

# Instrument from: Test Results Communication

## – An Interview Study in the Embedded Software Industry

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### 1. Introduction

This document contains the interview instrument used for the study *Test Results Communication – An Interview Study in the Embedded Software Industry*, that is currently in submission.

### 2. How to Cite

P E Strandberg, E P Enoiu, W Afzal, D Sundmark, and R Feldt. (2018). “Test Results Communication – An Interview Study in the Embedded Software Industry” *In submission*.

### 3. Survey Questions

#### 3.0 Before we Start

We have roughly 40 questions on 8 topics. The goal is to keep this interview to 60 minutes, but we have typically needed 90 minutes so far. More details on goals, confidentiality and terminology is available in <this handout>.

The goal of this study is to discover challenges and approaches in test results communications, in order to facilitate it for industrial practitioners.

We will keep your answers confidential.

Terminology:

- Testing: The act of manually or automatically inspecting or executing SW (with or without custom HW) in order to gather information (for feedback, quality control, finding issues, building trust. . . )
- Test Results Communication: the process of communicating test results, from formal standards-compliant test reporting to reading log files. The concept also includes face-to-face communication, as well as reading or looking at automatically generated reports or visualizations.

- Visualization: Graphic visual representations of information, data or knowledge intended to present information quickly and clearly.

Exclusion: We are not interested in covering detailed technical topics on your products, detailed discussions on libraries or software used, such as names of plotting libraries.

Let’s start recording!

#### 3.1 Consent (Swedish: Medgivande, samtycke)

(Q1) Do you have any questions before we start?

(Q2, Q3) <removed>

#### 3.2 About the Interviewee

(Q4) Discussion of work situation .

- Education? At company for N years? Worked with SE M years?
- Role? Daily tasks? Responsibilities?
- Team?

(Q5) <removed>

(Q6) Which other roles/other persons do you cooperate with most during your daily work? How?

#### 3.3 Process, Decisions

(Q7) Do you follow an overall process model?

- Such as kanban, scrum, v-model, waterfall, . . .

(Q8) What are the overall phases/steps in your process?

- Meetings/Rituals?
- Protocols/Artifacts?

(Q9) When in the process is testing performed?

- Gates in the process?

- Certain types of testing only performed in certain points?
- How are the results used?

### 3.4 System under Test, Test Environment, and Feedback Loop

(Q10) Tell me about your current (or latest) system under test?

- Hardware, software?
- What other systems does it communicate with?
- Test environment, test framework?
- Do you use several test systems?

(Q11) How are test cases executed?

(Q12) Tell me about how code changes in the system under test reaches the test environment?

- Anything needed before code check-in?
- What are the steps and duration required to go from code change to test result?
- How do the test results reach developers?
- How can you tell that the code change was OK?

(Q13) What are your feelings about the system under test, test environment and the steps needed from code change to result?

### 3.5 Testing and Test Results

(Q14) What is a typical test case?

- How is it specified?
- What is needed to run the test?
- How long does it take to execute it?
- Who decides when a new test case should be implemented? Why? Is this the same person that wants the results from the testing?

(Q15) How often are test cases executed? Do you have some strategy when selecting test cases for execution?

- How many test results are generated here?
- How do you keep track of it?
- Long-term storage of results?

- Do you ever miss any of it?

(Q15.5) Do you ever get the feeling that there is too much information to handle the reporting?

(Q16) How is reporting done?

- Do you report results from one test case at the time? How?
- With whom do you communicate about these results? How?
- How does this help you fulfill your responsibilities?
- Would you benefit from more/other types of reports? Which ones?
- Do your reports follow templates or standards? Which ones?<sup>1</sup>
- Is the reporting supported with tools? Which ones?

(Q16.5) Do you have different types of test reports?

(Q17) What happens when a test fails?

- How do you determine the root cause? Do you help with this process?

(Q18) How do you separate software failures from other issues? (For example issues with test cases, the test framework, the test environment, hardware in the test system or issues with test reporting?)

(Q18.5) Can we have an example of a test report, or a template?

(Q18.7) How important are your challenges with test results communication when compared to other challenges in testing?

(Q19) What are your feelings about how you handle and report on test results?

### 3.6 Visualizations and Summaries

(Q20) Do you create or look at visual representations or summaries of test results?

- What do they show or tell you?
- What are they? Plots? Animations? Links? PDF

1. Some common ones are IEEE 829 Standard for Software and System Test Documentation, ISO/IEC/IEEE 29119 Software Testing, Part 3: Test Documentation, or BS 7925-2 Standard for Software Component Testing.

documents? Can you explain some examples? May we use in a publication (when properly anonymized)?

- Do you think they are easy to understand?
- In addition to looking at them: can you interact with them?
- Which of these visualizations or summaries are the most useful? Why?

(Q21) What types of visualizations or summaries have you tried in the past?

- How come you no longer look at these?

(Q22) How does visualization or summaries help you fulfill your duties?

(Q23) What do you wish you had visualized or summarized?

(Q24) In your previous experiences (other organizations, projects, ...), what are your views on meaningful visualizations or summaries?

(Q25) What are your feelings about on these visualizations or summaries?

### 3.7 Challenges

(Q26) So there are a number of stakeholders and methods for test results communication...

- What stakeholders understand you and your needs the best? Why?
- Any stakeholder that does not understand you or your needs? Why?
- When are there misunderstandings? Why?

(Q27) What other challenges in test results communication have you encountered?

(Q28) Are there situations where you feel that your existing test results communication process is too slow or even a bottleneck in your progress?

- What do you do to overcome such situations?

(Q29, Q30, Q31, Q32, Q33, Q34) <removed>

### 3.8 Wrap-up

(Q35) Thank you very much – your answers are valuable to us.

(Q36) We will transcribe this interview into text – would you like to read and comment on the transcribed text?

- How would you like this communication? Email? Private mail? Physical mail?

(Q37) <removed>

(Q38) Can you recommend other persons in your organization who would be interested in participating in this study (perhaps after we stop the audio)?

(Q39) Anything else that you would like to add?

(Q40) Let's double check that you have the contact details

## 4. About Westermo



Westermo designs and manufactures data communications products for mission-critical systems in physically demanding environments. The products are used both in social infrastructure, such as transport, water and energy supplies, as well as in process industries, such as mining and petrochemical.

Westermo was founded in 1975, currently has 200+ employees and spend 14% on R&D. Westermo has sales and support offices in 11 countries and sales partners in many others.

The software testing process at Westermo includes continuous integration and automated nightly testing on a system level. On a typical night thousands of test cases are automatically executed, on more than 15 test systems, many WeOS versions and more than 30 different hardware variants.

## 5. About Per Erik Strandberg



Per Erik Strandberg has been at Westermo R&D since 2011. Per has more than 10 years of experience from the IT industry, and in 2017 he changed from the role of test lead into being an industrial doctoral student. As an industrial doctoral student Per gets the best of two worlds: the real industrial challenges can be attacked with academic depth and tools, in order to create excellent solutions for the industry while at the same time pushing the boundaries of the academic state of the art.

His research interests are focused on automated system level testing of embedded systems.

## 6. More Research from Westermo R&D

- P E Strandberg, D Sundmark, W Afzal, T J Ostrand, and E J Weyuker. (2016). “Experience Report: Automated System Level Regression Test Prioritization Using Multiple Factors.” In *ISSRE 2016, Ottawa, Canada*.
- P E Strandberg. (2017). “Software Test Data Visualization with Heatmaps – an Initial Survey.” In *MRTC Technical Report of April 2017, Mälardalen University*.
- J Danielsson, S M H Ashjaei, M Behnam, T Sörensen, M Sjödin, and T Nolte. (2017). “Performance Evaluation of Network Convergence Time Measurement Techniques.” In *ETFA'17, Limassol, Cyprus*.
- P E Strandberg, T J Ostrand, E J Weyuker, D Sundmark, and W Afzal. (2018). “Automated Test Mapping and Coverage for Network Topologies.” *In submission*.
- P E Strandberg, E P Enoiu, W Afzal, D Sundmark, and R Feldt. (2018). “Test Results Communication – An Interview Study in the Embedded Software Industry.” *In submission*.