

STP Optional Characteristics Configuration

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Chapter 1 STP Optional Characteristics Configuration

1.1 Introduction of STP Optional Characteristics

STP module in our switch supports 7 additional features (hereinafter referred to as "optional characteristics") which has not configure by default. The corresponding relationship between STP modes and optional characteristics is listed in the following table.

Optional Characteristics	Single STP	PVST	RSTP	MSTP
Port Fast	Yes	Yes	No	No
BPDU Guard	Yes	Yes	Yes	Yes
BPDU Filter	Yes	Yes	No	No
Uplink Fast	Yes	Yes	No	No
Backbone Fast	Yes	Yes	No	No
Root Guard	Yes	Yes	Yes	Yes
Loop Guard	Yes	Yes	Yes	Yes

1.1.1 Port Fast

By Port Fast characteristic, a port can be transferred into Forwarding state directly without transition waiting from Listening to Learning. In SSTP or PVST mode, Port Fast can be enabled on the ports connected directly to hosts and servers which connects hosts and servers fast to the network.

Port Fast is applicable to the ports connected directly to a host. These ports will not receive BPDU, so that it would not influence network topology and can be transferred into Forwarding States without waiting. If Port Fast is configured on a port connected to the switch, it is possible to bring up loops.

Port Fast characteristic can be configured in global or port configuration mode. If configured in global mode, all the ports will be considered as Port Fast ports and enter the Forwarding state fast. But it will be much more possible to bring up loops. To prevent network loops from Port Fast configuration, use BPDU Guard or BPDU Filter to protect the ports.

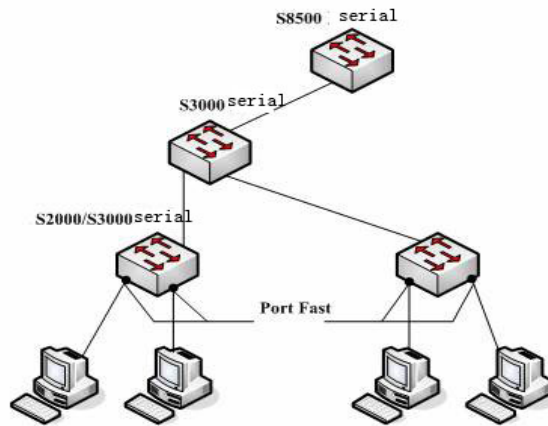


Figure 1.1 Port Fast Ports

Comment:

STP with fast convergence, including RSTP and MSTP, can migrate ports into forwarding state by default. So it is not necessary to use **Port Fast**.

1.1.2 BPDU Guard

If a port with Port Fast receives BPDU, it can be considered to be caused by an incorrect configuration. After a port with Port Fast receives BPDU, it will be protected passively by BPDU Guard.

The behavior of BPDU Guard is different in various STP modes. If a Port Fast port configured BPDU Guard receives BPDU in SSTP/PVST mode, it will be forced to be shutdown and users can only manually recover it afterwards. If a port configured BPDU Guard receives BPDU in RSTP/MSTP mode, it will be set Blocking after a while.

BPDU Guard can be configured independently from Port Fast. In all STP modes, ports configured with BPDU Guard will not send BPDU while they can receive BPDU and handle it. At RSTP/MSTP mode, you can configure BPDU Guards on hosts connected ports to prevent devices connected to switch from receiving BPDU.

BPDU Guard is able to be configured in global or port configuration mode. In global configuration mode, use spanning-tree portfast bpduguard to prevent all ports from sending BPDU. It is noted that inappropriate use of BPDU Guard may result in loops in a complex network circumstance.

1.1.3 BPDU Filter

BPDU Filter can make the port of switch disabled to send BPDU exteriorly in SSTP/PVST mode, which is another protection of Ports with Port Fast configured.

If a Port Fast configured with BPDU Filter receives BPDU in SSTP/PVST mode, its BPDU Filter and Port Fast will be closed automatically so as to restore it to a common port which must pass the states transition from Listening to Learning to enter Forwarding.

BPDU Filter can be configured in global or port mode as BPDU Guard. **spanning-tree portfast bpdupfilter** can stop all the ports sending BPDU in global configuration mode while the ports can still receive and process BPDU.

1.1.4 Uplink Fast

Uplink Fast enables the new root port fast enter Forwarding when the switch is not connected to network root bridge.

It shows the multi-layers of devices distribution in a complicated network in figure 1.2. Switches on convergence layer and access layer can provide redundant uplink. Normally these redundant links are blocked by spanning tree to avoid loops.

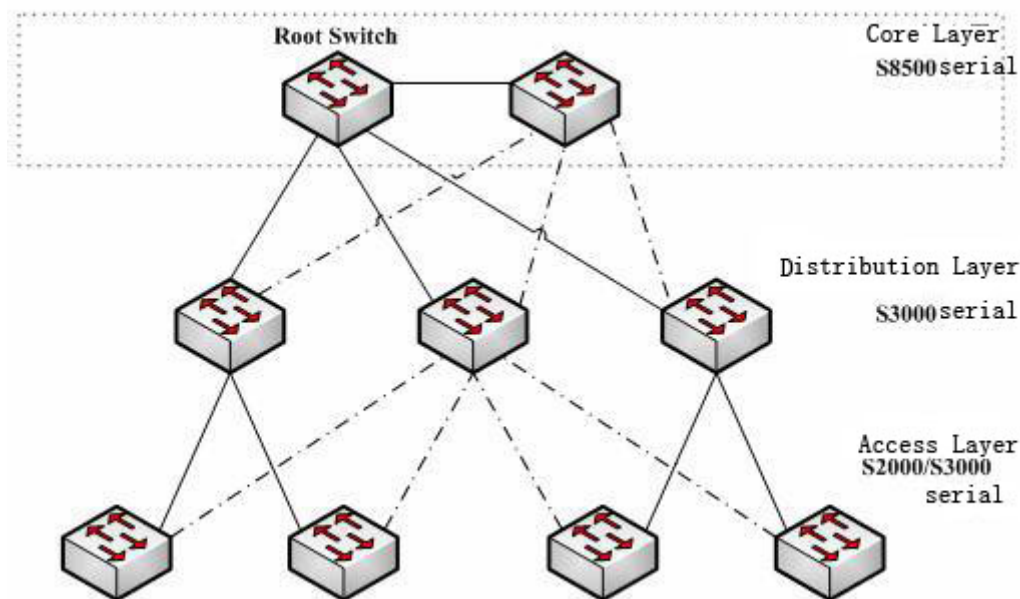


Figure 1.2 Layered Switched network example

If the uplink of a switch is failed (called Direct Link Failure), STP will choose Alternate port on the redundant link to be the new Root port which will enter Forwarding state after transition from Listening to Learning. If Uplink Fast is configured by global command **spanning-tree uplinkfast**, new Root port will directly enter Forwarding without states waiting so as to recover the uplink of the switch.

Figure 1.3 indicates the work principle of Uplink Fast by a simple network example. Initially the port connected from C to B is a backup port. After disconnected from C to Root Bridge A, the previous Alternate port is chosen as the new root port and start to forward packets immediately.

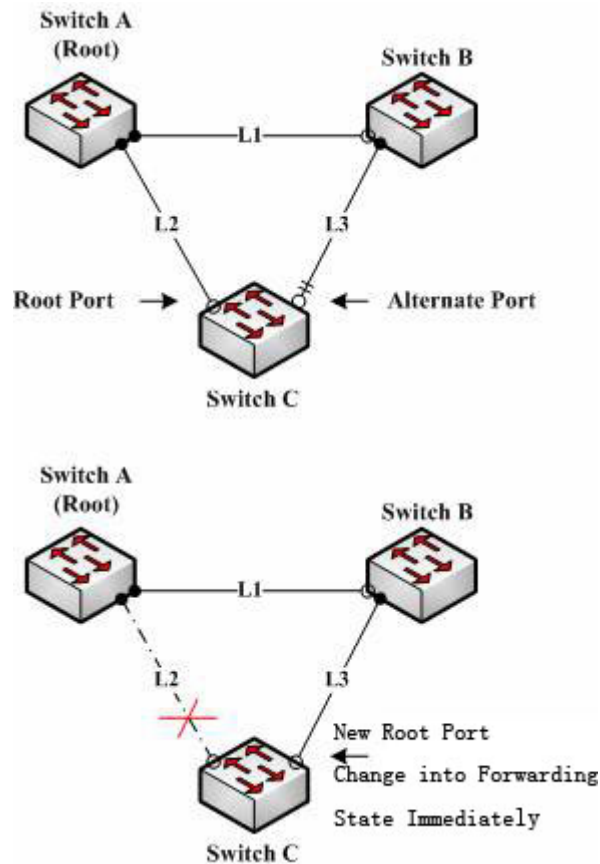


Figure 1.3 Uplink Fast Example

Comments:

Uplink Fast feature is applicable for SSTP and PVST with slow convergence. In RSTP and MSTP mode, the new root port can be fast migrated to Forwarding state without the help of **Uplink Fast**.

1.1.5 Backbone Fast

Backbone Fast feature is a supplement of Uplink Fast. Uplink Fast can urge the redundant link to start work fast at the time when the direct connection to designated switch fails, while Backbone Fast can detect the indirect connection failure in the upper layer network and speed up state transition of ports.

Take the network of Figure 1.3 for example, the link L2 from switch C to A is called Direct Link to root bridge, which can be disconnected by Uplink Fast. While the link L1 from B to A is indirect connection for switch C. The Indirect Failure of L1 can be processed by Backbone Fast.

Figure 1.4 shows the work principle of Backbone Fast as follow.

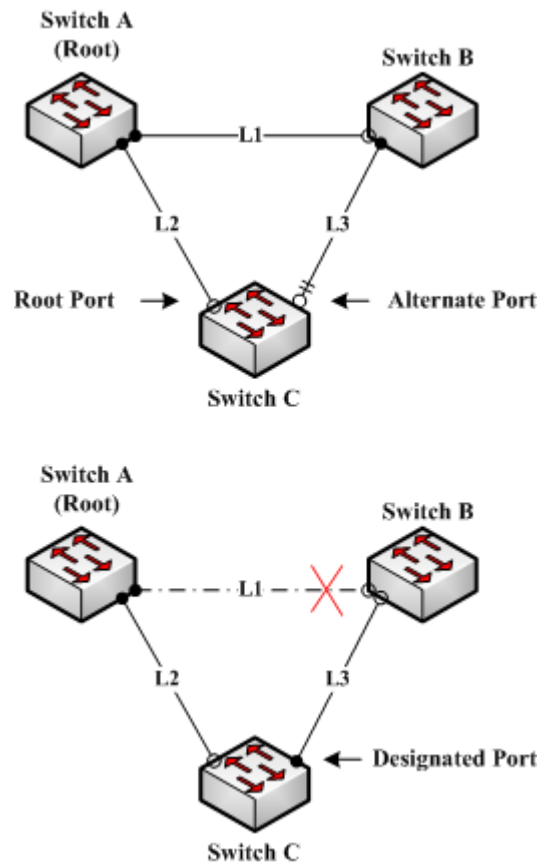


Figure 1.4 Uplink Fast Example

Suppose switch C has higher network bridge priority than B. When L1 disconnected, switch B will use its own Bridge priority as root priority to send BPDU to C. The information that BPDU contains is not prior to C itself. When Backbone Fast disabled, the port from C to B will become Designated Port after Root bridge is aged since it does not receive BPDU from Root bridge any longer. In general, it takes several seconds to wait up to information aged. If Backbone Fast is already enabled by **spanning-tree backbonefast**, switch C will consider that an indirect and root bridge reached connection is disconnected once the Alternate port of C receives a BPDU with lower priority, and change this port into Designated port immediately, without waiting for port information aged.

After Backbone Fast enabled, BPDU with low priority is received on the ports with different roles, which will result in various behaviors of a switch. If the BPDU packet is received on Alternate port, as the example above, this port will be transferred to designated port. When Root Port receives low priority packets and there are no other backup ports, the switch will become the network root.

It is noted that Backbone Fast only skips the Aging time of a port and the new designated port still needs to pass the states transition from Listening to Learning to enter Forwarding.

Comment:

Same with Uplink Fast, Backbone Fast is only valid within SSTP or PVST.

1.1.6 Root Guard

Root Guard can prevent a port from becoming a Root Port for receiving BPDU with high priority

In a complex layer 2 network, administrator may expect a switch located in core layer to be the network root bridge. But he can not manage all the switches located in access layer(Probably because the access layer switches belong to other clients). Then the incorrect configuration of other switches may cause that the core switch can not become the Root.

You can configure Root Guard on the Edge switch so as to prevent Root Bridge robbed by switches outside administration area. If a Root Guard configured port is chosen as Root Port for receiving BPDU with higher priority, Root Guard will automatically set it blocked and restore it to a designated port.

In PVST or MSTP mode , Root Guard can work independently in each Spanning-tree instance. In MSTP mode, if an Edge Port is blocked by Root Guard in CIST, it will be blocked at all other MSTIs. Edge port refers to the port that is connected to LAN hosts, STP switches, RSTP switches or MSTP switches outside region.

Within port configuration mode, use **spanning-tree guard root** to enable **Root Guard** on the port.

Note:

The behaviors of Root Guard are different in SSTP/PVST or RSTP/MSTP mode. Root port is always blocked by Root Guard in SSTP/PVST mode, while in RSTP/MSTP mode; ports will be blocked by Root Guard only when it receives higher priority BPDU. A port originally with Root role will not be blocked.

1.1.7 Loop Guard

Loop Guard can protect Root Port or Alternate Port after being changed into Designated Port, which can prevents loops caused by not receiving BPDU continually.

You can use **spanning-tree loopguard default** to enable Loop Guard on the switch. After being enabled, the port will be blocked when it is changed from a Root port or Alternate port to a Designated port. If the port receives BPDU with high priority again after a while, it will recover from Loop Guard automatically.

In **PVST** or **MSTP** mode , **Loop Guard** can work independently in each Spanning-tree instance. In **MSTP mode**, if an Edge Port is blocked in CIST because of **Loop Guard**, it will be blocked at all other **MSTIs**.

Note:

The behavior of Loop Guard is different in SSTP/PVST or RSTP/MSTP. In SSTP/PVST mode, Designated port is always blocked by Loop Guard, while in RSTP/MSTP, the port will be blocked when it is transformed into Designated port for not receiving BPDU. A port with Designated characteristic after receiving lower priority BPDU will not be blocked by Loop Guard.

1.2 Configuring STP Optional Characteristics

1.2.1 STP Optional Characteristics Configuration Tasks

- Configuring Port Fast
- Configuring BPDU Guard
- Configuring BPDU Filter
- Configuring Uplink Fast
- Configuring Backbone Fast
- Configuring Root Guard
- Configuring Loop Guard

1.2.2 Configuring Port Fast

Port Fast can make a port transferred into Forwarding directly in SSTP/PVST mode without states transition from Listening to Learning. Port Fast is not valid in other STP modes.

Use the following commands to configure **Port Fast** under the global configuration mode:

Command	Purpose
spanning-tree portfast default	Enable Port Fast globally, which is valid to all ports
no spanning-tree portfast default	Disable Port Fast globally, which does not influence port configuration

Note:

Port Fast is only available for hosts connected ports, if configured globally, configure BpduGuard or BpduFilter for preventing at the same time.

Use the following commands to configure **Port Fast** under switched port configuration mode:

Command	Purpose
spanning-tree portfast	Enable Port Fast of current port
no spanning-tree portfast	Disable Port Fast of current port, which does not influence global configuration

1.2.3 Configuring BPDU Guard

BPDU Guard can provide protection for a port when it receives BPDU. The port configured BPDU Guard will not send BPDU any longer.

The behaviors of BPDU Guard are different at various STP modes. If a port configured Port Fast and BPDU Guard receives BPDU in SSTP/PVST mode, it will be forced to be shutdown, and users can only manually recover it afterwards. If a port configured BPDU Guard receives BPDU in RSTP/MSTP mode, It will be set Blocking for some time.

Use the following commands to configure **BPDU Guard** under the global configuration mode:

Command	Purpose
spanning-tree portfast bpduguard	Enable BPDU Guard globally, which is valid to all ports.
no spanning-tree portfast bpduguard	Disable BPDU Guard globally

Comment:

Configuring Port Fast globally may result in broadcast storm. To avoid it, configure **BPDU Guard** or **Filter simultaneously**.

Use the following commands to configure **BPDU Guard** under switched port configuration mode:

Command	Purpose
spanning-tree bpduguard enable	Enable BPDU Guard on the port
spanning-tree bpduguard disable	Disable BPDU Guard, which does not influence global configuration
no spanning-tree bpduguard	Disable BPDU Guard, which does not influence global configuration

1.2.4 Configuring BPDU Filter

With BPDU Filter, the ports of a switch can be disabled to send BPDU exteriorly, which is another protection for ports with Port Fast configured.

Use the following commands to configure **BPDU Filter** under the global configuration mode:

Command	Purpose
spanning-tree portfast bpdufilter	Enable BPDU Filter globally, which is valid to all ports.
no spanning-tree portfast bpdufilter	Disable BPDU Filter globally

Comment:

Configuring Port Fast globally may result in broadcast storm. To avoid it, configure **BPDU Guard** or **Filter** simultaneously.

Use the following commands to configure **BPDU Filter** under switched port configuration mode:

Command	Purpose
spanning-tree bpdufilter enable	Enable BPDU Filter on a port
spanning-tree bpdufilter disable	Disable BPDU Filter , which does not influence global configuration
no spanning-tree bpdufilter	Disable BPDU Filter , which does not influence global configuration

1.2.5 Configuring Uplink Fast

Uplink Fast enables the new root port fast enter Forwarding when the switch is not connected to network Root Bridge.

Uplink Fast is valid only in SSTP/PVST mode.

Use the following commands to configure **Uplink Fast** in the global configuration mode:

Command	Purpose
spanning-tree uplinkfast	Enable Uplink Fast
no spanning-tree uplinkfast	Disable Uplink Fast

1.2.6 Configuring Backbone Fast

Backbone Fast is a supplement of Uplink Fast. Uplink Fast can urge the redundant link to start work fast at the time when the direct connection to designated switch failed, while Backbone Fast can detect the indirect connection failure in the upper layer network and speed up state transition of ports.

Backbone Fast is valid only in SSTP/PVST modes.

Use the following commands to configure **Backbone Fast** under the global configuration mode:

Command	Purpose
spanning-tree backbonefast	Enable Backbone Fast
no spanning-tree backbonefast	Disable Backbone Fast

1.2.7 Configuring Root Guard

By Root Guard, a port is prevented from becoming a Root port for receiving the BPDU with higher priority.

The behaviors of Loop Guard are different in SSTP/PVST or RSTP/MSTP mode. Root port is always blocked by Root Guard in SSTP/PVST mode, while in RSTP/MSTP mode, ports will be blocked by Root Guard only when it receives higher priority BPDU. A port originally with Root character will not be blocked.

Use the following commands to configure Root Guard under switched port configuration mode:

Command	Purpose
spanning-tree guard root	Enable Root Guard on a port
no spanning-tree guard	Disable Root Guard and Loop Guard on the port
spanning-tree guard none	Disable Root Guard and Loop Guard on the port

1.2.8 Configuring Loop Guard

Loop Guard can protect Root Port or Alternate Port after being changed into Designated Port, which can prevent loops caused by not receiving BPDU continually.

The behaviors of Loop Guard are different in SSTP/PVST or RSTP/MSTP mode. In SSTP/PVST mode, Designated port is always blocked by Loop Guard, while in RSTP/MSTP, the port will be blocked when it is transformed into Designated port for not receiving BPDU. A port with Designated characteristic after receiving lower priority BPDU will not be blocked by Loop Guard.

Use the following commands to configure **Loop Guard** in the global configuration mode:

Command	Purpose
spanning-tree loopguard default	Enable Loop Guard globally, which is valid to all ports.
no spanning-tree loopguard default	Disable Loop Guard globally

Use the following commands to configure **Loop Guard** under switched port configuration mode:

Command	Purpose
spanning-tree guard loop	Enable Loop Guard on the port
no spanning-tree guard	Disable Root Guard and Loop Guard on the port
spanning-tree guard none	Disable Root Guard and Loop Guard on the port