Unit 36

PC Gaming Investigation

The 1980s

Commodore 64

(1982)

- Specifications [1,4]
  - CPU – MOS Technology 6510 @ 0.985 MHz, VIC II for video and SID for sound (co-processors)
  - Memory – 64 KB of RAM and 20 KB of ROM
  - Graphics:
    - 16 colours + 16 border colours
    - 320 x 200 resolution
  - Sound – 3 voices across 9 octaves

- Computer [2,3]
  - The computer comes built inside of a keyboard, from which a monitor, controllers and similar items can be plugged into it. This keyboard is used to play some of the games and enter commands into the console.
  - On the side of the computer there is 2 controller ports, a power button and power jack.
  - On the back there is a cartridge slot, TV RF jack, A/V jack for audio or a monitor, a serial port, cassette port and a "user port" which is freely programmable for cartridges or interface cards.

- Controller [5]
  - The C64 takes input from a joystick like controller that contains: 4-directional joystick, 2 fire buttons and 8 other programable buttons
  - The computer's keyboard can often be used as input for some of the games on it

Atari ST

(1985)

- Specifications [1,2]
  - CPU – Motorola 68000 @ 8 MHz
  - Memory – 512 KB of RAM and 192 KB of ROM
  - Storage – 360 KB floppy disk drive
  - Graphics
    - 60 Hz display
    - 3 levels of resolution –low at 320x200 with 16 colours and a palette of 512, medium at 640 x 200 with 4 colours and a palette of 512 colours, and high with 640x400 with monochrome colours
  - Sound – 3 voices across 8 octaves
- Computer [3]
  - Similar to the C64, the computer was built into a keyboard, meaning you would need to buy a monitor to go with it, including any peripherals such as a mouse.
  - On the side of the computer, there is a midi in and out port, a slot to plug your game cartridge into and 2 slots for peripherals.
  - On the back, there is ports for: a modem, printer, hard disk, floppy disk, TV, monitor, an on-off switch, a reset button and a power connector.
- Controller [1]
  - One of the most loved controllers for the AST is the Mindscape Powerplays Joystick. Mice are also often commonly used.
  - This has a joystick and pistol-like trigger button, the joystick can move in 4 directions.

The 1990s

Amiga 4000

(1992)

- Specifications [1]
  - CPU – Motorola 68EC030 / 88040 @ 25 MHz
  - Memory – 2 MB of RAM on the board with up to 16 MB additional, 512 KB of ROM
  - Graphics:
    - Amiga Advanced Graphic Architecture
    - 24-bit colour palette (16.8 million colours)
    - 256 on-screen colours in indexed mode with 144 colours in HAM-8 mode
    - Supported resolutions of 320x256 to 1280x512i in PAL and 640x480 using VGA
  - Storage – 120 MB IDE HDD (which is upgradeable) and has a 1.76 MB removeable floppy drive
  - Sound – 4 of 8-bit PCM channels with a maximum of 56 kHz DMA sampling rate

- Ports and Expansions [1]
  - In-terms of IO, the computer has: an analogue RGB video out, 2 x audio out (RCA), keyboard (6 min mini-DIN), 2 x mouse/gamepad (DE9), RS-232 serial ports (DB-25M), parallel port (DB-25F), floppy disk drive (DB-23F), ATA controller (40-pin)
  - In-terms of expansion, the computer has: 4 x 100 pin Zorro 3, an AGA video, 3 x 16-bit ISA, 200-pin CPU expansion, 4-5 x 72-pin SIMM
- Physical Layout [2,3]
  - The machine has 15 x 5 x 15 ¼" inch dimensions in W x H x D
  - At the front of the machine, there is a DVD drive and floppy disk drive
  - At the back there is a power port; serial, parallel and floppy expansion; keyboard, video and audio ports

iMac G3

(1999 – 2nd generation)

- Specifications [1]
  - CPU – PowerPC 750 @ 400 MHz
  - Memory – 64 MB of PC100 SDRAM, expandable to 1GB – 64 KB of L1 cache and 512 KB of L2 cache
  - Graphics:
    - ATI Rage 128 VR
    - 8 MB of SDRAM
    - 15-inc CRT display
    - 1024 x 768 resolution
  - Storage – 6, 10 or 13 GB HDD @ 5400-rpm
- Ports and Connectivity [1]
  - In-terms of IO, the computer has: 2 x USB-A 1.1, 2 x FireWire 400, 2 x headphone mini-jacks, analogue audio input mini-jack and a CD/DVD drive
  - In-terms of connectivity: an optional 11 Mbit/s AirPort 802.11b (for WiFi, adapter required), 10/100 BASE-T ethernet and a 65k V.90 modem
- Physical Layout [1,2]
  - The machine has 15 x 1 5 x 17.1 inch dimensions in W x H x D
  - At the front of the machine, there is the CD/DVD drive, speakers, audio jacks and the power button
  - At the side there is: audio in and out, FireWire, Modem, USB, Ethernet and the reset programmer switch

The 2000s

Power Mac G3

(2003)

- Specifications [1]
  - CPU – PowerPC 970 @ up to 2 GHz dual core
  - Memory – 512 MB of PC-3200 DDR SDRAM, expandable up to 8GB
  - Graphics:
    - ATI AMD Radeon 9800 Pro
    - Up to 256 MB of DDR VRAM
  - Storage – up to a 250 GB HDD @ 7200-rpm
- Ports and Connectivity [1]
  - In-terms of IO, the computer has: 3 x USB 2.0, 2 x FireWire 400, a FireWire 800, audio-in mini-jack, 2 x audio-out mini-jack and a DVD drive
  - In-terms of connectivity: AirPort Extreme 802.11b/g (optional, external antenna needed), a gigabit ethernet and Bluetooth 1.1 (optional)
- Physical Layout [2,3]
  - The machine has 8.1 x 20.1 x 18.7 inch dimensions in W x H x D
  - At the front of the machine, there is an optical drive, power button / status light, headphone jack, a USB-A 2.0 and a FireWire 400
  - At the side there is AirPort antenna, Bluetooth antenna, digital audio in / out, analogue audio in/out, 2 x USB-A 2.0, FireWire 400, FireWire 800 and an ethernet port

Dell XPS 730x

(2008)

- Specifications [1]
  - CPU – Intel Core i7 920 @ 2.66 GHz, 4 cores
  - Memory – 3 GB of DDR3 RAM, with a maximum of 6 GB
  - Graphics [2]:
    - ATI AMD Radeon HD4850, running on a PCIe 2.0 16x slot
    - 512 MB VRAM GDDR3
    - Resolution of up to 1600x900
  - Storage – 320 GB SATA HDD
- Ports and Connectivity [1]
  - In-terms of IO, the computer has: 8 x USB-A 2.0, an eSATA, PS2, microphone in (3.5mm), audio out (3.5mm), and a DVD drive
  - In-terms of connectivity: a FireWire IEEE 1394 and 1000 mbps Ethernet
- Physical Layout [1,3]
  - The machine has 8.6 x 21.9 x 23.4 inch dimensions in W x H x D
  - At the front of the machine, there is 2 USB-A, FireWire, audio in and audio out and a DVD drive
  - At the back there is 6 USB-A, eSATA and PS2, audio in and out and ethernet

The 2010s

Microsoft Surface Studio

(2016)

- Specifications [1]
  - CPU – 6th Generation Intel Core i7
  - Memory – up to 32 GB of RAM
  - Graphics:
    - NVIDIA GeForce GTX 980M
    - 4GB of GDDR 5 VRAM
    - 4500 x 3000 resolution
    - 28" touchscreen display
  - Storage – Hybrid drive setup (uses both an SSD and HDD) with up to a 128 GB SSD and a 2 TB HDD
- Ports and Connectivity [1]
  - In-terms of IO, the computer has: 4 x USB-A 3.0, full-size SD card reader and a 3.5mm headset combo jack
  - In-terms of connectivity: 1 gigabit ethernet port and WiFi 802.11ac, IEEE 802.11a/b/g/n, Bluetooth 4.0 and Xbox wireless
- Physical Layout [1]
  - The machine has a 12.1 x 17.3 z 0.5 inch display and 9.8 x 8.7 x 1.3 inch base dimensions in W x H x D
  - At the front of the machine, there is a 1080p camera compatible with Windows Hello
  - At the side there is a volume and power button, with the back having 4 USB-A, ethernet, power connector, mini DisplayPort, SD card reader and audio in/out

iMac Pro

(2017)

- Specifications [1]
  - CPU – up to 18-core Intel Xeon @ 4.3 GHz Boost
  - Memory – between 32 and 256 GB of DDR4 ECC SDRAM
  - Graphics:
    - AMD Radeon Pro Vega 56, 64 or 64X
    - Up to 16 GH MBM2 VRAM
    - 5120 x 2880 resolution
    - 27" LED display at 60 Hertz
    - 1.07 billion colours
  - Storage – between 1 TB and 4 TB SSD

- Ports and Connectivity [1,2]
  - In-terms of IO, the computer has: 4 x USB-A 3.0, 4 x Thunderbolt 3, SD card reader, headphone combo jack and support for up to 4 external displays
  - In-terms of connectivity: Internal WiFi 802.11a/b/g/n/ac, 10 gigabit ethernet and Bluetooth 5.0
- Physical Layout [2]
  - The machine has 25.6 x 20.3 x 65.02 inch dimensions in W x H x D
  - At the front of the machine, there is a 1080p HD FaceTime camera
  - At the back there is the headphone jack, SD card reader, 4 USB-A and 4 Thunderbolt 3 and an ethernet port

The 2020s

M1 Mac mini

(2020)

- Specifications [1]
  - CPU – Apple M1 chip with 8 CPU cores (4 performance, 4 efficiency) and 16-core neural engine
  - Memory – 8-16 GB of unified memory
  - Graphics:
    - Apple M1 chip with 8 GPU cores
    - Uses the unified memory as VRAM
    - Support for up to 2 monitors, 1 at 6K and the other at 4K via HDMI
  - Storage – 256 GB - 2 TB SSD

- Ports and Connectivity [1]
  - In-terms of IO, the computer has: 2 x Thunderbolt 4, 2 x USB-A 3.0, HDMI 2.0, Gigabit-10Gb ethernet, 3.5mmm headphone jack
  - In-terms of connectivity: WiFi 6 802.11ax & IEEE 802.11/a/b/g/n/ac, Bluetooth 5.0
- Physical Layout [1]
  - The machine has 7.7 x 1.4 x 19.3 inch dimensions in W x H x D
  - At the front of the machine, there is the power indicator
  - At the back there is all of the IO and connectivity mentioned above, and the power button and connector

MSI MEG Aegis Ti5

(2021)

- Specifications [1]
  - CPU – 10th Generation Intel i9-10900K
  - Memory – up to 128 GB of DDR 4 RAM
  - Graphics:
    - Up to a MSI GeForce RTX 3080
    - Max option has 10 GB GDDR6X VRAM
  - Storage – configurable to user's like, the machine has: 3 x M.2 SSD slots, 2 x 2.5" drive bays and a 3.5" drive bay
- Ports and Connectivity [1]
  - In-terms of IO, the computer has: 2 x USB-A 2.0, 5 x USB-A 3.2, 2 x USB-C 3.2, thunderbolt 3, PS2, HDMI out, 5 x audio jacks, a mic-in and headphone out
  - In-terms of connectivity: a 2.5G and a gigabit ethernet port, and Intel WiFi 6 AX2021, Bluetooth 5.1
- Physical Layout [1]
  - The machine has 551, 511, 239 millimetre dimensions in W x H x D
  - At the front of the machine, there is USB-C, 2 USB-A, mic-in and headphone-out
  - At the back there is everything mentioned in the IO and connectivity list above

Unit 36

Arcade Machine Investigation

Early History

1971-1977

The First Machines

(1971-1974)

- In 1971 at Stanford University in California[2], 2 students using a PDP-11 based machine which contained a series of 16-bit minicomputers[3] released a clone of "Spacewar!" called Galaxy Game.[1] However, this machine wasn't commercialised and wasn't widely used
- Later in the year, Syzygy Engineering launched the game Computer Space, which was the first commercial video arcade game.[1]
- In 1972, Atari released Pong. It was considered the first 'commercially successful' game and the first sports video game.[1]
- Later in 1974, Taito released Space Race, which was controlled via a racing wheel and introduced scrolling sprite graphics. [1]

Getting the Ball Rolling

(1975-1977)

- In 1975, Midway MFG released the first arcade game to use a microprocessor which allowed for smoother animations and improved graphics: Gun Fight. [1]
- The first ever first-person racing game with 3D graphics was released: Nürburgring 1 by Dr Reiner. [1]
- Atari starts to ramp up their production by releasing 4 new games: Hi-way, Crash 'N Score, Indy 800 (included with overhead mirrors on the cabinet so spectators can watch the game) and Steeplechase [1]
- In 1976, Sega enters the scene and released Moto-Cross which was the first game to use haptic feedback on the game's handlebars during a collision. Sega later released Heavyweight Champ which was the first game to feature hand-to-hand fighting. [1]
- Atari continues pushing out new games with Night Driver (a FP racing game) and Breakout. [1]
- Exidy releases Death Race[1], which was a game to "inspire protest and cause panic". [2]
- Gremlin releases Blockade which used mechanics seen in the game "Snake". [1]

The Golden Era

1978-1986

✨ Early Golden Era ✨

(1978-1981)

- Causing the start of the golden area in 1978 – Taito releases **Space Invaders** which is the first blockbuster arcade game and has influenced most shooter games released since. [1]
- In 1979 Atari releases Asteroids which is their best setting game of all time. [1]
- Namco later releases Galaxian which is the first game to use RGB colour. [1]
- In 1980, the first game to include voice synthesis was released: Speak & Rescue by Sun Electronics. [1]
- Namco later releases Pac-Man, one of the most influential games of all time and was one of the first games to use power-ups and cutscenes. [1]
- Data East released the first standardized platform: the DECO Cassette System which many future games were made for. [1]

✨ Late Golden Era ✨

(1982-1986)

- In 1981, Nintendo enters the industry with Donkey Kong – one of the first platformer games. [1]
- Konami later released Scramble which was one of the first side-scrolling shooter and multiple distinct levels. [1]
- In 1982, Namco releases Pole Position, which was the first 16-bit video game. [1]
- In 1983 the first game to use digitized sprites is released: Journey by Bally Midway. [1]
- Atari releases an arcade version of Star Wars as a 3D vector graphics simulation. [1]
- In 1885 Nintendo releases Vs Super Mario Bros – the arcade version of Super Mario Bros. [1]
- In 1886, Exidy releases Chiller – one of the first times blood and gore is seen in an arcade game. [1]
- Vidid Group later releases the first 'virtual reality' arcade game to use 3D polygon graphics: Turbo Kourier. [1]

Post-Golden Era

1987-present

The End

(1987-present)

- As time progressed, Arcades became less and less popular, especially with the introduction of PC gaming and console gaming. Depending on the area, Arcades still do exist and operate today but with no where near the popularity they used to have.
- Games such as Street Fighter and Mortal Combat were released during this period which helped maintain some popularity, but as these titles started getting ported to different platforms their popularity once again decreased

Unit 36

TV Gaming Investigation

Plug and Play

- Plug and Play are devices that can be directly plugged into a TV and can be used to play a game – for example Pong!
- These devices are usually built inside controllers to keep clutter down.
- The first plug and play devices were seen around the mid 1990s when the Retro Game movement started to gain more popularity

- Using a HDMI signal, the PnP games do all the processing for the game on its own compute unit. It is essentially a single-game console that has everything build inside of it.

Ceefax and Teletext

- Ran by BBC and ITV, Ceefax and Teletext were primarily for seeing the current news, listening to the radio, booking flights and much more.
- These systems also included a couple, very basic games. These games could be accessed and played just like they were a TV channel.
- Ceefax was able to play the following: Howlers, Dotty Trees, Loony Limericks, Reg's Tale, Tee Hee, Figure It Out, Daft Definitions and Riddler's. When you selected a game, it would briefly show you a description of the game before it begins. The games are controlled via the remote controller.
- Teletext was able to play: Bamboozle, Competition, Children, Digitiser, Chess and Bridge. Similarly to Ceefax, the game's description will be shown before you can play.
- For both systems, you select the game through typing it's number at the top left search box.

Smart TVs

- Most modern smart-tvs include app stores, from which games can usually be downloaded
- Some TVs run off Android TV, meaning they can play supported games directly off of the Play Store
- This works similarly with Apple TV as you can download apps from the App Store on that.

- However Android TV and Apple TV vary in how they operate: Android TV is usually baked into TVs and is the primary operating system for the TV. However, Apple TV comes as a separate box that must be plugged into a TV through HDMI.