Back to the basics – Sharing my tips and tricks for using ARM REST APIs

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Agenda

- Azure Resource Manager REST APIs?
  - Why?
  - How?
- (Lots of) Demo
- Q&A

REST APIs

- *"Representational State Transfer (REST) APIs are service endpoints that support sets of HTTP operations (methods), which provide create, retrieve, update, or delete access to the service's resources."* - Azure REST API reference
- HTTP call → Service endpoints (URIs)
- Methods (GET, POST, PUT, PATCH, etc.)
- Headers (auth token)
- Body (Json)
- Response (status code, body, headers)

Azure REST APIs

- Authority: https://login.microsoftonline.com/<TenantId>
- Endpoints (Resource URLs)
  - Control Plane (ARM): https://management.azure.com/
  - Data Plane (various)
    - Key Vault: https://vault.azure.net/
    - Storage blob: https://accountName.blob.core.windows.net/
    - Synapse workspace: https://dev.azuresynapse.net/
    - etc.
  - Others (i.e. MS Graph) https://graph.microsoft.com/

Authentication – Access Token

- Access Token is generated for each endpoint
- Valid for 3600 seconds
- How to generate access tokens
  - Azure PowerShell: `Get-AzAccessToken`
  - Az CLI: `az account get-access-token`
  - MSAL.PS module: `Get-MsalToken`
  - Manually via HTTP request

Azure REST APIs – Why??

- Used by all the tooling
  - Azure SDKs
  - Az PowerShell
  - Az CLI
  - Azure Portal
  - Terraform
  - Bicep & ARM templates
  - etc.
- What if there're gaps in the tools?
- When there is no other way to achieve your goal, API is the source of truth

Gaps? What do you mean? Examples?

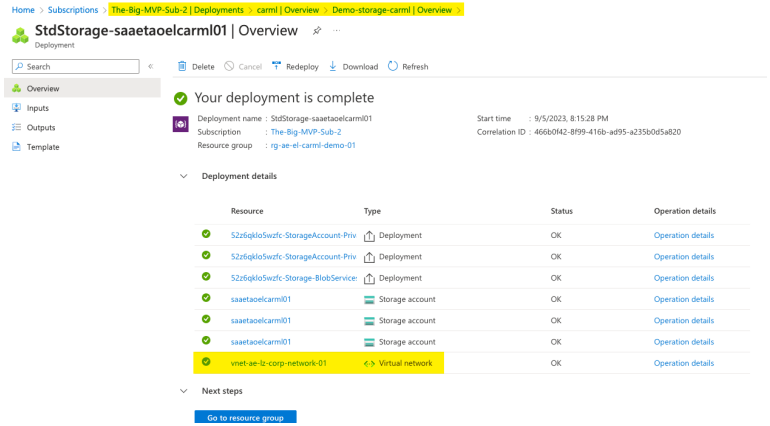
- CARML pipelines deletes test resources after deployments
- How CARML detects deployed resources

```
'subscription' {
    [array]$deploymentTargets = (Get-AzDeploymentOperation -DeploymentName $name).Targ
    break
}
```

Gaps? What do you mean? Examples?

- List of resources to be deleted

```
Get-DeploymentTargetResourceList -Name carml -Scope 'subscription'
/subscriptions/681512a3-2969-4449-b1b0-5b8dcad20059/resourceGroups/rg-ae-el-carml-demo-01
/subscriptions/681512a3-2969-4449-b1b0-5b8dcad20059/resourceGroups/rg-ae-el-carml-demo-01/providers/Microsoft.KeyVault/vaults/kv-taoelcarmo6v6bn02
/subscriptions/681512a3-2969-4449-b1b0-5b8dcad20059/resourceGroups/rg-lz-corp-network-01/providers/Microsoft.Network/virtualNetworks/vnet-ae-lz-corp-network-01
/subscriptions/681512a3-2969-4449-b1b0-5b8dcad20059/resourceGroups/rg-ae-el-carml-demo-01/providers/Microsoft.Network/privateEndpoints/pe-kv-taoelcarmo6v6bn02
/subscriptions/681512a3-2969-4449-b1b0-5b8dcad20059/resourceGroups/rg-ae-el-carml-demo-01/providers/Microsoft.KeyVault/vaults/kv-taoelcarmo6v6bn02
/subscriptions/681512a3-2969-4449-b1b0-5b8dcad20059/resourceGroups/rg-ae-el-carml-demo-01/providers/Microsoft.KeyVault/vaults/kv-taoelcarmo6v6bn02
/subscriptions/681512a3-2969-4449-b1b0-5b8dcad20059/resourceGroups/rg-lz-corp-network-01/providers/Microsoft.Network/virtualNetworks/vnet-ae-lz-corp-network-01
/subscriptions/681512a3-2969-4449-b1b0-5b8dcad20059/resourceGroups/rg-ae-el-carml-demo-01/providers/Microsoft.Network/privateEndpoints/pe-kv-taoelcarmo6v6bn02
/subscriptions/681512a3-2969-4449-b1b0-5b8dcad20059/resourceGroups/rg-ae-el-carml-demo-01/providers/Microsoft.Network/privateEndpoints/pe-kv-taoelcarmo6v6bn02
/subscriptions/681512a3-2969-4449-b1b0-5b8dcad20059/resourceGroups/rg-ae-el-carml-demo-01/providers/Microsoft.KeyVault/vaults/kv-taoelcarmo6v6bn01
```



Gaps? What do you mean? Examples?

- But hold on, I did not create the vnet???

```
// ---------- Lookup Private Endpoint subnet ----------

resource peVnet 'microsoft.network/virtualNetworks@2022-07-01' existing = {
  name: privateEndpointVirtualNetworkName
  scope: resourceGroup(privateEndpointVirtualNetworkResourceGroup)

  resource peSubnet 'subnets' existing = {
    name: privateEndpointSubnetName
  }
}
```

Gaps? What do you mean? Examples?

- Get-AzDeploymentOperations with –debug switch

```
DEBUG: ============================ HTTP REQUEST ============================

HTTP Method:
GET

Absolute Uri:
https://management.azure.com/subscriptions/[redacted]/providers/M

Headers:
Accept-Language               : en-US
x-ms-client-request-id        : 630034b9-0748-4de9-a335-984b22d53ee9

Body:


DEBUG: ============================ HTTP RESPONSE ============================

Status Code:
OK

Headers:
Cache-Control                 : no-cache
Pragma                        : no-cache
x-ms-ratelimit-remaining-subscription-reads: 11999
x-ms-request-id               : 3743b206-8ed5-490d-b167-779eaab18250
x-ms-correlation-request-id   : 3743b206-8ed5-490d-b167-779eaab18250
x-ms-routing-request-id       : AUSTRALIAEAST:20230911T022506Z:3743b206-8ed5-490d-b167-779e
Strict-Transport-Security     : max-age=31536000; includeSubDomains
X-Content-Type-Options        : nosniff
Date                          : Mon, 11 Sep 2023 02:25:06 GMT

Body:
{
  "value": [
    {
      "id": "/subscriptions/[redacted]/providers/Microsoft.Resour
      "operationId": "F4CE5632F07232FB",
      "properties": {
        "provisioningOperation": "Read",
        "provisioningState": "Succeeded",
        "timestamp": "2023-09-11T02:12:40.9146372",
        "duration": "PT1M55.3572996S",
        "trackingId": "da6f0b0c-ca68-4de9-872f-82e3ced36d6b",
        "statusCode": "OK",
```

Gaps? What do you mean? Examples?

- No Way to filter **ProvisioningOperation** using Azure PowerShell!

Learn / Azure / Azure PowerShell / Reference / Resources /

Get-AzDeploymentOperation

Reference

Feedback

Module: Az.Resources

Get deployment operation

Syntax

PowerShell Copy

```
Get-AzDeploymentOperation
   -DeploymentName <String>
   [-OperationId <String>]
   [-Pre]
   [-DefaultProfile <IAzureContextContainer>]
   [<CommonParameters>]
```

PowerShell Copy

```
Get-AzDeploymentOperation
   -DeploymentObject <PSDeployment>
   [-Pre]
   [-DefaultProfile <IAzureContextContainer>]
   [<CommonParameters>]
```

```
Get-AzDeploymentOperation -DeploymentName carml | Format-List *

Id                : /subscriptions/[redacted]/providers/Micr
OperationId       : F4CE5632F07232FB
ProvisioningState : Succeeded
StatusCode        : OK
StatusMessage     :
TargetResource    : /subscriptions/[redacted]/resourceGroups

Id                : /subscriptions/[redacted]/providers/Micr
OperationId       : 8140705D31E73989
ProvisioningState : Succeeded
StatusCode        : OK
StatusMessage     :
TargetResource    : /subscriptions/[redacted]/resourceGroups

Id                : /subscriptions/[redacted]/providers/Micr
OperationId       : EEDFF64E01F47509
ProvisioningState : Succeeded
StatusCode        : OK
StatusMessage     :
TargetResource    : /subscriptions/[redacted]/resourceGroups
```

Gaps? What do you mean?

- ARM REST API (https://learn.microsoft.com/en-us/rest/api/resources/deployment-operations/get#provisioningoperation)

```powershell
Function GetDeploymentOperation {
  [CmdletBinding()]
  param (
    [Parameter(Mandatory = $true)]
    [string] $deploymentId,

    [Parameter(Mandatory = $true)]
    [string]$apiToken
  )
  $url = "https://management.azure.com/$deploymentId/operations?api-version=2021-04-01"
  $headers = @{
    'Authorization' = "Bearer $apiToken"
    'Content-Type'  = 'application/json'
  }
  Write-Verbose "Getting deployment operation for deployment via url $url" -verbose
  $request = invoke-webrequest -Uri $url -Method Get -Headers $headers -ErrorAction SilentlyContinue
  if ($request.StatusCode -ge 200 -and $request.StatusCode -le 299) {
    $result = ($request.Content | ConvertFrom-Json).value
  } else {
    Write-Verbose "Unable to get deployment operation for deployment $deploymentId via url $url. Error: $($re
    $result = $null
  }
  #Filter on ProvisioningOperation and only return 'Create'
  $filteredResult = $result | where-object { $_.properties.provisioningOperation -ieq 'create' }
  $filteredResult
}
```

ProvisioningOperation

The name of the current provisioning operation.

Name	Type	Description
Action	string	The provisioning operation is action.
AzureAsyncOperationWaiting	string	The provisioning operation is waiting Azure async operation.
Create	string	The provisioning operation is create.
Delete	string	The provisioning operation is delete.
DeploymentCleanup	string	The provisioning operation is cleanup. This operation is part of the 'complete' mode deployment.
EvaluateDeploymentOutput	string	The provisioning operation is evaluate output.
NotSpecified	string	The provisioning operation is not specified.
Read	string	The provisioning operation is read.
ResourceCacheWaiting	string	The provisioning operation is waiting for resource cache.
Waiting	string	The provisioning operation is waiting.

```
Get-DeploymentTargetResourceList -Name carml -Scope 'subscription' -SubscriptionId 681[redacted]059
/68[redacted]59/resourceGroups/rg-ae-el-carml-demo-01
/68[redacted]59/resourceGroups/rg-ae-el-carml-demo-01/providers/Microsoft.Storage/storageAccounts/saaetaoelcarml01
/68[redacted]59/resourceGroups/rg-ae-el-carml-demo-01/providers/Microsoft.Network/privateEndpoints/pe-saaetaoelcarml01-dfs
/68[redacted]59/resourceGroups/rg-ae-el-carml-demo-01/providers/Microsoft.Network/privateEndpoints/pe-saaetaoelcarml01-blob
/68[redacted]59/resourceGroups/rg-ae-el-carml-demo-01/providers/Microsoft.Storage/storageAccounts/saaetaoelcarml01/blobServices/default
/68[redacted]59/resourceGroups/rg-ae-el-carml-demo-01/providers/Microsoft.KeyVault/vaults/kv-taoelcarmo6v6bn02
/68[redacted]59/resourceGroups/rg-ae-el-carml-demo-01/providers/Microsoft.Network/privateEndpoints/pe-kv-taoelcarmo6v6bn02
/68[redacted]59/resourceGroups/rg-ae-el-carml-demo-01/providers/Microsoft.KeyVault/vaults/kv-taoelcarmo6v6bn01
/68[redacted]59/resourceGroups/rg-ae-el-carml-demo-01/providers/Microsoft.Network/privateEndpoints/pe-kv-taoelcarmo6v6bn01
```

Putting it together

1. Construct the URL for your REST API call
2. Build request header (with auth token)
3. Construct request body (optional)
4. Invoke the HTTP request with correct method
5. Pulling for the result (optional)

Demo

- Azure Portal
  - Resource Json view
  - API Playground
- MS Docs site
- Postman
- PowerShell | Bash | Python

Q&A

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Introduction to CARML and how it can help your organization adopt Azure Bicep and Infrastructure as Code

References

- Azure REST API reference (https://learn.microsoft.com/en-us/rest/api/azure/)
- Azure REST API Specifications: https://github.com/Azure/azure-rest-api-specs
- Azure Resource Manager Schemas: https://github.com/Azure/azure-resource-manager-schemas/
- Azure Portal API Playground: https://portal.azure.com/#view/Microsoft_Azure_Resources/ArmPlayground
- JWT token decoder: https://jwt.ms
- How to call Azure REST APIs with Postman: https://learn.microsoft.com/en-us/rest/api/azure/#how-to-call-azure-rest-apis-with-postman

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