NIRMA UNIVERSITY
INSTITUTE OF TECHNOLOGY
NAAC ACCREDITED 'A' GRADE

Generic IP independent BIOS Signing and Parsing

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March 17, 2020

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Outline

About the Project

In general to generate BIOS image (*.rom file), compilation of XYZ.c (source code) has to be done, this compilation not only involves compilation of DXE driver, PEI driver, EFI Application but also includes pre-processing checks, compression of raw files which takes huge amount of time depending on the system configuration. Implementation of this project aids in reduction of this compilation time.

Motivation: Stakeholders

- BIOS development Team
- Automation Team
- Validation Team
- Other Development Team

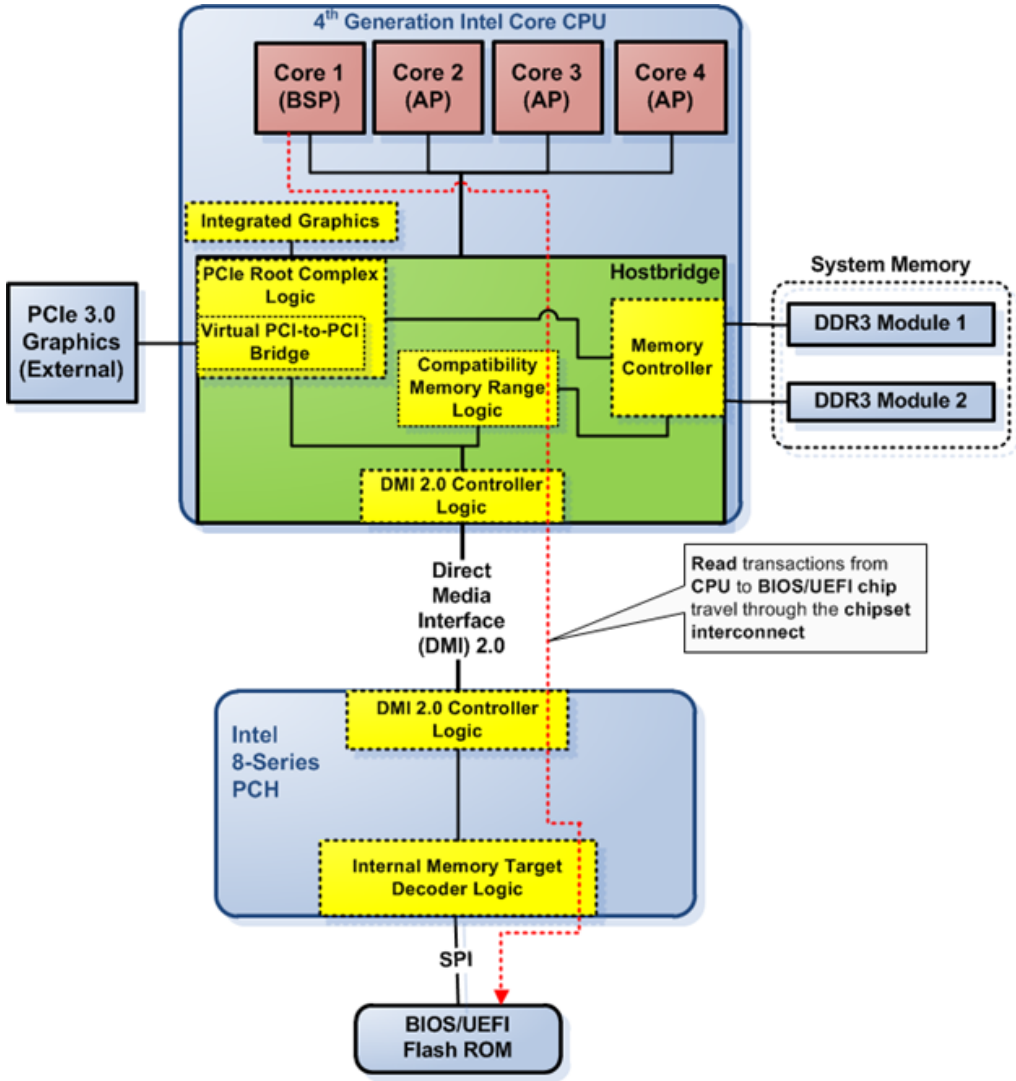
Motivation: Issues/Challenges to the industry (Towards my contribution)

- BIOS image generation: Compilation of whole source code
- More Time complexity: Compilation of source code to generate BIOS image

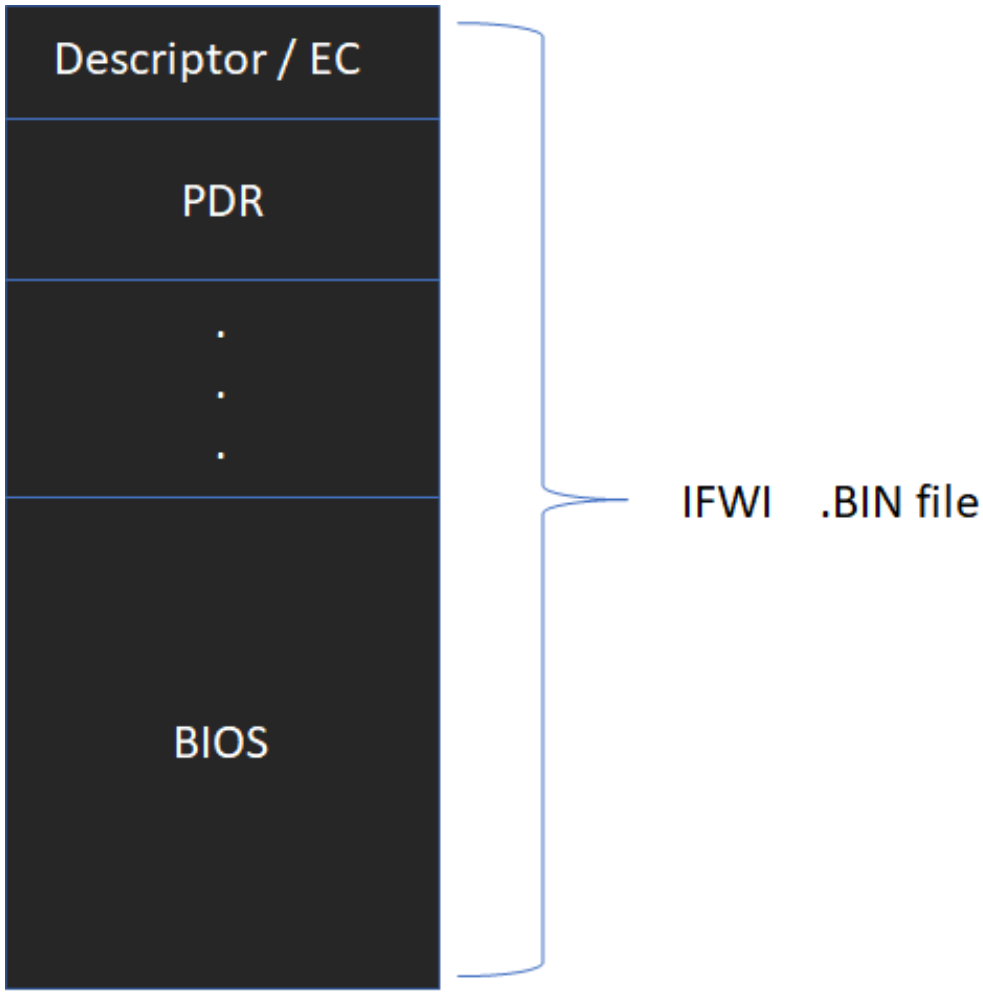
BIOS: Basics

- Set of Software Routines
  - Initialize and test hardware on start
  - Provides the OS with a generic hardware abstraction
- the BIOS must do its job before your computer can load its operating system and applications

BIOS: Architecture



BIOS: Firmware Image

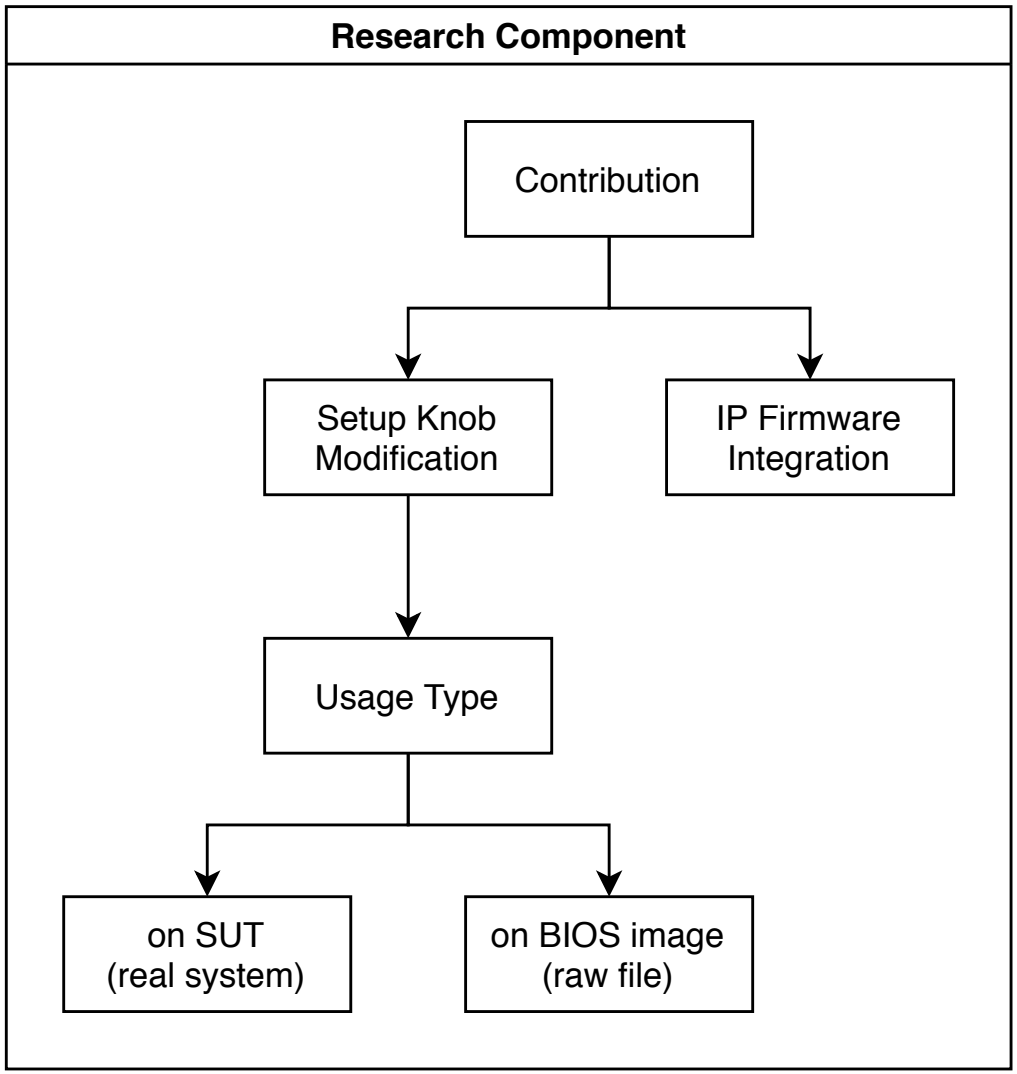


Requirement Specification

- Visual Studio C/C++ IDE
- Python 3
- Visual Studio Code
- Memory Access Interfaces[1]

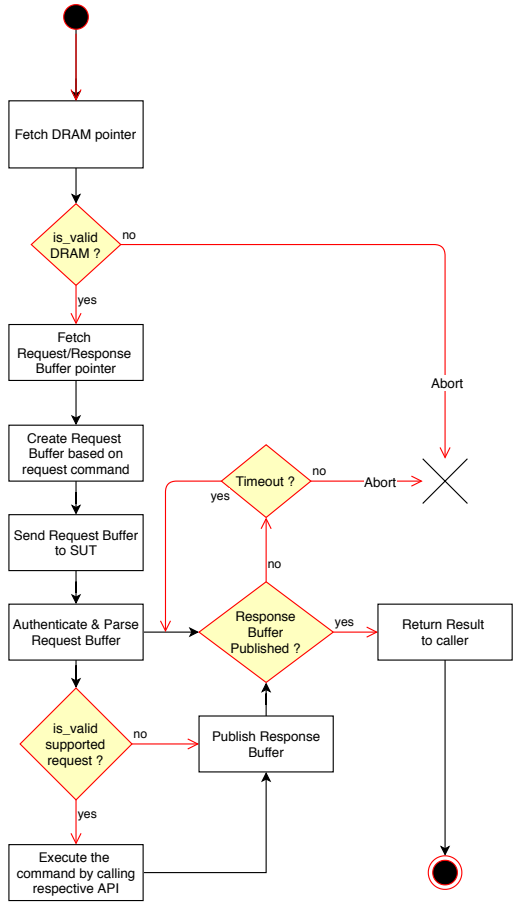
[1] itp, itp2, windows, linux, ltb, dci, efi shell, etc.

My Contribution towards issues/challenges



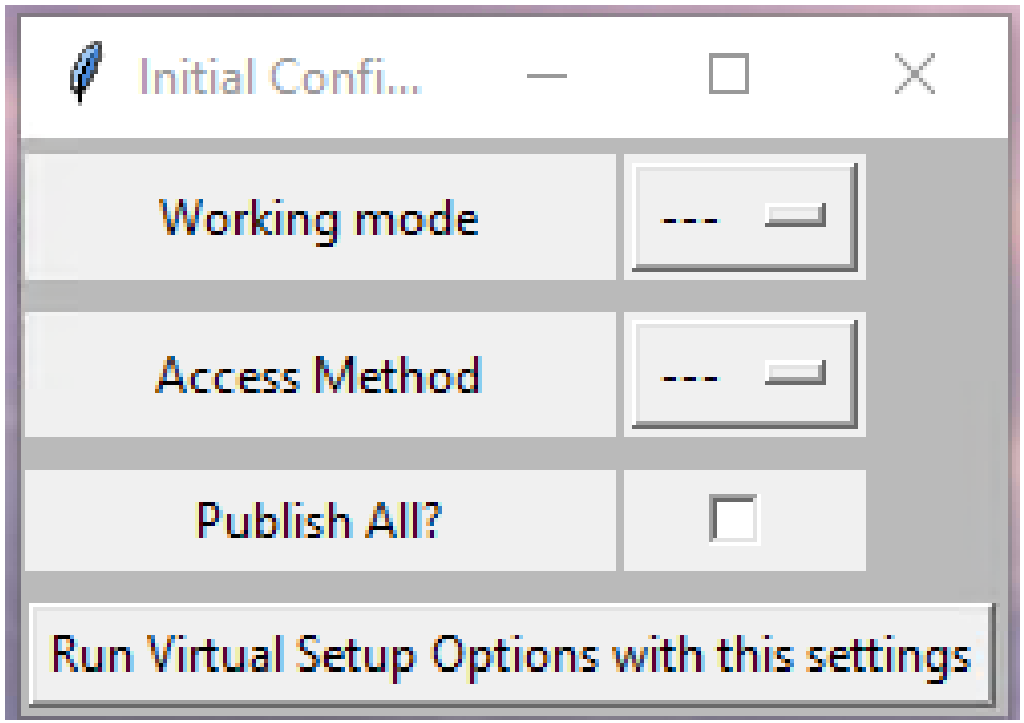
5. My Contribution

Setup Knobs Modification: Process Flow I



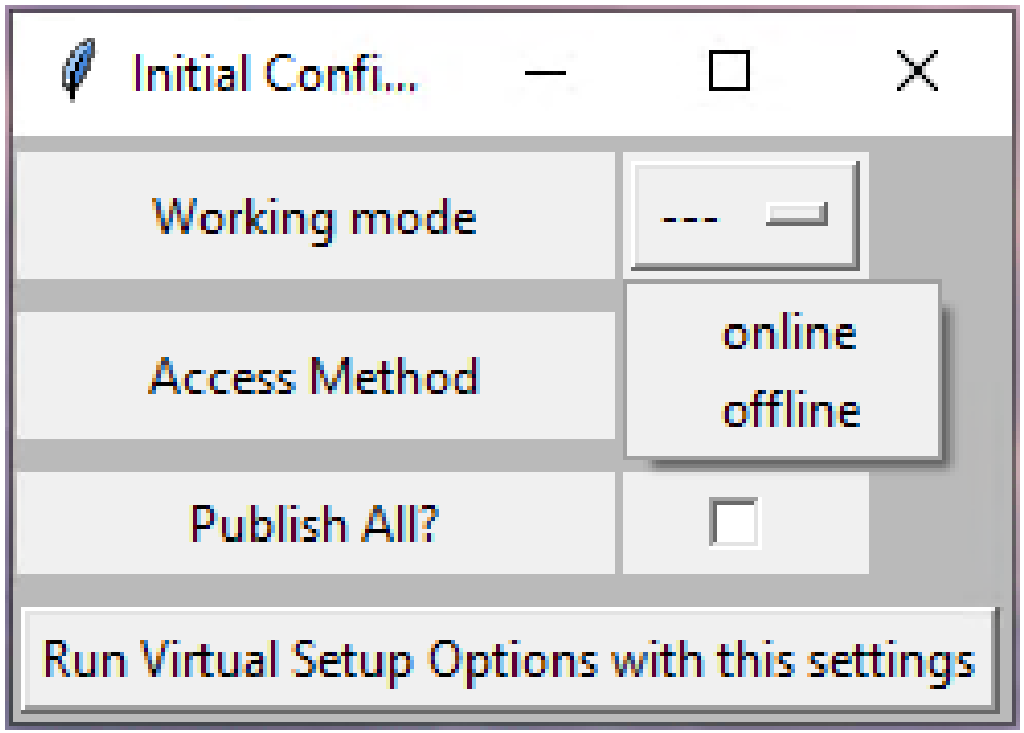
Setup Knobs Modification Flow on SUT

Setup Knobs Modification: Implementation Snaps I



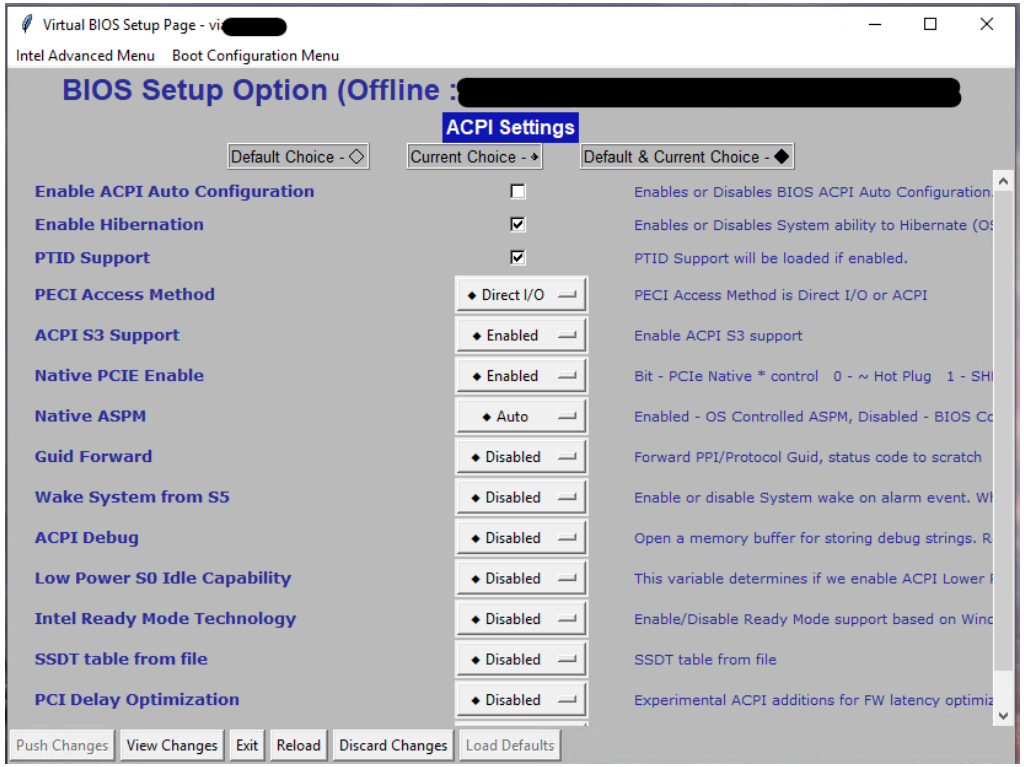
Menu to Select initial configuration for work

Setup Knobs Modification: Implementation Snaps II



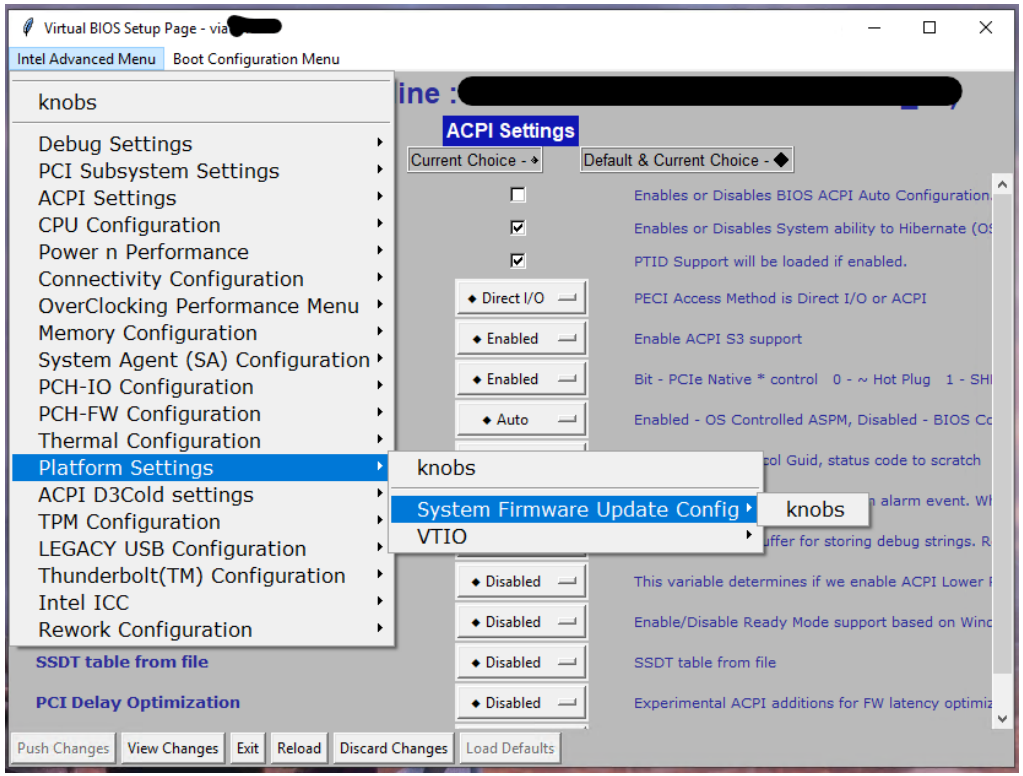
Available work mode for the system: Online and Offline

Setup Knobs Modification: Implementation Snaps III



Setup Options listed under ACPI Configurations

Setup Knobs Modification: Implementation Snaps IV

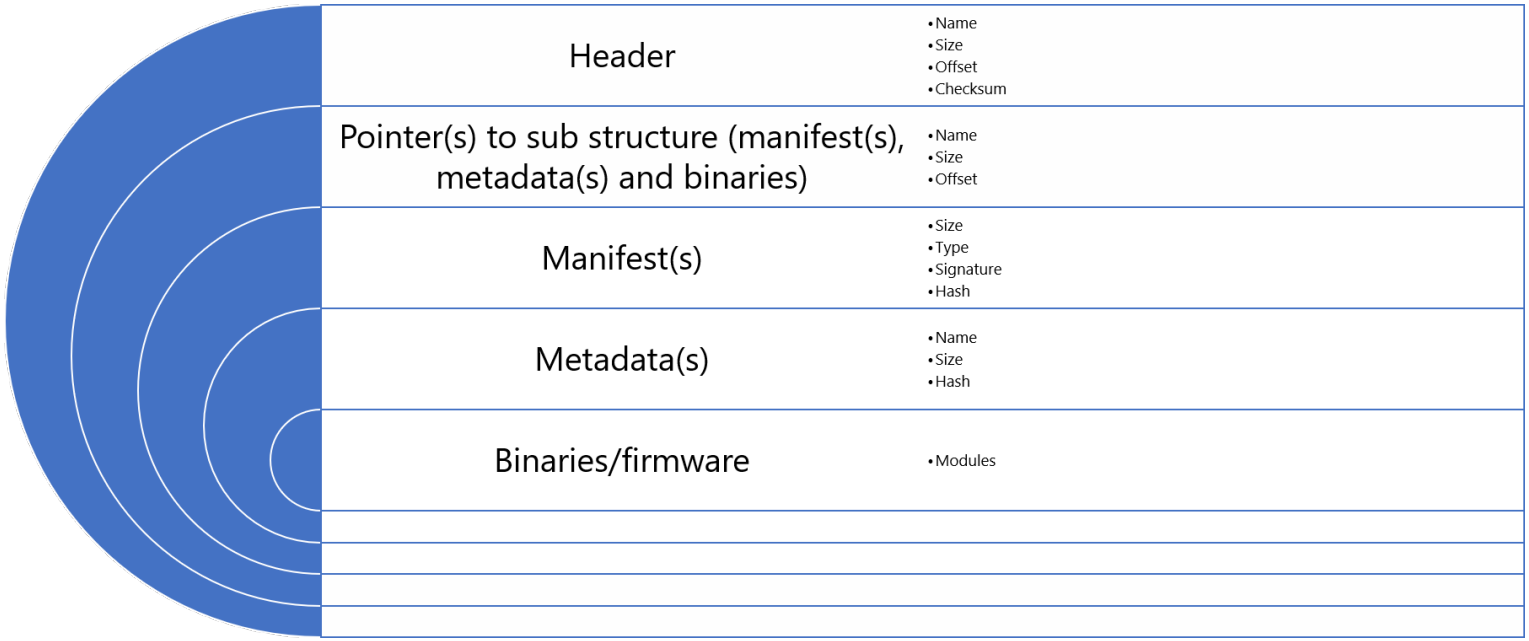


Navigating through BIOS setup page

Setup Knobs Modification: Outcome

- Cross platform usage
- API as a driver in BIOS Firmware
- Generic solution for usage types - on **SUT**, on **BIOS image**
- Information parsing and simulation
- Realtime sync for simulation changes
- Seamless Integration

IP firmware Integration: Structure of Module



Proposed Structure for firmware signing

IP firmware Integration: Outcome

- Removal of IP dependency during firmware loading
- IP Subsystem :
  - Loader and Verifier
  - IP is always consumer
- Signature verification using SHA hash algorithm
- Seamless Integration of any other hash algorithm for verification
- Hardware based and Software based verification support
- Prevent common security threats
- Allow easier OEM adoption and modification based on the respective design
- Reusability/Portability of design across many IPs
- Generic design which supports any new IP integration

Future Scope

- Study of existing hotspots for automation
- Analyzing and gathering requirements of automation to hotspot
- Implementing and managing platform to keep up-to-date the user base of the framework

Phase 1: Study of existing architecture for hotspot

- Identifying changes of two different BIOS Image of different check-ins
- Lookup of module by GUID and vice-versa
- Exposed source code support for OEM information
- Runtime BIOS Support for temporary UEFI variable creation

Phase 2: Analysis and gathering detailed information of the problem

- Debugging via comparing Setup Knobs
- Lookup of order of the module in BIOS Image as file system
- Verification of module integration via GUID
- OEM needs to fill information which need not to compulsorily expose the source code
- Automation and Testing for **non-BIOS driver** require BIOS Support for creation of temporary UEFI variables

Requirement Specification

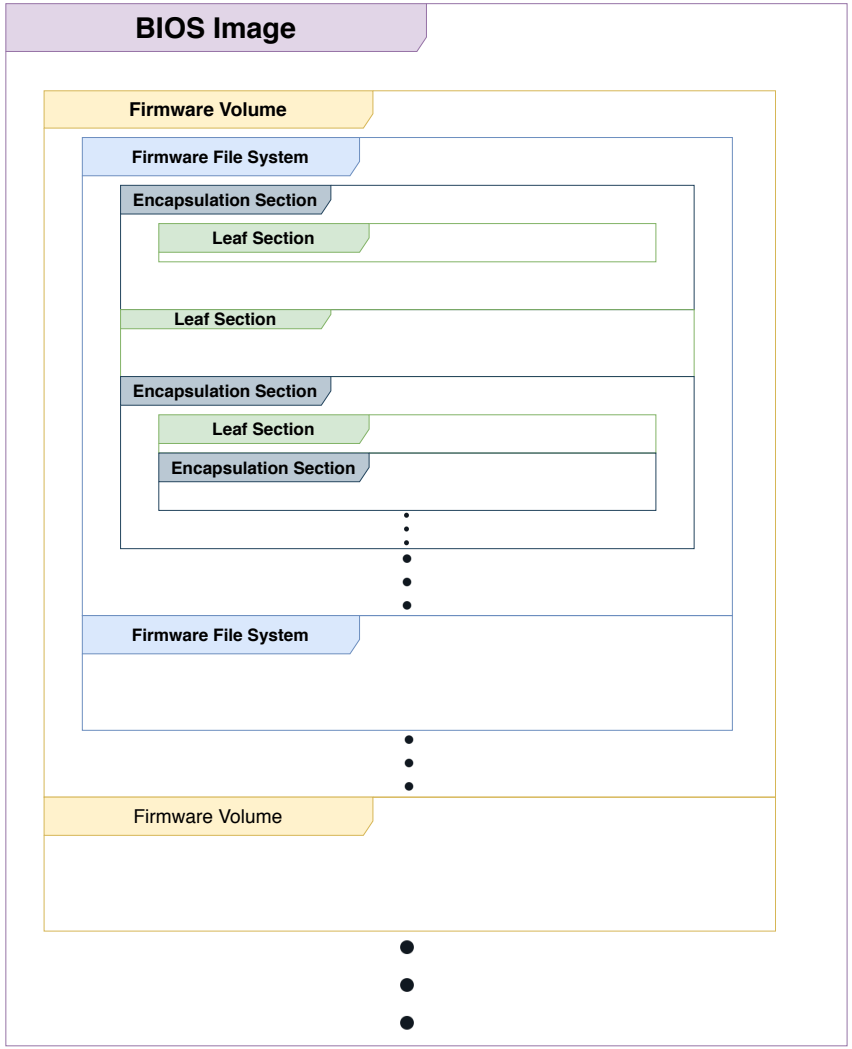
- Visual Studio C/C++
- Visual Studio Code
- Python
- JSON
- Memory Access Interfaces[2]

[2] itp, itp2, windows, linux, ltb, dci, efi shell, etc.

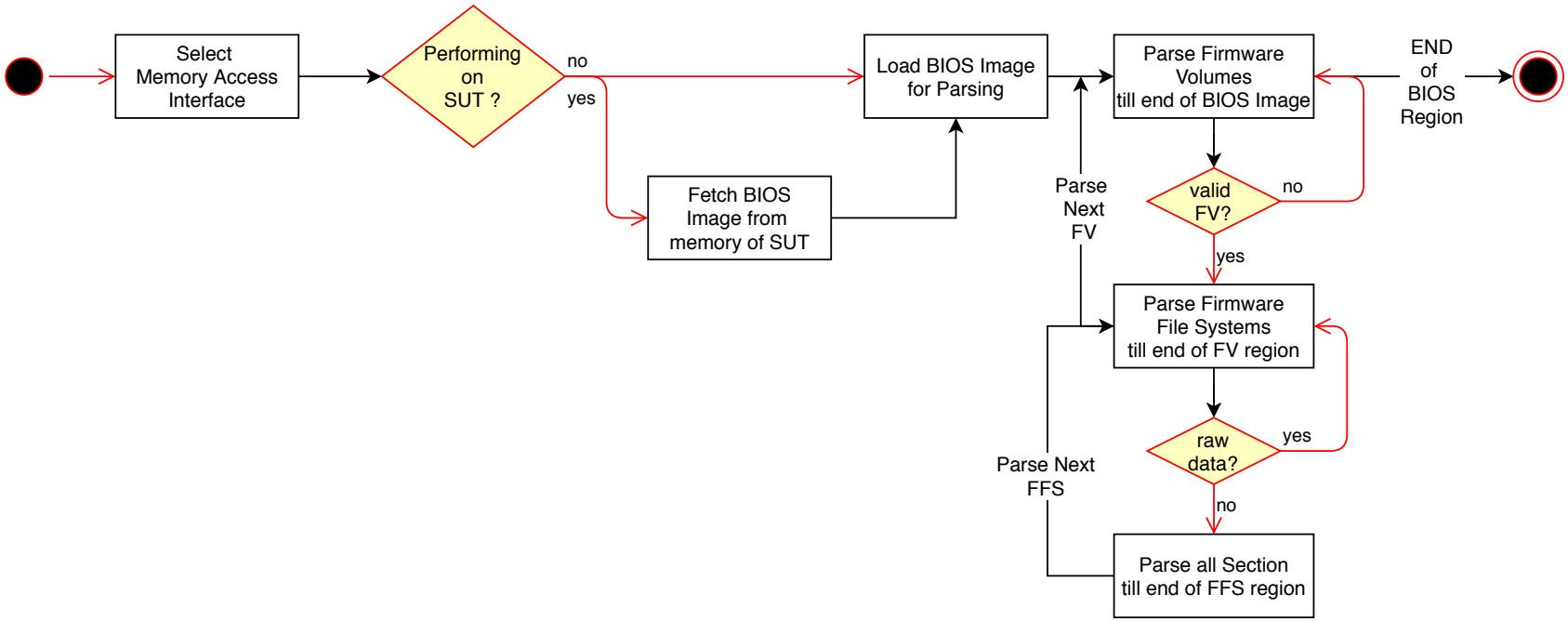
Why JSON?

- Light-weight structured-database!
- Minimal in terms of space complexity
- Easier to parse and interpret
- Portable

Implementation of Parsing: Format of BIOS Image



Implementation of Parsing: Work Flow



Outcome

- Human Readable interpretation of BIOS Image
- GUIDs Lookup
- Verification of existence of module by GUID
- Storing the image file system content by GUID
- Summarizing changes of two BIOS image

Future Scope

- Exposed source code support for OEM information
- Runtime BIOS Support for temporary UEFI variable creation

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Thank You