Research Web Application Development

Presented by Paul Mercier & Astha Tiwari   May 2022

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Quick facts about uOttawa

- Founded in 1848
- The largest bilingual French/English university in the World
- Over 45,000 students, including 8,700 international students (20%)
- Over $380M in external research grants, 6th in Canada for Tri-Agency funding
- In the top-10 Research intensive universities for two decades.

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Who are we?

A dedicated team of Research Software Developers and Analysts to provide guidance, training, and expertise in the development of research software.

Research Software Development team

Support to the team
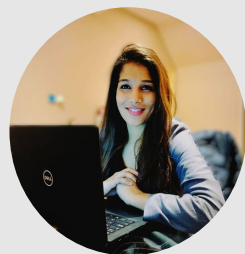
Astha Tiwari
Research Software Analyst

Stevy Kuimi
Research Software Developer

Clifford Denis
Senior Research Software Developer

Peter Darveau
Research Software Developer

Jarno van der Kolk
Senior Scientific Computing Specialist

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IT Manager, Research

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Background

❑ Transformation of Research Software Applications to Web-based digital research applications was observed during the first year of RSDT work at uOttawa.

❑ These Web Applications are driven by a need for broader scope and scalability to accommodate global research collaboration.

❑ Open-source technology are generally cost effective and enables simpler customization and system maintenance for the researchers.

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Trends towards digital transformation of research software

❑ Secure collaboration platforms
- Multi-user, single repository for content with built-in disaster recovery
- access management, role management

❑ Data Security
- On-prem VMs and Storage
- Scalable within Firewall without downtime

❑ Sustainability
- Coding best practices
- automated revision control
- Version control of researcher's codebase providing error-proofing in code handover to new researchers

❑ Database design
- Optimized for performance in a new stack architecture

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Trends towards digital transformation of research software

❑ Customizability
- Application of Open-source software components vetted by RSDT.
- Minimization of complexity by enhancing user experience.

❑ Accessibility
- Provision of equal access to users with diverse abilities by following existing regulations from the start.
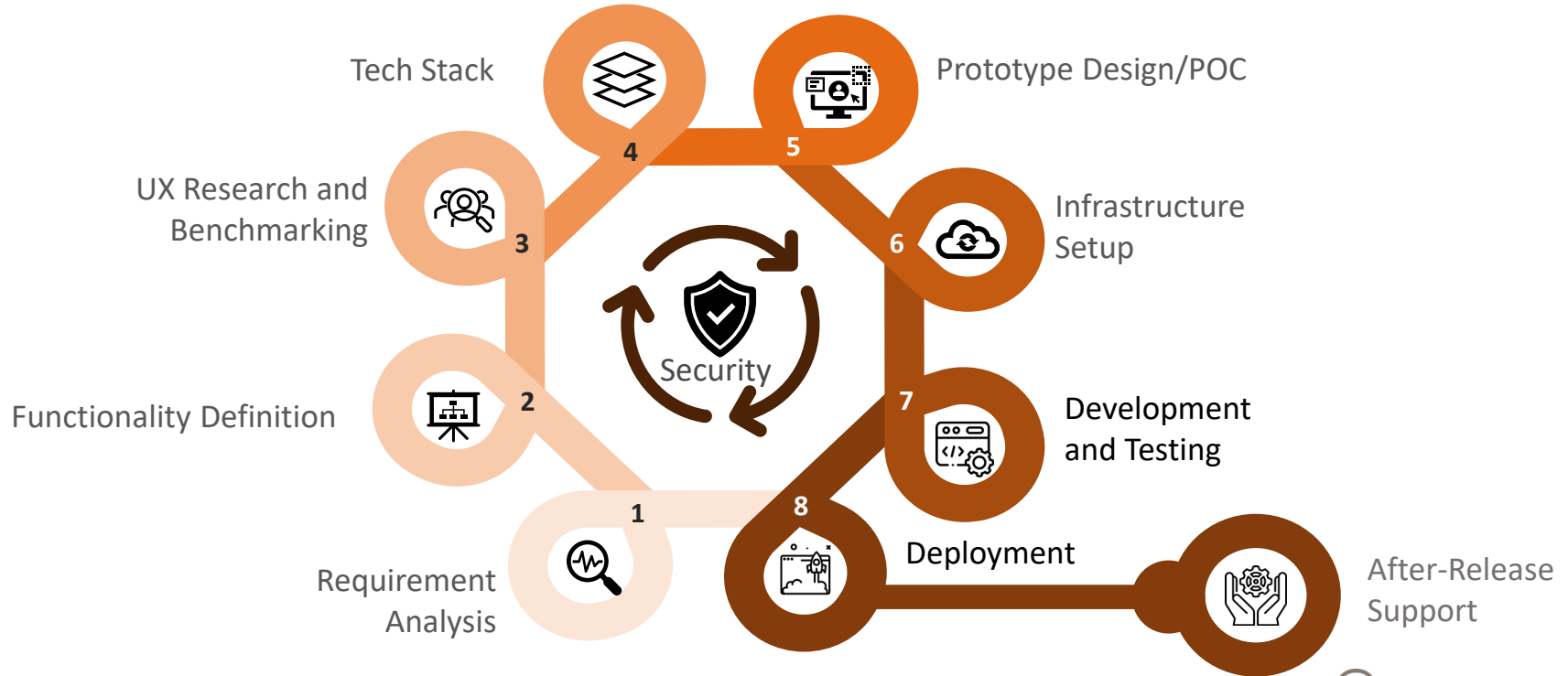- Design to accommodate all devices (Mobile).

❑ High performance computing
- Parallelization, Visualization and implementation of emerging technologies such as AI and machine learning.
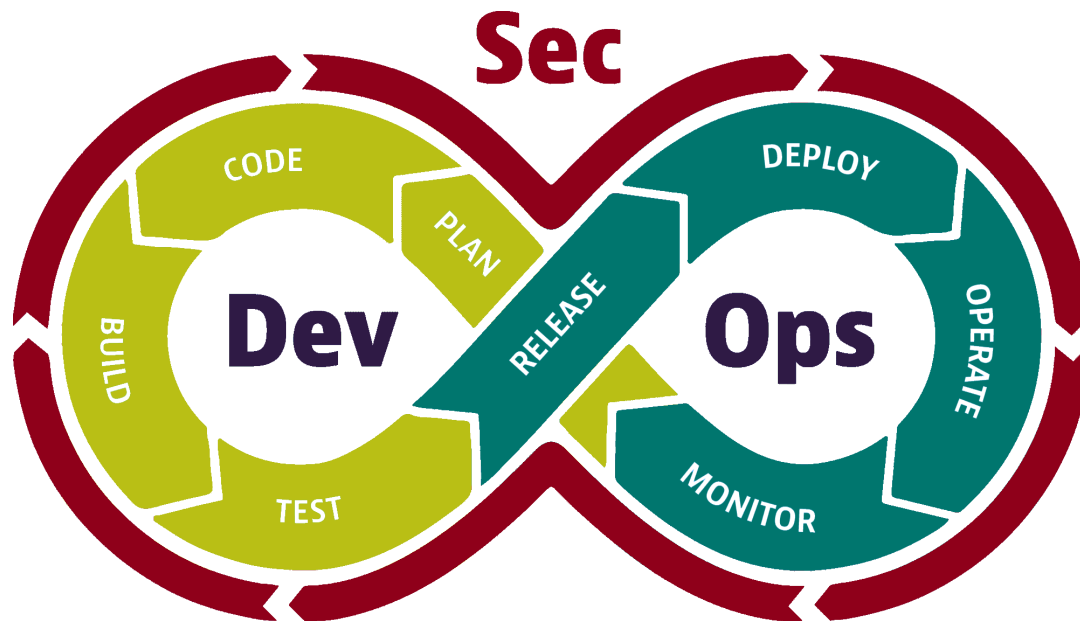
❑ Optimized User Interface Design
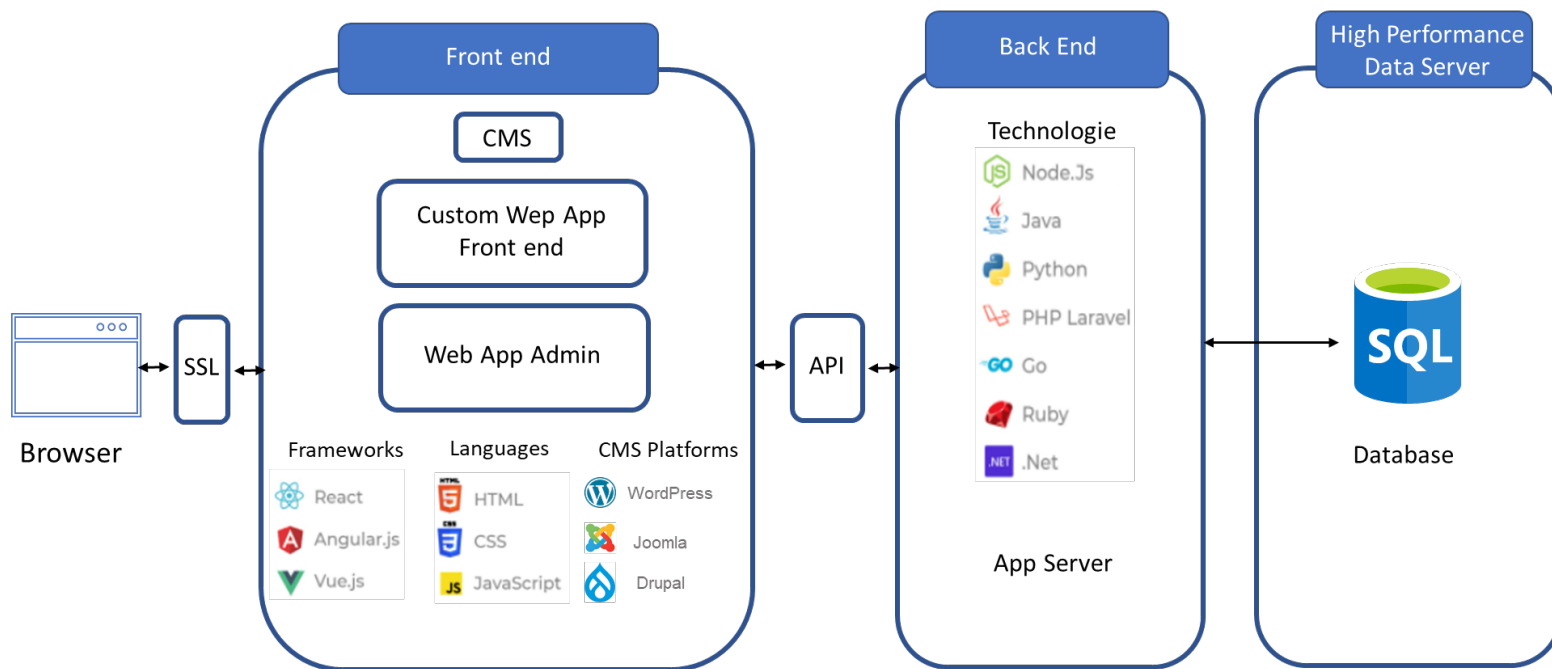- Researcher access to professional level User Interface (UI) and User experience (UX) design.

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Research Application Development Phases

Tech Stack

UX Research and Benchmarking

Functionality Definition

Requirement Analysis

Prototype Design/POC

Infrastructure Setup

Development and Testing
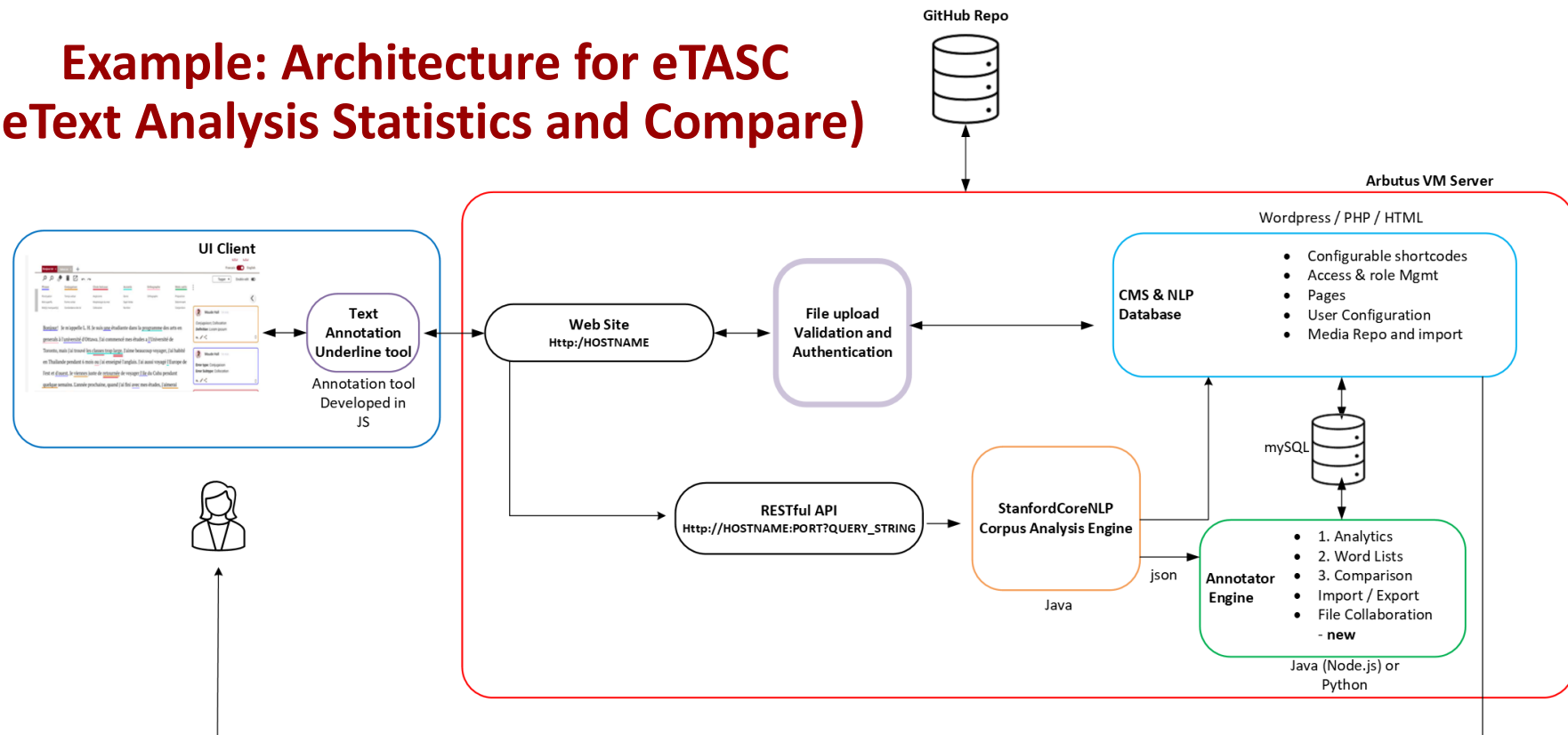
Deployment

After-Release Support

Security

The coding perspective-DevOps Process

Proposed Hybrid Web Application Architecture

Example: Architecture for eTASC (eText Analysis Statistics and Compare)

GitHub Repo

Arbutus VM Server

UI Client

Annotation tool Developed in JS

Text Annotation Underline tool

Web Site Http:/HOSTNAME

File upload Validation and Authentication

Wordpress / PHP / HTML

CMS & NLP Database
- Configurable shortcodes
- Access & role Mgmt
- Pages
- User Configuration
- Media Repo and import

RESTful API Http://HOSTNAME:PORT?QUERY_STRING

StanfordCoreNLP Corpus Analysis Engine

Java

mySQL

json

Annotator Engine
- 1. Analytics
- 2. Word Lists
- 3. Comparison
- Import / Export
- File Collaboration
- - **new**

Java (Node.js) or Python

Notes:
1. Source code in Statistics.java
2. Source code in Statistics.java – Freq band, Lexical complex.
3. Compare files from saved data – See OneNote demo section

Longer term vision

❑Deepen RSDT expertise in research software
- Standardization through reuse of design components across multiple research projects
- Standardization through reuse of specialized software components across multiple research projects
- Application of new standards that aids programming of CPUs, GPUs, VPUs in HPC applications

❑ Showcase projects in portfolio
- ❑ Deepen scope of work within research projects and act as a trusted advisor to PIs
- ❑ Increase visibility by co-authoring research papers

❑ Collaborate with other universities
- ❑ Available as consultants to research groups outside uOttawa
- ❑ Approved repo for code than can be used in other research projects
- ❑ Social media presence

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Examples of RSDT's contribution to the Research Community

eTASC

Pratiques (numériques) de rétroaction corrective des enseignants de langue et prototype d'outil numérique pour les optimiser

GenLib-R Library

Correspondence Between Genomic- and Genealogical/Coalescent-Based Inference of Homozygosity by Descent in Large French-Canadian Genealogies

Inclusive entrepreneurship education and training

A conceptual model and assessment criteria to inform gender-smart entrepreneurship education and training plus

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Questions?