

**Noah's Capsule HCK001**  
SoC Final Project – Group 1

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# **Introduction**

Is there any product that can meet both of these needs?

1. a comfortable and immersive entertainment environment
2. a place where people can rest and sleep well
3. a place where people can be isolated from the outside world
4. to provide people with a good independent working environment

Taking the capsule hotel market as an entry point, Why do we need a product such as a capsule hotel ? A capsule hotel is a type of hotel that provides a simple and comfortable place to stay. They are usually made up of a number of small, capsule-shaped accommodation units, each of which can usually accommodate only one person. The main advantage of capsule hotels is that they offer basic amenities while keeping room rates low. They also offer a convenient accommodation option, especially for people who like to experience exotic places or travel for business.

The market for capsule hotels is estimated at US\$218.89 million in 2020 and is expected to grow at a rate of more than 8.20 percent from 2021 to 2027.

The growth of personal travel in many regions of the world and the continued introduction of personal travel by companies are contributing to this market. And, coupled with the low investment necessary to build capsule hotels, the increase in corporate and business meetings where people can travel for short periods of time, and the increase in favorable government initiatives to expand tourism, has brought new opportunities to the capsule hotel industry.

But the main drawback of capsule hotels is that they just provide a simple place to rest or sleep rather than a suitable working environment, and they can only be used for a single purpose, i.e. rest.

"Now that companies around the world are in the third stage of the epidemic, where strains of the virus continue to mutate and the epidemic is slowing down and heating up, the focus is no longer on telecommuting/working from home, but on how to ensure that employees are productive and have a consistent work experience regardless of where they work."

This means that people's work style will move from Work From Home (WFH) to Work From Anywhere (WFA), and any plans deployed by company will not just support employees working from home or take turns going to office, but will enable them to access the resources they need from any device, anywhere, whether at home, in the office, or in a temporary location. access the resources they need from any device, at home, in the office or in a temporary location.

Global multinationals are taking a new turn in their office leasing strategies: 58% of respondents in Asia Pacific are inclined to increase the use of non-traditional office space, such as co-working spaces and serviced offices, as office space, indicating that many corporate tenants are still cautious about capital expenditure decisions. On the one hand, this indicates that many corporate tenants are still cautious about capital expenditure decisions, and with limited new supply in major office districts, there are not many unused units available for relocation in the market. CBRE believes that the new hybrid office model of "office + telecommuting" will become mainstream in the next five years.



Figure.1



Figure.2



Figure.3

The three pictures above are of Tokyo's time-limited sleep capsule, and its service is only to provide people with a place to rest and sleep at busy stations, but it is still not considered comfortable enough. There is only a chair and a table inside, as well as a coffee machine.



Figure.4

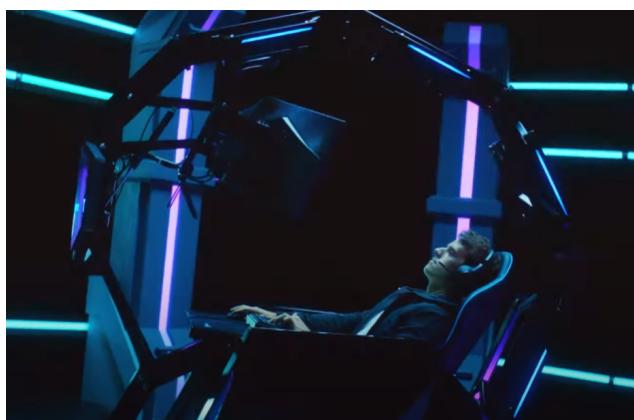


Figure.5

The two pictures above are of a gaming company's eSports cockpit, which is geared towards providing high-quality gaming experiences for players, allowing them to have a good and comfortable gaming experience in the

cockpit.



Figure.6

This is an airline's cockpit trainer, which provides professional simulation and immersive experiences for pilots to engage in realistic simulated flights. We hope to provide a product that satisfies the following three conditions for people:

1. Provides immersive experiences for people.
2. Provides a comfortable resting space for people.
3. Provides an environment for people to escape the noise.

## **Motivation**

Our motivations are mainly the following two points:

1. The high housing prices in cities make it difficult for people to find a place to live and settle down, and people need a space that belongs to themselves.
2. The high pressure in modern life makes it necessary for people to have a place to relieve stress that belongs to themselves.

We hope to provide the following two important functions: immersive experience and smart home experience.

For an immersive experience, the gaming experience Playing with 144 Hz QLED Curved Monitors, and having a Gaming workstation, gives you the best gaming experience.

For an immersive experience ,the working experience, you can work at any place you want and work with the Huge monitor to improve your efficiency.

For smart home experience, the smart home can work with sensors and monitor the condition in the cockpit.

## Architecture

In this product, the architecture of it is shown as the figure.7 below. It consists of three parts: sensor, arduino board, wifi, main control and display. First, sensors, in order to let users soak in a friendly environment and make themselves at home, are equipped with multiple sensors for different functions such as temperature, cameras, humidity, light and air-conditioning. With these sensors, the system can do the modification so as to let the place be comfortable for users. These sensors are regarded as the I/O of the system. After installing the sensors, the data collected by the sensors will be sent to the arduino board and then use the wifi will connect to the main control system. And then the main control system can get the data from the sensors. In the main control system, it comprises CPU, GPU, and the memories, SSD and RAM. Here, CPU, Intel 13th core is adopted. With its powerful arithmetic capability, it can process at 1.20 GHz. That enables the users to build up an IoT environment. For the graphics processing unit, NVIDIA GetForce RTX4090 is equipped in our system. This is the latest version and the most powerful functionality of GPU now. It can work at 148FPS when running 11 kinds of games on average. With its ability, it enables clients to experience a real-time game. As for the memory, here it takes DDR5 which is up to 32GB and 8TB V NAND SSD as its memory. At last, for the display, the technology, the OLED panel, is adopted in this system. OLED provides the users with high resolution and a wide range of screens. That enhances the feeling of immersive experience. According to all the components which are mentioned in this section, it allows all clients to have a new experience of an immersive environment.

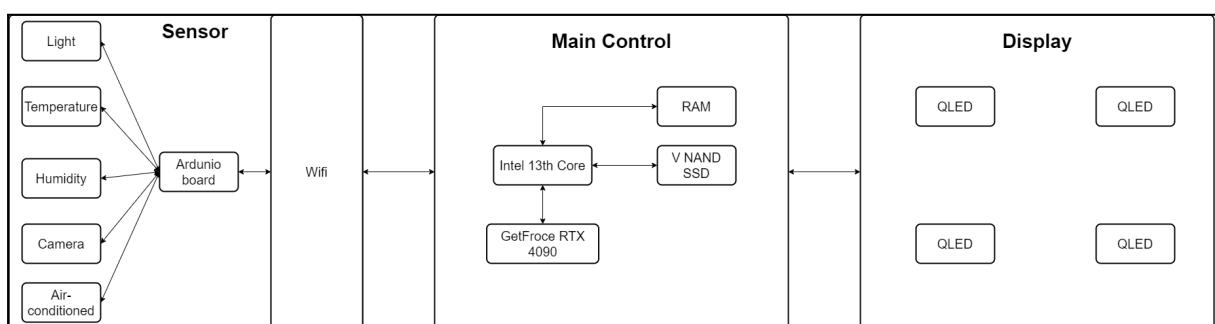


Figure.7

# Technology

## i. Smart Cockpit

**We hope to use massage chairs as cockpit chairs to bring users a comfortable experience.**

Our massage chair hopes to provide the following functions:

1. Heat therapy : the use of infrared or heating pads to help alleviate muscle fatigue and relieve muscle spasms.
  2. Air pressure massage : the use of pressure sensors to control air pressure for massaging muscles.
  3. Vibration massage : the use of vibrations to relax muscles.
- infrared lamp , air pressure sensor and temperature sensor, accelerometer, pressure sensor.

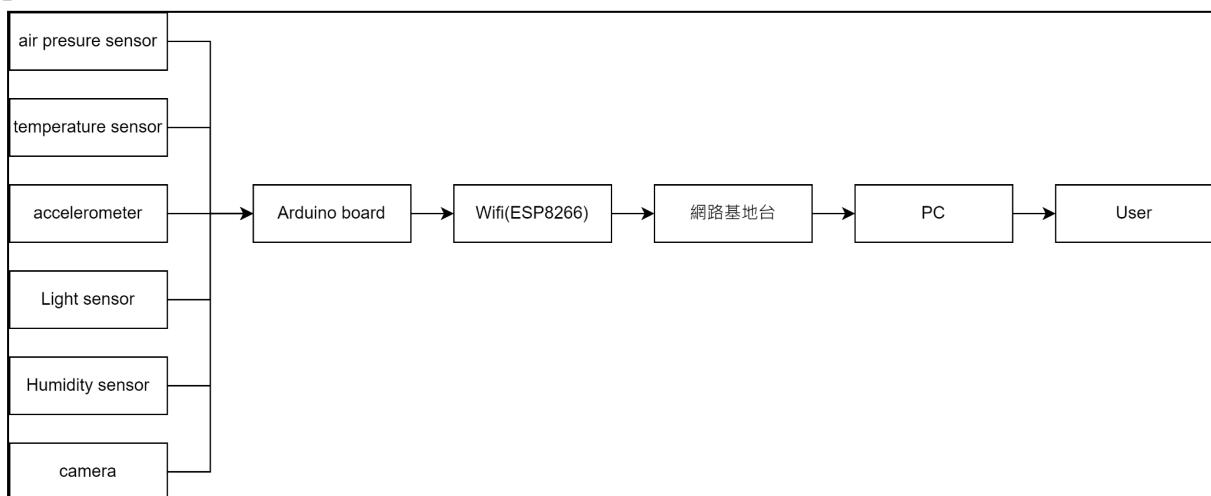


Figure.8 Sensing Structure

The data is collected by Arduino and transmitted through Wifi. The sensor measurement value will be input into the MySql database, and presented through the webpage and APP, and the data will be extracted for calculation.

We will use an air pressure sensor to provide monitoring of the massage intensity of the smart seat in the smart cabin.

We will use a temperature sensor to monitor whether the temperature of the massage chair in the smart cabin is appropriate and whether the air conditioning temperature in the smart cabin is appropriate. When the temperature in the smart cabin is too high, the air conditioning temperature will be automatically adjusted to provide a comfortable body temperature for the user.

We will use an accelerometer to provide monitoring of the vibration level

of the massage chair in the smart cabin.

We will use a light sensor to provide monitoring of the brightness level in the smart cabin. When the user is working or playing, the lights will be adjusted to a brighter level. When the user is resting or sleeping, the lights will be adjusted to a dimmer level.

We will use a humidity sensor to provide monitoring of the humidity level in the smart cabin. When the humidity in the smart cabin is too high, the dehumidifying function will be turned on to provide a comfortable dryness level for the user.

We will use a camera to provide object recognition of the user and the surrounding environment, such as detecting the user's posture, to ensure that the user doesn't stay seated in the smart cabin for too long, which is harmful to health. Even the user can use hand detection to adjust the air conditioning temperature and seat tilt angle in the smart cabin.

### (1) air pressure sensor

**We will use the air pressure sensor to realize the massage monitoring function of the massage chair to ensure that the massage experience is good for the user, and the relevant monitoring data will also be transmitted to the PC for related calculations.**

Usually air pressure sensor is divided into two types

#### 1. Capacitive air pressure transducer

In this method, two capacitive plates are separated by a very small gap. One is fixed, and the other (which comes into contact with the air) acts as an elastic diaphragm (see the diagram on the right). Increasing air pressure causes the diaphragm to deform, narrowing the gap and reducing the capacity. The change in capacity is converted into an electrical signal.

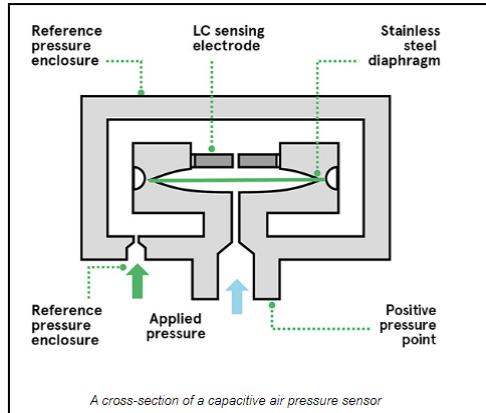


Figure.9

## 2. Inductive air pressure transducer

Uses the principle of induced current generation, converting the deformation of the diaphragm into linear movement of the iron-magnetic core. The movement of the core causes a change in the induced current generated on the auxiliary winding by the AC power drive. This change is then converted back into an electrical signal.

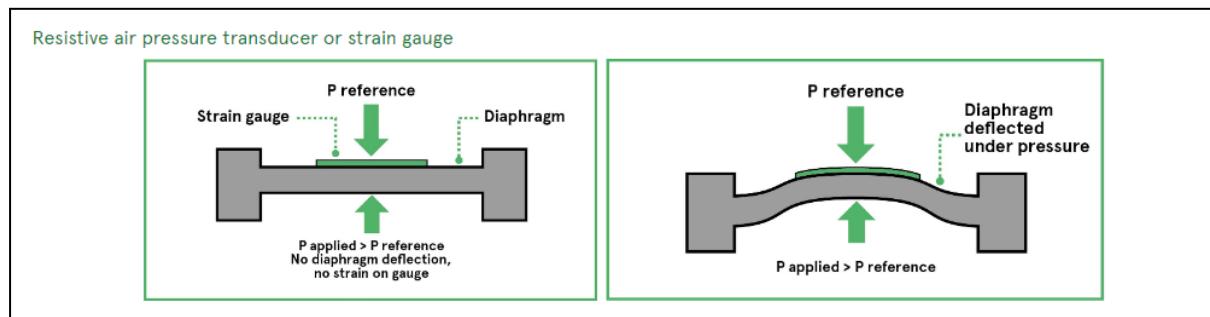


Figure.10

We will use resistive air pressure sensors. This is because resistive air pressure sensors have lower cost, simpler structure, lower sensitivity, lower accuracy and lower temperature stability.

## (2) Temperature Sensor

**We hope to use the temperature sensor to monitor whether the massage temperature of the massage chair is appropriate, and to monitor the temperature in the smart cockpit, and the information will be transmitted to the PC for calculation.**

A temperature sensor typically works by measuring the effect of temperature on a certain physical quantity.

Temperature sensors can be divided into two categories: contact temperature sensors and non-contact temperature sensors. Contact temperature

sensors must make direct contact with the object being measured and measure the temperature of the point of contact. Common contact temperature sensors include thermometers, thermohygrometers, and thermocouples.

Non-contact temperature sensors do not need to make direct contact with the object being measured and instead measure the temperature and thermal radiation of the object being measured. Common non-contact temperature sensors include infrared thermometers, thermal imaging cameras, and optical temperature sensors.

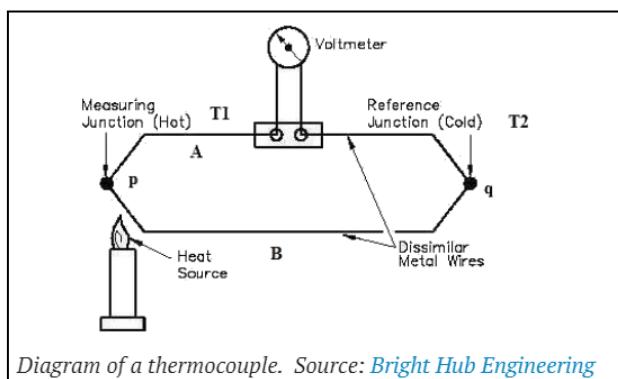


Figure.11

Massage chairs usually use contact temperature sensors such as thermometers or thermocouples. This is because contact temperature sensors have a simpler structure, lower cost, faster temperature detection speed, and higher accuracy, making them suitable for measuring the surface temperature of massage chairs.

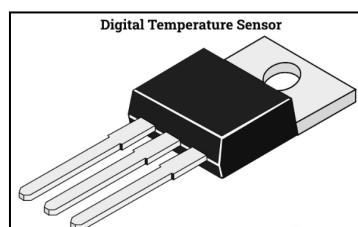


Figure.12

Additionally, massage chairs may also use non-contact temperature sensors such as infrared thermometers or thermal imaging cameras to measure the skin temperature or blood vessel temperature of the human body.

In smart homes, both contact and non-contact temperature sensors can be used, and the specific choice of sensor depends on the needs of your home system. Non-contact temperature sensors have higher sensitivity, faster temperature detection speed, better hygiene, and lower cost and are suitable for

situations where accurate temperature control is not required. We will use non-contact temperature sensors in our smart cockpit, and we will use contact temperature sensors in our cockpit chair.

### (3) Accelerometer

**We want to be able to use an accelerometer Achieved monitor whether the massage force and range of the massage chair are appropriate, and the information will be transmitted to the PC for calculation.**

An accelerometer is a sensor that can measure the acceleration of an object. It typically consists of a mass attached to a pendulum suspended from a support and the displacement of the pendulum is measured by a sensor. When the pendulum is subjected to external acceleration, it will generate displacement. The sensor can measure this displacement and convert it into an electrical signal. By analyzing the electrical signal, the magnitude and direction of the external acceleration can be inferred.

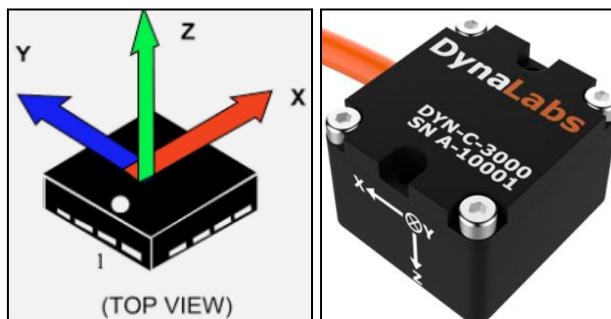


Figure.13

Massage chairs usually use a three-axis accelerometer, also known as a three-axis accelerometer. This sensor has three axes, which can respectively measure the acceleration of an object in three axes (X, Y, Z). With a three-axis accelerometer, massage chairs can accurately sense the posture and movement of the body, and adjust the massage intensity and frequency based on the person's movements.

### (4) Light Sensor

**We hope to be able to use the Light sensor .The achieved monitoring depends on whether the brightness of the smart cockpit is appropriate. For example, if the user is working, the brightness needs to be adjusted to be bright enough. When the user is sleeping and resting, the brightness is adjusted to be darker, or even completely dark, and the information will be transmitted to the PC for calculation.**

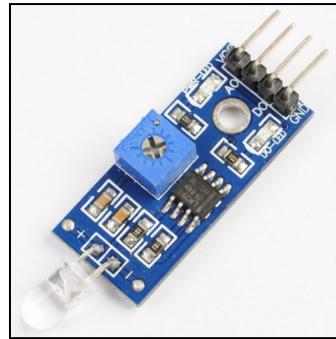


Figure.14

"Smart home light sensors usually use photoresistors or photodiodes as light sensors. Photoresistors are conductive materials that change their resistance value when exposed to light. When a photoresistor is used in a light sensor, it is combined with a resistor or capacitor to form a circuit, and the light intensity is measured based on changes in the resistance or capacitance value of the circuit. Photoresistors have low cost, simple structure and high sensitivity, and are suitable for measuring weak light intensities.

Photodiodes are electronic components that generate current when exposed to light. When a photodiode is used in a light sensor, it is combined with a resistor or capacitor to form a circuit, and the light intensity is measured based on changes in the current or voltage value of the circuit. Photodiodes have high sensitivity and low noise, and are suitable for measuring strong light intensities.

When measuring the light intensity in a room to determine whether it is sufficient, using a photodiode may be more suitable. Photodiodes have high sensitivity and low noise, and can accurately measure strong light intensities. In a room, the light is usually strong, so using a photodiode can provide more accurate results.

However, if the light intensity in the room is very weak, using a photodiode may result in a decrease in measurement accuracy. In this case, using a photoresistor may be more appropriate, as photoresistors have high sensitivity and can accurately measure weak light intensities."

## (5) Humidity sensor

**We hope to use the Humidity sensor to monitor whether the humidity in the smart cockpit is appropriate. If the humidity is too high after the computer receives the information and calculates, the humidity needs to be adjusted through the air conditioner.**

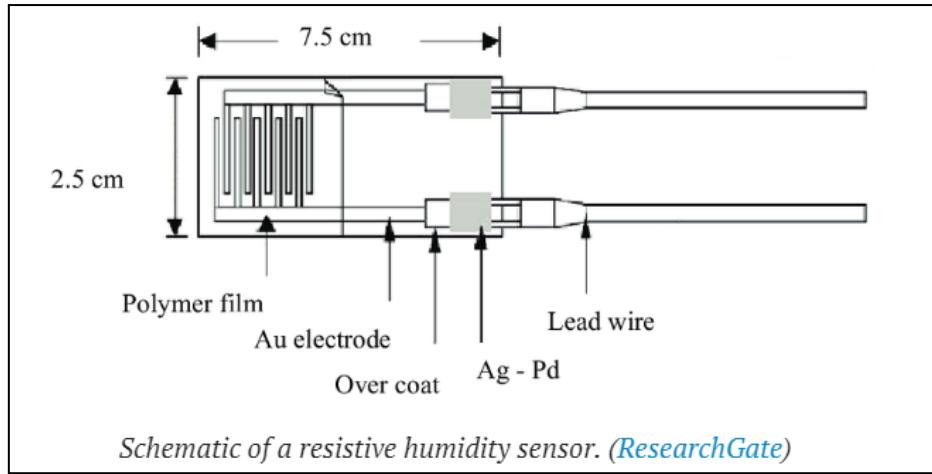


Figure.15

Humidity sensors will be divided into capacitive / resistive humidity sensors.

Capacitive sensors can monitor the capacitance (i.e. the ability to store charge) of a thin metal strip placed in the middle of the sensor. As the humidity in the environment of the sensor changes, the capacitance of the metal will increase or decrease at a directly proportional rate.

The voltage difference (charge) produced by the increase in humidity is amplified and sent to an embedded computer for processing. On the other hand, resistive humidity sensors work on a different principle.

These sensors use a small polymer comb, which increases or decreases in size as humidity changes, which directly affects the ability of the system to store charge.

## (6) Camera

**We will use OV7670 Color Camera to achieve Gesture recognition, posture recognition, and environmental object recognition and other functions for us.**

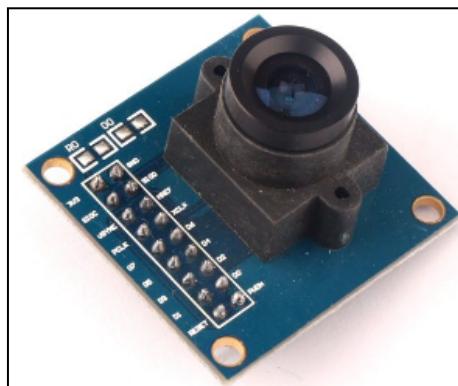


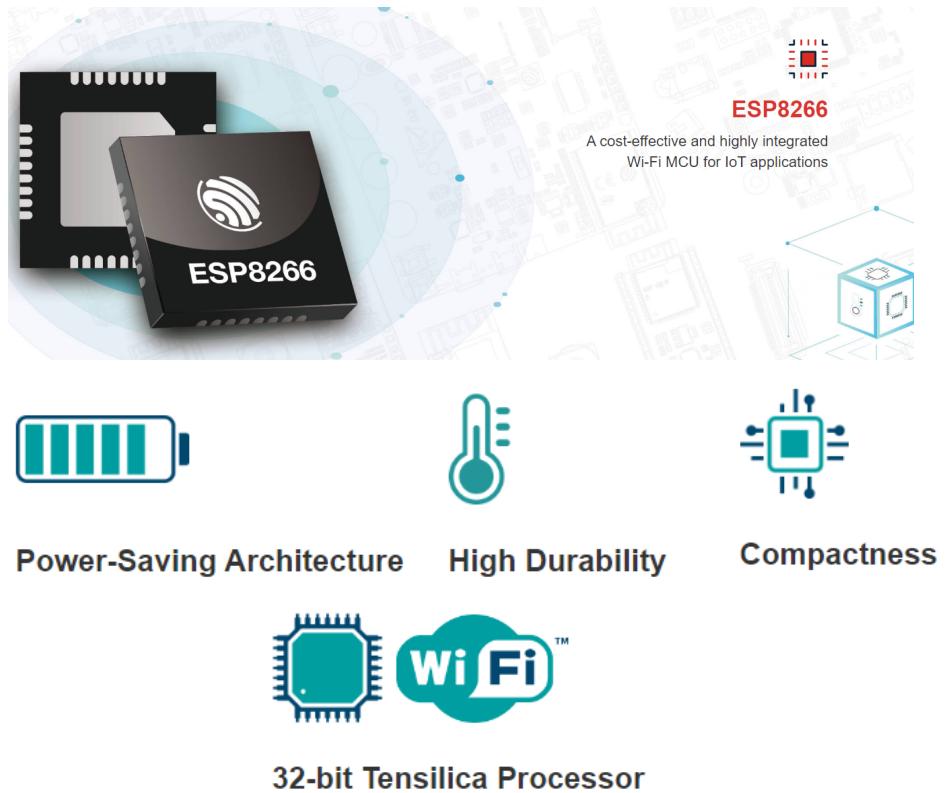
Figure. 16

The OV7670 is a color image sensor chip that is commonly used to build camera modules. It features low power consumption, small size, high resolution, and low cost, making it suitable for a wide range of applications such as smartphones, tablets, car driver assistance systems, industrial monitoring, and so on.

OV7670 uses CMOS technology to provide high-quality color images, and it also has features such as automatic exposure, automatic white balance, analog-to-digital conversion and digital signal processing.

## (7) Wi-Fi

**We will use the ESP8266 Wifi MCU to transmit the information collected by the sensors to the Arduino to the network base station, and enable the PC to perform subsequent calculations.**



The ESP8266EX has a wide working temperature range and is able to maintain stable performance in various operating environments. It integrates a 32-bit Tensilica processor, standard digital peripheral interfaces, an antenna switch, RF balun, power amplifier, low noise amplifier, filters, and power management module, which greatly reduces the amount of PCB space needed, using minimal peripheral circuits.

ESP8266EX is designed for mobile devices, wearable electronic products, and the Internet of Things (IoT) applications, and by using proprietary

technology, it achieves ultra-low power consumption.

ESP8266EX has several power-saving modes suitable for different low-power applications.

It also has a built-in ultra-low power Tensilica L106 32-bit RISC processor, CPU clock speed can reach up to 160 MHz, support for Real-Time Operating System (RTOS) and Wi-Fi protocol stack, can leave up to 80% processing power to the application programming and development.

## (8) Board

**We will use Arduino Mega 2560 Rev3 to collect the sensors and transmit them to the network base station through ESP8266, and enable the PC to perform subsequent calculations.**

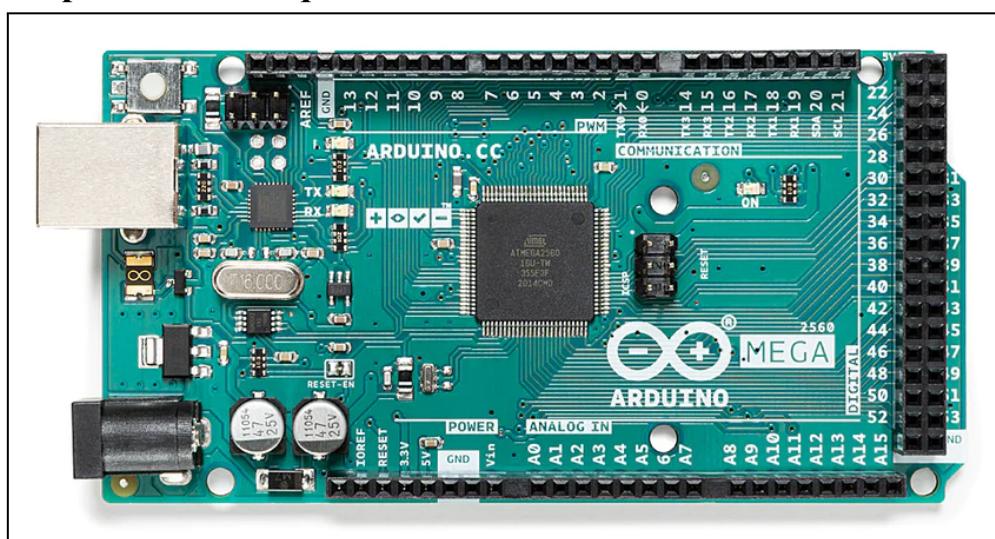


Figure.17

The Arduino Mega 2560 Rev3 is a development board based on the Atmel AVR microcontroller. It has 54 digital input/output (I/O) pins, 16 analog input pins, 4 UART (serial communication) pins, a 16 MHz crystal oscillator, a USB connector, a power jack, and a ICSP header.

The main features of the Arduino Mega 2560 Rev3 include:

- A large number of I/O pins: can connect to various sensors and output devices.
- Programmable analog input pins: can receive analog signals, such as audio signals.
- Support for multiple communication protocols: can connect to various devices such as networks, Bluetooth, Zigbee, etc.
- Support for multiple burners: can use different tools to burn programs.

## *ii. V NAND SSD*

About the storage, we choose Samsung 990 PRO PCIe 4.0 NVMe M.2 SSD to be our storage. Its interface is PCIe Gen 4.0 x4, NVMe 2.0 and memory, we take the 2TB one. Storage memory using Samsung V-NAND 3-bit MLC. Sequential Read/Write Speed can Up to 7450/6900(MB/s), and random Read/Write Speed can Up to 1400K/1550K (IOPS). It has very high speed, 40% and 55% faster random read/write speeds than 980 PRO. And has a good power efficiency. Everyone knows that higher performance usually consumes more power. But this one 990 PRO uses less power with over 50% improved performance per Watt over 980 PRO. This low-power design makes max PCIe 4.0 performance possible with optimal power efficiency. About the heat problem, there have the nickel-coated controller and cutting-edge thermal control algorithm to manage heat for unwavering performance. The heat spreader label controls NAND chip heat, while Dynamic Thermal Guard keeps temperatures optimal. Samsung also created a software named Samsung Magician. This optimization tool has many applications like it can always get user the best SSD performance, protect valuable data, monitor drive health, and get important updates.

## *iii. QLED Curved Monitors*

In our design, we choose Samsung 98" QN90A Neo QLED 4K Smart TV to be our display, It has 4k@120fps and also has some interesting features like Neo Quantum Processor 4K, Quantum Matrix Technology, Object Tracking Sound + and Quantum HDR 32x.

The Neo QLED comes with an all-new form of light source, Quantum Mini LED. A whole new display technology featuring thousands of LEDs that are much smaller than standard LED modules, the size is like 1/40 of others, Quantum Mini LEDs reveal accurate and sophisticated image detailing while maintaining precise backlight control. The technology behind the miniature size of Quantum Mini LEDs is Samsung's proprietary micro layer technology that mounts micro layers inside the LED itself, as opposed to conventional technologies that pack layers on top of the LED, in order to eliminate unnatural noise among the LED elements and ensure deeper blacks can be displayed without blooming.

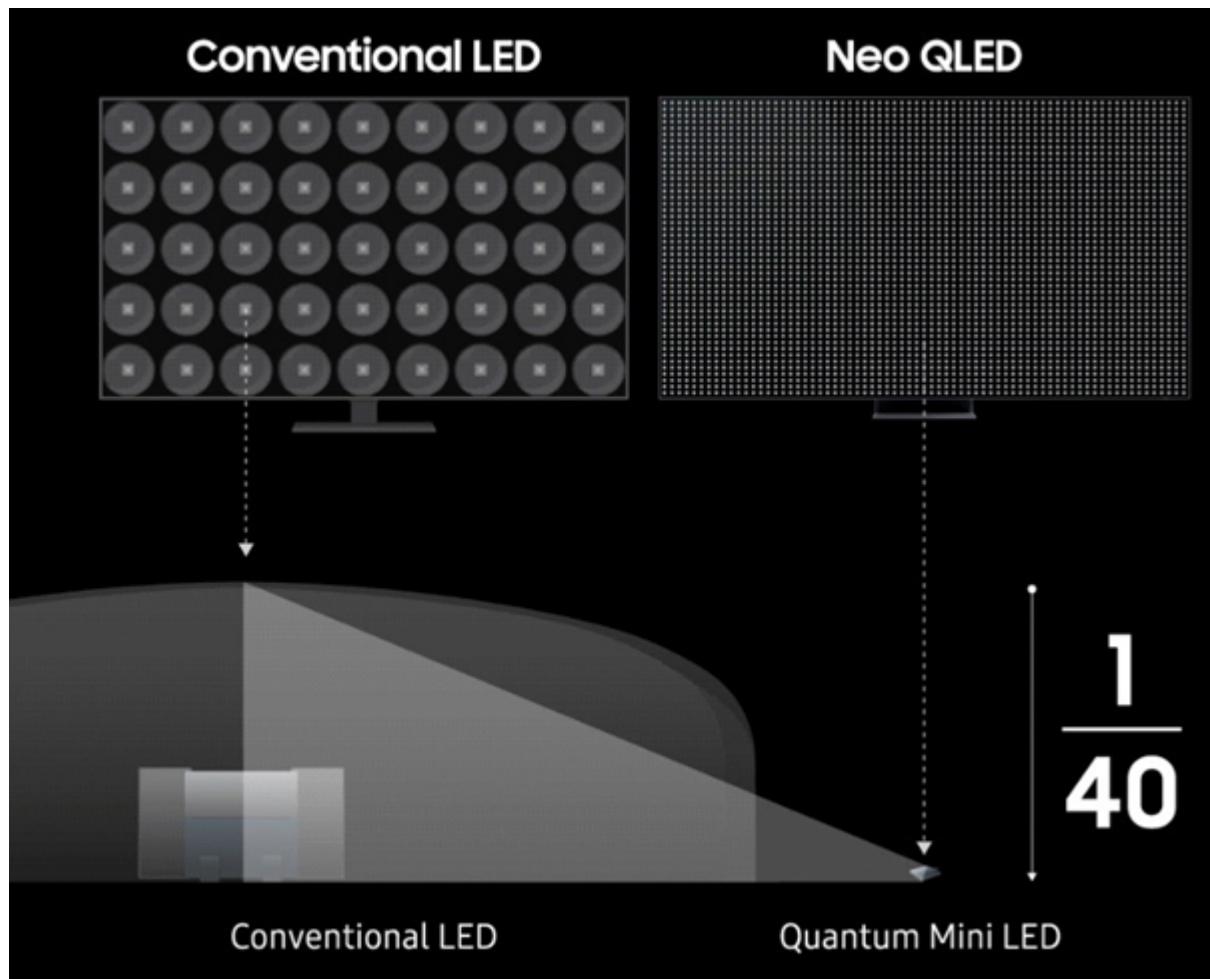


Figure.18 1/40 size of others LED

And Neo Quantum Processor 4K and its AI upscaling capabilities. With 16 neural networks running at once, this Neo QLED lineup delivers smooth and seamless 4K or 8K upscaling that meets the needs of the finest home theaters.

The Neo Quantum Processor features AI-powered deep learning technologies that mimic the mechanism of human learning and memory, and the Neo QLED lineup sees a significant upgrade in this technology as the Neo Quantum Processor has grown from featuring one to 16 neural networks. These 16 different neural networks categorize content based on input resolution, quality and more.

Furthermore, since the Neo Quantum Processor includes dedicated upscaling models to precisely upscale content based on various factors including resolution, edges, details and noise levels, its 16 neural networks can

upscale SD broadcast content, HD videos on streaming services or even FHD content from Blu-ray disks, enhancing the exact aspect of picture quality needed for each content type.

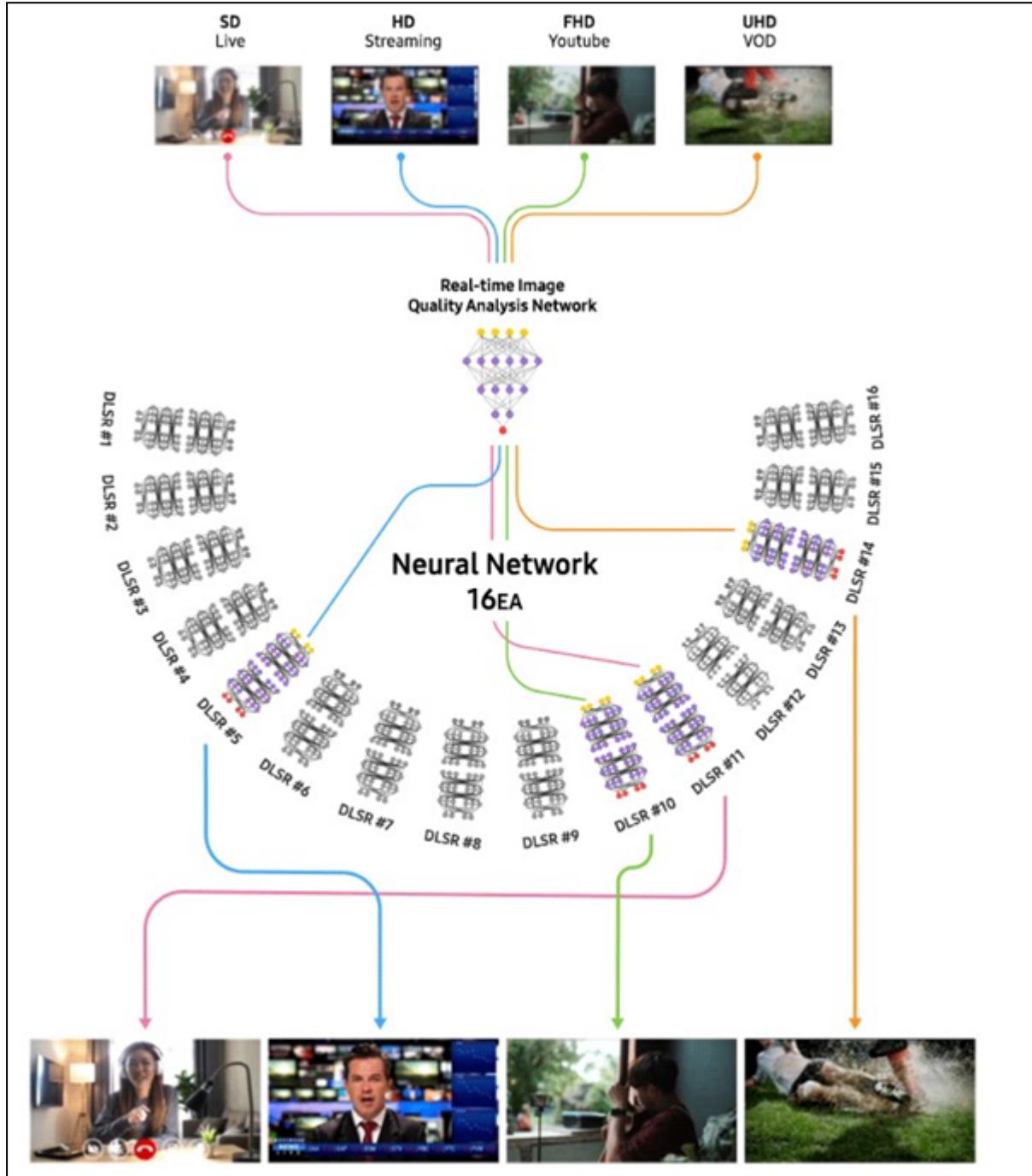


Figure.19 Neural Network in QLED

#### iv. Intel 13rd Core

In our main control system, for the central processing unit, Intel 13rd core is adopted. It's the latest version of cpu from Intel. Its feature is that it can display four 4k60 panels and 8k60 HDR video with the function of dynamic noise reduction. Here the spec is going to be discussed. Intel 13rd core applies hybrid architecture. In hybrid architecture, there are 8 performance-cores and 16 efficient-cores. Based on both cores, it can be up to 32 threads, plus performance-cores are capable of reaching 5.8GHz. Here the functionality of performance-core and efficient-core is to be described. As a matter of fact, they are same-level processors but for different functions. Performance core is responsible for performance. It owns a wider, deeper and more intelligent architecture. For the wide function, it now has six decoders, 8 micro-instruction caches. The deeper capability is thanks to more registers for storing data and 512 lines of buffer. The deeper capability is thanks to more registers for storing data and 512 lines of buffer. As being more intelligent, it has improved the accuracy of catching correct instructions, effectively reduces the latency of L1 cache and optimizes the speed of read and write in L2 cache. As for the efficient-core, it sustains the performance of multitasks when the number of cores increases and the area of chips reduces. For its architecture, it is given a larger instruction cache, 64KB. In the instruction cache, the more useful instructions are placed in places close to the central process unit. Also, the decoder for variable length instruction is introduced for the first time.

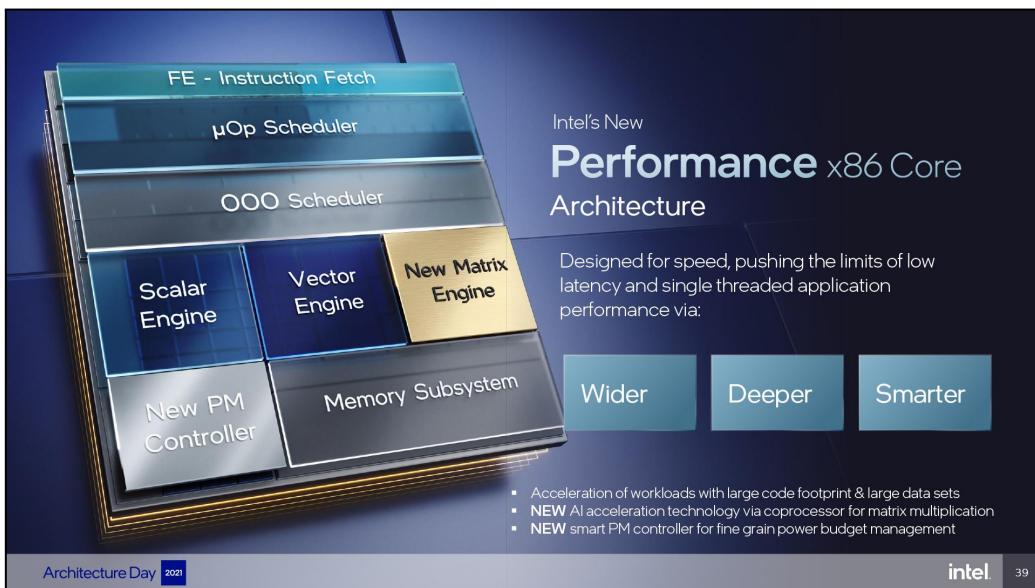


Figure. 20

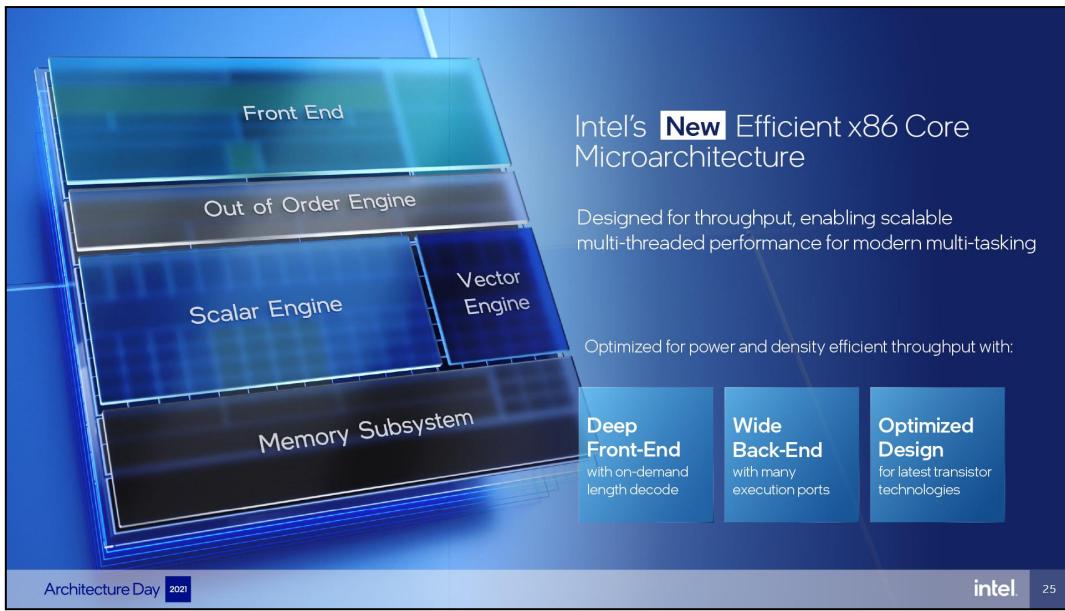


Figure. 21

### v. NVIDIA GeForce RTX 4090

NVIDIA GeForce RTX 4090 uses the entirely new Ada Lovelace architecture. This architecture, Ada Lovelace, is similar to previous architecture, Ampere, which uses a streaming multiprocessor as its basic component. In Lovelace Ada, for each unit, it contains 128 CUDA cores, 1 RT core, and 4 Tensor cores. For half of cuda cores, it concentrates on the arithmetic of float points, and another half of cuda cores is in charge of dealing with dynamic changing between floating point and integer point. Besides, GeForce RTX 4090 is manufactured in 4nm by TSMC. That allows the transistors in the GPU to be up to 76.3 billion. The boost clock reaches 2.5GHz. Compared to Ampere, in the same power consumption, the performance is up to 2 times the efficiency of Ampere. In terms of the heat efficiency, Ada Lovelace can maintain high efficiency even at 450W. In conclusion, the speed is 4 times higher than 3090, and the gaming efficiency is 2 times higher. As for the export of the video and 3D fusion, it promotes 2 times higher efficiency. In the meantime, it is equipped with the deep learning sampling graphic technology, DLSS3. Therefore, for gamers and video editors, it is the best to have this generation of GPU, GeForce RTX 4090.

## *vi. DDR5*

For the memory in this system, DD5 is adopted. The clock of DDR5 starts at 4800 MT/s. It is higher than DDR4 since its clock is 3200 MT/s. The bandwidth increases 50%. In the power management, the 20% power consumption can be reduced compared to DDR4 working at 1.2V when DDR5 is working at 1.1V. It allows computers to extend the period of the usage of the battery. DDR5 is also equipped with PMIC. It can promote the integrity of the signal and reduce the interference of the noise. There is another new function which is On-Die ECC. It can correct the bit error in the DRAM since the size of chips is getting smaller and smaller. The error in DRAM may occur. On-Die ECC offers a nice capability to handle the issue. Last, the bank in DDR5 grows from 16 times to 32 times. It allows users to open more websites at the same time and integrate the working efficiency. What's more, it lowers down the reading and writing times of fetching the same data. All in all, with DDR5, it lets the system run more efficiently and fastly.

## *vii. WIFI 6*

We use wifi 6 technology to host the application on the PC including the game, film watching, working and download. In this section we will talk about the new features of wifi 6 technology. The first one is Speeds can be faster when compared to Wi-Fi 5. Provided you are using a Wi-Fi router on a single device. Wi-Fi 6 achieves these higher data transfer speeds through a variety of technologies, starting with more efficient data encoding and the rational use of wireless spectrum through more powerful processorsprocessors.

The second one is Wi-Fi 6 can result in up to 75% less latency. Wi-Fi 6 does this by more efficiently handling large amounts of network traffic. For gamers, this means faster game downloads, better upload speeds for streaming games, up to 75% less lag, and more reliable media multitasking.

And the last one is Wi-Fi 6 brings wired and wireless signals closer to parity. It lets more users get rid of the limitation of fixed wire connection to the modem. As a result, many gamers or content creators are still connecting directly to routers or network switches via Ethernet cables, rather than taking advantage of the flexibility that wireless networking offers. Wi-Fi 6 helps further bridge the gap between wired and wireless connectivity capabilities.

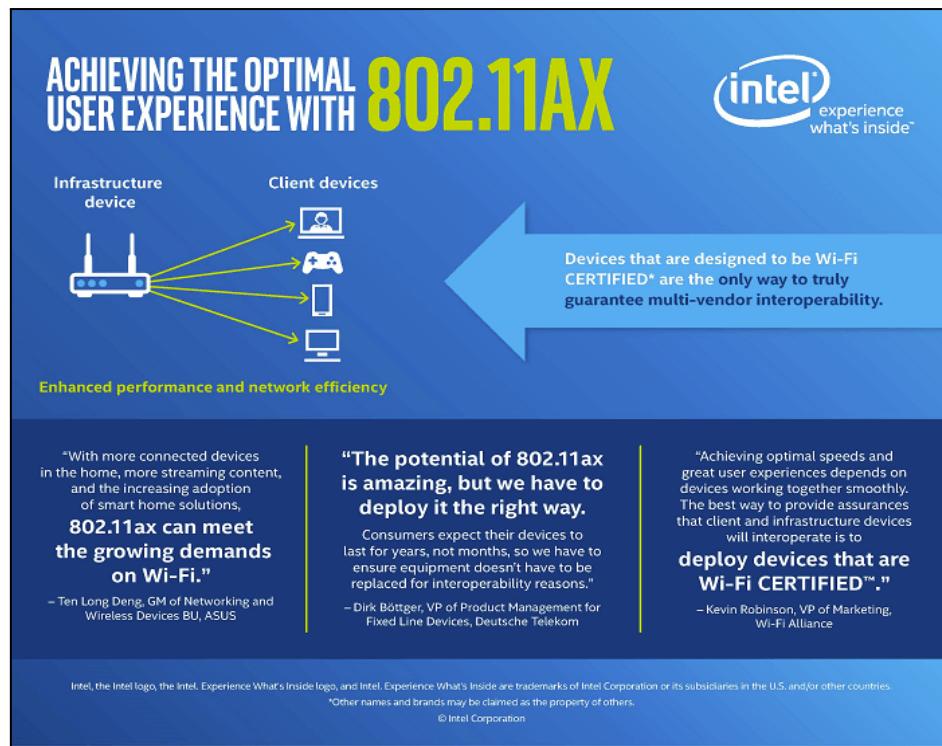


Figure.22

### viii. Bluetooth 5.3

Our product needs to connect several entertainment devices including the earphone, keyboard, VR device and so on. Therefore we use Bluetooth 5.3 technology to connect these devices. Next we are going to talk about the new features of Bluetooth 5.3 technology. Bluetooth 5.3 technology has made a lot of progress compared to the previous one.

First one is periodic advertising enhancement. Typically, Bluetooth transmitting devices will send the same information out multiple times to ensure that it is received, but this improvement means that the received data has to only be scanned once and duplicates will be discarded immediately. This efficiency can even provide an energy-saving benefit to receiving devices.

Second is encryption key size control enhancements. Under normal situations, the bluetooth protocol uses encryption to protect the data being transmitted. The level of security depends in part on the number of characters contained in the key. This new feature allows the host to specify a minimum key size, reducing the back and forth between the receiver and transmitter.

Third is connection subrating. Usually the Bluetooth protocol uses encryption to protect the data being transmitted. The level of security depends

on part of the number of characters the key contains. This new feature allows the host to specify a minimum key size, reducing the back and forth between the receiver and transmitter.

Fourth is channel classification enhancement. Previously, data classification was only possible via a central transmission facility, this new feature allows connected devices to perform channel classification as packets pass through different frequencies, with this added capability, packet collisions are minimized, improving throughput and reliability.

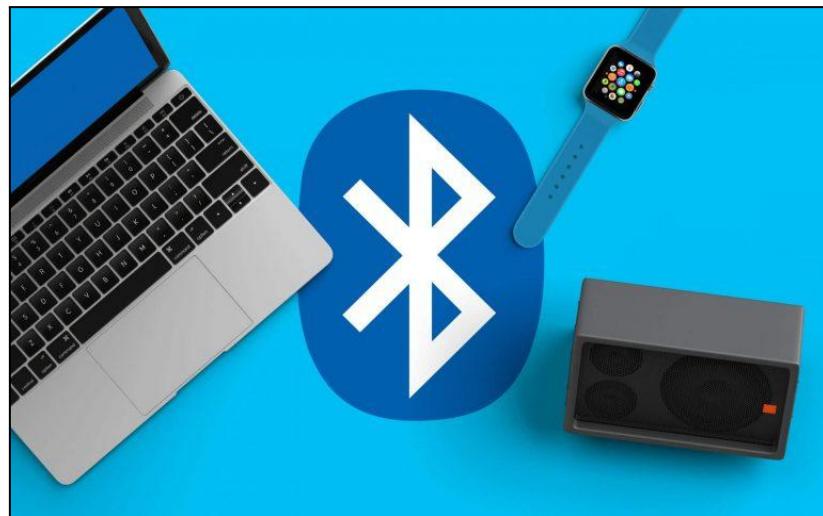


Figure.23

#### *ix. Valve Index*

Not just games on the screen, we hope that users of the product can also use VR for a deeper experience. We added Valve Index to our product.



Figure.24

In this section, we will introduce the Valve Index and why we choose it to

be our VR devices. Next, I will introduce some features of Valve Index.

Valve Index consists of three parts including the headset, controllers and the base station. With Valve Index you will have excellent screen and field of view, the dual 1440x1600 RGB LCD display on the head-mounted display has 50% more sub-pixels than OLED, which can present a sharper picture while consuming the same color rendering resources. In addition, its fill factor is three times better than that of OLED, which greatly reduces the "screen door effect".

The Valve Index® HMD runs at 120 Hz, fully backward compatible at 90 Hz, and features an experimental mode at 144 Hz. Increasing the frame rate can enhance realism and visual comfort, and achieve a clear and comfortable long-term gaming experience. Natural and intuitive input method. The Valve Index headset is designed to optimize the experience specific to virtual reality, and as such has a number of noteworthy design differences from traditional headsets used by the average consumer. The Valve Index headset is designed to optimize the experience specific to virtual reality, and as such has a number of noteworthy design differences from traditional headsets used by the average consumer. Most VR audio is transmitted in stereo, with one audio channel on the right and one on the left. These two channels contain embedded binaural and head-related transfer function (HRTF) tonal coloration that changes depending on the direction the player is looking at at any one time.



Figure. 25

Immersive, finger-tracking controllers, each controller is equipped with 87 sensors that track hand position, finger position, movement and pressure to determine the user's intent. Combining all the signals with finely tuned software and algorithms, we can further understand how players hold and use controllers.

# **Market Analysis**

## *i. SWOT*

In the strengths part, our product is able to let users work at any place they want, so it has a convertible environment ability. It also has multifunctional abilities such as lighting up the user's way, knowing how to help, automatically controlling the lights and ERV, and giving users a better experience than at home. The best advantage is safe for the user's health because it has a self-health monitor such as blood oxygen, heart rate, and drink water period. In the weaknesses part, our product's cost is expensive because it consists of a lot of advanced equipment. Because of the immersive experience, users may waste too much time on games. In the opportunities part, we can reduce cost to make our product more affordable and increase the forced end mechanism to remind users that don't spend too much time on games. In the threats part, our product's price is more expensive than AR/VR in the entertainment part so our product isn't the first choice, and the main reason why people buy our product is for games, so the user range is too small.

## *ii. Porter's five forces analysis*

Bargaining power of customers: Low. Our product is a combination of many advanced devices.

Bargaining power of suppliers: Low. To supply the high performance and multifunction to the user, the advanced device is difficult to change.

Threat of new entrants: Low. Our product required a professional system to integrated all function

Threat of substitutes: High. The customer can buy AR/VR for entertainment

Competitive rivalry: None. There are no competitors in the market.

## **Conclusion**

In this project, we proposed a product called Noah's Capsule CHK001. Our product provides a comfortable immersive entertainment environment for people, a place for people to have a good rest and sleep and a secluded paradise for people to escape from external disturbances. Our product's application has an immersive experience, living like in the smart home and self-health monitoring. The system is composed of a sensor, main controller and display. The technology is IOT control system and entertainment devices. Finally, we use SWOT analysis and Porter's five forces analysis to analyze our product. However, our product still has some application needs to improve in the future such as the ability of self-health monitoring is not specific.

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## **Team Member task Partition**

Introduction:許鏡璋

Motivation and application:許鏡璋

Architecture:黃柏凱

Technology:許鏡璋、郭孟軒、陳峒羽

Market Analysis:許祐杰

Conclusion:許祐杰