ASSIGNMENT 1

Translate from English to Serbian

Excerpt from Windows Internals, page 68

Topic: Hardware Abstraction Layer (HAL) and Device Drivers

HARDWARE ABSTRACTION LAYER

As mentioned at the beginning of this chapter, one of the crucial elements of the Windows design is its portability across a variety of hardware platforms. The hardware abstraction layer (HAL) is a key part of making this portability possible. The HAL is a loadable kernel-mode module (Hal.dll) that provides the low-level interface to the hardware platform on which Windows is running. It hides hardware-dependent details such as I/O interfaces, interrupt controllers, and multiprocessor communication mechanisms—any functions that are both architecture-specific and machine-dependent.

Notice that Ntoskrnl is linked against the HAL, which is in turn linked against Ntoskrnl. (They both use functions in each other.) Ntoskrnl is also linked to the following binaries:

- Pshed.dll, the Platform-Specific Hardware Error Driver.
- Bootvid.dll, the Boot Video Driver.
- Kdcom.dll, the Kernel Debugger Protocol Communications Library.
- Ci.dll, the code integrity library.
- Clfs.sys, the common logging file system driver.

So rather than access hardware directly, Windows internal components as well as user-written device drivers maintain portability by calling the HAL routines when they need platform-dependent information.

Although several HALs are included with Windows, newer versions of Windows can detect at boot-up time which HAL should be used.

TABLE: List of x86 HALs

Halacpi.dll — Advanced Configuration and Power Interface (ACPI) PCs.

Halmacpi.dll — Advanced Programmable Interrupt Controller (APIC) PCs with ACPI.

DEVICE DRIVERS

Device drivers are loadable kernel-mode modules (typically ending in .sys) that interface between the I/O manager and the relevant hardware.

They run in kernel mode in one of three contexts:

- In the context of the user thread that initiated an I/O function
- In the context of a kernel-mode system thread
- As a result of an interrupt

Device drivers in Windows do not manipulate hardware directly. Instead, they call functions in the HAL to interface with the hardware.

There are several types of device drivers:

- Hardware device drivers
- File system drivers
- File system filter drivers
- Network redirectors and servers
- Protocol drivers
- Kernel streaming filter drivers

Assignment 2: BINOMIAL THEOREM

Statement:
(a + b)^n = sum_{k=0 to n} C(n,k) a^(n-k) b^k

where:
C(n,k) = n! / (k!(n-k)!)

Meaning:
The coefficients in the expansion of (a+b)^n are binomial coefficients (Pascal triangle row n).

Example:
(a + b)^5 =
a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + b^5

PROOF IDEA 1 (combinatorial)
(a+b)^n = (a+b)(a+b)...(a+b) [n times]

Each term a^m b^(n-m):

- choose m factors where we pick “a”
- remaining n-m factors give “b”

Number of ways:
C(n,m)

So coefficient = C(n,m)

Thus:
(a+b)^n = sum_{m=0 to n} C(n,m) a^m b^(n-m)

PROOF IDEA 2 (induction)
Base:
(a+b)^1 = a + b

Assume true for n:
(a+b)^n = sum_{k=0 to n} C(n,k)a^(n-k)b^k

Multiply by (a+b):
(a+b)^(n+1) = (a+b)^n (a+b)

Expand and group terms → use identity:
C(n,k) + C(n,k-1) = C(n+1,k)

Result:
(a+b)^(n+1) = sum_{k=0 to n+1} C(n+1,k)a^(n+1-k)b^k

PROOF IDEA 3 (via exponentials)
e^(a+b) = e^a * e^b

Use series:
e^x = sum_{n=0 to infinity} x^n / n!

Compare coefficients:

(a+b)^n / n! =
sum_{k=0 to n} (a^k/k!) (b^(n-k)/(n-k)!)

Multiply by n!:

(a+b)^n =
sum_{k=0 to n} C(n,k)a^k b^(n-k)

GENERALIZATION (Newton binomial)
(a+b)^r = sum_{k=0 to infinity} C(r,k) a^(r-k)b^k

where:
C(r,k) = r(r-1)...(r-k+1) / k!

COMMON USE
Example:
x^5 + 4x^4 + 6x^3 + 4x^2 + x
= x(x^4 + 4x^3 + 6x^2 + 4x + 1)
= x(x+1)^4

(the source:
https://artofproblemsolving.com/wiki/index.php/Binomial_Theorem?srsltid=AfmBOoqP6ti6jY5XLmQrT-XXElX0gCPY4_InHdoP74H41dyxcnUCMW3h) .

CERPT — Bruce Sterling

(From the storu „User-centric: Design Team")
Bruce Sterling

ORIGINAL (ENGLISH)

User-centric: "Design Team"
[Engineer, Graphic Designer, Legal Expert, Marketer, Programmer, Social Anthropologist & Team Coordinator]
Subject: New Product Brainstorm

Another new product launch. Well, we all know what that means. Nobody ever said that they're easy. But I do believe the seven of us—given our unique backgrounds and our proven skills—are just the people to turn things around for this company.

Things aren't as bad as the last quarterly report makes them look. Despite what the shareholders may think, we've definitely bottomed out from that ultrasonic cleanser debacle. Sales in muscle-gel apps remain strong. Plus, the buzz on our new product category just couldn't be hotter.

People across our industry agree that locator tag microtechnology is a killer app in the intelligent-environment market. MEMS tech is finally out of the lab and bursting into the marketplace, and our cross-licenses and patents look very solid.

As for the development budget—well, this is the biggest new product budget I've seen in eight years with this company.

My point is, we've got to get away from our old-fashioned emphasis on "technology for tech's sake." That approach is killing us in the modern marketplace. Yes, of course MEMS locator chips are a "hot, sweet" technology—and yes, "If you build it, they will come." Our problem is, we do build it, and they do come, but they *give all the money to somebody else.*

We can't live on our reputation as a cutting-edge engineering outfit. Design awards just don't pay the bills. That's not what our shareholders want, and it's not what the new management wants. No matter how we may grumble, this company has got to be competitive in the real world

From: Design Engineer
To: Design Team
Subject: Re: New Product Brainstorm

FYI, User specs: Classic early adapter type. Male. Technically proficient. 18–35 age demographic. NAFTA/Europe. Owns lots of trackable, high-value-added, mobile hardware products: sporting goods, laptops, bicycles, luggage, possibly several cars.

From: Marketer
To: Design Team
Subject: User Specs

I just read the Engineer's e-mail, and gee whiz, people. That is dullsville. That is marketing poison. Do you have any idea how burned out the Male- Early-Adapter thing is in today's competitive environment? These guys have digital toothbrushes now. They're nerd-burned, they've been consumer-carpet-bombed! There's nothing left of their demographic! They're hiding in blacked-out closets hoping their shoes will stop paging their belt buckles. Nerds can't push this product into the high-volume category that we need for a breakeven. We need a housekeeping technology. I mean ultra-high volume, in the realm of soaps, mops, brooms, scrubbing brushes, latex gloves, light bulbs. An impulse buy, but high-margin and everywhere.