AutoCAD Release 13
AutoCAD Runtime Extension (ARX) Overview

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1 June 1995

**Executive
Summary**

This document provides a high level introduction to the AutoCAD Runtime Extension (ARX), the new object-oriented application development environment provided to application developers in AutoCAD Release 13.

The following points are addressed in this paper:

▫ Autodesk has re-implemented AutoCAD's database to support a broad base of interoperable design automation and visualization products.

▫ AutoCAD Release 13 demonstrates Autodesk's ability to develop a next-generation CAD software product implementing new technologies while retaining upward compatibility for customers and developers.

▫ ARX provides powerful facilities that support the development of a new generation of design automation solutions based on object oriented technology.

▫ ARX also enables the development of industry-specific frameworks, or foundation classes, that provide flexible & powerful solutions for data interoperabilty in multiple-discipline design & engineering projects.

ARX Goals

The AutoCAD Runtime Extension (ARX) is a new object-oriented programming environment for AutoCAD Release 13. ARX is designed to provide vertical market application developers with the enabling technology to provide our mutual customers with a revolutionary "next generation" set of object-based design & drafting solutions.

Autodesk will establish ARX as the premier object-based design automation platform

Autodesk's goal in introducing ARX is to clearly establish AutoCAD as the premier object-based design automation product platform through the provision of state-of-the-art technology & support services to our application developers & corporate partners.

Autodesk has earned its number one position in the industry by providing sophisticated desktop design automation software and an open architecture that has resulted in more than 4,000 third party applications that cover a broad spectrum of disciplines. In order to maintain this success, Autodesk is enhancing extensibility and preserving open architecture while incorporating modern software technologies.

With Release 13, Autodesk has begun a major re-architecting of AutoCAD. This new "technology foundation" provides an advanced CAD engine which is the basis for creating modern application software encompassing the entire design workflow process.

Building around common foundations and data formats allows Autodesk to efficiently reuse code and provides greater interoperability across products, as well as a higher degree of flexibility to quickly respond to customer needs. The phased delivery of technologies enables Autodesk to smoothly deliver "modular evolution" whereby components can be changed without disrupting workflow, and customer investment in AutoCAD databases can be protected.

Furthermore, since ARX applications can interoperate with existing AutoLisp & AutoCAD Development System (ADS) applications, Autodesk partner investment in existing solutions can also be protected as solutions evolve over time to exploit AutoCAD's new interfaces.

End users benefit from these new approaches to application development in several ways.

AutoCAD applications have access to the same core functionality, or kernel, that Autodesk's own developers use to extend the product. AutoCAD applications can create native commands & entities that are completely integrated inside AutoCAD's object oriented database & command hierarchies.

The tighter linkage between AutoCAD & its applications also allows for much higher performance by applications that rely heavily on database directions.

Finally, object oriented application development mirrors very closely the types of problems addressed by design automation solutions - how to specify, create, and modify "real world objects" such as chairs, valves, pipes, and geographic data.

ARX Architecture & Functionality

ARX applications are implemented as dynamic link libraries (DLL) that run in the same address space as AutoCAD and operate directly with core AutoCAD data structures & code.

The initial ARX Software Developer's Kit will provide 6 Application Programming Interfaces (APIs) for use by application developers:

- AcDb   AutoCAD database
- AcEd   Native command definition & notification
- AcGi   Graphics interface for entities
- AcGe   Linear algebra & geometry utility library
- AcBr   Boundary representation query library for solid models
- AcRx   Runtime class registration & identification

Each of these APIs is described in more detail below.

AcDb

AcDb provides C++ classes that allow access to the AutoCAD database. This API enables the development of custom AutoCAD database objects & protocol extension of existing objects defined by Autodesk or 3rd parties.

AutoCAD database objects include both geometrical objects such as polylines, circles, and solids, and non-geometrical objects such as symbol tables, & dictionaries.

AutoCAD itself builds on this object-oriented technology. New objects included in Release 13 such as multilines, ellipses, NURBS curves, B-rep solid models, and multiline text have been implemented through the AcDb environment instead of being added directly to AutoCAD core code, as would have been required in previous versions of AutoCAD.

AcEd

AcEd allows application developers to register new AutoCAD commands that function identically to commands defined in core AutoCAD. In addition, applications can optionally choose to be notified when certain actions (such as the initiation or completion of particular commands) occur so as to synchronize their state with the current state of AutoCAD.

AcGi

AcGi provides the graphics interface for on-screen and hardcopy elaboration of AutoCAD entities. All custom defined entities must utilize this API to specify to AutoCAD how to display themselves to the AutoCAD user.

AcGe

AcGe provides utility classes that provide common linear algebra operations such as matrices, vectors, and quarternions. It also provides definitions for some geometric objects such as points, curves, and surfaces.

AcBr

AcBr provides query operations on solid models contained in AutoCAD databases. Applications can use this API to find the topology & geometry of solids created either directly in AutoCAD or by AutoCAD Designer.

AcRx

AcRx provides the object transport layer between AutoCAD & its applications, as well as support for run-time class identification & dictionaries.

Supported Platforms & Release Dates

The initial version of the ARX SDK will support Microsoft Windows NT 3.51 and Windows 95 as development platforms. Application development will be supported for DOS, Windows 3.1, Windows 95, and Windows NT.

Release plans for ARX on Unix have not yet been determined.

The AutoCAD component of ARX was implemented and shipped at FCS of AutoCAD Release 13 in November 1994. The SDK is still under development and will be released to application developers in Q4 of 1995.

For further information

For further information on ARX, contact your local Autodesk representative, email us at arx-info@autodesk.com, visit our World Wide Web home page **http://www.autodesk.com**, or GO ACAD on CompuServe.