

E-Mailing from a Macro Using APDL to Impress Your Date

By Jason Krantz

Wouldn't it be nice if your UNIX computer would e-mail you or send you a text message when it's done running an ANSYS job? It's actually pretty easy to make that happen. Using the /SYS command, you can pass UNIX shell commands directly to the system solving your job. The one big caveat is that you must have your Unix machine configured to send mail. (This is most often done with a program called, appropriately, sendmail).

So here's how to do it. In your APDL script (or in your batch file, or wherever it makes sense), insert a modified version of the following line just before the FINI command:

```
/SYS,echo "Dear Engineer: Your analysis is done. Ciao, ANSYS" | mail -S "analysis done" engineer@company.com
```

What does this do?

- /SYS sends a command (actually a raw command) to the Unix machine
- echo "Dear Engineer: Your analysis is done. Ciao, Ansys" | mail tells the Unix shell to send the words above (via a "pipe"--that vertical line

character: |) as input to the program "mail." This program is what we use to send mail from the command line.

- -S "analysis done" specifies the subject line for the mail
- engineer@company.com This is (perhaps obviously) the address to which the e-mail should be sent. Of course, you should substitute in your own e-mail address.

Ways to get fancy

Use operating system environment variables instead of raw text strings. This will personalize things a little. What would such a command look like?

(Cont. on pg. 2)



Professor F. E. Jargon

Real Nerds Love START.ANS

By Doug Oatis

Whether you started using ANSYS while rocking out to Simon and Garfunkel, through Run DMC, or what I consider the train-wreck of "Gimme More" by Britney Spears, you've always been able to customize through the START.ANS file. I truly hope you appreciate my "nerds through time" picture.

Anyways, the ANSYS Classic interface by default has 4 buttons on it: SAVE_DB, RESUM_DB, QUIT, POWRGRPH. You can add your own buttons interactively by using the Macro > Edit Abbreviations toolbar (or *abbr command). Using this menu, you can add buttons that perform single, or multiple, APDL commands.

After you finish setting up all your buttons, you may notice that these buttons only ap-

pear when you resume the .db that they were saved in. To make these appear by default, you need to wander into the Program Files for ANSYS and edit the STARTXX.ANS file (where XX is the version number, so START110.ANS for V11.0).

I've shown the typical location for a 64-bit installation on a Windows Vista machine in

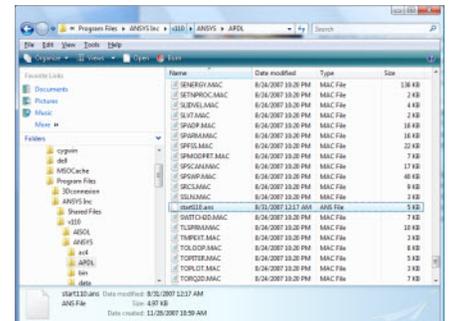


Fig. 1: Default location of START.ANS file, and a way for Doug to show off the fact that he runs ANSYS n Vista

Figure 1. If in doubt, do a search for the START*.ANS file to find all applicable. Open this file with a text editor (pick your favorite), and you'll see a long list of APDL

(Cont. on pg. 2)

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E-Mailing cont...)

```
/SYS,echo Dear $USER: Your analysis on $HOSTNAME is done. Ciao, ANSYS" | mail -S 'analysis done' 4805551212@txt.att.net
```

\$USER is the current username, and \$HOSTNAME is the hostname of the Unix machine ANSYS is running on. You'll notice that the e-mail address is not a PADT e-mail address. It's a phone number at the AT&T mobile SMS gateway. That means that the /SYS command would send a text message to my phone instead of an e-mail. (Almost all mobile operators have such a gateway...Google around and you'll find the right one for your phone). The text message I'd get would look like this:

Dear Jason: Your analysis on rhel4.padtinc.com is done. Ciao, ANSYS

Unfortunately, the /SYS command does not propagate APDL parameters so putting ANSYS parameters into an e-mail is a little trickier. The simplest way to do it is to use the *CFOPEN/*VWRITE/*CFCLOSE commands to build the command listed above in a file, then execute that file:

```
*get,wtm,active,,time,wall
*get,ctm,active,,time,cpu
*dim,t1,string,80
*dim,jnm,string,80
/inquire,t1,title,0
/inquire,jnm,jobname,0

*cfopen,tmp_eml,mac
*vwrite,jnm(1),t1(1),wtm,ctm
/SYS,echo "Dear Engineer: Your analysis %s: "%s" is done. Wall time = %g, CPU time = %i. Ciao, ANSYS" | mail -S "analysis done" engineer@company.com
*cfclose
tmp_eml,mac
t1=
jnm=
```

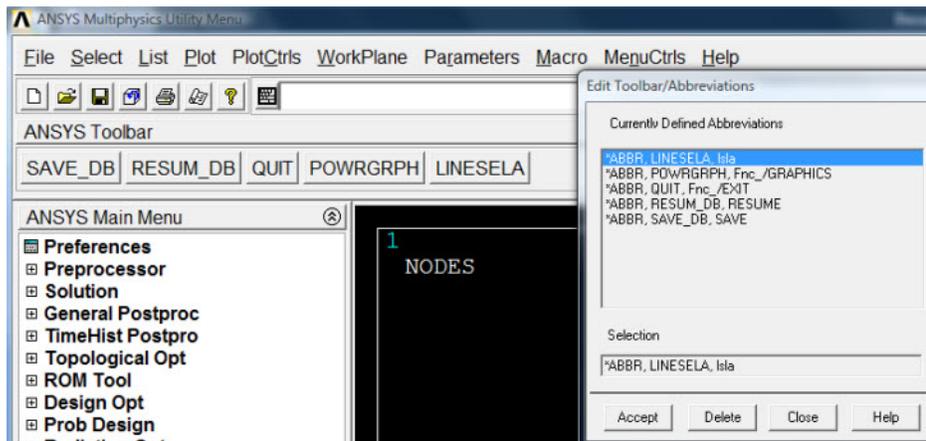
This produces an e-mail that says:

```
Dear Engineer: Your analysis brackmod1: "Bracket Modal Analysis, Mod 1" is done. Wall time = 12.5, CPU time = 10.2. Ciao, ANSYS" | mail -S "analysis done" engineer@company.com
```

The above examples are not really revolutionary; most Unix nerds would think it was obvious. The idea here is to remind users

that the /SYS command can be a way to get ANSYS information and results out of the data center and into the real world.

So, how will this impress your date and/or boss? You can time things so that your job finishes just after dinner out with the person in question. You will appear competent, professional and maybe even dashing, at least if your date is also an engineer. It would also likely impress your boss, engineer or not. However, if your date and your boss are the same person, we at the Focus editorial board would urge you to seek career counseling.



(START.ANS, cont...)

commands that setup the default interface. Simply insert your *abbr line from your session into the START.ANS file, restart ANSYS, and you'll see your button is now a default.

For example, let's say you made a button that selects all lines with active areas (LSLA). Interactively, go through the GUI to define a button named LineSelArea that performs the LSLA command, and hit accept. Now, let's make this a permanent thing in any ANSYS session we launch. Copy the *abbr,linesela,Isla line, and paste it into the START110.ANS file, and launch a new session to see the button automatically there. If you already have an ANSYS

session open, simply go File > Clear & Start New, and you'll see that it asks whether or not it should re-read the START.ANS file. Click 'yes' and you'll see the button appear.

Not only can you use the START.ANS file to put your own buttons into the default startup, but you can also customize the color palette and other environment options. One command I like to include is /color,u,yell . This will make all of my displacement constraints appear in yellow, rather than the default blue (which is the same color as type/mat/real/etc. #1). If you prefer to work in the reverse video mode, you can perform that switch through the GUI PlotCtrls > Style > Colors > Reverse

Video. Then copy the command lines that appear at the end of your log file into the START.ANS file. You'll never have to Reverse Video again!

The last thing to know about the START.ANS file is where ANSYS looks for it. When you start up ANSYS, it looks first in the current working directory, then the user's home and finally in the ANSYS APDL directory. So, if you share your ANSYS installation or don't have access to the APDL directory, copy the file to your home directory and make changes there.

The START.ANS file is the Ronco Rotisserie of the ANSYS world. Just set it (the START.ANS file) and forget it! When you upgrade to a new version of ANSYS, you simply need to copy/paste your custom lines into the new START.ANS file. It's that easy!



A Bonus in ANSYS 11.0 - The AMG Solver

By: Ted Harris

Prior to version 11.0, the Algebraic Multi-Grid or AMG solver as well as the other parallel solvers were only available for those customers who purchased the "Parallel Performance for ANSYS" license. The high cost of that license meant that typically only large companies had access to AMG. That changed with 11.0, as now nearly all ANSYS licenses allow you to use the solvers tailored to high performance computing, albeit with a limit of 2 processors or cores being utilized without additional licenses. For more information on what the AMG solver is and how it works, see the side bar or the Basic Analysis Guide in the ANSYS Help, section 3.2 Types of Solvers.

The command to invoke the AMG solver is EQSLV,AMG. Assuming you are solving

using a batch input file, a typical setup in the ANSYS launcher is shown in the figure.

Focusing on the AMG solver, for certain problems we have seen a significant speed up in solution relative over SPARSE and PCG. For PADT's benchmark 7 www.padtinc.com/support/benchmark, which is a fairly large nonlinear model, the solution times using the AMG solver were about 30% faster than either the PCG solver or SPARSE solver for the same or similar memory and solution settings. This was using 2 cores for all runs on the same Windows XP x64 machine with 8 GB of RAM, with a RAID0 2x72GB 15K RPM SAS hard drive.

For smaller problems PCG can be faster than AMG, but for large nonlinear structural models where you are searching for more speed, it's worth looking into the AMG solver.

What is AMG

Every time we do an article on solvers or other complex math issues I head off to research and end up dozing off at my desk. This is no exception. In between snores I learned a couple of key things about the AMG solver used in ANSYS.

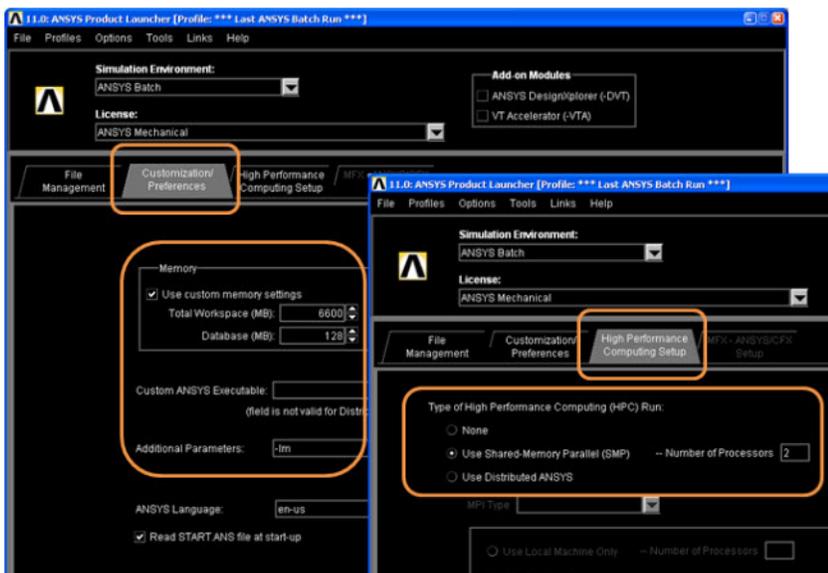
First off, ANSYS, Inc. did not write this solver, they licence it from a company called Solvers International. They appear to have two products, one of which is the AMG solver.

Reading various papers and manuals it seems that AMG stands for Algebraic Multigrid Solver. And Multigrid Solver refers to a family of iterative solvers that speed themselves up by solving a coarser version of the model first, then converging on the actual mesh. So basically, they take your mesh and coarsen it up and do an iterative solve on that first. Then use the coarse result as a starting point for iterative solves on the actual mesh.

I never could get a clear answer on why it is an "Algebraic" Multigrid Solver. Perhaps AMG just sounds better than the other options?

We have downloaded two papers on the AMG solver technology from Solvers International, one of which is co-written with ANSYS, Inc. and has some useful information that those who can stay awake might find useful. You can download them from our FTP site:

ftp.padtinc.com/public/downloads/AMG_papers.zip



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Awesome APDL /INQUIREing Minds Want to Know

While providing some of the examples in the START.ANS article, we had cause to use the /INQUIRE command. Most users of APDL are familiar with *GET and *VGET but don't know about, or don't think about, /INQUIRE as much. The purpose of this command is to get "System" information from ANSYS. So what it can or can't get is a little limited. But what it can do is save you many lines of code, or fancy *do-loops trying to get a long string by grabbing 8 characters at a time with multiple *get commands.

There are four forms of the command. Instead of providing a code example we will discuss the different forms and provide some handy tables.

The first version simply retrieves system information and has the form: /INQUIRE,*StrArray*, *FUNC* where *StrArray* is a string array and *FUNC* can be any of the values in Table 1.

For the second form of the command, *FUNC* becomes TITLE and it is used to put the title or sub-titles into a string array. The command has the form: /INQUIRE,*StrArray*,TITLE, *Title_num*. *Title_num* is blank or 1 for the title, and 2 through 5 for subtitles.

The third form is one of the more useful> *FUNC* becomes ENV and you can use it to get system environment variables. It takes the form: /INQUIRE,*StrArray*, ENV,*Envname*,*Substring*. For environment variables that have multiple answers, leaving Substring blank returns all the variables, and specifying a number returns a specific one.

The fourth and final form of the /INQUIRE command allows you to get information about files. It has the form: /INQUIRE,*Param*, *FUNC*,*Fname*, *Ext*. Since it can return values other than strings, *Param* can be of many different types. Table 2 shows the various values for *FUNC*.

To learn more, check out the /INQUIRE command in the help.

Table 1: System /INQUIRE FUNC Values

| FUNC | Description |
|-----------|--|
| LOGIN | Pathname of login/default directory |
| DOCU | Pathname of docu directory |
| APDL | Pathname of APDL directory |
| PROG | Pathname of ANSYS executable directory |
| AUTH | Pathname of license file directory |
| USER | Current user name |
| DIRECTORY | Pathname of current working directory |
| JOBNAME | Current jobname |
| RSTDIR | Pathname of result directory (FILE) |
| RSTFILE | Result filename (FILE) |
| RSTEXT | Result filename extension (FILE) |
| PSEARCH | Macro search path (/PSEARCH) |

Table 2: File /INQUIRE FUNC Values

| FUNC | Description |
|-------|--|
| EXIST | Returns 1 if file exists, 0 if not |
| DATE | Date stamp on the file: yyyyymmdd.hhmmss |
| SIZE | Size of file in MB's |
| WRITE | Returns 1 if write permissible, 0 if not |
| READ | Returns 1 if read permissible, 0 if not |
| EXEC | Returns 1 if execute permissible, 0 if not |
| LINES | Number of lines in an ASCII text file |

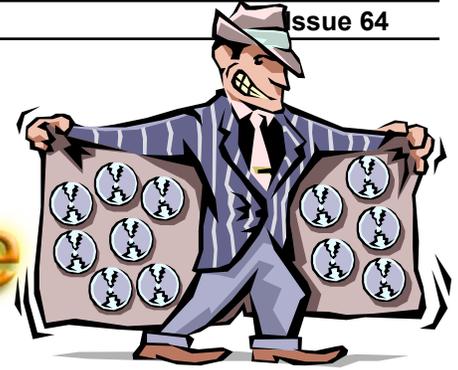
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| Month | Start | End | # | Title | Location | |
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| | 5/12 | 5/13 | 205 | WB Simulation Dynamics | Tempe, AZ | |
| | 5/14 | 5/14 | 702 | WB DesignXplorer | Tempe, AZ | |
| | 5/19 | 5/20 | 207 | WB Sim. – Struct. Nonlinearities | Tempe, AZ | |
| | 5/22 | 5/23 | 302 | WB Sim. Heat Transfer | Tempe, AZ | |
| | 5/29 | 5/30 | 100 | Engineering with FE Analysis | Tempe, AZ | |
| Jun '08 | 6/2 | 6/4 | 101 | Introduction to ANSYS, Part I | Tempe, AZ | |
| | 6/9 | 6/10 | 201 | Basic Structural Nonlinearities | Tempe, AZ | |
| | 6/11 | 6/12 | 204 | Advanced Contact and Fasteners | Tempe, AZ | |
| | 6/19 | 6/20 | 301 | Heat Transfer | Tempe, AZ | |
| | 6/23 | 6/23 | 107 | WB DesignModeler | Tempe, AZ | |
| Jul '08 | 7/8 | 7/9 | 104 | WB Simulation – Intro | Albq., NM | |
| | 7/10 | 7/11 | 205 | WB Simulation Dynamics | Albq, NM | |
| | 7/14 | 7/15 | 801 | ANSYS Customization with APDL | Tempe, AZ | |
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