The SSIG-Onvif C++ Library

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Chapter 1

Introduction:

Interoperability between IP-based physical security devices is a challenge. Usually each company develops and implements it's own private software. On this landscape the consumer is tied to solutions offered by only one company, since the system integrator cannot use different equipments from different companies. Being tied to one private solution usually means that the system integrator may not reach the level of specificity the consumer wants, also it can increase cost and makes it harder to come up with a system that meets the requirements.

With this problem in mind ONVIF (Open Network Video Interface Forum) was founded by three major companies: Axis Communications, Bosh Security Systems and Sony corporation. The main goal is to set a industry standard for interfaces of IP-based physical security products, which means that it intendeds to create a standard way of how IP products can communicate with each other. It is a non-profit communication and it's membership is opened to manufacturers, software developers, consultants, system integrators, end users and other interest groups. There are different levels of membership, with different costs involved ranging from user, contributer, full to observer membership.

The main benefits of the standardization is to make IP-based physical security solutions easier. Different devices can be integrated into one solution. Software developers/vendors can guarantee there product will support various brands of devices. And for device manufactures there is interopelability with other manufacturers.

The main objective of this library is to implement easy PTZ control and streaming of IP-based Onvif compliant cameras, independent of the manufacturer. Future improvements to cover more IP-devices from different scopes, is intended to be just as easy, as long as it is in conformance with the Onvif standard. Interoperability being so important, the standard was chosen since this is one of it's main objectives and fits our needs.

Onvif sets it's standard interface in the form of WSDL (Web Services Description Language) definitions. WSDL is basically a way of calling methods on a device through the web. It uses the SOAP (Simple Object Access Protocol) protocol specification, which is a form of exchanging structured information

(XML Schema) through the web. What the library does is to simplify the communication using the gSOAP Toolkit, turning the software development straight forward.

The gSOAP Toolkit is a C and C++ software development toolkit for SOAP Web Services. It analyzes the WSDLs and XML Schemas provided by Onvif and maps it to C or C++ code. The generated code is much easier to handle than implementing XML Web Services in C/C++, which saves time, since the data binding is made automatically. The generated code is then used on our library, which presents a more natural interface and makes the development of specific software easier.

Chapter 2

The Onvif Standard:

The cornerstones of ONVIF are:

- **Standardization** of communication between network video devices

- **Interoperability** between network video products regardless of manufacturer

- **Open** to all companies and organizations

Summing up the benefits of the open standard are:

- **Interoperability** products from various manufacturers can be used in the same systems and speak the same language.

- **Flexibility** end-users and integrators are not locked within proprietary solutions based on technology choices of individual manufacturers.

- **Future-proof** standards ensure that there are interoperable products on the market, no matter what happens to individual companies.

- **Quality** when a product conforms to a standard, the market knows what to expect from that product.

The Onvif standard is devided into three Profiles. Each Profile covers a set of IP-devices with common capabilities. The SSIG-Onvif C++ library is initially focused on the **Profile S** which includes:

- Video and audio streaming

- PTZ- control and relay output

- Video configuration and multicast

Being part of The Smart Surveillance Interest Group (SSIG), which focuses on Computer Vision, Pattern Recognition and Digital Image processing, the library is initially being implemented with intention to be used with PTZ tracking algorithms, providing an easy and flexible way to implement software that can be used with cameras from different manufacturers. That's why the Profile S was chosen, although future expansions are welcome and should be straight forward.

The Onvif standard specification covers communication between network clients and devices. The interface is defined in the form of Wed services, more specifically, WSDl (Web Services Description Language), XML Schema and SOAP (Simple Object Access Protocol).

- **XML** is used as the data description

- **SOAP** is used for message transfer

- **WSDL** is used for describing the services

All services defined in the standard are expressed as Web Services and defined in WSDL with HTTP as the underlying transport mechanism. The device (service provider) implements the ONVIF service. The service is described using XML-based WSDL. The WSDL is used as the basis for the client or requester implementation/ integration. Using WSDL compiler tools, in our case the gSOAP toolkit, the client-seide integration is simplified.

Example of WSDL:

Stop
Description:
Operation to stop ongoing pan, tilt and zoom movements of absolute relative and continuous type. If no stop argument for pan, tilt or zoom is set, the device will stop all ongoing pan, tilt and zoom movements.
SOAP action:
http://www.onvif.org/ver20/ptz/wsdl/Stop
Input:

[Stop]
- **ProfileToken** [ReferenceToken]
  A reference to the MediaProfile that indicate what should be stopped.
- **PanTilt** - optional; [boolean]
  Set true when we want to stop ongoing pan and tilt movements.If PanTilt arguments are not present, this command stops these movements.
- **Zoom** - optional; [boolean]
  Set true when we want to stop ongoing zoom movement.If Zoom arguments are not present, this command stops ongoing zoom movement.
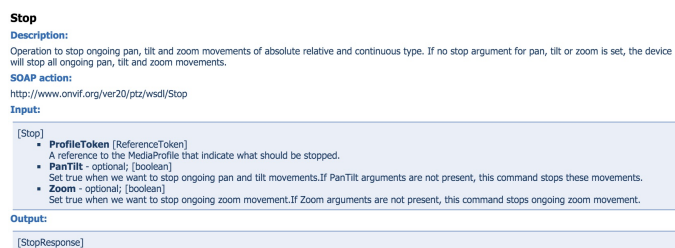**Output:**

[StopResponse]

Figure 2.1: Example of a Web Service, the Stop command for a PTZ camera

Currently on our Library there are implementations of:

- **Discovery**

- **Device Management**

- **Media**

- **Controlling**

Chapter 3

The gSOAP toolkit:

3.1   wsdl2h:

3.2   soapcpp2:

Chapter 4

The SSIG-Onvif C++ Library:

4.1 Client Device Class:

4.2 Client Media Class:

4.3 Client PTZ Class:

4.4 Client Discovery Class:

Chapter 5

Conclusion/Future Works:

Chapter 6

References:

1. http://www.onvif.org/

2. http://www.cs.fsu.edu/ engelen/soap.html