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The bridge to possible

ISE Deployments in the Cloud

Automate ISE Deployments in AWS

Jesse Dubois
Patrick Lloyd, Senior Security Solutions Architect, CX Customer Delivery

LTRSEC-2000

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Cisco Webex App

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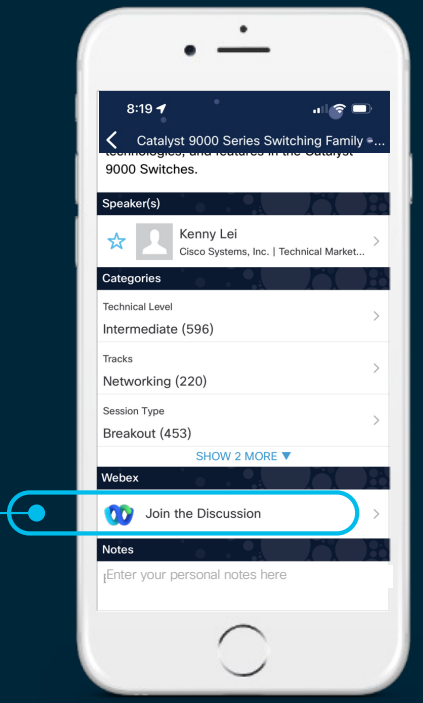
4. Enter messages/questions in the Webex space

Webex spaces will be moderated by the speaker until June 17, 2022.



https://ciscolive.ciscoevents.com/ciscolivebot/#LTRSEC-2000

Agenda

- Introduction
- Overview: ISE in AWS
- Overview: Ansible
- Deployment Caveats and Topology
- Integrations
- Conclusion

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About Patrick Lloyd

- name: Patrick Lloyd

  Details.patricklloyd:

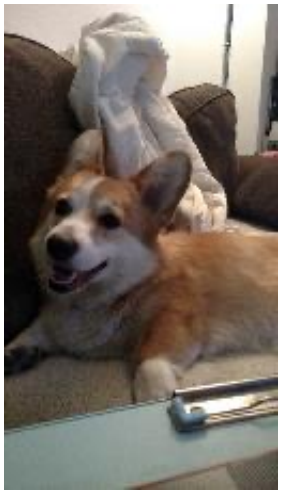
  Location: Raleigh, NC

  Interests: Technology, Brewing

  Pets: Luna the Corgi

  Travel: All over the world

  Fun Fact: New home owner



About Jesse Dubois

- name: Jesse Dubois

  Details.jessedubois:

  Location: Durham, North Carolina

  Interests: Brewing, Golf, Cooking

  Pets: Dunkel, Apollo, Comet, Calypso

  Travel: Lots

  Fun Fact: Squirrels in your attic are not fun.









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ISE 3.1 Release Highlights

SAML SSO for admin login

ISE deployment on AWS

APIs for system and policy management

Random & Changing MAC address

Zero-touch provisioning

Streamlined upgrade experience

Enhanced audit logs

Endpoint Remediation Scripts

Linux posture

Posture bi-directional trigger

Enhanced posture discovery

Authentication Dashboard Alarms

Active Directory DC failover enhancement

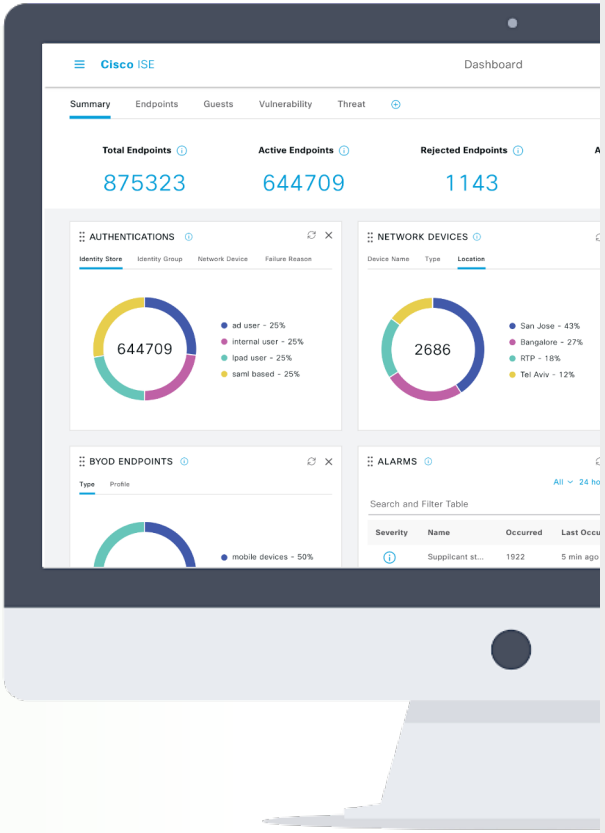
Context visibility import/export

Prevent AD account lockout

RADIUS CoA Proxy

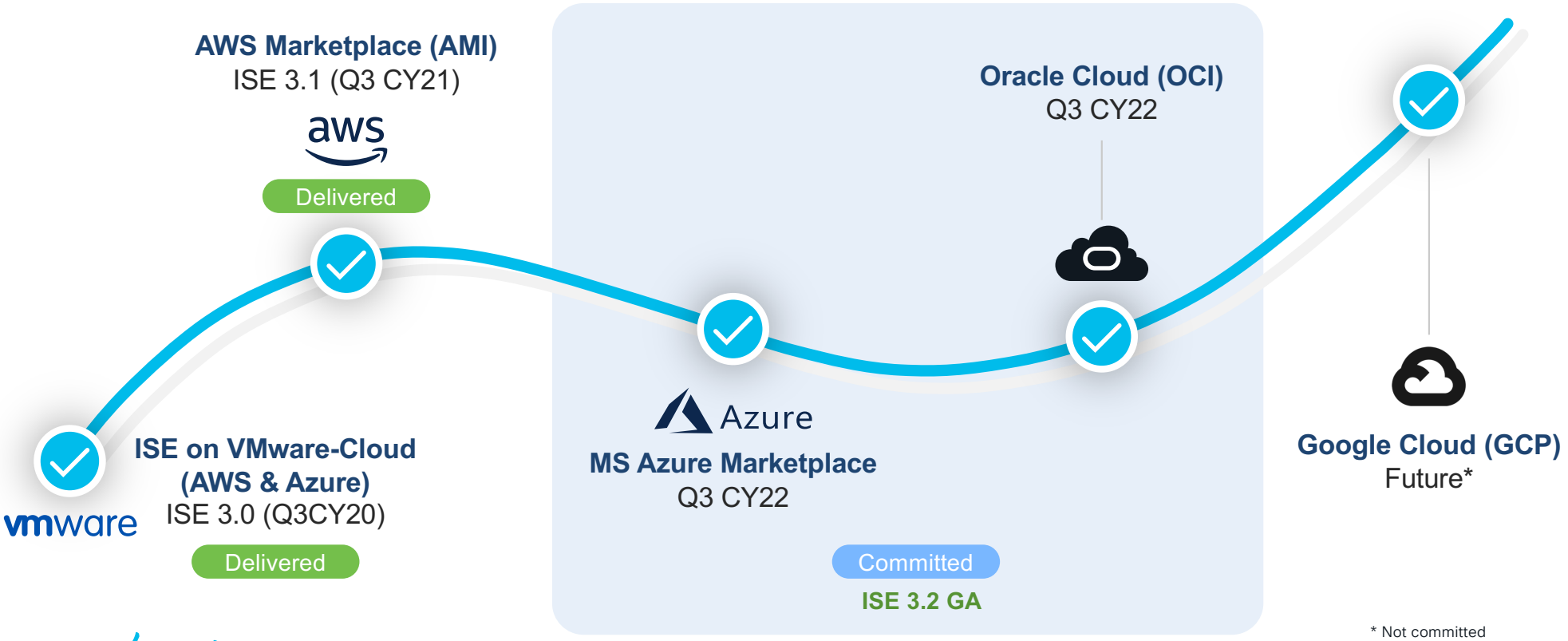
Seamless EA integration

Logical profile dashlet



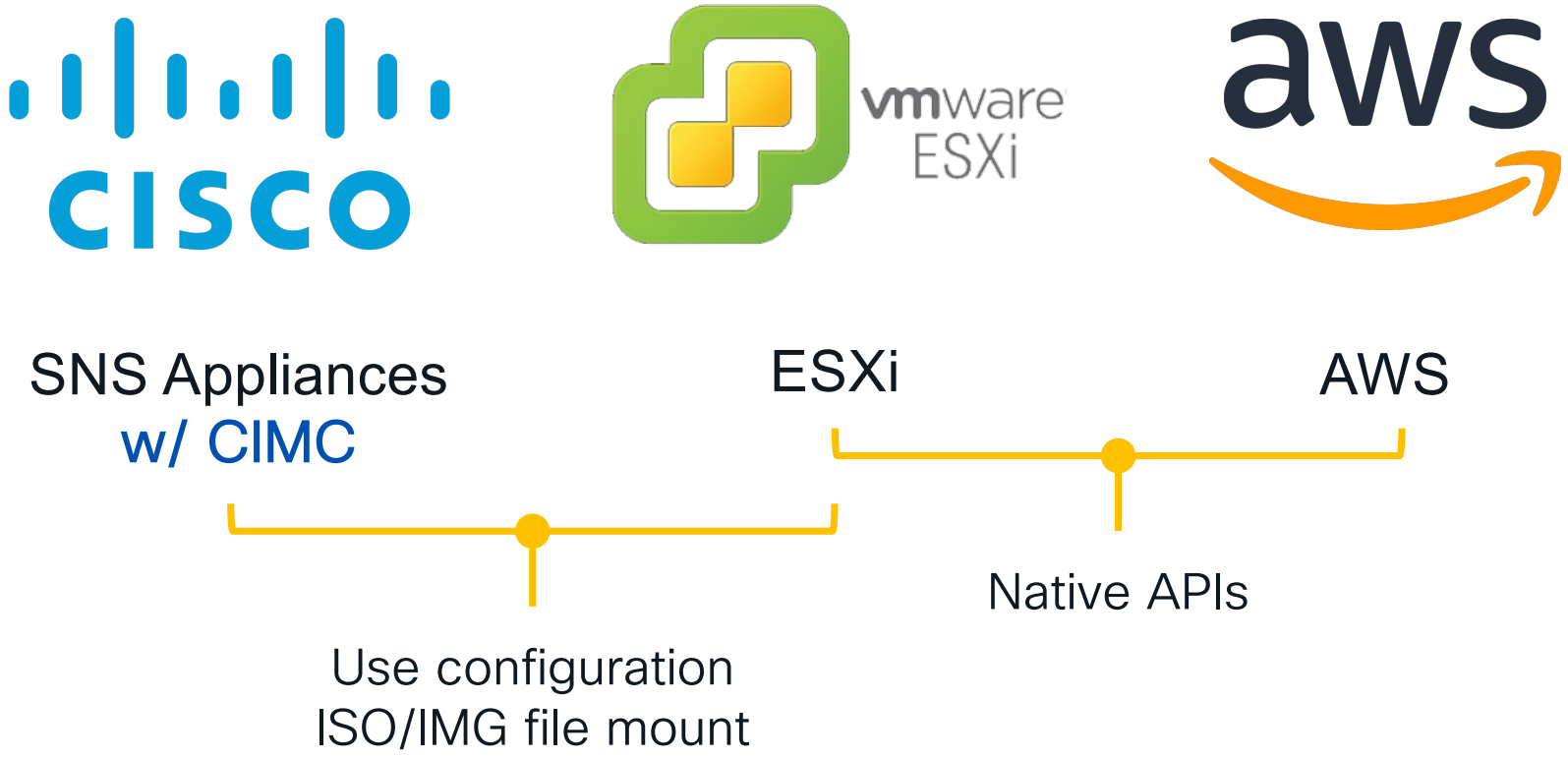
cs.co/ise-webinars

ISE journey on public cloud



* Not committed

Zero Touch Provisioning



CIMC – Cisco Integrated Management Controller

ISE Architecture

Standalone ISE

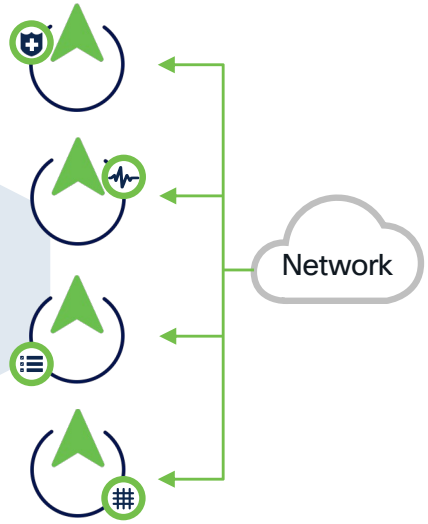
Policy Administration Node (PAN)
- Single plane of glass for ISE admin
- Replication hub for all config changes

Monitoring & Troubleshooting Node (MnT)
- Reporting and logging node
- Syslog collector from ISE Nodes

Policy Services Node (PSN)
- Makes policy decisions
- RADIUS / TACACS+ Servers

pxGrid Controller
- Facilitates sharing of context

Distributed ISE



Single Node (Virtual/Appliance)		Multiple Nodes (Virtual/Appliance)
Up to 20,000 concurrent endpoints	3500	Up to 500,000 concurrent endpoints
Up to 50,000 concurrent endpoints	3600	Up to 2,000,000 concurrent endpoints

ISE 3.1 Supported AWS Platforms

AWS Instance Type	Standalone Sessions	PSN Sessions	PAN/MNT Total Sessions	Cores	Memory	Disk
c5.4xlarge	10,000	40,000	-	16	32 GB	300 GB – 2.4 TB
c5.9xlarge	25,000	100,000	-	36	72 GB	300 GB – 2.4 TB
m5.4xlarge	-	-	500,000	16	64 GB	300 GB – 2.4 TB

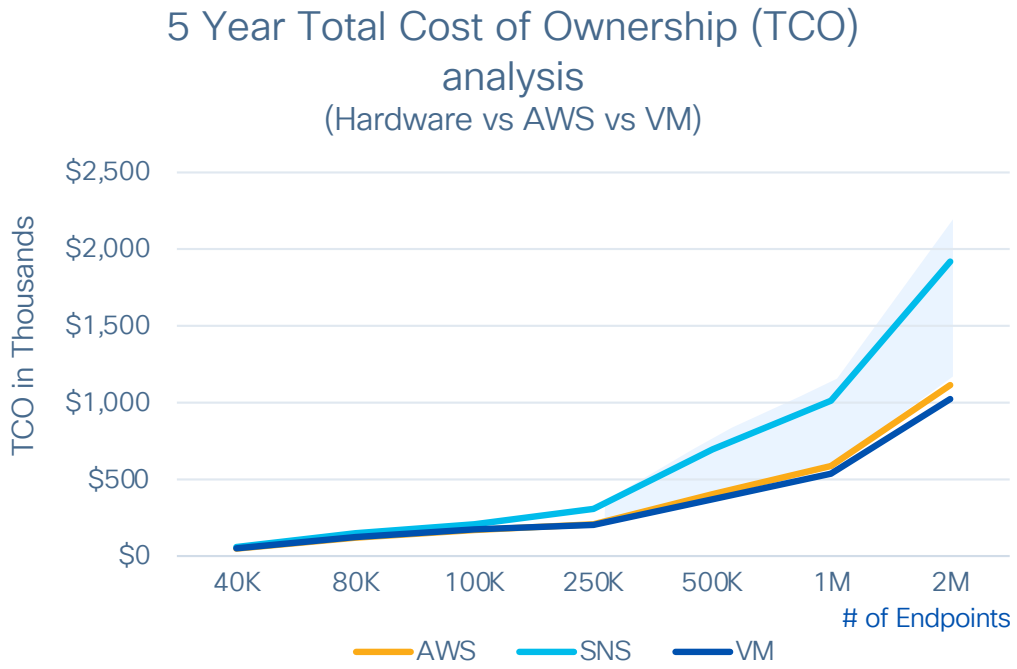
ISE on AWS TCO

Discount Assumptions

- Hardware and VM appliance/solution support with 65% discount.
- AWS costing is calculated for 3 years reserved EC2 and all upfront pay.

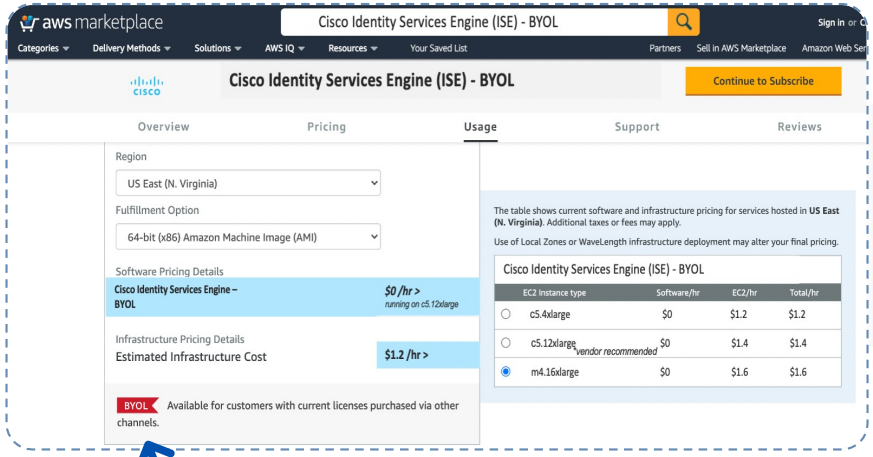
Conclusion

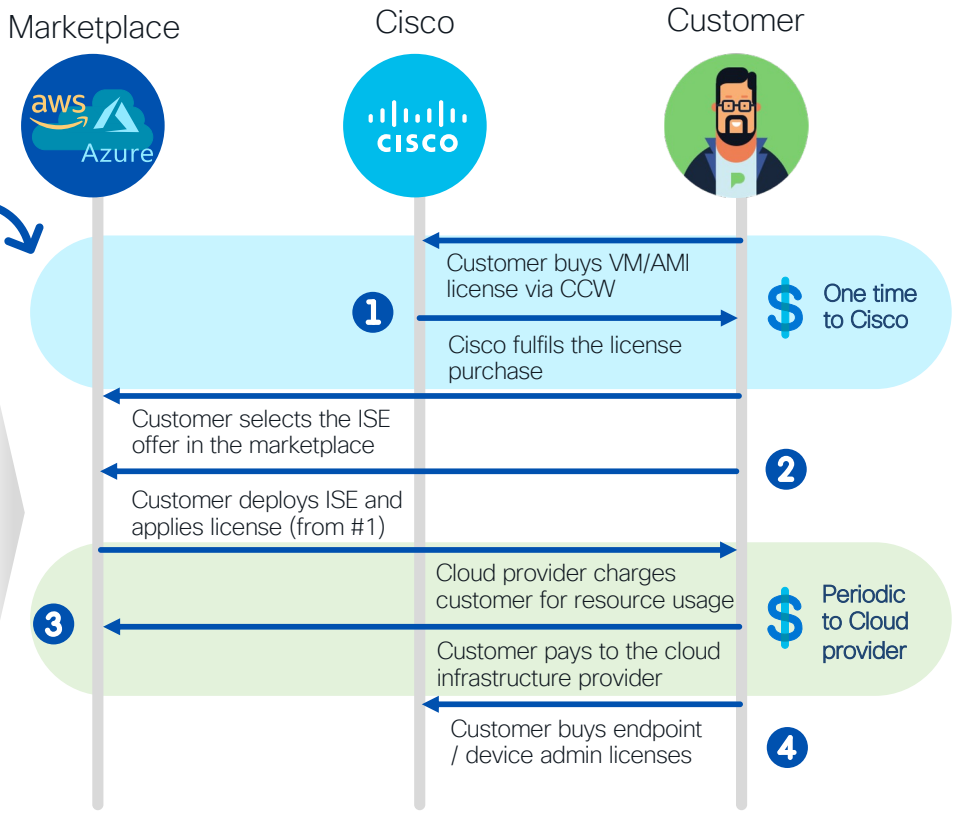
- AWS is significantly cheaper than hardware for S/M/L deployments.
- AWS marginally costlier than VM deployments for larger deployments.



ISE Cloud Instance Buying Experience

Flexibility to move from virtual appliances to AWS/Azure without license transaction.



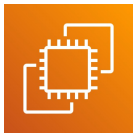


BYOL – Bring Your Own License
Customer will purchase VM license from Cisco and use it in either in VM or Cloud IaaS.

ISE Setup Options

AWS Marketplace

AWS CloudFormation Template



Amazon Elastic Compute Cloud AMI (Amazon Machine Image)

Infrastructure as Code (IoC) tools

Cisco MSX (Managed Services Accelerator)

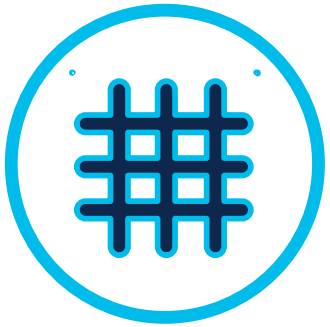
Bring up ISE node one at a time

Bring up multiple ISE nodes at the same time*

* Initial release of ISE + MSX will be single node only

ISE APIs

New in ISE 3.1

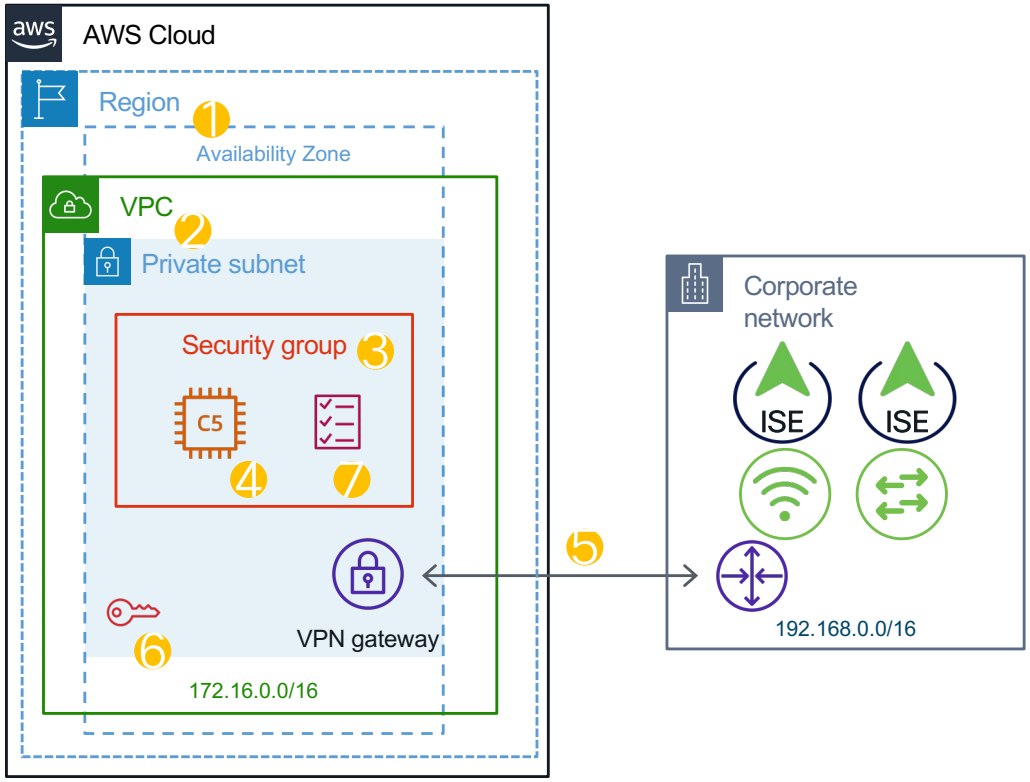


OpenAPIs	ERS	MNT	pxGrid
configuration	configuration	sessions	asynchronous endpoint context

cs.co/ise-api

github.com/cisco-pxgrid/pxgrid-rest-ws

ISE Installation Prerequisites



1. Decide on Region and Availability zones
2. Create VPC & Subnet
3. Create Security Group
4. Decide on Instance Type
5. Setup VPN between AWS and on-prem network
6. Create Key pair for SSH
7. Collect ISE setup information: hostname, domain, DNS, NTP, Timezone, Admin credentials

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{JSON}

```
{
  "object": {
    "hostname": "ise.securitydemo.net",
    "port": 443,
    "auth": {
      "username": "admin",
      "password": "C1sco12345"
    },
    ”verify": true
  }
}
```

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YAML

```
---
object:
  hostname: ise.securitydemo.net
  port: 443
  auth:
    username: admin
    password: C1sco12345
  verify: true

# YAML supports Comments!!!
```

ANSIBLE

Simple	Flexible	Agentless
• human-readable • declarative configs • ordered tasks • no coding required • start small and scale	• config management • workstations • servers / containers • applications • networks • security services • workflows	• SSH (Linux, macOS) • REST (ISE) • WinRM (Windows) • others as needed • efficient • secure

Terminology

galaxy.ansible.com

Collections

- cisco.ios.*
- ...
- cisco.ise.*

Modules

- endpoint
- network_device
- ...

Roles

Playbooks

YAML

1. Task
2. Task
3. Task
4. Task

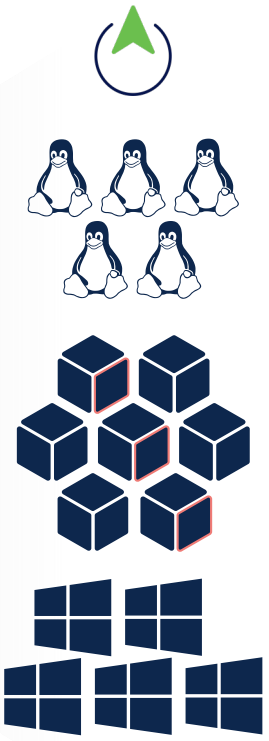
Control Node

Inventory

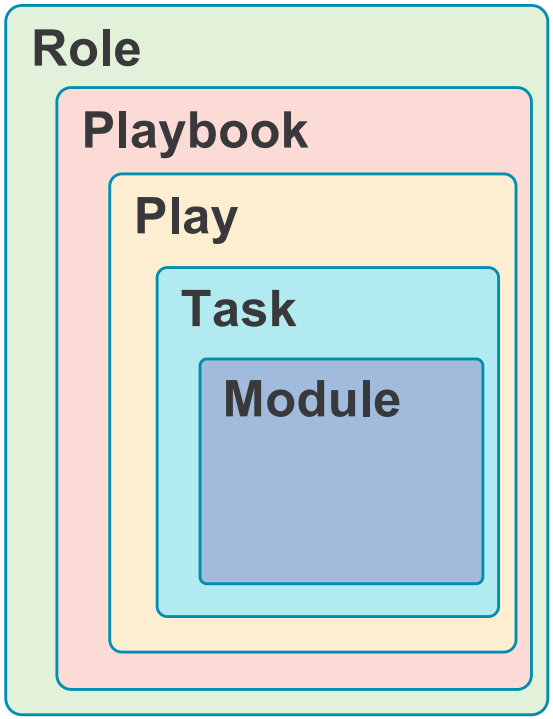
nodes INI

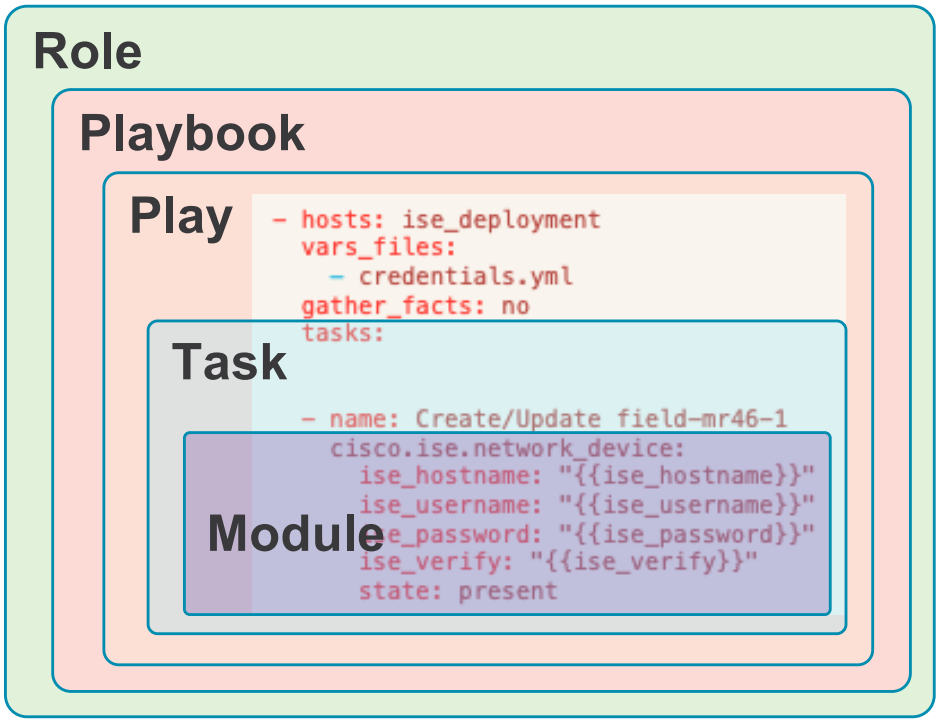
hosts

Managed Nodes



Ansible Taxonomy





```
pip3 install --upgrade pip
pip3 install pipenv
pipenv install --python 3.9
pipenv install ciscoisesdk
pipenv install ansible
pipenv install jmespath
pipenv shell

ansible-galaxy collection install cisco.ise
ansible-galaxy collection install cisco.ise --upgrade

ansible-galaxy collection install community.general
```

Ansible Collections

amazon.aws	cisco.ise	community.hashi_vault	community.windows	hetzner.hcloud	ngine_io.cloudstack
ansible.builtin	cisco.meraki	community.hrobot	community.zabbix	hpe.nimble	ngine_io.exoscale
ansible.netcommon	cisco.mso	community.kubernetes	containers.podman	ibm.qradar	ngine_io.vultr
ansible.posix	cisco.nso	community.kubevirt	cyberark.conjur	infinidat.infinibox	openstack.cloud
ansible.utils	cisco.nxos	community.libvirt	cyberark.pas	inspur.sm	openvswitch.openvswitch
ansible.windows	cisco.ucs	community.mongodb	dellemc.enterprise_sonic	junipernetworks.junos	ovirt.ovirt
arista.eos	cloudscale_ch.cloud	community.mysql	dellemc.openmanage	kubernetes.core	purestorage.flasharray
awx.awx	community.aws	community.network	dellemc.os10	mellanox.onyx	purestorage.flashblade
azure.azcollection	community.azure	community.okd	dellemc.os6	netapp.aws	sensu.sensu_go
check_point.mgmt	community.crypto	community.postgresql	dellemc.os9	netapp.azure	servicenow.servicenow
chocolatey.chocolatey	community.digitalocean	community.proxysql	f5networks.f5_modules	netapp.cloudmanager	splunk.es
cisco.aci	community.docker	community.rabbitmq	fortinet.fortimanager	netapp.elementsw	t_systems_mms.icinga_director
cisco.asa	community.fortios	community.routeros	fortinet.fortios	netapp.ontap	theforeman.foreman
cisco.intersight	community.general	community.skydive	frr.frr	netapp.um_info	vyos.vyos
cisco.ios	community.google	community.sops	gluster.gluster	netapp_eseries.santricity	wti.remote
cisco.iosxr	community.grafana	community.vmware	google.cloud	netbox.netbox	

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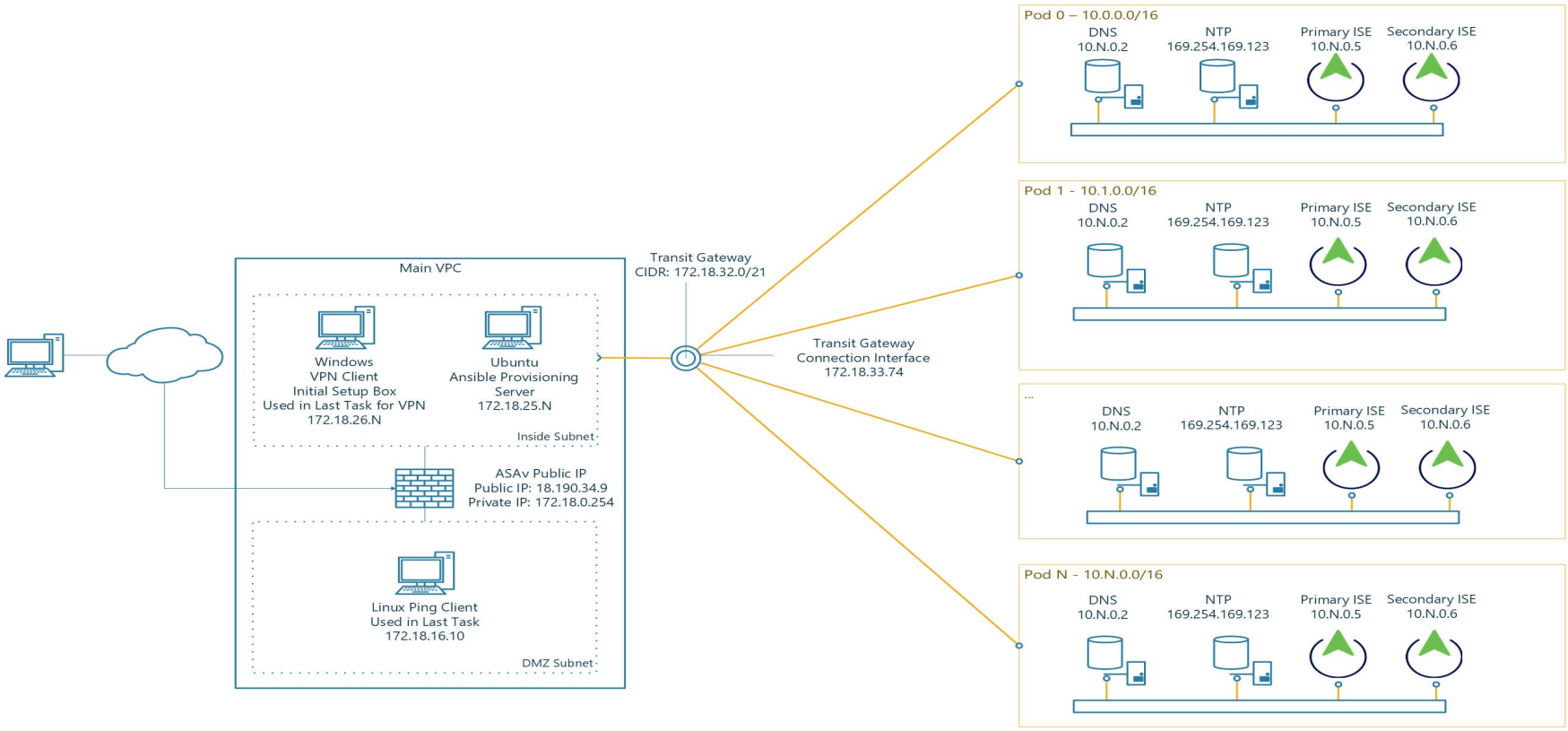
What Are We Doing?

- If you were to deploy this manually, the following tasks would be accomplished:
  - Create an SSH Key Pair
  - Create AWS VPC
  - Create Subnets
  - Create Route Tables
  - Edit Route Tables
  - Create a Linux Test Instance for Pinging

Topology

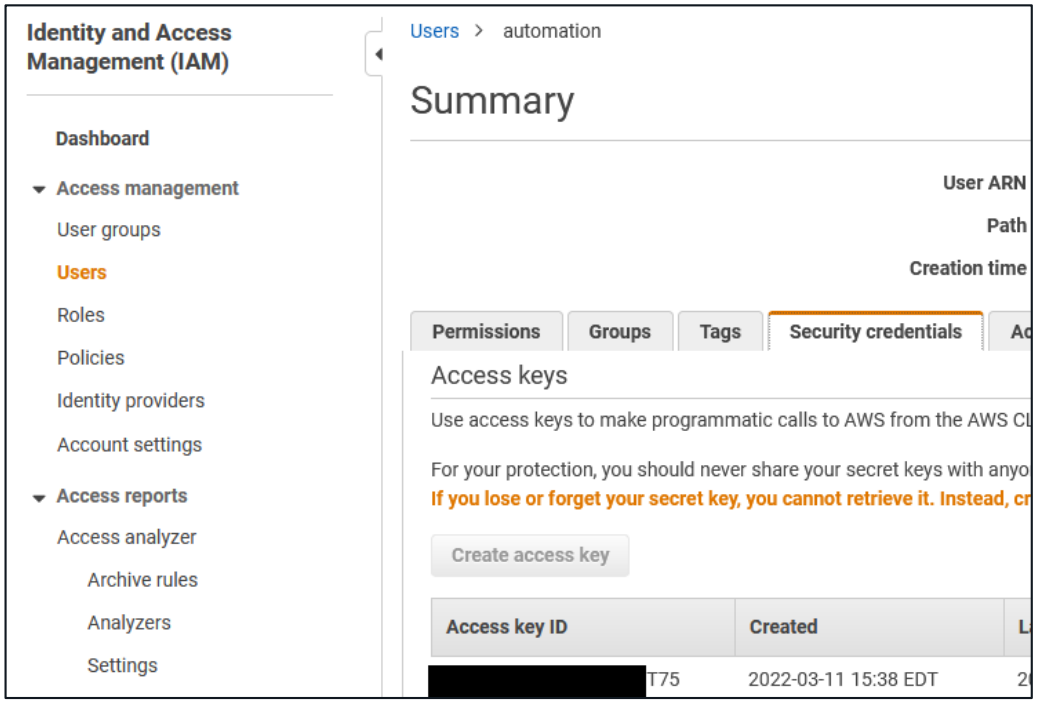


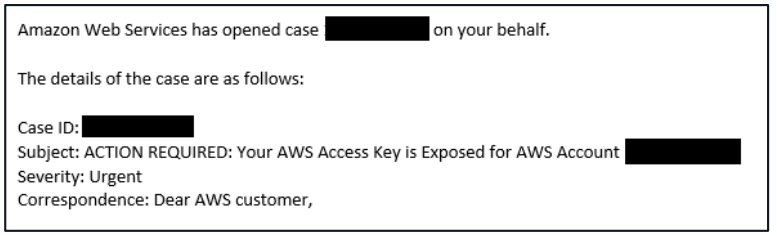
What You'll Need

- An AWS Account (and preferably budget to run that AWS instance!)
- A Linux Deployment Machine
  - Access to Git
  - Ansible Installed
- Knowledge of your Deployment
  - AWS Region
  - AWS Access Key
  - AWS Secret Key
  - Expected ISE Credentials

What You'll Need

- An AWS Account with Programmatic Access
- Don't be like Patrick!
  - Save files and hidden files
  - Search for secrets with Linux Utilities
  - find ./ -type f -exec grep -H 'YOUR_SECRET_KEY' {} \;






```
ubuntu@ip-10-0-1-217:~/CiscoLive_ISE_in_AWS/ISE_with_Meraki_in_AWS$ find ./ -type f -exec grep -H '[redacted]T75' {} \;
./vars/main.yaml.save:AWS_ACCESS_KEY: [redacted]T75
./vars/main.yaml.save:export AWS_ACCESS_KEY=[redacted]T75
```

What You'll Need

- An Ubuntu Deployment Machine
  - Routing tables must be present for addressing!
  - Separate Region Model (Public address)
  - Same Region Model (Private address)

```
---
#
# Tasks to enable and confirm ISE APIs
#

  - name: Enable ISE OpenAPIs (ISE 3.1+)
    delegate_to: localhost
    ansible.builtin.uri:
# note that the following all references the private IP address
# if this script sits outside of the region or subnet, use public
#     url: "https://{{ item.private_ip }}/admin/API/apiService/update"
      url: "https://{{ item.public_ip }}/admin/API/apiService/update"
      method: POST
```

What You'll Need

- Knowledge of your Deployment
  - AWS Region
  - AWS Access Key
  - AWS Secret Key
  - Expected ISE Credentials

```
pod_id: pod4
#set this to your ip used to access ise, or a hostname if DNS configured
#called in tasks/radius_probes.create.yaml
inventory_hostname: 18.218.29.225
ise_hostname: test-hostname.palloyd.xyz
ise_username: admin
ise_password: Cis12345!
AWS_REGION: us-east-2
ise_verify: false
```

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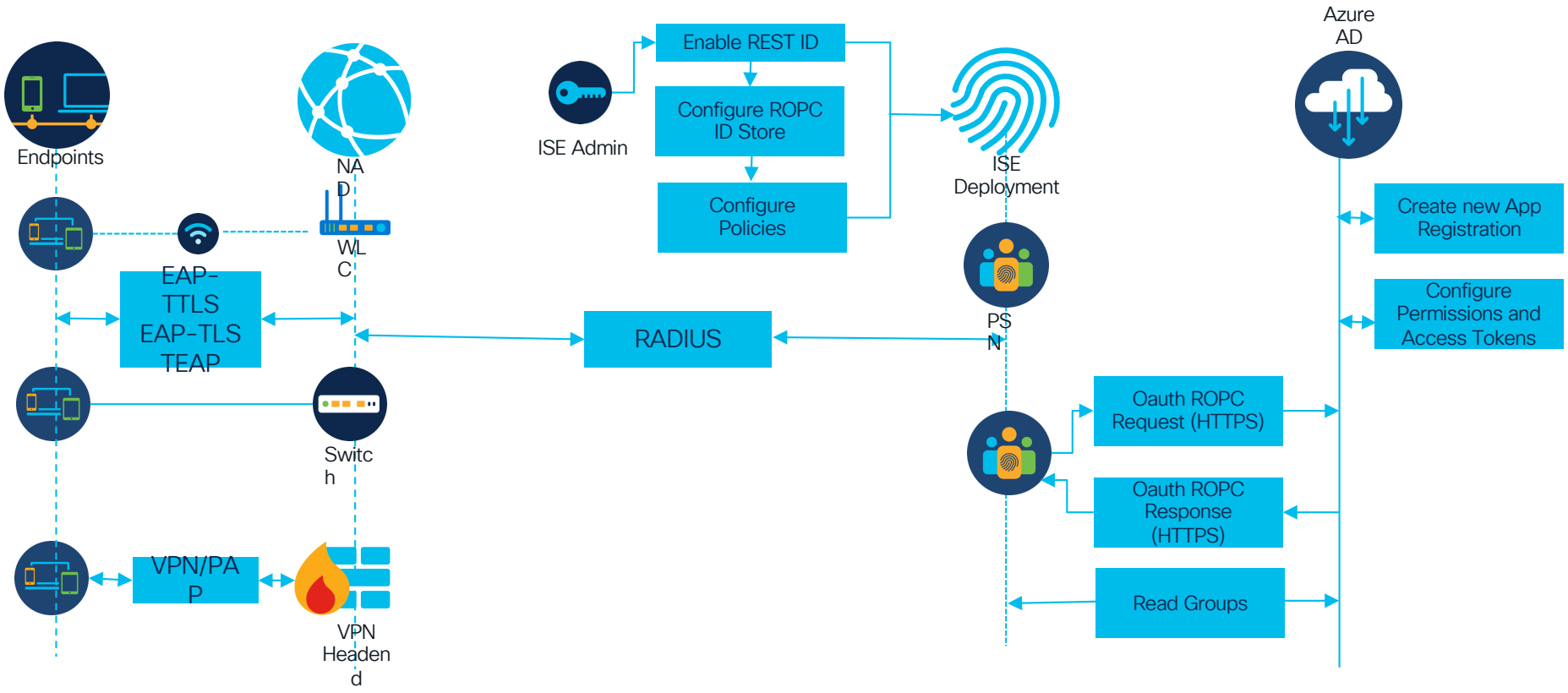
Azure AD / ROPC

- Resource Owner Password Credentials (ROPC) is an OAuth 2.0 grant type that allows Cisco ISE to carry out authorization and authentication in a network with cloud-based identity providers.
- Controlled Access Introduction Feature
- Supports EAP-TTLS and PAP authentications with ISE 3.0+
- Supports EAP-TLS and TEAP with ISE 3.2+

```
ISE PROCESS NAME                       STATE            PROCESS ID
--------------------------------------------------------------------
Database Listener                      running          8864
Database Server                        running          115 PROCESSES
Application Server                     running          26777
Profiler Database                      running          17001
ISE Indexing Engine                    running          28790
AD Connector                           running          30324
M&T Session Database                   running          23085
M&T Log Processor                      running          27013
Certificate Authority Service          running          30113
EST Service                            running          74954
SXP Engine Service                     running          3497002
TC-NAC MongoDB Container               running          3508280
TC-NAC Core Engine Container           running          3509361
VA Database                            running          3511016
VA Service                             running          3511272
PassiveID WMI Service                  running          3486473
PassiveID Syslog Service               running          3487203
PassiveID API Service                  running          3488149
PassiveID Agent Service                running          3489868
PassiveID Endpoint Service             running          3493221
PassiveID SPAN Service                 running          3495802
DHCP Server (dhcpd)                    disabled
DNS Server (named)                     disabled
ISE Messaging Service                  running          12100
ISE API Gateway Database Service       running          15723
ISE API Gateway Service                running          21553
ISE EDDA Service                       running          51664
REST Auth Service                      running          1486625
Hermes (pxGrid Cloud Agent)            disabled
ISE Node Exporter                      running          40606
ISE Prometheus Service                 running          43036
ISE Grafana Service                    running          49934
ISE MNT LogAnalytics Elasticsearch     disabled
ISE Logstash Service                   disabled
ISE Kibana Service                     disabled
```

Azure AD Integration with ISE – High Level Flow Overview



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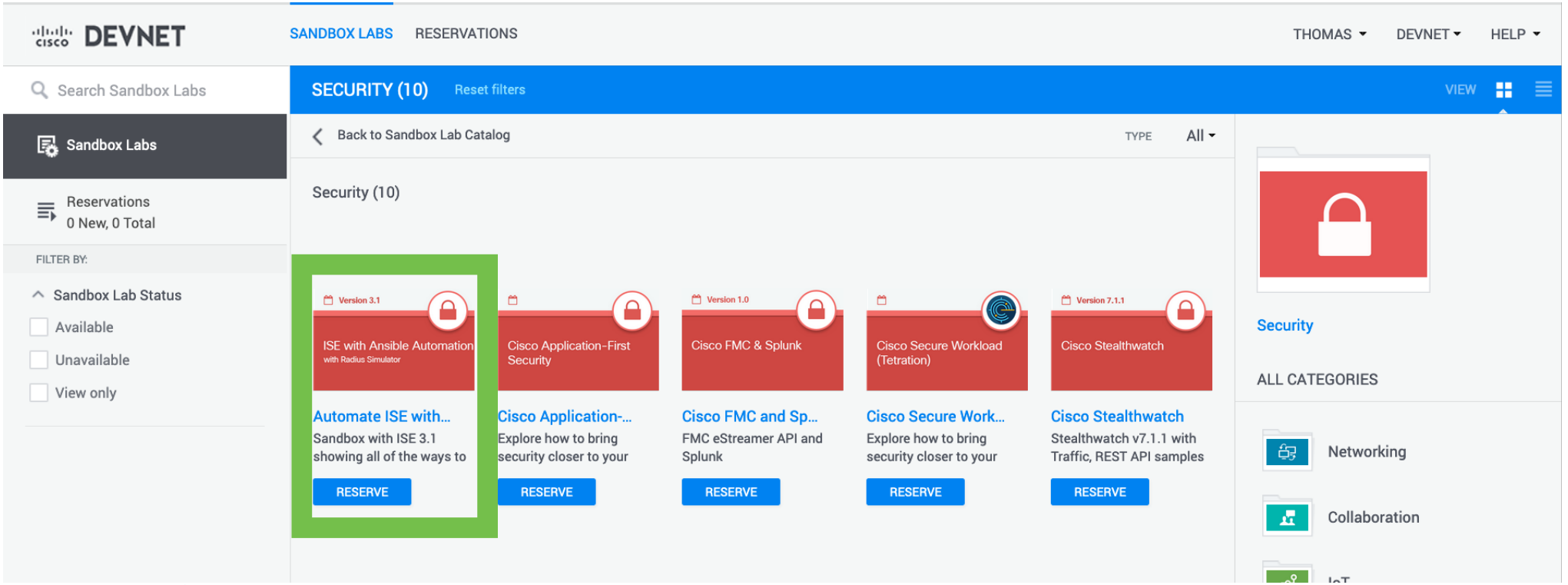
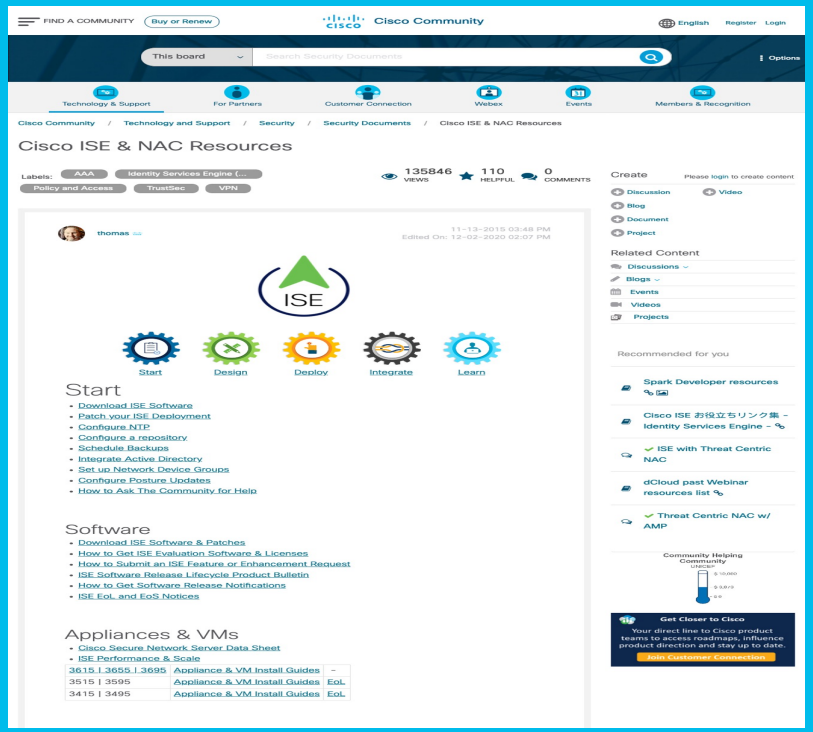
Continue Your Learning

devnetsandbox.cisco.com



ISE Customer Resources



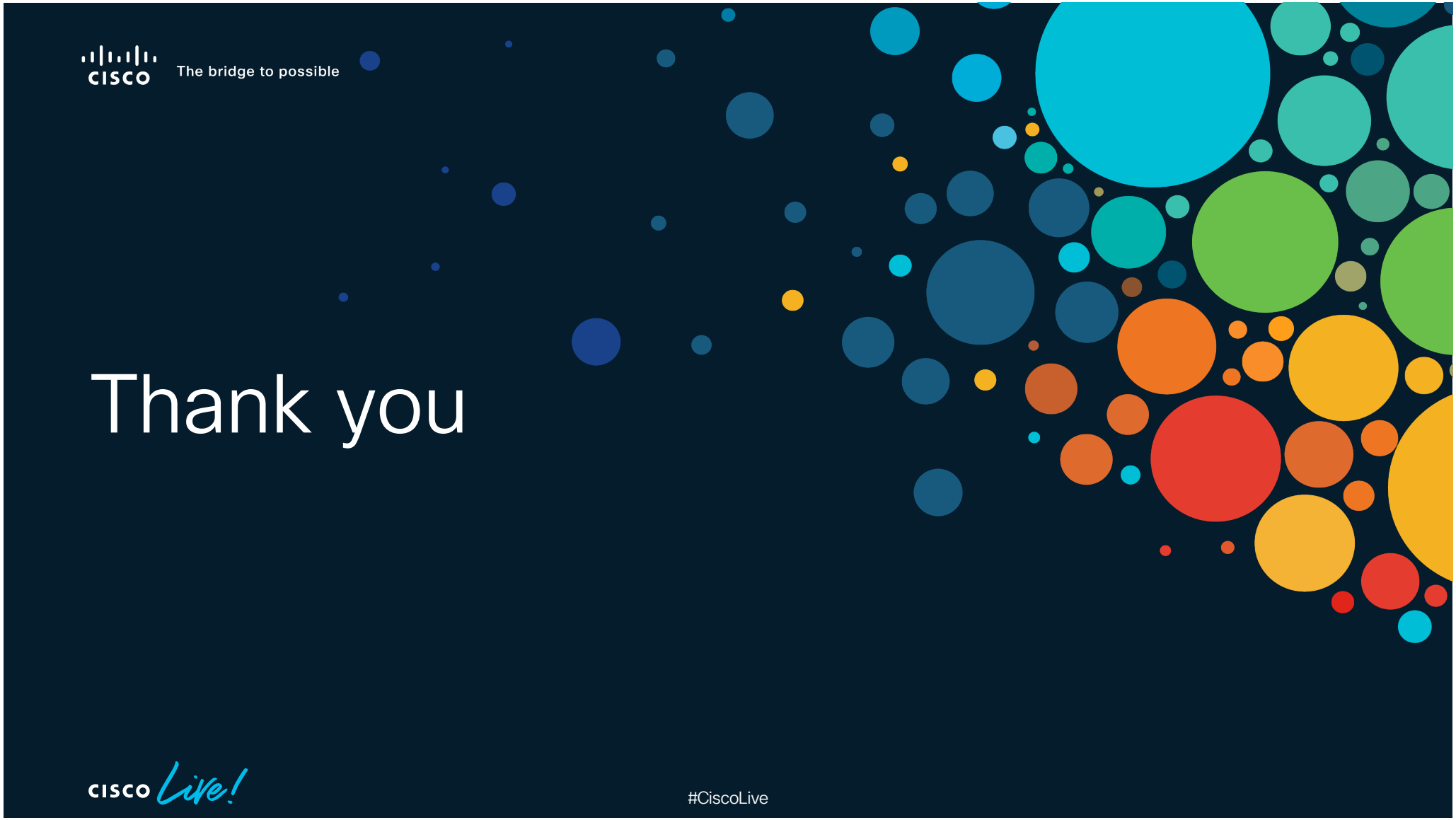
- Resources cs.co/ise-resources
- Community cs.co/ise-community
- YouTube Channel cs.co/ise-videos
- Licensing Guide cs.co/ise-licensing
- API SDK cs.co/ise-api
- Future webinars! cs.co/ise-webinars
- Devnet https://cs.co/ise-devnet
- ISE Github https://github.com/CiscoISE
- Patrick Lloyd's GitHub https://github.com/plloyd44

Technical Session Surveys

- Attendees who fill out a minimum of four session surveys and the overall event survey will get Cisco Live branded socks!
- Attendees will also earn 100 points in the Cisco Live Game for every survey completed.
- These points help you get on the leaderboard and increase your chances of winning daily and grand prizes.

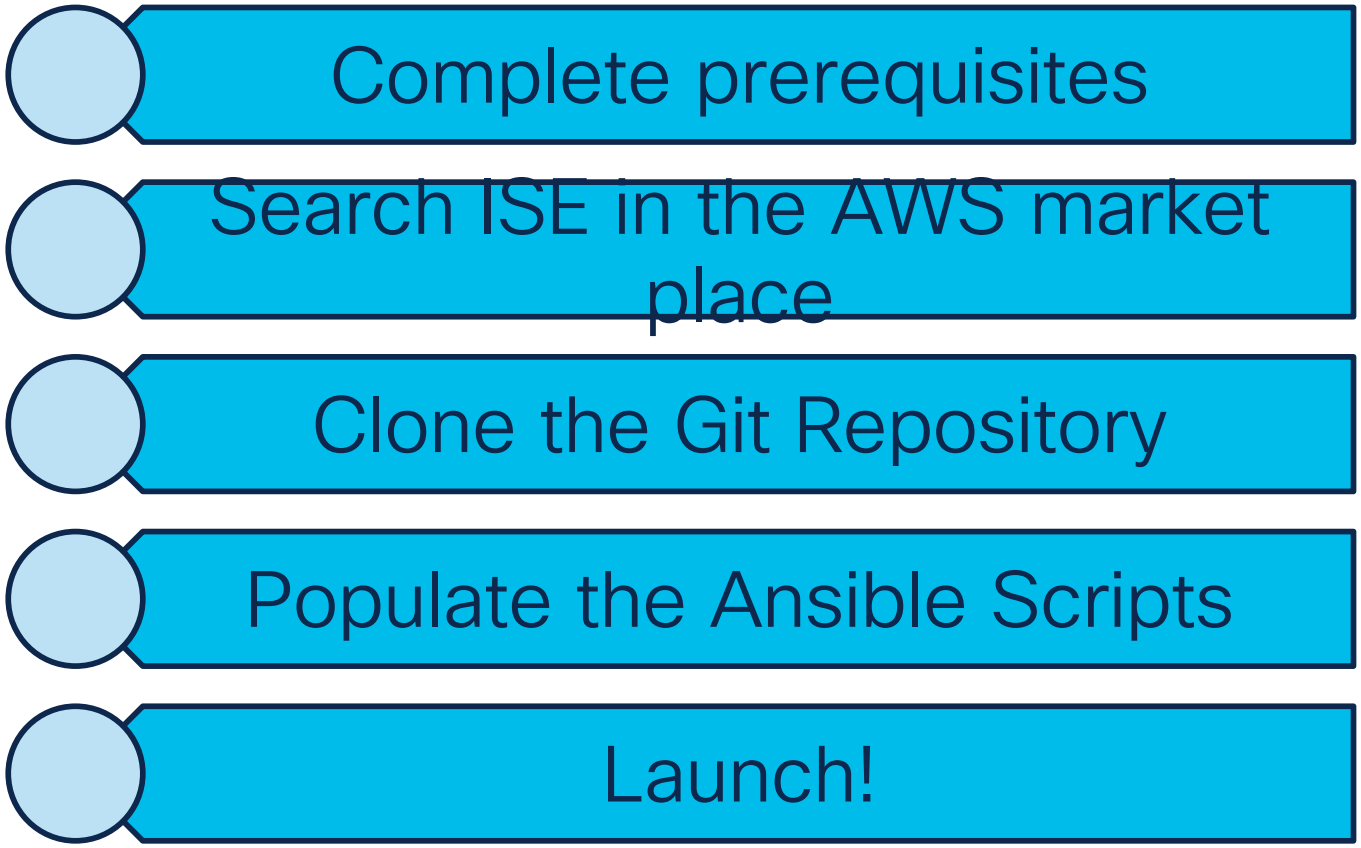
Continue your education

- Visit the Cisco Showcase for related demos
- Book your one-on-one Meet the Engineer meeting
- Attend the interactive education with DevNet, Capture the Flag, and Walk-in Labs
- Visit the On-Demand Library for more sessions at www.CiscoLive.com/on-demand


cisco
The bridge to possible
Thank you
cisco Live!
#CiscoLive


cisco Live!
ALL IN
#CiscoLive

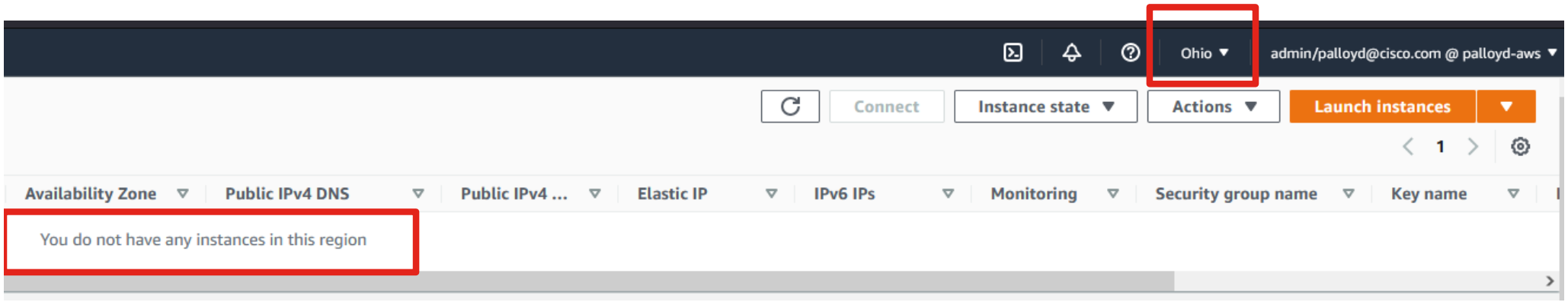
Launch ISE using AWS Market Place



Prerequisites: Critical Information

- Does your organization have a centralized SSH key for AWS?
- What region are you deploying ISE to?
- Do you know your access key?
- Do you know your secret key?
- How will you extend your domain into the cloud?
- What IP’s will you be using for ISE?

Prerequisites: Regions and Availability Zones



Prerequisites: Regions and Availability Zones

< Product Detail Subscribe Configure

Configure this software

Choose a fulfillment option and software version to launch this software.

Fulfillment option

Amazon Machine Image

Amazon Machine Image
Deploy a vendor-provided Amazon Machine Image (AMI) on Amazon EC2

64-bit (x86) Amazon Machine Image (AMI)

Software version

3.1 Patch1 (Dec 09, 2021)

Region

US East (N. Virginia)

Use of Local Zones or WaveLength infrastructure deployment may alter your final pricing.

Ami Id: ami-0bb0a9d243824a077

Product Code: basttrzv6xwc4yn2uup6bh730

Release notes (updated December 9, 2021)

< Product Detail Subscribe Configure

Configure this software

Choose a fulfillment option and software version to launch this software.

Fulfillment option

Amazon Machine Image

Amazon Machine Image
Deploy a vendor-provided Amazon Machine Image (AMI) on Amazon EC2

64-bit (x86) Amazon Machine Image (AMI)

Software version

3.1 Patch1 (Dec 09, 2021)

Region

US West (N. California)

Ami Id: ami-0965fef2e601ad4d0

Product Code: basttrzv6xwc4yn2uup6bh730

Release notes (updated December 9, 2021)

Prerequisites: Regions and Availability Zones

- $ env
  - AWS_REGION: us-east-2

- $ more main.yaml
  - aws_region: "{{ lookup('env','AWS_REGION') | default('us-east-2') }}"

Prerequisites: Regions and Availability Zones

- $ export AWS_REGION=us-west-1
- $ ansible-playbook ise_in_aws.vpc.yaml
- fatal: [localhost]: FAILED! => changed=false
  - msg: The amazon.aws.ec2_vpc_net module requires a region and none was found in configuration, environment variables or module parameters <===Missing Env

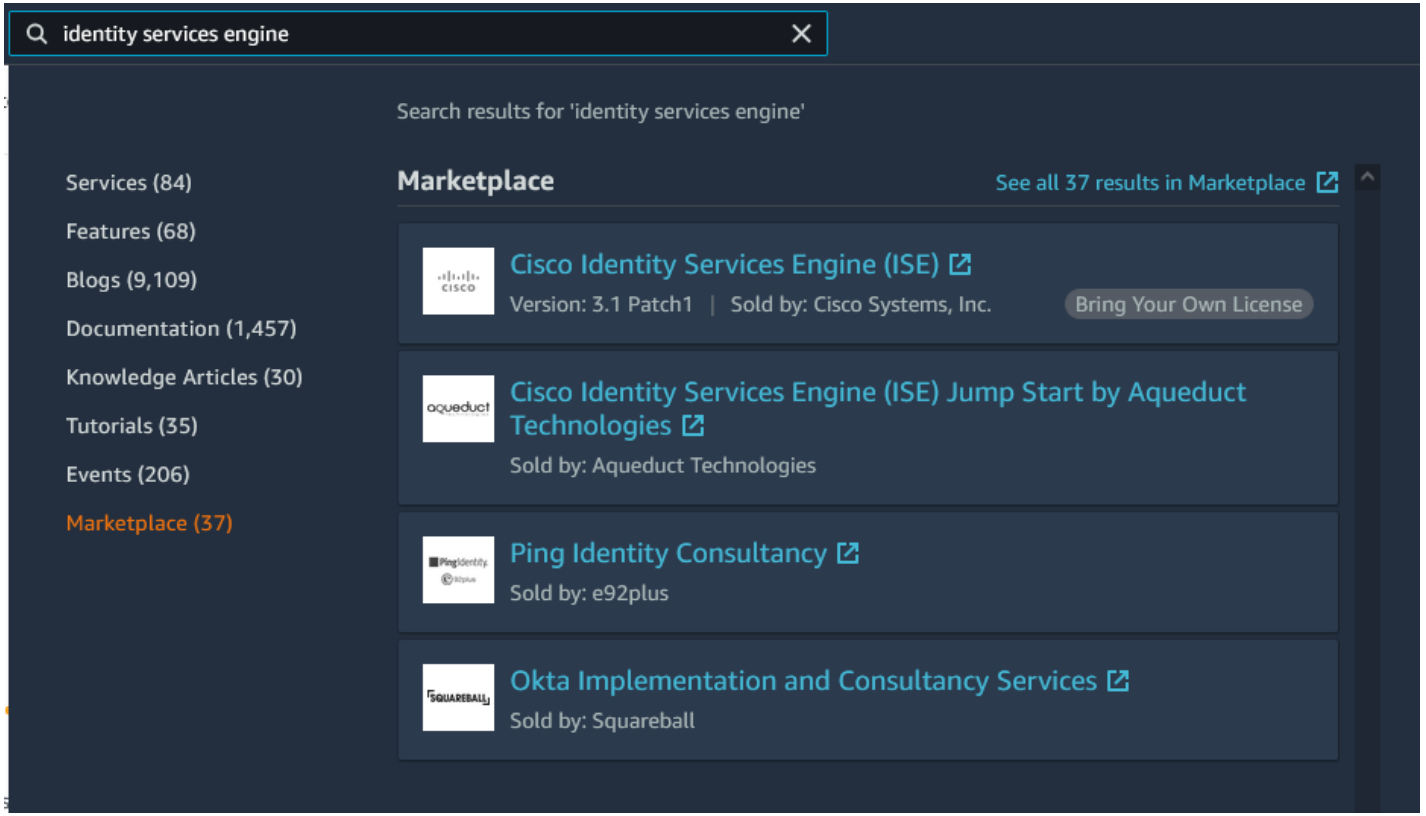
OR

  - msg: 'Failed to create new EC2 instance: An error occurred (InvalidAMIID.NotFound) when calling the RunInstances operation: The image id ''[ami-0bb0a9d243824a077]'' does not exist' <===Wrong AMI for the Region

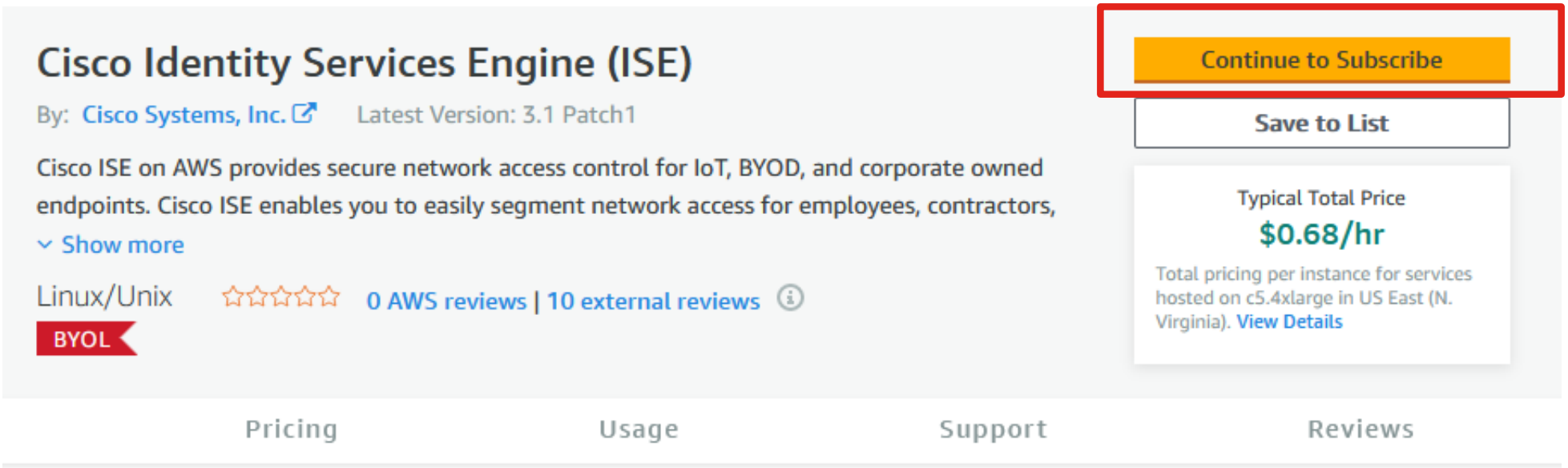
Prerequisites: Access Keys

- To manage access keys when signed in as the root user
  - Sign in to the AWS Management Console as a user with programmatic access.
  - Search for “IAM” in the top search bar. Click “Users” on the left
  - Expand the Access keys (access key ID and secret access key) section. Create as needed

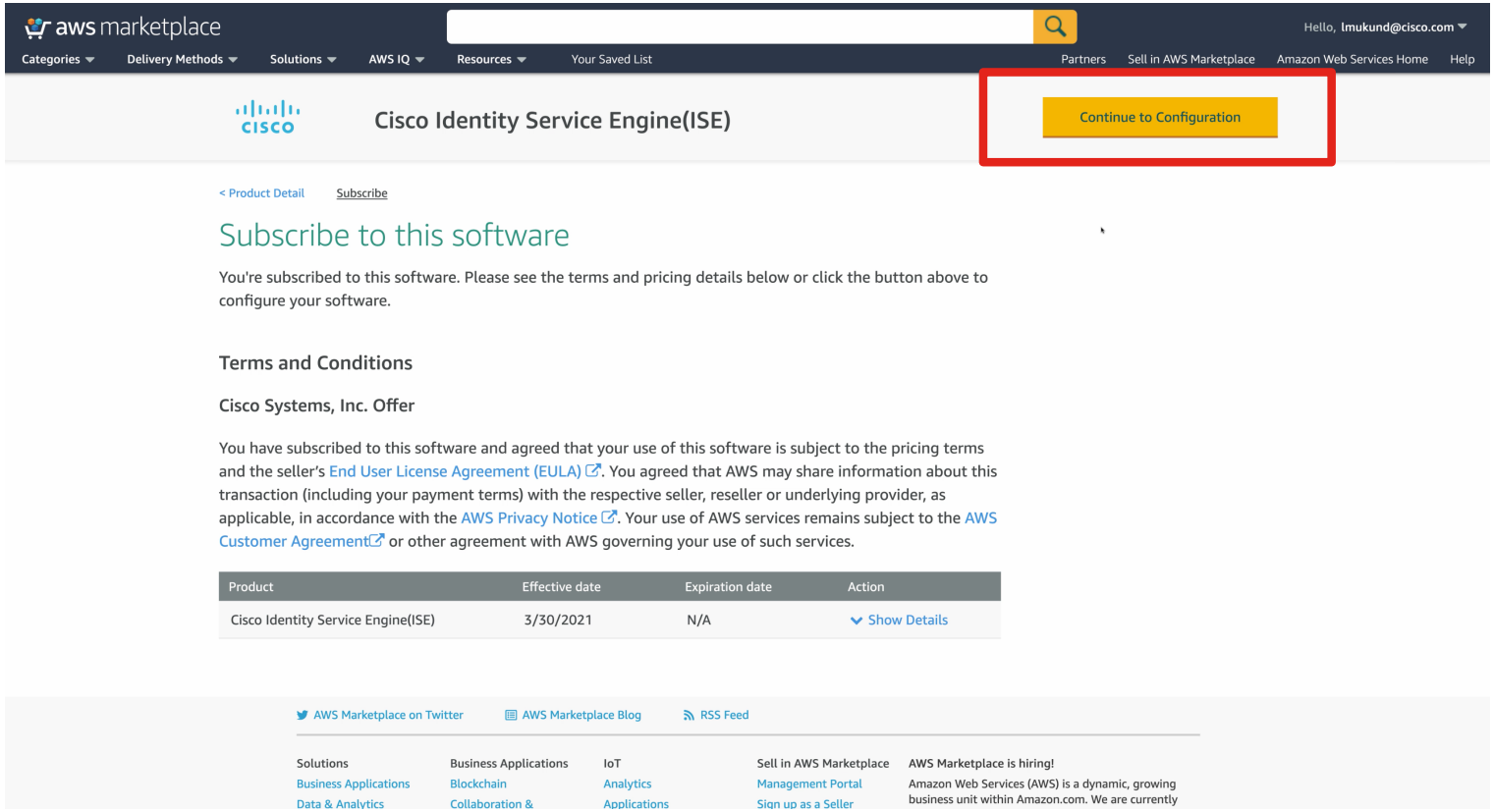
Search for ISE In AWS Marketplace



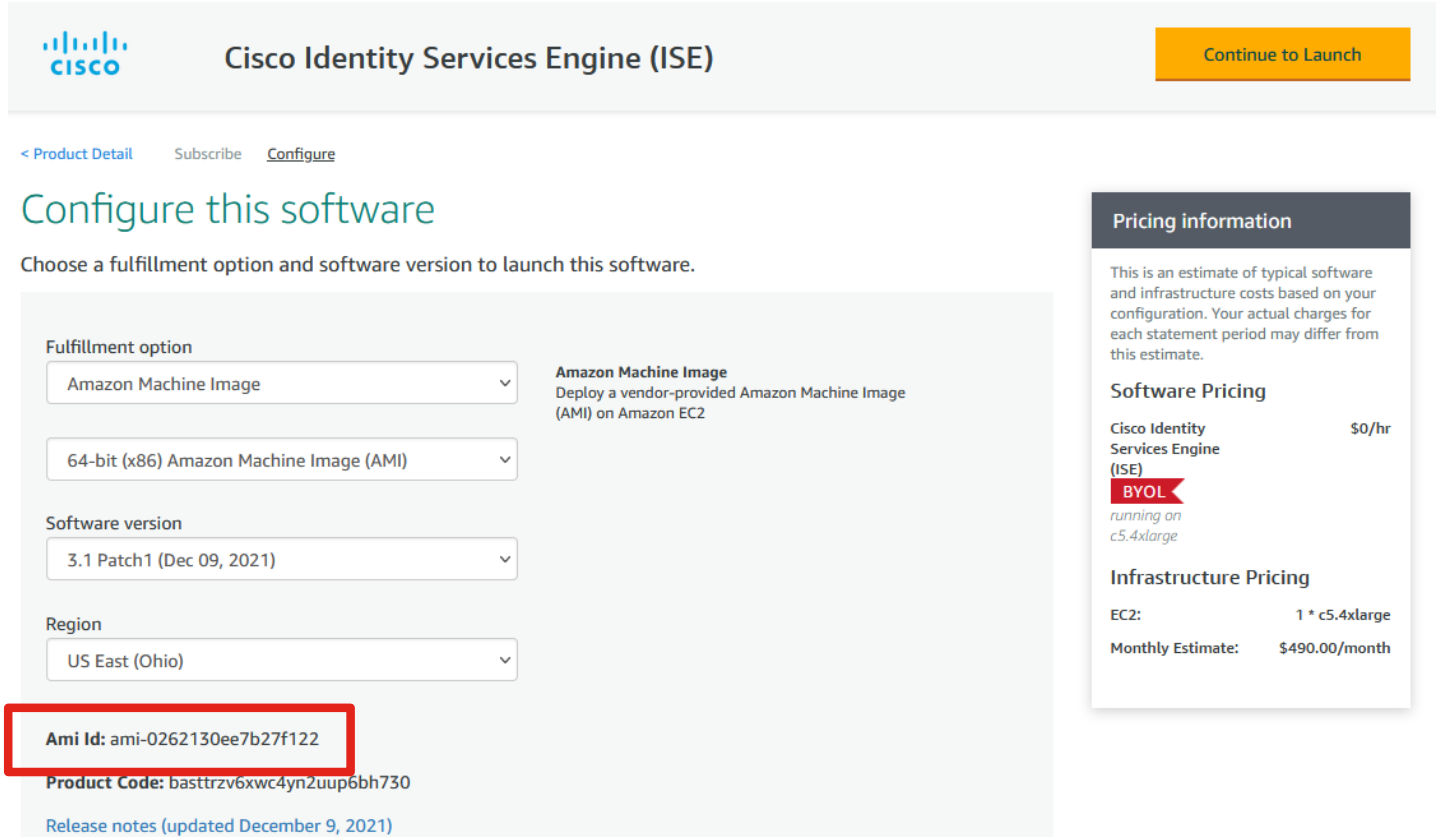
Search for ISE In AWS Marketplace: Subscribe



Search for ISE in AWS Marketplace: Configure



Search for ISE in AWS Marketplace: AMI ID



Clone the GIT Repository

- https://github.com/plloyd44/CiscoLive_ISE_in_AWS

Populate the Ansible Scripts: Env Variables

```
(ubuntu) ubuntu@ip-10-0-1-217:~/ISE_with_Meraki_in_AWS$ env

# AWS IAM API Keys

AWS_ACCESS_KEY=ABCXYZ

AWS_SECRET_KEY=ZYXCBA

AWS_REGION=us-east-2


# ISE Options

ise_password=Cis12345!

ise_username=admin
```

Populate the Ansible Scripts

Variables, Variables Everywhere

```
pod_id: pod4

#set this to your ip used to access ise, or a
hostname if DNS configured

#called in tasks/radius_probes.create.yaml

inventory_hostname: 18.218.29.225

ise_hostname: test-hostname.palloyd.xyz

ise_username: admin

ise_password: Cis12345!

AWS_REGION: us-east-2

ise_verify: false
```

```
project_name: ISEinAWS-{{ pod_id }}        # use
for tagging VMs and resources

aws_vpc_cidr: 10.192.0.0/16

aws_public_subnet_cidr:  10.192.169.0/24

aws_private_subnet_cidr: 10.192.168.0/24

aws_public_access_cidr: 0.0.0.0/0

ise_dns_server: 169.254.169.253
```

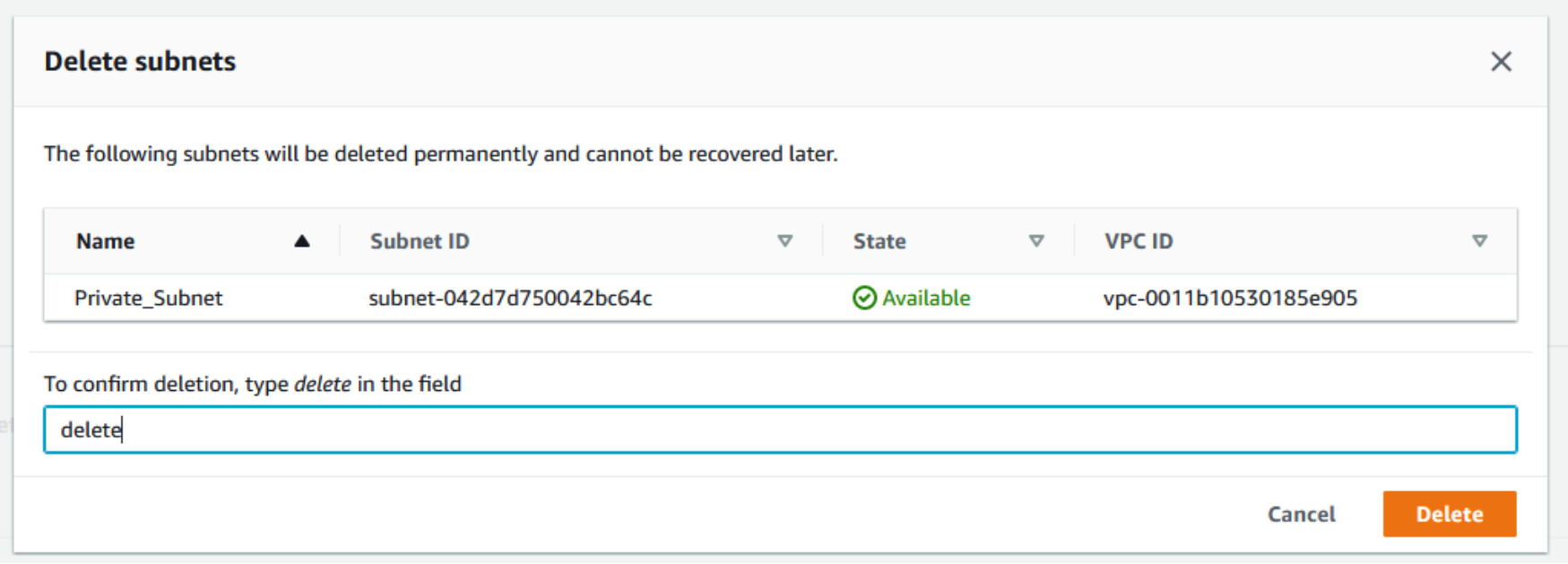
Running Scripts Individually

- Ansible-playbook ssh_key_pair.yaml
- Ansible-playbook ise_in_aws.vpc.yaml
- Ansible-playbook ise_in_aws.ise.yaml
- ssh -i ~/.ssh/ISEinAWS-pod#.pem admin@<ip>
- Ansible-playbook ise.configuration.yaml

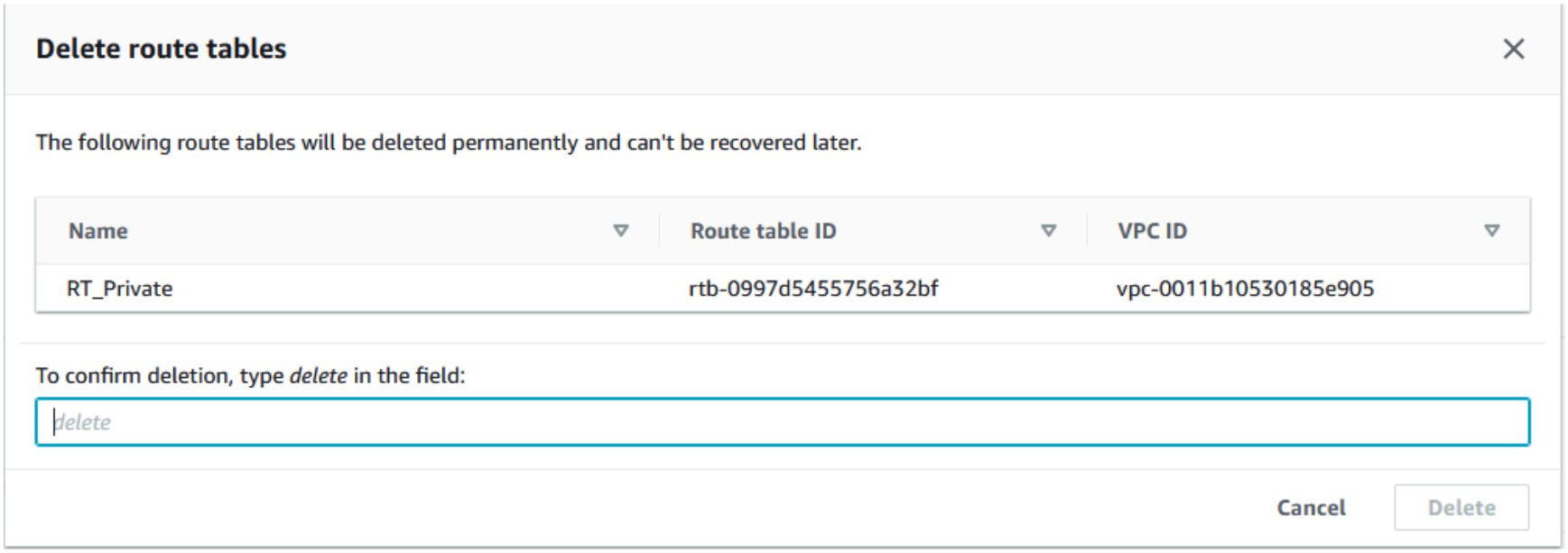
Launch: Result

```
ise/admin# show run

hostname ise

ip domain-name zer0k.org

interface GigabitEthernet 0

  ip address 10.192.168.44 255.255.255.0

  ipv6 address dhcp

  ipv6 address autoconfig

  ipv6 enable

ip name-server 208.67.222.222

ip default-gateway 10.192.168.1

clock timezone EST5EDT

ntp server time.nist.gov

username admin password hash
$6$bLgPMB97IZT3ljJF$43l3EFueywsy16ZG5iAV94R5RA3FgW4s0YLuuVru7XJFtLVimgWf8HaXYkPDZkejxw2FfbArz2X20jYOGuEX.
1 role admin
```

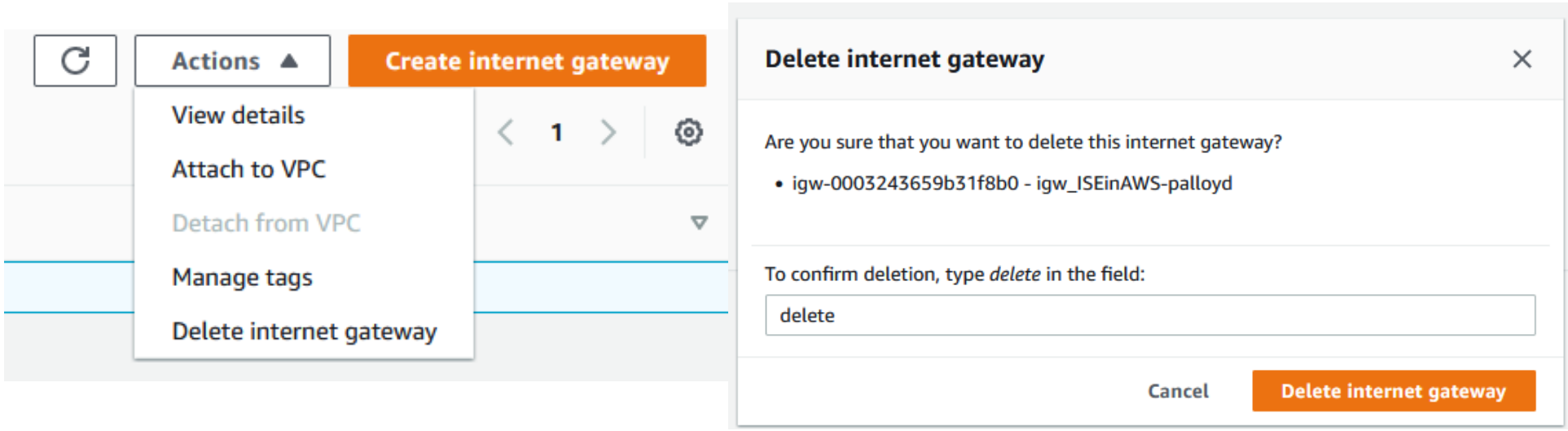
Clean Up – Start with Subnets



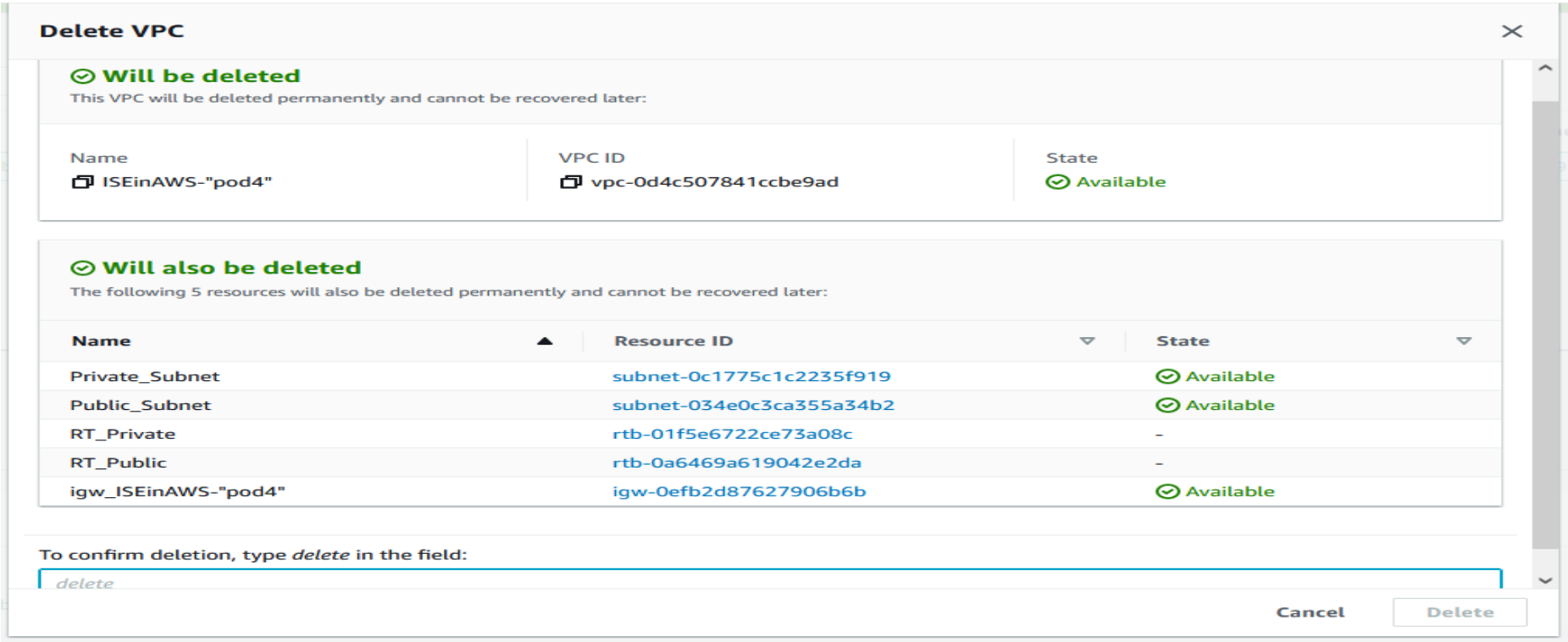
Clean Up – Route Tables



Clean Up – Detach and Delete Internet Gateway from VPC



Clean Up – Or Just Delete VPC



Clean Up – Or Do It Programmatically

- Ansible-playbook ise_in_aws.terminate.yaml