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10 Years of PDF/A-3 Based Electronic Invoicing

State of Play and Outlook

Dr. Bernd Wild, intarsys GmbH

The very beginning ...



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- 2000 - 2010
 - electronic Invoicing was either
 - Exchanging EDIFACT messages via file transfer or AS2
 - Sending PDF invoices which had been signed by an QES (qualified electronic signature)
- 2010
 - A few interested people formed the founding members of FeRD at AWW at Eschborn
 - >90% of all invoices are paper-based
 - EU abolished the requirement for qualified electronic signatures on electronic invoices

The very beginning ...



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- 2012
 - Germany abolishes the requirement for qualified electronic signatures on electronic invoices → no format requirements (but procedural requirements)
 - Economy moves to
 - plain PDF (no data part) sent via eMail → cheap for the sender, no benefit for receiver
 - EDIFACT (no visual part) → expensive to implement

The very beginning ...



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- 2012
 - FeRD sees a real need for an electronic invoice format which can be used by SMEs as well as by big companies and which can bring substantial savings in invoice processing
 - The idea:
 - PDF for visual representation of the invoice to address SMEs
 - XML for invoice data and process automation
 - Both parts should be handled equivalently

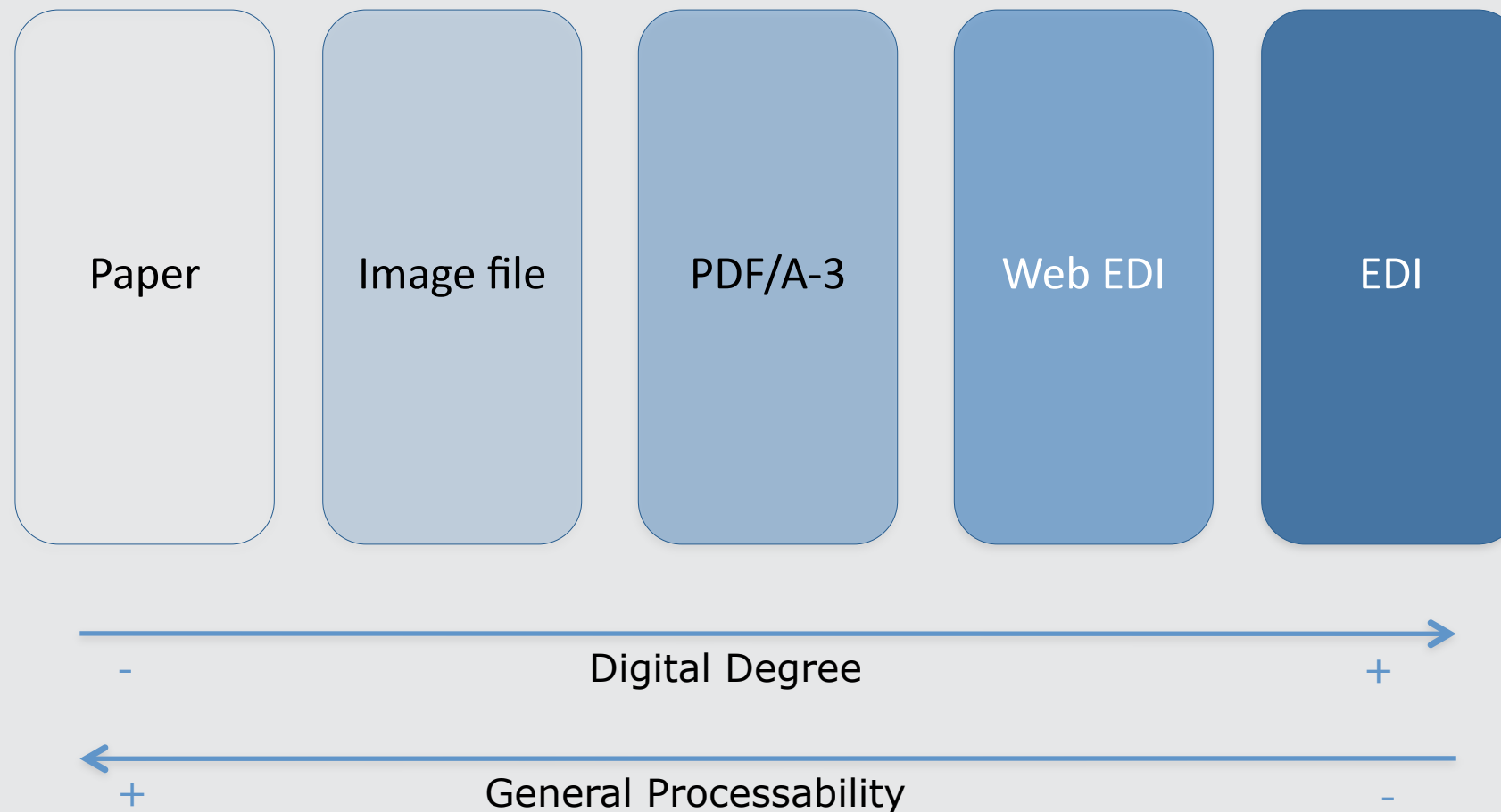
Hybrid Invoice Format

Transmission Paths for eInvoices



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Source: Entscheidungsvorlage Datenformat vom 14.11.2012

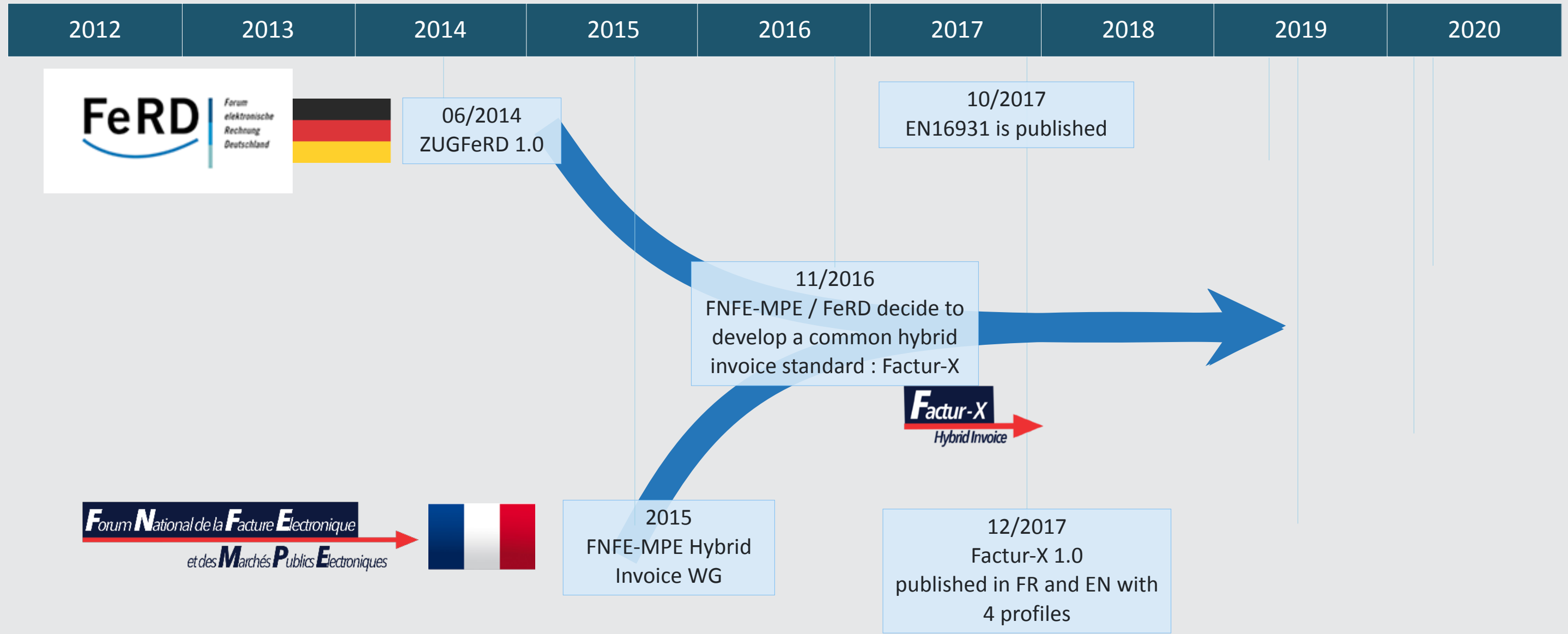
The Role of PDF/A

- PDF should be compliant to an well-established standard —> ISO 32000-1/ISO 19005
- PDF should have a mid-term stability (10 - 12 years) —> PDF/A (1,2,3)
- The XML data of the invoice should be embedded in a standardized way —> PDF/A 3
- Additional documents (so-called Invoice supporting documents) should be embeddable in their original format -> PDF/A-3
- There should be a marker which tags the hybrid PDF to be an eInvoice compliant with a certain data standard —> Metadata —> PDF/A (1,2,3)
- Finally: PDF/A-3

The Role of the XML Syntax

- The ZUGFeRD data model is a reference data model and thus syntax neutral. Messages in different syntaxes may be mapped onto each other (interoperability)
- The finally used syntax should satisfy the following quality criteria:
 - The syntax should support also other message types like Orders or Payment Advices beside the invoice
 - The syntax should have a methodology for data modelling and support of repositories
- FeRD recommends to use the XML syntax of UN/CEFACT
 - Standardized as Core Component Technical Standard (CCTS) at ISO

Early Milestones ...

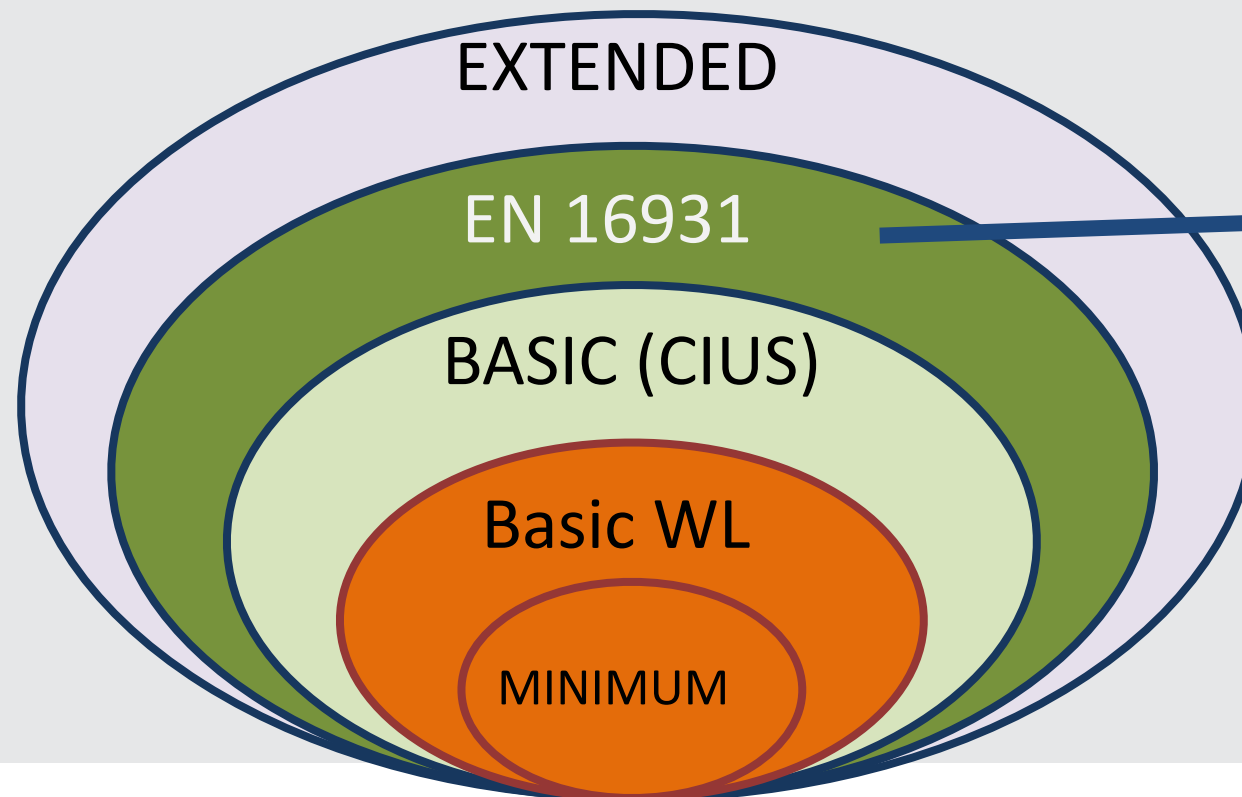


France and Germany ... and others



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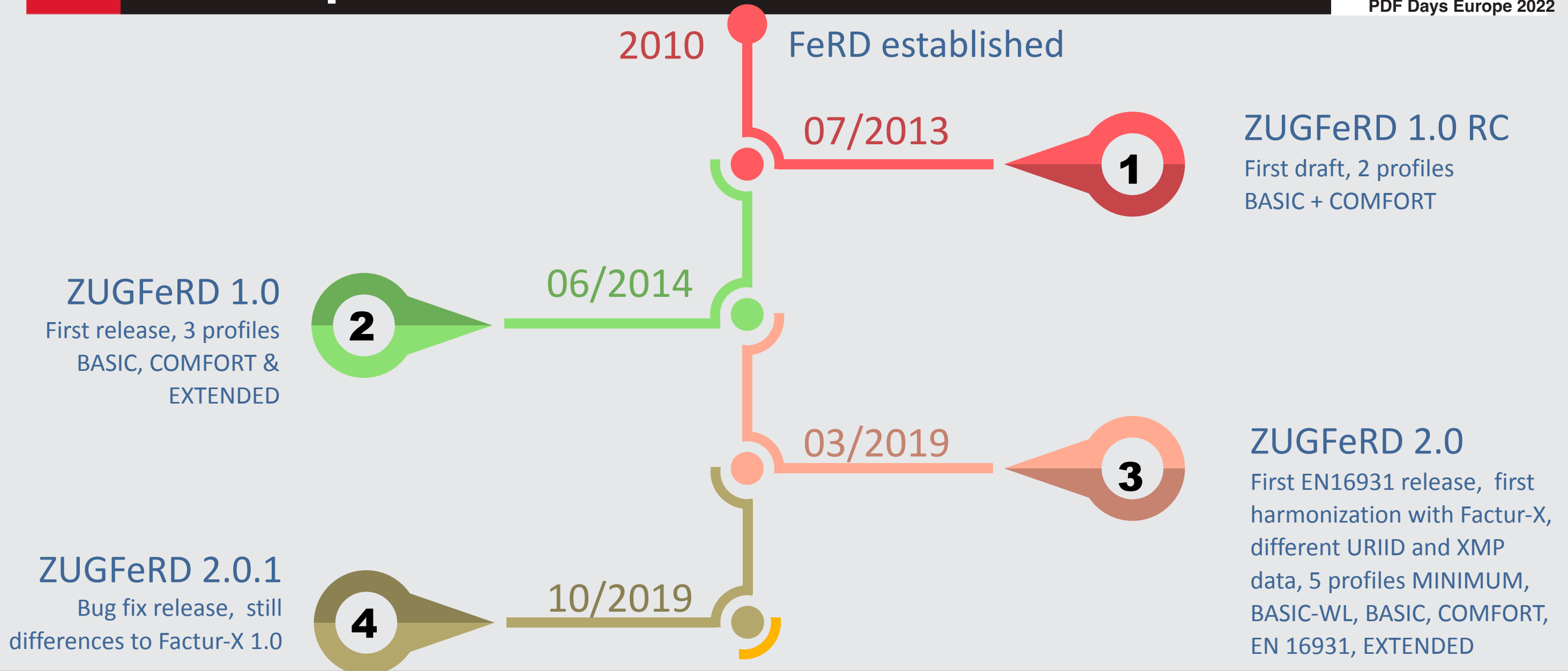
EN16931 Profile is fully „compliant“ with EN 16931
(all the Norm, only the Norm)

Development of ZUGFeRD



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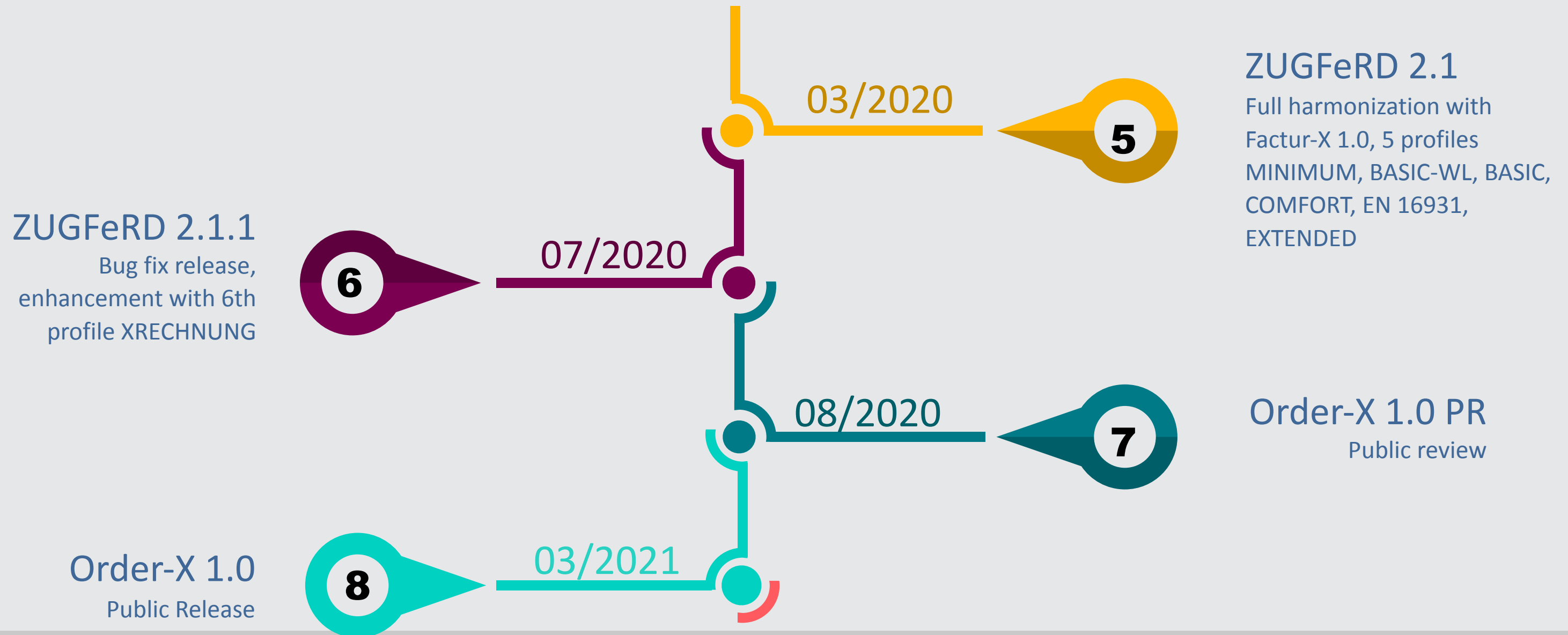


Development of ZUGFeRD



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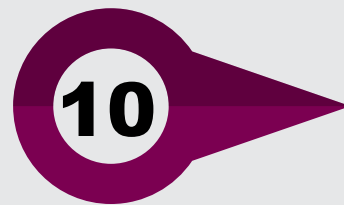
Development of ZUGFeRD



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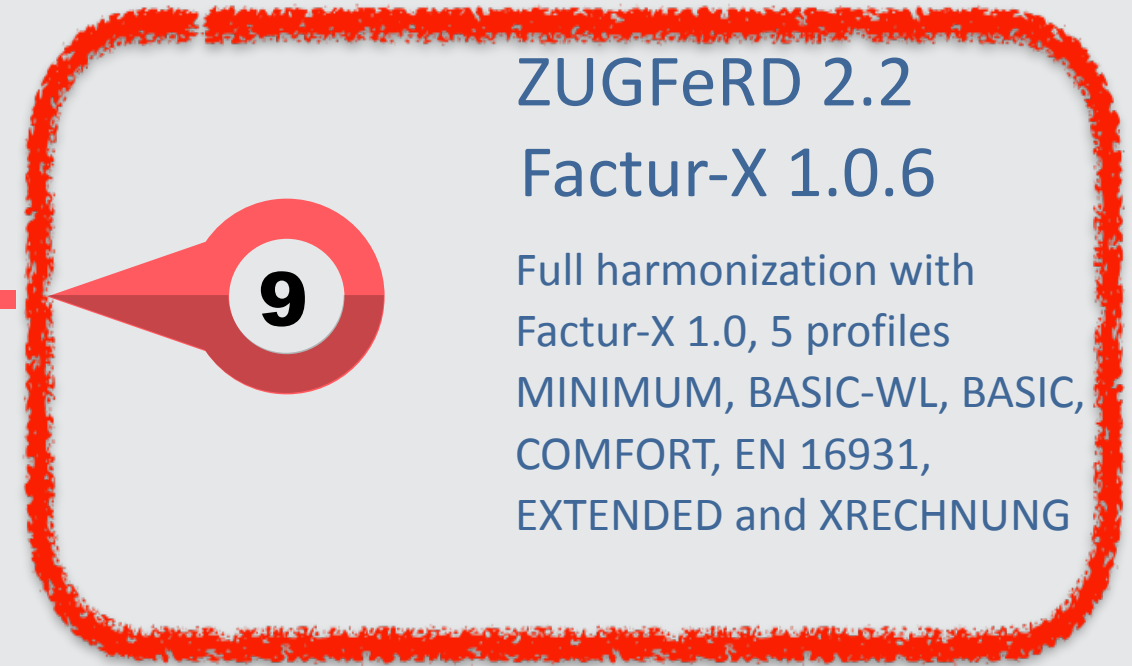
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Delivery-X
First Draft



??

03/2022



ZUGFeRD 2.2
Factur-X 1.0.6

Full harmonization with
Factur-X 1.0, 5 profiles
MINIMUM, BASIC-WL, BASIC,
COMFORT, EN 16931,
EXTENDED and XRECHNUNG

ZUGFeRD 1.0

BASIC

COMFORT

EXTENDED

ZUGFeRD 2.1.1

MINIMUM

BASIC

BASIC-WL

EN16931

XRECHNUNG

EXTENDED

XRechnung 1.1

XRechnung 1.2

XRechnung 2.0

ZUGFeRD 2.0

MINIMUM

BASIC

BASIC-WL

EN16931

EXTENDED

ZUGFeRD 2.2

MINIMUM

BASIC

BASIC-WL

EN16931

XRECHNUNG

EXTENDED

XRechnung 2.1

Normal

EXTENSION

ZUGFeRD 2.1

MINIMUM

BASIC

BASIC-WL

EN16931

EXTENDED

FACTUR-X 1.0.6

MINIMUM

BASIC

BASIC-WL

EN16931

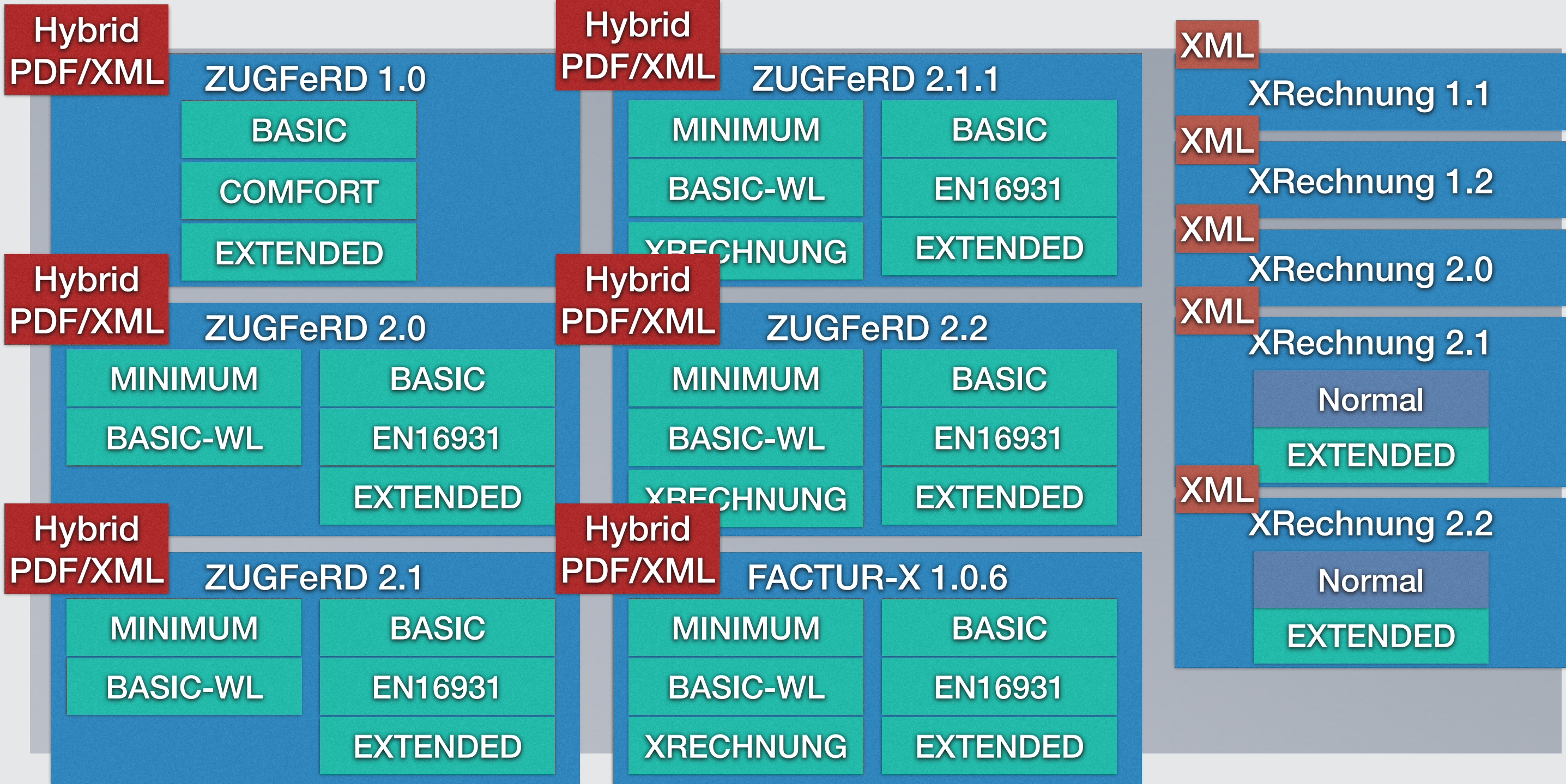
XRECHNUNG

EXTENDED

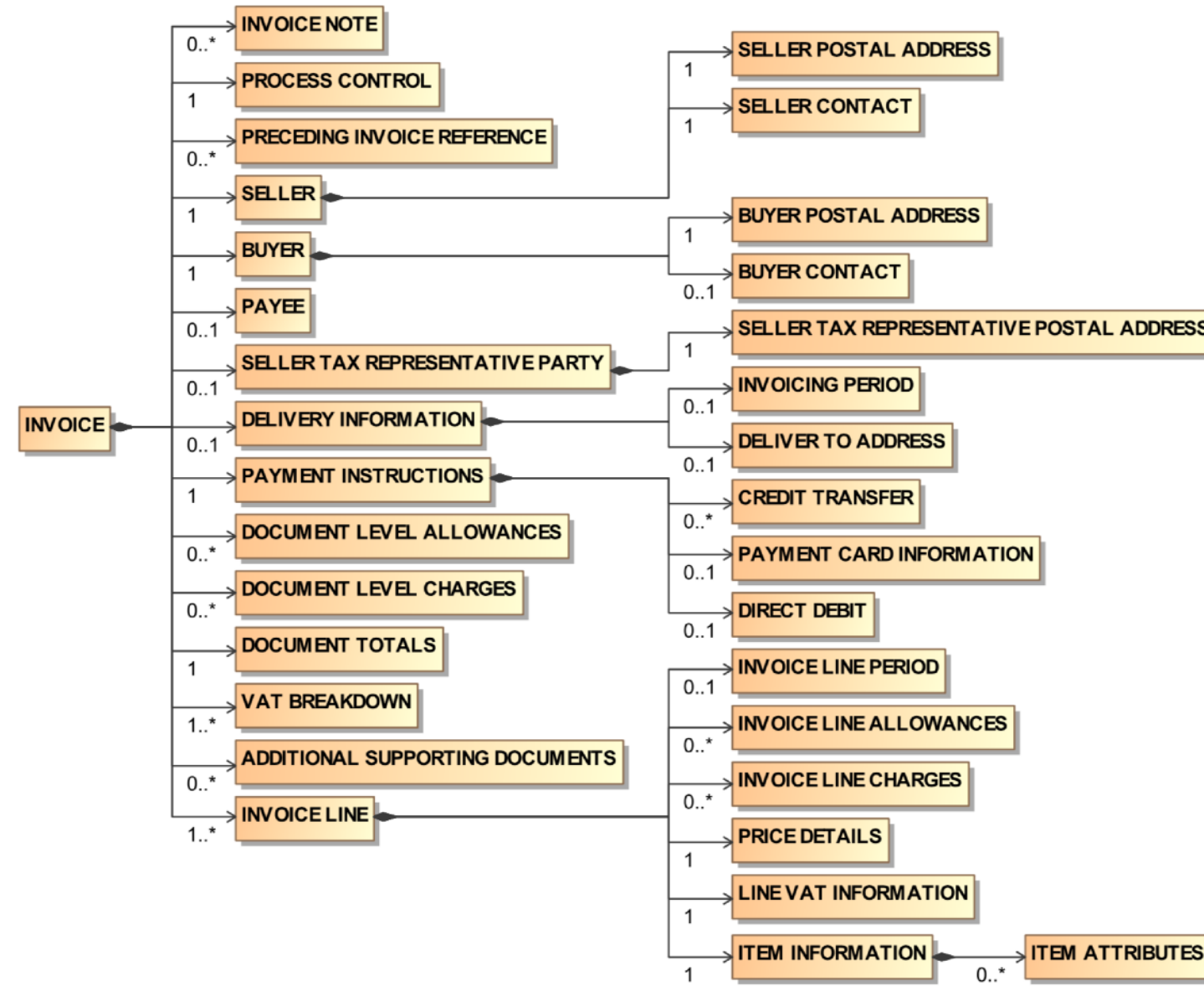
XRechnung 2.2

Normal

EXTENSION



Structure of an EN16931 compliant eInvoice



Header of a ZUGFeRD 2.x Invoice



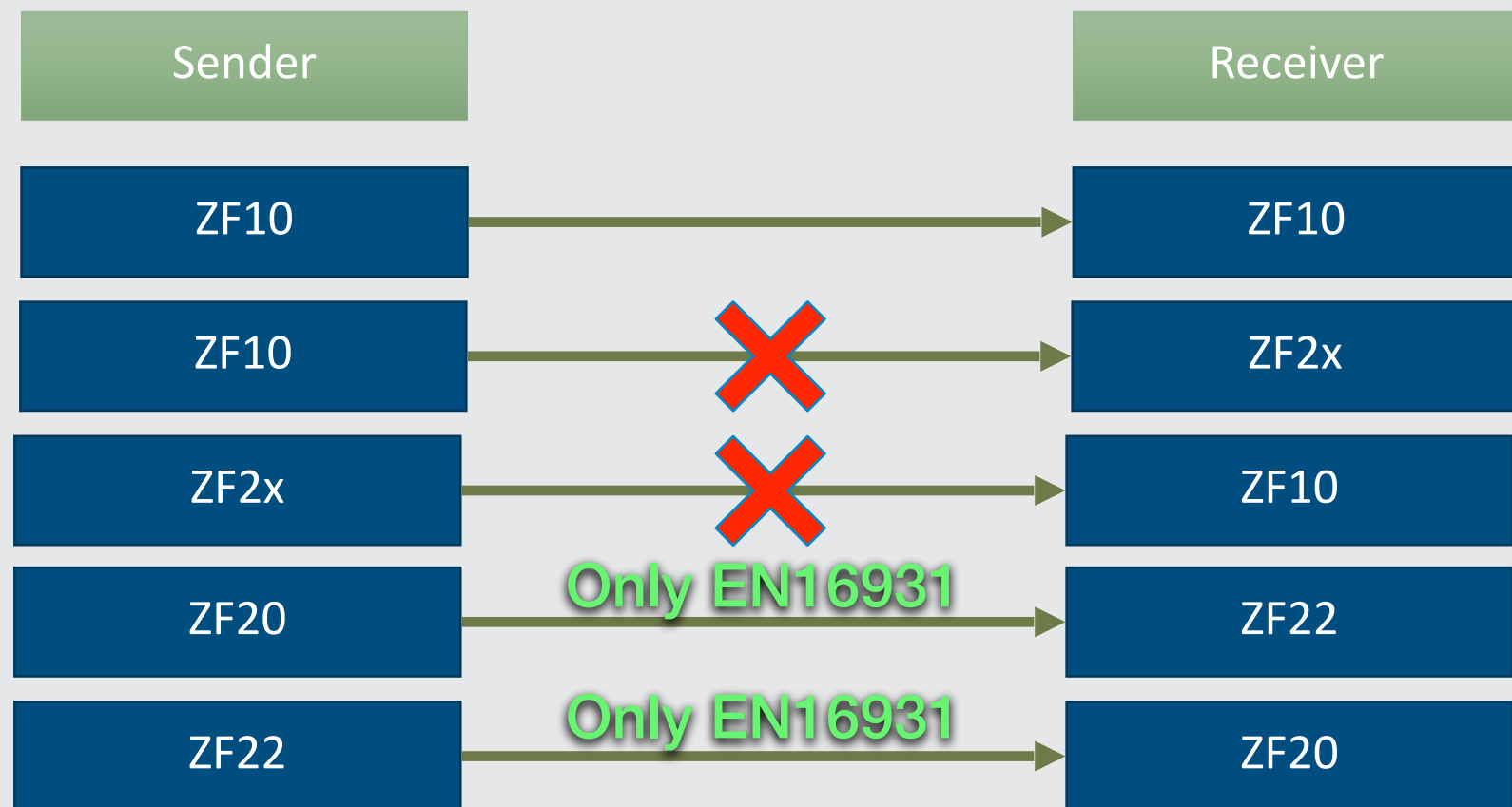
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```
<rsm:CrossIndustryInvoice xmlns:qdt="urn:un:unece:uncefact:data:standard:QualifiedDataType:100"
xmlns:ram="urn:un:unece:uncefact:data:standard:ReusableAggregateBusinessInformationEntity:100"
xmlns:rsm="urn:un:unece:uncefact:data:standard:CrossIndustryInvoice:100" xmlns:udt="urn:un:unece:uncefact:data:standard:UnqualifiedDataType:100"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <rsm:ExchangedDocumentContext>
    <ram:BusinessProcessSpecifiedDocumentContextParameter>
      <ram:ID>A1</ram:ID>
    </ram:BusinessProcessSpecifiedDocumentContextParameter>
    <ram:GuidelineSpecifiedDocumentContextParameter>
      <ram:ID>urn:cen.eu:en16931:2017</ram:ID>
    </ram:GuidelineSpecifiedDocumentContextParameter>
  </rsm:ExchangedDocumentContext>
  <rsm:ExchangedDocument>
    <ram:ID>2017-TEST-01</ram:ID>
    <ram:TypeCode>380</ram:TypeCode>
    <ram:IssueDateTime>
      <udt:DateTimeString format="102">20171031</udt:DateTimeString>
    </ram:IssueDateTime>
    <ram:IncludedNote>
      <ram:Content>FOURNISSEUR F SARL au capital de 50 000 EUR</ram:Content>
      <ram:SubjectCode>REG</ram:SubjectCode>
    </ram:IncludedNote>
    <ram:IncludedNote>
      <ram:Content>Retard de paiement: Indemnité forfaitaire de recouvrement de 40 Euros</ram:Content>
      <ram:SubjectCode>PMT</ram:SubjectCode>
    </ram:IncludedNote>
  </rsm:ExchangedDocument>
</rsm:SupplyChainTradeTransaction>
```

ZUGFeRD 2.2 - Backward Compatibility

- ZUGFeRD 2.2 is not backward compatible with ZUGFeRD 1.0



Assumption:
Receiver only supports the
specified standard

Other profiles can be understood

ZUGFeRD 2.2 - What's important?



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- ZUGFeRD 1.0 is still valid and may be used in B2B and B2C (mainly national);
- ... but ZUGFeRD 1.0 is end-of-life and will not be supported by FeRD —> we don't recommend longterm future usage!!!
- ZUGFeRD 2.x supports industry extensions (not possible with ZF10)
- ZUGFeRD 2.x is actively supported
 - Updates in UN/CEFACT base and code lists
 - Updates of EN 16931
 - Common code base for other document types like Order-X, Invoice Receipt etc.
 - Unique specification of ZUGFeRD 2.2 + Factur-X 1.0.6 in DE, FR and EN
 - Other countries like Switzerland and Portugal adopted ZUGFeRD/Factur-X

The 6. Profile – XRechnung

- XRechnung is a so-called CIUS of EN16931 —> EN16931 + additional Business Rules
- ZUGFeRD 2.2 Profile EN16931 does not include the additional Business Rules of XRechnung
- Decision at FeRD:
 - Introduction of a new profile (6th profile) XRECHNUNG beginning with ZUGFeRD 2.1
 - Embedding of the XRechnung XML file within a PDF/A-3 (Visualisation)
 - Equal treatment of all profiles
 - Included even in French and English version of the spec
 - No description of XRechnung specific rules in ZUGFeRD 2.x spec —> reference to XOEV

CIUS = Core Invoice Us

- There's one special thing between embedded XML and PDF/A
 - XRechnung allows the embedding of „invoice supporting documents (ISDs)“ as Base64 encoded XML elements or alternatively as external URL references
 - Problem: where to embed now the ISDs, in the PDF/A part or in the XML part
 - ZUGFeRD approach: ISDs are embedded always in PDF/A, using URIs with Fragment identifiers

CIUS = Core Invoice Us

Background on URI and Fragment ID

- URI (Universal Resource Indicator)

ZUGFeRD 2.0	XRechnung 1.0
In XML part: RFC 7320, RFC 3986	RFC 7320, RFC 3986
In PDF part: ab ISO-32000-2 (PDF 2.0) via Fragment Identifiers	

- URI standard supports beside other. absolute references, relative references and Fragment Identifiers (—> navigation within a document)

References in ZUGFeRD 2.x



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```
<ram:SellerOrderReferencedDocument>
  <ram:IssuerAssignedID>per Mail vom 19.02.2013</ram:IssuerAssignedID>
</ram:SellerOrderReferencedDocument>
<ram:AdditionalReferencedDocument>
  <ram:IssuerAssignedID>42389</ram:IssuerAssignedID>
  <ram:URIID>#ef=rapport.png</ram:URIID>
  <ram:TypeCode>916</ram:TypeCode>
</ram:AdditionalReferencedDocument>
```

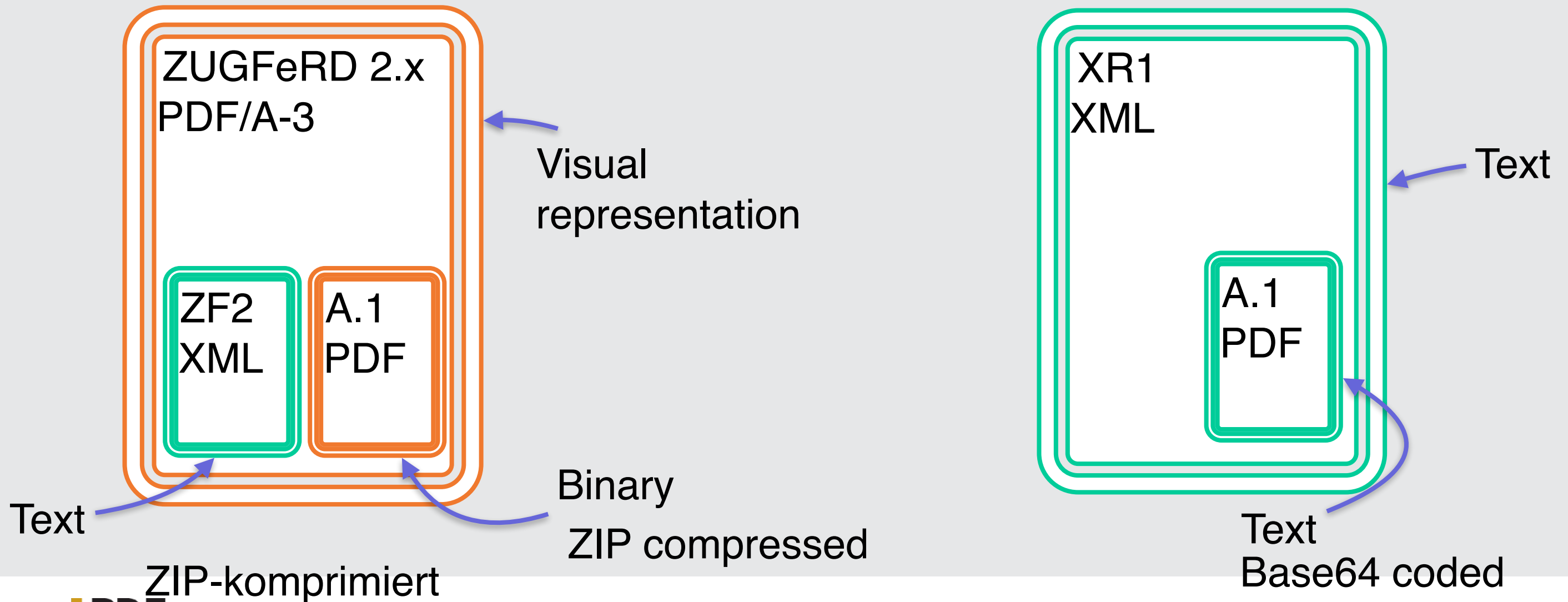
Relative URI with fragment identifier (#ef), points to file attachment on same level than the invoice XML within PDF(/A)
Compliant to ISO 32000-2 and RFC 3986

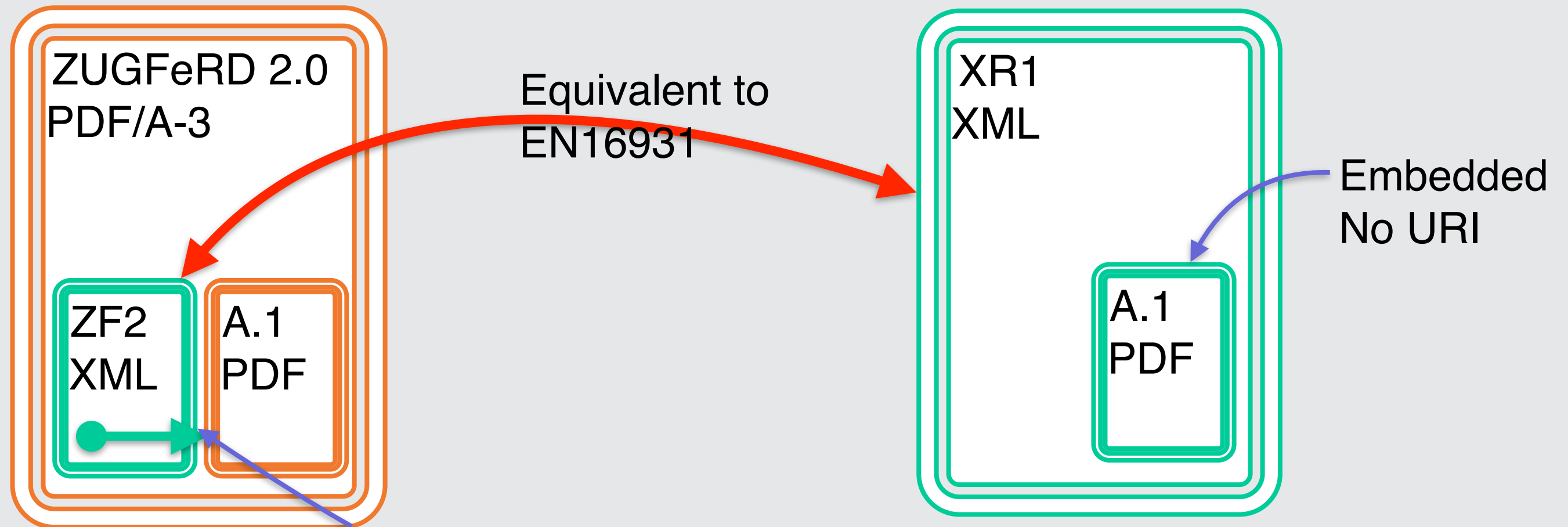
Comparison of both Embedding Models



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Relative reference via URI + fragment identifier

What's Order-X in 20 sec?



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- **Order-X is for electronic ordering what ZUGFeRD/Factur-X is for electronic invoicing**
 - Hybrid data and document format (PDF/A-3 + XML)
 - XML is UN/CEFACT SCRDM based (no UBL!!)
 - Extensive use of same elements and structures as ZUGFeRD/Factur-X
 - Keeping the promise of FeRD/FNFE that there is more after eInvoice

Business Messages Derived From SCRDM



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Processes	Business Messages	Status
Cataloguing	Catalogue	Published
Quotation	Quotation Proposal	Published
	Quotation Proposal Request	Published
	Quotation Request	Published
	Quotation Request Response	Published
Ordering	Order	Published
	Order Change	Published
	Order Response	Published
Delivering	Despatch Advice	Published
	Receiving Advice	Finalized
Invoicing	Invoice	Published
Paying	Remittance Advice	Published
Scheduling	Demand Forecast	Published
	Demand Forecast Response	Published
	Inventory Forecast	Published
	Supply Instruction	Published
	Supply Notification	Published
	Consumption Report	Published

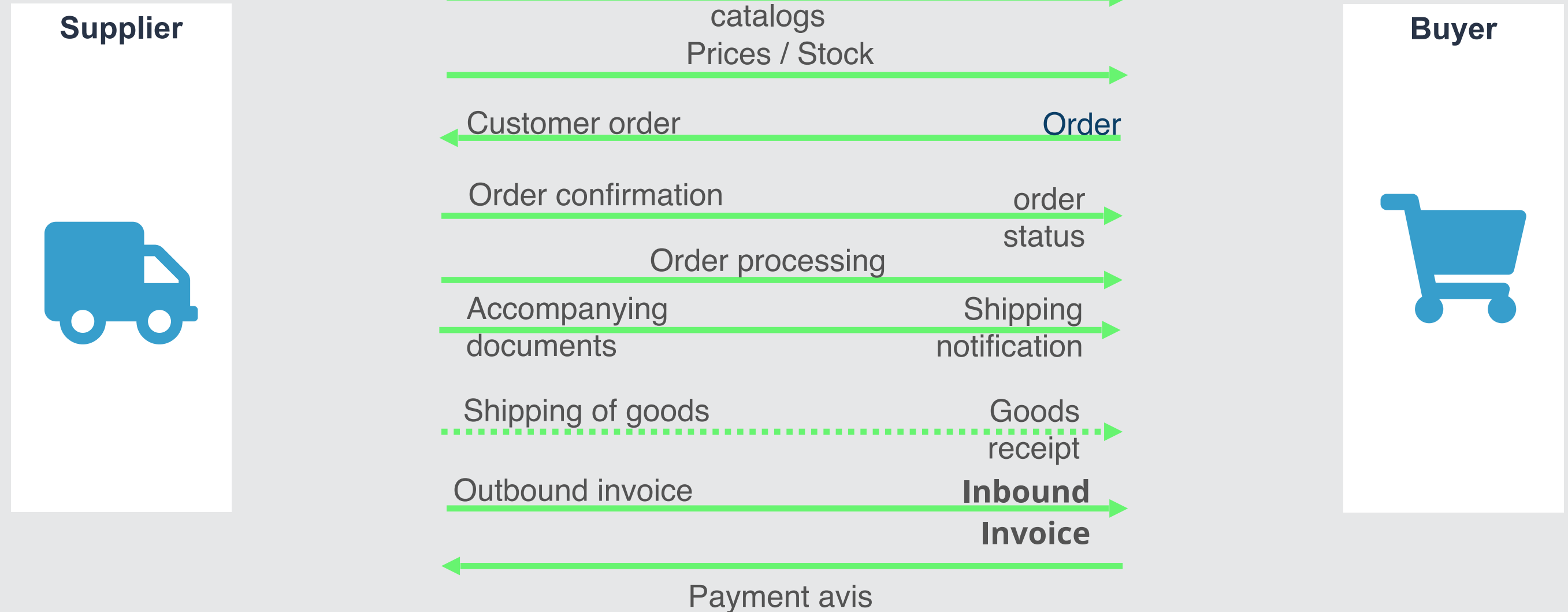
Strategic Direction

eOrder is Integral Part of the Digitized Supply Chain



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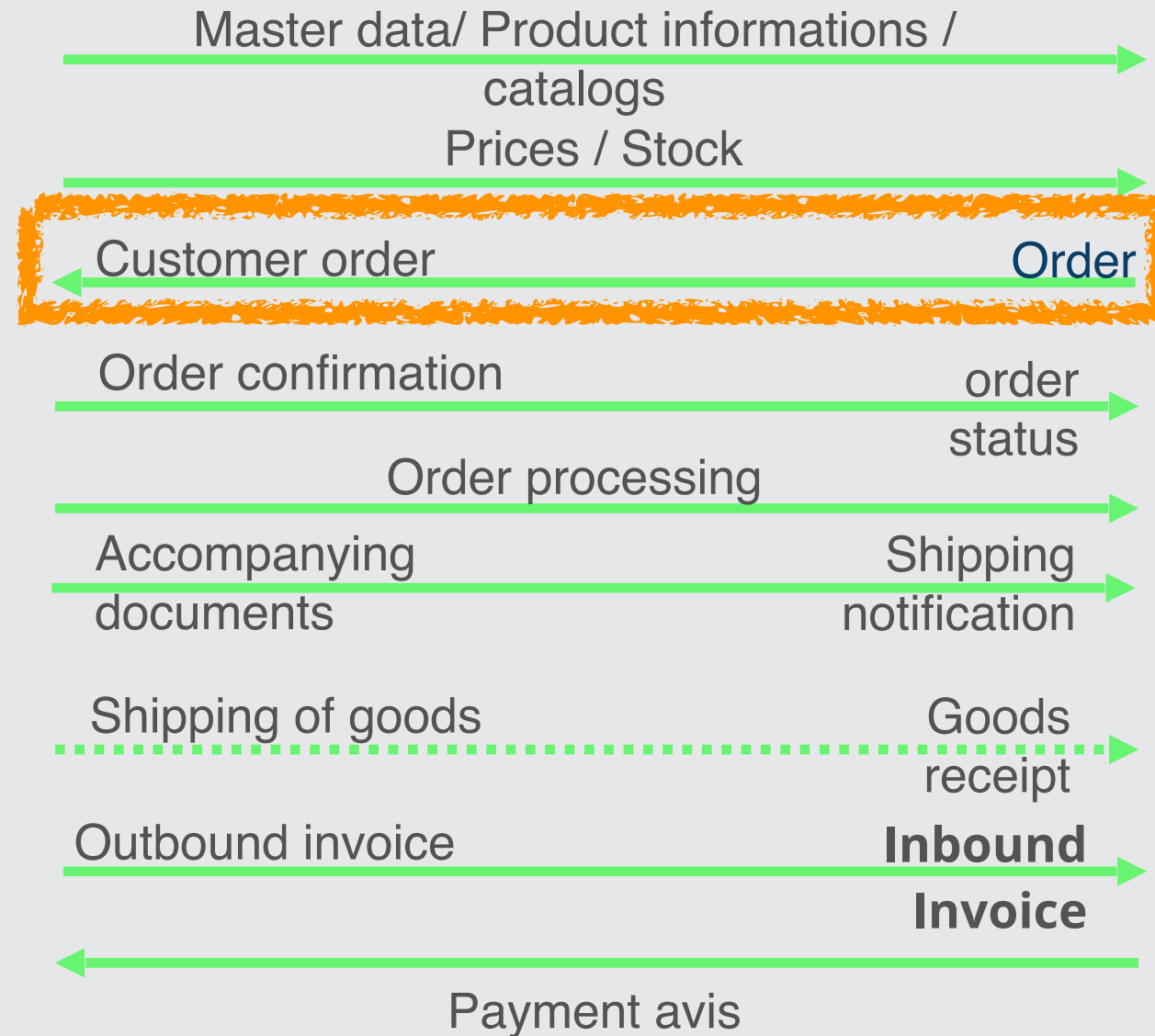
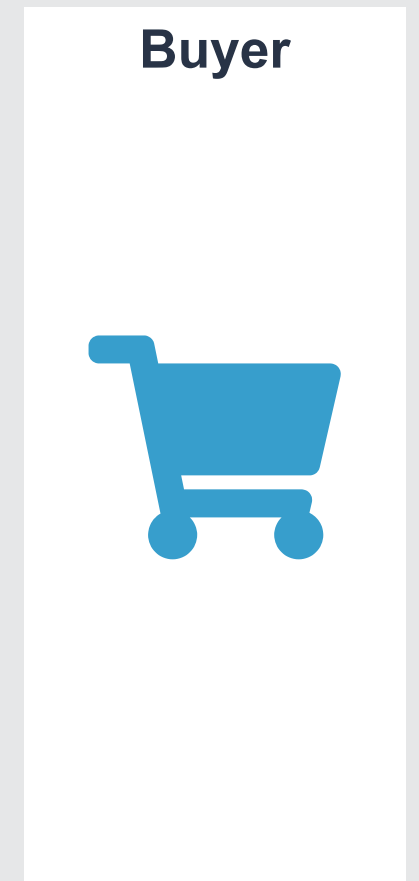
Strategic Direction

eOrder is Integral Part of the Digitized Supply Chain



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The Embedding into PDF/A-3



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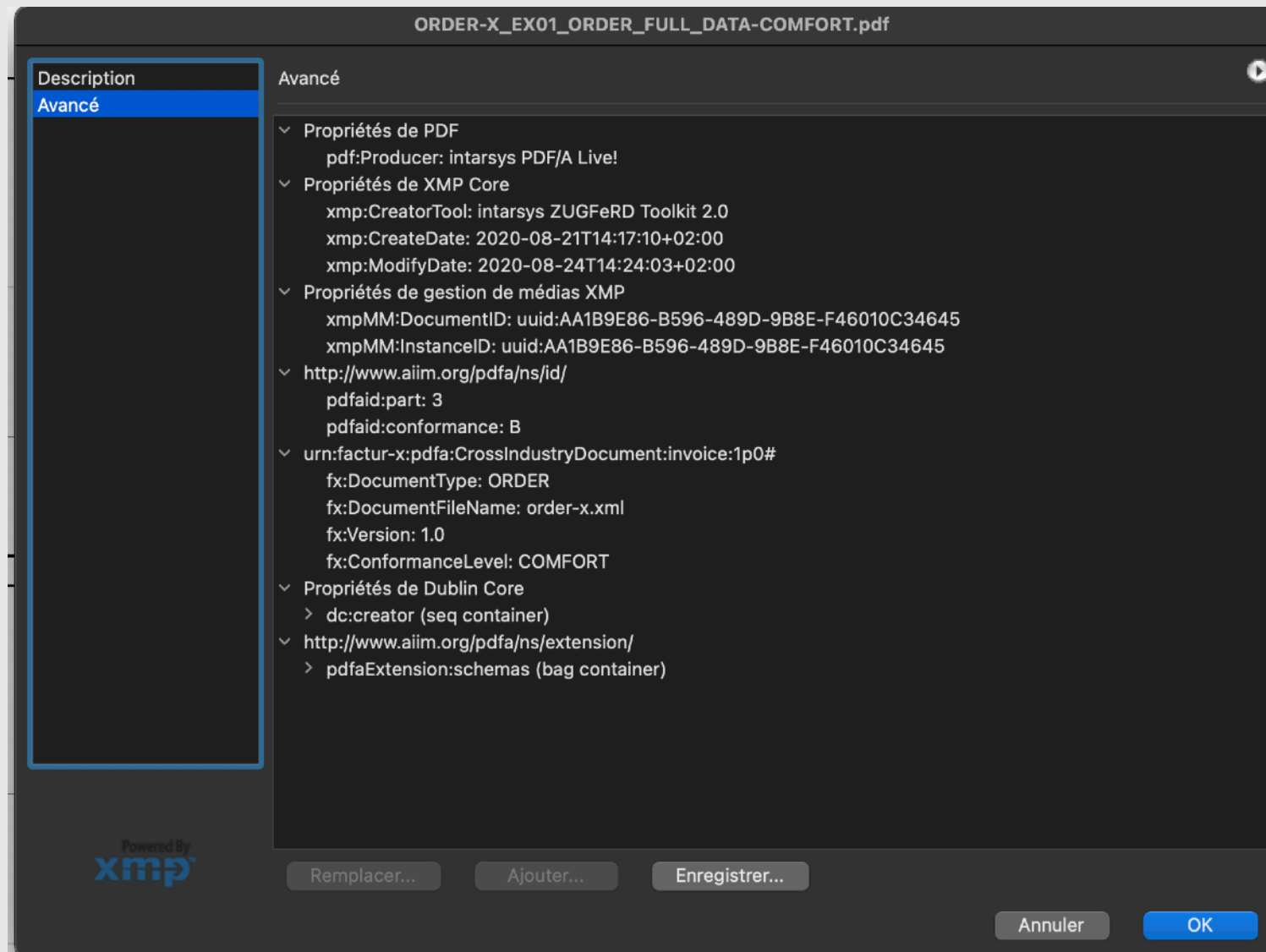
XMP Element	Order-X	ZUGFeRD 2.1/Factur-X 1.0
fx:DocumentType	ORDER or ORDER_RESPONSE or ORDER_CHANGE	INVOICE
fx:DocumentFileName	order-x.xml	factur-x.xml
fx:Version	1.0	1.0
fx:ConformanceLevel	BASIC or COMFORT or EXTENDED	MINIMUM or BASIC-WL or BASIC or EN16931 or EXTENDED or XRECHNUNG

Metadata for ORDER-X



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- Re-using PDF/A Extension Schema for Invoices

- The „electronic Delivery Bill“ matches Factur-X and Order-X
- Ongoing work at FeRD and FNFE-MPE
- First Draft end of 2022 or beginning of 2023
 - Advantage: experiences with Order-X
 - Established Modering base of Factur-X and Supply Chain Resource Modelling of UNCEFACT

- Support for PDF/A-4 —> no need to embed PDF/A extension schema in every invoice
- Enhanced metadata
 - Invoice number
 - Totals
 - Sender name
- Tools
 - Integrated support for displaying invoice metadata

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- › Chair of TWG Digital Signatures



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- ▶ Personal, Batch and Mass Signing
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