





AZURE POLICY COMPLIANT BACKDOOR

WHOAMI

 Principal Security Consultant at NCC Group

Cloud and CI/CD Security

 Certs: AZ-IOH, AZ-HOO, AZ-500, SC-IOO, CARTP, CAWASP

• Black Hat USA 2022 DefCon3l Cloud Village, DoD Coccoous Wo #15

AZURE POLICY

 "Azure Policy evaluates resources and actions in Azure by comparing the properties of those resources to business rules." - Microsoft

 Business rules = I.e.: Resources Only in European Regions

AZURE POLICY

- Policy Definition JSON
- Policy Initiative
- Assigned to scope (Mgmt group, Subscription, Resource group, Resource)
- Remediation
- Policy Initiative(Pol Defs, Rem)->Scope

AZURE POLICY

```
"properties": {
    "displayName": "<displayName>",
    "description": "<description>",
   "mode": "<mode>",
    "parameters": {
           <parameters>
    "policyRule": {
        "if": {
           <rule>
        },
        "then": {
            "effect": "<effect>"
```

ELEMENTS OF DEFINITION

- displayName
- description
- mode

- parameters
- policyRule
 - · logical evaluations
 - effect

```
"roleDefinitionIda": [
                                                                                                                                                                                                                                                                                                                                                                                                                 "/providers/Microsoft.Authorization/roleDefinitions/5e467623-bblf-42f4-a55d-6e525e11384b"
         properties", ("displayment," (Feevier); Configure blob backup for all storage accounts that do not contain a given tag to a backup venit in the same reg 184. "Policy/pye": "Sultim," 115. "mode", "Todas", "Todas
                                                                                                                                                                                                                                                                                                                                                                                                          "deployment": {
    "properties": {
        "mode": "incremental",
}
         "description": "Enforce backup for blobs on all storage accounts that do not contain a given tag to a central backup vault. Doing this can ge backup of blobs contained across multiple storage accounts at scale. For more details, rafer to https://aka.ms/Ab-BlobBackupArPolicies".
                                                                                                                                                                                                                                                                                                                                                                                                                      "template": {
                                                                                                                                                                                                                                                                                                                                                                                                                          "5achema": "https://schema.management.arure.com/schemas/2019-04-01/deploymentTemplate.jscn#".
                                                                                                                                                                                                                                                                                                                                                                                                                           "contentVersion": "1.0.0.0",
                                                                                                                                                                                                                                                                                                                                                                                                                           "parameters": {
    "backupFolicyId": {
        "type": "string",
        "
              'parameters": {
    "vaultLocation": {
                                                                                                                                                                                                                                                                                                                                                                                                                                     "metadata": {
                       "metadata": {
                                                                                                                                                                                                                                                                                                                                                                                                                                           "description": "Backup Policy Id"
                        "displayName": "Location (Specify the location of the storage accounts that you want to protect)",
"description": "Specify the location of the storage accounts that you want to protect. Blobs in the storage accounts should be backe
  cault in the same location. For example - CanadaCentral"
"atrongType": "location"
                                                                                                                                                                                                                                                                                                                                                                                                                                 "storageAccountResourceId": {
                                                                                                                                                                                                                                                                                                                                                                                                                                     "type": "string",
                                                                                                                                                                                                                                                                                                                                                                                                                                      "metadata": (
                 "backupPolicyId": {
                                                                                                                                                                                                                                                                                                                                                                                                                                            "description": "ResourceId of the Storage Account"
"type a state of the state of t
                                                                                                                                                                                                                                                                                                                                                                                                                                 "location": {
                                                                                                                                                                                                                                                                                                                                                                                                                                     "type": "string"
                                                                                                                                                                                                                                                                                                                                                                                                                                      "metadata": {
                                                                                                                                                                                                                                                                                                                                                                                                                                            "description": "Location for all resources"
                  * Space Stating

The Control of the Lap to use for excluding storage accounts in the scope of this policy. This should be used along with the 141.

"description": "Hame of the Lap to use for excluding storage accounts in the scope of this policy. This should be used along with the 142.

143.

145.
                                                                                                                                                                                                                                                                                                                                                                                                                            "variables": {
                                                                                                                                                                                                                                                                                                                                                                                                                                "storageAccountName": "[first(skip(split(parameters('storageAccountResourceId'), '/'), 8))]",
"dataSourceType": "Microsoft.Storage/storageAccounts/DlobServices",
                                                                                                                                                                                                                                                                                                                                                                                                                              "essoured": "Ricrosoft.Storage/storageAccounts",
"backsploitopiams": "Risst(skipisplit(passmoters('hacksploitopid'), '/'), 10))]",
"voultknas": "[first(skipisplit(passmoters('hacksploitopid'), '/'), 8))]",
"voultknas": "[first(skip(split(passmoters('hacksploitopid'), '/'), 4))]",
"voulthacesproideroup": "[first(skipisplit(passmoters('hacksploitopid'), '/'), 2))]"
"voulthacesploind": "[first(skipisplit(passmoters('hacksploitopid'), '/'), 2))]"
                "exclusionTagValues": {
   "type": "Array",
                     Texts.ders: [

"displayMame": Enclusion Tay Values",

"displayMame": Textlusion Tay Values",

"displayMame": Textlusion Tay Values',

"displayMame": Textlusion Tay Values',

"displayMame": Textlusion Tay Values',

"displayMame": Textlusion Tay Values,

1481. This Should be used along with the Enclusion Tay Wame parameter. Learn more at https://dki.ma/Ab-MichibachephiPolicies.
                                                                                                                                                                                                                                                                                                                                                                                                                            "resources": [
                                                                                                                                                                                                                                                                                                                                                                                                                                      "apiVersion": "2021-04-01"
                                                                                                                                                                                                                                                                                                                                                                                                                                       "resourceGroup": "[variables('vaultResourceGroup')]",
                      "metadata": {
  "displayName": "Effect",
  "description": "Enable or disable the execution of the policy"
                                                                                                                                                                                                                                                                                                                                                                                                                                      "subscriptionId": "[variables('vaulfsubscriptionId')]",
"name": "[concat('DeployFotection-',uniqueString(variables('storageAccountName')))]",
                                                                                                                                                                                                                                                                                                                                                                                                                                      "properties": {
    "mode": "Incremental"
                     "allowedValues": [
                                                                                                                                                                                                                                                                                                                                                                                                                                                 "Sachema": "https://schema.management.arure.com/schemas/2015-01-01/deploymentTemplate.jeon#",
                                                                                                                                                                                                                                                                                                                                                                                                                                                   "contentVersion": "1.0.0.0",
                      "defaultValue": "DeployIfNotExists"
                                                                                                                                                                                                                                                                                                                                                                                                                                                 "parameters": {},
"resources": [
          "policyRule": {
   "if": {
      "allOf": [
                                                                                                                                                                                                                                                                                                                                                                                                                                                              "type": "Microsoft.DataProtection/backupvaults/backupInstances"
                                                                                                                                                                                                                                                                                                                                                                                                                                                              "name": "[concat(variables('vaultName'), '/', variables('storageAccountName'))]",
                              "field": "type",
"equals": "Microsoft.Storage/StorageAccounts"
                                                                                                                                                                                                                                                                                                                                                                                                                                                             "properties": {
   "objectType": "BackupInstance",
   "dataSourceInfo": {
                                                                                                                                                                                                                                                                                                                                                                                                                                                                        "resourceID": "[parameters('storageAccountResourceId')]",
                               "equals": "StorageV2"
                                                                                                                                                                                                                                                                                                                                                                                                                                                                         "resourceName": "[variables('storageAccountName')]"
                                                                                                                                                                                                                                                                                                                                                                                                                                                                        "resourceType": "[variables('resourceType')]",
                              "field": "Microsoft.Storage/storageAccounts/sku.name", "contains": "Standard"
                                                                                                                                                                                                                                                                                                                                                                                                                                                                         "resourceUri": "[parameters('storageAccountResourceId')]",
                                                                                                                                                                                                                                                                                                                                                                                                                                                                         "resourceLocation": "[parameters('location')]"
                                                                                                                                                                                                                                                                                                                                                                                                                                                                         "datasourceType": "[wariables('dataSourceType')]"
                                                                                                                                                                                                                                                                                                                                                                                                                                                                 "policyInfo": {
    "policyId": "[parameters('backupPolicyId')]",
    "name": "[variables('backupPolicyWame')]"
                                "notEquals": "true"
                              "field": "Microsoft.Storage/storageAccounts/isNfsV3Enabled"
"notEquals": "true"
                              "field": "location",
"equals": "[parameters('vaultLocation')]"
                                "anyOf": [
                                                                                                                                                                                                                                                                                                                                                                                                                       "parameters": (
                                            "in": "[parameters('exclusionTagValues')]"
                                                                                                                                                                                                                                                                                                                                                                                                                           "storageAccountResourceId": {
   "value": "[field('id')]"
                                      "value": "[empty(parameters('exclusionTagValues'))]",
"equals": "true"
                                                                                                                                                                                                                                                                                                                                                                                                                           "backupPolicyId": {
                                       "value": "[empty(parameters('exclusionTagName'))]".
"equals": "true"
                                                                                                                                                                                                                                                                                                                                                                                                                          "location": {
    "value": "[field('location')]"
                     "effect": "[parameters('effect')]".
                      "detaile": (
                          "name": "default",
"existenceCondition": {
   "field": "Microsoft.Storage/storageAc
                                                                                                                                                                                                                                                                                                                                                                                 "type": "Microsoft.Ruthorization/policyDefinitions"
"name": "958dbd4e-0e20-4385-2082-d3f20c2a62d8"
                         "roleDefinitionIde": [
```

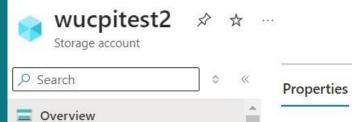
PROPERTIES & ALIAS

 Policy Alias and Resource Property and Modifiable

Resourcetype

PROPERTIES & ALIAS

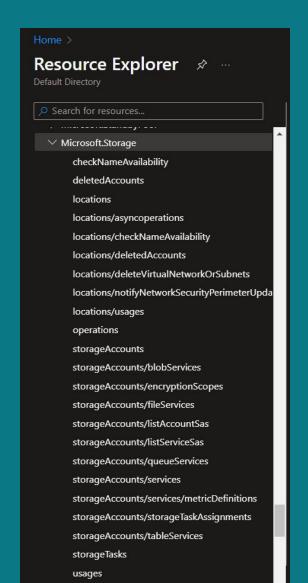
- Cet-AZPolicyAlias
- · AZ CLI
- ARM Template
- Deployment Template
- Azure Resource Explorer



```
Monitoring
                                                                                    Capabilities (7)
                                                                                                     Recommendations (0)
                                                                                                                           Tutorials
"type": "Microsoft.Storage/storageAccounts",
                                                                   service
                                                                                                                     Security
"apiVersion": "2023-05-01",
                                                                                                                     Require secure transfer for REST API
"name": "[parameters('storageAccounts_wucpinewstorage_name')]",
                                                                                                 Disabled
                                                                  rchical namespace
                                                                                                                                                         Disabled
"location": "westeurope",
                                                                                                                      operations
                                                                  ılt access tier
                                                                                                 Hot
"sku": {
                                                                                                                     Storage account key access
                                                                                                                                                         Enabled
    "name": "Standard LRS",
                                                                                                 Disabled
                                                                  anonymous access
    "tier": "Standard"
                                                                    "policyRule": {
                                                                     "if": {
"kind": "StorageV2",
                                                                       "all0f": [
"properties": {
    "allowCrossTenantReplication": false,
                                                                            "field": "type",
    "minimumTlsVersion": "TLS1 0",
                                                                            "equals": "Microsoft.Storage/storageAccounts"
    "allowBlobPublicAccess": false,
    "networkAcls": {
        "bypass": "AzureServices",
                                                                            "anyOf": [
        "virtualNetworkRules": [],
        "ipRules": [],
                                                                                "allof": [
        "defaultAction": "Allow"
    "supportsHttpsTrafficOnly": true,
                                                                                    "value": "[requestContext().apiVersion]",
    'encryption": {
                                                                                    "less": "2019-04-01"
        "services": {
            "file": {
                "keyType": "Account",
                                                                                    "field": "Microsoft.Storage/storageAccounts/supportsHttpsTrafficOnly"
                "enabled": true
                                                                                    "exists": "false"
            "blob": {
                "keyType": "Account",
                                                                                                                                  True/False/Null/Empty?
                "enabled": true
                                                                                "field": "Microsoft.Storage/storageAccounts/supportsHttpsTrafficOnly",
                                                                                "equals": "false"
        "keySource": "Microsoft.Storage"
```

Tools + SDKs

PROPERTIES & ALIAS



PROPERTIES & ALIAS

```
PS /home/viktor> az provider show --namespace Microsoft.Storage --expand "resourceTypes/aliases" --query "resourceTypes[].aliases[].name"

[
    "Microsoft.Storage/storageAccounts/storageTaskAssignments/taskId",
    "Microsoft.Storage/storageAccounts/storageTaskAssignments/enabled",
    "Microsoft.Storage/storageAccounts/storageTaskAssignments/description",
    "Microsoft.Storage/storageAccounts/storageTaskAssignments/executionContext",
    "Microsoft.Storage/storageAccounts/storageTaskAssignments/executionContext.target",
    "Microsoft.Storage/storageAccounts/storageTaskAssignments/executionContext.target.prefix",
    "Microsoft.Storage/storageAccounts/storageTaskAssignments/executionContext.target.prefix[*]",
    "Microsoft.Storage/storageAccounts/storageTaskAssignments/executionContext.target.excludePrefix",

"Microsoft.Storage/storageAccounts/storageTaskAssignments/executionContext.target.excludePrefix",
```

PS /home/viktor> az provider show --namespace Microsoft.Storage --expand "resourceTypes/aliases" --query "resourceTypes[].aliases[].name" | grep supportsHttpsTrafficOnly "Microsoft.Storage/storageAccounts/supportsHttpsTrafficOnly",
PS /home/viktor>

PROPERTIES & ALIAS & MODIFABLE

az provider show --namespace
 Microsoft.Storage --expand
 "resourceTypes/aliases" --query
 "resourceTypes[].aliases[].name"

• (Cet-AzPolicyAlias -NamespaceMatch 'Microsoft.Storage').Aliases

PROPERTIES & ALIAS & MODIFABLE

- Oet-AzPolicyAlias -NamespaceMatch Microsoft.Sql | where ResourceType -like 'servers/databases*' | Select-Object -ExpandProperty 'Aliases' | where name like '*backup*' | Select Name, defaultPath
- Oet-AzPolicyAlias -NamespaceMatch Microsoft.Sql | where ResourceType -like '*servers/database*' | Select-Object -ExpandProperty Aliases | Where-Object { \$_.DefaultMetadata.Attributes -eq 'Modifiable' } | where name -like

AZURE VS ENTRA ID

MANAGED VS CUSTOM POLICY

PERMISSION

- Microsoft.Authorization
- Microsoft.PolicyInsights

EVALUATION

- A resource is deployed to or updated within a scope
- Once every 24 hours, assignments are automatically reevaluated.
- On-Demand Possible (I.e.: Call in Automation Account)

FASTER TRIGGER

• az policy state trigger-scan --resource-group "demo-rg"

ENUMERATION

- List of Storage Accounts
- List of Storage Accounts With Anonymous Access
- Virtual Machines With Public IP Address

```
"properties": {
 "displayName": "Storage accounts",
 "policyType": "Custom",
 "mode": "All",
 "description": "List of Storage accounts.",
 "metadata": {
   "version": "1.0.3",
   "category": "Storage"
 "version": "1.0.3",
 "parameters": {
   "effect": {
     "type": "String",
     "metadata": {
       "displayName": "Effect",
       "description": "Enable or disable the execution of the policy"
     "allowedValues": [
       "Audit"
     "defaultValue": "Audit"
 "policyRule": {
   "if": {
     "allof": [
         "field": "type",
         "equals": "Microsoft.Storage/storageAccounts"
   "then": {
     "effect": "[parameters('effect')]"
 "versions": [
```

```
"type": "Microsoft.Storage/storageAccounts",
"apiVersion": "2023-05-01",
"name": "[parameters('storageAccounts wucpi name')]",
"location": "westeurope",
"sku": {
   "name": "Standard LRS",
   "tier": "Standard"
"kind": "StorageV2",
"properties": {
   "dnsEndpointType": "Standard",
    "defaultToOAuthAuthentication": false,
    "publicNetworkAccess": "Enabled",
    "allowCrossTenantReplication": false,
    "minimumTlsVersion": "TLS1 2",
    "allowBlobPublicAccess": false,
    "allowSharedKeyAccess": true,
```

```
"policyRule": {
 "if": {
   "all0f": [
        "field": "type",
        "equals": "Microsoft.Storage/storageAccounts"
        "not": {
          "field": "Microsoft.Storage/storageAccounts/allowBlobPublicAccess",
          "equals": "false"
```

```
"properties": {
 "displayName": "Storage accounts with public access",
 "policyType": "BuiltIn",
 "mode": "Indexed",
 "description": "List all publicly accessible storage account",
 "metadata": {
   "version": "1.0.3",
   "category": "Storage"
 "version": "1.0.3",
 "parameters": {
     "type": "String",
     "metadata": {
       "displayName": "Effect",
       "description": "Enable or disable the execution of the policy"
     "allowedValues": [
     "defaultValue": "Audit"
  "policyRule": {
   "if": {
     "allOf": [
         "field": "type",
         "equals": "Microsoft.Storage/storageAccounts"
         "not": {
           "field": "Microsoft.Storage/storageAccounts/allowBlobPublicAccess",
           "equals": "false"
    "then": {
     "effect": "[parameters('effect')]"
 "versions": [
```

ENUMERATION

- All The Virtual Machines With External IP Built-In Policy
- https://github.com/Azure/azure-policy/blob/master/built-ininpolicies/policyDefinitions/Network/NetworkPublicIPNic_D eny.json

ENUMERATION

```
"if": {
 "allOf": [
     "field": "type",
     "equals": "Microsoft.Network/networkInterfaces"
   },
     "not": {
       "field": "Microsoft.Network/networkInterfaces/ipconfigurations[*].publicIpAddress.id",
       "notLike": "*"
```

```
"properties": {
           "displayName": "Network interfaces should not have public IPs",
           "policyType": "BuiltIn",
           "mode": "Indexed",
           "description": "This policy denies the network interfaces which are configured with any public IP.
           "metadata": {
             "version": "1.0.0",
             "category": "Network"
           "version": "1.0.0",
12
           "parameters": {},
           "policyRule": {
             "if": {
               "allOf": [
16
                   "field": "type",
                   "equals": "Microsoft.Network/networkInterfaces"
                 },
20
                   "not": {
                     "field": "Microsoft.Network/networkInterfaces/ipconfigurations[*].publicIpAddress.id",
                     "notLike": "*"
26
             },
             "then": {
               "effect": "deny"
           },
           "versions": [
             "1.0.0"
35
         "id": "/providers/Microsoft.Authorization/policyDefinitions/83a86a26-fd1f-447c-b59d-e51f44264114",
         "name": "83a86a26-fd1f-447c-b59d-e51f44264114"
```

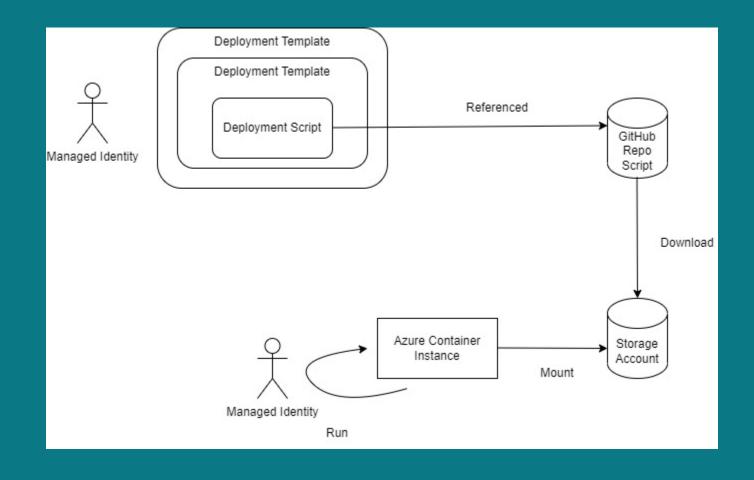
PROOF OF CONCEPT

- Check If Storage Account Has HTTPS (supportsHttpsTrafficOnly)
- Remediation Task DeployIfNotExists Effect
- Role Assignment To The Managed Identity
- Download Deployment Script (PowerShell) From External URL

PROOF OF CONCEPT

- Create A Service Principal
- Call Controlled Website With Secret
- Triggered By Default Every 24 Hours, But Not The Remediation
- The Remediation Task Will Do Other Things As I Modified It (2 MI, I ST, 2 Role Assignment)

PROOF OF CONCEPT



PROOF OF CONCEPT ELEMENTS

- Storage Account
- Managed Identity (For SP Creation App Admin, User Admin, Owner and Not Contributor)
- Azure Container Instance
- Deployment
- Deployment Script
- Website / CitHub

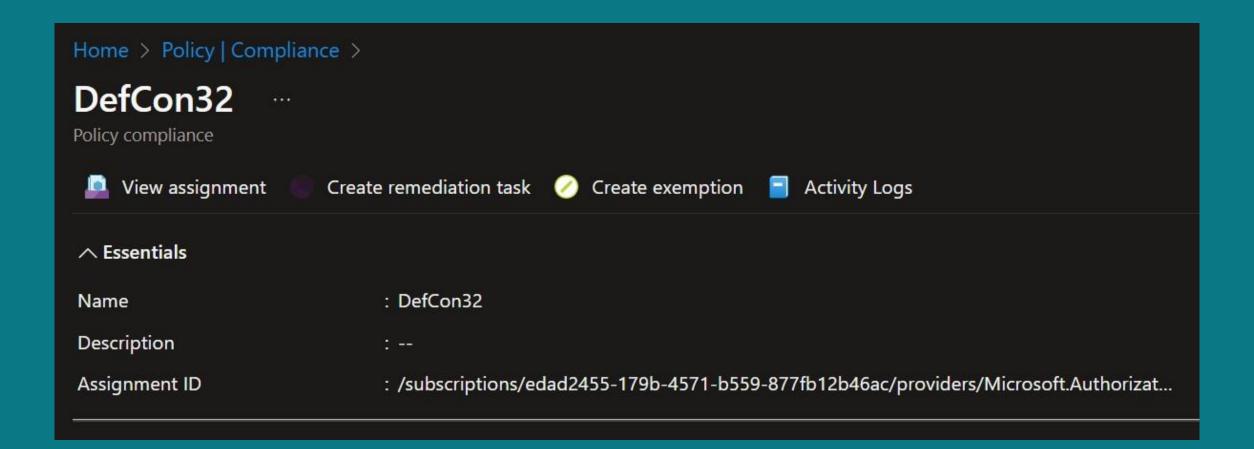
DEMO

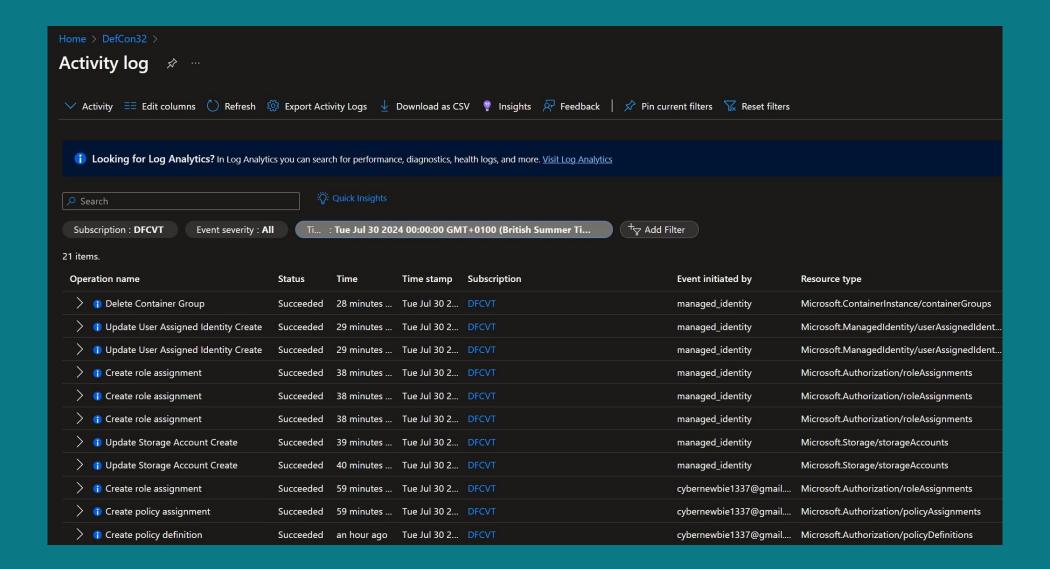
Video - 8:30 mins

PROOF OF CONCEPT - PROBLEMS

- Requires A "LOT"
- Basically, Everything Is In Audit Log
- Deployment And Script Stored In The Storage Account
- Remediation Task Run Only Once

AUDIT LOG





Create role assignment

Tue Jul 30 2024 01:13:07 GMT+0100 (British Summer Time)

+ New alert rule

Summary JSON Change history (Change history is not applicable to this type of activity log)

Resource /subscriptions/edad2455-179b-4571-b559-

877fb12b46ac/providers/Microsoft.Authorization/roleAssignments/fa527a5e-1010-40d9-bac4-

ed9050af22c5

Operation name Create role assignment

Time stamp Tue Jul 30 2024 01:13:07 GMT+0100 (British Summer Time)

Event initiated by cybernewbie1337@gmail.com

Message Shared with 'managed_identity'.

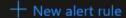
Role -

Scope -

Create role assignment

X

Tue Jul 30 2024 01:33:28 GMT+0100 (British Summer Time)



Summary JSON Change history

Resource /subscriptions/edad2455-179b-4571-b559-

877fb12b46ac/resourceGroups/cvtrsg/providers/Microsoft.Authorization/roleAssignments/0c1432c5-

843b-40ff-80d8-47861bd204d9

Operation name Create role assignment

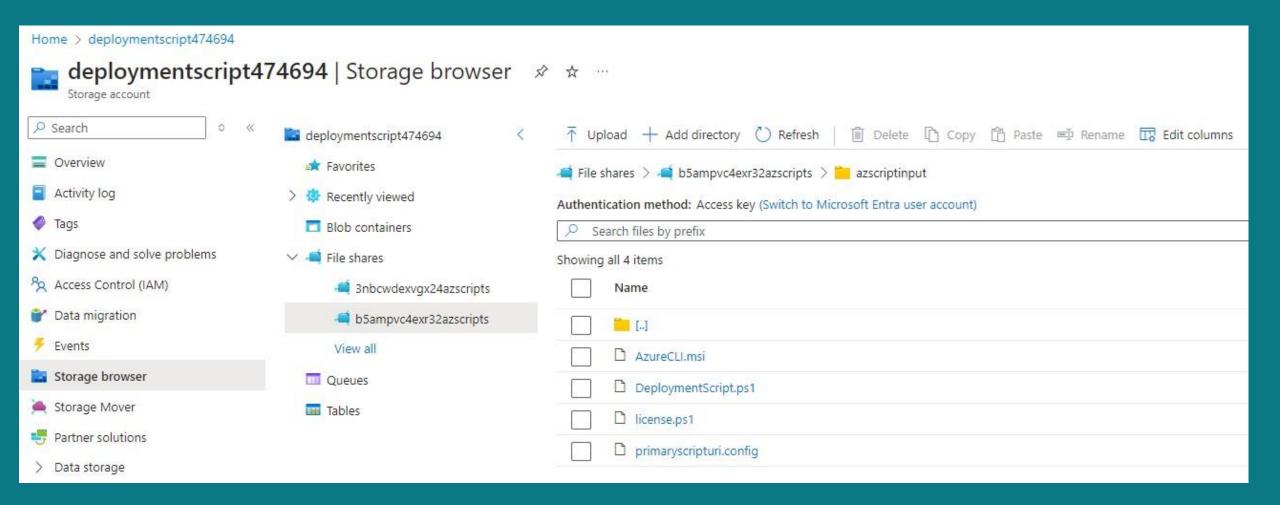
Time stamp Tue Jul 30 2024 01:33:28 GMT+0100 (British Summer Time)

Event initiated by managed_identity

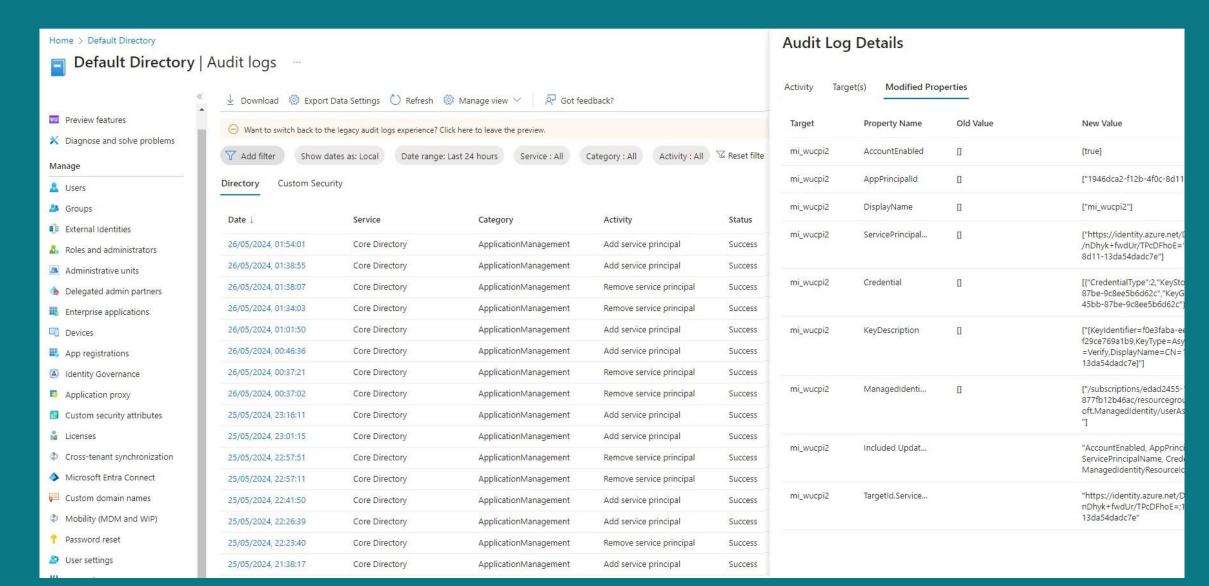
Message Shared with 'defcon32_cv'.

Role -

Scope -



ENTRA ID AUDIT LOG



- Original Policy https://techcommunity.microsoft.com/t5/core infrastructure-and-security/azure-policy-remediation with-deployment-scripts/ba-p/l594674
- Azure Policy Examples https://github.com/Azure/azurepolicy
- Azure Community Policy Examples https://github.com/Azure/Community-Policy
- Azure Policy Examples https://www.azadvertizer.net/azpolicyadvertizer_all.html

- https://codingfor.beer/creating-an-azure-policyremediation-task-for-an-azure-policy-initiativee75214373c99
- https://marcogerber.ch/the-power-of-azure-policydeployifnotexists/
- https://itnext.io/implementing-and-troubleshooting-acustom-azure-policy-definition-lab8d0634bb2

- https://stefanstranger.github.io/2021/01/22/LessonsLear nedDevelopingACustomPolicy/
- https://journeyofthegeek.com/2021/03/07/writing-acustom-azure-policy/
- https://msftplayground.com/2022/03/building-yourazure-policies-part-I/

- https://securitylabs.datadoghq.com/articles/azure-policyprivilege-escalation/
- https://medium.com/cyesec/azure-ad-privilegeescalation-through-auto-assignment-policies-2d0422be4f25
- https://medium.com/@vladimir.tul/elevating-privilegesthrough-azure-policy-872298cf673f

QUESTIONS

- @wucpi
- viktor.gazdag@nccgroup.com
- https://github.com/woodspeed/conferences

