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Future Scientific Data Infrastructure: Towards Platform Research Infrastructure as a Service (PRIaaS)

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Modern Science is becoming increasingly data driven and works with a large amount of data, which are heterogeneous, distributed and require special infrastructure for data collection, storage, processing, and visualisation. Science digitalization, likewise industry digitalization, is facilitated by the explosive development of digital technologies and cloud based infrastructure technologies and services.

Current development and establishment of the European Open Science Cloud (EOSC) provided a strong basis for creating federated data infrastructure for European research and bringing to practice the FAIR (Findable, Accessible, Interoperable, Reusable) data principles of the Open Science. EOSC allow for effective data exchange and integration across scientific domains, making scientific data a valuable resource and a growth factor for the whole digital economy and society. To uncover the potential of the future digital and data driven science, the future Scientific Data Infrastructure (SDI) must provide a platform for effective use of scientific data by providing functionality to automate creating specialized/customised ecosystems supporting full cycle of the value creation from data collection to model creation and knowledge acquisition and exchange. Shift of the focus from infrastructure operation to value creation will require new FutureSDI design approach, operation and evolution to respond to changing requirements and evolving technologies. Growing infrastructure complexity will require automation of the infrastructure provisioning and operation, allowing researchers to focus on problem solving. Responsibility and sustainability principles must be applied at all stages of the created instant infrastructure from the design to operation, monitoring and key performance indicators must be assessed continuously, presumably assisted by AI optimisation algorithms.

This paper presents two lines of analysis: one is retrospective analysis related to the European Research Infrastructure (RI) development stages and timeline from centralized to distributed and current Federated Interoperable; another storyline provides analysis of digital technologies trends and identifies what technologies will impact the future SDI.

Based on this analysis, the paper proposes a vision for the future RI Platform as a Service (PRIaaS) that incorporates recent digital technologies and enables platform and ecosystem model for future science. Notably the proposed PRIaaS adopts TMForum Digital Platform Reference Architecture (DPRA) that will simplify building and federating domain specific RIs while focusing on the domain specific data value chain with data protection and policy based management by design.

This research is a part of the SLICES-DS project that represents a design Study stage for the future SLICES Research Infrastructure for digital technologies that is a part of the ESFRI Roadmap.

About the speaker:

Yuri Demchenko is a Senior Researcher at the Complex Cyber Infrastructure Research Group of the University of Amsterdam. He is graduated from the National Technical University of Ukraine “Kiev Polytechnic Institute” where he also received his PhD degree. His main research areas include Data Science and Data Management, Big Data and Infrastructure and Technologies for Data Analytics and Artificial Intelligence, DevOps and cloud based software development, general security architectures and distributed access control infrastructure. He is currently involved in the European projects GEANT4, SLICES-DS where he develops different elements of cloud based infrastructures for scientific research and trusted data sharing, as well as projects MATES, FAIRsFAIR that address aspects of skills management and organizational capacity building.

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Primary authors: Dr DEMCHENKO, Yuri (University of Amsterdam); Dr JOSHI, Kishor (University of Amsterdam)

Presenter: Dr DEMCHENKO, Yuri (University of Amsterdam)

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