

# Independent Tests of Anti-Virus Software



## Single Product Test Superna Data Security Edition Commissioned by Superna

TEST PERIOD: JULY - AUGUST 2024

LAST REVISION: 20<sup>TH</sup> AUGUST 2024

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## Introduction

Superna Data Security Edition works by monitoring user data on storage clusters in real-time and checking for file operations typically conducted by ransomware programs, i.e. encryption of the files. As soon as such activity is detected, access from the infected user’s account to the storage cluster is blocked. The product can manage multiple clusters, each with multiple shares, and when ransomware activity is detected on one share on one cluster, the user’s access to all managed shares and clusters will be removed. If ransomware activity is detected, an alert is raised immediately and displayed in the web interface of Superna Data Security Edition. The product locks out only the infected user, allowing other users to continue to access the storage. The locked-out user will not be able to use any PC or device since the security lockout is applied at the user level.

The goal of this test is to verify that the protection functions of Superna Data Security Edition work as intended and can be used to detect and respond to ransomware infections and protect the underlying file storage systems. Tests were performed using Vast Data as the storage backend.

This report has been commissioned by Superna. The tests were conducted in July/August 2024.

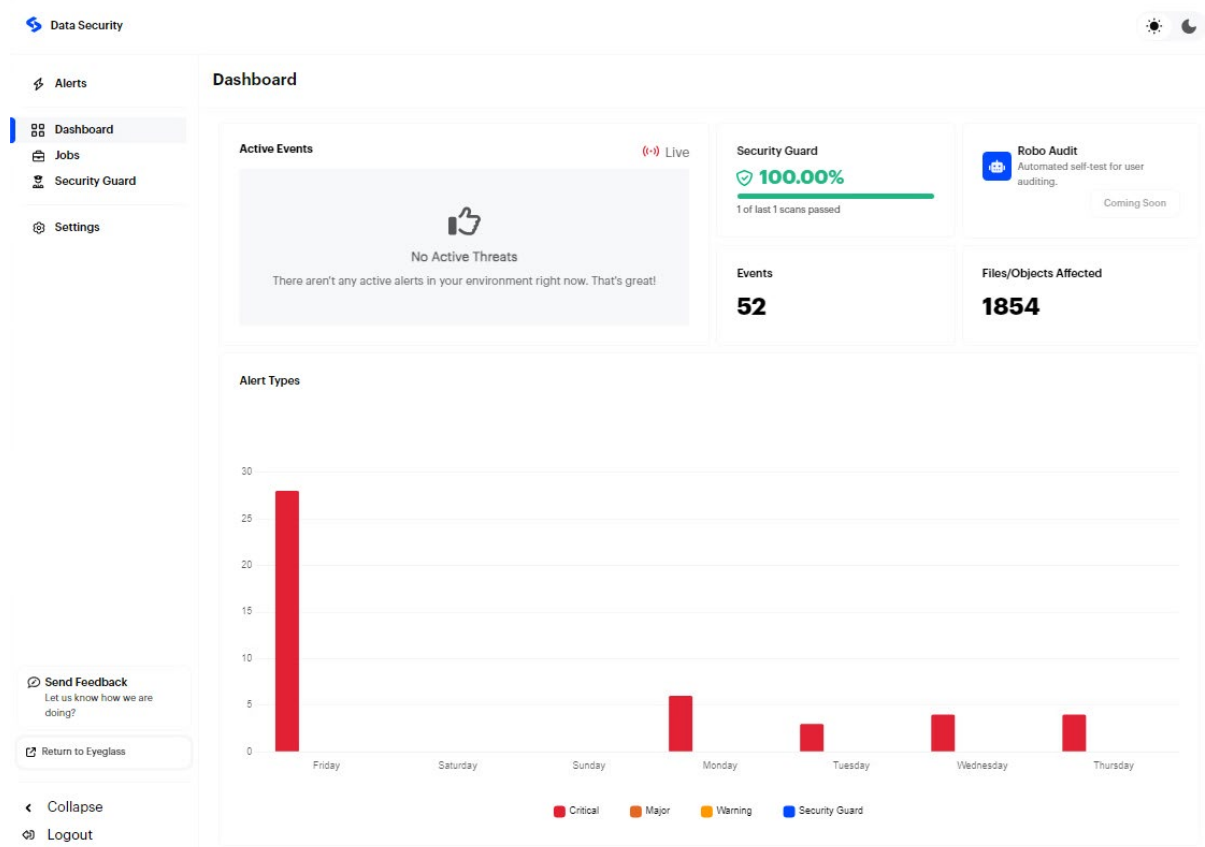


Figure 1: Superna Data Security Edition – Web Interface

Superna Data Security Edition prevents ransomware from encrypting user data on storage clusters. It does not replace endpoint protection software on client or server computers but is designed to be used in conjunction such software.

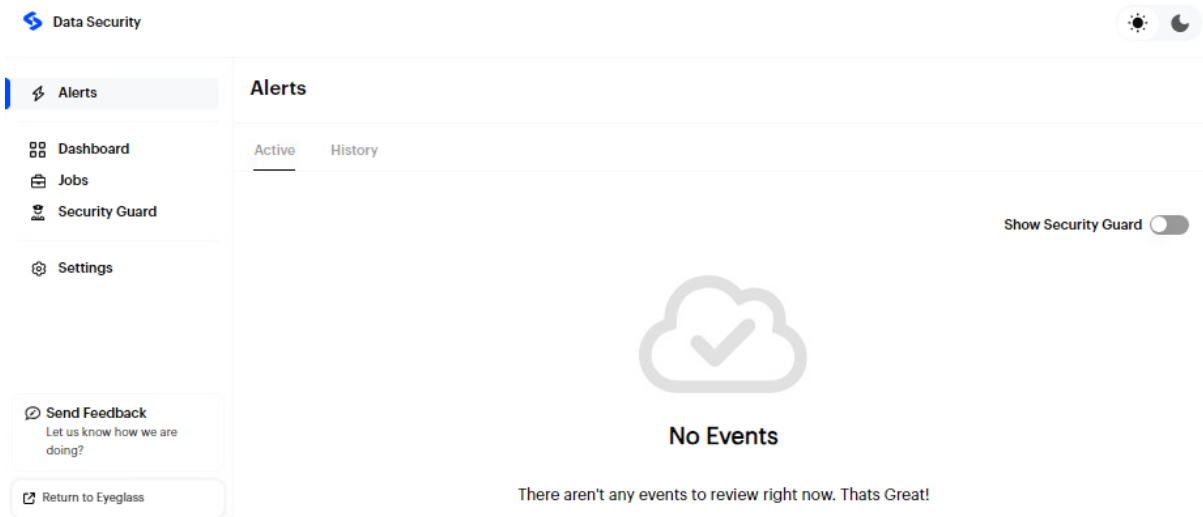


Figure 2: Superna Data Security Edition

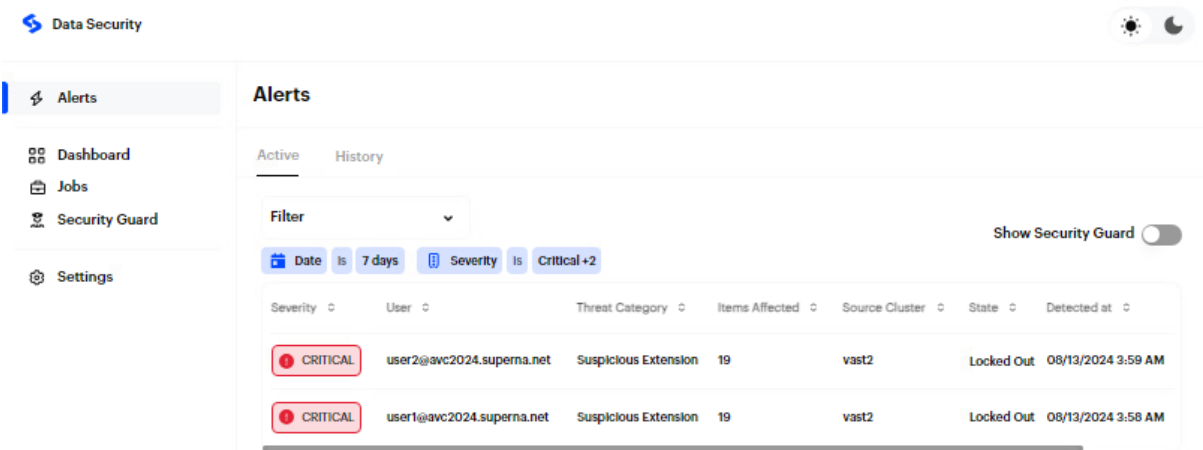


Figure 3: Superna Data Security Edition – Detection

## Test Configuration

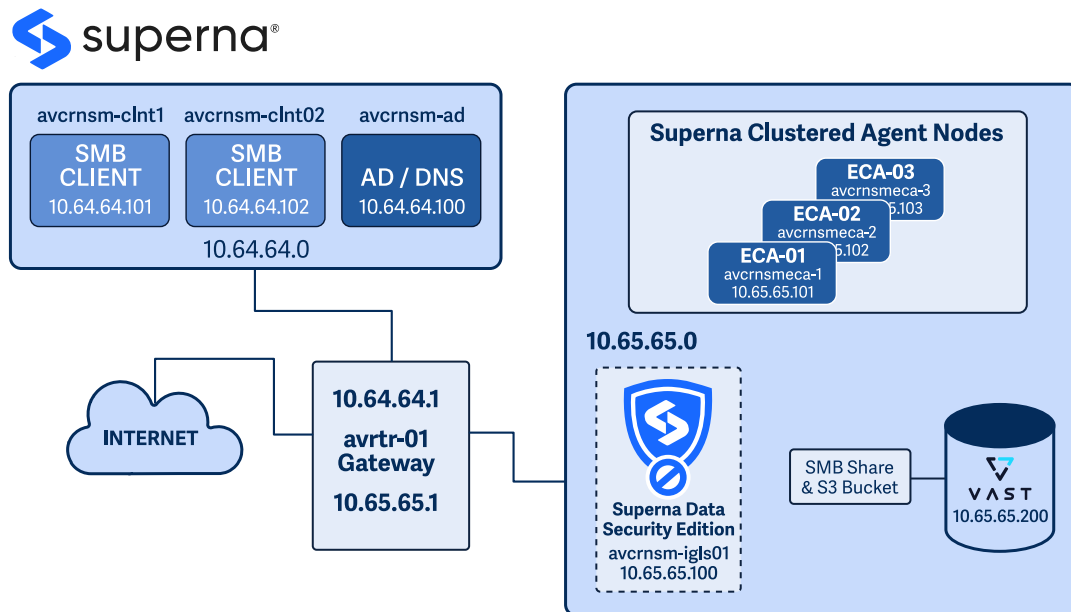


Figure 4: Infrastructure

## Product Versions

- Superna Data Security Edition 2.9.0-24085
- Vast Data VMS:
  - Build: release-4-7-0-sp10-1157242-vms
  - Software version: 4.7.0.80
- Vast Data Cluster:
  - Build: release-4-7-0-sp10-1157242
  - PSNT: lb-release-4-7-0-sp10-1147242
  - Software version: 4.7.0.80

## Settings

The settings of Superna Data Security Edition were configured by Superna:

- “Enforcement Mode” activated
- Warning Event Thresholds:
  - Expiry: 30min
  - Signal Strength Threshold: 30
  - Interval: 1h
  - Minimum User Behaviour Duration: 30min
- Major Event Thresholds:
  - Signal Strength Threshold: 5
  - Interval: 10min
  - Upgrade to Major: 2 events
  - Grace Period: 240min
- Critical Event Thresholds:
  - Signal Strength Threshold: 10
  - Interval: 30min
  - Upgrade to Critical: 2 events

## Test scenario

Three ransomware samples were executed manually on two clients with connected shares. Before starting the test, a CLI health check was performed to verify that the cluster was operational.

## Test Procedure

For each tested ransomware sample, the following test procedure was used:

1. Copy the ransomware sample onto both clients
2. Execute the sample on both clients
3. Monitor the web interface of Superna Data Security Edition for detection events
4. Record screenshots of the event and event details (affected files and shares, username, snapshot list)
5. Verify that the user was locked out of the affected share
6. Recover affected files using the Cyber Recovery Manager
7. Restore user access from the active event
8. Verify that the user can access the share again
9. Verify that all files were recovered correctly
10. Cleanup/prepare for the next test sample execution

## Clients

Two Windows 10 64-bit (English) VMware virtual machines were used to access the managed file shares and execute the ransomware samples in this test. Before test execution, for each client, a VM snapshot was created to allow resetting the clients to a clean state after each test iteration. Tests were performed as different Active Directory users on both clients – “User1” and “User2”, respectively.

## Shares

On the Vast Data cluster (cf. Figure 4: Infrastructure), a separate SMB share for each test user was configured. The shares were mounted on the respective Windows client/user as network drives before the sample was executed. On each share, 5000 unique text files with a file size of roughly 1kB were created using a PowerShell script. The SHA256 hash of each created file was recorded to be able to verify that all files are restored to their original state in the recovery stage. After creating the test files, two storage snapshots of the respective shares were created in the web console of Vast Data. To allow all internals of Superna Data Security Edition to adapt to the new storage state, tests were started at least one hour after snapshot creation.

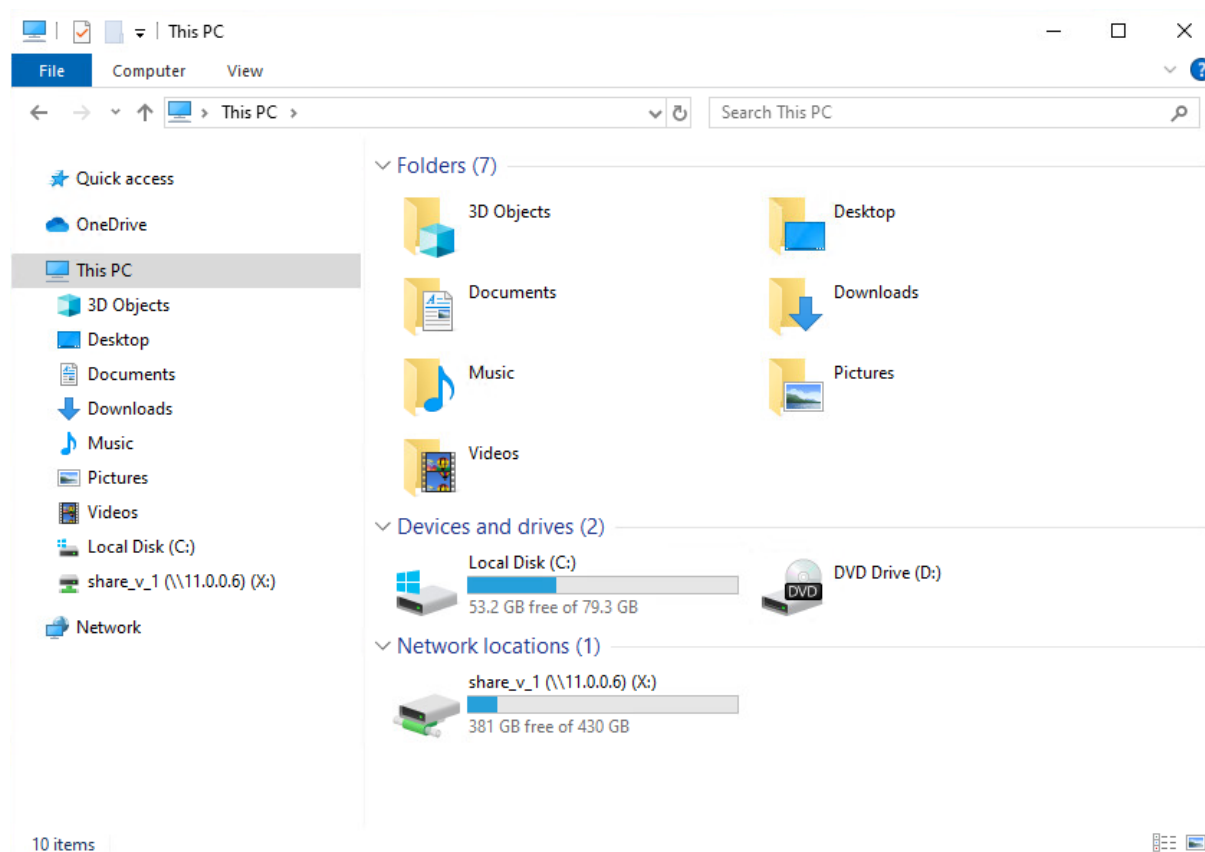


Figure 5: Share on the Windows 10 – User 1 client

## Used Ransomware Samples

Two self-compiled ransomware samples, which encrypt files on network shares and can be configured in an attempt to bypass Superna Data Security Edition’s detection, were used for the test:

1. No special modifications – the sample will encrypt all files and add the “.owned” extension to encrypted files
2. Similar to the first version, but will encrypt files without changing their extension

Additionally, one ransomware sample of the CylanCrypt family was used as a representative of ransomware found in-the-wild, since this sample also affects connected network shares.

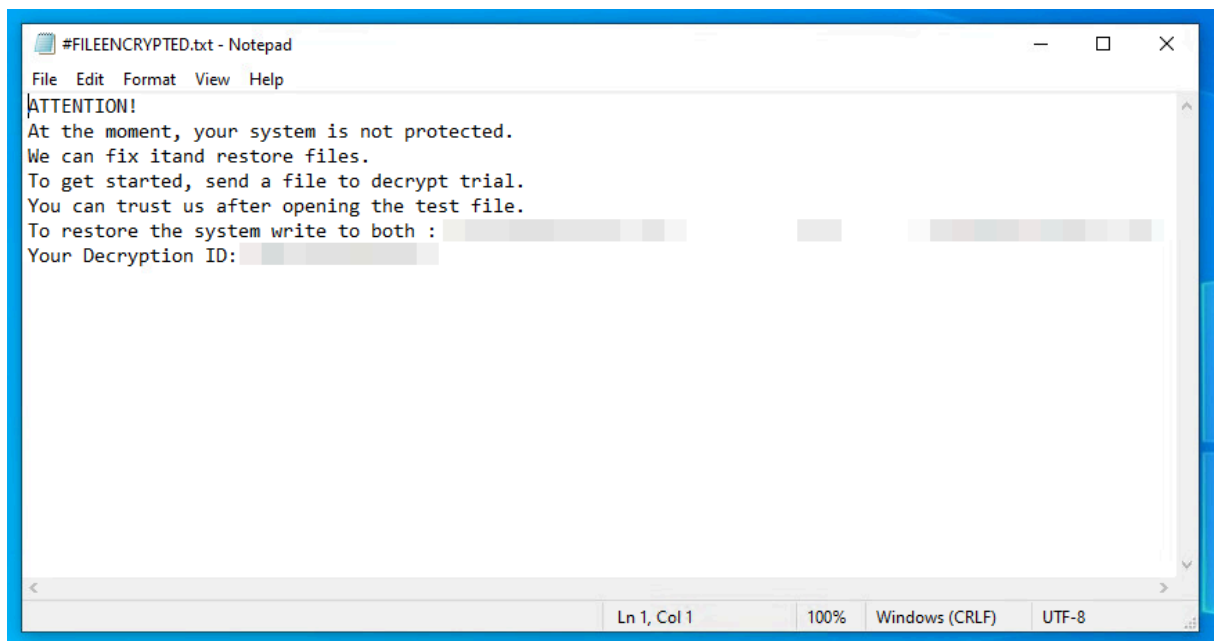


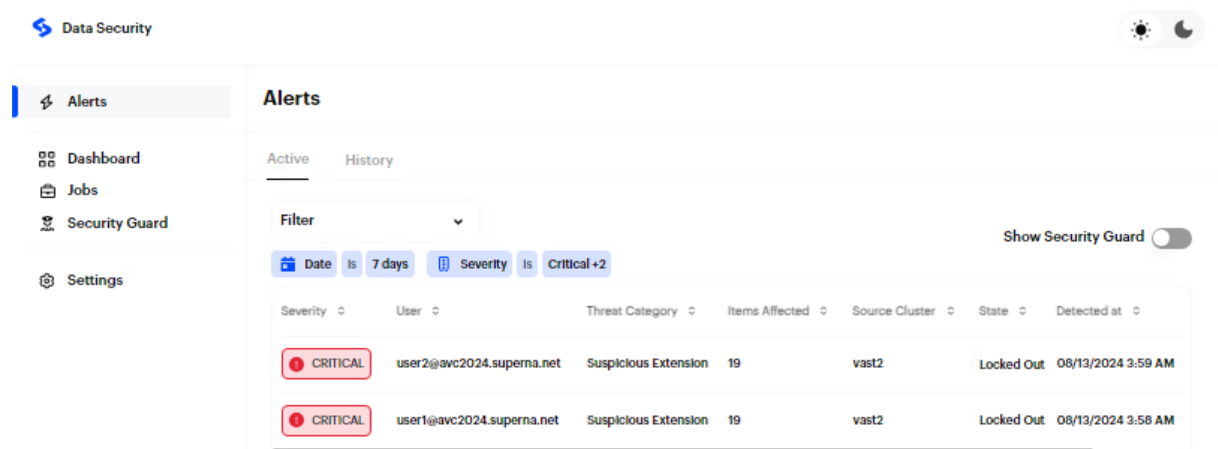
Figure 6: CylanCrypt Encryption Notice

## Test Result

The samples encrypted several files on the client and the storage cluster. However, Superna Data Security Edition detected all events, removed write access of the originating user to the affected share and created new storage snapshots for further incident investigation. From the Recovery Manager, all files could be restored back to their state before the infection. In the following sections, screenshots and further details about the reaction of Superna Data Security Edition to the tested samples are provided.

### Custom Ransomware, Variant 1:

Shortly after executing the first custom ransomware variant, Superna Data Security Edition raised alarms in the web interface:



The screenshot displays the 'Alerts' section of the Superna Data Security web interface. The interface includes a navigation menu on the left with options for Alerts, Dashboard, Jobs, Security Guard, and Settings. The main content area shows a table of active alerts. The table has columns for Severity, User, Threat Category, Items Affected, Source Cluster, State, and Detected at. Two alerts are visible, both marked as 'CRITICAL' and 'Locked Out'.

Severity	User	Threat Category	Items Affected	Source Cluster	State	Detected at
CRITICAL	user2@avc2024.superna.net	Suspicious Extension	19	vast2	Locked Out	08/13/2024 3:59 AM
CRITICAL	user1@avc2024.superna.net	Suspicious Extension	19	vast2	Locked Out	08/13/2024 3:58 AM

Figure 7: Detection events in the "Alerts" section



After a few files on the connected shares were encrypted, write access on the shares was disabled for both users:

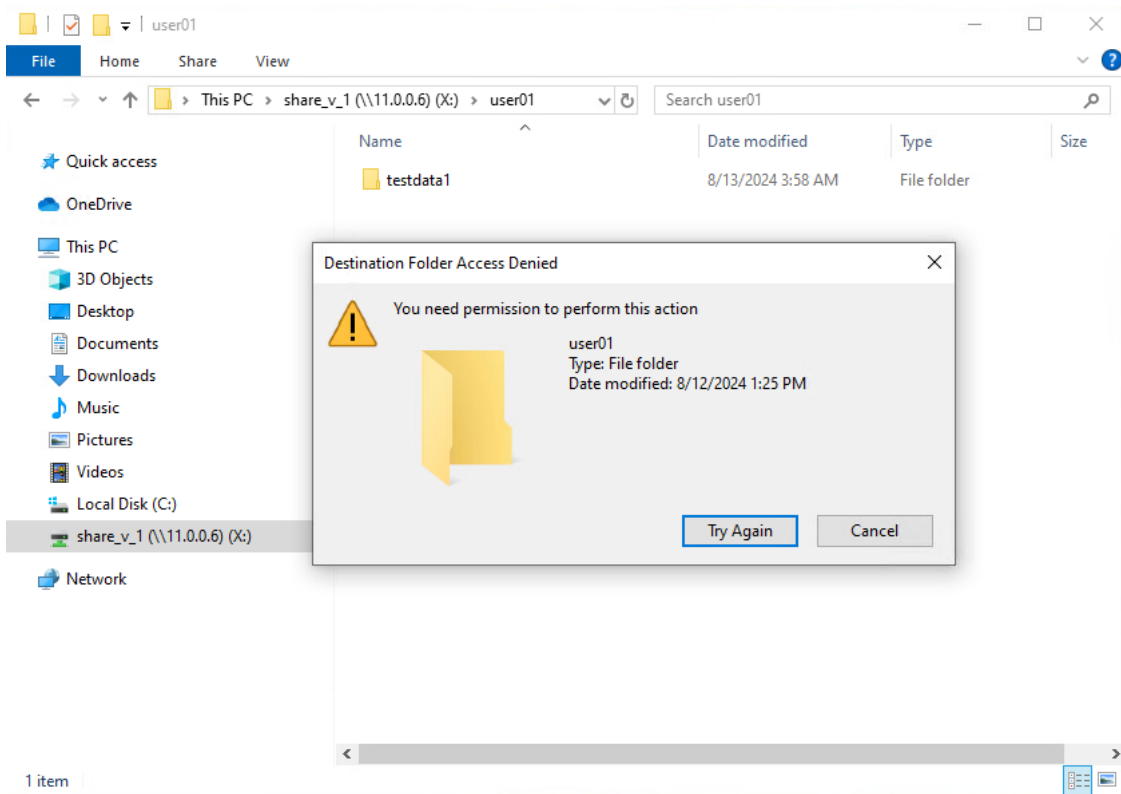


Figure 8: Permissions for User 1 changed to read-only

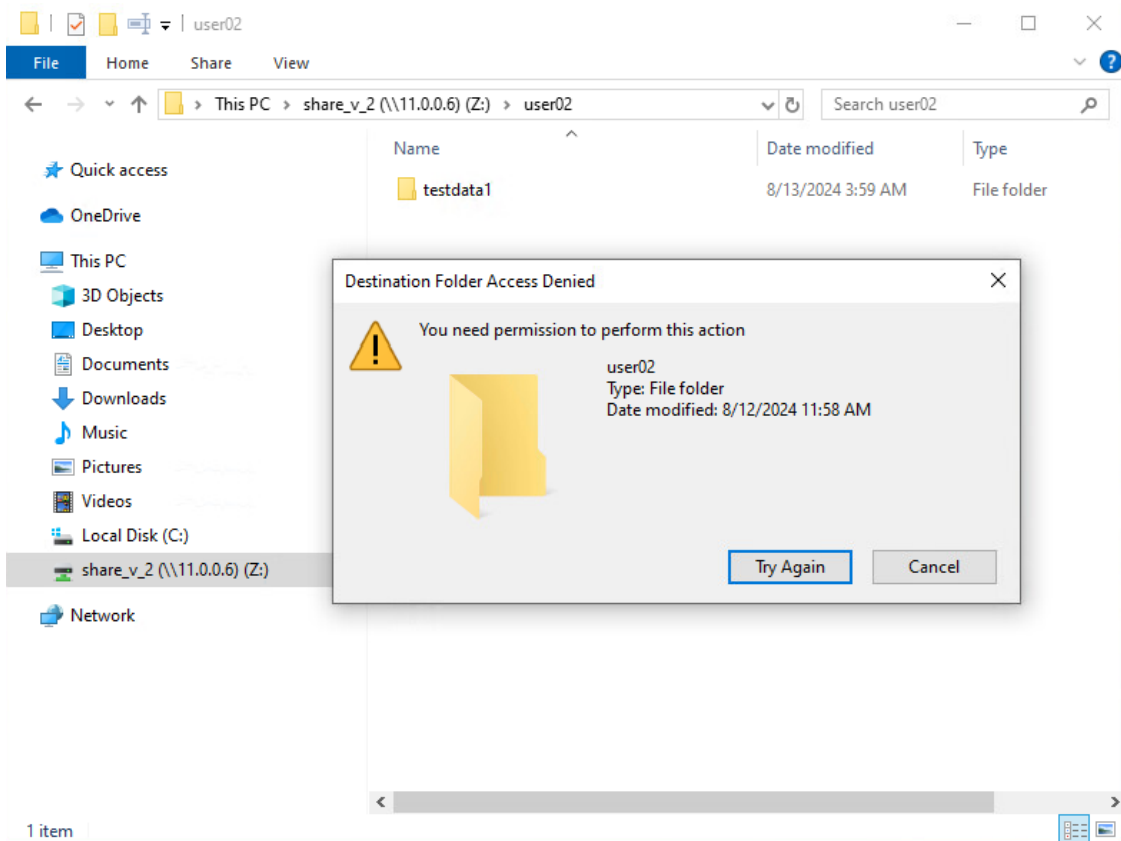


Figure 9: Permissions for User 2 changed to read-only

As the detection was raised, Superna Data Security Edition created a new storage snapshot to allow an administrator to investigate the incident:

The screenshot displays the Superna Data Security Edition interface. On the left is a navigation sidebar with options: Alerts, Dashboard, Jobs, Security Guard, and Settings. The main content area shows an alert titled "Suspicious Extension" with a "CRITICAL" severity. The alert description is "Activity related to file extensions on the blocked list." Key details include: State: Locked Out, Detected at: 08/13/2024 3:58 AM, User: user1@avc2024.superna.net, Duration: 8 minutes 27 seconds, Expires: 3 hours 52 minutes 8 seconds, and Source IP Address: 10.64.64.101. Below the alert, there are tabs for "Overview" and "Recovery Manager". The "Overview" tab shows a list of events for August 13, 2024, all labeled "Locked Out". The events include severity upgrades to CRITICAL and MAJOR, and a signal received event. Below the events is a "Snapshots" section showing two snapshots created for the user "user1" on 01/20/1970 5:45 PM. The snapshots are named "igls-avc2024.superna.net-user1 Test-default-smb-share1-17\_387-1723535915329". There are also sections for "Shares" and "User Alert History".

Figure 10: Automatic snapshots created by Superna Data Security Edition – User 1 Event

**Data Security**

**Suspicious Extension**

**CRITICAL** Activity related to file extensions on the blocked list. State: **Locked Out** Detected at: **08/13/2024 3:59 AM** User: **user2@avc2024.superna.net**

Actions: Create Snapshot, Archive as Unresolvable, Restore User Access

Duration: **8 minutes 54 seconds** Expires: **3 hours 51 minutes 5 seconds** Source IP Address: **10.64.64.102**

Overview Recovery Manager

**August 13, 2024**

- Locked Out** Signal received; Event state going to LOCKED\_OUT 3:59 AM
- Locked Out** Signal received; Event state going to LOCKED\_OUT 3:59 AM
- Locked Out** Signal received; Event state going to LOCKED\_OUT 3:59 AM
- Locked Out** Signal received; Event state going to LOCKED\_OUT 3:59 AM

Write a comment...

**Snapshots**

- igls-avc2024.superna.net-user2 test-default-smb-share1-17\_388-1723535953787 01/20/1970 5:45 PM
- igls-avc2024.superna.net-user2 test-default-smb-share2-17\_388-1723535953788 01/20/1970 5:45 PM

**Shares**

**User Alert History** [View All](#)

**Send Feedback** Let us know how we are doing?

[Return to Eyeglass](#)

[Collapse](#)

[Logout](#)

Figure 11: Automatic snapshots created by Superna Data Security Edition - User 2 Event

The „Shares“ view lists all affected shares on the cluster affected by the lock out:

**Data Security**

**Suspicious Extension**  
Activity related to file extensions on the blocked list.

State: **Locked Out** | Detected at: **08/13/2024 3:58 AM** | User: **user1@avc2024.superna.net**

Create Snapshot
Archive as Unresolvable
Restore User Access
Duration: 11 minutes 56 seconds
Expires: 3 hours 48 minutes 39 seconds
Source IP Address: 10.64.64.101

Overview | Recovery Manager

**August 13, 2024**

- Locked Out**  
Severity automatically upgraded to CRITICAL | 3:59 AM
- Locked Out**  
Severity automatically upgraded to MAJOR | 3:59 AM
- Locked Out**  
Signal received; Event state going to LOCKED\_OUT | 3:58 AM
- Locked Out**

Write a comment...

**Shares**

smb_policy	vast2	default	/smb/share1
<b>Permission</b>		<b>Clients</b>	
NFS Read-Write		*	
NFS Read-Only			
SMB Read-Only		10.64.64.101	

Figure 12: Affected shares – User 1 Event

Data Security
☀️ 🌙

- Alerts
- Dashboard
- Jobs
- Security Guard
- Settings

Send Feedback  
Let us know how we are doing?

Return to Eyeglass

Collapse

Logout

← CRITICAL

### Suspicious Extension

Activity related to file extensions on the blocked list.

State: **Locked Out**

Detected at: **08/13/2024 3:59 AM**

User: **user2@avc2024.superna.net**

📷

Create Snapshot

🗑️

Archive as Unresolvable

🔒

Restore User Access

⌚

Duration  
**13 minutes 27 seconds**

🕒

Expires  
**3 hours 46 minutes 32 seconds**

🌐

Source IP Address  
**10.64.64.102**

Overview    Recovery Manager

---

**August 13, 2024**

- Locked Out**

Signal received; Event state going to LOCKED\_OUT

3:59 AM
- Locked Out**

Signal received; Event state going to LOCKED\_OUT

3:59 AM
- Locked Out**

Signal received; Event state going to LOCKED\_OUT

3:59 AM
- Locked Out**

Signal received; Event state going to LOCKED\_OUT

3:59 AM

Write a comment... ➤

📷 Snapshots

🗑️ Shares

smb_policy	vast2	default	/smb/share ↕
<b>Permission</b>		<b>Clients</b>	
NFS Read-Write		*	
NFS Read-Only			
SMB Read-Only		10.64.64.101, 10.64.64.102	

Figure 13: Affected shares – User 2 Event

From the “Recovery Manager” Tab in the event details page, administrators can list files affected by the ransomware event and select files to be restored to an earlier state.

← **CRITICAL** Suspicious Extension  
Activity related to file extensions on the blocked list. State: Locked Out, Detected at: 08/13/2024 3:58 AM, User: user1@avc2024.superna.net

Buttons: Create Snapshot, Archive as Unresolvable, Restore User Access. Metrics: Duration: 17 minutes 39 seconds, Expires: 3 hours 42 minutes 56 seconds, Source IP Address: 10.64.64.101

Overview | **Recovery Manager**

43 Total | 100% Recoverable | 0% Unrecoverable | 0% Recovered | Filter

<input checked="" type="checkbox"/>	Path	Cluster	Event Type	Event Time	File Name	Recovery Source	Recovery Time	Status
<input checked="" type="checkbox"/>	/smb/share1/user01/t...	vast2	FILE_CREATE, FILE_WR...	08/13/2024 3:58 AM	/smb/share1/user01/t... user01_base			
<input checked="" type="checkbox"/>	/smb/share1/user01/t...	vast2	FILE_CREATE, FILE_WR...	08/13/2024 3:58 AM	/smb/share1/user01/t... user01_base			
<input checked="" type="checkbox"/>	/smb/share1/user01/t...	vast2	FILE_CREATE, FILE_WR...	08/13/2024 3:58 AM	/smb/share1/user01/t... user01_base			
<input checked="" type="checkbox"/>	/smb/share1/user01/t...	vast2	FILE_CREATE, FILE_WR...	08/13/2024 3:58 AM	/smb/share1/user01/t... user01_base			
<input checked="" type="checkbox"/>	/smb/share1/user01/t...	vast2	FILE_CREATE, FILE_WR...	08/13/2024 3:58 AM	/smb/share1/user01/t... user01_base			
<input checked="" type="checkbox"/>	/smb/share1/user01/t...	vast2	FILE_CREATE, FILE_WR...	08/13/2024 3:58 AM	/smb/share1/user01/t... user01_base			
<input checked="" type="checkbox"/>	/smb/share1/user01/t...	vast2	FILE_CREATE, FILE_WR...	08/13/2024 3:58 AM	/smb/share1/user01/t... user01_base			
<input checked="" type="checkbox"/>	/smb/share1/user01/t...	vast2	FILE_CREATE, FILE_WR...	08/13/2024 3:58 AM	/smb/share1/user01/t... user01_base			
<input checked="" type="checkbox"/>	/smb/share1/user01/t...	vast2	FILE_CREATE, FILE_WR...	08/13/2024 3:58 AM	/smb/share1/user01/t... user01_base			
<input checked="" type="checkbox"/>	/smb/share1/user01/t...	vast2	FILE_CREATE, FILE_WR...	08/13/2024 3:58 AM	/smb/share1/user01/t... user01_base			

43 Items Selected | Recalculate Snapshots | Export as CSV | Recover

Figure 14: Selecting files to restore

After file recovery was started, the Jobs view of the web interface provided more details about the status of the recovery job:

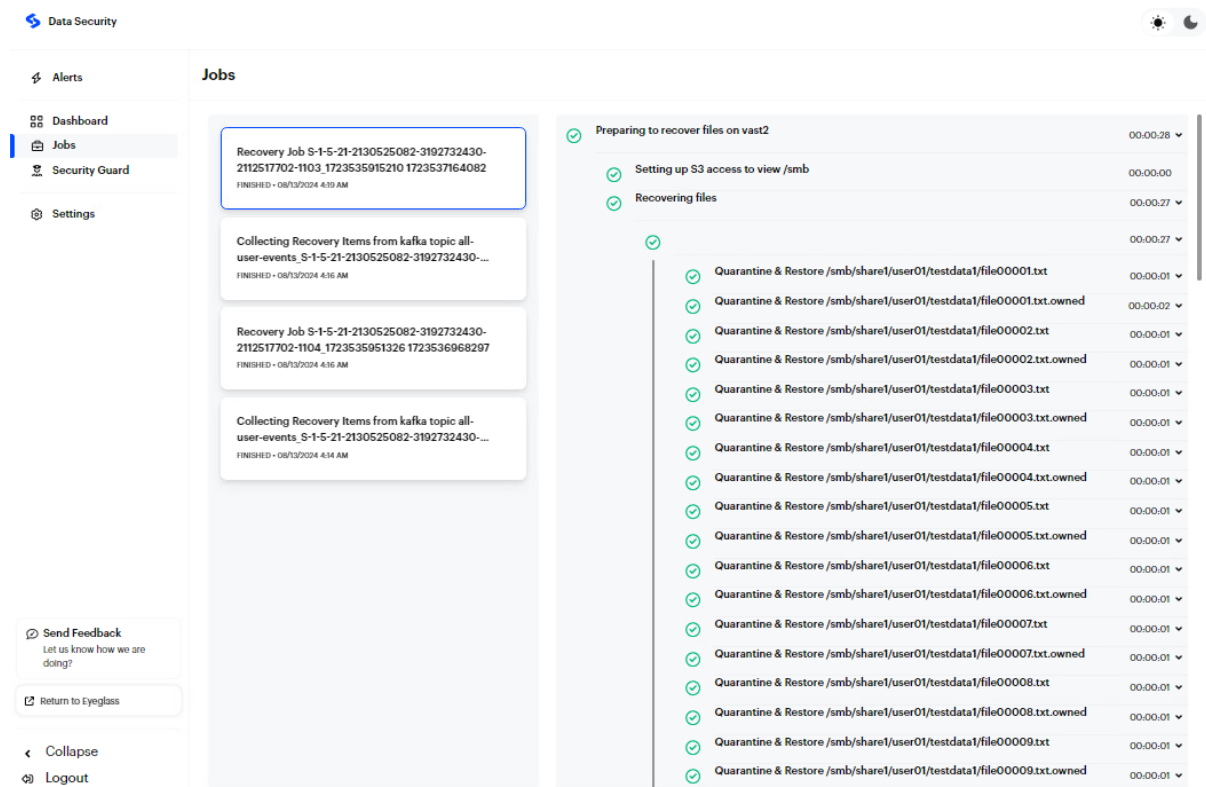


Figure 15: Recovery complete

At this point, both client VMs were reverted to a clean snapshot. After verifying that the recovery of all selected files was complete, User Access was restored using the respective button in the event overview page.

Once User access was restored for both shares, the clients were able to write to their shares again

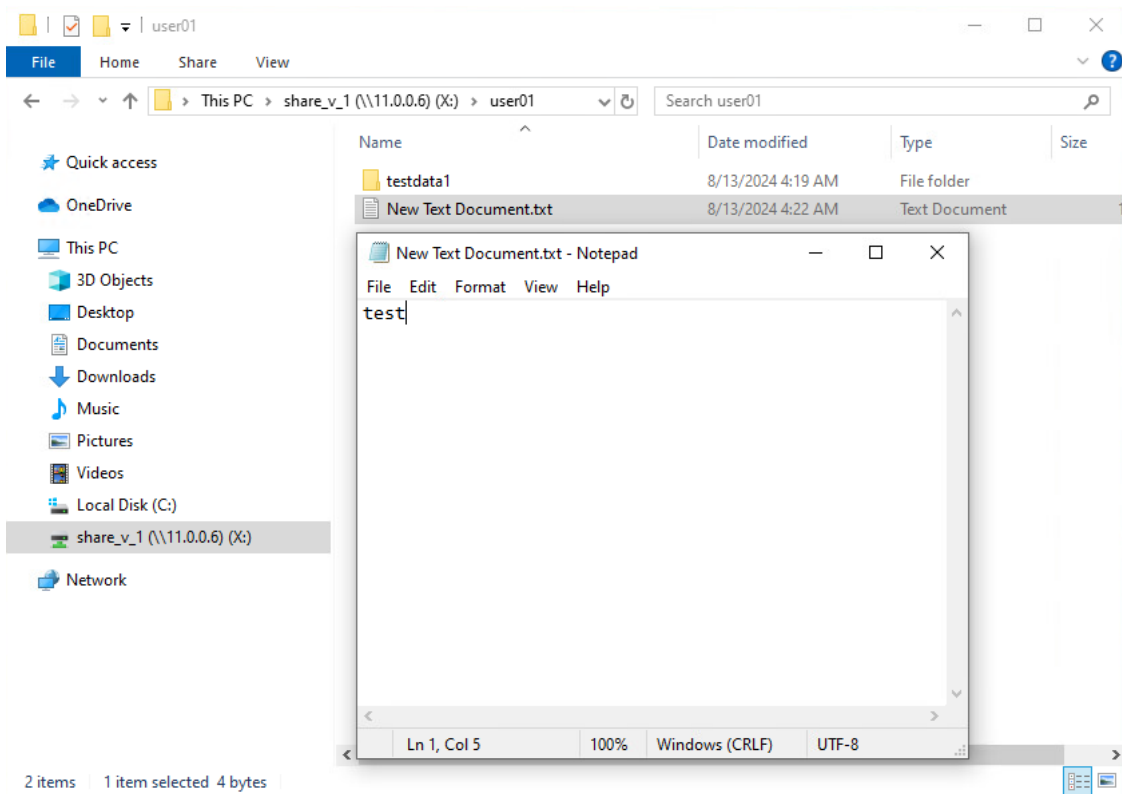


Figure 16: Write access restored for User 1

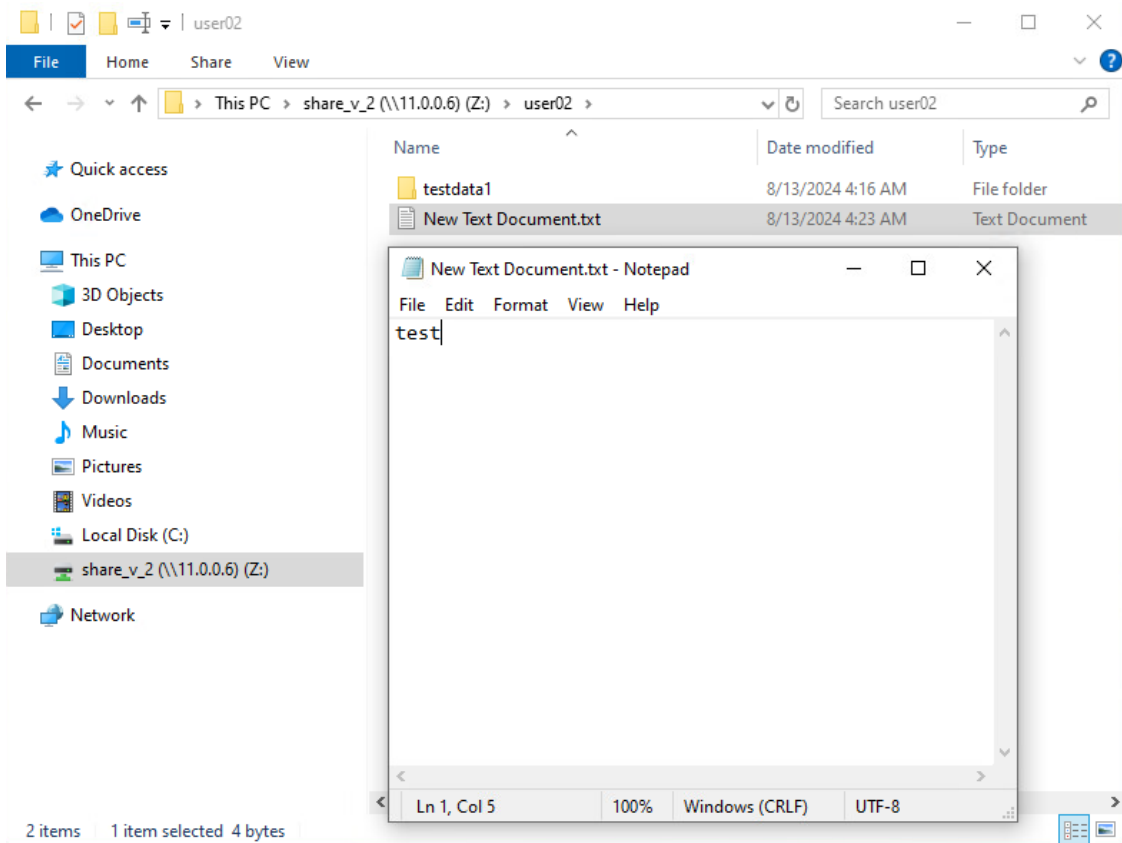


Figure 17: Write access restored for User 2



Note: After restoring the files affected by the ransomware infection, only administrators have access to the restored files. According to Superna, this behaviour is specific to Vast and occurs because Vast does not currently provide an API for Superna Data Security Edition to reset the file permissions after a restore. In a real-world scenario, administrators would have to reset the file permissions themselves.

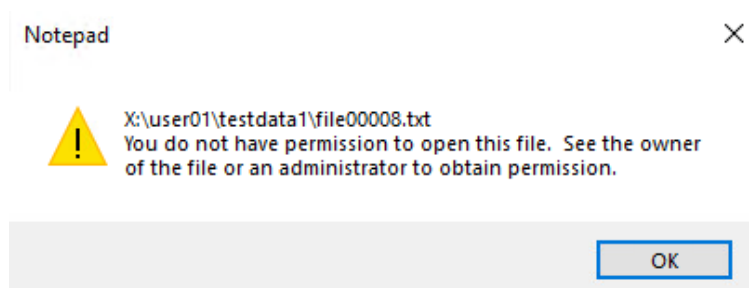


Figure 18: Users don't have access to restored files

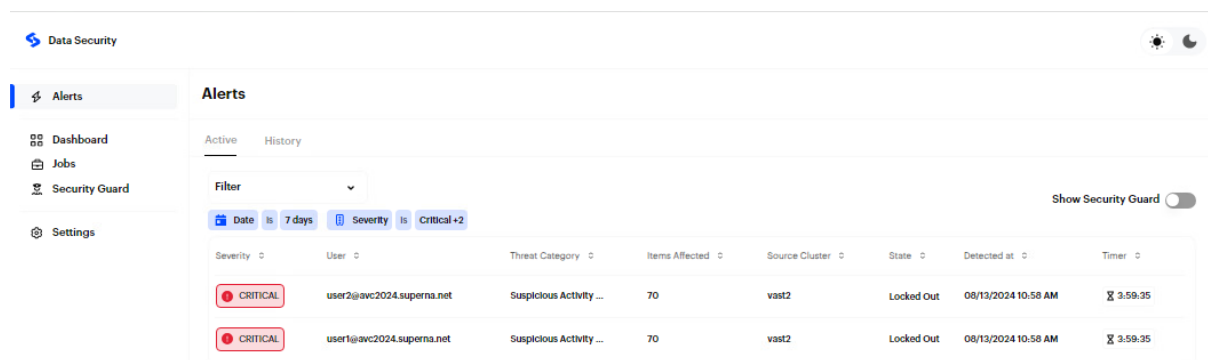
Comparing the SHA256 hashes of the recovered files using an administrator account confirmed that content-wise, all files were correctly restored to their state before the ransomware infection.

To prepare for testing the next ransomware sample, affected files were deleted and re-created on the Windows clients. Furthermore, existing storage snapshots on Vast were removed and fresh snapshots were created as described previously.

## Custom Ransomware, Variant 2:

The alert messages in Figure 7 indicate that the first custom ransomware variant was detected due to it renaming encrypted files to a suspicious file extension. The second variant was used to test whether Superna Data Security Edition can also detect ransomware, which only encrypts, but does not rename any files.

Indeed, similar to the first test execution, shortly after executing the ransomware, detection events were shown in the web interface, now under the “Suspicious Activity” category:



The screenshot shows the 'Alerts' section of the Superna Data Security Edition web interface. The interface includes a sidebar with navigation options: Alerts, Dashboard, Jobs, Security Guard, and Settings. The main content area displays a table of alerts under the 'Active' tab. The table has columns for Severity, User, Threat Category, Items Affected, Source Cluster, State, Detected at, and Timer. Two alerts are visible, both marked as 'CRITICAL' and categorized as 'Suspicious Activity ...'. The first alert is for user 'user2@avc2024.superna.net' and the second is for 'user1@avc2024.superna.net'. Both alerts show 70 items affected, source cluster 'vast2', and state 'Locked Out'. The detection time for both is '08/13/2024 10:58 AM'.

Severity	User	Threat Category	Items Affected	Source Cluster	State	Detected at	Timer
CRITICAL	user2@avc2024.superna.net	Suspicious Activity ...	70	vast2	Locked Out	08/13/2024 10:58 AM	3:59:35
CRITICAL	user1@avc2024.superna.net	Suspicious Activity ...	70	vast2	Locked Out	08/13/2024 10:58 AM	3:59:35

Figure 19: Custom Variant 2 detected

As during the first iteration, Superna Data Security Edition quickly removed write access to the shares both users.

New storage snapshots were created for each event:

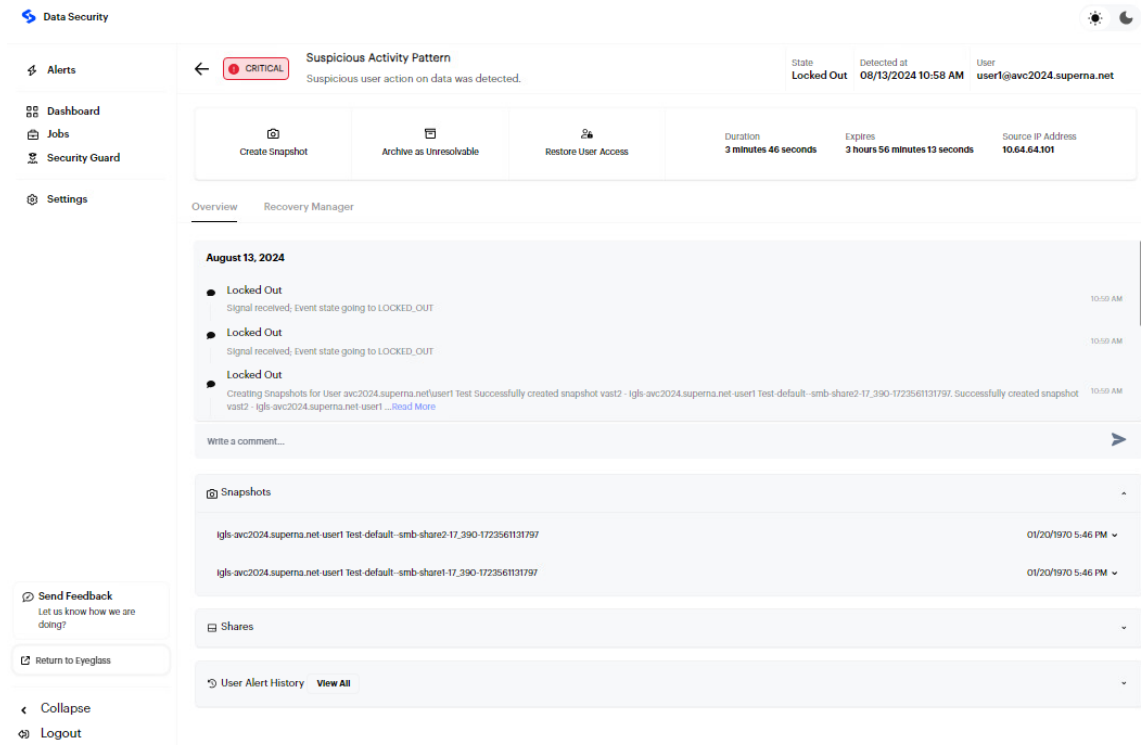


Figure 20: New storage snapshots created by Superna Data Security Edition – User 1

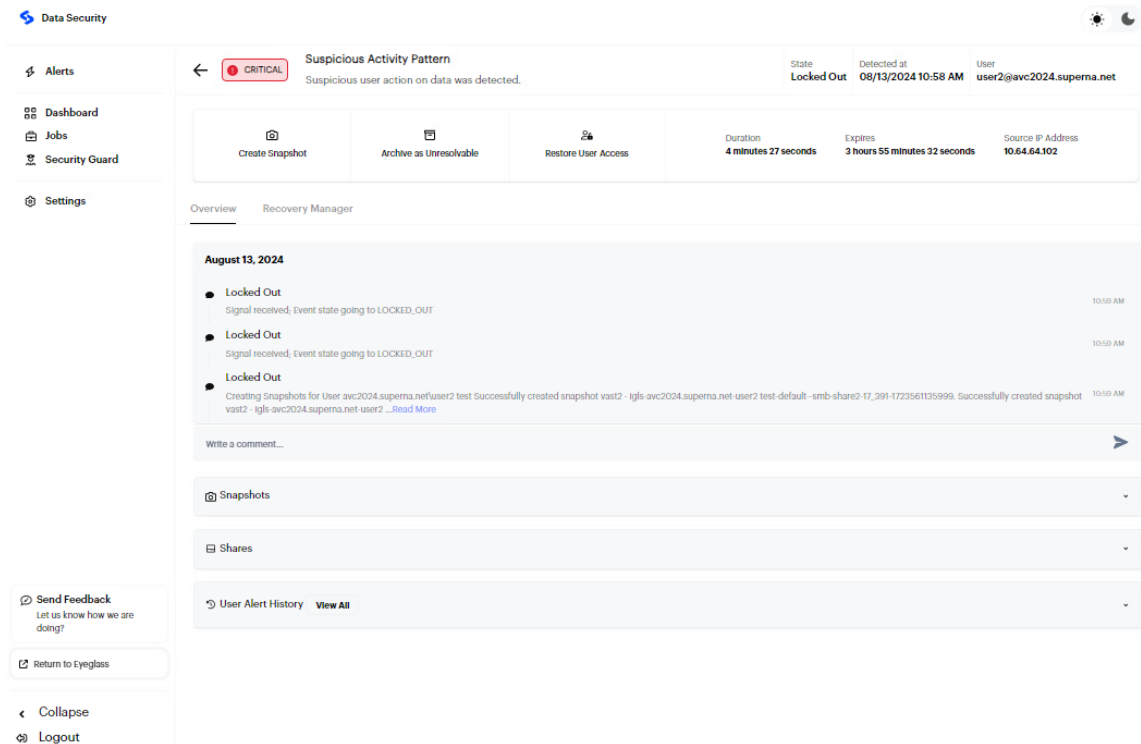


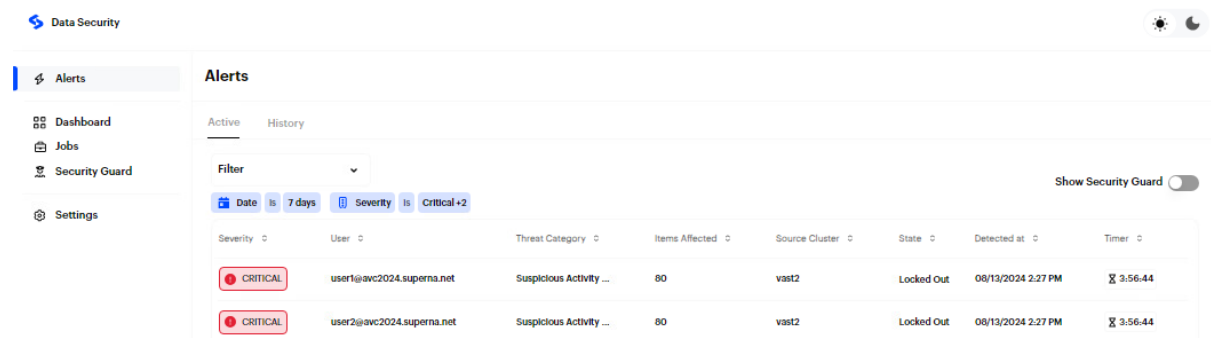
Figure 21: New storage snapshots created by Superna Data Security Edition - User 2

The same procedure as during the previous test iteration was used to recover affected files and restore User access. All files were restored correctly.

## CylanCrypt

To test the reaction of Superna Data Security Edition on a ransomware sample found in-the-wild, a sample of the CylanCrypt family was chosen, since it also affects files on network shares.

Similar to the previous test iterations, shortly after executing the malware on the clients, ransomware events were shown in the alerts view of the web interface:



The screenshot displays the 'Alerts' section of the Superna Data Security web interface. The interface includes a sidebar with navigation options: Alerts, Dashboard, Jobs, Security Guard, and Settings. The main content area shows a table of alerts with columns for Severity, User, Threat Category, Items Affected, Source Cluster, State, Detected at, and Timer. Two alerts are visible, both marked as 'CRITICAL' and 'Locked Out', detected on 08/13/2024 at 2:27 PM. The alerts are for users user1@avc2024.superna.net and user2@avc2024.superna.net, both with 80 items affected and source cluster vast2.

Severity	User	Threat Category	Items Affected	Source Cluster	State	Detected at	Timer
CRITICAL	user1@avc2024.superna.net	Suspicious Activity ...	80	vast2	Locked Out	08/13/2024 2:27 PM	3:56:44
CRITICAL	user2@avc2024.superna.net	Suspicious Activity ...	80	vast2	Locked Out	08/13/2024 2:27 PM	3:56:44

Figure 22: CylanCrypt detected

As during the previous iterations, share write access was quickly removed for both users.

New storage snapshots were created for each event:

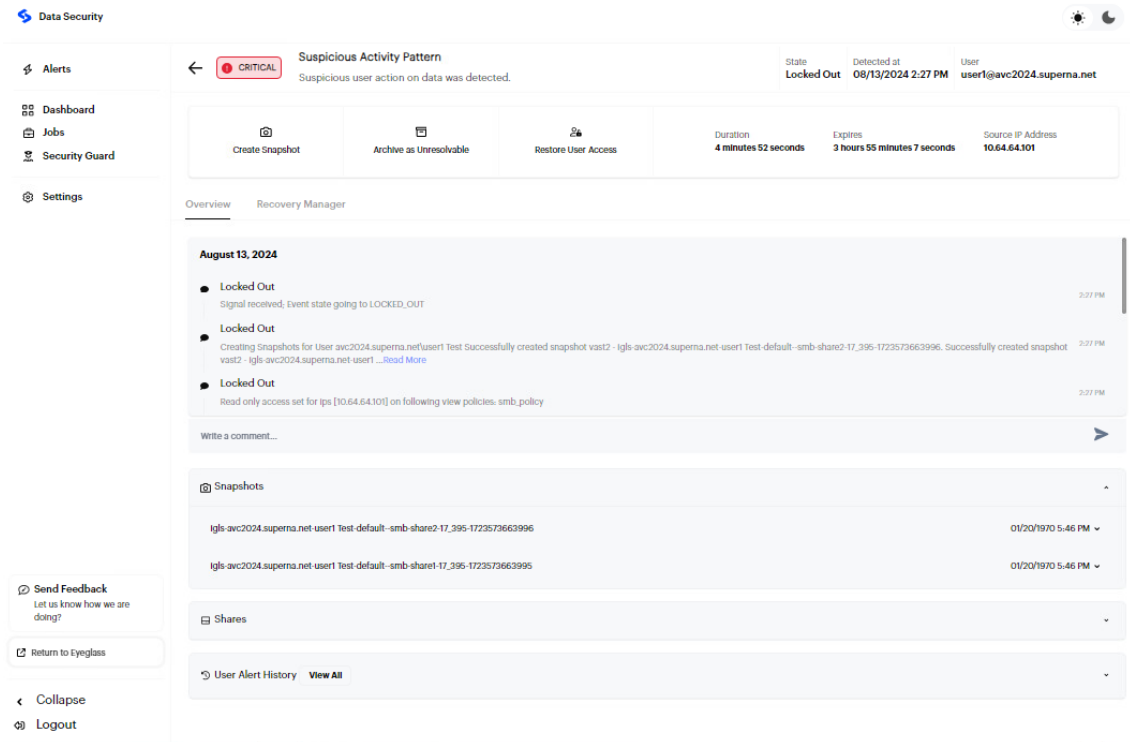


Figure 23: New storage snapshots created - User 1

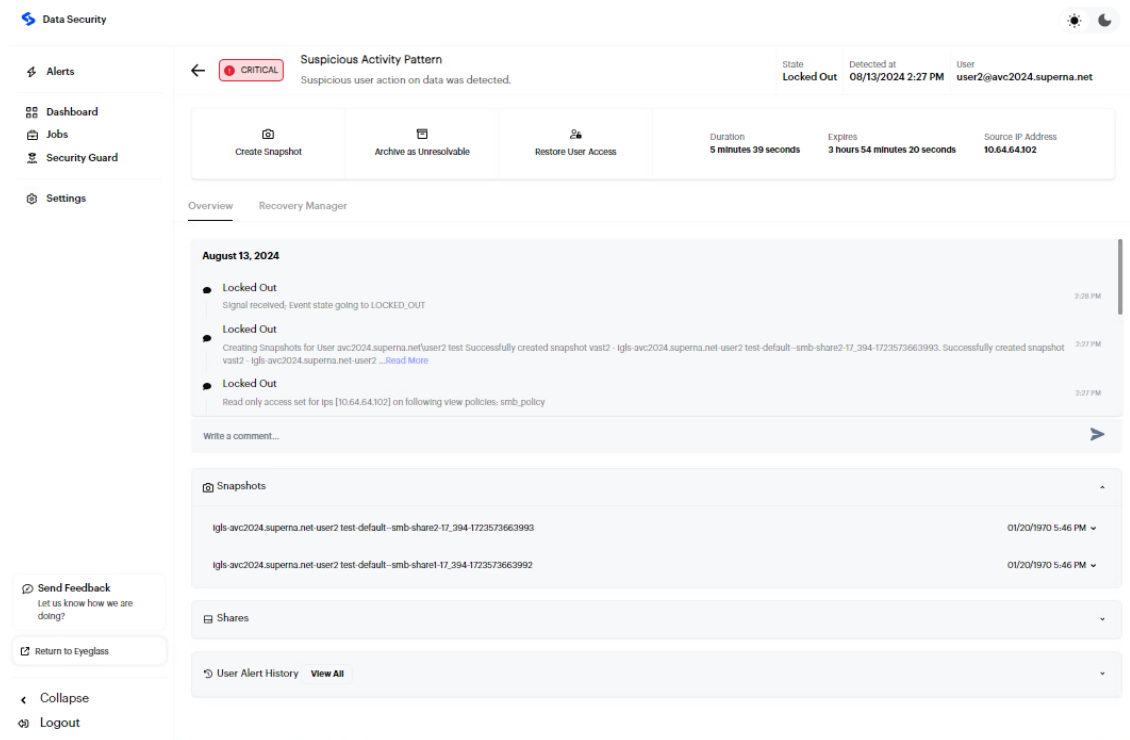


Figure 24: New storage snapshots created - User 2

The same procedure as during the first test iteration was used to recover affected files and restore User access. All files were restored correctly.

## NIST Compliance<sup>1</sup>

<b>NIST Framework Attribute</b>	<b>How Superna Data Security Edition Complies</b>	<b>NIST Compliance Status</b>
<b><i>Identify</i></b>	Threat identified by username and IP address	Compliant
<b><i>Protect</i></b>	Stops the threat with user lockout in real time	Compliant
<b><i>Detect</i></b>	Detect malicious ransomware file attack and raise an alert to the user	Compliant
<b><i>Respond</i></b>	Create automated Snapshots to protect SMB shares and create new restore points for a multiuser attack	Compliant
<b><i>Recover</i></b>	File level recovery from previous snapshots to restore encrypted files and quarantine encrypted data for analysis	Compliant

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<sup>1</sup> The table showing NIST compliance is provided solely for informational purposes and does not constitute definitive advice. Serious efforts have been made to ensure the accuracy of the information presented. All trademarks mentioned herein belong to their respective owners and are used for reference purposes only. No endorsement or affiliation is implied.

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