



The Quest for the Web Services Stack: A Fast Trip

Flávio O. Silva, M.Sc.
União Educacional Minas Gerais
Praça Doutor Duarte, 99
Uberlândia, MG, Brasil 38400-156
55-34-3292-1914
flavio@uniminas.br

Pedro F. Rosa, Ph.D.
Universidade Federal de Uberlândia
Av. João Naves de Ávila, 2121-BI B
Uberlândia, MG, Brasil 38400-902
55-34-3239-4144
frosi@facom.ufu.br

ABSTRACT

The strong use of distributed applications is due to the fact that Internet and the Web are based on common and widely accepted standards. Web services can be the basis of the next generation of applications. Unfortunately if someone asks for the layers of the Web Services protocol stack, the answer cannot be given right away. Considering that this technology is emerging and its bases are being defined, different companies and working groups propose standards that come and go with the same speed. Another problem is that these groups provide their own vision about the stack and, finally, the widely available standards proposals makes this environment a standard's Babel. In this paper we will run a quest in order to find the Web Services protocol stack, by putting together different standards and visions and finally providing an independent Web Services protocol stack.

Categories and Subject Descriptors

H.3.5 [Information Storage and Retrieval]: Online Information Services – *Web-based services*.

General Terms

Design, Standardization, Languages, Theory.

Keywords

Web Services, Protocols, Standards, Specifications, Layers

1. INTRODUCTION

Internet and, particularly, the Web have generated deep transformations in all knowledge fields. The impact provided by the Web is changing the way applications are being constructed. The strong use of distributed applications is due the fact that the Web is based on common and widely accepted protocols like Hyper Text Transfer Protocol (HTTP)

Right now the Web is being prepared to switch the way users interact with it. The user-to-machine relationship will be extended by a machine-to-machine relationship. This is the role of Web Services.

Unfortunately if one asks what are the layers of the Web Services protocol stack this answer cannot be given right away. Although this can be accepted in an emerging technology, that is under development, this can be a great risk for the Web Services approach.

Right now different companies and working groups are proposing protocol specifications and standards. These protocols reflect their vision about Web Services protocol stack. In this environment the protocol proposals come and go with the same speed. The applications that are being created right now may lack of compatibility in the future because of a selected protocol suite.

Another problem is that software architects, engineers, developers may be victims of this standard's Babel.

In this paper we will run a quest in order to find the Web Services protocol stack. This will be accomplished first by analyzing the multiple visions of this stack provided by different groups and the myriad of protocols and standards available; this will be done on section 2. Section 3 will propose the Web Services protocol stack and its layers and finally in section 4 some concluding remarks.

2. THE STACK - SEARCHING FOR THE CLUES

To reduce their complexity, network software is organized as a stack of layers. Each layer offer services to the higher layers and use the services provided by the lower ones. The same concept must be applied to Web Services.

The search will begin at World Wide Web Consortium (W3C), considering that this standard organization is responsible by SOAP [1] protocol, one of the main Web Services standards, adopted de facto, as the message format.

This organization created a working group [2] in order to define Web Services Architecture. Although the final document contains a conceptual view of the Web Services stack, it did not achieve its objectives, as noted by Steve Vinoski [3] a charter member of this group.

Some books about the subject could be another interesting place for this quest. Most of them, like [4] are concerned about the basic and well stated Web Services protocols like SOAP, Web Services Description Language (WSDL) [1] and Universal Description Discovery & Integration (UDDI) [1] and does not mentioning the new standards available.

Considering that companies like IBM, Microsoft, Sun, Oracle and others are leading the standards proposals a good source of information for this quest is look for their vision.

Microsoft's vision of the Web Services stack [5] contains information about well established and new standards. The stack considered in this document does not show how a specification, like BP4WS [1], fits on it, although this standard is cited in the document.

The same happens to management related specifications, like WS-Management [6]. They are very new specifications, but the Web Services stack does not show their layer.

Compared to Microsoft's stack, IBM view contains additional layers [7]. Most of the protocols are similar, considering that both companies have a work together proposing Web Services specification. But there are differences. The security layer from IBM contains the standard Security Assertion Markup Language (SAML) [1], while it is not present at Microsoft's security layer.

This clearly indicates that there is no consensus in some areas and this may lead to incompatibilities between applications. In this case the Web Services interoperability can turn in a far promise.

All this information and different point of views, produce new visions, and some researchers are proposing custom Web Services architectures, which are related to some specific domains like Semantic Web [8], creating vertical Web Services protocol stacks.

3. WEB SERVICES STACK – THE HOLY GRAIL

Section 2 shows that there is no consensus about the Web Services protocol Stack. In order to propose a protocol suite, all the actually available views were considered and more than fifty protocols at hand until this moment where analyzed.

Figure 1 shows the layers present in the Web Services protocol stack:

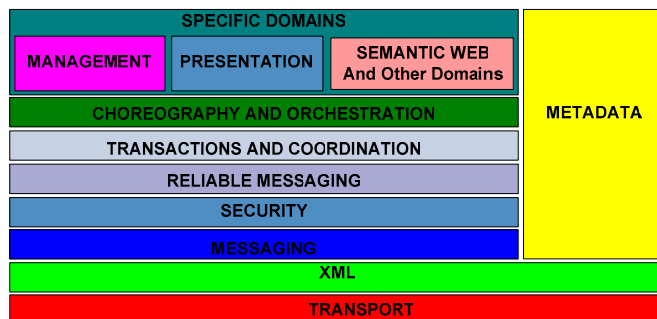


Figure 1. Web Services Protocol Stack

The model shown at Figure 1 considers the main aspects related to Web Services taking into account their current development state and the proposed protocols right now.

In order to propose this protocol stack more than fifty Web Services specifications and standards were analyzed.

On this fast trip of the quest, the protocols within each layer are not shown, but at the long trip they are analyzed in depth.

4. CONCLUDING REMARKS

The concept of a protocol stack is an important abstraction. The actual development of computer networks is based on this concept and in the fact that these protocols specifications are accepted and implement by different software vendors.

The benefits of Web Service cannot come true if these different views of the protocol start to compete with each other instead of contributing.

The Web Services stack presented and proposed is an independent view of the Web Services architecture and can contribute to merge different efforts performed by the research community.

The Web Service protocol stack is a key component that will guide the development and the implementation of this technology.

This paper brings this important issue to the discussion and proposes an independent view of the Web Services stack, resulted from the comparison and reasoning about a myriad of protocols and personal protocol stacks actually available.

5. REFERENCES

- [1] Weerawarana, Sanjiva et al. Web Services Platform Architecture: SOAP, WSDL, WS-Policy, WS-Addressing, WS-BPEL, WS-Reliable Messaging, and More. Prentice Hall PTR, 2005
- [2] World Wide Web Consortium. Web Services Architecture Working Group. [Cited in January 11, 2006]. Available from: <<http://www.w3.org/2002/ws/arch/>>
- [3] Vinoski, Steve. WS-Nonexistent Standards. IEEE Internet Computing, vol. 8, no. 6, 2004, pp. 94-96. [Cited in January 11, 2006]. Available from: <<http://dsonline.computer.org/0412/d/w6towp.htm>>
- [4] McGovern, James et al. Java Web Services Architecture. Morgan Kaufmann, San Francisco, 2003.
- [5] Microsoft. Web Services Specifications. [Cited in January 11, 2006]. Available from: <<http://msdn.microsoft.com/webservices/webservices/undersanding/specs/default.aspx?pull=>>>
- [6] Arora, Akhil et al. Web Services for Management (WS-Management June 2005). [Cited in January 11, 2006]. Available from: <<http://msdn.microsoft.com/ws/2005/08/ws-management/>>
- [7] IBM. Standards and Web services. [Cited in January 11, 2006]. Available from: <<http://www-128.ibm.com/developerworks/webservices/standards/>>
- [8] Turner, Mark; Budgen, David; Brereton, Pearl. Turning Software into a Service. Computer, vol. 36, no. 10, pp. 38-44, October, 2003.