

# 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 ( <a href="https://software.intel.com/content/www/us/en/develop/topics/iot/hardware/vision-accelerator-arria-10.html">https://software.intel.com/content/www/us/en/develop/topics/iot/hardware/vision-accelerator-arria-10.html</a> )

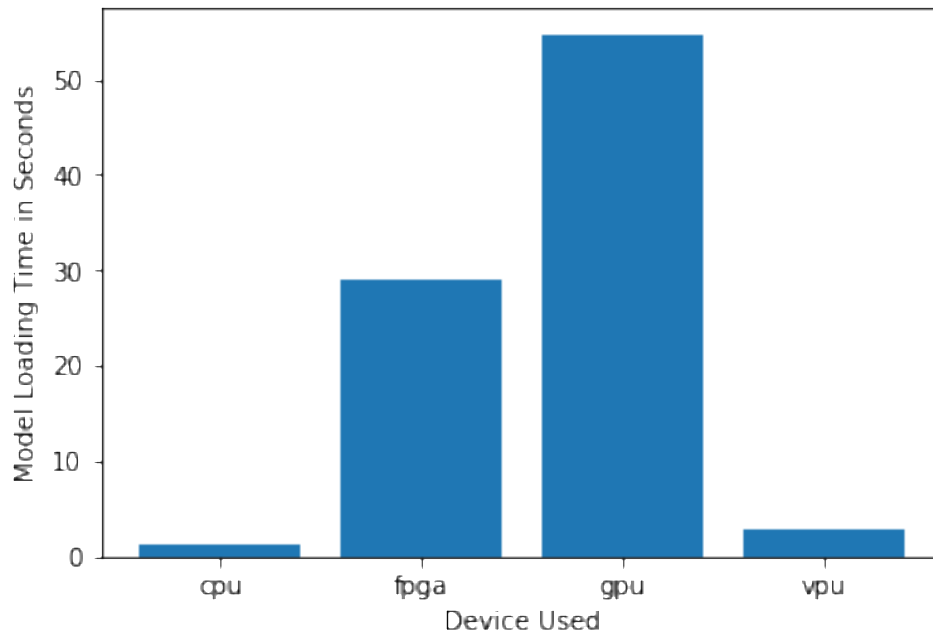
Requirement Observed (Include at least two.)	How does the chosen hardware meet this requirement?
"Each camera records video at <b>30-35 FPS</b> "	FPGAs performs better than other devices on the FPS metrics (and will be able to meet the given requirements)
"repurpose the system to address a second issue... need to be flexible so that it can be <b>reprogrammed</b> and optimized to quickly detect flaws in different chip designs."	FPGA (Field Programmable Gate Array), is meant for reprogramming It supports various precision options (FP16, FP11, FP9).
"ideally like it to last for at least <b>5-10 years</b> ."	As per the datasheet, recommended FPGA has a lifespan of "Eight years with active fan and more than 10 years with passive thermal solution"
"No hard limitation on budget as flaws detected prior to packaging, this <b>would save money and improve the company's reputation</b> "	Whilst the Unit price of suggested FPGA is \$1.8K , it will meet the given requirement. <a href="#">Check Price</a>

#### Queue Monitoring Requirements

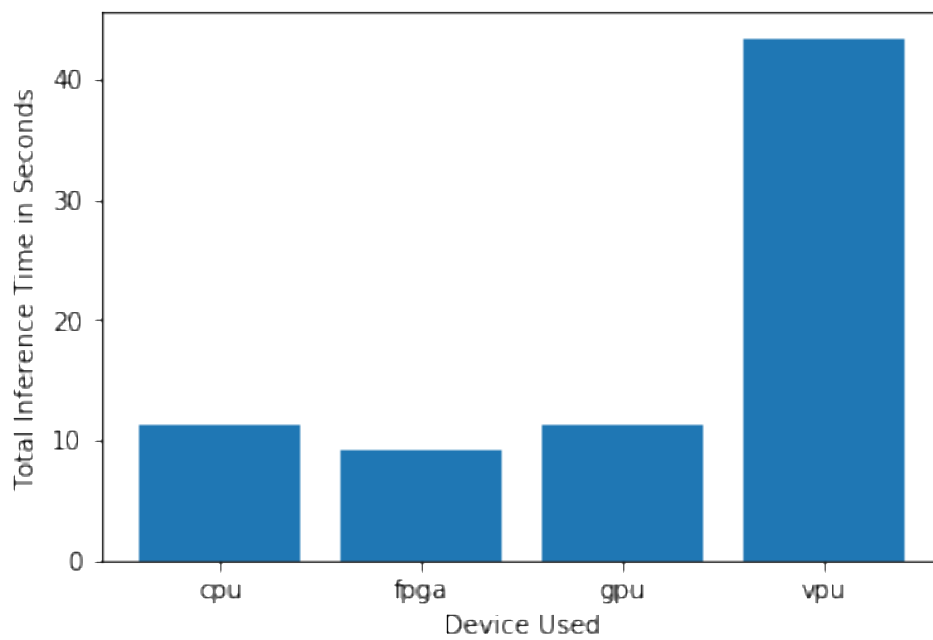
Maximum number of people in the queue	2
Model precision chosen (FP32, FP16, or Int8)	FP16

#### Test Results

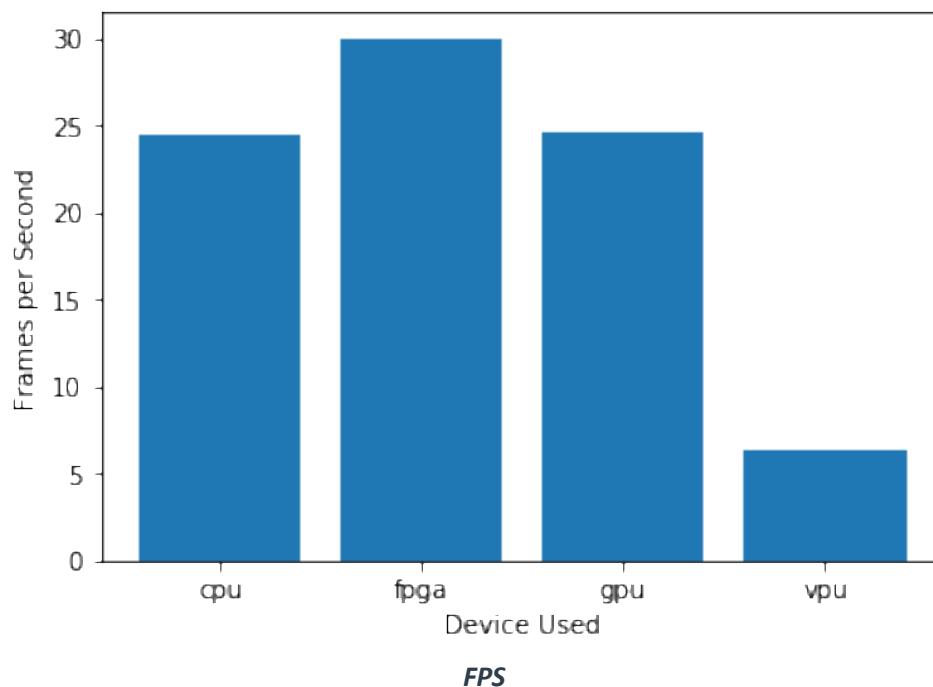
After you've tested your application on all four hardware types (CPU, IGPU, VPU, and FPGA), copy the matplotlib output showing the comparison into the spaces below. You should have three graphs (for model load time, inference time, and FPS).



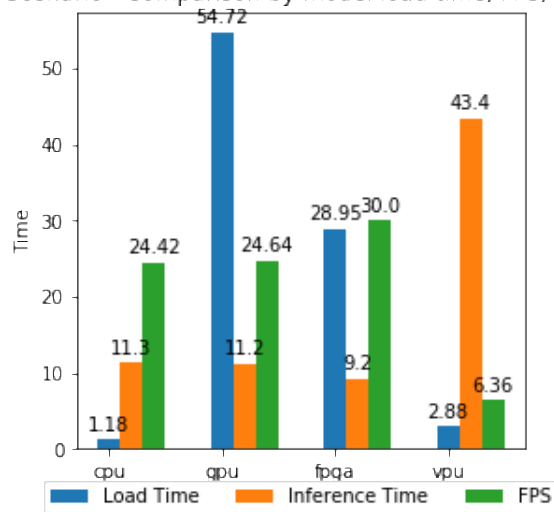
***Model Load Time***



***Inference Time***



Manufacturing Scenario - Comparison by model load time, FPS, and Inference Time



### Overall Comparison – Final Recommendation

### 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

- The client's camera records video at 30-35 Frames per second (FPS) and based on the above test result we can confirm that FPGA performs better than other device and reads at about 30Frames per seconds. Also, the inference time is the least compared to other device and hence it's ideal for better performance.
- The client wants a flexible system. repurpose the system to address a second issue and needs to be flexible so that it can be reprogrammed, FPGAs are field programmable, and can be reprogrammed easily to adjust to new configurations.
- The client wants to implement a quality system which is a significant investment and expect to last for at least 5 to 10 years. FPGAs have a long life and as per the data sheet the lifespan is Eight years with active fan and more than 10 years with passive thermal solution.

## 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)
IGPU

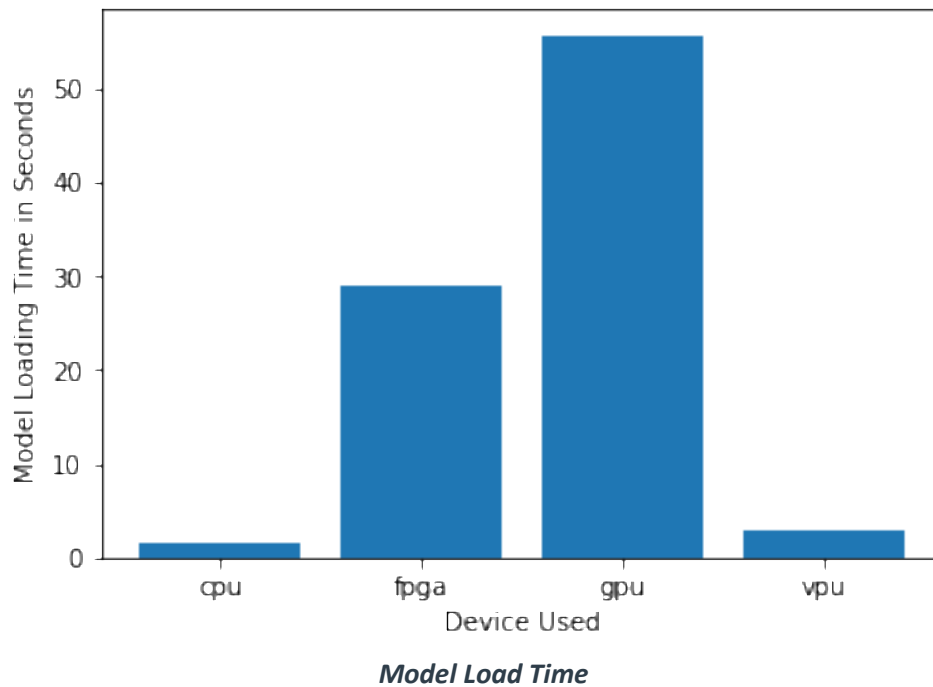
Requirement Observed (Include at least two.)	How does the chosen hardware meet this requirement?
"Counters <b>already have a modern computer</b> , each of which has an Intel i7 core processor, currently these processors are only used to carry out some <b>minimal tasks that are not computationally expensive.</b> "	As the current i7 core processor carries only minimal computational task , it is recommended to leverage the current infrastructure.
Mr. Lin does <b>not</b> have much <b>money</b> to invest in <b>additional hardware</b>	It is ideal to not spend on additional devices and leverage the current infrastructure (CPU) with the <b>integrated GPU</b> could be a recommended option.
Would like to <b>save</b> as much as possible on his <b>electric bill</b>	Unused section of the GPU can be powered down to reduce power consumption.

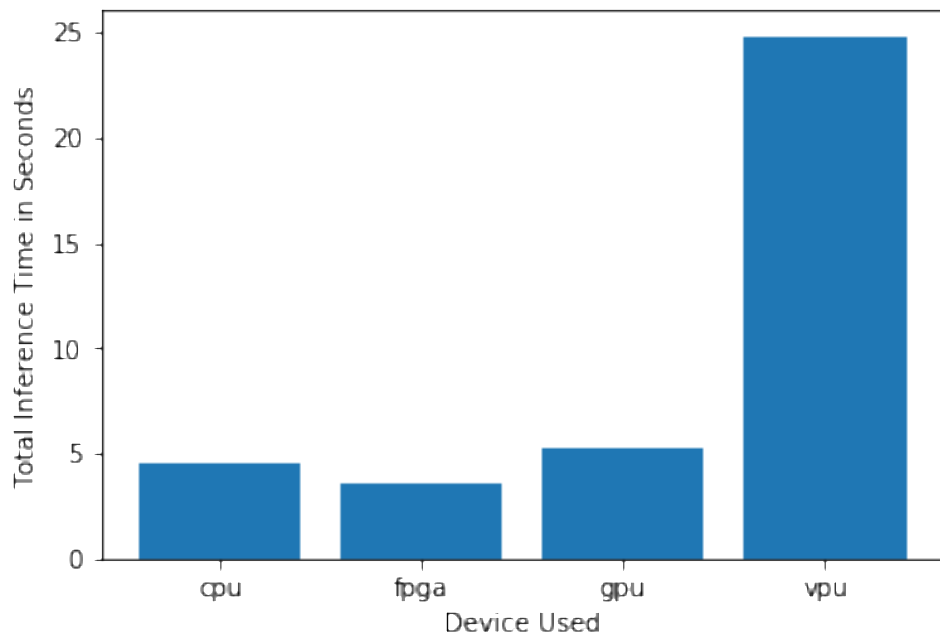
## Queue Monitoring Requirements

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

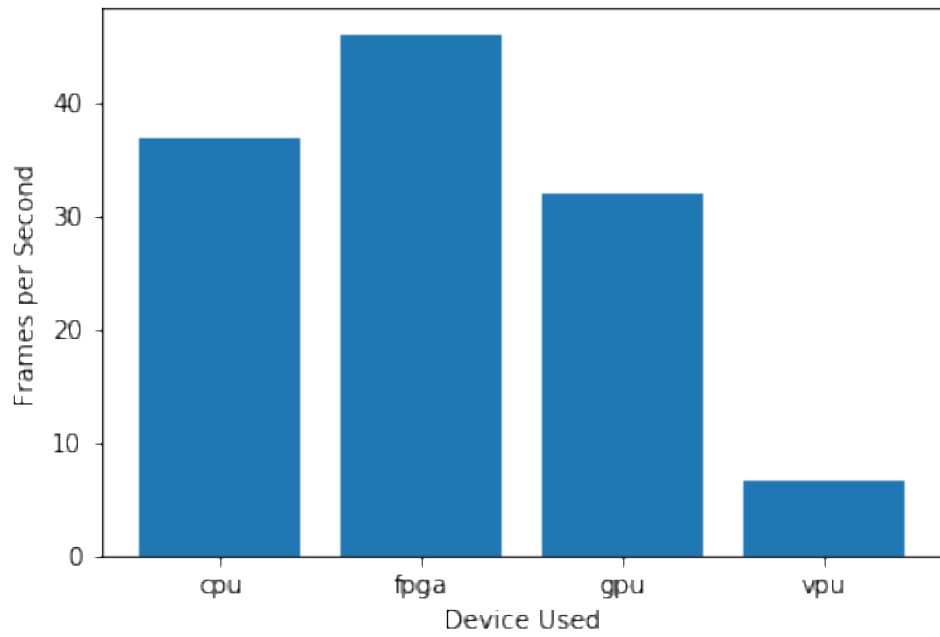
## Test Results

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).



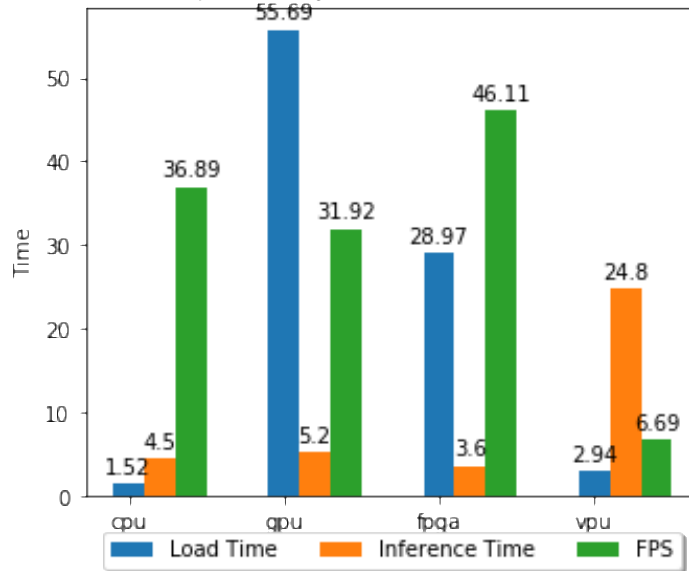


***Inference Time***



***FPS***

Retail Scenario - comparison by model load time, FPS, and Inference Time



Overall Comparison – For Final Recommendation

## 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

- The client does not have a lot of money to invest in additional equipment, but has the modern computers equipped with intel i7 and contain IGPU.
- The CPU and IGPU inference time are marginally closer, whilst FPGA outperforms it is not viable because of the cost aspects.
- Similarly, Model load time and FPS again are the tradeoff considering the fact the client's requirement could still be met from IGPU.

## 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

(<https://software.intel.com/content/dam/develop/public/us/en/documents/ncs2-data-sheet.pdf>)

Requirement Observed (Include at least two.)	How does the chosen hardware meet this requirement?
<i>Ms. Leah's budget allows for <b>a maximum of \$300 per machine</b></i>	<i>VPU or NCS2 is only about 27.40 mm in size and would fit in the price range. <a href="#">Check price</a></i>
<i>The CPUs in these machines are currently being used to process and view CCTV footage for security purposes and no significant additional processing power is available to run inference</i>	<i>The client's PC has already been utilized to the fullest, the NCS2 is a low powered device and it can be used to make inference on models.</i>

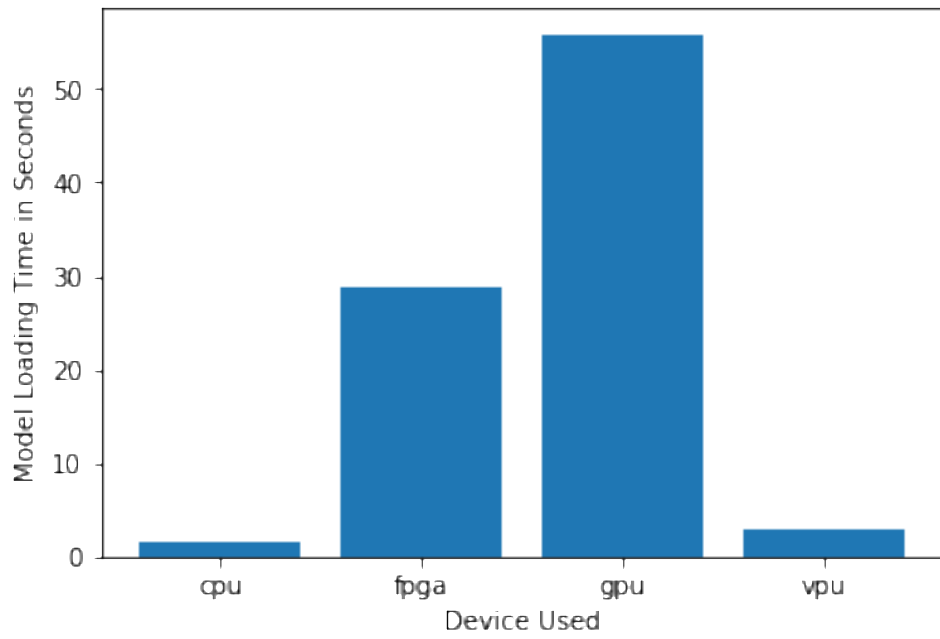
## Queue Monitoring Requirements

Maximum number of people in the queue	7 (targeting Non-peak hours)
Model precision chosen (FP32, FP16, or Int8)	FP16

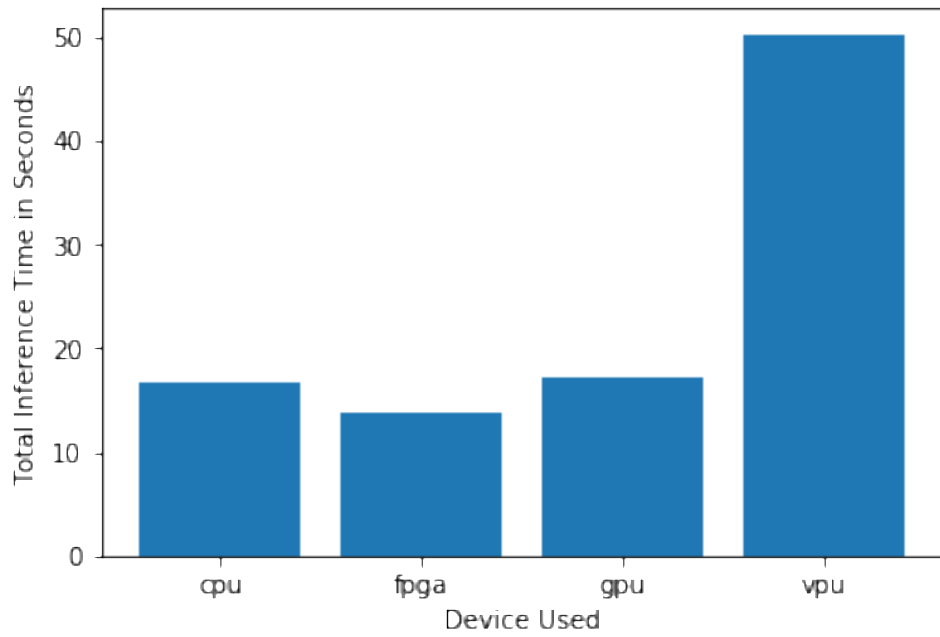
## Test Results

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).

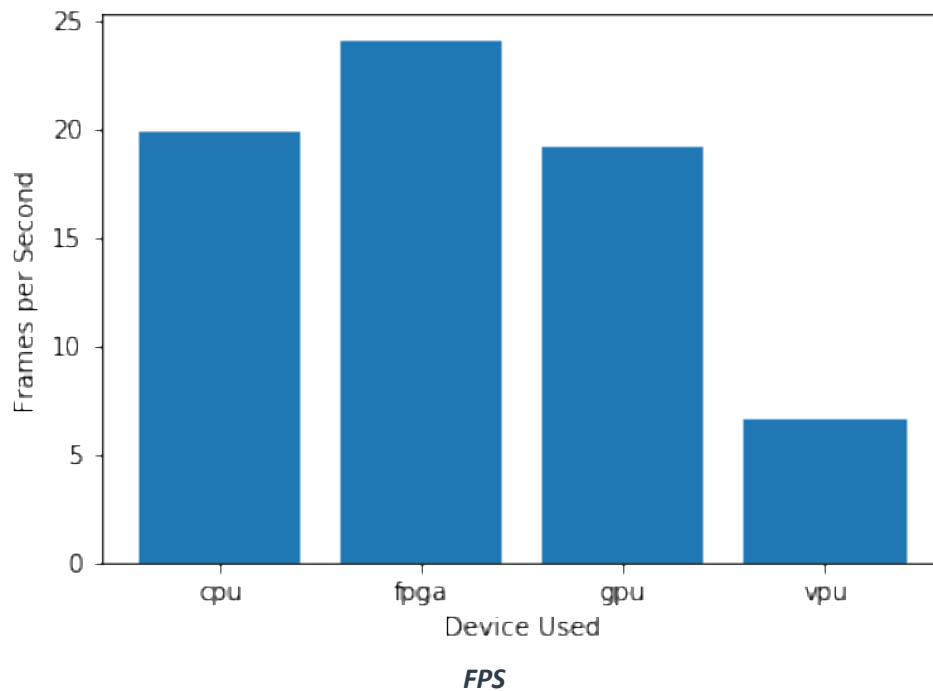




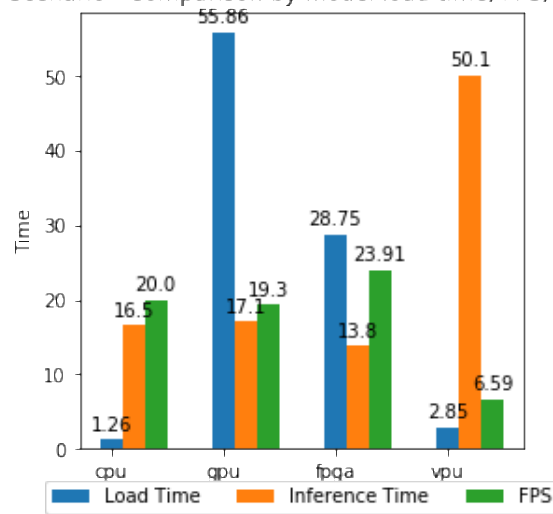
***Model Load Time***



***Inference Time***



Transportation Scenario - Comparison by model load time, FPS, and Inference Time



Overall Comparison – For Final Recommendation

## 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

- *The client has a budget of at most \$300 per machine and VPU or NCS2 is ideal hardware for this specific scenario.*
- *The Inference time for the VPU is significantly higher than that of the CPU, IGPU and FPGA, but these hardware don't meet the client needs, FPGA is too expensive, CPU is already being used extensively.*
- *The client cannot use CPU because they are used to process and view CCTV footage for security purposes and no significant additional processing power is available to run inference.*
- *Although the VPU reads fewer frames than the CPU, FPGA, and IGPU, the VPU is what still meets the client's needs.*