Microsoft

Azure AD Workbooks

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February 18, 2021

Solorigate Video Series

The importance of using the Azure AD Workbook to help see common attack patterns

01. How to access the Azure AD Workbook

02. Part 1: Modified application and service credentials and authentication methods

03. Part 2: Modified federation settings

04. Part 3: New permissions granted to service principals

05. Part 4: Overview of changes made to service principle memberships

Microsoft Security

01.

Sign in to the **Azure portal**.

02.

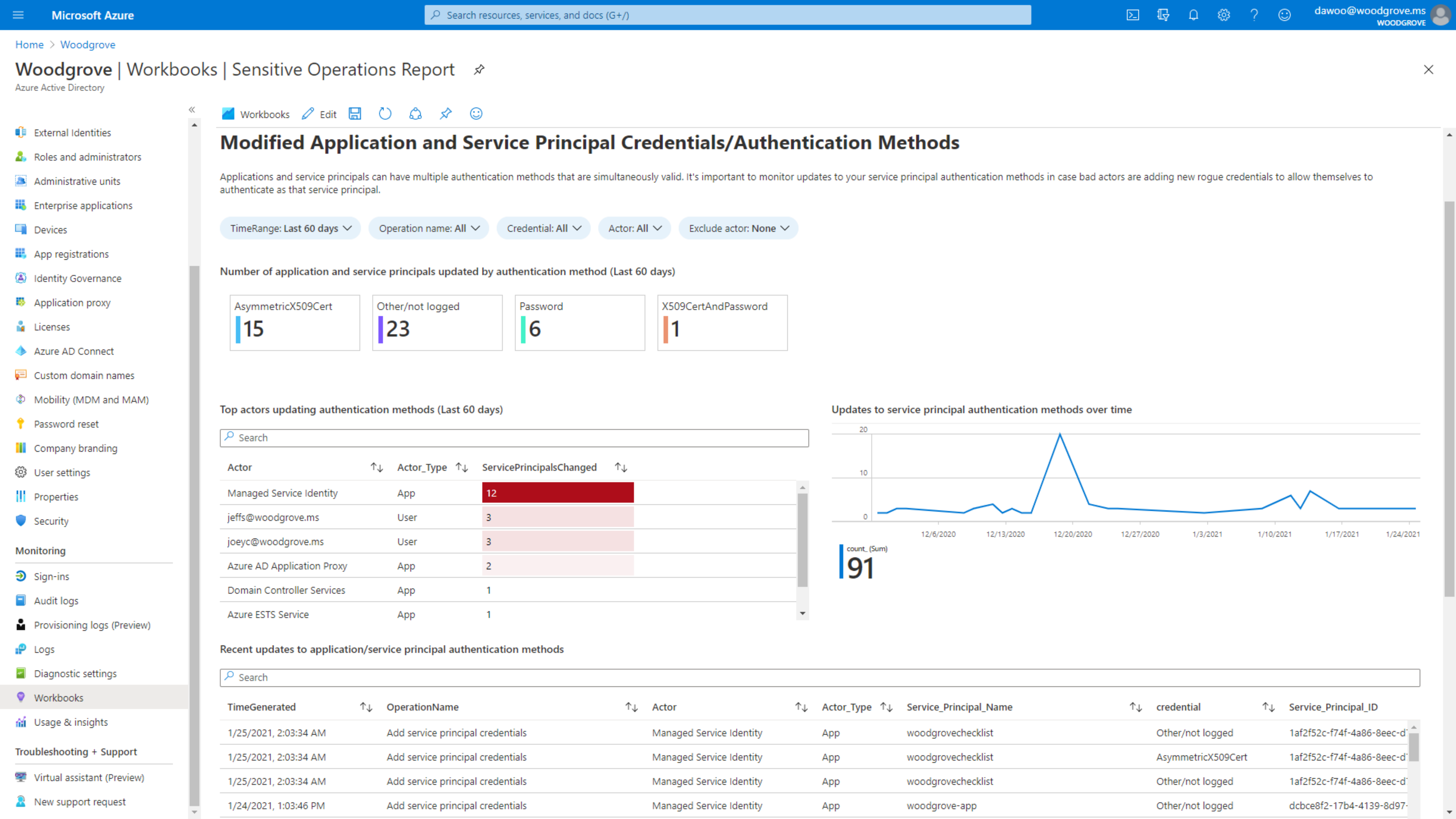
Navigate to **Azure Active Directory > Monitoring > Workbooks**

03.

In the Troubleshoot section, open the **Sensitive Operations Report**

01.

Modified application and service principal credentials/ authentication methods



Modified Application and Service Principal Credentials/Authentication Methods

Applications and service principals can have multiple authentication methods that are simultaneously valid. It's important to monitor updates to your service principal authentication methods in case bad actors are adding new rogue credentials to allow themselves to authenticate as that service principal.

TimeRange: Last 60 days | Operation name: All | Credential: All | Actor: All | Exclude actor: None

Number of application and service principals updated by authentication method (Last 60 days)

AsymmetricX509Cert	Other/not logged	Password	X509CertAndPassword
15	23	6	1

Top actors updating authentication methods (Last 60 days)

Search

Actor	Actor_Type	ServicePrincipalsChanged
Managed Service Identity	App	12
jeffs@woodgrove.ms	User	3
joeyc@woodgrove.ms	User	3
Azure AD Application Proxy	App	2
Domain Controller Services	App	1
Azure ESTS Service	App	1

Updates to service principal authentication methods over time

Recent updates to application/service principal authentication methods

Search

TimeGenerated	OperationName	Actor	Actor_Type	Service_Principal_Name	credential	Service_Principal_ID
1/25/2021, 2:03:34 AM	Add service principal credentials	Managed Service Identity	App	woodgrovechecklist	Other/not logged	1af2f52c-f74f-4a86-8eec-d
1/25/2021, 2:03:34 AM	Add service principal credentials	Managed Service Identity	App	woodgrovechecklist	AsymmetricX509Cert	1af2f52c-f74f-4a86-8eec-d
1/25/2021, 2:03:34 AM	Add service principal credentials	Managed Service Identity	App	woodgrovechecklist	Other/not logged	1af2f52c-f74f-4a86-8eec-d
1/24/2021, 1:03:46 PM	Add service principal credentials	Managed Service Identity	App	woodgrove-app	Other/not logged	dcbce8f2-17b4-4139-8d97-

01.

Modified application and service credentials and authentication methods

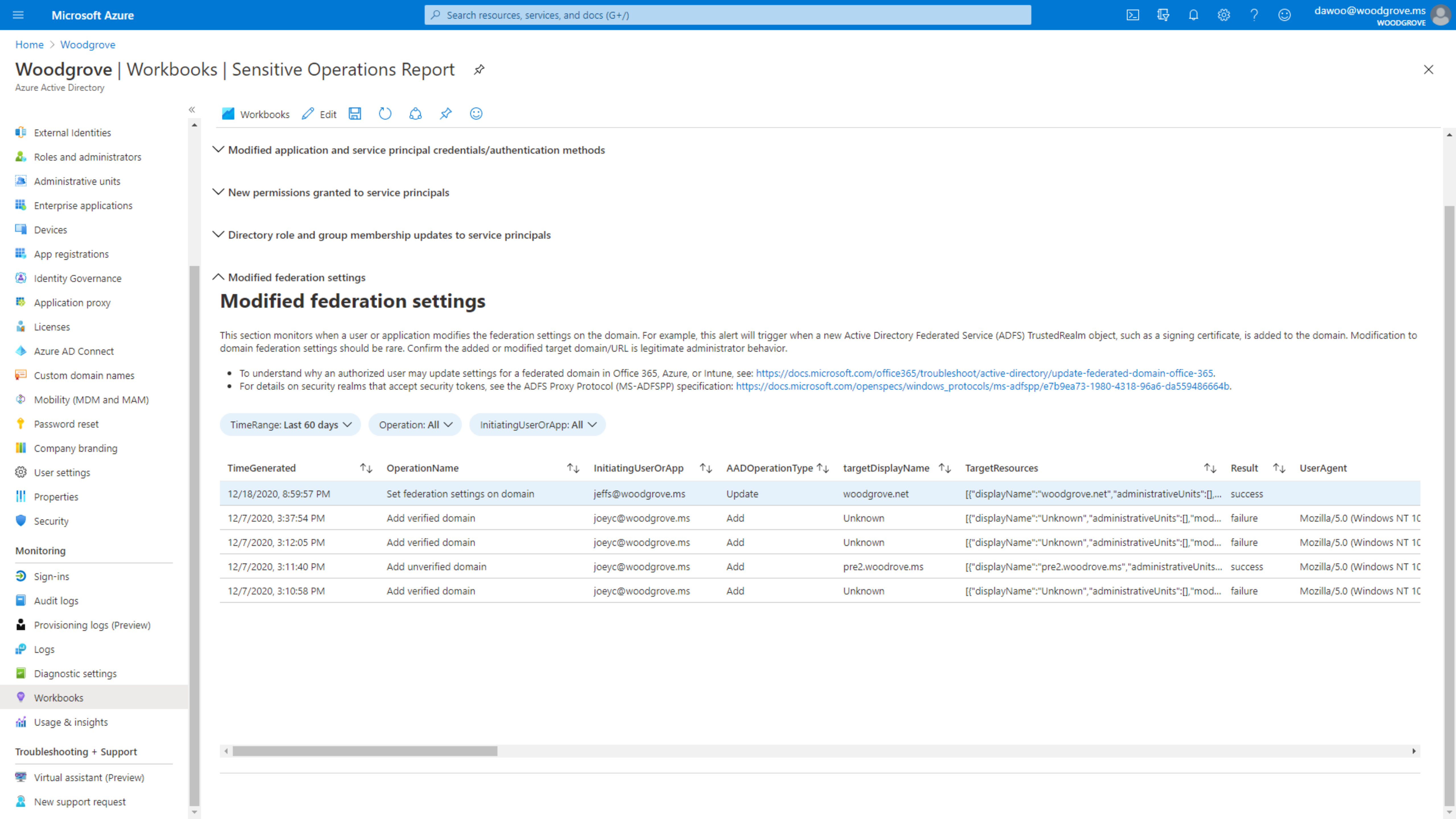
All new credentials added to apps and service principals, including the credential type

Top actors and the amount of credentials modifications they performed

A timeline for all credential changes

02.

Modified federation settings



Modified federation settings

This section monitors when a user or application modifies the federation settings on the domain. For example, this alert will trigger when a new Active Directory Federated Service (ADFS) TrustedRealm object, such as a signing certificate, is added to the domain. Modification to domain federation settings should be rare. Confirm the added or modified target domain/URL is legitimate administrator behavior.

- To understand why an authorized user may update settings for a federated domain in Office 365, Azure, or Intune, see: https://docs.microsoft.com/office365/troubleshoot/active-directory/update-federated-domain-office-365.
- For details on security realms that accept security tokens, see the ADFS Proxy Protocol (MS-ADFSPP) specification: https://docs.microsoft.com/openspecs/windows_protocols/ms-adfspp/e7b9ea73-1980-4318-96a6-da559486664b.

TimeRange: Last 60 days

Operation: All

InitiatingUserOrApp: All

TimeGenerated	OperationName	InitiatingUserOrApp	AADOperationType	targetDisplayName	TargetResources	Result	UserAgent
12/18/2020, 8:59:57 PM	Set federation settings on domain	jeffs@woodgrove.ms	Update	woodgrove.net	[{"displayName":"woodgrove.net","administrativeUnits":[],...	success	
12/7/2020, 3:37:54 PM	Add verified domain	joeyc@woodgrove.ms	Add	Unknown	[{"displayName":"Unknown","administrativeUnits":[],"mod...	failure	Mozilla/5.0 (Windows NT 10
12/7/2020, 3:12:05 PM	Add verified domain	joeyc@woodgrove.ms	Add	Unknown	[{"displayName":"Unknown","administrativeUnits":[],"mod...	failure	Mozilla/5.0 (Windows NT 10
12/7/2020, 3:11:40 PM	Add unverified domain	joeyc@woodgrove.ms	Add	pre2.woodrove.ms	[{"displayName":"pre2.woodrove.ms","administrativeUnits...	success	Mozilla/5.0 (Windows NT 10
12/7/2020, 3:10:58 PM	Add verified domain	joeyc@woodgrove.ms	Add	Unknown	[{"displayName":"Unknown","administrativeUnits":[],"mod...	failure	Mozilla/5.0 (Windows NT 10

02.

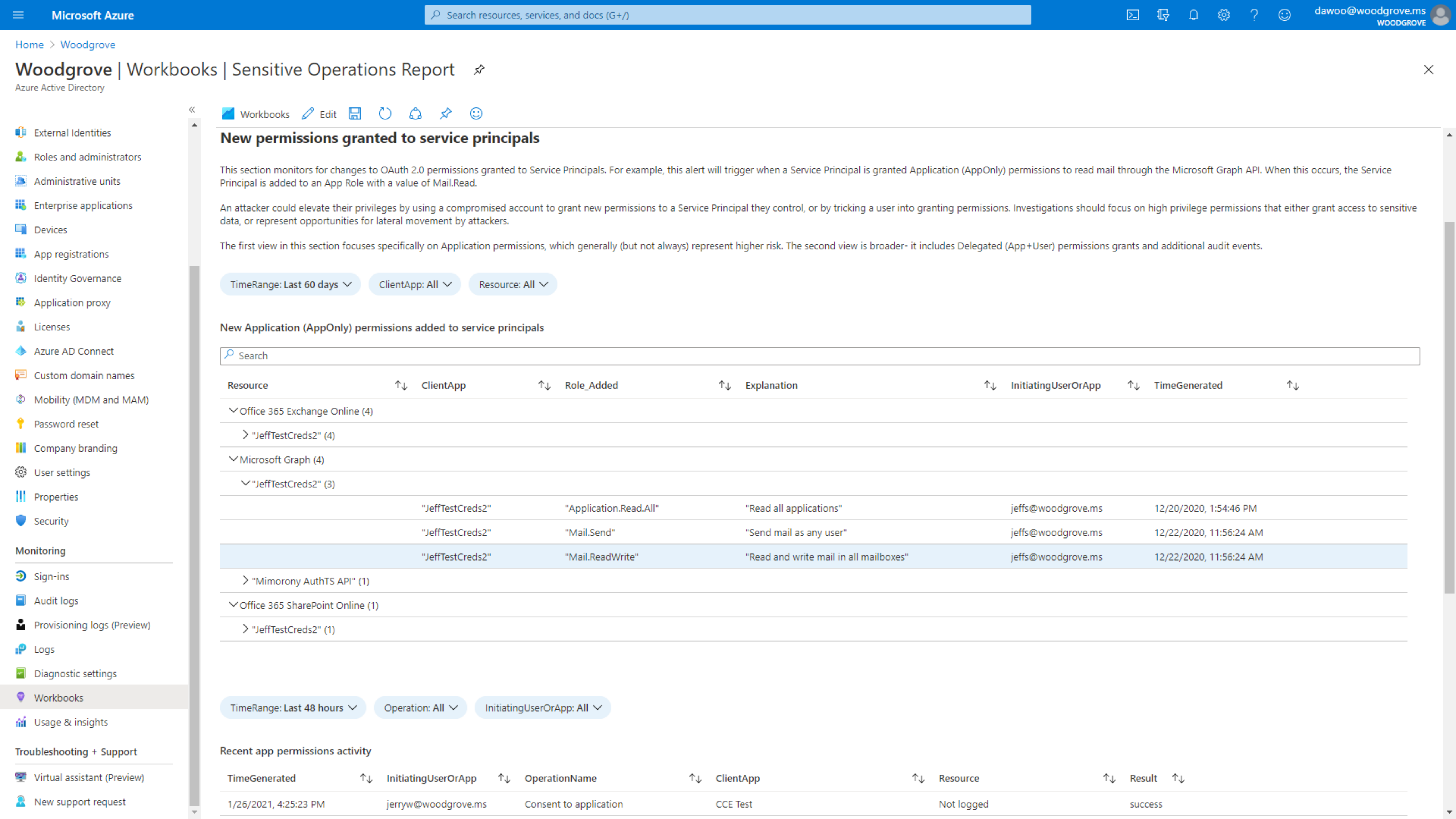
Modified federation settings

Changes performed to existing domain federation trusts

Addition of new domains and trusts

03.

New permissions granted to service principals



New permissions granted to service principals

This section monitors for changes to OAuth 2.0 permissions granted to Service Principals. For example, this alert will trigger when a Service Principal is granted Application (AppOnly) permissions to read mail through the Microsoft Graph API. When this occurs, the Service Principal is added to an App Role with a value of Mail.Read.

An attacker could elevate their privileges by using a compromised account to grant new permissions to a Service Principal they control, or by tricking a user into granting permissions. Investigations should focus on high privilege permissions that either grant access to sensitive data, or represent opportunities for lateral movement by attackers.

The first view in this section focuses specifically on Application permissions, which generally (but not always) represent higher risk. The second view is broader- it includes Delegated (App+User) permissions grants and additional audit events.

New Application (AppOnly) permissions added to service principals

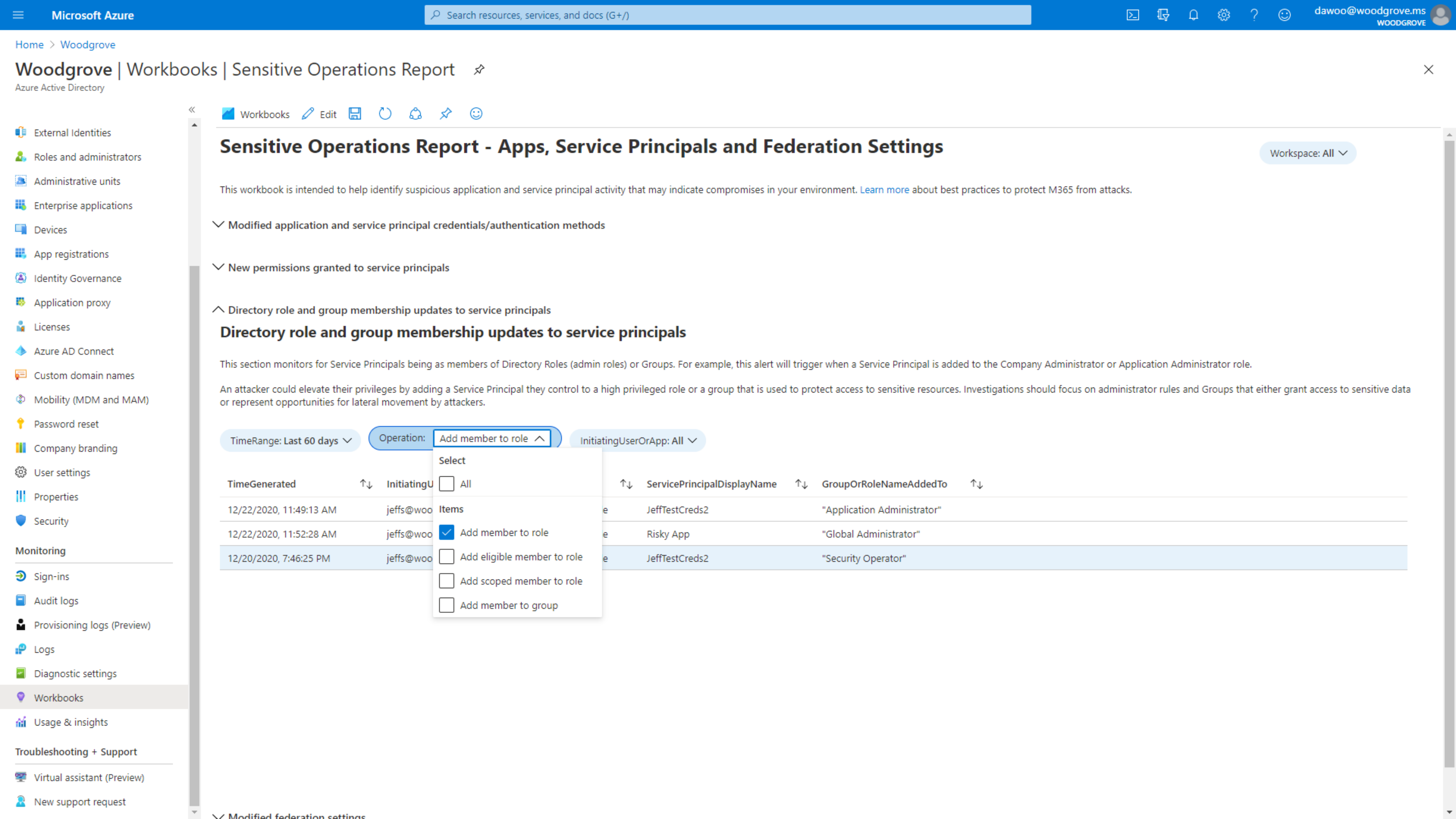
Resource	ClientApp	Role_Added	Explanation	InitiatingUserOrApp	TimeGenerated
Office 365 Exchange Online (4)					
"JeffTestCreds2" (4)					
Microsoft Graph (4)					
"JeffTestCreds2" (3)					
	"JeffTestCreds2"	"Application.Read.All"	"Read all applications"	jeffs@woodgrove.ms	12/20/2020, 1:54:46 PM
	"JeffTestCreds2"	"Mail.Send"	"Send mail as any user"	jeffs@woodgrove.ms	12/22/2020, 11:56:24 AM
	"JeffTestCreds2"	"Mail.ReadWrite"	"Read and write mail in all mailboxes"	jeffs@woodgrove.ms	12/22/2020, 11:56:24 AM
"Mimorony AuthTS API" (1)					
Office 365 SharePoint Online (1)					
"JeffTestCreds2" (1)					

Recent app permissions activity

TimeGenerated	InitiatingUserOrApp	OperationName	ClientApp	Resource	Result
1/26/2021, 4:25:23 PM	jerryw@woodgrove.ms	Consent to application	CCE Test	Not logged	success

04.

Overview of changes made to service principle memberships



Sensitive Operations Report - Apps, Service Principals and Federation Settings

This workbook is intended to help identify suspicious application and service principal activity that may indicate compromises in your environment. Learn more about best practices to protect M365 from attacks.

⌄ Modified application and service principal credentials/authentication methods

⌄ New permissions granted to service principals

⌃ Directory role and group membership updates to service principals

Directory role and group membership updates to service principals

This section monitors for Service Principals being as members of Directory Roles (admin roles) or Groups. For example, this alert will trigger when a Service Principal is added to the Company Administrator or Application Administrator role.

An attacker could elevate their privileges by adding a Service Principal they control to a high privileged role or a group that is used to protect access to sensitive resources. Investigations should focus on administrator rules and Groups that either grant access to sensitive data or represent opportunities for lateral movement by attackers.

TimeRange: Last 60 days | Operation: Add member to role | InitiatingUserOrApp: All

Select
- ☐ All

Items
- ☑ Add member to role
- ☐ Add eligible member to role
- ☐ Add scoped member to role
- ☐ Add member to group

TimeGenerated	InitiatingU		ServicePrincipalDisplayName	GroupOrRoleNameAddedTo
12/22/2020, 11:49:13 AM	jeffs@woo	e	JeffTestCreds2	"Application Administrator"
12/22/2020, 11:52:28 AM	jeffs@woo	e	Risky App	"Global Administrator"
12/20/2020, 7:46:25 PM	jeffs@woo	e	JeffTestCreds2	"Security Operator"

⌄ Modified federation settings

Solorigate Overview

Next Steps

01 Watch the Solorigate Video series at this location

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03 Read the blog posts on: www.microsoft.com/security/blog/

https://aka.ms/solorigate

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