mipi® DEVCON

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Using the Protocol To Simplify PHY Testing: A Practical Example with MIPI UniPro℠

2017
MIPI ALLIANCE
DEVELOPERS
CONFERENCE

BANGALORE, INDIA
MIPI.ORG/DEVCON

Agenda

- Problem Statement
- General Solution
- MIPI UniPro PHY Test Mode
- Proposed Solution

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Problem Statement

- It's often challenging to do MIPI PHY® test, due to the lack of a standardized, widely adopted test mode
- Specs contain "Recommended Test Functionality" as annex, but informative
  - It still requires the user to implement a dll for a test automation software to control the DUT and to perform the tests
  - It also requires out-of-band DUT control capabilities
- Loopback is widely used, but some features can't be tested with standard equipment (e.g. MIPI M-PHY PWM), and manual reconfiguration is needed between tests
- Manufacturers' validation teams need to invest time (and $$) to prepare for testing
- Certification workshops (e.g. UFSA) become increasingly complicated

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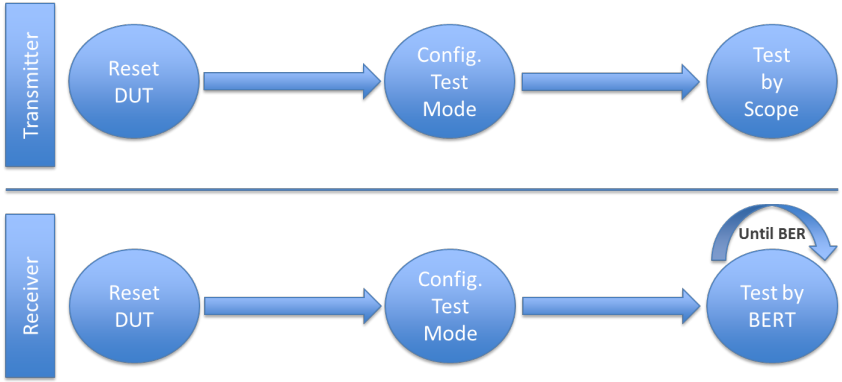
General Solution

- A Test Mode defined in the protocol layer simplifies testing
- Requirements:
  - In-band configuration of the DUT for each test must be possible
  - DUT must remain in test mode until explicitly disabled
  - DUT must implement counters and it must be possible to retrieve them in-band



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UniPro PHY Test Mode

- Mandatory
- Enter test mode through PACP_TEST_MODE_req frame
- Allows lane distribution setting (single- and multi-lane test possible)
- Configure transmission mode and speed
- RX test:
  - Implements Frame and Error counters
  - Counters can be retrieved in-band through TX
- TX test:
  - The DUT can be configured to transmit a CRPAT pattern for testing with the oscilloscope

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Proposed Solution

- Use the UniPro Test Mode to test the Physical Layer
- Train DUT into each required test mode
- Poll DUT frame and error counters
- UniPro counters are global, can test all lanes simultaneously to save time
- Everything must be done in-line, no sideband connection needed
- Must require little or no customization

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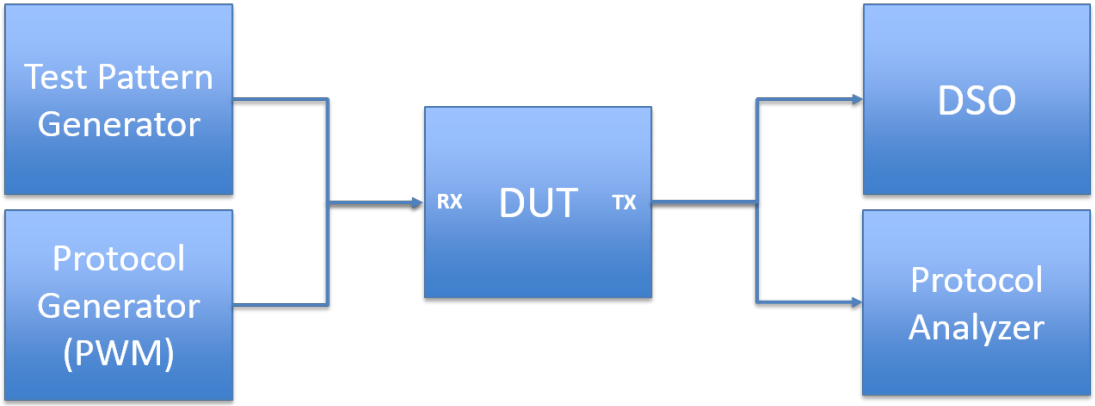
Proposed Solution

- Hardware:
  - Oscilloscope for TX test and calibration of the RX test setup
  - High speed data generator for test pattern generation for RX test
  - Protocol generator and analyzer for device configuration and frame and error counter reception



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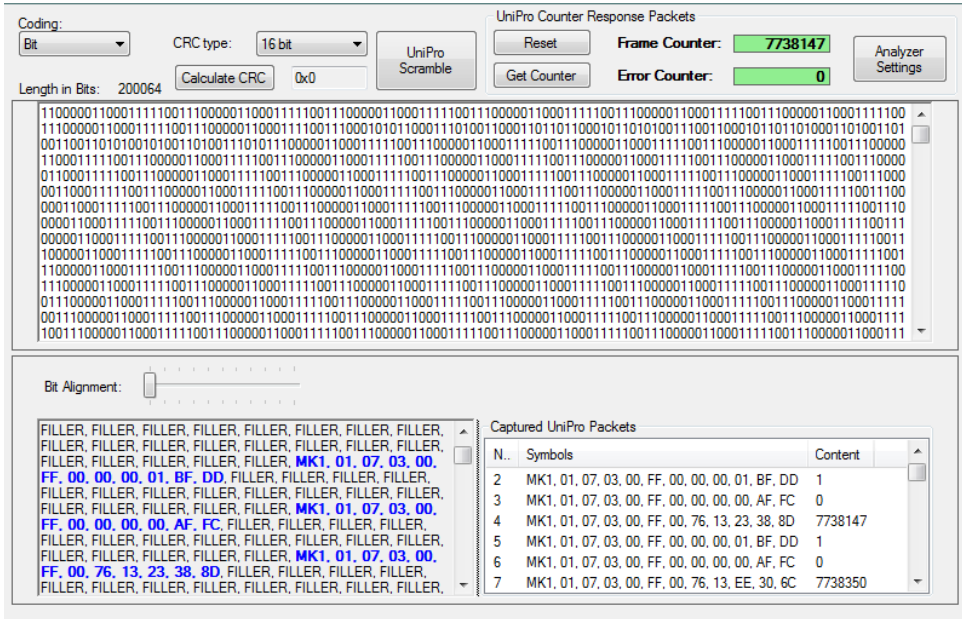
Proposed Solution

- Debug Software:
  - Individual adjustment of each PHY parameter (timings, levels, jitter)
  - Test script wizard for automated generation of configuration pattern for each gear and mode
  - Ability to control DUT configuration flow
  - Poll and decode frame and error counters from DUT



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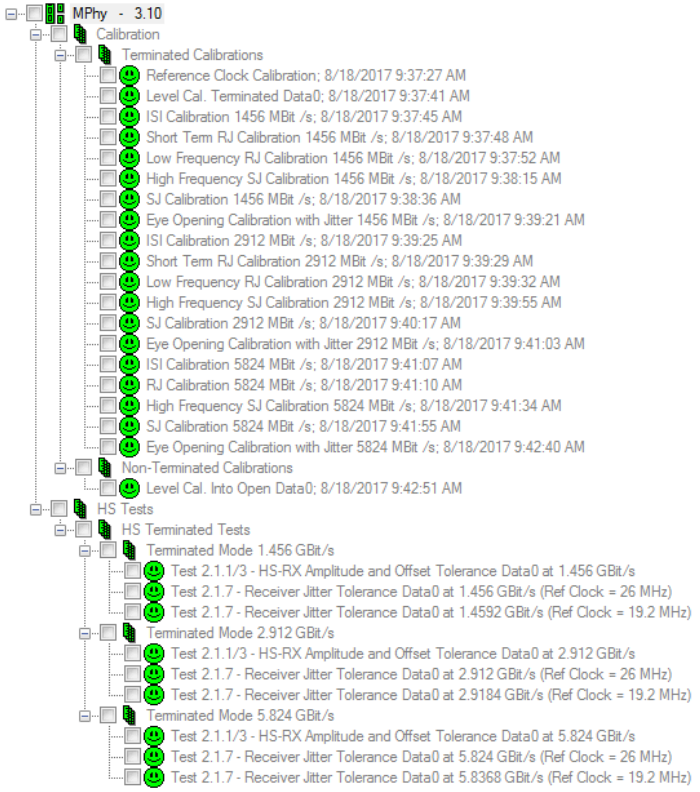
Proposed Solution

- Test Automation Software:
  - Automated calibration of stress signal
  - Automated DUT configuration for each CTS test
  - Automated testing for each CTS item
  - Test report generation



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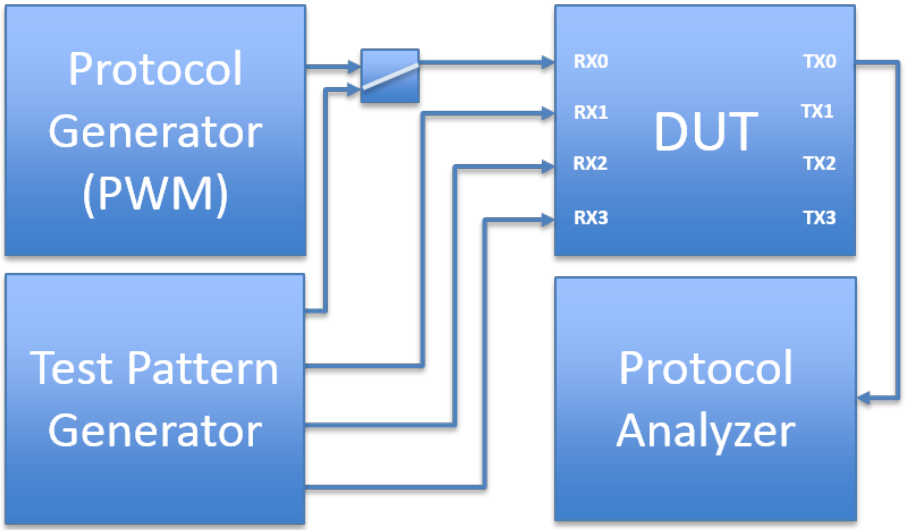
Proposed Solution

- Use Case RX test
  - DUT Data0 RX is connected to switch that can alternate between test pattern generator and protocol generator
  - DUT Data1-3 RX connected directly to test pattern generator
  - DUT Data 0 TX connected to protocol analyzer
  - DUT RST_n also controlled to alternate test modes
- Test Flow
  - Automation connects protocol generator to DUT
  - Hardware Reset sent to RST_n of DUT
  - Protocol generator sends link configuration pattern to DUT
  - Automation connects test pattern generator to DUT
  - Test pattern generator sends test pattern to DUT, interleaving Frame and Error counter requests
  - DUT responds, protocol analyzer captures response and test automation decodes it
  - Test goes on until DUT reports errors or target BER is achieved



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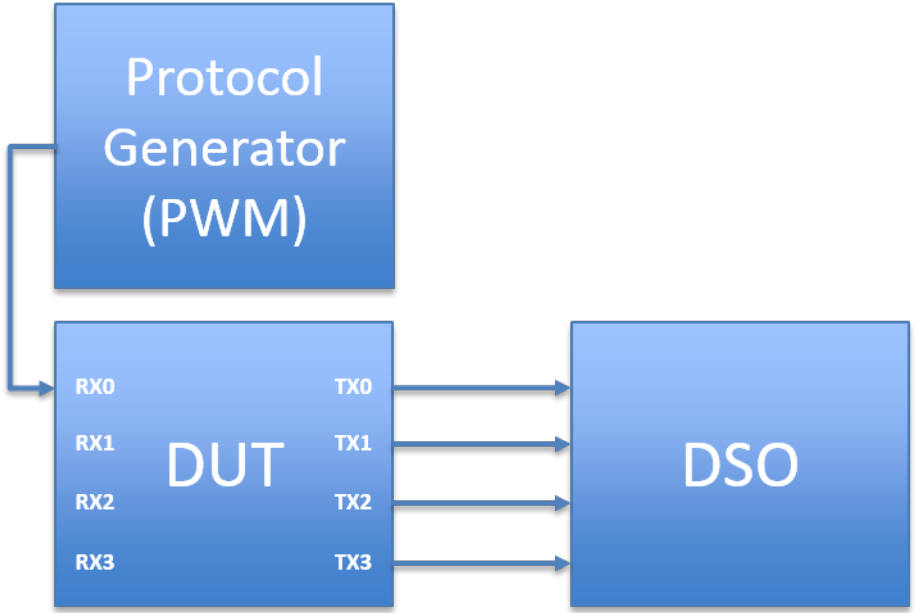
Proposed Solution

- Use Case TX test
  - DUT Data0 RX is connected protocol generator
  - DUT TX Lane under test is connected to oscilloscope
  - DUT RST_n also controlled to alternate test modes
- Test Flow
  - Protocol generator sends Hardware Reset to DUT
  - Protocol generator sends link configuration pattern to DUT
  - Automation controls oscilloscope TX Test software to run selected tests



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- Live demo in our booth!

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Questions?

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