ANT302

What's new with Amazon EMR

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What's new with Amazon EMR

Speakers

- Neil Mukerje, Principal Product Manager, Amazon Web Services

Announcements

- EMR Serverless, and lots of performance and enhancements. See New links.

Takeaways

- EMR Serverless gives you the power of EMR without having to manage the infrastructure
- Great discussion of Transactional Data Lakes and why they are needed.

Azure

- Azure's Synapse Analytics is the closest service to EMR Serverless. Customers can use Delta Lake or Hudi for Transactional Lakes, although Delta Lake is better supported (IMO)

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What is EMR

- Runs Big Data Apps using Spark, Hive, Presto, Hbase, Flink
- New – EMR Serverless
- Comparison of EMR On-Premises vs Cloud (blah blah blah)
  - [Editor] If you are still on-prem you are wasting $$$
- Cloud Cost Optimizations through Transient Instances, Spot Instances, or reserved instances.

What's New

- New Enhancements for EMR on EC2
  - Reduced startup time in private subnet up to 30%
  - Reduced task nodes startup time by 30%
  - Better performance with Spark Shuffle awareness
  - Reduced costs, improved performance with EBS GP3 instances
- New Enhancements for EMR on EKS
  - Job Templates – simplifies authoring experience by enforcing common parameters
  - Spark-SQL runner – Execute SQL scripts directly with API
  - DynamoDB connector – Easily Access data in DynamoDB
  - Enhanced job failure messages – show task failure messages
- New - Performance Optimized Runtimes
  - Spark on EMR 3.9x Faster than OSS Spark
  - Spark EMR 6.9 1.3x faster than EMR 6.5
  - Trino up to 4x faster on EMR than OSS
  - Hive S3 Storage Optimizations 15x faster
- New – Engine Improvements (Presto/Trino)
  - Spot Loss Handling – Faster fail on queries when using spot instances
  - Improved join reordering
  - Presto - Enforce fine-grained lake formation policies
  - Trino supports for Iceberg and Delta Lake transactions
  - Trino – HDFS for checkpointing
- New – Hive Engine Improvements
  - Zero-rename Writes, MSCK Optimizations, Parquet Modular Encryption, Fine-grained lake formation policies, 500+ incorporated fixes, Iceberg support in EMR 6.9
  - Glue now supports this capability natively, no connectors needed
- Transactional Data Lakes. More customers investigating or using TDLs (Iceberg, Delta Lake, Hudi) to solve challenges related to
  - New – Iceberg features for Transactional Data Lakes
  - New – Support for OSS Delta Lake 2.1 (Spark3, Trino)

EMR Serverless (New)

- Watch Here.
  - Jobs, Workers, and Pre-Initialized Workers
  - As Jobs are submitted, they acquire workers from a shared pool
  - Support for Multiple Availability Zones for High Availability
  - Can define boundaries for scaling overall, or by job.
  - Spark history service is included to view job history
  - Integrated with Cloud Watch to Monitor EMR Serverless applications
  - Graviton2 Support for lower cost

EMR Studio

- Watch Here.
  - Fully managed IDE for Interactive Notebooks
  - New – Mixed language notebooks, real-time collaboration, SQL Explorer build-in, mount local filesystem into EMR
  - New – Security Enhancements
  - New – Role based access integration with SageMaker

Amazon EMR

EASILY RUN SPARK, HIVE, PRESTO, HBASE, FLINK, AND MORE BIG DATA APPS ON AWS

Latest versions

Updated with latest open source frameworks within 60 days

Support for popular OSS like Spark, Flink, Hudi, Iceberg etc.

Great performance at lower cost

Spark workloads run up to 3x faster compared to open source

50–80% reduction in costs with EC2 Spot, EC2 Savings Plan, Reserved Instances

Per-second billing for flexibility

Use S3 storage

Process data in S3 securely with high performance using the EMRFS connector

Scale Compute and Storage independent of each other

Multiple deployment options

Fully managed, choose multiple deployment options based on your need

Amazon EMR on EC2 enhancements

NEW!

Reduce start-up time for Amazon EMR on EC2 cluster in a private subnet by up to 30%

Reduce task nodes start-up time for Amazon EMR on EC2 cluster by up to 30%

Better performance and lower costs with Spark shuffle awareness in managed scaling

Reduce costs and improve performance with EBS GP3 volumes

Building applications on Amazon EMR on EKS

NEW!

Job templates

Simplifies job authoring experience for data engineers and scientists by enforcing common parameters

Spark-SQL runner

Execute SQL scripts directly with API without writing any additional code

DynamoDB connector

Easily access data in DynamoDb

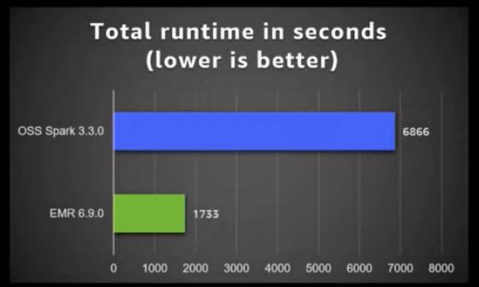
Enhanced job failure messages

Show task failure messages in DescribeJobRun API and driver logs for job failures

Amazon EMR runtime vs. OSS Spark

NEW!

UP TO 3.9X FASTER PERFORMANCE FOR APACHE SPARK 3.3.0



Spark 3.3.0 on EMR 6.9.0

*Based on TPC-DS 3TB Benchmarking running 6 node C5.9XL cluster and EMR 6.9.0 running Spark 3.3.0

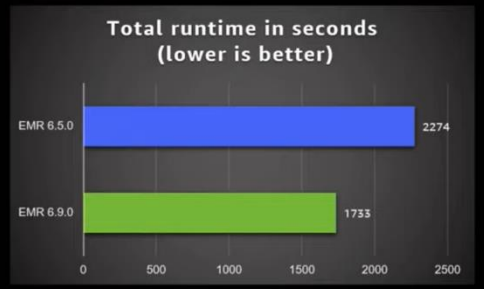
Runtime built on a optimized version of Apache Spark

Best performance

- **Up to 3.9x faster on total time**

NEW!

Amazon EMR runtime for Apache Spark: Performance improvements - 2022



Runtime built on a optimized version of Apache Spark

Best performance
- **Up to 1.3X faster on total time**

100% compliant with Apache Spark APIs

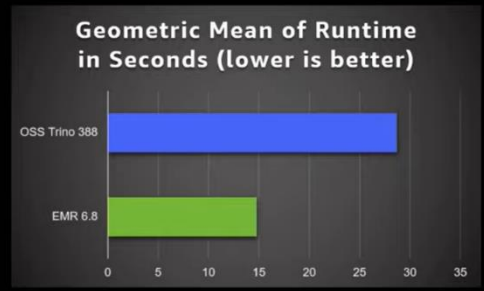
Spark 3.3.0 on EMR 6.9.0

*Based on TPC-DS 3TB Benchmarking running 6 node C5.9XL cluster and Amazon EMR 6.5.0 running Spark 3.0

NEW!

Amazon EMR runtime vs. OSS Trino

UP TO 3.1X FASTER PERFORMANCE FOR APACHE TRINO 388



Runtime built on a optimized version of Trino

Best performance
- **Up to 3.1x faster on geometric mean**
- **Up to 4.2x faster for total time**

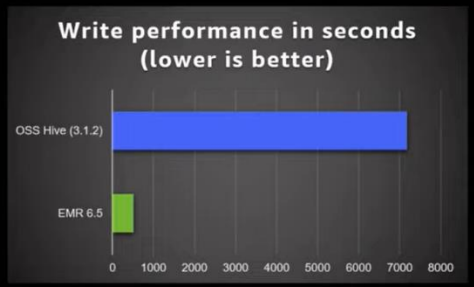
Trino 388 on EMR 6.9.0

*Based on TPC-DS 3TB Benchmarking running 6 node C5.9XL cluster and EMR 6.9.0 running Trino 388

NEW!

Amazon EMR runtime vs. OSS Hive

UP TO 15X FASTER PERFORMANCE FOR APACHE HIVE WRITES USING EMRFS S3-OPTIMIZED COMMITTER



Hive write performance with the Amazon EMR Hive zero-rename feature

Best performance:
- **Up to 15x faster writes**

Hive 3.1.2 on EMR 6.5.0

*Based on load phase of TPCx-BB 1 TB Benchmarking running 1 m5d.8xlarge master node, 20 m5d.8xlarge core nodes cluster on EMR 6.5.0 running Hive 3.1.2

NEW!

Presto/Trino improvements

Spot loss handling

Improved join reordering, selection and common subexpression removal

Enforce fine-grained lake formation policies (Presto)

Iceberg and Delta support (Trino)

HDFS for checkpointing (Trino)

Hive improvements

NEW!

Zero-rename Writes

MSCK Optimization

Parquet Modular Encryption

Fine-grained lake formation based policies

Incorporated 300+ improvements, critical fixes into Amazon EMR Hive

Iceberg support in Amazon EMR 6.9

Transactional data lakes features

TRANSACTIONS, RECORD-LEVEL UPDATES/DELETES, AND CHANGE STREAMS TO DATA LAKES

Ingestion

- Transactions (ACID) - Reader and writer isolation
- Transactions (ACID) - Concurrent write support
- Record level upserts and deletes
- High throughput streaming ingestion
- Spark, Flink, and Java Writer Support
- Automatic compaction of small files
- SQL DML support

Query

- Spark, PrestoDB/Trino, Flink, Hive Support
- Efficient queries across partitions and files
- Incremental query support
- Time travel query support

Transactional data lakes features

TRANSACTIONS, RECORD-LEVEL UPDATES/DELETES AND CHANGE STREAMS TO DATA LAKES!

Administration

- Async background compaction of files
- Async background sorting and clustering of keys
- Automatically clean up files beyond retention period
- Metrics for past commits or rollbacks

Apache Iceberg

NEW!

OPEN TABLE FORMAT FOR HUGE ANALYTIC DATASETS

Apache Iceberg 0.14.1 is packaged as a library for Spark3 Runtime, Trino, Flink, and Hive in EMR 6.9.0.

Key new features include:

Apache Iceberg

- Time travel support with Spark SQL and Trino SQL
- Merge on Read (MoR) support
- Optimistic concurrency with AWS Glue Data Catalog
- Disaster recovery with S3 access points
- Flink and Hive integration (EMR 6.9.0)

NEW!

OSS Delta Lake

OPEN-SOURCE STORAGE FRAMEWORK THAT ENABLES BUILDING A LAKEHOUSE ARCHITECTURE

OSS Delta Lake 2.1.0

OSS Delta Lake 2.1.0 is packaged as a library in EMR 6.9.0

Engines supported : Spark3 and Trino

To learn more :

https://docs.aws.amazon.com/emr/latest/ReleaseGuide/emr-delta.html

Amazon EMR Serverless

All the benefits of EMR without managing clusters and servers

- Run frameworks more easily; just pick a version and run
- Automatically scale; don't guess cluster sizes
- Optimize cost; Automatic and fine-grained scaling reduces cost
- Performance-optimized version delivers 2x better performance
- Multi-AZ resiliency from day 1
- Integration with familiar tools like Apache Airflow

Jobs

- Run jobs on applications
- Can run multiple jobs on an application
- Can control authorization using per-job execution role

Workers

- Internally used to execute your workloads
- Workers run the OSS framework you choose
- You can change the size of workers to control performance

Pre-initialized workers

- Optional feature to pre-initialize workers
- Jobs start immediately
- Helps you maintain a warm pool

NEW!

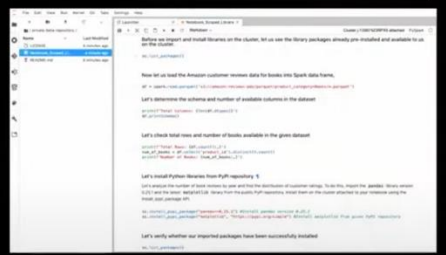
Amazon EMR Serverless

ALL THE BENEFITS OF EMR – WITHOUT MANAGING CLUSTERS

- AWS Graviton2 Support
- Application capacity and job metrics in Amazon Cloudwatch
- Live debugging of jobs
- Fast Fine-Grained Auto Scaling
- Auto stop Auto start

EMR Studio

FULLY MANAGED IDE FOR INTERACTIVE DATA ANALYTICS: DEVELOP, VISUALIZE, AND DEBUG APPLICATIONS



- Single sign-on integration with IdP
- Fully-managed Jupyter Notebooks
- Integrated with Git Repositories
- Simplified debugging with Spark UI and YARN UI
- Browse, create, or delete EMR clusters
- Run Notebooks in workflows using APIs
- Run interactive data analysis using EMR on EKS clusters

NEW!

EMR Studio features

FULLY MANAGED IDE FOR INTERACTIVE DATA ANALYTICS: DEVELOP, VISUALIZE, AND DEBUG APPLICATIONS

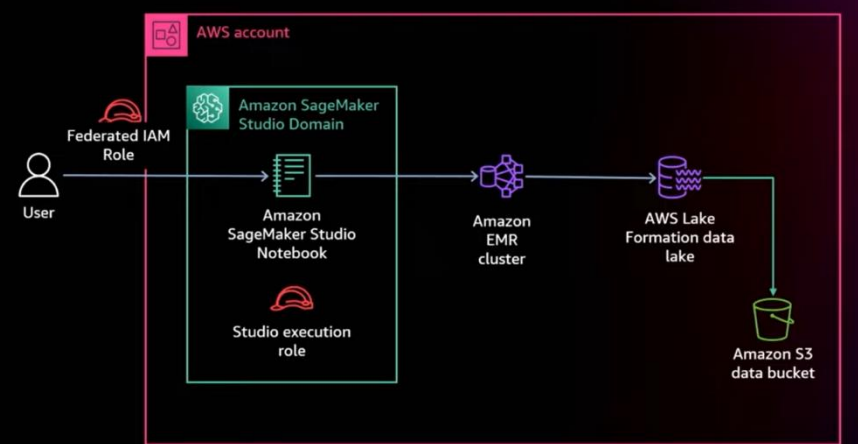
- IAM authentication and federation support
- Multi-language support (R, PySpark, Scala, SQL)
- Auto-terminate idle clusters
- Real-time co-authoring of notebooks
- SQL explorer with Presto support
- Mount workspace directories to EMR clusters
- Latest JupyterLab, JEG, Livy, SparkMagic

Security pillars

Isolation	Authentication	Authorization	Encryption	Audit
VPC	LDAP	Cluster IAM Role	Encrpytion at rest	Audit using Ranger
Private subnets	Kerberos	FGAC using Apache Ranger	Encrpytion in transit	Audit using AWS Lake Formation NEW!
Security groups	AWS IAM Identity Center (EMR Studio)	FGAC using AWS Lake Formation NEW!		
	AWS IAM (EMR Studio)	Job runtime role NEW!		

NEW!

Data access control from Amazon SageMaker



Fine-grained access control from interactive SageMaker Studio Notebooks