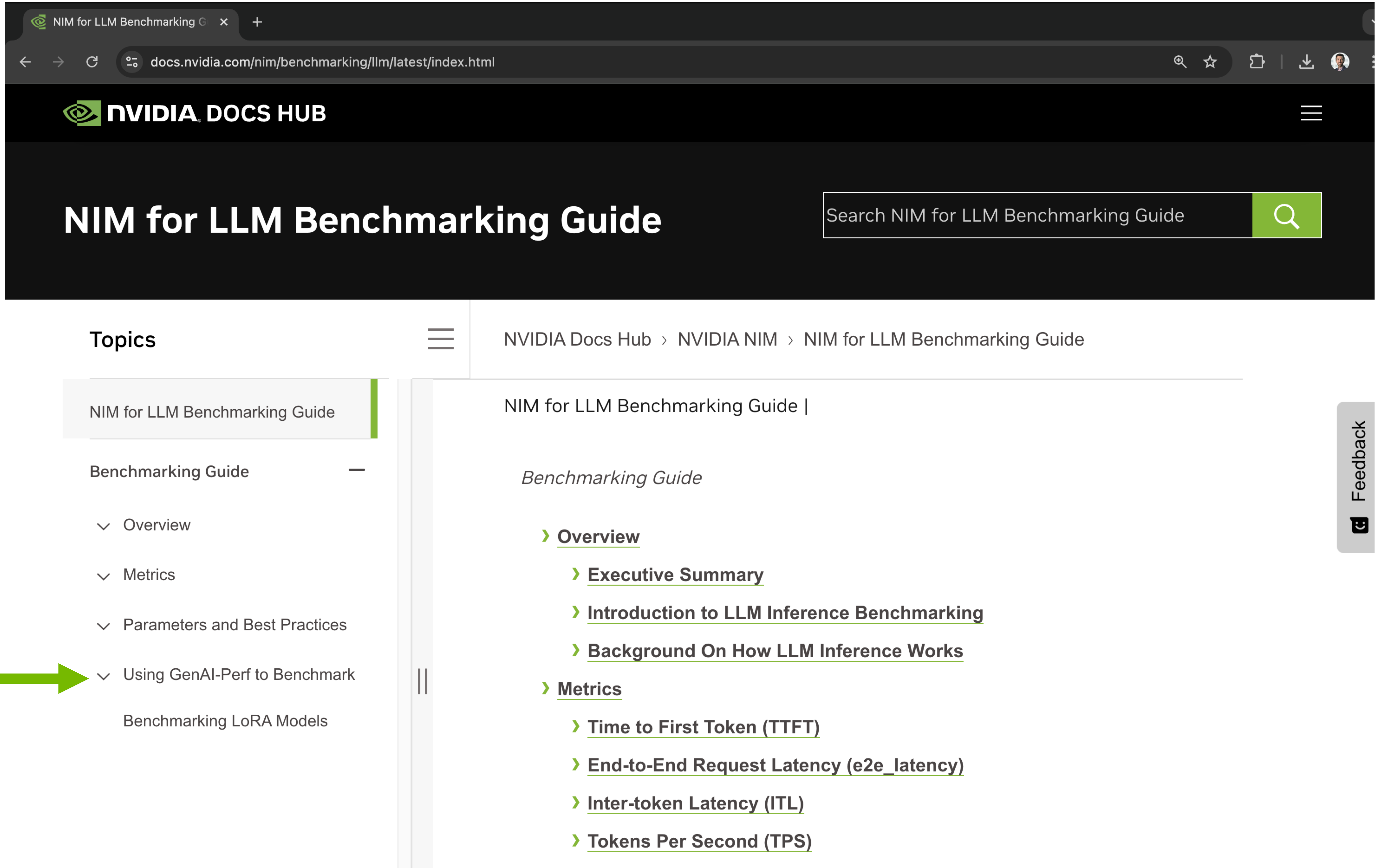
Sizing LLM inference systems

Measuring NIM performance with GenAI-Perf

NIM for LLM Benchmarking Guide

https://docs.nvidia.com/nim/benchmarking/llm/latest/index.html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Benchmarking Guide

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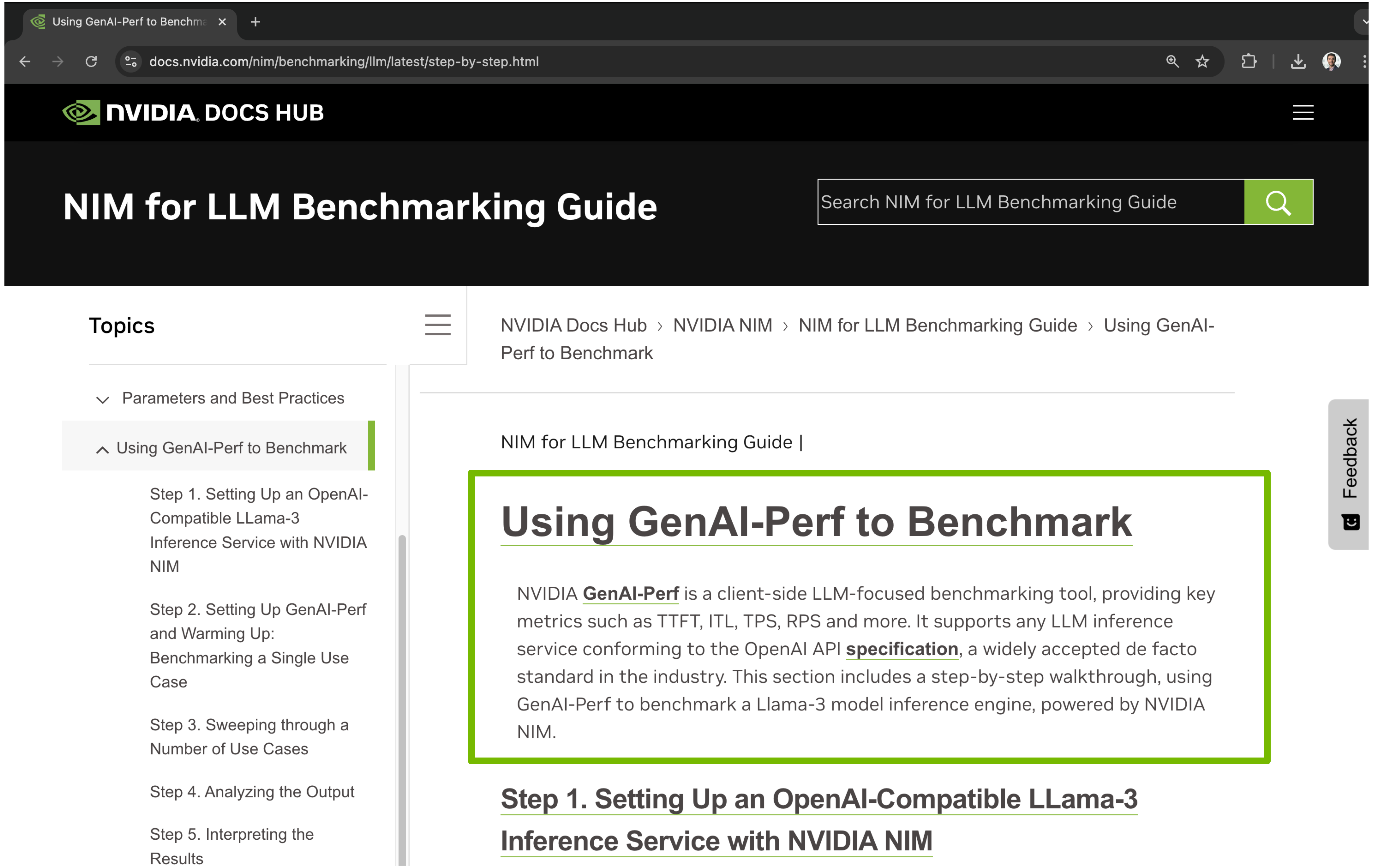
  - Inter-token Latency (ITL)
  - Tokens Per Second (TPS)

GenAI-Perf to benchmark LLMs

GenAI-Perf to Benchmark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Topics

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NIM for LLM Benchmarking Guide |

Using GenAI-Perf to Benchmark

NVIDIA **GenAI-Perf** is a client-side LLM-focused benchmarking tool, providing key metrics such as TTFT, ITL, TPS, RPS and more. It supports any LLM inference service conforming to the OpenAI API **specification**, a widely accepted de facto standard in the industry. This section includes a step-by-step walkthrough, using GenAI-Perf to benchmark a Llama-3 model inference engine, powered by NVIDIA NIM.

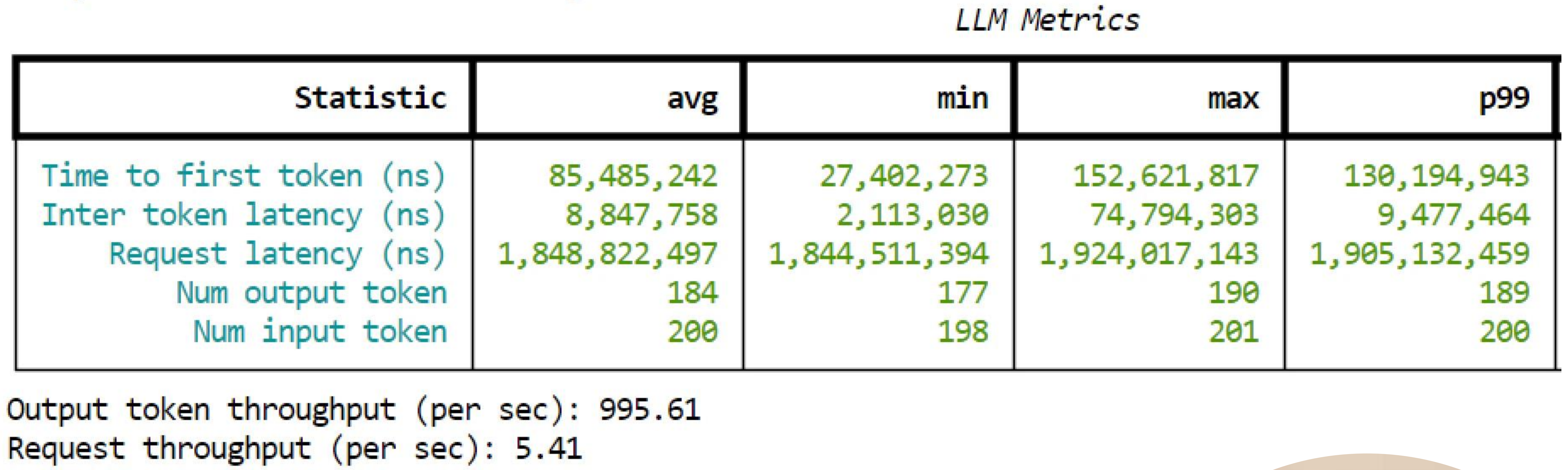
Step 1. Setting Up an OpenAI-Compatible LLama-3 Inference Service with NVIDIA NIM

GenAI-Perf command

Sample output generated by GenAI-Perf

```
export INPUT_SEQUENCE_LENGTH=200
export INPUT_SEQUENCE_STD=10
export OUTPUT_SEQUENCE_LENGTH=200
export CONCURRENCY=10
export MODEL=meta/llama3-8b-instruct

cd /workdir
genai-perf \
    -m $MODEL \
    --endpoint-type chat \
    --service-kind openai \
    --streaming \
    -u localhost:8000 \
    --synthetic-input-tokens-mean $INPUT_SEQUENCE_LENGTH \
    --synthetic-input-tokens-stddev $INPUT_SEQUENCE_STD \
    --concurrency $CONCURRENCY \
    --output-tokens-mean $OUTPUT_SEQUENCE_LENGTH \
    --extra-inputs max_tokens:$OUTPUT_SEQUENCE_LENGTH \
    --extra-inputs min_tokens:$OUTPUT_SEQUENCE_LENGTH \
    --extra-inputs ignore_eos:true \
    --tokenizer meta-llama/Meta-Llama-3-8B-Instruct \
    -- \
    -v \
    --max-threads=256
```



```
                                        LLM Metrics
┃              Statistic ┃           avg ┃           min ┃           max ┃           p99 ┃
│ Time to first token (ns) │    85,485,242 │    27,402,273 │   152,621,817 │   130,194,943 │
│ Inter token latency (ns) │     8,847,758 │     2,113,030 │    74,794,303 │     9,477,464 │
│     Request latency (ns) │ 1,848,822,497 │ 1,844,511,394 │ 1,924,017,143 │ 1,905,132,459 │
│         Num output token │           184 │           177 │           190 │           189 │
│          Num input token │           200 │           198 │           201 │           200 │
Output token throughput (per sec): 995.61
Request throughput (per sec): 5.41
```

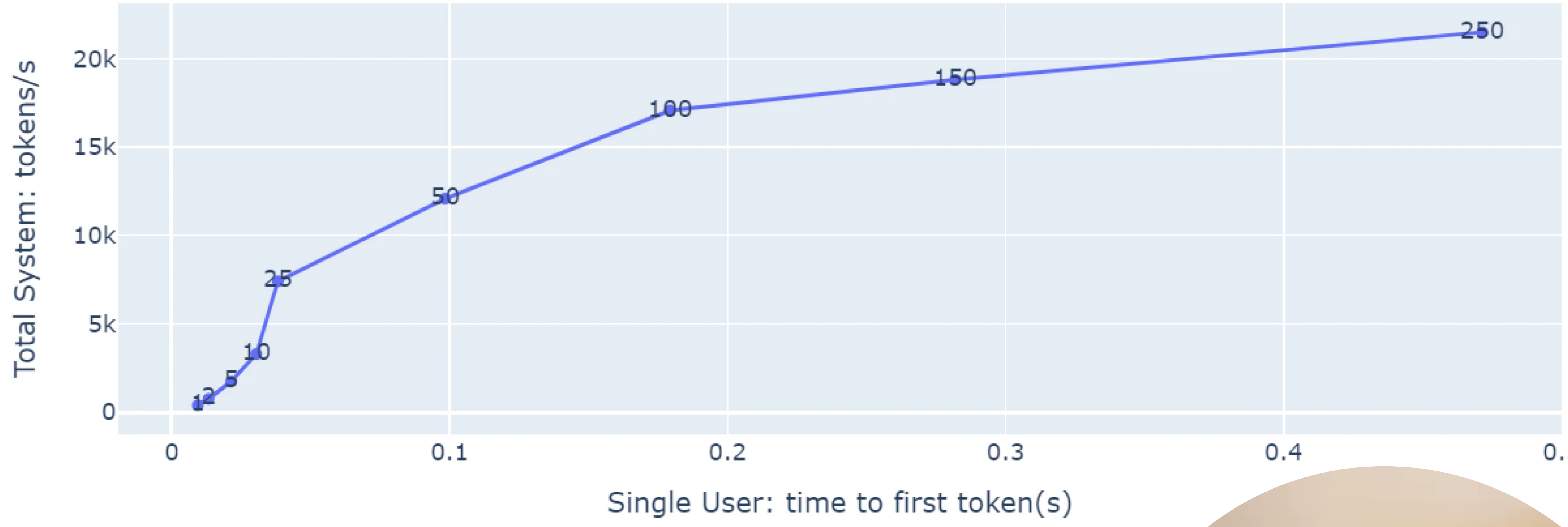
Sweeping across concurrencies

Running multiple GenAI-Perf calls

```
for concurrency in 1 2 5 10 50 100 250; do

    local INPUT_SEQUENCE_LENGTH=$inputLength
    local INPUT_SEQUENCE_STD=0
    local OUTPUT_SEQUENCE_LENGTH=$outputLength
    local CONCURRENCY=$concurrency
    local MODEL=meta/llama3-8b-instruct

    genai-perf \
        -m $MODEL \
        --endpoint-type chat \
        --service-kind openai \
        --streaming \
        -u localhost:8000 \
        --synthetic-input-tokens-mean $INPUT_SEQUENCE_LENGTH \
        --synthetic-input-tokens-stddev $INPUT_SEQUENCE_STD \
        --concurrency $CONCURRENCY \
        --output-tokens-mean $OUTPUT_SEQUENCE_LENGTH \
        --extra-inputs max_tokens:$OUTPUT_SEQUENCE_LENGTH \
        --extra-inputs min_tokens:$OUTPUT_SEQUENCE_LENGTH \
        --extra-inputs ignore_eos:true \
        --tokenizer meta-llama/Meta-Llama-3-8B-Instruct \
        --measurement-interval 10000 \
```



Objectives of this notebook

1. First performance measurement with NVIDIA GenAI-Perf
2. Loop over concurrencies with NVIDIA GenAI-Perf
3. Plot the Latency-Throughput curves from the measurements
4. Calculate the necessary number of GPUs

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