Johannesburg Stock Exchange

Colocation Network Configuration

Guidance Note

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1. Introduction

This JSE Colocation Network Configuration Guidance Note document provides clients who will be making use of the JSE Colocation Services. It is intended to provide clients with high level guidance and sample configurations to apply when configuring and connecting their Hosting Unit up in Colocation.
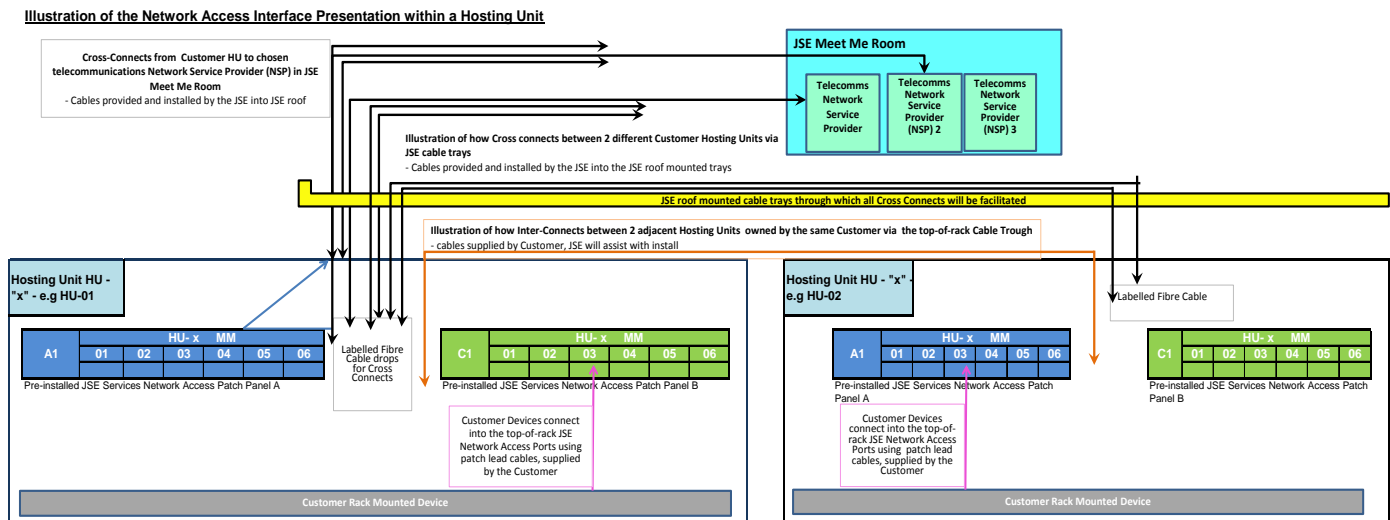
This guide follows commands and principles used on Cisco networking devices. Sample configurations need to be modified for each specific client environment as per their unique requirements as well as the Hosting Unit IP address ranges assigned by the JSE.

Please refer to the JSE Client Connectivity document for additional information as well as the JSE Colocation Services documentation

2. Hosting Unit Cabling

The JSE has pre-terminated multimode fibre in each Hosting Unit, providing access to the JSE's markets and services via network access interfaces or ports at the top of the Hosting Unit.

The following diagrams provide further clarification on the fibre drop cable termination layout, installed within and to each Hosting Unit. Note that the JSE's pre-terminated cabling handoffs require an LC connecter.

Illustration of the Network Access Interface Presentation within a Hosting Unit

Cross-Connects from Customer HU to chosen telecommunications Network Service Provider (NSP) in JSE Meet Me Room
- Cables provided and installed by the JSE into JSE roof

JSE Meet Me Room

| Telecomms Network Service Provider | Telecomms Network Service Provider (NSP) 2 | Telecomms Network Service Provider (NSP) 3 |

Illustration of how Cross connects between 2 different Customer Hosting Units via JSE cable trays
- Cables provided and installed by the JSE into the JSE roof mounted trays

JSE roof mounted cable trays through which all Cross Connects will be facilitated

Illustration of how Inter-Connects between 2 adjacent Hosting Units owned by the same Customer via the top-of-rack Cable Trough
- cables supplied by Customer, JSE will assist with install

Hosting Unit HU - "x" - e.g HU-01

| A1 | HU- x MM 01 02 03 04 05 06 |
Pre-installed JSE Services Network Access Patch Panel A

Labelled Fibre Cable drops for Cross Connects

| C1 | HU- x MM 01 02 03 04 05 06 |
Pre-installed JSE Services Network Access Patch Panel B

Customer Devices connect into the top-of-rack JSE Network Access Ports using patch lead cables, supplied by the Customer

Customer Rack Mounted Device

Hosting Unit HU - "x" - e.g HU-02

| A1 | HU- x MM 01 02 03 04 05 06 |
Pre-installed JSE Services Network Access Patch Panel A

Labelled Fibre Cable

| C1 | HU- x MM 01 02 03 04 05 06 |
Pre-installed JSE Services Network Access Patch Panel B

Customer Devices connect into the top-of-rack JSE Network Access Ports using patch lead cables, supplied by the Customer

Customer Rack Mounted Device

Illustration of the Network Access Interface Presentation within a Hosting Unit

Notes

1 **Cross Connects to** Telecommunications Network Service Providers (NSPs) in the **JSE Meet Me Room or to another Customer Hosting Unit** in Colocation, are presented as **labelled fibre cable drops** in the Hosting Unit.

2 Cross Connect cables are **supplied by the JSE and installed by the JSE** on behalf of Customers via the roof mounted cable trays.

3 Customers requiring **6 or more Cross Connects can request the installation of a patch panel presentation** for Cross Connects of the Hosting Unit. Please request a quote for this from the JSE.

4 **All cables are multi-mode fibre cables** with LC connectors, JSE can support single-mode cables if required by Customer.

5 **Inter-Connects** are installed between **adjacent Hosting Units owned by the same Customer** via top-of-rack cable trays. **Inter-connect cables are supplied by the Customer** and the JSE will assist with the install.

Pre-Installed Patch Panel Fibre Port Access Legend

A1 - 01	Management Network Access Point - PRIMARY	C1 - 01	Management Network Access Point - SECONDARY
A1 - 02	Equity Market Data - A Feed	C1 - 02	Equity Market Data - B Feed
A1 - 03	Equity Trading Access - PRIMARY	C1 - 03	Equity Trading Access - SECONDARY
A1 - 04	Derivatives Trading and Market Data Access	C1 - 04	Derivatives Trading and Market Data Access - SECONDARY
A1 - 05	Discretionary spare port for JSE Services	C1 - 05	Discretionary spare port for JSE Services
A1 - 06	Discretionary spare port for JSE Services	C1 - 06	Discretionary spare port for JSE Services

NOTE: As part of the **CSOF** that will be provided to clients once we receive a complete Order Form - following is an **EXAMPLE** of the **"C" Class IP address Range** that will be assigned to the **JSE Network Access Ports** of a Customer Hosting Unit i.e. Customer Source address for connecting to the JSE services

		NW Range	Default GW				NW Range	Default GW	
Remote Mgmt NW (optional)	A1 - 01	10.11.125.0/24	10.11.125.1/24	usable 2-252	Remote Mgmt NW (optional)	C1 - 01	10.11.125.0/24	10.11.125.1/24	usable 2-252
Equity Market Data - A Feed	A1 - 02	10.21.125.0/24	10.21.125.254/24	usable 2-252	Equity Market Data - B Feed	C1 - 02	10.22.125.0/24	10.22.125.254/24	usable 2-252
Equity Trading - Primary	A1 - 03	10.20.125.0/24	10.20.125.1/24	usable 2-252	Equity Trading - Secondary	C1 - 03	10.20.125.0/24	10.20.125.1/24	usable 2-252
Derivatives Trd and Mkt Data	A1 - 04	10.23.125.0/24	10.23.125.1/24	usable 2-252	Derivatives Trd and Mkt Data - Secondary	C1 - 04	10.23.125.0/24	10.23.125.1/24	usable 2-252
	A1 - 05	unused				C1 - 05	unused		
	A1 - 06	unused				C1 - 06	unused		

3. Access to JSE Markets and Services

Clients can access the JSE markets by configuring and connecting their servers or switching infrastructure within their Hosting Unit to the pre-defined network access patch panel fibre ports installed by the JSE in the reserved section of the Hosting Unit. Clients can access the relevant JSE markets and services offered by the JSE as per the diagram in Section 2 of this document.

Clients can consider the below configurations for their network switches or routing capable devices when configuring their own connectivity to the relevant JSE services.

3.1 Equity Market Configuration samples

3.1.1 ~~Two Separate Links on Two Separate Routers / Switches~~TCP services Links patched to JSE patch panel A1-03 and C1-03 from two separate switches/routers

TCP Services(A1-03 and C1-03)

Switch-A (*primary path switch for TCP services(A1-03).Only path for Feed-A(A1-02)~~Feed-A~~*)

(Setup *static route for Equity TCP services to the JSE HU virtual IP(10.20.x.1 were x is the HU number)~~route to the Feed-A RP~~*)

~~IP route 192.168.153.98 255.255.255.255 next-hop-to-JSE interface <10.20.x.1>~~ip route 10.10.22.12 255.255.255.255 next-hop-to-JSE interface 10.20.x.1
Ip route 10.10.22.13 255.255.255.255 next-hop-to-JSE interface 10.20.x.1
Ip route 10.12.10.10 255.255.255.255 next-hop-to-JSE interface 10.20.x.1
Ip route 10.13.10.11 255.255.255.255 next-hop-to-JSE interface 10.20.x.1

Switch-B (Secondary path switch for TCP services. Only path for Feed-B) routes are weighted to ensure that the primary path is used until an even were there is a failure.

(Setup static route for Equity TCP services to the JSE HU virtual IP(10.20.x.1 were x is the HU number)

ip route 10.10.22.12 255.255.255.255 next-hop-to-JSE interface 10.20.x.1 200
Ip route 10.10.22.13 255.255.255.255 next-hop-to-JSE interface 10.20.x.1 200
Ip route 10.12.10.10 255.255.255.255 next-hop-to-JSE interface 10.20.x.1 200
Ip route 10.13.10.11 255.255.255.255 next-hop-to-JSE interface 10.20.x.1 200

~~*(Setup access-list to bind to Feed-A RP)*~~
~~IP access-list standard 12~~
~~Remark allow prod feed-a~~
~~Permit host 224.0.112.30~~
~~Permit host 224.0.112.32~~
~~Permit host 224.0.112.34~~
~~Permit host 224.0.112.36~~
~~Permit host 224.0.112.38~~
~~Permit host 224.0.112.40~~
~~Permit host 224.0.112.42~~
~~Permit host 224.0.112.44~~
~~Permit host 224.0.112.46~~

~~*Setup the RP for feed-A with the above access-list bound*~~
~~IP pim rp-address 192.168.153.98 12~~

UDP services links for Market data Services (A1-02 and C1-02)

No PIM/IGMP joins to be accepted for market data groups.
JSE to push down(igmp static-oif 224.0.112.x) market data to the client's HU on A1-02 and C1-02 as per the client enablement

==**Sample configuration on a Cisco Nexus - 3548 for a client:**==

JSE will supply clients with the VLAN ID's for TCP Unicast(A1-03 and C1-03), Multicast "A"(A1-02) and "B"(C1-02) feeds that needs to be configured under their interfaces connecting to the JSE switch.

Switch-A (Primary switch path for TCP services(A1-03).Only path for Feed-A(A1-02))
TCP Unicast(A1-03 and C1-03)
interface Ethernet X/X
switchport mode trunk
switchport access vlan 4XX (JSE can supply if need be or client can use an VLAN ID of their choice)
spanning-tree port type edge

Multicast "A" feed
interface Ethernet X/X
switchport mode trunk
switchport access vlan 6XX(JSE can supply if need be or client can use an VLAN ID of their choice)
spanning-tree port type edge

Multicast "B" feed
interface Ethernet X/X
switchport mode trunk
switchport access vlan 8XX
spanning-tree port type edge

ip route 10.10.22.12 255.255.255.255 next-hop-to-JSE interface 10.20.x.1
Ip route 10.10.22.13 255.255.255.255 next-hop-to-JSE interface 10.20.x.1
Ip route 10.12.10.10 255.255.255.255 next-hop-to-JSE interface 10.20.x.1
Ip route 10.13.10.11 255.255.255.255 next-hop-to-JSE interface 10.20.x.1

The JSE will configure below multicast groups on ~~their switch facing the client's network~~the clients HU's layer 3 for "A" feed multicast

interface Vlan 6XX
ip igmp static-oif 224.0.112.30
ip igmp static-oif 224.0.112.32
ip igmp static-oif 224.0.112.34
ip igmp static-oif 224.0.112.36
ip igmp static-oif 224.0.112.38
ip igmp static-oif 224.0.112.40
ip igmp static-oif 224.0.112.42
ip igmp static-oif 224.0.112.44
ip igmp static-oif 224.0.112.46

Switch-B (~~Feed-B~~Secondary path for TCP services(C1-03). Only path for Feed-B(C1-02))

(Setup route to the Feed-B RP)
IP route 192.168.153.99 255.255.255.255 next hop to JSE_interface <10.20.x.1>

(Setup access-list to bind to Feed B RP)
IP access-list standard 13
Remark allow prod feed b
Permit host 224.0.112.31
Permit host 224.0.112.33
Permit host 224.0.112.35
Permit host 224.0.112.37
Permit host 224.0.112.39
Permit host 224.0.112.41
Permit host 224.0.112.43
Permit host 224.0.112.45
Permit host 224.0.112.47
Multicast "B" feed
interface Ethernet X/X
switchport access vlan 8XX(JSE can supply if need be or client can use an VLAN ID of their choice
spanning-tree port type edge

ip route 10.10.22.12 255.255.255.255 next-hop-to-JSE interface 10.20.x.1 200
Ip route 10.10.22.13 255.255.255.255 next-hop-to-JSE interface 10.20.x.1 200
Ip route 10.12.10.10 255.255.255.255 next-hop-to-JSE interface 10.20.x.1 200
Ip route 10.13.10.11 255.255.255.255 next-hop-to-JSE interface 10.20.x.1 200

(Setup the RP for Feed-B with the above access-list bound)
IP pim rp address 192.168.153.99 13

```
interface Vlan 8XX
ip igmp static-oif 224.0.112.31
ip igmp static-oif 224.0.112.33
ip igmp static-oif 224.0.112.35
ip igmp static-oif 224.0.112.37
ip igmp static-oif 224.0.112.39
ip igmp static-oif 224.0.112.41
ip igmp static-oif 224.0.112.43
ip igmp static-oif 224.0.112.45
ip igmp static-oif 224.0.112.47
```

Note

1. Client need to ensure that the VLAN used on the A1-03 and C1-03 is the same and trunked between the two switches/routers so the VRRP on their HU becomes operational
1. 2. With the JSE pushing the market data down to the clients HU, clients needs to ensure the market data reaches the intended destination servers if they are not located in the same VLAN as the A1-02 and C1-02 ports.

3.1.2 TCP services Links patched to JSE patch panel A1-03 and C1-03 from one switch/router.

~~**One Link with One Router**~~

~~**Switch (Feed-A+Feed-B)#**~~

~~*(Setup route to the Feed-A RP)*~~
~~IP route 192.168.153.98 255.255.255.255 next hop to JSE interface~~ <10.20.x.1>

~~*(Setup route to the Feed-A RP)*~~
~~IP route 192.168.153.99 255.255.255.255 next hop to JSE interface~~ <10.20.x.1>

~~*(Setup access list to bind to Feed-A RP)*~~
~~IP access list standard 12~~
~~Remark allow pre-prod feed-a~~
~~Permit host 224.0.112.30~~
~~Permit host 224.0.112.32~~
~~Permit host 224.0.112.34~~
~~Permit host 224.0.112.36~~
~~Permit host 224.0.112.38~~
~~Permit host 224.0.112.40~~
~~Permit host 224.0.112.42~~
~~Permit host 224.0.112.44~~
~~Permit host 224.0.112.46~~

~~*(Setup access list to bind to Feed-B RP)*~~
~~IP access list standard 13~~
~~Remark allow pre-prod feed-b~~
~~Permit host 224.0.112.31~~
~~Permit host 224.0.112.33~~
~~Permit host 224.0.112.35~~
~~Permit host 224.0.112.37~~
~~Permit host 224.0.112.39~~
~~Permit host 224.0.112.41~~
~~Permit host 224.0.112.43~~
~~Permit host 224.0.112.45~~
~~Permit host 224.0.112.47~~

~~*(Setup the RP for Feed-A with the above access-list bound)*~~
~~IP pim rp address 192.168.153.98 12~~

~~*(Setup the RP for Feed-B with the above access-list bound)*~~
~~IP pim rp address 192.168.153.99~~7 13

TCP Services(A1-03 and C1-03)

Switch (Link 1(A1-03) for primary path and Link2 for secondary path (C1-03)for TCP services. path for both Feed-A and Feed-B)

(Setup static route for Equity TCP services to the JSE HU virtual IP via link 1(10.20.x.1 were x is the HU number))
ip route 10.10.22.12 255.255.255.255 next-hop-to-JSE interface 10.20.x.1

Ip route 10.10.22.13 255.255.255.255 next-hop-to-JSE interface 10.20.x.1
Ip route 10.12.10.10 255.255.255.255 next-hop-to-JSE interface 10.20.x.1
Ip route 10.13.10.11 255.255.255.255 next-hop-to-JSE interface 10.20.x.1

(Setup static route for Equity TCP services to the JSE HU virtual IP via link 2(10.20.x.1 were x is the HU number) routes are weighted to ensure that link 1 is used until an even were there is a failure.

ip route 10.10.22.12 255.255.255.255 next-hop-to-JSE interface 10.20.x.1 200
Ip route 10.10.22.13 255.255.255.255 next-hop-to-JSE interface 10.20.x.1 200
Ip route 10.12.10.10 255.255.255.255 next-hop-to-JSE interface 10.20.x.1 200
Ip route 10.13.10.11 255.255.255.255 next-hop-to-JSE interface 10.20.x.1 200

UDP services links for Market data Services (A1-02 and C1-02)

No PIM/IGMP joins to be accepted for market data groups.
JSE to push down(igmp static-oif 224.0.112.x) market data to the client's HU on A1-02 and C1-02 as per the client enablement

Sample configuration on a Cisco Nexus - 3548 for a client:

JSE will supply clients with the VLAN ID's for TCP-Unicast(A1-03 and C1-03), Multicast "A"(A1-02) and "B"(C1-02) feeds that needs to be configured under their interfaces connecting to the JSE switch.

Switch(primary TCP services(A1-03) via link 1 and secondary TCP services via link 2.Only path for Feed-A(A1-02))
TCP-Unicast(A1-03 and C1-03)
interface Ethernet X/X

switchport access vlan 4XX (JSE can supply if need be or client can use an VLAN ID of their choice)
spanning-tree port type edge

Multicast "A" feed
interface Ethernet X/X

switchport access vlan 6XX(JSE can supply if need be or client can use an VLAN ID of their choice)
spanning-tree port type edge
Multicast "B" feed
interface Ethernet X/X
switchport access vlan 8XX(JSE can supply if need be or client can use an VLAN ID of their choice
spanning-tree port type edge

ip route 10.10.22.12 255.255.255.255 next-hop-to-JSE interface 10.20.x.1
Ip route 10.10.22.13 255.255.255.255 next-hop-to-JSE interface 10.20.x.1
Ip route 10.12.10.10 255.255.255.255 next-hop-to-JSE interface 10.20.x.1
Ip route 10.13.10.11 255.255.255.255 next-hop-to-JSE interface 10.20.x.1

Note

1. Client need to ensure that the VLAN used on the A1-03 and C1-03 ports is the same on the switch/router so the VRRP on their HU becomes operational
2. With the JSE pushing the market data down to the clients HU, client's needs to ensure the market data reaches the intended destination servers if they are not located in the same VLAN as the A1-02 and C1-02 ports.

3.2 Derivative Market configuration sample

Clients will be required to create static routing entries on their switches, allowing pre-defined network access patch panel fibre ports installed by the JSE in the reserved section of the Hosting Unit. Clients can access the relevant JSE Derivative markets as per the diagram in Section 2 of this document.

3.2.1. TCP Links patched to JSE patch panel A1-04 and C1-04 from two separate switches/routers

TCP Services(A1-03 and C1-03)

Switch-A (primary path switch for TCP services(A1-04).

(Setup static route for Equity TCP services to the JSE HU virtual IP(10.23.x.1 were x is the HU number))

ip route 10.10.35.50 255.255.255.255 next-hop-to-JSE interface 10.23.x.1
Ip route 10.10.35.51 255.255.255.255 next-hop-to-JSE interface 10.23.x.1
Ip route 10.10.35.52 255.255.255.255 next-hop-to-JSE interface 10.23.x.1
Ip route 10.10.35.53 255.255.255.255 next-hop-to-JSE scterface 10.23.x.1

Switch-B (Secondary path switch for TCP services.) routes are weighted to ensure that the primary path is used until an even were there is a failure.

(Setup static route for Equity TCP services to the JSE HU virtual IP(10.23.x.1 were x is the HU number)

ip route 10.10.22.12 255.255.255.255 next-hop-to-JSE interface 10.23.x.1 200
Ip route 10.10.22.13 255.255.255.255 next-hop-to-JSE interface 10.23.x.1 200
Ip route 10.12.10.10 255.255.255.255 next-hop-to-JSE interface 10.23.x.1 200
Ip route 10.13.10.11 255.255.255.255 next-hop-to-JSE interface 10.23.x.1 200

Note

1. Client need to ensure that the VLAN used on the A1-04 and C1-04 is the same and trunked between the two switches/routers so the VRRP on their HU becomes operational

    Sample configuration on a Cisco Nexus - 3548 for a client:

    Switch-A
            JSE will supply clients with the VLAN ID's for TCP-Unicast(A1-04 and C1-04), configured under their interfaces connecting to the JSE switch.

            Switch(primary TCP services(A1-03) via link 1 and secondary TCP services via link 2.Only path for Feed-A(A1-02))
            TCP-Unicast(A1-04 and C1-04)
            interface Ethernet X/X

            switchport access vlan 24XX (JSE can supply if need be or client can use an VLAN ID of their choice)
            spanning-tree port type edge

    ip route 10.10.35.50 255.255.255.255 next-hop-to-JSE interface 10.23.x.1
    Ip route 10.10.35.51 255.255.255.255 next-hop-to-JSE interface 10.23.x.1
    Ip route 10.10.35.52 255.255.255.255 next-hop-to-JSE interface 10.23.x.1
    Ip route 10.10.35.53 255.255.255.255 next-hop-to-JSE interface 10.23.x.1

    Switch-B
            JSE will supply clients with the VLAN ID's for TCP-Unicast(A1-04 and C1-04), configured under their interfaces connecting to the JSE switch.

            Switch(primary TCP services(A1-03) via link 1 and secondary TCP services via link 2.Only path for Feed-A(A1-02))
            TCP-Unicast(A1-04 and C1-04)
            interface Ethernet X/X

            switchport access vlan 24XX (JSE can supply if need be or client can use an VLAN ID of their choice)
            spanning-tree port type edge

    ip route 10.10.35.50 255.255.255.255 next-hop-to-JSE interface 10.23.x.1 200
    Ip route 10.10.35.51 255.255.255.255 next-hop-to-JSE interface 10.23.x.1 200
    Ip route 10.10.35.52 255.255.255.255 next-hop-to-JSE interface 10.23.x.1 200
    Ip route 10.10.35.53 255.255.255.255 next-hop-to-JSE interface 10.23.x.1 200

3.2.2. TCP Links patched to JSE patch panel A1-04 and C1-04 from one switch/router

TCP Services(A1-04 and C1-04)

Switch (Link 1(A1-04) for primary path and Link2 for secondary path (C1-04)for TCP services.)

(Setup static route for Equity TCP services to the JSE HU virtual IP via link 1(10.23.x.1 were x is the HU number))
ip route 10.10.22.12 255.255.255.255 next-hop-to-JSE interface 10.23.x.1
Ip route 10.10.22.13 255.255.255.255 next-hop-to-JSE interface 10.23.x.1
Ip route 10.12.10.10 255.255.255.255 next-hop-to-JSE interface 10.23.x.1
Ip route 10.13.10.11 255.255.255.255 next-hop-to-JSE interface 10.23.x.1

(Setup static route for Equity TCP services to the JSE HU virtual IP via link 2(10.23.x.1 were x is the HU number) routes are weighted
to ensure that link 1 is used until an even were there is a failure.

ip route 10.10.22.12 255.255.255.255 next-hop-to-JSE interface 10.23.x.1 200
Ip route 10.10.22.13 255.255.255.255 next-hop-to-JSE interface 10.23.x.1 200
Ip route 10.12.10.10 255.255.255.255 next-hop-to-JSE interface 10.23.x.1 200
Ip route 10.13.10.11 255.255.255.255 next-hop-to-JSE interface 10.23.x.1 200

~~Switch#~~
~~Ip route 10.10.35.52 255.255.255.255 10.23.x.1 remark All Markets / Information Subscribers~~
~~Ip route 10.10.35.51 255.255.255.255 10.23.x.1 remark IRC~~
~~Ip route 10.10.35.50 255.255.255.255 10.23.x.1 remark SAFEX EDM~~
~~Ip route 10.10.35.53 255.255.255.255 10.23.x.1 remark SAFEX CCD~~

4. Time Synchronsation Service

4.1 Precision Time Protocol (PTP) Service

The JSE's PTP service will be made available to client Hosting Units in Colocation via the following pre-defined network access patch panel ports:
- A-03 & C-03 Equity Trading Access
- A-04 & C-04 Derivatives Trading and Market Data Access

Clients must please ensure that their servers or switching infrastructure is PTP capable before attempting to configure their Hosting Unit infrastructure to connect to the JSE's PTP service.

4.1.1 PTP configuration sample on the nexus 3548

A-03 & C-03 Equity Trading Access
Customer#xx#
feature ptp_____ (enable the ptp feature)
ptp source 10.20.x.1 (source address that downstream devices will see when ptp multicast messages are sent)

interface Ethernetx/x
  description Customerxx to JSEswitch-01 ey/y
  ptp_____ (enable ptp on the port)
  ptp vlan xxx (used when the port is in trunk mode to distinguish which vlan should process ptp)
  switchport access vlan xxx
  spanning-tree port type edge

A-04 & C-04 Derivatives Trading and Market Data Access
Customer#xx#
feature ptp   (enable ptp feature)
ptp source 10.23.x.1   (source address that downstream devices will see when ptp multicast messages are sent)

interface Ethernetx/x
  description Customerxx to JSEswitch-01 ey/y
  ptp   (enable ptp on the port)
  ptp vlan xxx   (used when the port in in trunk mode to distinguish which vlan should process ptp)
  switchport access vlan xxx
  spanning-tree port type edge

5. Colocation Network Connectivity Test and Troubleshooting

5.1 Colocation Network Connectivity Test

As part of the Colocation Take-on and initial set-up of clients in Colocation, network connectivity tests will be conducted between the JSE infrastructure and the clients Hosting Unit or client infrastructure within their Hosting Unit e.g. from client switch to the Hosting Unit Network default gateways. These tests will confirm the Hosting Unit set-up is in accordance with the Colocation services they will subscribe to.

In addition, ICMP by default is not configured by the JSE, however this can be temporarily permitted to a clients own Hosting Unit Network default gateways to assist clients with additional testing or troubleshooting that they may require.

Below is a sample script that clients can apply to their own switch infrastructure, allowing them to ping their Hosting Unit Network default gateways confirming connectivity to the JSE Colocation services.

Sample configurations:

Conf terminal
Loopback 1Interface VLAN 4xx
Description Test loopback VLAN for Unicast Equity Trading
Ip address 10.20.x.2 255.255.255.0255
No shutdown

Conf terminal
~~Loopback 1~~ Interface VLAN 6xx
Description Test VLAN~~loopback~~ for Multicast~~C~~ A feed
Ip address 10.21.x.2 255.255.255.0~~255~~
No shutdown

Conf terminal
~~Loopback 1~~ Interface VLAN 8xx
Description Test VLAN~~loopback~~ for Multicast~~C~~ B feed
Ip address 10.22.x.2 255.255.255.0~~255~~
No shutdown

Conf terminal
~~Loopback 1~~ Interface VLAN 24xx
Description Test VLAN~~loopback~~ for Derivatives Trading and Market Data
Ip address 10.23.x.2 255.255.255.0~~255~~
No shutdown

Conf terminal
~~Loopback 1~~ Interface VLAN 14xx
Description Test VLAN~~loopback~~ for Management
Ip address 10.11.x.2 255.255.255.0~~255~~
No shutdown

NB: If it is a Cisco switch which supports VTP, it must be in transparent mode to accept VLAN range above 1005, otherwise the client can use own VLAN.

6. Troubleshooting Multicast Data

There are a number of helpful tools and commands that can assist a client in troubleshooting multicast data on their routers and networks. The following is only a guide for troubleshooting multicast traffic on a client router / network.

*** *The commands to be executed are in italics, with a sample output beneath***

In addition to the below, a strategically placed network sniffer (e.g. a PC with Wireshark installed, listening to a span port off the router or switch closest to the router), can assist greatly in troubleshooting:

~~Confirm routing to Pre-Prod multicast RP"s~~
~~Confirm RPF checks to multicast sources~~
~~Checking the IP mroute" table~~
~~Checking multicast packet count~~
- Confirm on the switch is multicast is flowing(if the VLAN were A1-02 and C1-02 is IGMP snooping enabled)

xxxxx# sh ip igmp snooping vlan 601
IGMP Snooping information for vlan 601
 IGMP snooping enabled
 Lookup mode: IP
 Optimised Multicast Flood (OMF) disabled
 IGMP querier present, address: 10.21.1.254, version: 2, i/f E1/1
 Switch-querier disabled
 IGMPv3 Explicit tracking enabled
 IGMPv2 Fast leave disabled
 IGMPv1/v2 Report suppression enabled
 IGMPv3 Report suppression disabled
 Link Local Groups suppression enabled
 Router port detection using PIM Hellos, IGMP Queries
 Number of router-ports: 1
 Number of groups: 3
 VLAN vPC function disabled
 Active ports:
   E1/7
xxxx# sh ip igmp snooping groups vlan 601
Type: S - Static, D - Dynamic, R - Router port, F - Fabricpath core port

Vlan Group Address   Ver Type Port list
601   224.0.112.34   v2   D   Eth1/7

        Confirm on the device(server/router/switch) that patch to A1-02 and C1-02 with a packet capture running on the device

Linux/Unix
Tcpdump –I eth0 udp 224.0.112.34

Microsoft
Start>run>Wireshark then filter messages incoming from port A1-02 and C1-02

Router/switch
SPAN traffic or tap the link between JSE device and client switch. Send the data to the sniffer programme running device so analyse the packets.

Confirming Routing to Multicast RP's

sh IP route 192.168.153.98
Routing entry for *192.168.153.98/32*
Known via "static", distance 1, metric 0
Routing Descriptor Blocks:
* JSE next hop, from JSE next hop,
Route metric is 1, traffic share count is 1
sh IP route 192.168.153.99
Routing entry for *192.168.153.99 /32*
Known via "static", distance 1, metric 0
Routing Descriptor Blocks:
* JSE-next-hop, from JSE-next-hop,
Route metric is 1, traffic share count is 1

Confirming Routing to Multicast RP's

sh IP rpf 10.12.10.22.10
RPF information for? (10.12.10.22.10)
RPF interface: next hop to JSE
RPF neighbor:? (next hop to JSE)
RPF route/mask: 10.12.10.22.10/32
RPF type: multicast (static)
Doing distance-preferred lookups across tables
RPF topology: ipv4 multicast base
sh IP rpf 10.13.10.22.11
RPF information for? (10.13.10.22.11)
RPF interface: next hop to JSE
RPF neighbor:? (next hop to JSE)
RPF route/mask: 10.13.10.22.11/32
RPF type: multicast (static)
Doing distance-preferred lookups across tables
RPF topology: ipv4 multicast base

Checking the IP Mroute Table

sh IP mroute 224.0.112.30
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP bit set, F - Register flag,
T - SPT bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
U - URD, I - Received Source Specific Host Report,
Z - Multicast Tunnel, z - MDT-data group sender,
Y - Joined MDT-data group, y - Sending to MDT-data group,
V - RD & Vector, v - Vector
Outgoing interface flags: H - Hardware switched, A - Assert winner
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode
(*, 224.0.112.30), 1w5d/stopped, RP 192.168.153.98, flags: SJCL
Incoming interface: nbr next hop to JSE, RPF nbr next hop to JSE, Mroute
Outgoing interface list:
GigabitEthernet9/7, Forward/Sparse, 1w5d/00:02:31

sh IP mroute 224.0.112.31
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP bit set, F - Register flag,
T - SPT bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
U - URD, I - Received Source Specific Host Report,
Z - Multicast Tunnel, z - MDT-data group sender,
Y - Joined MDT-data group, y - Sending to MDT-data group,
V - RD & Vector, v - Vector
Outgoing interface flags: H - Hardware switched, A - Assert winner
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 224.0.112.31), 1w5d/stopped, RP 192.168.153.99, flags: SJCL
Incoming interface: nbr next-hop to JSE, RPF nbr next-hop to JSE, Mroute
Outgoing interface list:
GigabitEthernet9/7, Forward/Sparse, 1w5d/00:02:31

Checking Multicast Packet Counts

sh IP mroute 224.0.112.30 count
Use "show IP mfib count" to get better response time for a large number of Mroutes
IP Multicast Statistics
211 routes using 262236 bytes of memory
126 groups, 0.67 average sources per group
Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kilobits per second

Other counts: Total/RPF failed/Other drops (OIF-null, rate-limit etc)
Group: 224.0.112.30, Source count: 1, Packets forwarded: 56544, Packets received: 56544
RP-tree: Forwarding: 33045/0/93/0, Other: 33045/0/0
Source: 10.12.10.22.10/32, Forwarding: 23499/10/100/8, Other: 23499/0/0

Confirm that the packets are incrementing

sh IP mroute 224.0.112.31 count
Use "show IP mfib count" to get better response time for a large number of Mroutes.
IP Multicast Statistics
205 routes using 257940 bytes of memory
126 groups, 0.62 average sources per group
Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kilobits per second
Other counts: Total/RPF failed/Other drops (OIF-null, rate-limit etc)
Group: 224.0.112.31, Source count: 1, Packets forwarded: 23983, Packets received: 23984
RP-tree: Forwarding: 243/0/83/0, Other: 243/0/0
Source: 10.13.10.22.11/32, Forwarding: 23740/0/100/0, Other: 23741/0/1

*** For additional information on Cisco Multicast guidelines, please see link below***
http://www.cisco.com/c/en/us/support/docs/ip/ip-multicast/16450-mcastguide0.html