

Connectivity Overview



<u>goodbooppoop</u>

For more than 150 years we have been creating opportunities for investors, both local and global, to grow their wealth, and assisting New Zealand businesses to prosper. As New Zealand's Exchange, we are proud of our record in supporting the growth of local companies to reach their global potential.

NZX operates New Zealand's equity, debt, funds, derivatives, and energy markets. To support the growth of our markets, we provide trading, clearing, settlement, depository, and data services for our customers.

Our global relationships with NASDAQ, Toronto (TMX), Singapore (SGX), London (LSE), Hong Kong (HKEX), Shanghai (SSE), Australia (ASX), South Pacific (SPX), World Federation of Exchanges (WFE), Sustainable Stock Exchanges (SSE) and the European Energy Exchange (EEX), alongside our other global alliances, mark a step-change in our engagement with markets around the world.

MARKET CONNECTIVITY

Connectivity Options

NZX offers a range of different connectivity options for clients to access the NZX systems, regardless of location. The right option will depend on your preference and the way you intend to access the NZX Markets.

All NZX services delivered using these connectivity methods are Transmission Control Protocol (TCP). When connecting to the NZX systems, you must ensure that you meet our minimum connectivity standards. This ensures that our services are delivered in an efficient and timely manner. For more information on these standards, please contact **Data@nzx.com**.

CONNECTIVITY OPTIONS INCLUDE:

- International Point of Presence (PoP)
- Spark Digital WAN Services (SDWS)
- Third Party Providers
- Virtual Private Network (IPSec Site to site)
- SSL over Internet

Connectivity options should each be considered against latency requirements, risk tolerance and strategy. Additionally, a combination of the connectivity options can be used for primary and secondary (redundancy/ business continuity purposes).

International Point of Presence

Access to NZX data centres can be facilitated via the global-network of Equinix data centres over their fibre interconnections. NZX tenancy is in Sydney SY4 data centre.

Cloud Provider Interconnect

NZX can leverage cloud provider (Azure, AWS) interconnects to deliver services across the International Point of Presence in Sydney.

Leased Line Circuit

NZX employs Spark as a provider for fibre-terminated Leased Line Circuits over Multiprotocol Label Switching (MPLS) VPN network. The minimum bandwidth provided over the SDWS is 100mbps.

Third Party Providers

The following third-party network service providers to allow connectivity into our Primary and DR data centres.

- BT Radianz
- IPC
 - Transaction Network Services Limited (TSNI)

VPN

NZX provides the ability for clients to connect to our internet-facing firewalls with an IPSec Site-to- Site VPN termination.

SSL over Internet

For a limited set of services and for connectivity with no latency or throughput requirements, data may be transmitted over the internet wrapped in TLS (Transport Layer Security).



Please note there are minimum standards and requirements that apply for connectivity. For further information on what these minimum standards are please contact NZX information services at **data@nzx.com**

MARKET CONNECTIVITY



NZX Trading Technology

NZX operates on a Nasdaq Matching Engine (ME) which is built upon the Nasdaq Financial Framework (NFF), managing the full range of trading functions - from price formation through order matching.

The Engine is among the lowest latency in the industry at sub-40 μ Sec. Orders are recycled to allow for an increase in total order capacity.

Order Entry Protocols

Nasdaq ME supports the widely used and industry standard FIX 5.0 (SP1) and OUCH protocols. Message standards have been developed to facilitate the electronic exchange of information related to securities transactions. Available order entry protocols include:

NATIVE FIX

- The Native FIX interface supports order management and limited CCP transactions (trading accounts, suspension of accounts and publication of trades).
- Higher throughput and large reduction in latency over non-native FIX gateways compared to GPC (Genium) FIX

OUCH

• High-speed / low latency fixed-width order entry protocol predominately targeting algorithmic/ high frequency trading firms

Market Data Protocol

The ITCH protocol is widely used and considered industry standard with a fixed width, binary protocol that is suited to low latency and high throughput data. ITCH feeds can provide either full orderbook, top-of-book or news information. Available ITCH feeds include:

THE ITCH TOTAL VIEW

• provides the public information required to build each full orderbook. Messages are published when orders are publicly added, removed, amended and executed, as well as for trades that occur outside of the book.

ITCH BASIC WITH LAST SALE

• provides top-of-book information for published orderbooks, as well as all trades that occur both in and out of the book.

ITCH NEWS

• Reference information for an orderbook, firms or strategy leg. Includes news information from the exchange and system event transition timings.

Order Management Systems & Independent Software Vendors (ISV)

NZX welcomes Trading Participants to connect to the ME engine using proprietary front-end systems or vendor systems. All Order Management Systems must comply with NZX connectivity standards for technological capability and complete a systems conformance test prior to production deployment.

CURRENT APPROVED ISVS INCLUDE:

- Chelmer
- FlexTrade
- IRESS
- SecuritEase

ME Workstation

Trading participants may also connect to the engine using a front-end GUI called the ME Trader Workstation. This interface provides a familiar and intuitive application for executing orders and utilising multiple workbooks.

NZX CLEARING TECHNOLOGY 🔻

The clearing and depository system software is provided by Tata Consultancy Services (TCS), one of India's largest companies with a market capitalisation of around US\$160bn. Its industry-leading market infrastructure product, BaNCS, has been implemented across all NZX Clearing business areas.

NZX provides SWIFT market infrastructure connectivity into TCS BaNCS. Any SWIFT member or customer of a SWIFT bureau is able to send and receive ISO 15022 messages using this network. NZX Clearing & Depository Participants are also able to connect to BaNCS via a web-based GUI.

Back Office System (BOS) Vendors

BOS Vendors develop custom interfaces to the BaNCS system enabling seamless interactions between the exchange and its Clearing and Depository Participants.

Clearing and Depository Participants use the settlement system for enquiries, trade settlement, risk management, corporate action information, securities custody, and stock lending. Before entry to Market all back-office system software goes through technical conformance to ensure integrity of the software. BOS systems must also adhere to the NZX connectivity standards.

CURRENT BACK OFFICE SYSTEM VENDORS INCLUDE:

Chelmer Dion Global GBST SecuritEase

NZX MARKET DATA

Data Feeds

NZX processes and generates information throughout the trading day, from data on individual trades and share price movements to company announcements.

MARKET DATA OPTIONS INCLUDE:

- Nasdaq ME Trading Information Protocol ITCH
- Market data Feed (MDF)
- Third Party data Vendors

As part of a multicast data provision, many clients receive data via both FIX and MDF.

NZX Data Licensing

NZX Data Licensing provides you with the right to complete a range of activities when permissioning and ingesting NZX data. Key NZX Data licences are:

Non-display application licensing - a computer application used for accessing, processing or consuming Information for a purpose other than in support of its display, on-dissemination or distribution.

- Revenue-generating non-display application carries out front office functions such as, monitoring trading activity, using Information in a reference-based system, generating orders, or executing transactions in an Automated Trading Application.
- Non-revenue generating non-display application carries out back-office functions such as, credit and risk management, surveillance, portfolio management, or valuation.

Display and distribution licensing - allows for the right to display and distribute NZX data.

- Real-time display and distribution
- Delayed display and distribution (also applies to End of Day Data Distribution)

Index and Financial Product Creation - covers the use of data for the creation of indices, and financial products off the back of NZX data.

Further information regarding display, distribution, and non-display licencing is covered in our Information License Agreement

Royalties

These are generally reported via your data vendor but can be reported directly to NZX if you have licensing or connectivity with us as well. Should you choose to redistribute data you'll be required to report real-time royalties on behalf of any of those end users.

FOR MORE INFORMATION ON NZX CONNECTIVITY PLEASE CONTACT: 🔻

INFORMATION SERVICES

data@nzx.com DDI: +64 4 495 2807

NATHAN JARDINE

Head of Information Services Nathan.jardine@nzx.com DDI: +64 4 495 2462