Link Aggregation Groups (LAG) User Guide

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Registered Address	Support	Sales
26, Kingston Terrace, Princeton, New Jersey 08540, United States		
		+91 80 4850 5445
http://www.rtbrick.com	support@rtbrick.com	sales@rtbrick.com

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1. Overview

A link aggregation group (LAG) combines multiple physical links into a single logical interface which is referred to as a bundle interface. These physical links are connected between two devices. The device uses LACP protocol to bundle the member links and create high speed connections. Although a bundle can be created based on static configuration, bandwidth can be increased by adding member links to the bundle. This also allows load sharing among the physical links. Thus, a group of ports combined together is called a link aggregation group, or LAG.

The LAG interface combines the bandwidth of the individual member links. The properties like speed and bandwidth of the individual member links should be the same to make it part of that LAG. The traffic which is directed towards the LAG interface is sent on the individual member links. This traffic is not pinned to a specific member link but rather determined by a specific flow. This hash could be calculated based on various fields in the packet.

1.1. Supported Platforms

Not all features are necessarily supported on each hardware platform. Refer to the *Platform Guide* for the features and the sub-features that are or are not supported by each platform.

1.2. LAG Interface Modes

The LAG interface could be formed statically or dynamically. LACP protocol helps to bring up the interface dynamically. The two modes of LAG interface are:

1. **Static LAG**: In this mode, the member links do not initiate or process any of the LACP packets received. The device brings up the LAG interface without LACP negotiation.
2. **Dynamic LAG**: In this mode, the member links process the LACP packets received. Under this mode, there two sub modes:
    a. **active**: LACP packets are generated on each of the member links on the transmit side.
    b. **passive**: LACP packets are generated on the member link in response to the LACP packet received. That means, at least one side of the LAG should be configured as active to bring up the LAG interface.

1.3. Layer2 and Layer 3 Interfaces

LAG interfaces can be used as layer 2 and layer 3 interfaces. A regular layer 2 or layer 3 interface can be created on top of the single LAG interface. These interfaces can be divided based on 802.1q VLAN ID's. Multiple layer 3 interfaces can be

created and each of them can be associated with different instances.

1.4. LACP (Link Aggregation Control Protocol)

LACP is part of an IEEE specification (802.3ad) that allows several physical ports to be grouped to form a single logical interface. LACP allows a switch to negotiate an LAG by sending LACP packets on its member links. It negotiates the various configuration parameters to bring up the individual member links.

1.5. Guidelines and Limitations

- You cannot configure logical interfaces on a LAG member ports.
- You cannot configure L2X on a LAG member port.

2. Configuring Link Aggregation Groups (LAGs)

2.1. Creating LAG Interfaces

Syntax:

set link-aggregation interface <name> <attribute> <value>

Attribute	Description
<name>	Specifies the name of the LAG interface. The supported LAG interface names: 'lag-1' to 'lag-99'.
<description>	Link aggregation interface description
mode <mode>	Specifies the LAG mode. The default mode is LACP. The possible modes are: • lacp - In this mode, the member links processes LACP packets received. When you create a LAG interface in LACP mode, the LACP PDUs are sent and received through member interfaces. • static: In this mode, the member links do not initiate or process any of the LACP packets received.
<minimum-link-count>	Minimum number of active member links required for the link aggregation interface.
<admin-status>	Administrative status of the link aggregation interface.

Example: LAG Interfaces Configuration

```
supervisor@rtbrick: cfg> show config link-aggregation
{
    "rtbrick-config:link-aggregation": {
      "interface": [
        {
          "interface-name": "lag-3",
          "mode": "lacp",
          "minimum-link-count": 2,
          "member-interface": [
            {
              "member-interface-name": "ifp-0/0/1",
              "lacp-mode": "active"
            },
            {
              "member-interface-name": "ifp-0/0/5",
              "lacp-mode": "active"
            }
          ]
        }
      ]
    }
  }
```

2.2. Configuring LAG Member Interfaces

You can add member ports to the LAG interface. The command below allows you to bundle multiple physical interfaces with similar properties like speed, MTU, MRU.

Syntax:

set link-aggregation interface <name> **member-interface** <name> <attribute> <value>

Attribute	Description
lacp-mode <mode>	Specifies the LACP mode. The default lacp-mode is active. **active**: LACP packets are generated on each of the member links on the trad, the receive side. **passive**: LACP packets are generated on the member link in response to the LACP packet received at one side of the LAG should be configured as active to bring the LAG interface.
lacp-timeout <timeout-value>	Specifies the timeout for the LACP session. The default long time-out value is 90 seconds; short is 3 seconds. The default lacp-timeout is short.

2.3. Configuring QoS on LAG Interface

RBFS supports QoS at physical interface level for LAG. Users can apply QoS profile at physical interface level through which one common QoS classification can be applied for all traffic on that port, irrespective of the destination logical interface.

The following features are supported:

- Classification (IEEE-802.1)
- Remarking (IEEE-802.1)
- Ingress Policing
- Egress Policing

For information about configuring the above features, refer the *HQoS Configuration Guide*.

- You cannot apply QoS class of service on LAG logical interface
- Currently, queuing and scheduling are not supported

Syntax:

```
set interface <physical interface> class-of-service <class-of-service>
```

Attribute	Description
<interface>	Name of the interface
<class-of-service>	Specifies the class of service

Example:

```
supervisor@rtbrick: cfg> set interface lag-11 class-of-service Retail_profile
supervisor@rtbrick: cfg> commit
supervisor@rtbrick: cfg> show config int lag-11
{
    "rtbrick-config:interface": [
      {
        "name": "lag-11",
        "class-of-service": "Retail_profile"
      }
    ]
  }
supervisor@rtbrick: cfg>
```

2.4. Configuring L2X on LAG Interface

All forms of L2X that are supported on the regular physical interfaces are supported on LAG. The incoming packet is be matched to a specific L2X profile based on the Cross Connect configuration on the specified LAG interface.

The following match conditions are supported on the LAG interface:

- Incoming LAG interface without any VLAN
- Incoming LAG interface with a single VLAN
- Incoming LAG interface with inner and Outer VLAN
- Incoming LAG interface with any single VLAN
- Incoming LAG interface with inner VLAN and any outer VLAN

For information about configuring L2X, see the L2X Configuration Guide.

3. LAG Operational Commands

3.1. Show Commands

3.1.1. Viewing LAG Running Configuration

The following command displays the LAG running configuration on the system.

Syntax:

```
show config link-aggregation
```

Example: LAG Running Configuration

```
supervisor@dev1: cfg> show config link-aggregation
{
  "rtbrick-config:link-aggregation": {
    "interface": [
      {
        "interface-name": "lag-4",
        "mode": "lacp",
        "minimum-link-count": 4,
        "member-interface": [
          {
            "member-interface-name": "ifp-0/0/1",
            "lacp-mode": "active",
            "lacp-timeout": "long"
          },
          {
            "member-interface-name": "ifp-0/0/4",
            "lacp-mode": "active",
            "lacp-timeout": "long"
          }
        ]
      }
    ]
  }
}
```

3.1.2. Viewing LAG Information

The following command displays the LAG information.

Syntax:

show lag <options>

Option	Description
<interface-name>	Displays information for a specific LAG interface
detail	Displays detailed LAG information
mode <mode>	Displays information for a LAG mode: static or LACP

Example: Viewing LAG Information

```
supervisor@rtbrick: cfg> show lag detail

  Lag interface name: lag-3
  Status:             Up
  Minimum link count: 2
  Mode:               lacp
    Member interface name: ifp-0/0/1
      Actor system id: 04:f8:f8:e9:bc:83
      Actor key: 107
      Partner system id: 04:f8:f8:e9:bf:83
      Partner key: 43
    Member interface name: ifp-0/0/5
      Actor system id: 04:f8:f8:e9:bc:83
      Actor key: 107
      Partner system id: 04:f8:f8:e9:bf:83
      Partner key: 43
```