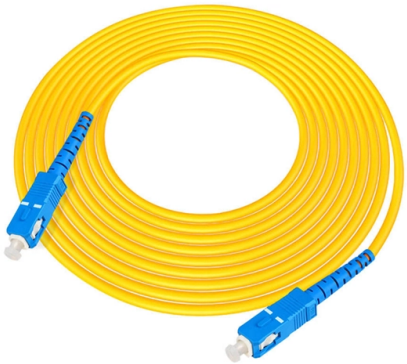
Ping-Pong Effect in Fiber Optic Switches



Overview

ping-pong switchingis a common network problem, but excessive ping-pong switching consumes network resources, increases the probability of dropped calls, reduces the performance of...

Key Takeaways

The Ping-Pong Effect occurs when a signal or device rapidly switches back and forth between two or more paths, causing performance degradation and increased network resource usage.

Definition and Context

In fiber optic switches, the Ping-Pong Effect refers to the rapid toggling of a signal or connection between two or more optical paths or controllers. This can happen in scenarios such as multi-path routing, cluster networking, or redundant switch configurations. The effect is analogous to a ball bouncing back and forth, where the system repeatedly switches the active path without stable operation, leading to inefficiencies and potential service interruptions.

Causes

The Ping-



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Pong Effect in fiber optic or network switches can be triggered by several factors: Fluctuating signal strength at the edges of coverage or optical paths, causing the system to repeatedly select different paths. Improper handover or switching parameters, such as low hysteresis or short time-to-trigger settings, which make the system overly sensitive to minor variations. Load balancing conflicts in cluster networks, where multiple controllers attempt to claim ownership of the same resource, such as a LUN in storage systems.

Hardware or configuration limitations, including insufficient isolation or delay in switch response, which can exacerbate rapid toggling.

Impacts

The Ping-

Pong Effect can significantly affect network and system performance: Increased signaling load and network resource consumption. Reduced throughput and higher latency due to frequent switching. Potential data loss or dropped connections, especially in storage or telecom networks.

Degraded user experience in communication systems due to instability.

Detection and Mitigation

Detection methods involve monitoring the serving duration or active time of each path or controller. If the average duration is below a preset threshold, a Ping-Pong condition is flagged, prompting parameter adjustments. Mitigation strategies include: Adjusting hysteresis and time-to-trigger parameters to prevent unnecessary rapid switching.

Prioritizing preferred paths or controllers to stabilize selection when multiple options are available. Improving isolation and switch response in hardware, such as using ping-pong architectures with RF or optical switches to manage fast frequency or path changes without instability. Load balancing policies in cluster networks to prevent simultaneous ownership conflicts between controllers.

Practical Example

In a dual-switch fiber optic cluster, if two controllers attempt to manage the same LUN, the Ping-Pong Effect can cause the LUN's working controller to switch repeatedly between the two controllers. Proper cable connections, controller prioritization, or disabling trespass policies can resolve this issue. Similarly, in RF or optical systems, a ping-pong architecture can be intentionally used to alternate outputs for fast frequency sweeps while maintaining stability.

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Conclusion

The Ping-

Pong Effect in fiber optic switches is a critical phenomenon that can degrade network performance and reliability. Understanding its causes, monitoring active durations, and applying proper configuration or hardware strategies are essential to ensure stable and efficient operation in optical networks and cluster systems.

Article Content

Use of "ping-pong" for optical transmission

A method for the bidirectional transmission of digital data via an optical fiber is specified, with which the bits of data streams to be transmitted are compressed in bursts by a factor> 2 in a constant number

WO2018149259A1

ping-pong switchingis a common network problem, but excessive ping-pong switching consumes network resources, increases the probability of dropped calls, reduces the performance of...

ping-pong effect

While reading about Cisco Compatible Extension Program, I read about ping-pong effect and new features to solve this problem. So from Cisco guide I read the next:

Understanding and Optimizing the Ping-Pong Effect in Telecom

□□ Ping-Pong Effect in Telecom Networks In mobile networks, the Ping-Pong Effect occurs when a user device rapidly switches back and forth between two neighboring cells within a short...

Fiber Network Troubleshooting – Common Issues & Fixes

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Reduction in ping-pong effect in heterogeneous networks using fuzzy ...

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Various researchers have attempted to provide efficient handover algorithms to reduce the ping-pong effect and to provide seamless connectivity to end users. The handover techniques

1x2 Mechanical PM Fiberoptic Switch

ACP''s PMS Series switch connects optical channels by redirecting an incoming optical signal into a selected output fiber. This is achieved using a patent

Using fuzzy logic to reduce ping-pong handover effects in ...

To reduce the ping-pong effect, in this paper, the FPEHS is proposed by using the fuzzy logic based decision policy on the LTE communication environment. In average, about 68.79% of unnecessary

Fiber Optic Ring Network Design Explained:

Learn how to design a fiber optic ring network with practical diagrams, topologies, and switch setup tips. Explore ring network switch options

Reduction in ping-pong effect in heterogeneous networks using fuzzy ...

This paper proposes a fuzzy-based decision system for reduction in ping-pong effect in heterogeneous network handover. The proposed system uses traversal frequency of familiar paths.

US7263358B2

A method for detecting and reducing ping-pong handover effect of a cellular network is disclosed. The method provides a systematic way to determine which cell pairs of the network have high probability

Analyses of ping-pong handovers in real 4G telecommunication networks

However, issues appear when a mobile phone starts switching rapidly between two different cells in a short period of time, referred to as ping-pong handover. These occurrences cause

What is Ping Pong Handover : Definition, Causes & Effects

Ping Pong Handover is a wireless network issue where a mobile device repeatedly switches between neighboring cells within a short period. This unnecessary handover behavior increases signaling

Adaptive Handover Decision Using Fuzzy Logic for 5G Ultra-Dense

Unnecessary handovers aggravate the ping-pong effect and degrade the quality of service of cellular networks. Fuzzy logic (FL) is considered the best technique to unravel the

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Association stability and handoff latency tradeoff in dense IEEE 802.11 ...

We conclude that the ping-pong effect can be reduced by using solutions commonly found in the literature, but in some cases they cause additional delay to the handoff process, which is

Analyses of ping-pong handovers in real 4G ...

The ping-pong rate is defined as a share of ping-pong handovers in total handovers, without taking into consideration the conditions under which they occur.

(PDF) Using fuzzy logic to reduce ping-pong handover effects in LTE ...

The Fuzzy based Low Ping-Pong Effect Handover System (FPEHS) reduces ping-pong effects by 92.94% in LTE networks. Five input parameters (SNR, bandwidth, energy) significantly influence

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