Benjamin Berman

Location: Pittsburgh, PA,
Willing to do remote work

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Overview

I am a software engineer with a **PhD** and **9+ years of experience in industry**. I continue to be interested applying my skills in writing quality code, learning new skills and systems, digging into the causes of bugs, and finding the best solution for the situation.

Most recently, I have been working primarily on Java/Spring Boot microservices, though a large portion of my time is actually spent using and/or debugging supporting technologies, such as Bash, Docker+Kubernetes, AWS, Git+Gitlab CI/CD, Maven+Gradle, Elasticsearch, PostgreSQL, MySQL, JavaScript+TypeScript, RabbitMQ, and Ruby+Rails. Somewhat less recently, I have also extensivly used Ansible, Terraform, Kafka, MongoDB, Redis, and Scala.

Education

- Ph.D. Computer Science, The University of Iowa, Iowa City, IA, December 2014
    - Dissertation Title: *Development And User Testing Of New User Interfaces For Mathematics And Programming Tools*
- B.S. Physics, Rice University, Houston, TX, May 2008

Work Experience

UPMC Enterprises, Pittsburgh, PA

***Senior Software Engineer**, February 2022 to present*
Worked as part a team on the development and maintenance of a suite of microservices, "Alexandria Charts", for aggregating, searching, and 3rd party access to medical records in the UPMC Hospital System and Health Plan. These microservices included:

- Document Viewer - A web app allowing users to search a patient's medical records across multiple EMR sources, view the higlighted results in multiple formats, and download them in bulk.
- Identity Reconciliation Tool - A web app allowing medical documents from multiple sources to be linked, manually, to the same patient when there are inexact matches or inconsistencies in name, DoB, or MRN.
- Bulk Extraction - A tool for downloading zip files of medical records, based on searches.
- Governor - A tool for transferring appropriate medical records between tenants (e.g. the provider and payer parts of UPMC).
- Indexing - A frontend for Elasticsearch, providing a domain specific language for searches.

Specific activities included

- Revitalization of "dusty" application code:
    - Enumerated and prioritized code quality issues such as misleading identifiers, problematic DRY violations, missing indirection, pointless mutability, etc.
        - Balanced fixing problems with feature work/not overwhelming dev and QA reviewers
    - Updated Spring Boot applications to use OAuth tokens (client credentials flow with AWS Cognito) when communicating with services further into in the system

    - Updated Spring Security analysis of user tokens (from Azure Entry, a.k.a. Azure AD) to support authorizaton based on user groups
    - Made numerous updates to remove security vulnerabilities in Java, JavaScript/TypeScript (AngularJS and Angular), Ruby and Docker images
        - Included backwards-incompatible updates to Java 17 and Spring Boot 2.7, requiring code changes
    - Updated Dockerfiles to support development on ARM64-based computers, in a corporate environment with MitM TLS decryption
    - Migrated databases, including MySQL from 5.7 to 8.0 in AWS RDS, and Elasticsearch from 7 to 8 in AWS EKS (Kubernetes)
        - For the Elasticsearch migration, wrote Ruby scripts to perform updates in an incremental/restartable way, since updating the large amount of data required several days and network connectivity would sometimes fail
    - Debugged failing tests and Kubernetes deployments in and out of the Gitlab CI/CD pipeline
- Project planning:
    - Reviewed development roadmap, avoiding unnecessary work and prioritizing work most likely to be productive
    - Actively participated in "sprint zero" (ticket creation) activities
        - Helped to avoid overspecification/underspecification in tickets
    - Developed plans to automate product packaging and deployment
- Application Performance:
    - Debugged performance bottlenecks using VisualVM, logging
    - Sped up "Bulk Extraction" service by at least 3x (had to apply rate limiting), using non-blocking/reactive programming
- Development Process:
    - Demonstrated speed up of Gitlab CI/CD jobs (e.g. 8x), while improving security
    - Automated Postman tests via newman cli tool
    - Handled security issues in the development process
        - Reported and mitigated weaknesses in test coverage
        - Updated deployment scripts to avoid mixups between development, production, and other environments
        - Avoided credentials leaking into Docker image layers and Git repositories
    - Managed context switching between projects
        - Updated READMEs to reduce ramp-up time when we switched back to a project a year later
        - Refactored development/deployment scripts for improved readability
    - Reviewed colleagues' code and mentored junior colleagues
- Other:
    - Shared knowledge with team in formal and informal settings
    - Presented current work to wider organization, and solicited feedback
    - Studied for, and passed, the AWS Certified Cloud Practitioner exam

M*Modal / 3M, Pittsburgh, PA

(3M acquired M*Modal in February, 2019, integrating it into its Healthcare Information Systems Division but keeping the brand)

***Senior Software Engineer**, July 2017 to February 2022*
Primarily Java/Spring Boot, with heavy usage of supporting technologies, plus leadership (included time as **tech lead**), architectural, and mentoring activities. The umbrella project/product I have been responsible for is Computer Assisted Provider Documentation (CAPD) Services, a web service which connects a desktop client interacting with an Electronic Medical Record (EMR) system, such as Epic or Cerner, with a real-time natural language processor, providing layers for security and feedback customization. Activities related to this included:

- Designing and developing CAPD Data Services
    - Created new microservices, the core of which uses Apache Kafka and the Kafka Streams library to gather and process large amounts of data from our clients in real time, primarily for reporting purposes
    - Collaborated with developers of a data-consuming app on the design and testing of an HTTP interface to the processed data
- Adding support for Encounter-Based Reasoning
    - Connected the real-time natural language processor with the results of processing completed documents from a customer EHR system
    - Required new systems to manage user and identifier mappings, configuration and credential caching, integration of JSON Web Tokens, fallback mechanisms, API call for extended NLP evidence, and improved metrics, monitoring, and logging
- Implementing the Notereader CDI interface
    - An intercompany project, connected 3M/M*Modal's NLP with Epic to provide near real-time encounter-based reasoning directly in the EMR
    - Modeled and stored provider feedback, and used that feedback in determining subsequent responses (Spring Data JPA/Hibernate, transactions)
- Migration to AWS
    - Created a library of Terraform and Ansible scripts that allows our services to be deployed, consistently, across multiple environments
    - Implemented new security requirements (automatic generation and maintenance of per-customer Postgres schemas, TLS between microservices)
- Improvements to build scripts
    - Incorporated Ansible configuration generation into a Gradle plugin to maintain consistency between local development and other environments, and to reduce risk of password exposure.
    - Dockerized application as part of the build process
    - Incorporated local dockerized Mongo and Postgres databases, speeding up application startup during development by about 4x
- Leadership and mentoring
    - Conducted rigorous code review and pair programming sessions
    - Presented architectural overviews and technical explanations for new hires and engineers on collaborating teams
    - Worked with Ops to debug production problems
    - Provided important product behavior details, verbally and in writing/diagrams, to non-technical stakeholders
    - Broke down, planned, prioritized, and provided updates for projects, in collaboration with product and QA managers

Interactive Brokers Group, Greenwich, CT

***Secure Application Developer**, February 2015 to July 2017.*

Primarily Java development, with some PL/SQL. Projects included (but were not limited to):

- File-based access to account management system
    - Processed XML files allowing $1,000,000,000+ clients to create batch requests for wire withdrawals, deposit notifications, position transfers, etc.; generated XML response files
    - Wrote XML schema specification files provided to clients
    - Created a web interface allowing users to
        - view the statuses of sorted and filtered instructions
        - upload and initiate processing of new files after providing 2nd factor credentials
    - Encrypted and signed files uploaded through the web interface
    - Refactored system to allow non-file instruction sources (e.g. SWIFT messages)
    - Designed and implemented fine-grained authorization system
- Second-factor authentication device mailing system
    - Generated pdfs with names and addresses for mailing envelope window
        - Gathered user information from Oracle database
        - Included barcodes for mapping devices (with their own barcodes) to users
    - Automatically activated devices after sending warning emails to device recipients
    - Generated system reports (e.g. number of "Bingo card" devices upgraded to PIN pad display cards)
- Client for OCR web service (SOAP) for processing passport images
    - Decrypted image files uploaded by users
    - Sent image files to web service over https
    - Compared extracted text with database records

The University of Iowa, Iowa City, IA

***Instructor**, spring semester, 2014.*

Introductory Java course for undergraduate and graduate students

- Developed new course material including programming projects, lesson plans, lectures, and exams
- Worked with students individually, in small groups, and as a class of 30

***Research Assistant**, September, 2012, to September, 2014.*

User interfaces for the Coq Proof Assistant

- Collaborated in the planning and development phases of NSF award CCF-1250306
- Developed a basic UI for Coq as a plugin for the jEdit editor
- Developed experimental extensions to the basic UI
- Developed and executed user testing protocol

***Research Assistant**, spring semester 2012*

- Developed a user interface for "KIND", a tool for automatically verifying properties of the programs written in the Lustre dataflow programming language
- Debugged connection with tool back end

***Teaching Assistant**, fall semester 2008 through fall semester 2013*

- Nine semesters in the University of Iowa Computer Science Department
- Guided discussion sections for three different courses
- Graded and answered student questions for the graduate level "Formal Methods in Software Engineering" course for three semesters

Skills

- Java (primary), Bash, SQL, Ruby, JavaScript, TypeScript, Scala, C, Groovy, Python (some)
- Spring, Spring Boot, Spring Data JPA, Spring Cloud Stream
- HTTP, REST, SOAP, node, npm
- MongoDB, PostgreSQL, MySQL, Redis, Kafka, Elasticsearch
- Java (Jakarta) EE (Servlets, JPA, JSPs, EJBs, etc.), Hibernate,
- Flyway, Jackson, Kafka Streams, Piccolo (Java library for zoom-able user interfaces), jEdit plugin development
- Unix/Linux, Vi/Vim, Emacs, SSH, nginx, gpg, openssl
- Docker, Kubernetes, Gitlab CI/CD
- Terraform, Ansible, AWS (CCP certified), Grafana, Graphite
- Gradle, Maven, Ant, Intellij IDEA
- JUnit, TestNG
- HTML, CSS, Angular, AngularJS
- LaTeX, JSON, YAML, XML, Markdown, Org Mode
- Git, Mercurial, Subversion, CVS
- Coq, Alloy, Lustre, ESC/Java2, Dafny

Publications

Berman, B. A. and Hourcade, J. P (2014). Keyboard Card Menus: A New Presentation of Non-Standard Shortcuts. *Journal of Universal Computer Science, Special Issue on Trending Breakthroughs in Human-Computer Interaction.*

Berman, B. A. and Hourcade, J. P (2014). Keyboard Card Menus: Faster Learning of Many Fast Commands. In *Proceedings of the XIV International Congress of Human-Computer Interaction (Interaction 2013), in the Spanish Congress of Informatics (CEDI)*, pages 105-112, Spain, 2013. ISBN 978-84-695-8352-4.

Presentations

New Coq User Interfaces: Survey and Ideas. Presentation co-authored with Aaron Stump and Juan Pablo Hourcade. Presented at *The Coq Workshop 2012*, Princeton, NJ, USA, August 12, 2012.