

Choose the Right Hardware

Proposal Template

Scenario 1: Manufacturing

Client Requirements and Potential Hardware Solution

Look through the scenario and find any relevant client requirements. Then, suggest a potential hardware type and explain how this hardware would satisfy each of the requirements.

Which hardware might be most appropriate for this scenario? (CPU / IGPU / VPU / FPGA)
FPGA

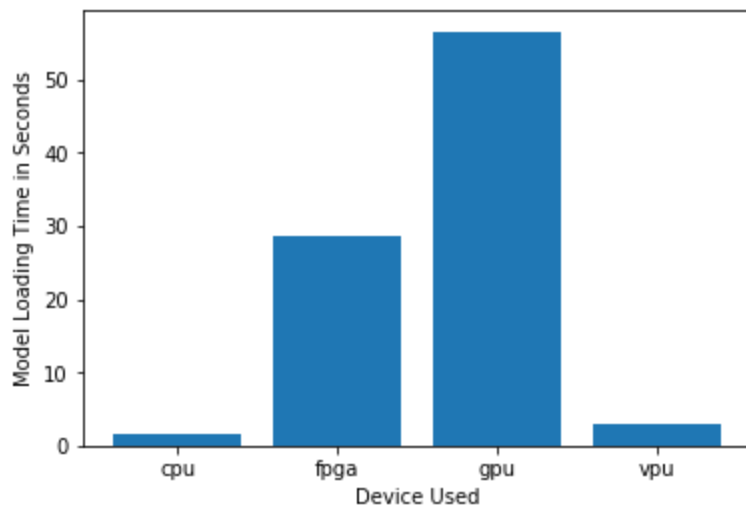
Requirement Observed (Include at least two.)	How does the chosen hardware meet this requirement?
<i>The client wants a system to monitor the number of people in the factory line. The factory has a vision camera installed at every belt. Each camera records video at 30-35 FPS (Frames Per Second) and this video stream can be used to monitor the number of people in the factory line. The client is required to complete image processing tasks five times per second.</i>	<i>IEI Mustang-F100-A10 FPGA card can provide required speed easily. In the test result in the manufacturing scenario, it clearly shows that this FPGA unit can process more than 25 FPS per second.</i>
<i>The client has multiple chip designs—and new designs are created regularly—the system would also need to be flexible so that it can be reprogrammed and optimized to quickly detect flaws in different chip designs.</i> <i>The client would ideally like it to implement this system for at least 5-10 years.</i>	<i>FPGAs are flexible and re-programmable. And also they have a long lifetime. For example, FPGAs that use devices from Intel's Internet of Things Group have a guaranteed availability of 10 years, from start of production.</i>
<i>Workers alternate shifts to keep the floor running 24 hours a day so that packaging continues nonstop.</i>	<i>FPGAs are designed to have 100% on-time performance, meaning they can be continuously running 24 hours a day, 7 days a week, 365 days a year.</i>
<i>The client has plenty of revenue to install a quality system, this is still a significant investment.</i>	<i>Even though FPGAs are expensive, this client is ready to go for a quality system.</i>

Queue Monitoring Requirements

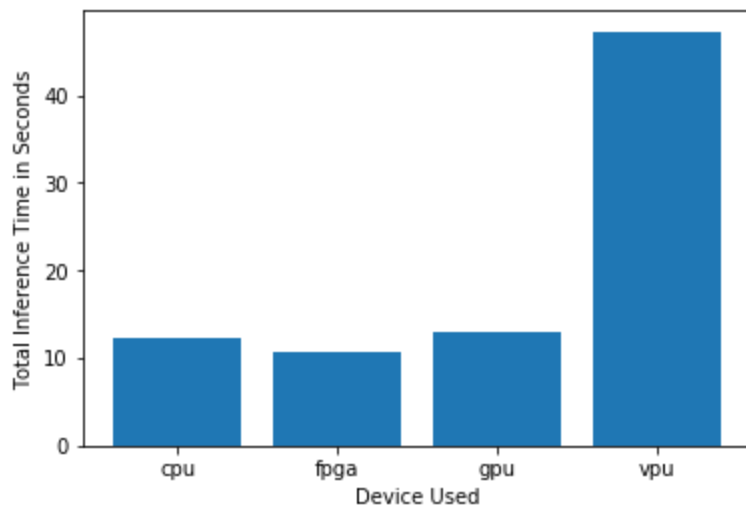
Maximum number of people in the queue	2
Model precision chosen (FP32, FP16, or Int8)	FP16

Test Results

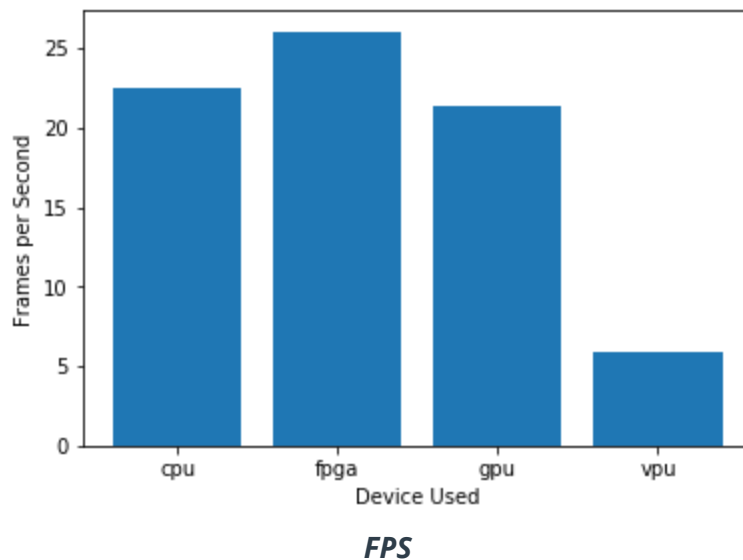
After you've tested your application on all four hardware types (CPU, IGPU, VPU, and FPGA), copy the matplotlib output showing the comparison into the spaces below. You should have three graphs (for model load time, inference time, and FPS).



Model Load Time



Inference Time



Final Hardware Recommendation

Now synthesize your points from above and provide a brief write-up describing why the chosen hardware is the best choice for this scenario. Be sure to discuss the client's requirements, the test results, and how these relate to one another (e.g., perhaps one of the devices performed better than the rest, but does not meet one of the client's requirements).

Write-up: Final Hardware Recommendation

I recommend IEI Mustang-F100-A10 FPGA for this scenario. Because it has capability to provide all requirements from the client.

The client is required to complete image processing tasks five times per second. According to our test result, FPGA can easily process 25 FPS per second. CPU and GPU also have FPS rates more than five times per second.

The client required a flexible and re-programmable system and long lifetime system that would run 24 hours a day. IEI Mustang-F100-A10 FPGAs are good enough for that. Other processors do not have such a capability.

Even though FPGAs are expensive, The client has plenty of revenue to install a quality system. So FPGA cost is not an issue for this scenario.

Scenario 2: Retail

Client Requirements and Potential Hardware Solution

Look through the scenario and find any relevant client requirements. Then, suggest a potential hardware type and explain how this hardware would satisfy each of the requirements.

Which hardware might be most appropriate for this scenario? (CPU / IGPU / VPU / FPGA)
CPU

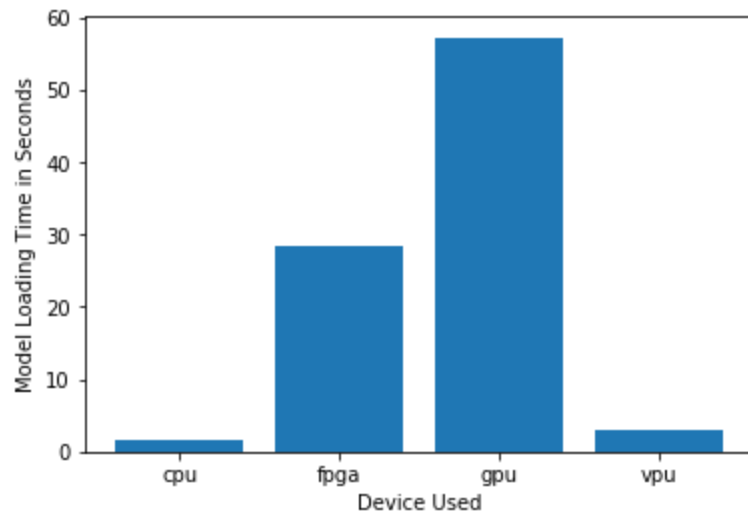
Requirement Observed (Include at least two.)	How does the chosen hardware meet this requirement?
<i>Most of the store's checkout counters already have a modern computer, each of which has an Intel i7 core processor. Currently these processors are only used to carry out some minimal tasks that are not computationally expensive.</i>	<i>The client already has modern computers at checkout counters and currently they don't have computationally expensive operation. So these computers are well enough for the hardware requirement of this project.</i>
<i>The client does not have much money to invest in additional hardware.</i>	<i>Since the client already has modern computers with CPU, there is no need for additional hardware for this project.</i>
<i>The client would like to save as much as possible on his electric bill.</i>	<i>Since we are using already existing CPUs for this project, we can minimise as much as possible on electricity bills. Because we do not install new devices.</i>
<i>The client does not have a specific FPS rate for image processing tasks.</i>	<i>We have enough freedom to choose required hardwares for this situation. CPUs have good enough FPS rates which is well enough for this project.</i>

Queue Monitoring Requirements

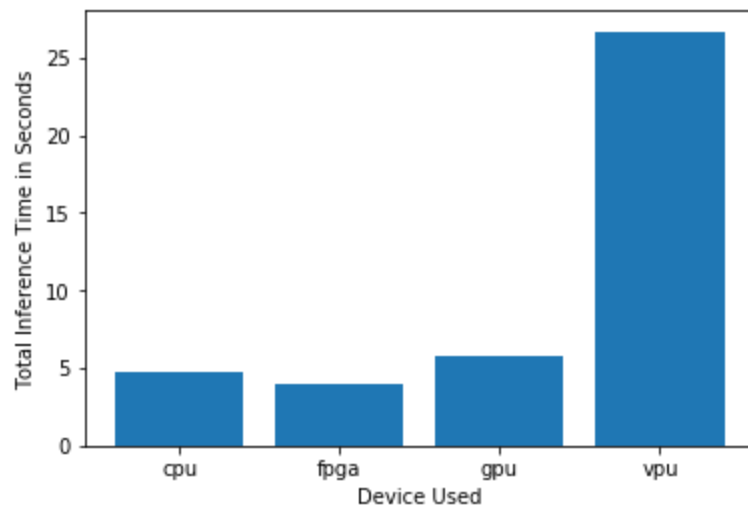
Maximum number of people in the queue	5 2 per queue (during normal daily hours) to 5 per queue (during rush hours).
Model precision chosen (FP32, FP16, or Int8)	FP32

Test Results

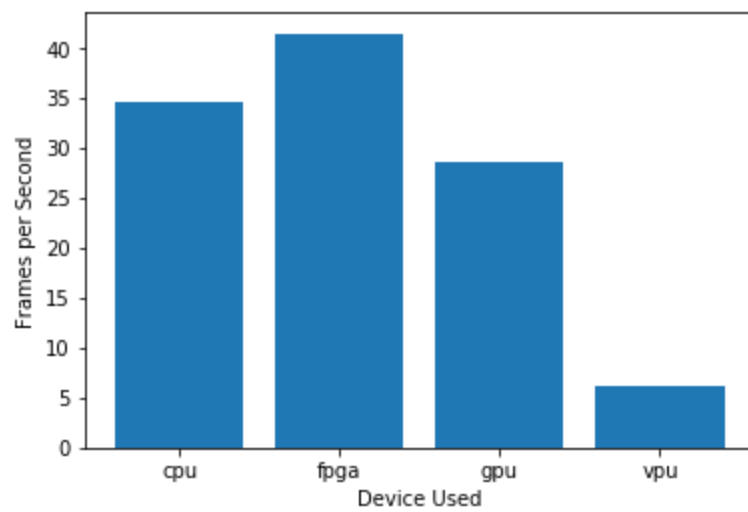
After you've tested your application on all four hardware types (CPU, IGPU, VPU, and FPGA), copy the matplotlib output showing the comparison into the spaces below. You should have three graphs (for model load time, inference time, and FPS).



Model Load Time



Inference Time



FPS

Final Hardware Recommendation

Now synthesize your points from above and provide a brief write-up describing why the chosen hardware is the best choice for this scenario. Be sure to discuss the client's requirements, the test results, and how these relate to one another (e.g., perhaps one of the devices performed better than the rest, but does not meet one of the client's requirements).

Write-up: Final Hardware Recommendation

I recommend CPU for this scenario. Because it has capability to provide all requirements from the client.

Since the client already has modern computers with CPUs, these computers can be used for this scenario. Because

- *There is no additional hardware cost.*
- *We can minimise power consumption by using already powered up computers at checkout counters.*
- *CPUs have well enough capability to fully fill hardware requirements in this project. (Our test result shows that CPUs have small model loading time and inference time compared to other devices and it has the 2nd highest FPS rate).*

Scenario 3: Transportation

Client Requirements and Potential Hardware Solution

Look through the scenario and find any relevant client requirements. Then, suggest a potential hardware type and explain how this hardware would satisfy each of the requirements.

Which hardware might be most appropriate for this scenario? (CPU / IGPU / VPU / FPGA)

VPU or NCS2

Requirement Observed (Include at least two.)	How does the chosen hardware meet this requirement?
<i>They monitor the entire situation with 7 CCTV cameras on the platform. These are connected to closed All-In-One PCs that are located in a nearby security booth. The CPUs in these machines are currently being used to process and view CCTV footage for security purposes and no significant</i>	<i>VPU or NCS2 will be suitable for this scenario because CPUs have USB3.0 output. Power requirement of NCS2 is very low, about 1W. So there is no need for significant additional power requirements.</i>

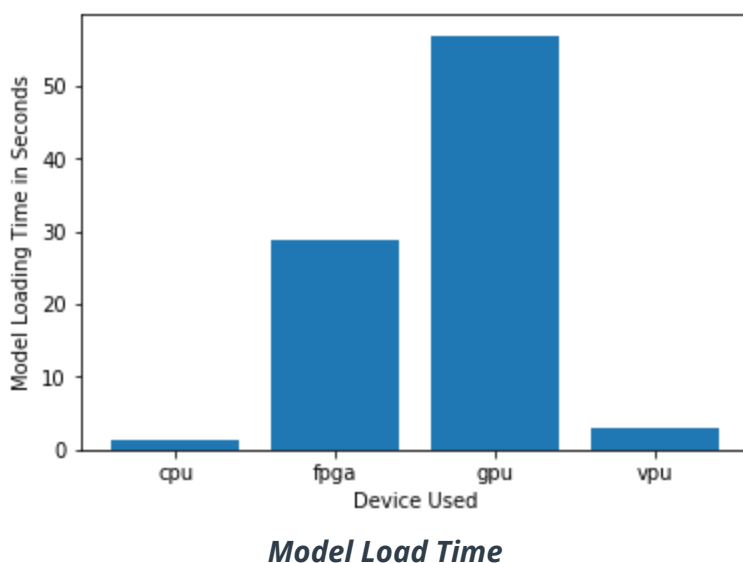
<i>additional processing power is available to run inference.</i>	
<i>The client can allows for a maximum of \$300 per machine</i>	<i>VPU or NCS2 cost less than \$100.</i>
<i>The client would like to save as much as possible both on hardware and future power requirements.</i>	<i>VPU or NCS2 requires very less power and it is less than 1W.</i>
<i>They monitor the entire situation with 7 CCTV cameras on the platform. These are connected to closed All-In-One PCs that are located in a nearby security booth.</i>	<i>VPU or NCS2 can accelerate the performance of the All-In-One PC system.</i>

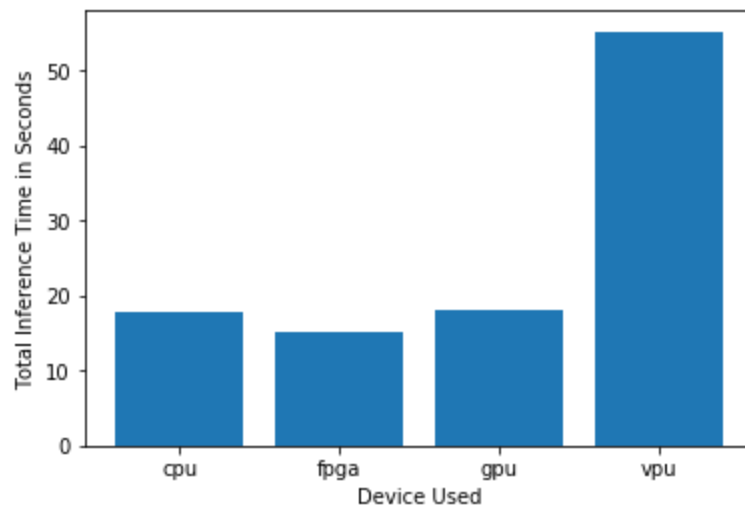
Queue Monitoring Requirements

Maximum number of people in the queue	4 (depending on time, the maximum number in a queue can vary from 15 to 7.)
Model precision chosen (FP32, FP16, or Int8)	FP16

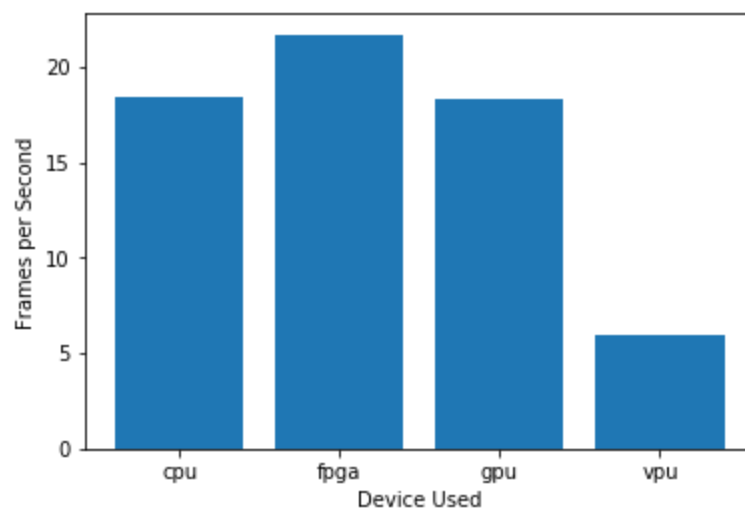
Test Results

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Inference Time



FPS

Final Hardware Recommendation

Now synthesize your points from above and provide a brief write-up describing why the chosen hardware is the best choice for this scenario. Be sure to discuss the client's requirements, the test results, and how these relate to one another (e.g., perhaps one of the devices performed better than the rest, but does not meet one of the client's requirements).

Write-up: Final Hardware Recommendation

I recommend VPU or NCS2 for this scenario. Because it has capability to provide all requirements from the client.

Since the client already has computers with CPUs, VPU or NCS2 can be used to accelerate and it does not require significant additional power because VPU or NCS2 can operate under very low power consumption. Since the NCS2 cost is less than \$100, this will be the best solution for the client budget.

Our test result shows that NC2 has very low model loading time. This will be another advantage for this scenario because this system will reboot in a very short time period in an emergency situation.