HIL/SIL-Testsystem with Active Middleware

The Solution for Embedded Testing!

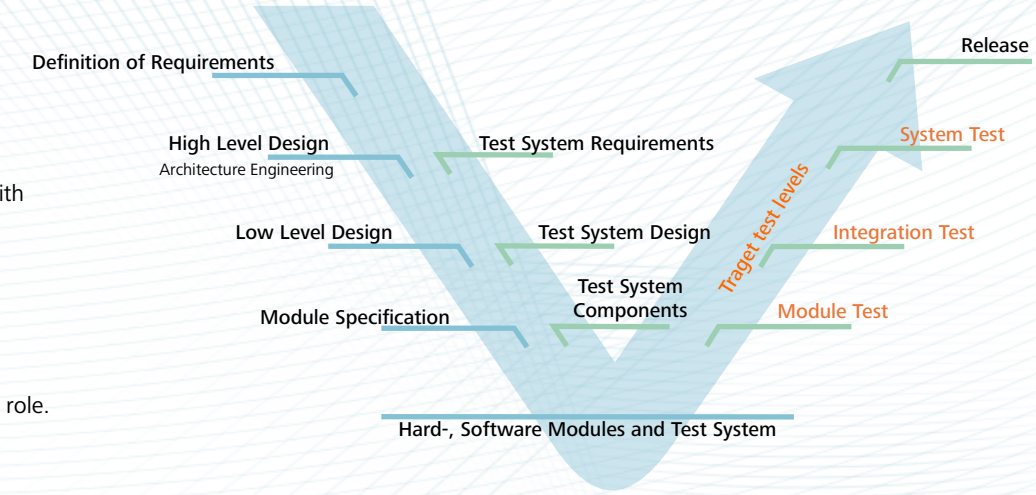
Introduction

In many embedded projects, the planning of a hardware-in-the-loop (HIL) test system is integrated too late into the daily project routine.

Requirements change constantly and interfaces must be adapted. The test system must serve all interfaces and environmental conditions of the device under test (DUT) and at the same time comply with real-time conditions.

Another aspect is the fact that hardware and software for the required interfaces are not always freely available. Often the requirements are so specific that they cannot be covered by one single provider.

In many cases, a middleware-based approach is therefore recommended to be able to change the test systems easily, effectively and quickly, with real-time capability, portability and flexibility playing a major role.



Challenges within Test Projects

- More complex systems
- Variety of different hardware platforms by different companies
- Setting of different priorities (e.g. performance or variety of interfaces)
- Emergence of mutually incompatible systems
- Shorter development cycles

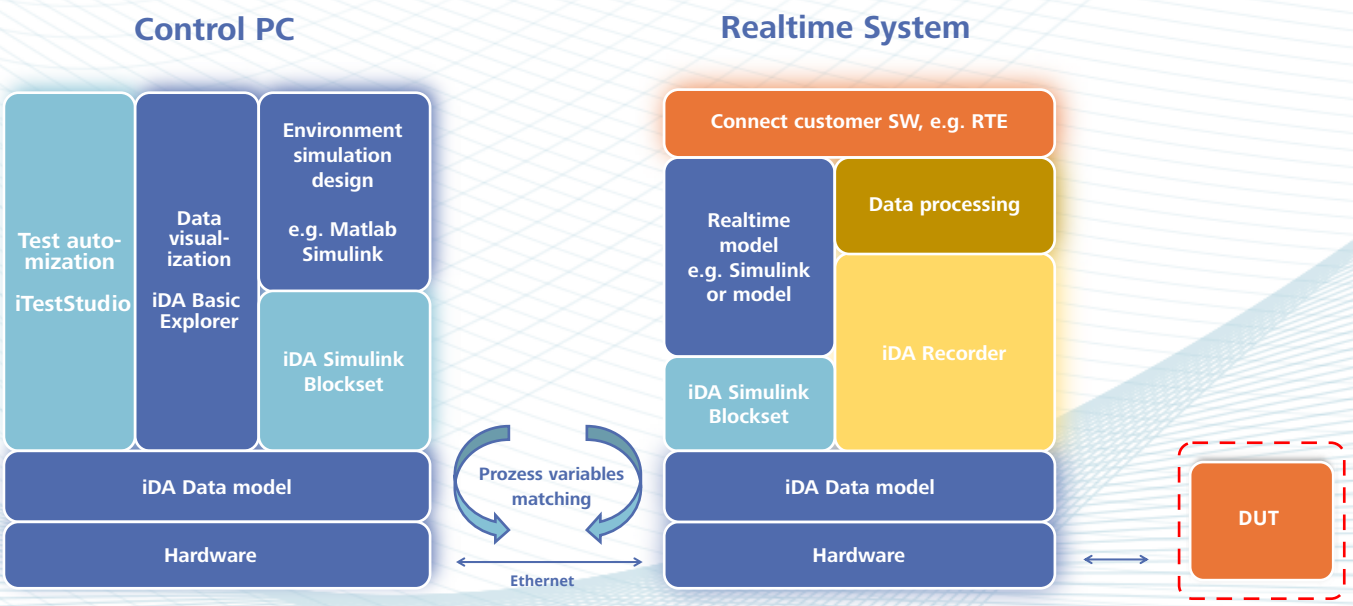
➡ Additional software layer should provide a remedy ➡ Middleware

Advantage

The possibility to assemble the test system freely, independent of the manufacturer / component supplier is a considerable advantage.

The possible mix of equipment also offers security / reliability in terms of availability and delivery time.

The integration of customized sensors and actuators must also be considered. In many cases, a middleware-based approach is then recommended in order to be able to change the test systems simply, effectively and quickly, whereby real-time capability, portability and flexibility play a major role.



Control PC

- Compilation of the test
- Execution of the sequential
- test sequences
- Logging of results, test reporting
- Visualisation of test data
- All tasks that are NOT real-time critical

Active middleware

- Preparation and composition of the test environment (data, sequences)
- Control and monitoring of the test system in a closed control loop
- Control of the environment simulation and plug-ins
- Management of the data (in real-time)
- Everything for an error-free environment for the DUT
- All time-critical tasks
- Easily changeable realtime hardware without reconfiguration (cost-efficient)

iDA Testware specifications

- Applicable in Continous Integration processes
- Easy remote access to data variables
- Can be used from SIL to HIL and covers the test levels from module to system

Performance of demo system: duration of read and set times
(Realtime PC: IPC, i5 12.Gen)

Digital-Plugin:	ca. 20µs
Analog-Plugin:	ca. 20µs
CAN-Plugin:	ca. 3µs
Total duration of one cycle:	ca. 60µs
Digital card:	96 free configurable digital IOs
Analog card:	16 input channels (ADC)
	8 output channels (DAC)

Application Examples

Full-size HIL-System

- Power Supply Unit
- Signal conditioning
- Connection Box
- Communication Box
- DUT module
- Real-time computer
- Fault injection unit
- Load Box
- Test device power supply
- Easily reducable to Mini-HIL-setup

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Mini-HiL

- Test system set-up suitable for the developer
- Cost-efficient and space-optimized
- Abstraction of the hardware via active middleware
- Automated test sequences, for example via iSyst iTestStudio
- Modularly expandable hardware for various interfaces, e.g. CAN, FlexRay, digital & analog I/Os, SPI, SENT, PSI5
- Easily expandable to full-size HIL-system

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