SAT

For e-Procurement invoicing

[EIRA extension]

e-Procurement invoicing Solution Architecture Template (SAT)

Change control

Table 1-1

Modification	Details
Version 1.0.0 beta	
Initial version	

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1 INTRODUCTION

This document contains the description for a Solution Architecture Document (SAT) for the e-Procurement *invoicing* business capability.

This SAT is based on EIRA*v2.0.0,* which is aligned with ArchiMate® *3.0.*

The ArchiMate source are embedded in this document in the "Archi format" as well as in "The Open Group ArchiMate Model Exchange File Format".

SAT e-Procurement invoicing v1.0.0 beta

SAT e-Procurement invoicing v1.0.0 beta

1.1 Purpose of this document

Enterprise and Solution architects can use this document to design solution architectures in the domain of e-Procurement invoicing business capability.

1.2 List of acronyms used in this document

Table 1-1

ABB	Architecture Building Block
BII	Business Interoperability Interfaces
CA	Contracting Authority
CEF	Connecting Europe Facility
CEN	Comité Européen de Normalisation (European Committee for Standardization)
CEN TC 440	CEN Technical Committee 440 – Electronic Public Procurement
EIRA	European Interoperability Reference Architecture
EO	Economic Operator(s)
GDPR	General Data Protection Regulation
HI	Human Interface
IES	Interoperable European Solution
ISA²	Interoperability solutions for public administrations, businesses and citizens
MMI	Machine to Machine Interface
SAT	Solution Architecture Template
SBB	Solution Building Block
TR	Technical Report

TS	Technical Specification
UBL	Universal Business Language

2 GOAL, DESCRIPTION AND TARGET AUDIENCE

This chapter gives the goals and a description on e-Procurement invoicing business capability and indicates the target audience and their potential use of this Solution Architecture Template (SAT).

2.1 Goal

The purpose of this SAT is to provide guidance by defining a minimal, but holistic (legal, organisational, semantic and technical) interoperability architecture in the domain of e-Procurement invoicing business capability. This SAT should allow businesses, citizens and public administrations to have a common understanding of the most-salient building blocks.

2.2 What is e-Procurement invoicing business capability?

The invoicing business capability of e-Procurement concerns the exchange of an electronic invoice document between a supplier and a buyer. An electronic invoice (eInvoice) is an invoice that has been issued, transmitted and received in a structured electronic format which allows for its automatic and electronic processing, as defined in Directive 2014/55/EU.

A structured electronic invoice contains data from the supplier in a machine-readable format that can be imported into the buyer's Account Payable (AP) system without requiring manual entering.

When comparing eInvoices to paper invoices it is useful to note that paper invoices have three characteristics that are so integrated that we typically do not notice that they can be separated. Paper invoices:

- Contain data details such as amounts, descriptions and quantities
- Render that data in a visual format, on printed paper, that can be manually read
- Have a physical form that allows them to be manually handled, exchanged and archived.

Digital images, pdf's and other visual digital forms of invoices remove the physical element and allow the invoices to be handled and archived in a more efficient way than paper. These formats however still require the invoice to be manually viewed and their data to be manually read and entered into AP systems.

eInvoices contain the core data in a structured form and can be automatically imported into AP systems. They do not include a visual presentation of the invoice data although they can be temporarily rendered during processing or transposed into visual formats. For eInvoices the visual format is secondary and the objective in automation is not to only view the invoice, except in irregular cases.

The standard for electronic invoices, EN16931, defines the structure of an eInvoice and various options exist for the transfer of the invoice.

2.3 What is a solution architecture template (SAT)

A Solution Architecture Template (SAT) is a specification extending the EIRA providing support to solution architects in a specific solution domain. An SAT contains a motivation (principles, requirements), a goal and a description of the supported functionalities, a sub-set of the EIRA core Architecture Building Blocks (ABBs) covering the four views, a set of specific ABBs extending EIRA's views enabling specific functionalities to be provided by implementations derived from the SAT and the interoperability specifications of selected ABBs and a narrative for each EIRA view.

The benefits of a SAT are the following:

- Provides architects with a common approach to cope with a specific interoperability challenge. It also places the focus on the key-points you need to consider.
- A solution architect can create a solution architecture by mapping existing Solution Building Blocks (SBBs) to an SAT, based on the interoperability specifications that are provided. This is done by providing SBBs for the ABBs identified in the SAT.
- When an architect creates an SAT, he/she can define the interoperability specifications for the SAT's ABBs and moreover recommend specific SBBs which produces faster and more interoperable results.
- An SAT can be created within and across the different views of the EIRA. An SAT can then support architects specialised in different interoperability levels.

2.4 Target audience

This document has the following target audience:

Table 2-1

| Audience	Description
Solution Architect	Solution architects in the need of understanding, implementing, or describing an e-Procurement invoicing solution
Policy maker	Policy makers studying the implications due to policy changes in the area of e-Procurement, invoicing part
Public Administration / Members States	Public Administrations of the European Union that need to have a holistic view of the e-Procurement, invoicing part interoperability architecture

3 e-PROCUREMENT INVOICING INTEROPERABILITY MAPPED TO THE EIRA

This chapter contains for each EIRA view the corresponding ArchiMate model and narrative. Next to the SAT's EIRA architecture building blocks, the ArchiMate model includes, where applicable, the related specifications, principles and requirements.

The models have been scaled down to fit with the text, they are included in bigger format in the appendix.

3.1 ArchiMate Motivation extension

The following specific requirement complements the general ones specified in the e-Procurement core SAT and must be respected by the e-Procurement invoicing solution.
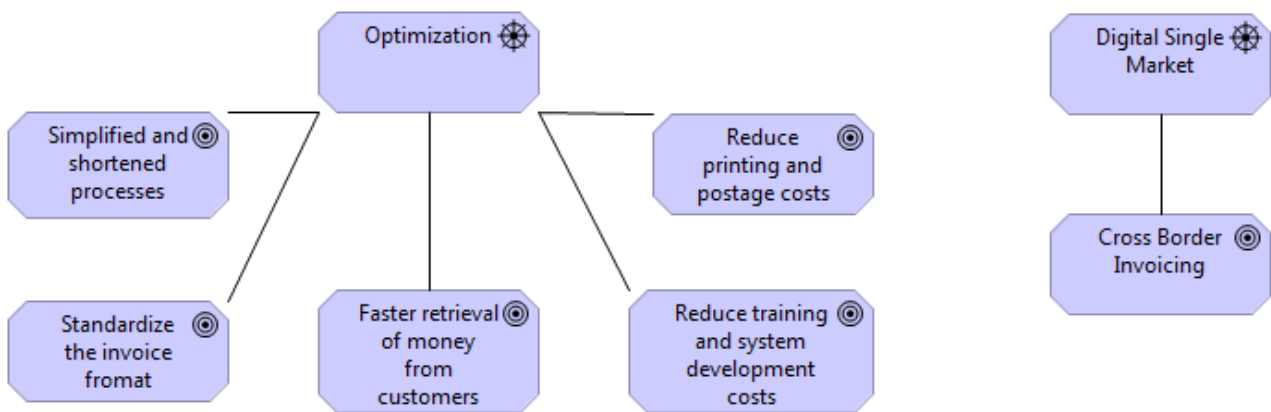
Drivers:

- Optimization driver: Compared to paper invoices, eInvoices are easier to process, they reach the customer faster and can be stored centrally at very low cost. A report[1] predicts potential annual benefits of up to €40 billion across Europe in the business-to-business field alone.

- Digital single market[2] driver: The internet and digital technologies are transforming our world. But existing barriers online mean citizens miss out on goods and services, internet companies and start-ups have their horizons limited, and businesses and governments cannot fully benefit from digital tools. It's time to make the EU's single market fit for the digital age – tearing down regulatory walls and moving from 28 national markets to a single one. This could contribute €415 billion per year to our economy and create hundreds of thousands of new jobs.

Goals:

- Faster retrieval of money from customers goal: reducing the time an invoice or payment is in the post

- Reduce printing and postage costs goal: replacing the physical paper form with a digital form allows the invoice to be handled and archived more efficiently. This provides significant savings in printing, postage, intra office routing and archiving. These benefits

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[1] http://ec.europa.eu/internal_market/payments/docs/sepa/sepa-capgemini_study-final_report_en.pdf
[2] https://ec.europa.eu/commission/priorities/digital-single-market_en

can be achieved with digital images of the invoice, such as pdf's, as well as with eInvoices.

- Reduce training and system development costs goal: Introducing standards for e-Procurement invoicing leads to a common knowledge and thus reduce the learning curve of both the users and developers involved in e-Procurement invoicing systems, reducing, as consequence, the total cost of the system.

- Standardize the invoice format goal: Adopting a standard format insure quality and liability and allows reusability and interoperability.

- Simplified and shortened processes goal: Complex invoicing processes causes unnecessary costs for public administration. Optimization of those processes will reduce those costs.

- Cross Border Invoicing goal: Allowing cross border invoicing in the EU is an enabler for a Digital Single Market.

3.2 How to use this SAT

The present SAT is specifically related to the invoicing business capability of e-Procurement. The present document has to be used in complement to the SAT related to e-Procurement.

Indeed:

- The e-Procurement core SAT focuses on the architecture that is common to all e-Procurement business capabilities.

- The present e-Procurement invoicing SAT addresses the architecture that is specific to the invoicing business capability.

Said in other words, the e-Procurement core SAT provides the foundation for the core e-Procurement, while the present SAT complements it by addressing the e-Procurement invoicing specificities.

A solution architect that uses the two Solution Architecture Templates typically wants to perform a gap-analysis between an existing solution and these SATs, or he/she wants to model a solution in the domain of e-Procurement invoicing and uses the two SATs as guidance.

3.2.1 e-Procurement invoicing Gap Analysis use case

Using the two *e-Procurement core* and *e-Procurement invoicing* SATs for gap analysis, the solution architect can map the building blocks of the solution to the ones in the two SATs and identify which building blocks are missing. These building blocks can either indicate missing functionality or missing interoperability specifications.

3.2.2 e-Procurement invoicing Building a solution architecture use case

When building a solution architecture, the solution architect is expected to use the four different EIRA views in the two *e-Procurement core* and *e-Procurement invoicing* SATs and provide a solution in the form of Solution Building Blocks (SBBs) for the Architecture Building Blocks (ABBs) that are indicated. This is done by replacing the Architecture Building Block (ABB) with an annotated Solution Building Block (SBB). The existing Solution Building Blocks in the two SATs should not be removed and replaced. However, the acknowledgement of reusing these building blocks can be done by removing the ABBs which they specialise.

Interoperability Specifications (IoP specs) are added as specialisation of an Interoperability ABB, implemented in the form of an SBB and attached to an ABB as interoperability requirements. The final solution should only contain the implementation (the SBB) of the IoP Spec
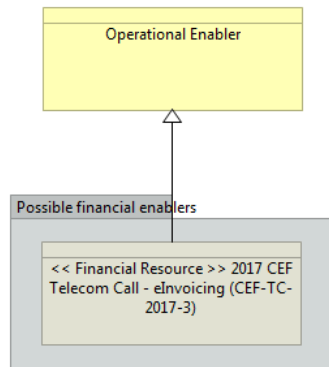
The result will be a solution architecture that will contain only SBBs, all ABBs should have been removed (in the case this SAT already provides SBBs for this ABB) or replaced by SBBs (solutions that implement that ABB).

> The SAT is a document describing the needed Architecture Building Blocks for a desired solution. This should not be taken as restrictive but as advisory. When an Architecture Building Block (ABB) is present for which there is no implementation foreseen in the form of a Solution Building Block (SBB), it is *strongly* recommended, but not mandatory, to take this ABB into consideration in the final solution.
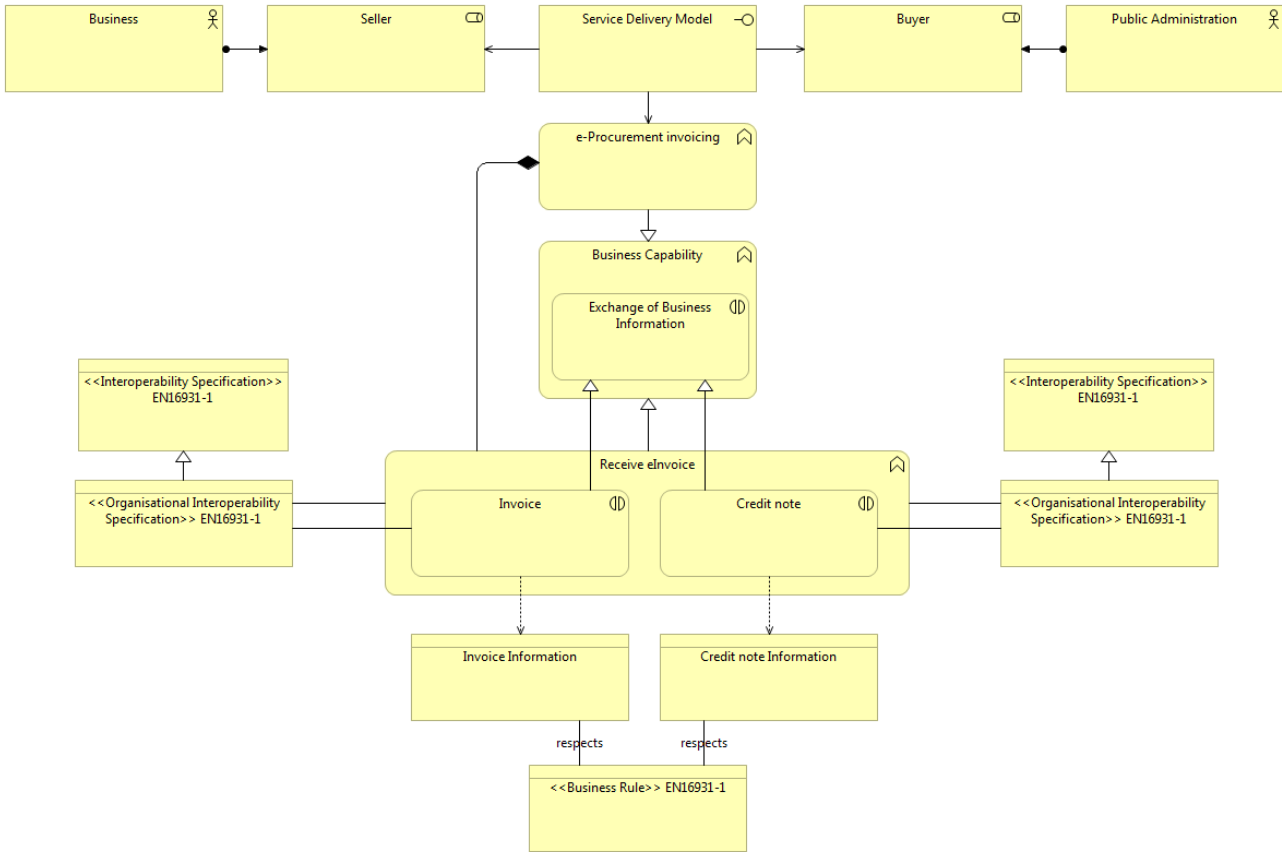
3.3 e-Procurement invoicing Legal View

The core Legal View specified in the e-Procurement core SAT applies. In addition, there is one supplementary building block in this specific e-Procurement invoicing Legal View in comparison with the e-Procurement core Legal View provided in the e-Procurement core SAT: the SBB 2017 2017 CEF Telecom Call - eInvoicing (CEF-TC-2017-3): up to €10 million is foreseen for grants managed by the Innovation and Networks Executive Agency (INEA) for the set-up, upgrade and deployment of e-Procurement invoicing solutions[3].

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[3]Source:https://ec.europa.eu/inea/en/connecting-europe-facility/cef-telecom/apply-funding/2017-cef-telecom-call-einvoicing-cef-tc-2017-3

3.4 e-Procurement invoicing Organisational View

The Organisational view for the e-Procurement invoicing business capability consists in the following sub-set of EIRA Architecture Building Blocks (ABBs) as well as a number of predefined Solution Building Blocks (SBBs):

The e-Procurement invoicing Business Capability is provided by the Buyer to the Seller through a Service Delivery Model and is made up of the Receive eInvoice Business capability, composed of the following Exchanges of Business Information, both having their specification defined in the CEN EN16931-1 specification:

- The Invoice exchange of Business Information, accessing Invoice Information.

- The Credit Note exchange of Business Information, accessing Credit Note Information.

The CEN EN16931-1 specification, part 1 of the CEN EN16931 specification, is a European Standard that establishes a semantic data model of the core elements of an electronic invoice. The semantic model includes only the essential information elements that an electronic invoice needs to ensure legal (including fiscal) compliance and to enable interoperability for cross-border, cross sector and for domestic trade. The semantic model may be used by organizations in the private and the public sector for public procurement invoicing. It may also be used for invoicing between private sector enterprises. It has not been specifically designed for invoicing consumers. This European Standard complies at least with the following criteria:

- It is technologically neutral;

- It is compatible with relevant international standards on electronic invoicing;

- The application of this standard should comply with the requirements for the protection of personal data of Directive 95/46/EC, having due regard to the principles of privacy and

data protection by-design, data minimization, purpose limitation, necessity and proportionality;

- It is consistent with the relevant provisions of Directive 2006/112/EC;

- It allows for the establishment of practical, user-friendly, flexible and cost-efficient electronic invoicing systems;

- It takes into account the special needs of small and medium-sized enterprises as well as of sub-central contracting authorities and contracting entities;

- It is suitable for use in commercial transactions between enterprises.

3.5 e-Procurement invoicing Semantic View

The Semantic view of this SAT consists of the following sub-set of EIRA Architecture Building Blocks (ABBs) as well as a number of predefined Solution Building Blocks (SBBs):
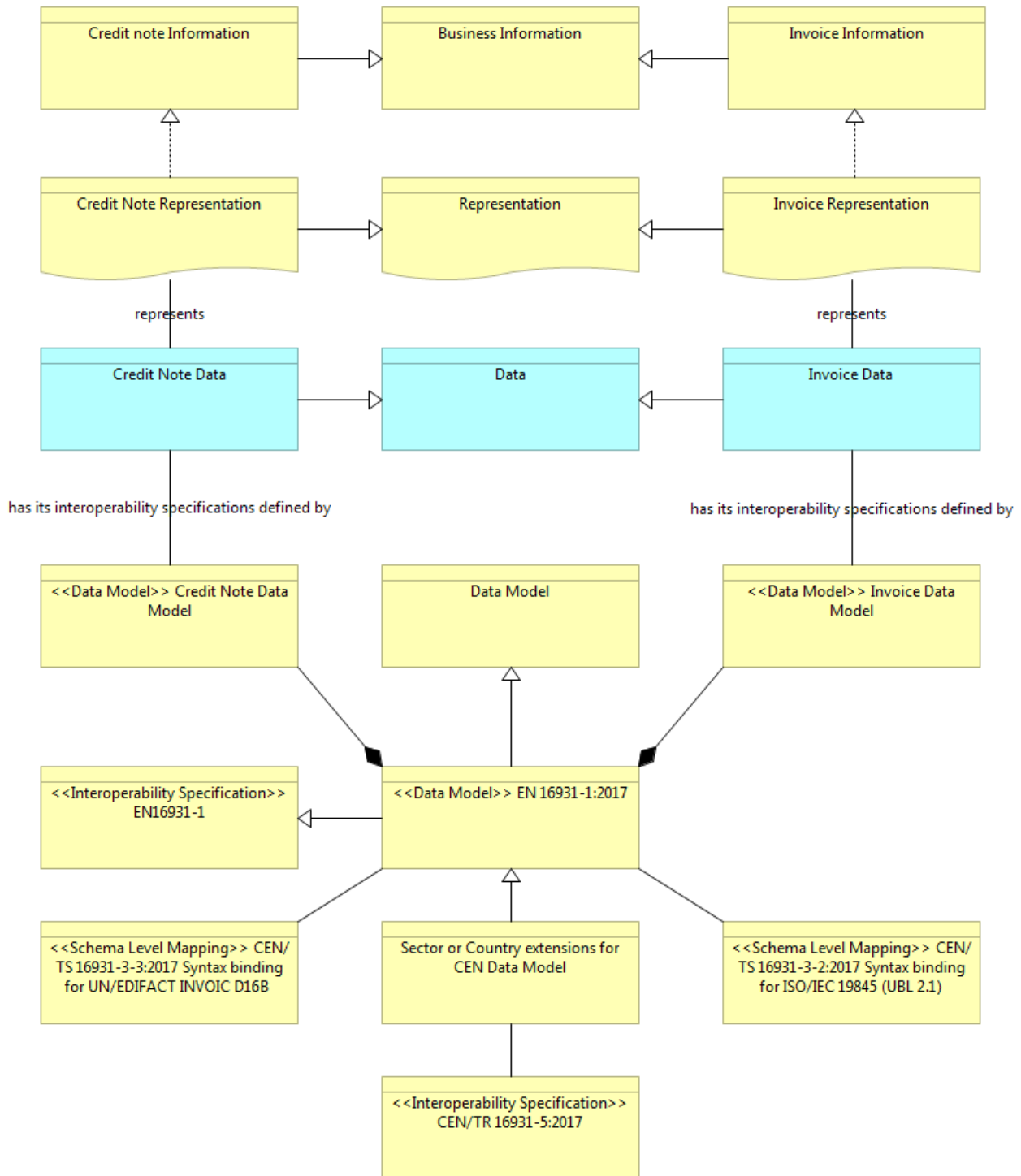
The Credit Note Information is realized by a Credit Note Representation representing the Credit Note Data. In the same way, the Invoice Information is realized by an Invoice Representation representing the Invoice Data.

Both Credit Note Data and Invoice Data should comply with respectively the Credit Note Data Model and Invoice Data Model, parts of the CEN EN16931-1-2017 specification.

As those data are subject to customization to comply with country or sector needs, CEN released the CEN/TR 16931-5:2017 technical report. This Technical Report (TR) describes how trading partners may extend the core invoice model and the related business rules and code lists, in order to support business cases that are specific to their trading environment, while at the same time maintaining semantic interoperability with the core invoice model. This Technical Report does not define a methodology for creation of core invoice usage specification, nor does it describe the detailed process of syntax binding.

Also, CEN specifications do not enforce any specification on the representation of the data but provide a methodology for syntax bindings of the core elements of an electronic invoice.
The CEN/TS 16931-3-3:2017 Syntax binding for UN/EDIFACT INVOIC D16B and CEN/TS 16931-3-2:2017 Syntax binding for ISO/IEC 19845 (UBL 2.1) Technical Specifications (TS) specify the methodology of the mapping between the semantic model of an electronic invoice, included in EN 16931-1 and a syntax to respectively UN/EDIFCAT and ISO/IEC 19845 (UBL2.1). For each element in the semantic model (including sub-elements or supplementary components such as Identification scheme identifiers) it should be defined which element in the syntax is to be used to contain its information contents. Any mismatches between semantics, format, cardinality or structure are indicated.

3.6 e-Procurement invoicing Technical View – Application

There are 3 supplementary building blocks in this specific e-Procurement invoicing Technical View – Application in comparison with the e-Procurement core Technical View – Application provided in the e-Procurement core SAT. The core Technical View – Application specified in the e-Procurement core SAT applies.

The 3 supplementary building blocks are:

- The *Test Service*
- The *GITB Test Bed* Test Component
- The CEN/TR 16931-4:2017 Operational Procedure

These building blocks are further detailed here after.
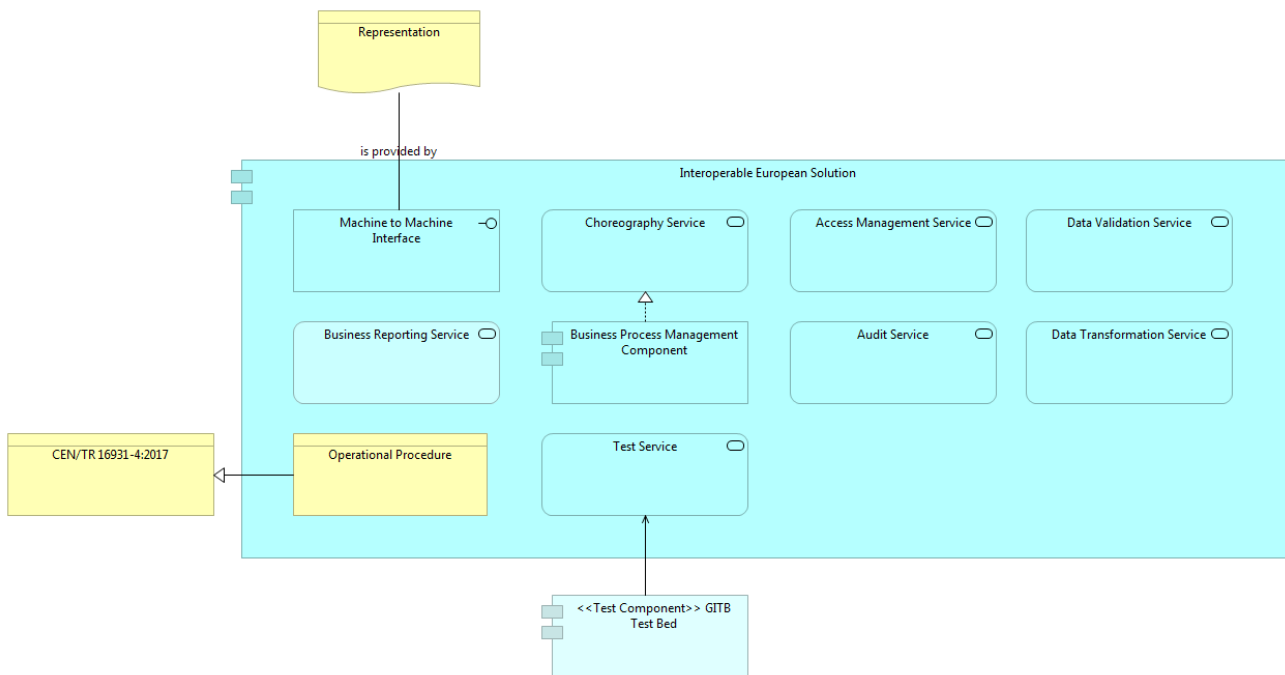
The Interoperable European Solution (IES) should provide a Machine to Machine Interface (MMI) to exchange data with the Portal of the Buyer. The Human Interface (HI) and the Machine to Machine Interface (MMI) render the Transactional Data using the Representations in the specific Semantic View shown in the previous paragraph of the present document.

The IES should also provide a Choreography Service implemented by a Business Process Management Component that manages the choreographies.

The IES should also provide the following services:

- Access Management Service, in order to grant authorised users the right to use a service, while preventing access to non-authorised users.

- Audit Service, in order to provide support for the principle of accountability, which is holding users of a system accountable for their actions within the system, and detection of policy violations.

- Data Validation Service, in order to validate data against predefined semantic and syntactic constraints.

- Data Transformation Service, in order to convert data, including the conversion from one data format to another.

- Business Reporting Service, in order to provide reports using unified views of the data.

- Operational Procedure, in order to define the process of operating the IES, how the procedures are implemented and the rules for operating it. As part of the CEN EN16931 specification, CEN provides the CEN/TR 16931-4:2017 Technical Report. These guidelines take into account the following aspects:

    o recommending best practices for use at the transmission level;

    o supporting interoperability between all the parties and systems that need to interact and within the various operating models in common use;

    o ensuring a level playing field for the various operating models and bi-lateral implementations and for the use of existing and future infrastructures, which support e-Invoicing;

    o promoting a common terminology and non-proprietary standards for transmission and related areas;

    o ensuring the authenticity of origin and integrity of electronic invoice content;

    o providing guidance on data protection, on the enablement of format conversion, and on e-invoice legibility, including the use of a readable visual presentations, as required;

    o providing guidance for identification, addressing and routing;

    o identifying requirements for robust legal frameworks and governance arrangements;

    o recognizing the roles of trading parties, solution and service providers and related infrastructure providers.

- Test Service, in order to, at least, validate the conformity of the exchanged messages. To support the member states the ISA² of the EC developed a Test bed, available in the cloud, the *GITB Test Bed*. This Test Bed allows users to execute predefined test cases on their systems. Test results are provided in a standardised, machine-readable format. The Test Bed also offers a test registry and repository to store test artefacts (assertions, test cases, validation schemas, etc.) and compile test services (validation services, simulator services, etc.). In the test registry and repository, validation scenario for e-Procurement invoicing are available.

3.7 e-Procurement invoicing Technical View – Infrastructure

There is no supplementary building block in this specific e-Procurement invoicing Technical View – Infrastructure in comparison with the e-Procurement core Tec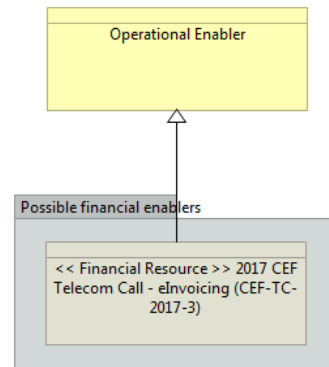hnical View – Infrastructure provided in the e-Procurement core SAT. The core Technical View – Infrastructure specified in the e-Procurement core SAT applies.

> There is no supplementary building block in this specific e-Procurement invoicing Technical View – Infrastructure in comparison with the e-Procurement core Technical View – Infrastructure provided in the e-Procurement SAT.

4 REFERENCES

The references listed in the e-Procurement core SAT apply.

5 ACKNOWLEDGEMENTS

The creation of this SAT was made possible with the help of CEN Technical Committee 440 – Electronic Public Procurement. We would like to thank the following people for their input (alphabetical order):
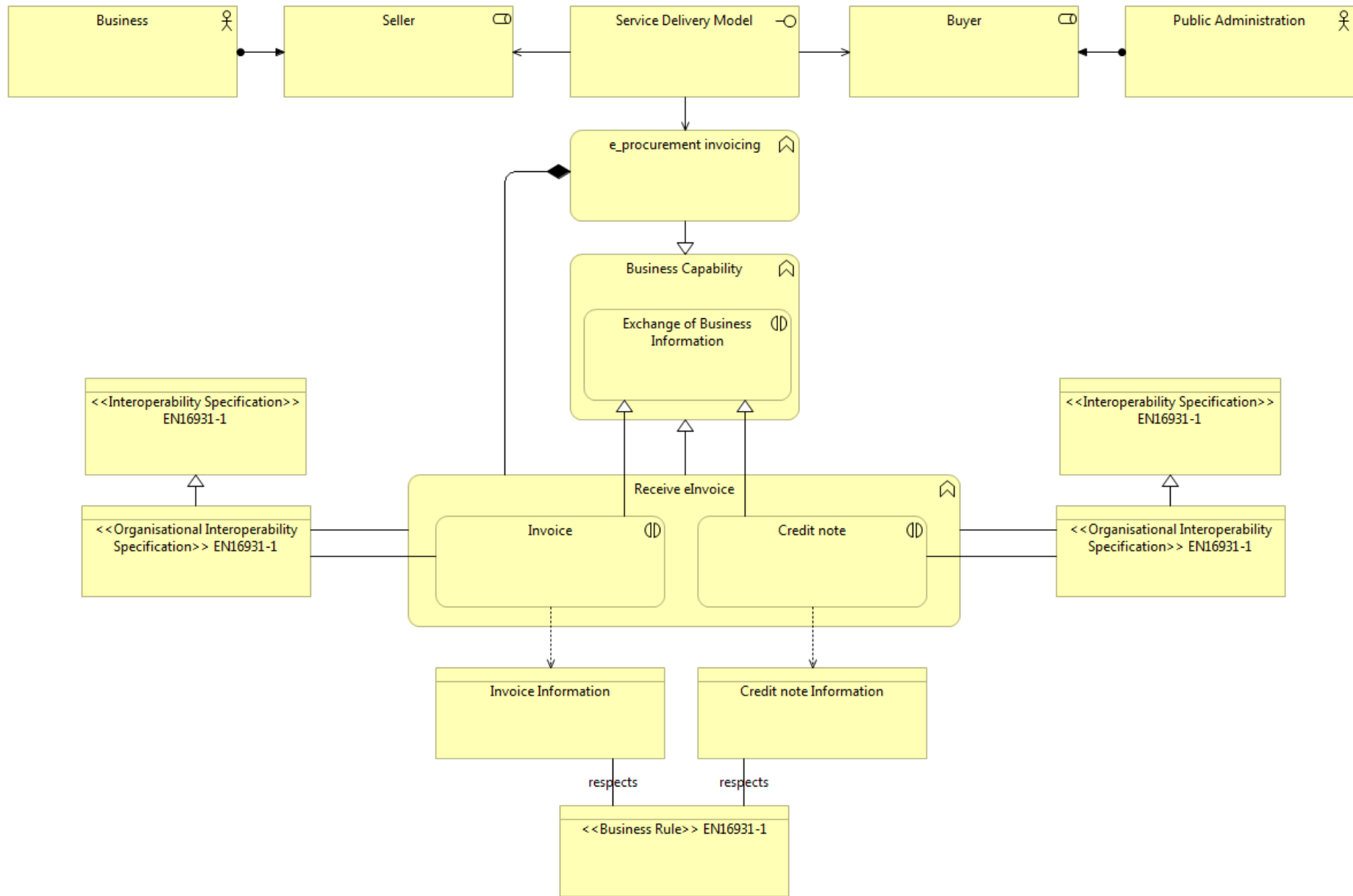
- APOLOZAN Liviu
- BLOMMESTEIN Fred
- DRIJFHOUT Kornelis
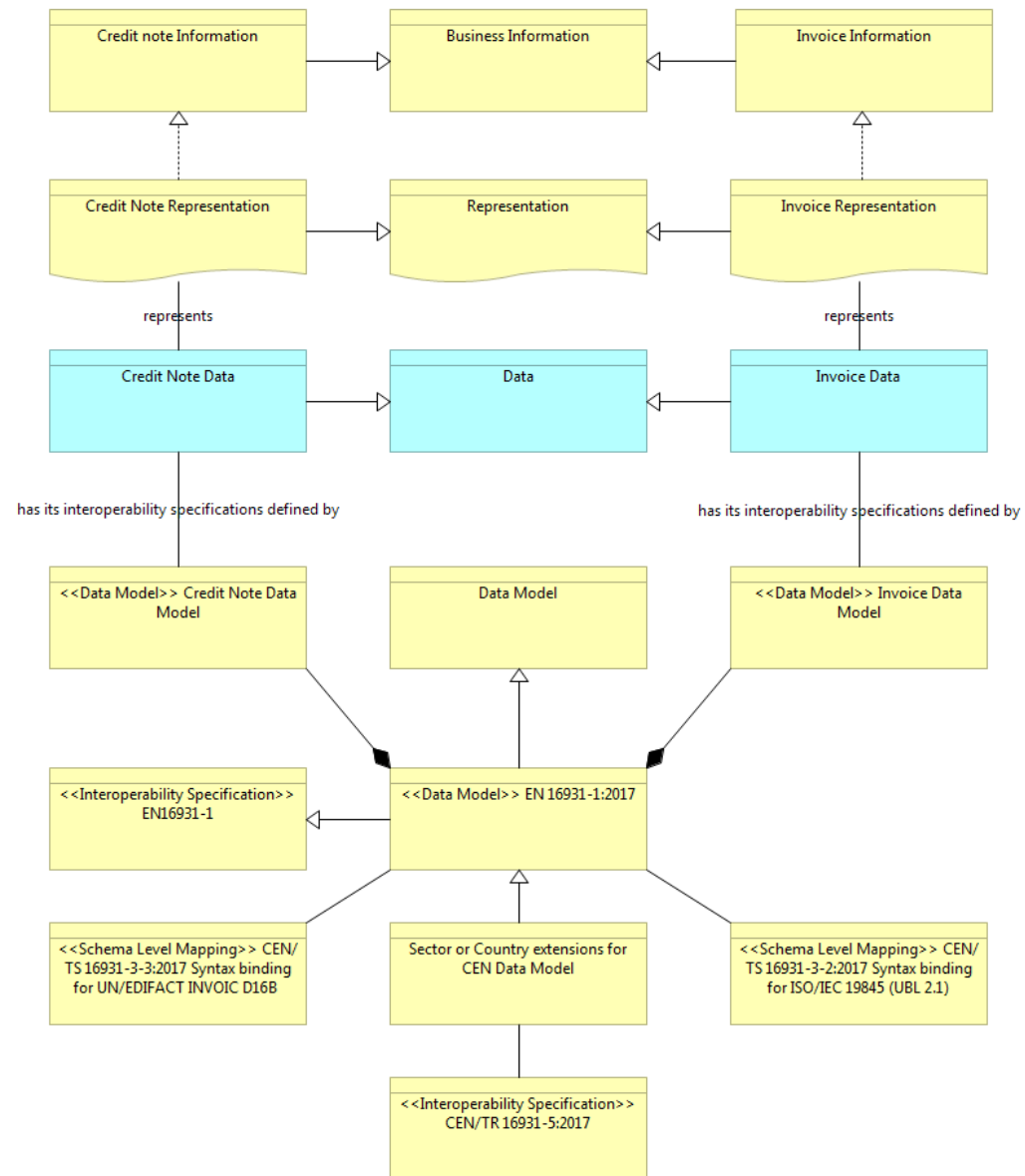- FROMYR Jostein
- GUASCH Cécile

6 APPENDIX: LEGAL VIEW

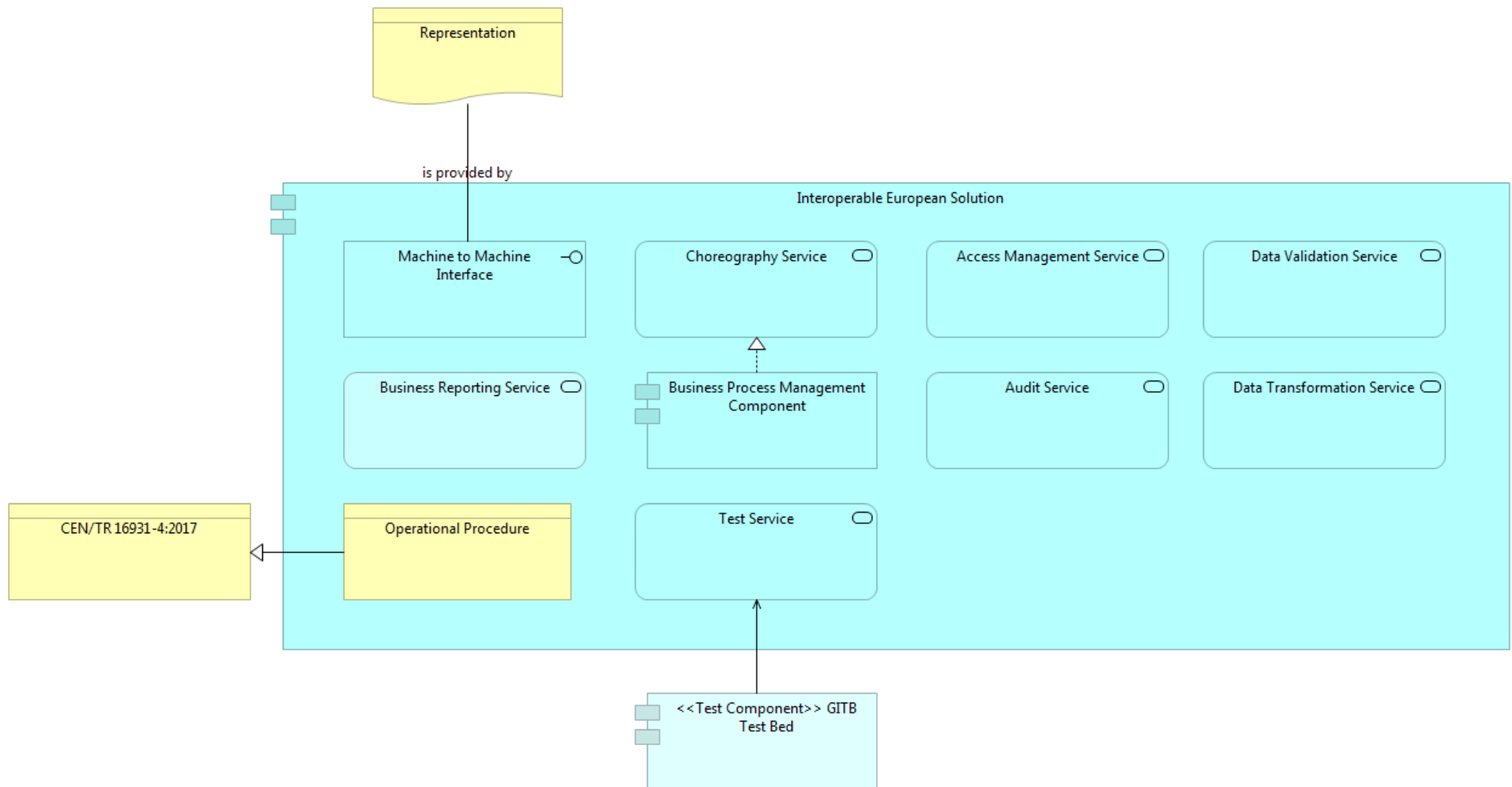# 7 APPENDIX: ORGANISATIONAL VIEW
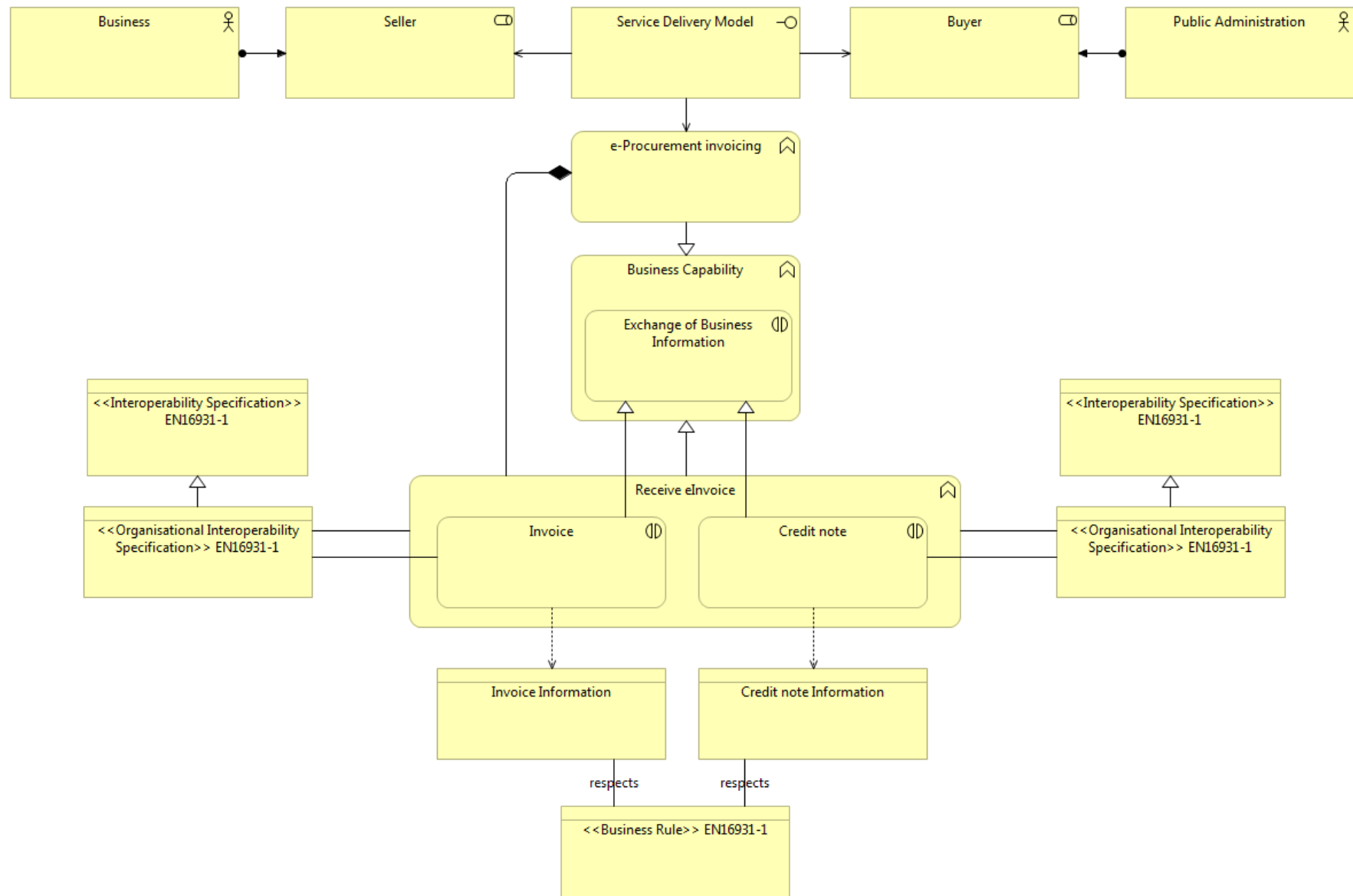
8 APPENDIX: SEMANTIC VIEW

9 APPENDIX: TECHNICAL VIEW – APPLICATION

10 APPENDIX: TECHNICAL VIEW – INFRASTRUCTURE

There is no supplementary building block in this specific e-Procurement invoicing Technical View – Infrastructure in comparison with the e-Procurement core Technical View – Infrastructure provided in the e-Procurement SAT.