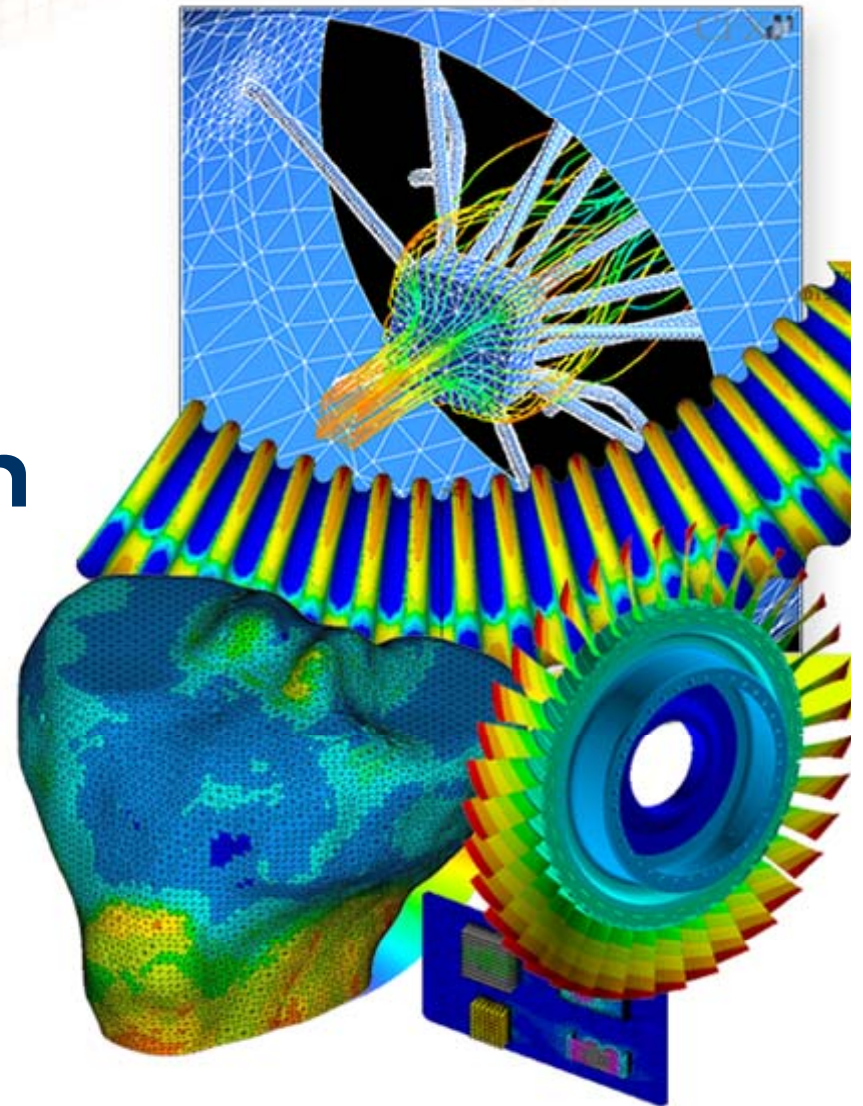


ANSYS Graphical User Interface Programming with Tcl/Tk

*Presented By
CAE Associates, Inc.*





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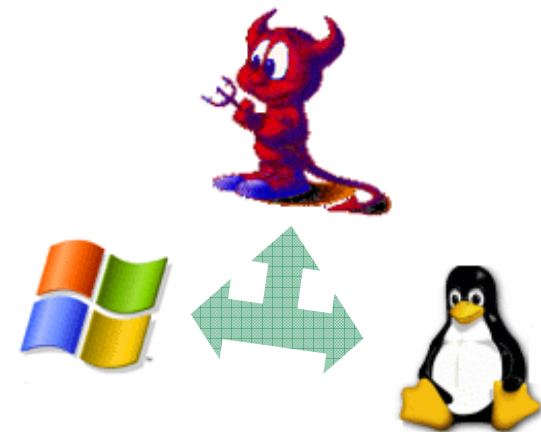
Introduction What is Tcl/Tk?

- Tcl/Tk is pronounced *“tickle-tee-kay”*.
 - Tcl is a universal scripting language.
 - Tk is a Graphical User Interface (GUI) toolkit and widgets based in Tcl.
- Developed by John Ousterhout at the University of California, Berkeley in 1989.
- Custom Tcl/Tk interpreters have been compiled into the ANSYS analysis environment since Revision 5.5.
- Some existing ANSYS Tcl/Tk components:
 - Material Modeler
 - Contact Wizard
 - Solution Controls
 - Time History Variable Viewer
 - Entire GUI (Revision 6.1)



Introduction Advantages of Tcl/Tk

- **Price:** *It's Free !!!*
- **Learning Curve:**
 - Easy learning curve compared with traditional software languages such as C++ and Fortran.
 - Interpreted (not compiled) so effects of modifications are immediately realizable.
- **Flexibility:**
 - Wide variety of tools to create entry boxes, canvases, scrollable forms, labels, etc.
 - Create own tools and procedures.
- **Compatibility:**
 - Cross-platform compatible.



- Sparse ANSYS Documentation:

- ANSYS documentation/training is sparse compared to UIDL and APDL.
- Limited technical support since GUI programming is considered a **non-standard** use of the software.

- Small ANSYS User Base:

- ANSYS implementation is recent so user base is limited.
- Very few user defined scripts and libraries exist in the public domain.

- Performance:

- To maintain platform independence, Tcl/Tk is not compiled, rather it is an **interpreted** language and implementation is **on the fly**.
- This tends to cause some degradation of speed particularly when trying to access ANSYS over a network connection.

- Tcl/Tk syntax is simple — similar to **sh**, **C**, and **Lisp**.
- A command is formed by words separated by white space.
- Dollar sign (**\$**) substitutes the value of a variable.
- Square brackets executes a nested command. Result from **cmd2** passed as argument to **cmd1**.
- Double quotes group words into a single argument.
- Curly braces group words into a single argument, however, elements within the braces are not interpreted.

| Tcl Expression | Result |
|-----------------------------------|--------------|
| <code>set x 2</code> | x=2 |
| <code>set y \$x</code> | y=2 |
| <code>set z [expr \$x+\$y]</code> | z=4 |
| <code>set t "z is \$z"</code> | t="z is 4" |
| <code>set t {z is \$z}</code> | t="z is \$z" |

Tcl/Tk in ANSYS Calling User Code

- There are various methods for calling your Tcl/Tk code from within ANSYS.
 - Tcl shell used for running scripts without GUI features:

```
~tcl,'source filename'
```

- Tcl/Tk shell for using GUI features:

```
~tk,'source filename'
```

- Enhanced UIDL for including object oriented and some ANSYS objects:

```
~eui,'source filename'
```

- From UIDL menus

```
:N Fnc_MyTclFunc  
:S      0,      0,      0  
:T Command  
:A My Tcl Function  
Inp_P  
Cmd_) ~eui,'tcl/tk command'  
:E END
```

ANSYS API Core Functionality

- Access to the core ANSYS functionality is provided via **ans_*** series of commands.
- Some frequently used commands:

ans_sendcommand *ansysCommand*

```
set n1 1
set n2 2
ans_sendcommand n,,$n1,$n2
```

Passes a command to ANSYS for processing

ans_getvalue *ansys*GetConstruct*

```
set ansRev [ans_getvalue ACTIVE,,REV]
```

***GET** an ANSYS value

ans_getvector *ansysAPDLarray*

| | |
|--|--|
| <pre>! APDL Command *dim,apdlArr,,2 apdlArr(1) = 1,2</pre> | <pre>! Tcl Commands set tclArr [ans_getvector apdlArr] puts \$tclArr</pre> |
|--|--|

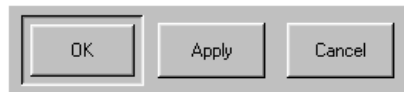
Returns an ANSYS array

- Tk provides numerous widgets for GUI creation.
- Example widgets:

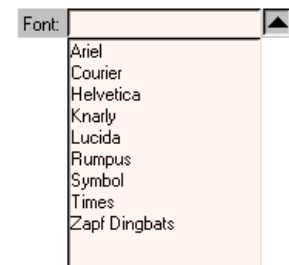
toplevel **.dlgMyDialog**



button **.btnOK**



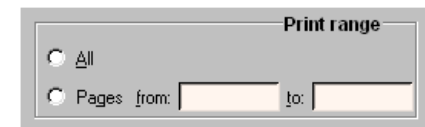
combobox **.cmbFont**



checkbox **.chbStyles**



labeledframe **.frmPrintRange**



- Some of the most common widgets used are the:

Label:

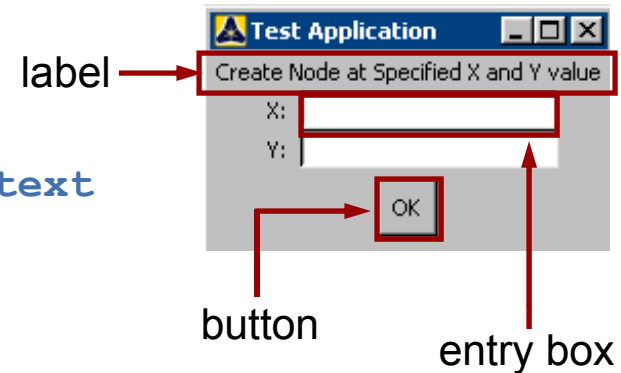
```
set myGUI(title) [label $myGUI(frame).lblTitle \
-text "Create Node at Specified X and Y value"]
set myGUI(xLabel) [label $myGUI(frame).lblX \
-text "X: "]
set myGUI(yLabel) [label $myGUI(frame).lblY \
-text "Y: "]
```

Entry Box:

```
set myGUI(entry.x) [entry $myGUI(frame).entXcoord \
-textvariable xcoord -bg white]
set myGUI(entry.y) [entry $myGUI(frame).entYcoord \
-textvariable ycoord -bg white]
```

Button:

```
set myGUI(buttonOK) [button $myGUI(frame).btnOK \
-text OK -bg grey -command {\
ans_sendcommand "*set, _nx, $xcoord"
ans_sendcommand "*set, _ny, $ycoord"
ans_sendcommand "*set, _BUTTON, 2"
ans_sendcommand "n, ,_nx,_ny"
destroy $myGUI(parent)
}]
```



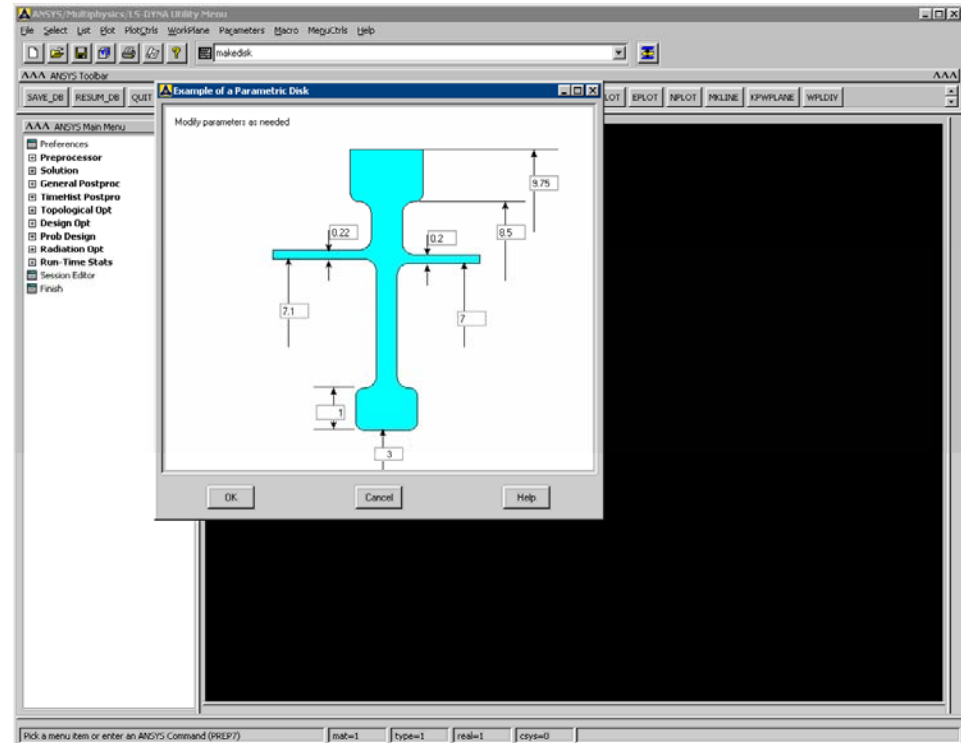
- Use the `-text` option
- Use the `-textvariable` option to set the variable name associated with the entry
- The `-text` option specifies a label for the button
- The `-command` option specifies a series of commands to perform once the button is pressed.

Example Applications Parametric Design

- Create customized GUI for parametric analysis.
- Users execute an ANSYS macro which has calls to Tcl/Tk code.

```
~eui, 'source filename'
```

- Users provide input for creating model and running the solution.
- All necessary analysis steps are predefined and transparent to the user.

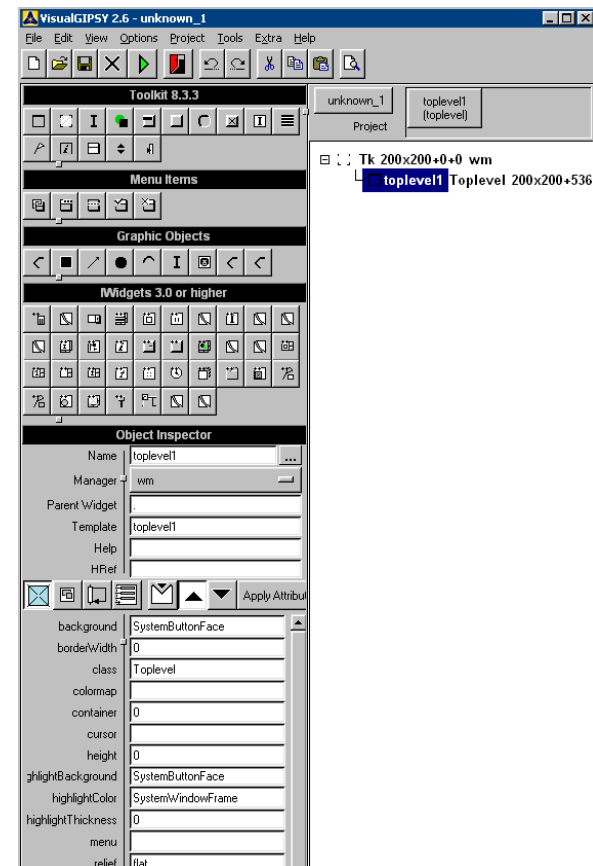
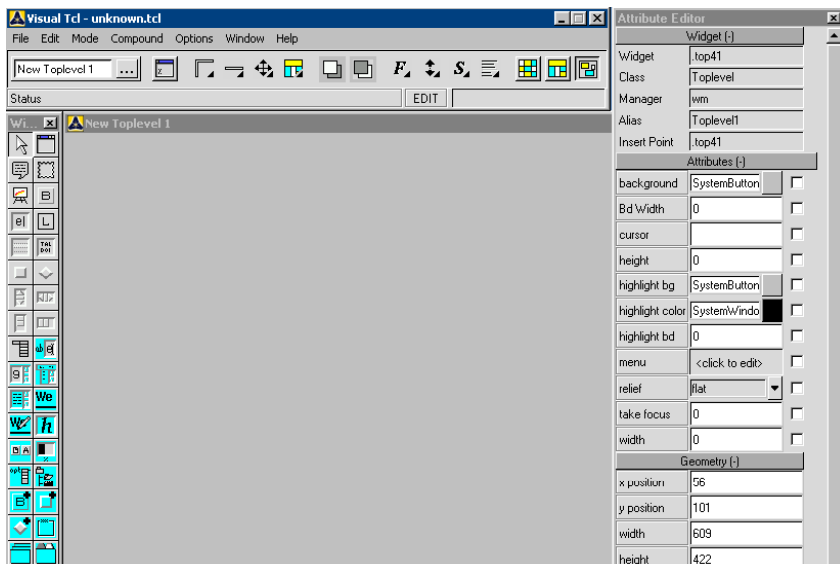


Other Tcl/Tk Tools Visual Development Tools

- Freely-available, high-quality application development environment.
- Written entirely in Tcl/Tk and generate pure Tcl/Tk code.

Visual Gypsy
<http://www.prs.de/int/index.html>

Visual Tcl
<http://vtcl.sourceforge.net/>



ANSYS Information:

- Chapters 5-7 of the *ANSYS GUI Style Guide*.
- ANSYS 2002 Users' Conference

General Tcl/Tk Information:

- Tcl Developers Exchange at

www.scriptics.com

- ActiveState – developers of Tcl/Tk tools and allied with ANSYS

www.activestate.com