

PEPPOL PROJECT

TECHNICAL REPORT WP5 INVOICING Gap Analysis between Northern European Subset (NES) Invoice and Turkish UBL eInvoice Customization (UBLTR)

Preparation Date: April 9th, 2009

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1 SCOPE

This document presents the gap analysis between two conformant customization of UBL 2.0, namely, (1) Northern European Subset (NES) and (2) the Turkish eInvoice customization (UBLTR). The analysis is performed from two perspectives: The Business Process and the Document Content.

2 INTRODUCTION

The Universal Business Language (UBL)¹ initiative from OASIS adopts the UN/CEFACT Core Component Technical Specification (CCTS)² approach and develops a set of standard XML common business document definitions. Currently, the approved version of UBL is 2.0 and there are thirty one XML schemas for common business documents such as “Order”, “Despatch Advice” and “Invoice”. In addition to the document definitions, UBL 2.0 provides a library of XML schemas (XSDs) for reusable common data components like “Address”, “Item”, and “Payment” from which the documents are constructed. The original UBL schemas can be customized to reflect the specific business needs. There are two ways of customizing UBL Schemas: (1) the conformant customization and (2) the compatible customization. The key idea behind the conformant customization is that the XML instances in the customized implementation also conform to the original standard UBL 2.0 schemas. On the other hand, all the customizations, which are not conformant, are called compatible, where the XML instances do not conform to original UBL 2.0 schemas.

UBL is being adopted by several communities around the world, especially in electronic government applications. The first government to use UBL Invoice is Denmark. The use of UBL Invoice is realized through the “Offentlig Information Online UBL (OIUBL)³” Project and has been mandated by law for all public-sector businesses in Denmark. Also in Sweden, the National Financial Management Authority recommended UBL Invoice customized to Sweden, namely, Svefaktura⁴ for all government use. Following the success of Danish and Swedish examples, representatives from Denmark, Norway, Sweden, UK, Finland and Iceland have created a Northern European Subset (NES)⁵ for UBL to ensure interoperability among these countries. Furthermore, Revenue Administration of Turkey chose UBL 2.0 as the electronic document standard to be used in the Turkish National Invoicing system and generated Turkish UBL 2.0 customization (UBLTR)⁶.

The large scale integration project, PEPPOL (Pan-European Public Procurement Online,) will be producing UBL 2.0 conformant invoice, order, virtual company dossier and catalog schemas to be customized to the Member States.

This document is prepared for the PEPPOL Project WP5 to present the results of the gap analysis between NES/UBL and UBLTR.

¹ http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=ubl

² www.unece.org/cefact/ebxml/CCTS_V2-01_Final.pdf

³ <http://www.oiubl.info/classes/en/index.html>

⁴ <http://www.svefaktura.se/>

⁵ www.nesubl.eu/

⁶ <http://www.efatura.gov.tr/web/efatura/anasayfa>

3 UBLTR eInvoice

This section provides brief summary of UBLTR eInvoice document content and the profile defined for the business processes.

3.1 UBLTR eInvoice Document Content

Figure 1 shows the customizations performed on the original UBL 2.0 Invoice to obtain the UBLTR Invoice. In customizing UBL 2.0 Invoice schemas to Turkey, the following conformant changes are applied⁷ :

- The optional “UBLExtensions” element is used to include non-UBL data elements specific to the intended use in Turkey. For example, the XSL files that are used to visualize the Invoice documents are embedded in the “UBLExtensions” element. The “UBLExtensions” element, which appears as the first child of all UBL 2.0 documents, allows for conformant customizations by restricting the use of non-UBL elements inside these tags.
- The optional information entities in the original UBL 2.0 invoice documents that are not necessary for the UBLTR are removed. For example, “TaxPointDate” information entity is removed from the Invoice document, since in Turkey the “IssueDate” is used to indicate the point at which the tax becomes applicable. Clearly, removing the optional elements does not violate the conformance to the original UBL 2.0 schema.
- There are additional constraints on the value space of the information entities in the UBLTR Profile. For example, a constraint is introduced to check whether the sum of “TaxAmount” items of the “TaxSubtotal” elements in a “TaxTotal” entity is equal to the “TaxAmount” item of the respective “TaxTotal” entity. Such requirements are reflected in the UBLTR schemas through Schematron rules.
- Finally, the customization of the code lists is realized. The code lists are used to convey the meaning of the values in the data elements. In UBL 2.0, only three code lists are enumerated in the schemas: (1) The CurrencyCodeContentType for internationally standardized currency codes, (2) The BinaryObjectMimeCodeContentType for MIME encoding identifiers and (3) The UnitCodeContentType for unit codes. The other code lists used in UBL are not enumerated in the schema expressions. Instead, UBL uses a common base type called CodeType, which is an extension of “xsd:normalizedString” for all elements expressing values from the code lists. The UBL 2.0 package includes files for every code list. These files are separate from the provided XSD schemas and they are in a standard format. For the UBLTR Profile, these files are generated for the codes used in Turkey. For example, a value set for “TaxTypeCode” basic business information entity is created. Some example values for this value set are: Income Tax, Value Added Tax (VAT), and Stamp Tax.
- Validation of the eInvoice, Turkey: UBL 2.0 recommends a two-phase validation technique since the specification of the default values directly in the schemas makes it difficult to modify the code lists to meet customization requirements. In the UBLTR implementation, the two-phase validation technique is used: in the first phase, an incoming invoice document is validated against UBL 2.0 UBLTR eInvoice XSD schemas. If the instance passes the first phase, in the second phase it is checked against the rules, which specify UBLTR business constraints on the values of the elements in the instance. These rules are specified through Schematron language. If the instance passes both of the phases successfully, it is delivered to the processing business application.

⁷ OASIS UBL Turkish Localization SC, http://www.oasis-open.org/committees/sc_home.php?wg_abbrev=ubl-trlsc

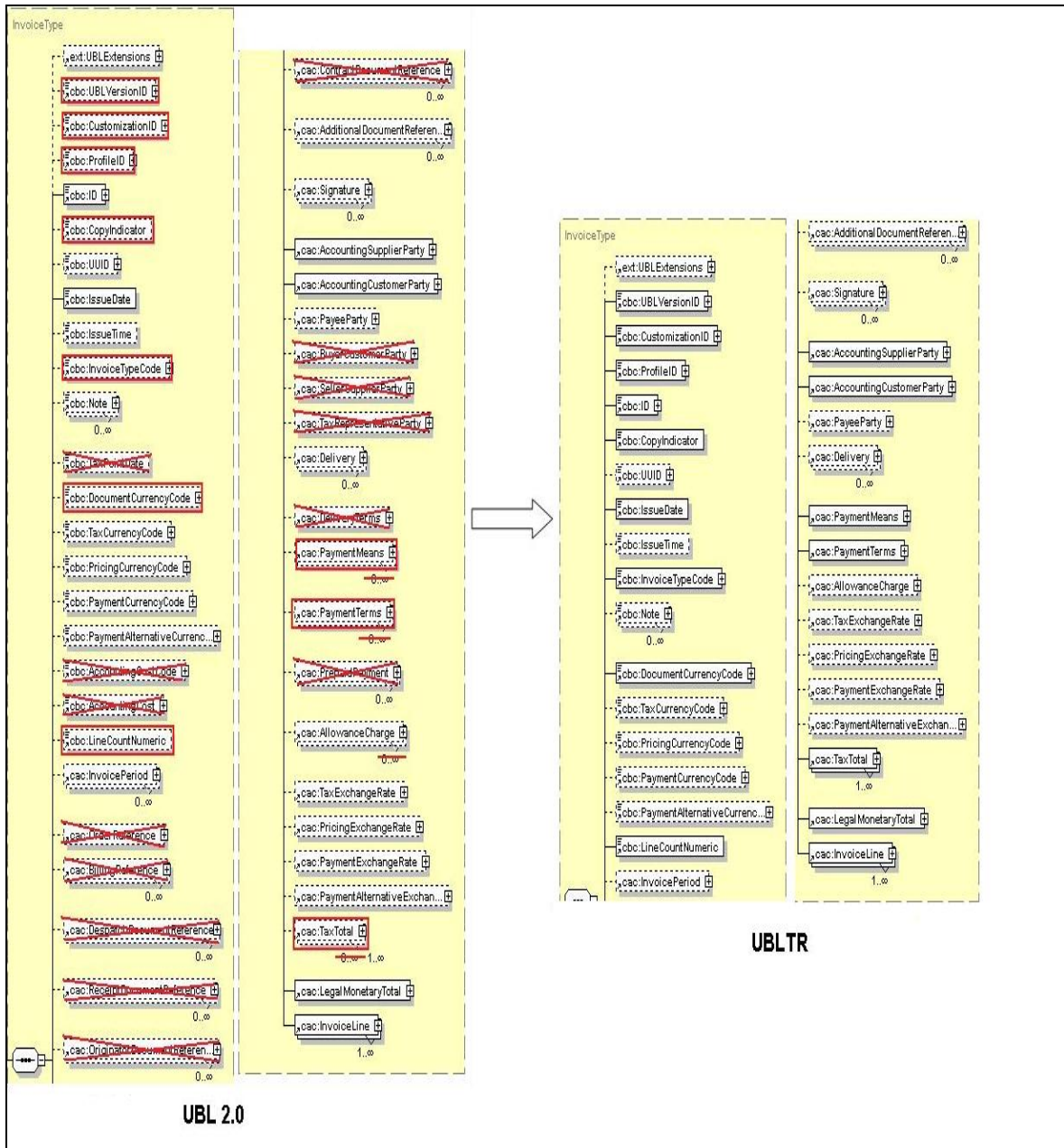


Figure 1 Customizing UBL 2.0 Invoice to UBLTR Invoice

3.2 UBLTR eInvoice Business Processes

In UBLTR, there are two profiles defining the business processes to be used:

- UBLTR Profile 1: Traditional Billing
- UBLTR Profile 2: Utility Billing

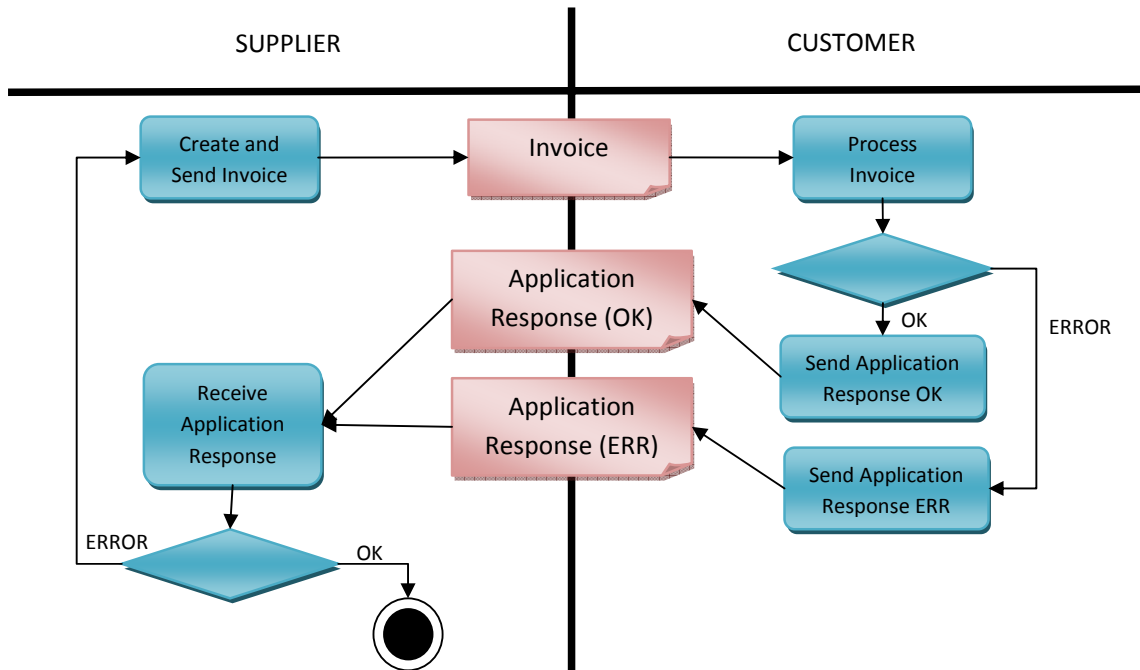


Figure 2 UBLTR Profile 1: Traditional Billing Process

As shown in Figure 2, in the Traditional Billing Profile, after getting the invoice, the customer checks the content and if there is an error, the customer sends an ApplicationResponse with error response code. Otherwise, an ApplicationResponse with OK response code is sent. Upon receiving the ApplicationResponse, the supplier either finishes the process or sends another Invoice according to the response code in the document.

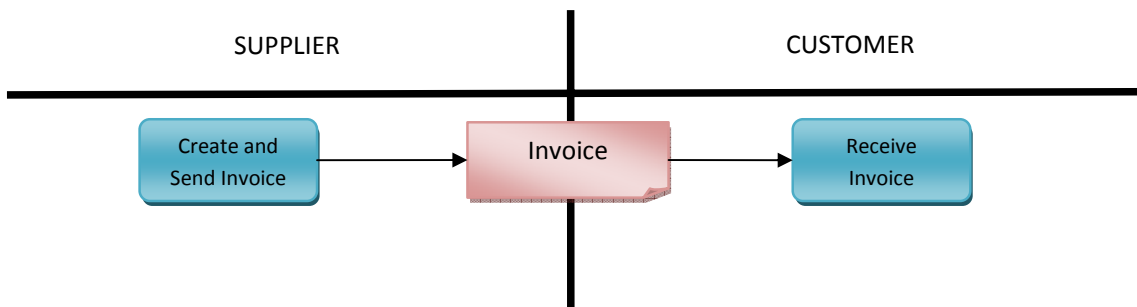


Figure 3 UBLTR Profile 2: Utility Billing Process

The Utility Billing profile covers the submission of utility bills to subscriber citizens. As shown, in Figure 3, the process only covers the sending of the invoice from supplier to the customer.

4 Gap Analysis from the Business Process Perspective

In this section, a gap analysis of UBLTR Profiles and the related NES Profiles are presented.

The NES Profiles are normative descriptions of business processes and scenarios based on a common application of UBL within NES. Each profile documents a context specific use of the UBL constrained by business rules and the recommendation for the use of the relevant UBL documents. In NES, there is a total of eight profiles and the following five of them is related with invoicing:

- NES Profile 4 - Basic Invoice Only
- NES Profile 5 - Basic Billing
- NES Profile 6 - Basic Procurement
- NES Profile 7 - Simple Procurement
- NES Profile 8 - Basic Billing with Dispute Response

Since the WP5 of the PEPPOL Project addresses Invoicing, the gap analysis is performed only with invoicing related profiles of NES.

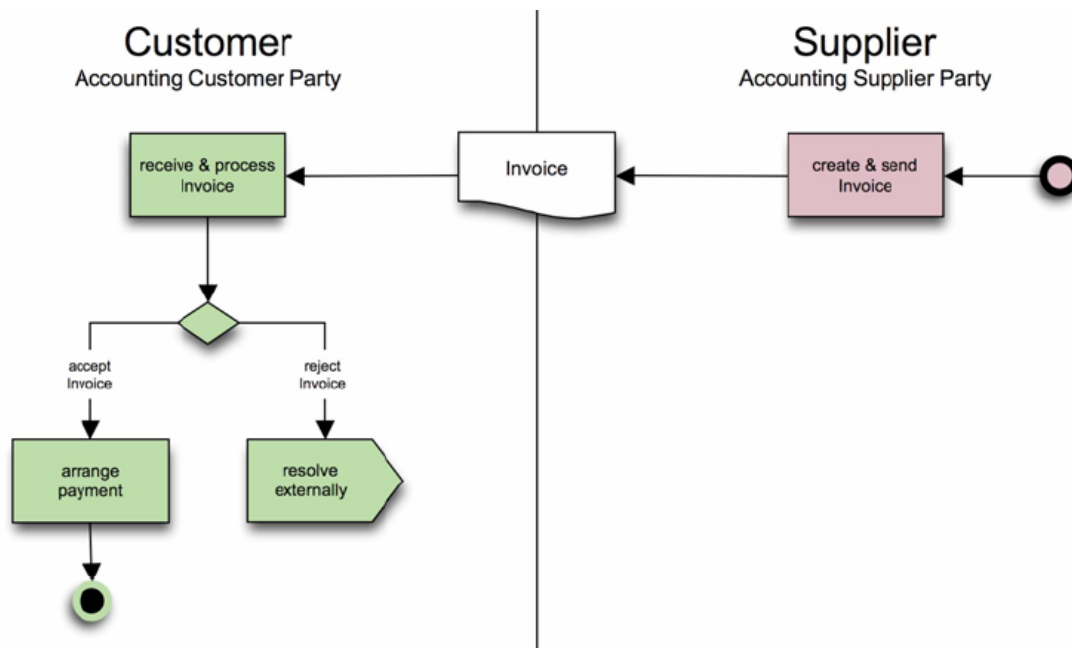


Figure 4 NES Profile 4 - Basic Invoice Only Process

In these five profiles, there are three different business processes. The first one is in “NES Profile 4 - Basic Invoice Only” as shown in Figure 4, where only an Invoice document is sent from supplier to the customer. The second type of business process is used in Profile 7 and 8 (Figure 5), where the subsequent steps are detailed in case of an invoice error. The invoice error is reported through ApplicationResponse document and the compensation of the error is realized through a CreditNote document and/or a new Invoice document. The third type of business process is similar to the second one, where the difference is the notification of an invoice error which is realized externally.

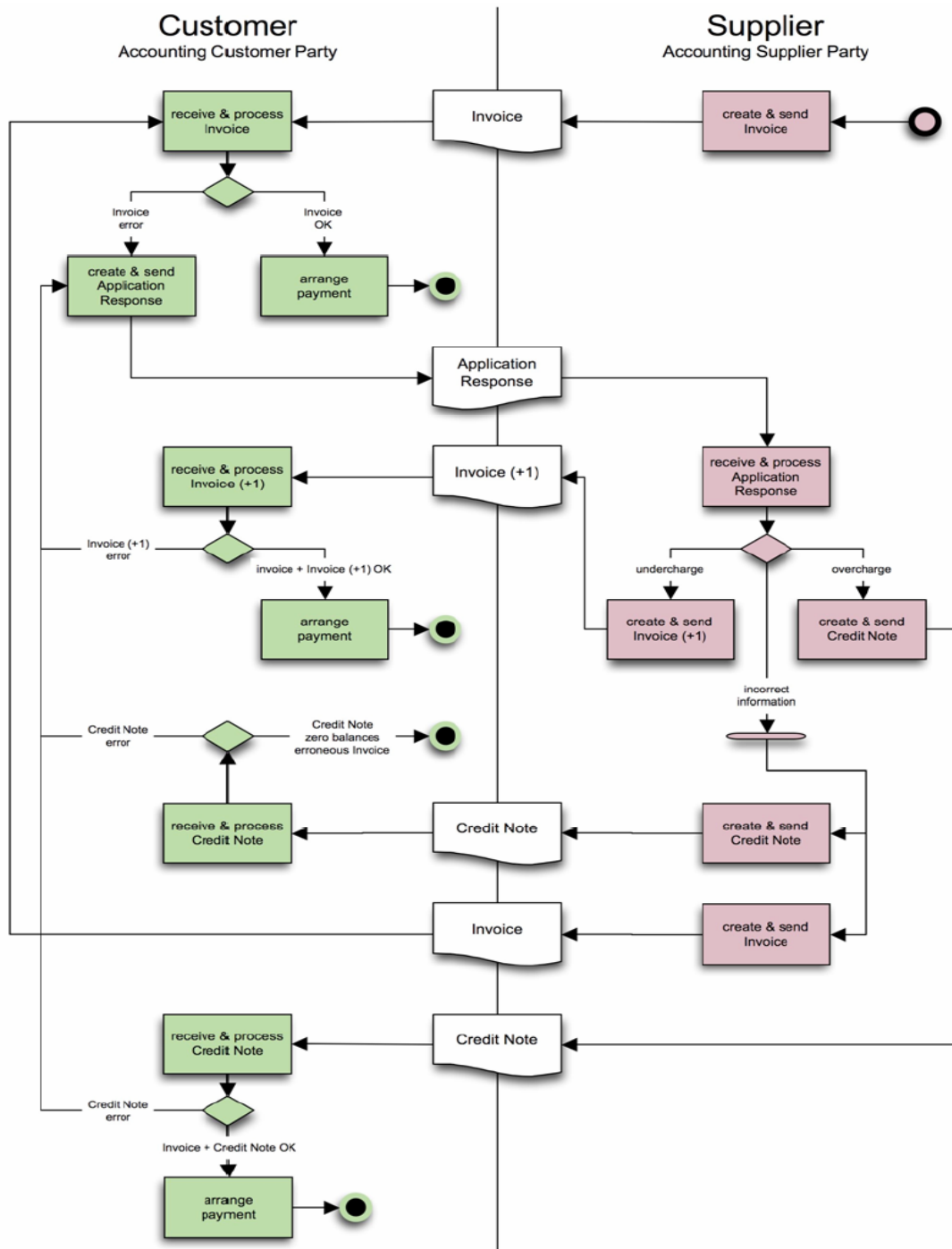


Figure 5 NES Profile 8 - Basic Billing with Dispute Response Process

The differences between NES and UBLTR considering business processes are as follows:

- In UBLTR Traditional Billing, the customer sends an ApplicationResponse document to the supplier independent of whether there is an error in the invoice.

- Turkey's trade conventions require that if there is an error in the content of an invoice (e.g. overcharge, undercharge and incorrect information) or there are defective goods in the delivery, the invoice is cancelled and a new invoice document is prepared. At the beginning of each month, the companies report their monthly revenues to the Revenue Administration of Turkey (GIB) by sending their invoices. An invoice reported to the GIB, cannot be cancelled. However, if the invoice is reported and if there is an error related with it or there are defective goods, a credit note document is prepared by the customer and is sent to the supplier along with a copy of the previously sent invoice. In Turkey, the credit note documents are just another type of invoice sent from the customer to the supplier. On the other hand, the CreditNote documents are sent from suppliers to customers in NES. Therefore, the CreditNote document of UBL 2.0 is not used in UBLTR.

5 Gap Analysis of the Document Contents

Unlike NES, where there is a different schema set for each profile, in UBLTR, only one invoice schema is used. However, this schema is used differently in each profile and this is achieved through Schematron rules. In this section, the difference between the UBLTR Schemas and NES Profile 4 - Basic Invoice Only schemas are identified. Although both NES and UBLTR are conformant subsets of UBL 2.0 standard, there are some incompatibilities between them. For example, `"/Invoice/LineCountNumeric"` is required as a mandatory element in UBLTR, whereas this element is excluded from NES.

There are four types of issues that may cause interoperability problems between NES and UBL:

- Issue 1 - Multiple Cardinality versus Optional Cardinality: There are elements with incompatible cardinalities. For example, a `"0..1"` cardinality in the `"/Invoice/Note"` element in UBLTR is set as `"0..n"` in NES.
- Issue 2 - Optional Cardinality versus Excluded Element: An element which is set as optional in one is excluded from the other. For example, `"/Invoice/TaxPointDate"` element is excluded from UBLTR, but it is optional in NES.
- Issue 3 - Optional Cardinality versus Mandatory Cardinality: An element which is set as mandatory in one is set as optional in another. For example, `"/Invoice/CopyIndicator"` element is mandatory in UBLTR, but it is optional in NES.
- Issue 4 - Mandatory Cardinality versus Excluded Element: An element which is set as mandatory in one is excluded from the other. For example, `"/Invoice/LineCountNumeric"` element is mandatory in UBLTR; however, it is excluded from NES.

Considering the severity, the issue 1 is the least important and issue 4 is the most important for interoperability. In tables Table 1 and Table 2, the elements of UBLTR and NES are compared by using the following color codes: Issue 1 → light blue, issue 2 → yellow, issue 3 → orange, issue 4 → red. In Table 1, the gaps are indicated in the Invoice document and in Table 2, the gaps in the common components are shown.

Table 1 Invoice Document Level Issues

Invoice	UBLTR-Usage	UBLTR-Cardinality	NES-Usage	NES-Cardinality
CopyIndicator	USED	1	USED	0..1
UUID	USED	0..1	EXCLUDED	
IssueTime	USED	0..1	EXCLUDED	
Note	USED	0..n	USED	0..1
TaxPointDate	EXCLUDED		USED	0..1
PricingCurrencyCode	USED	0..1	EXCLUDED	
PaymentCurrencyCode	USED	0..1	EXCLUDED	
PaymentAlternativeCurrencyCode	USED	0..1	EXCLUDED	
AccountingCost	EXCLUDED		USED	0..1
LineCountNumeric	USED	1	EXCLUDED	
OrderReference	EXCLUDED		USED	0..1
BillingReference	EXCLUDED		USED	0..1
Delivery	USED	0..n	USED	0..1
DeliveryTerms	EXCLUDED		USED	0..1
PaymentMeans	USED	1	USED	0..n
PaymentTerms	USED	1	USED	0..1
AllowanceCharge	USED	0..1	USED	0..n
PricingExchangeRate	USED	0..1	EXCLUDED	
PaymentExchangeRate	USED	0..1	EXCLUDED	
PaymentAlternativeExchangeRate	USED	0..1	EXCLUDED	

Table 2 Common Components Level Issues

Address	UBLTR-Usage	UBLTR-Cardinality	NES-Usage	NES-Cardinality
ID	EXCLUDED		USED	0..1
AddressFormatCode	EXCLUDED		USED	0..1
Postbox	EXCLUDED		USED	0..1
StreetName	EXCLUDED		USED	0..1

AdditionalStreetName	EXCLUDED		USED	0..1
BuildingName	EXCLUDED		USED	0..1
BuildingNumber	EXCLUDED		USED	0..1
Department	EXCLUDED		USED	0..1
CityName	EXCLUDED		USED	0..1
PostalZone	EXCLUDED		USED	0..1
Region	EXCLUDED		USED	0..1
AddressLine	USED	1	USED	0..n
Country	USED	1	USED	0..1
AllowanceCharge	USED		USED	
ChargeIndicator	USED	1	USED	1
AllowanceChargeReasonCode	EXCLUDED		USED	0..1
TaxCategory	EXCLUDED		USED	0..1
Attachment	USED		USED	
EmbeddedDocumentBinaryObject	USED	1	USED	0..1
ExternalReference	EXCLUDED		USED	0..1
BillingReference	EXCLUDED		USED	
InvoiceDocumentReference	EXCLUDED		USED	0..1
CreditNoteDocumentReference	EXCLUDED		USED	0..1
BillingReferenceLine	EXCLUDED		USED	0..1
BillingReferenceLine	EXCLUDED		USED	
ID	EXCLUDED		USED	1
Branch	EXCLUDED		USED	
ID	EXCLUDED		USED	0..1
FinancialInstitution	EXCLUDED		USED	0..1
CommodityClassification	USED		USED	
CommodityCode	EXCLUDED		USED	0..1
ItemClassificationCode	USED	1	USED	0..1
Communication	USED		EXCLUDED	
ChannelCode	USED	1	EXCLUDED	
Channel	USED	0..1	EXCLUDED	
Value	USED	1	EXCLUDED	

Contact	USED		USED	
ID	EXCLUDED		USED	0..1
Name	EXCLUDED		USED	0..1
OtherCommunication	USED	0..n	EXCLUDED	
Country	USED		USED	
IdentificationCode	USED	0..1	USED	1
Name	USED	1	EXCLUDED	
CreditAccount	EXCLUDED		USED	
AccountID	EXCLUDED		USED	1
Delivery	USED		USED	
ActualDeliveryDate	EXCLUDED		USED	0..1
DeliveryLocation	EXCLUDED		USED	0..1
Despatch	USED	1	EXCLUDED	
DeliveryTerms	EXCLUDED		USED	
ID	EXCLUDED		USED	0..1
SpecialTerms	EXCLUDED		USED	0..1
Despatch	USED		EXCLUDED	
ID	USED	1	EXCLUDED	
ActualDespatchDate	USED	1	EXCLUDED	
DocumentReference	USED		EXCLUDED	
IssueDate	EXCLUDED		USED	0..1
DocumentTypeCode	USED	0..1	EXCLUDED	
ExchangeRate	USED		USED	
SourceCurrencyBaseRate	EXCLUDED		USED	0..1
TargetCurrencyBaseRate	EXCLUDED		USED	0..1
CalculationRate	USED	1	USED	0..1
ExternalReference	EXCLUDED		USED	
URI	EXCLUDED		USED	1
FinancialAccount	USED		USED	
ID	USED	1	USED	0..1
AccountTypeCode	EXCLUDED		USED	0..1
FinancialInstitutionBranch	EXCLUDED		USED	0..1

FinancialInstitution	EXCLUDED		USED	
ID	EXCLUDED		USED	1
Name	EXCLUDED		USED	0..1
InvoiceLine	USED		USED	
InvoicedQuantity	USED	1	USED	0..1
AccountingCost	EXCLUDED		USED	0..1
OrderLineReference	EXCLUDED		USED	0..1
Delivery	EXCLUDED		USED	0..1
AllowanceCharge	USED	0..1	USED	0..n
TaxTotal	USED	0..1	USED	0..n
Price	USED	1	USED	0..1
Item	USED		USED	
BrandName	USED	0..1	EXCLUDED	
ModelName	USED	0..1	EXCLUDED	
ManufacturersItemIdentification	USED	0..1	EXCLUDED	
StandardItemIdentification	EXCLUDED		USED	0..1
OriginCountry	EXCLUDED		USED	0..1
ClassifiedTaxCategory	EXCLUDED		USED	0..n
AdditionalItemProperty	EXCLUDED		USED	0..n
ItemInstance	EXCLUDED		USED	0..n
ItemInstance	EXCLUDED		USED	
ProductTraceID	EXCLUDED		USED	0..1
ManufactureDate	EXCLUDED		USED	0..1
ManufactureTime	EXCLUDED		USED	0..1
RegistrationID	EXCLUDED		USED	0..1
SerialID	EXCLUDED		USED	0..1
LotIdentification	EXCLUDED		USED	0..1
ItemProperty	EXCLUDED		USED	
Name	EXCLUDED		USED	1
Value	EXCLUDED		USED	1
UsabilityPeriod	EXCLUDED		USED	0..1
ItemPropertyGroup	EXCLUDED		USED	0..n
ItemPropertyGroup	EXCLUDED		USED	

ID	EXCLUDED		USED	1
Name	EXCLUDED		USED	0..1
Location	EXCLUDED		USED	
Address	EXCLUDED		USED	0..1
LotIdentification	EXCLUDED		USED	
LotNumberID	EXCLUDED		USED	0..1
ExpiryDate	EXCLUDED		USED	0..1
MonetaryTotal	USED		USED	
TaxExclusiveAmount	USED	1	USED	0..1
TaxInclusiveAmount	USED	1	USED	0..1
PayableRoundingAmount	USED	1	USED	0..1
OrderLineReference	EXCLUDED		USED	
LineID	EXCLUDED		USED	1
OrderReference	EXCLUDED		USED	0..1
OrderReference	EXCLUDED		USED	
ID	EXCLUDED		USED	1
IssueDate	EXCLUDED		USED	0..1
Party	USED		USED	
EndpointID	EXCLUDED		USED	0..1
PartyIdentification	USED	1	USED	0..1
PartyName	USED	0..1	USED	1
PostalAddress	USED	1	USED	0..1
PartyTaxScheme	USED	0..1	USED	0..n
PartyLegalEntity	EXCLUDED		USED	0..1
Person	USED	0..1	EXCLUDED	
PartyLegalEntity	EXCLUDED		USED	
RegistrationName	EXCLUDED		USED	0..1
CompanyID	EXCLUDED		USED	1
RegistrationAddress	EXCLUDED		USED	0..1
PartyTaxScheme	USED		USED	
RegistrationName	EXCLUDED		USED	0..1
CompanyID	EXCLUDED		USED	0..1

ExemptionReason	EXCLUDED		USED	0..1
PaymentMeans	USED		USED	
PaymentDueDate	USED	0..1	USED	1
InstructionID	EXCLUDED		USED	0..1
PaymentID	EXCLUDED		USED	0..1
CreditAccount	EXCLUDED		USED	0..1
PaymentTerms	USED		USED	
ReferenceEventCode	EXCLUDED		USED	0..1
SettlementPeriod	EXCLUDED		USED	0..1
PenaltyPeriod	EXCLUDED		USED	0..1
Period	USED		USED	
DurationMeasure	USED	0..1	EXCLUDED	
Description	USED	0..1	EXCLUDED	
Person	USED		EXCLUDED	
FirstName	USED	1	EXCLUDED	
FamilyName	USED	1	EXCLUDED	
Title	USED	0..1	EXCLUDED	
MiddleName	USED	0..1	EXCLUDED	
NameSuffix	USED	0..1	EXCLUDED	
Price	USED		USED	
BaseQuantity	EXCLUDED		USED	0..1
AllowanceCharge	EXCLUDED		USED	0..1
TaxCategory	USED		USED	
ID	EXCLUDED		USED	1
Percent	EXCLUDED		USED	0..1
TaxExemptionReasonCode	EXCLUDED		USED	0..1
TaxExemptionReason	USED	0..1	USED	0..1
TaxScheme	USED		USED	
ID	EXCLUDED		USED	1
JurisdictionRegionAddress	USED	0..1	EXCLUDED	
TaxSubtotal	USED		USED	
TaxableAmount	USED	0..1	USED	1
CalculationSequenceNumeric	USED	0..1	EXCLUDED	

Percent	USED	0..1	EXCLUDED	
BaseUnitMeasure	USED	0..1	EXCLUDED	
PerUnitAmount	USED	0..1	EXCLUDED	
TaxTotal	USED		USED	
TaxSubtotal	USED	1..n	USED	0..n

6 The Use of iSURF eDoCreator Environment for Document Content Gap Analysis

The iSURF eDoCreator⁸ environment (Figure 6) allows creation and customization of UN/CEFACT Core Components Technical Specification (CCTS) based document schemas. With its Web accessible user interface, the user is allowed to work collaboratively.

Creating, extending, customizing document schemas conforming to UN/CEFACT CCTS methodology are tedious, labour intensive and time-consuming processes requiring (1) analysis of available component interfaces (2) design of spreadsheet model of the document (3) creation of XSD files and finally (4) creation of genericcode files for each of the coded attributes.

Although UN/CEFACT CCTS and UBL provide guidelines for document modeling and document customization guidelines respectively, there is no machine processable process implemented to help the designers. iSURF eDoCreator environment converts the UN/CEFACT CCTS modeling methodology into a machine processable process to execute on the document building blocks in the online repository and implements the UBL Customization guidelines to provide common and publicly available document modeling services. The tool also generates the spreadsheet model of the document schema and the XSD files along with the genericcode files.



Figure 6 iSURF eDoCreator displaying available document building blocks in the repository

⁸ Fulya Tuncer, Asuman Doğaç, Yıldırım Kabak, Şenan Postacı, Suat Gönül, Erdem Alpay, "iSURF eDoCreator: e-Business Document Design and Customization Environment", to appear in the Proc. of the eChallenges Conference, October 2009.

An additional feature of iSurf eDoCreator tool being implemented is the Gap Analysis Tool, which compares two customized e-business documents from document content perspective. Gap Analysis Tool is available under the “Tools” menu.

As shown in Figure 7, in the first panel, the tool list all available e-business document schemas in two separate lists. In the lists e-business document schemas are identified via their Dictionary Entry Names, Standards on which they are based on and Customization identifiers. Users are requested to select a document schema from each list and click to “Compare” Button to initiate the gap analysis process.

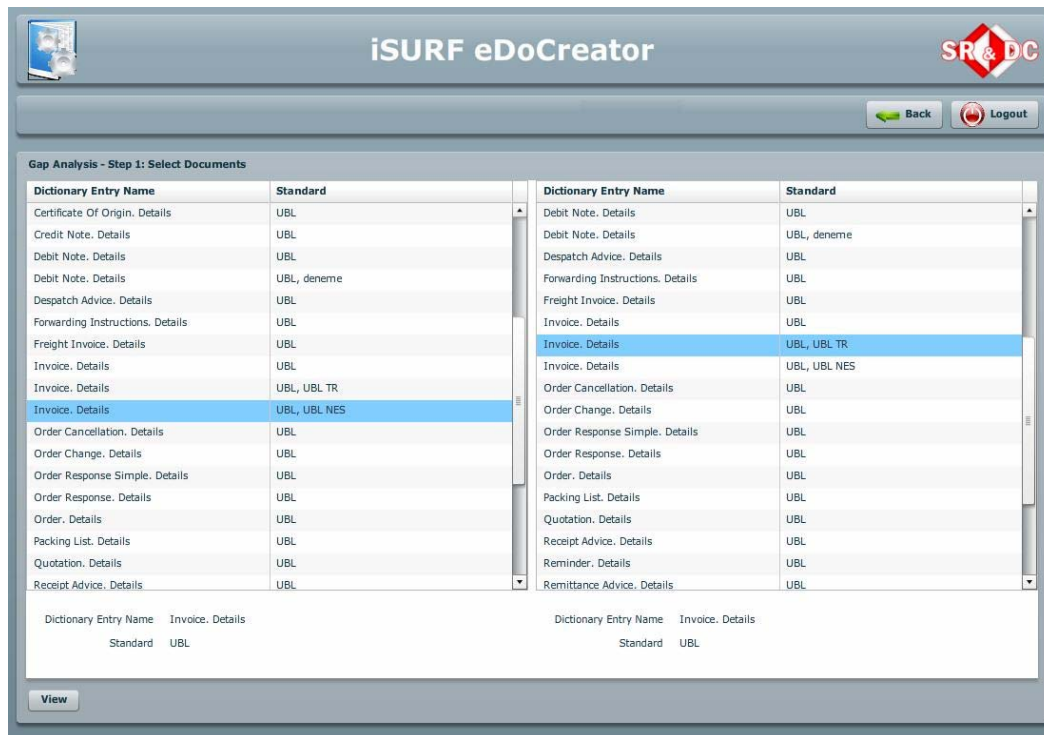


Figure 7 Gap Analysis Tool

The tool graphically presents two selected document schema details in a separated panel as shown in Figure 8. Through this expandable hierarchical tree view of document schemas, users are enabled to see the whole data content of a component at a glance by opening nodes of the tree. Furthermore, the cardinality values of selected document building block is presented at the bottom of each panel to let users to manually identify the differences.

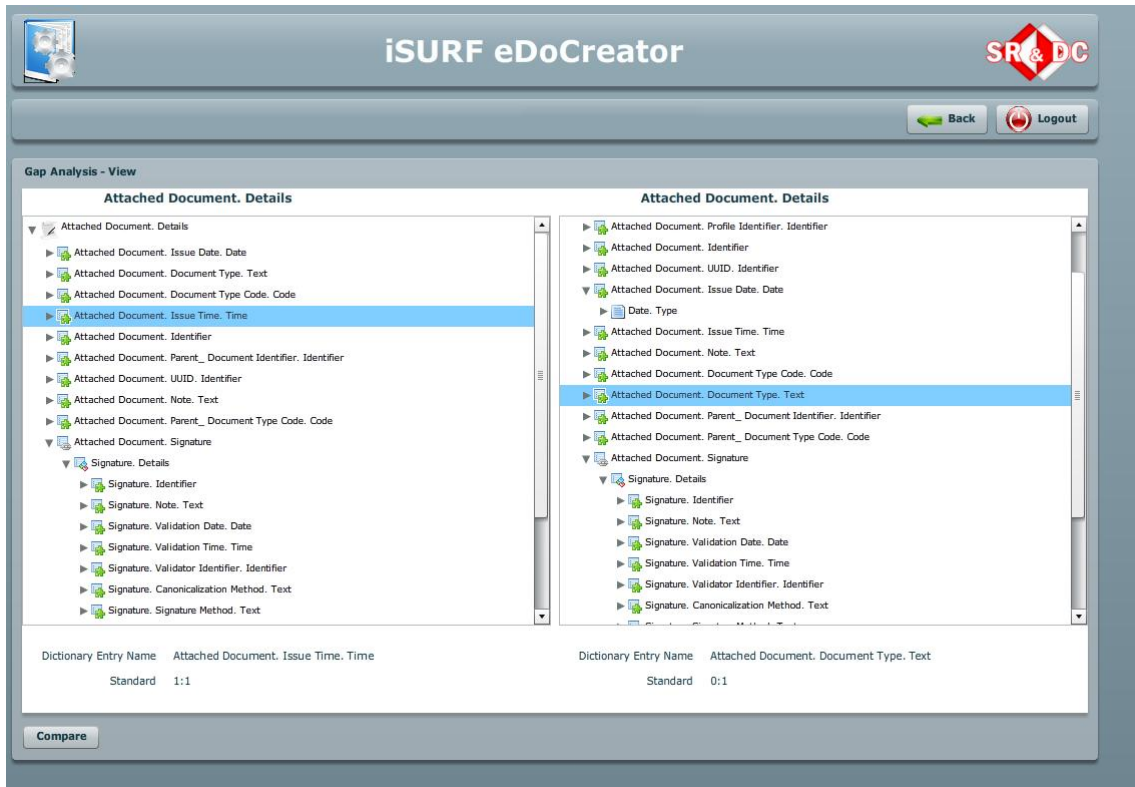


Figure 8 Gap Analysis View

When a user clicks on “Compare” button, the tool navigates over all document elements and identify the differences between two e-business document schema based on their cardinality values. As mentioned previously, there are four identified problem levels for cardinality values which may cause interoperability problems among document schemas. All four issue levels are indicated through colors in the Document Level Compare List as presented in Table 3.

Table 3 Color coding of the interoperability issues

	No issue
	Issue Level 1 - Multiple Cardinality versus Optional Cardinality
	Issue Level 2 - Optional Cardinality versus Excluded Element
	Issue Level 3 - Optional Cardinality versus Mandatory Cardinality
	Issue Level 4- Mandatory Cardinality versus Excluded Element

In addition to possible issues, the list also presents Dictionary Entry Names of document building blocks and their cardinality values.

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Gap Analysis - Document Level Issues

Dictionary Entry Name	First Document Usage	First Document Cardinality	Second Document Usage	Second Document Cardinality
Attached Document. Issue Date. Date	Mandatory	1:1	Mandatory	1:1
Attached Document. UBL Version Identifier. Identifier	Excluded	--	Optional - up to 1	0:1
Attached Document. Document Type. Text	Optional - up to 1	0:1	Optional - up to 1	0:1
Attached Document. Customization Identifier. Identifier	Excluded	--	Optional - up to 1	0:1
Attached Document. Document Type Code. Code	Optional - up to 1	0:1	Optional - up to 1	0:1
Attached Document. Profile Identifier. Identifier	Excluded	--	Optional - up to 1	0:1
Attached Document. Issue Time. Time	Mandatory	1:1	Optional - up to 1	0:1
Attached Document. Identifier	Mandatory	1:1	Mandatory	1:1
Attached Document. Parent_ Document Identifier. Identifier	Mandatory	1:1	Mandatory	1:1
Attached Document. UUID. Identifier	Optional - up to 1	0:1	Optional - up to 1	0:1
Attached Document. Note. Text	Optional - up to 1	0:1	Optional- unbounded	0:unbounded
Attached Document. Parent_ Document Type Code. Code	Optional - up to 1	0:1	Optional - up to 1	0:1
Attached Document. Signature	Optional- unbounded	0:unbounded	Optional- unbounded	0:unbounded
Attached Document. Sender_ Party. Party	Optional- unbounded	0:unbounded	Mandatory	1:1
Attached Document. Receiver_ Party. Party	Mandatory	1:1	Mandatory	1:1
Attached Document. Attachment	Mandatory	1:1	Mandatory	1:1
Attached Document. Issue Date. Date	Mandatory	1:1	Excluded	--
Attached Document. Document Type. Text	Optional - up to 1	0:1	Optional - up to 1	0:1
Attached Document. Document Type Code. Code	Optional - up to 1	0:1	Optional - up to 1	0:1
Attached Document. Profile Identifier. Identifier	Excluded	--	Optional - up to 1	0:1
Attached Document. Issue Time. Time	Mandatory	1:1	Optional - up to 1	0:1
Attached Document. Identifier	Mandatory	1:1	Mandatory	1:1

Get Component Level Issues

Figure 9 Gap Analysis Results at the Document Level

Furthermore, using a similar approach, the tool can visualize component level issues, which goes one level deeper and compares the properties of encapsulated Aggregate Business Information Entities as shown in Figure 10.

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Gap Analysis - Component Level Issues

Party. Details

Dictionary Entry Name	First Document Usage	First Document Cardinality	Second Document Usage	Second Document Cardinality
Party. Website_ URI. Identifier	Optional - up to 1	0:1	Optional - up to 1	0:1
Party. Party Name	Excluded	--	Optional- unbounded	0:unbounded
Party. Logo Reference. Identifier	Optional - up to 1	0:1	Optional - up to 1	0:1
Party. Language	Excluded	--	Optional - up to 1	0:1
Party. Mark Care_ Indicator. Indicator	Optional - up to 1	0:1	Optional - up to 1	0:1

Signature. Details

Dictionary Entry Name	First Document Usage	First Document Cardinality	Second Document Usage	Second Document Cardinality
Signature. Signatory_ Party. Party	Mandatory	1:1	Mandatory	1:1
Signature. Digital Signature_ Attachment	Optional - up to 1	0:1	Optional - up to 1	0:1
Signature. Original_ Document Referen	Optional - up to 1	0:1	Optional - up to 1	0:1
Signature. Identifier	Mandatory	1:1	Mandatory	1:1
Signature. Note. Text	Optional - up to 1	0:1	Optional - up to 1	0:1

Attachment. Details

Dictionary Entry Name	First Document Usage	First Document Cardinality	Second Document Usage	Second Document Cardinality
Attachment. External Reference	Optional - up to 1	0:1	Optional - up to 1	0:1
Attachment. Embedded_ Document. Bi	Optional - up to 1	0:1	Optional - up to 1	0:1

Get Component Level Issues

Figure 10 Gap Analysis Results at Component Level

7 CONCLUSIONS

In this document, the differences between UBLTR and NES are presented from business process and electronic document content perspectives. At the business process level, it seems the identified differences will not cause severe interoperability problems. The “NES Profile 4 - Basic Invoice Only” profile of NES is the same as “UBLTR Profile 2: Utility Billing” of UBLTR. On the other hand, the first steps of “NES Profile 7 - Simple Procurement” and “NES Profile 8 - Basic Billing with Dispute Response” are similar to “UBLTR Profile 1: Traditional Billing”.

At the business document content level, the elements that may cause problem are presented in Table 1 and Table 2. In order to better identify the problematic elements, we validated an example Invoice document that conforms to UBLTR with “NES Profile 4 - Basic Invoice Only” schemas. In order to successfully validate the invoice instance with NES, some elements are commented out and some new elements are inserted as shown in Table 4. The newly added elements are shown with bold characters, whereas commented out elements are within “<!-- -->” characters. As it is clear from Table 4, these changes must be made to establish interoperability between UBLTR and NES although both UBLTR and NES documents are UBL 2.0 conformant.

Table 4 UBLTR Invoice Instance Validated with NES Profile 4 - Basic Invoice Only

```
<Invoice xsi:schemaLocation="urn:oasis:names:specification:ubl:schema:xsd:Invoice-2 UBL-Invoice-2.0.xsd"
xmlns="urn:oasis:names:specification:ubl:schema:xsd:Invoice-2"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:cac="urn:oasis:names:specification:ubl:schema:xsd:CommonAggregateComponents-2"
xmlns:cbc="urn:oasis:names:specification:ubl:schema:xsd:CommonBasicComponents-2">
  <cbc:UBLVersionID>2.0</cbc:UBLVersionID>
  <cbc:CustomizationID>UBL-TR</cbc:CustomizationID>
  <cbc:ProfileID>UBL-TR-Profile-1</cbc:ProfileID>
  <cbc:ID>A123456</cbc:ID>
  <cbc:CopyIndicator>true</cbc:CopyIndicator>
  <!--cbc:UUID--></cbc:UUID-->
  <cbc:IssueDate>2008-01-02</cbc:IssueDate>
  <cbc:InvoiceTypeCode>SatisFaturasi</cbc:InvoiceTypeCode>
  <cbc:DocumentCurrencyCode>TRL</cbc:DocumentCurrencyCode>
  <!--cbc:LineCountNumeric>1.0</cbc:LineCountNumeric-->
  <cac:Signature>
    <cbc:ID/>
    <cac:SignatoryParty>
      <cbc:WebsiteURI/>
      <cac:PartyIdentification>
        <cbc:ID/>
      </cac:PartyIdentification>
      <cac:PartyName>
        <cbc:Name></cbc:Name>
      </cac:PartyName>
      <!--cac:PostalAddress>
        <cac:AddressLine>
          <cbc:Line/>
        </cac:AddressLine>
        <cac:Country>
          <cbc:Name/>
        </cac:Country>
      </cac:PostalAddress-->
    </cac:SignatoryParty>
  </cac:Signature>
</Invoice>
```

```

</cac:Signature>
<cac:AccountingSupplierParty>
  <cac:Party>
    <cbc:WebsiteURI>www.satıcı.com</cbc:WebsiteURI>
    <cac:PartyIdentification>
      <cbc:ID schemeID="VKN">1234567890</cbc:ID>
    </cac:PartyIdentification>
    <cac:PartyName>
      <cbc:Name>SATICI A.Ş.</cbc:Name>
    </cac:PartyName>
    <cac:PostalAddress>
      <cac:AddressLine>
        <cbc:Line>Atatürk Cad. 06000 ANKARA</cbc:Line>
      </cac:AddressLine>
      <cac:Country>
        <cbc:IdentificationCode>TR</cbc:IdentificationCode>
        <!--cbc:Name>Türkiye</cbc:Name-->
      </cac:Country>
    </cac:PostalAddress>
    <cac:PartyTaxScheme>
      <cac:TaxScheme>
        <cbc:ID</cbc:ID>
        <!--cac:JurisdictionRegionAddress>
          <cac:AddressLine>
            <cbc:Line>BüyükMükellefler</cbc:Line>
          </cac:AddressLine>
          <cac:Country>
            <cbc:IdentificationCode>TR</cbc:IdentificationCode>
            <cbc:Name>Türkiye</cbc:Name>
          </cac:Country>
        </cac:JurisdictionRegionAddress-->
      </cac:TaxScheme>
    </cac:PartyTaxScheme>
    <cac:Contact>
      <cbc:Telephone>(0312)1234567</cbc:Telephone>
      <cbc:Telefax>(0312)1234568</cbc:Telefax>
      <cbc:ElectronicMail>satıcı@satıcı.com</cbc:ElectronicMail>
    </cac:Contact>
  </cac:Party>
</cac:AccountingSupplierParty>
<cac:AccountingCustomerParty>
  <cac:Party>
    <cbc:WebsiteURI>www.alıcı.com</cbc:WebsiteURI>
    <cac:PartyIdentification>
      <cbc:ID schemeID="VKN">1234567891</cbc:ID>
    </cac:PartyIdentification>
    <cac:PartyName>
      <cbc:Name>ALICI LTD. ŞTİ.</cbc:Name>
    </cac:PartyName>
    <cac:PostalAddress>
      <cac:AddressLine>
        <cbc:Line>Mustafa Kemal Cad. 06000 ANKARA</cbc:Line>
      </cac:AddressLine>
      <cac:Country>
        <cbc:IdentificationCode>TR</cbc:IdentificationCode>
        <!--cbc:Name>Türkiye</cbc:Name-->
      </cac:Country>
    </cac:PostalAddress>
  </cac:Party>
</cac:AccountingCustomerParty>

```

```

<cac:PartyTaxScheme>
  <cac:TaxScheme>
    <cbc:ID></cbc:ID>
    <!--cac:JurisdictionRegionAddress>
      <cac:AddressLine>
        <cbc:Line>BüyükMükellefler</cbc:Line>
      </cac:AddressLine>
      <cac:Country>
</cac:Country>
<cbc:IdentificationCode>TR</cbc:IdentificationCode>
      <cbc:Name>Türkiye</cbc:Name>
      </cac:Country>
    </cac:JurisdictionRegionAddress-->
  </cac:TaxScheme>
</cac:PartyTaxScheme>
<cac:Contact>
  <cbc:Telephone>(0312)1234569</cbc:Telephone>
  <cbc:Telefax>(0312)1234560</cbc:Telefax>
  <cbc:ElectronicMail>alici@alici.com</cbc:ElectronicMail>
</cac:Contact>
</cac:Party>
</cac:AccountingCustomerParty>
<cac:PaymentMeans>
  <cbc:PaymentMeansCode>42</cbc:PaymentMeansCode>
  <cbc:PaymentDueDate>2009-08-12</cbc:PaymentDueDate>
  <!--cbc:PaymentChannelCode>BANKA</cbc:PaymentChannelCode-->
  <!--cac:PayeeFinancialAccount>
    <cbc:ID>BBB Bankası Ank. CCC Şb. 00000001-0001</cbc:ID>
    <cbc:CurrencyCode>TRL</cbc:CurrencyCode>
  </cac:PayeeFinancialAccount-->
</cac:PaymentMeans>
<cac:PaymentTerms>
  <cbc:Note>30 GÜN VADELİ</cbc:Note>
</cac:PaymentTerms>
<cac:TaxTotal>
  <cbc:TaxAmount currencyID="TRL">329.24</cbc:TaxAmount>
  <cac:TaxSubtotal>
    <cbc:TaxableAmount currencyID="TRL">1829.10</cbc:TaxableAmount>
    <cbc:TaxAmount currencyID="TRL">329.24</cbc:TaxAmount>
    <cbc:TransactionCurrencyTaxAmount
currencyID="TRL">0.0</cbc:TransactionCurrencyTaxAmount>
    <!--cbc:Percent>18.0</cbc:Percent-->
    <cac:TaxCategory>
      <cbc:ID></cbc:ID>
      <cac:TaxScheme>
        <cbc:ID></cbc:ID>
        <cbc:TaxTypeCode>KDV</cbc:TaxTypeCode>
      </cac:TaxScheme>
    </cac:TaxCategory>
  </cac:TaxSubtotal>
</cac:TaxTotal>
<cac:LegalMonetaryTotal>
  <cbc:LineExtensionAmount currencyID="TRL">1829.10</cbc:LineExtensionAmount>
  <cbc:TaxExclusiveAmount currencyID="TRL">1829.10</cbc:TaxExclusiveAmount>
  <cbc:TaxInclusiveAmount currencyID="TRL">2158.34</cbc:TaxInclusiveAmount>
  <cbc:PayableRoundingAmount currencyID="TRL">0</cbc:PayableRoundingAmount>
  <cbc:PayableAmount currencyID="TRL">2158.34</cbc:PayableAmount>
</cac:LegalMonetaryTotal>
</cac:InvoiceLine>

```

```
<cbc:ID>1</cbc:ID>
<cbc:InvoicedQuantity unitCode="NIU">30</cbc:InvoicedQuantity>
<cbc:LineExtensionAmount currencyID="TRL">1829.10</cbc:LineExtensionAmount>
<cac:Item>
  <cbc:Name>Ürün 1</cbc:Name>
  <cac:SellereItemIdentification>
    <cbc:ID>P/N:000000000001</cbc:ID>
  </cac:SellereItemIdentification>
</cac:Item>
<cac:Price>
  <cbc:PriceAmount currencyID="TRL">60.97</cbc:PriceAmount>
</cac:Price>
</cac:InvoiceLine>
</Invoice>
```