Automation

A Simple Idea, with Complex Concepts

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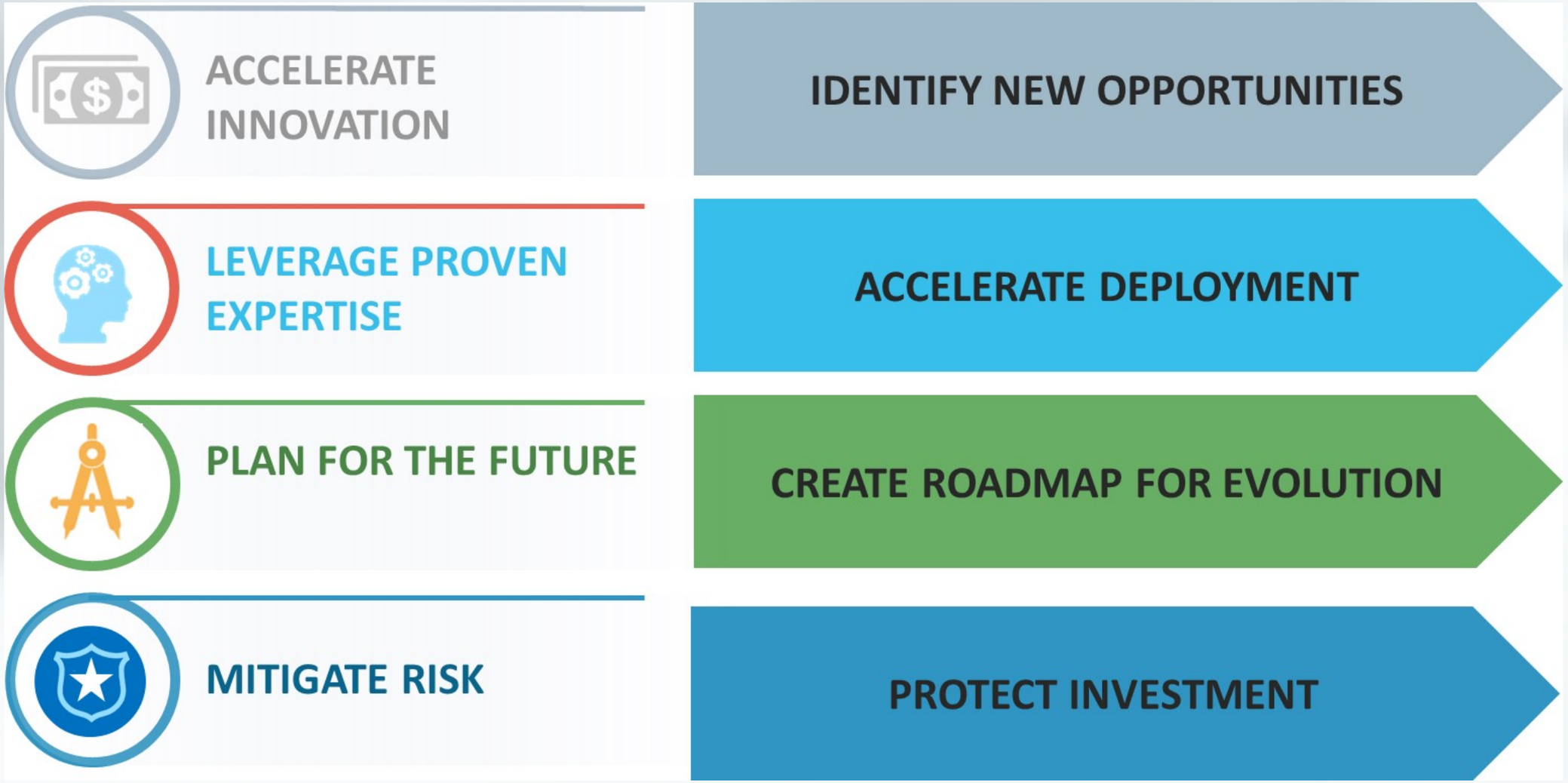
Consider Today Within The Context Of…



Services Across Your Network Lifecycle

Enabling you to drive more value from the network

AGENDA

- Automation
  - What is it?
  - Why is it important?
- Solutions
  - Types of automation
  - Building blocks: Juniper & Open Source
- Examples
  - Zero Touch Provisioning (ZTP)

AGENDA (Continued)

- Tools
  - Puppet
  - Chef
  - Ansible
  - Netconf
  - SLAX & Juise
- Code Libraries
- Case Studies
- Resources
- Hands-on Exercises

Defining Automation

Webster defines Automation as:

The operation of an apparatus, process, or system by mechanical or electronic devices that take the place of human labor.

- **We define Automation as:**

The use of Standard's based tools (APIs, Scripting, Provisioning Tools, etc.) to perform tasks to meet customer requirements with little to no human interaction required.

Types of Automation:

What are you going to automate?

- Deployment Automation
- Migration Automation
- Operations Automation
- Configuration Generation Automation
- Network Compliance Auditing Automation
- Service Provisioning Automation
- Etc…

Why Automate

Automation: Why

Business value

Business Continuity

- Simplified operations
- Increased operations control
- Standardization
- Pro-active remediation
- Reduced remediation time
- Hardened certification

Reduce Cost

- OPEX savings:
  - Improved efficiency
  - Effective resource utilization
  - Reduced fees

Accelerate Business

- Network Build
- Certification time
- Service creation
- Service elasticity
- ROI

Automation Opportunities continue throughout the Network Lifecycle

PLAN: Design & Certify	BUILD: Implement & Migrate	OPERATE: Audit & Testing
• Design Validation • Product / code • Feature • Workflow	• Zero Touch Provisioning • Configuration Generation • Network Stand-up • Rapid Deployment Migration	• Validation • Configuration Compliance • Run State Compliance • Product Compliance

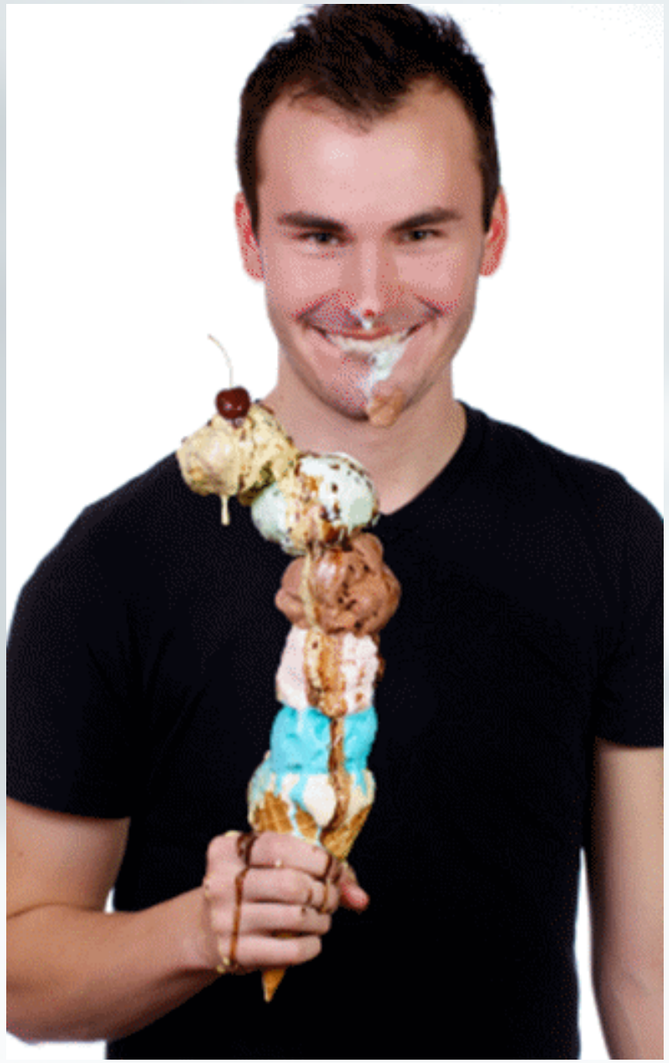
OPERATE: Product Lifecycle	OPERATE: Service Provisioning	OPERATE: Troubleshoot
• Software Upgrades • Updates Based on Events • Inventory • Alerts & Remediation	• Service Creation • Scale Up/Down • On/Off Box Coordination • Change Impact	• Fault Finding • Remediation • Escalation

Comments on Automation

- Benefit of Automation
  - Reduces Human Error
- Risk of Automation
  - Enables Human Error “At Scale”
- We Have Been Using Automation for Years
  - Pakistan Hijacks YouTube (2008)

How to Build Automation Solutions

Automation is Like Ice Cream



- Everyone want it
- Everyone wants something different
- No-one wants to make it
- No-one wants to clean up the mess

Automation: How do you want it to be?

The ice-cream analogy

Automation capabilities

Programing Expertise

BUILDING BLOCKS

The Grocery Store

SCRIPT IT

DIY with Kitchen-Aid

PRODUCT

Banana Split at Baskin Robins

Automation: How

Juniper building blocks

Network Director
Security Director
Service Now
Service Insight
Configlet

Contrail

On-box

Ruby-EZ
PY-EZ
Snapshot

ZTP
JEAP

Automation: How

Open source building blocks

Programmable Interfaces for Junos

- INNOVATION LEADERSHIP build on One Junos
  - Junos XML API – workflow automation
    - Junos Script
    - XSLT
    - SLAX
    - Netconf
    - Http
  - Junos SDK API – new features and functionality
    - Control Plane API
    - Data Plane API
    - Remote API
  - Junos Space API – intelligent and programmable NMS
  - Contrail API – SDN and NFV orchestration

Deployment Automation

Large Restaurant Chain

Customers Problem

- Traditional deployment of Juniper devices across 1000+ concept restaurants is time-consuming and error-prone

Solution

- Provide a one-touch provisioning solution – a custom web-based solution that is simple, reliable, flexible and scalable to rapidly configure and deploy Juniper devices

Project Challenges

Customers Challenges

- Aggressive schedule
- Integration into existing MS SQL database
- Incorrect data in the database and poorly built templates
- Device bootstrap process

Internal Challenges

- Learning curve – first of its kind
- Limited Initial information from customer
- Large number of moving parts

Solution at a Glance

- Simple
  - Custom Web-based Interface and management
  - Configurations based on minimal input about each site
  - Interface does not require high technical knowledge
- Reliable
  - Leverages pre-defined configuration templates
  - Standardized configuration applied based on selected criteria
  - Minimizes/eliminates configuration errors
- Flexible/rapid deployment
  - Multiple staging environments
  - Accelerated and hassle-free provisioning of multiple devices for multiple stores in parallel

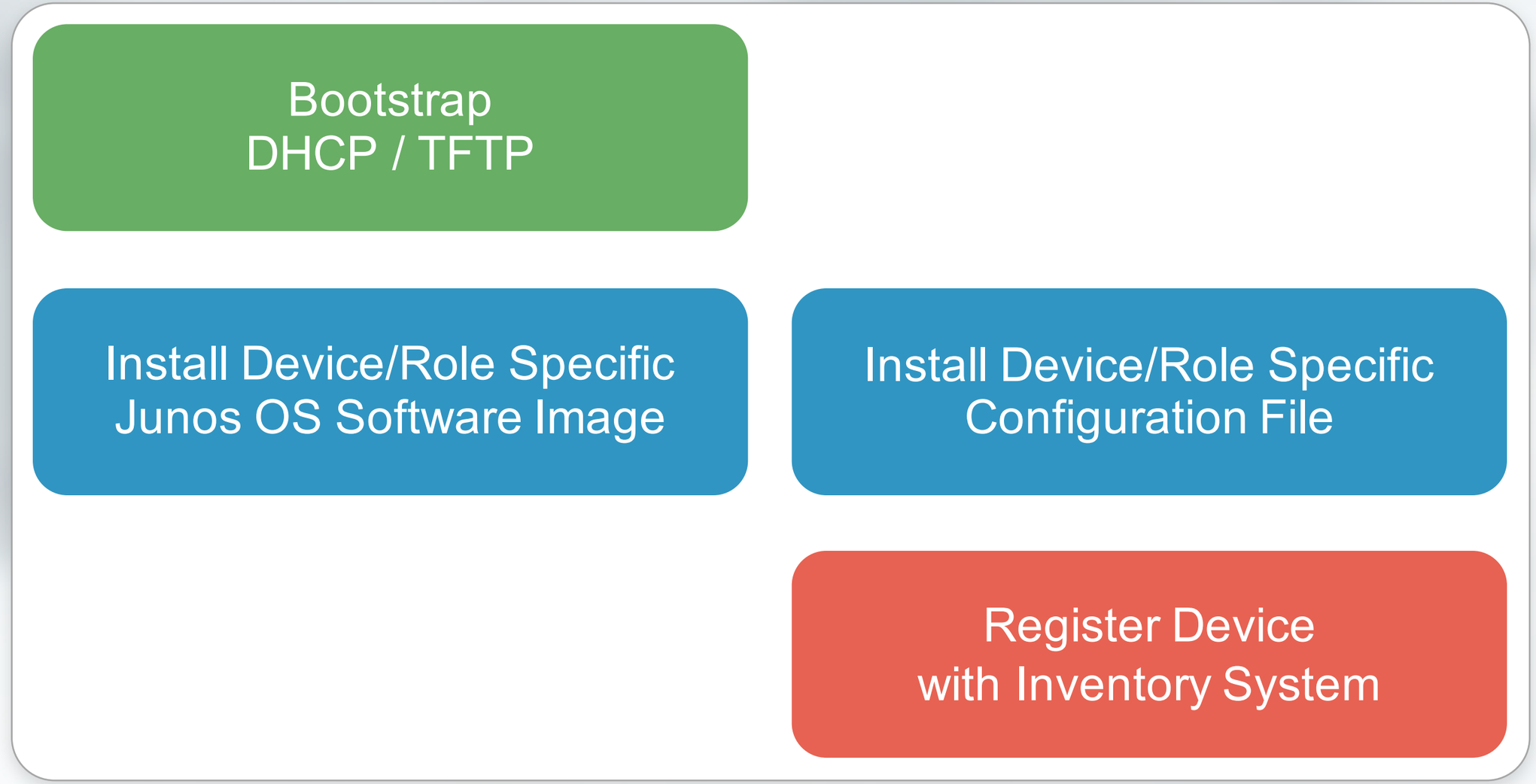
Deploy New Equipment

Sounds simple enough?

Install Device/Role Specific Junos OS Software Image

Install Device/Role Specific Configuration File

But There's Always More Workflow…



Make a Rapid Deployment Staging Center

So non-techie can stage gear on a bench

Now do it for a “Store”

Multiple devices, different roles

"Front-of-House"
Switch
EX2200

Bootstrap
DHCP / TFTP

Install Device/Role Specific
Junos OS Software Image

Install Device/Role Specific
Configuration File

Register Device
with Inventory System

"Back-of-House"
Switch
EX2200

Bootstrap
DHCP / TFTP

Install Device/Role Specific
Junos OS Software Image

Install Device/Role Specific
Configuration File

Register Device
with Inventory System

CorpVPN
Firewall Router
SRX240

Bootstrap
DHCP / TFTP

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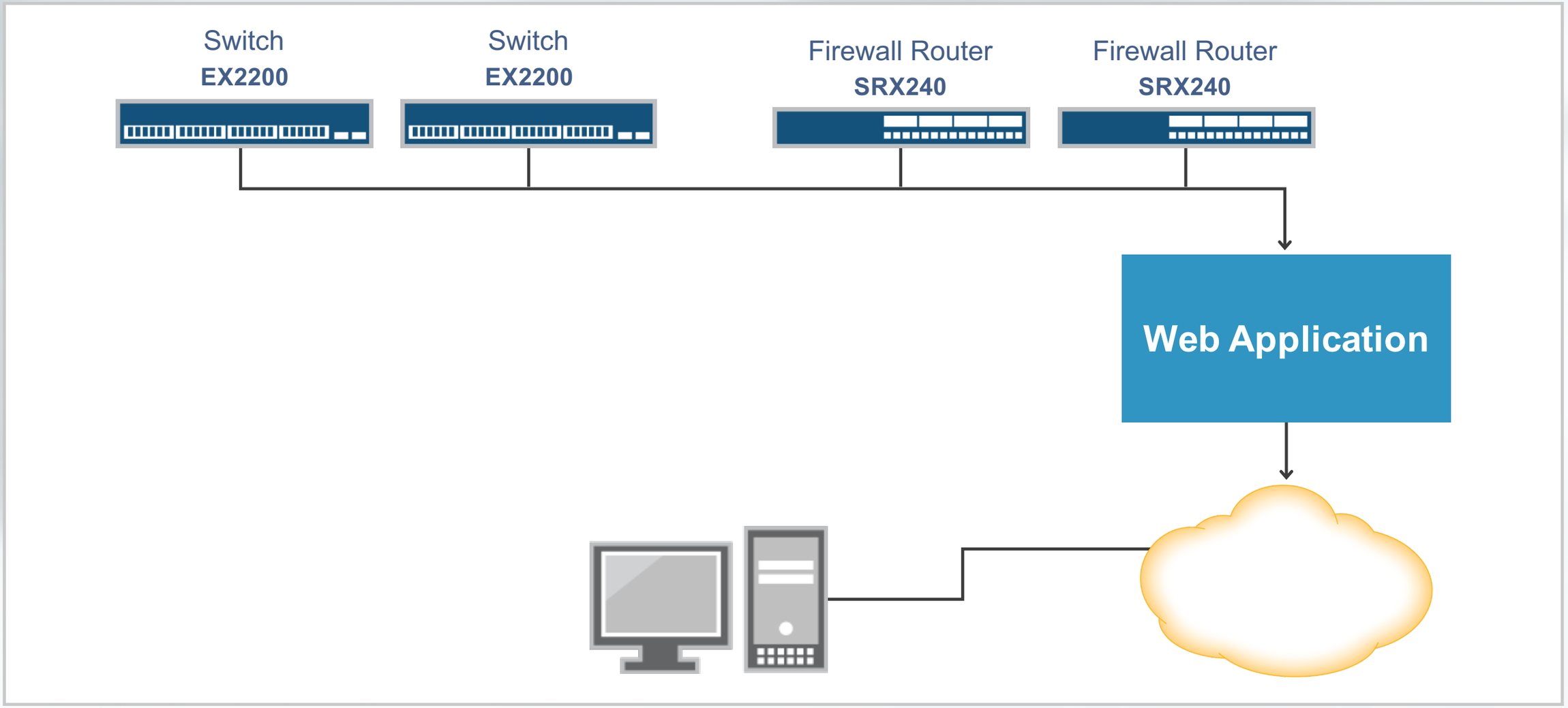
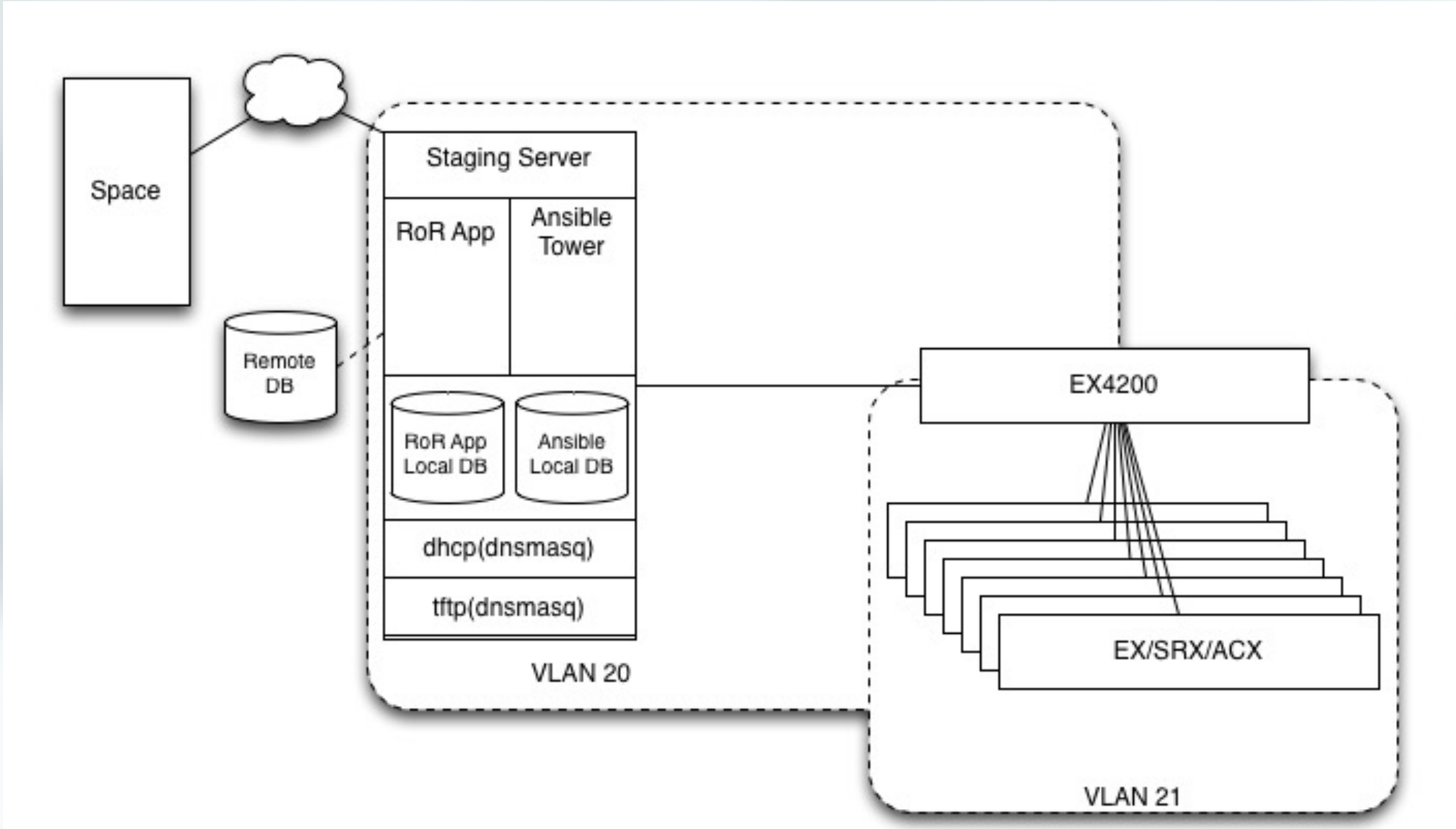
Component Overview



Staging Center Workflow

Overview


Space
Remote DB
Staging Server
RoR App
Ansible Tower
RoR App Local DB
Ansible Local DB
dhcp(dnsmasq)
tftp(dnsmasq)
VLAN 20
EX4200
EX/SRX/ACX
VLAN 21

Staging Flow

- Cable Device
- Bootstrap
- Provision
- Register
- Profit!

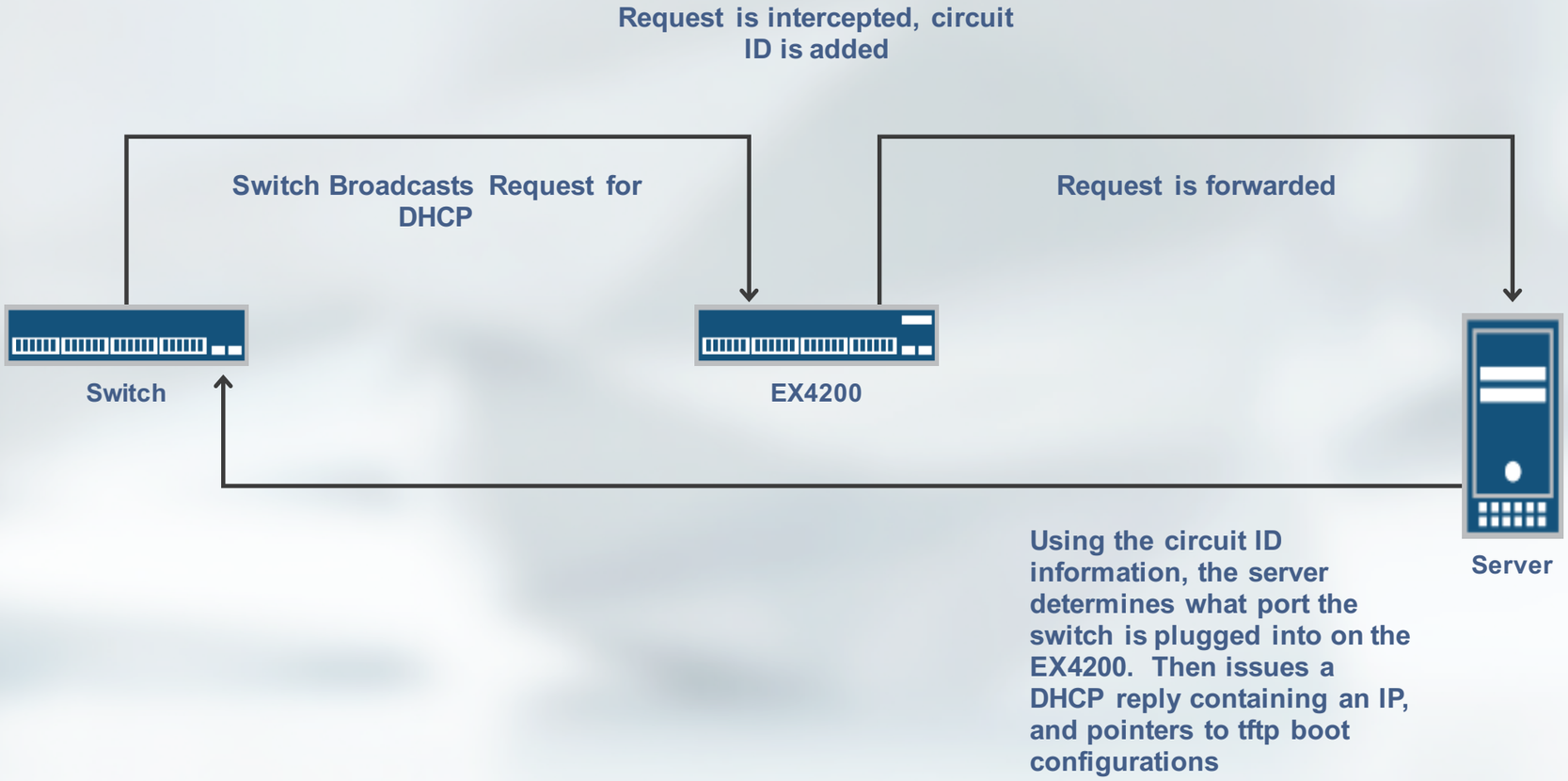
Cable Device

- Each port of the EX4200 corresponds to a port in a “bench” in the deployment dashboard.
- In this case it is Role specific…. Ge-0/0/0 is always an ex2200, ge-0/0/3 is always an srx100…. Etc
- Device is cabled and plugged in… when device comes up, starts autoconf/ztp/bootstrap automatically

Bootstrap

- Device Broadcasts for IP via DHCP….
- Broadcast contained to VLAN 21… EX4200 is setup as a DHCP relay. EX4200 applies circuit-id (“port number:vlan name) to DHCP request… and forwards to Staging Server
- Server determines what IP to issue based on circuit id….(same port always reachable on same ip)
- Server sends back DHCP reply with IP and Pointers to a TFTP server (self), and Conf filename.

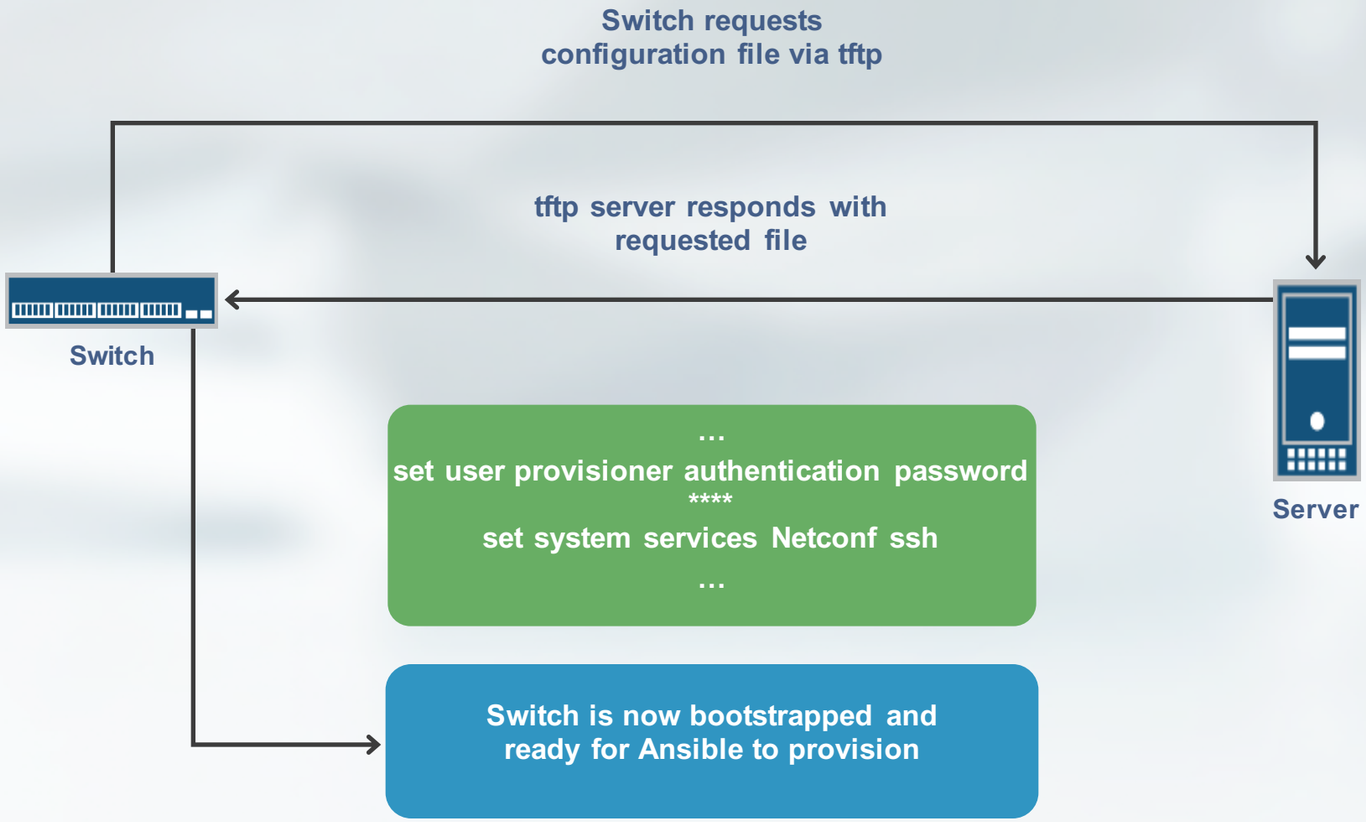
Bootstrap (Cont)



Bootstrap (Cont)

- Device retrieves configuration from TFTP server
- Configuration sets up user credentials, enables Netconf, and LLDP, and sets up IP as static (prevent interface flapping).
- Device is now ready to be provisioned.

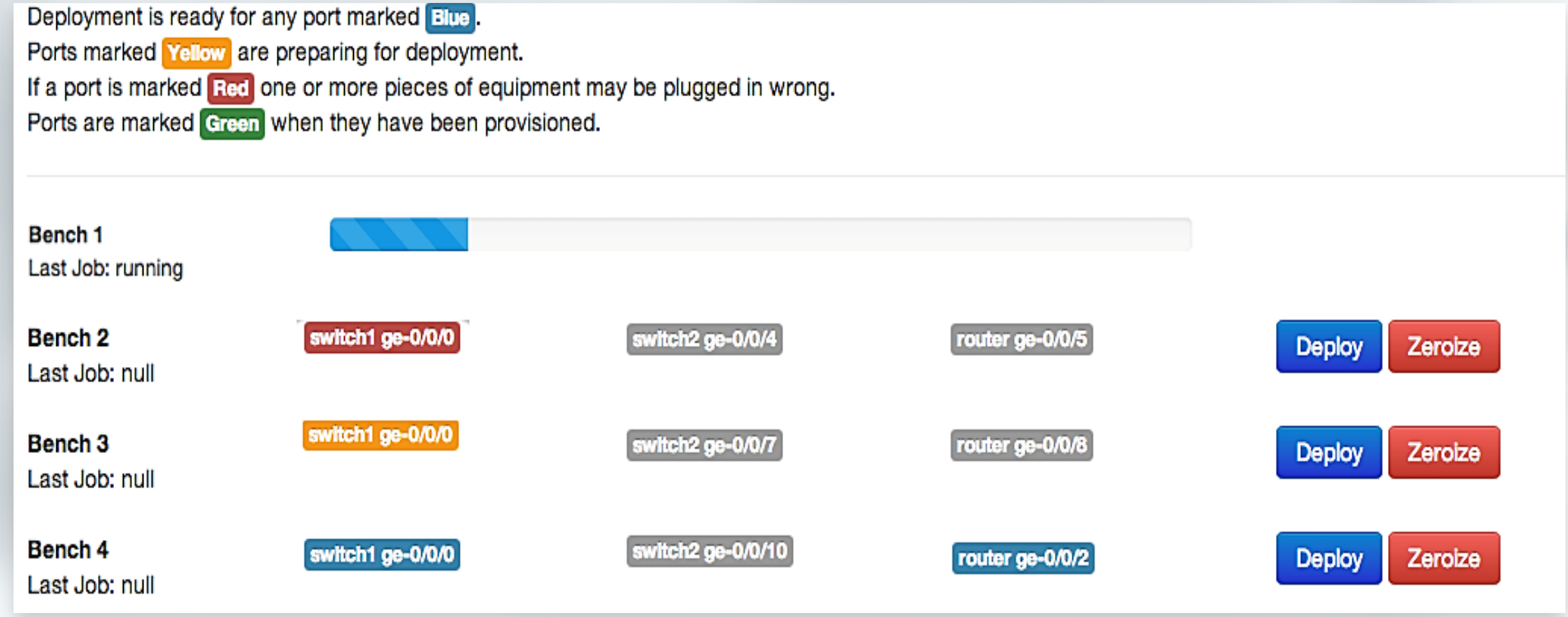
Bootstrap (Cont)



Provision

- Device is now sitting and waiting for provisioning.
- User Can view device status, job status, and issue command to start provisioning from RoR app dashboard.
- Dashboard is updated about device status via Netconf requests to the EX4200 about its LLDP neighbors.

Deployment Dashboard



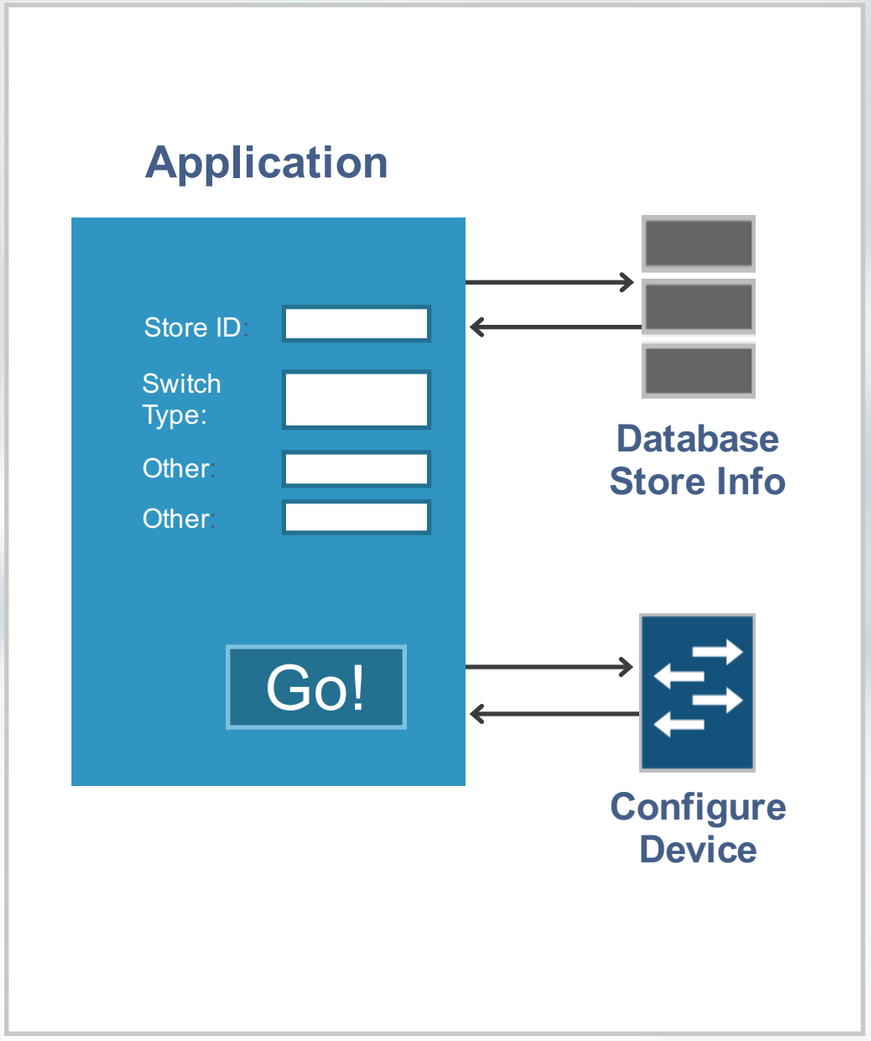
Provision

- User now selects to start provisioning against specified devices… user provides Restaurant Type and code and submits form.
- RoR app records the deployment in internal database, accesses remote database retreiving needed variables for configuration templates.
- RoR app then issues request to Ansible Tower to setup the list of devices to run against, and variables gathered previously.

Provision (cont)

- Ansible Tower Takes Over
- Ansible Tower queues job, and starts running defined “playbook”. Each Task in Playbook is ran in parallel.
- Playbook first checks for connection
- Then creates log directory, and generates configuration file based on variables and templates.
- Then Downgrades/Upgrades device if needed.
- Then applies generated configuration

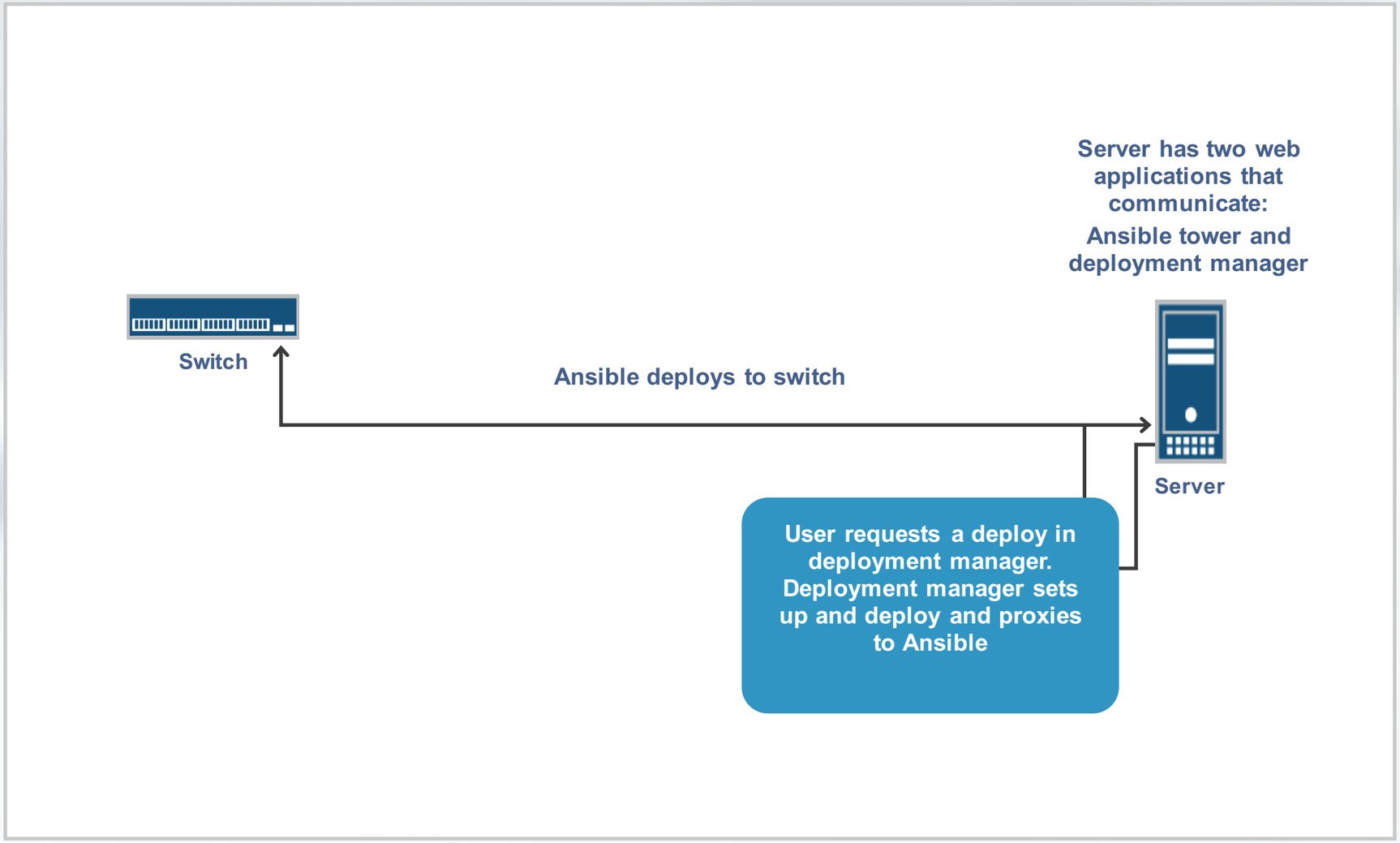
Deployment Workflow



1. Input Information into Application
2. Application Selects Configuration Template (World-Class / Type B vs. Type C)
3. Configuration Created with correct
   1. Model
   2. Host Name
   3. Mac Address
   4. IP Address
   5. Junos O/S Version

   Junos O/S Version updated (if needed)
4. Configuration Applied to Device
5. Device Rebooted to store Configuration
6. Device Ready for Shipping
7.

One-Touch Provisioning

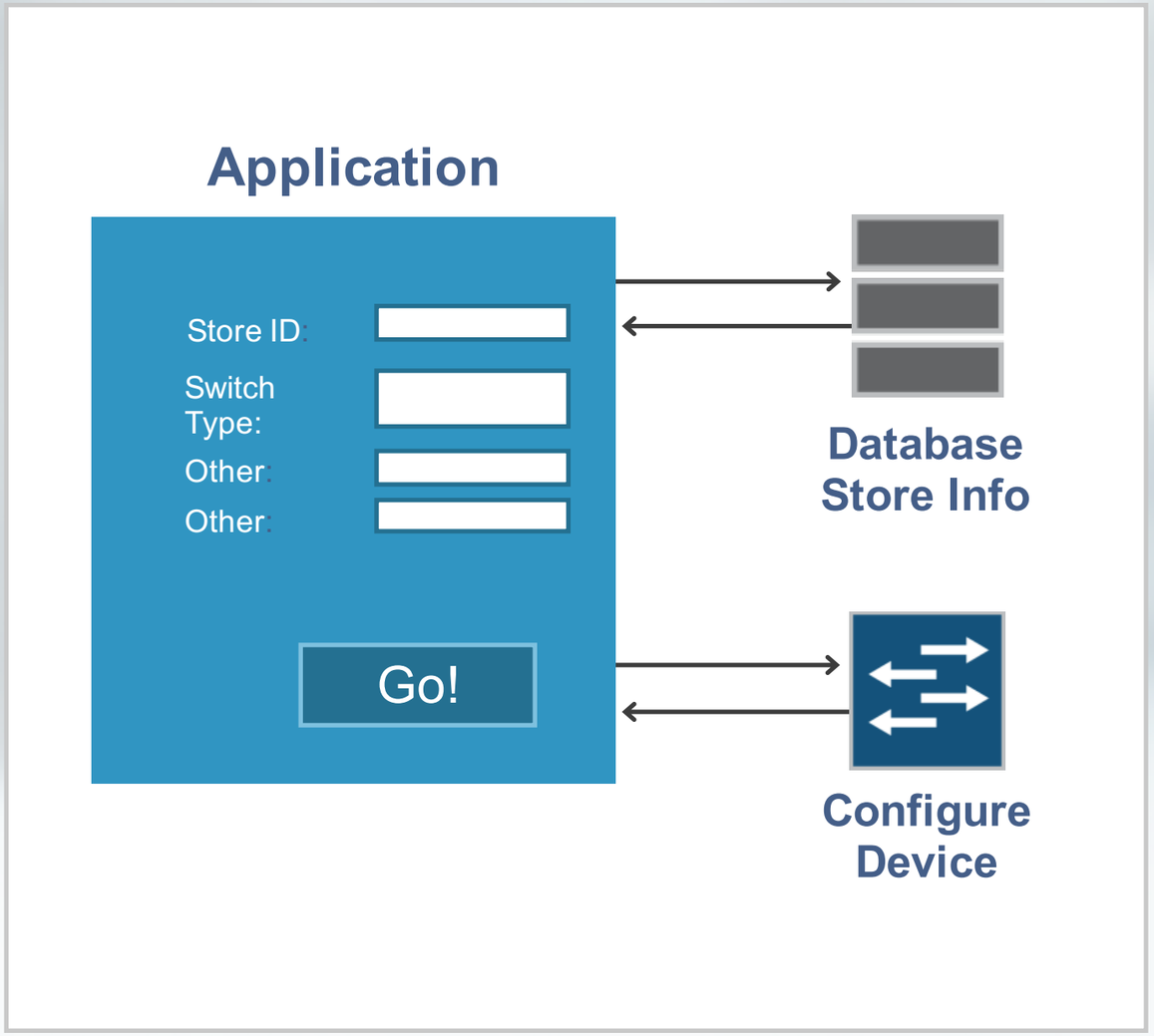


Provision/Register

- Finally, Playbook registers device in Junos Space

- Device is Ready to Be Shipped/Installed

Deployment Workflow



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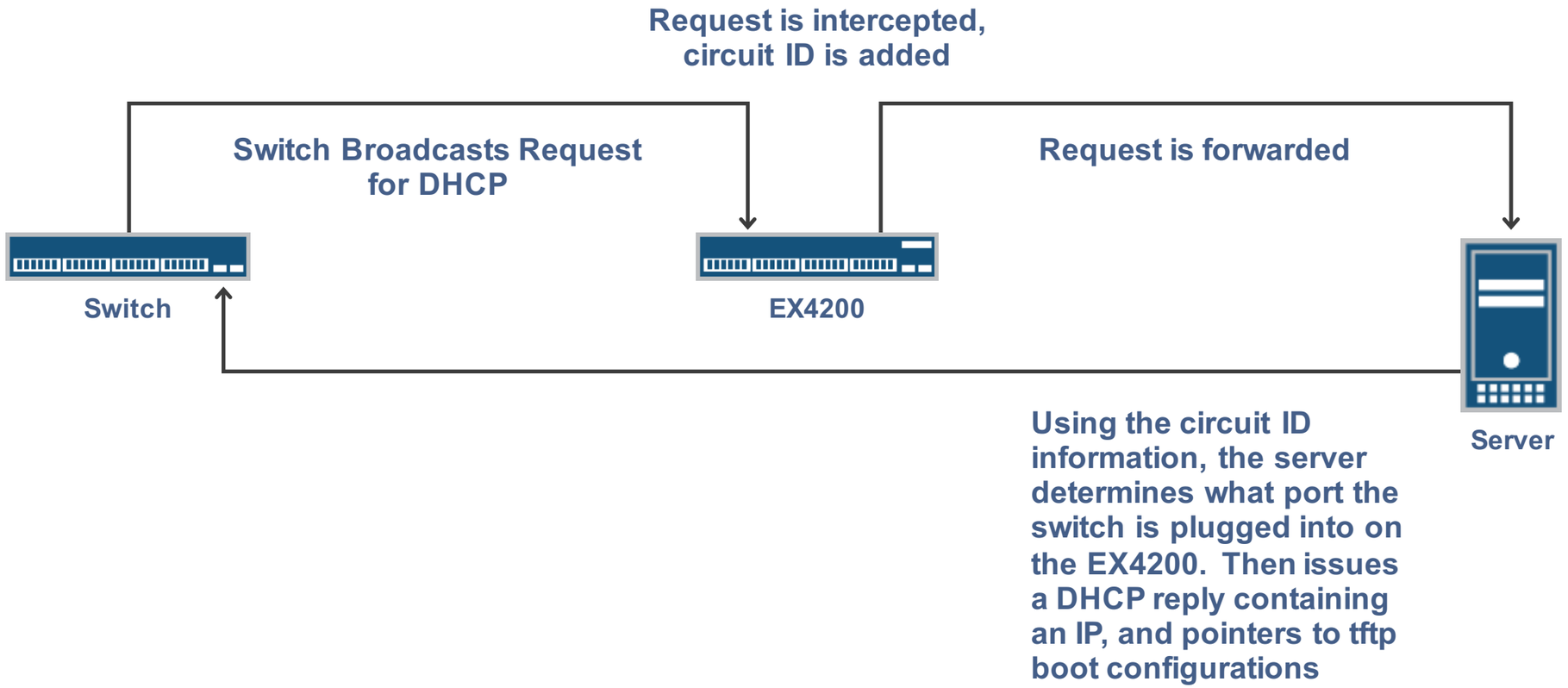
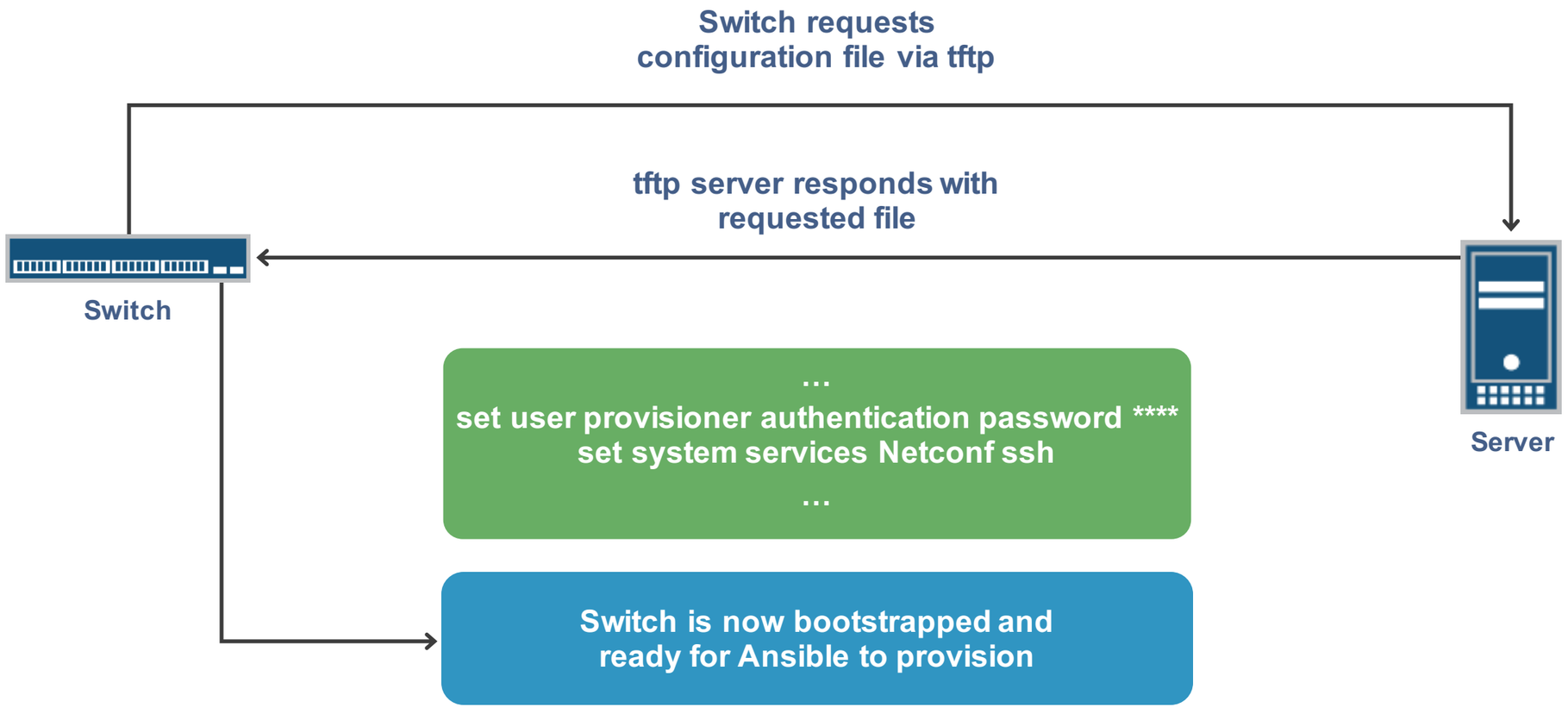
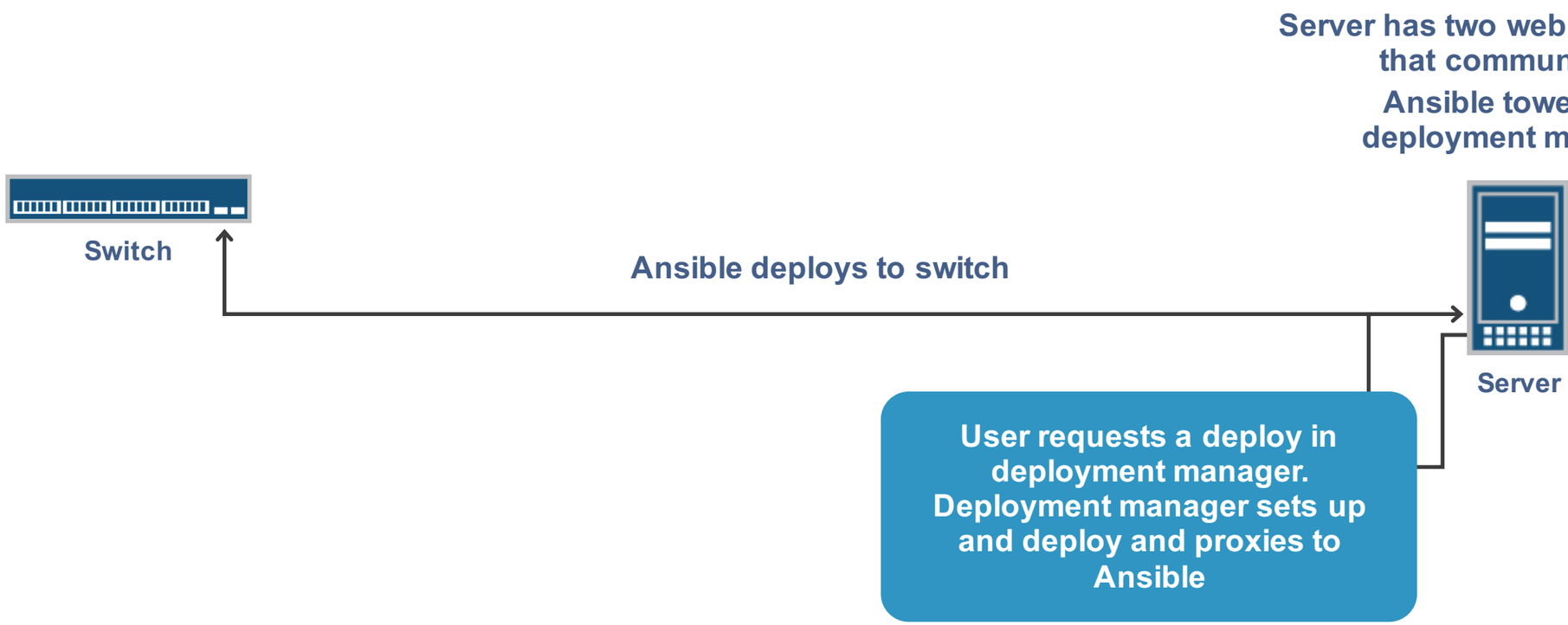
Bootstrap Step – 1



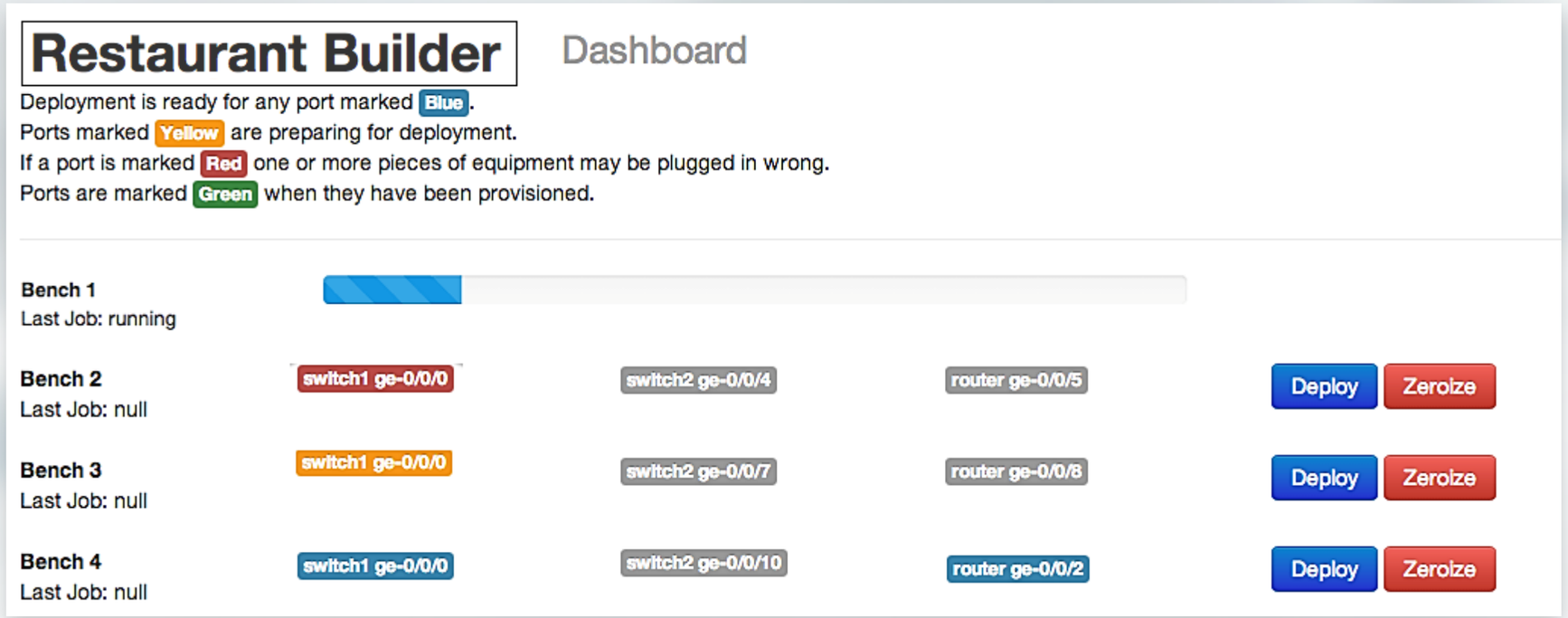
Bootstrap Step – 2



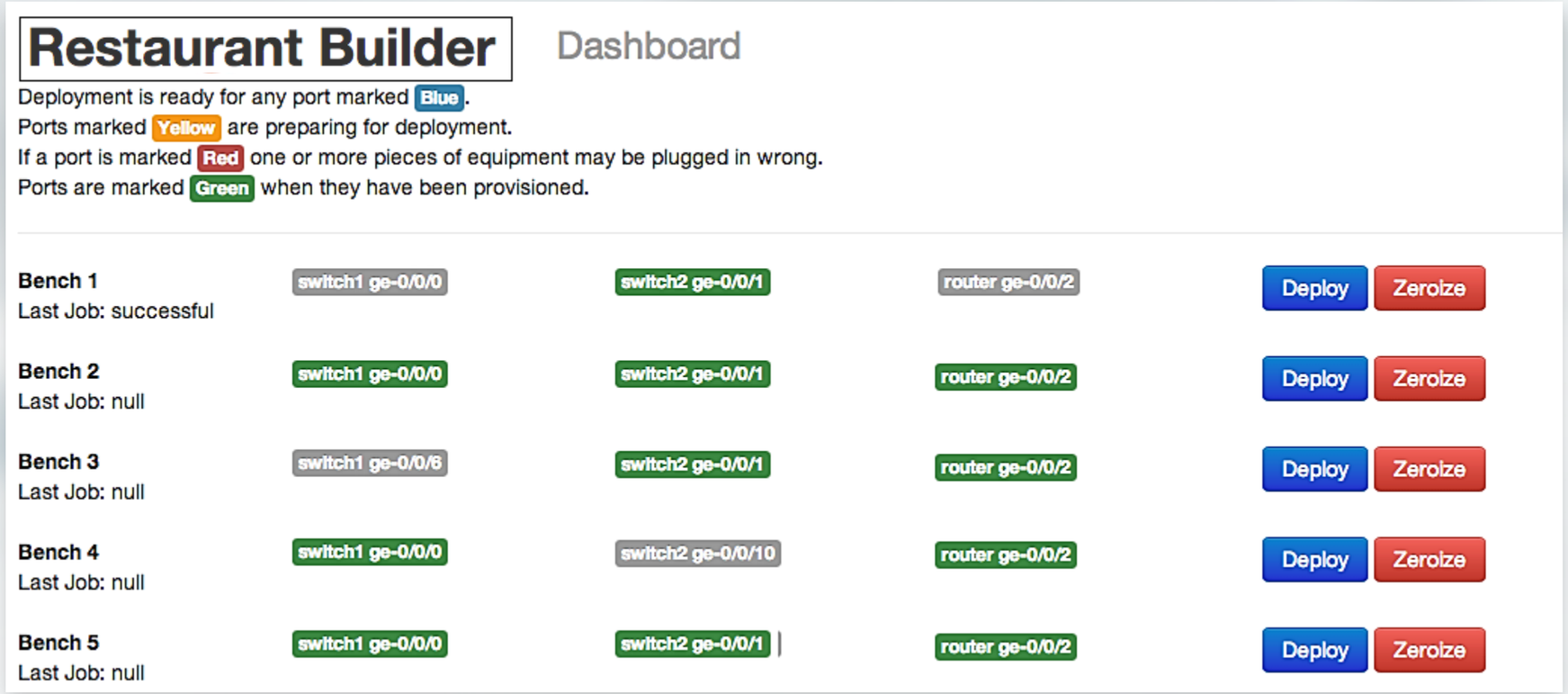
One-Touch Provisioning



Sample Dashboard – Deployment In Progress



Sample Dashboard – Deployment Successful



Project Conclusion

- Provided the Restaurant Builder Tool to automate and parallelize provisioning of Juniper devices
- Delivery
  - Tool was delivered to in July 2014
  - Provided on-site and remote deployment support
  - Provided training and post-delivery support
- Future
  - Tool can be easily generalized for other customers for rapid deployment of new devices
  - Tool can be optimized/cleaned-up further

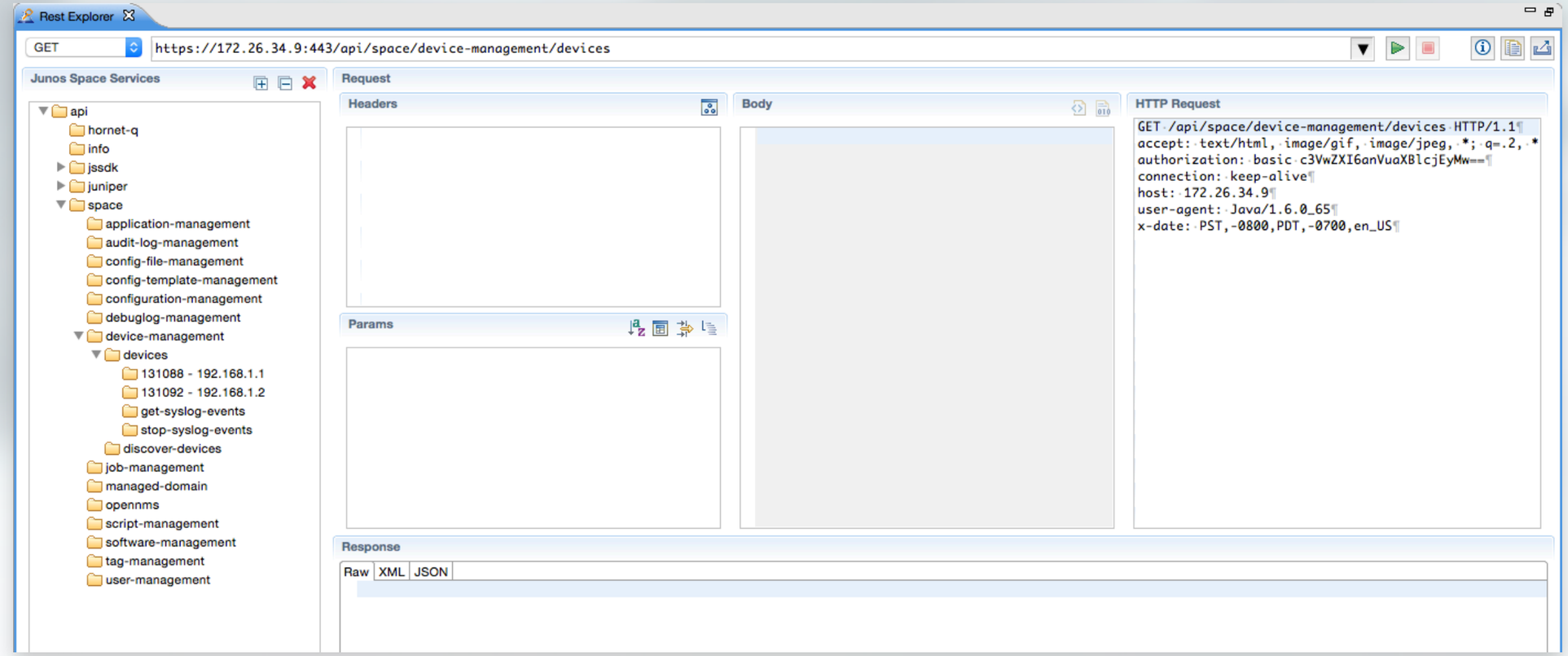
Junos Space

Leverage Junos Space Externally

- Junos Space and its various services provide a large amount of restful APIs
- The APIs can abstract connection and authentication details
- This enables the architect to leverage Junos Space in external scripts and programs
- Generally, if it can be done via Junos Space directly, it can be done via the APIs

Junos Space API Explorer

- Junos Space SDK plugin for eclipse contains “Rest explorer”
- Can explore the APIs, figure out how to achieve the result, and what parameters are accepted



Junos Space API Code Generation

- Junos Space SDK plugin for eclipse has code generation for popular languages
- Implement and GO!
- Found in Rest Explorer