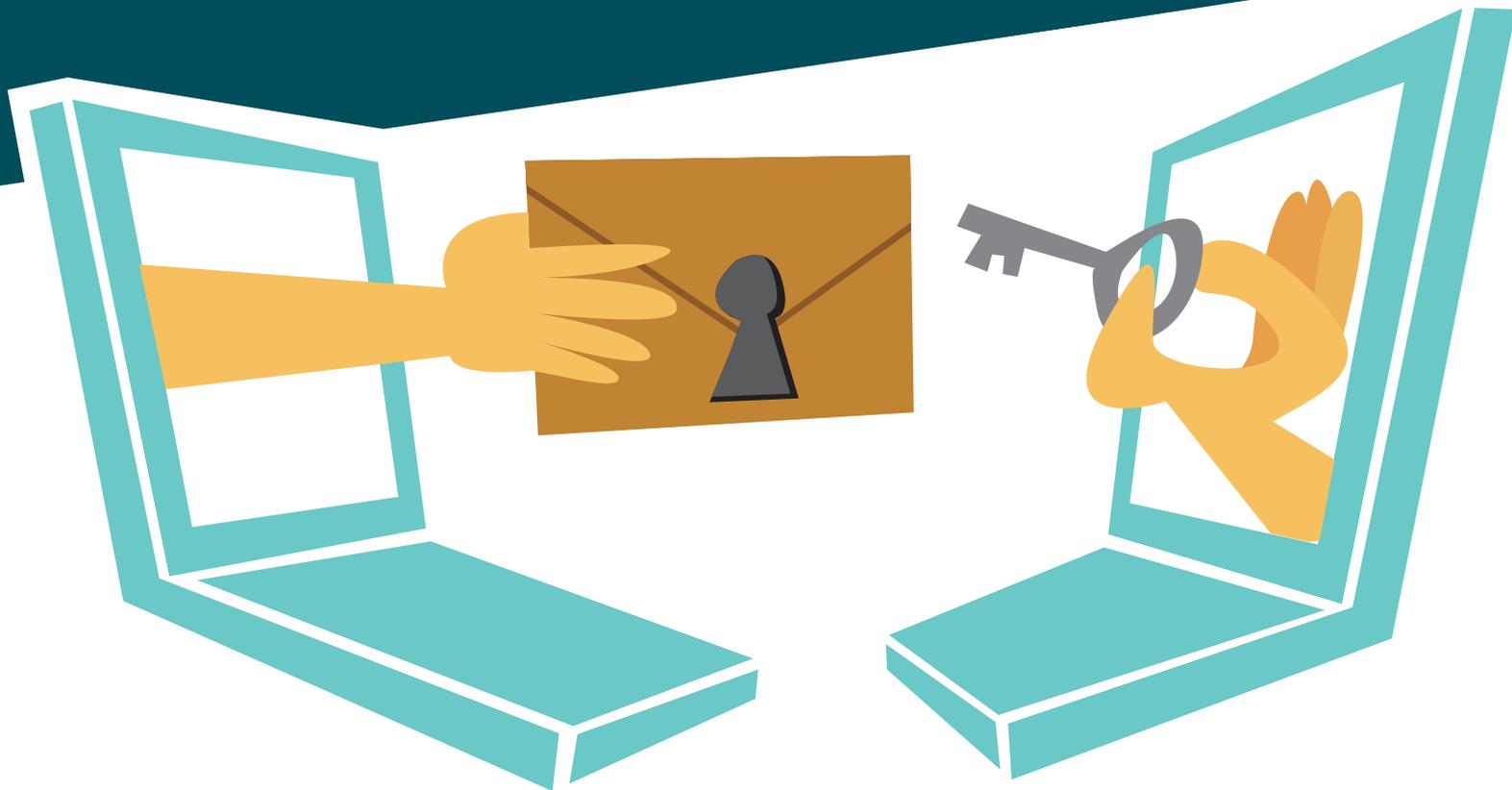




National IT and Telecom Agency

Ministry of Science  
Technology and Innovation

# A NATIONAL WEB SERVICE BASED INFRASTRUCTURE



## OIO Service Oriented Infrastructure

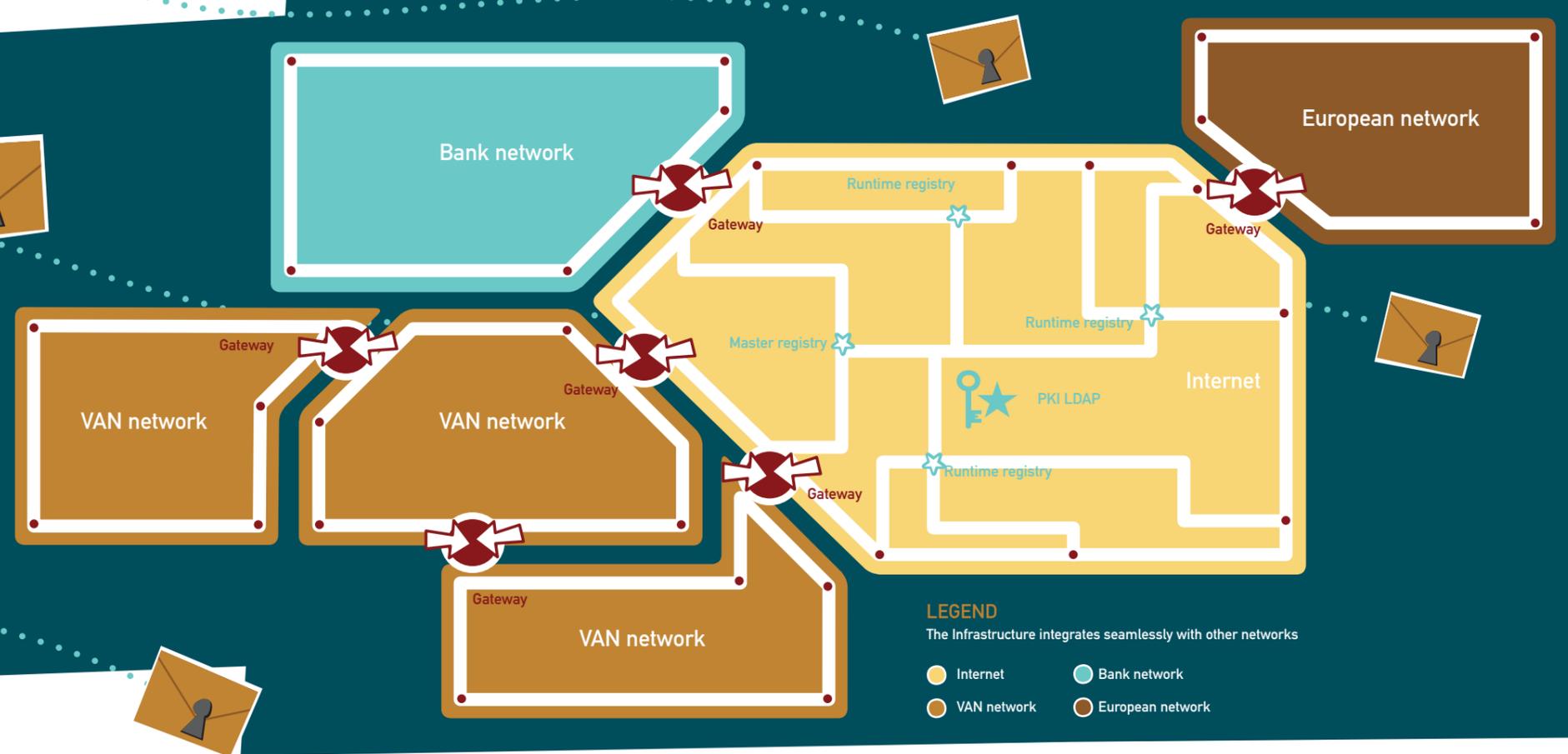
- SECURE AND RELIABLE EXCHANGE OF BUSINESS DOCUMENTS IN A  
WEB SERVICE BASED INFRASTRUCTURE.

Denmark is establishing a national Service Oriented Infrastructure consisting of a number of government controlled replicated UDDI registries and interoperability profiles based on the WS-\* stack of standards. The infrastructure will support the reliable, secure and asynchronous exchange of business messages across heterogeneous networks. Electronic invoicing in the public sector is

a key driver for the initiative, which will address the 190 million paper-based orders and invoices flowing b2b. The Infrastructure will be operational on July 1st 2007 and most ERP-vendors are expected to support the infrastructure and the upcoming version 2.0 of Universal Business Language at this date.

# BUSINESS REQUIREMENTS

THE PUBLIC SECTOR AND THE PRIVATE SECTOR MUST BE ABLE TO EXCHANGE DATA AND EXPOSE SERVICES IN A SECURE, RELIABLE AND HOMOGENEOUS ENVIRONMENT. SERVICE ORIENTED ARCHITECTURE PRINCIPLES MUST GUIDE THE DEVELOPMENT AND BUSINESS TRANSACTIONS IN THE ENVIRONMENT MUST SATISFY 5 CONDITIONS: AUTHENTICATION, AUTHORIZATION, CONFIDENTIALITY, INTEGRITY AND NON-REPUDIATION.



## WE HAVE A PROBLEM WITH WEB SERVICE INTEROPERABILITY

For several years the public sector in Denmark, has embraced XML and web services as key technologies for lowering the barriers for efficient and cost effective exchange of data and exposure of services. 5 years of XML based standardization and harmonization of public sector interfaces are paying off, but there is still a long way to go towards full interoperability in the web services arena.

*Lack of interoperability in web services is a major barrier to growth in e-government services.*

The effect of this lack of interoperability is that many of the errors of the past are being repeated today. The public sector is going through a phase of intense modernization and a structural reform of municipalities and counties that will be implemented on January 1st 2007 is occupying thousands of IT-specialists with integration work. Expectations to the service level of the public sector are growing. Companies and citizens wish to be able to interact with the public sector 24 hours a day via the Internet.

Because of the lack of interoperability – each digitalization project is building its own infrastructure. Most infrastructures are indeed based on open standards, but each project has its own interpretation and has made disparate implementation choices. The result is that infrastructures that are built with the same core set of business requirements are not interoperable with each other. This leads to higher costs because most public sector organizations are required to exchange data through several of these different infrastructures to other organizations - private and public alike.

*We cannot continue to build infrastructures from scratch for each new digitalization project.*

## WEB SERVICE INTEROPERABILITY REQUIRES GOVERNANCE

The Web Services Interoperability Organization (WS-I) defines profiles of web service standards in order to ensure interoperability among vendors. But a WS-I profile alone does not provide full interoperability. Variations in different markets and geographic regions make a differ-

ence in how a profile should be composed. The profiles must be localized further to encompass local needs and the possible availability of a PKI infrastructure. The private sector cannot be expected to develop the localized profiles and establish independent infrastructure services (i.e. UDDI registries, federated identity and access management services) without public sector governance.

This is the reason why the public sector must show leadership and establish the necessary shared infrastructure services and manage the development of localized web service profiles. And that is exactly what Denmark is doing.

## PROCUREMENT AS A DRIVER - A WINDOW OF OPPORTUNITY

Denmark is in unique position in regard to establishing a national web service based infrastructure. A public key infrastructure is in place and more than 600 thousand certificates have been distributed to citizens and companies. The business requirements have been identified and agreed upon in public hearings. But most importantly, there is a critical mass of public sector endpoints that can be exposed from day one. The driver is electronic invoicing. The private sector is required, by law to send all invoices electronically to the public sector and approximately 1.3 million invoices are exchanged every month. All public sector institutions are connected to one of five Value Added Network Operators (VANS-operators). All these public endpoints can be made available in a web service based infrastructure by establishing one or more gateways to the VANS-network. The effect is that there is a positive business case for early adopters. Another driver for extending the infrastructure is the potential economic gain. A recent report by KPMG demonstrates that there is a total economic potential of approximately 630 million Euros that can be realized by digitalizing business processes for the small and medium sized companies.

These figures have convinced the Danish Minister for Science, Technology and Innovation and a lead on globalization issues lead by the Prime minister, that the infrastructure should be established.

## FIVE KEY ELEMENTS

The Service Oriented Infrastructure is built around five key elements

- An addressing mechanism for service lookup
- A web service profile of standards
- An open Source Software toolkit
- A reference implementation of a message handler
- A legal framework

## ADDRESSING MECHANISM BASED ON UDDI

A hierarchy of replicated service registries based on the UDDI standard (Universal Description, Discovery and Integration) will be established. Registration of endpoints will only be allowed for companies equipped with digital certificates issued under the auspices of the Danish IT and Telecom Agency. The UDDI registry will initially be used for simple endpoint lookups without taking advantage of the more advanced features of the UDDI standard. Users will rarely get in direct contact with the registry. Registration will in most cases be part of the configuration phase when a user installs a piece of business software that supports the infrastructure.

## RASP – A PROFILE BASED ON WS\* STANDARDS

The standards used in the infrastructure all belong to the WS\* stack of standards. The standards are described in detail in an interoperability profile called “Reliable Asynchronous Secure Profile”. RASP is based on the WS-I recommendations and is based on SOAP 1.1, WSDL 1.1, UDDI 2.0, XML 1.0, XML Schema 1.0, WS-Security and WS-ReliableMessaging. The profile narrows down the implementation choices and describes in detail various policies and how the standards are used in combination. RASP varies, however, from the WS-I profiles by also supporting SMTP/POP3 as an alternative message protocol. This is due to the following business requirement: Even the smallest companies without dedicated servers must be able to receive business messages 24 hours a day 365 days a year. Email is a medium that provides just that.

## OPEN SOURCE TOOLKIT IN JAVA AND .NET

A software toolkit and a reference implementation have been developed in order to support software developers and system integrators in using of the

infrastructure. The toolkit enables software developers and system integrators to easily integrate their applications with the Service Oriented Infrastructure and seamlessly exchange business messages. The toolkit implements the RASP profile with all underlying standards and policies offering a simple application programming interface to the developers.

The software toolkit is available for both the Java and the .Net platforms employing an open source license. The license will allow software developers and system integrators to enhance the toolkit and develop commercial products with no restrictions and with no need to sign license agreements.

## OPEN SOURCE MESSAGE HANDLER

A reference implementation of a message handler client has been developed using the software toolkit. The primary purpose of the reference implementation is to provide a complete testing environment with which system integrators can benchmark their own implementation of an RASP profile compliant piece of software. The reference implementation emulates an email program displaying two lists messages. The first list contains outgoing messages and the other list contains incoming messages.

The reference implementation may be bundled with commercial software should suppliers of business software wish to do so. However, the obligation to support the message handler lies with the supplier bundling the software. The source code of the reference implementation is also freely available to software developers.

## LEGAL FRAMEWORK

Last but not least – a legal framework takes care of important contractual issues. Danish law requires that an agreement has been made prior to the exchange of electronic invoices, for instance. Having to manage bilateral exchange agreements would be a severe inhibitor to the infrastructure. Companies registering electronic procurement endpoints are therefore asked to sign a multilateral contract that permits all the signing organizations to exchange e-procurement messages. The contract furthermore describes important non-repudiation aspects of the infrastructure and the concept of gateways to other trusted network infrastructures.

## Milestones

- OCTOBER 25ND 2006:** Technical pilot project suppliers of business software and public institutions.
- NOVEMBER 12TH-17TH 2006:** International UBL conference in Copenhagen with track on infrastructure (<http://www.ublconference.com>).
- FEBRUARY 1ST 2007:** Large pilot private companies, public organizations and suppliers of business software. This pilot is conducted in collaboration with private IT-suppliers and trade organizations.
- JULY 1ST 2007:** Official launch of the service oriented infrastructure.

## Contact information

THE OIO SERVICE ORIENTED INFRASTRUCTURE IS AN INITIATIVE TAKEN BY THE MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION. THE IT AND TELECOM AGENCY IS RESPONSIBLE FOR ROLLING OUT THE INFRASTRUCTURE.

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## Further information

OIO Service Oriented Infrastructure:  
[www.oio.dk/arkitektur/soa/infrastruktur/english](http://www.oio.dk/arkitektur/soa/infrastruktur/english)

Web Services Interoperability Organization:  
[ws-i.org](http://ws-i.org)

Universal Business Language:  
[www.oasis-open.org/committees/tc\\_home.php?wg\\_abbrev=ubl](http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=ubl)

International UBL conference in Copenhagen  
(November 12th-17th 2006):  
[www.ublconference.com](http://www.ublconference.com)



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