

Watson Supply Chain

PEPPOL – Data formats and Communication Protocols

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Agenda

Brief B2B History – How we got here

Contrasting PEPPOL with some e-Invoicing schemes

PEPPOL Communications - AS2 and AS4

PEPPOL BIS – Data Formats

Enterprise - Getting started with PEPPOL

Access Point - Getting started with PEPPOL

Service Provider Considerations

Best Practices from IBM's Implementation

A Brief History of B2B

Data Standards

- X12
- Tradacoms, VDA
- EDIFACT
- Bespoke XML and defacto standards (e.g. cXML, RosettaNet, CIDX, PIDX)
- ebXML - Core Components
- UBL
- PEPPOL BIS

Communication Protocols

- VAN (originally modems, etc.)
- X.400
- OFTP....OFTP2
- AS1 (e-Mail)
- AS2 (HTTPS)
- Rosettanet -RNIF
- ebMS 1.0, 2.0, 3.0
- AS4 (Web Services / SOAP)

E-Invoicing Options

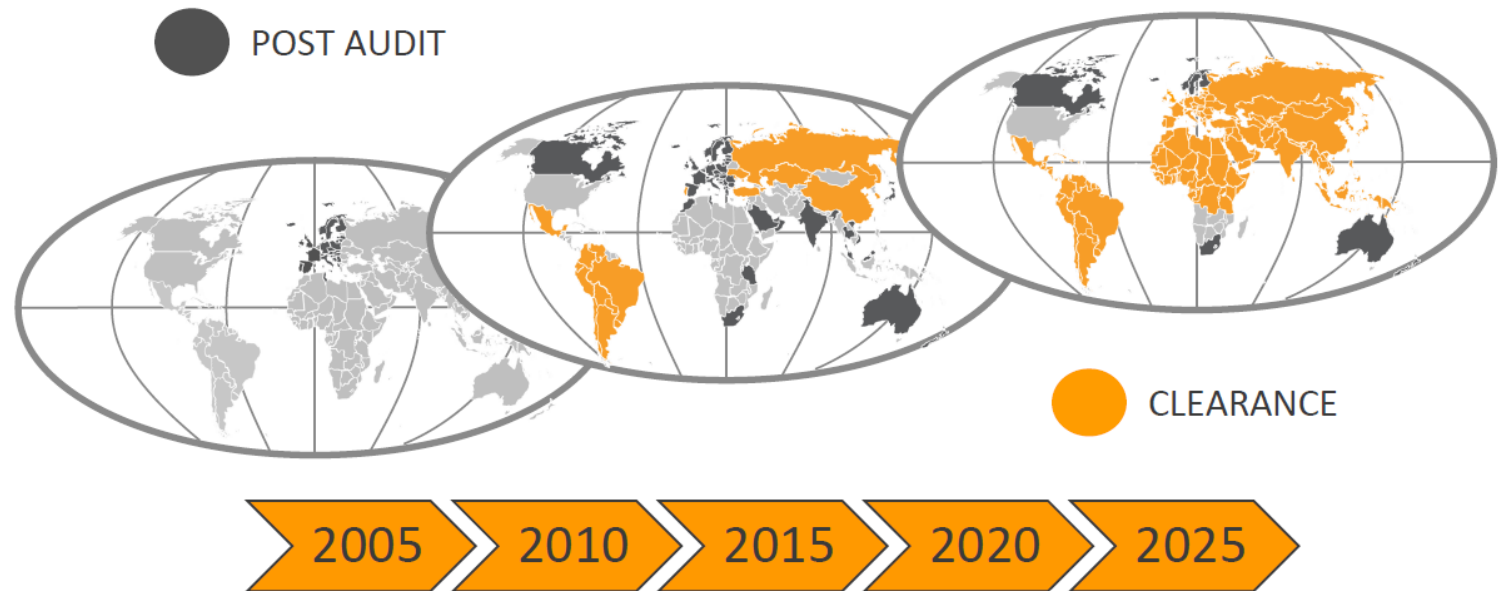
Ex Poste (Post Audit)

- “Europe Style”
- Long term Integrity / Authenticity
- EDIFACT
 - Note US X12 810 just another EDI doc
- PEPPOL
- XML variants, e.g. cXML
- ZUGFeRD (PDF/A)
- PDF / e-mail
- Web Portal
- Singapore – PEPPOL (UBL XML)

Clearance

- “South America Style”
- Governments want real time information and control
- Chile - DTE
- Mexico – CFDI
- Brazil - NFe / CTe
- Turkey - UBL TR
- Colombia – UBL variant
- Spain...Italy....
 - Moving toward clearance

E-Invoicing Post Audit vs. Clearance



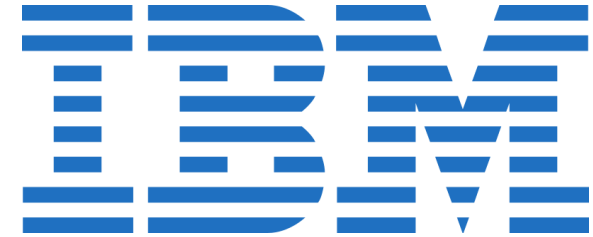
B2B automation a Challenge for Companies of all sizes

Tweexy

- Two person company
- Single product
- API's with Amazon
- Using Third Party for Walmart
- Struggling with Target requirements



IBM



- International Company
- Business in virtually every industry and every country
- Supporting over 170 Different Types of Invoicing requirements for customers

PEPPOL in 2018

Great Choice Singapore!

Format - UBL Based

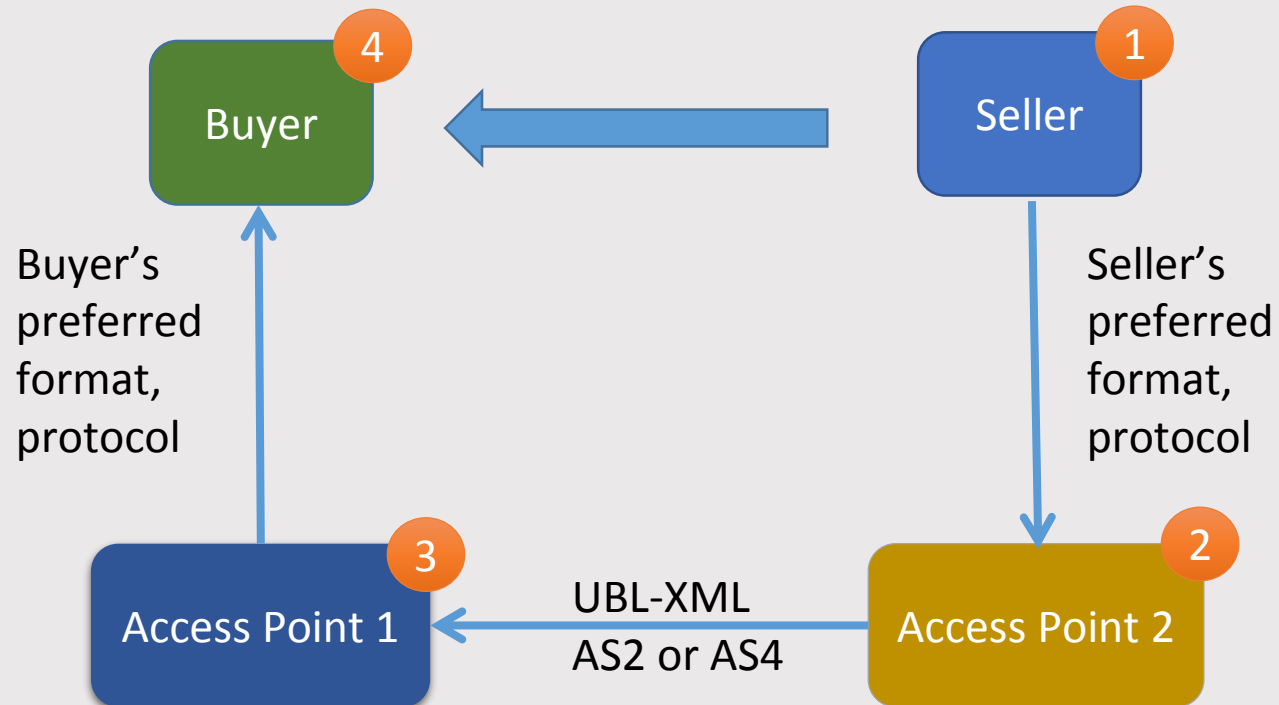
- Clean, well structured, built on years of data standards thinking
- Supports current and future transaction needs

Communications - AS2 and AS4

- Well established option with lots of supporting software
- AS4 gives more Flexibility, Security, and closer to API methods

BEST OF ALL WORLDS!!

PEPPOL Communications Flow Invoice Example

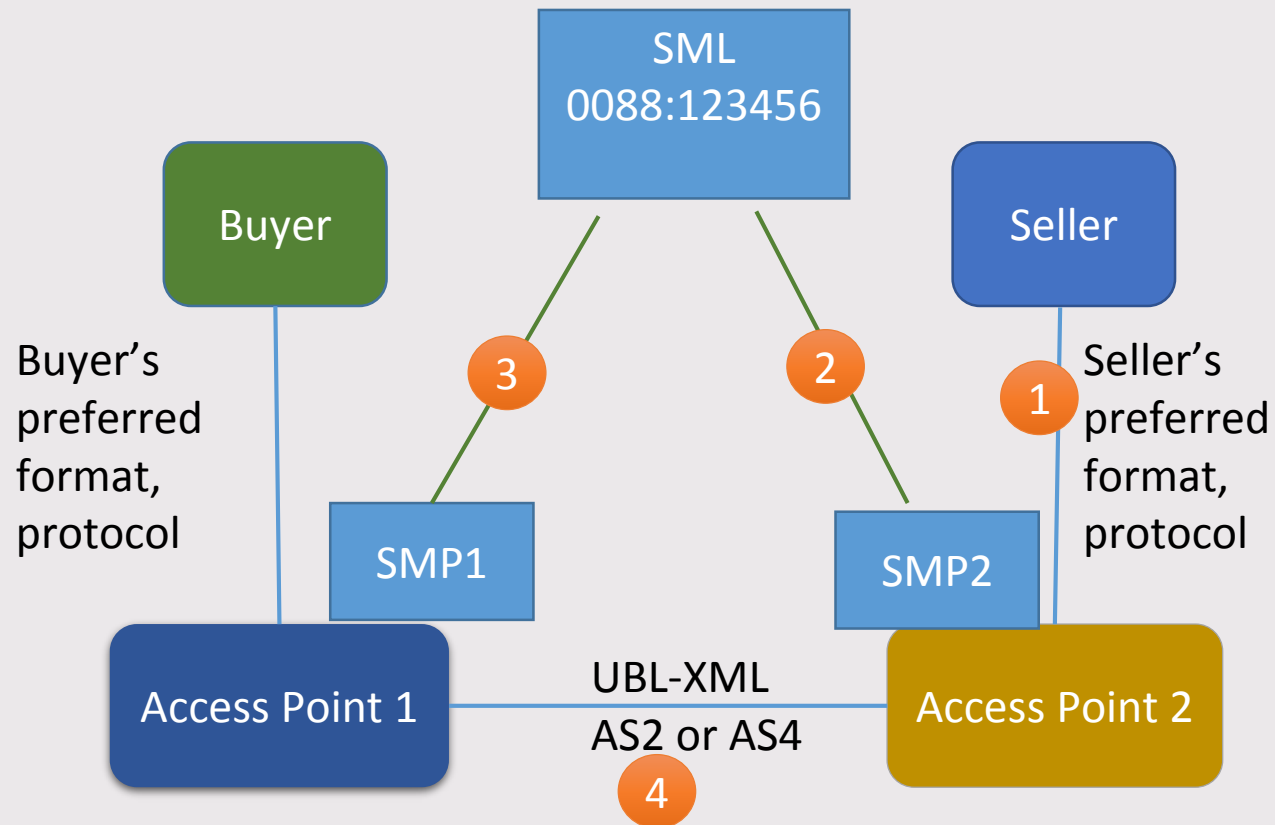


Flow:

- 1 Seller connects to its Access Point 2 **using preferred protocol and file format** for issuing invoice to buyer.
- 2 Access Point 2 translates document into UBL format, routes the document to Access Point 1 over AS2/AS4.
- 3 Access Point 1 receives the document and sends an acknowledgement back, converts document into buyer's preferred format.
- 4 Buyer receives the invoice from seller in **preferred format and protocol**.

Enterprise to Access Point Example: Options by many service providers will include protocols like FTP, SFTP, FTP/S, HTTPS, AS1, AS2, AS3, AS4, MQ, and others. Formats include SAP iDocs, Flat File, various XML, CSV, etc.

PEPPOL Communications with SMP and SML

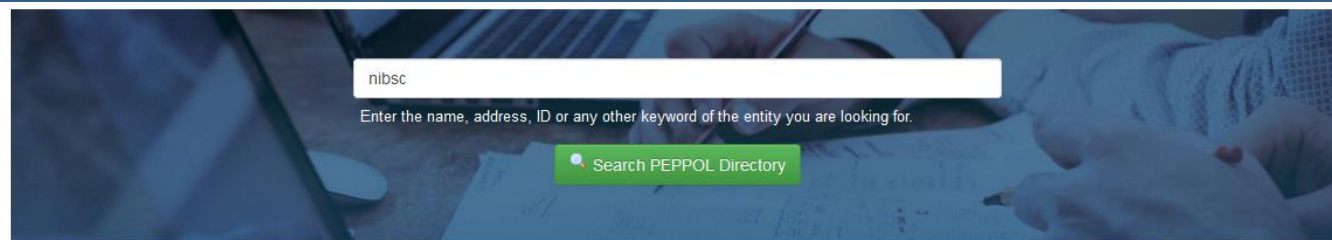
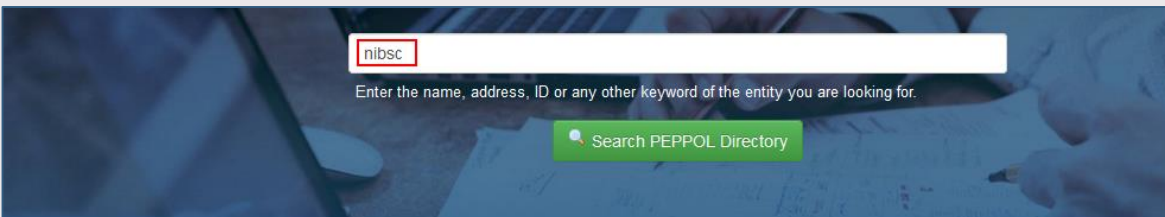


Flow:

- 1 Seller sends invoice data to their Access Point 2.
- 2 SMP2 for Seller uses the Buyer qualifier and ID to lookup the Access Point on SML
- 3 SMP2 pulls the info on how to send to Buyer at Access Point 1.
- 4 Access Point 2 Sends PEPPOL Invoice to Access Point 1 in via desired protocol.

All of the PEPPOL interactions between the Access Points, SML, SMP are hidden from Buyer and Seller

SG Buyer looks up UK supplier in PEPPOL Directory



Details for: 0088:5055923900000 (EAN International)

Details for: 0088:5055923900000 (EAN International)

Business information ¹ Supported document types ¹

Country: United Kingdom [GB]

Entity Name: National Institute for Biological Standards and Control

Geographical information: NIBSC
Blanche Lane,
South Mimms,
Potters Bar,
Hertfordshire,
EN6 3QG,
UK

Additional identifiers:	Scheme	Value
	0088	5055923900000

Website URIs: 1. <http://nibsc.org>

Contacts:	Type	Name	Phone Number	Email
	Sales and Logistics Manager	Paul J Bolton	+44 1707 641 532	Paul.Bolton@nibsc.org

Additional information: NIBSC is a centre of the UK Medicines and Healthcare Products Regulatory Agency - MHRA

Registration date: Nov 9, 2017

Full PEPPOL participant ID: `iso6523-actorid-upis::0088:5055923900000`

Business information ¹ Supported document types ¹

The following document types are supported by 'National Institute for Biological Standards and Control':

- Predefined document type** PEPPOL Ordering profile V1
`busdox-docid-qns::urn:oasis:names:specification:ubl:schema:xsd:Order-2::Order#urn:www.cenbii.eu:transaction:biitrns001:ver2.0:extended:urn:www.peppol.eu:bis:peppol28a:ver1.0::2.1`

<http://directory.peppol.eu/public>

UK Vendor looks up SG Buyer in PEPPOL Directory

Enter the name, address, ID or any other keyword of the entity you are looking for.

Details for: **0088:200604346e** (EAN International)

Business information **1**

Supported document types **4**

Country:  Singapore [SG]

Entity Name: National University of Singapore NUS

Geographical information: Department of Chemistry - Lab Supplies
8 Science Drive 2
Block S5
Singapore 117547

Additional identifiers:	Scheme	Value
	Company Registration #	200604346E

Website URIs: 1. <http://www.nus.edu.sg>

Contacts:	Type	Name	Phone Number	Email
	Scientific Officer	Ms. Leng Zhi Jin	+65 6516 2691	chmlzj@nus.edu.sg

Additional information: Singapore PEPPOL Demo

Full PEPPOL participant ID: **iso6523-actorid-upis::0088:200604346e**

Enter the name, address, ID or any other keyword of the entity you are looking for.

Details for: 0088:200604346e (EAN International)

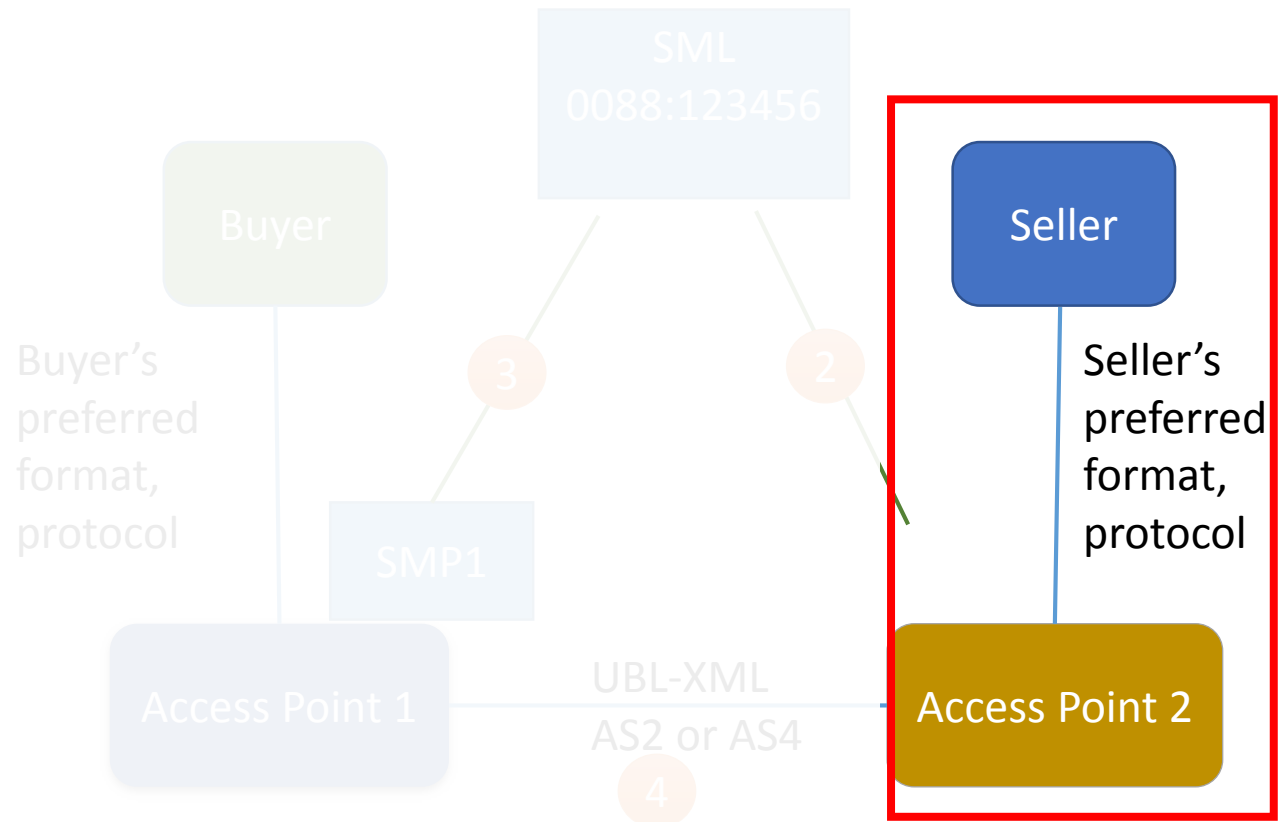
Business information **1**

Supported document types **4**

The following document types are supported by 'National University of Singapore NUS':

- Predefined document type** PEPPOL Billing profile V2
busdox-docid-qns::urn:oasis:names:specification:ubl:schema:xsd:CreditNote-2::CreditNote#urn:www.cenbii.eu:transaction:biitrns014:ver2.0:extended:urn:www.peppol.eu:bis:peppol15a:ver2.0::2.1
- Predefined document type** PEPPOL Despatch Advice V1
busdox-docid-qns::urn:oasis:names:specification:ubl:schema:xsd:DespatchAdvice-2::DespatchAdvice#urn:www.cenbii.eu:transaction:biitrns016:ver1.0:extended:urn:www.peppol.eu:bis:peppol130a:ver1.0::2.1
- Predefined document type** PEPPOL Invoice profile V2
busdox-docid-qns::urn:oasis:names:specification:ubl:schema:xsd:Invoice-2::Invoice#urn:www.cenbii.eu:transaction:biitrns010:ver2.0:extended:urn:www.peppol.eu:bis:peppol14a:ver2.0::2.1
- Non standard document type**
busdox-docid-qns::urn:oasis:names:specification:ubl:schema:xsd:OrderResponse-2::OrderResponse#urn:www.cenbii.eu:transaction:biitrns076:ver2.0:extended:urn:www.peppol.eu:bis:peppol128a:ver1.0::2.1

Remember: Choice on format and Protocol between Provider and Client



Flow:

- 1 Seller sends invoice data to their Access Point 2.
- 2 SMP2 for Seller uses the Buyer qualifier and ID to lookup the Access Point on SML
- 3 SMP2 pulls the info on how to send to Buyer at Access Point 1.
- 4 Access Point 2 Sends PEPPOL Invoice to Access Point 1 in via desired protocol.

AS2 and AS4 Communications

AS2

- “EDIINT” standard based on HTTP / HTTPS
- Utilizes HTTP headers
- Popular in US / Healthcare
- Push Only
- Took off with Walmart mandate in early 2000’s. Many followed.

AS4

- SOAP with Attachments
- Implementation of ebMS 3.0
- Multiple Push / Pull Scenarios
- WS Security
- Gaining traction globally

AS2

AS2 is a bi-directional protocol built on top of HTTP. Sender, receiver, security, reliability and version information is specified as HTTP headers.

Commonly used together with EDI in the Supply Chain and US Healthcare industries.

- IBM's B2B Advanced Comms provides everything you need to implement AS2.
- HTTP(S) Server - hostname and port for inbound communications
- AS2 Receiver - uri for inbound communications
- HTTP(S) Destination – remote url for outbound communications
- Optionally request an MDN
 - MDN Destination – for acknowledgements
 - Use or override the receipt URL specified in the incoming request
 - May be synchronous or asynchronous

All of these are combined into Exchange Profiles, which also incorporate the security policy and AS2 sender/receiver ids associated with AS2 Receiver for inbound communications or AS2 Destination outbound communications

AS4 Definition

*AS4 (Applicability Statement 4) provides guidance for a standardized methodology for the secure and document-agnostic exchange of B2B payloads using **Web services**.*

*By constraining the **ebMS v3.0** specification and the underlying **WS-*** specifications for messaging **packaging, transport, security** and business **non-repudiation**, the profile focuses on providing an entry-level on-ramp for Web services B2B messaging. ***

AS4 Specification offers 6 Message Exchange Patterns. In its initial release, the focus is on 4 of them.

- **One-Way/Push** - Either sender or receiver may push data. One way transfer of data.
- **One-Way/Pull** - Receiver of data initiates the call. One way transfer of data
- **Two-Way/Sync** - Traditional request and response flows for data
- **Two-Way/PushAndPull** - One-Way push followed by a one-way pull , both initiated by same party. Pulled message refers to the previously pushed message.

An **AS4 Receiver** is provided, and much like the AS2 receiver it identifies a uri running on an HTTP(S) server.

A **Pull Destination** is provided to support the Pull Message Exchange Patterns

User Exits may be added to AS4 receivers and related HTTP and Messaging destinations

AS4 Continued

Security in OpenPEPPOL

- Transport protocols supported are **AS2 and AS4**
- **Authenticity** is assured by **TLS 1.2** and **Digital Signature for AS2** messages, and **Digital Signature only for AS4 messages**
 - Only the trust chain is checked in OpenPEPPOL
- **Confidentiality** is ensured by encryption via **TLS 1.2 for AS2** and by **encrypting the payload in AS4**

Certificates (complete sets for test and production)

- OpenPEPPOL Root CA certificate
 - OpenPEPPOL SMP intermediate CA certificate
 - OpenPEPPOL Access Point (AP) intermediate certificate
 - IBM (Service Provider) SMP certificate (signed by OpenPEPPOL)
 - IBM ((Service Provider) Access Point certificate (signed by OpenPEPPOL)
- SML / SMP REST Calls – Use Certs and Signing for responses

The PEPPOL eDelivery Network Specifications

<https://peppol.eu/downloads/the-peppol-edelivery-network-specifications/>

Q SEARCH

Detailed information in the PEPPOL Site

Downloads

Pre-Award Specifications and Guidelines

The PEPPOL eDelivery Network Specifications

Post-Award 'BIS' Specifications and Guidelines

Access Point (AP) Implementation Guidelines

Presentations about PEPPOL

The PEPPOL eDelivery Network Specifications

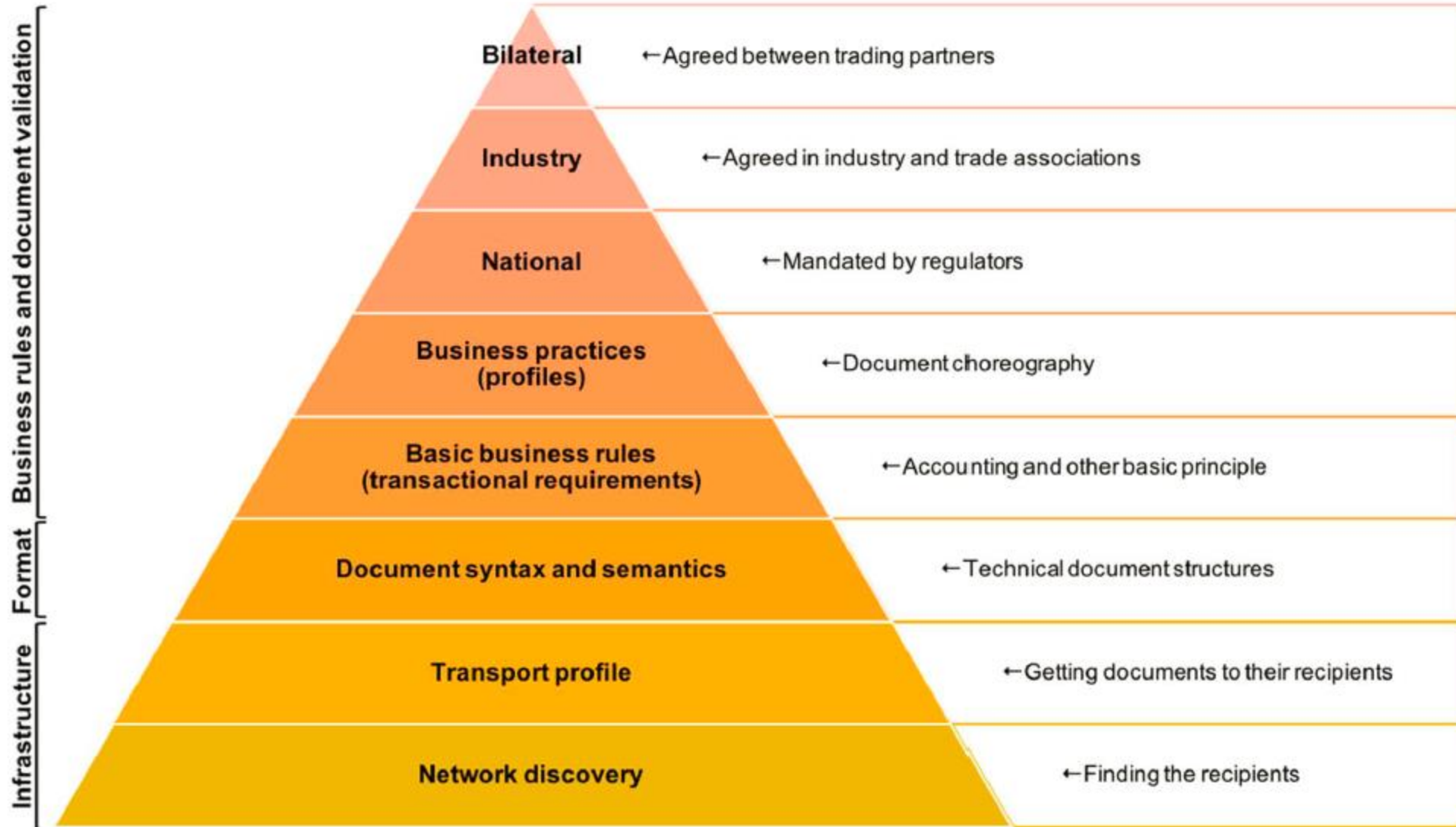
This section includes specifications and resources to enable access to the PEPPOL eDelivery Network and to implement the following components: Access Points, gateways which ensure a standard and solid transport mechanism to exchange different types of documents across different communities or countries; Service Metadata Publishers (SMPs), which contain the exact location and the capabilities of participants; Service Metadata Locator (SML), used to add/update/delete the IDs of the participants, and which offers a DNS-based mechanism to discover the SMP where the specific participant data is described.

In the table below you will find the set of specifications that define the implementation of the PEPPOL eDelivery Network. Support for these specifications is mandatory.

PEPPOL eDelivery Network specifications:

Document	Specifications
Busdox	ICT-Transport-BusDox_Definitions-101.pdf
The SML	ICT-Transport-SML_Service_Specification-101.pdf
The SMP	ICT-Transport-SMP_Service_Specification-101.pdf
The AS2 protocol	ICT-Transport-AS2_Service_Specification-2014-01-15.pdf
Policy for using identifiers	PEPPOL_Policy_for_use_of_identifiers-300-11_certificates
Envelope specifications	ICT-Transport-OpenPEPPOL-Envelope_Specification-100_2014-01-15.pdf
The AS4 protocol	ICT-Transport-AS4_Service_Specification-1.0.pdf

Interoperability and validation layers



PEPPOL BIS Data Formats

Description

UBL Based (XML)

<https://peppol.eu/downloads/post-award/>

Document Types

PEPPOL BIS 1A Catalogue

PEPPOL BIS 3A Order

PEPPOL BIS 28A Ordering

PEPPOL BIS 4A Invoice

PEPPOL BIS 5A Billing

PEPPOL BIS 30A Despatch Advice

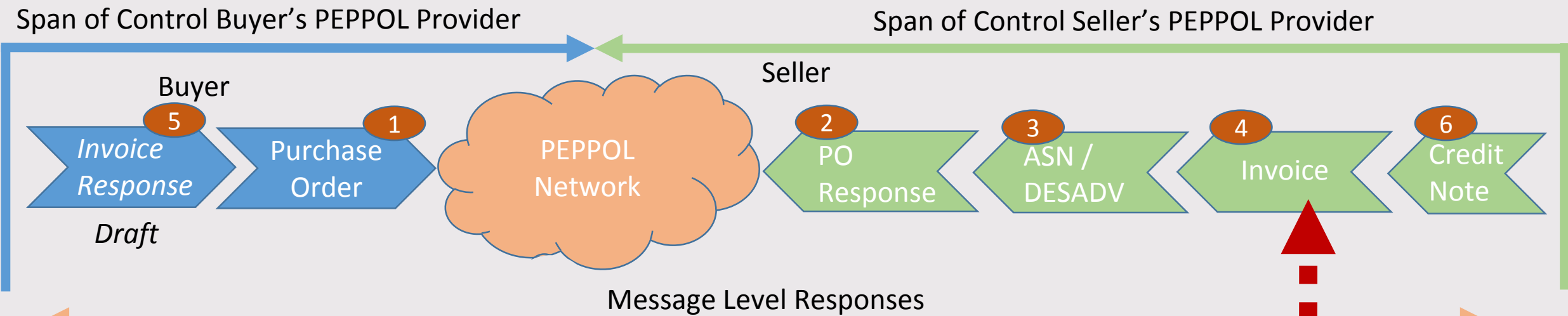
PEPPOL BIS 42A Order Agreement

PEPPOL BIS 18A Punch Out

PEPPOL Punch Out Login & Transmission

PEPPOL BIS 36A Message Level Response

PEPPOL Order -> Cash Document Flows



Invoice is most common PEPPOL document
 Not every PEPPOL BIS in use in every country (yet)
 Some countries extending / customising BIS for "local needs"

"Only" electronic invoicing triggers Invoice retention, integrity, archiving rules
 On-Premise archives not designed to manage electronic retention rules

- Archives
- Tax Audit
- Compliance
- Clearance

Tax Authorities

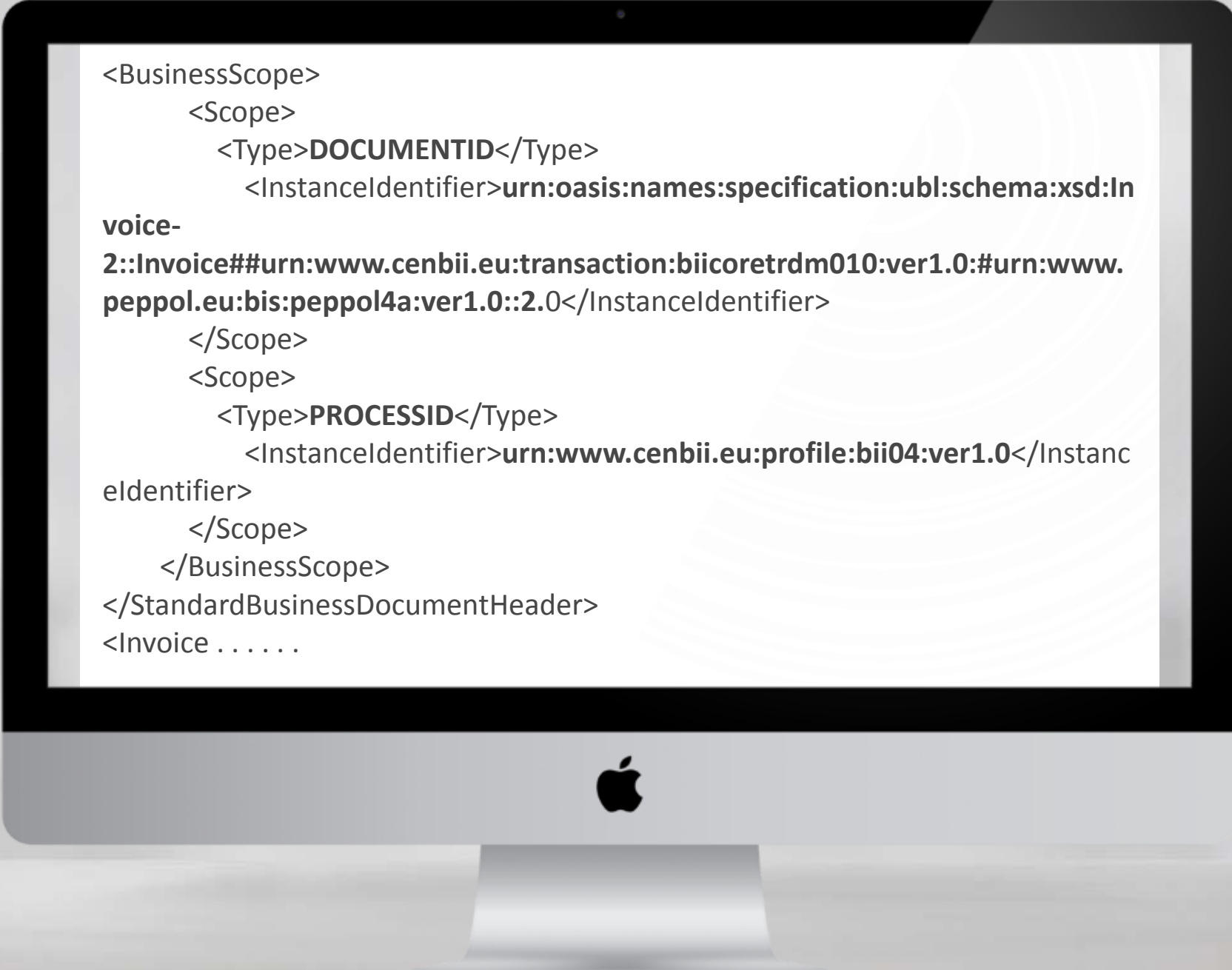
Structure

OpenPEPPOL Document

```
<?xml version="1.0" encoding="UTF-8"?>
<StandardBusinessDocument
  xmlns="http://www.unece.org/cefact/namespaces/StandardBusinessDocumentHeader">
  <StandardBusinessDocumentHeader>
    <HeaderVersion>1.0</HeaderVersion>
    <Sender>
      <Identifier Authority="iso6523-actorid-upis">0088:1234567890111</Identifier>
    </Sender>
    <Receiver>
      <Identifier Authority="iso6523-actorid-upis">9905:leckma-peppol</Identifier>
    </Receiver>
    <DocumentIdentification>
      <Standard>urn:oasis:names:specification:ubl:schema:xsd:Invoice-2</Standard>
      <TypeVersion>2.0</TypeVersion>
      <InstanceIdentifier>1070e7f0-3bae-11e3-aa6e-1234500c9999</InstanceIdentifier>
      <Type>Invoice</Type>
      <CreationDateAndTime>2017-06-21T16:10:10</CreationDateAndTime>
    </DocumentIdentification>
  </StandardBusinessDocumentHeader>
</StandardBusinessDocument>
```

Structure

OpenPEPPOL Document (cont.)



PEPPOL BIS Data Formats Example - Seller Party

cbc = Common Basic Component
cac = Common Aggregate Component.

<http://docs.oasis-open.org/ubl/UBL-2.1.html>

<https://www.youtube.com/watch?v=TsyapRtjUu8>

```
<cac: SellerSupplierParty>
  <cac: Party>
    <cbc: EndpointID schemeID="NO:ORGNR">965678996</cbc:EndpointID>
    <cac: PartyIdentification>
      <cbc: ID schemeID="GLN">5790000435951</cbc:ID>
    </cac: PartyIdentification>
    <cac: PartyName>
      <cbc: Name>The Sellercompany AS</cbc: Name>
    </cac: PartyName>
    <cac: PostalAddress>
      <cbc: StreetName>Address line 1</cbc: StreetName>
      <cbc: AdditionalStreetName>Address Line 2</cbc: cbc: AdditionalStreetName >
      <cbc: CityName>BERGEN</cbc: CityName>
      <cbc: PostalZone>5000</cbc: PostalZone>
      <cbc: CountrySubentity>Region B</cbc: cbc: CountrySubentity >
    <cac: Country>
      <cbc: IdentificationCode listID="ISO3166-1:Alpha2">NO</cbc: IdentificationCode>
    </cac: Country>
    </cac: PostalAddress>
    <cac: Contact>
      <cbc: Name>Doe, John</cbc: Name>
      <cbc: Telephone>915043212</cbc: Telephone>
      <cbc: Telefax>915043213</cbc: Telefax>
      <cbc: ElectronicMail>john.doe@sellercompany.no</cbc: ElectronicMail>
    </cac: Contact>
  </cac: Party>
</cac: SellerSupplierParty>
```

Understanding the Universal Business Language

OASIS



A royalty-free library of standard electronic XML business documents

The UBL Structures



PEPPOL - Attachments

Non-XML documents can be sent as attachments to the PEPPOL BIS Order. This could be drawings or timesheets or other documents relevant for the order. The attachment can either be sent as a binary object encoded in

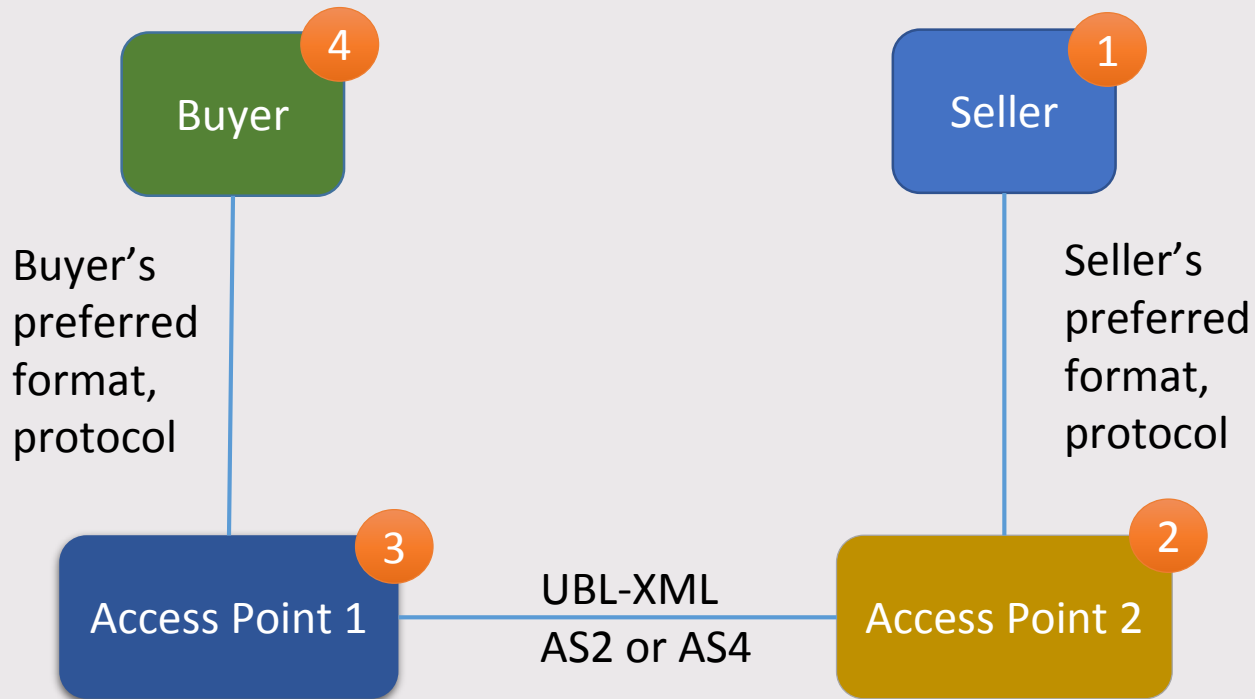
Base64 embedded in the message or as a URI to an external address as a link.

It is recommended to send attachments as embedded, binary objects and not as external references.

Coding - Base64

File name - File name and extension should be sent in the filename attribute to the EmbeddedDocumentBinaryObject element.

PEPPOL Communications Flow Review



Flow:

- 1 Seller connects to its Access Point 2 using preferred protocol and file format for issuing invoice to buyer.
- 2 Access Point 2 translates document into UBL format, routes the document to Access Point 1 over AS2/AS4.
- 3 Access Point 1 receives the document and sends an acknowledgement back, converts document into buyer's preferred format.
- 4 Buyer receives the invoice from seller.

Enterprise - Getting started with PEPPOL

Setup

- Select Access Provider
- Define identifier on Network
- Implement Integration to back end ERP system
- Map to PEPPOL Standards (or have mapping done by service provider)

Adding partners

- Find partner in the registry (or ask Service Provider)
- Potentially no additional mapping
- Configure partner on ERP
- Start trading!

Service Provider

Getting started with PEPPOL

Setup

1. Acquire or build software
2. SML / SMP interaction
3. Establish AS2 Connection
4. Establish AS4 Connection(optional)
5. TEST
6. Get Certified!

Adding New Clients

1. Add clients to Registry
2. Establish connection to the client
3. Map client Application format to the PEPPOL format (or validate)

Adding New Partners

1. Find Partners in Registry
2. Potentially no additional mapping

Service Provider Considerations

Other Formats / Protocols

- VAN Connectivity
- Direct Connections (AS2, SFTP, etc.)
- EDI Data standards
- Clearance e-Invoicing
- Rosettanet (and other schemes)
- Mapping Capabilities

Value Added Services

- Web Forms
- Document Conversion Services

Support

- Support options, hours
Dedicated Client Support
- Visibility tools
- Self Service
- High Availability
- SLA's
- GDPR

Implementation Lessons Learned

PEPPOL

- Picking up across the world (Singapore, United States)
- Country / Customer Variations and Access Point variability causes some friction

Overall Services

- Long term relationship with customers
- Balance consistency with latest technology
- Continuous investment and roadmap
- Accelerate ROI

Support

- 24/7 a must for some customers
- Standard SLA's and custom requirements
- Proactive resolution

How to find more information:

- <https://www.linkedin.com/in/tomlimanek/>
- <https://ibm.biz/PEPPOL> by IBM
- <http://ibm.biz/YouTube> PEPPOL
- <http://ibm.biz/NHS> PEPPOL
- <https://twitter.com/clancger>
- <https://www.linkedin.com/pulse/e-invoicing-peppol-101-sandeep-sharma/>



Backup Slides

1x IBM PEPPOL connection for all



IBM PEPPOL Access Point

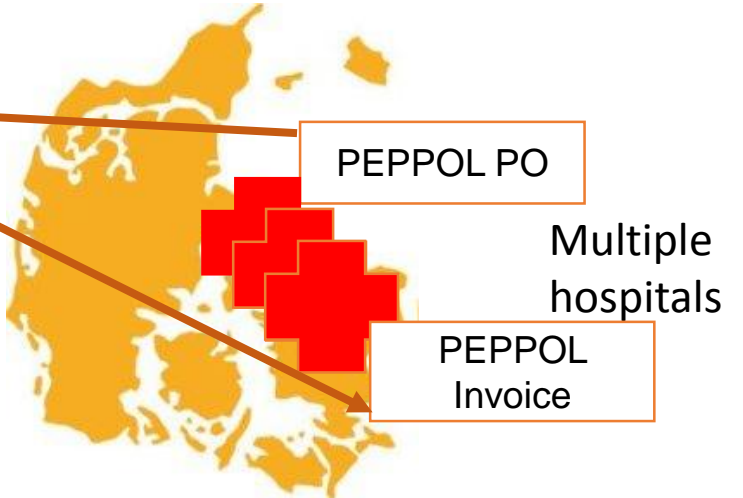
PEPPOL Network

Other PEPPOL Access Point

Other PEPPOL Access Point

Any Other PEPPOL Access Point

Other PEPPOL Access Point



Multiple hospitals

PEPPOL PO

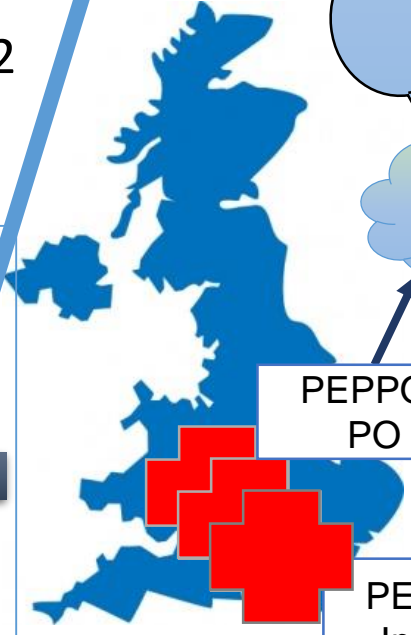
PEPPOL Invoice

IBM "Supplier" Client

AS2

In - Purchase Order (Invoice Response)
Out - PO Response
ASN/ DESADV
Invoice
CreditNote

ERP

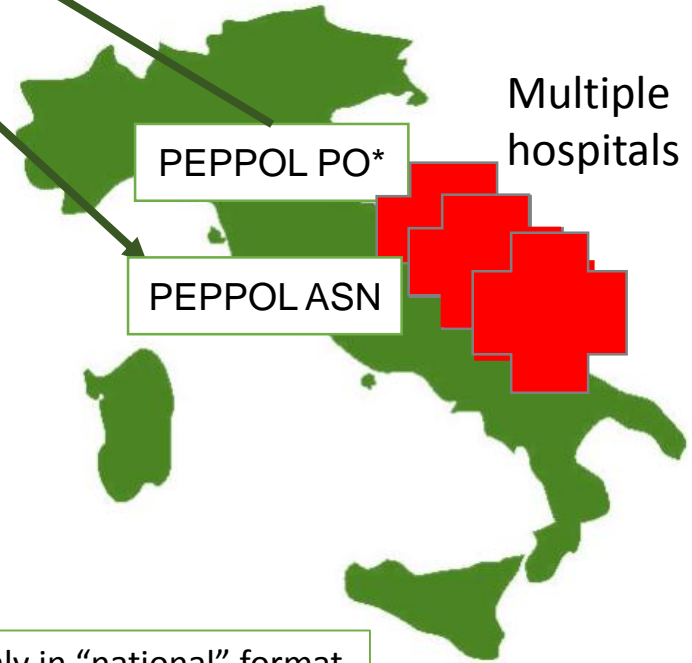


Multiple hospitals

PEPPOL PO

PEPPOL Invoice

France ChorusPro (PEPPOL)
Netherlands (SimplerInvoicing)



Multiple hospitals

PEPPOL PO*

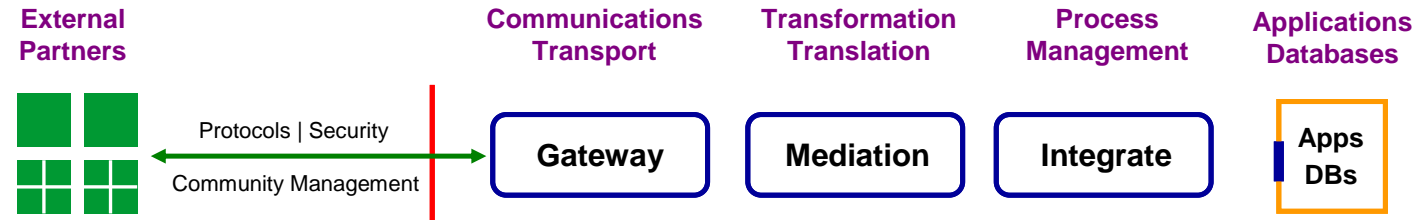
PEPPOL ASN

Any Other PEPPOL User, Anywhere (Singapore?)

*Note: Invoices to Italy in "national" format

Common Business Transaction Processing Requirements

Important to validate the granular services across any project's current/future state



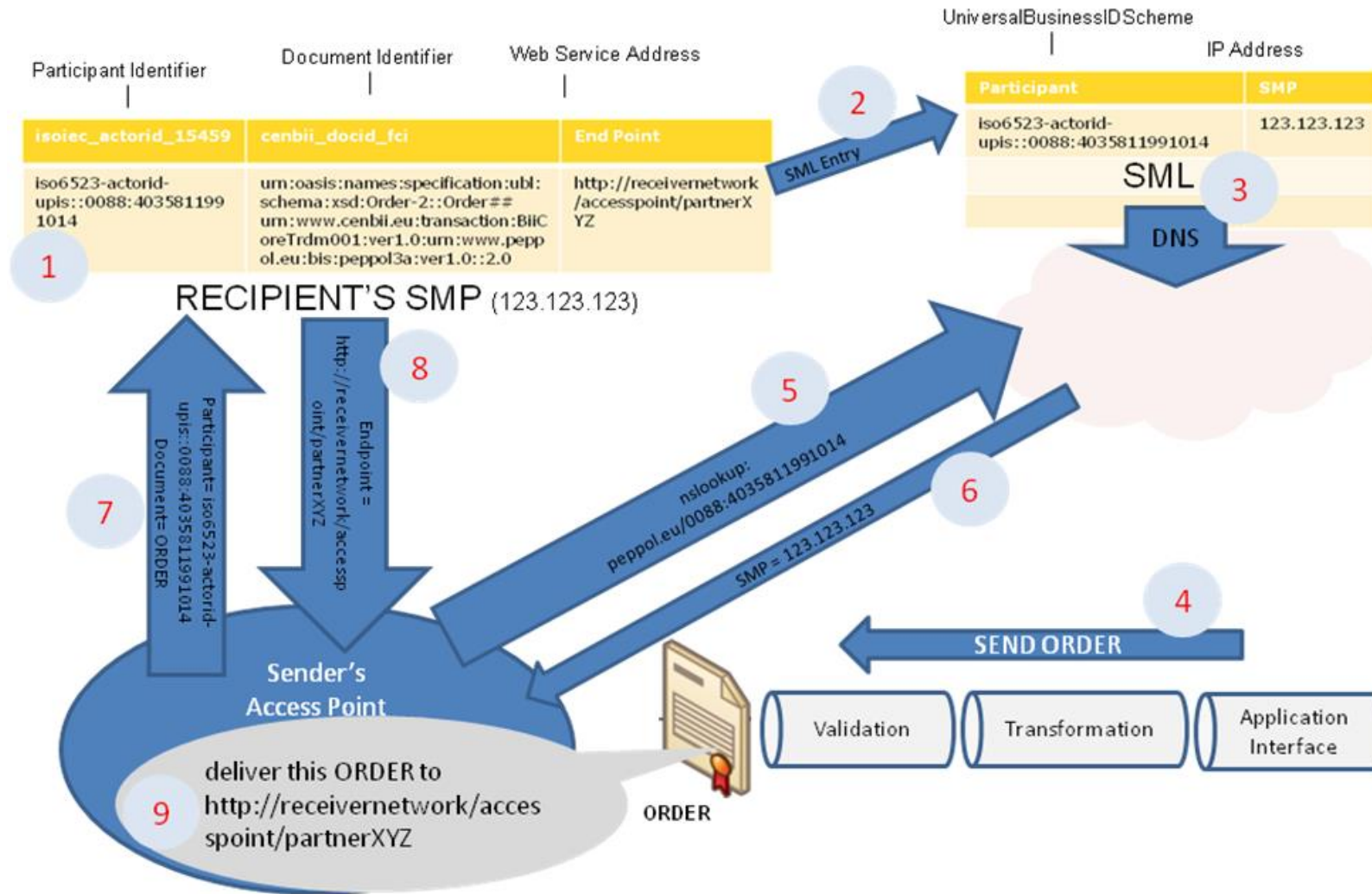
- | | | |
|--|---|---|
| <ul style="list-style-type: none"> ▪ Files, Messages, Web Services ▪ Transport – S/FTP/S, HTTP/S, C:D, WMQ, FTE, EDIINT ▪ Batch Realtime ▪ Security – SSH, SSL, PGP ▪ Authentication Authorization ▪ Encryption Decryption ▪ File Naming ▪ Validation ▪ Acknowledgements – 997 999 ▪ Content Introspection Routing ▪ Business Decisions | <ul style="list-style-type: none"> ▪ Batching De-batching ▪ Parsing ▪ Enveloping De-enveloping ▪ Transformation Translation ▪ Versioning ▪ Industry Standard Formats ▪ Transaction Logging Archiving ▪ Transaction Repository ▪ Transaction Correlation ▪ Transaction Reconciliation ▪ Job Scheduling ▪ Operational Management | <ul style="list-style-type: none"> ▪ Monitoring ▪ Alerting ▪ Tracking ▪ Viewers ▪ Error Handling Mitigation ▪ Resend Resubmit ▪ Reporting ▪ Partner Profile Creation ▪ Community Management ▪ Partner Self-service ▪ GUI Configuration ▪ SLA Management |
|--|---|---|

Typically more than 70% of project-required services are common across multiple patterns resulting in benefits across common technologies, decoupled architecture and reusable services

Information Stored in the Service Meta Data Provider (SMP)

- Our customer's participant identifiers
- For each of their participant identifiers
 - For each documents that they can receive
 - Document ID (UBL ID + PEPPOL specialization ID)
 - Process ID of the process utilizing the document (UBL ID + PEPPOL specialization ID)
 - Transport protocol to be used (always AS2 in R1)
 - Destination URL to send the document to
 - The PEPPOL signed Access Point certificate of the owning AP
 - Business Alias ID of the customer

A Closer Look at the Operation of the SML and SMP



Remember! There are Two Senders and Two Receivers

- Original Sender
 - PEPOL Identifier like 0088:1234567890111
- Final Recipient
 - PEPOL identifier like 9905:leckma-peppol
- AS2/AS4 Sender – OpenPEPOL issued
 - IBM Access Point (APP_1000000327 for CTE) on outbound
 - The partner's Access Point (APP_1000000nnn) on inbound
- AS2/AS4 Receiver – OpenPEPOL issued
 - IBM Access Point (APP_1000000327 for CTE) on inbound
 - The partner's Access Point (APP_1000000nnn) on outbound
- The AS2/AS4 sender and receiver don't tell us who the customer is