DYANA: an integrated development environment for simulation and verification of real-time avionics systems[1]

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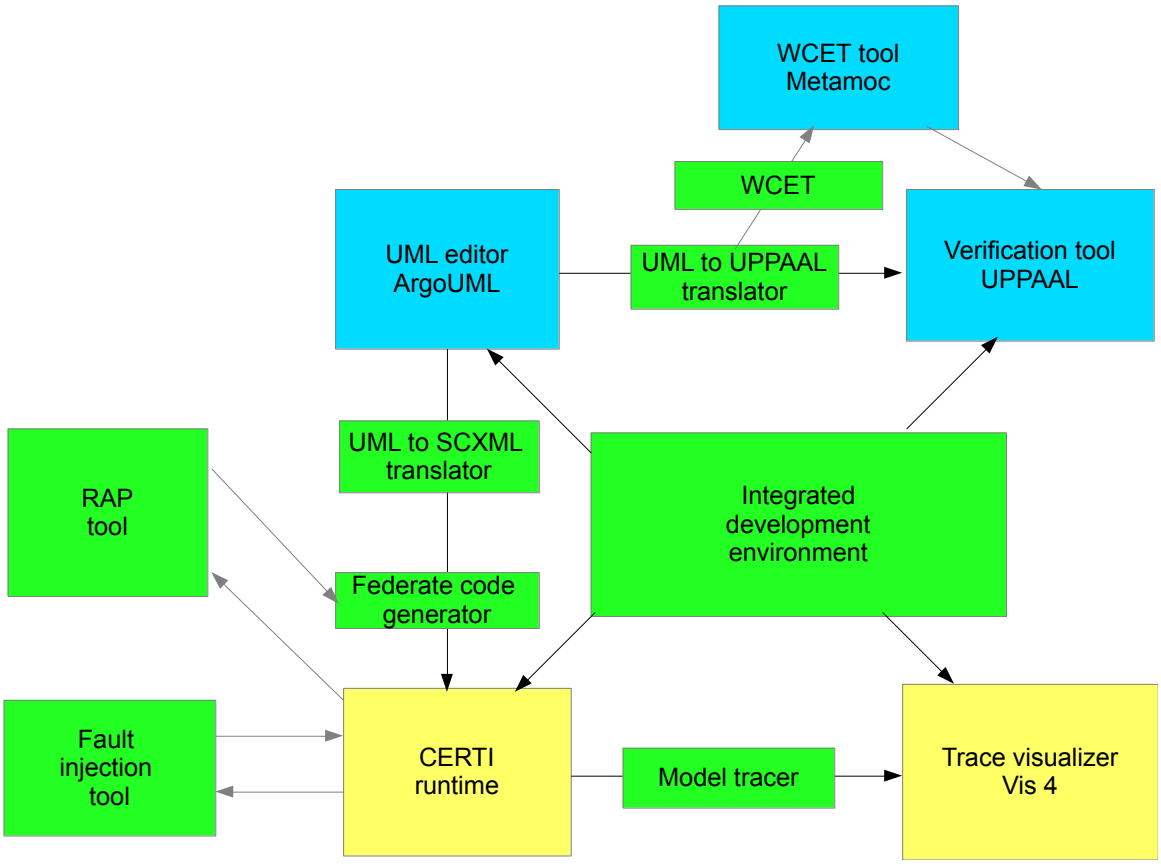
The process of developing development avionic devices and Real-time avionics systems (RTAS) is usually distributed among several teams, each of them located in its own organization. In this paper we present DYANA, a toolset for modeling and verification of real-time avionics systems, which supports such a distributed development process. This tool is a new revision of DYANA simulation environment [1]. The new version of DYANA is designed to support development based on well-known standards such as UML [2] and HLA [3]. The following figure shows the main components of the new system:



Different colors indicate the degree of reusing open source tools: The blue color designates the tools that were integrated without any modification; The yellow color shows the

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tools that were substantially modified; The green color highlights the new tools developed exclusively for DYANA.

DYANA IDE provides the user with a workplace to run different tools within the development system, it also integrates the tools by performing translation between various formats.

We use ArgoUML [4] as an editor of UML statecharts, which we use as the modeling language for real-time systems; more details are to be found in Section 2. The integration is done on the level of XMI format, so technically any UML editor that supports XMI can be used instead of ArgoUML.

We use UPPAAL [5] as a verification tool for timed automata. UMLToUppaal Tool translates UML statecharts, which represent modeled components, to UPPAAL timed automata as described in [6]. As a byproduct of the translation, the user can check the worst computation estimated time (WCET) by invoking the WCET analysis tool Metamoc [7]. Verification capabilities are described in Section 3.

DYANA is using CERTI [8] as the runtime for the real-time modeling. As the part of DYANA development efforts we improved CERTI to support multi-thread execution of models [9]. In near future, we are going to contribute the modifications to the CERTI community. Federator Generator produces HLA federates from UML models by a two-step process: first, UML models are translated to SCXML notation, which is providing an intermediate integration point; then, federates in C++ are generated from SCXML representations. Execution traces of models run in CERTI can be visualized in Vis4, the tool based on [10]. The details on simulation are given in Section 4. In Section 5 we present an RTAS modeling and verification case study using the new version of DYANA.

Finally, we discuss the prospects of future development of DYANA.

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