Provisioning and Managing Networks Using Common Automation Tools

GETTING STARTED WITH DEVICE PROVISIONING TECHNIQUES

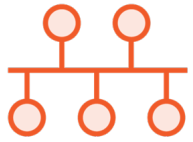
Nick Russo
NETWORK ENGINEER

@nickrusso42518 www.njrusmc.net

Suggested Prerequisite Courses

Getting Started with Software Development using Cisco DevNet

Consuming Cisco APIs and Understanding Application DevOps



Managing Cisco Networks via Infrastructure as Code

Agenda

Provisioning techniques

- iPXE
- ZTP
- Cisco PnP

Implementing zero touch provisioning

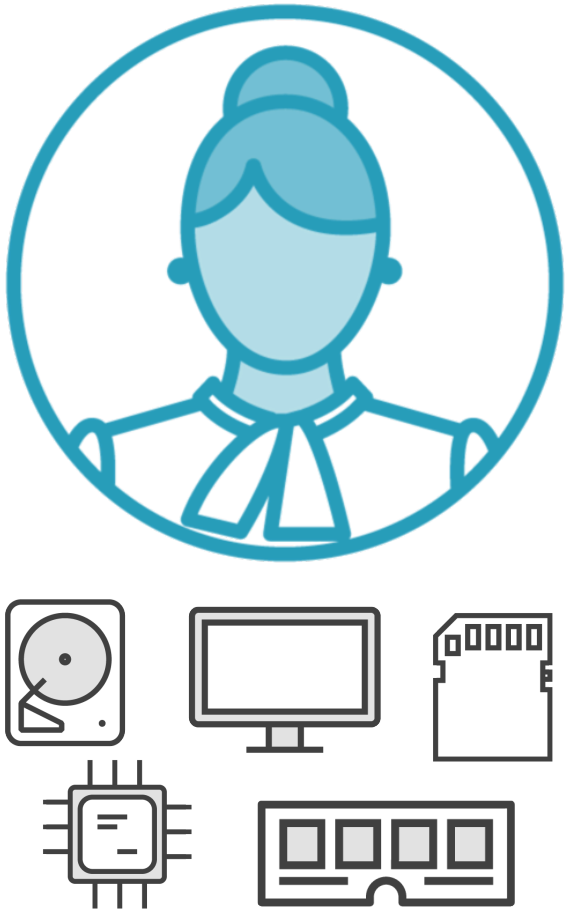
- Write the code
- Build the infra services
- Stand up new devices

Day 0 Provisioning

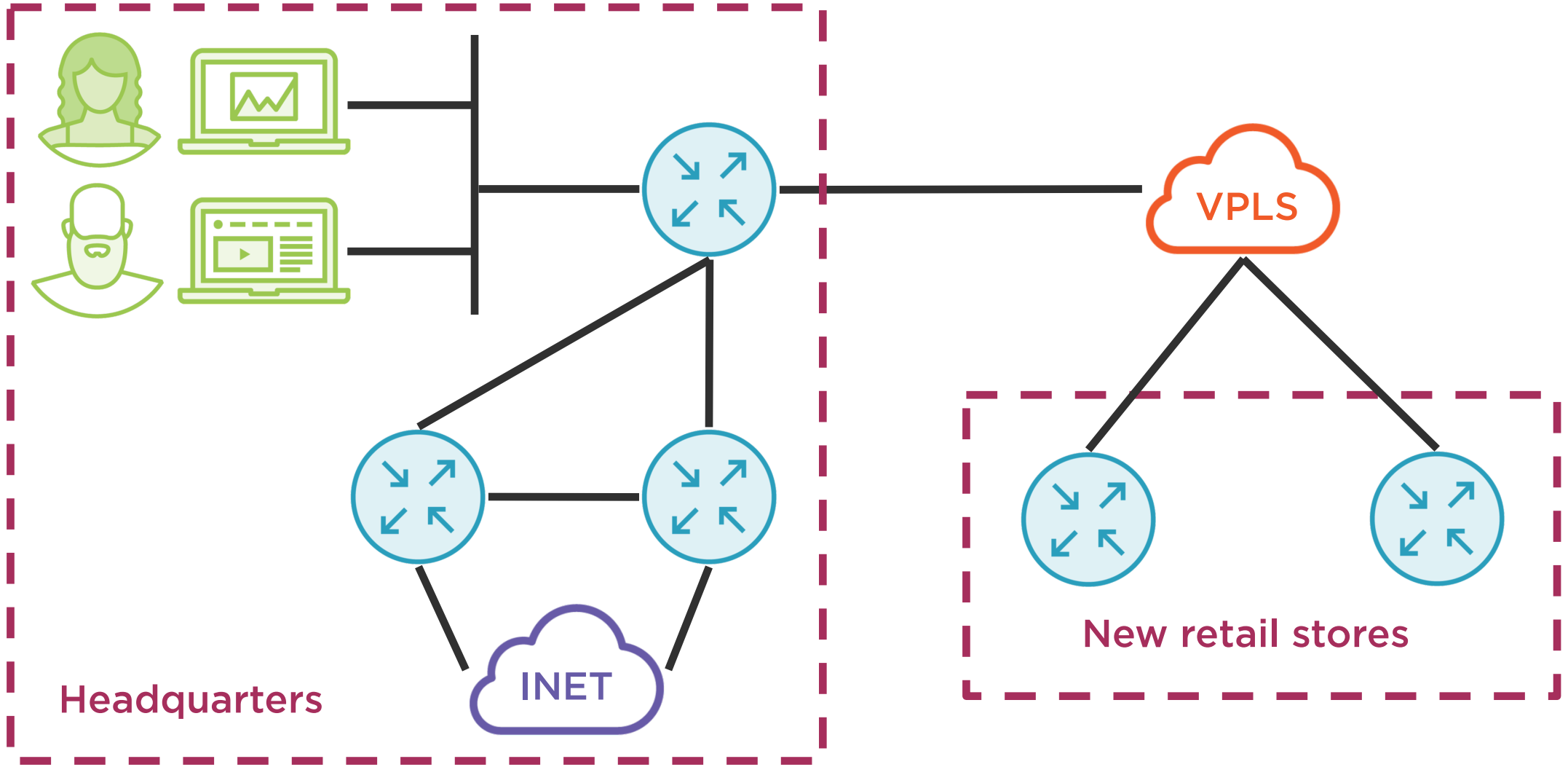
Initial configuration applied to a device **during** **onboarding, often with zero or minimal touch.**

Day 1, Day 2-N, and others coming later!

Introducing Globomantics



Globomantics Retail Expansion Plan



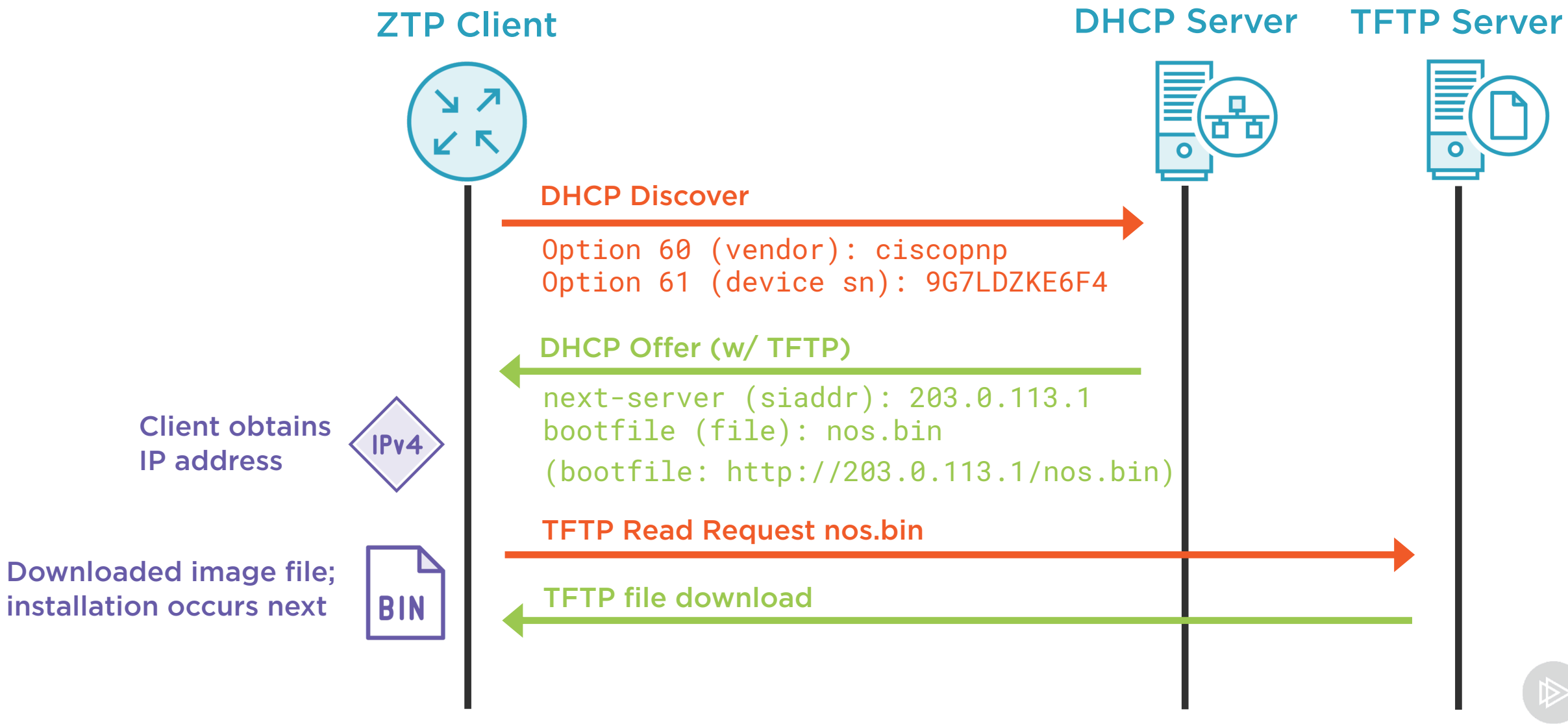
Preboot Execution Environment (iPXE)

Network-based boot

Configurable via rommon shell

Uses DHCP and TFTP/FTP/HTTP

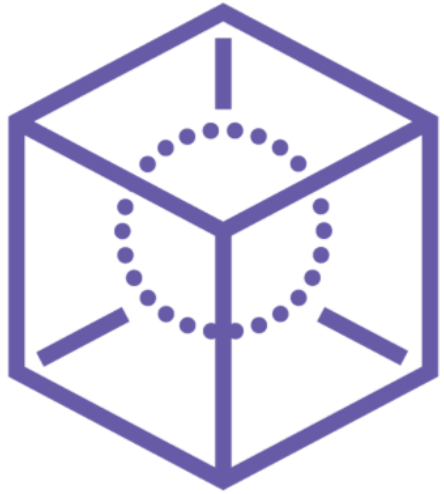
How iPXE Works



Zero Touch Provisioning (ZTP)

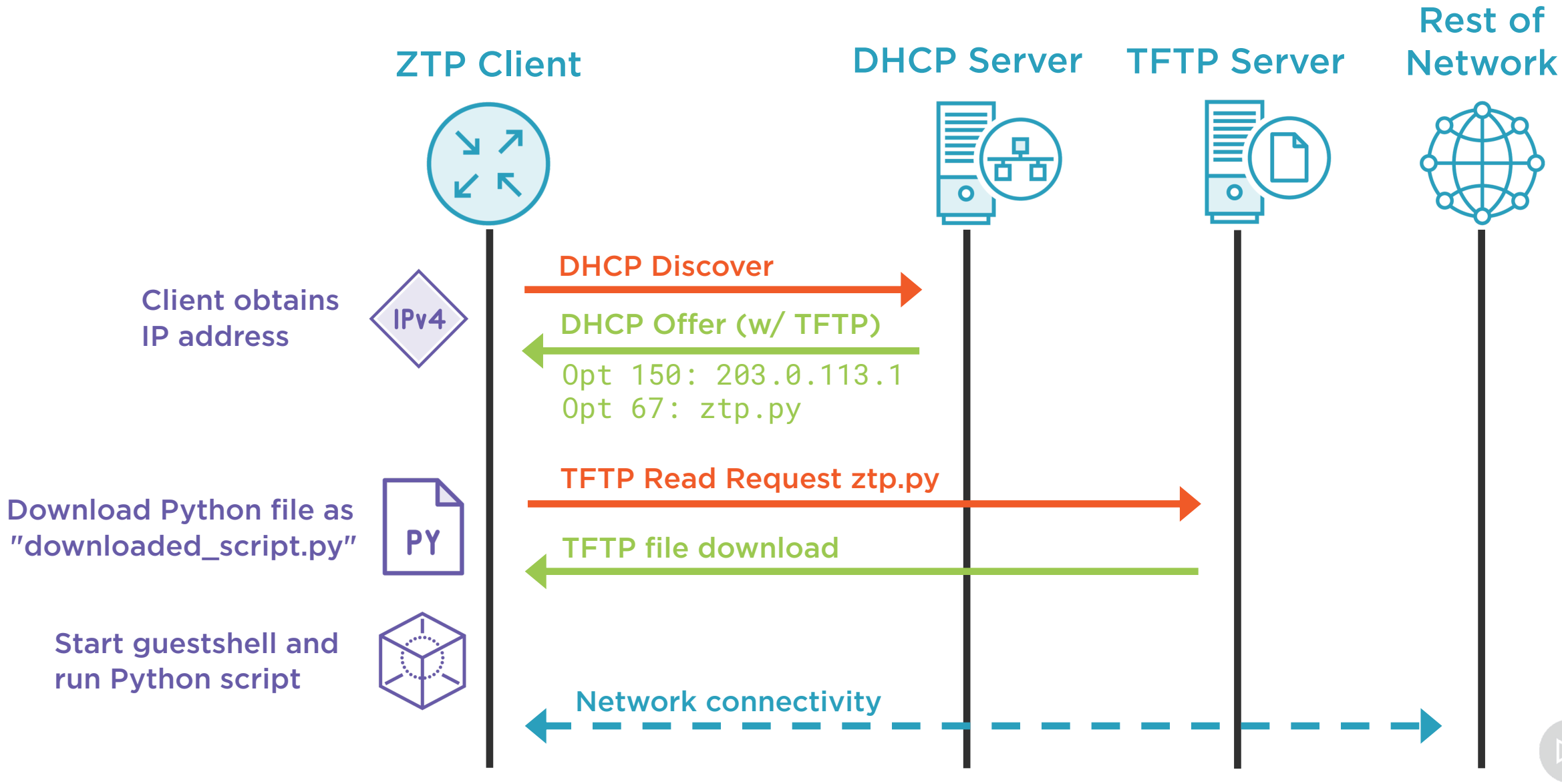
Network-based initial configuration

Similar to iPXE, except uses a Python script



Uses "guestshell" IOx container

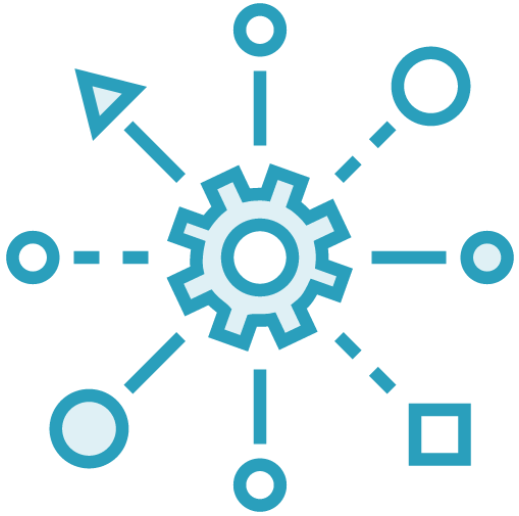
How ZTP Works



Cisco Plug-n-Play (PnP)

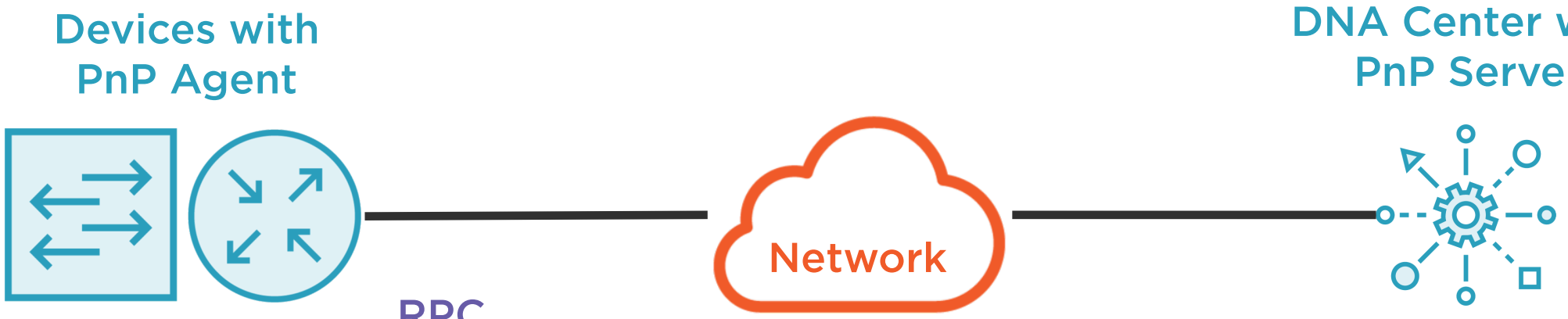
High scalability and security

Optional cloud redirection service



Centralized device mapping in DNA Center

Core PnP Components



PnP Protocol
XML-over-HTTP

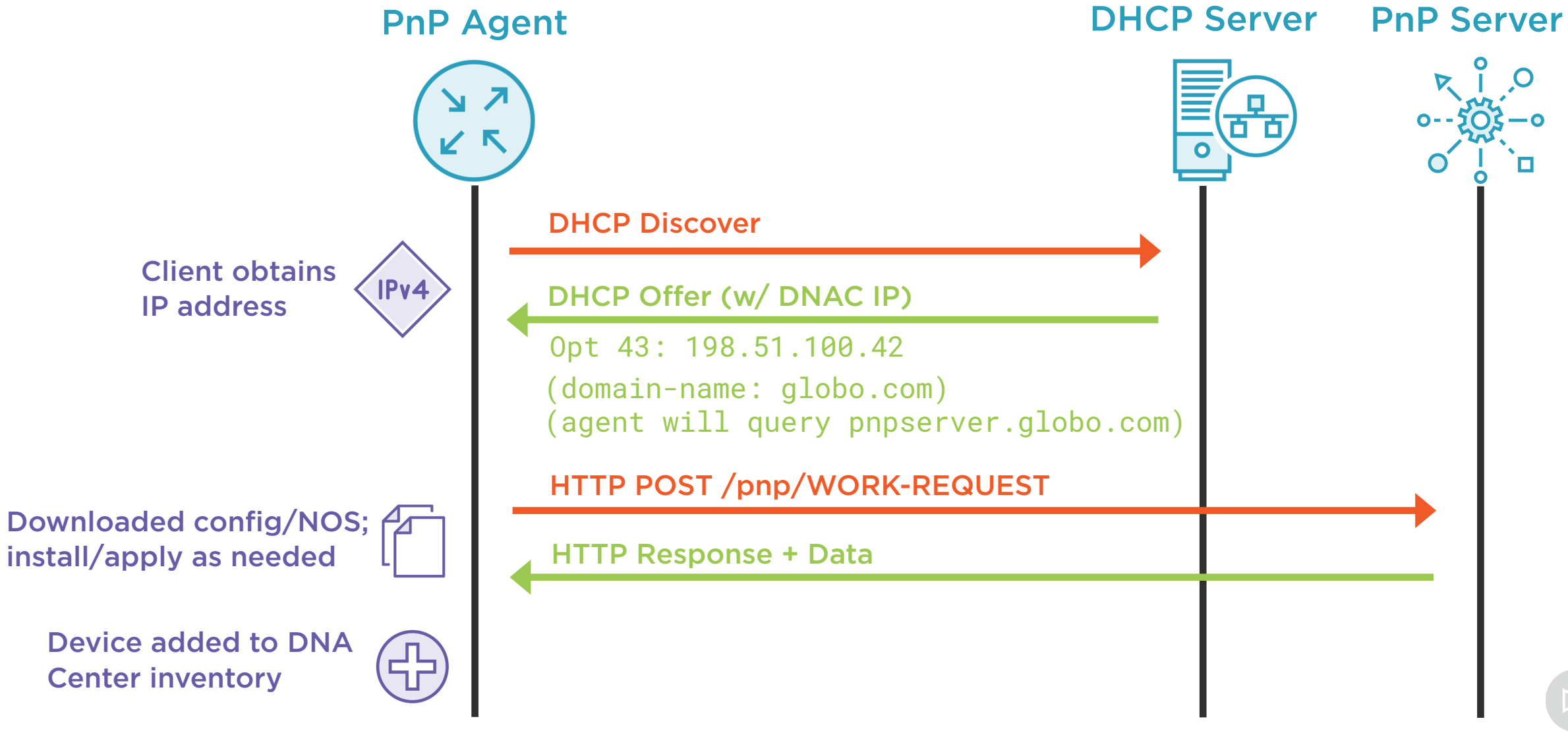
RPC

```
<pnp>
  <info>
   <deviceId>
    <udi>PID:C3750X,SN:FDO170</udi>
    <hostname>R1</hostname>
   </deviceId>
  </info>
</pnp>
```

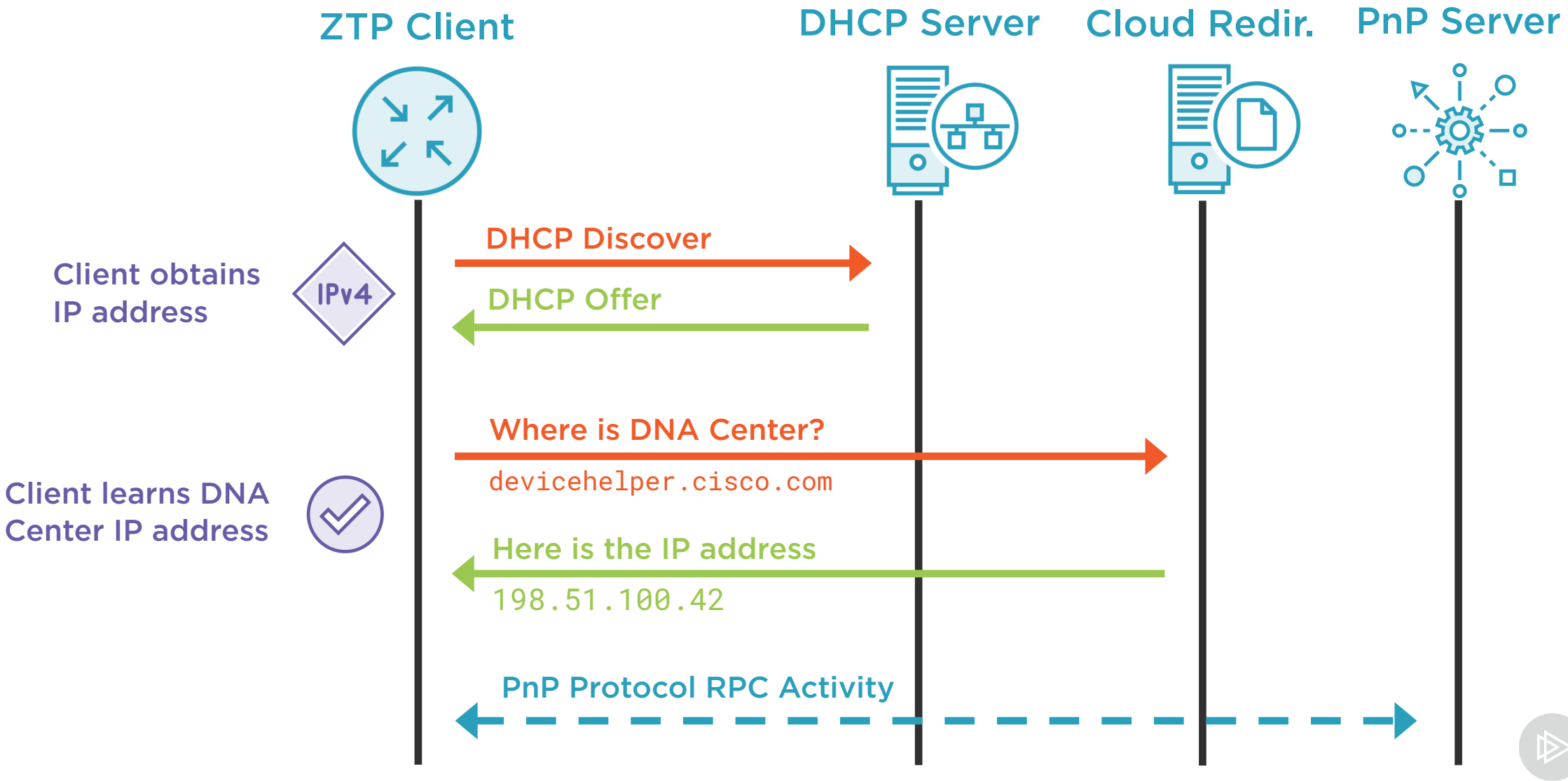
RPC reply

```
<pnp>
  <request>
   <deviceInfo type="all"/>
  </request>
</pnp>
```

How Cisco PnP Works



PnP Server Discovery via Cloud Redirection



Which One Is Right for Globomantics?

Summer interns have upgrade device images

Utilize existing DHCP and TFTP infrastructure

Campus access layer uses Arista switches

Day 0 Provisioning Comparison Chart

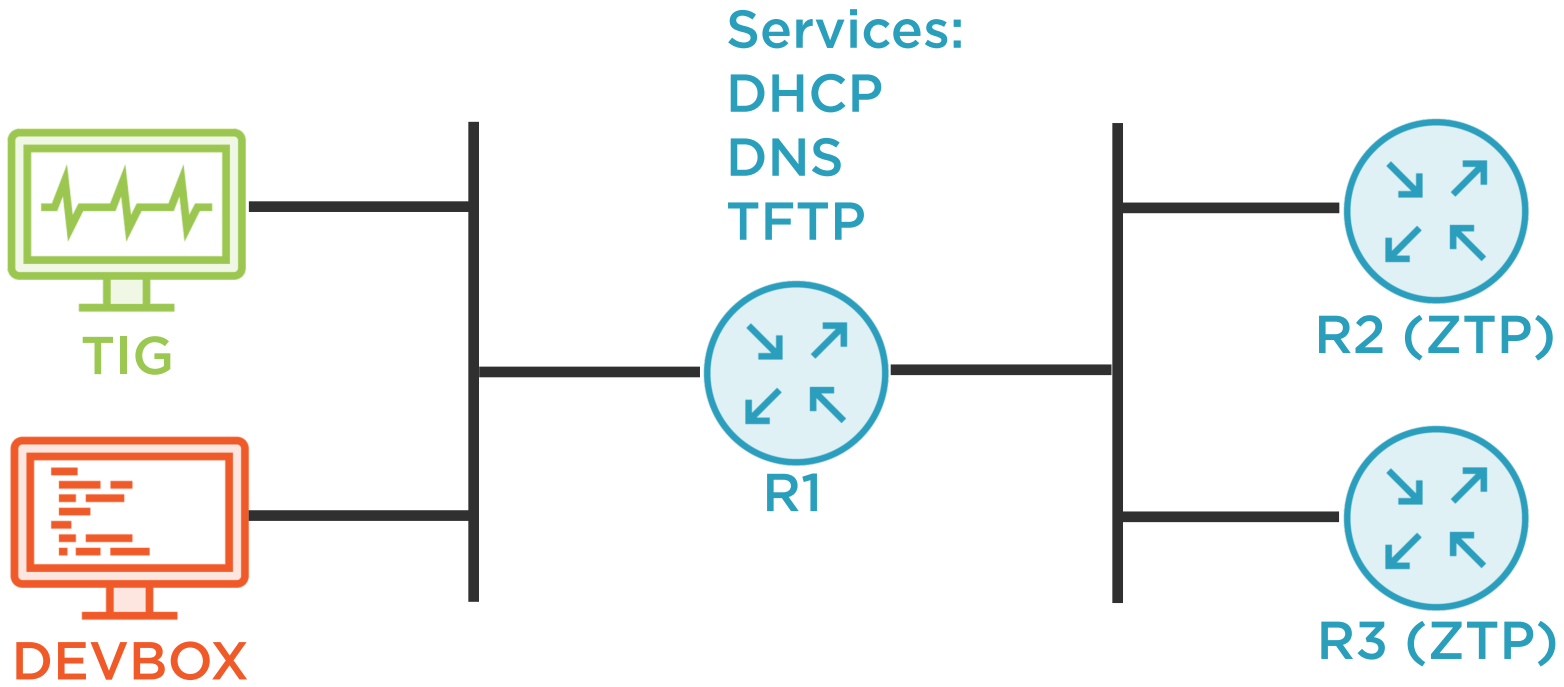
iPXE	ZTP	Cisco PnP
Boot from network	Boot from device	Boot from device
DHCP + file transfer	DHCP + file transport	DHCP + PnP protocol
DHCP client options 60 and/or 61	DHCP client options 60 and/or 61	No DHCP client options required
DHCP server "next-server" and "bootfile"	DHCP server options 67 and/or 150	DHCP server option 43 or domain-name
Standards-based	Standards-based	Cisco proprietary
Use when device has no/outdated NOS	Use to centrally apply initial configs	Use to centrally apply initial configs/NOS

ZTP!

Demo

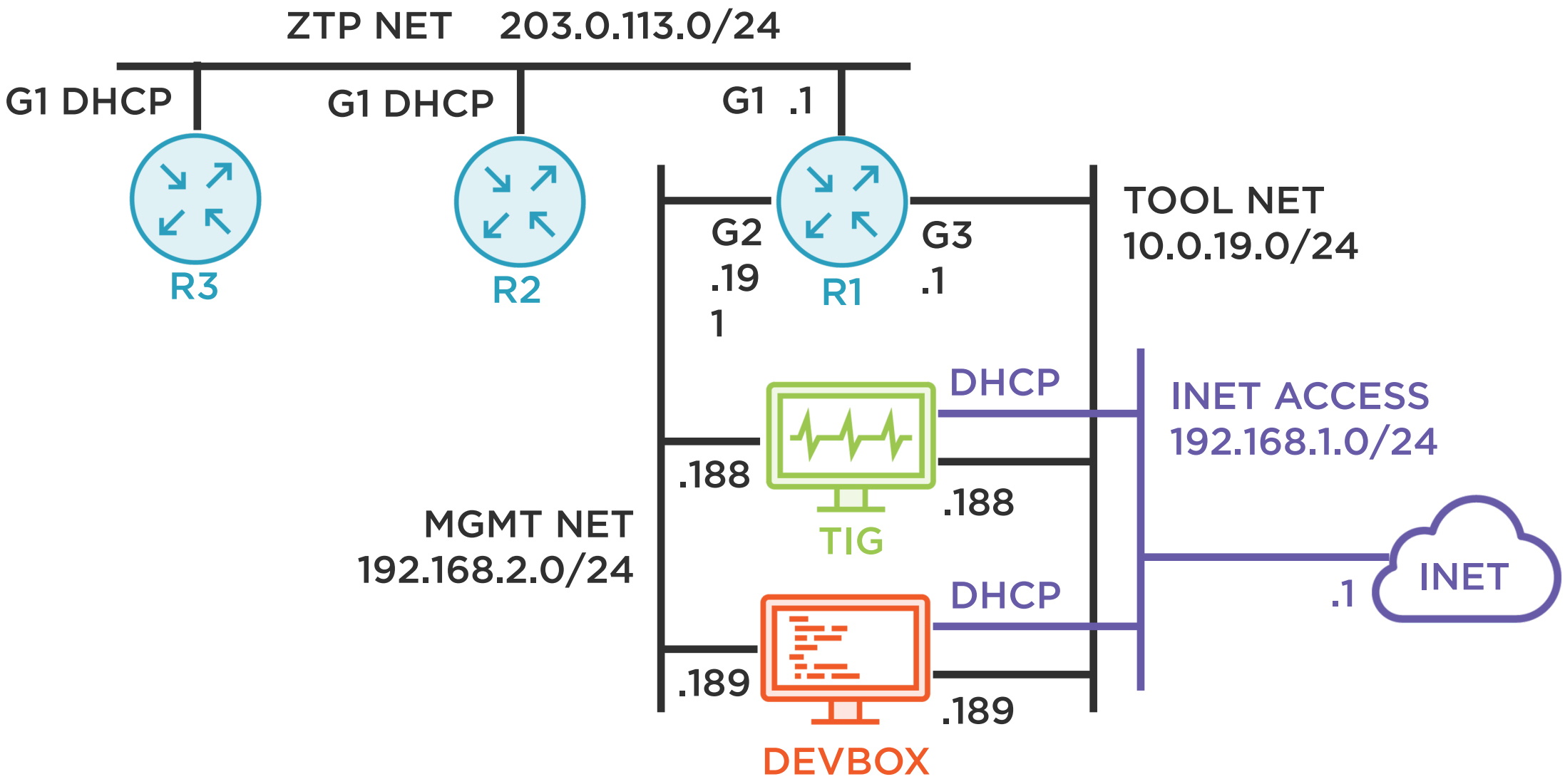
Writing the ZTP Python script

Logical Diagram

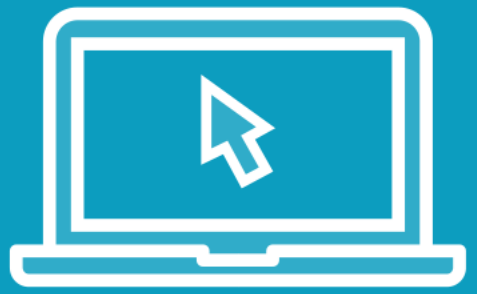


Tool Systems DMVPN Hub DMVPN Spokes

Connectivity Diagram



Demo



Implementing required ZTP services

- DHCP
- DNS
- TFTP

Demo

Test the solution; standing up new sites

Summary

Many solutions

Be patient

Challenge

- If you have hardware, try iPXE
- If not, redo ZTP with Linux-based infrastructure services