

3AF



10th
EDITION

EUROPEAN
CONGRESS

EMBEDDED REAL TIME SYSTEMS

ERTS 2020

FROM 29th TO 31st JANUARY / TOULOUSE FRANCE
PIERRE BAUDIS CONGRESS CENTER

 PROGRAMME





Alexandre Corjon

*Alliance (Renault-Nissan) Global Vice President,
Electrics, Electronics and Systems - France
& Congress General C-Chair*

For the second time, I have the honor to be industrial chairman for the ERTS Conference. Since 2018, the importance of Embedded systems hasn't been decreasing and the trend that was observed is confirmed day after day. In addition, the digitalization of the industry is also continuing at high pace as every company has a risk to be disrupted by new competitors, potentially coming from other domains without the backlog of their history.

Anyhow in Automotive industry or Aeronautics we are confronted to the same evolution, aiming at being more efficient, quicker in terms of time to market, more User Centric, but with a constraint which is different from Consumer Electronics: the mandatory "Safe and Secure" aspect of all systems and their related embedded software.

In Automotive, this evolution is pulled by the Autonomous Vehicle which has difficulties to be realized due to the number of real-life scenarios to be demonstrated to guarantee the safety of the system. Currently we estimate the need of 20 Peta equivalent-kilometers. This is not affordable and requires different types of strategies:

One of them is obviously to increase the level of simulations to model all discovered use cases and apply systematically some variations in terms of conditions to transform them in generic ones.

Another one is to limit the complexity, and therefore we have delivery of new systems having continuous increase of driving scene complexity instead of a full driverless vehicle.

The need of demonstrating the safety and security of the system is driving the speed of the deployment.

Artificial Intelligence continues to be one of the key technologies to be implemented and homologated. This is obviously used into the perception systems but also more and more in control systems. The non-deterministic approach is for sure new in our industries and a key stake. Demonstrating the safety of such systems will also be an important challenge.

Autonomous vehicle also requires having a strong interaction between on-board and off-board systems and to deal with a high amount of data either to monitor the behavior of the system in operation, or during test phases for which data ingestion and treatment is of first essence.

Cybersecurity is another domain where we foresee more and more developments. The technology we need to implement is closer and closer to the one used in data centers and forces us to have more massive and quicker updates of our vehicles while also adding some risks. Thanks to FOTA (update over the air), the content of our vehicles will vary in time and will need to be guarantee to all regulatory authorities.

ERTS is now a very well-known convention, with people coming from almost all parts of the world with representatives from Academia to Industry teams. It is a real opportunity to exchange across domains, to share best practices, to discover roadblocks and items in research phase, to present difficulties and solutions. In this edition we have health domain representatives and agriculture ones.

The more we will attend the best will be the exchanges!



Jean Arlat

LAAS-CNRS, seconded from CNRS, as Scientific Advisor to the French Embassy in the UK - France

ERTS marks the 10th edition of the Congress. It is a good opportunity to reflect on the progresses and achievements made in the development of embedded systems and also to look forward to the main trends and challenges that lie ahead.

Industrial processes and transportation have long been the core sectors that have witnessed the deployment of digitalized control and command functions for critical applications. Along the time, expertise has been built and accrued to develop (design, implement, assess and operate) embedded systems that are both resilient and timely in order to match the stringent requirements attached to such critical application domains, spanning for example nuclear and chemical plants, as well as aerospace, railways, and automobile.

The aim at providing more autonomy, flexibility and openness, as well as the demand for more cost-effective development, operator-centred exploitation and maintenance procedures results in an increasing sophistication and complexity of the functions being embedded. This is bound to necessitate research efforts for more advanced, innovative and adaptive (hardware and software) solutions as well as comprehensive and rigorous assessment approaches to cope with the high-level of resilience and timeliness that is to be achieved.

Thanks to the progress made in the context of such pioneering application domains and to the technological advances allowing for more powerful and smarter digital components and building-blocks, the pervasive deployment of computerized systems has progressively stretched to an unprecedented outreach in the various facets of our everyday life. New frontiers

are being explored that encompass for example, domestic appliances, e-health, smart cities, advanced manufacturing, future farming technology, etc. People are becoming more and more involved. They are now able to seamlessly: i) communicate among them via personal devices and ii) interact with the environment. The networking infrastructures (telecommunication networks, the Internet, industrial and home networks), as well as the data processing capabilities are being merged or at least significantly interwoven. This trend builds up and further elaborates on the so-called Cyber-Physical Systems and Internet of Things paradigms. In such a context, one has the ability to sense, measure and analyse the actual condition of virtually everything.

While application-level safety remains the ultimate key matter, this rapidly evolving context and the related trend have given rise to a wider range of concerns and challenges that go beyond real-time and data integrity issues. In particular, to allow for an efficient adaptation to changes, they should encompass: achieving transparency in the data analysis and decision processes, ensuring security as well as privacy, providing fast and precise prediction of the actual status of the system (including in the presence of accidental or deliberate faults) as well as the optimization of resources.

Being a leading European cross-sector event for embedded resilient and timely systems, that has been gathering, for almost two decades, researchers, engineers and professionals from a wide variety of application domains, ERTS is a unique forum for building up upon the accrued insight and awareness in coping with a wide range of cross-domain issues and for paving the way to address future challenges and investigate innovative solutions.

I am looking forward for you to join us in Toulouse to celebrate the 10th edition of the ERTS Congress!

Registration conference access

All attendees must register upon arrival and receive a conference badge which will be requested to access all ERTS 2020 events. The registration desk opening hours are as follows:

| | |
|-----------------------------|----------------------|
| Tuesday 28 January | 16:00 – 18:00 |
| Wednesday 29 January | 08:00 – 18:00 |
| Thursday 30 January | 08:30 – 18:30 |
| Friday 31 January | 08:30 – 12:30 |

Conference proceedings

All conference attendees will receive a conference bag including the Programme, proceedings on usb key and Book of Abstracts. Proceedings will be also available to download on the website after the conference.

Exhibition

A major exhibition is run in parallel to ERTS 2020 during the two first days, covering a wide range of products and services in the field of embedded software. The exhibition is located in the room Concorde, Level -1.

| | |
|-----------------------------|----------------------|
| Wednesday 29 January | 09:00 – 20:00 |
| Thursday 30 January | 09:00 – 19:00 |

Coffee Breaks

Coffee breaks will take place as follows :

| | |
|----------------------------------|---|
| Wednesday 29 January from | 10:30 to 11:00 and from 16:00 to 16:30, Level -1 in the exhibition Hall |
| Thursday 30 January from | 10:45 to 11:15 and from 15:30 to 16:00, Level -1 in the exhibition Hall |
| Friday 31 January from | 11:00 to 11:30, Level 1 in Foyer Ariane |

Conference Meals

Seated lunches are included in the Registration fees and will be served from Wednesday to Friday in room Caravelle, Level 0.

Wednesday from 12:15 to 13:45, Thursday from 12:45 to 14:00
& Friday from 12:30 to 14:00

Internet Access

A WIFI system will be provided, giving free internet access to all ERTS 2020 Conference delegates.

Network: ERTS2020
Password: ERTS2020

Luggage room

A cloakroom is at the delegates' disposal at the Conference centre, in front of the Registration desk, Level 0

Social Events

- Cocktail party on Wednesday 29 January – from 18:30 to 19:30
Exhibition Hall, Room Concorde, Level -1
- Gala Evening on Thursday 30 January - from 19:30 to 23:00
Room Caravelle, Level 0 of the Congress Center.

The invitation will be requested at the main entrance (given at the badge withdrawal for those who benefit from a full registration including the gala dinner).

Additional gala dinner can be purchased onsite (until Wednesday 29 January, upon availabilities) at the price of 90€

ERTS 2020 will be held at the Pierre Baudis Convention Center, located in the centre of Toulouse.

Address:

Centre de Congrès Pierre Baudis

11, esplanade Compans Caffarelli
31000 Toulouse

Access:

By Metro

Compans Caffarelli (Line B) Station

By bus

The congress centre is served by bus lines:
N°1 N°70 & N°71 (Bus stop Compans Caffarelli),
N°16 (Bus stop Jeanne d'Arc)

From/To Airport

A shuttle bus every 20 minutes with a station in front of the Pierre Baudis Congress Centre (Compans Caffarelli)

Taxi Company

A station is available just in front of the entrance of the Hotel Mercure Atria, Boulevard Lascrosse

ERTS 2020 at Pierre Baudis Congress Center

Level 2

St Exupéry Auditorium
Room Guillaumet

Level 1

Rooms Ariane 1
Friday Coffee breaks

Level 0

Main Entrance Hall – Conference registration
Room Caravelle – Lunches & Gala Evening

Level -1

Room Concorde 1+2
Exhibition registration & B to B meetings,
Welcome reception
Thursday : Poster Area
Wednesday & Thursday : Coffee Breaks

ERTS 2020 PROGRAMME AT-A-GLANCE

| | | | | | |
|----------------------------------|------------------------------|------------|--|--------------------------------|------------|
| Autonomous and Connected Systems | Processes, Methods and Tools | Resilience | Embedded Computing Platforms and Networked Systems | Model Based System Engineering | Scheduling |
|----------------------------------|------------------------------|------------|--|--------------------------------|------------|

WEDNESDAY, 29TH OF JANUARY

| | Auditorium Saint Exupéry | Guillaumet | Ariane 1 |
|-------|---|-----------------------------------|---------------------------------------|
| 09:00 | Opening Allocation: Louis-Claude Vrignaud - Continental Automotive France | | |
| 09:15 | Opening Allocutions by 3AF and SEE representatives and by local authorities Occitanie with La Region Occitanie and Toulouse Métropole | | |
| 10:00 | Opening Session: Programme Chair: Jean Arlat, LAAS-CNRS and Scientific Advisor to the French Embassy in the United Kingdom | | |
| 10:30 | Exhibition & Refreshment break (Concorde Room, level -1) | | |
| 11:00 | Plenary Session: Industrial Co-chairs: Alexandre Corjon, Global Vice President, Electrics, Electronics and Systems, Alliance (Renault-Nissan) & Charles Champion, Chairman of the Toulouse-Blagnac Airport Supervisory Board | | |
| 11:30 | Plenary Session: Keynote Address 1: Marta Kwiatkowska, University of Oxford | | |
| 12:15 | Lunch (Caravelle Room, level 0) | | |
| 13:45 | Plenary Session: Keynote Address 2: Jean-David Malo, European Innovation Council | | |
| 14:30 | We.1.A Autonomy and Validation | We.1.B Safety and AI | We.1.C Scheduling Verification |
| 16:00 | Exhibition & Refreshment break (Concorde Room, level -1) | | |
| 16:30 | We.2.A Autonomy and IHM | We.2.B Safety and Security | We.2.C Scheduling Design |
| 17:30 | We.3.A Connected Vehicles | We.3.B Safety and Security | |
| 18:30 | Welcome Reception (Exhibition Hall, Concorde Room level -1) | | |

THURSDAY, 30TH OF JANUARY

| | Auditorium Saint Exupéry | Guillaumet | Ariane 1 |
|-------|--|-----------------------------------|--|
| 09:00 | Plenary Session: Keynote Adress 3: Marc Mortureux, PFA General Manager (Plateforme de la Filière Automobile) | | |
| 09:45 | Poster overview | | |
| 10:45 | Exhibition and Posters Visit & Refreshment break (Concorde Room, level -1) | | |
| 11:15 | Th.1.A Agile Process | Th1.A Formal Verification | Th. 1.C Scheduling Verification |
| 12:45 | Lunch (Caravelle Room, level 0) | | |
| 14:00 | Th.2.A Network and SOA | Th.2.B Formal Verification | Th.2.C Model-based Engineering |
| 15:30 | Exhibition and Posters Visit & Refreshment break (Concorde Room, level -1) | | |
| 16:00 | Panel 1 - Certification of Machine Learning for Safety Critical Applications: Probable, Plausible or Impractical? | | |
| 17:00 | Th.3.A Embedded AI | Th.3.B Safety Assessment | Th.3.C Model-based Engineering |
| 18:00 | Special focus Session: Building the future today: a certification path for Hyperloop technology, Benjamin Pasquier, RAMS engineering director, Virgin | | |
| 18:30 | Hyperloop One and Jean-Louis Boulanger, Assessor Leader, Certifier | | |
| 19:30 | Gala Evening (Room Caravelle, Level 0) | | |
| 23:00 | | | |

FRIDAY, 31ST OF JANUARY

| | Auditorium Saint Exupéry | Guillaumet | Ariane 1 |
|-------|--|---------------------------------|---------------------------------------|
| 09:00 | Fr.1.A Platforms | Fr.1.B Safety by Design | Fr.1.C Model-based Engineering |
| 10:00 | Fr.2.A Platforms | Fr.2.B Safety Assessment | |
| 11:00 | Coffee Break (Foyer Ariane, level 1) | | |
| 11:30 | Panel 2: Challenges and Perspectives for Robotics and Autonomous Systems with Human Interaction: Multi Domain Transportation, Medical Care, Agriculture | | |
| 12:35 | Lunch including Closing Session (Caravelle Room, level 0) | | |
| 14:00 | End of the Conference | | |

AUDITORIUM SAINT EXUPÉRY

- 09:00 **Opening Allocution:** **Louis-Claude Vrignaud** - Continental Automotive France
- 09:15 **Opening Allocutions** by **3AF** and **SEE** representatives and by local authorities Occitanie with La Region Occitanie and Toulouse Métropole
- 10:00 **Opening Session:** Programme Chair: **Jean Arlat**, LAAS-CNRS and Scientific Advisor to the French Embassy in the United Kingdom
- 10:30 **Exhibition & Refreshment break** (Concorde Room, level -1)

14:30-16:00

AUDITORIUM ST EXUPÉRY

We.1.A : Autonomy and Validation
Chair : Gilles Le Calvez, Vedecom - France

We.1.A.1 - 14:30

Towards an Operational Design Domain That Supports the Safety Argumentation of an Automated Driving System

Magnus Gyllenhammar - Zenuity, Sweden
Rolf Johansson - Autonomous Intelligent Driving, Sweden
Fredrik Warg, Anders Thorsén - SP Technical Research Institute of Sweden, Sweden

Deju Chen - KTH Royal Institute of Technology, Sweden
Hans-Martin Heyn, Martin Sanfridson - Volvo Technology AB, Sweden

Jan Söderberg - Systemite AB, Sweden
Stig Ursing - Semcon Sweden AB, Sweden

We.1.A.2 - 15:00

Autonomous Vehicle Validation, generate variability on known uses cases and to discover new unknown unsafe uses cases required by ISO21448 SOTIF
Fabrice Trollet - ALL4TEC, France

We.1.A.3 - 15:30

Assuring ED-12C Autonomous Decision Making for UAVs
Nick Tudor, Colin O'Halloran - D-RisQ Ltd, United Kingdom

11:00 **Plenary Session:** Industrial Co-chairs: **Alexandre Corjon**, Global Vice President, Electrics, Electronics and Systems, Alliance (Renault-Nissan) & **Charles Champion**, Chairman of the Toulouse-Bagnac Airport Supervisory Board

11:30 **Plenary Session: Keynote Address 1:** **Marta Kwiatkowska**, University of Oxford

12:15 **Lunch** (Caravelle Room, level 0)

13:45 **Plenary Session: Keynote Address 2:** **Jean-David Malo**, European Innovation Council

GUILLAUMET

We.1.B : Safety and AI
Chair : Emmanuel Ledinot, Dassault Aviation - France

We.1.B.1 - 14:30

Concept Enforcement and Modularization as Methods for the ISO 26262 Safety Argumentation of Neural Networks

Gesina Schwalbe, Martin Schels - Continental Automotive GmbH, Germany

We.1.B.2 - 15:00

A Survey on Methods for the Safety Assurance of Machine Learning Based Systems
Gesina Schwalbe, Martin Schels - Continental Automotive GmbH, Germany

We.1.B.3 - 15:30

Current Challenges in the Certification of Machine Learning for Safety Critical Systems

Eric Jenn, Alexandre Albore, Franck Mamalet, Grégory Flandin - IRT Saint-Exupéry, France
Christophe Gabreau, Hervé Delseny, Adrien Gauffriau - AIRBUS SAS, France
Hugues Bonin, Lucian Alecu, Jérémy Pirard - Continental, France

ARIANE 1

We.1.C : Scheduling Verification
Chair : Denis Claraz, Vitesco France - France

We.1.C.1 - 14:30

Towards Probabilistic Timing Analysis for SDFGs on Tile Based Heterogeneous MPSoCs

Ralf Stemmer, Wolfgang Nebel - Carl von Ossietzky Universität Oldenburg, Germany

Hai-Dang Vu, Sebastien Le Nours, Sebastien Pillement - University of Nantes, France

Kim Gruetner - OFFIS e.V., Germany

We.1.C.2 - 15:00

Build Your Own Static WCET Analyzer: the Case of the Automotive Processor AURIX TC275

Wei-Tsun Sun - IRT Saint Exupéry, France
Eric Jenn - IRT Saint Exupéry, second by Thales AVS., France
Hugues Hugues Cassé - IRT - University of Toulouse, France

We.1.C.3 - 15:30

Multicore shared memory interference analysis through hardware performance counters

Alfonso Mascarenas Gonzalez, Youcef Bouchebaba - ONERA, France
Luca Santinelli - AIRBUS DS Germany, France

16:00 **Exhibition & Refreshment break** (Concorde Room, level -1)

16:30-17:30

AUDITORIUM ST EXUPÉRY

We.2.A : Autonomy and IHM

Chair : **Christophe Grand**, ONERA - France

We.2.A.1 - 16:30

Safer Transitions of Responsibility for Highly Automated Driving: Designing HMI for Transitions with Functional Safety in Mind

Matthew Sassman, Richard Wiik - Semcon Sweden AB, Sweden

We.2.A.2 - 17:00

Towards Safety Analysis of Interactions Between Human Users and Automated Driving Systems

Fredrik Warg - RISE Research Institutes of Sweden, Sweden
Stig Ursing, Martin Kaalhus, Richard Wiik - Semcon Sweden AB, Sweden

17:30-18:30

AUDITORIUM ST EXUPÉRY

We.3.A : Connected Vehicles

Chair : **Marc Boyer**, Onera - France

We.3.A.1 - 17:30

An Ontology Based Anomaly Detection System for Cellular Vehicular Communications

Quentin Ricard, France Philippe Owezarski - LAAS-CNRS, France

We.3.A.2 - 18:00

Testbed for Multi-access Edge Computing V2X applications prototyping and evaluation

Bilel Cherif - LAAS-CNRS, France
Nicolas Riviere, Pascal Berthou, Yann Labit - LAAS-CNRS and University of Toulouse, France

GUILLAUMET

We.2.B : Safety and Security

Chair : **Rafael Rodriguez**, GTD, Spain

We.2.B.1 - 16:30

Combined Real-Time, Safety and Security Model Analysis

Pierre Dissaux - Ellidiss Technologies, France
Frank Singhoff, Laurent Lemarchand, Hai Nam Tran, III-Ham Atchadam - University of Brest, Lab-STICC, CNRS UMR 6285, France

We.2.B.2 - 17:00

Preliminary Safety-Security Co-engineering Process in the Industrial Automation Sector

Alejandra Ruiz, Javier Puelles, Jabier Martinez - Tecnalia, Spain
Thomas Gruber - AIT Austrian Institute Of Technology, Austria
Martin Matschnig, Bernhard Fischer - Siemens AG, Austria

GUILLAUMET

We.3.B : Safety and Security

Chair : **Youssef Laarouchi**, EDF, France

We.3.B.1 - 17:30

High-Precision Sound Analysis to Find Safety and Cybersecurity Defects

Daniel Kästner, Laurent Mauborgne, Christian Ferdinand - AbsInt GmbH, Germany

We.3.B.2 - 18:00

Integration of safety and cybersecurity analysis through combination of systems and reliability theory methods

Joaquim Maria Castella Triginer - Virtual Vehicle Research Center, Spain
Helmut Martin, Bernhard Winkler, Nadja Marko - Virtual Vehicle Research Center, Austria

ARIANE 1

We.2.C : Scheduling Design

Chair : **Patrick Cormery**, Ariane Group, France

We.2.C.1 - 16:30

Safe Scheduling on Multicores: an approach leveraging mixed-criticality and end-to-end deadlines.

Daniel Loche - Renault S.A.S. & LAAS-CNRS, France
Michaël Lauer - Université de Toulouse/LAAS-CNRS, France
Matthieu Roy, Jean-Charles Fabre - LAAS-CNRS, France

We.2.C.2 - 17:00

Non-Preemptive Scheduling of Mixed-Criticality Real-Time Systems

Jasdeep Singh, Luca Santinelli - ONERA, France
Federico Reghenzani - Politecnico di Milano, Italy
Konstantinos Bletsas - Polytechnic Institute of Porto (ISEP/IPP), Portugal
Zhishan Guo - University of Central Florida, United States

We.2.C.3 - 17:30

Accounting for interferences in the design of Time-Triggered Applications

Antoine Ferlin - IRT Saint Exupéry, France
Eric Jenn - Thales AVS and IRT Saint Exupéry, France
Marc Kaufmann - Safran Electronics and Defense, France

18:30 **Welcome Reception - Exhibition Hall**, (Concorde Room, level -1)

AUDITORIUM SAINT EXUPÉRY

09:00 **Keynote Address 3**

Marc Mortureux, PFA General Manager (Plateforme de la Filière Automobile)

09:45 **Poster Overview**

Chair : Philippe Cuenot, Continental Automotive SAS - France

Th.Po.1 - 09:45

Profiling Two Broadcast Protocols for Transiently Powered Wireless Sensor Networks

David Richardson, Arshad Jhumka - Department of Computer Science, The University of Warwick, United Kingdom

Th.Po.2 - 09:50

Anomaly detection using hardware performance counters on a large scale deployment

Malcolm Bourdon, Eric Alata, Mohamed Kaaniche, Vincent Migliore, Vincent Nicomette - LAAS-CNRS, France
Youssef Laarouchi - EDF R&D, France

Th.Po.3 - 09:55

Interaction-oriented programming for Cockpits and Controller Working Positions

Stéphane Conversy - ENAC, France

Th.Po.4 - 10:00

Toward real-time embedded observer of unsteady fluid flow environment

Valentin Resseguier, Matheus Ladvig, Agustin Martin Picard - Lab, SCALIAN DS, France
Etienne Memin - Fluminance team, Inria, France
Bertrand Chapron - LOPS, Ifremer, France

Th.Po.5 - 10:05

A user privacy-centric access control policy of data for intelligent transportation systems

Rémi Adelin, Eric Alata, Vincent Migliore, Vincent Nicomette - LAAS-CNRS, France

Th.Po.6 - 10:10

EMBEDDED FRANCE new Organization and Missions

Cendrine Barruyer - Embedded France, France
Cedric Demeure - Thales, France
Olivier Guetta - Renault, France
Jean-Luc Chabaudie - Altran, France

Th.Po.7 - 10:15

Efficient refactoring in industrial projects

Flavien Huynh, Cyril Benkimoun - Vector, France

Th.Po.8 - 10:20

Validating the Numerical Accuracy of Critical Systems: A Case Study with Spout and Space Launcher Flight Software

Corentin De Souza, Ludovic Gauthier, Arnault Ioualalen - Numalis, France
David Lesens - Ariane Group, France
Matthieu Martel - Université de Perpignan Via Domitia, France
Philippe Miramont - CNES, France

Th.Po.9 - 10:25

Dynamic virtual platform for HW/SW partitioning on MPSoC platforms

Adrien Thierry, Hubert Guerard - Space Codesign Systems, Canada
Guy Bois - Polytechnique Montreal/Space Codesign Systems, Canada

10:45 **Exhibition and Posters Visit & Refreshment break** (Concorde Room, level -1)

11:15 - 12:45

AUDITORIUM ST EXUPÉRY

Th. 1.A : Agile Process

Chair : **Eric Armengaud**, AVL - Austria

Th. 1.A.1 - 11:15

A Model-Driven Approach for Managing Software Development Processes in the Automotive Industry

Frederic Bessonier - Renault, France

Erich Meier - MethodPark, Germany

Theo Lafontan - Altran Toulouse, France

Th. 1.A.2 - 11:45

Introducing Agile Methodology into Advanced Systems Engineering Training

Uwe Kuehne, Colin Hamilton, Stefan Brueggemann - Airbus Defence and Space, Germany

Th. 1.A.3 - 12:15

Quality Quantification Applied to Automotive Embedded Systems and Software - Advances with quality science

Yann Argotti - LAAS/CNRS - Renault Software Labs, France

Claude Baron - LAAS/CNRS - INSA, France

Philippe Esteban - LAAS/CNRS - Université Toulouse III, France

Denis Chaton - Renault Software Labs, France

GUILLAUMET

Th. 1.B : Formal Verification

Chair : **Cyril Comar**, Adacore - France

Th. 1.B.1 - 11:15

Automatic Verification of BPMN Models

Mihal Brumbulli, Emmanuel Gaudin - PragmaDev, France

Ciprian Teodorov - ENSTA Bretagne, France

Th. 1.B.2 - 11:45

Formal Approach for the Verification of Onboard Autonomous Functions in Observation Satellites

Silvano Dal Zilio - LAAS-CNRS, France

Vincent Mussot, Serge Rainjonneau, Yves Bardout,

Grégoire Scano - Institute of Research and Technology (IRT) Saint-Exupéry, France

Loïc Correnson - CEA, List, Software Safety and Security Lab, France

Th. 1.B.3 - 12:15

Industrial use of a safe and efficient formal method based software engineering process in avionics

Abderrahmane Brahmi, Mohamed Habib Essoussi, Pascal Lacabanne, Jean Souyris, Marie-Jo Carolus, David Delmas

- Airbus Operations SAS, France

Victoria Moya Lamiel - Airbus Operations SAS, Spain

Famantanantsoa Randimbivololona - Cepresy, France

ARIANE 1

Th. 1.C : Scheduling Verification

Chair : **Philippe Baufreton**, Safran - France

Th. 1.C.1 - 11:15

PHYLOG certification methodology: a sane way to embed multi-core processors

Frédéric Boniol, Bouchebaba Youcef, Brunel Julien, Kevin Delmas, Thomas Loquen, Alfonso Mascarenas Gonzalez, Thomas Polacsek, Nathanaël Sensfelder - ONERA, France
Claire Pagetti - ONERA / IRT-ENSEEIH, France

Th. 1.C.2 - 11:45

Using Model Checking to Identify Timing Interferences on Multicore Processors

Viet Anh Nguyen, Eric Jenn - IRT Saint Exupéry, France
Wendelin Serwe, Frederic Lang, Radu Mateescu - Univ. Grenoble Alpes, Inria, CNRS, France

Th. 1.C.3 - 12:15

Formal Modeling and Verification for Timing Predictability

Mihail Asavoae, Mathieu Jan, Belgacem Ben Hedia - CEA LIST, France

12:45 **Lunch** (Caravelle Room, level 0)

14:00 - 15:30

AUDITORIUM ST EXUPÉRY

Th.2.A : Network and SOA

Chair : Stefan Dreiseitel, Continental Teves AG & Co. oHG, Germany

Th.2.A.1 - 14:00

Suitability of Time Sensitive Networking for spacecraft industry

Pierre-Julien Chaine, Franck Wartel - Airbus Defence and Space, France

Marc Boyer, Claire Pagetti - Onera, France

Th.2.A.2 - 14:30

A new network configuration management architecture for future aircraft systems

Thibault Delmas, Jean-Pierre Garcia - Safran Electrical and Power, France

Luigi Iannone - Telecom ParisTech, France

Bruno Monsuez - ENSTA ParisTech, France

Th.2.A.3 - 15:00

Service Oriented Architecture in Automotive

Marc Bellanger, Edward Marmounier - Renault Software Labs, France

GUILLAUMET

Th.2.B : Formal Verification

Chair : Adrien Gauffriau, Airbus - France

Th.2.B.1 - 14:00

Towards Formal Verification of Autonomous Driving Supervisor Functions

Assioua Yasmine, Guitton-Ouhamou Patricia - Renault Software Labs, France

Ameur-Boulifa Rabea - LTCI, Telecom Paris, Institut polytechnique de Paris, France

Th.2.B.2 - 14:30

ASTERIOS Checker: A Verification Tool for Certifying Airborne Software

Amira Methni, Emmanuel Ohayon - Krono-Safe, France

Francois Thuriereau - Safran Electronics & Defense, France

Th.2.B.3 - 15:00

Data Consistency Testing in Automotive Multi-Core Applications - towards systematic requirement elicitation

Ralph Mader - Vitesco Technologies GmbH, Germany

Stefan Resmerita, Anton Pölzleitner - University of Salzburg and Chrona.com, Austria

Lucian Bara - Vitesco Technologies GmbH, Romania

Wolfgang Pree - Chrona.com, Austria

ARIANE 1

Th.2.C : Model-based Engineering

Chair : Uwe Kuehne, Airbus Defence and Space GmbH - Germany

Th.2.C.1 - 14:00

Early validation of satellite COTS-on-board computing systems

Philippe Cuenot, Amin Ouestali, Paul Bouche - IRT Saint Exupéry, France

Julien Deantoni - Université Côte d'Azur, I3S/INRIA Kairos, France

Robert De Simone - INRIA Kairos, France

Th.2.C.2 - 14:30

LAMP: A new model processing language for AADL

Pierre Dissaux - Ellidiss Technologies, France

Th.2.C.3 - 15:00

Engineering Railway Systems using an Architecture-Centric Process Supported by AADL and ALISA: an Experience Report

Paolo Crisafulli, Cristian Maxim - IRT SystemX, France

Dominique Blouin - Telecom Paristech, France

Francoise Caron - Eiris Conseil, France

15:30 **Exhibition and Posters Visit & Refreshment break** (Concorde Room, level -1)

AUDITORIUM ST EXUPÉRY

16:00 **Panel 1 - Certification of Machine Learning for Safety Critical Applications: probable, plausible or impractical?**
Chair : Claire Pagetti, Onera/ENSEEITH - ANITI Chair on CertifAI - France
Panelists : Christophe Gabreau, Airbus - Eurocae WG114 group leader - France
George Romanski - Chief Scientific and Technical Advisor (FAA) - US
Guillaume Soudain, EASA – Software Senior Expert - Germany
François Terrier, CEA -Director of research a CEA, Professor at INSTN - France
Hugues Bonnin, Continental Digital Service, France

Summary

Artificial Intelligence based applications have offered unthinkable progress in many areas and have invaded transport systems like aircraft, cars, rail, and all critical embedded systems. While the performance gains and huge opportunities offered by machine learning are enticing, their embedding is impeded by their seemingly unpredictable nature, which is incompatible with safety critical environments and certification. Indeed, the design of safety critical systems requires demonstrations able to argument for the dependability of the results of such complex algorithms. Still, a number of initiatives and working groups are focusing on defining and determining the means for manufacturers to fulfill certification expectations despite the complex and uncontrolled internal behaviors of machine learning.

17:00 - 18:00

AUDITORIUM ST EXUPÉRY

Th.3.A : Embedded AI

Chair : Jean-Luc Dormoy, EDF Group - France

Th.3.A.1 - 17:00

Profiling and optimization of Deep Neural Networks for embedded automotive applications

Eric Perraud, Jean-Marc Gabriel, Loïc Cordone - Renault Software Labs, France

Th.3.A.2 - 17:30

Capability to Embed Deep Neural Networks: Study on CPU Processor in Avionics Context

Sergei Chichin, Dominique Portes, Victor Jegu - Airbus S.A.S., France

Marc Brundler - AUSY, France

GUILLAUMET

Th.3.B : Safety Assessment

Chair : Eric Jenn, Thales Avionics - France

Th.3.B.1 - 17:00

Safety Annex for the Architecture Analysis and Design Language

Danielle Stewart, Mats Heimdahl, Michael Whalen - University of Minnesota, United States
Jing Liu, Darren Cofer, Michael Peterson - Collins Aerospace, United States

Th.3.B.2 - 17:30

On the safety assessment of RPAS safety policy

Diego Couto, Kevin Delmas, Xavier Pucel - ONERA, France

ARIANE 1

Th.3.C : Model-based Engineering

Chair : Hervé Delseny, Airbus - France

Th.3.C.1 - 17:00

Using SPARK to Ensure System to Software Integrity

Tonu Naks - AdaCore, Estonia
M. Anthony Aiello, S. Tucker Taft - AdaCore, United States

Th.3.C.2 - 17:30

Practical Application of SPARK to OpenUxAS

M. Anthony Aiello - AdaCore Technologies, United States
Claire Dross - AdaCore, France
Pat Rogers - AdaCore, United States
Laura Humphrey - Air Force Research Laboratory, United States
James Hamil - LinQuest Corporation, United States

18:00 Th.Special Focus Session

18:30 **Building the Future Today: a Certification Path for Hyperloop Technology,**

Chair : Mohamed Kaïniche - LAAS - CNRS - France
Panelists : Benjamin Pasquier, RAMS Engineering Director, Virgin Hyperloop One
Jean-Louis Boulanger, Assessor Leader, Certifier

In the process of building the world's first hyperloop system, Virgin Hyperloop One (VHO) is creating a disruption in the transportation industry. We see the rise of a new mode - travel in low pressure tubes under electromagnetic propulsion and levitation at speeds close to 1000 km/h – at the same time the regulatory framework is developing for the technology.

Together, VHO and Certifier will outline the process and challenges for transitioning a company from a start-up with ground-breaking technology to a mature transportation company capable to deliver a certified first deployment in a matter of years.

09:00 - 10:00

AUDITORIUM ST EXPÉRY

Fr.1.A : Platforms

Chair : **Olivier Guetta**, Renault - France

Fr.1.A.1 - 09:00

Selection and evaluation of an embedded hypervisor: application to an automotive platform

Etienne Hamelin, Moha Ait Hmid, Yves Mouafou-Tchinda, Amine Naji - CEA, LIST, France

Fr.1.A.2 - 09:30

Make life easier for embedded software engineers facing complex hardware architectures

Romain Leconte - Space Codesign Europe, France

Eric Jenn - Thales Avionics, France

Guy Bois - Polytechnique Montreal/Space Codesign Systems, Canada

Hubert Guerard - Space Codesign Systems Inc, Canada

10:00 - 11:00

AUDITORIUM ST EXPÉRY

Fr.2.A : Platforms

Chair : **Christophe Moreno**, Thales Alenia Space - France

Fr.2.A.1 - 10:00

Low Cost High Integrity Platform

Thierry Lecomte, David Deharbe, Etienne Prun, Patrick

Peronne, Denis Sabatier - CLEARSY, France

Emmanuel Chailloux, Adilla Susungi - Sorbonne Université, France

Sylvain Conchon, Steven Varoumas - LRI, France

Fr.2.A.2 - 10:30

CeCar: A platform for research, development and education on autonomous and cooperative driving

Carsten Thomas, Frank Bauernöppel, Thomas Baar, Heide Brandtstädter - HTW Berlin (University of Applied Sciences), Germany

Joachim Wegener - Expleo Group, Germany

GUILLAUMET

Fr.1.B : Safety by Design

Chair : **Kevin Delmas**, Onera - France

Fr.1.B.1 - 09:00

An Assurance Case based on Overarching Properties for a TQL1 Code Generator

M. Anthony Aiello - AdaCore Technologies Inc., United States

Cyrille Comar, José Ruiz - AdaCore SAS, France

Fr.1.B.2 - 09:30

Efficient fine-grain parallelism in shared memory for real-time avionics

Philippe Baufreton - Safran, France

Vincent Bregeon, Jean Souyris - Airbus, France

Keryan Didier, Dumitru Potop Butucaru - INRIA, France

Guillaume looss - ENS, France

GUILLAUMET

Fr.2.B : Safety Assessment

Chair : **Claire Pagetti**, Onera - France

Fr.2.B.1 - 10:00

Towards Rebalancing Safety Design, Assessment and Assurance

Emmanuel Ledinet - Thales Research and Technology, France

Jean Paul Blanquart - Airbus Defence and Space, France

Jean Gassino - IRSN, France

Rémy Astier - Rolls-Royce Civil Nuclear, France

Philippe Baufreton, Bertrand Ricque - Safran Electronics and Defense, France

Jean-Louis Boulanger - CERTIFER, France

Jean-Louis Camus - ANSYS Esterel Technologies, France

Cyrille Comar - AdaCore, France

Philippe Quééré - Renault, France

Fr.2.B.2 - 10:30

Data & Safety: challenges and opportunities

Hugues Bonnin, Olivier Flebus - Continental, France

ARIANE 1

Fr.1.C : Model-based Engineering

Chair : **Jean Loup Terrailon**, ESA - France

Fr.1.C.1 - 09:00

Using Generic Software Components for Safety-Critical Embedded Systems - An Engineering Framework

Felix Bräunling - Method Park Engineering GmbH, Germany
Isabella Stilkerich - Schaeffler Technologies AG & Co. KG, Germany

Robert Hilbrich - Deutsches Zentrum für Luft- und Raumfahrt DLR, Germany

Simon Wegener, Daniel Kästner - AbsInt GmbH, Germany

Fr.1.C.2 - 09:30

CocoSim, a code generation framework for control/command applications : from Simulink to C

Hamza Bourbouh - NASA Ames/SGT, United States

Pierre-Loic Garoche, Thomas Loquen, Eric Noulard, Claire Pagetti - ONERA, France

Fr.1.C.3 - 10:00

Hardware / software / Analog System Partitioning with SysML and SystemC-AMS

Daniela Genius - Sorbonne Université, LIP6, France

Ludovic Aprville - LTCI, Télécom Paris, Institut polytechnique de Paris, France

11:00 **Refreshment break** (Foyer Ariane, level 1)

11:30 **PANEL 2**

CHALLENGES FOR ROBOTICS AND AUTONOMOUS SYSTEM WITH HUMAN INTERACTION: A MULTI DOMAIN PERSPECTIVE

Moderators

Helene Gaspard-Boulinc, DSNA/DTI - France

Philippe Palanque, IIRIT- France

Panelists

Jean-Loup Chrétien - Tektronik - Médical

Marc Garbey, Institute for Academic Medicine at Houston Methodist and Weill Cornell Medical College, USA

Hélène Waeselynck, LAAS- Agriculture

Stéphane Chatty, DGAC- Contrôle aérien

Christine GRIS, Expert Flight Warning, Airbus

Summary

The aim of this panel is to raise awareness and to foster discussions around the notions of Automation and User Interaction and their interplay in the design, development, evaluation and deployment of interactive systems. The panel will bring diverse (potentially conflicting) perspectives on User Interaction in a world that embeds increasing automation. While early approaches in automation were focusing on allocating basic functions to the best player (e.g. Fitts' approach Machine Are Better At – Men Are Better At), this panel focuses on the combined use of the concepts of automation within interactive systems development. Current push in automation is towards fully autonomous systems (such as google cars) raising critical issues such as: how to make it possible for users to foresee future states of the automation, how to disengage automation or how to make sure that users are able to take over when automation fails When higher automation levels are considered, users' activity gets closer to supervision, which is a different interaction paradigm deeply impacting user interaction. In domains such as medical care and transportation, safety is at stake.

12:30 **Lunch** (Caravelle Room, level 0) and **Closing Session**

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Guetta Olivier - Renault - France

Hochgeschwender Nico - German Aerospace Center (DLR) - Germany

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The **SEE** (the French Electrical, Electronics, and Information & Communication Technologies Society) is a non-profit-making scientific association, directed to the public benefit. The SEE groups its members into 22 Technical Committees and 12 Regional Groups, creating links between them through its Newsletter and website. SEE mission's is to promote French science and technology, as well as create within these two fields meeting opportunities for industrialists, research scientists, teachers, students and trainee engineers both from France and abroad. The SEE thereby organises and co-organises events in its particular fields of competence. These professional national colloquia deal with particular topics and prospects, as well as major international Conferences. Other events include technical visits, evening lectures and training courses.

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Founded in 1994, **AdaCore** supplies software development and verification tools for mission-critical, safety-critical, and security-critical systems. Four flagship products highlight the company's offerings:

- The GNAT Pro development environment for Ada, a complete toolset for designing, implementing, and managing applications that demand high reliability and maintainability,
- The CWE-Compatible CodePeer advanced static analysis tool, an automatic Ada code reviewer and validator that can detect and eliminate errors both during development and retrospectively on existing software, CodePeer can detect a number of the "Top 25 Most Dangerous Software Errors" in the MITRE Corporation's Common Weakness Enumeration (CWE).
- The SPARK Pro verification environment, a toolset based on formal methods and oriented toward high-assurance systems,
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Over the years customers have used AdaCore products to field and maintain a wide range of critical applications in domains such as commercial and military avionics, automotive, railway, space, defence systems, air traffic management/control, medical devices, and financial services. AdaCore has an extensive and growing worldwide customer base; see www.adacore.com/industries/ for further information.

AdaCore products are open source and come with expert online support provided by the developers themselves. The company has North American headquarters in New York and European headquarters in Paris. www.adacore.com/



IRT Saint Exupéry is a technological research institute which accelerates science, technology research and transfer to aeronautics, space and embedded systems industries through the development of dependable, robust, certifiable and sustainable innovative solutions.

IRT Saint Exupéry offers on its Toulouse, Bordeaux, Montpellier, Sophia Antipolis and Montreal sites a collaborative environment composed of engineers, researchers, experts and PhDs from academic and industrial sectors to lead R&T projects and services thanks to its Technology Platforms in four strategic domains:

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- More Electrical Aircraft: Dielectrics, Conductors & Plasmas - Power Technologies & Integration - Components Modeling & Reliability
- Intelligent Systems & Communications: Digital Signal Processing – Intelligent Systems & Applications – Artificial Intelligence for autonomous & critical systems
- Systems Engineering & Modeling: Systems Engineering – Multidisciplinary Design Optimization

IRT Saint Exupéry has been launched by the French government within Investments for the Future Program. (PIA)



SYSGO is the leading European provider of Real-Time Operating Systems for safety-critical and certifiable embedded systems in the Internet of Things (IoT). PikeOS, a hard RTOS with hypervisor functionality, allows to securely run critical and non-critical applications on the same hardware, reducing footprint, hardware cost, energy consumption and weight. PikeOS has been designed from scratch for mission-critical projects with certification requirements according to various safety and security standards such as DO-178B/C, IEC 61508, EN 50128, ISO 26262 or IEC 15408 (Common Criteria). Currently the version PikeOS 4.2 is available for developers. It is characterized by an improved multicore CPU handling and is the new foundation for projects that need get certified. Next to this we present ELinOS 6.2. ELinOS is an industrial grade Linux distribution, designed to be built out of the box and adapted to customer needs. ELinOS is a SYSGO own distribution and 100 % compatible with PikeOS.

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(1)The customers were counted at the end of 2018 per delivery site; a customer can have two delivery points: one for electricity and another for gas

AIRBUS

Airbus is a global leader in aeronautics, space and related services. In 2018 it generated revenues of € 64 billion and employed a workforce of around 134,000. Airbus offers the most comprehensive range of passenger airliners. Airbus is also a European leader providing tanker, combat, transport and mission aircraft, as well as one of the world's leading space companies. In helicopters, Airbus provides the most efficient civil and military rotorcraft solutions worldwide."



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Groupe Renault has manufactured cars since 1898. Today it is an international multi-brand group, selling close to 3.9 million vehicles in 134 countries in 2018, with 36 manufacturing sites, 12,700 points of sales and employing more than 180,000 people.

To address the major technological challenges of the future, whilst continuing to pursue its profitable growth strategy, Groupe Renault is focusing on international expansion. To this end, it is drawing on the synergies of its five brands (Renault, Dacia, Renault Samsung Motors, Alpine and LADA), electric vehicles and its unique alliance with Nissan and Mitsubishi Motors. With a 100% Renault-owned team committed to the Formula 1 World Championship since 2016, the brand is involved in motorsports, a real vector for innovation and awareness.

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