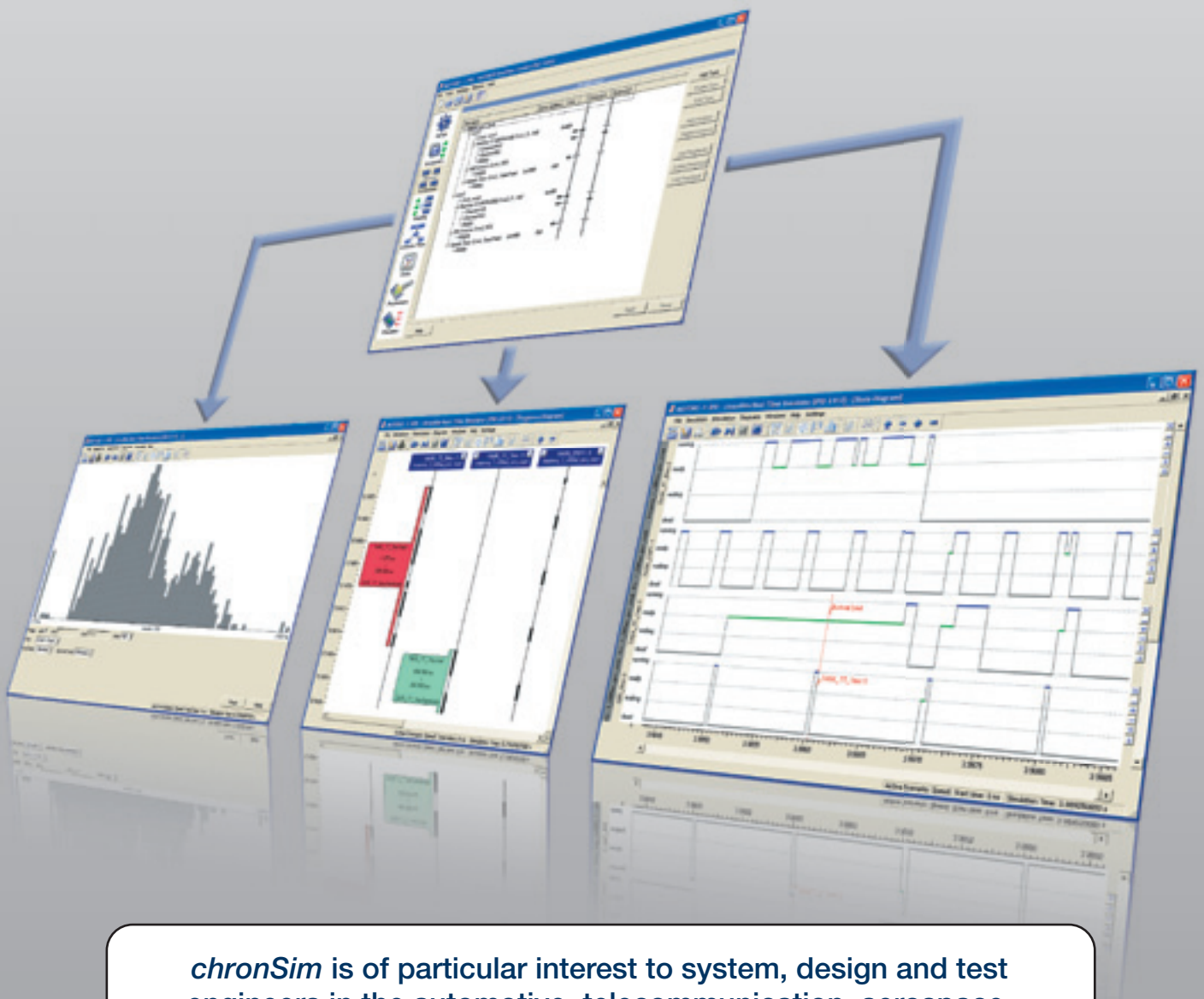


CHRON *Sim*

chronSim the integrated solution for the design, test and optimization of real-time critical embedded software

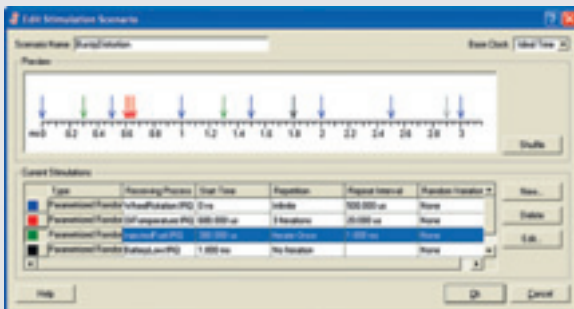


chronSim is of particular interest to system, design and test engineers in the automotive, telecommunication, aerospace, medicine and automation industries.

Analyse. Model. Optimize

Analyzing the real-time behavior of C code

chronSim executes the embedded C code and simulates your system's real-time behavior. The optional *chronEst* module can automatically determine the required execution times of your C code or you can allocate time budgets to your tasks, functions or code segments. The real-time behavior is



reproduced in such a way that it responds, to external stimuli, in the same manner as it would in a true operational environment. External stimuli include such things as periodic and stochastic interrupt signals as well as time-based values of digital and analogue signals. It is also possible to reproduce highly complex technical processes, such as control loops, by implementing bespoke plug-ins in C code. *chronSim* offers a number of meaningful diagrams to enable an optimal analysis of the real-time behavior of your embedded system.

Flexibility with task models

As an alternative to C code, the extensive *chronSim* library can be used to create application-specific task models. The library models are designed to be flexible and adaptable to the situation at hand. A particularly powerful feature is the ability to mix task models and embedded C code in simulations.

```
DELAY(175, unit_us);  
TerminateTask();  
  
TASK(TASK_TT_5ms){  
  DELAY(430, unit_us); Schedule();  
  write32(uart2, TxData);  
  DELAY(390, unit_us); Schedule();  
  DELAY(175, unit_us);  
  TerminateTask();  
}
```

chronSim allows you to:

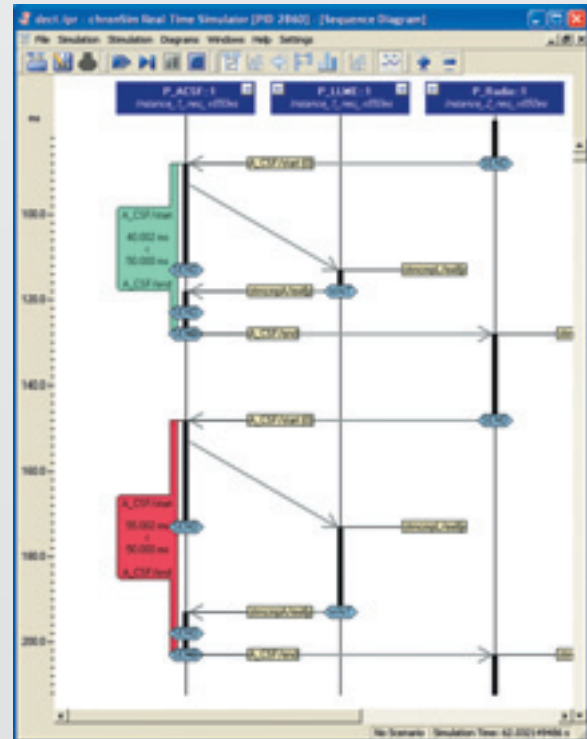
- make an early start on system performance tests, even when only individual software routines are available.
- integrate existing C code into a new system architecture and determine its suitability (code re-usage in new products)
- integrate and model software components, whose IP belongs to a third party, in order to analyze the performance of the system as a whole (combination of software from a variety of suppliers in an embedded system).

Task models are also ideal for analyzing distributed systems, to detect real-time errors that are caused by the mutual dependencies between communicating embedded systems.

Design. Draft. Optimize

chronSim, the design and test tool

chronSim is a patented simulator for the design and test of real-time critical embedded systems. The performance and real-time behavior of single, multi-core and multi-processor systems as well as networked embedded systems can be analyzed and simulated without problem. *chronSim* simulates your software on a PC, even long before the corresponding embedded system is physically available. You can detect bottlenecks and stack overflows as well as real-time errors, such as those caused by the multiple activation of tasks, interrupt or task preemption or the mutual exclusion of access to commonly used resources. Run-time errors can be detected and eliminated throughout the development process, from system design to release test.



Design and Optimization of Embedded Systems

Whether a new design or an upgrade, in the course of life-cycle maintenance, there are many possible design alternatives, from which you can choose the most economic solution to fulfill all the technical requirements placed on the embedded system.

chronSim lets you determine, for example:

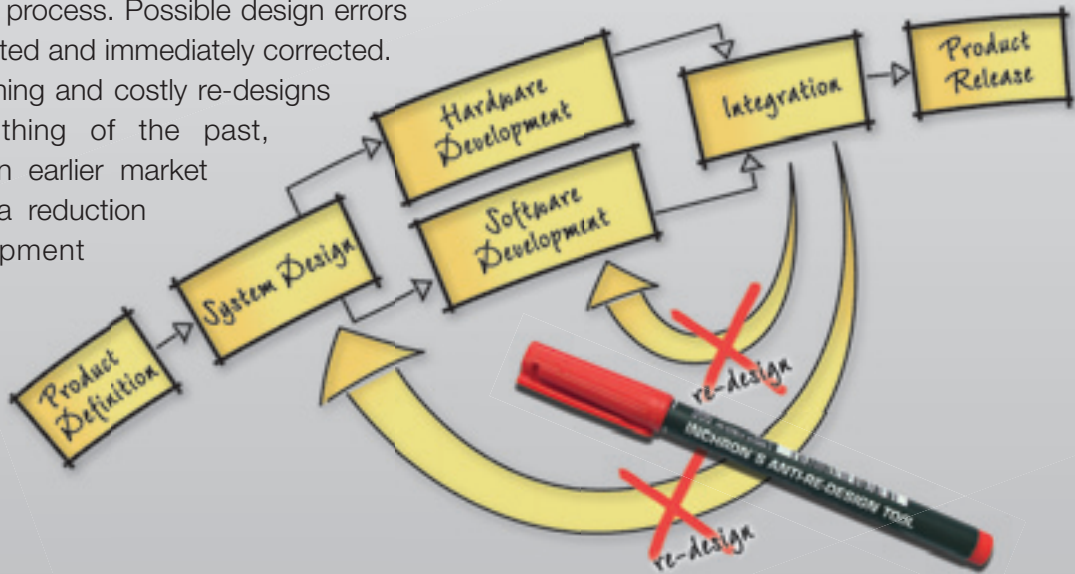
- the optimum number of the most suitable type of microprocessor,
- the most suitable software architecture (definition of tasks, Interrupt-Service-Routines, functions, etc.)
- the best distribution of tasks onto microprocessors or cores,
- the necessary execution times for specific code segments,
- the optimum scheduling procedure, including allocation of priorities to interrupts and tasks.



Fast. Direct. Error-Free

Eliminate Re-Designs

chronSim allows you to simulate, visualize and analyze your design - and subject it to evaluation and quality test, throughout the development process. Possible design errors can be detected and immediately corrected. Time-consuming and costly re-designs become a thing of the past, leading to an earlier market launch and a reduction in development costs.



Function

- Detect and correct run-time errors sooner
- Simulation of the dynamic behavior of single, multi-core and multi-processor systems
- Performance analysis of embedded systems
- Automatic detection of real-time errors and stack overflows
- Analysis of the interaction between networked embedded systems, that communicate, for example, via a FlexRay bus

Benefits

- Shortened development times result in earlier market launch
- More efficient development lowers costs
- Optimization of the system architecture reduces product costs
- Rapid feasibility studies increase flexibility to integrate the changing demands of the market
- Guaranteed system performance
- Prevention of costly recall actions, caused by run-time errors

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Revision date: 25th May, 2007

Document: 50-0003-01

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