MEF

1

2

3 # MEF 134

4

5

6
7 # Billing and Invoice Invoice Business Requirements and Use Cases

8

9

10 # October 2022

11 EXPORT CONTROL: This document contains technical data. The download, export, reexport or disclosure
12 of the technical data contained in this document may be restricted by applicable U.S. or foreign export
13 laws, regulations and rules and/or applicable U.S. or foreign sanctions ("Export Control Laws or Sanc-
14 tions"). You agree that you are solely responsible for determining whether any Export Control Laws or
15 Sanctions may apply to your download, export, reexport or disclosure of this document, and for obtaining
16 (if available) any required U.S. or foreign export or reexport licenses and/or other required authorizations.

17

18

19 Disclaimer

20 © MEF Forum 2022. All Rights Reserved.

21 The information in this publication is freely available for reproduction and use by any recipient
22 and is believed to be accurate as of its publication date. Such information is subject to change
23 without notice and MEF Forum (MEF) is not responsible for any errors. MEF does not assume
24 responsibility to update or correct any information in this publication. No representation or war-
25 ranty, expressed or implied, is made by MEF concerning the completeness, accuracy, or applica-
26 bility of any information contained herein and no liability of any kind shall be assumed by MEF
27 as a result of reliance upon such information.

28 The information contained herein is intended to be used without modification by the recipient or
29 user of this document. MEF is not responsible or liable for any modifications to this document
30 made by any other party.

31 The receipt or any use of this document or its contents does not in any way create, by implication
32 or otherwise:

33   a) any express or implied license or right to or under any patent, copyright, trademark or
34   trade secret rights held or claimed by any MEF member which are or may be associated
35   with the ideas, techniques, concepts or expressions contained herein; nor

36   b) any warranty or representation that any MEF members will announce any product(s)
37   and/or service(s) related thereto, or if such announcements are made, that such an-
38   nounced product(s) and/or service(s) embody any or all of the ideas, technologies, or
39   concepts contained herein; nor

40   c) any form of relationship between any MEF member and the recipient or user of this
41   document.

42 Implementation or use of specific MEF standards, specifications, or recommendations will be vol-
43 untary, and no Member shall be obliged to implement them by virtue of participation in MEF
44 Forum. MEF is a non-profit international organization to enable the development and worldwide
45 adoption of agile, assured and orchestrated network services. MEF does not, expressly or other-
46 wise, endorse or promote any specific products or services.

47

Table of Contents

List of Figures

75 # List of Tables

84

1 List of Contributing Members

The following members of the MEF participated in the development of this document and have requested to be included in this list.

- Amartus
- CDG
- Colt
- Lumen
- Sage MI
- Spirent

2 Abstract

This document contains the Business Requirements and Use Cases for Invoicing between a Seller and a Buyer at the Sonata Interface Reference Point.

3 Terminology and Abbreviations

This section defines the terms used in this document. In many cases, the normative definitions to terms are found in other documents. In these cases, the third column is used to provide the reference that is controlling, in other MEF or external documents.

In addition, terms defined in MEF 55.1 [3]are included in this document by reference and are not repeated in the table below.

Term	Definition	Reference
Invoice	A legal document generated by the Seller to the Buyer relating to charges associated to Products provided by the Seller to the Buyer.	This document
Line-Item	One or more rows in an Invoice that represent charges associated with a Product instance.	This document
Printable Invoice	An Invoice that is in a format that can be printed and reviewed by a human.	This document

Table 1 – Terminology and Abbreviations

4   Compliance Levels

The key words "**MUST**", "**MUST NOT**", "**REQUIRED**", "**SHALL**", "**SHALL NOT**", "**SHOULD**", "**SHOULD NOT**", "**RECOMMENDED**", "**NOT RECOMMENDED**", "**MAY**", and "**OPTIONAL**" in this document are to be interpreted as described in BCP 14 (RFC 2119 [1], RFC 8174 [2]) when, and only when, they appear in all capitals, as shown here. All key words must be in bold text.

Items that are **REQUIRED** (contain the words **MUST** or **MUST NOT**) are labeled as **[Rx]** for required. Items that are **RECOMMENDED** (contain the words **SHOULD** or **SHOULD NOT**) are labeled as **[Dx]** for desirable. Items that are **OPTIONAL** (contain the words **MAY** or **OP-TIONAL**) are labeled as **[Ox]** for optional**.**

5   Numerical Prefix Conventions

Editor Note 1:   This section will be deleted if no numerical prefixes are used in the document.

This document uses the prefix notation to indicate multiplier values as shown in Table 2.

Decimal		Binary	
Symbol	**Value**	**Symbol**	**Value**
k	10^3	Ki	2^{10}
M	10^6	Mi	2^{20}
G	10^9	Gi	2^{30}
T	10^{12}	Ti	2^{40}
P	10^{15}	Pi	2^{50}
E	10^{18}	Ei	2^{60}
Z	10^{21}	Zi	2^{70}
Y	10^{24}	Yi	2^{80}

Table 2 – Numerical Prefix Conventions

123 # 6 Introduction

124 This document defines the Business Requirements and Use Cases for Invoicing at the Sonata In-
125 terface Reference Point (IRP). The focus of this document is on the ability of a Seller to notify a
126 Buyer that an Invoice for their products is available and for the Buyer to retrieve an Invoice. The
127 Buyer then either accepts the Invoice or disputes one or more charges associated with the Invoice.
128 Disputed charges are resolved by the Buyer and Seller.

129 The document does not address how payment of an Invoice is made by the Buyer. This is beyond
130 the scope of the project.

131
132

7 Use Cases

Based on the Epics and User Stories defined previously, the following Use Cases have been developed, An overview of the Use Cases contained in this document are shown in Table 3.

Use Case Number	Use Case Name	Use Case Description	Reference Section
1	Register for Invoice Notification	Buyer is able to register for Invoice Notifications	7.1.1
2	Generate Invoice Notifications	Seller sends an Invoice Notification to a Buyer	7.1.2
3	Retrieve Invoice List	The Buyer is able to retrieve a list of Invoices.	7.2.1
4	Retrieve Invoice by Invoice Identifier	The Buyer is able to retrieve a specific Invoice based on the Invoice Identifier of the Invoice	7.2.2
5	Retrieve Invoice Line Item by Invoice Identifier	The Buyer is able to retrieve one or more specific Line Items in an Invoice.	7.2.3
6	Retrieve Printable Invoice	The Buyer is able to retrieve a specific Invoice in a printable format using the Invoice Identifier of the Invoice.	7.2.4

Table 3 – Use Case Overview

7.1 Notification Use Cases

The Use Cases that support Sonata Invoicing are defined in this section.

7.1.1 Register for Invoice Notifications

A request initiated by the Buyer to instruct the Seller to send notifications of Invoice state changes to the Buyer. Pre-Conditions

The Buyer has a commercial relationship with the Seller. The Buyer is the responsible party for payment for products that have been delivered to the Buyer by the Seller.

7.1.1.1 Process Steps

1. The Buyer sends the Register for Invoice Notification request to the Seller.

   [R1]   The Buyer request **MUST** contain the following:

Attribute	Value	Definition
Notification Action	Stop	Stops notifications

Attribute	Value	Definition
	Start	Starts notifications
Notification Type	Created State Change	Invoice has been created A change of state has oc- curred
Return Address Information	Agreed to by Buyer and Seller	The detailed information on the mechanism and address specifying where the Seller is to send any Product Order Notifica-tions. There can be mul-tiple locations for one Buyer.

Table 4 – Register for Invoice Notification Buyer Request Attributes

2. The Seller responds to the Buyer's request with an acknowledgment.

3. The Seller is now aware of where to send Invoice Notifications and generates Invoice No-
   tifications to the Buyer for any Invoice State Changes going forward.

The Seller returns an error message if they do not support notifications.

[R2] If the Seller does not support notifications, they **MUST** return an error message to a Buyer's request to register for notifications that indicates that notifications are not supported.

7.1.2 Generate Invoice Notifications

The Seller sends Invoice notifications to a Buyer target address when the Buyer has registered for Invoice notifications.

7.1.2.1 Process Steps

1. The Seller sends an Invoice Notification to the Buyer.

[R3] The Invoice notification **MUST** contain the following:
- Notification Type (Created, State Change)
- Invoice Identifier

[R4] The Generated notification **MUST** be sent when an Invoice is in the Generated state.

2. The Buyer acknowledges the Notification received from the Seller.

[O1] If the Seller fails to receive an acknowledgement from the Buyer repeatedly, they Seller **MAY** make the target address as bad and stop sending notifications.

7.2 Retrieve Invoice Use Cases

The Use Cases for the Retrieve Invoice Epic are defined in this section of the document.

7.2.1 Retrieve Invoice List

A request initiated by a Buyer, who is authorized to purchase products from the Seller, to retrieve a list of Invoices that meet a set of filter criteria.

7.2.1.1 Process Steps

1. The Buyer sends a Retrieve Invoice List request to the Seller.

    [R5] The Buyer request **MUST** contain the following:

    - Invoice Account ID
    - Start Date
    - End Date
    - Invoice Category
    - Invoice State

2. The Seller receives this request and returns a response.

    [R6] The Seller response **MUST** include the following for each entry in the list:

    - Invoice Identifier – an identifier for the Buyer's Invoicing Account that is unique within the Seller and that is assigned by the Seller.
    - Invoice Number – a number assigned to the Invoice by the Seller that is unique within the Invoicing Account.
    - Invoice Category
        o Normal – an Invoice for the Invoicing Cycle
        o Duplicate – a copy of an Invoice that has been provided.
        o Trial – a Invoice for a customer during a trial period
    - Invoice State
        o Credit - The Seller has agreed with the Buyer that disputed charges are in error and has provided a credit for the disputed charges in error.
        o Settled – an Invoice for which all payment due has been received
        o Generated - An Invoice that has been created based on the completion of an Invoicing Cycle and an Invoice Notification has been sent to the Buyer.
        o Dispute_Being_Investigated - A Buyer has disputed charges included in an Invoice and those charges are in the Seller's Dispute Process.
        o Payment_Due – The Seller has completed their dispute process and they are expecting payment from the Buyer.
        o Withdrawn - A Seller has agreed with the Buyer that disputed charges are in error and has withdrawn the Invoice.

209 **[R7]** If no Invoices match the criteria provided by the Buyer, the Seller **MUST** return
210 a positive response with an empty list.

211 ### 7.2.2 Retrieve Invoice by Invoice Identifier

212 A request initiated by the Buyer, who has been authorized to purchase products from the Seller, to
213 retrieve a specific Invoice using the Invoice Identifier to identify the Invoice.

214 #### 7.2.2.1 Process Steps

215 1. The Buyer sends a Retrieve Invoice by Invoice Identifier request to the Seller.

216 **[R8]** The Buyer request **MUST** contain the following:
217

218 • Invoice Identifier – an identifier for the Buyer's Invoice that is unique
219 within the Seller and that is assigned by the Seller.

220 2. The Seller receives this request and returns a response.

221 **[R9]** The Seller response **MUST** include the attributes in Table 5 for the Invoice
222 Identifier.

223

Attribute		Description
Invoice Identifier		An identifier assigned to the Invoice by the Seller.
Invoice Number		A number assigned to the Invoice by the Seller
Run Type	**Sub-Attribute**	The Invoicing cycle as set by the Seller
	On_Cycle	Invoice created as a result of the normal Invoicing Cycle
	Off_Cycle	Invoice created outside the normal Invoicing Cycle. This may be based on a Buyer request or for other reasons.
Invoice Category	**Values**	The type of Invoice. One of the following: Normal Duplicate Trial
	Normal	An Invoice for the Invoicing Cycle
	Duplicate	A copy of an Invoice that has been provided
	Trial	An Invoice that is sent by the Seller to the Buyer for test Invoicing purposes to assist in assuring that their Invoicing implementations are

Attribute		Description
		compatible. The Trial Invoice is not paid.
Invoice State	**Values**	The state of the Invoice derived from the Line-Item states.
	Credit	The Seller has agreed with the Buyer that disputed charges are in error and has provided a credit for the disputed charges in error.
	Generated	An Invoice that has been created based on the completion of an Invoicing Cycle and an Invoice Notification has been sent to the Buyer.
	Dispute_Being_Investigated	A Buyer has disputed charges included in an Invoice and those charges are in the Seller's Dispute Process.
	Settled	An Invoice for which all payment due has been received.
	Payment Due	The Seller has completed their dispute process and they are expecting payment from the Buyer.
	Withdrawn	A Seller has agreed with the Buyer that disputed charges are in error and has withdrawn the Invoice.
Last Update Date		The date when the Invoice was last modified.
Invoice Date		Date the Invoice was issued.
Invoicing Period	**Sub-Attribute**	The Start and Stop Dates of the Invoicing Period.
	Start Date	The date the Invoicing Period started.
	Stop Date	The date the Invoicing Period ended.
Invoicing Cycle Identifier		The identifier of the Invoicing Cycle iteration.
Amount Due		The total amount of money (unit, value) with all taxes, fees, and credits applied that is due.
Payment Due Date		The date by which a payment of the Amount Due must be received by the Seller
Remaining Amount		An amount of money (unit, value) that still requires payment.

Attribute			Description
Tax Excluded Amount			The amount of money (unit, value) due without taxes being calculated for the current Invoicing Cycle.
Tax Included Amount			The amount of money (unit, value) due with taxes being calculated for the current Invoicing Cycle.
Discounts			Amount of discounts included
Fees			Amount of fees included
Credits			Amount of credits included
Applied Payment	**Sub-Attribute**		A list details of a payment that has been received from the Buyer
	Applied Amount		The amount of money (unit, value) that was received from the Buyer and applied to the Invoice as payment.
	Payment Item	**Sub-Sub-Attribute**	A list of payment items that have been received.
		Payment Identifier	An identifier for the payment that is unique within the Buyer Invoicing Account and is assigned by the Seller.
		Payment Date	The Date the payment was received.
		Amount	The amount of money (unit, value) received.
		Payment Method	The specific means of payment. One of the following: Check Wire Transfer Electronic Cash Other
Invoicing Account	**Sub-Attribute**		The Buyer Invoicing Account.
	Invoicing Account Identifier		An identifier for the Invoicing Account that is unique within the Seller and is assigned by the Seller.
Tax Items	**Sub-Attribute**		
	Tax Category		The Tax Category for this tax item.
	Tax Rate		The Tax Rate for this Tax Item.
	Tax Amount		The amount of money (unit, value) calculated for this Tax Item.
Related Contact Information	**Sub-Attribute**		A party related to this Invoice.
	Identifier		An identifier for the Contact that is unique within the Seller and is assigned by the Seller.

Attribute		Description
	Name	The name of the Contact.
	Role	The role of the Contact.
	Type	The type of Contact.
	Contact Phone Number	Identifies the telephone number (excluding extension) of the Contact.
	Contact Phone Number Extension	Identifies the telephone number extension of the Contact
	Contact Email Address	Identifies the Email address of the Contact
	Contact Postal Address	Identifies the postal address of the person or office to be contacted.
Financial Account	**Sub-Attribute**	A Financial Account within the Seller.
	Identifier	An identifier for the Financial Account that is unique within the Seller and is assigned by the Seller.
	Name	The name of the Financial Account.
	Type	The type of the Financial Account.
Invoice Line Item	Reference to Line Item	A reference to one or more Invoice Line Items for this Invoice.
Bill Document	The location of a Printable Invoice	URL pointing to PDF file

Table 5 – Invoice Attributes

224

225

226

Attribute	Description
Item Identifier	The Invoice Line-Item identifier.
Product Identifier	The identifier of the Product that is the subject of the Line Item.
Product Order Identifier	The identifier for a Product Order that did not result in an installed Product.
Product Order Item Reference Identifier	Identifier of the POI with reference to the Product Order
Product Name	The name of the Product that is the subject of the Line Item.
Invoicing Start Date	The start date of Invoicing for the Line Item
Invoicing End Date	The end date of Invoicing for the Line Item.
Charge Description	A text description of the charge.
Unit Rate	The rate per unit for the Invoice determined during or after the Invoicing Process.
Unit Quantity	The number of units.

Attribute		Description
Charge Type		The type of charge related to the Line Item. The type is one of: • Recurring • Non-recurring • Usage-based
Duty Free Amount		The amount of money (unit, value) of the charge before taxes and fees are calculated and applied.
List of Taxes	**Sub-Attribute**	Taxes associated with the Line Item
	Tax Category	The category of the Tax. One of the following: Country State County City Other
	Tax Description	A description of the type of Tax
	Tax Rate	The rate at which the Tax is calculated.
	Tax Amount	The amount of money (unit, value) of the Tax.
List of Fees	**Sub-Attribute**	Fees associated with the Line Item
	Fee Category	The category of the Fee. One of the following: Recurring Non-recurring Other
	Fee Description	A description of the type of Fee
	Fee Rate	The rate at which the Fee is calculated.
	Fee Amount	The amount of money (unit, value) of the Fee.
Invoice Line-Item State	**Values**	The state of the Invoice
	Credit	The Seller has agreed with the Buyer that disputed charges are in error and has provided a credit for the disputed charges in error.
	Generated	An Invoice that has been created based on the completion of an Invoicing Cycle and an Invoice Notification has been sent to the Buyer.
	Dispute_Being_Investigated	A Buyer has disputed charges included in an Invoice and those charges are in the Seller's Dispute Process.
	Settled	An Invoice for which all payment due has been received.

Attribute		Description
	Payment Due	The Seller has completed their dispute process and they are expecting payment from the Buyer.
	Withdrawn	A Seller has agreed with the Buyer that disputed charges are in error and has withdrawn the Invoice.

227

228 **Table 6 – Invoice Line-Item Attributes**

229 **[R10]** A Product Identifier **MUST** be provided unless no Product Identifier exists.

230 **[R11]** If no Product Identifier exists, the Product Order Identifier **MUST** be used in-
231 stead of the Product Identifier.

232 ### 7.2.3   Retrieve Invoice Line Item by Identifier

233 A request initiated by the Buyer, who has been authorized to purchase products from the Seller, to
234 retrieve a specific Invoice and specified Item Identifier using the Invoice Identifier and the Item Iden-
235 tifier.

236 #### 7.2.3.1   Process Steps

237   1. The Buyer sends a Retrieve Invoice Detail by Invoice Identifier request to the Seller.

238 **[R12]** The Buyer request **MUST** contain the following:
239

240 • Invoice Identifier – an identifier for the Buyer's Invoice that is unique
241 within the Seller and that is assigned by the Seller
242 • Item Identifier - the Invoice Line-Item identifier

243 **[O2]** The Buyer request **MAY** contain the following:

244 • Product Identifier – the identifier of the Product that is the subject of the
245 Line Item

246 • Product Order Identifier - the identifier for a Product Order that did not re-
247 sult in an installed Product

248 • Product Order Item Reference Identifier - a Buyer provided identifier to
249 identify Product Order Items and to be able to relate them to one another

250 • Invoicing Start Date - the start date of Invoicing for the Line Item

251 • Invoicing End Date - The end date of Invoicing for the Line Item

252   2. The Seller receives this request and returns a response.

253   **[R13]**   The Seller response **MUST** include the attributes in Table 5 and Table 6 for the
254   Invoice Identifier and Item Identifier.

255   **7.2.4   Retrieve Printable Invoice**

256 A request initiated by the Buyer, who has been authorized to purchase products from the Seller, to
257 retrieve a specific Invoice using the Invoice Identifier to identify the Invoice in a printable format.
258 The Buyer is pointed to a URL by the Seller where the Buyer can retrieve the Printable Invoice in
259 PDF format.

260   *7.2.4.1   Process Steps*

261   1. The Buyer sends a Retrieve Invoice by Invoice Identifier request to the Seller.

262   **[R14]**   The Buyer request **MUST** contain the following:
263

264   • Invoice Identifier – an identifier for the Buyer's Invoice that is unique
265   within the Seller and that is assigned by the Seller.

266   2. The Seller receives this request and returns a response that includes a URL for a file in
267   PDF format that is printable by the Buyer.

268   **[R15]**   The Printable Invoice **MUST** be in a PDF format.

269   **[R16]**   The Seller response **MUST** include the attributes in Table 5 and Table 6 for the
270   Invoice Identifier in the printable file.

271   **[R17]**   If a printable document is agreed upon by the Buyer and Seller, then the Seller
272   **MUST** provide the URL.
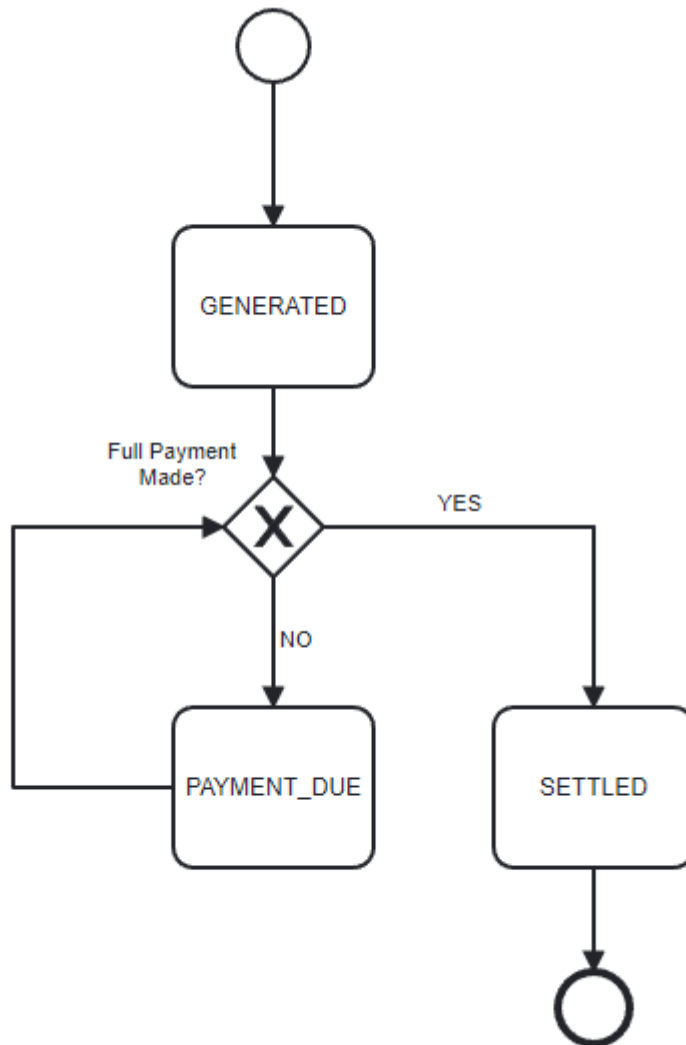
273   3. The Buyer retrieves the Printable Invoice.

274   **[R18]**   The Buyer **MUST** use the URL provided by the Seller to retrieve the Printable
275   Invoice.
276

277 # 8 Process Flows

278 ## 8.1 Invoice Process Flow

279 The process flow for Invoicing is shown in Figure 1.

280

281 **Figure 1 – Invoice Process Flow**

282 The states within the Invoice Process Flow are described in Table 7.

283

State	Definition	Comments
GENERATED	An Invoice that has been created based on the completion of an Invoicing Cycle and an Invoice Notification has been sent to the Buyer.	

PAYMENT_DUE	The Seller has completed their dispute process and they are expecting payment from the Buyer.	
SETTLED	An Invoice for which all payment due has been received or for which payment is due.	

Table 7 – Invoice Process Flow States

[R19]   An Invoice API **MUST** support the states and transitions shown in Figure 1 and Table 7.

8.2   Invoice Line-Item Flow

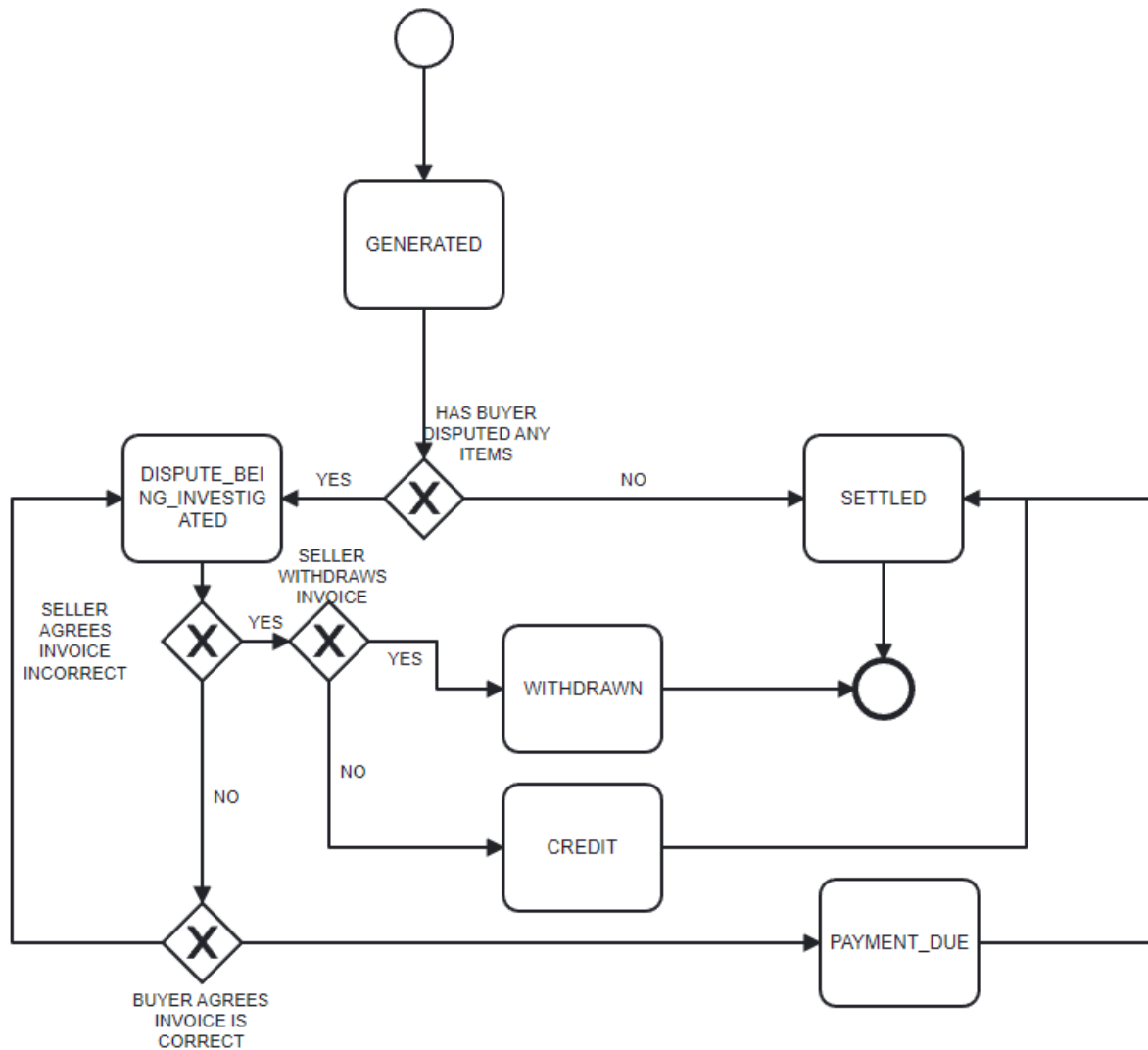The process flow for line item in Invoicing is shown in

289

Figure 2 – Invoice Line-Item Flow

291

| State	Definition	Comments
CREDIT	The Seller has agreed with the Buyer that disputed charges are in error and has provided a credit for the amount in error.	How a Seller determines whether to offer a credit or withdraw the Invoice is be-yond the scope of this docu-ment.
DISPUTE_BEING_INVES-TIGATED	A Buyer has disputed charges included in an Invoice and those charges are in the Seller's Dispute Process.	The method of disputing charges on an Invoice is be-yond the scope of this docu-ment.

	Disputes cannot exit the dispute process until the Dispute is resolved.	
GENERATED	An Invoice that has been created based on the completion of an Invoicing Cycle and an Invoice Notification has been sent to the Buyer.	
PAYMENT_DUE	The Seller has completed their dispute process and they are expecting payment from the Buyer.	
SETTLED	An Invoice for which all payment due has been received or payment is due for the Invoice Line Item.	
WITHDRAWN	A Seller has agreed with the Buyer that disputed charges are in error and has withdrawn the Invoice.	How a Seller determines whether to offer a credit or withdraw the Invoice is beyond the scope of this document.

292   **Table 8 – Invoice Line-Item Process Flow States**

293   **[R20]**   An Invoice API MUST support the states and transitions shown in Figure 2 and
294   Table 8.

8.3   Invoice Line-Item State to Invoice State Interaction

296   The interaction between Invoice Line-Item and Invoice States is shown in Figure 3.

297
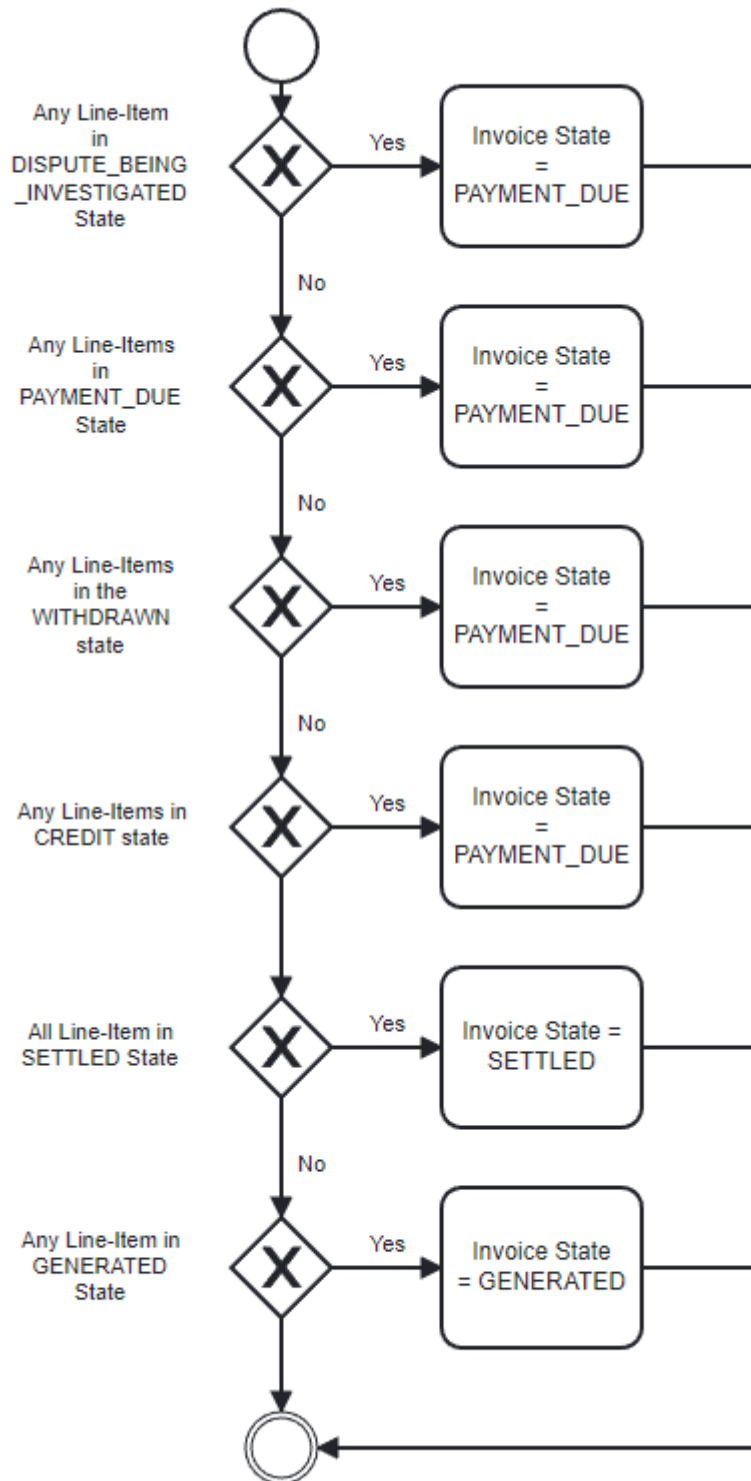
298   **Figure 3 – Line-Item State to Invoice State Interaction**

299 As shown in Figure 3, the Invoice State is determined by the Line-Item States. As an example, if
300 any Line-Item is in the DISPUTE_BEING_INVESTIGATED state, the Invoice state is DIS-
301 PUTE_BEING_INVESTIGATED. If there are no Line-Items in the DISPUTE_BEING_INVES-
302 TIGATED state, the logic moves to the next Line-Item state and if any match that state, the Invoice
303 is set to that state. This repeats until an Invoice State is identified based on the Line-Item states.

304 **[R21]**   An Invoice implementation **MUST** support the logic shown in Figure 3.

9 References

[1] IETF RFC 2119, *Key words for use in RFCs to Indicate Requirement Levels*, by S. Bradner, March 1997

[2] IETF RFC 8174, *Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words*, by B. Leiba, May 2017, Copyright (c) 2017 IETF Trust and the persons identified as the document authors. All rights reserved.

[3] MEF 50.1, MEF Forum, *MEF Services Lifecycle Process Flows, MEF 50.1*, August 2017.

[4] TMF678, *Customer Bill Management API Rest Specification R17.5.1*, May 2018