
AWS
re:Invent
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STG216

Amazon FSx Intelligent-Tiering

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AWS

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Principal Software Engineer, FSx
AWS

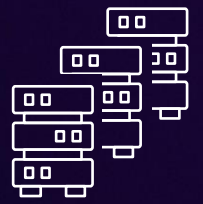
NEW

Generally available

Amazon FSx Intelligent-Tiering storage class

Available today on Amazon FSx for OpenZFS

Fully elastic
Automatically grows and shrinks to fit your data set as you add/delete data



Intelligently tiered
Automatically optimizes cost by tiering data based on access patterns

Low cost
Up to 85% lower cost than FSx SSD
Up to 20% lower cost than HDD-based NAS deployments on premises

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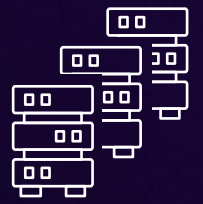

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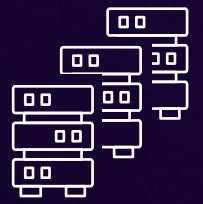

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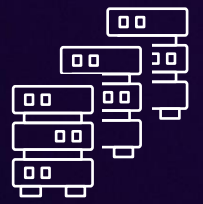

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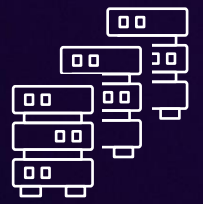

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Amazon FSx provides like-for-like NAS in the cloud

Fully managed

High performance

AWS integrations

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Amazon FSx for Windows File Server

Amazon FSx for NetApp ONTAP

Amazon FSx for OpenZFS

Amazon FSx for Lustre

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OpenZFS

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lustre

Amazon FSx for Lustre

Amazon FSx for OpenZFS: Broad fit for NAS workloads

Amazon FSx for OpenZFS: Broad fit for NAS workloads

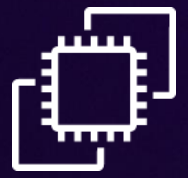
NAS capabilities
NFS, user/group quotas, compression, snapshots, clones, data replication

High performance
Sub-ms latencies, 21 GB/s throughput, > 1 million IOPS

No licensing costs
30%+ better price–performance vs. commercially licensed offerings

Amazon FSx for OpenZFS: Broad fit for NAS workloads

Databases
(Oracle, MySQL, PostgreSQL)



Semiconductor design
(EDA scratch, EDA front-end design)

Data analytics
(financial analytics, genomics analysis)

Machine learning
(image recognition, speech recognition)

Media and entertainment
(video streaming, special effects rendering)

Gaming
(game development, game streaming)

Customers need cost-effective storage for large data sets

Unpredictable growth makes **capacity planning** a challenge

Data sets are **growing** at an ever-faster rate

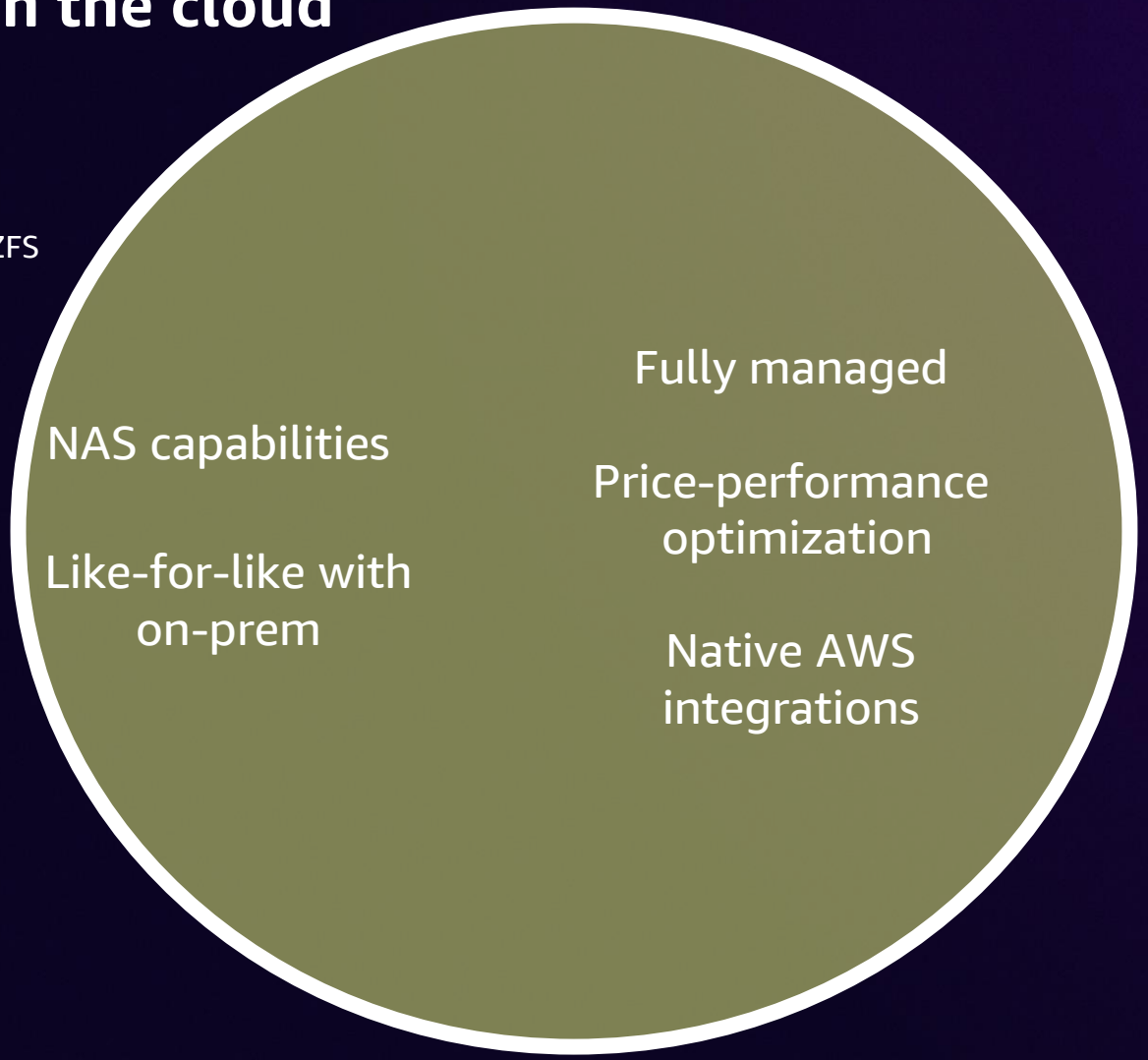
All-SSD storage is **cost-prohibitive** for HDD data sets

We went back to the drawing board…

NAS in the cloud

FSx

FSx for OpenZFS



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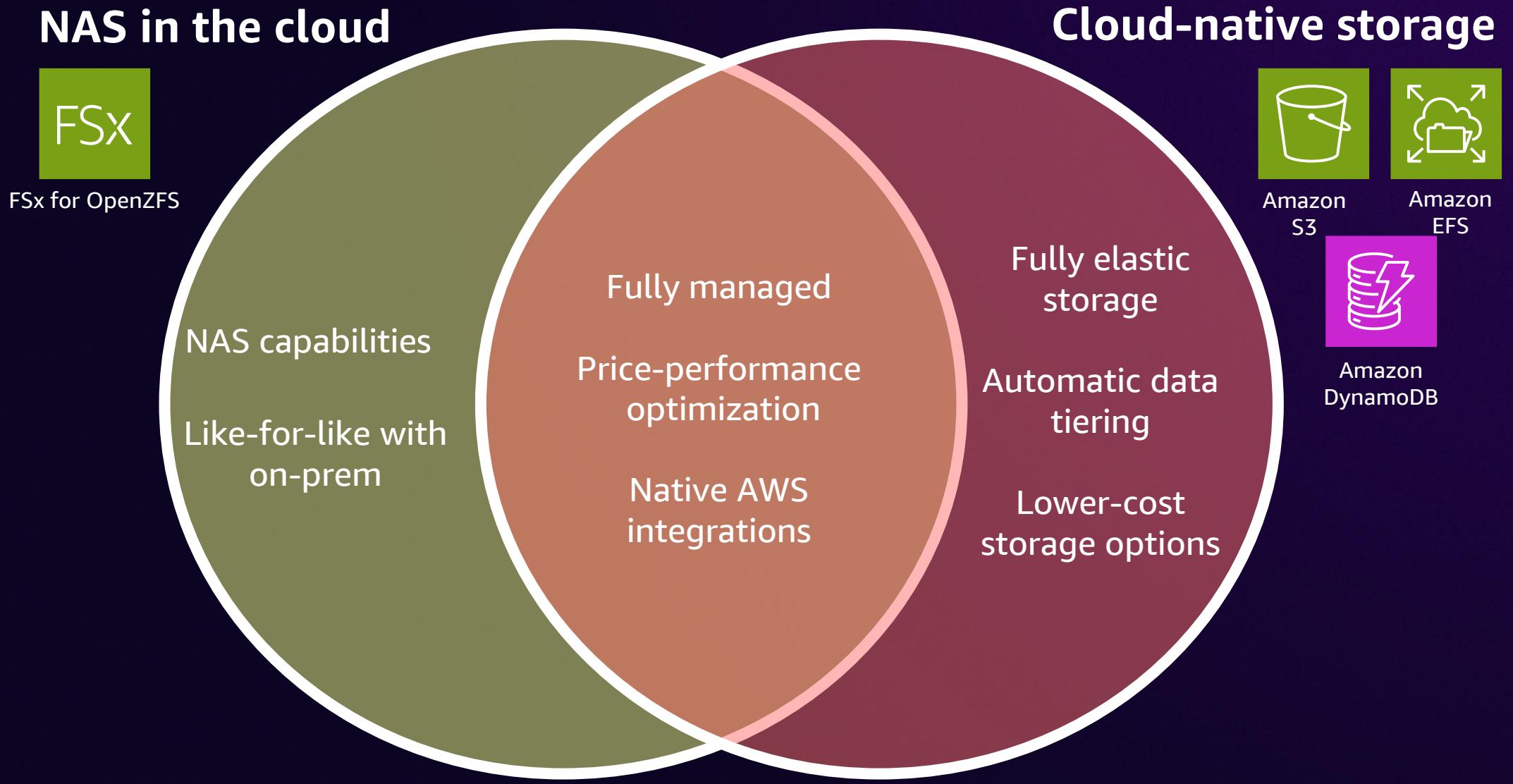
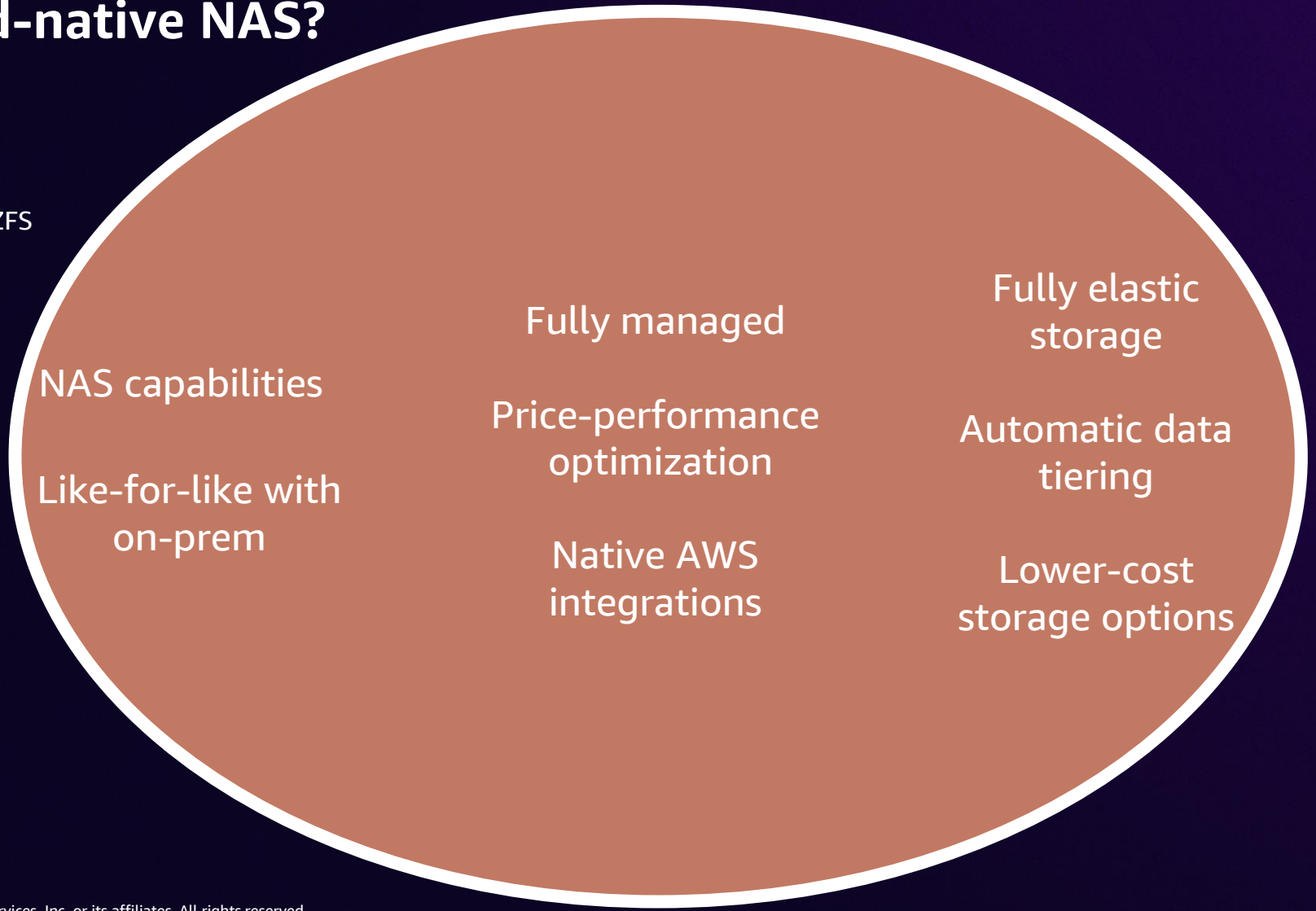


...to reimagine FSx for OpenZFS

Cloud-native NAS?

FSx for OpenZFS



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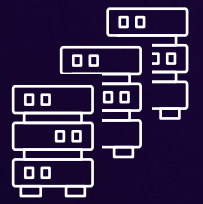

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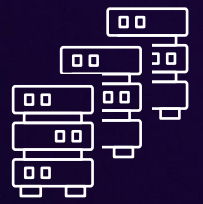

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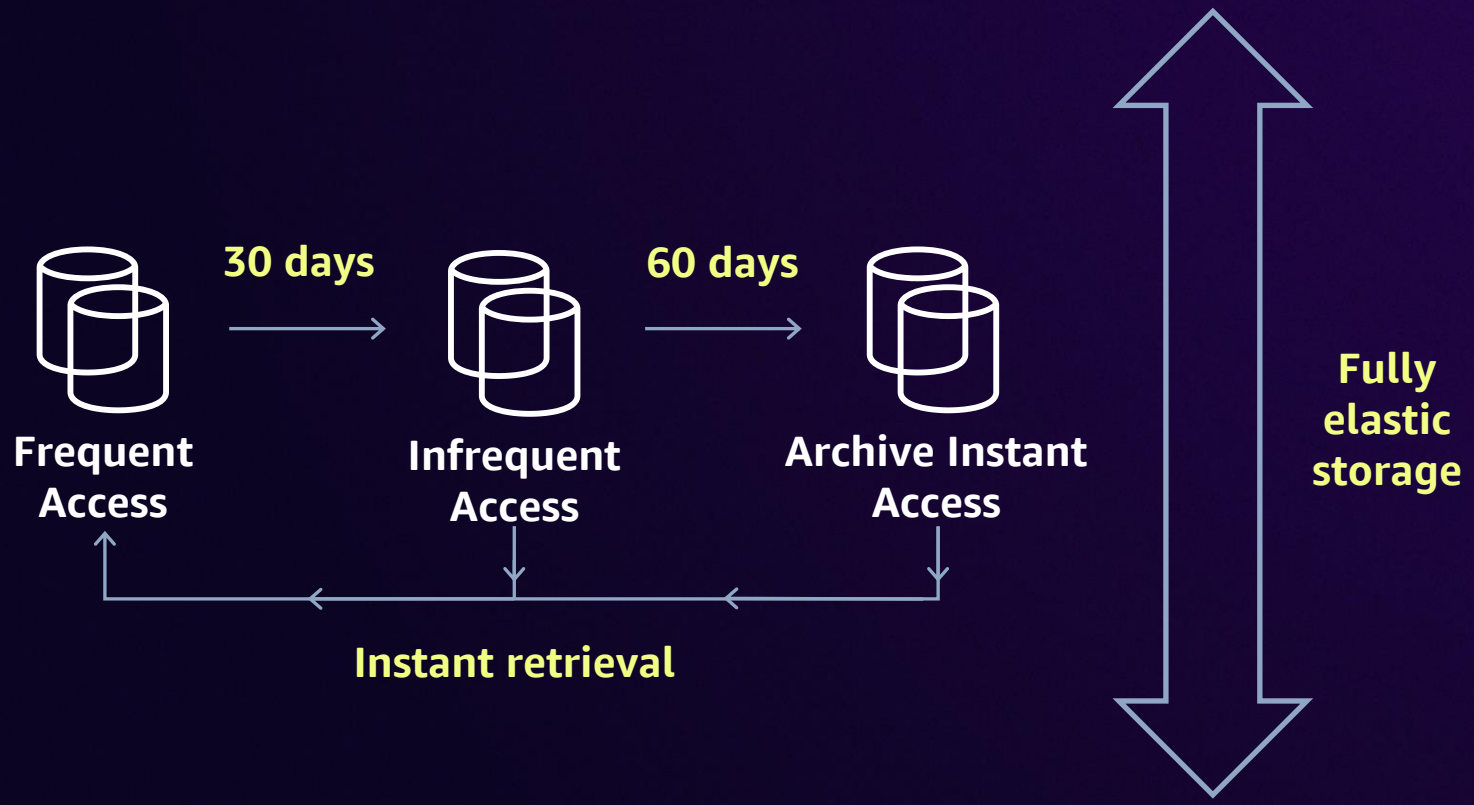
Fully elastic, intelligently tiered storage



Prices equivalent to S3

Prices shown for FSx Intelligent-Tiering in the US-EAST-1 region

Data stored

Frequent Access

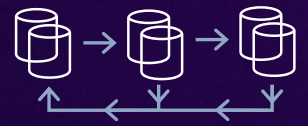
$0.023
per GB-mo

Infrequent Access

$0.0125
per GB-mo

Archive Instant Access

$0.004
per GB-mo



Monitoring and automation

$0.0006
per GB-mo

Requests

Read requests

$0.0004
per 1,000 requests

Write requests

$0.005
per 1,000 requests

Cost-effective for any mix of data

Prices shown for FSx Intelligent-Tiering in the US-EAST-1 region

	Data in Frequent Access	Data in Infrequent Access	Data in Archive Instant Access	Blended storage + request price ($/GB-mo)	Effective cost with compression enabled* ($/GB-mo)
Hot	80%	10%	10%	$0.035	$0.025
Typical	20%	20%	60%	$0.013	$0.007
Cold	10%	10%	80%	$0.008	$0.004

* Based on typical compression savings of 50% for general-purpose file sharing workloads

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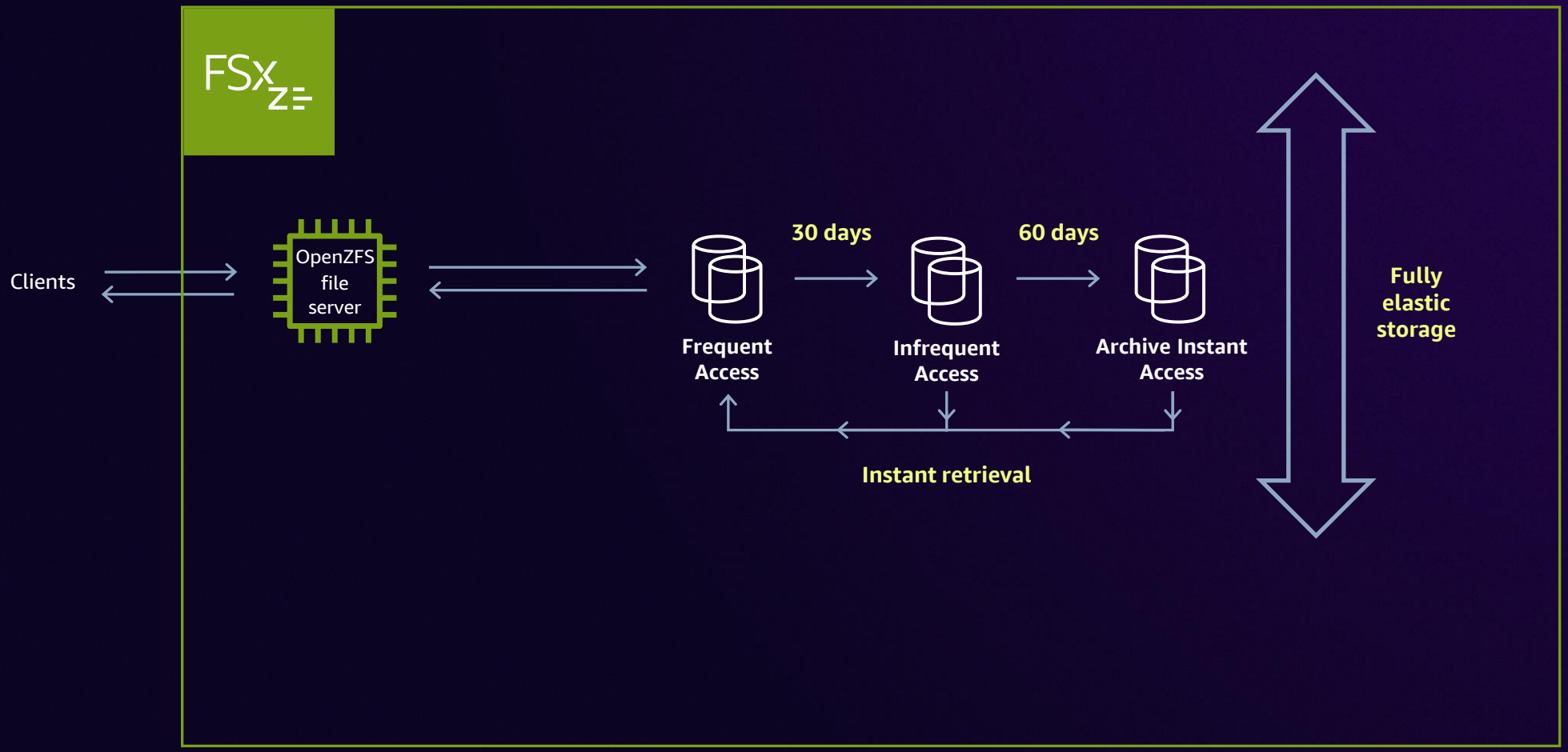
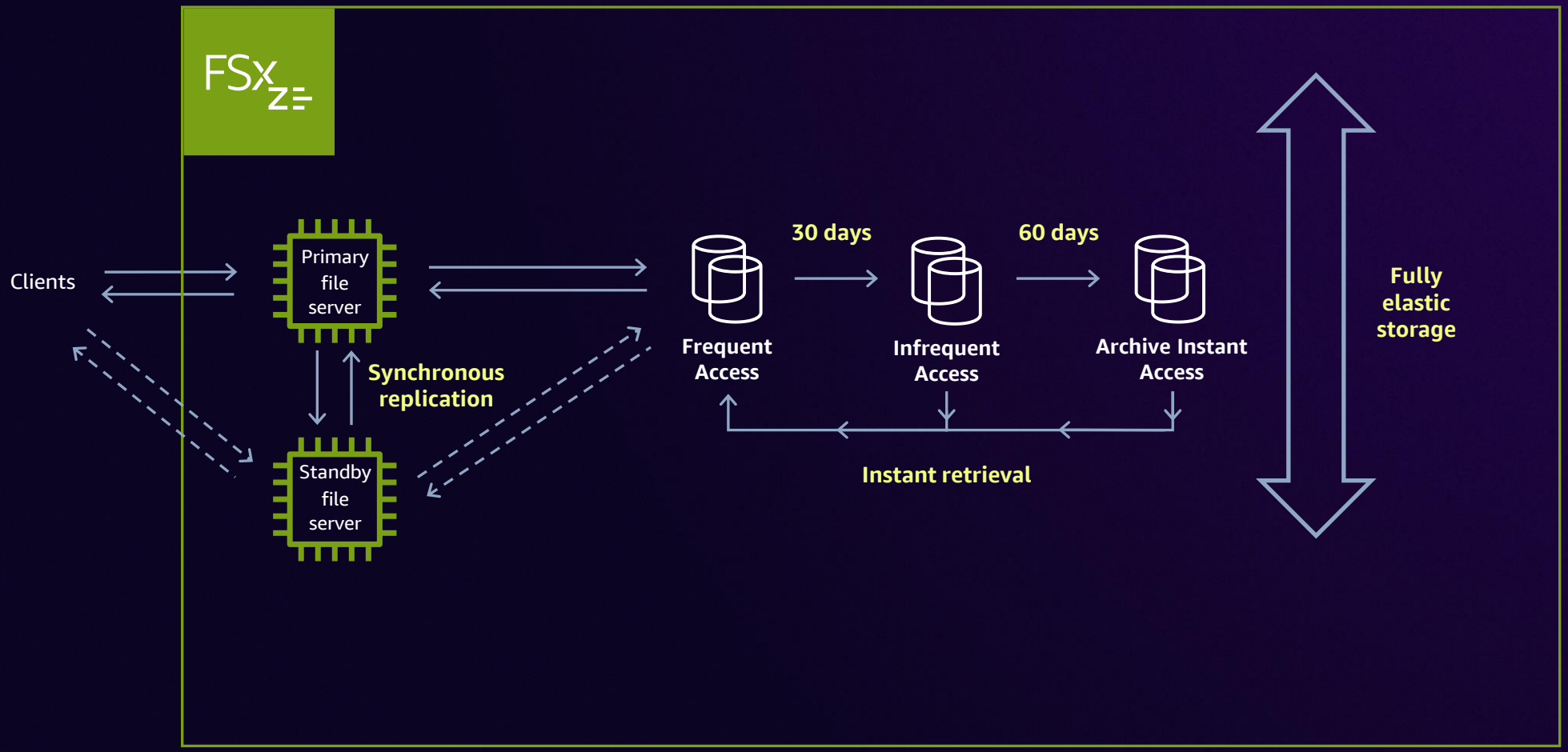
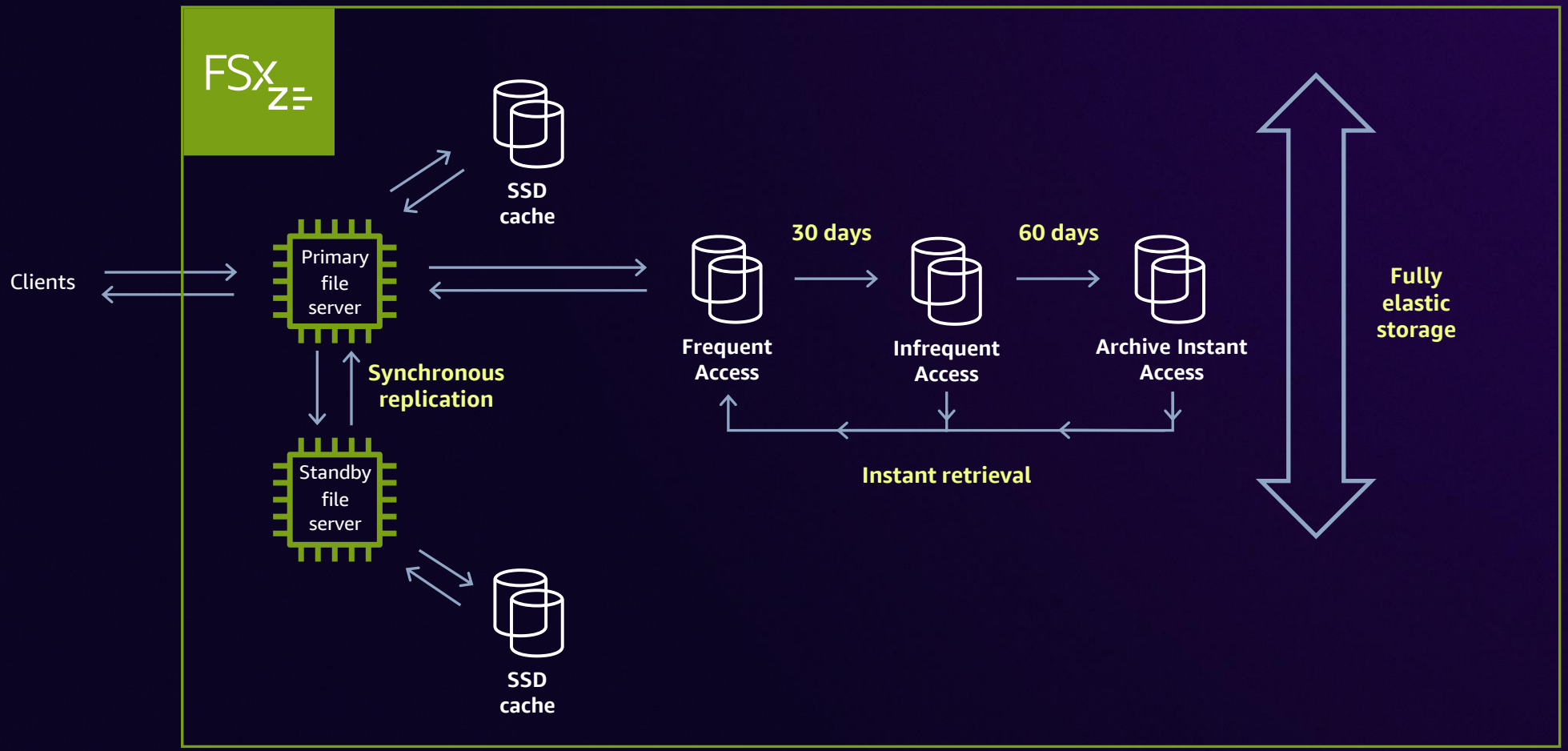
Same FSx for OpenZFS functionality



Highly available



SSD caching for high performance



Comparable performance, much lower cost

Example 1: Shared file storage for 200+ user home directories using all-SSD versus FSx Intelligent-Tiering

	FSx SSD	FSx Intelligent-Tiering
Data stored	126 TB	126 TB
File system size	180 TB (70% utilization)	126 TB + 25 TB cache
Maximum throughput	10 GBps	10 GBps
p50 write latency	~1ms	~1ms
p50 read latency	~1ms	~1ms
Storage costs (inc. requests and cache)	$32,400 per month	$6,138 per month

Cost savings with FSx Intelligent-Tiering: **81%**

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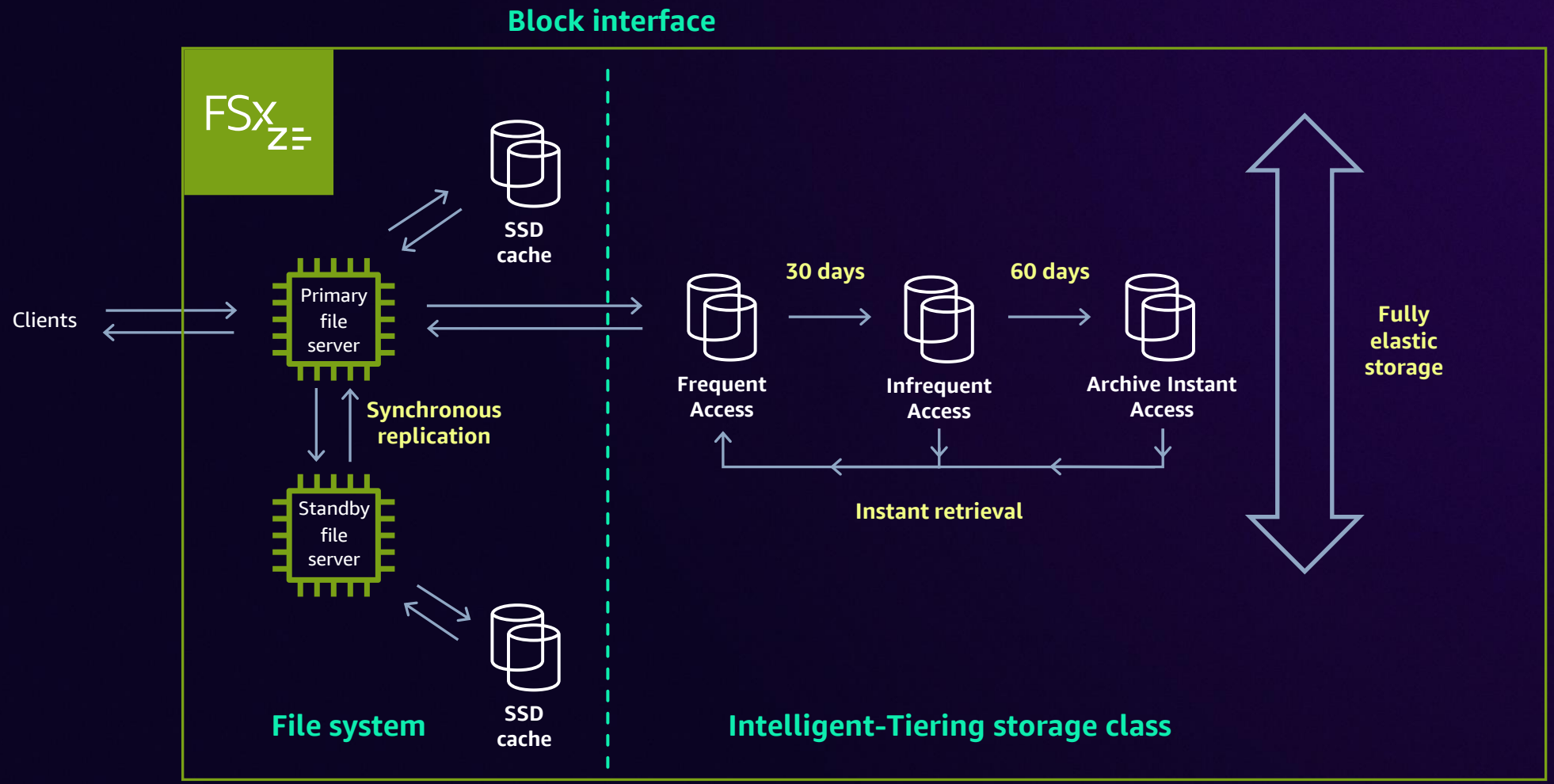
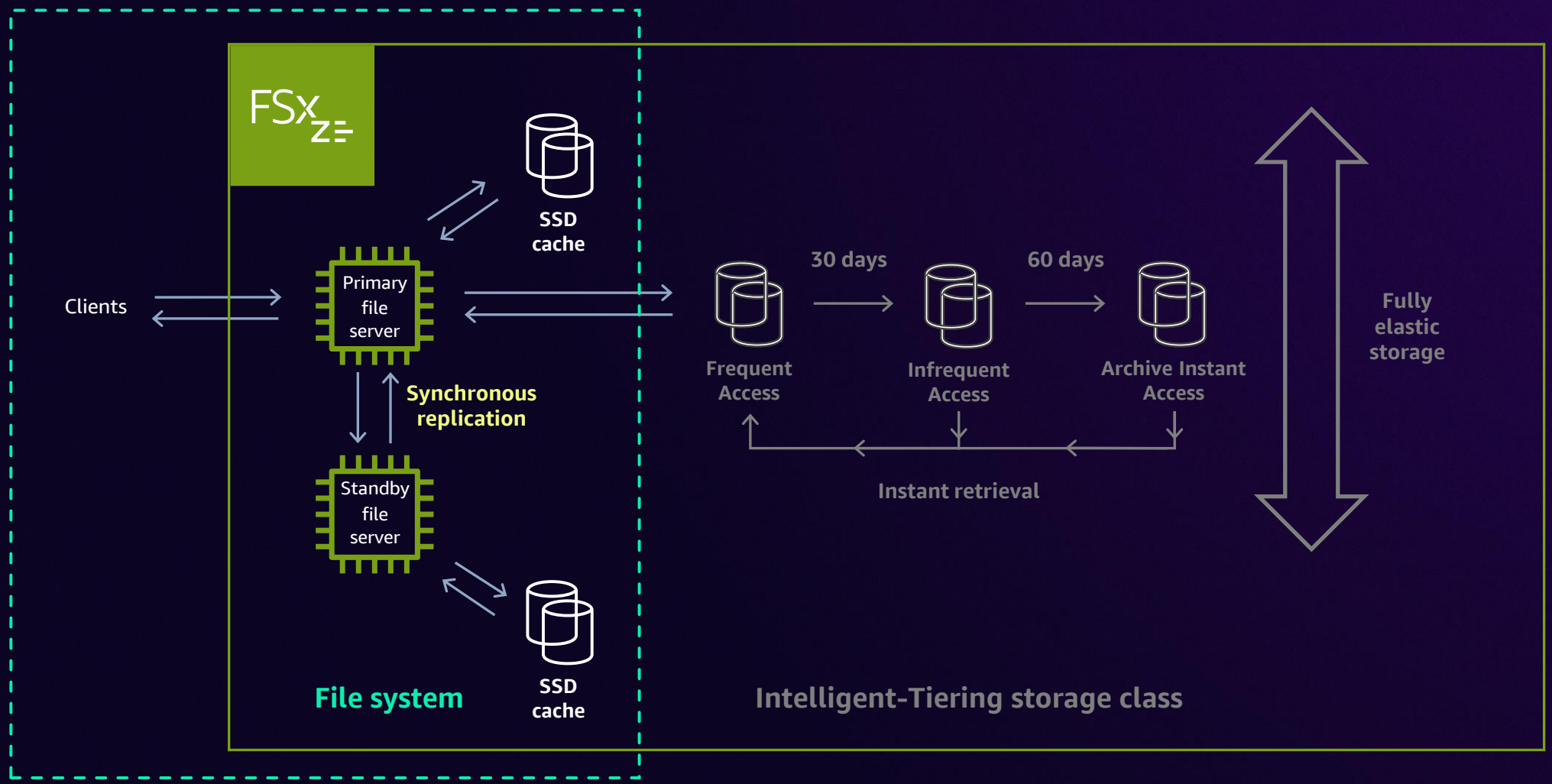
Cost-optimized, high-performance storage

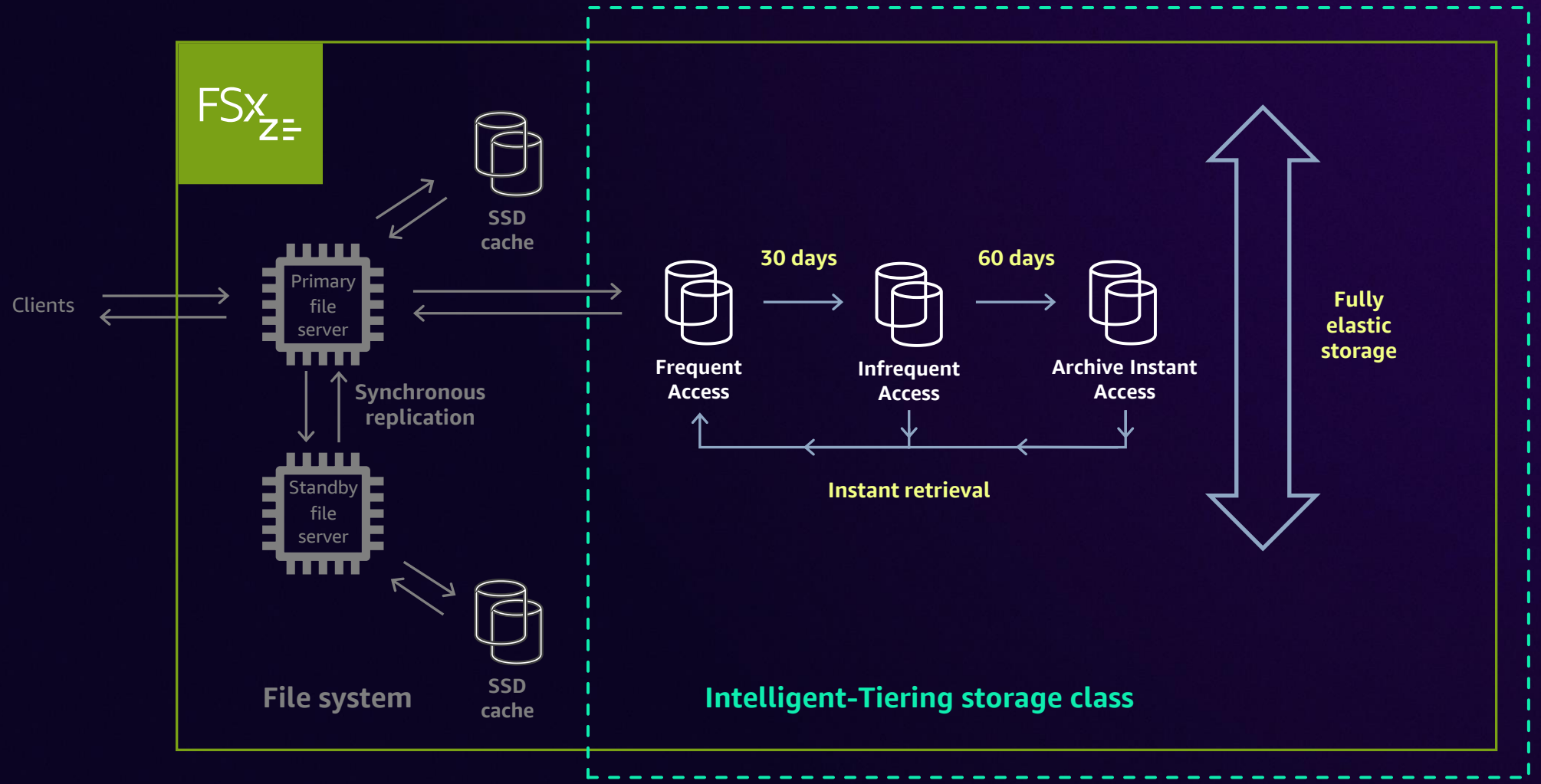
FSx Intelligent-Tiering: Implemented at the block layer



Enabling all the FSx for OpenZFS file system capabilities



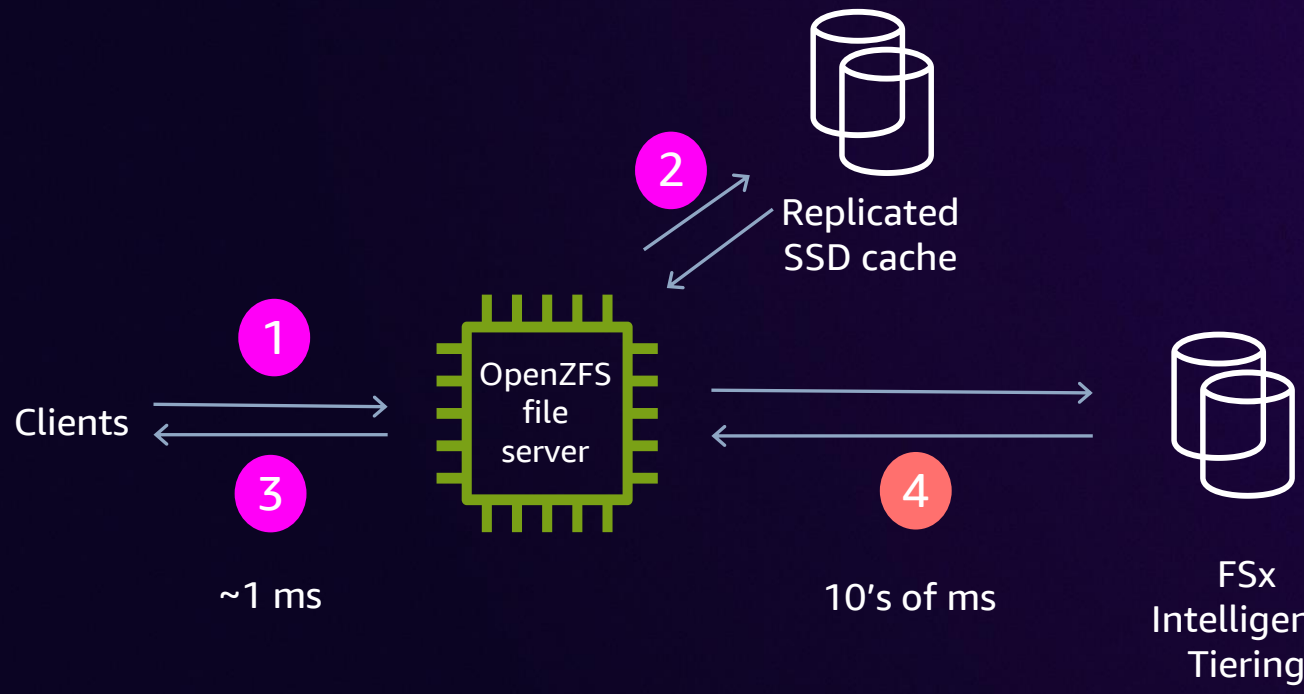
And enabling cost optimized, fully elastic storage



Optimized cost and performance for write IO

	FSx Intelligent-Tiering Write IO
IOPS	Up to 200,000
Latency	~1 millisecond
Throughput	Sync: up to 3+GB/s Async: up to 6+ GB/s
Request cost	$0.005 per 1,000 write requests

Optimized performance for write IO



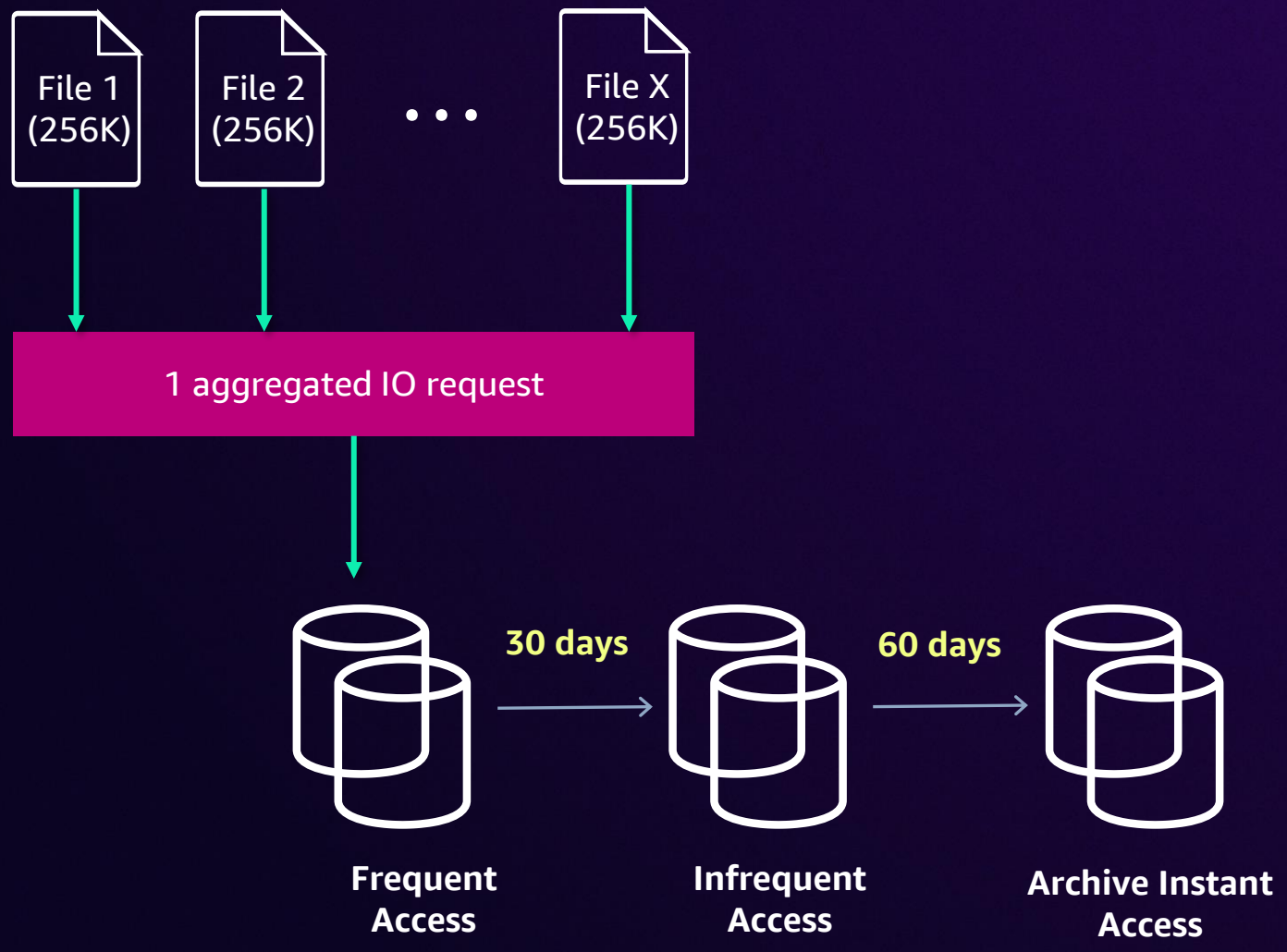
- Writes are logged to replicated SSD for low latency & high IOPS
- Later, writes are aggregated and written to frequent access, improving throughput

Optimized cost for write IO

1. FS clients writes to multiple different files

2. IOs are aggregated into one block IO

3. One IO request is made to FSx Intelligent-Tiering



Optimized cost and performance for read IO

	In-memory cache	SSD cache	Primary storage on FSx Intelligent-Tiering
Size	Up to 256GB	Up to 512TB	Virtually unlimited
Throughput	Up to 25 GB/s	Up to 12.5 GB/s	Up to 12.5 GB/s
IOPS	Up to 1 million	Up to 400,000	Tens of thousands
Latency	Sub-millisecond	Sub-millisecond	Tens of milliseconds
Request cost	N/A	N/A	$0.0004 per 1,000 requests

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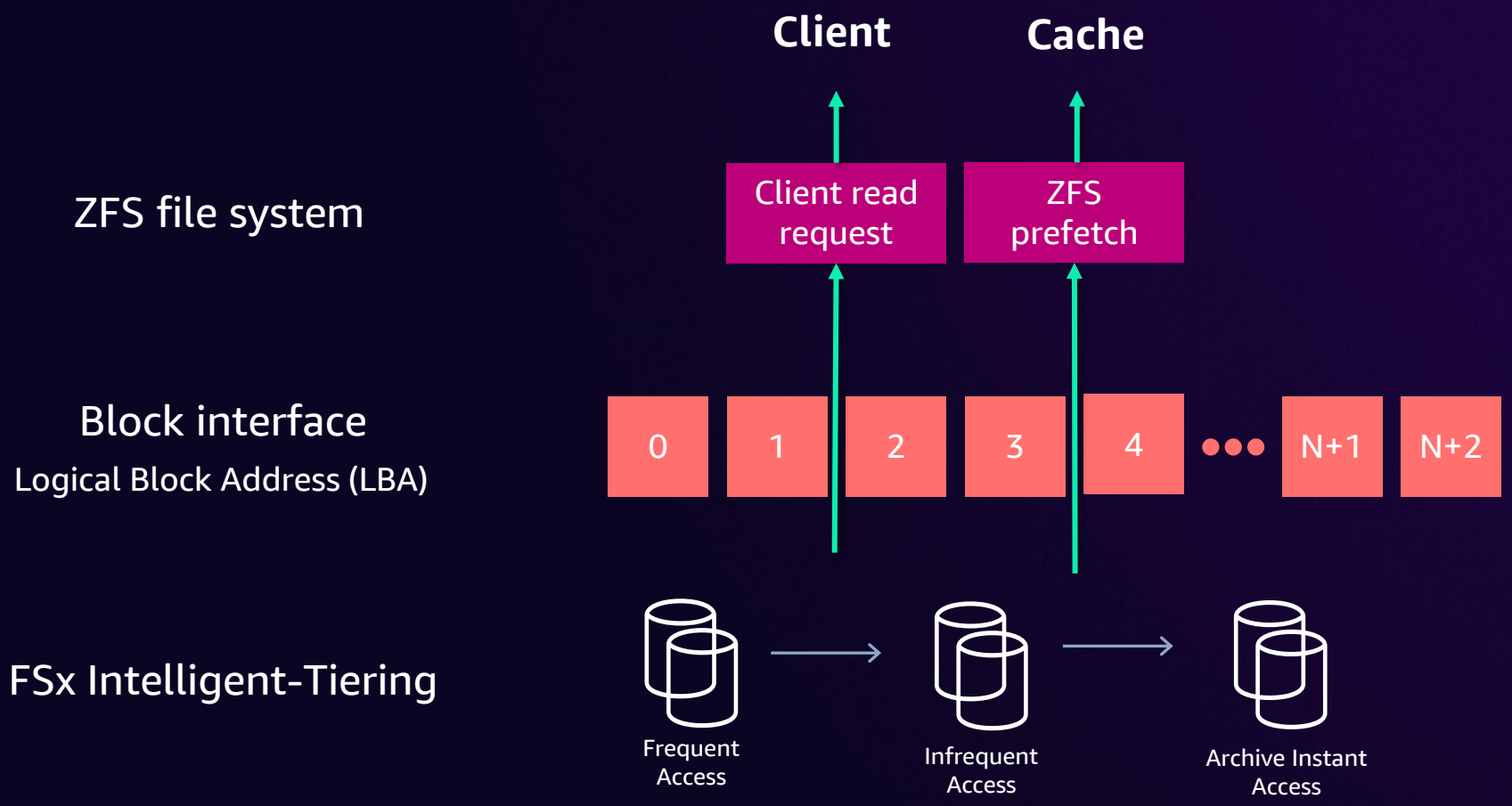
Prefetch: Optimized performance for read IO



Comparable performance, much lower cost

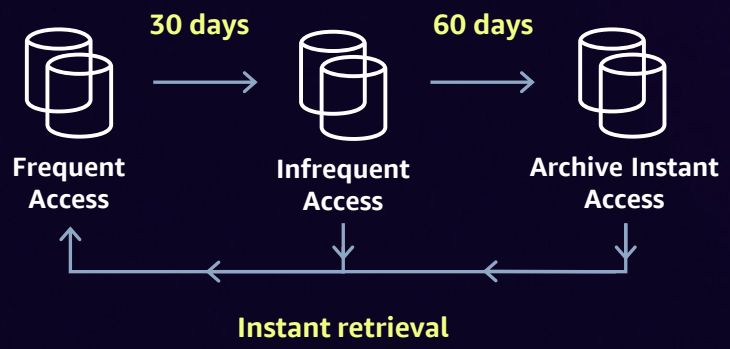
Example 2: Software build - compiling the Linux kernel

	FSx SSD	FSx Intelligent-Tiering
Data stored	18 TB	18 TB
File system size	26 TB (70% utilization)	18 TB + 4 TB cache
Time to compile Linux	3 minutes 54 seconds	4 minutes 0 seconds
Storage costs (inc. requests and cache)	$4,680 per month	$1,350 per month

Cost savings with FSx Intelligent-Tiering: **71%**

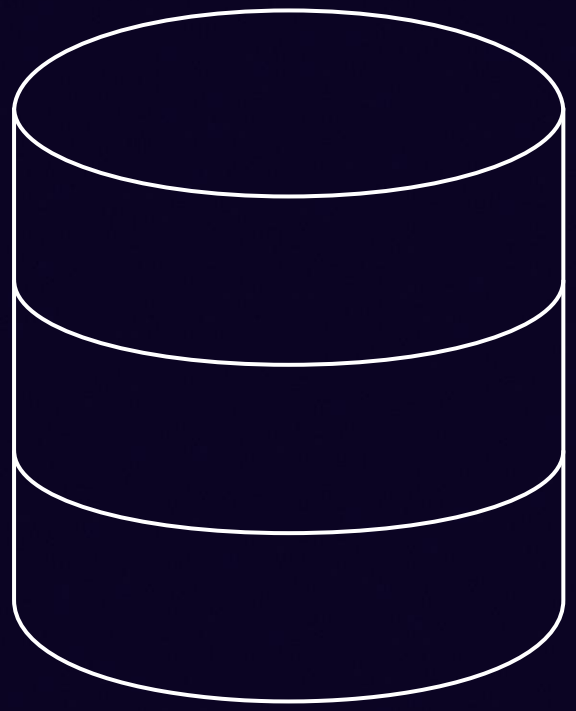
When should I use FSx Intelligent-Tiering?

Intelligent-Tiering
Most workloads; high performance, low cost



Provisioned SSD
For latency-sensitive, small random reads

FSx backups

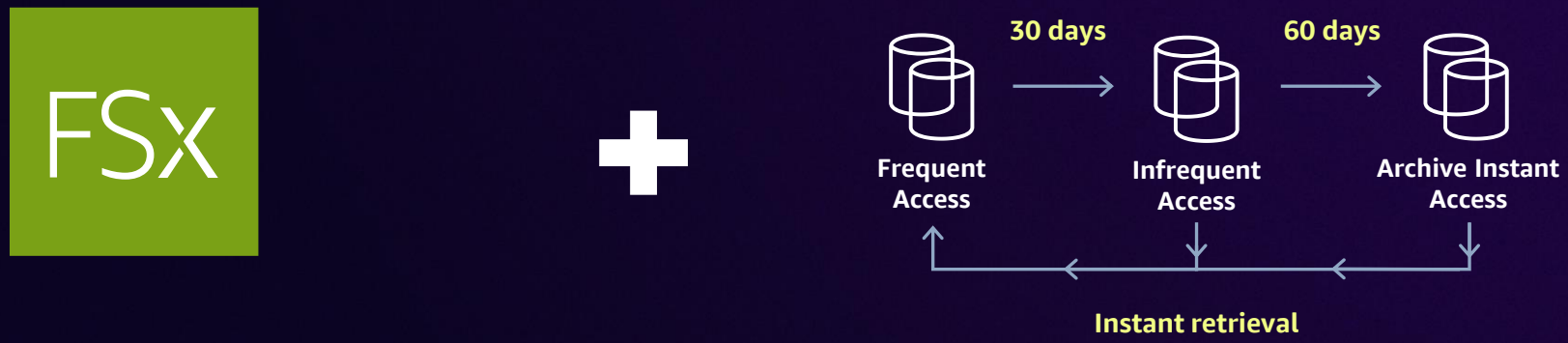


1. Independent copy of your data
2. Point-in-time consistency
3. Compression-enabled
4. Incremental
5. Stored on S3

Backups for FSx Intelligent-Tiering

	Backups
Storage price (GB/month)	$0.05
Restore price (GB)	None
Incremental	Yes
Time to restore	~5 minutes

Amazon FSx Intelligent-Tiering



High performance, powerful capabilities

Cloud-native, fully elastic storage

Thank you!

Please complete the session survey in the mobile app

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