Identity Round Robin Workshop

Permission Boundaries

Agenda

- Intro
- Permission boundary basics
- Policy categories
- Permission boundary mechanism
- Resource restrictions
- Q & A

- Workshop
- Final Q & A

What are permission boundaries?

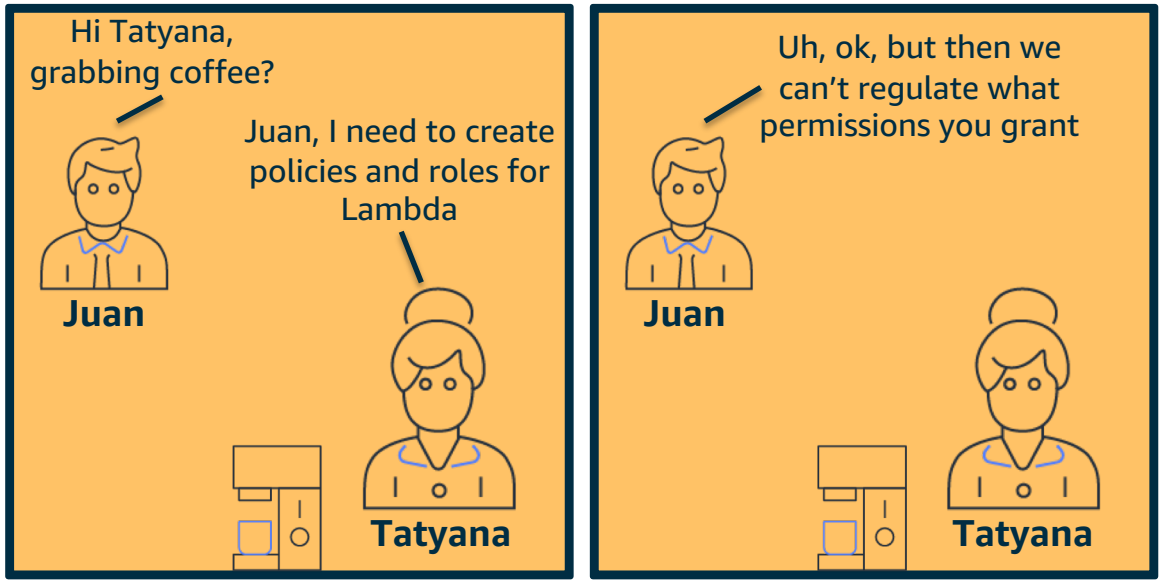
Mechanism to delegate the permission to create users and roles while preventing privilege escalation or unnecessarily broad permissions.

Method to safely grant actions like:
"iam:CreateRole"
"iam:PassRole"

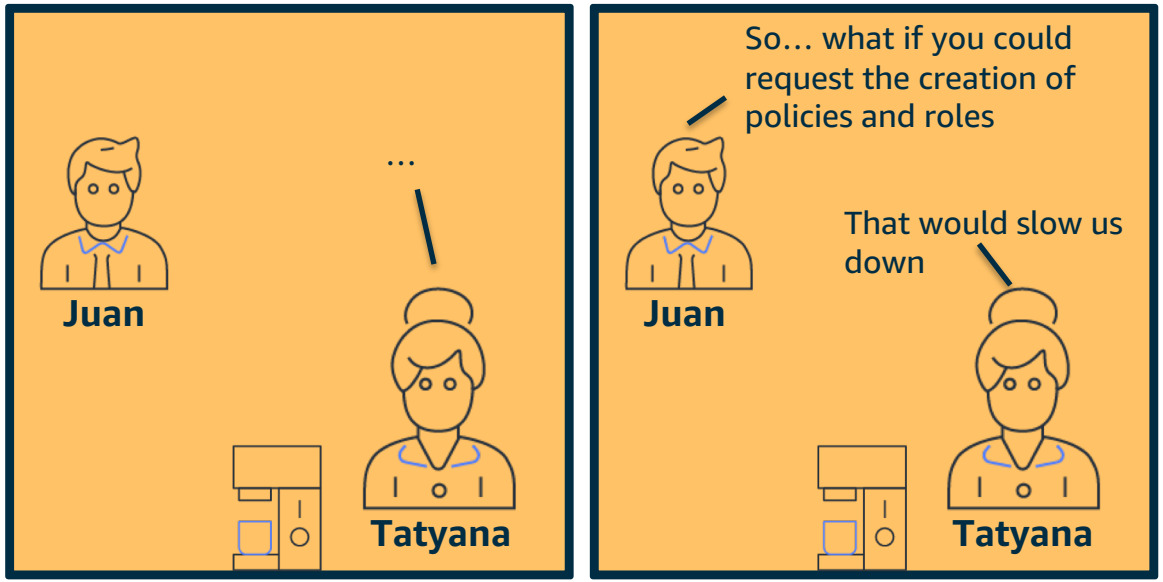
Use cases

- Developers that need to create roles for Lambda functions
- Application owners that need to create roles for EC2 instances
- Admins that need to be able to create users for particular use cases
- Any others?

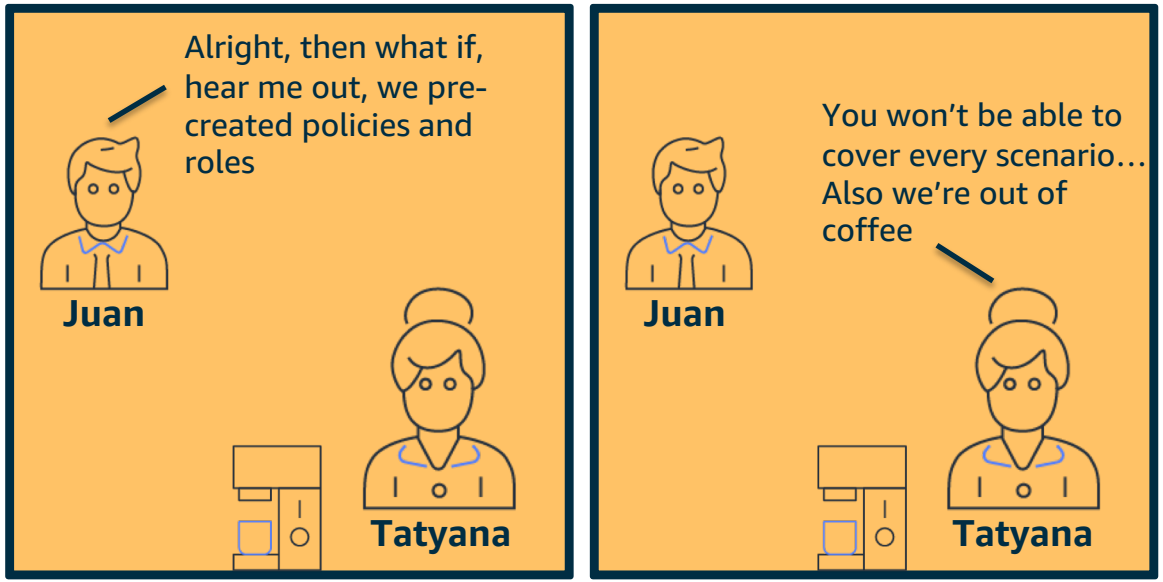
Two viewpoints – the problem



Two viewpoints – old solution 1



Two viewpoints – old solution 2



Permission boundary basics

Before and After Permission Boundaries

Before

- Certain IAM policy actions (e.g. PutUserPolicy, AttachRolePolicy) are essentially full admin-like permissions.
- Doing any form of self-service permissions management was non-trivial.

Now

- Administrator can grant full admin-like permissions, but specify a "permissions boundary."
- Allow developers to create principals for their applications and attach policies, but only within the boundary.

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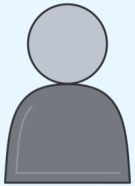
Permission Boundaries – mechanism

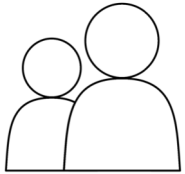
Admins



Create delegated admins

Admins create delegated admins with permissions such that users and roles created must have a permission boundary

Delegated admins



Create “bound” user & roles

Delegated admins create users and roles that have permission boundaries attached

“Bound” IAM users and roles

Permission boundary restricts the users and roles

Delegated admins attach the IAM roles to resources (or use the IAM user)

Restricted resources

Resource permissions restricted

Effective permissions of resources like Lambda functions are limited by permission boundary

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A condition

```
"Condition": {"StringEquals":
    {"iam:PermissionsBoundary":
    "arn:aws:iam::ACCOUNT_ID:policy/permissionboundary"
    }
}
```

A condition applied to principal creation actions (users and roles)

```
"Effect": "Allow",
"Action": ["iam:CreateRole"],
"Resource": ["arn:aws:iam::ACCOUNT_ID:role/path/"],
"Condition": {"StringEquals":
    {"iam:PermissionsBoundary":
    "arn:aws:iam::ACCOUNT_ID:policy/permissionboundary"
    }
}
```

Mechanism

Developer creates a role for a Lambda function

 # Step 1: Create role

```
$ aws iam create-role –role-name roleforlambda
–assume-role-policy-document file://Role_Trust_Policy_Text.json
–permissions-boundary arn:aws:iam::<ACCOUNT_NUMBER>:policy/department_a/boundary_1
```

 # Step 2: Create policy

```
No change
```

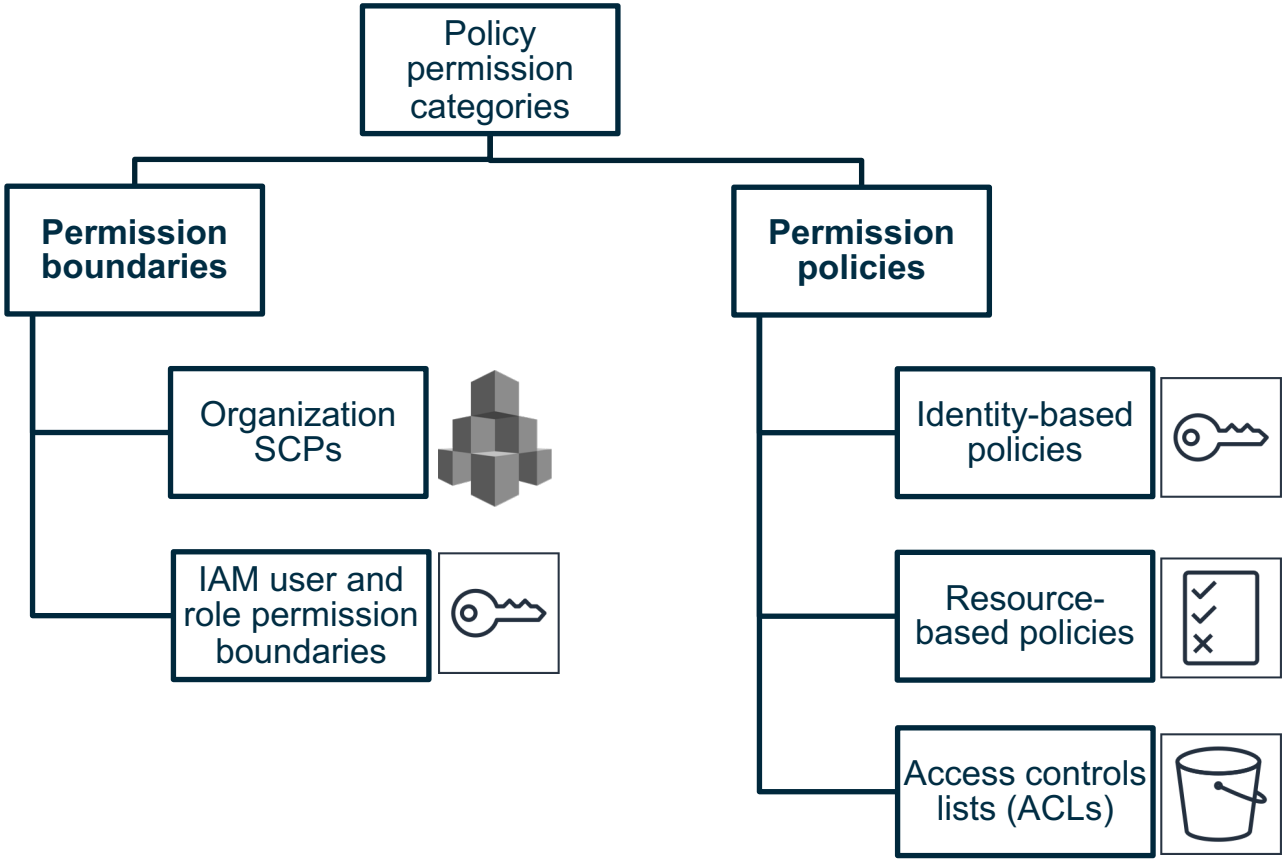
 # Step 3: Attach policy

```
No change
```

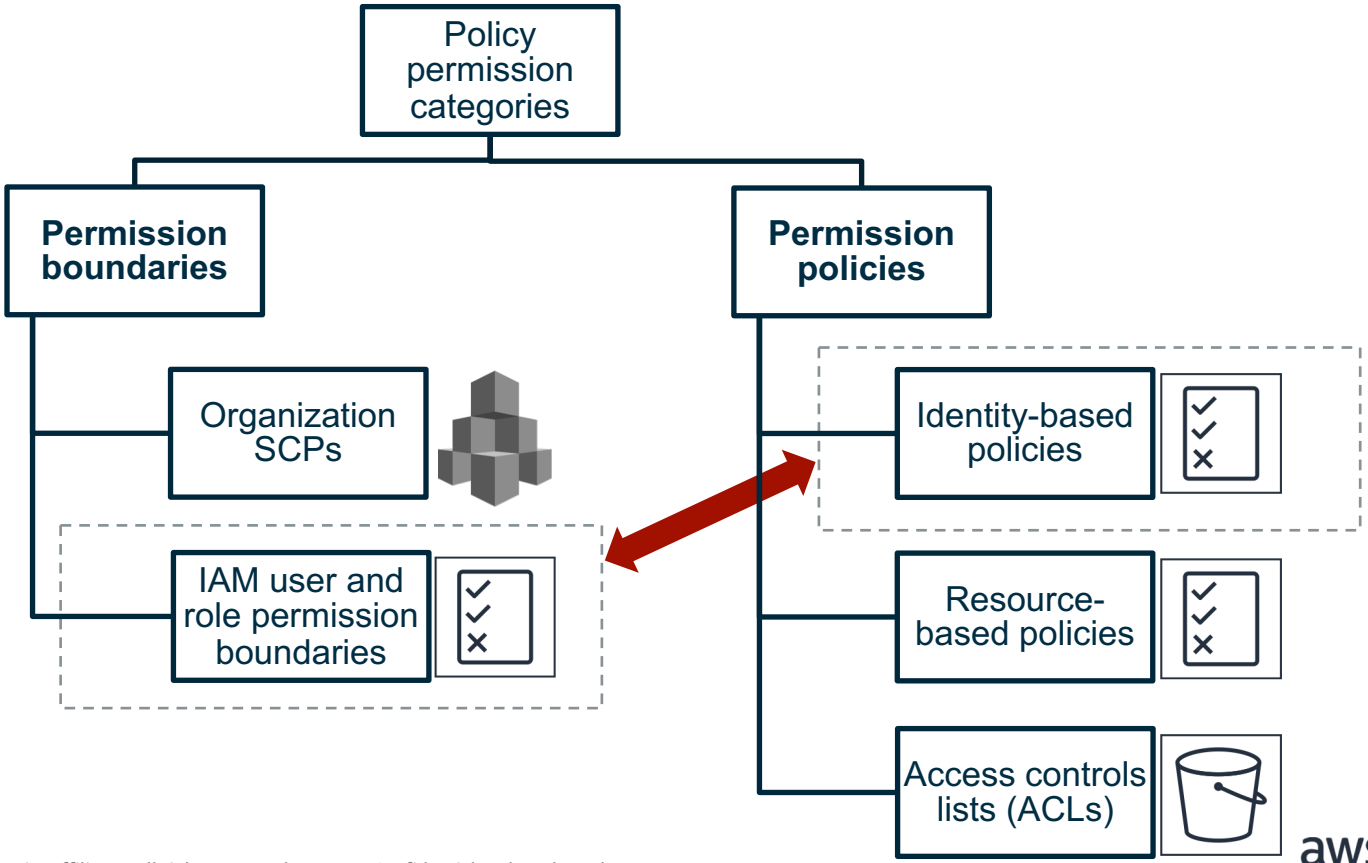
Demo

Policy categories

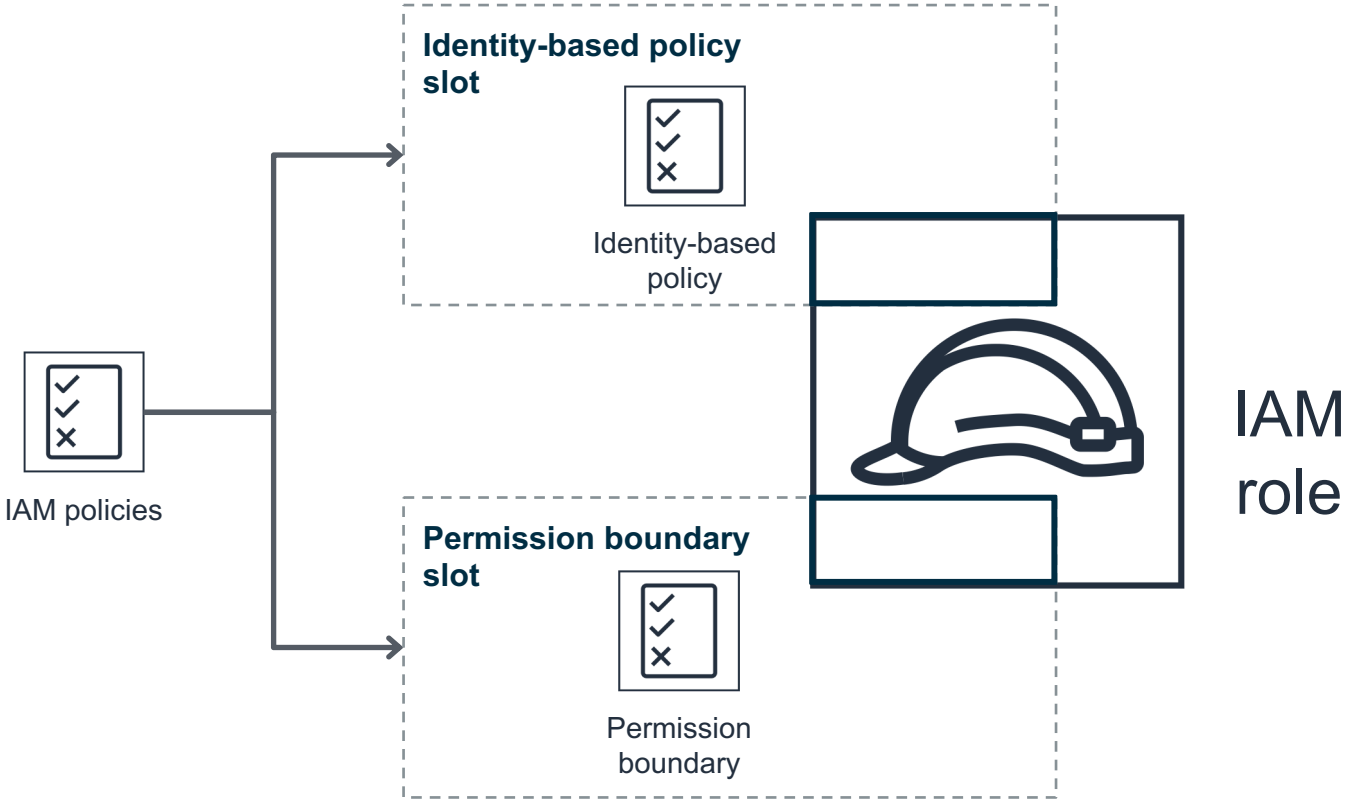
Policy permission categories



Are these two things the same?



But, it’s just an IAM policy right?



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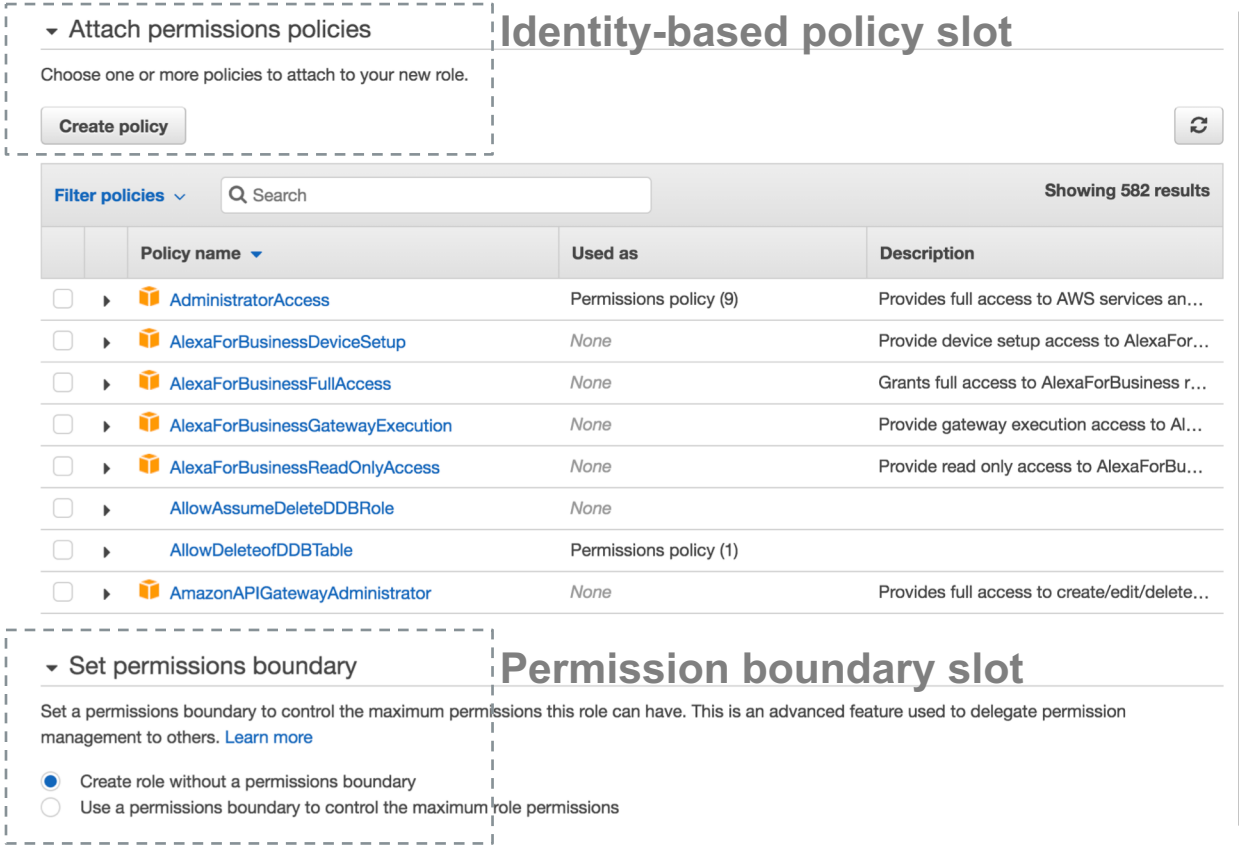
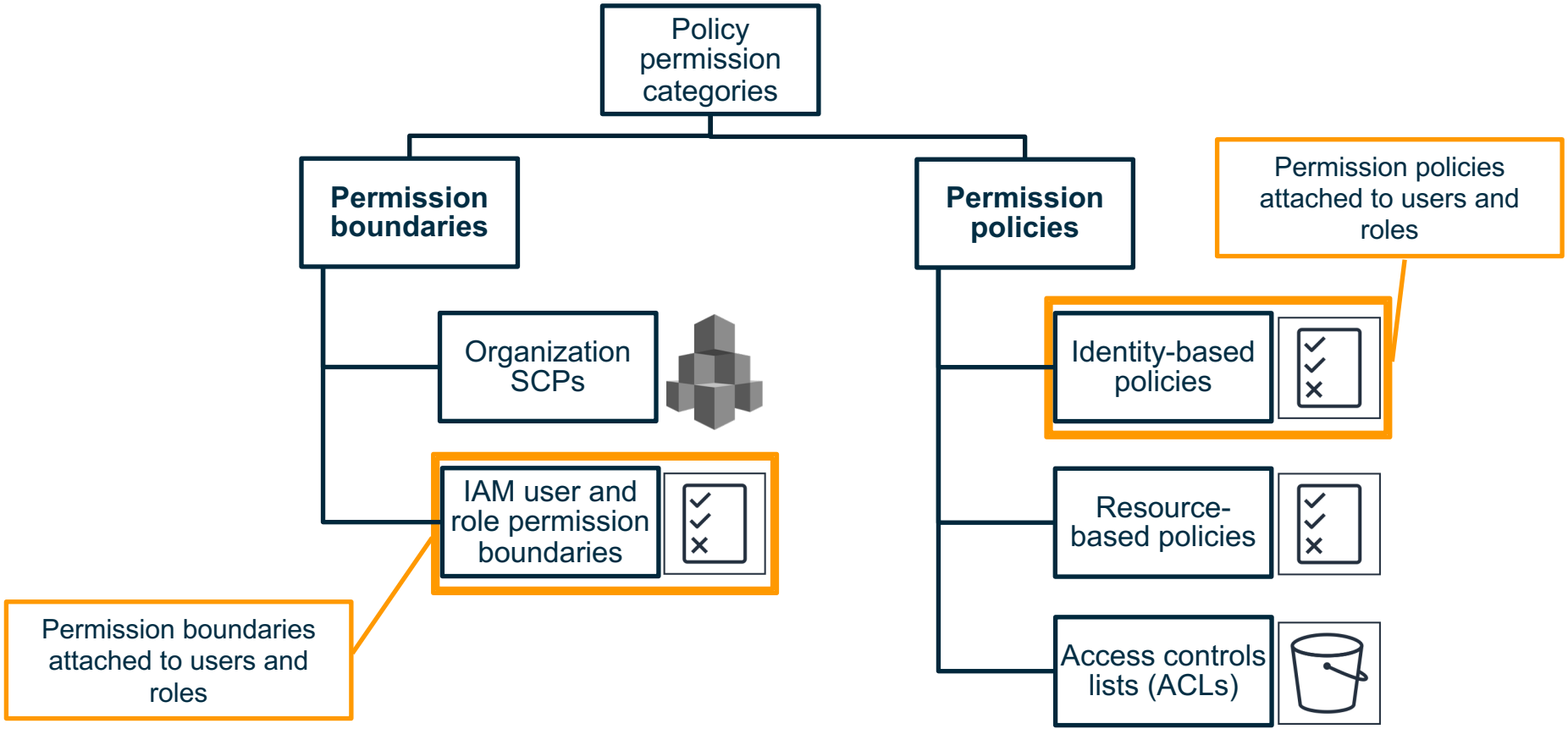


Permission boundary mechanism

Policy permission categories



Everything after authentication

1. **Authenticate** the principal

2. Determine which **policies** apply to the request

3. **Evaluate** the different policy types that apply which affect the order in which they are evaluated.

4. **Allow or Deny** the request

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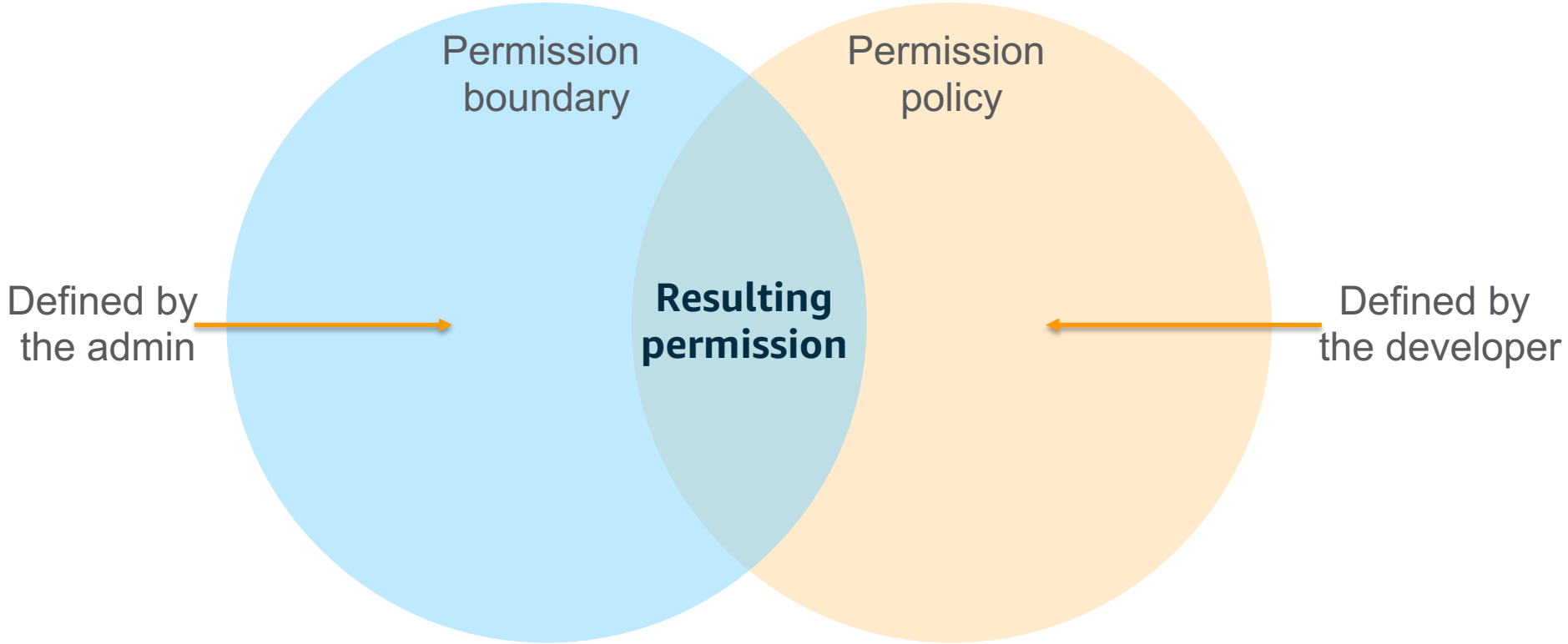
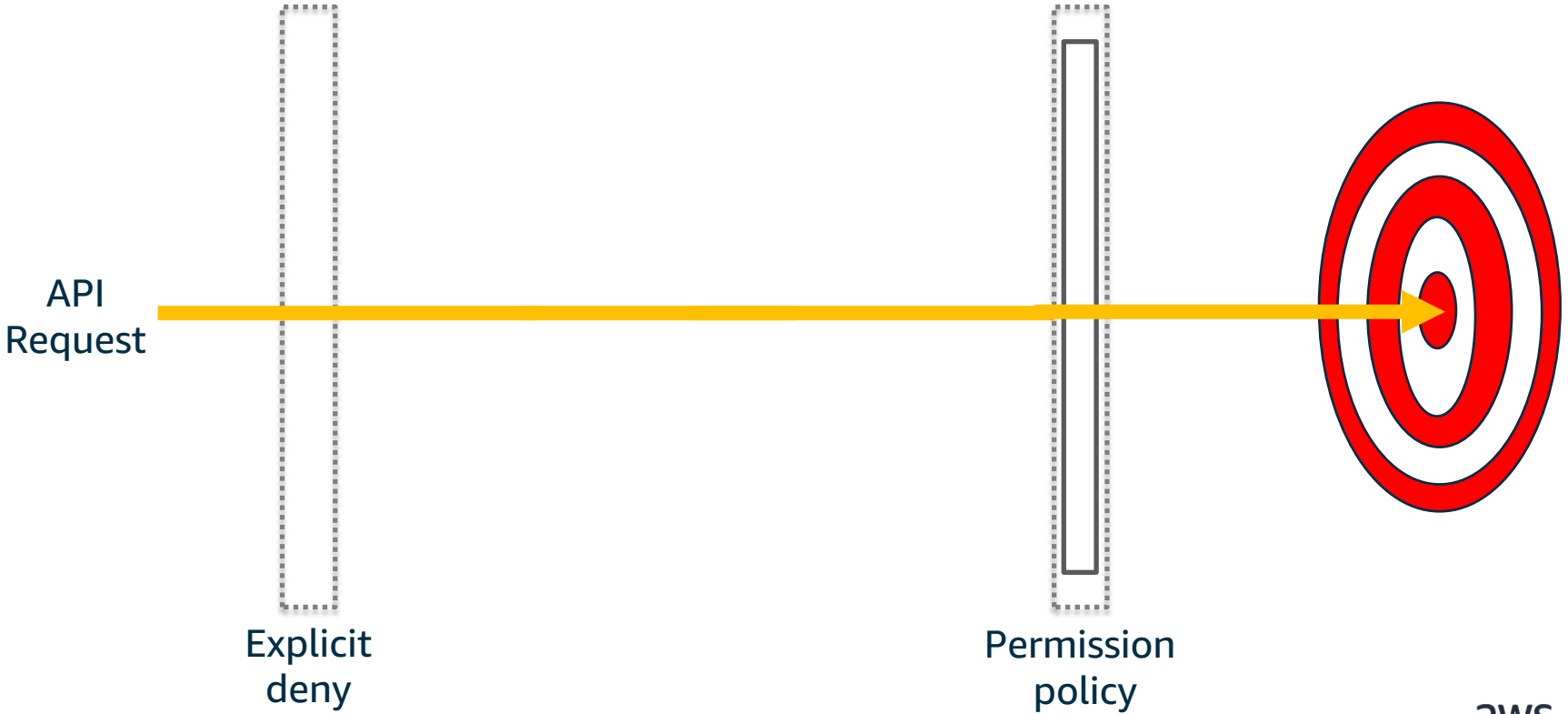
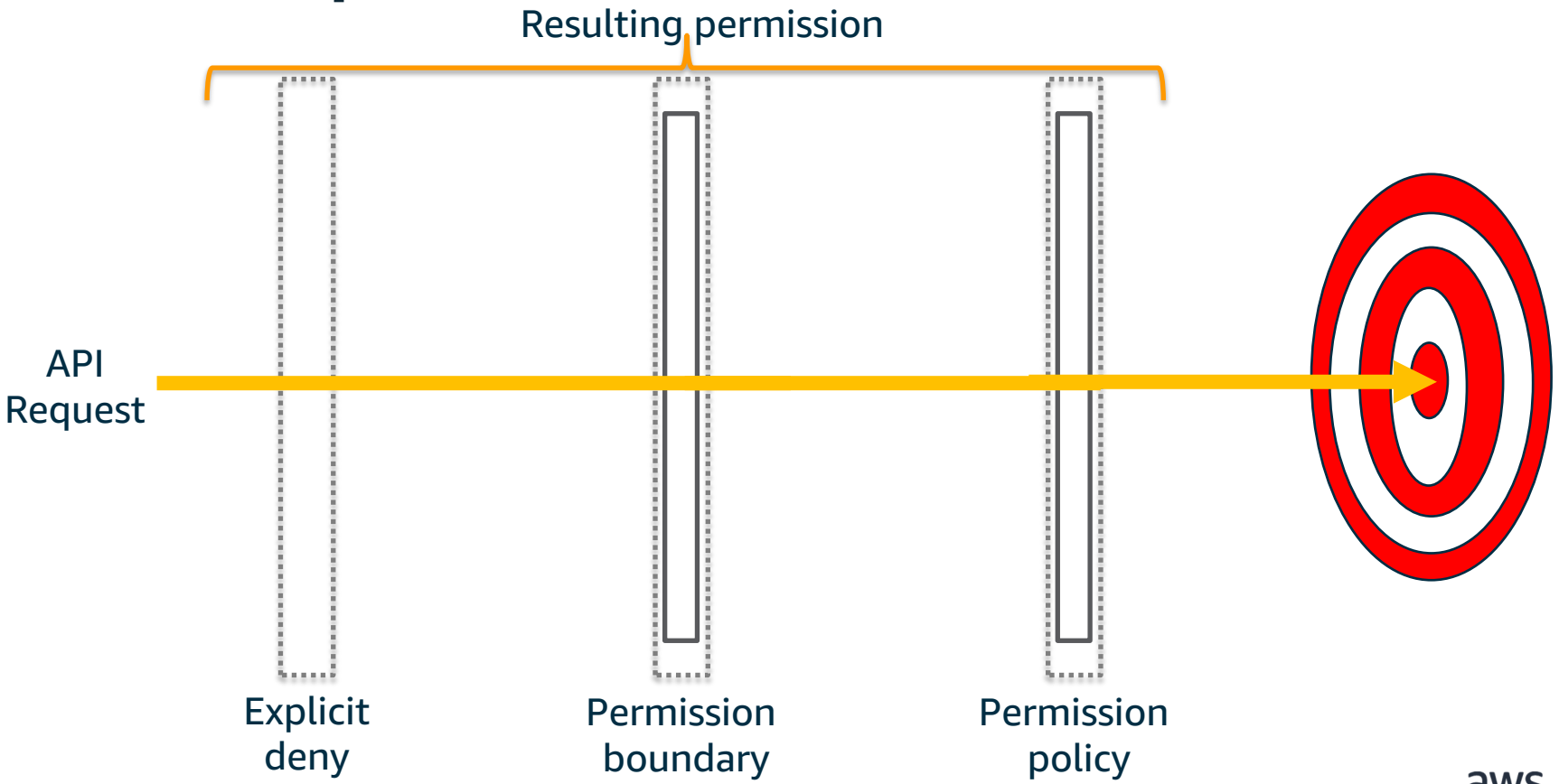
Effective Permissions - intersection



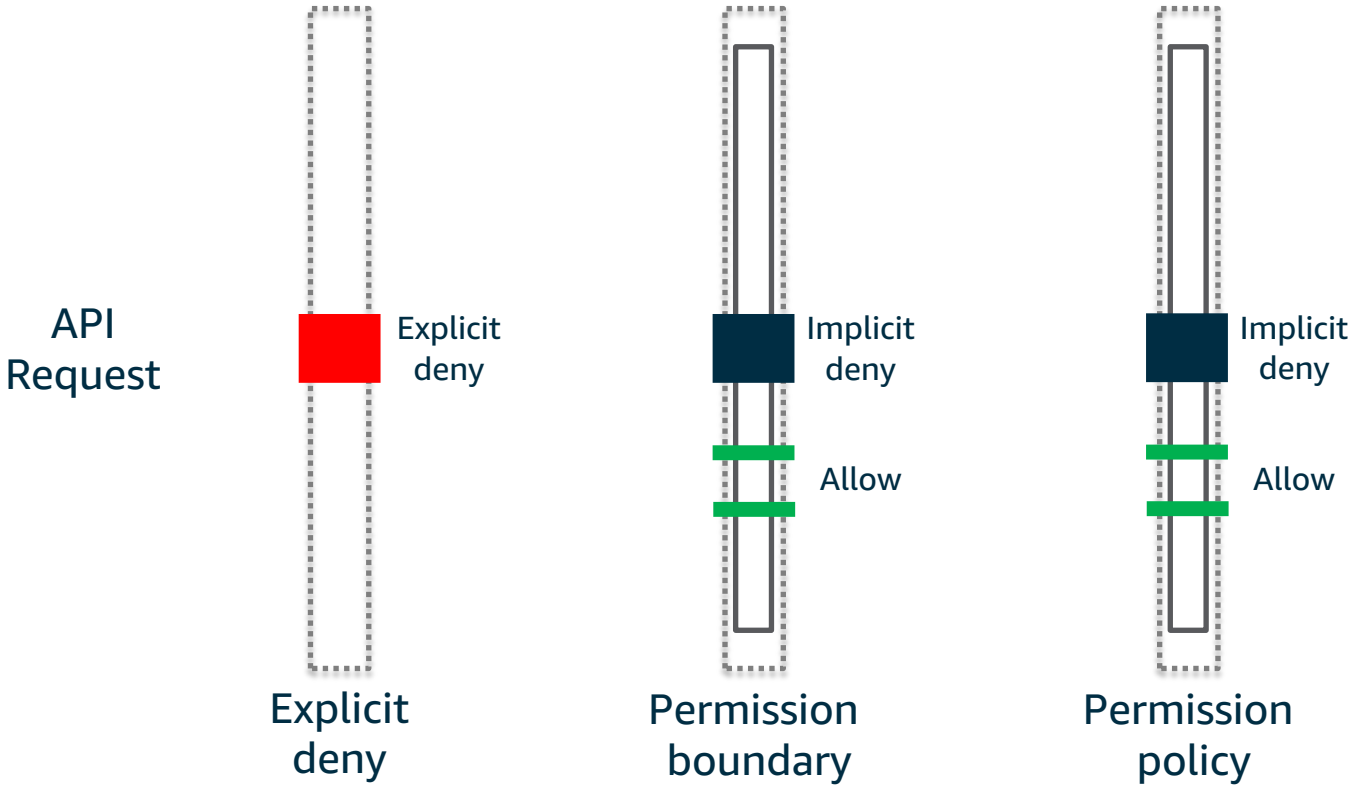
Effective permissions – mechanism



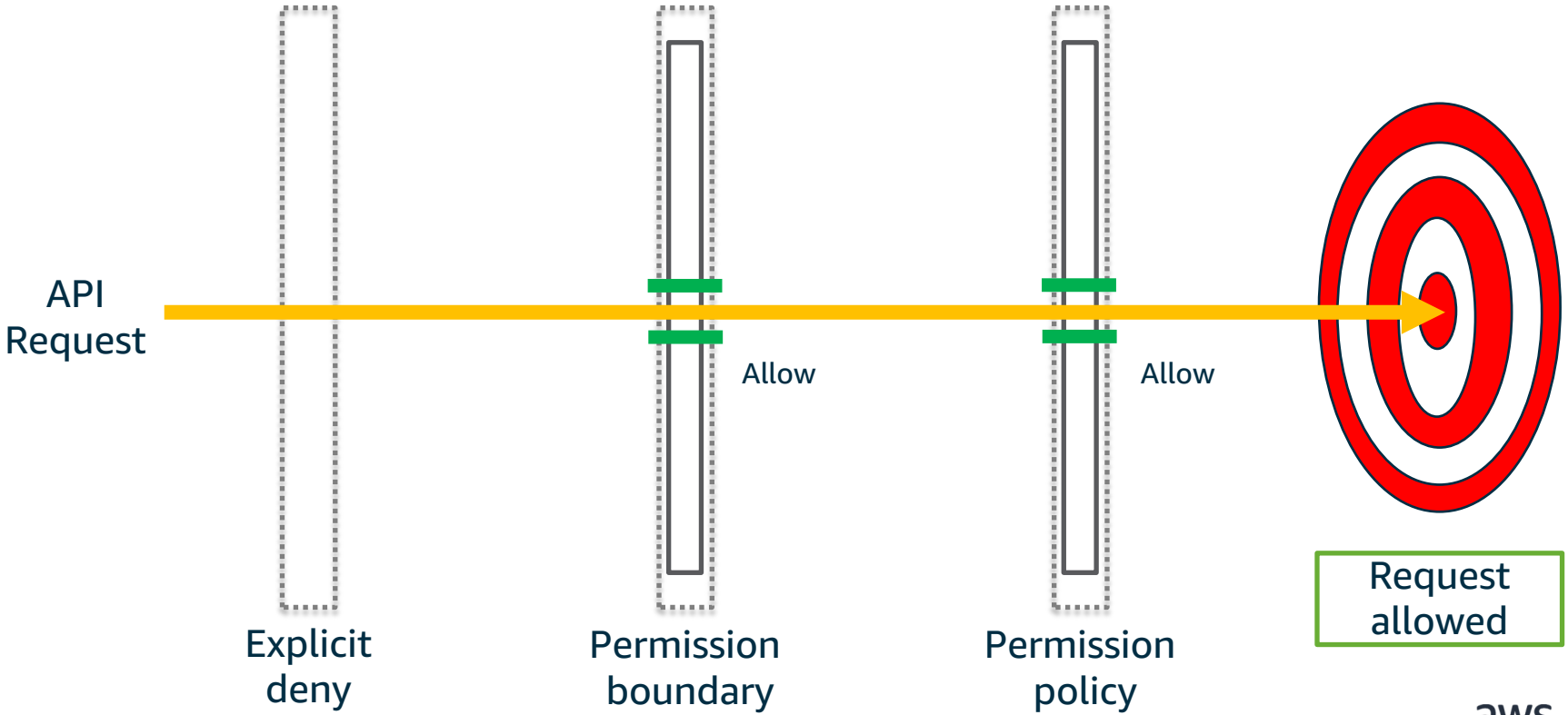
Effective permissions – mechanism



Effective permissions – mechanism



Effective permissions – allow example



Effective permissions – scenario 1

Request: s3:GetObject / bucket name: example1

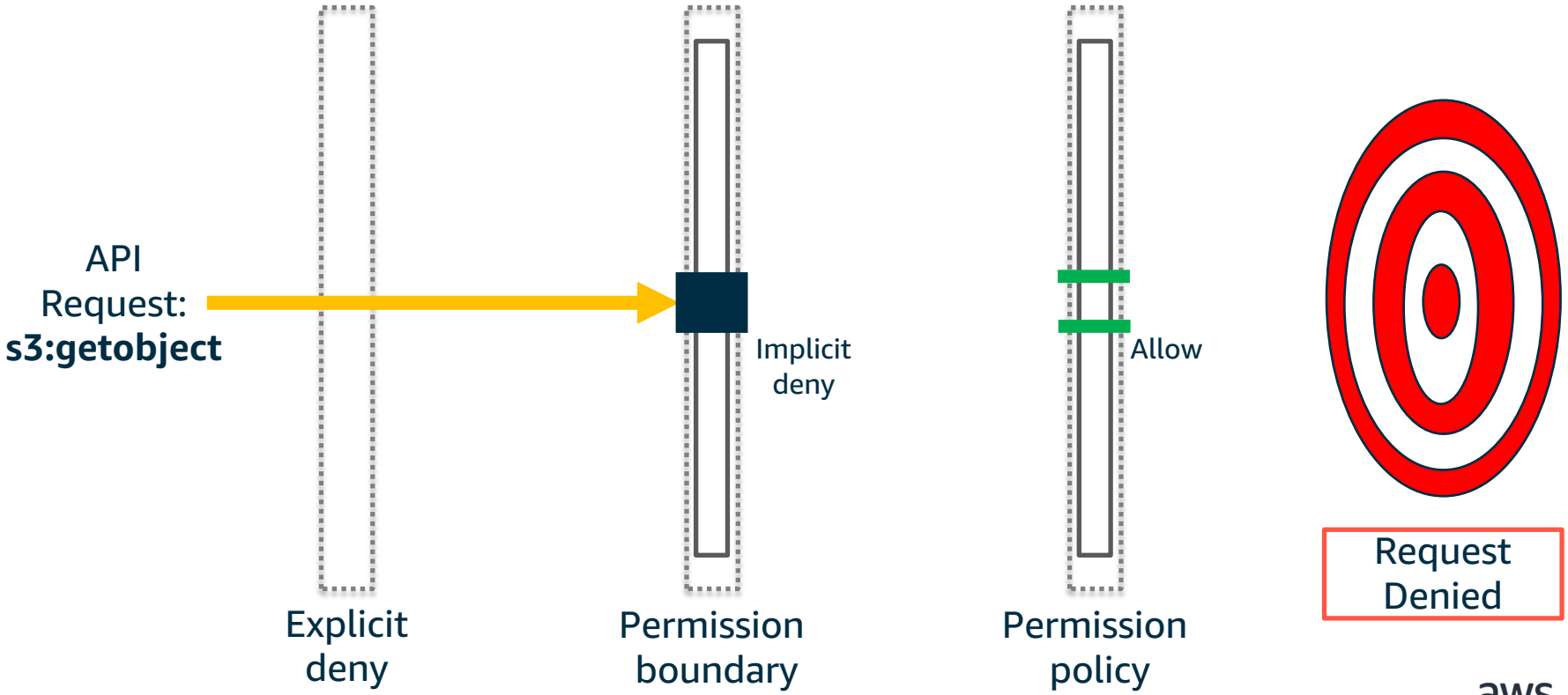
Permission Boundary

```
{
  "Version": "2012-10-17",
  "Statement": [
     {
       "Effect": "Allow",
       "Action": [
         "logs:CreateLogGroup",
         "logs:CreateLogStream”,
         "logs:PutLogEvents”
       ],
     "Resource": "arn:aws:logs:*:*:*"
     }
}
```

Permission Policy

```
{
  "Version": "2012-10-17",
  "Statement": [
     {
       "Effect": "Allow",
       "Action": [
         "logs:CreateLogGroup",
         "logs:CreateLogStream",
         "logs:PutLogEvents",
         "s3:*"
        ],
      "Resource": "*"
      }
   ]
}
```

Effective permissions – result



Effective permissions – scenario 2

Request: s3:GetObject / bucket name: example1

Permission Boundary

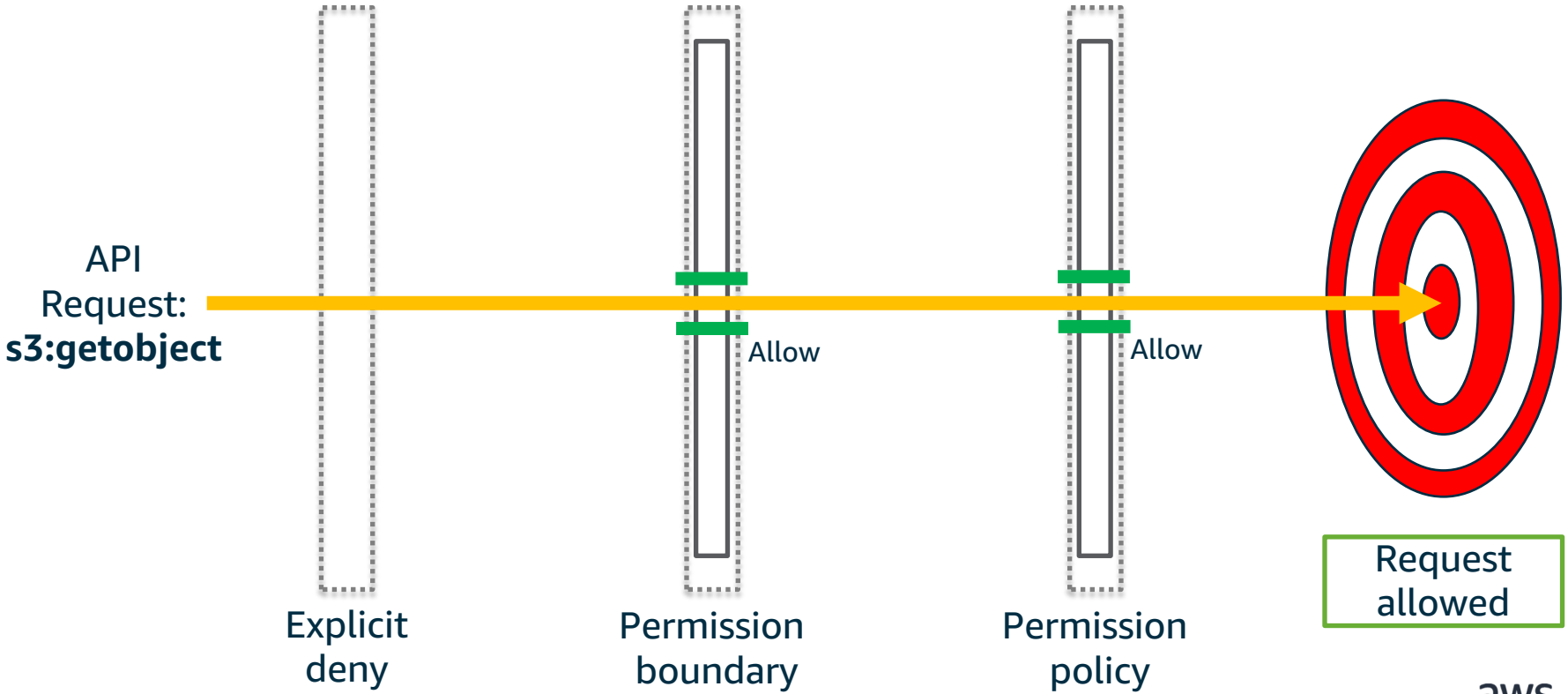
```
{
  "Version": "2012-10-17",
  "Statement": [
     {
       "Effect": "Allow",
       "Action": [
            "logs:CreateLogGroup",
            "logs:CreateLogStream”,
            "logs:PutLogEvents”
       ],
     "Resource": "arn:aws:logs:*:*:*"
     },
     {
      "Effect": "Allow",
      "Action": ["s3:GetObject"],
      "Resource”:"arn:aws:s3:::example1/*"
     }
}
```

Permission Policy

```
{
  "Version": "2012-10-17",
  "Statement": [
     {
       "Effect": "Allow",
       "Action": [
            "logs:CreateLogGroup",
            "logs:CreateLogStream",
            "logs:PutLogEvents",
            "s3:*"
        ],
      "Resource": "*"
      }
   ]
}
```


aws

Effective permissions – result



Effective permissions – scenario 3

Request: s3:GetObject / bucket name: example1

Permission Boundary

```
{
  "Version": "2012-10-17",
  "Statement": [
     {
       "Effect": "Allow",
       "Action": [
            "logs:CreateLogGroup",
            "logs:CreateLogStream”,
            "logs:PutLogEvents”
       ],
     "Resource": "arn:aws:logs:*:*:*"
     },
     {
      "Effect": "Allow",
      "Action": ["s3:GetObject"],
      "Resource”:"arn:aws:s3:::example1/*"
     }
}
```

Permission Policy

```
{
  "Version": "2012-10-17",
  "Statement": [
     {
       "Effect": "Allow",
       "Action": [
            "logs:CreateLogGroup",
            "logs:CreateLogStream",
            "logs:PutLogEvents",
        ],
      "Resource": "*"
      }
   ]
}
```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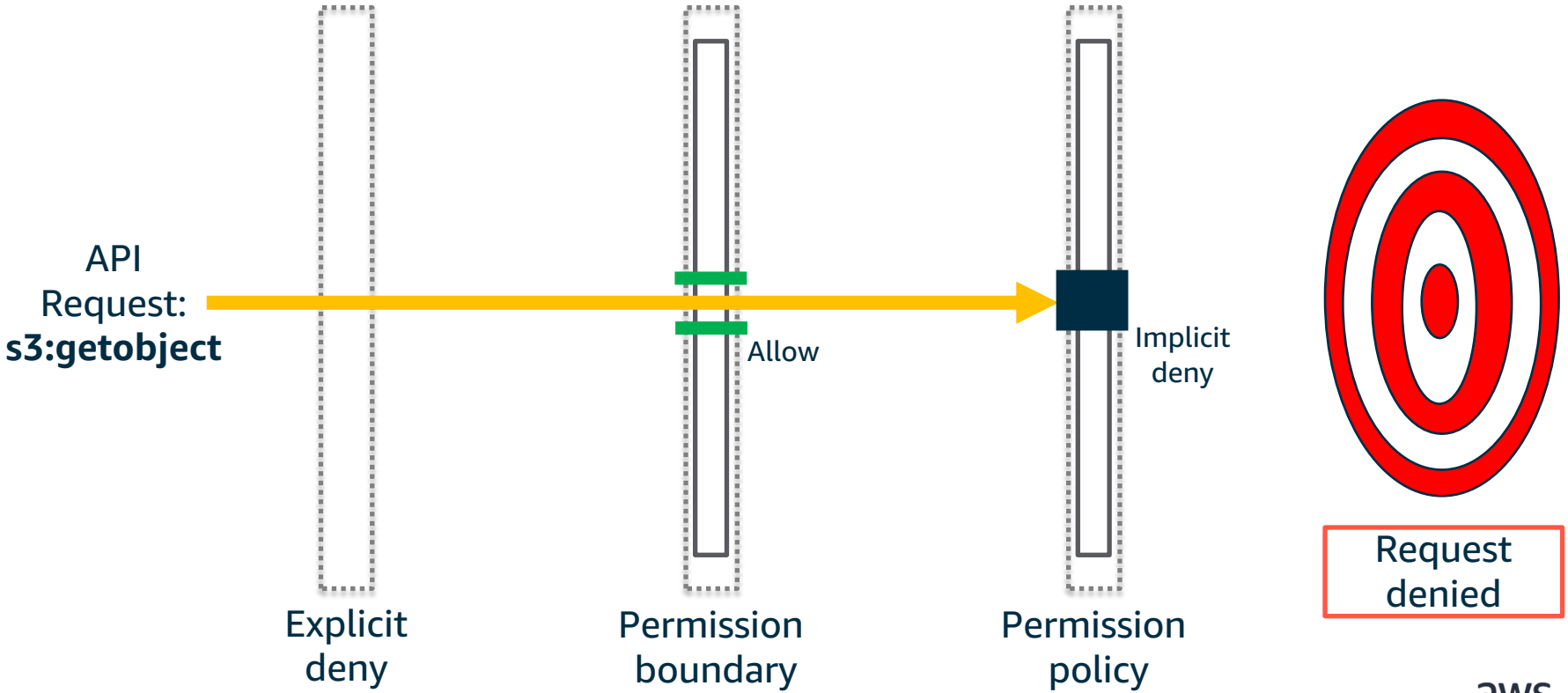
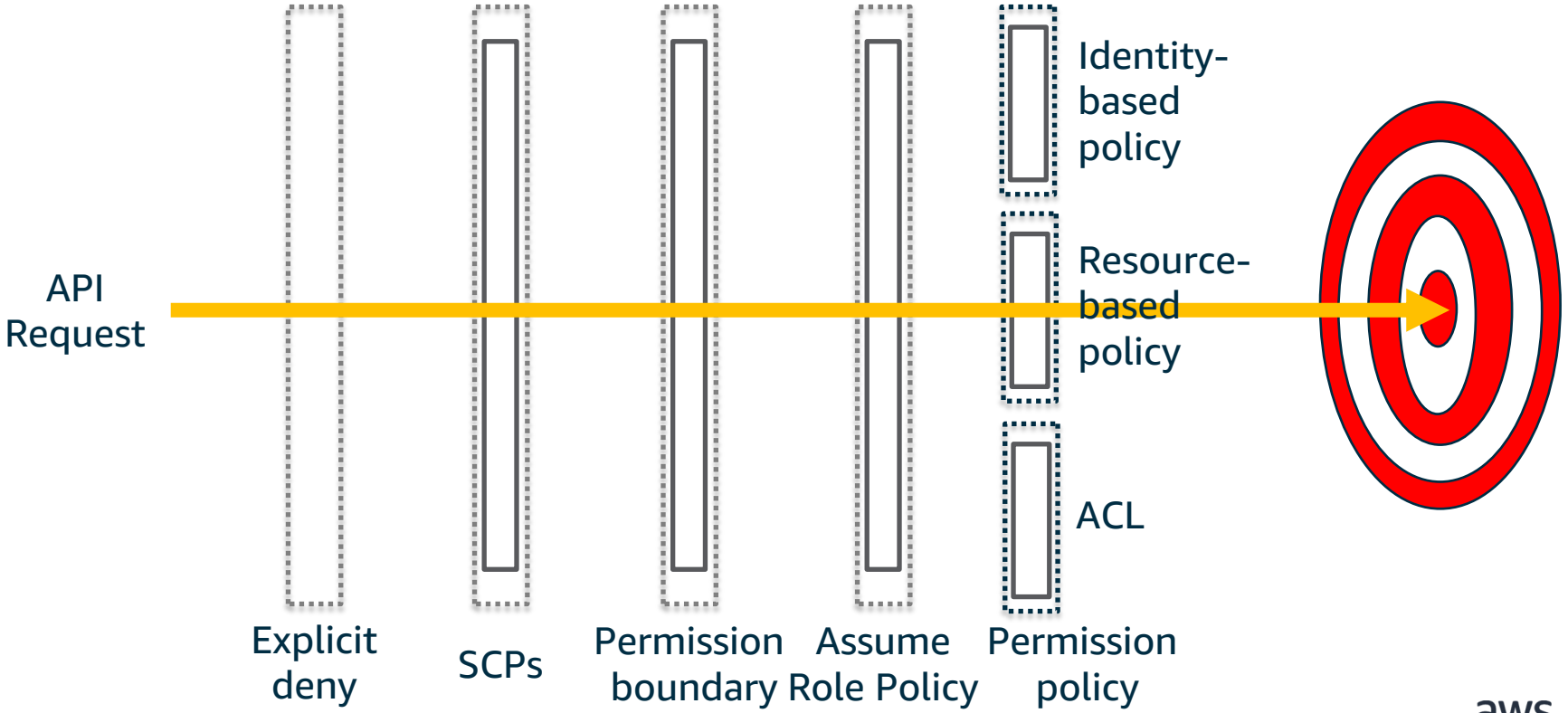
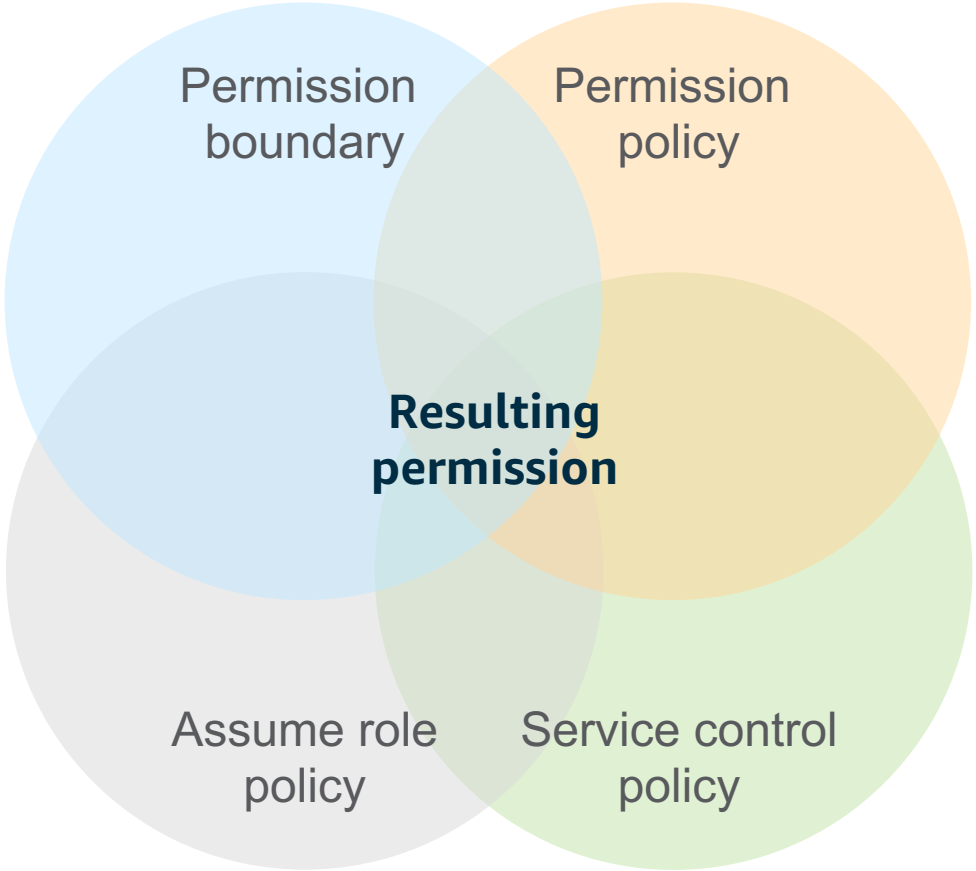
Effective permissions – result



Effective permissions – mechanism expanded



Effective Permissions – intersection expanded



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Resource Restrictions

Goal: carve out a space for the delegated admins to be able to modify resources without impacting other resources.

Paths are preferred by request the CLI. Naming (name*) can also be used.

https://docs.aws.amazon.com/general/latest/gr/aws-arns-and-namespaces.html#arns-paths

https://docs.aws.amazon.com/IAM/latest/UserGuide/reference_identifiers.html#identifiers-arns

Resource Restrictions

- We are granting admin-like permissions (create and delete policies and roles)
- Permission boundary is one part of the delegation
- The other part is restricting the policies and roles they can impact then they could

```
"Effect": "Allow",
"Action": [
        "iam:CreatePolicy",
        "iam:DeletePolicy",
        "iam:CreatePolicyVersion",
        "iam:DeletePolicyVersion",
        "iam:SetDefaultPolicyVersion"
        ],
"Resource": "*"
```

Resource Restrictions - examples

Resource restriction using paths:
arn:aws:iam::123456789012:role**/department1/***
Example role: arn:aws:iam::123456789012:role**/department1/role1**

Resource restriction using names:
arn:aws:iam::123456789012:policy**/development-users***
Example policy: arn:aws:iam::123456789012:policy**/development-users-policy1**

Resource Restrictions - policies

- Examine permissions assigned to a delegated admin to create policies
- If there is not a resource restriction then the delegated admins could modify any customer managed policies

```
"Effect": "Allow",
"Action": [
        "iam:CreatePolicy",
        "iam:DeletePolicy",
        "iam:CreatePolicyVersion",
        "iam:DeletePolicyVersion",
        "iam:SetDefaultPolicyVersion"
        ],
"Resource": "*"
```

vs

```
"Effect": "Allow",
"Action": [
        "iam:CreatePolicy",
        "iam:DeletePolicy",
        "iam:CreatePolicyVersion",
        "iam:DeletePolicyVersion",
        "iam:SetDefaultPolicyVersion"
        ],
"Resource":
"arn:aws:iam::ACCOUNT_ID:policy/path/name*"
```


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Resource Restrictions - roles

- Just like with policies we want to carve out a safe space for roles.
- Permission boundaries play a part here, but not all actions support the condition
- In addition different teams could be using the same permission boundaries

```
"Effect": "Allow",
"Action": [
        "iam:UpdateRole",
        "iam:DeleteRole"
        ],
"Resource": "*"
```

vs

```
"Effect": "Allow",
"Action": [
        "iam:UpdateRole",
        "iam:DeleteRole"
        ],
"Resource":
"arn:aws:iam::ACCOUNT_ID:role/path/name*"
```

Presentation Q & A

Presentation Q & A

- **How does a permission boundary differ from a standard IAM policy?**
- **What would happen if we delegated permissions without resource restrictions?**
- **The scenario where you have user in an account that need to be able to create IAM polices, roles and Lambda functions is common. How was this situation handled before permission boundaries came along?**

Final Q & A

Final Q & A

- What is the fundamental mechanism of permission boundaries?
- Why do we not allow the web admins to attach any role to the Lambda functions?
- There are two ways of doing resource restrictions (naming and pathing.) Which option allows you to create policies using both the AWS Console and CLI?
- Can an IAM policy be used as both a permission boundary and a permission policy? Is this a good practice?
- Is there an advantage to using one over the other?