Aquis Matching Pool Connectivity Guide

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Contents

1. Introduction 4
   1.1. Connectivity Overview 4
   1.2. Costs 4
   1.3. Opening Hours 4
   1.4. Fair and Equal Access 4
2. Physical Connectivity Options 5
   2.1. Physical Points of Presence 5
      2.1.1. Equinix LD4 6
      2.1.2. Interxion London City 7
      2.1.3. AMP DR Site at Middlesex 8
   2.2. Third Party Vendors 9
      2.2.1. BT Radianz 9
      2.2.2. Fixnetix 9
      2.2.3. IPC 9
      2.2.4. Pico Global 9
      2.2.5. TNS 9
      2.2.6. ULLink 9
      2.2.7. Other Vendors 10
   2.3. Internet (UAT Environment only) 10
      2.3.1. VPN 10
   2.4. Latency and Bandwidth Considerations 10
      2.4.1. Latency 10
      2.4.2. Bandwidth 10
3. Logical Connectivity 11
   3.1. IP Addressing and TCP Ports 11
   3.2. 'Last Resort' Connectivity 11
   3.3. Trading Ports 12
   3.4. Drop-copy Ports 12
   3.5. FIX Protocol 12
4. UAT Environments, Certification and Onboarding 13
   4.1. Conformance Environment 13
   4.2. UAT Environment 13
   4.3. Certification and Onboarding 13
5. Disaster Recovery 14
6. Technical Support and Escalations 14
7. Useful Contacts 15

7.1. AMP Contacts 15
7.2. Third Party Contacts 15
8. Useful Links 15

1. Introduction

The scope of this document is to provide Aquis Matching Pool (AMP) members with the information required to establish physical and logical connectivity. The information contained within is mostly of a technical nature, and is provided for network administrators of member companies.

There are links to the FIX Rules of Engagement (RoE) documentation for developers or FIX on-boarding teams in the Useful Links section of this document.

1.1. Connectivity Overview

AMP members are responsible for choosing their method of connectivity, and the providers used. All charges levied by those third party providers are to be covered by the member. The MTF is not able to provide hosting for equipment of any kind within the AMP locations outlined below.

This document is provided as a guideline as to the currently-available methods of connectivity. Note that connectivity is subject to the AMP Membership Agreement, a link to which can be found in the Useful Links section of this document.

1.2. Costs

The cost of connectivity to the AMP is summarized in the Fee Schedule document, a link to which can be found in the Useful Links section of this document. The costs outlined in that document cover physical and logical connectivity, as well as the trading fees. It should be noted that the MTF is not responsible for any aspect of member connectivity, up to the entry point to the AMP-allocated locations in the datacentres. The member is therefore liable for any and all charges levied by circuit carriers, network service providers and hosting venues.

1.3. Opening Hours

The MTF operates on UK hours from 08.00 to 16.30, working to a UK bank holiday schedule. The trading calendar is available in the news section of the website, a link to which can be found in the Useful Links section of this document.

1.4. Fair and Equal Access

All AMP member connectivity will be treated equally. Whilst AMP takes no responsibility for the connectivity method chosen by the member, we will ensure that this connectivity is not discriminated for or against in terms of latency or priority. The latency to market for order flow will therefore be dictated by the connectivity method and associated path chosen by the member firm. Aquis Exchange is not responsible for latencies related to the distance between the MTF members' network infrastructure and the MTF network infrastructure.

2. Physical Connectivity Options

This section outlines the various connectivity options available to AMP members. There is at present no requirement for our members to set up resilient connectivity or connections to the disaster recovery sites, although of course it is recommended. Members can order any combination of the below options as they see fit. For all connectivity detailed in section 2, the member is responsible for all connectivity costs up to the Z-end demarcation point of the cross-connect or circuit at AMP infrastructure.

To initiate a connectivity request, members should contact the Deployment and Testing team outlined in the AMP Contacts section of this document. They can help with the decision on the connectivity in question, provide a Letter of Authority to set up cross-connects, and initiate any network engineering discussions as required.

2.1. Physical Points of Presence

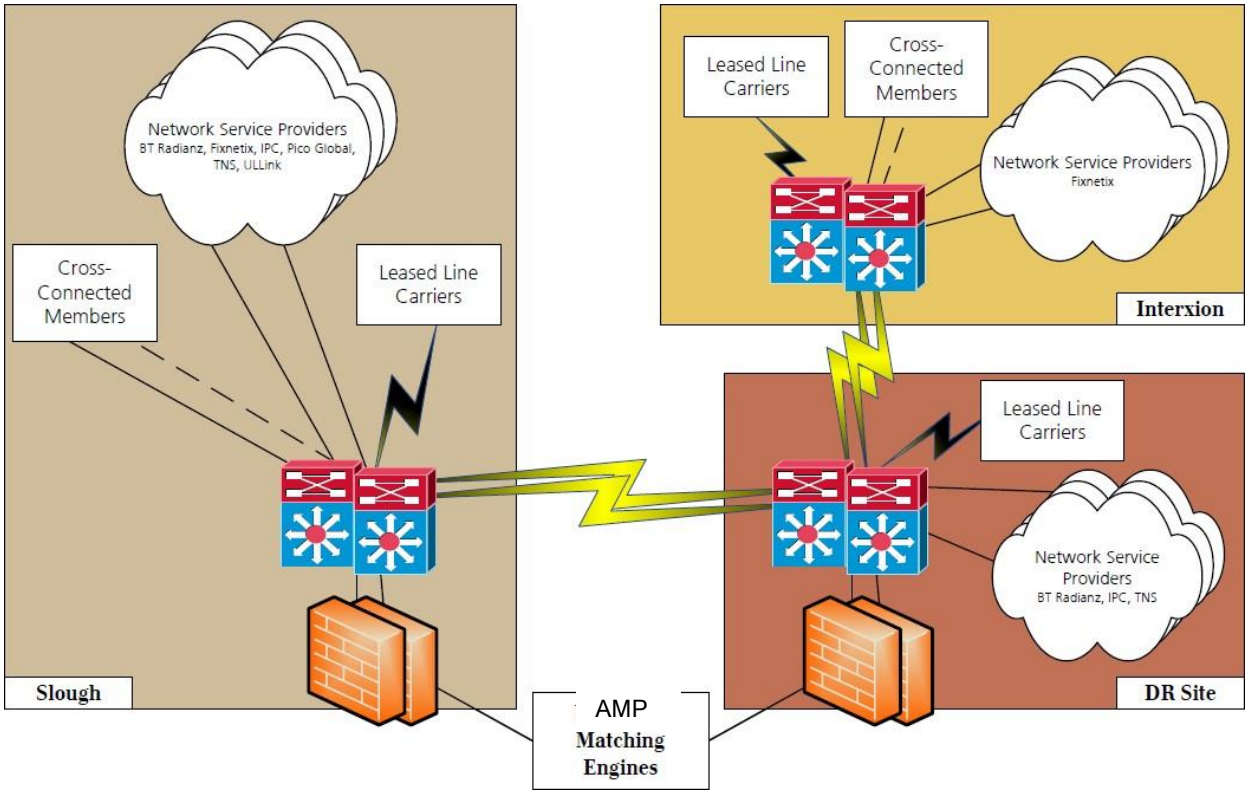
Physical cross-connects or leased line circuits can be established to the below sites.

- Equinix LD4 - 2 Buckingham Avenue, London, SL1 4NB. United Kingdom
- Interxion London City - 11 Hanbury Street, London, E1 6QR. United Kingdom
- AMP Disaster Recovery Site Services Location – Middlesex. United Kingdom

Equinix LD4 should be considered to be the primary site, which is where the matching engines reside in normal operation. AMP also runs a disaster recovery site for the matching engine, but we provide a more central London Point-of-Presence at Interxion London City. AMP provide a resilient WAN circuit between Interxion and the DR site.

For those members that are only setting up a single site to connect to the AMP, we strongly encourage Equinix LD4. Further details can be found below, based on site. For those members setting up multiple sites to connect to the AMP, we suggest Equinix LD4 as the primary site, and *either* Interxion or the DR site as a secondary. Our Interxion PoP connects to the DR site, so there is no resilience value in connecting to both.

Figure 1 - Connectivity Option Overview



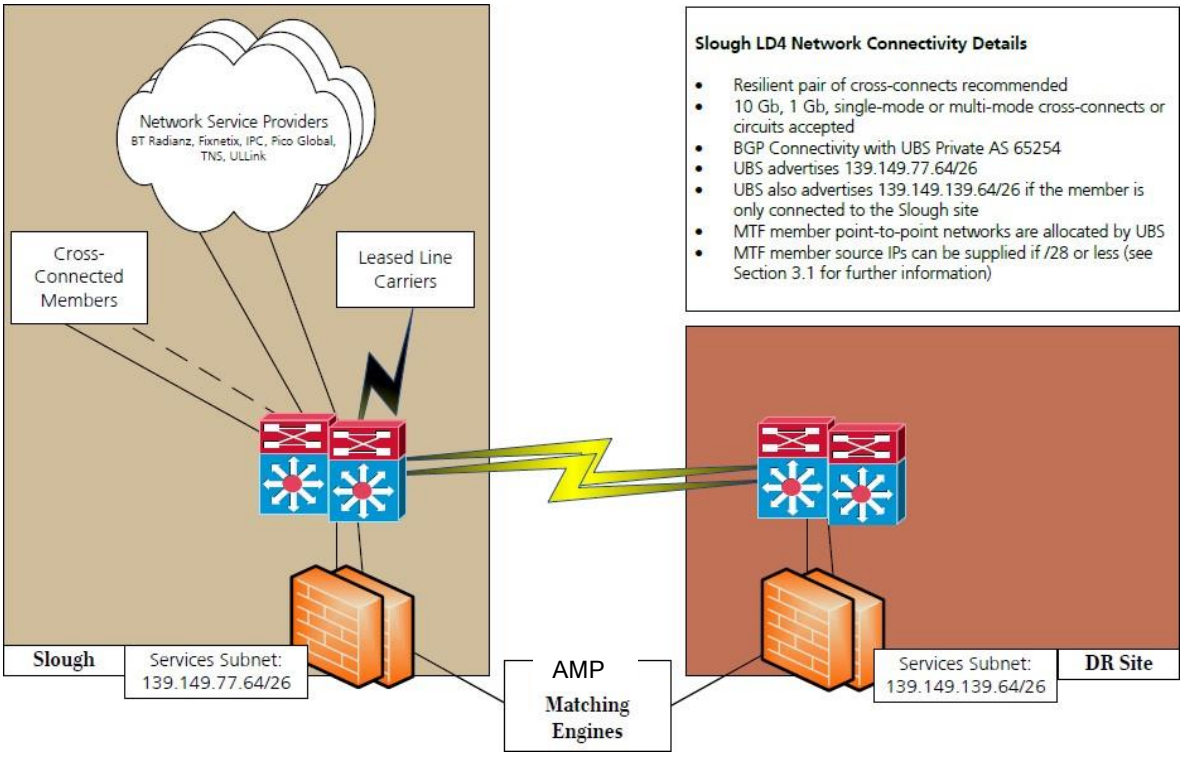
2.1.1. Equinix LD4

This is the primary site of the matching engines for the AMP.

- Resilient pair of switches and firewalls
- We can accept 1 Gb and 10 Gb cross-connects to our cabinets, single-mode or multi-mode
- Our preference for peering is BGP
- AMP will advertise the local firewall NAT subnet 139.149.77.64/26
- If this is a single-site connection, Aquis will also advertise 139.149.139.64/26, which directs traffic over a WAN circuit to our DR Site firewall

Services provided by Equinix are hosting, remote hands, patching, power, and cooling. Any requirements you have for those services should be requested directly from the Equinix group. Their contact details are in the Third Party Contacts section of this document. The AMP member is responsible for payment and support up to the demarcation point of the circuit or cross-connect landing in the AMP rack in the datacenter.

Figure 2 – Slough LD4 Connectivity



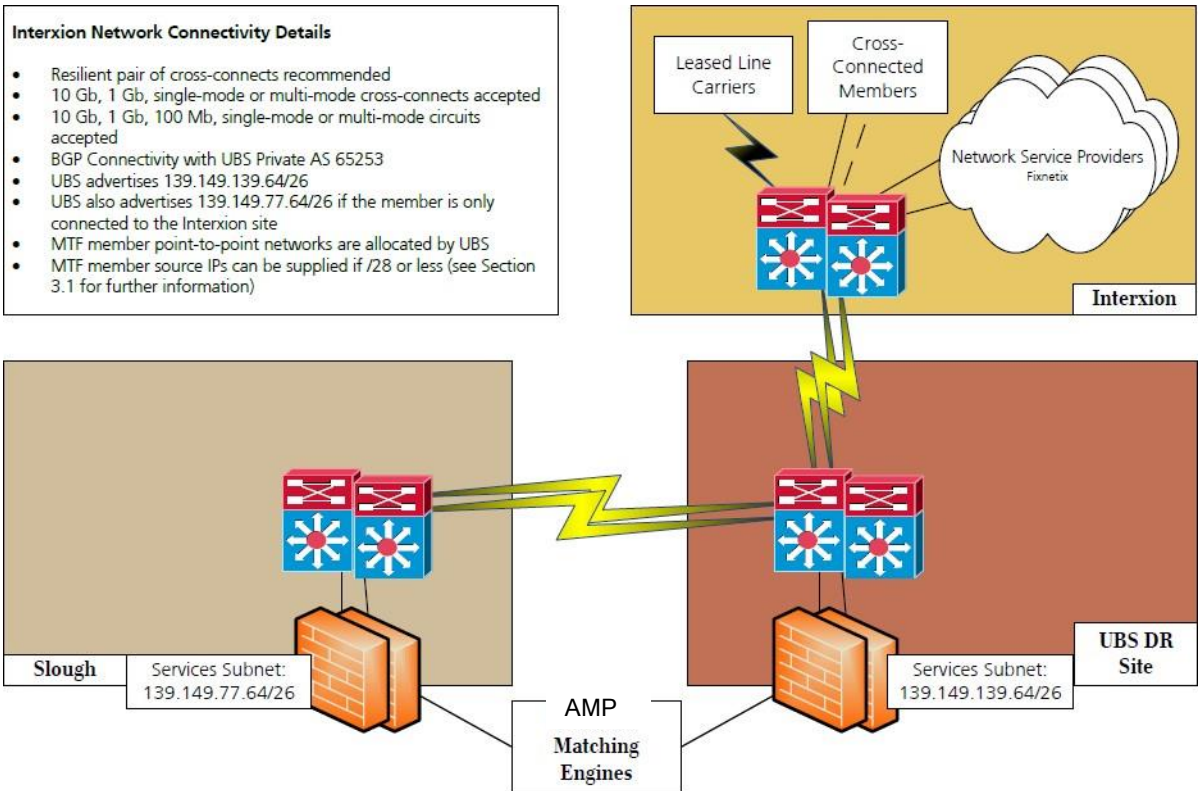
2.1.2. Interxion London City

The AMP presence in Interxion is purely a resilient PoP; no matching engines are present at this site. From Interxion, we provide resilient WAN circuits to our DR site.

- Resilient pair of switches
- We can accept 1 Gb and 10 Gb cross-connects to our cabinets, single-mode or multi-mode
- Our preference for peering is BGP
- AMP will advertise subnet 139.149.139.64/26, which directs traffic to our DR site firewall
- If this is a single-site connection, AMP will also advertise 139.149.77.64/26, which directs traffic over a WAN circuit to our Slough firewall

Services provided by Interxion are hosting, remote hands, patching, power, and cooling. Any requirements you have for those services should be requested directly from the Interxion group. Their contact details are in the Third Party Contacts section of this document. The AMP member is responsible for payment and support up to the demarcation point of the circuit or cross-connect landing in the AMP rack in the datacentre.

Figure 3 - Interxion Connectivity



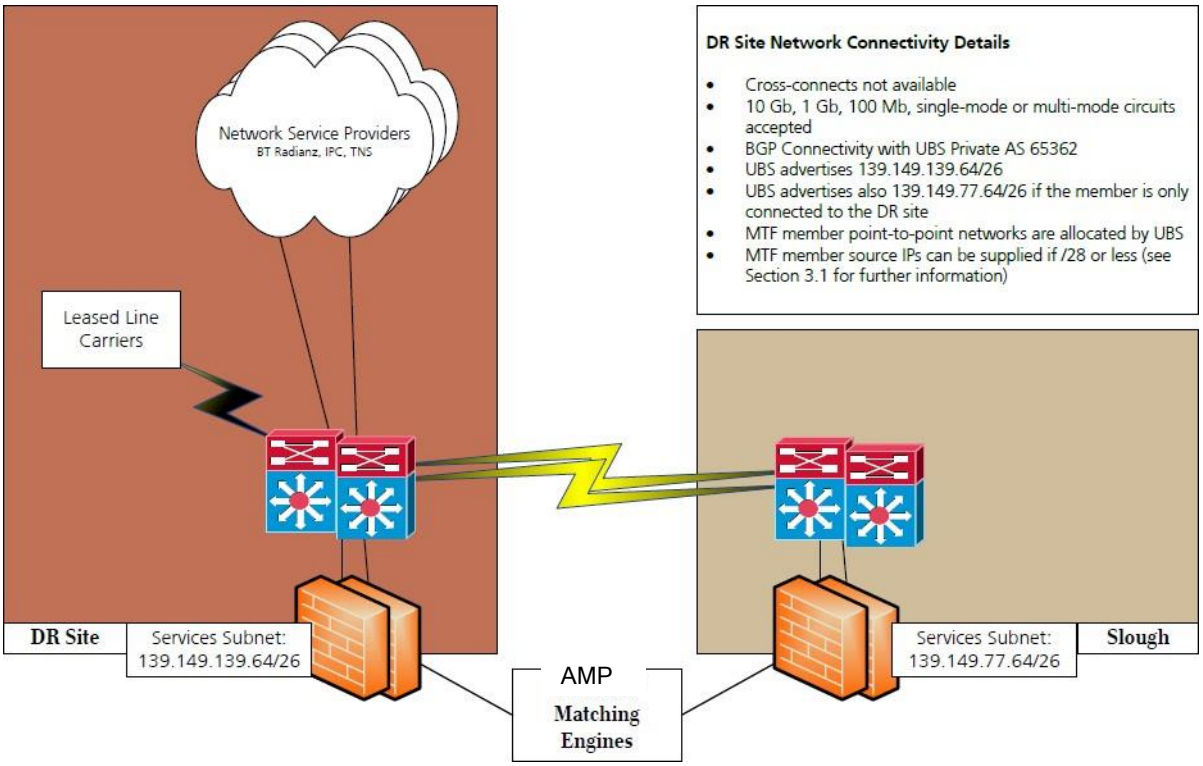
2.1.3. AMP DR Site at Middlesex

AMP run a DR site for the MTF service at a datacentre in Middlesex. Since this is a AMP-dedicated site rather than a third-party datacentre, cross-connects are not available here.

- Resilient pair of switches
- We can accept 100 Mb, 1 Gb and 10 Gb circuits to this location with a variety of carriers, single-mode or multi-mode
- Our preference for peering is BGP
- AMP will advertise subnet 139.149.139.64/26, which directs traffic to the DR site firewall
- If this is a single-site connection, AMP will also advertise 139.149.77.64/26, which directs traffic over a WAN circuit to our Slough firewall

AMP will not host servers or provide any other services within the DR site datacentre Hayes other than the receipt and support of the local end of a circuit, and the extending of that circuit to the appropriate network devices to establish connectivity to the MTF. The member firm is responsible for the payment and support up to the demarcation point of the circuit landing in the AMP rack in the datacentre.

Figure 4 – DR Site Connectivity



2.2. Third Party Vendors

In the case of all of the below vendors, they will levy their own charges for connectivity to the AMP. The member firm is responsible for all connectivity charges levied by the third party.

2.2.1. BT Radianz

AMP has a pair of resilient links with BT Radianz in both Slough LD4 and the AMP DR site. Your firm and source IP addresses across the Radianz network will need to be a member of the Service Access Name (SAN) called "AMP_fix_lon", which your firms BT Radianz service delivery manager can arrange.

Members should target the BT Global IPs provided for the Slough LD4 datacentre as a primary route, and the DR site IP addresses as a secondary route. We do not operate in a manner whereby the BT Global IPs fail over from Slough to DR site in the case of an outage. If this were to happen, the member firm would need to target the DR site IP to get to the matching engine.

The IP addresses and TCP ports required, as well as some other details, can be found in the Logical Connectivity section of this document.

2.2.2. Fixnetix

AMP has a pair of resilient links with Fixnetix in both Slough LD4 and Interxion London City. AMP advertises public addresses through the Fixnetix network for members to target. In the case of the public addressing supplied for Slough LD4, traffic is passed straight through a local firewall to the FIX gateways. In the case of the public addressing supplied via Interxion, the traffic is passed over a WAN circuit to the AMP DR site, and passed through a firewall to the FIX gateways. Note that the primary FIX gateways are in Slough, so this would be a higher latency route to take.

The TCP ports required, as well as some other details, can be found in the Logical Connectivity section of this document.

2.2.3. IPC

AMP has a pair of resilient links with IPC in both Slough LD4 and the AMP DR site. We do not currently advertise access to the AMP to IPC, but this would be something that could be set up as required. IPC may decide to NAT the AMP public IP addresses.

The TCP ports required, as well as some other details, can be found in the Logical Connectivity section of this document.

2.2.4. Pico Global

AMP has a pair of resilient links with Pico Global in Slough LD4. AMP advertises public addresses through the Pico Global network for members to target. In the case of the public addressing supplied for Slough LD4, traffic is passed straight through a local firewall to the FIX gateways. In the case of the public addressing supplied via Interxion, the traffic is passed over a WAN circuit to the AMP DR site, and passed through a firewall to the FIX gateways. Note that the primary FIX gateways are in Slough, so this would be a higher latency route to take. Pico Global may decide to NAT the AMP public IP addresses.

The TCP ports required, as well as some other details, can be found in the Logical Connectivity section of this document.

2.2.5. TNS

AMP has a pair of resilient links with TNS in both Slough LD4 and the AMP DR site. AMP advertises public addresses to TNS, but they NAT these addresses to their internal ranges - those would be provided by TNS once connectivity is ordered. In the case of the public addressing supplied for Slough LD4, traffic is passed straight through a local firewall to the FIX gateways. In the case of the public addressing supplied via Interxion, the traffic is passed over a WAN circuit to the AMP DR site, and passed through a firewall to the FIX gateways. Note that the primary FIX gateways are in Slough, so this would be a higher latency route to take.

The TCP ports required, as well as some other details, can be found in the Logical Connectivity section of this document.

2.2.6. ULLink

AMP has a pair of resilient links with ULLink in Slough LD4. AMP advertises public addresses through the ULLink network for members to target. In the case of the public addressing supplied for Slough LD4, traffic is passed straight through a local firewall to the FIX gateways. In the case of the public addressing supplied via Interxion, the traffic is passed over a WAN circuit to the AMP DR site, and passed through a firewall to the FIX gateways. Note that the primary FIX gateways are in Slough, so this would be a higher latency route to take. ULLink may decide to NAT the AMP public IP addresses.

The TCP ports required, as well as some other details, can be found in the Logical Connectivity section of this document.

2.2.7. Other Vendors

The above list is not exhaustive of the offerings provided by various third parties, but it is the list of the vendors that AMP currently has peering with. If you have a relationship with a network service provider, we would be happy to look into setting up peering so that you can achieve access to the MTF.

2.3. Internet (UAT Environment only)

2.3.1. VPN

We can arrange a single or dual VPN connection for member UAT or conformance environment traffic. To initiate a VPN connectivity request, members should contact the Deployment and Testing team outlined in the AMP Contacts section of this document.

VPN connectivity is not available for the production environment.

2.4. Latency and Bandwidth Considerations

2.4.1. Latency

If latency is a concern for a members order flow, we highly suggest physical connectivity in Slough and the DR site should be at 10 Gb. The internal infrastructure at AMP is under regular review in order to keep the round-trip latencies competitive with other venues.

2.4.2. Bandwidth

The amount of bandwidth required is entirely dependent on the trading profile of each member. We recommend a minimum of 128 Kbps per 50 messages per second you intend to send. However, if the intended trading strategy has a burst nature, it is recommended to take more bandwidth to cover for those spikes in activity.

3. Logical Connectivity

To request a new trading or drop-copy session in the production, pre-production or UAT environments, members should contact the Deployment and Testing team outlined in the AMP Contacts section of this document.

3.1. IP Addressing and TCP Ports

The IPs that members will target to get to the trading or drop-copy gateways are AMP publicly-registered IPs. Obviously in the case of vendors such as BT Radianz and TNS, where the remote IP is hidden behind their internal network addressing, that will not be the case from the member perspective.

Member source networks can be allocated on demand by AMP from the 10.x.y.z range (subnet allocation sizes will vary up to a maximum size of a /28, depending on member requirements). AMP will also support connectivity sourced from a member's public address range. While not recommended, if a member wishes to allocate their own private network range to represent their source networks, this can be discussed during a design call arranged by the Deployment and Testing team, whose contact details are in the AMP Contacts section of this document.

Transit Point to Point allocations are assigned by AMP using addresses from the 10.x.y.z network.

Each member session is assigned a unique TCP port, as defined below.

The AMP environment does not fully close outside of trading hours from a network perspective. MTF members should be able to telnet test to their production, pre-production and UAT ports at any time, even when the TCP ports are closed out of trading hours. We provide this so that members can check their network connectivity at any time. Obviously in some cases we will need to do some infrastructure work which means that this is temporarily not possible – the AMP reserves the right to make TCP ports unavailable outside of trading hours in such cases.

3.2. 'Last Resort' Connectivity

The IP addressing for FIX gateways detailed below for the production environment all traverse a AMP firewall, before heading directly to the gateway assigned to the member firm. This is done so as to reduce latency as much as possible. Inevitably, the MTF will need to have infrastructure changes, which will potentially jeopardize the ability of members to connect.

For the conformance and UAT environments, we have implemented load balancers in between the member connectivity infrastructure and the FIX gateways. The design for normal running of the production environment is not intended to be routed via a load balancer, so as to try and maintain low latency with minimal fluctuation between member connections. However, in the interests of providing access during outages, we have provided 'Last Resort' IP addresses in Table 1, below. below

The latency of FIX messages through the 'Last Resort' IP addresses will have be higher than the others. These should be configured by members so that they are accessible if needed, but they should only be actually used when the other direct connectivity gateway addresses fail.

Table 1 - AMP Connectivity IP Addresses

Environment	Description	AMP Site	BT Radianz Global IP	Target IP Address (All Other Connectivity Types)
Production	Cluster A Primary	Slough LD4	75.96.193.153	139.149.77.72
Production	Cluster A DR	Slough LD4	75.96.193.154	139.149.77.73
Production	Cluster B Primary	Slough LD4	75.96.193.155	139.149.77.66
Production	Cluster B DR	Slough LD4	75.96.193.158	139.149.77.69
Production	Cluster C Primary	Slough LD4	75.96.193.157	139.149.77.68
Production	Cluster C DR	Slough LD4	75.96.193.156	139.149.77.67
Production	Cluster D Primary	Slough LD4	75.96.193.159	139.149.77.70
Production	Cluster D DR	Slough LD4	75.96.193.160	139.149.77.71
Production	Cluster A Primary	AMP (DR)	75.96.195.29	139.149.139.72
Production	Cluster A DR	AMP (DR)	75.96.195.30	139.149.139.73
Production	Cluster B Primary	AMP (DR)	75.96.195.23	139.149.139.66
Production	Cluster B DR	AMP (DR)	75.96.195.26	139.149.139.69
Production	Cluster C Primary	AMP (DR)	75.96.195.25	139.149.139.68
Production	Cluster C DR	AMP (DR)	75.96.195.24	139.149.139.67
Production	Cluster D Primary	AMP (DR)	75.96.195.27	139.149.139.70
Production	Cluster D DR	AMP (DR)	75.96.195.28	139.149.139.71
Production	Last Resort Access via Load Balancer	Slough LD4	75.96.52.54	139.149.77.65
Production	Last Resort Access via Load Balancer	AMP (DR)	75.96.53.11	139.149.139.65
Conformance / UAT	Load Balancer	Slough LD4	75.96.195.168	139.149.77.121
Conformance / UAT	Load Balancer	Slough LD4	75.96.195.169	139.149.77.122
Conformance / UAT	Load Balancer	AMP (DR)	75.96.195.31	139.149.139.121
Conformance / UAT	Load Balancer	AMP (DR)	75.96.195.32	139.149.139.122
Conformance / UAT	Internet	AMP (DR)	Not available	139.149.22.242

3.3. Trading Ports

The trading FIX gateway TCP ports will fall within the below ranges.

- Production TCP ports will be in the range 46001-46999
- Conformance TCP ports will be in the range 45001-45999
- UAT TCP ports will be in the range 44001-44999

The first five production FIX sessions are provided free as part of the connectivity bundle. Subsequent sessions beyond five FIX sessions are provided at a cost outlined in the Fee Schedule, which can be found by following the link in the Useful Links section. Pre-production and UAT sessions are provided free of charge.

3.4. Drop-copy Ports

The drop-copy FIX gateway TCP ports will fall within the below ranges.

- Production TCP ports will be in the range 46001-46999
- Conformance TCP ports will be in the range 45001-45999
- UAT TCP ports will be in the range 44001-44999

The drop-copy sessions are charged individually as per the Fee Schedule, which can be found by following the link in the Useful Links section of this document. Pre-production and UAT sessions are provided free of charge.

3.5. FIX Protocol

A separate document outlines the FIX Rules of Engagement (RoE) for the AMP. A link to the location can be found in the Useful Links section of this document.

4. UAT Environments, Certification and Onboarding

There are two test environments available for the AMP. The Conformance environment runs the version of the FIX engine and backend services that is currently running in production. The UAT environment runs a version of the FIX engine and backend services that will be released to production in the near future.

4.1. Conformance Environment

The Conformance environment will be used for general testing, and for passing the certification test to be fully on boarded into the production environment. The Conformance environment is available in UK hours between 08.00 and 16.30, Monday to Friday, and working to a UK bank holiday schedule.

4.2. UAT Environment

The UAT environment is available in UK hours between 08.00 and 16.30, Monday to Friday, and working to a UK bank holiday schedule. However, it is only available when there is a new version of the FIX engine and backend which is due to be pushed to the production environment.

The MTF supervisors will send out a notice indicating the schedule of the pre-production environment.

4.3. Certification and Onboarding

Before a member can start trading on the production environment, a certification test will need to be passed in the Conformance environment. In order to arrange a certification test, members should contact the Deployment and Testing team outlined in the AMP Contacts section of this document.

5. Disaster Recovery

As previously mentioned, the primary site for the AMP matching engines is in Slough LD4. Whilst it is a good idea to set up site resiliency, it is not a specified requirement as a part of membership. The FIX engines for DR are in the AMP DR site, which can be reached either via a third party vendor, cross-connects in the Interxion Point-of-Presence, or a WAN circuit to the AMP DR site.

In the case where an outage only occurs at the server end and not the network infrastructure, the DR environment is also available from Slough LD4 cross-connects via a AMP WAN circuit from that site to the AMP DR site.

6. Technical Support and Escalations

From a support perspective, the demarcation point for all connectivity to the MTF is the handover point (Z-end) of the circuit or cross-connect in the AMP suite.

The Production Support group should be contacted in the case of any outages – their contact details are in the AMP Contacts section of this document. The MTF Supervisors should be contacted in the case of escalation.

7. Useful Contacts

7.1. AMP Contacts

Below is a list of the contacts for the AMP. They are available in UK hours between 07.30 and 17.30, Monday to Friday, and working to a UK bank holiday schedule.

Contact	Function	Phone	Email
Production Support	• Network connectivity issues • FIX connectivity issues • Order management	+44 20 3597 6333	support@aquis.eu
Deployment and Testing	• Connectivity onboarding • Certification • New session requests	+44 20 3597 6333	support@aquis.eu
Supervisors	• Member communications • New business • Order management • Escalation	+44 20 3597 6321	sales@aquis.eu

7.2. Third Party Contacts

Below is a list of contacts for external vendors

Contact	Function	Phone	Email
Equinix Service Desk	• Server hosting, including rack space and power • Cross-connects	+44 345 373 2999	servicedesk.uk@eu.equinix.com
Interxion Customer Service Centre	• Server hosting, including rack space and power • Cross-connects	+44 207 375 7070	customer.services@interxion.com

8. Useful Links

Below is a list of links to the AMP website, and what you can expect to find there.

- AMP Website
- AMP Legal Information and Tariffs
  - Fee Schedule
- AMP Member Information
  - MTF Rulebook
  - User Guide
  - FIX Protocol Rules of Engagement (RoE)

Disclaimer

This guide and other relevant materials including but not limited to the AMP Rulebook and the AMP Membership Agreement, are being distributed by AMP AG only to, and is directed only at (a) persons who have professional experience in matters relating to investments who fall within Article 19(1) of the FSMA 2000 (Financial Promotion) Order 2005 and (b) persons to whom it may otherwise lawfully be communicated (together "relevant persons"). Any investment or investment activity to which this document relates is available only to and will be engaged in only with, relevant persons. Any person who is not a relevant person should not act or rely on this guide or any of its contents.

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System response times may vary for a number of reasons including market conditions, trading volumes and system performance.

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