



Service Provisioning Markup Language

Subscription and Identity Management Interoperability

Business Case: Automobile Dealer's Supply Chain Model

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Introduction

Web Services technology is changing the evolution of provisioning across the extended enterprise. In this paper, we will be tackling the Business-to-Business (B2B) interactions and the lifecycle management of the provisioning actions conducted on these interactions built on top of existing and emerging standards including Service Provisioning Markup Language (SPML), Hypertext Transfer Protocol (HTTP), eXtensible Markup Language (XML), Simple Object Access Protocol (SOAP), Web Services Description Language (WSDL), and the Universal Description, Discovery and Integration (UDDI) project.

This paper presents a business scenario showing how standards in a web services-oriented environment are used to solve problems in a business situation. Preceding this scenario is a brief overview of the major Web services concepts and standards.

Web Services Overview

A **Web service** is an interface that describes a collection of operations that are network accessible through standardized XML messaging. A Web service performs a specific task or a set of tasks. A Web service is described using a standard, formal XML notation, called its **service description**, that provides all of the details necessary to interact with the service, including message formats (that detail the operations), transport protocols, and location. Web service descriptions are expressed in the Web Services Description Language or WSDL.

This paper describes Web services in terms of a service-oriented architecture. As described in Figure 1, this architecture sets forth three roles and three operations. The three **roles** are the service provider, the service requester, and the service registry; the **objects** acted upon are the service and the service description; and the **operations** performed by the actors on these objects are publish, find and bind.

A **Provisioning Service Point** (PSP) creates a Web service and its service definition and then **publishes** the service with a **service registry** based on a standard called the Universal Description, Discovery and Integration (UDDI) specification. The **Requesting Authority** (RA) gets provisioned to the Web service based on a set of criteria established by the **Provisioning Service Point**.

Once a Web service is published, a **Requesting Authority** may **find** the service via the UDDI interface. The UDDI registry provides the service requester with a WSDL service description and a URL pointing to the service itself. The requesting authority may then use this information to directly **bind** to the service and invoke it.

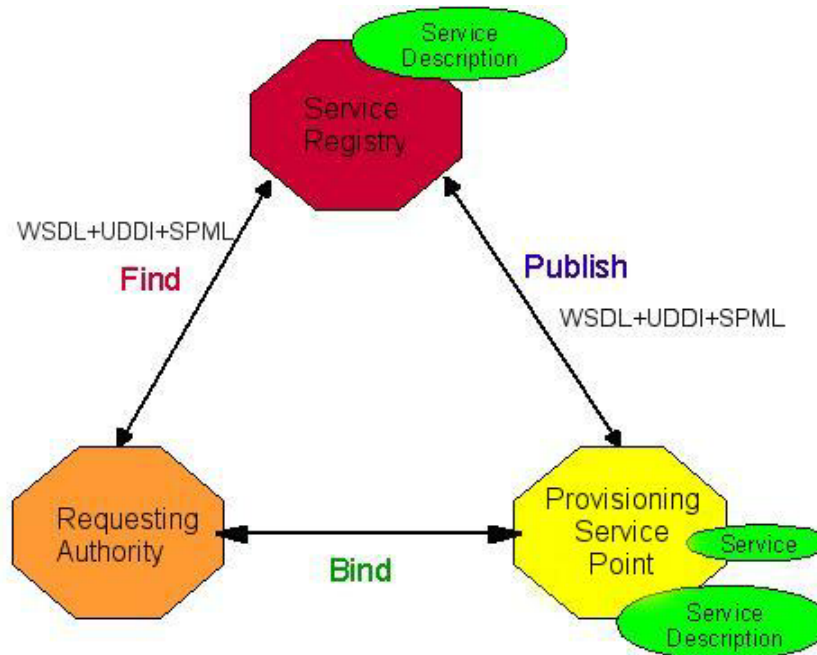


Figure 1 - Web Services Actors, Objects and Operations

Introduction to the Web Services Programming Stack

In this section we give a brief introduction to the Web services programming stack. This stack is a collection of standardized protocols and APIs that let people and applications locate and utilize Web services. After introducing the stack itself, we will illustrate how each of its layers facilitates the use of Web services.

The Conceptual Web Services Stack

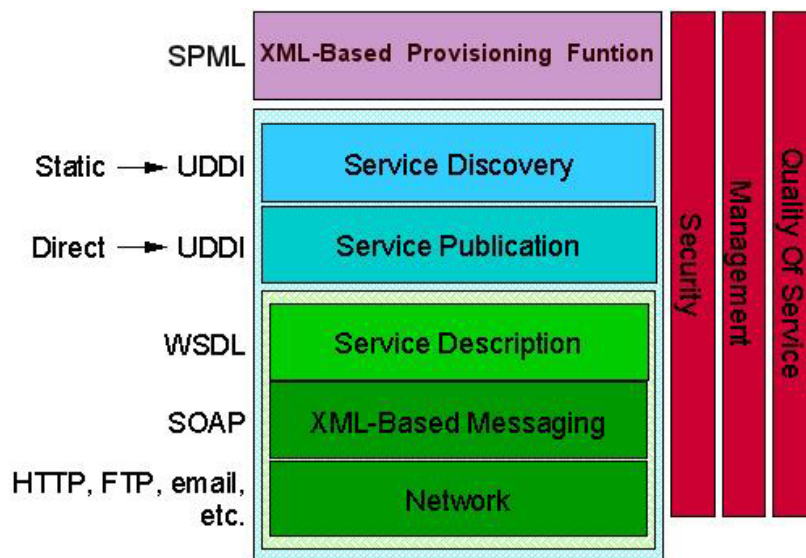


Figure 2 - Web Services Conceptual Stack

Prominent at each layer in the Web services conceptual stack is the standardization of simple, open protocols and APIs. This standardization is key to the ubiquitous deployment of Web services architectures. Ubiquitous deployment of the infrastructure is key to the network effect of Web services adoption.

The network is the foundation layer for the Web services conceptual stack. All Web services must be available over some network. The network is often based on an HTTP protocol, but other kinds of network protocols are also used.ⁱ

On top of the networking layer is an XML-based messaging layer that facilitates communications between Web services and their clients. The messaging layer is based on the Simple Object Access Protocol, or SOAP. SOAP is an XML protocol that facilitates the publish, find, bind and invoke operations described above.ⁱⁱ

Web Services Description Language, or WSDL, is a specification that describes available web services to their clients. These descriptions take the form of XML documents describing the programming interface and location of Web services.ⁱⁱⁱ

Service Provisioning Markup Language, or SPML, is a proposed specification that addresses the required semantics for Provisioning Service Points to exchange requests relating to the managed Provisioning Service Targets. SPML requests will facilitate the creation, modification, activation, suspension, enablement and deletion of data on managed Provisioning Service Targets.

The four layers described thus far are required in order to have interoperable and secure Web services. These layers also create a low cost of entry for leveraging Web services by allowing these services to be deployed over the Internet. The remaining layers in the conceptual stack are optional and will be used depending on business needs.

Publication of a service is really any action by the service provider that makes the WSDL document available to a potential service requester. E-mailing the WSDL (or a URL pointer to the WSDL) to a developer is publishing. So is advertising the WSDL in a UDDI registry for many developers or executing services to find.^{iv}

Likewise, discovery of a service is any action that gives the service requester access to the WSDL for a service. The action may be as simple as accessing a file or URL containing the WSDL or as complex as querying a UDDI registry and using the WSDL file(s) to select one of many potential services. The provisioning or subscribing function of the web services will be assigned to Service Provisioning Markup Language (SPML) to specify. SPML may dictate the provisioning (Add/Create, Delete, Modify, Query) of Provisioning Service Points (PSP) and Provisioning Service Targets (PST) based on a formal submittal from the Requesting Authority (RA). In some cases the PST may be a RA requesting access to a service on another PSP.

In order for a Web services application to meet the stringent demands of today's e-businesses, enterprise-class infrastructure must be supplied: including security, management and quality of service management. These strong recommendations must be addressed at each layer of the stack. The solutions at each layer may be independent of each other. More of these vertical towers will emerge as the Web services paradigm is adopted throughout the industry.

In this section we have briefly summarized the layers and standards in the Web services conceptual stack. In the next section we will present a scenario describing how these standards apply in the real world.

Applying Web Services Standards to a Business Scenario

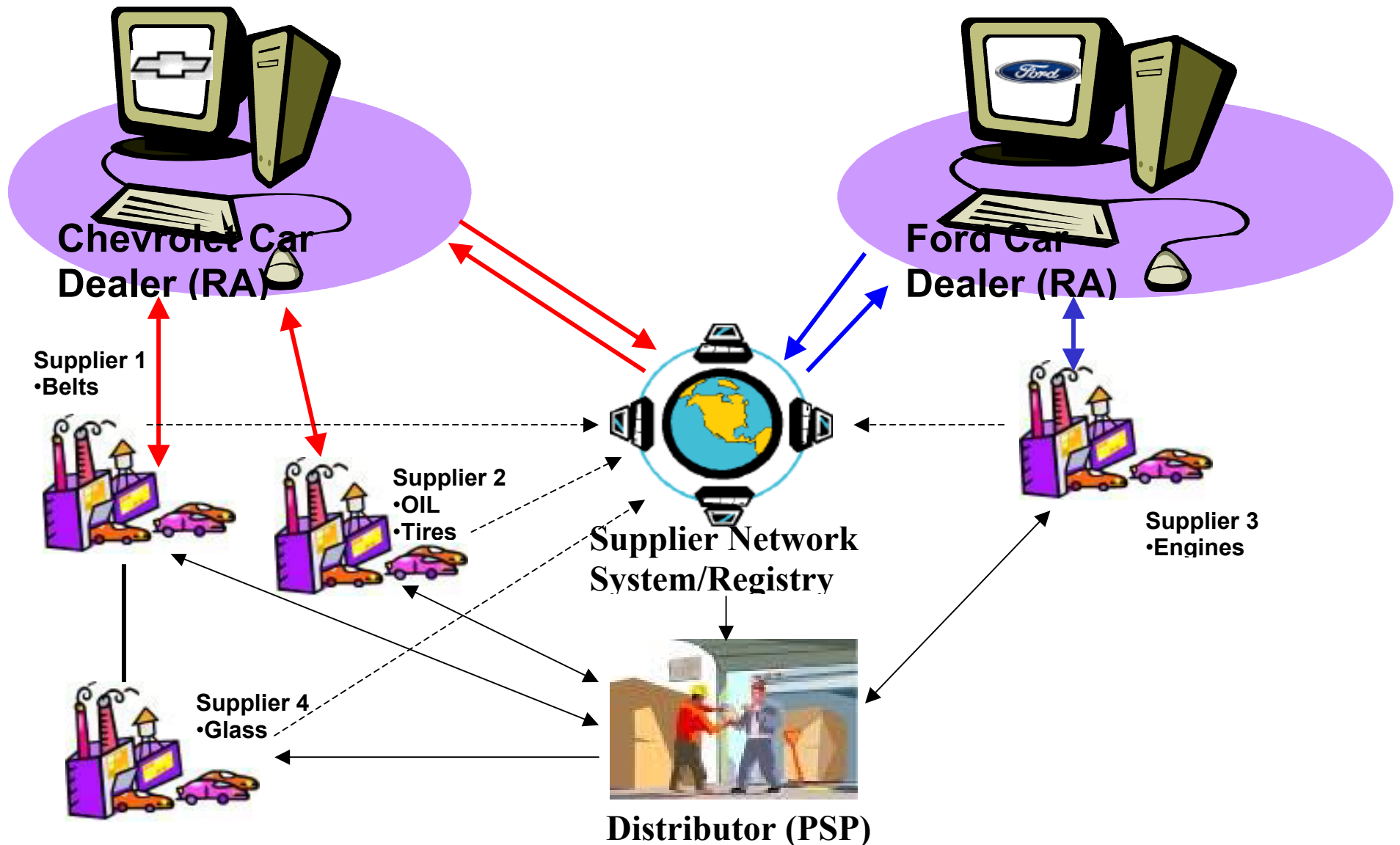
In this section we will set forth a scenario describing how Web services standards and Service Provisioning Markup Language (SPML) presented in the previous section apply to a business situation. The scenario leads to a complex chain of commands leading to complex information access requirements.

In the example below, the Supplier Network System provides a set of Web services oriented toward facilitating parts purchasing within the automotive industry. There exists no relationship between the dealers of Chevrolet and Ford vehicles but a dynamic relationship is created among the distributed web services within the Supplier Network System.

Key Scenario Points:

- Two (2) automobile dealers may or may not share parts suppliers
 - Simultaneously develop and maintain multiple supply chains
 - Sometimes use the same primary sub-Suppliers for all vehicles
 - Primary Distributors continue to maintain sub-levels of specialized Suppliers several layers below themselves
 - Contracts disallow overlap in workers between
 - Parts may be supplied by either Supplier for either dealer
 - Similar parts for other clients / competitors
 - The dealers may request services/parts as web service requests via approved Suppliers registered in the Supplier Network System.

Car Dealers for Chevrolet and Ford Vehicles: Supply-Chain Business Case



SPML Business Case: Dealer – Supplier Relationship Analyzed

- 1) Supplier 2 visits a Supplier Network System and signs up to sell vehicle parts.
- 2) Response comes back as the Distributor of the Supplier Network System would be happy to have Supplier 2 join pending it meets certain requirements, as stated in the web service query.
 - a. Distributor (PSP) requests specified business profile information, from Supplier 2, to fulfill the request to be able to sell as part of the Network.
- 3) Supplier 2 (acting as an RA) responds to Distributor (PSP) with the completed requirements to list its services, via the Supplier Network System.
 - a. Suppliers requesting to list and supply parts are credentialed by the Distributor of the Supplier Network System. The distributor has the authority to accept/decline and allocate credentials and mediate for services.
- 4) Upon meeting all requirements as specified by Distributor (PSP), Supplier 2 (RA) is assigned a Provisioning Service User Identifier (PSU-ID) as a Provisioning Service User (PSU) of the Supplier Network System.
- 5) Other Suppliers, as shown in the above diagram, are also successfully entered as parts suppliers on the Supplier Network System.
- 6) The Chevrolet Car Dealer (an RA) wants to order parts for a vehicle it sells via the Supplier Network System. The Chevrolet's procurement manager sets up user profiles for each of his company's buyers, establishing purchase areas and purchase limits for each user.

- 7) Once each buyer's profile, from the dealership (RA), has been set up, he or she can access the Supplier Network System of parts suppliers.
- 8) The buyer, from that dealership (RA) can then search through the list of items and their prices that the supplier has available.
- 9) The Chevrolet and Ford dealerships (RA) each may or may not have access to the same set of suppliers on the Supplier Network System. This may be based on the query written in the request to the Supplier Network System.
- 10) When an order is made, the Supplier Network System kicks off a business process, validating the purchase against the company policies defined by the procurement manager, submitting appropriate orders to the individual suppliers, updating order status and finally, reporting the status back to the dealer (RA).

Analysis of the Scenario

- Correct account setup for each person at each layer
 - Suppliers can only choose from options assigned by their Distributors assigned by their credentials.
- Hierarchy of delegation
- Context sensitive views
 - Supplier 1 (RA) can't see information about the Distributor (PSP)
 - Supplier 4 (RA) has only permissions to view people only in Supplier 4 and its hierarchical-chain partner, Supplier 1.
 - Assumption: Supplier 1 and 4 have an existing trust relationship.
 - Supplier 4 can't make changes to Distributor (PSP) of itself or Supplier 1.

Service Description Standards for Web Services

A requester, in this case the dealerships, must know what services are available from the supplier network system, what message format is required to invoke them, what costs are involved, what is the supply like, etc. A supplier who wants to use the supplier network system to sell his automotive parts must be able to describe them in such a way that the supplier network system can understand the descriptions and convey them to potential dealers.

Standardization of service descriptions to support Web services is achieved via the Web Services Description Language (WSDL). WSDL defines the interface required for interaction between a requester and a service provider, and also defines the location of the service provider. A service provider publishes a service by making its WSDL description document available to potential requesters. This can be done in a variety of ways, but one standardized way is for the service provider to register the service with a registry and for the service requester to discover the service by searching the registry. The specification used for the registry is the Universal Description, Discovery and Integration (UDDI) specification.

In the example given above, a supplier who sells engines to dealerships would describe his items in terms specified by the Supplier Network System and register them via a registry of preferred suppliers for the automotive industry that might be maintained by the Supplier Network System. When an automotive dealership wants to buy an engine, he would use this registry to discover and consider the items of each registered seller of engines. A WSDL document would describe each supplier's offerings at a basic programming-interface level.

Some business context descriptions for services have already been specified by UDDI, including categorization information on the type of business, geographic location, and contact information. In order to facilitate discovery and usage of appropriate services, further standardization is needed of descriptive material for specific industries and across industries; this is work that is ongoing in many industry groups.^v

Service Publication and Service Discovery Standards for Web Services

Service publication and service discovery go hand in hand. In the case of the Supplier Network System, suppliers must publish their services to the Supplier Network System Registry, and buyers must find these services by searching the registry for appropriate services. Obviously, for this to be successful, Supplier Network System must provide standard APIs to its suppliers and its buyers for publishing and finding services.

A standard is needed for publishing and finding Web services to make the Supplier Network System, the distributors, the suppliers, and the buyers successful. This standard is the UDDI standard mentioned above, which provides standard sets of APIs for publishing and finding services, which is illustrated in the supply-chain diagram above.

There are two types of UDDI registry – public and private. Public registries are located at www.uddi.org and are maintained and synchronized by companies such as IBM and Microsoft. Individual enterprises or industry consortiums maintain private UDDI registries, and control what service data is registered and who can access them. The illustration of the supply-chain diagram is a private UDDI registry. Supplier Network System controls this registry to ensure that only supplier, buyers, and their distributors from companies that meet its strict standards are allowed to publish and discover information there.

Conclusion

In this paper, a business scenario, specifically a Supply-Chain model, illustrating how Web services may be applied to solve a real business problem with the proposed Service Provisioning Markup Language (SPML). SPML is only one component of the pyramid that will allow this scenario to come to completion seamlessly. Many standards that need to build this scenario are still in development, one of these Web Services. Web Services has not presented itself as a real B2B corporate solution but developing real-life scenarios to show how the functions may occur can help commercialize the effort. Standard working groups like the Provisioning Service Technical Committee (PSTC) have vendors working together to achieve the business scenario described and to make it a reality.

ⁱ For more information on HTTP, see <http://www.w3.org/Protocols/>

ⁱⁱ For more information on SOAP, see <http://www.w3.org/TR/SOAP/>

ⁱⁱⁱ For more information on WSDL, see <http://www.w3.org/TR/wsdl>

^{iv} The UDDI project is a cross-industry initiative to create an open framework for describing, discovering, and integrating web services across the Internet. For more information on UDDI, see <http://www.uddi.org>

^v See the standardization work being done by OASIS and XML.org (at <http://www.oasis-open.org/>) and by the ebXML work on an electronic business framework (at <http://www.ebxml.org/>)

Resources

This section contains the locations of various specifications, document references and useful information where you can learn more about this subject.

HTTP: <http://www.w3.org/Protocols/>

SOAP: <http://www.w3.org/TR/SOAP/>

WSDL: <http://www.w3.org/TR/wsdl>

UDDI: <http://www.uddi.org>

ebXML: www.ebxml.org

Gottschalk, Karl; Graham, Steve; Kreger, Heather; and Snell, James. "Introduction to Web Services Architecture."
<http://www.research.ibm.com/journal/sj/412/gottschalk.html>. Emerging Technologies. IBM Software Group. November 2001.