Handling Web of Objects interoperability issues

Web of Objects project

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March 10th, 2015
Clients’ issues

Heterogeneous ecosystem of devices management

Today’s connected-objects (sensors, actuators, industrial devices...) are communicating, but often in different languages.

The number and diversity of communication protocols between these devices are for any industrial system a real Babel tower:

smartEngine is Sogeti HighTech’s solution to clients critical issue.

A solution to:

- Provide communication between heterogeneous devices with or without local/remote management system.
- Manage heterogeneous data and events.
- Configure devices remotely.
- Call services remotely.
Sogeti HighTech smartEngine is a solution to this issue (and others) developed during ITEA2 WoO: **A versatile generic engine to manage and process Internet of Things /M2M devices, data, events & services**

- **Agnostic to business domain**
- **Multi-OS**
  - Linux.
  - Windows 32/64 bits.
  - Mac OS.
  - Portable on other OSes
- **Multi-hardware targets**
  - X64, x86, ARM, ...
  - PC, Smartphones, tablets, embedded systems...
- **A scalable architecture**
  - Modular by plugins.
- **Built to be embeddable**
  - Small footprint to fit to smallest customer’s environment & products, but adaptable to all target size.
Communicating between external entities to the Core application (core input)

- Input plugins dedicated to dialog with specific devices (sensors, actuators...)
- Communication with core (data, events, services... synchronous/asynchronous).
- Provide specific & logical business services View for devices.
- Allow remote clients to call/configure these services & devices.
• **Industrial devices / smart-***: web services, DPWS, modbus, KNX, profibus, ...

• **Geolocation**: GPS coordinates, RFID tag,

• **Home automation**: Zigbee HA, Xbee, USB, IRDA, wifi, ZWave (door opening, presence detection...)

• **Multimedia**: camera, microphone, Kinect, UPnP, DLNA devices, mouse, keyboard...

  • **Automotive**: OBDII, CAN, ...

  • **Health**: HL7 (Continua) ...

  • **Security**: HTTP, TCP, UDP, ...frame sniffers.

  • **Reactive to external websites**: Twitter thread, RSS...

  • **Misc. sensors**: accelerometer, compass, gas, QRCode reader, radiation sensor management...
Communicating from Core to remote entities

- Send data to remote entities (sensors, actuators, databases, remote apps...)
- Can embed behavior to transform raw data/events on the fly
- Provide a way to remote devices to call services provided by input plugins (embedded in devices).
• **Heterogeneous devices / Communication Protocols:** MQTT, AMQP, XMPP, stomp, HTTP, FTP, Web services, ...

• **Social networks & web sites:** twitter, facebook, Google map...

• **Databases:** mySQL, mariDB, ...

• **Cloud:** Amazon web services, Microsoft windows Azure...

• **Image processing:** Face detection, image plate detection, crowd motion detection...

• **Backends for IoT data:** IBM IoT Foundation, Thingspeak...

• ...

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**Output plugins examples**
Handling IoT interoperability issues

High integration & evolution capabilities

Easy interoperability

Powerful analytics

Unified vision

Smarter actions

Internet of Things/M2M devices, sensors, actuators, mobile, and applications

Connect everything, everywhere, easily.

Help you Acquire, Aggregate, Analyze, Assign & Act according to your needs

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Connect everything, everywhere, easily.

Create your own plugins, for your own devices, with smartEngine SDK
Example #1 - Let devices being social

Inform user by:

- Its Twitter thread: of the different sensors status.
- A smartphone/tablet app: when an intrusion is detected (thanks to real time correlation of sensor data).
Example #2 - Control UPnP/DLNA devices with pure Web Services
Example #3 - Picture/Video processing plugins

- Plugin License plate detection
- Plugin Face detection
- Plugin Crowd motion detection
- Plugin Counting number of people
- Plugin Hand gesture recognition

smartengine core

Plugin webcam

Video flow

Configuration
# Core size - smartEngine v2

<table>
<thead>
<tr>
<th>OS</th>
<th>Flash size required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linux / Arm (Raspberry Pi)</td>
<td>142 kB</td>
</tr>
<tr>
<td>Linux 32 bits</td>
<td>139 kB</td>
</tr>
<tr>
<td>Windows 7 64 bits</td>
<td>82 kB</td>
</tr>
<tr>
<td>eCos (STM32 – core + plugins)</td>
<td>132 kB</td>
</tr>
</tbody>
</table>

## Performance benchmarks - smartEngine v2

<table>
<thead>
<tr>
<th>Target</th>
<th>OS</th>
<th>CPU</th>
<th>Nb cores</th>
<th>RAM</th>
<th>Core Speed Processing (dsc=data/sec/core)</th>
<th>CSP (bitmaps) (64x480)</th>
<th>CSP (800x600)</th>
<th>CSP Full HD (1920x1080)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>laptop Lenovo T530</strong></td>
<td>Win7 64 bits</td>
<td>Intel Core i7 <a href="mailto:3720QM@2.6GHz">3720QM@2.6GHz</a> (Q2 2012)</td>
<td>4 cores</td>
<td>8 GB</td>
<td>1,801,775 data/sec/core (up to 14 Millions data/sec on 8 threads)</td>
<td>3284 bmp/sec/core</td>
<td>2110 bmp/s/core</td>
<td>415 bitmaps/sec/core</td>
</tr>
<tr>
<td><strong>PC Dell</strong></td>
<td>Win7 32 bits</td>
<td>Intel Core2 Duo E6550 @ 2GHz (Q3 2007)</td>
<td>2</td>
<td>2 GB</td>
<td>847,230 d.s.c</td>
<td>1451 bmp/sec/core</td>
<td>903 bmp/s/core</td>
<td>174 bitmaps/sec/core</td>
</tr>
<tr>
<td><strong>PC Dell Optiplex 745</strong></td>
<td>Linux Debian 7.4 32bits</td>
<td>Intel Core2 <a href="mailto:6400@2.13GHz">6400@2.13GHz</a> (Q3 2006)</td>
<td>2</td>
<td>2 GB</td>
<td>685,837 d.s.c</td>
<td>456 bmp/sec/core</td>
<td>293 bmp/s/core</td>
<td>60 bitmaps/sec/core</td>
</tr>
<tr>
<td><strong>PC Dell Optiplex 745</strong></td>
<td>Linux Ubuntu 13.11 32bits</td>
<td>Intel Core2 <a href="mailto:6400@2.13GHz">6400@2.13GHz</a> (Q3 2006)</td>
<td>2</td>
<td>2 GB</td>
<td>683,400 d.s.c</td>
<td>423 bmp/sec/core</td>
<td>274 bmp/s/core</td>
<td>60 bitmaps/sec/core</td>
</tr>
<tr>
<td><strong>Raspberry Pi model B</strong></td>
<td>Linux Raspbian</td>
<td>Broadcom BCM2835 ARM1176JZF-S (ARMv6)@700 MHz</td>
<td>1</td>
<td>512MB</td>
<td>64,000 data/sec</td>
<td>36 bmp/sec.</td>
<td>23 bmp/sec.</td>
<td>5 bitmaps/sec.</td>
</tr>
<tr>
<td><strong>STM32F4 Discovery</strong></td>
<td>eCos</td>
<td>STM32F4 ARM Cortex-M4 @168MHz max.</td>
<td>1</td>
<td>192KB 1MB Flash</td>
<td>21,768 data/sec</td>
<td>33 bmp/sec.</td>
<td>21 bmp/sec.</td>
<td>1920x1080: N/A 1024x768: 13 bmp/sec</td>
</tr>
</tbody>
</table>
Context & Issues

One of the main issues of Internet of Things is the numbers of communication protocols available and used, coming from various business domains: industry, automotive, multimedia, home automation, IT…. These protocols are not interoperable and using heterogeneous devices (based on various protocols) create barriers (“silos”) between devices, prevent providing a fully interoperable devices ecosystem, and add complexity to integrate them in M2M projects.

SOGETI achievements

Sogeti HT has designed an end-to-end IoT/M2M solution, realizing an innovative engine dedicated to routing, analysis, and processing of data from the Internet of Things. Our smartEngine is modular and tailored to be embeddable in industrial and logistics facilities.

This platform allows to make interoperable incompatible devices of today. Heterogeneous data from sensor networks, are captured, analyzed and transmitted to remote entities whatever communication protocol, relying on plugins developed specifically for each standard or set of devices.

Plugins “lower layers” are used to connect objects mode USB, Bluetooth, Zigbee, 6LoWPAN ...

Plugins “upper layers” allow the implementation of services such as email, SMS, Twitter, video on NAS ...

The platform is operational and allows the monitoring and administration of remote objects for the management of their deployment or monitoring. It is ready to be customized for your projects with the shortest Time-To-Market, in a secure vertical solution.
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