Link-Aggregation Modes

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Link-aggregation modes are categories that define different methods for combining multiple network connections into a single logical link.

These modes enable network devices to use several physical links together, improving performance, redundancy, and load balancing. Common terms associated with link-aggregation include LACP (Link Aggregation Control Protocol), balance mode, backup mode, and broadcast mode.

This approach distributes traffic across several links, which increases bandwidth and ensures network availability if a link fails. The Link Aggregation Control Protocol (LACP) dynamically manages link aggregation based on the IEEE 802.3ad standard, making it a widely adopted solution for Ethernet networks.

IEC6400 has two 10GBASE-T ports. If it is configured with the optional VIC card, it also has four SFP28 ports. These ports are configured into two logical groups by port type. The first group consists of the two 10GBASE-T ports. The second group consists of the four SFP28 ports.

Link-aggregation manages network traffic among the physical ports belonging to the same group, improving the efficiency of packet transfer. The device supports simultaneous use of Ethernet ports, which increases redundancy, balances network load, and enhances overall performance. Balance mode and LACP mode are specifically designed to optimize packet transfer performance.

By default, the device operates in Backup mode.

Types of Link-Aggregation Modes

These modes define how the device manages aggregated links:

- Backup mode
- Broadcast mode
- Balance mode
- LACP mode

Backup mode

Backup mode is one of the link-aggregation methods, where one link is designated as the primary (active) link, and the others act as backups (standby). Normally, all network traffic flows through the primary link. If the primary link fails, a backup link automatically takes over, ensuring continuous network connectivity.

Broadcast mode

Broadcast mode is one of the link-aggregation methods, where all links belonging to the same group are active and can be used to connect to other equipment.

- In this mode, you should not create loops.
- Broadcast mode does not increase bandwidth efficiency, as all links carry the same traffic, but it maximizes reliability in mission-critical networks.

This mode is ideal for critical network connections where reliability is essential, and bandwidth requirements can be met by a single link.

Sample use case

First Ethernet port is connected to the external device (Switch) on the customer side, and the other Ethernet port is connected to the laptop device.

Balance mode

Balance mode is one of the link-aggregation methods, that distributes network traffic evenly across all available member links in an aggregation group. This helps optimize bandwidth usage and improves overall network performance by preventing any single link from becoming a bottleneck. Hashing on the on the header of the packet decides which part to assign.

LACP mode

LACP mode is one of the link-aggregation methods, that enables the multiple physical Ethernet links to combine into a single logical link. These protocols increase network bandwidth and provide redundancy.

Benefits

- Increased Reliability: Multiple network links are combined, so network connectivity is maintained even if one or more links fail.
- Redundancy: Backup paths for data transmission are automatically provided, significantly reducing the risk of network downtime.
- Simplified Management: Aggregated links are managed as a single logical connection, streamlining configuration and ongoing management tasks.
- Scalability: Network capacity can be easily expanded by adding more links to the aggregation group, supporting growing traffic demands.
- Flexibility: Link aggregation can be configured to meet different networking needs such as load balancing, high availability, or ensuring reliable data delivery, depending on the selected mode.

Prerequisites

- Compatible Network Devices: Both ends of the aggregated links (such as switches, routers, or servers) must support link aggregation and the specific aggregation mode you plan to deploy.
- Uniform Link Speed and Duplex Settings: All physical links within the aggregation group must operate at the same speed (for example, 1 Gbps or 10 Gbps) and have matching duplex settings to ensure stable and consistent performance.
- Port Availability: Ensure that enough free ports are available on both devices to create the desired aggregation group.
- LACP Support and Configuration: Both devices should support IEEE 802.3ad (Link Aggregation Control Protocol, or LACP). LACP must be enabled on both devices when using this dynamic aggregation mode.

Configure Link-aggregation modes using CLI

Configure link aggregation modes to optimize network performance, enhance bandwidth, and provide redundancy for network links.

Link aggregation combines multiple physical Ethernet links into a single logical link. This task describes how to configure the various link aggregation modes available on your device using CLI

Procedure

Step 1 Use the **ethernet link-aggregation** command to display the available link aggregation modes on the device.

```
Device# ethernet link-aggregation
```

The device supports these link aggregation modes:

```
Device# ethernet link-aggregation
 lacp       dynamic link aggregation (802.3ad) mode
balance    XOR balanced mode
broadcast  broadcast mode
backup     backup mode
```

Example:

- Enable LACP mode:

  ```
  Device# ethernet link-aggregation lacp
  ```

- Enable balance mode:

  ```
  Device# ethernet link-aggregation balance
  ```

- Enable broadcast mode:

  ```
  Device# ethernet link-aggregation broadcast
  ```

- Enable backup mode:

  ```
  Device# ethernet link-aggregation backup
  ```

Step 2 Use the **write** command to save the current configuration settings to the device's persistent memory.

```
Device# write
```

Step 3 Use the **reboot** command to restart the device.

```
Device# reboot
```

Configure Backup mode using CLI

Perform this task to enable a backup mechanism for link aggregation, ensuring network resilience and continued operation in case of primary link failure.

This procedure outlines the steps to configure and apply backup mode settings using the CLI, that is crucial for maintaining network availability and stability.

Procedure

Step 1 Use the **ethernet link-aggregation backup** command to configure backup mode on the device.

```
Device# ethernet link-aggregation backup
```

Step 2 Use the **write** command to apply the current configuration settings to the device.

```
Device# write
```

Step 3 Use the **reboot** command to restart the device.

```
Device# reboot
```

Configure Broadcast mode using CLI

Configure the broadcast mode to define how broadcast traffic is handled across the aggregated Ethernet link.

Procedure

Step 1 Use the **ethernet link-aggregation broadcast** command to configure broadcast mode on the device.

```
Device# ethernet link-aggregation broadcast
```

Step 2 Use the **write** command to apply the current configuration settings to the device.

```
Device# write
```

Step 3 Use the **reboot** command to restart the device.

```
Device# reboot
```

Configure Balance mode using CLI

Perform this task to effectively configure the balance mode on your device. This process allows you to optimize network traffic distribution across aggregated links, enhancing bandwidth utilization and providing redundancy.

Configure the balance mode to distribute network traffic across aggregated links, optimizing bandwidth utilization and providing redundancy.

Procedure

Step 1 Use the **ethernet link-aggregation balance** command to configure balance mode on the device.

Example:

```
Device# ethernet link-aggregation balance
```

Step 2 Use the **ethernet link-aggregation balance policy** command to configure any specific policy on the balance mode of the device.

Example:

```
Device# ethernet link-aggregation balance policy
l2   l2 policy: src_mac XOR dst_mac
l23  l23 policy: src_mac XOR dst_mac XOR src_ip XOR dst_ip
l34  l34 policy: src_ip XOR dst_ip XOR src_port XOR dst_port
```

Note

- The l2 policy operates at Layer 2, using source and destination MAC addresses.
- The l23 policy operates at Layer 2 and Layer 3, using source and destination MAC and IP addresses.

- The l34 policy operates only on IP traffic, supporting data transfer through TCP or UDP ports. It does not accept Ethernet traffic.

Policy options are same for both balance and LACP modes.

Step 3 Use the **write** command to apply the current configuration settings to the device.

```
Device# write
```

Step 4 Use the **reboot** command to restart the device.

```
Device# reboot
```

Configure LACP mode using CLI

Use this procedure to enable and customize LACP on your device, which improves network performance and redundancy.

This procedure guides you through configuring LACP mode and its associated load-balancing policies using the CLI.

Procedure

Step 1 Use the **ethernet link-aggregation lacp** command to configure LACP mode on the device.

Example:

```
Device# ethernet link-aggregation lacp
```

Step 2 Use the **ethernet link-aggregation lacp policy** command to configure any specific policy on the lacp mode of the device.

Example:

```
Device# ethernet link-aggregation lacp policy
l2   l2 policy: src_mac XOR dst_mac
l23  l23 policy: src_mac XOR dst_mac XOR src_ip XOR dst_ip
l34  l34 policy: src_ip XOR dst_ip XOR src_port XOR dst_port
```

Note

- The l2 policy operates at Layer 2, using source and destination MAC addresses.
- The l23 policy operates at Layer 2 and Layer 3, using source and destination MAC and IP addresses.
- The l34 policy operates only on IP traffic, supporting data transfer through TCP or UDP ports. It does not accept Ethernet traffic.

Policy options are same for both balance and LACP modes.

Step 3 Use the **write** command to apply the current configuration settings to the device.

```
Device# write
```

Step 4 Use the **reboot** command to restart the device.

```
Device# reboot
```