Beyond KV-Cache

Topics for Today

- **KV-Cache: Bluefield DPU vs KubeFlash**
- **Deepseek Engram, implication for flash storage**
- **Beyond KV-Cache**

Bluefield/DPU essentially is All Flash Array

All Flash Array

Major Player

KubeFlash Advantage

- Off-the-Shelf components
- Utilizing server from any vendor
- High performance and low CPU utilization

Bluefield

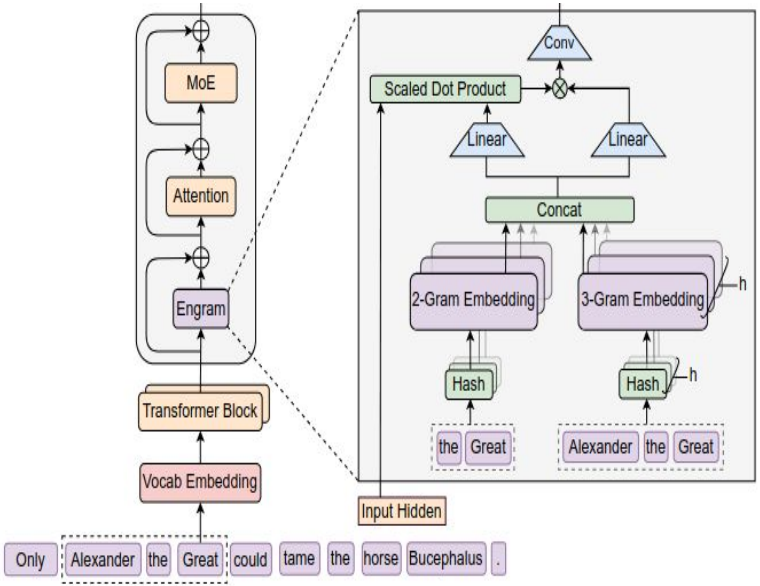
- Eliminate x86 CPU
- Redevelop full storage stack
- Proprietary Nvidia specific

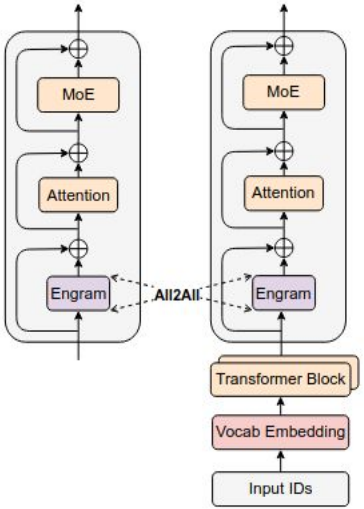
KubeFlash HCI mode best utilizing local native SSD

Cost effective, best investment/performance ratio

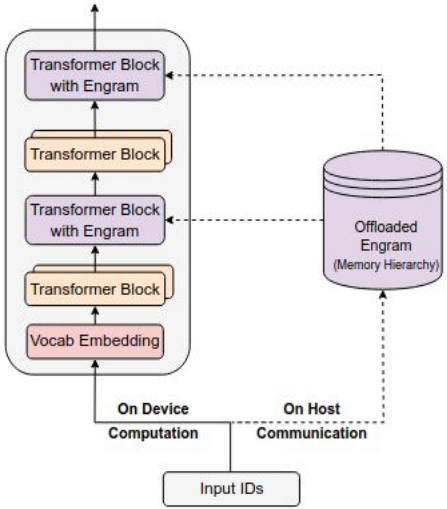
PCIE switch port limitation

Engram & Implication



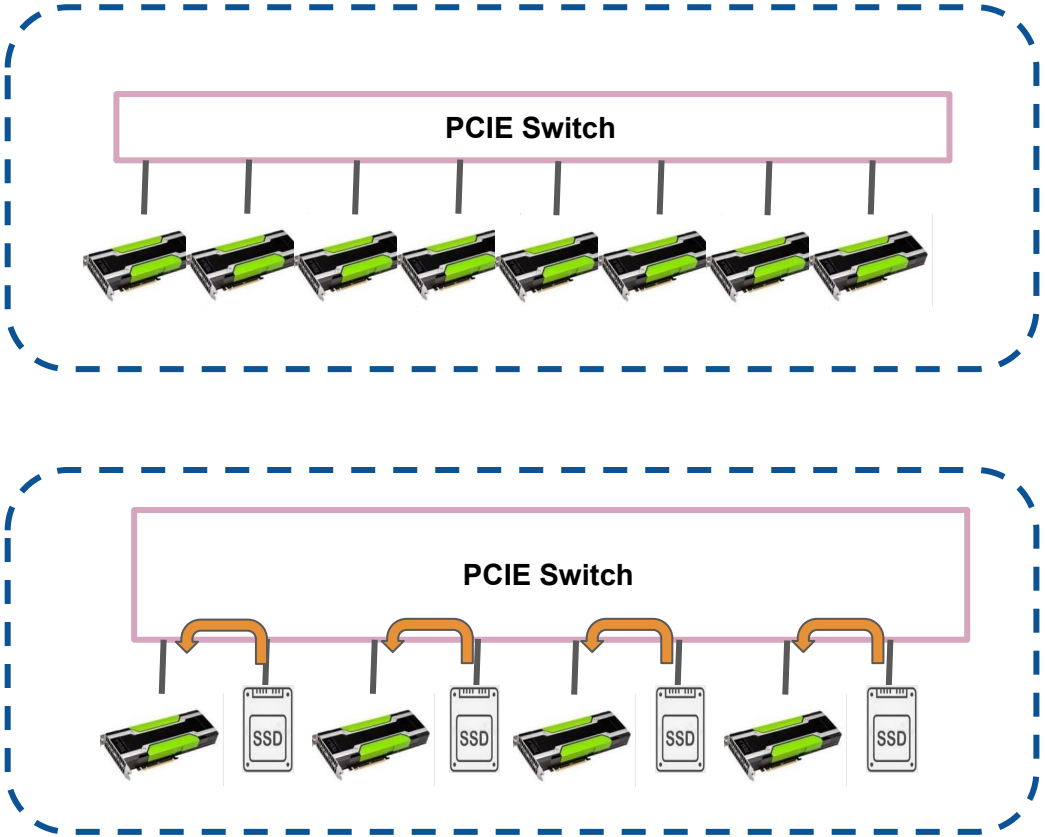


(a) Engram at training



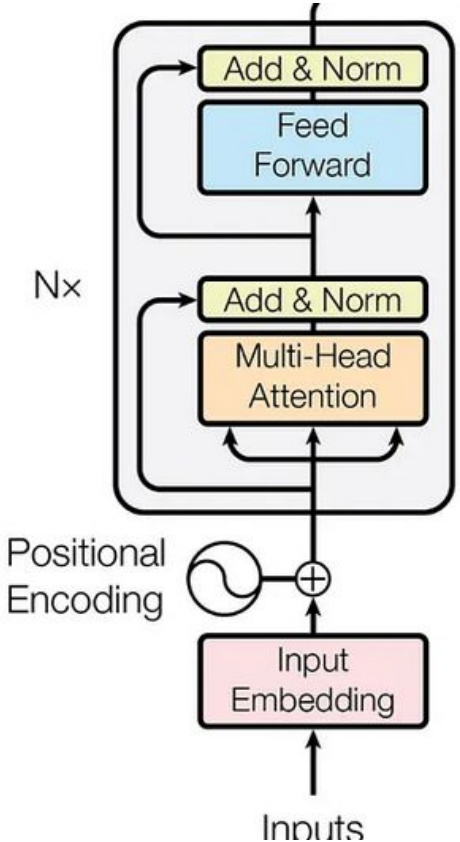
(b) Engram at inference

GPU Server Restructured



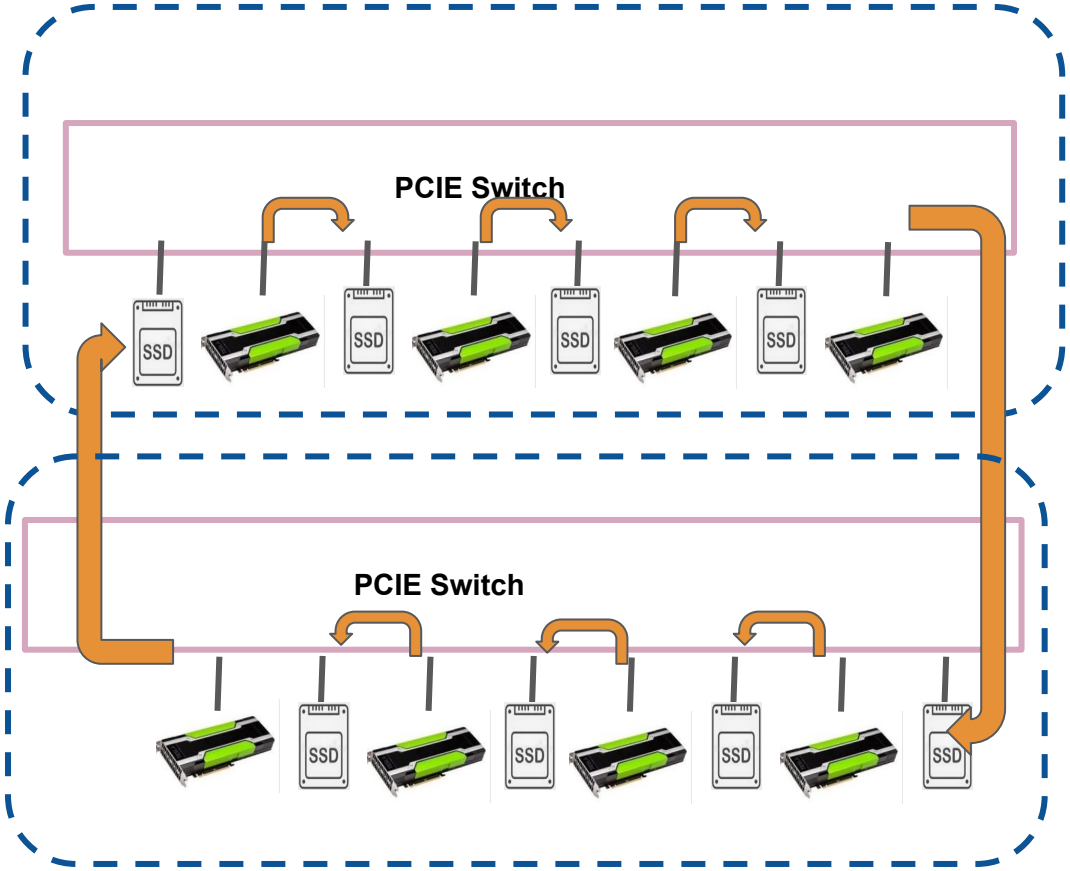
- GPU paired with SSD
- GPU now have dedicated computing scratch pad
- SSD will hold all model parameters, Gradients, optimizer states
- GPU exchange data through neighbour SSD

SSD LLM inference Streaming Computing



- GPT-3 175B, 96 layer
- Each layer ~1.8B, 3.6G Bytes
- Gen5x16 SSD bandwidth ~ 100GB/s
- Model loading time for one layer: 3.6/100 ~ **35ms**
- Computing: 100K x 1.8B / 1000 T ~ **180 ms**

GPU Server Ring Extension



- Commodity GPU, less HBM dependency
- No NVlink dependency
- Better parallelism All/All Ring reduce
- Training largest LLM with a few tens of GPU