Safety Qualification of Open Source Software

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Use Case Qualification of Open Source Realtime Operating System RTEMS according to ECSS **LEON 3/4** ▶ **RISC-V**

Qualification Challenges

Ruled software-development process

Comprehensive documentation

Extensive testing

Laborious review and documentation

Any change requires to repeat the whole testing and review process

Example

Qualification Data Package

~ 350,000 files

~ 25,000 pages documentation

for RTEMS ECSS Cat. C/B on Gaisler GR 740

Consequences

Expensive (core RTEMS >10,000 hrs)

Very static (high effort for delta-qualification)

Effort increases exponentially with system complexity

Many different processors, drivers and interfaces to be qualified

Open Source Software

No royalties

No licensing hassles

Transparent source code

Users used to DYI (Do It Yourself)

Private versions facing a dead end

Funding options

a) Individual contributions

b) Crowdfunding

c) Sponsored by company

d) Sponsored by foundation

Challenges

Too much effort for single contributors

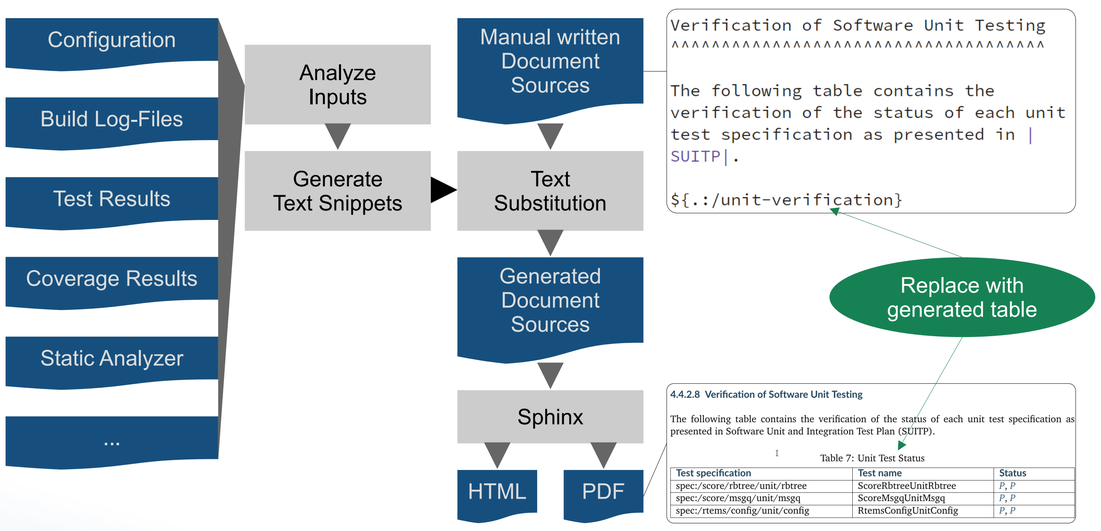
Commercial sponsors do not want to benefit competitors

Institutional sponsors cannot manage the variety of features and configurations

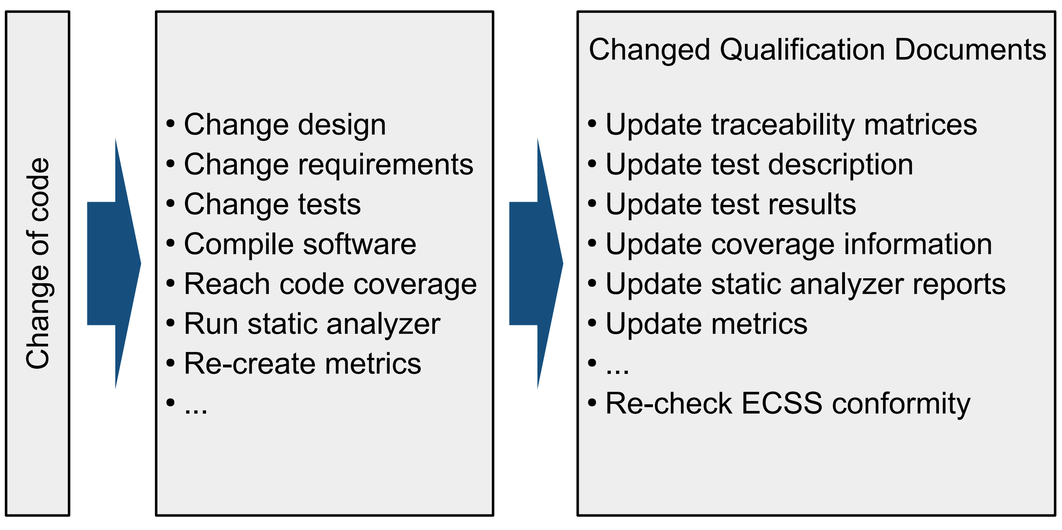
Who maintains a qualification package?

Approach: Automated Qualification Toolchain

Concept



Managing code changes



Results

Concept and first use case (GR712 RC and GR 740) sponsored by ESA

Transition from LEON 3 / LEON 4 to RISC-V architectures in 50 to 200 hrs (for qualification, excl toolchain work)

DYI or as a commercial service

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