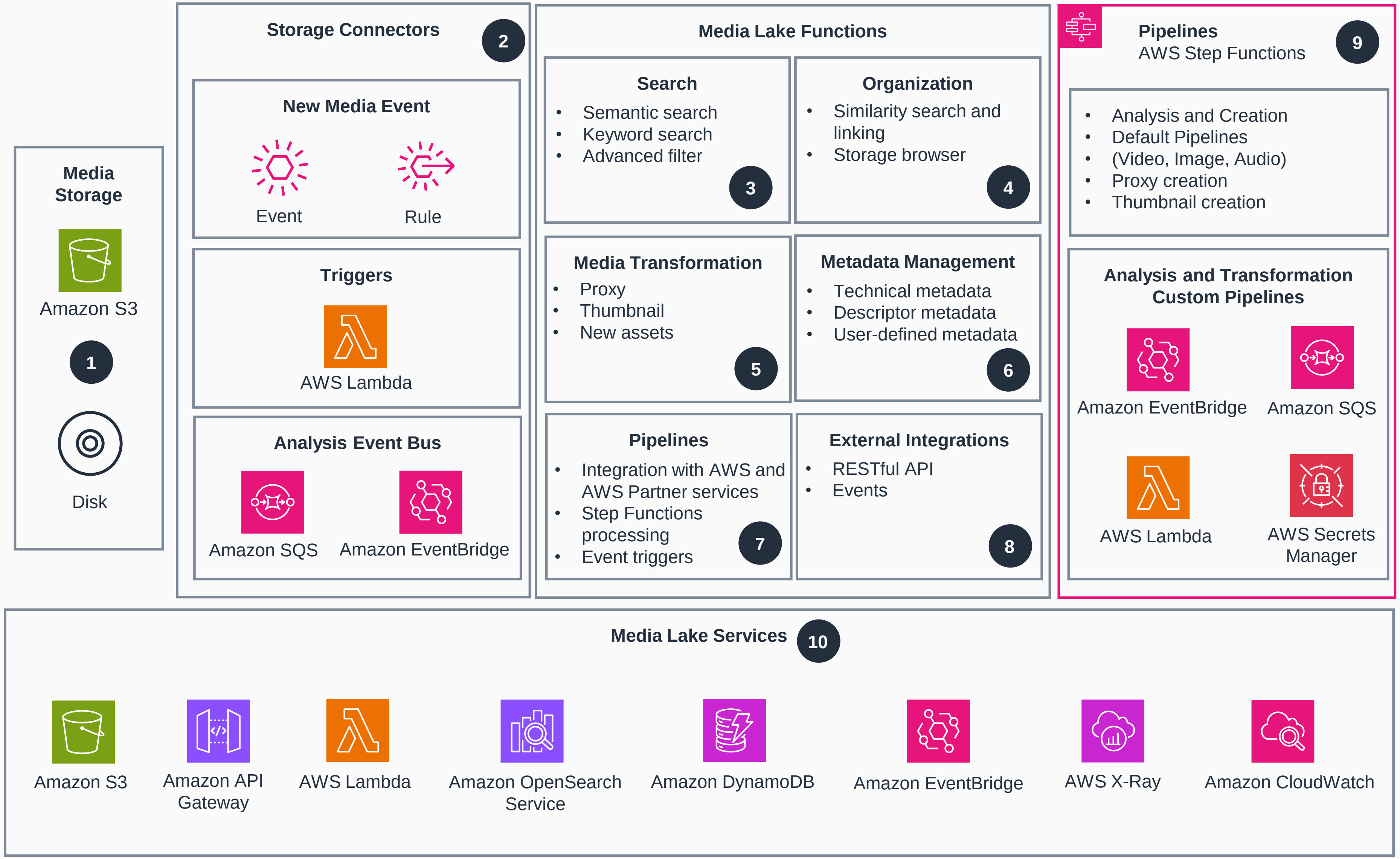
Guidance for a Media Lake on AWS

Overview

This architecture diagram provides a functional overview of the capabilities of a media lake on AWS.



Media Storage

Amazon S3

1

Disk

Storage Connectors 2

New Media Event

Event

Rule

Triggers

AWS Lambda

Analysis Event Bus

Amazon SQS

Amazon EventBridge

Media Lake Functions

Search

- Semantic search
- Keyword search
- Advanced filter

3

Organization

- Similarity search and linking
- Storage browser

4

Media Transformation

- Proxy
- Thumbnail
- New assets

5

Metadata Management

- Technical metadata
- Descriptor metadata
- User-defined metadata

6

Pipelines

- Integration with AWS and AWS Partner services
- Step Functions processing
- Event triggers

7

External Integrations

- RESTful API
- Events

8

Pipelines

AWS Step Functions

9

- Analysis and Creation
- Default Pipelines
- (Video, Image, Audio)
- Proxy creation
- Thumbnail creation

Analysis and Transformation Custom Pipelines

Amazon EventBridge

Amazon SQS

AWS Lambda

AWS Secrets Manager

Media Lake Services 10

Amazon S3

Amazon API Gateway

AWS Lambda

Amazon OpenSearch Service

Amazon DynamoDB

Amazon EventBridge

AWS X-Ray

Amazon CloudWatch

1 Upload new media files to **Amazon Simple Storage Service (Amazon S3)**. Upload triggers an event to initiate processing.

2 **AWS Lambda**, **Amazon Simple Queue Service (Amazon SQS)**, and **Amazon EventBridge** coordinate the flow of events after ingestion. **Lambda** functions handle initial processing, and **EventBridge** routes events to transformation, enrichment, and pipeline components.

3 Search features support semantic and keyword search in addition to filtering of indexed assets.

4 Organization logic groups related assets using metadata or similarity scoring. A storage browser is used to explore assets in the connector.

5 Media transformation creates proxies, thumbnails, or derivative assets when triggered.

6 Metadata management extracts technical- and user-defined metadata to support powerful search and discovery.

7 Default or custom pipelines coordinate analysis, enrichment, and transformation using AWS and partner services.

8 RESTful APIs and workflow and API events enable integration with external systems, allowing ingestion, search, and asset and metadata retrieval.

9 **Lambda** and **EventBridge** coordinate the execution of custom analysis and transformation pipelines, accessing credentials in **AWS Secrets Manager** enabling secure workflows.

10 **Amazon S3**, **Amazon API Gateway**, **Lambda**, **Amazon OpenSearch Service**, **Amazon DynamoDB**, **EventBridge**, **Amazon SQS**, **Amazon CloudWatch**, and **AWS X-Ray** power media lake functions.

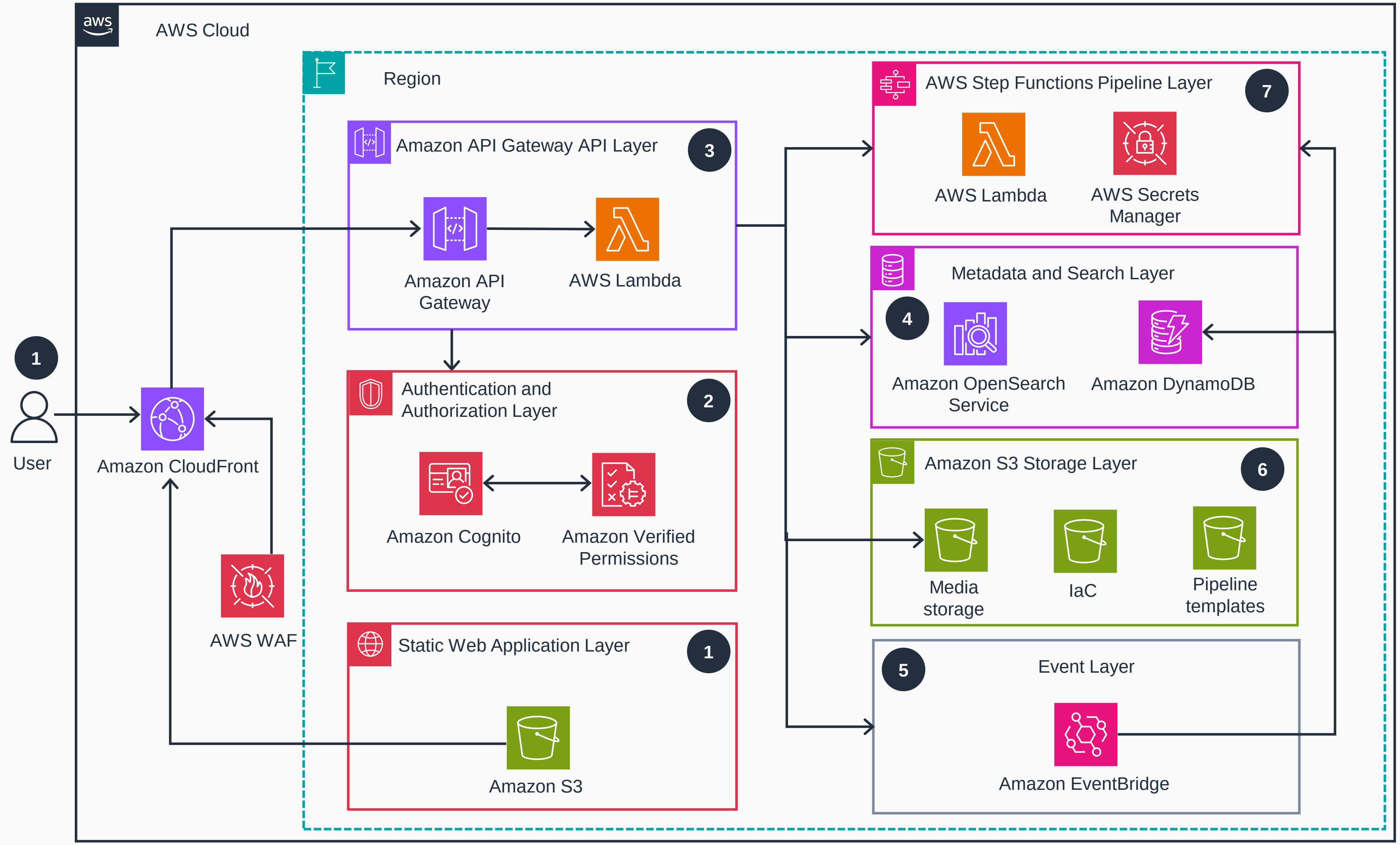
Reviewed for technical accuracy June 30, 2025

AWS Reference Architecture

Guidance for a Media Lake on AWS

High-level application architecture

This architecture diagram shows the high-level API, storage, and back-end architecture of a media lake on AWS.



1 Operators access the media lake user interface through **Amazon CloudFront** with protection provided by **AWS WAF**. **CloudFront** serves the static web application from **Amazon S3**.

2 **Amazon Cognito** performs user authentication with authorization managed through **Amazon Verified Permissions**.

3 **API Gateway** routes authenticated requests, which are processed by **Lambda** functions that invoke backend services as needed.

4 **Lambda** queries **OpenSearch Service** to return search and retrieval results.

5 **EventBridge** receives internal events from the media lake through its API layer and pipeline layer, powering downstream processes such as pipeline execution, audit logging, and compliance tracking.

6 **Amazon S3** stores media files and assets in the Storage Layer, while **DynamoDB** stores metadata. This layer also includes infrastructure as code (IaC) and pipeline templates to enable scalable, reusable workflows.

7 **EventBridge** triggers pipelines upon receiving events. These pipelines pull media from **Amazon S3**, metadata from **Amazon DynamoDB**, and credentials from **Secrets Manager**. **Lambda** functions carry out operations such as proxy generation, embedding generation, and media enrichment, all orchestrated through **Step Functions**.

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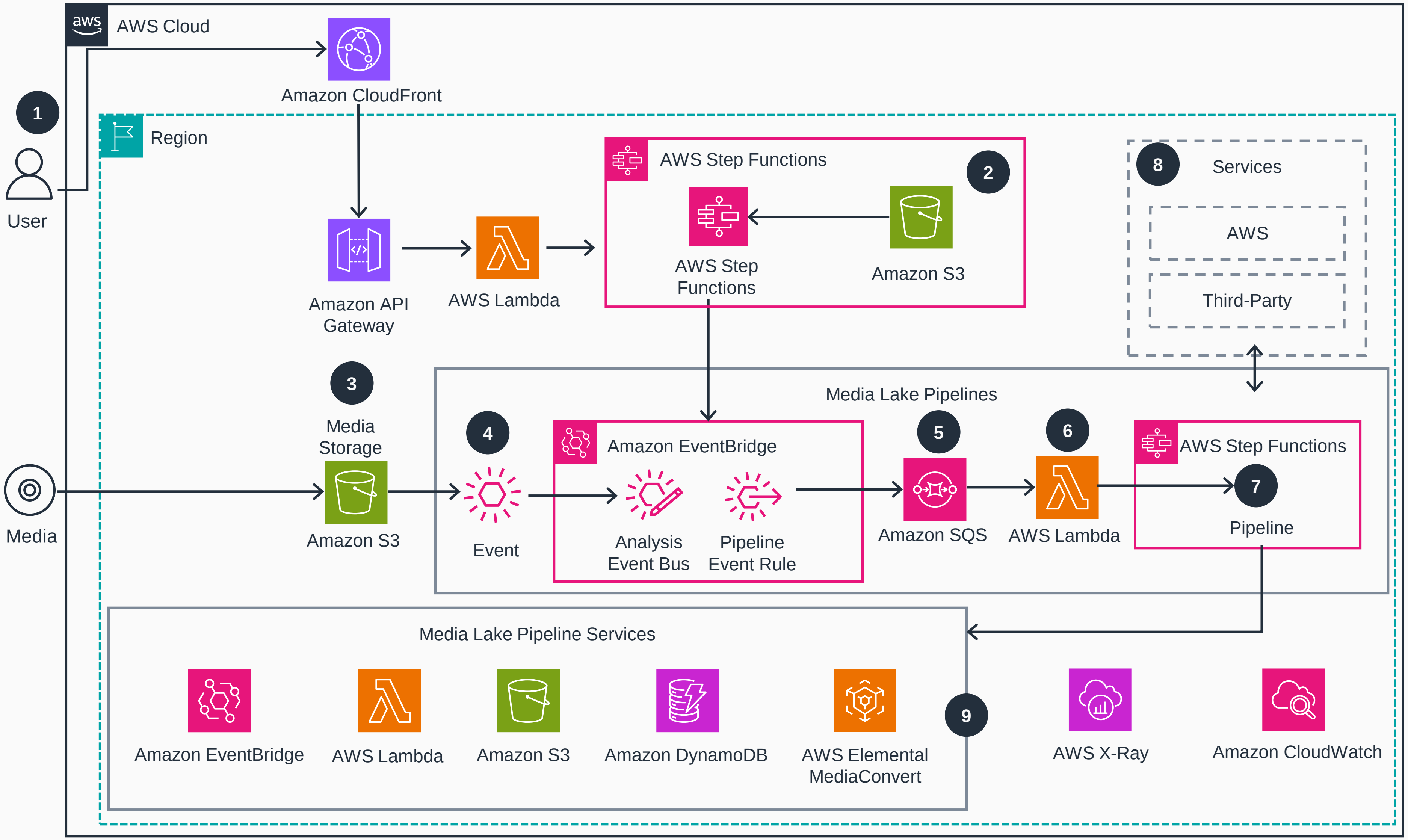
AWS Reference Architecture

Guidance for a Media Lake on AWS

Pipeline execution and deployment

This architecture diagram shows the deployment and execution of pipelines used in a media lake to process media and produce metadata to aid search and render new versions for use with downstream systems.



1 Users define media processing workflows, through a no-code drag-and-drop canvas, save them, and deploy them as pipelines.

2 **Lambda** sends requests to **Step Functions**, accessing IaC in **Amazon S3**.

3 **Amazon S3** generates event notifications when new media is uploaded, which are copied and sent to the media lake analysis event bus.

4 The media lake creates **EventBridge** event rules that trigger pipelines based on new asset events or the completion of previous pipelines.

5 **Amazon SQS** queues incoming events, allowing them to be buffered and processed asynchronously.

6 **Lambda** handles events from the queue and triggers the **Step Functions** that represent deployed pipelines.

7 **Step Functions** define each pipeline as an individual state machine, executing the logic configured in the canvas.

8 **Step Functions** enable pipelines to integrate with AWS services, AWS internal software vendor (ISV) partners, or third-party systems as needed.

9 **Step Functions** coordinates the entire pipeline, reading media from **Amazon S3**, invoking **Lambda** (monitored through **CloudWatch** and **X-Ray**) to extract metadata and write it to **DynamoDB**, and finally, using **AWS Elemental MediaConvert** to generate proxies. It then stores outputs back in **Amazon S3**.

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AWS Reference Architecture