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Nagaraju Shiramshetti

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Continuous Data Reconciliation and Automatic Billing

ABSTRACT

E-commerce platforms partner with external vendors for the purposes of fulfillment. Upon completion of the sale or contracted services, the e-commerce platform may owe money to the associated vendors that deliver their services to the end customer, or the vendor may owe money to the e-commerce platform for selling their service. This disclosure describes techniques to automate billing/accounting validation and account/transaction reconciliation between an e-commerce platform and its vendors. A one-time setup procedure enables a user to define rules for data extraction, to set up mappings of data elements that originate from different sources, etc. A data mapper identifies data elements that come from source and target data sources and selects mapping rules used for comparison. A reconciliation (data comparator) module compares data from various sources using data elements and mapping rules. An output handler generates invoices, payments, discrepancy reports, etc.

KEYWORDS

- E-commerce
- Electronic retailing (e-tailing)
- Data reconciliation
- Account reconciliation
- Automatic billing
- Discrepancy detection
- Data mapping
- Customer fulfillment

BACKGROUND

Many e-commerce providers or platforms partner with external vendors or service providers for the purposes of fulfillment. For example, once a customer has placed an order for a product or service, the e-commerce provider can partner with a first vendor for installing the product; a second vendor for trading in the product; a third vendor for activating services on the product; etc. Upon completion of the sale and of the contracted services (e.g., installation, trade-in, activation, etc.), the e-commerce platform may owe money to the associated vendors that deliver their services to the end customer, the vendor may owe money to the e-commerce platform for selling their service, or both.

Reconciliation of accounts (billing and validation of the sale and of the services) between the e-commerce platform and vendors is often done manually. This increases the operating costs and risk for both platform and vendor. It can also hinder expansion of the services of the platform to more markets.

DESCRIPTION

This disclosure describes techniques to automate billing and accounting validation and reconciliation between an e-commerce platform and its vendors. In particular, for each partner/vendor, the following verification and billing procedures are automated:

- **Transaction reconciliation:** Compare the list of transactions as maintained by the e-commerce platform with the partner-supplied list of transactions. Verify that the two match and escalate discrepancies for human review.
- **Automated billing:** Generate invoices for the amount that the partner owes the e-commerce platform or payouts for the amount that the e-commerce platform owes the partner.

- **Account reconciliation:** Compare the transactions at the e-commerce platform with the resulting accounting entries. Verify that the amounts match.

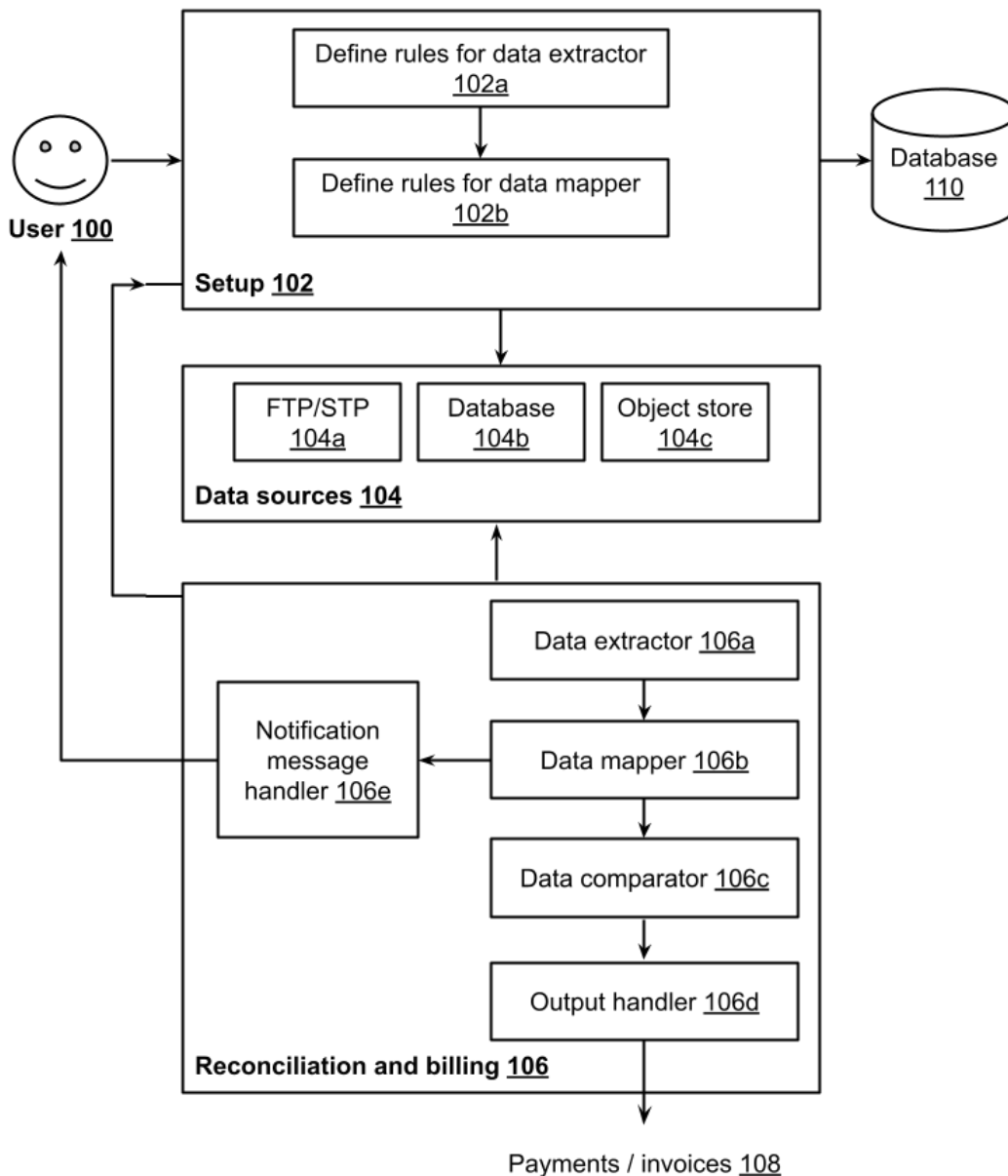


Fig. 1: Continuous data reconciliation and automatic billing

Fig. 1 illustrates continuous data reconciliation and automatic billing. A one-time setup procedure (102) enables a user (100) to define rules for data extraction (102a), to set up mappings between data sources (102b), to identify relationships between different data elements,

etc. The data-mapping field, mapping rules, object rules, scheduled frequencies of updates, notifications, etc. are stored in a database (110).

A reconciliation and billing module (106), which can run continuously, extracts data (106a) from different data sources (104) such as via file transfer protocol (104a), from databases (104b), from an object store (104c), file system, etc. A data mapper (106b) identifies data elements that come from source and target data sources and selects mapping rules used for comparison. For example, a user can provide source and target data sources, each with different field names; as part of one-time setup, the user maps fields between the two data sources. A data comparator (106c) compares data from different sources, identifies discrepancies, stores results in a human-readable format (e.g., spreadsheet) in an object store based on user ID, etc. The identification of discrepancies can result in two sets of data, e.g., matched data and unmatched data. The results can be shared with external vendors or with relevant units within the e-commerce organization. The completion of a task triggers a notification message handler (106e), which notifies the user of reports that may be ready for review. If a user or a partner/vendor finds any discrepancies in the generated reports, they can send back differential information to correct the report. Based on configured setup, an output handler (106d) generates outputs, which can include discrepancy reports, invoices, payments (108), etc. The outputs, e.g., discrepancy reports, can be shared with the user. The outputs, e.g., invoices, payment advices, etc., can be shared for the purposes of validation with partners/vendors and with the appropriate units (e.g., payment processing unit) within the e-commerce organization. The generation of an output triggers a notification (e.g., in the form of an email, message, etc.) to the user, vendor, etc., to the effect that a report is generated, a payment is processed, etc. Some outputs, e.g., discrepancy reports, can be configured to trigger alerts or alarms of various priorities, e.g., P1 (high priority), P2

(medium priority), P3 (low priority), etc., depending on the kind/importance of the discrepancy or the number of discrepancies. The modules are described in greater detail below.

Setup (102)

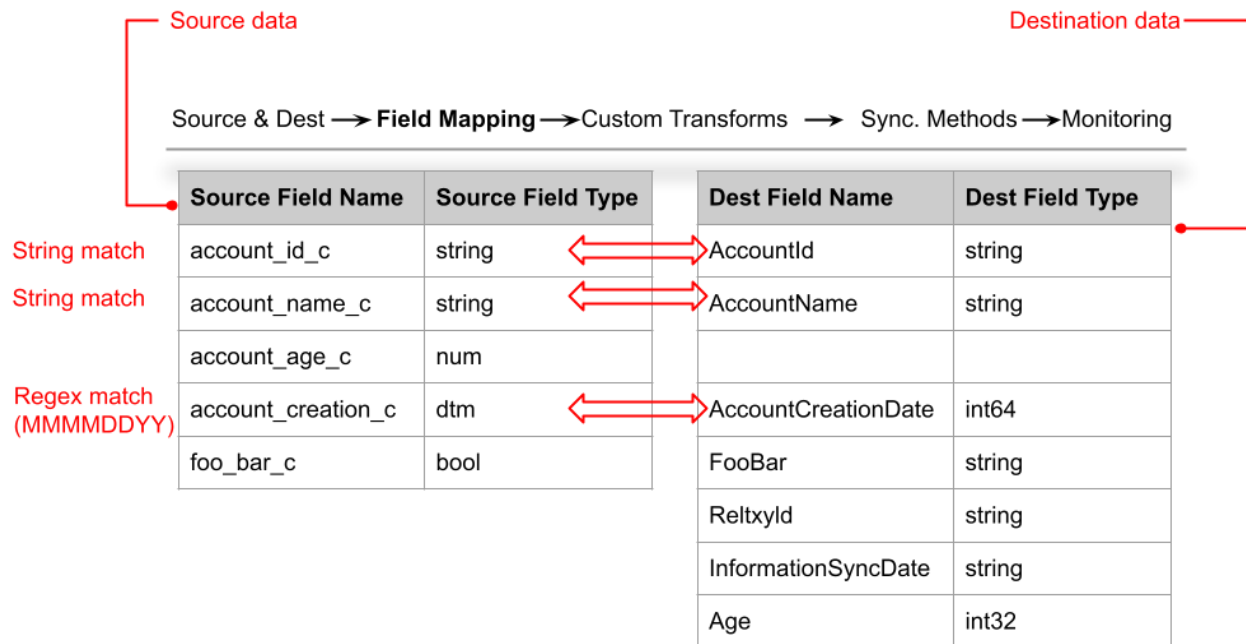


Fig. 2: An example user interface for the purposes of setup

Setup, which can be a one-time procedure, enables a user to provide two or more data sources to compare; to establish data mapping, e.g., to create a map between the data sources and to identify the relationships between different data elements; etc. Fig. 2 illustrates an example user interface for the purposes of setup. In a field mapping stage (of several stages, e.g., source and destination specification; custom transaction; synchronization methods; monitoring; etc.), a table of source field names/types are mapped to destination field names/types. In this example, of many fields, the user selected three for source-destination comparison. Furthermore, the user selected string matching for comparing two pairs of fields (source: account_id_c, dest: AccountId; and source: account_name_c, dest: AccountName) and regex matching for

comparing one pair (source: account_creation_c, dest: AccountCreationDate) of fields.

Comparison rules are selected for each data element.

Using natural language processing or other techniques, the setup module can be implemented to automatically map fields based on a comparison of the field names, structure, metadata, etc. The automatically generated mapping rules are displayed to the user, who can modify them as necessary. Mapping can be based on string match, number match, Boolean match, regular expression (regex) match, regex extraction, etc., and can be established after combining multiple fields as necessary.

Setup also enables a user to define rules for output generation. The rules can be based on the use of matched data to generate billing; the use of unmatched data to generate discrepancy reports; etc. Options for recording data for auditing or certain use cases can be specified.

Data sources (104)

Data to be compared can come from different sources such as database tables, comma-separated values (CSV) files, spreadsheets, Extensible Markup Language (XML) files, text files, etc. The files can be shared using file transfer protocol (FTP), secure FTP, object store, etc. Databases maintained by e-commerce providers, which include products, hardware items, subscriptions, activations, orders with device and serial IDs, installation histories, etc., can serve as a source of groundtruth.

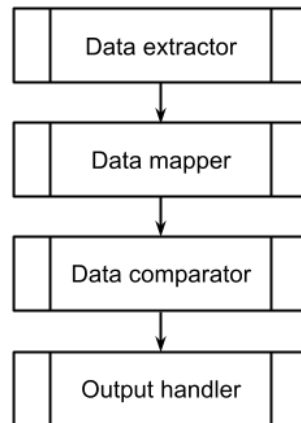
Reconciliation and billing (106)

Fig. 3: Workflow during reconciliation and billing

Fig. 3 illustrates the workflow during reconciliation and billing. Reconciliation and billing can run continuously, starting at the first availability of a batch of data and thereafter upon the incremental availability of data. Reconciliation and billing can include the comparison of data from different sources using the predefined mapping rules; the identification of discrepancies, e.g., the generation of a matched set of data and an unmatched set of data; the storing of results in an object store (e.g., based on userID); etc. Data can be extracted using different injectors from different sources such as object store, FTP, file system, etc. based on predefined data extraction rules. Upon the completion of a task, e.g., installation, a message (e.g., email or detailed notification) is sent to the user by the notification message handler. The notification can be used to validate automatically generated invoices or payments.

After reconciliation, results are stored in a secure location such as an object store on a user partition that particular partners or services can access. Output is generated based on predefined output generation rules. Output can include, e.g., invoices, billing statements, payments, discrepancy reports, etc. Discrepancies can be resolved by the user, an agent of the e-commerce provider, etc., and can be processed in the next data update (delta).

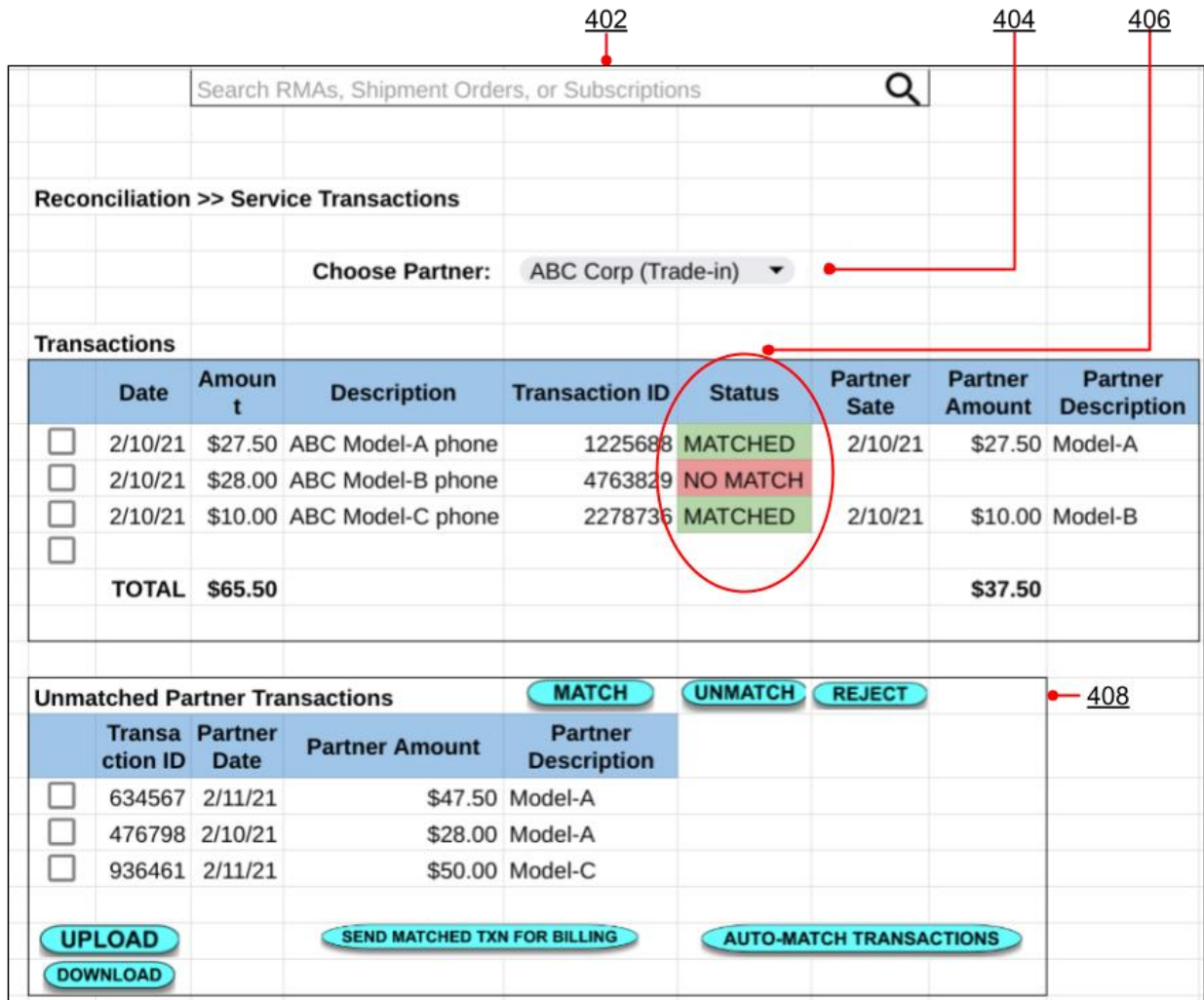


Fig. 4: An example reconciliation report

Fig. 4 illustrates an example of a reconciliation report. The reconciliation report can enable a user to search through return material authorizations (RMA), shipment orders, subscriptions (402), etc. It can enable the user to select a given vendor for further study (404). For transactions of the selected vendor, a match/unmatch status can be reported (406). Unmatched transactions can be listed for rectification (408).

The customer's usage is automatically accumulated, and ongoing statements are provided. Risk checks are performed to ensure compliance obligations. At the end of a billing cycle (e.g., at the end of the month), usage is automatically summarized, invoices raised, and the

customer billed. For customers that auto-pay their dues, funds are obtained from their selected form of payment. If a product offers other forms of invoicing (e.g., net-30 payment), the customer is invoiced. When the customer pays their invoice, the payments are matched to the invoice. In case of disbursements to vendors on an e-commerce platform, funds accumulated by a seller can be automatically disbursed (after due validation) at a regular cadence to the vendor's specified form of payment, e.g., bank account.

In this manner, the described data reconciliation and automatic billing framework provides interfaces for a user to define templates to compare data from different sources and to continuously generate results based on matched data or unmatched data. The described framework can be used to automatically generate bills or invoices based on the results, e.g., whether a discrepancy is found. The frequency of operation can be set by the user. The described techniques apply generally to situations that require continuous operation to determine discrepancies and to automatically generate output.

CONCLUSION

This disclosure describes techniques to automate billing/accounting validation and account/transaction reconciliation between an e-commerce platform and its vendors. A one-time setup procedure enables a user to define rules for data extraction, to set up mappings of data elements that originate from different sources, etc. A data mapper identifies data elements that come from source and target data sources and selects mapping rules used for comparison. A reconciliation (data comparator) module compares data from various sources using data elements and mapping rules. An output handler generates invoices, payments, discrepancy reports, etc.