L2X Configuration Guide

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1. Introduction

Layer 2 Cross-Connect (L2X) is a data plane feature that connects two physical ports (IFPs)) using Layer 2 switching. At the simplest, L2X can switch all the traffic between two IFPs to provide the trunk service of an Ethernet switch.

1.1. Port and VLAN Cross-connects

Both types of L2X switches Layer 2 traffic from input interface to output interface. The difference is that a port cross-connect switches all Layer 2 traffic arriving at an input interface, but a VLAN cross-connect only switches the Layer 2 traffic associated with a specific VLAN. A port-based L2X means a port-only configuration, so there are no VLANs involved.

Both single-tag and double-tagged (inner and outer VLAN tags) are supported. The port and VLAN L2X support both local and remote L2X configurations. In remote L2X connections, the VLAN cross-connects are typically configured on the MPLS tunnel ingress router.

Untagged traffic on L2X interfaces is also supported. However, there is no way to select only untagged traffic for cross-connecting. Therefore, only port crossconnects are supported for untagged traffic.

1.2. L2X 802.1ad Ethertype Support

RBFS supports VLAN-operations like VLAN add, VLAN swap, and VLAN delete on egress interface. RBFS supports similar functionality at the ingress side as well. That is, RBFS supports the below VLAN operations:

- Single-VLAN-Add with an option to configure encapsulation (that is, 802.1q or 802.1ad)
- Single-VLAN-Delete
- Swap-Outer-VLAN

By default the encapsulation method is 802.1q. If an encapsulation method is not specified, the 802.1q will be the default mode.

In addition to setting the Ethertype for a VLAN operation, the 802.1ad support includes that ingress traffic for all tagged match options will match on both Ethertype 0x8100 (802.1q) and 0x8A88 (802.1ad) by default.

2. L2X Configuration Examples

These examples cover the various possibilities for VLAN value editing in local L2X.

2.1. Ingress VLAN Operation

RBFS supports VLAN-operations like VLAN add, VLAN swap and VLAN delete on ingress interface.

The current functionality has been extended all existing CLIs to accept ingress vlan-operation and ingress VLAN encapsulation value.

Both 802.1q and 802.1ad encapsulations are supported. The default encapsulation is 802.1q.

Traffic will be matched at ingress direction based on the match criterion. RtBrick Full Stack (RBFS) supports below match parameters.

There can be five different match types on a physical interface, that is, traffic can be matched based on the following:

1. (ifp)
2. (ifp, outer_vlan)
3. (ifp, outer_vlan, inner_vlan)
4. (ifp, outer_vlan, any inner_vlan)
5. (ifp, any vlan)

A few modes in above list are mutually exclusive (for example (ifp, outer_vlan, inner_vlan) and (ifp, outer_vlan, any inner_vlan) configuration on the same interface is conflicting configuration).

> ℹ The match-type attribute is mandatory for match-untagged, match-any and match-inner-any match criterion.

For more information, see the L2X Ingress Configuration Examples section below.

2.2. Supported Match Type Validations

Case1 : IFP A, *

> ℹ The asterisk (*) indicates *any* or *no vlan* tags.

Configuration A	Configuration B	Support

IFP A, *	IFP A, ov 10	Not supported
IFP A, *	IFP A, ov 10, iv 20	Not supported
IFP A, *	IFP A, ov 10, *	Not supported
IFP A, *	IFP A, untagged	Not Supported

Case 2: IFP A, untagged:

Configuration A	Configuration B	Support
IFP A, untagged	IFP A, *	Not supported
IFP A, untagged	IFP A, ov 10	supported
IFP A, untagged	IFP A, ov 30, iv 20	Supported
IFP A, untagged	IFP A, ov 20, *	Supported

Case 3: IFP A, outer_vlan:

Configuration A	Configuration B	Support
IFP A, ov 10	IFP A, *	Not supported
IFP A, ov 10	IFP A, ov 10, *	Not supported
IFP A, ov 10	IFP A, ov 20	Supported
IFP A, ov 10	IFP A, ov 10 , iv 20	Not supported
IFP A, ov 10	IFP A, ov 40 , iv 7	supported
IFP A, ov 10	IFP A, ov 30, *	supported
IFP A, ov 10	IFP A, untagged	supported

Case 4: IFP A, outer_vlan, inner_vlan:

Configuration A	Configuration B	Support
IFP A,ov 10, iv 20	IFP A, *	Not supported
IFP A,ov 10, iv 20	IFP A, ov 10, *	Not supported
IFP A,ov 10, iv 20	IFP A, ov 10	Not supported
IFP A,ov 10, iv 20	IFP A, ov 30	Supported
IFP A,ov 10, iv 20	IFP A, ov 20 , *	supported
IFP A,ov 10, iv 20	IFP A, untagged	supported
IFP A,ov 10, iv 20	IFP A, ov 10, iv 30	supported

Case 5: IFP A, outer_vlan, *

The asterisk (*) indicates *any* or *no vlan* tags.

Configuration A	Configuration B	Support
IFP A,ov 10, *	IFP A, *	Not supported
IFP A,ov 10, *	IFP A, ov 10	Not supported
IFP A,ov 10, *	IFP A, ov 10, iv 20	Not supported
IFP A,ov 10, *	IFP A, ov 20, iv 7	Supported
IFP A,ov 10, *	IFP A, ov 30	supported
IFP A,ov 10, *	IFP A, untagged	Supported
IFP A,ov 10, *	IFP A, ov 40, *	supported

2.3. L2X Ingress Configuration Examples

The following command shows how to configure ingress VLAN operation (Local Cross-Connect)

```
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> match-type <match-type>

set l2x name <l2x-name> <direction> incoming-interface <incoming-interface>

set l2x name <l2x-name> <direction> ingress-vlan-operation <ingress-vlan-action>

set l2x name <l2x-name> <direction> ingress-outer-vlan <vlan-id>

set l2x name <l2x-name> <direction> ingress-vlan-encapsulation <encapsulation>

set l2x name <l2x-name> <direction> outgoing-interface <outgoing-interface>

set l2x name <l2x-name> <direction> egress-vlan-operation <vlan-action>

set l2x name <l2x-name> <direction> outgoing-outer-vlan <vlan-id>

set l2x name <l2x-name> <direction> egress-vlan-encapsulation <encapsulation>
```

The following command shows how to configure ingress VLAN operation (remote

Cross-Connect)

```
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> match-type <match-type>

set l2x name <l2x-name> <direction> incoming-interface <incoming-interface>

set l2x name <l2x-name> <direction> ingress-vlan-operation <ingress-vlan-action>

set l2x name <l2x-name> <direction> ingress-outer-vlan <vlan-id>

set l2x name <l2x-name> <direction> ingress-vlan-encapsulation <encapsulation>

set l2x name <l2x-name> <direction> nexthop4/nexthop6 <nexthop>

set l2x name <l2x-name> <direction> lookup-instance <lookup-instance>

set l2x name <l2x-name> <direction> lookup-afi <lookup-afi>

set l2x name <l2x-name> <direction> lookup-safi <lookup-safi>

set l2x name <l2x-name> <direction> service-label <service_label>
```

For ingress L2x either outgoing-interface or nexthop is mandatory.

2.3.1. Port and Any VLAN (ifp, any vlan)

You can run the following commands in this mode:

```
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> match-type match-any

set l2x name <l2x-name> <direction> incoming-interface <incoming-interface>

set l2x name <l2x-name> <direction> outgoing-interface <outgoing-interface>
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> match-type match-any

set l2x name <l2x-name> <direction> incoming-interface <incoming-interface>

set l2x name <l2x-name> <direction> outgoing-interface <outgoing-interface>

set l2x name <l2x-name> <direction> egress-vlan-operation <vlan-action>

set l2x name <l2x-name> <direction> outgoing-outer-vlan <vlan-id>
```

```
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> match-type match-any

set l2x name <l2x-name> <direction> incoming-interface <incoming-interface>

set l2x name <l2x-name> <direction> nexthop4/nexthop6 <nexthop>

set l2x name <l2x-name> <direction> lookup-instance <lookup-instance>

set l2x name <l2x-name> <direction> lookup-afi <lookup-afi>

set l2x name <l2x-name> <direction> lookup-safi <lookup-safi>

set l2x name <l2x-name> <direction> service-label <service_label>
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> match-type match-any

set l2x name <l2x-name> <direction> incoming-interface <incoming-interface>

set l2x name <l2x-name> <direction> ingress-vlan-operation <ingress-vlan-action>

set l2x name <l2x-name> <direction> ingress-outer-vlan <vlan-id>

set l2x name <l2x-name> <direction> ingress-vlan-encapsulation <encapsulation>

set l2x name <l2x-name> <direction> nexthop4/nexthop6 <nexthop>

set l2x name <l2x-name> <direction> lookup-instance <lookup-instance>

set l2x name <l2x-name> <direction> lookup-afi <lookup-afi>

set l2x name <l2x-name> <direction> lookup-safi <lookup-safi>

set l2x name <l2x-name> <direction> service-label <service_label>
```

Command Arguments

Command Argument	Description
<incoming-interface>	Incoming interface is where the traffic originates
<outgoing-interface>	Outgoing interface traffic is going to
<vlan-action>	Indicates the VLAN action such as Single-Vlan-Add, Single-Vlan-Delete, or Swap-Outer-Vlan
<vlan_id>	VLAN ID value (2 to 4095)
<encapsulation>	Specifies the encapsulation value, that is, 802.1q or 802.1ad
<nexthop>	Next-Hop address
<lookup_instance>	Instance name
<lookup_afi>	AFI value: ipv4 or ipv6
<lookup_safi>	SAFI value: safi values are unicast, labeled-unicast
<service_label>	Service label value

Configuration Example

```
set l2x name test4 ingress
set l2x name test4 ingress incoming-interface ifp-0/0/4
set l2x name test4 ingress outgoing-interface ifp-0/0/8
set l2x name test4 ingress match-type match-any


set l2x name test4 ingress
set l2x name test4 ingress incoming-interface ifp-0/0/4
set l2x name test4 ingress outgoing-interface ifp-0/0/8
set l2x name test4 ingress match-type match-any
set l2x name test4 ingress ingress-vlan-operation Single-Vlan-Add
set l2x name test4 ingress ingress-outer-vlan 100

set l2x name test4 ingress
set l2x name test4 ingress incoming-interface ifp-0/0/4
set l2x name test4 ingress nexthop4 10.1.1.2
set l2x name test4 ingress lookup-instance default
set l2x name test4 ingress lookup-afi ipv4
set l2x name test4 ingress lookup-safi labeled-unicast
set l2x name test4 ingress service-label 1000
set l2x name test4 ingress match-type match-any
set l2x name test4 ingress ingress-vlan-operation Single-Vlan-Add
set l2x name test4 ingress ingress-outer-vlan 200

set l2x name test4 ingress
set l2x name test4 ingress incoming-interface ifp-0/0/4
set l2x name test4 ingress nexthop4 10.1.1.2
set l2x name test4 ingress lookup-instance default
set l2x name test4 ingress lookup-afi ipv4
set l2x name test4 ingress lookup-safi labeled-unicast
set l2x name test4 ingress service-label 2000
set l2x name test4 ingress match-type match-any
set l2x name test4 ingress ingress-vlan-operation Single-Vlan-Delete
```

2.3.2. Port and Untagged VLAN (ifp, untagged)

You can run the following commands in this mode:

```
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> match-type match-untagged

set l2x name <l2x-name> <direction> incoming-interface <incoming-interface>

set l2x name <l2x-name> <direction> outgoing-interface <outgoing-interface>
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> match-type match-untagged

set l2x name <l2x-name> <direction> incoming-interface <incoming-interface>

set l2x name <l2x-name> <direction> outgoing-interface <outgoing-interface>

set l2x name <l2x-name> <direction> egress-vlan-operation <vlan-action>

set l2x name <l2x-name> <direction> outgoing-outer-vlan <vlan-id>
```

```
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> match-type match-untagged

set l2x name <l2x-name> <direction> incoming-interface <incoming-interface>

set l2x name <l2x-name> <direction> ingress-vlan-operation <ingress-vlan-action>

set l2x name <l2x-name> <direction> ingress-outer-vlan <vlan-id>

set l2x name <l2x-name> <direction> ingress-vlan-encapsulation <encapsulation>

set l2x name <l2x-name> <direction> nexthop4/nexthop6 <nexthop>

set l2x name <l2x-name> <direction> lookup-instance <lookup-instance>

set l2x name <l2x-name> <direction> lookup-afi <lookup-afi>

set l2x name <l2x-name> <direction> lookup-safi <lookup-safi>

set l2x name <l2x-name> <direction> service-label <service_label>
```

For (IFP, untagged) match criteria, the **match_type** attribute is mandatory when you perform L2X configuration using curl.

Command Arguments

See the Command Arguments section.

Configuration Example

```
set l2x name test4 ingress
set l2x name test4 ingress incoming-interface ifp-0/0/4
set l2x name test4 ingress outgoing-interface ifp-0/0/8
set l2x name test4 ingress match-type match-untagged


set l2x name test4 ingress
set l2x name test4 ingress incoming-interface ifp-0/0/4
set l2x name test4 ingress outgoing-interface ifp-0/0/8
set l2x name test4 ingress match-type match-untagged
set l2x name test4 ingress ingress-vlan-operation Single-Vlan-Add
set l2x name test4 ingress ingress-outer-vlan 100

set l2x name test4 ingress
set l2x name test4 ingress incoming-interface ifp-0/0/4
set l2x name test4 ingress nexthop4 10.1.1.2
set l2x name test4 ingress lookup-instance default
set l2x name test4 ingress lookup-afi ipv4
set l2x name test4 ingress lookup-safi labeled-unicast
set l2x name test4 ingress service-label 1000
set l2x name test4 ingress match-type match-untagged
set l2x name test4 ingress ingress-vlan-operation Single-Vlan-Add
set l2x name test4 ingress ingress-outer-vlan 200
```

2.3.3. Port and Outer VLAN (ifp, outer_vlan))

You can run the following commands in this mode:

```
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> incoming-outer-vlan <vlan-id>

set l2x name <l2x-name> <direction> incoming-interface <incoming-interface>

set l2x name <l2x-name> <direction> outgoing-interface <outgoing-interface>
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> incoming-outer-vlan <vlan-id>

set l2x name <l2x-name> <direction> incoming-interface <incoming-interface>

set l2x name <l2x-name> <direction> outgoing-interface <outgoing-interface>

set l2x name <l2x-name> <direction> egress-vlan-operation <vlan-action>

set l2x name <l2x-name> <direction> outgoing-outer-vlan <vlan-id>
```

```
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> incoming-outer-vlan <vlan-id>

set l2x name <l2x-name> <direction> incoming-interface <incoming-interface>

set l2x name <l2x-name> <direction> nexthop4/nexthop6 <nexthop>

set l2x name <l2x-name> <direction> lookup-instance <lookup-instance>

set l2x name <l2x-name> <direction> lookup-afi <lookup-afi>

set l2x name <l2x-name> <direction> lookup-safi <lookup-safi>

set l2x name <l2x-name> <direction> service-label <service_label>
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> incoming-outer-vlan <vlan-id>

set l2x name <l2x-name> <direction> incoming-interface <incoming-interface>

set l2x name <l2x-name> <direction> ingress-vlan-operation <ingress-vlan-action>

set l2x name <l2x-name> <direction> ingress-outer-vlan <vlan-id>

set l2x name <l2x-name> <direction> ingress-vlan-encapsulation <encapsulation>

set l2x name <l2x-name> <direction> nexthop4/nexthop6 <nexthop>

set l2x name <l2x-name> <direction> lookup-instance <lookup-instance>

set l2x name <l2x-name> <direction> lookup-afi <lookup-afi>

set l2x name <l2x-name> <direction> lookup-safi <lookup-safi>

set l2x name <l2x-name> <direction> service-label <service_label>
```

Command Arguments

See the Command Arguments section.

Configuration Example

```
set l2x name test4 ingress
set l2x name test4 ingress incoming-interface ifp-0/0/4
set l2x name test4 ingress incoming-outer-vlan 100
set l2x name test4 ingress outgoing-interface ifp-0/0/8


set l2x name test4 ingress
set l2x name test4 ingress incoming-interface ifp-0/0/4
set l2x name test4 ingress incoming-outer-vlan 200
set l2x name test4 ingress outgoing-interface ifp-0/0/8
set l2x name test4 ingress ingress-vlan-operation Single-Vlan-Add
set l2x name test4 ingress ingress-outer-vlan 100


set l2x name test4 ingress
set l2x name test4 ingress incoming-interface ifp-0/0/4
set l2x name test4 ingress incoming-outer-vlan 300
set l2x name test4 ingress nexthop4 10.1.1.2
set l2x name test4 ingress lookup-instance default
set l2x name test4 ingress lookup-afi ipv4
set l2x name test4 ingress lookup-safi labeled-unicast
set l2x name test4 ingress service-label 1000
set l2x name test4 ingress ingress-vlan-operation Single-Vlan-Add
set l2x name test4 ingress ingress-outer-vlan 100


set l2x name test4 ingress
set l2x name test4 ingress incoming-interface ifp-0/0/4
set l2x name test4 ingress incoming-outer-vlan 400
set l2x name test4 ingress nexthop4 10.1.1.2
set l2x name test4 ingress lookup-instance default
set l2x name test4 ingress lookup-afi ipv4
set l2x name test4 ingress lookup-safi labeled-unicast
set l2x name test4 ingress service-label 2000
```

2.3.4. Port and Dual VLAN Tags (ifp, outer_vlan, inner_vlan)

You can run the following commands in this mode:

```
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> incoming-outer-vlan <vlan-id>

set l2x name <l2x-name> <direction> incoming-inner-vlan <vlan-id>

set l2x name <l2x-name> <direction> incoming-interface <incoming-interface>

set l2x name <l2x-name> <direction> outgoing-interface <outgoing-interface>
```

```
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> incoming-outer-vlan <vlan-id>

set l2x name <l2x-name> <direction> incoming-inner-vlan <vlan-id>

set l2x name <l2x-name> <direction> incoming-interface <incoming-interface>

set l2x name <l2x-name> <direction> outgoing-interface <outgoing-interface>

set l2x name <l2x-name> <direction> egress-vlan-operation <vlan-action>

set l2x name <l2x-name> <direction> outgoing-outer-vlan <vlan-id>
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> incoming-outer-vlan <vlan-id>

set l2x name <l2x-name> <direction> incoming-inner-vlan <vlan-id>

set l2x name <l2x-name> <direction> incoming-interface <incoming-interface>

set l2x name <l2x-name> <direction> nexthop4/nexthop6 <nexthop>

set l2x name <l2x-name> <direction> lookup-instance <lookup-instance>

set l2x name <l2x-name> <direction> lookup-afi <lookup-afi>

set l2x name <l2x-name> <direction> lookup-safi <lookup-safi>

set l2x name <l2x-name> <direction> service-label <service_label>
```

```
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> incoming-outer-vlan <vlan-id>

set l2x name <l2x-name> <direction> incoming-inner-vlan <vlan-id>

set l2x name <l2x-name> <direction> incoming-interface <incoming-interface>

set l2x name <l2x-name> <direction> ingress-vlan-operation <ingress-vlan-action>

set l2x name <l2x-name> <direction> ingress-outer-vlan <vlan-id>

set l2x name <l2x-name> <direction> ingress-vlan-encapsulation <encapsulation>

set l2x name <l2x-name> <direction> nexthop4/nexthop6 <nexthop>

set l2x name <l2x-name> <direction> lookup-instance <lookup-instance>

set l2x name <l2x-name> <direction> lookup-afi <lookup-afi>

set l2x name <l2x-name> <direction> lookup-safi <lookup-safi>

set l2x name <l2x-name> <direction> service-label <service_label>
```

Command Arguments

See the Command Arguments section.

Configuration Example

```
set l2x name test4 ingress
set l2x name test4 ingress incoming-interface ifp-0/0/4
set l2x name test4 ingress incoming-outer-vlan 100
set l2x name test4 ingress incoming-inner-vlan 500
set l2x name test4 ingress outgoing-interface ifp-0/0/8

set l2x name test4 ingress
set l2x name test4 ingress incoming-interface ifp-0/0/4
set l2x name test4 ingress incoming-outer-vlan 200
set l2x name test4 ingress incoming-inner-vlan 600
set l2x name test4 ingress outgoing-interface ifp-0/0/8
set l2x name test4 ingress ingress-vlan-operation Single-Vlan-Add
set l2x name test4 ingress ingress-outer-vlan 100

set l2x name test4 ingress
set l2x name test4 ingress incoming-interface ifp-0/0/4
set l2x name test4 ingress incoming-outer-vlan 300
set l2x name test4 ingress incoming-inner-vlan 700
set l2x name test4 ingress nexthop4 10.1.1.2
set l2x name test4 ingress lookup-instance default
set l2x name test4 ingress lookup-afi ipv4
set l2x name test4 ingress lookup-safi labeled-unicast
set l2x name test4 ingress service-label 1000
set l2x name test4 ingress ingress-vlan-operation Single-Vlan-Add
set l2x name test4 ingress ingress-outer-vlan 100

set l2x name test4 ingress
set l2x name test4 ingress incoming-interface ifp-0/0/4
set l2x name test4 ingress incoming-outer-vlan 400
set l2x name test4 ingress incoming-inner-vlan 800
set l2x name test4 ingress nexthop4 10.1.1.2
set l2x name test4 ingress lookup-instance default
set l2x name test4 ingress lookup-afi ipv4
set l2x name test4 ingress lookup-safi labeled-unicast
set l2x name test4 ingress service-label 2000
```

2.3.5. Port + Outer VLAN + Inner VLAN Any (ifp, outer_vlan, any inner_vlan)

You can run the following commands in this mode:

```
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> incoming-outer-vlan <vlan-id>

set l2x name <l2x-name> <direction> match-type match-inner-any

set l2x name <l2x-name> <direction> incoming-interface <incoming-interface>

set l2x name <l2x-name> <direction> outgoing-interface <outgoing-interface>
```

```
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> incoming-outer-vlan <vlan-id>

set l2x name <l2x-name> <direction> match-type match-inner-any

set l2x name <l2x-name> <direction> incoming-interface <incoming-interface>

set l2x name <l2x-name> <direction> outgoing-interface <outgoing-interface>

set l2x name <l2x-name> <direction> egress-vlan-operation <vlan-action>

set l2x name <l2x-name> <direction> outgoing-outer-vlan <vlan-id>
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> incoming-outer-vlan <vlan-id>

set l2x name <l2x-name> <direction> match-type match-inner-any

set l2x name <l2x-name> <direction> incoming-interface <incoming-interface>

set l2x name <l2x-name> <direction> nexthop4/nexthop6 <nexthop>

set l2x name <l2x-name> <direction> lookup-instance <lookup-instance>

set l2x name <l2x-name> <direction> lookup-afi <lookup-afi>

set l2x name <l2x-name> <direction> lookup-safi <lookup-safi>

set l2x name <l2x-name> <direction> service-label <service_label>
```

```
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> incoming-outer-vlan <vlan-id>

set l2x name <l2x-name> <direction> match-type match-inner-any

set l2x name <l2x-name> <direction> incoming-interface <incoming-interface>

set l2x name <l2x-name> <direction> ingress-vlan-operation <ingress-vlan-action>

set l2x name <l2x-name> <direction> ingress-outer-vlan <vlan-id>

set l2x name <l2x-name> <direction> ingress-vlan-encapsulation <encapsulation>

set l2x name <l2x-name> <direction> nexthop4/nexthop6 <nexthop>

set l2x name <l2x-name> <direction> lookup-instance <lookup-instance>

set l2x name <l2x-name> <direction> lookup-afi <lookup-afi>

set l2x name <l2x-name> <direction> lookup-safi <lookup-safi>

set l2x name <l2x-name> <direction> service-label <service_label>
```

Command Arguments

See the Command Arguments section.

Configuration Example

```
set l2x name test4 ingress
set l2x name test4 ingress incoming-interface ifp-0/0/4
set l2x name test4 ingress incoming-outer-vlan 100
set l2x name test4 ingress outgoing-interface ifp-0/0/8
set l2x name test4 ingress match-type match-inner-any

set l2x name test4 ingress
set l2x name test4 ingress incoming-interface ifp-0/0/4
set l2x name test4 ingress incoming-outer-vlan 200
set l2x name test4 ingress outgoing-interface ifp-0/0/8
set l2x name test4 ingress match-type match-inner-any
set l2x name test4 ingress ingress-vlan-operation Single-Vlan-Add
set l2x name test4 ingress ingress-outer-vlan 100

set l2x name test4 ingress
set l2x name test4 ingress incoming-interface ifp-0/0/4
set l2x name test4 ingress incoming-outer-vlan 200
set l2x name test4 ingress nexthop4 10.1.1.2
set l2x name test4 ingress lookup-instance default
set l2x name test4 ingress lookup-afi ipv4
set l2x name test4 ingress lookup-safi labeled-unicast
set l2x name test4 ingress service-label 1000
set l2x name test4 ingress match-type match-inner-any
set l2x name test4 ingress ingress-vlan-operation Single-Vlan-Add
set l2x name test4 ingress ingress-outer-vlan 100

set l2x name test4 ingress
set l2x name test4 ingress incoming-interface ifp-0/0/4
set l2x name test4 ingress incoming-outer-vlan 400
set l2x name test4 ingress nexthop4 10.1.1.2
set l2x name test4 ingress lookup-instance default
set l2x name test4 ingress lookup-afi ipv4
set l2x name test4 ingress lookup-safi labeled-unicast
set l2x name test4 ingress service-label 2000
```

2.3.6. L2X with Exit Interface

> This configuration is applicable only for link-local nexthop6 address.

To configure L2X with exit interface, enter the following command:

Syntax

```
set l2x name <l2x-name> <direction> exit-interface <exit-interface>
```

Command Arguments

Command Argument	Description
<l2x-name>	Name of the Layer 2 Cross-Connect
<direction>	Indicates the direction of the traffic, that is egress or ingress
<exit-interface>	Name of the exit interface.

Example

```
set l2x name test4 ingress exit-interface ifl-0/0/52/13
```

2.4. Egress Interface Action

In the Egress direction, incoming-interface is not required, and RBFS supports the below commands.

```
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> service-label <service_label>

set l2x name <l2x-name> <direction> outgoing-interface <outgoing-interface>
```

```
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> service-label <service_label>

set l2x name <l2x-name> <direction> outgoing-interface <outgoing-interface>

set l2x name <l2x-name> <direction> egress-vlan-operation <vlan-action>

set l2x name <l2x-name> <direction> outgoing-outer-vlan <vlan-id>
```

Command Arguments

See the Command Arguments section.

Configuration Example

```
set l2x name test4 egress
set l2x name test4 egress service-label 1234
set l2x name test4 egress outgoing-interface ifp-0/0/8

set l2x name test4 egress
set l2x name test4 egress service-label 1234
set l2x name test4 egress outgoing-interface ifp-0/0/8
set l2x name test4 egress egress-vlan-operation Single-Vlan-Add
set l2x name test4 egress outgoing-outer-vlan 100
```

2.5. Support for Bidirectional Local Cross Connect

In the earlier releases of RBFS, to establish cross connection between two ports, there was a need to install two l2x configurations, that is, one connection for the ifp1 to ifp2 and another connection for ifp2 to to ifp1.

With bidirectional cross connect, you can establish cross connection between two local ports say ifp1 □□ ifp2 with single l2x configuration.

To support this feature, the existing L2X commands are extended to accept “bi-directional” direction attribute, and this bi-directional attribute is applicable to only for local cross connect. If bi-directional direction is used for remote cross connect (that is, if nexthop4, nexthop6 or service-label is present) configuration will fail with an error.

> ℹ The VLAN operations are not supported for bi-directional local cross connect.

Syntax

```
set l2x name <l2x-name> <direction>

set l2x name <l2x-name> <direction> match-type <match-type>

set l2x name <l2x-name> <direction> incoming-interface <incoming-interface>

set l2x name <l2x-name> <direction> outgoing-interface <outgoing-interface>
```

Example

```
set l2x name test4 bi-directional
set l2x name test4 bi-directional incoming-interface ifp-0/0/4
set l2x name test4 bi-directional outgoing-interface ifp-0/0/8
set l2x name test4 bi-directional match-type match-any
```

The following example shows the show running-configuration in JSON format.

```
{
"data": {
"rtbrick-config:l2x": {
"name": [
{
"name": "test4",
"direction": "bi-directional",
"incoming-interface": "ifp-0/0/4",
"outgoing-interface": "ifp-0/0/8",
"match-type": "match-any"
}
]
}
}
}
```

2.6. Deleting L2x Configuration

To delete the L2X configuration, enter the following command:

Syntax

```
delete l2x name <l2x-name> <direction>
```

Command Arguments

Command Argument	Description
<l2x-name>	Name of the Layer 2 Cross-Connect
<direction>	Indicates the direction of the traffic, that is egress or ingress

Example

```
delete l2x name test4 bi-directional
```

2.7. Clearing Statistics

By clearing the L2X statistics and interface physical counters, you can reset all of the previous packet statistics and counters.

2.7.1. Clearing L2X statistics

To clear the statistics, enter the following command:

```
rtb fibd clear bcm l2x statistics
```

3. Viewing the L2X Configuration

The L2X show commands display data from FIB local table. Therefore local L2X with down ports or remote l2x with unresolved nexthop address are note displayed.

3.1. Summary Commands

The summary commands display L2X information in tabular format. Key information will be displayed in the summary output.

> Since the availability of space is less in the summary output, the L2X name will be truncated after certain length. In such cases, you can refer detail command output where full name will be printed.

3.1.1. show l2x

This command displays all l2x configuration information such as ingress l2x and egress l2x.

Syntax

```
show l2x
```

Example

```
supervisor@rtbrick: op> show l2x
Name                           Direction  Incoming Intf        Outgoing
Intf/Next Hop    Outer VLAN       Inner VLAN     Service label
test2                          egress     -                    ifp-0/0/4
-                -              1234
test1                          ingress    ifp-0/0/4            ifp-0/0/10
Any              Any            -
```

3.1.2. show l2x <l2x-name>

This command displays the L2X configuration of the specified l2x-name.

Syntax

```
show l2x <l2x-name>
```

Example

```
supervisor@rtbrick: op> show l2x test2
Name                           Direction  Incoming Intf        Outgoing
Intf/Next Hop    Outer VLAN       Inner VLAN    Service label
test2                          egress     -                    ifp-0/0/4
-                -             1234
```

3.1.3. show l2x type <type>

This command displays the L2X configuration of the specified type, where the type can be local or remote.

Syntax

show l2x type <type>

Example

```
supervisor@rtbrick: op> show l2x type local
Name                           Direction  Incoming Intf        Outgoing
Intf/Next Hop    Outer VLAN       Inner VLAN    Service label
test1                          ingress    ifp-0/0/4            ifp-0/0/10
Any              Any           -
```

```
supervisor@rtbrick: op> show l2x type remote
Name                           Direction  Incoming Intf        Outgoing
Intf/Next Hop    Outer VLAN       Inner VLAN    Service label
test2                          egress     -                    ifp-0/0/4
-                -             1234
```

3.1.4. show l2x type <type> <l2x-name>

This command displays the L2X information of the specified type l2x-name.

Syntax

show l2x type <type> <l2x-name>

Example

```
supervisor@rtbrick: op> show l2x type remote test2
Name                           Direction  Incoming Intf        Outgoing
Intf/Next Hop    Outer VLAN       Inner VLAN    Service label
test2                          egress     -                    ifp-0/0/4
-                -             1234
```

3.1.5. show l2x direction <direction>

This command displays L2X information of the specified direction, where direction can be ingress, egress or bi-directional.

Syntax

show l2x direction <direction>

Example

```
supervisor@rtbrick: op> show l2x direction ingress
Name                           Direction  Incoming Intf        Outgoing
Intf/Next Hop    Outer VLAN       Inner VLAN    Service label
test1                          ingress    ifp-0/0/4            ifp-0/0/10
Any              Any           -
```

3.1.6. show l2x direction <direction> <l2x-name>

This command displays L2X information of the specified direction and l2x-name.

Syntax

show l2x direction <direction> <l2x-name>

Example

```
supervisor@rtbrick: op> show l2x direction egress test2
Name                           Direction  Incoming Intf        Outgoing
Intf/Next Hop    Outer VLAN       Inner VLAN    Service label
test2                          egress     -                    ifp-0/0/4
-                -             1234
```

3.2. Detail commands

The following commands provided detailed information L2X.

3.2.1. show l2x detail

Similar to the summary output, this command displays all L2X information in detailed format.

Syntax

```
show l2x detail
```

Example

```
supervisor@rtbrick: op> show l2x detail
L2X name: test2
  Direction: egress
  Outgoing interface: ifp-0/0/4
  Service label: 1234
  Subtype: Service Label Match
  Incoming outer VLAN: -
  Incoming inner VLAN: -
  Ingress vlan operation:
  NextHop:
    NextHop type: Remote egress cross connect
    NextHop action: No vlan manipulation - l2 forward
  Egress vlan operation:
L2X name: test1
  Direction: ingress
  Incoming interface: ifp-0/0/4
  Outgoing interface: ifp-0/0/10
  Subtype: Incoming Port - Any Vlan Match
  Incoming outer VLAN: Any
  Incoming inner VLAN: Any
  Ingress vlan operation:
  NextHop:
    NextHop type: Local egress cross connect
    NextHop action: No vlan manipulation - l2 forward
  Egress vlan operation:
```

3.2.2. show l2x <l2x-name> detail

This command displays detailed l2x information of the specified l2x-name.

Syntax

show l2x <l2x-name> **detail**

Example

```
supervisor@rtbrick: op> show l2x test1 detail
L2X name: test1
  Direction: ingress
  Incoming interface: ifp-0/0/4
  Outgoing interface: ifp-0/0/10
  Subtype: Incoming Port - Any Vlan Match
  Incoming outer VLAN: Any
  Incoming inner VLAN: Any
  Ingress vlan operation:
  NextHop:
    NextHop type: Local egress cross connect
    NextHop action: No vlan manipulation - l2 forward
  Egress vlan operation:
```

3.2.3. show l2x type <type> <l2x-name> detail

This command displays detailed L2X information of the specified type and l2x-name.

Syntax

show l2x type <type> <l2x-name> **detail**

Example

```
supervisor@rtbrick: op> show l2x type local test1 detail
L2X name: test1
  Direction: ingress
  Incoming interface: ifp-0/0/4
  Outgoing interface: ifp-0/0/10
  Subtype: Incoming Port - Any Vlan Match
  Incoming outer VLAN: Any
  Incoming inner VLAN: Any
  Ingress vlan operation:
  NextHop:
    NextHop type: Local egress cross connect
    NextHop action: No vlan manipulation - l2 forward
  Egress vlan operation:
```

3.2.4. show l2x direction <direction> <l2x-name> detail

This command displays detailed L2X information of the specified direction and l2x-name.

Syntax

show l2x direction <direction> <l2x-name> **detail**

Example

```
supervisor@rtbrick: op> show l2x direction egress test2 detail
L2X name: test2
  Direction: egress
  Outgoing interface: ifp-0/0/4
  Service label: 1234
  Subtype: Service Label Match
  Incoming outer VLAN: -
  Incoming inner VLAN: -
  Ingress vlan operation:
  NextHop:
    NextHop type: Remote egress cross connect
    NextHop action: No vlan manipulation - l2 forward
  Egress vlan operation:
```

3.3. L2X Statistics Commands

The following commands enable you to verify l2x statistics.

3.3.1. show l2x statistics

This command displays statistics of all the installed L2X.

Syntax

show l2x statistics

Example

```
supervisor@rtbrick: op> show l2x statistics

L2X Name: l2x-test1/0
    Physical Interface Name: ifp-0/0/4
    Logical Interface Type: L2x ingress vlan interface
    Port-Mapping-Core: 0
    Vlan-Port-ID: 1149251592
    MPLS-Port-ID: N/A
    Counters:
        In-Forward-Packets: 57
        In-Forward-Bytes: 5700
        In-Drop-Packets: 0
        In-Drop-Bytes: 0
        Out-Forward-Packets: 0
        Out-Forward-Bytes: 0
        Out-Drop-Packets: 0
        Out-Drop-Bytes: 0
L2X Name: l2x-d3b529d74770f91fb2acf5e38da70eb9213473dd7e996c6a
    Physical Interface Name: ifp-0/0/10
    Logical Interface Type: L2x egress vlan interface
    Port-Mapping-Core: 0
    Vlan-Port-ID: 1149251591
    MPLS-Port-ID: N/A
    Counters:
        In-Forward-Packets: 0
        In-Forward-Bytes: 0
        In-Drop-Packets: 0
        In-Drop-Bytes: 0
        Out-Forward-Packets: 0
        Out-Forward-Bytes: 0
        Out-Drop-Packets: 0
        Out-Drop-Bytes: 0
```

3.3.2. show l2x statistics <l2x-name>

This command displays statistics of the specified l2x-name.

Syntax

```
show l2x statistics <l2x-name>
```

Example

```
supervisor@rtbrick: op> show l2x statistics l2x-test1/0
L2X Name: l2x-test1/0
    Physical Interface Name: ifp-0/0/4
    Logical Interface Type: L2x ingress vlan interface
    Port-Mapping-Core: 0
    Vlan-Port-ID: 1149251592
    MPLS-Port-ID: N/A
    Counters:
        In-Forward-Packets: 61
        In-Forward-Bytes: 6100
        In-Drop-Packets: 0
        In-Drop-Bytes: 0
        Out-Forward-Packets: 0
        Out-Forward-Bytes: 0
        Out-Drop-Packets: 0
        Out-Drop-Bytes: 0
```

3.3.3. L2X clear statistics

The following commands allow you to clear L2X statistics.

3.3.4. clear l2x statistics

This command allows you to clear all L2X statistics.

Syntax

clear l2x statistics

Example

```
supervisor@rtbrick: op> clear l2x statistics
```

3.3.5. clear l2x statistics <l2x-name>

This command allows you to clear the statistics of the specified l2x-name.

Syntax

clear l2x statistics <l2x-name>

Example

```
supervisor@rtbrick: op> clear l2x statistics l2x-test1/0
```