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## NVIDIA NCP-AIN Exam Syllabus Topics:

Topic	Details
Topic 1	<ul style="list-style-type: none"><li>Spectrum-X Configuration, Optimization, Security, and Troubleshooting: This section of the exam measures the skills of Network Performance Engineers and covers configuring, managing, and securing NVIDIA Spectrum-X switches. It includes setting performance baselines, resolving performance issues, and using diagnostic tools such as CloudAI benchmark, NCCL, and NetQ. It also emphasizes leveraging DPUs for network acceleration and using monitoring tools like Grafana and SNMP for telemetry analysis.</li></ul>
Topic 2	<ul style="list-style-type: none"><li>InfiniBand Configuration, Optimization, Security, and Troubleshooting: This section of the exam measures the skills of Data Center Network Administrators and covers the configuration and operational maintenance of NVIDIA InfiniBand switches. It includes setting up InfiniBand fabrics for multi-tenant environments, managing subnet configurations, testing connectivity, and using UFM to troubleshoot and analyze issues. It also focuses on validating rail-optimized topologies for optimal network performance.</li></ul>
Topic 3	<ul style="list-style-type: none"><li>AI Network Architecture: This section of the exam measures the skills of AI Infrastructure Architects and covers the ability to distinguish between AI factory and AI data center architectures. It includes understanding how Ethernet and InfiniBand differ in performance and application, and identifying the right storage options based on speed, scalability, and cost to fit AI networking needs.</li></ul>

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## NVIDIA-Certified Professional AI Networking Sample Questions (Q16-Q21):

### NEW QUESTION # 16

You are optimizing a multi-node AI training cluster using InfiniBand networking and NVIDIA GPUs. You need to implement efficient collective communication operations across the nodes.

Which feature of NVIDIA Collective Communications Library (NCCL) allows for optimized performance in multi-subnet InfiniBand environments?

- A. GPU Direct RDMA
- B. Static plugin linking
- C. Lazy connection establishment
- D. **Support for IB Router**

**Answer: D**

Explanation:

In multi-subnet InfiniBand environments, AI training clusters are segmented across network zones (or subnets). Direct GPU-to-GPU communication (especially for collective ops like AllReduce, Broadcast, etc.) requires inter-subnet reachability. NCCL supports this via the InfiniBand Router (IB Router) feature.

From the NCCL User Guide - Environment Variables Section:

"`NCCL_IB_USE_IB_ROUTER`: Enables NCCL support for IB routers which are used in multi-subnet InfiniBand fabrics. When enabled, NCCL can traverse IB subnets using a properly configured IB router." This is critical because without IB Router support:

- \* NCCL would be restricted to intra-subnet GPU collectives.

- \* Multi-node training across subnets would fail or fall back to slower TCP fallback mechanisms.

Technical Explanation:

- \* IB Routers use subnet managers (like OpenSM with routing tables) to bridge communication across different InfiniBand partitions.

- \* NCCL queries the subnet topology, discovers routing paths, and uses RDMA CM (Connection Manager) to establish GPU transport over routers.

- \* This capability is especially important in data center-scale AI clusters spanning multiple racks or zones, connected via IB routers like Mellanox SB7800 or QM8700 series.

When `NCCL_IB_USE_IB_ROUTER=1` is set:

- \* NCCL includes router-aware route resolution in its path selection logic.

- \* Enables efficient zero-copy communication across GPUs in different IB domains, maintaining low latency.

Other Options Explained:

- \* A. Lazy connection establishment- controls when peer connections are made but does not enable cross-subnet reach.

- \* B. GPU Direct RDMA- enables intra-node direct memory access, not applicable for routing across subnets.

- \* C. Static plugin linking- affects how NCCL links plugins, not related to IB topology.

Exact Extract Reference:

Source: NVIDIA NCCL User Guide - Environment Variables Section

Extract: "`NCCL_IB_USE_IB_ROUTER`: Enables NCCL support for IB routers, required for multi-subnet InfiniBand configurations. Ensures proper routing of collectives over fabric-wide topologies."

### NEW QUESTION # 17

You suspect there might be connectivity issues in your InfiniBand fabric and need to perform a comprehensive check. Which tool should you use to run a full fabric diagnostic and generate a report?

- A. **ibdiagnet**
- B. perfquery
- C. taping
- D. ibnetdiscover

**Answer: A**

Explanation:

The `ibdiagnet` utility is a fundamental tool for InfiniBand fabric discovery, error detection, and diagnostics. It provides comprehensive reports on the fabric's health, including error reporting, switch and Host Channel Adapter (HCA) configuration dumps, various counters reported by the switches and HCAs, and parameters of devices such as switch fans, power supply units, cables, and PCI lanes. Additionally, `ibdiagnet` performs validation for Unicast Routing, Adaptive Routing, and Multicast Routing to ensure correctness and a credit-loop-free routing environment.

Reference Extracts from NVIDIA Documentation:

- \* "The `ibdiagnet` utility is one of the basic tools for InfiniBand fabric discovery, error detection and diagnostic. The output files of the `ibdiagnet` include error reporting, switch and HCA configuration dumps, various counters reported by the switches and the HCAs."
- \* "`ibdiagnet` also performs Unicast Routing, Adaptive Routing and Multicast Routing validation for correctness and credit-loop free routing."

### NEW QUESTION # 18

You are troubleshooting a Spectrum-X network and need to ensure that the network remains operational in case of a link failure. Which feature of Spectrum-X ensures that the fabric continues to deliver high performance even if there is a link failure?

- A. RoCE Adaptive Routing
- B. NVIDIA NetQ
- C. RoCE Performance Isolation
- D. RoCE Congestion Control

#### Answer: A

Explanation:

RoCE Adaptive Routing is a key feature of NVIDIA Spectrum-X that ensures high performance and resiliency in the network, even in the event of a link failure. This technology dynamically reroutes traffic to the least congested and operational paths, effectively mitigating the impact of link failures. By continuously evaluating the network's egress queue loads and receiving status notifications from neighboring switches, Spectrum-X can adaptively select optimal paths for data transmission. This ensures that the network maintains high throughput and low latency, crucial for AI workloads, even when certain links are down.

Reference Extracts from NVIDIA Documentation:

- \* "Spectrum-X employs global adaptive routing to quickly reroute traffic during link failures, minimizing disruptions and preserving optimal storage fabric utilization."
- \* "RoCE Adaptive Routing avoids congestion by dynamically routing large AI flows away from congestion points. This approach improves network resource utilization, leaf/spine efficiency, and performance."

### NEW QUESTION # 19

You are concerned about potential security threats and unexpected downtime in your InfiniBand data center.

Which UFM platform uses analytics to detect security threats, operational issues, and predict network failures in InfiniBand data centers?

- A. Telemetry Platform
- B. Host Agent
- C. Cyber-AI Platform
- D. Enterprise Platform

#### Answer: C

Explanation:

The NVIDIA UFM Cyber-AI Platform is specifically designed to enhance security and operational efficiency in InfiniBand data centers. It leverages AI-powered analytics to detect security threats, operational anomalies, and predict potential network failures. By analyzing real-time telemetry data, it identifies abnormal behaviors and performance degradation, enabling proactive maintenance and threat mitigation.

This platform integrates with existing UFM Enterprise and Telemetry services to provide a comprehensive view of the network's health and security posture. It utilizes machine learning algorithms to establish baselines for normal operations and detect deviations that may indicate security breaches or hardware issues.

Reference:NVIDIA UFM Cyber-AI Documentation v2.9.1

### NEW QUESTION # 20

In which mode of the BlueField DPU does the ARM system on the DPU control the NIC data path, but allow access to the DPU OS from the host?

- A. NIC mode
- B. DPU mode
- C. Separated Host mode

- D. Restricted mode

**Answer: B**

### Explanation:

InDPU Mode, the ARM cores on BlueField own the NIC data path, while still allowing the host system to access the DPU OS (via OOB or virtio).

From NVIDIA BlueField Documentation:

"In DPU Mode, the data path is offloaded to the BlueField Arm cores, enabling advanced security and networking functions, while still allowing host access to the BlueField OS." This is different from:

- \* NIC Mode: Data path controlled by host, ARM cores inactive.
- \* Separated Host Mode: Complete isolation; host cannot access DPU OS.
- \* Restricted Mode: Limited host access to DPU OS, but without full offload capabilities.

Reference: NVIDIA BlueField DPU Architecture Guide - Operating Modes Section

## NEW QUESTION # 21

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