



SPANNING TREE PROTOCOL GUIDE

FOR ARAKNIS NETWORKS EQUIPMENT

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See the next page to quickly fix STP problems caused by DirecTV or Sonos equipment.



1 - Find, Fix, and Prevent STP Issues

Note - This guide assumes that all STP settings in the LAN have been left default. Also, you must have a managed switch installed as the core switch in order to modify STP settings.

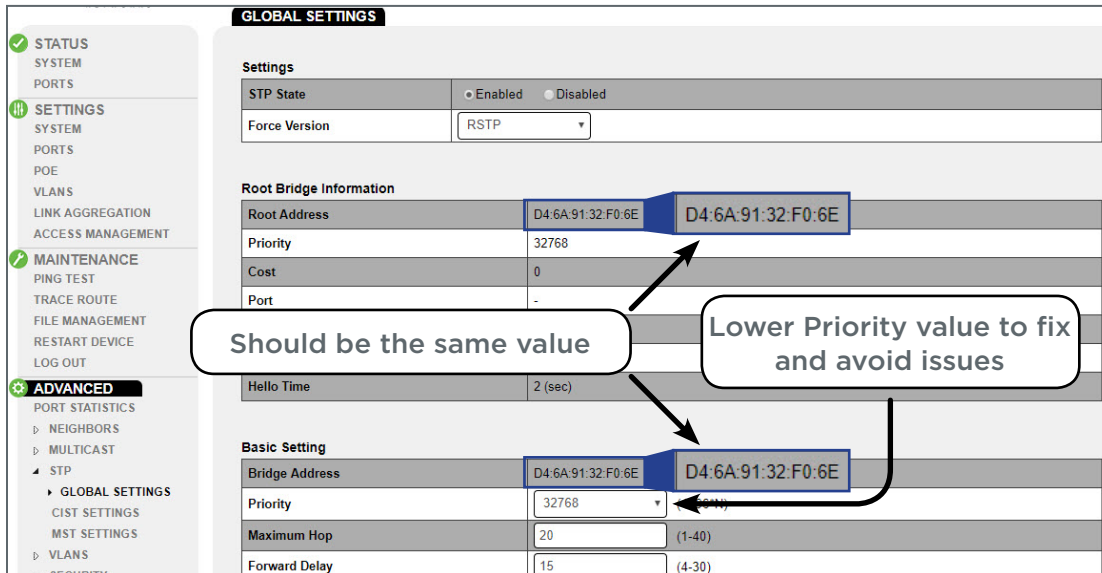
What Performance Issues Will I Notice?

You may notice control system latency when sending commands, slow or no traffic in part or all of the LAN, and/or switch port activity LED indicators flashing wildly or staying on solid.

How do I know STP is the Problem?

Check the root bridge status in the [core switch](#) (Advanced>STP>Global Settings):

- **Root Bridge Information>Root Address** - MAC address of currently-elected root bridge device.
- **Basic Setting>Bridge Address** - MAC address of the switch you are currently logged into



If the fields do not match, then the core switch is not the root bridge, meaning that STP may be causing issues. This means the problem device either has a smaller priority value or a lower MAC address.

Fixing and Preventing Issues

1. If you aren't monitoring or changing any other STP settings in the LAN, set the Priority to **4096**. This will force the core switch to be the elected root bridge and resolve most STP issues.
2. If you are customizing STP settings for the LAN, you may need to use a different value. Test thoroughly after setup to ensure that the problem equipment works well with your configuration. Read the rest of this guide for more information.
3. Click **Apply** to save the new switch settings, then **reboot the network and connected devices**.
4. Log back into the core switch and check the MAC addresses above to ensure that the LAN is now configured correctly. You should see immediate improvement in network performance.

Check out the rest of this guide to learn more!

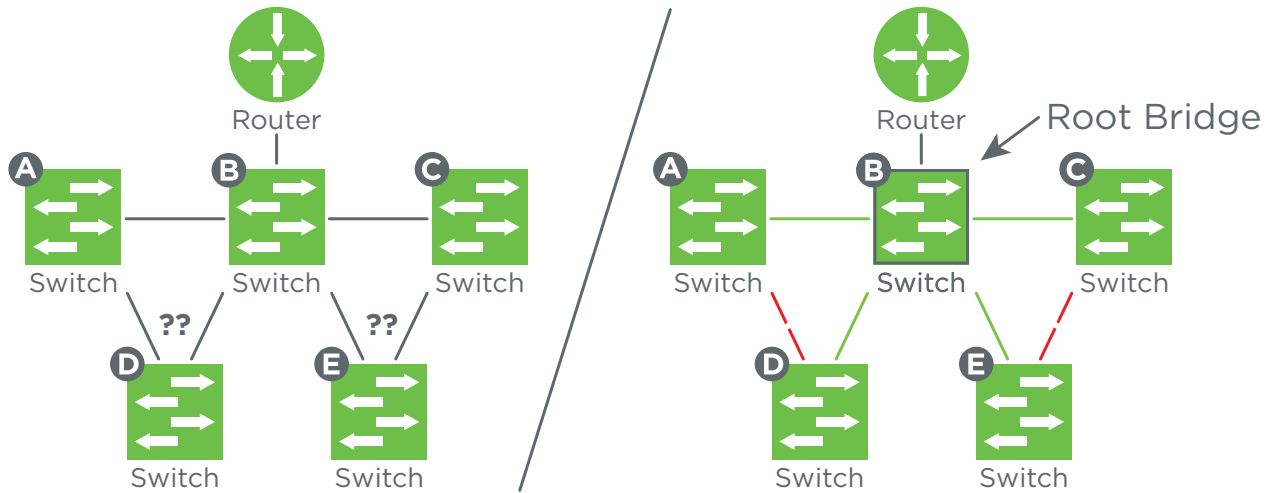
2 - How STP Works

This section uses simplified terms and explanations for Spanning Tree Protocol operation within one VLAN. See the [210/310 managed switch manual](#) or search online for more detailed information.

What is Spanning Tree Protocol?

Spanning Tree Protocol (STP) is a Layer 2 protocol that decides the best path for LAN traffic when multiple options exist, preventing network loops while guaranteeing redundancy in case of link failure.

STP data from each switch is aggregated into a logical map of the LAN, with values assigned to each device and each link between. The most central switch in the LAN becomes the **root bridge**, which manages the spanning tree configuration for the network. Then, for any redundant links, the path with the **lowest** calculated cost is selected and the others are blocked.



In the diagram on the left, the redundant links between switches could cause network loops. Once STP calculates the path costs and elects a root bridge, the redundant links can be blocked, as shown on the right.

How the Root Bridge is Elected

The switch with the lowest **Bridge ID** (Bridge Priority + MAC address) is elected as the root bridge. The default Bridge Priority for all Araknis switches is 32768, so if you have three installed, the one with the lowest MAC address will be selected, which may not be the one we want. This is a good reason to always lower the Bridge Priority setting for the core switch.

How Paths are Calculated and Selected

Working out from the Root Bridge, each path's cost is calculated based on its link speed plus the cost of equipment and links between itself and the Root Bridge. The best paths are designated for use and remaining paths are blocked from passing any traffic not related to LAN management.

Dealing with Changes

STP data is sent in special data packets called BDPUs. When a change is detected, the spanning tree is recalculated accordingly, even selecting a new root bridge if necessary.

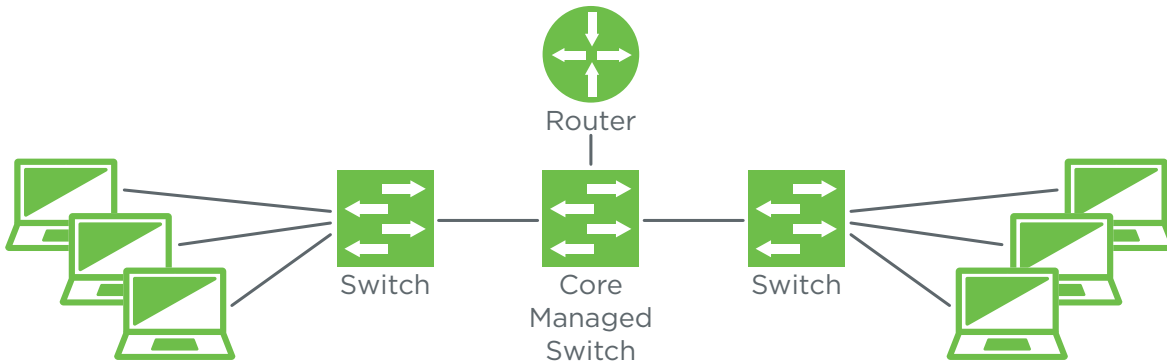
3 - Araknis Equipment & STP

By Series

- **100/110 Series Unmanaged Switches** - Do not support STP configuration, but **do** pass STP data. Use these devices at the edge of the network, connected back to the core switch if possible.
- **210/300/310 Series Managed Switches** - Fully support STP configuration and operation. Araknis managed switches support three types of STP configuration:
 - **802.1d (STP)** - The original protocol for spanning tree. Operates only within one VLAN. We use RSTP instead because it will still support this protocol.
 - **802.1t (RSTP)** - Rapid Spanning Tree Protocol. Known primarily for decreasing response time for topology changes from 30-50 seconds to less than 10 seconds. Backwards compatible with STP as long as equipment supports it. **Default setting for Araknis switches.**
 - **802.1s (MSTP)** - Multiple Spanning Tree Protocol. Enhances RSTP to better support VLANs. Compatible with RSTP. This advanced feature is not covered in this guide. See the 210/310 managed switch manual for more information.

Best Practices

- **Use Router-On-A-Stick Topology** - Place the most powerful managed switch between the router and the rest of the LAN to serve as the **core switch**. Connect additional equipment to the managed switch. Avoid placing unmanaged switches between other switches, only at the edges of the LAN.



- **Customize Bridge Priority Settings** - The easiest way to avoid most STP issues. See [1 - Find, Fix, and Prevent STP Issues](#) for instructions.
 - **Core Managed Switch** - Set Priority. This will ensure that another system such as sonos or DirectTV won't become the root bridge by mistake.
 - **Additional Managed Switches** - Use differing Priority values to force the order in which switches would take over as the root bridge in case of failure. Especially important when you have redundant links between switches.
- **Equipment Specific Guidelines** - See the rest of the guide for details on the most common issues we encounter, along with ways to solve or prevent them.

4 - DirecTV STP Issues

Newer DirecTV systems are turning to wired and wireless Ethernet for media distribution, using a master device to communicate with secondary slave devices throughout the location. The master device behaves as a switch to control communication and relies on spanning tree features to work correctly.

Problems occur because of the way the spanning tree algorithm selects the [root bridge](#) for the LAN. DirecTV uses the same default bridge priority setting as Araknis (32768), which means the device with the lowest MAC address will be selected. Since DirecTV has been in business longer than Araknis, all of their MAC addresses are lower than Araknis MAC addresses.

Solutions

The fix for this issue is simple, just lower the priority of the core switch and force it to be the root bridge. See [1 - Find, Fix, and Prevent STP Issues](#) for instructions (requires a managed switch).

5 - Sonos STP Issues

Sonos is equipped with a standalone, wireless mesh network called **SonosNet** that links all in-range wireless Sonos devices (that aren't connected to a Wi-Fi SSID). SonosNet uses STP to prevent redundant links between SonosNet devices.

Sonos suggests using a single hardwired link between the LAN and the Sonos system, and under these conditions, STP works correctly. However, when multiple Sonos devices are hardwired to different network switches, STP for the LAN may no longer behave correctly, resulting in issues.

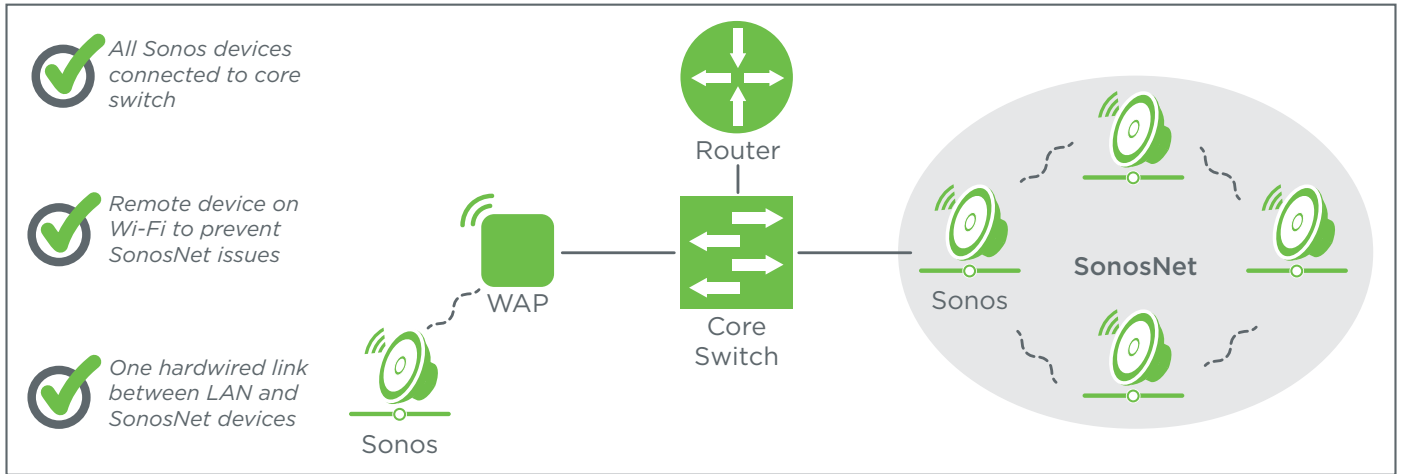
This is due to either incorrect STP settings in network switches, or because Sonos is connected to equipment that does not support STP, such as the Araknis router.

Solutions

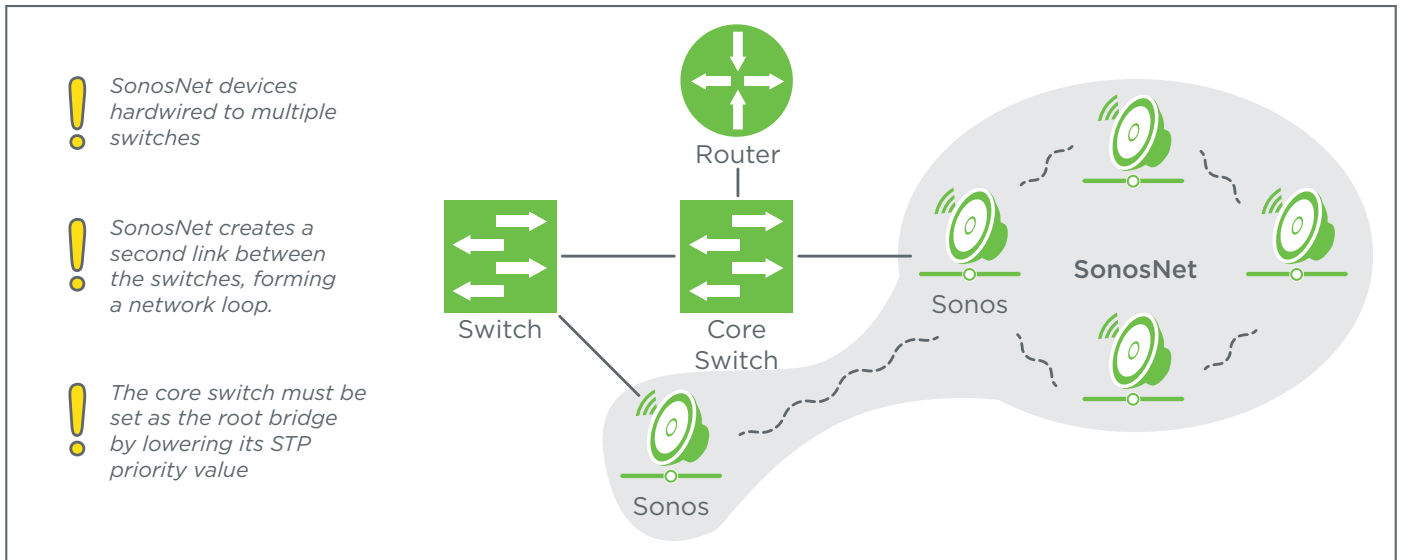
- Lower the priority of the core switch and force it to be the root bridge. See [1 - Find, Fix, and Prevent STP Issues](#) instructions (requires a managed switch).
- Minimize the number of hardwired Sonos devices. If remote devices won't stay connected to SonosNet, try moving them to the Wi-Fi network.
- Daisy-chain hardwired connections between Sonos devices instead of connecting to the switch. (Only works with Sonos models equipped with two LAN ports.)
- Connect all hardwired Sonos equipment to one Araknis switch (not the router). This should eliminate any LAN issues caused by Sonos. Even unmanaged 100 and 110 series switches may be used. See the next page for network topology recommendations.

Sonos Network Topology Recommendations

Example 1 - No STP Setup Required



Example 2 - STP Setup Required



Topography Notes

- The diagrams illustrate a **router-on-a-stick** topology, See [Best Practices](#) for more information.

6 - Contacting Technical Support

Phone: (866) 838-5052

Email: support@araknisnetworks.com