

Metrics Dashboards for Agile Development of Safety-Critical Software

Kelly Gasperski, P.Eng.
Software Product Assurance, Canadarm3
Safety & Mission Assurance, Robotics & Space Operations
Kelly.Gasperski@mda.space
www.mda.space

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The collection of metrics throughout the software development process is not only an activity required by many safety-critical program requirements and standards, such as NPR 7150.2D and ECSS-Q-ST-80C Rev 1; it serves as a valuable method for tracking progress and identifying trends that may affect the overall success of the program.

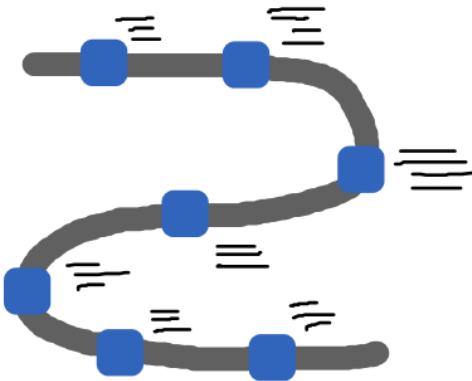
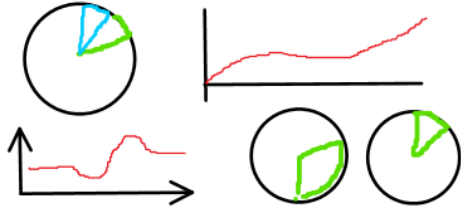
Using modern software development practices and tools, such as those used in Agile and CI/CD pipelines, programs can easily implement customized, scalable data collection services, which in turn support real-time data visualizations known as "metrics dashboards." These dashboards can bring immediate value to the program by displaying easy-to-interpret graphical representations of ongoing trends in the software development process, which enables stakeholders to make informed decisions and address key areas of concern in a timely manner. These metrics dashboards are especially useful when implementing Scaled Agile for safety-critical software development, as there are many teams working in parallel on a large development effort, and viewing overall program trends and gaps becomes critical to ensuring a successful outcome. Some examples of the metrics that may be useful in the Agile development of safety-critical software include:

- Adherence to coding standards and quality thresholds such as code coverage, nesting levels, and cyclomatic complexity limits
- Detection of outdated software libraries and cybersecurity vulnerabilities
- Measurement of the software development progress and average velocity across all teams
- Monitoring the health status of the software development environment and CI/CD pipeline

Using real examples from the development of Canadarm3, this poster aims to provide an overview for implementing an automatic, scalable metrics collection and visualization process, tailored to the specific environment and program needs to support the Agile development of safety-critical software.

A rough outline of the proposed poster can be found on the following page of this abstract.

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Examples of useful data visualizations.

Bullet-points describing use cases and stakeholders of metrics dashboards.

A guided walkthrough of common tools used in Agile and CI/CD pipeline environments (task tracking tools, code repositories, static analysis tools etc.)

For each tool (shown as a blue square), a description of its function and the useful metrics to collect will be described.

A description of how to retrieve and store data from these tools and how to turn this data into graphical representations will also be provided.