第 5 讲：The Interface of OS

第一节：Introduction

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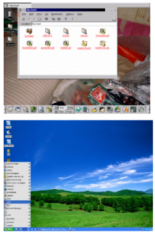
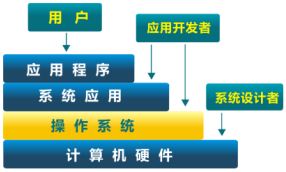
Introduction



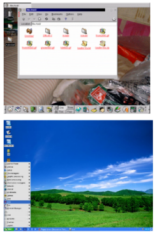


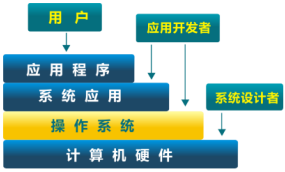
Interface

In computing, an **interface** is a shared boundary across which two or more separate components of a computer system exchange information. [wikipedia]

What is the OS interface?

Introduction





Application programming interface

An **application programming interface (API)** is a computing interface exposed by a particular software program, library, operating system or internet service, to allow third parties to use the functionality of that software application.

Fisher, Sharon (1989). "OS/2 EE to Get 3270 Interface Early".

- POSIX
  - Linux,FreeBSD, UNIX, etc.
- Windows API(Win32)
  - Windows

A Critique of the Windows Application Programming Interface, Computer Standards & Interfaces, 20:1–8, November 1998.

Implementation of APIs is the lesser problem

(Performance can be improved later;
bugs are irritating, but can be fixed)

API design is the big problem

API design is the big problem

- Bugs
- Performance
- Many apps will be affected

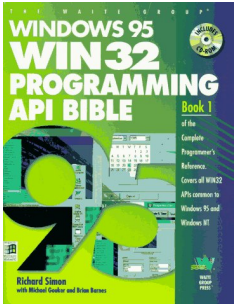
Introduction – Why is API design a problem?

POSIX

stands for

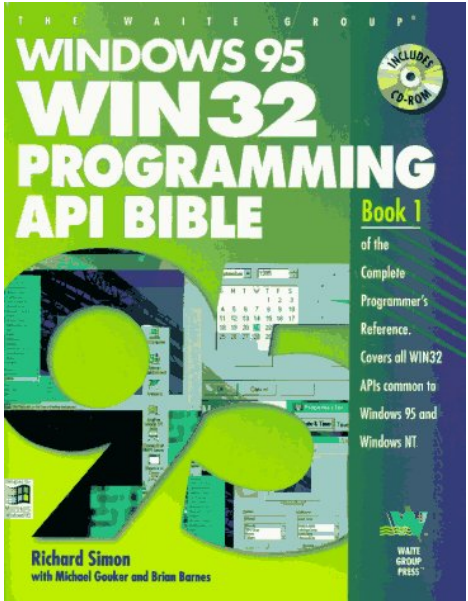
Portable Operating System Interface based on UNIX

Abbreviations.com



- Hard to get right
- Long-term effect
  - Thousands of user-space programmers will live with your (bad) design for decades
- (Usually) can't be fixed
  - Fix == ABI change
  - User-space will break

Windows API – from the view of software engineering

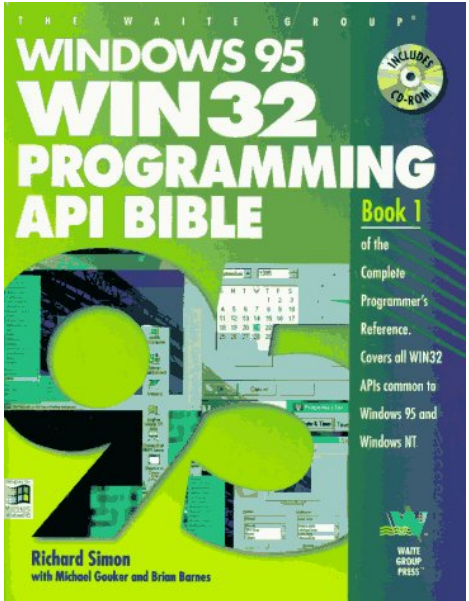


Win32 API

- Input and output devices: mouse, keyboard, pen, screen, printer, and sound.
- User interface elements: windows, menus, dialogs, input widgets, the clipboard, etc.
- System services: files, memory, hardware, system databases, and networking.
- Graphical elements: bitmaps, fonts, drawing primitives, and 3D graphics rendering, etc.
- the Microsoft's Component Object Model (COM), OLE, ActiveX,
- game applications (DirectX 2), etc.

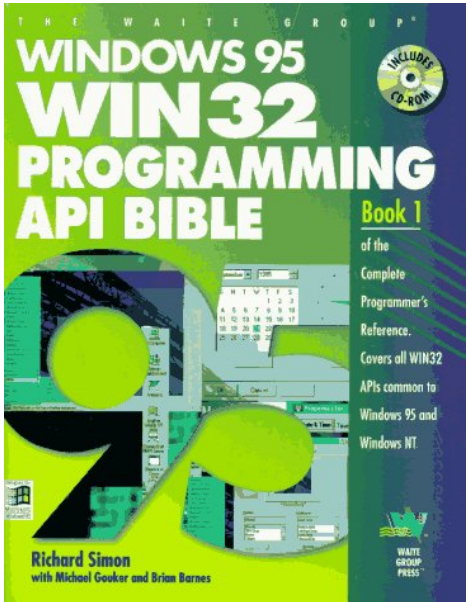
A Critique of the Windows Application Programming Interface, Computer Standards & Interfaces, 20:1–8, November 1998.

Windows API – from the view of software engineering



Element	Number
Number of root header files	129
Number of import libraries	48
Total number of header files	232
Header file size (Mb)	5.2
Header file lines (non empty non comment)	120516
Macro and constant definitions	33174
Type definitions	4858
Functions	3433
Interface methods	1462
Messages	858
Notification messages	180
Structures	1077
Properties	498
Enumeration types	110
Function error codes	1137

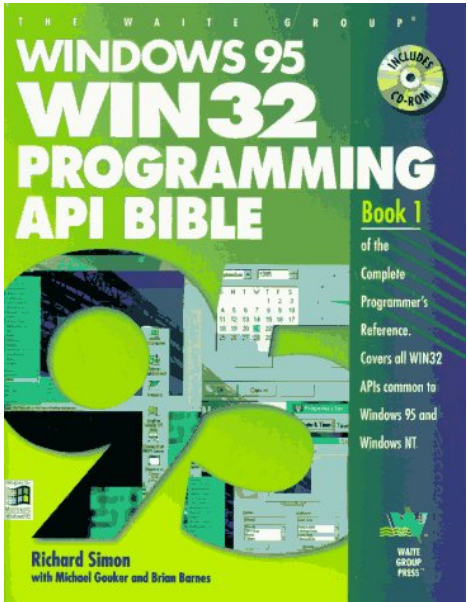
Windows API – from the view of software engineering



Size, Structure, and Implementation of Win32

- 9067 API elements (functions, interface methods, structures, messages, macros, properties, etc.)
- The large size and monolithic nature of the Win32 API
- Microsoft's exclusive control of the API can distort competition and market diversity.
- Any formal proof of specific properties or the correctness of programs using it is an extremely difficult task.

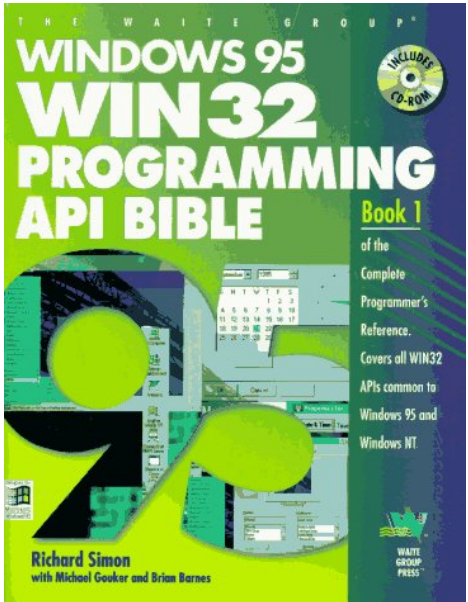
Windows API – from the view of software engineering



Interface of Win32

- The provided functions have a complex and non-intuitive interface with a number of mode changing flags and exceptions that unnecessarily complicate system application development.
  - 91 functions that create entities, and the return value ~~inconsistencies~~ across these functions.
  - 131 "extended" functions that perform similar tasks to the original ones.
  - e.g. CreateWindowEx has 21 "extended" window styles in addition to the 139 styles

Windows API – from the view of software engineering



Type System Problems in the Interface of Win32

- Specifying in a large number of cases arguments with minimal type information associated with them.
  - More than 150 functions pass an argument of type LPVOID or PVOID which is a pointer to any type.
  - even worse abuse of the type system is the use of the LPARAM (32bit) and WPARAM(16bit) type.

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- Namespace Pollution in the Interface of Win32
- The functionality of win32 is in a number of cases inconsistent, inadequately documented, or incomplete. e.g. the spec of 1130 errors.