



**MEF Standard**  
**MEF 134**

**Billing and Invoice Business Requirements and  
Use Cases**

**February 2023**

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## Table of Contents

|          |   |           |
|----------|---|-----------|
| <b>1</b> | <b>List of Contributing Members</b> .....                 | <b>1</b>  |
| <b>2</b> | <b>Abstract</b> .....                                     | <b>1</b>  |
| <b>3</b> | <b>Terminology and Abbreviations</b> .....                | <b>2</b>  |
| <b>4</b> | <b>Compliance Levels</b> .....                            | <b>3</b>  |
| <b>5</b> | <b>Numerical Prefix Conventions</b> .....                 | <b>3</b>  |
| <b>6</b> | <b>Introduction</b> .....                                 | <b>4</b>  |
| <b>7</b> | <b>Use Cases</b> .....                                    | <b>5</b>  |
| 7.1      | Notification Use Cases .....                              | 5         |
| 7.1.1    | Register for Invoice Notifications.....                   | 5         |
| 7.1.2    | Generate Invoice Notifications .....                      | 6         |
| 7.2      | Retrieve Invoice Use Cases .....                          | 7         |
| 7.2.1    | Retrieve Invoice List.....                                | 7         |
| 7.2.2    | Retrieve Invoice by Invoice Identifier .....              | 8         |
| 7.2.3    | Retrieve Invoice Line Item by Identifier .....            | 13        |
| 7.2.4    | Retrieve Printable Invoice.....                           | 14        |
| <b>8</b> | <b>Process Flows</b> .....                                | <b>15</b> |
| 8.1      | Invoice Process Flow.....                                 | 15        |
| 8.2      | Invoice Line-Item Flow .....                              | 16        |
| 8.3      | Invoice Line-Item State to Invoice State Interaction..... | 17        |
| <b>9</b> | <b>References</b> .....                                   | <b>20</b> |



## List of Figures

|  |    |
|--|----|
| Figure 1 – Invoice Process Flow .....                        | 15 |
| Figure 2 – Invoice Line-Item Flow .....                      | 16 |
| Figure 3 – Line-Item State to Invoice State Interaction..... | 18 |

## **List of Tables**

|  |    |
|--|----|
| Table 1 – Terminology and Abbreviations .....                              | 2  |
| Table 2 – Numerical Prefix Conventions.....                                | 3  |
| Table 3 – Use Case Overview.....   | 5  |
| Table 4 – Register for Invoice Notification Buyer Request Attributes ..... | 6  |
| Table 5 – Invoice Attributes .....   | 11 |
| Table 6 – Invoice Line-Item Attributes .....                               | 13 |
| Table 7 – Invoice Process Flow States .....                                | 16 |
| Table 8 – Invoice Line-Item Process Flow States .....                      | 17 |

## **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.

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- 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.

| <b>Term</b>              | <b>Definition</b>   | <b>Reference</b> |
|--------------------------|---|------------------|
| <b>Invoice</b>           | 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    |
| <b>Line-Item</b>         | One or more rows in an Invoice that represent charges associated with a Product instance.   | This document    |
| <b>Printable Invoice</b> | 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 **OPTIONAL**) are labeled as [Ox] for optional.

## 5 Numerical Prefix Conventions

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

| Decimal |                  | Binary |                 |
|---------|------------------|--------|-----------------|
| Symbol  | Value            | Symbol | Value           |
| k       | 10 <sup>3</sup>  | Ki     | 2 <sup>10</sup> |
| M       | 10 <sup>6</sup>  | Mi     | 2 <sup>20</sup> |
| G       | 10 <sup>9</sup>  | Gi     | 2 <sup>30</sup> |
| T       | 10 <sup>12</sup> | Ti     | 2 <sup>40</sup> |
| P       | 10 <sup>15</sup> | Pi     | 2 <sup>50</sup> |
| E       | 10 <sup>18</sup> | Ei     | 2 <sup>60</sup> |
| Z       | 10 <sup>21</sup> | Zi     | 2 <sup>70</sup> |
| Y       | 10 <sup>24</sup> | Yi     | 2 <sup>80</sup> |

Table 2 – Numerical Prefix Conventions

## **6 Introduction**

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

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

## 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<br>State Change       | Invoice has been created.<br>A change of state has occurred  |
| 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 Notifications. There can be multiple 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 Notifications 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
  - Normal – an Invoice for the Invoicing Cycle
  - Duplicate – a copy of an Invoice that has been provided.
  - Trial – a Invoice for a customer during a trial period
- Invoice State
  - 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.
  - Settled – an Invoice for which all payment due has been received
  - 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.
  - 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.

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

**7.2.2 Retrieve Invoice by Invoice Identifier**

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

**7.2.2.1 Process Steps**

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

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

- Invoice Identifier – an identifier for the Buyer’s Invoice that is unique within the Seller and that is assigned by the Seller.

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

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

| <b>Attribute</b>   |                      | <b>Description</b>   |
|--------------------|----------------------|--|
| Invoice Identifier |                      | An identifier assigned to the Invoice by the Seller.   |
| Invoice Number     |                      | A number assigned to the Invoice by the Seller   |
| Run Type           | <b>Sub-Attribute</b> | 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   | <b>Values</b>        | The type of Invoice. One of the following:<br>Normal<br>Duplicate<br>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 compatible. The Trial Invoice is not paid. |



## Billing and Invoice Business Requirements and Use Cases

| Attribute                  |                            | Description  |
|----------------------------|----------------------------|--|
| Invoice State              | <b>Values</b>              | 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           | <b>Sub-Attribute</b>       | 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.  |
| 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   |



| Attribute                   |   | Description   |  |
|-----------------------------|---|---|--|
| Fees                        |   | Amount of fees included   |  |
| Credits                     |   | Amount of credits included  |  |
| Applied Payment             | <b>Sub-Attribute</b>                        | 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                                | <b>Sub-Sub-Attribute</b>  | 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:<br>Check<br>Wire Transfer<br>Electronic<br>Cash<br>Other  |
| Invoicing Account           | <b>Sub-Attribute</b>                        | 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                   | <b>Sub-Attribute</b>                        |   |  |
|                             | 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 | <b>Sub-Attribute</b>                        | A party related to this Invoice.  |  |
|                             | Identifier                                  | An identifier for the Contact that is unique within the Seller and is assigned by the Seller.             |  |
|                             | 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 |   |  |

| <b>Attribute</b>  |                                     | <b>Description</b>  |
|-------------------|-------------------------------------|---|
|                   | Contact Postal Address              | Identifies the postal address of the person or office to be contacted.                                  |
| Financial Account | <b>Sub-Attribute</b>                | 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**

| <b>Attribute</b>                        | <b>Description</b>   |
|---|--|
| 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.   |
| Charge Type                             | The type of charge related to the Line Item. The type is one of: <ul style="list-style-type: none"> <li>• Recurring</li> <li>• Non-recurring</li> <li>• Usage-based</li> </ul> |
| Duty Free Amount                        | The amount of money (unit, value) of the charge before taxes and fees are calculated and applied.  |



| <b>Attribute</b>   | <b>Description</b>  |
|--|---|
| List of Taxes  | <b>Sub-Attribute</b><br>Taxes associated with the Line Item   |
|  | Tax Category<br>The category of the Tax. One of the following:<br>Country<br>State<br>County<br>City<br>Other                                       |
|  | Tax Description<br>A description of the type of Tax   |
|  | Tax Rate<br>The rate at which the Tax is calculated.  |
|  | Tax Amount<br>The amount of money (unit, value) of the Tax.   |
| List of Fees   | <b>Sub-Attribute</b><br>Fees associated with the Line Item  |
|  | Fee Category<br>The category of the Fee. One of the following:<br>Recurring<br>Non-recurring<br>Other   |
|  | Fee Description<br>A description of the type of Fee   |
|  | Fee Rate<br>The rate at which the Fee is calculated.  |
|  | Fee Amount<br>The amount of money (unit, value) of the Fee.   |
| Invoice Line-Item State  | <b>Values</b><br>The state of the Invoice   |
|  | Credit<br>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<br>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<br>A Buyer has disputed charges included in an Invoice and those charges are in the Seller's Dispute Process.            |
|  | Settled<br>An Invoice for which all payment due has been received.  |
| Payment Due<br>The Seller has completed their dispute process and they are expecting payment from the Buyer. |   |

| Attribute |           | Description  |
|-----------|-----------|--|
|           | Withdrawn | A Seller has agreed with the Buyer that disputed charges are in error and has withdrawn the Invoice. |

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

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

**[R11]** If no Product Identifier exists, the Product Order Identifier **MUST** be used instead of the Product Identifier.

**7.2.3 Retrieve Invoice Line Item by Identifier**

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

**7.2.3.1 Process Steps**

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

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

- Invoice Identifier – an identifier for the Buyer’s Invoice that is unique within the Seller and that is assigned by the Seller
- Item Identifier - the Invoice Line-Item identifier

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

- 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 - a Buyer provided identifier to identify Product Order Items and to be able to relate them to one another
- Invoicing Start Date - the start date of Invoicing for the Line Item
- Invoicing End Date - The end date of Invoicing for the Line Item

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

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

## 7.2.4 Retrieve Printable Invoice

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

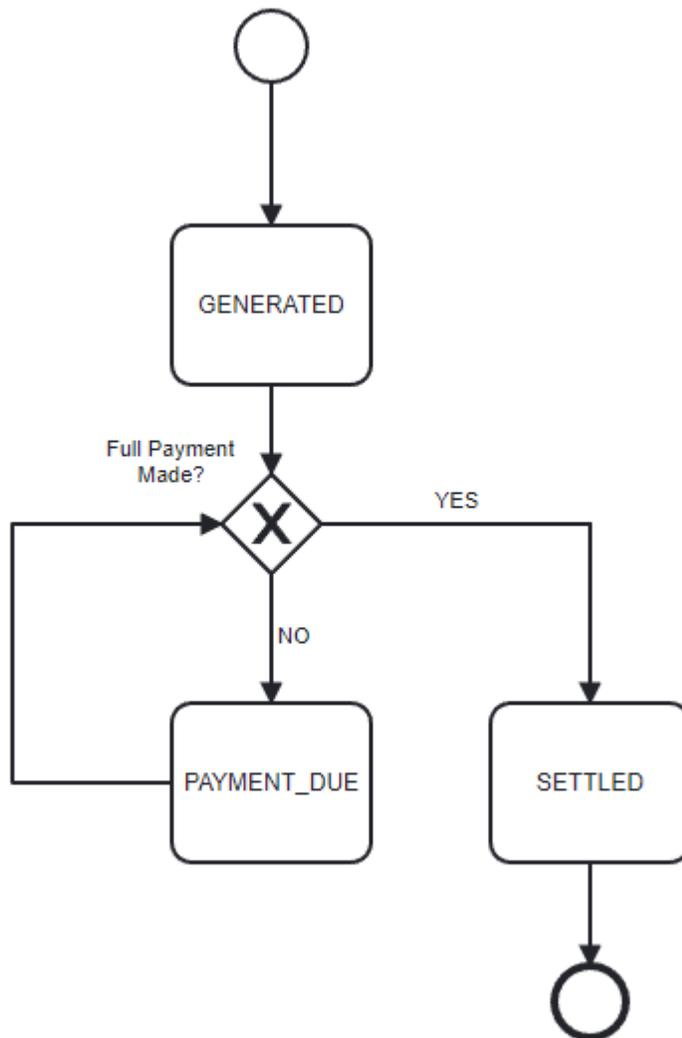
### 7.2.4.1 Process Steps

1. The Buyer sends a Retrieve Invoice by Invoice Identifier request to the Seller.
  - [R14] The Buyer request **MUST** contain the following:
    - Invoice Identifier – an identifier for the Buyer’s Invoice that is unique within the Seller and that is assigned by the Seller.
  - 2. The Seller receives this request and returns a response that includes a URL for a file in PDF format that is printable by the Buyer.
    - [R15] The Printable Invoice **MUST** be in a PDF format.
    - [R16] The Seller response **MUST** include the attributes in Table 5 and Table 6 for the Invoice Identifier in the printable file.
    - [R17] If a printable document is agreed upon by the Buyer and Seller, then the Seller **MUST** provide the URL.
3. The Buyer retrieves the Printable Invoice.
  - [R18] The Buyer **MUST** use the URL provided by the Seller to retrieve the Printable Invoice.

## 8 Process Flows

### 8.1 Invoice Process Flow

The process flow for Invoicing is shown in Figure 1.



**Figure 1 – Invoice Process Flow**

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

| 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. |          |

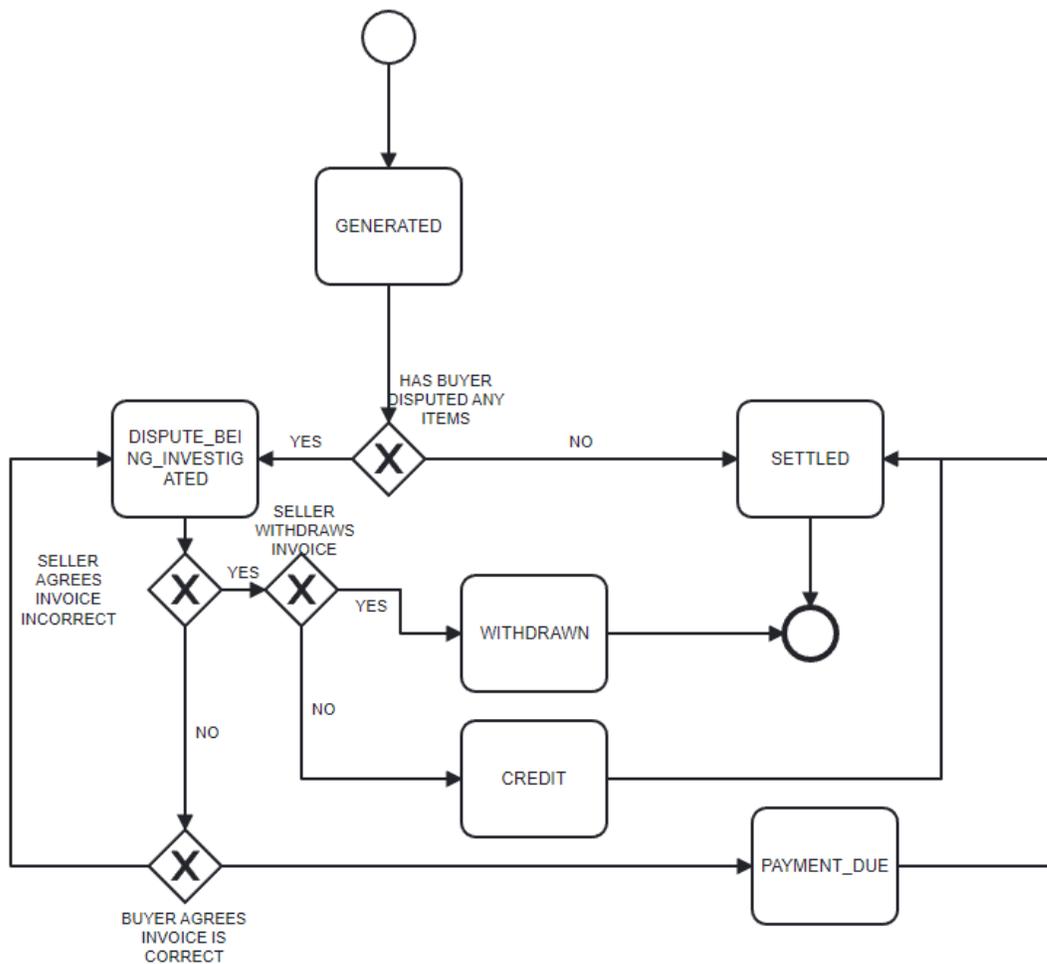
|             |   |  |
|-------------|---|--|
| PAYMENT_DUE | The Seller has completed their dispute process and they are expecting payment from the Buyer. |  |
| SETTLED     | An Invoice for which all payment due has been received or for which payment is due.           |  |

**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 Figure 2.



**Figure 2 – Invoice Line-Item Flow**

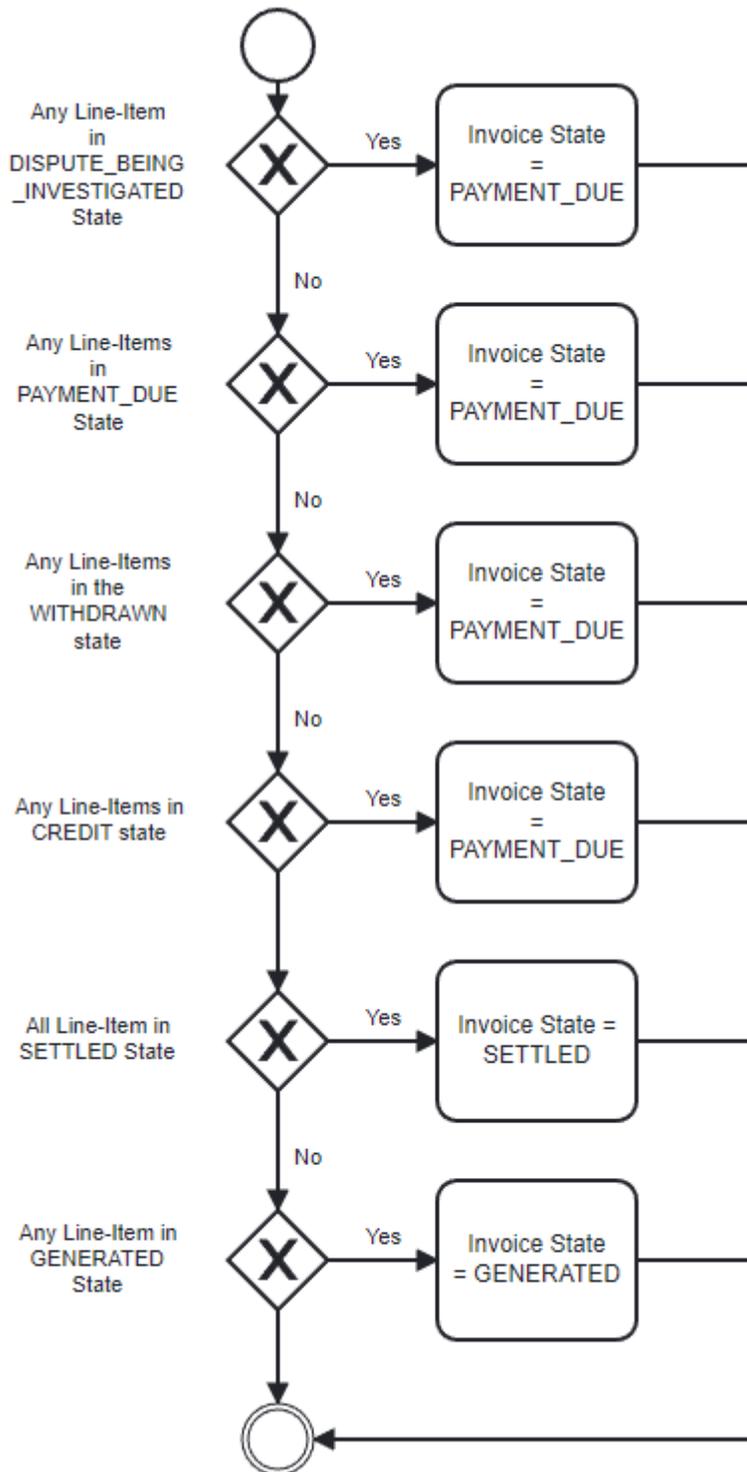
| <b>State</b>               | <b>Definition</b>  | <b>Comments</b>   |
|----------------------------|--|---|
| CREDIT                     | The Seller has agreed with the Buyer that disputed charges are in error and has provided a credit for the amount in error.   | How a Seller determines whether to offer a credit or withdraw the Invoice is beyond the scope of this document. |
| DISPUTE_BEING_INVESTIGATED | A Buyer has disputed charges included in an Invoice and those charges are in the Seller’s Dispute Process. Disputes cannot exit the dispute process until the Dispute is resolved. | The method of disputing charges on an Invoice is beyond the scope of this document.                             |
| 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. |

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

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

### **8.3 Invoice Line-Item State to Invoice State Interaction**

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



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

As shown in Figure 3, the Invoice State is determined by the Line-Item States. As an example, if any Line-Item is in the DISPUTE\_BEING\_INVESTIGATED state, the Invoice state is

DISPUTE\_BEING\_INVESTIGATED. If there are no Line-Items in the DISPUTE\_BEING\_INVESTIGATED state, the logic moves to the next Line-Item state and if any match that state, the Invoice is set to that state. This repeats until an Invoice State is identified based on the Line-Item states.

**[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 © 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