

ACPI 5.0 introduction

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Agenda

- What is ACPI
- What is new in ACPI 5.0

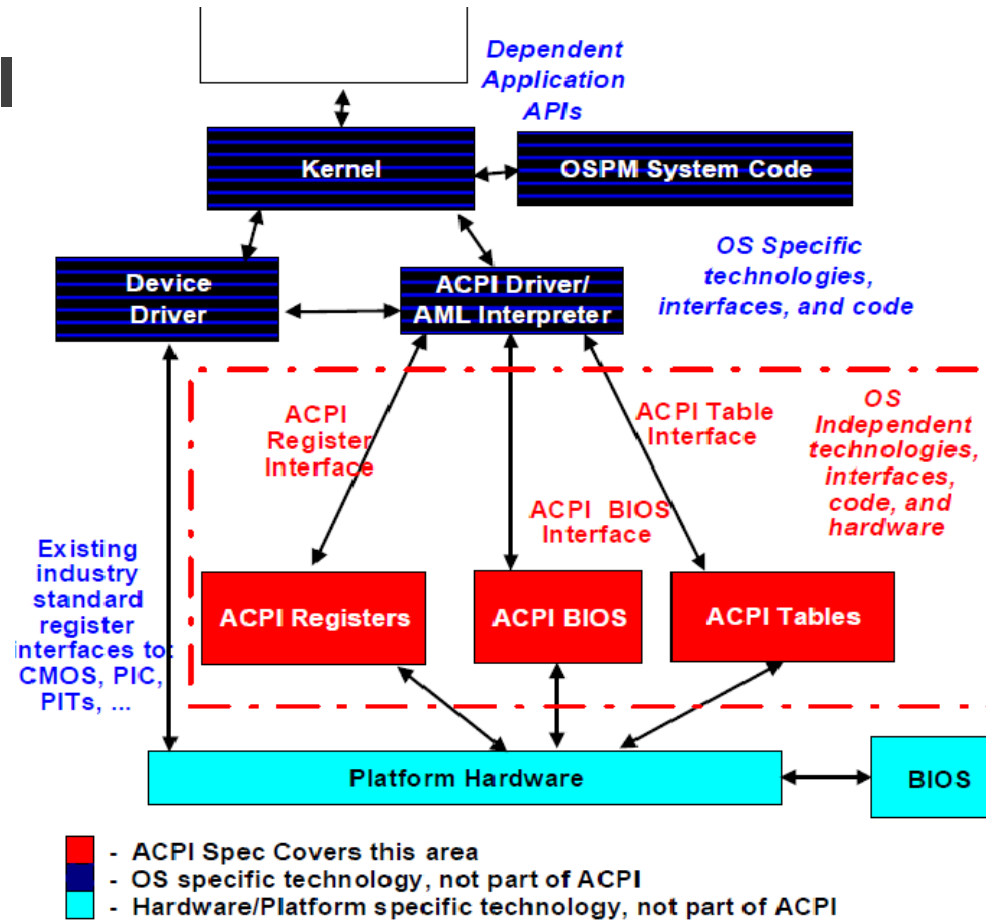


What is ACPI

- Advanced Configuration and Power Interface
- an abstraction layer between the OS and platform firmware and hardware
 - a new OS be able to handle old hardware
 - an old OS should be able to handle new hardware



What is ACPI



What is ACPI

- A piece of memory
- Provided by ACPI compatible BIOS
- Read and used by ACPI compatible OS
- Made up of a couple of ACPI system description table



What does ACPI do

- MADT/APIC/SRAT, etc
- Standby/Suspend/hibernation
- Processor
- AC/Battery
- Lid/Power button
- LCD backlight
- Thermal
- Fan
- etc



Case study: lid switch

- User closes the lid
- An SCI is generated
- ACPI interrupt handler checks ACPI PM EVENT registers to see what triggers the interrupt, and knows it is a General Purpose Event
- AML GPE handler is invoked
- In the AML GPE handler, a notification is sent to ACPI Lid device
- ACPI Lid driver catches the notification and knows the lid status is changed
- ACPI Lid driver invokes an ACPI control method to get the Lid status
- ACPI Lid driver exports this change to userspace



The current status of ACPI in Linux kernel

- source
 - drivers/acpi/*
 - arch/x86/kernel/acpi/*
- Maintained by Len Brown
- Bug reported to: <http://bugzilla.kernel.org>
- ACPI mailing list: linux-acpi@vger.kernel.org



What is new in ACPI 5.0

- Hardware_reduced ACPI mode
- GPIO abstraction
- SPB device enumeration
- Time & alarm device
- Generic Interrupt controller
- etc



Hardware_reduced ACPI mode 1/3

- FADT.HW_REDUCED_ACPI bit
 - “ACPI HW specification” optional
 - UEFI FW for Boot (no legacy BIOS)
 - Boot into ACPI Mode (no legacy mode)
 - No SCI, no SMI_CMD, no GPEs, no fixed events



Hardware_reduced ACPI mode 2/3

- SW-based alternatives added/used:
 - GPIO replaces GPE
 - SLEEP_CONTROL replaces SLP_TYP
 - FADT.LOW_POWER_S0_CAPABLE bit
 - If platform offers STR when idle is better, this bit suggests that OS avoids STR



Hardware_reduced ACPI mode 3/3

- FADT.CMOS_RTC_Not_Present
 - Use control method Time & Alarm device instead
- IRQ descriptors get wake property
 - Replacing wake GPEs
- EC: GpioInt() replaces _GPE
- Question: why hardware reduced ACPI?
- Linux: In development



GPIO Abstraction 1/2

- Hardware_Reduced ACPI mode requires GPIO (no GPE)
- But GPIO does not require Hardware_Reduced ACPI
- ACPI 5.0 Event Model



GPIO Abstraction 2/2

- ASL: GpioInt, GpioIo resource macros
- ASL: GPIO operation regions
- Kernel: ACPI GPIO controller
- ACPICA: supported
- Linux: prototyped, not yet upstream



SPB: Simple Peripheral Bus

- Controllers enumerated in ACPI namespace
 - Resource type: I2C, UART, SPI.
- Peripherals list `_*RS` as resources
 - Easily describe non parent-child connections
- ASL can use Operation Region for access
- ACPICA: supported
- Linux: prototyped, not yet upstream



Time & Alarm device

- RTC/CMOS declared burdensome
- New Time & alarm device abstraction
 - FADT.No_legacy_CMOS_RTC
 - Device: ACPI000E
 - ASL access
 - - GCP/GRT/SRT/GWS/CWS/STP/STV/TIP/TIV
- Linux: not yet supported



Generic Interrupt Controller

- MADT “APIC” table retained
 - Function unchanged, language now generic
- MADT grows a GIC structure
- Linux: not yet supported



Q&A



TURE INTEL LINUX WIRELESS
OP CS YOCTO CONNMANXEN GUPNP KVM POKY OFONO
SYNCEVOLUTION SIMPLE FIRMWARE INTERFACE (SFI) ENTERPRISE SECURITY INFRASTRUCTURE
LINUX KERNEL



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BACKUP: ACPIA (ACPI Component Architecture)

- OS-independent reference implementation
- Open Source at www.acpica.org
- All non-MS ACPI OS's today use ACPIA
- Intel OTC keeps Linux kernel in sync
 - driver/acpi/acpica/*
- ASL/AML compiler dis-assembler etc.

