



Reliability by Design

PROJECT FACTS

Partners: NXP Semiconductors, NXP Research, IMEC, Philips Consumer Electronics, TASS Software Professionals, Delft University of Technology, Eindhoven University of Technology, University of Leiden, University of Twente, Embedded Systems Institute

Period: October 2004 - September 2009

Capacity: 20 fte/year, 7 PhDs, 2 Postdocs

INDUSTRIAL CHALLENGE

Modern high-tech systems such as digital television, mobile phones, medical imaging equipment, and advanced automobiles, are becoming increasingly dependant on the software content. Future system reliability is a prime concern. A major challenge being faced by many technology driven companies is how to bring new high-quality products to market faster and with less resource. The cost to develop each new generation is increasing fast and is driven by the following trends:

- **Complexity** Over the last decade the software content of many products has grown exponentially. This is caused by the increase in required functionality and the migration of control from hardware to software. One of the undesirable side effects of this is unpredictable feature interaction and the large number of possible use cases.
- **Development life-cycle** Market competition dictates that the innovation rate of high-tech products must continuously improve, resulting in increased feature integration and shorter time-to-market. This places significant pressure on all phases of the product creation process.
- **Open Systems** Many high-tech systems are no longer *stand alone* appliances. They have become a components in a wider networked environment. After integration system behavior may be provoked that was not foreseen during the original product concept.

The Trader project will address this industrial challenge by developing generic methods and tools that improve system level reliability, and by using specific industrial study cases in the area of digital entertainment systems as identified by NXP Semiconductors.

RESEARCH OBJECTIVES

Taking into account the above constraints, the Trader project aims to develop techniques to optimize the customer experience by: (1) detecting potentially undesirable system behavior, (2) developing strategies to correct the situation.

The results are expected to be applicable not only to consumer style products but also to embedded systems in general. The project focuses on three main research topics:

- **Behavioral awareness** Complex consumer products have little awareness that their behavior is acceptable or not. The project aims to provide a high level 'user centric' executable model of correct behavior.
- **Run time error correction** Based on an understanding of how customers perceive system failures, develop a strategy and architecture to correct a system that is showing or will show functional failures or performance degradation.
- **Non domain specific test and fault diagnosis** The complexity of testing a system increases at a faster rate than the increase in its functional complexity. To simply test all combinations of events over all possible use cases becomes an unbounded task.



EXPECTED RESULTS

Architectures, methods and tools that can be used during all stages of the product creation process to design in enhanced reliability:

- Techniques to measure and analyze user perception of failures;
- Executable models to explore system behavior during the product concept phase;
- Architectural constructs to create behavioral awareness, detect errors and the ability to perform local recovery;
- Test and fault diagnosis techniques to be used during the test and integration phase;
- Run time monitoring and control to prevent resource overloads causing customer visible failures.

INFORMATION

For further information, please visit the website www.esi.nl