

Attachmate Application Programming Interface (API) Overview

Attachmate Technical Bulletin #156

Purpose

This document presents an overview of Application Programming Interfaces (API). The following topics are discussed:

- [Definitions](#)
- [APIs Supported in Attachmate Products](#)
- [How HLLAPI Works](#)
- [Types of HLLAPI](#)
- [DLLs for Each Type of HLLAPI](#)
- [API-related Issues](#)
- [Tool Kits](#)

Definitions

API - Application Programming Interface

An API is an interface into an application which allows a programmer to write a program to interact with that application. The most common API in Attachmate products is HLLAPI in its many types.

HLLAPI -High Level Language API

HLLAPI allows a programmer to use any high level language (e.g., Visual Basic, C, C++, COBOL, Pascal) to write a program for interacting with the host presentation space. HLLAPI comes in different types (e.g., EHLLAPI, WinHLLAPI, and Attachmate HLLAPI). Each comes in 16- and 32-bit versions.

ATMAPI -Enterprise Access Library (EAL)

ATMAPI is a standard API across most Attachmate emulators (e.g., EXTRA! Personal Client, EXTRA! for Windows, IRMA for the Mainframe for Windows, KEA!). ATMAPI is available in 16- and 32-bit version, but not for every emulator.

DDE -Dynamic Data Exchange

DDE is a Windows 3.x technology, replaced by OLE. It allows applications to interact with other DDE-enabled applications for exchanging data. For example, DDE can be used through Excel to grab host data from EXTRA! and display it in a spreadsheet.

OLE -Object Linking and Embedding

OLE is a 32-bit technology backed by Microsoft. The next generation is ActiveX which extends OLE to the Web. OLE is used to embed an object, such as an Excel spreadsheet, into another application (e.g., a Word document).

OLE Automation

OLE Automation is the process of manipulating an application's exposed objects through a macro or programming language. This technology is used extensively in EXTRA! Personal Client, where much of the emulator is exposed as objects. The emulator and host applications can be manipulated using this interface. The EXTRA! Objects technology takes this to the extreme, where the entire emulator is exposed as objects, and a programmer can design it however they want. EXTRA! Basic uses OLE Automation in EXTRA! Personal Client 6.x.

DLL-Dynamic Link Library

A DLL is an executable program module that is linked to an application and performs a function (e.g., HLLAPI calls). A DLL does not reside in memory until requested by an application, and is removed from memory when all programs using it have exited.

APIs Supported in Attachmate Products

Emulator	EHLLAPI	WinHLLAPI	Attachmate HLLAPI	ATMAPI	DOS HLLAPI	DDE	OLE Automation
EXTRA! Personal Client*	Yes	Yes	Yes	Yes	Yes	No	Yes
EXTRA! for Windows (16-bit)	Yes	Yes	Yes	Yes	Yes	Yes	No
IRMA for the Mainframe for Windows (16-bit)	Yes	Yes	No	Yes	Yes	Yes	No
RALLY! (16-bit)	Yes	Yes	No	Yes	No	No	No
KEA! (16- and 32-bit)	No	No	No	Yes	No	Yes	Yes

***NOTE:** All EXTRA! Personal Client derivatives are included (e.g., RALLY! 32-bit).

How HLLAPI Works

HLLAPI is a set of functions that are used to write applications that communicate with a host computer. Through HLLAPI functions, an application can interact with the host in much the same way an operator would interact using a 3270 or 5250 terminal. When a program calls a function, the HLLAPI software interprets the data and passes it to the 3270 or 5250 presentation-space buffer for processing.

With HLLAPI, applications can easily be written to accomplish the following tasks:

- Automate logon procedures.
- Develop custom menus as a front end for any host application.
- Simplify user screens for complex host applications.
- Process data or transfer files during off-hours, unattended.
- Combine data from multiple hosts applications.

When a program calls a HLLAPI function, the following actions occur:

1. Windows finds the function in the HLLAPI DLL and passes the required parameters to the function.
2. The DLL interprets the request.
3. The DLL sends the request to the host access software.
4. The host access software processes the request, performs any necessary host communications, and returns the result of the request to the DLL.
5. The DLL sends the results back to the application through the returning parameters.

Types of HLLAPI

EHLLAPI

EHLLAPI is an industry standard API originally developed by IBM. It's the oldest and most common type of HLLAPI, and is widely supported across Windows emulators. If a developer wishes to write an application that works with terminal emulation software from any vendor, they should write the application using the EHLLAPI interface.

WinHLLAPI

WinHLLAPI is the Microsoft standard Windows HLLAPI. It is based on IBM's EHLLAPI, but is extended to include additional features for Windows programmers. These extensions include additional functions that support asynchronous operations designed for the event-driven, message-based nature of the Windows

environment. WinHLLAPI is part of Microsoft's Windows Open Systems Architecture (WOSA), and is supported by most Windows terminal emulation vendors.

Attachmate HLLAPI

Attachmate's proprietary HLLAPI is often referred to as a multi-tasking API, because it allows a single HLLAPI client application to interact with multiple host sessions at the same time (with EHLLAPI and WinHLLAPI, a program must disconnect from one session before it can connect and interact with another). The interface is tailored to those writing programs in C and C++.

DOS HLLAPI

The DOS HLLAPI Pass-through allows users to run DOS HLLAPI applications with Windows emulators. The HLLAPI supported is essentially the same as EHLLAPI.

Enterprise Access Library (EAL, ATMAPI)

ATMAPI is an Attachmate proprietary API based on Attachmate HLLAPI, and was originally created for programmers using non-C and C++ languages (e.g., Visual Basic and PowerBuilder). An advantage of ATMAPI is that it can be used not only with EXTRA! for Windows and EXTRA! Personal Client, but also with the IRMA for the Mainframe for Windows, RALLY!, KEA!, and INFOConnect emulators. Each type of HLLAPI discussed above is available in 16- and 32-bit versions. There is not much difference between the 16- and 32-bit versions other than the DLL name. The function declarations are slightly different (some parameters are changed from integers to longs), but the functions themselves are called in the same way.

NOTE: IBM recently released new specifications for 32-bit EHLLAPI which are different from the 32-bit EHLLAPI developed by Attachmate, and they are not compatible. To work around this, EXTRA! Personal Client 6.30 provides separate DLLs for the two versions of 32-bit EHLLAPI.

DLLs for Each Type of HLLAPI

Emulator	EHLLAPI	WinHLLAPI	Attachmate HLLAPI	EAL(ATMAPI)
EXTRA! Personal Client (32-bit)*	ACS3EHAP.DLL, EHLAPI32.DLL, or PCSHLL32.DLL	WHLLAPI.DLL WHLAPI32.DLL	HLLAPI.DLL HLLAPI32.DLL	ATMAPI.DLL ATMAPI32.DLL
EXTRA! for WINDOWS (16-bit)	ACS3EHAP.DLL or PCSHLL.DLL	WHLLAPI.DLL	HLLAPI.DLL	ATMAPI.DLL
IRMA for the	ACS3EHAP.DLL	WHLLAPI.DLL	N/A	ATMAPI.DLL

Mainframe for Windows (16-bit)				
RALLY! (16-bit)	ACS3EHAP.DLL	AHLLAPI.DLL	N/A	ATMAPI.DLL
KEA! (16- and 32-bit)	N/A	N/A	N/A	ATMAPI.DLL ATMAPI32.DLL

***NOTE:** All EXTRA! Personal Client derivatives are included (e.g., RALLY! 32-bit).

EXTRA! Personal Client and its derivatives contain 16- and 32-bit versions of the HLLAPI DLLs. The 16-bit DLLs are merely "thunking" DLLs that call into the 32-bit ones. For example, if a call is made into ACS3EHAP.DLL, it makes a call into EHLAPI32.DLL, which processes the HLLAPI call as usual. Therefore, 16-bit HLLAPI applications will run with EXTRA! Personal Client, but 32-bit HLLAPI applications will not run with 16-bit emulators (e.g., EXTRA! for Windows and IRMA for the Mainframe for Windows).

Even though most of the Attachmate emulators use HLLAPI DLLs of the same name (all use ACS3EHAP.DLL for EHLLAPI, except KEA!), it's important for an application to use the correct DLL for the emulator. Each DLL is written specifically for the emulator it ships with.

API-related Issues

Timing Issues

Timing issues are the most common issues encountered by HLLAPI developers. Typical problems involve knowing when the X () clock has cleared. The X () clock in Attachmate emulators sometimes flickers so it's difficult for a program to know when the X () clock has actually cleared. In addition, faster PCs, slower hosts, or different connection types can affect the timing of an API application. The problem usually manifests itself if the program sends data to the host when the host isn't ready, or the program thinks it should be on a certain host screen when it's not there yet.

Configuration Issues

When an API application doesn't work, often the emulator or the application isn't configured properly. The most common configuration problems include incorrect pathing, no session short name, incorrect DOS HLLAPI Pass-through configuration, or the API application is using the wrong DLL.

Changes With Different Versions

Sometimes an application will work with one version of a product, but fails with a later version. Occasionally, an attempt to fix one problem in the APIs breaks something else. In addition, developers get used to functions behaving in certain ways, and if those functions change (even when the changes are to fix a problem), programs must be changed too.

Intermittent Errors

This is the most difficult type of problem that can occur. Problems that are not reproducible on demand are hard to track down. These problems may be timing issues, memory issues, bugs in the code (developer's or Attachmate's), or communications issues disguised as API issues.

Tool Kits

Attachmate sells several different API tool kits. API tool kits are intended for programmers writing applications with HLLAPI or the other APIs, and are not designed for end users. It is expected that programmers using tool kits have a working knowledge of Microsoft Windows, 3270 or 5250 concepts, and the programming language and compiler they are using.

EXTRA! Developer API SDK

Main Components

The main components of the EXTRA! Developer API SDK are shown below.

Documentation

The tool kit provides documentation for EHLLAPI and Attachmate HLLAPI. WinHLLAPI is documented by Microsoft, however the WinHLLAPI documentation set (on-line and a help file) is included in the EXTRA! Developer API SDK. A general Programmer's Guide, which introduces the basics of HLLAPI programming, is also included. OLE Automation documentation is provided with EXTRA! Personal Client, so it is not included in the SDK.

Samples

16- and 32-bit samples are provided for Attachmate HLLAPI, EHLLAPI, WinHLLAPI, the Enterprise Access Library, and OLE Automation for the following development environments:

- C
- Delphi
- PowerBuilder
- Visual Basic
- Visual C++

Samples are not provided for all API interfaces with all development environments. For example, only Visual Basic and C samples are provided for EHLLAPI and WinHLLAPI.

Include Files

Header and include files are provided for each API interface and for each development environment. For example, the ATMAPI.BAS header file is included for Visual Basic, and the ASC3EHAP.H header file is included for C.

QuickApp

Main Components

The main components of QuickApp are shown below. They are available in 16- and 32-bit versions.

Enterprise Access Library (ATMAPI)

ATMAPI includes documentation, samples, and header files. It also includes the Enterprise Access Tutor, which allows a programmer to execute each function, as well as copy and paste the appropriate code into their application.

Navigation Components

Navigation components include the Recorder and several custom controls (OCXs) used to record host screens, and the keystrokes necessary to move between them. Once host screens and keystrokes are recorded, it is easy to build an application that uses the recorded information to move through the host screens and retrieve data. Advantages to using the navigation components include the following:

- The programmer has much less code to write than with traditional HLLAPI applications.
- QuickApp takes care of most timing and host synchronization problems that occur with HLLAPI.

QuickAPI

QuickAPI is an Attachmate proprietary API. It uses WinHLLAPI and works with most host access products that support WinHLLAPI, including EXTRA! Personal Client, EXTRA! for Windows, IRMA for the Mainframe for Windows, and KEA!.

Additional Custom Controls

QuickApp contains additional custom controls carried over from the TOOLS! for Visual Basic and PowerBuilder products. One of these is the Terminal control, which displays a host screen within an application window.

Development Tools Supported

The following development tools are supported with QuickApp:

- Delphi
- PowerBuilder
- Visual Basic
- Visual C++
- CA-Visual Realia

Supported Host Access Products

The following host access (emulation) products are supported with QuickApp:

- EXTRA! Personal Client 6.2 or later
- EXTRA! for Windows 4.3 or later
- IRMA for the Mainframe for Windows 3.0 or later
- NetWare 3270 LAN Professional 2.0 or later
- RALLY! 1.13 or later
- KEA! 4.23 or later
- INFOConnect

QuickApp replaces TOOLS! for Visual Basic and TOOLS! for PowerBuilder.

EXTRA! Host Publishing System

The EXTRA! Host Publishing System converts host data into HyperText Markup Language (HTML) so that host data can be accessed from a Web browser. At this time, only Visual Basic is supported. A server version of QuickApp is included.

EXTRA! Objects SDK

EXTRA! Objects SDK is a tool kit used to develop applications using EXTRA! Objects. EXTRA! Objects are OLE 2.0 compatible software building blocks used to build a complete emulator application.

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