WG3 Final meeting

September 17-19, 2025

cost
EUROPEAN COOPERATION
IN SCIENCE & TECHNOLOGY

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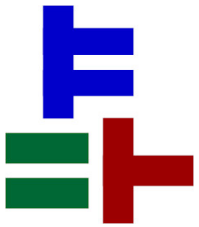


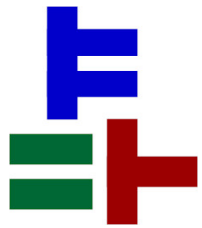
WG3 - Program Verification

Alicia Villanueva
Universitat Politècnica de València, Spain
WG3 chair

Adrián Riesco
Universidad Complutense de Madrid, Spain
WG3 vice-chair

About WG3

- About 116 members from 32 different countries
  - different perspectives and approaches to the verification problem



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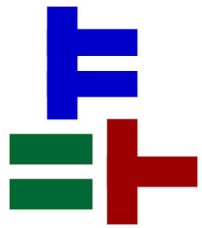
Action challenge

boost the interoperability and usability of proof systems



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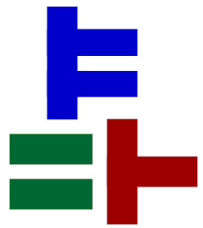
- WG3 - beyond the state-of-the-art
  - Verification approaches can envisage new applications and integration of proof systems to overcome challenging problems that combine features that are better expressed in different logics.
  - Scalability and usability of verification techniques can be improved thanks to the exploitation of synergies among different verification tools.
  - Make verification techniques more successful by taking advantage of advances on interoperability between automated and interactive theorem proving, the mathematical formalisation of program semantics, and type theory.

The WG3 final meeting

- Goals of this meeting:
  - Bring together members of the different communities.
  - Transfer knowledge in terms of expertise.
  - Consolidate an excellent and inclusive network of researchers in Europe.
  - Conclude discussions to identify future directions and challenges (deliverable!).



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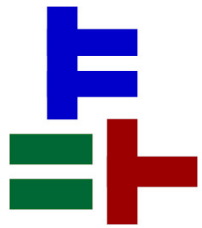
- How:
  - Common knowledge about goals and deliverables.
    - *Next!*
  - Sharing and discussing perspectives of different WG3 members
    - *Talks and discussions*
  - Creating the space to discuss and agree about how to reach the goals. How can we contribute to the action.
    - *Discussion and interaction sessions*
    - *Zulip discussions*

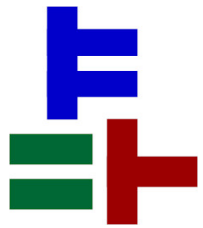


WG3 Communication

- Mailing list: only for WG3 announcements – epn-wg3-verif@inria.fr
- Zulip: official communication channel for interaction, independent from meetings and events. We'll move topics and discussions to Zulip to keep them live after this meeting.

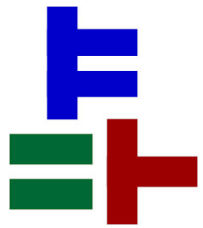
  `https://epn.zulipchat.com`
- GitHub repository, including deliverables.

  `https://github.com/EuroProofNet/ProgramVerification`



WG3 Context

- Several comunities/approaches/categories of tools in program verification:
  - Theorem provers
    - with expressive type systems as the basis for program verification.
    - to synthetise programs



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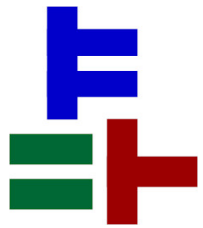
  - Symbolic representation of state space
    - that use different proof systems to incorporate techniques such as fixpoint reasoning, predicate abstraction, interpolation, backward reachability.



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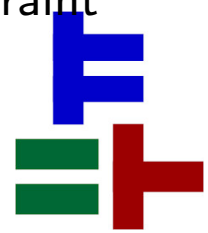
  - Semantic-based approaches
    - inspired on Hoare-based verification, and that use SMT-based reasoning for proving correctness
    - that reduce the verification problem to some kind of logic/constraint representation, that must be solved later by provers
    - semantic frameworks



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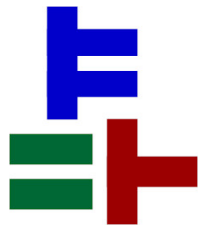
Challenge

Formal verification involves solving intractable or even undecidable problems. Techniques and tools require a high level of expertise. This makes it difficult for the industry to embrace formal verification.



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  - Verification approaches can envisage new applications and integration of proof systems to overcome challenging problems that combine features that are better expressed in different logics.
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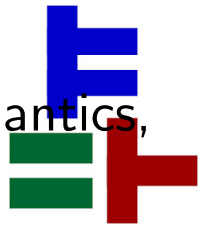


Objectives

Research Coordination Objectives (RCO) for WG3

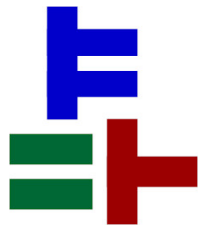
- Make techniques for program verification more effective and more accessible to all stakeholders.

Capacity-building Objectives (All WG)

- Bring together members of the different communities working on proofs in Europe.
- Act as a stakeholder platform in the field of formal proofs from its theoretical grounds to its industrial applications.
- Create an excellent and inclusive network of researchers in Europe with lasting collaboration beyond the lifetime of the Action.
- Ease access to formal verification techniques in education and other areas of science.
- Actively support young researchers, the under-represented gender, and teams from regions with less capacity.
- Transfer knowledge in terms of expertise, scientific tools and human resources.
- Prepare competitive EU researchers for a fruitful career.
- Disseminate the results of the Action activities.

Implementation

- Each WG: at least one meeting every year to present results and discuss collaborative research activities for the next year.
- Six WGs:
  - WG1 on tools for interoperability.
  - WG2 on automated theorem provers.
  - WG3 on program verification.
  - WG4 on libraries of formal proofs.
  - WG5 on machine learning in proofs.
  - WG6 on type theory.



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  - WG2 on automated theorem provers.
  - WG3 on program verification. Tasks:
    - Investigate and develop proof systems for program semantics in cooperation with other working groups;
    - strengthen traditional techniques for program verification;
    - identify and exploit synergies between different verification tools and proof systems;
    - and develop new systems for checking the correctness of programs and complex software.
  - WG4 on libraries of formal proofs.
  - WG5 on machine learning in proofs.
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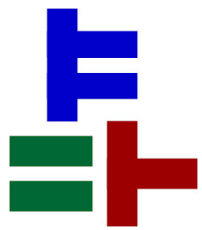

Thank you!