Presentation abstract

Trace today, improve tomorrow

We all know how time to market is essential to success and we strive for being the first to deliver our ideas to the world. But more than often, we also find that the world out there is more complex than expected and face some hard-to-understand problems affecting our carefully designed devices.

We will show how a good tracing strategy can help us tackle these problems more efficiently and improve our products in the face of complex and evolving environments. You will see with a few examples that, using specially designed tools, inserting meaningful traces does not take much time and may even take less time than inserting ad-hoc qDebug() statements.

The modmedLog trace library is such a tool, designed according to the needs and experience of Medical Cyber-Physical Systems developers. It complements the flexible Qt trace facility with features giving more meaning to traces:
- a standard TSV+JSON trace format that facilitates both human exploration and tools analysis by removing most redundancy and ambiguity from traces
- full compatibility with existing qDebug() statements
- mTrace() macros provide simpler trace statements and more consistent traces
- fluent interface for mapping complex event data types to JSON (or XML)
- easy and robust identification of similar events
- support for domain-specific event "tags"

The 25' session will go through C++ code examples to show how little the effort of tracing can be and how much meaningful traces can help understand complex problems such as incorrect thread affinities and other hidden software assumptions.

We will then show how to interactively explore large TSV+JSON traces using common spreadsheet filtering and bookmarking features such as found in MS Excel. And we will write some Python snippets to demonstrate how easy it can be to automate moderately complex trace analysis.

The whole "trace today, improve tomorrow" approach will be exemplified by the history of the development of a complex Medical Cyber-Physical System from Blue Ortho that helped surgeons perform thousands of "Total Knee Replacement" operations around the world... and keeps improving thanks to its traces.

The modmedLog open source library is developed by MinMaxMedical, a technology provider for Computer-Assisted Surgery, and benefits from the experience and work from Software Engineering researchers who are developing state-of-the-art analysis tools for structured

traces based on a "temporal and parametric trace properties" DSL. This work is partly funded by ANR-15-CE25-0010 grant from the French "Agence Nationale de la Recherche" to improve Runtime Verification methods and tools for medium-to-low criticality software.

http://modmed.minmaxmedical.com/

Bio

Arnaud Clere has been crafting software from the 80's on a Texas Instrument TI99/4A and later worked for various industries including telecommunication, digital signage, and now Computer-Assisted Surgery.

He is now Software Technical Director at MinMaxMedical where he helps his partners reap the best out of Qt to develop dependable and innovative Medical Cyber-Physical Systems.

Pragmatic, yet interested in theoretical advances in Software Engineering that can improve his coding craftsmanship such as Contract-Based programming. He leads the MODMED research project with the intuition that better traces and trace analysis tools are necessary for all sort of reasons in our cybernetic era.