

Client Connectivity Standards and Requirements
Effective from 30 June 2011 for new JSE Clients and
Effective from 30 September 2011 for all JSE Clients

(This document also forms part of the JSE Services Documentation
as per the JSE Services Agreement (JSA))

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1. Introduction

The purpose of this document is to detail the various connectivity options and requirements for Clients who require connectivity to the JSE and its services across all JSE Markets. The Customer Access Network (CAN) aligns to the JSE's strategic goal for ease of access to markets through various connectivity options available to Clients.

The JSE currently offers several methods of connectivity, each with different levels of management and performance depending on the specific Market requirements.

In line with the JSE's principle of protecting market integrity through minimum prescribed standards, it is a requirement for Clients to have sufficient connectivity to both the JSE's Primary Data Centre (Primary Data Centre) and JSE Remote Disaster Recovery Site (Remote DR Site).

Please note that this document also forms part of the JSE Services Documentation as defined in the JSE Services Agreement (JSA) entered into by Clients of the JSE and will be reviewed from time to time as the JSE introduces new services and/or requirement changes.

It is also important to note that this document does not deal with any transitional requirements as the JSE decommissions its current mirror site and commissions its Remote DR Site.

Client means any JSE Client (including JSE Members) requiring connectivity to the JSE for the purposes of subscribing to any of the JSE services outlined in this document.

2. Principles

The Client Connectivity Standards and Requirements document has been drafted with the following principles in mind:

2.1. Principle 1 – Client Connectivity to the JSE

Clients of the Equity Market are required to have a Primary connection to the JSE Primary Data Centre. They are also required to have a Backup connection to the JSE and Clients may choose whether this back up connection is to the Primary Data Centre or to the Remote DR Site subject to complying with principle 2.

Clients of all other JSE Markets are required to have at least one connection to the JSE Primary Data Centre and will be required to connect to the Remote DR Site when the JSE invokes the Remote DR Site.

2.2. Principle 2 – Client Connectivity to Remote DR Site

2.2.1. JSE Equity Market

1. Currently JSE Equity Market Clients are required to have a Primary and Backup connection to the JSE. This will still be required however; as all Equity Market Clients will be required to connect to the Remote DR Site when it is being used there are additional considerations.
2. Clients will need to consider the following:
 - o Whether to have their Primary connection terminate at the Primary Data Centre and their Backup connection terminates at the Remote DR Site. The JSE will allow the Backup connection to be "backhauled" across from the Remote DR Site to the Primary Data Centre if the Primary connection fails. This "backhauling" will have up to a maximum of 10ms additional latency.
 - o Whether to have their Primary and Backup connections terminate at the Primary Data Centre and commission a new connection to the Remote DR Site.

- Whether to use an MPLS provider and have their Primary and Backup connections to the MPLS provider and then the MPLS provider ensures the two connections to the JSE as per the JSE requirements.
- 3. End of Day Dissemination Subscribers who currently connect to the Information Delivery Portal (IDP) via the internet will not be required to change their current connectivity setup to connect to the Remote DR Site as the JSE will facilitate the connectivity via the internet to the Remote DR Site. However Clients who have a leased line connection will be required to connect to the Remote DR site when this is being used.

2.2.2. Other JSE Market Clients (excl JSE Equity Market Clients)

- Currently Clients need to have connectivity to the JSE. This will still be required however; Clients will be required to connect to the Remote DR Site when it is being used and there are additional considerations.
- Clients will need to consider the following:
 - Implementing solutions so that in the event of the JSE failing over to the Remote DR Site that the Client can connect to the Remote DR Site.
 - Whether to commission a new connection to the Remote DR Site.
 - Using a private “Access Point Network” (making use of 3G) which is currently available through MTN and Vodacom.
- Information Subscribers of Other JSE Markets to decide whether they want to have connectivity to the Remote DR Site.

3. Additional Information

- If a Client uses an MPLS Network provider (for the Equity Market it must be an accredited JSE SIP), the switching of connectivity between the Primary Data Centre and the Remote DR Site can then be facilitated by the MPLS Network provider.
- It is important that Clients determine which MPLS Network providers are able to carry Multicast Data.
- Connections can be shared across markets (i.e. same connection for a number of JSE services) providing the available bandwidth meets the accumulated bandwidth requirements for all the services being accessed.
- Due to the fact that ADSL and 3G are ‘best effort shared services’, connectivity cannot be guaranteed. The JSE cannot provide technical support for such connections should a Client experience connectivity related issues or performance issues.
- Each Client’s connectivity is different and Clients will need to engage with the JSE so we can determine the best connectivity option for the Client.

4. Connectivity Methods

The JSE offers flexible connectivity options for Clients to connect to its systems. Minimum requirements in terms of line capacity and service guarantees for the various business services offered are set to ensure that services are delivered in an efficient and timely manner. With these connectivity methods, Clients are given a choice to connect directly to the JSE via Direct Connectivity or fibre optic infrastructure, or via Value Added Network (VAN).

As the JSE is not registered as a VAN, we cannot permit Clients to access services offered by other providers via the Customer Access Network (CAN). Only services that are hosted on behalf of the JSE may be accessed via the CAN.

The JSE supports both Transmission Control and User Datagram Protocols (*TCP* and *UDP*) for its various markets and services.

4.1. Direct Connectivity

Direct Fixed Line Connectivity is used by Clients to access services via Leased lines.

Below is a list of known current network providers who have network equipment in the Primary Data Centre and/or Remote DR Site. Please note that these may not be accredited SIPs.

#	NW Provider	JSE Primary Data Centre	JSE Remote DR Site
1.	Dark Fibre	Y	Y
2.	Internet Solutions	Y	Y
3.	MTN Business	Y	Y
4.	Neotel	Y	Y
5.	Telkom	Y	Y
6.	Vodacom	Y	N

If any Client wishes to connect to the JSE using fibre optics, they need to supply the JSE with a LC GBIC and a single mode LC patch lead.

Clients have the option of installing a primary line directly to the JSE, and have their secondary line connect via a VAN, or vice versa. The current JSE standard is to cap bandwidth at 10Mbps, and this will be reviewed from time to time. The lines can be used for both the production and test environments.

Clients will use static routing to route data across the interface between the Customer and Customer Access Network (CAN). Dynamic routing updates will not be forwarded to the CAN from the JSE Network as the JSE's private IP address range might conflict with the Clients IP address range.

Below is a summary of Direct Connectivity options:

#	Line Options	Bandwidth Supported	Load Balancing Support
1.	Leased Line Connectivity	64kbps – 2Mbps	N
2.	Fibre Connectivity	Max 100Mbps limited to 10 Mbps	N

4.1.1. Leased Line Connectivity

A leased line is a symmetric telecommunications line connecting two locations. It is also known as a 'Private Circuit' or 'Data Line'. Unlike traditional telephone lines, it does not have a telephone number as a permanent connection exists between the two ends of the line.

- The JSE will support leased lines with bandwidth of 64k to 10Mbps (Refer to 'Application and Service Requirements' table in section 4). This will be reviewed from time to time for the various JSE markets as the JSE introduces new services and/or requirement changes.
- Load balancing between a customer's multiple leased lines is not supported with this type of connection.

4.1.2. Fibre Connectivity

- JSE Client's fibre connections will terminate on the JSE network equipment.
- The JSE will support fibre connections up to a maximum bandwidth of 100Mbps. These will however be limited to 10Mbps (Refer to 'Application and Service Requirements' table in section 4). This will be reviewed from time to time for the various JSE markets as the JSE introduces new services and/or requirement changes.
- Load balancing between a customer's multiple fibre connections is not supported with this type of connection.

4.2. Connectivity via a Value Added Network (VAN)

Clients may connect to the JSE via a JSE authorised VAN available through an accredited SIP - this is the preferred connectivity method. However, the JSE will give Clients flexibility to connect directly to the JSE.

Below is a summary of connectivity options via a VAN:

#	Line Options	Bandwidth Supported	Load Balancing Support
1.	Leased Line	64kbps – 2Mbps	N
2.	Direct Fibre	Max 100Mbps limited to 10Mbps	N
3.	Multi-Protocol Label Switching (MPLS)	64kbps – 10 Mbps	Y
4.	3G Access Point Name (APN)	3G connectivity via a APN provided by a service provider	N

Clients have the option to install a primary line via a VAN and have their secondary line connect directly to the JSE, or vice versa. The JSE standard is to cap bandwidth at 10 Mbps (Refer to 'Application and Service Requirements' table in section 4), and this will be reviewed from time to time. Clients may use the same access medium to access both the production and test environments should they wish, providing the combined minimum bandwidth requirements for both environments are met.

4.2.1. Leased Line

A leased line is a point to point connection, connecting the Client directly to the JSE's network infrastructure. These lines range from 64kbps to 2Mbps, and can accommodate for TCP and UDP multicast traffic.

4.2.2. Direct Fibre

A direct fibre optic line is a point to point connection, connecting the customer directly to the JSE's network infrastructure. This type of connection can accommodate a 100Mbps connection, but will be restricted to a 10Mbps on the JSE network (Refer to 'Application and Service Requirements' table in section 4).

4.2.3. Multi-Protocol Label Switching (MPLS)

MPLS is a data-carrying mechanism that belongs to the family of packet-switched networks and a Point of Presence (PoP) providing networks with a more efficient way to manage applications and move information between locations.

- VANs will support lines with bandwidth of 64kbps to 10Mbps (Refer to 'Application and Service Requirements' table in section 4). This will be reviewed from time to time as the JSE introduces new services and/or requirements change.
- Load balancing between the customer's MPLS links can be configured by the VAN.

4.2.4. 3G Access Point Name (APN)

Clients with 3G connectivity can access the JSE's network by connecting to one of the VAN 3G APN network. This service must still cater for the minimum bandwidth requirements as per Schedule 1. Please refer to 'Application and Service Requirements' table in section 4, as this connection is only permitted for certain markets.

- A private 3G APN (Configured by one of the current VAN providers), allowing Clients with 3G access to connect to the JSE's network.
- This is not a guaranteed service, as 3G connectivity is viewed as 'best effort' and is shared amongst other data users.
- This service is solely provided and managed by the service provider.
- The quality of the service is not guaranteed over a '3G APN' connection, and no SLA between the customer and the JSE can be applied.

5. Application and Service Requirements

The following table displays the services on offer by the JSE, and provides the JSE's guidelines for corresponding connectivity and minimum bandwidth requirements for each service.

Service description	Protocols	Minimum Bandwidth	Primary Connection Options	Backup / DR Connection Options
Equity Market - TSP Host to Host (including JSE TradElect and JSE InfoWiz)	<ul style="list-style-type: none"> TCP UDP Multicast 	1.5 Mbps (2Mbps recommended) *	<ul style="list-style-type: none"> Leased line Direct Fibre SIP MPLS 	<ul style="list-style-type: none"> Leased line Direct Fibre SIP MPLS
Talx ASP	<ul style="list-style-type: none"> TCP 	64kbps per terminal	<ul style="list-style-type: none"> Leased line Direct Fibre SIP MPLS 	<ul style="list-style-type: none"> Leased line Direct Fibre SIP MPLS
Equity Derivatives Market (EDM)	<ul style="list-style-type: none"> TCP 	180kbps per terminal, per market **	<ul style="list-style-type: none"> Leased line Direct Fibre SIP MPLS SIP 3G APN SIP ADSL VPN 	<ul style="list-style-type: none"> Leased line Direct Fibre SIP MPLS SIP 3G APN SIP ADSL VPN
Commodity Derivatives Market (CDM)	<ul style="list-style-type: none"> TCP 	64kbps per terminal, per market **	<ul style="list-style-type: none"> Leased line Direct Fibre SIP MPLS SIP 3G APN SIP ADSL VPN 	<ul style="list-style-type: none"> Leased line Direct Fibre SIP MPLS SIP 3G APN SIP ADSL VPN
Currencies and Interest Rate Market (IRM)	<ul style="list-style-type: none"> TCP 	180kbps per terminal, per market **	<ul style="list-style-type: none"> Leased line Direct Fibre SIP MPLS SIP 3G APN SIP ADSL VPN 	<ul style="list-style-type: none"> Leased line Direct Fibre SIP MPLS SIP 3G APN SIP ADSL VPN
Global Market	<ul style="list-style-type: none"> TCP 	64kbps per terminal, per market **	<ul style="list-style-type: none"> Leased line Direct Fibre SIP MPLS SIP 3G APN SIP ADSL VPN 	<ul style="list-style-type: none"> Leased line Direct Fibre SIP MPLS SIP 3G APN SIP ADSL VPN
MSS System	<ul style="list-style-type: none"> TCP 	70kbps per terminal ***	<ul style="list-style-type: none"> Leased line Direct Fibre MPLS SIP 3G APN SIP ADSL VPN 	<ul style="list-style-type: none"> Leased line Direct Fibre MPLS SIP 3G APN SIP ADSL VPN
BDA	<ul style="list-style-type: none"> TCP/SNA 	15kbps per terminal	<ul style="list-style-type: none"> Leased line Direct Fibre SIP MPLS SIP 3G APN SIP ADSL VPN 	<ul style="list-style-type: none"> Leased line Direct Fibre SIP MPLS SIP 3G APN SIP ADSL VPN
Equity End of Day Dissemination	<ul style="list-style-type: none"> TCP 	64kbps	<ul style="list-style-type: none"> Leased line Direct Fibre MPLS 	<ul style="list-style-type: none"> Leased line Direct Fibre ISDN Router MPLS
Dissemination (EDM/CDM/IRM)	<ul style="list-style-type: none"> TCP 	64kbps	<ul style="list-style-type: none"> Leased line Direct Fibre MPLS 	<ul style="list-style-type: none"> Leased line Direct Fibre MPLS

JSE InfoWiz (Data Vendor)	<ul style="list-style-type: none"> • TCP • UDP Multicast 	1.5Mbps	<ul style="list-style-type: none"> • Leased line • Direct Fibre • MPLS 	<ul style="list-style-type: none"> • Leased line • Direct Fibre • MPLS
Information Subscriber (EDM/CDM/IRM)	<ul style="list-style-type: none"> • TCP 	512K per listener per market	<ul style="list-style-type: none"> • Leased line • Direct Fibre • MPLS 	<ul style="list-style-type: none"> • Leased line • Direct Fibre • MPLS

* Please note that this 1.5Mbps caters only for public multicast data. Clients are required to perform their own calculation to cater for the SII data, which must be added to this.

Example:

- An Equity Member using a 'host to host' solution requires 1.5Mbps for public data, and 500kbps for private data. A 2Mbps connection into the JSE would cater for this requirement.

** Please note that should a user connect to more than one market at any one time, will require an additional bandwidth.

Examples:

- Two users connecting each to the EDM market concurrently, the total bandwidth consumption will be 360kbps.
- One user connecting to all three markets concurrently, the total bandwidth consumption will be 524kbps.

*** Please note that this average of 70kbps per user is for ten users or less concurrently connecting to the MSS environment. This bandwidth utilization decreases per user as the concurrent user base increases. (See table below for further information)

Examples:

- One user connecting to MSS requires 70kbps.
- Five users concurrently connecting to MSS requires approximately 350kbps (5 x 70kbps)
- Fifteen users concurrently connecting to MSS requires approximately 915kbps (15 x 61kbps)

Number of Concurrent Users	Average Kilobits Per User
10 Users	70.72 (Approximately 70kbps)
25 Users	61.31 (Approximately 61kbps)
50 Users	49.37 (Approximately 50kbps)
75 Users	45.03 (Approximately 45kbps)
100 Users	38.63 (Approximately 39kbps)
200 Users	27.86 (Approximately 28kbps)

6. Remote DR Site Location

Venus 2 Data Centre
The Campus
1st floor Imola Building
57 Sloane Street
Bryanston

7. Security

To prevent unauthorised access to the Clients' network and their systems, it is the Clients' responsibility to implement security controls between the JSE and Customer Network. However, the JSE will implement additional security controls, listed below, to minimise the risk of unauthorised access to its network.

- Incoming access-lists or firewall policies to ensure that Customer Networks can only establish routes to valid Networks at the JSE's Primary Data Centre and Remote Disaster Recovery sites.
- Each edge router will maintain an access-list of allowable IP addresses and only packets from addresses in that list will be allowed through the router. Access-lists on the routers will be configured by the JSE.
- The JSE will not respond to any Internet Control Message Protocol (ICMP), for example, ping or any requests other than the permitted protocols sent by any customer.

To implement security controls between the JSE and Customer Networks, Clients are advised to use a firewall to secure their environment. Any firewall installed between the JSE and Customer Networks must be enabled for all the relevant protocols and ports to ensure connectivity to the required JSE Services.

8. Glossary

The terms, abbreviations, and acronyms listed in the table below have been used in this document.

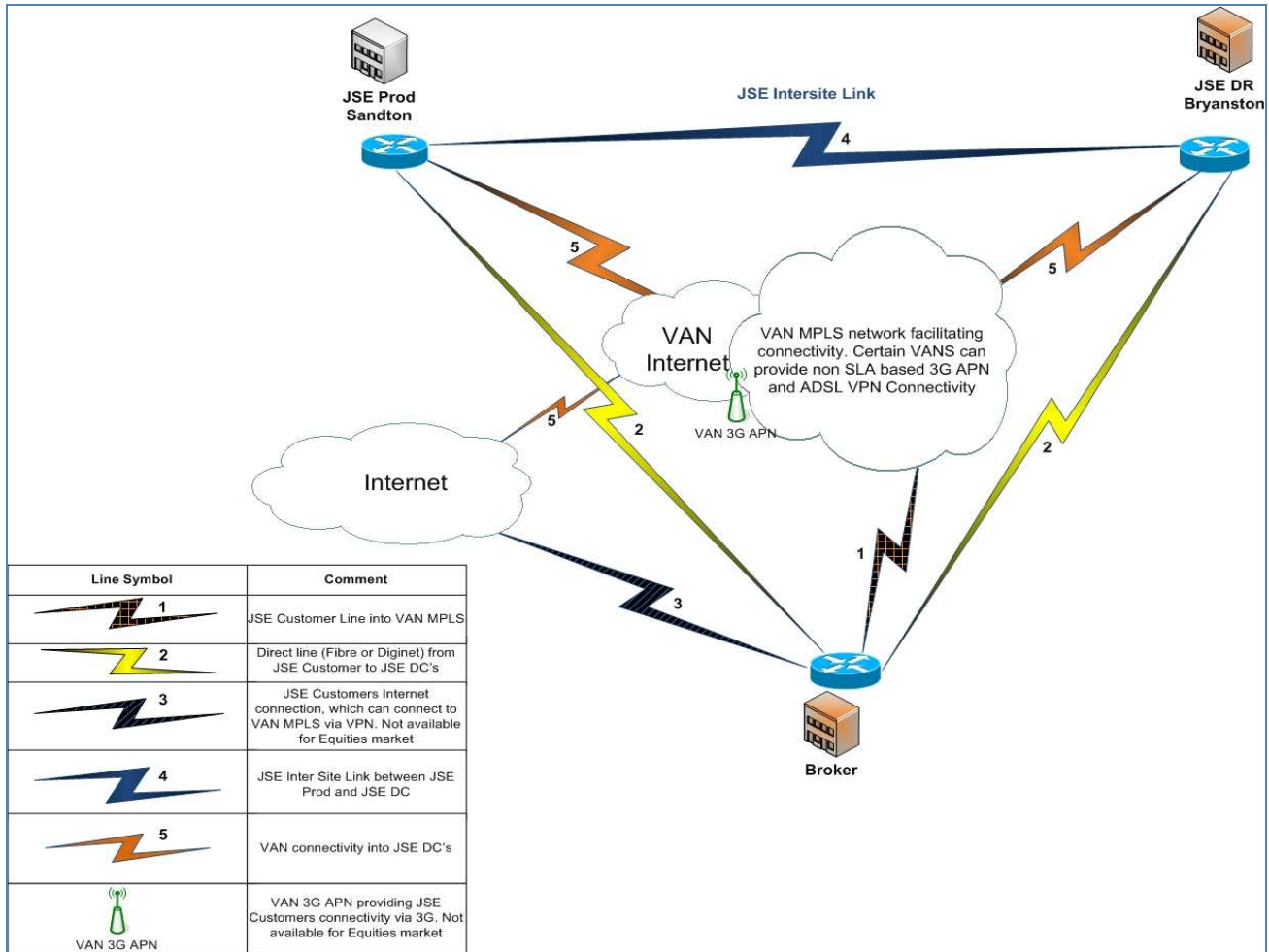
Term	Definition / Description
EDM	Equities Derivatives Market
CDM	Commodities Derivatives Market
IRM	Interest Rate Market
ASP	Connectivity to the Tax servers at the JSE
BRI	Basic Rate Interface
BACKHAULED	Getting data to a point from which it can be distributed over the network.
CAN	Customer Access Network – the network the customers connect to
DR	Disaster Recovery
Host to Host	Direct connectivity to the LSE trading engine
ICMP	Internet Control Message Protocol
IP	Internet Protocol
ISDN	Integrated Services Digital Network
LC GBIC	LuxCis Gigabit Interface Connector

Term	Definition / Description
Markets	One of the four markets run by the JSE
MPLS	Multi-Protocol Label Switching
MTN	MTN Business
PoP	Point of Presence
TCP	Transport control protocol
UDP	User datagram protocol
VAN	Value added networks
SIP	Shared Infrastructure Provider
APN	Access Point Name
TCP	Transmission Control Protocol
TSP	Equity Market Trading Service Participants

9. Contact Information for Support and Queries

For JSE Connectivity requirements and information, please contact the JSE Customer Support team on (011) 520 7777 or alternatively via e-mail at CustomerSupport@jse.co.za.

The following diagram illustrates the various means of connectivity that Clients can use to connect to the JSE Primary Data Centre and Remote DR Site.



10. Schedule 1 – Summary Connectivity and Minimum Bandwidth Requirements

Service description	Bandwidth	Protocols		Primary Connections						DR Connections					
		TCP	UDP Multicast	Leased Line	Dark Fibre	MPLS	SIP MPLS	SIP 3G APN	SIP ADSL VPN	Leased Line	Dark Fibre	MPLS	SIP MPLS	SIP 3G APN	SIP ADSL VPN
Equity Market (EM) - TSPs Host to Host (including JSE TradElect and JSE InfoWiz)	1.5 Mbps (2Mbps recommended)	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	N	N
Equity Market (EM) - Only JSE InfoWiz Subscribers	1.5 Mbps (2Mbps recommended)	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	N	N
TALX ASP	64kbps per terminal	Y	N	Y	N	N	Y	N	N	Y	Y	N	Y	N	N
Equity Derivatives Market (EDM)	180kbps per terminal, per market	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Commodity Derivatives Market (CDM)	64kbps per terminal, per market	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Currencies and Interest Rate Market (IRM)	180kbps per terminal, per market	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Global Market	64kbps terminal, per market	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
MSS System	70kbps terminal, per market	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
BDA	15kbps	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Equity End of Day Dissemination	64kbps	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dissemination (EDM/CDM/IRM)	64kbps	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Information Subscriber (EDM/CDM/IRM)	512k market per	Y	N	Y	Y	Y	Y	N	N	Y	Y	Y	Y	N	N