June 01, 2018

APPLICATIONS ON TOP OF DNA CENTER: TOPOLOGY EVOLUTION BASED ON CUSTOMER NETWORK DYNAMICS

Smruti Lele

Ankur Bhargava

Ajay Madhavan

APPLICATIONS ON TOP OF DNA CENTER: TOPOLOGY EVOLUTION BASED ON CUSTOMER NETWORK DYNAMICS

AUTHORS:
Smruti Lele
Ankur Bhargava
Ajay Madhavan

ABSTRACT

Techniques are provided for detecting and managing dynamically changing loads in a network, for example, during large scale events that may cause a bottleneck such as a stadium game event or a musical concert. These techniques allow network administrators to improve network efficiency by monitoring and tweaking the network capabilities in order to handle network load during periods of high demand without a detailed background knowledge of the network.

DETAILED DESCRIPTION

A conventional topology as shown in *Figure 1*, below, shows network devices connected to each other with links. Two edge routers are present, with the edge routers linked to the Internet and to the other routers in the network, with a network link between the edge routers. There is no indication that this network link is running near capacity or that a bottleneck is present.

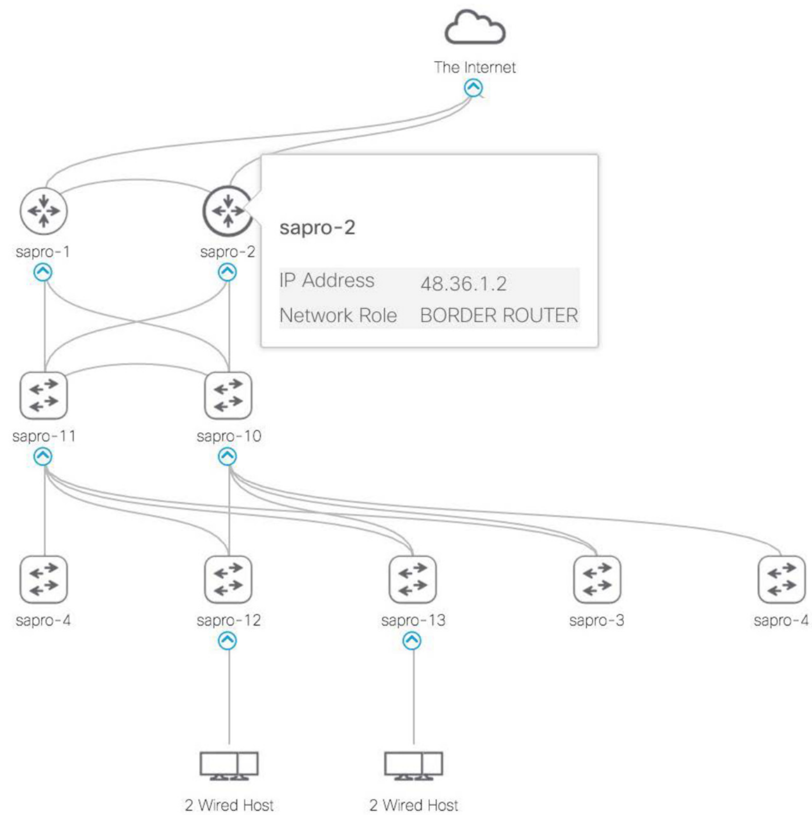

Figure 1

Further, as the load increases on the network, the underlying topology does not detect possible disruptions to the network. The network load may exceed its capacity and may have a massive fault, which could result in loss of network connectivity. Although some systems have alarms/notifications that are triggered by high loads, it is difficult to successfully intervene once high loads have been detected. However, if increasing load conditions are detected ahead of time, a network administrator may be able to remodel the network and still continue to support high loads to maintain the network. Thus, present techniques and systems may utilize one or both of the following components to manage loads.

The first component comprises determining device capabilities or parameters and comparing these to peak statistic measures on the network to clearly indicate bottlenecks to the network administrator. For example, a "health score" could be computed for each of the devices and links in the network and graphically displayed to an administrator for ease of visualization. With these visual changes mapped to the network topology, a network administrator can effectively and easily manage and scale a network on demand.

For example, the peak statistic measures for the network link between the two edge routers above can be computed to be operating close to 800 Mbps for a prolonged period of time, and the device characteristics may indicate that this network link is a Gigabit link. By visualizing this information for the link (e.g., showing the link as "red" to indicate a potential bottleneck), a network administrator can easily determine that the link is near capacity most of the time. For example, when this component is implemented, it would take inputs from the basic topology service and show the enhanced network topology based on congestion statistics (e.g., peak statistic measures) as shown below in *Figure 2*. Here, the administrator can easily visualize which links are running at capacity.

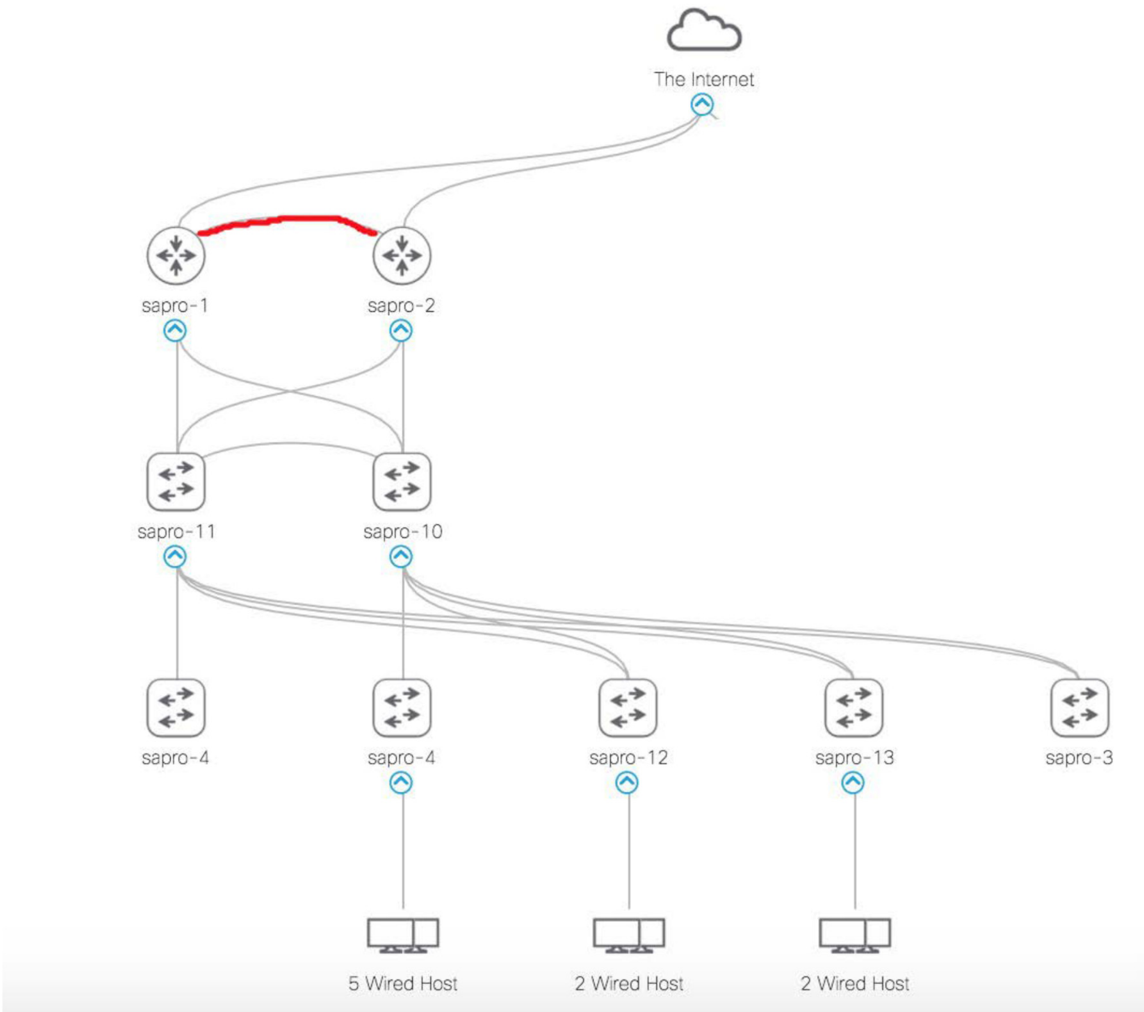

Figure 2

In some cases, an alarm/notification may be sent to the administrator regarding this high capacity usage.

The second component comprises improving network capacity planning based on topology and configuration analysis. In this aspect, a background job may run periodically to analyze the topology of the network. The background job may identify links with heavy loads and may recommend topology changes to alleviate congestion, e.g., changing a Gigabit device/link to a Multi-Gigabit device/link. For example, a configuration change may be made to tweak link parameters to lead to better performance, or the network device may be replaced with another device capable of handling heavier loads.

In summary, the techniques presented herein allow a network administrator to more easily detect and manage load capacity on a network by identifying potential bottlenecks based on device parameters and usage, and to recommend network topology changes to the administrator to optimize load and improve network stability.