

Juniper® Validated Design

JVD Solution Overview: Enterprise WAN for Finance and Stock Exchange



sol-overview-JVD-EWAN-FINANCE-01-01

Executive Summary

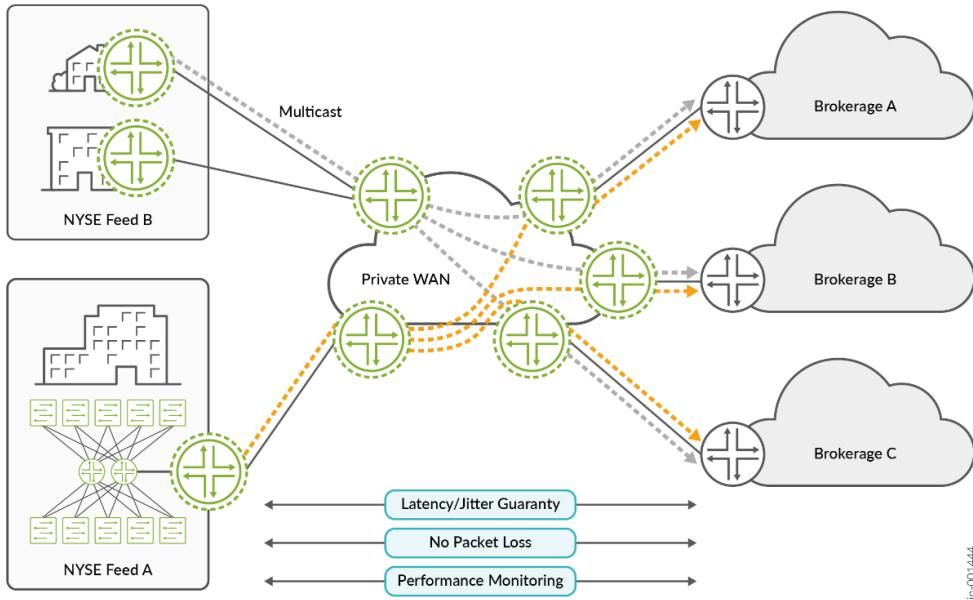
Stock exchange networks are among the most latency-sensitive and performance-critical environments. The solution in this JVD meets stringent requirements to ensure fair, deterministic, and ultra-fast trade execution with WAN infrastructure built of the Juniper Networks ACX7100 Cloud Metro Router series, MX480, MX304, MX10000 series. Key requirements include:

- Zero Packet Loss
- No Packet Reordering
- Deterministic Packet Delivery
- Low Latency
- High Availability and Redundancy
- Security and Segmentation
- Performance Monitoring

Multicast traffic is fundamental to stock exchange networks. It is primarily used for the efficient and simultaneous distribution of real-time market data, including quotes, trades, and order book updates, to many trading participants. This approach ensures fairness because all clients receive the same data at nearly the same time. It supports synchronized decision-making and competitive parity. Given the extremely high volume and velocity of market data, multicast traffic provides a scalable solution. It avoids the overhead of duplicate data streams for each recipient, unlike unicast traffic. However, because multicast typically uses UDP, which lacks retransmission, you must minimize packet loss through a reliable and lossless network design.

Figure 1 illustrates the finance and stock exchange network overview and highlights connectivity over a private WAN. Two identical market data feeds serve brokerage clients. Market data feeds provide brokerage clients with real-time or delayed streams of financial information. They include price quotes, trade volumes, and historical data, from various financial instruments. Clients typically subscribe to these market data feeds through brokerage platforms.

Figure 1: Overview of Finance and Stock Exchange Network



Low latency and jitters are critical requirements for finance and stock exchange networks, as even microsecond delays can affect trade outcomes. Protocols such as Internet Group Management Protocol (IGMP) and Protocol-Independent Multicast (PIM) handle multicast group membership and route traffic efficiently. Technologies such as IGMP snooping and hardware-based multicast replication ensure high performance and minimal network strain. Strict quality of service (QoS) policies prioritize multicast traffic, and access control mechanisms prevent unauthorized access to sensitive data streams. Continuous monitoring helps ensure the integrity and performance of multicast delivery, making it a cornerstone of modern stock exchange infrastructure.

Solution Overview

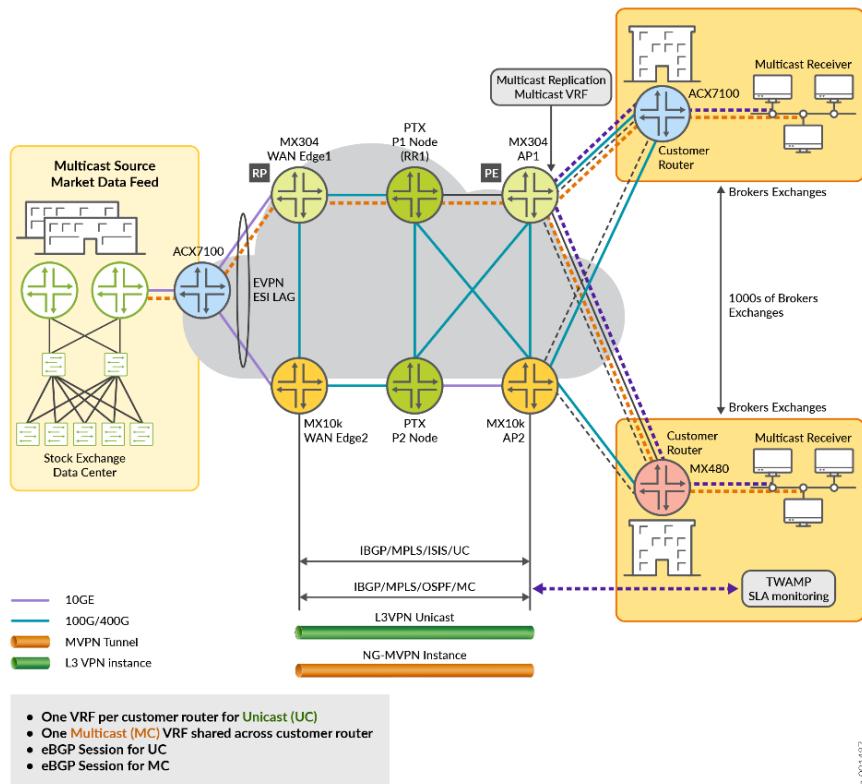
To satisfy stringent requirements of the finance and stock exchange networks, the proposed solution in this JVD incorporates the Enterprise WAN Finance and Stock Exchange Architecture shown in [Figure 2](#). The solution uses Protocol-Independent Multicast (PIM) Sparse Mode with a Static RP since the First Hop Router (FHR) is directly connected to the Multicast Source. In the solution, next-generation multicast virtual private network (NG-MVPN) is implemented in shortest path tree only (SPT-only) mode to carry multicast traffic for the market feeds to the Broker clients. In the **Shortest Path Tree (SPT)-only mode, Next-Generation Multicast VPN (NG-MVPN)** delivers market data feeds directly from the source PE (at the stock exchange edge) to the broker or trading clients across the MPLS core, eliminating the need for shared trees or rendezvous-point switching. By relying on **BGP-based signaling (Type-5 Source-Active and Type-7 Join routes)**, egress PEs immediately join the source-specific tree, allowing multicast traffic to flow along the most efficient MPLS path with minimal latency and jitter.

For efficient management of multicast traffic, the solution uses NG-MVPN, Multi-Protocol Label Switching (MPLS), and IP Virtual Private Network (VPN) and utilizes Resource Reservation Protocol-Traffic Engineering (RSVP-TE) for optimized transport. In the underlying network topology, Open Shortest Path First (OSPF) is deployed as a routing protocol, facilitating dynamic routing capabilities among multiple nodes. This design ensures **deterministic, low-latency delivery**, essential for time-sensitive financial transactions, while removing complexity and delay of the traditional PIM or MSDP-based multicast. NG-MVPN in SPT-only mode enhances **network performance, scalability, and reliability** by using hardware-based replication (via P2MP LSPs or ingress replication), integrating QoS for strict priority traffic (LLQ/Strict-High), and supporting fast convergence through MPLS FRR and BGP failover.

Furthermore, Two-Way Active Measurement Protocol (TWAMP) is implemented for SLA (Service Level Agreement) monitoring, enabling proactive performance assessment between Access Points and Customer Routers. Additionally, this architecture utilizes Ethernet Virtual

Private Network (EVPN) technology to enable Active/Standby redundancy. This ensures high availability and resilience for critical financial data transmission from finance and stock exchange, data center.

Figure 2: Network Architecture of Finance and Stock Exchange



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To enhance traffic management, Class of Service (CoS) is configured with multifield classifiers that prioritize multicast traffic with a strict-high priority designation, while assigning a lower priority to all remaining services.

In this JVD, the next generation of ACX Series and MX Series platforms introduces support for the 100G access segment. The Juniper Networks ACX7100-48L Cloud Metro Router acts as a CPE device, and the MX480, the MX304, the MX10004, and the MX10008 function as PE devices.



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