OASIS AS4 and the e-SENS AS4 Profile

Pim van der Eijk, OASIS

CEF e-Delivery Infrastructure Day

November 2016, Brussels

Agenda

- E-Delivery
- Background and Context
- ebXML and AS4
- Profiling AS4
- Conformance and Interoperability
- AS4 users
- AS4 solutions
- Standardization at OASIS

E-DELIVERY

E-Delivery

SAT - eDelivery

Created by Melis Özgür Çetinkaya Demir, last modified on Apr 30, 2015

Objective

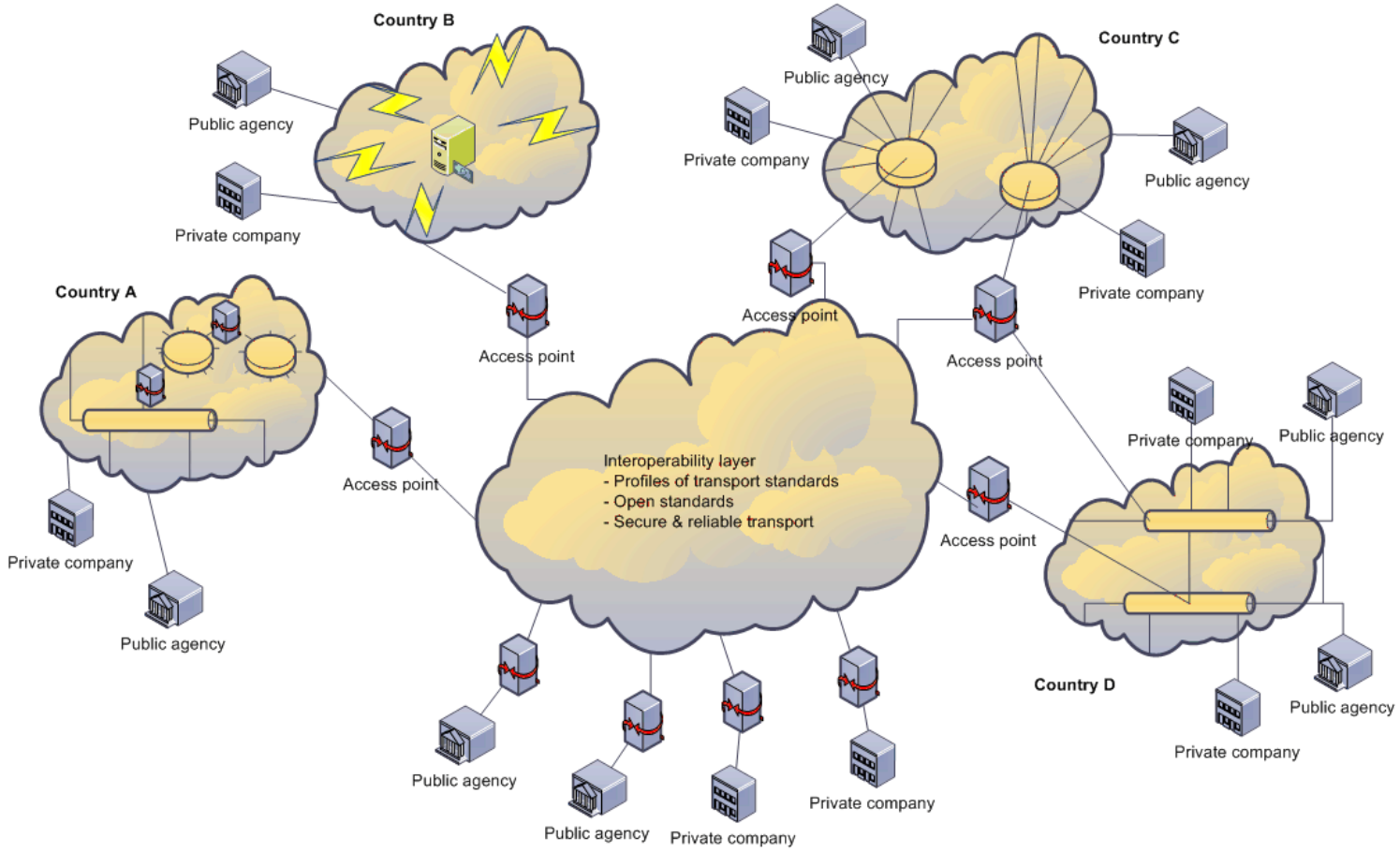
In the convergence scope of e-SENS, e-Delivery denotes the process to take (store) and hand over (route and forward) business data and evidence asynchronously, securely and reliably:

- interconnected by applying the four-corner model network arrangement
- to form a Pan European Registered e-Delivery ICT Transport Infrastructure
- to and from existing national and/or private ICT Transport Infrastructures to form a bridged Pan European Registered e-Delivery ICT Transport Infrastructure.

The main objective of the e-SENS e-Delivery infrastructure is the interoperable, secure and reliable exchange of structured, non-structured and/or binary data within (at least) asynchronous communication scenarios. As most preceding LSPs, the e-SENS common e-Delivery infrastructure aims to interconnect transparently existing electronic delivery communities:

- as set up by the MS for general e-Government purposes
- or sector oriented ones like e.g. for e-Procurement, e-Health or e-Justice.

Interconnecting Infrastructures



Four Corner Model

Scope

In e-SENS, e-Delivery is constrained to operate in a four-corner model. A four-corner model is a network arrangement to facilitate *End Entity* inter-connection by using Gateways in a scalable way. Networks using four-corner models usually share these characteristics:

- *End Entities* may choose any *Gateway* connected to the network.
- The *Gateways* are using pre-agreed transport protocols.
- The *Exchange Format* of payloads/messages used between the *Gateways* MAY be pre-agreed (but not always as in the case of payload agnostic Gateways).
- The *Gateways* are acting on behalf of the *End Entities.*
- Each *End Entity* only needs to enter into a contractual agreement with its selected *Gateway.*
- *Gateways* may transform to/from the agreed *Exchange Format* before sending or after receiving depending of the *End Entity's* preferences. The creation of the business document, in its *Exchange Format,* can happen either in the issuer´s own systems or it may be translated from an *In-house Format* to the *Exchange Format* by the *Gateway*. As in the e-CODEX [ECODEXD59] architecture the concept of "Connector" refers to common B2B Gateway functionality other than basic Message Exchange Protocol handling, such as transformation.
- The *Gateway* often offers more added value services to the *End Entity* (such as archiving, syntax validation, syntax transformation).
- *End Entity* may connect directly to the *Messaging Gateways*, or may connect via a separate eco-system served by its own Messaging Gateways.

The usage of a four corner model is a best practice previously adopted in the SPOCS PEPPOL and e-CODEX LSPs and reused in e-SENS as an efficient way to interconnect the different Member State infrastructures, the domain requirements and to have a uniform approach. In some e-SENS domains, a Member State is expected to provide a single national gateway that acts as a Messaging Bridge between the national Transport Infrastructure and the interoperability infrastructure. In other domains, end entities may have a choice of Gateways and/or Gateways may not be limited to a single Member State. Some entities may connect directly at the interoperability layer. The following diagram from PEPPOL provides an illustration of the four corner model and some of these options.

Architectural Building Blocks

- Core:
  - Message Exchange Protocol
  - Addressing of End Entities
- Dynamic Discovery
  - Capability Lookup
  - Service Location
- Abstract
  - Backend Integration
- http://wiki.ds.unipi.gr/display/ESENS/

BACKGROUND AND CONTEXT

OASIS

STATSKONTORET

SHS Version

The Swedish Agency for Pub

This version:
http://www.statskontoret.s

Latest version:
http://www.statskontoret.s

Previous versions:
part of followings docun
http://www.statskontoret.s
http://www.statskontoret.s
http://www.statskontoret.s

Editors:

IDA eLink Specification

iDA
Interchange of Data between Administrations

EUROPEAN DYNAMICS

EUROPEAN DYNAMICS SA
209 Kifissias Ave.
GR-151 24 Athens

Tel: +30 210 8094500
Fax: +30 210 8094508
Web: www.eurodyn.com

November 18, 2004
Ref: eLink/SpecII-1.2

Large Scale Pilots

- SPOCS
  - Simple Procedures Online for Cross- Border Services
  - Developed REM-SOAP
- PEPPOL
  - Pan-European Public Procurement Online
  - Developed START, LIME
- E-CODEX
  - E-Justice Communication via Online Data EXchange

IDABC study on B2B frameworks (2003)

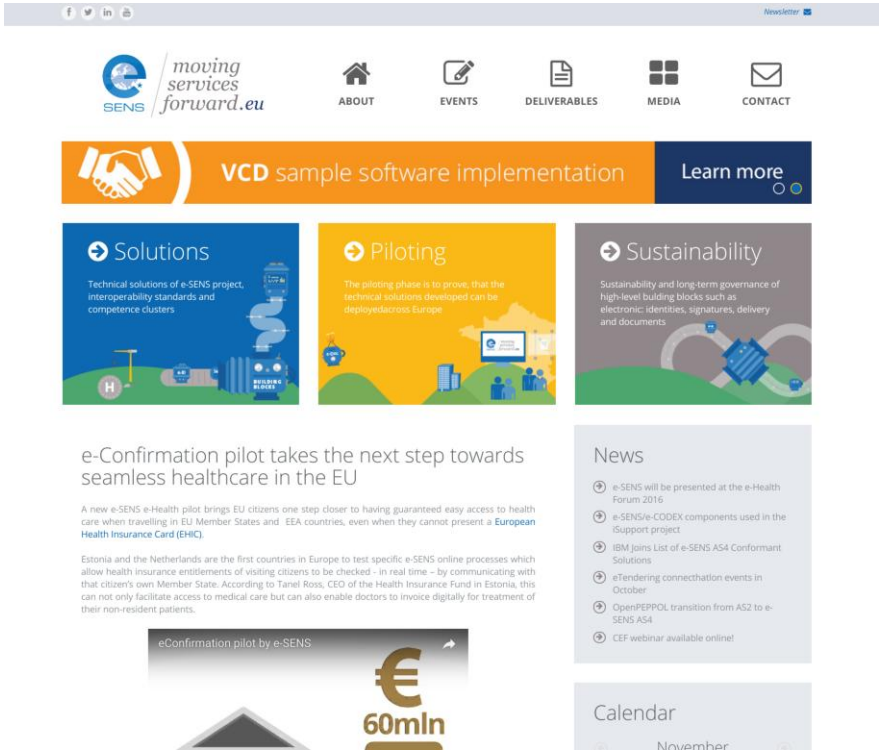
- Recommendation for transport architecture of regulated network:

Nature of Network	*Recommendations*							
	Global architecture and functioning process construction					**Content and data**	**Security**	**Directories**
	General	*Modelling*	*Transport Architecture*	*Interface*	*Execution control*			
Regulated	Use **ebXML**	Use **UML / UMM** **BPSS**	*Consensus*: use **ebMS**	*Consensus & heterogeneous local domains*: use **CPP / CPA**	Use stabilised standard execution control language (BPEL4WS, WSCI or future new compromise)	The clear direction is XML: for future developments, use XML Schemas	Choose TESTA as much as possible	Use **ebXML Registry** in all cases
				Consensus & Homogeneous local domains: no need			Use Web Services Security	
			No consensus: use **ebMS** for Eurodomain + gateways	*No consensus*: conversions have to be done		In all situations use **Core components**		
Unregulated	Use component mix **ebXML** and Web Services	Use **UML**	*Consensus*: if pure XML then use **SOAP** Otherwise, use **ebMS**	*Consensus*: use WSDL		Consider **UBL** and other existing dictionaries	*For sensitive access*: use XML signature *For sensitive data*: use XML Encryption	Use UDDI in rare cases when needed to find unknown services
			No consensus: use **SOAP** (if pure XML) or **ebMS** in Eurodomain + gateways	*No consensus*: conversions have to be done		Build **ebXML repository**	Use LDAP with X509 certificate and PKI when possible	

	ebMS2/3/ AS4 (ebBP)	PEPPOL START/LIME	SPOCS REM SOAP
SOAP version	1.1 or 1.2	1.1	1.2
Payloads and attachments	Multipart/Related: SOAP with attachments	Multipart/Related MTOM WS-Transfer	Multipart/Related MTOM
Reliable Messaging	WS-Reliability 1.1, WS-Reliable-Messaging 1.1 or 1.2 AS4 Reception Awareness	WS-ReliableMessaging 1.1	(Optional) WS-ReliableMessaging 1.1
Security	WS-Security 1.0 or 1.1 X.509 and UserName password token	WS-Security 1.1 START SAML token	WS-Security 1.1 SPOCS SAML token
Intermediary / forwarding model	ebMS 2.0 or 3.0 multi-hop (end-to-end), WS-I RSP compliant	“Four corner” model (relayed/re-encoded, not based on WS-I RSP)	“Four corner” model (relayed/re-encoded, not based on WS-I RSP)
B2B headers	ebMS header extension elements (WS-Addressing optional)	WS-Transfer values for WS-Addressing and extension headers	SPOCS values for wsa:Action REM Dispatch / Evidence Body
Encoding Sender /Submitter Indentity and authentication	No	START SAML token	SPOCS SAML token
Non-Repudiation of Receipt	ebMS Receipt (ebBP)	No?	REM evidence
(Relayed) Delivery Notifications	Out of scope (ebBP)	Out of scope	REM evidence
Acceptance Signal	Out of scope (ebBP)	Out of scope	REM evidence
“Light Clients”	ebMS 3 “Pull”	LIME	(webmail, email client)
Routing and Discovery	(ebXML Registry)	SML / SMP	TSL
Partner Identification	(ebCore Party Id)	(PEPPOL or ebCore Party Id)	(Multiple including email)
Compression	AS4 payload compression or Part 2 message compression	No	No
Very large message handling	AS2 Restart or Part 2 split/join protocol	No	No
Multiple user messages	Part 2 Bundling	No	No

E-SENS

- The aim of e-SENS is to facilitate the deployment of cross-border digital public services through generic and re-usable technical components, based on the building blocks of the Large Scale Pilots.
- The consolidated technical solutions, with a strong focus on e-ID, e-Documents, e-Delivery, Semantics and e-Signatures, aim to provide the foundation for a platform of “core services” for the eGovernment cross-border digital infrastructure foreseen in the regulation for implementing the Connecting Europe Facility (CEF).



EBXML AND AS4

B2B / Messaging Requirements

- **Support fully automatic processing**
  - **Structured** business **content**
  - Structured **metadata** to express purpose and requested processing
- **Security**
  - **Protect integrity** and **confidentiality** of content
  - **Authenticate** identity of sender and receiver
- **Reliability**
  - **Guaranteed** once-and-only once delivery
- **Open Standard**
  - Mechanism should be **independent** of specific vendor products
  - Users should be able to procure solutions in a competitive environment

ebXML

International Organization for Standardization

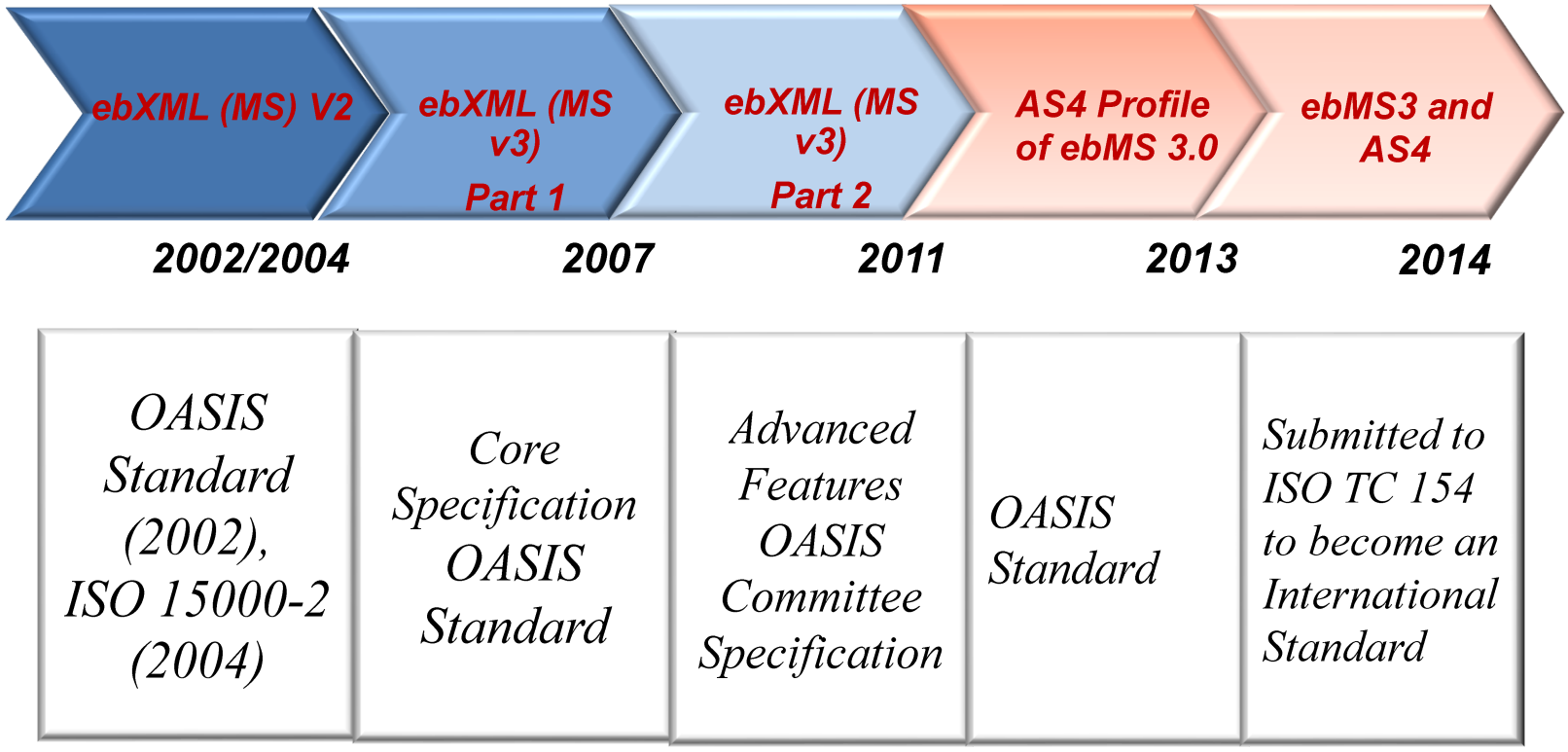
- Technical and semantic interoperability
- Modular, cohesive set of B2B standards developed from 1999
  - OASIS, ISO and UN/CEFACT
  - ISO 15000 standards since 2004
- OASIS ebXML standards support
  - Secure reliable messaging, rich metadata
  - Choreographed business collaborations
  - Partner profiles and agreements
  - Registry functionality
- One component is ebXML Messaging (ebMS)

ebXML Messaging Features

- **Message Header with Business Metadata**
  - Identifies Business Partners, Service, Action, Context, Agreement, Properties, Payloads
- **Reliable Message Delivery**
  - At-Least-Once, At-Most-Once delivery
- **Secure Messaging**
  - Digital Signature and Payload Encryption
  - Support for Non-Repudiation of Origin & Receipt
- **Flexible Packaging using SOAP and MIME**
  - XML, EDI, multimedia payloads
  - Multiple payloads per message
- **Transport Protocol Mappings**
  - HTTP and SMTP

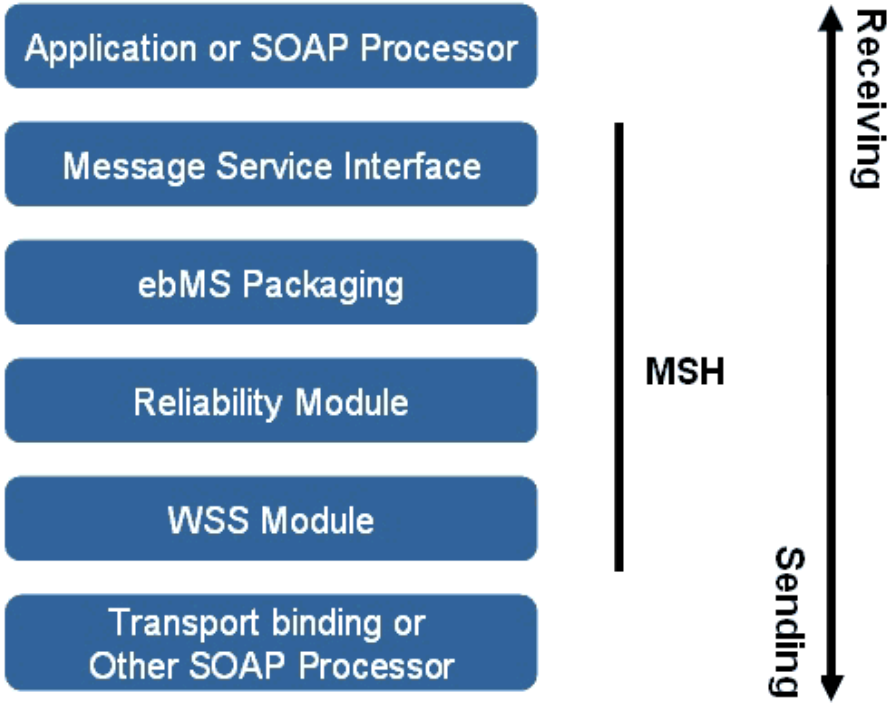
ebXML Messaging Standards

History and evolution of AS4



ebXML Messaging Standards

- B2B exchange protocol based on Web Services
- B2B header and envelope
- SOAP, WS-Security
- Reliable Messaging
- “Processing modes” for configuration
- Push and Pull



ebMS3 Profiling Concepts

- Conformance Profiles
  - A set of capabilities that an MSH implementation must have. This is determined at development time regardless of the way the MSH is being used later.
  - Main audience are product developers
- Usage Profiles
  - A way of using an MSH implementation, that a community of users has agreed upon. This may in turn require a particular conformance profile.
  - Main audience are users (integration teams, application management)

AS4, an interoperable profile

- **Functionally similar to older standards, but**
  - Based on more modern **Web Services** technology
  - Provides enhancements for SMEs (client only endpoints)

- **Profile ebMS 3.0 by**
  - **Reducing options** and filling in details (e.g. for Receipts)
  - Not using modules with known complexity and interoperability issues, e.g. WS-ReliableMessaging
  - **Adding** some AS2-like **features** (e.g. compression)

AS4 Conformance Profiles

- ebHandler
  - B2B Gateway, client and server, rich security feature set
- Light Client
  - Client only endpoint, rich security feature set
- Minimal Client
  - Constrained device, more limited security and other features

PROFILING AS4

Why Profile a Profile?

- Messaging Standards are configurable
  - Optional features, and options on how to implement features
  - Too many combinations to test exhaustively for conformance and interoperability
- AS4 is a profile of ebMS3
  - Narrows down, but far from completely
  - Some parameters remain inherently domain-specific
  - Define how to use AS4 with other standards, in specific topologies
  - Additional profiling useful for interoperability, ease of implementation etc.
  - Less to test, configure etc. by pre-selecting choices

AS4 Profiles

- ENTSOG AS4 Profile
  - http://www.entsog.eu/publications/as4#AS4-USAGE-PROFILE
  - Secure and reliable point-to-point communication
- E-CODEX ebMS3
  - https://www.e-codex.eu/news-and-media/media/deliverables.html?eID=dam_frontend_push&docID=889
  - Includes enhancements for four-corner e-Delivery
- E-SENS AS4 Profile
  - Reuses ENTSOG and e-CODEX profiling
  - Additional Usage Profiling
  - http://wiki.ds.unipi.gr/display/ESENS/PR+-+AS4
  - Referenced by CEF Digital

European Network of Transmission System Operators for Gas

Commission Regulation EU 2015/703 network code on interoperability and data exchange rules

Common data exchange solutions

1. Depending on the data exchange requirements under Article 20(2), one or more of the following types of data exchange may be implemented and used:

(a) **document-based data exchange**: the data is wrapped into a file and automatically exchanged between the respective IT systems;

(b) **integrated data exchange**: the data is exchanged between two applications directly on the respective IT systems;

(c) **interactive data exchange**: the data is exchanged interactively through a web application via a browser.

2. The common data exchange solutions shall comprise the protocol, the data format and the network. The following common data exchange solutions shall be used for each of the types of data exchange listed in paragraph 1:

(a) For the document-based data exchange:

(i) protocol: AS4;

(ii) data format: Edig@s-XML, or an equivalent data format ensuring identical degree of interoperability. Entsog shall publish such an equivalent data format.

(b) For the integrated data exchange:

(i) protocol: HTTP/S-SOAP;

(ii) data format: Edig@s-XML, or an equivalent data format ensuring identical degree of interoperability. Entsog shall publish such an equivalent data format.

(c) For the interactive data exchange, the protocol shall be HTTP/S.

For all data exchange types set out in points (a) to (c), the network shall be internet.

3. Where a potential need to change the common data exchange solution is identified, Entsog, on its own initiative or on the request of ACER, should evaluate relevant technical solutions and produce a cost-benefit analysis of the potential change(s) that would be needed including the analysis of the reasons that make a technological evolutional step necessary. A public consultation involving all stakeholders shall be carried out by Entsog including the presentation of the result of the evaluation and proposal(s) based on the cost-benefit analysis realised.

Where an amendment to the common data exchange solutions is considered necessary, Entsog shall submit a proposal to ACER in accordance with the procedure set out in Article 7 of Regulation (EC) No 715/2009.

Objectives of the ENTSOG AS4 Profile

- Support exchange of EDIG@S-XML documents and other payloads.
- Support business processes in the gas sector
- Leverage experience gained with other B2B protocols, such as AS2 as described in the EASEE-gas implementation guide.
- Provide security guidance based on state-of-the-art best practices, following recommendations for “near term” (defined as “at least ten years”) future system use.
- Provide suppliers of AS4-enabled B2B communication solutions with guidance regarding the required AS4 functionality.

Profiling AS4

- **Selecting an AS4 Conformance Profile**
  - AS4 defines three “Conformance Profiles”
  - ENTSOG, e-CODEX and e-SENS profiles are based on an extended subset of “ebHandler”
- **Profiling the ebHandler Feature Set**
  - Following the structure of ebMS 3.0 Core
  - Detailed information for product vendors and for production selection
- **Defining a Usage Profile**
  - Guidance for implementation and operation teams at users

AS4 Conformance Profiles

Selection of ebHandler Conformance Profile

Feature review of ebHandler onformance Profile

Usage Profile

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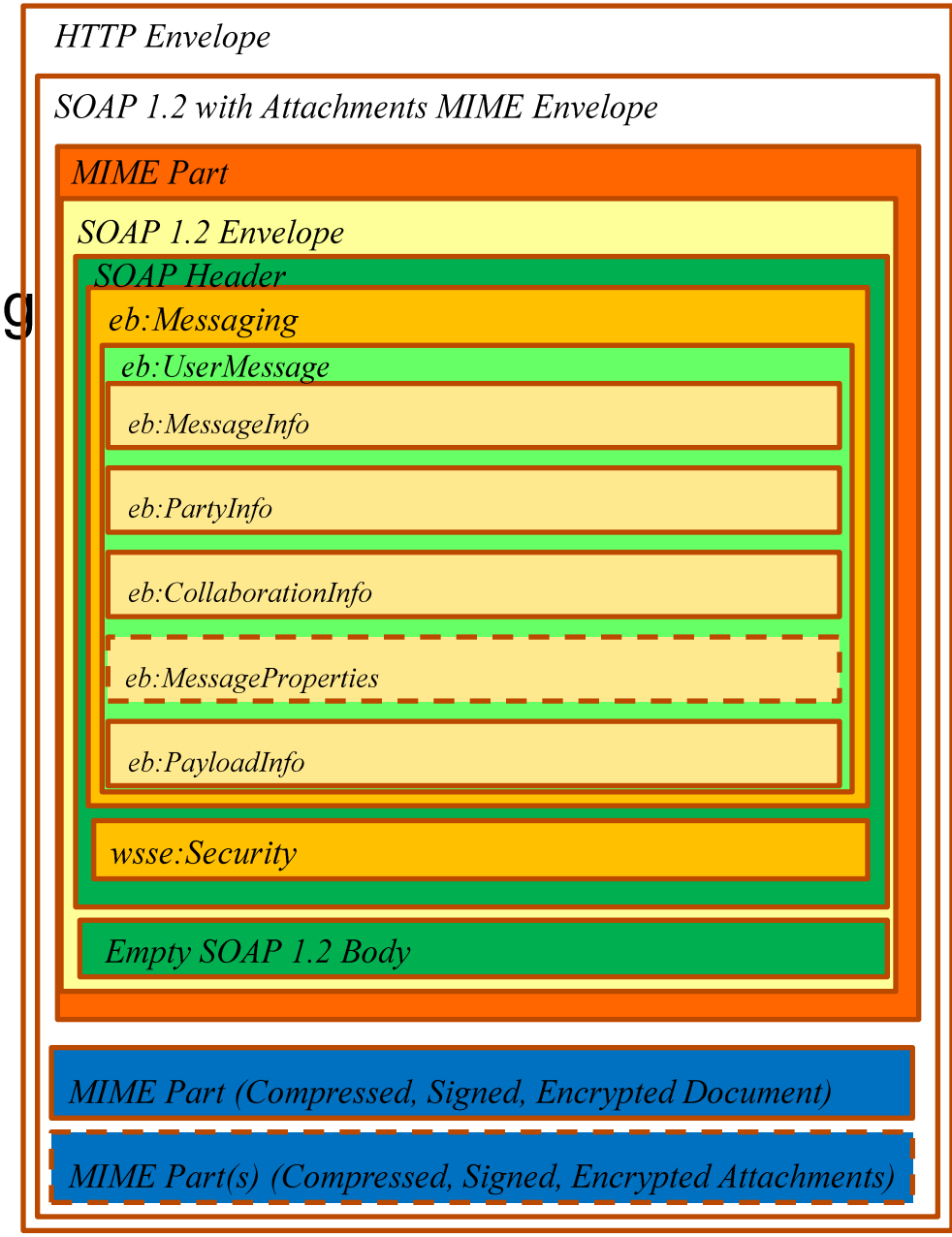
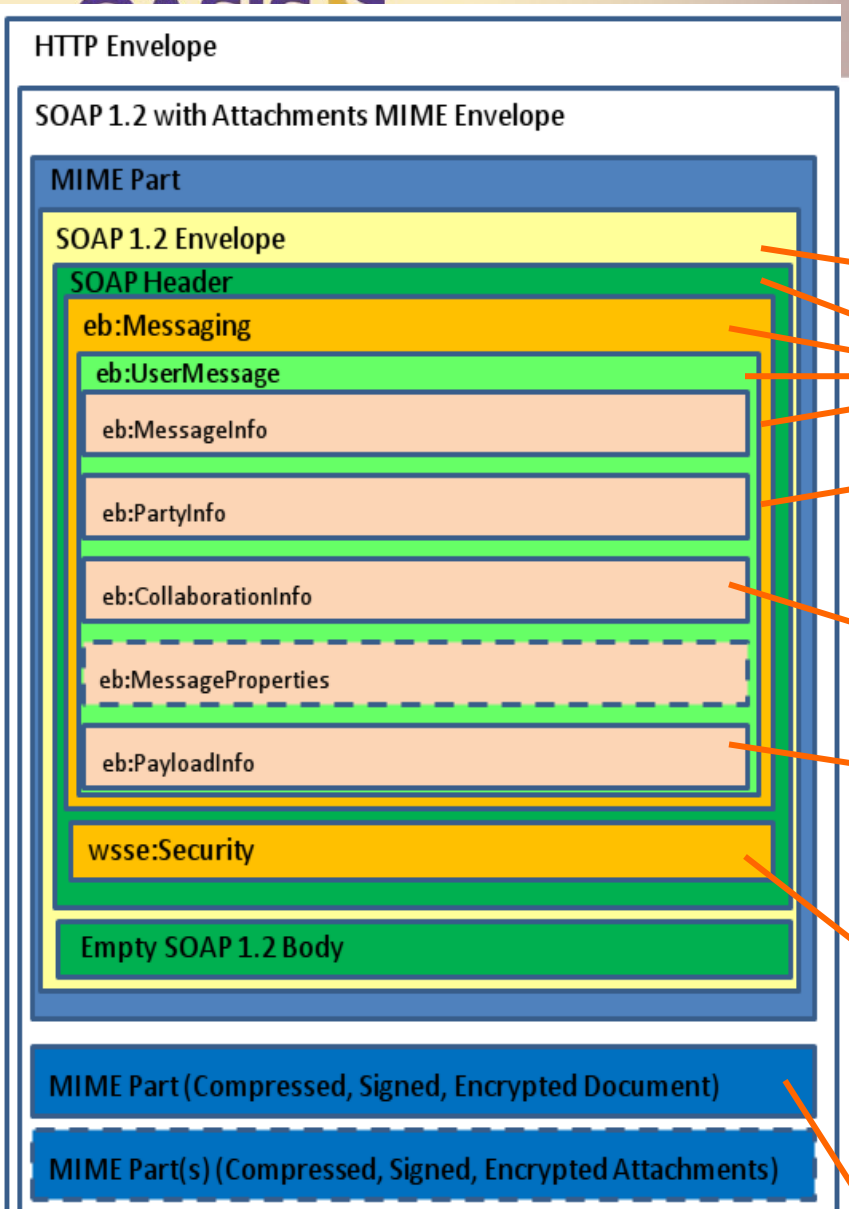
ebMS 3.0 Packaging

- **AS4:**
  - SOAP 1.2 with Attachments
  - SOAP Header with Messaging extension headers

- **ENTSOG and e-SENS Profile:**
  - No content in SOAP Body
  - Main business document in separate MIME part
  - Optional adjunct payloads
  - All payloads compressed, signed and encrypted






```
POST /as4handler HTTP/1.1
Host: receiver.example.com:8893
User-Agent: Turia
Content-Type: multipart/related; start="<f8df1904-a6b9-422b-8239-6a971838503f@sender.example.com>";
boundary= "c5bae1842d1e"; type="application/soap+xml"
Content-Length: 472639

--c5bae1842d1e
Content-Id: <f8df1904-a6b9-422b-8239-6a971838503f@sender.example.com>
Content-Type: application/soap+xml; charset="UTF-8"

<S12:Envelope xmlns:S12="http://www.w3.org/2003/05/soap-envelope"
 xmlns:wsse="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd"
 xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
 xmlns:eb3="http://docs.oasis-open.org/ebxml-msg/ebms/v3.0/ns/core/200704/">
  <S12:Header>
    <eb3:Messaging wsu:Id="_18f85fc2-a956-431e-a80e-09a10364871b">
     <eb3:UserMessage>
        <eb3:MessageInfo>
           <eb3:Timestamp>2016-04-03T14:49:28.886Z</eb3:Timestamp>
           <eb3:MessageId>2016-921@5209999001264.example.com</eb3:MessageId>
        </eb3:MessageInfo>
        <eb3:PartyInfo>
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              <eb3:PartyId>21X-EU-A-X0A0Y-Z</eb3:PartyId>
              <eb3:Role>ZSH</eb3:Role>
           </eb3:From>
           <eb3:To>
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              <eb3:Role>ZSO</eb3:Role>
           </eb3:To>
        </eb3:PartyInfo>
        <eb3:CollaborationInfo>
           <eb3:AgreementRef>2016-3</eb3: AgreementRef>
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           <eb3:ConversationId>2016-921</eb3:ConversationId>
        </eb3:CollaborationInfo>
        <eb3:PayloadInfo>
         <eb3:PartInfo href="cid:0b960692-a3c6-4e85-80da-36009d3ae043@sender.example.com">
           <eb3:PartProperties>
             <eb3:Property name="MimeType">application/xml</eb3:Property>
             <eb3:Property name="CharacterSet">utf-8</eb3:Property>
             <eb3:Property name="CompressionType">application/gzip</eb3:Property>
             <eb3:Property name="EDIGASDocumentType">01G</eb3:PartProperties>
         </eb3:PartInfo>
       </eb3:PayloadInfo>
     </eb3:UserMessage>
    </eb3:Messaging>
    <wsse:Security xmlns:wsse="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-
secext-1.0.xsd"
      xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-
1.0.xsd">
      <!-- details omitted -->
    </wsse:Security>
  </S12:Header>
  <S12:Body wsu:Id="_b656ef2c-516"/>
</S12:Envelope>

--c5bae1842d1e
Content-Id: <0b960692-a3c6-4e85-80da-36009d3ae043@sender.example.com>
Content-Type: application/octet-stream
Content-Transfer-Encoding: binary

BINARY CIPHER DATA


--c5bae1842d1e--
```

Security Profiling

- Message Layer
  - Sign and encrypt the AS4 message including its payloads
  - Provide non-repudiation of origin and receipt
- Transport Layer
  - Encrypt and authenticate the communication channel
- Provide “near term” (at least ten years) security
  - Detailed guidance on algorithms and key size from ENISA (European Union Agency for Network and Information Security)

E-SENS Usage Profile

- Four Corner profiling from e-Codex
  - Inner corners use From/To; outer corners encoded using properties
- How to use SMP with e-SENS AS4
  - Service=Process, Document=Action
- How to use SBDH with e-SENS AS4
  - Standard Business Document Header
  - Multipart, CID-based part references
- Test service
- Environments (test, production)

CONFORMANCE AND INTEROPERABILITY

AS4 Interoperability Tests

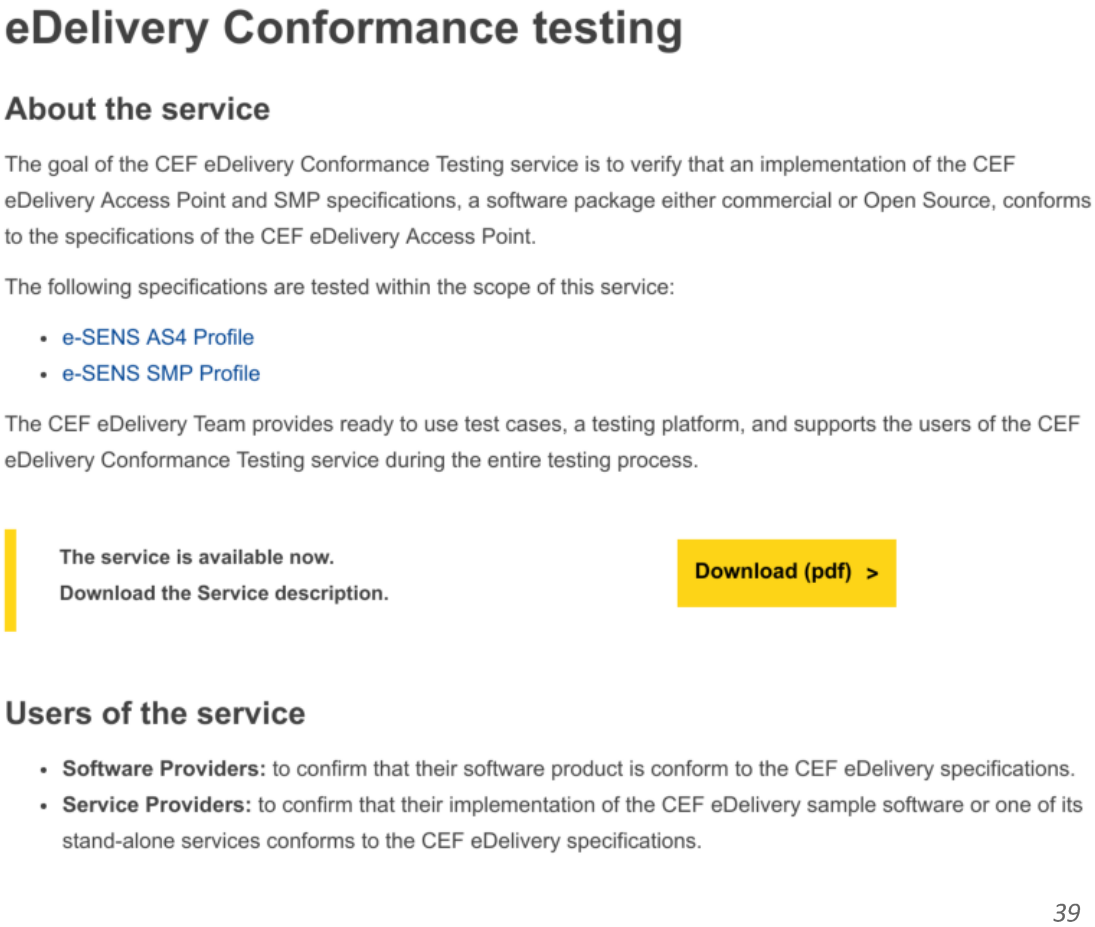
- Drummond Group, Interop Tests
  - 3Q13: Axway, Flame, Oban, Tibco
  - 3Q14: Axway, Flame, IBM, Oracle, Software AG
  - 3Q15: …
- Features Tested
  - Light Client (28) and ebHandler (32)
  - Push, Pull, Sync and Async Receipts, RA and NRR receipts, Password Auth, XML Signature, Encryption, Compression, Different message sizes

Interoperability PoCs in Europe

- ENTSOG PoC, Q3 2014
  - ENTSOG Profile for TLS, Signing, Encryption, Compression, Reliable Messaging and Receipts (11)
  - Axway, ADES, Seeburger, Software AG, Tibco
- EU E-SENS Q3 2015
  - Focused on e-SENS Profile
  - Signing, Encryption, Compression, Two Way (3)
  - Axway, IBM, Flame, Domibs, Holodeck
  - Also conformance testing

CEF Conformance Testing

- CEF Digital
- AS4 Conformance Testing



eDelivery Conformance testing

About the service

The goal of the CEF eDelivery Conformance Testing service is to verify that an implementation of the CEF eDelivery Access Point and SMP specifications, a software package either commercial or Open Source, conforms to the specifications of the CEF eDelivery Access Point.

The following specifications are tested within the scope of this service:

- e-SENS AS4 Profile
- e-SENS SMP Profile

The CEF eDelivery Team provides ready to use test cases, a testing platform, and supports the users of the CEF eDelivery Conformance Testing service during the entire testing process.

The service is available now.
Download the Service description.

Download (pdf) >

Users of the service

- **Software Providers:** to confirm that their software product is conform to the CEF eDelivery specifications.
- **Service Providers:** to confirm that their implementation of the CEF eDelivery sample software or one of its stand-alone services conforms to the CEF eDelivery specifications.

- https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/eDelivery+Conformance+testing

CEF Conformance Testing

- Tests created in two steps:
  1. From the AS4 profile a set of “Test Assertions” are extracted
  2. These assertions are implemented in a testbed
- Currently, tests are grouped in two categories:
  - AS4 generic
  - E-SENS specific

COMMUNITIES USING AS4

E-Delivery (e-CODEX, e-SENS)

- E-Justice
  - Civil Justice, Legal Assistance a.o.
- E-Procurement
  - E-tendering a.o.
- E-Health
  - E-Confirmation, health insurance
- Business Lifecycle
  - Interconnecting national secure mail systems

Australia

- SuperAnnuation
  - Data exchange in the Australian Pension system
  - Large scale, in production
  - A variety of commercial AS4 solutions is in use
  - https://www.ato.gov.au/uploadedFiles/Content/SPR/downloads/spr00335171_Rollover_Message_Implementation.pdf
- Standard Business Reporting, SBR
  - Businesses reporting (in XBRL format) to government.
  - http://www.sbr.gov.au/__data/assets/pdf_file/0005/40199/SBR-ebMS3-Web-Services-Implementation-Guide-WIG-v1-0.pdf

AS4 SOLUTIONS

Solution Overviews

- Overview of AS4 solutions
  - Maintained by e-SENS project
  - http://wiki.ds.unipi.gr/display/ESENS/SBB+-+Access+Point
  - 21 solutions on current list
  - Includes commercial closed source and open source solutions

- CEF Digital AS4 Page
  - Solutions (having) been tested for e-SENS AS4 profile
  - https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/e-SENS+AS4+conformant+solutions
  - 7 solutions listed, 5 completed, 2 ongoing
  - Includes commercial closed source and open source solutions

SUMMARY AND WHERE TO GO NEXT

E-SENS AS4 Benefits

- Highly secure and reliable exchange of any payload in any domain
- Open standard with choice of solutions, including open source
- State of the art, future-proof choice
- Can be used in point-to-point or four-corner topologies
- Interoperability and conformance established
- Increasing adoption in Europe and internationally

Some links to get started

- CEF e-Delivery
  - Information available at https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/eDelivery
  - Tutorial at https://ec.europa.eu/cefdigital/wiki/download/attachments/23003271/eDelivery%20tutorial%20v1.2.pdf?api=v2.
- ENTSOG
  - How to set up an AS4 system, http://www.entsog.eu/publications/as4#AS4-HOW-TO-SET-UP-A-SYSTEM-DOCUMENT

STANDARDISATION AT OASIS

ebXML Messaging Services TC

- Produced and maintains specifications
  - ebMS3 Part 1, Core
  - ebMS3 Part 2, Advanced Features
  - AS4 profile
- Maintains an issue log
  - https://issues.oasis-open.org/browse/EBXMLMSG/

ebXML Core TC

- Maintenance of ebXML specifications (other than messaging)
- ebCore Agreement Update (AU), recently completed
  - Protocol allowing parties to (semi-)automatically update partner configurations
  - Main use case is automated Certificate Updates
  - ENTSOG will mandate AU with AS4
- ebCore Collaboration Protocol Profiles and Agreements version (CPPA3), ongoing
  - XML formats for communication partner profiles and agreements
  - Covers AS4 and other protocols
  - Algorithm to automatically unify partner profiles

Q & A

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