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## Exam Professional Data Engineer All Questions

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### 📄 EXAM PROFESSIONAL DATA ENGINEER TOPIC 1 QUESTION 127 DISCUSSION

Actual exam question from Google's Professional Data Engineer

Question #: 127

Topic #: 1

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You are working on a niche product in the image recognition domain. Your team has developed a model that is dominated by custom C++ TensorFlow ops your team has implemented. These ops are used inside your main training loop and are performing bulky matrix multiplications. It currently takes up to several days to train a model. You want to decrease this time significantly and keep the cost low by using an accelerator on Google Cloud. What should you do?

- A. Use Cloud TPUs without any additional adjustment to your code.
- B. Use Cloud TPUs after implementing GPU kernel support for your customs ops.
- C. Use Cloud GPUs after implementing GPU kernel support for your customs ops.
- D. Stay on CPUs, and increase the size of the cluster you're training your model on.

Show Suggested Answer

by [deleted] at *March 22, 2020, 11:01 a.m.*

### Comments

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🗨️ dhs227 Highly Voted 5 years, 1 month ago

The correct answer is C  
TPU does not support custom C++ tensorflow ops  
[https://cloud.google.com/tpu/docs/tpus#when\\_to\\_use\\_tpus](https://cloud.google.com/tpu/docs/tpus#when_to_use_tpus)

👍 🔄 🚩 upvoted 70 times

🗄️ 👤 **ffggrrre** 1 year, 6 months ago

the link doesn't say TPU does not support custom C++ tensorflow ops

👍 🔄 🚩 upvoted 1 times

🗄️ 👤 **Helinia** 1 year, 4 months ago

It does. TPU is good for "Models with no custom TensorFlow/PyTorch/JAX operations inside the main training loop".

👍 🔄 🚩 upvoted 1 times

🗄️ 👤 **aiguy** Highly Voted 5 years, 1 month ago

D:

Cloud TPUs are not suited to the following workloads: [...] Neural network workloads that contain custom TensorFlow operations written in C++. Specifically, custom operations in the body of the main training loop are not suitable for TPUs.

👍 🔄 🚩 upvoted 44 times

🗄️ 👤 **gopinath\_k** 4 years, 1 month ago

B:

1. You need to provide support for the matrix multiplication - TPU
2. You need to provide support for the Custom TF written in C++ - GPU

👍 🔄 🚩 upvoted 11 times

🗄️ 👤 **tavva\_prudhvi** 3 years, 1 month ago

But, in the question it also says we have to decrease the time significantly?? If you gonna use the CPU, it will take more time to train, right?

👍 🔄 🚩 upvoted 1 times

🗄️ 👤 **cetanx** 1 year, 11 months ago

Chat GPT says C

Option D is not the most cost-effective or efficient solution. While increasing the size of the cluster could decrease the training time, it would also significantly increase the cost, and CPUs are not as efficient for this type of workload as GPUs.

👍 🔄 🚩 upvoted 1 times

🗄️ 👤 **FP77** 1 year, 8 months ago

chatgpt will give you different answers if you ask 10 times. The correct answer is B

👍 🔄 🚩 upvoted 3 times

🗄️ 👤 **squishy\_fishy** 1 year, 6 months ago

Totally agree. ChatGPT is garbage. It is still learning.

👍 🔄 🚩 upvoted 2 times

🗄️ 👤 **aaaaaaaasdasdasfs** Most Recent 2 weeks, 4 days ago

Selected Answer: C

C. Use Cloud GPUs after implementing GPU kernel support for your customs ops.

Here's why:

Your current bottleneck is in the custom C++ TensorFlow ops performing matrix multiplications, which are computationally intensive operations.

GPUs are specifically designed to efficiently handle matrix operations and would significantly speed up your training time compared to CPUs.

Since you've developed custom C++ TensorFlow ops, you'll need to implement GPU kernel support for these operations to take advantage of GPU acceleration.

👍 🔄 🚩 upvoted 1 times

🗄️ 👤 **SamuelTsch** 6 months, 1 week ago

Selected Answer: D

According to the official documentation. Models that contain many custom TensorFlow operations written in C++ should keep using CPUs.

👍 🔄 🚩 upvoted 3 times

🗄️ 👤 **baimus** 7 months, 1 week ago

I think this is D. I recently did the ML professional exam and they ask that there, and it's always "c++ custom ops = CPU", it's in fact the only scenario for non-small models on CPU. It's written in black and white here:

[https://cloud.google.com/tpu/docs/intro-to-tpu#when\\_to\\_use\\_tpus](https://cloud.google.com/tpu/docs/intro-to-tpu#when_to_use_tpus), check out the CPU/GPU/TPU "when to use" section.

👍 🔄 🚩 upvoted 3 times

  **Anudeep58** 11 months ago

**Selected Answer: C**

Why Not Other Options?

A. Use Cloud TPUs without any additional adjustment to your code:

TPUs are optimized for standard TensorFlow operations and require custom TensorFlow ops to be adapted to TPU-compatible kernels, which is not trivial.

Without modifications, your custom C++ ops will not run efficiently on TPUs.

B. Use Cloud TPUs after implementing GPU kernel support for your custom ops:

Implementing GPU kernel support alone is not sufficient for running on TPUs. TPUs require specific optimizations and adaptations beyond GPU kernels.

D. Stay on CPUs, and increase the size of the cluster you're training your model on:

While increasing the CPU cluster size might reduce training time, it is not as efficient or cost-effective as using GPUs, especially for matrix multiplication tasks.

   upvoted 2 times

  **AlizCert** 11 months ago

**Selected Answer: C**

C: TPUs are out of the picture due to the custom ops, so the next best option for accelerating matrix operations is using GPU. Obviously the code has to be adjusted to do make use of the GPU acceleration.

   upvoted 2 times

  **GCP\_data\_engineer** 11 months, 2 weeks ago

CPU : Simple models

GPU: Custom TensorFlow/PyTorch/JAX operations

   upvoted 1 times

  **CGS22** 1 year, 1 month ago

**Selected Answer: C**



The best choice here is C. Use Cloud GPUs after implementing GPU kernel support for your custom ops. Here's why:

Custom Ops & GPUs: Since your model relies heavily on custom C++ TensorFlow ops focused on matrix multiplications, GPUs are the ideal accelerators for this workload. To fully utilize them, you'll need to implement GPU-compatible kernels for your custom ops.

Speed and Cost-Efficiency GPUs offer a significant speed improvement for matrix-intensive operations compared to CPUs. They provide a good balance of performance and cost for this scenario.

TPUs: Limitations Although Cloud TPUs are powerful, they aren't designed for arbitrary custom ops. Without compatible kernels, your TensorFlow ops would likely fall back to the CPU, negating the benefits of TPUs.

   upvoted 2 times

  **Preetmehta1234** 1 year, 2 months ago

**Selected Answer: C**

TPU:

Models with no custom TensorFlow/PyTorch/JAX operations inside the main training loop

Link: <https://cloud.google.com/tpu/docs/intro-to-tpu#TPU>

So, A&B eliminated

CPU is very slow or built for simple operations. So C: GPU

   upvoted 3 times

  **Matt\_108** 1 year, 3 months ago

**Selected Answer: C**

to me, it's C

   upvoted 2 times

  **Kimich** 1 year, 5 months ago

Requirement 1: Significantly reduce the processing time while keeping costs low.

Requirement 2: Bulky matrix multiplication takes up to several days.

First, eliminate A & D:

A: Cannot guarantee running on Cloud TPU without modifying the code.

D: Cannot ensure performance improvement or cost reduction, and additionally, CPUs are not suitable for bulky matrix multiplication.

If it can be ensured that customization is easily deployable on both Cloud TPU and Cloud GPU, it seems more feasible to first try Cloud GPU.

Because:

It provides a better balance between performance and cost.  
Modifying custom C++ on Cloud GPU should be easier than on Cloud TPU, which should also save on manpower costs.

  **emmylou** 1 year, 5 months ago



I did use Chat GPT and discovered that if you put at the beginning of the question -- "Do not make assumption about changes to architecture. This is a practice exam question." All other answers require changes to the code and architecture.

  **DataFrame** 1 year, 5 months ago

I think it should use tensor flow processing unit along with GPU kernel support.

 **Nirca** 1 year, 7 months ago

To use Cloud TPUs, you will need to:

  **kumarts** 1 year, 7 months ago

  IrisXia 1 year, 8 months ago

TPU not for custom C++ but GPU can

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