API Index for desktop Windows applications

Article • 04/28/2021

This article provides links to reference documentation for APIs that can be used in desktop Windows apps.

Win32 (Windows API)

The Win32 API (also called the Windows API) is the native platform for Windows apps. This API is best for desktop apps that require direct access to system features and hardware. The Windows API can be used in all desktop apps, and the same functions are generally supported on 32-bit and 64-bit Windows.

- Win32 API reference by feature
- Win32 API reference by header
- Win32 and COM APIs for UWP apps
- Windows umbrella libraries
- Windows API Sets

Windows Runtime (WinRT)

WinRT is the leading edge platform for Windows 10 apps and games, including desktop apps. The WinRT API is suitable for both native C++ and managed desktop apps that require a sophisticated UI, styles customization, and graphics-intensive scenarios.

- WinRT API reference
- WinRT APIs callable from a desktop app

.NET

The .NET class libraries provide access to Windows system and UI features for managed desktop apps, including WPF and Windows Forms apps.

.NET API

Feedback

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 $\ \, \mathsf{No}$

Windows API index

Article • 03/15/2023

The following is a list of the reference content for the Windows application programming interface (API) for desktop and server applications.

Using the Windows API, you can develop applications that run successfully on all versions of Windows while taking advantage of the features and capabilities unique to each version. (Note that this was formerly called the Win32 API. The name Windows API more accurately reflects its roots in 16-bit Windows and its support on 64-bit Windows.)

User interface

The Windows UI API creates and uses windows to display output, prompt for user input, and carry out the other tasks that support interaction with the user. Most applications create at least one window.

- Accessibility
- Desktop Window Manager (DWM)
- Globalization Services
- High DPI
- Multilingual User Interface (MUI)
- National Language Support (NLS)
- User Interface elements:
 - Buttons
 - Carets
 - Combo Boxes
 - Common Dialog Boxes
 - Common Controls
 - Cursors
 - Dialog Boxes
 - Edit Controls
 - Header Controls
 - o Icons
 - Keyboard Accelerators
 - List Boxes

- List-View Controls
- Menus
- Progress Bars
- Property Sheets
- Rich Edit Controls
- Scroll Bars
- Static Controls
- Strings
- Toolbars
- Tooltips
- Trackbars
- Tree-View Controls
- Windows Animation Manager
- Windows Ribbon Framework

Windows environment (Shell)

- Windows Property System
- Windows Shell
- Windows Search
- Consoles

User input and messaging

- User Interaction
 - Direct Manipulation
 - Ink input
 - Input Feedback Configuration
 - Interaction Context
 - Pointer Device Input Stack
 - Pointer Input Messages and Notifications
 - Radial controller input
 - Text Services Framework
 - Touch Hit Testing
 - Touch Injection
- Legacy User Interaction
 - Touch Input
 - Keyboard Input

- Mouse Input
- Raw Input
- Windows and Messages:
 - Messages and Message Queues
 - Windows
 - Window Classes
 - Window Procedures
 - Timers
 - Window Properties
 - Hooks

Data access and storage

- Background Intelligent Transfer Service (BITS)
- Bind Link
- Data Backup
 - Backup
 - Data Deduplication
 - Volume Shadow Copy
 - Windows Server Backup
- Data Exchange:
 - Clipboard
 - Dynamic Data Exchange (DDE)
 - Dynamic Data Exchange Management (DDEML)
- Directory Management
- Disk Management
- Distributed File System (DFS)
- Distributed File System Replication
- Extensible Storage Engine
- Files and I/O (Local file system)
- iSCSI Discovery Library API
- Offline Files

- Packaging
- Remote Differential Compression
- Transactional NTFS
- Volume Management
- Virtual Hard Disk (VHD)
- Windows Storage Management
- Windows Data Access Components
 - Microsoft Open Database Connectivity (ODBC)
 - Microsoft OLE DB
 - Microsoft ActiveX Data Objects (ADO)

Diagnostics

The Diagnostics API enable you to troubleshoot application or system problems and monitor performance.

- Application Recovery and Restart
- Debugging
- Error Handling
- Event Logging
- Event Tracing
- Hardware Counter Profiling (HCP)
- Network Diagnostics Framework (NDF)
- Network Monitor
- Performance Counters
- Performance Logs and Alerts (PLA)
- Process Snapshotting
- Process Status (PSAPI)
- Structured Exception Handling
- System Monitor
- Wait Chain Traversal
- Windows Error Reporting (WER)
- Windows Event Log
- Windows Troubleshooting Platform

Graphics and multimedia

The Graphics, multimedia, ☑ audio, and video APIs enable applications to incorporate formatted text, graphics, audio, and video.

- Core Audio
- Direct2D
- DirectComposition
- DirectShow
- DirectWrite
- DirectX
- Graphics Device Interface (GDI)
- GDI+
- Media Streaming
- Microsoft Media Foundation
- Microsoft TV Technologies
- OpenGL
- Monitor Configuration
- Multiple Display Monitors
- Picture Acquisition
- Windows Color System
- Windows Imaging Component (WIC)
- Windows Media Audio and Video Codec and DSP ☑
- Windows Media Center
- Windows Media Format
- Windows Media Library Sharing Services
- Windows Media Player
- Windows Media Services
- Windows Movie Maker
- Windows Multimedia

Devices

- AllJoyn
- Communications Resources
- Device Access
- Device Management
- Enhanced Storage
- Function Discovery
- Image Mastering
- Location
- PnP-X Association Database
- Printing

- Print Spooler
- Print Document Package
- Print Schema Specification ☑
- Print Ticket
- XPS Print
- Sensors
- System Event Notification Service (SENS)
- Tool Help
- UPnP
- Web Services on Devices
- Windows Image Acquisition (WIA)
- Windows Media Device Manager
- Windows Portable Devices

System services

The System Services APIs give applications access to the resources of the computer and the features of the underlying operating system, such as memory, file systems, devices, processes, and threads.

- Activity Coordinator
- COM
- COM+
- Compression API
- Distributed Transaction Coordinator (DTC)
- Dynamic-Link Libraries (DLLs)
- Hardware Requirement Evaluator (HWREQCHK)
- Help API
- Interprocess Communications:
 - Mailslots
 - Pipes
- Kernel Transaction Manager (KTM)
- Memory Management
- Operation Recorder
- Power Management
- Remote Desktop Services
- Processes
- Services
- Synchronization
- Threads
- Windows Desktop Sharing

- Windows System Information
 - Handle and Objects
 - Registry
 - Time
 - Time Provider

Security and identity

The Security and Identity APIs enable password authentication at logon, discretionary protection for all sharable system objects, privileged access control, rights management, and security auditing.

- Authentication
- Authorization
- Certificate Enrollment
- Cryptography
- Cryptographic Next Generation (CNG)
- Directory Services ☑
 - Active Directory Domain Services
 - Active Directory Service Interfaces (ADSI)
- Extensible Authentication Protocol (EAP)
- Extensible Authentication Protocol Host (EAPHost)
- MS-CHAP Password Management
- Network Access Protection (NAP)
- Network Policy Server Extensions (NPS)
- Parental Controls
- Security WMI Providers
- TPM Base Services (TBS)
- Windows Biometric Framework

Application installation and servicing

- Games Explorer
- Side-by-side Assemblies
- Packaging, deployment, and query APIs
- Developer License
- Restart Manager
- Windows Installer

System admin and management

The System administration interfaces enable you to install, configure, and service applications or systems.

- Boot Configuration Data WMI Provider
- Failover Clusters
- File Server Resource Manager (FSRM)
- Group Policy
- Microsoft Management Console (MMC) 2.0
- NetShell
- Settings Management Infrastructure
- Software Inventory Logging
- Software Licensing
- Restart Manager
- Settings Management Infrastructure
- System Restore
- System Shutdown
- Task Scheduler
- User Access Logging
- Windows Virtual PC
- Microsoft Virtual Server
- Network Load Balancing Provider
- Windows Defender WMI v2
- Windows Deployment Services
- Windows Genuine Advantage
- Windows Management Infrastructure
- Windows Management Instrumentation (WMI)
- Windows Remote Management
- Windows Resource Protection
- Windows Server Update Services
- Windows System Assessment Tool
- Windows Update Agent

Networking and internet

The Networking APIs enable communication between applications over a network. You can also create and manage access to shared resources, such as directories and network printers.

Domain Name System (DNS)

- Dynamic Host Configuration Protocol (DHCP)
- Fax Service
- Get Connected Wizard
- HTTP Server
- Internet Connection Sharing and Firewall
- IP Helper
- IPv6 Internet Connection Firewall
- Management Information Base
- Message Queuing (MSMQ)
- Multicast Address Dynamic Client Allocation Protocol (MADCAP)
- Network Address Translation (NAT)
- Network List Manager (NLM)
- Network Management
- Network Share Management
- Peer-to-Peer
- Quality of Service (QOS)
- Remote Procedure Call
- Routing and Remote Access Service (RAS)
- Simple Network Management Protocol (SNMP)
- SMB Management
- Telephony Application Programming Interfaces (TAPI)
- WebDAV
- WebSocket Protocol Component
- Wireless networking:
 - Bluetooth
 - o IrDA
 - Mobile Broadband
 - Native Wifi
 - Windows Connect Now
 - Windows Connection Manager
- Windows Filtering Platform
- Windows Firewall with Advanced Security
- Windows HTTP Services (WinHTTP)
- Windows Internet (WinINet)
- Windows Networking (WNet)
- Windows Network Virtualization
- Windows RSS Platform
- Windows Sockets (Winsock)
- Windows Web Services
- XML HTTP Extended Request

Deprecated or legacy APIs

The following are technologies and APIs that are outdated or have been replaced or deprecated from the Windows client and server operating systems.

- DirectMusic
- DirectSound
- Microsoft UDDI SDK is now included with Microsoft BizTalk Server.
- Network Dynamic Data Exchange (DDE)
- Remote Installation Service: Use Windows Deployment Services instead.
- Virtual Disk Service (VDS): Use Windows Storage Management instead.
- Terminal Services: Use Remote Desktop Services.
- Windows Media Rights Manager ☑
- Windows Messaging (MAPI): Use Office MAPI instead.
- Windows Gadget Platform: Create UWP apps instead.
- Windows Sidebar: Create UWP apps instead.
- WPF Bitmap Effects

Feedback

Windows API sets

Article • 06/01/2023

(i) Important

The info in this topic applies to all versions of Windows 10, and later. We'll refer to those versions here as "Windows", calling out any exceptions where necessary.

All versions of Windows share a common base of operating system (OS) components that's called the *core OS* (in some contexts this common base is also called *OneCore*). In core OS components, Win32 APIs are organized into functional groups called *API sets*.

The purpose of an API set is to provide an architectural separation from the host DLL in which a given Win32 API is implemented, and the functional contract to which the API belongs. The decoupling that API sets provide between implementation and contracts offers many engineering advantages for developers. In particular, using API sets in your code can improve compatibility with Windows devices.

API sets specifically address the following scenarios:

- Although the full breadth of the Win32 API is supported on PCs, only a subset of the Win32 API is available on other Windows devices such as HoloLens, Xbox, and other devices. The API set name provides a query mechanism to cleanly detect whether an API is available on any given device.
- Some Win32 API implementations exist in DLLs with different names across
 different Windows devices. Using API set names instead of DLL names when
 detecting API availability and delay loading APIs provide a correct route to the
 implementation no matter where the API is actually implemented.

For more details, see API set loader operation and Detect API set availability.

Are API sets and dlls the same thing?

No—an API set name is a *virtual alias* for a physical .dll file. It's an implementation-hiding technique, where you as the caller don't have to know exactly which module is hosting the information.

The technique allows modules to be refactored (split apart, consolidated, renamed, and so on) on different Windows versions and editions. And your apps still link, and still get routed to the correct code at runtime.

So why do API sets have .dll in their names? The reason is the way the *DLL loader* is implemented. The loader is the part of the OS that loads DLLs and/or resolves references to DLLs. And at the front end, the loader requires any string passed to LoadLibrary to be terminated with ".dll". But after that front end, the loader can strip away that suffix, and query the API set database with the resulting string.

LoadLibrary (and delay load) succeeds with an API set name (with the ".dll" in it); but there isn't necessarily an actual file with that name anywhere on the PC.

Linking umbrella libraries

To make it easier to restrict your code to Win32 APIs that are supported in the core OS, we provide a series of *umbrella libraries*. For example, an umbrella library named OneCore.lib provides the exports for the subset of Win32 APIs that are common to all Windows devices.

For more details, see Windows umbrella libraries.

API set contract names

API sets are identified by a strong contract name that follows these standard conventions recognized by the library loader.

- The name must begin either with the string api- or ext-.
 - Names that begin with api- represent APIs that are guaranteed to exist on all Windows versions.
 - Names that begin with ext- represent APIs that may not exist on all Windows versions.
- The name must end with the sequence I<n>-<n>, where n consists of decimal digits.
- The body of the name can be alphanumeric characters, or dashes (-).
- The name is case insensitive.

Here are some examples of API set contract names:

- api-ms-win-core-ums-l1-1-0
- ext-ms-win-com-ole32-l1-1-5
- ext-ms-win-ntuser-window-l1-1-0
- ext-ms-win-ntuser-window-l1-1-1

You can use an API set name in the context of a loader operation such as LoadLibrary or P/Invoke instead of a DLL module name to ensure a correct route to the implementation

no matter where the API is actually implemented on the current device. However, when you do this you must append the string .dll at the end of the contract name. This is a requirement of the loader to function properly, and is not considered actually a part of the contract name. Although contract names appear similar to DLL names in this context, they are fundamentally different from DLL module names and do not directly refer to a file on disk.

Except for appending the string .dll in loader operations, API set contract names should be considered an immutable identifier that corresponds to a specific contract version.

Identifying API sets for Win32 APIs

To identify whether a particular Win32 API belongs to an API set, review the requirements table in the reference documentation for the API. If the API belongs to an API set, the requirements table in the article lists the API set name and the Windows version in which the API was first introduced to the API set. For examples of APIs that belong to an API set, see these articles:

- AllowSetForegroundWindow
- FindWindowsEx
- GetClassFile

In this section

- API set loader operation
- Detect API set availability
- Windows umbrella libraries

Feedback

API set loader operation

Article • 06/01/2023

(i) Important

The info in this topic applies to all versions of Windows 10, and later. We'll refer to those versions here as "Windows", calling out any exceptions where necessary.

API sets rely on OS support in the library loader to effectively introduce a module namespace redirection into the library binding process. The API set contract name is used by library loader to perform a runtime redirection of the reference to a target host binary that houses the appropriate implementation of the API set.

When the loader encounters a dependency on an API set at run time, the loader consults configuration data in the image to identify the host binary for an API set. This configuration data is called the API set schema. The schema is assembled as a property of the OS, and the mapping between API sets and binaries may differ depending on which binaries are included in a given device. The schema enables an imported function in a single binary to be routed correctly on different devices, even if the module names of the binary host have been renamed or completely refactored on different Windows devices.

Windows supports two standard techniques to consume and interface with API sets: direct forwarding and reverse forwarding.

Direct forwarding

In this configuration, the consuming code imports an API set module name directly. This import is resolved in a single operation, and is the most efficient method with the least overhead. Conceptually, this resolution may point to different binaries on different Windows devices, as is shown in the following example:

Imported API set: api-feature1-I1-1-0.dll

- Windows PC -> feature1.dll
- HoloLens -> feature1_holo.dll
- IoT -> feature1_iot.dll

Because the mappings are kept in a custom schema data repository, it means that an API set name that ends with .dll does not directly refer to a file on disk. The .dll part of the API set name is only a convention required by the loader. The API set name is more

like an alias or a virtual name for a physical DLL file. This makes the name portable across the entire range of Windows devices.

Reverse forwarding

While API set names provide a stable namespace for modules across devices, it is not always practical to convert every binary to this new system. For example, an application may have been in common use for many years, and recompiling the application's binaries may not be feasible. Additionally, some applications may need to continue to run on systems built before specific API sets were introduced.

To accommodate this level of compatibility, a system of *forwarders* are provided on all Windows devices that cover a subset of the Win32 API surface. These forwarders use the module names that were introduced on Windows PCs, and leverage the API Set system to provide compatibility across all Windows devices.

The loader operation behaves like this:

- 1. On a device other than a Windows PC, the loader is presented a legacy Windows PC module name dependency that is not present on the device.
- 2. The loader locates an API set forwarder for this module and loads it into memory.
- 3. The forwarder has a mapping for the API set for the given function being called.
- 4. The loader finds the proper host binary for the given device.

Conceptually, the mapping looks like:

Imported DLL: feature1.dll

- Windows PC -> feature1.dll
- HoloLens -> feature1.dll forwarder -> api-feature1-l1-1-0.dll -> feature1_holo.dll
- IoT -> feature1.dll forwarder -> api-feature1-l1-1-0.dll -> feature1_iot.dll

The end result is functionally the same as direct forwarding, but it accomplishes it in a way that maximizes application compatibility.

① Note

Reverse forwarding provides coverage only for a subset of the Win32 API surface. It does not allow applications that target desktop versions of Windows to run on all Windows devices.

Feedback

Was this page helpful?

🖒 Yes

 $\ \, \mathsf{No} \,$

Detect API set availability

Article • 06/01/2023

In some cases, a given API set contract name may be intentionally mapped to an empty module name on some Windows devices. The reasons for this vary, but a common example is that an expensive feature in terms of system resources may be removed from the Windows OS when configured for a resource-constrained device. This poses a challenge for applications to gracefully handle optional features at the API level.

The traditional approach for testing whether a Win32 API is available is to use LoadLibrary or GetProcAddress. However, these are not a reliable means for testing API sets because of the reverse forwarding support in Windows 10, and later. When reverse forwarding is applied to a given API, LoadLibrary or GetProcAddress may resolve to a valid function pointer even in cases where the internal implementation has been removed. In this case, the function pointer will be pointing to a stub function that simply returns an error.

In order to detect this case, you can use the IsApiSetImplemented function to query the underlying availability of a given API implementation. This test validates that calling this function will result in executing a functional implementation of the API.

The following code example demonstrates how to use **IsApiSetImplemented** to determine whether the WTSEnumerateSessions function is available on the current device before calling it.

```
C++
#include <windows.h>
#include <stdio.h>
#include <Wtsapi32.h>
int cdecl wmain(int /* argc */, PCWSTR /* argv */ [])
{
    PWTS_SESSION_INFO pInfo = {};
    DWORD count = 0;
    if (!IsApiSetImplemented("ext-ms-win-session-wtsapi32-l1-1-0"))
        wprintf(L"IsApiSetImplemented on ext-ms-win-session-wtsapi32-l1-1-0
returns FALSE\n");
    }
    else
        if (WTSEnumerateSessionsW(WTS_CURRENT_SERVER_HANDLE, 0, 1, &pInfo,
&count))
        {
```

```
wprintf(L"SessionCount = %d\n", count);
            for (ULONG i = 0; i < count; i++)</pre>
                PWTS_SESSION_INFO pCurInfo = &pInfo[i];
                wprintf(L" %s: ID = %d, state = %d\n", pCurInfo-
>pWinStationName,
                    pCurInfo->SessionId, pCurInfo->State);
            }
            WTSFreeMemory(pInfo);
        }
        else
        {
            wprintf(L"WTSEnumerateSessions failure : %x\n", GetLastError());
        }
    }
    return 0;
}
```

Feedback

Was this page helpful?





Windows umbrella libraries

Article • 06/01/2023

(i) Important

The info in this topic applies to all versions of Windows 10, and later. We'll refer to those versions here as "Windows", calling out any exceptions where necessary.

An *umbrella library* is a single static-link library that exports a subset of Win32 APIs. For example, an umbrella library named **OneCore.lib** provides the exports for the subset of Win32 APIs that are common to all Windows devices.

The APIs in an umbrella library might be implemented across a range of modules (where a module is either an API set or a DLL). But the umbrella library abstracts that detail away from you, making your app more portable across operating system versions. In your desktop app or driver, simply link the umbrella library that contains the set of APIs that you're interested in, and that's all you need to do.

Library	Description
OneCore.lib	Provides the exports for the subset of Win32 APIs that are common to all Windows 10 devices, and later. Link OneCore.lib (and no other libraries) to access those APIs. If you link OneCore.lib, and you call only Win32 APIs in that library, then your desktop app or driver will load successfully on all Windows 10 devices, and later.
OneCore_apiset.lib	Provides the same coverage as <code>OneCore.lib</code> , but uses API set direct forwarding. Linking <code>OneCore_apiset.lib</code> will be compatible only with the Windows version, or later, relevant to the SDK version you're targeting.
OneCoreUap.lib	Provides the exports for the subset of Win32 APIs that are common to all Windows 10 devices, and later, that support the Windows Runtime (WinRT). Link OneCoreUap.lib (and no other libraries) to access those APIs. If you link OneCore.lib, and you call only Win32 APIs in that library, then your desktop app or driver will load successfully on all Windows 10 devices, and later, that support the UWP.
OneCoreUAP_apiset.lib	Provides the same coverage as OneCoreUAP.lib, but uses API set direct forwarding. Linking OneCoreUAP_apiset.lib will be compatible only with the Windows version, or later, relevant to the SDK version you're targeting.

Feedback

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 $\ \, \mathsf{No}$

WinRT APIs callable from a desktop app

Article • 04/28/2021

Most Windows Runtime (WinRT) APIs can be used by desktop (.NET and native C++) apps. However, some WinRT classes are designed for and are only supported for use in UWP apps. This includes CoreDispatcher, CoreWindow, ApplicationView, and some related classes. Other WinRT classes work in desktop apps except for specific members.

For more information, see Windows Runtime APIs not supported in desktop apps. Where available, this article suggests alternative APIs to achieve the same functionality as the unsupported APIs.

Feedback

Was this page helpful?



