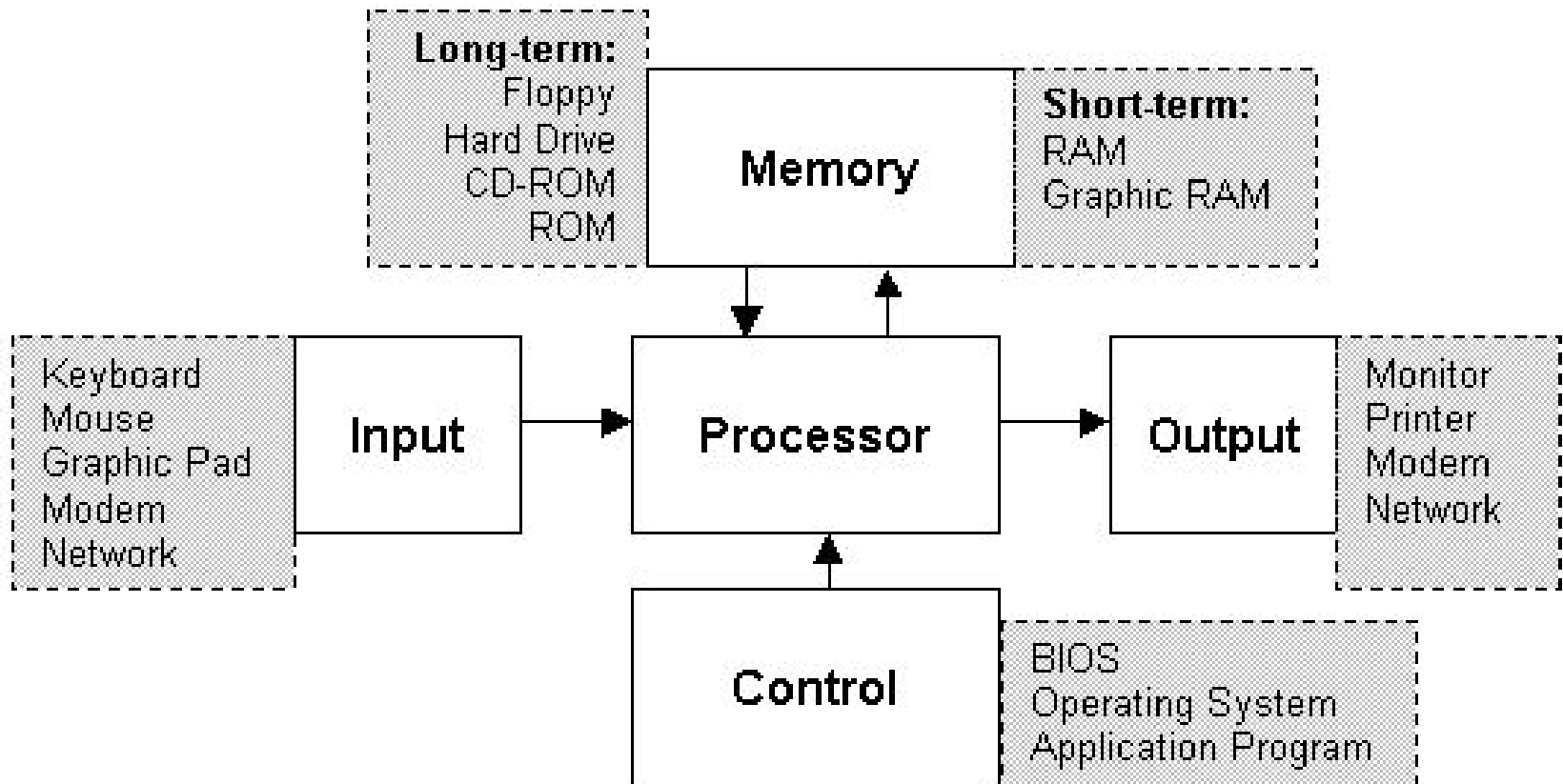


Computer Basics 'Then and Now'

Combined Probus Club of
Wheelers Hill

- The first microprocessor chip was developed in the 1970s and it wasn't long before the first personal computers appeared.
- Early PCs for home use lacked any kind of standardisation, had limited amount of memory, and generally used audio cassettes to load and save programs.
- Examples were the Commodore 64, Vic-20, TRS-80, Atari, Sinclair, PET, and Apple.
- When IBM released their PC in 1981 the personal computer revolution really got going. They used a new operating system called PC-DOS provided by the newly formed Microsoft company.
- IBM clones started appearing. Most offered MS-DOS, which was essentially the same as PC-DOS.
- The industry now had a defacto standard for both hardware and software.

Anatomy of a PC



Not Just PCs

- Microprocessor systems are everywhere.
- They form the basis of:
 - Mobile phones
 - Smart TVs
 - Computer tablets
- They also run our cars, most home appliances, and supermarket checkouts, to name just a few.

CPU

- Central Processing Unit, now all in one microprocessor.
- Three Types of Tasks:
 1. Move data between various parts of system.
 2. Perform arithmetic operations.
 3. Perform logical comparisons for decisions.
- #1,2 done by Control Unit(CU), #3 by Arithmetic-Logic Unit (ALU).
- Over time other functions have been added to the CPU chip. Most chips incorporate a Graphics Processing Unit (GPU) which may or may not be used plus other support functions which were formerly separate chips.
- The IBM clone family has stuck with the x86 family of CPUs graduating over time from 8-bit to 64-bit processing.
- The recently released Windows 11 is restricted to 64-bit.
- The two main CPU makers are Intel and AMD. Their chips are not interchangeable.

CPU Performance

- Clock speed is most obvious indicator. The first IBM PC had a clock rate of 1 MHz. Current motherboards run at more than 3 GHz.
- Clock sets the pace and synchronizes components. *Think metronome, drummer in marching band.*
- Other differences in architecture affect amount of work done per ‘tick’ of clock.
Intel <> AMD!
- Modern chips include cache memory, and multiple processing cores.
- The faster it runs, the hotter it gets. Cooling is essential. The first PCs relied on natural ventilation. Current PCs have a chip fan as well as one or more case fans. Some use water cooling of the CPU.

Main (Short Term) Memory

- Some form of RAM – Random Access Memory, freely read/write.
- Storage capacity in Bytes – the first PCs had 640 kB of RAM. Modern PCs have at least 4 GB.
- Also speed issues
 - SRAM
 - DRAM
 - SDRAM
 - DDR double data rate
- Speed comes at price of volatility. Contents are lost when the power is off.
- RAM now comes in modules which plug into the motherboard whereas the RAM in the first PCs was soldered onto the board.

Specialized Memory

- Other type is ROM – Read Only Memory
- Contents cannot be changed. Data “locked” in at manufacture.
- Is non-volatile – data not lost when power is lost.
- Used in PCs mainly for BIOS, Basic Input Output System, startup instructions for PC. Modern PCs use flash memory for the BIOS which means it can be updated.
- Flash – specialized type that can be erased and re-written. Used in memory cards and USB sticks, and now in Solid State Drives (SSD).

Disk Drives

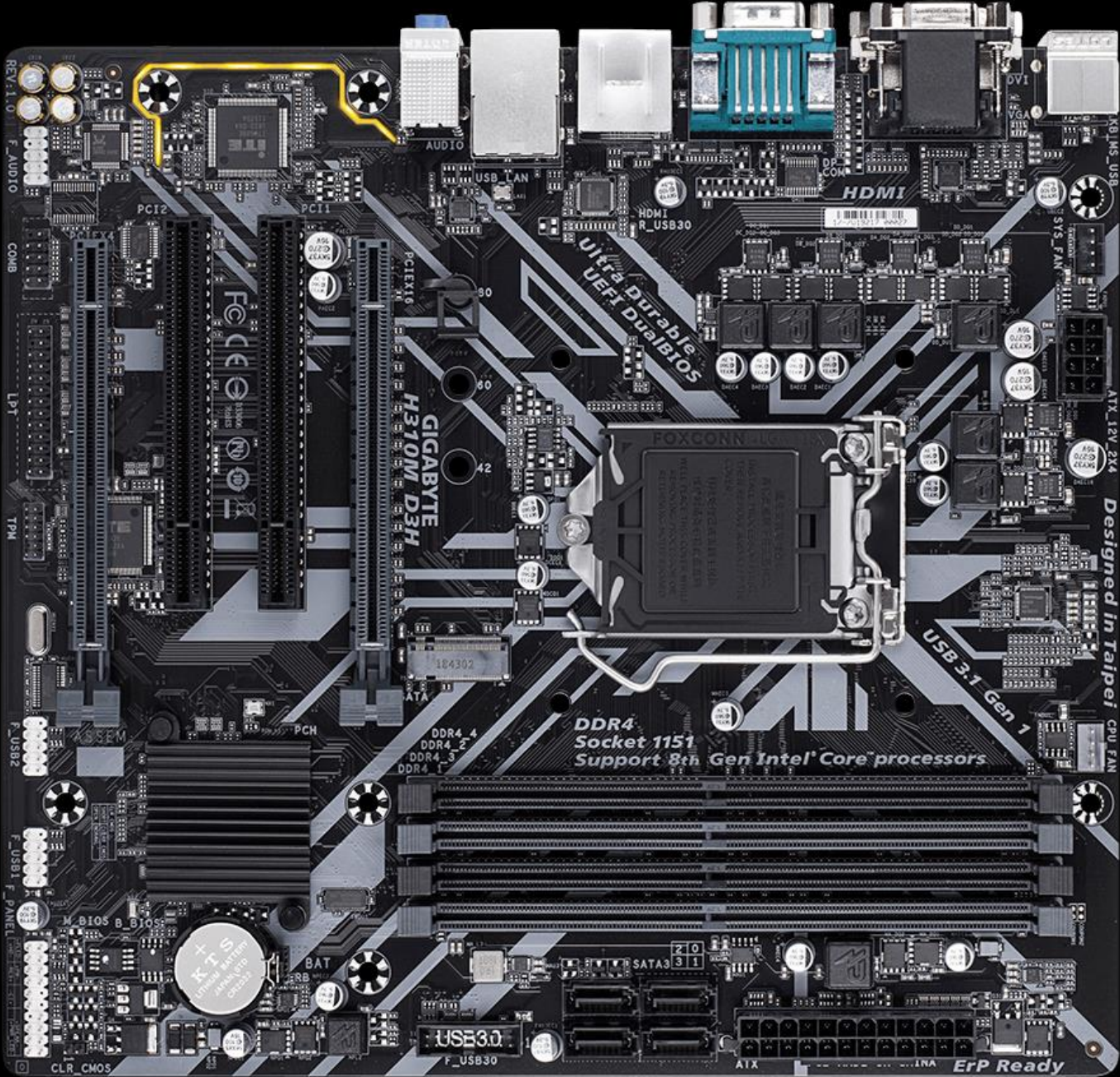
- Hard disk contains dormant programs and data - retained when power is off.
- Processor cannot use contents directly, must copy into memory first.
- Much, MUCH slower compared to processor and main memory.
- Larger/faster disk normally does not make machine much faster as a whole.
- On-board cache improves performance.
- Installing programs/apps basically copies from CD to HD.
- The advent of SSDs means much faster data transfer.

How It Works: “Booting” the PC

1. System power-on. The ‘power’ switch on a PC front panel does NOT turn everything off. The switch on the PSU does.
2. BIOS instructions executed. BIOS is now replaced by UEFI (Unified Extensible Firmware Interface).
 - Check h/w configuration has not changed.
 - Self-test of memory and hardware POST beeps
3. Access boot sector of hard drive or other boot device (CDROM, USB drive).
4. Load Operating System kernel into memory.
5. Pass execution (and control) to O/S.
6. O/S may be Windows but could also be one of the many versions of Linux, or an Apple O/S.
7. The O/S provides an environment for running programs (apps).

Motherboard

- Mobo connects CPU & RAM with all other system components.
- CPU and RAM installed in sockets or slots.
- External devices plugged into ports at rear.
- Adapter boards installed into internal slots on a bus.
- Storage devices plug into SATA sockets (was IDE in old days).
- M2 socket now provided for SSD M2 modules.
- Connectors for front panel controls and indicators.
- Power connectors.
- Fan connectors (note than fans = dust build up).
- Battery to maintain real-time clock (and BIOS setting in older PCs).



Combined Probus Club of
Wheelers Hill

Interfaces

- Keyboard - PS2 or USB
- Mouse - PS2 or USB
- Audio
- USB ports
- Video; VGA, HDMI, Displayport, DVI
- Ethernet
- Front panel (USB & audio)



Combined Probus Club of
Wheelers Hill

More on Motherboards

- Motherboard choice depends on CPU choice – *and vice-versa*.
- Tend to be labelled by the 'chipset' make and model. The chipset provides the link between the CPU and the I/O devices.
- Most motherboards can use integrated GPU for video graphics. This means some of the RAM is used for the video, reducing the amount available for other use.
- For graphic intense application like games, a separate graphics card is preferred.
- Motherboard form factor – size & shape, mounting.

PSU

- The Power supply unit provides all the DC power for the CPU and storage devices.
- It has a true on/off switch and is usually mounted at either the top or bottom of the rear of the case.
- Power rating is typically about 400 W but can vary from 250 W to more than 750 W.
- Higher wattages are only required for very high-powered CPU systems with many storage drives.

Inside a PC Case



Combined Probus Club of
Wheelers Hill

Putting It Together

- Computers can be bought as a “package” or assembled from components (by you or a supplier).
- Packaged units are simpler but need to consider future replacement of parts. Watch for “non-standard” cases and “locked” OS.
- Ensure system comes with disks for OS, drivers etc., although OS are generally down-loaded now so there may just be a registration number.