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Innovative Software Tools & Methods to Profile, Test and Optimize UEFI Firmware Improving Test Coverage and Debug Results

UEFI US Fall Plugfest – September 20 - 22, 2016

Presented by Kevin Davis (Insyde Software)

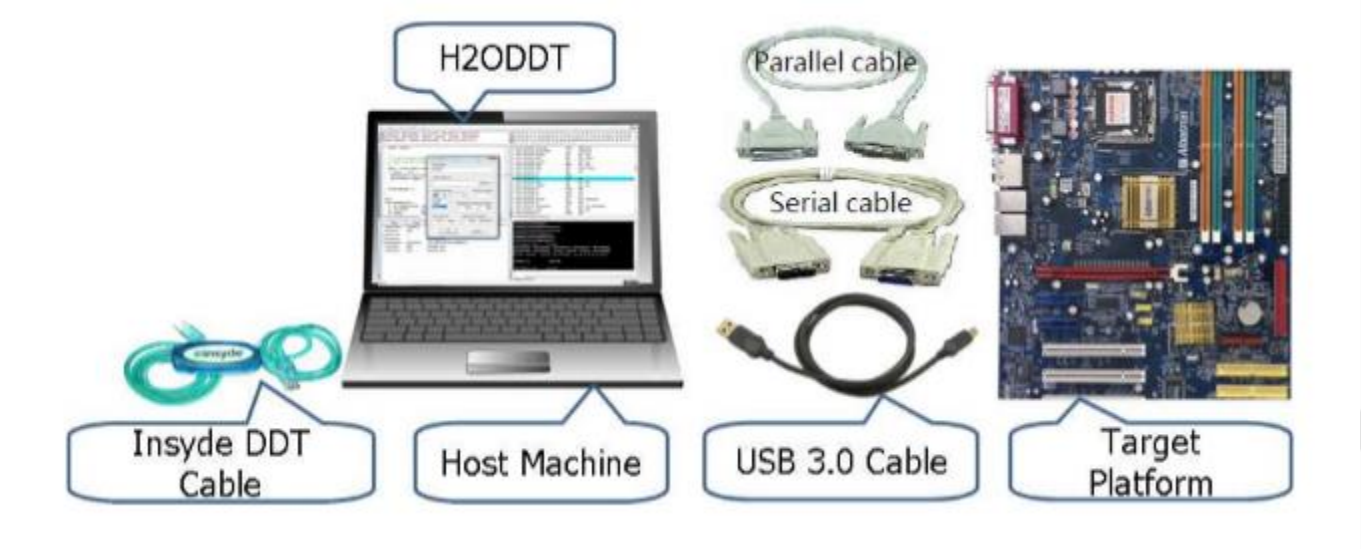
Agenda

- Introduction
- Intel Processor Trace Buffer
- Driver Profiling
- Code Coverage Display
- Questions?

Debug Models

- Hardware Level Debuggers
  - Physical Access to board required
  - Complexity of connection to board
  - No or minor impact to software execution
- Software Level Debuggers
  - No need to have physical access to the board
  - Some impact to software execution
  - Complexity of sharing a processor

Define Software Terms

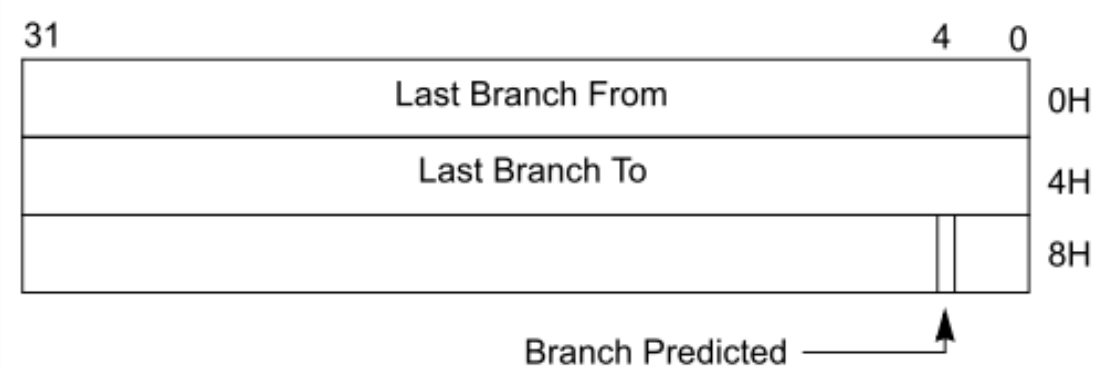


- **Host Machine** – runs the User Interface of the Software Debugger to the engineer
- **Target Platform** – runs the BIOS interface of the Software Debugger

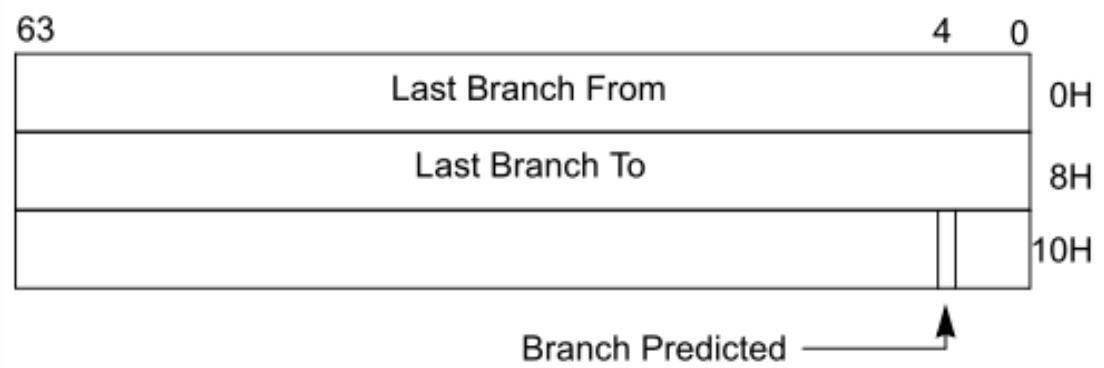
Innovation of Branch Tracing

- Previously to trace, SW debuggers broke on either each instruction or at branches
  - On each break:
    - Transmit data to host or store locally
    - Check various debug control conditions
    - Restart next instruction
  - Very slow execution
- Now with Branch Tracing
  - SW debugger stops on a condition
  - Unwinds execution trace to previous IP or size of the Trace buffer
  - Target code executes much faster

Branch Records



32-bit Branch Trace Record Format



64-bit Branch Trace Record Format

Solving new problems

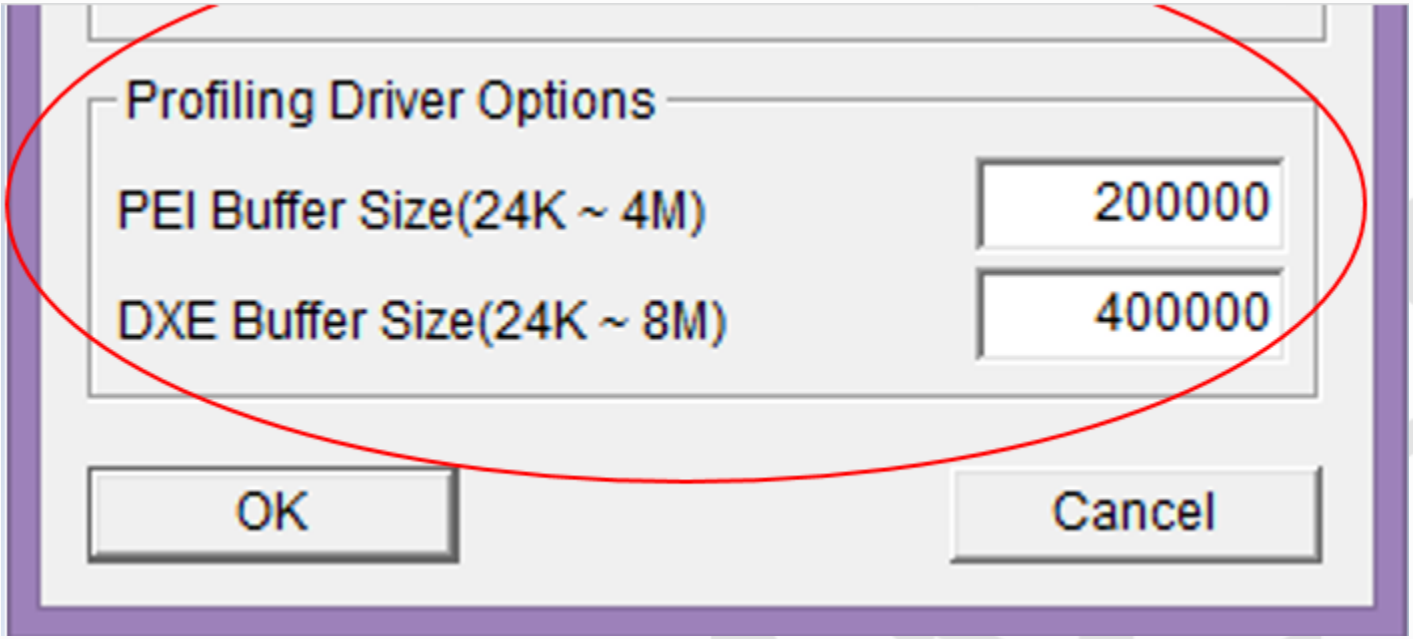
- More features can be created in a software debugger
  - Unravel call trees
  - Highlight areas called by Oss
  - Find long hardware I/O loops
  - Figure out where a crash started
  - Test sequence code coverage
  - Profile specific drivers

Profiling Drivers

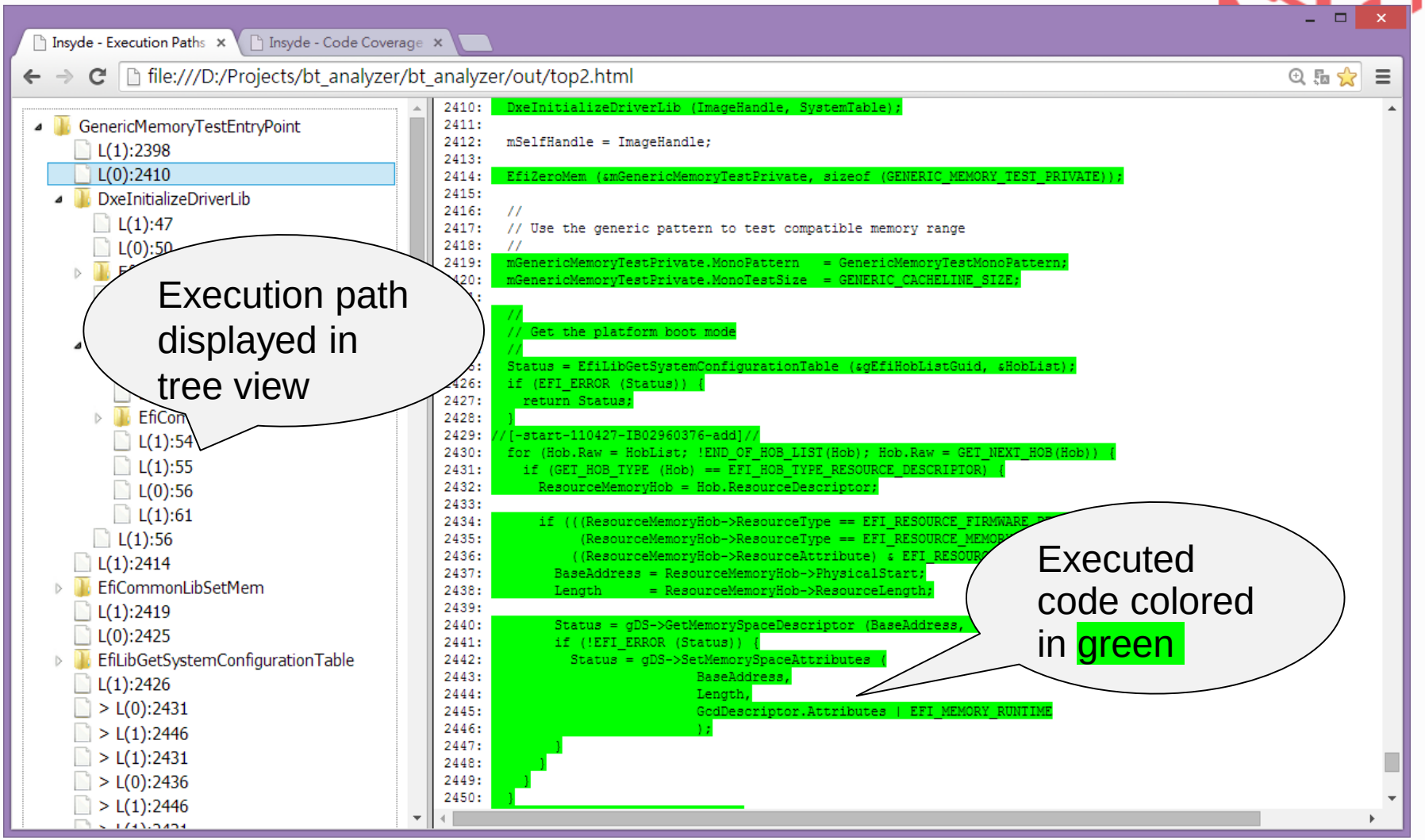
Steps to profile a driver

Update to Bios	Debugger	Log Analysis
Update debug engine to support Profiling	Setup Profiling buffer size from Project Setting dialog	Select Profiling Analyzer from Profiling menu to start profiling analysis
Build bios with non-optimized and generating debug info	Enable/Disable Profiling from Profiling menu	The reports will be displayed on Report view after completion

Setup Trace Buffer sizes



Profiling Execution Flow Example

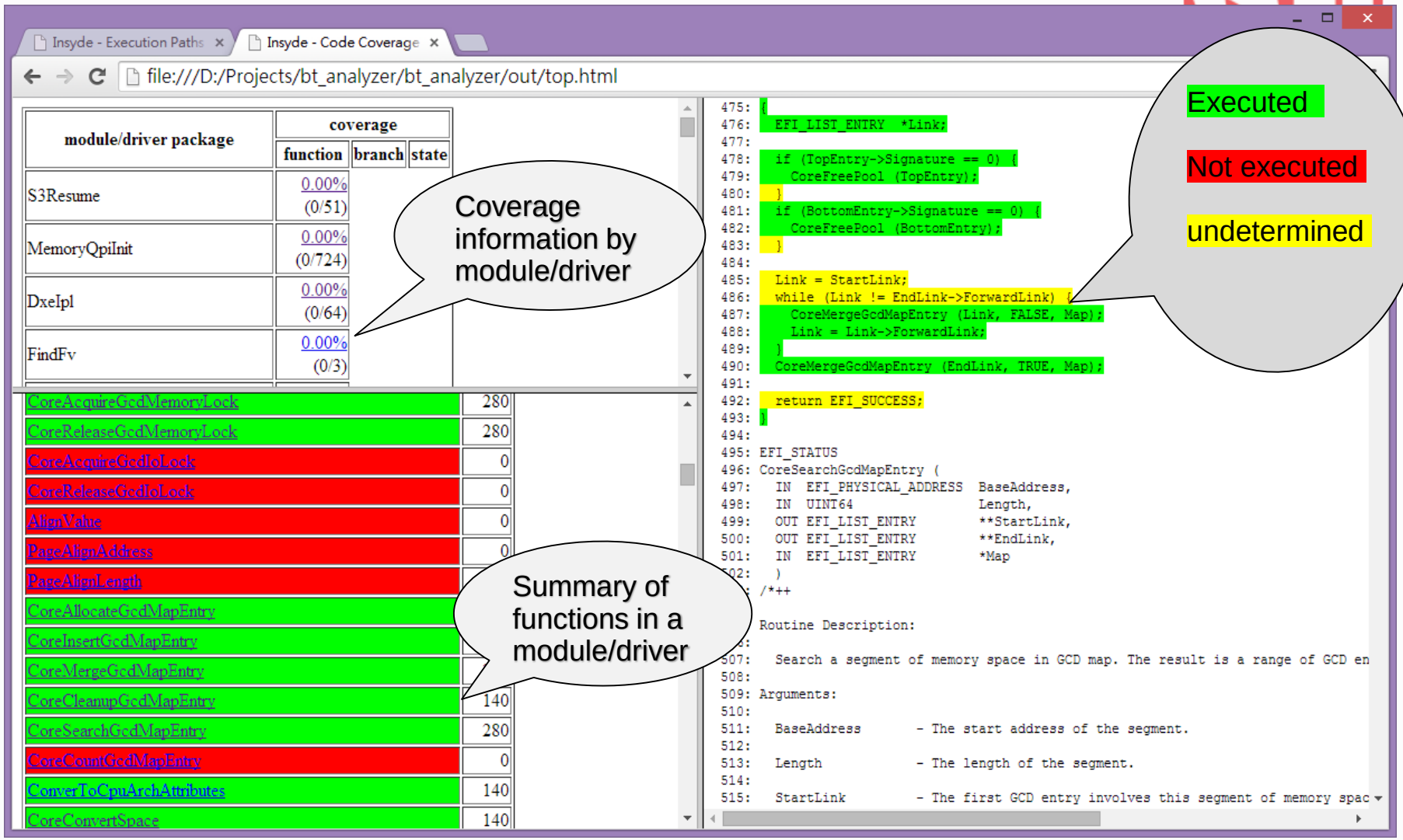


Code Coverage

Need for Code Coverage

- Validate that all code is being tested
  - If code isn't being tested during validation, code path is either:
    - Unnecessary – remove it!
    - Not being tested – probably buggy, might cause problems in the field
      - Fix the test & test the code

Code Coverage Example



Call to action

- Contact your Debugger vendor
  - Ask about their support for tracing code execution
- Profile your drivers to understand their execution flow
- Verify that your code is executed during your testing

Thanks for attending the
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For more information on the Unified EFI Forum and UEFI Specifications, visit
http://www.uefi.org

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Backup

References
Pointers to more information

References

- Material heavily borrowed from:
  - Intel 64, ia, 32 Architectures Software Developer Manual #325462
  - Insyde Software DDT Developer Manual
- Pointer
  - http://www.intel.com/content/www/us/en/processors/architectures-software-developer-manuals.html
  - https://www.insyde.com/products/developertools