machine-to-cloud direction, hardware status information and business data are periodically sent to the cloud server. Hardware status information is processed in real-time for health assessment and failure detection. Data is stored in a database for further analysis and modeling. In the cloud-to-machine direction, commands and data can be sent to manage, control, and configure the vending machines. This includes performing remote diagnostics as well as pushing software updates to all devices as required.

Solution Architecture

Shown below is the end-to-end architecture of the Vending Machine Management and Analytics solution based on hardware, software, and cloud technologies from AD-LINK. In this solution, new and/or legacy vending machines are connected to the internet via broadband or wireless connection. Data from vending machines are then aggregated and stored on the cloud. From there, the data can be accessed via web-based dashboard, or retrieved by external applications for analytics purposes. Commands and data can also be sent from the cloud to remotely manage and control the vending machines.

The key building blocks of the solution are:

Intelligent vending machines based on an ADLINK

board/module or custom solution, collecting device data and supporting remote management, control and configuration.

- ADLINK IoT Gateways, aggregating data from multiple vending machines and connecting securely to the cloud.
- ADLINK SEMA Cloud solution, enabling edge-to-cloud integration and supporting cloud-based management of vending machines and real-time monitoring of machine data.
- ADLINK SEMA Cloud API, exporting device data and control points for use by external applications.

IoT Solution Benefits

Retailers have the most to benefit from this IoT solution for vending machine management and analytics. Operational expenses are significantly lowered due to reduced resources directed at on-site care, maintenance and repairs. Moreover, Internet based monitoring helps to optimize delivery schedules and streamline logistics.

Business performance will also greatly benefit from an increase in vending machine uptime. Pricing of sold goods can be dynamically adjusted and simplified inventory tracking helps optimize the range of available goods. Last but not least, increased transparency improves business insights into the entire sales process.



Headquarters

ADLINK Technology, Inc.

9F., No.166, Jian 1st Rd., Zhonghe Dist., New Taipei City 235, Taiwan 新北市中和區建一路166號9樓 Tel: +886-2-8226-5877 Fax: +886-2-8226-5729 Email: service@adlinktech.com

Worldwide Offices

Ampro ADLINK Technology, Inc.

5215 Hellver Avenue, #110, San Jose, CA 95138, USA Tel: +1-408-360-0200 Toll Free: +1-800-966-5200 (USA only) Fax: +1-408-360-0222 Email: info@adlinktech.com

ADLINK Technology Singapore Pte. Ltd.

84 Genting Lane #07-02A, Cityneon Design Centre, Singapore 349584 Tel: +65-6844-2261 Fax: +65-6844-2263 Email: singapore@adlinktech.com

ADLINK Technology Singapore Pte. Ltd.

(Indian Liaison Office) #50-56, First Floor, Spearhead Towers

Margosa Main Road (between 16th/17th Cross), Malleswaram, Bangalore - 560 055, India Tel: +91-80-65605817, +91-80-42246107 Fax: +91-80-23464606 Email: india@adlinktech.com

ADLINK Technology Japan Corporation

〒101-0045 東京都千代田区神田鍛冶町3-7-4 神田374ビル4F Tel: +81-3-4455-3722 Fax: +81-3-5209-6013 Email: japan@adlinktech.com

ADLINK Technology, Inc. (Korean Liaison Office)

137-881 서울시 서초구 서초대로 326, 802 (서초동, 모인터빌딩) Tel: +82-2-2057-0565 Fax: +82-2-2057-0563 Email: korea@adlinktech.com



All products and company names listed are trademarks or trade names of their respective companies. All specifications are subject to change without further notice.

ADLINK **TECHNOLOGY INC.**

SEMA Cloud

□ ADLINK Technology (China) Co., Ltd. 上海市浦东新区张江高科技园区芳春路300号(201203) 6 Feat 1 ice Event ment Processina M **MIXE 2001** 北京市海淀区上地东路1号盈创动力大厦E座801室(100085) R ADLINK Technology Shenzhen MXE-100 深圳市南山区科技园南区高新南七道数字技术园 LEC-BIS REMOTE MANAGE LIPPERT ADLINK Technology GmbH Hans-Thoma-Strasse 11, D-68163, Mannheim, Germany

5 E











=

 \sim

Tel: +86-21-5132-8988

Tel: +86-10-5885-866

Fax: +86-10-5885-8626

A1栋2楼C区(518057)

Tel: +49 621 43214-0

Fax: +49 621 43214-30

Email: emea@adlinktech.com

Fax: +33 (0) 1 60 12 35 66

Tel: +972-54-632-5251 Fax: +972-77-208-0230 Email: israel@adlinktech.com

Email: france@adlinktech.com

ADLINK Technology, Inc. (French Liaison Office) 6 allée de Londres, Immeuble Ceylan 91940 Les Ulis, France Tel: +33 (0) 1 60 12 35 66

ADLINK Technology, Inc. (Israeli Liaison Office)

27 Maskit St., Corex Building PO Box 12777 Herzliya 4673300, Israeli

Tel: +86-755-2643-4858

Fax: +86-755-2664-6353

Email: market@adlinktech.com

Email: market@adlinktech.com

Fax: +86-21-5192-3588

Email: market@adlinktech.com

ADLINK Technology Beijing

Version 2.0



TECHNOLOGY INC. WWW.adlinktech.com





SEMA Cloud - A Solution to Manage, Control and Configure your devices

An Intelligent Cloud Solution for Remote Monitoring, Management and Control

Downtime of devices or systems is not acceptable in today's industries. To help customers to analyze their systems and take counter measures for preventive maintenance, ADLINK has developed a tool which is able to monitor and collect system performance and status information from the hardware in a timely, flexible and precise manner: the Smart Embedded Management Agent (SEMA).

By combining SEMA intelligent middleware with cloud connectivity, ADLINK takes remote management technology a step further than previous generations. By employing full connectivity, from edge to cloud to end application, SEMA-enabled embedded devices can connect to the cloud without additional design requirements. Pushing data to the cloud enables operators to verify, monitor and control system performance from a single, central location - improving reliability and reducing management costs.

- Manage and control all devices with one click
- Avoid system downtime by predictive maintenance
- Integration of operational device data to business processes
- Reducing the Total Cost of Ownership

Manage and control all devices with one click

- Integrate an unlimited number of devices into the SEMA Cloud service
- Monitoring and control all devices from anywhere at anytime
- Reduce downtime and increase system reliability

Avoid system downtime with Predictive Maintenance

- Proactively respond as irregularities are identified
- Automatic event processing avoids system downtime
- Assign threshold to any kind of data
- Assign alerts when thresholds are crossed
- Stay informed about irregularities by SMS and email notifications

Integration of operational device data to business processes

 vertical networked/ integration of embedded systems with business processes -> interface to ERP systems (e.g. SAP, SQL)

Reducing Total Cost of Ownership

- Concurrently run common tasks for predefined groups of devices
- Remotely apply batch updates to devices
- Save costs by avoiding on-site maintenance

The Architecture of SEMA Cloud

Being a holistic solution, ADLINK's SEMA cloud offers users the entire infrastructure required. Customers do not need to develop their own cloud solution, avoiding laborious checking of hardware compatibility, finding a suitable cloud server, implementing data encryption or developing proprietary communication protocols.

SEMA Cloud is based on ADLINK products. In addition to individual devices, it includes encrypted data transfer to our cloud infrastructure and an intuitive graphical user interface (GUI) to monitor and/or control devices from any location at any time via the Internet.



ADLINK devices

All SEMA-enabled ADLINK products feature a Board Management Controller (BMC). The BMC collects all relevant data from the chipset and other sources and provides it to a software layer, which prepares the data and transfers it to the cloud via encrypted communication (TLS).



• Devices transmit data via Ethernet 🖉, Wireless LAN 🕮

- or 3 / 4 cellular network to the cloud
- Integrate external sensors via MQTT protocol
- Additional customer data can be transferred



While Embedded Computing and Measurement and Automation Solutions form ADLINK's core offerings for many vertical markets, ADLINK is also focused on developing gateways to implement the Internet-of-Things (IoT). Smart gateways collect data from sensors, which are not capable of autonomously transferring information to the cloud. These gateways require a wide range of different interfaces and the relevant communication protocols to provide the connection between sensors and the cloud infrastructure. So that legacy devices can be included, rarely used and uncommon may need to be accommodated. Intelligent filtering of data by gateways reduces the bandwidth required.

Online Portal MXE-500i-924

Use Case: Vending Machines

ADLINK's Global Cloud Server Infrastructure

ADLINK's cloud services meet the highest safety standards and the highest demands on reliability. ADLINK offers their customer's servers in three geographies (United States, Ireland and Japan). Customers have the following key functions at their disposal:

ADLINK's SEMA Cloud Agent

The SEMA Cloud Agent offers the ability of a device to interwork with the Cloud Server.

The Cloud agent provides an Operation Rule Processor, so it is possible to download a configuration file from the online portal and execute it. If the devices lose the connection to the cloud, it will recognize the lost connection and will store all data until the connection is reestablished. The contact of the devices for transmitting data can be planned. At pre-defined times the device establishes a connection to the cloud and sends or receives data. That is possible for 2G/3G/4G connections.

ADLINK's Cloud agent is running on the most popular embedded OSes. It is available for Windows. Linux and Android in 32/64Bit and it is usable on x86 and ARM architectures.

- Operation Rule Processor: downloads and executes configuration files on the device
- Not-always connected mode (2G/3G/4G)

Device Management

- Manage connected devices with unique ID
- Monitor data connection for guality and reliability
- Re-establish connection and collect buffered data if connection has been lost
- Store the data from field clients (optional)

SDK for customer specific data

• push your own data from device to the cloud

Data Management

- Connection management, including server availability and traffic control
- Interface to ERP systems (e.g. SAP, SQL)
- Download of any kind of files to one or multiple devices, e.g. to perform FW upgrades

Event Processing

- Analyze device and sensor data using defined rules for device and data type
- Trigger SEMA calls when preset threshold values are exceeded (e.g. send SMS or email notification, initiate system shutdown)
- Operation Rule Processor: Rules can be processed in

the cloud as well as downloaded to one or multiple devices to run locally

Online Portal

- Access device information and sensor data via HTML capable browser
- Web APIs for customer specific HTML or mobile app development
- Location tracking: positional representation of all devices
- Campaign management: scheduling of actions or tasks for single devices or pre-defined groups of devices

The Online Portal offers an easy to use approach to get all information of your devices in the field and control individual or groups of devices. The implemented location tracking function informs the user about the exact position of the application.

At the edge, intelligent machines and IoT gateways are protected by security mechanisms based on Secure Boot and TXT capabilities. Furthermore, McAfee-based application whitelists and change controls are enforced at gateways to guard against software tampering and malicious code. Data and control messages between the SEMA Agent on the device and SEMA Cloud Server are transported over TLS connections. On the SEMA Cloud server, dashboard access requires login credentials, and SEMA Web API calls are controlled via authorization and authentication.

The following scenario demonstrates the various functions of ADLINK's SEMA Cloud services, highlights potential savings and illustrates its benefits.

Use Case: Vending Machines

Vending machines have been in use by retailers for many years as self-serve solutions to sell beverages, snacks, and tickets to consumers. In recent years, vending machines have proliferated both in numbers and diversity. They can be found in many public locations as well as private facilities, selling different types of goods and services. They are also becoming more and more intelligent, supporting better user interfaces and offering more selection.

Situation

- High cost of maintenance and support (software updates, troubleshooting and repairs)
- Revenue loss when a vending machine goes out of order

These challenges can be met with an Internet of Things (IoT) solution enabled through two-way communication between vending machines and a cloud server. In the

