

An Automated Integration Testing Module for Amazon Machine Images (AMIs)

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ABSTRACT

This paper presents the design and implementation of an automated testing module for validating Amazon Machine Images (AMIs), developed to optimize operational workflows in a real-world cloud infrastructure project. The underlying use case is based on an industry scenario involving an AMI factory pipeline that generates machine images deployed on EC2 clusters to expose a Software-as-a-Service (SaaS) product. In current practices, patched AMIs are often delivered directly to production environments without prior validation, and version upgrades typically require manual testing by QA teams. This introduces risks related to system instability and delays in delivery.

Our proposed solution automates the validation process of AMIs using a scalable serverless architecture. The core components include AWS Step Functions for orchestrating test workflows, AWS Lambda for executing initialization, monitoring, and validation steps, AWS DynamoDB for persistent state and metadata management, and AWS CloudWatch for continuous monitoring and alerting [1–4]. Step Functions provides built-in error handling and retry logic [5], while DynamoDB data modeling decisions were based on best practices presented in AWS re:Invent materials [6].

The overall design follows the six pillars of the AWS Well-Architected Framework—operational excellence, security, reliability, performance efficiency, cost optimization, and sustainability—ensuring that the solution is robust, scalable, and aligned with industry standards [7].

Key features include a user-friendly interface, a robust EC2 instance management mechanism, and flexible support for custom testing scenarios. The results demonstrate a secure and efficient mechanism for triggering automated AMI validations via an API, significantly reducing QA manual workload and enhancing reliability in production environments.

While primarily targeting QA teams, this solution also benefits DevOps engineers, cloud administrators, and other technical teams involved in infrastructure maintenance. The system is designed with extensibility in mind, enabling future enhancements such as advanced security testing and support for additional cloud resources.

KEYWORDS

Cloud Automation, AMI Testing, AWS Serverless, Infrastructure Validation, QA Automation, Well-Architected Framework

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