

# Choose the Right Hardware

## Scenario 1: Manufacturing

### Which hardware?

Which hardware is most appropriate for this scenario? (CPU + Intel GPU / CPU + FPGA / CPU + VPU)
<b>CPU + FPGA</b>

### Requirements

Now that you've picked the hardware, it's time to explain *why* this hardware is the right choice. Look through the scenario and find any relevant requirements. Be sure that you at least include the following:

1. Power Requirements
2. Space Requirements
3. Economic Constraints

Describe each requirement below, along with an explanation of how the selected hardware meets that requirement.

Requirement observed	How does the chosen hardware meet this requirement?
Client wants a device that has future flexibility. This can help them create their own code and run it for a specific use-case.	FPGA can be designed according to the <b>application requirement</b> . It has the <b>flexibility</b> to try out a few algorithms initially and optimise the module as required. Once the requirements are tested from the client, it can be made as a complete product and can be used <b>only for this specific task</b>
Client wants to install in a factory line, he has some space constraints. Client can only accommodate small devices along the line.	Client has some space constraints. So NCS sticks cannot be used as it will be installed outside the computer and it will occupy a space of 27 to 28 mm.
Client is moving to a energy efficient work space.	Installing an energy efficient module will help the client to maintain an energy efficient work space. <b>GPU</b> consumes more power. The power requirement of a good GPU can be from 200 Watts to even 600 Watts.

## Write-up

Now synthesize your points from above and provide a brief write-up (not more than about 50 words) describing why the chosen hardware is the best choice for this scenario.

Write-up: Why is this the right hardware?
On checking the requirement of the client, <b>CPU + FPGA</b> is the perfect hardware for this application. NCS2 Neural stick can take less power, but it needs some space as it can be installed in the USB slot available in the desktop computer. Where FPGA modules can be designed and installed inside the desktop as well. This will remove the space constraints. Also the client needs an energy efficient device, so GPU cannot be an option. GPU consumes more power than any other devices. For example Geforce Titan, one of the most used GPU's, consumes a power of 500 Watts. More importantly, Client needs the flexibility to develop and run his own algorithm in an optimized way. This is possible only in FPGA. So a <b>CPU + FPGA</b> module is recommended.

## Queue Monitoring Requirements

Number of people required per queue:	There is no Queue as such. We need to monitor 2 people working on the shop floor. So a person identification algorithm can be used
Time for the process in the queue (ms/s):	Client needs the hardware to work at 5 Frames per second. So the hardware should be able to run the algorithm, detect the presence of a person within 200 ms in every single frame.
Model precision chosen (FP32, FP16, or Int8)	FP16

## Scenario 2: Retail

### Which hardware?

Which hardware is most appropriate for this scenario? (CPU+In GPU / CPU+ FPGA / CPU+VPU)
<b>CPU + In GPU</b>

### Requirements

Now that you've picked the hardware, it's time to explain *why* this hardware is the right choice. Look through the scenario and find any relevant requirements. Be sure that you at least include the following:

4. Power Requirements
5. Space Requirements
6. Economic Constraints

Describe each requirement below, along with an explanation of how the selected hardware meets that requirement.

Requirement observed	How does the chosen hardware meet this requirement?
Client cannot invest in new appliances - economic constrain	Designing an FPGA incurs designing cost and the hardware cost. VPU also incurs extra cost, even though it is small. So it is a best option to use the integrated <b>GPU</b> .
Clients future area of investment is power and energy	GPU consumes more power than the other two types of the hardware. Since client needs to invest in the power/energy sector, installing a GPU will not hurt the client.
Space constraint	Desktop I7 computer is already available in the billing counter. Installing a VPU in a billing counter will not be a good option as the CPU is located in the billing counter and not in any isolated place.

## Write-up

Now synthesize your points from above and provide a brief write-up (not more than about 50 words) describing why the chosen hardware is the best choice for this scenario.

Write-up: Why is this the right hardware?
The client does not want to invest in any new hardware design or manufacturing process. So utilising the inbuilt GPU in the computer is a possible option. Also Clients future investment is in power and energy which is inline with the higher power requirements needed for <b>GPU</b> . Also the waiting time in the queue is normal days is 230 secs and during peak time is 400 secs. Inorder to change the queue length, the number of people in the queue should be identified quickly and intimated. So we need a faster processor. Among the available hardwares, GPU can be the faster compared to NCS2. So Integrated GPU + CPU is recommended for this application.

## Queue Monitoring Requirements

Number of people required per queue:	Normal day : 2, Weekends : 5
Time for the process in the queue (ms/s):	Normal day: 230 secs, Weekends : 350 - 400 secs
Model precision chosen (FP32, FP16, or Int8)	FP16

## Scenario 3: Transportation

### Which hardware?

Which hardware is most appropriate for this scenario? (CPU+In GPU / CPU+ FPGA / CPU+VPU)
<b>CPU + VPU</b>

### Requirements

Now that you've picked the hardware, it's time to explain *why* this hardware is the right choice. Look through the scenario and find any relevant requirements. Be sure that you at least include the following:

7. Power Requirements
8. Space Requirements
9. Economic Constraints

Describe each requirement below, along with an explanation of how the selected hardware meets that requirement.

Requirement observed	How does the chosen hardware meet this requirement?
Clients budget is only about \$100 - \$150	VPU or NCS2 would fit in the price range.
Client has a All-in-One PC with an i-5 core processor with consumes 80 watt power	Installing a GPU will not be good here as the power requirement for a GPU is high. VPU instead will not consume more than 2 Watts power.
Client doesn't want a bulky device and wants to manage	VPU is a tiny device and is only about 27.40 mm in size.

### Write-up

Now synthesize your points from above and provide a brief write-up (not more than about 50 words) describing why the chosen hardware is the best choice for this scenario.

Write-up: Why is this the right hardware?
The NCS 2 with Myriad X processor delivers up to 1 TFLOPS. So can do 1 Terra floating point operations per second. Which is powerful enough to handle the current scenario. This hardware can take only FP16 modules which are already available. At the same time according to client requirement, the hardware is not bulky occupying only 3 cm approx in length. The hardware is not also expensive, available at \$100 - \$150, which perfectly fits clients requirement. So <b>CPU + VPU</b> is suggested for this scenario.

## Queue Monitoring Requirements

Number of people required per queue:	Peak hours : 15, Non-peak hours : 7
Time for the process in the queue (ms/s):	Peak hours : 120 secs, Non-peak hours : 300 secs
Model precision chosen (FP32, FP16, or Int8)	FP16