ADVANCED TECHNOLOGY GROUP (ATG)

Accelerate with ATG Webinar: Exploring the IBM DS8000 Safeguarded Copy Capacity Study

Rick Pekosh
Principal Storage Technical Specialist – DS8000 SME
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Meet the Speakers

Rick Pekosh is a Principal Storage 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 is also the ATG DS8000 SME Team Lead. Rick works with customers, IBM Business Partners, and IBMers in the Americas. He 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 is Technical Specialist (Thought Leader).

Dan Zehnpfennig joined the Advanced Technology Group as a Senior Storage Technical Specialist concentrating on DS8000 and Healthcare ISV. He is a DS8000 subject matter expert specializing in High Availability, Disaster Recovery, and Cyber Resiliency solutions. Dan comes from the Business Partner community, where he was a technical storage seller for more than 20 years. He has been involved with DS8000 products and their precursors since 2000 and Spectrum Virtualize products since 2003. He enjoys helping customers get the most out of their storage.

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Sizing Solutions for the DS8000

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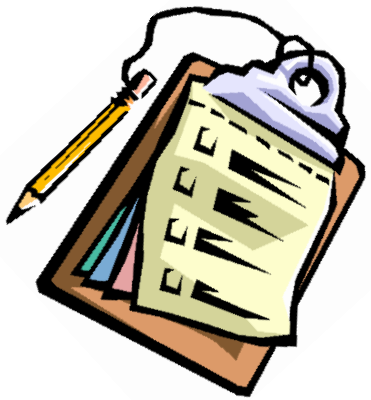
Discussion Topics

- Sizing Solutions Data Requirements
- Safeguarded Copy Sizing



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Sizing Solutions Data Requirements

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What is the difference between SMF, RMF, & CMF? Aren't they the same thing?

IBM System Management Facilities ("SMF")

- is a component of IBM's z/OS for mainframe computers, providing a standardized method for writing out records of activity to a file (or data set to use a z/OS term). SMF provides full "instrumentation" of all baseline activities running on that IBM mainframe operating system, including I/O, network activity, software usage, error conditions, processor utilization

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IBM Resource Measurement Facility ("RMF")

- Resource Measurement Facility is a performance monitor for the z/OS Operating System. It also collects data for long-term performance analysis and capacity planning. The product consists both data gathering (i.e., collecting) and reporting components.

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BMC Comprehensive Management Facility ("CMF")

- CMF MONITOR is a performance monitoring, statistics gathering, and reporting system developed and maintained by BMC Software. Statistics gathered by CMF MONITOR can be compiled and presented either in batch reports or through windowed online displays.

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Note: RMF & CMF are competitive products. Customers use one or the other and most typically collect data in 15 minute intervals. Sometimes 10, and on much rarer occasions, 1 or 5 minute intervals. Anything over 15 minutes smooths out the peaks too much and are not very useful for our ATG studies.

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IBM ATG, BTS, & WSC Studies

IBM ATG Studies Based on Customer Provided RMF or CMF data

- **DS8000 Global Mirror Bandwidth Study** – estimate required network bandwidth for target Recovery Point Objective (“RPO”)

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IBM ATG, BTS, & WSC Studies

IBM ATG Studies Based on Customer Provided RMF or CMF data

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- **DS8000 Safeguarded Copy Sizing** – calculate the capacity needed to meet Cyber Resilience (“CR") requirements

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- **DS8000 Transparent Cloud Tiering Savings Analysis** – calculate CPU savings from “TCT” offload of HSM host cycles for Migrate/Recall (SMF default record types 240 & 241)

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IBM BTS Studies Based on Customer Provided RMF or CMF data

- **StorM Performance Modeling** – used to appropriately size a solution to meet workload performance requirements

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- StorM Performance Modeling – used to appropriately size a solution to meet workload performance requirements

IBM WSC Studies Based on Customer Provided RMF or CMF data

- **zBNA HyperLink Study** – used to determine workloads eligible for zHyperLink e.g., Db2 reads, VSAM reads, Db2 sequential log writes (SMF record type 42.6). Customers can perform their own zBNA Hyperlink Study

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Starting Point for RMF based Studies

- **Customer provides RMF or CMF data for at least one week. Week chosen should be representative. Some customers choose to use a peak week (end of month, quarter, or year); others elect to use a "typical" week or particular workload. Customer also completes questionnaire.**
- **RMF interval should be no more than 15 minutes. Longer intervals will not provide accurate detail**
- **Data must be collected and supplied from every system and LPAR accessing the disk system(s).**
- **RMF records should include SMF record types 70–78 and must include at a minimum:**
  - ✓ Type 70.1 – CPU activity
  - ✓ Type 73 – Channel path activity
  - ✓ Type 74.1 – Device activity
  - ✓ Type 74.5 – Cache subsystem activity
  - ✓ Type 74.8 – ESS/DS8000 statistics ← Note "ESS" in SYS1.PARMLIB(ERBRMFxx) must be set
  - ✓ Type 78.3 – I/O queuing activity and HyperPAV activity
- **The IBM Advanced Technology Group DS8000 subject matter expert will:**
  - ✓ **Run a series of jobs to transform customer RMF data**
  - ✓ **Load the transformed data into our bandwidth tools**
  - ✓ **Provide an analysis and recommendation**

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RMF or CMF 70 – 78 record types enables the following studies

IBM ATG Studies Based on Customer Provided RMF or CMF data

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IBM BTS Studies Based on Customer Provided RMF or CMF data

- **StorM Performance Modeling** – used to appropriately size a solution to meet workload performance requirements

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Spectrum Control & Storage Insights performance data enable the following studies

IBM ATG Studies using Spectrum Control & Storage Insights performance data

- **DS8000 Global Mirror Bandwidth Study** – estimate required network bandwidth for target Recovery Point Objective (“RPO”)
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IBM BTS Study using Spectrum Control & Storage Insights performance data

- **StorM Performance Modeling** – used to appropriately size a solution to meet workload performance requirements

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ADVANCED TECHNOLOGY GROUP (ATG)

Safeguarded Copy Sizing using StorM

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danz@ibm.com

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Client Data Analysis using StorM

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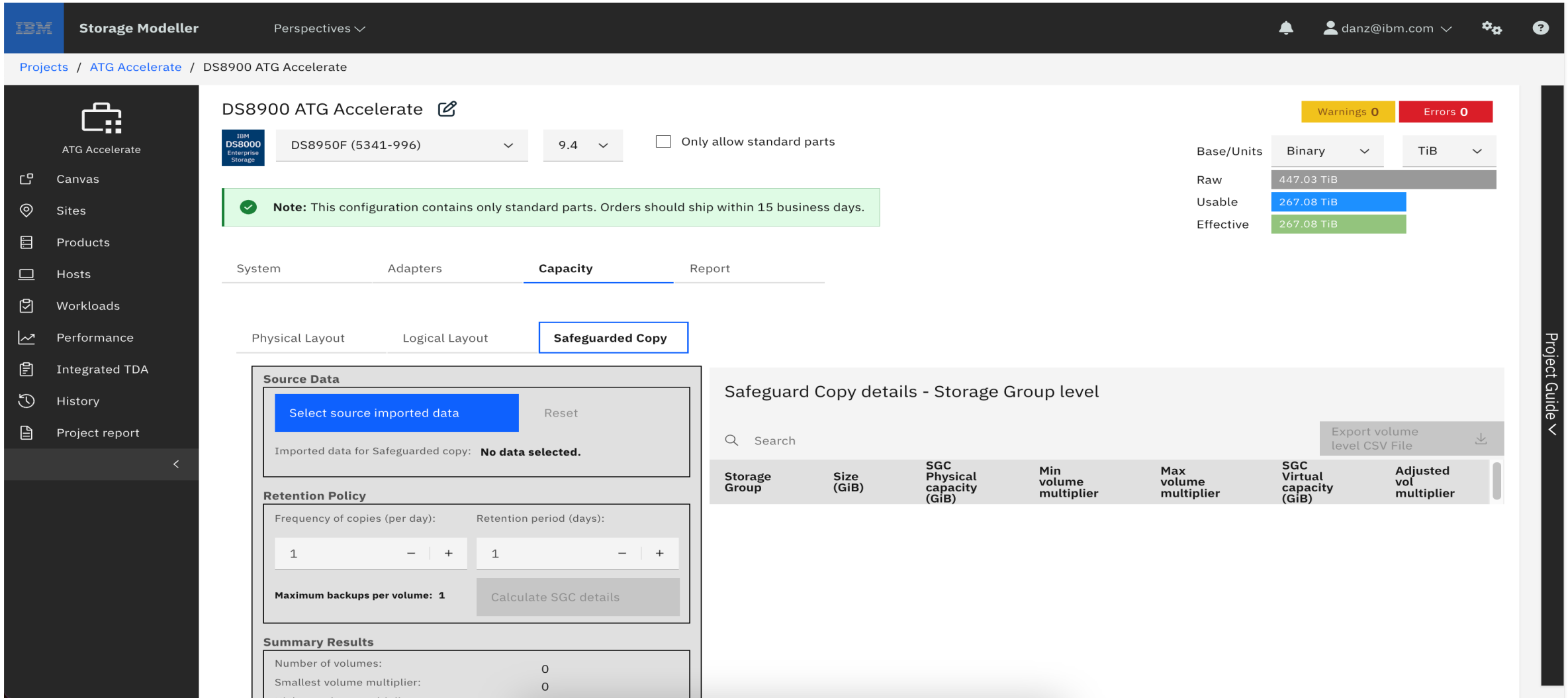
StorM – enter safeguarded copy tab



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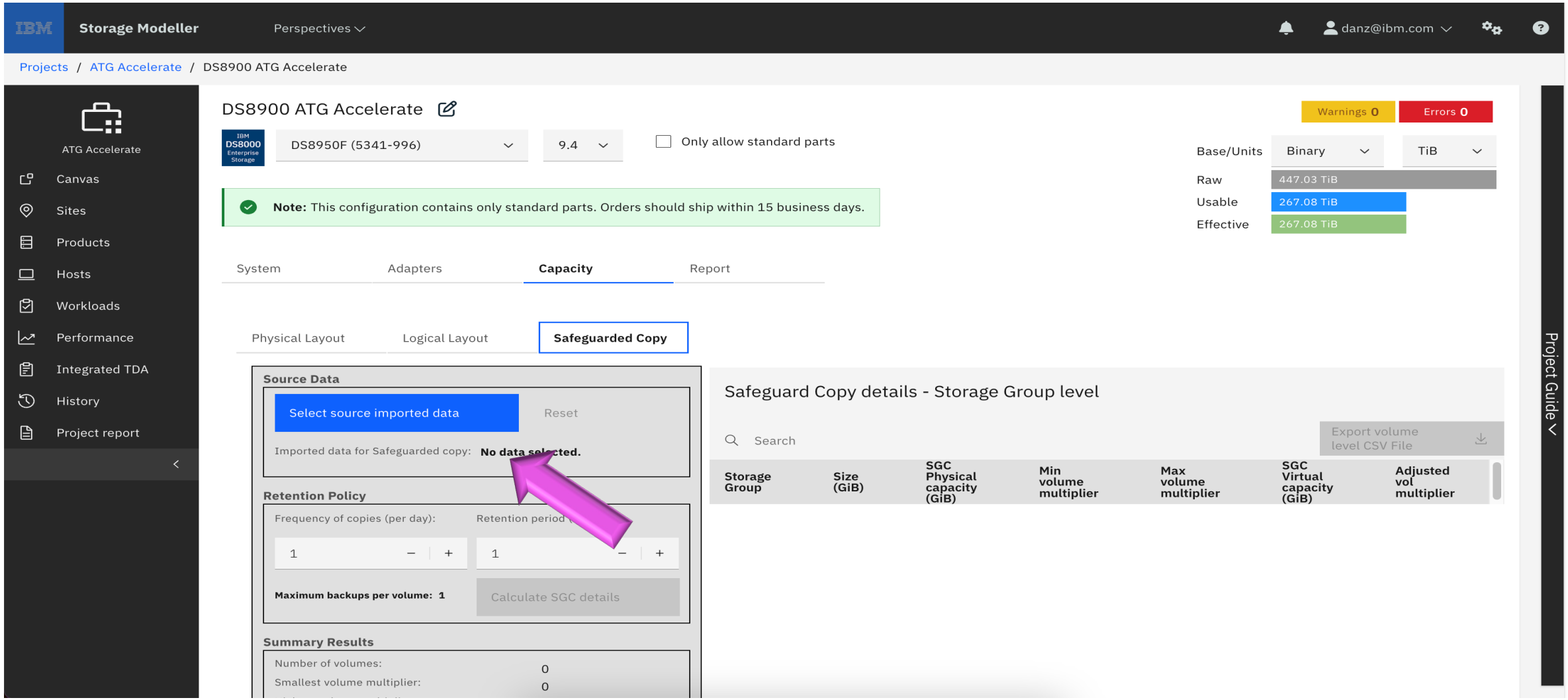
StorM – retrieve import data list



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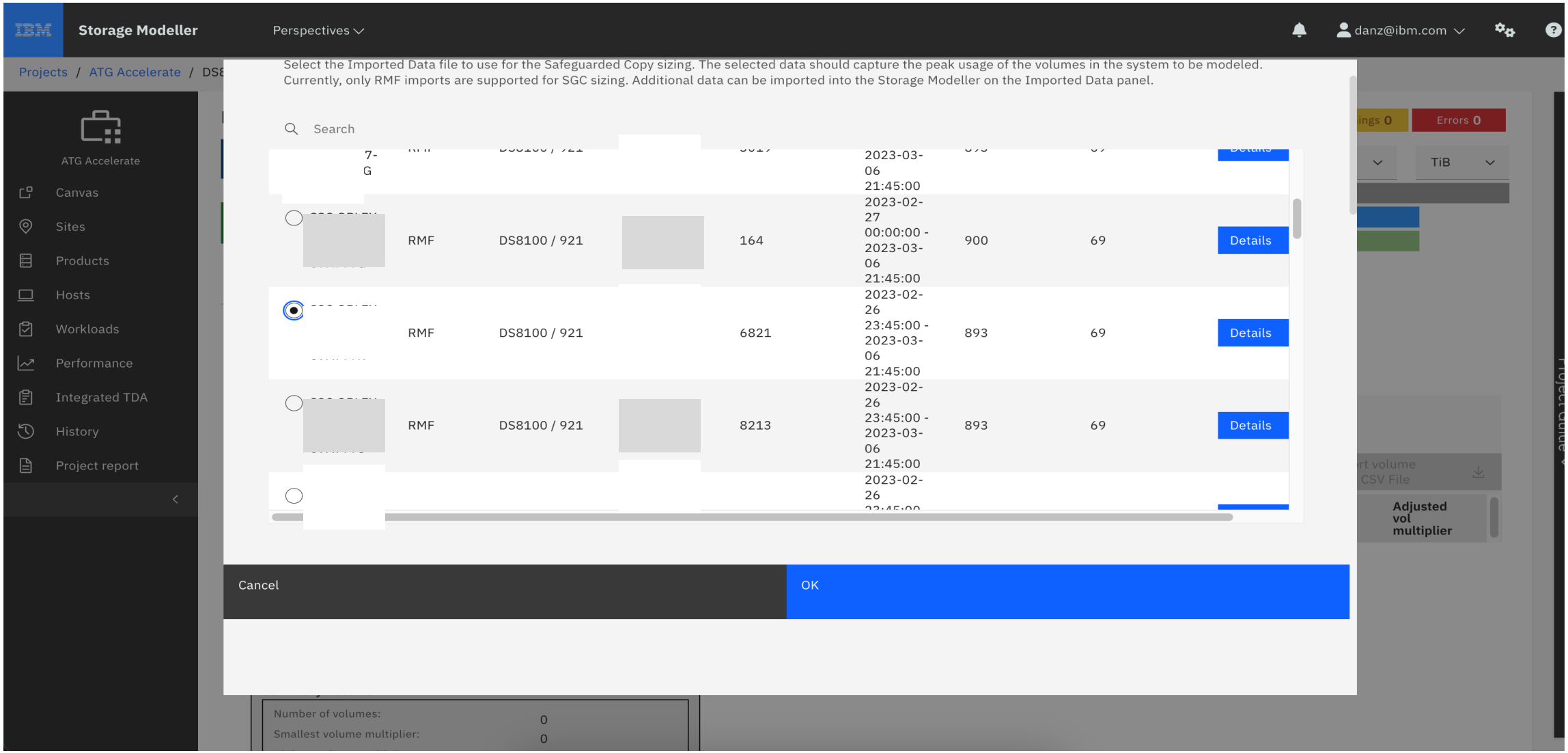
StorM – select file from import data list



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Safeguarded Copy current planning

- Data is replicated as a 2-Site Global Mirror
- SGC will be implemented using SGC at the Secondary Site with logical isolation
- RMF data shows online production capacity as 93 TB
- Possible planned Safeguarded Copy management policy:
  - ✓Backup every 12 hours with a retention period of 7 days
- Purpose of this study: help to estimate the required physical and virtual capacity for SGC

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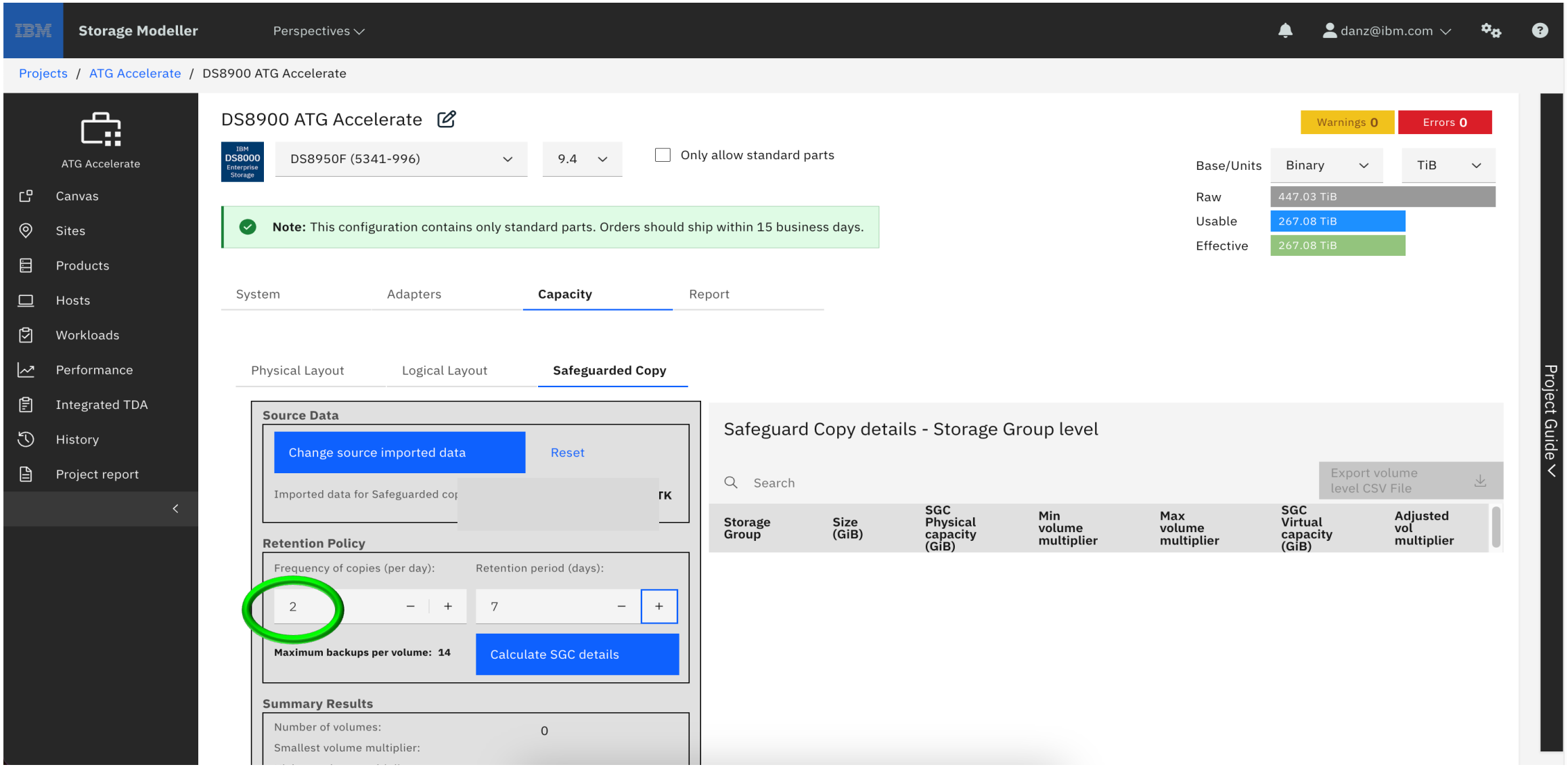
StorM – Retention Policy select backup frequency



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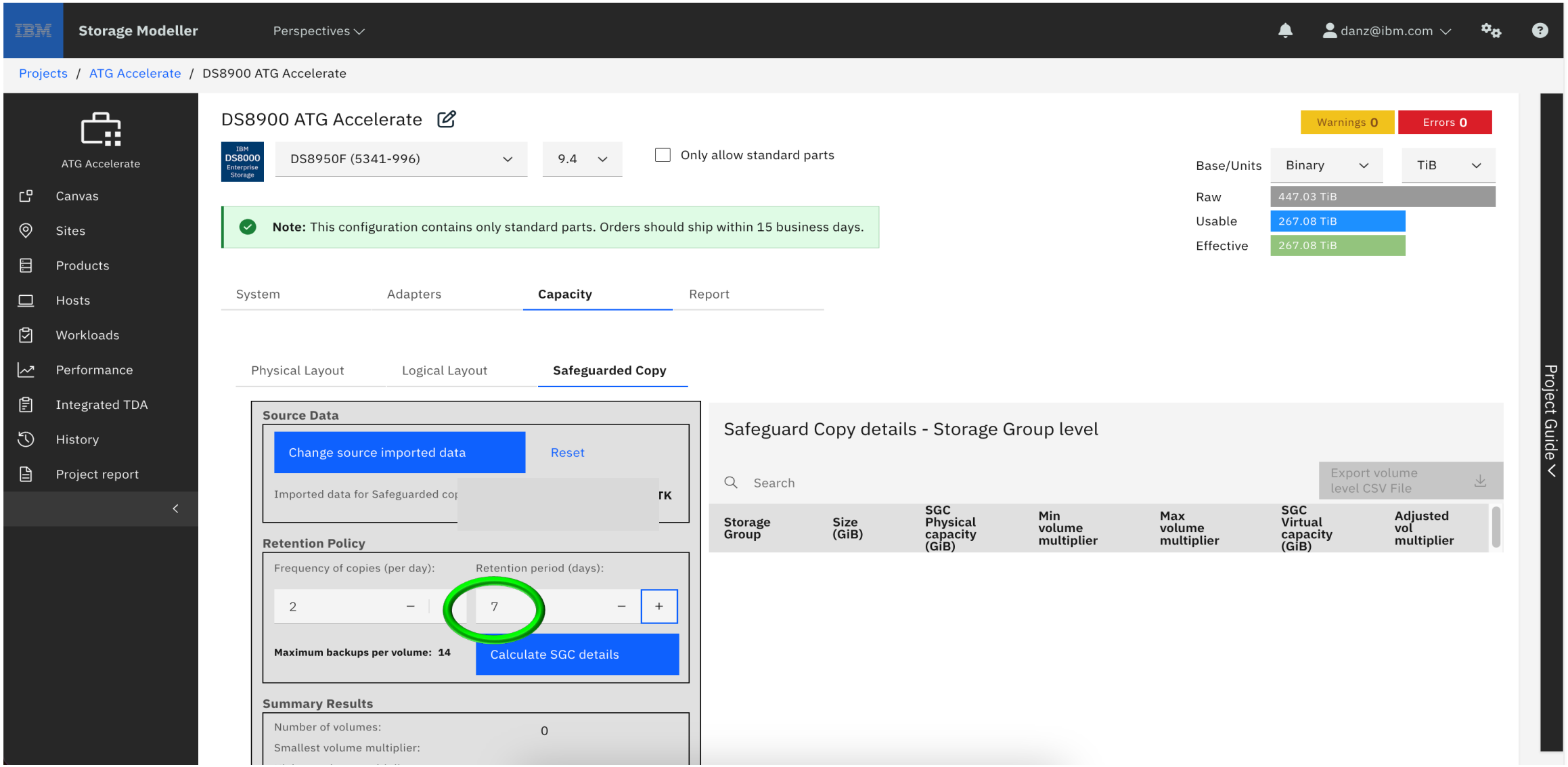
StorM – Retention Policy select retention period



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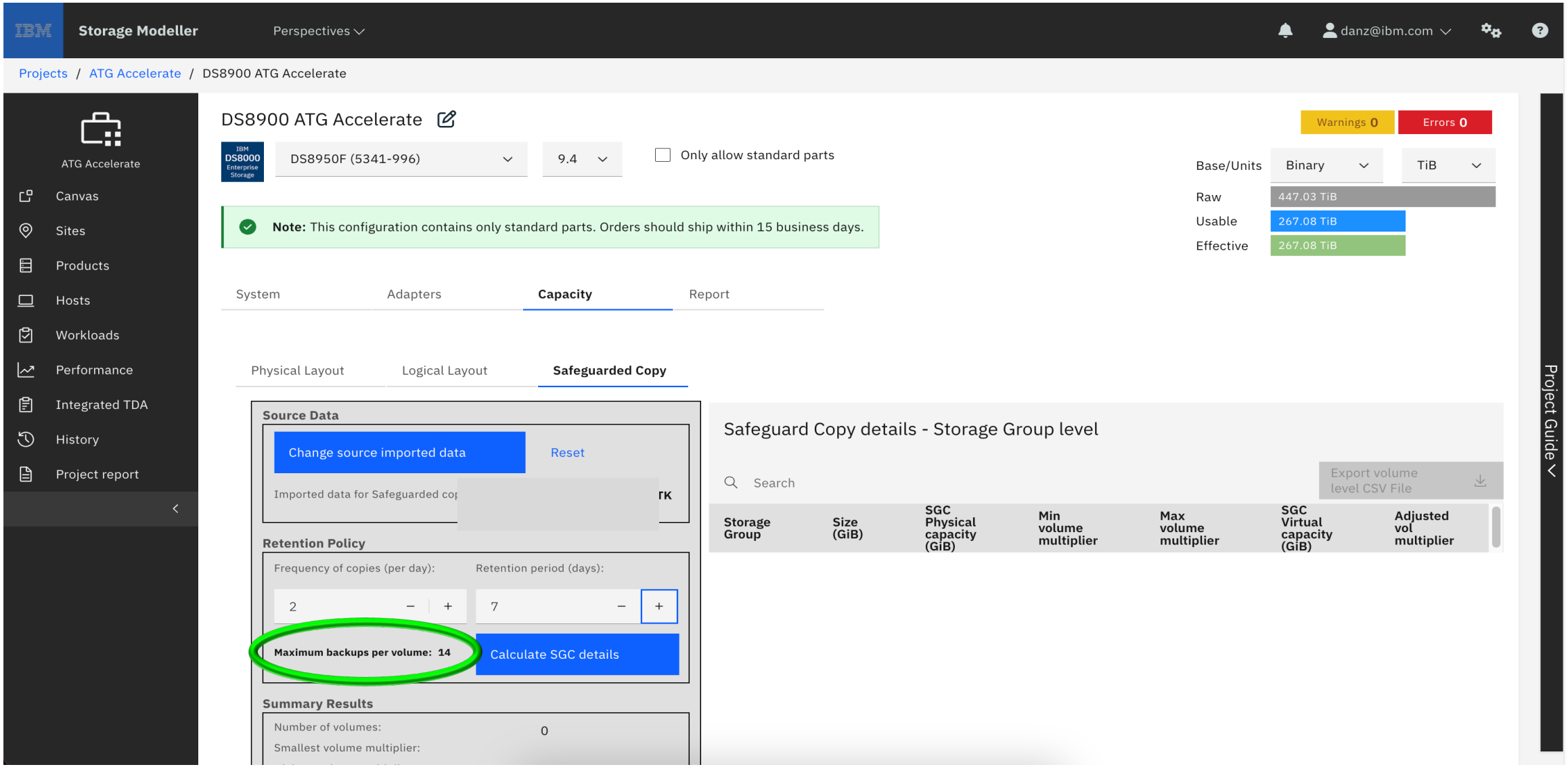
StorM – review maximum backups per volume



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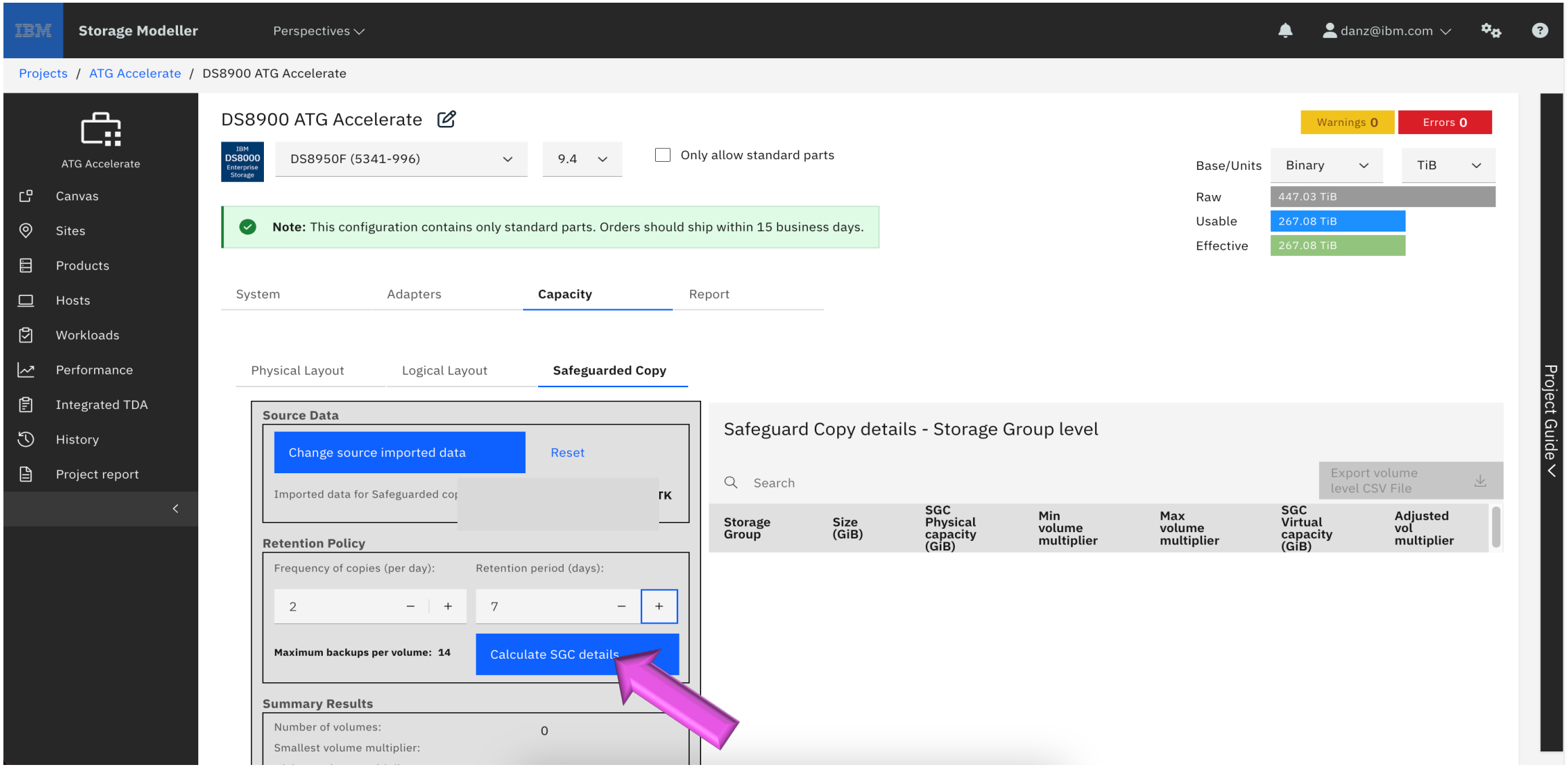
StorM – Calculate SGC details



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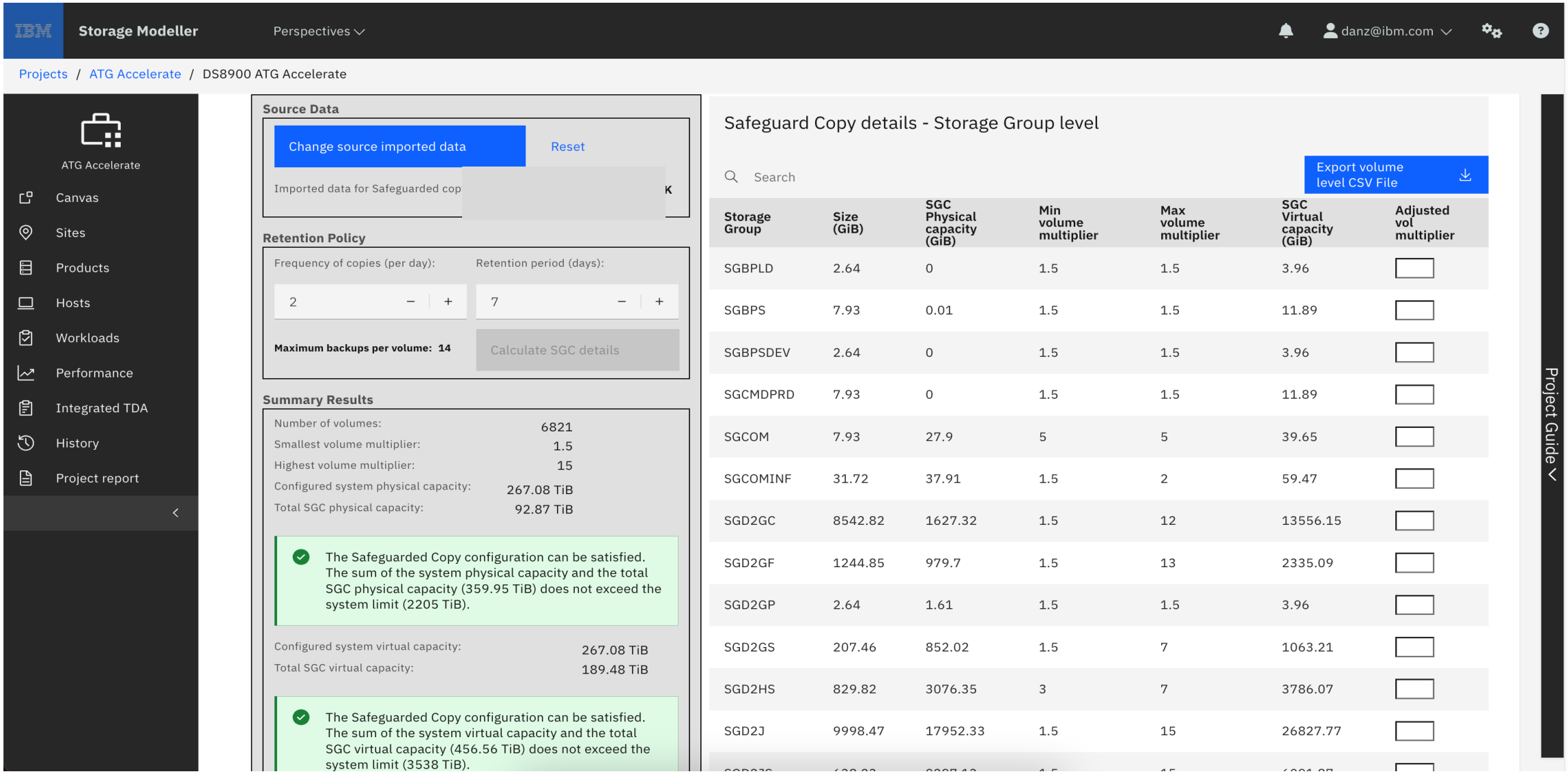
StorM – calculation results



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StorM – Adjusted Multiplier Planning

- Review summary results

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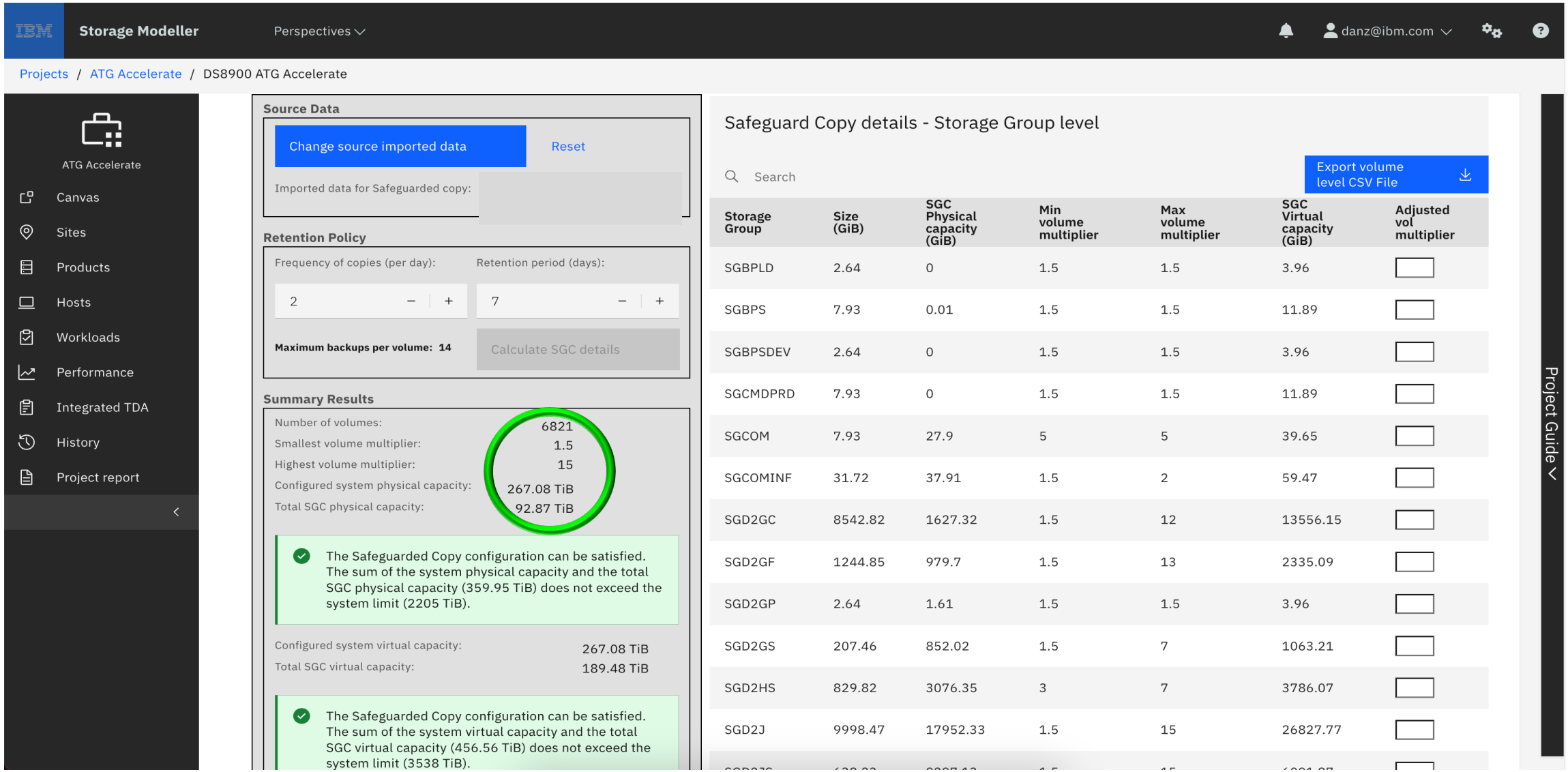
StorM – Review Summary



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StorM – Adjusted Multiplier Planning

- Review summary results
- Check physical capacity

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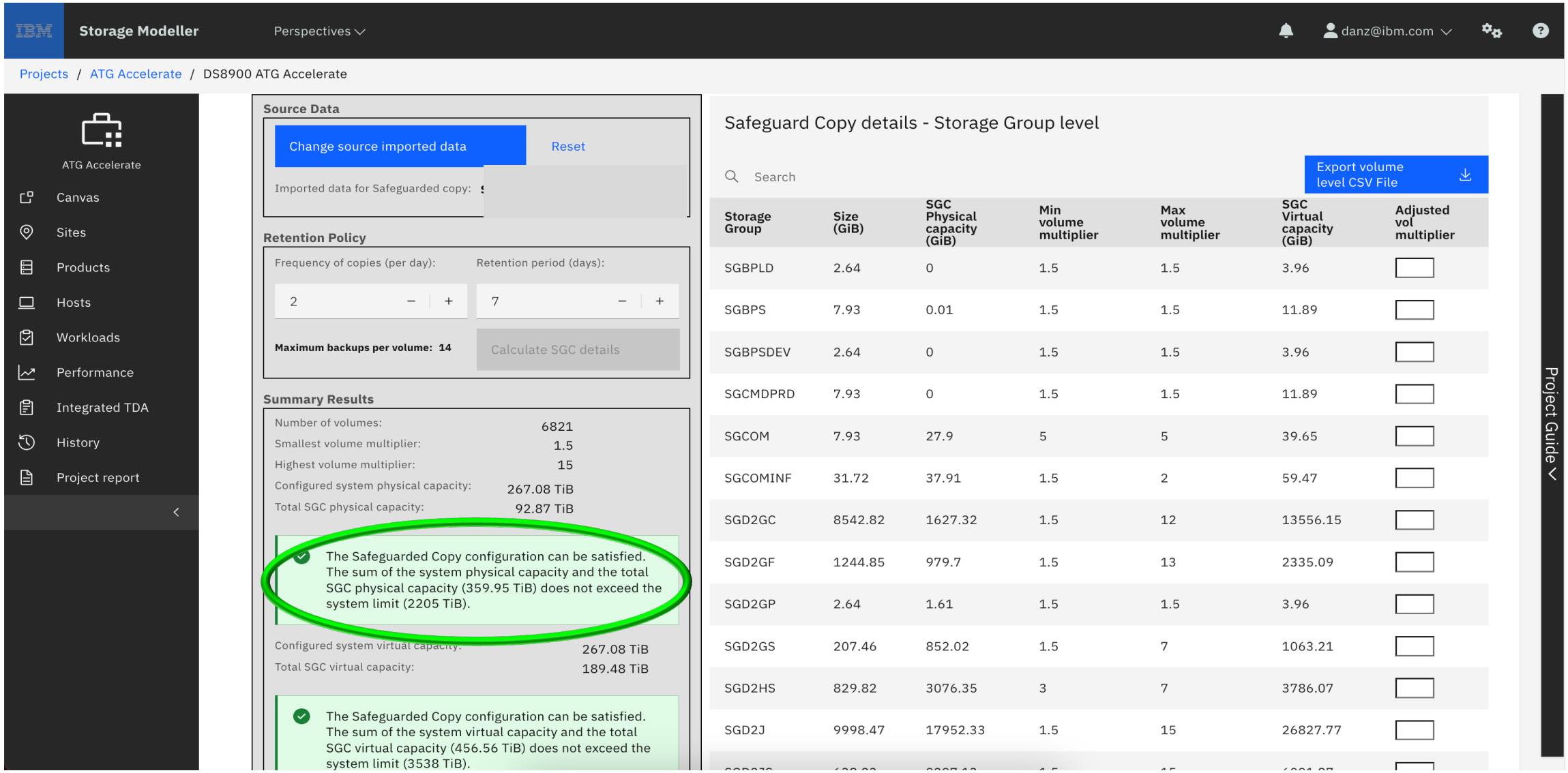
StorM – Review Physical Capacity Limits



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StorM – Adjusted Multiplier Planning

- Review summary results
- Check physical capacity
- Examine the different maximum multipliers

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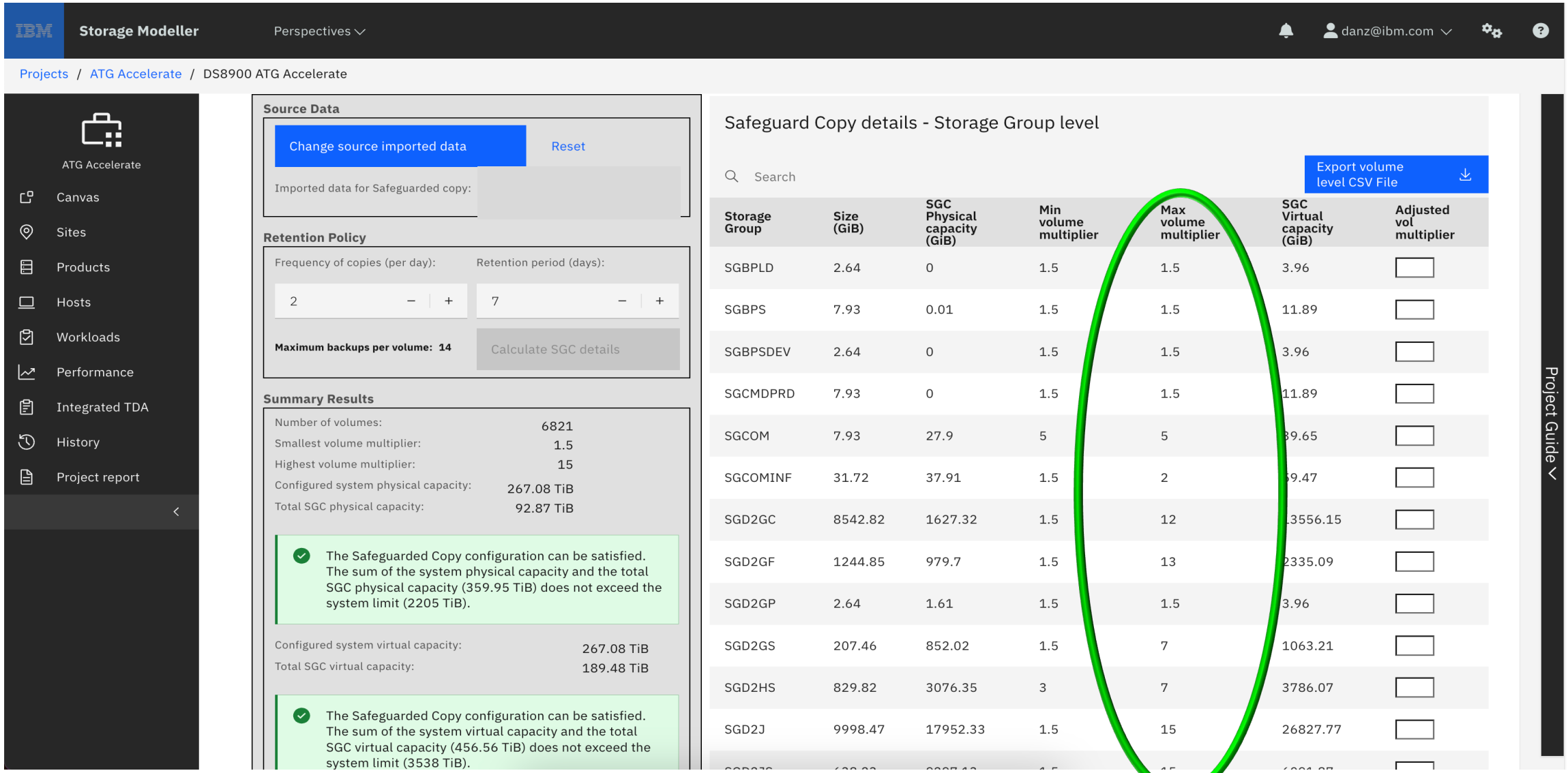
StorM – Examine Max volume multiplier column



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StorM – Adjusted Multiplier Planning

- Review summary results
- Check physical capacity
- Examine the different maximum multipliers
- The maximum multipliers list for this customer: 1.5, 2, 3, 4, 5, 6, 7, 10, 11, 12, 13, 14, 15

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StorM – Adjusted Multiplier Planning

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- The maximum multipliers list for this customer: 1.5, 2, 3, 4, 5, 6, 7, 10, 11, 12, 13, 14, 15
- Storage Group maximum multiplies into no more than six groups
  - ✓For example, 1.5, 2, 3 = 3

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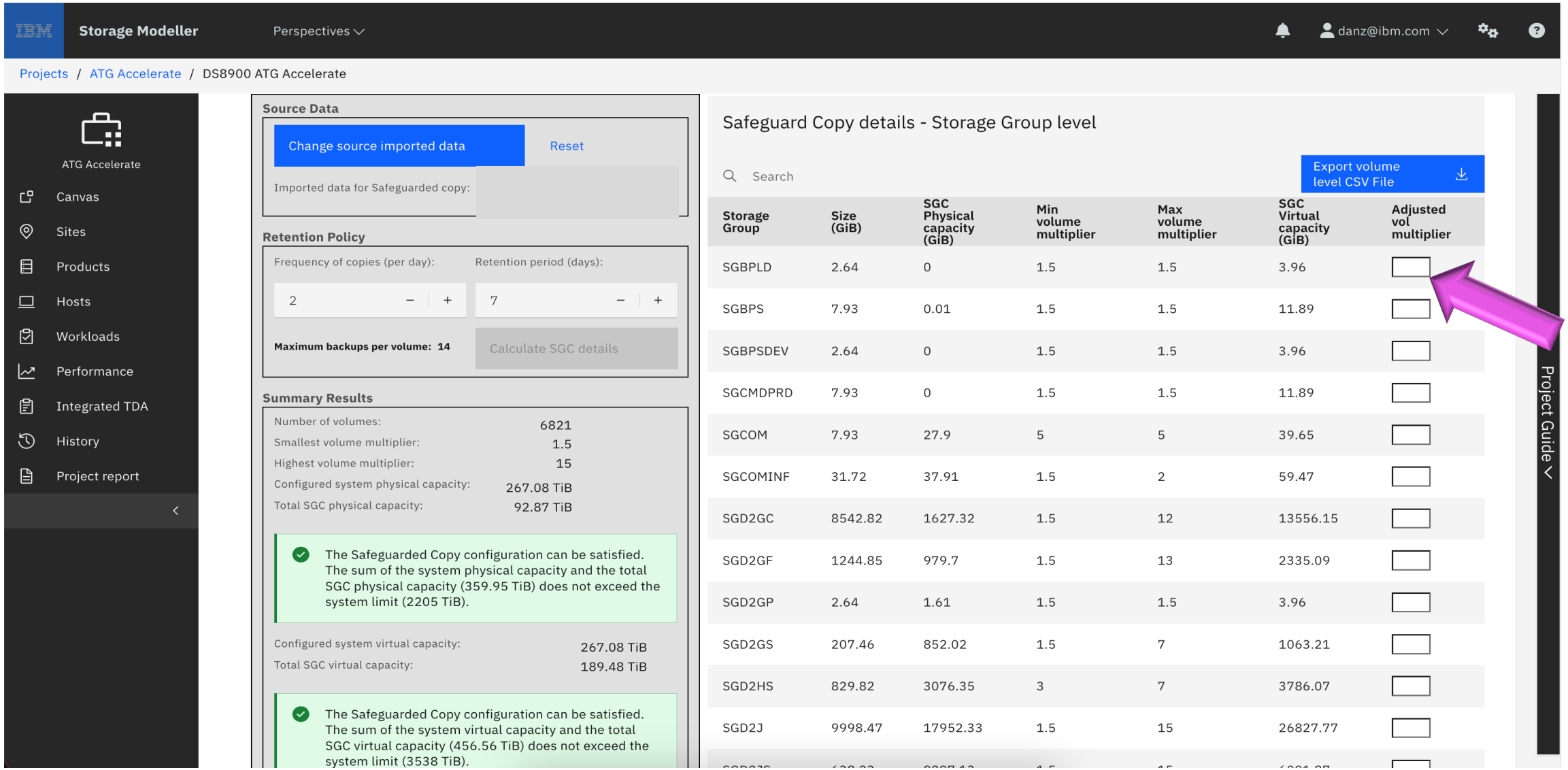
StorM – enter Adjusted volume multipliers



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- The maximum multiplier grouping for this customer: 3, 8, 15
  - ✓1.5, 2, 3 = 3
  - ✓4, 5, 6, 7, 8 = 8
  - ✓10, 11, 12, 13, 14, 15 = 15

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- Remember to press the “Save adjusted multipliers” button

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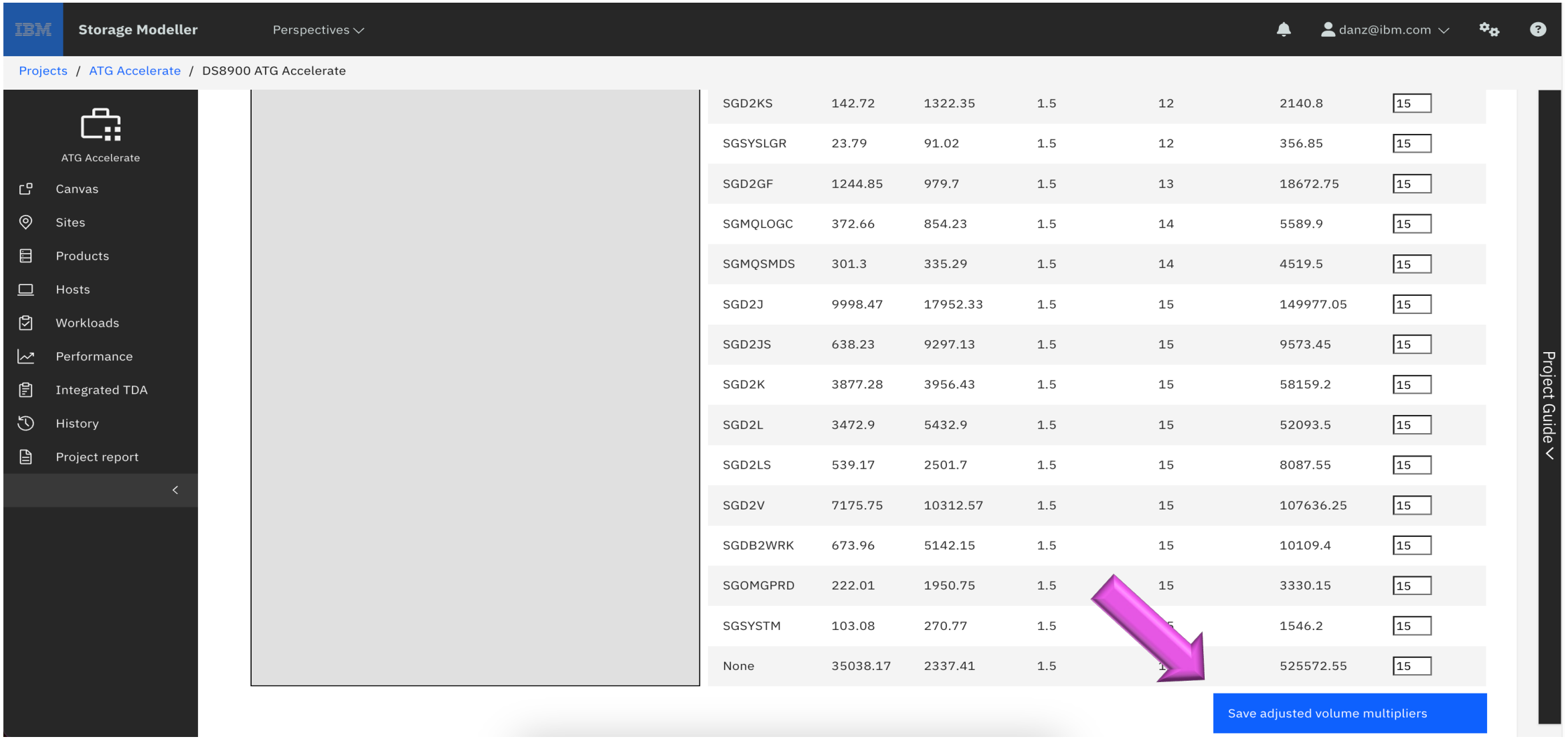
StorM – Save adjusted volume multipliers



SGD2KS	142.72	1322.35	1.5	12	2140.8	15
SGSYSLGR	23.79	91.02	1.5	12	356.85	15
SGD2GF	1244.85	979.7	1.5	13	18672.75	15
SGMQLOGC	372.66	854.23	1.5	14	5589.9	15
SGMQSMDS	301.3	335.29	1.5	14	4519.5	15
SGD2J	9998.47	17952.33	1.5	15	149977.05	15
SGD2JS	638.23	9297.13	1.5	15	9573.45	15
SGD2K	3877.28	3956.43	1.5	15	58159.2	15
SGD2L	3472.9	5432.9	1.5	15	52093.5	15
SGD2LS	539.17	2501.7	1.5	15	8087.55	15
SGD2V	7175.75	10312.57	1.5	15	107636.25	15
SGDB2WRK	673.96	5142.15	1.5	15	10109.4	15
SGOMGPRD	222.01	1950.75	1.5	15	3330.15	15
SGSYSTM	103.08	270.77	1.5		1546.2	15
None	35038.17	2337.41	1.5		525572.55	15

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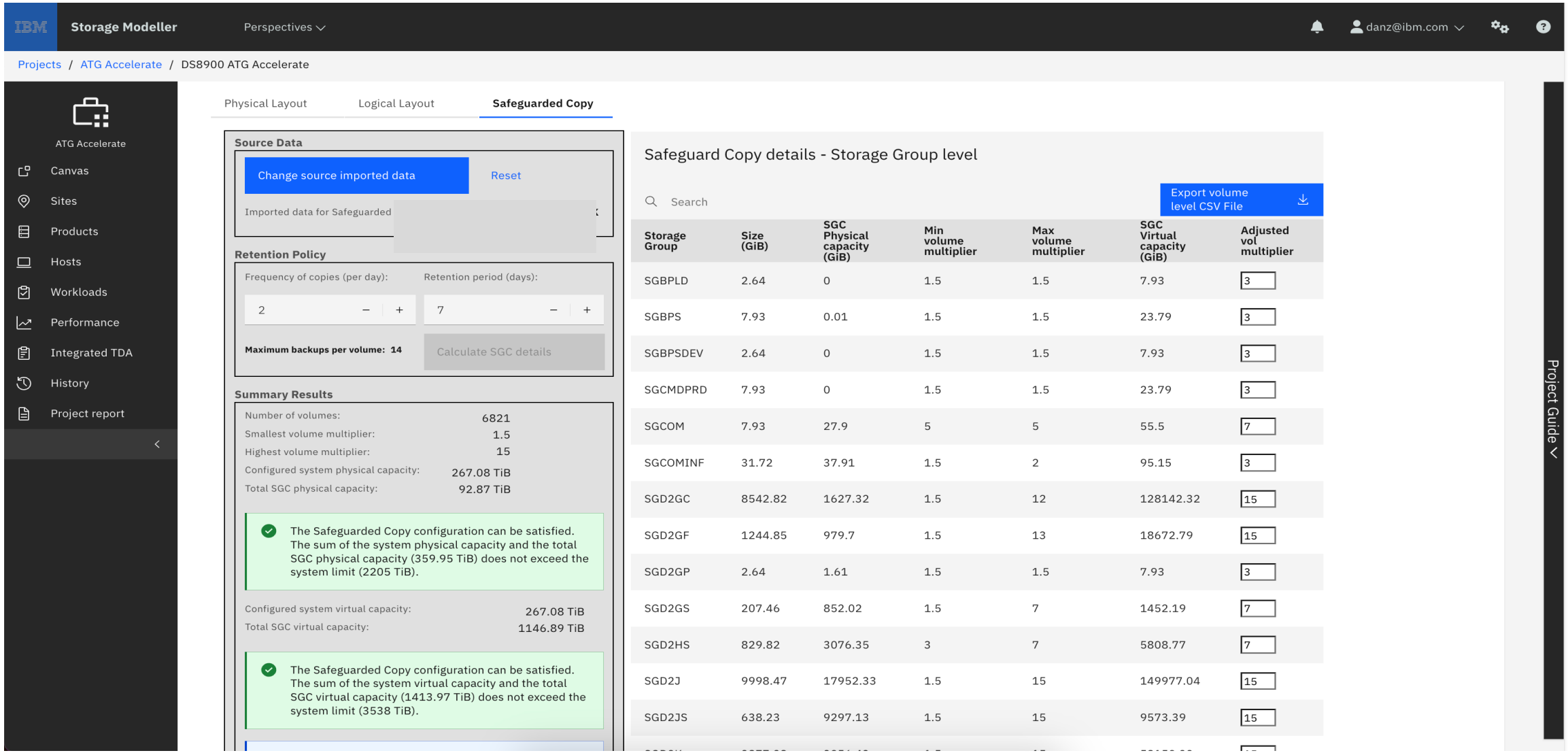
StorM - results



Storage Group	Size (GiB)	SGC Physical capacity (GiB)	Min volume multiplier	Max volume multiplier	SGC Virtual capacity (GiB)	Adjusted vol multiplier
SGBPLD	2.64	0	1.5	1.5	7.93	3
SGBPS	7.93	0.01	1.5	1.5	23.79	3
SGBPSDEV	2.64	0	1.5	1.5	7.93	3
SGCMDPRD	7.93	0	1.5	1.5	23.79	3
SGCOM	7.93	27.9	5	5	55.5	7
SGCOMINF	31.72	37.91	1.5	2	95.15	3
SGD2GC	8542.82	1627.32	1.5	12	128142.32	15
SGD2GF	1244.85	979.7	1.5	13	18672.79	15
SGD2GP	2.64	1.61	1.5	1.5	7.93	3
SGD2GS	207.46	852.02	1.5	7	1452.19	7
SGD2HS	829.82	3076.35	3	7	5808.77	7
SGD2J	9998.47	17952.33	1.5	15	149977.04	15
SGD2JS	638.23	9297.13	1.5	15	9573.39	15

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StorM – Adjusted Multiplier Planning

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  - ✓ 10, 11, 12, 13, 14, 15 = 15
- Remember to press the “Save adjusted multipliers” button
- Check virtual capacity

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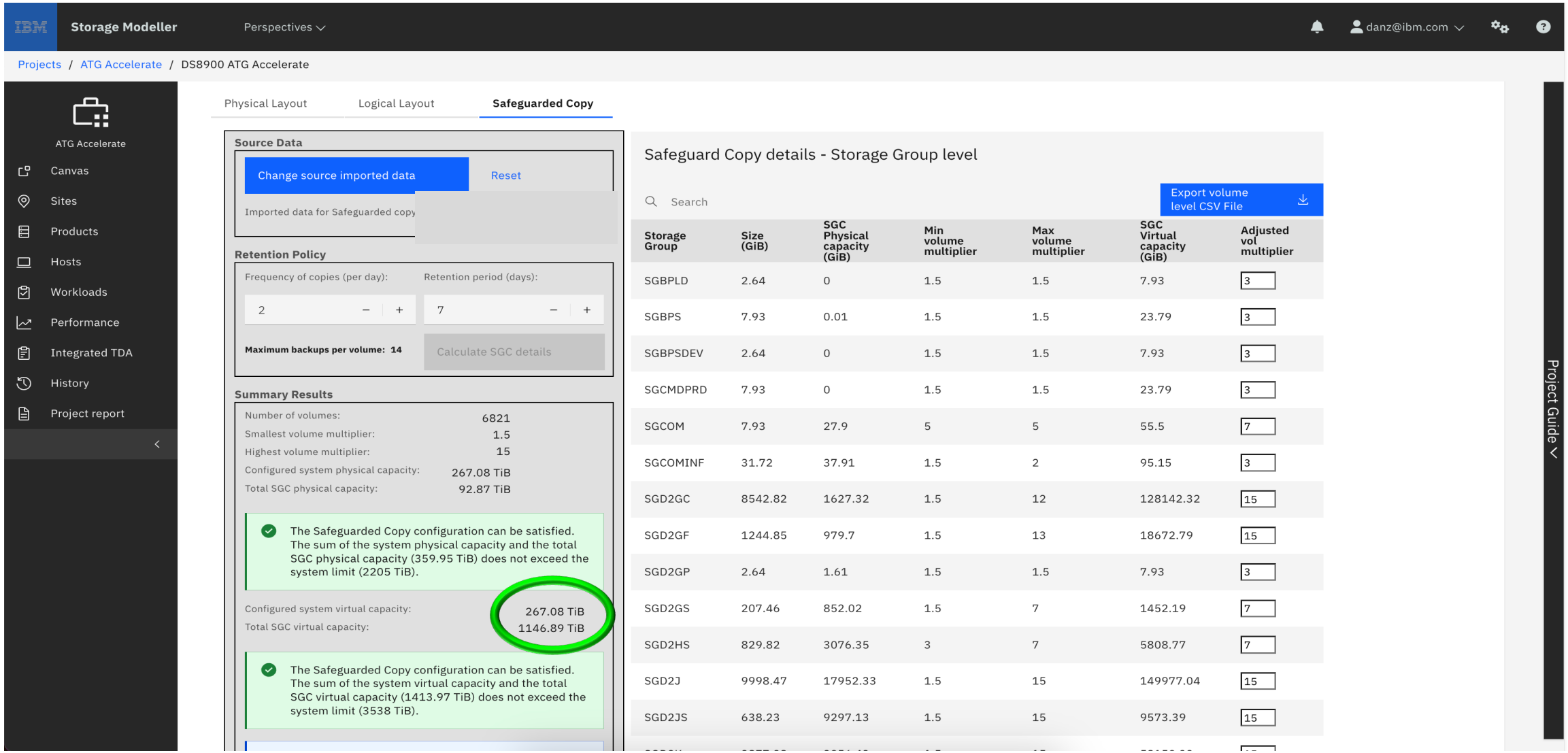
StorM – Check Total SGC virtual Capacity



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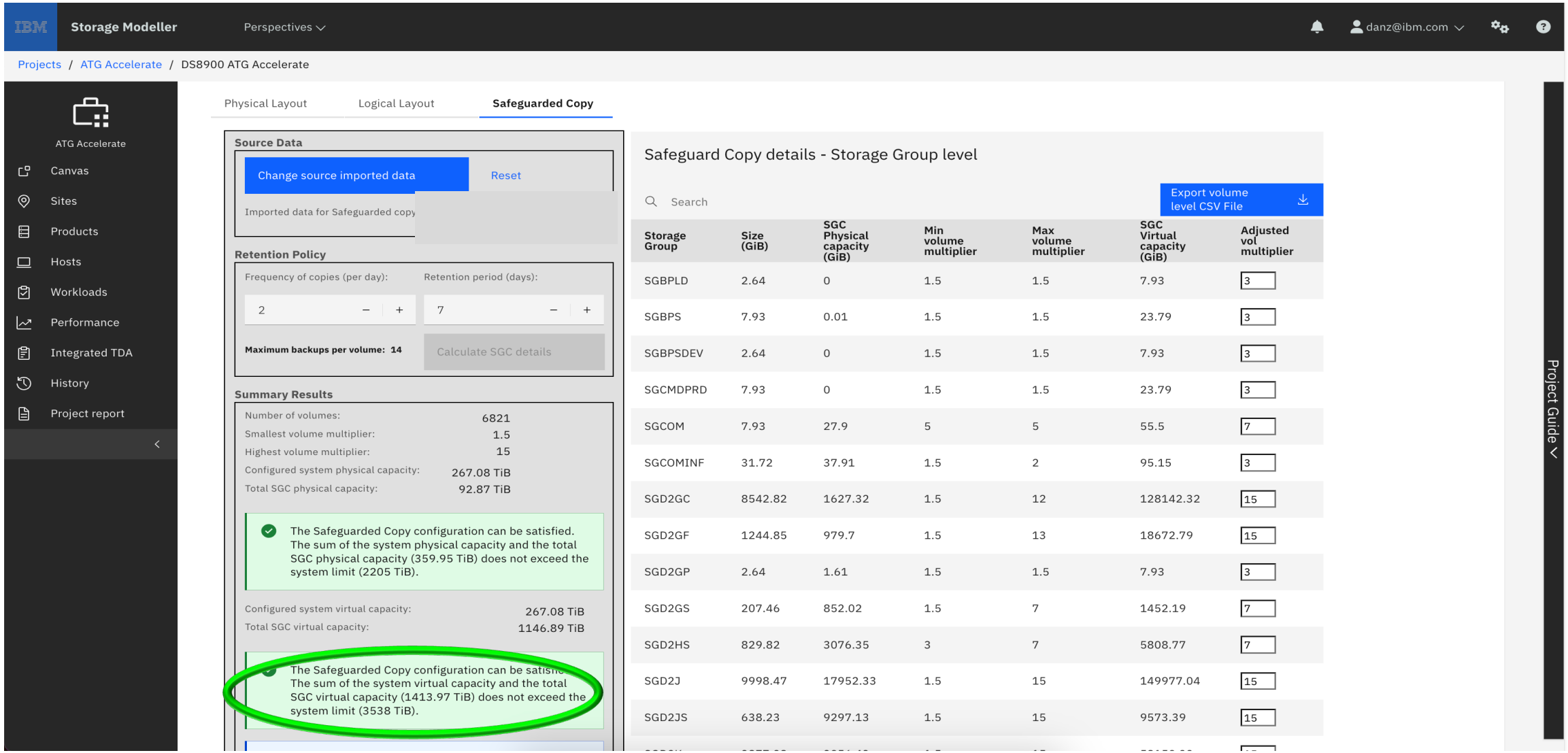
StorM – Check Virtual Capacity Limits



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  - ✓ 10, 11, 12, 13, 14, 15 = 15
- Remember to press the “Save adjusted multipliers” button
- Check virtual capacity
- Press the “Export volume level CSV file”
  - ✓ You may need this file if you need to do a more detailed volume-level multiplier planning

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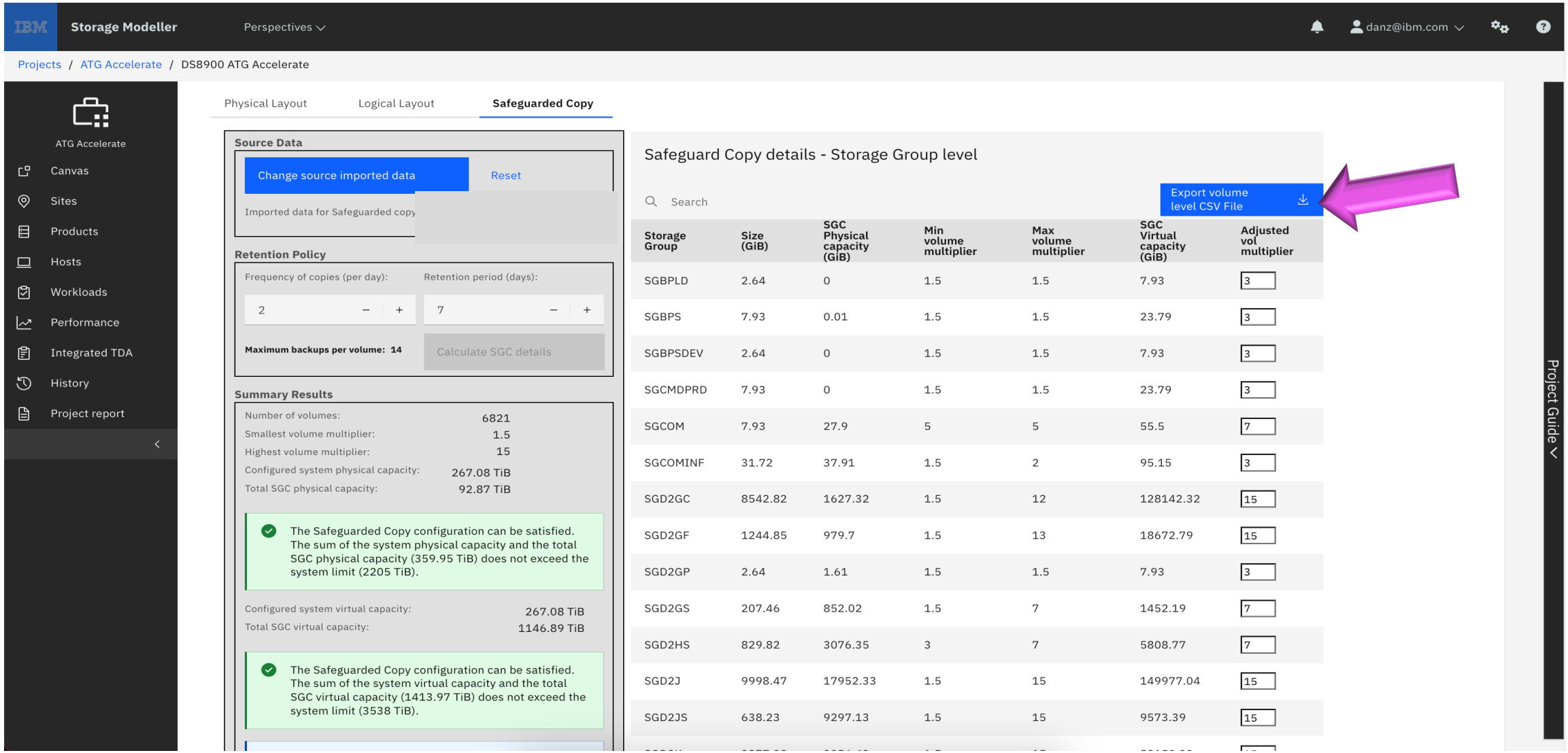
StorM – Export volume level CSV file



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ADVANCED TECHNOLOGY GROUP (ATG)

Acme Widgets – Safeguarded Copy Study

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Senior Storage Technical Specialist – DS8000 SME
IBM Advanced Technology Group
danz@ibm.com

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Safeguarded Copy current planning

- Data is replicated as a 2-Site Global Mirror
- SGC will be implemented using SGC at the Secondary Site with logical isolation
- RMF data shows online production capacity as 93 TB
- Possible planned Safeguarded Copy management policy:
  - ✓Backup every 12 hours with a retention period of 7 days
- Purpose of this study: help to estimate the required physical and virtual capacity for SGC

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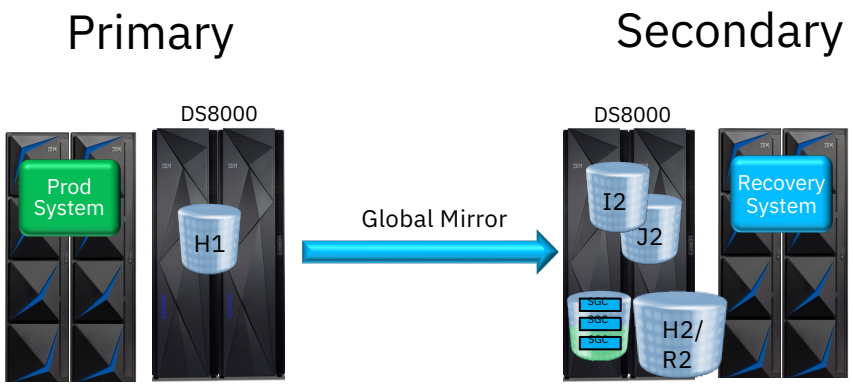
Safeguarded Copy logical isolation at Secondary site



Safeguarded Copy on Global Mirror Secondary

Global Mirror suspended with consistency to enable consistent data copy to be used to perform captures

No production impact with SGC capture process but Global Mirror will be paused for some seconds each time a Safeguarded Backup is taken

Practice volumes can be used as recovery volumes but can only be used as practice volumes or recovery volumes.

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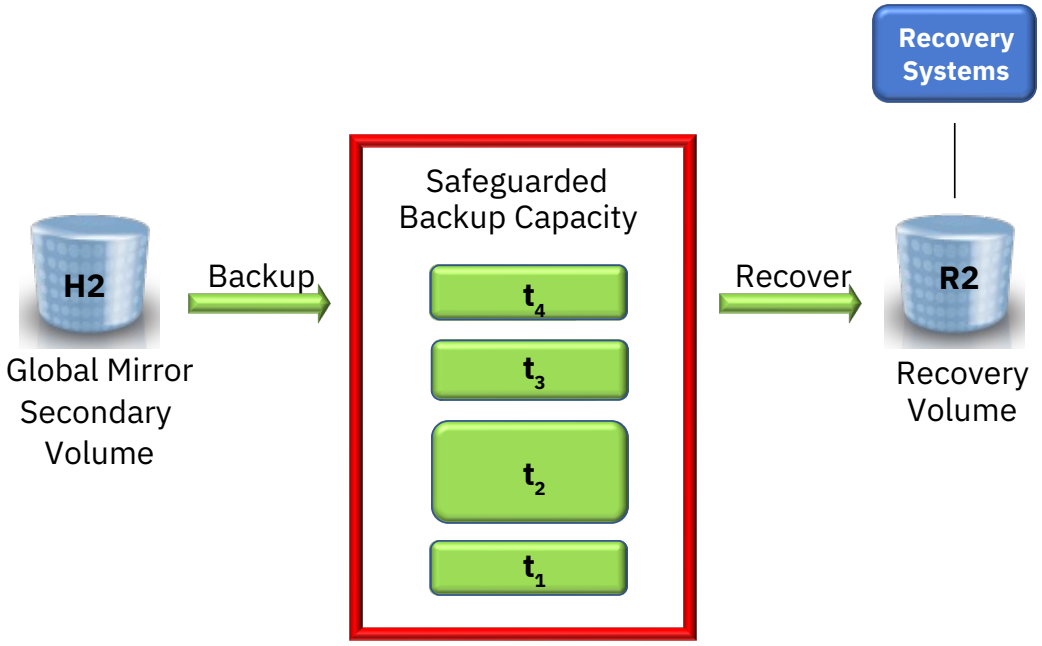
Two components of capacity for Safeguarded Copy

- Safeguarded Backup Capacity
  - ✓Required to store backup data
  - ✓Required physical capacity depends on change rate on H1, frequency of backups, retention period of backups and threat scenarios to cover

- Recovery volume (R2)
  - ✓Required to recover backups for analysis and / or restore
  - ✓Same virtual capacity as H1
  - ✓Physical capacity depends on purpose



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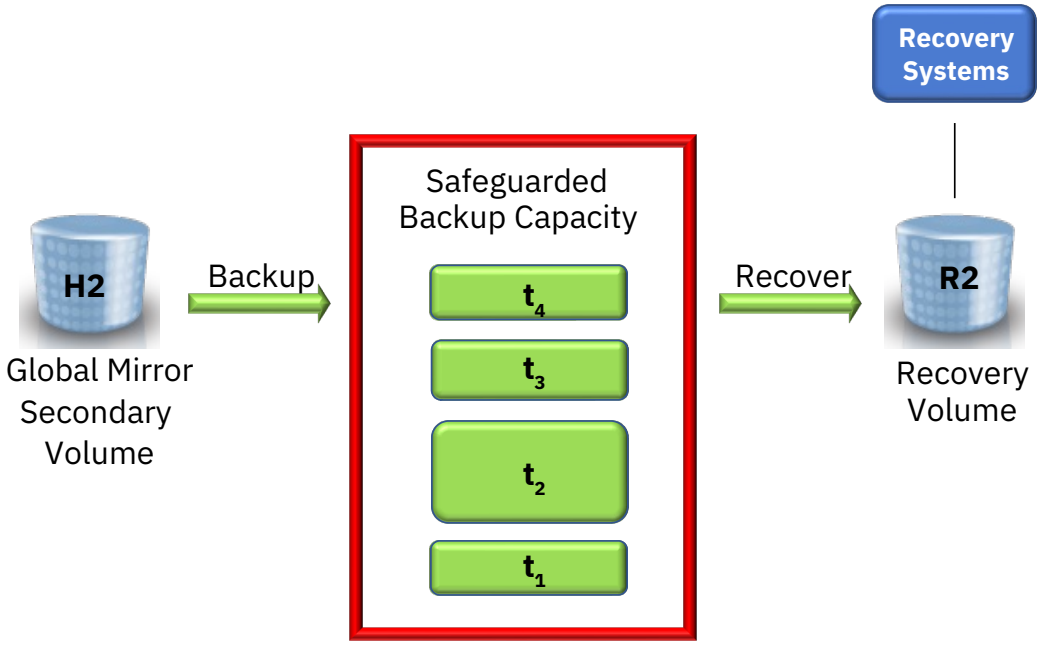
Safeguarded Copy Backup capacity

- Required capacity for regular backup without incident depends on
  - ✓Data change rate to production volume
  - ✓Retention period for backups
  - ✓Frequency of backups

- Threat scenarios to cover
  - ✓Selective manipulation or deletion of small amounts of data: little extra capacity required, depends on client expectations
  - ✓Worst case: ransomware attack, all data is encrypted before attack is recognized; requires additional 100% of production capacity



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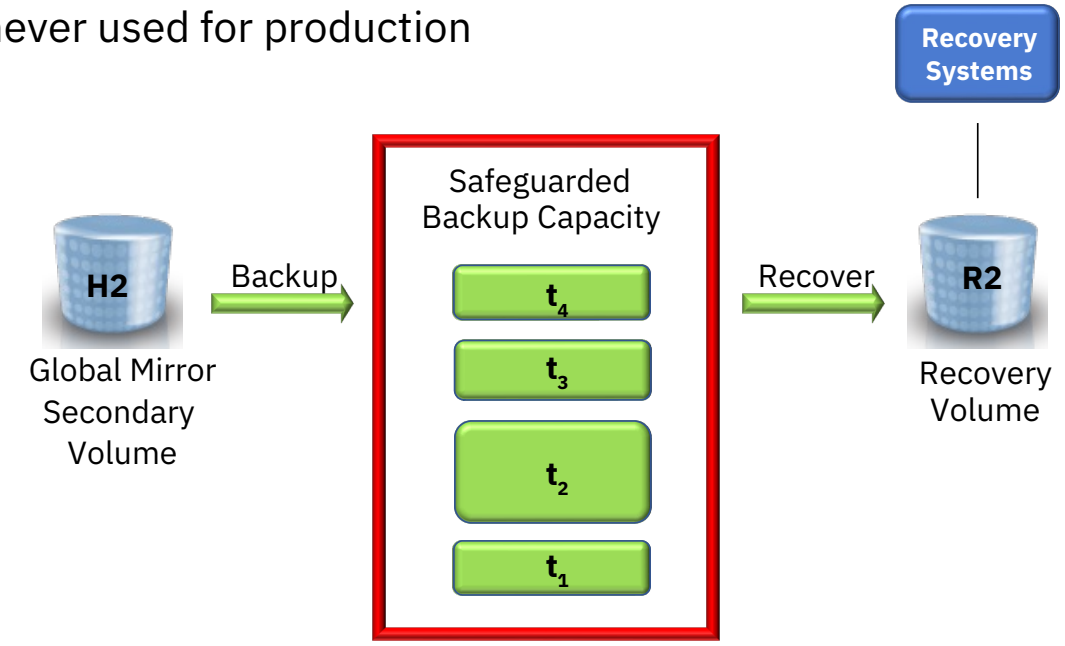
Recovery volume capacity depends on usage after recovery

- Mostly read only for forensic analysis & to restore back to (any) of the production volumes (H1)
  - ✓Recover with NOCOPY option
  - ✓Small percentage of primary capacity (10% - 20%)
  - ✓The longer the recovery point is retained with production ongoing , the more capacity is needed for copy-on-write operations H2 ➜ R2
  - ✓The R2 DS8K volume set is a “Cyber Vault only” set which is never used for production
- Full read / write access for production
  - ✓Recover with COPY option
  - ✓Same physical capacity as H1
  - ✓The R2 DS8K volume set is used for Cyber Vault AND for production in case of an event



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Determination of data change rate

- Base: RMF data, SMF record type 74-5 (Cache Activity), field R745DCTD (Cache to DASD XFRs)
  - R745DCTD = Tracks de-staged during SMF interval
  - 1 CKD track = 56,664 Bytes
  - GiB destaged / interval = R745DCTD * 56,664 /1024^3
  - Changed amount during retention period = GiB destaged / interval * interval period * retention period
  - Estimation is at the upper end: it does not consider rewrites of data within the same backup
- Client RMF data available for:
  - December 28, 2024– January 4, 2024
  - Estimation is based on available data
  - Workload changes, or incomplete data, render the estimation invalid

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Safeguarded Copy Capacity Estimates – 12 Hour Interval with a 7 Day Retention

- Protected — Assumption: Protected data is 93 TB
- SGC Backup — Capacity estimates for SGC based on measurement data from RMF
- Full Recovery — Fully provisioned Recovery volumes

Volume / Capacity Type	Physical Capacity	Virtual Capacity
SGC Backup Capacity (“SGBC”)	93 TB	1,262 TB
Source Volumes (H2)	93 TB	93 TB
Recovery Volumes (R2)	93 TB	93 TB
Global Mirror Journal Volumes (J2)	28 TB	93 TB
Total	**307 TB**	**1,541TB**

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Additional considerations

- Once the required capacity is determined, the DS8900F configuration can be created
  - ✓ System must be able to handle peak write workload of primary (H1) system
    - ➢ Global Copy secondary workload
    - ➢ Safeguarded Copy backup workload
  - ✓ Basically 2 x the write workload of H1

- Sizing / disk modelling strategy:
  - ✓ Model Cyber Vault system from peak write interval of H1 system
  - ✓ Make sure utilization of resources like devices and device interfaces is at or below 30%

- Virtual capacity requirements are needed before implementation phase
  - ✓ SGC backup capacity (multiplier) is defined at the volume level and needs to be set to hold track changes for the retention period
  - ✓ Best approach for this analysis is using the SGCSizer capability provided by DS8900F R9.4 and CSM 6.9 or higher

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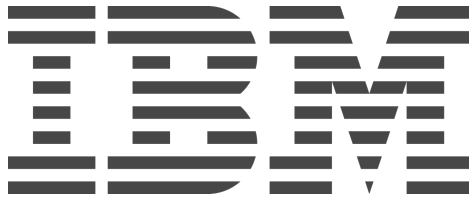
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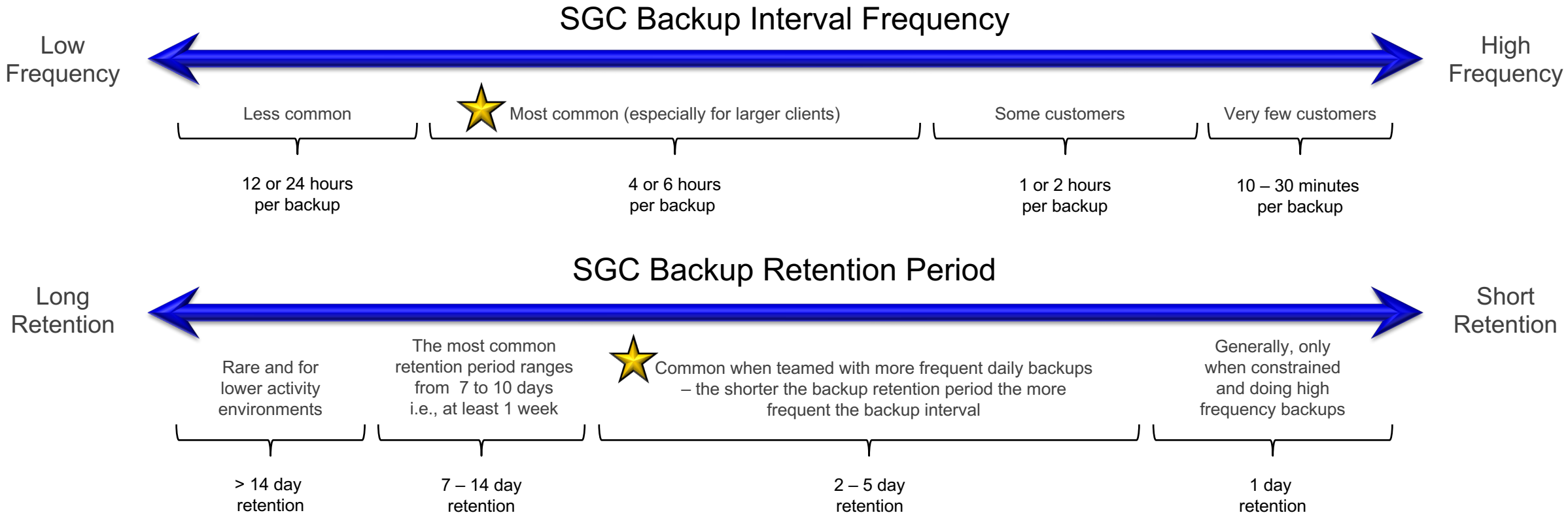
IBM DS8000 SGC – Backup Frequency & Retention Period – Early Adopters 2018-19

Safeguarded Copy Backup Interval Frequency & Retention Period should be determined by [1]*business requirements* to ensure that the frequency and retention period are relevant for business recovery. Safeguarded Copy can be complemented with offline backup to virtual tape for longer term retention. e.g., create an offline backup after data validation.



[1]For more on *business requirements* see Chapter 2 in IBM Redbook ***IBM DS8000 Safeguarded Copy (Updated for DS8000 Release 9.3)***

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IBM DS8000 SGC – Backup Frequency & Retention Period – Second Wave 2020-22

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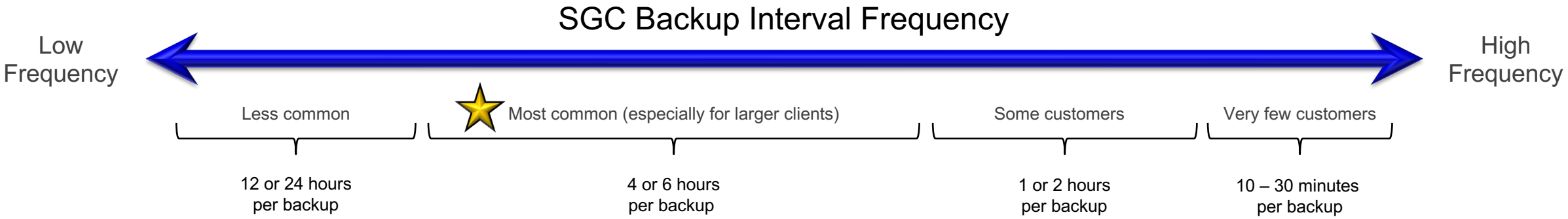

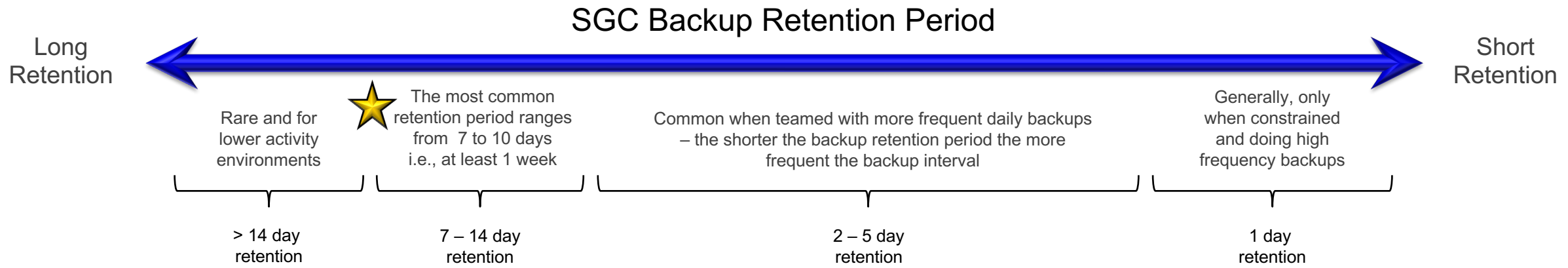

[1]For more on *business requirements* see Chapter 2 in IBM Redbook ***IBM DS8000 Safeguarded Copy (Updated for DS8000 Release 9.3)***

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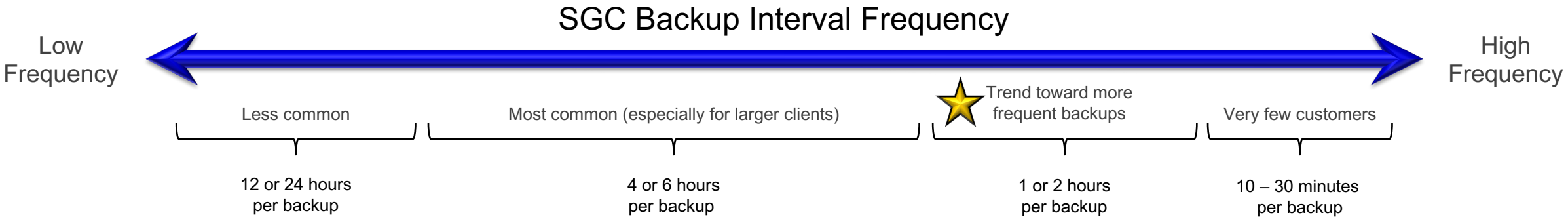
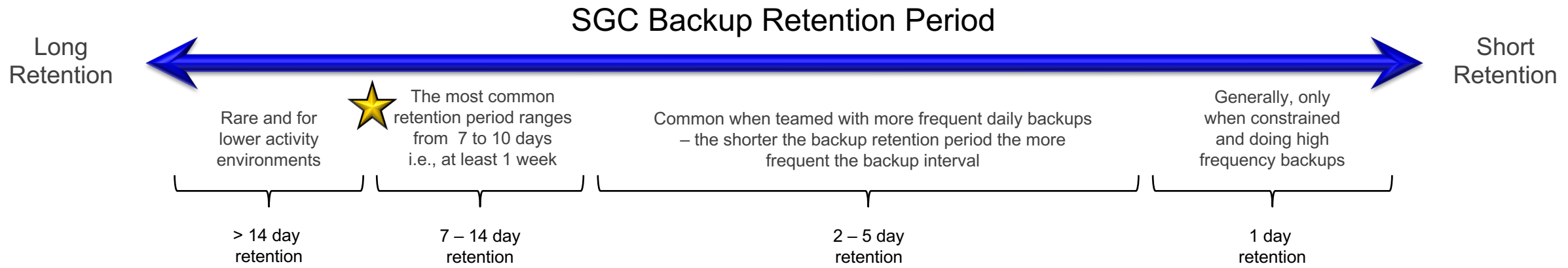
IBM DS8000 SGC – Backup Frequency & Retention Period – Current 2023+

Safeguarded Copy Backup Interval Frequency & Retention Period should be determined by [1]*business requirements* to ensure that the frequency and retention period are relevant for business recovery. Safeguarded Copy can be complemented with offline backup to virtual tape for longer term retention. e.g., create an offline backup after data validation.





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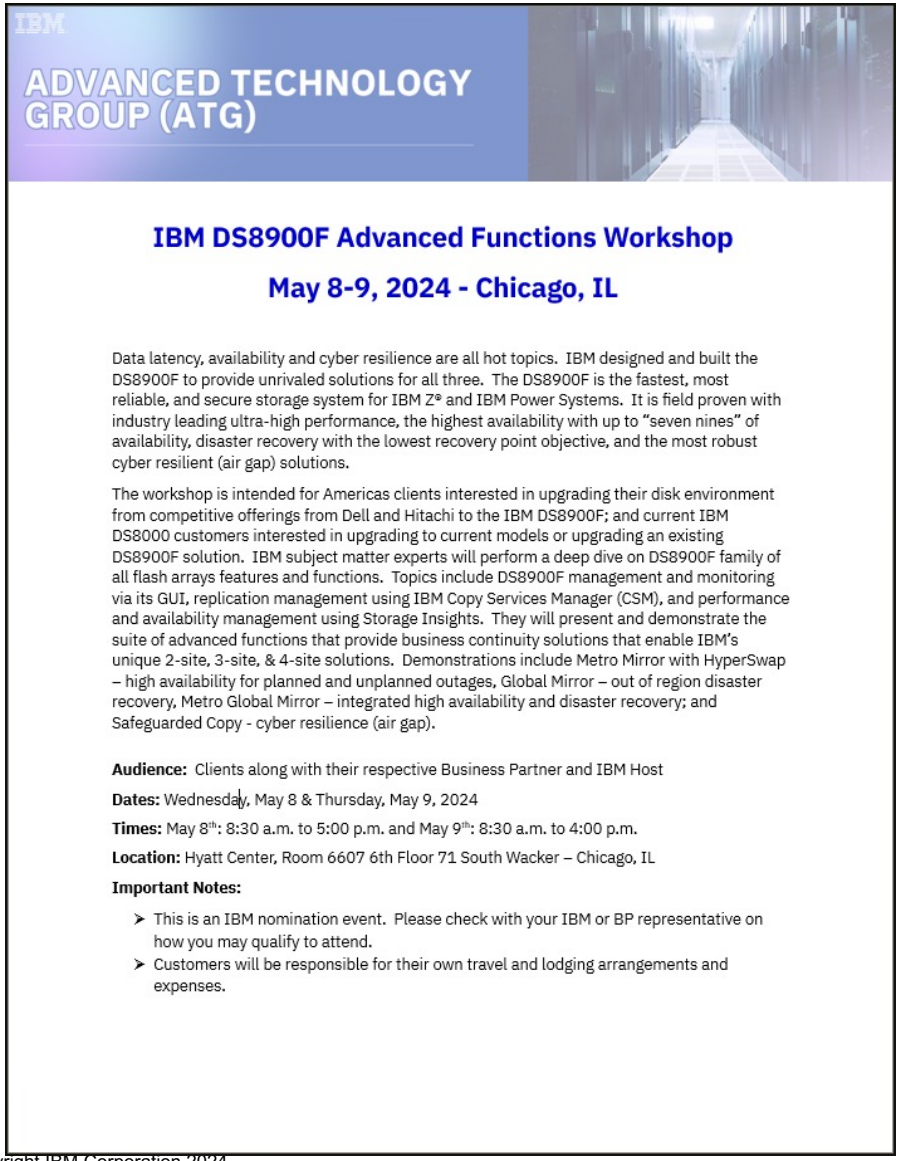
IBM DS8900F Advanced Functions Workshop in Chicago May 8th & 9th



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ADVANCED TECHNOLOGY GROUP (ATG)

IBM DS8900F Advanced Functions Workshop

May 8-9, 2024 - Chicago, IL

Data latency, availability and cyber resilience are all hot topics. IBM designed and built the DS8900F to provide unrivaled solutions for all three. The DS8900F is the fastest, most reliable, and secure storage system for IBM Z® and IBM Power Systems. It is field proven with industry leading ultra-high performance, the highest availability with up to "seven nines" of availability, disaster recovery with the lowest recovery point objective, and the most robust cyber resilient (air gap) solutions.

The workshop is intended for Americas clients interested in upgrading their disk environment from competitive offerings from Dell and Hitachi to the IBM DS8900F; and current IBM DS8000 customers interested in upgrading to current models or upgrading an existing DS8900F solution. IBM subject matter experts will perform a deep dive on DS8900F family of all flash arrays features and functions. Topics include DS8900F management and monitoring via its GUI, replication management using IBM Copy Services Manager (CSM), and performance and availability management using Storage Insights. They will present and demonstrate the suite of advanced functions that provide business continuity solutions that enable IBM's unique 2-site, 3-site, & 4-site solutions. Demonstrations include Metro Mirror with HyperSwap – high availability for planned and unplanned outages, Global Mirror – out of region disaster recovery, Metro Global Mirror – integrated high availability and disaster recovery; and Safeguarded Copy - cyber resilience (air gap).

Audience: Clients along with their respective Business Partner and IBM Host

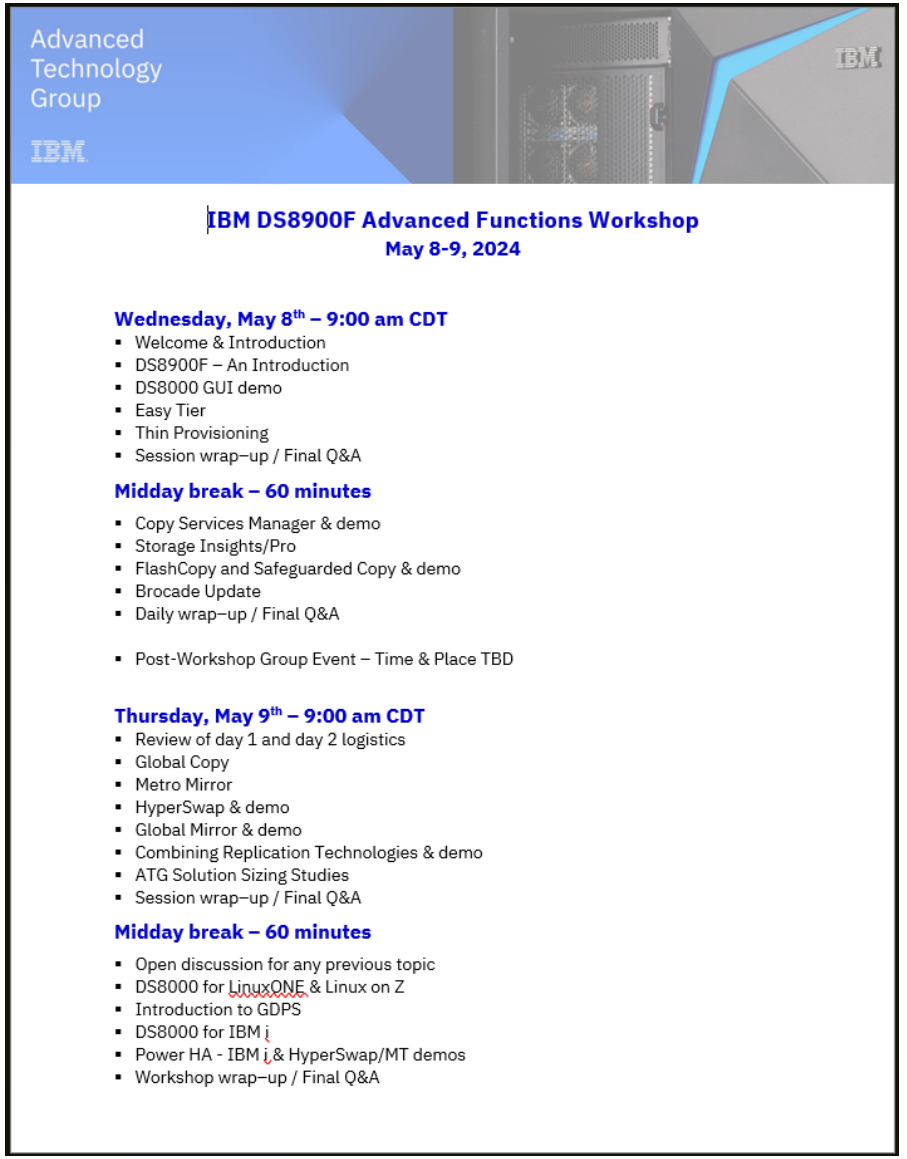
Dates: Wednesday, May 8 & Thursday, May 9, 2024

Times: May 8th: 8:30 a.m. to 5:00 p.m. and May 9th: 8:30 a.m. to 4:00 p.m.

Location: Hyatt Center, Room 6607 6th Floor 71 South Wacker – Chicago, IL

Important Notes:

- This is an IBM nomination event. Please check with your IBM or BP representative on how you may qualify to attend.
- Customers will be responsible for their own travel and lodging arrangements and expenses.



Advanced Technology Group

IBM

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IBM DS8900F Advanced Functions Workshop

May 8-9, 2024

Wednesday, May 8th – 9:00 am CDT

- Welcome & Introduction
- DS8900F – An Introduction
- DS8000 GUI demo
- Easy Tier
- Thin Provisioning
- Session wrap–up / Final Q&A

Midday break – 60 minutes

- Copy Services Manager & demo
- Storage Insights/Pro
- FlashCopy and Safeguarded Copy & demo
- Brocade Update
- Daily wrap–up / Final Q&A

- Post-Workshop Group Event – Time & Place TBD

Thursday, May 9th – 9:00 am CDT

- Review of day 1 and day 2 logistics
- Global Copy
- Metro Mirror
- HyperSwap & demo
- Global Mirror & demo
- Combining Replication Technologies & demo
- ATG Solution Sizing Studies
- Session wrap–up / Final Q&A

Midday break – 60 minutes

- Open discussion for any previous topic
- DS8000 for LinuxONE & Linux on Z
- Introduction to GDPS
- DS8000 for IBM i
- Power HA - IBM i & HyperSwap/MT demos
- Workshop wrap–up / Final Q&A

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Thank you!

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Accelerate with ATG Survey

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

You can access this 6-question survey via Menti.com with code 1708 6924 or

Direct link https://www.menti.com/alwhyze7z1gz

Or

QR Code

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