

Computing

Lesson 2: Under the Hood

Computer Systems

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Task 1 - Check the specs

The configuration of a computing system is described using 'specs' (specifications), a table of hardware components and technical characteristics.

In the pages that follow, you will find the specs for a range of computing systems. Real-life specs can be difficult to read. They may include a lot of technical jargon, and the information presented sometimes depends on what the manufacturer wants to highlight for commercial reasons.

The specs in this handout have been simplified, and the information is structured and presented in a uniform way, to facilitate comparisons.



Typical Desktop

Processor	8-core CPU, clock speed 3.0GHz, 12MB cache
Memory	8GB RAM
Storage	512GB SSD (solid-state disk) 1TB HDD (hard disk drive)
Communication	Ethernet (wired) Wi-Fi, Bluetooth (wireless)
Graphics processor	Advanced gaming GPU Over 1000 cores and 6GB memory



Source: Pixabay



Typical Desktop

Expansion slots

Hard disk slots
Memory slots
Expansion slots (e.g. for sound or graphics cards)

Connections

Ports for video output (screens)
Ports for sound input and output (microphone, speakers)
Ports for other devices (through USB)

Power

225W via power connectors (460W power supply)

Software

Operating system
Productivity software (office suite)
Security software



Source: Pixabay



Typical Laptop

Processor	4-core CPU, clock speed 1.6GHz, 6MB cache
Memory	8GB onboard RAM
Storage	256GB SSD (solid-state disk)
Communication	Wi-Fi, Bluetooth (wireless)
Graphics processor	Integrated GPU
Video	13.3" IPS multitouch display, 1920 x 1080 Camera



Source: Pixabay



Typical Laptop

Sound	Microphone and speakers
Connections	Ports for video output (screens) Ports for sound input and output (microphone, speakers) Ports for other devices (through USB) Slot for storage (SD card)
Power	60Wh lithium-ion battery
Weight	1.2kg
Software	Operating system



Source: Pixabay



Typical Mobile Phone

Processor	8-core CPU, clock speed 2.3GHz Includes an integrated neural processing unit
Memory	8GB onboard RAM
Storage	512GB
Communication	Wi-Fi, Bluetooth, NFC, MHL (wireless) GSM, 3G, 4G (mobile telephone network)
Graphics processor	Integrated GPU
Video	5.4" display, 3040 x 1440 Front and rear cameras



Source: Pixabay



Typical Mobile Phone

Sound	Microphone and speakers
Sensors	Accelerometer, ambient light, barometer, compass, fingerprint, gyroscope, heart rate, magnetometer, proximity
Navigation	GPS, GLONASS, Galileo
Connections	Ports for sound input and output (microphone, speakers) Ports for other devices (through USB) Slot for storage (SD card)
Power	12Wh battery
Weight	150g
Software	Operating system for mobile devices



Source: Pixabay



Raspberry Pi 4

Processor

4-core CPU, clock speed 1.5GHz

Memory

4GB onboard RAM

Storage

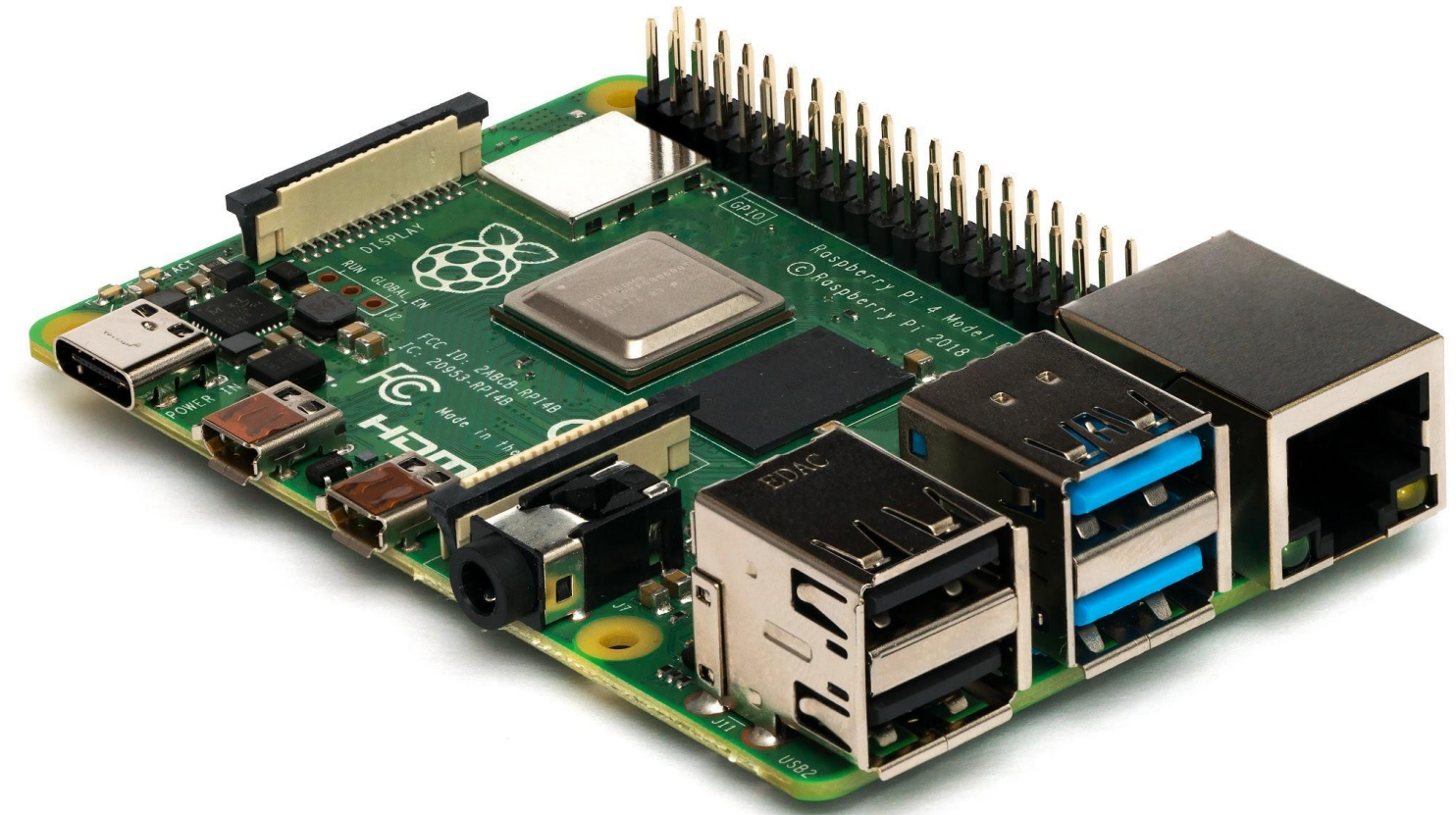
No onboard storage
Uses SD card for software and data storage

Communication

Ethernet (wired)
Wireless LAN,
Bluetooth (wireless)

Graphics processor

Integrated GPU



Sources:

<https://www.raspberrypi.org/products/raspberry-pi-4-model-b/specifications/>

https://en.wikipedia.org/wiki/Raspberry_Pi

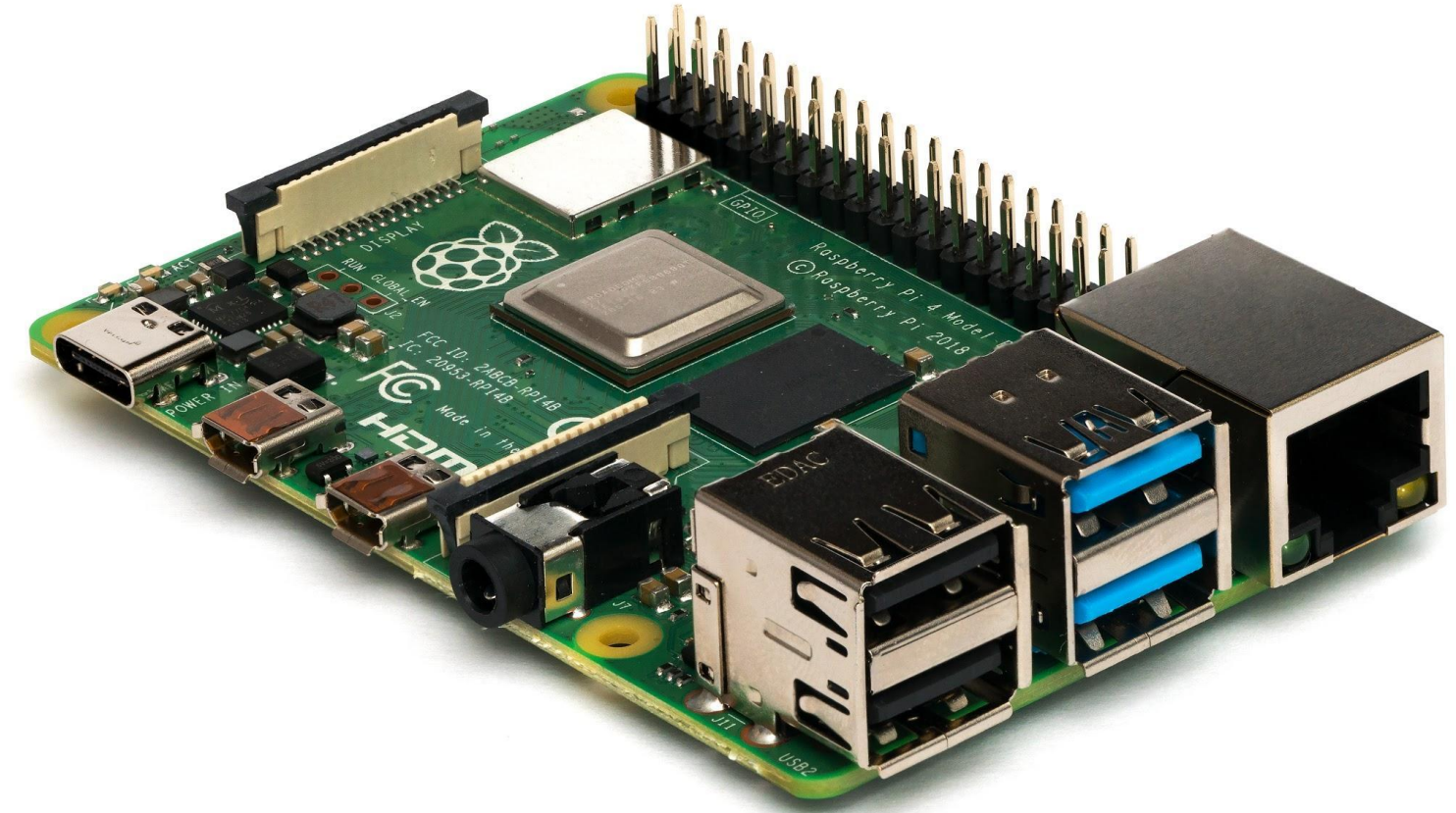


Raspberry Pi 4

Connections Standard 40-pin GPIO header
Ports for video output (screens)
Port for video input (camera slot)
Ports for sound input and output (microphone, speakers)
Ports for other devices (through USB)
Slot for storage (SD card)

Power Via 5V USB-C connector or GPIO header

Weight 46g



Sources:

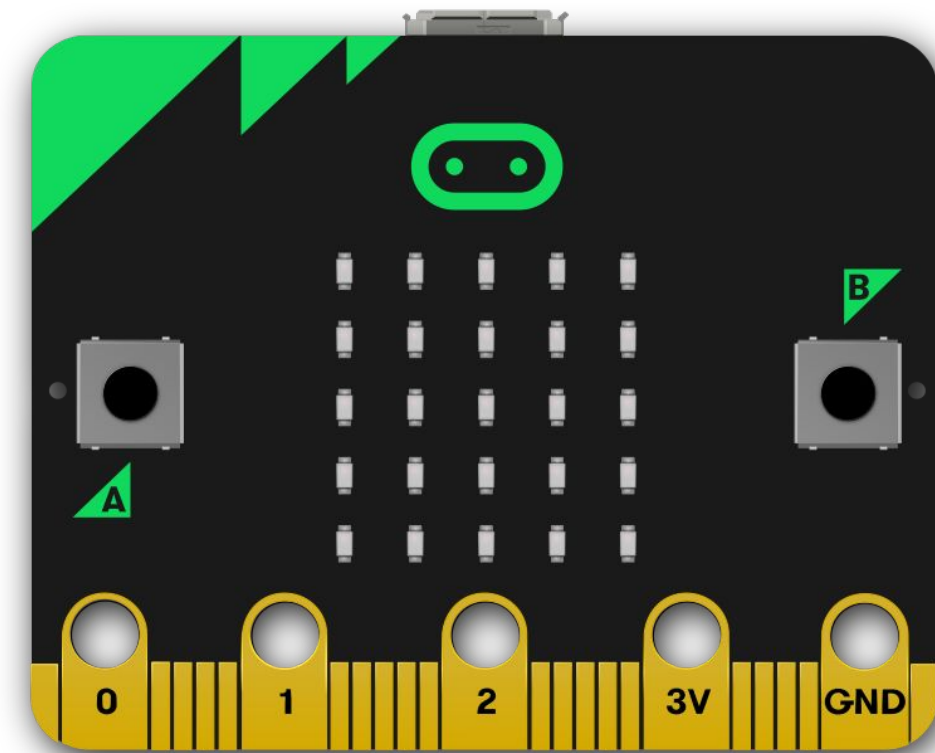
<https://www.raspberrypi.org/products/raspberry-pi-4-model-b/specifications/>

https://en.wikipedia.org/wiki/Raspberry_Pi



micro:bit

Processor	Single application processor, clock speed 16MHz
Memory	16kB onboard RAM
Storage	256kB
Communication	Bluetooth, Low Level Radio (wireless)
Display	5x5 red LED matrix
Buttons	2 tactile user buttons, 1 tactile system button

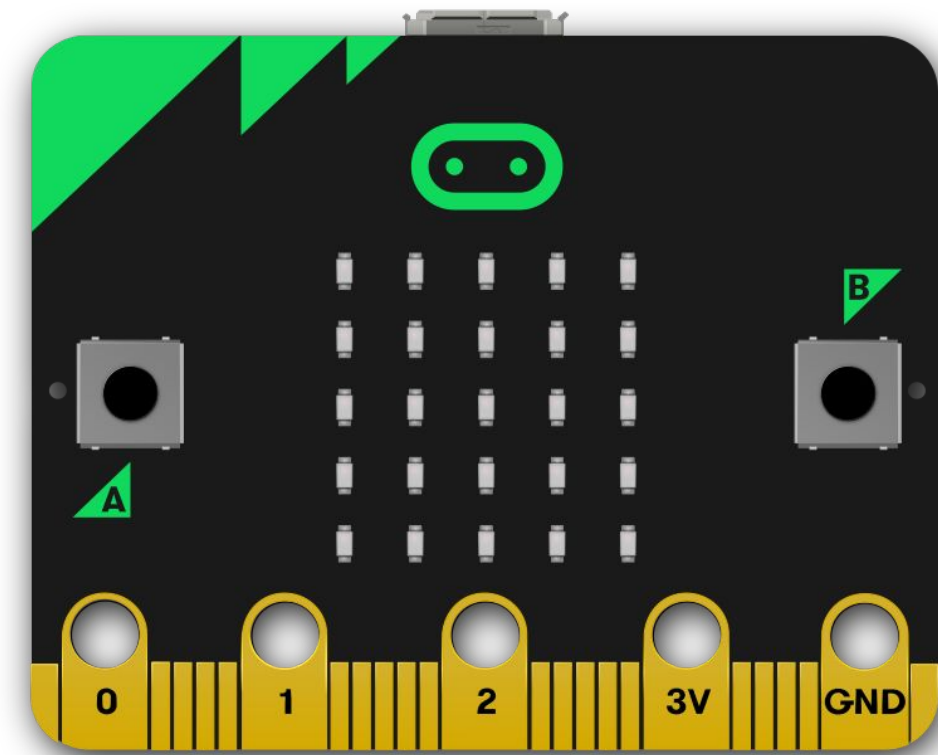


Sources:
<https://tech.microbit.org/hardware/>
https://en.wikipedia.org/wiki/Micro_Bit



micro:bit

Sensors	Ambient light, accelerometer, magnetometer, temperature
Connections	3 input/output rings, 2 power rings
Power	Via USB connection, the interface chip, or a battery
Weight	5g

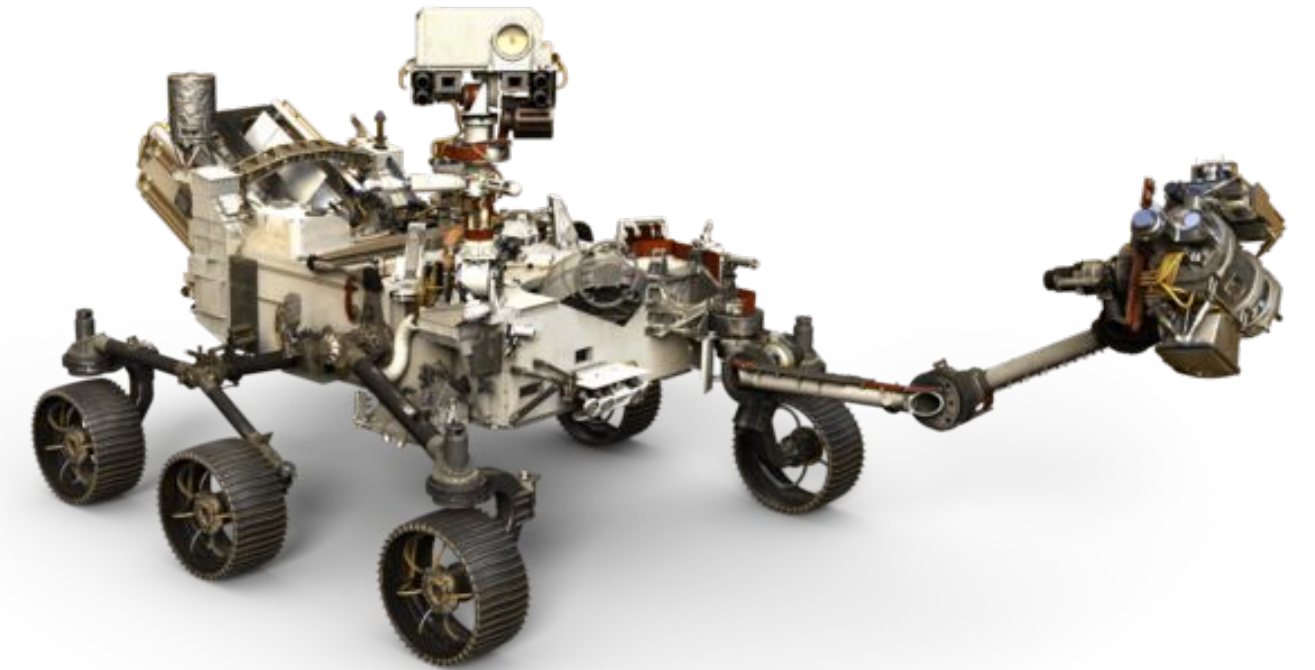


Sources:
<https://tech.microbit.org/hardware/>
https://en.wikipedia.org/wiki/Micro_Bit



Perseverance rover: Mars 2020 mission

Processor	Radiation-hardened CPU, clock speed 110MHz
Memory	256MB onboard RAM
Storage	2GB + 256kB EEPROM
Communication	Ultra-high frequency antenna X-band high-gain antenna (transmission) X-band low-gain antenna (reception)



Sources:

<https://mars.nasa.gov/mars2020/spacecraft/rover/brains/>

[https://en.wikipedia.org/wiki/Perseverance_\(rover\)](https://en.wikipedia.org/wiki/Perseverance_(rover))

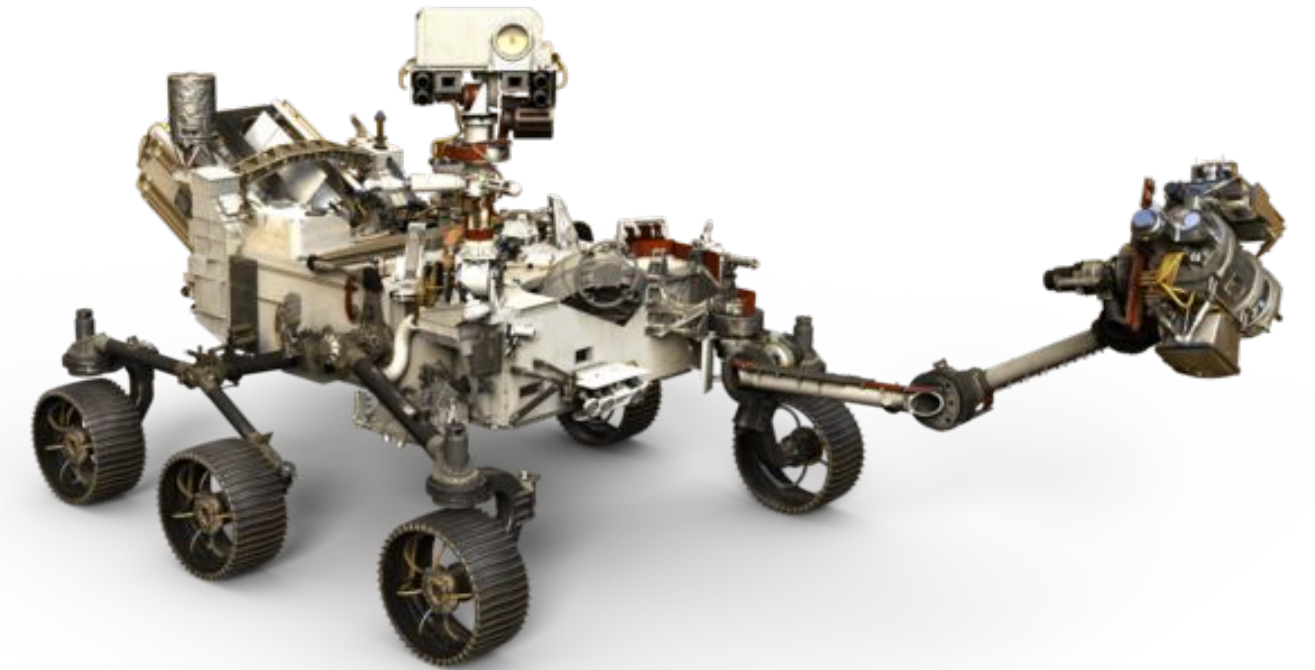
Image source:

<https://mars.nasa.gov/resources/mars-2020-rover-artists-concept/>



Perseverance rover: Mars 2020 mission

Video	23 cameras
Audio	2 microphones
Sensors	Inertial Measurement Unit (IMU) A range of instruments for measurements and scientific experiments
Power	Radioisotope power system 2 lithium-ion rechargeable batteries
Software	Real-time operating system Flight software Surface operations software



Sources:
<https://mars.nasa.gov/mars2020/spacecraft/rover/brains/>
[https://en.wikipedia.org/wiki/Perseverance_\(rover\)](https://en.wikipedia.org/wiki/Perseverance_(rover))
Image source:
<https://mars.nasa.gov/resources/mars-2020-rover-artists-concept/>



Task 1 - Complete the table

	Desktop	Laptop	Mobile	Raspberry Pi 4	micro:bit	Rover
Processor	✓					
Memory	✓					
Storage	✓					
Communication	✓					
Graphics processor	✓					
Input and output						
Connections	✓					
Weight						



Task 1 - Similar components - part 2

What are the components that are present in every one of these computing systems?



Task 2 - Wearable computing

The image on the next slide shows several different **hardware components** of a wearable computing system called Google Glass. Label each component using one of the labels provided below.

Input

Output

Program execution

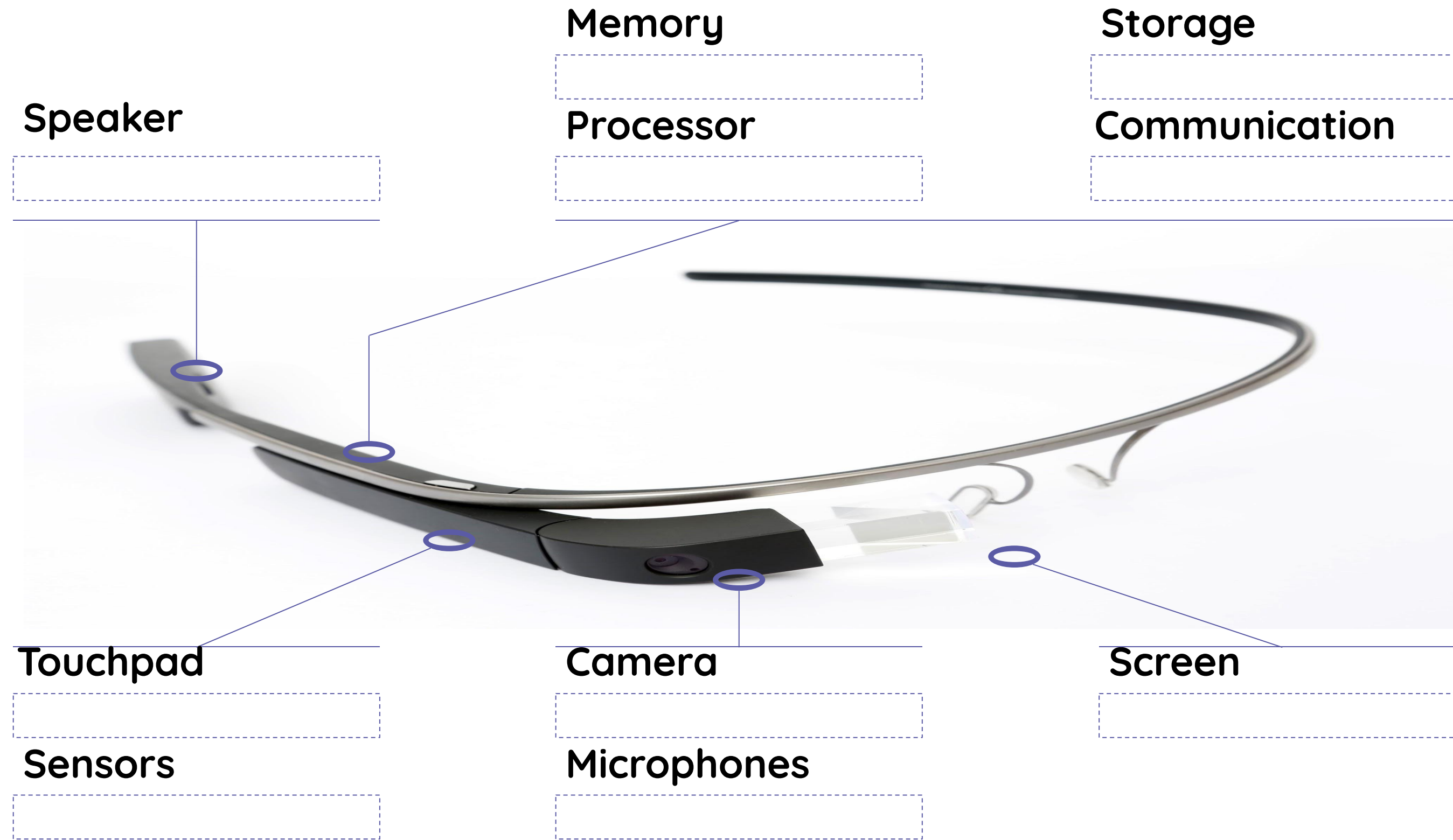
Data exchange
with other systems

Program & data
(volatile storage)

Program & data
(persistent storage)



Task 2 - Wearable computing - part 2



Google Glass Main
Source: Wikimedia

