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SOCRADES

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**Service-Oriented Cross-layer infRAstructure for
Distributed smart Embedded devices**

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Dissemination Level:

PUBLIC	Public
PP	Restricted to other programme participants (including the Commission Services)
RESTRICTED	Restricted to a group specified by the consortium (including the Commission Services)
CONFIDENTIAL	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 till the end of the month 18 (February 2008).

1.2. Main achievements

A white paper was issued comparing DPWS and OPC-UA. Based on this white paper, and on the agreement between Schneider, Siemens and ABB to find a common interoperable solution (also supported by SAP), Schneider got in touch with the OPC Foundation in order to explore the feasibility of this common solution.

Schneider looked at possible standardization paths through IEC65E, and concluded that it will be possible to push such a solution through this committee when a detailed specification will be available. Schneider is in charge of writing this specification, and to discuss it and validate it with SOCRADES partners.

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:

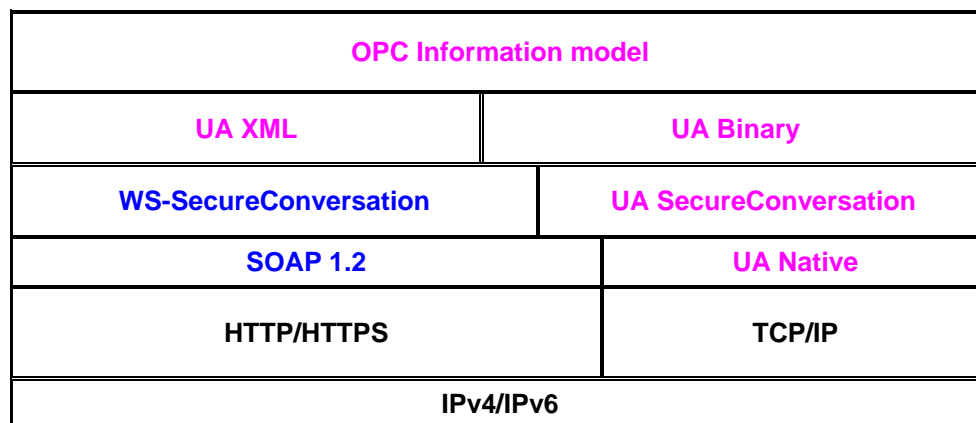


Figure 1 - OPC UA protocol stack

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:

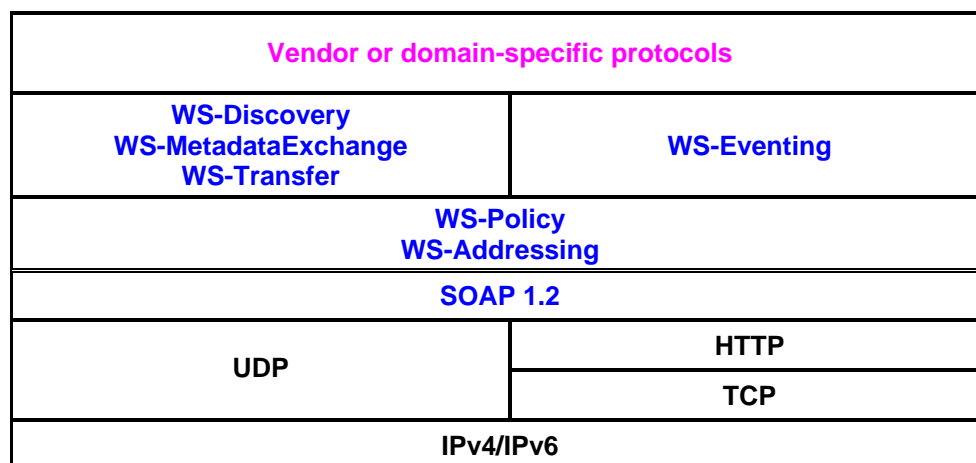


Figure 2 - DPWS protocol stack

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

Feature	OPC UA	DPWS + WS-*
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, it should be noted that during the latest SOCRADES meetings (February and March 2008), Siemens expressed a modified point of view, which requires further discussions among the consortium.

3. Contacts with the OPC Foundation

The OPC Foundation is in charge of the OPC-UA specifications. In order to look at the feasibility and at the possible acceptance of the DPUA solution, Schneider got in touch with OPC Foundation experts during the last quarter of 2007.

These contacts were used to refine the potential solution, and the contacts will be re-activated as soon as a first draft of the specification will have been written by the SOCRADES project (under the Schneider leadership).

If the DPUA specification gets approved by the OPC Foundation, the resulting specifications will be proposed to the IEC standardization body.

4. IEC standardization

Schneider, together with its standardization specialists, and in agreement with Siemens, looked at potential standardization bodies where the SOCRADES solution will be proposed.

The IEC, and more specifically the IEC TC65, was identified as the major standardization body for the industrial automation domain addressed by SOCRADES.

Inside the TC65, the sub-committee SC65E is addressing “Devices and integration in enterprise systems”, which is exactly the SOCRADES domain. Moreover, this committee is chaired by Schneider, and Siemens is deeply involved in several of its working groups.

The new “WG8 OPC-UA” working group, led by Siemens, is in charge of standardizing existing OPC-UA specifications. It is expected that, when DPUA specifications will be approved by the OPC Foundation, this WG will update its OPC-UA standard to take into account this new release.

Another WG, about diagnostic, led by Schneider, should be approved and would start working in 2008. It is also expected that available results from SOCRADES about diagnostic will be the basis for some parts of this WG work.

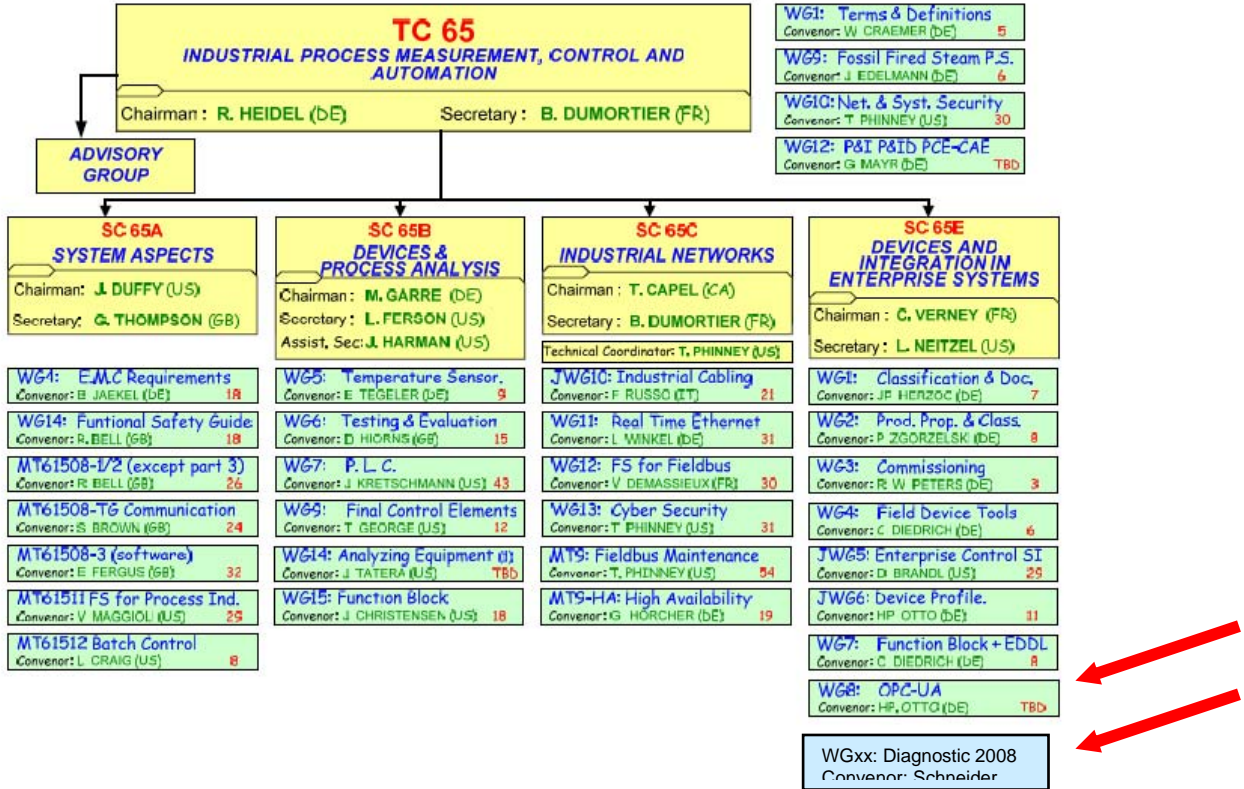


Figure 3: TC65 description