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 manger 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)

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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

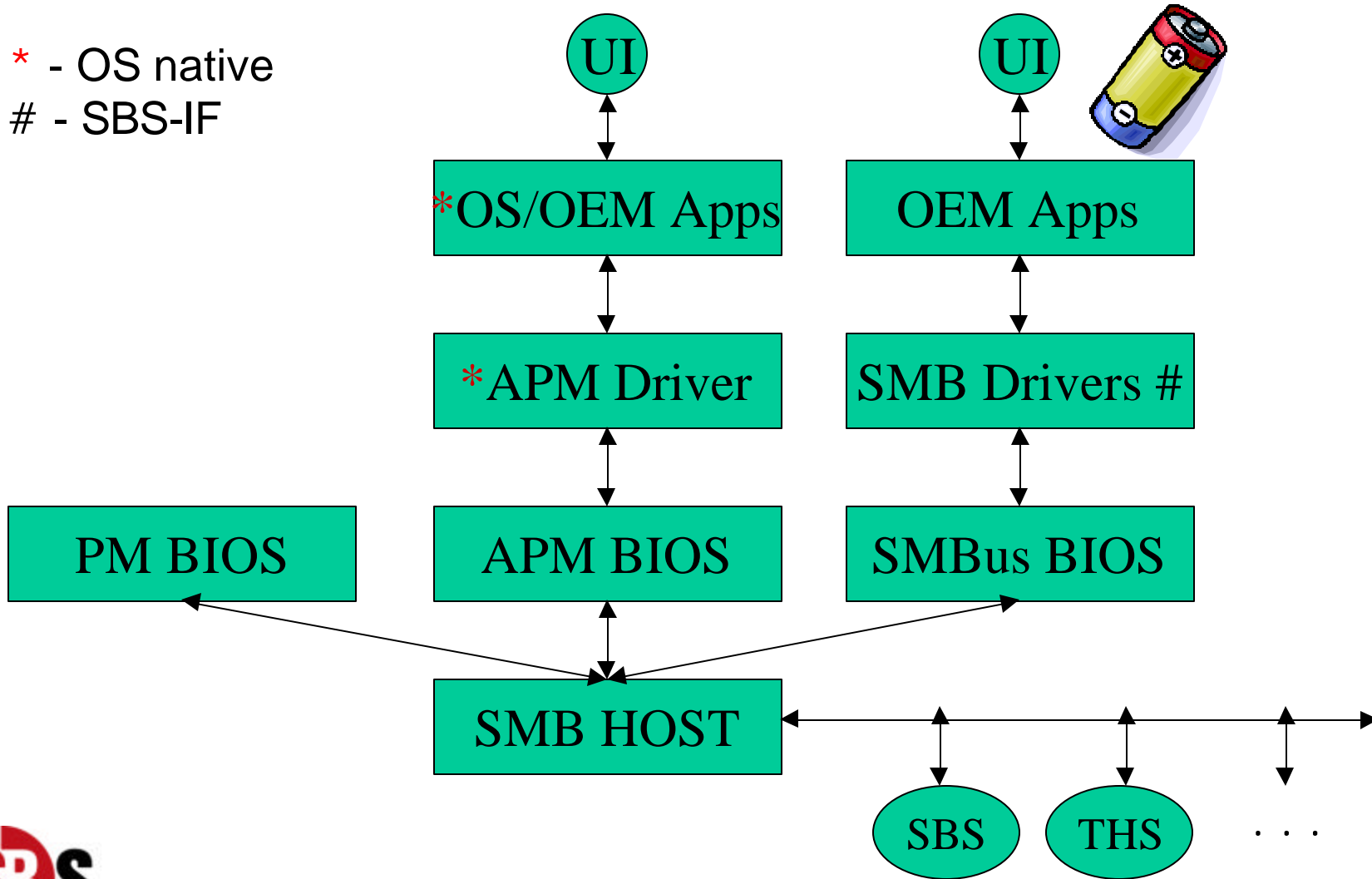Phoenix Technologies Ltd - Smart Battery Data Expo

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

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HISTORY: SMBUS & SBS UNDER APM

* - OS native
\# - SBS-IF

UI		UI
*OS/OEM Apps		OEM Apps
*APM Driver		SMB Drivers #
APM BIOS		SMBus BIOS

PM BIOS

SMB HOST

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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)
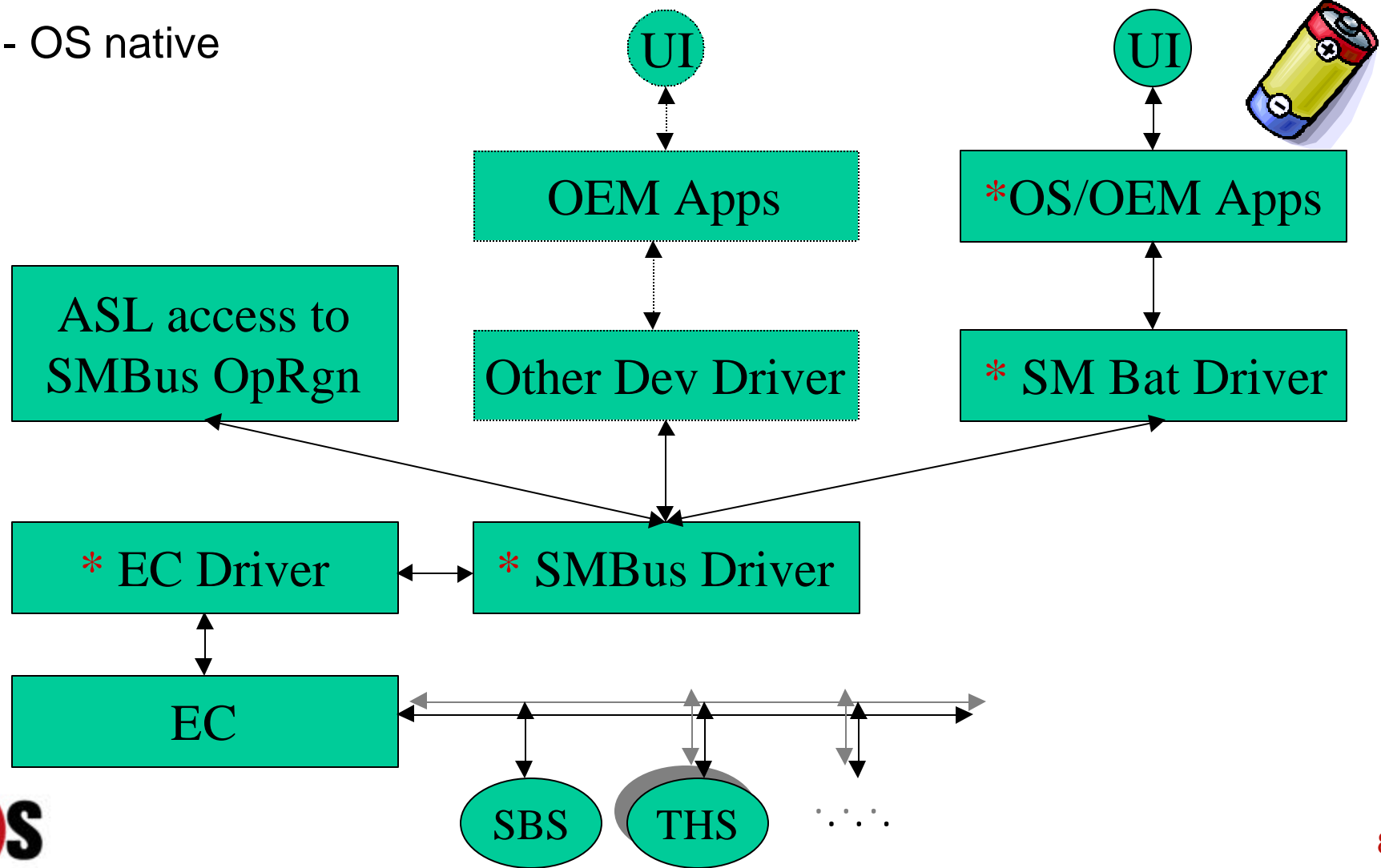
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SMBUS & SBS UNDER ACPI: NATIVE OS INTERFACE

* - OS native

UI

UI

OEM Apps

*OS/OEM Apps

ASL access to SMBus OpRgn

Other Dev Driver

* SM Bat Driver

* EC Driver

* SMBus Driver

EC

SBS

THS

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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)

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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

Smart Battery System
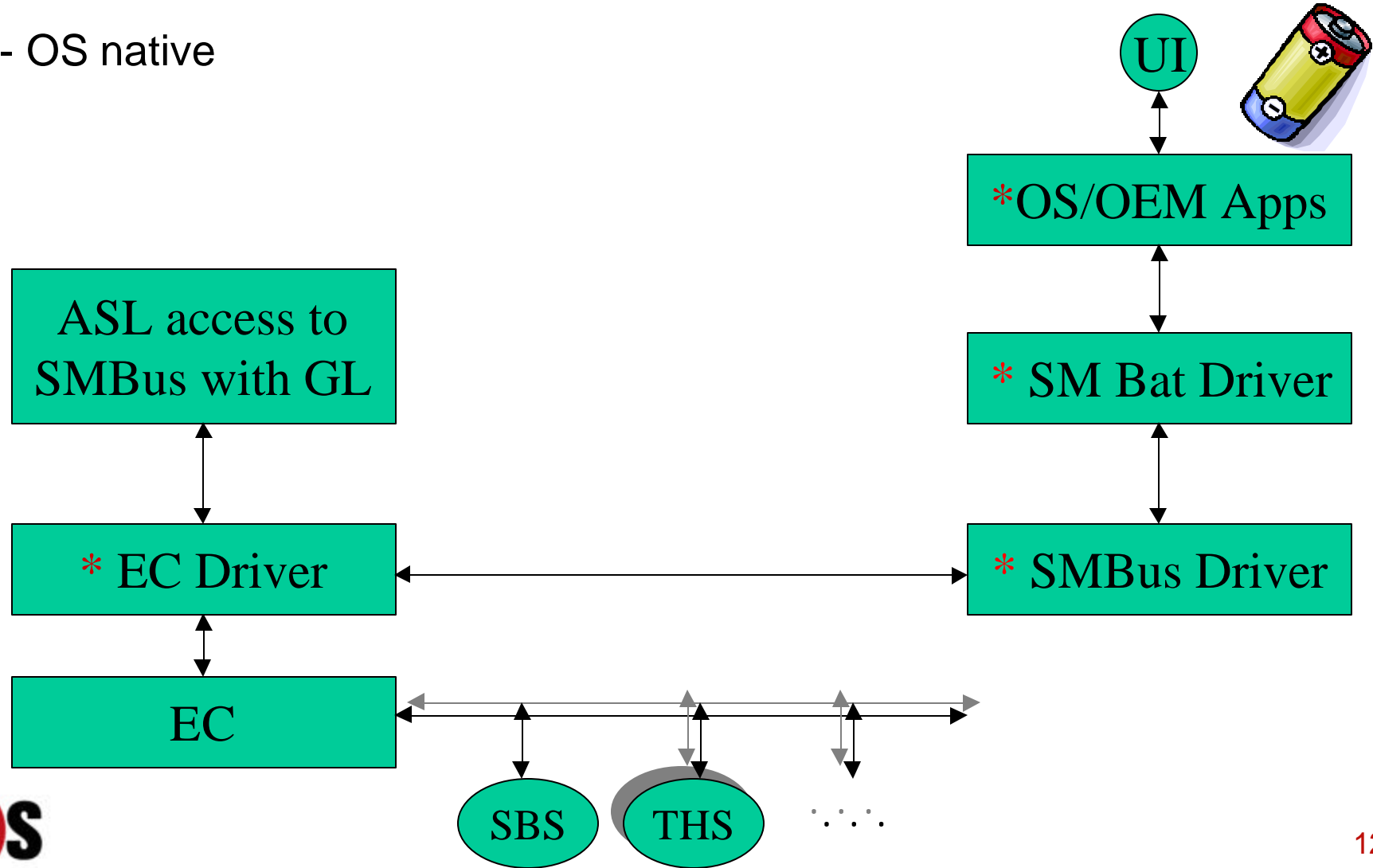Implementers Forum

SMBUS & SBS UNDER ACPI: NATIVE OS INTERFACE (cont)

- Native Interface is <u>not generic</u> (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

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SMBUS & SBS UNDER ACPI: NATIVE OS INTERFACE (cont)

* - OS native

UI

*OS/OEM Apps

ASL access to SMBus with GL

* SM Bat Driver

* EC Driver

* SMBus Driver

EC

SBS   THS   ·····

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SBS

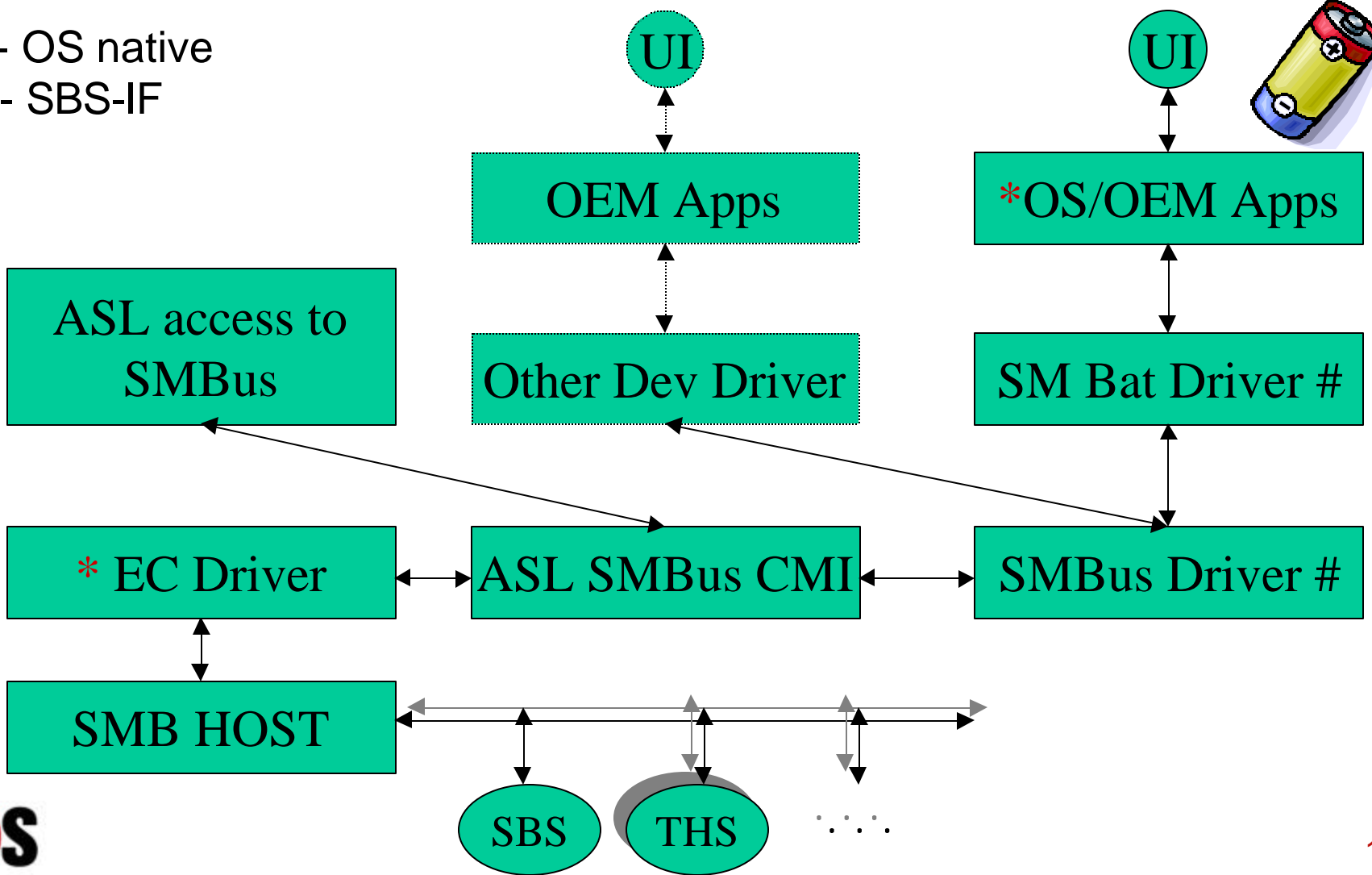Smart Battery System Implementers Forum

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SMBUS & SBS UNDER ACPI: SBS-IF INTERFACE

* - OS native
\# - SBS-IF

UI

UI

OEM Apps

*OS/OEM Apps

ASL access to SMBus

Other Dev Driver

SM Bat Driver #

* EC Driver

ASL SMBus CMI

SMBus Driver #

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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
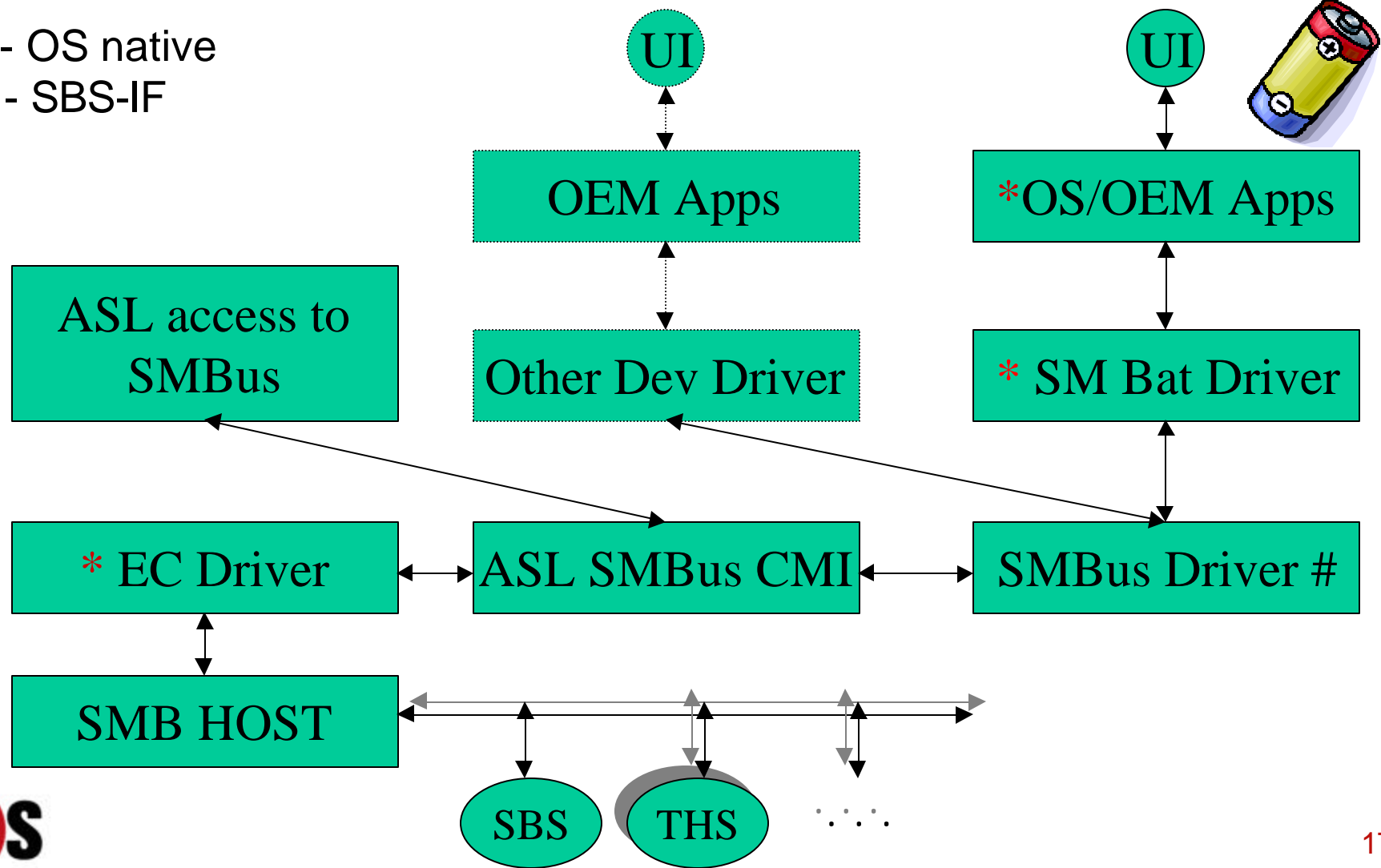 - Power Meter (*OS native, still works with SBS-IF stack)

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

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SMBUS & SBS UNDER ACPI:
SBS-IF INTERFACE (cont)

* - OS native
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UI

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ASL access to SMBus

Other Dev Driver

* SM Bat Driver

* EC Driver

ASL SMBus CMI

SMBus Driver #

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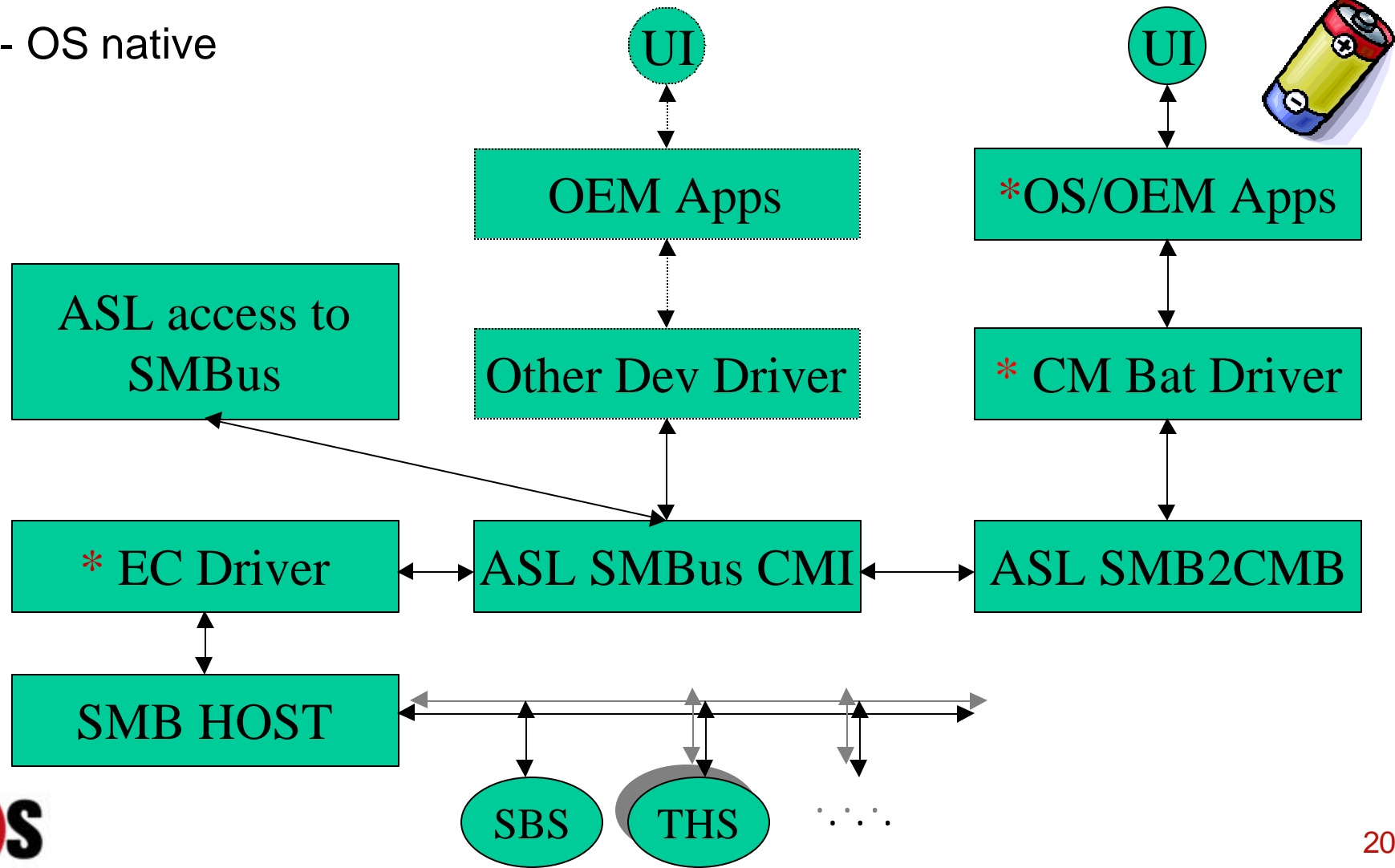Smart Battery System
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SMBUS & SBS UNDER ACPI: CMB INTERFACE

- 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???)

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SMBUS & SBS UNDER ACPI: CMB INTERFACE(cont)

* - OS native

UI

UI

OEM Apps	*OS/OEM Apps

ASL access to SMBus	Other Dev Driver	* CM Bat Driver

* EC Driver	ASL SMBus CMI	ASL SMB2CMB

SMB HOST

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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

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