SERUMS

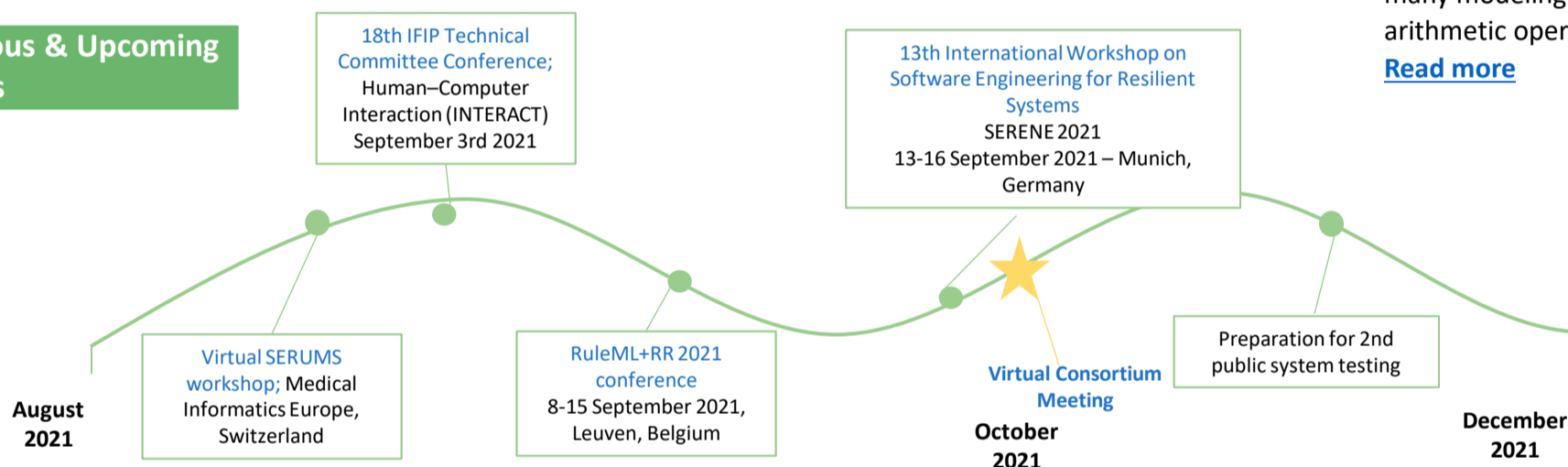## SHARING PATIENT DATA IN A SAFE AND SECURE WAY ACROSS EUROPE

Serums System Validation and Verification Eduard Baranov, Université Catholique de Louvain

Accuracy and security of a healthcare system developed within Serums are among the most important requirements, making validation and verification tasks an essential part of the project. An additional challenge is caused by the size and complexity of the developed platform including multiple components based on various technologies. It is essential that not only each component is working as intended but that the whole system works seamlessly. To tackle the problem, we use multiple verification approaches applied to separate components to the complete system.

Model checking is the most common approach to guarantee the smooth operation of the system. Given a model of the system in formal language with a strict semantics ensuring a single interpretation of system's behaviour, model checking can mathematically prove the satisfaction or violation of properties. Indeed, the approach has its limitations, the most important being computational expensiveness limiting model checking to small systems. We are using an alternative approach to avoid this limitation: statistical model checking performs the large number of simulations on the same formal model and can ensure property satisfaction with a desired level of confidence. **Read more**

TDF -- Test Data Fabrication for SERUMS

Eyal Bin, IBM

TDF is a technology that is used to fabricate synthetic data. The goal is to populate databases with data that is coherent and appears realistic, despite being entirely fabricated. TDF is used either when real data does not exist or cannot be used due to privacy rules or to fabricate cases that do not exist in the real world. An external data observer (both human or a machine) should not be able to distinguish between real data or fabricated data. To this end, TDF is based on rules. The fabrication is constrained by rules to create realistic data. Those rules guide the fabrication engine.

Two main enhancements have been recently added to the tool TDF -- the Rule Editor and the parallel fabrication engine. The fabrication rules are written in a declarative language. There are many types of functions in this language that cover many modeling requirements such as distribution of values, arithmetic operators, ratios between number of records in **Read more**

Previous & Upcoming Events

18th IFIP Technical Committee Conference; Human–Computer Interaction (INTERACT) September 3rd 2021

13th International Workshop on Software Engineering for Resilient Systems SERENE 2021 13-16 September 2021 – Munich, Germany

August 2021

Virtual SERUMS workshop; Medical Informatics Europe, Switzerland

RuleML+RR 2021 conference 8-15 September 2021, Leuven, Belgium

Virtual Consortium Meeting October 2021

Preparation for 2nd public system testing

December 2021

Optim Test Data Fabrication - Core Component Architecture:

Serums Smart Patient Record System Vladimir Janjic, University of Dundee

The Serums Smart Patient Record (SPR) defines a universal, well-structured format for representing medical records of patients across different medical use cases, which is a requirement for applying machine-learning techniques for predicting outcomes of treatments and automated diagnosis for presence of diseases. However, the problem of converting the "raw" medical data, obtained from personal monitoring devices and medical investigations, into a structured format for inclusion into smart patient records remains.

Raw data is usually difficult to decipher and is sometimes even inaccurate or inconsistent. Over the reminder of the Serums project, the University of Dundee will apply their expertise in big data analytics; specifically in extracting, transforming and 'cleaning up' raw data so that appropriate analytics can be applied to it, to develop automated techniques of structuring raw medical data into the SPR format. This work will be undertaken in collaboration with Sopra Steria, who will add machine learning expertise and will provide unstructured data sets for development and testing of the techniques for structuring.

Recent paper 'Design of a Trustworthy and Resilient Data Sharing Platform for Healthcare Provision' University of St Andrews

Healthcare data sharing platforms have been gaining prominence over the last decade, especially with the emergence of technologies dedicated to increase system security and users' privacy. Moreover, these platforms are becoming less centralised as time progresses, with the need for more data from a variety of locations and settings to be transferred between authorised parties. These requirements also include legal and ethical concerns when creating such solution. Through data sharing, organisations can gain access to previously unknown information or higher quality data, share research findings, and make decisions based on larger (and hopefully more representative) datasets. Such platform should be resilient to attack or loss of data and be able to recover quickly and efficiently from unexpected events. This paper focuses on the blend of emerging technologies (data lake and blockchain) in a design to provide secure and resilient data sharing to only those patients and healthcare professionals authorised to access it across multiple European countries. **Read more**

FlexPass System Update Argyris Constantinides, University of Cyprus

The team at the University of Cyprus has been further developing and enhancing the FlexPass authentication system to enable an improved and seamless user authentication experience. The major updates include; improvements of the FlexPass frontend user interface based on the feedback received from patients and usability experts during the Proof of Concept 2 evaluation; implementation of password security strength meters for both graphical passwords and passphrases; implementation of a notification service to inform users about suspicious authentication attempts; implementation of a standalone tool for the analysis of image semantics and properties in order to assist system administrators to find best-fit images for the FlexPass system and improvements of the multi-factor authentication processes and user interfaces of the Serums Authenticator mobile application.

On a Personal Note. . . .
My involvement in the Serums project as a researcher and software engineer has been beneficial for my PhD studies in two ways. First, I had the opportunity to collaborate with researchers from world-class **Read more**