SEMA
Smart Embedded Management Agent

SEMA Cloud
Next Generation Remote Control API

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At ADLINK, We CARE
SEMA - Smart Embedded Management Agent

SEMA is a set of embedded functions integrated in every latest ADLINK product.

**SEMA consists of**

- Board Controller
- Embedded BIOS Extensions
- API Library
  - EAPI (the PICMG Standard)
- Application Software
  - Command Line Interface
  - Management GUI for Windows / Linux
  - Web Server backend
  - M2M Solution
SEMA — Multi Platform API for x86 and ARM
The core of the system is an onboard MCU with firmware 100% developed in-house by the ADLINK team.

**Hardware Abstraction**
- All embedded functions are included in a single part that is the same for all ADLINK modules ensuring compatibility between product generations

**Always Accessible**
- Do you need to know, online and immediately, what is happening with your remote system?

SEMA offers access to the your modules embedded features via Command Line, GUI and even WEB browser or M2M Connectivity!
- The MCU is powered from standby voltage and can even be active when your system is down
Watchdog Function

• A watchdog timer (WDT) is a hardware timer that automatically generates a system reset if a software application program neglects to periodically reset it. It is often used to automatically reset an embedded device that hangs because of a software or hardware fault.

Operation

• After System start the Watchdog can be automatically enabled with a startup value from Flash memory.
• The timeout value is given in seconds and has a 16-bit (two byte wide) size. So the Timeout of the Watchdog can be set to 1-65535 seconds. 0 disables the Watchdog
**SEMA — Module Info and Statistics**

**Board Info**
The following information is stored in the BC:
- Board name
- CPU type
- BIOS version
- Part Number
- Serial Number
- LAN MAC ID
- BC firmware revision
- Repair information

**Runtime Statistics**
- The total system uptime in hours and minutes.
- Uptime since last boot, hrs / min / sec
- Number of power cycles.
- Boot cycles, HW / SW-Reset and Power-ups.
- Last Boot reason
Free High Speed I2C

- In addition to the SMbus supplied by the main chipset of the module up to 2 free to use high speed I2C busses are supported with the SEMA board controller. The I2C supports multi master mode and 100 or 400 kHz operation.

- The SEMA Board controller and I2C bus are both powered by the standby-power domain allowing operation during power down and suspend states.
Status Indicator LED

- The BC status LED can signal system state changes and power-up failures. A blink code will be displayed in case of a failure.
- **System state changes**: HW-Reset, SW-Reset, Power-Up, Power-Down, Reset-Button and Power Button activity.
- **Power-up failures**: the LED flashing code can signal a corrupted BIOS, failures at the onboard power supply or the module hanging while waiting for a Power OK due to problem with supply power or power sequence.

Last State

- Forensic information available after system or module failures include Min-/Max-temperature of CPU and system, cause of the last system restart and latest measurement of voltages on the module. All which can be used to analyze the system or module failure.
User Data
• The BC provides 512 for normal end user data. This memory area is independent from the BIOS and not cleared or restored during BIOS updates, which makes it perfect to store serial numbers, keys, configuration data, and other sensitive or board specific information.

Secure Area
• The SECURE area is 128 bytes in size and used to store critical data such as secure key codes. It can be protected through a one-time programmable hardware fuse to provide a maximum of security.
• This area may be compared to similar features such as Trusted Platform Modules (TPM) or SIM cards. Attach a unique key to your system and prevent your data from read or copied without your permission.
Backlight Control

- To suppress the BIOS screen appearing on the screen during boot the BC can inhibit the BKL_ENABL signal. It can either release it after POST or inhibit indefinitely after which on OS level an API command can release the signal.

Brightness Control

- Settings the PWM source for brightness control can be done in the BIOS. Sources are the
  - the integrated Graphics Core
  - the Board Controller’s own PWM output
  - a discrete PWM controller on the carrier.
- Startup brightness intensity can be selected in the BIOS.
**SEMA — Fail Safe BIOS**

**Dual SPI BIOS**
- Two identical BIOS are located on every board. One active and one continuously standing by.
- If through accidental corruption of the first BIOS the system becomes unbootable the BC detects this problem, resets the system and permanently switches over to the secondary backup BIOS.

**Fully compatible**
- The fail-safe BIOS implementation is fully compatible with the PICMG COM specification that allows an SPI BIOS to be located on the carrier or on a module.
SEMA — Temperature Monitor & Fan Control

CPU / System Temperatures
- Monitors temperature sensor readings of CPU and board temperature.

Hardware Monitor Logging
- When the SEMA GUI application is running the CPU and System temperature are queried every second (temperatures, power consumption etc.) and can optionally be written to a log file. The data is written as plain ASCII text in TAB separated columns and therefore can easily be imported into any spreadsheet calculation program or other data processing tools.

FAN Control
- The BC has its own PWM fan out output can automatically relates measured CPU temperature to the PRM of the Fan just like a normal smart fan controller

GPIO Control
- Every board comes with a GPIO extender that can be controlled by SEMA
Power Control

- The BMC controls the power sequence on the COM module. In cases where the carrier does not comply with the specifications and there are power up problems we can tune the BMC to match the carrier board.
- AT Power Mode detection by monitoring 12V and 5Vsb inputs.

ECO mode in S5

- When powered in ATX mode, standby voltage is consumed during the S5 state. In ECO mode the SEMA BMC can disconnect 5Vsb from the rest of the module to save maximum power.

Monitor System Voltages

- All voltages used on the module are measured and stored in up to 8 separate registers that can be read out by the end user.

Power Consumption Measurement

- The supply current on the 12V power input to the module and thereby the module’s power consumption can be measured.
GUI for Linux and Windows

- The SEMA GUI program is the same for Windows and Linux and is based on the QT Library version 4.8
- For Windows QTCore4.dll and QTGui4.dll are needed
- For Linux libQtCore.so.4 and libQtGui.so.4 are needed

CMD Line, Library, EAPI Calls for:

- Windows Family (including CE)
- Linux
- VxWorks
- QNX
SEMA — Remote Access / Control

Web Access

• CGI Script + Web Sever
• Remote Access & Remote Control
• 1-to-1 Connection (One device is controlled by one application)
SEMA Cloud — Next Generation Remote Control API

The Idea of Embedded Connectivity:

- Make your System Available Anywhere, Anytime
- Make your System Easily Maintainable
- Be Always Informed about your System’s Health and Status
- Re-act Proactive to Minimize System Downtime

Cloud Access

- M2M Stack (incl. Secure data connection)
- Remote Access & Remote Control
- 1-to-X Connection (X devices are controlled by one cloud application)

Analysis …

Case 1: CPU1

Case 2: Operator Interaction

Case 3: M2M Interaction — CPUs fail, SEMA-Cloud takes over

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SEMA Cloud — The Mechanism

- Application Control (Whitelisting)
- Intrusion Detection

Cloud Service (Dashboard)

Security

M2M Stack

SEMA Library Functions

Device Driver

BMC

mPCIe 3G Modem

M2M Device + SIM Card
SEMA Cloud – One-Stop-Shopping

**SW**: OS, SEMA, Virtualization, Middleware

**HW**: ZigBee, Bluetooth, GSM, CDMA, 3G/4G, LTE, WLAN...

**HW**: CoMs - x86 & ARM

**Managed Connectivity**
- Global Roaming
- Data tariffs with revenue sharing

**Customer Portal**
- Smartphone Apps
- Cloud Services (*SEMA Cloud*)

**Data Center + Hosting**
SEMA Cloud – Dashboard Application
Q & A