Deployment of Boundary Scan Based HW Self-test in a radio base station

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INTRODUCTION

HW Self-test is a part of Fault Management and maintenance system in a radio base station. Traditionally HW Self-test has been implemented as functional tests, using the HW in operational mode. Fault detection and coverage capabilities of functional tests are quite abstract.

Current complex IC technologies offers opportunities to implement advanced internal Self-tests (BIST) i.e. IJTAG of the devices along with features for test of device to device interfaces. The test functions can be accessed through the board level JTAG bus.

When exploited on board level with an Embedded Boundary scan test engine these new test opportunities will be a complement to the legacy tests and hence increase the test coverage and diagnostics drastically for Fault management and maintenance.
WHY HW SELF-TEST

- HW self-test is mainly intended for use in the field
- Faults may occur due to reliability issues and ageing
- Faults may occur due to software problems
- The HW is continuously supervised by HW and SW, issuing alarms at fault indications
- The operator may observe strange behaviour not yet alarmed by supervision system, e.g. cyclic restarts of SW

Field test purposes
- Detect latent faults at (re)start of boards
- Validate HW faults related alarms, pinpoint replaceable unit
- Decrease capacity instead of shutdown until next service
- Avoid non-faulty units being sent to repair (NonFaultFound)
New HW Self-test Approach

HW Self-test is mainly intended for test in the field:
- At power-up and restart
- Automatically at fault escalation
- Ordered by operator via management system
- Fault/signature storage
- Diagnostics at repair or remote
- Fault isolation down to replaceable hw unit/component

Power-up Test flow
1. Boundary scan based MBIST and LBIST of ASIC’s
2. Potentially also BIST of DSP’s and complex IC’s, provided by vendors
3. Boundary scan based interconnect test
4. Reset and load of application SW
5. Functional memory test
6. Functional internal interface test at-speed
7. (Functional test of other complex devices)
Embedded Boundary Scan Test overview

- Embedded Scan Engine
- Test Vectors
- Test Program (Sequence&Ctrl com)
- Result compare (GoNogo)
- Result Storage

- Test Development
- Control of test sequence
- Result capture
- Fault analysis
- Extended diagnostics tools

Maintenance System
Other sources

Test Manager, Remote control
& Development tools

Traditional Boundary Scan

i.e. Ethernet, RS232

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Saab Boundary Scan Concept

Test exec

TSTAP-PG

SVF + APL, GEN

TSTAP-RT

Traditional Bscan test

Ethernet

System Management

Electronic product

Saab Embedded Scan Engine

Control SW

TAP

Control SW

PC SW
Saab Embedded Scan Engine

Platform Adaptation

Customer Specific Functions
e.g. signaling

Saab Run Time
Scan Engine

NRE
Base SW
Saab Embedded Scan Engine- TSTAP-EMB
Main functions

- Run/ control embedded Bscan test vectors
- Interface to customer signaling and remote test control
- Analyze and debug interface to external Saab TSTAP-RT environment
- Fault signaling and storage of fault signatures

Saab Embedded Scan Engine has a modular and scalable structure and consists of different building blocks configured according to customer requirements and needed functionality.

Runs under different operating system
System requirements

- A microprocessor which executes C– code and controls the TAP port
- Minimum 32 Kbyte Flash memory for the scan engine and test vectors in a small application. On board fault analysis requires more memory.
- Communication interface, RS232, Ethernet…
CONCLUSIONS

Remote Boundary Scan is a technique that enables remote isolation and handling of errors.

The technology uses already built in tests (Vendor) in electronic components and thus is very cost effective.

Best cost effectiveness is obtained if implemented in the design phase (DFT).

Reuse of test vectors - verification - production - embedded - repair.

The Remote Boundary Scan will significantly reduce logistics footprint – yet improve operational capability and stability.

On demand increase/adaptation of capabilities are possible to offer by remote upgrades.

Product unique test vectors are a part of the product - CM.

Test development is largely simplified, using traditional JTAG development platform and methods.