Identity Round Robin Workshop

Permission Boundaries

AWS Pop-up Loft

Greg McConnel

Solutions Architect
Amazon Web Services (AWS)

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Agenda

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

- Workshop
- Final Q & A

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

What are permission boundaries?

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

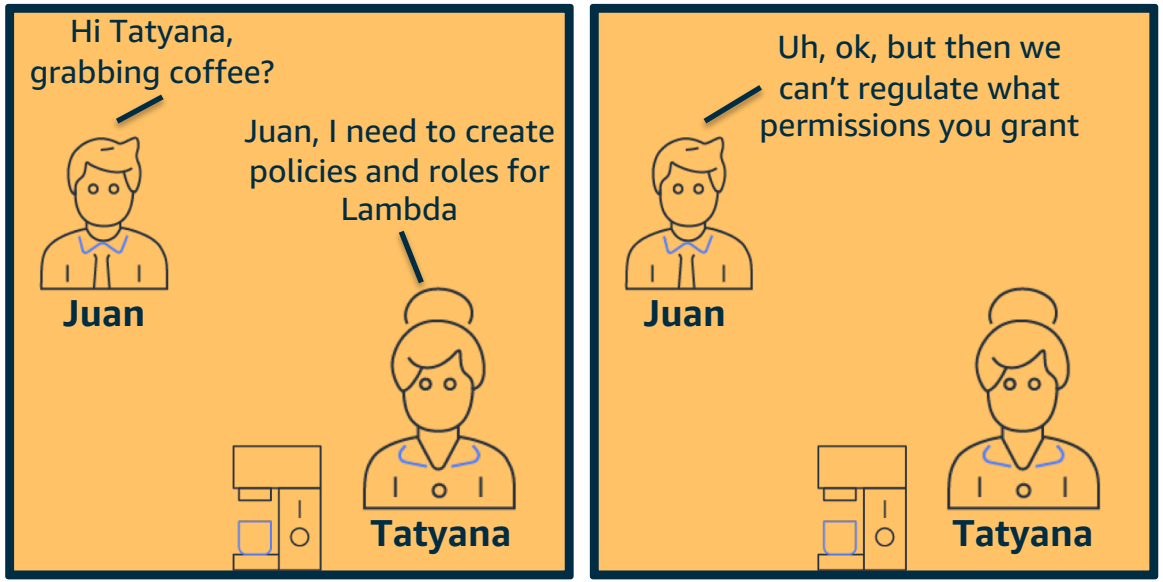
© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

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?

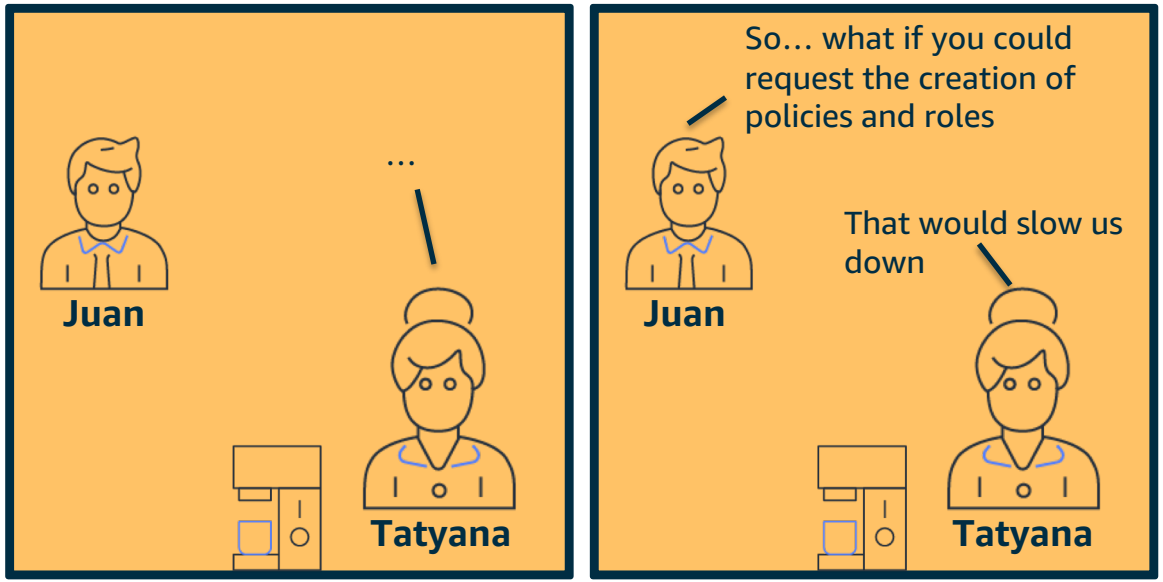
© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Two viewpoints – the problem



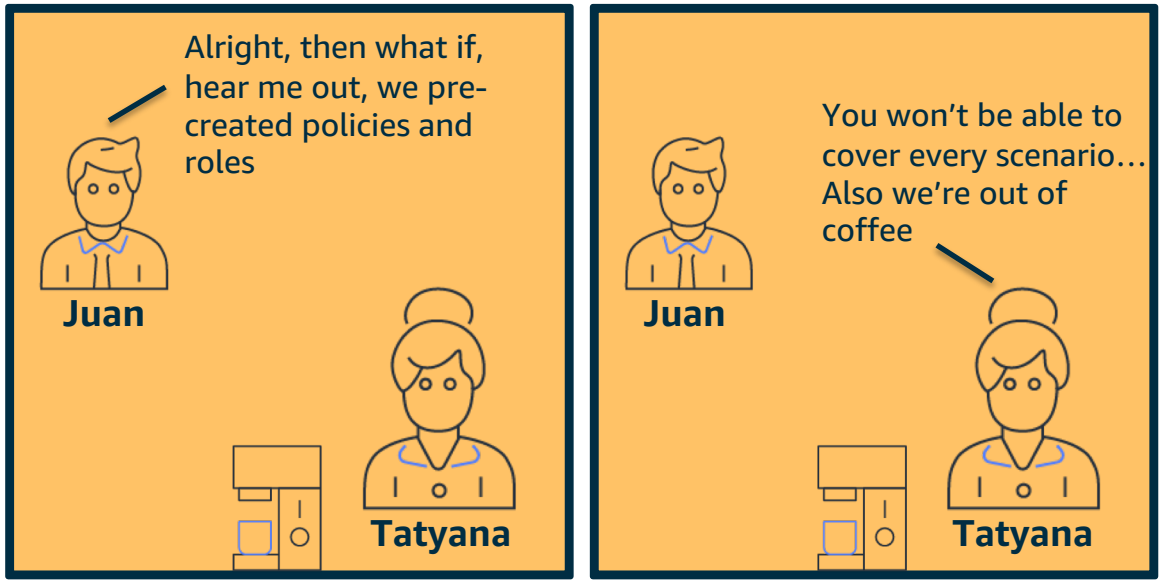
© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Two viewpoints – old solution 1



© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Two viewpoints – old solution 2



© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Permission boundary basics

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

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

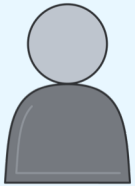
- Administrator can grant full admin-like permissions, but specify a "permissions boundary."
- Allow developers to create principals for their applications and attach policies, but only within the boundary.

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

aws

Permission Boundaries – mechanism

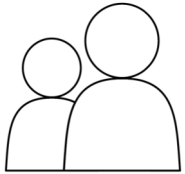
Admins



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

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

aws

A condition

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

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

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"
    }
}
```

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

aws

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

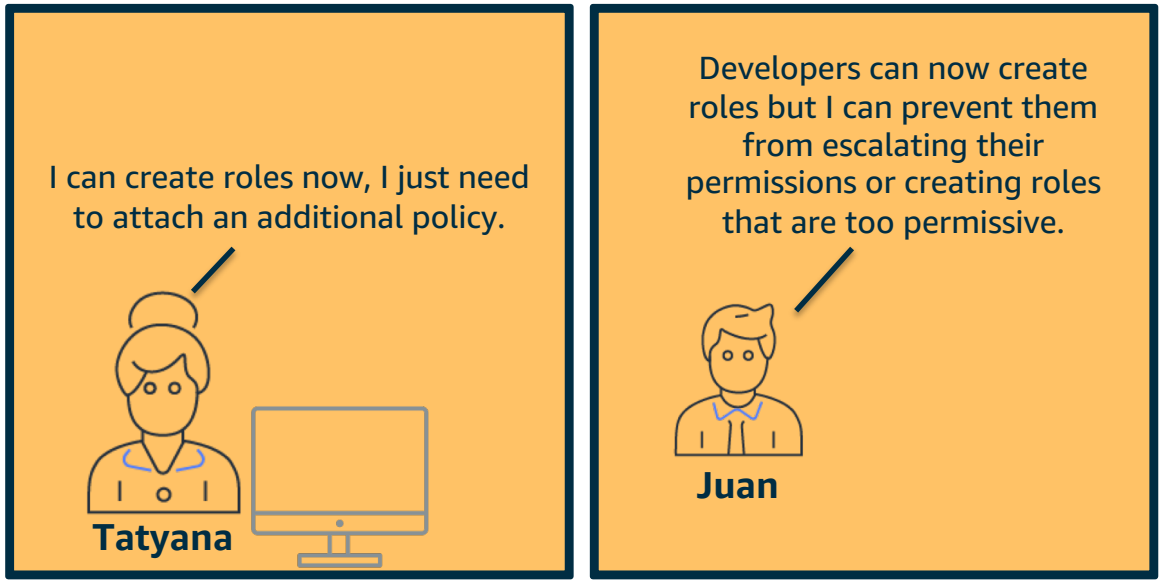
```
No change
```

 # Step 3: Attach policy

```
No change
```

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Two viewpoints – the new solution

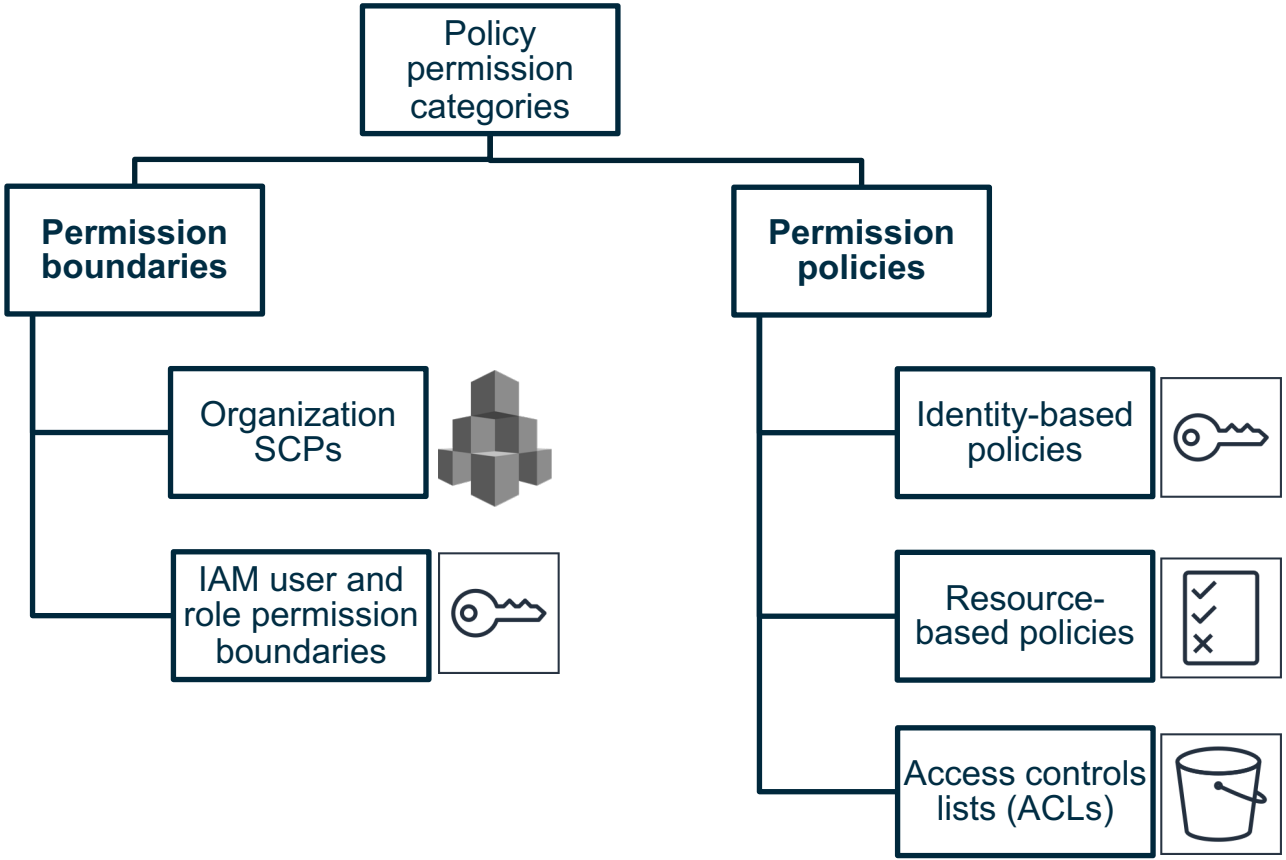


© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Policy categories

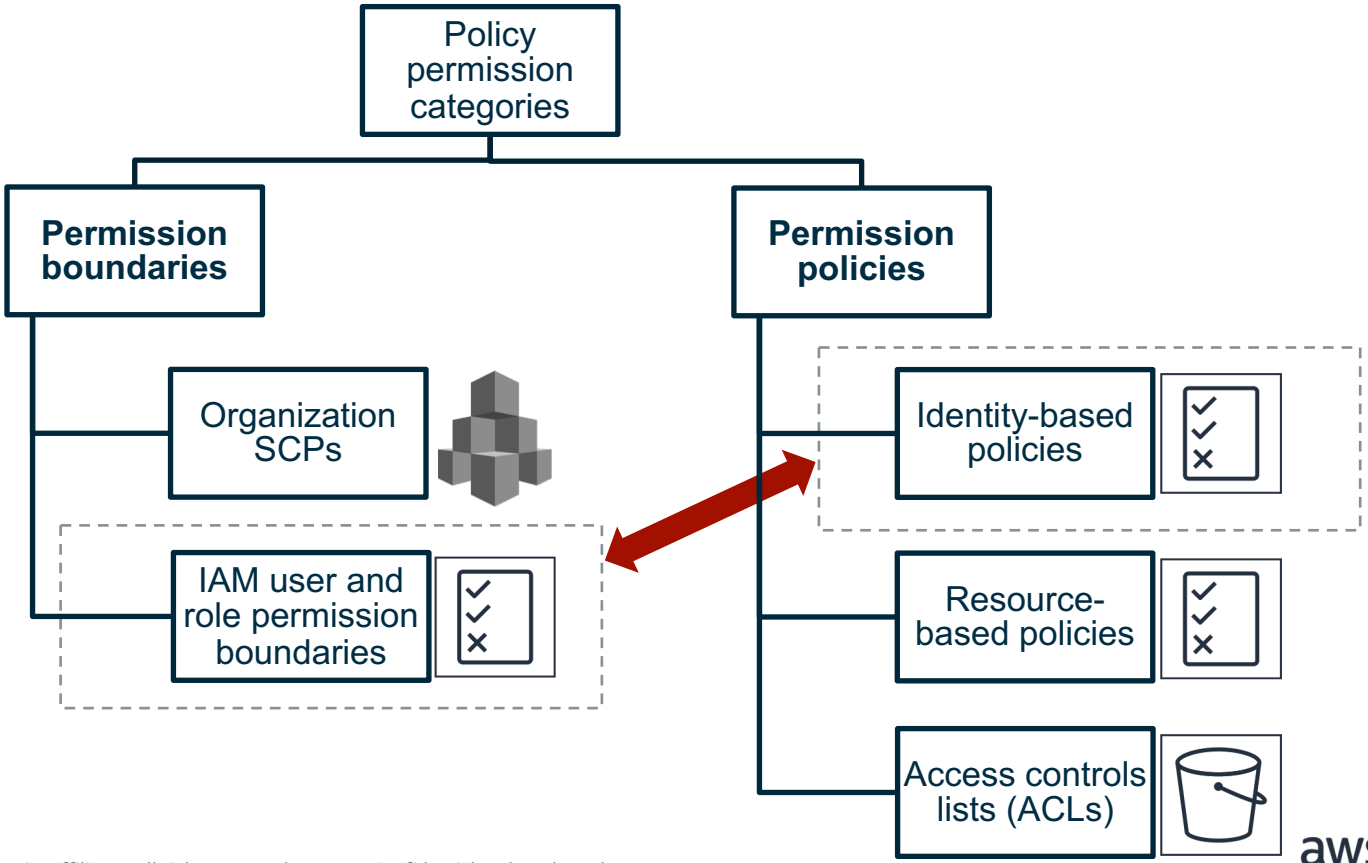
© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Policy permission categories



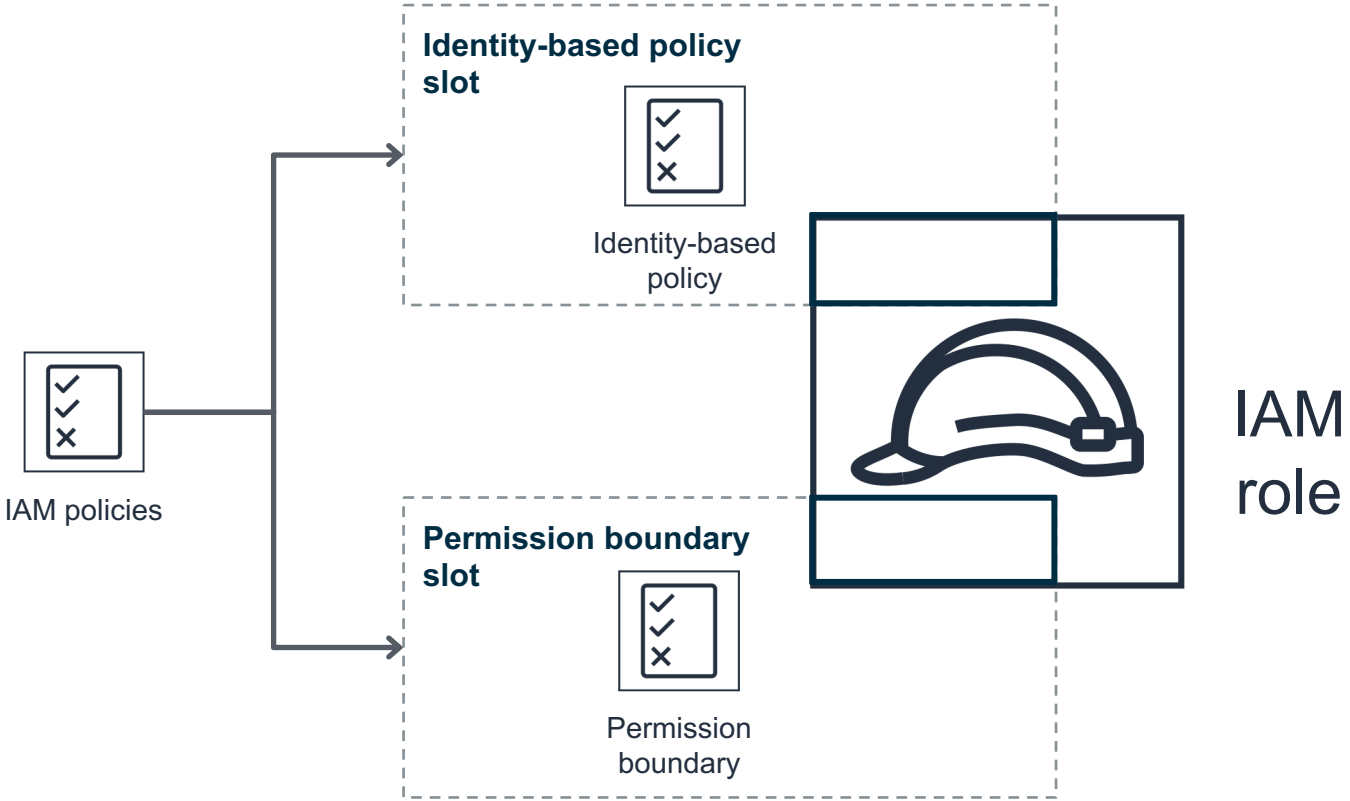
© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Policy permission categories



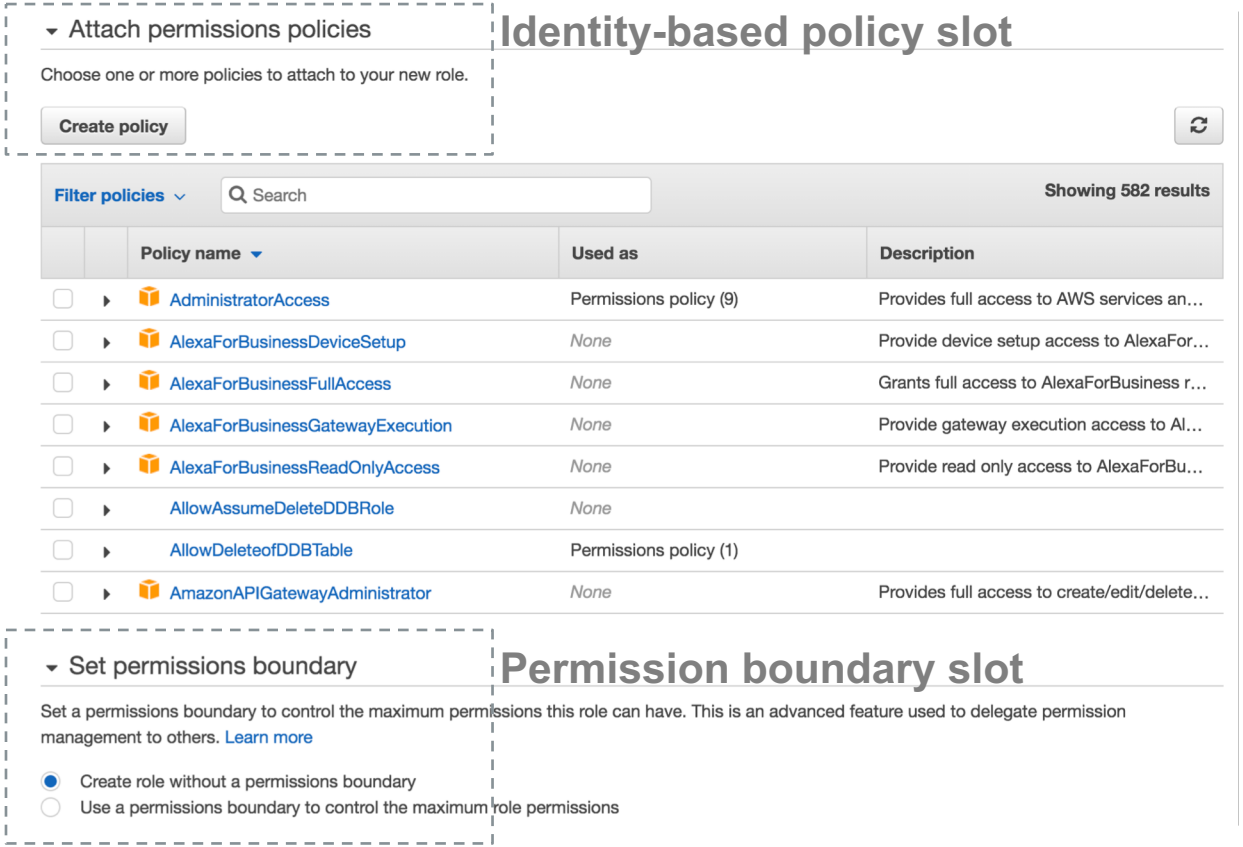
© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

But, it’s just an IAM policy right?



© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

But, it's just an IAM policy right?

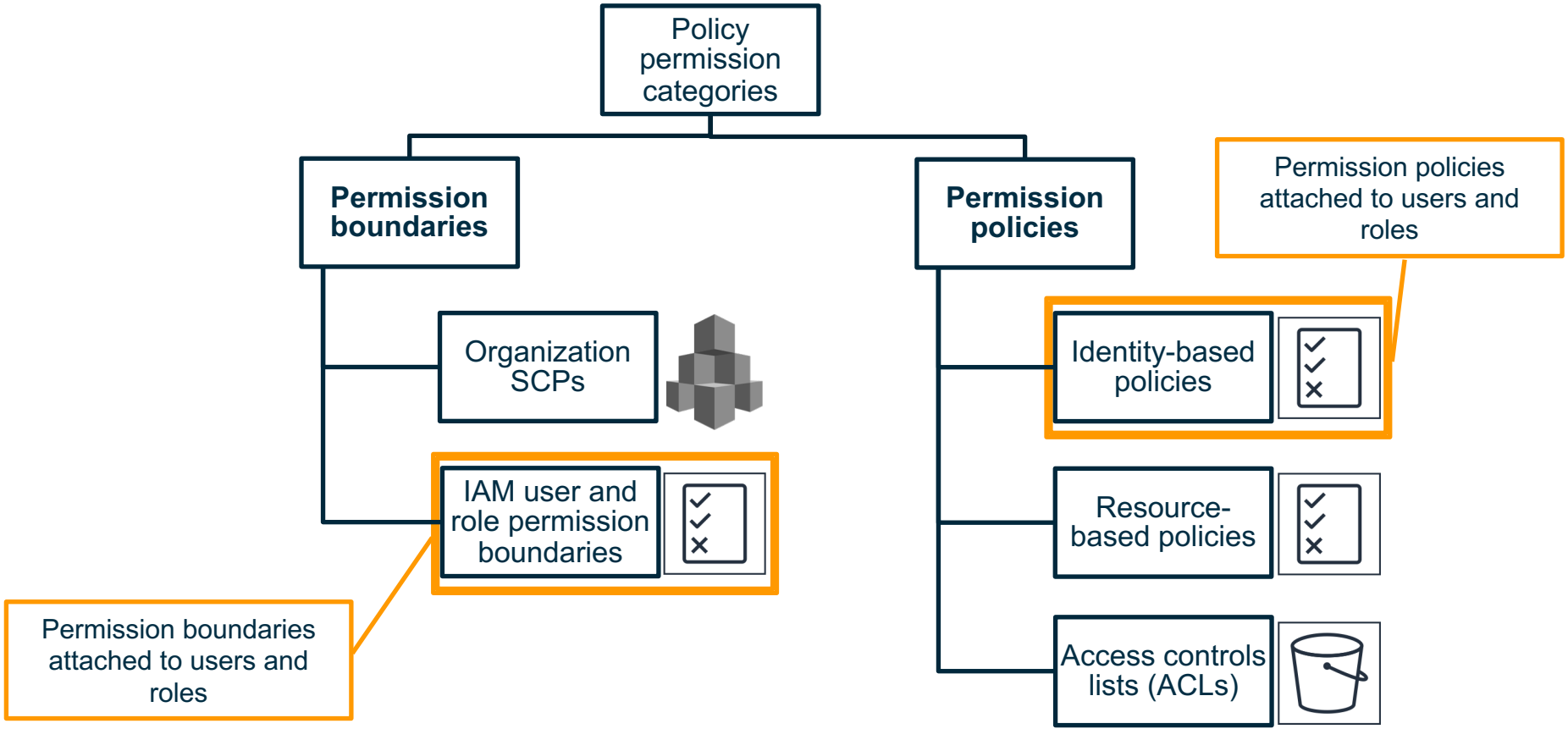


© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Permission boundary mechanism

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Policy permission categories



© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Everything after authentication

1. **Authenticate** the principal

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

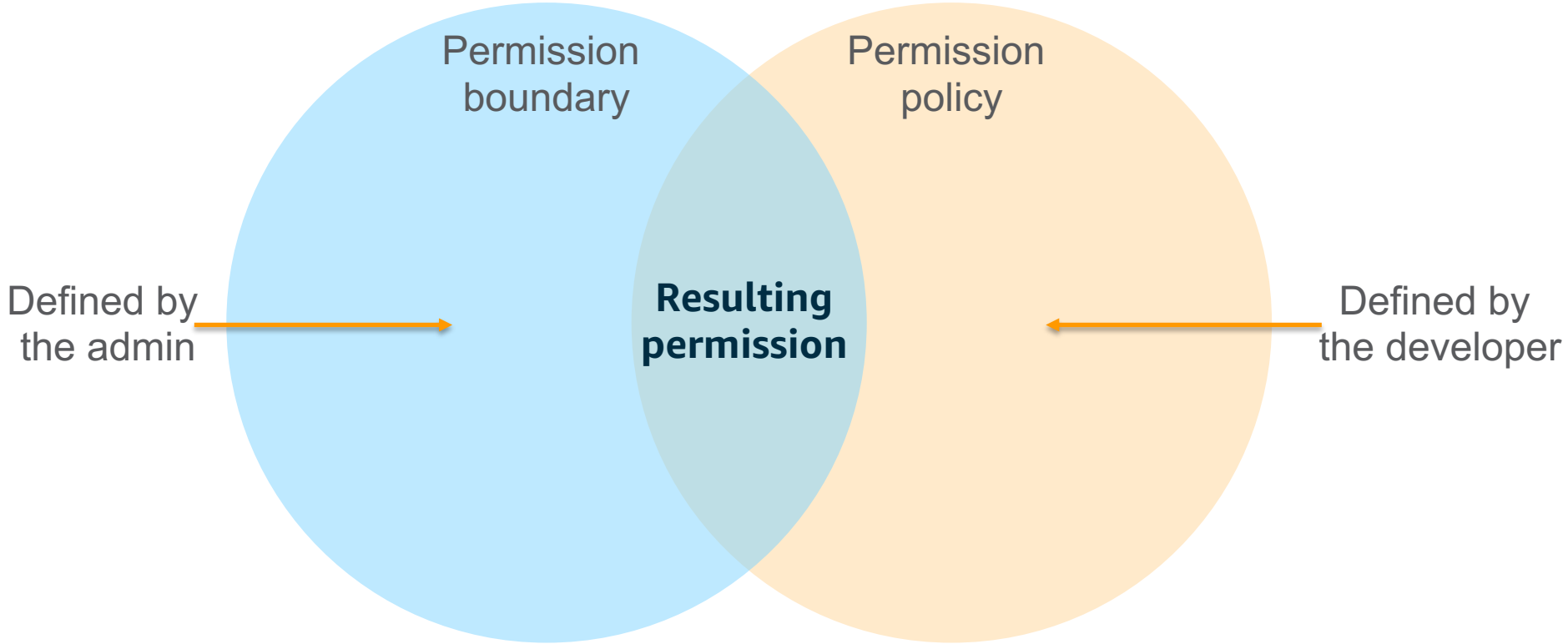
3. **Evaluate** the different policy types that apply which affect the order in which they are evaluated.

4. **Allow or Deny** the request

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

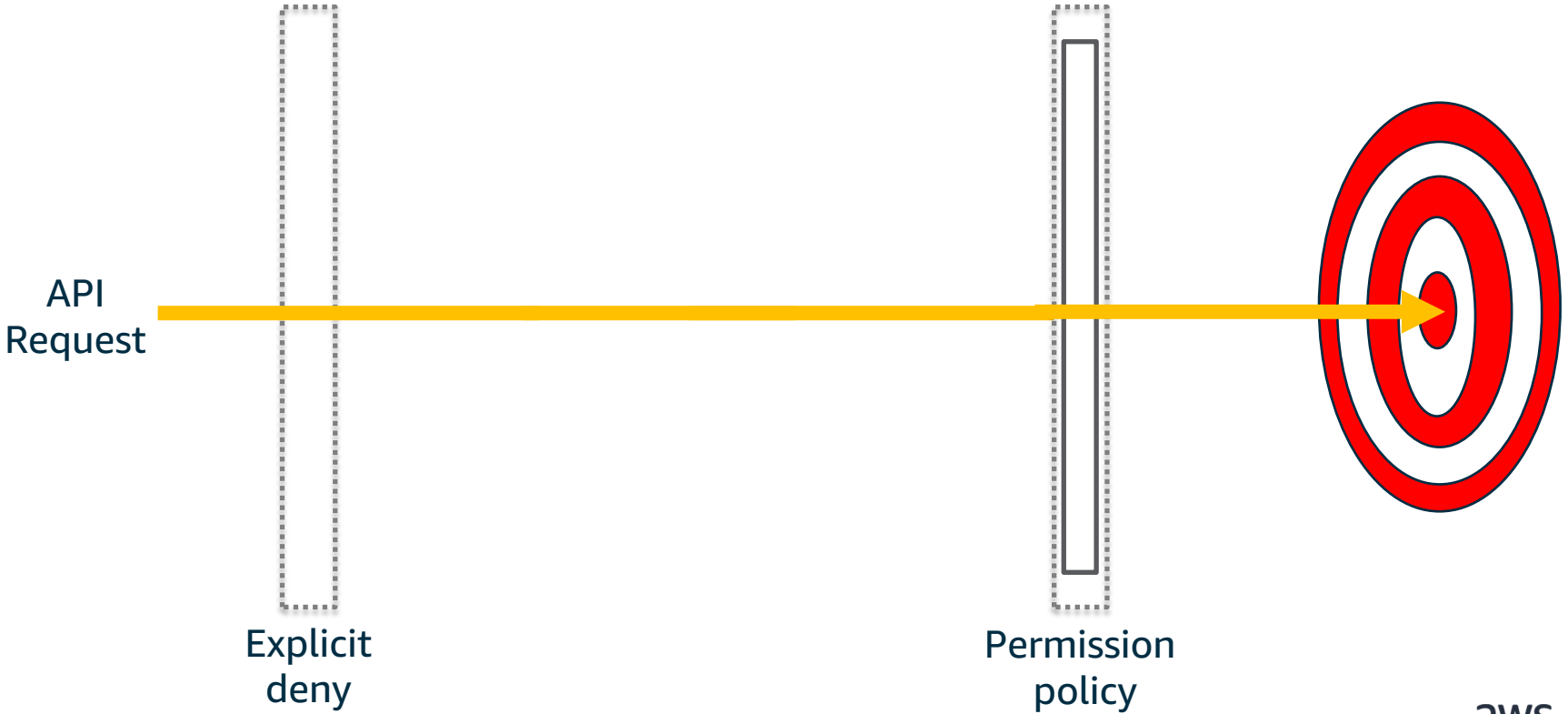
aws

Effective Permissions - intersection



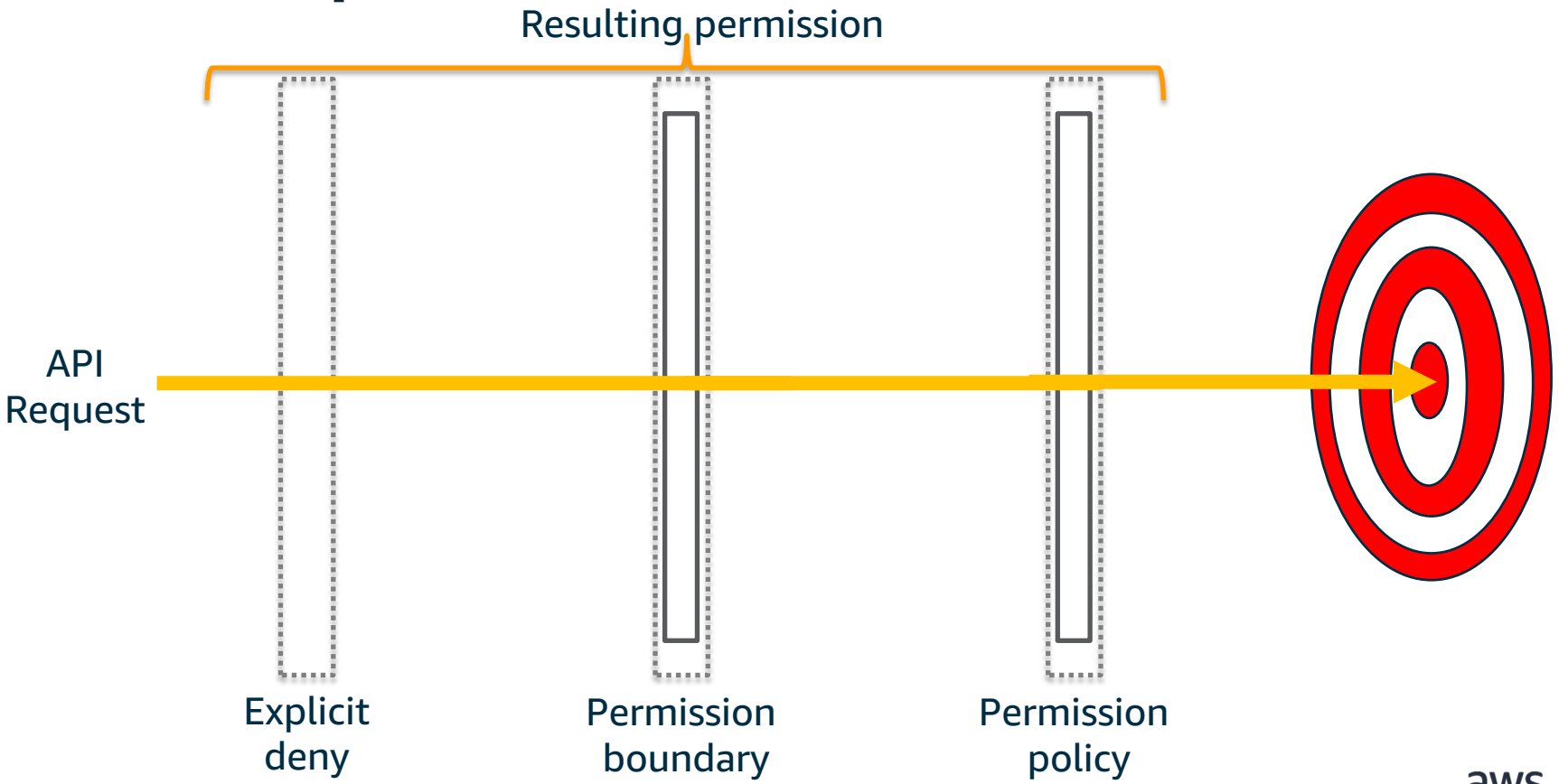
© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Effective permissions – mechanism



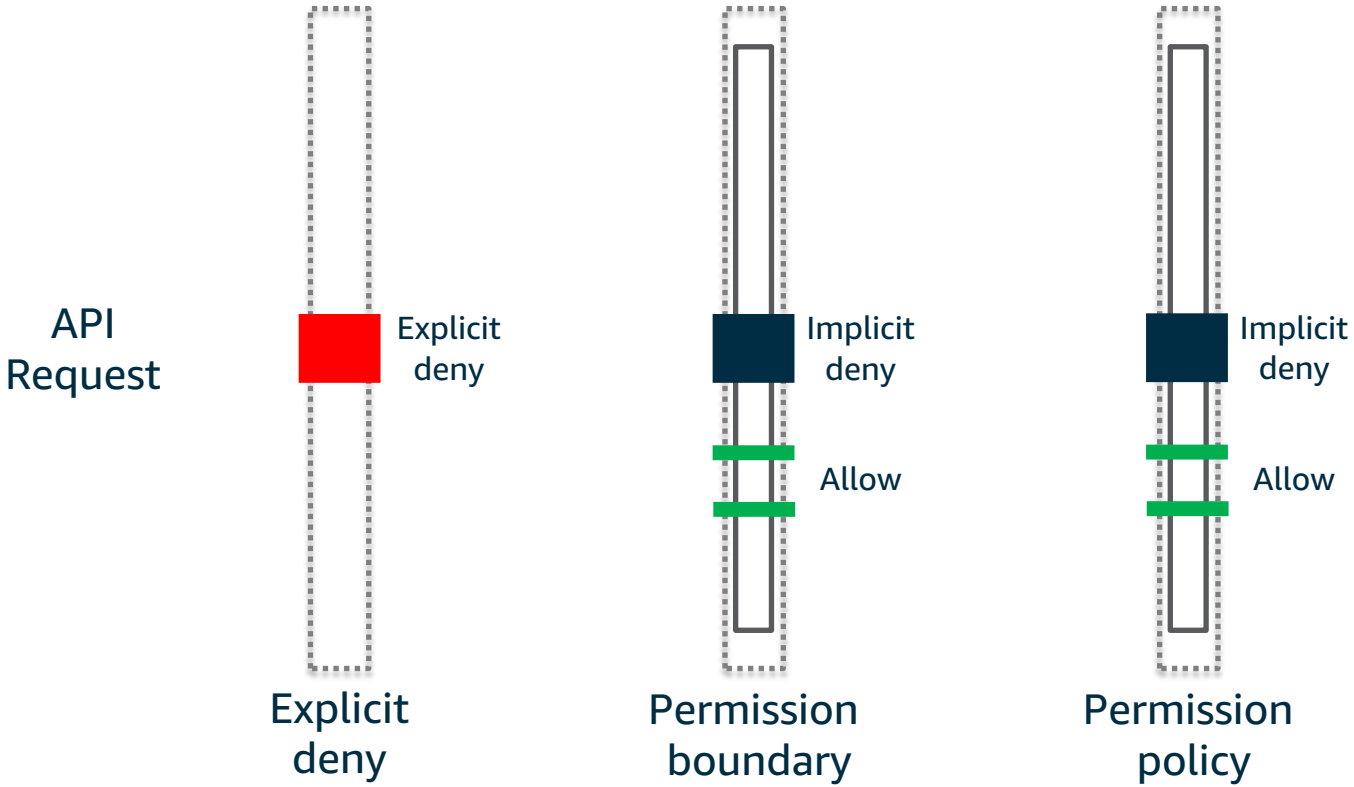
© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Effective permissions – mechanism



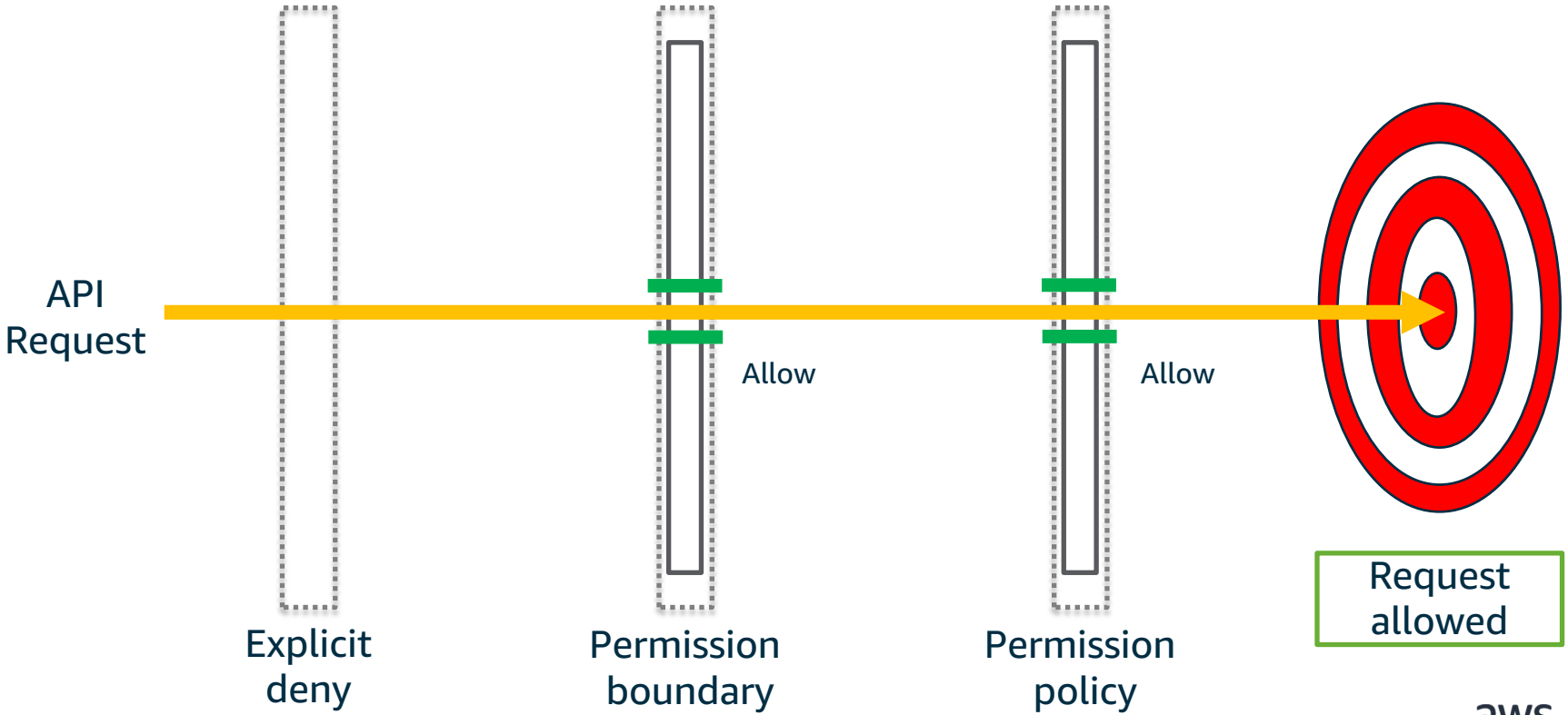
© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Effective permissions – mechanism



© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Effective permissions – allow example



© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

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:*:*:*"
     }
}
```

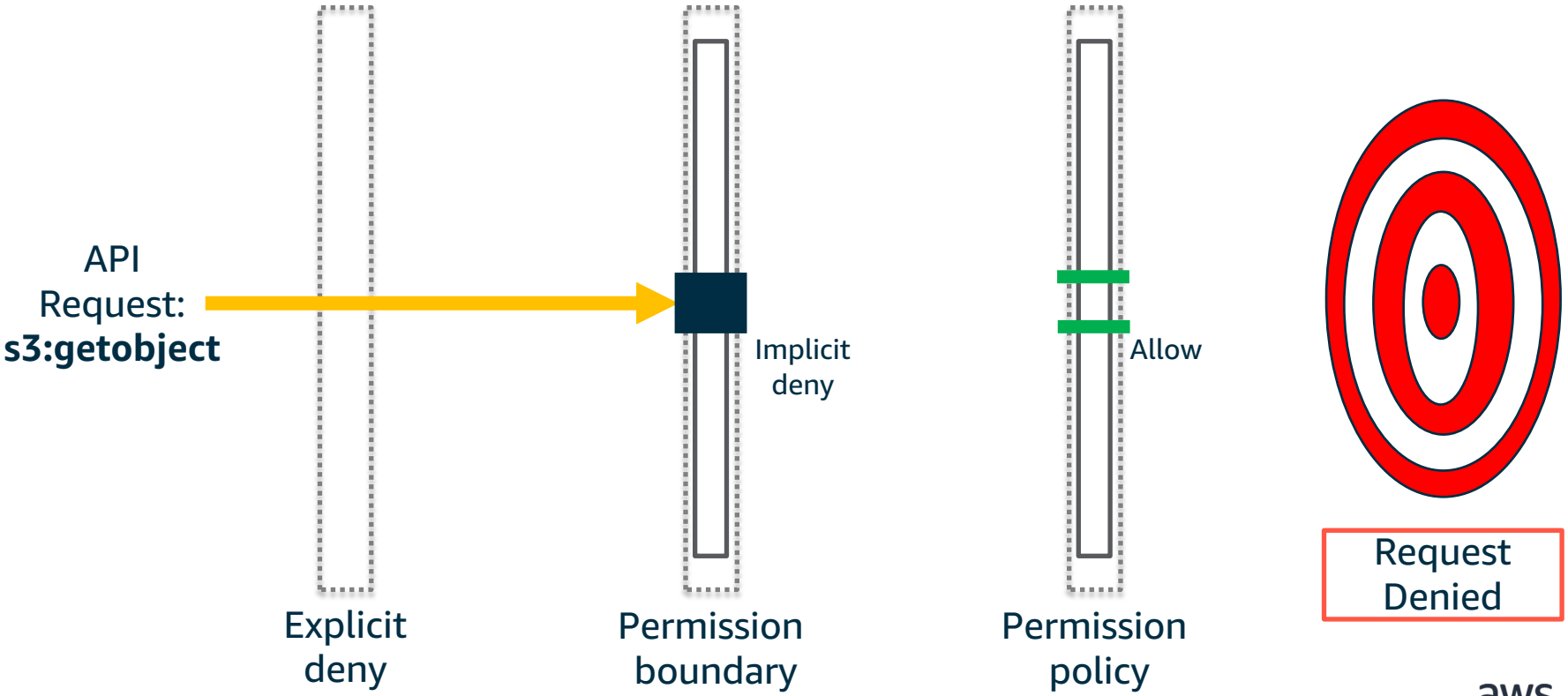
Permission Policy

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

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

aws

Effective permissions – mechanism



© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

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:*:*:*"
     },
     {
      "Effect": "Allow",
      "Action": ["s3:GetObject"],
      "Resource”:"arn:aws:s3:::example1/*"
     }
}
```

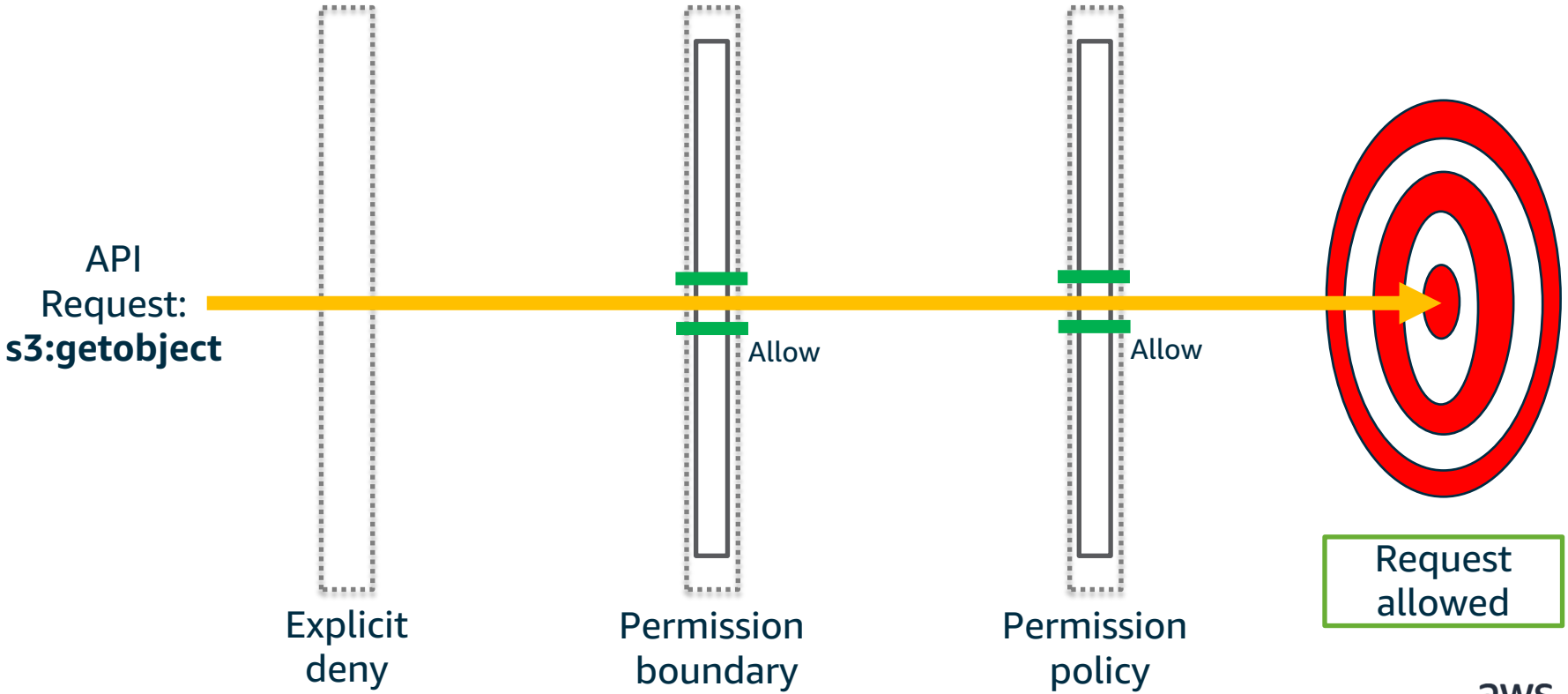
Permission Policy

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

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

aws

Effective permissions – mechanism



© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

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:*:*:*"
     },
     {
      "Effect": "Allow",
      "Action": ["s3:GetObject"],
      "Resource”:"arn:aws:s3:::example1/*"
     }
}
```

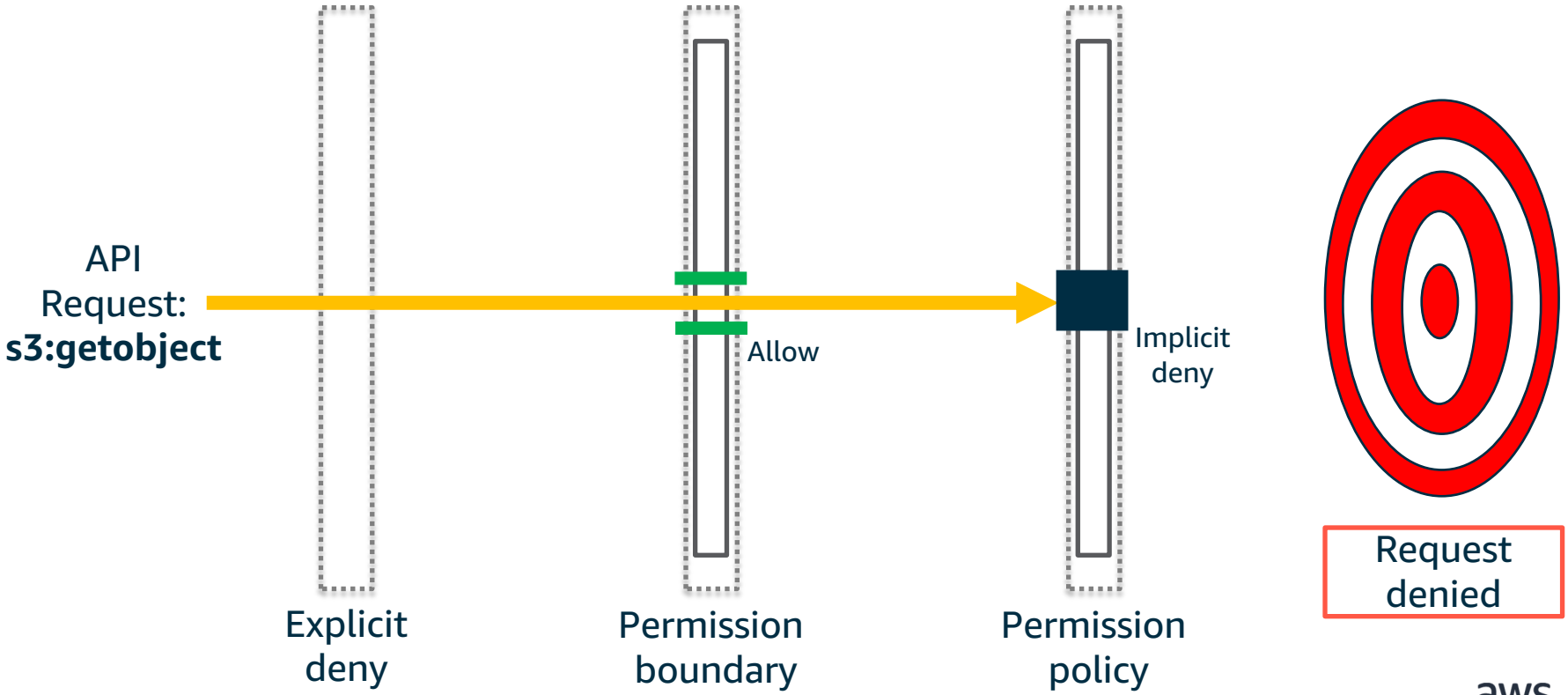
Permission Policy

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

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

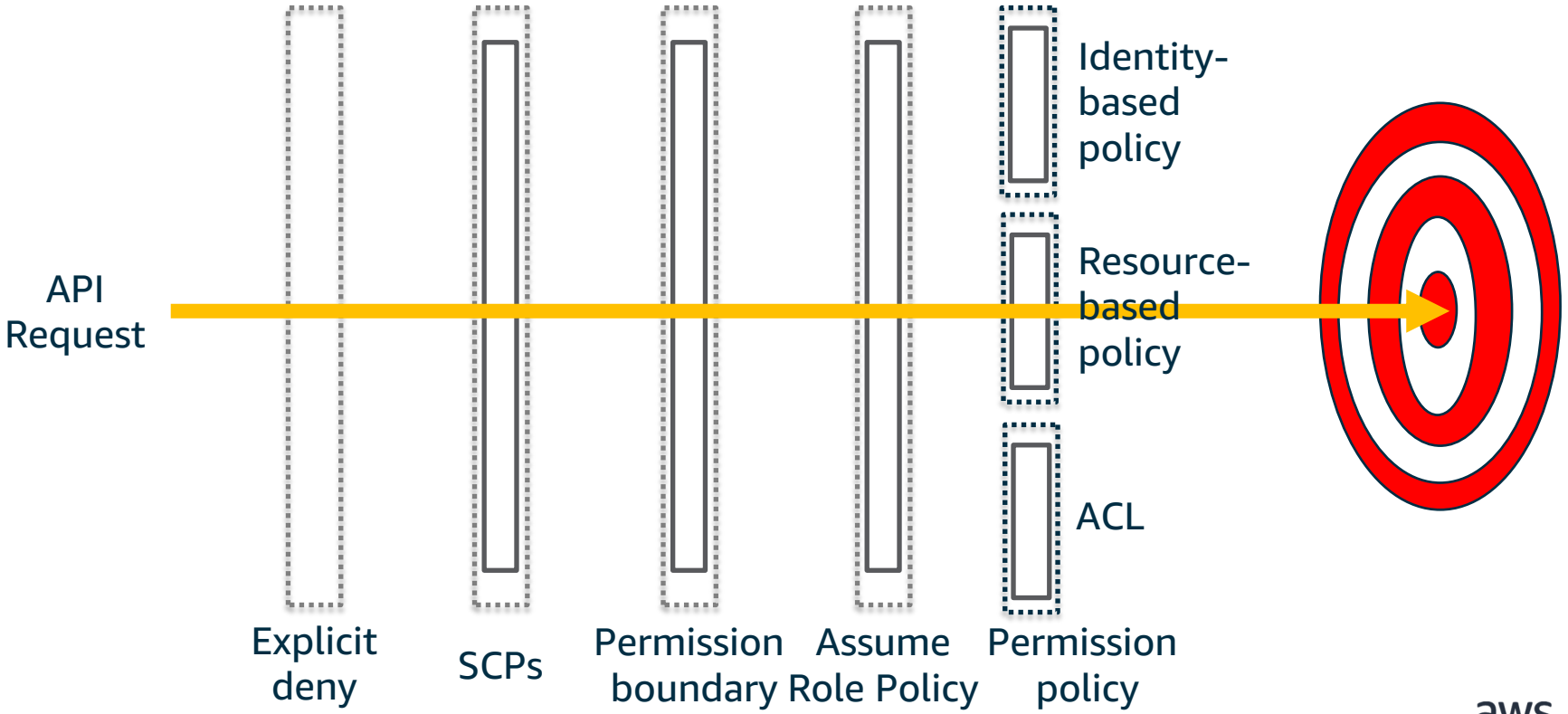
aws

Effective permissions – mechanism



© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Effective permissions – mechanism



© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Resource Restrictions

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

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

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

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": "*"
```

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Resource Restrictions

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**

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

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*"
```

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

aws

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*"
```

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Presentation Q & A

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

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?

Agenda reminder

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

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Workshop Overview

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

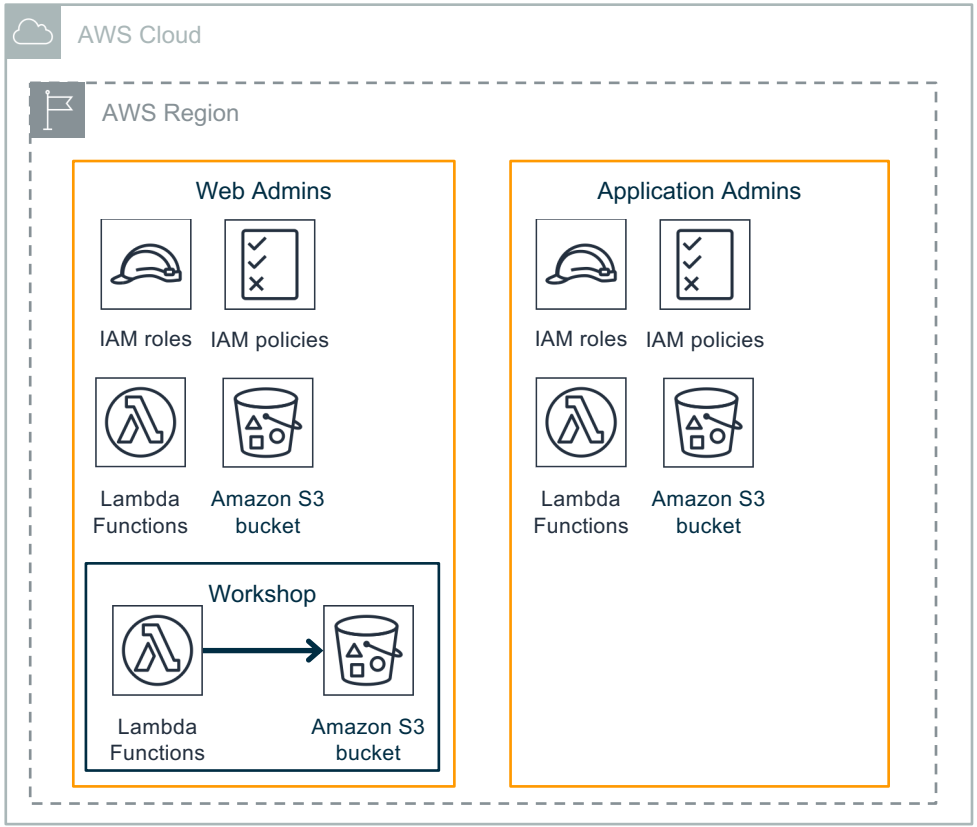
Workshop

The round is broken down into a BUILD and VERIFY phase.

BUILD (60 min): First each team will carry out the activities involved in the BUILD phase.

VERIFY (30 min): Each team will carry out the VERIFY activities as if they were part of the web admin team.

Workshop


AWS Cloud
AWS Region
Web Admins
IAM roles
IAM policies
Lambda Functions
Amazon S3 bucket
Workshop
Lambda Functions
Amazon S3 bucket
Application Admins
IAM roles
IAM policies
Lambda Functions
Amazon S3 bucket

Workshop

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Final Q & A

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

Final Q & A

- What is the fundamental mechanism of permission boundaries?
- 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?
- Is there an advantage to using one over the other?
- Why do we not allow the web admins to attach any role to the Lambda functions?

End of day survey

https://tinyurl.com/yb6naz8f

© 2018, Amazon Web Services, Inc. or its Affiliates. All rights reserved. Amazon Confidential and Trademark

aws