SANS | CLOUD SECURITY

Stop Playing Security Whack-a-Mole: Enforcing Cloud Security with Organizational Controls

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WHAC-A-MOLE
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The Case for Organizational Controls

Why shift to preventive, org-level controls?

The Problem:

- **Alert Fatigue:** Security teams are overwhelmed playing Whack-a-Mole with misconfigurations
- **Resource Drain:** Time spent on basic violations instead of sophisticated threats
- **Compliance Gaps:** Inconsistent security postures across cloud environments

The Solution:

- **Block Before Deploy:** Prevent misconfigurations at the source
- **Scale Automatically:** Policies inherit across entire organizational hierarchies
- **Reduce Noise:** Fewer alerts mean higher priority alerts get attention
- **Multi-Cloud Consistency:** Same governance approach across AWS, Azure, GCP

Organization-level Controls Comparison

Cloud Service Provider	Name of Org-Level Control
Amazon Web Services	Service Control Policies
Microsoft Azure	Azure Policy
Google Cloud	Organization Constraints + Deny Policies

AWS Service Control Policies (SCPs) – Overview

What are SCPs?

- Org-wide permission guardrails in AWS Organizations
- Define *maximum* available permissions (permission ceilings)
- Apply to Organization → Organizational Units → Accounts
- Work alongside IAM policies (SCPs restrict, IAM grants)
- **Key Concept:** *SCPs don't grant permission; they define the ceiling of what's possible*

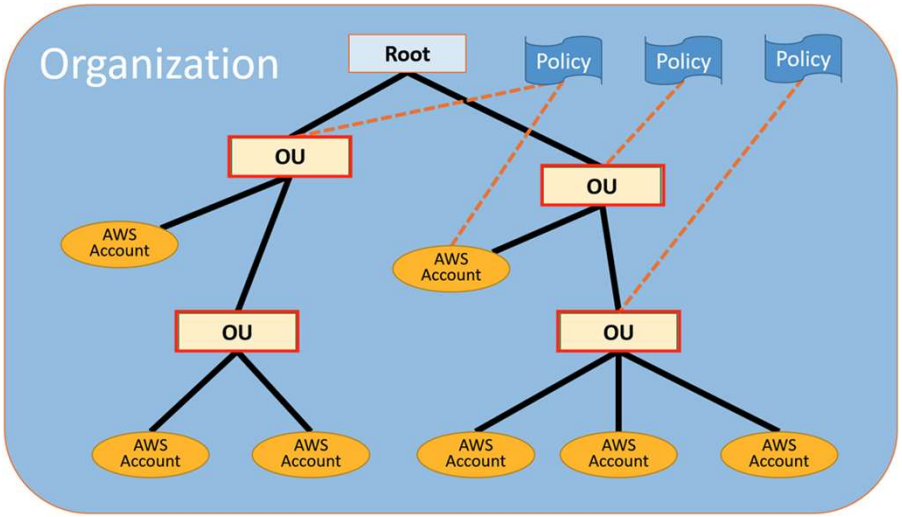
AWS SCPs – Key Mechanics & Use-Cases

How SCPs Work:

- **Evaluation Logic:** Request must be allowed by IAM *AND* not denied by SCP
- **Inheritance:** SCPs attached to parent OUs apply to all child accounts
- **Multiple SCPs:** All attached SCPs must allow the action (most restrictive wins)

Common Use Cases:

- Deny root user login (or require MFA)
- Prevent public S3 buckets
- Force encryption on EBS volumes and S3
- Restrict deployment to approved regions
- Block access to specific AWS services



AWS SCPs – Testing & Validation

Testing Strategy:

- **Sandbox First:** Test SCPs in an isolated OU with non-production accounts
- **Real Action Testing:** Test SCPs by attempting actual actions that should be denied
- **Gradual Rollout:** Start with audit mode, monitor impact, then enforce
- **Documentation:** Maintain clear evaluation logic and exemption procedures

Validation Methods:

- **Real Action Testing:** Test SCPs by attempting actual actions
- **Service Last Accessed Data:** Identify which services need SCP restrictions
- **CloudTrail Analysis:** Review actual API calls to understand impact
- **Break-Glass Procedures:** Document emergency SCP bypass processes

Common Pitfalls to Avoid:

- Deploying SCPs directly to production accounts
- Not testing with real user scenarios
- Over-restrictive policies that break legitimate operations
- Lack of exemption procedures for emergency situations

Azure Policy – Overview

What is Azure Policy?

- **Governance Service:** Define, assign, and manage policy definitions across Azure resources
- **Multi-Purpose:** Addresses resource consistency, compliance, cost, and security
- **Hierarchical:** Policies apply from Management Groups → Subscriptions → Resource Groups → Resources
- **Policy-as-Code:** Define policies using JSON, ARM templates, Bicep, or Terraform

Key Capabilities:

- **Preventive Controls:** Block non-compliant resources before creation
- **Audit Mode:** Log violations without blocking (unlike AWS SCPs)
- **Auto-Remediation:** Automatically fix non-compliant resources
- **Built-in Policies:** 200+ pre-built policy definitions available

Azure Policy – Effects & Deny Mechanism

Policy Effects Overview:

- **Deny:** Blocks non-compliant resource creation/updates (403 error)
- **Audit:** Logs violations without blocking (Azure's advantage over AWS SCPs)
- **Modify:** Automatically adds required properties to resources
- **DeployIfNotExists:** Deploys remediation resources when conditions aren't met
- **Append:** Adds additional properties to existing resources

The Deny Effect in Detail:

- **Evaluation:** Happens during resource creation/update requests
- **Blocking:** Returns 403 Forbidden before resource is created
- **Scope:** Can target specific resource types, locations, or conditions
- **Exemptions:** Management Group admins can create exemptions for legitimate cases

Azure Policy – Built-in Definitions & Implementation

Built-in Policy Library:

- **200+ Pre-built Definitions:** Covering security, compliance, cost, and governance
- **Categories:** Security Center, Storage, Compute, Network, Identity, and more
- **Policy Initiatives:** Grouped sets of related policies for comprehensive coverage
- **Regular Updates:** Microsoft continuously adds new policies based on best practices

Implementation Best Practices:

- **Start with Audit Mode:** Deploy policies in audit mode first to understand impact
- **Gradual Rollout:** Begin with non-critical resources, then expand scope
- **Policy-as-Code:** Define policies using ARM templates, Bicep, or Terraform
- **Continuous Validation:** Integrate with CI/CD pipelines for ongoing compliance

Integration with Third-Party Tools:

- **CSPM Platforms:** Azure Policy complements Cloud Security Posture Management tools
- **SIEM Integration:** Policy compliance data feeds into security monitoring
- **Compliance Reporting:** Automated compliance dashboards and reports

GCP Org Constraints – Overview

What are GCP Organization Policy Service / Org Constraints?

- **Hierarchical Control:** Define allowed/denied configurations at org/folder/project levels
- **Limited Scope:** Only ~30 built-in constraints available (unlike Azure's 200+ policies)
- **Organization Requirement:** Projects must be part of a GCP Organization to use constraints
- **Inheritance Model:** Policies inherit downward from Organization → Folders → Projects

Key Constraint Examples:

- **External IP Access:** `compute.vmExternalIpAccess` - restrict VM external IPs
- **Resource Locations:** `gcp.resourceLocations` - limit where resources can be created
- **Domain Restrictions:** `iam.allowedPolicyMemberDomains` - control who can access resources
- **Service Account Creation:** `iam.disableServiceAccountCreation` - prevent service account sprawl

GCP Deny Policies – Overview

What are GCP IAM Deny Policies?

- **Deny-First Evaluation:** Conditional deny rules evaluated before allow policies
- **Hierarchical Attachment:** Attach at org, folder, or project levels
- **Conditional Logic:** Support complex conditions using Common Expression Language (CEL)
- **Flexible Targeting:** Can target specific principals, permissions, or resources

Key Advantages over Org Constraints:

- **Custom Conditions:** Create complex conditional logic (unlike Org Constraints)
- **Granular Control:** Target specific users, groups, or service accounts
- **Resource-Specific:** Apply policies based on resource attributes
- **Comprehensive Coverage:** Work with any GCP service (not limited like Org Constraints)

GCP Deny Policies – Example

```
{
 "denyRules": [
   {
     "denyCondition": {
        "expression": "request.auth.claims.email_verified == false ||
!request.auth.claims.email.matches('.*@yourcompany\\.com$')"
     },
     "deniedPrincipals": ["allUsers"],
      "deniedPermissions": [
        "storage.objects.get",
        "storage.objects.create",
        "storage.objects.update",
        "storage.objects.delete"
      ],
      "deniedResourceNames": [
        "projects/*/buckets/sensitive-data-*"
      ]
   }
 ]
}
```

Example: Prevent External Users from Accessing Sensitive Resources

What This Policy Does:

- **Email Verification:** Blocks users with unverified email addresses
- **Domain Restriction:** Only allows users from your company domain
- **Sensitive Bucket Protection:** Applies to buckets with "sensitive-data-" prefix
- **Comprehensive Storage Control:** Blocks all object-level storage operations

GCP Deny Policies – Best Practices

- **Start with Dry-Run Mode:** Test policies in dry-run mode (audit mode) before enforcement
- **Use Specific Resource Names:** Target specific resources rather than broad patterns
- **Test with Real Users:** Validate policies with actual user scenarios
- **Document Exemptions:** Maintain clear procedures for legitimate exceptions

When you are so busy fighting alligators, it is hard to drain the swamp

Integrating Prevention & Detection

The Synergy Model:

- **Prevention Reduces Noise:** Organizational controls eliminate entire classes of misconfigurations
- **Detection Validates Prevention:** Monitoring confirms controls are working and catches bypasses
- **Signal Amplification:** Fewer false positives mean higher priority alerts get attention
- **Resource Optimization:** Security teams can focus on sophisticated threats, not basic misconfigurations

Real-World Integration Examples:

- **AWS SCP + CloudTrail:** SCP prevents public S3 buckets, CloudTrail alerts if SCP is bypassed
- **Azure Policy + Defender for Cloud:** Policy enforces encryption, Defender for Cloud monitors compliance
- **GCP Deny + Security Command Center:** Deny Policy blocks external access, SCC monitors compliance and policy violations

Implementation Strategy: Start to Scale

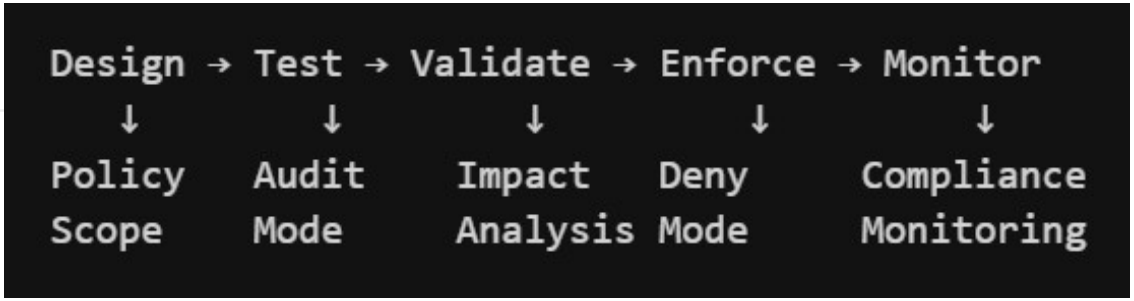
The Incremental Rollout Approach:

- **Phase 1: Start Small:** Begin with one high-impact control in non-production environment
- **Phase 2: Test & Validate:** Use audit mode (Azure/GCP) or sandbox testing (AWS) to understand impact
- **Phase 3: Gradual Enforcement:** Move from audit to deny mode, expanding scope incrementally
- **Phase 4: IaC Integration:** Embed policies in Infrastructure as Code for consistent deployment

Key Success Factors:

- **Dedicated Security Teams:** 51% already have multicloud security teams (p.7)
- **Cross-Functional Collaboration:** Include DevOps, compliance, and business stakeholders
- **Success Metrics:** Track alert reduction, compliance improvement, and operational impact

The Preventive Policy Lifecycle



Key Lifecycle Components:

- **Design:** Define policy scope, conditions, and exemptions
- **Test:** Use audit mode or sandbox testing to understand impact
- **Validate:** Analyze results and refine policy before enforcement
- **Enforce:** Deploy policy in deny mode with proper scope
- **Monitor:** Track compliance, violations, and operational impact

Maturity Progression:

- **Intermediate:** Reactive security with some preventive controls
- **Advanced:** Proactive prevention with comprehensive organizational controls
- **Lifecycle Discipline:** Systematic approach to policy management
- **Continuous Improvement:** Regular review and refinement of policies

AWS Service Control Policies:

- AWS SCPs:
  https://docs.aws.amazon.com/organizations/latest/userguide/orgs_manage_policies_scps.html
- SCP Syntax:
  https://docs.aws.amazon.com/organizations/latest/userguide/orgs_manage_policies_scps_syntax.html

Azure Policy:

- Overview:
  https://learn.microsoft.com/en-us/azure/governance/policy/overview
- Deny Effect:
  https://learn.microsoft.com/en-us/azure/governance/policy/concepts/effect-deny

GCP Deny Policies:

- Overview:
  https://cloud.google.com/iam/docs/deny-overview
- Deny Access:
  https://cloud.google.com/iam/docs/deny-access

Conclusion

Ready to Deep-Dive into Preventive Cloud Security?

➔Enroll in **SEC510: Cloud Security Engineering and Controls**.

- Hands-on labs for AWS, Azure, GCP org-level controls.
- Learn to design, test, and maintain preventive controls at scale.
- Move from reactive to proactive defense.

https://www.sans.org/cyber-security-courses/cloud-security-engineering-controls