SMBus & Smart Battery Access under ACPI OS

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INTRODUCTION

• SMBus Host
  • EC (commonly combined with KBC)
  • Chipset (PIIX4, ICHx)
• SMBus Segment
  • Possible multiple Hosts = multiple SMBus segments
  • Smart Battery System (SBS)
  • Thermal Sensors (THS)
  • Other System Management devices (voltage and fan speed control, system indicators …)
• SMBus Clients
  • OS power policy manager and native apps (Power Meter)
  • OEM battery gauging apps (Phoenix BatteryScope, Power Panel, …)
  • OEM other apps/drivers (Platform Management drivers)
  • OEM Platform specific ASL code (e.g., Thermal Zone access)
INTRODUCTION (cont)

• Software Access to SMBus segment.
  • Access synchronization?
  • Different OS? APM and ACPI
  • SMBus driver availability:
    • Native OS drivers
    • Smart Battery Implementers Forum (SBS-IF)
    • OEM drivers
  • Battery gauging applications
TOPICS

- History: SMBus & SBS Under APM
- SMBus & SBS under ACPI: Native OS interface
- SMBus & SBS under ACPI: SBS-IF interface
- SMBus & SBS under ACPI: CMB interface
HISTORY: SMBUS & SBS UNDER APM

* - OS native
# - SBS-IF

- PM BIOS
- APM BIOS
- SMB HOST
- SMBus BIOS
- SMB Drivers #
- *APM Driver
- *OS/OEM Apps
- OECD Apps
- UI

- SBS
- THS

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HISTORY: SMBUS & SBS UNDER APM (cont)

• SMBus Host = EC/KBC or Chipset
• SMBus access synchronization in BIOS
  • Int15 SMBus BIOS extensions
  • APM calls to get Smart Battery status
  • BIOS access to SMBus devices (e.g., Thermal Sensors)
• Drivers
  • APM Driver (*OS native)
  • SMBus and Smart Battery Drivers (SBS-IF#)
• Applications
  • Phoenix BatteryScope
  • Battery Meter (SBS-IF#)
  • APM Control Panel (*OS native)
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• SMBus & SBS under ACPI: CMB interface
SMBUS & SBS UNDER ACPI: NATIVE OS INTERFACE

* - OS native

- ASL access to SMBus OpRgn
- * EC Driver
- * SMBus Driver
- Other Dev Driver
- OEM Apps
- * OS/OEM Apps
- * SM Bat Driver
- UI

SBS
THS

Phoenix Technologies Ltd - Smart Battery Data Expo
SMBUS & SBS UNDER ACPI: NATIVE OS INTERFACE (cont)

- SMBus Host = EC Only
  - Multiple Hosts/SMBus segments and SBS on one of them
- SMBus access synchronization - OS native SMBus driver
  - ASL CM access via SMBus Operation Regions
  - OS and Applications access to Smart Battery data
  - OS and Application access to other SMBus devices (e.g., Thermal Sensors)
- Drivers
  - EC, SMBus and Smart Battery drivers (*OS native)
  - Other Device Drivers (OEM???)
- Applications
  - Phoenix BatteryScope
  - Power Meter (*OS native)
SMBUS & SBS UNDER ACPI: NATIVE OS INTERFACE (cont)

- Specified in ACPI 1.0 -- Never completed in ACPI 1.0 OSes
  - No support at all in Win98/Me
  - W2k provides
    - SM Battery stack (SMBus & SM Battery drivers) – with many known limitations (e.g., no support for SM Battery System Manager)
    - SMBus Op Region support is broken
- Changed SMBus Operation Region definition in ACPI 2.0,
- XP – same as W2K
- Still waiting for full SMBus Op Region support
SMBUS & SBS UNDER ACPI: NATIVE OS INTERFACE (cont)

• Native Interface is not generic (even in the future)
  • EC SMBus Host Only
  • Win2K/XP+ only
  • No support for SBS Manager
  • Problems with composite battery data

• Current W2K/XP only solution
  • SMBus access synchronization – ACPI GLOBAL LOCK mechanism (adverse affect on system performance)
  • ASL CM access directly to SMBus Host registers in EC space (essential implementation efforts)
  • OS and Applications access to battery data via W2K SM Battery stack
SMBUS & SBS UNDER ACPI: NATIVE OS INTERFACE (cont)

* - OS native

ASL access to SMBus with GL

* EC Driver

UI

*OS/OEM Apps

* SM Bat Driver

* SMBus Driver

SBS

THS

EC
TOPICS

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• **SMBus & SBS under ACPI: SBS-IF interface**
• SMBus & SBS under ACPI: CMB interface
SMBUS & SBS UNDER ACPI: SBS-IF INTERFACE

* - OS native
# - SBS-IF

ASL access to SMBus

* EC Driver

SMB HOST

OEM Apps

Other Dev Driver

ASL SMBus CMI

SM Bus Driver #

*OS/OEM Apps

SM Bat Driver #
SMBUS & SBS UNDER ACPI: SBS-IF INTERFACE (cont)

- SMBus Host = EC or Chipset
  - Multiple Hosts/SMBus segments and SBS on one of them
- Standardized ASL Control Method Interface (CMI) used for SMBus access synchronization
  - All ASL CM access – call CMI methods
  - OS and Applications access to SMBus via SMBus Driver on the top of CMI methods
- Drivers
  - EC (*OS native), SMBus and Smart Battery drivers (SBS-IF#)
  - Other Device Drivers (OEM???)
- Applications
  - Phoenix BatteryScope
  - Power Meter (*OS native, still works with SBS-IF stack)
SMBUS & SBS UNDER ACPI: SBS-IF INTERFACE (cont)

- Availability.
  - SMBus CMI specification, version 1.0 (with ASL implementation sample code)
  - SMBus Driver available from SBS-IF now
  - Smart Battery Driver – under development

- Future SBS-IF solution - Generic
  - All ACPI OS (Win98/Me/W2K/XP)
  - EC and Chipset Host
  - SBSM specification support
  - Improved battery composition scheme

- Current W2K/XP only solution
  - SBS-IF SMBus driver is compatible with W2K Smart Battery Driver
  - No Global Lock
  - Standard CMI ASL code
SMBUS & SBS UNDER ACPI: SBS-IF INTERFACE (cont)

* - OS native
# - SBS-IF

ASL access to SMBus

* EC Driver

ASL SMBus CMI

SMB HOST

SBS THS

OEM Apps

Other Dev Driver

SMBus Driver #

*OS/OEM Apps

*SM Bat Driver

UI

UI

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SMBUS & SBS UNDER ACPI: CMB INTERFACE

- Generic (for all ACPI OS) solution that is available now: SM Battery to CM Battery data conversion
- Requires 2 layers of ASL code
  - SMBus access layer (access synchronization)
    - OEM proprietary, or Based on SMBus CMI spec – strongly recommended
  - Data Conversion Layer
- Drivers
  - EC, CM Battery (all *OS native)
  - Other Device Drivers (OEM???)
SMBUS & SBS UNDER ACPI: CMB INTERFACE(cont)

- OS native

* EC Driver

ASL access to SMBus

OEM Apps

Other Dev Driver

* OS/OEM Apps

* CM Bat Driver

ASL SMBus CMI

ASL SMB2CMB

SBS

THS

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SMBUS & SBS UNDER ACPI: CMB INTERFACE (cont)

- Applications
  - Phoenix BatteryScope
  - Power Meter (*OS native)

- Limitations
  - Only small subset of SM Battery Parameters can be retrieved after conversion to CM Battery standards
  - Specifically: no remaining time and battery wear information is available

- Important advantage of BatteryScope that can partially overcome CM Battery limitations
  - Calculations are less precise than SM Battery data
Questions and Answers