IDF14

Firmware Flexibility using Intel® Firmware Support Package

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STTS001

intel

Agenda

- Overview of the Intel® Firmware Support Package (Intel® FSP) to encapsulate Intel® silicon initialization
- Scaling platform initialization with the Intel FSP and open source Intel® Architecture (IA) firmware ecosystems
- Details on building an open source IA platform with Intel FSP
- Full openness
- Summary and next steps

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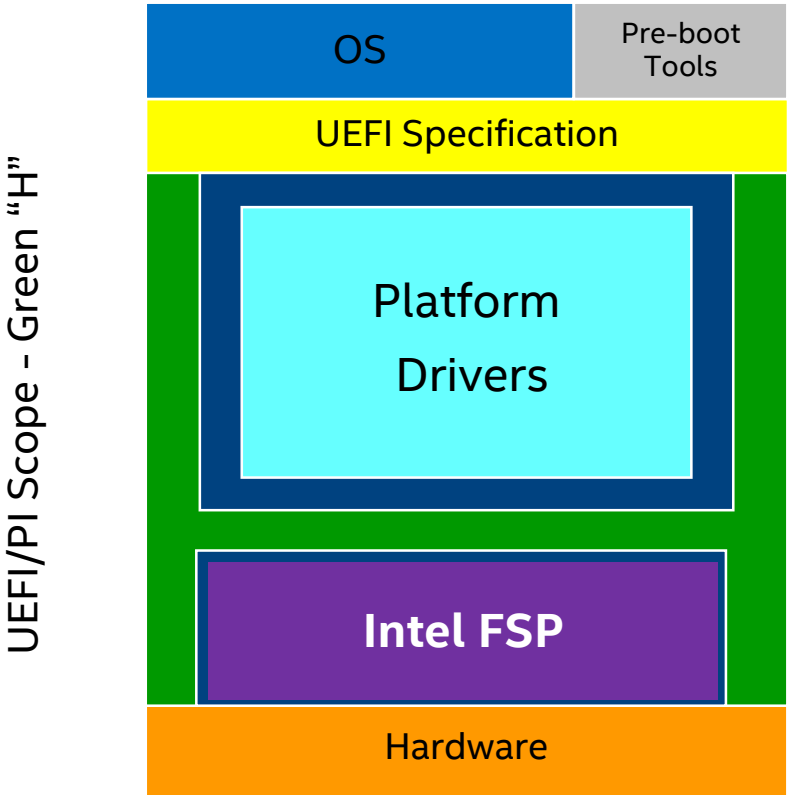
The Intel® Firmware Support Package (Intel® FSP)

Intel® Firmware Support Package (Intel® FSP) components

- CPU, memory controller, and chipset initialization functions as a binary package
- Provides silicon initialization ingredients
- Plugs into existing firmware frameworks
- Integration guide, includes API documentation

Intel FSP is currently available for the many Intel® hardware-producing divisions

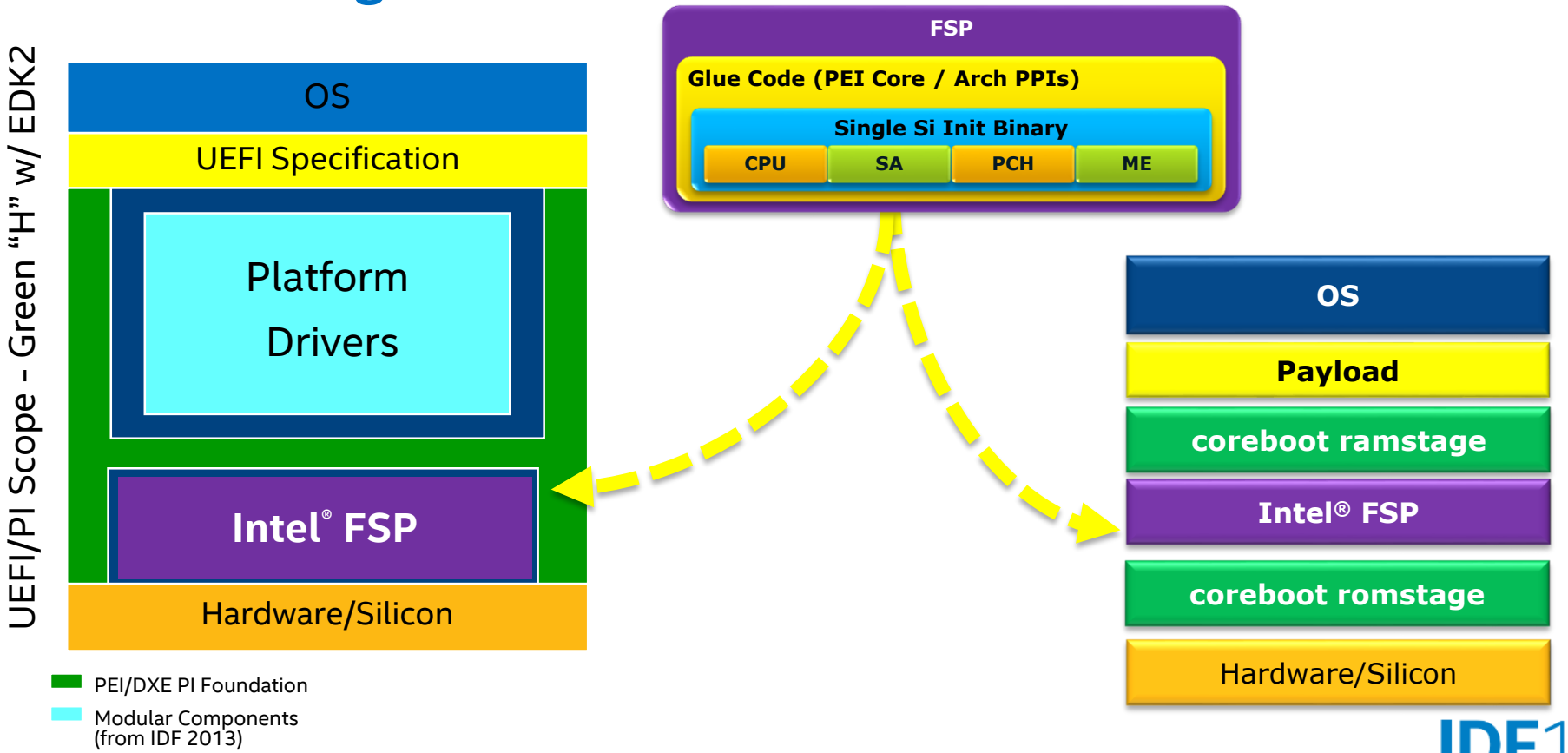
From IDF 2013 Applying Intel® Firmware Support Package to Open Source EDK II



EDK II provides the framework ("Green H")

Intel® Firmware Support Package (Intel® FSP) provides low level of silicon initialization

Applying “Produced” Intel® Firmware Support Package (FSP) to “Consuming” IA firmware



Intel® FSP Producer

- Examples of binary instances on http://www.intel.com/fsp with integration guides
- This includes hardware initialization code that is EFI Developer Kit II (EDK II)-based PEI Modules (PEIM's)
- Modules are encapsulated as a UEFI PI firmware volume w/ extra header
- Configure w/Vital Product Data (VPD)-style Platform Configuration Data (PCD) externalized from the modules
- Resultant output state reported via UEFI Platform Initialization (PI) Hand Off Block (HOB)
- Present 1.0 specification at FSP 1.0 External Architecture Specification (EAS)

The Source for the Intel® FSP Producer Code

- CPU and chipset-specific code for PEIM's inside of the Intel FSP can be open or closed, added to…
- PEI core and infrastructure code at https://svn.code.sf.net/p/edk2/code/trunk/edk2/MdePkg and https://svn.code.sf.net/p/edk2/code/trunk/edk2/MdeModulePkg
- And the code to create the Intel FSP interfaces can be found at https://svn.code.sf.net/p/edk2/code/trunk/edk2/IntelFspPkg/

Intel FSP can encapsulate IP protected initialization code PRODUCED by Intel business units

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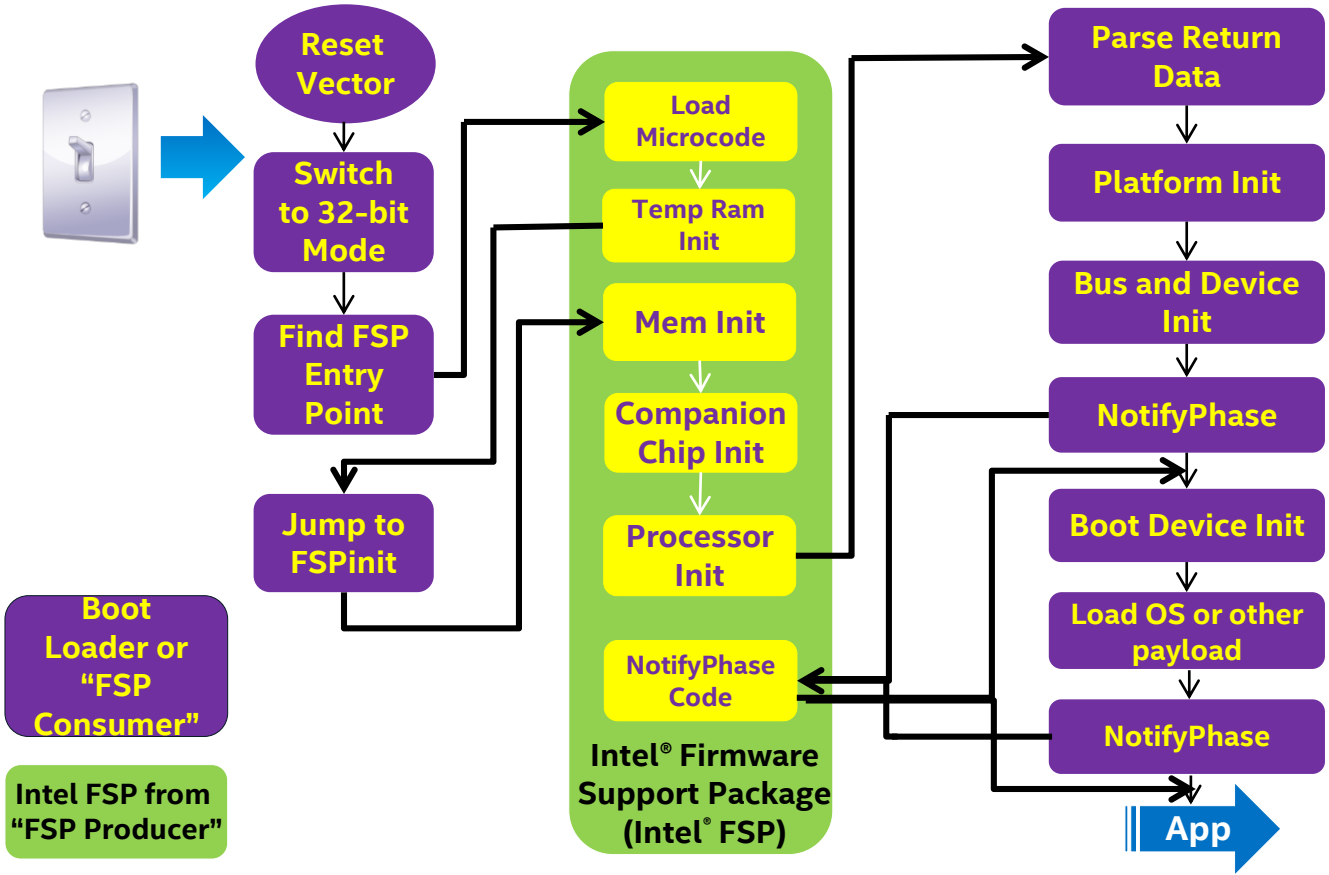
Intel® FSP Consumer

- Consumer Firmware can be bootloaders from board support packages, traditional BIOS, UEFI/PI based EDK II firmware, or other embedded software solutions
- Firmware to absorb, integrate, or ‘consume’ the Intel FSP binary
- Consistent consumer code in the open source Intel® Architecture firmware up streams
- Enables fully open work-flow of using Intel FSP and open source IA firmware code

Intel® FSP Boot Flow



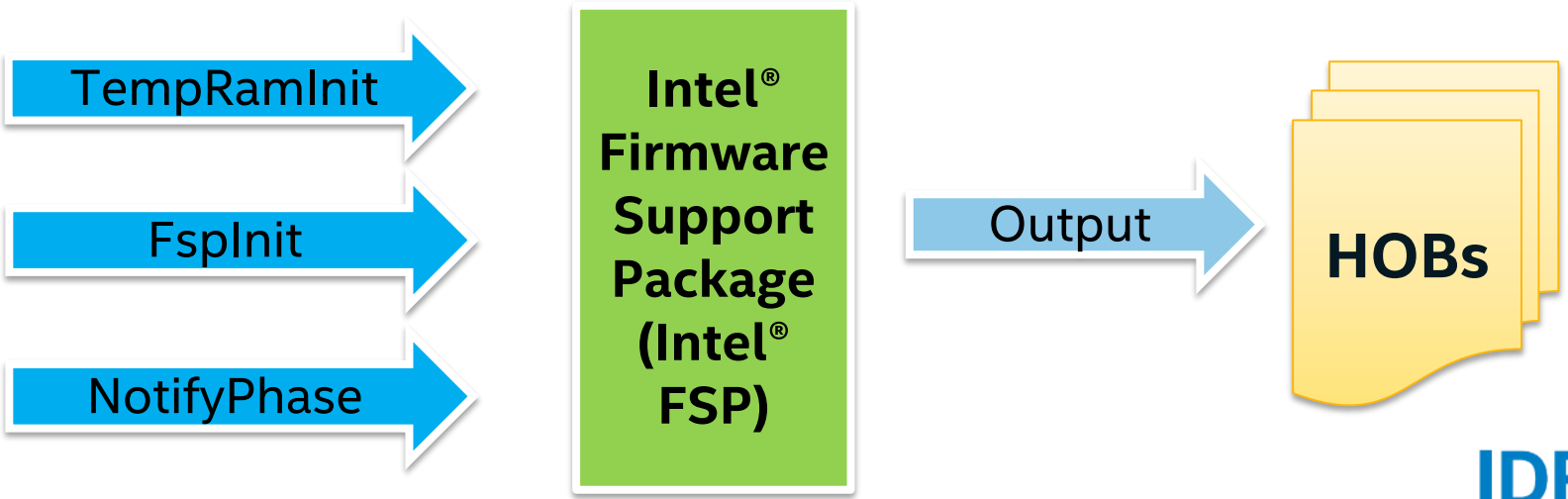
Intel® FSP External Interfaces

APIs published by the Intel FSP Producer and invoked by the Consumer

- **TempRamInit** - Enables cache for using as temporary memory and code caching
- **FspInit** - Performs the processor and companion chipset initialization
- **NotifyPhase** - Hooks for certain phase during the platform initialization

Intel FSP Producer/binary creates the UEFI PI Hand-off Blocks (Vol 3 of the UEFI PI spec)

- Contains basic platform information



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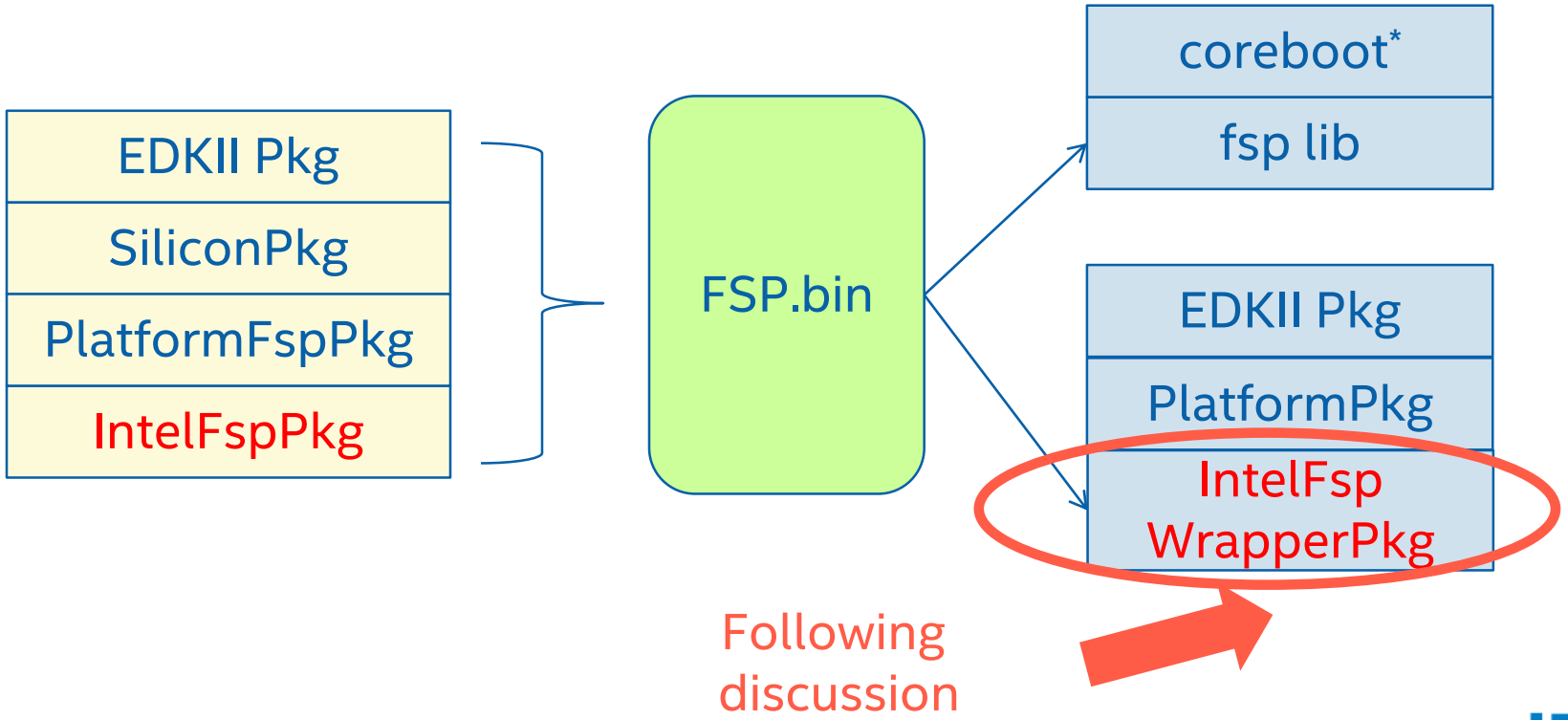
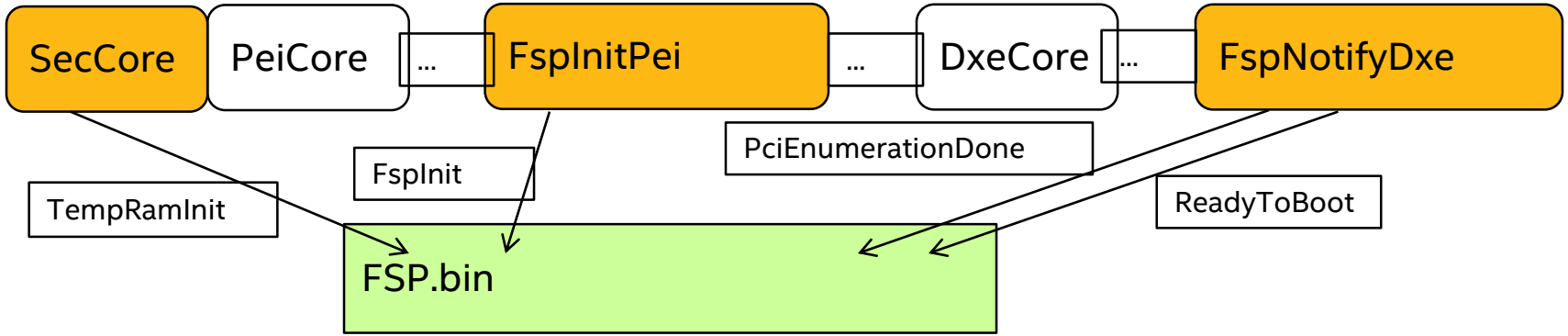
2 Consumers: EDK II firmware and coreboot*

Functionality	coreboot	UEFI / PI
The reset vector and pre cache-as-ram setup	bootblock	Security Phase (SEC)
Cache as Ram setup, early silicon initialization, memory setup. Covered largely by Intel® Firmware Support Package	romstage	Pre-EFI Initialization (PEI) Create HOBs
Normal device setup and mainboard configuration. Publish SMBIOS/ACPI Tables	ramstage	Early Driver Execution Environment (DXE)
Memory map hand-off	CBMEM	UEFI Memory Map
The OS or application bootloader	payload	DXE BDS and UEFI Drivers

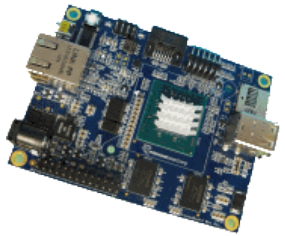
EDK II based Intel® FSP Consumer Details



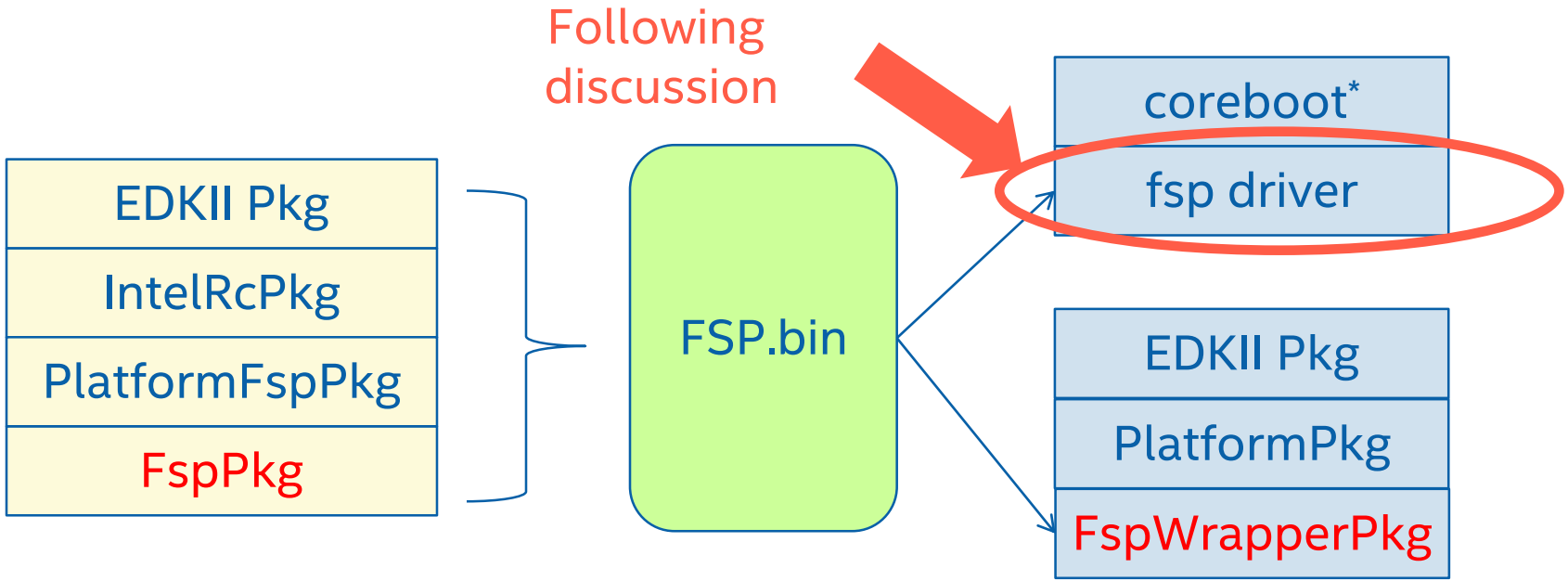
EDK II based Intel® FSP Consumer Flow



- Generic EDK II code, the *FSP Wrapper*
- https://svn.code.sf.net/p/edk2/code/trunk/edk2/IntelFspWrapperPkg/
- Allows for integration of Intel® Firmware Support Package binary into EDK II-based platform code
- Some sample platform code at http://uefidk.com



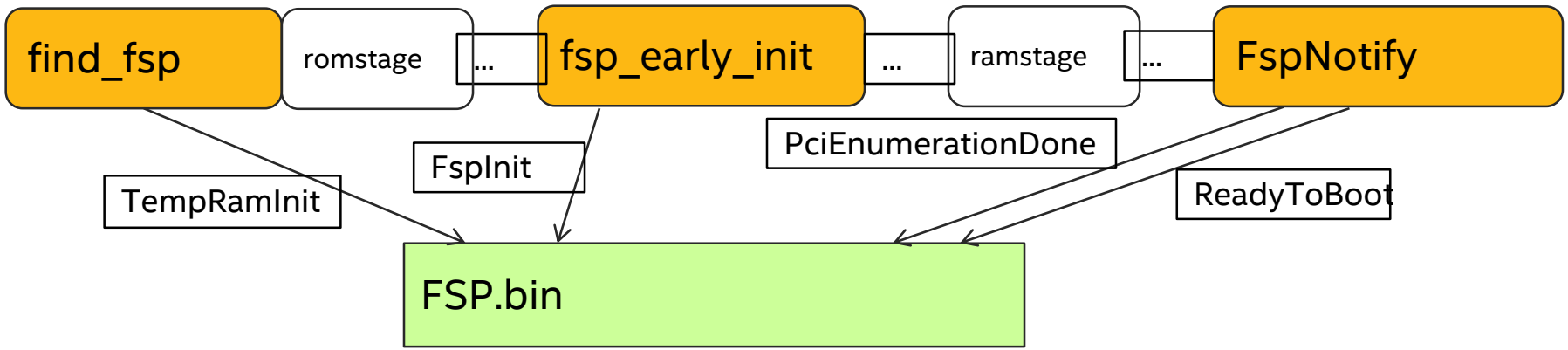
coreboot* based Intel® FSP Consumer Details



coreboot* Intel® FSP Consumer Code Details

coreboot* driver	Functionality
find_fsp	Function to find the FSP in memory
fsp_early_init	FSP memory and early device setup function. Called in romstage by the chipset driver
romstage_fsp_rt_buffer_callback	Callback from fsp_early_init for mainboard specifc RT buffer customizations (soldered down memory timings, etc.)
FspNotify	There are two notify calls in ramstage. AfterPciEnumeration during device finalize and ReadyToBoot during chip finalize.
save_mrc_data	Called in romstage after fsp_early_init to save the memory configuration to CBMEM
update_mrc_cache	Moves the mrc data from CBMEM to NVRAM in late ramstage

coreboot* based Intel® FSP Consumer Flow



The EDK II and coreboot* open source ecosystems can CONSUME FSP's with the upstreamed FSP wrapper package & driver

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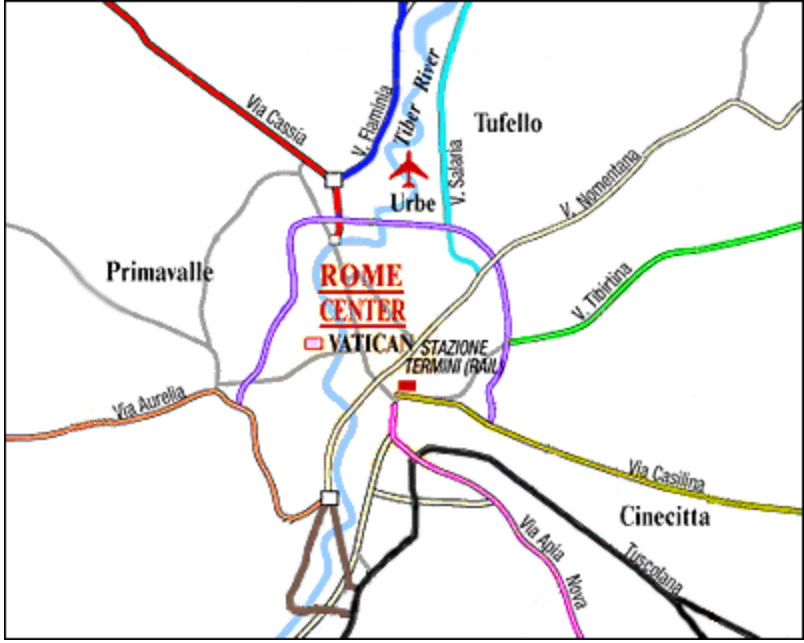
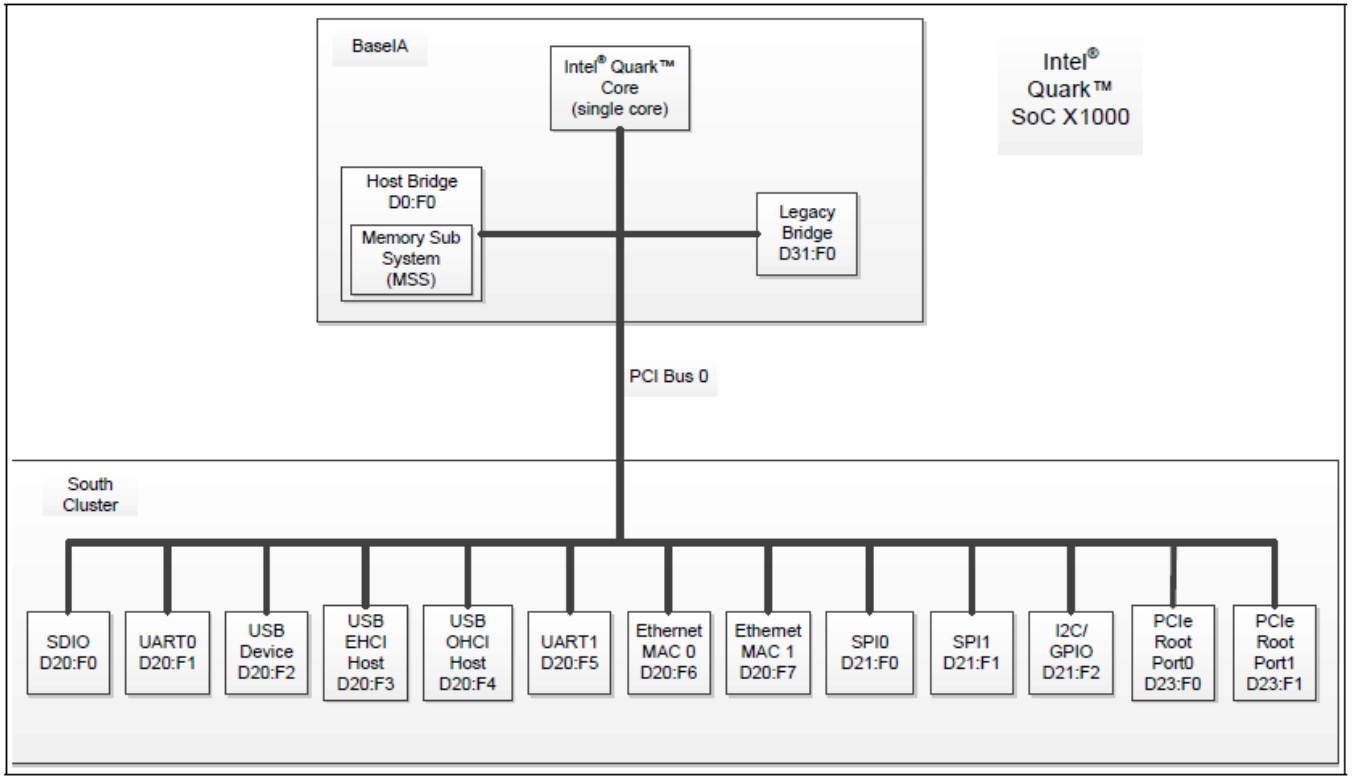
Many Paths for Enabling

- We’re moving into a world where it is easier to work with Intel® platforms
- Open platforms, open source
- Intel® Unified Binary Management System (Intel® UBMS)
- Development kits, Reference boards
- There is also a full open source EDK II option
  - See full platform sources for Intel® Quark™ SoC, including a feature rich UEFI build



Intel® Quark™ SoC – Hardware Overview

- 32 bit Intel® Pentium® ISA-class processor
- PCI
- USB
- I2C
- Single core



UEFI for Intel® Quark™ SoC

- First fully open source Intel-based platform
- Builds on Intel® UDK2010 packages like MdePkg, MdeModulePkg w/ a 32-bit build, adding
  - IA32FamilyCpuBasePkg
  - QuarkPlatformPkg
  - QuarkSocPkg
- Standard build is 1 Mbyte image w/full features
  - Capsule update, SMM, S3, PCI, recovery, full UEFI OS support, FAT OS support, UEFI variables

UEFI for Intel® Quark™ SoC

- A modular firmware architecture like UEFI PI and code-base like EDK II allows for scaling the technology
- Fixed function UEFI OS load experiences can scale in size
- Introducing “TinyQuark” open source example
  - 64 kbyte to boot UEFI-aware Yocto* image from SPI NOR flash

Module	Size (K)	%
Generic	34	50%
Silicon	10	14%
Platform	24	36%

```
FV Space Information
EDKII_BOOT_STAGE1_IMAGE1 [99%Full] 65536 total, 65216 used, 320 free
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Many paths for enabling, including full openness

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Summary

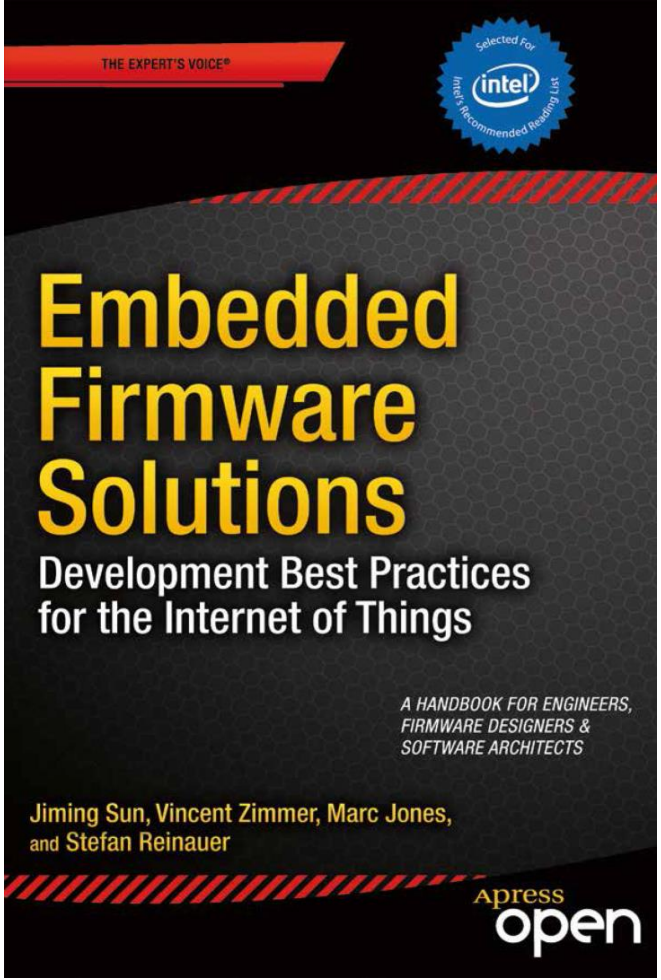
- Intel® Firmware Support Package (Intel® FSP) can encapsulate IP protected initialization code PRODUCED by Intel business units
- The EDK II and coreboot* open source Intel® Architecture (IA) firmware ecosystems can CONSUME FSP's with the up streamed FSP wrapper package and driver code
- Beyond mixing binary FSP and source, a full open source EDK II experience is possible, as noted by the Intel Quark Firmware

Next Steps

- Start to examine the Intel® Firmware Support Package (Intel® FSP) collection at intel.com/fsp, support code at tianocore.org, and sample projects at uefidk.com
- Provide Intel feedback as Intel FSP 1.0 EAS evolves going forward for new platform topologies FSP 1.0 External Architecture Specification (EAS) and whitepaper at FSP on EDKII Whitepaper
- Build more platforms with open source platform packages on www.tianocore.org and www.coreboot.org
- Evaluate the first fully-featured platforms on uefidk.com, like Intel® Quark™ SoC https://communities.intel.com/docs/DOC-22226 and Tiny Quark https://uefidk.com/content/get-started-intel-galileo-development-board and whitepaper at TinyQuark Whitepaper

Additional Sources of Information

- A PDF of this presentation is available from our Technical Session Catalog: www.intel.com/idfsessionsSF. This URL is also printed on the top of Session Agenda Pages in the Pocket Guide.
- More web based info:
  www.tianocore.org
  www.intel.com/fsp
  www.uefidk.com
  www.coreboot.org
- More on topics discussed in this presentation:
  see upcoming book
  Embedded Firmware Solutions
  http://www.apress.com/9781484200711



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Innovation and fun go hand in hand!

- Get your RFID/USB wristband and details at the Software & Services Pavilion in the Technology Showcase, or at our mobile carts outside Moscone West.
- Once you register, you're connected to:
  - Software and services content
  - Tracking earned coins for the "Surf the Code" game and other prizes
  - Your own 3D avatar with 10 coins… Play the game, share with friends
- Visit the Software & Services Pavilion to earn more coins
  - Talk with Intel experts about your development needs and plans
  - Tinker on your own time with self-run labs, source code, tools
  - Swipe your wristband on the Galileo Scan Stations to get coins
- Play to Win in the Software & Services Pavilion
  - Get 5 coins to play "Surf the Code"… Gift cards for three highest scores!
  - Get 10 coins to get your 3D avatar… And enter daily drawing for tablets and 2-in-1s
  - Get 15 coins for your King Code t-shirt, and increase total game score potential

Don't let the fun stop!
Daily lunch at food trucks

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Other Technical Sessions

from Software Services Group & System Tools and Technology Tracks

	Session ID	Title	Day	Time	Room
✓	SFTS005	Oracle* Exalytics in the Speed of Thought: Extreme Scaling on Intel® Xeon® Processor E7	Tues	4:00	2007
✓	SFTS006	Creating Immersive Augmented Reality Experiences on Android* Mobile Platforms Based on Intel® Architecture	Tues	5:15	2007
✓	STTS001	Firmware Flexibility Using the Intel® Firmware Support Package	Thurs	9:30	2008
	STTS002	Simplifying Firmware Development with Intel® Unified Binary Management Suite	Thurs	10:45	2008
	STTS003	Complex Systems Become Simple: Internet of Things with Wind River Simics*	Thurs	1:00	2008
	BIGS004	Accelerating Hadoop* Performance on Intel® Architecture Based Platforms	Thurs	1:00	2004
	IOTS007	Intel® Firmware Support Package for Internet of Things	Thurs	2:15	2001
	STTS004	Software Based System Power and Thermal Optimization Technology	Thurs	2:15	2008

✓ = DONE

Completing an online session evaluation by 10:00 a.m. tomorrow automatically enters you in a drawing to win.

Day 1 Prize

Win an Intel® Galileo Gen 2 Development Board

Day 2 Prize

Win an Intel® Gigabyte* BRIX Pro-Ultra Compact PC

Day 3 Prize

Win a Microsoft® Surface Pro 3

Winners will be announced by email

Copies of the complete sweepstakes rules are available at the Info Desk on Level 2.

Q&A

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