MIGRATION TO THE CLOUD: LESSONS LEARNED FROM THE PROJECT "Development and Operation of the Astromaterials Data System"

P. Ji[1], K. Lehnert[1], D. Stern[2], J.D. Figueroa[1], L. Profeta[1], J. Mays[1], A. Johansson[1], L Song[1]
[1]Lamont -Doherty Earth Observatory, Palisades, NY, United States
[2]Stern Devops Group

Introduction: The Astromaterials Data System (AstroMat) team has been working over the past year to migrate the initial on-premise infrastructure of the Astromaterials Data System to Amazon Web Services (AWS). This presentation will discuss the rationale for migrating Astromat to the cloud and describe the lessons learned from the migration.

What is the Astromat: AstroMat is a comprehensive data system for laboratory analytical data generated by the study of astromaterials curated at the NASA Johnson Space Center[1]. It is designed as an ecosystem of interconnected applications that provide human- and machine-readable interfaces to the data gathered and managed in AstroMat's databases[2]. The architecture is illustrated in Fig. 1. The various components of AstroMat are intended for specific purposes and include interfaces for users to search, access, explore, visualize, analyze, and contribute data; software tools for data curators to compile, track, validate, ingest, manage, and annotate data; and machine-actionable interfaces that connect the databases to internal and external software tools.

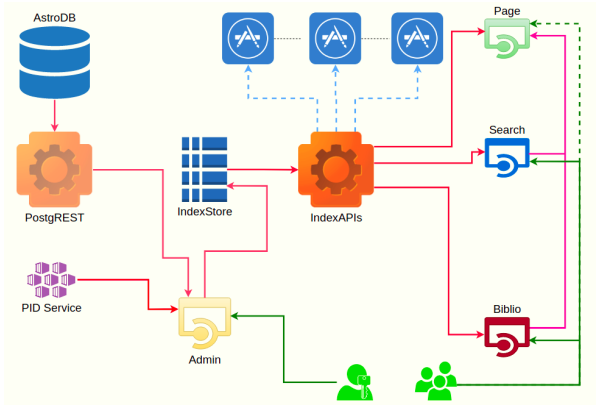

Fig. 1. Architecture of the Astromaterials Data System

Why Migrate: Astromat uses an API-driven architecture. In the original architecture, each component of Astromat was containerized and operated in an on-premise container orchestration platform. While operationally stable, this infrastructure required substantial effort for data backup and recovery, maintenance of the orchestration platform, development and deployment automation, and did not offer sufficiently robust reliability and scalability.

Migration to AWS: The migration to AWS followed a simplified five-step model, which included assessment, prototype, implementation, testing, and optimization. This migration path was designed in collaboration with a consultant, who provided the required expertise in AWS architectures. The migration assessment was the first step necessary to understand the architecture, the team's knowledge of AWS, the usage level of different components, and other critical aspects.. The next step was to map each component of Astromat to proper AWS services, like S3, Fargate service, etc., and to create a proof of concept on which to build the infrastructure. In the next step, a series of AWS CloudFormation templates were developed to automate AWS resource management, and github actions to trigger automated deployment. Following implementation, component testing and optimization were iterated many times. Finally, a stable AWS infrastructure for Astromat was achieved see Fig. 2.

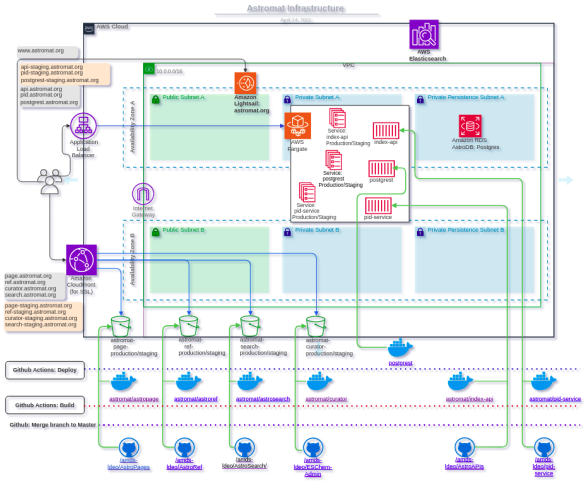

Fig. 2. the Infrastructure of Astromat

Conclusion: Migration into the cloud and operation within the cloud have a lot of challenges, such as rapid technological changes, potential vendor lock-ins, and culture changes in the team, etc.. With a prescriptive approach from experienced partners can help to achieve a successful future in the cloud. Creating the required guidelines and workflows for an agile execution of development, deployment and management is the key to survive in the cloud. Transforming workforce culture and growing cloud skills of the team continually is the way to adapt to the new agile-DevOps-cloud software engineering mode.

Acknowledgments: The work described in this abstract was supported by National Aeronautics & Space [80NSSC19K1102].

References:

[1] Lehnert, K., Ji, P., Mays, J., Figueroa, J. D., Johansson, A., Profeta, L., Song, L., and Morrison, S.(2020) The Astromaterials Data System: Advancing Access to Past, Present, and Future Lab Analytical Data of NASA's Astromaterials Collections, Europlanet Science Congress ,EPSC2020-918.

[2] Ji, P., Lehnert, K., Evans, C. A., and Zeigler, R. A.(2018) AstroDB- A Data System for Analytical Data of extraterrestrial samples, American Geophysical Union, Fall Meeting 2018, abstract #IN31A-08.