

## Understanding RSTP for EX-series Switches

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EX-series switches use Rapid Spanning Tree Protocol (RSTP) to provide better reconvergence time than the original STP. RSTP identifies certain links as point to point. When a point-to-point link fails, the alternate link can transition to the forwarding state.

Although STP provides basic loop prevention functionality, it does not provide fast network convergence when there are topology changes. STP's process to determine network state transitions is slower than RSTP's because it is timer-based. A device must reinitialize every time a topology change occurs. The device must start in the listening state and transition to the learning state and eventually to a forwarding or blocking state. When default values are used for the maximum age (20 seconds) and forward delay (15 seconds), it takes 50 seconds for the device to converge. RSTP converges faster because it uses a handshake mechanism based on point-to-point links instead of the timer-based process used by STP.

For networks with VLANs, you can use VLAN Spanning Tree Protocol (VSTP), which takes the paths of each VLAN into account when calculating routes. VSTP uses RSTP by default.

An RSTP domain running on an EX-series switch has the following components:

- A *root port*, which is the “best path” to the root device.
- A *designated port*, indicating that the switch is the designated bridge for the other switch connecting to this port.
- An *alternate port*, which provides an alternate root port.
- A *backup port*, which provides an alternate designated port.

Port assignments change through messages exchanged throughout the domain. An RSTP device generates configuration messages once every hello time interval. If an RSTP device does not receive a configuration message from its neighbor after an interval of three hello times, it determines it has lost connection with that neighbor. When a *root port* or a *designated port* fails on a device, the device generates a configuration message with the proposal bit set. Once its neighbor device receives this message, it verifies that this configuration message is better than the one saved for that port and then it starts a *synchronizing* operation to ensure that all of its ports are in sync with the new information.

Similar waves of proposal agreement handshake messages propagate toward the leaves of the network, restoring the connectivity very quickly after a topology change (in a well-designed network that uses RSTP, network convergence can take as little as 0.5 seconds). If a device does not receive an agreement to a proposal message it has sent, it returns to the original IEEE 802.D convention.

RSTP was originally defined in the IEEE 802.1w draft specification and later incorporated into the IEEE 802.1D-2004 specification.

VSTP uses RSTP as the protocol on a per-VLAN basis.

- Related Topics**
- Example: Configuring Faster Convergence and Improving Network Stability with RSTP on EX-series Switches
  - Understanding STP for EX-series Switches
  - Understanding MSTP for EX-series Switches
  - Understanding VSTP for EX-series Switches