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IBM



## IBM Storage DS8900F R9.3.2 – What's New!

**Brian Sherman, Craig Gordon, John Bernatz, Rick Pekosh – ATG Storage**



## Accelerate with ATG Technical Webinar Series

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## ATG-Storage Offerings

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### CLIENT WORKSHOPS

- IBM Cloud Object Storage System
- IBM Storage Scale and Storage Scale System
- IBM DS8900F Advanced Functions
- IBM Storage Point of View on Cyber Resiliency
- IBM FlashSystem 9500 Deep Dive & Advanced Functions
- IBM Storage Fusion

Please reach out to your IBM Rep or Business Partner for future dates and to be nominated.

### TEST DRIVE / DEMO'S

- North America ATG Storage - IBM Storage Scale and Storage Scale System GUI
- North America ATG Storage - IBM Storage Virtualize Test Drive
- North America ATG Storage - IBM DS8900F Storage Management Test Drive
- North America ATG Storage - Managing Copy Services on the DS8000 Using IBM Copy Services Manager Test Drive
- North America ATG Storage - IBM DS8900F Safeguarded Copy (SGC) Test Drive
- North America ATG Storage - IBM Cloud Object Storage Test Drive - (Appliance based)
- North America ATG Storage - IBM Cloud Object Storage Test Drive - (VMware based)
- North America ATG Storage - IBM Storage Protect Live Test Drive
- North America ATG Storage - IBM Storage Protect Plus Live Test Drive
- North America ATG Storage - IBM Storage Ceph Test Drive - (VMware based)

Please reach out to your IBM Rep or Business Partner for more information.

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Please take a moment to share your feedback with our team!

You can access this 6-question survey via [Menti.com](https://www.menti.com) with code 2243 3599 or

Direct link <https://www.menti.com/albneqj15g57>

Or

QR Code



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## IBM Storage DS8900F R9.3.2 – What's New!

**Brian Sherman, Craig Gordon, John Bernatz, Rick Pekosh – ATG Storage**





## Meet the Speakers



**Brian Sherman** is a Distinguished Engineer with over thirty years experience as a Storage I/T Specialist. Brian works directly with clients WW in solving storage related challenges.

Brian has extensive understanding of storage related industry trends and emerging technologies. He currently provides Storage Hardware and Software technical sales and support as part of the Advanced Technology Group (ATG) organization. Brian also develops and provides World Wide technical education on new Storage Hardware and Software product launches, best practices and provides new function priorities to several Storage Product Development Teams.



**Craig Gordon** is a Senior Brand Technical Specialist currently working in the Advanced Technology Group (ATG) for Storage. Craig has been supporting sales for IBM's DS8000 product family since it was introduced in 2004 and supported the Enterprise Storage Server, aka Shark, before that time. Craig is a respected subject matter expert in the implementation of DS8000 storage for mainframe and open systems platforms, to include Copy Services deployments, sizings, and data migration planning.



**John Bernatz** is a Senior Brand Technical Specialist with the IBM Advanced Technology Group. John has extensive experience in working with most products in the IBM storage portfolio and is an expert in Open Systems attachment and management and IBM's zLinux solutions.



**Rick Pekosh** is a Senior Brand Technical Specialist working in the IBM Advanced Technology Group as a DS8000 subject matter expert specializing in High Availability, Disaster Recovery, and Cyber Resiliency solutions. He works with customers, IBM Business Partners, and IBMers in North America. Rick began working with the DS8000 in early 2005 while working as a technical sales specialist and functioning as a regional designated specialist. He joined IBM in 2001 after spending 20 years in application development in various roles for the Bell System and as a consultant. Rick earned a BS degree in Computer Science from Northern Illinois University and an MBA from DePaul University. Additionally, his IBM Profession Certification level is Certified IT Specialist (Expert).

## Agenda

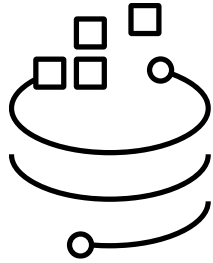
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- **IBM Storage Portfolio Announcement Summary – March 2, 2023**
- **Multi-Factor Authentication**
- **Customer Provided Certificates for Call Home**
- **Safeguarded Copy Enhancement**
  - ✓ Preserve backups
- **Host Event Notification Improvements**

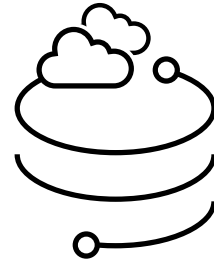


## IBM Storage Portfolio

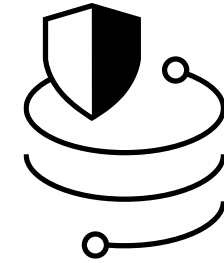
[Announced March 2, 2023](#)



Storage for  
Data and AI



Storage for  
Hybrid Cloud



Storage for  
Data Resilience

Software

IBM Storage Scale  
IBM Storage Ceph

IBM Storage Fusion  
IBM Storage ODF

IBM Storage Defender  
IBM Storage Insights

Hardware

IBM Storage Scale System

IBM Storage Fusion HCI  
System

IBM Storage FlashSystem |  
DS8000 | Tape | Networking



## Multi-Factor Authentication



# What is MFA & How does it work?

## What is Multi-Factor Authentication (MFA)?

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An authentication method which requires multiple proofs of identification in order to gain access

A strong method of authentication necessary to protect sensitive data

## Factors of Authentication

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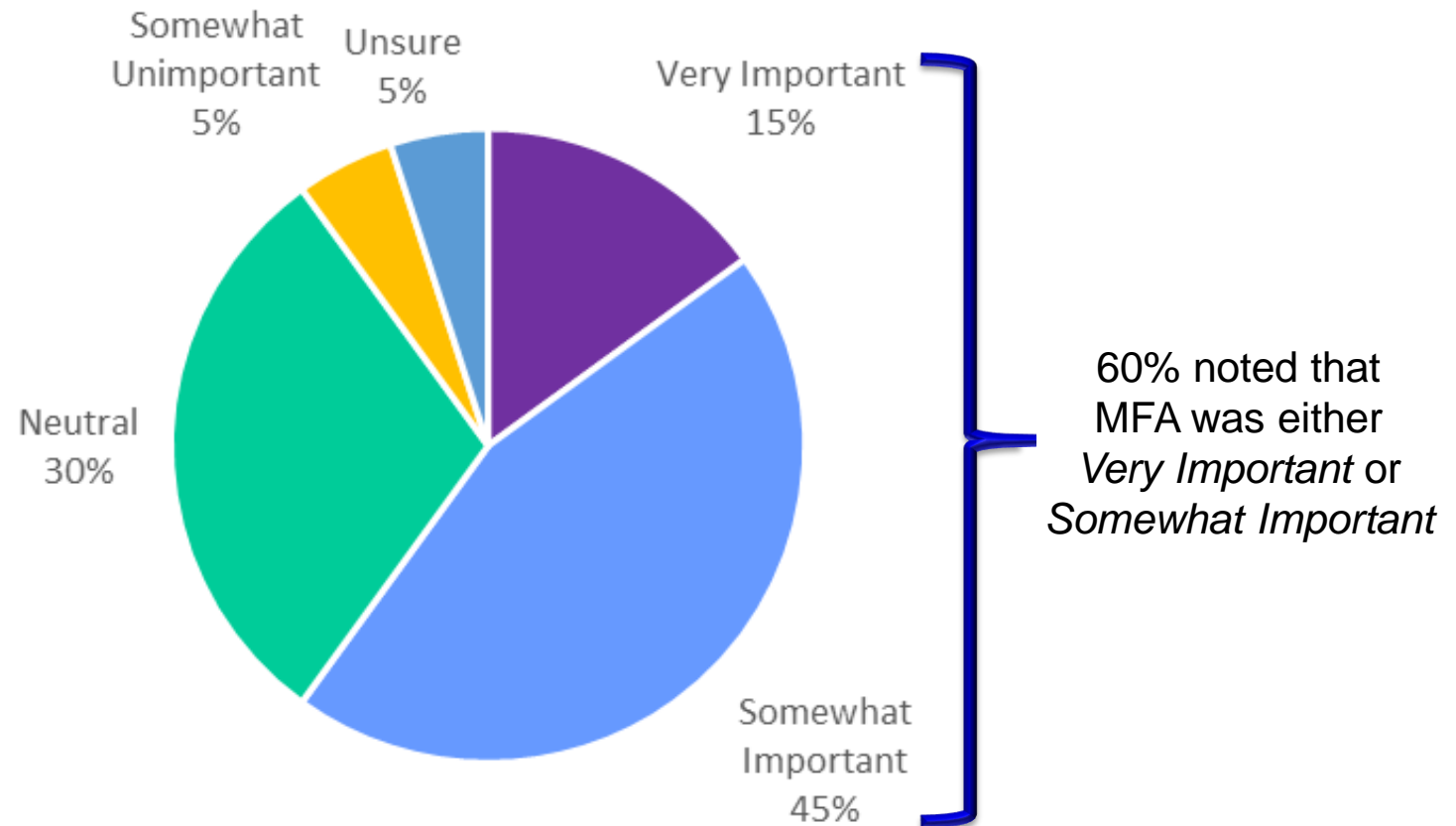
# Factors of Authentication

- A factor is a proof of identification
- Some common factors are:
  - ✓ Permanent Passwords
  - ✓ One-Time Passwords delivered by text, phone, or email
  - ✓ Certificates
  - ✓ Tokens
  - ✓ Smart Cards
  - ✓ Key Fobs
  - ✓ Biometrics
- MFA best practices require the following types of factors:
  - ✓ Something you have
  - ✓ Something you know

## 2022 DS8000 Customer Survey (1 of 2)

# 2022 DS8000 Customer Survey (1 of 2)

### How important is Multi-Factor Authentication?





## 2022 DS8000 Customer Survey (2 of 2)

## 2022 DS8000 Customer Survey (2 of 2)

Please rank the following MFA Products from most desirable & feasible to least desirable & feasible

Item	Overall Rank	Overall Score
RSA	1	48
RACF	2	40
IBM Security Verify	3	36
Okta	4	27
PING Identify	5	25
Cisco (Duo)	6	20
Microsoft Azure	7	19
Microsoft FS	8	14
Google	9	14

## RSA SecurID Authentication Manager

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# RSA SecurID Authentication Manager

- RSA SecurID Authentication Manager is an On-Premise solution
- DS8000 R9.3.2 communicates with RSA SecurID using RESTful API protocol
- Handles Multi-Factor Authentication
  - ✓ Supports *something you have* – TOKEN
  - ✓ Supports *something you know* – PIN
- Market leader per Gartner
- Most popular MFA server in 2022 DS8000 Customer Survey

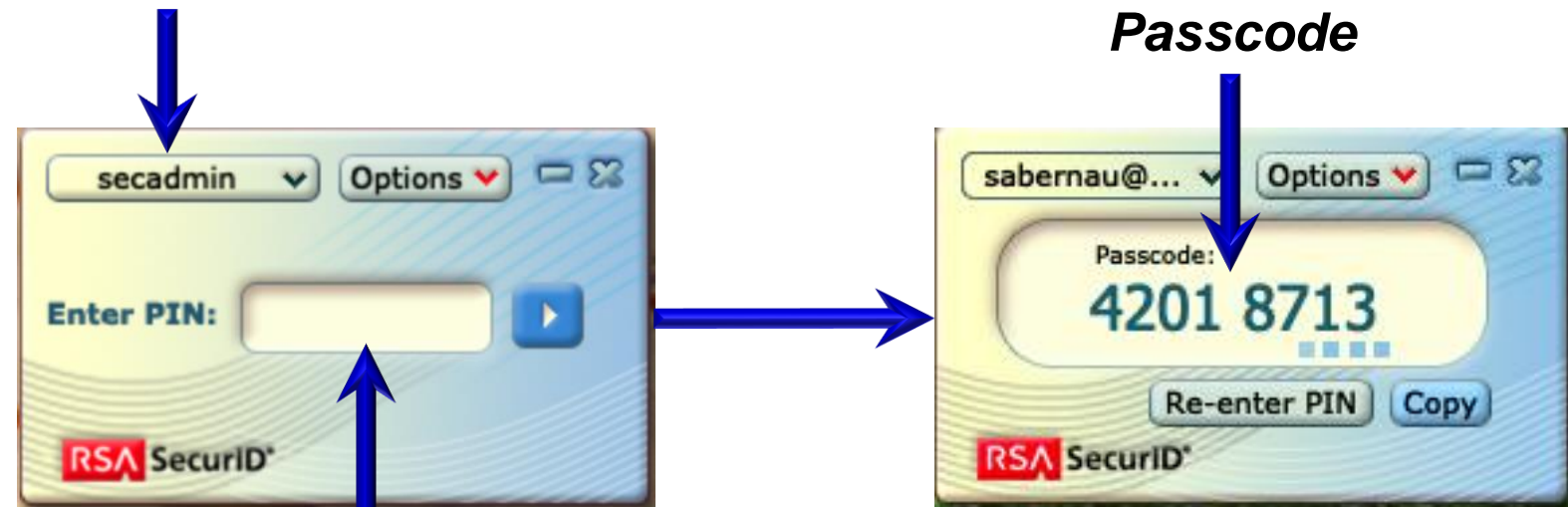
## RSA SecurID Authentication Manager

### RSA Multi-Factor Authentication

- RSA 2-factor authentication requires downloading a TokenID (something you have) and entering a PIN (something you know)

(security admin gen'd)  
Downloaded **TokenID**

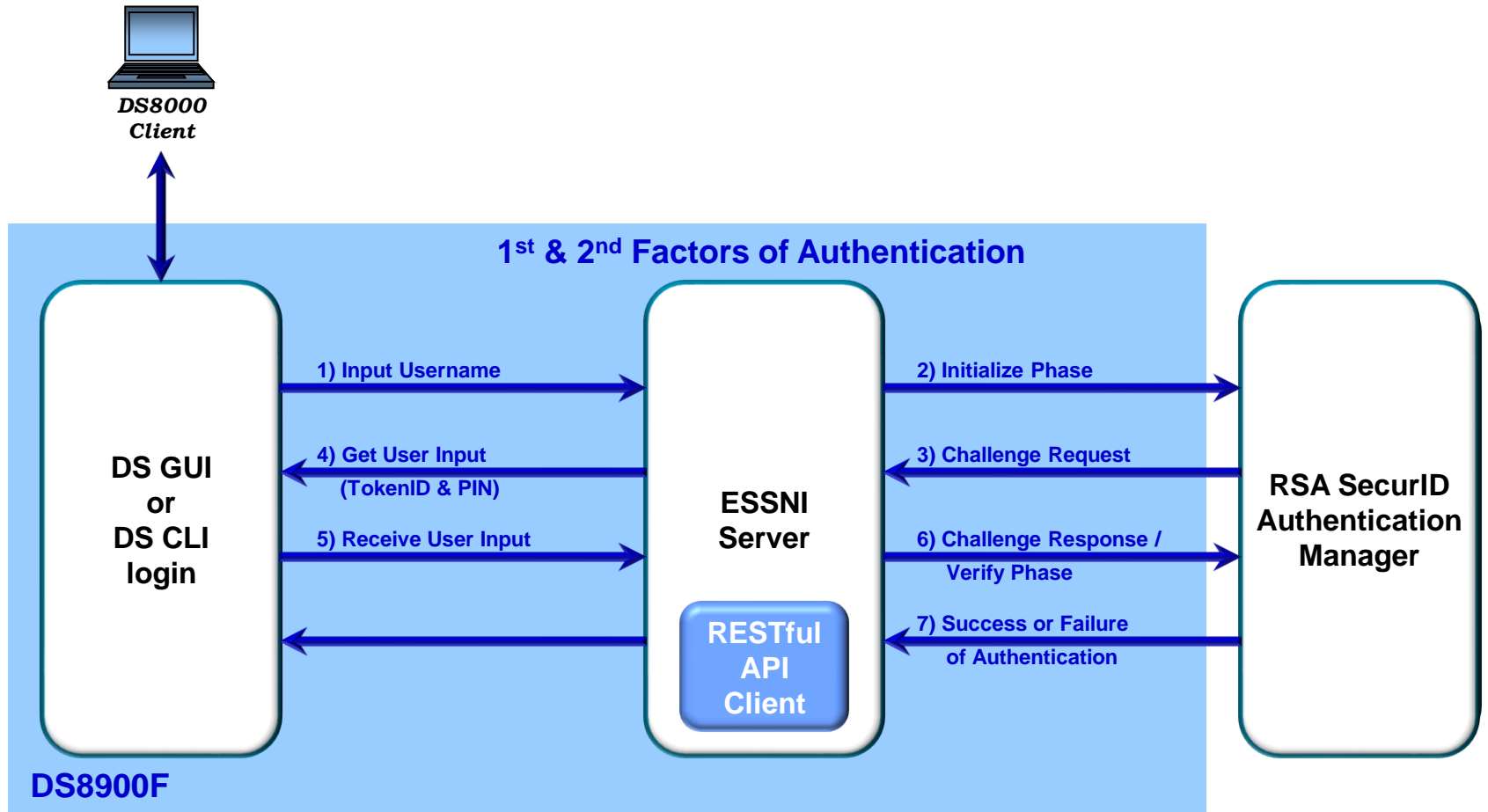
(generated single  
use time sensitive)  
**Passcode**



**PIN**  
(user initiated  
system gen'd)

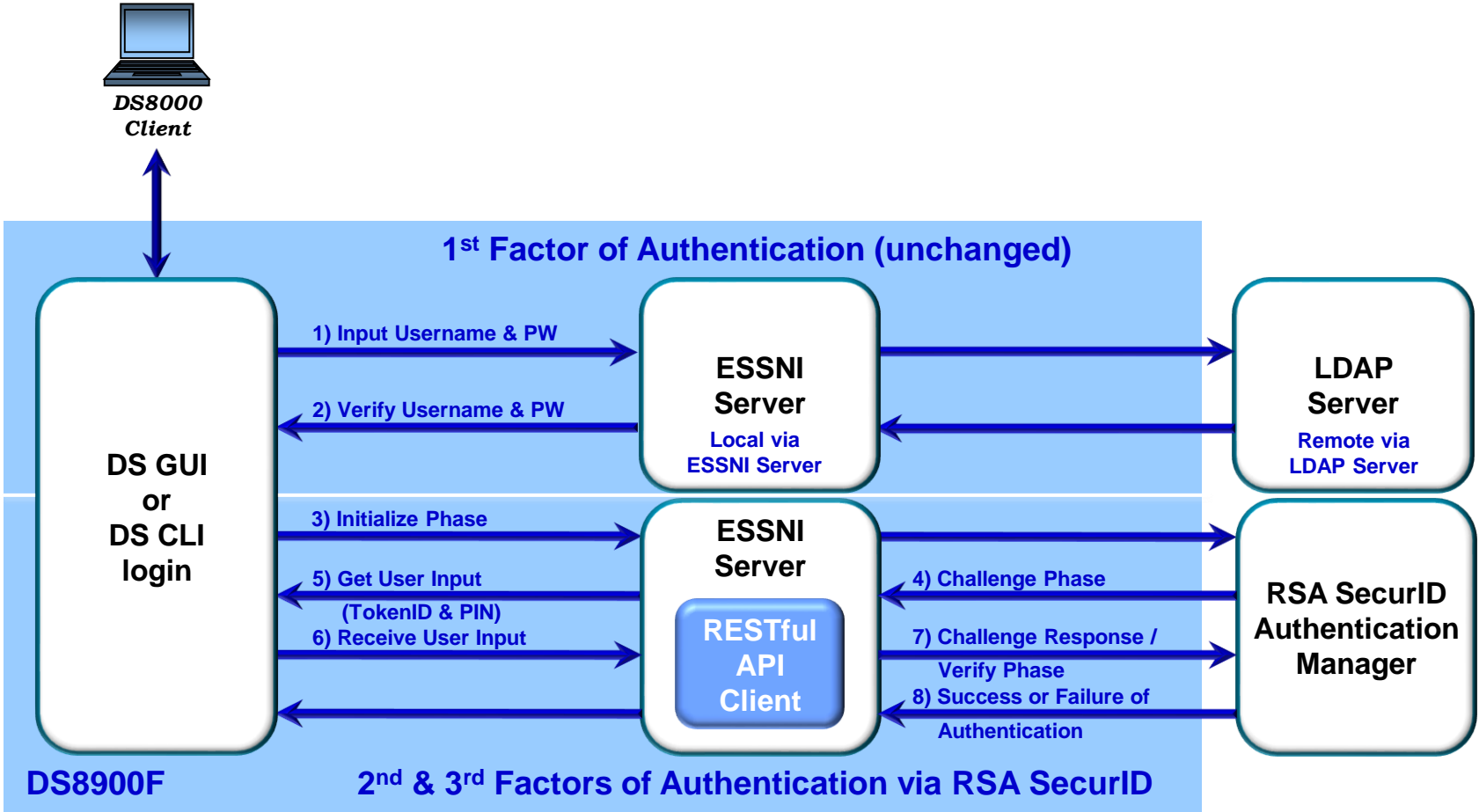
# MFA Flow Diagram with all Factors of Authentication Handled by RSA SecurID

## MFA Flow Diagram with all Factors of Authentication Handled by RSA SecurID



# MFA Flow Diagram with LDAP Server as 1<sup>st</sup> Factor of Authentication

## MFA Flow Diagram with LDAP Server as 1<sup>st</sup> Factor of Authentication

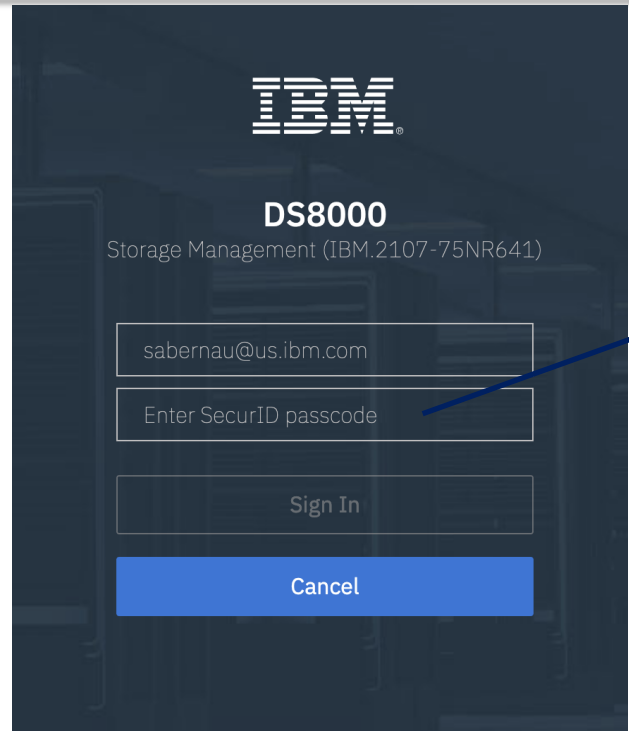




# Logging into a DS8000 using MFA

# Login using RSA

# Login using RSA



**Paste SecurID  
Passcode  
Click [Sign In]**



**Passcode  
is gen'd  
Click [Copy]**

# Login using RSA – Successful login

# Login using RSA

The screenshot displays the IBM DS8000 management console interface. The top navigation bar includes the IBM logo, system identification (IBM DS8000, IBM.2107-75, Frame 1), and user information (Administrator). A sidebar on the left provides navigation for Dashboard, Monitoring, Pools, Volumes, Hosts, Copy Services, Access, Settings, and DS CLI.

The main content area is divided into several sections:

- Performance:** A table and a line graph showing latency and bandwidth.
 

Latency			Bandwidth			IOPS		
read	write		read	write		read	write	
0.08 ms	0.04 ms	0.4 ms	316.87 MBps	146.85 MBps	170.02 MBps	42.26 KIOPS	36.67 KIOPS	5.6 KIOPS
- System Health Overview:** Displays release information (9.3 bundle 89.32.37.0), MTM (5331-996), and S/N. It includes tabs for Hardware View and System Health View.
- Used Capacity:** A bar chart showing capacity usage for Open Systems (FB), IBM z (CKD), and Unassigned space.
- Provisioned Capacity:** Shows that 8.03% of Open Systems (FB) and 81.43% of IBM Z (CKD) capacity is provisioned.

# Login using RSA + LDAP

# Login using RSA + LDAP

The screenshot shows the IBM DS8000 Storage Management login interface. At the top is the IBM logo. Below it, the text reads "DS8000 Storage Management (IBM.2107-75NR641)". There are three input fields: the first contains the email "sabernau@us.ibm.com", the second is masked with dots, and the third is labeled "Enter SecurID passcode". Below the fields are two buttons: "Sign In" and "Cancel".

**Paste SecurID  
Passcode  
Click [Sign In]**

The screenshot shows the RSA SecurID PIN generation window. It has a title bar with "secadmin" and "Options". The main area says "Enter PIN:" followed by a text input field and a blue arrow button. The RSA SecurID logo is at the bottom.

**Passcode  
is gen'd  
Click [Copy]**

# Login using RSA + LDAP – Successful login

**Login using RSA + LDAP**

The screenshot displays the IBM DS8000 management console interface. The top navigation bar includes the IBM logo, system identification (IBM DS8000, IBM.2107-75, Frame 1), and user information (Administrator). A sidebar on the left provides navigation for Dashboard, Monitoring, Pools, Volumes, Hosts, Copy Services, Access, Settings, and DS CLI.

The main content area is divided into several sections:

- Performance:** A table and a line graph showing latency and bandwidth.
 

Latency	read	write	Bandwidth	read	write	IOPS	read	write
0.08 ms	0.04 ms	0.4 ms	316.87 MBps	146.85 MBps	170.02 MBps	42.26 KIOPS	36.67 KIOPS	5.6 KIOPS
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- Used Capacity:** A bar chart showing capacity usage for Open Systems (FB), IBM z (CKD), and Unassigned space.
- Provisioned Capacity:** Shows the percentage of usable capacity provisioned for Open Systems (FB) at 8.03% and IBM Z (CKD) at 81.43%.



# Accessing MFA Setup from the GUI

# Select Access → Remote Authentication

The screenshot shows the IBM DS8000 management console interface. The top navigation bar includes the IBM logo, system information (IBM DS8000, IBM.2107-75KWK61, Frame 1), and user details (rpekosh, Administrator). A left-hand navigation menu is visible, with 'Access' and 'Remote Authentication' highlighted with green circles. The main content area displays performance metrics and system health information.

**Performance Metrics:**

Latency	read	write	Bandwidth	read	write	IOPS	read	write
0.07 ms	0.03 ms	0.24 ms	278.35 MBps	64.01 MBps	214.34 MBps	19.82 KIOPS	15.98 KIOPS	3.84 KIOPS

**System Health Overview:**

- Release: 9.3 bundle 89.32.37.0
- MTM: 5331-996
- S/N: 75KWK60

**Provisioned Capacity:**

- Provisioned of Usable Capacity
- 8.03% Open Systems (FB) Provisioned
- 81.43% IBM Z (CKD) Provisioned

## Click *Configure Remote Authentication*

The screenshot shows the IBM DS8000 management interface. The breadcrumb trail at the top reads: IBM > IBM DS8000 > IBM.2107-75KWK61 > Remote Authentication. The user is logged in as 'rpekosh Administrator'. The left sidebar contains navigation options: Dashboard, Monitoring, Pools, Volumes, Hosts, Copy Services, Access, Settings, and DS CLI. The main content area is titled 'Remote Authentication' and contains the following text: 'Remote authentication allows a user logging into the storage system management interfaces to be authenticated through a central repository such as an LDAP server, IBM Copy Services Manager server or, MFA using RSA SecurID server. Currently using local authentication for user access.' A blue button labeled 'Configure Remote Authentication' is highlighted with a green circle.

# Click Next

The screenshot shows the IBM DS8000 management interface. At the top, the breadcrumb trail reads "IBM DS8000 IBM.2107-75KWK61 Remote Authentication". The user is logged in as "rpekosh Administrator". A modal window titled "Configure Remote Authentication" is open, showing a "Welcome" screen with a list of steps: Welcome, Remote Authentication, Configure Server MFA, Enable Local Administrator, Authentication Mappings, Administrator Verification, and Summary. The "Next" button at the bottom right of the modal is highlighted with a green circle.

# Selecting MFA – RSA SecurID Authentication Manager with & without Direct LDAP

IBM DS8000 IBM.2107-75KWK61 Remote Authentication rpekosh Administrator

### Configure Remote Authentication

Remote Authentication

Select the type of Remote Authentication configuration:

- Direct LDAP  
Direct LDAP connection from the storage system. Current explicitly supported systems include IBM Directory Server, OpenLDAP, Microsoft Active Directory, RACF, and TopSecret.
- IBM Copy Services Manager (CSM)  
Remote authentication supported using IBM Copy Services Manager servers as a proxy to the remote authentication servers.
- Multi Factor Authentication - RSA SecurID Authentication Manager  
RSA SecurID AM connection from storage system. Current explicitly supported system is RSA SecurityID.
- Multi Factor Authentication - Direct LDAP + RSA SecurID Authentication Manager  
Native LDAP + RSA SecurID AM connection from storage system. Current explicitly supported system is RSA SecurityID.
- Import a direct LDAP configuration that was created on another IBM storage system  
Import a configuration that was created on another IBM storage system.

Navigation: ? Cancel Back Next

Two new MFA options

# Multi-Factor Authentication – RSA SecurID Authentication Manager

The screenshot shows the IBM DS8000 Remote Authentication configuration interface. A dialog box titled "Configure Remote Authentication" is open, displaying several configuration options. The option "Multi Factor Authentication - RSA SecurID Authentication Manager" is selected and highlighted with a green box. A yellow callout box labeled "RSA SecurID" points to this option. The "Next" button at the bottom right of the dialog is also circled in green. A green arrow points to the "Remote Authentication" menu item in the left sidebar.

**Configure Remote Authentication**

Remote Authentication

Select the type of Remote Authentication configuration:

- Direct LDAP  
Direct LDAP connection from the storage system. Current explicitly supported systems include IBM Directory Server, OpenLDAP, Microsoft Active Directory, RACF, and TopSecret.
- IBM Copy Services Manager (CSM)  
Remote authentication supported using IBM Copy Services Manager servers as a proxy to the remote authentication servers.
- Multi Factor Authentication - RSA SecurID Authentication Manager**  
RSA SecurID AM connection from storage system. Current explicitly supported system is RSA SecurityID.
- Multi Factor Authentication - Direct LDAP + RSA SecurID Authentication Manager  
Native LDAP + RSA SecurID AM connection from storage system. Current explicitly supported system is RSA SecurityID.
- Import a direct LDAP configuration that was created on another IBM storage system  
Import a configuration that was created on another IBM storage system.

Navigation buttons: Back, Next

**RSA SecurID**



# Configure Server MFA

The screenshot shows the IBM DS8000 management console interface. At the top, the breadcrumb navigation reads "IBM DS8000 IBM.2107-75KWK61 Remote Authentication". The user is logged in as "rpekosh Administrator".

The left sidebar contains navigation options: Dashboard, Monitoring, Pools, Volumes, Hosts, Copy Services, Access, Settings, and DS CLI. The "Remote Authentication" menu item is highlighted with a green checkmark, and a green arrow points to the "Configure Server MFA" sub-item.

The main content area displays the "Configure Remote Authentication" dialog box. The dialog title is "Configure Remote Authentication" with a close button (X) in the top right corner. The current step is "Configure RSA SecurID".

The configuration fields are as follows:

- RSA SecurID Base URL:** A text input field containing "https://hostname:5555" and a plus icon (+) on the right.
- Retrieve Certificates:** A button located below the Base URL field.
- Access ID:** An empty text input field.
- Access Key:** An empty text input field.

At the bottom of the dialog, there is a "Cancel" button with a question mark icon (?), a "Back" button with a left arrow, and a "Next" button with a right arrow.

# Multi-Factor Authentication – Direct LDAP + RSA SecurID Authentication Manager

IBM DS8000 IBM.2107-75KWK61 Remote Authentication rpekosh Administrator

Dashboard Monitoring Pools Volumes Hosts Copy Services Access Settings

### Configure Remote Authentication

Remote Authentication

Select the type of Remote Authentication configuration:

- Direct LDAP  
Direct LDAP connection from the storage system. Current explicitly supported systems include IBM Directory Server, OpenLDAP, Microsoft Active Directory, RACF, and TopSecret.
- IBM Copy Services Manager (CSM)  
Remote authentication supported using IBM Copy Services Manager servers as a proxy to the remote authentication servers.
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RSA SecurID AM connection from storage system. Current explicitly supported system is RSA SecurityID.
- Multi Factor Authentication - Direct LDAP + RSA SecurID Authentication Manager  
Native LDAP + RSA SecurID AM connection from storage system. Current explicitly supported system is RSA SecurityID.
- Import a direct LDAP configuration that was created on another IBM storage system  
Import a configuration that was created on another IBM storage system.

Cancel Back Next

**RSA SecurID + LDAP**

# Configure Server LDAP + MFA

IBM DS8000 IBM.2107-75KWK61 Remote Authentication

Dashboard Monitoring Pools Volumes Hosts Copy Services Access Settings

### Configure Remote Authentication

LDAP server type

Select LDAP server type:

- Microsoft Active Directory
- Resource Access Control Facility (RACF)
- OpenLDAP
- IBM Security Directory Server
- CA LDAP server for z/OS (Top Secret)
- Other LDAP Server

Cancel Back Next

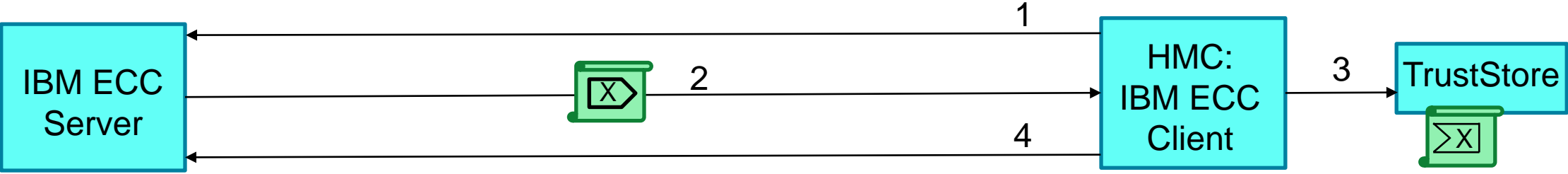
## Customer Provided Certificate



# Call Home Customer Provided Certificate - Communication Path

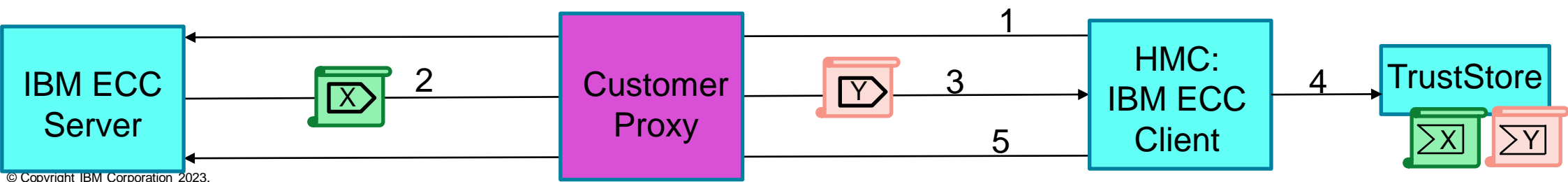
## Call Home with no customer proxy Configured

- 1. Client initiates communication with the ECC Server.
- 2. The ECC Server presents certificate (X) to client. (X)
- 3. Client has matching certificate (X) in TrustStore, so communication is allowed.
- 4. Communication continues with session certificates.



## Call Home with customer proxy Configured

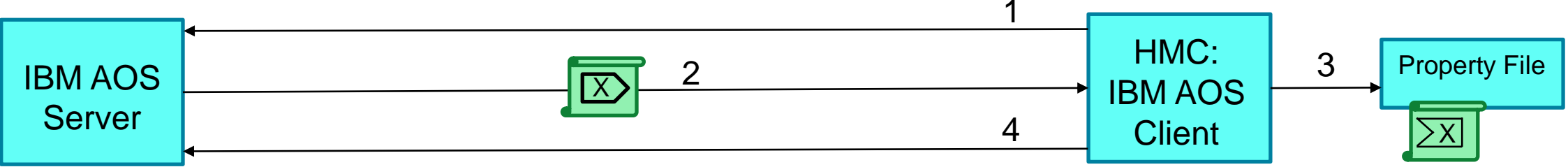
- 1. Client initiates communication with the ECC Server through the customer proxy server.
- 2. ECC Server presents certificate (X) to proxy.
- 3. Proxy presents Customer supplied certificate (Y) to client on HMC.
- 4. Client has matching certificate (Y) in the TrustStore, so proxy allows communication. Note that client still has original certificate (X) in the event Call home is not configured with Proxy.
- 5. Communication Continues with session certificates through the customer proxy.



# AOS Customer Provided Certificate - Communication Path

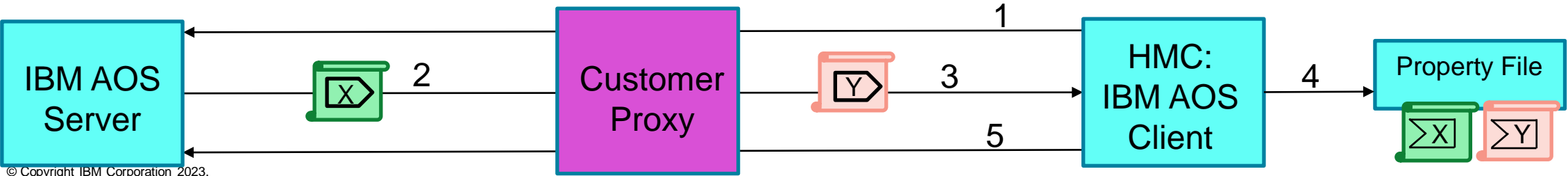
## AOS with no customer proxy Configured

1. Client initiates communication with the AOS Server.
2. The AOS Server presents certificate (X) to client. (X)
3. Client has matching certificate (X) in lightsoutprofile property file, so communication is allowed.
4. Communication continues with session certificates.



## AOS with customer proxy Configured

1. Client initiates communication with the AOS Server through the customer proxy server.
2. AOS Server presents certificate (X) to proxy.
3. Proxy presents Customer supplied certificate (Y) to client on HMC.
4. Client has matching certificate (Y) in the lightsoutprofile property file, so proxy allows communication. Note that client still has original certificate (X) in the property file, but it is not configured with Proxy.
5. Communication Continues with session certificates through the customer proxy.

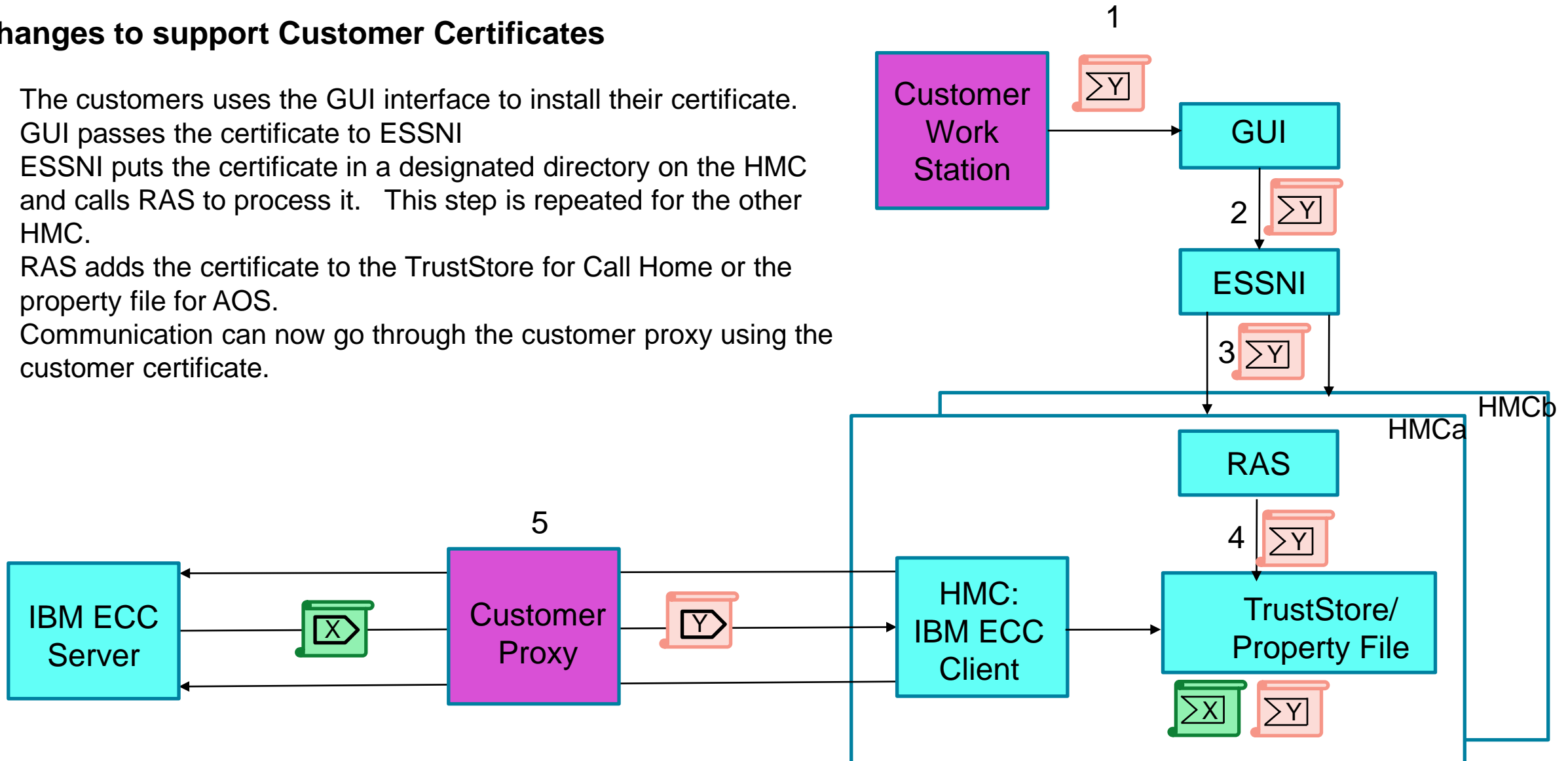




## Call Home/AOS Customer Provided Certificate - New Support

### Changes to support Customer Certificates

1. The customer uses the GUI interface to install their certificate.
2. GUI passes the certificate to ESSNI
3. ESSNI puts the certificate in a designated directory on the HMC and calls RAS to process it. This step is repeated for the other HMC.
4. RAS adds the certificate to the TrustStore for Call Home or the property file for AOS.
5. Communication can now go through the customer proxy using the customer certificate.



# DS8950F GUI – Settings / Notifications

- Call Home
- Syslog

## Call Home

Save Reset

When you enable call home, your management console sends an electronic call home record to IBM support when there is a problem within the storage complex.

### Enablement

Call home:  Enable [Test](#)

### Connection

Connection type:  Direct connection to the internet  Configure HTTP proxy

IP address:  port  [Install TLS certificate](#)

User name:

Password:

### Company Information

Company name:

Company ID:

Service branch office:

### Administrator Information

Name:

Email address:

Telephone number:

Alternate telephone number:

Address:

# DS8950F GUI – Settings / Support / Assist On-Site

Save Reset

- Update System
- Remote Support Center
- Assist On-Site**
- Serviceable Events
- Troubleshooting

## Assist On-Site

Remote assist allows IBM service to remotely access this system in order to quickly resolve any issues you may be having. This service can be enabled directly on the DS8000.

Assist On-Site ✔ Service started

- Service:
- Start
  - Stop
  - Restart

Company name:

Company ID:

AOS groups:

- Connection type:
- Direct connection to the internet
  - Configure HTTP proxy

IP address:  port

[Install TLS certificate](#)

User name:

Password:

Broker list:

Reset: [Reset](#)

## Install TLC Certificate Wizard (1 of 5)

### Configure customer certificate ×

Welcome

Upload certificate

Summary

#### Welcome

This wizard guides you through the customer certificate setup for IBM DS8000.

▼ **Prerequisites**

- A valid certificate file in .PEM format.

## Install TLC Certificate Wizard (2 of 5)

### Configure customer certificate ✕

- ✓ Welcome
- Upload certificate
- Summary

#### Upload certificate

Select file to upload

Certificate

# Install TLC Certificate Wizard (3 of 5)

Configure customer certificate
✕

- Welcome
- Upload certificate
- Summary

### Add customer certificate

Summary information

▼ **Certificate chain:**

**Sequence 1**

Serial: 226610680068265244887556155913150509535410375859

Issued to: O=IBM, L=Tucson, ST=Arizona, C=US

Issued by: O=IBM, L=Tucson, ST=Arizona, C=US

MIICIjANBgkqhkiG9w0BAQEFAAOCAg8AMIICCgKCAgEA57saohjGKj90g...  
 /+whqlv6/npY08W3kzmNTqTuECSLQ365Jx  
 /giNumiXKQ5fe3xUoZJYofC7fTR2G014RhPQgmtdxrNQswPA8HbjSDRE...

Fingerprint (SHA-Digest): /TQW77eWXUvI+6lAWTcyLROzIjgSBmRpgJkiPKelEVSCj2aJUdV8dFKi7d...  
 /I2l3ljmsMXdrru  
 /qjN1hsBdWpvq6ZVuIQYW0yu0CTrL2TJ32Z7PLgpdU7v6EtupAYrDGSZ7...  
 /tSjOATN9lMj684FSGDugqJjr05vGA9aI8uRCsN5O2ZDpF89qqobYsHRJ...

Expiration: Fri, Sep 17, 2032, 01:23:24 PM GMT-08:00

Cancel
◀ Back
Finish



## Install TLC Certificate Wizard (4 of 5)

### Install Certificate

---

✓ *Task completed.* 100%

▼ **More details**

Task started.	4:53 PM
Installing Certificate on TrueStore.	4:53 PM
Task completed.	4:53 PM

## Install TLC Certificate Wizard (5 of 5)

### Assist On-Site Settings

---

✓ *Task completed.* 100%

▼ **More details**

Task started.	4:55 PM
Modifying Assist On-Site on HMC1.	4:55 PM
Modified Assist On-Site on HMC1.	4:55 PM
Modifying Assist On-Site on HMC2.	4:55 PM
Modified Assist On-Site on HMC2.	4:55 PM
<b>Task completed.</b>	4:55 PM

## Safeguarded Copy Enhancement



## Safeguarded Copy Backup (SGC) Capacity - Background

---

- Two elements of Safeguarded Copy capacity
  - ✓ Volume Capacity – defined on each volume in the SGC configuration (virtual capacity)
  - ✓ Extent Pool Capacity – share capacity across all volumes in the pool (physical capacity)
- If a capacity threshold is met, the DS8900F will automatically expire the oldest SGC, in order to free up space to continue to capture changes
  - ✓ When the oldest SGC is expired for the volume that exceeded the threshold, then subsequently the management software will detect this “roll-off” and will optionally expire all corresponding SGCs in the SGCset
- Volume Capacity threshold default is set at 98% of SGC volume capacity
- Extent Pool Capacity threshold default is set at 90% of extent pool capacity (prior to R9.3.2)

## Challenges that need addressing

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### 1. Exceeding available capacity

- ✓ Based on the configuration available, and the I/O workload that is being protected by Safeguarded Copy, reaching these thresholds may result in the customer having fewer SGC's than was planned
- ✓ Worst case: (most likely due to extent pool threshold) only a single SGC will remain, and possibly all available capacity could be consumed and volume(s) will be placed in a write inhibited mode

### 2. Mismatch of Global Mirror management threshold and SGC threshold

- ✓ There is an extent pool threshold for protecting Global Mirror consistency (default prior to R9.3.2 is 98%), so that if the target extent pool reaches the threshold, then Global Mirror will get suspended, protecting the last committed consistency group before the extent pool is completely exhausted
- ✓ In a Safeguarded Copy environment which is protecting the Global Mirror target volumes, the SGC extent pool threshold (default 90%, pre-R9.3.2) will be reached before the GM threshold, resulting in SGC backups being expired due to incoming write workload

## Changes introduced in R9.3.2 (1 of 2)

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- Introduce controls to define the minimum number of SGCs that must be preserved and not expired
- By default, this will be set to 1, and will result in similar behavior as in pre-R9.3.2
- Can be set in the range of 0 to 500
  - ✓ Setting to 0 will result in the SGC process being terminated (no more recording, no possible recovery from SGC) if only 1 SGC remains not expired, and space is exhausted
    - This protects production over SGCs – write inhibit will not be introduced, but the SGC process will terminate
  - ✓ Setting to 500 will not allow the internal rollofs to occur, but you can still manage the retention period through management software
    - If capacity is exceeded, then automatic expiration is not possible and volumes will be placed in write inhibit state
- Behavior when either volume or extent pool capacity is above the threshold, and the minimum number of SGCs exist:
  - ✓ A new SGC request will fail during the reservation phase, with a new out of space sense code returned to the requestor
  - ✓ The current active SGC will continue to protect the environment, saving tracks that have already been captured but net new updates that continue to be received could push the capacity further past the threshold and to exhaustion



## Changes introduced in R9.3.2 (2 of 2)

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- Threshold changes:
  - ✓ Global Mirror extent pool threshold reduced from 98% to 97%
  - ✓ Safeguarded Copy extent pool threshold increased from 90% to 98%
  - ✓ Safeguarded Copy volume level threshold remains at 98%
- Threshold changes will result in the Global Mirror process getting suspended, prior to the SGC thresholds being reached
- Specification of the minimum number of SGCs will be defaulted to 1 and can be changed to another value by opening a hardware support case against the DS8900F and requesting a change
  - ✓ IBM would like to discuss the implications of the change in your environment, before activating this new behavior

## Space Notifications



## Safeguarded Copy & GDPS

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So, why are we talking about Out of Space Messages, anyway?

**Short answer: increased demand for Safeguarded Copy!**

Adoption is driving clients to ask for GDPS enhancements to their SGC support. Several would like automated monitoring and reporting of SGC backup capacity. Others have requested function that would see GDPS automatically initiate a dynamic volume expansion for SGC back-up volumes.

These requests go hand-in-hand with an older RFE requesting that GDPS provide some sort of monitoring of space usage when it comes to space-efficient extent pools in environments with Global Mirror and Flash Copy.

## Out of Space Messages – Background

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- Became a requirement when DS8K implemented thin-provisioning
- Used to notify hosts and/or users that a volume or extent pool has reached a capacity threshold or has completely exhausted its capacity
- Also used to indicate when an out of space condition has been relieved
- Usually resolved either by issuing a release space command, or by adding more actual capacity
  
- For Safeguarded Copy backup volumes there were new messages implemented to indicate a specific backup/consistency group was “rolled-off” in order to make space for the next back-up
  
- Messages are delivered to System Z/CKD hosts by generating Attention status, which prompts the host to issue CCWs to read the waiting message
- Attention status is only provided to hosts that have devices “online” i.e., have at least one base device as part of a path group
- Because Safeguarded Copy targets are not host-addressable by design – i.e. will never be “online” - Out of Space messages for SGC target volumes are presented on the source volume’s LSS/LCU

## Out of Space Message Generation

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- Out of Space messages are generated in two different ways
  - ✓ Extent-pool related messages are presented to every online host on every LSS/LCU on the box
  - ✓ Backup volume messages are only presented to hosts that have a volume online in the source LSS/LCU
- Extent Pool Messages
  - ✓ Extent Pool messages that are sent out to every host online to every LSS are good at notifying every potential stakeholder
  - ✓ Are essentially over-presented with duplicate messages presented to hosts running to multiple LSSes
  - ✓ Messages can still be missed in disaster recovery environments where a secondary control unit might have no production online
- LSS/Volume-Specific Messages
  - ✓ Single LSS messages are more efficient by limiting delivery only to production systems online to that LSS
  - ✓ Non-production management or disaster recovery systems like GDPS require explicitly configured paths and devices to each LSS they would like to receive Out of Space messages for
  - ✓ No hosts online to a given LSS still leaves the chance that nobody will be notified of an out of space condition

## New Message Generation Solution

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- Allows a GDPS controlling system (K-sys) to receive *all* Out of Space messages generated by a managed DS8900F
- Minimizes the need for extra logical paths or volumes defined to the K-Sys
- Limits any extra message presentation to only systems that need to know
- Preserves existing DS8900F message presentation to avoid impacting existing customer configurations
- **Allow any interested hosts to explicitly register to receive Out of Space messages**
- Registered host systems will receive messages if they have at least one device online to that DS8900F cluster
- Easily applied in GDPS environments where utility devices are present on the managed DS8900Fs
- Easy to add two small utility devices and the associated paths to any DS8900F that doesn't already have them defined
- Registered hosts will generally receive only one message per event, even if they have devices online to multiple LCUs

## Co-requisites to exploit new function

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Software Component	Required Level
SDM	zOS 2.4 or 2.5 with PTF UJ09789-HDZ2240 or UJ09790-HDZ2250
GDPS	GDPS 4.5 with APAR PH50146





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**Thank you!**