Manageability HW Sensors and Controls

Intel Corporation
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Agenda

- Manageability Sensor types and uses
- Sensors/Controls Roadmap
- How sensors tie into Applications
- Sensor across Servers/Desktop/Mobile
- Trends and Recommendations
- Summary

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Role of HW Sensor in Manageability

- Provide data on HW conditions
- Provide data on HW inventory
- Provide data on SW conditions
- Provide data on SW inventory
- Proactively warn of impending problems

Manageability Hardware Overview

Anticipating failures before they occur and proactively correcting them during non-peak hours.

H/W condition(s) examples:

- **Power supply out of tolerance**
- **Fan speed too slow**
- **Temperature too high**
- **Someone is opening the chassis**

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Types of Sensors / Controls

- Cooling
  - Temperature probe
  - Fan rotation speed sensing
  - Fan rotation speed control
- Power
  - Power supply approaching failure
- Chassis
  - Intrusion detection
- Equipment status
  - LAN leash (detect missing or inoperative systems)
- MicroControllers

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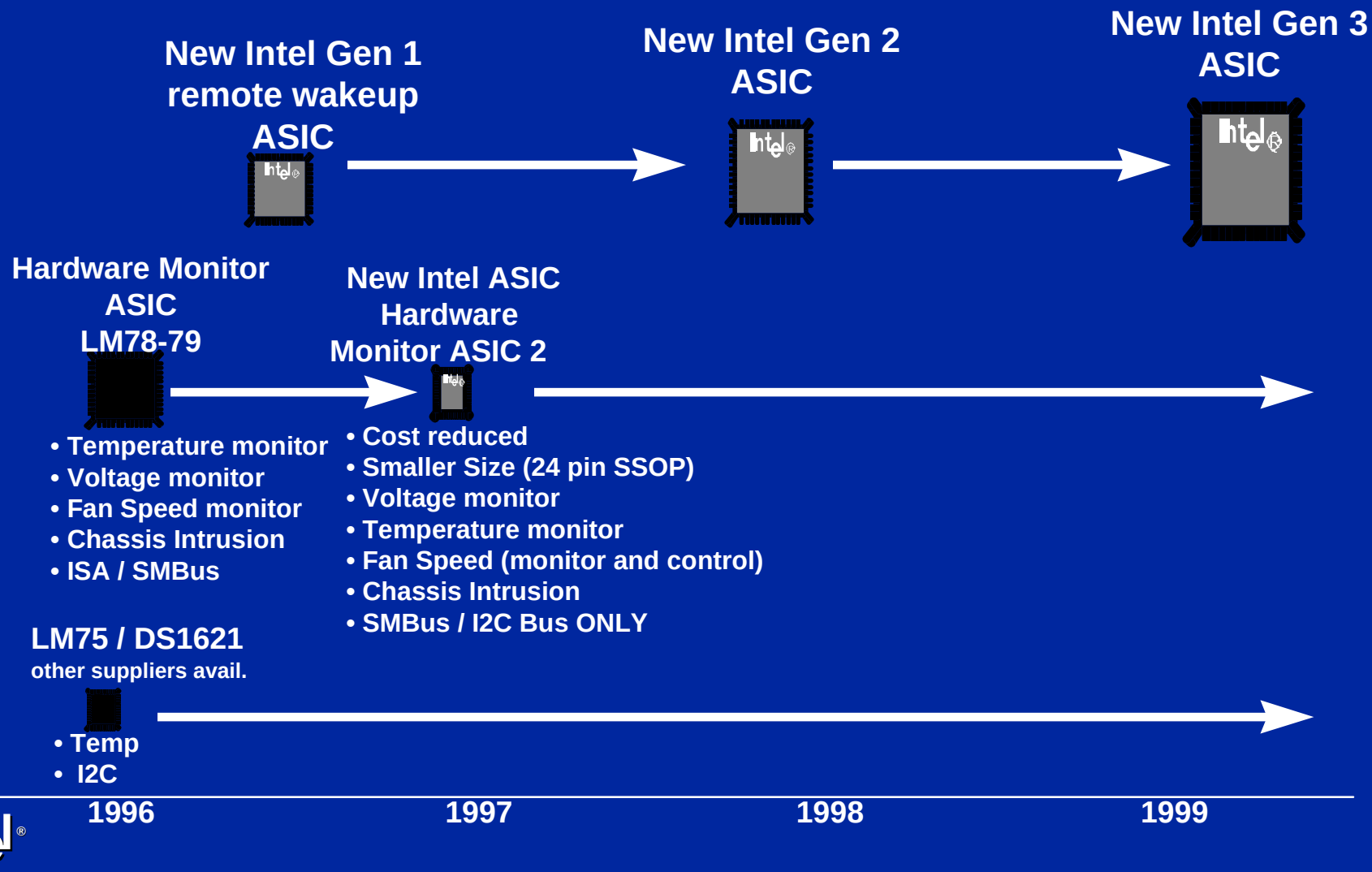
Commonly Used Sensors

- Typical sensors
  - LM75
  - LM78
  - LM79
  - DS 1621
  - AD9264
  - MAX1617
  - Remote Wake-up ASIC

Manageability Hardware + Roadmap



How Sensors tie into Management Apps

- data flow
- instrumentation (sensors and controls)
- alerts
- service provider
- management apps

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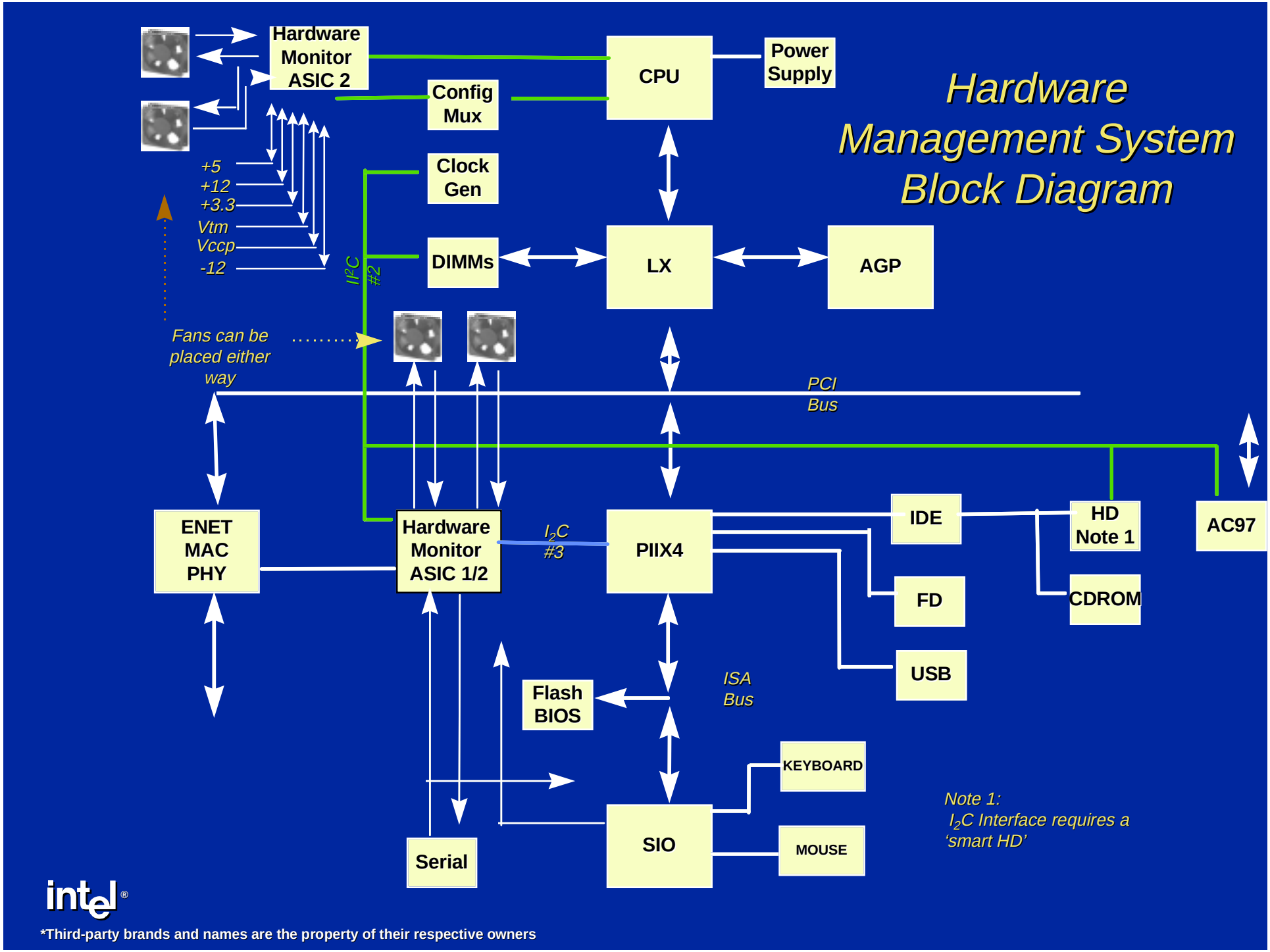
Hardware Management System Block Diagram



Thermal Sensors

- LM75 sensor example
  - Electrically connected to PIIX4 or EC
  - Programmable trip point interrupt or polled mode
  - SMBus address 90h
  - More info ...
    `http://developer.intel.com/design/mobile/datashts/index.htm`

    `http://national.com/appinfo/tempsensor/temphb.html`

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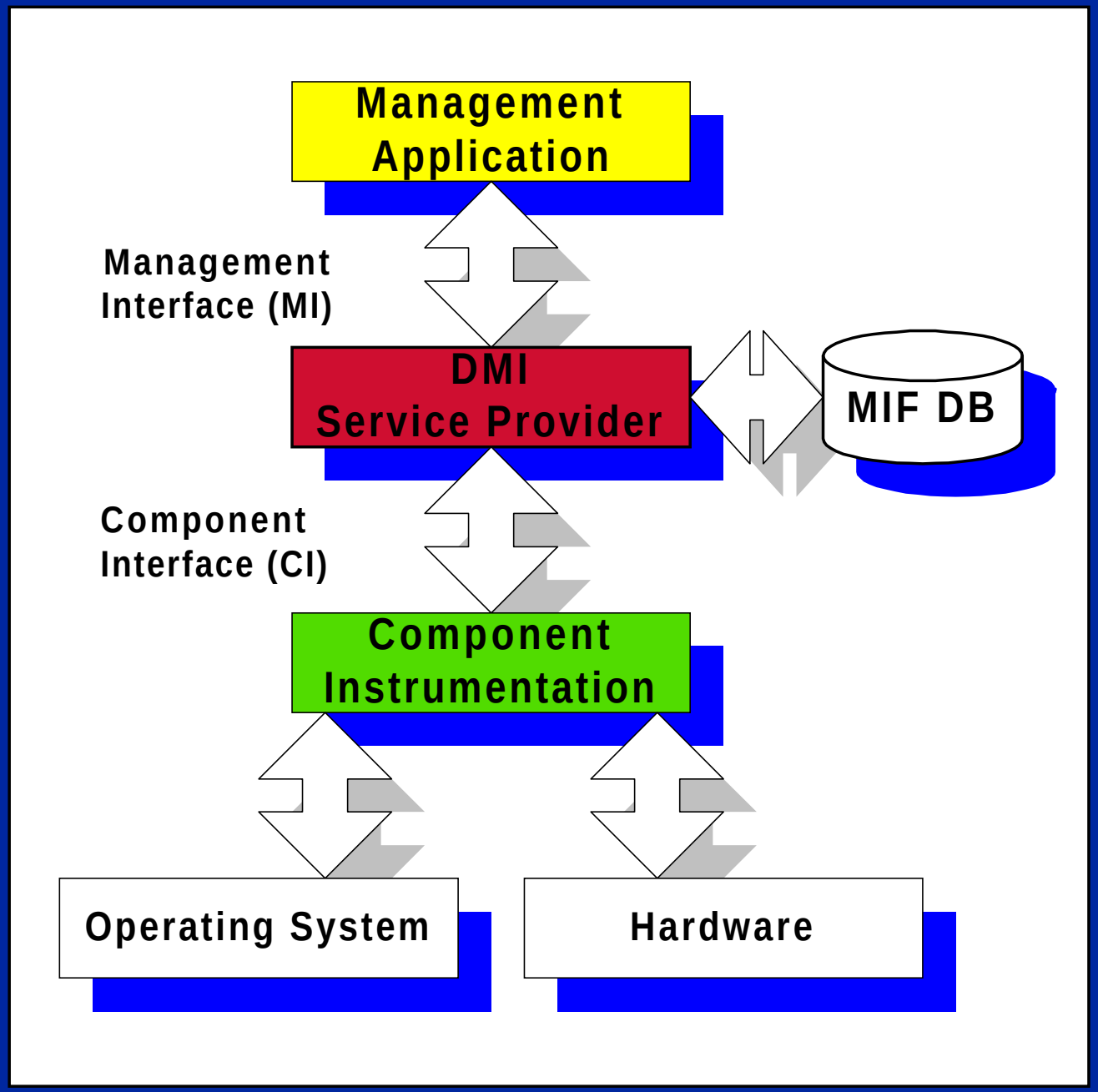

Platform Considerations

- **How sensors are wired in HW**
  - **Microcontrollers and custom ASICs are used as digital and analog sensing devices.**
  - **Intel, Compaq, Dell, IBM, NCR, and others have used microcontrollers for some time.**

Many discrete a/d converters, latches, etc., were formerly used indicating that there is a trend going from 'discrete' and 'custom' implementations to highly integrated, and more intelligent (autonomous) implementations for sensors.

Platform Sensors

The following information is routed to the platform management subsystem, and corresponding events logged in the event logs on each class of systems:

	Servers	Desktop	Mobile
Voltage/Analog Sensors:			
+12V, +5V, -5V, +3.3V, -12V	Y	Y	Y
CPU Voltage (per CPU)	Y	Y	Y
Chipset logic voltage	Y	Y	Y
SCSI Termination voltage	Y	N	N
Temperature Sensors:			
Baseboard Chipset Area	Y	Y	Y
I/O area	Y	NA	NA
RAID Backplane	Y	NA	NA
CPU (per CPU)	Y	Y	Y
Fans:			
Fan RPM (tach) low speed	Y	Y	Y
Chassis:			
Chassis Intrusion	Y	Y	Y
Electrical Interlock Status	Y	Y	Y

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Platform Sensors

	Servers	Desktop	Mobile
ECC Memory:			
◆ SIMM/DIMM count/pres.	Y	Y	Y
◆ DIMM module size	Y	Y	Y
◆ Single bit	Y	Y	Y
◆ Double bit ECC errors	Y	Y	Y
● **Bus Errors:**			
◆ PCI - PERR	Y	Y	Y
◆ PCI - SERR	Y	Y	Y
◆ EISA/ISA NMIs	Y	Y	Y
● **Processor Monitoring:**			
◆ IERR (Internal Error)	Y	Y	Y
◆ Thermal Trip	Y	Y	Y
◆ Machine Check Exception	Y	Y	Y
◆ Processor Presence	Y	Y	Y
◆ CPU voltage ID @ CPU	Y	Y	Y
◆ BIST Failure	Y	Y	Y

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Platform Sensors

	Servers	Desktop	Mobile
Power Supply			
◆ Power Supply Fan RPM	Y	Y	Y
Redundant power supplies			
◆ Power Supply Presence	Y	N	N
◆ Power Supply Fault	Y	N	N
◆ Fault Resilient Booting	Y	N	N
◆ Current Overload	Y	N	N
◆ Redundancy State	Y	N	N
Hot-swap Drive Backplane			
◆ Drive Presence	Y	N	N
◆ Drive array status	Y	N	N
◆ Drive Power Status	Y	N	N
Disk Drive			
◆ S.M.A.R.T.	Y	S	N

SMART indicates predictive failure from IDE and SCSI disk drives

Drive Array Status (Fault, Rebuilding, Identify, etc. - extracted from information set to backplane via SCSI)

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Thermal Sensors

Mobile Peripheral Components

- Use Other sensors as needed
  - Example: Motherboard, PC Card slots, Battery
- For Mobile choose appropriate thermal sensors
- Low voltage - 2.7V (or lower) - 3.3V
  - Low current - ~250µA
  - Examples: LM75 / LM56

    `www.national.com/pf/LM56.html`

    `www.national.com/pf/LM/LM75.html`

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Trends/Recommendations

- Sensor interfaces will evolve
  - Abstract via SW as much as possible
- Sensor populations and types of sensors will increase
  - Plan for extensibility
- Hot plug becomes more important (ACPI, SMBIOS, USB, 1394)
  - Build self-descriptive platforms and dynamically-configurable SW

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Summary

- Sensors/Controls are prevalent
- Level of integration is increasing
- Size and costs remain small
- Software stacks are key (flexibility)