**High Level Description:**

A real-life counterpart of a propagating class is a mail carrier. Lets assume a man named John loaned a large amount of money to his friend Paul, but now John needs the money back. He writes a letter to Paul requesting the money; a mail carrier takes the letter from John to Paul. Now, Paul must get a part-time job to pay back the loan, so there is a big change that propagated from John to Paul.

In this example, there are two interactions; John interacts with the mail carrier, and the mail carrier interacts with Paul. The change originated with John and propagates through the mail carrier to Paul. The mail carrier is in the middle of the propagation but does not have to change anything; just keeps delivering the letters from one person to another.

**1) The problem domain of the software system:**

The problem domain is an engineering term referring to all information that defines the problem and constrains the solution. It includes the goals that the problem owner wishes to achieve, the context within which the problem exists, and all rules that define essential functions or other aspects of any solution product. It represents the environment in which a solution will have to operate, as well as the problem itself.

In our mailing system, the problem domain would consist of John, Paul, the mail carrier, and the amount of money that was loaned.

**2) The initial impact set determined during concept location (describe the class and its responsibilities)**

Impact Analysis is the process that finds the estimated impact set. Large estimated sets cannot be determined in a single step. The programmers work step by step and trace how the code modifications propagate through class interactions. To facilitate impact analysis, programmers use marks that indicate the status of the individual classes. Initially, all classes of the program receive the Blank status. The class identified during concept location receives the Changed status, and after that, all Blank neighbors are marked Next.

Then, the programmers select one of the Next classes, inspect it, and decide on its mark. If the programmers conclude that the selected class is going to change, they mark it Changed and then mark all its Blank neighbors as Next. If the programmers conclude that the selected class is not going to change, they mark it Unchanged and they select another Next class for inspection. If there are no Next classes to select from, the process of impact analysis is completed; all classes marked Changed constitute the estimated impact set.

The initial impact set is John, as he initializes the mailing process to Paul when he begins to write the letter. After John is done writing the letter, he passes on the letter the to his blank neighboring classes, which in this case, is just the mail carrier. When the mail carrier receives the letter, he must decide where the letter must be sent. While delivering the letter, the mail carrier nor the letter changes, so the class will be marked as Unchanged. Then, the letter is passed to the mail carriers blank, neighboring classes, which is Paul. When Paul receives the letter, Paul must make a major change to come up with the money he owes John so his class gets set to Changed. Within the process, all the classes that got marked as Changed, is the complete impact set.

**3) The propagating class (describe the class and its responsibilities, as well as the reason why it does not change itself but propagates the changes to its neighbors)**

This is a mark for classes that do not change themselves, but propagate the change to their neighbors; therefore, their neighbors have to be inspected by the programmers. The propagating classes, for example, can be the classes that just deliver a message from one class to another, and although they are in the middle of the propagating change, they do not need to change themselves.

The only propagating class within the specified system is the mail carrier. The reason being is that the mail carrier is only responsible for delivering mail from one class to another. So if the letter delivered initializes a change to a particular class while the class delivering the mail does not alter in any way, then that would state the mail carrier as a propagating class.

**4) The impacted neighbors of the propagating class in the class interaction graph. (describe the classes and their responsibilities and why they change in response to changes to the initial impact set at point 2)**

Propagating classes are most commonly used to send and receive messages to be passed onto other classes. Paul had to change because he received a signal/message from John notifying him of a duty he had to carry out.

**Legend:**

Blank: Unknown status of the class; the class was never inspected and is not currently scheduled for an inspection.

Changed: The programmers inspected the class and found that it is impacted by the change and thus belongs to the estimated impact set. All formerly Blank neighbors of the Changed class will be marked Next.

Unchanged: The programmers inspected the class and found that it is not impacted by the change. It also does not propagate the change to any of its neighbors.

Next: the class is scheduled for inspection.