🧪 Lab 17 — Dynamic Inventory in Ansible (Deep Concept + Easy Hands-On)

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🕐 Learning Objectives

In this lab, you will learn: - What dynamic inventory is and why it is used - Difference between static and dynamic inventory - How cloud environments require dynamic inventory - How to configure AWS EC2 dynamic inventory (plugin-based) - How to filter hosts dynamically using inventory plugins - How to execute playbooks using dynamic inventory sources

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👙 Learning Outcomes

After this lab, you will: - Understand how dynamic inventories work internally - Use inventory plugins instead of static host files - Fetch cloud host information automatically - Run playbooks without manually updating host IPs

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🧰 What Is Dynamic Inventory?

A **dynamic inventory** is an inventory source that automatically discovers and lists hosts.
Instead of manually maintaining IPs in `/etc/ansible/hosts`, a dynamic inventory pulls data from: - AWS EC2 - Azure - GCP - VMware - Kubernetes - Custom scripts / APIs

Dynamic inventory solves: - Auto-scaling hosts - Frequently changing cloud IPs - Multi-region environments - Large-scale fleet automation

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🧱 Static vs Dynamic Inventory (Concept Level)

Feature	Static Inventory	Dynamic Inventory
Host IP updates	Manual	Automatic
Cloud scaling	Not supported	Supported
Best for	Small labs	Cloud/production

Feature	Static Inventory	Dynamic Inventory
Inventory format	INI/YAML	Plugins / scripts
Example	`/etc/ansible/hosts`	`aws_ec2.yml`

Dynamic inventory is essential for real-world cloud automation.

🏛️SECTION A — AWS EC2 Dynamic Inventory (Plugin-Based)

Ansible provides **built-in inventory plugins**, one of them is `aws_ec2`.

Your machine must have: - Python `boto3` - AWS CLI - AWS credentials configured (`~/.aws/credentials`)

Install boto3:

```
pip install boto3 botocore
```

Configure AWS credentials:

```
aws configure
```

🏛️SECTION B — Create AWS Dynamic Inventory File

Create inventory file:

```
nano aws_ec2.yml
```

Add:

```
---
plugin: aws_ec2
regions:
```

```
  - ap-south-1
  - us-east-1
keyed_groups:
  - key: tags.Name
    prefix: name
filters:
  instance-state-name: running
```

Explanation: - `plugin`: name of the inventory plugin - `regions`: AWS regions to scan - `filters`: only running instances - `keyed_groups`: dynamically group hosts by Name tag

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🏛️SECTION C — Test the Dynamic Inventory

Run:

```
ansible-inventory -i aws_ec2.yml --list
```

You should see: - EC2 instance details - Groups created from Name tags - Public/private IP addresses

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🏛️SECTION D — Run a Playbook Using Dynamic Inventory

Create simple playbook:

```
nano test-ec2.yml
```

Add:

```
---
- name: Test dynamic EC2 inventory
  hosts: all
  gather_facts: yes

  tasks:
    - name: Print machine hostname
      debug:
        var: ansible_hostname
```

Run:

```
ansible-playbook -i aws_ec2.yml test-ec2.yml
```

This automatically runs on all running EC2 instances.

🏛️SECTION E — Filtering Hosts Using Dynamic Groups

If EC2 machines have a tag like:

```
Name = webserver
```

Then run playbook only on them:

```
ansible-playbook -i aws_ec2.yml test-ec2.yml -l name_webserver
```

🏛️SECTION F — Easy Hands-On (Minimal Setup)

If you do NOT want to use AWS, we can use a **script-based dummy dynamic inventory**.

Create script:

```
nano demo_inventory.py
```

Add:

```
#!/usr/bin/env python3
import json

data = {
  "all": {
    "hosts": ["node1", "node2"],
    "vars": {}
  }
}
```

```
print(json.dumps(data))
```

Make it executable:

```
chmod +x demo_inventory.py
```

Test:

```
ansible-inventory -i demo_inventory.py --list
```

Run a playbook:

```
ansible all -i demo_inventory.py -m ping
```

🧪 Hands-On Checklist

- [ ] Install boto3 and configure AWS CLI
- [ ] Create `aws_ec2.yml` inventory plugin file
- [ ] List AWS dynamic hosts
- [ ] Run playbook using AWS inventory
- [ ] Create dummy Python inventory script
- [ ] Test dynamic inventory without cloud setup

👙 Lab Summary

This lab explained dynamic inventory in depth — concepts, plugin-based architecture, AWS integration, grouping, filtering, and how to create a basic custom dynamic inventory script.

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