Python3 support in GRUB2

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About me

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- PC Engines platforms maintainer
- interested in:
  - advanced hardware and firmware features
  - coreboot
  - security solutions

Problem statement

- all firmware validation systems run on top of OS - OS may introduce another point of failures
- there are few implementations of firmware validation but some of them require Python
  - FWTS
  - BITS (Python based)
  - CHIPSEC (Python based)
  - LUV (mix of above implementations on top of Linux)
- existing solutions
  - BITS run with the help of GRUB2 and custom Python 2
- other effort
  - microPython in UEFI for validation
  - CHIPSEC migration to microPython
  - BITS and CHIPSEC as coreboot payloads
- upstream GRUB have no support for Python

https://2018.osfc.io/talks/bits-and-chipsec-as-coreboot-payloads.html

Who should care

- BIOS developers - not enough validation in open source firmware
- Customers that would like to have a compact validation entirely in the BIOS
- Certification issues

Business case

- deeply embedded and high performing applications rely on:
  - precise hardware initialization made by firmware
  - stable and reliable interface exposed by firmware
- what things applications may care about?
  - MP tables
  - ACPI
  - UEFI Boot and Runtime services
  - SMBIOS/DMI tables
- during manufacturing there is need to quickly validated hardware configuration and exposed interface/tables
- natural way is to load slim and quickly executed validation payload and if it pass replace it with target application payload

What is needed?

- Python 3 compilation support for GRUB2 (Python2 would also work if not incoming deprecation)
- various Python libraries for running BITS and/or CHIPSEC
- OS helpers providing posix operations for BITS and/or CHIPSECs

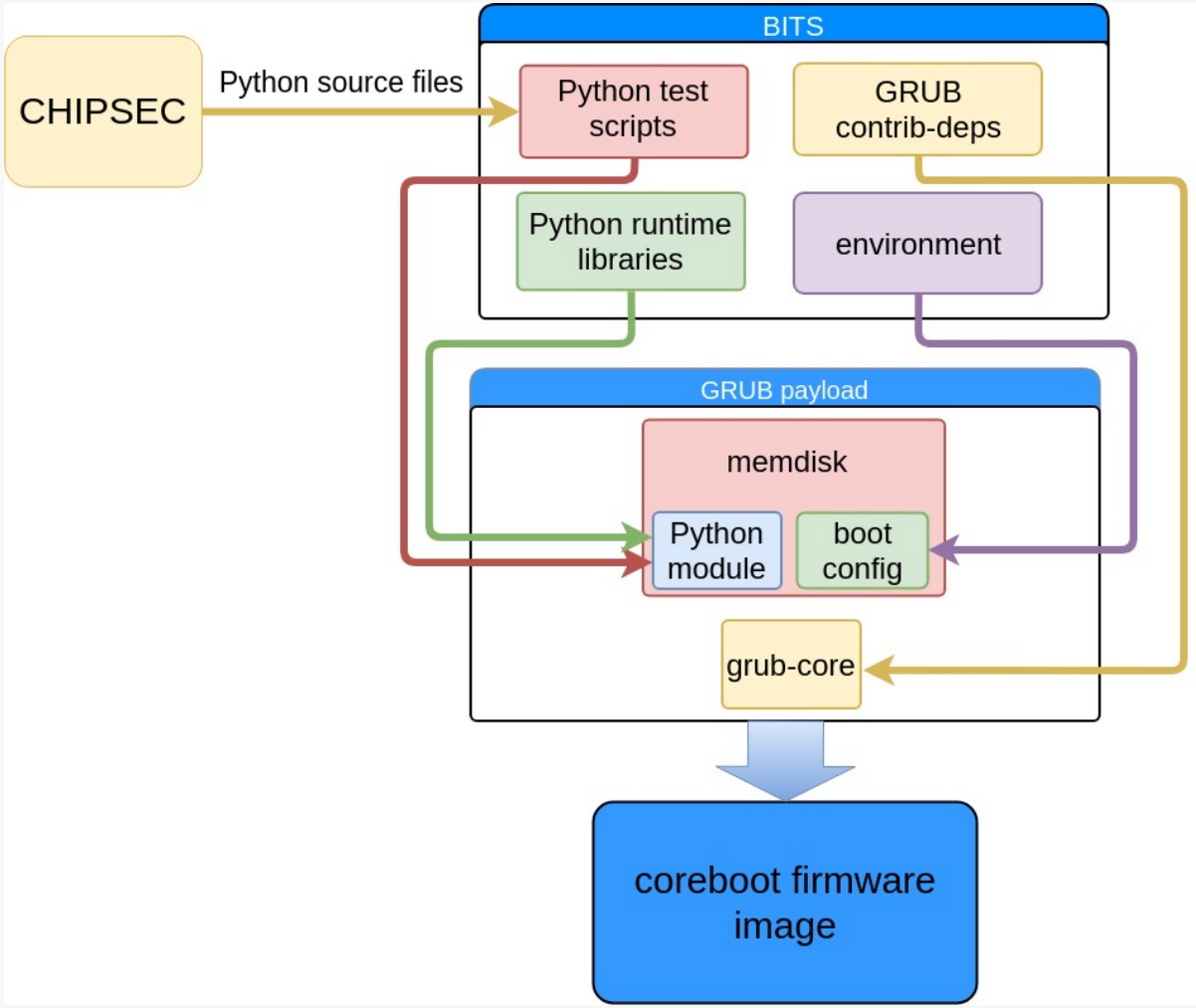
State of various components

- BITS
  - uses custom Python 2
  - keeps own fork of GRUB2 with modifications
  - relies on some deprecated GRUB2 calls
  - long time unmaintained
- GRUB2
  - no Python 3 support or Python 3 interpreter
  - can be used as coreboot payload
- CHIPSEC
  - requires some helper functions from OS or BITS
  - some of the operations will not be available
  - very focused on UEFI
  - Intel silicon only

List of items to be done

- port Python building and integration from BITS to GRUB2
- use Python 3 source code
- re-add couple of functionalities in GRUB2:
  - `grub_strcat`
  - disable support for software floating point arithmetic using compiler flags (needs probably better solution)
  - BITS need to understand paths (`isdir` fixing) if running from SPI flash

Example of BITS and CHISPEC with GRUB2



Open questions

- Does adoption of Python make sense in light of dependencies of various components?
- Do GRUB2 care about Python support?

Summary

- OS is external firmware customer and may introduce another point of failures so we should be able to validate firmware before OS takes over
- Build system is not so user friendly and consists of many components with different dependencies for each one
- Practically no validation suite available for pre-OS testing that would support non-UEFI firmware and would be maintained

Q&A