



US007673303B2

(12) **United States Patent**  
**Sadovsky et al.**

(10) **Patent No.:** **US 7,673,303 B2**  
(45) **Date of Patent:** **\*Mar. 2, 2010**

(54) **SIMPLIFIED DEVICE DRIVERS FOR  
HARDWARE DEVICES OF A COMPUTER  
SYSTEM**

(52) **U.S. Cl.** ..... **718/101**; 719/322; 719/326;  
719/327

(58) **Field of Classification Search** ..... 719/322,  
719/326-327; 718/101

See application file for complete search history.

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(\* ) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 631 days.

This patent is subject to a terminal dis-  
claimer.

(21) Appl. No.: **11/276,482**

(57) **ABSTRACT**

(22) Filed: **Mar. 1, 2006**

A computer system uses simplified device drivers for operat-  
ing hardware devices. A simplified device driver for a hard-  
ware device of a given device type, such as a flatbed scanner,  
works with a system-supplied common driver for that given  
device type. The common driver and the simplified driver  
together function like a regular device driver. The simplified  
device driver implements a small number of entry point func-  
tions corresponding to a pre-selected set of operation com-  
mands “generic” to hardware devices of that given device  
type. When an application makes a request for an operation by  
the device, the request is passed through a device driver  
interface (DDI) to the common driver. The common driver  
then calls the entry point functions in the simplified device  
driver to carry out the requested operation.

(65) **Prior Publication Data**

US 2006/0147234 A1 Jul. 6, 2006

**Related U.S. Application Data**

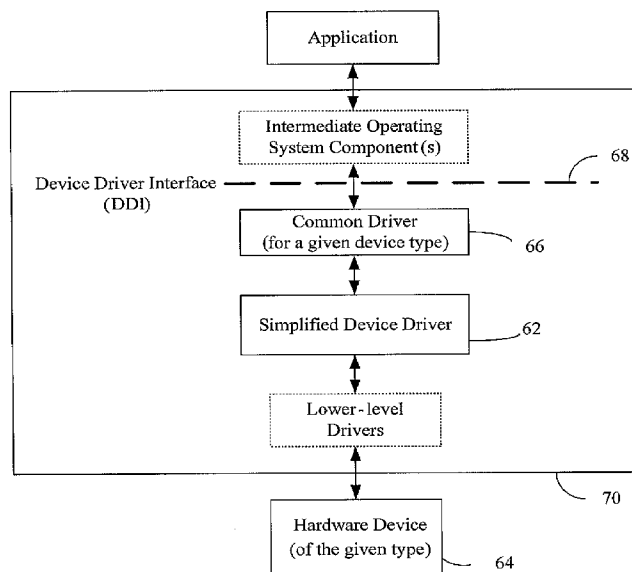
(63) Continuation of application No. 09/809,237, filed on  
Mar. 15, 2001, now Pat. No. 7,047,534.

(60) Provisional application No. 60/190,457, filed on Mar.  
17, 2000.

(51) **Int. Cl.**

**G06F 9/46** (2006.01)  
**G06F 9/44** (2006.01)

**18 Claims, 3 Drawing Sheets**



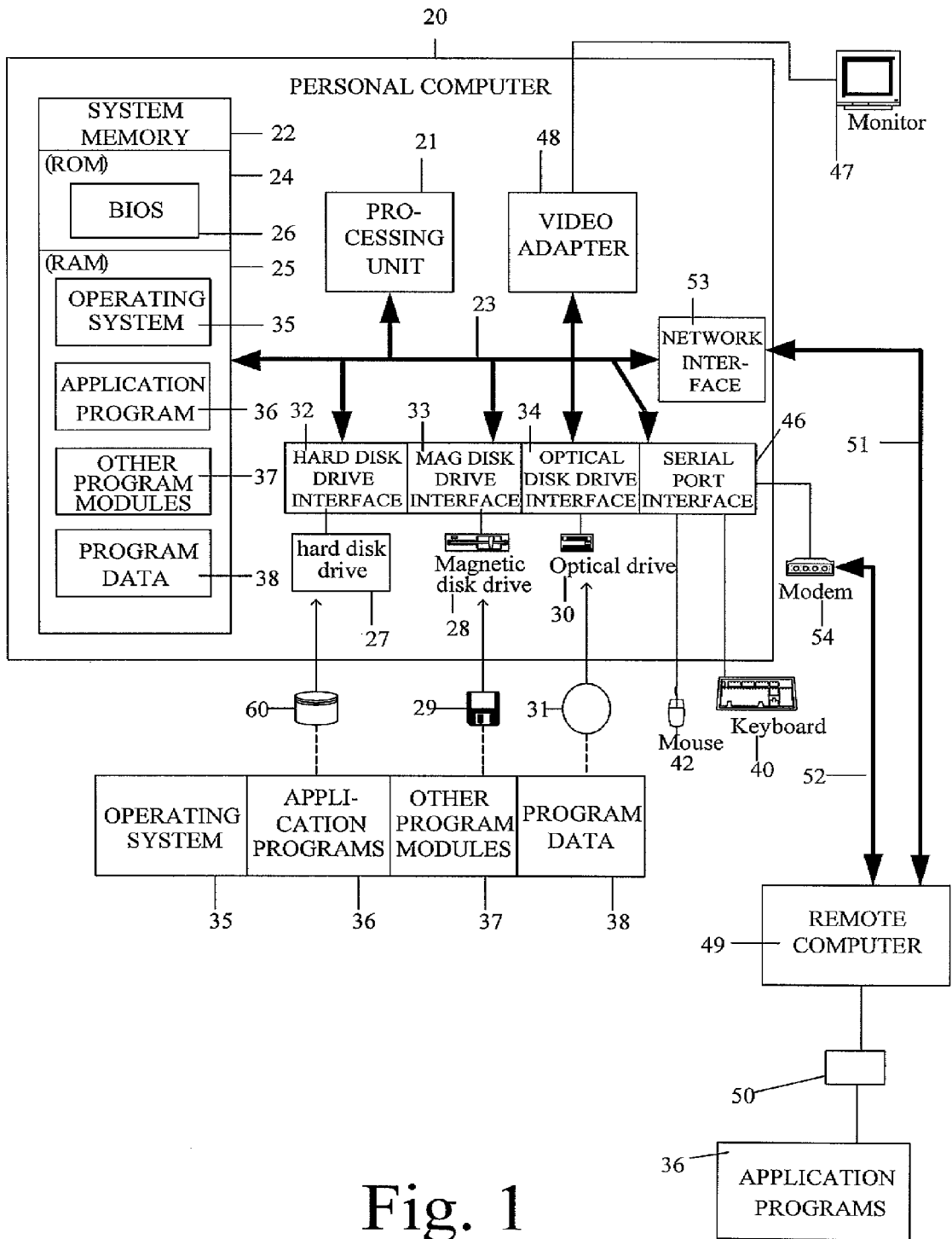


Fig. 1

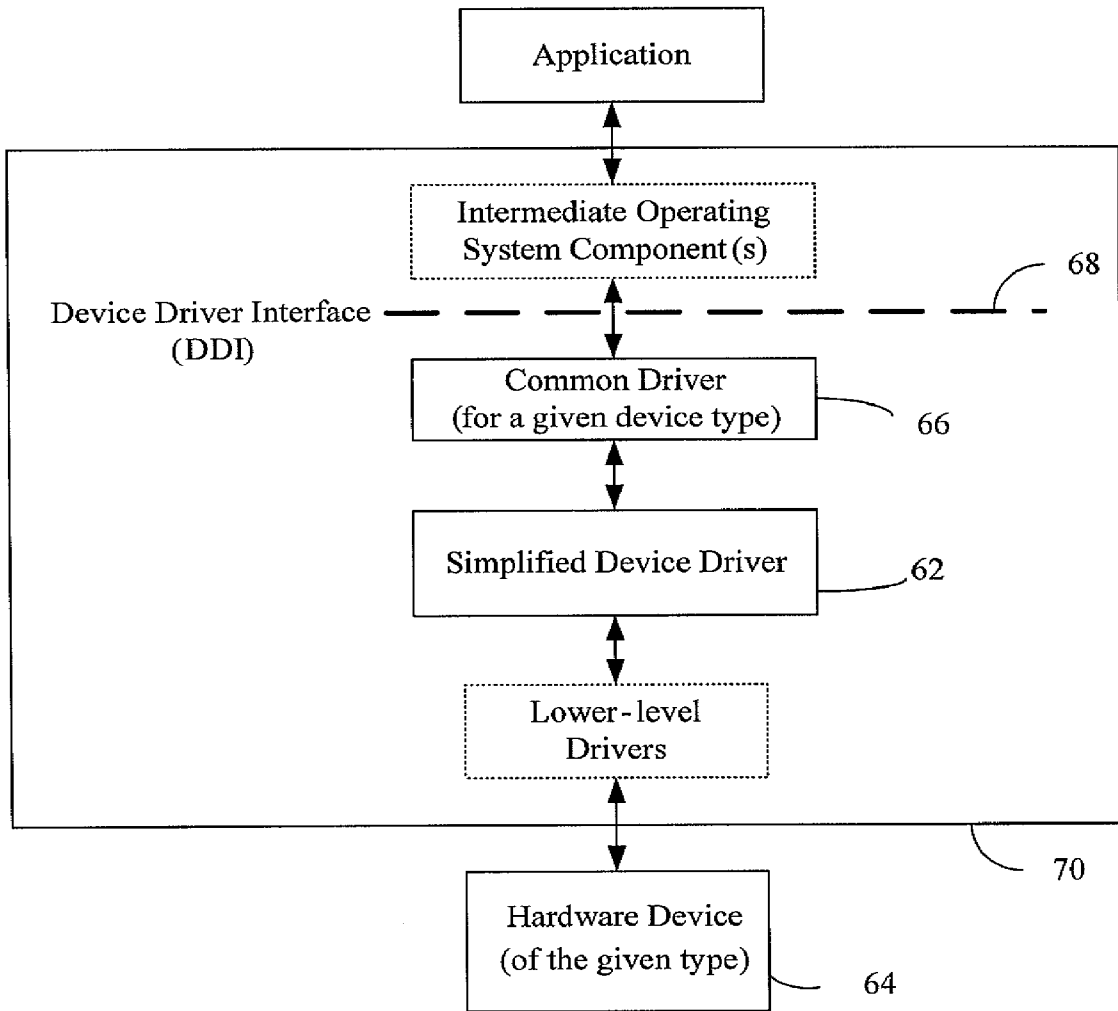


Fig. 2

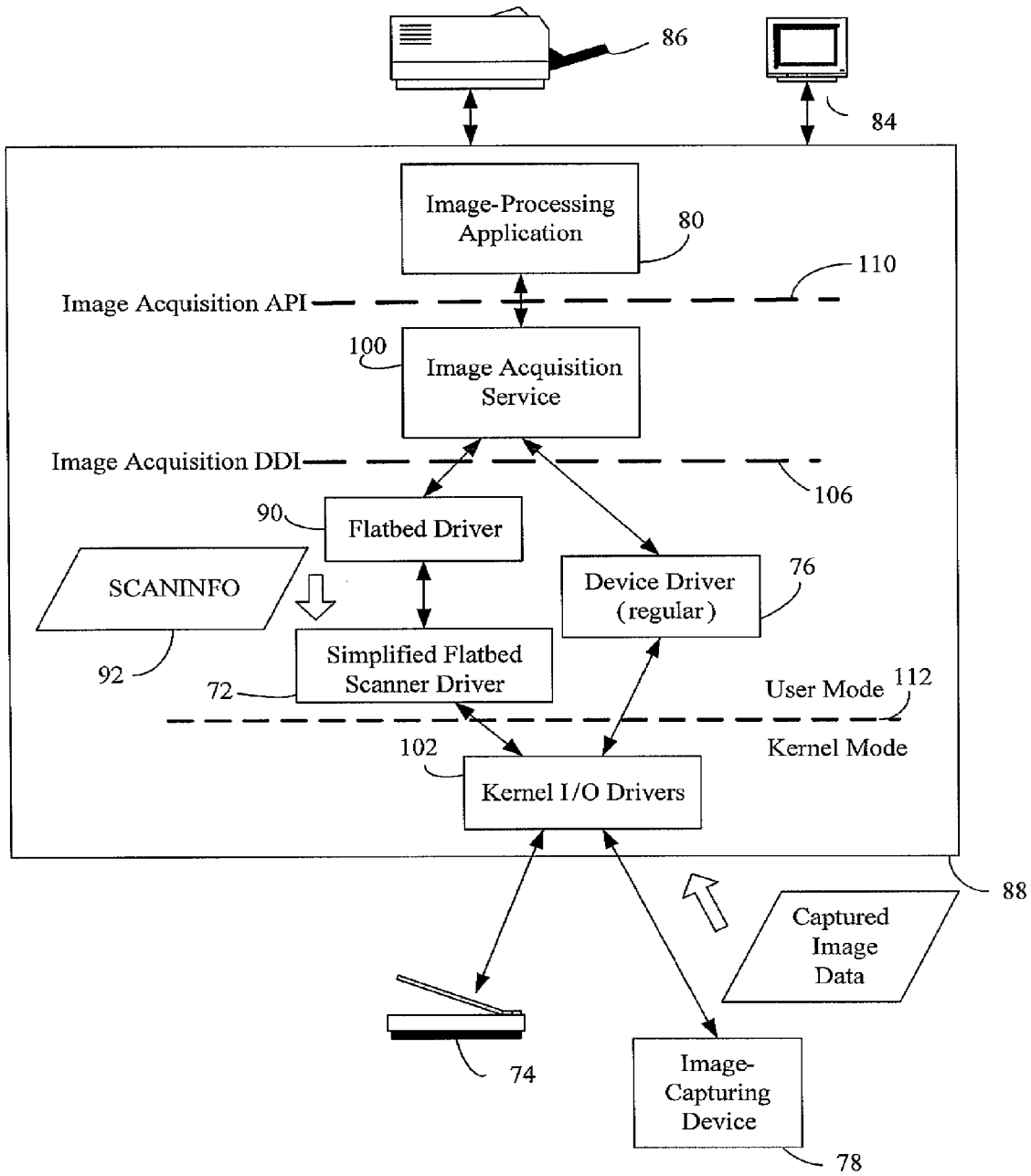


Fig. 3

## SIMPLIFIED DEVICE DRIVERS FOR HARDWARE DEVICES OF A COMPUTER SYSTEM

### CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of and priority is claimed to application Ser. No. 09/809,237, filed Mar. 15, 2001, now U.S. Pat. No. 7,047,534 titled "SIMPLIFIED DEVICE DRIVERS FOR HARDWARE DEVICES OF A COMPUTER SYSTEM" and issued to Sadovsky, which claims priority from U.S. Provisional Patent Application Ser. No. 60/190,457, filed Mar. 17, 2000. This United States patent is commonly assigned herewith and is hereby incorporated herein by reference for all that it discloses.

### TECHNICAL FIELD OF THE INVENTION

This invention relates generally to computer operating systems, and more particularly to software components for communicating with and controlling the operation of a computer hardware device, such as a scanner.

### BACKGROUND OF THE INVENTION

A computer system employs hardware devices for various functions, such as data input and output, printing, display, etc. Each hardware device in the computer system is typically operated through its associated device driver, which is typically provided by the vendor of the hardware device and loaded as part of the operating system. The device driver allows the operating system of the computer and applications running on the computer to communicate with the device and control its operations. The device driver is device-specific in that it is written to handle the specific behavior of the device. On the other hand, the device driver also has to be written according to specifications and requirements of the operating system with which the driver is to be used.

Although the quality of the device driver for a hardware device is critical to the proper operation of the device, many hardware vendors find it difficult to put in the significant time and resources needed to adequately develop a device driver. As a result, device drivers provided by hardware vendors are often of unsatisfactory quality and require extensive fixing before they can be used with the operating system. This problem is especially significant for models with low profit margins. For example, flatbed color scanners are commonly used for capturing color images for incorporation in presentations and communications. Some low-end models of flatbed scanners have rather low retail prices, which limit the resources their vendors could reasonably spend on writing device drivers for them.

The difficulty in obtaining well-developed device drivers is exacerbated by the need to include many device drivers with an operating system. One of the goals of modern operating systems is to provide an "out-of-the-box" experience, where an end user can simply connect a device to her computer and the device will work without the need to install any extra software. To provide such an experience, an operating system typically includes many device drivers from different hardware vendors. Due to the large number of device drivers involved, the time and resources required to test and fix the drivers to ensure their proper operations can become unacceptably high. Accordingly, there is a need for a new approach

## SUMMARY OF THE INVENTION

In view of the foregoing, the present invention provides a computer system that allows the use of simplified device drivers for operating hardware devices. A simplified device driver for a hardware device of a given type, such as a flatbed scanner, works with a common driver provided for that given type, and together they function like a regular device driver. The simplified device driver implements entry point functions for a small set of pre-selected operation commands "generic" to different device models and brands of that given device type. When an application makes a request for an operation by the device, the request is passed through a device driver interface (DDI) to the common driver. The common driver then calls the entry point functions in the simplified device driver to control the device to carry out the requested operation. Because a simplified device driver only has to implement a small number of entry point functions for generic device operation commands, it is significantly less complicated than a regular device driver that has to handle various driver interface functions required by the operating system. As a result, it is much easier for a hardware vendor to develop a high-quality simplified device driver.

Additional features and advantages of the invention will be made apparent from the following detailed description of illustrative embodiments, which proceeds with reference to the accompanying figures.

### BRIEF DESCRIPTION OF THE DRAWINGS

While the appended claims set forth the features of the present invention with particularity, the invention, together with its objects and advantages, may be best understood from the following detailed description taken in conjunction with the accompanying drawings of which:

FIG. 1 is a block diagram generally illustrating an exemplary computer system on which the present invention may be performed;

FIG. 2 is a schematic diagram showing a general view of a system that employs a simplified device driver in accordance with the invention; and

FIG. 3 is an embodiment of an image acquisition system that has a simplified device driver for a flatbed scanner.

### DETAILED DESCRIPTION OF THE INVENTION

Turning to the drawings, wherein like reference numerals refer to like elements, the invention is illustrated as being implemented in a suitable computing environment. Although not required, the invention will be described in the general context of computer-executable instructions, such as program modules, being executed by a personal computer. Generally, program modules include routines, programs, objects, components, data structures, etc. that perform particular tasks or implement particular abstract data types. Moreover, those skilled in the art will appreciate that the invention may be practiced with other computer system configurations, including hand-held devices, multi-processor systems, microprocessor based or programmable consumer electronics, network PCs, minicomputers, mainframe computers, and the like. The invention may also be practiced in distributed computing environments where tasks are performed by remote processing devices that are linked through a communications network. In a distributed computing environment, program

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