

RSTP

GS1900 Series

Support Note

Version 2.00 Nov. 2022

Overview of RSTP

Rapid Spanning Tree Protocol (RSTP) is identified by IEEE as 802.1.w. RSTP enhances the drawbacks of the STP and provides rapid convergence of the STP by assigning port roles and by calculating the active topology.

While STP can take 30 to 50 seconds to respond to a topology change, RSTP is typically able to respond to changes within $3 \times \text{Hello times}$ (default: 3 times 2 seconds) or within a few milliseconds of a physical link failure.

General Operation

The switch with the highest priority is selected as root and spanning-tree algorithm uses this information as the source of the spanning-tree topology. Based on the calculation, individual ports are assigned to one of the following port roles.

Port Roles

1. **Root port** – Represents the best path for the traffic toward the root switch.
2. **Designated port** – The lowest cost path when forwarding packets from the LAN to the root switch. A designated switch port on one switch connects to a root port on another switch. The traffic flows from the root port to the designated port, which is closer toward the root switch.
3. **Alternate port** – Provides a backup path for the present root port toward the root switch. Alternate port exists on another switch.
4. **Backup port** – Provides a backup path for the designated port for the traffic flowing from the root switch toward the LAN. The backup port exists on the same switch as the active port. To have a backup port, ports must be connected by a point-to-point link, or a switch must have multiple connections to a shared LAN segment.
5. **Disabled port** – Has no role in the operation of the spanning-tree.

Port Status

Discarding – No user data is sent over the port.

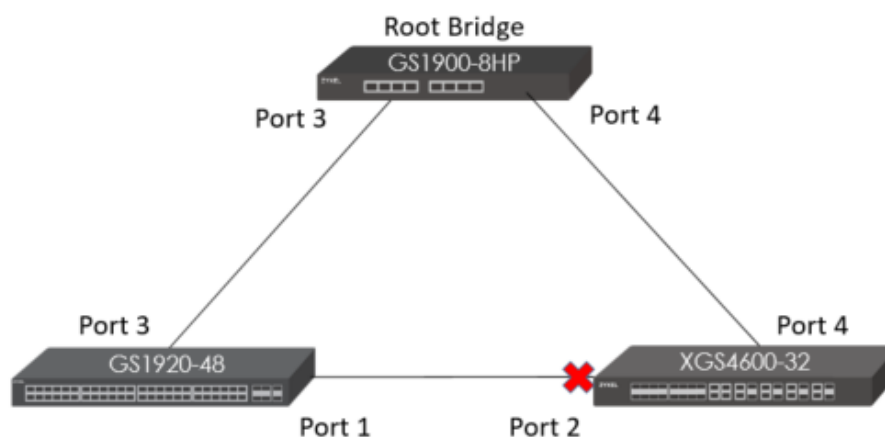
Learning – The port is not forwarding frames yet, but is populating its MAC-address table.

Forwarding – The port is fully operational,

Additional Operation

1. Detection of root switch failure is done in 3 hello times, which is 6 seconds if the default hello times have not been changed.
2. Ports may be configured as edge ports if they are attached to a LAN that has no other bridges attached. These edge ports transition directly to the forwarding state. RSTP still continues to monitor the port for BPDUs in case a bridge is connected. RSTP can also be configured to automatically detect edge ports. As soon as the bridge detects a BPDU coming to an edge port, the port becomes a non-edge port.
3. RSTP will respond to BPDUs sent from the direction of the root bridge. An RSTP bridge will "propose" its spanning tree information to its designated ports. If another RSTP bridge receives this information and determines this is the superior root information, it sets all its other ports to discarding. The bridge may send an "agreement" to the first bridge confirming its superior spanning tree information. Upon receiving the agreement, the bridge will know it can transit that port to the forwarding state rapidly.

Scenario



We would like to setup RSTP for GS1900-8HP, GS1920-48, and XGS4600-32.

Here are the requirements:

GS1900-8HP → Root Bridge

Port 3: designated port

Port 4: designated port

GS1920-48 → Port 1: designated port

Port 3: root port

XGS4600-32 → Port 2: blocked port in this topology

Port 4: root port

Web GUI configuration

Step 1. Enable RSTP on GS1900-8HP.

ZYXEL GS1900-8HP

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Global STP Port CIST CIST Port MST MST Port

State ☒ Enable ☐ Disable

BPDU Forward ☒ Flooding ☐ Filtering

PathCost Method ☐ Short ☒ Long

Version RSTP

Configuration Name RSTP_LAB (Max.32 character)

Configuration Revision 0 (0 - 65535)

Apply Cancel

Step 2. Enable port 3 and port 4 STP status.

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Global STP Port CIST CIST Port MST MST Port

	Port	State	External Cost	Edge Port	BPDU Filter	P2P MAC
<input type="checkbox"/>	1	Enable	0	Yes	No	Yes
<input type="checkbox"/>	2	Enable	0	Yes	No	Yes
<input checked="" type="checkbox"/>	3	Enable	0	Yes	No	Yes
<input checked="" type="checkbox"/>	4	Enable	0	Yes	No	Yes
<input type="checkbox"/>	5	Enable	0	Yes	No	Yes
<input type="checkbox"/>	6	Enable	0	Yes	No	Yes
<input type="checkbox"/>	7	Enable	0	Yes	No	Yes
<input type="checkbox"/>	8	Disable	0	Yes	No	Yes
<input type="checkbox"/>	LAG1	Enable	0	Yes	No	Yes
<input type="checkbox"/>	LAG2	Enable	0	Yes	No	Yes
<input type="checkbox"/>	LAG3	Enable	0	Yes	No	Yes
<input type="checkbox"/>	LAG4	Enable	0	Yes	No	Yes
<input type="checkbox"/>	LAG5	Enable	0	Yes	No	Yes
<input type="checkbox"/>	LAG6	Enable	0	Yes	No	Yes
<input type="checkbox"/>	LAG7	Enable	0	Yes	No	Yes
<input type="checkbox"/>	LAG8	Enable	0	Yes	No	Yes

Edit Cancel

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STP Port
Global STP Port **CIST** CIST Port MST MST Port

Port List	3-4
External Path Cost(0 = Auto)	0
State	<input checked="" type="radio"/> Enable <input type="radio"/> Disable
Edge Port	<input checked="" type="radio"/> Yes <input type="radio"/> No
BPDU Filter	<input type="radio"/> Yes <input checked="" type="radio"/> No
P2P MAC	<input checked="" type="radio"/> Yes <input type="radio"/> No
Migrate	<input type="radio"/> Yes <input checked="" type="radio"/> No

Apply Cancel

Step 3. Set the CIST priority to make the GS1900 root bridge.

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CIST Instance
Global STP Port **CIST** CIST Port MST MST Port

Priority	0	
Max Hops	20	(1-40)
Forward Delay	15	(4-30)
Max Age	20	(6-40)
Tx Hold Count	6	(1-10)
Hello Time	2	(1-10)

Apply Cancel

Step 4. Enable RSTP on GS1920-48 and XGS4600-32.

GS1920-48

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Spanning Tree Protocol Status

Spanning Tree Protocol: RSTP

Bridge	Root	Our Bridge
Bridge ID	0000-000000000000	0000-000000000000
Hello Time (second)	0	0
Max Age (second)	0	0
Forwarding Delay (second)	0	0
Cost to Bridge	0	
Port ID	0X0000	
Topology Changed Times	0	
Time Since Last Change	0:00:00	

Port	Port State	Port Role	Designated Bridge ID	Designated Port ID	Designated Cost
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Spanning Tree Configuration

Spanning Tree Mode

☒ Rapid Spanning Tree

☐ Multiple Rapid Spanning Tree

☐ Multiple Spanning Tree

Apply **Cancel**

XGS4600-32

ZYXEL XGS4600

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Spanning Tree Protocol Status

Spanning Tree Protocol: RSTP

Bridge	Root	Our Bridge
Bridge ID	0000-000000000000	0000-000000000000
Hello Time (second)	0	0
Max Age (second)	0	0
Forwarding Delay (second)	0	0
Cost to Bridge	0	
Port ID	0X0000	
Topology Changed Times	0	
Time Since Last Change	0:00:00	

Port	Port State	Port Role	Designated Bridge ID	Designated Port ID	Designated Cost	Root Guard State

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Spanning Tree Mode

1 Rapid Spanning Tree

☐ Multiple Rapid Spanning Tree

☐ Multiple Spanning Tree

2
Apply
Cancel

Step 5. Set the bridge priority and the ports, which join the RSTP for GS1920-48 and XGS4600-32

GS1920-48

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Spanning Tree Protocol: RSTP

Bridge	Root	Our Bridge
Bridge ID	0000-000000000000	0000-000000000000
Hello Time (second)	0	0
Max Age (second)	0	0
Forwarding Delay (second)	0	0
Cost to Bridge	0	
Port ID	0X0000	
Topology Changed Times	0	
Time Since Last Change	0:00:00	

Port	Port State	Port Role	Designated Bridge ID	Designated Port ID	Designated Cost

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Rapid Spanning Tree Protocol
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Active	<input checked="" type="checkbox"/>
Bridge Priority	32768 ▼
Hello Time	2 Seconds
MAX Age	20 Seconds
Forwarding Delay	15 Seconds

And then click "Apply" button

Port	Active	Edge	Priority	Path Cost
*	<input type="checkbox"/>	<input type="checkbox"/>		
1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	128	4
2	<input type="checkbox"/>	<input type="checkbox"/>	128	4
3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	128	4
4	<input type="checkbox"/>	<input type="checkbox"/>	128	4
5	<input type="checkbox"/>	<input type="checkbox"/>	128	4
6	<input type="checkbox"/>	<input type="checkbox"/>	128	4

XGS4600-32

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Spanning Tree Protocol: RSTP

Bridge	Root	Our Bridge
Bridge ID	0000-000000000000	0000-000000000000
Hello Time (second)	0	0
Max Age (second)	0	0
Forwarding Delay (second)	0	0
Cost to Bridge	0	0
Port ID	0X0000	
Topology Changed Times	0	
Time Since Last Change	0:00:00	

Port	Port State	Port Role	Designated Bridge ID	Designated Port ID	Designated Cost	Root Guard State

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Rapid Spanning Tree Protocol

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Active	<input checked="" type="checkbox"/>
Bridge Priority	32768 ▼
Hello Time	2 Seconds
MAX Age	20 Seconds
Forwarding Delay	15 Seconds

And then click "Apply" button

Port	Active	Edge	Root Guard	Priority	Path Cost
*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	128	4
2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	128	19
3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	128	4
4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	128	19
5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	128	4
6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	128	4

Verification:

Connect all ports and check the RSTP status on GS1900-8HP, GS19200-48, and XGS4600-32.

RSTP status on **GS1900-8HP**

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CIST Instance

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State	Enable
Bridge Identifier	4096 / 0/BC:CF:4F:FF:BA:31
Designated Root Bridge	4096 / 0/BC:CF:4F:FF:BA:31
External Root Path Cost	0
Regional Root Bridge	4096 / 0/BC:CF:4F:FF:BA:31
Internal Root Path Cost	0
Designated Bridge	4096 / 0/BC:CF:4F:FF:BA:31
Root Port	0/0
Remaining Hops	20
Last Topology Change	11

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Refresh Save

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CIST Port										CIST				MST		STP Statistics	
Port	Identifier (Priority / Port Id)	External Path Cost Operation	Internal Path Cost Operation	Designated Root Bridge	External Root Cost	Regional Root Bridge	Internal Root Cost	Designated Bridge	Edge Port Operation	P2P MAC Operation	Port Role	Port State					
1	128 / 1	20000	20000	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	Yes	Yes	Disable	Disable					
2	128 / 2	20000	20000	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	Yes	Yes	Disable	Disable					
3	128 / 3	20000	20000	4096 / BC:CF:4F:FF:BA:31	0	4096 / BC:CF:4F:FF:BA:31	0	4096 / BC:CF:4F:FF:BA:31	No	Yes	Designated	Forwarding					
4	128 / 4	20000	20000	4096 / BC:CF:4F:FF:BA:31	0	4096 / BC:CF:4F:FF:BA:31	0	4096 / BC:CF:4F:FF:BA:31	No	Yes	Designated	Forwarding					
5	128 / 5	20000	20000	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	Yes	No	Disable	Disable					
6	128 / 6	20000	20000	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	Yes	No	Disable	Disable					
7	128 / 7	20000	20000	4096 / BC:CF:4F:FF:BA:31	0	4096 / BC:CF:4F:FF:BA:31	0	4096 / BC:CF:4F:FF:BA:31	Yes	Yes	Designated	Forwarding					
8	128 / 8	20000	20000	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	Yes	Yes	Disable	Disable					
LAG1	128 / 9	20000	20000	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	Yes	No	Disable	Disable					
LAG2	128 / 10	20000	20000	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	Yes	No	Disable	Disable					
LAG3	128 / 11	20000	20000	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	Yes	No	Disable	Disable					
LAG4	128 / 12	20000	20000	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	Yes	No	Disable	Disable					
LAG5	128 / 13	20000	20000	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	Yes	No	Disable	Disable					
LAG6	128 / 14	20000	20000	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	Yes	No	Disable	Disable					
LAG7	128 / 15	20000	20000	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	Yes	No	Disable	Disable					
LAG8	128 / 16	20000	20000	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	0	0 / 00:00:00:00:00:00	Yes	No	Disable	Disable					

RSTP status on **GS1920-48****ZYXEL** GS1920

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Spanning Tree Protocol: RSTP

Bridge	Root	Our Bridge
Bridge ID	1000-bccf4fffba31	8000-bc99118da3a8
Hello Time (second)	2	2
Max Age (second)	20	20
Forwarding Delay (second)	15	15
Cost to Bridge	4	
Port ID	0X8003	
Topology Changed Times	5	
Time Since Last Change	0:03:00	

Port	Port State	Port Role	Designated Bridge ID	Designated Port ID	Designated Cost
1	FORWARDING	Designated	8000-bc99118da3a8	0x8001	4
3	FORWARDING	Root	1000-bccf4fffba31	0x8003	0

RSTP status on **XGS4600-32****ZYXEL** XGS4600

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Spanning Tree Protocol: RSTP

Bridge	Root	Our Bridge
Bridge ID	0000-bccf4fffba31	8000-1c740dfe11fc
Hello Time (second)	2	2
Max Age (second)	20	20
Forwarding Delay (second)	15	15
Cost to Bridge	19	
Port ID	0X8004	
Topology Changed Times	10	
Time Since Last Change	0:00:11	

Port	Port State	Port Role	Designated Bridge ID	Designated Port ID	Designated Cost	Root Guard State
2	DISCARDING	Alternate	8000-bc99118da3a8	0x8001	4	Forwarding
4	FORWARDING	Root	0000-bccf4fffba31	0x8004	0	Forwarding