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Dissemination Level:

PUBLIC	Public
PP	Restricted to other programme participants (including the Commission Services)
RE	Restricted to a group specified by the consortium (including the Commission
CONFIDENTIONAL	Confidential, only for members of the consortium (including the Commission Services)

1. Executive summary

1.1. Document objective

This document has for objective to present the status of the standardization actions that have been performed by the SOCRADES project.

1.2. Main achievements

A white paper was issued comparing DPWS and OPC-UA. Based on this white paper, a proposed convergence path between the two solutions has been worked between Siemens, ABB and Schneider and the "DPUA" (Device Profile for Unified Architecture) document has been issued, and is implemented in the APS trials.

Regarding DPWS, the OASIS standardization has been completed mid of 2009: the DPWS standard has been officially approved on June 30, 2009.

This standard has been proposed to the OASIS WS-DD TC (***Web Services Discovery and Web Services Devices Profile Technical Committee)*** http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=ws-dd, by CA, Canon, Lexmark, **Microsoft**, Nortel, Novell, Progress Software, Red Hat, Ricoh, **Schneider Electric**, Software AG, and WSO2. Some partners from the previous ITEA SIRENA project (such as MATERNA) also joined the WS-DD TC in order to help achieving this standardization.

This approved standard covers DPWS, WS-Discovery, and SOAP-over-UDP.

2. DPWS vs OPC-UA

DPWS (Device Profile for Web Services) is the basic foundation technology of the SOCRADES project, providing the Web Services communication infrastructure applicable at the device level.

However, a few months ago, some SOCRADES partners (including Siemens) declared their strong interest for the OPC-UA solution, which also provides a Service oriented Architecture communication infrastructure.

SOCRADES partners then decided to :

- Compare DPWS and OPC-UA
- Look for a common interoperable solution "DPUA"
- Specify this solution
- Promote together this solution at the OPC Foundation and get their agreement
- And finally push this solution as an international standard through IEC65E committee.

2.1. Comparison

A white paper comparing DPWS and OPC-UA was issued by Schneider in September 2007.

Main conclusions of this paper are reported here:

2.1.1. OPC-UA

The OPC Unified Architecture is the new version of the well-known OPC architecture originally designed by the OPC Foundation to connect control devices to control and supervision applications. The focus of OPC is

on getting access to large amounts of real-time data while meeting performance constraints and without disrupting the operation of the devices.

The OPC UA protocol stack is shown below:

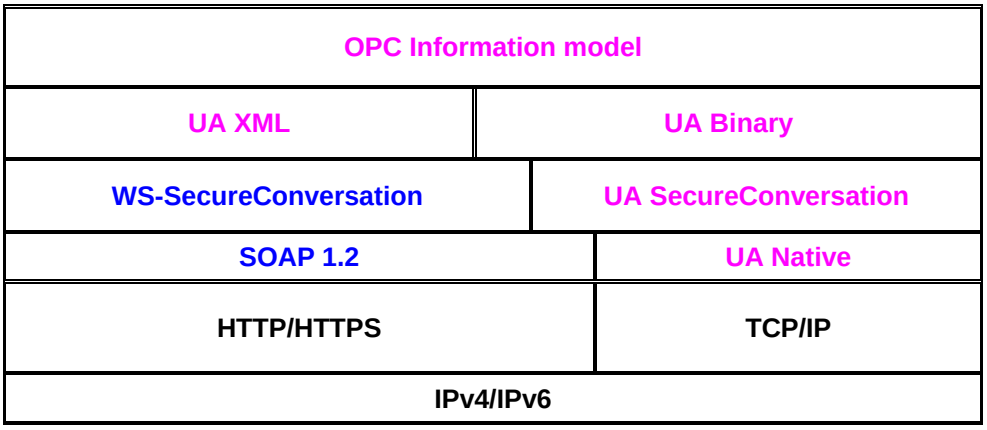

Figure 1 - OPC UA protocol stack

2.1.2. DPWS

A proposal for using Web Services protocols for device networking, entitled "Devices Profile for Web Services", was submitted in May 2004. This subset of the Web Services protocol suite was originally designed to become the next major version of the popular UPnP Device Architecture (UPnP V2). It may still be eventually proposed as such, but for reasons of market strategy related to the lack of backward compatibility between these two protocol stacks, no date is set for this transition.

The OPC UA protocol stack is shown below:

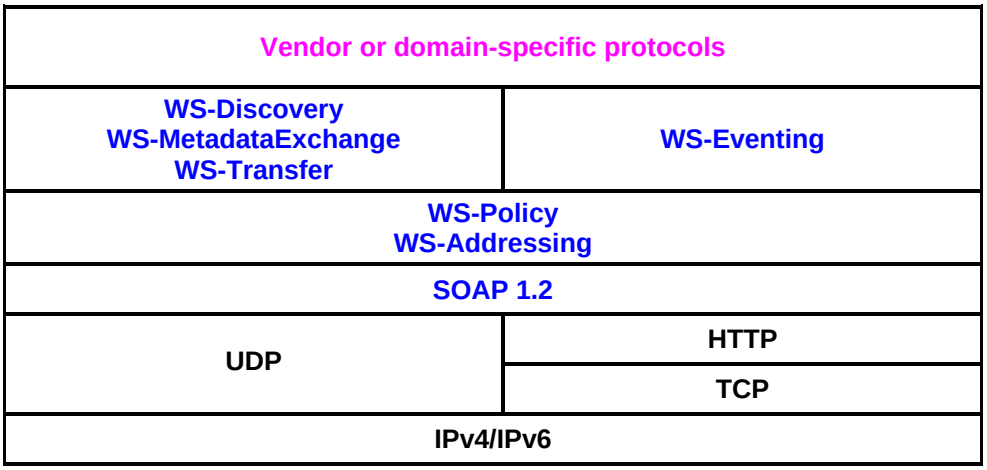

Figure 2 - DPWS protocol stack

2.1.3. Feature comparison

Feature	OPC UA	DPWS + WS-*
Infrastructure		
General-purpose transport	HTTP 1.1	HTTP 1.1
General-purpose messaging	SOAP 1.2 WS-Addressing	SOAP 1.2 WS-Addressing
General-purpose encoding	XML encoding	XML encoding
Security	WS-Security WS-Trust WS-SecureConversation	WS-Security WS-Trust WS-SecureConversation
Optimized transport	UA Native (TCP based) UA SecureConversation	None specified (open)
Optimized encoding	UA Binary	Efficient XML Interchange?
Discovery	WS-Inspection WS-Discovery UDDI	WS-Discovery
Architecture		
Software architecture	Client-server Layered client-server	Peer-to-peer Client-server
Target hardware platform	Gateways	Devices
Modelling		
Meta model	UA Object Model	None specified (open)
Management services		
Session management	SecureChannel service set Session service set	None required WS-SecureConversation may be used
Resource discovery and selection	View service set Query service set	WS-Enumeration
Resource access and management	NodeManagement service set Attribute service set	WS-Transfer Fragment-level WS-Transfer
Eventing	MonitoredItem service set Subscription service set	WS-Eventing WS-Eventing additional delivery modes for WS-Management
Operation invocation	Method service set	Standard Web Services

2.1.4. Integrated DPWS and OPC UA framework

The above discussion has shown that DPWS and OPC UA should be considered together in order to provide a rich framework for device-level SOA. Due to the strong similarities in the basic building blocks of both specifications, a concerted implementation would bring several benefits:

- Avoid the duplication of effort in implementing a SOAP 1.2 stack, as well as additional protocols such as WS-Addressing, WS-Discovery, WS-Security, WS-Trust and WS-SecureConversation.
- Avoid the extra memory footprint in devices that would be induced by a duplicate implementation of some of the above technologies.

An additional level of integration could be considered, by implementing the OPC UA meta-model in a way that will allow it to be accessed and managed through the Web Services of both OPC UA and WS-Management. This should be possible, as WS-Management is very flexible about the resource model to be managed through its services. Exposing the same device meta-model to both OPC UA clients and WS-Management clients could ease the integration of the plant floor layer with the supervision layer, where OPC clients will be common, and the enterprise IT layer, where WS-Management clients might be more widespread. The Web Services exposed by the WS-Management protocol might also be easier to access from standard Web Services clients, while OPC UA services will in many cases require the use of OPC UA clients, due to their stateful mode of operation and their strong dependency on the OPC UA meta-model.

2.2. Proposed "DPUA" solution

Based on this comparison, and on the proposed integration, Siemens, ABB and Schneider (with the support of SAP) agreed in January 2008 to look for a common integrated interoperable solution, which was latter on named "DPUA".

The main agreed principles of the DPUA solution is to use the DPWS protocols and to model the devices using a subset of the OPC-UA resource model, in order to ease the interoperability with full OPC-UA solutions while keeping the DPWS foundation technology of the project.

Schneider agreed to take the lead of writing this specification, to be discussed and approved by the Socrades partners.

However, due to non technical reasons, the agreement between SOCRADES partners was reduced to the "DPUA translator" that was specified, implemented and demonstrated on the APS trials, and no further standardization work on the DPUA solution was performed. Instead, a huge action for standardizing DPWS through OASIS was performed (see hereunder).

3. OASIS DPWS standardization

Regarding DPWS, the OASIS standardization has been completed mid of 2009: the DPWS standard has been approved on June 30, 2009.

This standard has been proposed to the OASIS WS-DD TC (***Web Services Discovery and Web Services Devices Profile Technical Committee)*** http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=ws-dd, by CA, Canon, Lexmark, **Microsoft**, Nortel, Novell, Progress Software, Red Hat, Ricoh, **Schneider Electric**, Software AG, and WSO2. Some partners from the previous ITEA SIRENA project (such as MATERNA) also joined the WS-DD TC in order to help achieving this standardization.

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