Transactions Venues

Connectivity Options Technical Deployment Guide

Document version 3.0
Date of issue: 6 September 2023

LSEG FX

Legal information

LSEG does not guarantee that any information contained in this document is and will remain accurate or that use of the information will ensure correct and faultless operation of the relevant service or equipment. LSEG, its agents and employees, accepts no liability for any loss or damage resulting from reliance on the information contained in this document.

This document contains information proprietary to LSEG and may not be reproduced, disclosed, or used in whole or part without the express written permission of LSEG.

Any software, including but not limited to, the code, screen, structure, sequence, and organization thereof, and documentation are protected by national copyright laws and international treaty provisions. This document is subject to U.S. and other national export regulations.

Nothing in this document is intended, nor does it, alter the legal obligations, responsibilities or relationship between yourself and LSEG as set out in the contract existing between us.

Contents

About this document

Intended readership

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

In this document

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

Glossary

Below are terms used in this document with associated definitions.

Term	Definition
API	Application Programming Interface
AS	Autonomous System. A collection of IP routing prefixes which are under the control of a single administrative entity
BFD	Bidirectional Forwarding Detection. A network protocol used to detect network faults
BGP	Border Gateway Protocol - Exterior core routing protocol used to interconnect heterogeneous IP networks
DNS	Domain Name System
DR	Disaster Recovery
EBGP	External Border Gateway Protocol. Used to connect different autonomous systems together.
FIX	Financial Information eXchange Protocol. Protocol for trading partners to communicate order related messages electronically.
FQDN	Fully Qualified Domain Name
FXT	Foreign Exchange Trading application
GLOP	A multicast addressing schema defined in RFC 3180
IBGP	Internal Border Gateway Protocol. Used to connect two routers in the same autonomous systems.
IGMP	Internet Group Management Protocol. A protocol for IP multicast group membership.
LC	'Lucent Connector' - a connector type for optical fibre cabling
LSEG	London Stock Exchange Group
MAPI	FX Matching API – the API used to connect to the FX Matching service

Term	Definition
MDFD	Matching Data Feed Direct (the name of this service has been changed to “FX Matching Real Time Data”
NAT	Network Address Translation
P2PS	Point to Point Server
PAT	Port Address Translation
PB	Prime Broker or Prime Broker Parent
PBC	Prime Broker Client
PIM	Protocol Independent Multicast
RFA	Robust Foundation API
RFQ	Request for Quote
RFS	Request for Stream
SC	'Subscriber Connector' - a connector type for optical fibre cabling
SSM	Source Specific Multicast
STP	Straight Through Processing
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.
RFC1918	Request for Comments are documents issued by the Internet Engineering Task Force. RFC1918 defines which IP addresses can be allocated for private networks.
RP	Rendezvous Point. A router which coordinates joins to a multicast network.
TCP	Transmission Control Protocol. A connection-oriented IP transport layer communications protocol.
TLAN	Transactions Local Area Network (LAN)
UDP	User Datagram Protocol. A connectionless IP transport layer communications protocol.
VIP	Virtual IP address

Reference Documentation

For additional information on LSEG FX Transactions Venues Connectivity Options or other services please refer to MyLSEG.

The following documents are also particularly relevant:

Reference	Title	Description
1	Delivery Direct Customer Managed Connectivity Installation Guide	Provides the geographical locations for where to connect directly to Delivery Direct WAN network using customer managed connections.

Reference	Title	Description
2	Refinitiv Customer Connectivity Guide	Provide technical information regarding how to migrate to and configure your customer network to connect to the Delivery Direct network.
3	FX Transactions Venues Connectivity Options Presentation	Provides high level overview of trading venue connectivity options for customers.

Document Change History

Version	Date	Comments
3.0	September 2023	Changes to Group 3 in 5.3.2.6 LD4 (Production Live) Group information
2.9.11	March 2023	Currencies added to table in section **5.3.2.6 LD4 (Production Live) Group information**
2.9.10	March 2023	EUR/HRK removed from table in section **5.3.2.6 LD4 (Production Live) Group information**
2.9.9	March 2022	Section 5.3.2.3, Binary Feed conflated rate changed from 25 to 50ms. Table in section 5.3.2.6 updated.
2.9.8	June 2021	Added Refinitiv FX Matching Credit API to table in section 5.3.3. Added new section 5.4.5 Connecting to the Matching Credit API.
2.9.7	June 2021	Added GBP/USD SML to Group 5 and added EUR/USD SML and USD/JPY SML to Group 7 in section 5.3.2.6
2.9.6	March 2021	Updated IP addresses for Equinix Secaucus in section 3.2
2.9.5	May 2020	Updated IP addresses in section 5.3.2.3 Table 13. LD4 Group 7, and all groups in Equinix Secaucus. Updated UDP in section 5.3.3 Table 16.
2.9.4	May 2020	Added information about Binary Feed conflated at 25ms, Binary Feed conflated at 5ms, and group information, sections 5.3.2.3 – 5.3.2.6
2.9.3	April 2020	Minor changes to product names. 5.3.2.1 Unicast based serves - Order Book via Liquidity Provider API - Equinix Secaucus – changed to 159.220.253.254 5.3.3 Firewall Rules – Aggregation API - Port Range Order Entry changed to 14501 (encrypted, primary connection)
2.9.1	November 2019	Removed reference to encryption waiver. Fixed broken diagram at start of section 5.4 “Connectivity Requirements for Matching API (MAPI) Services”.
2.9	October 2019	Added clarification around LD4.2 building to section 3.1.1.3 Cable Equalization.
2.8	June 2019	Change to wording on some diagrams. Not material changes.
2.7	June 2019	Has been put into Refinitiv template. No change to content.
2.4	March 2019	Additional wording to section 5.3.2.1 Service to IP address mapping.

Feedback

For more information please contact your Refinitiv/LSEG Account Manager or Transactions Business contact.

Chapter 1 Document Overview

1.1 Which APIs and locations does this document cover?

This document covers connectivity to transactions APIs at the following venue data centers:

- London (Equinix Slough)
- Tokyo (Equinix Tokyo TY3)
- New Jersey (Equinix Secaucus Campus). See section 2.1 Locations for more details and planned product enhancements.

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

Yes but with certain restrictions. See section 2.4 Prerequisites and other Business Rules.

1.3 What physical cross connect types do LSEG support at these sites?

See Table 4: Physical Connection Types on page 16 .

1.4 What IP addressing and EBGP parameters do I need to enter on my side to connect to LSEG?

Your IP address information and EBGP password will be provided to you as part of the onboarding process. Other BGP parameters, including yours and LSEG' AS details, can be found in section 3.2 Logical Deployment Model - IP Address Allocation and section 4.2 Preparing for BGP Peering. 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. LSEG recommend that these timers are explicitly defined.
- A customer specific BGP password which will be provided by the onboarding team.
- Assign the LSEG 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.

1.5 What firewall ports will I need to open to connect to LSEG? What IP addresses will I need to target at LSEG for each service?

Further information about each of the services which are available over the link can be found in section Chapter 5 Accessing LSEG Services. The client will initiate the connections to LSEG.

Chapter 2 Locations and Prerequisites

2.1 Locations

The table below outlines the location where CoLo cross connects to Transactions venues are possible. Sites within the Equinix Secaucus campus (NY2, NY4, NY5, NY6) are hereafter referred to collectively as 'Equinix Secaucus'.

Other Equinix sites are hereafter referred to as the data center vendor.

Service Name	Primary Service Locations	Americas	Europe	Asia
		Equinix Secaucus	Equinix LD4	Equinix TY3
FXall RFQ via Provider Interface (TCPI)	NY	Y	Y	Y
PriceStream via Liquidity Provider API	NY (primary service location), regional liquidity in London and Tokyo	Y	Y	Y
Orderbook via Liquidity Provider API	NY	Y	N	N
Other APIs				
FX Matching API	London	Y	Y	Y
Aggregation API for RFQ	NY	Y	Y	Y
Aggregation API for RFS	NY (primary service location), regional liquidity in London and Tokyo	Y	Y	Y
FX Matching Binary Multicast Feed	London	Y (DR only)	Y	N
FXall Legacy APIs	NY	Y (existing customers of these services only)	N	N

Table 1: LSEG 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.

> **Note**
>
> LSEG and Equinix also support customers from other buildings on the Equinix LD4 and Equinix TY3 campuses connecting to LSEG FX Transactions Venues via cross connects. The details in this document can be equally applied to customers located in other buildings on these Equinix campuses, with the only exception being the 'Cable Equalization' section, which contains some building-specific information with respect to the Equinix campuses.

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

- Delivery Direct
- Internet Delivery (not available for FX Matching API or FX Matching Binary Multicast Feed connectivity)

2.2 Disaster Recovery Planning

LSEG encourages all subscribers to create a comprehensive disaster recovery plan for each of their API endpoints. Such plans could involve:

- Taking a cross connect in at least one of the other regions.
- API in another location configured to access services over Wide Area Network (Internet or Delivery Direct)

> **Note**
>
> FXall RFQ, PriceStream and Orderbook services are located at Cyxtera (formerly CenturyLink) NJ2 site. For TVCO clients on the Equinix Secaucus campus, LSEG provides the connectivity back from Secaucus to CenturyLink NJ2. At the current stage Transactions Venue Access cross connects should not be considered to be a Disaster Recovery site to be used in the event of NJ2 site failure. Wide Area Network connections are the best contingency for this failure situation, and should be considered for any of the products listed where the Primary Service Location is NJ2.

See 5.4 Connectivity Requirements for FX Matching API (MAPI) service for specific Disaster Recovery planning information for the Matching service at LD4 and the Equinix Secaucus campus.

2.3 Location Details

2.3.1 Europe and Asia

	LD4	TY3
Data Center Vendor	Equinix	Equinix
Facility Address	2 Buckingham Avenue, Slough Trading Estate, London SL1 4NB, UK	1-9-20, Edagawa, Koto-ku, Tokyo, 135-0051, Japan
Service Desk	servicedesk.uk@eu.equinix.com +44 345 373 2999	servicedesk.jp@equinix.com +81 3 4520 8118
Sales Contacts	See https://www.equinix.com/contact-us/sales/	See https://www.equinix.com/contact-us/sales/
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

Table 2: Europe and Asia data center Location Details

2.3.2 North America

	Equinix Secaucus
Data Center Vendor	Equinix
Facility Address	NY2: 275 Hartz Way, Secaucus, NJ 07094 NY4: 755 Secaucus Road Secaucus, NJ 07094 NY5: 800 Secaucus Road, Secaucus, NJ 07094 NY6: 105 Enterprise Avenue South, Secaucus, NJ 07094
Service Desk	support@equinix.com +1 866 378 4649
Sales Contacts	www.equinix.com/contact-us/sales
Further Details	http://www.equinix.co.uk/locations/united-states-colocation/new-york-data-centers/ny4

Table 3: North America data center Location Details

2.4 Prerequisites and other Business Rules

In order to connect to the transactions venues the customer must meet one of the following prerequisites:

- The customer must have a contract in place with the data center vendor in order to place the order for the cross connect
- The customer must have 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.

For details of LSEG hosting options at or near the Equinix New Jersey, LD4, or Tokyo campuses, please contact your LSEG account manager or see https://www.refinitiv.com/en/products/elektron-enterprise-data-management/. It is optional whether customers use LSEG hosting at these locations and customers who use LSEG hosting are treated equally with customers who use independent hosting.

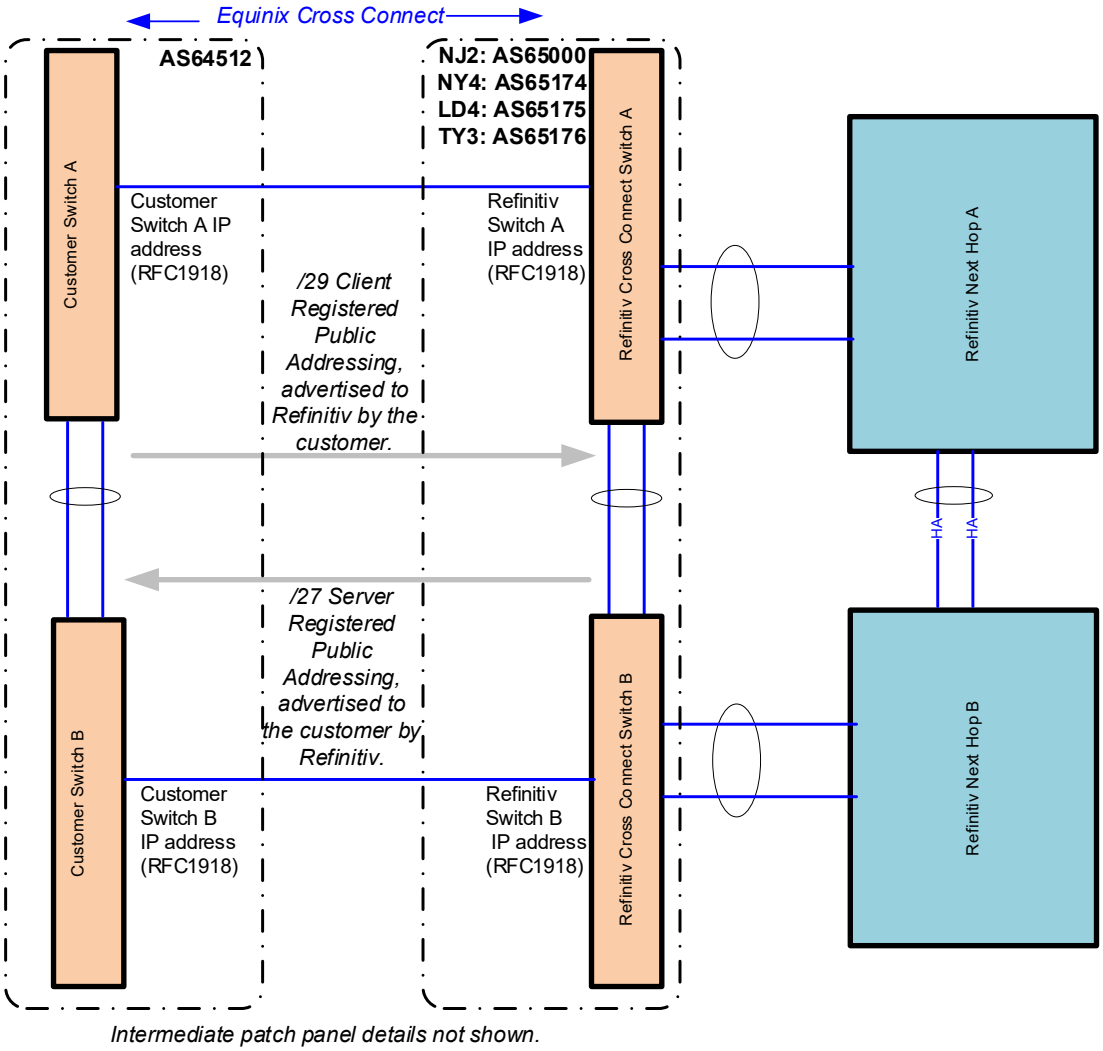
> **Note**
>
> All cross connects to LSEG FX Transactions Venues must be sponsored by a customer with a subscription to one of the services offered over the cross connect. LSEG will not accept cross connects from infrastructure/network providers that are not associated with a customer subscription.

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

Chapter 3 Deployment Model

3.1 Overview

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



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

3.1.1 Physical Deployment Model

3.1.1.1 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.

LSEG allocates each cross connect customer one port on LSEG Cross Connect Switch A, and one port on LSEG 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 LSEG 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.

Setting	Supported Value
Media	Single Mode Fibre (SMF)
Speed	10GbE (LR) (1 Gbps on request – see note below)
Duplex	Full
MTU	1500 bytes
Auto-negotiate	Disabled
Flow-control	Disabled
Layer 3	Routed interface

Table 4: Physical Connection Types

Location	Connector
LD4	LC
TY3	SC (clients can request SC to LC cable from Equinix as part of their cross connect order with Equinix)
Equinix Secaucus	SC (clients can request SC to LC cable from Equinix as part of their cross connect order with Equinix)

Table 5: Connector Types by Location

Note

LSEG 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 5.2Client Data Rate Policing.

3.1.1.2 Client Hand off

The demarcation point between LSEG and the subscriber will be a LSEG 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 the data center vendor's responsibility. This cross connect is ordered from the data center vendor by the customer following the data center vendor's local order process.

However, for in-scope sites, a process will be followed by LSEG and Equinix to ensure cable equalization 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 LSEG are the customer's responsibility. LSEG 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 LSEG CoLo switch after go-live, the customer should raise a ticket with Equinix and with LSEG, and should include the Equinix ticket number in the LSEG ticket. This will facilitate quick collaboration for LSEG 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 LSEG applications which it is clear are not related to the cross connect.

3.1.1.3 Cable equalization

Within the LD4, TY3 and in scope Equinix Secaucus data centers a standard cable length and patch panel layout will be used so that the latency between the LSEG switch and the peering client device will be as consistent as possible across subscriber connections.

While LSEG 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 LSEG service.

Exclusions:

- Customers outside the EFX rooms in the main LD4 building (2 Buckingham Avenue) may have longer cable runs or more patch panels than customers within LD4 in scope for the cable equalised service. In addition, customers in other buildings on the LD4 campus (including LD4.2) may have longer cable runs or more patch panels than customers within the main LD4 building (2 Buckingham Avenue).
- Customers connecting to TY3 services from TY5 (another Equinix building in Tokyo which is in close physical proximity to TY3) may have longer cable runs or more patch panels than customers in scope for the cable equalised service.
- Cable equalization for the Equinix Secaucus campus is only offered at the following buildings on the campus:
    1. NY4 Main building (excluding mezzanine)
    2. NY5

- Customers in other locations within the Equinix Secaucus campus (e.g. NY2, NY4 Mezzanine, NY6) will connect via the NY4 or NY5 patch panels and will have longer cable runs than customers within NY4 main building or NY5.

3.2 Logical Deployment Model - IP Address Allocation

LSEG will advertise 1 x /27 LSEG 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
Equinix Secaucus	159.220.253.224 /27 159.220.245.64 /27 – advertised via A-Side only 159.220.245.96 /27 – advertised via B-Side only
LD4	159.220.249.224 /27 159.220.245.0/27 – advertised via A-Side only 159.220.245.32/27 – advertised via B-Side only
TY3	159.220.251.224 /27

Table 6: Address ranges advertised by LSEG

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 LSEG 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 5 Accessing LSEG Services. LSEG 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, LSEG will also provide the following IP address information for their cross connect:

- 1 x /29 subnet LSEG 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 LSEG 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.

Chapter 4 Onboarding Milestones

LSEG has a two part process for establishing cross connects to us.

4.1 Milestone 1 – Port Up and IP connectivity established

As part of the onboarding process, LSEG will work with the customer to ensure their cross connect port shows on the cross connect infrastructure and is pingable. LSEG will provide the customer with the RFC1918 IP addresses for the LSEG 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. LSEG confirms interfaces on LSEG Cross Connect Switches A and B are up.
- Customer confirms they can ping the RFC1918 IP addresses on LSEG Cross Connect Switches A and B.
- LSEG confirms they can ping the RFC1918 IP addresses on the Customer Cross Connect Switches A and B.

If the link does not show as ‘up’ after being enabled on the LSEG side, the customer will be required to liaise with the data center vendor to swap the polarity and test the cable.

In order to fully confirm IP connectivity, LSEG 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 LSEG and Customer Switches, and retain at least until BGP peering is fully established (onboarding milestone 2). LSEG 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 LSEG if they blocking ICMP traffic from LSEG local interface addresses. LSEG 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.

4.2 Preparing for BGP Peering

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

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. LSEG recommend that these timers are explicitly defined.

- A customer specific BGP password which will be provided by the onboarding team.
- Assign the LSEG 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 LSEG of the /29 network.

The following AS numbers will be configured on the LSEG side:

Site	Refinitiv AS Number
Equinix Secaucus	AS65174
LD4	AS65175
TY3	AS65176

Table 7: LSEG AS Numbers

Note

“EBGP Multihop” is not supported, and that LSEG 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 LSEG 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.

LSEG 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.

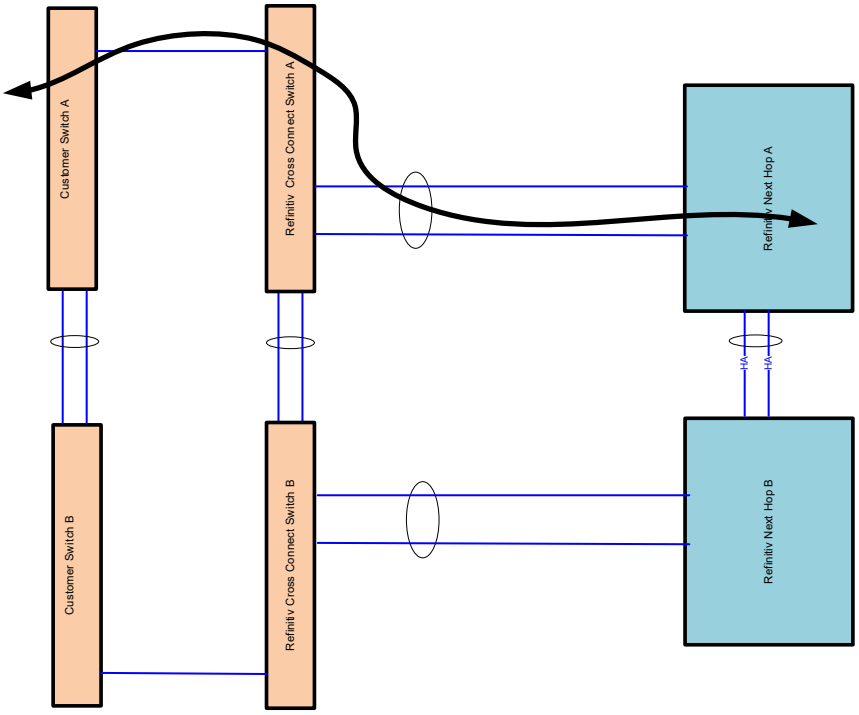
LSEG adopts industry best practices with respect to eBGP standards including the use of MD5 authentication in order to prevent unauthorised peering. MD5 encryption keys are required and will be communicated as part of the on-boarding and deployment process.

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

4.2.1 BGP Peering Failover Scenarios

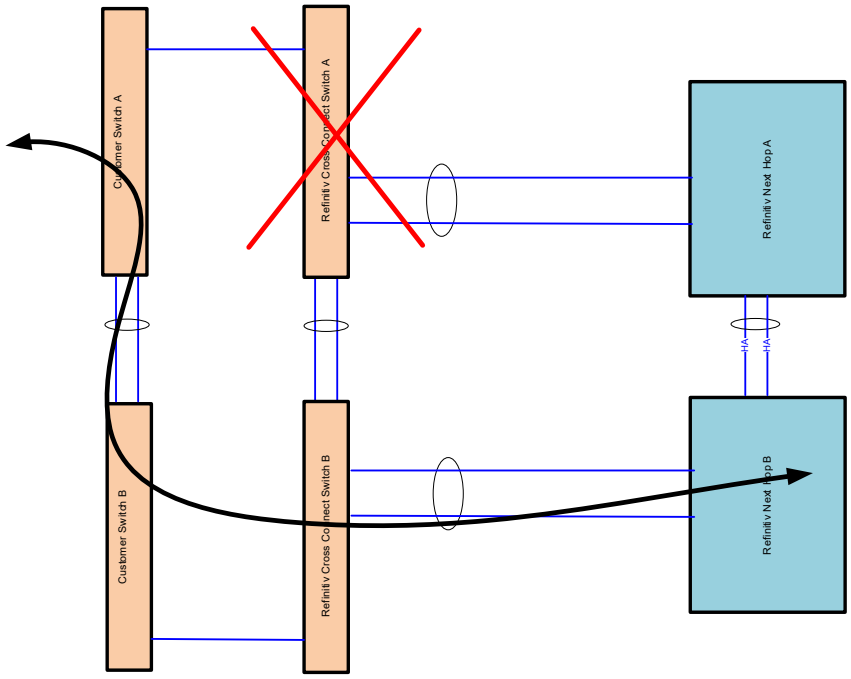
4.2.1.1 Normal Operation

In normal operation, the customer data to the LSEG infrastructure should go via the primary switch (LSEG Cross Connect Switch A). Customers are advised to allow northbound traffic via the primary EBGP link. To ensure this, LSEG 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.



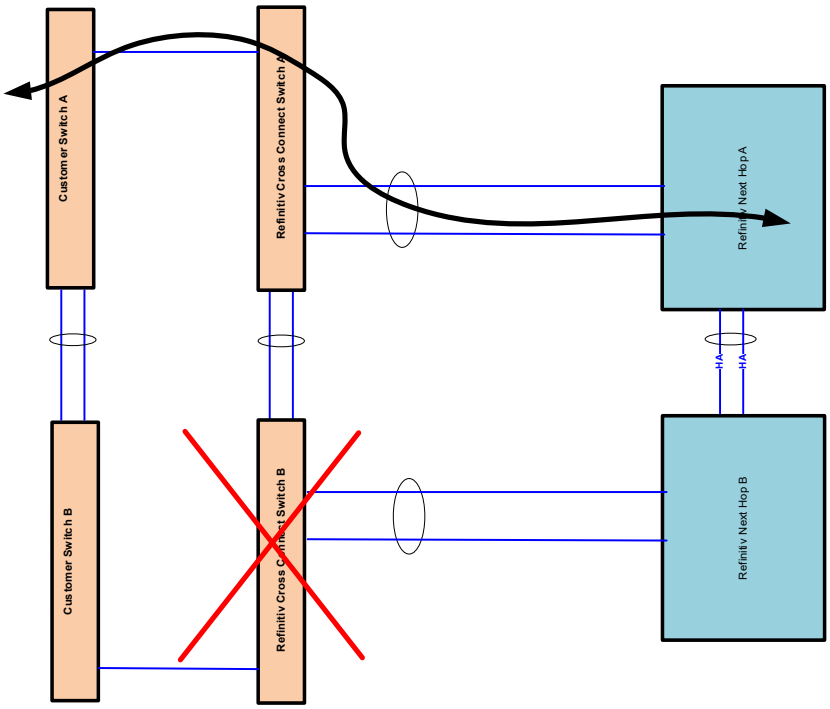
4.2.1.2 A-Side LSEG Cross Connect switch Failure

In the event the A-side LSEG Cross Connect switch were to fail, the customer switch will use its iBGP link to traverse to its partner and to LSEG using the resilient EBGP connection from Customer Switch B to LSEG Cross Connect switch B.



4.2.1.3 B-Side LSEG 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.



4.3 Milestone 2 – BGP Peer Relationship established

Once milestone 1 has been completed successfully LSEG 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, LSEG will disable the BGP peering and a follow-up weekend will be scheduled to reattempt the connection.

LSEG also recommends that the customer conduct failover tests at this point, to ensure that connectivity to the LSEG address space is possible in the event of a failure of the A side link. A side link failure can be simulated by the customer temporarily shutting their A side port. If the testing involves end to end testing, the timing of these tests should be planned with LSEG to ensure that a server process will be listening at the time of the tests.

From this point:

- LSEG 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 LSEG 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.

4.4 Milestone 3 –FX Matching Binary Multicast Feed Onboarding

If the customer has ordered a multicast feed capability, this will be enabled as a third milestone.

LSEG deliver independent A/B multicast data feeds in a controlled and static manner. PIM neighborship is established between the physical /30 RFC1918 addresses assigned to either end of the cross connect.

LSEG will not provide a Rendezvous Point (RP) for colocated customers: LSEG statically route the multicast feeds and no joins will be accepted or processed. If the customer requires a Rendezvous Point setup, then a Phantom RP design can be implemented by the customer.

Apart from during maintenance of the feed delivery infrastructure, the multicast feeds will always have data being transmitted. Even if there is no market data being sent, a periodic application heartbeat will be transmitted per feed.

The “always on” approach LSEG has deployed means a customer will be able to build source trees on their network infrastructure during onboarding for feeds they are entitled to.

4.4.1 Configuration Details for Multicast Feeds

The following table details the A and B address ranges for Network provisioning:

Location	Path	Unicast Source Range	Multicast Group Range
LD4 (Live)	A	159.220.245.0/27	233.34.14.128/27
LD4 (Live)	B	159.220.245.32/27	233.34.14.160/27
Equinix Secaucus (DR)	A	159.220.245.64/27	233.40.217.128/27
Equinix Secaucus (DR)	B	159.220.245.96/27	233.40.217.192/27

Table 8: A and B address ranges

The globally unique unicast source range will be advertised by LSEG on its respective path. The A path unicast source will be advertised only via the A-side BGP peering, and the B path unicast source will be advertised only via the B-side BGP peering.

By advertising the unicast source via BGP, LSEG ensures that the customer has a valid route for the RPF check but also has the flexibility to use PIM-SSM in their own infrastructure should they wish to.

For the multicast group addresses, RFC 3180 GLOP addressing has been utilised to ensure there are no clashes with other exchanges or venues.

LSEG do not provide alternate network path for A/B multicast feeds so the customer will never receive an A feed via the B cross connect nor the B feed via the A cross connect. The customer is responsible for any forwarding decisions for feeds within their own infrastructure.

The Disaster Recovery service at the Equinix Secaucus campus will provide a new instance of the Binary Multicast Feed to be enabled in a Disaster Recovery event. In normal operation, Security Definition data will

be sent so clients can determine their connection health. In the event of DR invocation, LSEG will enable the additional channels (Trades, Snapshot, Incremental and Statistics). Please contact your Transactions Relationship Manager to discuss DR options.

4.4.1.1 Customer side multicast configuration parameters and examples

In order to receive the multicast feeds, the customer must add some basic multicast configuration to the cross connect layer 3 interface. PIM sparse mode is strongly recommended in line with industry best practice and efficient use of bandwidth.

LSEG will request of the customer to leave the PIM DR priority at the default value of 1 in most cases. If the customer must define a DR priority other than 1, the value must be lower than the LSEG assigned value of 120. Failure to adhere to this policy will result in the multicast feeds not being received on the customer infrastructure.

The below configuration example is for a Cisco Nexus device. It shows the minimum configuration needed to receive the multicast feed. It is to be used as an example only and the customer should tailor the configuration to their own standards and best practices. LSEG also accepts no responsibility for bugs or misconfiguration that may or may not be present in the Network platform related to PIM or multicast: the customer is strongly advised to perform due diligence before enabling.

```
feature pim

interface Ethernet1/1
ip pim sparse-mode
ip pim border
ip pim dr-priority 1
```

LSEG will not be responsible for troubleshooting the customer's network. It is a prerequisite that the customer is proficient in the design, configuration and troubleshooting of IP multicast.

4.4.1.2 Multicast On-boarding verification

Ideally the customer will have a host in operation that can perform an IGMP Join for the relevant multicast groups. If however this is not in place LSEG recommends that the customer create a Layer 3 loopback to statically send the multicast data to. In doing this, the shared tree and source tree details will be visible during on boarding even without a host requesting it. Here is a configuration example of how to achieve this on a Cisco Nexus device:

```
interface loopback100
  ip address 5.5.5.5/32
  ip pim sparse-mode
  ip igmp static-oif 233.34.14.12
```

Note

The loopback interface will be using CPU rather than hardware resource. It is strongly recommended to remove the loopback once onboarding has been completed to ensure no adverse affects to the customer's infrastructure.

An output similar to the below should now be visible:

```
switch# sh ip mroute
IP Multicast Routing Table for VRF "default"

(*, 233.34.14.129/32), uptime: 00:00:13, static ip pim
  Incoming interface: [X], RPF nbr: [X.X.X.X], uptime: 00:00:13
  Outgoing interface list: (count: 1)
    loopback100, uptime: 00:00:13, static

(159.220.245.1/32, 233.34.14.129/32), uptime: 00:00:07, ip mrib pim
  Incoming interface: Ethernet1/1, RPF nbr: 10.233.28.X, uptime: 00:00:07
  Outgoing interface list: (count: 1)
    loopback100, uptime: 00:00:07, mrib
```

Note

The above output has been modified to show an [X] where this will be customer unique given their multicast setup.

4.4.1.3 Multicast demo feeds

LSEG will provide any demo feeds over the existing production cross connects in LD4 (only) and different multicast group and unicast source addresses will be used. Please refer to 5.3.2.2 Multicast-based Services – Matching Binary Data FX Spot Unscreened for more details.

Multicast demo feeds are only available at the LD4 site.

Chapter 5 Accessing LSEG Services

5.1 Encryption

Given the overhead that encryption introduces to data processing, it is anticipated that customers will wish to use cleartext connectivity for colo connections which aim to achieve the lowest latency performance. Encryption options are available on request, but will introduce a latency overhead.

Encryption will not be provided for any multicast delivered feeds.

5.2 Client Data Rate Policing

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

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

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

Although LSEG 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 9: Example values for Client Data Rate Policing

Repeated and persistent policer events will need to be reviewed between LSEG and the client to find a solution in order to ensure service quality. LSEG 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 LSEG 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 LSEG 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 10: 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 LSEG 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.

5.3 General Connectivity Requirements and Target IP Addresses

5.3.1 DNS

LSEG does not provide a DNS service as part of the Co Location service. Clients should refer to the following table for details of the IP addresses for the services that you will be connecting to. How many of these IP addresses you connect to will depend upon which LSEG services you are subscribing to over the cross connect. LSEG will support customers either using their own static name resolution to resolve these records locally or using IP address to connect.

5.3.2 Service to IP Address Mapping

5.3.2.1 Unicast-based Services

Service	LD4	TY3	Equinix Secaucus
Aggregation API for RFS	159.220.249.225	159.220.251.225	159.220.253.225
PriceStream via Liquidity Provider API. *Inbound customer initiated connection to LSEG.*	159.220.249.226	159.220.251.226	159.220.253.226
PriceStream via Liquidity Provider API. *Outbound initiated connections from LSEG to customer. This is for existing legacy customers only who wish to migrate away from NJ2.*	159.220.249.236	159.220.251.236	159.220.253.236
FXall RFQ via Provider Interface (TCPI)	159.220.249.233	159.220.251.233	159.220.253.233

Service	LD4	TY3	Equinix Secaucus
Aggregation API for RFQ	159.220.249.234	159.220.251.234	159.220.253.234
Orderbook via Liquidity Provider API. *Inbound customer initiated connections only.*	Not available	Not available	159.220.253.254
FX Matching API	See section 5.4 Connectivity Requirements for FX Matching API (MAPI)	See section 5.4 Connectivity Requirements for FX Matching API (MAPI)	See section 5.4 Connectivity Requirements for FX Matching API (MAPI)
FXall Legacy APIs	Not available	Not available	

Table 11: Hostname to IP address mapping (unicast-based services)

5.3.2.2 Multicast-based Services – Matching Binary Data FX Spot Unscreened

The FX Matching Binary Data FX Spot Unscreened feed is a UDP multicast based service for subscribing to unscreened market data from the FX Matching venue.

5.3.2.3 Binary Feed conflated at 50ms

Service and Location	A-side Multicast Group Address	A-side Unicast Source Address	B-side Multicast Group Address	B-side Unicast Source Address
LD4 (Demo)	233.34.14.158	159.220.245.29 159.220.245.30	233.34.14.190	159.220.245.61 159.220.245.62
LD4 (Production Live)	233.34.14.129	159.220.245.1 159.220.245.2	233.34.14.161	159.220.245.33 159.220.245.34
Equinix Secaucus (Production DR)	233.40.217.129	159.220.245.65 159.220.245.66	233.40.217.193	159.220.245.97 159.220.245.98

Table 12: Source and destination addresses for binary feed conflated at 50ms

5.3.2.4 Binary Feed conflated at 5ms

Service and Location	Instrument Group	A-side Multicast Group Address	A-side Unicast Source Address	B-side Multicast Group Address	B-side Unicast Source Address
LD4 (Demo) See table below for group information	Group 1	233.34.14.157	159.220.245.29 159.220.245.30	233.34.14.189	159.220.245.61 159.220.245.62
	Group 2	233.34.14.156		233.34.14.188	
LD4 (Production Live) See table below for group information	Group 1	233.34.14.130	159.220.245.1 159.220.245.2	233.34.14.162	159.220.245.33 159.220.245.34
	Group 2	233.34.14.131		233.34.14.163	
	Group 3	233.34.14.132		233.34.14.164	
	Group 1	233.40.217.130	159.220.245.65 159.220.245.66	233.40.217.194	159.220.245.97 159.220.245.98
	Group 2	233.40.217.131		233.40.217.195	

Service and Location	Instrument Group	A-side Multicast Group Address	A-side Unicast Source Address	B-side Multicast Group Address	B-side Unicast Source Address
Equinix Secaucus (Production DR)	Group 3	233.40.217.132		233.40.217.196	

Table 13: Source and destination addresses for binary feed conflated at 5ms

5.3.2.5 LD4 (Demo) Group information

Group	Instruments in Group
Demo Group 1	gbp/xts, xts/jpy, xts/chf
Demo Group 2	eur/xts, aud/xts, xts/cad

Table 14: LD4 Demo Group information

5.3.2.6 LD4 (Production Live) Group information

Group	Group Name	Instruments in Group
Group 1	Majors	AUD/CAD, AUD/JPY, AUD/NZD, AUD/USD, CAD/JPY, EUR/AUD, EUR/CAD, EUR/GBP, EUR/NZD, GBP/AUD, GBP/CAD, GBP/CHF, GBP/JPY, GBP/USD, NZD/CAD, NZD/USD, USD/CAD
Group 2	Others	EUR/CNH, EUR/CZK, EUR/DKK, EUR/HUF, EUR/MXN, EUR/NOK, EUR/PLN, EUR/RON, EUR/SEK, NOK/SEK, USD/CNH, USD/CZK, USD/DKK, USD/HKD, USD/HUF, USD/ILS, USD/MXN, USD/NOK, USD/PLN, USD/RUB TOM, USD/SEK, USD/SGD, USD/THB, USD/TRY TOM, USD/ZAR
Group 3	Non-Core	EUR/CHF, EUR/JPY, EUR/USD, USD/CHF, USD/JPY

Table 15: LD4 Production Group information

5.3.3 Firewall Rules

The protocol is TCP, unless otherwise specifically stated.

Service	Port Range (Order Entry)	Port Range (Market Data)	Direction
FX Matching API	60237 (non encrypted, default) 60238 (encrypted, on request)	60239	Customer initiates connection to LSEG
FX Matching Credit API	443 (encrypted)		Customer initiates connection to LSEG
Aggregation API	14501 (encrypted, primary connection)	Not required for access to RFQ. For access to RFS: 14500 (encrypted)	Customer initiates connection to LSEG

Service	Port Range (Order Entry)	Port Range (Market Data)	Direction
FXall RFQ via Provider Interface (TCPI)	443 (encrypted)	Not required.	Customer initiates connection to LSEG
PriceStream and Orderbook via Liquidity Provider API	Specific destination port details will be provided to the client as part of their onboarding documentation. One port will be allocated for Order Entry, and one port for Market Data from the following ranges: 15000 to 19999 (non encrypted, default) 10000 to 14999 (encrypted, on request)		Customer initiates connection to LSEG. *Outbound initiated connections from LSEG to customer can be provided for legacy customers only who wish to migrate away from NJ2.*
FX Matching Binary Multicast Feed	UDP 20001 to 20005		LSEG sends statically to the customer.
FXall Legacy APIs	See detail in 5.5 Connectivity Requirements for FXall Legacy APIs (New Jersey existing customers only)		Customer initiates connection to LSEG.

Table 16: Firewall Rules

5.4 Connectivity Requirements for FX Matching API (MAPI) service

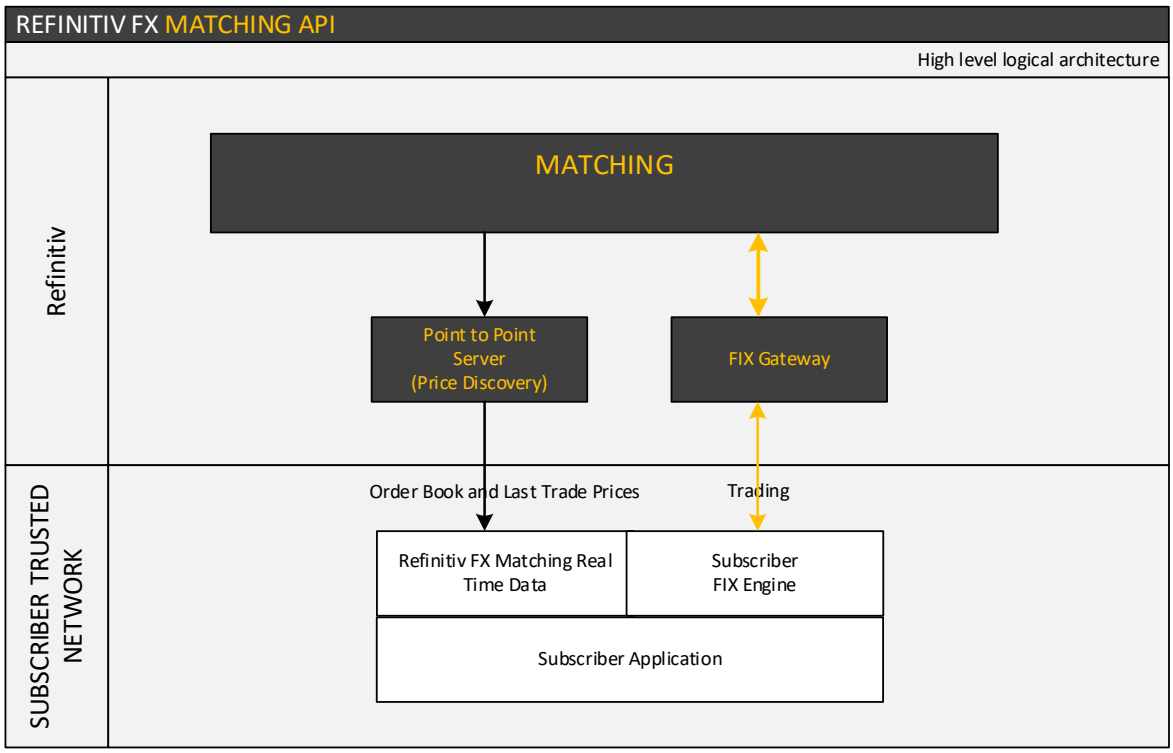
The diagram below shows a high-level logical architecture diagram of the FX Matching API services.

The FX Matching API (MAPI) is a TCP unicast based service for accessing the FX Matching venue.

Subscriber applications connect to two services:

- FIX gateway to support FIX protocol message workflows

- Point to Point server (P2PS) to provide market data to the RFA FX Matching Real Time Data consumer.



5.4.1 Location of the Matching Host

The Primary Matching Service is in the Equinix LD4 site with DR site in the Equinix Secaucus Campus.

5.4.2 Disaster Recovery Planning for client connections

In normal failure conditions, LSEG will endeavour to ensure that if failover is invoked for the Matching Host, that customers connected at LD4 will still be able to connect via their LD4 cross connects to the Matching Host services at Equinix Secaucus campus.

However, LSEG recommends customers implement a comprehensive DR strategy - see Section 2.2 – Disaster Recovery Planning. This comprehensive DR planning should take into account large scale failure of a single site or campus, including the unlikely possibility that this type of event may affect LSEG but not the customer. In that unlikely situation, the customer client connections at the live site would be unavailable to locally connected clients – only clients connecting over WAN connections (see section 2.1 Locations) or with a TVCO connection at another location would be able to connect.

5.4.3 Connecting to the Matching FIX Gateway

Clients will be provided with two VIP addresses used to access the live Matching FIX Gateway in LD4 in normal operation and the Equinix Secaucus Campus in DR operation. The IP addresses target a load balancer located within each of the LSEG data centres. The load balancer effectively acts as a proxy for all FIX connections originating from the client site to the LSEG data centre where the live Matching FIX Gateway is deployed and running. The Load Balancer manages FIX Server pool redundancy in the datacenter. This approach simplifies the connection process for the client.

These IP addresses are for the purposes below:

- The first IP address routes the client FIX connections to the load balancer in the LSEG primary London data centre.
- The second IP address routes the client FIX connections to the load balancer in the LSEG DR data centre.

> **Note**
>
> Under normal operating conditions (non-DR scenarios) clients will be unable to establish connections to servers located within the LSEG DR site.

The IP addresses which clients will connect to for the Matching FIX Gateway are documented below in Table 17. Clients must factor into their requirements the ability to re point the FIX engine as required given the service conditions (normal operation or disaster recovery mode) set out in this table.

Cross Connect Location	FIX Proxy IP Address – Normal Operation	FIX Proxy IP Address – Secondary
LD4	159.220.249.227	159.220.249.230
TY3	159.220.251.227	159.220.251.230
Equinix Secaucus	159.220.253.227	159.220.253.230

Table 17: Matching FIX Gateway Address Ranges

5.4.4 Connecting to the Matching Point to Point Servers (P2PS)

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

- One pair (2) of destination IP addresses for ‘A’ and ‘B’ connections that point to a pool of P2PSs located within the LSEG primary London data centre.
- Another pair (2) of destination IP addresses for ’A’ and ‘B’ connections that point to a pool of P2SPs located at the LSEG DR data centre. These will not be active in normal operation.

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

Clients will only be permitted to deploy a maximum of 2 RFA client applications per client site.

The pairs of IP addresses which clients will connect to for the P2PS applications are documented below in Table 18. Clients must factor into their requirements the ability to re point the RFA client applications as required given the service conditions (normal operation or disaster recovery mode) set out in this table.

Cross Connect Location	P2PS Target IP Address Range – Normal Operation	P2PS Target IP Address – Secondary
LD4	159.220.249.228 & 159.220.249.229	159.220.249.231 & 159.220.249.232
TY3	159.220.251.228 & 159.220.251.229	159.220.251.231 & 159.220.251.232
Equinix Secaucus	159.220.253.228 & 159.220.253.229	159.220.253.231 & 159.220.253.232

Table 18: P2PS Address Ranges

5.4.5 Connecting to the Matching Credit API

The FX Matching Credit API uses the same setup as Matching FIX Gateway (5.4.4) with the IP addresses documented in the table below.

Cross Connect Location	FIX Proxy IP Address – Normal Operation	FIX Proxy IP Address – Secondary
LD4	159.220.249.227	159.220.249.230
Equinix Secaucus	159.220.253.227	159.220.253.230

Table 19: Matching Credit API Address Ranges

5.5 Connectivity Requirements for FXall Legacy APIs (New Jersey existing customers only)

> **Note**
>
> The following services are only available to current FXall customers of these APIs who already have cross connects to FXall at NJ2 or Equinix Secaucus.

For most services, it is customer choice whether to target the cleartext port or the encrypted port. This choice should be agreed with LSEG prior to milestone 1 onboarding, as the majority of customers choose to use cleartext for colo services. See section 5.1 Encryption.

Service	Target IP Address	TCP Port Range (cleartext)	TCP Port Range (encrypted)
STP FIX	159.220.253.243	8085	443
Market Data Service (MDS) Gateway	159.220.253.254	19000	14000

Service	Target IP Address	TCP Port Range (cleartext)	TCP Port Range (encrypted)
Common Client Gateway (CCG)	159.220.253.254	19001 to 19010 (see note below)	14001 to 14010 (see note below)
Marketview (MV) Gateway	159.220.253.254	19011	14011
FIX Drop Copy (FIXDC)	159.220.253.254	19012	14012
FIXTRADING Market Data Gateway (FIXTRADING-MD)	159.220.253.254	19013 or 19014 (see note below)	14013 or 14014 (see note below)
FIXTRADING Order Routing Gateway (FIXTRADING-OR)	159.220.253.254	19015 to 19017 (see note below)	14015 to 14017 (see note below)
MidBook	159.220.253.254	19019 to 19021 (see note below)	14019 to 14021 (see note below)

Table 20: FXall legacy API Hostname to IP address mapping and Firewall Rules

Note

Where a port range is specified in the table above, a specific port will be communicated by LSEG during onboarding.

Visit **www.lseg.com/en/fx**

LSEG FX