Gruppe 5
Lars Bro Nielsen
Leon Norsk
Nadeem Abdullahi
Per Rasmussen
Teknologi aflevering d 26/4

Introduction(General)
This document entails information on Windows 95 and specifically the cpu chip Intel 80386 where we will look into its history & architecture.

Introduction to windows 95.
Windows 95 is a consumer-oriented operating system developed by Microsoft, as the successor to Windows 3.1x, and was released to retail on August 24, 1995. Three years after its introduction, Windows 95 was followed by Windows 98. Microsoft ended extended support for Windows 95 on December 31, 2001.[1]

Introduction to the cpu.
The **80386**, also **i386** and **386**, was a family of 32-bit 3rd-generation x86 microprocessors introduced by Intel in 1985 as a successor to 80286. These processors were fully backwards compatible with previous generations of x86 processors and introduced a set of major new features including enhancements to protected mode and virtual 8086 mode. The changes brought about by 386 became the standard for all future 32-bit x86 processors, dubbed i386-architecture.

Kernel : The core OS services which facilitates interactions between hardware and software components. The **80386** made use of Windows 9x.
Shell : The user-facing interface for the OS was Windows 95.

Questions for session 2 in Technology

A. Find out which hardware platform(s) your chosen operating system runs on. In the following research questions, use that platform. If your OS runs on multiple platforms, pick one. If you're working with a historical OS (eg. AmigaOS, Windows 95), then go with a processor of that era (eg. a Motorola 68K CPU for Amiga, an old Pentium for Windows 95).

- Os = Window 95
- Platform = Intel x86
- begyndte i 1978
- cpu: Intel 80386

B. Research the basics of your chosen hardware platform.

How many registers are there? How big are each? (16-, 32, 64-bit). Are multicore processors available? Give an overview description of the processor.

- Den har 8 registrer og kører 32 bit multicore.
- No multicore cpus available for windows 95.

C. Find out what the pipeline architecture of the platform is like.
How many stages are there?

- The 80386 added a three-stage instruction pipeline, extended the architecture from 16-bits to 32-bits.

Can you find out what each stage does?
The three stages used in the pipeline are:

- (i) Fetch : In this stage the ARM processor fetches the instruction from the memory.
- (ii) Decode : In this stage recognizes the instruction that is to be executed.
- (iii) Execute 2 In this stage the processor processes the instruction and writes the result back to the desired register.[3]

Pipelining, when there's a fetch/decode/execute cycle going on, then there are three different hardware components (a fetcher, a decoder and an executor). These all spend roughly 2/3 of their time waiting for the preceding step to finish.

D. Describe the cache architecture (if any) of your chosen hardware platform.

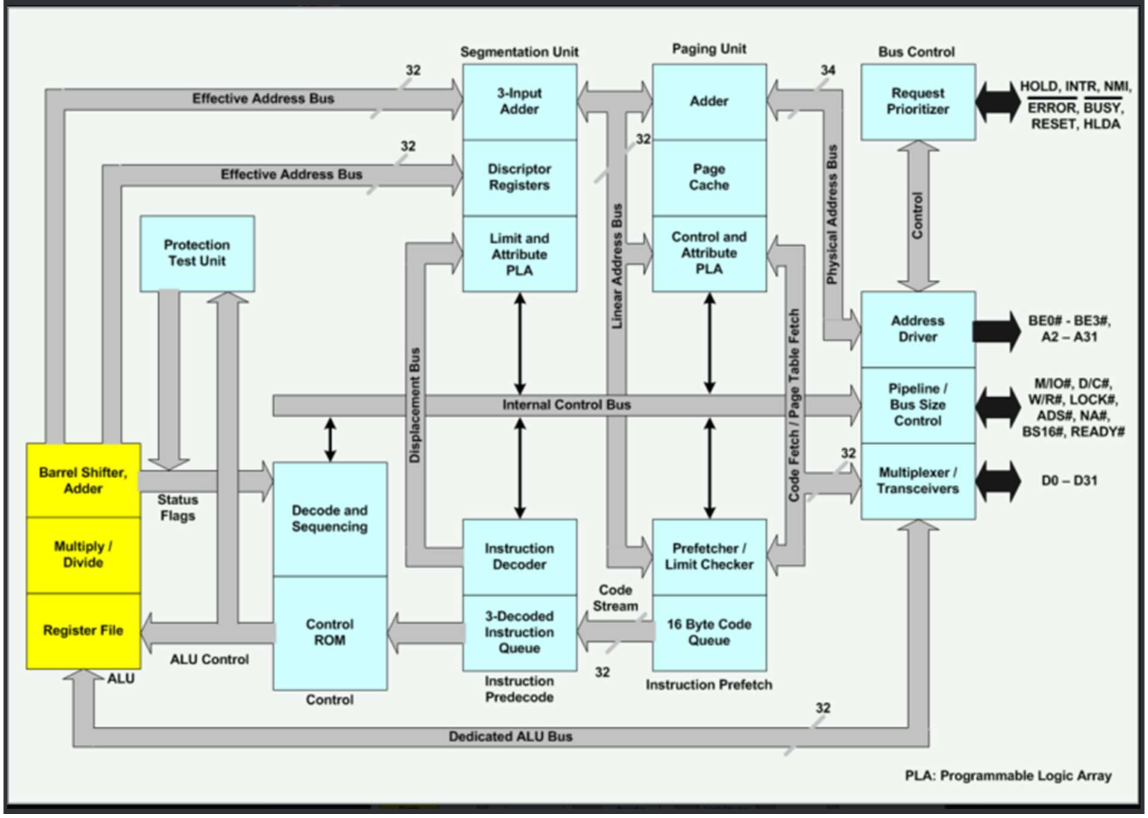
VCACHE is the disk cache system in Windows 95. VCACHE replaces the Smartdrive system used in older versions of Windows. Whereas SmartDrive is a 16-bit driver, VCACHE is a 32-bit driver. VCACHE can dynamically change the size of the disk cache depending on available disk space and application requirements.[2]

E. Describe the bus architecture of your chosen platform --- eg. does it use a single bus, a Northbridge/Southbridge split, or something completely different?

We have not been able to completely verify the bus architecture. However, given the timeframes, we believe it is plausible it was made up of a Northbridge/Southbridge split. Motherboards during the time period mostly implemented the PCI standard, which implemented the Northbridge/Southbridge split. [9] [10]

Page cache

In computing, a page cache, sometimes also called disk cache, is a transparent cache for the pages originating from a secondary storage device such as a hard disk drive (HDD) or a solid-state drive (SSD). The operating system keeps a page cache in otherwise unused portions of the main memory (RAM), resulting in quicker access to the rest of the system.



Microsoft Windows'95, an operating system for a single-user personal computer, needs more than twelve megabytes of RAM to operate optimally.[6]

Filesystem

Windows Explorer was first included with Windows 95 as a replacement for File Manager, which came with all versions of Windows 3.x operating systems. While "Windows Explorer" or "File Explorer" is a term most commonly used to describe the file management aspect of the operating system, the Explorer process also houses the operating system's search functionality and File Type associations (based on filename extensions), and is responsible for displaying the desktop icons, the Start Menu, the Taskbar, and the Control Panel. Collectively, these features are known as the Windows shell.
After a user logs in, the explorer process is created by the userinit process. Userinit performs some initialization of the user environment (such as running the login script and applying group policies) and then looks in the registry at the Shell value and creates a process to run the system-defined shell – by default, Explorer.exe. Then Userinit exits. This is why Explorer.exe is shown by various process explorers with no parent – its parent has exited.[1]

Plug and play

Windows 95 was responsible for implementing Plug and Play functionality, using bus enumerators and I / O port allocation, IRQ’s, DMA channels and memory. During the installation of Windows 95, the system automatically tried to detect all connected devices. The introduction of plug and play was also the starting point for Windows 95 to introduce the Device Manager to clearly indicate which devices were working optimally with correct drivers and configuration, and to allow the user to override automatic Plug and Play-based driver installation with manual options or give a choice of several semi-automatic configurations to try to free up resources for devices that still needed manual configuration.[1]

Intel 80386

With the release of the 386 in 1985 many of the issues preventing widespread adoption of the previous protected mode were addressed. The 386 was released with an address bus size of 32 bits, which allows for 2^{32} bytes of memory accessing, equivalent to 4 gigabytes. The segment sizes were also increased to 32 bits, meaning that the full address space of 4 gigabytes could be accessed without the need to switch between multiple segments. In addition to the increased size of the address bus and segment registers, many other new features were added with the intention of increasing operational security and stability. Protected mode is now used in virtually all modern operating systems which run on the x86 architecture, such as Microsoft Windows, Linux, and many others.

Furthermore, learning from the failures of the 286 protected mode to satisfy the needs for multiuser DOS, Intel added a separate virtual 8086 mode, which allowed multiple virtualized 8086 processors to be emulated on the 386. Hardware x86 virtualization required for virtualizing the protected mode itself, however, had to wait for another 20 years.[8]

With the release of the 386, the following additional features were added to protected mode:

- Paging
- 32-bit physical and virtual address space (The 32-bit physical address space is not present on the 80386SX, and other 386 processor variants which use the older 286 bus.)
- 32-bit segment offsets
- Ability to switch back to real mode without resetting
- Virtual 8086 mode

Protected mode Features

Protected mode has a number of features designed to enhance an operating system's control over application software, in order to increase security and system stability. These additions allow the operating system to function in a way that would be significantly more difficult or even impossible without proper hardware support.[4]

Virtual 8086 mode

(also called **virtual real mode**, **V86-mode** or **VM86**) allows the execution of real mode applications that are incapable of running directly in protected mode while the processor is running a protected mode operating system. It is a hardware virtualization technique that allowed multiple 8086 processors to be emulated by the 386 chip; it emerged from the painful experiences with the 80286 protected mode, which by itself was not suitable to run concurrent real mode applications well.[5]

Cooperative vs preemptive Multitasking

With window 95 came preemptive multitasking which runs one thread, with a predetermined time, unless another thread with a higher priority is ready to run.Cooperative also called non-preemptive functions different, it runs the thread until its complete, before a new thread is allowed to be selected.[7]

There are 32 different priority levels which the scheduler determines. The scheduler has 2 different types, a primary and a secondary. The primary looks for all the threads to find the one with the highest priority. When all of the highest priority threads have run one time, the secondary scheduler takes over and boosts the threads which have not run yet. The threads that has been boosted keeps getting priority boosts until they have been runned.[7]

source:

[1] https://en.wikipedia.org/wiki/Windows_95

[2] https://www.webopedia.com/definitions/vcache/

[3] https://www.ques10.com/p/34835/explain-pipelining-in-arm-processor/

[6] https://www.cs.kent.ac.uk/people/staff/rej/gcbook/preface.html

[8]https://en.wikichip.org/wiki/intel/80386

[4]https://en.wikipedia.org/wiki/Protected_mode#The_386

[5]https://en.wikipedia.org/wiki/Virtual_8086_mode

[7]http://www.cwdixon.com/support/win98_support/multi_tasking.htm

[9]https://www.redhill.net.au/b/b-95.html

[10]https://www.geeksforgeeks.org/motherboard-parts-south-bridge/