Infomosaic
CORPORATION

Ensuring Web Service Security With SecureXML™

A Look Under The Hood

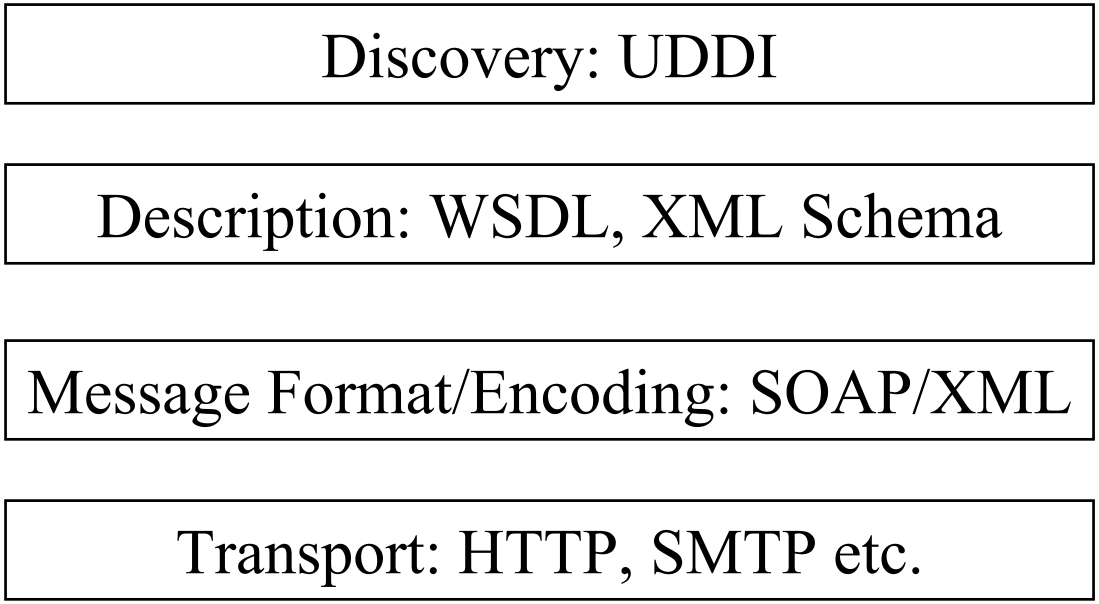
Agenda

- Web Service Components
- What Are The Various Threats
- How to Architect Systems To Minimize Exposure to Threats
- A Real Life Example
- Questions

Caution

- Technology is not enough to ensure security
- Business processes must be designed with security in mind
- Security policies must be revised in a timely fashion as additional threats are discovered and business requirements change
- Policies must be enforced

Web Services Building Blocks



Discovery: UDDI

Description: WSDL, XML Schema

Message Format/Encoding: SOAP/XML

Transport: HTTP, SMTP etc.

Broad Issues With Web Services Security

- Transport level security
- Application level security

Transport Level Security

- SSL/VPN does the job
- Configuring SSL for Web Services
  - For Apache-Axis
    - Please visit http://www.pankaj-k.net/WSOverSSL/WSOverSSL-HOWTO.html
  - For IIS
    - Configure Your Web Server for SSL
    - Install Certificate Authority's Certificate on Client
    - Modify WSDL from HTTP to HTTPS
    - Verify That It Works
    - Enforce SSL-Only Access

Application Level Security

- Authenticating data source
- Ensuring data integrity, Non-repudiation
- Protection from misbehaving clients
- Data confidentiality

STRIDE Threat Model*

- Spoofing Identity
- Tampering with Data
- Repudiation
- Information Disclosure
- Denial of Service
- Elevation of Privilege

* Idea borrowed from Scott Short

Spoofing Identity

- Authenticate principals using technologies such as X.509 certificates and 2-factor authentication
- Add XML Signature to data to ensure that the data indeed came from the right source. This could be a signature added by a known server (not necessarily an individual)

Tampering With Data

- Add Hash to data
- Add HMAC based Digital Signature
- Add X.509 certificate based digital signature (also takes care of the Spoofing Identity problem)

Repudiation

- It wasn’t me!
- Add XML Signature to the SOAP messages.
- Verify signature before accepting any message.

Information Disclosure

- Restricted functionality of the web service by using multiple WSDL files for the same web service
- Limit access to the WSDL to trusted IP addresses.
- Don’t write buggy software!

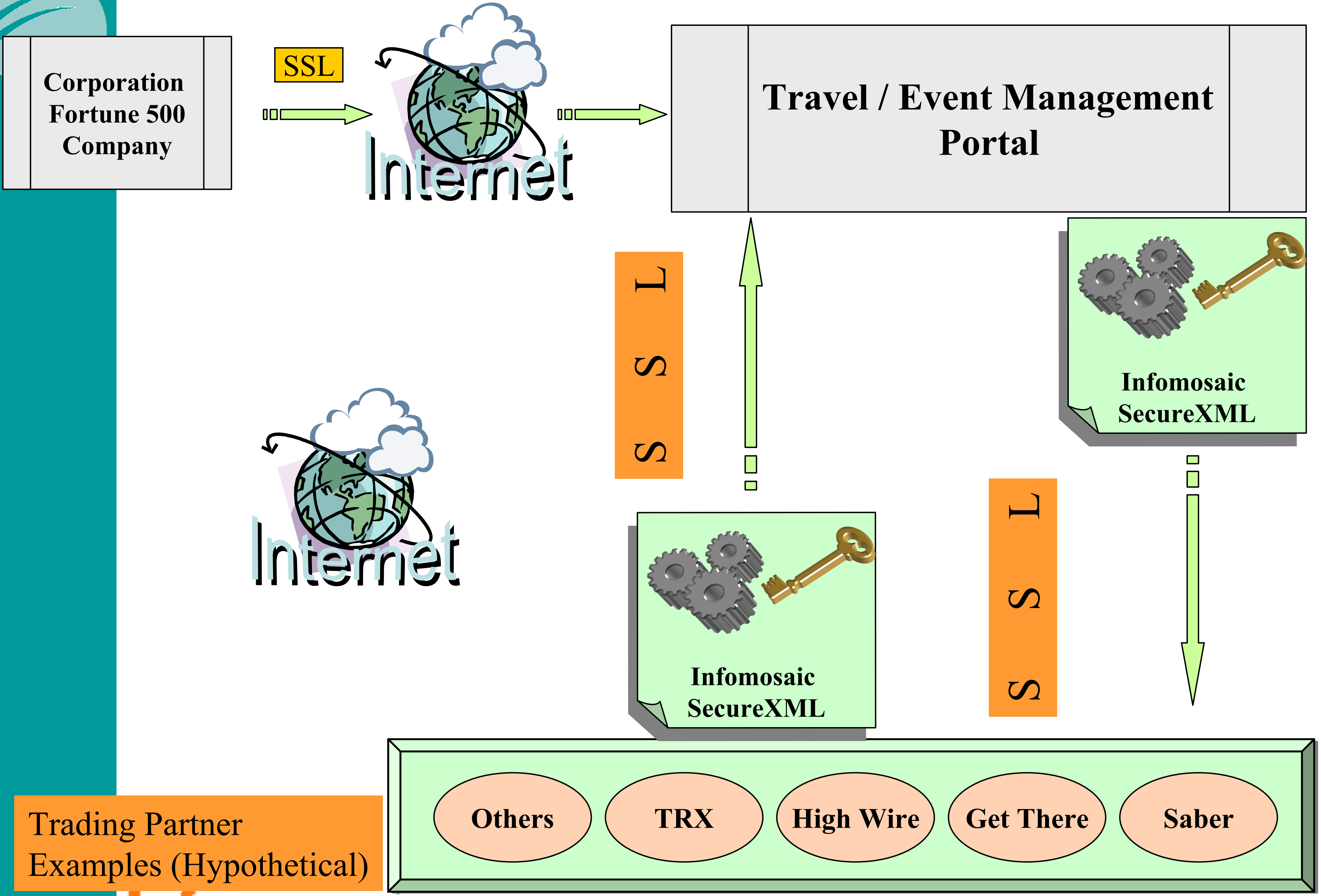
Denial of Service

- Use methods available for web server denial of service attack prevention such as proper firewall configuration.

Elevation of Privilege

- Internal application and system setup must be conformant with privilege policy.
- Use PKI/2-factor authentication along with XML Signature

Real Life Example of a Complex Web Application Which Uses Web Services and Other XML Data Exchange Mechanisms



Corporation Fortune 500 Company

SSL

Internet

Travel / Event Management Portal

SSL

Infomosaic SecureXML

SSL

Infomosaic SecureXML

Internet

Others

TRX

High Wire

Get There

Saber

Trading Partner Examples (Hypothetical)

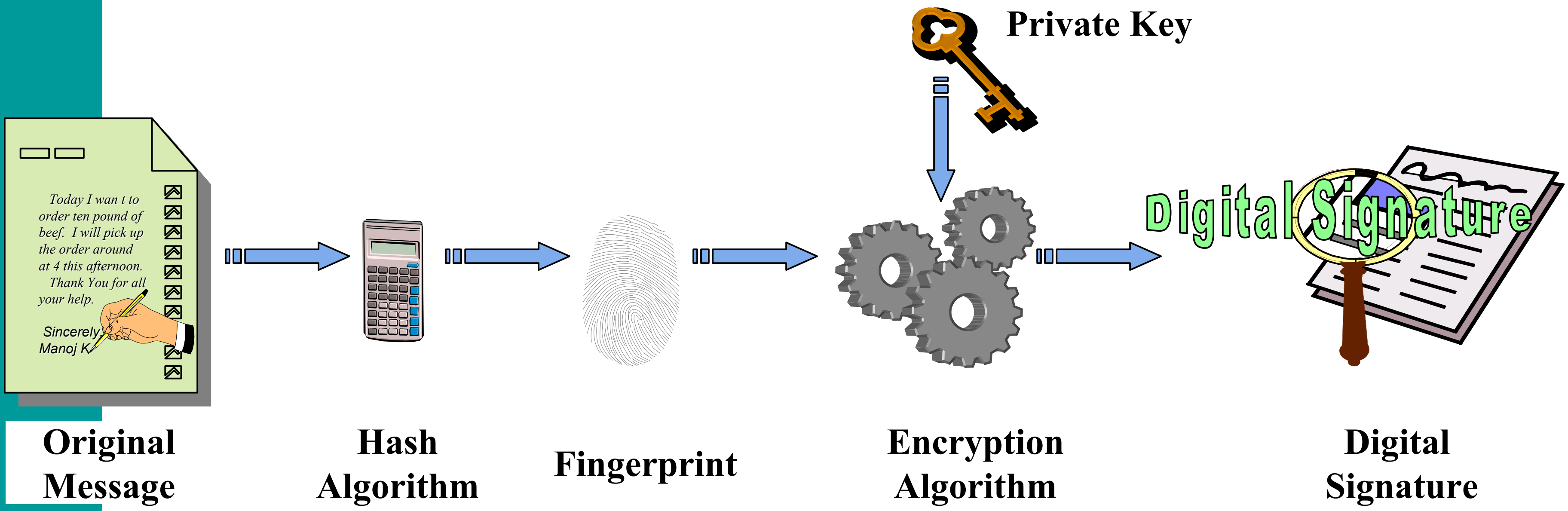
Related W3C Standards

- XML Digital Signature
- XML Encryption
- XML Key Management Services (XKMS)

Related Oasis Standards

- SAML

Creating Digital Signature


Today I wan t to order ten pound of beef. I will pick up the order around at 4 this afternoon. Thank You for all your help.
Sincerely
Manoj K
Digital Signature

Private Key

Original Message

Hash Algorithm

Fingerprint

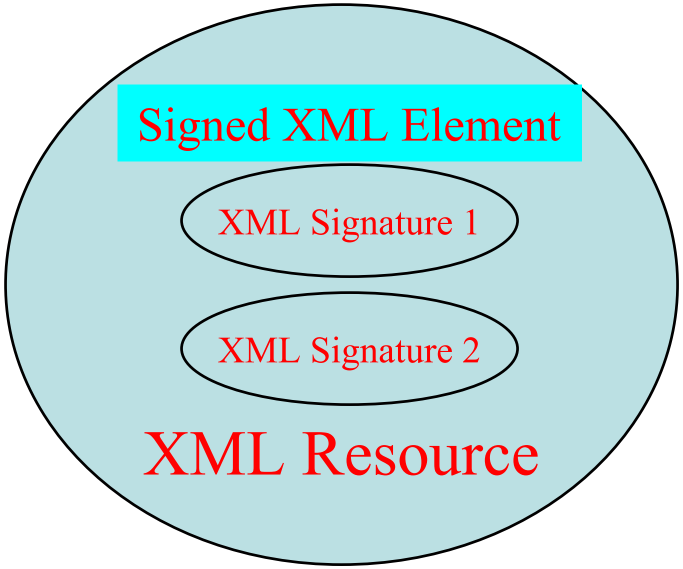
Encryption Algorithm

Digital Signature

XML Digital Signature

Enveloped Signature

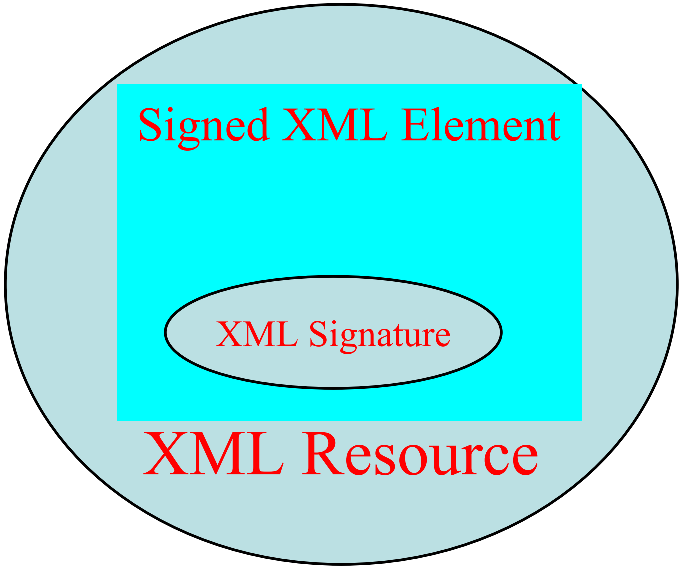
An enveloped signature is a signature of a document, where the XML signature will itself be embedded within the signed document.



XML Digital Signature

Enveloping Signature

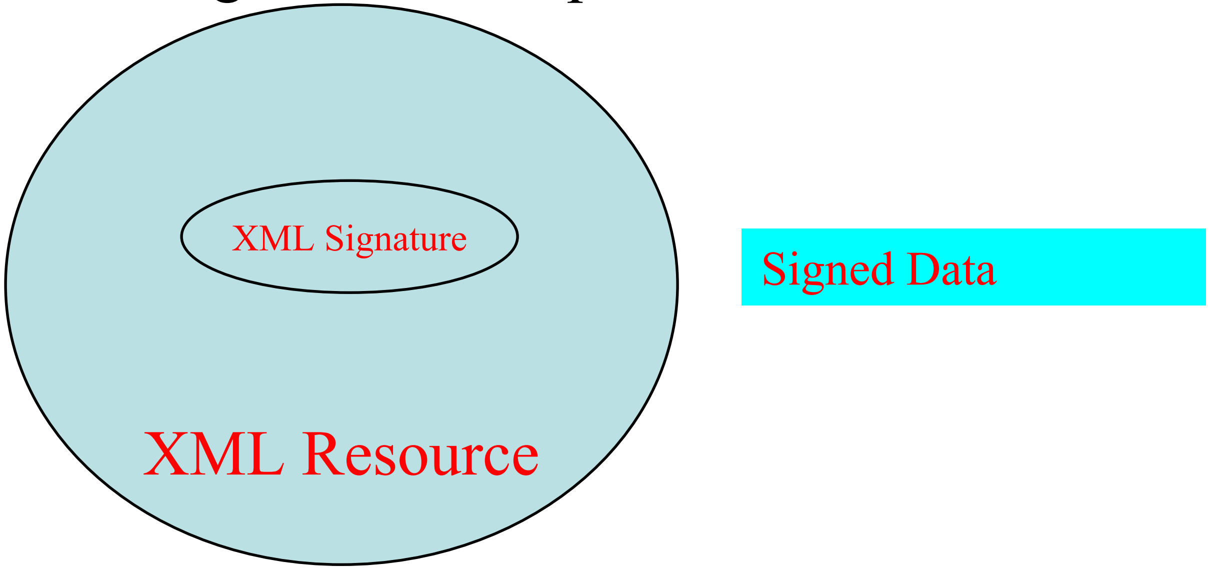
An enveloping signature is a signature where the signed data is actually embedded within the XML signature element.



XML Digital Signature

Detached Signature

A detached signature is a signature where the signed entities and the XML signature are separate.



What is SecureXML

- Infomosaic’s implementation of W3C XML Digital Signature Standard
- High performance implementation
- Easy to use
- Full integration with CSP layer of Windows allowing use of hardware accelerators, smart cards and USB tokens.

Using SecureXML Is Easy

- Programming Languages Supported
  - C/C++
  - Java, VB, C# etc. .NET Family of Languages
- Packaging
  - C-runtime Library
  - ActiveX Component

Using MS SOAP Client

```
<%@ LANGUAGE = JScript %>
<%
var WSDL_URL = "http://www.securexml.net/SecureXML/SecureXML.wsdl"
var soapclient
        if (!Application("SecureXMLClient")) {
        soapclient = Server.CreateObject("MSSOAP.SoapClient")
        soapclient.ClientProperty("ServerHTTPRequest") = true
        soapclient.mssoapinit(WSDL_URL)
        Application.Lock
        if (!Application("SecureXMLClient")) {
        Application("SecureXMLClient") = soapclient
        }
        Application.UnLock
        } else {
        soapclient = Application("SecureXMLClient")
        }

        var inputXML, res
        inputXML = Request("inputData")
        if (inputXML == "") {
        res = "No input Provided"
        Response.Write(res)
        } else {
        res = soapclient.SecureXMLVerify(inputXML)
        Response.ContentType="text/xml"
        Response.Write(res)
        }
        inputXML = "“
%>
```

Using Java (Apache-Axis) Client

```
serviceLocation = "http://www.securexml.net/SecureXML/SecureXML.wsdl"
dataFile = “signedXML.xml”

SecureXMLLocator service = new SecureXMLLocator();
SignatureSoapPort port = service.getSignatureSoapPort(new URL(serviceLocation));
File inpFile = new File(dataFile);
int fileSize = (int)inpFile.length();
FileReader fr = new FileReader(dataFile);
char[] cbuf = new char[fileSize];
int n = fr.read(cbuf, 0, cbuf.length);

System.out.println("Read " + n + " characters from file " + dataFile);

String result = port.secureXMLVerify(new String(cbuf, 0, n));

System.out.println("Result:");
System.out.println(result);
```

Using Local Java Client

```
import infomosaic.securexml.*;

dateFile = “signedXML.xml”
ISignature service = (ISignature) new Signature();
File inpFile = new File(dataFile);
int fileSize = (int)inpFile.length();
FileReader fr = new FileReader(dataFile);
char[] cbuf = new char[fileSize];
int n = fr.read(cbuf, 0, cbuf.length);
System.out.println("Read " + n + " characters from file " + dataFile);
String result = " ";
try {
    result = service.SecureXMLVerify(new String(cbuf, 0, n));
}
catch (Exception e) {}
System.out.println("Result:");
System.out.println(service.SecureXMLVerify(new String(cbuf, 0, n)));
```

Demonstration of a simple purchase order web service using SecureXML to ensure data security

Questions And Follow Up

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- Download this presentation: Visit http://www.infomosaic.net and follow the link to WWW2002