20CSI605 - Mobile Application Development

Integration with Hardware Components

Integration with hardware components

- **Hardware integration** (also called Hardware-Software integration or system integration) is the process of writing software that connects with one or more pieces of physical hardware to make a single usable system.
- Frequently a single piece of hardware works with a companion App to complement its features or provide all of its user-facing functionality such as a display screen and control.

Integration with hardware components

Hardware integrated devices may include:

- Optimized hardware modules including system-on-module (SOM) and system-in-package (SiP) solutions that can be integrated in final hardware platforms
- Product accelerators : form factor hardware platforms that support dedicated use-cases and can be customized to fit final product needs
- Standalone hardware available for a larger variety of platforms that can be used in final products

Main Components of a Hardware Integrated System

Five main Components

- **Physical hardware** – This is the physical device that provides the data that is monitored and analysed. A few examples of physical hardware include In/Out (I/O) devices, basic integrated circuits and electronics or more complex devices like cameras and small computer systems.
- **Sensors** – These are monitoring devices connected to the physical hardware that receive data and transform it into a format that can be processed by a computer. These sensors can be thermometers, pressure sensors or specialised timers.

Main Components of a Hardware Integrated System

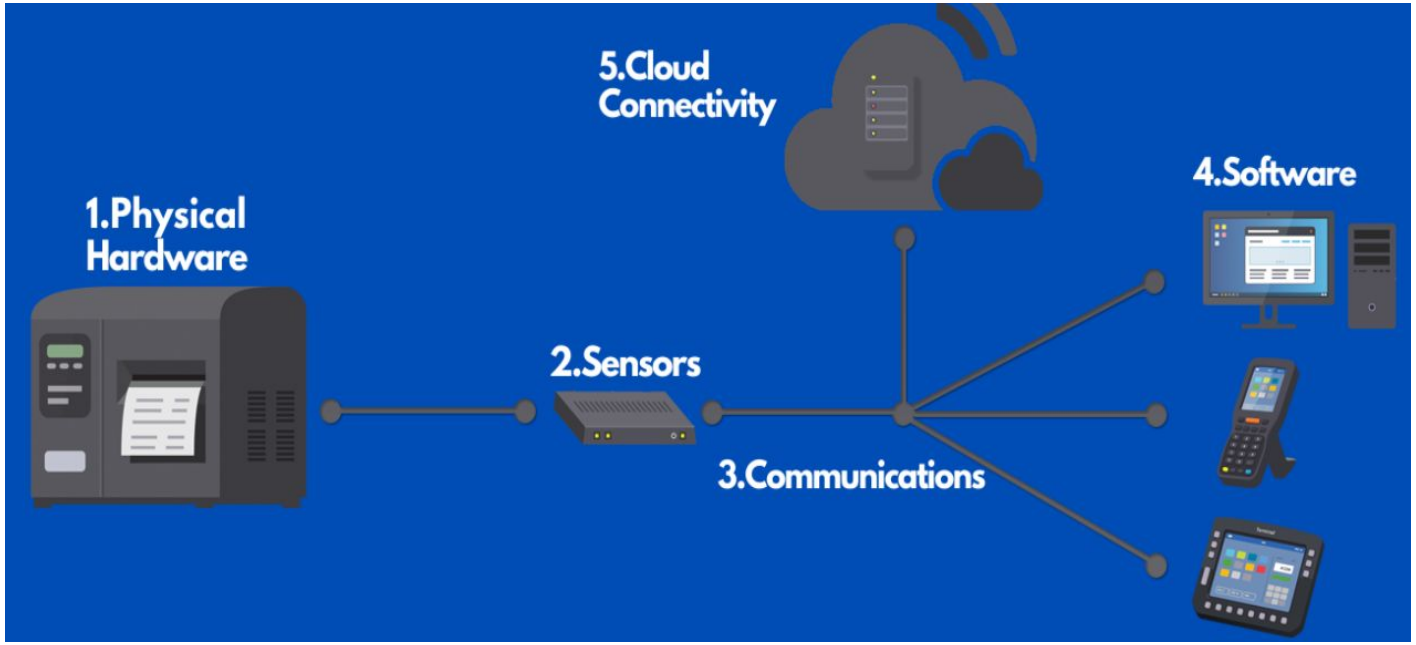
Five main Components

- **Communications** – The method through which the electronics communicate with the software. The communication can be physical (USB cables, Ethernet cables, HDMI cables, Fibre) or wireless (Wi-fi, Bluetooth and Bluetooth Low Energy).
- **Software** – These are applications that allow end-users to manage and control the physical hardware and the data it gathers. The objective of most Hardware integration Apps is to complement the functionality of the hardware system and extend the user interface onto the users device or computer.

Main Components of a Hardware Integrated System

Five main Components

- **Cloud Connectivity** – using an intermediary device such as a phone or using 4G and wifi to directly connect, cloud connectivity of hardware is the final piece to the "Internet of Things" or IOT puzzle.



Example

Software controlled lighting equipment for operating theatres

- Operating rooms utilise a number of surgical lamps and general lighting fixtures to assist the clinical staff and the surgeon working at the surgical site.
- A complex may have two or more totally separate systems and hundreds of different settings.
- This is why most operating lighting systems are connected to digital control panels that can adjust their colour temperature (e.g. warm/cold), intensity and focus and in some cases, the RGB colour mix as some procedures need to be done under full green or blue lighting.
- The software can then easily store these settings and change between presets so that the entire lighting system can re-arranged with the touch of a button

Example

GPS tracking system for delivery companies

- One of the oldest and most prolific examples of an integrated hardware solution is the combination of GPS and traffic monitoring systems that delivery companies use.
- These systems utilise data from traffic cameras and position data from GPS systems to predict the best route for delivery drivers. In turn, this helps deliveries stay on schedule.

Example

Automated robots for warehouse management

- When you have a warehouse with thousands of items stored in boxes finding the right item can be a tedious task.
- This is why the biggest warehousing companies have adopted integrated systems with automated robots that use data from warehousing databases to easily find and retrieve items from anywhere in the warehouse.
- This saves a lot of person-hours during the daily movement of inventory in and out of the warehouse.

How can hardware integrated systems directly increase profits?

On the whole, when using a companion App or other integrated system, you can directly influence the profit margin of your business, increase customer satisfaction and differentiate your products in the marketplace.

- **Increasing the quality of work** – by constantly monitoring and controlling the process with the use of a software application your business can fully automate quality control.
- **Monitoring for production failures** – using a system of connected sensors and gauges you can be alerted of a possible failure in the production line that would slow your output.
- **Decreasing the need for manual labour** – since your devices can share information between one another and make the necessary adjustments less time is spent on manual calibration

How can hardware integrated systems directly increase profits?

- **Eliminating bottlenecks in the production** – when you have software that can monitor and analyze data from the entire production line you can quickly spot where bottlenecks are happening and eliminate them.
- **Improve inventory control** – When your warehouse database is connected to a proper analytics dashboard you can analyze and predict how your inventory is moving and what you need to keep in stock.
- **Make complicated hardware setups easier** – Sometimes your hardware will need to be adjusted and calibrated differently for every job. With an integrated software solution, you can easily save your settings and reuse them again when needed.

Hardware Integration / Benefits

- Quickly add and remove devices from the infrastructure system
- Optimise the data distribution process
- Add and remove features easily
- Increase all departments' workflow efficiency
- Benefit from real-time backup
- Reduce time spent on the back-end office processes

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THANK YOU