

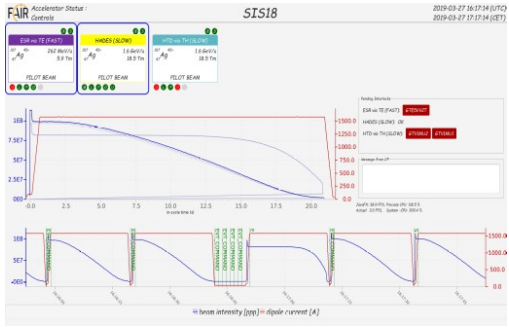
Open-Source Software Development with Industry

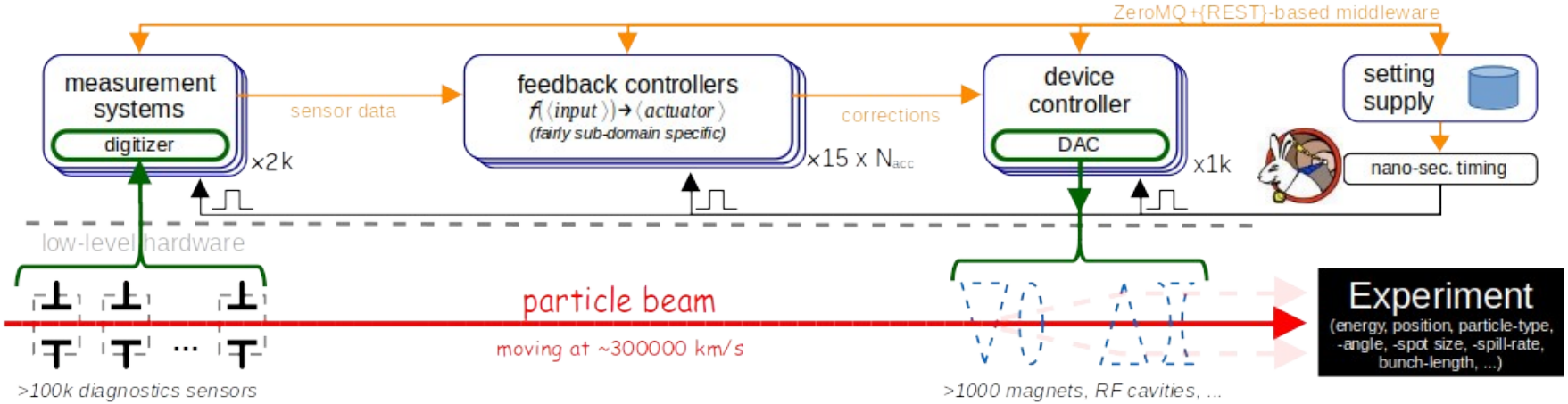
Alexander Krimm, SIS100/SIS18
1st Workshop on Open Science @ GSI/FAIR 20.10.2023

Finland France Germany India Poland Romania Russia Slovenia Sweden UK

GSI HELMHOLTZ ASSOCIATION FAIR

Who are we?

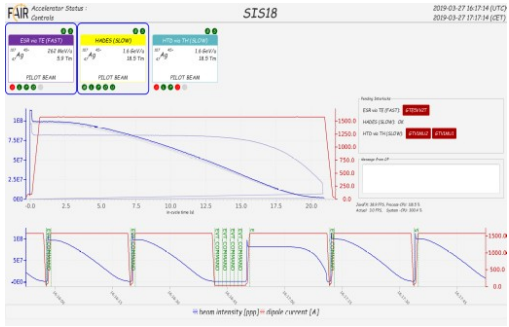

SIS18

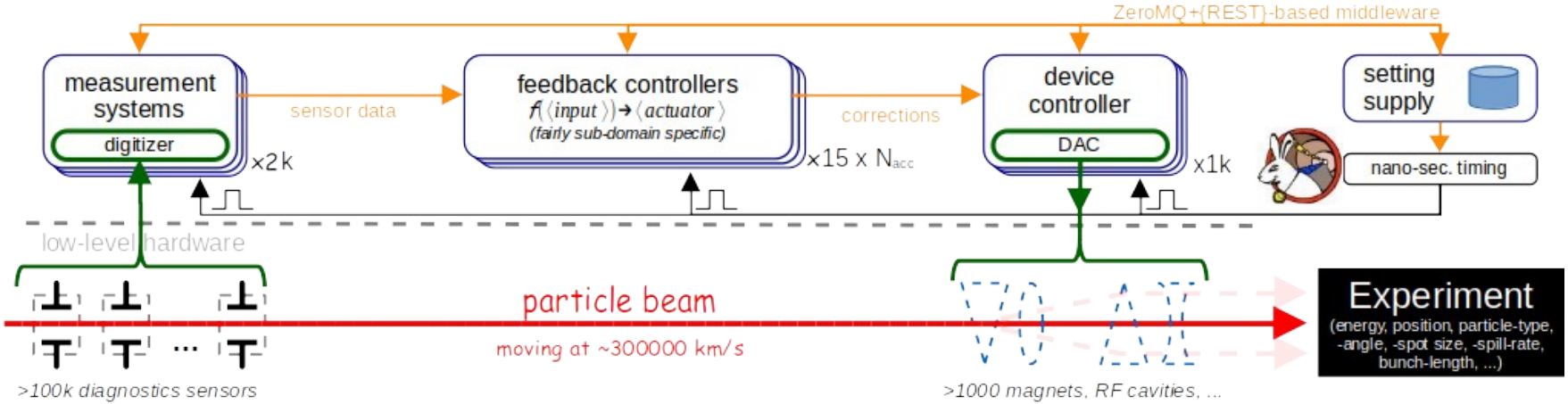

ZeroMQ+{REST}-based middleware
measurement systems
digitizer
×2k
sensor data
feedback controllers
f(⟨input⟩)→⟨actuator⟩
(fairly sub-domain specific)
×15 x N_acc
corrections
device controller
DAC
x1k
setting supply
nano-sec. timing
low-level hardware
particle beam
moving at ~300000 km/s
>100k diagnostics sensors
>1000 magnets, RF cavities, ...
Experiment
(energy, position, particle-type, -angle, -spot size, -spill-rate, bunch-length, ...)

Who are we?

small team in SIS100/SIS18 + help from CIT and ACO working on system integration, beam-based diagnostic and feedback systems for FAIR

- 100k signals from various data-acquisition sources & 100s of systems
- 20+ core services per machine for commissioning, first-line diagnostics and operation + co-use by experiments





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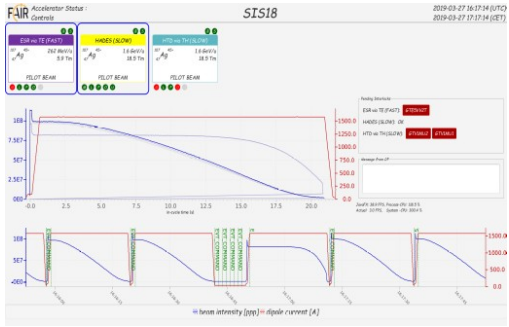
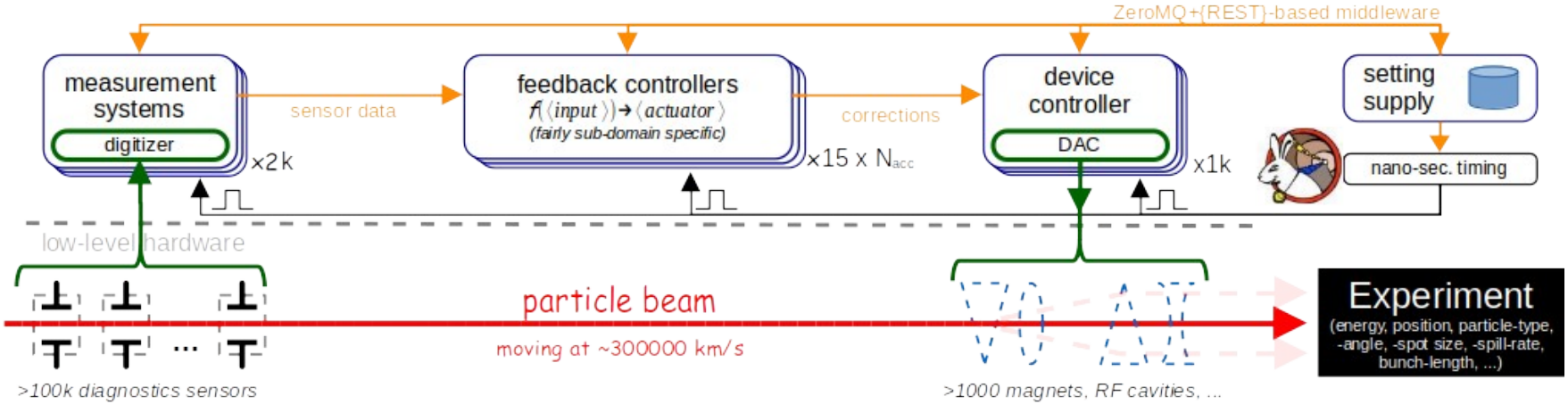
- **60+ person-years of scheduled work → only possible with external partners**

=> huge demand for **sustainable** software development





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1) Mitigating Risks → ‘agile’ and ‘lean’ Framework Contract
   - general FAIR contract designed for established technologies but unsuitable for SW development
2) Software Quality and Efficiency mirrors Communication Structure (→ M. Conway’s Law)
   - **collaborations must be based on trust + open and transparent communication**
3) Public Documentation of Technologies & Outreach
   - fostering seamless collaboration & attract a diverse talent pool
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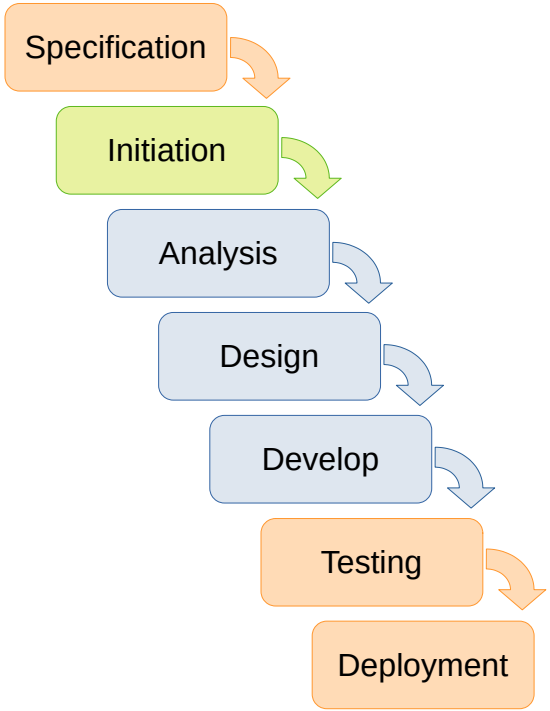
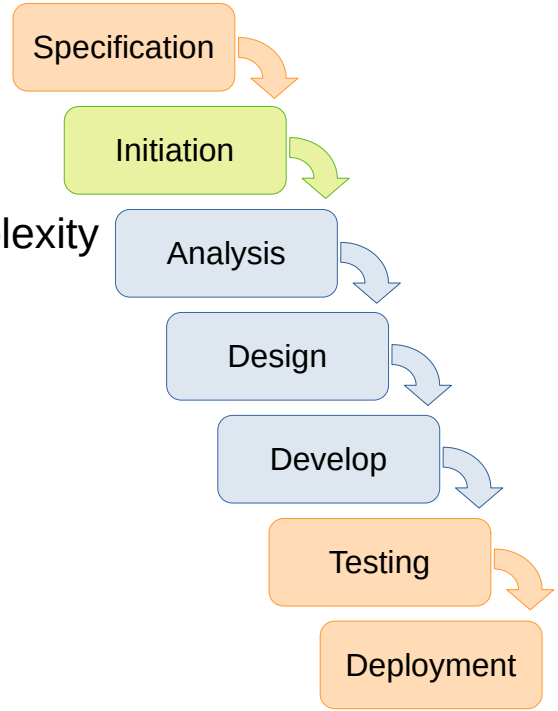
Creating Shared Value through creating public ‘clean’ and ‘lean’ Code-Base

- efficient response to 24h/7 operational needs and sustainable long-term maintenance
- FAIR as technology forge: develop technologies critical to FAIR
  & enable industry and general public in new emerging key technologies.

Common Problems



- “old contract”: ‘waterfall’ design process with few pros and mostly cons
  - strong tendency to over- or underspecification for software
    - overspecification time consuming for us and industry partners
    - design effort nearly identical to implementation effort
  - asymmetry between in-house and external understanding of project complexity
    - initial over- or underestimation of the project effort
  - slow feedback loops and expensive ECRs
  - “code-dump”: quality control and future maintainability



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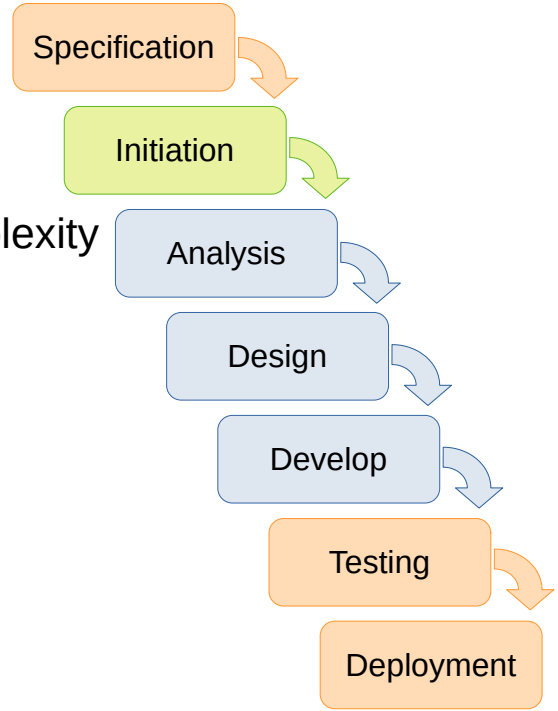

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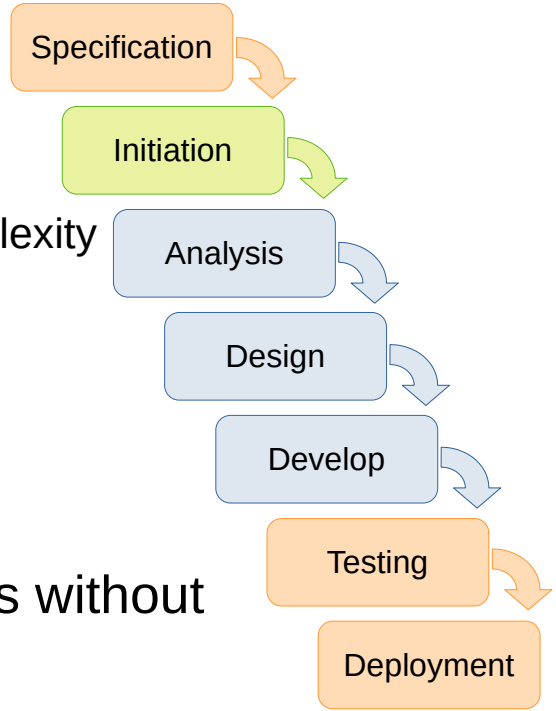
- hard to assess qualities and prior work of new industry partners without reliable public track record



New ‘agile’ and ‘lean’ Framework Contract (dt. “Rahmenvertrag”)

shout-out @
F. Arndt, G. Harks,
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  - small, re-usable, and describes the collaborative process
  - live iterations: ‘change for free’ policy
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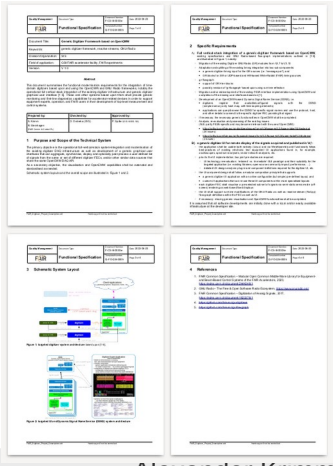
- project description (2-10 pages, by FAIR)
  - outlines scope of work that should be performed
  - details provided in referenced public resources



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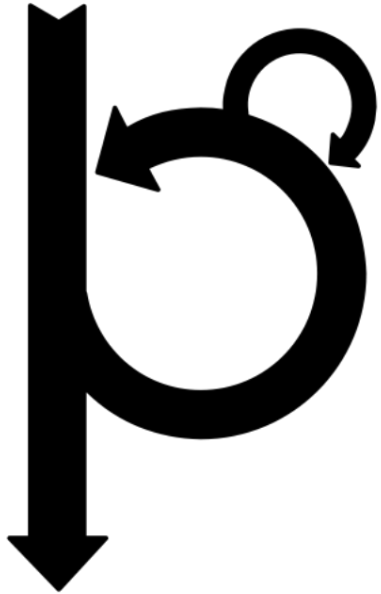

Alexander Krimm, A.Krimm@gsi.de, 2023-10-20

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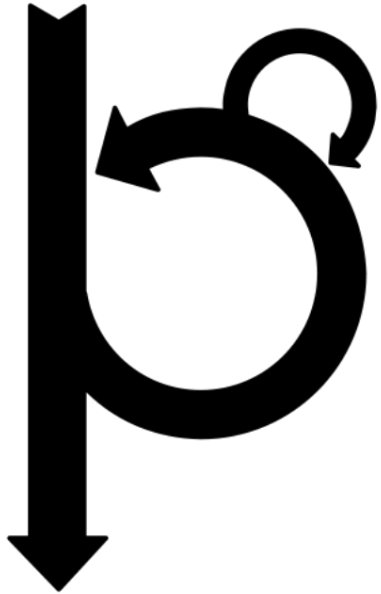
  - focus on design, function and intended use
  - ... rather than overspecified implementation details that are impossible to know at project start



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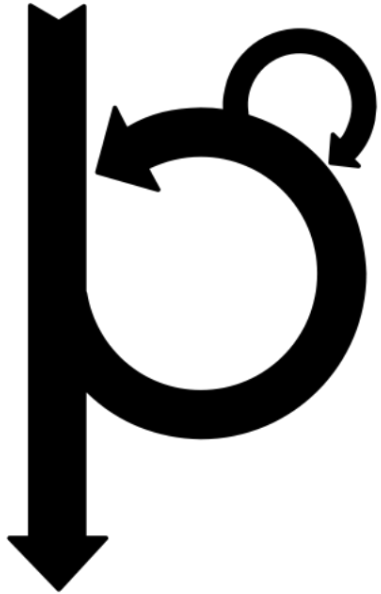

Co-Development and Continuous Iteration & Communication

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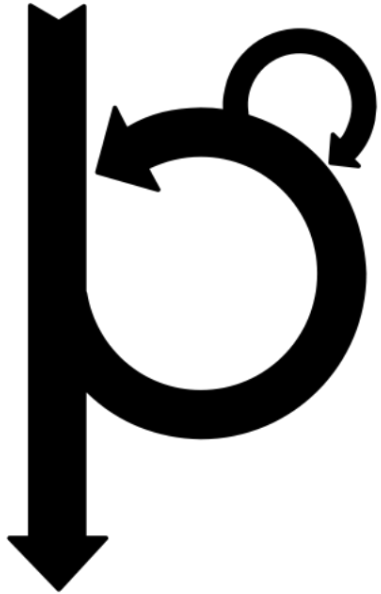

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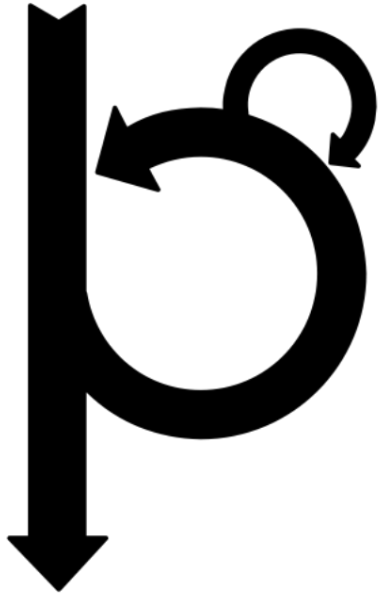

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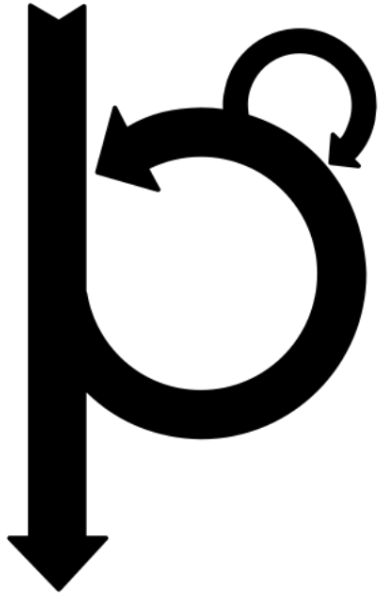
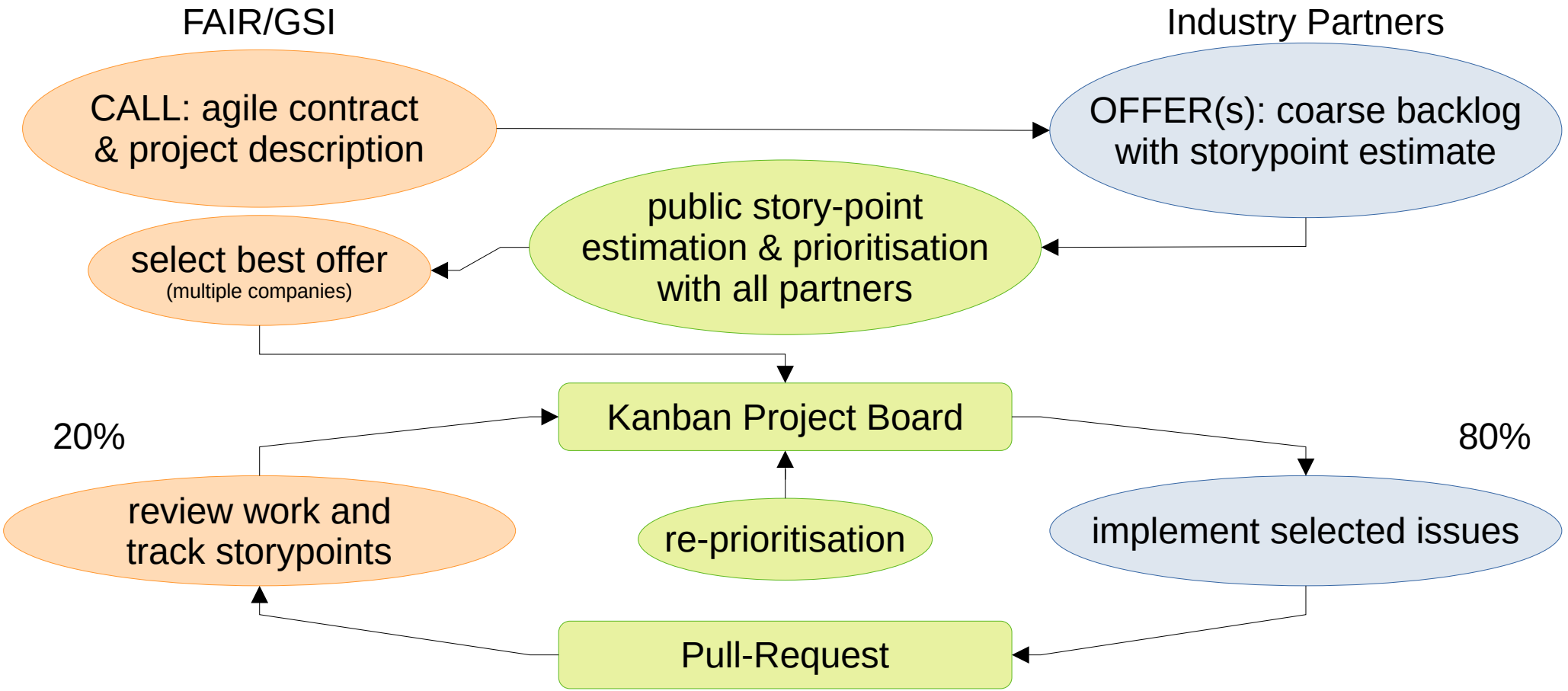
- **collaboration must be based on trust and open communication**
  - communicate early on wrong estimates

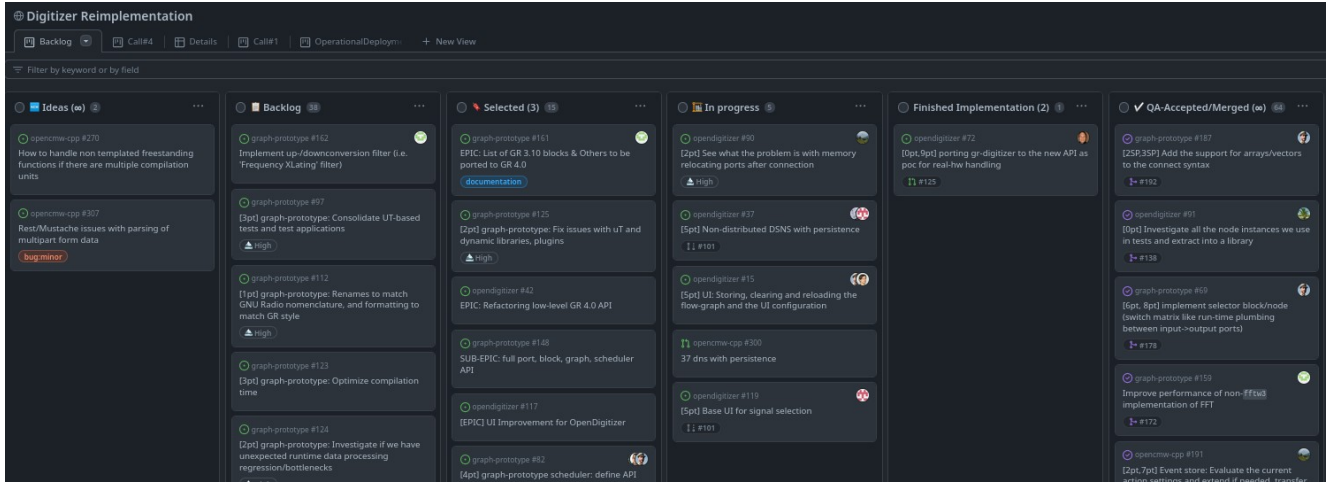


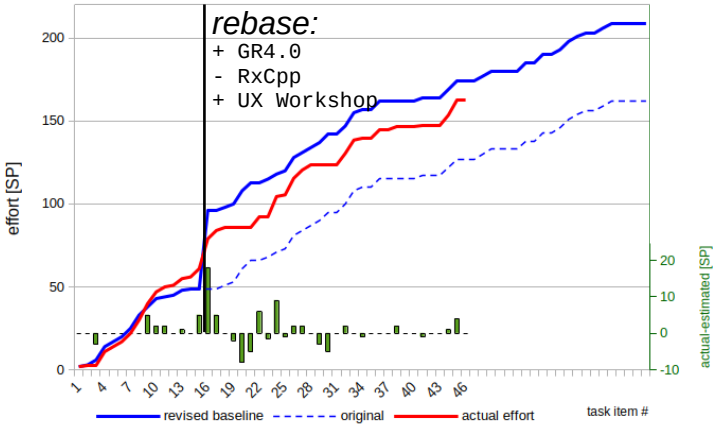
Joint Open Source Development - Overview

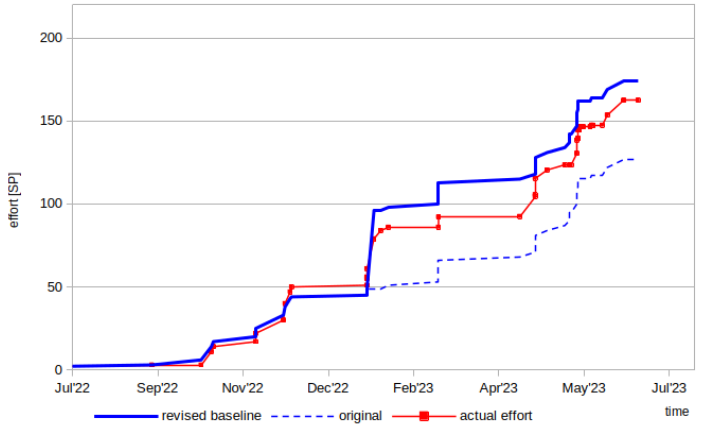


Backlog and Story-Point Estimation

- story-point: one unit of work, approximately one workday
- [estimated, actual] tracking on kanban board issues
  - functional and financial records
  - but more important: continuous feedback and improvement on shared understanding of task and project complexity







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  - reviewed by GSI/FAIR,
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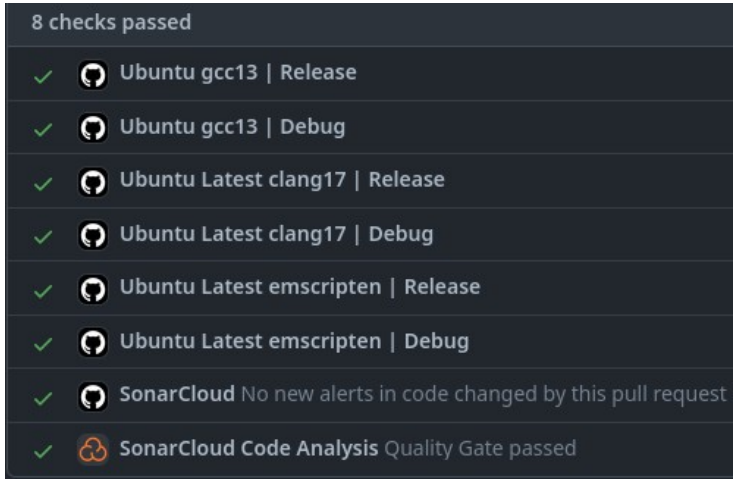

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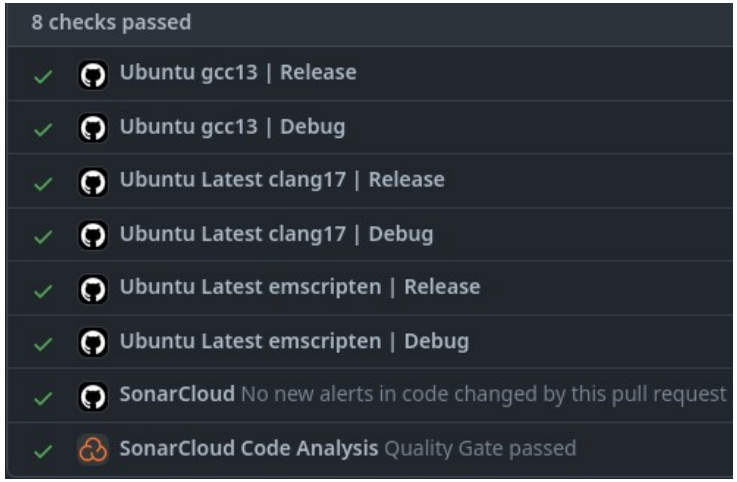

- for big differences between estimated and used story points, discuss causes and possible ways to get back on track

Example collaborations

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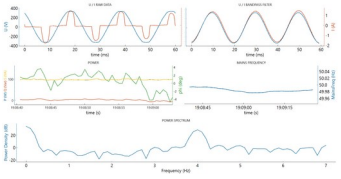
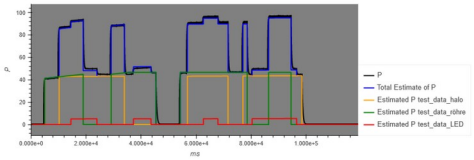
OpenCMW

GNURadio
THE FREE & OPEN SOFTWARE RADIO ECOSYSTEM

KDAB

- AI-based pulsed-power monitoring + Infoteam AG (2 x 90SP)





infoteam
software

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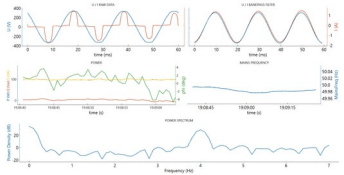
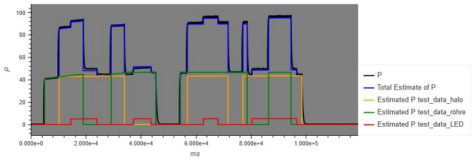
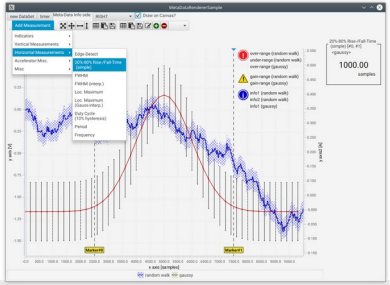




infoteam
software

- chart-fx (Java charting library) + HEBI Robotics (20SP)

ChartFx



HEBI
ROBOTICS

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Thanks for your Attention!

Do you use/develop/manage open-source projects?
What are your experiences and approaches?

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Finland France Germany India Poland Romania Russia Slovenia Sweden UK