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Fiscal Service

U.S. DEPARTMENT OF THE TREASURY

Overview of G-Invoicing System Interfaces

Version 2.1

June 21, 2023

Agenda

- System Integration Guide
- System Interface Specifications
- Pull Documents
  - XML-based: GT&C, Order, Performance, Attachments
  - JSON-based: GT&C, Order, Performance, 7600EZ, Attachments, Org, Features, Remittance Advice
- Push Documents
  - Order
  - Orders
  - Performance
  - 7600EZ
  - Attachments

System Integration Guide

- Communicates how Federal Program Agencies (FPA) may utilize automated data exchanges to communicate IGT Buy/Sell activities to/from G-Invoicing
  - Describes the automated data exchanges
  - Provides references to additional information
  - Details the steps needed to establish system interfaces
  - Recommended best practices for pushing/pulling data from G-Invoicing

Application Program Interfaces

1. **Push Order** (JSON & XML) allows clients to upload Orders to so they can be shared with their trading partners.
2. **Push Performance** (JSON & XML) allows clients to upload Performance data to G-Invoicing.
3. **Push 7600EZ** (JSON) allows clients to upload 7600EZ data to G-Invoicing.
4. **Push Attachment** (JSON & XML) allows clients to attach files to Order, Performance and 7600EZ documents.
5. **Pull GT&C** (JSON & XML) allows clients to extract new and updated GT&C agreements.
6. **Pull Order** (JSON & XML) allows clients to extract Orders and attachments submitted by their trading partners.
7. **Pull Performance** (JSON & XML) allows clients to extract Performance transactions.
8. **Pull 7600EZ** (JSON) allows clients to extract 7600EZ transactions.
9. **Pull Attachment** (JSON & XML) allows clients to download files which have been attached to GT&C agreements, Orders, Performance or 7600EZ documents.
10. **Pull Organization** (JSON) allows clients to extract Org data used to create Orders and 7600EZs:
    - Get Accounts
    - Get Groups in an Agency Account
    - Get Groups for a GT&C
    - Get TAS-BETCs for a Group
11. **Pull Features** (JSON) allows clients to extract which Account supports different G-Invoicing features. Turning features on our Account-wide and allows for additional functionality within the UI and APIs. Both trading partners must have a feature activated to be able to use the feature within G-Invoicing. This API gives out that information to clients.
12. **Pull Remittance** (JSON) allow clients to extract data that has been settled.

JSON or XML?

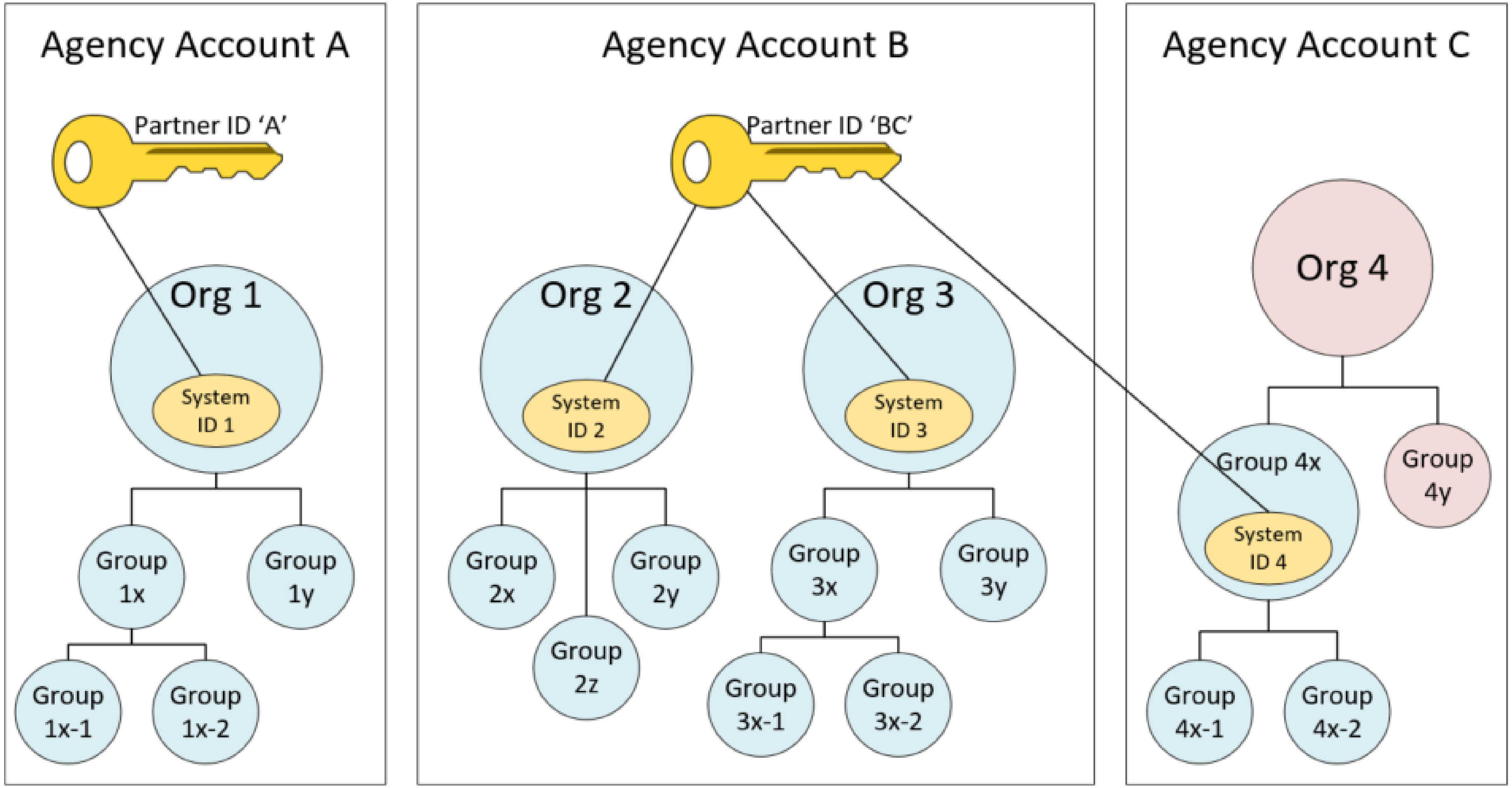
- It's highly recommended if a system is utilizing the existing XML endpoints in G-Invoicing to have an upgrade path in place to move to the JSON endpoints.
- G-Invoicing will continue to support older XML endpoints for the documents (GTC, Orders, and Performance) for a time, but they will not be upgraded or enhanced.
- All future endpoints will be created only utilizing JSON
- G-Invoicing currently supports all endpoints in JSON

Authorization

- Systems must be granted user roles and data access in order to pull/push data from/to G-Invoicing
  - Permissions are maintained by Administrators at each agency
  - An agency system ID only requires access to one side of a document to view all data associated with the document, including attachments
  - The agency system ID must be assigned an organizational Group high enough in the agency's hierarchy to access the requested data
    - System gain access to all documents at the group assigned and below
  - Systems granted access to Order roles/data also have access to view Performance data, but to create Performance it will need access to Performance roles/data
  - All authenticated system IDs have access to organizational (group) data for all agency accounts

System ID Parameter

- Required for authorization of Partner ID (i.e., client certificate)



Security

- The API Gateway will accept web service traffic, perform certificate-based authentication against security policies, and route the requests to G-Invoicing
  - Separate certificates are needed for test and production environments

- No high Personal Identifying Information (PII) is being transported by this system interface
  - G-Invoicing cannot control the content of attachments

Error Handling

- Standard web service faults are generated for exceptions that can cause the request to not be processed
- All services may return the following HTTP status codes along with variable error message text describing the error(s) in the response
  - 400 Bad Request
    - ValidationFailedException
  - 403 Unauthorized
    - AccessDeniedException
  - 500 Internal Server Error
    - ServerException

Pull Interfaces – General Rules

- Requests for documents (e.g., GT&C or Attachment) are fulfilled with current data only
  - G-Invoicing will not provide a document history for GT&Cs or deleted attachments (i.e., multiple versions of the same document)
  - G-Invoicing does support pulling document history for Orders
- (XML-based only) Character entity references "ampersand" (&) and "less than" (<) are escaped on output to XML
  - The escape sequence for ampersand is &amp
  - The escape sequence for less than is &lt
- Clients should not validate XML returned from API request
  - XML schema version number may change when optional tag(s) added, for example:
    - 3.2 release introduced new (2.1) version of the GT&C schema
    - added optional Requesting and Servicing Group Name(s)
    - kept the Pull API at version 1_0

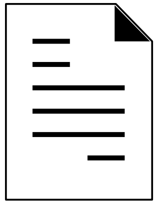
Pull Interfaces – General Parameters

- Agency Tracking Identifier
  - Unique identifier from agency system, optionally supplied in the request and returned in the response
- Agency Location Code
  - Limits results to documents related to one of the requested ALCs
- Last Modified Date Time
  - Limits results to documents updated since the requested timestamp
  - Client keeps track of date/time of last successful pull request
- Status
  - Limits documents to one of the requested status types
  - Most draft and deleted documents are not accessible
    - Exception: Order drafts where Mod > 0
    - *Deleted 7600EZ & Performance records are accessible*

Each API supports a unique set of parameters – Please reference the specific API specification for more details on the G-Invoicing Resource website

Requesting G-Invoicing Documents

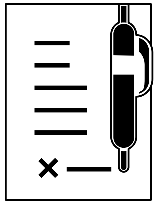
3 steps to pull G-Invoicing documents (i.e., GT&C, Order, Performance, 7600EZ) and attachments – Supported in XML & JSON



Document List

Document List

The initial request to G-Invoicing will return a list of GT&C's, Orders or Performance based on the API resource polled and the System User's access and permissions. The list returned in the response will contain meta data about each document as well as the link (URL) to request the individual documents in a subsequent request.



GT&C, Order, Performance

Individual Document

Individual document requests (e.g., GT&C, Order, Performance) will return all non-empty data elements in the XML payload of the requested document along with meta data about attachments (if any exist) associated with the document. The meta data contains links (URLs) for agency systems to pull individual attachments.

Attachment

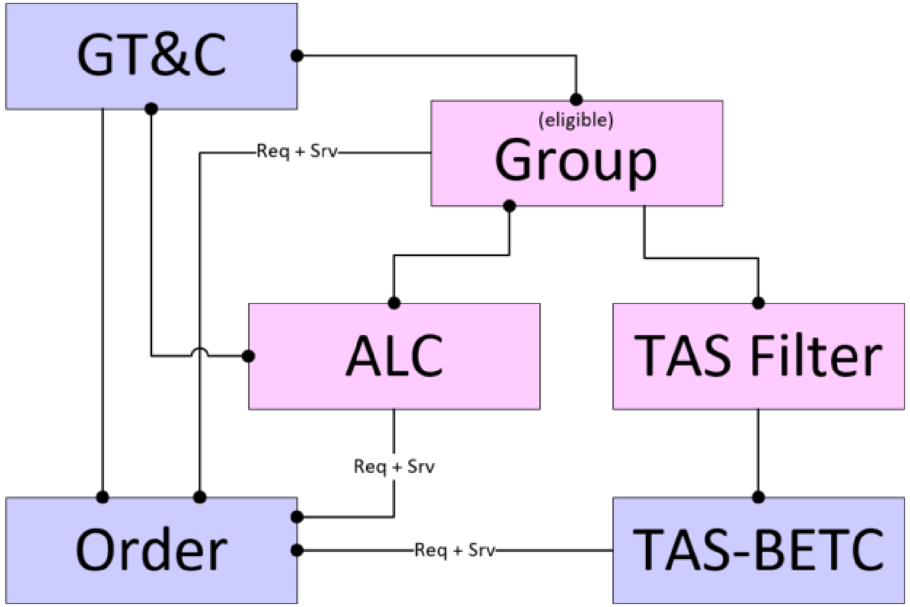
Individual Attachments may be pulled by agency systems on request. Attachments are pulled by passing a unique identifier in the request URL, found in the attachment meta data, located in the XML payload of the associated document.

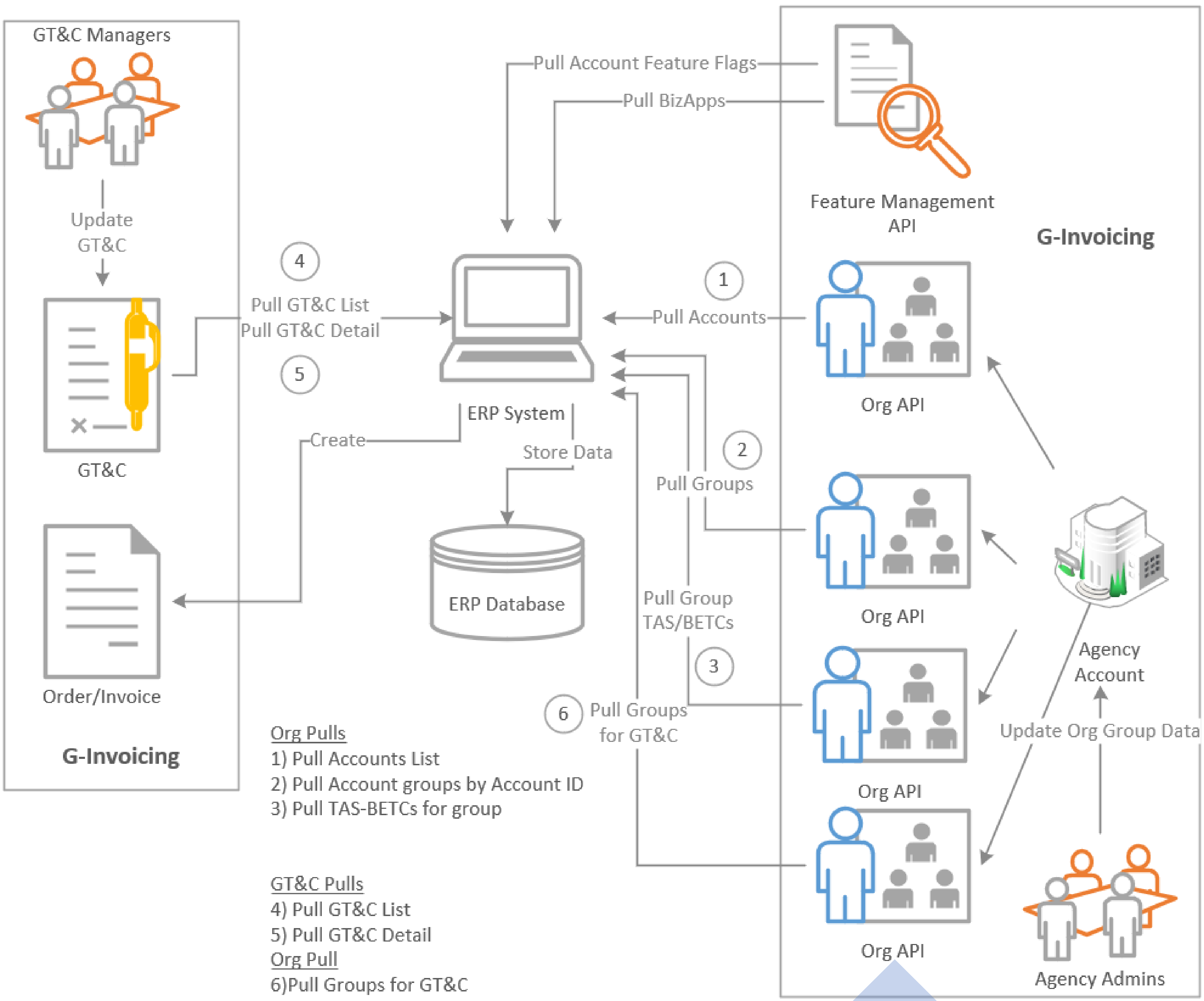
Single Step Pull APIs

- Pull Organization (JSON)
  - Get Accounts
  - Get Groups in an Agency Account
  - Get Groups for a GT&C
  - Get TAS-BETCs for a Group
- Pull Features or BizApps (JSON)
  - Extract which Account supports different G-Invoicing features. Turning features on our Account-wide and allows for additional functionality within the UI and APIs. Both trading partners must have a feature activated to be able to use the feature within G-Invoicing. This API gives out that information to clients.
- Pull Remittance Advice (JSON)
  – Limited to a single ALC on a single date

How does a system know which groups to us on an Order or Invoice?

- Requesting and Servicing Groups are established on the GT&C
- Orders must reference an open GT&C and two valid Groups, ALCs and TAS-BETCs
- Question: How can agency systems guide their users' selections?




GT&C Managers
Update GT&C
GT&C
Order/Invoice
G-Invoicing
4
Pull GT&C List
Pull GT&C Detail
5
Create
ERP System
Store Data
ERP Database
Pull Account Feature Flags
Pull BizApps
Feature Management API
G-Invoicing
1
Pull Accounts
2
Pull Groups
Pull Group TAS/BETCs
3
6
Pull Groups for GT&C
Org API
Org API
Org API
Org API
Agency Account
Update Org Group Data
Agency Admins
Org Pulls
1) Pull Accounts List
2) Pull Account groups by Account ID
3) Pull TAS-BETCs for group
GT&C Pulls
4) Pull GT&C List
5) Pull GT&C Detail
Org Pull
6)Pull Groups for GT&C

Best Practices for utilizing the Org API

Potential Reasons to repull Org Data

- Modification or Admin Changes to a GT&C
  - Increment the Last Modified Date/Time, which should be used to pull updated data using the GT&C List (#4 API).
  - It's recommended that a system pulls the GT&C Detail (#5 API).
  - It's recommended that a system pulls the Get Groups for GT&C (#6 API).
    - It is **highly recommended that a system stores this data** and doesn't rely on G-Invoicing for every Order or 7600EZ Invoice creation within their system.
- Organizational Group Changes
  - It's recommended that a system pulls the Get Accounts (#1 API) no more than once a day.
    - By using the lastModifiedDateTime parameter G-Invoicing will only return Accounts that have been updated since the last time the system has pulled data from this endpoint.
  - If using the Get Groups for Account (for either their own Account or Trading Partners) we recommend storing the data and only repulling if the account appears in the Get Accounts response.
    - This would pull in any new, updated, or deactivated Org groups due to an organization change.

As G-Invoicing matures this data will become more and more static over time, but there always a potential organizational changes to occur governmentwide.

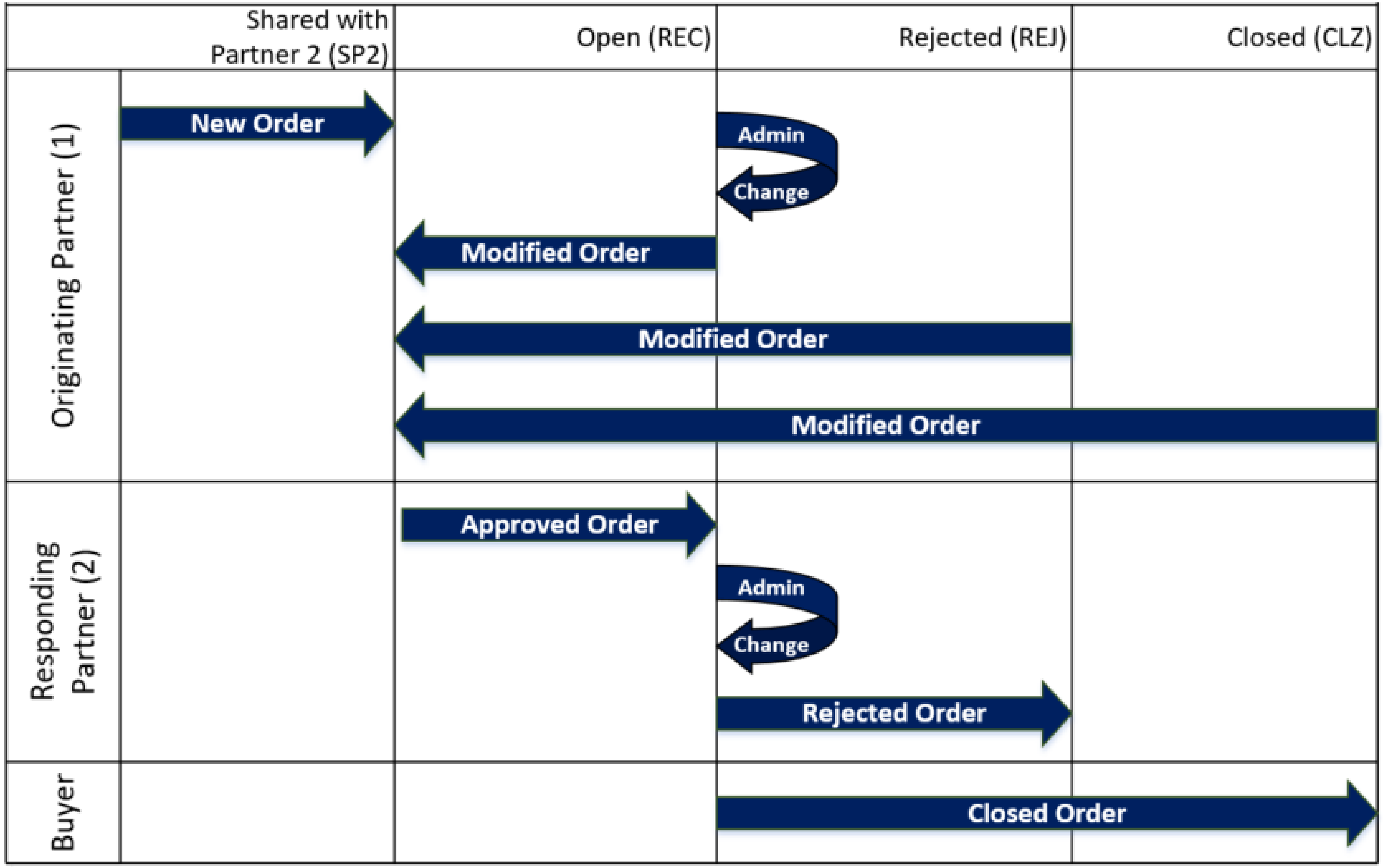
Push Interfaces

- Four sets of services
    1. Create or update Order
    2. Create or delete Performance
    3. Create or delete 7600Ez
    4. Create or delete Attachment
- Based on RESTful API principles
- Synchronous processing of one document per request
- Response includes critical information, for example:
    - Order, Performance & EZ Number
    - Complete XML or JSON representation of document
    - Attachment IDs
    - Error descriptions

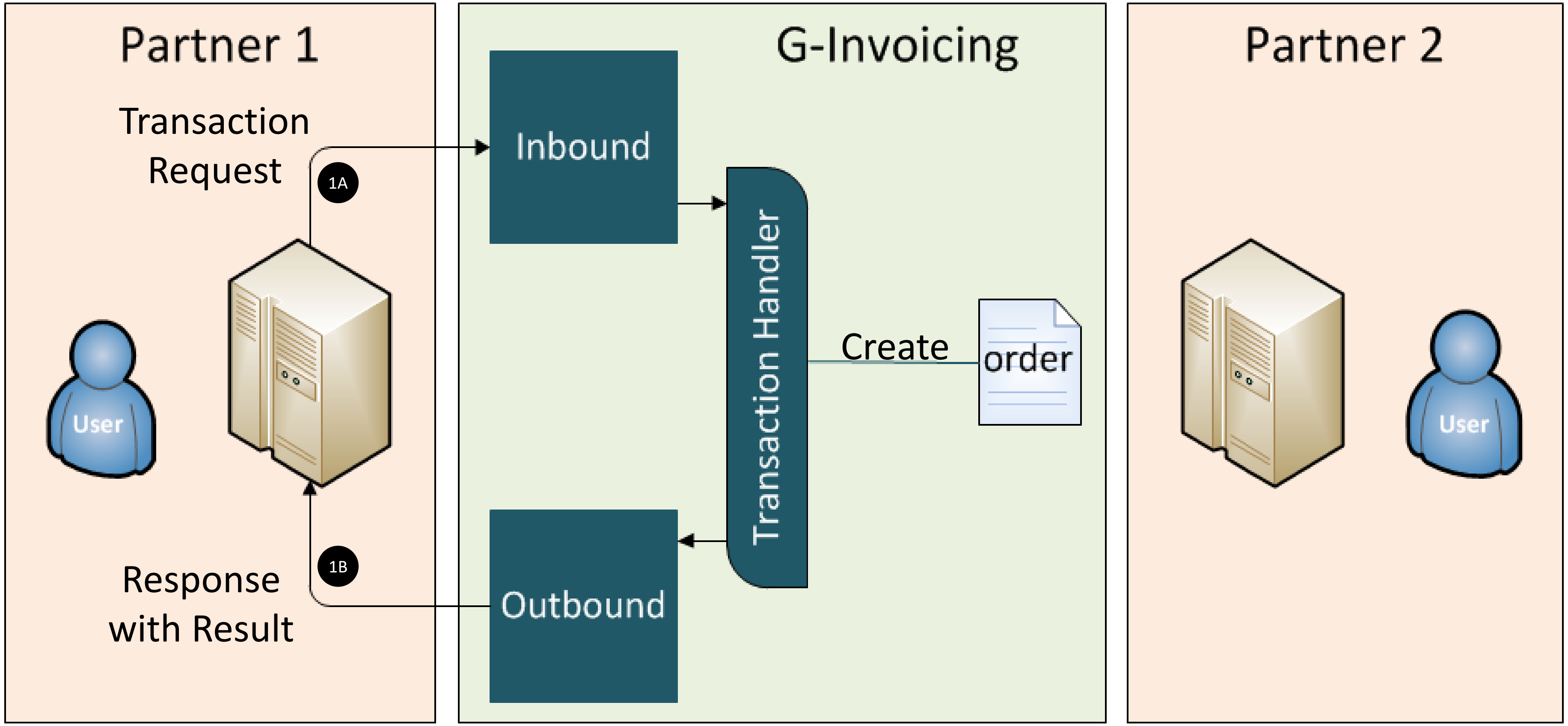
General Rules for Push Interfaces

- Servicing Agency are not allowed to change data elements belonging to Requesting Agency and vice-versa
  - Submission of partner’s data will be ignored
    - Exception: Some data may be provided by either partner. Please reference the appropriate SM&VR or FIDS on the G-Invoicing website under Resources.
- XML included in request must comply with appropriate schema
- JSON is must comply with business validations
- Attachments may be added to, and deleted from, existing Order, Performance, 7600EZ records using the Attachment service
- For add Attachment requests, the attachment FileName in the XML or JSON payload must exactly match the filename in the Content-Disposition parameter within the multipart form-data

• Order State Diagram for System User



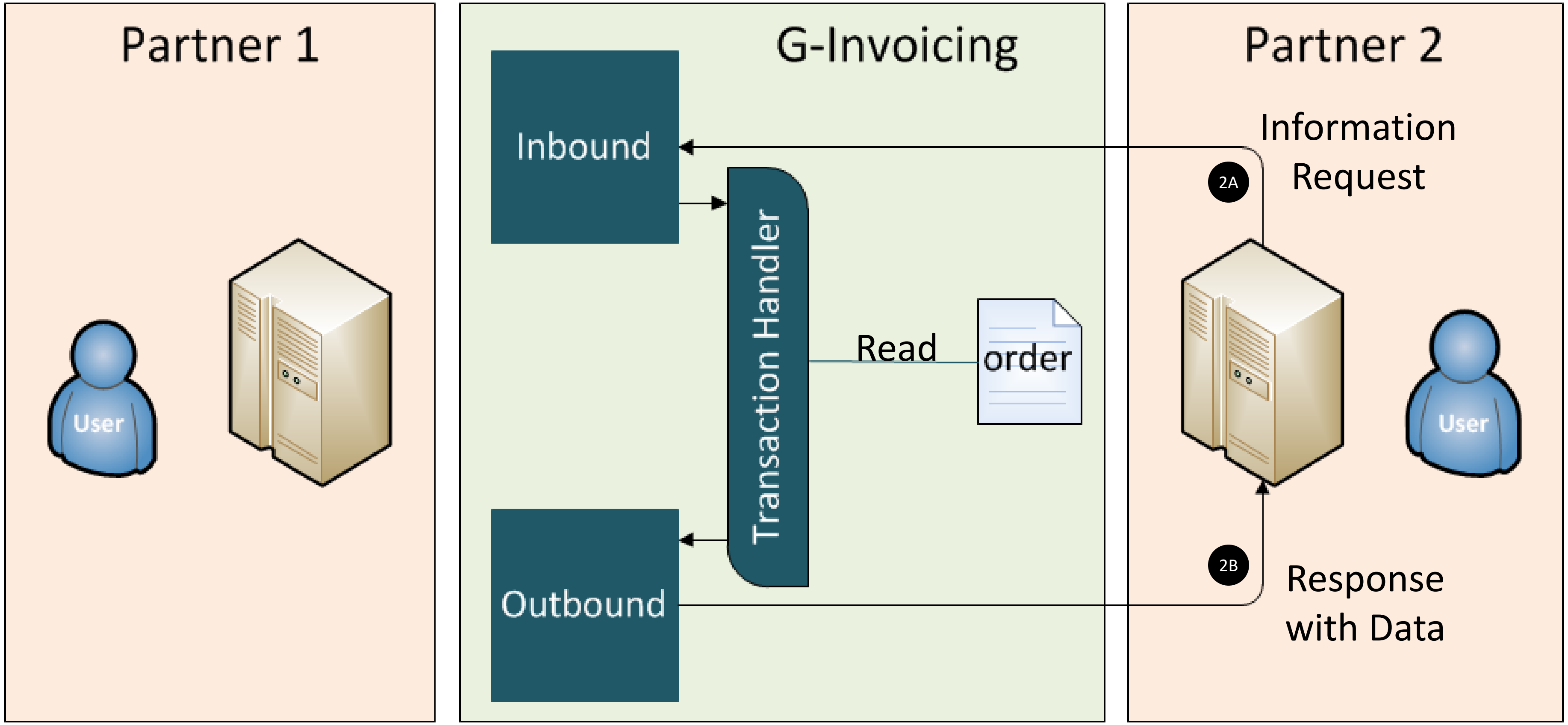
Order REST Service (1 of 4)



1A. Partner 1 submits (pushes) a new Order to be processed immediately

1B. G-Invoicing processes the single Order transaction and synchronously delivers a response to Partner 1

Order REST Service (2 of 4)

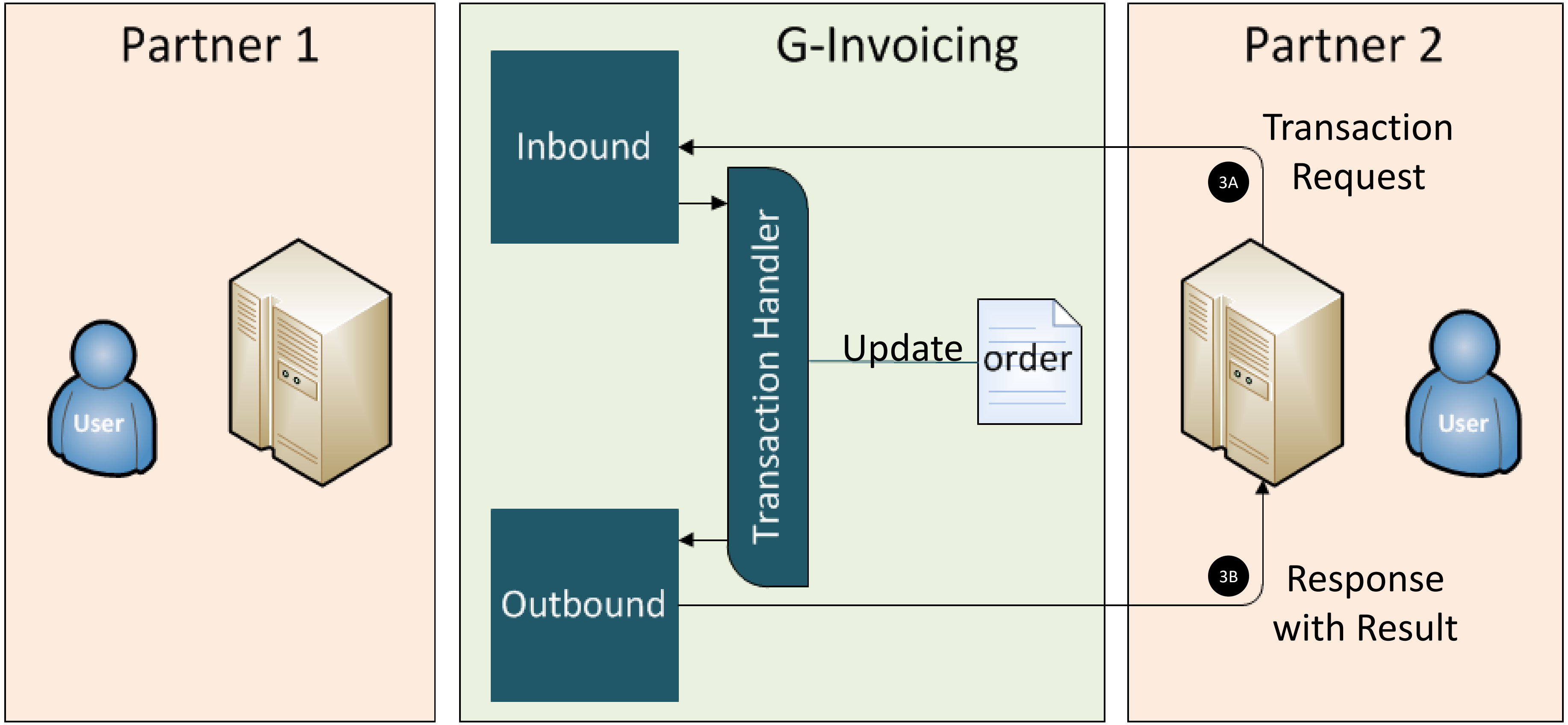


2A. Partner 2 requests a pull of new/modified documents from G-Invoicing

2B. G-Invoicing responds by delivering the requested data to Partner 2

Note: This is a 3-step process as described by Requesting G-Invoicing Documents slide

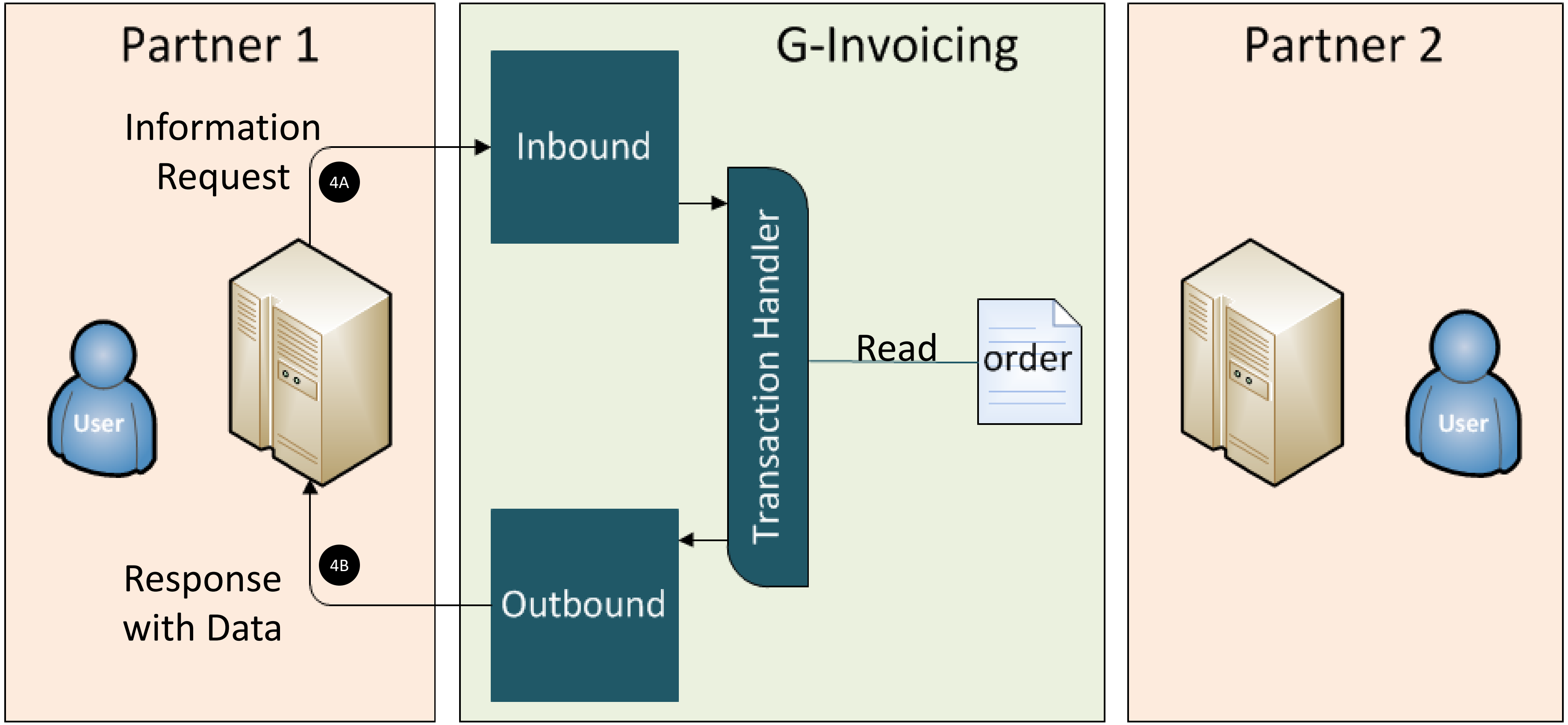
Order REST Service (3 of 4)



3A. Partner 2 submits (pushes) an Order approval transaction to G-Invoicing

3B. G-Invoicing processes the single Order transaction request and delivers a response to Partner 2

Order REST Service (4 of 4)



4A. Partner 1 requests a pull of new/modified documents from G-Invoicing

4B. G-Invoicing responds by delivering the requested data to Partner 1

Note: This is a 3-step process as described by Requesting G-Invoicing Documents slide

• Order Processing

Requested By	Type of Request	Method	Current State	New State	Data Validation Rules
Partner 1	New Order	POST	N/A	Shared with Partner 2	• All required Partner 1 data in request (see SM&VR) • Partner 2 (only) data in request will be ignored
Partner 2	Approved Order	PUT	Shared with Partner 2	Open	• All required Partner 2 data in request (see SM&VR) • Partner 1 (only) data in request will be ignored
Partner 2	Rejected Order	PUT	Shared with Partner 2	Rejected	• Required data for rejection in request (see SM&VR) • All other Partner 2 data in request will be ignored • Partner 1 (only) data not in request
Partner 1	Modified Order	PUT	Open, Rejected or Closed	Shared with Partner 2	• All required Partner 1 data in request (see SM&VR) • Changes detected to Partner 1 data elements (xml/json) • Partner 2 (only) data in request will be ignored
Requesting Agency	Closed Order	PUT	Open	Closed	• Required data for closure in request (see SM&VR) • All other Buyer data in request will be ignored • All Seller data in request will be ignored
Requesting Agency	Requesting Admin Changes	PUT	Open	Open	• All required Buyer data in request (see SM&VR) • Administrative changes detected to Buyer data (xml/json) • Only data elements Provided By ‘Requesting’ (BIO or SFO, depending on the situation) with How to Update ‘Admin Change’ in FIDS may be altered
Servicing Agency	Servicing Admin Changes	PUT	Open	Open	• All required Seller data in request (see SM&VR) • Administrative changes detected to Seller data (xml/json) • Only data elements Provided By ‘Servicing’ (BIO or SFO, depending on the situation) with How to Update ‘Admin Change’ in FIDS may be altered

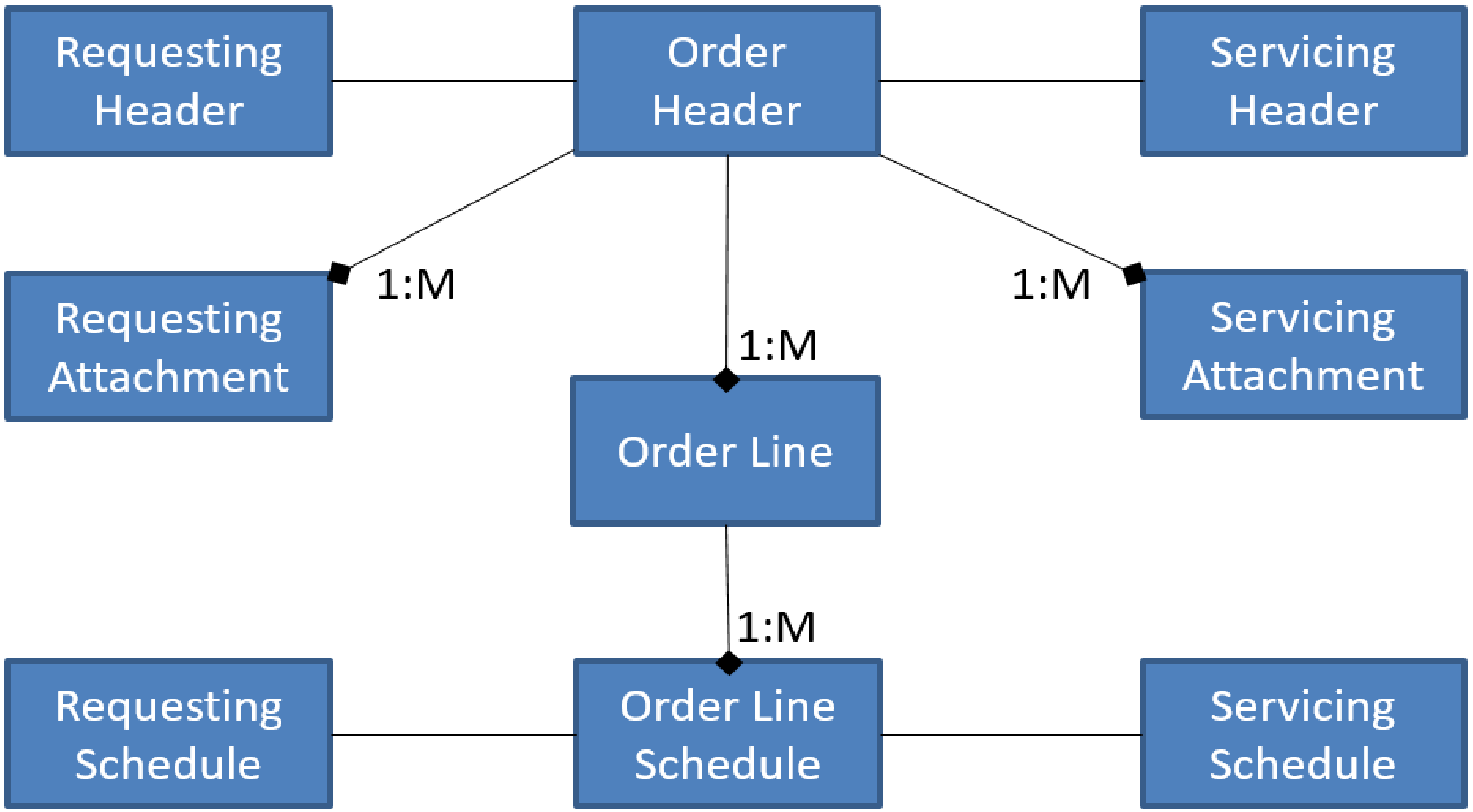
Push Interfaces – Updating Documents

- Business Transaction Identifier on Orders
  - Unique identifier used to guarantee an update request is based on the most recent version of the Order
  - Every change made to an Order results in the assignment of a new Business Transaction Identifier
  - **If the latest Business Transaction Identifier is not included in the XML/JSON, the request will be rejected**
- Performance/7600EZTransactions
  - There is no way to update a Performance transaction
  - Transactions with a future Performance Date may be deleted
- There is no API to create or update GT&C agreements
  - GT&C agreements must be negotiated in the user interface

Supporting Documents

- Federal Intragovernmental Data Elements (FIDS)
  - Data dictionary for GT&Cs, Orders, Performance and Organization
  - Ties data elements to Schemas and to Fiscal Service Data Registry
  - Contains critical information
    - Which partner supplies each data element for Buyer initiated Order
    - Which partner supplies each data element for Seller Facilitated Order
    - What action can be taken (if any) to change the value of each data element
- System Mapping and Validation Rules (SM&VR)
  - Show detailed validation rules for each data element in each status
  - Separate worksheets for Buyer Initiated Orders and Seller Facilitated
  - Includes UI statuses, so focus on column headings with orange highlights
    - Approved Order from Buyer (or Seller for SFO)
    - Approved Order from Seller (or Buyer for SFO)
    - Modified Order from Buyer (or Seller for SFO)

Logical Data Model for Orders



Push Order – Basic Requirements

- GT&C must be in open status to update an Order
- Period of Performance (POP) for the Order must fall within the GT&C's POP
- In a future release, G-Invoicing will allow either trading partner to initiate Orders
  - System user presenting the Order must have proper access as required by the *Order Originating Partner Indicator* in the GT&C
    - 'R' requires Requesting Order Manager & Approver roles
    - 'S' requires Servicing Order Manager & Approver roles

These and many more rules may be found in the Order SM&VR

Push Order – Data Sources

- Some data elements are system generated
  - Order Number
- Some data elements are exclusively supplied by one partner
  - Program Authority Citation
- Some data elements are sent in by both partners
  - Attachment File Name
- Some data elements are supplied by Partner 1 once, then exclusively updated by Partner 2
  - (Partner 2's) Group Name
- Data supplied by the wrong partner is ignored
  - Unless otherwise specified in SM&VR

Data sources are defined in the Order FIDS

Push Order – Lines and Schedules

- Lines and Schedules cannot be physically deleted
- Lines and Schedules can be cancelled
- Schedule Quantity may be set to zero
- All lines and schedules must be pushed for an Order, even those that have been cancelled or zeroed out
- Missing lines or schedules will result in error code 400
  - "The lines and schedules provided for this order do not match existing data. Please send all lines and schedules for this order"

Push Order – Administrative Changes

- Values of certain “administrative” data may be changed while Order remains in open status
- Filter the “How to Update” column in FIDS for ‘Admin Change’
- Attempts to change the value of a data element not marked for ‘Admin Change’ will be ignored
  - i.e., G-Invoicing will only examine candidates for Admin Change
- Attempts to change values of data elements on a Schedule against which Performance has been reported will be rejected
- System user must be assigned Order Manager role
- Admin Changes work the same for Seller Facilitated Orders

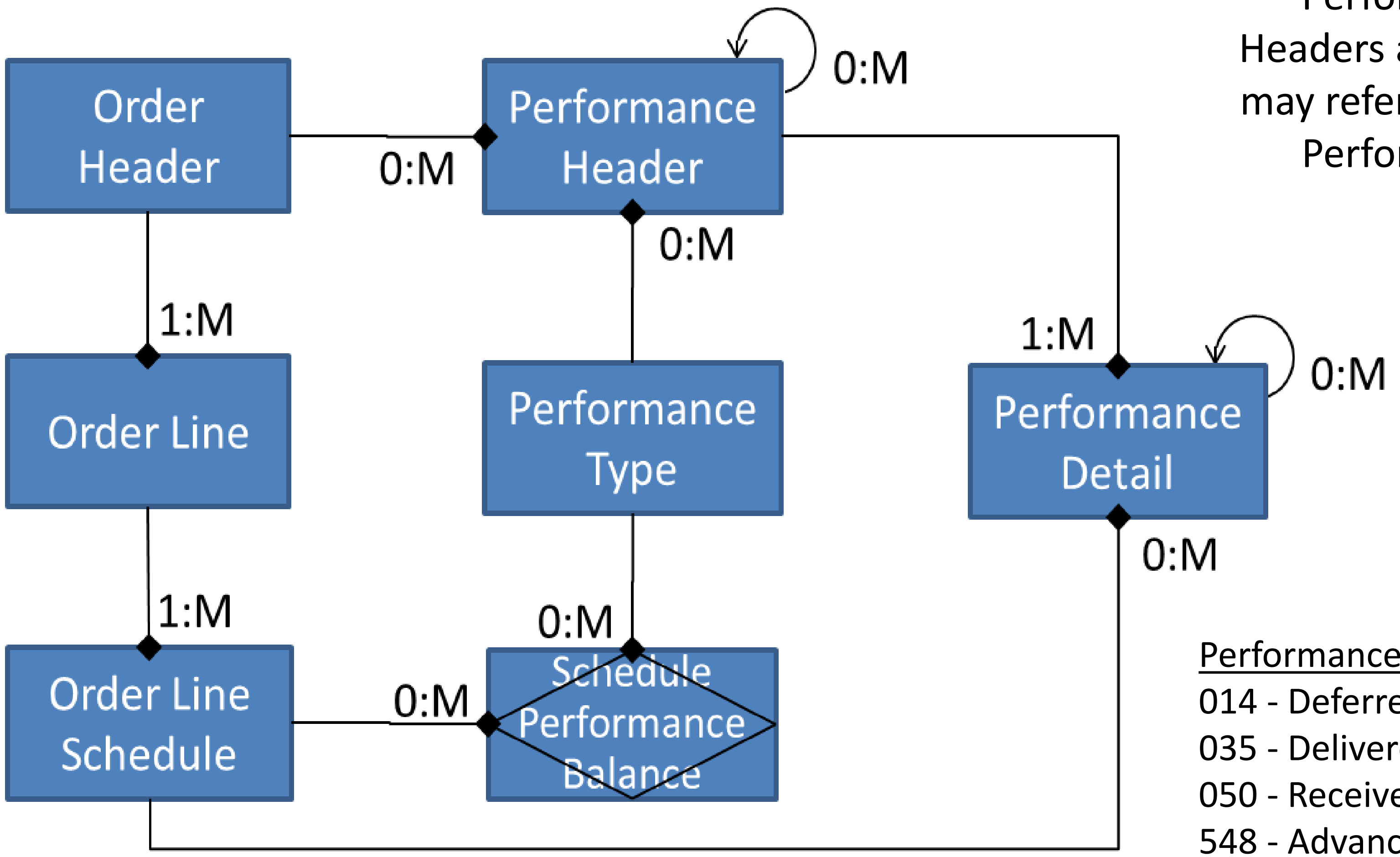
Push Order – Modifications

- Modifications may be requested by “Partner 1” (i.e., the same partner that introduced the new Order)
- See Order FIDS to determine which data may be modified
- Partner 2 may modify data once Partner 1 has approved
- Modifications require approval by each trading partner
- Modifications can be rejected and sent back to draft status
  - An Order in Rejected status by Partner 1, if Order Revert feature is enabled and both trading partners can support
- Order Schedule Quantity cannot be reduced to a point below the sum of quantity performed for any Performance Type
  - Most recent Deferred Payment is evaluated with Delivered/Performed
- Modifications may also alter data elements eligible for “Administrative Change” *(see Order FIDS)*

Push Order – Closing Rules

- Orders can be closed under the following conditions
  - Sum of Advanced quantity equals sum of Delivered/Performed
  - Sum of Delivered/Performed equals sum of Received/Accepted
    - when FOB Point is ‘Destination’ or ‘Other’ (and not Advanced)
    - when Received/Accepted has been provided by Buyer
  - No Performance pending settlement
  - At least one of the following conditions are met for each Schedule on the Order:
    1. Balance is zero (i.e., no unpaid quantity), or
    2. Seller has reported the “final” Delivered/Performed transaction

Logical Data Model for Performance



Performance Headers and Details may reference prior Performance

<u>Performance Types</u>
014 - Deferred Payment
035 - Delivered/Performed
050 - Received/Accepted
548 - Advance

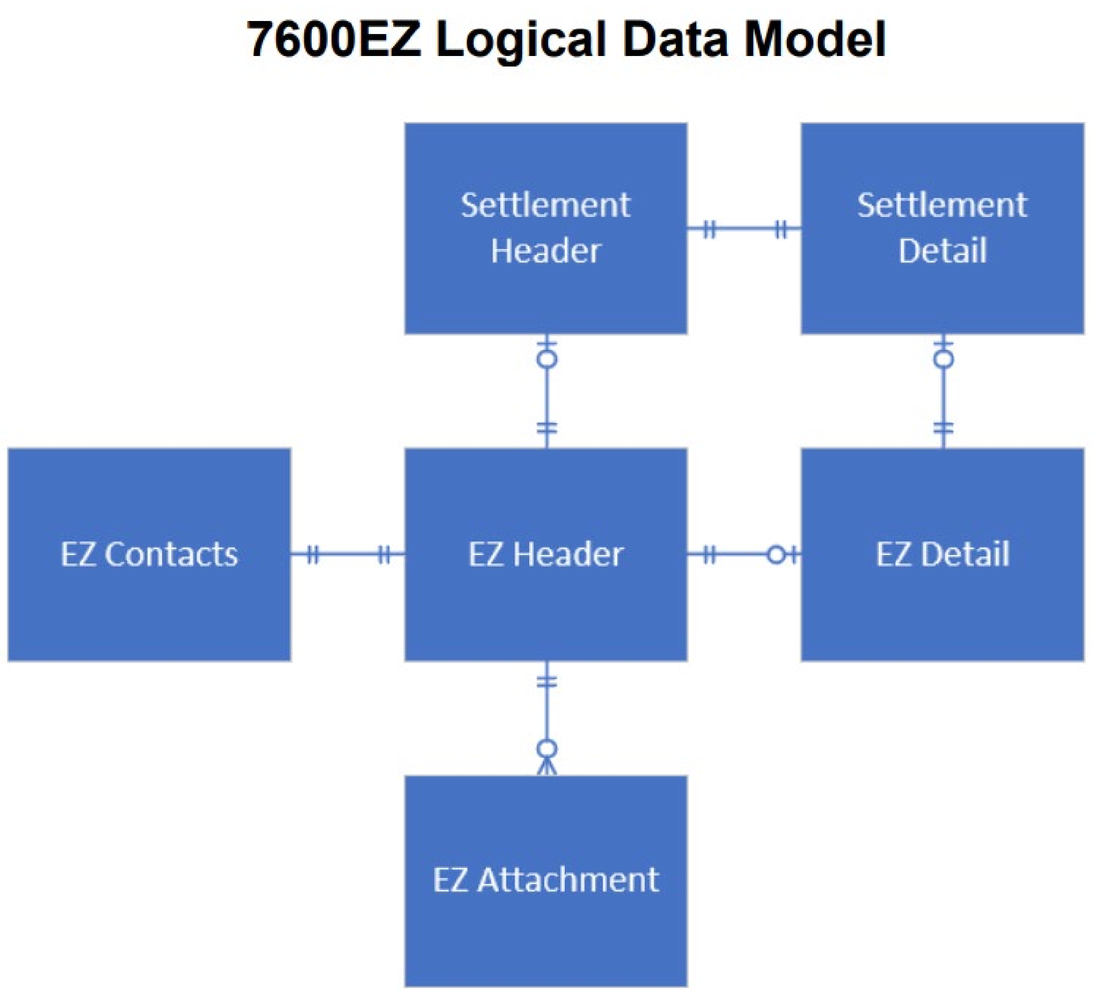
Settlement of Performance

- G-Invoicing settles qualified Performance through IPAC to CARS
- Performance status is included in API response:

Performance Status	Code	Use Case
Informational	INF	Performance has not triggered settlement
Pending	PND	Performance awaiting settlement
Previously Settled	PRE	Performance will not settle
Settled	STL	Performance has been settled
Deleted	XXX	Performance has been logically deleted
Error	ERR	Performance for which settlement has failed

- Future dated Performance settles on the Performance Date
- Advance settles immediately, unless future dated
- Delivered/Performed settles if FOB Point is Source/Origin
- Received/Accepted settles if FOB Point is Destination or Other
- Adjustments follow the same settlement rules
- Settlement errors will be corrected by G-Invoicing Production Support

Logical Data Model for 7600EZ



Settlement of 7600EZ

- G-Invoicing settles qualified 7600EZ transactions through IPAC to CARS
- 7600EZ status is included in API response but may change later

Performance Status	Code	Use Case
Informational	INF	7600EZ has not triggered settlement
Pending	PND	7600EZ awaiting settlement
Settled	STL	7600EZ has been settled
Deleted	XXX	7600EZ has been logically deleted
Error	ERR	7600EZ for which settlement has failed

- Future dated Invoices settles on the Performance Date
- Invoice & Reversed settles settled on Performance Date
- Accepted is always Informational
- Rejected settles if transaction is submitted within Rejection Days window of the Invoice
- 7600EZs don’t allow adjustments are need to be fully reversed if needed
- Settlement errors will be corrected by G-Invoicing Production Support

Attachment Services

- Stand-alone Attachment web service
  - Pull single Attachment (GT&C, Order, Performance, 7600EZ)
  - Push single Attachment (Order, Performance, 7600EZ)
    - The method for submitting an attachment is POST
    - DocumentNumber is required in the XML body of the attachment request in order to add the attachment to the appropriate document
    - See Push Spec Appendix B for more details (Section 4 Multipart Form-Data)