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Packet Optical Zero Touch Provisioning

Automation Speeds Service Activation and Enables Higher Network Availability While Lowering OpEx

Network operator requirements for reduced operational costs, faster deployment, and increased network availability have driven the industry to innovate around the installation, commissioning, and provisioning of network elements. This evolution has reduced the amount of manual input, or touch, necessary before a new network element can begin delivering services to customers. More recently, low touch has evolved to zero touch, and its scope has expanded beyond Ethernet NIDs/CPE to include transport and aggregation devices. This application note describes support for Zero Touch Provisioning (ZTP) across the Coriant packet optical transport portfolio including the Coriant® 7090 Packet Transport Solutions, Coriant® 7100 Packet Optical Transport Solutions, Coriant Groove™ G30 DCI Platform, and Coriant® mTera® Universal Transport Platform as supported by the Coriant® Transport Network Management System (TNMS).

WHAT IS ZERO TOUCH PROVISIONING?

To understand ZTP, it is helpful to consider the tasks that typically need to be completed when a new network element is installed in order for service delivery to begin. These tasks include the physical installation of the network element including powering the device and network cabling. Additional tasks typically include establishing DCN connectivity, upgrading the device to the latest software, and configuring the device.

	Before	ZTP
Physical installation, power, and cabling	• Onsite Engineer	• Installation Technician
NMS	• Onsite Engineer	• Automated
SDN	• Onsite Engineer	• Automated
ASON/GMPLS	• Onsite Engineer	• Automated

Table 1: Commissioning and Provisioning Tasks

As shown in Table 1, while the physical installation, powering, and cabling will continue to require onsite personnel, ZTP enables the remaining tasks including establishing DCN connectivity, software upgrade, and device configuration to be automated without additional onsite activity. Furthermore, installation can be completed by less skilled technicians.

BENEFITS OF CORIANT ZERO TOUCH PROVISIONING

- **Reduce** operational costs by minimizing onsite installation time and reducing the skill level required by technicians

- **Accelerate** the deployment of new network elements and speed the activation of revenue-generating services

- **Maximize** service availability using automation to eliminate manual errors

- **Leverage** the benefits of ZTP across a wide range of Coriant packet optical solutions including the 7100 Pico, 7090 Series, and Groove G30

- **Simplify** the tasks of implementing and operating ZTP through TNMS deployment planning and automated network preparation

THE BENEFITS OF ZERO TOUCH PROVISIONING

Reduced Operational Costs

ZTP reduces operational costs by automating the DCN setup, software updates, and configuration steps from the point after the network element has been physically installed, powered, and cabled. This process minimizes the amount of time spent on site, in addition to reducing the skill level required and therefore the cost. It also minimizes offsite operational costs by automating the remote commissioning and DCN provisioning tasks. Additionally, it eliminates the operational cost of troubleshooting and extra site visits that are likely to result from manual errors that occur in traditional commissioning and provisioning processes.

Faster Deployment and Service Activation

ZTP speeds the time to deploy new network elements and provision new services. In the competitive market for wholesale and business services, service activation times can be a key differentiator, making the difference between winning and losing business. Furthermore, faster service activation times mean the customer can be charged and start paying for services sooner, resulting in a corresponding increase in revenues.

Higher Availability

In addition to operational cost savings, another benefit from eliminating manual errors is higher availability, which can have a direct impact on revenues from reduced customer churn and minimized Service Level Agreement (SLA) penalties.

ZTP SUPPORT IN THE CORIANT PACKET OPTICAL PORTFOLIO

Coriant ZTP simplifies the process of deploying and commissioning new packet optical network elements at the network edge, not only by automating DCN connectivity, software upgrades, and device configuration but also by assisting with deployment planning and network preparation. Coriant products play three roles in the ZTP process. First are the ZTP Devices that are being added to the network. Second is the ZTP Manager role that includes deployment planning, network preparation, management IP address assignment, device identification, software upgrades, and device configuration.
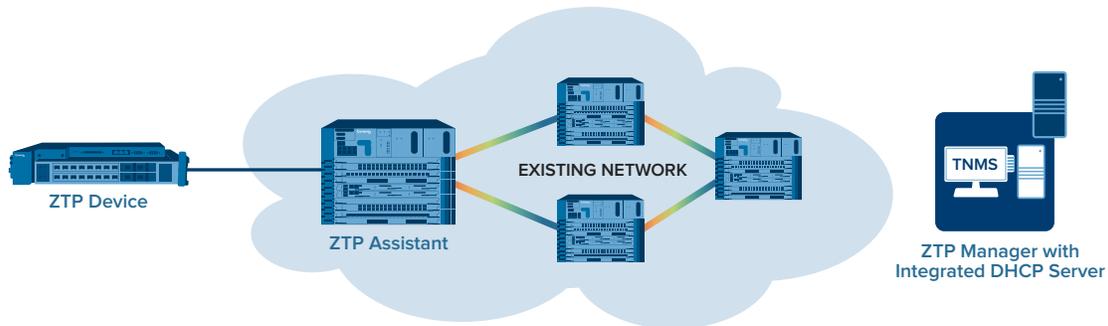

Figure 1: Coriant ZTP Roles

Third is the ZTP Assistant role played by the network element to which the ZTP Device is connected. These network elements are already part of the network with existing connectivity to the DCN and the ZTP Manager (i.e., TNMS). The ZTP Assistant relays messages between the ZTP Device and the ZTP Manager adding location information for the ZTP Device (i.e., the ZTP Assistant's port it is connected to) and enabling routing to the ZTP Device in the DCN.

As shown in Table 2, ZTP Devices include the Coriant® 7100 Pico™ Packet Optical Transport Platform, 7090 Series, and Groove G30. The 7100 Pico supports ZTP over both OTN GCC (all interface modules) and VLAN (packet switching modules) options for in-band management, while the 7090 Series supports VLAN in-band management, and the Groove G30 supports GCC in-band management. The Groove G30 also supports a ZTP option that is independent of TNMS relying instead on third-party DHCP servers.

The ZTP Assistants include the 7100 Pico, Coriant® 7100 Nano™ Packet Optical Transport Platform, and Coriant® 7100 Optical Transport System (OTS), both the 8-slot and 14-slot versions of the mTera UTP, and the 7090 Series. TNMS supports the ZTP Manager role with an integrated DHCP server, although, external third-party DHCP servers can also be supported.

	ZTP Devices	ZTP Assistants	ZTP Manager
Coriant Products	• Coriant 7100 Pico • Coriant 7090 CE • Coriant 7090 M/CEM • Coriant Groove G30	• Coriant mTera • Coriant 7100 Nano • Coriant 7100 OTS • Coriant 7100 Pico • Coriant 7090 CE • Coriant 7090 M/CEM	• Coriant TNMS
Key Functions	• Creates transport entities to ZTP Assistant • Sends DHCP request with device identification • Tears down unused transport entities	• Relays DHCP messages between ZTP Device and ZTP Manager/DHCP server • Appends location of ZTP Device to DCHP request • Injects route to ZTP Device into DCN OSPF domain	• Deployment Planning • Prepares the network by preconfiguring the ZTP Assistants • Integrated DHCP server supplies management IP address • Upgrades ZTP Device software • Configures ZTP Device

Table 2: The ZTP Roles of Coriant Packet Optical Products

Coriant is planning to extend the roles of ZTP Device and ZTP Assistant to additional products in the future. In addition, rack and stack staging services, where the network element can be preconfigured, tested, and optionally racked before shipment to the customer, are currently available for several Coriant products including the Coriant® hiT 7300 Multi-Haul Transport Platform, 7100 Nano, mTera UTP, and Groove G30. Furthermore, the Coriant® 8600 Smart Router Series also supports ZTP capabilities with the Coriant® 8000 Intelligent Network Manager (INM) functioning as a ZTP Manager.

CORIANT ZTP PROCESS

The Coriant ZTP process is largely automated and the user can proceed with only minimal knowledge of the details. While there are some differences between products, the 7100 Pico example summarized in Figure 2 provides a effective illustration of the process.
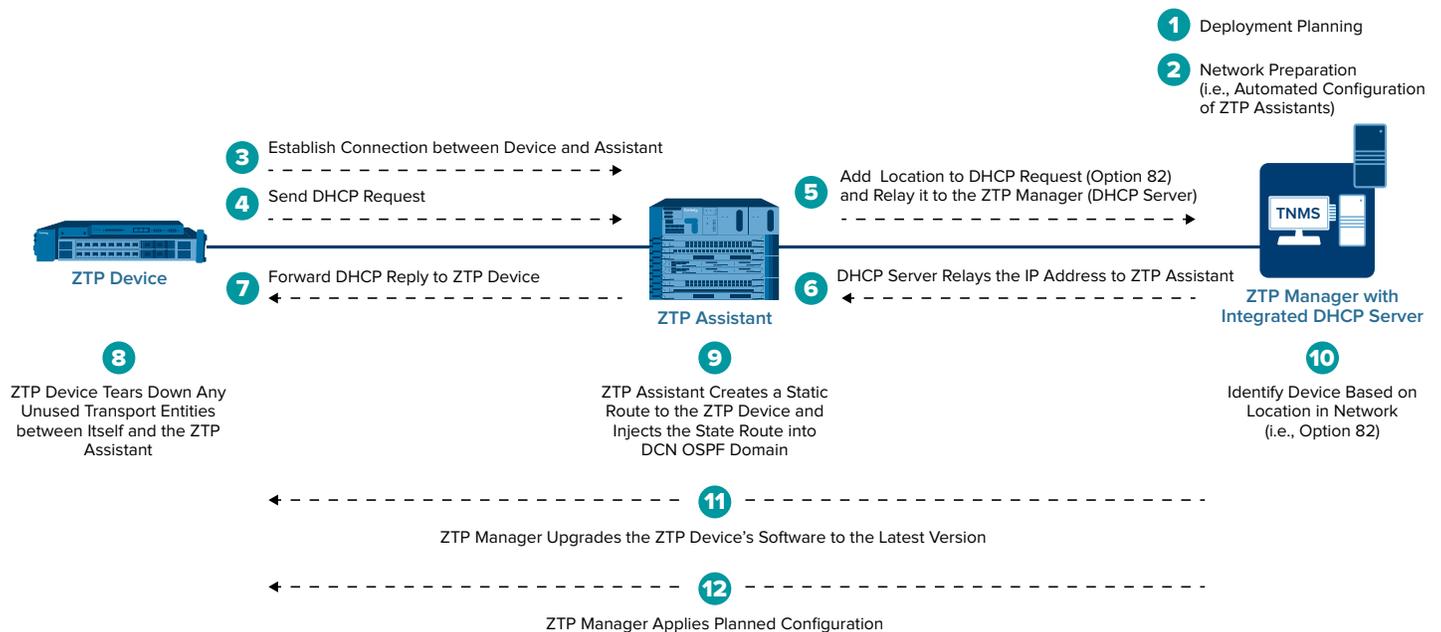

1 Deployment Planning

2 Network Preparation (i.e., Automated Configuration of ZTP Assistants)

3 Establish Connection between Device and Assistant

4 Send DHCP Request

5 Add Location to DHCP Request (Option 82) and Relay it to the ZTP Manager (DHCP Server)

6 DHCP Server Relays the IP Address to ZTP Assistant

7 Forward DHCP Reply to ZTP Device

ZTP Device

ZTP Assistant

ZTP Manager with Integrated DHCP Server

TNMS

8 ZTP Device Tears Down Any Unused Transport Entities between Itself and the ZTP Assistant

9 ZTP Assistant Creates a Static Route to the ZTP Device and Injects the State Route into DCN OSPF Domain

10 Identify Device Based on Location in Network (i.e., Option 82)

11 ZTP Manager Upgrades the ZTP Device's Software to the Latest Version

12 ZTP Manager Applies Planned Configuration

Figure 2: Coriant ZTP Process - 7100 Pico Example

Following TNMS deployment planning (step 1), TNMS then prepares the network (step 2) for ZTP by configuring the ZTP Assistants. These tasks occur before any devices are added to the network. During the deployment planning step, the network operator can assign configurations to individual ZTP Devices or groups of ZTP Devices.

When a new ZTP Device is added to the network, it automatically establishes connectivity to the ZTP Assistant (step 3) either via the creation of OTN/GCC resources or by scanning for a management VLAN. The ZTP Device then sends a DHCP request (step 4). The ZTP Assistant adds location information (DHCP Option 82) and forwards this to the ZTP Manager's integrated DHCP server (step 5). The integrated DHCP server replies with a management IP address to the ZTP Device via the ZTP Assistant (steps 6 and 7).

The ZTP Device then tears down any of the unused transport entities it created between itself and the ZTP Assistant (step 8), while the ZTP Assistant injects a static route to the ZTP Device into the DCN OSPF domain (step 9). DCN connectivity is then established. The ZTP Manager, having first identified the ZTP Device based on the Option 82 location information that was in the DHCP request (step 10), then upgrades the NE software to the latest version (step 11) and configures the ZTP Device (step 12) based on the configuration and software assigned to the device in the planning phase.

SUMMARY

Coriant extends the benefits of ZTP to packet optical transport including the 7100 Pico, 7090 Series, and Groove G30 with support over both OTN GCC and Ethernet VLAN in-band management. Further enhancing the ZTP benefits of reduced operational costs, faster deployment/service activation, and higher availability, TNMS greatly simplifies the tasks of implementing and operating ZTP through deployment planning and automated network preparation capabilities.

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