



ESReDA

European Safety, Reliability &  
Data Association

JKU  
JOHANNES KEPLER  
UNIVERSITÄT LINZ



LINZ  
CENTER OF  
MECHATRONICS  
GMBH

# Programme

56<sup>th</sup> ESReDA Seminar On  
**Critical Services continuity, Resilience and Security**



May 23<sup>rd</sup> – 24<sup>th</sup>, 2019, Johannes Kepler University, Linz, Austria



## Scope of the seminar

Vital services continuity is a major societal security issue in modern society. The supply of the vital services is guaranteed thanks to a large variety of Critical Infrastructures (CIs). Some CIs' disruptions may endanger the security of the citizen, the safety of the strategic assets and even the governance stability.

The CIs are more and more connected thanks to the information technology (IT) and supply services in every aspect in man's daily-life. The continuous progress in the IT fields pushes modern systems and infrastructures to be more and more: intelligent, distributed and proactive. That increases not only the operational complexity of the CIs but also their vulnerability. The more complex a system is, the more vulnerable it will be and the more numerous are the threats that can impact on it. The loss of operability of critical infrastructures may, thus, lead to severe global crises.

Engineers, designers, operators and legislators should enhance the system preparedness and resilience facing different threats. That requires continuous efforts and resources of all kinds in a variety of fields. One of them is "Modelling, Simulation & Analysis (MS&A)" of the CI in order to enhance the CIs' preparedness & resilience.

The European Safety, Reliability and Data Association (ESReDA) as one of the most active EU networks in the field has initiated a project group (CI-PR/MS&A-Data) on the "Critical Infrastructure/Modelling, Simulation and Analysis – Data". The main focus of the project group is to report on the state of progress in MS&A of the CIs preparedness & resilience with a specific focus on the corresponding data availability and relevance.

In order to report on the most recent developments in the field of the CIs preparedness & resilience MS&A and the availability of the relevant data, ESReDA will hold its 56<sup>th</sup> Seminar on the following thematic: "*Critical Services continuity, Resilience and Security*".

The 56<sup>th</sup> ESReDA seminar will be held on May 23-24, 2019, hosted by Johannes Kepler University, Linz, Austria.



## Topics

- Threats identifications & specifications
- CIs disruptions MS&A
- CI's vulnerability MS&A
- CIs' dependencies and interdependency MS&A
- Data and Databases
- Emergency and crises management models & tools
- IT inferences on CIs preparedness & resilience
- Standards & Ontology in the domain of CI protection (CIP)

## Domains

### Critical Infrastructures Sectors

- Air-transport & airports
- Electrical power generation & supply
- Gas & Oil production, storage & transport
- ICT networks
- Massive data storage & servers
- Maritime transport & ports
- Medical & health care
- Process industry
- Railway transportation
- Supply chain process
- Water supply and water works

## Threats

- Extreme weather conditions
- Natural threats
  - Climatic changes
  - Earthquake
  - Flood
  - Forest fire
  - Landslide
  - Torrential rain
  - Tsunami
  - Volcanic eruptions
- Industrial & technological accidents
- Financial & stock market perturbation
- Industrial wastes disposal & destruction



## Chairman of the Seminar

- ESReDA President Dr. Luis Andrade Ferreira,
- LCM Chief Scientific Officer Dr. Johann Hoffelner

## Technical Programme Committee (TPC)

Andrews John	UK
Bukowski Lech	PL
Cepin Marko	SI
Charmpis Dimos	CY
Chateauneuf Alaa	FR
D'agostino Gregorio	IT
Demichela Micaela	IT
Efrosinin Dmitry	AT
Eid Mohamed	FR
El-Hami Abdel Khalik	FR
Ferreira Luís	PT
Kolowrocki Krzysztof	PL
Kopustinskas Vytis	IT
Kortner Henrik	NO
Lannoy André	FR
Marle Leila	FR
Merad Myriam	FR
Messias Ricardo	PT
Nowakowski Tomasz	PL
Pestana Maria	PT
Pietrucha Katarzyna	PL
Rykov Vladimir	RU
Simola Kaisa	FI
Sola Antonio	SP
Tchórzewska–Cieślak Barbara	PL
Žutautaitė Inga	LT

## Local Organization Committee (LOC)

For practical local information relative to the venue, please, contact: Dmitry Efrosinin ([dmitry.efrosinin@jku.at](mailto:dmitry.efrosinin@jku.at)), Cornelia Brandt-Springsits ([cornelia.brandt-springsits@jku.at](mailto:cornelia.brandt-springsits@jku.at)), with Inga Žutautaitė-Šarunienė ([Inga.Saruniene@lei.lt](mailto:Inga.Saruniene@lei.lt)) and Mohamed Eid ([mohamed.eid@cea.fr](mailto:mohamed.eid@cea.fr)) in Cc.



## Organizers

### Johannes Kepler University Linz – JKU

Johannes Kepler University in Linz (JKU) is the largest research and educational institute in Upper Austria. As a young university (inaugurated in 1966) and the largest scientific institution in Upper Austria, JKU has evolved into a hub of science, industry and business in a short space of time. 60 study programmes for over 19,000 students guarantee a modern and practical education with excellent job prospects. The research activities of the faculties and institute are recognised worldwide. ([www.jku.at](http://www.jku.at))

### Institute for Stochastics JKU

The lecture courses at the Institute for Stochastics provide an overview of relevant topics in probability theory and statistics. Further there are regularly particular courses based on the research areas of the members of the Institute for Stochastics: e.g., Time Series Analysis, Queuing Theory, Reliability Theory, Stochastic Numerics, Martingale and Brownian Motion, Markov Chains. Research areas of the members of the Institute for Stochastics comprise stochastic analysis, stochastic numerics, statistics and their applications in other disciplines. ([www.jku.at/stochastik](http://www.jku.at/stochastik))

### Linz Center of Mechatronics – LCM

Mechatronics – an intelligent fusion of informatics, mechanics and electronics. The Linz Center of Mechatronics is a reliable partner for research and development for national and international customers since more than 15 years. The LCM supports the customers from idea generation, research and development to the introduction of series production. Our infrastructure allows for the production of prototypes and small lot sizes as well as the verification of developed systems and components. The specific knowledge that the employees of LCM possess forms the basis for collaborations in research and development and the foundations to design new, intelligent, networked or autonomous systems for the manufacturing industry. The JKU belongs to the ownership list. ([www.lcm.at](http://www.lcm.at))

### European Safety, Reliability & Data Association – ESReDA

ESReDA is an international non-profit association with approximately 35 member organizations comprising companies from different industries, research organizations and universities working within the safety and reliability field. ESReDA aims to promote the development and the exchange of data, information and knowledge through the promotion of Project Groups (PG) on subjects related to Reliability, Safety and Data Analysis. In this PG's some of the best world specialists in these subjects are able to meet and, in a first time, to aggregate their knowledge and then to disseminate it for the sake of the scientific and technological communities in Europe and around the World. This dissemination can be made by organizing seminars twice per year and publishing the most important results of the Project Groups. Safety and Reliability Engineering is viewed as being an important component in the design of a system. However the discipline and its tools and methods are still evolving and expertise and knowledge dispersed throughout Europe. There is a need to pool the resources and knowledge within Europe and ESReDA provides the means to achieve this. ([www.esreda.org](http://www.esreda.org))



**Wednesday May 22<sup>nd</sup>, 2019**

**ESReDA Project Group Meeting (public events)**

Johannes Kepler University Linz  
Altenbergerstraße 69, Linz, Austria

10.00-12.00 PG on Big Data, Reliability, Risk and Safety Analysis

12.00-13.00 lunch

13.00-15.00 Joint meeting PG CI-PR / MS&A-Data and PG on Resilience Engineering and Modelling of Networked Infrastructure

15.00-18.00 BoD meeting

Participation is free and open to all experts, engineers and researchers interested in the topic. For logistic reasons, would you please send your interest expression by mail to Inga Žutautaitė-Šarūnienė ([Inga.Saruniene@lei.lt](mailto:Inga.Saruniene@lei.lt)), Dmitry Efrosinin ([Dmitry.Efrosinin@jku.at](mailto:Dmitry.Efrosinin@jku.at)) and Mohamed Eid ([mohamed.eid@cea.fr](mailto:mohamed.eid@cea.fr)).



# Programme

## 1<sup>st</sup> day, Thursday May 23<sup>rd</sup>, 2019

08.00 – 08.30      **Registration**

08.30 – 09.00      **Welcoming Session**

09.00 – 10.00      **Keynote Paper**  
Chair: Pr. Luís Ferreira

Towards an ecosystem of models - Common visions of automated engineering and critical infrastructure modelling  
*Pr. Johann Hoffelner*

10.00 – 11.20      **SESSION 1:      S1 - CI Interdependency & Disruption Risk Analysis**  
Chair: Dr. Kaisa Simola, Pr. Dimos Charmpis

Challenges to protect critical energy infrastructure  
*Vytis Kopustinskas, Marcelo Masera, Ricardo Bolado-Lavin*

Advances in vulnerability assessment of coupled gas and electricity transmission networks by using graph theory  
*Jose M. Yusta, Jesus Beyza, Jose A. Dominguez-Navarro, Rodolfo Dufo, Jose L. Bernal-Agustin*

Recoverability analysis model for railway networks  
*Ratthaphong Meesit, John Andrews, Rasa Remenyte-Prescott*

11.20 – 11.40      **Coffee Break**

11.40 – 12.40      **SESSION 2:      S2 - Systems & Processes Performance Modelling**  
Chair: Pr. Cyp F.H. van Rijn, Dr. Vytis Kopustinskas

Prevention of thermal runaway risk in chemical process industries infrastructure by using model-based fault detection and diagnosis methods  
*Amine Dakkoun, Lamiae Vernières-Hassimi, Lionel Estel, Dimitri Lefebvre*

A Polynomial Chaos method to the analysis of the dynamic behaviour of Vertical Axis Wind Turbine  
*Abdelkhalak El Hami, Imen Bel Mabrouk*

12.40 – 14.00      **Lunch**



14.00 – 15.20

**SESSION 3: S3 - Continuity, Disruption Modelling & Resilience**

Chair: Dr. Kate Sanderson, Pr. Abdelkhalak El Hami

Evaluation of the power system reliability considering the renewable sources  
*Marko Čepin*

Modelling resilience of complex engineered systems using service continuity approach  
*Lech A. Bukowski*

Models of information influence for assessing information systems security  
*Igor Goncharov, Nikita Goncharov, Pavel Parinov*

Simulation-driven approach for measuring risk and resilience in the network of critical infrastructures  
*Stefan Schauer, Thomas Grafenauer, Sandra König, Stefan Rass*

15.20 – 15.40

**Coffee Break**

15.40 – 17.00

**SESSION 4: S4 - Mathematical Modelling of System Performance**

Chair: Dr. Dmitry Efrosinin, Dr. Stefan Schauer

Markov chain model for floods and earthquakes  
*Mario Lefebvre*

Refining stochastic models of critical infrastructures by observation  
*Stefan Rass, Stefan Schauer*

On sensitivity of reliability and risk models to shape of their elements  
*N. Kuznetsov, G. Popov, V. Rykov*

17.00 – 18.30

**ESReDA General Assembly**

19.30

**Gala Dinner**





## 2<sup>nd</sup> day, Friday May 24<sup>th</sup>, 2019

09.00 – 10.00

### Invited Lecture

Chair: Pr. Marko Čepin

Risk and reliability engineering for crisis management: using experience from asset management.

Pr. Cyp F.H. van Rijn

10.00 – 11.20

### SESSION 5: S5 - Monitoring, Diagnosis & Data

Chair: Dr. Vladimir Rykov, Dr. Stefan Rass

Probabilistic models and methods for processing data in "smart" monitoring system to define rational preventive measures of supporting reliability and safety

*Andrey Kostogryzov, Vladimir Artemyev, Jury Rudenko, Oleg Kurpatov, Andrey Nistratov, George Nistratov*

Time series segmentation of linear stochastic processes for anomaly detection problem using supervised methods

*Dmitry Efrosinin, Valentin Sturm*

Index for asset value measure obtained from condition monitoring digitalized data interpretation. A railway asset management application.

*Pablo González, Antonio Guillén, Antonio de la Fuente, Eduardo Candón, Pablo Martínez-Galán, Adolfo Crespo.*

Using advanced data analysis to learn from infrastructure databases: The case of the US National Bridge Inventory

*Filippos Alogdianakis, Dimos C. Champis and Ioannis Balafas*

11.20 – 11.40

### Coffee Break

11.40 – 12.40

### SESSION 6: S6 - Surveillance, Maintenance and Services Continuity

Chair: Dr. Stefan Schauer, Dr. Stefan Rass,

Analysis of the impact of the asset health index in a maintenance strategy  
*Javier Serra, Adolfo Crespo, Juan Gómez, Antonio Sola*

Degradation analysis and preventive maintenance modelling and assessment for improved resilience of critical infrastructures – Application to Torrent Checkdams

*Chahrour Nour, Hariri Sleiman, Tacnet Jean-Marc, Bérenguer Christophe*

12.40 – 14.00

### Lunch



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14.00 – 15.20

**INTERACTIVE SESSION: S7-Climate & CI Protection**

Moderator: Mr. Antonio Sola

Speaker: Dr. Jed Cohen

Effect of global warming on willingness to pay for uninterrupted electricity supply in European nations

*Jed Cohen, Klaus Moeltner, Johannes Reichl and Michael Schmidthaler*

15.20 – 15.40

**Closure Session & Next Event**

ESReDA General Secretary



## ESReDA

ESReDA membership is open to organisations, privates or governmental institutes, industry researchers and consultants, who are active in the field of Safety and Reliability.

Membership fees are currently 1000 EURO for organisations and 500 EURO for universities and individual members. Special sponsoring or associate membership is also available.

For more information on ESReDA, contact:

ESReDA General Secretary: Inga Žutautaitė-Šarūnienė ([Inga.Saruniene@lei.lt](mailto:Inga.Saruniene@lei.lt))

ESReDA address: European Safety, Reliability & Data Association, an International Non-Profit Scientific Association under the Belgium law (June 27, 1921, Title III). Headquarter: ESReDA, rue Gachard 88 Bte 14, B-1050 Bruxelles, Belgium, Siret:E00005802.

Any interested party is welcome to contribute to ESReDA project groups. (<http://www.esreda.org>)

## ESReDA Project Group on CI-P&R

The project group “CI-PR/MS&A-Data” is working on a comprehensive technical document on the existing Data and models that have been developed and are used in the fields of the CIP. Establishing a comprehensive state-of-the-art may hopefully lead to identifying lacks and measures to complete lacking data or lacking organisation to acquire data. These data are a critical input to all Modelling, Simulation and Analysis activities.

The technical document will be published with a EUR Tech-Doc reference number, by the end of 2018.

It will be published with the names of all the co-authors. The contribution to the technical document is open to all Experts in CIP with no restriction of being an ESReDA member.

The technical document will be available on ESReDA site for free download.

## Seminars Proceedings

The final proceedings of the 56<sup>th</sup> Seminar will be edited in the form of an EU Technical Report and e-published with public access. Some elected papers of the 56<sup>th</sup> ESReDA seminar will be published in referenced journals indexed in EBSCO, INSPEC, Index Copernicus and/or SCOPUS.