

# A Guided Tour of the AltaRica 3.0 Workshop

Friday October 11  
2 p.m to 3.30 p.m



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## Summary

- Introduction
- Demonstrations
  - Case study 1: COM-MON modelling pattern
  - Case study 2: Electrical System
  - Case study 3: Wind Mill farm
- Conclusion and perspectives
- Questions

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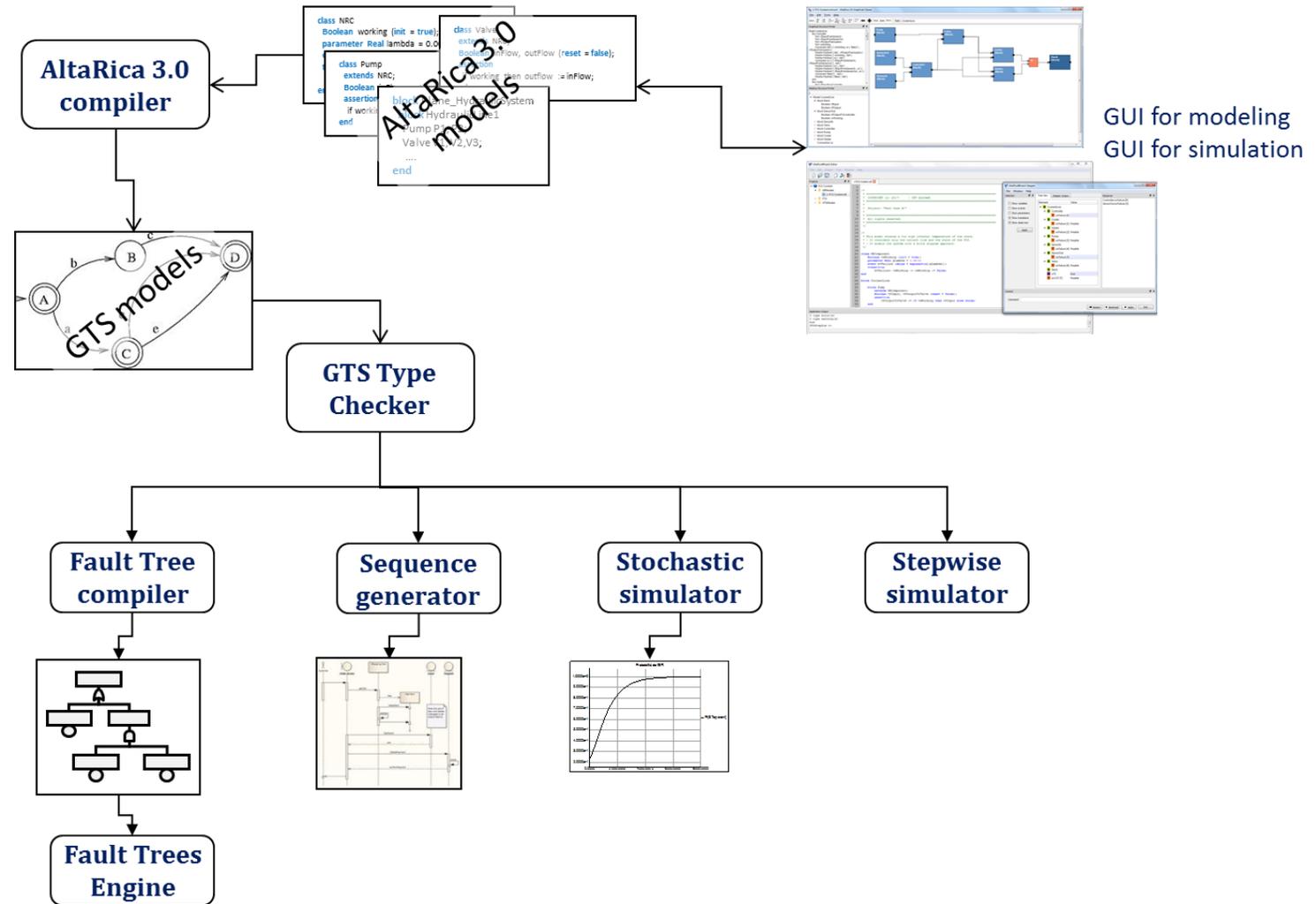
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# History

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- 2011
    - 2011: The **AltaRica 3.0 project** started at Ecole Polytechnique
      - Definition of AltaRica 3.0 modelling language
      - Development of first versions of the assessment tools
        - Stepwise and stochastic simulators
        - Compiler to stochastic Boolean equations
  - 2014
    - 2014:
      - Creation of **AltaRica Association**
    - 2014 – 2019:
      - OpenAltaRica project hosted by IRT SystemX
        - Partners: Airbus Protect, SAFRAN, Thales, AltaRica Association
        - OpenAltaRica platform
  - 2019
    - Since 2019:
      - **AltaRica 3.0 Workshop** developed by AltaRica Association
        - Freely available for research and education
        - <http://www.altarica-association.org/Products/Software/AltaRicaWizard/AltaRicaWizard.html>

# The AltaRica 3.0 technology

The **AltaRica 3.0 Workhop**  
An integrated platform to **design**  
and **assess** AltaRica 3.0 and  
Open-PSA models



Michel Batteux, Tatiana Prosvirnova, and Antoine Rauzy. "AltaRica Wizard: an integrated modeling and simulation environment for AltaRica 3.0". In *Actes du congrès Lambda-Mu 21 (actes électroniques)*. Reims, France. October, 2018.

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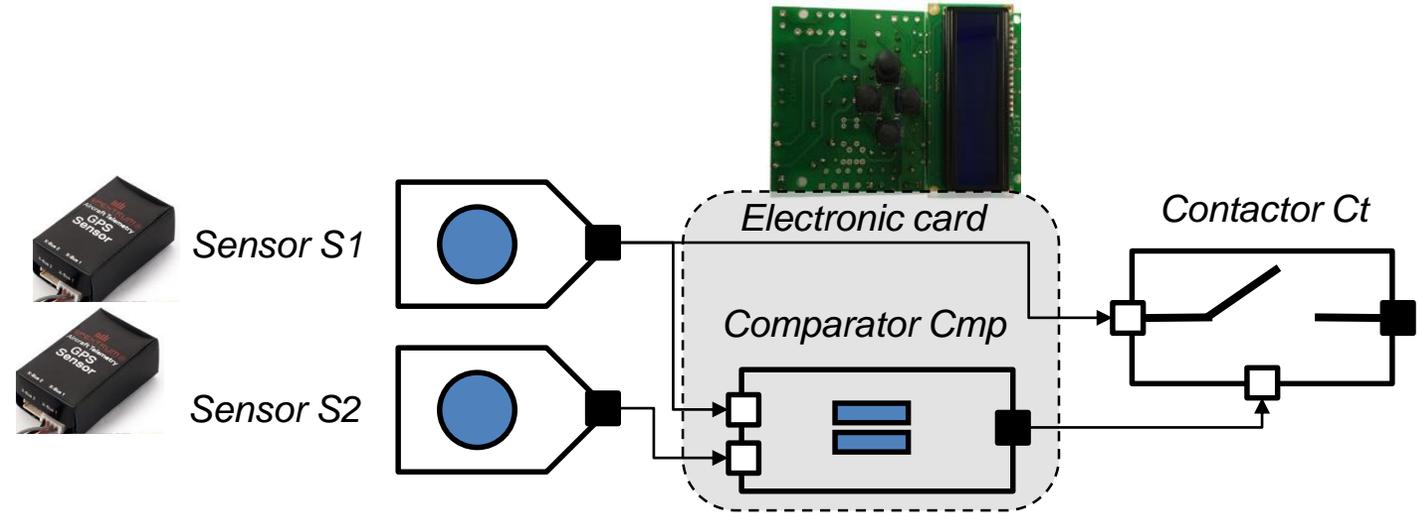
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# COMMON modelling pattern

## Illustration of static and dynamic models

- Command/monitoring pattern of safety architecture to compute correct orders even if one error occurs
- Structure:
  - Two **sensors S1** and **S2**
  - A **comparator Cmp** that checks the equality of two inputs
  - A **contactor Ct** that is closed as long as the equality check is true. When it is closed, it transmits S1 output; else, it transmits no output.



- The **sensors** have two failure modes:
  - they may produce an erroneous output;
  - they may produce no output at all.
- The **comparator** has a failure mode:
  - May be lost, when it is lost it always transmits the command to close to the contactor
- The **safety requirements** of interest for this pattern are:
  - Failure condition **FC\_B1**: an **erroneous** output is CAT.
  - Failure condition **FC\_B2**: the output **loss** is minor.

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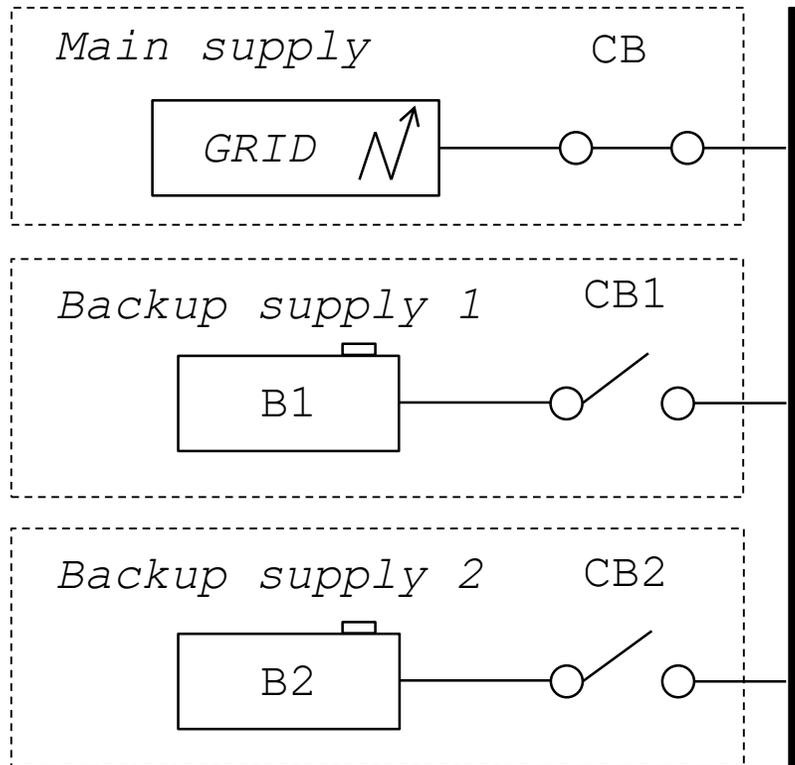
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# Electrical system

## Illustration of theoretical notions of abstract semantics

*Busbar*



- Three redundant lines
  - Main line composed of a **Grid** and a **circuit breaker CB**
  - Two backup lines composed of a **battery B** and a **circuit breaker CB**
- The **Grid**
  - Failure (**exponential** distribution)
  - Repair (**uniform** distribution)
- **Circuit breakers**
  - Open/close (**Dirac(0.0)**)
  - Stuck open or closed (**exponential** distribution)
- **Batteries**
  - Activation/ stop (**Dirac(0.0)**)
  - Dormant failure (**exponential** distribution)
  - Discharge when activated (**uniform** distribution)

- Mixes stochastic and determinist transitions
  - Stochastic transitions (**exponential, uniform**)
  - Immediate transitions (**Dirac(0.0)**)

Michel Batteux, Tatiana Prosvirnova, Antoine Rauzy. Abstract Executions of Stochastic Discrete Event Systems. International Journal of Critical Computer-Based Systems, 2022, 10 (3), pp.202-226.

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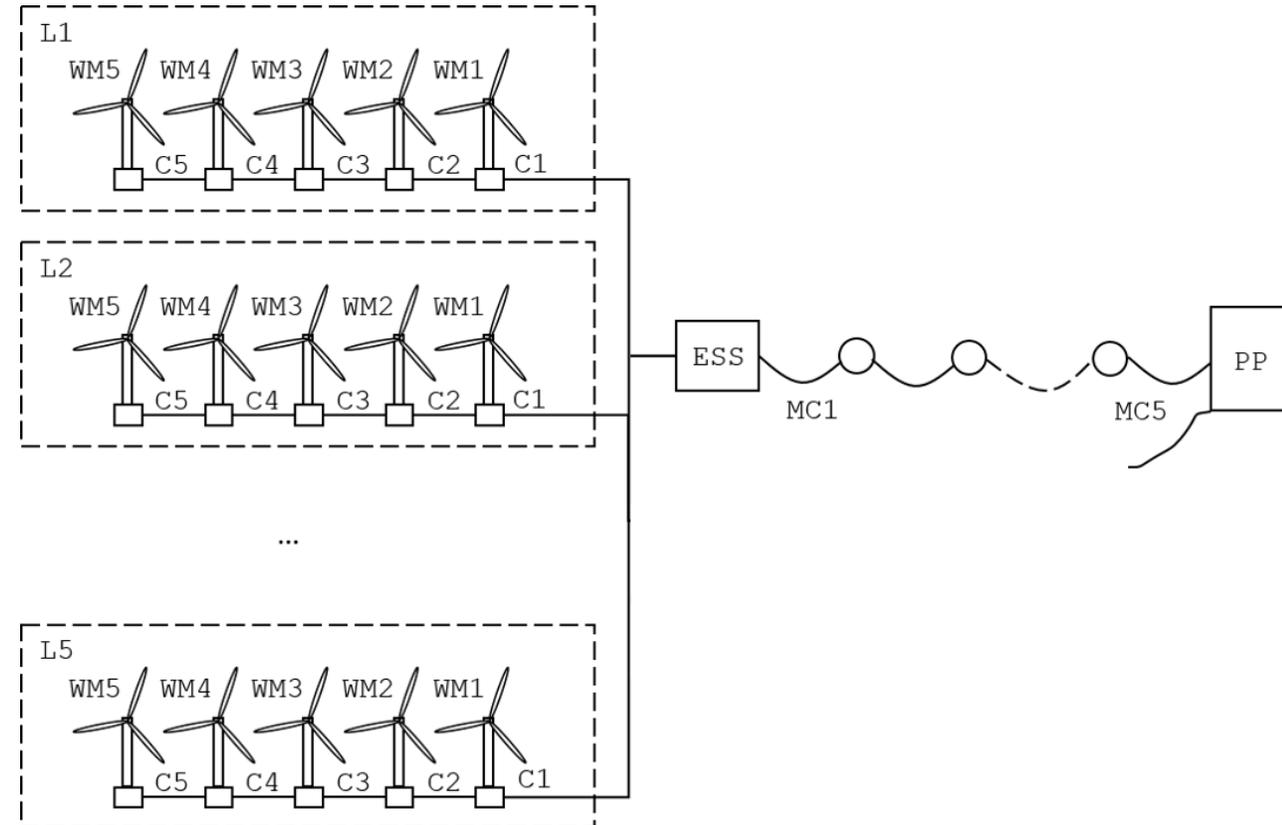
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# Wind Mill Farm

- Force of the wind
- Power production demand coming from clients (seasons and times of the day)
- Limited number of repairers for maintenance: 2 repairers (if a line fails when the repairers are busy, it has to wait until one repairer has finished to repair its line)

## Estimate

- the power production of the offshore windmill farm over a year
- the difference between the power demand and the power production over a year



M. Batteux, T. Prosvirnova and A. Rauzy. "Performance assessment of an offshore windmill farm with AltaRica 3.0", International Symposium on Model Based Safety Assessment, IMBSA 2022. Munich, Germany. September 2022.

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# Conclusion and perspectives

- Development works
  - Generator of critical sequences
  - AltaRica Wizard
- New versions
  - End of 2024
  - 2025 ...
- AltaRica 3.0 Workshop
  - <http://www.altarica-association.org/Products/Software/AltaRicaWizard/AltaRicaWizard.html>

# Questions

