Port Channels and LACP

This chapter describes channel groups, port channels, port channel interfaces, and the Link Aggregation Control Protocol (LACP). This chapter contains the following sections:

- Section 11.1: Port Channel Introduction
- Section 11.2: Port Channel Conceptual Overview
- Section 11.3: Port Channel Configuration Procedures
- Section 11.4: Load Balancing Hash Algorithms
- Section 11.5: Port Channel and LACP Configuration Commands

11.1 Port Channel Introduction

Arista’s switching platforms support industry-standard link aggregation protocols. Arista switches optimize traffic throughput by using MAC addressing, IP addressing, and services fields to effectively load share traffic across aggregated links. Managers can configure multiple ports into a logical port channel, either statically or dynamically through the IEEE Link Aggregation Control Protocol (LACP). Various negotiation modes are supported to accommodate different configurations and peripheral requirements, including LACP fallback to support devices that need simple network connectivity to retrieve images or configurations prior to engaging port channel aggregation modes.

Arista’s Multi-chassis Link Aggregation protocol (MLAG) supports LAGs across paired Arista switches to provide both link aggregation and active/active redundancy.

11.2 Port Channel Conceptual Overview

11.2.1 Channel Groups and Port Channels

A port channel is a communication link between two switches supported by matching channel group interfaces on each switch. A port channel is also referred to as a Link Aggregation Group (LAG). Port channels combine the bandwidth of multiple Ethernet ports into a single logical link.

A channel group is a collection of Ethernet interfaces on a single switch. A port channel interface is a virtual interface that serves a corresponding channel group and connects to a compatible interface on another switch to form a port channel. Port channel interfaces can be configured and used in a manner similar to Ethernet interfaces. Port channel interfaces are configurable as layer 2 interfaces, layer 3 (routable) interfaces, and VLAN members. Most Ethernet interface configuration options are also available to port channel interfaces.
11.2.2 Port Channel Subinterfaces

Port channel subinterfaces divide a single port channel interface into multiple logical L3 interfaces based on the 802.1q tag (VLAN ID) of incoming traffic. Subinterfaces are commonly used in the L2/L3 boundary device, but they can also be used to isolate traffic with 802.1q tags between L3 peers by assigning each subinterface to a different VRF.

For further details about subinterfaces, see Subinterfaces.

11.2.3 Link Aggregation Control Protocol (LACP)

The Link Aggregation Control Protocol (LACP), described by IEEE 802.3ad, defines a method for two switches to automatically establish and maintain link aggregation groups (LAGs). When LACP is enabled, a switch can configure LACP-compatible ports into a LAG (also called a channel group); the maximum number of ports per LAG varies by platform (numbers for each platform in the latest EOS release are available here: https://www.arista.com/en/support/product-documentation/supported-features).

Static LAGs

In static mode, switches create LAGs without awareness of their partners’ port channels. Packets may drop when static LAG configurations differ between switches. The switch aggregates static links without LACP negotiation. The switches do not send LACP packets, and do not process inbound LACP packets.

Dynamic LAGs

In dynamic mode, LAGs are aware of their partners’ port-channel states. Interfaces configured as dynamic LAGs are designated as active or passive.

- **Active interfaces** send LACP Protocol Data Units (LACP PDUs) at a rate of one per second when forming a channel with an interface on the peer switch. An aggregate forms if the peer runs LACP in active or passive mode.

- **Passive interfaces** only send LACP PDUs in response to PDUs received from the partner. The partner switch must be in active mode and initiates negotiation by sending a LACP packet. The passive mode switch receives and responds to the packet to form a LAG.

An active interface can form port channels with passive or active partner interfaces, but port channels are not formed when the interface on each switch is passive. Table 11-1 summarizes the valid LACP mode combinations:

### Table 11-1 Valid LACP Mode Combinations

<table>
<thead>
<tr>
<th>Switch 1</th>
<th>Switch 2</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>active</td>
<td>active</td>
<td>Links aggregate when LACP negotiation is successful.</td>
</tr>
<tr>
<td>active</td>
<td>passive</td>
<td>Links aggregate when LACP negotiation is successful.</td>
</tr>
<tr>
<td>passive</td>
<td>passive</td>
<td>Links aggregate without LACP.</td>
</tr>
<tr>
<td>on</td>
<td>—</td>
<td>Links aggregate without LACP.</td>
</tr>
</tbody>
</table>

During synchronization, interfaces transmit one LACP PDU per second. After synchronization is complete, interfaces exchange one PDU every thirty seconds, facilitated by a default timeout of 30 seconds and a failure tolerance of three. Under these parameters, when the switch does not receive a LACP PDU for an interface during a ninety-second period, it records the partner interface as failed and removes the interface from the port channel.
Falback Mode

An active interface that is not in fallback mode does not form a LAG until it receives PDUs from, and negotiates with its peer. Fallback Mode allows an active LACP interface to maintain a LAG without receiving PDUs from its peer. The fallback timer specifies the period the LAG waits to receive a peer PDU. Upon timer expiry, the port channel reverts to its configured fallback mode if one is configured.

**Static fallback:** the port channel maintains one active port while in fallback mode; all its other member ports are in standby mode until a LACP PDU is received by the port channel. All member ports send (and can receive) LACP PDUs, but only the active port sends or receives data.

**Individual fallback:** all member ports act as individual switch ports while in fallback mode. Individual port configuration (rather than port channel configuration) is active while the port channel is in fallback mode, with the exception of ACLs. This includes VLAN membership. All member ports send and receive data, and continue to send LACP PDUs. As soon as a LACP PDU is received by a member of the port channel, all ports revert to normal port channel operation.

The switch uses a link aggregation hash algorithm to determine the forwarding path within a Link Aggregation Group. The IP and MAC header fields can be selected as components of the hash algorithm.
11.3 Port Channel Configuration Procedures

These sections describe channel group and port channel configuration procedures:

- Section 11.3.1: Configuring a Channel Group
- Section 11.3.2: Configuring a Port Channel Interface
- Section 11.3.4: Configuring LACP

11.3.1 Configuring a Channel Group

Creating a Channel Group

The `channel-group` command assigns the configuration mode Ethernet interfaces to a channel group and specifies LACP attributes for the channel.

Channel groups are associated with a port channel interface immediately upon their creation. A command that creates a new channel group also creates a port channel with a matching ID. The port channel is configured in port-channel configuration mode. Configuration changes to a port channel interface propagate to all Ethernet interfaces in the corresponding channel group.

Example

- These commands assign Ethernet interfaces 1 and 2 to channel group 10, enable LACP, and place the channel group in a negotiating state:
  ```
  switch(config)#interface ethernet 1-2
  switch(config-if-Et1-2)#channel-group 10 mode active
  ```

Adding an Interface to a Channel Group

The `channel-group` command adds the configuration mode interface to the specified channel group if the channel group exists. When adding channels to a previously created channel group, the LACP mode for the new channel must match the mode for the existing group.

Example

- These commands add Ethernet interfaces 7 through 10 to previously created channel group 10, using the LACP mode under which it was created.
  ```
  switch(config)#interface ethernet 7-10
  switch(config-if-Et7-10)#channel-group 10 mode active
  ```

Removing an Interface from a Channel Group

The `no channel-group` command removes the configuration mode interface from the specified channel group. Deleting all members of a channel group does not remove the associated port channel interface from `running-config`.

Example

- These commands remove add Ethernet interface 8 from previously created channel group 10.
  ```
  switch(config)#interface ethernet 8
  switch(config-if-Et8)#no channel-group
  ```
Deleting a Channel Group

A channel group is deleted by removing all Ethernet interfaces from the channel group. A channel group’s LACP mode can be changed only by deleting the channel group and then creating an equivalent group with a different LACP mode. Deleting a channel group by removing all Ethernet interfaces from the group preserves the port channel interface and its configuration settings.

View `running-config` to verify the deletion of all Ethernet interfaces from a channel group.

11.3.2 Configuring a Port Channel Interface

Creating a Port Channel Interface

The switch provides two methods for creating port channel interfaces:

- creating a channel group simultaneously creates an associated port channel.
- the `interface port-channel` command creates a port channel without assigning Ethernet channels to the new interface.

The `interface port-channel` command places the switch in interface-port channel configuration mode.

Example

- This command creates port channel interface 8 and places the switch in port channel interface configuration mode.


```
switch(config)#interface port-channel 8
switch(config-if-Po8)#
```

Deleting a Port Channel Interface

The `no interface port-channel` command deletes the configuration mode port channel interface and removes the channel group assignment for each Ethernet channel assigned to the channel associated with the port channel. Removing all Ethernet interfaces from a channel group does not remove the associated port channel interface from `running-config`.

11.3.3 Configuring Port Channel Subinterfaces

When configuring subinterfaces on a port channel interface (the virtual interface associated with a port channel), the following restrictions apply:

- An L3 interface with subinterfaces configured on it should not be made a member of a port channel.
- An interface that is a member of a port channel should not have subinterfaces configured on it.
- A subinterface cannot be made a member of a port channel.

Port channel subinterfaces are otherwise configured similarly to Ethernet subinterfaces. For additional information, see Subinterfaces.

11.3.4 Configuring LACP

Configuring the LACP Mode

The LACP mode is configured when a channel group is created. A channel group’s LACP mode cannot be modified without deleting the entire channel group. A channel group’s LACP mode can be altered without deleting the port channel interface associated with the channel group.
Example

- These commands create a channel group and place it in LACP-active mode.

  ```
  switch(config)#interface ethernet 1-2
  switch(config-if-Et1-2)#channel-group 10 mode active
  switch(config-if-Et1-2)#
  ```

Configuring the System Priority

Each switch is assigned a globally unique system identifier by concatenating the system priority (16 bits) to the MAC address of one of its physical ports (48 bits). The system identifier is used by peer devices when forming an aggregation to verify that all links are from the same switch. The system identifier is also used when dynamically changing aggregation capabilities in response to LACP information; the system with the numerically lower system identifier is permitted to dynamically change advertised aggregation capabilities.

The `lacp system-priority` command configures the switch’s LACP system priority.

Example

- This command assigns the system priority of 8192 to the switch.

  ```
  switch(config)#lacp system-priority 8192
  switch(config)#
  ```

Configuring Port Priority

LACP port priority determines the port that is active in a LAG in fallback mode. Numerically lower values have higher priority. Port priority is supported on port channels that are enabled with LACP physical interfaces.

The `lacp port-priority` command sets the aggregating port priority for the configuration mode interface.

Example

- This command assigns the port priority of 4096 to Ethernet interface 1.

  ```
  switch(config-if-Et1)#lacp port-priority 4096
  switch(config-if-Et1)#
  ```

Configuring the LACP Packet Reception Rate

The `lacp rate` command sets the reception rate of LACP packets on the local device at the interface configuration mode. This command supports the following reception rates:

- **normal**: The reception rate to receive LACP packets:
  - 30 seconds for synchronized interfaces
  - One second for interfaces that are being synchronized.
- **fast**: The reception rate to receive LACP packets every second.

Example

- This command sets the LACP reception rate to one second on the Ethernet interface 4.

  ```
  switch(config-if-Et4)#lacp rate fast
  switch(config-if-Et4)#
  ```
Configuring LACP Fallback

Fallback mode (static or individual) is configured on a port channel interface with the `port-channel lacp fallback` command. The fallback timeout interval is configured with the `port-channel lacp fallback timeout` command. Fallback timeout settings persist in `running-config` without taking effect for interfaces that are not configured into fallback mode. The default fallback timeout period is 90 seconds.

**Examples**

- These commands enable LACP static fallback mode, then configure an LACP fallback timeout of 100 seconds on port channel interface 13. If LACP negotiation fails, only the member port with the lowest LACP priority will remain active until an LACP PDU is received by one of the member ports.

  ```
  switch(config)# interface port-channel 13
  switch(config-if-Po13)# port-channel lacp fallback static
  switch(config-if-Po13)# port-channel lacp fallback timeout 100
  switch(config-if-Po13)# show active
  interface Port-Channel13
    port-channel lacp fallback static
    port-channel lacp fallback timeout 100
  switch(config-if-Po13)#
  ```

- These commands enable LACP individual fallback mode, then configure an LACP fallback timeout of 50 seconds on port channel interface 17. If LACP negotiation fails, all member ports will act as individual switch ports, using port-specific configuration, until a LACP PDU is received by one of the member ports.

  ```
  switch(config)# interface port-channel 17
  switch(config-if-Po17)# port-channel lacp fallback individual
  switch(config-if-Po17)# port-channel lacp fallback timeout 50
  switch(config-if-Po17)# show active
  interface Port-Channel17
    port-channel lacp fallback individual
    port-channel lacp fallback timeout 50
  switch(config-if-Po17)#
  ```

Configuring Minimum Links

The `port-channel min-links` command specifies the minimum number of interfaces that the configuration mode LAG requires to be active. If there are fewer ports than specified by this command, the port channel interface does not become active.

**Note**

In static LAGs, the min-links value must be met for the LAG to be active. The LAG will not become active until it has at least the min-links number of functioning links in the channel group. If failed links cause the number to drop below the minimum, the LAG will go down and administrator action will be required to bring it back up.

In dynamic LAGs, the LACP protocol must determine that at least min-links physical ports are aggregable (they are physically compatible and have the same keys both remotely and locally) before it begins negotiating to make any ports active members of the port-channel. However once negotiation begins, an error on the partner’s side or an error in programming of member interfaces can cause the LAG to become active with fewer than the minimum number of links.

EOS evaluates min-links after min-links-review-timeout (linearly proportional to configured min-links) when LACP protocol collecting and/or distributing state changes. If the number of active member interfaces in a port-channel is less than configured min-links, it brings the corresponding port-channel Link Down and syslogs LAG-4-MINLINK_INTF_INSUFFICIENT message.
If additional interfaces get programmed as collecting and distributing, EOS re-evaluates min-links on the port-channel. If sufficient number of interfaces are available to be a part of port-channel, then all interfaces of the corresponding port-channel are re-enabled for LACP negotiation and the port-channel becomes Link Up. LAG-4-MINLINK_INTF_NORMAL is syslogged after min-links-review-timeout if the min-links condition is satisfied; otherwise LAG-4-MINLINK_INTF_INSUFFICIENT is syslogged and the port-channel goes Link Down.

If an interface remains in collecting state but not in distributing state for min-links-review-timeout, it is moved out of collecting state. It is periodically re-enabled after min-links-retry-timeout (which is 200 seconds) till it progresses to collecting and distributing. Meanwhile, if a port-channel becomes Link Up because sufficient number of interfaces progressed to collecting and distributing states, then this interface is enabled for LACP negotiation.

Example

- This command sets four as the minimum number of ports required for port channel 5 to become active.

```
switch(config-if-Po5)#port-channel min-links 4
switch(config-if-Po5)#
```

11.3.5 Displaying Port Channel Information

Port channel information is accessed using some of the `show` commands listed under Interface Display Commands. Ensure that while using the `show interfaces counters rates` command to view the rate information of a port channel, rate values for the individual member ports are less inaccurate than rate values of the port channel.

Both the port channel rate and the individual port rates are calculated approximations; the rate value of a port channel might vary from the total of the rates for the member ports. The discrepancy is likely to be larger for port channels with fewer ports, and will be most obvious in single-port port channels.
11.4 Load Balancing Hash Algorithms

The switch balances packet load across multiple links in a port channel by calculating a hash value based on packet header fields. The hash value determines the active member link through which the packet is transmitted. This method, in addition to balancing the load in the LAG, ensures that all packets in a data stream follow the same network path.

In network topologies that include MLAGs or multiple paths with equal cost (ECMP), programming all switches to perform the same hash calculation increases the risk of hash polarization, which leads to uneven load distribution among LAG and MLAG member links. This uneven distribution is avoided by performing different hash calculations on each switch routing the paths.

The `port-channel load-balance` command specifies the seed for hashing algorithms that balance the load across ports comprising a port channel. Available seed values vary by switch platform.

**Example**

- This command configures the hash seed of 10 on 7150 Series (FM6000 platform) switches.

```
switch(config)#port-channel load-balance fm6000 10
switch(config)#
```

Hashing algorithm inputs varies by switch platform. These sections describe hashing algorithm inputs for each platform.

- **Section 11.4.1: Load Balance Hash Algorithms on 7048 and 7500 Series Switches**
- **Section 11.4.2: Load Balance Hash Algorithms on 7500E Series Switches**
- **Section 11.4.3: Load Balance Hash Algorithms on 7050 Series Switches**
- **Section 11.4.4: Load Balance Hash Algorithms on 7150 Series Switches**

### 11.4.1 Load Balance Hash Algorithms on 7048 and 7500 Series Switches

One command configures the load balance hash algorithm on 7048 and 7500 Series switches:

- **port-channel load-balance petraA fields ip**: controls the hash algorithm for IP packets by specifying the algorithm's use of IP and MAC header fields. Fields that the command can specify include source and destination IP addresses, source and destination port fields (for TCP and UDP packets), and the entire MAC address header.

The hash algorithm for non-IP packets is not configurable and always includes the entire MAC header.

**Example**

- These commands configure the load balance algorithm for IP packets by using the entire MAC header.

```
switch(config)#port-channel load-balance petraA fields ip mac-header
switch(config)#
```

### 11.4.2 Load Balance Hash Algorithms on 7500E Series Switches

One command configures the load balance hash algorithm on 7500E Series switches:

- **port-channel load-balance arad fields ip**: controls the hash algorithm for IP packets by specifying the algorithm's use of IP and MAC header fields. Fields that the command can specify include source and destination IP addresses, source and destination port fields (for TCP and UDP packets), and the entire MAC address header.

The hash algorithm for non-IP packets is not configurable and always includes the entire MAC header.
Example

- These commands configure the load balance algorithm for IP packets by using the entire MAC header.

```
switch(config)#port-channel load-balance arad fields ip mac-header
switch(config)#
```

11.4.2.1 Dynamic and Symmetric LAG Hashing

Dynamic LAG hashing enables high link utilization and highly even distribution among LAG members by employing a randomized hashing algorithm. Symmetric LAG hashing allows the two flows of a bidirectional communication link, even when the two flows enter the switch on different ingress ports, to be hashed to the same member of a LAG on egress.

Dynamic and symmetric LAG hashing policies are enabled via named port-channel load-balancing profiles. LAG load-balancing policies can be provisioned on per line-card basis using these profiles. Load-balancing profiles can be used to provision all LAG load-balance attributes, including hash polynomials, hash seeds, and hash fields.

When no specific LAG hashing profile is assigned to a line card, then a global LAG hashing profile can be defined and applied to all the line cards with no LAG hashing defined on them.

Note, if no profile is selected as global profile then the default profile takes the precedence and set as a global profile. The default profile is reserved and if it is set as a global profile it cannot be deleted, if the profile is deleted then the following warning message is displayed.

```
Note
When a global profile is already set and if some other profile is tried to configured as a default profile the following warning message is displayed "A global load balancing profile myProfile is currently active. This setting will not take effect."
```

Examples

- These commands configure a load balance profile for symmetric hashing.

```
switch(config)#load-balance policies
switch(config-load-balance-policies)#load-balance arad profile symmetric-profile-1
switch(config-sand-load-balance-profile-symmetric-profile-1)#hash symmetric
switch(config-sand-load-balance-profile-symmetric-profile-1)#show active
load-balance policies
    load-balance arad profile symmetric-profile-1
    hash symmetric
```

- These commands configure a load balance profile for dynamic hashing.

```
switch(config)#load-balance policies
switch(config-load-balance-policies)#load-balance arad profile dynamic-hash-profile-1
distribution clock
switch(config-sand-load-balance-profile-dynamic-hash-profile-1)#distribution clock
switch(config-sand-load-balance-profile-dynamic-hash-profile-1)#show active
load-balance policies
    load-balance arad profile dynamic-hash-profile-1
distribution clock
```

- This command assigns a named load-balancing profile to a linecard.

```
switch(config)#port-channel load-balance module 3-7 sand profile Linecard5
switch(config)#
```
This command unassigns a named load-balancing profile to a linecard.

```conf
switch(config)#no port-channel load-balance module 3-7 sand profile Linecard5
switch(config)#
```

This command configures a global profile on all line cards on which LAG hashing is not defined.

```conf
switch(config)#port-channel load-balance sand profile myGlobalProfile
```

These commands designates a default profile as a global profile, if no other profile is set as a global profile.

```conf
switch(config)#load-balance policies
switch(config-load-balance-policies)#load-balance sand profile default
```

These commands configure a hash seed in a profile and assigns it as a global profile.

```conf
switch(config)#load-balance policies
switch(config-load-balance-policies)#load-balance sand profile myGlobalProfile
switch(config-sand-load-balance-profile myGlobalProfile)#hash seed 20
switch(config)#port-channel load-balance sand profile myGlobalProfile
```

This command assigns a named load-balancing profile to a linecard.

```conf
switch(config)#port-channel load-balance module 3-7 sand profile Linecard5
switch(config)#
```

This command unassigns a named load-balancing profile to a linecard.

```conf
switch(config)#no port-channel load-balance module 3-7 sand profile Linecard5
switch(config)#
```

### 11.4.3 Load Balance Hash Algorithms on 7050 Series Switches

Three commands configure the load balance hash algorithm on 7050 Series switches:

- **`port-channel load-balance trident fields ip`** controls the hash algorithm for IP packets by specifying the algorithm's use of IP and MAC header fields. Fields that the command can specify include source and destination IP addresses, source and destination port fields (for TCP and UDP packets), and fields specified by the `port-channel load-balance trident fields mac` command.

- **`port-channel load-balance trident fields ipv6`** controls the hash algorithm for IPv6 packets by specifying the algorithm's use of IP and MAC header fields. Fields that the command can specify include source and destination IP addresses, source and destination port fields (for TCP and UDP packets), and fields specified by the `port-channel load-balance trident fields mac` command.

- **`port-channel load-balance trident fields mac`** controls the hash algorithm for non-IP packets by specifying the algorithm's use of MAC header fields. Fields that the command can specify include the MAC source address, MAC destination address, and Ethernet type fields.

**Example**

- These commands configure the switch's port channel load balance for non IP packets by using the MAC destination and Ethernet type fields in the hashing algorithm.

  ```conf
  switch(config)#port-channel load-balance trident fields mac dst-mac eth-type
  switch(config)#
  ```
11.4.4  Load Balance Hash Algorithms on 7150 Series Switches

Load balance profiles specify parameters used by hashing algorithms that distribute traffic across ports comprising a port channel or among component ECMP routes. The switch supports 16 load balance profiles, including the default profile. The default load balance profile is configured through `port-channel load-balance fm6000 fields ip` and `port-channel load-balance fm6000 fields mac` commands.

11.4.4.1  Load Balance Profiles

Load balance profiles are managed in `load-balance-policies` configuration mode. Load-balance-policies mode provides commands that display the contents of all configured profiles and place the switch in load-balance-profile command. Load balance profiles are created by entering load-balance-profile mode and edited while in that mode.

The `load-balance policies` command places the switch in `load-balance-policies` configuration mode. Load balance profiles specify the inputs used by the hashing algorithms that distribute traffic across ports comprising a port channel or among ECMP routes.

**Example**

- This command places the switch in `load-balance-policies` configuration mode.
  
  ```
  switch(config)#load-balance policies
  switch(config-load-balance-policies)#
  ```

- This command displays the contents of the four load balance profiles configured on the switch.
  
  ```
  switch(config-load-balance-policies)#show active
  load-balance policies
  load-balance fm6000 profile F-01
    port-channel hash-seed 22
    fields ip dscp
    distribution random port-channel
  !
  load-balance fm6000 profile F-02
    fields ip protocol dst-ip
    distribution random port-channel
  !
  load-balance fm6000 profile F-03
    fields ip protocol dst-ip
    fields mac dst-mac eth-type
    distribution random ecmp port-channel
  !
  load-balance fm6000 profile F-04
  switch(config-load-balance-policies)#
  ```

**Creating a Load Balance Profile**

The `load-balance fm6000 profile` command places the switch in `load-balance-profile` configuration mode to configure a specified load balance profile. The command specifies the name of the profile that subsequent commands modify. It creates a profile if the profile it references does not exist.
Example

- These commands enter load-balance-profile configuration mode, creates the LB-5 profile, and lists the default settings for the profile.

  switch(config)#load-balance policies
  switch(config-load-balance-policies)#load-balance fm6000 profile LB-5
  switch(config-load-balance-profile-LB-5)#show active all
  load-balance policies
    load-balance fm6000 profile LB-5
    port-channel hash-seed 0
    fields mac dst-mac src-mac eth-type vlan-priority vlan-id
    fields ip protocol dst-ip dst-port src-ip src-port dscp
    no distribution symmetric-hash
    no distribution random
  switch(config-load-balance-profile-LB-5)#

Configuring a Load Balance Profile

These commands are available in load-balance-profile configuration mode to specify the parameters that comprise a profile.

- The **fields ip** command specifies the L3/L4 data fields used by the hash algorithm defined by the configuration mode load balance profile.

- The **fields mac** command specifies the L2 data fields used by the hash algorithm defined by the configuration mode load balance profile.

- The **distribution symmetric-hash** command enforces traffic symmetry on data distributed by the hash algorithm defined by the configuration mode load balance profile. Symmetric traffic is the flow of both directions of a data stream across the same physical link.

- The **distribution random** command specifies the random distribution of data packets handled by the hash algorithm defined by the configuration mode load balance profile.

Example

- These commands configure the following components of the hash algorithm defined by the LB-7 load balance profile:
  - L2 header fields: MAC destination address, VLAN priority
  - L3/L4 header fields: Source IP address, protocol field
  - Symmetric hash distribution of IP and non-IP packets.

  switch(config)#load-balance policies
  switch(config-load-balance-policies)#load-balance fm6000 profile LB-7
  switch(config-load-balance-profile-LB-7)#fields ip src-ip protocol
  switch(config-load-balance-profile-LB-7)#fields mac dst-mac vlan-priority
  switch(config-load-balance-profile-LB-7)#distribution symmetric-hash mac-ip
  switch(config-load-balance-profile-LB-7)#show active
  load-balance policies
    load-balance fm6000 profile LB-7
    fields mac dst-mac vlan-priority
    fields ip protocol src-ip
    distribution symmetric-hash mac-ip
  switch(config-load-balance-profile-LB-7)#exit
  switch(config-load-balance-profile-LB-7)#exit
  switch(config-load-balance-policies)#exit
  switch(config)#exit
Assigning a Load Balance Profile to an Interface

The `ingress load-balance profile` command applies a specified load-balance profile to the configuration mode interface. Load balance profiles specify parameters used by hashing algorithms that distribute traffic across ports comprising a port channel or among ECMP routes. The switch supports 16 load balance profiles, including the default profile.

**Example**

- This command applies the **LB-1** load balance profile to port channel interface 100.

  ```
  switch(config)#interface port-channel 100
  switch(config-if-Po100)#ingress load-balance profile LB-1
  switch(config-if-Po100)#show active
  interface Port-Channel100
       ingress load-balance profile LB-1
  switch(config-if-Po100)#
  ```

11.4.4.2 Default Load Balance Profile

Two commands configure the load balance default profile on 7150 Series switches:

- `port-channel load-balance fm6000 fields ip` controls the hash algorithm for IP packets by specifying the algorithm’s use of IP and MAC header fields. Fields that the command can specify include source and destination IP addresses, source and destination port fields (for TCP and UDP packets).

- `port-channel load-balance fm6000 fields mac` controls the hash algorithm for non-IP packets by specifying the algorithm’s use of MAC header fields. Fields that the command can specify include the MAC source address, MAC destination address, and Ethernet type, VLAN-ID, and VLAN-priority fields.

**Example**

- These commands configure the load balance default profile for IP packets by using source and destination IP address fields, along with source and destination port fields for TCP, and UDP packets.

  ```
  switch(config)#port-channel load-balance fm6000 fields ip ip-tcp-udp-header
  switch(config)#
  ```

- This command applies the default load balance profile to port channel interface 100.

  ```
  switch(config)#interface port-channel 100
  switch(config-if-Po100)#no ingress load-balance profile
  switch(config-if-Po100)#show active
  interface Port-Channel100
  switch(config-if-Po100)#
  ```
11.5 Port Channel and LACP Configuration Commands

Global Port Channel and LACP Configuration Commands
- interface port-channel
- lACP system-priority

Interface Configuration Commands – Ethernet Interface
- channel-group
- lACP port-priority
- lACP rate
- port-channel lACP fallback
- port-channel lACP fallback timeout
- port-channel min-links

Load Balance (Default) Commands
- port-channel load-balance
- port-channel load-balance arad fields ip
- port-channel load-balance fm6000 fields ip
- port-channel load-balance fm6000 fields mac
- port-channel load-balance sand profile (7500E/7500R)
- port-channel load-balance module
- port-channel load-balance petraA fields ip
- port-channel load-balance trident fields ip
- port-channel load-balance trident fields ipv6
- port-channel load-balance trident fields mac

Load Balance Policies Commands
- distribution random
- distribution symmetric-hash
- fields ip
- fields mac
- hash-seed
- load-balance sand profile (7500E/7500R)
- ingress load-balance profile
- load-balance fm6000 profile
- load-balance policies
- port-channel hash-seed

EXEC Commands
- show etherchannel
- show lACP aggregates
- show lACP counters
- show lACP interface
- show lACP internal
- show lACP neighbor
- show lACP sys-id
- show load-balance profile
- show port-channel
- show port-channel limits
- show port-channel load-balance fields
- show port-channel summary
• show port-channel traffic
channel-group

The channel-group command assigns the configuration mode Ethernet interfaces to a channel group and specifies LACP attributes for the channel. When adding channels to a previously created channel group, the LACP mode for the new channel must match the mode for the existing group.

Channel groups are associated with a port channel interface immediately upon their creation. A command that creates a new channel group also creates a port channel with a matching ID. The port channel is configured in port-channel configuration mode. Configuration changes to a port channel interface propagate to all Ethernet interfaces in the corresponding channel group. The interface port-channel command places the switch in interface-port-channel configuration mode.

The no channel-group and default channel group commands remove the configuration mode interface from the specified channel group.

Command Mode
Interface-Ethernet Configuration

Command Syntax
```
channel-group number LACP_MODE
no channel-group
default channel-group
```

Parameters
- number specifies a channel group ID. Values range from 1 through 2000.
- LACP_MODE specifies the interface LACP mode. Values include:
  - mode on Interface is a static port channel, LACP disabled. Port neither verifies nor negotiates port channel membership.
  - mode active Interface is an active LACP port that transmits and receives LACP negotiation packets.
  - mode passive Interface is a passive LACP port that only responds to LACP negotiation packets.

Guidelines: Port Channels
You can configure a port channel to contain many ports, but only a subset may be active at a time. All active ports in a port channel must be compatible. Compatibility includes many factors and is platform-specific. For example, compatibility may require identical operating parameters such as speed and maximum transmission unit (MTU). Compatibility may only be possible between specific ports because of the internal organization of the switch.

Guidelines: MLAG Configurations
Static LAG is not recommended in MLAG configurations. However, these considerations apply when the channel group mode is on while configuring static MLAG:
- When configuring multiple interfaces on the same static port channel:
  - all interfaces must physically connect to the same neighboring switch.
  - the neighboring switch must configure all interfaces into the same port channel.
  The switches are misconfigured when these conditions are not met.
- Disable the static port channel membership before moving any cables connected to these interfaces or changing a static port channel membership on the remote switch.
Example

- These commands assign Ethernet interfaces 8 and 9 to channel group 10, and enable LACP in negotiating mode.

```bash
switch(config)#interface ethernet 8-9
switch(config-if-Et8-9)#channel-group 10 mode active
switch(config-if-Et8-9)#show active
interface Ethernet8
    channel-group 10 mode active
interface Ethernet9
    channel-group 10 mode active
switch(config-if-Et8-9)#
```
distribution random

The **distribution random** command specifies the random distribution of data packets handled by the hash algorithm defined by the configuration mode load balance profile. All data fields and hash seeds that are configured for the profile are used as seeds for the random number generator that defines the distribution of individual packets.

Command options allow for the random distribution of traffic across port channel links and ECMP routes. Random distribution can be enabled for either, both, or neither.

The **no distribution random** and **default distribution random** commands remove random distribution on the configuration mode load balance profile by deleting the corresponding **distribution random** command from the configuration.

**Command Mode**

Load-balance-profile Configuration

**Command Syntax**

```
distribution random BALANCE_TYPE
no distribution random
default distribution random
```

**Parameters**

- **SCOPE** Specifies use of random distribution for port channels and ECMP routes. Options include:
  - `<no parameter>` Random distribution is enabled for ECMP routes and port channel links.
  - `ecmp` Random distribution is enabled for ECMP routes.
  - `port-channel` Random distribution is enabled for port channel links.
  - `ecmp port-channel` Random distribution is enabled for ECMP routes and port channel links.
  - `port-channel ecmp` Random distribution is enabled for ECMP routes and port channel links.

**Guidelines**

The **distribution random** command takes precedence over the **distribution symmetric-hash** command when both methods are simultaneously enabled.

**Related Commands**

- **load-balance fm6000 profile** places the switch in load-balance-profile configuration mode.

**Example**

- These commands configure symmetric hashing on all traffic distributed through the algorithm defined by the LB-1 load balance profile.

```bash
switch(config)#load-balance policies
switch(config-load-balance-policies)#load-balance fm6000 profile LB-1
switch(config-load-balance-profile-LB-1)#distribution random ecmp port-channel
switch(config-load-balance-profile-LB-1)#show active
load-balance policies
    load-balance fm6000 profile LB-1
        distribution random ecmp port-channel
switch(config-load-balance-profile-LB-1)#
```
distribution symmetric-hash

The **distribution symmetric-hash** command enforces traffic symmetry on data distributed by the hash algorithm defined by the configuration mode load balance profile. Symmetric traffic is the flow of both directions of a data stream across the same physical link.

Two symmetric-hash options specify the traffic upon which symmetry is enforced:

- **distribution symmetric-hash mac** specifies that only non-IP traffic is hashed symmetrically. IP traffic is hashed normally without regard to symmetry.
- **distribution symmetric-hash mac-ip** specifies that all traffic is hashed symmetrically.

The **no distribution symmetric-hash** and **default distribution symmetric-hash** commands remove the specified hashing symmetry restriction on the configuration mode load balance profile by deleting the corresponding **distribution symmetric-hash** command from **running-config**.

**Command Mode**

Load-balance-profile Configuration

**Command Syntax**

```
distribution symmetric-hash **FIELD_TYPE**
no distribution symmetric-hash
default distribution symmetric-hash
```

**Parameters**

- **FIELD_TYPE** fields the hashing algorithm uses for layer 3 routing. Options include:
  - **mac** non-IP traffic is hashed symmetrically.
  - **mac-ip** all traffic is hashed symmetrically.

**Guidelines**

The **distribution random** command takes precedence over the **distribution symmetric-hash** command when both methods are simultaneously enabled.

**Related Commands**

- **load-balance fm6000 profile** places the switch in load-balance-profile configuration mode.

**Example**

- These commands configure symmetric hashing on all traffic distributed through the algorithm defined by the LB-1 load balance profile.

```
switch(config)#load-balance policies
switch(config-load-balance-policies)#load-balance fm6000 profile LB-1
switch(config-load-balance-profile-LB-1)#distribution symmetric-hash mac-ip
switch(config-load-balance-profile-LB-1)#show active
load-balance policies
    load-balance fm6000 profile LB-1
t    distribution symmetric-hash mac-ip
switch(config-load-balance-profile-LB-1)#
```
The `fields ip` command specifies the L3/L4 data fields used by the hash algorithm defined by the configuration mode load balance profile. When a load balance profile is assigned to a port channel or Ethernet interface, its associated hash algorithm determines the distribution of packets that ingress the interface. Profile algorithms can load balance packets across port channel links or ECMP routes.

The switch calculates a hash value by using the packet header fields to balance packets across links. The hash value determines the link through which the packet is transmitted. This method also ensures that all packets in a flow follow the same network path. Packet flow is modified by changing the inputs to the port channel hash algorithm.

In network topologies that include MLAGs, programming all switches to perform the same hash calculation increases the risk of hash polarization, which leads to uneven load distribution among LAG and MLAG member links in MLAG switches. This problem is avoided by performing different hash calculations between the MLAG switch, and a non-peer switch connected to it.

The `no fields ip` configures the algorithm not to use L3/L4 data fields. The `default fields ip` command restores the default data L3/L4 fields to the load balancing algorithm defined by the configuration mode profile by removing the corresponding `fields ip` or `no fields ip` command from `running-config`.

**Command Mode**
Load-balance-profile Configuration

**Command Syntax**
```
fields ip IP_FIELD
no fields ip
default fields ip
```

**Parameters**
- `IP_FIELD` specifies the L3/L4 fields the hashing algorithm uses. Options include:
  - `dscp` algorithm uses dscp field.
  - `dst-ip` algorithm uses destination IP address field.
  - `dst-port` algorithm uses destination TCP/UDP port field.
  - `protocol` algorithm uses protocol field.
  - `src-ip` algorithm uses source IP address field.
  - `src-port` algorithm uses source TCP/UDP port field.

Command may include from one to six fields, in any combination and listed in any order. The default setting is the selection of all fields.

**Related Commands**
- `load-balance fm6000 profile` places the switch in load-balance-profile configuration mode.
Example

- These commands specify the IP source and protocol fields as components of the hash algorithm defined by the LB-1 load balance profile.

```
switch(config)#load-balance policies
switch(config-load-balance-policies)#load-balance fm6000 profile LB-1
switch(config-load-balance-profile-LB-1)#fields ip src-ip protocol
switch(config-load-balance-profile-LB-1)#show active
load-balance policies
   load-balance fm6000 profile LB-1
   fields ip protocol src-ip
switch(config-load-balance-profile-LB-1)#
```
fields mac

The fields mac command specifies the L2 data fields used by the hash algorithm defined by the configuration mode load balance profile. When a load balance profile is assigned to a port channel or Ethernet interface, its associated hash algorithm determines the distribution of packets that ingress the interface. Profile algorithms can load balance packets across port channel links or ECMP routes.

The switch calculates a hash value using the packet header fields to balance packets across links. The hash value determines the link through which the packet is transmitted. This method also ensures that all packets in a flow follow the same network path. Packet flow is modified by changing the inputs to the port channel hash algorithm.

In network topologies that include MLAGs, programming all switches to perform the same hash calculation increases the risk of hash polarization, which leads to uneven load distribution among LAG and MLAG member links in MLAG switches. This problem is avoided by performing different hash calculations between the MLAG switch, and a non-peer switch connected to it.

The no fields mac configures the algorithm not to use L2 data fields. The default fields mac command restores the default data L2 fields to the load balancing algorithm defined by the configuration mode profile by removing the corresponding fields mac or no fields mac command from running-config.

Command Mode
Load-balance-profile Configuration

Command Syntax
fields mac MAC_FIELD
no fields mac
default fields mac

Parameters
- **MAC_FIELD** specifies the L2 fields the hashing algorithm uses. Options include:
  - **dst-mac** algorithm uses MAC destination field.
  - **eth-type** algorithm uses MAC destination field.
  - **src-mac** algorithm uses MAC source field.
  - **vlan-id** algorithm uses VLAN ID field.
  - **vlan-priority** algorithm uses VLAN priority field.

Related Commands
- **load-balance fm6000 profile** places the switch in load-balance-profile configuration mode.

Example
- These commands specify the MAC destination and VLAN priority fields as components of the hash algorithm defined by the LB-1 load balance profile.

```bash
switch(config)#load-balance policies
switch(config-load-balance-policies)#load-balance fm6000 profile LB-1
switch(config-load-balance-profile-LB-1)#fields mac dst-mac vlan-priority
switch(config-load-balance-profile-LB-1)#show active
load-balance policies
  load-balance fm6000 profile LB-1
    fields mac dst-mac vlan-priority
switch(config-load-balance-profile-LB-1)#
```
ingress load-balance profile

The `ingress load-balance profile` command applies the specified load-balance profile to the configuration mode interface. Load balance profiles specify parameters used by hashing algorithms that distribute traffic across ports comprising a port channel or among ECMP routes. The switch supports 16 load balance profiles, including the default profile.

Load balance profiles can be assigned to Ethernet and port channel interfaces. Profiles define the distribution method of traffic that ingresses the interface among the ports comprising a port channel or routes comprising an ECMP.

The default load balance profile is configured through `port-channel load-balance fm6000 fields ip` and `port-channel load-balance fm6000 fields mac` commands.

The `no ingress load-balance profile` and `default ingress load-balance profile` commands restore the default load balance profile for the configuration mode interface by removing the corresponding `ingress load-balance profile` command from `running-config`.

**Command Mode**

- Interface-Ethernet Configuration
- Interface-Port-Channel Configuration

**Command Syntax**

```
ingress load-balance profile profile_name
no ingress load-balance profile
default ingress load-balance profile
```

**Parameters**

- `profile_name` name of profile assigned to interface.

**Example**

- This command applies the `LB-1` load balance profile to port channel interface 100.

```
switch(config)#interface port-channel 100
switch(config-if-Po100)#show active
interface Port-Channel100
switch(config-if-Po100)#ingress load-balance profile LB-1
switch(config-if-Po100)#show active
interface Port-Channel100
  ingress load-balance profile LB-1
switch(config-if-Po100)#
```
interface port-channel

The `interface port-channel` command places the switch in port-channel interface configuration mode for modifying parameters of specified link aggregation (LAG) interfaces. When entering configuration mode to modify existing port channel interfaces, the command can specify multiple interfaces.

The command creates a port channel interface if the specified interface does not exist prior to issuing the command. When creating an interface, the command can only specify a single interface.

The `no interface port-channel` and `default interface port-channel` commands delete the specified LAG interfaces from `running-config`.

**Command Mode**
- Global Configuration

**Command Syntax**

```
interface port-channel p_range
no interface port-channel p_range
default interface port-channel p_range
```

**Parameter**

- `p_range` port channel interfaces (number, range, or comma-delimited list of numbers and ranges).
  - Port channel numbers range from 1 to 2000.

**Guidelines**

When configuring a port channel, you do not need to issue the `interface port-channel` command before assigning a port to the port channel (see the `channel-group` command). The port channel number is implicitly created when a port is added to the specified port channel with the `channel-group number` command.

To display ports that are members of a port channel, enter `show port-channel`. To view information about hardware limitations for a port channel, enter `show port-channel limits`.

All active ports in a port channel must be compatible. Compatibility comprises many factors and is specific to a given platform. For example, compatibility may require identical operating parameters such as speed and/or maximum transmission unit (MTU). Compatibility may only be possible between specific ports because of internal organization of the switch.

You can configure a port channel with a set of ports such that more than one subset of the member ports are mutually compatible. Port channels in EOS are designed to activate the compatible subset of ports with the largest aggregate capacity. A subset with two 40 Gbps ports (aggregate capacity 80 Gbps) has preference to a subset with five active 10 Gbps ports (aggregate capacity 50 Gbps).

**Example**

- This example creates port channel interface 3:

```
switch(config)#interface port-channel 3
switch(config-if-Po3)#
```
**lacp port-priority**

The `lacp port-priority` command sets the aggregating port priority for the configuration mode interface. Priority is supported on port channels with LACP-enabled physical interfaces. LACP port priority determines the port that is active in a LAG in fallback mode. Numerically lower values have higher priority.

Each port in an aggregation is assigned a 32-bit port identifier by prepending the port priority (16 bits) to the port number (16 bits). Port priority determines the ports that are placed in standby mode when hardware limitations prevent a single aggregation of all compatible ports.

Priority numbers range from 0 to 65535. The default is 32768. Interfaces with higher priority numbers are placed in standby mode before interfaces with lower priority numbers.

The `no lacp port-priority` and `default lacp port-priority` commands restore the default port-priority to the configuration mode interface by removing the corresponding `lacp port-priority` command from `running-config`.

**Command Mode**

Interface-Ethernet Configuration

**Command Syntax**

```
lacp port-priority priority_value
no lacp port-priority
default lacp port-priority
```

**Parameters**

- `priority_level` port priority. Values range from 0 to 65535. Default is 32768

**Example**

- These commands assign the port priority of 4096 to Ethernet interface 8.

  ```
  switch(config)#interface ethernet 8
  switch(config-if-Et8)#lacp port-priority 4096
  switch(config-if-Et8)#show active
  interface Ethernet8
    lacp port-priority 4096
  switch(config-if-Et8)#
  ```
**lACP rate**

The `lACP rate` command configures the LACP reception interval on the configuration mode interface. The LACP timeout specifies the reception rate of LACP packets at interfaces supporting LACP. Supported rates include:

- **normal**: 30 seconds with synchronized interfaces; one second while interfaces are synchronizing.
- **fast**: one second.

This command is supported on LACP-enabled interfaces. The default value is **normal**.

The `no lACP rate` and `default lACP rate` commands restore the default value of **normal** on the configuration mode interface by deleting the corresponding `lACP rate` command from `running-config`.

**Command Mode**

Interface-Ethernet Configuration

**Command Syntax**

```plaintext
lACP rate RATE_LEVEL
no lACP rate
default lACP rate
```

**Parameters**

- **RATE_LEVEL** LACP reception interval. Options include:
  - **fast** one second.
  - **normal** 30 seconds for synchronized interfaces; one second while interfaces synchronize.

**Examples**

- This command sets the LACP rate to one second on Ethernet interface 4.

  ```plaintext
  Switch(config-if-Et4)#lACP rate fast
  Switch(config-if-Et4)#
  ```
**lACP system-priority**

The **lACP system-priority** command configures the switch’s LACP system priority. Values range between 0 and 65535. Default value is 32768.

Each switch is assigned a globally unique 64-bit system identifier by prepending the system priority (16 bits) to the MAC address of one of its physical ports (48 bits). Peer devices use the system identifier when forming an aggregation to verify that all links are from the same switch. The system identifier is also used when dynamically changing aggregation capabilities resulting from LACP data: the system with the numerically lower system identifier can dynamically change advertised aggregation parameters.

The **no lACP system-priority** and **default lACP system-priority** commands restore the default system priority by removing the **lACP system-priority** command from running-config.

**Command Mode**

Global Configuration

**Command Syntax**

```
lACP system-priority priority_value
no lACP system-priority
default lACP system-priority
```

**Parameters**

- **priority_value** system priority number. Values range from 0 to 65535. Default is 32768.

**Example**

- This command assigns the system priority of 8192 to the switch.

  ```
  switch(config)#lACP system-priority 8192
  switch(config)#
  ```
Chapter 11: Port Channels and LACP

Port Channel and LACP Configuration Commands

load-balance fm6000 profile

The `load-balance fm6000 profile` command places the switch in load-balance-profile configuration mode to configure a specified load balance profile. The command specifies the name of the profile that subsequent commands modify. It creates a profile if the profile it references does not exist.

Load balance profiles specify parameters used by hashing algorithms that distribute traffic across ports comprising a port channel or among component ECMP routes. The switch supports 16 load balance profiles, including the default profile. The default load balance profile is configured through `port-channel load-balance fm6000 fields ip` and `port-channel load-balance fm6000 fields mac` commands.

The load balance profile name is referenced when it is applied to an interface. The default profile is not associated with a name and is applied to an interface in the absence of a named profile assignment.

The `no load-balance fm6000 profile` and `default load-balance fm6000 profile` commands delete the specified load balance profile from `running-config`. Profiles that are assigned to an interface cannot be deleted. Attempts to delete an assigned profile generate a `profile in use` error messages.

The `load-balance fm6000 profile` command is accessible from load-balance-policies configuration mode. Load-balance-profile configuration mode is not a group change mode; `running-config` is changed immediately upon entering commands. Exiting load-balance-policies configuration mode does not affect the configuration. The `exit` command returns the switch to load-balance-policies configuration mode.

Command Mode

```
Load-balance-policies Configuration
```

Command Syntax

```
load-balance fm6000 profile profile_name
no load-balance fm6000 profile profile_name
default load-balance fm6000 profile profile_name
```

Parameters

- `profile_name` name of the load-balance profile.

Commands Available in Load-balance-profile Configuration Mode

- `fields ip`
- `fields mac`
- `distribution random`
- `distribution symmetric-hash`
- `port-channel hash-seed`
- `show active` displays the contents of the configuration mode profile.

Related Commands

- `load-balance policies` places the switch in load-balance-policies configuration mode.
- `ingress load-balance profile` applies a load-balance profile to an Ethernet or port channel interface.
- `show load-balance profile` displays the contents of load balance profiles.
Example

- These commands enter load-balance-profile configuration mode, creates the LB-1 profile, and lists the default settings for the profile.

```"switch(config)#load-balance policies
switch(config-load-balance-policies)#load-balance fm6000 profile LB-1
switch(config-load-balance-profile-LB-1)#show active all
load-balance policies
  load-balance fm6000 profile LB-1
    port-channel hash-seed 0
    fields mac dst-mac src-mac eth-type vlan-priority vlan-id
    fields ip protocol dst-ip dst-port src-ip src-port dscp
    no distribution symmetric-hash
    no distribution random
switch(config-load-balance-profile-LB-1)#"```
hash-seed

The **hash-seed** command specifies the seed used by the hash algorithm defined by the configuration mode load balance profile. Profile algorithms can load balance packets across port channel links or ECMP routes.

The **no hash-seed** and **default hash-seed** commands restore the default hash seed value of 0 to the load balancing algorithm defined by the configuration mode profile by removing the corresponding **hash-seed** command from *running-config*.

**Command Mode**

Load-balance-profile Configuration

**Command Syntax**

```
hash-seed number
no hash-seed number
default hash-seed number
```

**Parameters**

- **number** specifies the value of the hash seed. Value ranges from 0 to 39.

**Example**

- These commands configure the hash seed 20 in a profile and assign it as the global profile.

```bash
switch(config)#load-balance policies
switch(config-load-balance-policies)#load-balance sand profile myGlobalProfile
switch(config-sand-load-balance-profile-myGlobalProfile)#hash-seed 20
switch(config)#port-channel load-balance sand profile myGlobalProfile
```
load-balance sand profile (7500E/7500R)

The `load-balance sand profile` command configures a load-balance profile on a sand module switch. A default profile is designated as a global profile when no other profile is set as global profile. Note, a warning message is displayed when a profile is entered or deleted.

If `no load-balance sand profile` command is executed when the profile set is default then the following warning message is displayed: "! profile default is a reserved profile and cannot be deleted".

**Command Mode**

Global Configuration

**Command Syntax**

```
load-balance sand profile profile_name
no load-balance sand profile profile_name
```

**Parameter**

`profile_name` name of the profile assigned to the selected module.

**Examples**

- These commands designate a default profile as a global profile on sand module platform switch. Note, a warning message is displayed when a profile is entered or deleted.

  ```
  switch(config)#load-balance policies
  switch(config-load-balance-policies)#load-balance sand profile default
  ! profile default is a reserved profile
  ! profile default is the current global profile
  ```

- When no form of the command is executed it displays the following warning message.

  ```
  switch(config)#load-balance policies
  switch(config-load-balance-policies)#no load-balance sand profile default
  ! profile default is a reserved profile and cannot be deleted
  ```
load-balance policies

The **load-balance policies** command places the switch in load-balance-policies configuration mode. Load-balance-policies configuration mode provides commands for managing load-balance profiles. Load balance profiles specify the inputs used by the hashing algorithms that distribute traffic across ports comprising a port channel or among ECMP routes.

The **no load-balance policies** and **default load-balance policies** commands delete all load balance profiles from *running-config*. The command generates an error message when at least one profile is assigned to an interface.

Load-balance-policies configuration mode is not a group change mode; *running-config* is changed immediately upon entering commands. Exiting load-balance-policies configuration mode does not affect *running-config*. The **exit** command returns the switch to global configuration mode.

**Command Mode**

Global Configuration

**Command Syntax**

- `load-balance policies`
- `no load-balance policies`
- `default load-balance policies`

**Commands Available in Load-balance-policies Configuration Mode**

- `load-balance fm6000 profile` places the switch in load-balance-profile configuration mode.
- `show active` displays contents of all load balance profiles.

**Related Commands**

- `ingress load-balance profile` applies a load-balance profile to an Ethernet or port channel interface.
- `show load-balance profile` displays the contents of load balance profiles.

**Example**

- This command places the switch in load-balance-policies configuration mode.

  ```
  switch(config)#load-balance policies
  switch(config-load-balance-policies)#
  ```

- This command displays the contents of the three configured load balance profiles.

  ```
  switch(config-load-balance-policies)#show active
  load-balance policies
  load-balance fm6000 profile F-01
  port-channel hash-seed 22
  fields ip dscp
  distribution random port-channel
  !
  load-balance fm6000 profile F-02
  fields ip protocol dst-ip
  fields mac dst-mac eth-type
  distribution random ecmp port-channel
  !
  load-balance fm6000 profile F-03
  switch(config-load-balance-policies)#
  ```
port-channel hash-seed

The **port-channel hash-seed** command specifies the seed used by the hash algorithm defined by the configuration mode load balance profile when distributing the load across ports comprising a port channel. When a load balance profile is assigned to a port channel or Ethernet interface, its associated hash algorithm determines the distribution of packets that ingress the interface. Profile algorithms can load balance packets across port channel links or ECMP routes.

The hash seed that the algorithm uses to select port channel links or ECMP routes is configured by the **ip load-sharing** command.

The **no port-channel hash-seed** and **default port-channel hash-seed** commands restore the default hash seed value of 0 to the load balancing algorithm defined by the configuration mode profile by removing the corresponding **port-channel hash-seed** command from **running-config**.

**Command Mode**

Load-balance-profile Configuration

**Command Syntax**

```
port-channel hash-seed number
no port-channel hash-seed
default port-channel hash-seed
```

**Parameters**

- **number**  The hash seed. Value ranges from 0 to 39.

**Related Commands**

- **load-balance fm6000 profile** places the switch in load-balance-profile configuration mode.

**Example**

- Thes commands configure the port-channel hash seed of 22 for the hash algorithm defined by the LB-1 load balance profile.

```plaintext
switch(config)#load-balance policies
switch(config-load-balance-policies)#load-balance fm6000 profile LB-1
switch(config-load-balance-profile-LB-1)#port-channel hash-seed 22
switch(config-load-balance-profile-LB-1)#show active
load-balance policies
  load-balance fm6000 profile LB-1
    port-channel hash-seed 22
switch(config-load-balance-profile-LB-1)#
```
The `port-channel lacp fallback` command enables the LACP fallback mode on the interface.

LACP fallback is unconfigured and disabled by default. An LACP interface without fallback enabled does not form a LAG until it receives PDUs from its peer.

LACP fallback can be configured on an interface in static or individual mode:

- **static mode** the port channel member with the lowest LACP port priority is active and maintains contact with the peer (sending and receiving data) while other port channel members remain in standby mode until a LACP PDU is received. All members continue to send (and can receive) LACP PDUs.
- **individual mode** all port channel members act as individual ports, reverting to their port-specific configuration while the channel is in fallback mode, and continue to send and receive data. All members continue to send LACP PDUs until a LACP PDU is received by one of the member ports.

The `no port-channel lacp fallback` and `default port-channel lacp fallback` commands disable LACP fallback mode on the configuration mode interface by removing the corresponding `port-channel lacp fallback` command from `running-config`.

**Command Mode**

Interface-Port-Channel Configuration

**Command Syntax**

```
port-channel lacp fallback [MODE]
no port-channel lacp fallback
default port-channel lacp fallback
```

**Parameters**

- **MODE** LACP fallback mode. Options include:
  - `<no parameter>` enables static LACP fallback mode.
  - `static` enables static LACP fallback mode.
  - `individual` enables individual LACP fallback mode.

**Related Commands**

- `port-channel lacp fallback timeout` configures the fallback timeout period for a port channel interface. The default LACP fallback timeout period is 90 seconds.
- `lacp port-priority` configures the port priority for an individual interface.

**Examples**

- These commands enable LACP static fallback mode, then configure an LACP fallback timeout of 100 seconds on port channel interface 13. If LACP negotiation fails, only the member port with the lowest LACP priority will remain active until an LACP PDU is received by one of the member ports.

  ```
  switch(config)#interface port-channel 13
  switch(config-if-Po13)#port-channel lacp fallback static
  switch(config-if-Po13)#port-channel lacp fallback timeout 100
  switch(config-if-Po13)#show active
  interface Port-Channel13
      port-channel lacp fallback static
      port-channel lacp fallback timeout 100
  switch(config-if-Po13)#
  ```
• These commands enable LACP individual fallback mode, then configure an LACP fallback timeout of 50 seconds on port channel interface 17. If LACP negotiation fails, all member ports will act as individual switch ports, using port-specific configuration, until a LACP PDU is received by one of the member ports.

```plaintext
switch(config)#interface port-channel 17
switch(config-if-Po17)#port-channel lacp fallback individual
switch(config-if-Po17)#port-channel lacp fallback timeout 50
switch(config-if-Po17)#show active
interface Port-Channel17
    port-channel lacp fallback individual
    port-channel lacp fallback timeout 50
switch(config-if-Po17)#
```
**port-channel lacp fallback timeout**

The **port-channel lacp fallback timeout** command specifies the fallback timeout period for the configuration mode interface.

Fallback timeout settings persist in **running-config** without taking effect for interfaces that are not configured into fallback mode. The default fallback timeout period is 90 seconds.

The **no port-channel lacp fallback timeout** and **default port-channel lacp fallback timeout** commands restore the default fallback timeout of 90 seconds for the configuration mode interface by removing the corresponding **port-channel lacp fallback timeout** command from **running-config**.

**Command Mode**

Interface-Port-Channel Configuration

**Command Syntax**

```
port-channel lacp fallback timeout period
no port-channel lacp fallback timeout
default port-channel lacp fallback timeout
```

**Parameters**

- **period**  maximum interval between receipt of LACP PDU packets (seconds). Value ranges from 1 to 300 seconds. Default value is 90.

**Related Commands**

**port-channel lacp fallback** configures fallback mode for a port channel interface.

**Guidelines**

The fallback timeout period should not be shorter than the LACP reception interval (**lACP rate**). The default LACP reception interval is 30 seconds.

**Example**

- This command enables LACP fallback mode, then configures an LACP fallback timeout of 100 seconds on port channel interface 13.

  ```
  switch(config)#interface port-channel 13
  switch(config-if-Po13)#port-channel lacp fallback
  switch(config-if-Po13)#port-channel lacp fallback timeout 100
  switch(config-if-Po13)#show active
  interface Port-Channel13
    port-channel lacp fallback
    port-channel lacp fallback timeout 100
  switch(config-if-Po13)#
  ```
port-channel load-balance

The `port-channel load-balance` command specifies the seed in the hashing algorithm that balances the load across ports comprising a port channel. Available seed values vary by switch platform.

The `no port-channel load-balance` and `default port-channel load-balance` commands remove the `port-channel load-balance` command from `running-config`, restoring the default hash seed value of 0.

**Command Mode**
Global Configuration

**Command Syntax**
```
port-channel load-balance platform { hash_seed | fields ip fields | hash hash_function }
no port-channel load-balance platform [hash_seed]
default port-channel load-balance platform [hash_seed]
```

**Parameters**

**Important!** Parameter options vary by switch model. Verify available options with the `?` command.

- **platform**  ASIC switching device. Value depends on the switch model.
- **hash_seed**  The numerical seed for the hash function. Value range varies by switch platform:
  - `arad`  0 to 65535.
  - `fm6000`  0 to 39.
  - `petraA`  uses field inputs only.
  - `trident`  0 to 47.
  - For trident platform switches, algorithms using hash seeds between 0 and 15 typically result in more effective distribution of data streams across the port channels.
- **fields**  Which fields will be used as inputs to the port channel hash.
  - `gre`  Configure which GRE fields are inputs to the hash.
  - `ip`  Configure which fields are inputs to the hash for IPv4 packets.
  - `ipv6`  Configure which fields are inputs to the hash for IPv6 packets.
  - `mac`  Configure which MAC fields are inputs to the hash.
  - `mac-in-mac`  Configure which MAC-in-MAC fields are inputs to the hash.
  - `mpls`  Configure which MPLS fields are inputs to the hash.
  - `destination-ip`  Use the layer 3 IP destination address in the hash.
  - `destination-port`  Use the layer 4 TCP/UDP destination port in the hash.
  - `dst-ip`  Use the destination IP address in the hash.
  - `dst-mac`  Use the destination Payload MAC in the hash (or the destination MAC address in the MAC hash).
  - `eth-type`  Use the Ethernet type in the MAC hash.
  - `ip-in-ip`  Use the outer IP header in the hash for IPv4 over IPv4 GRE tunnel.
  - `ip-in-ipv6`  Use the outer IP header in the hash for IPv4 over IPv6 GRE tunnel.
  - `ipv6-in-ip`  Use the outer IP header in the hash for IPv6 over IPv4 GRE tunnel.
  - `ipv6-in-ipv6`  Use the outer IP header in the hash for IPv6 over IPv6 GRE tunnel.
• **ip-tcp-udp-header** Use the layer 3 and layer 4 hashes.
• **isd** Use the MAC-in-MAC ISID in the hash.
• **label** Use the MPLS label in the hash.
• **mac-header** Use the MAC hash.
• **outer-mac** Use the outer MAC of source and destination in the hash.
• **source-ip** Use the layer 3 IP source address in the hash.
• **src-ip** Use the source IP address in the hash.
• **source-port** Use layer 4 TCP/UDP source port in the hash.
• **src-mac** Use the source payload MAC in the hash (or the source MAC address in the MAC hash).

• **hash_function** Specifies the hash polynomial function. Values range from 0-2.

**Example**

- This command configures a hash seed of 10 on an FM6000 platform switch.

  ```
  switch(config)#port-channel load-balance fm6000 10
  switch(config)#
  ```
port-channel load-balance sand profile (7500E/7500R)

The port-channel load-balance sand profile command configures a global LAG hashing profile on the port channel interface. A default profile is set as a global profile when no other profile is set as global.

The no port-channel load-balance sand profile command removes the active profile from the port-channel load-balance command from running-config, restoring the default profile.

Command Mode
Global Configuration

Command Syntax

    port-channel load-balance sand profile profile_name
    no port-channel load-balance sand profile profile_name

Parameter

profile_name  name of the profile assigned to the selected module.

Example

- This command configures a global LAG hashing profile on 7500 series platform switch.

  switch(config)#port-channel load-balance sand profile myGlobalProfile
  switch(config)#
port-channel load-balance arad fields ip

The `port-channel load-balance arad fields ip` command specifies the data fields that the port channel load balance hash algorithm uses for distributing IP packets on Arad platform switches. The hashing algorithm fields used for IP packets differ from the fields used for non-IP packets.

The switch calculates a hash value using the packet header fields to load balance packets across links in a port channel. The hash value determines the link through which the packet is transmitted. This method also ensures that all packets in a flow follow the same network path. Packet flow is modified by changing the inputs to the port channel hash algorithm.

In network topologies that include MLAGs, programming all switches to perform the same hash calculation increases the risk of hash polarization, which leads to uneven load distribution among LAG and MLAG member links in MLAG switches. This problem is avoided by performing different hash calculations between the MLAG switch, and a non-peer switch connected to it.

The `no port-channel load-balance arad fields ip` and `default port-channel load-balance arad fields ip` commands restore the default data fields for the IP packet load balancing algorithm by removing the `port-channel load-balance arad A fields ip` command from `running-config`.

Command Mode

Global Configuration

Command Syntax

```
port-channel load-balance arad fields ip  IP_FIELD_NAME
no port-channel load-balance arad fields ip
default port-channel load-balance arad fields ip
```

Parameters

- `IP_FIELD_NAME` fields the hashing algorithm uses for layer 3 routing. Options include:
  - `ip-tcp-udp-header` algorithm uses source and destination IP address fields. Source and destination port fields are included for TCP and UDP packets.
  - `mac-header` algorithm uses entire MAC header.

A command can only specify one option. The default setting is `ip-tcp-udp-header`.

Guidelines

The port channel hash algorithm for non-IP packets is not configurable and always includes the entire MAC header.

Related Commands

- `port-channel load-balance` configures the hash seed for the algorithm.

Example

- These commands configure the switch’s port channel load balance hash algorithm for IP packets to use source and destination IP address (and port) fields.

```markdown
switch(config)#port-channel load-balance fm6000 fields ip ip-tcp-udp-header
switch(config)#
```
**port-channel load-balance fm6000 fields ip**

The `port-channel load-balance fm6000 fields ip` command specifies the data fields that the port channel load balance hash algorithm uses for distributing IP packets on FM6000 platform switches. The hashing algorithm fields used for IP packets differ from the fields used for non-IP packets.

The switch calculates a hash value using the packet header fields to load balance packets across links in a port channel. The hash value determines the link through which the packet is transmitted. This method also ensures that all packets in a flow follow the same network path. Packet flow is modified by changing the inputs to the port channel hash algorithm.

In network topologies that include MLAGs, programming all switches to perform the same hash calculation increases the risk of hash polarization, which leads to uneven load distribution among LAG and MLAG member links in MLAG switches. This problem is avoided by performing different hash calculations between the MLAG switch, and a non-peer switch connected to it.

The `no port-channel load-balance fm6000 fields ip` and `default port-channel load-balance fm6000 fields ip` commands restore the default data fields for the IP packet load balancing algorithm by removing the `port-channel load-balance fm6000 fields ip` command from `running-config`.

**Command Mode**
- Global Configuration

**Command Syntax**

```
port-channel load-balance fm6000 fields ip IP_FIELD_NAME
no port-channel load-balance fm6000 fields ip
default port-channel load-balance fm6000 fields ip
```

**Parameters**

- `IP_FIELD_NAME` specifies fields the hashing algorithm uses for layer 3 routing. Options include:
  - `ip-tcp-udp-header` algorithm uses source and destination IP address fields. Source and destination port fields are included for TCP and UDP packets.

  A command can only specify one option. The default setting is `ip-tcp-udp-header`.

**Related Commands**

- `port-channel load-balance` configures the hash seed for the algorithm.
- `port-channel load-balance fm6000 fields mac` controls the hash algorithm for non-IP packets

**Example**

- These commands configure the switch’s port channel load balance for IP packets by source and destination IP address and port fields.

  ```
  switch(config)#port-channel load-balance fm6000 fields ip ip-tcp-udp-header
  switch(config)#
  ```
The `port-channel load-balance fm6000 fields mac` command specifies data fields that configure the port channel load balance hash algorithm for non-IP packets on FM6000 platform switches. The hashing algorithm fields used for balancing non-IP packets differ from the fields used for IP packets.

The switch calculates a hash value using the packet header fields to load balance packets across links in a port channel. The hash value determines the link through which the packet is transmitted. This method also ensures that all packets in a flow follow the same network path. Packet flow is modified by changing the inputs to the port channel hash algorithm.

In network topologies that include MLAGs, programming all switches to perform the same hash calculation increases the risk of hash polarization, which leads to uneven load distribution among LAG and MLAG member links in MLAG switches. This problem is avoided by performing different hash calculations between the MLAG switch, and a non-peer switch connected to it.

The `no port-channel load-balance fm6000 fields mac` and `default port-channel load-balance fm6000 fields mac` commands restore the default data fields for the non-IP packet load balancing algorithm by removing the `port-channel load-balance fm6000 fields mac` command from `running-config`.

**Command Mode**
- Global Configuration

**Command Syntax**
```
port-channel load-balance fm6000 fields mac MAC_FIELD_NAME
no port-channel load-balance fm6000 fields mac
default port-channel load-balance fm6000 fields mac
```

**Parameters**
- `MAC_FIELD_NAME` fields the hashing algorithm uses for layer 2 routing. Options include:
  - `dst-mac` MAC destination field
  - `eth-type` EtherType field
  - `src-mac` MAC source field
  - `vlan-id` VLAN ID field
  - `vlan-priority` VLAN priority field

  Command may include from one to five fields, in any combination and listed in any order. The default setting is the selection of all fields.

**Related Commands**
- `port-channel load-balance` configures the hash seed for the algorithm.
- `port-channel load-balance fm6000 fields ip` controls the hash algorithm for IP packets

**Example**
- These commands configure the switch’s port channel load balance for non-IP packets by using the MAC destination and Ethernet type fields in the hashing algorithm.

```
switch(config)#port-channel load-balance fm6000 fields mac dst-mac eth-type
switch(config)#
```
port-channel load-balance module

The **port-channel load-balance module** command assigns a named load-balancing profile to a linecard.

**Note**
Available on the 7500E platform.

The **no port-channel load-balance module** and **default port-channel load-balance module** commands unassigns the load balancing module, or restores the default data fields for the load balancing module.

**Command Mode**
Global Configuration

**Command Syntax**
```
port-channel load-balance module LINECARD_RANGE sand profile PROFILE_NAME
no port-channel load-balance module LINECARD_RANGE sand profile PROFILE_NAME
default port-channel load-balance module LINECARD_RANGE sand profile PROFILE_NAME
```

**Parameters**
- **LINECARD_RANGE**  linecard number range includes
  - `<3-10>`  linecard number range
- **PROFILE_NAME**  load-balancing profile name

**Examples**
- This command assigns a named load-balancing profile to a linecard.
  ```
  switch(config)#port-channel load-balance module 3-7 sand profile Linecard5
  switch(config)#
  ```
- This command unassigns a named load-balancing profile to a linecard.
  ```
  switch(config)#no port-channel load-balance module 3-7 sand profile Linecard5
  switch(config)#
  ```
port-channel load-balance petraA fields ip

The **port-channel load-balance petraA fields ip** command specifies the data fields that the port channel load balance hash algorithm uses for distributing IP packets on Petra platform switches. The hashing algorithm fields used for IP packets differ from the fields used for non-IP packets.

The switch calculates a hash value using the packet header fields to load balance packets across links in a port channel. The hash value determines the link through which the packet is transmitted. This method also ensures that all packets in a flow follow the same network path. Packet flow is modified by changing the inputs to the port channel hash algorithm.

In network topologies that include MLAGs, programming all switches to perform the same hash calculation increases the risk of hash polarization, which leads to uneven load distribution among LAG and MLAG member links in MLAG switches. This problem is avoided by performing different hash calculations between the MLAG switch, and a non-peer switch connected to it.

The **no port-channel load-balance petraA fields ip** and **default port-channel load-balance petraA fields ip** commands restore the default data fields for the IP packet load balancing algorithm by removing the **port-channel load-balance petraA fields ip** command from **running-config**.

**Command Mode**
- Global Configuration

**Command Syntax**

```
port-channel load-balance petraA fields ip **IP_FIELD_NAME**
no port-channel load-balance petraA fields ip
default port-channel load-balance petraA fields ip
```

**Parameters**

- **IP_FIELD_NAME** fields the hashing algorithm uses for layer 3 routing. Options include:
  - **ip-tcp-udp-header** algorithm uses source and destination IP address fields. Source and destination port fields are included for TCP and UDP packets.
  - **mac-header** algorithm uses entire MAC header.

  A command can only specify one option. The default setting is **ip-tcp-udp-header**.

**Guidelines**

The port channel hash algorithm for non-IP packets is not configurable and always includes the entire MAC header.

**Related Commands**

- **port-channel load-balance** configures the hash seed for the algorithm.

**Example**

- These commands configure the switch’s port channel load balance hash algorithm for IP packets to use source and destination IP address (and port) fields.

  switch(config)#port-channel load-balance fm6000 fields ip ip-tcp-udp-header
  switch(config)#
port-channel load-balance trident fields ip

The **port-channel load-balance trident fields ip** command specifies the data fields that the port channel load balance hash algorithm uses for distributing IP packets on Trident platform switches. The hashing algorithm fields used for IP packets differ from the fields used for non-IP packets.

The switch calculates a hash value using the packet header fields to load balance packets across links in a port channel. The hash value determines the link through which the packet is transmitted. This method also ensures that all packets in a flow follow the same network path. Packet flow is modified by changing the inputs to the port channel hash algorithm.

In network topologies that include MLAGs, programming all switches to perform the same hash calculation increases the risk of hash polarization, which leads to uneven load distribution among LAG and MLAG member links in MLAG switches. This problem is avoided by performing different hash calculations between the MLAG switch, and a non-peer switch connected to it.

The **no port-channel load-balance trident fields ip** and **default port-channel load-balance trident fields ip** commands restore the default data fields for the IP packet load balancing algorithm by removing the **port-channel load-balance trident fields ip** command from **running-config**.

**Command Mode**
Global Configuration

**Command Syntax**

```
port-channel load-balance trident fields ip IP_FIELD_NAME
no port-channel load-balance trident fields ip
default port-channel load-balance trident fields ip
```

**Parameters**

- **IP_FIELD_NAME** specifies fields the hashing algorithm uses for layer 3 routing. Options include:

  Command may include from one to four of the following four options, in any combination and listed in any order.

  - **destination-ip** algorithm uses destination IP address field.
  - **source-ip** algorithm uses source IP address field.
  - **destination-port** algorithm uses destination TCP/UDP port field.
  - **source-port** algorithm uses source TCP/UDP port field.
  - **ip-tcp-udp-header** algorithm uses source and destination IP address fields. Source and destination port fields are included for TCP and UDP packets. *This option can't be used in combination with any other option.*
  - **mac-header** algorithm uses fields specified by **port-channel load-balance trident fields mac**. *This option can't be used in combination with any other option.*

  Default setting is **ip-tcp-udp-header**

**Related Commands**

- **port-channel load-balance** configures the hash seed for the algorithm.
- **port-channel load-balance trident fields ipv6** controls the hash algorithm for IPv6 packets
- **port-channel load-balance trident fields mac** controls the hash algorithm for non-IP/IPv6 packets
Example

- These commands configure the switch's port channel load balance for IP packets by using the IPv6 destination field in the hashing algorithm.

```
switch(config)#port-channel load-balance trident fields ip destination-ip
switch(config)#
```
**port-channel load-balance trident fields ipv6**

The `port-channel load-balance trident fields ipv6` command specifies the data fields that the port channel load balance hash algorithm uses for distributing IPv6 packets on Trident platform switches. The hashing algorithm fields used for IPv6 packets differ from the fields used for non-IPv6 packets.

The switch calculates a hash value using the packet header fields to load balance packets across links in a port channel. The hash value determines the link through which the packet is transmitted. This method also ensures that all packets in a flow follow the same network path. Packet flow is modified by changing the inputs to the port channel hash algorithm.

In network topologies that include MLAGs, programming all switches to perform the same hash calculation increases the risk of hash polarization, which leads to uneven load distribution among LAG and MLAG member links in MLAG switches. This problem is avoided by performing different hash calculations between the MLAG switch, and a non-peer switch connected to it.

The `no port-channel load-balance trident fields ipv6` and `default port-channel load-balance trident fields ipv6` commands restore the default data fields for the IPv6 packet load balancing algorithm by removing the `port-channel load-balance trident fields ipv6` command from `running-config`.

**Command Mode**

Global Configuration

**Command Syntax**

```
port-channel load-balance trident fields ipv6 IP_FIELD_NAME
no port-channel load-balance trident fields ipv6
default port-channel load-balance trident fields ipv6
```

**Parameters**

- `IP_FIELD_NAME` specifies fields the hashing algorithm uses for layer 3 routing. Options include:
  - `destination-ip` algorithm uses destination IPv6 address field.
  - `source-ip` algorithm uses source IPv6 address field.
  - `destination-port` algorithm uses destination TCP/UDP port field.
  - `source-port` algorithm uses source TCP/UDP port field.
  - `ip-tcp-udp-header` algorithm uses source and destination IPv6 address fields. Source and destination port fields are included for TCP and UDP packets. This option can't be used in combination with any other option.
  - `mac-header` algorithm uses fields specified by `port-channel load-balance trident fields mac`. This option can't be used in combination with any other option.

Default setting is `ip-tcp-udp-header`

**Related Commands**

- `port-channel load-balance` configures the hash seed for the algorithm.
- `port-channel load-balance trident fields ipv6` controls the hash algorithm for non-IP packets
- `port-channel load-balance trident fields mac` controls the hash algorithm for non-IP packets
Example

- These commands configure the switch's port channel load balance for IP packets by using the IPv6 source field in the hashing algorithm.

  switch(config)#port-channel load-balance trident fields ipv6 source-ip
  switch(config)#
The `port-channel load-balance trident fields mac` command specifies data fields that the port channel load balance hash algorithm uses for distributing non-IP packets on Trident platform switches. The hashing algorithm fields differ from the fields used for IP packets.

The switch calculates a hash value using the packet header fields to load balance packets across links in a port channel. The hash value determines the link through which the packet is transmitted. This method also ensures that all packets in a flow follow the same network path. Packet flow is modified by changing the inputs to the port channel hash algorithm.

In network topologies that include MLAGs, programming all switches to perform the same hash calculation increases the risk of hash polarization, which leads to uneven load distribution among LAG and MLAG member links in MLAG switches. This problem is avoided by performing different hash calculations between the MLAG switch, and a non-peer switch connected to it.

The `no port-channel load-balance trident fields mac` and `default port-channel load-balance trident fields mac` commands restore the default data fields for the non-IP packet load balancing algorithm by removing the `port-channel load-balance trident fields mac` command from `running-config`.

**Command Mode**

Global Configuration

**Command Syntax**

- `port-channel load-balance trident fields mac MAC_FIELD_NAME`
- `no port-channel load-balance trident fields mac`
- `default port-channel load-balance trident fields mac`

**Parameters**

- `MAC_FIELD_NAME` fields the hashing algorithm uses for layer 2 routing. Options include:
  - `dst-mac` MAC destination field
  - `eth-type` EtherType field
  - `src-mac` MAC source field

  Command may include from one to three fields, in any combination and listed in any order. The default setting is the selection of all fields.

**Related Commands**

- `port-channel load-balance` configures the hash seed for the algorithm.
- `port-channel load-balance trident fields ip` controls the hash algorithm for IP packets
- `port-channel load-balance trident fields ipv6` controls the hash algorithm for IP packets

**Example**

- These commands configure the switch’s port channel load balance for non-IP packets by using the MAC destination and Ethernet type fields in the hashing algorithm.

```
switch(config)# port-channel load-balance trident fields mac dst-mac eth-type
switch(config)#
```
**port-channel min-links**

The **port-channel min-links** command specifies the minimum number of interfaces that the configuration mode LAG requires to become active. If there are fewer ports than specified by this command, the port channel interface does not become active. The default min-links value is 0.

The **no port-channel min-links** and **default port-channel min-links** commands restore the default min-links setting for the configuration mode LAG by removing the corresponding **port-channel min-links** command from the configuration.

**Note**

In static LAGs, the min-links value must be met for the LAG to be active. The LAG will not become active until it has at least the min-links number of functioning links in the channel group. If failed links cause the number to drop below the minimum, the LAG will go down and administrator action will be required to bring it back up.

In dynamic LAGs, the LACP protocol must determine that at least min-links physical ports are aggregable (they are physically compatible and have the same keys both remotely and locally) before it begins negotiating to make any ports active members of the port-channel. However once negotiation begins, an error on the partner’s side or an error in programming of member interfaces can cause the LAG to become active with fewer than the minimum number of links.

EOS evaluates min-links after min-links-review-timeout (linearly proportional to configured min-links) when LACP protocol collecting and/or distributing state changes. If the number of active member interfaces in a port-channel is less than configured min-links, it brings the corresponding port-channel Link Down and syslogs LAG-4-MINLINK_INTF_INSUFFICIENT message.

If additional interfaces get programmed as collecting and distributing, EOS re-evaluates min-links on the port-channel. If sufficient number of interfaces are available to be a part of port-channel, then all interfaces of the corresponding port-channel are re-enabled for LACP negotiation and the port-channel becomes Link Up. LAG-4-MINLINK_INTF_NORMAL is syslogged after min-links-review-timeout if the min-links condition is satisfied; otherwise LAG-4-MINLINK_INTF_INSUFFICIENT is syslogged and the port-channel goes Link Down.

If an interface remains in collecting state but not in distributing state for min-links-review-timeout, it is moved out of collecting state. It is periodically re-enabled after min-links-retry-timeout (which is 200 seconds) till it progresses to collecting and distributing. Meanwhile, if a port-channel becomes Link Up because sufficient number of interfaces progressed to collecting and distributing states, then this interface is enabled for LACP negotiation.

**Command Mode**

    Interface-Port-Channel Configuration

**Command Syntax**

```
port-channel min-links quantity
no port-channel min-links
default port-channel min-links
```

**Parameters**

- **quantity** minimum number of interfaces. Value range varies by platform. Default value is 0.
Example

- These commands set four as the minimum number of ports required for port channel 13 to become active.

```bash
switch(config)#interface port-channel 13
switch(config-if-Po13)#port-channel min-links 4
switch(config-if-Po13)#show active
interface Port-Channel13
    port-channel min-links 4
switch(config-if-Po13)#
```
show etherchannel

The `show etherchannel` command displays information about members of the specified port channels.

**Command Mode**

EXEC

**Command Syntax**

```
show etherchannel [MEMBERS] [PORT_LIST] [INFO_LEVEL]
```

**Parameters**

- **MEMBERS** list of port channels for which information is displayed. Options include:
  - <no parameter> all configured port channels.
  - `p_range` ports in specified channel list (number, number range, or list of numbers and ranges).
- **PORT_LEVEL** ports displayed, in terms of aggregation status. Options include:
  - <no parameter> Displays information on ports that are active members of the LAG.
  - `active-ports` Displays information on ports that are active members of the LAG.
  - `all-ports` Displays information on all ports (active or inactive) configured for LAG.
- **INFO_LEVEL** amount of information that is displayed. Options include:
  - <no parameter> Displays information at the brief level.
  - `brief` Displays information at the brief level.
  - `detailed` Displays information at the detail level.

**Display Values**

- **Port Channel** Type and name of the port channel.
- **Time became active** Time when the port channel came up.
- **Protocol** Protocol operating on the port.
- **Mode** Status of the Ethernet interface on the port. The status value is Active or Inactive.
- **No active ports** Number of active ports on the port channel.
- **Configured but inactive ports** Ports configured but that are not actively up.
- **Reason unconfigured** Reason why the port is not part of the LAG.

**Guidelines**

The `show etherchannel` and `show port-channel` commands are identical. See `show port-channel` for additional information.
show lACP aggregates

The `show lACP aggregates` command displays aggregate IDs and the list of bundled ports for all specified port channels.

Command Mode

EXEC

Command Syntax

```
show lACP [PORT_LIST] aggregates [PORT_LEVEL] [INFO_LEVEL]
```

`PORT_LEVEL` and `INFO_LEVEL` parameters can be placed in any order.

Parameters

- **PORT_LIST**  port channels for which aggregate information is displayed. Options include:
  - `<no parameter>`  all configured port channels.
  - `c_range`  channel list (number, range, or comma-delimited list of numbers and ranges).
- **PORT_LEVEL**  ports displayed, in terms of aggregation status. Options include:
  - `<no parameter>`  ports bundled by LACP into the port channel.
  - `all-ports`  all channel group ports, including channel group members not bundled into the port channel interface.
- **INFO_LEVEL**  amount of information that is displayed. Options include:
  - `<no parameter>`  aggregate ID and bundled ports for each channel.
  - `brief`  aggregate ID and bundled ports for each channel.
  - `detailed`  aggregate ID and bundled ports for each channel.
Examples

- This command lists aggregate information for all configured port channels.

  ```
  switch>show lACP aggregates
  Port Channel Port-Channel1:
  Aggregate ID:
  [(8000,00-1c-73-04-36-d7,0001,0000,0000), (8000,00-1c-73-09-a0-f3,0001,0000,0000)]
  Bundled Ports: Ethernet43 Ethernet44 Ethernet45 Ethernet46
  Port Channel Port-Channel2:
  Aggregate ID:
  [(8000,00-1c-73-01-02-1e,0002,0000,0000), (8000,00-1c-73-04-36-d7,0002,0000,0000)]
  Bundled Ports: Ethernet47 Ethernet48
  Port Channel Port-Channel3:
  Aggregate ID:
  [(8000,00-1c-73-04-36-d7,0003,0000,0000), (8000,00-1c-73-0c-02-7d,0001,0000,0000)]
  Bundled Ports: Ethernet3 Ethernet4
  Port Channel Port-Channel4:
  Aggregate ID:
  [(0001,00-22-b0-57-23-be,0031,0000,0000), (8000,00-1c-73-04-36-d7,0004,0000,0000)]
  Bundled Ports: Ethernet1 Ethernet2
  Port Channel Port-Channel5:
  Aggregate ID:
  [(0001,00-22-b0-5a-0c-51,0033,0000,0000), (8000,00-1c-73-04-36-d7,0005,0000,0000)]
  Bundled Ports: Ethernet41
  switch>
  ```
show lACP counters

The **show lACP counters** command displays LACP traffic statistics.

**Command Mode**

EXEC

**Command Syntax**

```
show lACP [PORT_LIST] counters [PORT_LEVEL] [INFO_LEVEL]
```

*PORT_LEVEL* and *INFO_LEVEL* parameters can be placed in any order.

**Parameters**

- **PORT_LIST** ports for which port information is displayed. Options include:
  - <no parameter> all configured port channels
  - *c_range* ports in specified channel list (number, number range, or list of numbers and ranges).
  - *interface* ports on all interfaces.
  - *interface ethernet e_num* port on Ethernet interface specified by *e_num*.
  - *interface port-channel p_num* port on port channel interface specified by *p_num*.
- **PORT_LEVEL** ports displayed, in terms of aggregation status. Options include:
  - <no parameter> only ports bundled by LACP into an aggregate.
  - *all-ports* all ports, including LACP candidates that are not bundled.
- **INFO_LEVEL** amount of information that is displayed. Options include:
  - <no parameter> displays packet transmission (TX and RX) statistics.
  - *brief* displays packet transmission (TX and RX) statistics.
  - *detailed* displays packet transmission (TX and RX) statistics and actor-partner statistics.

**Example**

- This command displays transmission statistics for all configured port channels.

```
switch>show lACP counters brief
```

<table>
<thead>
<tr>
<th>Port Channel</th>
<th>Port Status</th>
<th>RX</th>
<th>TX</th>
<th>RX</th>
<th>TX</th>
<th>RX</th>
<th>TX</th>
<th>Illegal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port-Channel1:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Et43 Bundled</td>
<td>396979</td>
<td>396959</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Et44 Bundled</td>
<td>396979</td>
<td>396959</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Et45 Bundled</td>
<td>396979</td>
<td>396959</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Et46 Bundled</td>
<td>396979</td>
<td>396959</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Port-Channel2:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Et47 Bundled</td>
<td>396836</td>
<td>396883</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Et48 Bundled</td>
<td>396838</td>
<td>396883</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

switch>
show lacp interface

The `show lacp interface` command displays port status for all port channels that include the specified interfaces. Within the displays for each listed port channel, the output displays sys-id, partner port, state, actor port, and port priority for each interface in the channel.

**Command Mode**

EXEC

**Command Syntax**

```
show lacp interface [INTERFACE_PORT] [PORT_LEVEL] [INFO_LEVEL]
```

**Parameters**

- **INTERFACE_PORT** interfaces for which information is displayed. Options include:
  - <no parameter> all interfaces in channel groups.
  - `ethernet e_num` Ethernet interface specified by `e_num`.
  - `port-channel p_num` port channel interface specified by `p_num`.

- **PORT_LEVEL** ports displayed, in terms of aggregation status. Options include:
  - <no parameter> command lists data for ports bundled by LACP into the aggregate.
  - `all-ports` command lists data for all ports, including LACP candidates that are not bundled.

- **INFO_LEVEL** amount of information that is displayed. Options include:
  - <no parameter> displays same information as `brief` option.
  - `brief` displays LACP configuration data, including sys-id, actor, priorities, and keys.
  - `detailed` includes `brief` option information plus state machine data.
Example

- This command displays LACP configuration information for all ethernet interfaces.

```
switch>show lacp interface
State: A = Active, P = Passive; S=ShortTimeout, L=LongTimeout;
G = Aggregable, I = Individual; s+=InSync, s-=OutOfSync;
C = Collecting, X = state machine expired,
D = Distributing, d = default neighbor state
|                       Partner                      | Actor
Port Status  | Sys-id                 | Port# State | OperKey | PortPri | Port#
--------------------|------------------------|--------------|---------|---------|---------
Et43 Bundled | 8000,00-1c-73-09-a0-f3 | 43 ALGs+CD   | 0x0001  | 32768   | 43      
Et44 Bundled | 8000,00-1c-73-09-a0-f3 | 44 ALGs+CD   | 0x0001  | 32768   | 44      
Et45 Bundled | 8000,00-1c-73-09-a0-f3 | 45 ALGs+CD   | 0x0001  | 32768   | 45      
Et46 Bundled | 8000,00-1c-73-09-a0-f3 | 46 ALGs+CD   | 0x0001  | 32768   | 46      
Et47 Bundled | 8000,00-1c-73-01-02-1e | 23 ALGs+CD   | 0x0002  | 32768   | 47      
Et48 Bundled | 8000,00-1c-73-01-02-1e | 24 ALGs+CD   | 0x0002  | 32768   | 48      
```

```
Port Channel Port-Channel1:
|                       Partner       | Actor
Port Status  | Sys-id                 | Port# State | OperKey | PortPri | Port#
--------------------|------------------------|--------------|---------|---------|---------
Et43 Bundled | 8000,00-1c-73-09-a0-f3 | ALGs+CD      | 0x0001  | 32768   |         
Et44 Bundled | 8000,00-1c-73-09-a0-f3 | ALGs+CD      | 0x0001  | 32768   |         
Et45 Bundled | 8000,00-1c-73-09-a0-f3 | ALGs+CD      | 0x0001  | 32768   |         
Et46 Bundled | 8000,00-1c-73-09-a0-f3 | ALGs+CD      | 0x0001  | 32768   |         
```

```
Port Channel Port-Channel2:
|                       Partner       | Actor
Port Status  | Sys-id                 | Port# State | OperKey | PortPri | Port#
--------------------|------------------------|--------------|---------|---------|---------
Et47 Bundled | 8000,00-1c-73-01-02-1e | ALGs+CD      | 0x0002  | 32768   |         
Et48 Bundled | 8000,00-1c-73-01-02-1e | ALGs+CD      | 0x0002  | 32768   |         
```

```
Port Channel Port-Channel1:
|                       Actor
Port Status  | State  | OperKey | PortPriority
--------------------|--------|---------|---------------
Et43 Bundled | ALGs+CD| 0x0001  | 32768        
Et44 Bundled | ALGs+CD| 0x0001  | 32768        
Et45 Bundled | ALGs+CD| 0x0001  | 32768        
Et46 Bundled | ALGs+CD| 0x0001  | 32768        
```

```
Port Channel Port-Channel2:
|                       Actor
Port Status  | State  | OperKey | PortPriority
--------------------|--------|---------|---------------
Et47 Bundled | ALGs+CD| 0x0002  | 32768        
Et48 Bundled | ALGs+CD| 0x0002  | 32768        
```

switch>

show lacp internal

The `show lacp internal` command displays the local LACP state for all specified channels. Local state data includes the state machines and LACP protocol information.

**Command Mode**

EXEC

**Command Syntax**

```
show lacp [PORT_LIST] internal [PORT_LEVEL] [INFO_LEVEL]
```

**Parameters**

- **PORT_LIST** interface for which port information is displayed. Options include:
  - `<no parameter>` all configured port channels
  - `c_range` ports in specified channel list (number, number range, or list of numbers and ranges).
  - `interface` ports on all interfaces.
  - `interface ethernet e_num` Ethernet interface specified by `e_num`.
  - `interface port-channel p_num` port channel interface specified by `p_num`.

- **PORT_LEVEL** ports displayed, in terms of aggregation status. Options include:
  - `<no parameter>` command lists data for ports bundled by LACP into an aggregate.
  - `all-ports` command lists data for all ports, including LACP candidates that are not bundled.

- **INFO_LEVEL** amount of information that is displayed. Options include:
  - `<no parameter>` displays same information as `brief` option.
  - `brief` displays LACP configuration data, including sys-id, actor, priorities, and keys.
  - `detailed` includes `brief` option information plus state machine data.

**PORT_LEVEL** and **INFO_LEVEL** parameters can be placed in any order.

**Example**

This command displays internal data for all configured port channels.

```
switch>show lacp internal
LACP System-identifier: 8000,00-1c-73-04-36-d7
State: A = Active, P = Passive; S=ShortTimeout, L=LongTimeout;
  G = Aggregable, I = Individual; s+=InSync, s-=OutOfSync;
  C = Collecting, X = state machine expired,
  D = Distributing, d = default neighbor state
<table>
<thead>
<tr>
<th>Partner</th>
<th>Port Status</th>
<th>Sys-id</th>
<th>Port#</th>
<th>State</th>
<th>OperKey</th>
<th>PortPriority</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Port Channel Port-Channel1:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Et43 Bundled</td>
<td>8000,00-1c-73-09-a0-f3</td>
<td>43</td>
<td>ALGs+CD</td>
<td>0x0001</td>
<td>32768</td>
</tr>
<tr>
<td></td>
<td>Et44 Bundled</td>
<td>8000,00-1c-73-09-a0-f3</td>
<td>44</td>
<td>ALGs+CD</td>
<td>0x0001</td>
<td>32768</td>
</tr>
<tr>
<td></td>
<td>Et45 Bundled</td>
<td>8000,00-1c-73-09-a0-f3</td>
<td>45</td>
<td>ALGs+CD</td>
<td>0x0001</td>
<td>32768</td>
</tr>
<tr>
<td></td>
<td>Et46 Bundled</td>
<td>8000,00-1c-73-09-a0-f3</td>
<td>46</td>
<td>ALGs+CD</td>
<td>0x0001</td>
<td>32768</td>
</tr>
</tbody>
</table>
```
show lacp neighbor

The **show lacp neighbor** command displays the LACP protocol state of the remote neighbor for all specified port channels.

**Command Mode**

EXEC

**Command Syntax**

```
show lacp [PORT_LIST] neighbor [PORT_LEVEL] [INFO_LEVEL]
```

---

**Parameters**

- **PORT_LIST** interface for which port information is displayed. Options include:
  - `<no parameter>` displays information for all configured port channels
  - `c_range` ports in specified channel list (number, number range, or list of numbers and ranges).
  - `interface` ports on all interfaces.
  - `interface ethernet e_num` Ethernet interface specified by `e_num`.
  - `interface port-channel p_num` port channel interface specified by `p_num`.
- **PORT_LEVEL** ports displayed, in terms of aggregation status. Options include:
  - `<no parameter>` command lists data for ports bundled by LACP into an aggregate.
  - `all-ports` command lists data for all ports, including LACP candidates that are not bundled.
- **INFO_LEVEL** amount of information that is displayed. Options include:
  - `<no parameter>` displays same information as `brief` option.
  - `brief` displays LACP configuration data, including sys-id, actor, priorities, and keys.
  - `detailed` includes `brief` option information plus state machine data.
Example

- This command displays the LACP protocol state of the remote neighbor for all port channels.

```
switch>show lacp neighbor
State: A = Active, P = Passive; S=ShortTimeout, L=LongTimeout;
G = Aggregable, I = Individual; s+=InSync, s-=OutOfSync;
C = Collecting, X = state machine expired,
D = Distributing, d = default neighbor state

<table>
<thead>
<tr>
<th>Port</th>
<th>Status</th>
<th>Sys-id</th>
<th>Port#</th>
<th>State</th>
<th>OperKey</th>
<th>PortPri</th>
</tr>
</thead>
<tbody>
<tr>
<td>Et1</td>
<td>Bundled</td>
<td>8000,00-1c-73-00-13-19</td>
<td>1</td>
<td>ALGs+CD</td>
<td>0x0001</td>
<td>32768</td>
</tr>
<tr>
<td>Et2</td>
<td>Bundled</td>
<td>8000,00-1c-73-00-13-19</td>
<td>2</td>
<td>ALGs+CD</td>
<td>0x0001</td>
<td>32768</td>
</tr>
<tr>
<td>Et23</td>
<td>Bundled</td>
<td>8000,00-1c-73-04-36-d7</td>
<td>47</td>
<td>ALGs+CD</td>
<td>0x0002</td>
<td>32768</td>
</tr>
<tr>
<td>Et24</td>
<td>Bundled</td>
<td>8000,00-1c-73-04-36-d7</td>
<td>48</td>
<td>ALGs+CD</td>
<td>0x0002</td>
<td>32768</td>
</tr>
<tr>
<td>Et3</td>
<td>Bundled</td>
<td>8000,00-1c-73-0b-a8-0e</td>
<td>45</td>
<td>ALGs+CD</td>
<td>0x0001</td>
<td>32768</td>
</tr>
<tr>
<td>Et4</td>
<td>Bundled</td>
<td>8000,00-1c-73-0b-a8-0e</td>
<td>46</td>
<td>ALGs+CD</td>
<td>0x0001</td>
<td>32768</td>
</tr>
<tr>
<td>Et19</td>
<td>Bundled</td>
<td>8000,00-1c-73-0c-30-09</td>
<td>49</td>
<td>ALGs+CD</td>
<td>0x0005</td>
<td>32768</td>
</tr>
<tr>
<td>Et20</td>
<td>Bundled</td>
<td>8000,00-1c-73-0c-30-09</td>
<td>50</td>
<td>ALGs+CD</td>
<td>0x0005</td>
<td>32768</td>
</tr>
<tr>
<td>Et6</td>
<td>Bundled</td>
<td>8000,00-1c-73-01-07-b9</td>
<td>49</td>
<td>ALGs+CD</td>
<td>0x0001</td>
<td>32768</td>
</tr>
<tr>
<td>Et5</td>
<td>Bundled</td>
<td>8000,00-1c-73-0f-6b-22</td>
<td>51</td>
<td>ALGs+CD</td>
<td>0x0001</td>
<td>32768</td>
</tr>
<tr>
<td>Et10</td>
<td>Bundled</td>
<td>8000,00-1c-73-10-40-fa</td>
<td>51</td>
<td>ALGs+CD</td>
<td>0x0001</td>
<td>32768</td>
</tr>
</tbody>
</table>

* - Only local interfaces for MLAGs are displayed. Connect to the peer to see the state for peer interfaces.
```

```
switch>
```
show lACP sys-id

The `show lACP sys-id` command displays the System Identifier the switch uses when negotiating remote LACP implementations.

Command Mode

EXEC

Command Syntax

```
show lACP sys-id [INFO_LEVEL]
```

Parameters

- `INFO_LEVEL` amount of information that is displayed. Options include:
  - `<no parameter>` displays system identifier
  - `brief` displays system identifier.
  - `detailed` displays system identifier and system priority, including the MAC address.

Examples

- This command displays the system identifier.
  ```
  switch> show lACP sys-id brief
  8000,00-1c-73-04-36-d7
  ```
- This command displays the system identifier and system priority.
  ```
  switch> show lACP sys-id detailed
  System Identifier used by LACP:
  System priority: 32768  Switch MAC Address: 00:1c:73:04:36:d7
  802.11.43 representation: 8000,00-1c-73-04-36-d7
  ```
show load-balance profile

The **show load-balance profile** command displays the contents of the specified load balance profiles. Load balance profiles specify parameters used by hashing algorithms that distribute traffic across ports comprising a port channel or among component ECMP routes.

**Command Mode**

EXEC

**Command Syntax**

```plaintext
show load-balance profile [PROFILES]
```

**Parameters**

- **PROFILES**  Load balance profiles for which command displays contents. Options include:
  - `<no parameter>`  displays all load balance profiles.
  - `profile_name`  displays specified profile.

**Related Commands**

- **load-balance policies**  places the switch in load-balance-policies configuration mode.
- **ingress load-balance profile**  applies a load-balance profile to an Ethernet or port channel interface.

**Example**

- This command displays the contents of the LB-1 load balance profile.
  
  switch>**show load-balance profile LB-1**
  
  ---------- LB-1 ----------
  
  Source MAC address hashing   ON
  Destination MAC address hashing   ON
  Ethernet type hashing   ON
  VLAN ID hashing   ON
  IP protocol field hashing   ON
  DSCP field hashing is   ON
  Symmetric hashing for non-IP packets   OFF
  Symmetric hashing for IP packets   OFF
  Random distribution for port-channel   ON
  Random distribution for ecmp   ON
  
  Profile LB-1 is applied on the following
  
  Port-Channel100
  
---------- myGlobalProfile (global) ----------
  
  L3 hashing is ON
  Symmetric hashing is OFF
  Hashing mode is flow-based
  Hash polynomial is 3
  Hash seed is 0
  
  Profile myGlobalProfile (global) is applied on the following
  
  Linecard3
  Linecard4
  Linecard5
  Linecard6
  
  switch>
**show port-channel**

The **show port-channel** command displays information about members the specified port channels.

**Command Mode**
EXEC

**Command Syntax**
```
show port-channel [MEMBERS] [PORT_LIST] [INFO_LEVEL]
```

**Parameters**
- **MEMBERS** list of port channels for which information is displayed. Options include:
  - `<no parameter>` all configured port channels.
  - `p_range` ports in specified channel list (number, number range, or list of numbers and ranges).
- **PORT_LEVEL** ports displayed, in terms of aggregation status. Options include:
  - `<no parameter>` Displays information on ports that are active members of the LAG.
  - `active-ports` Displays information on ports that are active members of the LAG.
  - `all-ports` Displays information on all ports (active or inactive) configured for LAG.
- **INFO_LEVEL** amount of information that is displayed. Options include:
  - `<no parameter>` Displays information at the brief level.
  - `brief` Displays information at the brief level.
  - `detailed` Displays information at the detail level.

**Display Values**
- **Port Channel** Type and name of the port channel.
- **Time became active** Time when the port channel came up.
- **Protocol** Protocol operating on the port channel.
- **Mode** Status of the Ethernet interface on the port. The status value is Active or Inactive.
- **No active ports** Number of active ports on the port channel.
- **Configured but inactive ports** Ports configured but that are not actively up.
- **Reason unconfigured** Reason why the port is not part of the LAG.

**Guidelines**
The **show etherchannel** and **show port-channel** commands are identical.

You can configure a port channel to contain many ports, but only a subset may be active at a time. All active ports in a port channel must be compatible. Compatibility includes many factors and is platform specific. For example, compatibility may require identical operating parameters such as speed and maximum transmission unit (MTU). Compatibility may only be possible between specific ports because of the internal organization of the switch.
Examples

- This command displays output from the **show port-channel** command:

  ```
  switch>show port-channel 3
  Port Channel Port-Channel3:
  Active Ports:
  ------------------------------
  Port                Time became active       Protocol    Mode
  ------------------------------
  Ethernet3           15:33:41                 LACP        Active
  PeerEthernet3       15:33:41                 LACP        Active
  ```

- This command displays output from the **show port-channel active-ports** command:

  ```
  switch>show port-channel active-ports
  Port Channel Port-Channel3:
  No Active Ports
  Port Channel Port-Channel11:
  No Active Ports
  switch>
  ```

- This command displays output from the **show port-channel all-ports** command:

  ```
  switch>show port-channel all-ports
  Port Channel Port-Channel3:
  No Active Ports
  Configured, but inactive ports:
  ------------------------------
  Port            Time became inactive    Reason unconfigured
  ------------------------------
  Ethernet3       Always                  not compatible with aggregate
  ```

  ```
  Port Channel Port-Channel11:
  No Active Ports
  Configured, but inactive ports:
  Port            Time became inactive    Reason unconfigured
  ------------------------------
  Ethernet25       Always                  not compatible with aggregate
  Ethernet26       Always                  not compatible with aggregate
  ```

  ```
  switch>
  ```
show port-channel limits

The `show port-channel limits` command displays groups of ports that are compatible and may be joined into port channels. Each group of compatible ports is called a LAG group. For each LAG group, the command also displays `Max interfaces` and `Max ports per interface`.

- **Max interfaces** defines the maximum number of active port channels that may be formed out of these ports.
- **Max ports per interface** defines the maximum number of active ports allowed in a port channel from the compatibility group.

All active ports in a port channel must be compatible. Compatibility comprises many factors and is specific to a given platform. For example, compatibility may require identical operating parameters such as speed and/or maximum transmission unit (MTU). Compatibility may only be possible between specific ports because of internal organization of the switch.

**Command Mode**

EXEC

**Command Syntax**

`show port-channel limits`

**Example**

- This command displays `show port-channel list` output:

  ```
  switch>show port-channel limits
  LAG Group: focalpoint
  "--------------------------------------------------------------------------------
  Max port-channels per group: 24, Max ports per port-channel: 16
  24 compatible ports: Ethernet1  Ethernet2  Ethernet3  Ethernet4
  Ethernet5  Ethernet6  Ethernet7  Ethernet8
  Ethernet9  Ethernet10 Ethernet11 Ethernet12
  Ethernet13 Ethernet14 Ethernet15 Ethernet16
  Ethernet17 Ethernet18 Ethernet19 Ethernet20
  Ethernet21 Ethernet22 Ethernet23 Ethernet24
  "--------------------------------------------------------------------------------
  
  switch>
  ```
show port-channel load-balance fields

The `show port-channel load-balance fields` command displays the fields that the hashing algorithm uses to distribute traffic across the interfaces that comprise the port channels.

**Command Mode**

`EXEC`

**Command Syntax**

```
show port-channel load-balance HARDWARE fields
```

**Parameters**

- `HARDWARE` ASIC switching device. Selection options depend on the switch model and include:
  - `arad`
  - `fm6000`
  - `petraA`
  - `trident`

**Examples**

- This command displays the hashing fields used for balancing port channel traffic.
  
  ```
  switch>show port-channel load-balance fm6000 fields
  Source MAC address hashing for non-IP packets is ON
  Destination MAC address hashing for non-IP packets is ON
  Ethernet type hashing for non-IP packets is ON
  VLAN ID hashing for non-IP packets is ON
  VLAN priority hashing for non-IP packets is ON
  Source MAC address hashing for IP packets is ON
  Destination MAC address hashing for IP packets is ON
  Ethernet type hashing for IP packets is ON
  VLAN ID hashing for IP packets is ON
  VLAN priority hashing for IP packets is ON
  IP source address hashing is ON
  IP destination address hashing is ON
  IP protocol field hashing is ON
  TCP/UDP source port hashing is ON
  TCP/UDP destination port hashing is ON
  
  switch>
  ```
show port-channel summary

The **show port-channel summary** command displays the port-channels on the switch and lists their component interfaces, LACP status, and set flags.

**Command Mode**

EXEC

**Command Syntax**

`show port-channel summary`

**Examples**

- This command displays **show port-channel summary** output:

```plaintext
switch>show port-channel summary

Flags
-----------------------------------------------
a - LACP Active          p - LACP Passive
U - In Use                D - Down
+ - In-Sync               - - Out-of-Sync      i - incompatible with agg
P - bundled in Po         s - suspended        G - Aggregable
I - Individual           S - ShortTimeout     w - wait for agg

Number of channels in use: 2
Number of aggregators:2

<table>
<thead>
<tr>
<th>Port-Channel</th>
<th>Protocol</th>
<th>Ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Po1(U)</td>
<td>LACP(a)</td>
<td>Et47(PG+) Et48(PG+)</td>
</tr>
<tr>
<td>Po2(U)</td>
<td>LACP(a)</td>
<td>Et39(PG+) Et40(PG+)</td>
</tr>
</tbody>
</table>
show port-channel traffic

The **show port-channel traffic** command displays the traffic distribution between the member ports of the specified port channels. The command displays distribution for unicast, multicast, and broadcast streams.

- The distribution values displayed are based on the total interface counters which start from zero at boot time or when the counters are cleared. For more current traffic distribution values, clear the interface counters of the member interfaces using the **clear counters** command.

**Command Mode**
EXEC

**Command Syntax**

```
show port-channel [MEMBERS] traffic
```

**Parameters**
- **MEMBERS** list of port channels for which information is displayed. Options include:
  - `<no parameter>` all configured port channels.
  - **c_range** ports in specified channel list (number, number range, or list of numbers and ranges).

**Examples**
- This command displays traffic distribution for all configured port channels.

```
switch> show port-channel traffic
ChanId Port Rx-Ucst Tx-Ucst Rx-Mcst Tx-Mcst Rx-Bcst Tx-Bcst
------- --------- ------- ------- ------- ------- ------- ------- -------
 8      Et10  100.00% 100.00% 100.00% 100.00%  0.00% 100.00%
 1       Et1  13.97%  42.37%  47.71%  30.94%  0.43%  99.84%
 1       Et2  86.03%  57.63%  52.29%  69.06% 99.57%   0.16%
 2      Et23  48.27%  50.71%  26.79%  73.22%  0.00% 100.00%
 2      Et24  51.73%  49.29%  73.21%  26.78%  0.00%   0.00%
 4       Et3  55.97%  63.29%  51.32%  73.49%  0.00%   0.00%
 4       Et4  44.03%  36.71%  48.68%  26.51%  0.00%   0.00%
 5      Et19  39.64%  37.71%  50.00%  90.71%  0.00%   0.00%
 5      Et20  60.36%  62.29%  50.00%   9.29%  0.00% 100.00%
 6      Et6  100.00% 100.00% 100.00% 100.00%  0.00% 100.00%
 7      Et5  100.00%  0.00% 100.00% 100.00%  0.00%   0.00%
switch>
```