PATCO Shipping Company Project

Final Project Submission

Dynamic Devs

CSIT-315, Dr. Johnson, 12/16/20

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### **Requirement and Specifications**

#### Introduction:

This document provides all goals that the system will be covering. Listing all functions that are detailed to specify exactly what will be done in each category listed in the client requirements. This document also provides a general overview of the systems specifications. This includes aspects such as the performance of the system, reliability, and general inputs and outputs.

#### Project Goals:

The goals of the project is to create a product that enhances the operational needs of the PATCO shipping company, design a system that manages the Cargo Network, Shipping and Freight Forwarding, Warehouse Management, and Accounting. The system will create a solution to end-to-end supply chain management for logistics. As well as provide accurate information on industry-specific workflow to domestic and international organizations. Among these features the product will also establish an online presence to connect with sales channels and couriers.

#### Major Functions:

**Cargo System**:

* Visibility & Tracking
  + The system will generate a unique tracking number that links the package

to its physical location.

* + Location and other shipping/customer information will be searchable through the

tracking number.

* Warehouse Automation
  + System will automatically assign each package a sorting destination within the warehouse

based on a predetermined sorting plan.

* Carrier Connections
  + The system will incorporate a company specific email to be able to communicate

with different sections of PATCO and couriers.

* Compliance Screening
  + Create a database that holds employee information and required training for

for authorization to the system.

* App for interacting with U.S. Customs
  + An app will be included with the system that forwards data on each international package

to the U.S. Customs.

**Shipping and Freight Forwarding:**

* Freight Quotes and Rate Management
  + Will generate a specific quote after a customer enters the weight and distance of the

package they want to ship.

* Bookings and Shipments
  + The systems database will provide a timeline of the shipment progression, starting

from the departure of the package, to the arrival at the destination.

* International Customs Integrations
  + Use the same application to forward data on each package to the U.S Customs.
* Denied Party Screening
  + The systems database will provide a lexicographic list of all parties that are prohibited

from shipping with PATCO

* ID Decoder
  + The ID decoder will provide internally relevant information stored in the system

associated with the tracking number.

**Warehouse Management:**

* Warehouse Receipts
  + The systems database will store and provide details of shipping freight ownership

and warehouse receipts.

* Pickup, Release, Delivery
  + The product will provide internal information on the packages next destination and

its pickup, release, and delivery time for the receiving warehouse or courier.

**Accounting:**

* Operations and Accounting
  + The system will allow users to monitor and log payroll, income, and all other

expenses throughout PATCO and store it in the systems database.

* Payment
  + The systems incorporated database will capture and process funds from the client

shipping the package with PATCO.

* Accounting Transactions
  + The system will log all transactions and details clients make with the

PATCO shipping company.

#### General Outputs:

The system will produce outputs such as the following:

* Tracking Information
* Expense totals
* Freight Quotes
* Employee Compliance Status
* Internal Sorting

#### General Information Inputs:

The system will accept inputs such as:

* Package Information
* Customer Account Information
* Employee Information
* Accounting Information

#### Performance:

The system will be able to manage large amounts of data such as payroll and package tracking. Once implemented the product will be accurate, efficient, and precise in terms of processing this data.

#### Growth:

The system will be separated into modules that can be improved on, such as patches for efficiency or new data, or removed as features become obsolete.

#### Operation and Environment:

Information will be stored on a company portal that can be accessed with username and password.

#### Compatibility, Interfaces:

The system will be compatible between multiple interfaces as long as it has internet access.

#### Reliability, Availability:

The system will be available with 24-hour access as long as the server is running. The only instances that the server will be down for a prolonged period of time, will be during scheduled mandatory server maintenance.

#### Human Interface:

Users will be able to interact with the system via an online portal, submitting information updates, and requests to the database.

#### Organizational Impact:

Due to the system being split into four major functions, with a total of fifteen modules; each module will have the ability to store specific information related to its intended purpose. This implementation lowers the functional strain on each module, creating a more organized system.

#### Maintenance and Support:

Security and performance updates will be able to be patched into the system by the company’s IT department via automatic update notifications. Any questions can be addressed via a help desk number or Email.

#### Documentation and Training:

At the time the system is released, all documentation will be provided with specifics on how to operate each major function, and all modules pertaining to it. Training will be initially conducted for each user who has an intended purpose for operating specific modules of the system. For all future users, who were not a part of the initial training, there will be a user manual as well as the initial documentation presented at the release of the system, intended for user guidance.

### **Use Case Diagram**

### **Class Diagram**

### **Sequence Diagram**

### **Workflow Diagram**

### **Top Level Design**

#### Cargo system:

* **Abstract**

The Cargo Network is a division of PATCO consisting of five modules. These five modules are: visibilityTracking, warehouseAutomation, carrierConnections, complianceScreening, and appCustoms. With the implementation of the visibilityTracking module, the cargo system will be able to generate a tracking number that customers may use to locate the package's physical location. As well as with the U.S. Customs application, the system will automatically forward specific details regarding the package that is being shipped. With these two modules, any and all information needed by outside parties is made available.

* **Design**

The design of the functions a part of the Cargo Network will be able to take a customers order, generate tracking information on the package, autonomously be able to sort packages based on package details, and provide information to U.S. customs for international shipments. This will be made effective by ensuring all training and important user information is logged and stored in the system database by performing a compliance screening on all applicable users of the system. The system will incorporate an email in order to communicate between other sectors of the company. The system will be able to do all objectives stated thus far both in the abstract and the design

* **Exports**

The modules that will be made available to other functions within the system would be the appCustoms, and visibilityTracking. These modules will assist modules within the Shipping and Freight Forwarding sector of PATCO. The appCustoms will be used by another module within the new function, and the visibilityTracking will send the tracking information so that another module in the new function can utilize the information for its processes.

* **Imports**

The functions that the Cargo Network utilize will import information from the Accounting sectors, accountingTrans function. This will provide all information on the order that the customer detailed while transacting with PATCO. The information will be imported from the systems database, where all information is stored.

* **Inputs/outputs**

Once the system receives information of an order, the visibilityTracking module will automatically generate a tracking number that will be outputted and sent to the customer. Any compliance screening necessary will require user information to be inputted into the systems database. All information needed for U.S. Customs will be outputted by the system and sent forwarded to them. And any email sent using the system will require manual input from the user.

* **Pre and post conditions**

An order must be placed with PATCO in order for the systems functions in the Cargo Network to be utilized properly.

* **Error handling**

The range of legal values that the system can generate a tracking number are 0-9 and A-Z or a-z. These values will be hardcoded in so that the system can not choose from any other values. A possible test case would be if the system does not delete old tracking numbers once a package is received, if too many exist, the system may try to reuse an old tracking number and cause the module to break. A way around that would be to implement a way to automatically delete old tracking numbers once the customer receives the shipment.

* **Miscellaneous**

The Cargo Network part of the system will run all modules pertaining to it, every time a new order is procured by the system.

#### Shipping and Freight Forwarding:

* **Abstract**

The Shipping and Freight Forwarding Department consists of five modules:

freightQuotes, bookShipment, appCustoms, deniedParty, idDecoder. Two of these modules will allow public users to interact, the first module will be the freight quotes and rate management. This module will allow for a user to enter a specific weight and distance of a package, and it will automatically generate a shipping quote for the user. The other module that will be accessible by outside users will be the international customs integration. This will be the same module that the cargo system will use to forward information to U.S. customs.

* **Design**

The design of the Shipping and Freight Forwarding function will be able to quote,

ship, and track package statuses. When a customer inputs specifications for a package, the system will generate a quote based on those specifications, and provide it to the customer. The system will then check the database to run a denied party screening, if the user is not a denied party, then the order can continue to be placed. Once the order is placed, the system will update the database with the shipping information and provide its shipping status. Once the shipment is sent out, the status will update to shipped, later updating to completed once delivered. If the package is to be shipped over international borders, then all information of the package will have previously been sent to U.S. customs by an application within the system. Any information needed from the package at any point can be provided by using the id decoder aspect of the system. This will decode the tracking number and provide information on the package in the system.

* **Exports**

In this module, the module that would be able to provide information to the rest of

the system would be the idDecoder. This function allows the system to provide information on a package using the tracking number. If any part of the system needs information on the package, it would be provided by the visibilityTracking tracking number and the data within decoded by the idDecoder. Thus, all information pertaining to the package will be attainable.

* **Imports**

This module will take imports from another module within the systems functions that are a part of the Warehouse Management department. This module provides information on when the package is picked up, released, and delivered. The reason why this information is needed in Shipping and Freight Forwarding is for the system to be able to update the module bookShipments. This will be to provide accurate and up to date information on the package whereabouts.

* **Input/Output**

In this module, inputs that would occur would be the product specifications consisting of weight and distance. The output will be a price quote for shipping that package. Another input would be the tracking number into the ID decoder, which will output any information on the package that was stored in the system.

* **Pre and post conditions**

Preconditions for most of this module to work, would be for a user to place an order with PATCO. This will then allow for the system to produce all the shipping information necessary for the package.

* **Error handling**

An error that could occur would be if the package got lost, the bookShipments feature that holds the information on the shipment progression wont accurately portray where the shipment is. This may break the system because the package may never get completed or arrive at its destination.

#### Warehouse Management:

* **Abstract**

The Warehouse Management network will consist of only two modules: The first being warehouseReceipts, and the second being visibilityTracking. These two modules will not provide any information to anyone outside of the PATCO shipping company. All information pertaining to these modules will be stored in the system and utilized when necessary.

* **Design**

The design of the Warehouse Management functions will be able to provide all details on the package shipment. The warehouseReceipts module will detail specific information on freight ownership and log it in the system. The other module visibilityTracking will provide all information on the pick up time of the package. As well as the release and delivery time of any and all packages within the warehouse.

* **Exports**

This part of the system will export freight ownership details and shipment progression

times and status into the system database.

* **Imports**

The functions within this part of the system will import all details and specifications regarding the package being shipped.

* **Input/Output**

All inputs will be taken from the systems database, for any information needed for the functions to properly execute their tasks.

* **Pre and post conditions**

An order must be placed for these modules to provide any information.

* **Error handling**

If a shipment gets lost, it may negatively impact the bookShipments module.

#### Accounting:

* **Abstract**

The accounting department consists of three modules: first is opAccounting, second is Payment, and third is accountingTrans. There is only one module in the Accounting aspect of the system that will interact with a customer. The Payment module will be able to verify, process, and collect funds from the customer. Once processed, the system will send a confirmation to the customer stating that their order has been placed.

* **Design**

The design of the Accounting aspect of the system will be very cohesive as all modules coincide with one another to perform very specific tasks. The Accounting modules’ jobs are to log all transactions occurring in the system and to monitor all expenses. The module opAccounting will be the main module to monitor payroll, income, and all other expenses throughout PATCO. This module will be working very closely with the Payment module, since it is responsible for ensuring funds are collected from the client and established in the database. Payments will work closely with the accountingTransactions module since it will be in charge of logging all transactions clients make with PATCO.

* **Exports**

The Accounting department aspect of the system will export the details of transactions made with clients to other aspects of the system. All features will be notified and start running their own modules.

* **Imports**

The functions a part of the Account system will not accept any inputs from any other module in the system.

* **Input/Output**

All inputs that will be performed will be all transactions performed throughout PATCO. The output will be a spreadsheet with an overview of PATCO’s income/spending, and all transactions made.

* **Pre and post conditions**

A client must want to place an order. A client must also provide payment information when placing the order with PATCO, in order for the Payment module to collect funds.

* **Error handling**

Many errors can occur when it comes to accounting, if a number is inputted incorrectly it can cause everything to be off. Problems that may occur is if the system does not log the transaction amounts correctly, which will cause the PATCO company to possibly lose money.

### **Detailed Design**

In this document, we are going into full detail on the system that is currently being designed for the PATCO Shipping company. This system will have the capabilities to interact with four different subsections of the PATCO company. These subsections include: Cargo Network, Shipping and Freight Forwarding, Warehouse management, and Accounting. With the interactions between each division of the company, the system will be able to produce a solution to end-to-end supply chain management for logistics. It will also provide detailed and specific information to domestic and international organizations. As well as allow the specific sections whose workflow incorporates an online establishment to sales channels and couriers. In order for the system to produce these expectations established by the PATCO Shipping Company, the system will have many functions pertaining to each division of the company.

For the Cargo Network, five major modules will work cohesively to produce tracking numbers, incorporate a sorting system, an online presence to carrier connections, a database for employee information, and a way to interact with the U.S. Customs. Some modules will also have the ability to communicate information between other functions in the system that are incorporated for different departments of the company, such as: Shipping and Freight Forwarding, Warehouse Management, and Accounting. Shipping and Freight Forwarding will incorporate five modules that integrate important features that produce information such as: user specific shipping quotes, shipment progression, interaction with the U.S. Customs, a database of denied parties, and an ID decoder for package information. Just like the Cargo System, some functions will be able to forward and receive information from other modules in the system. Within the Warehouse Management department, the system will have two modules incorporated. The function of these modules will allow for specific information on freight ownership, and provide information on pickup, release, and delivery times of any and all packages. These two modules will also provide information to the system database, for retrieval from other functions related within other departments. Accounting being the final sector of the PATCO Shipping Company, will incorporate three major functions that allow for the following: a subsystem to monitor all economic expenses and income, collection of funds from customers, and a log of all transactions. Only one function will communicate with other functions in the system. The users that will interact with the system being developed will be the customers when placing an order, and employees when fulfilling their desired task.

Since the PATCO Shipping Company is divided into sections, the designed system incorporates functions with specific tasks that assist the overall workflow of these specified divisions. The first division being the Cargo Network, the functions responsibilities consist of producing tracking numbers, implementing a destination sorting system, incorporating an email to communicate with the rest of the company, creating a database to hold employee information, and an application to forward package information to the U.S. Customs.

In order to produce tracking numbers, the system will rely on a module called visibilityTracking. Once order details are imported from the accountingTrans function, the module will input all information necessary to automatically output a unique tracking number, following the range of legal values that are 0-9, A-Z, and a-z, for the customer. Once the tracking ID is generated, it will export to the systems database. At any time, the shipping/customer information and location of the package can be retrieved from the database and viewed using the tracking number. Since, the information will be stored within the systems database, other modules such as idDecoder, and appCustoms will be able to access information stored in the tracking number. In order to ensure the system function runs efficiently and precisely as indicated, we formulated a test case in order to prevent errors from occuring. The possible error that could occur would be running out of unique tracking numbers, but because of the formulated test case, we will be implementing a submodule that clears any completed shipments from the year for the reuse of old tracking numbers.

Following the implementation of visibilityTracking, would be the warehouseAutomation module. The warehouseAutomation module will have the responsibility of producing a network for sorting and organizing packages based on weight and size. If an order has been placed, the module will import package related data from the information accountingTrans exported into the database. The system will then input package related specifications into the function, autonomously producing a destination for the package. This function will then export package location-specific information into the systems database for easy retrieval by users and other functions. Other functions that may utilize information produced by this function include: pickup\_release\_Delivery, and warehouseReceipts. Errors that may occur in this function could be the possibility of it trying to populate a location that has already been populated by another package. In this case, it is up the user to manually fix the location error in the system.

For shipments that require international travel, the system will have an incorporated function called appCustoms. This module will have an application based implementation, that will allow the system to forward package related data to the U.S. Customs. The function will require all package information from visibilityTracking, accountingTrans, warehouseReceipts, and pickup\_release\_Delivery to be extracted from the database and imported for the module's usage. Once all information is imported, the function will input all necessary information that is required by the U.S. Customs, followed by an exported document that will be forwarded. This function will also be utilized within the Shipping and Freight Forwarding department of PATCO. Any errors in information sent to the U.S. Customs may result in the package that is being shipped, to be returned to the sender.

For users to gain the ability to access the system, the Cargo Network division of PATCO will also uphold employee compliance screenings. These screenings will consist of the employee’s information as well as any required training. The system will provide a secondary database that will encapsulate all screenings, this database will be implemented using the complianceScreening function. Once an employee is hired, his/her/their information will be inputted into the system where the module will then create a “folder” within the secondary database to hold the data. From there, the complianceScreening function will mandate tests that the employee must pass before accessing the system. Once the employee passes, the function will export all results into the employees file, with the completion date. Then the system will be accessible by the employee for full usage. Any errors like false data, or the possible need to change an employee’s information will be editable by accessing the systems secondary database, and the associates designated folder.

All users that have access to the system will have the ability to communicate with the rest of the PATCO Shipping departments and establish connections with carriers through the incorporation of a company specific email. This email will be implemented with the carrierConnections function. This function will run a Simple Transfer Mail Protocol (SMTP) in order to export the email to a designated mail server. The function will then run a Post Office Protocol 3 (POP3) so that the company mail server can receive and store incoming emails. The only time the email will not be functional is during scheduled maintenance on the server.

Within the Shipping and Freight Forwarding department of PATCO, five functions will be integrated in the system and will be essential for producing: Freight quotes, handling bookings and shipments, interacting with Customs, updating/reviewing all denied party screenings, and the integration of an ID decoder. With all modules working cohesively, this shall produce a smooth workflow of shipments being processed and organized for couriers at time of pickup.

The first function incorporated for this section of the system is freightQuotes. The freightQuotes module's main priority will be to accept a customer's input of a package's specifications such as weight and distance traveling. Once the specifications are imported to the function from the systems database, the module will generate and export a price quote of how much it will cost for PATCO to ship it and will be forwarded to the customer. If the customer accepts the quote, they can then make payment, which will be collected by the Payment module in the accounting sector. Otherwise, the customer and withdraw from shipping their package through PATCO. The only errors that may occur with this function would be user error by the customer with incorrect package specifications.

The next function that will be incorporated would be the bookShipment module. This module is tasked to log and update information in the systems database regarding shipment progression. The function will input all order details and monitor the status of the order. Once shipped the function will update and through the progression of the shipment, the function will export new updates to the database according to the package location. The customer will be able to access this information to view their shipments status by using the tracking number provided to them by the visibilityTracking module. Errors that may occur with this function is the possibility of the package getting lost in transit, this will cause the function to never update its progression status.

If a package is going to be shipped internationally, the Shipping and Freight Forwarding department will have to provide all package information to the U.S. Customs. Once a package leaves the warehouse, the users apart of Shipping and Freight Forwarding will have the ability to use the same appCustoms function that will be used in the Cargo Network. This allows the system to import all information on the package from the systems database and export the necessary document to the U.S. Customs office.

The deniedParty function integrated in the system will be responsible for ensuring that all customers trying to ship with PATCO are verified to do so. The function will incorporate a log in the systems database that will have the ability to be viewed and updated at any time. The information logged will allow the system to display why a customer is not allowed to ship with PATCO, and the customers basic information such as name, phone number, etc. deniedParty will export all updates back into the database for all other users in the company to view. Errors that may occur could possibly be wrong information being exported into the systems database.

The last function in the Shipping and Freight Forwarding aspect of the system will be the idDecoder. This module will access the systems database and import the visibilityTracking’s generated tracking number. The function will then input all fields from the id that are necessary to output the data provided by the tracking number. Once the function finishes inputting all required fields, it will output all information pertaining to the shipping order and tracking information. This includes: package specifications, destination address, package senders name, phone number, email, and receivers name, phone number, and email. Any function in the system that needs this information will have it readily available from the idDecoder, as it will export all information back into the systems database for other functions to use. Possible errors could occur if a tracking number is inputted incorrectly. Or, if an already used tracking number that has shipped and is already completed was not removed from the database is entered.

The Warehouse Management Division will be responsible for warehouse receipts. In order for the system to generate receipts it will utilize the modulewarehouseReceipt. This module will draw data that has been inputted into the system done at the time the customer signs up for the company’s services. This data includes destination, name of recipient, name of sender, and contents. This data will then be used to create an accurate receipt of the transaction that is viewable by staff for organization purposes and for accounting for record keeping. Errors at this stage will be brought about by incorrect database construction linking the wrong information to customer accounts but should rarely, if ever, occur.

Also provided by Warehouse Management will be accurate information on expected pickup and delivery of freight. The customer, upon ordering the service, will be able to use the system to get an accurate reading on where their delivery is and when its arrival will be. This will be the visibilityTracking module. Information will be received from the cargo system department pertaining to the package’s current location. This will then be used to provide an estimate as to how much time is left until it’s arrival at its destination. The information generated will then be exported to our online tracking system for use by the customer.

The Accounting department will be handling all requests and responsibilities related to money and accounts. The first of these will be the operations and accounting information, such as payroll, income, and expenses. The system will utilize time cards for hourly employees to track hours worked and have predetermined wages for salary employees. This ensures an accurate payroll. The income will be generated by taking in the gross income from sales and subtracting the expenses generated such as payroll. This will be accomplished by the opAccounting module. The opAccounting module pulls the relevant pay information from the database in order to provide the users with accurate information. The users will then be able to create forecast models and ensure that expenses are within an acceptable amount. The biggest room from error will come from inaccurate reporting of expenses or unupdated payroll values.

Separately there will be the Payment module. This module is exclusively designed for collecting customer payment data. This module will capture the credit card or other payment used and collect funds for services rendered. The goal of this collection will be a safe and secure transaction with the user’s banking account and make sure that there are enough funds for the transaction. The Payment module will then send this purchase information to accountingTrans in order to keep a record of it. Issues that can arise would be bank verification or insufficient funds from the customer’s account, but these should be handled by the system before continuing the transaction.

Customers will also be able to check their transactions and be able to print receipts for all services rendered since creating an account. This data will be pulled from the customer database and from the information obtained by the Payment module. These actions will be handled by the accountingTrans module. This module aside from retrieving data from Payment will also export its data to the cargo network. This data will then be used by the cargo network for customer information such as where the package is being sent to. Error checking here will need to ensure that the database is in proper form and that data is pulled correctly from it and can reliably send the information to the cargo network.

### **User Guide:**

**Introduction**

Following the requirements and specifications stated by the PATCO Shipping Company, the established system will have the ability to alleviate the workload on various departments across the company. It will also organize and provide accurate information on domestic and international shipments and incorporate a manageable and smooth process for the logistics of the shipping process.

For the Cargo System, it will autonomously generate tracking numbers, sort shipment packages, regulate employee information and training, create an online establishment to connect with shipping couriers, communicate with the U.S. Customs, and incorporate a company specific email.

The second sector of the company, Shipping and Freight Forwarding, will benefit from the incorporated system in numerous ways. The system will automatically generate price quotes for a customer, show the shipment status, communicate with the U.S. Customs, manage party screenings, and implement an ID decoder.

The Warehouse Management division of PATCO will incorporate the system to automate warehouse receipts, which detail the shipping freight ownership. It will also monitor and provide information on pickup, release, and delivery times of the shipments available.

The Accounting section of the company will utilize the system to monitor payroll, income, and all other expenses made throughout the company. The system will be able to collect payment from a customer when an order is placed. Then it will log all information related to the customer’s order in the database for other aspects of the system to use, once payment is received.

**Process Overview**

**Cargo System:**

* For a user to have access to the system, they first must pass a series of compliance screening tests, once passed they will gain access.
  + Employees then can log in to the system using user credentials and can access the Cargo System aspect of the system to do the following.
    - Access autonomously generated tracking numbers, to acquire details on a shipment.
    - Locate specific shipment packages by inquiring information from the systems database.
    - For international shipments, users can forward information regarding said shipments to the U.S. Customs before shipments leave the warehouse.

**Shipping and Freight Forwarding:**

* To access the system, users must enter their authorized credentials, username and password.
  + Users can view and manually update shipment progression between leaving the warehouse and arriving at the destination.
  + Users can view and update denied parties who are not allowed to utilize the company's services.
  + Users can implement the system's ID Decoder to inquire package details based on a shipment’s tracking number.
  + Users can forward information once a shipment departs from the warehouse for an international delivery to the U.S. Customs.

**Warehouse Management:**

* To access this part of the system, employees must enter authorized user credentials.
  + The user can gain insight on specific freight information and ownership by utilizing warehouse receipts stored in the systems database.
  + The user will acquire shipment related times, such as pickup, release, and delivery from the database. This will allow the user to better prepare and organize a shipment before said times are due.

**Accounting:**

* To access this part of the system, employees must enter authorized user credentials.
  + The user can utilize the system to log, monitor, and update payroll, expense, and income information.
  + The user will be able to view and verify that the system collected and processed payment from the customer.
  + The user can view all orders transacted through PATCO shipping company by accessing the transactions log.