Cost Reduction and Data Monetization with ADLINK’s SEMA Cloud

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ADLINK - Company Profile

Establishment: August 1995
Headquarter: Taipei, Taiwan
Ownership: Publicly listed since January 2002
Listing: TAIEX: 6166
Revenue: US$265M (Y2014); US$219M (Y2013)
Employees: 1,456 (Apr. 2014)
Branch Offices: USA, Germany, France, Israel, UK, Singapore, India, China (BJ, SH, SZ), Korea, Japan

World-class provider of Industrial Building Blocks (IBB) and Industrial Application Platforms (IAP) for embedded computing, measurement and automation applications.
Agenda

• Introduction
• Architecture Overview
• Features Overview
• Special Features
• Scenarios
• Summary
• Q&A
IoT: More than “just” connecting things... ... it’s about Data!

- **Generating Data**
  - Sensors

- **Collecting Data**
  - Devices Hardware / Firmware

- **Consolidating Data**
  - Gateways

- **Transferring Data**
  - Network Infrastructure

- **Storing Data and Making it Available**
  - Cloud
  - Big Data

- **Analysing Data and Taking Action**
  - Remote Management, Update and Control
  - Predictive Maintenance
  - Lifecycle Management

At ADLINK, We CARE
ADLINK’s Vision of the IoT

• Connect all devices together using a cloud based solution
  - Make your systems available anywhere at anytime
  - Make your systems easily maintainable and reduce OPEX
  - Make data available and monetize your data
ADLINK’s Solution: SEMA Cloud

- Application ready comprehensive industrial IoT Platform
  - connecting Devices to a Cloud Platform and to Web Applications
  - for monitoring and controlling your devices
  - ready to develop own Applications
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SEMA Cloud 2.0
Architecture Overview

Intelligent Middleware

Device
SEMA Cloud Gateway/Agent

Custom Data

ERP System

WebAPI

Mobile Application

Management Portal / Online Portal

Device Management
- Ensure reliable communication

Event Processing
- E-Mail / SMS / SEMA Call

Data Management
- Storage, High Load Balancing

Security

Servers

web-based
SEMA Cloud 2.0
Platforms and Systems Supported

- mini-ITX
- PC/104
- COMExpress
- Q7
- SMARC
- ETX
- mini-ITX Systems
- Intelligent Computing Platforms
- SBC
- Infotainment Systems
- Smart Touch Computer
- CompactPCI
- IoT Gateway

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SEMA Cloud

ADLINK’s Edge-to-Cloud-to-Application IoT Solution

SEMA Cloud is providing a full connectivity from edge to cloud to application where it focuses on

- Remote monitoring, management and controlling of all kind of computer modules and devices.
- Providing application and platform for predictive maintenance
- Platform for vertical integration of operational device data to business processes
- Helping our customers to reduce their TCO and to develop own business models leveraging data
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SEMA Cloud 2.0
Features Overview – Cloud Gateway / Agent

- **SEMA Cloud Agent / Gateway**
  - Available for Linux x86 / ARM and Windows x86
  - Secure connection (TLS 1.2) to Cloud Platform (MQTT / TR-50 Interface)
  - Full remote integration and support of SEMA 3.0 monitoring and controlling features!
  - Local Data Base
  - Special Features: e.g. Operation Rule Processor, Remote SW/FW Update, …

- **Software Development Kit**
  - Integrate customer specific data
  - Connect other sensors/actors
SEMA Cloud 2.0
Features Overview – Data Server / IoT Service

• **Data Server / IoT Service**
  – Platform-as-a-Service (PaaS)
  – Servers in 3 geographical areas:
    • Europe: Germany / Americas: USA(*) / Asia: Japan(*)
  – Features
    • Connection Management
    • Device Management
    • Data Storage
    • Alert Notifications
    • Reporting Engine
    • MQTT Broker

• **Enterprise Gateway** (optional)(*)
  – Vertical integration of embedded system data in Business Processes
  – Interface to ERP system or database (e.g. SAP, SQL)

(*) on request / future roadmap item
SEMA Cloud 2.0
Features Overview – Management Portal and WebAPI

• **Management Portal**
  – web-based Online Portal
  – incl. Dashboard

• **WebAPI**
  – secure MQTT or HTTP TR-50 or RESTful HTTP interface
  – to develop own mobile or desktop applications.

- Managing SEMA Cloud IoT Service
- Managing Users
- Managing Devices
- Develop Applications
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SEMA Cloud 2.0
Special Features - Overview

Operation Rule Processor

Connection drop recognition

Not always connected mode

Location Tracking
Create a Software Update Package (SUP)
Execute Campaign
Distribute Package
Execute Update

Remote FW/SW Update

Campaign Management

File Transfer

Tunnel Manager

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SEMA Cloud 2.0
Special Features – Operation Rule Processor

- Rules <=\(\) Event -> Trigger -> Action
- Running on device level and/or cloud level
- Trigger Events, e.g.:
  - Data – device data meets a defined condition
  - Listener – message arrived from other application
  - Fire Trigger – action caused by another Trigger
  - Schedule – scheduled trigger
  - User Operation – manual execution of trigger
  - Cellular Modem Event – e.g. SMS is received
  - Agent Events, Enterprise Events, Internal Events – events from different entities
  - Management Portal Events, Thing Events, TR50 Events, …
- Use Case Examples:
  - CPU Temperature exceeds threshold -> generate Alarm + throttle down CPU + increase fan speed
  - GPIO status indicates box opened without authorization -> generate Alarm + shutdown system.
  - Application generates Alarm -> upload status-reporting file to cloud.
SEMA Cloud 2.0
Special Features: Not-always connected mode

Use the not-always connected mode to save data volume and online time in your mobile applications.

Schedule the connection
- Define timings for establishing a connection to the cloud. The device will follow the schedule and contact the cloud at these timings automatically.

Example
- In mobile applications it is not possible to use LAN or WiFi connections. In this case it is possible to use a 3G/4G Interface. To reduce the traffic, the not-always connected mode only establishes a connection in pre-defined timings.
Use Connection Drop Recognition to establish a confirmed data transmission from device to cloud and to avoid loss of data in case of temporary network connection drop.

**Buffering data when connection is lost**

- Connection Drop Recognition allows to identify when the network connection between device and cloud is lost so that collected data is stored temporarily locally at the device and forwarded to the cloud when the network connection is available again.

**Example**

- Sensor data shall be pushed frequently or device data shall be pushed in case of events to the cloud, but in case of network problems loss of data has to be avoided.
Transfer files in both directions from or to the device through the cloud.

**Transfer all kind of data**
- Device data
- Customer data
- Commands

**Always Accessible**
- Download any kind of data files to one or multiple devices.
- Perform firmware updates
- Analyze business data
- Update price lists
- Control your device
SEMA Cloud 2.0
Special Features: Tunnel Manager(*)

Tunnel Manager allows to create and use an IP-Tunnel from your computer via SEMA Cloud Platform to the device using the existing secure TR50 connection.

TR-50-Tunnel for Remote Management

- Supporting remote of server applications on the devices with client applications like the SEMA Cloud Workbench
- (Optional) other applications, e.g.
  - SSH client,
  - Remote Desktop Protocol (RDP) client

Example

- Remote Workbench access to allow service experts to maintain device remotely.

(*) optional enhancement
SEMA Cloud 2.0
Special Features – Campaign Management

• Scheduling of actions or tasks for single devices or pre-defined groups of devices.

• Use Case Example: Remote FW Updates
SEMA Cloud 2.0
Special Features – Remote FW / SW Update

- Firmware or software can be updated remotely
- Many updates can be performed in parallel

Use Case Examples:
- Update firmware of your embedded devices without need to be on site.
- Update software with new optimized settings / configurations or error corrections without service staff to travel.

Create a Software Update Package (SUP)
Execute Campaign
Distribute Package
Execute Update
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Use Case Examples

- Remote Monitoring, Controlling, Management (TR50 tunnel)
- Condition Based Maintenance -> reduction of Downtime
  [using basic parameters like system temperature]
- Remote SW/FW Update -> reduction of Maintenance Costs
- Logfile Parsing -> reduction of Downtime & Maintenance Costs
SEMA Cloud 2.0
Use Case: Remote FW Update

Local vs. Cloud

FW Update (10 min)

Example:
1000 Devices, 4 FW Updates / Year
= Multiple Technicians travel and update on site
= 1000 Devices x 4 Updates x 100€
= 400,000€ / Year

FW Update (10 min)

Example:
1000 Devices, 4 FW Updates / Year
= One Technician updates all devices at once by remote
= 100€ / Year

Reduction of the Total Cost of Ownership.
Use Case Examples

• Monitoring Operational Data and Health Status of Device (sensors connected via I2C)

• -> Predictive Maintenance

• -> New Maintenance Service Business Model
Scenario: Factory Automation

- Re-Configure Machines remotely
- Access Factory Data globally
- Report Data
- Take Control
- Analyze Data
- External Big Data Analytics
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SEMA Cloud 2.0 in a Nutshell

- ADLINK’s one-stop Edge to Cloud to Application IoT Solution
- Application ready comprehensive industrial grade IoT Platform
- Connecting Devices to a Cloud Platform and Web Applications
- Comprising: device SW + M2M/IoT Service on Cloud Platform (PaaS) + Management Portal + WebAPI + SDK + Support + [...]
- Devices: multiple HW/OS support (x86, ARM / Linux, Windows)
- For remote monitoring and controlling your devices
- Platform for predictive maintenance
- Ready for integrating device data in business processes
- Ready to develop own Web applications leveraging data
ADLINK’s SEMA Cloud

ADLINK’s one-stop edge-to-cloud-to-application IoT Solution.

Reduce maintenance costs and monetize your data!
Case Study – Vending Machine
Challenge: Secure Data Communication

„The main concerns in the industry when talking about cloud is that data may be stolen, lost or attacked.“
SEMA Cloud – Security Framework

To address security challenges SEMA Cloud is complemented by...

**Secure Boot**
Mechanism to prevent loading of unauthorized software during device boot

**McAfee Application Control**
Whitelisting Solution to guard against software tampering and malware and zero-day exploits

**Transport Layer Security (TLS 1.2)**
Secure, reliable data transfer from device to Cloud through state of the art encrypted data transmission protocols. (*)

**Secure hosted Cloud Platform**
Ultra-secure environments through leading global platform hosting partners.

**Authentication**
Authentication processes using application and device specific keys.

(*) e.g. AES-256 (Advanced Encryption Standard)
SEMA Cloud 2.0
Leveraging SEMA 2.X and 3.0 monitoring and controlling features

SEMA Cloud 2.0 leverages SEMA 2.5/3.0 comprehensive monitoring and controlling features by integrating them in a secure e2e industrial grade IoT Platform.

### SEMA 2.5 – Features

- CPU Temperature
- Board Temperature
- Voltages
- Power Consumption (current)

### SEMA 3.0 – Features

- **CPU Information**: CPU frequency, CPU operating mode, number of CPUs, number of Cores, CPU usage, Cache size
- **Memory Information**: Total memory, free memory, frequency
- **Network Information**: Network interface, IP address, subnet mask, MAC address
- **HDD**: S.M.A.R.T.
- **Temperature**: HDD, HDD health, HDD capacity, HDD device information
- **Heartbeat**

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**Online Portal**
- SEMA Cloud Platform
- MQTT / HTTPS
- TLS/SSL, TR50

**Application Layer**
- SEMA Cloud Agent
- SEMA Extended EAPI
- Extended EAPI Library

**Driver Layer**
- I2C Protocol

**Hardware / Firmware Layer**
- BMC Controller
- I2C-bus
- Chipset

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Thank you