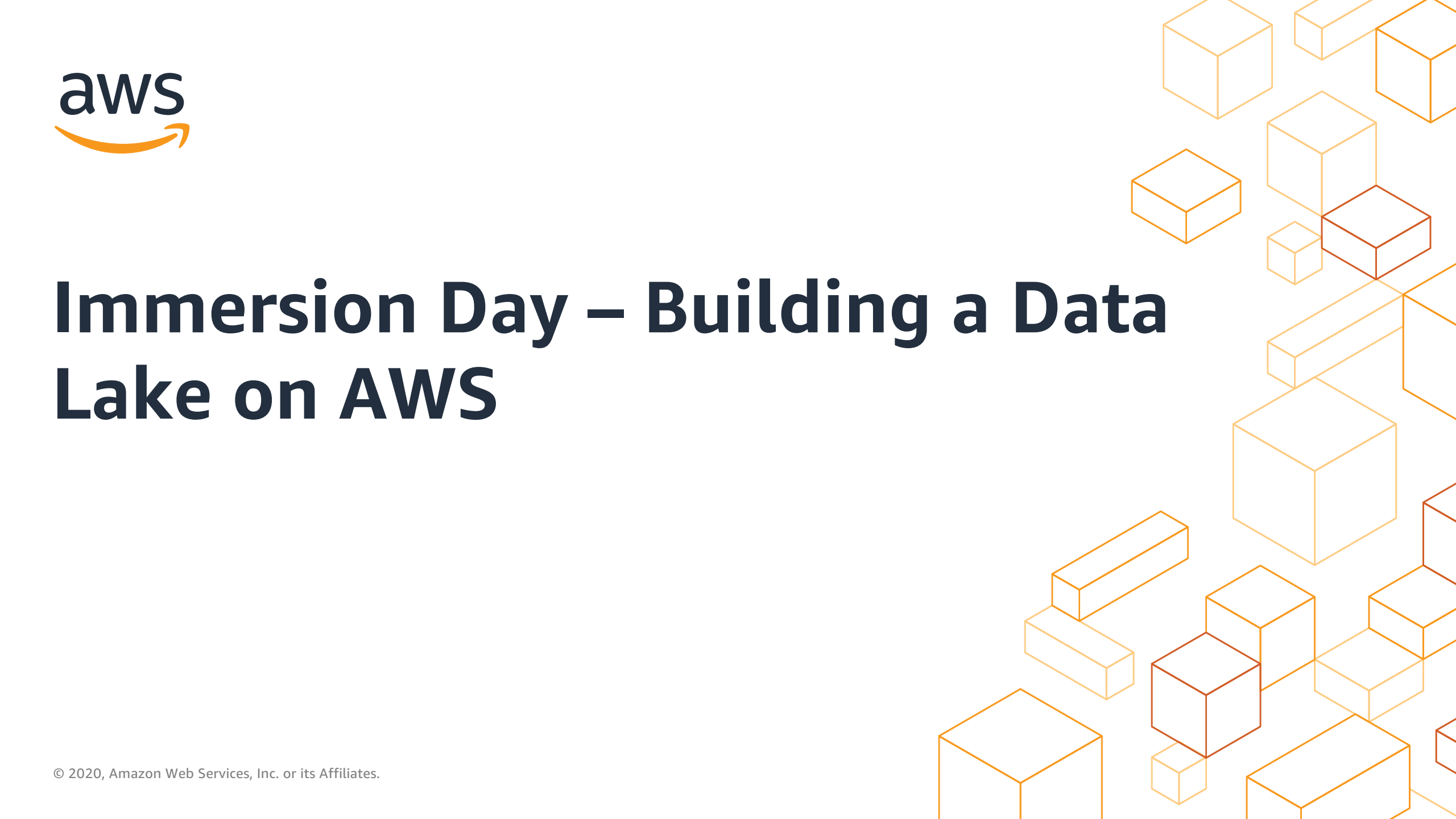


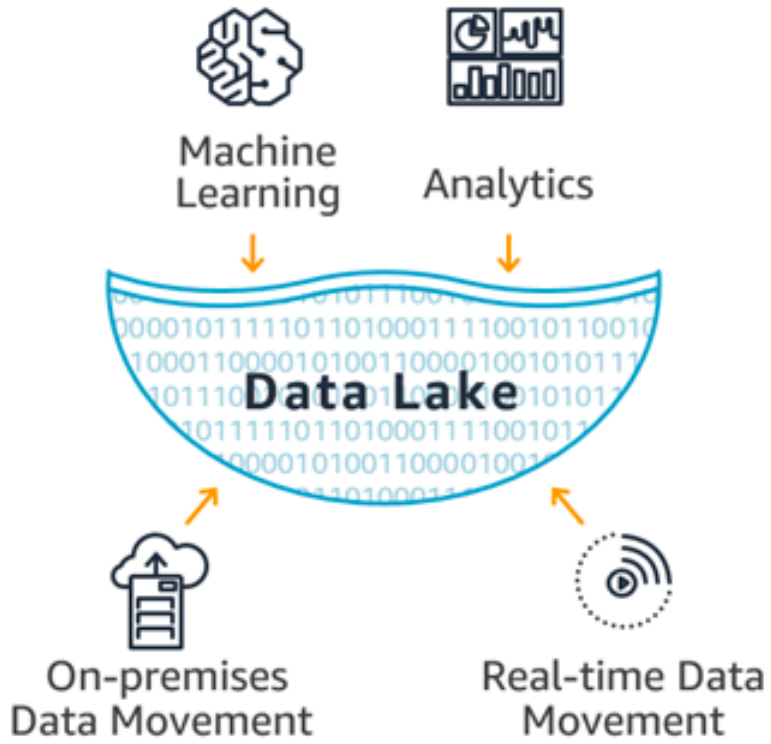
Immersion Day – Building a Data Lake on AWS

Workshop Agenda

- Overview of the Data Lake
- Hydrating the Data Lake
- Lab - Hydrating the Data Lake
- Working Within the Data Lake
- Lab - Transforming and Query Data in the Data
- Consuming the Data Lake – Reporting, Analytics, Machine Learning
- Lab – Extending Consuming Data Lake for Machine Learning
- Automating Data Lake with AWS Lake Formation
- Lab- Data Lake Automation

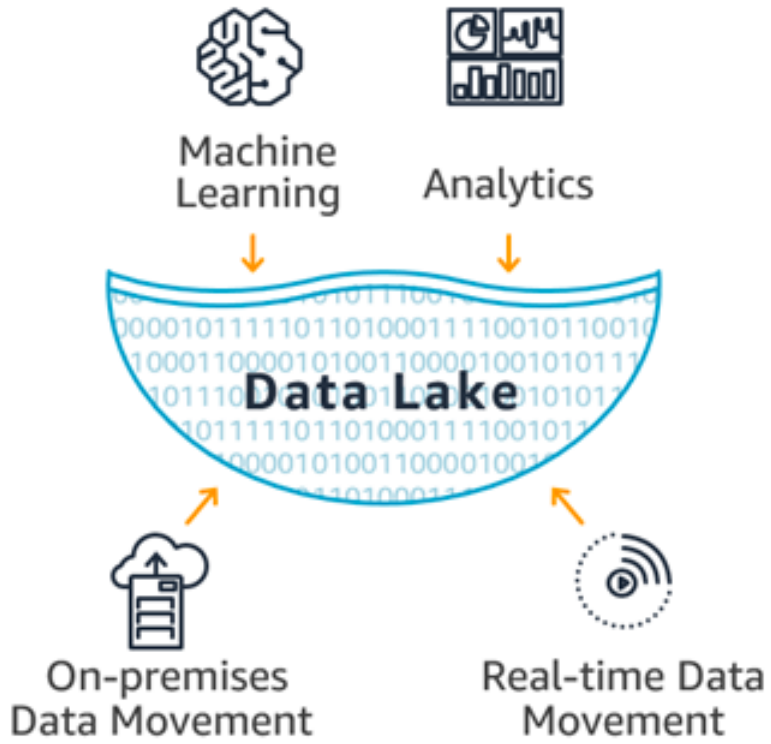
What is a Data Lake?

- A centralized repository for both structured and unstructured data
- Store data as-is in open-source file formats to enable direct analytics

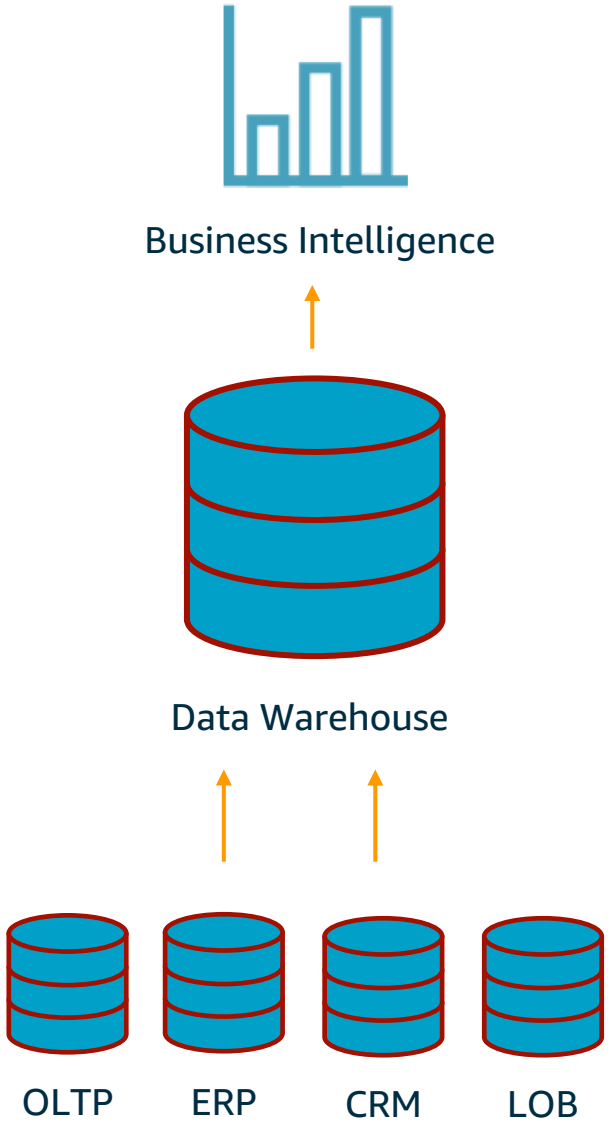


Why a Data Lake?

- Decouple storage from compute, allowing you to scale
- Enable advanced analytics across all of your data sources
- Reduce complexity in ETL and operational overhead
- Future extensibility as new database and analytics technologies are invented



Traditionally, Analytics Looked Like This



Relational Data

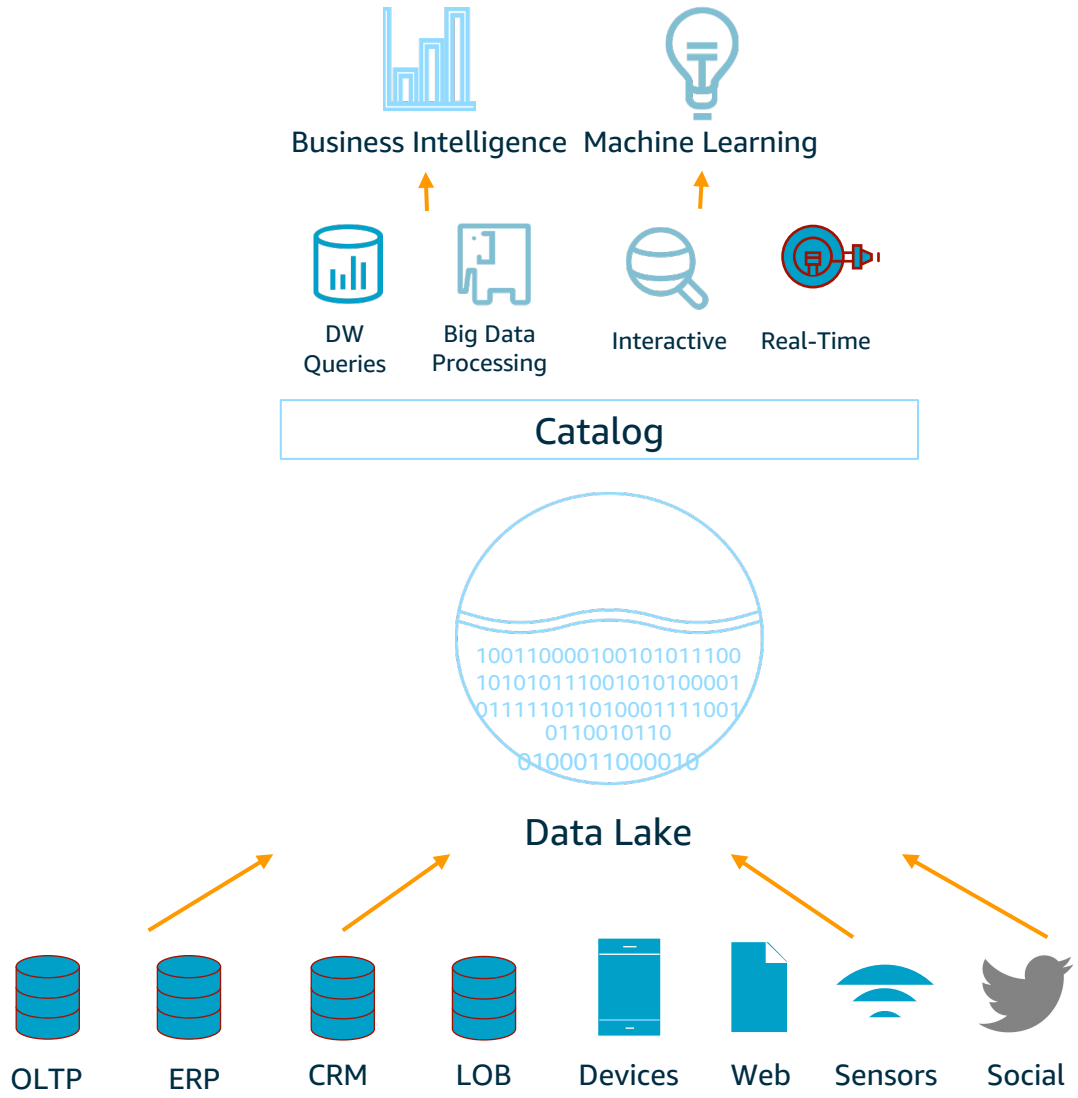
TBs-PBs Scale

Schema Defined Prior to Data Load

Operational and Ad Hoc Reporting

Large Initial Capex + $$K / TB/ Year

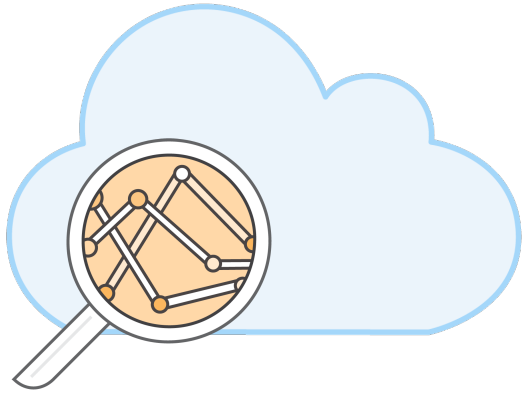
Data Lakes Extend the Traditional Approach



- TB-EBs Scale
- All Data in one place, a Single Source of Truth
- Relational and Non-Relational Data
- Decouples (low cost) Storage and Compute
- Schema on Read
- Diverse Analytical Engines

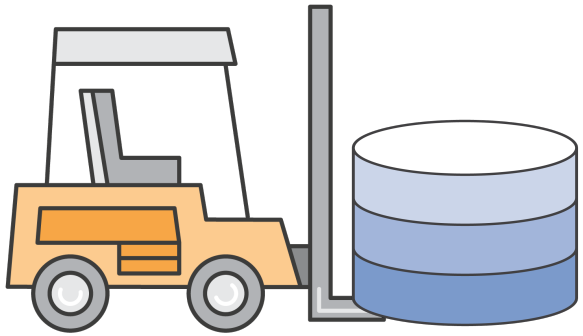
Benefits of a Data Lake – All Data in One Place

"Why is the data distributed in many locations? Where is the single source of truth ?"

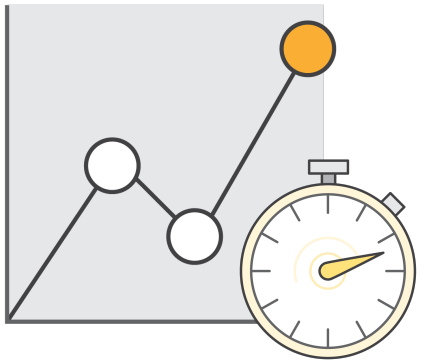


Store and analyze all of your data, from all of your sources, in one centralized location.

Benefits of a Data Lake – Quick Ingest

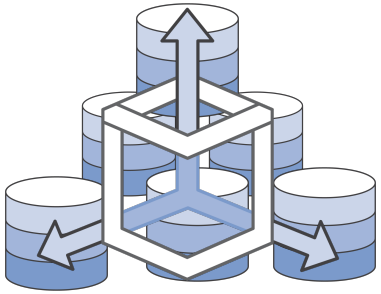


"How can I collect data quickly from various sources and store it efficiently?"

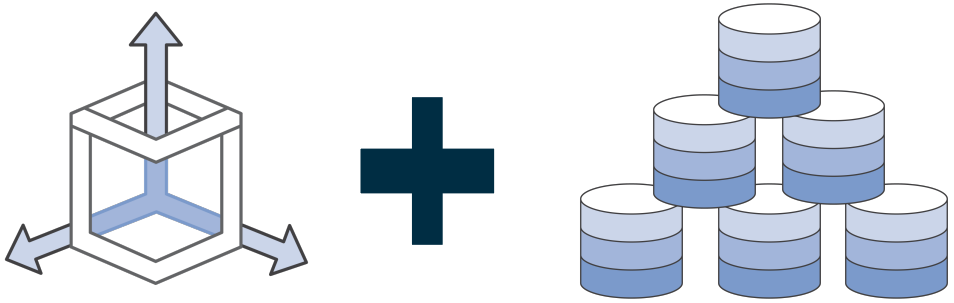


Quickly ingest data without needing to force it into a pre-defined schema.

Benefits of a Data Lake – Storage vs Compute

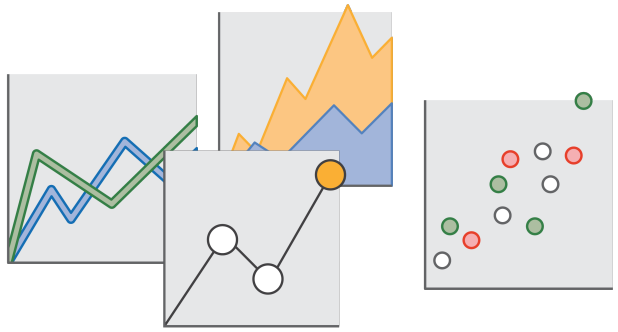


"How can I scale up with the volume of data being generated?"



Separating your storage and compute allows you to scale each component as required

Benefits of a Data Lake – Schema on Read



"Is there a way I can apply multiple analytics and processing frameworks to the same data?"

A Data Lake enables ad-hoc analysis by applying schemas on read, not write.

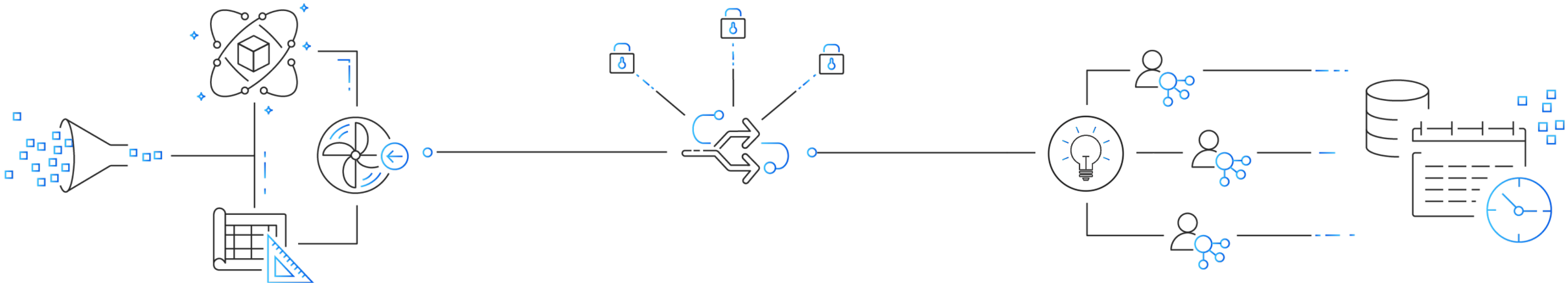
Building a Data Lake on AWS

aws

Why AWS?

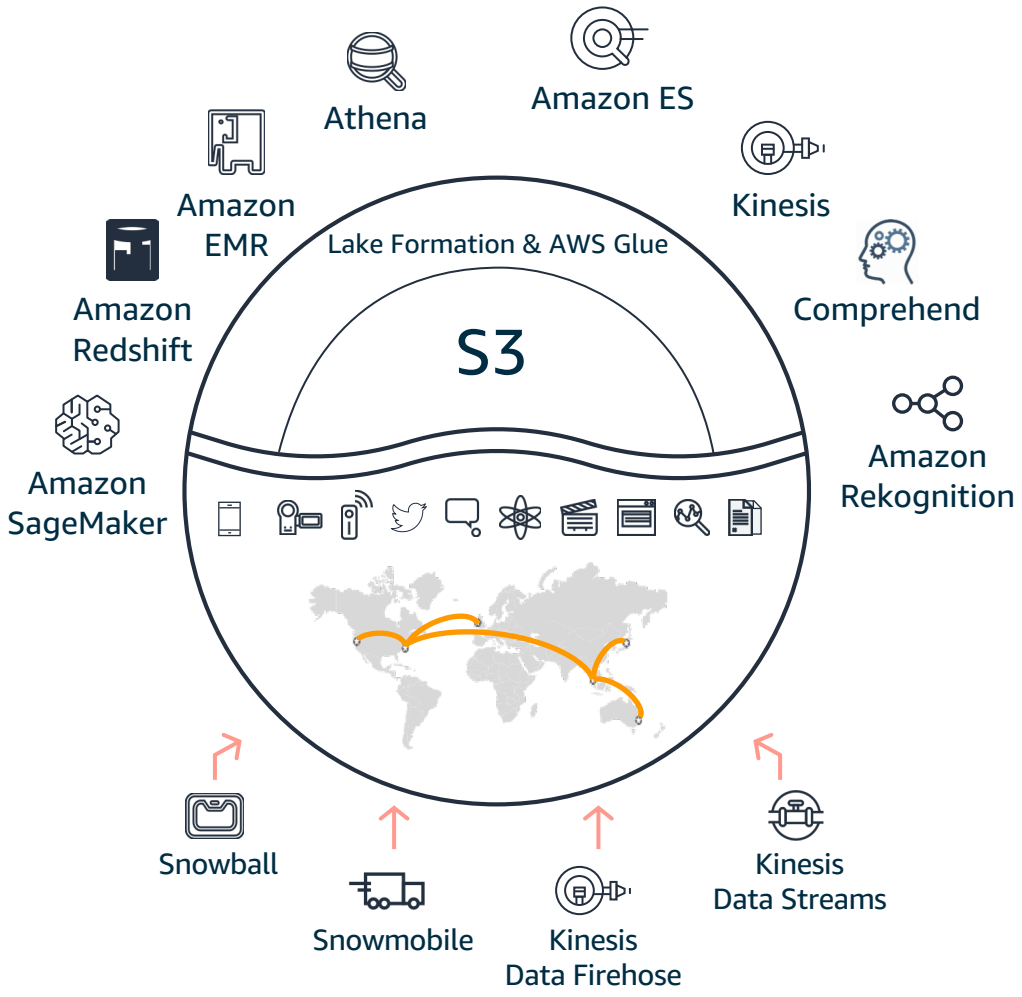
Implementing a Data Lake architecture requires a broad set of tools and technologies to serve an increasingly diverse set of applications and use cases.

Typical steps for building a data lake



1. Set up storage
2. Move data
3. Cleanse, prep, and catalog data
4. Configure and enforce security and compliance policies
5. Make data available for analytics

Robust data lake infrastructure with AWS



Durable and available; exabyte scale

Secure, compliant, auditable

Object-level controls for fine-grained access

Fast performance by retrieving subsets of data

Decoupling of compute and storage

On-demand resources, tiering, cost choices

Why Amazon S3 for a Data Lake?

Durable

Designed for **11 9s** of durability

Available

Designed for **99.99**% availability

High performance

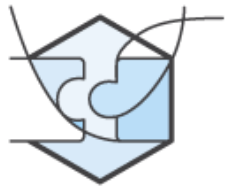
- Multiple upload
- Range GET

Easy to use

- Simple REST API
- AWS SDKs
- Read-after-create consistency
- Event notification
- Lifecycle policies

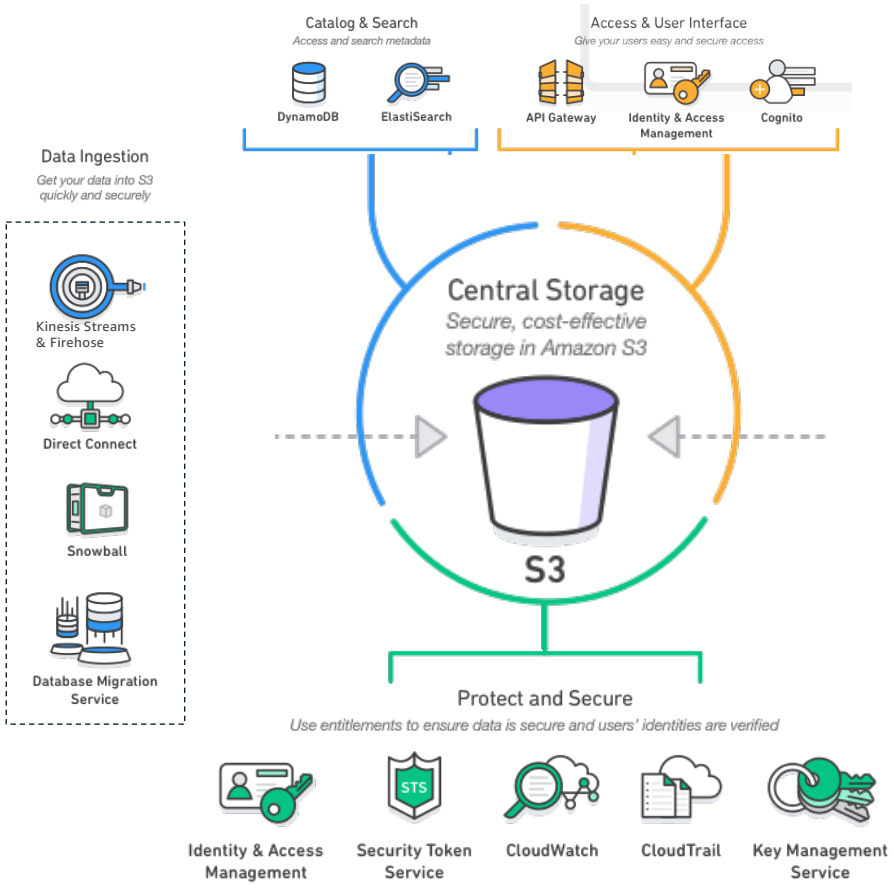
Scalable

- Store as much as you need
- Scale storage and compute independently
- No minimum usage commitments



Integrated

- Amazon EMR
- Amazon Redshift
- Amazon DynamoDB
- Amazon SageMaker
- Many more



Processing & Analytics

Real-time

- Elasticsearch Service
- Kinesis Data Analytics, Kinesis Data Streams
- Spark Streaming on EMR
- Apache Flink on EMR
- AWS Lambda
- Apache Storm on EMR

Analytics

- EMR Hadoop, Spark, Presto
- Athena Query Service
- Redshift Data Warehouse

AI & Predictive

- Amazon Lex Speech recognition
- Amazon Polly Text to speech
- Amazon Rekognition
- Machine Learning Predictive analytics

Transactional & RDBMS

- DynamoDB NoSQL DB
- Aurora Relational Database

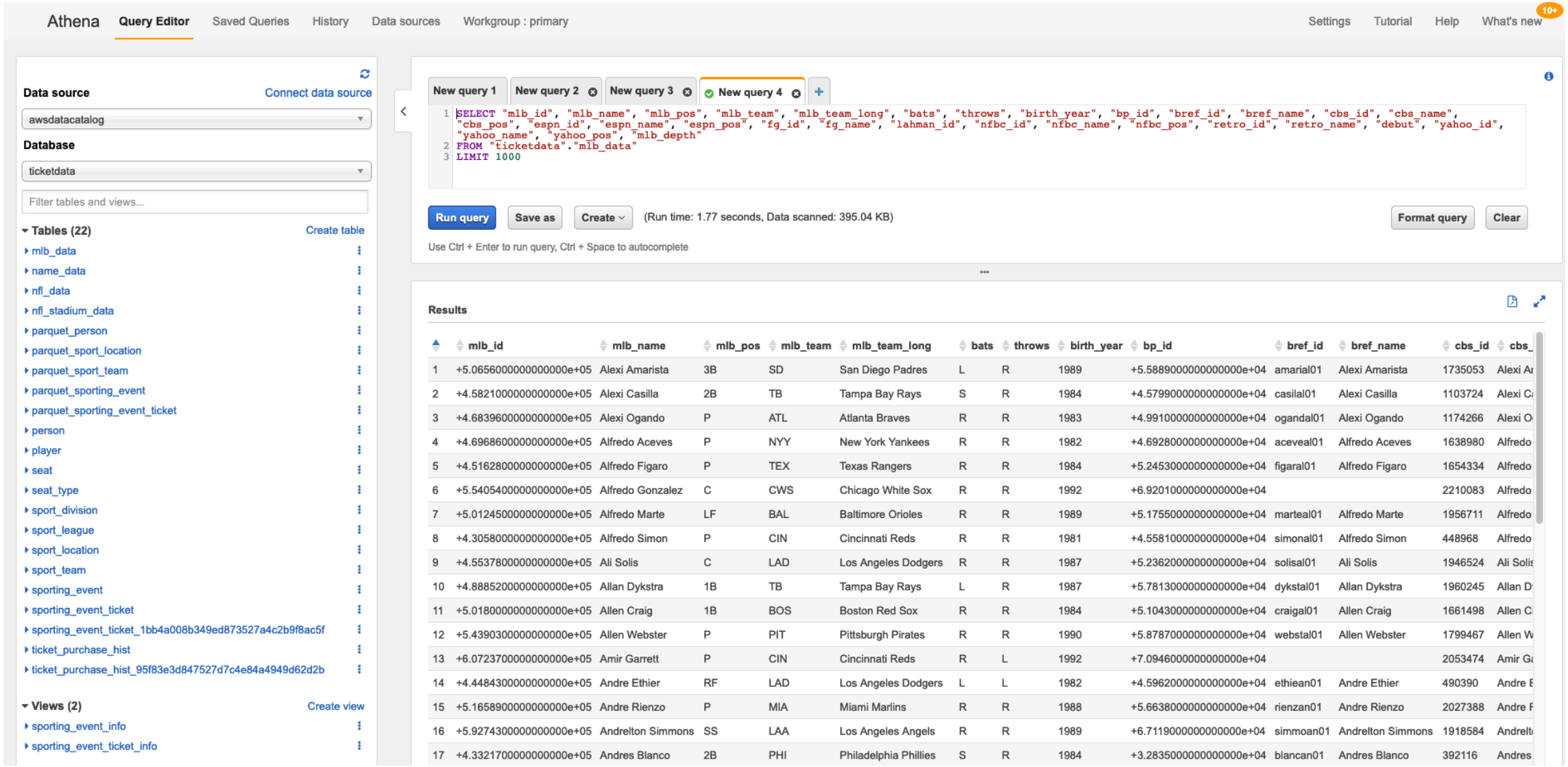
BI & Data Visualization

- Amazon QuickSight
- tableau
- MicroStrategy
- kibana

What can you do with a Data Lake?

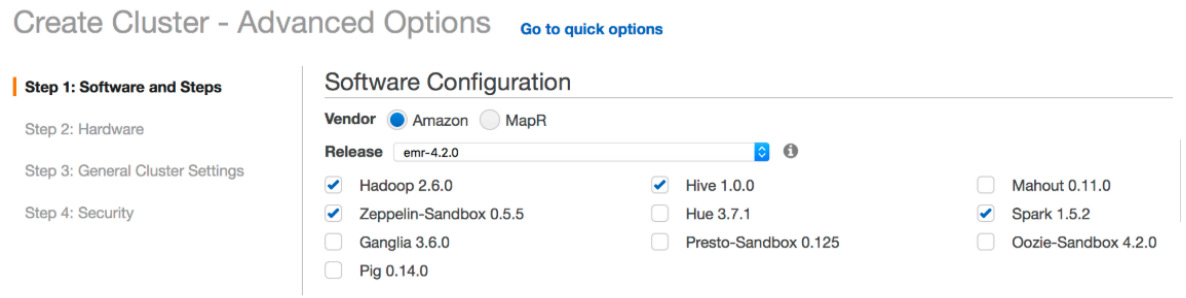
aws

Query Directly with Amazon Athena

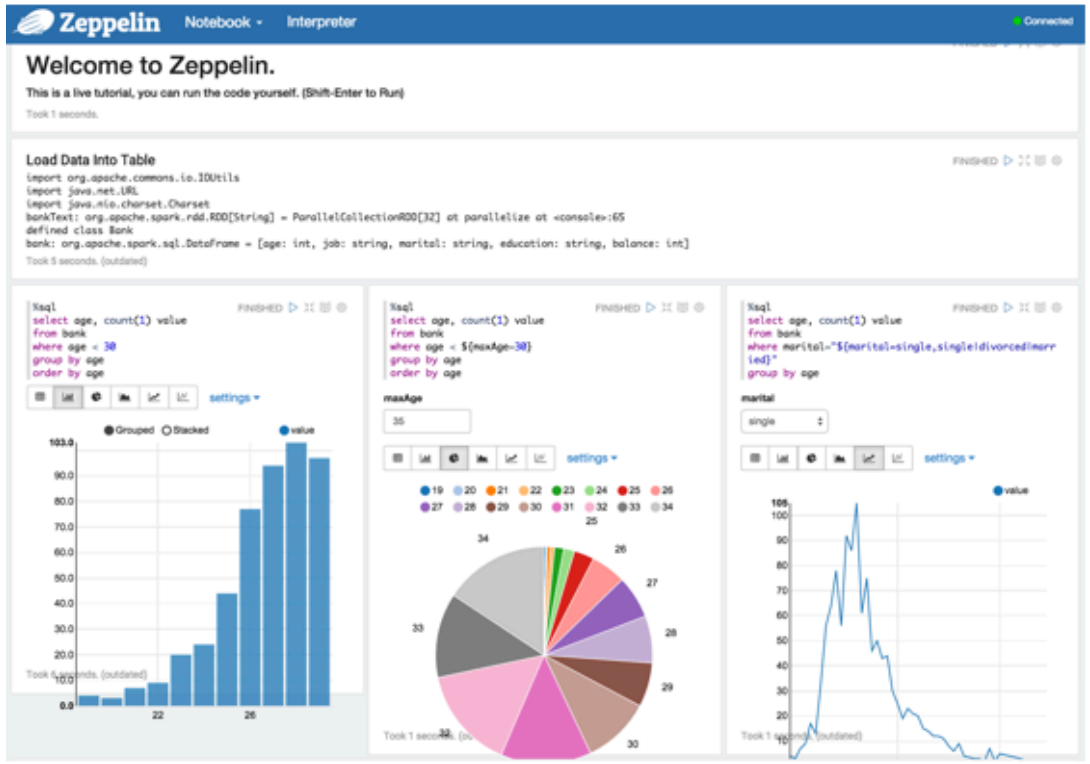


	mlb_id	mlb_name	mlb_pos	mlb_team	mlb_team_long	bats	throws	birth_year	bp_id	bref_id	bref_name	cbs_id	cbs_
1	+5.0656000000000000e+05	Alexi Amarista	3B	SD	San Diego Padres	L	R	1989	+5.5889000000000000e+04	amarial01	Alexi Amarista	1735053	Alexi A
2	+4.5821000000000000e+05	Alexi Casilla	2B	TB	Tampa Bay Rays	S	R	1984	+4.5799000000000000e+04	casilal01	Alexi Casilla	1103724	Alexi C
3	+4.6839600000000000e+05	Alexi Ogando	P	ATL	Atlanta Braves	R	R	1983	+4.9910000000000000e+04	ogandal01	Alexi Ogando	1174266	Alexi O
4	+4.6968600000000000e+05	Alfredo Aceves	P	NYY	New York Yankees	R	R	1982	+4.6928000000000000e+04	aceveal01	Alfredo Aceves	1638980	Alfredo
5	+4.5162800000000000e+05	Alfredo Figaro	P	TEX	Texas Rangers	R	R	1984	+5.2453000000000000e+04	figaral01	Alfredo Figaro	1654334	Alfredo
6	+5.5405400000000000e+05	Alfredo Gonzalez	C	CWS	Chicago White Sox	R	R	1992	+6.9201000000000000e+04			2210083	Alfredo
7	+5.0124500000000000e+05	Alfredo Marte	LF	BAL	Baltimore Orioles	R	R	1989	+5.1755000000000000e+04	marteal01	Alfredo Marte	1956711	Alfredo
8	+4.3058000000000000e+05	Alfredo Simon	P	CIN	Cincinnati Reds	R	R	1981	+4.5581000000000000e+04	simonal01	Alfredo Simon	448968	Alfredo
9	+4.5537800000000000e+05	Ali Solis	C	LAD	Los Angeles Dodgers	R	R	1987	+5.2362000000000000e+04	solisal01	Ali Solis	1946524	Ali Solis
10	+4.8885200000000000e+05	Allan Dykstra	1B	TB	Tampa Bay Rays	L	R	1987	+5.7813000000000000e+04	dykstal01	Allan Dykstra	1960245	Allan D
11	+5.0180000000000000e+05	Allen Craig	1B	BOS	Boston Red Sox	R	R	1984	+5.1043000000000000e+04	craigal01	Allen Craig	1661498	Allen C
12	+5.4390300000000000e+05	Allen Webster	P	PIT	Pittsburgh Pirates	R	R	1990	+5.8787000000000000e+04	webstal01	Allen Webster	1799467	Allen W
13	+6.0723700000000000e+05	Amir Garrett	P	CIN	Cincinnati Reds	R	L	1992	+7.0946000000000000e+04			2053474	Amir G
14	+4.4484300000000000e+05	Andre Ethier	RF	LAD	Los Angeles Dodgers	L	L	1982	+4.5962000000000000e+04	ethiean01	Andre Ethier	490390	Andre E
15	+5.1658900000000000e+05	Andre Rienzo	P	MIA	Miami Marlins	R	R	1988	+5.6638000000000000e+04	rienzan01	Andre Rienzo	2027388	Andre R
16	+5.9274300000000000e+05	Andrelton Simmons	SS	LAA	Los Angeles Angels	R	R	1989	+6.7119000000000000e+04	simmoan01	Andrelton Simmons	1918584	Andrelt
17	+4.3321700000000000e+05	Andres Blanco	2B	PHI	Philadelphia Phillies	S	R	1984	+3.2835000000000000e+04	blancan01	Andres Blanco	392116	Andres

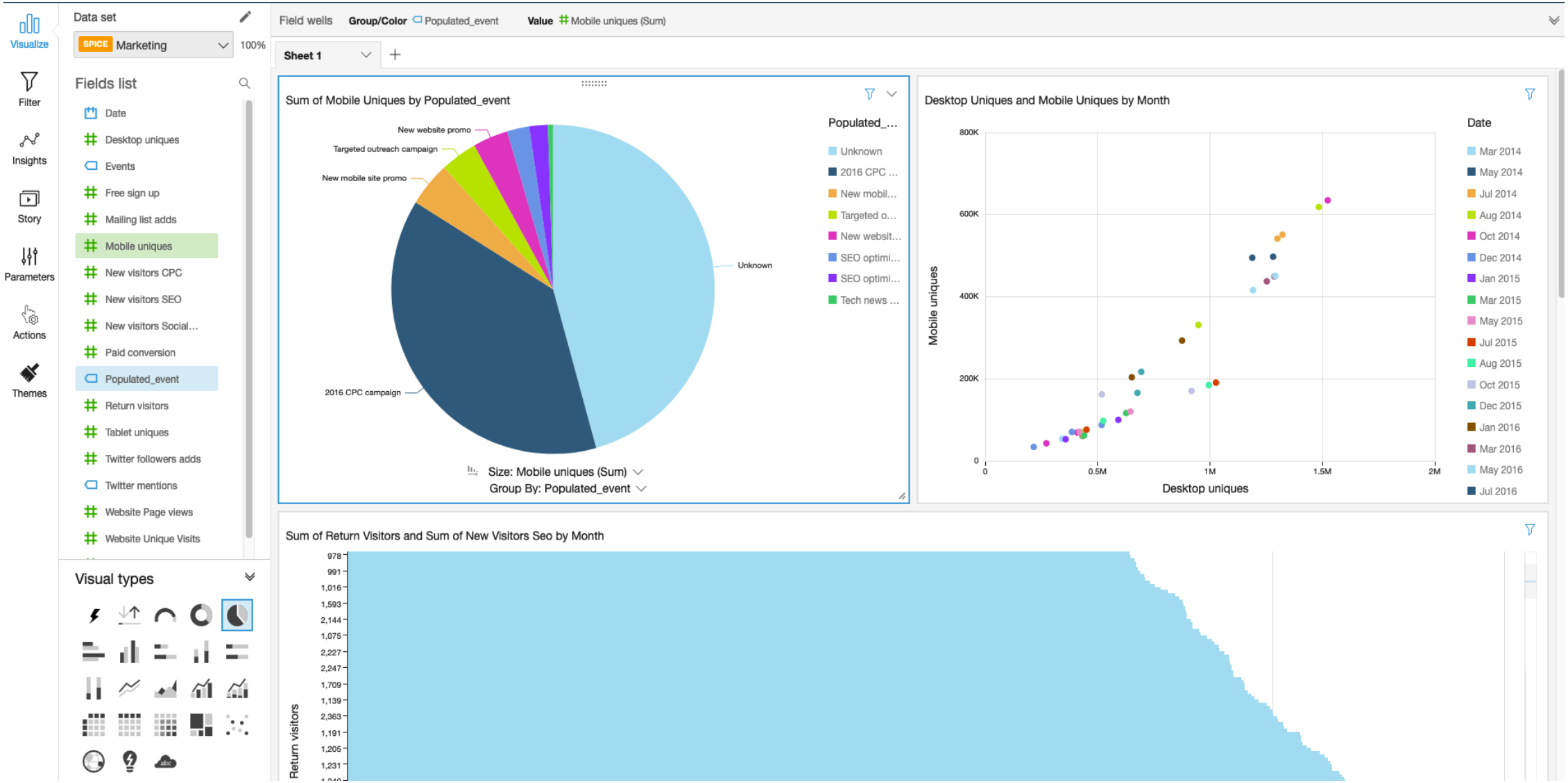
Analyze with Hadoop on Amazon EMR



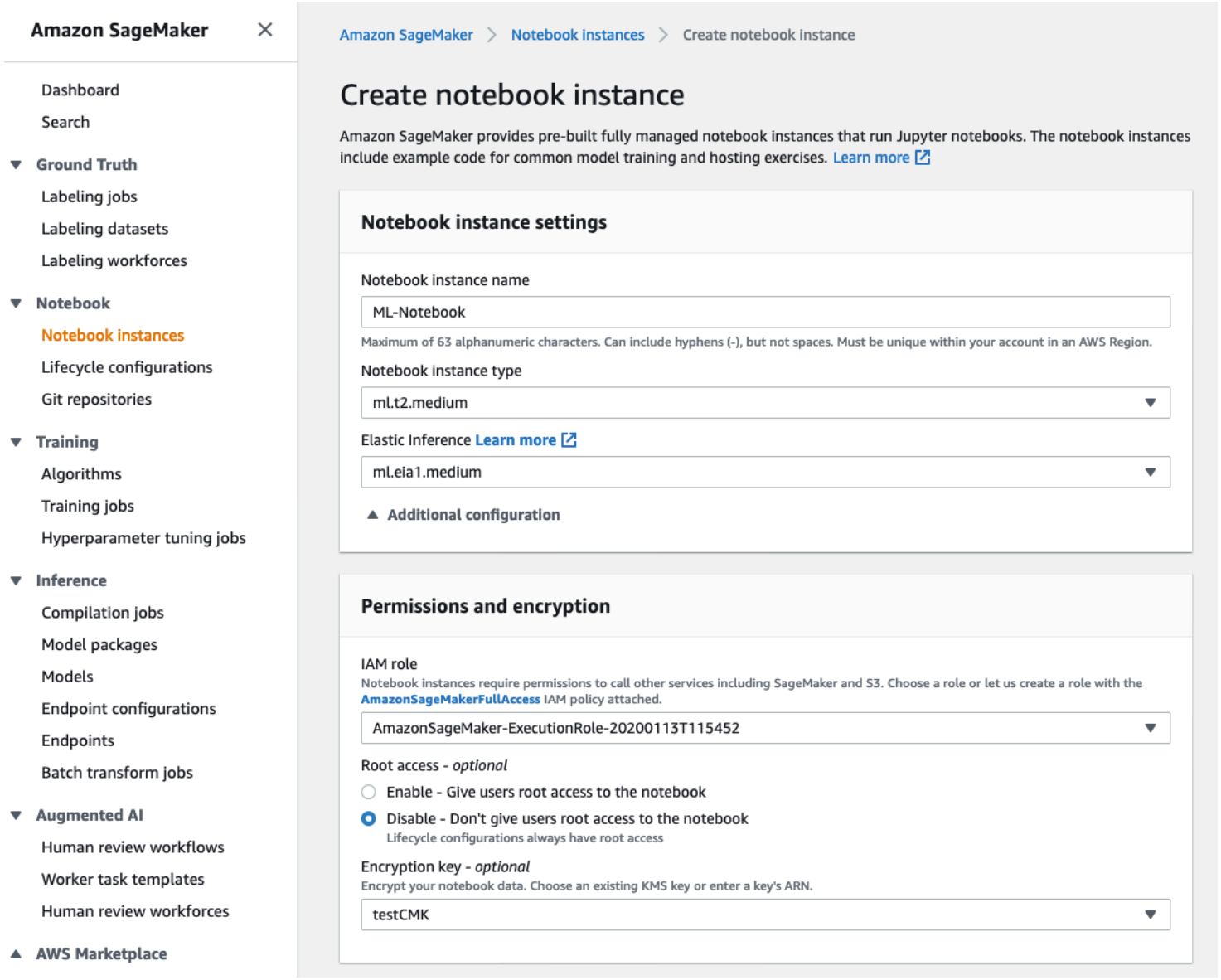

```
Scala
val movieLensHomeDir = "s3://emr.examples/movieLens/"

val movies = sc.textFile(movieLensHomeDir + "movies.dat").map { line =>
  val fields = line.split("::")
  // format: (movieId, movieName)
  (fields(0).toInt, fields(1))
}.collect.toMap

val ratings = sc.textFile(movieLensHomeDir + "ratings.dat").map { line =>
  val fields = line.split("::")
  // format: (timestamp % 10, Rating(userId, movieId, rating))
  (fields(3).toLong % 10, Rating(fields(0).toInt, fields(1).toInt, fields(2).toDouble))
}
```



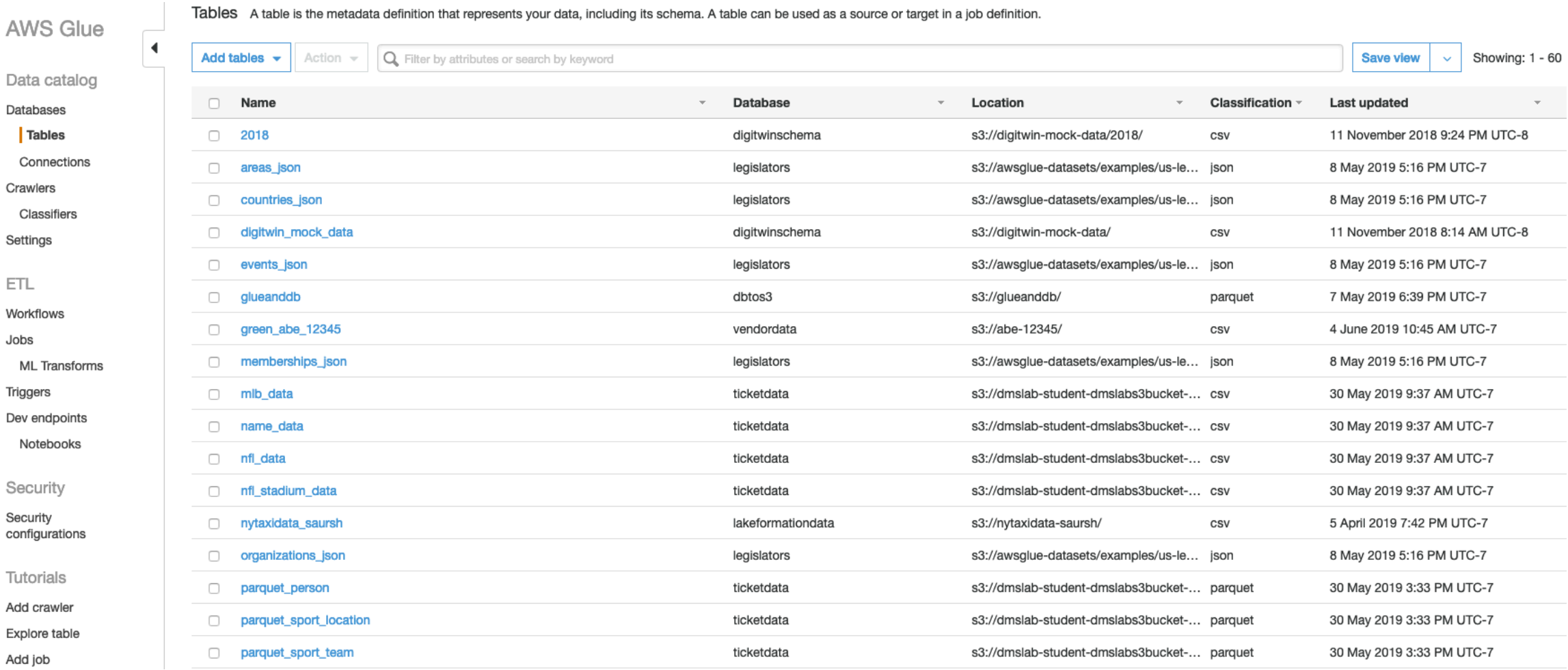
Create Visualizations with Amazon QuickSight



Train ML Models with Amazon SageMaker



Create a Central Data Catalog with AWS Glue



Load into Downstream Services

Amazon Redshift

Run complex analytic queries against petabytes of structured data

Amazon Aurora

A MySQL and PostgreSQL compatible relational database built for the cloud

Amazon DynamoDB

A NoSQL database service that delivers consistent, single-digit millisecond latency at any scale.

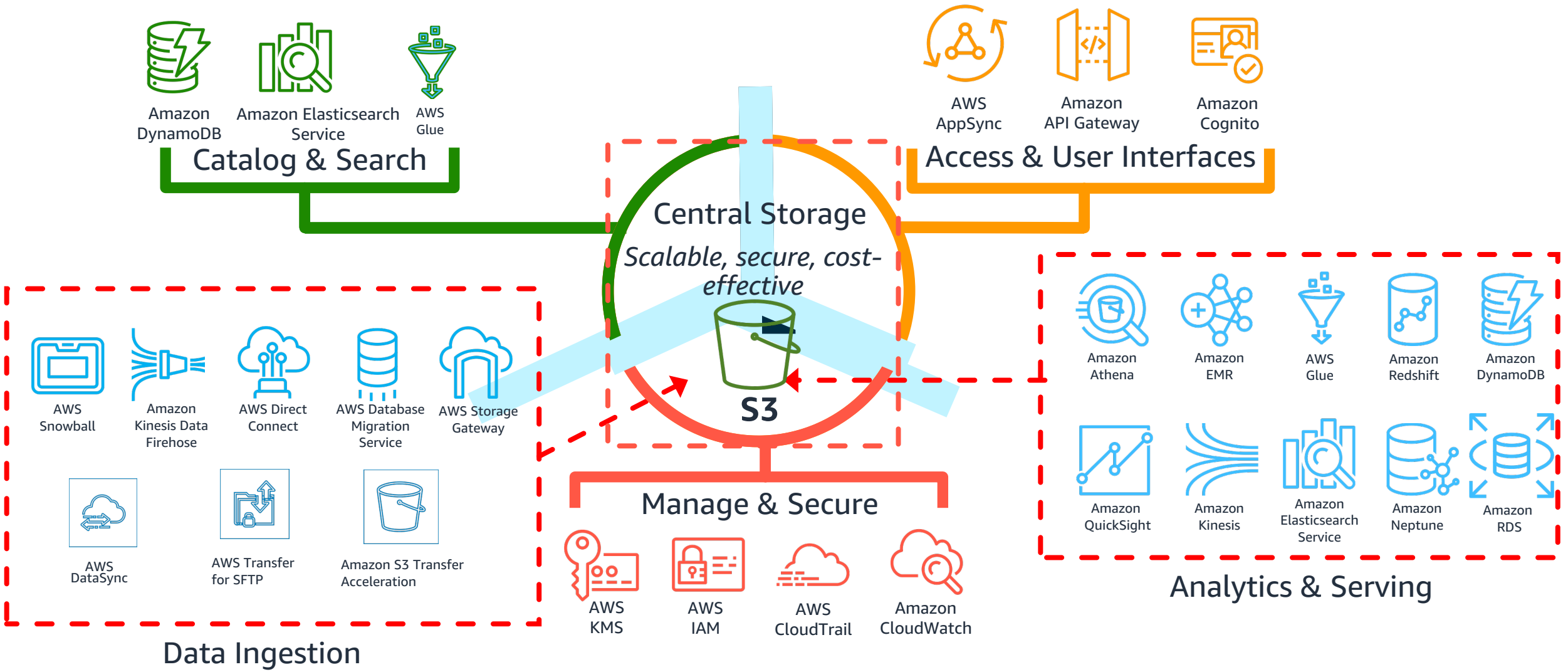
Amazon Elasticsearch

Delivers Elasticsearch's real-time analytics capabilities alongside the availability, scalability, and security that production workloads require.

Amazon SageMaker

fully managed service that provides every developer and data scientist with the ability to build, train, and deploy machine learning (ML) models quickly

Today's Focus



Thanks! You