

Flower Use Case

In this chapter we provide a specification of the "Fast Flower Delivery" application in a detailed, yet informal type of specification. As we proceed through the book we will examine each aspect of this application in some detail. You will find a more formal specification of the application, expressed using our building block notation, in Appendix B.

General Description

The flower stores association in a large city has established an agreement with local independent van drivers to deliver flowers from flower stores to their destinations. When a store gets a flower delivery order it creates a request which is broadcasted to relevant drivers within a certain distance from the store, with the time for pick up (typically now) and the required delivery time if it is an urgent delivery. A driver is then assigned and the customer is notified that a delivery has been scheduled. The driver picks up the delivery and delivers it, and the person receiving the flowers confirms the delivery time by signing for it on the driver's mobile device. The system keeps track of the ranking of each individual driver based on his or her punctuality (getting the flowers on time). Each store has a profile that can include a constraint on the ranking of its driver, for example a store can require its drivers to have a ranking greater than 10. The profile also indicates whether it wants an automatic driver assignment or whether it wants to receive several applications and then make its own choice

Skeleton Specification

Phase 1: Bid Phase

The communication between the store and the person who makes the order is outside the scope of the system, so as far as we are concerned a delivery's life-cycle starts when a store places a `Delivery Request` event into the system. The system *enriches* the `Delivery Request` event by adding to it the minimum ranking that the store is prepared to accept (each store has different level of tolerance for service quality). Each van is equipped with a GPS modem which periodically transmits a `GPS Location` event. The system *translates* these events, which contain raw latitude and longitude values, into events which indicate which region of the city the driver is currently in. When it receives a `Delivery Request` event the system matches it to its list of drivers. A filter is applied to this list to select only those authorized drivers who satisfy the ranking requirements and who are currently in nearby regions. A `Bid Request` event is then broadcast to all drivers that pass this filter.

Phase 2: Assignment phase

A driver responds to the `Bid Request` by sending a `Delivery Bid` event designating his or her current location and committing a pick up time. Two minutes after the broadcast the system starts the assignment process. This is either an automatic or a manual process, depending on the store's preference. If the process is manual the system collects the `Delivery Bid` events that match the original `Bid Request` and sends the five highest-ranked of these to the store. If the process is

automatic then the first bidder among the selected drivers wins the bid. The pickup time and delivery time are set and the `Assignment` is sent to the driver.

There are also some alerts associated with this process: If there are no bidders an alert is sent both to the store and to the system manager; if the store has not performed its manual assignment within one minute of receiving its `Delivery Bid` events then both the store and system manager receive an alert.

Phase 3: Delivery process

When the driver arrives to pick up the flowers from the store, the store sends a `Pick Up Confirmation` event; when the driver delivers the flowers, the person receiving them confirms by signing the driver's mobile device, and this generates a `Delivery Confirmation` event. Both `Pick Up Confirmation` and `Delivery Confirmation` events have time-stamps associated with them, and this allows the system to generate several alert events. A `Pick Up Alert` is reported if a pick up confirmation has not been reported within five minutes of the committed pick up time. A `Delivery Alert` is reported if a `Delivery Confirmation` has not been reported within ten minutes of the committed delivery time,

Phase 4: Ranking Evaluation

The system performs an evaluation of each driver's ranking every time that that driver completes 20 deliveries. If the driver did not have any `Delivery Alerts` during that period then the system generates a `Ranking Increase` event indicating that the driver's ranking has increased by one point. Conversely if the driver has had more than five delivery alerts during that time then the system generates a `Ranking Decrease` to reduce the ranking by one point. If the generation for a `Ranking Increase` was for a driver, whose previous evaluation generated that ranking decrease in the previous evaluation, then the system generates an `Improvement Note`.

Phase 5: Activity Monitoring

The system aggregates assignment and other events and counts the number of assignments per day for each driver for each day on which the driver has been active. Once a month the system creates reports on drivers' performance, assessing the drivers according to the following criteria:

- A *permanent weak driver* is a driver with fewer than five assignments on all the days on which the driver has been active.
- An *idle driver* is a driver with at least one day of activity which had no assignments.
- A *consistent weak driver* is a driver, whose daily assignments are at least two standard deviations lower than the average assignment per driver on each day in question.
- A *consistent strong driver* is a driver, whose daily assignments are at least two standard deviations higher than the average assignment per driver on each day in question.
- An *improving driver* is a driver whose assignments increase or stay the same day by day.