Managing work orders for automotive maintenance activities

Sparks AS is a certified company providing automotive maintenance activities for its customers.

Entities

Within Sparks, the order management system is the main entity responsible for ordering maintenance activities. The *order management system* interacts with five parties:

- *The customer:* customers interact with the order management system for the purpose of scheduling a maintenance activity (also called a "work order").
- *The warehouse management system:* the order management system may interact with the warehouse management system to check for the availability of parts that are needed in a work order and to order such parts.
- *The reseller's catalogue:* the order management system may interact with a catalogue provided by a certified reseller to order parts that are required in a work order and not available in the warehouse. The catalogues of the certified resellers are available online, some as web applications (with HTML front-end) others as Web services (XML).
- *The garage booking system:* the order management system interacts with the garage booking system to book a service bay and a mechanic to perform the required work.
- *The insurance department:* a customer's vehicle can be insured. For the purpose of scheduling a work order for an insured car, the order management system interacts with the insurance department. Employees from the insurance department then get to see the work orders on insured cars and to interact with the corresponding insurer to get approval for the work orders and to bill them for their part of the work order.

Business Process

The ordering business process starts with the receipt of a request for work order from a customer. It finishes when either the order management system schedules an appointment with the customer or the customer rejects the quote for work order.

Upon the receipt of a request for work order, the order management system estimates the expected usage of supplies, parts and labour and prepares a quote with the estimated total cost for the maintenance activity. If the customer's vehicle is insured, the order management system interacts with the insurance department to retrieve the details of the customer's insurance plan. Depending on the plan, the customer's insurance may cover for the full maintenance costs or a contribution may be required from the customer.

The order management system then sends the quote to the customer, who can either accept or reject the quote by notifying the order management system. If the customer accepts the quote, the order management system contacts the warehouse management system to check if the required parts are in stock before scheduling an appointment with the customer. If some parts are not in stock, the order management system notifies the customer who can decide whether to obtain the parts by themselves, or to order them through Sparks. In both cases, the customer communicates their decision to the order department. If the customer decides that Sparks has to provide for the required parts, the order department orders the required parts by interacting with the catalogue of a certified reseller.

Once all required parts are in stock or have been ordered, the order management system schedules an appointment with the customer to bring their vehicle in and interacts with the garage booking system to book a suitably-equipped service bay and a suitably-qualified mechanic to perform the work. Finally, a confirmation of the appointment is sent to the customer directly from the garage booking system.

Technical details

- Customers can place orders either via Java EE web application deployed on IBM WebSphere or via phone call to a back-office clerk who uses a C++ desktop application.
- Warehouse management system is a product bough from an external vendor who is now bankrupt. System has got only DCOM interface for different operations. IT-department claims that the system is written in C++, but as they seem to be missing the source code you are not sure about it.
- Insurance department is using an application built on top of the MS Access database. Application can be integrated with CSV import/export only.
- Garage booking system is built in-house as a Python application using Oracle 10g Enterprise Edition RDBMS.
- Communication with external systems is implemented via direct TCP-IP socket calls. Each external system has got his own data format specified.
- Reseller catalogue information is downloaded once a week and copied into a local MSSQL database for searching
- All systems have implemented their own concept of a user and authentication
- Garage booking system and insurance department share the concept of a customer, all other systems have implemented their own concept. When a customer is missing from a system it is created manually for each system.

Problems

You are a newly hired CIO of the Sparks AS. You have an IT-department of 15 persons who currently have maintained all the systems described. Management board handles you the following problems to tackle:

For each problem, propose a solution and reason about it

1. When external systems (reseller catalogues, insurances) are unavailable, the whole system crashes.
2. Operations against most insurance companies are too slow (queries taking more than 10 seconds), which irritates customers resulting orders to be abandoned.
3. Duplicating customer data affects invoicing precision and service speed - invoices are sent to the wrong addresses, customers are forced to give out their contact data several times, etc.
4. Processing time of the order is too slow. Even without human interaction it will last more than several minutes per order.
5. Failures in the system are not transparent. Corrective actions are not always taken, which causes inconsistency in data structures
6. Making a change to a process is expensive and error-prone. Wish list for different implementation requests is always at least three months long.
7. There spectrum of different technologies in house is too wide. Each specialist has to learn several technologies to be efficient at his work.

You can propose additional changes you yourself would like to change in the Sparks AS.