Deploy Secure Dynamic Attribute Connector in FMC

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Introduction

This document describes about Cisco Secure Dynamic Attribute Connector In FMC.

Background – Problem

CSDAC (Cisco Secure Dynamic Attributes Connector) can be integrated into FMC (Firepower Management Center), providing the same level of functionality as the standalone CSDAC application and CSDAC in CDO. For standalone CSDAC, it relieves customers from the overhead of administering and maintaining a separate machine for CSDAC. As a Network Admin, I want the programmatic interfaces to be easy to integrate and keep up to date with changes to external dynamic environment providers. This integration solves the problem of gathering attributes from dynamically changing cloud environments without deploying a policy.

Solution (Summary)

CSDAC can now be configured in FMC to fetch tag attributes from Azure, vCenter, AWS, GCP, Office 365, and Azure Service Tags, providing feature parity with the standalone CSDAC and CSDAC in CDO.

- You can now choose to use
 - CSDAC in FMC (or)
 - CSDAC in CDO (or)
 - Standalone CSDAC
- Target Market: Enterprise, Service Provider

Dynamic Attributes Connector in FMC Summary

FMC Dynamic Attributes Connector:

- Dashboard screen to build and operate the Dynamic Attribute Connector features.
- FMC UI to configure Source workload Connectors (AWS, Azure, vCenter, Office 365, GCP)
- FMC UI to define dynamic attribute filters to create Dynamic Objects

Deployment Examples

On-Prem CSDAC

Last year, I deployed a dedicated VM for CSDAC to collect attributes from my AWS and Azure Accounts.

The Problem

Now, my organization has moved to Cloud, and I cannot deploy and manage a dedicated Virtual Machine for CSDAC in my environment.



Option 1: Use Dynamic Attributes Connector built inside FMC

You can fix the problem by using Dynamic Attributes Connector built inside FMC. The dynamic objects created by it can be used in Access Policy.

Option 2: Use cloud-delivered Dynamic Attributes Connector in CDO

You can fix the problem by using Dynamic Attributes Connector in CDO. The dynamic objects created by it can be used in

- CDO cloud-delivered FMC
- CDO on-prem FMC

Prerequisites, Supported Platforms, Licensing

Minimum Supported Software & Hardware Platforms

Min Supported Manager Version	Managed Devices	Min Supported Managed Device Version Required	Notes
FMC 7.4	Any FTD Supported	Any 7.0+ FTD	

* Dynamic Attributes Connector is not supported on FDM-Managed Devices

Components Used

The information in this document is based on these software and hardware versions:

- Cisco Firewall Management Center running 7.4
- Cisco Firepower Threat Defense running 7.4 or higher.

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

Feature Details

Standalone CSDAC Overview (Currently released - 7.4)

The Cisco Secure Dynamic Attributes Connector enables you to use tags from various cloud service platforms in Firewall Management Center (FMC) access control rules.

On-Prem CSDAC is installable on a Linux Machine, supports getting attributes from:

• AWS, Azure, VMware vCenter and NSX-T, Office 365, Azure Service Tags, GCP, GitHub.

CSDAC in CDO Overview (Currently released - 7.4)

Supports the same functionality as On-Prem CSDAC with no need to install and maintain a dedicated application.

vCenter connector is not currently supported in CDO.

Supports sending the received attributes to cloud-delivered FMC and On-Prem FMC in CDO.

CSDAC in FMC

Supports the same functionality as Standalone CSDAC with no need to install and maintain a dedicated application.

CSDAC in FMC supports getting attributes from:

• AWS, Azure, VMware vCenter and NSX-T, Office 365, Azure Service Tags, GCP, GitHub

There is no explicit adapter configuration here as it is local to FMC.

How It Works

Connectors are used to get attributes from AWS, Azure, o365, vCenter.

Local Adapter is then used to save these streamlined attributes and its IP mappings in FMC as dynamic objects.

FMC sends the mapping real time to FTD (without deploy).



Enable CSDAC in FMC

Navigate to Integration > Dynamic Attributes Connector.

Use Toggle button to enable the connector.

FMC takes a few minutes to download and bring up the docker images and containers.

This can only be configured in FMC global domain.

Firewall Management Center Integration / Dynamic Attributes Connector	Overview	Analysis	Policies	Devices	Objects	Integration
Dynamic Attributes Connector	Disable					Dynamic Attributes Connector SecureX Security Analytics & Logging Other Integrations AMP AMP Management Dynamic Analysis Connections
	The	Dynamic Attrik	outes Connect	tor is being en	abled. This pr	ocess can take some time to complete.

CSDAC Dashboard

After enabling CSDAC, user is presented with CSDAC Dashboard page. Dashboard is used to both configure and view consolidated connectors and filter.

Firewall Management Center	Overview	Analysis	Policies	Devices	Objects	Integration
Dynamic Attributes Connector	Disable a Filters					
			You c Cn Az	There is nothing an start with a sate the first concorrespond of the sate t	ng configured iny of followin nector by clickin conding type: UCenter	f yet. ng actions: g on the AST
				Go to	Connectors	

Configure Connectors

Add Connectors from Dashboard

On the Dashboard, click on the icon for the desired connector to add it.



Configure a time interval (in the Pull Interval field) so that the connectors can pull information from providers with the configured periodicity.

Enter the provider credentials to get the tag attributes. Once you have configured the connector, you can test the connector by clicking on the Test Button.

Name*		
AWS		
Description		
Pull Interval (sec)*		
30		
Region*		
us-east-1		
Access Key*		
AKIA2PWAVDBNRHF6UKIQ		
Secret Key*		

	_	

Configure Filters

Click on the "Dynamic Attribute Filters" tab in the "Dynamic Attributes Connector" menu to go to the Dynamic Attributes Filters page.

Dynamic Attributes Conn	ector 🔍 Disable			
Dashboard Connectors Dynar	nic Attributes Filters			
0 dynamic attributes filters				+
# Name	Connector	Query		Actions
			There are no Dynamic Attributes Filters yet.	
			Create a Dynamic Attributes Filter	
		_		

Adding Filters

Click on the + button to create a filter for attribute connectors.



Add AWS tags

For example, we can assume you are interested in the key 'HR' and value 'App' in AWS workloads.

This is what it would look like in AWS.

aws III services Q Search t	for services, features, blogs, docs, and more [Option+5]	I 🛛 🖓
New EC2 Experience X	☐ i-0e3e344f2405ba92c	🗇 3.223.6.235 open address 🗹
EC2 Dashboard EC2 Global View Events	IPv6 address - Hostname type	Private IP DNS name (IPv4 only)
Tags Limits	IP name: Ip-172-31-15-97.ec2.internal	ip-172-31-15-97.ec2.internal
▼ Instances Instances teer	t3.medium	–
Instance Types Launch Templates Spot Requests	AWS Compute Optimizer finding Opt-in to AWS Compute Optimizer for recommendations. Learn more 🖸	IAM Role SSFullAccess
Savings Plans Reserved Instances New	Details Security Networking Storage St	atus checks Monitoring Tags
Scheduled instances Capacity Reservations	Tags ୍	
▼ Images	Кеу	Value
AMI Catalog	HR	Арр

CSDAC in FMC

You can create a 'HR equals App' rule by clicking on the + button.

The local FMC adapter would send the matching IP addresses as dynamic object mappings to FMC

		aws1	
Query*			
Туре	Op. Value		
all HR	eq (any) App		

Preview

You can also view the matching IP addresses of a particular attribute rule by clicking the 'Show | Hide Preview' button.

Add Dynamic Attribute Filter			
Name*	Connec aws1	stor*	
Query*			•
Type	Op. Value		
(ett) HR	eq (any) App		1
~ Hide Preview			
172.31.26.184		App	
172.31.31.21		App	
172.31.33.85		App	
3.223.6.235		App	

Dynamic Objects

View the Dynamic objects created by CSDAC in Objects > External Attributes, Dynamic Object in FMC

Defense Orchestrator Objects / Object Management	Monitoring	Policies	Devices	Objects	Integration	*> Return to Inventory	Deploy	Q, I	• •	aplakshm@cisco.com	- 222	ECURE
> AAA Server > Access List	Dynamic Ob	jects o								T Filter		•
> Address Pools	Name		Des	cription						Number of Mapped IPs		
Application Filters	hr_app										01	÷.
AS Path												
Cipher Suite List												
> Community List												
> Distinguished Name												
DNS Server Group												
 External Attributes 												
Dynamic Object												
Security Group Tag File List												

AC Policy

Configuration: Access Policy

In FMC, add access policy to allow or block the received dynamic objects from Dynamic Attribute Connector.

 Beturn Period Packets 										pacy UI eve
۳٩.	T Q Total 2 rules 🛇 🐻 📓 Add Caregory Add Rule								-1 I	
_			Source	Source			Destination			
	Name	Action	Networks	Ports	Zones	Networks	Ports	Dynamic Attributes	Ag	
□ ~ M	landatory (1 - 2)									:
	1 Accounting to Azure Cloud	Allow	Accounting	Any		Any		AzureServiceTag_AzureCloud_australiaeast		1
	2 Engineering to Sharepoint	Block	Engineering	Any	Any	Any	Any	o365_SharePoint	Ar	÷
~ D	efault									1
Ther	There are no rules in this section. Add Rule or Add Category									

Platform Limits

- Connector limits are based on available FMC memory.
- vFMC would need an extra 1GB memory to support 5 connectors
- Azure AD realm is also included in the limit, as it is also a CSDAC container.

Models	No of Connectors Supported	Platforms	Limit based on Memory	
Basic	Only Azure AD	1600	32GB	
Small	5	vFMC	> 32 GB	
Medium	10	vFMC 300, 2600	>= 64 GB	
Large	20	4600	>= 128 GB	

Troubleshooting / Diagnostics

Troubleshooting is best performed by tracing dynamic object(s) from CSDAC Connectors to Dynamics Attributes in FMC.Many internal logs refer to this feature as 'muster'. You can peek into system state along the broadcast chain to isolate problems. CSDAC uses Docker containers. Messages and names of logs and other files must be referred to as "docker"



Check the Connectors

First make sure Connectors can connect to vCenter, AWS, or Azure servers.

If Connectors are not configured correctly, then downstream processes cannot obtain tag information.

View Connectors from the Connectors Tab

Connector status is displayed in status field and updated every 15 seconds.

Here, we see that connector was unable to authenticate using the provided credentials.

Firewall Management Center Overview	Analysis Policies Devices	Objects Integration	Depky Q 💕 🗘 🛛 at	imin• and secure					
Dynamic Attributes Connector 🔍 Disable									
Deshboard Connectors Dynamic Attributes Filters									
1 connector			Error: An error accurred (AuthFailure) when colling the Describelinstances operation: AWS was not able to validate the provided	+ ~					
8 Name Description		Туря	access cradentais	Actions					
1 AllS		JWS	Erri						
1									

Check the Attribute Filters

Make sure the Rule preview shows the matching IP addresses for your query condition.

If there are no matching IP addresses, then FMC cannot get the dynamic object mappings.

Checking the Attribute Filters

Check that Dynamic Attribute IP mappings are available in Preview. Show preview button is available on Dynamic Attribute Filter edit popup.

Edit Dynamic Attribute Filter							
Name* east_aws_object			Connector* awa_wast	<u>्</u>			
Туре	Op.	Value					
ell HR	eq	(any) App		1			
✓ Hide Preview							
172.31.25.40 172.31.26.184 172.31.31.21							

Check the Dynamic Objects in FMC UI

First, make sure FMC server contains the bindings you expect.

- Look under Object Management, External Objects tab, check Dynamic Objects for bindings.
- If FMC does not get the bindings, then FTD cannot get them.

Check FMC Health Monitor and Notifications for CSDAC Health Alerts.

Checking Dynamic Objects

FMC Object Manager allows you to download current Dynamic Object IP addresses.

CISCO Object Management	Overview	Analysis	Policies	Devices	Objects	AMP	Intelligence	Deploy	Q	6 ¢	0	admin 🕶
Cipher Suite List Dynamic Objects Add Dynamic Object					Q, Fill	ler						
> Distinguished Name DNS Server Group	A dynamical access co	A dynamic object represents one or more attributes which can be dynamically mapped to the object. You can use dynamic objects in access control policies.					N					
✓ External Attributes Dynamic Object	Account	tant_PC		Description				0	er of M	fapped I	5	±∕`≆
File List > FlexConfig	Enginee	er_PC						0				±/1 ±/1
Geolocation	Product	_Developmen	t_Server					0				±⁄¥

CSDAC Health Alerts

FMC's Task Manager displays Health Alerts if any core service, including the Dynamic Attributes Connector, is down. The Alert contains information regarding service name and status.



Note: We still have the "muster" naming in several notifications and it is required here to provide service name for detailed information.

Firewall Management Center Integration / Dynamic Attributes Connector	Analysis Policies Devices	Objects Integration	Deploy Q 🌮 🌣 🔕 admin 🕶 付 SECURE
Dynamic Attributes Connector Consultante Dashboard Connectors Dynamic Attributes Filters	€ C Lipsteing between C Lip		Control of reservers of the service of the ser

Here we see that muster-bee and muster-local-fmc-adapter are "unhealthy".

If error indicates any of the core services, then troubleshoot logs need to be collected for debug.



CSDAC in Troubleshoots

Generating a CSDAC Troubleshoot

• CSDAC logs are automatically collected during FMC Troubleshoot generation. The bundle contains

Docker status, logs, and data needed to debug the problem offline.

• Good practice is to enabling CSDAC debug mode before reproducing error for which troubleshoot logs are collected .

From /usr/local/sf/csdac call ./muster-cli debug-on

Find the CSDAC logs in untarred Troubleshoot in these folders:

/results-XX/command-outputs/csdac_troubleshoot/info

This contains the data stored in the etcd database.

/results-XX/command-outputs/csdac_troubleshoot /log

This contains the logs from the docker containers.

$/results-XX/command-outputs/csdac_troubleshoot/status.log$

This shows the container status, versions and docker image details.

CLI Troubleshooting

muster-cli script can be used to check the status of CSDAC from FMC CLI.

If the status for any service is "Exited" or otherwise different from "Up", then start by checking logs for that container.

The container Name is needed for getting logs; it can be obtained from the output.

<pre>'root@firepower:/Volume/home/admin# cd /usr/local/sf/csdac/</pre>									
<pre>root@firepower:/usr/local/sf/csdac# ./muster-cli status</pre>									
CORE SERVICES									
Name	Command	State	Ports						
muster-bee	./docker-entrypoint.sh run	Up	127.0.0.1:15050->50050/tcp, 50443/tcp						
muster-envoy	/docker-entrypoint.sh runs	Up	127.0.0.1:6443->8443/tcp						
<pre>muster-local-fmc-adapter</pre>	./docker-entrypoint.sh run	Up							
muster-ui-backend	./docker-entrypoint.sh run	Up	50031/tcp						
CONNECTORS AND ADAPTERS									
	Name		Command	State	Ports				
muster-connector-aws.2.muster			./docker- <u>entrypoint.sh</u> run Up 50070/ <u>tcp</u>						
muster-connector-o365.1.muster			./docker- <u>entrypoint.sh</u> run Up 50070/ <u>tcp</u>						

CSDAC Debug Mode

'muster-cli' script can be used to turn on and off the debug logs.By default, the containers are logged at the INFO level.INFO and DEBUG are the only supported levels.

To enable DEBUG level user: ./muster-cli debug-on.

This would provide more information for troubleshoot generation and help with debug. This option must be enabled while reproducing an issue.

To return to INFO level use: ./muster-cli debug-off.

```
<#root>
root@firepower:/usr/local/sf/csdac# ./muster-cli debug-on
Recreating muster-bee ...
Recreating muster-bee ... done
Recreating muster-user-analysis ... done
Recreating muster-local-fmc-adapter ... done
Recreating muster-ui-backend ... done
```

Logged messages with Debug

When debug mode is enabled all docker container logs would also contain debug messages

Obtain logs in real time using docker commands: docker logs -f <container_name>

In the example below, the debug message shows what triggered a gRPC error

<#root>

```
2022-12-12 14:33:29,649 [status_storage] DEBUG: Loading status from /app/status/aws.1_status.json...
2022-12-12 14:33:29,650 [status_storage] DEBUG: Loading status from /app/status/gcp.1_status.json...
2022-12-12 14:33:29,651 [status_storage] DEBUG: Loading status from /app/status/github.1_status.json...
2022-12-12 14:33:29,651 [status_storage] DEBUG: Loading status from /app/status/o365.1_status.json...
2022-12-12 14:33:43,279 [server] DEBUG: Got health status request.
```

2022-12-12 14:33:43,280 [bee_api] WARNING: Got gRPC error from BEE: StatusCode.UNAVAILABLE failed to con

Sample Problem with Troubleshooting Walkthrough

Problem and Troubleshooting Overview

Problem:

Most common problem we encounter is that FMC does not receive all dynamic object mappings.

Troubleshooting:

To troubleshoot the problem, we

- Enable debug mode from "muster-cli"
- Generated Troubleshoot file from FMC UI
- Checked the CSDAC AWS Connector logs in collected the Troubleshoot.
- Found out that CSDAC AWS Connector only queried for first IP in the AWS instances.

Prepare troubleshot bundle

- From FMC CLI we enabled debug mode using ./muster-cli debug-on. muster-cli tool is available in /usr/local/sf/csdac.
- Recreated the problem by waiting for the connector to have status OK and then checking the Dynamic Attribute Filters.
- Collected the troubleshoot logs from FMC UI and extracted them.Checked the AWS Connector logs for contents of snapshot



Look at the tag attributes for an IP

The tag attributes for a given IP is logged in the Troubleshoot logs. For AWS Connector, we looked at muster-connector-aws.1.muster-docker.log.gz

Summary of Checks

Does the Connector and Adapter status look good?

Check the statuses in the corresponding Connector, Adapter pages.

Did the Connectors get all the mappings?

Check the rule preview for matching IP addresses.

Check the Connector docker logs to see if it is querying the mappings correctly.

Did the REST Server receive dynamic tag mappings from connector?

Check the FMC dynamic objects page.

Check the USMS logs (in /opt/CSCOpx/MDC/log/operation/usmsharedsvcs.log) to see if the FMC REST server processed the API request from CSDAC correctly.

Q&A

Q: What version of on-premises CSDAC supports an ISE connector, I also do not see such a connector in Version 7.4.0 (build 1494)?

A: This is in Standalone CSDAC and not in FMC or in CDO. you would need a CSDAC ansible package to test this.

Q: When released, what on-premises CSDAC version would it be?

A: Likely 2.1.0.

Q: A screen with a gear that has API laid over it has been shown. I think it is CSDAC; what does that mean?

A: API explorer is inbuilt in this CSDAC, you can make API calls to CSDAC from that page.