NOKIA

Discover multilayer topology automatically

Gain visibility into your IP/optical network to drive efficient operations and support service quality

An IP/optical coordination use case

Many operators gather and record multilayer topologies, particularly cross-domain connectivity information, manually. Automatic discovery of the multilayer topology using the Nokia Network Services Platform (NSP) allows network operations to be carried out with full and accurate knowledge of the deployed architecture. You can expect reduced probability of service outages, simpler troubleshooting and tighter latency control.

Running blind

In IP/optical networks, a lack of visibility into the network architecture can complicate network operations and impair network reliability. Cross-domain (IP layer-to-optical layer) connectivity information is often captured using labor-intensive manual methods. For example, information is gathered from the IP and optical operations teams, manually correlated and recorded in spreadsheets.

> Cumulative errors from manual data entry can result in up to a 10% deviation from reality over time.

This lack of visibility into the true network topology can lead to several operational problems and inefficiencies and can also negatively impact the end-user quality of experience. These problems include:

- Increased risk of service outages because backup cross-domain links either are not installed or are incorrectly configured

- Difficult troubleshooting because tracing service faults to connectivity root causes is misdirected due to incorrect cross-domain information

- Lack of latency control because primary and backup paths take unexpected routes, incurring unforeseen delays

- Increased inaccuracies in the cross-domain link database as maintenance actions and changes happen over time.

Clearly, without accurate knowledge of the network architecture, network operations are carried out without full visibility of all resources. A mechanism is needed to provide this vision.

Knowledge is power!

A better, fully automatic and deterministic approach uses an embedded, standard link layer protocol called Link Layer Discovery Protocol (LLDP) to reliably detect and communicate topological and connectivity details to the Nokia NSP. The NSP monitors inter-node link layer communications (LLDP snooping) used by network devices for advertising their identity, capabilities and neighbors. This information allows the NSP to construct the true network topology, including the links that exist between routers and optical nodes.

This automated monitoring using LLDP has many benefits, including the avoidance of cumbersome manual configuration, capture and verification while also detecting misconfigurations. However, LLDP is not available on some legacy optical equipment; therefore, a solution based on the correlation of packet counts is required in addition to network protocol monitoring.

The Nokia NSP solution leverages a combination of LLDP network protocol monitoring and the correlation of network equipment statistical data together with a multi-layer SDN controller, all within the NSP. This enables comprehensive topology discovery as shown in Figure 1. The network operator directs the process using the NSP Cross-Domain Coordinator application via a powerful graphical interface.

Figure 1. Automatic topology discovery
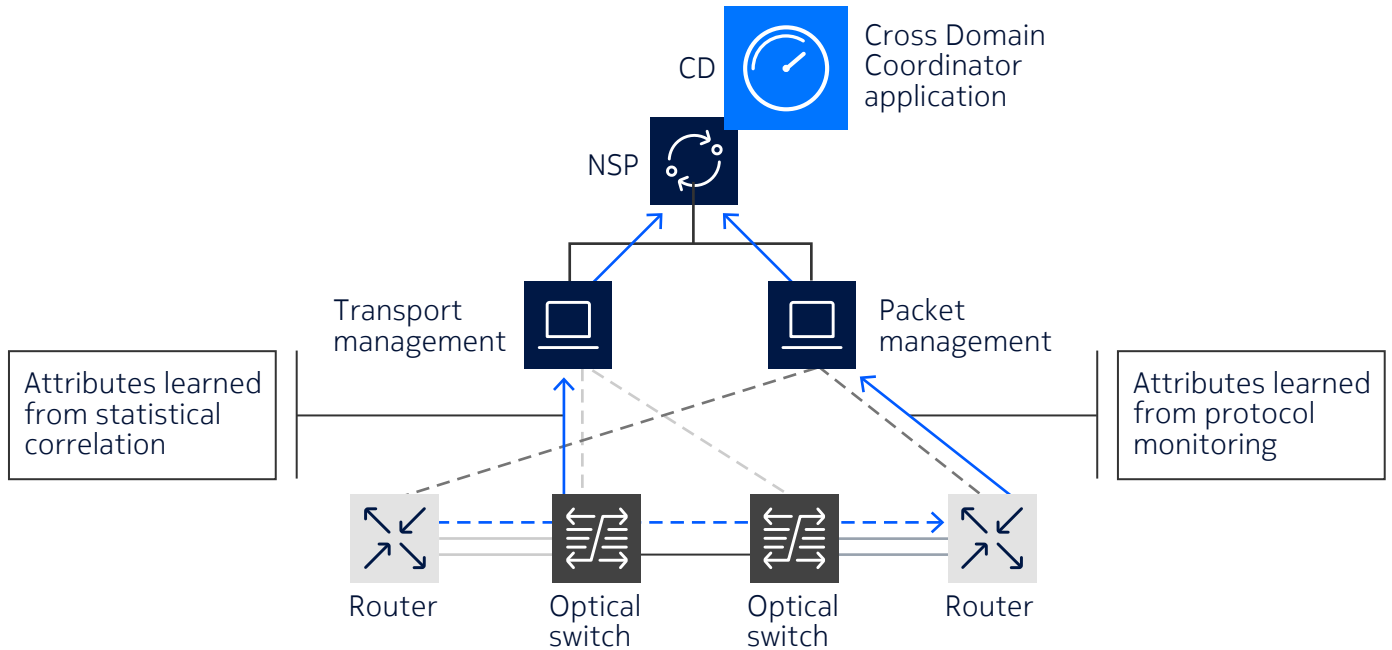
The application can implement the discovery process for the entire network or limit the process to just the controller or even to a single network element. At the end of the discovery process, a summary is presented to the user. This is captured graphically on a network map, as shown in Figure 2, and also in a cross-domain link list. This summary includes how much time it took for the process to complete and how many cross-domain links were discovered.

The Cross-Domain Coordinator application can also determine if there are any misconfigured links in the system. The user can validate the links in the cross-domain links list and commit to the database, capturing an accurate view of the network topology.

Figure 2. Sample Cross-Domain Coordinator network map
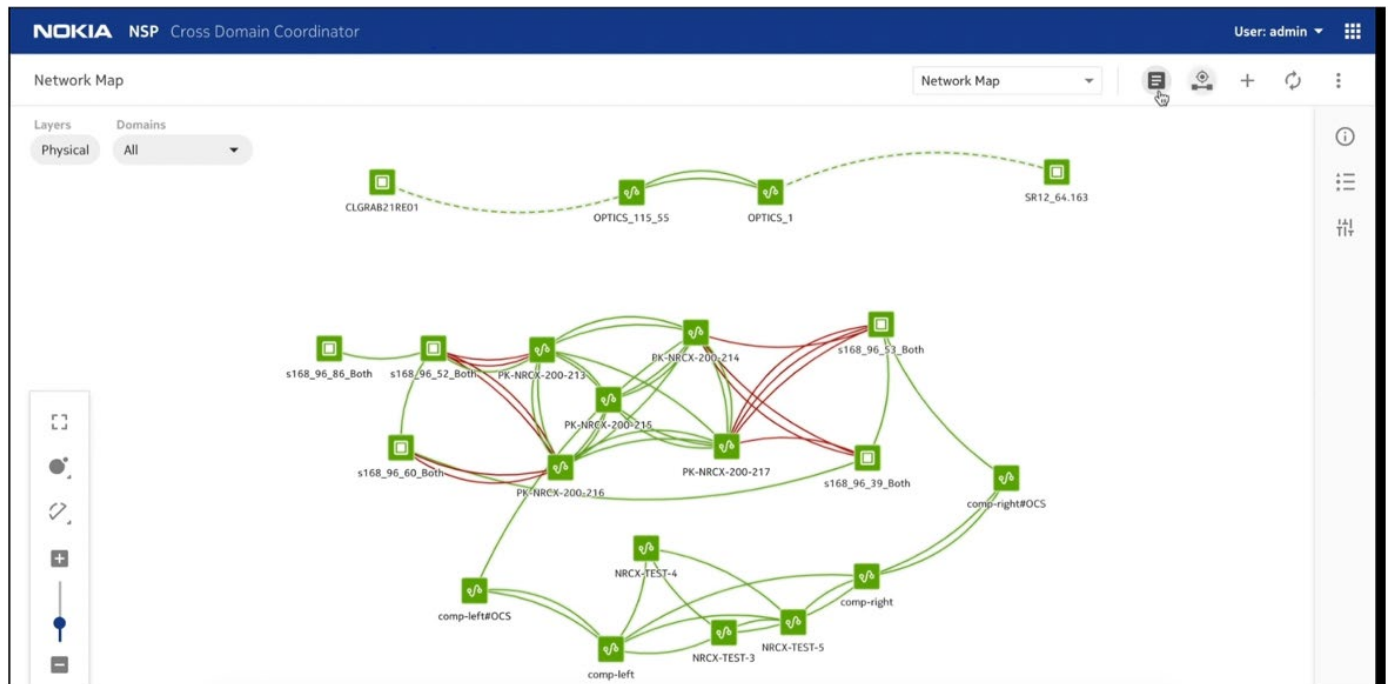
Working with a clear vision

With the NSP Cross-Domain Coordinator application you can capture an accurate view of network topology and update it at any time to keep a current view as changes are made to the architecture. Now network operations can be based on comprehensive, reliable topology data. You can:

• Reduce the chance of service outages with backup cross-domain links correctly installed as needed

• Simplify troubleshooting when tracing service faults to connectivity root causes by using correct cross-domain information

• Take control of latency, establishing primary and backup paths with full knowledge of the routing implications.

For more information about this and other topics in IP/optical networking optimization and automation, visit the Nokia IP/optical coordination page.

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