INFO213 Course Project Milestone 2:
The Terminal Operating System Implementation
Invoicing
arb142
88866582

Table of Contents

Definition of Terms

Invoice	A bill for goods or services provided.
Subdomain	A smaller section of a larger domain.
Domain/Scope	The area which a subject deals with or includes.
Terminal	The end of a railway or other transport route, or a station at such a point.
Data Terminal	A computer system at which a person can enter data into a system or receive data from one.
Prototype	A first version from which other forms are developed.
TOS	Terminal Operating System.
RDT	Remote Data Terminal.
Operating System	Software that supports basic functions, such as scheduling tasks and controlling peripherals.
Exception	An event that disrupts the normal flow of the program's instructions.
Object	An abstract data structure, can include multiple properties and methods.
Class	A defined structure to create an object, defines a set of properties and methods that are common to all objects of one type.
Property	A piece of information.
Method	A set of instructions for a computer to perform a task.
XML	Extensible Mark-up Language.
UML	Unified Modelling Language.
Schema	Logical grouping of classes, together with their associated methods and properties.
Tabular	Consisting of or presented in columns or tables.
Format	The way in which something is arranged or set out.
Data	Information.
Hierarchy	Structured arrangement of objects.

Project Overview/Summary

This project is focused on the implementation of a minimal working prototype of the invoicing subdomain of JADE's Master Terminal Operating System.

JADE's Master Terminal is described as the following:
"Master Terminal is a comprehensive, easily configurable and fully integrated TOS that provides a secure, real-time view of information and activity across the [transport] enterprise. It is designed to cater for all cargo types. Mobile applications running on vehicle-mounted and handheld RDT devices allow operators to record activities and information from any work area within the terminal. Multiple sites, terminals and sub-terminals can all be managed within a single database."

Because the project domain of the Master Terminal is too large, the scope has been reduced to the invoicing subdomain, which is described as "Configure and track charges and invoices for every cargo event, handling flexible tariffs and rates, multiple currencies, cash payments and integration with standard invoicing systems."

The presented schema is a minimal working prototype, created to demonstrate a concept and/or understanding of said concept. Therefore, it is not fully functional, and all current functionality can be found in the Functionality/Use Cases section.

Functionality/Use cases

Current implementation functionality:

The minimal working prototype currently supports the following:

- Import invoices from XML file format.
    - By selecting Invoicing and then Import from XML.
- Display of invoices in tabular format.
    - By selecting Invoicing and then Table.
- Modification and creation of invoice data.
    - By selecting Invoicing and then Add or selecting an Invoice from Table and clicking Edit.
    - When creating a new invoice, the current date and next valid invoice number is automatically entered for you.
    - When editing an existing invoice, the invoice number, date and total cost start off locked – to ensure no accidental changes are made.
- Allocation of objects into containment hierarchies.
    - Automatic – Reference in Terminal and Invoice automatically maintained.
- Error and exception logging to an external file.
    - All exceptions and errors are logged to Jade's log directory("C:\Jade2018\logs") and stored in invoicing_system_errors.log.

Future functionality:

Below is a list of functionality that should be included in later prototypes to more accurately represent the entire invoicing subdomain (not included in this minimal working prototype).

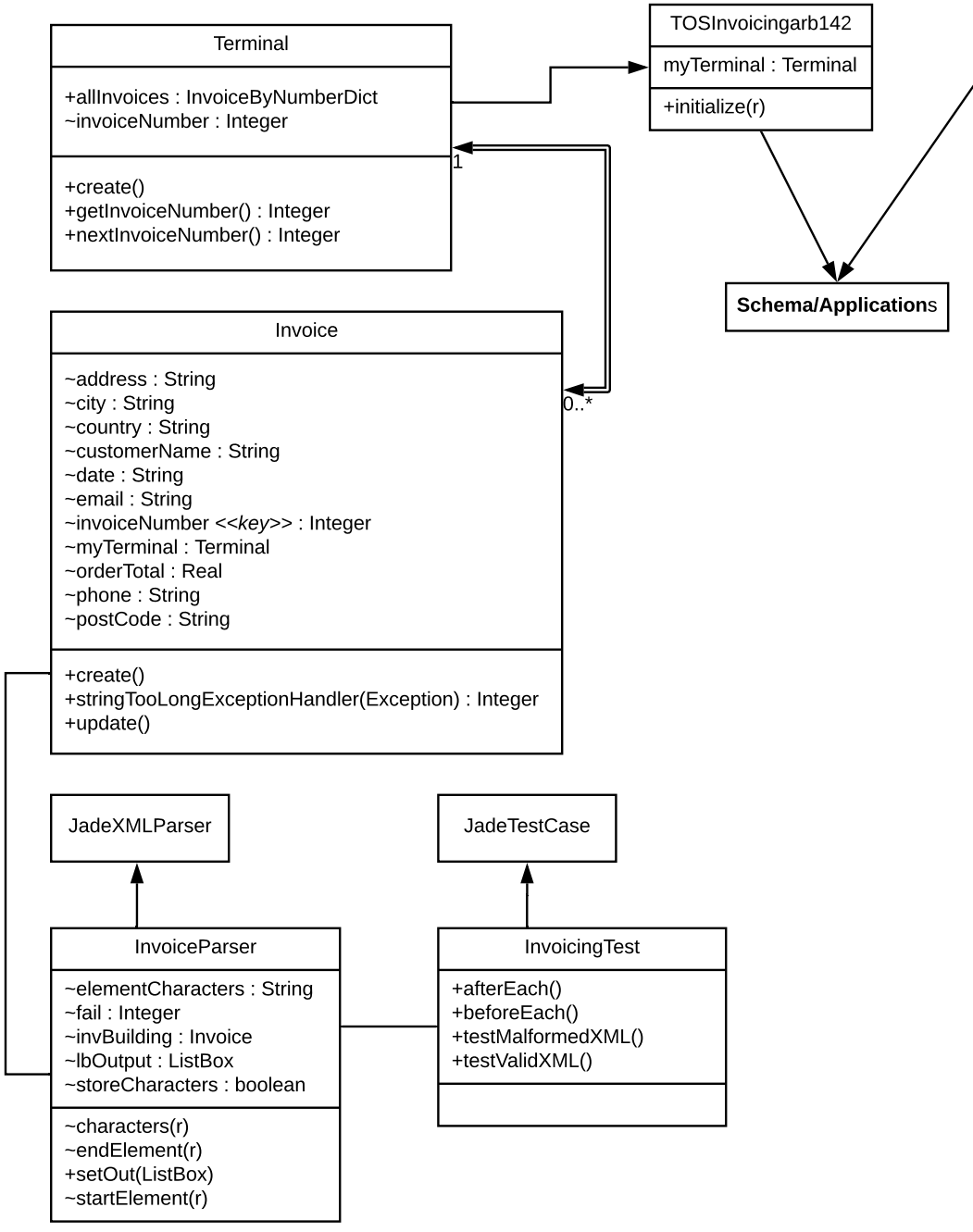
- Generation of reports from object data.
- Interfacing with external, third-party systems.
- Handling of individual cargoes and services instead of a flat total.
- Track and trace of cargo.
- Customizable outputs.
- Cash handling functionality.
- Manage custom customer and rate tables.
- Support for multiple currencies.
- Automated transaction history backup.

UML Diagram

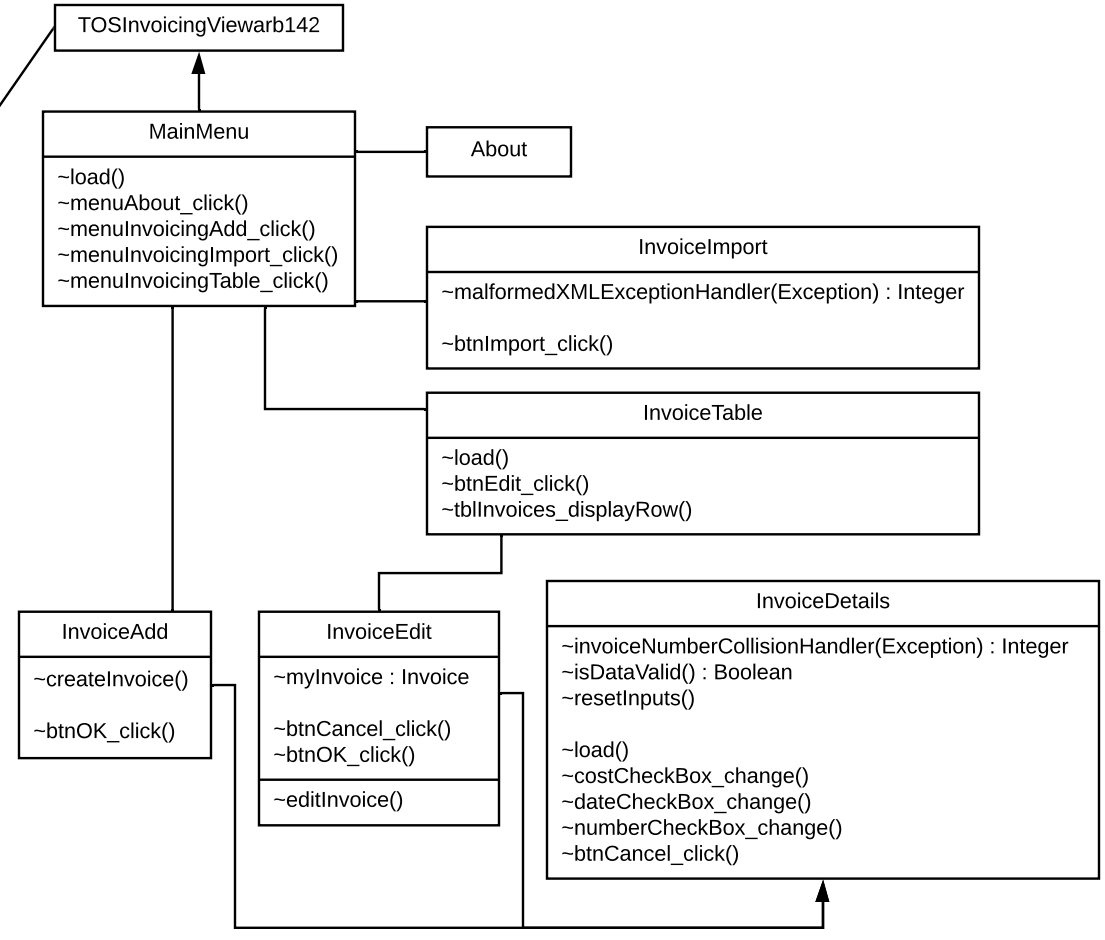
NOTE:: Invoice class - for create() and update(), method parameters are one of each attribute that Invoice has (cut from UML due to length).

GUI elements of the schema aren't represented in proper UML standards, because of their size. i.e. Form elements aren't listed, just items of interest.

Terminal Operating System
UML Class Diagram



Terminal Operating System
GUI UML Class Diagram



Exceptions and Error Handling

malformedXMLExceptionHandler

Triggered when importing a malformed XML (see ”Import objects from XML-base file format.” for import instructions). When attempting this, the import will be aborted, a message box with “Malformed XML file” will appear, and the list box that displays XML parser status will show “Malformed XML detected. Aborting Import”. The standard XML parser error (8091) is logged to the log file (“C:\Jade2018\logs\invoicing_system_errors.log).

invoiceNumberCollisonHandler

Triggered when attempting to set an invoices number (i.e. the dictionary key) to a key that is already occupied. When attempting this, a message box with “That invoice number has already been used!” will appear, and the input fields will be reset. The standard Key already used in this dictionary error (1310) is logged to the log file (“C:\Jade2018\logs\invoicing_system_errors.log).

stringTooLongExceptionHandler

Triggered when attempting to create an invoice with a string that exceeds the attribute’s defined length. When attempting this, a message box with “Reduce amount of text in the input field” will appear. It should be noted that it’s not possible to trigger this exception through the GUI, as the form’s text box size limits size of the input string. The standard String too long error (1310) is logged to the log file (“C:\Jade2018\logs\invoicing_system_errors.log).

List of Unit Tests

NOTE:: All instances of Invoice, Terminal and InvoiceByNumberDict are cleared when running tests.

Default test files: InvoiceData5.xml, InvoiceDataMalformed.xml

Default file directory: C:\Jade2018\TOSInvoicing\<xmlFile>

testValidXMLTests

Tests importing a valid XML file, then checks the first and last invoice instances to see if the customer’s name is correct.

testMalformedXML:

Tests importing an invalid XML file, checking for exception 8901 (XML parser error), then checks that the list of Invoice instances is still empty.

References

Jade Software Corporation. (n.d.). *Invoicing Fact Sheet.* Retrieved from https://www.jadelogistics.com/wp-content/uploads/2018/06/jade-logistics-master-terminal-tos-fact-sheet-invoicing.pdf

Jade Software Corporation. (n.d.). *JADE Master Terminal Overview*. Retrieved from https://learn.canterbury.ac.nz/pluginfile.php/1644601/mod_resource/content/0/JADE-Master-Terminal-Overview.pdf