The IRRAD Data Manager (IDM)

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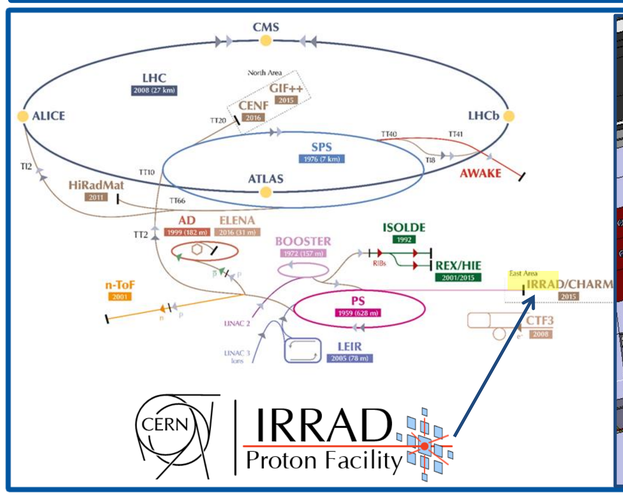
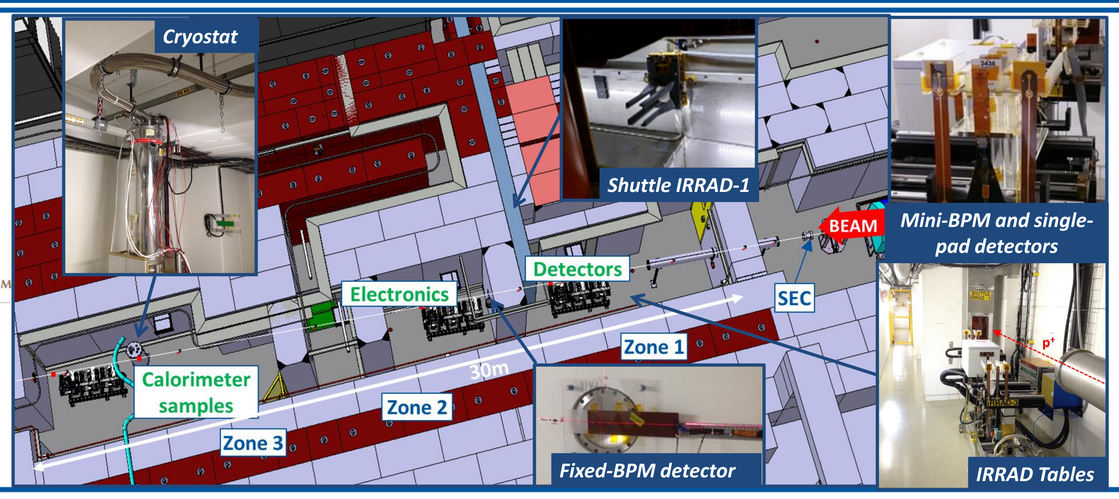
ABSTRACT

The **Proton Irradiation Facility (IRRAD)** is a reference facility at **CERN** for characterizing detectors and other accelerator components against radiation. To ensure a reliable facility operation and smooth experimental data handling, **a new IRRAD Data Manager (IDM) web application** has been developed and first used during the last facility run before the CERN Long Shutdown 2. Following best practices in **User Experience design**, IDM provides a user-friendly interface that allows both **users to handle their samples' data and the facility operators to manage and coordinate the experiments** more efficiently. Based on **the latest web technologies such as Django, JQuery and Semantic UI**, IDM is characterized by its minimalistic design and functional robustness. In this paper, **we present the key features of IDM, our design choices and its overall software architecture**. Moreover, we discuss scalability and portability opportunities for IDM in order to cope with the requirements of other irradiation facilities.

PROTON IRRADIATION FACILITY IRRAD





Purpose and Characteristics

- **Qualification of radiation hardness** of materials, detectors, and electronic systems for High-Energy Physics experiments.
- **Proton beam 24 GeV/c,** size of 12×12 mm^2, 5×10^{11} protons / spill.

Software requirements for IRRAD data management

- Web-based application.
- Compatibility with the CERN software infrastructure.
- Focus on the User Experience (UX).
- Communication with CERN system for the traceability of potentially radioactive equipment (TREC).
- Dosimetry data integration.
- Security.
- Scalability.
- Portability.

http://cern.ch/ps-irrad

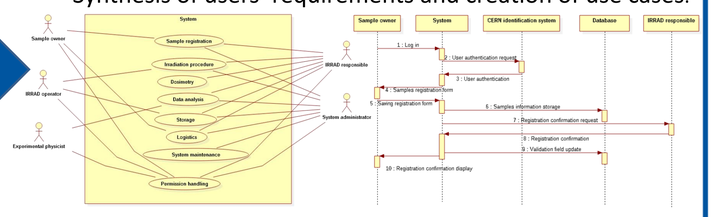
DESIGN LIFE CYCLE

Research & Exploration

Research on users' needs in IRRAD and other CERN and worldwide facilities. Questionnaires and interviews with facility coordinators, operators and users.

Insight Synthesis

Synthesis of users' requirements and creation of use cases.



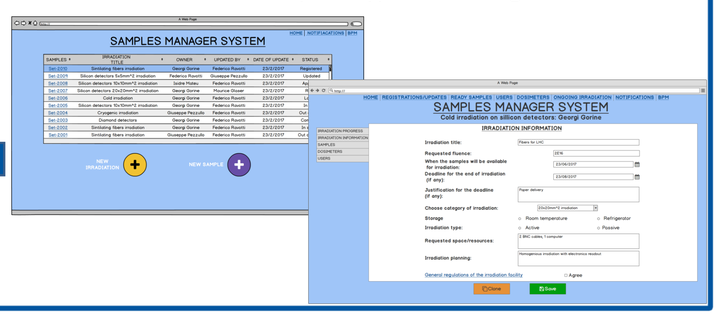
User-Centered Design (UCD)

Evaluation

Evaluation of the UI prototypes. In case no suitable UI is found, the research continues.

UI Prototyping

Creation of various UI prototypes according to the use cases.



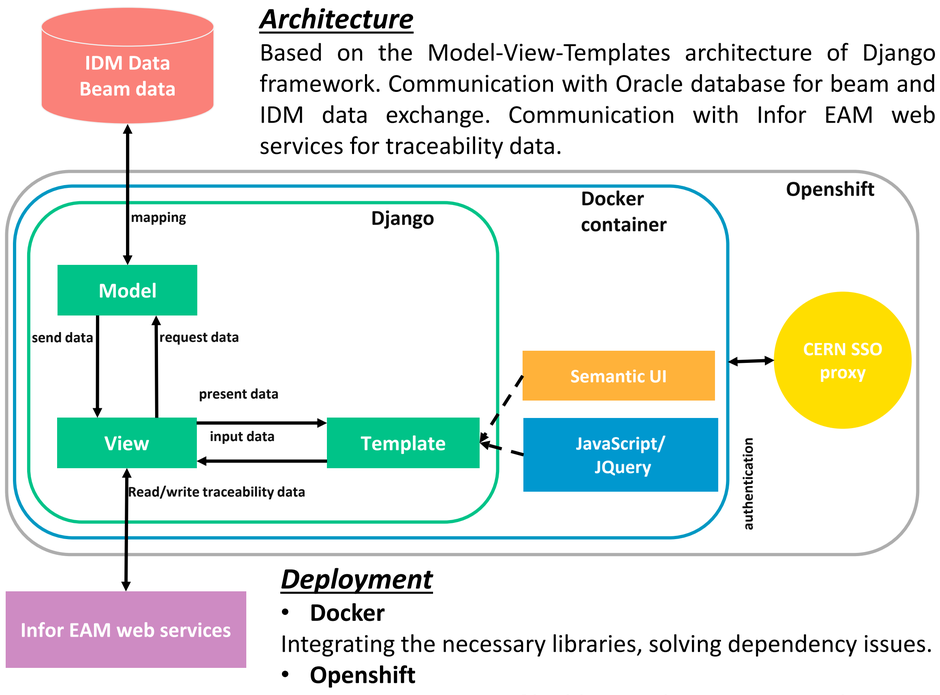
DEVELOPMENT

Software choices

- **Django Framework**
Better security, quick development, less code, redundancy avoidance.
- **Oracle Database**
Broadly used and supported at CERN, maintenance and backup opportunities.
- **Javascript and Jquery**
Simplified development and interactive features.
- **Semantic UI**
Minimalistic design, aesthetic and responsiveness.

Architecture

Based on the Model-View-Templates architecture of Django framework. Communication with Oracle database for beam and IDM data exchange. Communication with Infor EAM web services for traceability data.



Deployment

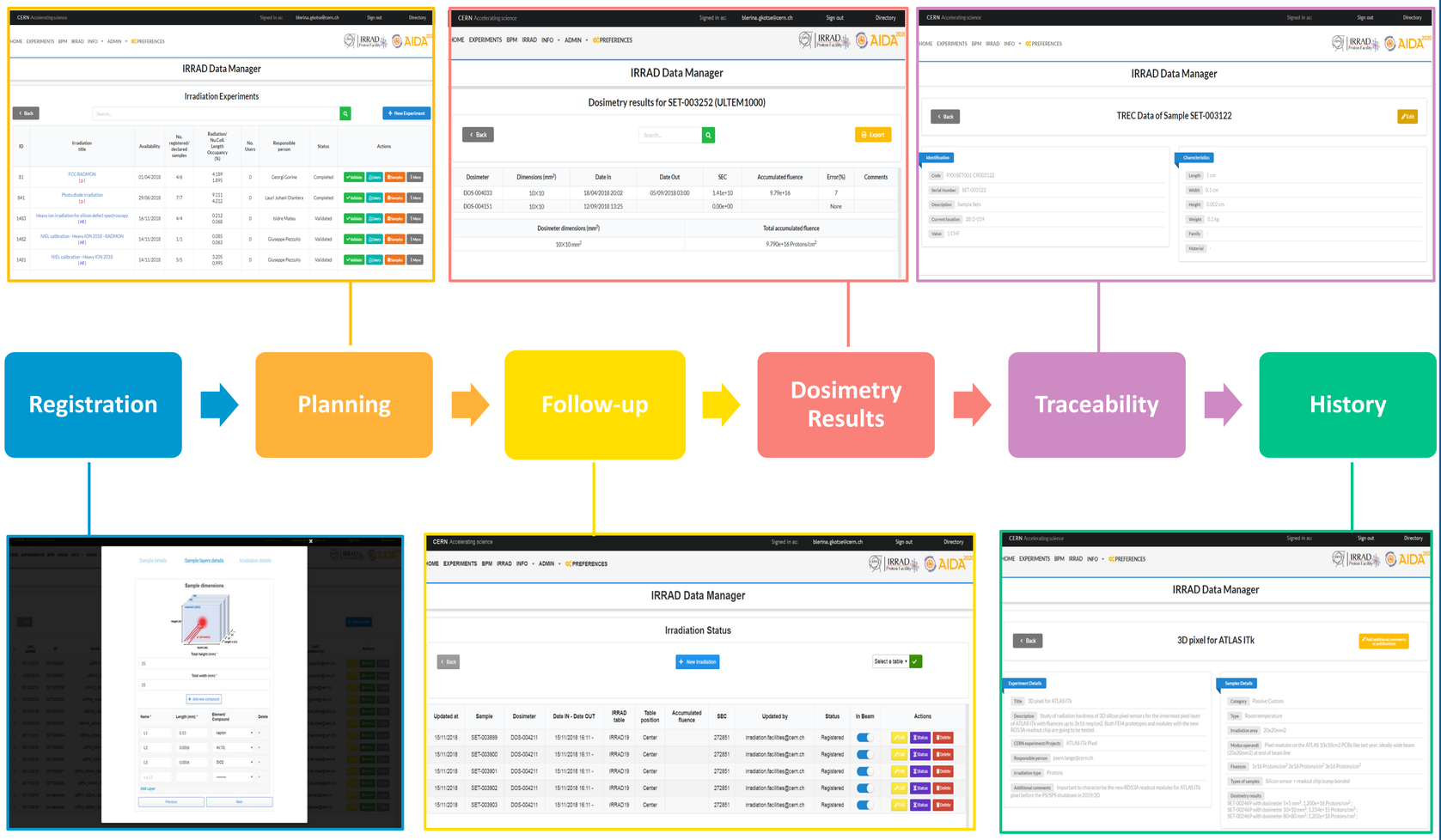
- **Docker**
Integrating the necessary libraries, solving dependency issues.
- **Openshift**
Automatic processes of building Docker images. Apache server deployed as a SSO authenticating proxy.

FEATURES

Key functionalities:

- **Registration**
Registration of experiments, samples, users and dosimeter data.
- **Planning**
Planning of the irradiation experiments according to the availability, radiation length, IRRAD capacity.
- **Follow-up**
Follow-up of the irradiation experiments status. Estimation of accumulated fluences. Notification of irradiation completion.
- **Dosimetry Results**
Final dosimetry results, provided through γ spectrometry, necessary for further physics data analysis.
- **Traceability**
Naming conventions compatible with the CERN Traceability System of Potentially Radioactive Equipment (TREC), communication with the TREC database and printing necessary labels.
- **History**
Archiving performed experiments. Visibility of other irradiation experiments details with the users' permission.
- **UI Customization**
Adapting the user interfaces to the users' preferences, e.g., different background color, font size or font color.

http://cern.ch/irrad-data-manager



CONCLUSION AND FUTURE WORK

Statistics of 2018 IRRAD Run

Irradiation Experiments	81
Users	97
Samples	78
Dosimeters	405
Dosimetry results	2056

Conclusions

- New tool for the management of the data from IRRAD;
- User-centered design (UCD);
- Use of modern technologies such as Django framework, JavaScript, JQuery and Semantic UI;
- Key functionalities for the IRRAD data management and follow-up implemented;
- Deployment of Docker containers and Openshift.

Future Work

- New functionalities due to users' requirements and facility upgrades to be implemented;
- Possibility of IDM customization for other irradiation facilities;
- Motivation for the development of an irradiation experiment data management ontology (IEDM) and use for the automatic generation of web applications [1].

See TUBPL01

[1] B. Gkotse, P. Jouvelot, and F. Ravotti, "Automatic Web Application Generation from an Irradiation Experiment Data Management Ontology (IEDM)", presented at ICALEPCS'2019, New York, USA, Oct. 2019, paper TUBPL01, this conference.

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