

## SolidWorks API Demystified

Leonard Kikstra  
Designer / CAD Administrator  
RITE-HITE Products Corporation  
Milwaukee, WI


```

Sub Macro1
  CadObjType(0) = 30 ' TEXT ' Value mach Dotted
  CadObjType(1) = 44 ' LINE
  CadObjType(2) = 3 ' HIDDEN
  CadObjType(3) = 1 ' HIDDEN
  Dim objapp = CreateObject("SolidWorks.Application")
  objapp.Visible = True
  objapp.SendControl = True
  Dim ModelDoc = objapp.ActiveDoc ' (ObjType)
  Source = objapp.GetCharacteristicsOfModelDoc
  Source = GetCharacteristicsOfModelDoc(3) = "Task"
  Dim FileObj = CreateObject("Scripting.FileSystemObject")
  SourceFolder = FileObj.Folder("C:\Users\lennik\Documents")
  If ModelDoc.IsInching Then ' Check to see if
  From_GlobalProperties.Show
  Else
  If SourceFolder.Exists Then
  For Each objapp In SourceFolder.Files
  objapp.Copy "C:\Users\lennik\Documents"
  End If
  End Sub

```

Lenny's SolidWorks Resources:  
<http://www.LennyWorks.com/SolidWorks>  
 Blog: <http://designsmarter.typepad.com/lennyworks/>

## SolidWorks API Demystified: Who Am I?



- ◆ Product Designer
  - Engineering since 1982.
  - CAD user since 1991.
  - SolidWorks user since 1998.
- ◆ CAD Administrator
  - 20+ people on site.
  - Advise other sites.
- ◆ Productivity Gains - I want to:
  - Simplifying my job.
  - Make my computer do more work for me.
  - Get the most out of the tools I use to do my job.
- ◆ Certified SolidWorks Professional (CSWP)
- ◆ SolidWorks User Group
  - SMART (SolidWorks Milwaukee Area Resource Team)
  - <http://www.smart-wi.com>
  - Active member since 1999.
- ◆ Lenny's SolidWorks Resources
  - Website online Sept. 2003.
  - New home Sept. 2006.
- ◆ Programming
  - Programmed over 40 SolidWorks macros.
  - Most of these are available for free on the Internet.

## SolidWorks API Demystified: What is covered here?

- ◆ Benefits:
  - Learning and using the SolidWorks API
- ◆ Definitions:
 

▫ Program	Objects
▫ Macro	API
▫ SolidWorks API	
- ◆ Programming:
  - Languages you can use to program.
- ◆ More Basics:
  - Macro Feature.
  - Macro Toolbar.

## SolidWorks API Demystified: What is covered here?

- ◆ Getting Started with the Macro Recorder.
  - Recording simple macros.
  - Use as a discovery tool.
- ◆ Why won't some recorded macro works?
- ◆ Typical Macro Process.
  - Automatic starting point.
  - How a macro functions.

## SolidWorks API Demystified: What is covered here?

- ◆ Research.
  - Finding or writing the code you need.
- ◆ Type Libraries.
- ◆ SolidWorks API Object Model.
- ◆ Programming strategies.

## SolidWorks API Demystified: What is covered here?


- ◆ Getting help.
- ◆ Learning Tips.
  - Hands on
- ◆ Learning Resources.
  - SolidWorks
  - Visual Basic
  - Examples

### SolidWorks API Demystified: What is NOT covered here?

- ◆ Programming basics.
- ◆ Basic programming techniques.


### SolidWorks API Demystified: Benefits of learning and using.

- ◆ Save Time:
  - Automate common and repetitive tasks.
    - Tasks are completed the same way every time.
    - Lets your computer work as fast as it can to complete a task.
  - Reduce user input -> Reduces time.
- ◆ Reduce Errors:
  - Consistently retrieve or export data that already exists in the SolidWorks documents.
  - Reduce user input -> Reduces errors.




### SolidWorks API Demystified: Benefits of learning and using.

- ◆ Develop useful tools to meet your specific needs.
- ◆ Make your computer (do some of your) work for you.
  - Save time and money -> increase productivity.
  - Increase consistency -> reduce errors.



### SolidWorks API Demystified: Benefits of learning and using.

- ◆ Customize SolidWorks.
  - Add commands, change settings, etc...
- ◆ Enforce standard procedures.
  - SolidWorks settings.
  - Document templates.
  - Custom properties.
  - Document settings.



### SolidWorks API Demystified: Definitions

- ◆ Program
  - List of instructions that define what to do and how to do it.
- ◆ Object Oriented Programming
  - Collection of objects used to define a program or data set.
- ◆ Macro
  - Similar to program
  - Dependant on "Parent" program(s) to launch
  - Control "parent" program.
  - "Parent" program requires an API.
- ◆ Application Programming Interface (API)
  - Consist of several sets of related functions or procedures.
  - Allows external programs to interact with, and control the application
  - Read and modify the data sets created by the application.

### SolidWorks API Demystified: Definitions

- ◆ SolidWorks API
  - Programming Interface for SolidWorks
  - Allows other programs to access and control SolidWorks.
  - Allows other programs to access and modify SolidWorks data.
  - Examples: SolidWorks Add-Ins
 

eDrawings	SolidWorks ToolBox
FeatureWorks	SolidWorks Utilities
PDMWorks	SolidWorks Routing
PhotoWorks	COSMOSWorks
- ◆ Why?
  - Allows developers to write programs that can run within SolidWorks and access SolidWorks data.
  - Lets users build custom tools to suit their own needs.
  - Lets SolidWorks focus on their core products.
- ◆ Many SolidWorks Add-Ins have API's.

### SolidWorks API Demystified: Accessing / Programming

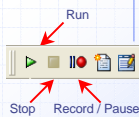
- ◆ Stand alone application Executable
  - Visual Basic Visual Basic .Net
  - Visual C++ Visual C++ .Net Visual C
    - Programming environment outside of SolidWorks.
    - Must be compiled to use outside of programming environment.
    - Can start SolidWorks as background task.
    - Required for creating Add-Ins/Dynamic Link Libraries (DLL).
- ◆ SolidWorks Macro .swp file
  - Microsoft Visual Basic for Applications.
    - SolidWorks Program (.swp) is a single file.
    - Must be launched from within SolidWorks.
    - Installed with SolidWorks.
    - No compiling necessary. (Slower than exe)
    - Some limitations.

### SolidWorks API Demystified: Macro Feature

- ◆ Embed macro as a feature in the model.
  - Executed every time macro feature rebuilds.
- ◆ Overview of Macro Feature
  - See SolidWorks API Help File
- ◆ Examples
  - SolidWorks Add-Ins and API Help
  - Mike Wilson (website)

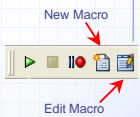
### SolidWorks API Demystified: Macro Toolbar

- ◆ Running a macro
  - Tools, Macro, Run.
  - Select macro.
  - Macro will automatically run.
- ◆ Record a macro
  - Tools, Macro, Record.
  - Complete tasks.
  - Pause macro recorder if needed.
  - Stop recorder and save new macro.
  - Source for learning about object and their properties.



### SolidWorks API Demystified: Macro Toolbar

- ◆ New Macro
  - Tools, Macro, New.
  - Enter macro name.
  - Visual Basic Editor automatically launched.
- ◆ Edit macro
  - Tools, Macro, Edit
  - Select macro.
    - Visual Basic Editor automatically launched.
  - Make changes.
  - Test Macro.
    - F5 to run macro.
    - F8 to step thru the macro line by line.
  - Save macro.
  - Exit Visual Basic editor.



### SolidWorks API Demystified: Why won't a macro work?

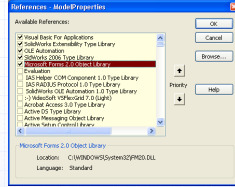
- ◆ Pre-selections:
  - Required pre-selections may not be done before running the macro.
  - Improper pre-selections may cause problems for the macro.
- ◆ Macro incorrectly started
  - Automatic starting point.
- ◆ Written for different version of SolidWorks
  - Incorrect Type Library References.
    - Version and macro specific.
  - Changes in the SolidWorks API.
    - Macro may be referencing obsolete API calls.

### SolidWorks API Demystified: Automatic Starting Point

- ◆ Last procedure of the last module inserted into the macro.
  - NOT module name specific.
  - NOT procedure name specific.
  - Important: Run Macro
- ◆ Toolbar Button
  - User must set module and routine starting point.
- ◆ Hotkey definition
  - User must set module and routine starting point.

## SolidWorks API Demystified: Visual Basic Editor – References

- ◆ How to:
  - "Tools | References" menu selections in the VB Editor
- ◆ What does it do:
  - Attach objects from another application to your project
  - Standard descriptions of object types, properties and methods.
- ◆ Already set during macro recording.
- ◆ SolidWorks version specific.
- ◆ Specific for each macro.



## SolidWorks API Demystified: Getting started with the Macro Recorder

- ◆ Great for simple macros.
  - Toggle options on/off.
- ◆ Discovery Tool
  - Provides insight into how SolidWorks sees the documents.
  - Provides list of commands necessary to complete recorded tasks.
- ◆ Records the following:
  - Object selections.
  - Menu selections.
  - Screen movements.
  - Some dialog box selections.
    - Does not record all selections in dialog boxes.
  - Other actions taken.

## SolidWorks API Demystified: Why won't some recorded macros work?

- ◆ NOTES:
  - The recorded macro will record the same objects and commands you used while recording the macro.
  - An unmodified recorded macro will only work with the objects you accessed during recording.
- ◆ While recording your macro, you may be modifying the document, so remember the following:
  - If the work is already done, there is nothing else for the macro to do.
  - When running a recorded macro that modifies documents, the SolidWorks documents must be in the same state, now, as they were when the macro was first recorded.
- ◆ Pre-selections:
  - Required pre-selections may not be done before running the macro.
  - Improper pre-selections may cause problems for the macro.

## SolidWorks API Demystified: Running And Testing a Macro

- ◆ Know where macro starts.
  - Automatic starting point.
- ◆ Testing macro or procedure
  - [ F5 ] - Run macro.
  - [ F8 ] - Step thru code line-by-line.
  - Start in current procedure.

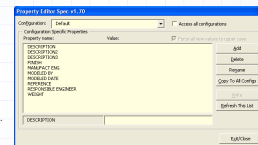
## SolidWorks API Demystified: Running a Macro - Typical Steps

- ◆ Launch Macro
  - Load type libraries.
  - Set global variables, constants, enumerations.
  - Attach to SolidWorks.
- ◆ Is a document open in SolidWorks?
  - No, warn user that you need one, then end.
- ◆ Get document type
  - Wrong type, warn user and end.
- ◆ Proceed.....



## SolidWorks API Demystified: Running a Macro – Typical Steps

- ◆ User Form Initialization
  - Set program defaults.
  - Read data from document.
  - Display data and form to user.
- ◆ Wait for input
  - React to user input.
    - Modify document.
    - Read more data from document.
    - Update user form.
    - Update document.
  - Action buttons
    - OK / Process.
    - Cancel.
    - Help.
    - Other.



## SolidWorks API Demystified: Running a Macro - Action

### ◆ Process

- Process user requests based on form values.
- Inform user of status during processing.
- Inform user of errors encountered.
- Inform user of status upon completion.
- Wait for user OK.

```
Sub Main()
  Const PropType(0) = 30 ' TEXT Value match Default
  Const PropType(1) = 64 ' DATE
  Const PropType(2) = 1 ' NUMBER
  Const PropType(3) = 11 ' YES/NO
  Set swApp = CreateObject("SolidWorks.Application")
  swApp.Visible = True
  swApp.TimeIsCritical = True
  Set ModelDoc2 = swApp.ActiveDoc ' Grab currently
  Source = swApp.GetCurrentDocPartName
  Source = Left(Source, Len(Source) - 3) * ".iss"
  Set FileObj = CreateObject("FileSystemObject")
  SourceExists = FileObj.FileExists(Source)
  If ModelDoc2 Is Nothing Then ' Check to see if
  Form_GlobalProp@Solid_Show
  Else
  If SourceExists = True Then
  ForceProperties
  If ForceProperty@66 = True Then
  ReadProperties
  End If
  End If
End Sub
```

### ◆ Clean up

- Close forms.
- Clear out objects and variables.
- Close macro.

## SolidWorks API Demystified: Research

- ◆ Every macro you write will require some research.

### ◆ Visual Basic

- Learning Visual Basic
- Routines
- Many different ways to complete a task.

### ◆ SolidWorks

- Learning the SolidWorks API
- Document Structure
- Feature Manager
- SolidWorks API Add-Ins and Help File

- ◆ Existing macros

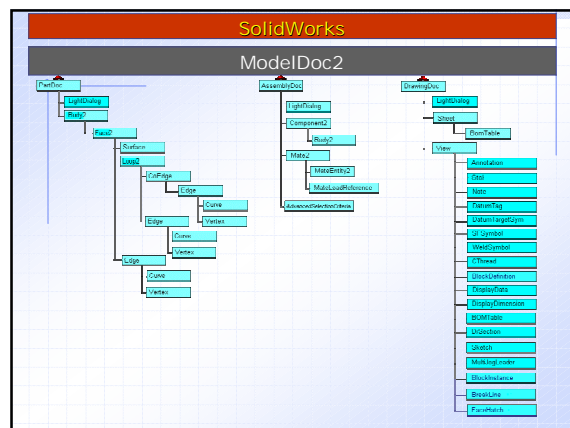
## SolidWorks API Demystified: Visual Basic Programming - Objects

### ◆ What are they?

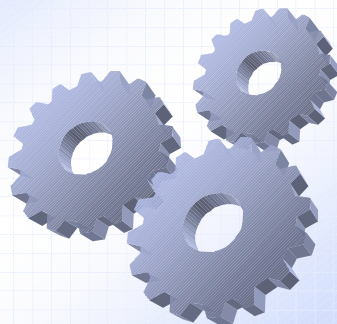
- Objects have attributes or properties.
- Some objects can contain other objects.
  - Parent - Child relationships.

### ◆ Can be accessed or modified by outside program.

- Must set an object to a variable to access it's properties.
  - Meta-data - Information about object (properties).
  - Features - Objects with an Object.
- Methods
  - Command and syntax that provides access to object's properties or features.
- Accessors
  - How to get the property or feature from parent.



## SolidWorks API Demystified: Examples - Recording and Writing a Macro



## SolidWorks API Demystified: Justification Example:

### ◆ Example #1 - New Macro - Document Export

- Scope:
  - Export documents to different file types.
  - Drawings, Models, Configurations.
  - 20 models to create 300 exported files.
- Manual process:
  - Repetitive, Time consuming. User input required at all steps!
  - Selecting file type by hand every time.
  - Consistent configuration naming.
  - Did I export all configurations?
  - Estimate time to complete: 12-14 Hours
- Time comparison:
 

▫ Time to write:	8 Hours
▫ Automated:	1.5 Hours
▫ Saved first use:	10-12 Hours
- Macro can be reused many, many times.

### SolidWorks API Demystified: Justification Example:

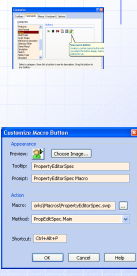
- ◆ Example #2 - Modify Macro - Change custom property value.
  - Scope:
    - All documents require addition or removal of a custom property.
    - 1000's of files.
    - Found macro on internet, can modify for use.
  - Manual process:
    - Repetitive, Time consuming, User input required at all steps!
    - Did I change all documents?
    - Did I make the right changes?
    - Estimate time to complete: 20+ Hours
  - Time comparison:
    - Time to modify macro: 15 Minutes
    - Automated: 2.5 Hours
    - Saved first use: 17+ Hours
  - Macro can be customized and reused many, many times.

### SolidWorks API Demystified: Assigning a Macro to a Shortcut/Hotkey.

- ◆ How To:
  - Tools, Customize
  - Keyboard tab
  - Category: Macro
  - Commands: Macro Name
  - Shortcut key: Keyboard combination
  - Click OK to complete.
- ◆ NOTES:
  - Macro must exist in "Macro" directory in SolidWorks installation directory.
  - Must have a document open in SolidWorks to add a macro to a shortcut/hotkey.

### SolidWorks API Demystified: Assigning a Macro to a Toolbar Button.

- ◆ How To:
  - Right-Click toolbar, Customize
  - Commands tab
  - Category: Macro
  - Grab and drag icon and drop on toolbar.
  - Select a bitmap image to use on toolbar.
  - Fill out fields in dialog box:
    - Tooltip - Balloon tip at arrow.
    - Prompt - Help info in status bar.
    - Macro - Name and full path.
    - Method - Module and procedure.
    - Shortcut - Keyboard combination.
  - Click OK to complete.
- ◆ NOTE:
  - Must have a document open in SolidWorks to add a macro to a toolbar.



### SolidWorks API Demystified: Tips - Learning

- ◆ Learn by example
  - Find a good macro, and study how it works.
  - Use [F8] in VB Editor to step thru code line-by-line.
- ◆ Experiment
  - Write "do nothing" macros for Visual Basic or SolidWorks API.
    - Learn functions you haven't used before.
    - Develop your own functions or common routines.
    - Test "What IF" scenarios.
  - Save your code for later use.

### SolidWorks API Demystified: Programming Strategies

- ◆ Start small and work your way up
  - Write and test small portions of code before continuing to larger portions.
  - Start with a "basic" program, then add more functionality and flexibility later.
    - Each feature added, requires more programming and increases macro complexity and potential for problems.
  - KISS: Keep It Short and Simple.
- ◆ Know that there are multiple ways to complete tasks
  - Conditional statements.
    - If ... Then, Else, End If True/False
    - Select Case ..., End Case Response based on value.
    - For ..., Next Set number of times to repeat.
    - Do While ..., End Loop Don't know how many times.
  - Multiple conditions may require nested statements.
  - The best method may not be the first one you develop or discover.

### SolidWorks API Demystified: Programming Strategies

- ◆ Use subroutines and functions
  - Simplifies code.
  - Allows repeated use of common code.
- ◆ Use existing code
  - Don't re-invent the wheel.
  - Saves time and your effort.
  - Keep sample code on hand for later use.
  - Export your own code for later use in other macros.
  - Create and use "Templates" for creating similar macros in the future.

### SolidWorks API Demystified: Programming Strategies

- ◆ Add comments to your code
  - Helps you and others understand what you did, and why.
  - Helps you remember what you did or why you did it that way.
  - Identify what the routines are doing.
- ◆ Use variable/constant/enumeration names that make sense.
  - Do not encrypt names
    - Use myCounter instead of myCnt.
  - Makes code more "readable".
  - Keep your variable names unique and separate from Visual Basic and SolidWorks variable names.
 

myCounter	vbCounter	swxCounter
-----------	-----------	------------
  - Be careful that you don't use command or system variables as your own variable names

### SolidWorks API Demystified: Programming Strategies

- ◆ Plan for multiple users or distribution
  - Think about other people who may be using your macros.
  - Macro may be used for needs other than initially intended.
  - User customization of existing macro.
    - Not every user will know how to modify a macro.
    - External settings file for modifiable default settings.
    - Macro defaults if settings file is not found.
  - Different companies have standards, procedures and needs.
  - Capable of running on different versions of SolidWorks

### SolidWorks API Demystified: Programming Strategies

- ◆ Plan for use in multiple versions of SolidWorks
  - API can check what version of SolidWorks is in use.
- ◆ Error trapping.
  - Think of ways that users may (unintentionally) misuse your macro.
    - Wrong document type, Improper selections, etc...
  - Error trapping can be one of the toughest part of programming.

### SolidWorks API Demystified: Tips - Getting Help

- ◆ SolidWorks API Help File.
- ◆ SolidWorks API forum.
- ◆ SolidWorks API Support.
  - SolidWorks API functionality only.
  - Not for learning.
- ◆ Be specific!
  - Repeatable problem.
    - Identify steps leading up to problem.
    - Identify specific conditions that lead to problem.
  - Identify specific problem you are experiencing.
  - Don't send complete macro.
    - Provide simple code to demonstrate.
- ◆ Don't expect help with programming techniques.

### SolidWorks API Demystified: Resources - Installed with SolidWorks

- ◆ SolidWorks Application Programming Interface.
- ◆ SolidWorks API and Add-Ins help file.
  - Explains object structure and command syntax.
  - 490+ ready to use Visual Basic examples.
  - The #1 resource for learning the SolidWorks API
  - Best help file I have seen for writing macros.
- ◆ Visual Basic for Applications Version 6.
  - SolidWorks 2001Plus and later.
  - Visual Basic for Applications Help File.
- ◆ Online Tutorial - SolidWorks API.
  - Record, Save, Edit a macro.

### SolidWorks API Demystified: Resources - SolidWorks' website

- ◆ API programming tips and updated help files.
- ◆ SolidWorks Express Newsletter - API Examples
- ◆ Download projects, sample programs and macros.
- ◆ SolidWorks Developer Kit. (SDK)
  - Not required.
  - Contains working sample programs.
  - New SDK for each version of SolidWorks.
  - Separate SDK's for Add-Ins.
- ◆ SolidWorks World Presentations.
- ◆ List of SolidWorks Resellers.
  - SolidWorks API Training classes.

### SolidWorks API Demystified: Resources - Examples (Users)


- ◆ Lenny's SolidWorks Resources                      Macros, Tips, Blog
  - <http://www.lennyworks.com/solidworks>
- ◆ Mike Wilson's Modeling Techniques              Macro Feature
  - [http://www.mikejwilson.com/solidworks/solidworks\\_files.htm](http://www.mikejwilson.com/solidworks/solidworks_files.htm)
- ◆ Matt Lombard    Macros, Tips, Blog
  - <http://mysite.verizon.net/mjlombard/>
- ◆ Joe Jones at New Hampshire CAD                Tutorials
  - [http://www.nhcad.com/sw\\_macros/index.html](http://www.nhcad.com/sw_macros/index.html)
- ◆ Stefan Berlitz's SolidWorks Tools                Macros, Tips, Blog
  - <http://www.swtools.de>
- ◆ SolidWorks Tips & Things                            API Tips
  - <http://www.solidworkstips.com/>

### SolidWorks API Demystified: Resources - Visual Basic Programming

- ◆ Websites
  - "Tutorial" and "Lessons"
  - May be Visual Basic Specific.
  - Some provide better explanation and examples.
  - Find a site with a training style you like.
  - May not be able to provide help with SolidWorks API specific questions.
- ◆ Forums
  - May be Visual Basic Specific.
  - May not be able to provide help with SolidWorks API specific questions.
- ◆ Search the web
  - Too many to list.

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Leonard Kikstra  
Designer / CAD Administrator  
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Blog: <http://designsmarter.typepad.com/lennyworks/>