

“

Defenders live in a world of uncertainty.

The goal is to reduce the attacker's window of opportunity and reduce uncertainty.

Visibility is the game.

”

Yossi Sassi

Yossi Sassi is a white hat hacker and consultant, and believes strongly that given enough time and motivation, any system can be hacked. Defenders live in a world of uncertainty. To succeed, they need to limit the access and time an attacker has.

# DATA-CENTRIC SECURITY – FUNDAMENTAL FOR THREAT DETECTION IN 2019 AND BEYOND



**Commonwealth**Bank



“Forensic investigators hired to assess the breach retraced the route of the truck to determine whether they could locate the drives along this route, but were unable to find any trace of them.”



# Hacked By #GOP

## Warning :

We've already warned you, and this is just a beginning.

We continue till our request be met.

We've obtained all your Internal data including your secrets and top secrets.

If you don't obey us, we'll release data shown below to the world.

Determine what will you do till November the **24th, 11:00 PM(GMT)**.

## Data Link :

<https://www.sonypicturesstockfootage.com/SPEData.zip>

<http://dmipiaewh36.spe.sony.com/SPEData.zip>

<http://www.ntcnt.ru/SPEData.zip>

<http://www.thammasatpress.com/SPEData.zip>

<http://moodle.universidadebomatech.com.br/SPEData.zip>



**Hacked: 2012**

**Leaked: 2016**



**Hacked: 2012**

**Leaked: 2016**



**Hacked: 2014**

**Leaked: 2017**



**Hacked: 2013**

**Leaked: 2017**

“

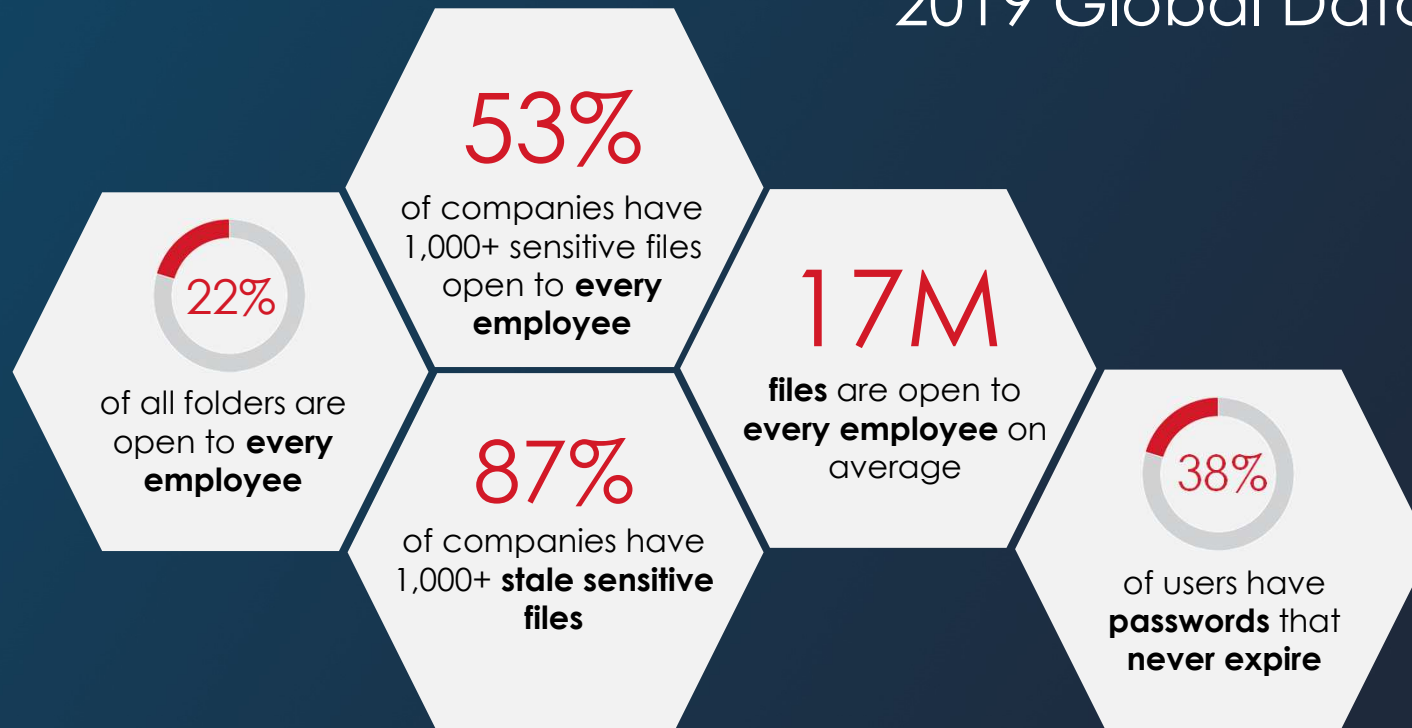
Organizations are failing at early breach detection, with fewer than 20% of breaches detected internally.

”

**Gartner**

Using SIEM for Targeted Attack Detection  
Oliver Rochford & Kelly M. Kavanagh

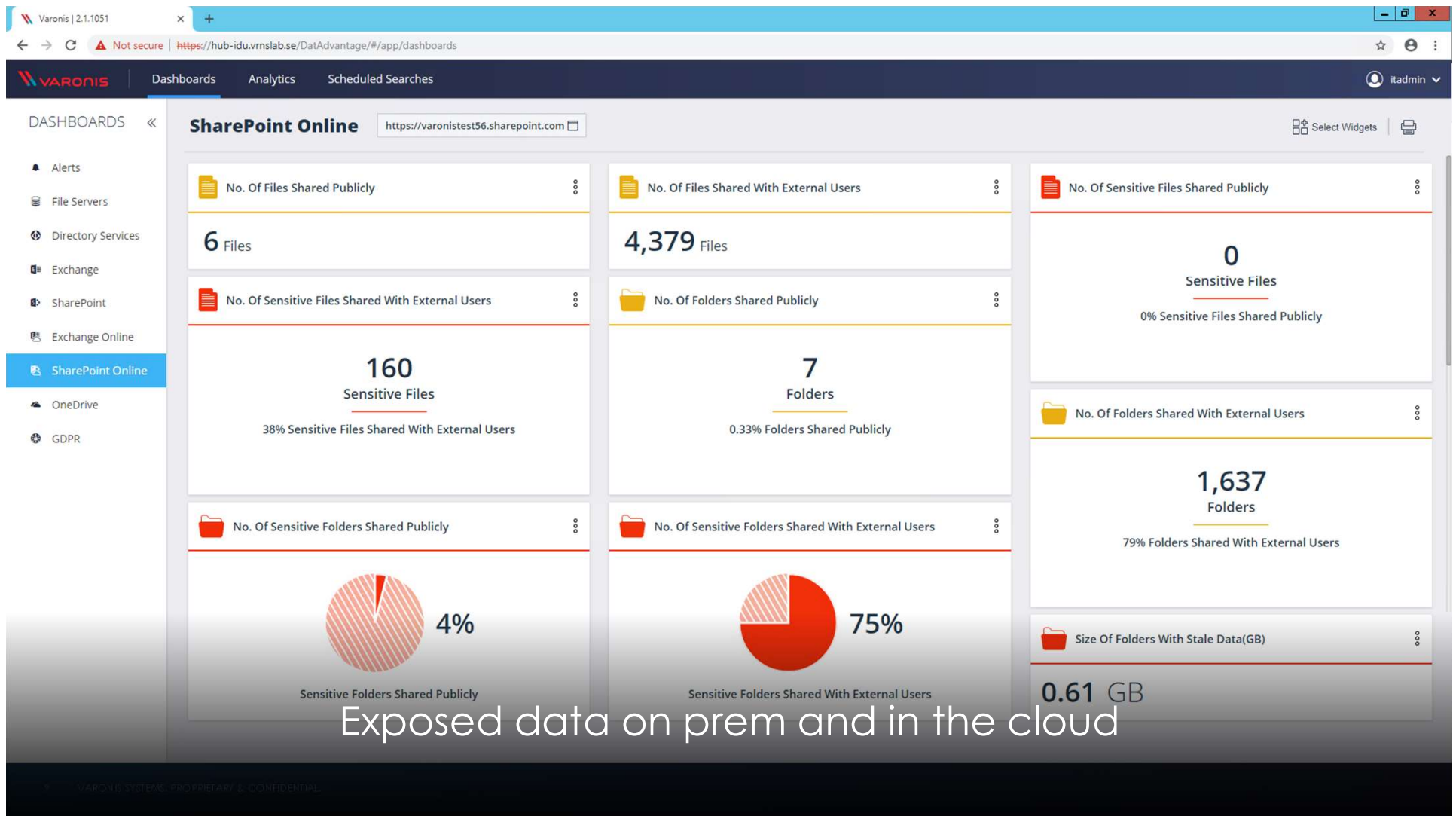
## Highlights from the Varonis 2019 Global Data Risk Report

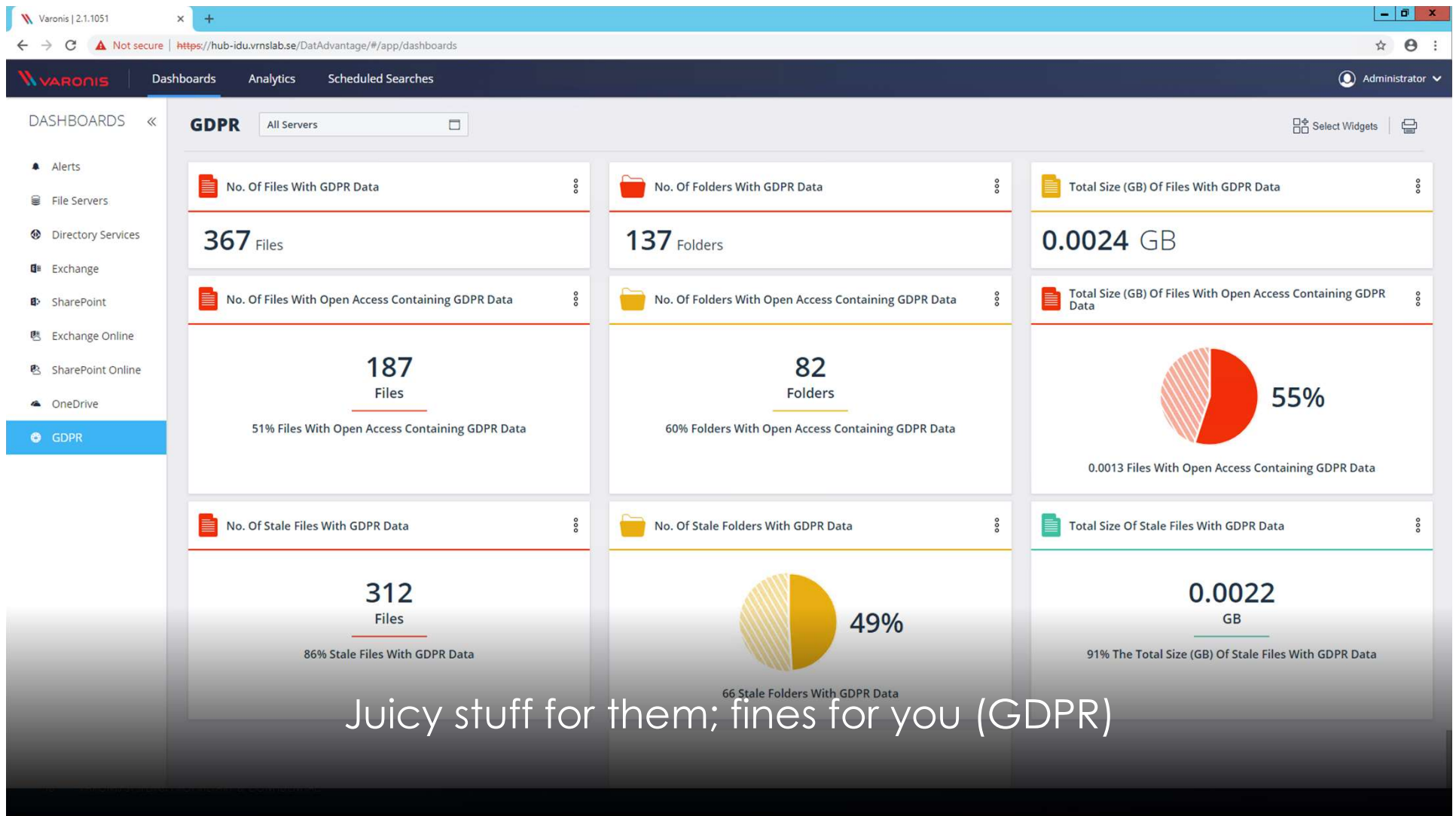


Read the full study: <https://www.varonis.com/2019-data-risk-report>



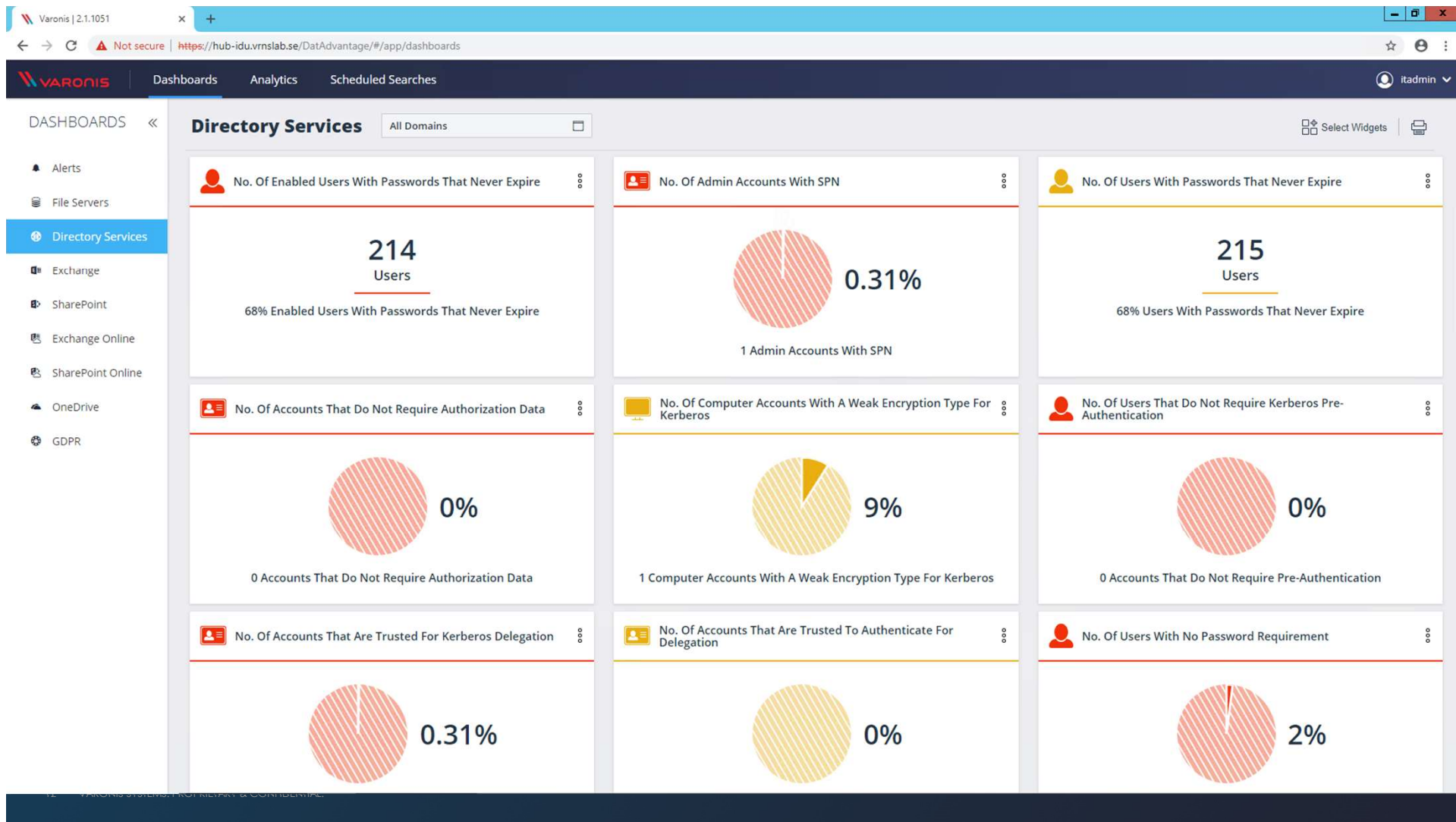








AD is complex, and almost endlessly configurable.  
Plus lots of AD vulnerabilities to help me



VARONIS | Dashboards | Analytics | Scheduled Searches | itadmin

### No. of Admin Accounts with SPN

1 Results

Export | Select Columns

Drag columns to group

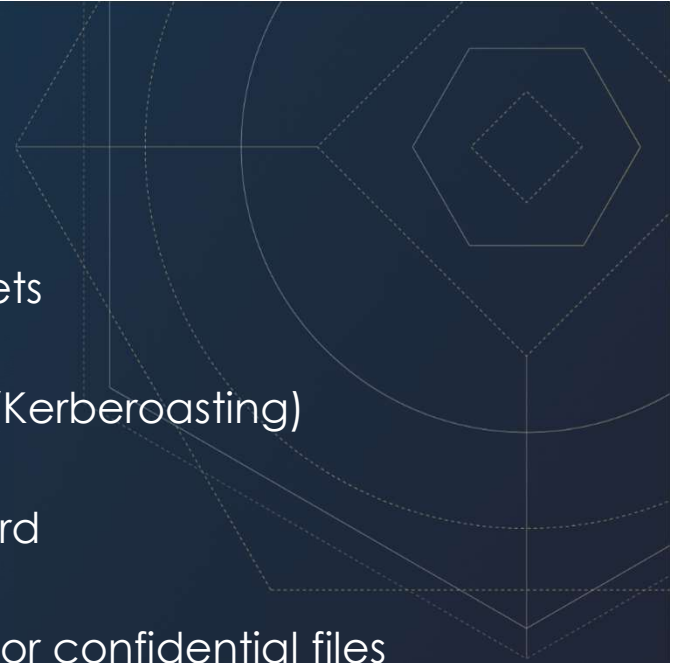
User	SAM Account Name	Email	Depart
BackupService	BackupService		

User	SAM Account Name	Email
BackupService	BackupService	



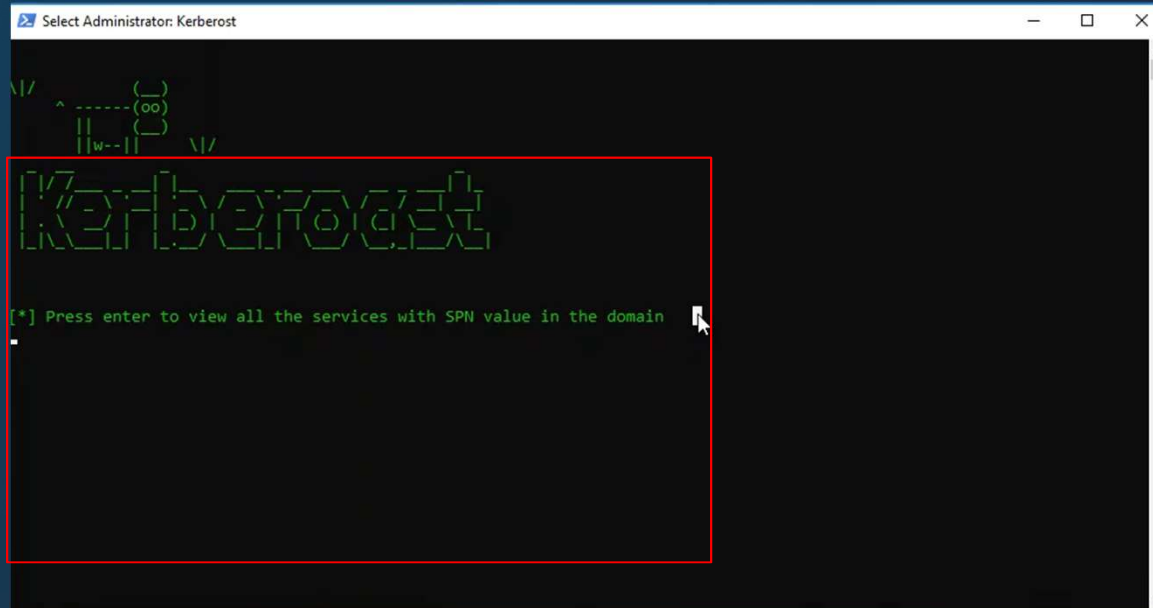
## Here's an attack we detected recently

- A savvy engineer decides to monetize corporate secrets
- Compromises a service account with Domain Admin (Kerberoasting)
- Uses personal workstation crack the account's password
- With privileged service account, user scans file shares for confidential files
- ZIPs the files and exfiltrates via personal Gmail account





Attackers might be exploiting these right now. Let's see how.



Step 1: find accounts with Service Principal Names

```
Administrator: Kerberos

[*] Press enter to view all the services with SPN value in the domain

exchangeAB/hub-dc
kadmin/changepw
TERMSRV/HUB-FILER
Dfsr-12F9A27C-BF97-4787-9364-D31B6C55EB04/hub-idu.vrnslab.se
IMAP/HUB-EXCHANGE
TERMSRV/hub-sharepoint.vrnslab.se
Hyper-V Replica Service/hub-hyperv.vrnslab.se
CIFS/test-cfg-name.vrnslab.se
HOST/pulsevpn.vrnslab.se
TERMSRV/HUB-COLL
TERMSRV/HUB-SOLR
TERMSRV/DESKTOP1-91148
TERMSRV/DESKTOP2-91148
BackupService/vrnslab.se
SQLService/vrnslab.se
FileServerService/vrnslab.se
VPNService/vrnslab.se
AutomationService/vrnslab.se

[*] Press enter to request and dump all the service tickets
```

Step 2: Get their Kerberos tickets (requesting weak encryption)

```
Administrator: Kerberos
Group 1 - Client Ticket ?
Group 2 - Ticket Granting Ticket
[00000000]
Start/End/MaxRenew: 12/28/2018 5:24:34 PM ; 12/29/2018 3:24:26 AM ; 1/4/2019 5:24:26 PM
Service Name (02) : krbtgt ; VRNSLAB.SE ; @ VRNSLAB.SE
Target Name (--) : @ VRNSLAB.SE
Client Name (01) : DESKTOP1-91148$ ; @ VRNSLAB.SE ( $$Delegation Ticket$$ )
Flags 60a10000 : name_canonicalize ; pre_authent ; renewable ; forwardable ;
Session Key : 0x00000012 - aes256_hmac
4fcdd9d7e74231930a4b5c893d62bcd5f4346ea5f93e68f1fb0badbe2303af21
Ticket : 0x00000012 - aes256_hmac ; kvno = 2 [...]
* Saved to file [0;3e7]-2-0-60a10000-DESKTOP1-91148$@krbtgt-VRNSLAB.SE.kirbi !
[00000001]
Start/End/MaxRenew: 12/28/2018 5:24:26 PM ; 12/29/2018 3:24:26 AM ; 1/4/2019 5:24:26 PM
Service Name (02) : krbtgt ; VRNSLAB.SE ; @ VRNSLAB.SE
Target Name (02) : krbtgt ; VRNSLAB.SE ; @ VRNSLAB.SE
Client Name (01) : DESKTOP1-91148$ ; @ VRNSLAB.SE ( VRNSLAB.SE )
Flags 40e10000 : name_canonicalize ; pre_authent ; initial ; renewable ; forwardable ;
Session Key : 0x00000012 - aes256_hmac
dbb970c7f9ae065f3f919c6eddcee16c588fd1ad13bb2d89bbf591e69f9c2f4
Ticket : 0x00000012 - aes256_hmac ; kvno = 2 [...]
* Saved to file [0;3e7]-2-1-40e10000-DESKTOP1-91148$@krbtgt-VRNSLAB.SE.kirbi !
mimikatz(commandline) # exit
Bye!

[*] Press enter to check who is member of Domain Admins group
```

Step 3: Which these accounts have elevated privileges?



```
Administrator: Kerberos
Flags 40e10000 : name_canonicalize ; pre_authent ; initial ; renewable ; forwardable ;
Session Key : 0x00000012 - aes256_hmac
dbb970c7f9ae065f3f919c6eddcee16c5888fd1ad13bb2d89bbf591e69f9c2f4
Ticket : 0x00000012 - aes256_hmac ; kvno = 2 [...]
* Saved to file [0;3e7]-2-1-40e10000-DESKTOP1-91148$@krbtgt-VRNSLAB.SE.kirbi !

mimikatz(commandline) # exit
Bye!

[*] Press enter to check who is member of Domain Admins group

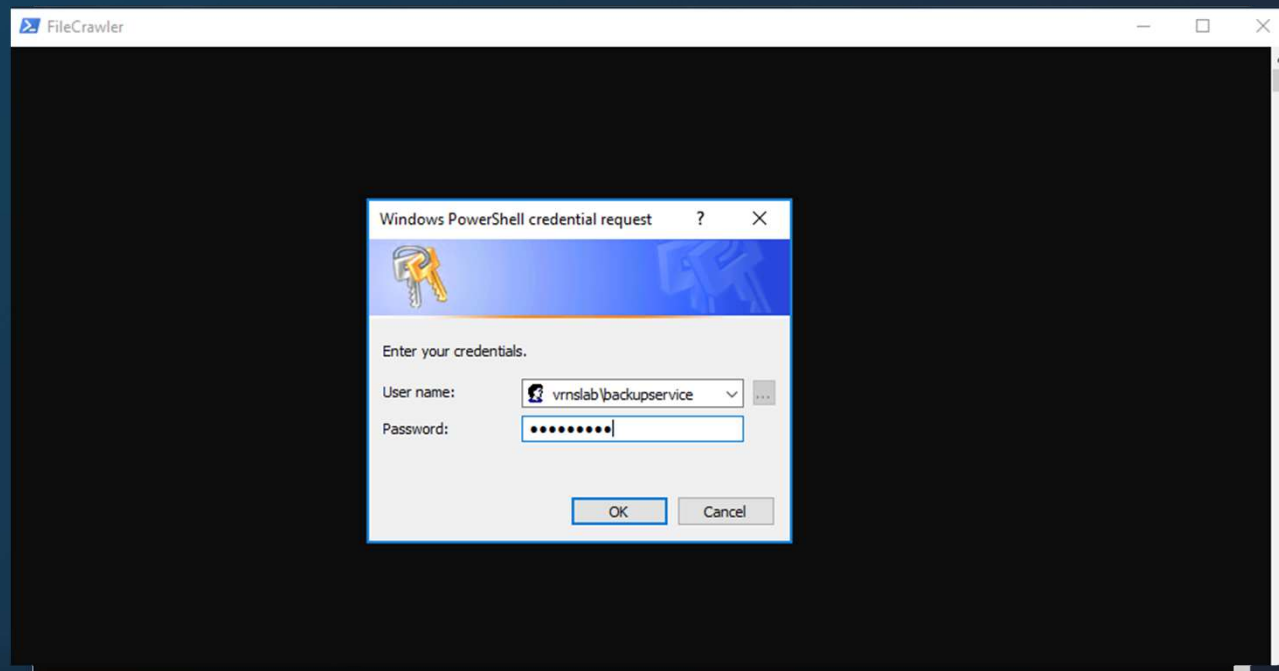
The request will be processed at a domain controller for domain vrnslab.se.

Group name      Domain Admins
Comment        Designated administrators of the domain

Members
-----
BackupService   itadmin          proxyu
The command completed successfully.

[*] Press enter to choose a service to bruteforce
```

Step 4: Let's crack one (offline)



Step 5: Let's use our new account to find some files

```
Administrator: Windows PowerShell

FileCrawler

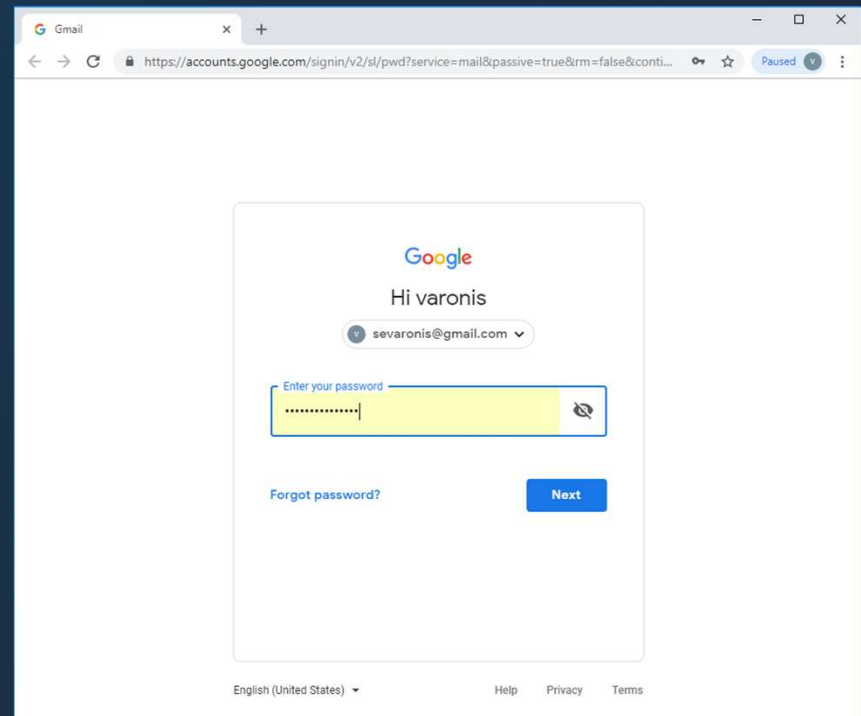
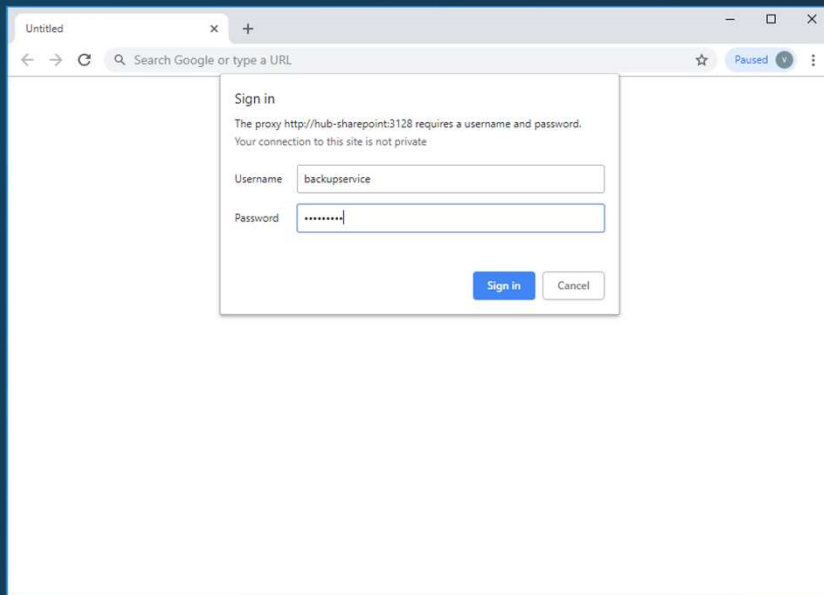
[*] Running as: vrnslab\backupservice

[*] searching for: Confidential confidential inside: \\hub-filer\share\finance

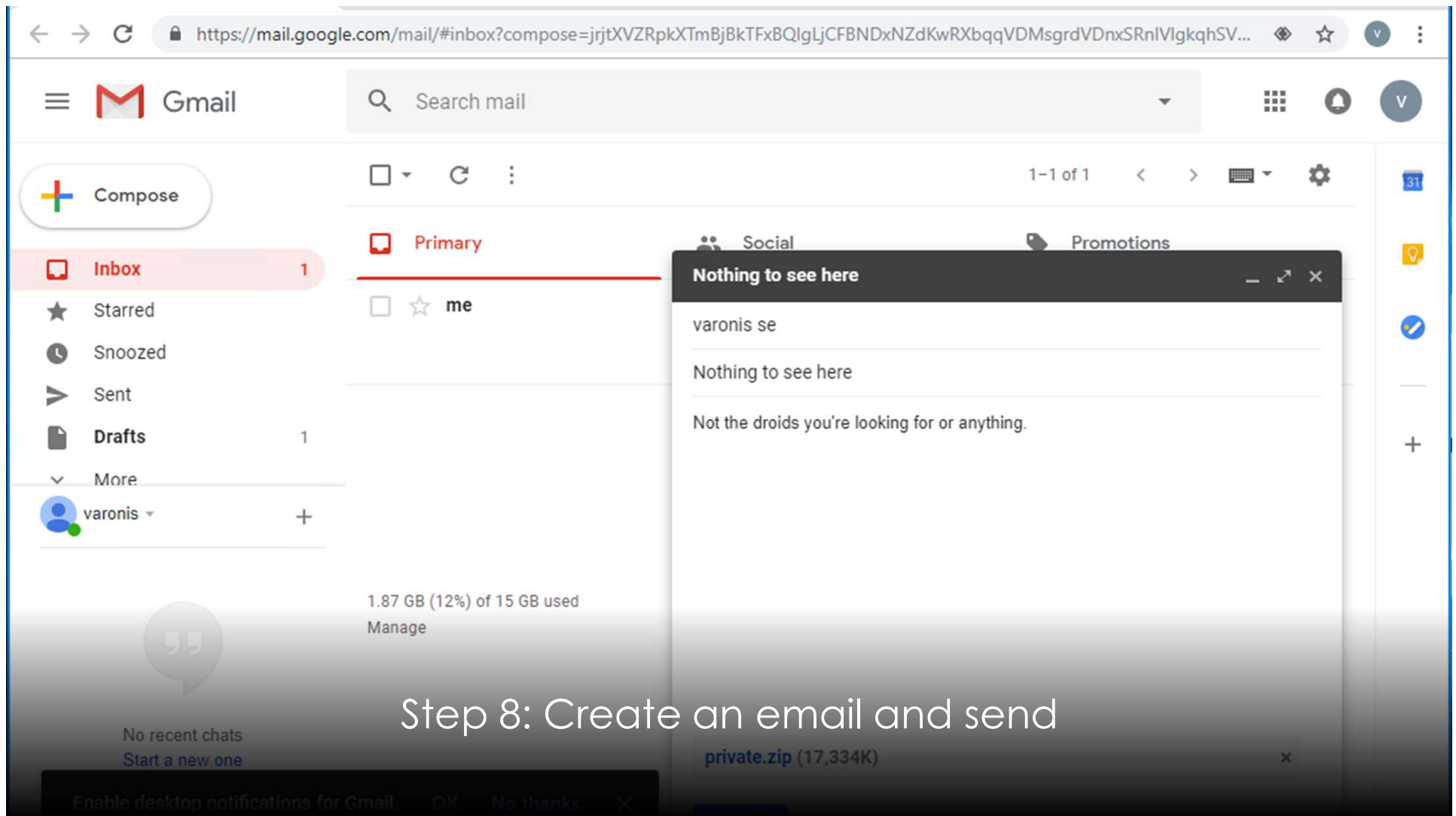
[*] Found files:
FileLocation                                     FoundWords
-----
\\hub-filer\share\finance\Customers\2020_Plan.docx {Confidential, confidential}
\\hub-filer\share\finance\Customers\customersFullList.docx {Confidential, confidential}
\\hub-filer\share\finance\Customers\Important.docx {Confidential, confidential}
\\hub-filer\share\finance\Customers\Marketing_Plan.docx {Confidential, confidential}
\\hub-filer\share\finance\Customers\Marketing_Plan2.docx {Confidential, confidential}
\\hub-filer\share\finance\Customers\report.docx {Confidential, confidential}
\\hub-filer\share\finance\2018-Q1.docx {Confidential, confidential}
\\hub-filer\share\finance\2018-Q2.docx {Confidential, confidential}
\\hub-filer\share\finance\2018-Q3.docx {Confidential, confidential}
\\hub-filer\share\finance\2018-Q4.docx {Confidential, confidential}
\\hub-filer\share\finance\Finance-report.docx {Confidential, confidential}

[*] Press enter to download the files to local directory
_
```

Step 6: Put them in a zip file



Step 7: Use Service Account to login to web proxy and Gmail







Oh no...

DASHBOARDS <<

## ALERT DASHBOARD

Alerts All Servers Last 7 Days Alert Status: Open, Under Investigati... Search 6 Results

ALERTS OVER TIME | Results displayed per day

Alert Severity: High Medium Low



### TOP ALERTED USERS

	BackupService (vrnslab.se)	5
	Engineer (vrnslab.se) Human	1
	FinancialManager (vrnslab.se) Zabrak	1

[See all alerts on users](#)

### TOP ALERTED DEVICES

	desktop1-91148	6
	desktop2-91148	2

[See all alerts on devices](#)

### TOP ALERTED THREAT MODELS

Abnormal service behavior: First-time access to the internet	1
Abnormal behavior: an unusual amount of data was uploaded to ...	1
Abnormal service behavior: access to atypical files	1
Potential ticket harvesting attack	1
Abnormal service behavior: access to atypical folders containing ...	1

[See all alerts on threat models](#)

Varonis | 2.1.979

https://hub-idu/datadavantage/#/app/analytics/alerts/10SVb78dOIH?desc=last-7-days

VARONIS

DashboardsAnalyticsScheduled Searches

itadmin

Alert Device De...

Alerts

SaveSave as

All ServersLast 7 DaysAlert Status: Open, Under Investigati...

Device Name = desktop1-91148Search for filters and values...

Run Search

6 Results

Timeline

LowMediumHigh

1

Alerted events with high severity

5

Alerts by service accounts

1

Alerts by admin accounts

5

Executive accounts

6

Open alerts

Select Columns

ExploreExport

Alert details

Threat model names (6)

Alert severities (3)

Categories (2)

Alert status: Open

Countries (2)

State (1)

Blacklisted location (0%)

Alert by

User names (2)

Privileged account types (3)

Department (1)

Alert on

Platforms (3)

File servers (3)

Drag columns to group

Threat Model Name	Platform	File Server/Doma	Alert ID	Alert Sever	User Name	Device Name
Abnormal service behavior: access to atypical folders containing GDPR data	Windows	HUB-FILER	Alert Details...IS-B92		BackupService (vrnslab....	desktop1-9...
Abnormal service behavior: access to atypical files	Windows	HUB-FILER	Alert Details...B4-B22		BackupService (vrnslab....	desktop1-9...
Abnormal service behavior: Service account logged on to a personal device for the first time	Directory Services	DirectoryServices	Alert Details...0C-8F:		BackupService (vrnslab....	desktop1-9...
Potential ticket harvesting attack	Directory Services	DirectoryServices	Alert Details...JC-A9C		Engineer (vrnslab.se)	desktop1-9...
Abnormal behavior: an unusual amount of data was uploaded to email websites	Proxy	Squid_proxy	Alert Details...44-979		BackupService (vrnslab....	desktop1-9...
Abnormal service behavior: First-time access to the internet	Proxy	Squid_proxy	Alert Details...61-AA:		BackupService (vrnslab....	desktop1-9...

26

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https://hub-idu/datadvantage/#/app/analytics/entity/Alert/33A9F178-402C-48DC-A902-104FC9A82945?tabId=15

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🏠📄☰

VARONIS

Dashboards

Analytics

Scheduled Searches

itadmin

Alert Device De...X

Alert Info: 2945. X

+

Potential ticket harvesting attack

↑ Previous Alert

↓ Next Alert

Summary

Users

Devices

Data

Time

Summary


Alert Info: ⚠ Critical | 🕒 Lateral Movement | Status: Open

The vrnslab.se\Engineer account requested low encrypted access to 5 services within one minute

[Threat model info](#)


Risk Assessment Insights:

USERS

vrnslab.se\Engineer  
Human


Account was not changed in the 7 days prior to the current alert  
Account is not on the Watch List  
Did not trigger alerts in the 7 days prior to the current alert  
[4 Additional insights](#)

DEVICES

desktop1-91148  
Belongs to: vrnslab.se\Engineer


All devices were used by the user in the 90 days prior to the current alert  
desktop1-91148 was involved in 5 alerts in the past 7 days  
No actions originate from devices belonging to other users  
[0 Additional insights](#)

DATA

Domain: VRNSLAB.SE  
VRNSLAB.SE

All data accessed by Engineer in the past 90 days  
[4 Additional insights](#)

TIME

12/20/2018 3:16 PM

[1 Additional insights](#)

PLAYBOOK

[Detection and Analysis \(No data\)](#)

[Incident Notification \(No data\)](#)

[Containment Eradication and Recovery \(No data\)](#)

[Improve Future Detection \(No data\)](#)

Next Steps

Alerted events

Alerted users

Alerted devices

Alerted data

Copy alert id

Manage alert

27

VARONIS SYSTEMS: PROPRIETARY & CONFIDENTIAL

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← → ↺ 🏠

https://hub-idu/datadvantage/#/app/analytics/entity/Alert/166D847D-E11E-4D0C-8F30-5CE7BC995E3F?tabId=16

⋮ ⚙ ⭐

VARONIS

Dashboards

Analytics

Scheduled Searches

itadmin

Alert Device De...

×

Alert Info: 2945.

×

Alert Info: 5E3F.

×

+

Abnormal service behavior: Service account logged on to a personal device for the first time

↑ Previous Alert

↓ Next Alert

Summary

Users

Devices

Data

Time

Summary

Alert Info: Warning | Lateral Movement | Status: Open

Service vrnslab.se\BackupService logged onto a personal device for the first time

Threat model info

Risk Assessment Insights:

USERS

vrnslab.se\BackupService

Account was not changed in the 7 days prior to the current alert

Account is not on the Watch List

Account is not disabled/deleted

Triggered 4 alerts in the 7 days prior to the current alert

3 Additional insights

DEVICES

desktop1-91148

Belongs to: vrnslab.se\Engineer

desktop1-91148 was involved in 5 alerts in the past 7 days

vrnslab.se\BackupService used Desktop1-91148 that belong(s) to someone else

0 Additional insights

DATA

Domain: VRNSLAB.SE

VRNSLAB.SE

All data accessed by BackupService in the past 90 days

2 Additional insights

TIME

12/20/2018 3:21 PM

100% of the events are outside BackupService's working hours

1 Additional insights

PLAYBOOK

Detection and Analysis

A service which has not logged on to personal devices in the past month has logged on to one. This may indicate an attacker is abusing the account in order to access personal devices and exploit their assets. It also exposes the credentials of the service to harvesting and reuse.  
Question: Is there a legitimate reason for the activity, or is the organization under attack?  
The following may indicate an attack:

Read more

Incident Notification

Containment Eradication and Recovery

Improve Future Detection

Next Steps

Alerted events

Alerted users

Alerted devices

Alerted data

Copy alert id

Manage alert

20

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https://hub-idu/datadvantage/#/app/analytics/entity/Alert/F49028E1-0F89-4435-B921-C1393C661AFF?tabId=17

⋮ 🛡️ ⭐

🔍 📄 ☰

VARONIS

DashboardsAnalyticsScheduled Searches

👤 itadmin

Alert Device De...Alert Info: 2945.Alert Info: 5E3F.Alert Info: 1AFF.

⬆️ Previous Alert⬇️ Next Alert

SummaryUsersDevicesDataTime

Summary


Alert Info: Error | Exfiltration | Status: Open

vrnslab.se\BackupService File opened shared folder C:\SHARE\finance\FINANCE-REPORT.DOCX on C: (HUB-FILER).

Threat model info


Risk Assessment Insights:

USERS

 vrnslab.se\BackupService

Account was not changed in the 7 days prior to the current alert  
Account is not on the Watch List  
Account is not disabled/deleted  
Triggered 4 alerts in the 7 days prior to the current alert  
[2 Additional insights](#)


DEVICES

 desktop1-91148

Belongs to: vrnslab.se\Engineer


All devices were used by the user in the 90 days prior to the current alert  
desktop1-91148 was involved in 5 alerts in the past 7 days  
[0 Additional insights](#)

DATA

 **11** Objects

First time use of C: in the past 90 days  
9 sensitive objects were affected  
[2 Additional insights](#)

TIME

 12/20/2018 3:22 PM

100% of the events are outside BackupService's working hours  
[1 Additional insights](#)

PLAYBOOK

[Detection and Analysis \(No data\)](#)

[Incident Notification \(No data\)](#)

[Containment Eradication and Recovery \(No data\)](#)

[Improve Future Detection \(No data\)](#)

Next Steps

Alerted events

Alerted users

Alerted devices

Alerted data

Copy alert id

Manage alert

27 VARONIS SYSTEMS: PROPRIETARY & CONFIDENTIAL

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← → ↺ 🏠

https://hub-idu/datadvantage/#/app/analytics/entity/Alert/41684940-2CEF-4CA4-9798-A06C8FEC51E2?tabId=18

⋮ 📄 ⭐

VARONIS

Dashboards Analytics Scheduled Searches

itadmin ▾

Alert Device De... X

Alert Info: 2945. X

Alert Info: 5E3F. X

Alert Info: 1AFF. X

Alert Info: 51E2. X

+

Abnormal behavior: an unusual amount of data was uploaded to email websites

↑ Previous Alert

↓ Next Alert

Summary

Users

Devices

Time

Summary

Alert Info: ⚠ Critical | 🕒 Exfiltration | Status: Open

vrnslab.se\BackupService uploaded 17643 KB of data to mail.google.com, exceeding this user's normal behavior.

[Threat model info](#) ▾

ABNORMAL AMOUNT OF DATA UPLOADED BETWEEN 12/20/2018, 3:31:00 PM AND 12/20/2018, 3:31:00 PM


Uploaded KB

17643

BackupService


Risk Assessment Insights:

USERS

 vrnslab.se\BackupService

Account was not changed in the 7 days prior to the current alert  
Account is not on the Watch List  
Account is not disabled/deleted  
Is a privileged account  
Account is stale/new  
Triggered 4 alerts in the 7 days prior to the current alert  
[0 Additional insights](#)

DEVICES

 desktop1-91148  
Belongs to: vrnslab.se\Engineer

All devices were used by the user in the 90 days prior to the current alert  
desktop1-91148 was involved in 5 alerts in the past 7 days  
[0 Additional insights](#)

PLAYBOOK

Detection and Analysis

A statistically significant increase was detected in the amount of data uploaded by a user to email websites; this behavior is compared to the user's behavioral profile. This may indicate that an attacker is exfiltrating data to unauthorized websites. Question: Is there a legitimate reason for the activity, does it stem from a misconfiguration, or is the organization under attack?

\* Focus on the account. Check whether it has changed or stale/new attributes.


[Read more](#)


Incident Notification


Containment Eradication and Recovery

Improve Future Detection

Next Steps

Alerted events 

Alerted users 

Alerted devices 

Copy alert id

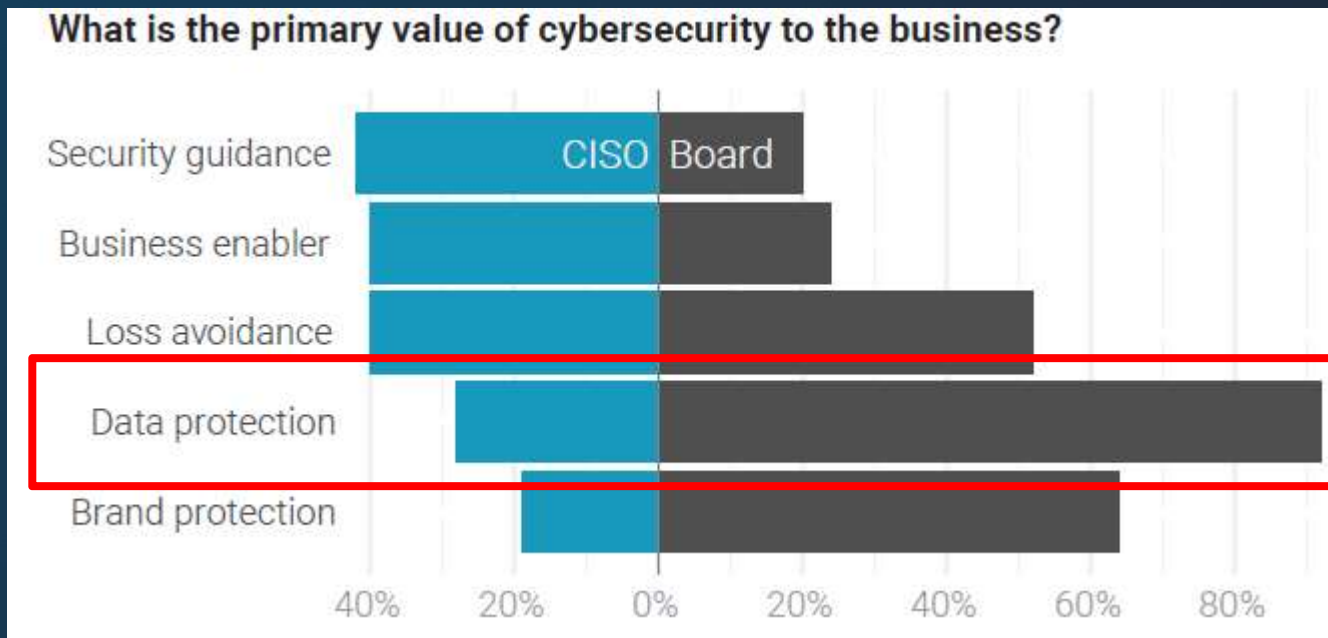
Manage alert

30 VARONIS SYSTEMS PROPRIETARY & CONFIDENTIAL

How quickly & accurately can you  
answer the most important question:

“Is our **data** safe?”

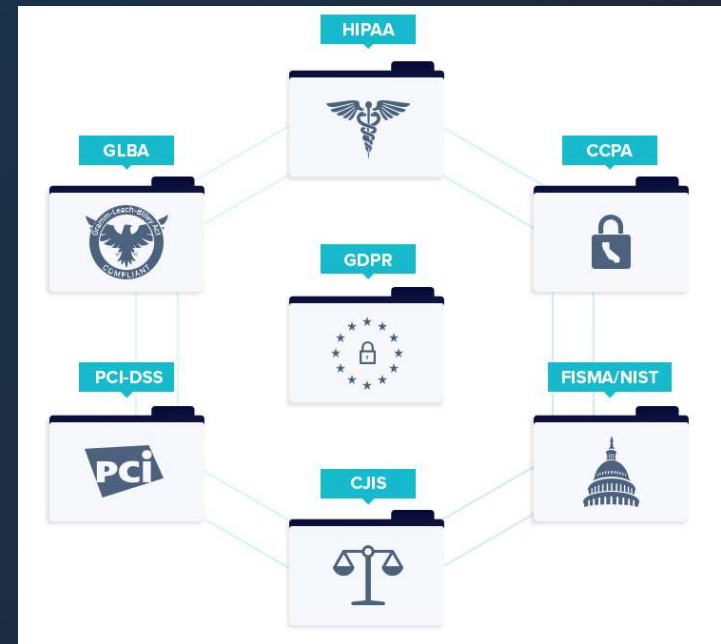
## The CISO / Board Disconnect



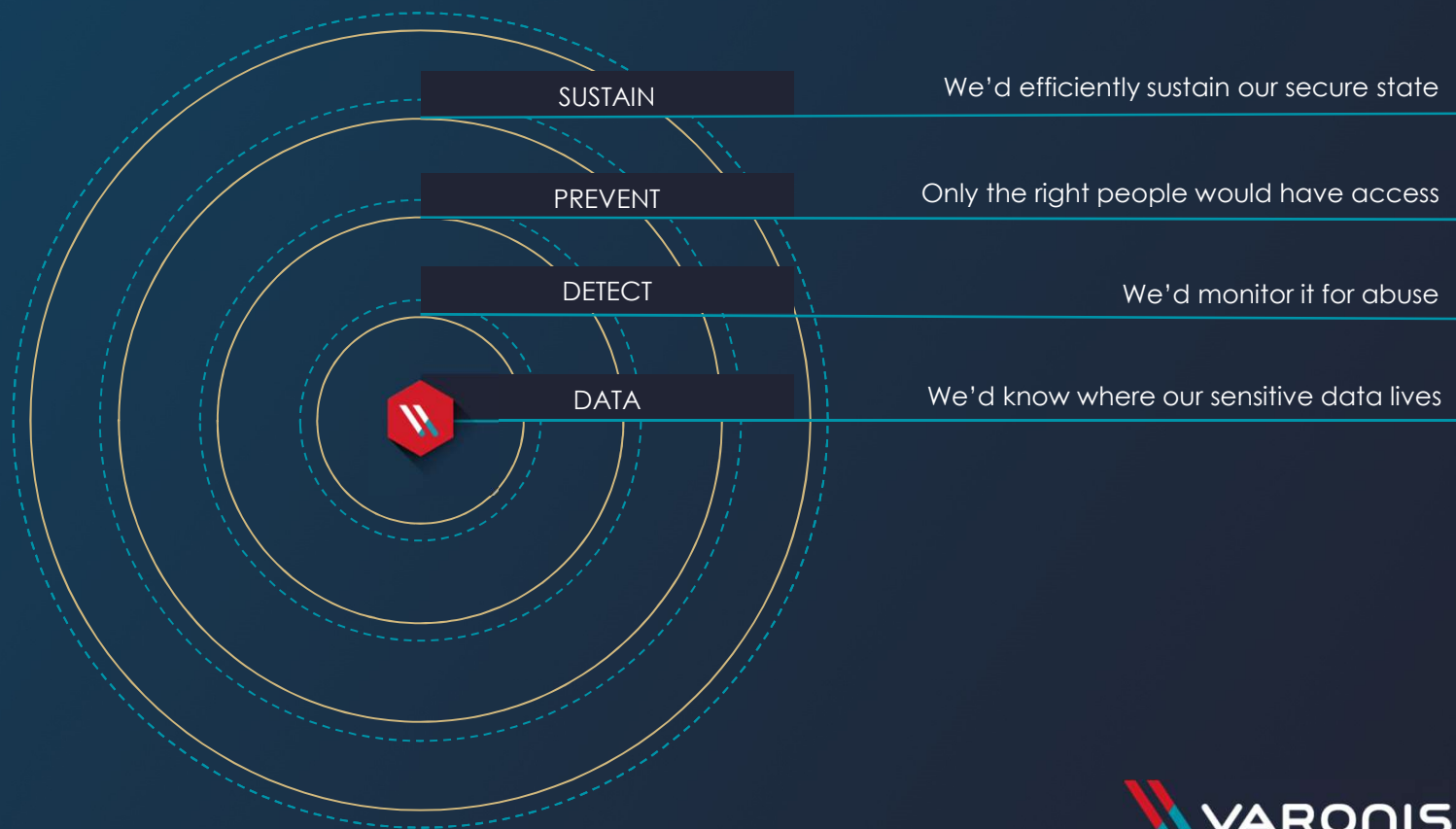
Source: Source: The Cyber Balance Sheet, Cyentia Institute

## Modern regulations are **data-centric**

- Where is your regulated data located?
- Is any of that data exposed and at-risk?
- Do only the right people have access?
- How is regulated data being processed?
- Can you find and delete personal data?



# What if security started with data?



For many data stores...



Windows



Office 365



Unix/Linux



SharePoint



Exchange



NAS



Box



# Many questions

Is my data at risk?



- Is it locked down?
- Who is accessing it?
- Who does it belong to?

Am I compliant?



- Where is my regulated and sensitive data?
- Can I delete it?
- Can I prove compliance?

Can I detect a breach?



- Is anyone stealing it?
- From where?
- Can I investigate quickly?

## THREE USE CASES



DATA PROTECTION



COMPLIANCE



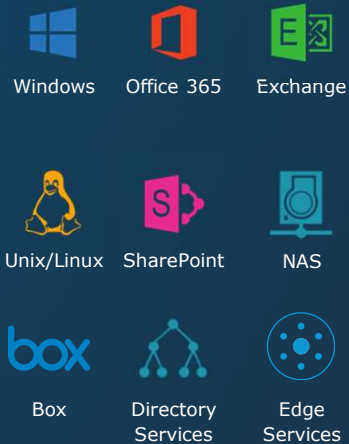
THREAT DETECTION & RESPONSE



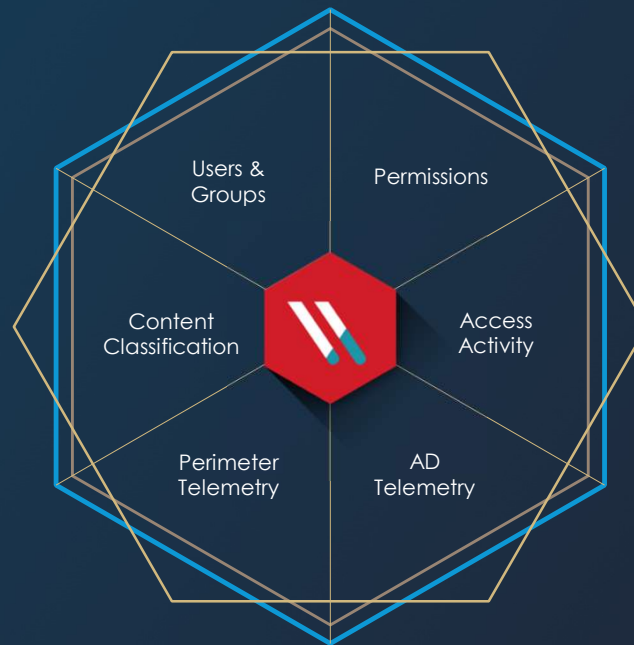
ONE PLATFORM

# Varonis Data Security Platform

## ENTERPRISE DATA STORES AND INFRASTRUCTURE



## ANALYTICS & AUTOMATION



## USE CASES



# Varonis Operational Journey



# Risk Assessments Reduce Uncertainty

- What kind of sensitive data do I have?
- Where is sensitive data overexposed?
- Where are users acting strangely or maliciously?
- What's being used and what's not?



# Thank You

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