

# Working Group 3

## Challenging Computational Domains

Chairs: César Sánchez  
Gerardo Schneider

ArVi Meeting

Prague

16 March 2017

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## **MoU and WG3**

# **Main objective of the Action (from the MoU)**

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## Memorandum of Understanding

*The main objective of the Action is to consolidate a network of runtime verification experts and practitioners in application domains, so that they jointly find new principles for reliable system engineering using monitoring as a building block.*

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## A. Abstract and Keywords

*The main goal is to overcome the fragmentation of RV research by:*

- (1) the design of common input formats for tool cooperation and comparison;*
- (2) the evaluation of different tools, building a growing sets benchmarks and running tool competitions; and*
- (3) by designing a road-map and grand challenges extracted from application domains.*

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# Main objective of the Action (from the MoU) (2)

## C.2 Objectives

*To achieve the overall aim, the main objectives are:*

- ▶ *the development of a common infrastructure that enables the development of a collection of runtime verification problems and benchmarks for the comparison of algorithms and tools, and to increase their collaboration*
- ▶ *the development and sharing of current challenges in runtime verification and monitoring*
- ▶ *the development of an interaction between the runtime verification community of experts at large with practitioners from application domains that could benefit from this technology, and influence its developments*
- ▶ *education of young researchers and potential users of monitoring technologies*
- ▶ *coordination of European research on monitoring, runtime verification and its applications*

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# MoU (3)

## C.4 Potential Impact of the Action

*This Action will coordinate the European efforts in the field of runtime verification and applications.*

[...]

*Concrete outcomes of the Action will include (1) a taxonomy of problems and techniques, and a taxonomy of existing tools, (2) a common family of input languages for describing problems and solutions, (3) a collection of benchmarks that allows to compare the different tools, (4) a set of challenges for the applicability of runtime verification to important areas of application.*

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# MoU (4)

## D.1 Scientific Focus

### Challenging Computational Domains

*Runtime verification has been studied in the context of several domains including embedded systems, hardware, distributed systems, and unreliable/approximate domains. To date such studies are fragmented and scattered at best. Through the Action, the existing work will be reviewed and a roadmap for future work will be drawn up.*

# **Aim and Objectives**

## WG3 Aim

*To study novel and challenging computational domains for runtime verification and monitoring that result from the study of other application areas than programming languages.*

# WG3 Objectives

The objectives of this Working Group will be to identify the challenges for monitoring in the following application domains:

- ▶ **Distributed systems**, where the timing of observations may vary widely in a non-synchronized manner.
- ▶ **Embedded systems**, where the resources of the monitor are constrained.
- ▶ **Hardware**, where the timing must be precise and the monitor must operate non-disruptively.
- ▶ **Unreliable domains** and **approximated domains**, where either the system is not reliable, or aggregation or sampling is necessary due to large amounts of data.

These areas involve expertise from more than one domain and have a much higher chance of success if attacked cooperatively.

# WG3 Output

The **concrete outputs** of WG3:

- ▶ First, a series of documents will be worked out giving a **roadmap** for the application of runtime verification techniques to the areas listed above, identifying connections with established work in the respective sub-areas of computer science, and challenges and opportunities.
- ▶ Second, a **concrete case study** will be performed, in which a runtime verification solution for multicore systems will be developed using dedicated monitoring hardware based on FPGAs to show the feasibility and general applicability of runtime verification techniques.

From MoU: **D.2 Scientific work plan methods and means**

# WG3 Milestones

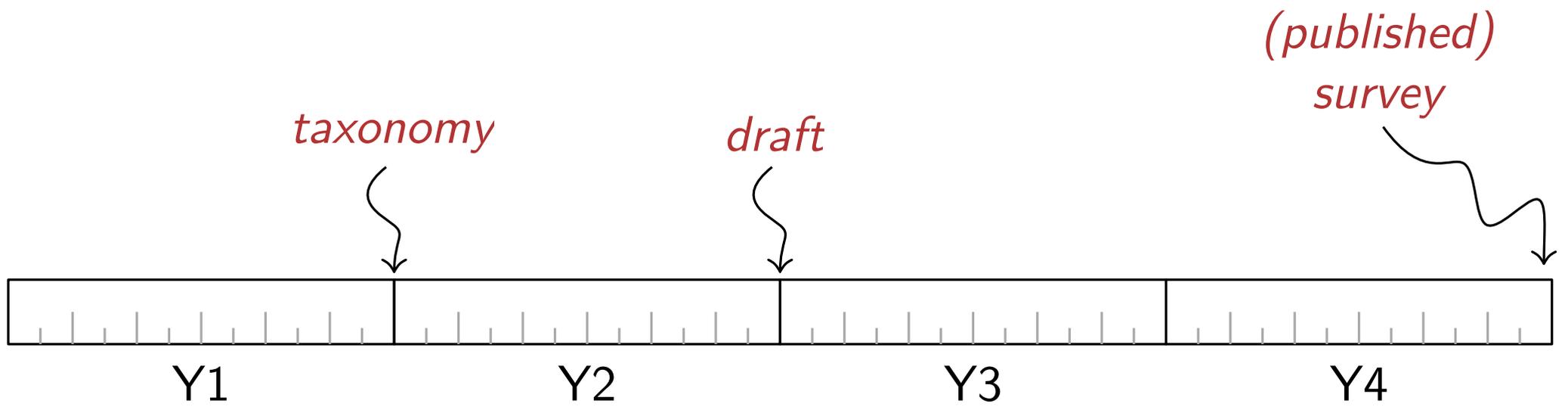
- ▶ M1 (end of Year 1): First Annual Report of the Action. Proposals on taxonomy, infrastructure, **challenges**. [...]
- ▶ M2 (end of Year 2): Second Annual Report of the Action. **First document with challenges**. [...]
- ▶ M3 (end of Year 3): Third Annual Report of the Action. First Summer school. [...]
- ▶ M4 (end of Year 4): Final report of the Action. **Published surveys**. Second Summer School. [...]  
Report on case studies using monitoring hardware and application domains, including medical devices.

From MoU: **E.1 Coordination and Organization**

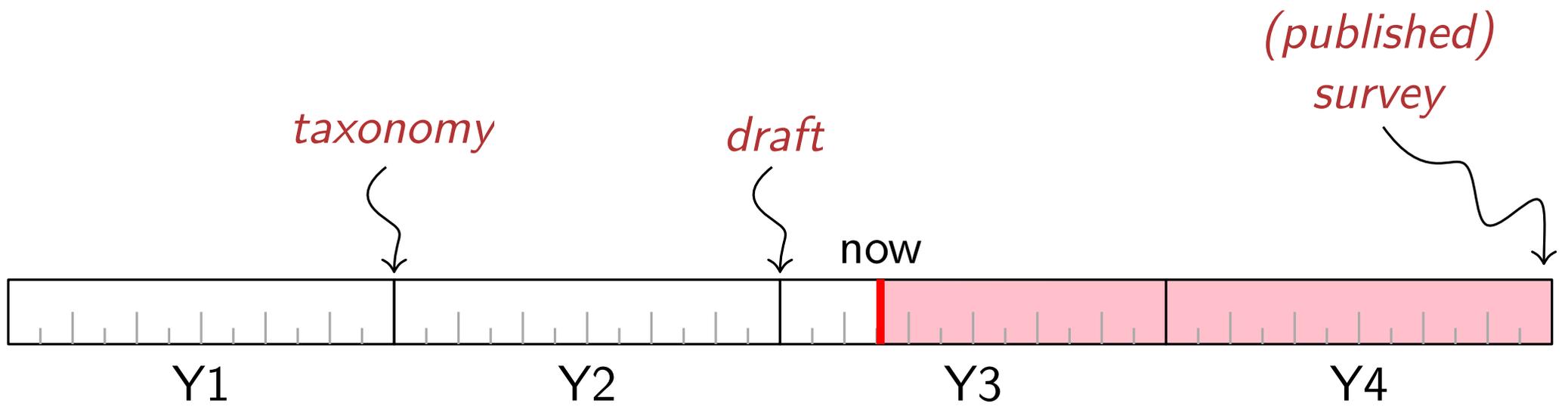
# WG3 Milestones



# WG3 Milestones



# WG3 Milestones



# Status and Plan

# WG3 Status

1. Foundations of Distributed Monitoring  
(Yliès Falcone, Adrian Francalanza)
2. Hybrid  
(Dejan Nickovic, Ezio Bartocci)
3. Hardware  
(Alex Weiss, José Rufino)
4. Security and Privacy  
(Juan Tapiador, Gerardo Schneider)
5. Transactions, DBs, Cloud, Distributed information systems, Financial transactions  
(Joao Lourenco, Christian Colombo)
6. Contracts and Policies  
(Gerardo Schneider, Gordon Pace)
7. Huge data streams/storages, approximate monitoring  
(Domenico Bianculli, César Sánchez)

# WG3 Status

3 challenges

10 refs

Last: Nov 2016

1. Foundations of Distributed Monitoring  
(Yliès Falcone, Adrian Francalanza)
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(Domenico Bianculli, César Sánchez)

Background

5 well described challenges

15 refs

Last: May 2016

# WG3 Status

1. Foundations of Distributed Monitoring  
(Yliès Falcone, Adrian Francalanza)
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(Dejan Nickovic, Ezio Bar)
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Coherent but short  
3 challenges  
5 refs  
Last: Nov 2016

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(Domenico Bianculli, César Sánchez)

No description or challenges  
9 refs  
Last: Sep 2016

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(Yliès Falcone, Adrian Francalanza)
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(Domenico Bianculli, César Sánchez)

Brief  
3 challenges  
3 refs  
Last: Nov 2015

# WG3 Status

1. Foundations of Distributed Monitoring  
(Yliès Falcone, Adrian Francalanza)
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Introduction  
7 challenges  
11 refs  
Last: Feb 2017

# WG3 Status

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Introduction

2 challenges

6 refs

Last: March 2016

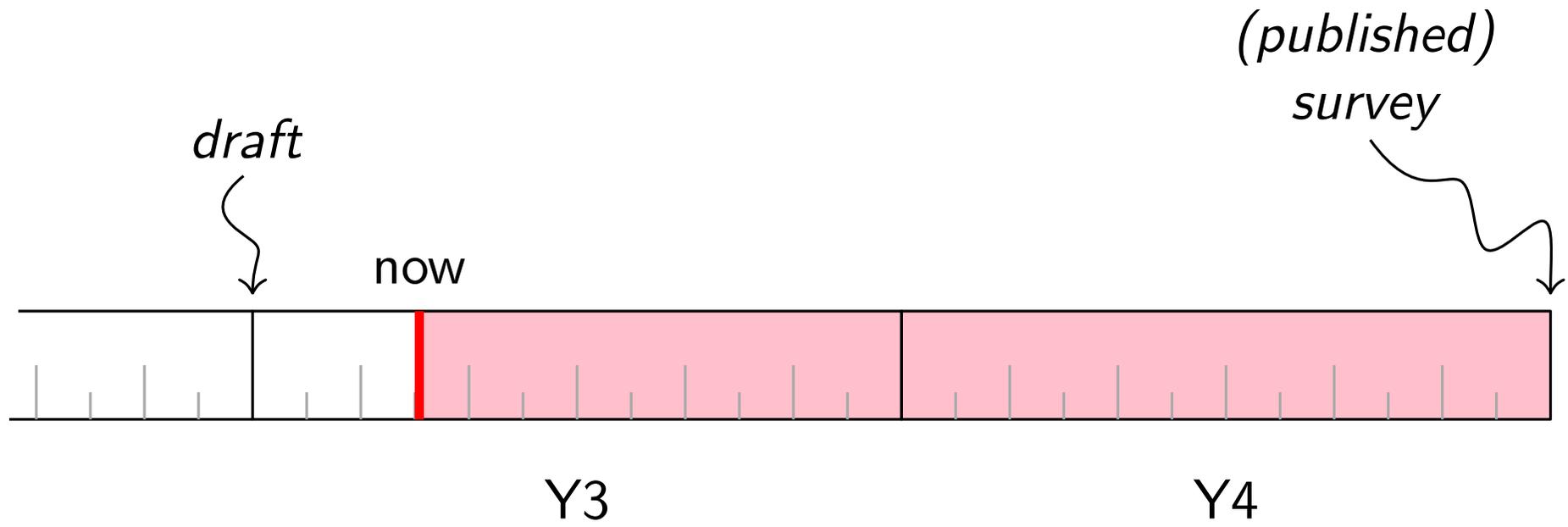
# WG3 Plan

GOAL (each line)

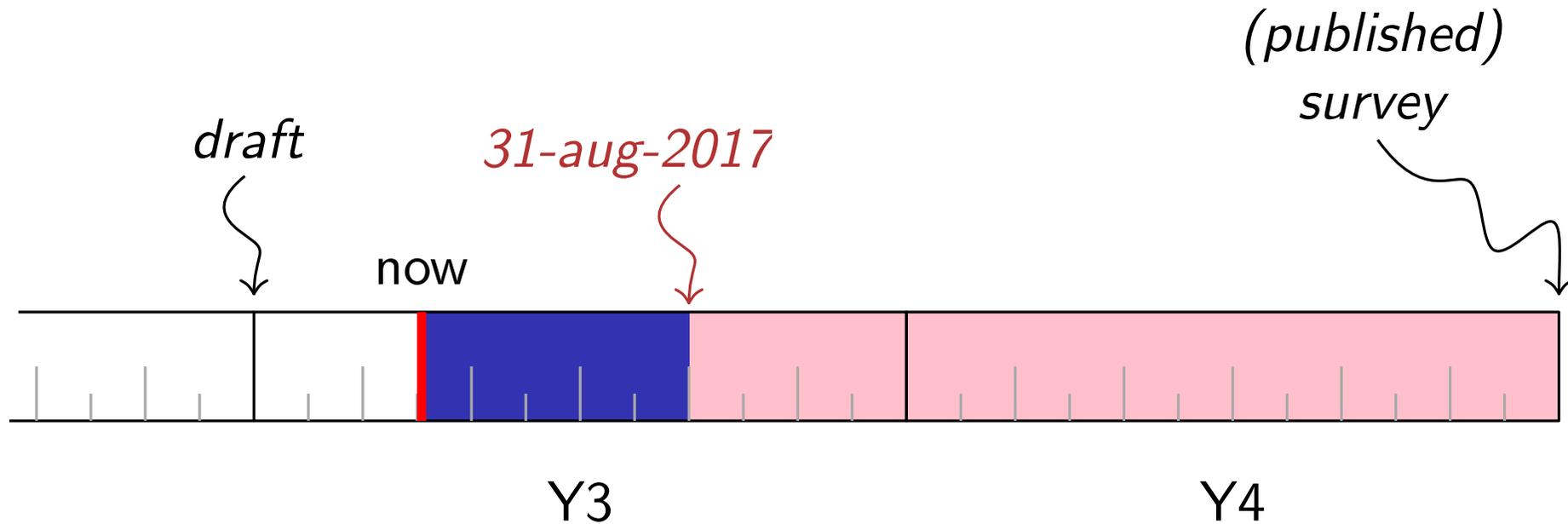
- ▶ 5 justified challenges (half page)
- ▶ 15-20 supporting references
- ▶ 4 pages introduction

TOTAL: 50 pp, 150 refs

# WG3 Plan

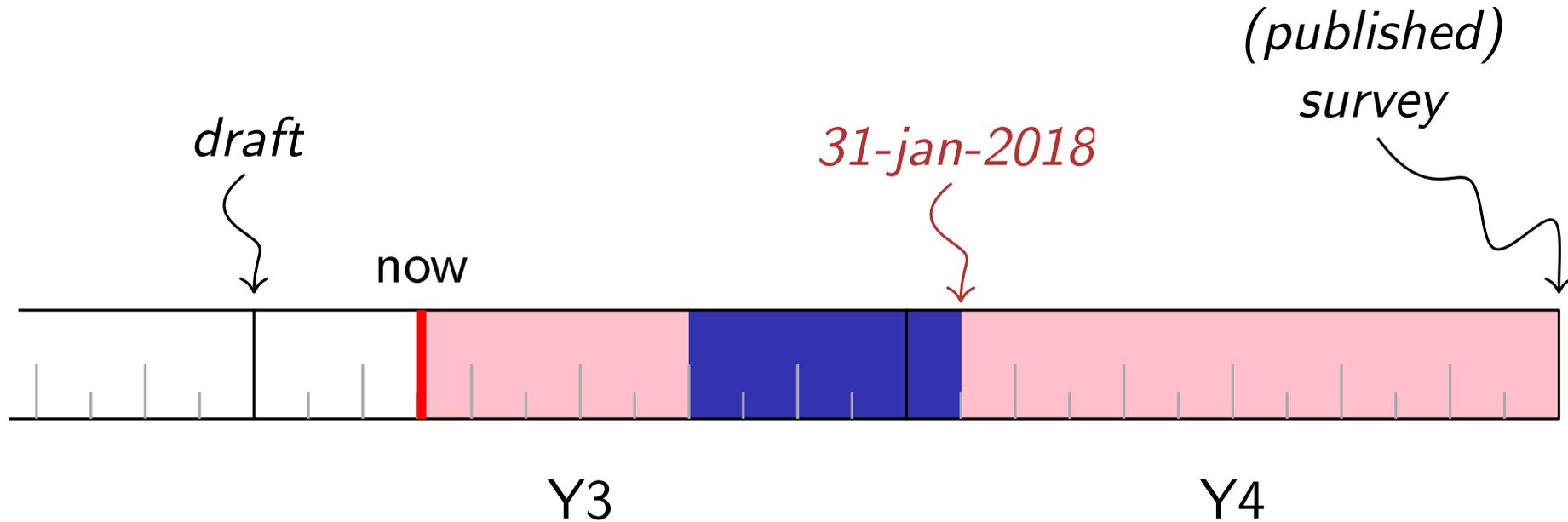


# WG3 Plan



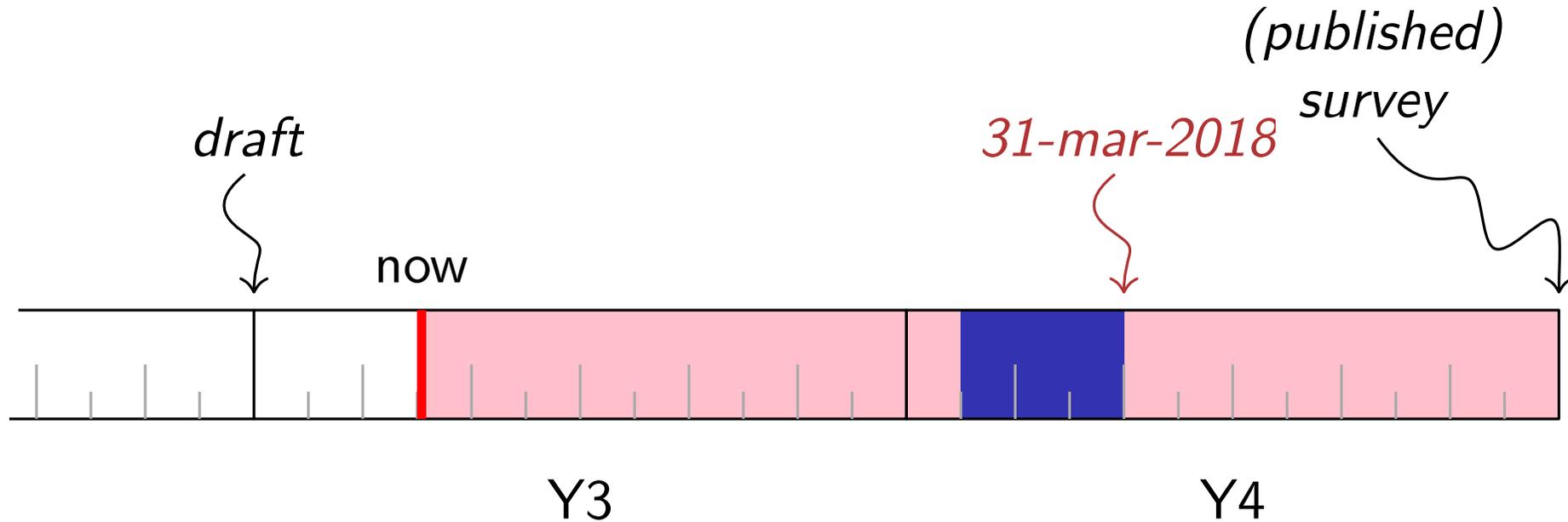
1. Finish capture of challenges (and their justifying SotA)

# WG3 Plan



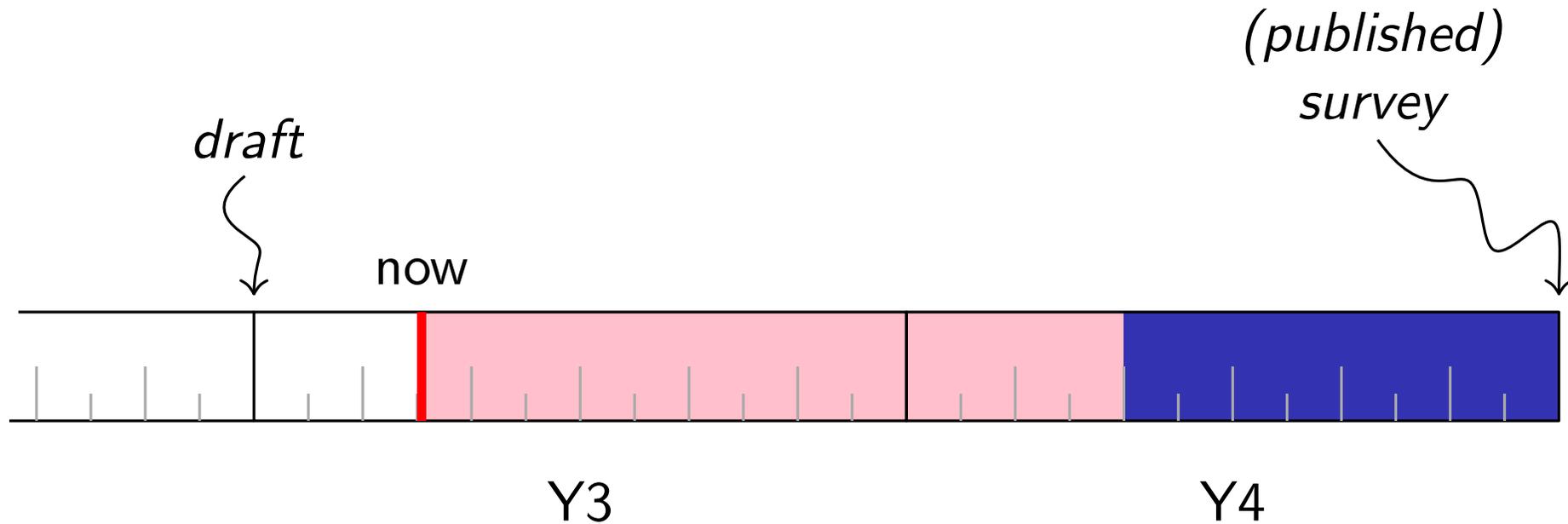
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2. Survey writing

# WG3 Plan



1. Finish capture of challenges (and their justifying SotA)
2. Survey writing
3. Internal review

# WG3 Plan



1. Finish capture of challenges (and their justifying SotA)
2. Survey writing
3. Internal review
4. Submission and external review