Exchange of Expertise Regarding FWO

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FWO: funding research in Flanders

- Research fellowships:
  - **PHD** fellowship (4 years)
    - Fundamental & strategic research
  - **Postdoc** (junior/senior) fellowships (3 years)
- Other grants, e.g. mobility grants, etc.
- Similar to FNRS in Wallonia

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Goal: share experience with FWO grant writing

My experience:

- 1 FWO junior postdoc grant
- Help 1 PhD student with FWO grant
- 3 successful travel grants
- Several mock juries for grants

What we will cover:

- What is expected
- How to prepare
- Tips that helped me most

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Disclaimer:

\+ Applicant perspective
\- Not jury perspective
\+ Foundational research
\- Not applied research

Part 1: Application

How I prepared

- Attending workshops
  - Workshop proposal writing postdoctoral fellowships
  - How to write a successful FWO postdoc proposal?
- Ask colleagues for their proposals
- Write proposal (took me 1 month)
  - Discussion with promotor
  - Include time for feedback loop

Links in last slide

Tip 1: Know the grading criteria

$$\text{total score} = \tfrac{1}{2} \times \text{candidate} + \tfrac{1}{2} \times \text{project}$$

Links in last slide

Grading criteria: candidate

PHD: Study results (ranking, grades)

PostDoc: Past research (quality and impact rather that quantity)

Both: Motivation and substantiation of relevant competences

- Demonstrate that your skills make you a good candidate: create a narrative between your past work and proposal
- Ack weaknesses: plan to improve (e.g., planned courses)
- Convey motivation

Example: How to convey motivation

As a researcher, I am **deeply interested** in the application of formal methods for security. I believe that a rigorous understanding of programs and security defenses **can enable better security guarantees**. In particular, **a topic I find both challenging and exciting** is the security between different abstraction layers. [...]

1. Express interest in the general field
2. Why should anyone care
3. Topic is challenging / scientifically interesting

Grading criteria: project

1. Scientific **quality/relevance** and **challenge/originality**
   - **Clear** research question
   - Scientifically **challenging**
   - **Significance** w.r.t. state-of-the-art
   - **Novelty**, high level of **risk**, **ambitious**
2. Research **methodology** and **feasibility** of the project
   - **Feasibility** in the timeframe of the grant
   - Good **methodology** and planning
   - Fits in research group / **collaborations** planned
   - **Risk assessment**, fallback options

Example: Risk assessment

The coverage-guided input validation proposed in WP2-3 is a **high-risk** task, the main challenge being that existing hardware fuzzing techniques are still in their infancy and not well understood [22]. However, this also means that we can **contribute to a better understanding** of this booming domain. Finally, because the goal of WP2-3 is to increase confidence in our validation framework, we can still **fallback** to heuristic-based input generation developed in prior work [16, 18]

1. High-risk task, explain challenge
2. Motivate high-reward
3. Give fallback option for high risk tasks

\+ Combination of low, medium, high

Example: Structure

Objective structured as

1. Context & problem stmt
2. Research question
3. Research idea
4. Expected contribution

O1 Secure compilation for hardware defenses

1

Hardware-software contract can be leveraged for deriving *software properties* enabling end-to-end security on a target platform. It is the role of software developers to make sure that their programs adhere to these properties. However, software developers work at a high level of abstraction, while these properties typically target *binary code*. Unfortunately, these properties do not necessarily have a direct equivalent for high level code and are generally not preserved by compilers [11, 12]. As I showed during my PhD [13], different (combinations of) optimizations play a role in preserving security, which exacerbates the challenge.

A promising solution is to design *secure compilers* that (at least) preserve security properties or (even better) transparently add security mitigations in target code [14, 15]. This project aims to address the particularly challenging research question:

2

> *Can we rely on the compiler to transparently support hardware defenses and enforce software-level properties required for end-to-end security?*

3

Specifically, we will study and implement secure compilation for ProSpeCT and AMi. AMi does not provide an explicit contract specifying leakage but serves as a building block for hardening code against potentially multiple side-channel observations models. A particularly interesting challenge will be to study how we can concretely design a compiler, supporting AMi, that is *parametric in a security contract*. For ProSpeCT, interesting challenges will be to study how to support *declassification* and avoid unintentional declassification of secrets, and how to leverage the ProSpeCT guarantees to *securely link constant-time* code in larger applications.

4

Contributions O1 aims at answering these questions both on the *formal* and on *practical* side. In particular, we will study how to design secure compiler support for ProSpeCT and AMi, and provide concrete implementations as part of the LLVM infrastructure. As a secondary objective, we will use this compiler support to evaluate the performance impact of these defenses in a realistic setting.

Most Useful Tips

- **Learn from others**: read successful grants
- Keep **evaluation criteria** in mind
- Convey **motivation**, make your **reader care**
- **How** you deliver your message is important
  - Strong message, clarity,
  - Accessible, easy to skim
  - If you can: attend a workshop writing skills
- **Writing** is an iterative process
  - Polish repeatedly
  - Allow time
  - Use proofreaders

Part 2: Interview

Overview Interview

5 minute “elevator” pitch

> ***What*** *your research is about,* ***why it is relevant****, and why you are the* ***right person*** *to do it?*

15 minutes discussion

- Lead by most expert reviewer ➜ expect technical questions
- But any reviewer can ask questions ➜ expect more naive questions

How I prepared

1. Work on **communication skills**
    a. One is not born, but rather becomes, a good public speaker
    b. During my PhD: workshop on public speaking
    c. Before interview: training on pitching skills

2. **Mock jury** with experienced colleagues
    a. Close and further to the field
    b. Let your jury know that you welcome challenging questions
    c. Take note of questions ➔ Prepare answers
    d. Was actually much harder than actual presentation

Most Useful Tips

- Focus on the **why (purpose)** before how (method) and what (outcome)
- **Sell** your project
  - Convey motivation: **how** you pitch is as important as **what** you pitch
  - If you can: attend a workshop pitching/public speaking
- Adapt to your **audience**
  - Look up your jury members and field
  - Keep it accessible for everyone
- **Identify weaknesses** in your project and be ready to answer
- **Practice** makes perfect
  - Prepare and be fluent with your pitch
  - Prepare answers for questions!

Example questions

Specific weakness:

- You project is very broad, how will you deliver?

Boilerplate questions:

- What is the closest related work to your project?
- What are the best people in your field?
- Do you have planned collaborations?
- How do you plan on maximizing the impact of your work?
- What are the risks in you plan, are there dependencies in your WP?

Conclusion and references

Most important takeaways

- Make your audience **care**, explain the **why**
- **How** you deliver message is important
- Focus on **clarity** and keep it **accessible**
- Polish and **prepare**

Yes this is a lot of work and chances are slim :(
But, this is not lost work :)

- Help organize your thoughts, get ideas
- Text and ideas can be reused

Useful links by KU Leuven (accessible for all)

Application:

- Info on FWO fellowships for strategic & fundamental research
- Presentation of **application process** + tips for **successful application**
- Links to slides and video recordings of presentations
  - For PhD: https://set.kuleuven.be/phd/applicants/FWO.htm
  - For PostDocs: https://research.kuleuven.be/nl/onderzoeksfinanciering/ondersteuning/nf/interne-evenementen/proposal2024 and https://research.kuleuven.be/nl/onderzoeksfinanciering/ondersteuning/nf/proposalwritingpostdoc2024

Interview:

- Pitching skills: https://lrd.kuleuven.be/kuleuvenkick/english/skills/kick-skills/skills_pitching

FWO scoring criteria

PhD:

- Preselection: https://www.fwo.be/media/5jdctmuq/asp-fo-preselection-scoring-grids.pdf
- Interview: https://www.fwo.be/media/rm3nwnjq/asp-fo-interview-scoring-grids.pdf

Postdoc:

- Preselection: https://www.fwo.be/media/o1ajjtft/postdoc-preselection-scoring-grids.pdf
- Interview: https://www.fwo.be/media/sx2etng1/postdoc_interview-scoring-grids.pdf