

AICN Status

Jieyu Li (CMCC)

Lily Lyu (Huawei)

March Plenary 2025

AICN study item Initiated

AICN study item website: <https://1.ieee802.org/nendica-aicn/>

IEEE 802 Nendica Initiating Motion (2024-03-14)

- To initiate a Nendica Study Item on AI computing network

Motivation of AICN Study Item

- To support the emerging AI workloads, high performance networking is required.
- Ethernet networking as the rich eco-system technology has opportunities to support AI clusters. However, it needs to be evolved in order to meet the requirements of AI computing network.
- How does IEEE802 networking fit for AI cluster?

Start from study item

- Analyzing network challenges for AI clusters
- Pointing out AI computing network technology trends
- Identifying IEEE802 standard gaps and opportunities

AICN Contributions and Report Draft

I. Understanding AI large model and its workload

Initial Analysis

- Surge of AI large Model
- Scale-up & scale-out network

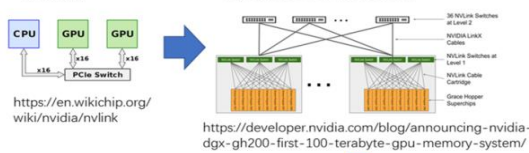
AI Traffic Analysis

- Parallelism strategy
- Traffic characteristics

<https://en.wikichip.org/wiki/nvlink>
<https://developer.nvidia.com/blog/announcing-nvidia-dgx-gh200-first-100-terabyte-gpu-memory-system/>

Scale-up

Bus technology evolves, trying to connect more GPUs in bus domain.

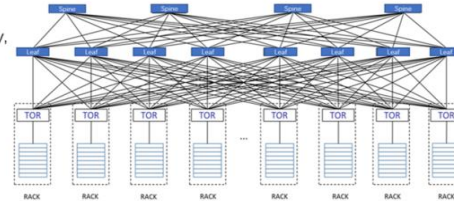


- PCIe, NVLink, CXL ...
 - Ultra high bandwidth: e.g NVLink5.0 is a 1.8TB/s bidirectional, direct GPU-to-GPU interconnect
- Server-scale -> rack-scale -> pod-scale
 - 10 -> 1000 GPUs

Scale-out

Network technology evolves, trying to improve performance (reliability, latency, throughput)

- Infiniband, Ethernet (RoCEV2), ...
 - High bandwidth: 800GE -> 1.6TGE
- Pod-scale -> across DC scale
 - Towards 10K+ GPUs



AICN report draft

Introduction

Scope

Purpose

Abbreviation

Stepping into the Large-Scale AI era

ChatGPT ignites enthusiasm for large-scale AI models

Large-scale AI models show emergent abilities

Large-scale AI model Training

AI training process

Distributed AI system and parallelism

Communication characteristics in AI training

Sparsity of traffic in space

Sparsity of traffic in time

Huge amount of traffic for communication

AI computing networks

Requirements and Challenges of AI computing Networks

Scale

Efficiency

Availability

Future technologies

Standard considerations

References

II. Potential requirements and challenges discussion

Scale issues

- DCI interconnection challenges.
- New cost-effective topologies and their challenges.

[1-24-0027-01-ICne-contributed-text-scale-requirements-and-challenges.pdf](https://en.wikichip.org/wiki/nvlink)

Availability issues

- Availability requirements
- Considerations on LLR and light weighted FEC

[1-24-0031-00-ICne-availability-challenges-and-requirements-of-aicn.pdf](https://en.wikichip.org/wiki/nvlink)
[1-24-0057-00-ICne-quantized-benefit-of-llr-fec-and-llr.pptx](https://en.wikichip.org/wiki/nvlink)

Load balancing issues

- Imbalance challenges under AI traffic
- Per-packet LB discussion

[1-24-0004-05-ICne-load-balancing-challenges-in-ai-fabric.pdf](https://en.wikichip.org/wiki/nvlink)
[1-24-0060-01-ICne-reviewing-load-balancing-issues-in-ai-computing-network.pdf](https://en.wikichip.org/wiki/nvlink)

Security issues

- Challenges of existing Link Security
- Considerations on PHY security

[1-24-0036-01-ICne-new-requirements-and-challenges-of-network-link-security.pdf](https://en.wikichip.org/wiki/nvlink)
[1-24-0056-00-ICne-follow-up-discussion-of-link-security.pdf](https://en.wikichip.org/wiki/nvlink)

Discussion

- Collaboration with 802.3 group?
 - Different focus, but potential for interaction
- Reach out to other industry organizations for collaboration?
 - IEEE802's interest in this area
 - Relevant activities/projects within IEEE802
 - Gather input from other organizations
 - Open to collaborating with other organizations

Thanks!