

(Research-)Softwareentwicklung für Non-IT'ler

Die Software Engineering Initiative des DLR

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Deutsches Zentrum für Luft- und Raumfahrt (DLR)
Institut für Softwaretechnologie

OOP 2022



Knowledge for Tomorrow



German Aerospace Center (DLR)

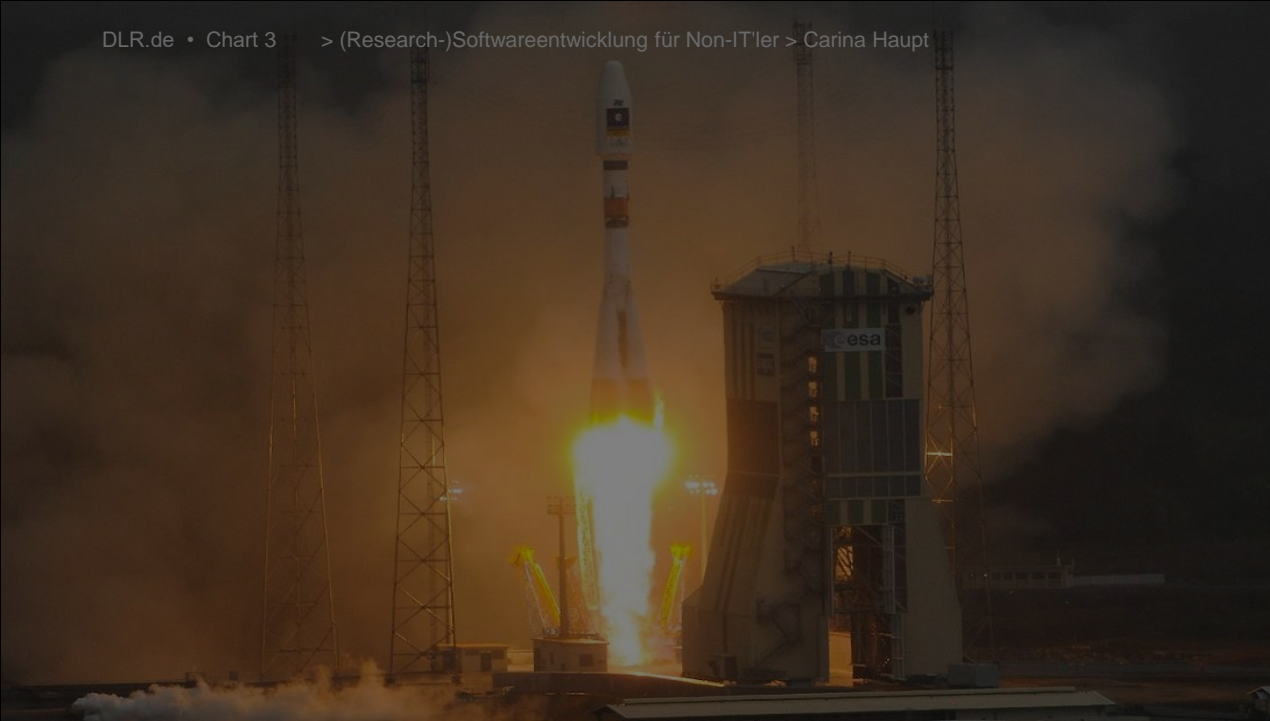
Numbers

- About 10.000 employees
- 30 locations
- 54 institutes and facilities

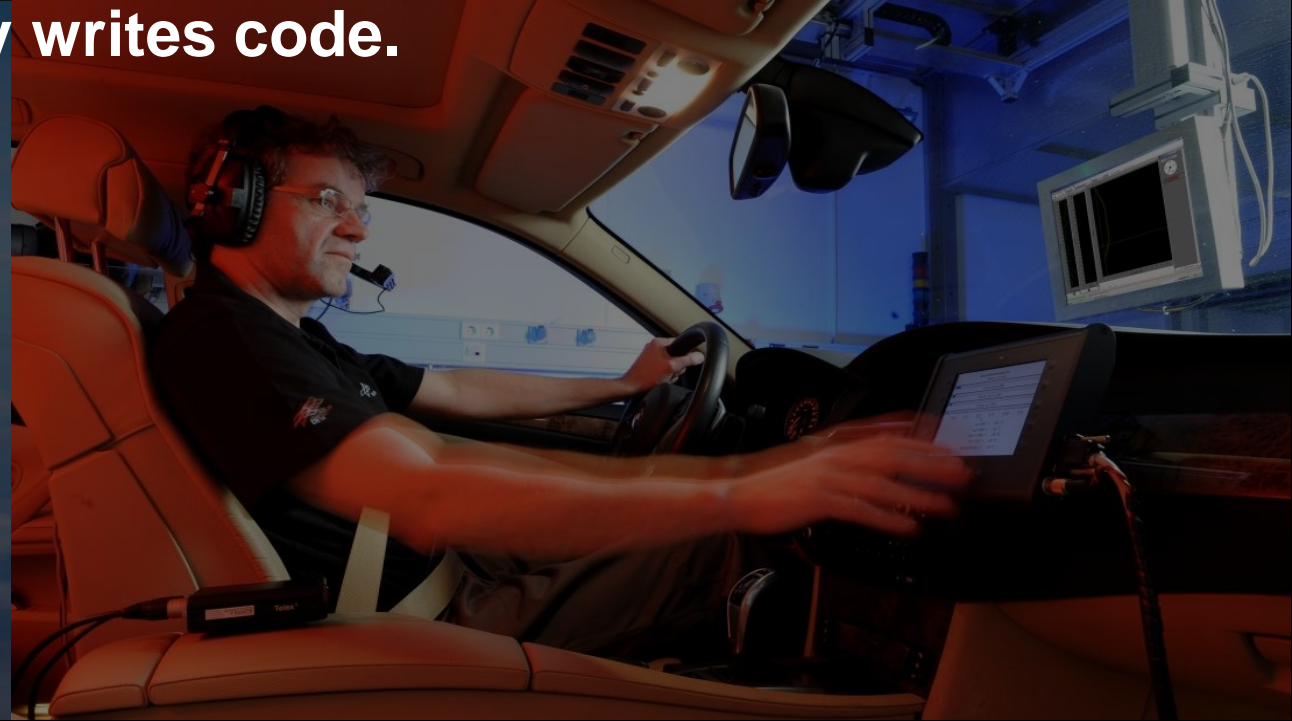
Fields

- Space
- Avionics
- Transportation
- Energy
- Safety

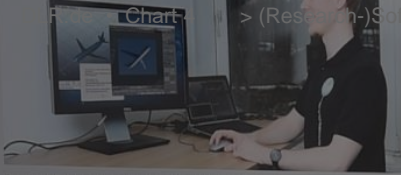




Everybody writes code.



Huge amount of software projects & variety of used software technologies



Open-Source-Software fördert Innovationen auf allen DLR-Forschungsebenen. Zum Beispiel die Geometrie-Bibliothek TIGL aus dem Bereich Luftfahrt. Sie wird zum Visualisieren von zukünftigen Flugkonzepten eingesetzt.

Software mit offenen Quellen

Software ist allgegenwärtig. Sei es, wenn physikalische Vorgänge im Rechner nachgestellt werden sollen, technische Systeme zu steuern beziehungsweise zu regeln sind die Daten verarbeitet und visualisiert werden müssen.

In fast allen Instituten des DLR wird daher Software entwickelt. Der Umfang der einzelnen Software-Pakete variiert dabei von kleinsten Entwicklungen, die etwa durch Studenten erstellt werden, bis hin zu sehr großen Softwaresystemen, die gemeinsam mit Partnern aus Forschung und Industrie über viele Jahre erarbeitet werden. Während früher in der Regel ein Großteil der Software komplett neu erstellt wurde, wird heute häufig existierende Software als Grundlage



Für jede Software, gleichgültig ob kommerziell oder nicht, gelten die üblichen Lizenzbestimmungen. Diese regeln die Rechte zum Nutzen und Verändern der Software. Die Lizenzbestimmungen sind vom Urheber, also dem Entwickler der Software festgelegt und dürfen in der Regel nicht geändert werden. Eine Software wird dann als „Open-Source-Software“ bezeichnet, wenn der Anwender mehr Rechte hat als bei kommerzieller Software. Diese zusätzlichen Rechte bestehen darin, die Software nach Belieben weiterzugeben, die Quelltexte zu bekommen, die Software zu verändern und in veränderter Form weiterzugeben sowie sie für jeden Zweck einzusetzen.

Open Source als Innovationstreiber

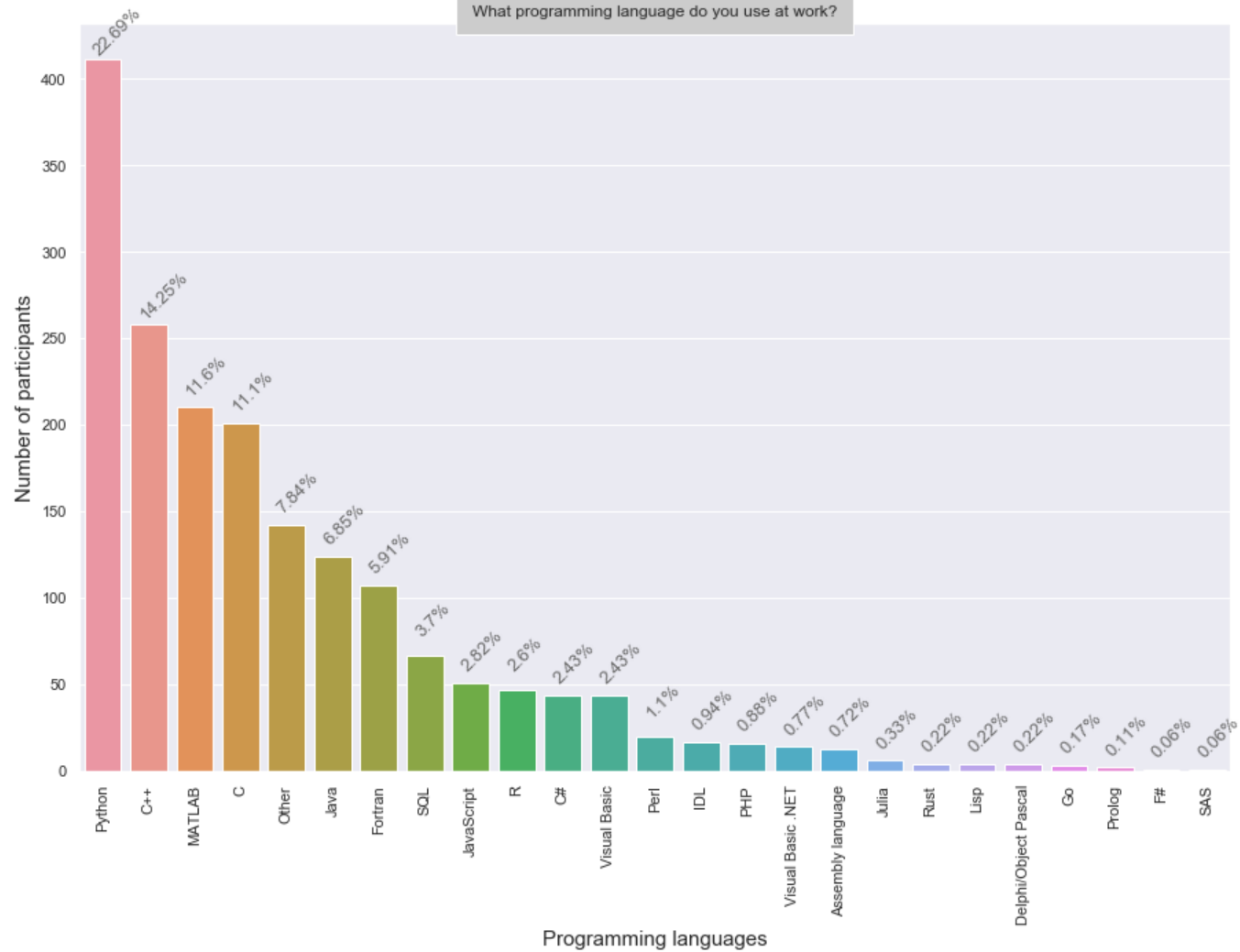
Der Einsatz von Open-Source-Software im DLR fördert die Innovationsfähigkeit des DLR selbst. Wenn bereits existierende Open-Source-Entwicklungen in eigene Entwicklungen einbezogen werden, so können sich die Entwickler im DLR auf die eigentlich spannendsten innovativen Teile ihrer Software konzentrieren. Sicherheit und das Potenzial zur Weiterentwicklung der Open-Source-Software ist hierfür ein entscheidendes Qualitätskriterium. Auch die Anpassbarkeit und der Einfluss von anderen Entwicklern können

Eine Übersicht über Software, die im DLR eingesetzt wird, bietet das Web-Portal software.dlr.de. Dieses Portal ist der Software-Katalog des DLR.



Technology

What programming language do you use at work?

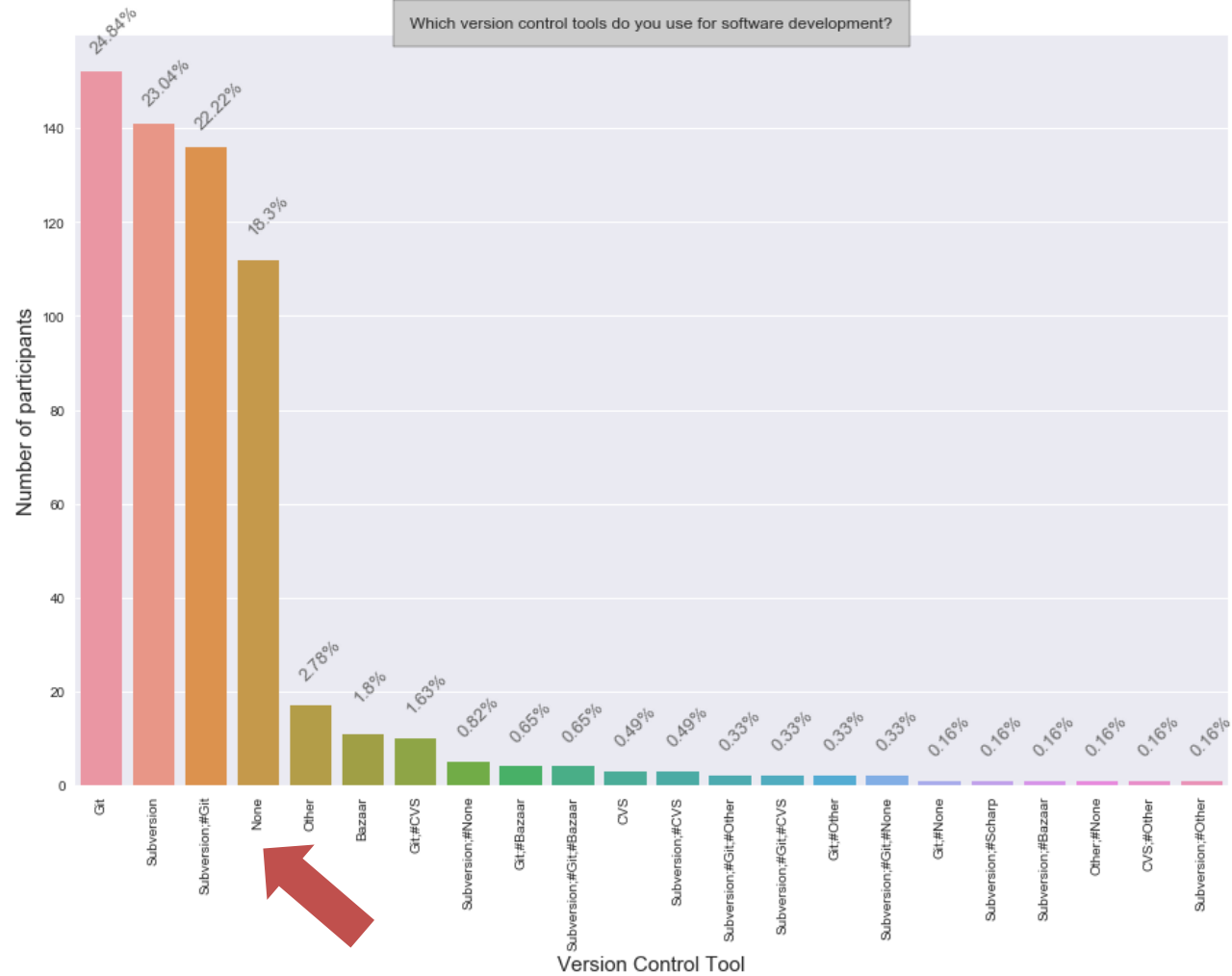




Most developers have no training in software development

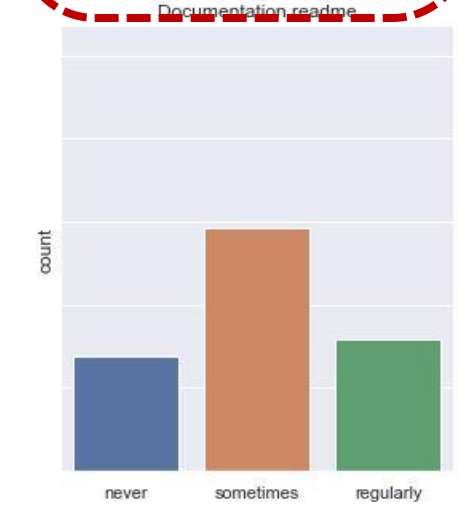
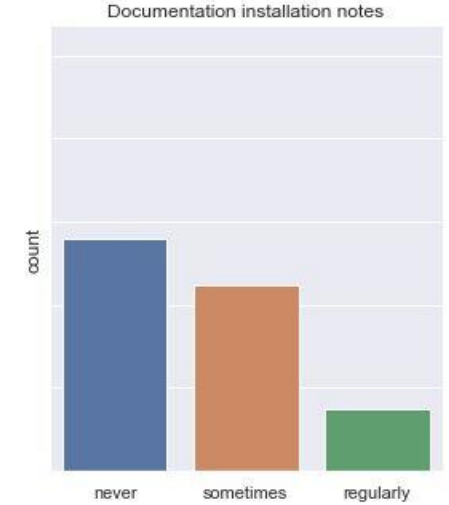
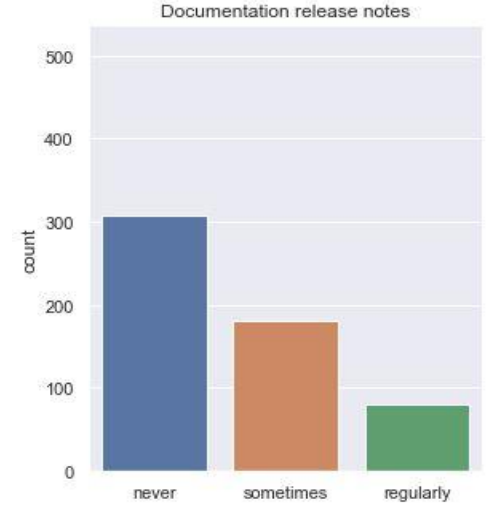
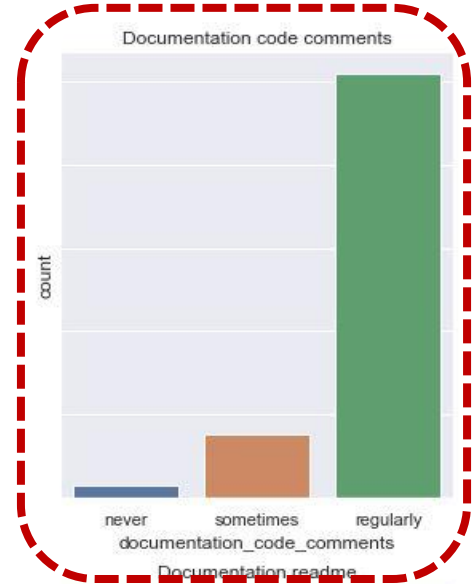
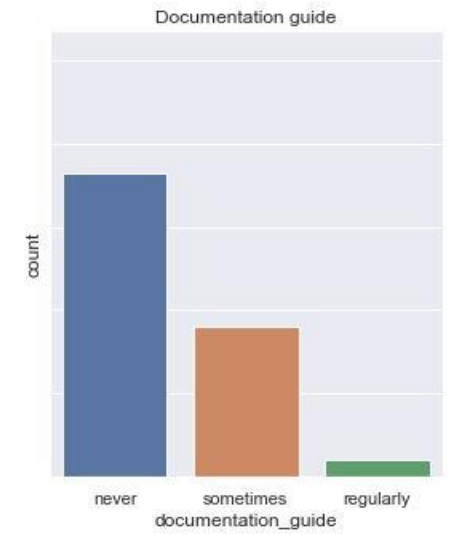
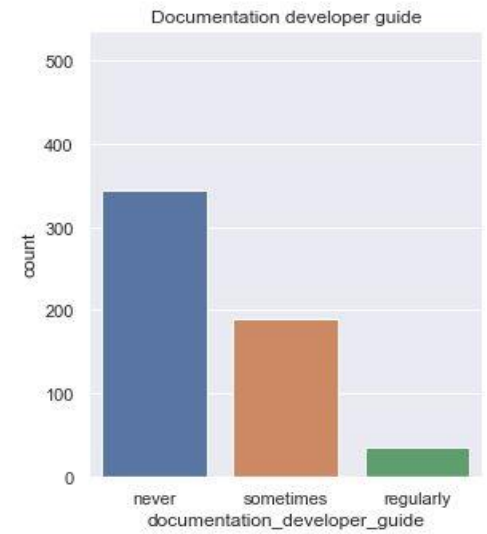
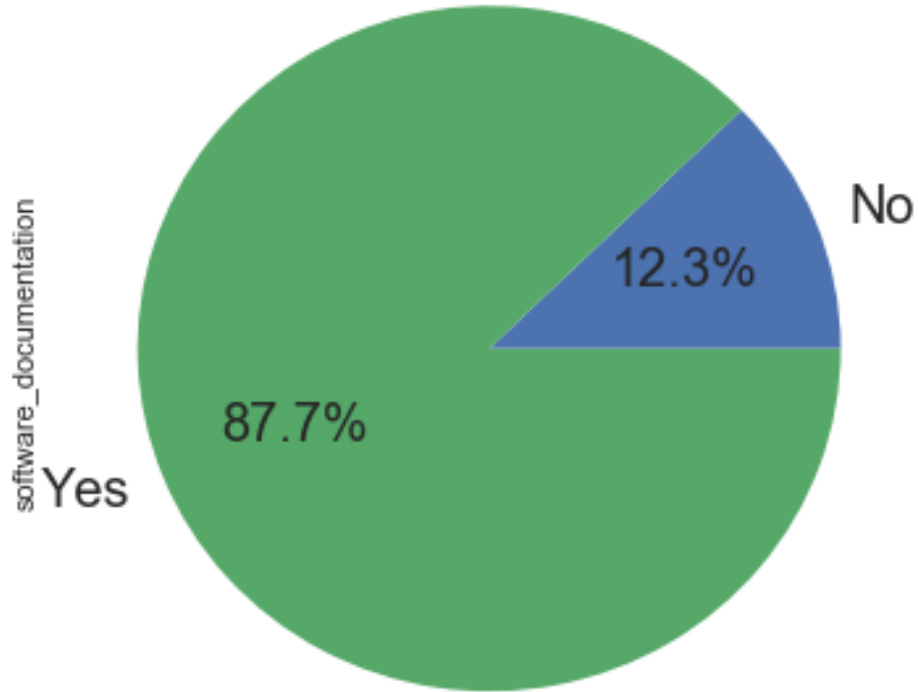


Development Version Control System



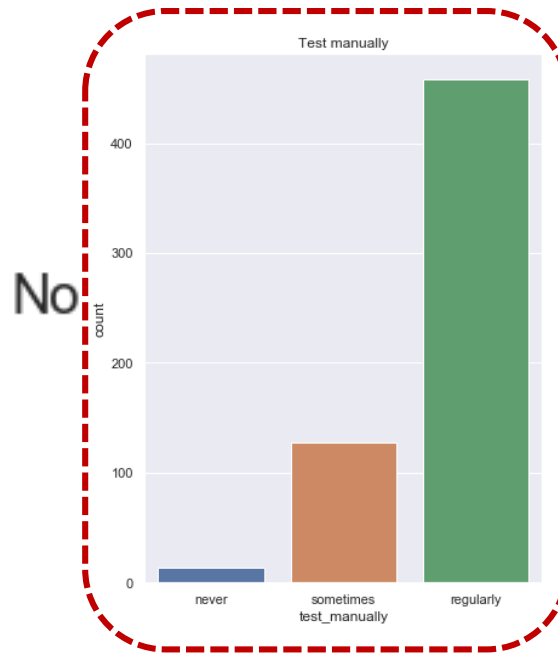
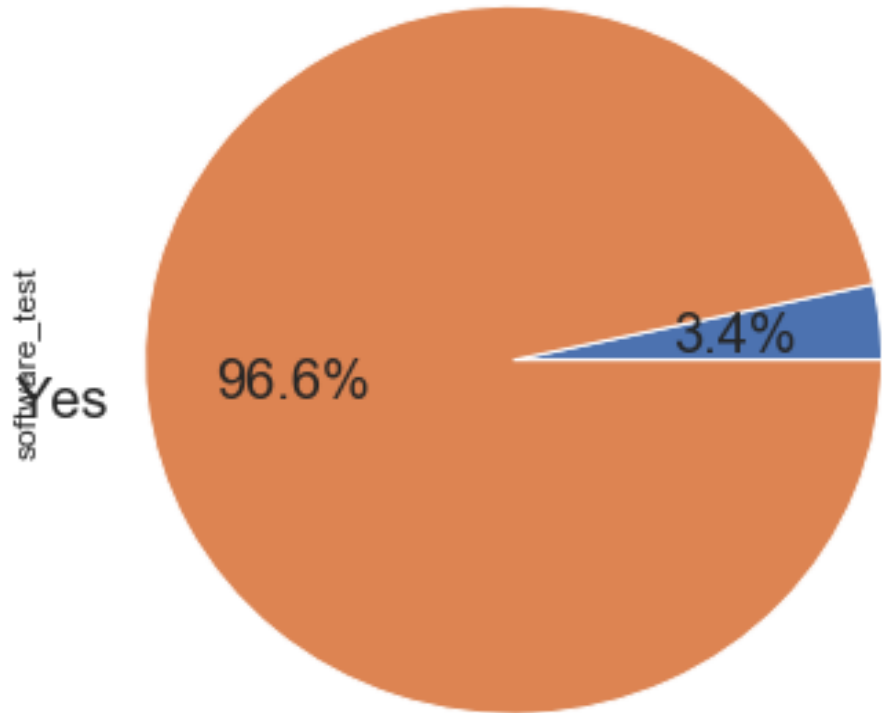
Development Documentation

Are you documenting your software?

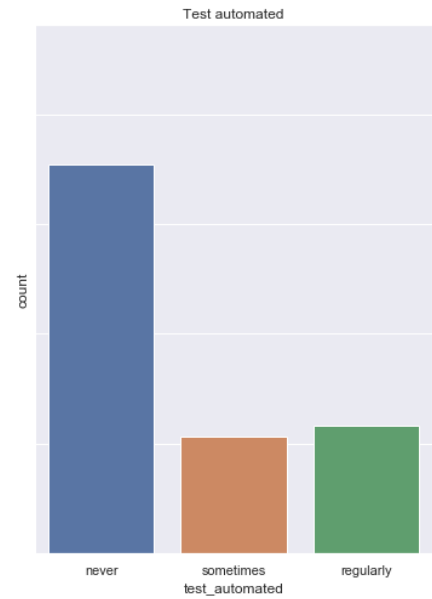
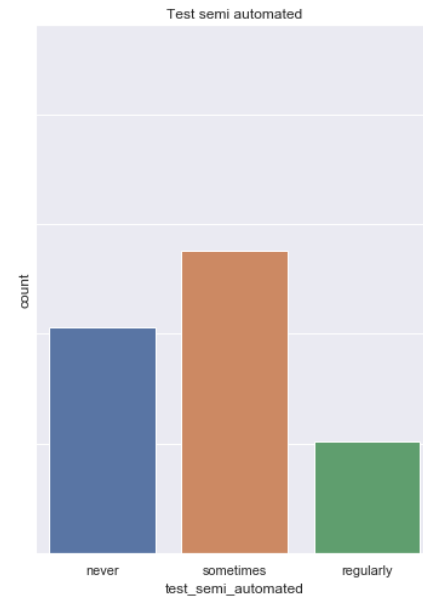


Development Testing

Are you testing your software?



How do you test your software?



Obviously, they need help



Knowledge for Tomorrow



Not so fast!

The Obstacles

Lack of Resources

- Project-based funding
- Hard accessible long-term funding
- Missing infrastructure

Lack of Motivation

- Unmotivated scientist
- Unmotivated management
- Missing incentives

Lack of Knowledge

- Missing knowledge
- Missing strategy



© stuartpilbrow

© 2014 Ebonezee cc-by

Current status of our approach for DLR

Goal: Improve sustainability
and quality of software
products

Software Engineering Initiative of DLR

Guidelines

Trainings

Knowledge
Provision

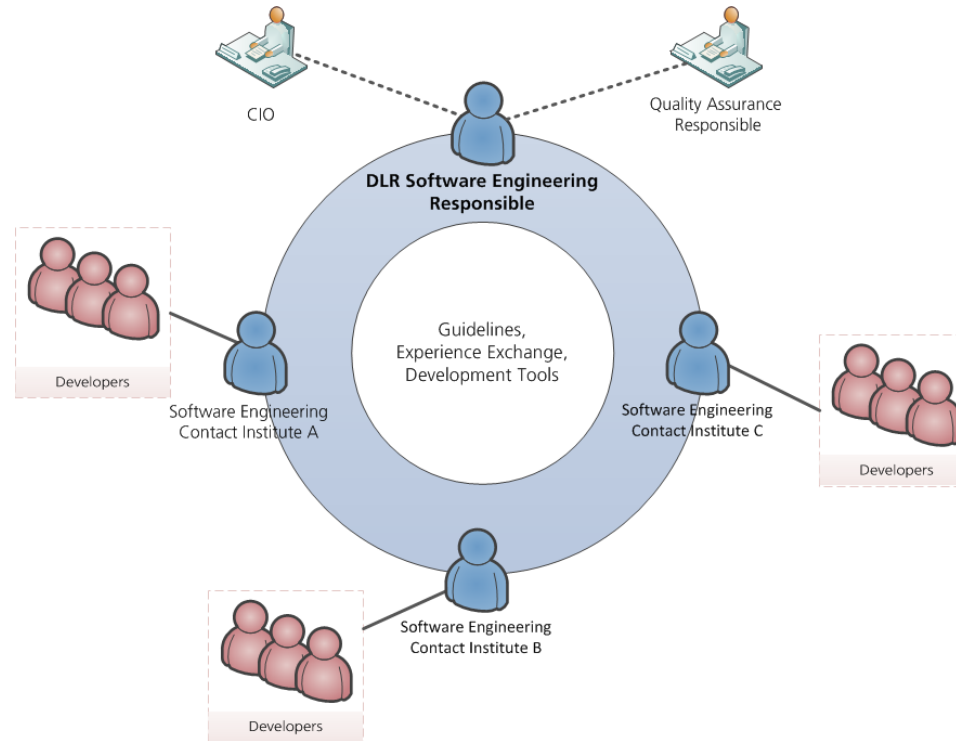
Collaboration

Experience
Exchange



Software Engineering Network

The Backbone



- Network consists of **representatives from all DLR institutes** concerned with software development.
- Representatives further organize software engineering activities in **their institutes**.



Software Engineering Guidelines

Guidelines support developers to self-assess their software concerning good development practices.

- Joint development with focus on **good practices, tools, and essential documentation**
- **Three maturity level** available as checklists in **different formats** to ease practical usage

Checklists for different maturity levels

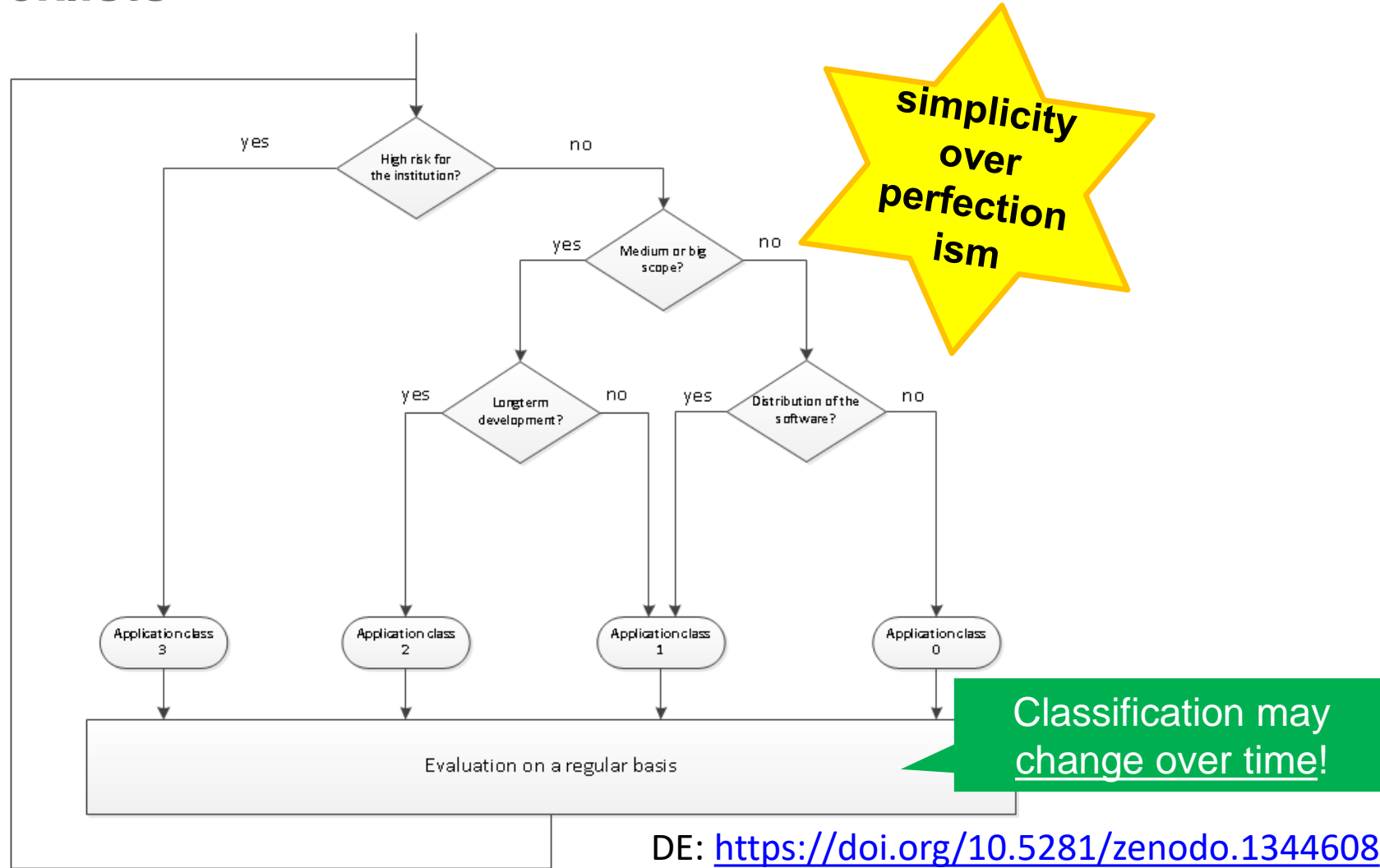
Change Management		
Recommendation	Comment	Status
EÄM.2: The most important information describing how to contribute to development are stored in a central location. <i>(from application class 1)</i>	Build steps are missing	todo
EÄM.5: Known bugs, important unresolved tasks and ideas are at least noted in bullet point form and stored centrally. <i>(from application class 1)</i>		
EÄM.7: A repository is set up in a version control system. The repository is adequately structured and ideally contains all artifacts for building a usable software version and for testing it. <i>(from application class 1)</i>		ok
EÄM.8: Every change of the repository ideally serves a specific purpose, contains an understandable description and leaves the software in a consistent, working state. <i>(from application class 1)</i>		ok

Reasoning and further advice

The repository is the central entry point for development. Main artifacts are stored in a safe way and are available at a single location. Each change is comprehensible and can be traced back to the originator. In addition, the version control system ensures the consistency of all changes.

The repository directory structure should be aligned with established conventions. References are usually the version control system, the build tool ([see the Automation and Dependency Management section](#)) or the community of the used programming language or framework. Two examples:

Tailoring Checklists



**simplicity
over
perfection
ism**

**Classification may
change over time!**

DE: <https://doi.org/10.5281/zenodo.1344608>

EN: <https://doi.org/10.5281/zenodo.1344612>

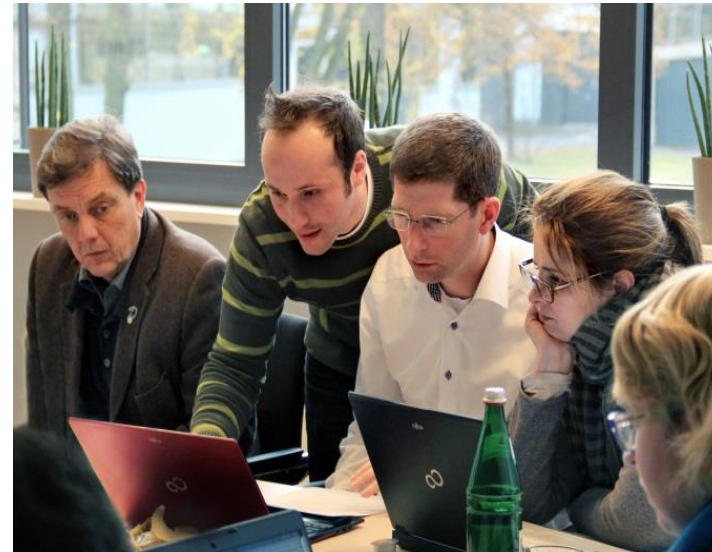


Trainings

Regular trainings are offered to provide hands-on experience in applying the guidelines and the DLR development tools.

Concept

- Intensive two-day course
- Small groups with up to 15 participants
- Hands-on experience on the basis of a complete example project
- Trainings are offered on a yearly basis at different DLR locations across Germany



Knowledge Provision and Collaboration SoftwareEngineering.Wiki

Internal Wiki space to share software engineering knowledge and experiences.

- Open to contributions of all DLR employees
- Moderation by a small central group

Main content categories

- News
- Information about topics like architecture, testing, etc.
- Official programming guides
- Experiences concerning dev. tools
- Questions & Answers

Software Engineering




Created by Plewischkies, Andre, last modified by Schlauch, Tobias on 10. February 2017

Welcome to the SoftwareEngineering.Wiki!

The **SoftwareEngineering.Wiki** is the place to create, share and discuss software engineering content with colleagues on a working-level! We aim for an open and constructive exchange of ideas. Therefore, feel free to share your knowledge and encourage others to do so as well!

- **Before you start:** Please visit the [Get Involved!](#) section and subscribe to our Blog!
- **Any Software Engineering related question?** You can ask it directly in the [Ask a Question](#) section!
- **You require more information how you can approach the topic software development in general?** This document [provides an overview about general recommendations](#) (German only, chapter 4). In addition, your [Software Engineering Contact](#) is able to support you!

This Wiki space is moderated by [Simulation and Software Technology](#). In addition, this work is supported and funded by DLR's central IT department.

 Get Involved! Learn about specific SE Tools!	 Ask a Question Programming recommendations, how-tos and more!	 Topics Learn about specific SE Topics!	 Literature Find out about useful SE readings!
 Tools Learn about specific SE Tools!	 Best Practices Programming recommendations, how-tos and more!	 Software Project Manual Learn how to organize your software project!	 Events Find out about upcoming workshops, presentations, or trainings!



Blog Posts

- [Aus DLR Open Blog: Folge-WAW DLR Open II - Thema und Termin steht - Anmelden](#) created by Haupt, Carina 06. April 2017 Software Engineering
- [SUMO als Projekt bei der Eclipse Foundation](#) created by Hilbrich, Robert 05. April 2017 Software Engineering
- [Interesting Summary of Google's Software Engineering Practices](#) created by Schlauch, Tobias 09. March 2017 Software Engineering

Latest Questions

- [Experience with Django framework](#) [question](#) | [software-engineering](#) | [django](#)
- [I want to upstream a \(small\) patch, what form of signoff do I need from whom?](#) [question](#) | [software-engineering](#) | [open-source](#)
- [Perl Distribution für Windows im DLR](#) [question](#) | [software-engineering](#) | [perl](#)

Latest Changes

-  **Schlauch, Tobias** [Organisation EAWSE4](#) updated about 2 hours ago · [view change](#)
-  **Bachmann, Arne** [Vagrant](#) updated yesterday at



Experience Exchange Workshops

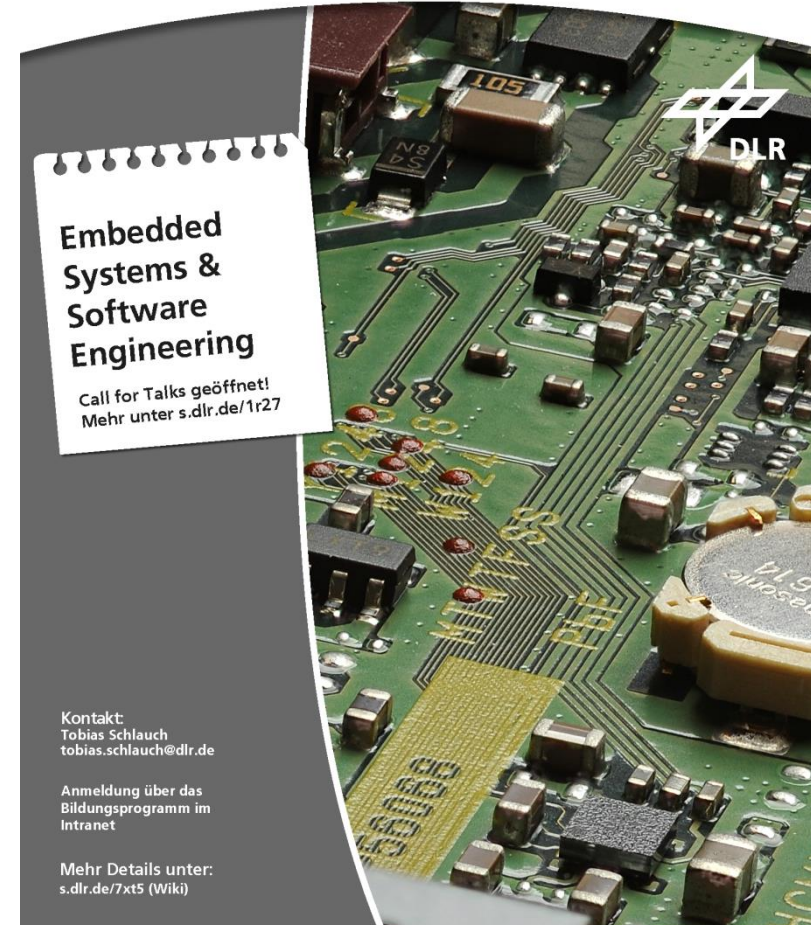
Regular knowledge exchange workshops are held to actively involve DLR scientists and to foster exchange.

Concept

- Intensive 1.5-day workshop
- Knowledge, experience exchange and networking opportunities
- Active involvement of the participants
- Results are shared via the SoftwareEngineering.Wiki
- 50 participants
- 2018 → EAW SE V

ErfahrungsaustauschWorkshop

Fallstricke bei der Software-Entwicklung V
15. - 16. Mai 2018 in Bremen



Embedded Systems & Software Engineering

Call for Talks geöffnet!
Mehr unter s.dlr.de/1r27

Kontakt:
Tobias Schlauch
tobias.schlauch@dlr.de

Anmeldung über das Bildungsprogramm im Intranet

Mehr Details unter:
s.dlr.de/7xt5 (Wiki)



Consulting

Concept

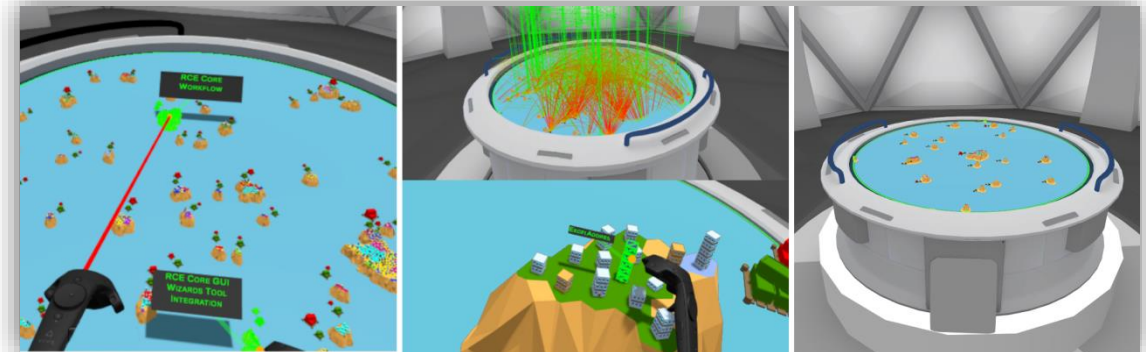
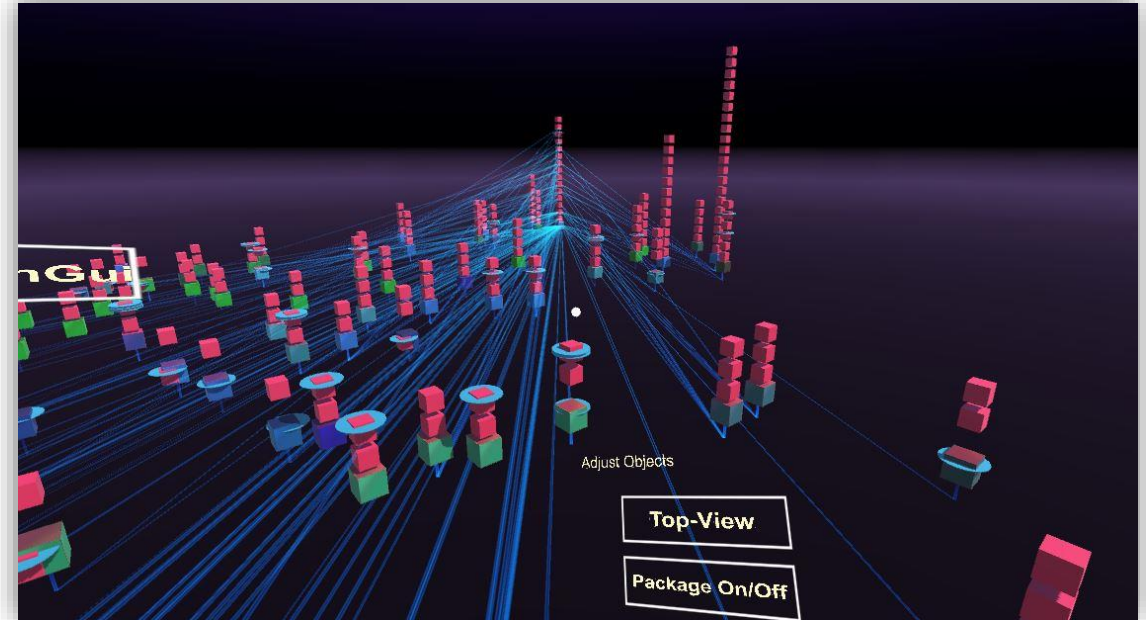
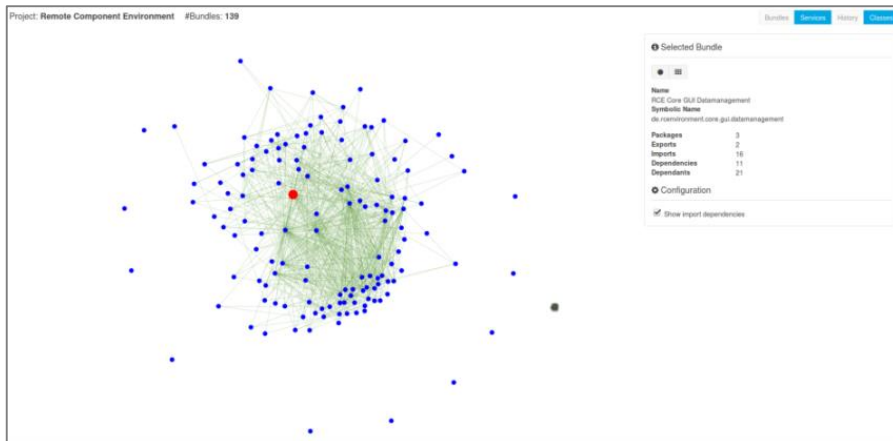
- Experienced software engineer
- Analyzing situation in institute / project
- Actions
 - SE-Guideline
 - Tooling
 - Trainings
 - Individual process
 - Individual support
 - (Feature development)



Software Visualisation

Visualisation of Software Architecture

- Modules, components and dependencies
- Interactive visualisation
 - Web-/VR-/AR-based
 - Chat and speech interfaces



Administration ✕

- Info
- Import
- Rooms
- Users
- Permissions
- Custom Sounds
- Custom Emoji
- Integrations
- Mailer
- OAuth Apps
- View Logs

SETTINGS

Search

- Accounts
- Assets
- Atlassian Crowd
- Bots
- CAS
- Chatops
- Custom Sounds Filesystem
- Email
- Custom Emoji Filesystem
- File Upload
- General
- IRC

#general

Start of conversation

February 15, 2017

stefan Admin 7:00 PM
Has joined the channel.

February 17, 2017

SO Sofia 8:15 PM
Has joined the channel.

June 21, 2017

BO Bob 10:06 AM
Has joined the channel.

stefan Admin 10:07 AM
I've got a bug (see ticket) that relates to the login function. Did anybody know where I should start to looking for a potential solution?

BO Bob 10:08 AM
Oh year you should look into the login bundle and maybe also into the gui bundle

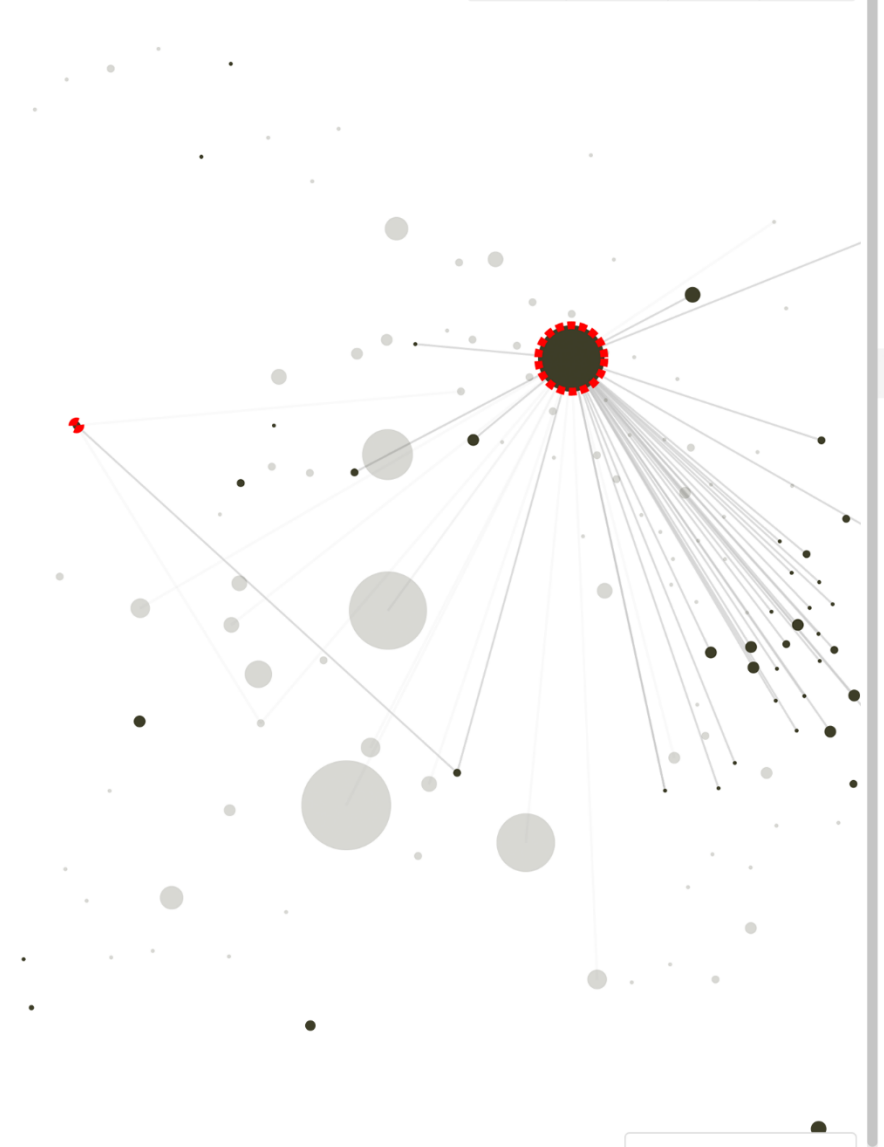
stefan Admin 10:09 AM
Okay thanks, I will look into the code 😊

Message

bold _italics_ ~strike~ `inline_code` `multi line` `[KaTeX]` >quote

Project: Revision: Model Timestamp:

Bundles Services History Classes



Stefan

-
-
-
-
-
-
-
-
-
-



Summary and Outlook

First steps have been taken to build a self-reliant RSE community at DLR. Low-Code tools are being developed to support scientists.

BUT (research specific)

- Incentives for sustainable software must be provided
- Funding structures need to be adapted
- RSE needs to be an official job title and career in research

ALSO (in general)

- It needs people with an appropriate background to support and enable scientists
- The target audience of software development tools and processes is not professional developers anymore
→ It needs software development tools and processes with low entry barriers
- More Low-Code approaches



Questions?

carina.haupt@dlr.de

@caha42



#WIRROCKENSOFWARE

BLUE
MAN
GROUP