

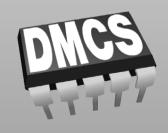
CM045/TCK7 Test-Stand

Test-Stand for High-Performance FPGA Computing Module

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Department of Microelectronics and Computer Science Lodz University of Technology, Poland

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3rd MicroTCA Workshop for Industry and Research



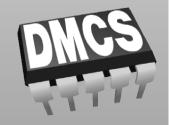
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Presentation Outline

CM045/TCK7 Test-Stand

- Motivation for Test-Stand Development
- High-Performance FPGA Computing Module
- Scope of Automated Tests
- Hardware Solution for Test-Stand
- Software Solution for Test-Stand
- Conclusion



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Motivation for Test-Stand Development

CM045/TCK7 Test-Stand

Motivation

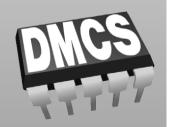
FPGA Module

Scope

Hardware

Software

Conclusion



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TCK7, an AMC computing module was developed for DESY by DMCS,

the module was commercialized by Vadatech as CM045,

10 already manufactured, 40 more to come,

each module has to be tested to detect possible assembly problems.



High-Performance FPGA Computing Module

CM045/TCK7 Test-Stand

Motivation

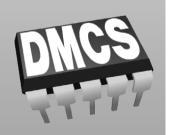
FPGA Module

Scope

Hardware

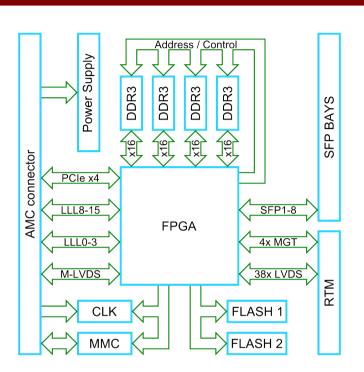
Software

Conclusion



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CM045 / TCK7 module contains:

- Kintex-7 FPGA,
- 16 Gb of RAM,
- 28 multi-gigabit links, up to 12.5 Gb/s per link,
- 2 SPI FLASH memories.



Scope of the Tests #1

CM045/TCK7 Test-Stand

Motivation

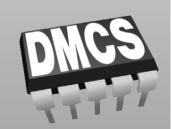
FPGA Module

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Legacy CM045 Test reports:

about 140 simple tests/measurements,

several hours to complete one report.

Can these be done automatically?

YES!

Can we get the same test coverage?

Well, NO, but...



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Scope of the Tests #2

CM045/TCK7 Test-Stand

Motivation

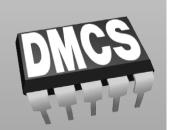
FPGA Module

Scope

Hardware

Software

Conclusion



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No, but:

- we can still get about 90% coverage,
- some of the test were redundant.

So, by doing an automated test-stand:

- it is possible to greatly speed up the testing,
- the tests can be more repeatable,
- no need for writing down the measurements,
- preparation of measurement reports is much faster.



Scope of the Tests #3

CM045/TCK7 Test-Stand

Motivation

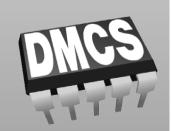
FPGA Module

Scope

Hardware

Software

Conclusion



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What will be measured / verified:

- 8 power supply voltages,
- 5 temperature sensors,
- 9 clock signals, 2 PLLs,
- operation of FPGA, CPLD and MMC,
- operation of 16 multi-gigabit links including PCIe x4,
- DDR3 memory access,
- RTM board communication (IPMI, parallel LVDS link, multi-gigabit links),
- SPI FLASH memory access,
- front panel LEDs.



Hardware Solution for Test-Stand #1

CM045/TCK7 Test-Stand

Motivation

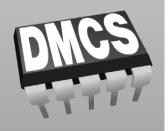
FPGA Module

Scope

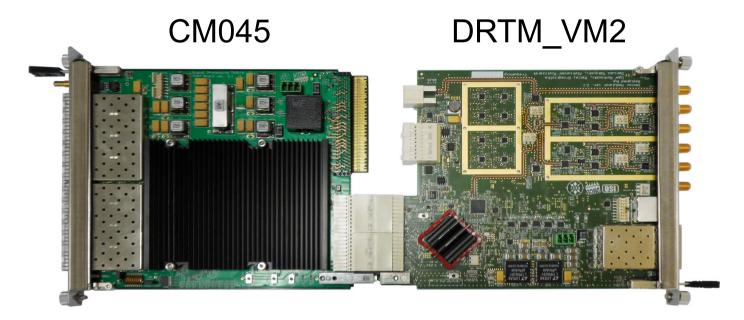
Hardware

Software

Conclusion



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Test-Stand bitstream

- Test-Stand bitstream
- Firmware upgrade bitstream
- MMC firmware
- CPLD application



Hardware Solution for Test-Stand #2

CM045/TCK7 Test-Stand

Motivation

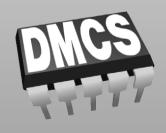
FPGA Module

Scope

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Software

Conclusion



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MTCA shelf MCH **CPU** Xilinx DRTM_VM2LF function generator



CM045/TCK7 Test-Stand

Motivation

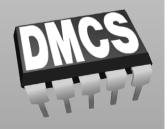
FPGA Module

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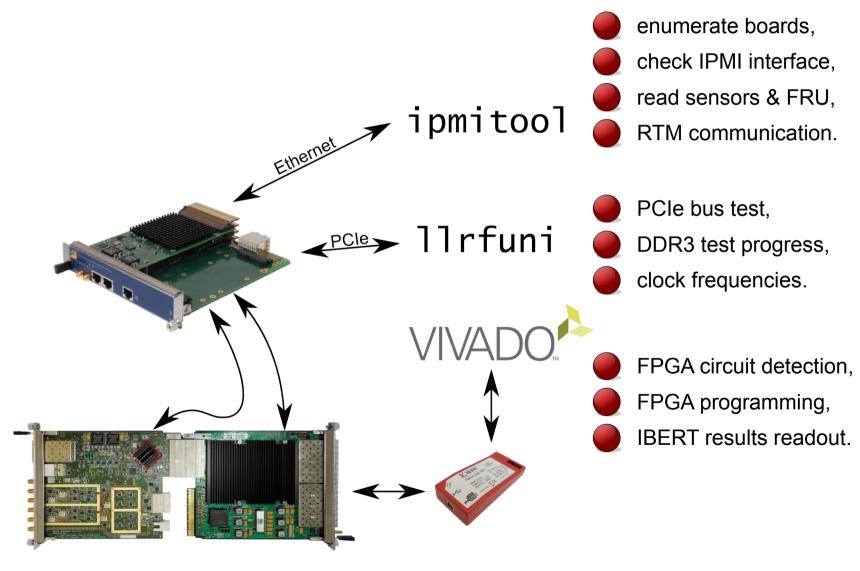
Hardware

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CM045/TCK7 Test-Stand

Motivation

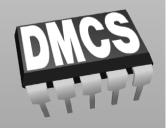
FPGA Module

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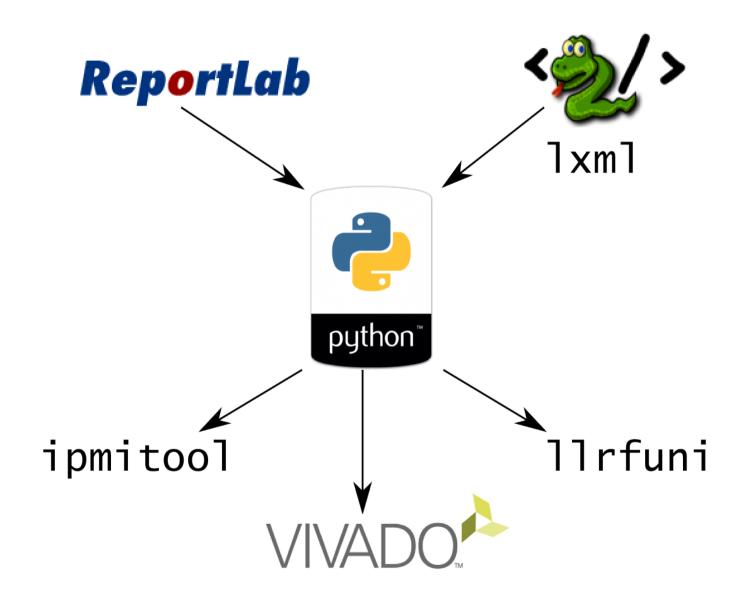
Hardware

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CM045/TCK7 Test-Stand

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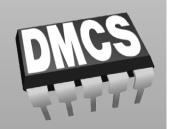
FPGA Module

Scope

Hardware

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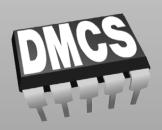
FPGA Module

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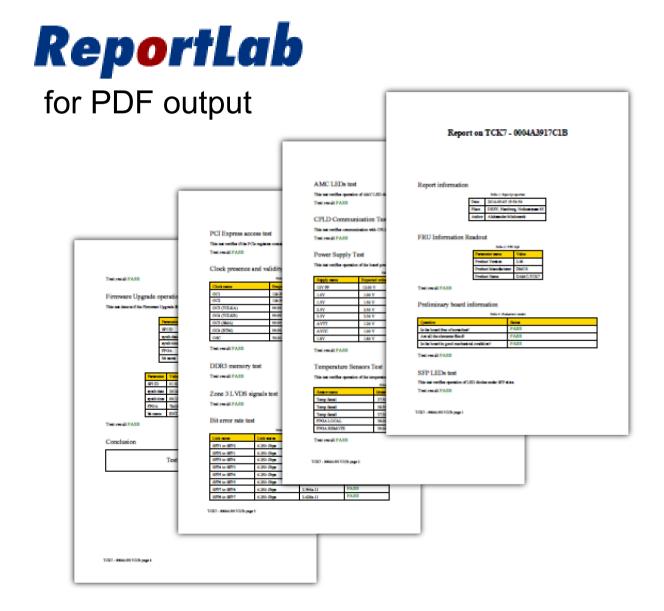
Hardware

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Conclusion

CM045/TCK7 Test-Stand

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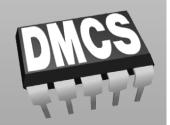
FPGA Module

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The developed Test-Stand:

- requires only single GNU/Linux machine to run,
- can be installed on MTCA compliant CPU,
- does not require any dedicated hardware,
- uses only free and open source components,
- saves a lot of tester's time,
- covers almost all of the functionality ever used,
- improves test repeatability,
- generates a nice report.



CM045/TCK7 Test-Stand

Motivation

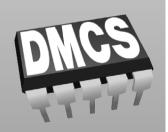
FPGA Module

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Thank you for your attention.