# IT Connectivity Guide

March 2019

Version 2.8

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# 1 Scope

This document aims to provide an overview of the various connectivity options available to firms wishing to connect to A2X Exchange (A2X). The intended audience of this document are system administrators.

## 1.1 Version History

| Date | Version | Changes |
|------|---------|---------|
| 20/07/2017 | 1.0 | Aquis Document inputs accepted, edited by Neal Lawrence (A2X CTO). |
| 02/08/2017 | 2.0 | Updated diagrams inserted, edited by Stuart Jackson |
| 15/09/2017 | 2.1 | Updated multicast group addressing |
| 27/02/2018 | 2.3 | Corrected TCP port for B feed replay channel to 17016 |
| 06/11/2018 | 2.4 | Corrected MD Snapshot speeds in section 5.3 |
|  | 2.4 | Corrected 10Mbps description in section 5.4.2 |
| 13/11/2018 | 2.5 | Document rebranded |
| 30/01/2019 | 2.7 | Corrected Test A Snapshot Feed group address |
| 26/03/2019 | 2.8 | Corrected Test B 10Mbps group address |
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# 2 Trading Services and Protocols

The following section will highlight the service types and message formats used when subscribing to market data feeds and when trading on the A2X platform.

## 2.1 Market Data

All market data flows received from A2X are in Multicast UDP format. A2X provides the following Market Data feeds:

- **A Feed –** This is delivered as a primary production market data feed from the primary A2X datacentre.
- **B Feed –** This is delivered from the same production datacentre as the 'A' feed but has a physically diverse primary path from the 'A' feed. Under normal conditions, both 'A' and 'B' feeds will be delivered with equal latency through separate infrastructure.
- **C Feed –** The 'C' feed is delivered from the A2X DR facility. This data is delivered from an entirely different location to the production 'A' and 'B' feeds.

## 2.2 Trading Messages

### 2.2.1 FIX

A2X supports FIX4.2 protocol trading sessions. The A2X implementation conforms to the FIX standard with the additional use of a specific FIX 4.4 tag (851) to carry a trade liquidity indicator on trade reports.

This industry-standard protocol corresponds to that used by other European MTFs.

### 2.2.2 A2X Trading Protocol (ATP)

A2X has partnered with Aquis Exchange to provide all of it's Trading system technology. As such A2X will offer clients, Aquis's binary trading protocol (ATP) designed for speed and simplicity, which maps efficiently into the internal trading protocol used within the matching engine software. Use of fixed sizes and formats for the business messages allows efficient processing.
If your technology team is already familiar with the binary protocols used by other venues, they should easily be able to leverage this work to adapt to ATP.

## 2.3 FTP

A2X makes end of day and reference data files available via an FTP service to directly connected Members.  The latest security and tick reference data files are available from 03:00 every day as csv files (tab delimited).   Trade files are available to Members each day, listing their executions, and are updated every hour from 08:00.  These are provided in the form of text files.

## 2.4 Test Environment

Connectivity to the test environment at A2X is available via direct Ethernet (see 'Ethernet, Routing and IP Addressing' section) connections as well as a via a VPN/ Internet based connection.

# 3 On-Boarding

## 3.1 Development and Testing

A2X provides a full test environment for prospective Members and vendors to test their software and platforms against.

## 3.2 Conformance

A conformance process is in place and must be completed successfully before any firm can become a Member and trade directly on the A2X Exchange production platform. Firms that wish to carry out conformance testing should contact A2X (see 'Contacts' section) for further details.
Technical on-boarding can take place in parallel with the legal on-boarding process so as not to delay production access.

## 3.3 Go-Live

Only after legal and technical compliance has been established can a Member be permitted to trade in the production environment. Production logins and unique port numbers will only be allocated to firms after full compliance has been established.

# 4 Connectivity

A2X can be accessed directly via cross connects or circuits. In addition, VPN connectivity is available to connect to the test system.

## 4.1 Ethernet, Routing and IP Addressing

### 4.1.1 Cross-connect and Co-location

Co-location and direct cross-connect Ethernet connectivity is available in both primary and DR datacentres. This can be delivered via A2X' datacentre providers or cross connects can be delivered into A2X's colocation area.

### 4.1.2 Circuits/Leased Lines

Any firms who do not have a physical presence in the A2X datacentre locations can opt to have circuits presented. Circuits are then patched through to the same exchange PoPs (Point-of-Presence) as direct connections. Optimised WAN market data feeds are available for this type of connection.

### 4.1.3 Network Connectivity Options
Various network options are available using both Layer-2 and Layer-3 connectivity. It is the firm's responsibility to provide adequate network switches/routers if they wish to connect directly to A2X.

#### 4.1.3.1 Routed Layer-3 BGP

Layer-3 devices should be capable of creating a BGP connection to the A2X PoP. Exchange connectivity can be delivered into multiple client sites via separate BGP connections. This enables complete separation of infrastructure for the delivery of 'A', 'B' and 'C' feeds and diverse trading connectivity. A single cross connect or circuit can also be used to deliver trading and market data feeds if required, although this would offer no protection against a failure. A2X can accept any publicly routable Member prefix and/or A2X-allocated source addressing. See diagram below:

## BGP Cross Connects/Circuits into separate Member sites/infrastructure:
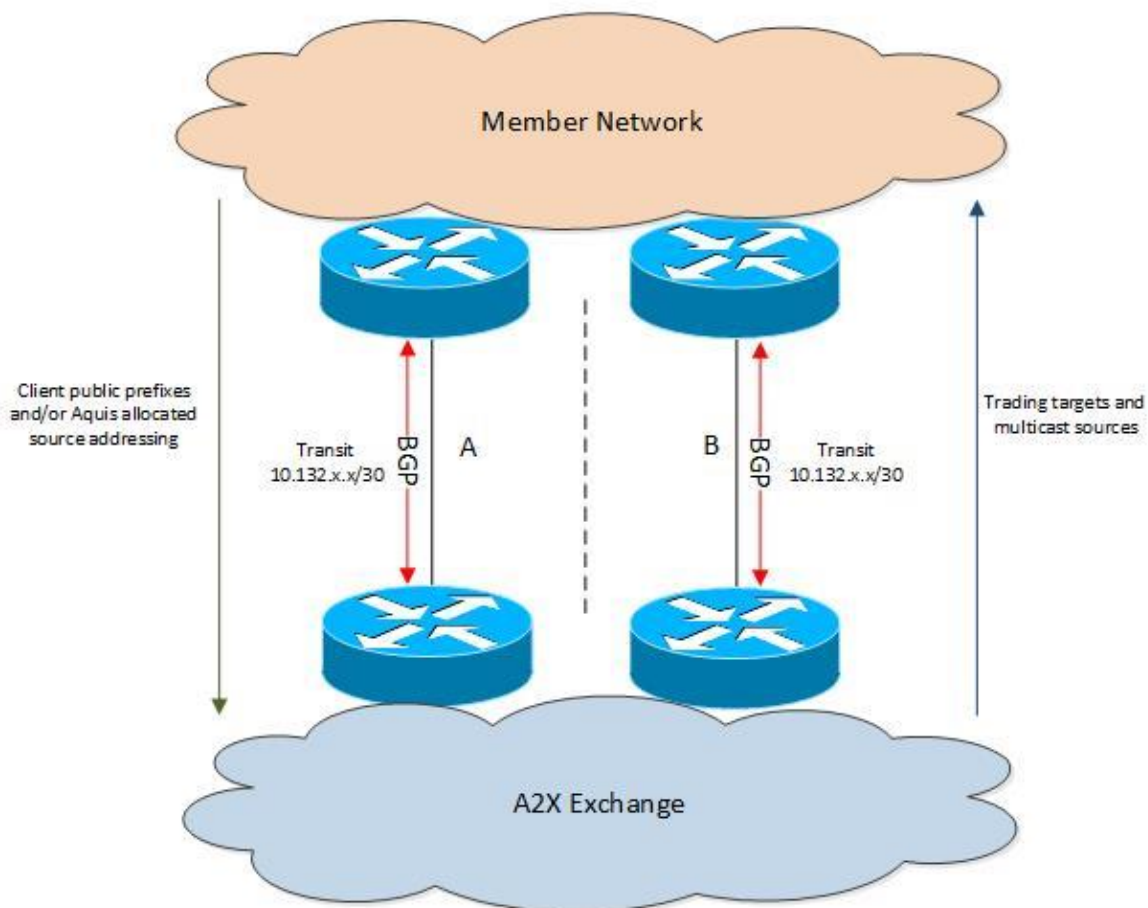
A meshed BGP option is also available where both connections for 'A' and 'B' feeds are delivered to the same client infrastructure. See diagram below:

**Meshed BGP Cross Connects/Circuits:**



Member Network

Client public prefixes and/or Aquis allocated source addressing

BGP   A

BGP

10.132.x.x/28

B   BGP

Trading targets and multicast sources

A2X Exchange
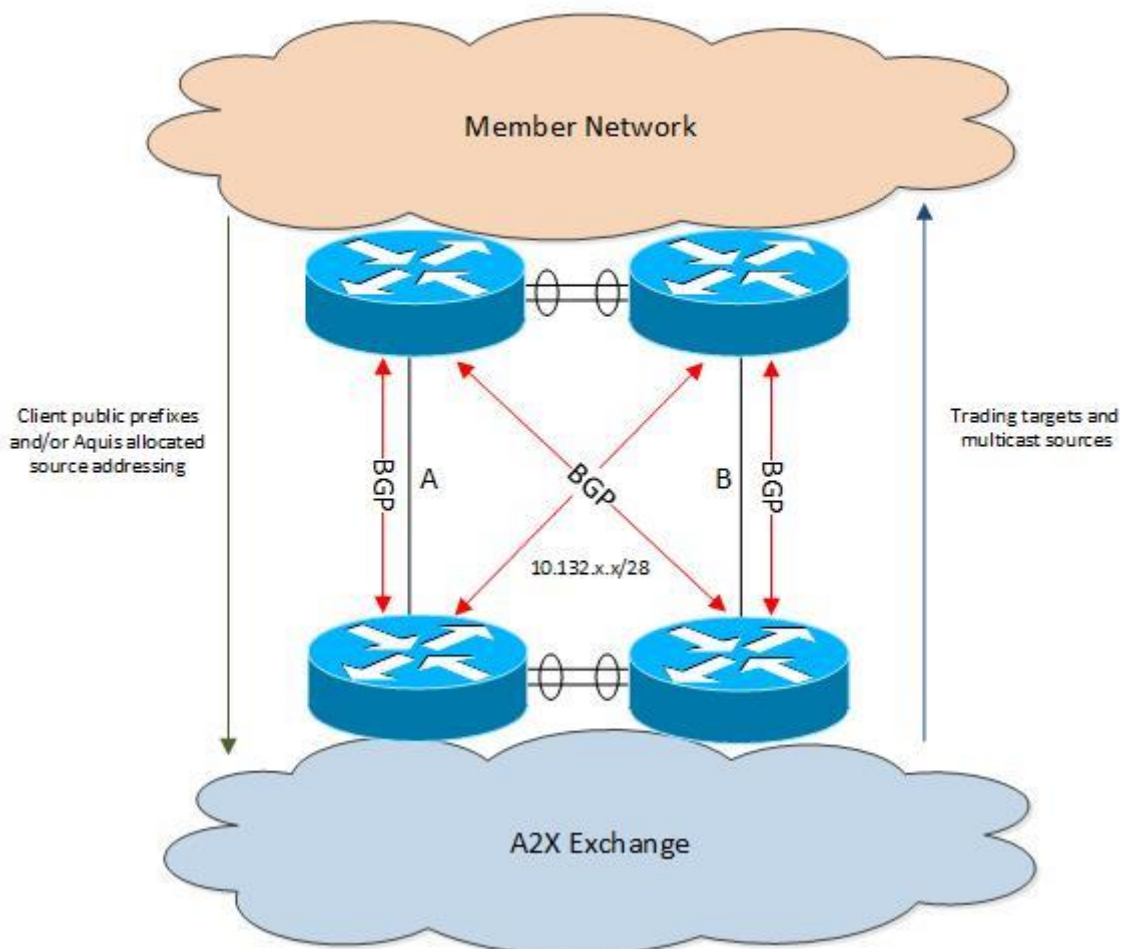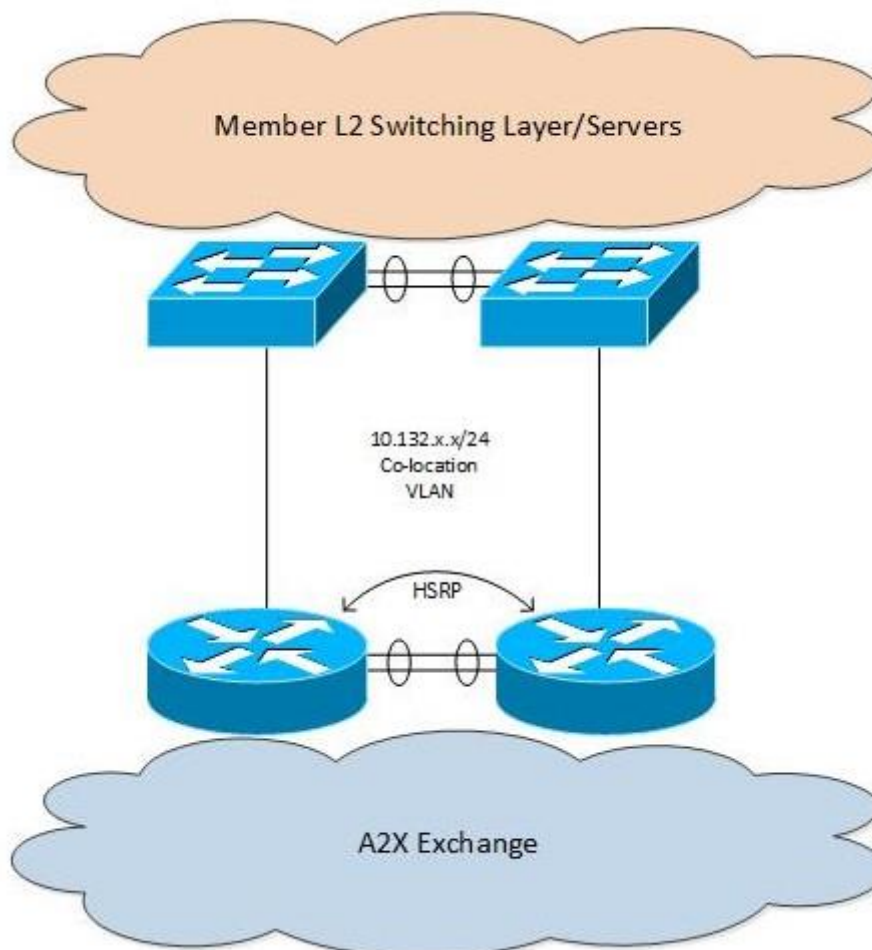
## 4.1.3.2 Directly Connected Servers

Where Members wish to place servers directly behind a cross connect (co-located) or circuit at Layer-2, A2X will provide the L3 handoff in the form of a HSRP/VRRP gateway. See diagram below:

**Directly Attached Servers Layer-2 Cross-connect/Circuit:**

Member L2 Switching Layer/Servers

10.132.x.x/24
Co-location
VLAN

HSRP

A2X Exchange

Directly connected servers can also be connected back to separate Member sites/infrastructure. See diagram below:



**Directly Attached Servers Layer-2 Cross-connect/Circuits to Separate sites/infrastructure:**
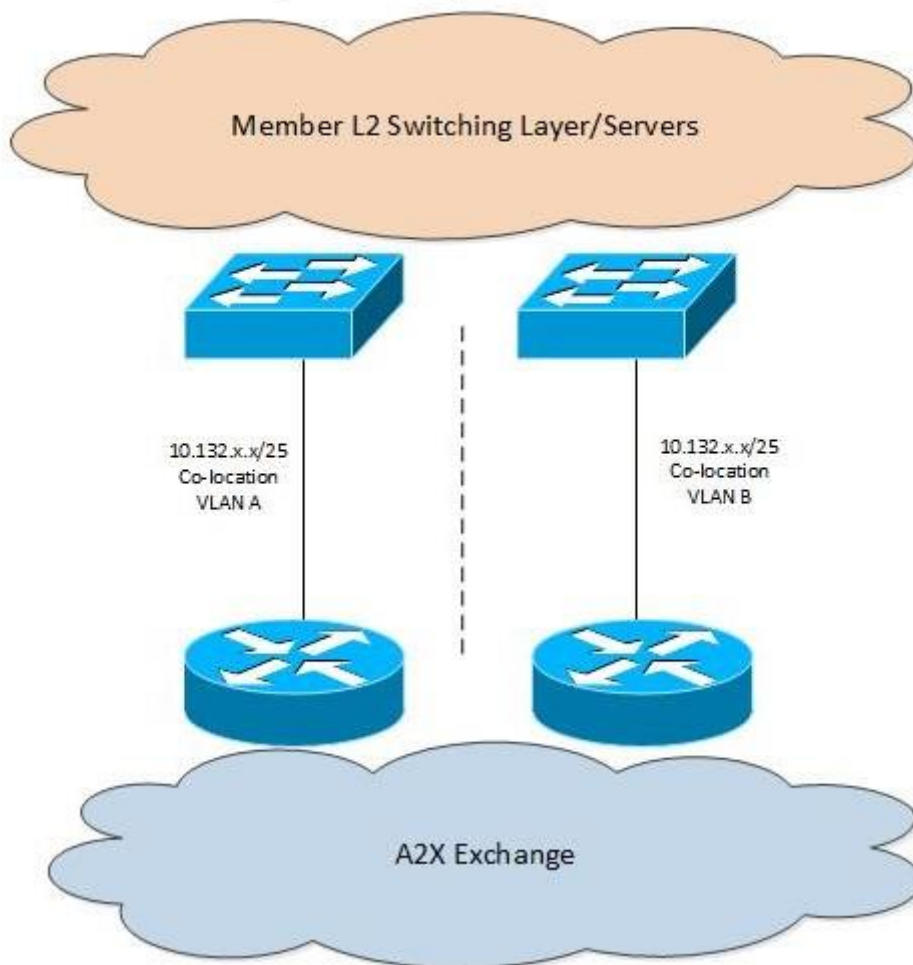
## 4.1.3.3 Directly Connected Servers and BGP

Members may also wish to create BGP connections through the Layer-2 segment where servers are located. This enables greater flexibility allowing the cross-connect or circuit to function as a Layer-2 segment for directly connected servers and as a Layer-3 transit network back to Member sites. See diagram below:

## Directly connected servers and BGP Cross Connects/Circuits:
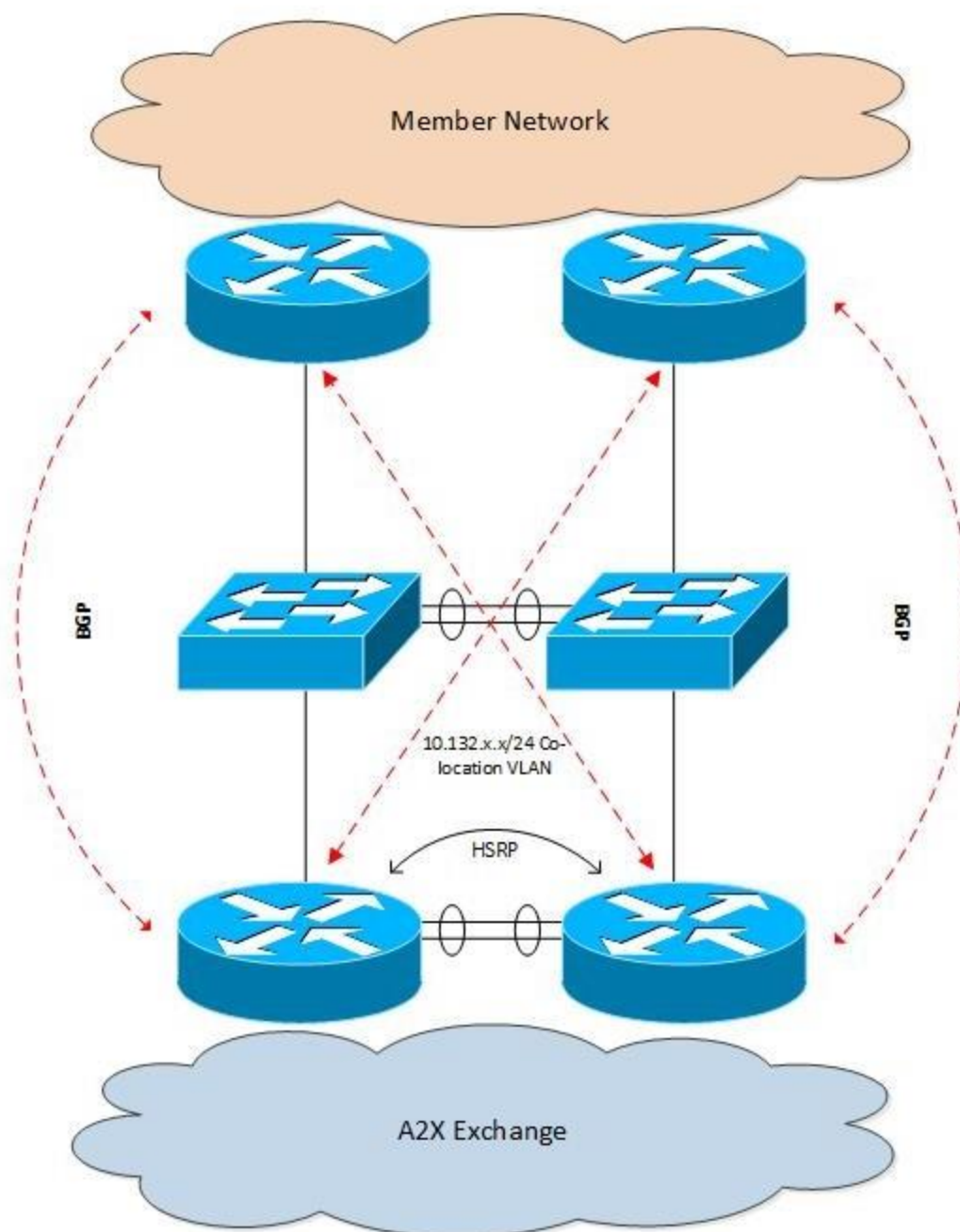


Directly connected servers with BGP connectivity are also offered with the option of connecting two VLANs and BGP connections back to separate Member sites/infrastructure. See diagram below:

## Directly connected servers and BGP Cross Connects/Circuits back to separate locations/infrastructure:
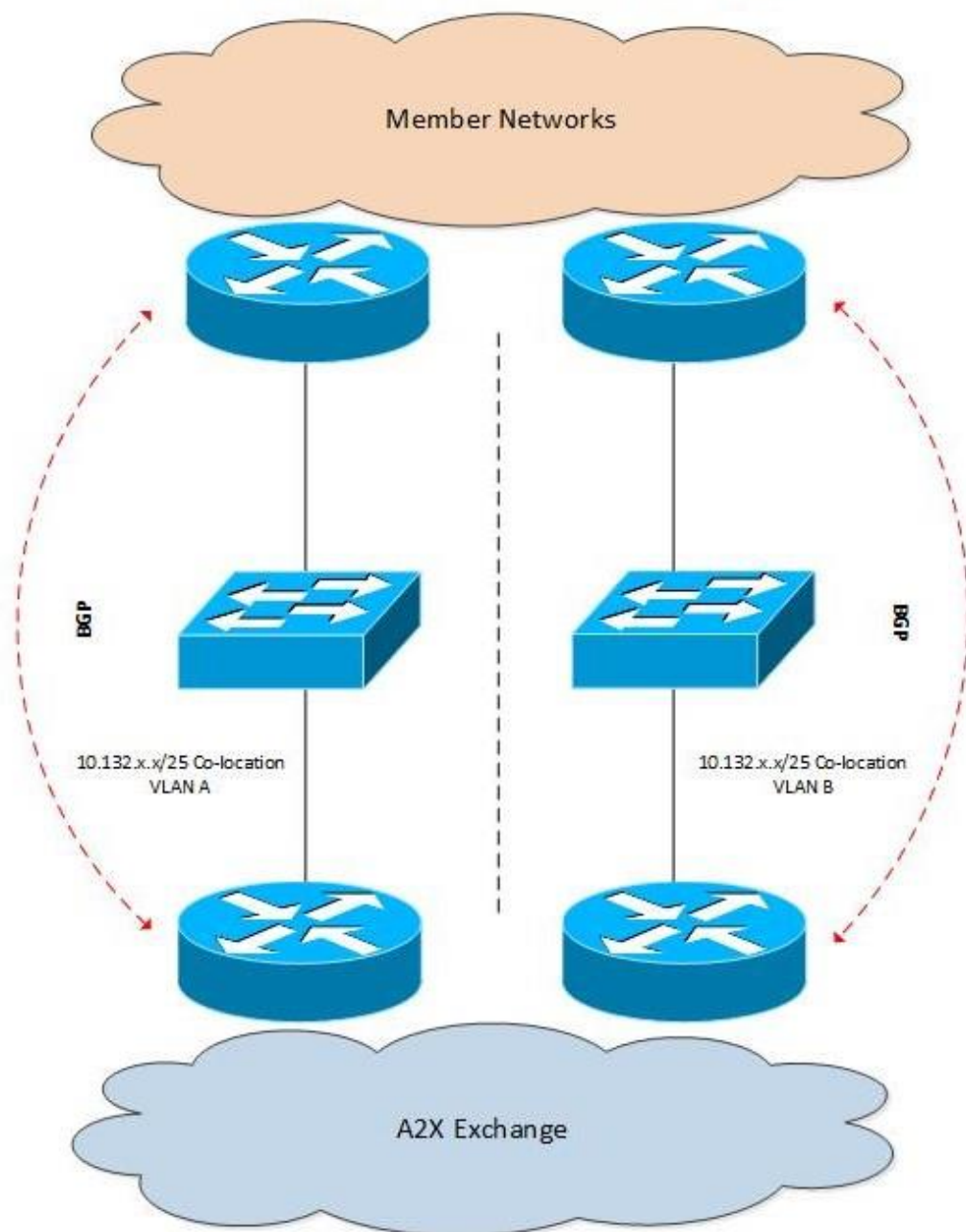


*A brief design phase will take place between prospective Members and an A2X network engineer in order to ascertain the firm's individual requirement. Diagrams will also be drawn up so that A2X and the connecting Member both understand what is to be delivered.*

*Please contact networks@a2x.co.za for a more detailed BGP connectivity guide.*

## 4.1.4 NAT

Members wishing to NAT/overload their source addressing to a single address can do so against their directly connected BGP interface IP address. A2X can also allocate a separate Member NAT pool if required.

### 4.1.5 Multicast
Sparse-mode PIM (for L3 connected devices) or IGMP (for L2 connected servers) is required to subscribe to multicast feeds.

## 5.1 IP Addressing

### 5.1.1 Source IP Addressing

A2X can provide private source address space to Members. This is normally provided in /24 blocks which can be broken up into subnets. Multiple /24 address blocks can also be aggregated into larger subnets if required.
The first ten addresses in any allocated range will be reserved for interfaces and networking equipment.
A2X can also accept any publicly routable address prefix from Member BGP connections.

### 5.1.2 Transit IP Addressing

For straight forward point-to-point BGP connectivity Members will be allocated /30 Transit networks as well as the client source ranges. Meshed BGP connections will be allocated a /28 Transit space for all peers.
Where a Member also wishes to co-locate servers with the Transit segment, a single /24 can be used for servers and BGP peering.

## 5.2 TCP Targets

All Members will be allocated a unique range of port numbers for trading. These are used to connect to the following TCP targets for trading, FTP and market data replay services:

| Service | Primary | DR | Test |
|---|---|---|---|
| FIX | 192.83.**208**.1 | 192.83.**210**.1 | 192.83.**209**.1 |
| ATP | 192.83.**208**.2 | 192.83.**210**.2 | 192.83.**209**.2 |
| FTP / SFTP (direct connect) | 192.83.**208**.3 | 192.83.**210**.3 | 192.83.**209**.3 |
| SFTP (Internet only) ** | 192.83.**209**.129 | 192.83.**211**.129 | 192.83.**209**.3 |

| MD REPLAY | 192.83.**208**.4 | 192.83.**210**.4 | 192.83.**209**.4 |
|---|---|---|---|
| FIX DropCopy | 192.83.**208**.5 | 192.83.**210**.5 | 192.83.**209**.5 |

** Note that file retrieval with SFTP or FTP is supported via a direct connection to A2X (cross connect, leased line or extranet) however when connecting across the Internet, only SFTP is supported. Reference data files are available via anonymous FTP or via SFTP (for SFTP, the username and password is "anonsftp") and are updated daily at 3am. Members will additionally be provided with private accounts for retrieval of member specific data, available through either protocol.

### TCP Prefixes (Trading, FTP and Replay):

| Production | Test | DR |
|---|---|---|
| 192.83.**208**.0/27 | 192.83.**209**.0/27 | 192.83.**210**.0/27 |

## 5.3 Multicast

Market data is delivered using multicast (UDP). Multicast is delivered to firms when they join multicast groups from the A2X IANA registered block (224.0.143.0/24). IGMP and Sparse Mode PIM are required. Multicast recovery is provided through a either a separate multicast snapshot feed, or via a TCP replay service.

A detailed multicast scheme is available. The public address multicast source networks and group ranges are shown below:

### Multicast Source Addressing:

| Prod 'A' Feed | Prod 'B' Feed | DR 'C' Feed | Test 'A' Feed | Test 'B' Feed |
|---|---|---|---|---|
| 192.83.**208**.64/26 | 192.83.**208**.128/26 | 192.83.**210**.64/26 | 192.83.**209**.32/27 | 192.83.**209**.64/27 |

### Multicast Group Addressing, Replay Channels and Rendezvous Points:

| Production 'A' Feed | | |
|---|---|---|
| **Speed** | **Address** | **Port** |
| 10Mbps | 224.0.143.64 | 19000 |
| 100Mbps | 224.0.143.72 | 19040 |
| 1Gbps | 224.0.143.80 | 19080 |
| 10Gbps | 224.0.143.88 | 19120 |
| 10Mbps Snapshot | 224.0.143.96 | 19160 |
| | | |
| TCP Replay Channel | 192.83.208.4 | 17000 |
| **Rendezvous Point** | **192.83.208.192** | |

| Production 'B' Feed | | |
|---|---|---|
| **Speed** | **Address** | **Port** |
| 10Mbps | 224.0.143.128 | 19275 |
| 100Mbps | 224.0.143.136 | 19320 |
| 1Gbps | 224.0.143.144 | 19400 |
| 10Gbps | 224.0.143.152 | 19440 |
| 10Mbps Snapshot | 224.0.143.160 | 19480 |
| | | |
| TCP Replay Channel | 192.83.208.4 | 17016 |
| **Rendezvous Point** | **192.83.208.193** | |

| Production 'C' Feed | | |
|---|---|---|
| **Speed** | **Address** | **Port** |
| 10Mbps | 224.0.143.192 | 19580 |

| | | |
|---|---|---|
| 100Mbps | 224.0.143.200 | 19620 |
| 1Gbps | 224.0.143.208 | 19670 |
| 10Mbps Snapshot | 224.0.143.216 | 19710 |
| | | |
| TCP Replay Channel | 192.83.210.4 | 17000 |
| **Rendezvous Point** | **192.83.210.32** | |

| Test 'A' Feed | | |
|---|---|---|
| **Speed** | **Address** | **Port** |
| 10Mbps | 224.0.143.0 | 18000 |
| 10Mbps Snapshot | 224.0.143.16 | 18080 |
| | | |
| TCP Replay Channel | 192.83.209.4 | 17500 |
| **Rendezvous Point** | **192.83.209.96** | |

| Test 'B' Feed | | |
|---|---|---|
| **Speed** | **Address** | **Port** |
| 10Mbps | 224.0.143.32 | 18160 |
| 10Mbps Snapshot | 224.0.143.48 | 18240 |
| | | |
| TCP Replay Channel | 192.83.209.4 | 17516 |
| **Rendezvous Point** | **192.83.209.97** | |

## 5.4 Network Interface and Bandwidth

## 5.4.1 Interface Speeds and Settings:

A2X offers 10G, 1G and 100Mbps cross connections and circuit connectivity directly into primary and DR Exchange PoPs. All connectivity types provide direct connectivity to the low latency trading backbone. Member ports should be hard set to either 10G, 1G Full Duplex or 100Mbps Full Duplex.

## 5.4.2 Bandwidth

A2X offers the following market data feeds, shaped to best serve Member requirements and bandwidth constraints. These feeds are available via direct cross connects, circuits or extranet connections. Members should subscribe to the correct feed based on the speed of their connection.

- **10G –** This is the fastest connectivity available from A2X and offers a completely raw, unshaped 10G market data feed. 10G direct connections are available from only the primary datacenter in Teraco. Members will need to provide suitable 10G interfaces with which to connect to A2X.
- **1G –** This level of connectivity will be served out of both datacentres. 1G market data is shaped to make sure all packets are received in order and in time.

- **100Mbps –** A2X offers this WAN shaped service allowing customers to receive a full market data service via more cost effective 100Mbps leased lines.
- **10Mbps –** A2X offers this WAN shaped service allowing customers to receive a full market data service via more cost effective 10Mbps leased lines.

### 5.4.3 Supported Handoffs:

**Teraco JB1 Financial Vault Co-location:**
- 1G cross connects can be terminated with copper Multi-Mode (MM) or Single-Mode (SM) fibre.
- 10G cross connects (Colocation only) can be terminated with SM or MM fibre.

**Other Teraco JB1 locations and Leased Lines:**
- Up to 1Gbps Single Mode (SM) Fibre via Meet-Me-Room 2

**Leased Lines – DRSA:**
- Up to 1Gbps Single Mode (SM) Fibre

**Internet:**
- Connectivity via Internet VPN is also available, however this is limited to the test and conformance systems only. ***Please contact*** networks@a2x.co.za ***for more details regarding connectivity options.***
- Secure SFTP access is available via the Internet. Connectivity is supported to both the test and production SFTP servers, see above section 5.1 for IP details. Members wishing to connect via the Internet should contact the email address above, with their source IP address so this can be permissioned.

## 5.5 Demarcation

### 5.5.1 Co-location:

A2X will provide a demarcation within the datacentres. Members are responsible for ordering cross connects from their own equipment to the provided demark.

### 5.5.2 Leased Lines:

Members should contact networks@a2x.co.za before ordering leased lines to ensure the correct termination points are used at Teraco (meet-me area) or DRSA.
Members will be required to provide A2X with demark and circuit ID assigned to them by the carrier in question. Lines within Teraco should ideally be presented to the meet-me area.

# 6 Contacts

For any connectivity questions please contact the A2X networks team: networks@a2x.co.za