



Las Vegas
November 27-30, 2001



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ObjectARX: Tools, Tips and Working Demonstrations

Presented by:

Charles McAuley

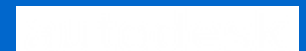
Developer Consulting Group

Autodesk.

Ask all the questions you want – that's why I'm here 😊

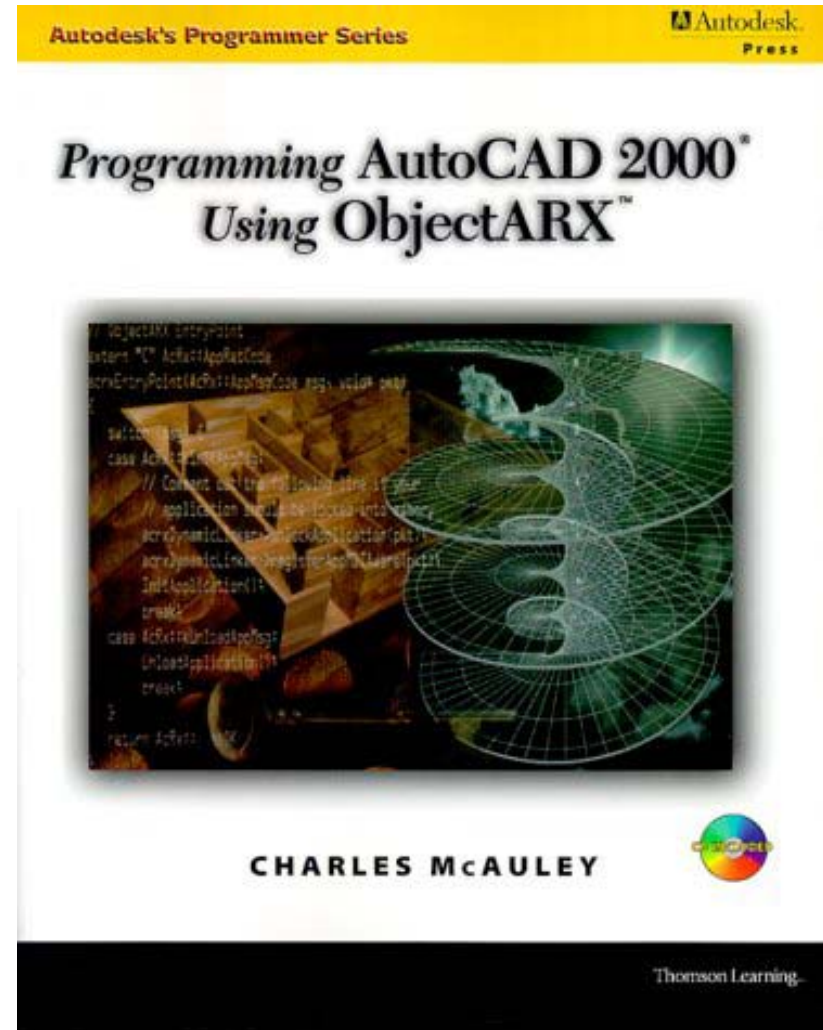


Autodesk University



Shameless Plug for ObjectARX

- What is in here applies to AutoCAD 2000i and AutoCAD 2002 as well.



Developer Consulting Group

- World Wide Workgroup
 - Over 30+ Specialists World Wide
- US Team
 - CA, WA, AZ
- European Team
 - United Kingdom, France
- APAC Team
 - India, China, Japan

ADN Website - Support

<http://adn.autodesk.com>

Provides access to

- On-line knowledge base
- Call submission
- Newsgroups
- Newsletters
- Answers to frequently asked questions are posted in our on-line knowledge base
- Download the "ObjectARX Wizard"

With a show of hands, how many of you know...

- C++ ?
- Visual LISP/AutoLISP ?
- Visual Basic – VB/VBA ?
- C++ -> MFC (Microsoft Foundation Classes) ?
- COM/ATL ?
- C -> ADS -> ADSRX (Die Hard resbuf defenders!, ads_command gurus!, single linked list warriors!)

What is ObjectARX?

- ObjectARX is an object-oriented C++ API for developers to use, customize, and extend AutoCAD. It provides...
 - Access the AutoCAD database
 - Interact with the AutoCAD editor
 - Create user interfaces using the MFC (AdUi/AcUi).
 - Create custom objects/entities with custom behavior.
 - Notifications and Transactions
 - Lots more...

What is ObjectARX? (2)

- ObjectARX is to AutoCAD as “Eric Clapton” is to one of these...



What are ObjectARX applications?

- ObjectARX applications are Dynamic Link Libraries (DLL), however instead of having a DLL file extension they have an ARX file extension.
 - ARX applications require a host application (AutoCAD) they don't execute by themselves. This is typical of DLL's.



How do I create ObjectARX applications?

- Use Visual C++, create a “Win32 Dynamic DLL” and add the required code manually (more work!).
- Use the ObjectARX Wizard (easier, concentrate on getting your job done!).
 - Download it from the ADN web site
 - <http://adn.autodesk.com> you need to be an ADN member however ☹
 - Download the ObjectARX SDK (contains the ObjectARX Wizard ☺)
 - <http://www.autodesk.com/objectarx>

Why ObjectARX ?

- Power and Speed!



ObjectARX is Object Oriented

- AutoLISP (simple but not OOP)

```
(command "_LINE" PT1 PT2 "")
```

- C -> ADS -> ADSRX (still not OOP)

```
acedCommand(RTSTR, "_LINE", RTPOINT  
PT1, RTPOINT PT2, RTSTR, "", RTNONE);
```

- ObjectARX (☺ OOP)

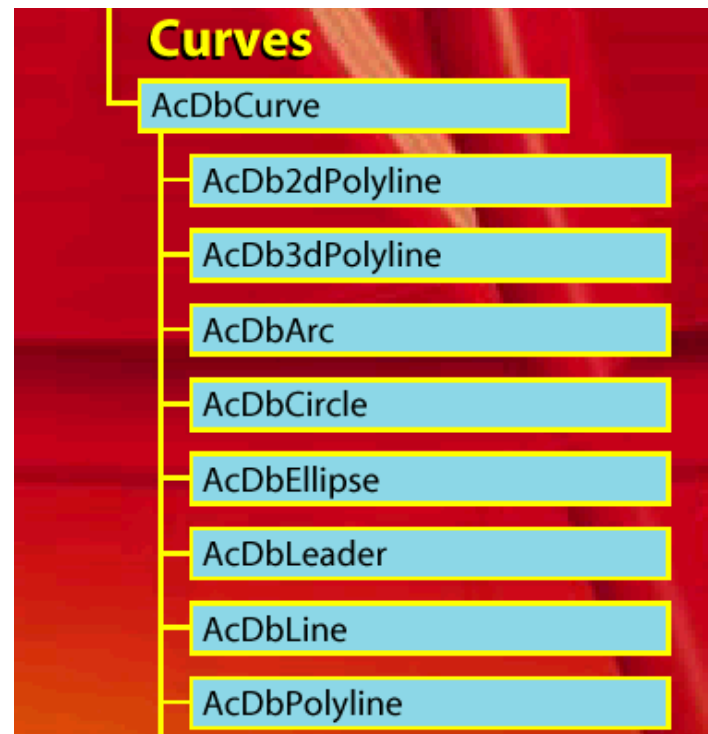
```
pMyLine = new AcDbLine;  
pMyLine->setStartPoint(pt1);  
pMyLine->setEndPoint(pt2);  
pMyLine->setDatabaseDefaults();
```



What does ObjectARX have?

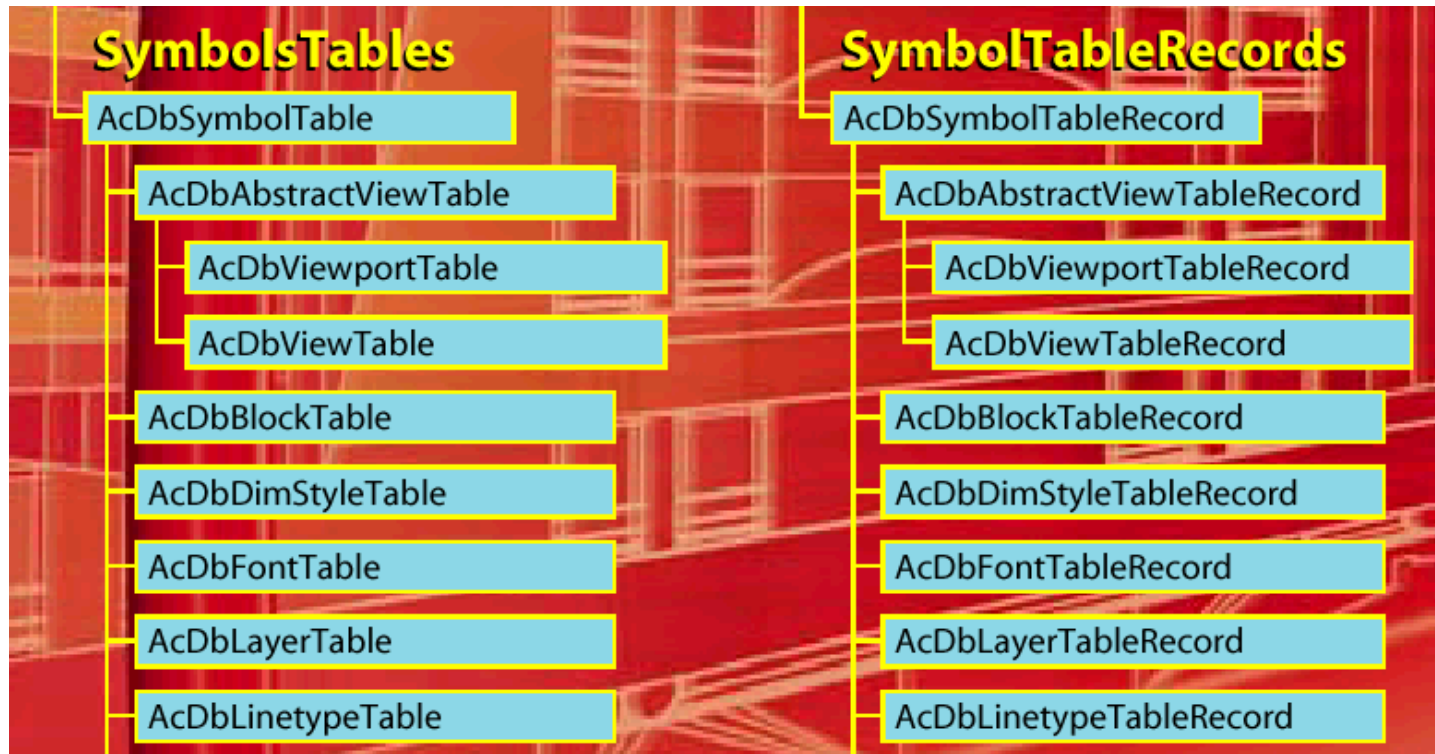
- Entities

- `AcDbEntity`, `AcDbLine`, `AcDbPolyline`, `AcDbCircle` etc.



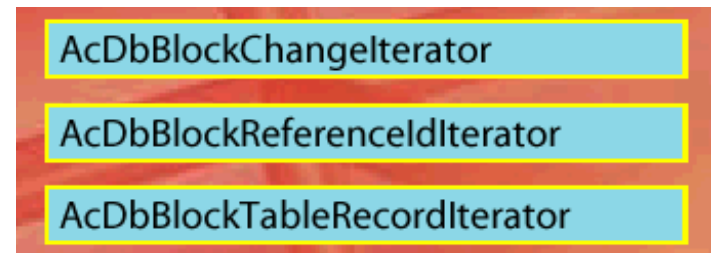
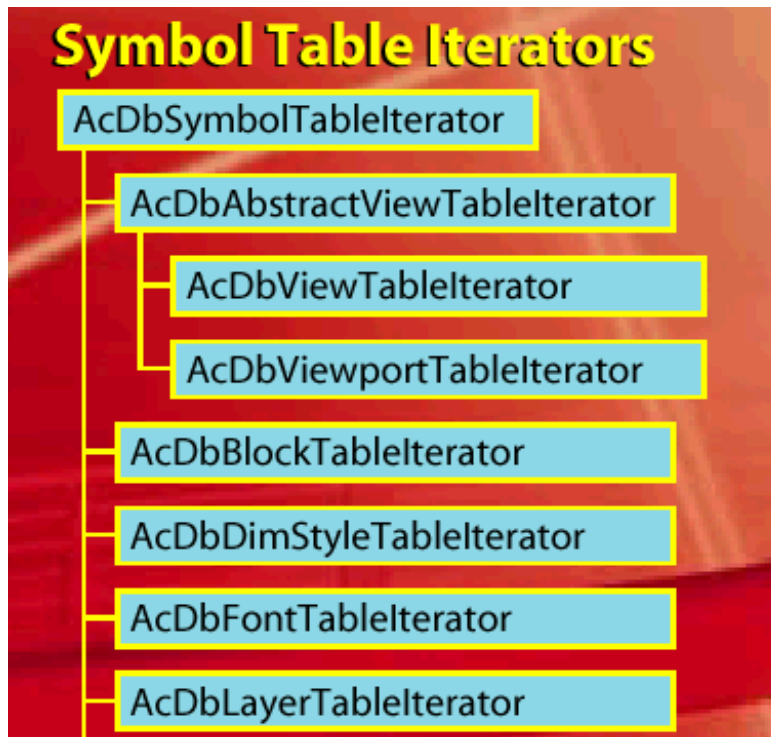
What does ObjectARX have? (2)

- Objects
 - `AcDbObject`, `AcDbSymbolTable`, `AcDbLayerTable`, `AcDbLayerTableRecord` etc.



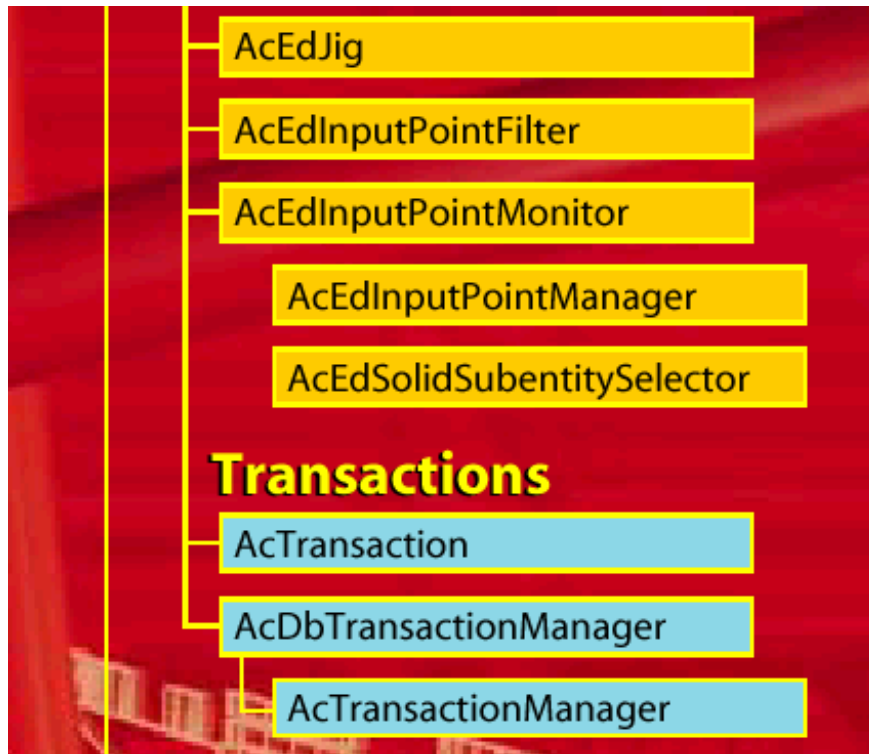
What does ObjectARX have? (3)

- Iterators, lots of Iterators not just Symbol tables!
 - `AcDbSymbolTableIterator`,
`AcDbLayerTableIterator` etc.



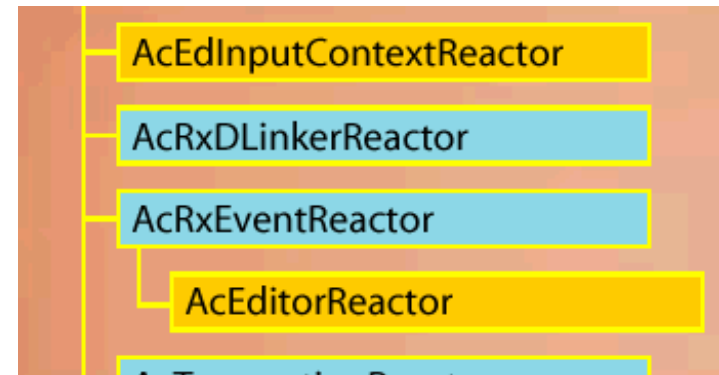
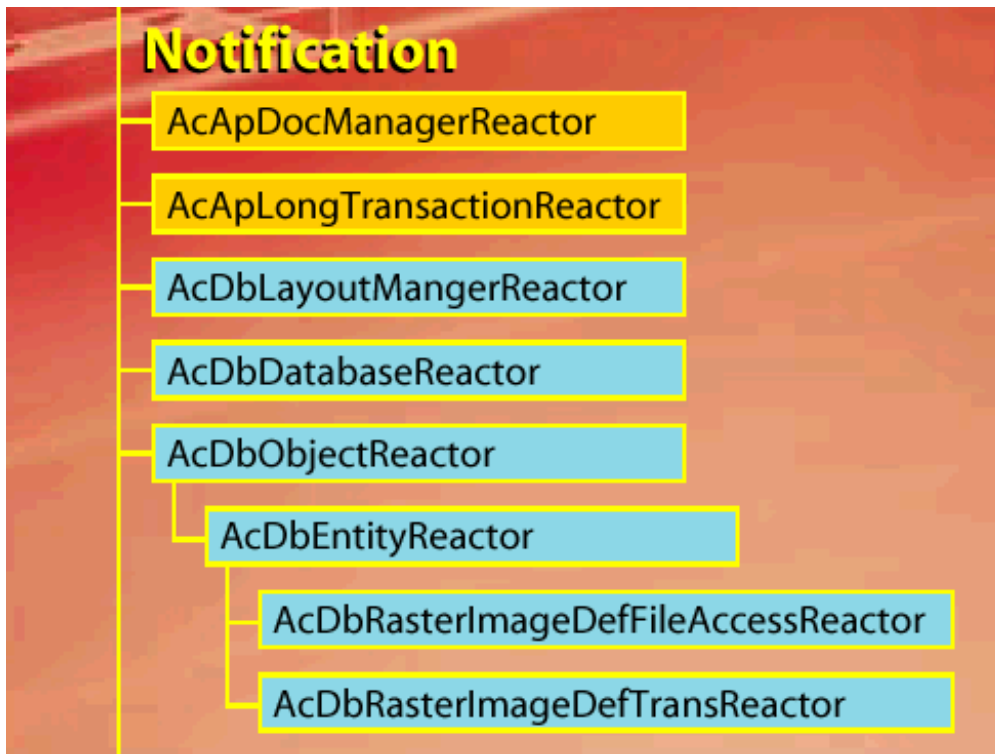
What does ObjectARX have? (4)

- Transactions, Managers of all kinds!
Monitors of all types!



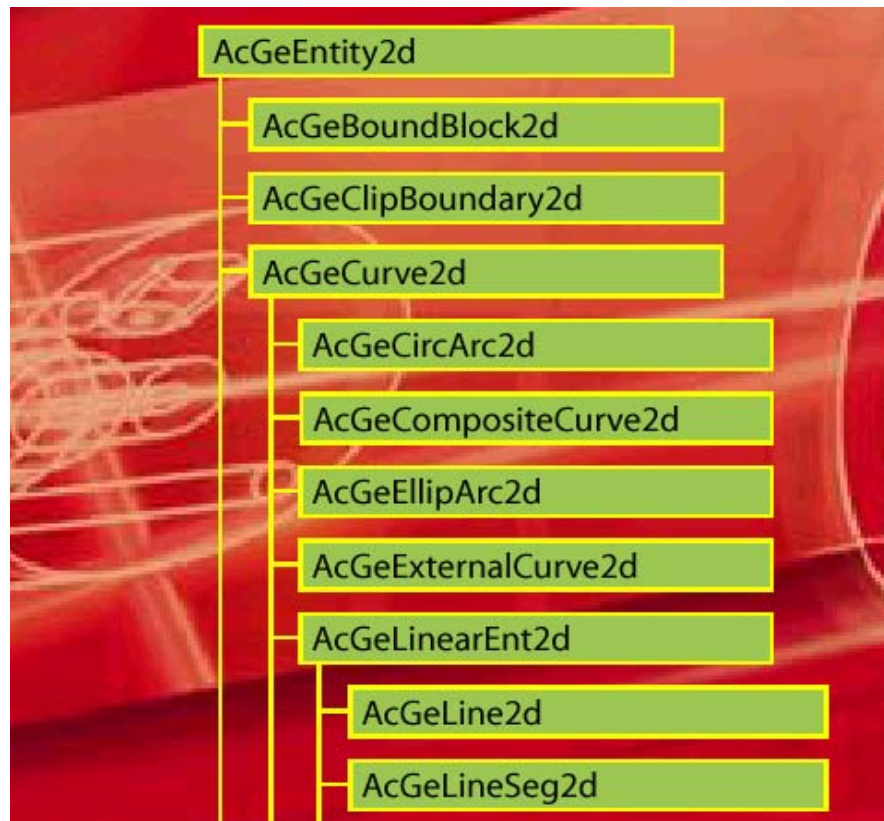
What does ObjectARX have? (5)

- Notifications! aka "Reactors" buckets of them!
 - `AcApDocManagerReactor`, `AcDbEntityReactor` etc.



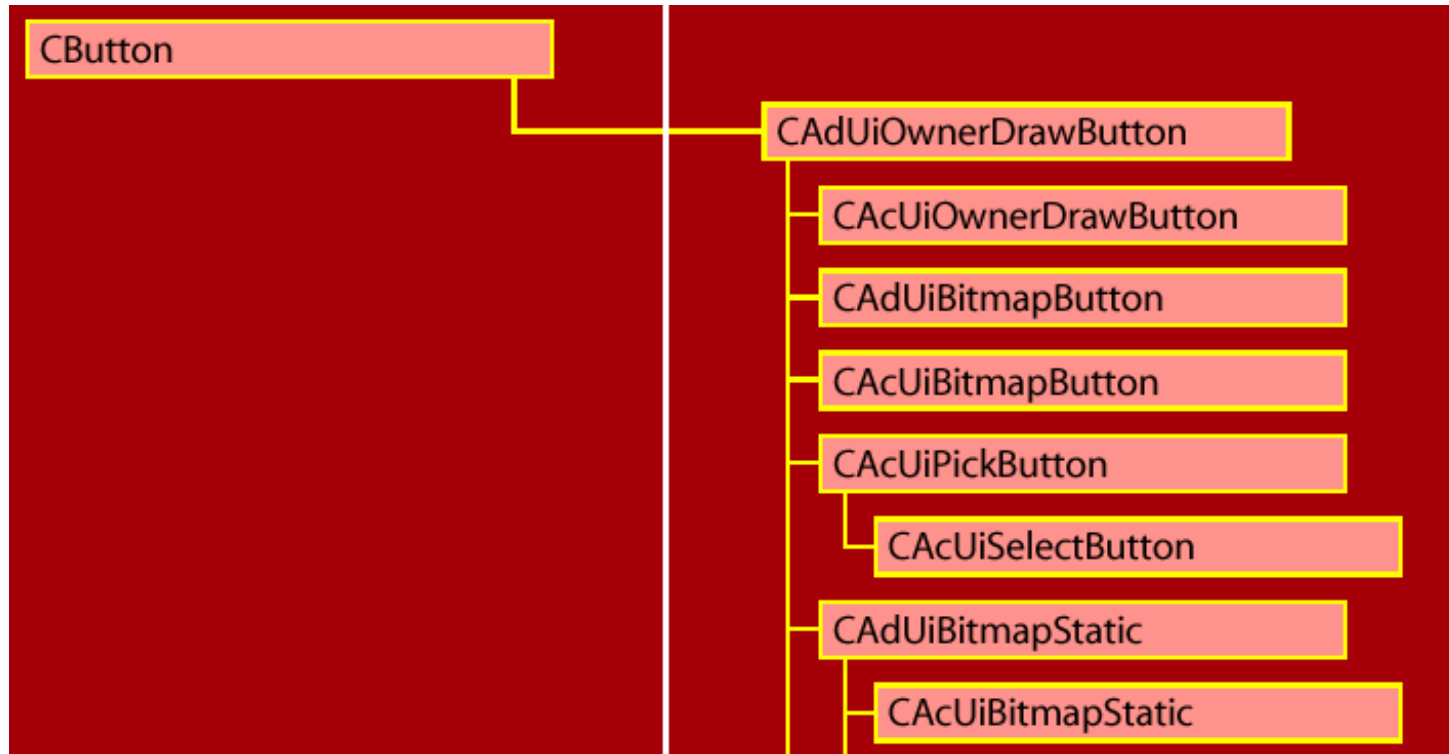
What does ObjectARX have? (6)

- Geometry Classes (AcGe) 2D and 3D let ObjectARX do the math for you!



What does ObjectARX have? (7)

- UI Classes (AdUi/AcUi) lots of them!
MFC Extension Classes.



ObjectARX Class Hierarchy Chart

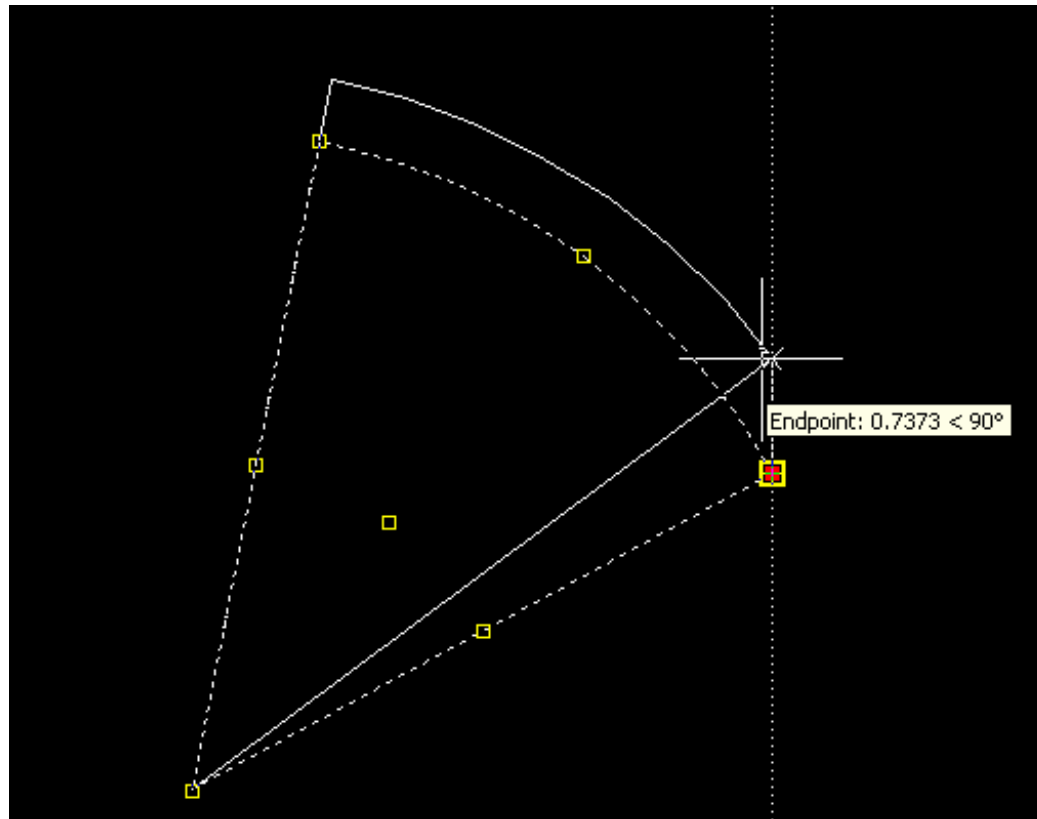
- On the ObjectARX SDK download area, there is a PDF file of the ObjectARX Class Hierarchy. (Here is what it looks like!)
 - <http://www.autodesk.com/objectarx>
- In the 'classmap' folder on the SDK there is a dwg file 'classmap.dwg', usually I make a dwf out of it and view it in my browser (or Volo View Express).

Extending ObjectARX

- Create our own custom Objects and create your own custom Entities!
- Store you custom Object in the Named Object Dictionary or an entity's Extension Dictionary.
- Custom Entities have their own behavior – custom grip points, object snaps and behavior.

Extending ObjectARX (2)

- Notice this custom entity has its own grip points and behavior (demo later!).

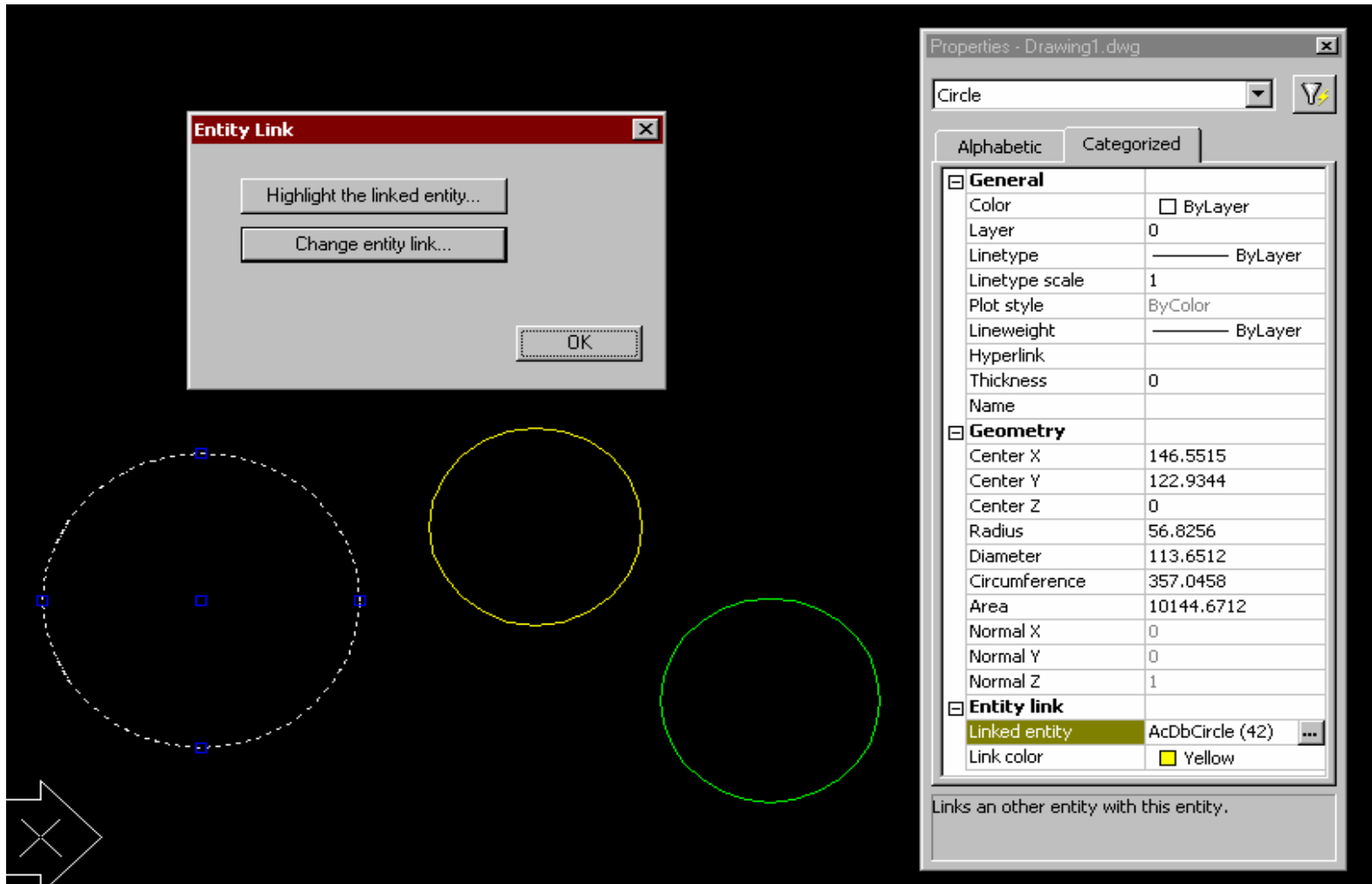


ObjectARX COM and ATL

- Expose your custom object and entities to any COM compliant language (VB/VBA) using COM wrappers.
- Access to the Object Property's Manager is via ATL (ObjectARX has a wizard for this).
- Access to the Design Center is via ATL again ObjectARX Wizard to the rescue!

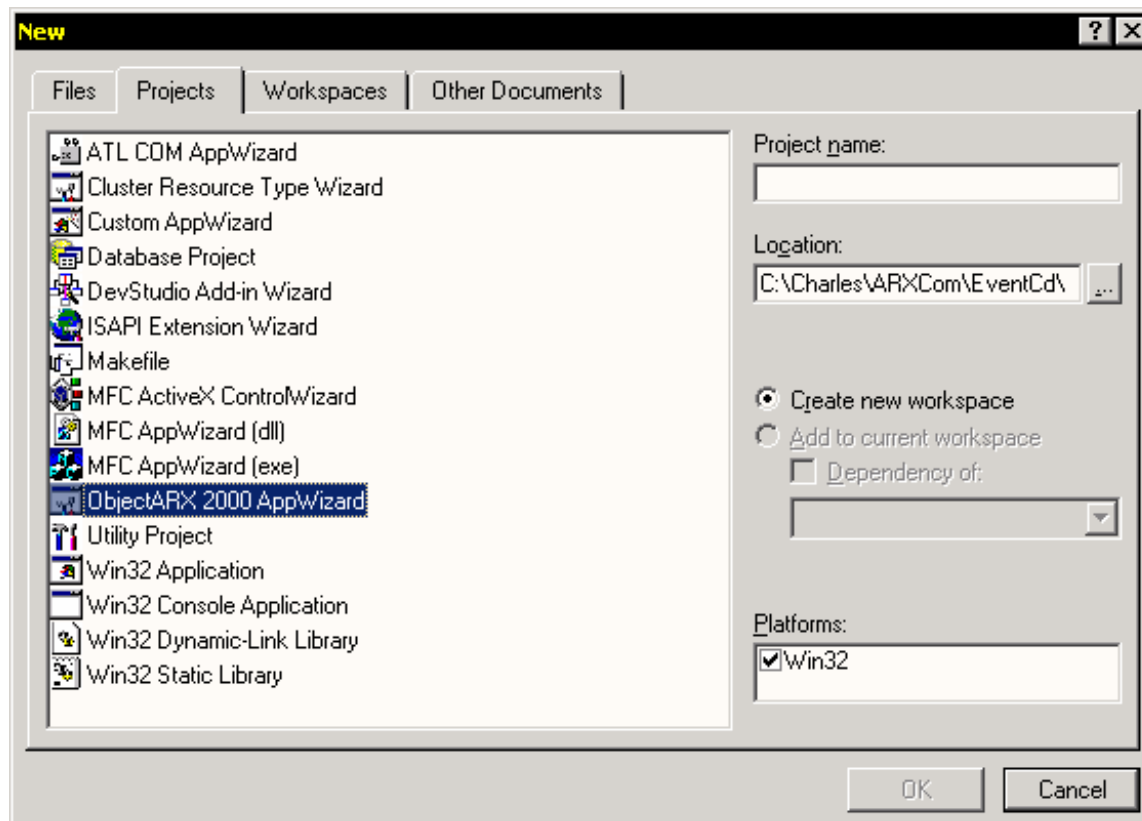


ObjectARX COM and ATL (2)



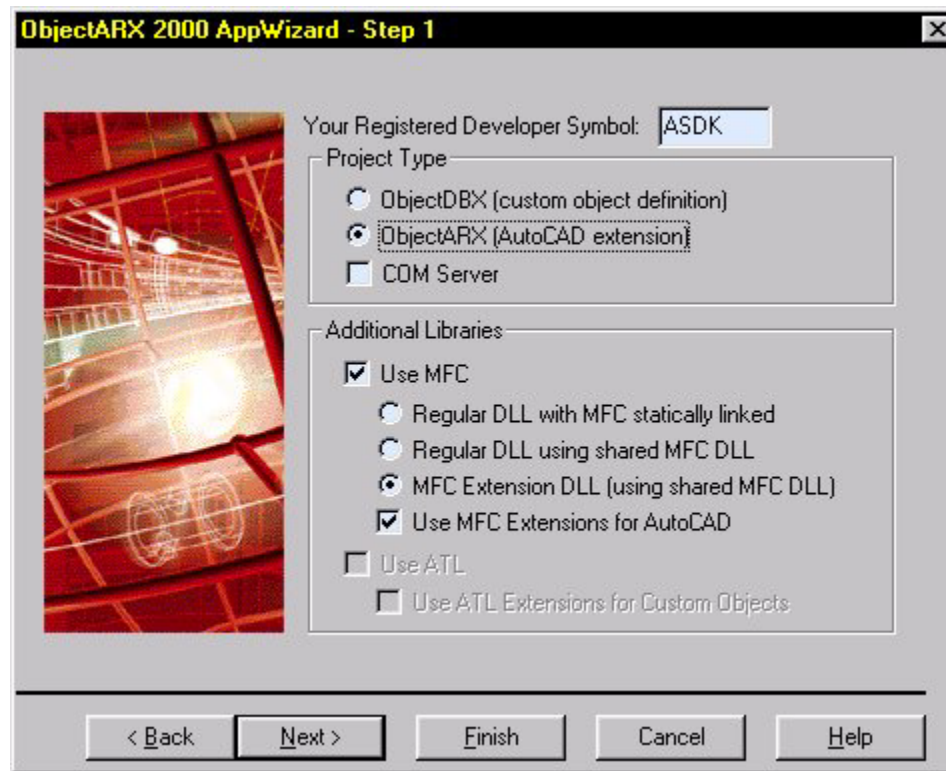
ObjectARX Wizard and VC++ (1)

- Creating an ObjectARX application using the ObjectARX Wizard from Visual C++.



ObjectARX Wizard and VC++ (2)

- The ObjectARX Wizard dialog.



ObjectARX Wizard and VC++ (3)

- The ObjectARX Wizard Toolbar in Visual C++.

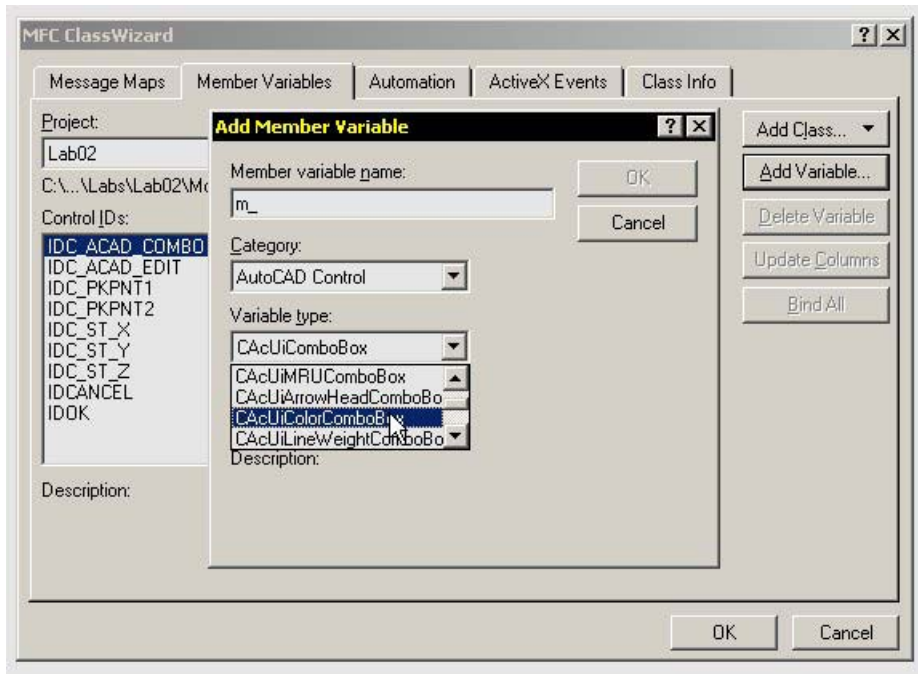


- ObjectARX color coded keywords in Visual C++.

```
////////////////////////////////////  
// ObjectARX EntryPoint  
extern "C" AcRx::AppRetCode  
acrxEEntryPoint(AcRx::AppMsgCode msg, void* pkt)  
{  
    switch (msg) {  
        case AcRx::kInitAppMsg:  
            // Comment out the following line if your  
            // application should be locked into memory  
            acrxDynamicLinker->unlockApplication(pkt);  
            acrxDynamicLinker->registerAppMDIAware(pkt);  
            InitApplication();  
            break;  
        case AcRx::kUnloadAppMsg:  
            UnloadApplication();  
            break;  
    }  
    return AcRx::kRetOK;  
}
```

ObjectARX Wizard and VC++ (4)

- The ObjectARX Wizard is tightly integrated into Visual C++, notice AutoCAD controls inside VC++ Class Wizard.



- Suffice to say a demo of the ObjectARX Wizard in action is in order!

ObjectARX Wizard Demonstration

- Let us have a quick overview of what the ObjectARX Wizard provides.
 - A word on installing the Wizard (setting up the toolbar)
 - Setting up color coded “user-defined” keywords
 - Setting up ObjectARX ‘inc’ and ‘lib’ paths
 - Header files
 - User defined commands
 - EntryPoint messages
 - Transient Reactors

ObjectARX Wizard Demonstration

- And continuing with our demonstration.
 - ObjectARX Class Wizard - ObjectDBX
 - MFC Support for ObjectARX, ATL support
 - Input Point and ObjectARX application Registration
 - ObjectARX Component Gallery
 - Configuring help and Code Finder

ObjectARX Wizard and VC++ (5)

- So hands up those who do not like the ObjectARX Wizard!



• Now that we are all happy, these are custom AutoCAD entities derived from `AcDbEntity` -> `AsdkSmiley`

(See the ObjectARX SDK 'Smiley' sample.)

ObjectARX Resources

- ObjectARX SDK contains a folder 'ARXLABS'.
- ObjectARX training supplied by the Developer Consulting Group
 - <http://www.autodesk.com/apitraining>
 - Class room training
 - Virtual Class room training
- See the "Customization Channel" on the PointA web site.
 - <http://www.autodesk.com/pointa> "Productivity Center"



ObjectARX Resources (2)

- Consider joining the Autodesk Developer Network (ADN).
 - <http://adn.autodesk.com>
- For more information on ADN go to the “Developer Center” on the Autodesk web site.
 - <http://www.autodesk.com>



ObjectARX Resources (3)

The screenshot shows a Microsoft Internet Explorer browser window displaying the Autodesk Developer Network (ADN) website. The address bar shows <http://adn.autodesk.com/>. The page title is "ADN Web Site - Microsoft Internet Explorer". The main content area is titled "ObjectARX Sample Applications" and includes a search bar and a table of contents for the sample applications.

ObjectARX Sample Applications

This document is part of [AutoCAD](#) [ObjectARX Developer Center](#)

Contents for ObjectARX Sample Applications	New?	Type	Read mins	Date d/m/y
AcUi Sample	•		2	5/30/200
ArxDD (Arx Drag & Drop)	•		4	5/26/200
AutoCAD OEM R14 SmileyCAD sample application	•		<1	5/30/200
AutoCAD OEM R2 SnakeCAD sample application	•		<1	5/30/200
BinaryChunk	•		1	5/30/200
BlockView	•		<1	5/30/200
ConvText	•		12	5/30/200
CurveText: Text along Ellipses, Splines or polylines with its ActiveX interface	•		1	5/30/200
Ddmodify	•		<1	5/30/200
File Open sample	•		<1	5/30/200
GetDwgVersion	•		<1	5/30/200
Inspector	•		<1	5/30/200
Inspector: A dynamic tool to view and monitor DWG databases activity	•		<1	5/30/200
Jig3d	•		<1	5/30/200
Koch Fractals: Use of ObjectARX Protocol Extension to create Koch fractals	•		1	5/30/200
LinkCirs: Circle linking ObjectARX sample using notification	•		<1	5/30/200
PolygonContent	•		<1	5/30/200
Polysamp	•		<1	5/30/200
Samples ReadMe Updates	•		<1	5/26/200
Smiley: Smiley entity ObjectARX sample	•		<1	5/30/200
SquareWrap	•		<1	5/30/200
ZeroDocMenu	•		<1	5/30/200

ObjectARX Resources (4)

The screenshot shows a Microsoft Internet Explorer browser window displaying the Autodesk Developer Network search results for the term 'modeless'. The browser's address bar shows 'http://adn.autodesk.com/'. The page features a search bar with 'modeless' entered, and a dropdown menu set to 'All Knowledge Base'. Below the search bar, it indicates 'Matched 15 documents out of 26525'. A list of search results is displayed, with the first seven items visible. Each result includes a rank, a progress indicator, the author 'API K.B.', a title, and a brief description.

Rank	Progress	Author	Title	Description
1		API K.B.	AcEdCommand() always fails when called from a modeless window	Question Why does acedCommand() always fail when called from a modeless window, such as a modeless dialog or toolbar? acedCommand(), acedInvoke(), and acedCmd() cannot be used from a modeless window. Instead of doing direct call into AutoCAD from your mo...
2		API K.B.	How can I use ads_getxxx() functions from a MFC modeless dialog box?	Question How can I use ads_getXXX() functions from an MFC modeless dialog box? The reason is that modeless windows have their own message loop, and while AutoCAD is busy, you must not c...
3		API K.B.	Erase entities from modeless dialog	Answer Because the dialog is modeless, explicit document locking is needed. #include <dbobjptr.h>; #include <dbents.h>; /// minimal error checking for code brevity // void CSampDialog::OnButton1() { // has to do document locking explicitly ac...
4		API K.B.	Create a modeless form	Question There is no API feature in VBA to create a modeless form. I heard VBA 6.0 will allow you to do that, is it true? This information is derived from a response to a specific question sent to the Developer Consulting Group at Autodesk, and thus give...
5		API K.B.	How to determine if the mouse leaves my modeless window?	Question How to determine if the mouse leaves my modeless window? Windows does not send any mouse notification messages to a window when the mouse is not currently over it. You can then check the window handle of the mouse message and compare it with the window y...
6		API K.B.	Adding entities to model space from a modeless dialog	Question I have a button in a modeless dialog that adds entities to model space in AutoCAD by executing the following code. This information is derived from a response to a specific question sent to the Developer Consulting Group at Autodesk, and thus gi...
7		API K.B.	Toolbar commands using sendStringToExecute() not executed immediately	Question If I send a command from a toolbar button handler using sendStringToExecute(), the command is executed in the current document only when the cursor leaves the toolbar. To achieve a reverse solution(i.e., keeping focus to a toolbar or a modeless ...

ObjectARX Resources (5)

ADN Web Site - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://adn.autodesk.com/

autodesk Developer Network

modeless All Knowledge Base All the words Search Help

Previous document in the result page Next document in the result page

Erase entities from modeless dialog

ID 60938 Applies to: AutoCAD 2000 Date 9/18/2000

This document is part of [Erasing Objects and entities](#)

Question

I'm having problems erasing entities from a **modeless** dialog.

Problem #1 - I know I need to iterate the Model Space Block Table Record, open each entity for write and call erase() on it. The code is executed without errors but the entities are still displayed on the screen.

Problem #2 - When I select the entities for modifications, AutoCAD shows an unhandled exception dialog.

How do I solve these problems?

Answer

Because the dialog is **modeless**, explicit document locking is needed. Also because its a **modeless** dialog, graphics display update is not performed (unlike, for example, working from a modal dialog), so you'll need to do that explicitly as well.

The following code snippet solves both the above mentioned problems.

```
#include <dbobjptr.h>
#include <dbents.h>
//
// minimal error checking for code brevity
//
void CSampDialog::OnButton1()
{
    // has to do document locking explicitly
    acDocManager->lockDocument(curDoc());
    AcDbBlockTableRecordPointer pBtr(AcDb::kForWrite);
    if(pBtr.openStatus() != Acad::eOk)
        return;
    AcDbBlockTableRecordIterator* pIter = NULL;
```

ARXLABS folder on the SDK

- Let us take a look at the ARXLABS folder on the ObjectARX SDK, specifically "ObjectARX 2000 Tutorial.htm".

SAMPLES folder on the SDK

- The Developer Consulting Group is responsible for the samples that appear in the Samples folder of the ObjectARX SDK.
 - Please note the ADN web site contains more recent versions of the samples in addition to new samples.
- Before you start, take a look at the “SamplesReadMe.htm”, it will help you get started!

DOCSAMPS folder on the SDK

- Not created by DCG. The DOCSAMPS follow the 'official' ObjectARX Developers Guide, in that any code in the guide has a corresponding sample in the DOCSAMPS folder. See the "Readme.txt" file.

Time for some real ObjectARX !



Okay time for some real ObjectARX!

Let's look at as many of the following topics as we can time permitting:

- ObjectARX Entry Point messages
- User defined commands
- AutoCAD database structure (Demo Inspector and ARX Debug app)
- Symbol Tables and Name Object Dictionary (NOD)
- Block Definitions and References

Time for some real ObjectARX ! (2)



Continue with, again time permitting:

- Custom Objects/Entities - ObjectDBX
- Transactions
- Transient and Persistent Reactors
- ObjectARX UI (AcUi/AdUi)
- COM Wrappers and ATL
- Other "bits and bobs" as I think of them 😊

EntryPoint Messages and Commands

- Let's use the ObjectARX Wizard to quickly build an application and create a few commands and discuss.
- Most important messages are
 - `AcRx::kInitAppMsg:`
 - `AcRx::kUnloadAppMsg:`
- Adding a command
 - `acedRegCmds->addCommand()`
- What else is interesting here?

AutoCAD Database and Structure

- Perhaps the easiest way to understand the AutoCAD database structure is to demonstrate this structure using two applications, the first is Inspector and the second is ARXDBG.
- “Inspector” is on the ADN web site and is an example of a dialog bar in ObjectARX
- “ARXDBG” is on the ‘SAMPLES’ folder on the ObjectARX SDK. (ARXDBG is a great tool!)
- As I demonstrate this please feel free to ask questions!

AutoCAD Database and Structure

- ObjectARX “Golden Rule!” repeat after me 😊...
- ***“It is very important that any objects open for read or write operations must be closed when you are finished with them. Failure to close open objects will cause AutoCAD to crash - you have been WARNED!”***

AutoCAD Database and Structure

- Let's discuss, in very generic terms the process on opening and closing objects, creating objects and navigating the database structure.
- Understand the process its used repeatedly.

AutoCAD Database and Structure

- Let's discuss, in very generic terms the process on opening and closing objects, creating objects and navigating the database structure.
 - Understand the process its used repeatedly.
-
- See Step 8 of the ARXLABS – `createLayer()` .
 - See Step 8 of the ARXLABS – `asdksetlayer()` . // Iterator

Block Definition and References

- Let's discuss and demonstrate this using "Inspector".
 - Take a look at the EMPLOYEE block of Step 8 in the ARXLABS.
-
- See Step 8 of the ARXLABS – `askdCreate()` .
 - See Step 8 of the ARXLABS – `createBlockRecord()` .

Custom Object/Entity - ObjectDBX

- What and why – ObjectDBX? What is separation of the UI from the DB? (UI/DB separation). Why is this a good thing?
- Let's explore with some demo applications that I use.
- Take a look at the ASKDEMPLOYEE custom entity of Step 8 in the ARXLABS.
- Are custom objects/entities worth the cost – you decide!

Transactions

- Have AutoCAD watch what you add to the database in case you change your mind!
- Let's explore with some demo applications that I use.
 - `startTransaction()`
 - `endTransaction()`
 - `abortTransaction()`
 - `addNewlyCreatedDBObject()`

Notifications/Reactors (Transient and Persistent)

- ObjectARX is very rich when it comes to Notifications/Reactors
- Let's explore with some some of the many Notifications/Reactors with demo applications that I use.
 - `AcDbEntityReactor`
 - `AcApDocManagerReactor`
 - `AcEditorReactor`
 - (please note there are lots more!)

ObjectARX UI

- ObjectARX is very rich when it comes to MFC UI. (AcUi/AdUi)
- Let's explore with some some demo applications that I use.
 - Modal/Modeless Dialogs
 - Toolbars
 - Tab Extension Dialogs
 - Other elements time permitting

COM and ATL

- COM wrappers and ATL
- Let's explore the AsdkSmiley application, it is in the SAMPLES folder of the ObjectARX SDK.

Thank You!

Developer Consulting Group



*Why ObjectARX is
just so powerful !*