



An Assessment of Abacus

By John Freeborn, Marquette University, WI

Overview

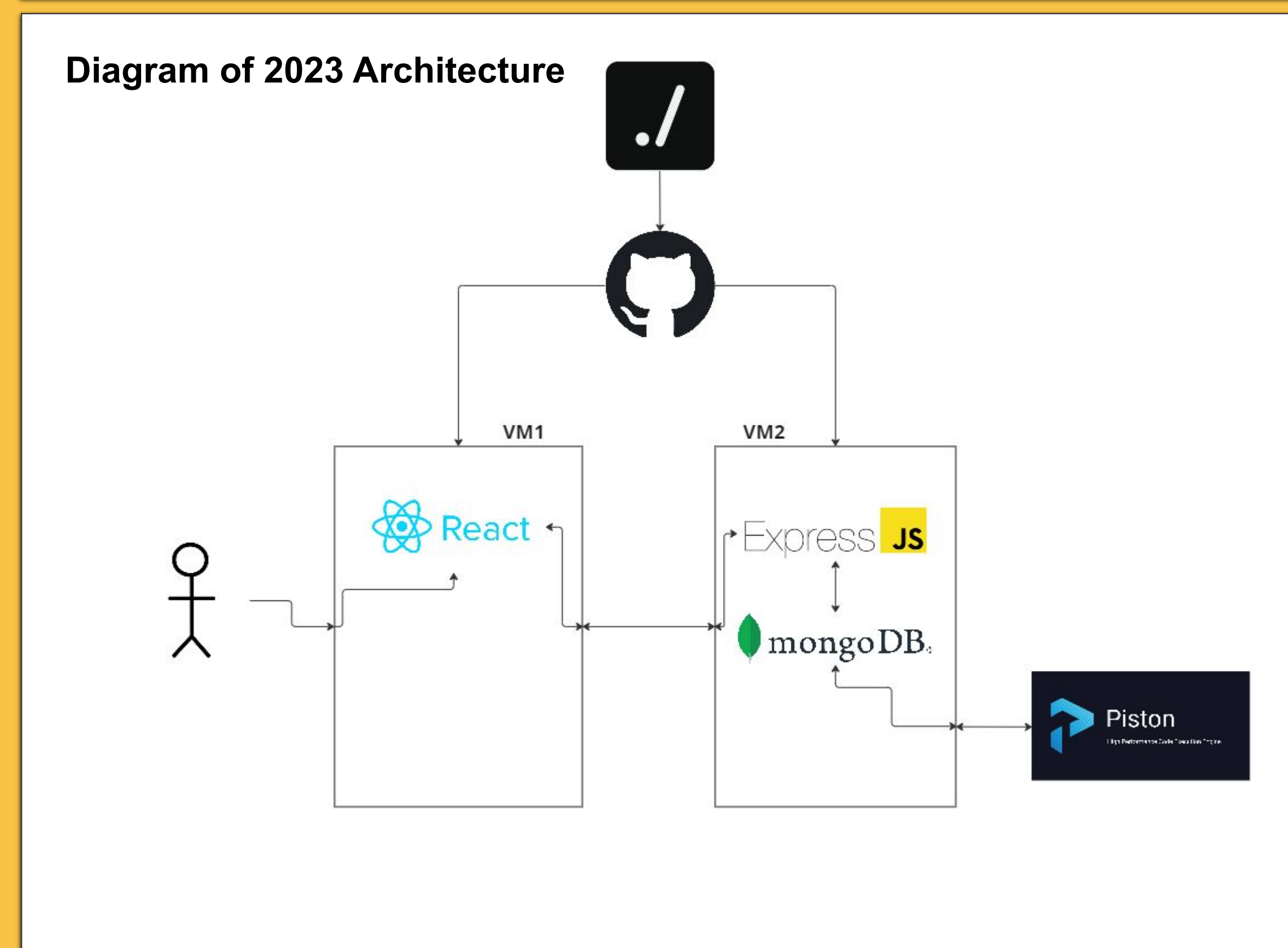
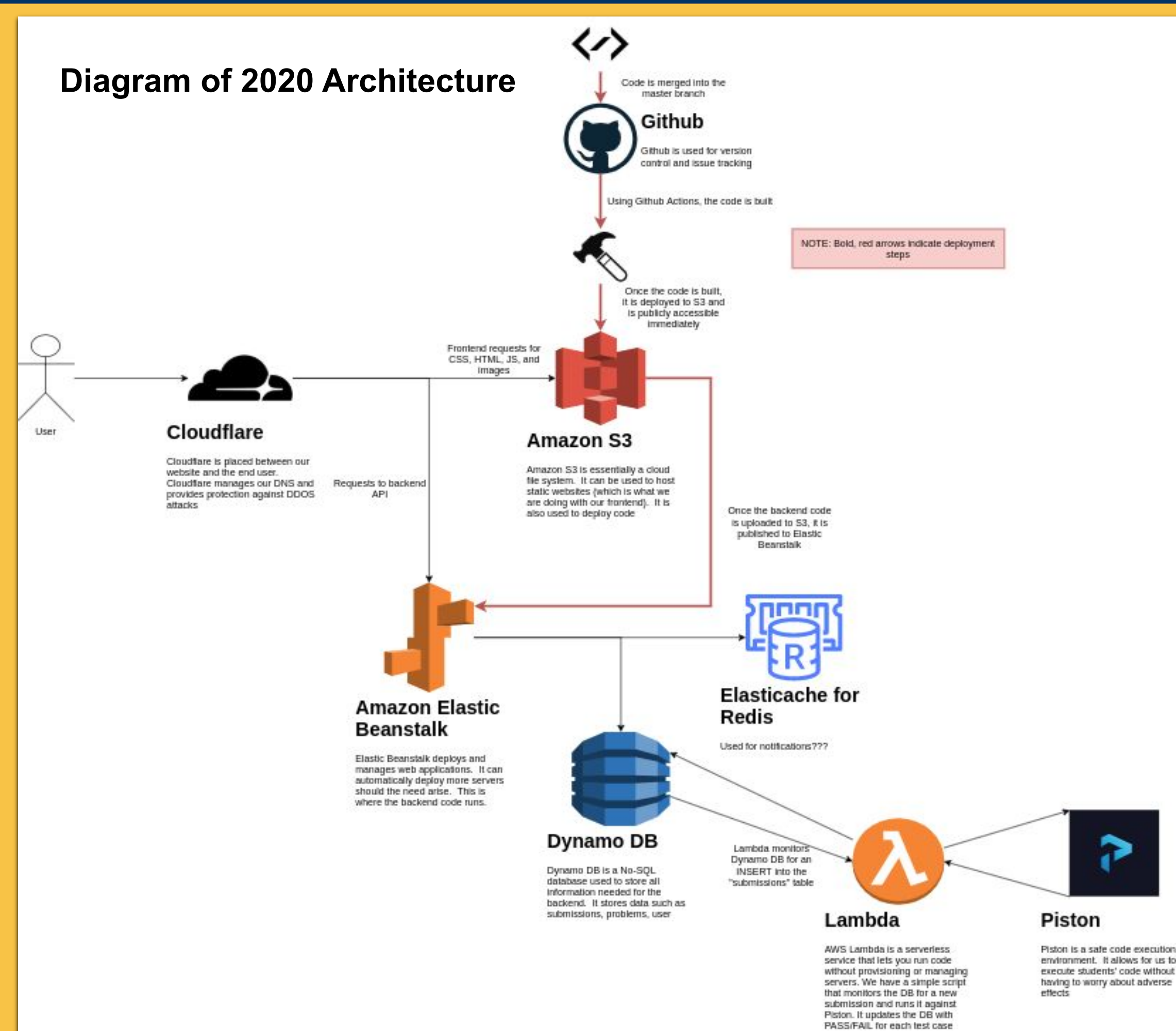
Abacus is a competition judging software built for the Marquette ACM Programming Competition. Its design is based off Kattis, the judging software used for ICPC. Since its creation in September of 2020, Abacus has been used during three competitions to varying degrees of success. In order to continue maintaining and improving Abacus an assessment of its current state was in order.

Objective

This study was conducted in order to have a better understanding of the current version of Abacus, as there is a lack of documentation, and to determine where improvements need to be made before any future competitions.

What Was Done

- All available documentation was read including but not limited to the User Manual, independent study syllabi, and all previous reviews.
- Discussed with the creators of Abacus to better understand their vision and design considerations.
- Read through all relevant accounts of previous ACM competitions.
- Studied up on the software that Abacus was based off of, Kattis.
- Familiarized myself with components of Abacus including React, ExpressJS, MongoDB, Piston, Kubernetes, and previous components such as S3, Elastic Beanstalk, Dynamo, and Lambda.



Findings

From a deep dive into Abacus there appear to be many weaknesses or oversights in its approach. The first major weakness is the lack of current or relevant documentation meaning when someone is just beginning to try to use Abacus there is little direction in what to do to properly set it up. This lack of documentation has led to instances such as this previous year where Abacus fails early on during use.

Another glaring weakness is its lack of maintenance. While minor changes have continued since its inception, these changes have not fully corrected the preexisting issues such as the full scaling of the backend rather than scaling only the resources needed.

Further Efforts

- Implementing new documentation
 - Standardizing deployment
 - Fixing Kubernetes Scaling
 - Stress Testing Abacus

Acknowledgements

This work was supported in part by National Science Foundation REU site grant #1950826, "Data Science Across the Disciplines," at Marquette University and by a U.S. Department of Education EIR Award #U411C190254, "Project {FUTURE}: FUndamentals Teachers Unit Research Exemplars, Innovations in Embedded Computer Science for Elementary Curricula," at Marquette University and Sacred Heart University.