# How can business partners establish a relationship of trust in order to share Web Services?

## - An analysis of UDDI and credibility in registered companies

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# ABSTRACT

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|---|---|
| **Title** | How can business partners establish a relationship of trust in order to share Web Services? <br> - An analysis of UDDI and credibility in registered companies |
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| **Department** | Department of Software Engineering and Computer Science |
| **Course** | Bachelor thesis (DVC001), 10 p |
| **Introduction** | Web Services is a relatively new concept to distributed data systems. It provides a new way for companies to easily integrate with other companies. With UDDI, companies are able to host their services in a wider market and also connect to other companies. However, with business expansion also follows trust issues. In order to share Web Services in a business partner relationship it is necessary to have a relation of trust. |
| **Purpose** | The purpose of this thesis is to investigate about this issue, i.e. how Web Services with the use of UDDI can be made as a "network of trust" and additionally obtain an idea about how the use of these two will look like in the future. The question of trust between partners sharing Web Services is still open. There has therefore been an interest to look at this problem. The aim for this thesis is to find possible solutions that can be used to address the problem. |
| **Method** | To investigate this we chose to do a literature study and continue with a survey consisted by interviews and questionnaires. Interviews were used to find which solutions that are available in reality and the questionnaires provide information about to what extent Web services and the found solutions are used. The questionnaire was done on random Swedish companies and was sent by e-mails. The interviews were done on two global Swedish companies, Volvo and Ericsson. This way information was found and could be compared in how the issue is dealt with in the literature and what is actually done in reality. |
| **Conclusion** | The outcome of the entire investigation is that Web Services today, even though it exists in most companies, is still in testing phase. As for this, the use of UDDI has had little attention and so has the issues regarding trust. The solution we found to the most applicable to create a network of trust is the Liberty Alliance Project. |
| **Key words** | Web Services, UDDI, trust |

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# PREFACE

This paper represents a bachelor thesis in the course, DVC001, 10p, at Blekinge Institute of Technology.

During our three years of studies in computer science we had both developed an interest in Web Services as well as network security, which became a basis for this thesis. We believe that distributed systems will expand in the future and be an important concept because of the ability of integration it provides. With networking follows a great flow of data, which increases the demands on trust. We would like to obtain knowledge about a trust problem in networking. Since Web Services is a new concept and due to an interest of it, we choose to look at the problem with Web Services as a basis.

In this preface we want to take the chance to gratefully thank the people that have been involved in this thesis. Great thanks to Pär Karlsson at Ericsson AB, Uno Eriksson at Volvo Group IT Governance, all the participants in the survey and Erik Hellman at Blekinge Institute of Technology for his support and knowledge in Web Services, which have been of great help. Finally, we want to thank our supervisor Nina Dzamashvili for great support in the help of finding the right way through our thesis.

### Readers guide

For the reader who has little or no knowledge about Web Services, the first chapter will provide an introduction and basic information about the subject. Chapter 2 introduces the problem area, which will be investigated in this thesis. How the investigation was performed is described in the following chapter 3. Chapter 4 describes a few possible solutions, which were used in the investigation. The reader who is interested of the results and the conclusion is advised to read chapter 5-8. These chapters present the findings, discussion and conclusion of the survey.

*(Note: Abbreviations and other unique words used in this thesis are explained in the dictionary in chapter 9.)*

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# Table of Contents

**How can business partners establish a relationship**
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# 1   BACKGROUND

"*Web services are a standards-based software technology that lets programmers and integrators combine existing and new systems or applications in new ways over the Internet, within a company's boundaries, or across many companies. Web services allow interoperability between software written in different programming languages, developed by different vendors, or running on different operating systems or platforms.*" [Mayo02]

Web Services is a new approach to distributed systems. Through Web Services companies have the ability to publish their services, search for and subscribe to other services and exchange information throughout the enterprise. However the term is often misunderstood and believed by many people to be a service across the World Wide Web. In fact Web Services is an abbreviation for *Web of Service*, which means that distributed applications is assembled from a web of software services in the same way that a web page is assembled from a web of HTML pages. [Graham02]

This sharing of services uses a set of standards called SOAP, WSDL, UDDI and XML as shown in figure 1.
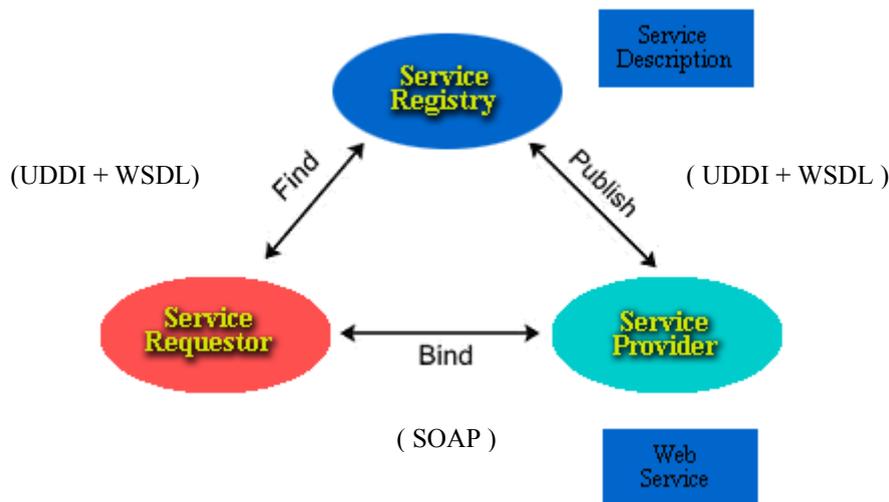


**Figure 1.** Web Services Architecture

SOAP is an XML based protocol. This standard is used for network communication between software services. SOAP is sometimes referred to as a "message envelope", simply meaning that its technology is used for sending messages between endpoints. This protocol consists of three parts: an envelope for describing what is in a message and how to process it, a set of rules for encoding data and a convention for representing remote procedure calls and responses. Represented by XML, SOAP messages can be sent over any transport layer. The most common used is HTTP. [Graham02]

Each Service has a *Web Services Description Language*, which describes the characteristics of its Web Service, such as what it can do, where it resides and how to invoke it. In brief, it is a description on how to access the Web Services. A published service with its WSDL allows other SOAP clients (other Web Services/ businesses) to find the service and bind to it. This is done using UDDI. [Graham02]

Service requestor and service provider may both be businesses with their own Web Service. The Service registry is an UDDI server and works as a digital yellow pages. Through the UDDI, companies are able to publish information about their services as well as their WSDL. The Service Requestor, who wants to find a service, sends a request to the UDDI, which acts as a "match-maker". This "match maker" searches for services that matches the sent request and sends back information about the target and its WSDL. The requestor then invokes the found service and binds to it. [Graham02]

*eXtensible Markup Language* represents a framework of organizing and sharing data. In brief XML provides a standard way of representing text and data in a format that can be processed with relatively little human intervention. XML is platform and language independent, allowing data to be exchanged across different hardware, operating systems and applications. [Graham02]

Web Services is a concept that has many advantages. It provides a networking, which is language, platform and location independent. Further, this service allows decentralization and distribution of businesses services over the Internet and access is possible through a wide variety of communication devices. [Adam02]

## 1.1 Chapter summary

This chapter starts with an introduction to Web Services, which is a new way o distributing data system. It is language, platform and location independent and uses a set of standard called SOAP, XML, WSDL and UDDI. However, business partners sharing Web Services and UDDI might run into a trust problem in their sharing.

# 2  PROBLEM DESCRIPTION

Outlined in the previous chapter Web Services brings certain issues in the use of UDDI. When using UDDI, trust and confidence in the companies hosted will be desired, before a business partnership is established.

## 2.1  Trust and UDDI

Trust concerns confidence, it is about assured reliance of the truth of someone or something [Reed02]. Trust has been an important step when starting a new relationship and companies have for years been doing business where trust have bond them together. The financing and banking industry for example are depended on their reputation of trust. The main reason that customers choose a particular institution is trust. In the same order for one company to choose another company registered on UDDI will be because of trust.

Outlined in the background, UDDI is the prime connector between companies in Web Services. It is the central where business provider and business requestor meet to satisfy their needs. This cooperation between business partners raises the question of trust.

According to Tarak [Tarak02] "trust issues" concerning Web Services can be defined from two aspects. One is the validity of the technology. Tarak argues that UDDI still has a long way to go; it is not fully developed yet. "Moderators" according to Tarak are the ones, which supervise and regulate the contents of the registries they are responsible of. He claims that the lack of moderation in existing UDDI-registries results in registries that would contain out-of-date and duplicate records, meaning invalidly formatted or validly formatted but unavailable entries.

Further Tarak found that due to the lack of moderation there is a possibility that companies have registered services that they do not provide, in other words there is *"Inadequate Quality of Service (QoS) guarantees in existing Web Services"*. Due to our interest in this aspect we choose to investigate further on this issue.

UDDI provides a "match making" service in Web Services, meaning a service between a business provider and a business requestor. The trust issue lies in how a requestor can be assured that the service registered is from a reliable company. Even though the requestor know and trust the vendor the requestor probably would want to enter an agreement before using the service, such as a Service Level Agreement (SLA) [Tarak02].

Today most companies do not choose to find business partners from UDDI registries; rather they already have existing relationship [Tarak02]. The discussion above is a reason why they choose to do so. Web Services and UDDI are growing and more companies would likely want to use this new technology. But how then can partners, unknown to each other, share a Web

Service through UDDI and at the same time establish a relationship of trust, or in other words, a "network of trust"? The term "network of trust" used in this thesis includes a circle of trust where all members within are able to trust each other. This circle means that anyone in the circle is to be trusted, otherwise they ought not to be allowed in. In this circle companies are able to connect to one another and share their services. Having the confidence to trust each other they do not have to worry about whom they choose to cooperate with in this circle.

## 2.2 Research questions

UDDI is a directory where any company is able to register its services. However, there is no credibility check in the registration process. Put in other words, companies, which cooperate in Web Services, do not know if the services published will actually be the services provided. Based on this discussion we will do an investigation according to the following questions:

**Main question:**

Which possible solutions can be found to make Web Services, with the use of UDDI, a "Network of trust"?

**Sub questions:**

- What is the extent of Web Services and UDDI usage today?
- Which solutions can be found to address the issue of trust today?
- Which solutions do the companies use today?
- Is it possible to make Web Services a "network of trust" without any human intervention?

## 2.3 Delimitations

In the problem description two definitions of "trust" are mentioned. One is about the validity of the technology, as for example the risk of finding out-of-date or duplicate records, and the other is about credibility between business partners sharing Web Services. We will focus on the latter, i.e. the issue of the trust between two or more companies sharing Web Services through UDDI.

## 2.4 Purpose/ Goals

The aim for this thesis is to investigate how Web Services can be established as a network of trust, with the use of UDDI. We will look at what existing solutions are available and used by companies today. Our aim is also to obtain an idea about how Web Services might look like in the future. One of the purposes of Web Services, is to have automatization, meaning limited human intervention. We are curious about this and will in this thesis find out if it will be possible to make Web Services a network of trust without any human

intervention. We think this thesis will make an interesting contribution to computer science, since Web Services is yet new and the problem area have had little attention.

## 2.5 Audience

We believe this thesis will be interesting for companies that use or will use Web Services in the purpose of business-to-business communication. Foremost the aim is for companies that are registered or are considering registering their company on an UDDI-registry. Further we think it will be interesting for anyone who is curious about this new, growing concept of distributed systems.

## 2.6 Chapter summary

This chapter starts with a description of "network of trust" and its connection to UDDI. The definition of trust used in this thesis is also presented. Our research questions are based on this and are presented in the end of this chapter together with our purpose and goal of this thesis.

# 3   METHOD

To obtain answers to our questions at issue in the thesis, there was a focus on which method to use to provide the best result. At first we had difficulties with this, but through discussions with each other and with our supervisor, we decided to do a literature study and a survey. The survey includes interviews and questionnaires. We also received information about Web Services from Erik Hellman, Teaching Assistant at Blekinge Institute of Technology, who is well informed in the subject.

## 3.1  Data collection

There are two different types of data collection, primary- and secondary data collection. The primary data is the data collected by the investigator for a report through interviews and questionnaires. The secondary data collection is the data that have been collected and documented by someone else than this investigator and is found in books, journals and articles [Eriksson01].

According to Patel & Davidsson [Patel94] qualitative study is frequently work with literature research and work with the result of interviews. This provides "in-depth" information about certain issues. Questionnaires provide quantitative information, which means that it looks at the extent of for example the usage of a product.

## 3.2  Literature Study

To get a hold of a general background about what Web Services is and how it works we have read relevant books (as for example [Graham02]) and also read articles at trusted web pages (as for example [Castro02]). The idea for this thesis research was obtained when reading articles from electronic newspaper and computer magazines. Articles and journals have provided a deeper understanding of the issue of trust within Web Services. The data collected from articles and journals have also provided information about current state in the research field of trust. This information then provided a base for our research questions. Information about existing possible solutions was presented in articles and journals.

## 3.3  Surveys

The survey methods are based on interviews and questionnaires. The general aim for the survey was to find out how companies are dealing with the trust issues in Web Services and further to see if they have any solutions to the problem. The aim for the interviews was to obtain in-depth information about the present situation regarding the trust issues concerning UDDI and Web Services, which could not be gained through questionnaires. The questionnaires provided information about the extent of Web Services and UDDI usage today.

### 3.3.1 Interviews and questionnaires

The companies used in this survey were found on the Internet.
At the outset we had a concentration on finding companies, which are using
Web Services. Later we also decided to send e-mail to other companies, which
we were not sure of if they were using this technique or not.

Our aim was to get a hold on three interviews and at least ten questionnaires.
We had, however, difficulties in getting a hold on our spokesperson at the
company, Cap Gemini Ernst & Young, for the third interview, which resulted in
us having only two interviews. The ten questionnaires also showed to be
difficult to obtain. We sent 25 questionnaires by e-mail to various companies
placed around the world and received only six answers, where one of these
could not answer our questionnaire.

### 3.3.2 Interview subjects and performance

The first company we established a contact with was Ericsson AB in
Karlskrona. Our spokesperson was found after reading a student thesis in the
library at BTH. The title of this thesis was *"Performance of SOAP in Web
Services Environment compared to CORBA"*. The student authors of the thesis
had an external advisor, Pär Karlsson at Ericsson AB in Karlskrona. We both
agreed that this person have knowledge about Web Services and we decided to
get in touch with him. Another reason for choosing Pär Karlssson was also
because Ronneby was placed close to Karlskrona and we thought it would be
easier to get a hold on the interview. We also found that there is a student
project working with Web Services at Ericsson AB and we were curious about
this. Pär Karlsson later told us that he was involved in this project.

We also got a hold of Uno Eriksson at Volvo Group IT Governance in
Gothenburg who as well is working with Web Services. He assured us that he
has enough knowledge about Web Services and we are welcomed to have an
interview. Volvo Group IT Governance is placed in Gothenburg and for this
reason we decided to do the interview through a telephone call.

The interviews were arranged from two directions. One of us took notes and the
other was concentrated on what was said between the subject and us. This way
we could ensure that information was noted and understood since there is a risk
for the writher to loose understanding of the information. During the interviews
we also used a tape recorder to ensure we will not loose any further
information. The questions were also designed in a way to be objective to make
sure we will not ask leading questions or make the interviewed subject feel
uncomfortable.

Booth these companies were chosen since we believed they could contribute
with information, which could help us with our trust problem.

### *3.3.3 Questionnaire subjects and performance*

The questionnaires were sent by e-mail to 25 companies and received six answers from:

- Eventhelix.com
- Vägverket
- Cap Gemini Ernst & Young

- Banverket
- Microsoft (SWE)
- Sun (did not complete questionnaire)

## 3.4 Revision of the data

The data from the literature study and the empirical study was collected and documented. These two data collections were then compared to each other. This was done to see how the literature study agreed with the reality we found.

All materials from the interviews and questionnaires were gathered and put down in a document. The raw data was then put down in data tables for analysis. By doing this, the data could be easily read and the answers received were easier to compare.

## 3.5 Chapter summary

This chapter starts with an introduction to the methods we choose to use for our investigation in this thesis, which are a literature study and a survey. Continuing is a description of the performance in the survey, how the interviews and the questionnaires were done. The chapter ends with how the data collected will be revised, a comparison between the data collected in literature study and the data collected in the survey.

# 4   POSSIBLE SOLUTIONS

There are a few possible solutions that can be found to establish trust in a network. The solutions found in the literature are presented in this chapter together with descriptions of how these solutions work.

## 4.1  The Liberty Alliance Project

"*The role of the Liberty Alliance Project in all of this is to support the development, deployment and evolution of an open, interoperable standard for federated network identity.*"[Hodges03]

There are several companies represented in The Liberty Alliance Project and their aim is to find a new level of trust, commerce and communication on Internet. The Liberty Alliances solution to establish a trusted network is a single sign-on for both consumers and Web Services providers.

The purpose with network identity is that users are able to have a set of attributes when the users create an account (username, password) or other information (name, social number, address) that the users will display (see Figure 2).
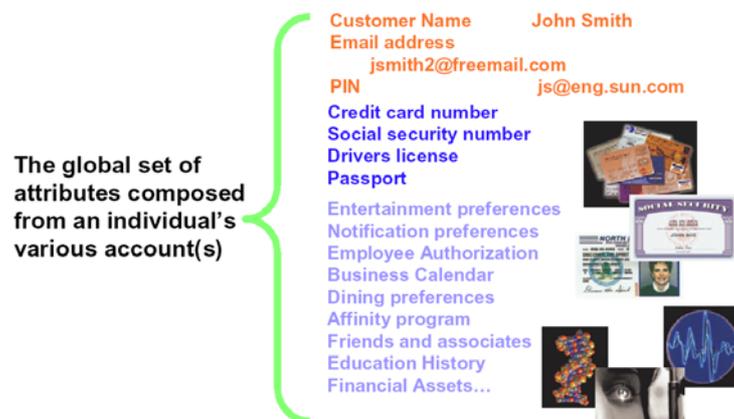


**Figure 2.** What is Network Identity? [Hodges03]

The intention with this network identity is enabling users to use this information on various accounts. The key objectives of the Liberty Alliance are to [Hodges03]:

- "Enable consumers to protect the privacy and security of their network identity information.
- Enable businesses to maintain and manage their customer relationships without third-party participation.
- Provide an open single sign-on standard that includes decentralized authentication and authorization from multiple providers.
- Create a network identity infrastructure that supports all current and emerging network access devices."

These objectives can be realizable when the companies/businesses will create a circle of trust. For a company to join the Liberty Project Alliance they have to accept Liberty Alliance Membership Agreements, which are divided in three different levels of agreements, Sponsor-, Associate- and Affiliate Membership. These agreements will provide trust relationships between the members in the Liberty Alliance. According to Hodges a circle of trust is:

"*[...] a federation of service providers and identity providers that have business relationships based on Liberty architecture and operational agreements and with whom users can transact business in a secure and apparently seamless environment.*" [Hodges03]

These agreements includes among other things "Compliance with Antitrust laws" [LibMem03].

## 4.2 Agents

The aim of Web Services is autonomy [Graham02], meaning there is limited human intervention. Without human interference how then will companies establish trust in their cooperation through Web Services? Huhns and Buell [Huhns02] argue that agents are the solution for constructing trustworthy systems. According to Huhns and Buell *"robust software and trusted autonomy- represent the future for agent technology and software engineering"*.

A research team at the University of South Carolina is doing an investigation of how to maintain information credibility in an environment of autonomous information sources such as the Internet [Huhns02]. This research aimed at increased security while ensuring availability. According to Huhns & Buell systems will be trustworthy when the information they provide is credible. This requires the information's sources to be reputable. Huhns and Buell found that agents are needed in order to manage peer-to-peer solutions. They argue that agents can balance cooperation and they have a property for persistency, which they claim is necessary for establishing trust.

## 4.3 SLA- Service Level Agreement

The SLA describes conditions of use and Quality of Service (QoS) characteristics, such as among others guaranteed reliability and availably. The SLA:s are standard parts in cooperation between business partners. They are required in this issue since UDDI registries do not have any way of capturing, verifying or enforcing such QoS characteristics. [Tarak02].

## 4.4 Microsoft Passport

This technique uses a user authentication service. According to Brian Arbogast [Arbogast 01] the purpose with Microsoft Passport is to bring convenience,

safety and speed to Internet navigation. When people enter the Internet to buy something online, for example in a web shop, a log in with a password is required. There are cases where people enter several different web shops, which leads to the users having plenty usernames and passwords. To remember all these, people might want to write down these usernames and passwords on a piece of paper. This is not a safe way to store usernames or passwords. To solve this problem Microsoft created the Passport. When users register a Passport account, a single sign-in username and password is created, which provides access to all web sites and services that are Passport connected. In several cases the user also is required to store other personal information such as the first name, family name and information about current living. By registering a Passport account users are allowed to enter participated sites on the Internet. According to Microsoft, Passport is a secure and easy way to authenticate the users. Thanks to the single sign-in this is a convenience, safety and fast way to log in.

The Passport is part of what Microsoft calls a "federated" model of Internet authentication, and it is supported with Kerberos technical standard. The goal with this "federated" technique is to build a "trusted network" on the Internet and Passport is part of this.

## 4.5 Other possible solutions

We believe that other possible solutions include the traditional way of establishing partnership, which are different types of policies and business agreements. Through arranged meetings in the physical reality, partners are able to sign contracts.

## 4.6 Chapter summary

This chapter represents the possible solutions found in the literature study, which are the Liberty Alliance Project, Agents, SLA, Microsoft Passport and other solutions. These are the solutions that are compared with the data collected from the survey, the solutions used by companies today.

# 5 RESULT

The survey was done on 2 interviews and 5 questionnaires on different companies.

*(Note: All answers from the survey are our translation from Swedish to English. To make sure we will present the closest translation of the Swedish words, these were first discussed and then documented after an agreement was reached.)*

## 5.1 Questionnaire

The questionnaire was done on 4 companies in Sweden and 1 in Maryland, USA. The participants did not leave any request for anonymous, but the result presented below was chosen to provide certain anonymous anyway.
A case where a question is not answered is called an "internal reduction". In this survey we had one case of this. Company 2 chose to leave the answer on the last (Opinion about Web Services as a "network of trust") question blank. The reason for this is because this person could not answer this question.

### 5.1.1 Web Services

|  | Company 1 | Company 2 | Company 3 | Company 4 | Company 5 |
|---|---|---|---|---|---|
| Have you heard about Web Services? | Yes | Yes | Yes | Yes | Yes |
|  |  |  |  |  |  |
| Does your company use Web Services? | No | Yes | Yes | No | Yes |
|  |  |  |  |  |  |
| For what purpose does your company use Web Services? | ▬ | As B2B communication | Internal within the company. [Comment] | A "supplier roll" - solutions for customer | Internal within company/concern and a "supplier roll" |
|  |  |  |  |  |  |
| Why does your company not use Web Services? | Uses online authentication service of another company. Current products do not demand such a service. | ▬ | ▬ | ▬ | ▬ |

**Comments:**

[Company 3]     We have not yet put many Web Services into practice, in present situation only a few simple ones for internal use (not UDDI). Among others, connected to the "24-hoursauthority" concept, future external (UDDI advertised) Web Services can be expected.

### 5.1.2 UDDI

|  | Company 1 | Company 2 | Company 3 | Company 4 | Company 5 |
|---|---|---|---|---|---|
| Have you heard about UDDI | Yes | Yes | Yes | Yes | Yes |
|  |  |  |  |  |  |
| Do you have any service registered on an UDDI server? | No | No | No | No | Yes |

### 5.1.3 Trust

|  | Company 1 | Company 2 | Company 3 | Company 4 | Company 5 |
|---|---|---|---|---|---|
| Have you experienced "trust" problem/s | No | No | No | Yes | No |
|  |  |  |  |  |  |
| Which solution have you used to solve the issue of trust, in other words to establish a "Network of trust"? | Do not have the problem | A policy of trust (within the cooperation) | Agreement from physical meeting and SLA [Comment] | Agreement from physical meeting | Microsoft Passport and A policy of trust (within the cooperation) |
|  |  |  |  |  |  |
| Opinion about Web Services as a "Network of trust"? | Very good | — | Nor good or bad | Nor good or bad | Very good |

**Comments:**

[Company 3]        We will much likely address and consider the questions/issues regarding security and trust in relation to Web Services, but also choose level of necessary "trust" on the basis of respectively real situation. If we offer Web Services, in our roll as a "24-hours authority", we can provide a certain degree of "trust". It is then the "caller" who decides if she/he wants to put their trust in our company. If we use a Web Services provided by another operator we do a check on what has to be regulated in order for us to put our confidence in this. Further, we will of course follow and adapt to the development of security in relation to Web Services and what can be expected (in for example standards and development of UDDI and more).

### 5.1.4 Web Services in the future

|  | Company 1 | Company 2 | Company 3 | Company 4 | Company 5 |
|---|---|---|---|---|---|
| Do you think that you will use Web Services in the future? | Yes | Yes | Yes | Yes | Yes |

**Comments:**

[Company 3]        We are considering and will likely successive use Web Services in increased extent, also in B2B-situations.

## 5.2 Interviews

The interviews were made on two global companies located in Sweden, Volvo and Ericsson.

### 5.2.1 Web Services

|  | Volvo | Ericsson |
|---|---|---|
| For what purpose do you use Web Services? | B2B<br>In today's situation still a test running within the company (5-6 projects). In present situation they are running on several platforms. They want to narrow this down to only 2-3 different platforms. | A "supplier roll", develops solutions/products to customers. |
| Why did you choose to use Web Services? | Promising concept<br>Today information acts on the web - Web Services to make that virtual business.<br>Integration | It facilitates the integration between different domains |
| For how long have you used Web Services? | 2 years | 2 years |
| Web Services, the advantages | A costless way to integrate better protocol.<br>Ability to integrate with other companies | Web Services has many advantages as a way of distributing data systems. |
| Web Services, the disadvantage | Not a clear concept yet.<br>The security part is not fully developed yet.<br>There is no reliable protocol developed yet. | Compared to their existing product,<br>Web Services is more complex. |

### 5.2.2 UDDI

|  | Volvo | Ericsson |
|---|---|---|
| Do you know about UDDI? | Yes | Yes |
| Do you have a service/s registered on UDDI? | No | No |
| Did you have a cooperation before UDDI? | ▬ | ▬ |
| Could you consider hosting a service on an UDDI registry? | Yes, about a year ago. [Comment 1] | There is a need for integration between other companies [Comment 1] |

**Further comments:**

**Volvo**

[Comment 1]        We asked Microsoft for help and received little support (because of low knowledge) from Microsoft in Europe. I am (Eriksson U., Volvo) doubtful about registering a service on UDDI. I believe that UDDI will be replaced by something else in the future. However, I think that a directory is and will be needed.

**Ericsson**

[Comment 1]        If the developer department will is doubtful. However, it is possible for other departments at Ericsson to use UDDI, since this is good for integration. UDDI can be used as a "note board" where companies find each other. However cooperation should be done through meetings in reality.

### 5.2.3 Trust

None of the companies could answer the questions about solutions they use to address the problem; many do not use Web Services today.

| | Volvo | Ericsson |
|---|---|---|
| Have you experienced trust problem/s | Yes, Firewall complex, Web access control | Through analysis the outcome was that they cannot trust UDDI. |
| How did you solve this? | No solution yet since Web Services is still in testing phase. [Comment 2] | Since they have the "supplier roll" they do not have any solutions. |
| Solution/s, the advantages | - | - |
| Solutions/s, the disadvantages | - | - |
| What it do solve/ do not solve | - | - |
| Reason for choosing this solution | - | - |
| Known to the Liberty project, Microsoft passport, physical business agreement and SLA? | Yes [Comment 3] | Yes |
| Could you consider using any of these solutions? | Uses Microsoft's active directory which is build on Kerberos | Yes, they are all conceivable solutions. |
| What is your opinion about these solutions? | These kinds of solutions are necessary. Great about the situation today is that we are analysing the area. It is good to have standards. All partners need to understand things in the same way. Semantic important. SLA is used as a general concept; it does not solve the issue of trust. Signing a contract is necessary. | Technology will never solve this problem with UDDI. Business agreements through physical meetings are necessary. |
| Do you know any other possible solutions that have not been mention in this interview to create a network of trust? | 1. The "Hub Solution" - X number of companies trust each other through Verisign. Uses PKI solutions. 2. "Chain of trust" - where A trusts B, which trusts C etc. 3. SAML solution accordingly to the Liberty Alliance | "Chain of trust" |

**Further comments:**

**Volvo**

[Comment 2]        We do however follow the updated literature and attend conferences regarding the issue. OASIS is developing standards.

[Comment 3]        SLA is used as a general concept, however it is not developed for the "trust" issue. On Volvo we have done an internal solution using PKI. Certificates are used for other companies to run systems on Volvo.

### 5.2.4 Web Services in the future

| | Volvo | Ericsson |
|---|---|---|
| Can you consider of implementing Web Services on the company? | Yes [Comment 4] | Yes [Comment 2] |

**Further comments:**

**Volvo**

[Comment 4]        I believe that Web Services will be the "next step" and that about 80-90 percent of the standards will survive. Ten percent will go through changes.

**Ericsson**

[Comment 2]        I am positive to Web Services in the future.
The security area is still a great challenge.
It is all about trust.

## 5.3 Chapter summary

The result is summarised in data tables below where one "X" correspond to one subject in the survey.

### 5.3.1 Data table: Web Services

| Web Services | |
|---|---|
| Awareness of Web Services | XXXXXXX |
| Uses Web Services | XXXXXX |
| Uses Web Services as: | |
| B2B | XX |
| Internal | XXX |
| Supplier | XX |

6/7 companies in the survey use Web Services in different purposes.

### 5.3.2 Data table: UDDI

| UDDI | |
|---|---|
| Awareness of UDDI | XXXXXXX |
| Services registered on UDDI | X |

7/7 companies are aware of UDDI and one company is using it.

### 5.3.3  Data table: Trust

| Trust | |
|---|---|
| Solutions used: | |
| Policy | XX |
| Agreements in reality | XX |
| Microsoft's solutions | XX |
| SLA | X |

### 5.3.4  Data table: Future

| Usage of Web Service in the future | xxxxxxx |
|---|---|

7/7 companies will use Web Services in the future.

# 6 ANALYSIS OF RESULT

The outcome of the survey was analysed and grouped by the research questions to provide answers on these and to contribute with information to answer the main question in the conclusion.

*(Note: When the word "survey" is used below, it represents the entire survey, including both questionnaires and interviews.)*

## 6.1 Background

*What is the extent of Web Services and UDDI usage today?*

Our findings showed that all subjects from the entire survey are aware of Web Services and UDDI. The findings demonstrate that the majority uses Web Services, however it is not yet implemented in all companies; many are still in testing phase. (see tables 5.1.1 and 5.2.1)

The survey further show that only one of these uses UDDI, i.e. has a service registered on an UDDI-server (see tables 5.1.2 and 5.2.2).

The most use of Web Services today is internal within the company as intent of B2B-communication in the future or in a "supplier roll" where Web Services is used in a product. The minority uses it as a B2B communication (see tables 5.1.1 and 5.2.1).

The reason the interviewed companies choose to use Web Services is because of the ease it provides in integration between different domains and/or companies (see table 5.2.1).

The companies from the entire survey are using and/or will all use Web Services in the future (see tables 5.1.4 and 5.2.4). The disadvantages found in the interviews, regard the complexity and the phases of Web Services that are not yet implemented (see table 5.2.1).

## 6.2 Available solutions

*Which solutions can be found to address the issue of trust today?*

Earlier in this thesis we mentioned some solutions that we could find in the literature. We found Agents, The Liberty Alliance Project, Microsoft Passport and SLA. The interviewed subjects all recognize these solutions (see table 5.2.3). One of the interviewed persons does not believe that any technical products will be a conceivable solution to address the issue of trust in cooperation. Yet, the other interviewed person argues that a number of these technical solutions are necessary. From the interviews we found further

possible solutions, which we did not found in the literature study. These solutions are

- "The Hub-solution", where x number of companies trust each other through Verisign, which uses PKI (Public Key Infrastructure).
- A "chain of trust", where A trusts B, which trusts C etc.
- SAML-solution, accordingly to the liberty alliance.

Both Public Key Infrastructure and SAML are technical based solutions.

## 6.3 Solutions used by companies

*Which solutions do the companies use today?*

The issue of trust did not showed to be a general problem. The outcome of the questionnaire showed that the majority have not experienced the trust problem regarding companies in cooperation (see tables 5.1.3 and 5.2.3). The companies which do not have any services registered on UDDI have not experienced the trust problem, except for one of these companies that has (see tables 5.1.3 and 5.2.3, 5.1.2 and 5.2.2).

The companies in the survey do all use agreements or policies in order to establish a "network of trust" (see tables 5.1.3 and 5.2.3). The only single company that do have a service registered on UDDI does not have the trust problem and use Microsoft Passport together with a policy of trust (see tables 5.1.2 and 5.1.3).

In the survey there were no clear connections between the trust issue and the purpose of usage. The company that uses Web Services as a B2B communication does not have the problem with trust. Neither do the companies that use Web Services internal. The companies that act as supplier rolls differ in the trust issue. One has experienced the trust problem, but the other one does not. (see tables 5.1.1 and 5.1.3)

The findings further showed that the companies do not use any specific or common solution to address the issue of trust. The majority in this survey do not use Web Services in present situation.

## 6.4 Web Services and UDDI in the future

*Is it possible to make Web Services a "network of trust" without any human intervention?*

All companies in this survey will use it in the future (see tables 5.1.4 and 5.2.4). Regarding the use of UDDI, one of the interviewed subjects believes that it will be replaced by something else in the future. He is doubtful of using the existing UDDI today for this reason. According to him there has not been

a need for using UDDI yet. However he claims that a directory similar to UDDI, where companies are able to find each other, is needed. Another interviewed subject works in the developer department and he is uncertain if this department will use UDDI. However he believes that it can be useful for other departments, since this is a good way for integration between companies.

The outcome from the interview at Ericsson (see table 5.2.3) is that this subject do not believe that technology alone will solve the issue of trust. It will be necessary to have human intervention to make Web Services a "network of trust". The companies today chose to use solutions where people are involved (see table 5.1.3). The outcome of one interview also showed that UDDI alone cannot provide trust. At this interview it was said that UDDI is a good way of finding each other; that it can be used as a "note board". A new relationship should however be established by arranged meetings.

## 6.5 Conclusion

The survey shows that Web Services still in developmental phase and the trust issues are not fully developed yet. This suggests being the reason that most companies do not use it in B2B communication.

The use of Web Services is further only internal and still in testing phase. For this reason there were no specific solutions found to address the problem. The survey shows that most companies use signed agreements or policies to solve the issue of trust. Technical solutions are not a common use.

The findings showed a general use of Web Services, but only one company have a service registered on UDDI. Another interviewed subject claims that a type of directory is needed, but the company in the matter do not, in the present situation, have the need for this service.

Our conclusion from the analysis is that the solutions for the trust issues are vague and companies do not use UDDI.

# 7 DISCUSSION

When doing an investigation there will always be discussions about certain issues. Did we use the right methods, the right subjects for the survey and so forth?

## 7.1 Reflections

A reflection back on the entire thesis showed that certain issues could have been dealt with differently.

When analysing the result from the survey we found that the questions for the interviews and questionnaires differed slightly and were not equally based on the problem description (Web Services, trust and UDDI). This weakness did not come to our knowledge before the analysis. The consequence was that this made it difficult to find a few connections between the interviews and the questionnaires.

During the analysis our interest in UDDI increased and we found that further questions could have resulted in a more informative base for the investigation. The questionnaires did not provide answers on "why" the companies do not use UDDI, which could have revealed interesting information for the survey. Due to the limited amount of time, there was no time left to send any e-mails with further questions. The consequence is that we can only make assumptions from what we know to answer the question of why they do not have a registration on UDDI. The interviews, however, provided information about this, which was usable.

The aim for the interviews was to obtain in-depth information, which could not be received from the questionnaires. When working with the results from the interviews we found this aim to be accomplished. The outcome of the interviews provided information about Web Services and UDDI in present situation, which we did not possess. This information became important to our investigation.

The data collected from the literature study was compared to the data collected from the empirical study. The aim was to find out if the literature agreed to the reality we found in the empirical study. In the literature we found that most companies do not choose to find business partners through UDDI, that they already have existing relationships. We found that companies in reality do not use UDDI at all. One reason could be that companies today are insecure regarding the use of UDDI and this could also be the reason that Tarak in the literature found that companies rather choose to have partnership without using UDDI.

## 7.2 Result discussion

### 7.2.1 Web Services

The findings show that all subjects of the survey are aware of Web Services and are using it or will use it in the future. This indicates that Web Services is a widespread technology, even though it is relatively new to the area of distributed data systems and is still growing. The disadvantages found in the interviews regard complexity and the phases of Web Services that are not implemented yet. It was found that all subjects in the survey are aware of Web Services, which indicates that companies today are very updated and curious about new technologies, such as Web services. The use of it is however uncertain. Not all of the companies use Web services today (most of them are still in testing phase), but there is a clear indication that this technology is fast growing and will be a widely-held concept.

### 7.2.2 UDDI

The use of UDDI was not found to be especially common today and there is no specific solution used, which indicates that Web Services with UDDI still has a long way to go. The technology is not yet fully developed and neither are the issues of trust.

The majority in the survey have not experienced the issue of trust, which indicates that trust is not a problem. One reason for this could be that most companies today do not have any service registered on UDDI. Their cooperation are assumed to be based on other relationships than sharing Web Services through UDDI. Another reason is based on previous discussion about the differences in the trust definition.

### 7.2.3 Solutions

The survey in whole indicates that the companies have been considering the issue of trust and have worked to find conceivable solutions. However, they did not mention any specific solution, which indicates that there is no particular solution used to address the problem today.

### 7.2.3.1 Agents

The findings of the survey did not show any use of agents today in the companies. One reason for this can be that agents are technical solutions that are applicable in the far future.

### 7.2.3.2 Agreements

The Service Level Agreement (SLA) was found in the interview to be a general concept in business cooperation. It is used between partners that already share an existing relationship. Our aim is to find a solution to establish trust between companies that are not aware of each other (do not know each other). For this reason, we do not consider SLA to alone be a solution to make a network of trust. However, we believe that signed business agreements and policies of trust are conceivable parts of solutions. This way there will be limited trust issues regarding the partnership.

### 7.2.3.3 Microsoft Passport

Passport allows a single sign-in username and password, which gives access to all web sites and services that are Passport connected. This is a fast and flexible solution for users on the Internet. We do not believe this to be a solution to make Web Services with UDDI a network of trust, since safety in this case implies the safety of having one single sign-in username and password. This information will then not be written down (easy to remember one sign-in than several for unauthorised people to read). However, if someone gets a hold on this one username and password they gain access to several web sites, which this person is not allowed to.

Further, Microsoft's single sign-in does only provide convenience in accessing several web sites. We believe that there is a risk of "fake" registering since there is no credibility check in the registering process. In other words, anyone who signs for an account is able to host information that is not correct. Additional, this concept in the matter of trust, only benefits the owner of the web site. It is only the owner who has information about the user. The user cannot be assured that the information on the web site is reliable. Our aim is to find a solution to establish a network of trust, which requires trust in both directions, meaning both the service requestor and the service provider ought to be trusted.

### 7.2.3.4 The Liberty Alliance Project

The Liberty Alliance has a basis on creating a confidence between members of the alliance through network identity (such as username and password among others). To join this alliance the future members ought to sign a membership agreement, which contains among others "compliance with Antitrust laws".

We wanted to find out if it is possible to somehow trust the companies registered in UDDI and if so, how this can be done.

The outcome of the survey showed that most companies use solutions where humans are involved. Indications can be made that the companies in general prefer "old-fashion" solutions such as business agreement through physical

meetings and trust policies between business partners above any technical solutions. Based on this, we presume that signed agreements (such as policies and business agreements) are in general necessary to establish trust between partners. Agreements are used in The Liberty Alliance and we believe this to be a sustainable solution to the issue of trust.

### 7.2.3.5  Suggestion

Further a discussion can be made on whether a third part (moderator) should supervise the registration on UDDI. Tarak found that lack of moderation result in QoS (Inadequeuate Quality of Service), meaning companies hosting services that they do not provide. For this reason an organisation behind UDDI, working with credibility checks could be desired. The disadvantage with having a third part, like this, is that registration of services on UDDI will be time consuming. Web Services will furthermore loose part of its concept, which is speed and convenience in distributing services.

### *7.2.4  The future of Web Services*

The outcome of the survey shows that most companies today uses Web Services and will use it in the future as well. This optimism indicates that Web Services will expand in the future. However, the use of UDDI for cooperation with other companies is uncertain.

## 7.3  Validity discussion

The aim for the survey was to obtain answers from 10 subjects for the questionnaires and have three interviews. This showed to be difficult to accomplish. The third subject for the interview was in a different city at the time and an interview through telephone was difficult to obtain since he was constantly on the move. Regarding the questionnaires, 25 companies were asked to complete the questionnaires through e-mail. From this, we received only six answers where one company could not answer the questionnaire. This resulted in a "loose" basis to work with. Although not giving a broad foundation to work with it provides an idea about the present situation on the issue.

Another question is if we made the interviews on the right persons. We believe that both our interviewed subjects could provide the information we needed. Our representative at Ericsson is working with product development, which includes the use of Web Services. Our representative at Volvo is a member of "Volvo Group IT Governance" and has knowledge about Web Services. They are both connected to the Information Technology (IT) at the companies and are well informed about Web Services.

When reflecting back on our work, a dilemma came across our minds. The question of the definition of trust, do our definition of the "trust" issue equals to

the "trust" issue defined by the companies in the questionnaires? Our definition regards the trust between companies sharing Web Services through UDDI. It can also be defined as the trust of UDDI as a service, which we believe is possible in this case. The answers to the questions in the questionnaires regarding this issue are interpreted according to our definition of trust. It ought to be considered that there is a possibility these answers could in fact have been given according to the latter definition.

## 7.4 Aims fulfilment

Finally, did we fulfill the aim of this thesis? Our answer to this is yes, we believe the aims to be fulfilled. We wanted to find a solution/s to establish a network of trust in a Web Services sharing. Based on the discussion and the analysis we have found answers on this, which will be presented in the conclusion. We have additionally obtained knowledge about Web Services as a network of trust without human intervention, which was presented in the discussion.

## 7.5 Future research

Web Services is likely to expand in the future and with expansion follows further issues and solutions to address these issues as well. The technology in this century has been, is and will be growing rapidly. This work on the issue today might become "old" research as early as tomorrow. Our contributions are a glance at the issue with adequate solutions today and provide an idea of what might be expected in the future of Web Services and UDDI. Suggestions for future research includes for this reason:

- A similar investigation of what we have done in this thesis, with the difference that instead of doing the research at companies that are *testing* Web Services, do an investigation on companies that *uses* Web services and UDDI.

- The use of UDDI or similar concepts in a few years. Is a directory actually needed?

- The use of Web Services versus existing techniques of data communication and distribution.

## 7.6 Chapter summary

This chapter starts with a reflection of our own work, meaning a valuation on the basis of how things worked out. There is a description about how different events could have possible affects on the outcome of the result. Continuing is reflections on the outcome of the survey. This chapter ends with suggestions for future research.

# 8 CONCLUSION

Answers to the sub questions have provided important information in the answering of the main question.

- *What is the extent of Web Services and UDDI usage today?*
- *Which solutions can be found to address the issue of trust today?*
- *Which solutions do the companies use today?*
- *Is it possible to make Web Services a "network of trust" without any human intervention?*

To summarize the answers we found that there is a general use of Web Services, yet it is still in testing phase and used only internally. There is an optimism regarding the use of Web Services for integration between companies and domains today and in the future. No general usage of UDDI was found; only one company has a service registered on UDDI. Possible solutions to address the issue of trust are Agents, the Liberty Alliance Project, Microsoft Passport and SLA (Service Level Agreement). The majority uses agreements or policies to establish trust. One company uses Microsoft Passport. Regarding Web Services as a network of trust in the future, companies do not believe that any technical solution will alone establish trust, which is desired in a network of partnerships.

Finally, we have found an answer to the main question, which is the aim for the entire investigation in this thesis. This is the answer we wanted to find out.

*Which possible solutions can be found to make Web Services, with the use of UDDI, a "Network of trust"?*

Through the analysis of the result of the survey and the discussion we have come to the conclusion that there are no technical solutions that alone can solve the issue of trust. In order to make Web Services a "Network of trust" humans ought to be involved.

The Liberty Alliance Project is the solution we find to be the most applicable solution to build a network of trust. Applying this to UDDI would create the kind of relationship of trust desired for the investigation in this thesis, which is a network of trust in a Web Services and UDDI sharing.

# 9 DICTIONARY

**Agent**
On the Internet, an agent (also called an intelligent agent) is a program that gathers information or performs some other service without your immediate presence and on some regular schedule. Typically, an agent program, using parameters you have provided, searches all or some part of the Internet, gathers information you're interested in, and presents it to you on a daily or other periodic basis. [whatis.com]

**Antitrust Laws**
The Federal laws forbidding businesses from monopolizing a market or restraining free trade. [investorwords.com]

**Authentication**
The process by which a Web Service determines the legitimacy of a requestor for processing. In many systems, both service requestors and service providers generally need to be authenticated each other to establish a valid communication. Authentication is often performed via use of a credential. [Xwss.org]

**Authorization**
The access rights a service requestor has. Once a requestor has been authenticated, authorization provides information as to what operations and data access rights the requestor has. [Xwss.org]

**B2B**
Business-To-Business. A transaction that occurs between a company and another company, as opposed to a transaction involving a consumer. The term may also describe a company that provides goods or services for another company. [investorwords.com]

**Distributed systems**
In general, distributed computing is any computing that involves multiple computers remote from each other that each has a role in a computation problem or information processing. [whatis.com]

**HTML**
HTML is a formal Recommendation by the World Wide Web Consortium (W3C) and is generally adhered to by the major browsers, Microsoft's Internet Explorer and Netscape's Navigator, which also provide some additional non-standard codes. The current version of HTML is HTML 4.0. However, both Internet Explorer and Netscape implement some features differently and provide non-standard extensions. Web developers using the more advanced features of HTML 4 may have to design pages for both browsers and send out the appropriate version to a user. Significant features in HTML 4 are sometimes described in general as dynamic HTML. [whatis.com]

**HTTP**
The Hypertext Transfer Protocol (HTTP) is the set of rules for exchanging files (text, graphic images, sound, video, and other multimedia files) on the World Wide Web. Relative to the TCP/IP suite of protocols (which are the basis for information exchange on the Internet), HTTP is an application protocol. [whatis.com]

| | |
|---|---|
| **Kerberos** | Kerberos is a network authentication protocol using key cryptography. Microsoft Passport uses Kerberos for its authentication scheme. [Xwss.org] |
| **Microsoft Passport** | A Kerberos based authentication scheme managed by Microsoft. Passport allows systems and web sites to authenticate users who have Passport credentials. [Xwss.org] |
| **Moderator** | A user who volunteers to take on the task of screening messages submitted to a moderated mailing list, a moderated newsgroup or a forum. This is done to help discussions stay productive and within the guidelines, so that inappropriate messages do not end up where they don't belong. In other words, "it's to keep the Nazi messages out." [whatis.com] |
| **Project Liberty** | The Liberty Alliance Project is a business alliance formed to deliver and support an identity solution for the Internet that enables single sign-on for consumers as well as business users in an open, federated way. For more information see www.projectliberty.org. [Xwss.org] |
| **Public Key Infrastructure** | The use of keys to personable data privacy and data integrity of communication between two services. Public Key Cryptography, typically through certificates is used to enable encryption and digital signatures to ensure confidentiality, non-repudiation, data integrity and authentication encryption and signatures. [Xwss.org] |
| **Quality of service (QoS)** | In a general context, quality of service is a set of methods and processes a service-based organization implements to maintain a specific level of quality. In the context of networking, Quality of Service (QoS) refers to a combination of mechanisms that cooperatively provide a specific quality level to application traffic crossing a network or multiple, disparate networks. [Microsoft.com] |
| **SAML** | Security Assertion Markup Language is being developed by the W3C and is a protocol for asserting authentication and authorization information. SAML compliant servers can be accessed for authentication and authorization data. [Xwss.org] |
| **Service Provider** | An application or entity that provides a Web Service. [Xwss.org] |
| **Service Requestor** | Application or entity that is requesting a Web Service. [Xwss.org] |
| **Single Sign On** | The ability for a system to use one credential to access multiple systems. XML Web Service environments are heterogeneous in nature and may require multiple authentication systems. Rather than maintaining multiple authentication tokens for multiple systems, single sign allows a user or a system to manage one credential. [Xwss.org] |

| | |
|---|---|
| **SLA** | A service level agreement is a document, which defines the relationship between two parties: the provider and the recipient. [sla-zone.co.uk] |
| **SOAP** | Simple Object Access Protocol is an XML-based protocol used to define the exchange of information between two systems. [Xwss.org] |
| **UDDI** | Universal Description, Discovery and Integration are a specification for Web Services directories. Services can be registered on a UDDI directory so that they can be discovered and accessed by other parties. UDDI directories can be both public and private. [Xwss.org] |
| **Verisign** | VeriSign's (Nasdaq:VRSN) critical infrastructure services deliver an unmatched level of security and reliability to Internet and telecommunications customers around the world. Nearly all of the Fortune 500, various governmental bodies and other organizations, hundreds of thousands of small businesses, and nearly one thousand telecommunications carriers and service providers rely on VeriSign to engage in digital commerce and communications. [Versign.com] |
| **Web Services** | Protocols and technologies used for applications to communicate with each other over web technologies such as HTTP, HTTPS, SMTP, etc. The typical protocols used include XML, SOAP and WSDL. A web service often consists of a number of operations that can be called. [Xwss.org] |
| **World Wide Web** | A technical definition of the World Wide Web is: all the resources and users on the Internet that are using the Hypertext Transfer Protocol (HTTP). A broader definition comes from the organization that Web inventor Tim Berners-Lee helped found, the World Wide Web Consortium (W3C): "The World Wide Web is the universe of network-accessible information, an embodiment of human knowledge." [whatis.com] |
| **WSDL** | Web Services Definition Language is an XML-based protocol that defines the network endpoints in a network of services. The bindings in the W3C specification apply to SOAP, HTTP GET/POST and MIME. [Xwss.org] |
| **W3C** | The World Wide Web Consortium (W3C) describes itself as follows: "The World Wide Web Consortium exists to realize the full potential of the Web. The W3C is an industry consortium, which seeks to promote standards for the evolution of the Web and interoperability between WWW products by producing specifications and reference software. Although industrial members fund W3C, it is vendor-neutral, and its products are freely available to all. [whatis.com] |
| **XML** | Extensible Markup Language is a protocol developed by the W3C designed to describe and markup data. XML is a variant of SGML. [Xwss.org] |

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# 11 APPENDIX

## The companies, Questionnaires

### Banverket (Sweden)

Banverket is the government authority, which is responsible for the railroads in Sweden. The authority is also in charge for the operation and administration of Swedish governments railroad construction, coordinate local, regional and interregional railway traffic. Banverket has approximately 6500 employees.

Banverket, http://www.banverket.se/templates/StandardTtH____2103.asp
Printed: 2003-05-07

### Cap Gemini Ernst & Young (Sweden)

Cap Gemini Ernst & Young is one of the biggest supplier in consult-, IT-, technology and outsourcing services in world. The company help out other companies to create benefit of businesses with durable strategies and new techniques. Cap Gemini has over 50.000 employees in the world of whom approximately 1700 in Sweden.

Cap Gemini Ernst & Young, http://www.se.cgey.com/asp/mainpage.asp?mID=1
Printed: 2003-05-07

### Microsoft (Sweden)

*"Microsoft's vision is to create innovative software that gives peoples access to use services, information and communication independent by time, location and unit."* (translated from Swedish to English according to our interpretation.)
Microsoft is one of the leading companies in the world, producing software's to computers. The company was grounded in USA and 10 years later in 1985 they were taking place in Sweden. Microsoft has over 300 employees in Sweden and over 50.000 all over the world.

Microsoft, http://www.microsoft.com/sverige/info/comppres/vision/
Printed: 2003-05-07

### EventHelix.com Inc. (USA)

EventHelix is a developing company in USA. They are committed to create techniques in real-time and embedded software development, distributed system design and object oriented analysis and design.

EventHelix.com Inc., http://www.eventhelix.com/contact_us.htm
Printed: 2003-05-07

**Vägverket (Sweden)**

The Swedish National Road Administration (SNRA) is the government authority, which is responsible for state-, public- and private roads in Sweden. SNRA is in charged for investment planning, road possibility studies and road design, structure and construction.

Vägverket, http://www.sweroad.se/
Printed: 2003-05-07


## The companies, Interviews

**Ericsson AB (Sweden, Karlskrona)**

Ericsson is the largest manufacture of mobile systems in the world. They supply solutions similar to systems and applications, services and technology for mobile handsets. The company was grounded in 1876 and has in these days over 60.000 employees in more than 140 countries.

Ericsson in Karlskrona was a freestanding company but since a year ago is Ericsson Karlskrona like other Ericsson companies in Sweden a part of Ericsson AB. There are about 600-700 employees in Karlskrona including Ericsson in Ronneby. They mainly provide products and solutions to what they describe as "service layer" for example systems to obtain payment for services and provisioning. Our contact person Pär Karlsson is a member of the department "System Management/User Provisioning". They make sure that present and future products are relevant and adequate to costumer's requirements.

Ericsson AB, http://www.ericsson.com/about/compfacts/
Printed: 2003-05-07

**Volvo (Sweden, Gothenburg)**

Volvo is one of the world largest manufactures of trucks, buses and construction equipments. They are also in a top position in the area of constructing industrial power systems and aircraft engine components. Volvo was grounded in 1927 and has today over 70.000 employees.

Our contact person Uno Eriksson is a member of the department Volvo Group IT Governance and it is consist of 8 people. IT Governance supervises the IT resources to fit with the Volvo businesses. Further the group develop common architectures.

Volvo, http://www.volvo.com
Printed: 2003-05-07

# Interview

**Web Services**

1. For what purpose do you use Web Services?
2. Why did you choose to use Web Services?
3. For how long have you used Web Services?
4. Which advantages and disadvantages can you see with Web Services?

**UDDI**

5. Do you know about UDDI (Universal Description Discovery and Integration)?
6. Do you use UDDI in cooperation with other companies, i.e. do you have a service registered on an UDDI?
7. If yes, did you have cooperation before you choose to join in a Web Service?
8. If not, could you consider hosting a service on an UDDI registry?

**Trust**

The definition of "trust" in this survey deals with the credibility on those companies that have their services registered on an UDDI-server. In present situation UDDI does not provide any guarantees for credibility on these companies.

9. Have you experienced this problem?
10. How did you solve this?
    a. The advantages and disadvantages with this solution?
11. Why did you choose this solution?
12. With our study we found these possible solutions to this presentation of the problem: Agents, The Liberty Project, Microsoft Passport and agreements through physical meetings in reality or SLA. Do you know about these solutions?
13. Could you consider using any of these solutions?
14. What is your opinion about these solutions? What is good? What is bad?

**Other**

15. Do you know any other possible solutions that have not been mention in this interview to create a network of trust?
16. What is your opinion about Web Services in the future? Can you consider of implementing Web Services on the company?

# Questionnaire

Please fill in the ( ) like this (*).
If you have any questions or comments on the questionnaire please do not hesitate to contact us:

Thomas Andersson                           Anita Arnevill

e- post: ia99tan@student.bth.se            e-post: ia00aar@student.bth.se

1. Have you heard about Web Services?                    ( ) Yes ( ) No

2. Does your company use Web Services?                   ( ) Yes ( ) No
   (If "No", please continue with question 4)

3. For what purpose does your company use Web Services

   a. ( ) As a business-to-business communication, in other words in cooperation
      with other companies.

   b. ( ) Internal within the company.

   c. ( ) Internal within the concern.

   d. ( ) We have a so called "supplier roll" and work to find solutions/products for
      our customers.

   e. ( ) We do not use Web Services.

   f. ( ) Other:

4. Why does your company not use Web Services?

   a. ( ) We do not have enough knowledge to use Web Services

   b. ( ) We have the knowledge, but feel insecure about this technology

   c. ( ) We use another technology and are pleased with it. What technology?

   d. ( ) Other:

5. Do you think that you will use Web Services in the future?  ( ) Yes ( ) No

**UDDI**

Within the concept of Web Services there is a standard called UDDI (Universal Description Discovery and Integration). This works like a digital "yellow pages", meaning that companies are able to register their services on an UDDI-server. The companies that have access to this UDDI-server are then able to easily search for desired services.

6. Have you heard about this register?           ( ) Yes( ) No
7. Do you have any service registered on an UDDI server?   ( ) Yes( ) No

**Trust issue**

The definition of "trust" in this survey deals with the credibility on those companies that have their services registered on an UDDI-server. In present situation UDDI does not provide any guarantees for credibility on these companies.

8. Have you experienced this type of problem with Web Services respectively with the alternative system (the answer from question 4c, if any)   ( ) Yes ( ) No

9. Which one/ones of these solutions have you used to solve this issue, in other words which one/ones have you used to establish a "Network of trust"?
    a. ( ) System Agents
    b. ( ) The Liberty Project
    c. ( ) Microsoft Passport
    d. ( ) An agreement from a face-to-face meeting in reality
    e. ( ) SLA – Service Level Agreement
    f. ( ) A policy of trust (within the cooperation)
    g. ( ) None, we do not have that problem
    h. ( ) Other:

10. What is your opinion about Web Services Web Services respectively about the
alternative system (the answer from question 4c, if any) as a "Network of trust" ?

    a.  ( ) Very good

    b.  ( ) Good

    c.  ( ) Nor bad or good

    d.  ( ) Bad

    e.  ( ) Very bad

**Thank you for your cooperation!**

Your contribution to our thesis is important!

Regards

Thomas Andersson

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