Research Web Application Development

Presented by Paul Mercier & Astha Tiwari
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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.
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

Asthata Tiwari
Research Software Analyst

Stevy Kuimi
Research Software Developer

Clifford Denis
Senior Research Software Developer

Peter Darveau
Research Software Developer

Support to the team

Jarno van der Kolk
Senior Scientific Computing Specialist

Paul Mercier
IT Manager, Research

Peter Darveau
Research Software Developer
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.
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
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.
The coding perspective-DevOps Process
Proposed Hybrid Web Application Architecture

Front end
- CMS
- Custom Web App Front end
- Web App Admin

Back End
- Technologies:
  - Node.js
  - Java
  - Python
  - PHP Laravel
  - Go
  - Ruby
  - .Net
- App Server
- Database

High Performance Data Server

Browser

Frameworks:
- React
- Angular.js
- Vue.js

Languages:
- HTML
- CSS
- JavaScript
- WordPress
- Joomla
- Drupal

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

Notes:
1. Source code in Statistics.java
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
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

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**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
Questions?