

IBM Storage Scale: Multitenancy Support

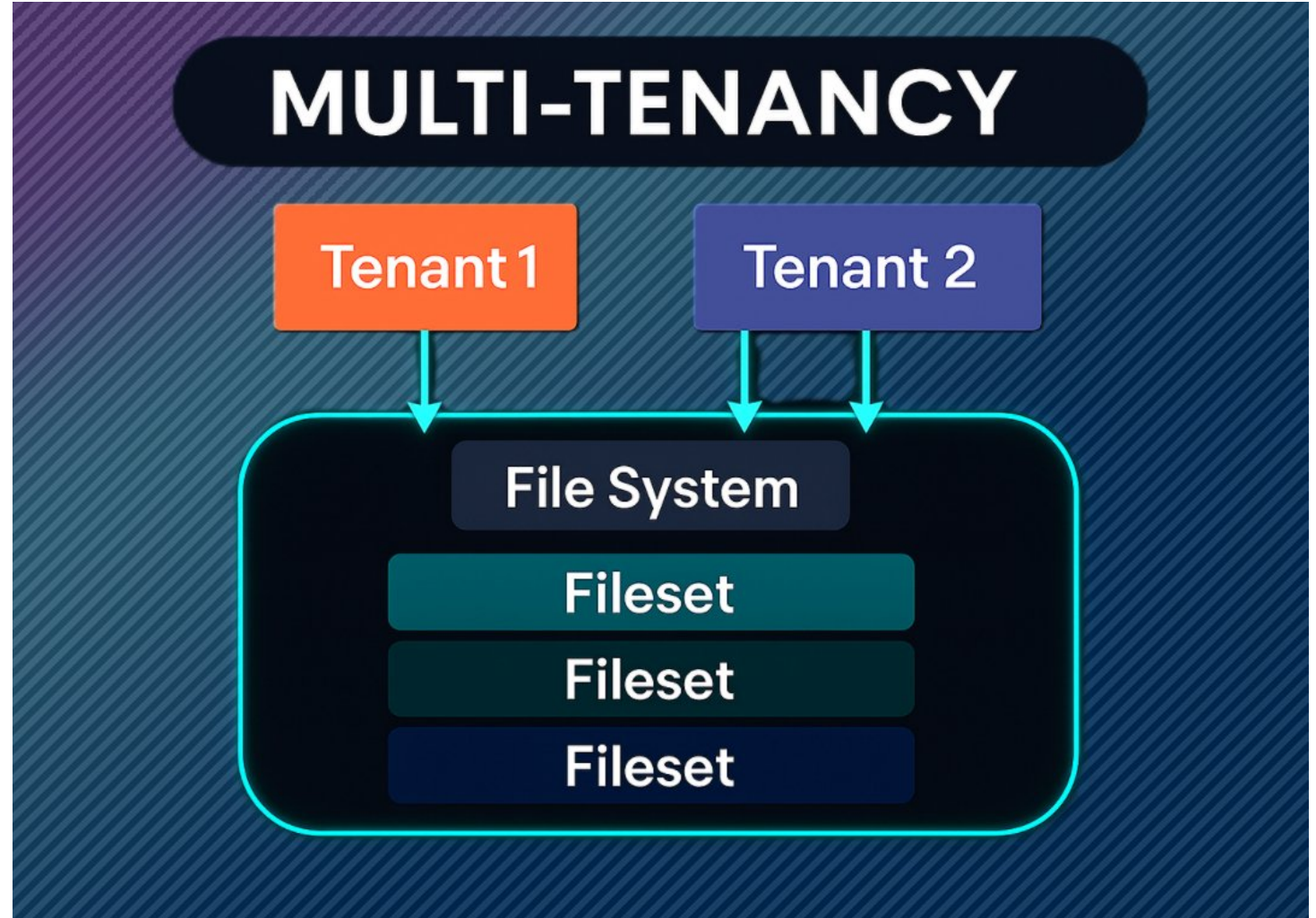
Secure, Scalable, and Efficient Storage for AI and Enterprise Workloads

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Performance is based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput or performance that any user will experience will vary depending upon many factors, including considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve results similar to those stated here.

Key Capabilities for Secure Multitenancy

“IBM Storage Scale & Storage Scale System is a multitenant storage solution allowing multiple tenants to securely share the same storage infrastructure while maintaining secure, logical separation”



Namespace Isolation

File Systems, Filesets and namespace isolation allow tenants to operate within separate logical partitions securely and efficiently.



Access Control

Remote Fileset Access Control restricts visibility and access to authorized filesets only, enhancing security.



Security & Data Privacy

Tenant-specific key encryption ensures data confidentiality and enables secure deletion for privacy.



Performance & Failure Isolation

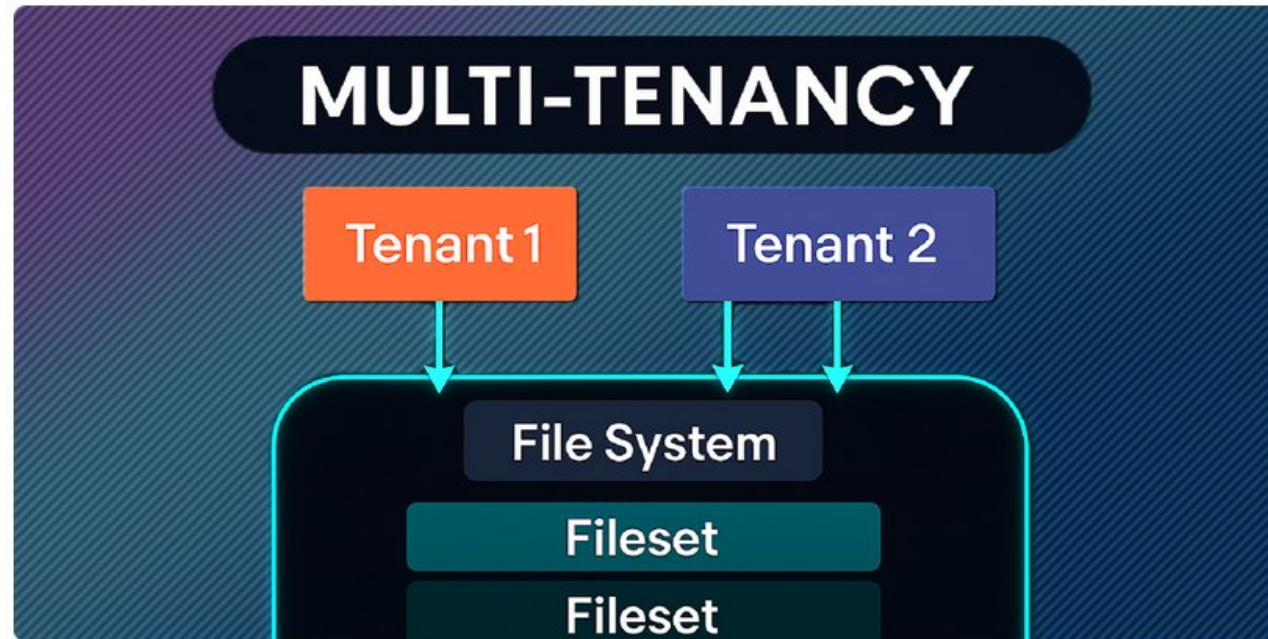
Ensures that each tenant operates independently without impacting others

Introducing Storage Scale Multi-Tenancy Reference Architecture

MD

By **Mathias Dietz** posted 5 days ago

Like



Introducing IBM Storage Scale Multi-Tenancy Reference Architecture

We're excited to announce the release of the **IBM Storage Scale Multi-Tenancy Reference Architecture (Version 2.0.4)** - a comprehensive guide for building secure, scalable, and efficient multi-tenant environments with IBM Storage Scale and IBM Storage Scale System 6000.

NEW!!!

We just announced the
Multi-tenancy Reference
Architecture Document
<https://lnkd.in/g/erV5mGGe>

Allow multiple tenants to utilize a common storage system

IBM Storage Scale System and IBM Storage Scale

Multitenancy in Scale with native POSIX access

- **Storage cluster:** data storage and management
- Each tenant owns a **client cluster** which remotely-mounts a file system from storage cluster
- Tenant accesses either a file system or a fileset
- Scale Client cluster independently (compute resource)

On **Storage cluster** allocate storage resources per tenant

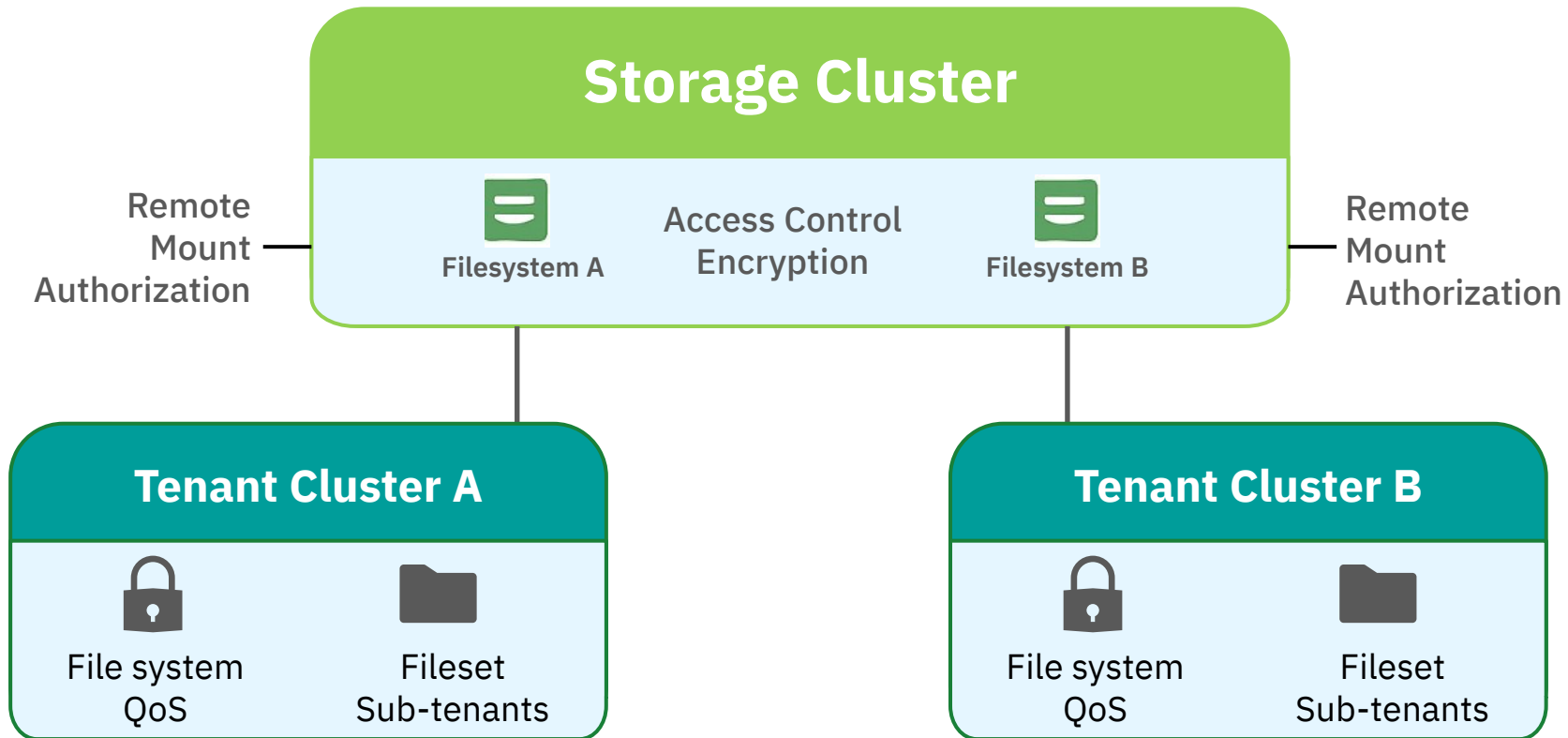
- Storage amount (limit with quotas / filesystem space)
- Read/write bandwidth (limit with QoS)

Prevent a tenant from accessing or damaging another tenant's data

Allow the tenant control over the allocated storage to the extent possible

File System Multitenancy

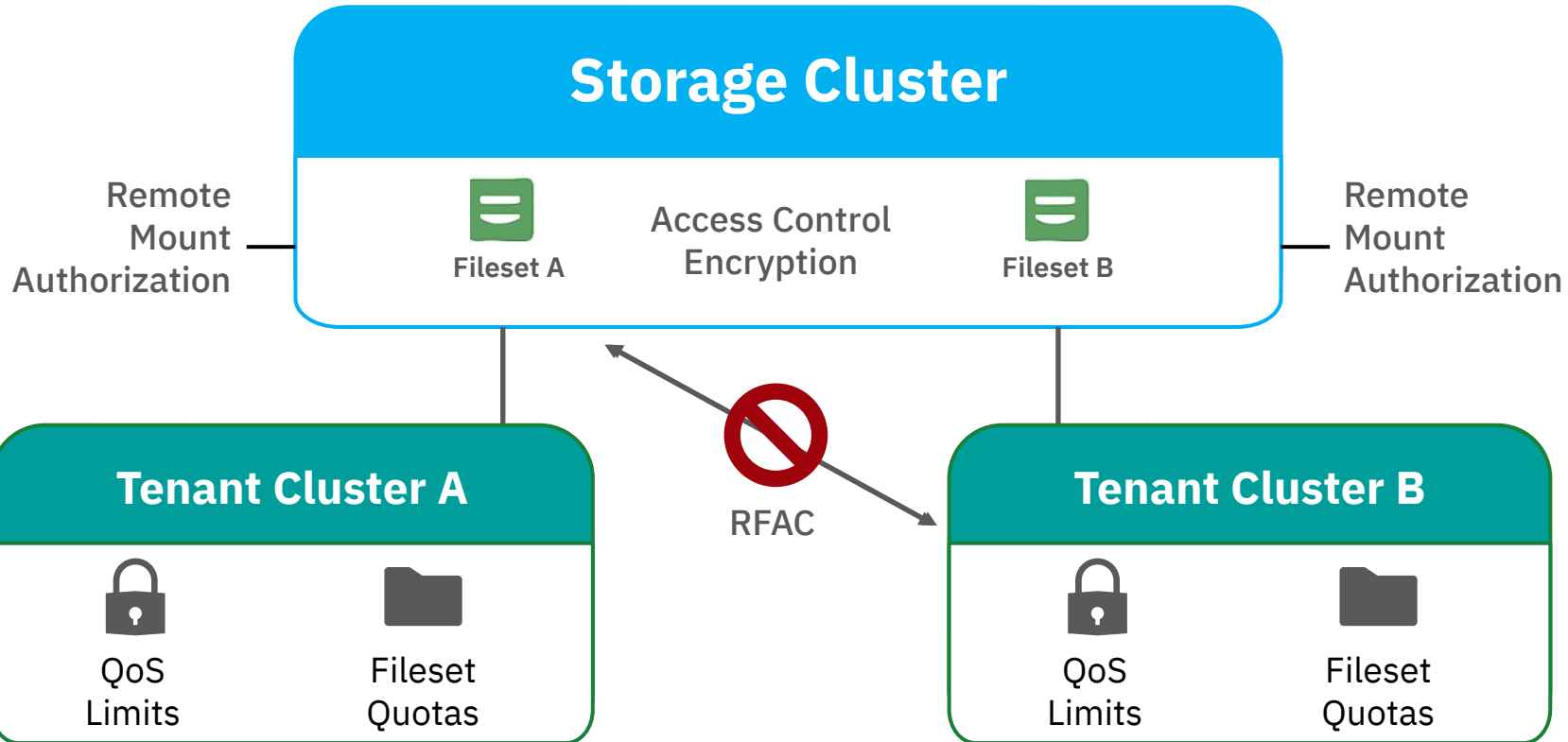
Secure Resource Sharing



Each tenant mounts a **dedicated file system** from the storage cluster with enforced **QoS**, encryption, and access control. Better **failure isolation**. Suited for **small number of tenants**.

Fileset Multitenancy

Fine-grained Resource Sharing



Filesets provide namespace isolation, quotas, encryption, and QoS per tenant for granular control. Suited for **large number of tenants**.

What to choose File System or Fileset ?

Use File System Multitenancy

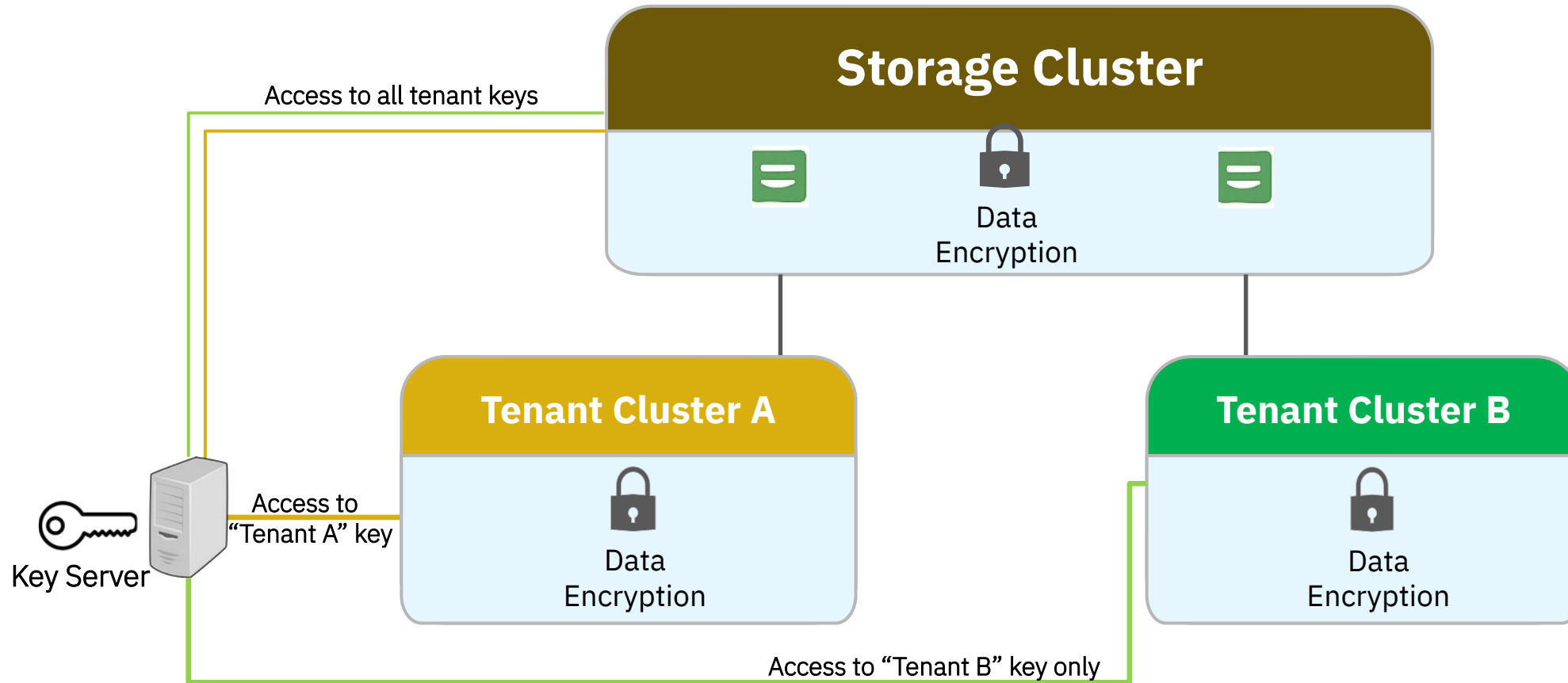
- Dozens of tenants
- Stringent security separation
- Better failure isolation
- Enables independent filesets for sub-tenants

Use Fileset Multitenancy

- Hundreds of tenants or more
- Departmental tenants
- Better resource sharing & utilization
- More fine-grained storage allocation – based on quotas

Secure Multitenancy

Data Encryption with tenant keys



Each tenant uses a dedicated encryption key to encrypt the data.

Tenant Day-2 Management - I

- With 6.0.0.0, the **Storage Admin / provider** needs to perform the bulk of operation on behalf of a **tenant**
- Some offline communication needed between **tenant** and **Storage Admin**
 - The GUI automation will make the exchanges between tenant and storage seamless – **Comes with 6.0.1.0**
- Future releases will give more capabilities to the **tenant** admin

Tenant Day-2 Management - II

Storage Admin operations

- Extend/reduce capacity and inode **quotas**
- Extend or reduce **QoS** throttles
- Create and link a **dependent fileset** inside the tenant fileset
- Set **ILM** policies (placement/migration/encryption) on the file system
- Take **snapshots** of the tenant fileset
- Restore tenant fileset from snapshot
- **Encryption** Key rewrap/rotation

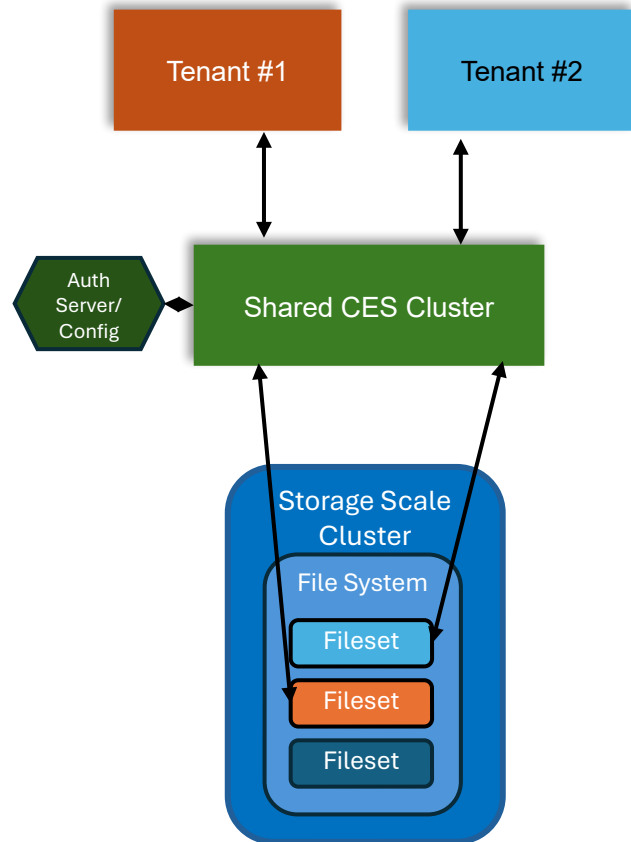
Tenant operations

- Manage files and folders including ACLs
- Copy/Restore individual files from snapshot
- Take backup of the tenant fileset using **mmbackup** command with **--allow-backup-on-remote** option
- Run LIST ILM policy against the fileset using **mmapplypolicy** command with **--allow-scan-on-remote** option

Protocol Multi-tenancy

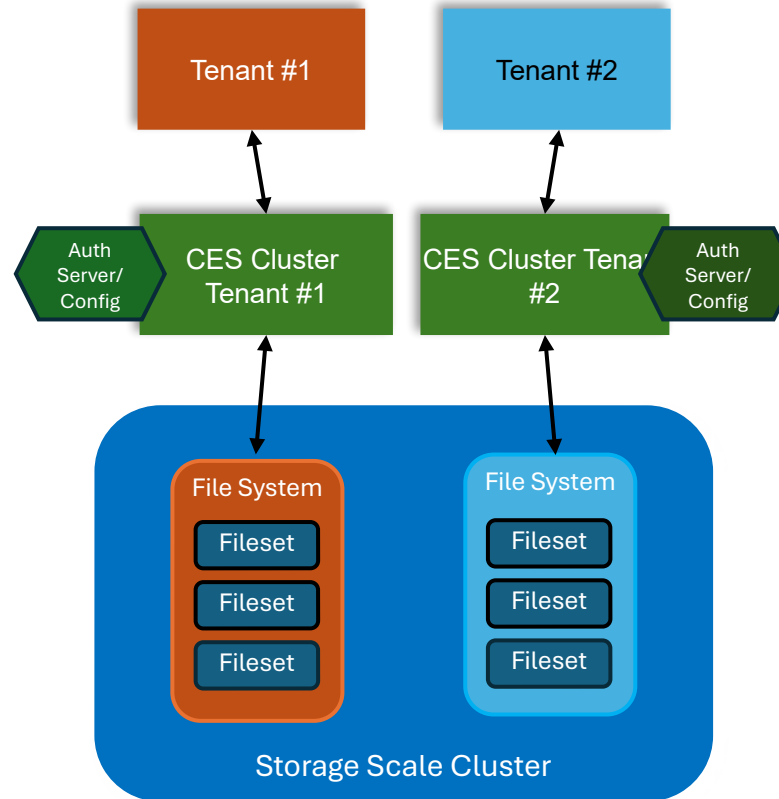
IBM Storage Scale Protocol Multitenancy (Storage admin managed)

Shared CES Cluster



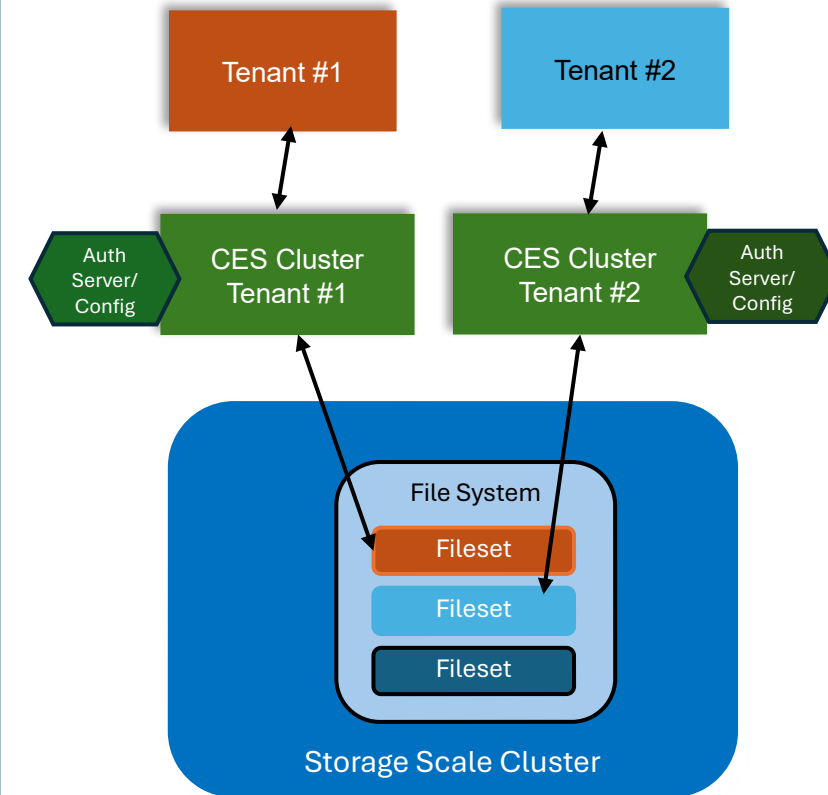
- CES Cluster managed by storage admin
- Shared Authentication Env.
- Isolation through Protocol Security (Exports/ACLs)
- Quotas / Qos on Fileset level

Per tenant CES Cluster with dedicated Filesystems



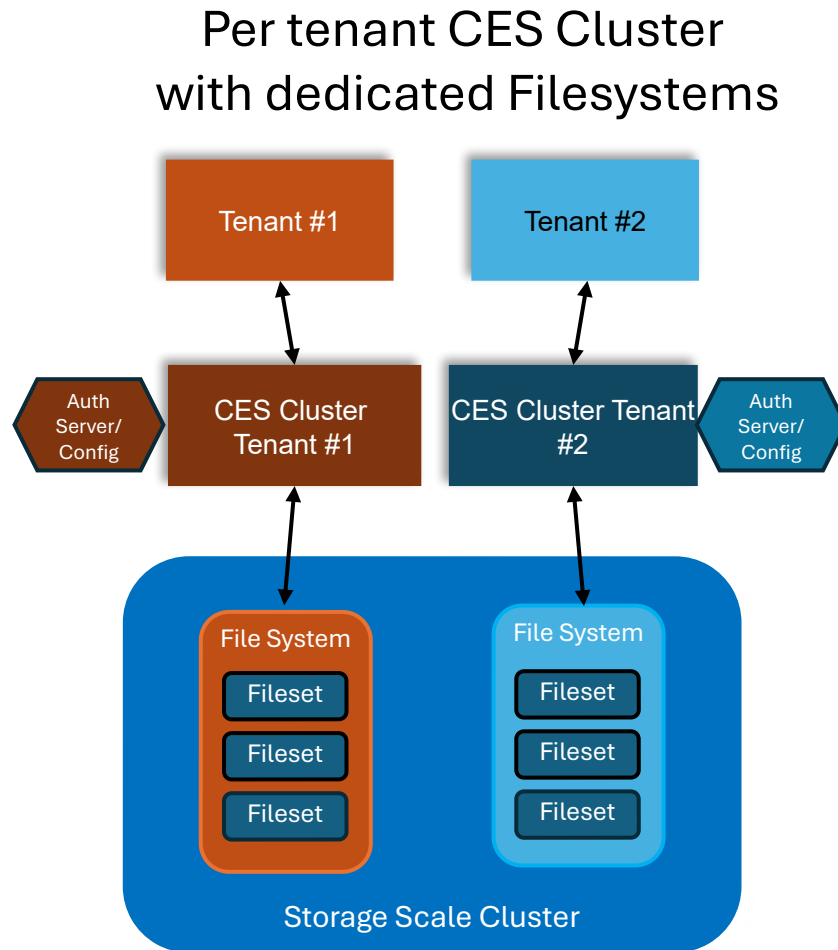
- CES Clusters managed by storage admin
- Dedicated CES Cluster and Authentication env. per tenant
- Additional failure isolation
- Security Isolation (optional)
 - per tenant Encryption keys
 - Filesystem mount permissions

Per tenant CES Cluster with shared filesystem

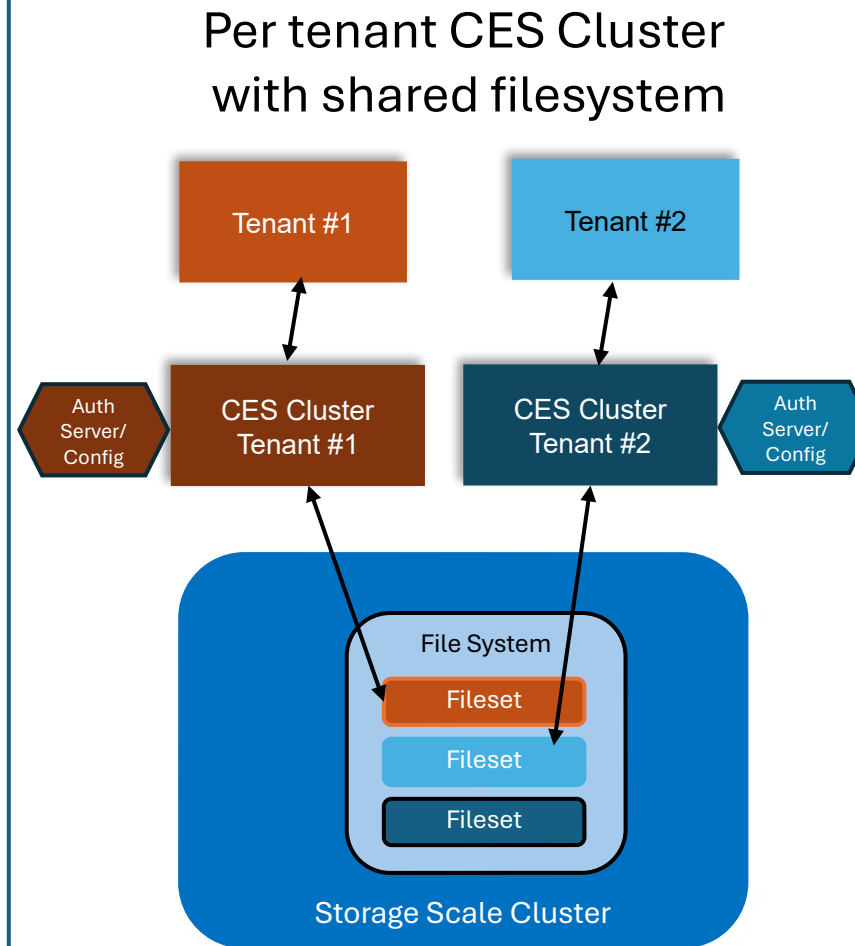


- CES Clusters managed by storage admin
- Dedicated CES Cluster and Authentication env. per tenant
- Additional security (optional)
 - per tenant Encryption keys
 - RFAC

IBM Storage Scale Protocol Multitenancy (**Tenant admin managed**)



- Dedicated CES Cluster and Authentication env. per tenant
- **Additional security & failure isolation**
 - per tenant Encryption keys
 - Filesystem mount permissions



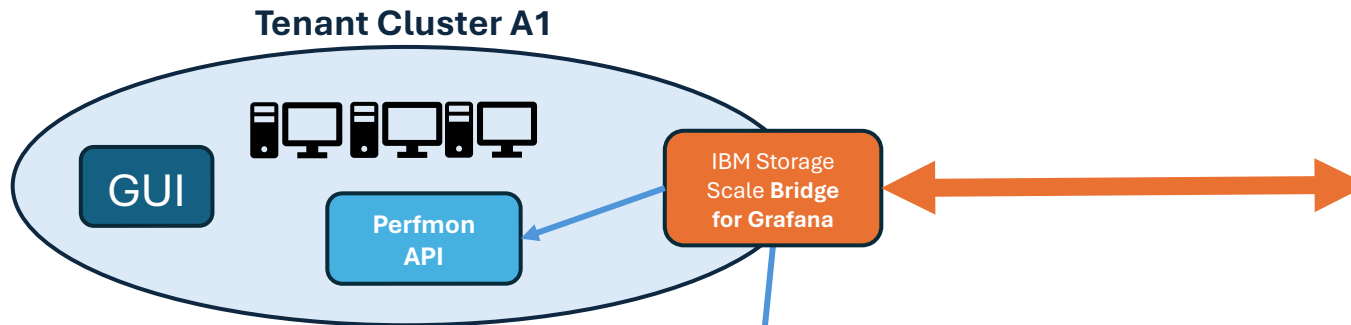
- Dedicated CES Cluster and Authentication env. per tenant
- **Additional security**
 - per tenant Encryption keys
 - RFAC

Multi-tenant Observability

Multi Tenant Observability



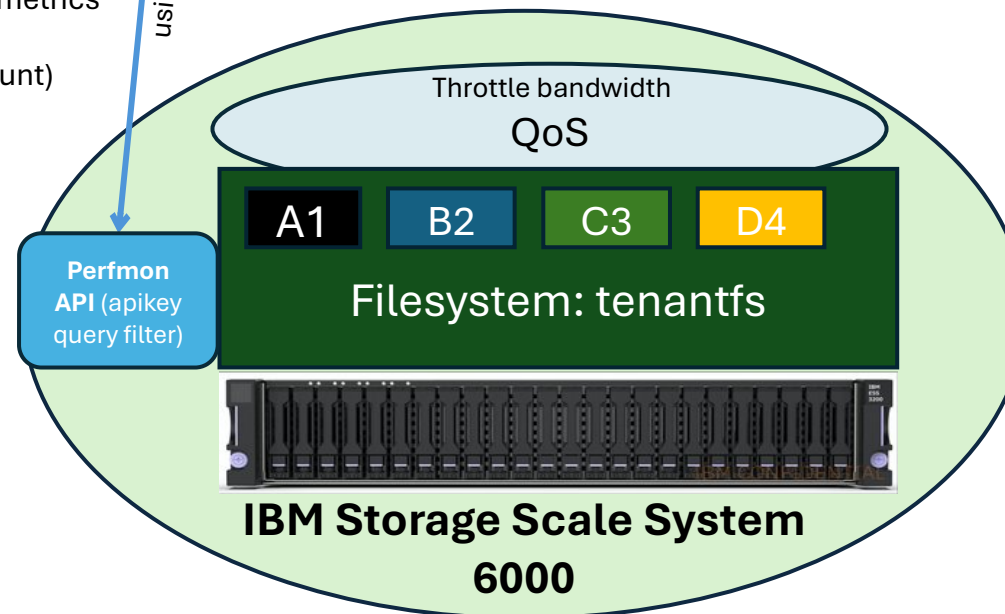
Grafana™ Dashboards



Each tenant cluster has its own perfmon instance collecting metrics of the local Scale client

Tenant Cluster Metrics

- Per Node filesystem IO, vfs ops, pagepool metrics
- Overall filesystem capacity
- Df sensor (tenant fileset only with bind mount)
- etc.



Storage metrics are collected in the storage cluster

Storage Cluster Metrics

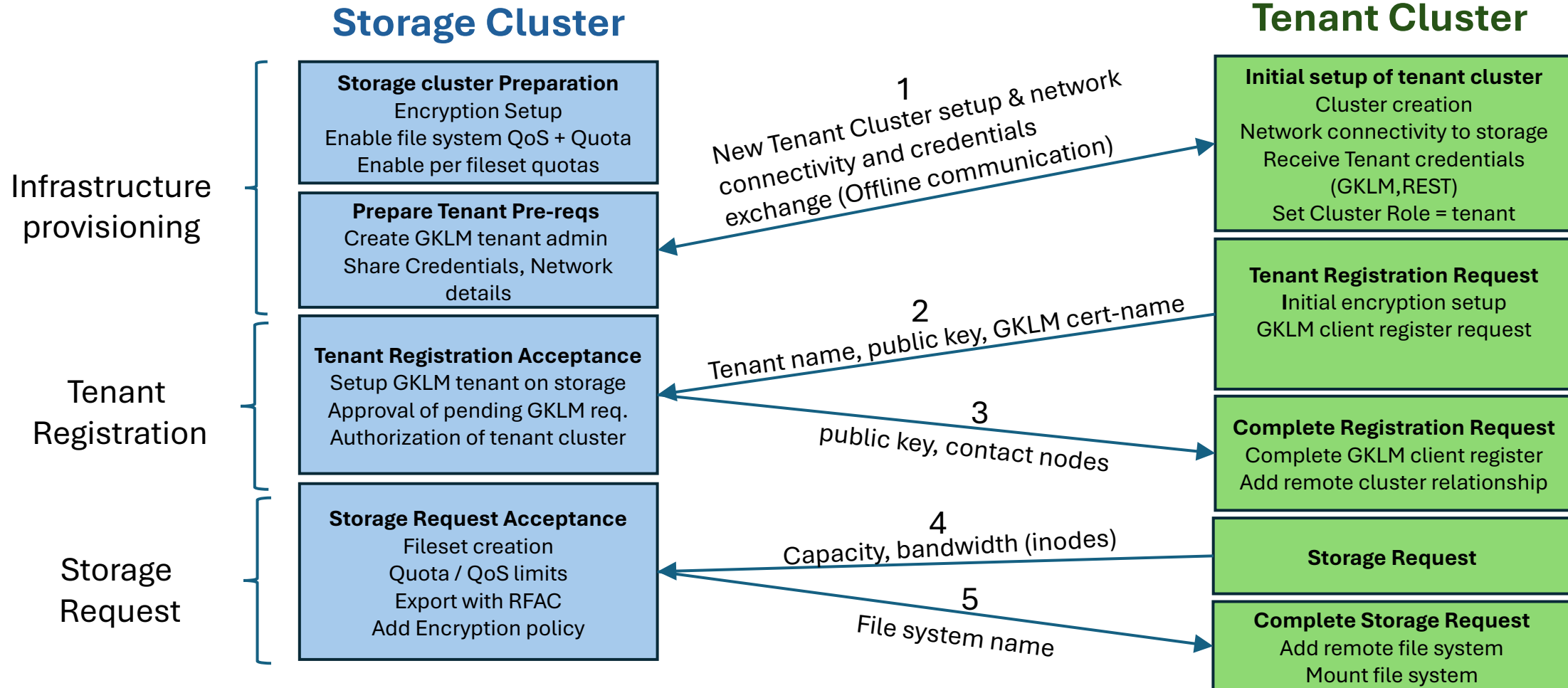
- QoS metrics
- AFM metrics
- Quota
- NSD metrics, pool metrics, etc

New in Scale 6.0.1:

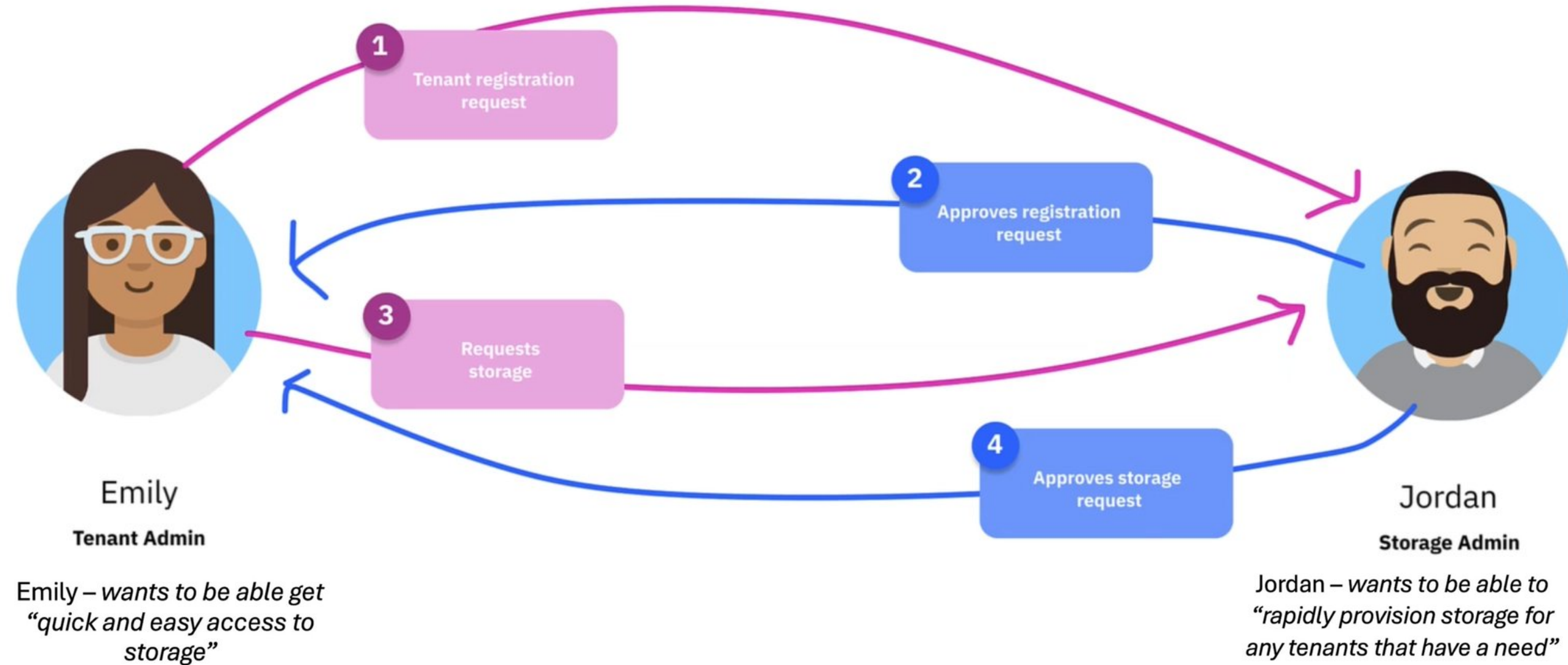
Selected metrics can be exposed to tenants by creating a tenant apikey with filter.
e.g. limit tenant A1 to get AFM metrics for fileset A1 only

Multi-tenancy Flow

Multitenancy Setup Flow



Upcoming Tenant Management using IBM Storage Scale GUI



Tenant Registration Request (Tenant Admin)

IBM Storage scale

Remote Storage Providers

Search

Storage Host	Registration Status	Cluster Name
No Remote Storage Providers No storage provider registrations found. Click 'Register' to add one.		

Items per page: 10 0-0 of 0 items

Register

Client Name	Activation Status
-------------	-------------------

1 of 1 page

Registration request

Storage provider IP

9.60.216.65

IP address or hostname of the storage-provider cluster.

Storage REST user

admin

REST API username for the storage cluster.

Storage REST password

REST API password for the storage cluster.

GKLM server

9.87.92.238 (MM_TENANT_1)

Select the GKLM server registered as TENANT role. Tenant details (name, client name, certificate UUID) will be looked up automatically from the GKLM settings.

Cancel

Submit

Registration Request Approval (Storage Admin)

IBM Storage scale

Tenant Systems

Search

Tenant Name	Cluster Name
MM_TENANT_1	10.16.130.48

Items per page: 10 1-1 of 1 items

Approve Registration Request

Review the tenant registration details below before approving.

Field	Value
Tenant Name	MM_TENANT_1
Tenant Cluster Name	10.16.130.48
Tenant Cluster IP	10.16.130.48
Status	PENDING
Client Name	MM_GPFS_TNT1_CNT
Registration ID	b7a29f82-265d-4512-8f53-4532d33b24c5
Certificate UUID	15882328130777966282_MM_TENANT_1_1771522695
Public Key	clusterName=mm-tenant-adm-1.gpf s.local clusterID=158823281307779 66282 genkeyForm...

Cancel

Approve

Status

Pending

1 of 1 page

Storage Request (Tenant Admin)

IBM Storage scale

Storage Requests

Search

☐ Storage alias	Status	Activation Status
No Storage Requests No storage requests found. Click 'Request Storage' to create one.		

Items per page: 10 0-0 of 0 items

Request storage capacity

Storage provider

9.60.216.65 (mm-storage-adm-1.gpfs.local)

Select the registered storage provider.

Capacity (TB)

100

Storage capacity to request in TB.

Bandwidth (GB)

10

Network bandwidth limit in GB.

Inode limit

1000000

Maximum number of inodes (files/directories).

Remote fileset

AN-Fset1

Name of the fileset on the storage provider.

Cancel

Submit request

Request Storage

Bandwidth (Mbps)	Comments
------------------	----------

1 of 1 page

Storage Request Approval (Storage Admin)

IBM Storage scale

Storage Requests

1 item selected

☒	Storage alias	Status	Tenant alias
☒	AN-Fset1	Pending	10.16.130.48 (10.16.130.48)

Items per page: 10 1-1 of 1 items

Provision Storage

Approve storage request for tenant: 10.16.130.48

☒ Select
Filesystem

☒ Configure
Fileset

☐ Review &
Approve

Configure Fileset

Configure the fileset details for the storage allocation.

Storage Alias (Fileset Name)
AN-Fset1

Capacity (GB)
100

of Files
1000000

Bandwidth
10

Cancel

Back

Next

Approve

Cancel

Bandwidth (Gbps)	Comments
10	

1 of 1 page

Storage Request Approval (Storage Admin)

IBM Storage scale

Storage Requests

1 item selected

Storage alias	Status	Tenant alias
AN-Fset1	Pending	10.16.130.48 (10.16.130.48)

Items per page: 10 1~1 of 1 items

Provision Storage

Approve storage request for tenant: 10.16.130.48

Select

Configure

Review & Approve

Select Filesystem

Choose an existing filesystem to provision storage for this tenant.

Filesystem Tier

FS1

Cancel

Next

Approve

Cancel

Bandwidth (Gbps)	Comments
10	

1 of 1 page

Storage Request Approval (Storage Admin)

IBM Storage scale

Storage Requests

1 item selected

Storage alias	Status	Tenant alias
☒ AN-Fset1	Pending	10.16.130.48 (10.16.130.48)

Items per page: 10 1-1 of 1 items

Provision Storage

Approve storage request for tenant: 10.16.130.48

Select Filesystem

Configure Fileset

Review & Approve

Review & Approve

Review the configuration before approving the storage request.

Request ID:

1396815c-0759-41a0-9fad-e7f605d9e920

Tenant Alias:

10.16.130.48 (10.16.130.48)

GKLM Tenant Name:

—

Filesystem Tier:

FS1

Storage Alias (Fileset Name):

AN-Fset1

Capacity (GB):

100

of Files:

1000000

Bandwidth:

10

Cancel

Back

Approve

Approve

Cancel

Bandwidth (Gbps)	Comments
10	

1 of 1 page

Storage Request completed (Tenant Admin)

IBM Storage scale

Remote Storage Providers

Search

Register +

Storage Host	Registration Status	Cluster Name	REST User	GKLM Tenant Name	GKLM Client Name	Activation Status
9.60.216.65	Approved	mm-storage-adm-1.gpfs.local	admin	MM_TENANT_1	MM_GPFS_TNT1_CNT	Active

Items per page: 10

1-1 of 1 items

1 of 1 page

Questions ?

