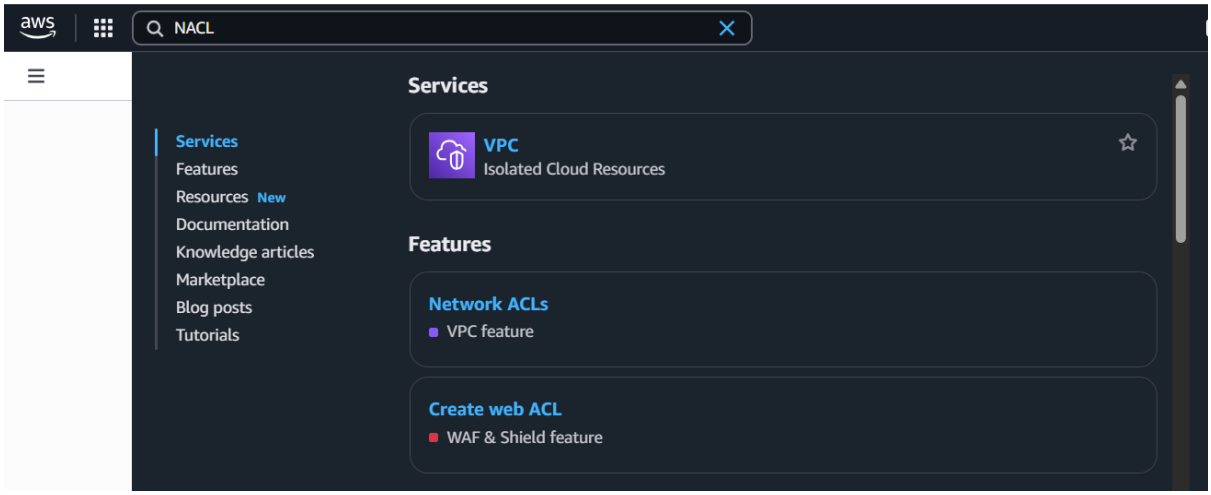
Day 13

“CLOUD SECURITY”

AWS Network ACLs (NACLs) to secure a VPC:

1. NACLs provide subnet-level, stateless firewall protection, requiring explicit rules for both inbound and outbound traffic.
2. They support both allow and deny rules, enabling fine-grained control over protocols, ports, and IPs—evaluated in order by rule number.
3. Best used alongside Security Groups for layered security; customize default NACLs to block unwanted traffic and mitigate DDoS attacks.

Where can we find this NACL?



What is NACL?

A Network Access Control List (NACL) is a stateless, subnet-level firewall in AWS used to control inbound and outbound traffic for one or more subnets within a VPC.

Why does NACL exist?

NACLs exist to provide:

- An additional layer of security in your AWS VPC.
- Fine-grained control over traffic at the network level, complementing Security Groups (which work at the instance level).
- Support for both allow and deny rules, which Security Groups do not offer (SGs only allow traffic).

This helps:

- Filter out unwanted traffic.
- Mitigate threats like DDoS, unauthorized access, or scanning.
- Ensure compliance with network-level access policies.

Why and How is NACL associated with a VPC?

- Why: Every VPC automatically comes with a default NACL to control traffic at the subnet level.
- How: When you create a custom VPC, AWS creates a default NACL which you can customize. You can also create new NACLs and associate them with subnets in your VPC.

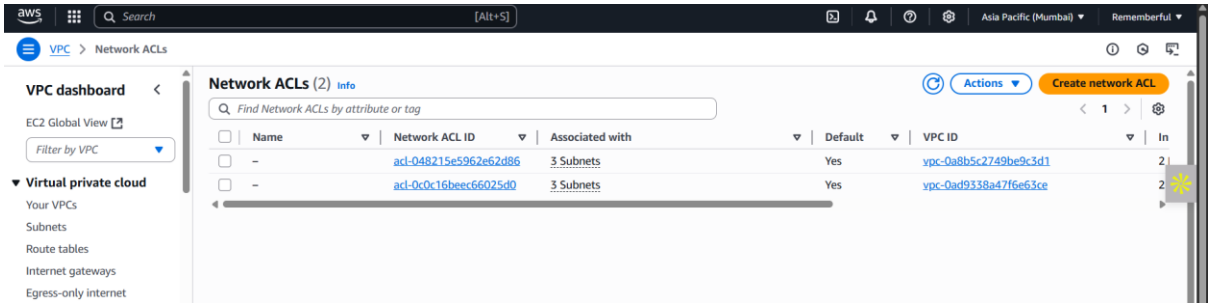
Why and How is NACL associated with a Subnet?

- Why: NACLs operate at the subnet level, not at individual instance level. Each subnet in a VPC must be associated with exactly one NACL.
- How:
  - When you create a subnet, it is automatically associated with the VPC's default NACL.
  - You can change this by explicitly associating a different NACL with that subnet.
  - The same NACL can be reused across multiple subnets if desired.

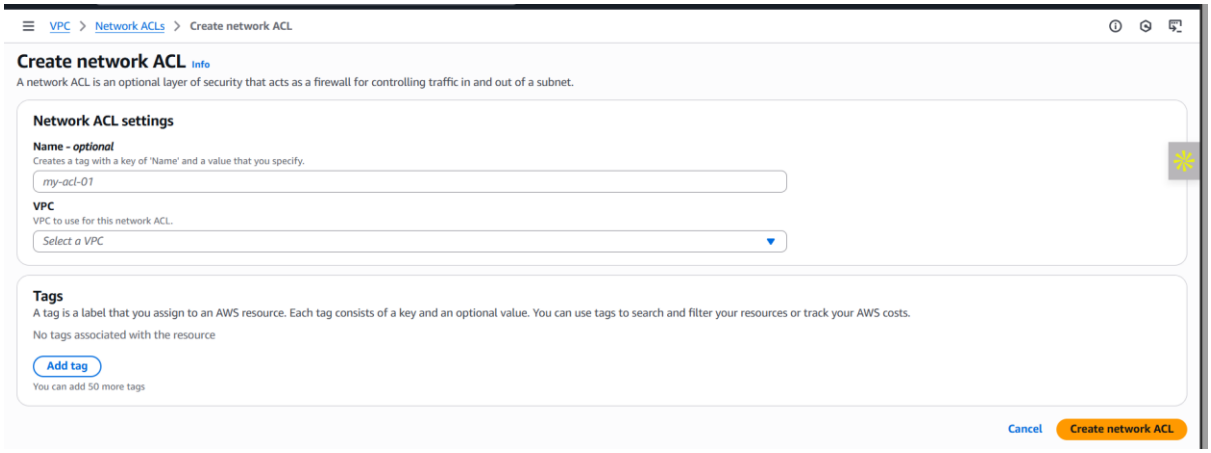
Creating a NACL:

Steps:

Open the dashboard of NACL:



Click on the "Create Network ACL" button: following screen will appear.

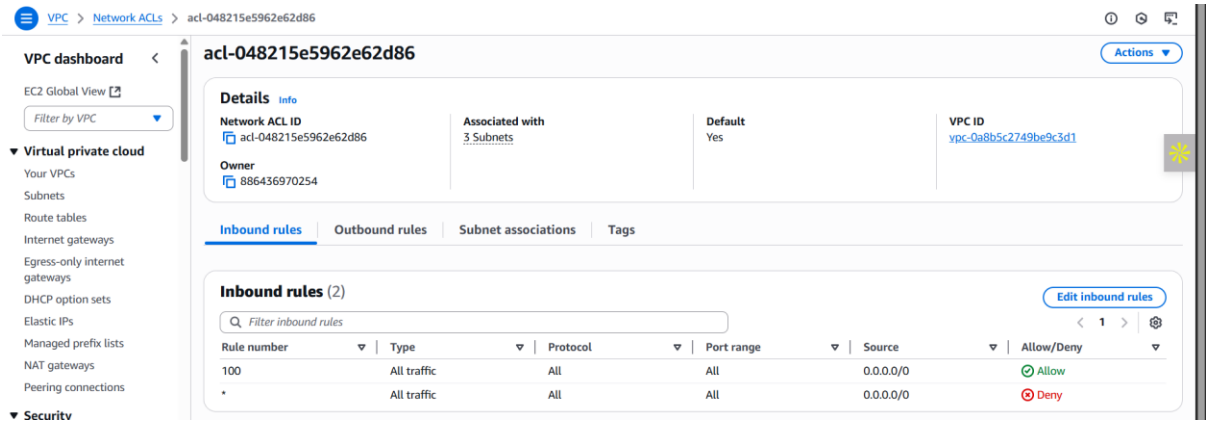


You may add the details and create the NACL associated with a particular VPC.

Key Reasons for NACL (even with VPC):

- Traffic Control at Subnet Level: NACLs apply before traffic even reaches EC2 or Security Groups. You can block malicious IPs or ports at subnet level.
- Support for Deny Rules: Unlike Security Groups, NACLs support explicit deny (e.g., block all traffic from a known bad IP).
- Stateless Filtering: Useful for fine-grained control of both inbound and outbound traffic — good for compliance and edge filtering.

What are the various information we can get from the NACL?



Think of It Like This:

- **VPC** = City boundary
- **Subnet** = Neighborhood
- **NACL** = Police checkpoint at the neighborhood entrance
- **Security Group** = Security guard at the individual house (instance)

Best practices of NACL:

1. Principle of Least Privilege

- Only allow the minimum traffic needed for a subnet to function.
- Deny all unnecessary ports and IP ranges.

2. Configure Both Inbound and Outbound Rules

- NACLs are stateless, so for every allowed inbound rule, a corresponding outbound rule must also be created.
    - e.g., Allow HTTP in → Allow ephemeral ports out (1024–65535).

3. Use Rule Numbering Wisely

- Rules are evaluated from lowest to highest number.
- Keep DENY rules at lower numbers to take precedence over ALLOW if needed.
- Use spacing (e.g., 100, 110, 120…) to make room for future rules.

4. Deny Known Malicious IP Ranges

- If you know malicious IPs or geographies, explicitly deny them at the NACL level.

5. Use Custom NACLs Instead of Default

- Default NACL allows all traffic.
- Replace with custom NACLs to apply security best practices.

6. Combine NACLs with Security Groups

- NACL = subnet-level, Security Group = instance-level
- Use both together for layered defense.

7. Separate Public & Private Subnets

- Apply restrictive NACLs to private subnets.
- Public subnets can be less strict, but should still block unnecessary ports (e.g., Deny port 22 from 0.0.0.0/0).

8. Enable VPC Flow Logs

- Use Flow Logs to monitor traffic going through subnets and validate whether NACLs are working as expected.

9. Use Descriptive Rule Comments (in console or IaC)

- When using tools like Terraform or CloudFormation, comment your rules clearly for better audit and management.

10. Review & Audit Regularly

- Periodically review NACLs to:
    - Remove unused rules.
    - Update ranges (e.g., if IP ownership changes).
    - Ensure they reflect current application needs.

--The End--