# Transactions Venues Connectivity Options

## COLO CONNECTIVITY TECHNICAL DEPLOYMENT GUIDE

THOMSON REUTERS

# Contents

# Document Overview

**Which APIs and locations does this document cover?**

This document covers connectivity to transactions APIs in Equinix Tokyo TY3 and the Equinix Slough campus. *See section 1.1  Locations for more details and planned product enhancements.*

**Can I engage a third party to deliver the cross connect solution for me?**

Yes but with certain restrictions. See *section 1.3 Prerequisities and other Business Rules.*

**What physical cross connect types do Thomson Reuters support at these sites?**

See table below and *section 0 Customers should* run iBGP between their A side and B side connections.

Physical Deployment *Model*

Connection Type

|  | **LD4** | **TY3** |
|---|---|---|
| Media | Single Mode Fibre (SMF) | Single Mode Fibre (SMF) |
| Connector | LC | SC (clients can request SC to LC cable from Equinix as part of their cross connect order) |
| Speed | 10GbE (LR)  (1 Gbps on request) | 10GbE (LR)  (1 Gbps available on request) |
| Duplex | Full | Full |
| MTU | 1500 bytes |  1500 bytes |
| Auto-negotiate | Disabled | Disabled |
| Flow-control | Disabled | Disabled |
| Layer 3 | Routed interface | Routed interface |

**What IP addressing and EBGP parameters do I need to enter on my side to connect to Thomson Reuters?**

Your IP address information and EBGP password will be provided to you as part of the onboarding process. Other BGP parameters, including yours and Thomson Reuters' AS details, can be found in section *2.2 IP Address Allocation* and section *2.4 Establishing the BGP Peering relationship.* A summary of the BGP values which should be entered on the customer side are as follows:

•       An Autonomous System (AS) of 64512.

•       BGP timers of 1 second keepalive and 3 seconds hold.

•       A customer specific BGP password which will be provided by the onboarding team.

•       Assign the Thomson Reuters provided interface IP address as the BGP peering address. This will be done using the "update-source" command in most cases.

•       BFD is not supported.

**What firewall ports will I need to open to connect to Thomson Reuters? What IP addresses will I need to target at Thomson Reuters for each service?**

Further information about each of the services which are available over the link can be found in section *Chapter 3 Accessing Thomson Reuters Services*. The client will initiate the connections to Thomson Reuters.

# About this document

## Intended readership

Support staff or infrastructure personnel who are planning to cross connect APIs to a Thomson Reuters Transactions venue from a CoLo site.

## Glossary

| Term | Definition |
|---|---|
| AS | Autonomous System. A collection of IP routing prefixes which are under the control of a single single administrative entity. |
| BGP | Border Gateway Protocol - Exterior core routing protocol used to interconnect heterogeneous IP networks |
| DNS | Domain Name System |
| EBGP | External Border Gateway Protocol. Used to connect different autonomous systems together. |
| FQDN | Fully Qualified Domain Name |
| FXT | Thomson Reuters Foreign Exchange Trading application |
| IBGP | Internal Border Gateway Protocol. Used to connect two routers in the same autonomous systems. |
| LC | 'Lucent Connector' - a connector type for optical fibre cabling |
| MAPI | Matching API – the API used to connect to the the Thomson Reuters FX Matching service |
| MDFD | Matching Data Feed Direct |
| MFG | Matching FIX Gateway |
| NAT | Network Address Translation |
| PAT | Port Address Translation |
| PB | Prime Broker or Prime Broker Parent |
| PBC | Prime Broker Client |
| RFA | Reuters Foundation API (RFA) |
| SC | 'Subscriber Connector' - a connector type for optical fibre cabling |
| RFA Client | The term RFA client or RFA client application refers to any market data application designed and built by a Matching subscriber using the RFA library. |
| TLAN | Transactions Local Area Network (LAN) |

## Feedback

For more information please contact your Thomson Reuters Account Manager or Transactions Business contact.

# Introduction

## In this document

This document describes configuration options associated with deploying cross connect APIs within a Thomson Reuters Transactions Venue CoLo Data Center.

## Reference Documentation

For additional information on Thomson Reuters Transactions Venues Connectivity Options or other services please refer to the Customer Zone.

The following documents are also particularly relevant:

| Reference | Title | Description |
|---|---|---|
| 1 | Thomson Reuters Elektron Hosting for Matching Deployment Guide | Provides details of how to connect to the Matching API service using Elektron Hosting in CenturyLink LO3/4 |
| 2 | Thomson Reuters Delivery Direct Customer Managed Connectivity Installation Guide | Provides the geographical locations for where to connect directly to Thomson Reuters Delivery Direct WAN network using customer managed connections. |
| 3 | Thomson Reuters Delivery Direct Private Network Customer Connectivity & DNS Migration Guide | Provide technical information regarding how to migrate to and configure your customer network to connect to the Thomson Reuters Delivery Direct network. |

# Chapter 1   Locations and Prerequisites

## 1.1 Locations

The table below outlines the location where CoLo cross connects to Transasctions venues are possible.

| Service | Americas | | Europe | | Asia |
|---|---|---|---|---|---|
| | CenturyLink NJ2 | Equinix NY4 | Equinix LD4 | CenturyLink LO3/4 | Equinix TY3 |
| Matching API | Y - Planned | Y - Planned | Y | Y | Y |
| Bank Stream via Liquidity Provider API | Y | Y | Y | N | Y |
| Order Book via Liquidity Provider API | Y | Y | Y - Planned | N | Y - Planned |
| FXall Request For Quote | Y | Y | Y – Planned | N | Y - Planned |
| Aggregation API | Y – Planned | Y – Planned | Y – Planned | N | Y - Planned |

Table 1 - Thomson Reuters Transactions Venues CoLo Locations

This document will be updated should geographic availability of these trading venues change, or should other services become available over these cross connects.

This document provides details of how to connect to the Thomson Reuters Transactions Venues services that are available at the following locations:

- Equinix LD4
- Equinix TY3

Equinix NJ2 and Equinix NY4 cross connect information will be provided in a later iteration of this document.

Note that Thomson Reuters and Equinix also support customers from other buildings on the Equinix Slough campus connecting to Thomson Reuters Transactions Venues via cross connects. The details in this document can be equally applied to customers located in other buildings on the Equinix Slough campus, with the only exception being the 'Cable Equalisation' section.

For details of how to cross connect to the Matching API service from CenturyLink LO3/4, please consult document reference 1.

For details of how to cross connect to Bank Stream or Order Book from CenturyLink NJ2 or Equinix NY4, please consult your Technical Account Team.

Customers wishing to connect to Thomson Reuters Transactions Venue services from other locations should use one of the following alternative delivery methods:

- Thomson Reuters Delivery Direct
- Internet Delivery

## 1.2    Location Details

|  | LD4 | TY3 |
|---|---|---|
| Facility Address | 2 Buckingham Avenue, Slough Trading Estate, London SL1 4NB, United Kingdom | 1-9-20, Edagawa, Koto-ku, Tokyo, 135-0051, Japan |
| Service Desk | servicedesk.uk@eu.equinix.com<br><br>+44 (0) 845 373 2999 | servicedesk.jp@equinix.com<br><br>+81 3 4520 8118 |
| Sales Contacts | See http://www.equinix.co.uk/contact-us/ | http://www.equinix.com/locations/japan-colocation/japan-data-centers |
| Further Details | http://www.equinix.co.uk/locations/united-kingdom-colocation/london-data-centers/ld4 | http://www.equinix.co.uk/locations/japan-colocation/tokyo-data-centers/ty3 |

## 1.3    Prerequisities and other Business Rules

Thomson Reuters does not offer hosting services in Equinix TY3 or LD4. It is a prerequisite that the customer has a contract in place with the facility owner in order to place the order for the cross connect, or has an agreement in place with a third party (e.g. a communications provider or integration company) who will be able to place the order for the cross connect and manage the cross connect on the customer's behalf.

Note that all cross connects to Thomson Reuters Tranasctions Venues must be sponsored by a customer with a subscription to one of the services offered over the cross connect. Thomson Reuters will not accept cross connects from infrastructure/network providers that are not associated with a customer subscription.

Each customer cross connect must be unique to that customer. Thomson Reuters will not permit cross connects being shared between multiple customers.

# Chapter 2   Connectivity Details

## 2.1 **Deployment Model**

The diagram below outlines the deployment model for these cross connects:



*Intermediate patch panel details not shown.*

Customers should run iBGP between their A side and B side connections.

### 2.1.1      **Physical Deployment Model**

#### 2.1.1.1  Connection Type

The only supported media for customer cross connectivity is Single Mode Fibre. This was selected because of the distances involved with cable equalization and industry best practice.

Thomson Reuters allocates each cross connect customer one port on Thomson Reuters Cross Connect Switch A, and one port on Thomson Reuters Cross Connect Switch B. The cable paths provided by Equinix to these switches follow diverse routes.

Each fibre cross connect will connect to a Layer 3 routed physical interface on the Thomson Reuters cross connect switch, this means no DOT1Q trunking or Etherchannel deployments are supported. Flow control is disabled, the sending and receiving of pause frames will not be allowed.

|  | LD4 | TY3 |
|---|---|---|
| Media | Single Mode Fibre (SMF) | Single Mode Fibre (SMF) |

| | LD4 | TY3 |
|---|---|---|
| Connector | LC | SC (clients can request SC to LC cable from Equinix as part of their cross connect order with Equinix) |
| Speed | 10GbE (LR)  (1 Gbps on request – see note below) | 10GbE (LR) (1 Gbps on request – see note below) |
| Duplex | Full | Full |
| MTU | 1500 bytes |  1500 bytes |
| Auto-negotiate | Disabled | Disabled |
| Flow-control | Disabled | Disabled |
| Layer 3 | Routed interface | Routed interface |

Table 2 Physical Connection Types

**NOTE:** Thomson Reuters will support 1Gbps cross connects if the customer makes this clear early in the onboarding process. Further details of 1Gbps speed support is available on request. Clients who take 1Gbps cross connects will be disadvantaged relative to 10Gbps clients – see section 3.2 Client Data Rate Policing.

### 2.1.1.2       Client Hand off

The demarcation point between Thomson Reuters and the subscriber will be a Thomson Reuters owned patch panel. The exact patch panel and port that is allocated to the customer will be provided to the client in their Letter of Acceptance.

There will then be a Single Mode Fibre cross connect between this patch panel and the customer equipment which is Equinix's responsibility. This cross connect is ordered from Equinix by the customer following Equinix's local order process. However, a process will be followed by Thomson Reuters and Equinix to ensure cable equalisation to a standard length across all customers in the same building.

Connections to this fibre are the customer's responsibility. The provision of network devices at the end of this fibre to BGP peer with Thomson Reuters are the customer's responsibility. Thomson Reuters does not provide power or smart hands to customers to enable this connectivity.

In the event of the customer experiencing issues with the connectivity to Thomson Reuters CoLo switch after go-live, the customer should raise a ticket with Equinix and with Thomson Reuters, and should include the Equinix ticket number in the Thomson Reuters ticket. This will facilitate quick collaboration for Thomson Reuters and Equinix to work together with the customer to resolve the connectivity issue.

There is no need for the customer to raise a ticket with Equinix should the customer experience issues with the Thomson Reuters applications which it is clear are not related to the cross connect.

### 2.1.1.3       Cable equalisation

Within the data center a standard cable length and patch panel layout will be used so that the latency between the Thomson Reuters switch and the peering client device will be as consistent as possible across subscriber connections.

While Thomson Reuters will make every attempt to assure that the cable lengths are the same and the client facing fibre handoffs are identical it is widely accepted that this will not necessarily

guarantee that latencies will be identical across all subscribers.  Latencies are a function of several factors which range from client specific hardware that is deployed at the site to the specific software characteristics of the client application that is connecting to the Thomson Reuters service.

Note that customers outside the EFX rooms in LD4 (or elsewhere on the Equinix Slough campus) may have longer cable runs or more patch panels than customers within LD4.

## 2.2 IP Address Allocation

Thomson Reuters will advertise 1 x  /27 Thomson Reuters registered address range to the customer. This will be used to provide services which are available to the client to connect to. The range advertised will vary depending on the customer site:

| Site | Address Range |
|------|---------------|
| LD4 | 159.220.249.224 /27 |
| TY3 | 159.220.251.224 /27 |

Table 3 Address ranges advertised by Thomson Reuters

Customers can, if they wish, route the /27 registered public addressing within their infrastructure. This address is specific to the service at this site via cross connects, and will not be used by Thomson Reuters for other services on other networks. The customer should never advertise this /27 network outside of their organisation.

Specific allocations of services within these ranges can be found in Chapter 3 Accessing Thomson Reuters Services. Thomson Reuters may choose to advertise extra ranges in the future – this will be communicated to customers in advance of any change being necessary on their systems.

As part of the customer's onboarding information, Thomson Reuters will also provide the following IP address information for their cross connect:

- 1 x /29 subnet Thomson Reuters registered public addressing per resilient pair of cross connects for customer client addressing.
- 1 x RFC1918 (non internet routable) IP address within a /30 subnet for assignment to the physical interface on the customer's Customer Switch A.
- 1 x RFC1918 (non internet routable) IP address within a /30 subnet for assignment to the physical interface on the customer's Customer Switch B.

The two RFC1918 addresses will be used for IP connectivity between Thomson Reuters and the customer, and will also form the basis of the EBGP peering. No other addressing will be allowed. These addresses must not be used outside of the local handoff.

Should the customer require addressing for more devices than can be accommodated by the /29 registered public addressing, it is the customer's responsibility to implement a NAT overload (PAT) solution on their infrastructure.

## 2.3      Onboarding Milestone 1 – Port Up and IP connectivity established

As part of the onboarding process, Thomson Reuters will work with the customer to ensure their cross connect port shows on the cross connect infrastructure and is pingable. Thomson Reuters will provide

the customer with the RFC1918 IP addresses for the TR Cross Connect Switch A and B to complete these tests.

The following checkpoints will be completed:

• Customer confirms interfaces on Customer Switch A and Customer Switch B are connected.Thomson Reuters confirms interfaces on TR Cross Connect Switches A and B are up.

• Customer confirms they can ping the RFC1918 IP addresses on TR Cross Connect Switches A and B.

• Thomson Reuters confirms they can ping the RFC1918 IP addresses on the Customer Cross Connect Switches A and B.

In order to fully confirm IP connectivity, Thomson Reuters recommends that customers allow ICMP ping (echo request/reply) traffic within the 2 x RFC1918 /30 subnets that are allocated to the physical interfaces on the Thomson Reuters and Customer Switches, and retain at least until BGP peering is fully established (onboarding milestone 2). Thomson Reuters recommends that this ICMP traffic between the handoff interfaces is permanently allowed, to assist with troubleshooting. Please be aware that in a fault situation, customers should clearly communicate to Thomson Reuters if they blocking ICMP traffic from Thomson Reuters local interface addresses. Thomson Reuters may request that ICMP is re-enabled for troubleshooting.

Although the customer will not be treated as live from the infrastructure perspective until BGP peering is established, customers are requested to leave their ports up and avoid frequent state transitions.


## 2.4    Establishing the BGP Peering relationship

Once IP connectivity is established between the customer and Thomson Reuters, the customer must configure certain BGP parameters in order to successfully peer with Thomson Reuters.

The following must be configured on the customer side:

• An Autonomous System (AS) of 64512. Customers can use their own AS if they prefer but it would need to be masked behind AS64512 (local-as 64512).

• BGP timers of 1 second keepalive and 3 seconds hold.

• A customer specific BGP password which will be provided by the onboarding team.

• Assign the Thomson Reuters provided interface IP address as the BGP peering address. This will be done using the "update-source" command in most cases.

• BFD is not supported.

• Advertisement back to Thomson Reuters of the /29


The following AS numbers will be configured on the Thomson Reuters side:


| Site | Thomson Reuters AS Number |
|------|---------------------------|
| LD4  | AS65175                   |
| TY3  | AS65176                   |

Table 4 Thomson Reuters AS Numbers

Please note that "EBGP Multihop" is not supported, and that Thomson Reuters will only accept BGP peering connections from network devices, not from servers.

It is required that the customer advertises the /29 public addressing allocated by Thomson Reuters to ensure successful routing of traffic back to the customer. No static or other dynamic routing is supported. Please be aware that only the range allocated to the customer will be allowed, no other range will be permitted.

Thomson Reuters limit the number of prefixes a customer can advertise. This is to ensure additional resource is not consumed unnecessarily for networks not valid to the solution. In the event a customer advertises more than the allocated /29 range, the BGP peering will be terminated.

Thomson Reuters adopts industry best practices with respect to eBGP standards including the use of MD5 authentication in order to prevent unauthorised peering. MD5 encryption keys are required and will be communicated as part of the on-boarding and deployment process.

Any attempt to influence the routing from Thomson Reuters by the use of path pre-pending in advertisements to the Thomson Reuters cross connect switch will be disregarded. It is your responsibility to route via a single path to Thomson Reuters at any one time. Any failure to comply with this could lead to a termination of service.

## 2.4.1 BGP Peering Failover Scenarios

### 2.4.1.1 Normal Operation

In normal operation, the customer data to the Thomson Reuters infrastructure should go via the primary switch (Thomson Reuters Cross Connect Switch A). Customers are advised to allow northbound traffic via the primary EBGP link. To ensure this, Thomson Reuters have implemented AS pre-pending to the secondary EBGP link and will show the secondary link as a less favorable path as long as the customer's iBGP link is up and working correctly.
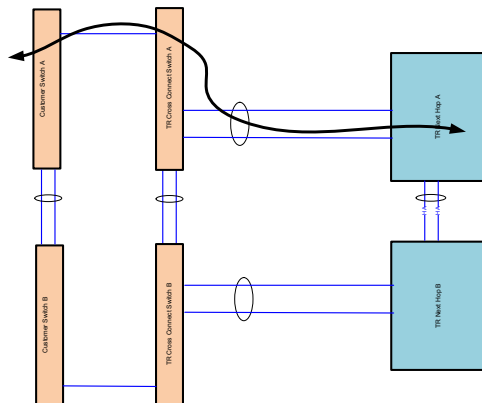


### 2.4.1.2 A-Side Thomson Reuters Cross Connect switch Failure

In the event the A-side Thomson Reuters Cross Connect switch were to fail , the customer switch will use its iBGP link to traverse to its partner and to Thomson Reuters using the resilient EBGP connection from Customer Switch B to Thomson Reuters Cross Connect switch B
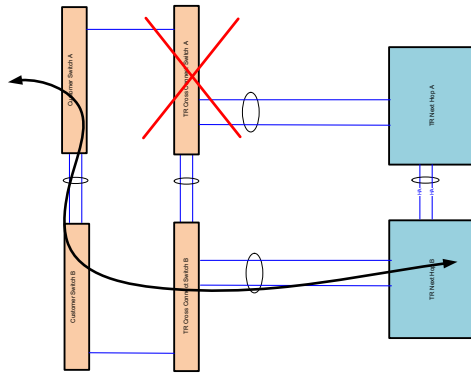
### 2.4.1.3　　　　B-Side TR Cross Connect switch Failure

In the event of a B-side Colo Switch failure, there should be no re-convergence in traffic due to it being the secondary path from the customer.
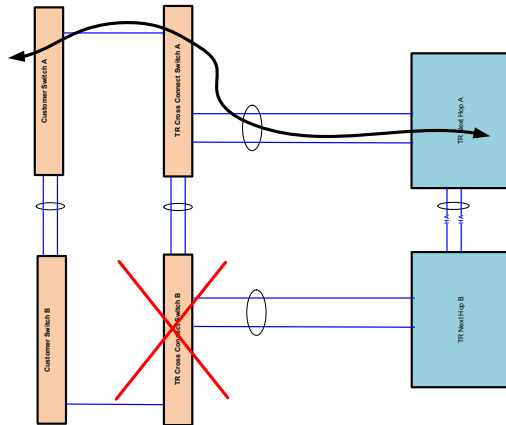


## 2.5 Onboarding Milestone 2 – BGP Peer Relationship established

Once milestone 1 has been completed successfully Thomson Reuters will schedule enablement of BGP. This will take place over a weekend. BGP peering should establish automatically. In the event that BGP peering does not establish successfully over the scheduled weekend, Thomson Reuters will disable the BGP peering and a follow-up weekend will be scheduled to reattempt the connection.

Thomson Reuters also recommends that the customer conduct failover tests at this point, to ensure that connectivity to the Thomson Reuters address space is possible in the event of a failure of the A side link. Thomson Reuters can assist the customer in this testing by temporarily shutting down the A side port on the CoLo switch.

From this point:

- Thomson Reuters will treat the customer connection as live from an infrastructure perspective.

- The customer can disable ICMP ping (echo request/reply) traffic within the 2 x RFC1918 /30 subnets that are allocated to the physical interfaces on the Thomson Reuters and Customer Switches. This is at the customer's discretion. It is recommended that this ICMP connectivity is left enabled, to simplify any post go-live troubleshooting activities.

Onboarding milestone 2 can coincide with application onboarding or application onboarding can be progressed subsequently.

# Chapter 3   Accessing Thomson Reuters Services

## 3.1   Encryption

Given that the overhead of introduces delays to data processing, it is anticipated that customers will wish to sign the Encryption Waiver document to confirm that they will not implement encryption.

## 3.2   Client Data Rate Policing

Although Thomson Reuters offers a 10Gbps hand-off to the customer, the client should configure their applications to ensure that their contribution rate to Thomson Reuters does not exceed their contracted inbound data rate.

This contracted data rate applies only to the rate at which the customer sends data to Thomson Reuters. The data rate at which the customer receives data from Thomson Reuters does not count towards this total.

This contracted data rate applies across all applications that are accessed through the customer cross connect.

Although Thomson Reuters will actively police this and will drop client data that is inserted at rates exceeding their contracted rate, responsibility for keeping within this limit is the responsibility of the client.

The measurement interval (burst commit) value to calculate the bandwidth used is 100milliseconds. See the table below:

| Cross Connect Package | Committed Information Rate (Mbps) | Maximum amount of data which can be sent in 100ms (KB) |
|---|---|---|
| Global | 200 | 2500 |
| Regional Enhanced | 10 | 125 |
| Regional Standard | 4 | 50 |

Table 5 Example values for Client Data Rate Policing

Repeated and persistent policer events will need to be reviewed between Thomson Reuters and the client to find a solution in order to ensure service quality. Thomson Reuters would expect clients to plan to have peak traffic fit comfortably within the available limits.

**Why am I being provided with a 10Gbps handoff, when I can only send data to Thomson Reuters at rates of under 200Mbps per second?**

The 10Gbps hand off is to provide the client with the benefit of the fastest possible insertion rate to the Thomson Reuters network. To take an example, even if the client is only sending a 64 byte packet, if the client is only using a 1Gbps interface speed it will take 500 nanoseconds for the data to be serialised. However, if the client uses a 10Gbps interface speed to transmit the same data, then serialisation will take place in the much shorter time of 50 nanoseconds.

The timing difference is even more significant for larger packets:

|  | Microseconds | Nanoseconds |
|---|---|---|
| 1Gbps | 8 | 8000 |
| 10Gbps | 1 | 800 |

Table 6 - Serialisation delay for 1024 byte packet at different data transmission rates

It is important to also bear in mind that the bandwidth policing does not apply to the data rate at which Thomson Reuters sends data to the customer.

If a client chooses to connect at 1Gbps, which is a non-standard deployment, it will take longer to implement the cross connect and the client will be at a disadvantage compared to clients who connect at 10Gbps.

## 3.3 Bank Stream Application Connectivity Requirements

### 3.3.1 DNS

Thomson Reuters does not provide a DNS service as part of the Co Location service. Clients should refer to the following table for details of the Name to IP mapping. Thomson Reuters will support customers either using their own static name resolution to resolve these records locally or using IP address to connect.

| Service | Subservice | Name | IP Address |
|---|---|---|---|
| Bank Stream | Provider | emea3.bankstreamprovider.trading.thomsonreuters.net | 159.220.249.226 |

Table 7 - LD4 Hostname to IP address mapping

| Service | Subservice | Name | IP Address |
|---|---|---|---|
| Bank Stream | Provider | apac3.bankstreamprovider.trading.thomsonreuters.net | 159.220.251.226 |

Table 8 - TY3 Hostname to IP address mapping

### 3.3.2 Bank Stream Firewall Rules

Specific destination port details will be provided to the client as part of their onboarding documentation. General access rules for Bank Stream are as follows:

| Service | Subservice | Protocol | Port Range | Direction |
|---------|-----------|----------|-----------|-----------|
| Bank Stream | Provider | tcp | 10000 to 14999 (encrypted)<br>15000 to 19999 (non encrypted) | Customer initiates connection to Thomson Reuters. |

Table 9 – Bank Stream Firewall Rules

## 3.4 MAPI Client Application Connectivity Requirements

### 3.4.1 MAPI Distribution Site Locations

Note that MAPI uses a cascaded fan out architecture from a central Matching host where orders are matched.

There are two distribution sites in each region. These distribution sites receive orders from clients throughout the region and pass them back to the Matching Host. They fan out prices received from the central host to clients in region.

| | EMEA (used by LD4) | APAC (used by TY3) |
|---|---|---|
| Primary Regional Distribution Site | London Docklands | Singapore |
| Secondary Regional Distribution Site | Geneva | Hong Kong |

Table 10 MAPI Regional Distribution Site Locations

### 3.4.2 RFA Client Connectivity for Price Discovery

Each subscriber will receive two sets of P2PS destination IP addresses:

• One pair (2) of destination IP addresses for 'A' and 'B' connections to their assigned P2PS nodes located within the primary regional distribution site.

• Another pair (2) of destination IP addresses for accessing the 'A' and 'B' P2PS nodes located at designated secondary regional distribution site.

In the event of a primary distribution site failure scenario, clients will be required to manually re-point their RFA applications accordingly, as advised by Thomson Reuters.

#### 3.4.2.1 MDFD Point to Point Server (P2PS) Connectivity Details

Table 11 and Table 12 detail the IP address ranges for connections to Point to Point Servers (P2PS) described above.  Here there are two service conditions to be considered.  These are:

• Primary Distribution site active

• Secondary Distribution site active (primary failure)

Clients must factor into their requirements the ability to re point their RFA based MDFD applications as required given the service conditions this are set out in Table 11 and Table 12 below.

| Distribution Center | P2PS Target IP Address Range | Service Condition |
|---|---|---|
| Primary Distribution EMEA (London) | 159.220.249.228 & 159.220.249.229 | NORMAL OPERATION Primary distribution IP address range |
| Secondary Distribution EMEA (Geneva) | 159.220.249.231 & 159.220.249.232 | Matching Engine or Primary Distribution Site DR Mode Transition from primary to secondary distribution site Use P2PS IP addresses at the secondary distribution site |

Table 11: P2PS Address Ranges (LD4)

| Distribution Center | P2PS Target IP Address Range | Service Condition |
|---|---|---|
| Primary Distribution APAC (Singapore, via TY3 cross connect) | 159.220.251.228 & 159.220.251.229 | NORMAL OPERATION Primary distribution IP address range |
| Secondary Distribution APAC (Hong Kong, via TY3 cross connect) | 159.220.251.231 & 159.220.251.232 | Matching Engine or Primary Distribution Site DR Mode Transition from primary to secondary distribution site Use P2PS IP addresses at the secondary distribution site |

Table 12: P2PS Address Ranges (TY3)

## 3.4.3   FIX Session Connectivity for Order Management and STP

Each subscriber will receive two Matching FIX Gateway destination IP addresses:

- One destination IP address for connectivity into the Matching FIX Gateway (MFG) from the primary distribution site to the primary Matching data center.

- One destination IP address for connectivity into the secondary distribution center to the MFG located at the Matching DR site (Geneva).

### 3.4.3.1        Matching FIX Gateway Connectivity Details

Table 13 and Table 14 detail the IP address ranges for connections to Matching FIX Gateways (MFGs) shown above.  Similar to the P2PS connectivity requirements subscribers must consider the DR state of the Matching service and the advice which they receive from Thomson Reuters. The service condition will dictate whether or not the primary and secondary distribution centers will be utilized to enter orders into the core matching engines.

Clients must factor into their requirements the ability to re point the FIX engine as required given the service conditions this are set out in Table 13 and Table 14 below.

| Regional Distribution Center | MFG IP Address Range | Service Condition |
|---|---|---|
| Primary Distributions EMEA (London) | 159.220.249.227 | NORMAL OPERATION Use MFG IP addresses at the primary distribution site |

| Regional Distribution Center | MFG IP Address Range | Service Condition |
|---|---|---|
| Secondary Distributions EMEA (Geneva) | 159.220.249.230 | Matching Engine / MFG/ Primary Distribution Site DR Mode<br>Matching Service and distribution site transition from normal operation to remote DR site.<br>Use secondary MFG IP addresses at the secondary distribution site |

Table 13: Matching FIX Gateway Address Ranges (from LD4)

| Regional Distribution Center | MFG IP Address Range | Service Condition |
|---|---|---|
| Primary Distributions APAC (Singapore, via TY3 cross connect) | 159.220.251.227 | NORMAL OPERATION<br>Use MFG IP addresses at the primary distribution site |
| Secondary Distributions EMEA (Hong Kong, via TY3 cross connect) | 159.220.251.230 | Matching Engine / MFG/ Primary Distribution Site DR Mode<br>Matching Service and distribution site transition from normal operation to remote DR site.<br>Use secondary MFG IP addresses at the secondary distribution site |

Table 14: Matching FIX Gateway Address Ranges (from TY3)

### 3.4.4 Matching API Firewall Rules

Specific destination port details will be provided to the client as part of their onboarding documentation. General access rules for Bank Stream are as follows:

| Service | Subservice | Protocol | Port Range | Direction |
|---|---|---|---|---|
| Matching API | FIX | tcp | 60237 (non encrypted)<br>60238 (encrypted) | Customer initiates connection to Thomson Reuters |
| Matching API | RFA | tcp | 60239 | Customer initiates connection to Thomson Reuters |