Member Connectivity and Disaster Recovery Guide

Version 3.1

Version Control

Version	Description	Date
1.0	First publication of Spectrum Connectivity Guide	🗓 19 Feb 2019
2.0	Updated to add new options for broker connectivity and reflect operational changes for the Exchange	🗓 10 Jan 2020
3.0	Added • Comments that single cross connect can be to either LD4 or LON1 • A hybrid option of primary connection going via LD4/LON1 with internet backup	🗓 26 Oct 2022
3.1	Updated • Replaced OrderMassStatusRequest message (35=AF) recommendation with the correct and current OrderStatusRequest (35=H) message implementation. • Changed the Rules of Engagement (RoE) link in the FIX Services section to be the external link the the website	🗓 09 Jan 2023

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Definitions

Document Phrasing	Meaning
"Exchange"	The Multilateral Trading Facility (MTF), legally named as Spectrum MTF Operator GmbH
"Member"	Trading Participant directly connected into the Exchange and submitting orders to trade in the case of a Broker or executable quotes when a Market Maker

A - Introduction

Purpose

This document specifies the physical network connectivity options available to firms ("Members") wishing to participate on the Spectrum MTF Operator GmbH (the "Exchange"). This document also specifies the disaster recovery mechanism.

B - Physical Connectivity / Network Architecture

The Exchange runs Active/Passive across two physically separated data centres (Spectrum-HPH and Spectrum-CBH)

Note: Throughout this document any IP addresses presented will be IPv4.

Market Makers (or Brokers)

Connectivity is available via cross-connect to the Exchange's cabinets in two Points of Presence (PoP), **Equinix LD4** (https://www.equinix.com/), and **Interxion LON1** (https://www.interxion.com/). The Exchange exposes the Member specific IP addresses at LD4 and LON1 that route to each data centre (IP Addresses will communicated during onboarding)

- We **REQUIRE** the Member is able to selectively target each of the Exchange's data centres. This requirement ensures that the Member can tolerate a failure of either one of the data centres by targeting the survivor.
- We **RECOMMEND** (but do not require) the Member establishes cross-connects to the cabinets at both LON1 and LD4. This allows the Member to tolerate an outage at either one of LD4 or LON1 by routing through the survivor.

NOTE: During the onboarding process we will require the IP address(es) that the Member will present to us.

Overview
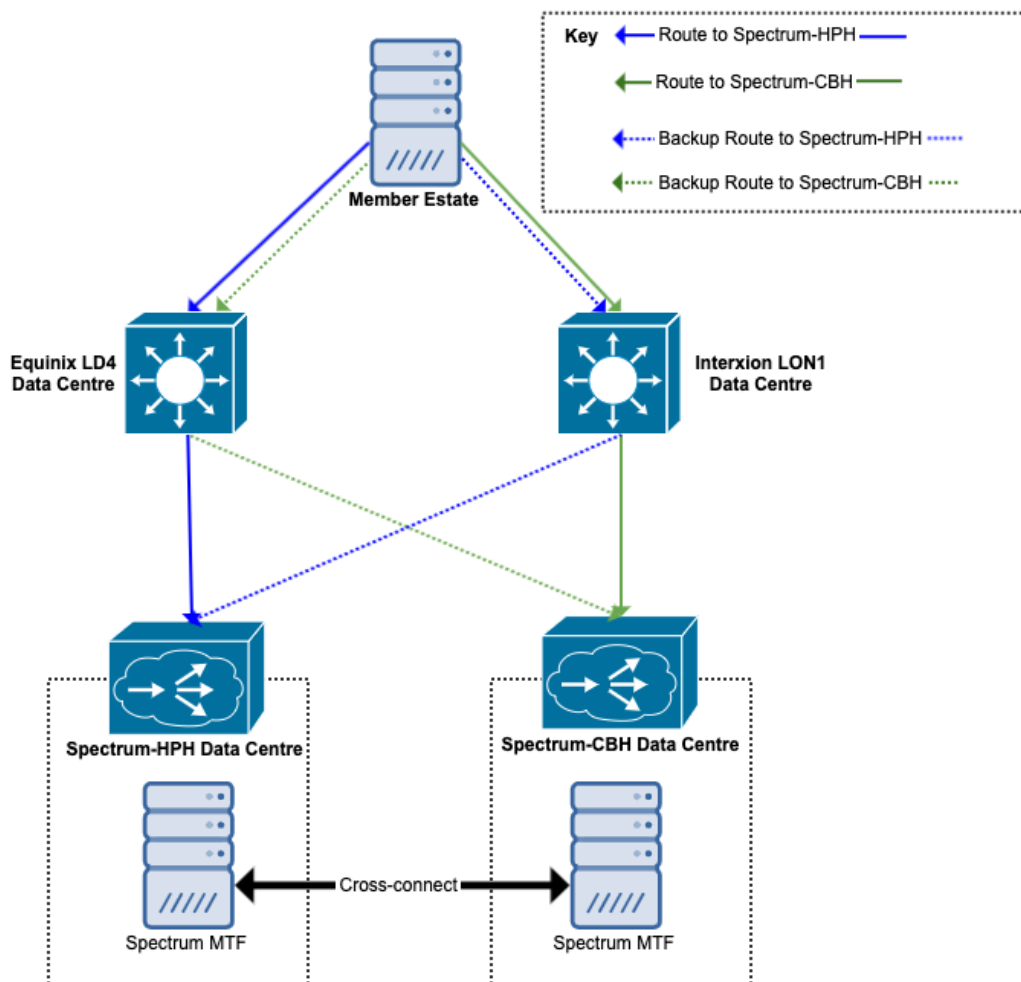
Brokers (only)

The Exchange can optionally support Internet connectivity. The Exchange exposes a pair of public IP (TLS encrypted) addresses with multiple ports per data centre at,

- prod - fixo.spectrum-markets.com (for order entry)
- prod - fixm.spectrum-markets.com (for market data)
- demo - demo-fixo.spectrum-markets.com (for order entry)
- demo - demo-fixm.spectrum-markets.com (for market data)

We **REQUIRE** the Member to whitelist all their addresses. This requirement ensures that the Member can tolerate a failure of either data centres

NOTE: During the onboarding process we will require the IP address(es) that the Member will present to us in order to white list them.

Overview
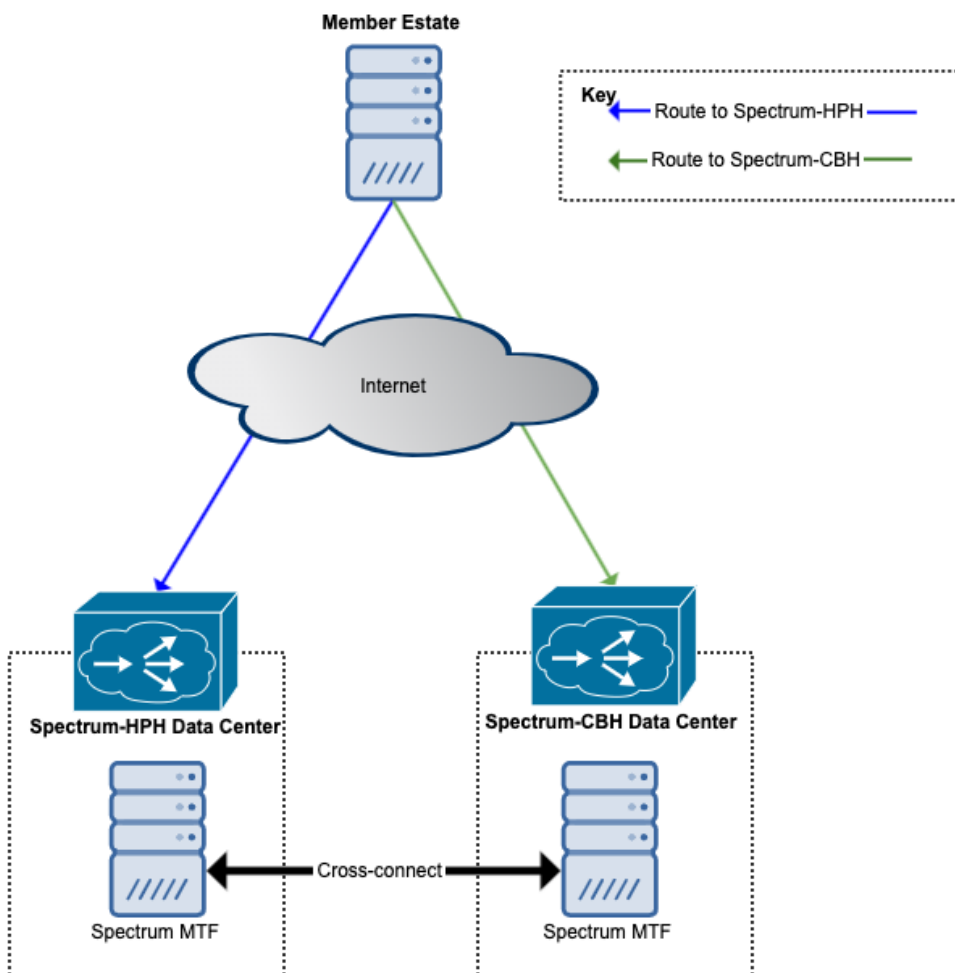
C - FIX Services

The Exchange will provide **eight** FIX endpoints to the Member (See Rules of Engagement for the technical details of these services)

1. LIVE Market Data session x2 (1 active, 1 standby)
2. LIVE Trading session x2 (1 active, 1 standby)
3. DEMO Market Data session x2 (1 active, 1 standby)
4. DEMO Trading session x2 (1 active, 1 standby)

For the remainder of this document we focus on the LIVE environment. DEMO is a parallel environment running on exactly the same infrastructure.

One of each pair of gateways (LIVE market data + trading) is hosted at Spectrum-CBH, and the second pair is hosted at Spectrum-HPH. These FIX gateways are independent from each other and transport messages to the Exchange co-located in the same datacenter. We require that the Member is able to connect to both Spectrum-HPH and Spectrum-CBH gateways, but do not require the Member to do so simultaneously

When the Member is connected via either the LON1 or LD4 PoP they will be able to connect to either of the two data centres, however we recommend that they connect via the PoP that offers the best experience with regards to latency.

Member Connected to the Primary Data Centre Using One Cross-connect (Active/Standby)

In this scenario where the Exchange is running from Spectrum-HPH the Member establishes a cross-connect to the Exchange's cabinet at Equinix LD4, and under normal operation targets the FIX gateways in Spectrum-HPH. In the event of a DR scenario where Spectrum-HPH is down and Spectrum-CBH become the live site the Member targets the Spectrum-CBH gateways.
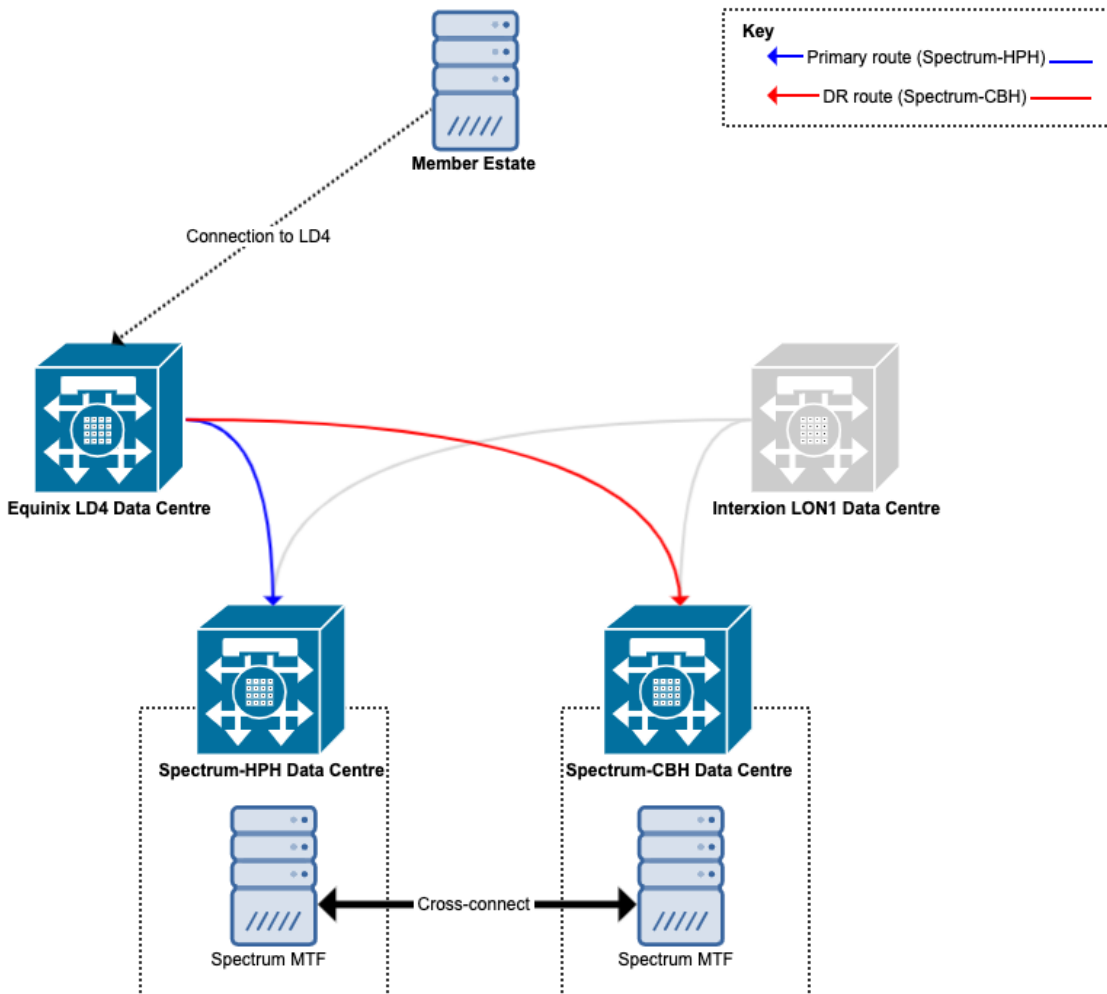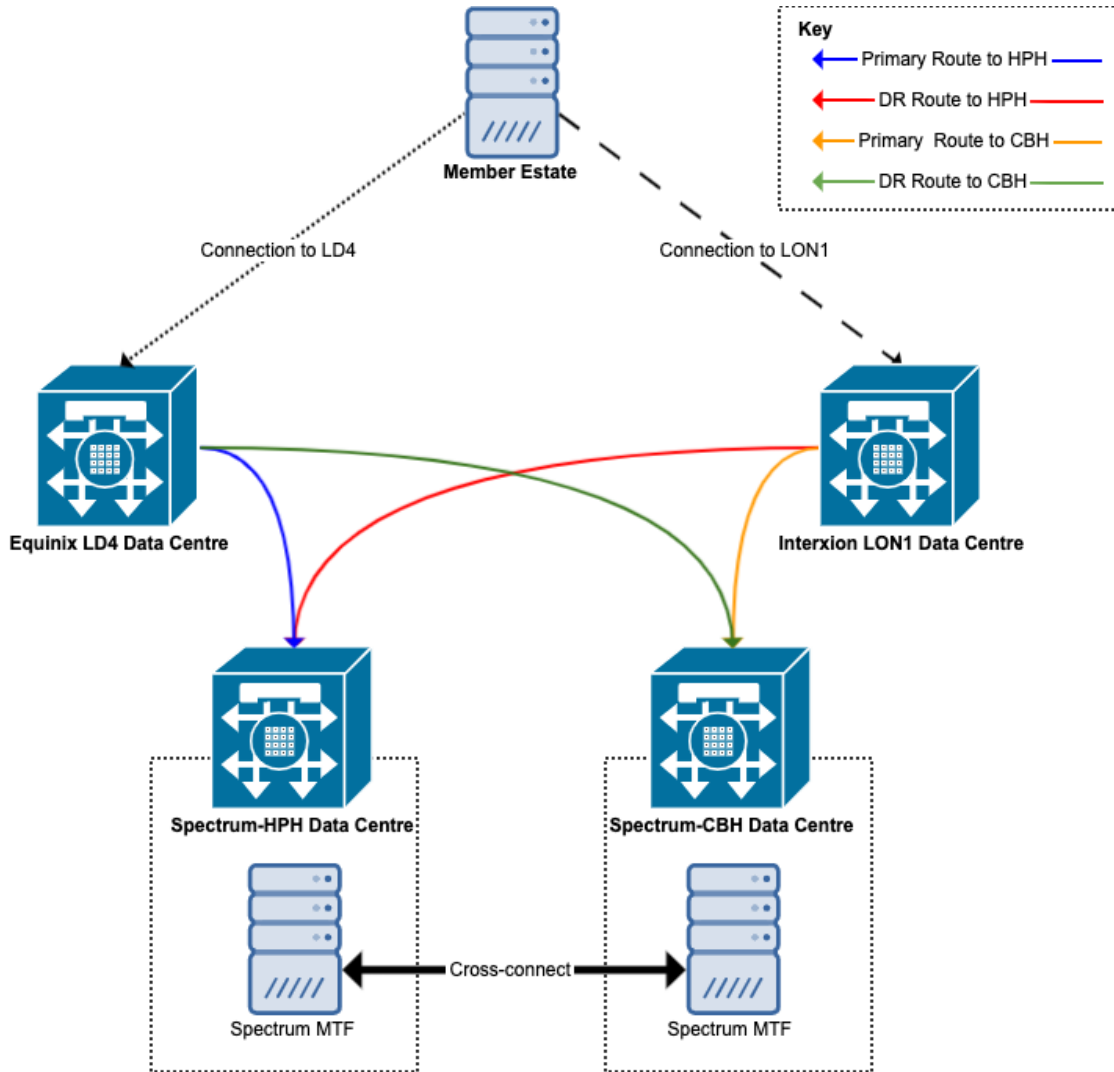
There are two points to note.

1) This connectivity option is not limited to LD4 as the Member may also chose to have a single cross connect to LON1. The primary and DR paths will follow the same pattern as LD4.
2) In this connectivity scenario the Member is exposed to a single point of failure at a specific PoP (LD4 or LON1)

Member Connected to Both Data Centres Using Two Cross-connects (Active/Active, Highly Resilient)

In this scenario the Member establishes a pair of cross-connect to one of the Exchange's cabinet at LD4 and one at LON1. The Member targets FIX gateways in both Spectrum-HPH and Spectrum-CBH, one pair will be live and one which will be in passive. For the best latency experience the Member should route via the cross-connect best positioned to each DC, LD4 for HPH and LON1 for CBH.

Note: In this connectivity scenario the Member is fully resilient to DC failures, both at LON1/LD4, and Spectrum-HPH/Spectrum-CBH.

Member Connected to a Hybrid Model

There is one other option the is available to the Member and that is to have a single cross connect to either LD4 or LON1, which will act as the primary, with an internet connection as a backup option.
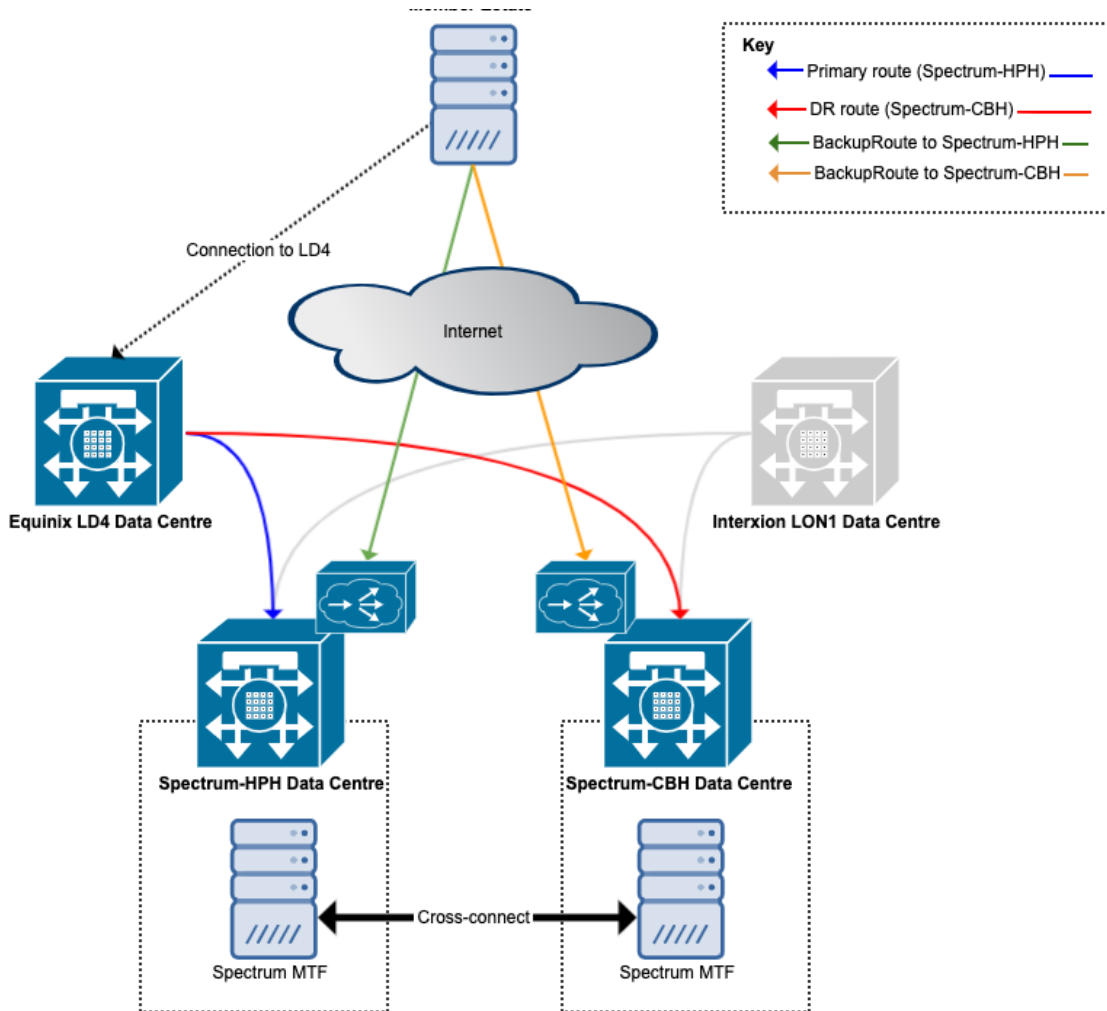
Note as per the single cross connect option previously shown this option is not limited to LD4 as the Member may also chose to have a single cross connect to LON1. The primary and DR paths will follow the same pattern as LD4 into the Exchange data centres.

D - Failover / Recovery

Under normal operation, the Exchange will run primary in either Spectrum-CBH or Spectrum-HPH with the other site being available for DR.. The two data centres operate independently to each other running a shared nothing model in order to provide resilience. In the event of a failure of the primary data centre the business continuity plan will be invoked and the running of the live Exchange will be migrated to the secondary data centre. The Member will be informed ahead of the resumption of trading of how long they can modify orders in the halt state before the markets are re-opened. During a DR event the Exchange operations team will keep the Member informed and up-to-date on the Member Operations email channel (**operations@spectrum-markets.com**).

As part of the regulatory obligation on the Exchange to ensure that the business continuity plans are viable and tested, the Exchange will alternate running of the primary site between the two data centres (Spectrum-HPH and Spectrum-CBH) . As such it is essential that the Member ensure that they are able to connect to both sites.

Scenario 1 - Exchange Data Centre Failure

As previously mentioned, in the event of a failure of one of the Exchange's data centres, the surviving data centre will become the primary Exchange. During the failover process the surviving data centre will reconstruct the last-known state of the order books prior to failure, once that is completed the markets will be re-opened for trading

Note: It is possible that a small number of messages at the point of outage may be irrecoverably lost. In a non-graceful DR Scenario, we advise the Member to confirm the state of their orders by issuing an OrderStatusRequest (35=H) message for each working orders. We recommend the Member to use the TradeCaptureReporting through their trading gateway or they can request a dedicated drop copy gateway to query and/or subscribe to their trades executed on the Exchange.

Member Impact and Recovery Actions For Cross Connected Clients

In this scenario the Member loses FIX connections to the failed Exchange data centre. The Member will be unable to reconnect to FIX sessions hosted in the failed data centre, re-connection attempts will result in network-layer timeouts. The next steps depend on the Member selected failover strategy, primarily the Member must redirect their FIX gateways to target IP addresses of the designated Exchange DC**.** The Member should connect (log in) their FIX sessions, and then wait for the Exchange Operations team to announce that failover has completed. The Member should then issue an OrderStatusRequest (35=H) message to confirm the state of each of their working orders.

Member Impact and Recovery Actions For Internet Connected Clients (brokers only)

The impact of this will be similar to that of the Member connected via the PoPs in LD4/LON1, however the targeting of the standby site will be managed (via the Exchange Network Support team) by the updating of the DNS records for fixo.spectrum-markets.com and fixm.spectrum-markets.com with IP addresses of the standby site. Once the propagation of this DNS change has completed the Member should connect (log in) their FIX sessions, and then wait for the Exchange Operations team to announce that failover has completed. The Member should then issue an OrderStatusRequest (35=H) to confirm the state of each of their working orders.

Scenario 2 - LON1 or LD4 Data Centre Failure

In the event of a failure of either the LON1 or LD4 data centre, where the Member was using the the failed data centre to connect to the Exchange, they will need to switch their network routing to the alternate data centre.

Member Impact and Recovery Actions For Cross Connected Clients

- Scenario 2a - The Member has only one cross-connect, and that DC has failed: If the Member has chosen to set up a cross-connect at only one of LON1/LD4, and that data centre has failed, then the Member must wait for the failed data centre to come back up. For this reason we advise (but do not require) the Member to establish redundant cross-connects at both LON1 and LD4.
- Scenario 2b - The Member has only one cross-connect, and the other DC has failed: No immediate impact.
- Scenario 2c - The Member has two cross-connects, and the one they are using as primary has failed: The Member must switch their network routing to target the same Exchange DCs as previously, but via the alternate cross-connect (e.g. if the Member was routing to the Exchange services via LD4, and LD4 has failed, the Member must switch their network routing to access the Exchange services via LON1).
- Scenario 2d - The Member has two cross-connects, and the one they are using as backup has failed: No immediate impact.

Note: These scenarios will require the Member to conform with the FIX session protocol and follow the sequence numbers reset per the RoE

Member Impact and Recovery Actions For Internet Connected Clients (brokers only)

In the event of this scenario there will no direct impact to the Member being able to target to the Exchange.