Forum
Spring 2001

ACPI 2.0 Specification Technical Update

Therien
are Architecture Manager
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Corporation

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February 27 – March 1, 2001

Agenda

- ACPI 2.0 Overview
- ACPI 1.0 -> ACPI 2.0 Key Information
- ACPI 2.0 Errata Overview
- ACPI 2.0 Key Errata Review
- Microsoft OS Implementation Update
- Other OS Vendors ACPI Support Update
- Summary
- Call to Action

ACPI 2.0 Overview

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- 64-bit processor / addressing support added
- Processor / device performance states added
- Functional Fixed Hardware concept defined
- Many server related enhancements added
  – hot-pluggable CPUs, memory, GPE Blocks
- Legacy Reduced HW IA-PC support included
- SM Bus CM interfaces rewritten
- General readability/consistency enhancements
- ASL examples updated (corrected)

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CPI 2.0 Key Information

- Requirements removed
  - Design guides will now specify required ACPI 2.0 defined interfaces / platform features
- No hardware changes are required for ACPI
- Fixed hardware register locations expanded
- ACPI system description table definitions contain significant changes
  - New XSDT
  - New FADT fields
  - New MADT structure entries
- New Device Notifications added for
  - Processor, Thermal, and PCI Hot Plug

CPI 2.0 Key Info. – cont.

SL / Definition Block changes

- _PR and _TZ scopes obsoleted - Processors and thermal zones now defined under _SB
- Server Support
  - Processor, Memory, Module, & GPE Block Devices
  - _FIX, _MAT, _PXM, _HPP, _SEG objects added
- Mobile Support
  - _EDL object added that enables multiple dock support
- Processor Object's Object List
  - _PTC, _CST, _PCT, _PSS, _PPC, device related objects
- Thermal Zones
  - _TZD, _TZP, and _HOT objects added
- New CMOS and PCI BAR target operation regions
- Many Useful ASL grammar enhancements

CPI 2.0 Key Info. – cont.

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- Added _GTS and _BFS control method invocation on sleep and wake
- Battery related updates
  - Smart Battery System Manager
  - Control Method Battery clarifications

Update your Control Method Battery Implementations Accordingly

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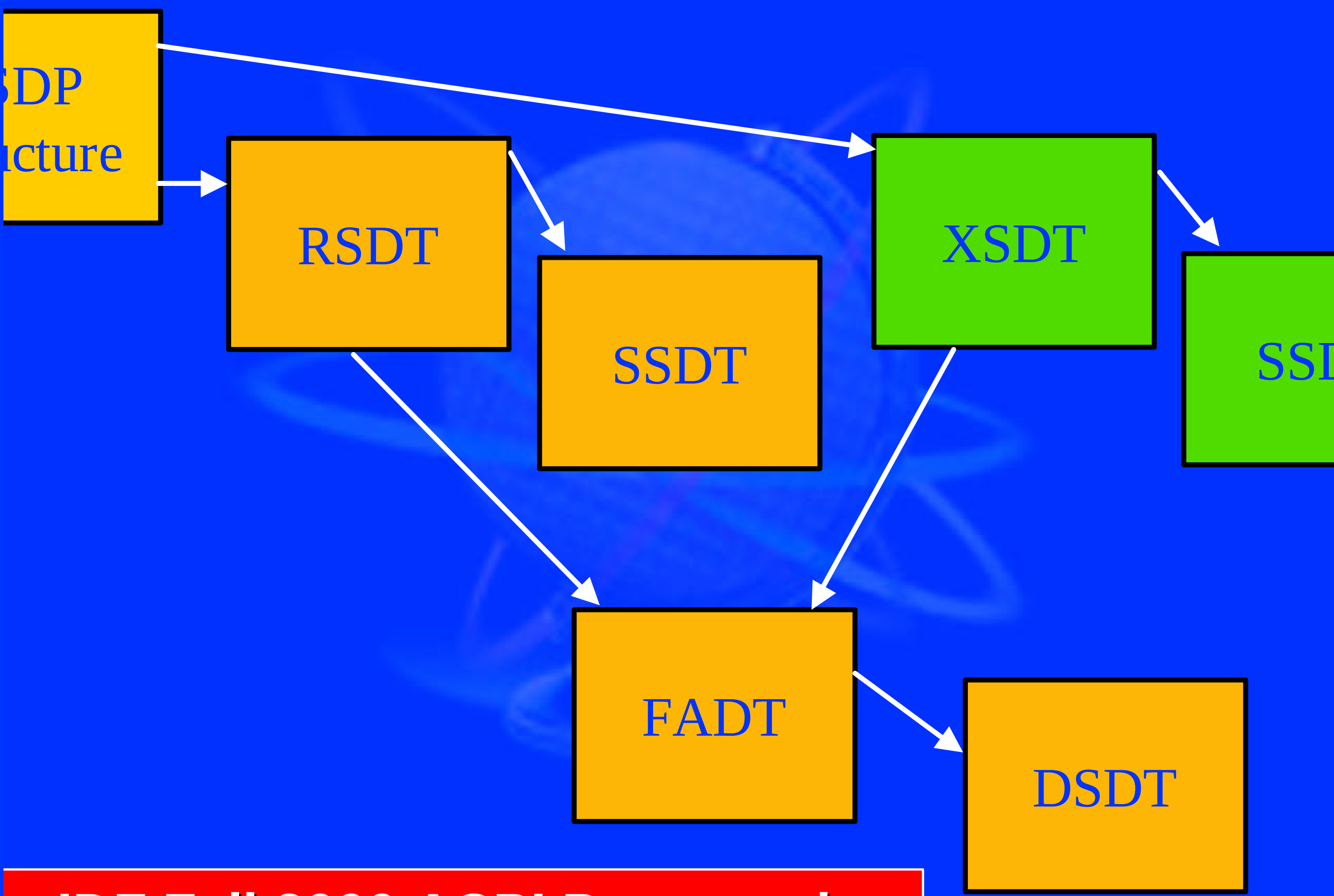
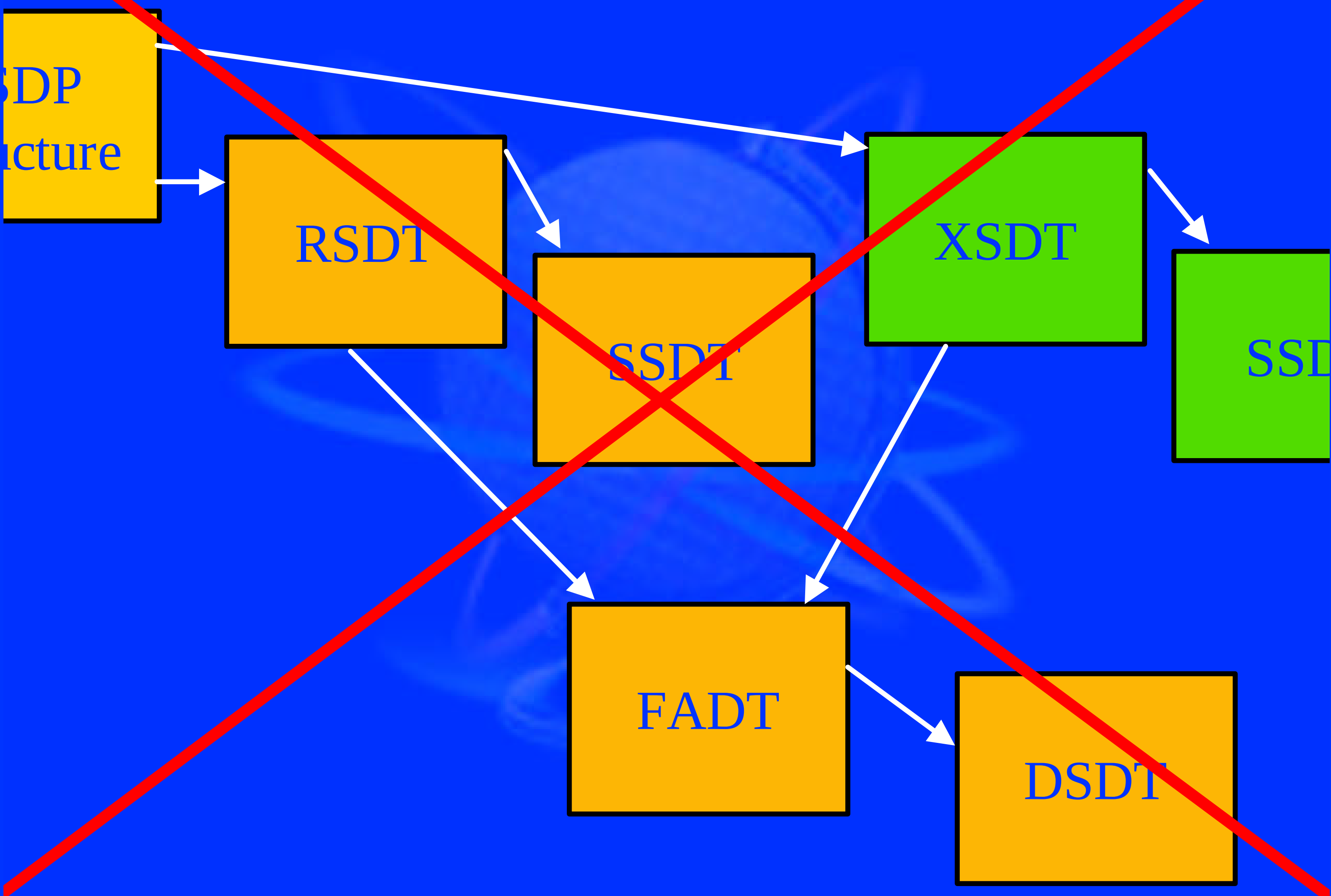
ACPI 2.0 System Description Tables

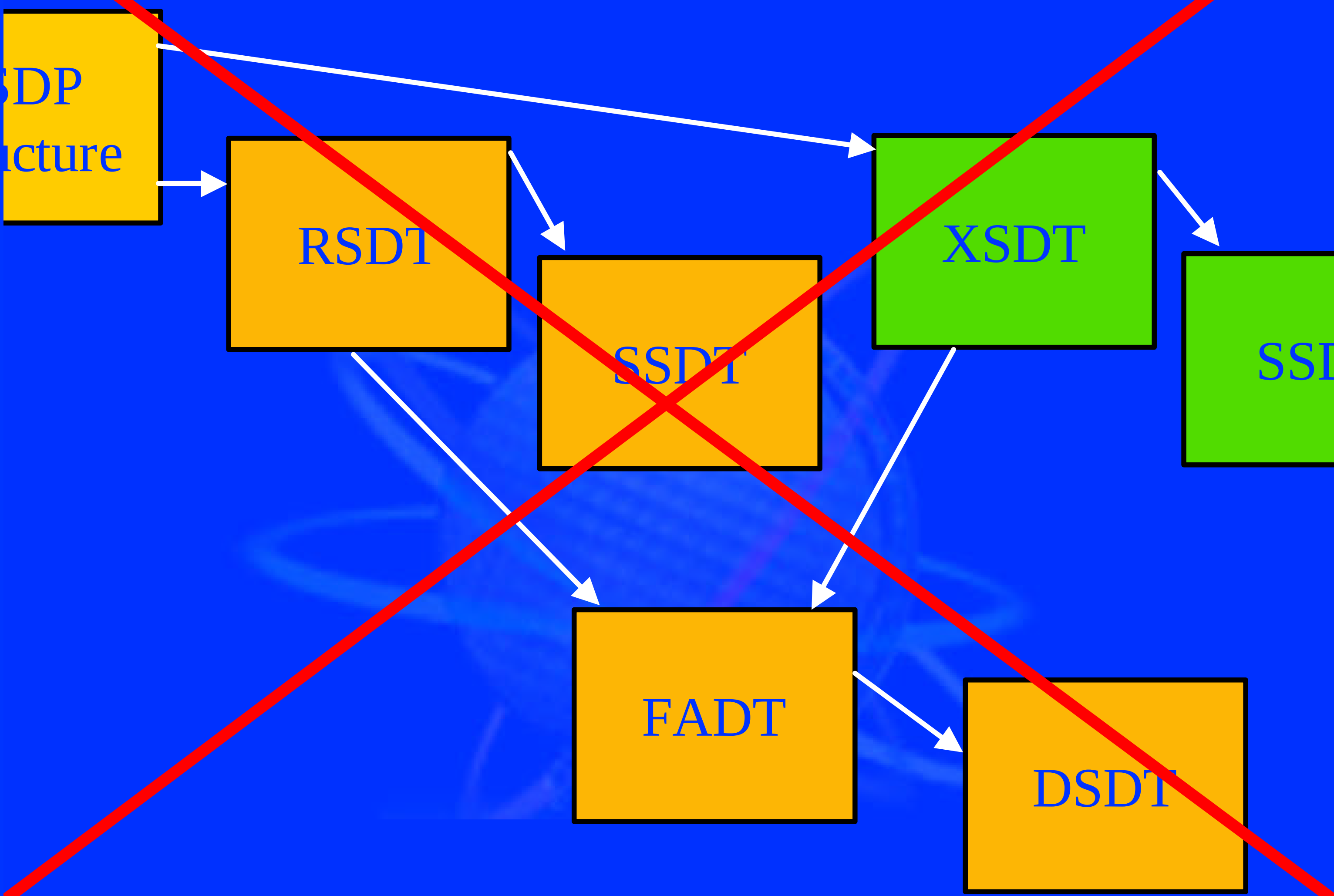


m IDF Fall 2000 ACPI Presentation

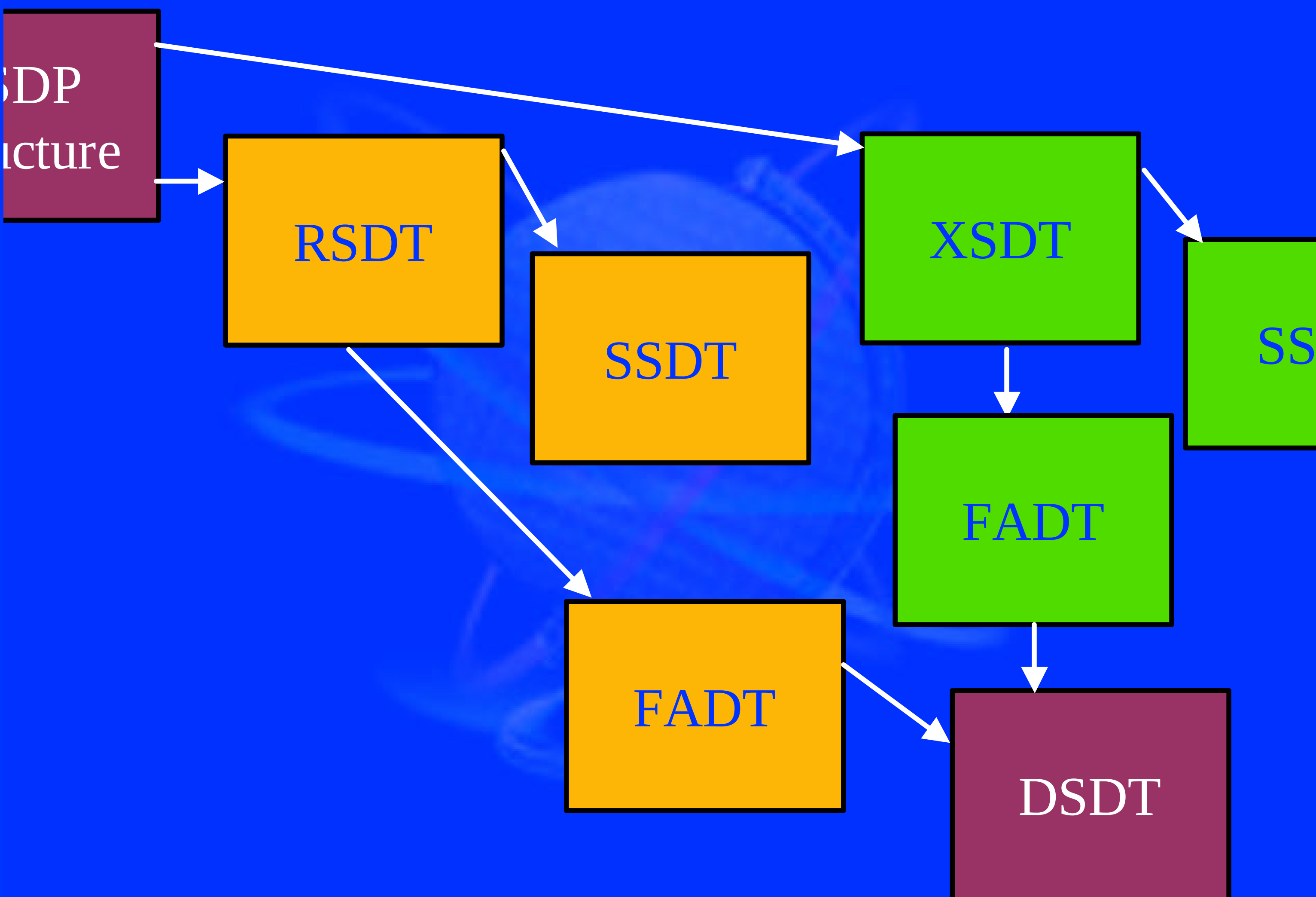
ACPI 2.0 System Description Tables



ACPI 2.0 System Description Tables



PI 2.0 System Description Tables
(Windows 2000 Compatibility)



Two FADTs are required!

rogrammer's New Cube

CPI 2.0 Errata Overview

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- urrent Errata Document revision is 1.4
- rrata document includes:
  - Correction of system description table format and field values
  - Correction of ASL / AML grammar errata
  - Necessary ASL grammar changes
  - 32-bit vs. 64-bit integer size default AML assumpt
  - Clarifications
  - Correction of spelling, grammar, and section reference errors

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ystem Description Table Changes nd Clarifications

ADT

- SCI_INT field contains global system interrupt number of the SCI interrupt on non 8259-based systems
- Only non-zero values of PSTATE_CNT and CST_CNT fields are written by OSPM
- PM1_CNT_LEN field is ? 2 (not ? 1) bytes
- IA-PC Boot Architecture Flags
  - Reserved field bit offset starts at bit 2 (not bit 3

ystem Description Table Changes
d Clarifications - continued

ADT

- Local APIC Address Override Structure leng
field is 12 (not 16) bytes
- I/O SAPIC Structure length field is 16 (not 20
bytes
- Local SAPIC Structure is significantly chang
  - Reserved field added
  - ACPI Processor ID field length changed from 2 t
byte
  - field order re-arranged

DT – Local SAPIC Structure

Table 5-26 Processor Local SAPIC Structure

Field	Byte Length	Byte Offset	Description
Type	1	0	7–Processor Local SAPIC structure
Length	1	1	12
ACPI Processor ID	1	2	The Processor Id listed in the processor object. For a definition of the Processor object, see section 16.2.3.3.1.17, "Processor (Declare Processor)."
Local SAPIC ID	1	3	The processor's local SAPIC ID
Local SAPIC EID	1	4	The processor's local SAPIC EID
Reserved	3	5	Reserved (must be set to zero)
Flags	4	8	Local SAPIC flags. See Table 5-18 for a description of this field.

ASL Grammar Changes

- ASL Type conversion function names changed to avoid legacy name collision
  - Buff > ToBuffer
  - DecStr > ToDecimalString
  - HexStr > ToHexString
  - Int > ToInteger
  - String > ToString
- CMOS Region Space Keyword renamed to SystemCMOS to avoid legacy name collision
- Copy function renamed to CopyObject to avoid lega
name collision
- Generic Register Descriptor
  - Single byte Reserved field inserted at byte offset 6 to matc
  the Generic Address Structure (GAS)

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ASL Grammar Changes

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2-bit vs. 64-bit Integer AML ssumption

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Existing AML may contain an inherent 32-bit assumption

OSPM will therefore use the definition block's Revision field to determine how integers are evaluated

– field value ? 2 means 64-bit integer assumption

ASL DefintionBlockTerm's *ComplianceRevision* field must be set appropriately by the ASL writer

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larifications

unctional Fixed Hardware

- OEMs may specify interfaces as Functional Fixed Hardware ONLY as specified by the CPU manufacturer!!!
- Requires coordination with the OS vendor

oad and Unload operators do not apply to tl ifferentiated Definition Block

ew thermal zone trip point object is named HOT (not _CS4)

ystem description tables may exist beyond -4GB address range

- Supports 64-bit systems

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Microsoft OS Implementation Update

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crosoft OS Implementation Update

/indows XP is not an ACPI 2.0
nplementation

/indows XP implements ACPI 1.0b
nd supports a few new features
efined in ACPI 2.0

crosoft OS Implementation Update

CPI 2.0 features supported in Vindows XP

- Processor Performance State Objects
- ACPI 2.0 64-bit Fixed System Description Tables
- _HPP (Hot Plug Parameters) object

CPI 1.0b features added to Windows XI

- Complete implementation of Video Extensio
  – Brightness Control objects are supported in addition to Display Output Control objects

ndows XP Processor Performance
ate Control Implementation

- egacy applet interface is used on 440B
nd 440MX-based systems

- CPI 2.0-defined objects can be used o
CH-based systems
  - Place objects in the Processor Object's object under the _PR Scope (_PCT, _PSS, _PPC)
  - Provide control value in PSTATE_CNT field in FADT at byte offset 55

indows XP Processor erformance Control Policy

- Performance state control policy is linked to Power Scheme
- Control policy types include:
  - None
    - Highest performance state
  - Constant
    - Lowest Performance state
  - Adaptive
    - Performance state chosen according to demand
  - Degrade
    - Lowest performance state + additional linear performance reduction as battery discharges

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indows XP Processor erformance Control Policy

ower Scheme	AC Power	DC Powe
me/Office Desk	None	Adaptive
rtable/Laptop	Adaptive	Adaptive
Presentation	Constant	Degrade
Always On	None	None
linimal Power Management	Adaptive	Adaptive
Max Battery	Adaptive	Degrade

Windows XP FADT Support

- Use PSTATE_CNT and CST_CNT fields as defined in ACPI 2.0
- Set FADT revision field = 2
  - ACPI 1.0b + legacy reduced hardware enhancements

Q Routing Problem Discovered

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IO devices that overlap with PCI link devices
ust have _DIS methods

xample: The _PRS method for PCI device
eturns IRQ 6 in the resource list. As a result
he OS assigns IRQ 6 to the PCI device. If the
DC does not have an _DIS method that
sconnects the interrupt, an inescapable
terrupt storm will occur.

CI devices include resources that overlap with resou
f SIO devices, the _DIS method under the SIO devic
must disconnect the interrupt routing!!

crosoft Call To Action

Test with Windows XP beta 2

Do not provide CPU performance state control through any means other than the O

– "Designed for Whistler" Logo requires use of OS native processor performance state control

Provide ACPI 2.0-defined Fixed Tables in Intel® Itanium™ Processor-based systems

– "Designed for Whistler" Logo requires ACPI 2.0-defined Fixed Tables for 64-bit systems

er OS Vendors ACPI Support Update

ntel® ACPI Component Architecture (ACPI CA)

– Provides an OS independent implementation of ACPI support in source code form
– Widely adopted by Itanium™ processor architecture OS vendors
– Linux and FreeBSD contain ACPI CA
– Includes ACPI 2.0 compliant ASL compiler

See: http://developer.intel.com/technology/iapc/acp

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el® ACPI CA ASL
mpiler Demonstration

Varning: Use of ACPI 2.0 grammar elements must b supported by the target operating systems! Consul vith your OSV to learn their implementation schedu

er OS Vendors ACPI Support Update

inux 2.4.0 kernel is released and ontains ACPI CA-based experimen CPI support

- Includes ACPI hardware subsystem initialization, Control Method Battery, power source device support
- Device power management architectu is under development

See: http://phobos.fachschaften.tu-muenchen.de/ac

Call To Action

- Download the ACPI 2.0 specification and its errata
  - http://www.teleport.com/~acpi/
- Include ACPI 2.0 support in your emerging platforms
  - Ask your BIOS vendor for ACPI 2.0 support
  - Request / implement devices performance state support
- Download and use the Intel® ASL compiler
  - http://developer.intel.com/technology/iapc/acpi/

ACPI 2.0 Specification Technical Update

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February 27 – March 1, 2001

Please remember to turn in your session survey form.