AWS re:Invent

NOV. 29 – DEC. 3, 2021 | LAS VEGAS, NV

STG348

Introducing the latest Amazon EFS performance optimizations

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Amazon EFS sessions

STG205 AWS storage solutions for containers and serverless applications

STG303 Deep dive on Amazon EFS

STG309 Integrating serverless applications with AWS storage services

STG325 Building serverless modern applications using Amazon S3 or Amazon EFS

STG326 Persistent file storage for containerized CMS platforms on Kubernetes

STG348 Introducing the latest Amazon EFS performance optimizations

STG401 Get the most out of your Amazon EFS deployments

STG403 Amazon EFS performance best practices

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Agenda

- Introduction to Amazon Elastic File System (Amazon EFS)
- Recent performance optimizations
- Benefits to applications
- Performance best practices
- Summary

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Introduction to Amazon EFS

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What are our customers doing?



Migrating

Migrating applications and storage to the cloud



Modernizing

Converting existing applications with microservices using containers and serverless



Building

Building and deploying brand new, cloud native applications using cloud native services



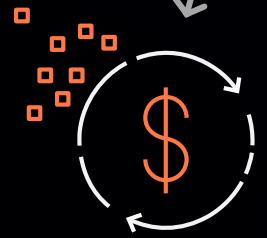
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Amazon Elastic File System (Amazon EFS)

COST OPTIMIZED

Four storage classes with automatic lifecycle-based cost optimization

Blended storage cost of $0.043 GB/month





Amazon EFS

Highly durable
Highly available

PERFORMANT

Latencies as low as 1 ms

Up to 35K - 500K IOPS

Up to 5 - 10 GB/s of throughput



CLOUD NATIVE

Cloud native integrations with AWS compute, security, and data protection services



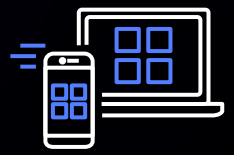
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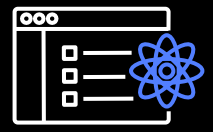
Use cases for Amazon EFS



Simplify and centralize DevOps



Web serving and content management



Data science and analytics



Media processing



Backup storage



Modern application development

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Recent performance optimizations

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Storage performance

Throughput
(MB/s, GB/s)

IOPS
(1/s)

Latency
(ms, µs)

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EFS performance since 2020

Amazon Elastic File System announces 400% increase in read operations for General Purpose mode file systems

Posted On: Apr 1, 2020

Starting today, Amazon Elastic File System
systems support up to 35,000 read operati
the previous limit of 7,000. Maximum writ
second.

Amazon Elastic File System increases per-client throughput by 100%

Posted On: Jul 23, 2020

Amazon Elastic File System (Ama
client throughput, a 100% increa
throughput for an EFS file syste

Amazon Elastic File System triples read throughput

Posted On: Jan 29, 2021

Amazon Elastic File System (Amazon EFS) now allows you to drive up to 3x higher read throughput on your file system. For example, bursting mode file systems now provide 300MB/s of bursting read throughput, or 300MB/s per TiB of data stored in Amazon EFS standard, whichever is higher. If you have configured 1 GB/s of

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What about latency…?

- Per-operation latency is important for many types workloads
- In March 2021, EFS introduced the One Zone storage class with 35% lower latency
- Since last re:Invent, reduced latency 2-4x for key operations

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Amazon EFS Storage Classes



EFS Standard

- Highly durable and available file system
- Data replicated to multiple Availability Zones
- $0.08/GB-month (1)
- Read latencies: 1.0 – 2.4 ms (2,3)
- Write latencies: 3.6 – 11.5 ms (2,3)

2x reduction since last re:Invent

10% - 4x reduction since last re:Invent

[1] *Price in US-EAST-1 in December 2021, assuming industry average of 20% Standard storage and 80% Standard-Infrequent Access Storage*
[2] Average read/write latencies for metadata and 4 KiB data operations for a test workload in US-EAST-1. Results may vary based on workload, operating system, and other factors.
[3] *General Purpose mode.*

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Amazon EFS Storage Classes



EFS One Zone

- Highly durable and available file system
- Data replicated within a single Availability Zone
- $0.043/GB-month (1)
- Read latencies: 1.0 – 1.5 ms (2)
- Write latencies: 2.4 – 7.4 ms (2)



EFS Standard

- Highly durable and available file system
- Data replicated to multiple Availability Zones
- $0.08/GB-month (1)
- Read latencies: 1.0 – 2.4 ms (2,3)
- Write latencies: 3.6 – 11.5 ms (2,3)

EFS One Zone: 47% lower cost and 35% lower latencies compared to EFS Standard

[1] *Price in US-EAST-1 in December 2021, assuming industry average of 20% Standard storage and 80% Infrequent Access Storage*
[2] Average read/write latencies for metadata and 4 KiB data operations in US-EAST-1. Results may vary based on workload, operating system, and other factors.
[3] *General Purpose mode*

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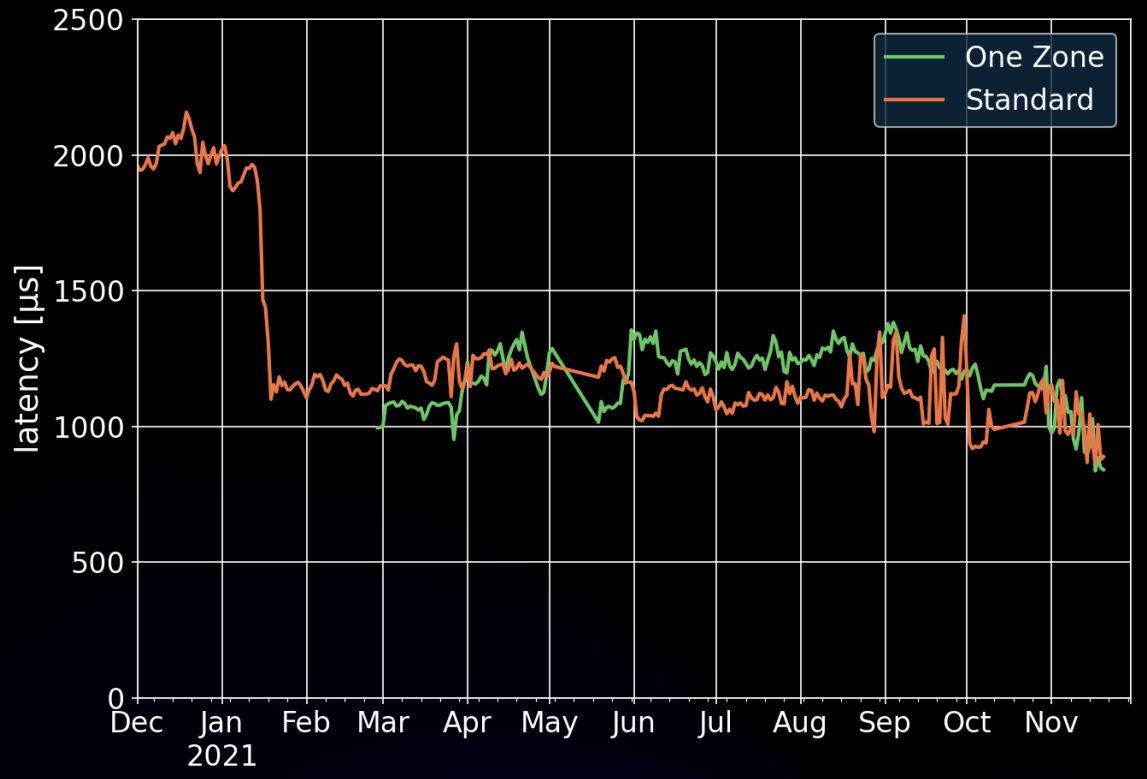
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Latency reduction – open()

2.0 ms
Dec 2020

→

1.0 ms
Today



Use cases:

- Content management (WordPress, Drupal, Confluence, …)
- ML Inferencing

** Repeated open with cached filename lookup for a test workload in US-EAST-1.*

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Latency reduction – write()

15 ms
Nov – Dec 2020

One Zone	2.4 ms (small file) 7.4 ms (large file)
Standard	3.6 ms (small file) 11.5 ms (large file)



Use Cases:

- DevOps (git, Jenkins)
- Data science (Jupyter, Conda)

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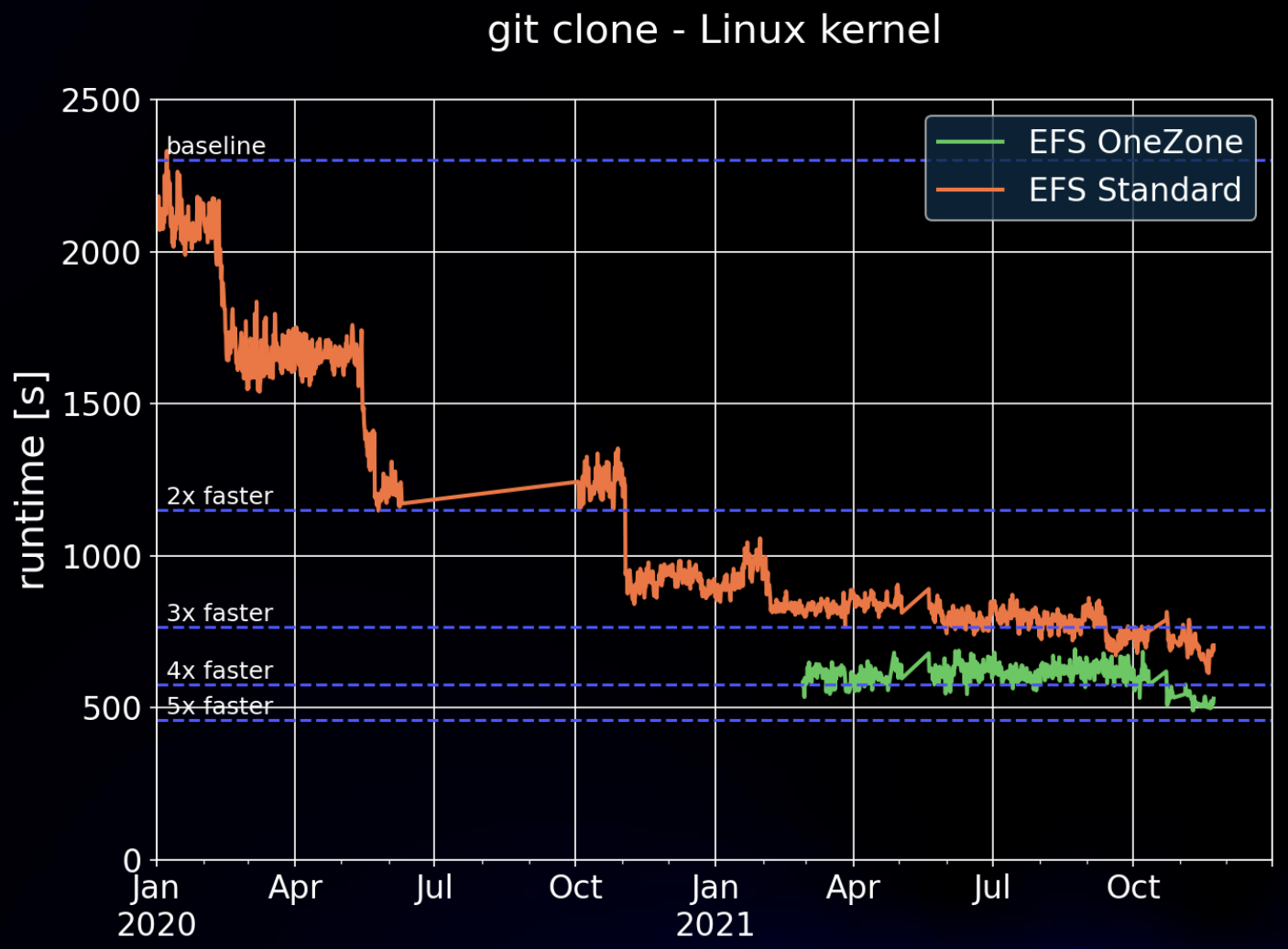
Benefits to applications

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Use case: DevOps

Git clone
Dec 2019

4.5x
Today

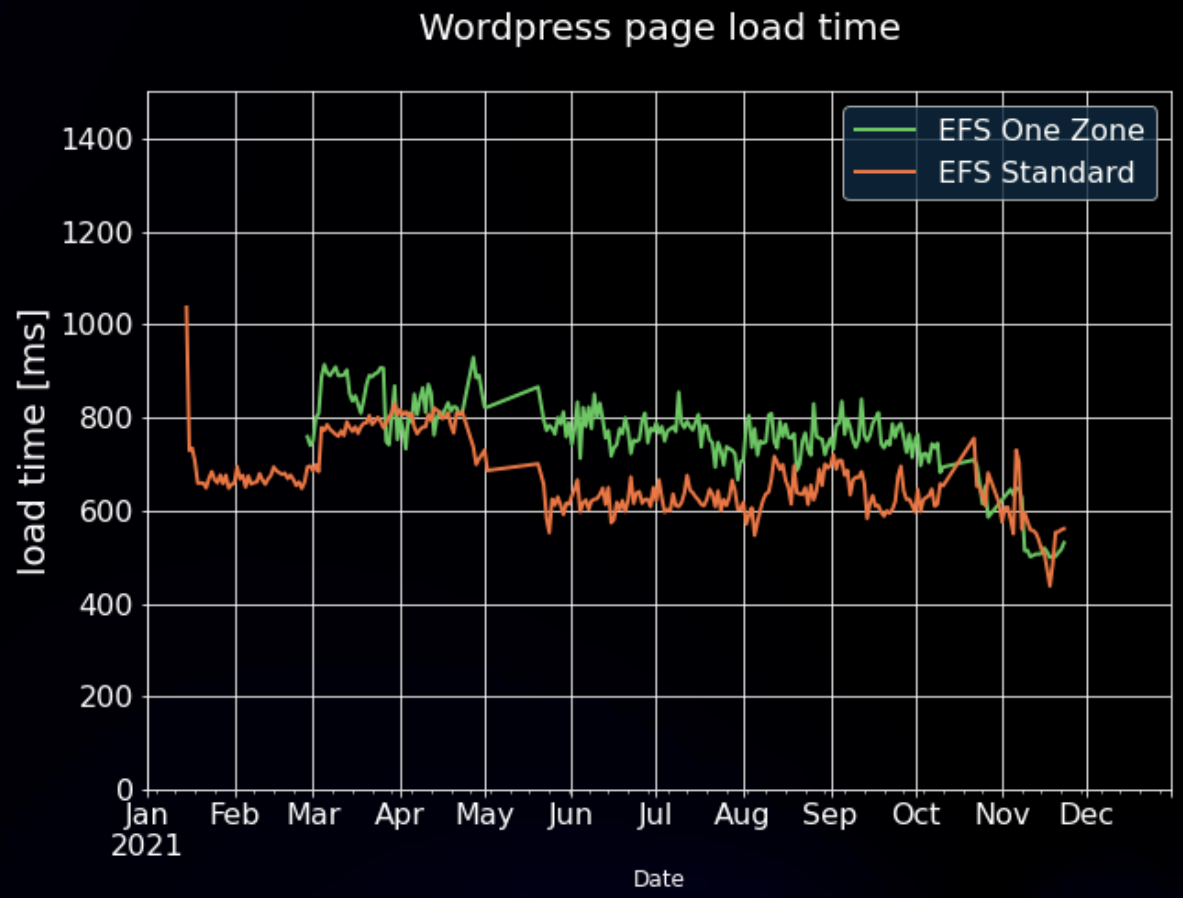


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Use case: Web serving

Wordpress
Jan 2021

2x
Today



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Acquia modernizes web hosting with Amazon EKS and Amazon EFS

Challenge

Sought to further improve ability to elastically scale across compute and storage to improve their customers' digital experience

Solution

Containerize hosting application, and run it on Amazon EKS, using Amazon EFS for persistent storage

Benefits

- Dynamic scaling of customer environments
- Lower TCO through improved storage and compute utilization
- Reduced administrative burden by using fully managed services

> By containerizing our hosting applications and running them on Amazon EKS and Amazon EFS, we have improved our customer experience, while considerably reducing our infrastructure and operational maintenance overhead.
>
> **Jake Farrell**, Senior Director of Engineering, Acquia

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Acquia

Company: Acquia

Industry: IT

Country: United States

Employees: 1K+

About Acquia

Acquia's software and services are built around Drupal to give enterprise companies the ability to build, operate, and optimize websites, apps, and other digital experiences.

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Asurion builds on-demand ML using AWS Lambda and Amazon EFS

Challenge

Perform real-time analysis of customer experience during support calls using ML

Call recordings didn't fit in AWS Lambda/tmp space

Solution

Asurion uses Amazon EFS to give extended storage space to their ML functions running in AWS Lambda

Benefits

- ML inference infrastructure scales elastically with call volume
- Reduced operational overhead compared to maintaining instances and auto scaling

> We really wanted to use AWS Lambda to make our ML inference elastic but thought we wouldn't be able to because of the size of data the process required. **With Amazon EFS, we were easily able to give our function all of the storage space it needs.**

Jeff Tougas, Senior Principal Software Engineer, Asurion

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asurion

Company: Asurion

Industry: Insurance services

Country: United States

Employees: 10K+

About Asurion

Asurion helps people stay connected to their technology. Their experts can repair, replace, and resolve nearly any tech issue. They can be reached via call, chat, and in person, at one of their uBreakiFix stores. They will also come directly to their customers, at their convenience.

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Performance best practices

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Performance best practices

1. Use General Purpose performance mode
2. Ensure you have sufficient burst credits, or use Provisioned Throughput
3. Use EFS One Zone for single zone services where you don't need multi-AZ replication
4. Use the EFS mount helper
5. Use default mount options
   - Use: NFSv4.1, default rsize/wsize
   - Do not use: noac, sync, lookupcache=pos, lookupcache=none
6. Use the newest version of the OS that works with your application
   - Good: Amazon Linux 1, RHEL 7.3+, Ubuntu 16.04
   - Better: Amazon Linux 2+, RHEL 8+, Ubuntu 18.04+
7. Unless you know your directory access patterns, keep directories < 10,000 entries

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Summary

- Amazon EFS continuously innovates on performance and rolls out many improvements that customers can benefit from with no action required
- Key application use cases improved their performance by up to 2-4.5x

Use case	Improvement
DevOps	4.5x
Web serving and Content management	2x

- One Zone storage class offers 35% lower latency than Standard at 47% lower cost
- Please check back frequently for our latest performance announcements!

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Thank you!

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