

COMP 3111: Software Engineering

Course Project Problem Statement

BACKGROUND

Sino Express LLC (SinEx) requires a logistics management system to allow its customers to manage the shipping and tracking, via the Web, of express package delivery. The logistics management system is composed of several systems one of which is the shipment management system. In this project, you are required to analyze the requirements for and to design and implement the functionality of the *shipment management system*.

SYSTEM REQUIREMENTS

1. Shipping accounts

To use the services provided by the shipment management system either a personal or a business shipping account should first be created. To create a shipping account, the following information should be provided, all of which should be required, except the department name for a business account and the postal code for a mailing address.

- *Personal account information*: first (given) name up to 35 characters, last (family) name up to 35 characters, mailing address, phone number between 8 and 14 digits and email address up to 30 characters.
- *Business account information*: contact person name up to 70 characters, company name up to 40 characters, department name (if any) up to 30 characters, mailing address, phone number between 8 and 14 digits and email address up to 30 characters.
- *Credit card information*: card type (only American Express, Diners Club, Discover, MasterCard, UnionPay and Visa should be accepted), card number between 14 and 19 digits¹, security number between 3 and 4 digits, cardholder name up to 70 characters and card expiry month and year.

A mailing address should include building information (name, floor, flat/suite, block/tower), if any, up to 50 characters, street information (number and name) up to 35 characters, city up to 25 characters, two-character province code² and postal code³ between 5 and 6 digits, if any.

A shipping account should be assigned a unique 12-digit account number by the system upon successful creation.

Customers should be able to display and change any of their personal/business account and credit card information. A shipping account number should never be changed and a shipping account should never be deleted.

2. Customer login accounts

To use a shipping account, a customer should create a user name and password. A user name should be unique, between 6 and 10 characters and contain only letters and digits. A password should be between 8 and 15 characters and contain at least two non-alphanumeric characters. The user name should be case insensitive while the password should be case sensitive. A customer should be able to change her password, but should not be able to change her user name. Upon successfully creating a login account, a confirmation email should be sent to the shipping account email.

3. Destinations

Shipment service to the following major Chinese cities (and their surrounding metropolitan area) should be available.

¹ See https://en.wikipedia.org/wiki/Payment_card_number.

² See https://en.wikipedia.org/wiki/Provinces_of_China.

³ See https://en.wikipedia.org/wiki/List_of_postal_codes_in_China and https://en.wikipedia.org/wiki/Postal_codes_in_Taiwan.

Beijing, BJ	Guiyang, GZ	Hulun Buir, NM	Nanjing, JS	Tianjin, HE
Changchun, JL	Haikou, HI	Jinan, SD	Nanning, JX	Urumqi, XJ
Changsha, HN	Hailar, NM	Kashi, XJ	Qiqihar, HL	Wuhan, HB
Chengdu, SC	Hangzhou, ZJ	Kunming, YN	Shanghai, SH	Xi'an, SN
Chongqing, CQ	Harbin, HL	Lanzhou, GS	Shenyang, LN	Xining, QH
Fuzhou, JX	Hefei, AH	Lhasa, XZ	Shijiazhuang, HE	Yinchuan, NX
Golmud, QH	Hohhot, NM	Macau, MC	Taipei, TW	Yumen, GS
Guangzhou, GD	Hong Kong, HK	Nanchang, JX	Taiyuan, SX	Zhengzhou, HA

4. Package types, service types and fees

Shipment service for the following **SinEx**-provided packaging options should be available.

Envelope – for correspondence and documents only with no commercial value.

(Size: 250x350mm. Weight limit: Not Applicable)

Pak – for flat, non-breakable articles including heavy documents.

(Size: small - 350x400mm; Size: large - 450x550mm. Weight limit: 5kg)

Tube – for larger documents, such as blueprints, which should be rolled rather than folded.

(Size: 1000x80mm. Weight limit: Not Applicable)

Box – for bulky items, such as electronic parts and textile samples.

(Size: small - 300x250x150mm. Weight limit: 10kg;

Size: medium - 400x350x250mm. Weight limit: 20kg;

Size: large - 500x450x350mm. Weight limit: 30kg)

The following service types should be available.

Same Day – same day delivery if picked up by 10:00 a.m.

Next Day 10:30 – next day delivery by 10:30 a.m. if picked up by 3:00 p.m.

Next Day 12:00 – next day delivery by 12:00 p.m. if picked up by 6:00 p.m.

Next Day 15:00 – next day delivery by 3:00 p.m. if picked up by 9:00 p.m.

2nd Day – delivery by 5:00 p.m. the second business day.

Ground – delivery by 1 to 5 business days depending upon the origin and destination.

The fee charged should depend on the package type, the service type and, for some package types, the weight⁴ as shown in the following table (amounts are stated in CNY).

Service type	Package type				
	Envelope	Pak	Tube	Box	Customer
Same Day	¥160	¥100/kg (¥160 minimum)		¥110/kg (¥160 minimum)	
Next Day 10:30	¥140	¥90/kg (¥140 minimum)		¥99/kg (¥140 minimum)	
Next Day 12:00	¥130	¥80/kg (¥130 minimum)		¥88/kg (¥130 minimum)	
Next Day 15:00	¥120	¥70/kg (¥120 minimum)		¥77/kg (¥120 minimum)	
2nd Day	¥50	¥50/kg (¥50 minimum)		¥55/kg (¥55 minimum)	
Ground	¥25	¥25/kg (¥25 minimum)		¥30/kg (¥30 minimum)	

The minimum charge should apply to each package individually in a shipment. If a package is over the weight limit for that package type, a ¥500 penalty charge should be applied to each overweight package. There should be no weight limit for the Customer package type.

It should be possible to display the fees in any of the following currencies: Chinese Yuan (CNY - the default), Hong Kong Dollar (HKD), New Taiwan Dollar (TWD) and Macanese Pataca (MOP)⁵.

Anyone who visits the **SinEx** website should be able to determine the cost for a shipment by providing the shipment details (i.e., origin, destination, service type, package type(s) and weight(s)) and should be able to display the package costs and the total shipment cost in any of the preceding currencies.

⁴ Each package in a shipment will be weighed at a sort facility before it is shipped and charged separately based on this weight.

⁵ The following initial exchange rates should be used: 1 CNY = [1.13 HKD; 4.56 TWD; 1.16 MOP].

5. Package shipping

SinEx will not have physical offices where packages can be dropped off. Instead, all package pickup arrangements should be done via the Web. To arrange for package shipping a customer should first login. Thereafter, she should specify details about the sender and recipient of the shipment, the contents of the shipment and the pickup location for the shipment. The pickup location can either be the same as the sender's mailing address or it can be different.

While every shipment should be from a single sender to a single recipient, a pickup may be for packages going to several recipients (i.e., for several shipments). Thus, a customer may have several shipments that will be picked up at the same time and each shipment can be for a different recipient.

For each recipient, a shipment waybill should be completed containing the following information:

- sender's shipping account number, full name, mailing address, phone number and email address, which should be provided automatically by the system from the shipping account information. Optionally, it should also be possible to enter a reference number, which is strictly for the sender's own use; it is not used by the shipment management system.
- recipient's full name (must be a person), company name and department name (if any), delivery address, phone number and email address.
- shipment information
 - *for each package*: the package type, a description of its contents, the value of the contents including in what currency (i.e., CNY, HKD, TWD or MOP) and its weight in kilograms to one decimal place. The maximum number of packages allowed in one shipment should be 10.
 - *for each shipment*: the service type, who pays for the shipment (sender or recipient) and who pays for any duties and taxes (sender or recipient). While each shipment can consist of several packages of different package types, it should have only one service type. If shipment payer or the duties and taxes payer is the recipient, then the recipient should also have a **SinEx** shipping account and the recipient's shipping account number should be provided.
- optional email notification, which should cause an email to be sent to the recipient when a shipment is picked up and/or to the sender when a shipment is delivered. The email should contain the following information: for pick up – pickup notification, waybill number, sender name and address, and pickup date; for delivery – delivery notification, recipient name and address, and delivery date.

The system should generate a unique 16-digit waybill number for a shipment and the completed waybill should show the estimated cost for each package and the total estimated cost for the shipment based on the user-provided weight for each package and the current **SinEx** fees. It should be possible to delete a shipment waybill or to modify its recipient, shipment or notification information at any time before it is confirmed. Once it is confirmed, it should not be possible to modify it. However, it should still be possible to cancel it provided the shipment has not yet been picked up. After a shipment waybill is confirmed, the sender should print and sign it and attach it to the shipment. Once a shipment has been picked up, it should not be possible to make further changes to the shipment waybill. For statistics, accounting and legal purposes, all shipment information should be retained even if the shipment is subsequently cancelled.

It should be possible to arrange either for immediate shipment pickup or prearranged pickup up to 5 days in advance. A customer should indicate the pickup type (immediate or prearranged) at the time that the shipment waybill is confirmed. For prearranged pickup, a pickup date should be specified as well as a time. All the packages in a shipment should be picked up together and in the same location.

6. Invoicing and payment

An invoice for a shipment should be generated immediately after its packages have been weighed at a sort facility and any duties and taxes payable have been determined. The invoice should be sent to the email address of the shipping account designated as the payer. When the shipment payer and the duties and taxes payer are different, an invoice for the respective charges should be sent to each payer. All payments should be charged automatically to the credit card number associated with the payer shipping account and should be authorized by a credit card authorization authority.

The invoice should show the shipping account number of the invoice payer, shipment waybill number, ship (pickup) date, service type, sender's reference number, sender and recipient information (full name

and mailing/delivery address), credit card type, credit card number (last four digits only), the authorization code, total amount payable and, for each package, the package type, the actual weight and the cost. The monetary amounts of an invoice should be in the currency of the city in which the payer is located.

7. Customer support tools

(a) Shipment tracking

It should be possible for anyone to track a shipment by providing the shipment waybill number. An example shipment tracking information should look like that shown below.

Waybill number:		1111222233334444	Service type:		Next Day 15:00
Delivered to:		J. Wong	Package type:		Envelope Tube
Delivered at:		Reception desk	Weight:		0.1kg 0.5kg
Status:		Delivered			
<i>Date</i>	<i>Time</i>	<i>Description</i>	<i>Location</i>	<i>Remarks</i>	
06/01/17	13:20	Delivered	Shanghai		
	12:00	On vehicle for delivery	Shanghai	Vehicle 100023	
	11:30	At local sort facility	Pudong	Waiting for customs clearance	
	07:30	Left origin	Hong Kong	Dragonair KA215	
05/01/17	23:15	At local sort facility	Tung Chung		
	20:30	Picked up	Tsim Sha Tsui	Vehicle 000067	

Shipment tracking is initiated when a shipment is picked up and terminated when the shipment is delivered, returned or lost.

(b) Recipient addresses

Rather than entering the address of a recipient for each shipment, a customer should be able to enter, save, edit and delete her recipient addresses and to select an address when completing a shipment waybill. It should be required to assign a nickname to each address (e.g., Beijing supplier) that is unique for the account for easy selection of the recipient address.

(c) Pickup locations

Rather than entering the pickup location for each shipment, a customer should be able to enter, save, edit and delete her pickup locations and to select a pickup location when completing a shipment waybill. It should be required to assign a nickname to each pickup location (e.g., Home) that is unique for the account for easy selection of the pickup location.

8. Report generation

It should be possible to generate the following reports.

<i>Report</i>	<i>Description</i>	<i>Accessible by</i>
(a)	A listing of a specified shipping account's shipping history over a specified date range. The listing should show the shipment waybill number, ship date, delivery date, recipient name, origin city, destination city, service type and total number of packages. It should be possible to order this listing by ship date, delivery date, recipient name, origin city, destination city or service type.	SinEx employee; the shipping account customer
(b)	A listing of a specified shipping account's invoices over a specified date range. The listing should show the shipment waybill number, ship date, recipient name, origin city, destination city, service type and total invoice amount. It should be possible to order this listing by ship date, recipient name, origin city, destination city, service type or total invoice amount.	SinEx employee; the shipping account customer
	In addition, it should be possible to select a shipment in the listing and to display all of the invoice information specified in requirement 6.	

For date ranges, the default start and end date should be the current date. If no date range is specified, then all dates should be included. For all reports, it is only necessary to be able to view them as a web page.

OTHER REQUIREMENTS

The following requirements are *not* part of the system requirements of the shipment management system, but are needed to test the correct functioning of the system.

Employee Login Accounts

Employees of *SinEx* will require login accounts to generate the reports described in requirement 8 and to perform the following functions.

- select a shipment using the waybill number and enter the actual weight of each package in the shipment.
- select a shipment using the waybill number and enter the amount of duty and the amount of tax for the shipment. (Note that duty and tax are two separate charges.)
- add service cities.
- change service type fees, including penalty fee.
- change currency rates.

Employee login accounts should be different and separate from customer login accounts and should be created directly by the system administrator. If an employee wants to use the *SinEx* delivery services, then she should create a shipping account and a customer login account as described previously.

External Systems

1. Shipment Tracking System

The shipment tracking system is a separate part of the logistics management system that sends the following information about a shipment to the shipment management system as shown in the example in requirement 7(a): date, time, activity, location, remarks, final status (delivered, returned, lost), final delivery place and the name of the person that accepted final delivery of a shipment. For the purpose of testing the ability of the shipment management system to display the tracking history of a shipment, it is necessary to provide an interface (i.e., a web page) that allows the waybill number for a shipment to be selected and a date, time, activity, location, remarks, delivered to, delivered at and status information to be entered for the shipment. Since this web page is strictly for testing purposes, it does not have to be password protected (i.e., no login should be required to use this web page).

2. Credit Card Authorization Authority

To authorize a charge to a credit card, the shipment management system should send details of the charge (credit card number, security number and charge amount) to a credit card authorization authority. The reply from the credit card authorization authority will authorize the credit card charge (or decline it as may be the case when a card is fake or has expired) and return a 4-digit authorization code that should be kept by the shipment management system as part of the payment information. To simulate the interaction between the shipment management system and the credit card authorization authority (i.e., send the required information to the credit card authorization authority and receive authorization for the charge), the system implementation should provide a function that mimics the credit card authorization authority. In the implementation, it can be assumed that the credit card authorization authority always authorizes a charge.

EXPRESS PACKAGE DELIVERY SERVICE WEBSITES

There are express package delivery service websites that can be browsed to see how they provide Web access. While they require an account, user name and password to use their services, much of their websites can be browsed without registering. As these are real businesses, please be considerate in accessing their websites.

- DHL Holdings, Inc. (<http://www.dhl.com>)
- Federal Express, Inc. (<http://www.fedex.com>)
- TNT Holdings B.V. (<http://www.tnt.com>)
- United Parcel Services of America, Inc. (<http://www.ups.com>)