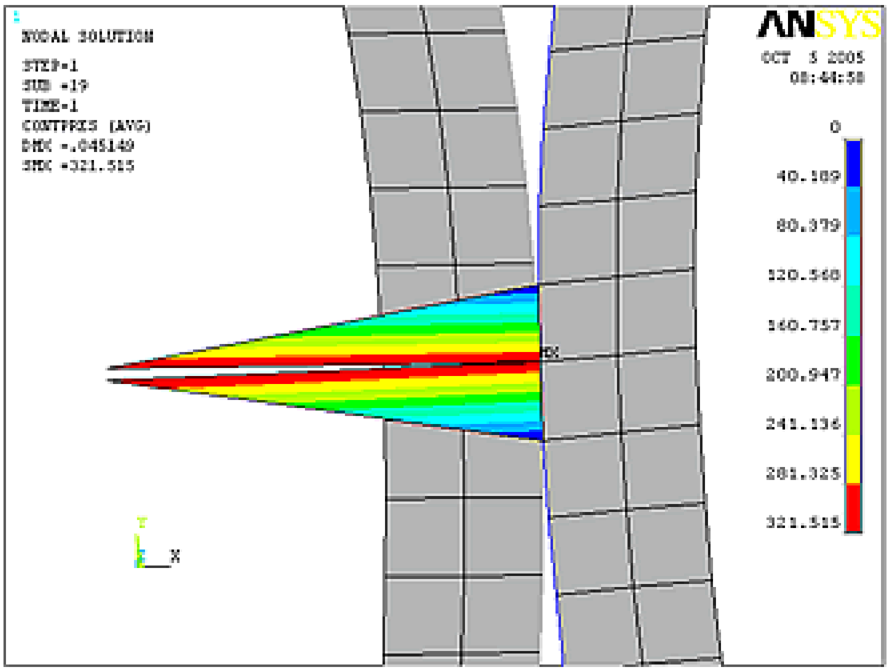
Contact's New Keyoption 6

by Rod Scholl



In ANSYS 10.0, a new keyoption was added for the 17X contact elements. As you recall from a previous article, setting Keyopt 10=1 or 2 improved convergence by as much as 10 times over the default setting of 0.

In evaluating the new keyoption, our brief and pretty much unscientific tests of Keyopt6=1 or 2 determine that this new keyoption should give you another factor of 2 reduction in required iterations over the advantage gained from Keyopt 10 = 1 or 2. Keyoption 7 = 1 or more should help further, but it was hard to test, because convergence was so fast for our test cases! But as luck would have it, our actual analyses will need everything we can throw at them.

We also tested out the new real constant FKOP option of damping. By entering a negative value (positive values are ignored), a damping term on any contact motion/separation reduces chattering and likelihood of rigid body motion and subsequent pass-through of surfaces. With our tests, the FKOP damping wasn't able to completely eliminate the need for displacement-controlled contact methodology for surfaces separated beyond the pinball region. However, for regions within the pinball region, force-controlled problems were very stable in our tests!

Below is a table of the runs of some of our test cases. The three cases in red are the default settings and exemplify the impact of turning on Keyoption 10 and Keyopt 6.

But there's more to learn here. Notice that macro tcont3d saw no improvement with any setting, so you

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might encounter the same. Further, cases with the macro Tcontblock with Keyopt 6 and 7 turned on doubled the required iterations! Thus, in some cases, especially those that are already stable, don't turn the Keyopts 6 and 7 on — only use it if needed. We've almost never seen a slow down with Keyopt 10=1, and I use it for nearly every contact problem I encounter.

Maybe toy with the macros yourself with setups most similar to your own industry.

• tcont2d.mac • tcont3d.mac • tcontblock.mac •

Macro Name	D or F Controlled	Convergence Norm	keyopt 10	keyopt 6	keyopt 7	Iterations
Tcont2d	D	F	0	0	0	48
Tcont2d	D	F	1	0	0	31
Tcont2d	D	F	1	1	0	25
Tcont2d	D	U	0	0	0	64
Tcont2d	D	U	1	0	0	33
Tcont2d	D	F	1	2	0	25
Tcont2d	F	U	0	0	0	201
Tcont2d	F	U	1	0	0	200
Tcont2d	F	F	0	0	0	66
Tcont2d	F	F	1	0	0	58
Tcont2d	F	F	1	1	0	24
Tcont2d	F	F	1	2	0	24
Tcont2d	D	F	1	1	0	25
Tcont2d	D	F	1	2	0	25
Tcont2d	F	F	1	1	0	23
Tcont3d	D	F	1	0	0	57
Tcont3d	D	F	1	1	0	57
Tcont3d	D	F	1	2	0	57
Tcont3d	D	F	1	0	1	57
Tcont3d	D	F	1	0	2	57
Tcont3d	D	F	1	0	3	57
Tcont3d	D	F	1	1	3	57
Tcont3d	D	F	1	2	3	57
Tcontblock	D	F	1	0	0	11
Tcontblock	D	F	1	1	0	24
Tcontblock	D	F	1	2	0	24
Tcontblock	D	F	1	0	1	26
Tcontblock	D	F	1	0	2	26
Tcontblock	D	F	1	0	3	26

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Newer is Better: Solver Speedup over Releases

by Eric Miller

Over the years we have consistently announced to our customers that each release has seen improvements in the speed of the ANSYS solver. In general, these announcements were based upon our own anecdotal evidence and data from ANSYS, Inc. A majority of these improvements have been in how ANSYS builds the matricies and improvements to memory usage in the solver itself. All very cut and dry, and the sort of thing you would expect a customer-focused company to do.

We were fine with this view until a customer actually said, “Prove it with our models.” A valid question to ask at renewal time, especially when explaining to your boss that the yearly TECS fee goes for technical support and pays for enhancements to the code. Most users find new capabilities in every release that help them produce more accurate results, work more efficiently, or conduct new types of simulation. But for some customers, like this one, they have a very set way of doing things and changes to the GUI, CAD import, hypereleastic elements and such are not going to benefit them. Their primary concern at this point is speed of solving their non-linear problems.

So, we took their models and Carlos Shultz ran them on one of his machines. What we were interested in is the wall clock time to solve the iterative solution that involved creep over several time steps. The machine was an Intel P4 3.61 GHz with 2GB RAM running Windows XP.

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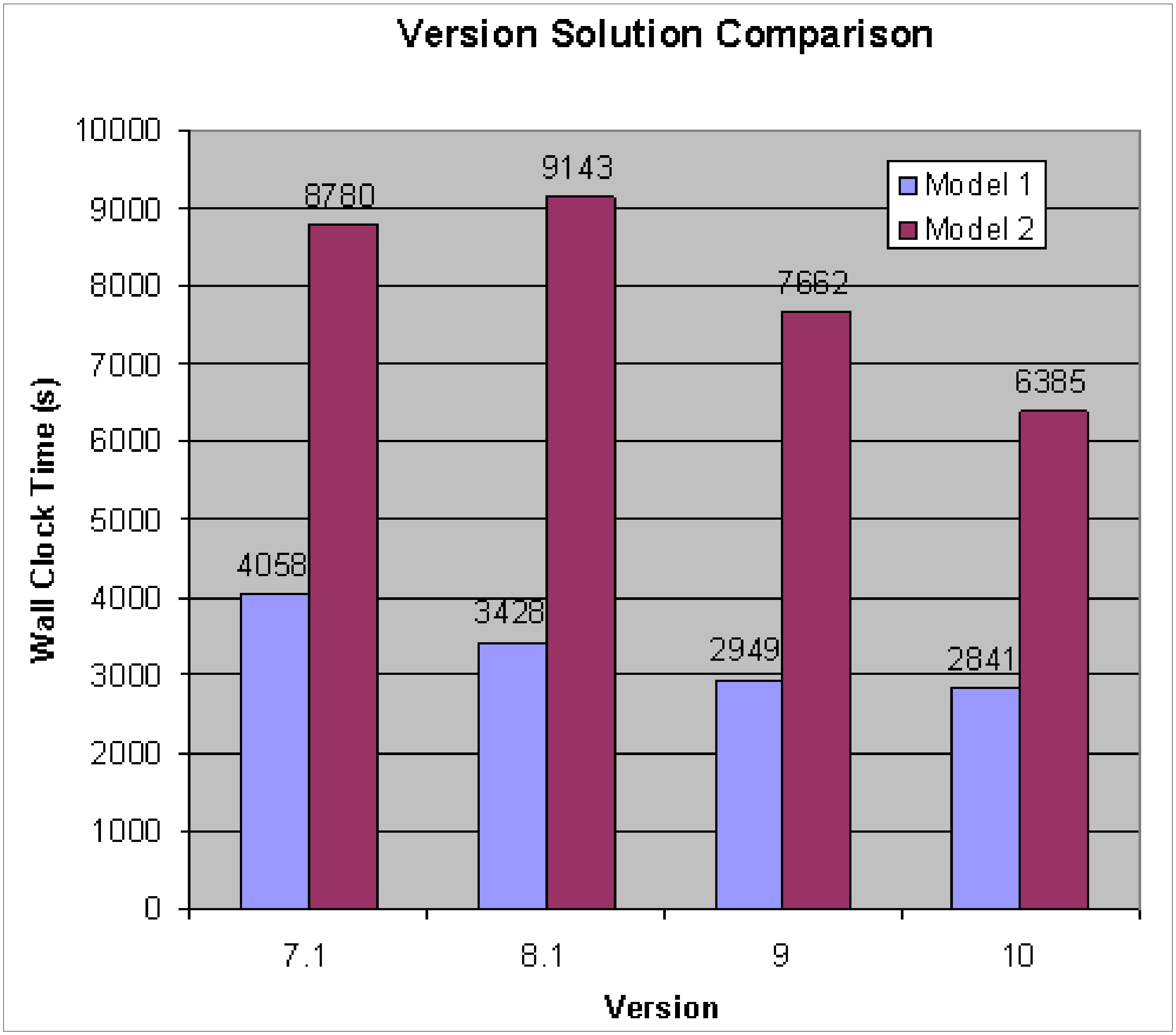
Here are the results:



As you can see, 7.0 to 10.0 (pre-release) showed 27% and 30% speedups on the same hardware. Needless to say we verified that the amount of total creep strain calculated did not change. This is substantial if you do a lot of non-linear analysis.

Digging deeper into the data, it looks like a lot of this improvement came from the time it took to formulate the matrix, as well as a general speedup of the whole process. Also, note how 8.1 saw a slow down in Model 2. This points out the fact that sometimes changes that are made to increase speed are problem-dependent. Whatever slowed things down in 8.1 for that model was changed in 9.0.

The bottom line is we were not imagining things. This type of model does run faster than it used to. Of course, your mileage may vary, but the trend we see here should hold true on most static stress analysis runs. We can also conclude that the code developers in ANSYS' solver group are earning their keep. So get your cattle prod out and sock that IT guy into loading 9.0 for you, and downloading and installing 10.0 when it comes out next month.

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About *The Focus*

The Focus is a periodic electronic publication published by PADT, aimed at the general ANSYS user. The goal of the feature articles is to inform users of the capabilities ANSYS offers and to provide useful tips and hints on using these products more effectively. *The Focus* may be freely redistributed in its entirety. For administrative questions, please contact Rod Scholl at PADT.

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Contributor Information

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