

Grandstream Networks, Inc.

GWN78xx Series GWN78xx – Link Aggregation Guide



GWN78XX(P) - Link Aggregation Guide

Overview

Link aggregation, also known as port aggregation or NIC teaming, is a technique used in layer 2 and layer 3 network switches to combine multiple physical links into a single logical link. This logical link provides increased bandwidth, redundancy, and load balancing.



Link aggregation diagram

The two main goals for creating link aggregation groups are :

- Enhancing the overall bandwidth beyond the capabilities of a single link by distributing traffic across the member ports.
- Increasing the reliability of the connection as the member ports dynamically back each other up. This means that if one port fails, the traffic is automatically routed to other member ports, ensuring uninterrupted network connectivity.

Link Aggregation Configuration Example

In this section of the guide, we will create a lab to combine two network connections into a single aggregated logical link. To accomplish this, we will use two Grandstream network switches.



Link Aggregation setup

We will go about two methods to do it :

- Static Link Aggregation
- LACP (Link aggregation Control Protocol)

Notes

Before we start configuring both switches, please make sure you review the following information:

- A logical link can bundle up to 8 ports.
- A port that is part of a link aggregation group should not have any form of authentication applied to it (NAC authentication for example).
- The bundled ports must have the same speed and duplex.
- LAG configuration is automatically applied to the port.
- Switching protocols should be applied to the LAG.
- The same Link Aggregation type (LACP or static) must be configured on both sides of the link.
- Always Configure LAG before connecting the cables: Using multiple Ethernet cables between two devices between LAG is created can cause a bridging loop especially when the spanning tree is disabled.

Static Link Aggregation Configuration

Static link aggregation is a manual configuration where both the switch and the host are required to recognize the LAGs. Because this setup is static, there is no additional protocol to assist the switch and host in recognizing issues such as incorrectly connected cables, which could lead to LAG failure.

To configure a static link aggregation on GWN78xx network switches, please follow the below steps:

- 1. On the first switch (Switch A), navigate to Web UI → Switching → Link Aggregation → Group, then select the Load Balance mode to MAC Address.
- 2. We will configure LAG1 to be our static Link aggregation group, to do that click the icon 🛛 to edit the LAG,

S GWN7803P							Save Q 💽 admin ~
Overview ~	Link Aggreg	ation					
Switching ^	Group	AG Settings LACP					
Port Basic Settings			Load Balance Mode	MAC Address	~		
Flow Statistics				Cancel OK			
Port Auto Recovery							
Link Aggregation	LAG	Name	Туре	Link Status	Active Member	Inactive Member	Operation
MAC Address Table	LAG1		Static	Down	-	-	
VEAN	LAG2		Static	Down	-	-	e o
1001	LAG3		Static	Down		-	e o
Spanning Tree	LAG4		Static	Down		-	2 3
© IP ~	LAG5		Static	Down		-	Z 💿
🗟 Multicast 🗸 🗸	LAG6		Static	Down		-	2 0
🖧 Routing 🗸 🗸	LAG7	-	Static	Down		-	e o
● PoE ~	LAG8	-	Static	Down	-	-	2 3

Choosing Load Balance mode and Editing LAG1

3. Choose a Name for the Link Aggregation group and then Select the LAG category. The LAG type will be set to **Static**. Following that, choose the ports that will be used in conjunction with other switch ports to aggregate bandwidth or provide dynamic backup, when done Click "OK" and then save the changes.

🙃 Overview 🗸 Grou	p > Edit Group		
Switching	Description	LAG1	0-128 characters
Port Basic Settings	Туре	Static ~	1
Flow Statistics	*Port		
Port Auto Recovery	Click on port to select/unselect		
Link Aggregation			
MAC Address Table		9 11 13 15 17 19 21 23	25 26 27 28
VLAN			SEP+ SEP+ SEP+
Spanning Tree		Cancel OK	
© IP ✓			

Setting up the LAG1 on Switch A

4. The members of the LAG1 will be shown under the **Inactive member** section, once the ports are plugged, they will be shown under the **Active member** section.

🕲 Overview 🗸 🗸	Link Aggregation	n					
Switching ^	Group LAG S	Settings LACP					
Port Basic Settings			Load Balance Mode	MAC Address	v		
Flow Statistics				Cancel OK			
Port Auto Recovery							
Link Aggregation	LAG	Description	Туре	Link Status	Active Member	Inactive Member	Operation
MAC Address Table	LAG1	LAG1	Static	Down		1/0/7-1/0/8	I 0
10.00	LAG2		Static	Down		-	I 0
VLAN	LAG3		Static	Down		-	2 9
Spanning Tree	LAG4		Static	Down	-	-	I 0
© IP ~	LAG5	-	Static	Down	-	-	2 9
😂 Multicast 🗸 🗸	LAG6		Static	Down	-	-	E 0

Setting Inactive members

5. Using the identical process, create LAG1 on the second switch (**Switch B**), which will be combined with our primary switch. Once configured, the Switch B Web UI will show the following results:

② Overview ~	Link Aggrega	tion					
Switching	Group L	AG Settings LACP					
Port Basic Settings			Load Balance Mode	MAC Address	~		
Flow Statistics				Cancel			
Port Auto Recovery				Cancer			
Link Aggregation	LAG	Description	Туре	Link Status	Active Member	Inactive Member	Operation
MAC Address Table	LAG1	LAG1	Static	Down	-	1/0/23-1/0/24	Z O
10.00	LAG2		Static	Down	-		C 3
VLAN	LAG3	-	Static	Down	-	-	C D
Spanning Tree	LAG4	-	Static	Down	-	-	2 3
♥ IP	LAG5	-	Static	Down	-	-	e 🕤
😂 Multicast 🗸 🗸	LAG6		Static	Down	-		Z 0

LAG1 created on Switch B

LACP Configuration

LACP dynamically recognizes links created between the switch and the host, allowing the LAG to be formed automatically. This functionality is supported by all server-class switches; however, network administrators must enable LACP on the switch port.

We will now configure on both switches A and B a LAG using LACP, to do that please follow the below steps:

1. Under Web UI → Switching → Link Aggregation → Group, select the Load Balance Mode to MAC Address based.

2. LAG2 will be set to an LACP, to do that click the icon 🛛 🗹 to edit the Link Aggregation group:

🙆 Overview 🗸 🗸	Link Aggregation						
Switching ^	Group LAG Se	ettings LACP					
Port Basic Settings			Load Balance Mode	MAC Address	~		
Flow Statistics				Cancel OK			
Port Auto Recovery							
Link Aggregation	LAG	Description	Туре	Link Status	Active Member	Inactive Member	Operation
MAC Address Table	LAG1	LAG1	Static	Down	-	1/0/7-1/0/8	20
	LAG2	-	Static	Down	-		⊡ ⊙
VLAN	LAG3	-	Static	Down	-	-	e d
Spanning Tree	LAG4	-	Static	Down	-	-	20
© IP ~ (LAG5	-	Static	Down	-	-	C 3
😂 Multicast 🗸 🗸	LAG6	-	Static	Down	-	-	C D

Edit LAG2

3. Name the group "LACPLAG", and then set the type to "LACP", then select the ports that will be part of "LACPLAG", please bear in mind that you can not select ports that were already added to a different LAG (eg: 1/0/7 and 1/0/8 are already part of LAG1), in our case we will select port 1/0/5 and 1/0/6, once Selected, Click "OK" then Save.

Group > Edit Group			
Switching	Description	LACPLAG	0–128 characters
Port Basic Settings	Туре	LACP ~	
Flow Statistics	Port Click on port to relact (unrelact		
Link Aggregation			
MAC Address Table	2	10 12 14 16 18 20 22 24	
VLAN		y 11 13 15 17 19 21 23	25 5FP+ 5FP+ 5FP+
Spanning Tree		Cancel OK	
v 91 ⊘			

Select LAG type

4. After the "LACPLAG" is created, it will be shown on the list of Link aggregation groups with their respective ports, they will be in the Inactive member section, and once the cables are plugged they will be under **Active member**.

🙆 Overview 🗸 🗸	Link Aggregation						
Switching ^	Group LAC	G Settings LACP					
Port Basic Settings			Load Balance Mode	MAC Address	~		
Flow Statistics				Cancel OX			
Port Auto Recovery							
Link Aggregation	LAG	Description	Туре	Link Status	Active Member	Inactive Member	Operation
MAC Address Table	LAG1	LAG1	Static	Down	-	1/0/7-1/0/8	I 0
	LAG2	LAGLACP	LACP	Down	-	1/0/5-1/0/6	2 O
VLAN	LAG3	-	Static	Down	-		e 9
Spanning Tree	LAG4	-	Static	Down	-	-	e o
© IP ~	LAG5	-	Static	Down	-	-	2 O

Verifying that LAG2 is created

5. After the LAG is created, go to LACP settings under **Switching** \rightarrow **Link Aggregation** \rightarrow **LACP**, then change the system priority to a lower value than the default one (32768), we will set the value for example 4096.

Information

In order to control and make decisions about the ports that will be actively participating in the link aggregation, we need to set a lower value. A lower value equals a higher priority.

Overview ~	Link Aggregation				
Switching ^	Group LAG Settings LACP				
Port Basic Settings		•System Priority	4096	Valid range is 1-85535	
Flow Statistics			Cancel	-	
Port Auto Recovery					
Link Aggregation	LACP List				
MAC Address Table					
	Port	Port Priority		Timeout	Operation
VLAN	1/0/1	1		Long	Z
Spanning Tree	1/0/2	1		Long	ß
© IP ~ (1/0/3	1		Long	e
😂 Multicast 🗸 🗸	1/0/4	1		Long	ß
😤 Routing 🗸	1/0/5	1		Long	ß
	1/0/6	1		Long	e
	1/0/7	1		Long	e

System Priority Settings

6. Select the ports 1/0/5 and 1/0/6 that are part of the LAGLACP then click "Edit", after that you can configure the port priority and the timeout to be set to either **Long** or **Short**. We will set both ports to have a **Short** timeout.

Information

- Long Timeout: The switch will send LACPDU notifications every 30 seconds and if there is no response after 90 seconds (3 LACPDUs), it will terminate LACP on the port.
- Short Timeout: The switch will send LACPDU every 1 second and if there is no response after 3 seconds (3 LACPDUs), it will terminate LACP on the port.
- **Port Priority:** The Port priority can be defined if more than one LACP LAG are created on the network, if we want to differentiate between them by priority, the ports with lower priority value to have the highest priority.

Port		
1/0/5-1/0/6		
Port Priority		
Valid range is 1-65535	5	
1		
Timeout		
Short		~

Edit LACP ports

7. We will repeat the same steps on Switch B, to set up ports 1/0/21 and 1/0/22 as LAGLACP, the only difference is that we will keep the system priority to its default value (32768), that way we have Switch A with lower priority to make decisions about the designated ports.

S GWN7803P							Save Q 💽 admin -	
(2) Overview ~	Link Aggregation							
Switching ^	Group LAG S	ettings LACP						
Port Basic Settings			Load Balance Mode	MAC Address	~			
Flow Statistics				Cancel OK				
Port Auto Recovery								
Link Aggregation	LAG	Name	Туре	Link Status	Active Member	Inactive Member	Operation	
MAC Address Table	LAG1	LAG1	Static	Down	-	1/0/23-1/0/24	E O	
10.41	LAG2	LAGLACP	LACP	Down	-	1/0/21-1/0/22	e o	
VL/UN	LAG3	-	Static	Down	-	-	2 3	
Spanning Tree	LAG4	-	Static	Down	-	-	I 0	
@ IP ~	LAG5	-	Static	Down	-	-	2 O	
😂 Multicast 🗸 🗸	LAG6	-	Static	Down	-	-	C I	
🛱 Routing 🗸 🗸	LAG7	-	Static	Down	-	-	e o	
∎ PaE ~	LAG8	-	Static	Down	-	-	20	

Creating LACPLAG on Switch B

Finally, once the cables are plugged into both Switches' ports, the links will be aggregated.

Verifying the Creation of the LAG

Once the LAG is created, it will be assigned a logical MAC Address and will be shown in the Dynamic MAC Address table, under **Switching** \rightarrow **MAC Address Table**:

🕜 Overview 🗸 🗸	MAC Address Table				
Switching ^	Dynamic Addresses Static MAC Addresses Blackho	ole Addresses Port Secure Ad	dresses		
Port Basic Settings	•Agi	ing Time (s)	300	Valid range is 0 and 60-1000000	
Flow Statistics			Cancel		
Port Auto Recovery					
Link Apprezation	Dynamic Addresses				
	Refresh Add Static MAC Address				Q Search
MAC ADDress Table	VLAN	MAC Address		Port	
VLAN		1C:99:57:BC:89:F7		1/0/	
Spanning Tree	□ 1	C0:74:AD:89:F1:9C		1/0/1	
> 91 ©	0 1	C0:74:AD:CC:DF:18		LAG	

Verifying the Aggregated Speed

After Plugging both ports, the results should be as follows :

1. First, for the purpose of this test, we will limit the speed of all four ports that are part of LAG1 on both Switch A and Switch B to 100 Mbps, this will include ports **1/0/7**, **1/0/8** on Switch A and port **1/0/23**, **1/0/24** on Switch B, to do so

under **Switching** \rightarrow **Port Basic settings**, select the desired ports and set the speed to 100 Mbps as shown below, after that click "OK", then "Save"

Overview ~	Port Basic Settings > Edit Port			
Switching ^		Port	1/0/7-1/0/8	
Port Basic Settings		Port Type	Copper	
Flow Statistics		Description		0-128 characters
Port Auto Recovery		Port Enable		
Link Aggregation		Speed	100Mbps ~	
MAC Address Table		L Duplex Mode	Auto Full Half	
VLAN		lumbo Frame	9216	Valid range is 1518-10000
D IR		Elow Control	Disabled Enabled Auto	
⊗ Multicast v		noncontrol	Flow Control setting will not take effect if Duplex Mode is set to "Half".	
홉 Routing 🗸			Cancel OK	

Setting the speed for ports

Note

Please make sure that you configure the speed of the ports before plugging the cables in and also make sure that ports 1/0/1, 1/0/2 on switch A and ports 1/0/23, 1/0/24 on switch B all have the same speed of 100 Mbps.

2. Since we are plugging two Ethernet links with 100 Mbps each, the aggregated final outputted bandwidth should be 200 Mbps theoretically, please bear in mind that the internet speed will be limited to the max speed that you receive from your internet service provider and to how congested your network is, to verify the final Internet bandwidth coming from the aggregated link (LAG1 for example), you can use the default internet speed tester on your browser for the connection that is coming from either a direct wired connection to your laptop or from a connected Wireless access point on the network.

An example will be :



Internet Speed

Supported Devices

Device Name	Supported	Number of LAGs supported	Firmware Required
GWN7801	Yes	8 LAGs	1.0.1.20 or higher
GWN7801P	Yes	8 LAGs	1.0.1.20 or higher
GWN7802	Yes	8 LAGs	1.0.1.20 or higher
GWN7802P	Yes	8 LAGs	1.0.1.20 or higher
GWN7803	Yes	8 LAGs	1.0.1.20 or higher
GWN7803P	Yes	8 LAGs	1.0.1.20 or higher
GWN7811	Yes	5 LAGs	1.0.1.8 or higher
GWN7811P	Yes	5 LAGs	1.0.1.8 or higher

GWN7812P	Yes	10 LAGs	1.0.1.8 or higher
GWN7813	Yes	14 LAGs	1.0.1.8 or higher
GWN7813P	Yes	14 LAGs	1.0.1.8 or higher
GWN7806	Yes	27 LAGs	1.0.1.14 or higher
GWN7806P	Yes	27 LAGs	1.0.3.3 or higher
GWN7830	Yes	6 LAGs	1.0.3.3 or higher
GWN7831	Yes	14 LAGs	1.0.3.3 or higher
GWN7832	Yes	6 LAGs	1.0.3.3 or higher

List of Supported Devices

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Can't find the answer you're looking for? Don't worry we're here to help!

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