Kevin Grimes

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Software systems engineer at NASA Jet Propulsion Laboratory with a range of experience including support for Mars missions, planetary data archives, multi-mission organizations, and Earth projects. Graduated with a Master of Science degree in computer science from the University of Southern California, and with a Bachelor of Science degree in mathematics from Evangel University. Experienced in designing, architecting, and leading implementation of complex, mission-critical software systems in high-pressure environments.

Skills

Programming languages: Java 12, Python, Bash, Go, JavaScript, C++, MySQL
Technologies: AWS[1], Docker, Kubernetes[2], Terraform, Ansible, ELK stack, Apache Solr, Linux, Github, Cameo System Modeler, image processing software (ISIS, VICAR, GDAL)
Other skills: Cloud-native application development, micro-service architectures, event-driven architectures, software cost estimation, GitOps[3], agile software development, object-oriented programming, team leadership, technical writing, requirements engineering, SysML modeling, public speaking, crisis management, linear algebra, stereo image processing of remote-sensing instruments

Experience

Systems Engineer June 2023 – Present
Mars 2020 GDS & MS (Phase E) *Jet Propulsion Laboratory, Pasadena, CA*

- Primary interface between the IDS software team and customers across the Mission System, with responsibilities including customer request triage and requirement interpretation, developer time prioritization, and software solution presentation
- Spearheaded the acceptance by MOS teams of over 2 years' worth of development effort–including 250 tickets representing nearly 3,000 hours of development work–with technical solution design, code review, test plans, release documentation, and UAT coordination
- Investigated more than 70 software anomalies, successfully closing 40 of them
- Brought the IDS subsystem into "maintenance mode", an effort which required a re-evaluation of IDS's backlog of 100s of tickets, and coordination with stakeholders to determine the highest priority items to work
- Held a 2-day "table-top" discussion between the MS and GDS, breaking down the complexity of the IDS subsystem by creating and presenting a new set of architecture diagrams that described IDS interfaces, processing flows, and general structure; outcome was 50 actionable items received over 2 full days of discussion

Systems Engineer June 2024 – July 2025
Surface Biology and Geology TIR (Phase B) *Jet Propulsion Laboratory, Pasadena, CA*

- Studied various baseline PCS solution alternatives (including Airflow, HySDS, and ECOSTRESS PCS heritage) being considered by the SDS team, and presented summaries of each based on multiple evaluation areas, including level of heritage, demonstrated scalability, and cost
- Worked with NASA LP-DAAC to create a prototype data access tool that enabled users of SBG data to download it immediately once it was available in the DAAC
- Supported SBG SDS through a successful PDR by distilling the highly controversial results of the aforementioned trade study into objective conclusions that were ultimately accepted at PDR

Cognizant Development Engineer July 2021 – June 2023
Mars 2020 GDS (Phase E) *Jet Propulsion Laboratory, Pasadena, CA*

- Maintains technical cognizance and responsibility of IDS's suite of mission-critical tools, including its image processing PCS, visualization platforms, and rover localization APIs
- Incorporated several IDS PGEs into the pipeline, taking into account parallelism and compute needs, to efficiently generate products without negatively impacting the performance of other processes

[1]AWS experience includes hands-on knowledge of various compute options, including EC2s managed with ASGs and Cloudwatch alarms, EKS, ECS, and Lambda; database options, including DynamoDB, managed Elasticsearch and Opensearch, RDS (MariaDB, MySQL, and PostgreSQL); S3 (including lifecycle management); Cloudwatch and Cloudtrail; Cost Explorer; Cloudfront
[2]Kubernetes experience includes Operator development, and familiarity with tools in the ecosystem, including Helm
[3]GitOps experience includes experience with Github Actions, Jenkins, AWS CodeBuild and CodePipeline; additionally, experience includes Kubernetes-related tools like Flagger, FluxCD, and Istio

- Overhauled the IDS Pipeline worker node autoscaling implementation by:
  - introducing automatic worker "warm-up" to give machines ample time to boot before needed,
  - adding handling for worker termination signals to give them time to suspend work and hand it off to other workers before being terminated, and
  - preferring workers with no active jobs on them to others when deciding which instances within an autoscaling group to terminate
- Introduced event-based triggering mechanism leveraging AWS SNS, SQS, and Lambda
- Supported Pipeline deployment and post-deployment verification activities
- Trained Pipeline operators on the correct usage of the system and provided tactical operations support
- Maintained PLACES, an API built in Java and used by rover planners and mapping specialists to store and search the rover's position and attitude throughout its traverse
- "Containerized" PLACES and made it deploy-ready in AWS with Terraform
- Worked with the RPS subsystem to define an interface between PLACES and their tools

Systems Engineer January 2017 – 2023
Planetary Data Systems Imaging Node (IMG) *Jet Propulsion Laboratory, Pasadena, CA*

- Architected, designed, and oversaw development of the Image Atlas, a system offering an "Amazon-like" search experience for more than 1 PB of planetary imagery data to the public. The system adheres to the micro-service style, consisting of over a dozen components orchestrated by Kubernetes and running in AWS
- Participated in requirement negotiation with the project manager, data providers, mission interfaces, and various other stakeholders in the planetary science community
- Scheduled development efforts and collaborated with the cognizant engineer to ensure their correctness and timely delivery
- Interfaced with data providers to ensure timely delivery of their data to the archive
- Maintained SysML model of IMG's software solutions
- Represented IMG at conferences both domestic and international

Cognizant Development Engineer January 2017 – 2020
Advanced Multi-Mission Operations System (AMMOS) *Jet Propulsion Laboratory, Pasadena, CA*

- Maintained the Web Resource Platform ("WRP"), a suite of tools and SDKs that enabled programmatic access of image products themselves, as well as their raster data and label information. Remote execution of image processing software on these images was possible through a well-defined REST API
- Maintained JEDI, a real-time analysis tool that rendered data products and their metadata as they are processed. Adapted JEDI for the InSight project
- Provided operational support and training
- Prototyped the WRP Tiling Service, which leveraged the WRP Product Repository technology to cache image tiles in DZI format and provide them on-demand to clients such as OpenSeadragon

Software Engineering Intern Summer 2016
Jason-3 (Phase E) *Jet Propulsion Laboratory, Pasadena, CA*

- Worked with the Jason-3 team to redesign the pipeline used to ingest, parse, and process Jason-3 telemetry
- Implemented an netCDF writer class for level-0 products in C++ using Boost
- Wrote functional test cases that exercised various parts of the PGE

Software Engineering Intern Summer 2015
Ocean Surface Topography Mission/Jason-2 (Phase E) *Jet Propulsion Laboratory, Pasadena, CA*

- Worked collaboratively with another intern to develop a visualization suite to assist the Mission in analyzing Jason-2 telemetry
- Wrote an ETL pipeline in Perl that parsed level-0 data products and ingested key metrics into Elasticsearch
- Defined an Elasticsearch schema to store level-0 data product metadata
- Worked with another intern to ensure that the Elasticsearch index was searchable by the frontend they were developing

Education

University of Southern California Los Angeles, CA
Master of Science in Computer Science *August 2017 – December 2020*

Evangel University Springfield, MO
Bachelor of Science in Mathematics *August 2013 – December 2016*

Selected Awards

Outstanding Department of Natural and Applied Sciences Alumnus Award — Evangel University
in recognition of professional success — *Awarded Fall 2024*

Voyager Award — Mars 2020
for mastery of IDS software and development leadership — *Awarded 2023*

Voyager Award — Mars 2020
for outstanding technical leadership and improvements made to software robustness — *Awarded 2022*

Volunteer Work

Alumni Mentor — September 2024 – Present
Ambition in Motion

- Provides mentorship for undergraduate students in a variety of academic programs in a structured, one-on-one format, providing insights from a professional lens

Selected Publications

"Searching the Stars with Atlas IV" (2022, Madrid, Spain).
https://kevinmgrimes.com/post/search-stars-atlas4-2022-update/. Grimes, Kevin M.; Soliman, Tariq K.; Natha, Anilkumar M.; McAuley, Michael M. Presented at Planetary Science Informatics and Data Analytics conference.

"Cloud Processing of PDS Archival Products" (2021, virtual).
https://kevinmgrimes.com/post/cloud-pds-archive-processing-post/. Grimes, Kevin M.; Verma, Rishi; McAuley, Michael M.; Soliman, Tariq K.; Taylor, Zachary M. Presented at the 5th Planetary Data Workshop.