Progress®
Kemp® LoadMaster®

Reference Guide Zero Trust Access Gateway

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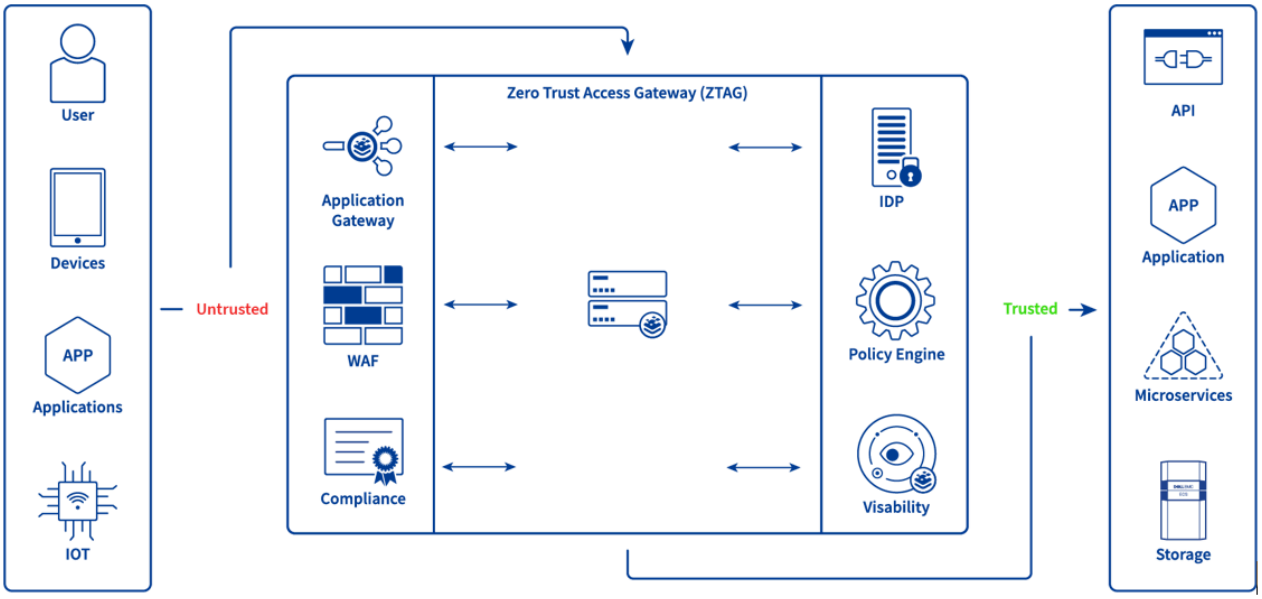
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Introduction

With the increase of threats and other malicious activities targeted at organizations today, the need for a layered security model providing the least privileged access has never been more essential. As most modern applications provide level protection, there are often some gaps that limit the ability to address specific security needs. The Progress Kemp load balancer is in a privileged position and, with its native capabilities, is empowered to apply security in ways other solutions fall short.

The Zero Trust Access Gateway (ZTAG) delivers a simple, flexible, and secure approach for providing the necessary access for users and applications to access backend systems while greatly reducing the exposure to today's threats.



The Zero Trust Access Gateway delivers secure publishing of workloads using the following attributes:

- **Authentication** – Leveraging an organization's existing identity provider (iDP), Zero Trust Access Gateway can authenticate users to determine the proper credentials provided before allowing access to the published applications. Using the Edge Security Pack, several authentication methods, including Multi-Factor Authentication (MFA), can be leveraged to pre-authenticate users before allowing access to the published application.
- **Group Membership** – Building off the authentication delivered as part of Zero Trust Access Gateway, group membership assignment can be required as part of access policies. This approach can allow or deny access to an application dependent on group membership or enforce additional authentication methods (i.e., Multi-Factor Authentication).
- **Location** – The load balancer can identify the source address of who or what is accessing the backend systems. Granular access control policies can be applied along with other characteristics to permit or deny access to portions of an application. Additional authentication methods can also be required based on location.
- **HTTP Header** – Publishing workloads at layer 7 provides full visibility of application traffic, which can be leveraged to identify intent and apply necessary security policies to ensure the least privileged access.
- **Path/ S3 Bucket** – Business-critical workloads, including web application and object storage solutions, require permissions to be applied based on what portion of the application or storage is accessed.

Related Links

For details, see the following topics:

- Document Purpose

Document Purpose

This document describes how to get started using the Zero Trust Access Gateway.

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Progress Kemp Zero Trust Access Gateway

The Zero Trust Access Gateway provides administrators with a policy builder to implement granular least privileged access to resources published through the load balancer. A configuration file is used to clearly define the application as well as the access policy rules. This configuration file is called by a script that allows the administrator to choose different options during each run, dependent on the use case being addressed. Example XML configuration files are provided to assist with the configuration of policies for each use case.

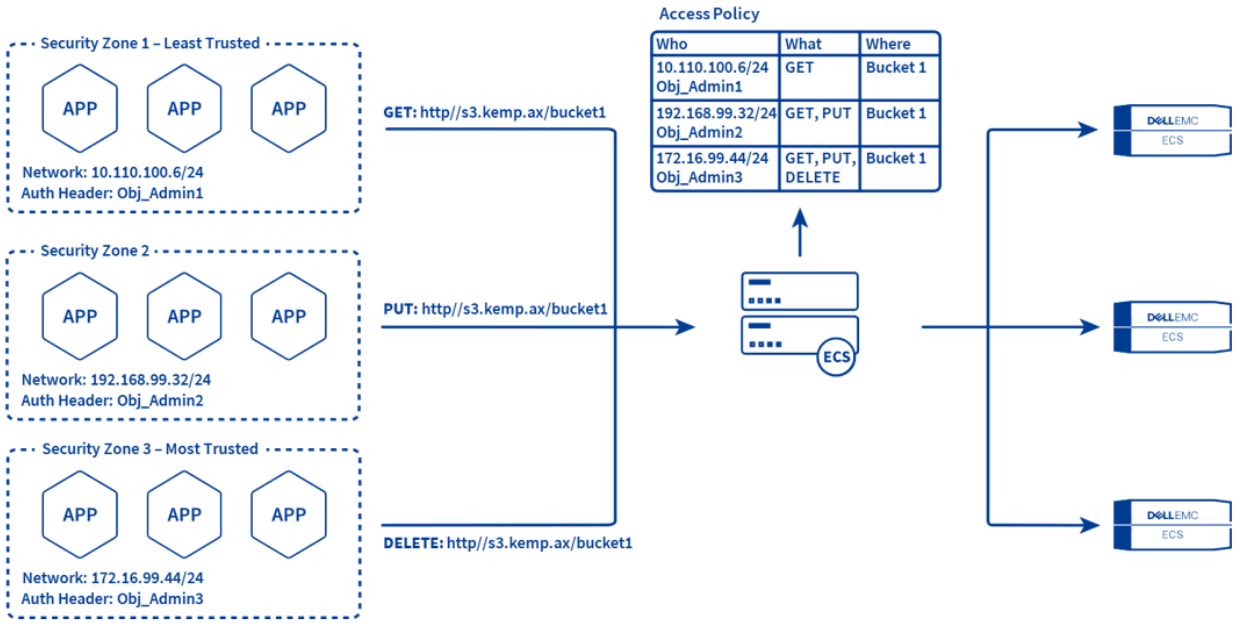
Related Links

For details, see the following topics:

- Supported Use Cases

Supported Use Cases

The following are the supported use cases for Zero Trust Access Gateway while additional variations are being developed and released.



Source IP/Method/Path

This security policy, although developed for object storage solutions, is not limited to this workload. This approach applies security looking at three specific characteristics of the traffic being captured: Who, What, and Where. The traffic must match all three attributes to be permitted access to the published system. This configuration will ensure applications or users in a less secure zone do not have the necessary access to possibly write any malicious data into the shared storage system that may compromise the applications in the highest security zone. Those same applications in the less secure zone might be able to write and delete data from other buckets if those buckets were not accessible to highly secure systems.

Who – The source IP Address of the requestor. Since the primary workload is object storage, this IP address may be that of a user or an application access the storage. These source IP addresses would be directly associated with security zones.

What – The HTTP Method being passed to the published system. This would most commonly be a GET, PUT, or DELETE.

Where – This is the path of the object being requested or written. In object storage terminology, this would commonly be the name of an S3 bucket.

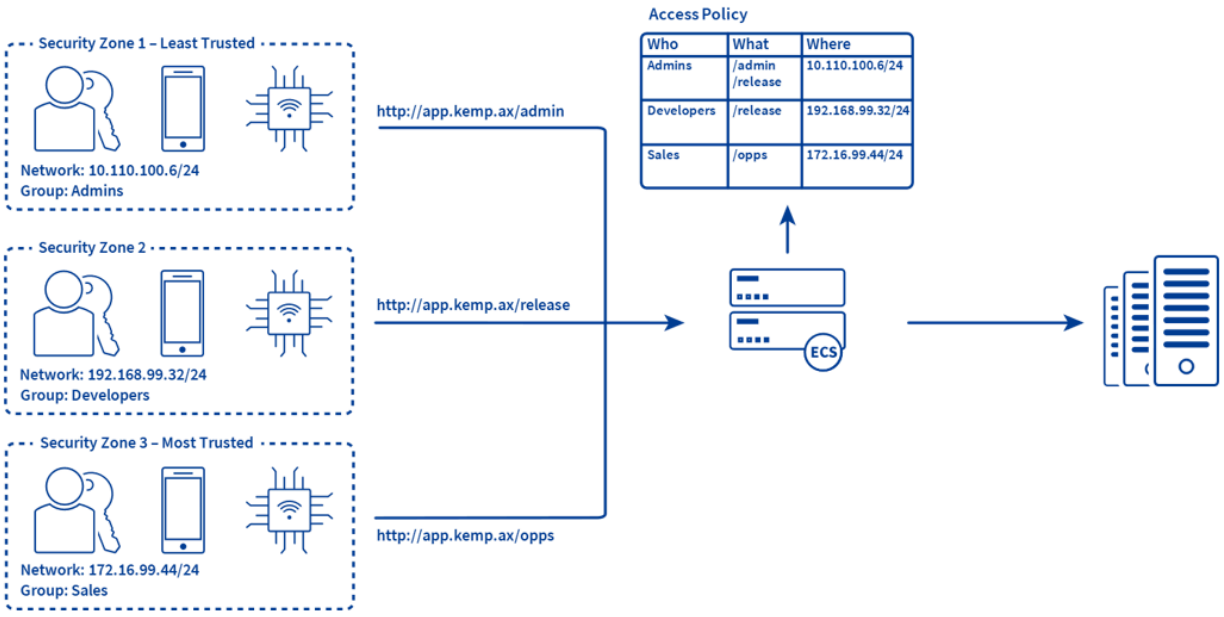
Authentication Header/Method/SourceIP

This security policy is also focused on the Object Storage workload but can be leveraged with other solutions that utilize HTTP methods and the Authorization Header. The traffic once again must match all three attributes to be permitted access to the published system. If the quantity of buckets being secured becomes more difficult to manage, the ability to leverage user accounts to secure the storage is an alternate solution. The accounts that are used to authenticate to today's storage solutions are passed within the HTTP header. This Authentication Header can set policies to permit or deny specific access to the storage or other backend system. This identifying header can be combined with the source IP address of the application or user to deliver granular security.

Who – The Authentication Header within the HTTP traffic. Many object storage vendors leverage the Authentication header to pass credentials for accessing the storage solution.

What – The HTTP Method being passed to the published system. This would most commonly be a GET, PUT, or DELETE.

Where – This is the Source IP address from where the traffic originated. This may be in the form of a single IP address or an entire network subnet.



SteeringGroup/Path/SourceIP

This security policy is designed for any application that allows for pre-authentication to occur on the Progress Kemp Load Balancer. The Edge Security Pack is a security feature that provides the ability to pre-authenticate users on the load balancer before sending connections to the backend systems. In addition to verifying a user's identity, Edge Security Pack permits or restricts access based on group memberships in Active Directory. This functionality, combined with identifying the requestor's source IP address, can enforce granular controls to different portions or paths of an application.

Who – Steering Group. This is a Progress Kemp specific attribute that looks at the Active Directory group a user is a member of and directs (steers) them to a specific element of the published application.

What – The path within the published application the user is trying to access. By defining this using regular expressions (regex), an application can be segmented to suit many scenarios

Where – This is the Source IP address from where the traffic originated. This may be in the form of a single IP address or an entire network subnet.

Trusted/ Untrusted Zone

This security policy leverages the Edge Security Pack, allowing pre-authentication to occur on the Progress Kemp Load Balancer. This approach applies security looking at two specific characteristics of the traffic being captured: Who and Where. Should the traffic match the attributes for a Trusted zone, the user is presented with a simple form to authenticate to the application. Should the traffic be identified as Untrusted, the user will be required to provide multi-factor authentication to gain access. Active Directory Group memberships identified using Edge Security Pack are also leveraged to ensure that only specific users, either from a known or unknown network, can access the published application.

Who – Permitted Group. This is a Progress Kemp-specific attribute that looks at the Active Directory group a user is a member of and permits or denies access dependent on their group membership.

Where – This is the Source IP address from where the traffic originated. This may be in the form of a single IP address or an entire network subnet.

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Getting Started

Refer to the following sections for details on how to get started with the Zero Trust Access Gateway.

Related Links

For details, see the following topics:

- Pre-Requisites
- Import the Progress Kemp PowerShell Module
- Download the Progress Kemp Zero Trust Access Gateway Package
- Modify the Configuration Files for the Desired Use Case - Ref
- Run the Zero Trust Policy Builder Script

Pre-Requisites

The Zero Trust Access Gateway does not require the user to have in-depth knowledge of Progress Kemp products or PowerShell, but some familiarity is recommended.

The components that make up the Zero Trust Access Gateway are as follows:

- LoadMaster or ECS Connection Manager
- Progress Kemp Load Balancer PowerShell Module
- Zero Trust Policy Builder PowerShell Script

- Zero Trust Policy Builder Configuration File (XML)

Import the Progress Kemp PowerShell Module

The latest Progress Kemp PowerShell Module can be found on the following page: LoadMaster Other Downloads.

The module contains the following files within the Kemp.LoadBalancer.Powershell folder:

- Kemp.LoadBalancer.Powershell.psd1
- Kemp.LoadBalancer.Powershell.psm1
- deprecated.psm1
- Kemp.LoadBalancer.Powershell-Help.xml

Import the Progress Kemp PowerShell Module

Copy the Kemp.LoadBalancer.Powershell folder to the relevant folder.

Install the module in a folder that is available in PSModulePath ($Env:PSModulePath).

If PSModulePath does not contain the module folder value, add the module path to the in PSModulePath environment variable. The module path can be for the current user only or for all users. Recommended values are:

- $home\Documents\WindowsPowerShell\Modules for the current User
- $Env:ProgramFiles\WindowsPowerShell\Modules for All Users

For example, install the Progress Kemp PowerShell module for the current user only:

 # Save the current value of PSModulePath

$mpath = [Environment]::GetEnvironmentVariable("PSModulePath")

 # Add the new path to the $mpath variable

$mpath += ";$home\Documents\WindowsPowerShell\Modules\Kemp.LoadBalancer.Powershell"

 # Add the paths in $mpath to the PSModulePath value.

[Environment]::SetEnvironmentVariable("PSModulePath", $mpath)

Import the module to start using it:

Import-Module Kemp.LoadBalancer.Powershell

Get-Module Kemp.LoadBalancer.Powershell

```
PS C:\> Get-Module Kemp.LoadBalancer.PowerShell

ModuleType Version    Name                                ExportedCommands
---------- -------    ----                                ----------------
Script     7.2.52.0   Kemp.LoadBalancer.PowerShell        {Add-BondedInterface, Add-GeoFQDN,
```

Note: For the PowerShell commands to work, the API interface must be enabled on the LoadMaster. To enable it using the Web User Interface (WUI), go to **Certificates and Security > Remote Access** and select **Enable API Interface**

You can test the connection to the load balancer by using the **Test-LmServerConnection** command, for example:

Test-LmServerConnection -ComputerName 10.10.99.100 -Port 8443 -Verbose

```
PS C:\> Test-LmServerConnection -ComputerName 10.10.99.100 -Port 8443 -Verbose
VERBOSE: Connecting to 10.10.99.100 on 8443 . . .
VERBOSE: Input params are OK, moving on . . .
VERBOSE: ParamName="Param" - ParamValue="version"
VERBOSE: [SetMultipleParamUrl] command url: https://10.10.99.100:8443/access/get?Param=version
VERBOSE: setting ServerCertificateValidationCallback to TRUE.
VERBOSE: Running the API command using the specified login/password (user: "bal") as login credential.
VERBOSE: Response received.
VERBOSE: HTTP STATUS: OK
VERBOSE: result: <?xml version="1.0" encoding="ISO-8859-1"?>
<Response stat="200" code="ok">
<Success><Data><version>7.2.53.0.20474.RELEASE</version>
</Data></Success>
</Response>

VERBOSE: setting ServerCertificateValidationCallback to NULL.
VERBOSE: closing connection.
VERBOSE: ret code [200]
VERBOSE: ret resp [Command successfully executed.]
VERBOSE: OK, the LM Server is up and running
True
```

Download the Progress Kemp Zero Trust Access Gateway Package

The latest Progress Kemp ZTAG Package can be found on the following page: LoadMaster Other Downloads.

Unzip the ZTAG Package.

The package contains the following files:

- ZTAG-Policy-Builder.ps1
- Config_AuthHeader.xml
- Config_SourceIP.xml
- Config_SteeringGroup.xml
- Config_Trusted_Zones.xml

Modify the Configuration Files for the Desired Use Case - Ref

The Zero Trust Policy Builder currently supports four different use cases. Each is defined within a sample configuration XML file. These configuration files determine the state of the environment which is being secured.

Config_AuthHeader.xml supports the Authentication Header/Method/SourceIP use case

Config_SourceIP.xml support the Source IP/Method/Path use case

Config_SteeringGroup.xml supports the SteeringGroup/Path/SourceIP use case

Config_Trusted_Zones.xml supports the Trusted/ Untrusted Zone use case

---

Note: It is recommended that Notepad++ or some other XML-aware application is used when working with the ZTAG configuration files.

Open the desired sample configuration file. The XML files contain similar sections for the Virtual Service configuration that will be used to publish and secure the application/workload. Policy-specific sections will be unique based on the use case.

SourceIP/Method/Path Use Case

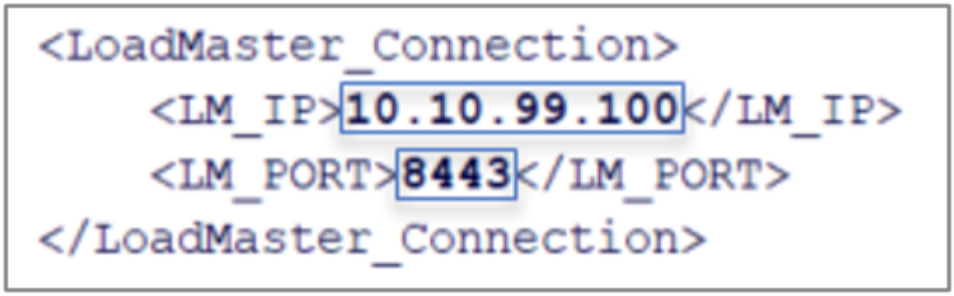
The following are the configuration steps for the **SourceIP/Method/Path** Use Case.

Open the **Config_SourceIP.xml** file in Notepad++ or your preferred application.

The ZTAG configuration sections for this use case are:

- LoadMaster_Connection
- VirtualService_Configration
- RealServer_Configuration
- RealServer_List
- Identify_Networks
- Zero_Trust_Access_Gateway_Policies
- Backup_Options
- Logging_Options

The configuration steps are as follows:



1. Modify the LoadMaster connection settings for the LoadMaster or ECS Connection Manager:
   - The LoadMaster or ECS Connection Manager IP Address
   - The LoadMaster or ECS Connection Manager TCP Port

```
<VirtualService_Configuration>
    <VS_NickName>ObjectStore</VS_NickName>
    <VS_IP>10.10.99.103</VS_IP>
    <VS_PORT>443</VS_PORT>
    <VS_Scheduling>lc</VS_Scheduling>
    <Enable_TLS>Y</Enable_TLS>
 <!-- ##These TLS settings are optional if a TLS certificate is already imported onto the Load Balancer to be used for this service ##-->
    <TLS_Cert_Location_Path></TLS_Cert_Location_Path>
    <TLS_Cert_Identifier></TLS_Cert_Identifier>
    <TLS_Cert_PassPhrase></TLS_Cert_PassPhrase>
</VirtualService_Configuration>
```

2. Modify the Virtual Service configuration with settings based on workload requirements.
   - A Nickname (friendly name) to identify the workload being published
   - A Virtual IP Address to publish the workload
   - A Scheduling Method on how the distribution of the traffic to backend systems should occur.
     - rr = round-robin
     - wrr = weighted round robin
     - lc = least connection
     - wlc = weighted least connection
     - fixed = fixed weighting
     - adaptive = resource based (adaptive)
     - sh = source IP hash
     - dl = weighted response time
     - sdn-adaptive = resource based (SDN adaptive)
     - uhash = URL hash
   - Select whether SSL/TLS Acceleration should be enabled on the Virtual Service.
     - Y
     - N

   Optional – If a certificate is present on the LoadMaster/ ECS Connection Manager, a prompt will be provided to select which certificate should be used in the configuration. A certificate can be uploaded and applied by entering the following parameters

   - Path/ location to the certificate file (PFX)
   - A friendly name or identifier for the certificate

- The passphrase for importing the certificate

```
<RealServer_Configuration>
    <RS_Check_Method>tcp</RS_Check_Method>
    <RS_Check_Port>9020</RS_Check_Port>
    <RS_Port>9020</RS_Port>
    <!-- ## This setting is used to specify whether the Real Servers are on a directly connected interface
    <Non_Local_RS>Y</Non_Local_RS>
</RealServer_Configuration>
```

3. Modify the Real Server configuration with settings based on workload requirements.

   Real Server Check Method

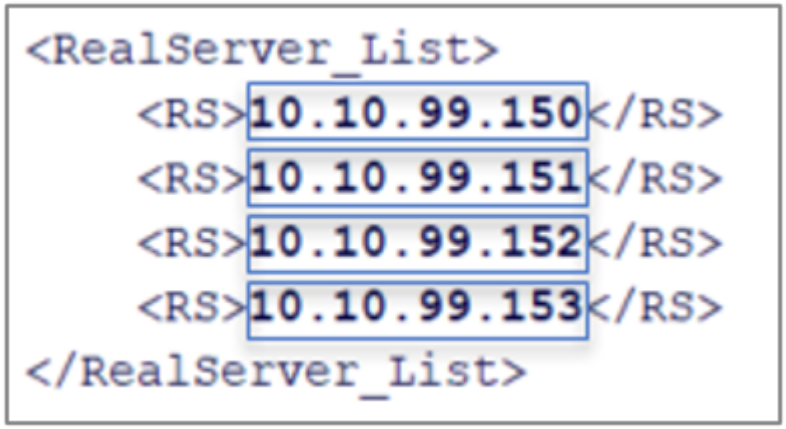
   - https
   - http
   - tcp

   Real Server Check Port to use

   Real Server Port should it differ from the check port

   Non_Local Real Servers to specify whether the Real Servers are on a directly connected interface or on a remote network

   - Y
   - N



4. Modify the Real Server list with the IP Address or FQDN of the backend systems being published. Lines can be removed or added based on the number of Real Servers in the environment.

```
<Identify_Networks>
    <Network SourceIP="/192\.168\.10\..*/" Description="SecureZone 11"></Network>
    <Network SourceIP="/10\.100\.110\..*/" Description="SecureZone 21"></Network>
    <Network SourceIP="/172\.16\.10\..*/" Description="SecureZone 31"></Network>
</Identify_Networks>
```

5. The SourceIP/Method/Path use case identifies where the traffic originates from based on the IP Address. This section defines the networks and descriptions for each within an environment.

- Source IP Address using Regular Expression (RegEx) to identify the networks in the environment.
- Description (friendly name) of the networks in the environment.

```
<Zero_Trust_Access_Gateway_Policies>
    <Policy SourceIP="/192\.168\.10\..*/" Method="GET" Path="bucket1"></Policy>
    <Policy SourceIP="/172\.16\.10\..*/" Method="PUT" Path="bucket2"></Policy>
    <Policy SourceIP="/172\.16\.10\..*/" Method="DELETE" Path="bucket3"></Policy>
    <Policy SourceIP="/10\.100\.110\..*/" Method="GET" Path="bucket3"></Policy>
    <Policy SourceIP="/192\.168\.10\..*/" Method="DELETE" Path="bucket4"></Policy>
</Zero_Trust_Access_Gateway_Policies>
```

6. The policy section is where the security settings are configured. Lines can be added or removed depending on the number of rules that should be applied in the policy.
   - Source IP Address to apply the security policy too.
   - The method that should be permitted for the defined path/ bucket.
     - GET
     - PUT
     - DELETE
     - POST
   - The path or bucket to apply the security policy too.

```
<Backup_Options>
    <BackupFilePath>C:\temp</BackupFilePath>
    <BackupFileName>ZTAG_Backup</BackupFileName>
</Backup_Options>
```

Note: Any Source IP Addresses that are applied here must be identified in the Identify_Network section for the SourceIP use case above

7. **Optional** - During each run of the Zero Trust Policy Builder, the option to take a backup before any changes are applied is presented. These options are used to define the name and where the backup should be stored. A date and time stamp will also be included in the backup file name.
   - File Path – Ensure the proper permissions are applied to the folder.
   - Backup file name – Used to identify the backup being taken

```
<Logging_Options>
    <LogFilePath>C:\temp\ZTAG.log</LogFilePath>
    <MaxLogSizeKB>500</MaxLogSizeKB>
    <MaxLogRollovers>1</MaxLogRollovers>
</Logging_Options>
```

8. Logging is generated for each run of the Zero Trust Policy Builder. These settings will provide the location for the log files and how much of the disk can be utilized to store files.
   - File Path – Ensure the proper permissions are applied to the folder.
   - Max Log Size – The maximum size of each of the log files.
   - Max Log Rollovers – The maximum number of log file rollovers to allow. The setting of 2 rollover files and 500KB maximum size will allow 1000KB of storage to be used on the system running the Zero Trust Policy Builder.

AuthHeader/Method/SourceIP Use Case

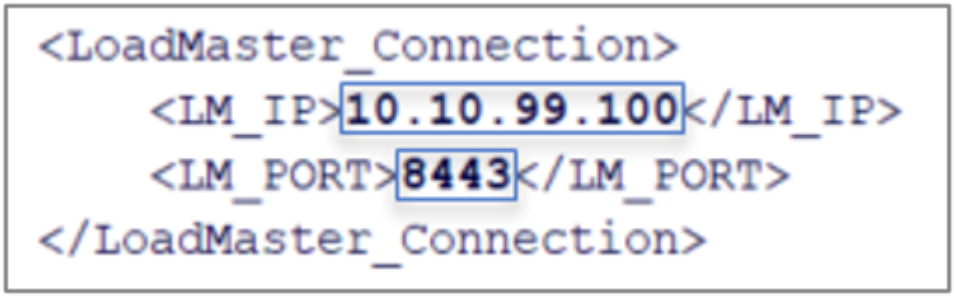
The following are the configuration steps for the **AuthHeader/Method/SourceI**P Use Case.

Open the **Config_AuthHeader.xml** file in Notepad++ or your preferred application.

The ZTAG configuration sections for this use case are:

- LoadMaster_Connection
- VirtualService_Configration
- RealServer_Configuration
- RealServer_List
- Identify_Users
- Zero_Trust_Access_Gateway_Policies
- Backup_Options
- Logging_Options

The configuration steps are as follows:



1. Modify the LoadMaster connection settings for the LoadMaster or ECS Connection Manager:
   - The LoadMaster or ECS Connection Manager IP Address
   - The LoadMaster or ECS Connection Manager TCP Port

```
<VirtualService_Configuration>
    <VS_NickName>objectStore</VS_NickName>
    <VS_IP>10.10.99.103</VS_IP>
    <VS_PORT>443</VS_PORT>
    <VS_Scheduling>lc</VS_Scheduling>
    <Enable_TLS>Y</Enable_TLS>
 <!-- ##These TLS settings are optional if a TLS certificate is already imported onto the Load Balancer to be used for this service ##-->
    <TLS_Cert_Location_Path></TLS_Cert_Location_Path>
    <TLS_Cert_Identifier></TLS_Cert_Identifier>
    <TLS_Cert_PassPhrase></TLS_Cert_PassPhrase>
</VirtualService_Configuration>
```

2. Modify the Virtual Service configuration with settings based on workload requirements.
   - A Nickname (friendly name) to identify the workload being published
   - A Virtual IP Address to publish the workload
   - A Scheduling Method on how the distribution of the traffic to backend systems should occur.
     - rr = round-robin
     - wrr = weighted round robin
     - lc = least connection
     - wlc = weighted least connection
     - fixed = fixed weighting
     - adaptive = resource based (adaptive)
     - sh = source IP hash
     - dl = weighted response time
     - sdn-adaptive = resource based (SDN adaptive)
     - uhash = URL hash
   - Select whether SSL/TLS Acceleration should be enabled on the Virtual Service.
     - Y
     - N

   Optional – If a certificate is present on the LoadMaster/ ECS Connection Manager, a prompt will be provided to select which certificate should be used in the configuration. A certificate can be uploaded and applied by entering the following parameters

   - Path/ location to the certificate file (PFX)
   - A friendly name or identifier for the certificate
   - The passphrase for importing the certificate

```
<RealServer_Configuration>
    <RS_Check_Method>tcp</RS_Check_Method>
    <RS_Check_Port>9020</RS_Check_Port>
    <RS_Port>9020</RS_Port>
    <!-- ## This setting is used to specify whether the Real Servers are on a directly connected interface
    <Non_Local_RS>Y</Non_Local_RS>
</RealServer_Configuration>
```

3. Modify the Real Server configuration with settings based on workload requirements.

   Real Server Check Method

   - https
   - http

- tcp

Real Server Check Port to use

Real Server Port should it differ from the check port

Non_Local Real Servers to specify whether the Real Servers are on a directly connected interface or on a remote network

- Y
- N

```
<RealServer_List>
      <RS>10.10.99.150</RS>
      <RS>10.10.99.151</RS>
      <RS>10.10.99.152</RS>
      <RS>10.10.99.153</RS>
</RealServer_List>
```

4. Modify the Real Server list with the IP Address or FQDN of the backend systems being published. Lines can be removed or added based on the number of Real Servers in the environment.

```
<Identify_Users>
    <User name="object_admin1" Description="SecureLevel 1"></User>
    <User name="object_admin2" Description="SecureLevel 2"></User>
    <User name="object_admin3" Description="SecureLevel 3"></User>
</Identify_Users>
```

5. The AuthHeader/Method/SourceIP use case identifies who is accessing the workload with the user account that appears in the Authentication Header. This section defines the user accounts or Object IDs and descriptions for each within an environment.
   - Username to identify the account or object ID in the environment.
   - Description (friendly name) of the user account in the environment.

```
<Zero_Trust_Access_Gateway_Policies>
    <Policy UserName="Object_Admin1" Method="GET" SourceIP="/10\.100\.110\..*/"></Policy>
    <Policy UserName="Object_Admin2" Method="PUT" SourceIP="/192\.168\.10\..*/"></Policy>
    <Policy UserName="Object_Admin1" Method="DELETE" SourceIP="/172\.16\.10\..*/"></Policy>
    <Policy UserName="Object_Admin3" Method="GET" SourceIP="/172\.16\.10\..*/"></Policy>
    <Policy UserName="Object_Admin3" Method="DELETE" SourceIP="/192\.168\.10\..*/"></Policy>
</Zero_Trust_Access_Gateway_Policies>
```

6. The policy section is where the security settings are configured. Lines can be added or removed

depending on the number of rules that should be applied in the policy.

- Username to apply the security policy too.
- The method that should be permitted for the defined path/ bucket.
  - GET
  - PUT
  - DELETE
  - POST
- The source IP Address as to where the traffic originates from using Regular Expression (RegEx).

```
<Backup_Options>
    <BackupFilePath>C:\temp</BackupFilePath>
    <BackupFileName>ZTAG_Backup</BackupFileName>
</Backup_Options>
```

Note: Any Usernames that are applied here **must** be identified in the Identify_Users section for the SteeringGroup use case above

7. **Optional** - During each run of the Zero Trust Policy Builder, the option to take a backup before any changes are applied is presented. These options are used to define the name and where the backup should be stored. A date and time stamp will also be included in the backup file name.
   - File Path – Ensure the proper permissions are applied to the folder.
   - Backup file name – Used to identify the backup being taken

```
<Logging_Options>
    <LogFilePath>C:\temp\ZTAG.log</LogFilePath>
    <MaxLogSizeKB>500</MaxLogSizeKB>
    <MaxLogRollovers>1</MaxLogRollovers>
</Logging_Options>
```

8. Logging is generated for each run of the Zero Trust Policy Builder. These settings will provide the location for the log files and how much of the disk can be utilized to store files.
   - File Path – Ensure the proper permissions are applied to the folder.
   - Max Log Size – The maximum size of each of the log files.
   - Max Log Rollovers – The maximum number of log file rollovers to allow. The setting of 2 rollover files and 500KB maximum size will allow 1000KB of storage to be used on the system running the Zero Trust Policy Builder.

SteeringGroup/ SourceIP/Path Use Case

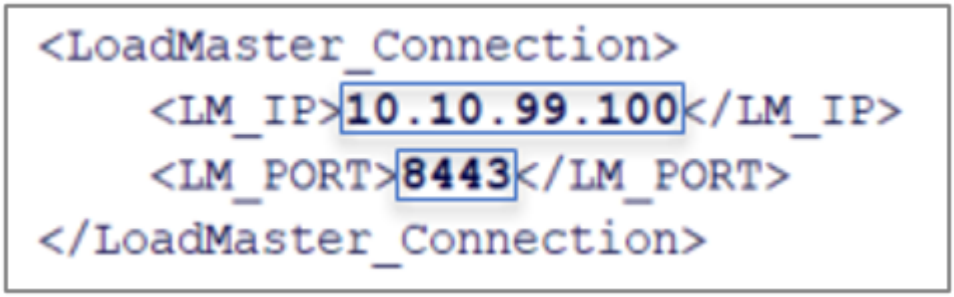
The following are the configuration steps for the **SteeringGroup/ SourceIP/Path** Use Case.

Open the **Config_SteeringGroup.xml** file in Notepad++ or your preferred application.

The ZTAG configuration sections for this use case are:

- LoadMaster_Connection
- VirtualService_Configration
- RealServer_Configuration
- RealServer_List
- Identify_Groups
- Zero_Trust_Access_Gateway_Policies
- Backup_Options
- Logging_Options

The configuration steps are as follows:



1. Modify the LoadMaster connection settings for the LoadMaster or ECS Connection Manager:
   - The LoadMaster or ECS Connection Manager IP Address
   - The LoadMaster or ECS Connection Manager TCP Port

```
<VirtualService_Configuration>
    <VS_NickName>objectStore</VS_NickName>
    <VS_IP>10.10.99.103</VS_IP>
    <VS_PORT>443</VS_PORT>
    <VS_Scheduling>lc</VS_Scheduling>
    <Enable_TLS>Y</Enable_TLS>
 <!-- ##These TLS settings are optional if a TLS certificate is already imported onto the Load Balancer to be used for this service ##-->
    <TLS_Cert_Location_Path></TLS_Cert_Location_Path>
    <TLS_Cert_Identifier></TLS_Cert_Identifier>
    <TLS_Cert_PassPhrase></TLS_Cert_PassPhrase>
</VirtualService_Configuration>
```

2. Modify the Virtual Service configuration with settings based on workload requirements.
   - A Nickname (friendly name) to identify the workload being published
   - A Virtual IP Address to publish the workload
   - A Scheduling Method on how the distribution of the traffic to backend systems should occur.
     - rr = round-robin
     - wrr = weighted round robin
     - lc = least connection
     - wlc = weighted least connection
     - fixed = fixed weighting
     - adaptive = resource based (adaptive)

- sh = source IP hash
- dl = weighted response time
- sdn-adaptive = resource based (SDN adaptive)
- uhash = URL hash

- Select whether SSL/TLS Acceleration should be enabled on the Virtual Service.
  - Y
  - N

Optional – If a certificate is present on the LoadMaster/ ECS Connection Manager, a prompt will be provided to select which certificate should be used in the configuration. A certificate can be uploaded and applied by entering the following parameters

- Path/ location to the certificate file (PFX)
- A friendly name or identifier for the certificate
- The passphrase for importing the certificate

```
<RealServer_Configuration>
    <RS_Check_Method>tcp</RS_Check_Method>
    <RS_Check_Port>9020</RS_Check_Port>
    <RS_Port>9020</RS_Port>
    <!-- ## This setting is used to specify whether the Real Servers are on a directly connected interface
    <Non_Local_RS>Y</Non_Local_RS>
</RealServer_Configuration>
```

3. Modify the Real Server configuration with settings based on workload requirements.

   Real Server Check Method

   - https
   - http
   - tcp

   Real Server Check Port to use

   Real Server Port should it differ from the check port

   Non_Local Real Servers to specify whether the Real Servers are on a directly connected interface or on a remote network

   - Y
   - N

```
<RealServer_List>
    <RS>10.10.99.150</RS>
    <RS>10.10.99.151</RS>
    <RS>10.10.99.152</RS>
    <RS>10.10.99.153</RS>
</RealServer_List>
```

4. Modify the Real Server list with the IP Address or FQDN of the backend systems being published. Lines can be removed or added based on the number of Real Servers in the environment.

```
<Identify_Groups>
    <Group  Name="Admin_Group" Description="Administrators"></Group>
    <Group  Name="Dev_Group" Description="Developers"></Group>
    <Group  Name="Sales_Group" Description="Sales"></Group>
</Identify_Groups>
```

5. The SteeringGroup/SourceIP/Path use case identifies who is accessing the workload with the Active Directory Group they are a member of. This section defines the Active Directory Groups and description for each within an environment.
   - Active Directory Group Names used to secure the environment.
   - Description (friendly name) of the AD Groups in the environment.

```
<Zero_Trust_Access_Gateway_Policies>
    <Policy Group="Admin_Group" SourceIP="/10\.100\.110\..*/" Path="admin"></Policy>
    <Policy Group="Dev_Group" SourceIP="/192\.168\.10\..*/" Path="release"></Policy>
    <Policy Group="Sales_Group" SourceIP="/172\.16\.10\..*/" Path="opps"></Policy>
    <Policy Group="Admin_Group" SourceIP="/10\.100\.110\..*/" Path="release"></Policy>
    <Policy Group="Dev_Group" SourceIP="/172\.16\.10\..*/" Path="admin"></Policy>
</Zero_Trust_Access_Gateway_Policies>
```

Note: If using the Steering Group Use Case, the Edge Security Pack Single Sign On domain must be configured before running the ZTAG Policy Builder

6. The policy section is where the security settings are configured. Lines can be added or removed depending on the number of rules that should be applied in the policy.
   - Username to apply the security policy too.
   - The source IP Address as to where the traffic originates from using Regular Expression (RegEx)
   - The path of the application that the AD group should have access to.

```
<Backup_Options>
    <BackupFilePath>C:\temp</BackupFilePath>
    <BackupFileName>ZTAG_Backup</BackupFileName>
</Backup_Options>
```

Note: Any Groups that are applied here **must** be identified in the Identify_Groups section for the SteeringGroup use case above

7. **Optional** - During each run of the Zero Trust Policy Builder, the option to take a backup before any changes are applied is presented. These options are used to define the name and where the backup should be stored. A date and time stamp will also be included in the backup file name.
   - File Path – Ensure the proper permissions are applied to the folder.
   - Backup file name – Used to identify the backup being taken

```
<Logging_Options>
    <LogFilePath>C:\temp\ZTAG.log</LogFilePath>
    <MaxLogSizeKB>500</MaxLogSizeKB>
    <MaxLogRollovers>1</MaxLogRollovers>
</Logging_Options>
```

8. Logging is generated for each run of the Zero Trust Policy Builder. These settings will provide the location for the log files and how much of the disk can be utilized to store files.
   - File Path – Ensure the proper permissions are applied to the folder.
   - Max Log Size – The maximum size of each of the log files.
   - Max Log Rollovers – The maximum number of log file rollovers to allow. The setting of 2 rollover files and 500KB maximum size will allow 1000KB of storage to be used on the system running the Zero Trust Policy Builder.

Trusted/Untrusted Zone Use Case

The following are the configuration steps for the **Trusted/Untrusted Zone** Use Case.

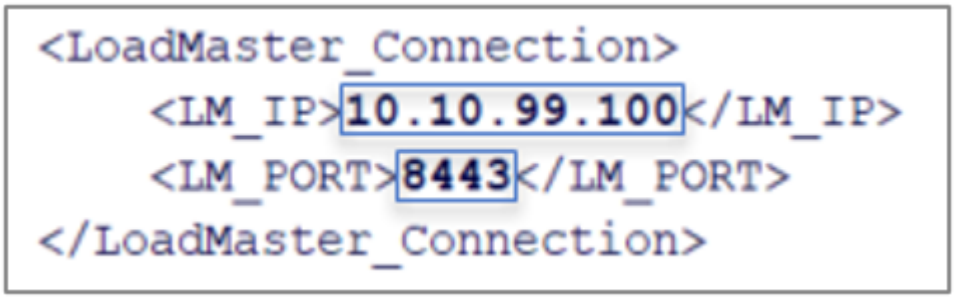
Open the **Config_Trusted_Zones.xml** file in Notepad++ or your preferred application.

The ZTAG configuration sections for this use case are:

- LoadMaster_Connection
- VirtualService_Configration
- RealServer_Configuration
- RealServer_List

- Zero_Trust_Access_Gateway_Trusted_Zones
- PermitedGroups_Trusted_Zone
- PermitedGroups_UnTrusted_Zone
- Backup_Options
- Logging_Options

The configuration steps are as follows:



1. Modify the LoadMaster connection settings for the LoadMaster or ECS Connection Manager:
   - The LoadMaster or ECS Connection Manager IP Address
   - The LoadMaster or ECS Connection Manager TCP Port

```
<VirtualService_Configuration>
    <VS_NickName>ObjectStore</VS_NickName>
    <VS_IP>10.10.99.103</VS_IP>
    <VS_PORT>443</VS_PORT>
    <VS_Scheduling>lc</VS_Scheduling>
    <Enable_TLS>Y</Enable_TLS>
 <!-- ##These TLS settings are optional if a TLS certificate is already imported onto the Load Balancer to be used for this service ##-->
    <TLS_Cert_Location_Path></TLS_Cert_Location_Path>
    <TLS_Cert_Identifier></TLS_Cert_Identifier>
    <TLS_Cert_PassPhrase></TLS_Cert_PassPhrase>
</VirtualService_Configuration>
```

2. Modify the Virtual Service configuration with settings based on workload requirements.
   - A Nickname (friendly name) to identify the workload being published
   - A Virtual IP Address to publish the workload
   - A Scheduling Method on how the distribution of the traffic to backend systems should occur.
     - rr = round-robin
     - wrr = weighted round robin
     - lc = least connection
     - wlc = weighted least connection
     - fixed = fixed weighting
     - adaptive = resource based (adaptive)
     - sh = source IP hash
     - dl = weighted response time
     - sdn-adaptive = resource based (SDN adaptive)
     - uhash = URL hash
   - Select whether SSL/TLS Acceleration should be enabled on the Virtual Service.
     - Y

- N

Optional – If a certificate is present on the LoadMaster/ ECS Connection Manager, a prompt will be provided to select which certificate should be used in the configuration. A certificate can be uploaded and applied by entering the following parameters

- Path/ location to the certificate file (PFX)
- A friendly name or identifier for the certificate
- The passphrase for importing the certificate

```
<RealServer_Configuration>
    <RS_Check_Method>tcp</RS_Check_Method>
    <RS_Check_Port>9020</RS_Check_Port>
    <RS_Port>9020</RS_Port>
    <!-- ## This setting is used to specify whether the Real Servers are on a directly connected interface
    <Non_Local_RS>Y</Non_Local_RS>
</RealServer_Configuration>
```

3. Modify the Real Server configuration with settings based on workload requirements.

   Real Server Check Method

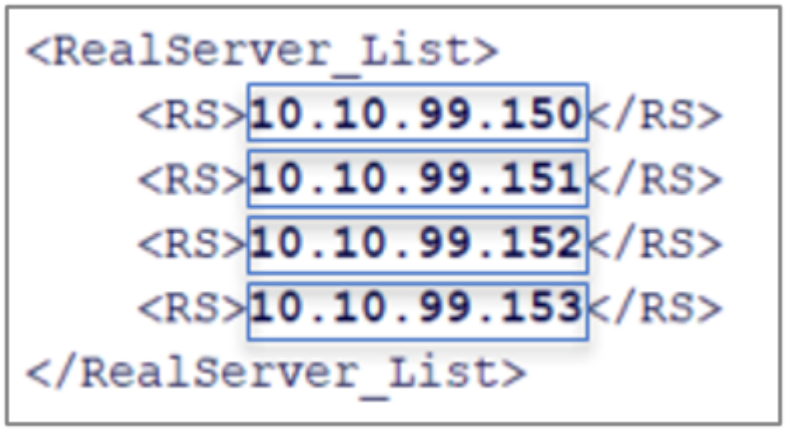
   - https
   - http
   - tcp

   Real Server Check Port to use

   Real Server Port should it differ from the check port

   Non_Local Real Servers to specify whether the Real Servers are on a directly connected interface or on a remote network

   - Y
   - N



4. Modify the Real Server list with the IP Address or FQDN of the backend systems being published. Lines can be removed or added based on the number of Real Servers in the environment.

```
<Zero_Trust_Access_Gateway_Trusted_Zones>
    <SourceIP>/10\.100\.110\..*/</SourceIP>
    <SourceIP>/192\.168\.99\..*/</SourceIP>
    <SourceIP>/172\.16\.99\..*/</SourceIP>
    <SourceIP>/10\.111\.111\..*/</SourceIP>
    <SourceIP>/10\.102\.102\..*/</SourceIP>
</Zero_Trust_Access_Gateway_Trusted_Zones>
```

5. The Trusted Zone section identifies the known networks in the environment. These are the networks where Multi-Factor Authentication will not be required.
   - The Source IP will be the network address using Regular Expression (RegEx) that clients will be connecting from. Lines can be added or removed depending on the number of known networks in the environment.

```
<PermittedGroups_Trusted_Zone>
    <Group>admins</Group>
    <Group>developers</Group>
    <Group>sales</Group>
    <Group>operations</Group>
    <Group>customer_support</Group>
</PermittedGroups_Trusted_Zone>
```

6. The Permitted Groups Trusted Zone section is where the Active Directory groups are defined. Members of these groups should be granted access to the application if they connect to the application from a network listed in the Trusted Zones section above. Lines can be added or removed depending on the number of groups that need access to the application.
   - Group – Active Directory group name

```
<PermittedGroups_UnTrusted_Zone>
    <Group>special_projects</Group>
    <Group>customer_support</Group>
</PermittedGroups_UnTrusted_Zone>
```

Note: If using the Trusted/ Untrusted Use Case, the Edge Security Pack Single Sign On domain for the trusted zone must be configured before running the ZTAG Policy Builder

7. The Permitted Groups Un-Trusted Zone section is where the Active Directory groups are defined. Members of these groups should be granted access to the application if they connect to the application from a network that is NOT listed in the Trusted Zone section above. If the same group should have access regardless of the network they are connected to; the group names should be listed in both sections. Lines can be added or removed depending on the number of groups that need access to the application.
   - Group – Active Directory group name

```
<Backup_Options>
    <BackupFilePath>C:\temp</BackupFilePath>
    <BackupFileName>ZTAG_Backup</BackupFileName>
</Backup_Options>
```

Note: Using the Trusted/ Un-Trusted Use Case, the Edge Security Pack Single Sign On domain for the un-trusted zone must be configured before running the ZTAG Policy Builder.

8. **Optional** - During each run of the Zero Trust Policy Builder, the option to take a backup before any changes are applied is presented. These options are used to define the name and where the backup should be stored. A date and time stamp will also be included in the backup file name.
   - File Path – Ensure the proper permissions are applied to the folder.
   - Backup file name – Used to identify the backup being taken

```
<Logging_Options>
    <LogFilePath>C:\temp\ZTAG.log</LogFilePath>
    <MaxLogSizeKB>500</MaxLogSizeKB>
    <MaxLogRollovers>1</MaxLogRollovers>
</Logging_Options>
```

9. Logging is generated for each run of the Zero Trust Policy Builder. These settings will provide the location for the log files and how much of the disk can be utilized to store files.
   - File Path – Ensure the proper permissions are applied to the folder.
   - Max Log Size – The maximum size of each of the log files.
   - Max Log Rollovers – The maximum number of log file rollovers to allow. The setting of 2 rollover files and 500KB maximum size will allow 1000KB of storage to be used on the system running the Zero Trust Policy Builder.

Run the Zero Trust Policy Builder Script

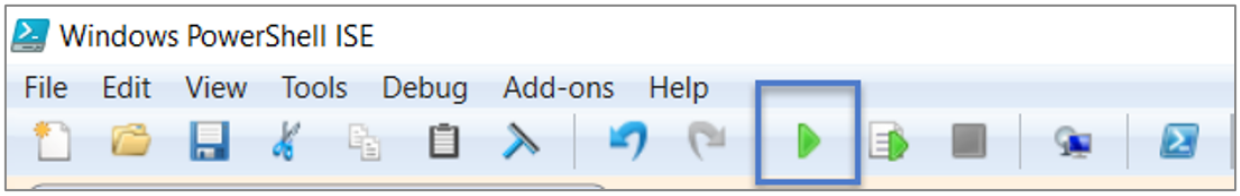
There are two approaches for running the Zero Trust Policy Builder PowerShell script. The PowerShell console and the PowerShell Integrated Scripting Environment (ISE). The interaction with the Zero Trust Policy Builder will be different between these two approaches, but the results will be identical. This document will focus on using PowerShell ISE since it provides more user-friendly prompts than the PowerShell Console.

CAUTION: The Zero Trust Policy Builder is a fixed script that should not be modified under any circumstances.

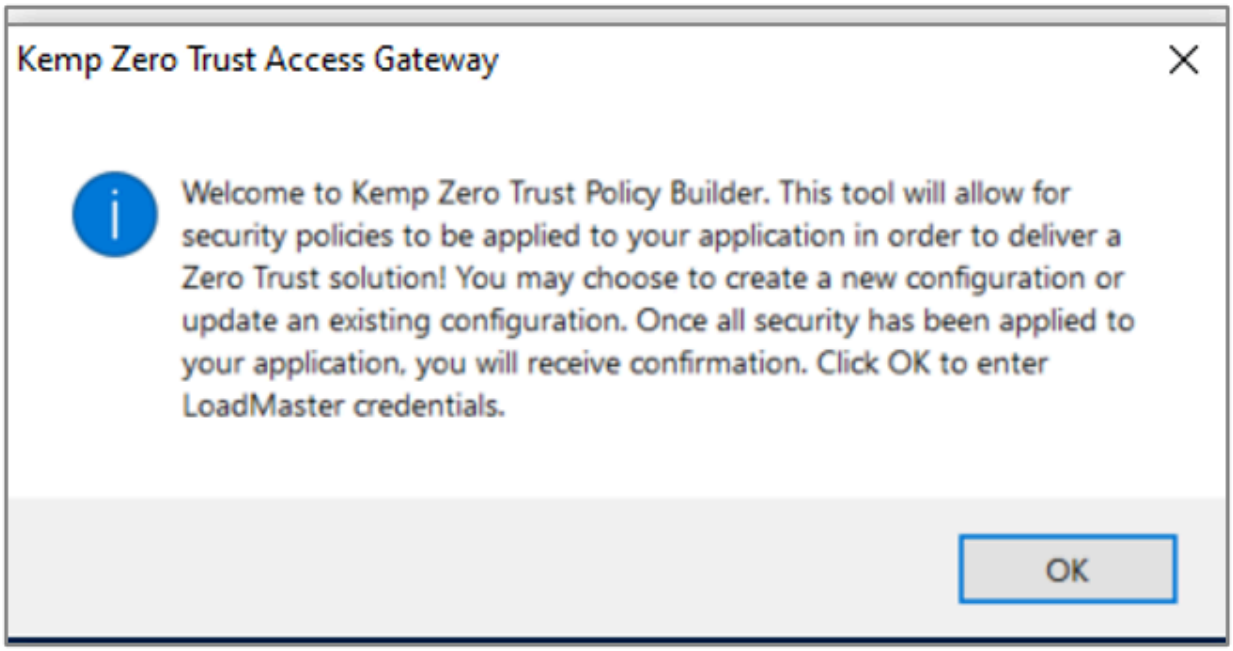
Although some interactions that are presented are common across the different use cases, there are some unique for each.

Deploy a new workload

1. Open the ZTAG-Policy-Builder.ps1 script using PowerShell ISE.



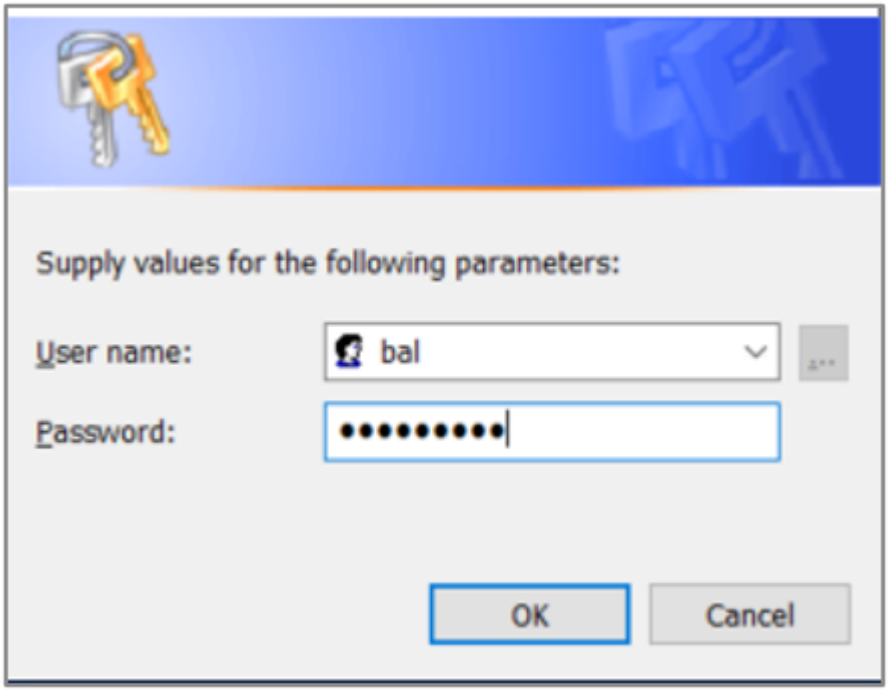
2. Click the Green Arrow to run the ZTAG Policy Builder script.



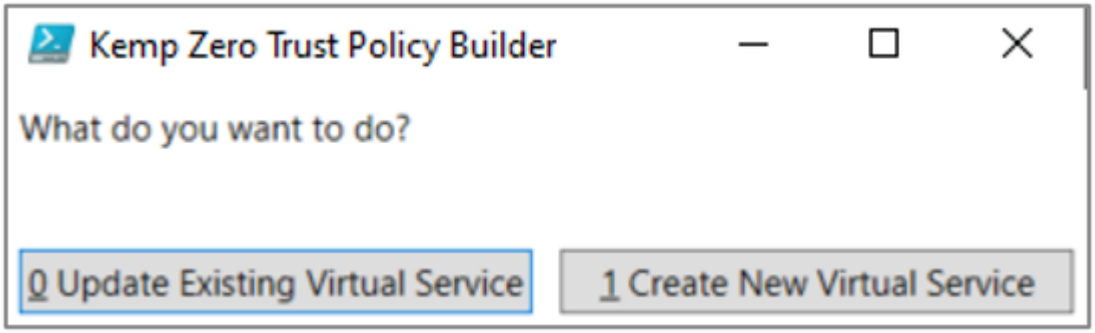
3. Click OK on the Welcome Message.

```
PS C:\> C:\Downloads\ZTAG-Package-Apr19\ZTAG-Policy-Builder.ps1
Enter path for configuration import file: C:\Downloads\Config_SourceIP.xml
```

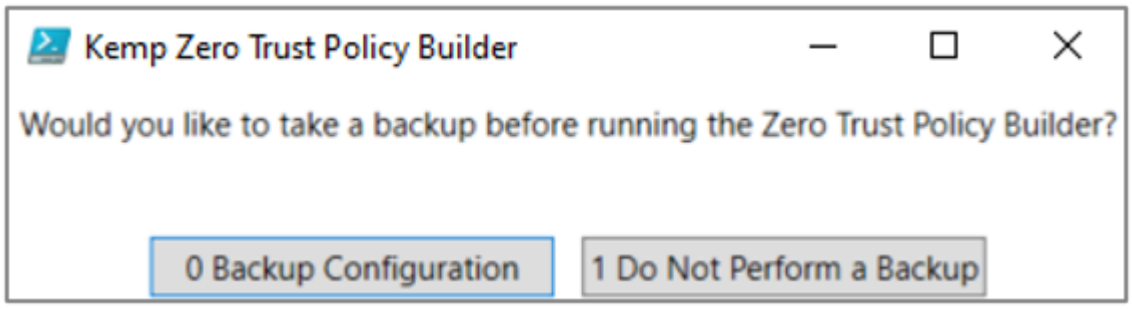
4. Enter the path to the configuration file that should be used and Enter



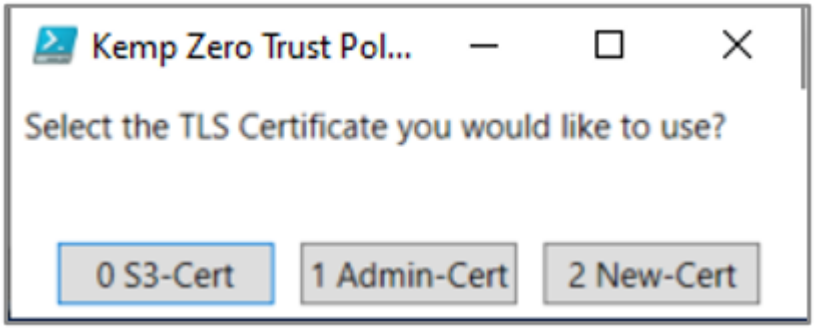
5. Enter the credentials to authenticate to the LoadMaster or ECS Connection Manager.



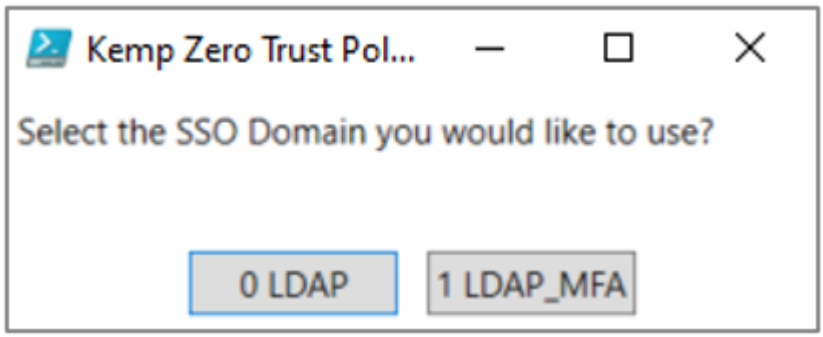
6. Select **Create New Virtual Service**



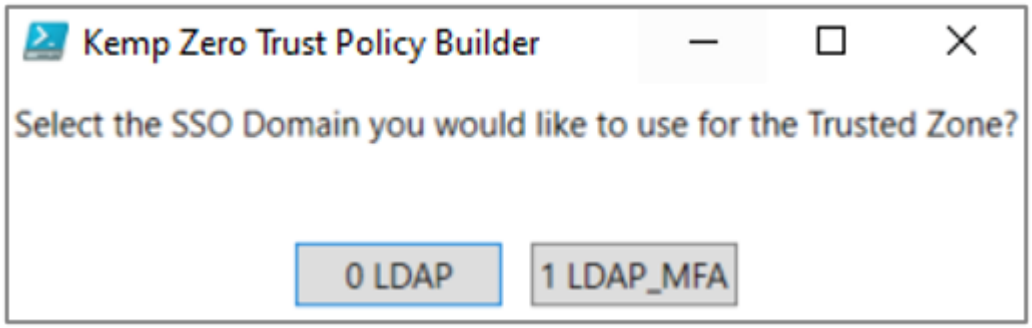
7. Choose whether to perform a backup before making any updates on the LoadMaster/ ECS Connection Manager.



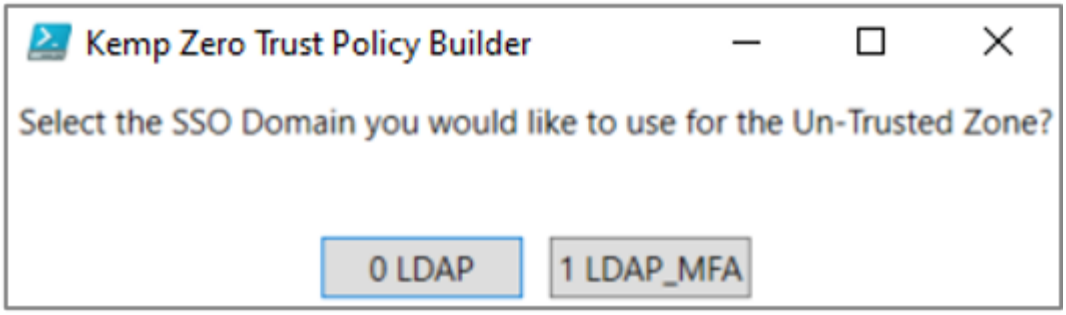
8. If enable TLS was set to “Y” in the configuration file, and no parameters were provided to add a new certificate, a prompt to select an existing certificate is provided.



9. **Steering Group Use Case Only** – A prompt is presented to select an existing SSO domain to use to pre-authenticate users.



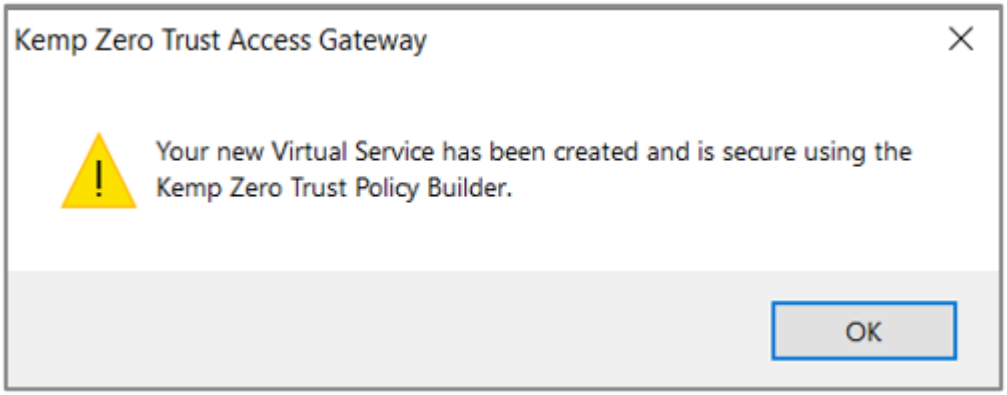
10. **Trusted/Untrusted Zone Use Case Only** – Select the SSO domain to use for known networks within the environment.



11. **Trusted/UnTrusted Zone Use Case Only** – Select the SSO domain to use for all other networks that do not exist in the environment.

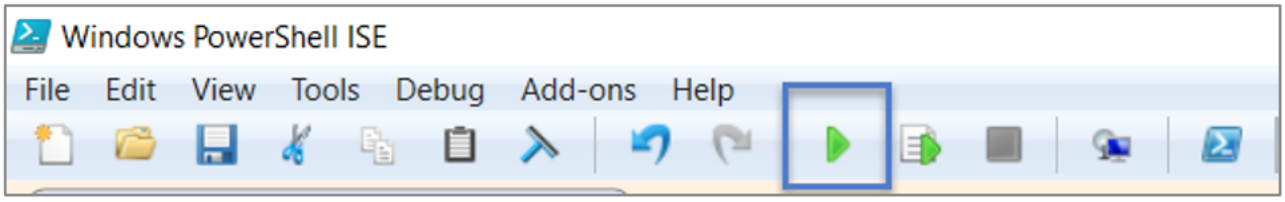
```
Enter path for configuration import file: C:\Downloads\ZTAG-Package-Apr19\Config_SourceIP.xml
cmdlet Get-Credential at command pipeline position 1
Supply values for the following parameters:
Creating rules based on Source IP
Creating rules based on Methods
Creating rules based on Paths/Buckets
Creating Virtual Service
Creating Sub Virtual Service(s)
Configuration of Sub Virtual Service(s)
Applying Method Rules
Applying Source IP Rules
Adding Real Servers to each Sub Virtual Service
Adding Path Rules to each Real Server and finalizing configuration
```

12. The script steps will be presented as the configuration takes place.

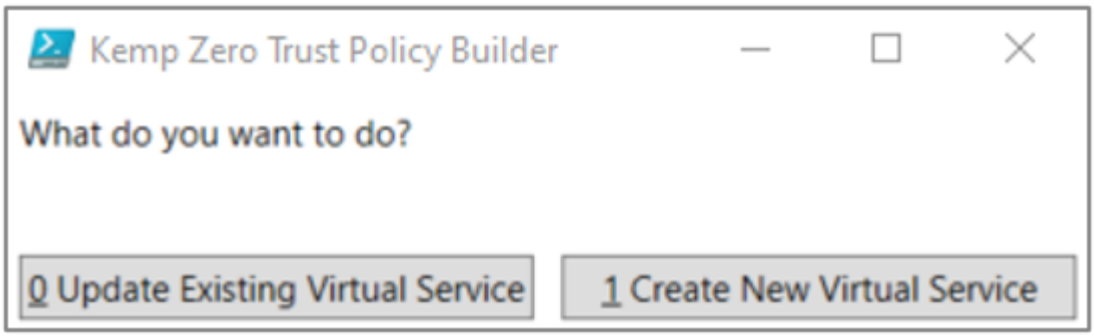


13. 13. A confirmation that the script ran successfully will be presented at completion.

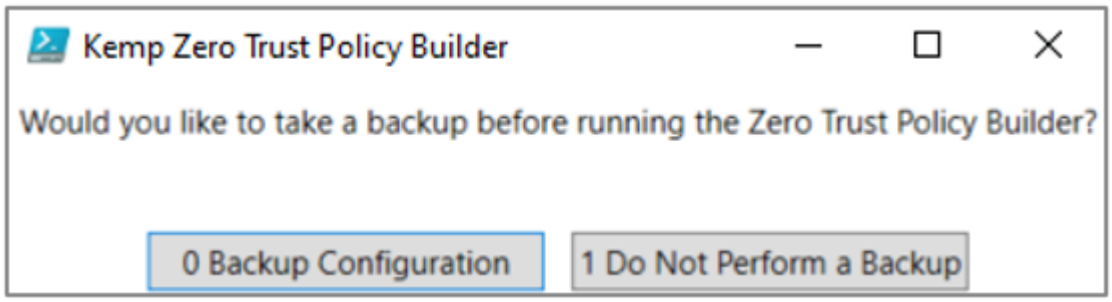
Update an existing workload



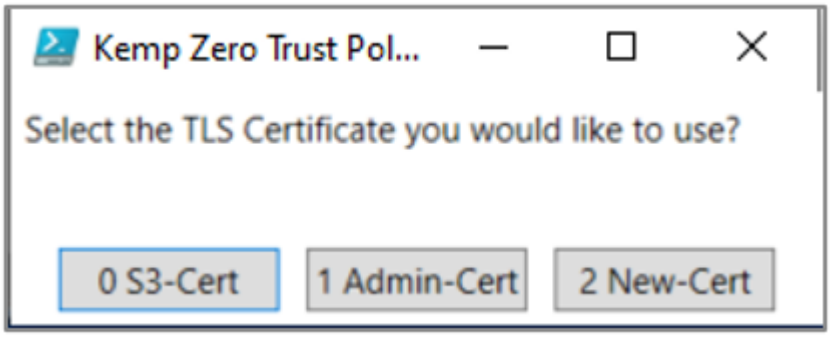
1. Run the script and accept the welcome message



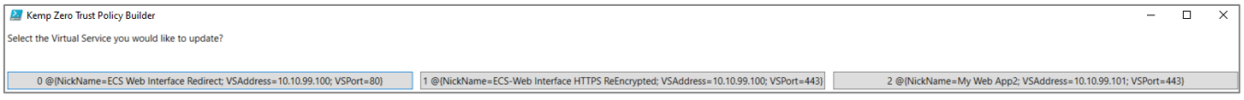
2. Select **Update Existing Virtual Service**



3. Choose whether to perform a backup before making any updates on the LoadMaster/ ECS Connection Manager.



4. If enable TLS was set to “Y” in the configuration file, and no parameters were provided to add a new certificate, a prompt to select an existing certificate is provided.



5. Select the Virtual Service you would like updated.

The remaining steps will be identical to the steps outlined in the **Deploy a New Workload** section.

4

Logging and Troubleshooting

The Zero Trust Policy Builder is developed with several layers of validation before running and applying the configuration files. In most cases, the script will display details of a misconfiguration or unsupported policy file and prevent any changes to the load balancer. In the rare instances that a policy is applied and does not depict the desired results, logging is made available to determine the cause.

Related Links

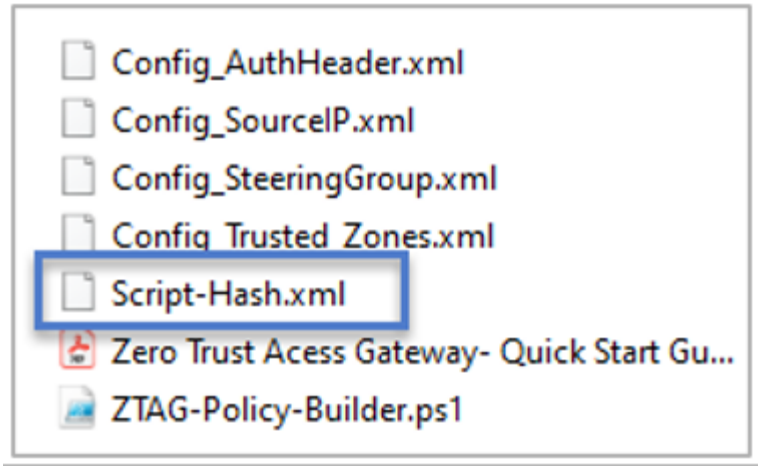
For details, see the following topics:

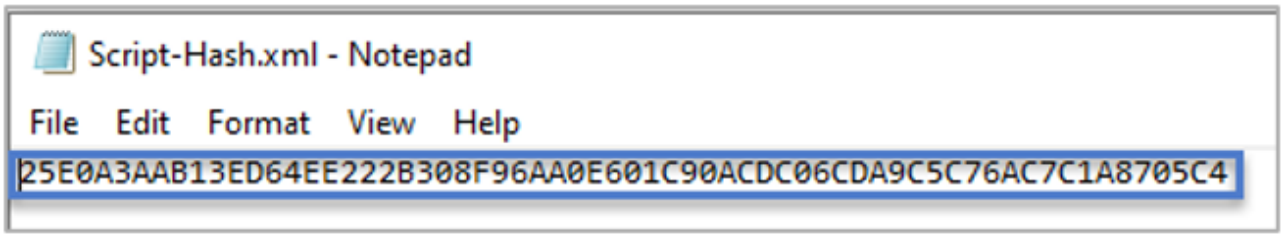
- Script Hash
- Extended Logging

Script Hash

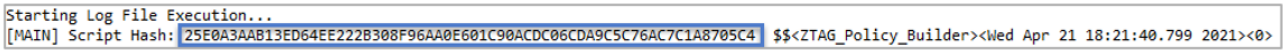
The Zero Trust Policy Builder script is built on PowerShell and should not be modified in any way. To ensure no unintentional changes have been made to the PowerShell script, a Hash is provided to verify its uniformity.

1. The expected hash is delivered as part of the Zero Trust Access Gateway (ZTAG) package. Open the file with the name Script-Hash.xml with Notepad or other application that can read XML.





2. Open the current log file in the specified path and find the line that reads Script-Hash. (There may be several lines depending on the number of times the script was run). The Script-Hash entry in the log must match the hash that is provided in the Script-Hash.xml file.



Extended Logging

To help identify any possible errors that may occur during the run of the Zero Trust Policy Builder, extended logging is made available. The log files are written to the path that is specified in the Configuration File (XML).

1. Open the log file and scroll down to the bottom.
2. Each Zero Trust Policy Builder run is separated, and each run starts with Starting Log File Execution.
3. Examine the log file for any entry that does NOT equal

   ReturnCode=200; Response=Command successfully executed

4. If a line is found that does not match the response above, there is a description of the action that attempted to take place, which can be used to troubleshoot the issue.

```
Starting Log File Execution...
[MAIN] Script Hash: 25E0A3AAB13ED64EE222B308F96AA0E601C90ACDC06CDA9C5C76AC7C1A8705C4  $$<ZTAG_Policy_Builder><Wed Apr 21 18:21:40.799 2021><0>
LM Backup for 10.10.99.100C:\temp\ZTAG_BackupApr21_2021_1821@{ReturnCode=200; Response=Command successfully executed.; Data=}  $$<ZTAG_Policy_Builder><Wed Apr
Source IP Rule create for @{ReturnCode=200; Response=Command successfully executed.; Data=}  $$<ZTAG_Policy_Builder><Wed Apr 21 18:21:55.007 2021><0>
Source IP Rule create for @{ReturnCode=200; Response=Command successfully executed.; Data=}  $$<ZTAG_Policy_Builder><Wed Apr 21 18:21:55.207 2021><0>
Source IP Rule create for @{ReturnCode=200; Response=Command successfully executed.; Data=}  $$<ZTAG_Policy_Builder><Wed Apr 21 18:21:55.459 2021><0>
Method Match Rule create for DELETE@{ReturnCode=200; Response=Command successfully executed.; Data=}  $$<ZTAG_Policy_Builder><Wed Apr 21 18:21:55.696 2021><0>
Method Match Rule create for GET@{ReturnCode=200; Response=Command successfully executed.; Data=}  $$<ZTAG_Policy_Builder><Wed Apr 21 18:21:55.919 2021><0>
Method Match Rule create for PUT@{ReturnCode=200; Response=Command successfully executed.; Data=}  $$<ZTAG_Policy_Builder><Wed Apr 21 18:21:56.200 2021><0>
Path Match Rule create for bucket3@{ReturnCode=200; Response=Command successfully executed.; Data=}  $$<ZTAG_Policy_Builder><Wed Apr 21 18:21:56.702 2021><0>
Path Match Rule create for bucket4@{ReturnCode=200; Response=Command successfully executed.; Data=}  $$<ZTAG_Policy_Builder><Wed Apr 21 18:21:56.910 2021><0>
Path Match Rule create for bucket1@{ReturnCode=200; Response=Command successfully executed.; Data=}  $$<ZTAG_Policy_Builder><Wed Apr 21 18:21:57.128 2021><0>
Path Match Rule create for bucket3@{ReturnCode=200; Response=Command successfully executed.; Data=}  $$<ZTAG_Policy_Builder><Wed Apr 21 18:21:57.366 2021><0>
Path Match Rule create for bucket2@{ReturnCode=200; Response=Command successfully executed.; Data=}  $$<ZTAG_Policy_Builder><Wed Apr 21 18:21:57.595 2021><0>
```