Fault Injection, how big can we go?

Introduction
The rapid expansion of the aerospace industry has exposed the limitations of traditional space-grade computing systems, which are burdened by outdated architectures, declining support, and an increasingly obsolete software ecosystem. Researchers are increasingly turning to innovative solutions. To ensure the reliability of these new systems in space, comprehensive ground testing is essential. A crucial aspect of design and testing with hardware-in-the-loop is the ability to conduct fault injection campaigns quickly and efficiently [1].

Fault injection (FI) in complex RTL designs is challenging due to the vast injection space, encompassing all possible injection points and numerous time instances for fault introduction [2]. Each combination of location and time can yield different effects, such as masking, Silent Data Corruption (SDCs), or critical failures like Detectable Uncorrectable Errors (DUEs).

Within CAES we have developed a novel FI environment, which has proven itself in various experiments. The question remains, however, what are the limitations to this tool?

Expected outcome

- Get familiarization with the tool.
- Preform various experiments to identify bottlenecks.
- Propose measures to resolve these limitations.

Requirements

- Interest in embedded systems and dependable computing.
- Familiarity with HDL and FPGA design is a plus.
- Programming experience in Python.

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References

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