Exploring Protolink

Effective Debugging from Firmware to Hardware

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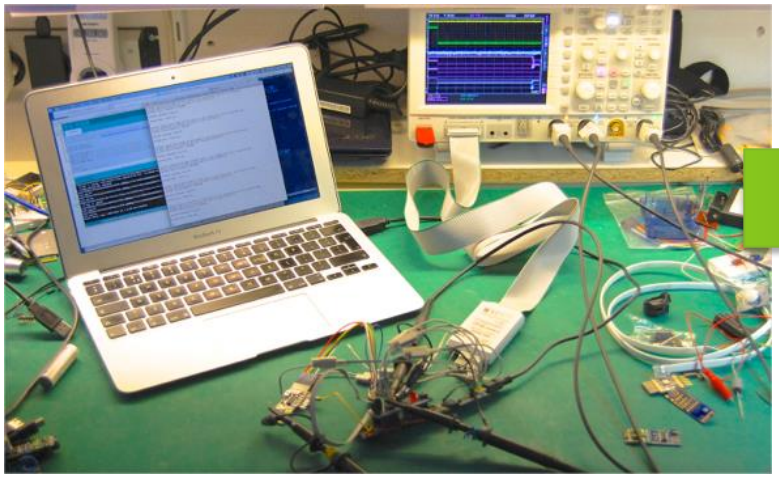
"The World's Smartest Debugging"

Debugging Scenario



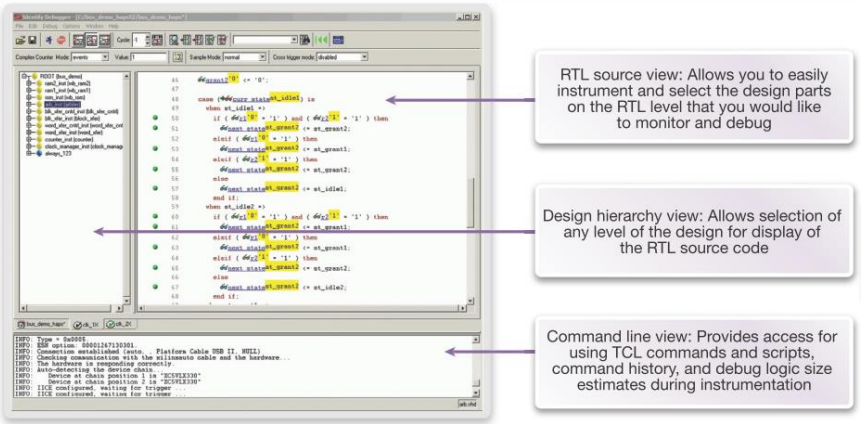


Figure 1: The powerful Identify Debugger GUI allows you to quickly navigate through your design and to debug the RTL source code

Make the world a better place…

……*at least for our engineers*

- **Imagine if you could…**
  - Found bug easier
  - Fix bug quicker
  - Go home earlier
  - Product will be stronger
  - Revenue will look better
  - Number on your pay slip will be bigger

Three Inspiring Stories for Free

-What is it? What can it do?

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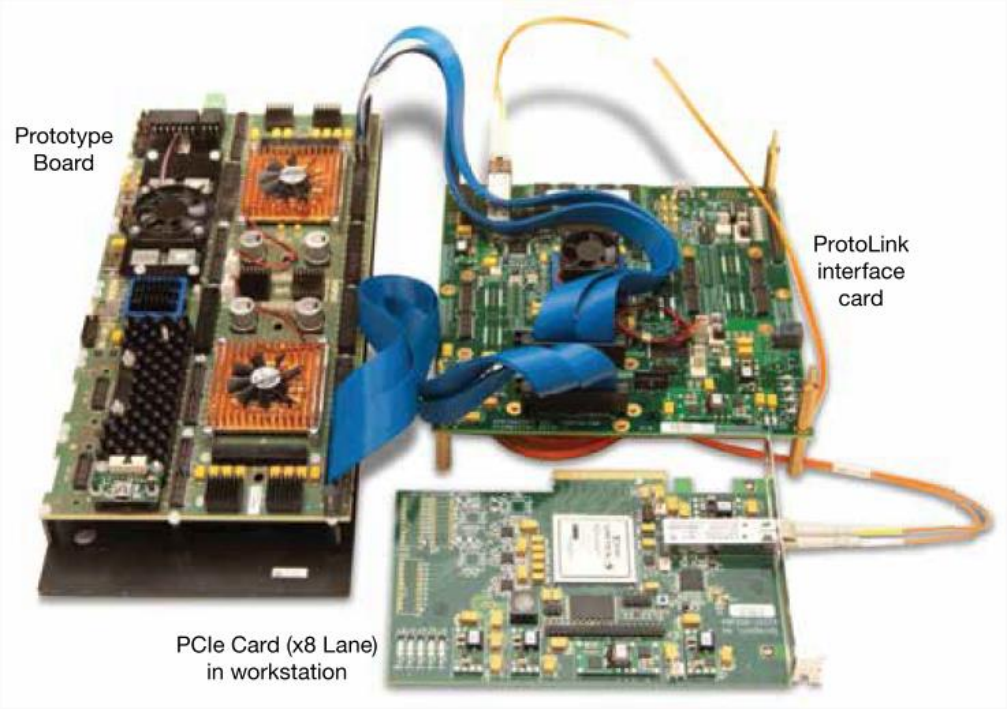
- ***Long capture length(<1s)***
- ***High speed (125MHz)***
- ***Easy connection***
- ***Easy to use***
- ***Fast eco***
- ***…***



Case Study

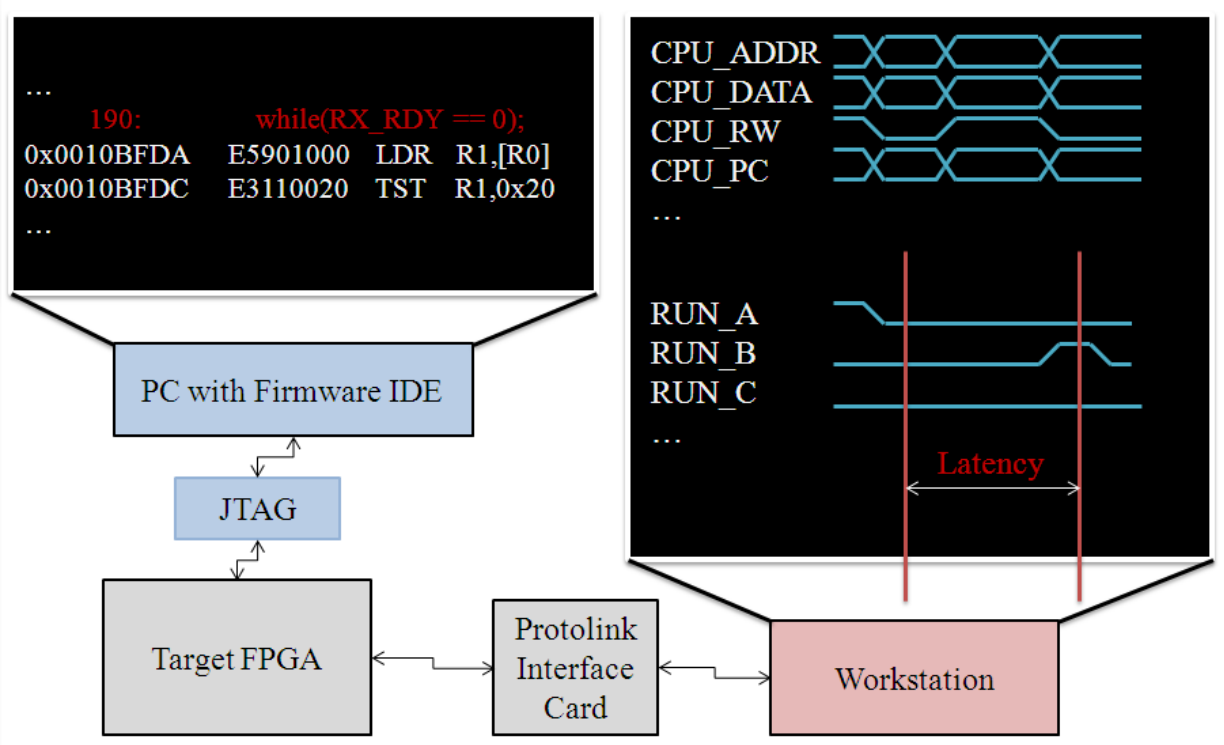
Firmware Flow Tracer

Firmware Flow Tracer

-Performance monitor

- Before
  - Output value to GPIO as check point, capturing by Logic Analyzer
  - No hardware latency information

NOW=> Performance measure by firmware check point, with the ability of analyzing Hardware Event at the same time

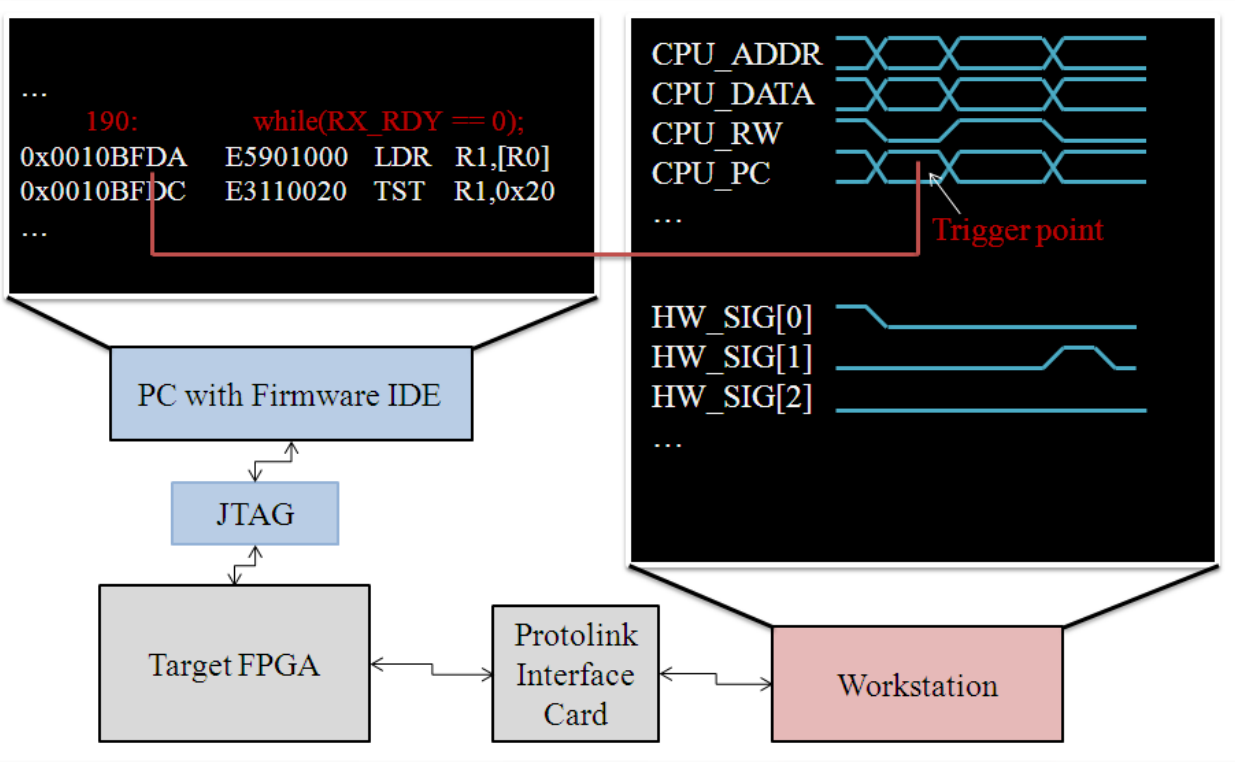


Firmware Flow Tracer

-Firmware execution and hardware status mapping

- Before
  - Error occurs while Firmware “Freerun”, often under RTOS
  - Firmware engineer debug purely by experience

NOW=> Further investigate into firmware flow by mapping machine code. Able to distinguish whether it is a firmware multi-task scheduling issue or an actual hardware bug

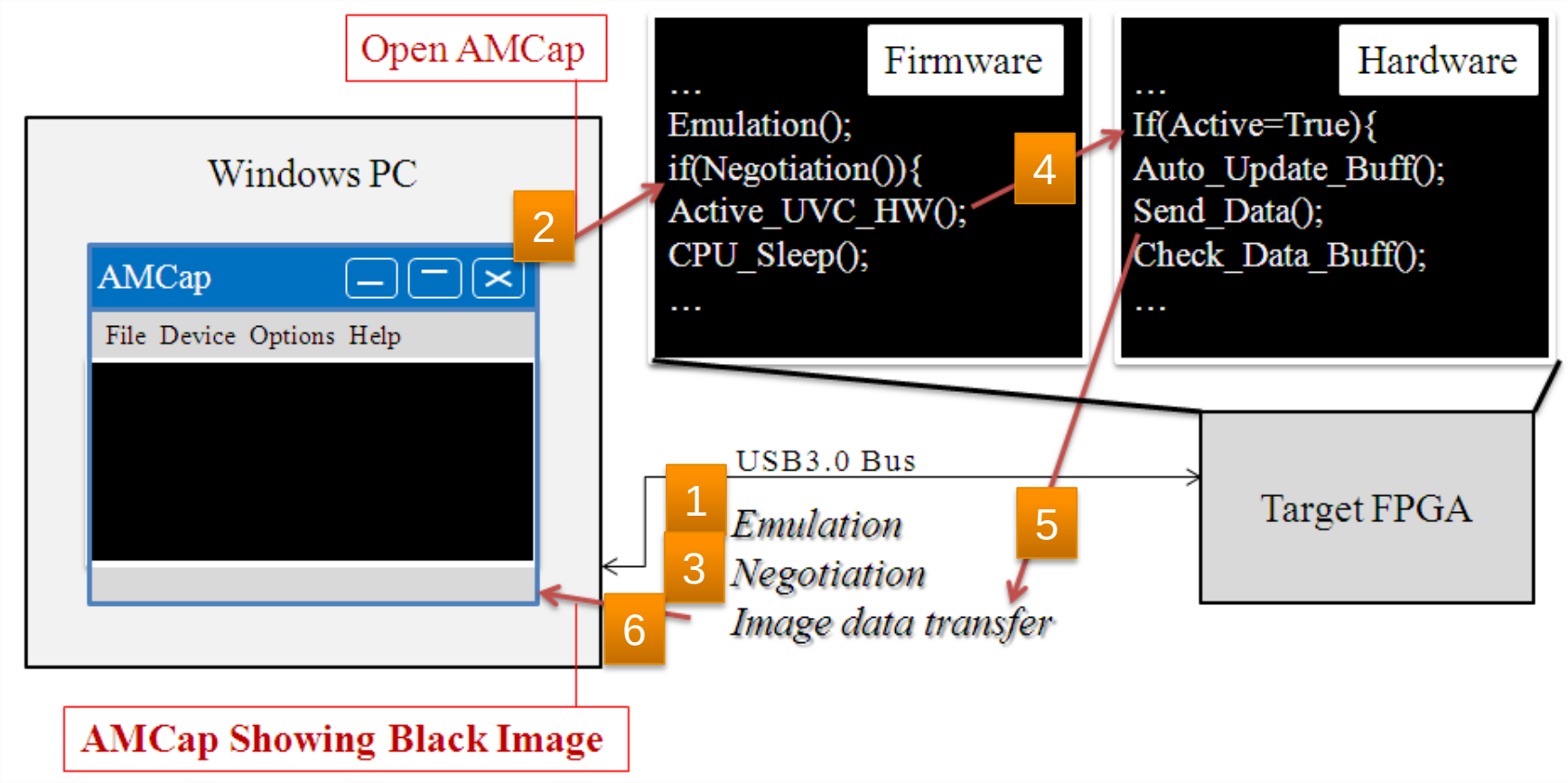


Case Study

Synchronize with 3rd Party Debug Tool

Problem: no Image shown on AMCap

-UVC Controller malfunction?



- AMCap will not display correct image unless it received correct data. (format, frame size…)

Found: Oversized Image Payload

-UVC Controller malfunction! ***But now what?***

- Oversized Image Payload occurs randomly, so there will be no hardware trigger point
  - Identify relies on specific trigger point

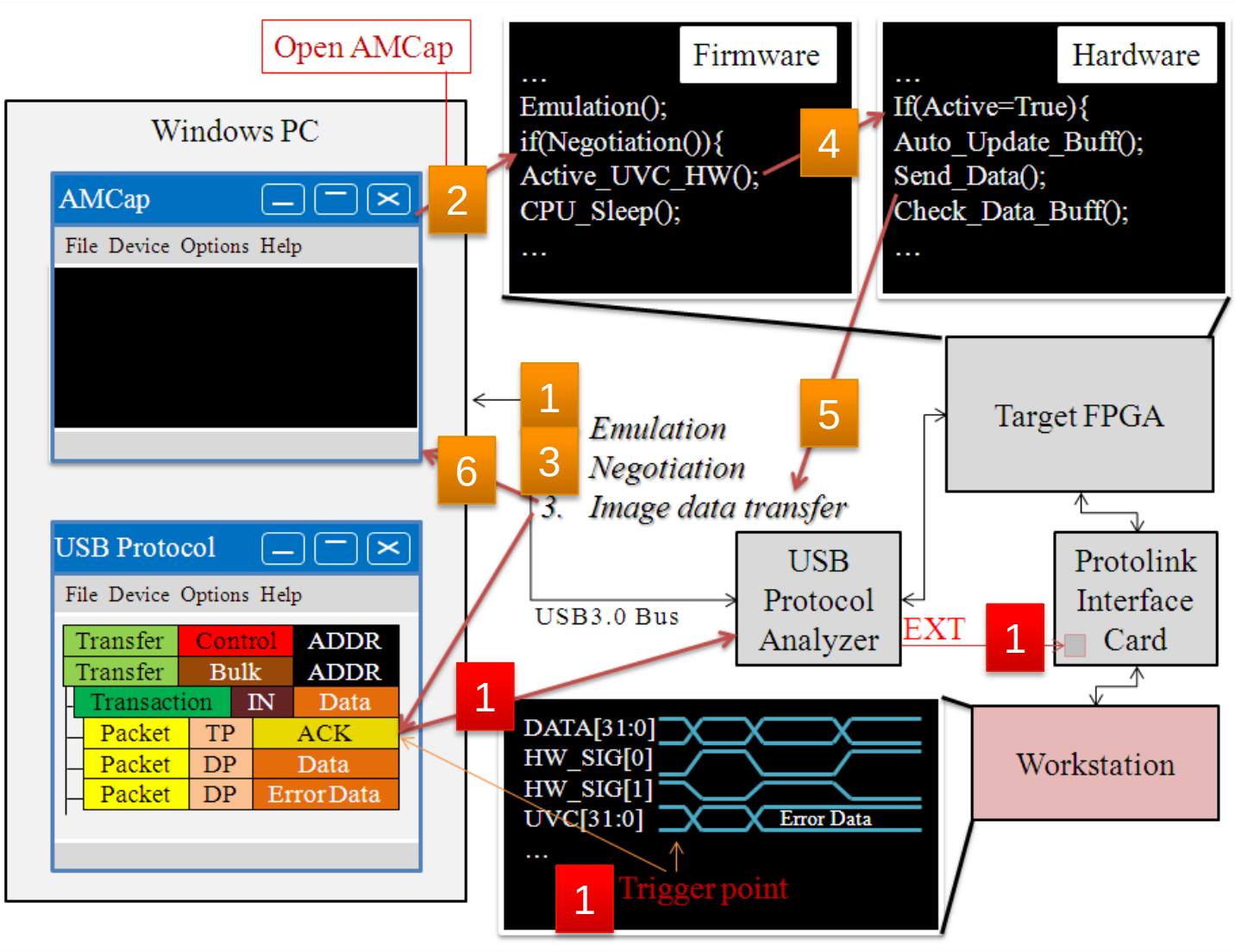
- It takes 33ms to transfer entire data of one Image Frame
  - Duplicate in Simulation environment is impossible
  - Still no specific hardware trigger point

Before => No solution!

Solution: Sync with USB Analyzer

-Capture hardware signal for almost 1s!

NOW=>
<2 Days



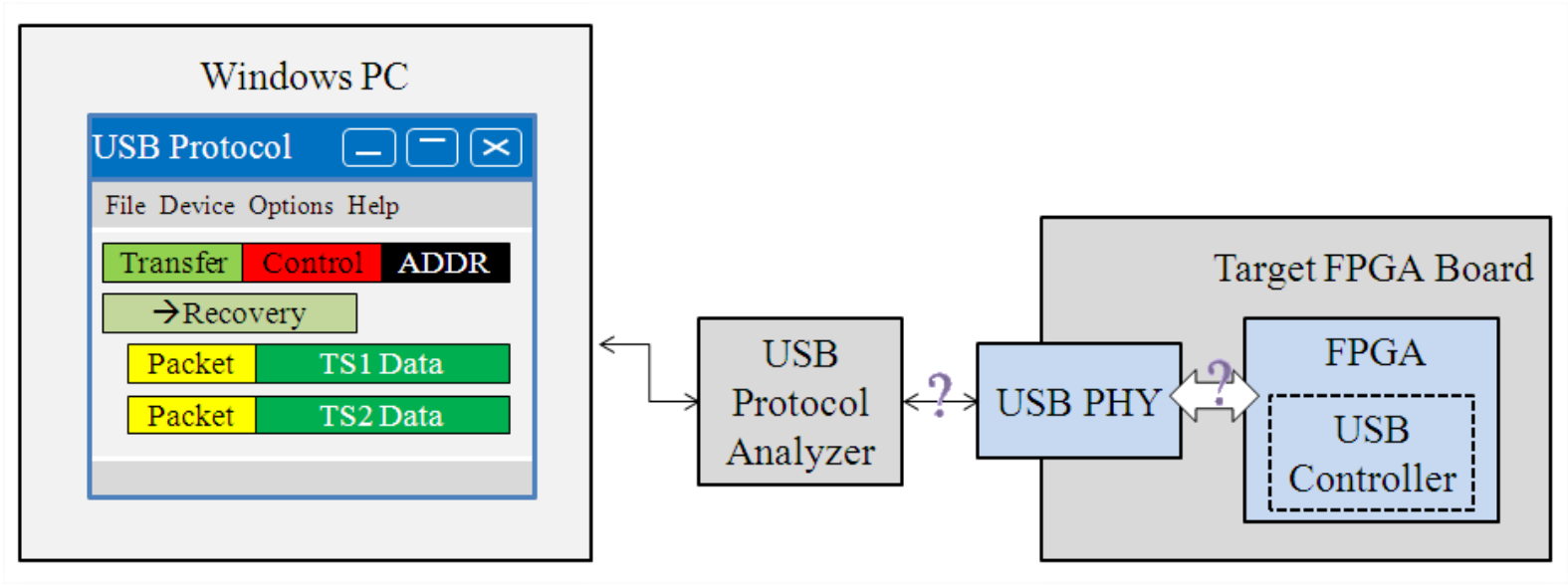
Case Study

125MHz USB3.0 Interface Debugging

Problem: Unexpected Recovery

-the source of incorrect link packet?

- Enter into Recovery mode randomly during “burn-in”
  - Performance drop
  - Potential design flaw

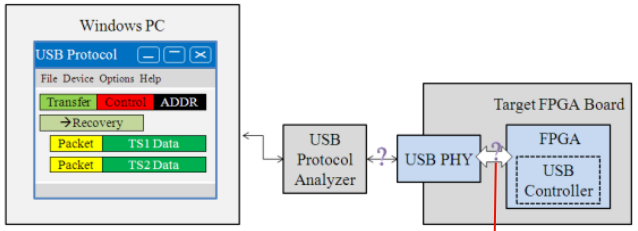


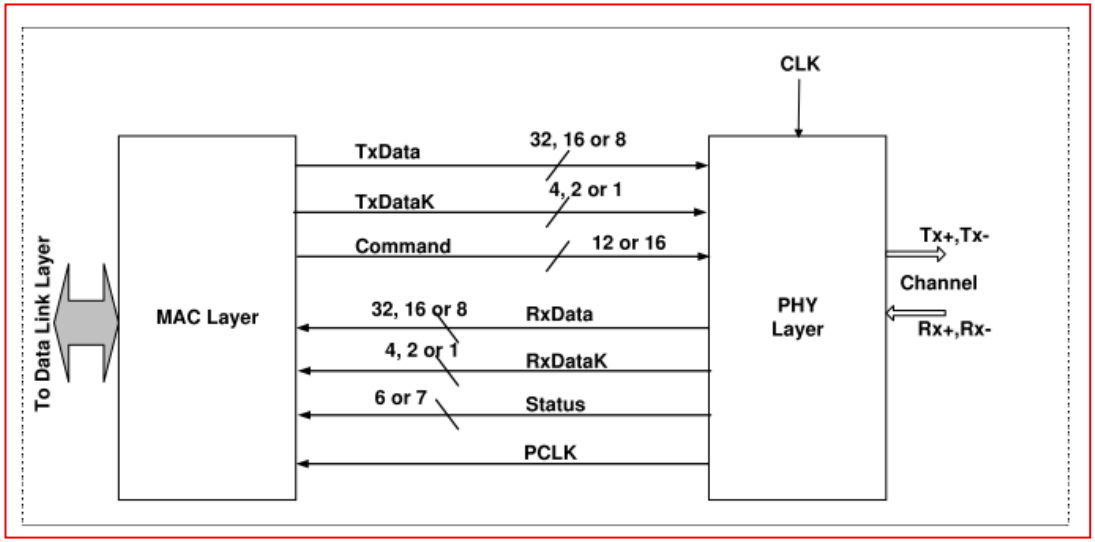
Who’s to blame?

Solution: 125MHz Probe & Sync

-Easy to setup

- 125MHz PCLK as Protolink Synch Probe Clock
  - Max user clock (TDM=1)
- Synchronize with 3rd Debug Tool
  - Trigger “Recovery”

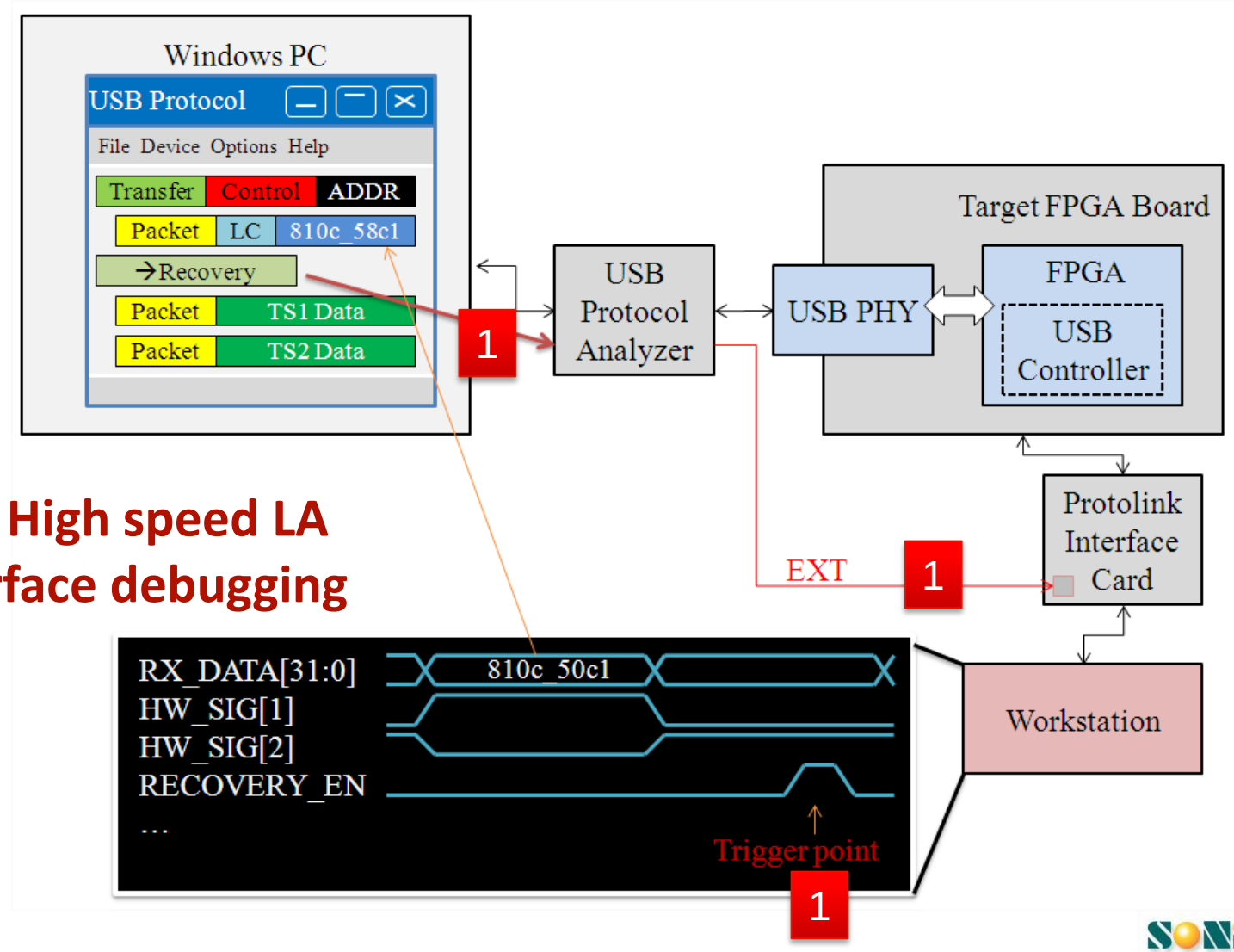




Note: Only 64*6 probe signals are allowed at 125MHz Synch Probe mode.

Result: Quick Clarification

-PHY or Board level issue



NOW=> High speed LA for interface debugging

Summary

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- Better co-working between firmware and hardware engineer
- Sync with other debug tool => Trigger point
- Feel safe
- Drawback: Feel terrible when going back to LA/Identify debugging!


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Now That's Smart.


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Thank You