

# Using APDL Snippets in ANSYS Mechanical

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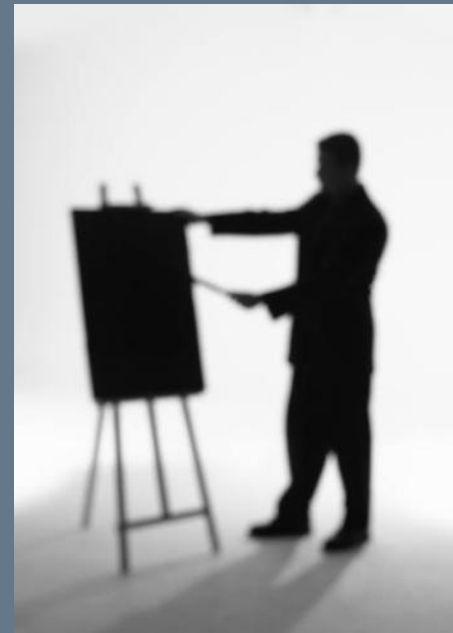
5/26/2011

PADT, Inc.



# Agenda

- Note: This presentation is being recorded
- Introductions
- Background and Foundation
- Item Snippets
- General Prep Snippets
- General Post Snippets
- Other Stuff to Know
- Conclusion



# Introductions



Phoenix Analysis &  
Design Technologies

# Upcoming Webinars

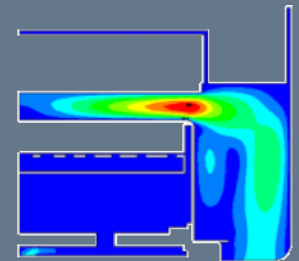
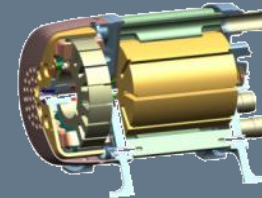
- Webinars go on Summer Breaks in June and July



- Look for an e-mail in early June with next webinars
  - Will introduce “User Issues” where you suggest a topic and we research and do the presentation
- See upcoming and past webinars at:
  - [padtincevents.webex.com](http://padtincevents.webex.com)
    - Click on ANSYS Webinar Series

# About PADT

- *PADT is an Engineering Services Company*
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# Cube HVPC Systems



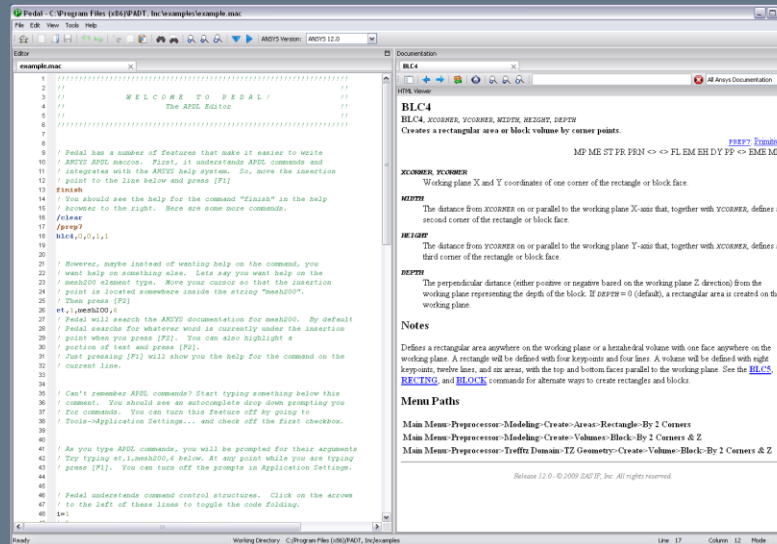
- Balance between speed and cost
  - **Mini-Cluster**  
96 Cores / 256 GB RAM / 3.6 TB Disk  
Mobile Rack / UPS / Monitor / Keyboard  
\$43,250
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\$5,800

- [www.CUBE-HVPC.com](http://www.CUBE-HVPC.com)

Cores	96 (2x4x12)	48 (4x12)	32 (4x8)	16 (2x8)	12 (2x6)	6 (1x6)	Fileserver (2x8)
System Name	c96SE1	c48	c32	w16	w12	w6	fs10
Price	\$43,250	\$15,500	\$12,300	\$11,600	\$5,600	\$5,400	\$5,800
Configuration	2 x 2U Rack	1U Rack	1U Rack	Tower	Tower	Tower	2U Rack
CPU	2.3GHz AMD 6176	2.3GHz AMD 6176	2.4GHz AMD 6136	2.6GHz AMD 6140	2.8GHz AMD 4164	2.8GHz AMD 4164	2.8GHz AMD 6128
RAM (DDR3 1333)	256GB	128GB	128GB	128GB	64GB	32GB	16GB
OS Drive	256 GB SSD	256 GB SSD	256 GB SSD	256 GB SSD	256 GB SSD	320 GB Hybrid	-
Data Drives	3.6 TB 6 x 600 GB SAS2 15k RAID0	3 TB 3 x 1 TB 7.2K SATAII RAID0	3 TB 3 x 1 TB 7.2K SATAII RAID0	1.7 TB 3 x 600GB SAS2 15k RAID0	1.5TB 3 x 500 GB 7.2K SATAII RAID0	1.5TB 3 x 500 GB 7.2K SATAII RAID0	10 TB 9 x 1.5 TB 7.2K SATAII RAID60
NIC	2 x GigE	2 x GigE	2 x GigE	4 x GigE	2 x GigE	2 x GigE	2 x GigE
Video Card	Matrox 16MB	Matrox 16MB	Matrox 16MB	QuadroFX 580	QuadroFX 580	QuadroFX 580	Matrox 16MB
OS	CentOS Linux64	CentOS Linux64	CentOS Linux64	Windows 7 64	Windows 7 64	Windows 7 64	CentOS Linux64
Infiniband	QDR 40Gbps	-	-	-	-	-	-
Other	SAS2 Key Mobile Rack KVM Keyboard 17" LCD Monitor GigE switch 2x1.5 KW UPS's	-	-	-	-	-	External eSATA Dual Drive Bay w/ 3TB SATAII drive



- Side-by-side editor and help viewer layout.
- Instant help on any documented APDL command by pressing F1.
- Full syntax highlighting for ANSYS v12 Mechanical APDL.
- Auto-complete drop downs for APDL Commands.
- APDL Command argument hints while typing commands.
- Search ANSYS help phrases and keywords.
- Multiple tabs for the editor and html viewer.
- Full capability web browser built in allows for rich web experience and web searches.



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[padtinc.com/focus](http://padtinc.com/focus)



# Background and Foundation



# APDL?

- **ANSYS Parametric Design Language**
  - The ANSYS program, now Mechanical APDL (MAPDL), originally worked by reading command files:
    - COMMAND, arg1, arg2, arg3, arg4...
    - Punch cards!
  - Using the GUI simply builds a command(s) that are sent to the program
  - A logical improvement was to turn the command stream into a language
    - Variable substitution for any arguments
    - Simple math with variables
    - Added control logic: if-then-else, do, goto
    - Added ability to interrogate the database and return values
    - Added ability to deal with data as arrays, vectors, and matrices
- Everything you can do in MAPDL you can do through a series of text commands: APDL



# Why is APDL Worshiped?

- No Limits
  - Everything you can do in MAPDL you can do through a series of text commands: APDL
  - Everything in APDL can be parameterized
  - Almost everything about your model can be interrogated
- Easy to learn and use
  - Very consistent
  - Well documented
  - Can start with contents of log file!
- Simple
  - Concise, man-readable
  - Old limits on character length (8char) keep things short
- Every item in a MAPDL is identified by a number
  - Very Important!



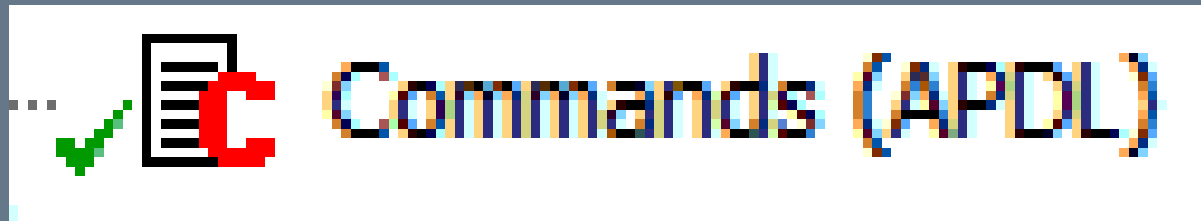
# Mechanical and APDL

- When you use ANSYS Mechanical you are building an object oriented description of your model
- When you hit solve, it converts the description into APDL
  - Runs MAPDL in batch
- To add a new function to a complex object oriented system is tough
  - But many features users want exist in MAPDL
  - Especially advanced functions and additional options
- So, users can add APDL commands to their model
  - As an object in the pre- or post-processing branches
- Allows user access to the full breadth and depth



# Command Objects

- Users insert “Command Objects” into the tree to insert APDL code
- Originally called “code snippets” many users still call them snippets
- But documentation refers to them as Command Objects
- Icon is a text file with a big Red C
  - (APDL) indicates the type of snippet, you can do other solvers...
  - Decoration (Green check, yellow Lighting bolt, question mark) is the same as for other objects in your model tree.



# Not Perfect

- You may not be able to post process your model
  - Some things done to results can not be viewed in Mechanical
- You can't touch geometry
  - Only works on FE model, not on geometry
  - KP, Line, Area, Volume don't exist in MAPDL from Mechanical
- Not interactive in Workbench
  - You can't try out commands and see what happens from inside Mechanical
  - You can only imbed APDL code in batch solves, even when working interactively
  - Plotting and listing is to files only

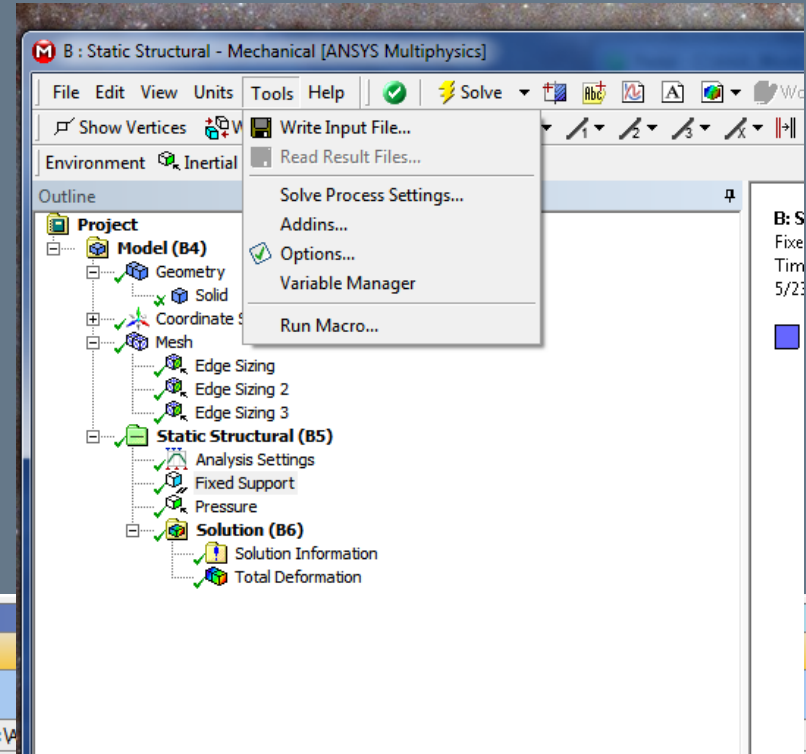
# You Need to Know Some MAPDL

- Biggest issue we see with Command Objects in Tech support:
  - User typed in their script and then ran their model – didn't work
- You need to be able to fire up MAPDL interactive
  - Read in ds.dat file or save \*.db and \*.rst and resume/set
  - Then try out your scripts and check that they work
- You are using the extensive features available in MAPDL
  - You can't treat it as a black box.
- If you are not familiar with MAPDL
  - The documentation is very good
  - Work interactive, commands go in log file



# The MAPDL Input File

- When you click Solve Mechanical makes a ds.dat file
  - Use the Files tool in Project to find the file
- Or you can save one anywhere you want
  - Or click anywhere on your solution branch and then use Tools->Write Input file...



Files						
	A	B	C	D	E	
1	Name	Cell ID	Size	Type	Date Modified	
2	TowerOfTest_1.wbpj		115 KB	ANSYS Project File	5/23/2011 3:32:30 PM	C:\V
3	Geom.agdb	A2,B3	11 KB	Geometry File	5/23/2011 3:33:17 PM	C:\AAA_Work\seminars\Snippets_2011_05_26\TowerOfTest_1_files\dp0\Geom\DM
4	material.engd	B2	18 KB	Engineering Data File	5/23/2011 3:33:02 PM	C:\AAA_Work\seminars\Snippets_2011_05_26\TowerOfTest_1_files\dp0\SYS\ENGD
5	SYS.engd	B4	18 KB	Engineering Data File	5/23/2011 3:33:02 PM	C:\AAA_Work\seminars\Snippets_2011_05_26\TowerOfTest_1_files\dp0\global\MECH
6	designPoint.wbdp		3 KB	Design Point File	5/23/2011 3:32:30 PM	C:\AAA_Work\seminars\Snippets_2011_05_26\TowerOfTest_1_files\dp0
7	CAERep.xml	B	10 KB	CAERep File	5/23/2011 3:42:49 PM	C:\AAA_Work\seminars\Snippets_2011_05_26\TowerOfTest_1_files\dp0\SYS\MECH
8	CAERepOutput.xml	B	849 B	CAERep File	5/23/2011 3:42:49 PM	C:\AAA_Work\seminars\Snippets_2011_05_26\TowerOfTest_1_files\dp0\SYS\MECH
9	ds.dat	B	7 KB	.dat	5/23/2011 3:39:55 PM	C:\AAA_Work\seminars\Snippets_2011_05_26\TowerOfTest_1_files\dp0\SYS\MECH
10	file.BCS	B	2 KB	.BCS	5/23/2011 3:39:57 PM	C:\AAA_Work\seminars\Snippets_2011_05_26\TowerOfTest_1_files\dp0\SYS\MECH
11	file.err	B	599 B	.err	5/23/2011 3:39:58 PM	C:\AAA_Work\seminars\Snippets_2011_05_26\TowerOfTest_1_files\dp0\SYS\MECH
12	file.rst	B	64 KB	ANSYS Result File	5/23/2011 3:39:57 PM	C:\AAA_Work\seminars\Snippets_2011_05_26\TowerOfTest_1_files\dp0\SYS\MECH
13	MatML.xml	B	18 KB	CAERep File	5/23/2011 3:42:49 PM	C:\AAA_Work\seminars\Snippets_2011_05_26\TowerOfTest_1_files\dp0\SYS\MECH
14	solve.out	B	19 KB	.out	5/23/2011 3:39:58 PM	C:\AAA_Work\seminars\Snippets_2011_05_26\TowerOfTest_1_files\dp0\SYS\MECH
15	solve_0_0.out	B	19 KB	.out	5/23/2011 3:39:58 PM	C:\AAA_Work\seminars\Snippets_2011_05_26\TowerOfTest_1_files\dp0\SYS\MECH



# Example – No Snippets

```
5/23/2011 file/C%3a/Windows/system32/totl.html
/batch
/config,nooldb,1 ! force off writing results to database
*get,_wallstrt,active,,time,wall
! ANSYS input file written by Workbench version 13.0 Release
! File used for geometry attach:
C:\AAA_Work\seminars\Snippets_2011_05_26\TowerOfTest_1_files\dp0\Geom\DM\Geom.agdb
/title,TowerOfTest_1--Static Structural (B5)
/com,--- Data in consistent BIN units.
/units,BIN
/nopr
/track,-1
/wb,file,start ! signify a WB generated input file
/pxep?
! Turn off shape checking because checks already performed inside WB mesher.
! See help system for more information.
SHPP,OFF,,NOWARN
/nolist
etcon,set ! allow ANSYS to choose best KEYOP's for 180x elements
/com,***** Nodes for the whole assembly *****
nblock,3
(i18,3e20.9e3)
1 1.000000000E+000 1.000000000E+000 0.000000000E+000
2 1.000000000E+000 1.000000000E+000 4.000000000E+000
3 1.000000000E+000 1.000000000E+000 8.000000000E+000
4 1.000000000E+000 1.000000000E+000 1.200000000E+001
5 1.000000000E+000 1.000000000E+000 1.600000000E+001
6 1.000000000E+000 1.000000000E+000 2.000000000E+001
7 1.365923997E-016 1.000000000E+000 0.000000000E+000
8 1.365923997E-016 1.000000000E+000 4.000000000E+000
9 1.365923997E-016 1.000000000E+000 8.000000000E+000
10 1.365923997E-016 1.000000000E+000 1.200000000E+001
11 1.365923997E-016 1.000000000E+000 1.600000000E+001
12 1.365923997E-016 1.000000000E+000 2.000000000E+001
13 0.000000000E+000 0.000000000E+000 1.600000000E+001
14 0.000000000E+000 0.000000000E+000 1.200000000E+001
15 0.000000000E+000 0.000000000E+000 8.000000000E+000
16 0.000000000E+000 0.000000000E+000 4.000000000E+000
17 0.000000000E+000 0.000000000E+000 0.000000000E+000
18 0.000000000E+000 0.000000000E+000 2.000000000E+001
19 1.000000000E+000 0.000000000E+000 1.600000000E+001
20 1.000000000E+000 0.000000000E+000 1.200000000E+001
21 1.000000000E+000 0.000000000E+000 8.000000000E+000
22 1.000000000E+000 0.000000000E+000 4.000000000E+000
23 1.000000000E+000 0.000000000E+000 0.000000000E+000
24 1.000000000E+000 0.000000000E+000 2.000000000E+001

-1
/wb,elem,start ! set before creation of elements
/com,***** Elements for Body 1 "Solid" *****
et,1,185
eblock,19,solid
(19i8)
1 1 1 1 0 0 0 0 8 0 1
5 6 12 11 19 24 18 13
1 1 1 1 0 0 0 0 8 0 2
4 5 11 10 20 19 13 14
1 1 1 1 0 0 0 0 8 0 3
3 4 10 9 21 20 14 15
1 1 1 1 0 0 0 0 8 0 4
2 3 9 8 22 21 15 16
1 1 1 1 0 0 0 0 8 0 5
```

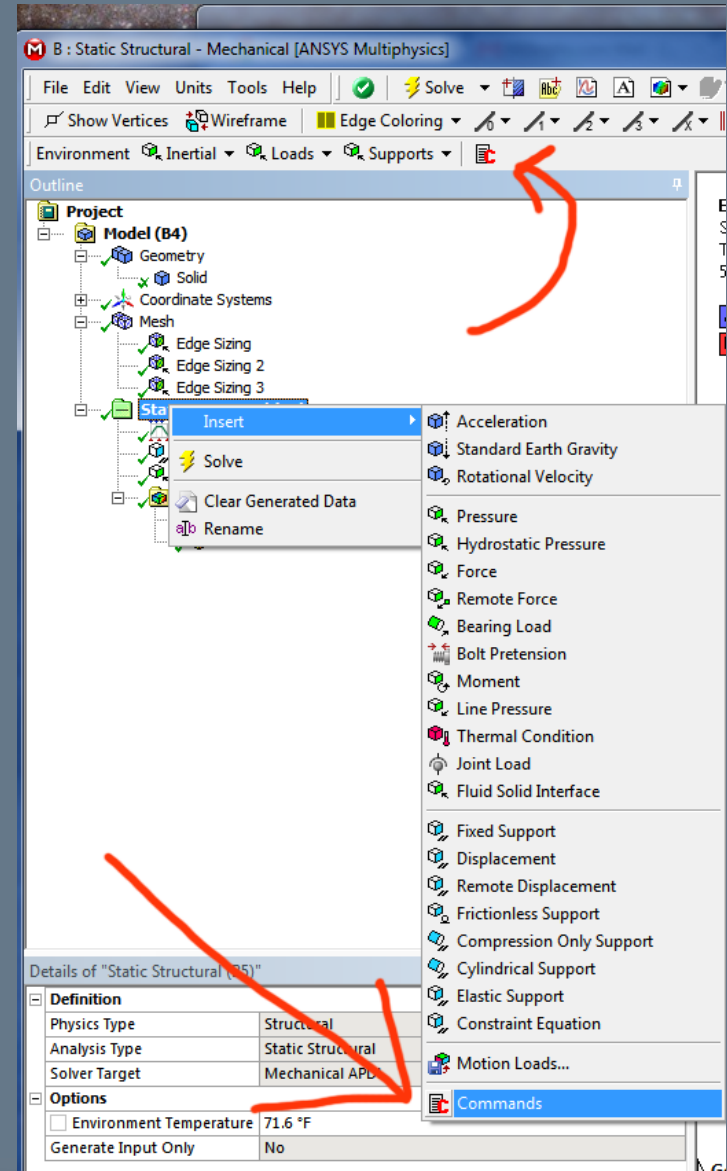
C:\AAA\_Work\seminars\...\totl.html

1/4



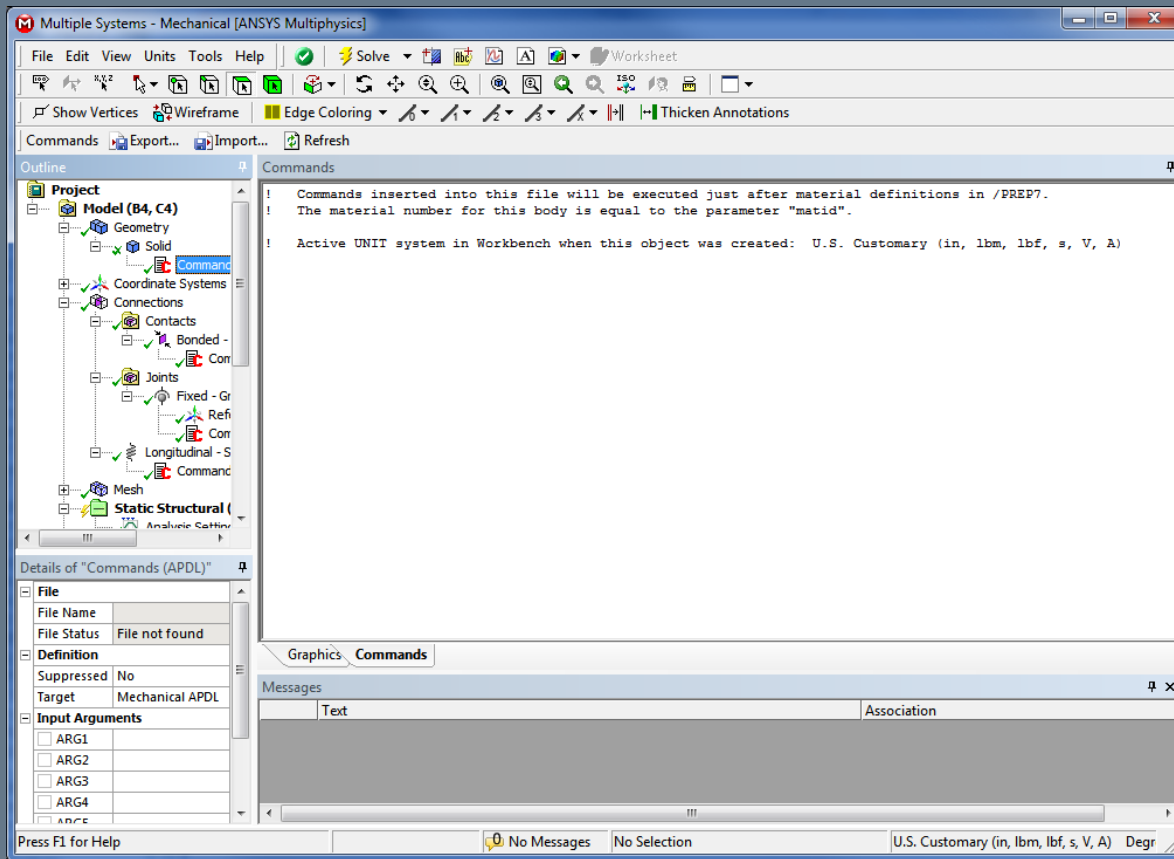
# Adding Snippets

- Click on Valid Object in Tree then
  - Click on Commands Icon
  - RMB->Insert->Commands
- Insert as many as you want
  - Executed in order



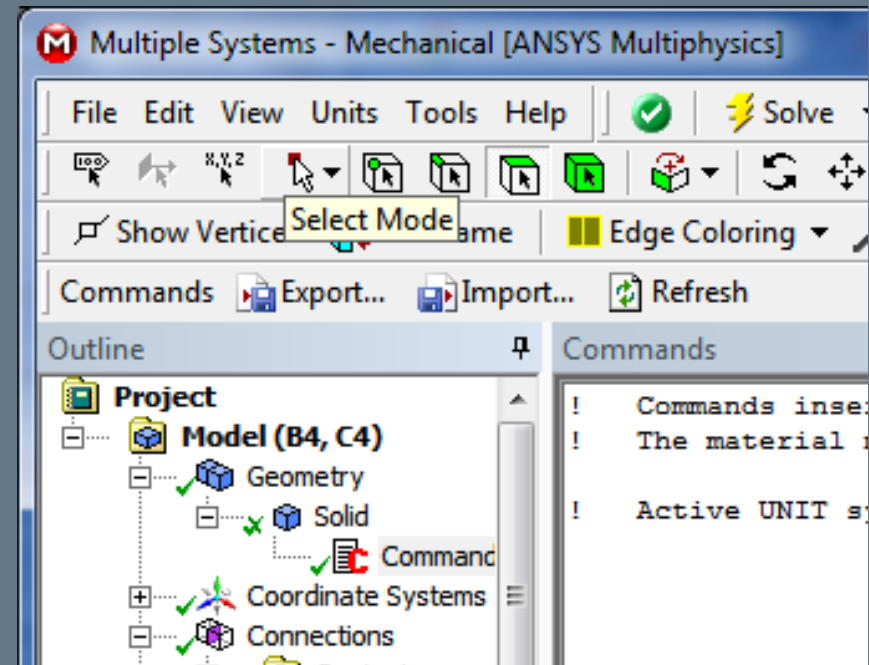
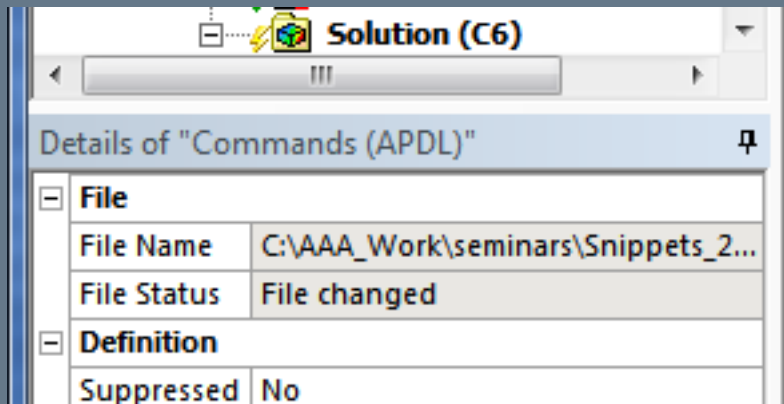
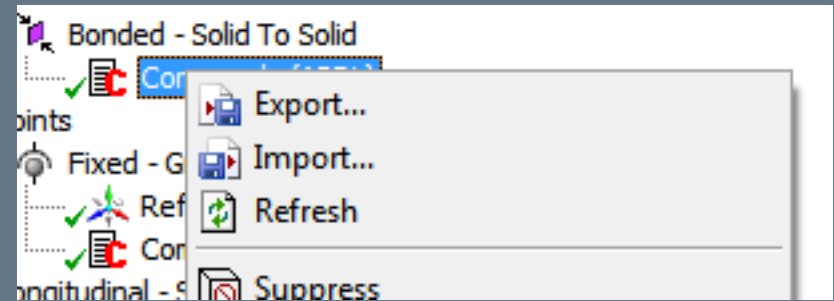
# Command Text Window

- When you click on a Command Object you get a text window tab called “Commands”
- Enter and view your APDL code in here



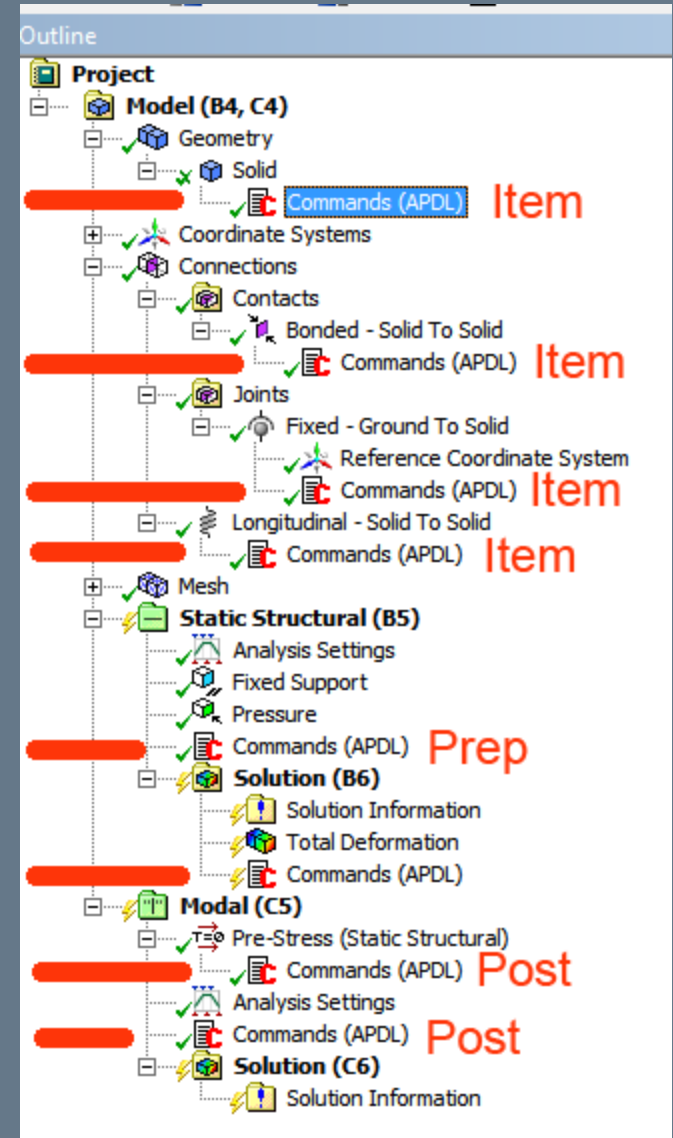
# Linking to a Macro file

- You can associate a Command Object with a text file
  - Usually \*.mac, but also \*.txt
- Export creates a file from your text
- Import links to an existing file
- Refresh replaces the text window with what is in the file
- File name and status are shown in Details view



# Three Types of Snippets

- Item Snippets
  - Are attached to an item in the tree
  - Contains APDL that modifies only that item
  - Some ID is set for the item number
- Prep
  - General commands that get executed right before the solve command
- Post
  - Post processing commands that get executed right after the solve



# Be in the Right Module

- ANSYS runs usually go through three modules:
  - /PREP7, /SOLU, /POST1
- APDL commands for a given module only work in that module
- Items: /PREP7
- PREP: /SOLU
- POST: /POST
- You can move in and out of modules, but make sure you go back to where you started
  - Very important for PREP snippets!

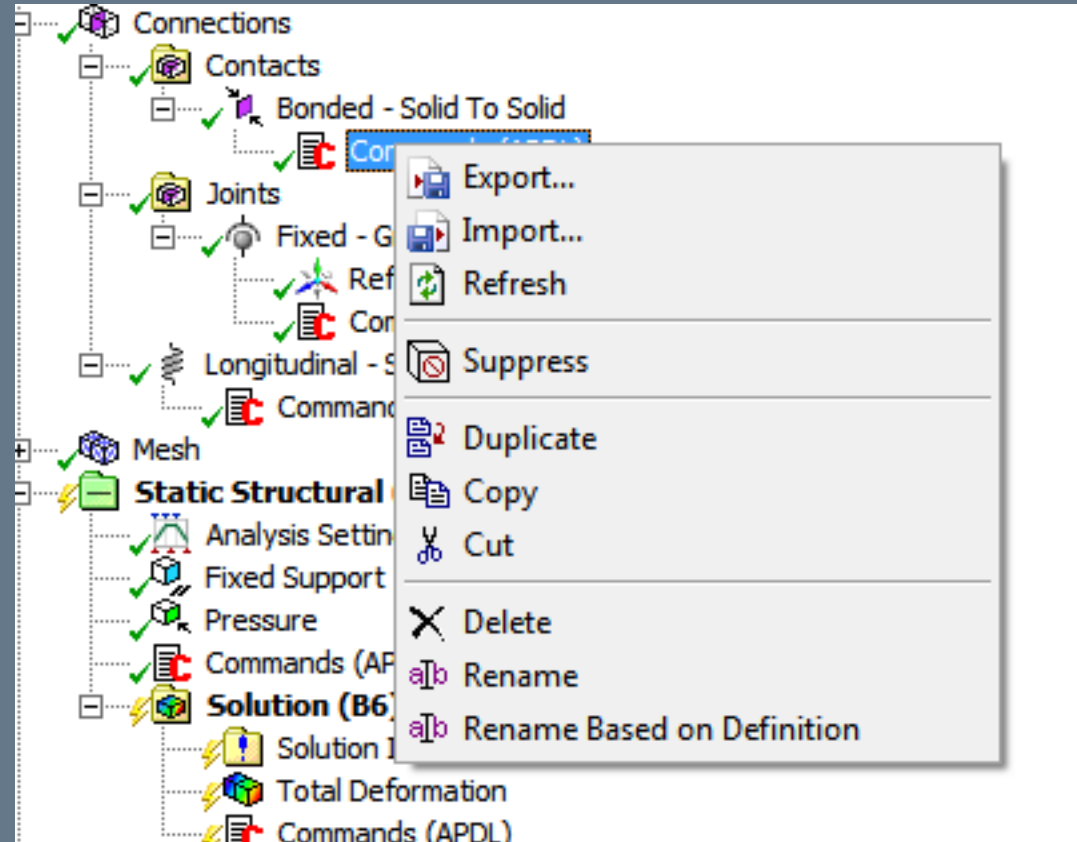


# Objects you can Add Command Objects To

Type	Tree Object	Inserted in APDL File	ID
ITEM	Body	After material for that body is defined	MATID
	Contact Pair	After contact is defined	TID, CID for Type, Real and Mat
	Joint	After the joint definition	_JID
	Spring	After spring definition	_SID.
PREP	Environment	Right Before the Solve Command	
POST	Solution	Right after the /POST1 command	
	Pre-Stress	Before first solve in Pre-stress modal	

# Command Object RMB

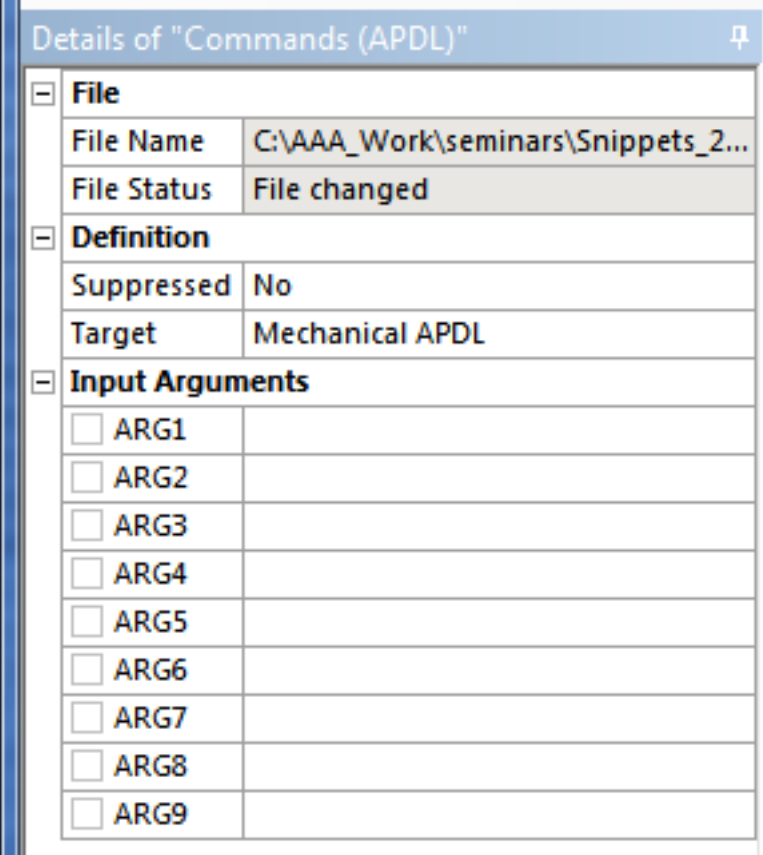
- File Operations
- Standard object tools
  - Suppress
  - Dup, Copy, Cut
  - Delete, rename
  - Rename Based on Definition
    - Shows File name if you are linked to a file.





# Command Object Details View

- The same for Item and PREP Command Objects
- File name and status if you are linked to a file
- Suppression flag
- Target
  - This is where you can point to other solvers besides MAPDL
- Input arguments for your script
  - They can be parameters managed by Workbench!



Details of "Commands (APDL)"	
<b>File</b>	
File Name	C:\AAA_Work\seminars\Snippets_2...
File Status	File changed
<b>Definition</b>	
Suppressed	No
Target	Mechanical APDL
<b>Input Arguments</b>	
<input type="checkbox"/> ARG1	
<input type="checkbox"/> ARG2	
<input type="checkbox"/> ARG3	
<input type="checkbox"/> ARG4	
<input type="checkbox"/> ARG5	
<input type="checkbox"/> ARG6	
<input type="checkbox"/> ARG7	
<input type="checkbox"/> ARG8	
<input type="checkbox"/> ARG9	

# Command Object Details View: POST

- POST Adds ability to bring back parameters
- User defines prefix for it to use
  - my\_ is default
- Result can be a parameter
- More on this in Post section

Details of "Commands (APDL)"

<b>File</b>	
File Name	C:\AAA_Work\seminars\Sn...
File Status	File and object changed
<b>Definition</b>	
Suppressed	No
Output Search Prefix	my_
Target	Mechanical APDL
<b>Input Arguments</b>	
<input type="checkbox"/> ARG1	
<input type="checkbox"/> ARG2	
<input type="checkbox"/> ARG3	
<input type="checkbox"/> ARG4	
<input type="checkbox"/> ARG5	
<input type="checkbox"/> ARG6	
<input type="checkbox"/> ARG7	
<input type="checkbox"/> ARG8	
<input type="checkbox"/> ARG9	
<b>Results</b>	
<input type="checkbox"/> my_stmx	1.

# Other and General Things to Remember

- Anything valid in APDL is valid in a snippet
  - Except geometry and interactive graphics stuff
- Command snippets do get copied to Reports
- Use Duplicate and drag and drop
- If no changes to script on Item snippets, link to the same file!
  - Example: 32 contact pairs that all have the same advanced options
- Remember that Mechanical generates APDL code
- Be aware of location that Mechanical inserts snippets
- Try and use Item Snippets when possible
  - ID makes it easy
- Use files for complex snippets
- Rename your snippets with useful names

# Item Snippets



# Adding Command Objects to Objects

- An object in the tree gets convert to a block of APDL code
- The Command Object let's you append your own code
- Nice because number of the object is passed to you as a parameter
- Body
  - Really material. This is the most used
- Contact Pair, Joint, Springs
  - Use this to get access to advanced features
- Strongly recommend using files for these
  - Especially if the same scripts are applied to multiple objects
  - Use Arg1-9 to specify anything unique for a given object
- Don't change item numbers in APDL



# Example: APDL Material for a Body

- Usually used for advanced materials not supported in Mechanical

```
! Commands inserted into this file will be executed just after material definitions in /PREP7.
! The material number for this body is equal to the parameter "matid".

! Active UNIT system in Workbench when this object was created: U.S. Customary (in, lbm, lbf, s, V, A)
!===== ERMSNIP
mptemp,1,30,50,600,700
mpdata,dens,matid,1,.0007,.00069,.00066,.00065
mpdata,ex,matid,1,29e6,28.9e6,28.5e6,27e6
!===== ERMSNIP
```

```
...
MP,NUXY,1,0.3,
MP,MURX,1,10000,

/wb,mat,end           ! done sending materials
! ***** Begin Command Snippet *****
*set,matid,1
! Commands inserted into this file will be executed just after material definitions in /PREP7.
! The material number for this body is equal to the parameter "matid".

! Active UNIT system in Workbench when this object was created: U.S. Customary (in, lbm, lbf, s, V, A)
!===== ERMSNIP
mptemp,1,30,50,600,700
mpdata,dens,matid,1,.0007,.00069,.00066,.00065
mpdata,ex,matid,1,29e6,28.9e6,28.5e6,27e6
!===== ERMSNIP

! ***** End Command Snippet *****
!***** Model Summary *****
...
```

# Comments on Item Command Objects

- You can also use the body object to change the element type, section, or real by body
  - MATID also refers to TYPE and REAL
  - Great place to change away from default 185 for solid elements
- Before you go down the road of a fancy Item snippet, make sure that a new feature in Workbench can't do it
  - Lots of things we used to write snippets for are available now



# General Preprocessing Snippets





# General Modifications of Your Model

- Executed right before the SOLVE command
- So you are in the /SOLU module
  - Ok for Loads, constraints, and solution options
  - Not OK for materials, moving/creating mesh, etc...
- You can go back to /PREP7 if you need to
  - Just remember to return to /SOLU
- The sky is the limit on what you can do here
  - But remember, if you create items (nodes, elements, numbering, etc..) you can't post process in Workbench



# Selecting Items to Work On

- Everything in MAPDL has a number associated with it
- Item Snippets group by some ID
  - Material ID, Contact Pair, Joint ID, etc...
- But for general stuff you have three choices:
  - APDL selection logic
  - Named Selections -> Nodal Components
  - Combine named selection and APDL selection logic
- Named Selections
  - For Every geometry object you name with Named Selection
  - And, every geometry object you assign a nodal load or constraint
  - A nodal component gets created in MAPDL
    - Note that load names may be tricky to figure out
    - Recommend using named components

# Named Selection

- Remember that it makes a nodal component for the nodes that sit on the geometry your select
  - Body named selections don't get turned into APDL
- They show up in your DS.DAT file as shown
- Use descriptive names
- Some users actually encode stuff they want to pass in the Names Selection
  - F\_Hydro\_34
  - Write a macro that loops through components
    - Looks for ones starting with F\_Hydro
    - Applies a hydrostatic load assuming the highest node is at 34 feet
  - Can get very fancy

```
/com,***** Send Named Selection as Node Component *****
CMBLOCK,ERMF1 ,NODE, 12
(8i10)
      13      14      15      16      17      18      19      20
      21      22      23      24
/golist
```

# Parameters

- User ARG1-ARG9 in Details to pass in Parameters
  - If you need more, use multiple Command Objects
- You can also define parameters that you want passed back to Mechanical
  - A trick required – Only user parameters with prefix in a Post Command Object are brought back
  - So, add a **my\_param = my\_param** to a post object as a work around

## PREP Command Object

```
! Commands inserted into this file will be executed just prior to the Ansys SOLVE command.
! These commands may supersede command settings set by Workbench.

! Active UNIT system in Workbench when this object was created: U.S. Customary (in, lbm, lbf, s, V, A)
nselect,all
nlist,all
*get,my_nmx,node,,num,max
```

## POST Command Object

```
! Commands inserted into this file will be executed immediately after the Ansys /POST1 command.

! Active UNIT system in Workbench when this object was created: U.S. Customary (in, lbm, lbf, s, V, A)
nselect,all
set,last
*get,my_stmx,active,,set,sbst
my_nmx = my_nmx
```

# General Postprocessing Snippets



# Getting Access to Full MAPDL POST

- Puts you in /POST1
  - Make plots not supported in Mechanical
  - Queries and calculations
  - Return scalar values as parameters
  - Graphs
  - Make output files that you need for other programs
- Also gives you access to POST26
  - Do time dependent post and then bring back graphs or scalar value



# Post Parameters

- Do any calculations you want that produce a scalar result and bring back the results
- The way it works:
  - Mechanical scans the Command Object looking for parameter definitions
    - \*get,par, \*set,par, par=
  - It puts code in to just return those parameters
- No arrays, no string
- You can't create parameters on the fly
  - \*get,my\_pf%i%, does not work

Details of "Commands (APDL)"	
<b>File</b>	
File Name	C:\AAA_Work\seminars\Sn...
File Status	File and object changed
<b>Definition</b>	
Suppressed	No
Output Search Prefix	my_
Target	Mechanical APDL
<b>Input Arguments</b>	
<input type="checkbox"/> ARG1	
<input type="checkbox"/> ARG2	
<input type="checkbox"/> ARG3	
<input type="checkbox"/> ARG4	
<input type="checkbox"/> ARG5	
<input type="checkbox"/> ARG6	
<input type="checkbox"/> ARG7	
<input type="checkbox"/> ARG8	
<input type="checkbox"/> ARG9	
<b>Results</b>	
<input type="checkbox"/> my_stmx	1.

# Parameter Example

- Get number of modes and participation factors
- Need to know ahead of time how many modes
  - Remember, no do-loops

```
*set,last
*get,my_nmd,active,,set,sbst
*get,my_pf01,mode,1,pfact
*get,my_pf02,mode,2,pfact
*get,my_pf03,mode,3,pfact
*get,my_pf04,mode,4,pfact
*get,my_pf05,mode,5,pfact
*get,my_pf06,mode,6,pfact
*get,my_pf07,mode,7,pfact
*get,my_pf08,mode,8,pfact
*get,my_pf09,mode,9,pfact
*get,my_pf10,mode,10,pfact
*get,my_pf11,mode,11,pfact
*get,my_pf12,mode,12,pfact
```

Details of "Commands (APDL)"	
<input type="checkbox"/> ARG5	
<input type="checkbox"/> ARG6	
<input type="checkbox"/> ARG7	
<input type="checkbox"/> ARG8	
<input type="checkbox"/> ARG9	
<b>Results</b>	
<input type="checkbox"/> my_pf01	4.6091e-002
<input type="checkbox"/> my_pf02	-4.6115e-002
<input type="checkbox"/> my_pf03	-9.2409e-002
<input type="checkbox"/> my_pf04	-2.9877e-002
<input type="checkbox"/> my_pf05	-2.5557e-002
<input type="checkbox"/> my_pf06	2.5789e-002
<input type="checkbox"/> my_pf07	5.1644e-002
<input type="checkbox"/> my_pf08	1.6757e-002
<input type="checkbox"/> my_pf09	-4.3161e-002
<input type="checkbox"/> my_pf10	1.5984e-002
<input type="checkbox"/> my_pf11	-1.5633e-002
<input type="checkbox"/> my_pf12	1.4861e-002
<input type="checkbox"/> my_nmd	12.



# Plots

- If you create a PNG file in your Command Object, Mechanical appends it to the Tree
- Standard MAPDL plotting to png files applies
  - Only requirement is to use /show,PNG
- Note: Files get appended to first post command object
  - Not the object that the plots were created in
- Files show up in MECH directory as PostImageNNN.png
  - Mechanical increments the NNN
  - Use Files viewer on project page to see



# Example: Mode Shape Plots

Multiple Systems - Mechanical [ANSYS Multiphysics]

File Edit View Units Tools Help

Show Vertices Wireframe Edge Coloring Thicken Annotations

Commands Export... Import... Refresh

Outline Worksheet

Mesh

Named Selections

Static Structural (B5)

Analysis Settings

Fixed Support

Pressure

Displacement

Commands (APDL)

Solution (B6)

Solution Information

Total Deformation

Commands (APDL)

Modal (C5)

Pre-Stress (Static Structural)

Analysis Settings

Commands (APDL)

Solution (C6)

Solution Information

Total Deformation

Commands (APDL)

Post Output

Post Output 2

Post Output 3

Frequency Plots

PFact Plot

Details of "Post Output"

1: 83.9362

2: 83.9447

3: 168.018

4: 169.609

5: 571.554

6: 571.632

7: 1194.68

8: 1208.1

9: 1593.97

TowerOfTest\_1—Modal (C5)

Graphics Worksheet

Messages

Text	Association	Timestamp
Warning: You have performed a pre-stress modal analysis with large deflection effects turned off	Project>Model>Modal>Solution	5/24/2011 4:36:02 PM
Info: The solution was executed using restart information	Project>Model>Static Structural>Solution	5/24/2011 10:00:13 AM

Press F1 for Help

2 Messages No Selection U.S. Customary (in, lbm, lbf, s, V, A) Degrees RPM

# Example: Mode Shape Plots

```
set,last /TLAB,xx+.05,yy+.05,'%i%: %frq%\n/gfile,600\n/show,png\n*get,nmd,active,,set,sbst\nicc = 1\nirr = 1\nnp = 3\naa = 2.8/np\nbb = 1.9/np\nxx = -1\nyy = 1-bb\n/plopts,info,0\n/plopts,minm,0\n/psymb,cs,off\n/triad,off\n/view,1,.9875,.125,-.09\n/angle,1,-50.41\n/dist,1,11\n/focus,1,.386,1.192,10\n/RGB,INDEX,100,100,100,0\n/RGB,INDEX,80,80,80,13\n/RGB,INDEX,60,60,60,14\n/RGB,INDEX,0,0,0,15\n*do,i,1,nmd\n  set,1,i\n  *get,frq,mode,i,freq\n  /window,1,xx,xx+aa,yy,yy+bb\n  /ANUM ,0, 1,-0.85480 , 0.37396\n  /TSPEC,15,0.75, 1,359, 0\n\nplnsol,u,sum\n/annot,delete\n\n/noerase\nxx = xx + aa\nicc = icc + 1\n*if,icc,gt,np,then\n  xx = -1\n  yy = yy - bb\n  icc = 1\n  irr = irr + 1\n*endif\n*if,irr,gt,np,then\n  /erase\n  /annot,delete\n  icc = 1\n  irr = 1\n  xx = -1\n  yy = 1 - bb\n*endif\n*enddo\n/erase\n/annot,delete\n/win,1,full\n/show,close
```



# Example: Mode Shape Plots

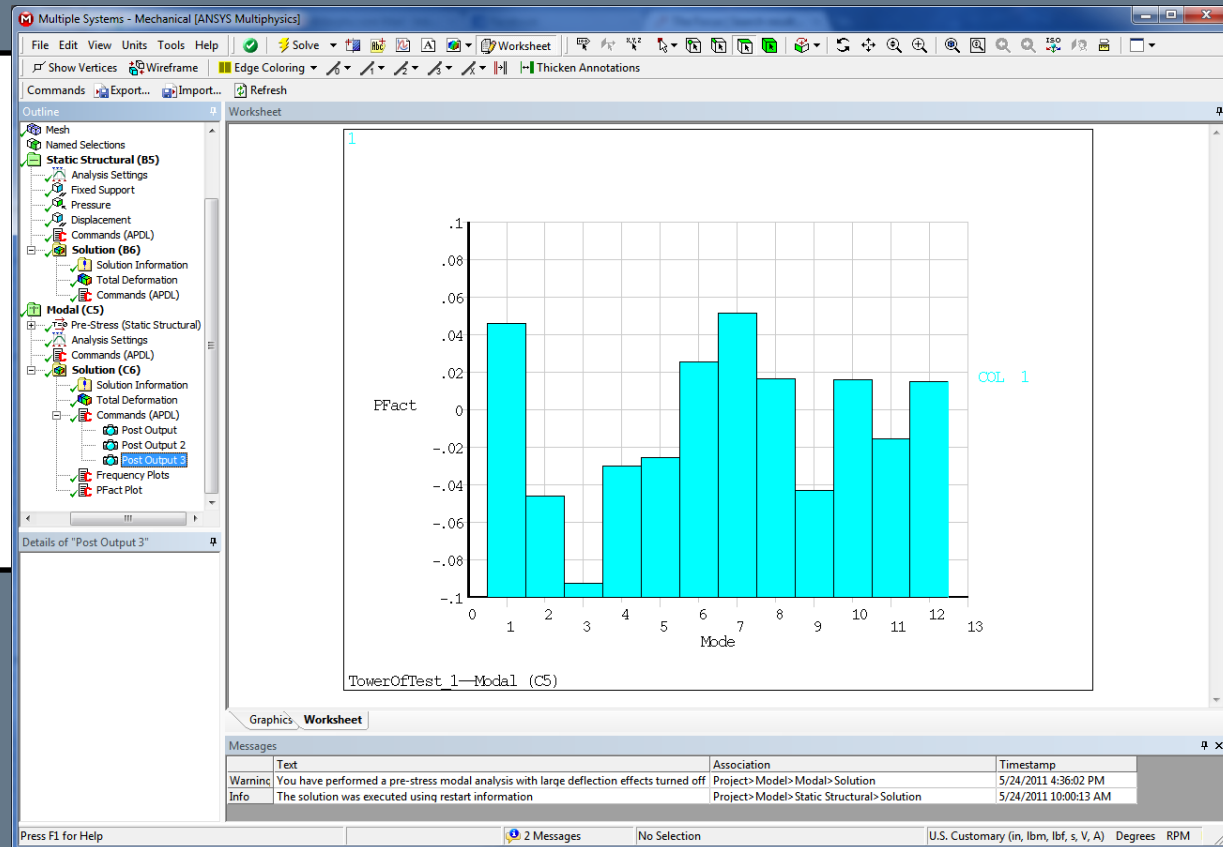
- Things to note
  - Users /erase and annotation without any problems
  - Change background to white or go for blue-blue background to look more like workbench
  - Not a MAPDL plot guru, see The Focus for a quick review of important comands:
    - [Making Pretty Plots in ANSYS Mechanical and Mechanical APDL](#)
    - Got to [www.PADTINC.com/blog](http://www.PADTINC.com/blog) and search for /gfile



# Example: A Graph

- Created a macro to make a bar graph of Participation Factors on a modal analysis
- Use this to plot arrays (bar) and table (line)

```
*set, last
*get, nmd, active, , set, sbst
*dim, pfs, , nmd
*do, ii, 1, nmd
  *get, pfs(ii), mode, ii, pfact
*enddo
/show, png
/gropt, fill, 1
/xrange, 0, nmd+1
/gropt, divx, nmd+1
/axlab, x, 'Mode'
/axlab, y, 'PFact'
*vplot, , pfs(1)
/show, close
```

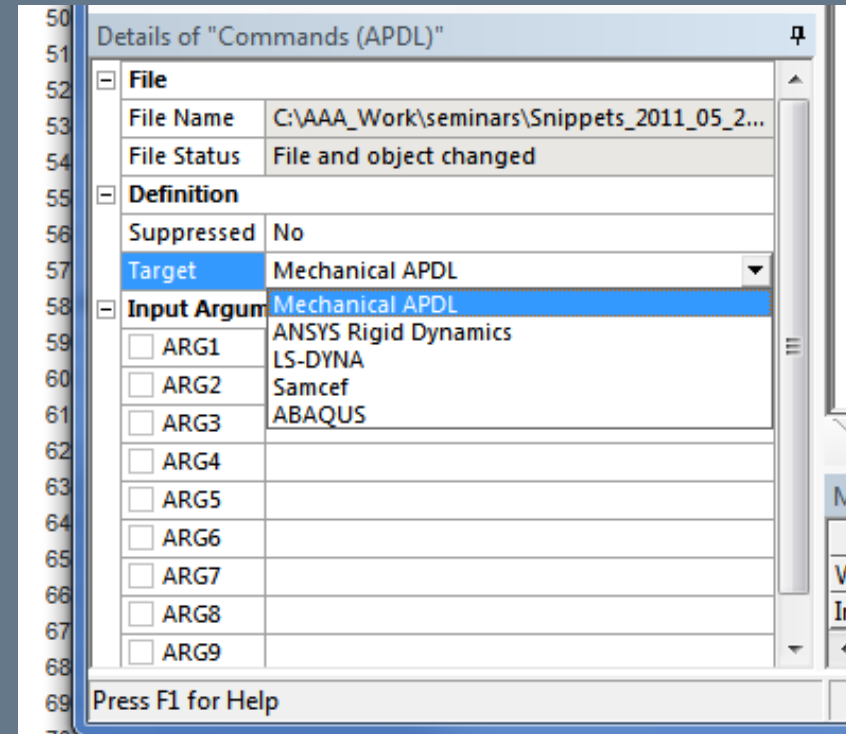


# Other Stuff to Know



# Not Just for MAPDL

- Works for other solvers that work with ANSYS Mechanical:
  - ANSYS Rigid Dynamics
  - LS-DYNA
  - SAMCEF
  - ABAQUS
- Put in appropriate keywords or commands and they will be inserted as needed



# Debugging

- Biggest issue is that creating snippets is not interactive
  - Testing requires a re-run of your model
- Suggested solution
  - Get your model ready without snippets
  - Write Input File...
  - Bring up in an interactive MAPDL session
  - Write and debug a macro
    - Or cut and paste it into your Command Object
- Much better way to debug
- Also, don't forget to check the output file under solution Information



# Dealing with Tabular Information

- No way right now to get tabular information from MAPDL back into ANSYS Mechanical
- Use /out or \*vwrite to create text files
- View manually
- If you want to see them during/after the run:
  - Use /sys,notepad filename to bring it up

```
/out,foo.txt  
nlist,all  
/out  
/sys,notepad foo.txt
```

The screenshot shows the ANSYS Mechanical interface. The Command Window displays the following commands and their results:

```
! Active UNIT system in Workbench when this object was created: U.S. Customary (in, lbf, in, V, A)  
  
*set,last  
*get,nr,node,1,part  
*get,nr,node,2,part  
*get,nr,node,3,part  
*get,nr,node,4,part  
*get,nr,node,5,part  
*get,nr,node,6,part  
*get,nr,node,7,part  
*get,nr,node,8,part  
*get,nr,node,9,part  
*get,nr,node,10,part  
*get,nr,node,11,part  
*get,nr,node,12,part  
*get,nr,node,13,part  
*get,nr,node,14,part  
*get,nr,node,15,part  
*get,nr,node,16,part  
*get,nr,node,17,part  
*get,nr,node,18,part  
*get,nr,node,19,part  
*get,nr,node,20,part  
*get,nr,node,21,part  
*get,nr,node,22,part  
*get,nr,node,23,part  
*get,nr,node,24,part  
*get,nr,node,25,part  
*get,nr,node,26,part  
*get,nr,node,27,part  
*get,nr,node,28,part  
*get,nr,node,29,part  
*get,nr,node,30,part  
*get,nr,node,31,part  
*get,nr,node,32,part  
*get,nr,node,33,part  
*get,nr,node,34,part  
*get,nr,node,35,part  
*get,nr,node,36,part  
*get,nr,node,37,part  
*get,nr,node,38,part  
*get,nr,node,39,part  
*get,nr,node,40,part  
*get,nr,node,41,part  
*get,nr,node,42,part  
*get,nr,node,43,part  
*get,nr,node,44,part  
*get,nr,node,45,part  
*get,nr,node,46,part  
*get,nr,node,47,part  
*get,nr,node,48,part  
*get,nr,node,49,part  
*get,nr,node,50,part
```

The Notepad window displays the output of the nlist command, showing a table of node coordinates and properties:

NODE	X	Y	Z	THX1	THX2	THX3
1	1.0000	1.0000	0.0000	0.00	0.00	0.00
2	1.0000	1.0000	4.0000	0.00	0.00	0.00
3	1.0000	1.0000	8.0000	0.00	0.00	0.00
4	1.0000	1.0000	12.0000	0.00	0.00	0.00
5	1.0000	1.0000	16.0000	0.00	0.00	0.00
6	1.0000	1.0000	20.0000	0.00	0.00	0.00
7	0.13659E-15	1.0000	0.0000	0.00	0.00	0.00
8	0.13659E-15	1.0000	4.0000	0.00	0.00	0.00
9	0.13659E-15	1.0000	8.0000	0.00	0.00	0.00
10	0.13659E-15	1.0000	12.0000	0.00	0.00	0.00
11	0.13659E-15	1.0000	16.0000	0.00	0.00	0.00
12	0.13659E-15	1.0000	20.0000	0.00	0.00	0.00
13	0.0000	0.0000	18.0000	0.00	0.00	0.00
14	0.0000	0.0000	16.0000	0.00	0.00	0.00
15	0.0000	0.0000	14.0000	0.00	0.00	0.00
16	0.0000	0.0000	12.0000	0.00	0.00	0.00
17	0.0000	0.0000	10.0000	0.00	0.00	0.00
18	0.0000	0.0000	8.0000	0.00	0.00	0.00
19	1.0000	0.0000	18.0000	0.00	0.00	0.00
20	1.0000	0.0000	12.0000	0.00	0.00	0.00
21	1.0000	0.0000	6.0000	0.00	0.00	0.00
22	1.0000	0.0000	0.0000	0.00	0.00	0.00
23	1.0000	0.0000	12.0000	0.00	0.00	0.00
24	1.0000	0.0000	20.0000	0.00	0.00	0.00
25	-0.32715	2.1483	12.0000	0.00	0.00	0.00
26	-0.25000	2.3441	12.0000	0.00	0.00	0.00
27	0.25000	2.3441	12.0000	0.00	0.00	0.00
28	0.40451	1.8686	12.0000	0.00	0.00	0.00
29	0.50000	1.5747	12.0000	0.00	0.00	0.00
30	-0.40451	1.8686	12.0000	0.00	0.00	0.00
31	-0.40451	1.8686	6.0000	0.00	0.00	0.00
32	-0.40451	1.8686	0.0000	0.00	0.00	0.00
33	-0.40451	1.8686	6.0000	0.00	0.00	0.00
34	-0.40451	1.8686	12.0000	0.00	0.00	0.00
35	0.0000	1.5747	0.0000	0.00	0.00	0.00
36	0.0000	1.5747	6.0000	0.00	0.00	0.00
37	0.0000	1.5747	12.0000	0.00	0.00	0.00
38	0.0000	1.5747	9.0000	0.00	0.00	0.00
39	0.40451	1.8686	0.0000	0.00	0.00	0.00
40	0.40451	1.8686	6.0000	0.00	0.00	0.00
41	0.40451	1.8686	12.0000	0.00	0.00	0.00
42	0.40451	1.8686	9.0000	0.00	0.00	0.00
43	0.25000	2.3441	0.0000	0.00	0.00	0.00
44	0.25000	2.3441	6.0000	0.00	0.00	0.00
45	0.25000	2.3441	12.0000	0.00	0.00	0.00
46	0.25000	2.3441	9.0000	0.00	0.00	0.00
47	-0.25000	2.3441	0.0000	0.00	0.00	0.00
48	-0.25000	2.3441	6.0000	0.00	0.00	0.00
49	-0.25000	2.3441	12.0000	0.00	0.00	0.00
50	-0.25000	2.3441	9.0000	0.00	0.00	0.00

# Conclusions

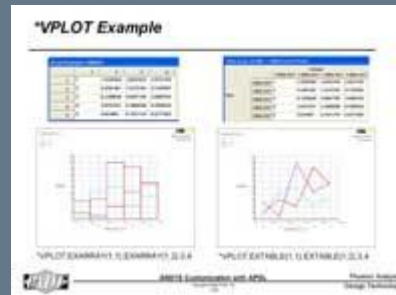


# Suggestions

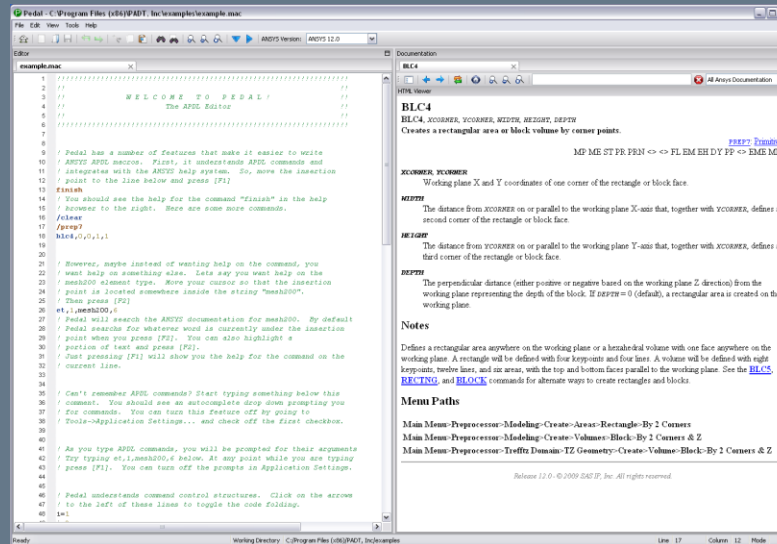
- Run MAPDL interactively and use log file!!!!!!!!!!!!
- Don't forget: No Geometry
- Put good comments in your snippets
  - Put in a “search string” like ermsnip so you can find them in your ds.dat easily
- If a restart is possible, when you “Write Input File...” you won't get your snippets
  - Clear restarts to get full file.
- Tell program to save DB
  - Go to directory and double-click on DB
  - Work on your macros interactively
- Get a very simple/quick model to write/debug with
- As always: Crawl, Walk, Run

# Resources

- Help System
- ANSYS.net
- XANSYS.org
- “Weathered” users
- “ANSYS Customization with ANSYS Parametric Design Language”
  - \$75/copy
  - [www.PADTINC.com/support/techguides](http://www.PADTINC.com/support/techguides)



- Side-by-side editor and help viewer layout.
- Instant help on any documented APDL command by pressing F1.
- Full syntax highlighting for ANSYS v12 Mechanical APDL.
- Auto-complete drop downs for APDL Commands.
- APDL Command argument hints while typing commands.
- Search ANSYS help phrases and keywords.
- Multiple tabs for the editor and html viewer.
- Full capability web browser built in allows for rich web experience and web searches.



# Thoughts

- Don't just dive into APDL because that is what you know
  - Every release, we need less and less snippets
- The incredible power of APDL is still there and available
  - But you get the incredible power of ANSYS Mechanical at the same time



# Thank You...

- PADT Enjoys doing these webinars...
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