

ACPI TOOL IMPLEMENTATION

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Abstract— ACPI tool implementation to reduce the time in verifying or debugging the code of ASL Language. ACPI is one of the standard specification used by the many companies for the power management purpose in servers, laptops etc. The Advanced Configuration and Power Interface (ACPI) specification was developed to establish industry common interfaces enabling robust operating system (OS)-directed motherboard device configuration and power management of both devices and entire systems. ACPI is the key element in Operating System-directed configuration and Power Management (OSPM).The interfaces and OSPM concepts defined within this specification are suitable to all classes of computers including (but not limited to) desktop, mobile, workstation, and server machines. From a power management perspective, OSPM/ACPI promotes the concept that systems should conserve energy by transitioning unused devices into lower power states including placing the entire system in a low-power state (sleeping state) when possible.

Keywords —ACPI, ASL, OSPM

I. INTRODUCTION

The ACPI which stand for the Advanced configuration and power interface specifications which was introduced as industry standard as a shared interface which allows the vigorous and efficient OS directed mother board device configuration and managing the power of the device and also full sytem .The ACPI is considered as one of the vital component in the OSPM . ACPI progressed as the existed old ACPI collection with added features and releasing as revision which is a combination of PMBIOS(power management BIOS code), APIs(application programming interface), APM(advanced power management), PNP-BIOS APIs,MPS(multiprocessor specification) table and etc in to the clearly defined power management(PM) and configuration interface specification .ACPI provides the resources for a methodological switch which is from legacy hardware to ACPI hardware, and it lets for in cooperation with the legacy and ACPI mechanisms to occur in a-only machine and can be utilized as required.

At the time of the original ACPI Specification inception system architecture is made and the restrictions of the historic plug and play interface is extended.ACPI replaced the existed mother board configuration interfaces where it introduces advanced architectures for a more vigorous, and potentially more efficient in working. The concepts of OSPM and interfaces well-defined here is suitable for all classes of computer including server machines, mobile, workstation, desktop but its not limited to. In the view of power management concept , ACPI/OSPM endorses the concept that system should save energy by making the unused peripherals in to lower power states (ie.logic low) and also keeping the entire sytem in to sleeping state when system is idle.

II. MOTIVATION

Power is one of important factor in the world which is to be used efficiently and also managed. This concept motivated to contribute to the power management field. ACPI is one of the specification used to manage the OS along with the motherboards peripherals . ACPI have applications in both client and servers(ex: data centre) .Here in this project time taken by the users of ACPI specifications to optimize the power is reduced by developing the tool where each time the code is changed there is no need of booting the system everytime . Using the tool created can verify or debug in lesser time.

III. PROBLEM STATEMENT

Power management is one of important concept to be studied and more enhancement should be done such that power consumption is more efficient. As the circuit complexity increases the power consumption goes on increasing so some technology should be adopted such that the power management will be efficient. ACPI is one of the specification which manages the power of software, hardware, system .

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Intel ,Toshiba ,Microsoft combinedly developed and produced the standard specifications and later Phoenix and HP also participated later. Then all the original developers agreed to transfer the ACPI standard to the UEFI Forum in October 2013, where the future development takes place. UEFI forum published the newest version of the standard that is Revision 6.1, in March 2016.

It takes long duration to boot to OS .Everytime we change the code, we need to verify by booting several times which is tedious job and time consuming.This is how ACPI tool implementation come into idea.This tool is more helpful for the developers.Before booting to OS ACPI part can be verified.

It has been seen that developers takes more time to bring the change in code or add the features in the available code so this was the idea which motivated to create tool which debugs and compile the code in lesser time. Many companies are using the tool to make the work more efficient and produce the required change for the client.

IV. BIOS

BIOS is the acronym of Basic-Input/output System.-It is a firmware that runs first when a computer is switched on. It is a software that initializes and tests hardware and loads operating system. When a system is switched on, BIOS runs a POST (Power on Self-Test). The acronym of POST is Power-On-Self-Test. Various initialisation and many test of the computer hardware is done by performing the series of routines or individual function. System devices for example CPU, Interrupt, RAM, and DMA controllers will be initialised , identified and checked by the POST and also other parts of the sytem bus,chipset, keyboard, video display card, optical disk, hard disk and other basic-hardware.The test performed in the order varies from mother-board to mother-board . If there is any beeping sound made when the PC is in on state then it indicates there is some error from POST test done, no beep then there is disconnected speaker.

V. UEFI SPECIFICATIONS

Unified Extensible Firmware Interface(UEFI) specification defines an interface between OS and BIOS. This interface consists of data tables. These tables have various services available for OS and OS loader and platform related information. UEFI specification has set of interfaces and structures that are used in booting. These interfaces, functions and structures are called through pointers which are architecturally same as pointers in C. A UEFI driver is an executable image on whole. UEFI driver model is implemented in the platform using which various boot devices can be accessed in the pre-boot environment .

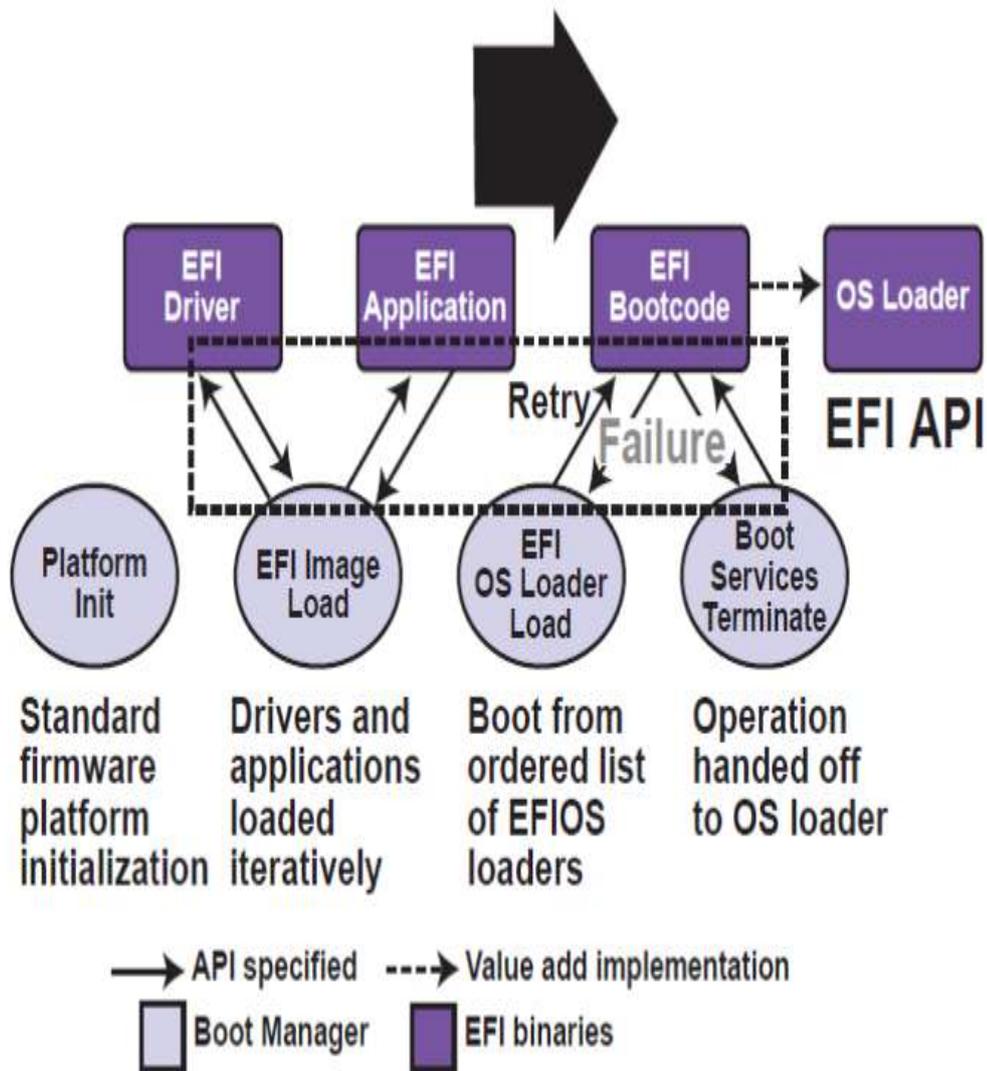


Figure 4. 2: -Booting Sequence

VI. ACPI OVERVIEW

Some of the platform supporting the ACPI specifications permits the OSPM for the special and direct controls for the power managing and computers configuration functions on the motherboard . When the OS initialisation takes place OSPM take the control over the fuctions present in the legacy implementation like SMM based firmware, PNP-BIOS, legacy application, APM-BIOS. After doing all this OSPM is given permission for configuration event handling on the mother-board and also for maintaining the performance, thermal status, and power of the system prioritised on user request, application request and usability goals/ OS impose quality of service(QOS).



Fig 5.1 ACPI/OSPM Subsystem

From the fig 5.1 we can see the interfaces related to the ACPI such as ACPI register interface, ACPI BIOS interface , ACPI Table Interface, OS independent technologies, interfaces, code and hardware.

VII. ACPI SOURCE LANGUAGE (ASL)

ACPI source language is pseudo code language for the ACPI. iASL is a good featured translator for the ACPI source language and ACPI binary table. ASL compiler is a part of the ACPI component architecture which translate or convert from ACPI source language to ACPI machine language. The disassembler will do the reverse operation that is converting back to the previous original ASL source code.

VIII. RESULTS

Boot code is available as a package where ACPI is part of it . To debug or to check the code after each change it takes long time hence a separate tool for ACPI is created where it can be compiled and debug the errors faster and can make sure that the error is not from ACPI before booting the code to OS. A special feature allows to convert the source language to required other formats such as .hex, .c, .asm etc. one of the output for hex format is given below .

```
:10010000214601360121470136007EFE09D2190140  
:100110002146017E17C20001FF5F16002148011928  
:10012000194E79234623965778239EDA3F01B2CAA7  
:100130003F0156702B5E712B722B732146013421C7 :00000001FF
```

Fig 3. Hex format output

IX. FUTURE SCOPE

It is implemented on single platform it can be extended for all other platforms available and also for new platforms introduced in the future. But before implementing ,the new platform should be analysed and can be added to the designed tool. Different platform differs by number of sockets, speed, memory etc. Drop menu can be created for the different platforms. It is similar to updating the tool as new platform introduced. (like updating the application with newer version).

So this can be extended to many teams working on different platforms such as clients and server team. Presently it is been implemented in one of the platform in server .

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