MICHIGAN STATE UNIVERSITY

Project Plan

Security Analytics Suite: Dataset Merger Tool

The Capstone Experience

Team Avata

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From Students…
…to Professionals

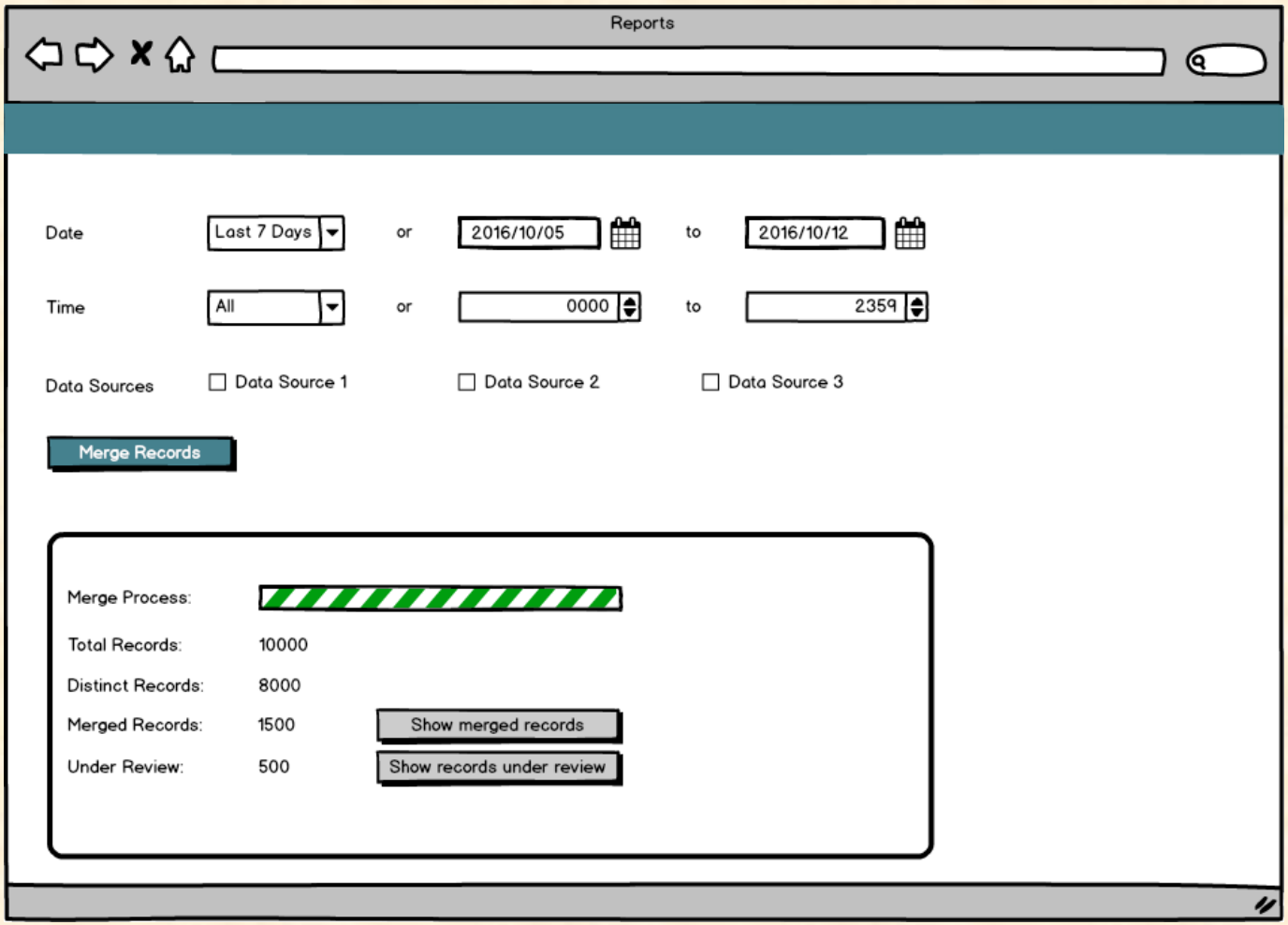
Functional Specifications

- Automatically identify and merge duplicate records within and across datasets
- Suggest similar records as potential duplicates to the user through responsive web application
- Allow the user to approve or disapprove the merging of similar records
- Present the results as a report containing tables and charts

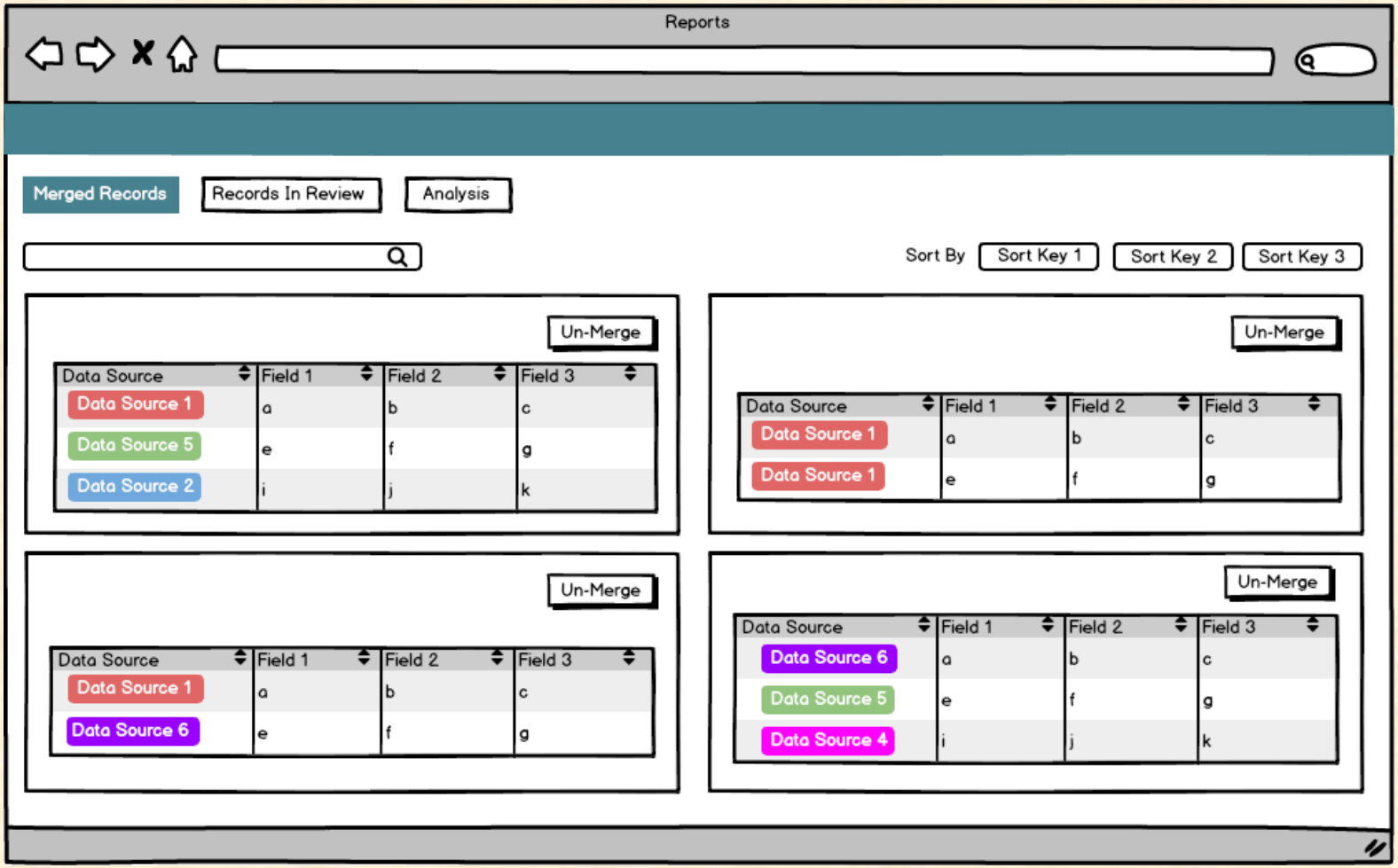
Design Specifications

- Run Page
  - Parameterized search (search within date range, select data sets, etc.)
  - Initiate merge job
  - Displays progress of running job
- Merged Records Page
  - History of merged records
  - Allows un-merging
- Review Page
  - Allows manual merging of suggested similar records
- Analysis Page
  - Displays merge process statistics

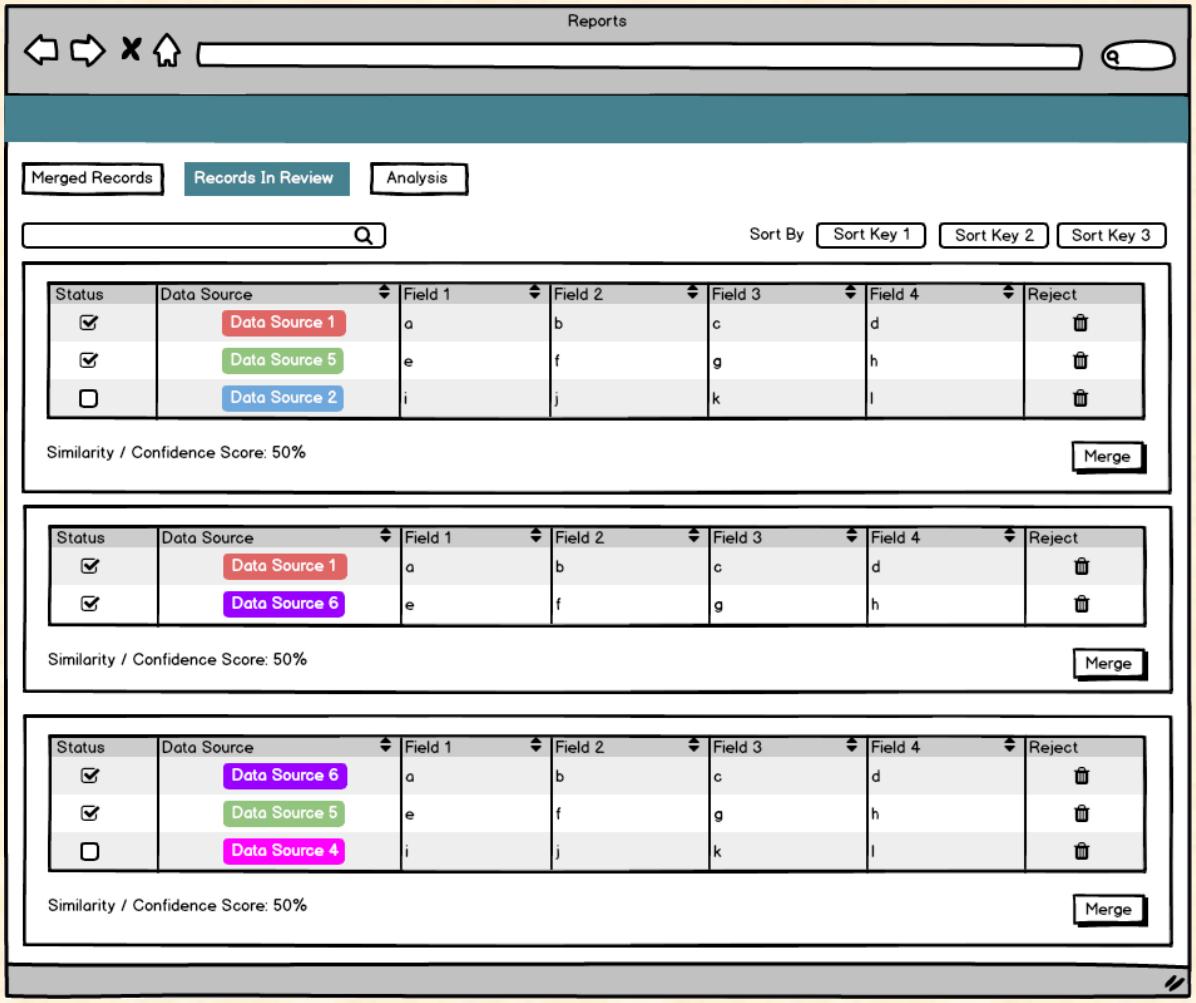
Screen Mockup: Run



Screen Mockup: Merged Records



Screen Mockup: Review



Screen Mockup: Analysis

Technical Specifications

- Front-end
  - Receives data from back-end to be displayed in view
  - Passes decisions about questionable mergers to the back-end
  - Orders controller to run the merge engine
  - Instructs controller to revert merged records from merge history table to original database

Technical Specifications

- Back-end
  - Written in Java and uses Spring Boot framework to connect to front-end and database
  - Utilizes model-service-controller architecture
  - Model: data structures
  - Service: Merge Engine
  - Controller: REST API

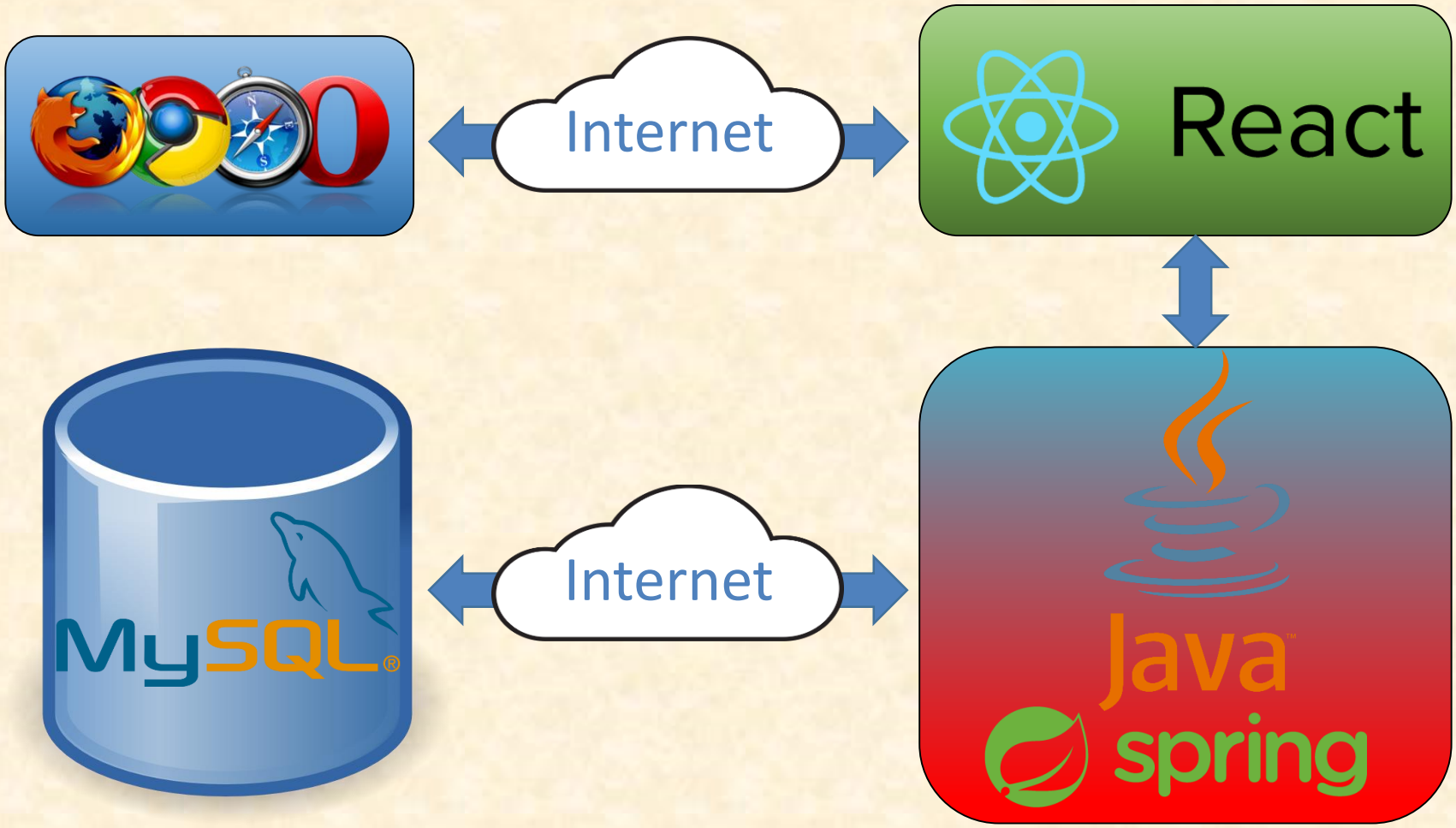
Technical Specifications

- Engine
  - Written in Java
  - Clears merge history table on run
  - Analyzes data with string-matching algorithm
  - Measure similarity between records and quantifies a “match score.”
  - Creates new record to represent two merged records and inserts into database
  - Moves two original records to merge history table

Technical Specifications

- Database & Server
  - MySQL Database
  - Hosted on Capstone server (Ubuntu 16.04)
  - Hosts original data and merge history table

System Architecture



System Components

- Hardware Platforms
  - Capstone server rack, Ubuntu 16.04 Server
  - iMac OSX
  - Windows Virtual Machine
- Software Platforms / Technologies
  - ReactJS - Javascript library
  - Flux - ReactJS application framework
  - Spring Boot - back-end Java framework
  - MySQL - database

Testing: Front-End

- User Interface testing
  - Application will be given to variety of new users
  - Users will test UI functionality through normal usage of app
- ReactJS Unit Testing
  - Unit testing will be performed using the Mocha Javascript Test framework
  - Unit testing on all major components
  - Records display tables, merge/un-merge buttons etc...

Testing: Back-End

- Unit Testing
  - JUnit - standard for unit testing Java applications
- Integration Testing
  - Spring Boot Test - utilities and integration test support for Spring Boot applications
  - Completed after all system components have been unit tested

Testing: Merge Engine

- Performance Evaluation
  - Error will be measured by evaluating the area under the Receiver Operating Characteristic (ROC) curve
  - ROC curve plots true positive rate against the false positive rate
  - Measure the probability a random positive sample will be scored higher than a random negative sample
  - Allow us to compare models
    - Models can vary on hyper-parameters such as confidence threshold

Risks

- Familiarity with new technologies
  - No one on the team has any past experience with ReactJS or Spring Boot
  - Mitigation: Researching and going through tutorials
- Catching duplicates with mismatched fields
  - We are not sure how we are going to match duplicate records with mismatched data (i.e. different formatting, mismatched fields for same records, etc.)
  - Mitigation: Research relevant algorithms and explore search capabilities of tools such as ElasticSearch

Risks

- Handling un-merging due to complexity of the data
  - We do not currently know the structure of the data provided by Avata
  - We may have difficulty devising a way to undo merges depending on the complexity of the data
  - Mitigation: Make sure our database is normalized and also use the client contacts as resources, as they have had experience working with these datasets