



Spanning Tree

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STP Status and Global Settings

Spanning Tree Protocol (STP) protects a Layer 2 Broadcast domain from Broadcast storms by selectively setting links to standby mode to prevent loops. In standby mode, these links temporarily stop transferring user data. After the topology changes so that the data transfer is made possible, the links are automatically re-activated.

STP provides a tree topology for any arrangement of switches and interconnecting links, by creating a unique path between end stations on a network, and thereby eliminating loops.

The STP Status and Global Settings page contains parameters for enabling the required STP mode. Use the STP Interface Settings page, RSTP Interface Settings page, and MSTP Properties page to configure each mode, respectively. To set the STP status and global settings, follow these steps:

Step 1 Click **Spanning Tree > STP Status & Global Settings**.

Step 2 Enter the parameters.

Global Settings:

Spanning Tree State	Select to enable on the device.
STP Loopback Guard	Select to enable Loopback Guard on the device.
STP Operation Mode	Select an STP mode.

BPDU Handling	Select how Bridge Protocol Data Unit (BPDU) packets are managed when STP is disabled. BPDUs are used to transmit spanning tree information. <ul style="list-style-type: none"> • Filtering-Filters BPDU packets when Spanning Tree is disabled on an interface. • Flooding-Floods BPDU packets when Spanning Tree is disabled on an interface.
Path Cost Default Values	Selects the method used to assign default path costs to the STP ports. The default path cost assigned to an interface varies according to the selected method. <ul style="list-style-type: none"> • Short-Specifies the range 1–65,535 for port path costs • Long-Specifies the range 1–200,000,000 for port path costs Bridge Settings:

Bridge Settings:

Priority	Sets the bridge priority value. After exchanging BPDUs, the device with the lowest priority becomes the Root Bridge. In the case that all bridges use the same priority, then their MAC addresses are used to determine the Root Bridge. The bridge priority value is provided in increments of 4096. For example, 4096, 8192, 12288, and so on.
Hello Time	Set the interval (in seconds) that a Root Bridge waits between configuration messages.
Max Age	Set the interval (in seconds) that the device can wait without receiving a configuration message, before attempting to redefine its own configuration.
Forward Delay	Set the interval (in seconds) that a bridge remains in a learning state before forwarding packets.
Designated Root / Bridge ID	The bridge priority concatenated with the MAC address of the device.
Root Bridge ID	The Root Bridge priority concatenated with the MAC address of the Root Bridge.
Root Port	The port that offers the lowest cost path from this bridge to the Root Bridge.
Root Path Cost	The cost of the path from this bridge to the root.
Topology Changes Counts	The total number of STP topology changes that have occurred.
Last Topology Change	The time interval that elapsed since the last topology change occurred. The time appears in a days/hours/minutes/seconds format.

Step 3 Click **Apply**. The STP Global settings are written to the Running Configuration file.

STP Interface Settings

The STP Interface Settings page enables you to configure STP on a per-port basis, and to view the information learned by the protocol, such as the designated bridge.

The defined configuration entered is valid for all flavors of the STP protocol.

To configure STP on an interface, follow these steps:

Step 1 Click **Spanning Tree > STP Interface Settings**.

Step 2 Select an interface and click **Edit**.

Step 3 Enter the parameters

Interface	Select the Port or LAG on which Spanning Tree is configured.
Edge Port	Enables or disables Fast Link on the port. If Fast Link mode is enabled on a port, the port is automatically set to Forwarding state when the port link is up. Fast Link optimizes the STP protocol convergence. The options are: <ul style="list-style-type: none"> • Enable—Enables Fast Link immediately • Disable—Disables Fast Link
BDU Guard	If enabled, the interface will shut down when a BPDU message is received.
BDU Filter	If enabled, the interface will not send and receive BPDU messages.
Path Cost	Set the port contribution to the root path cost or use the default cost generated by the system.
Priority	Set the priority value of the port. The priority value influences the port choice when a bridge has two ports connected in a loop. The priority is a value 0–240, and must be a multiple of 16.
Port State	Displays the current STP state of a port. <ul style="list-style-type: none"> • Disabled—STP is currently disabled on the port. The port forwards traffic while learning MAC addresses. • Blocking—The port is currently blocked, and can't forward traffic (except for BPDU data) or learn MAC addresses. • Learning—The port is in Learning mode. The port can't forward traffic, but it can learn new MAC addresses. • Forwarding—The port is in Forwarding mode. The port can forward traffic and learn new MAC addresses.
Designated Bridge ID	Displays the bridge priority and the MAC address of the designated bridge.
Designated Port ID	Displays the priority and interface of the selected port.
Designated Cost	Displays the cost of the port participating in the STP topology. Ports with a lower cost are less likely to be blocked if STP detects loops.

Step 4 Click **Apply**. The interface settings are written to the Running Configuration file.

RSTP Interface Settings

Rapid Spanning Tree Protocol (RSTP) enables a faster STP convergence without creating forwarding loops.

The RSTP Interface Settings page enables you to configure RSTP per port. Any configuration that is done on this page is active when the global STP mode is set to RSTP.

To enter RSTP settings, proceed with the following steps:

Step 1 Click **Spanning Tree > STP Status and Global Settings**.

Step 2 Enable RSTP.

Step 3 Click **Spanning Tree > RSTP Interface Settings**. The RSTP Interface Settings page appears.

Step 4 Select a port.

Note Activate Protocol Migration is only available after selecting the port that is connected to the bridge partner being tested.

Step 5 If a link partner is discovered by using STP, click **Activate Protocol Migration** to run a Protocol Migration test. This discovers whether the link partner using STP still exists, and if so whether it has migrated to RSTP or MSTP. If it still exists as an STP link, the device continues to communicate with it by using STP. Otherwise, if it has been migrated to RSTP or MSTP, the device communicates with it using RSTP or MSTP, respectively.

Step 6 Select an interface, and click **Edit**.

Step 7 Enter the parameters:

Interface	Set the interface, and specify the port or LAG where RSTP is to be configured.
Point to Point Administrative Status	<p>Define the point-to-point link status. Ports defined as Full Duplex are considered Point-to-Point port links.</p> <ul style="list-style-type: none"> • Enabled-This port is an RSTP edge port when this feature is enabled, and is brought to Forwarding mode quickly (usually within 2 seconds). • Disabled-The port isn't considered point-to-point for RSTP purposes, which means that STP works on it at regular speed, as opposed to high speed. • Auto-Automatically determines the device status by using RSTP BPDUs.
Point to Point Operational Status	Displays the Point-to-Point operational status if the Point to Point Administrative Status is set to Auto.

Role	<p>Displays the role of the port that was assigned by STP to provide STP paths. The possible roles are:</p> <ul style="list-style-type: none"> • Root-Lowest cost path to forward packets to the Root Bridge. • Designated-The interface through which the bridge is connected to the LAN, which provides the lowest cost path from the LAN to the Root Bridge. • Alternate-Provides an alternate path to the Root Bridge from the root port. • Backup-Provides a backup path to the designated port path toward the Spanning Tree leaves. This provides a configuration in which two ports are connected in a loop by a point-to-point link. Backup ports are also used when a LAN has two or more established connections to a shared segment. • Disabled-The port is not participating in Spanning Tree.
Fast Link Operational Status	<p>Displays whether the Fast Link (Edge Port) is enabled, disabled, or automatic for the interface. The values are:</p> <ul style="list-style-type: none"> • Enabled-Fast Link is enabled. • Disabled-Fast Link is disabled.
Port Status	<p>Displays the RSTP status on the specific port.</p> <ul style="list-style-type: none"> • Disabled-STP is currently disabled on the port. • Learning-The port is in Learning mode. The port cannot forward traffic, however it can learn new MAC addresses. • Blocking-The port is currently blocked, and can't forward traffic (except for BPDU data) or learn MAC addresses. • Forwarding-The port is in Forwarding mode. The port can forward traffic and learn new MAC addresses.

Step 8 Click **Apply**. The Running Configuration file is updated.

MSTP Properties

The global MSTP configures a separate Spanning Tree for each VLAN group and blocks all but one of the possible alternate paths within each spanning tree instance. MSTP enables formation of MST regions that can run multiple MST instances (MSTI). Multiple regions and other STP bridges are interconnected using one single common spanning tree (CST).

MSTP is fully compatible with RSTP bridges, in that an MSTP BPDU can be interpreted by an RSTP bridge as an RSTP BPDU. This not only enables compatibility with RSTP bridges without configuration changes, but also causes any RSTP bridges outside of an MSTP region to see the region as a single RSTP bridge, regardless of the number of MSTP bridges inside the region itself. For two or more switches to be in the same MST region, they must have the same VLANs to MST instance mapping, configuration revision number, and

region name. Switches intended to be in the same MST region are never separated by switches from another MST region. If they are separated, the region becomes two separate regions.

This mapping can be done in the [MSTP Instance Settings, on page 7](#). Use this page if the system operates in MSTP mode.

To define MSTP, follow these steps:

Step 1 Click **Spanning Tree > MSTP > MSTP Properties**.

Step 2 Enter the parameters.

- Region Name—Define an MSTP region name.
- Revision—Define an unsigned 16-bit number that identifies the revision of the current MST configuration. The field range is 0–65535.
- Max Hops—Set the total number of hops that occur in a specific region before the BPDU is discarded. Once the BPDU is discarded, the port information is aged out. The field range is 1–40.

Step 3 Click **Apply**. The MSTP properties are defined, and the Running Configuration file is updated.

VLANs to MSTP Instance

The VLAN to MSTP Instance page enables you to map each VLAN to a Multiple Spanning Tree Instance (MSTI). For devices to be in the same region, they must have the same mapping of VLANs to MSTIs.



Note The same MSTI can be mapped to more than one VLAN, but each VLAN can only have one MST instance attached to it. Configuration on this page (and all of the MSTP pages) applies if the system STP mode is MSTP. Up to 16 MST instances can be defined in addition to instance zero. For those VLANs that aren't explicitly mapped to one of the MST instances, the device automatically maps them to the CIST (Core and Internal Spanning Tree) instance. The CIST instance is MST instance 0.

To map VLANs to MST Instances, follow these steps:

Step 1 Click **Spanning Tree > RSTP Interface Settings > MSTP > VLAN to MSTP Instance**.

The VLAN to MSTP Instance page displays the following fields:

- MSTP Instance ID-All MST instances are displayed.
- VLANs-All VLANs belonging to the MST instance are displayed.

Step 2 To add a VLAN to an MSTP instance, select the MST instance, and click **Edit**.

Step 3 Enter the parameters:

- MSTP Instance ID-Select the MST instance.
- VLANs-Define the VLANs being mapped to this MST instance.

- Action-Define whether to Add (map) the VLAN to the MST instance or Remove it.

Step 4 Click **Apply**. The MSTP VLAN mappings are defined, and the Running Configuration file is updated.

MSTP Instance Settings

The MSTP Instance Settings page enables you to configure and view parameters per MST instance. This is the per-instance equivalent to the Configuring STP Status and Global Settings.

To enter the MSTP instance settings, proceed as follows:

Step 1 Click **Spanning Tree > MSTP > MSTP Instance Settings**.

Step 2 Enter the parameters.

- Instance ID-Select an MST instance to be displayed and defined.
- Included VLAN-Displays the VLANs mapped to the selected instance. The default mapping is that all VLANs are mapped to the common and internal spanning tree (CIST) instance 0).
- Bridge Priority-Set the priority of this bridge for the selected MST instance.
- Designated Root Bridge ID-Displays the priority and MAC address of the Root Bridge for the MST instance.
- Root Port-Displays the root port of the selected instance.
- Root Path Cost-Displays the root path cost of the selected instance.
- Bridge ID-Displays the bridge priority and the MAC address of this device for the selected instance.
- Remaining Hops-Displays the number of hops remaining to the next destination.

Step 3 Click **Apply**. The MST Instance configuration is defined, and the Running Configuration file is updated.

MSTP Interface Settings

The MSTP Interface Settings page enables you to configure the port MSTP settings for every MST instance, and to view information that has currently been learned by the protocol, such as the designated bridge per MST instance.

To configure the ports in an MST instance, follow these steps:

Step 1 Click **Spanning Tree > MSTP > MSTP Interface Settings**.

Step 2 Enter the parameters.

- Instance equals to—Select the MSTP instance to be configured.
- Interface Type equals to—Select whether to display the list of ports or LAGs.

Step 3 Click **Go**. The MSTP parameters for the interfaces on the instance are displayed.

Step 4 Select an interface, and click **Edit**.

Step 5 Enter the parameters.

Option	Description
Instance ID	Select the MST instance to be configured.
Interface	Select the interface for which the MSTI settings are to be defined.
Interface Priority	Set the port priority for the specified interface and MST instance.
Path Cost	Enter the port contribution to the root path cost in the User Defined textbox or select Use Default to use the default value.
Port State	Displays the MSTP status of the specific port on a specific MST instance. The parameters are defined as: <ul style="list-style-type: none"> • Disabled—STP is currently disabled. • Learning—The port on this instance is in Learning mode. The port cannot forward traffic, but it can learn new MAC addresses. • Blocking—The port is currently blocked, and can't forward traffic (except for BPDU data) or learn MAC addresses. • Forwarding—The port on this instance is in Forwarding mode. The port can forward traffic and learn new MAC addresses.
Port Role	Displays the port or LAG role, per port or LAG per instance, assigned by the MSTP algorithm to provide STP paths: <ul style="list-style-type: none"> • Master—A Master port provides connectivity from an MSTP region to the outlying CIST root • Root—Forwarding packets through this interface provides the lowest cost path for forwarding packets to the root device. • Designated Port—The interface through which the bridge is connected to the LAN, which provides the lowest root path cost from the LAN to the Root Bridge for the MST instance. • Alternate—The interface provides an alternate path to the Root Bridge from the root port. • Backup—The interface provides a backup path to the designated port path toward the Spanning Tree leaves. Backup ports occur when two ports are connected in a loop by a point-to-point link. Backup ports also occur when a LAN has two or more established connections to a shared segment. • Disabled—The interface does not participate in the Spanning Tree.
Mode	Displays the current interface Spanning Tree mode. <ul style="list-style-type: none"> • If the link partner is using MSTP or RSTP, the displayed port mode is RSTP. • If the link partner is using STP, the displayed port mode is STP.
Type	Displays the MST type of the port.

Option	Description
	<ul style="list-style-type: none">• Boundary—A Boundary port attaches MST bridges to a LAN in a remote region. If the port is a boundary port, it also indicates whether the device on the other side of the link is working in RSTP or STP mode.• Internal—The port is an internal port.
Designated Bridge ID	Displays the ID number of the bridge that connects the link or shared LAN to the root.
Designated Port ID	Displays the Port ID number on the designated bridge that connects the link or the shared LAN to the root.
Designated Cost	Displays the cost of the port participating in the STP topology. Ports with a lower cost are less likely to be blocked if STP detects loops.
Remain Hops	Displays the hops remaining to the next destination.

Step 6 Click **Apply**. The Running Configuration file is updated.
