Chapter 3 – Use Cases

Solutions to End-of-Chapter Problems

Review Questions

1. What are the six activities of systems analysis, and which activity is discussed beginning with this chapter?

> The five activities of systems analysis are:
>   1. Gather detailed information – begun in Chapter 2 with discussion of fact finding, stakeholders, interviewing, etc.
>   2. Define requirements – begun in this chapter by creating use cases
>   3. Prioritize requirements –
>   4. Develop user-interface dialogs –
>   5. Evaluate requirements with users –

2. What is a use case?

> A use case is an activity that the system performs as a result of some event or action by a user.

3. What are the two techniques used to identify use cases?

> User goal technique and the event decomposition technique

4. Describe the user goal technique for identifying use cases.

> The user goal technique is done by interviewing a user (or user role) to see what their work "goals" or objectives are. These are low level objectives to accomplish a piece of work or to complete a work procedure. The system then must have use cases to support each user goal.

5. What are some examples of users with different functional roles and at different operational levels?

> Functional roles may be like department organization such as shipping, or sales, or accounting. Different operational level may be like clerks, or middle management like supervisors, and then executives.

6. What are some examples of use case names that correspond to your goals as a student going through the college registration process? Be sure to use the verb-noun naming convention.

> Answers will vary:
>   • Find a course and section

- Register for a section of a course
- Cancel a registration

7. What is the overarching objective of asking users about their specific goals?

To discover and document every use case that the system must support.

8. How many types of users can have the same user goals for using the system?

No real limit. Users from different departments can access the same use cases, e.g. can have the same user goal for using the system.

9. Describe the event decomposition technique for identifying use cases.

Look at all of the business processes that result in some type of business event. The business events are triggers that require system processing, e.g. that require use cases.

10. Why is the event decomposition technique considered more comprehensive than the user goal technique?

Event decomposition not only looks at user initiated events (the same as the user goal technique), but it also considers temporal events and state events. Hence it is more comprehensive.

11. What is an elementary business process (EBP)?

An EBP is a fundamental business process that may input data and receive information, but upon completion of the EBP the system has finished processing and can enter a quiescent state ready for a new event.

12. Explain how the event decomposition technique helps identify use cases at the right level of analysis.

Since event decomposition depends on EBP, then it automatically arrives at the right level of analysis. EBP, where the system has finished a complete transaction, is the same level that is required for a use case definition.

13. What is an event?

Something that occurs at a specific time and place. It can be identified, and for purposes of systems analysis, the system must recognize it and capture some information from it or about it.

14. What are the three types of events?

External event – usually from a user

Temporal event – occurs at a point in time, or due to a time interval
State event – a change of state or condition of some data within the system

15. Define an external event and then give an example that applies to a checking account system.

An external event is something that occurs external to the system, and is trigger by a user action. An example might be that a user makes a direct deposit to his/her account.

16. Define a temporal event and then give an example that applies to a checking account system.

A temporal event is one that occurs at a point in time. An example might be that at the end of the month interest (or monthly checking account fee) is calculated and credited to the account.

17. What are system controls, and why are they not considered part of the users' functional requirements?

System controls are safety procedures or mechanisms that protect the system and the data. They are not part of the users' functional requirements because the users normally do not initiate nor activate these controls. They must exist above and overriding the external events. These controls are not normally part of the users' work processes.

18. What is the perfect technology assumption?

It assumes that technology will work perfectly and that in the early stages of systems analysis we do not worry about such things as security, logging in, database backup, etc. Those issues are addressed after the initial functional requirements are determined.

19. What are three examples of events that are system controls in a typical information system that should not be included as a use case because of the perfect technology assumption?

Backing up a database
User logging onto the system
Restoring the database

20. What are the four operations that make up the CRUD acronym?

C = Create
R = Read or Report (output)
U = Update
D = Delete

21. What is the main purpose of using the CRUD technique?

The CRUD technique is a good way to validate the use cases that have been identified using the user goal and event decomposition techniques. It is a double check to make sure the list of use cases covers all of the processes against the database. When it is used as the primary method to find use cases, the

use cases often do not track the business procedures very well.

22. What is a brief use case description?

A one or two sentence description of the use case and what it accomplishes.

23. What is UML?

UML stands for Unified Modeling Language, and it is the graphical modeling technique used to model object-oriented models. It is the industry standard for OO modeling.

24. What is the purpose of UML use case diagrams?

Use case diagrams provide a graphical view of use cases and the actors that invoke those use cases. They provide a nice overview of use cases. They can organize use cases together in meaningful ways.

25. What is another name for "actor" in UML, and how is it represented on a use case diagram?

An actor is also an external agent. In a use case diagram it is represented as a stick figure.

26. What is the automation boundary on a use case diagram, and how is it represented?

The automation boundary is the boundary between the automated system, i.e. the application, and the external world, including the actors. It is represented by a rectangular boundary box.

27. How many actors can be related to a use case on a use case diagram?

As many as necessary. All those that use that particular use case.

28. Why might a systems analyst draw many different use case diagrams when reviewing use cases with end users?

An analyst will draw different use case diagrams to organize the use cases in different ways to illustrate different subsystems, or departments, or work associations.

29. What is the «includes» relationship between two use cases?

The «includes» relationship is where one use case effectively uses the services of another use case. It is as though one use case were embedded within another use case.

Problems and Exercises

1. Review the external event checklist in Figure 3-3 and then think about a university course registration system. What is an example of an event of each type in the checklist? Name each event by using the guidelines for naming an external event.

>   External agent wants something – Student registers for a section of a course
>   External agent wants some information – Student searches for a course
>   Data changed and needs to be updated – Instructor assigned to teach a course section
>   Management wants some information – Show enrollments for all courses in a department

2. Review the temporal event checklist in Figure 3-4. Would a student grade report be an internal or external output? Would a class list for the instructor be an internal or external output? What are some other internal and external outputs for a course registration system? Using the guidelines for naming temporal events, what would you name the events that trigger these outputs?

>   Grade report: External
>   Class list: Internal
>   Other external: Financial aid confirmation, graduation notice, employment confirmation letter
>   Other internal: Enrollment report and paycheck

>   To name the temporal events, include *Time to produce* with the output name, as well as the recipient. For example, *Time to produce grade report for students*. Others are similar.

3. Consider the following sequence of actions taken by a customer at a bank. Which action is the event the analyst should define for a bank account transaction-processing system? (1) Kevin gets a check from Grandma for his birthday. (2) Kevin wants a car. (3) Kevin decides to save his money. (4) Kevin goes to the bank. (5) Kevin waits in line. (6) Kevin makes a deposit in his savings account. (7) Kevin grabs the deposit receipt. (8) Kevin asks for a brochure on auto loans.

>   The event for the bank is *Customer makes a deposit*. Grabbing the receipt is just the way the response (receipt) is implemented. Asking for a brochure on auto loans might be a separate event if the bank wants to remember that Kevin asked about it, or if they want to deduct one brochure in their brochure inventory system (if they have such a thing). If the bank does not need to remember the event, then doing something by the system is not "required."

4. Consider the perfect technology assumption, which states that use cases should be included during analysis only if the system would be required to respond under perfect conditions. Could any of the use cases listed for the RMO CSMS be eliminated based on this assumption? Explain. Why are such use cases as *Log on to the system* and *Back up the database* required only under imperfect conditions?

>   All of the events listed must be included because the system must do something each time one

of the events occurs even if there is perfect technology. *User logs on to system* and *Time to back up the data* are only required because users are not perfectly honest, and disk drives are prone to crash or corrupt data.

5. Visit some Web sites of car manufacturers, such as Honda, BMW, Toyota, and Acura. Many of these sites have a use case that is typically named *Build and price a car*. As a potential customer, you can select a car model, select features and options, and get the car's suggested price and list of specifications. Write a brief use case description for this use case (see Figure 3-10).

Use case name:	Brief Description:
Build and price a car	Customer selects the model; the system displays the options; customer selects all the options; the system displays final result and suggested retail price.

6. Again looking at a Web site for one of the car manufacturers, consider yourself a potential buyer and then identify all the use cases included on the site that correspond to your goals.

Answers will vary:
- View available models
- View available options
- View detailed specifications
- Compare vehicles
- Build and price a car
- Find a dealer
- Get a quote on specific model

7. Set up a meeting with a librarian. During your meeting, ask the librarian to describe the situations that come up in the library to which the book checkout system needs to respond. List these external events. Now ask about points in time, or deadlines, that require the system to produce a statement, notice, report, or other output. List these temporal events. Does it seem natural for the librarian to describe the system in this way? List each event and then name the resulting use case.

Answers will vary.
External events might include
- *Student checks out book*
- *Student returns book*
- *Student wants to check book availability*

Temporal events might include
- *End of month → Time to send overdue notice*
- *End of month → Time to produce monthly summary reports*
- *Book has not returned in a year → Time to declare book is lost*

8. Again considering the library, ask some students what their goals are in using the library system. Also ask some library employees about their goals in using the system. Name these goals as use cases (verb-noun) and discuss whether student users have different goals than employee users.

     Answers will vary:
     Students may have goals of:
- *Check book availability*
- *Verify books checked out*
- *Check outstanding fines*
- *Reserve library materials*

     Librarians will have goals
- *Patron wants to check out book*
- *Patron returns book*
- *Check book availability*
- *Reserver library materials*
- *Add a new book to library*
- *Remove a book from library*
- *Update book information*

9. Visit a restaurant or the college food service to talk to a server (or talk with a friend who is a food server). Ask about the external events and temporal events, as you did in exercise 7. What are the events and resulting use cases for order processing at a restaurant?

     Answers will vary. External events might include *Customer places order*, *Customer changes order*, *Kitchen returns completed order*, *Customer pays bill*, and so on. Temporal events might include *Time to produce daily order totals report*, *Time to produce weekly sales analysis reports*, and so on.

10. Review the procedures for course registration at your university and then talk with the staff in advising, in registration, and in your major department. Think about the sequence that goes on over an entire semester. What are the events that students trigger? What are the events that your own department triggers? What are the temporal events that result in information going to students? What are the temporal events that result in information going to instructors or departments? List all the events and the resulting use cases that should be included in the system.

     Answers will vary. Events might include *Department schedules a class*, *Student enrolls in a class*, *Student changes schedule*, *Student drops a class*, *Instructor submits final grades*, *Time to generate grade report for students*, *Time to produce enrollment totals report for administration*, and *Time to produce class lists for faculty*. Note that the event names should indicate information about the external agent or actor involved. Temporal events make the most sense if *Time to* is used at the beginning of the event name.

11. Refer to the RMO CSMS Order Fulfillment subsystem shown in Figure 3-11. Draw a use case diagram that shows all actors and all use cases. Use a drawing tool such as Microsoft Visio if it is available.
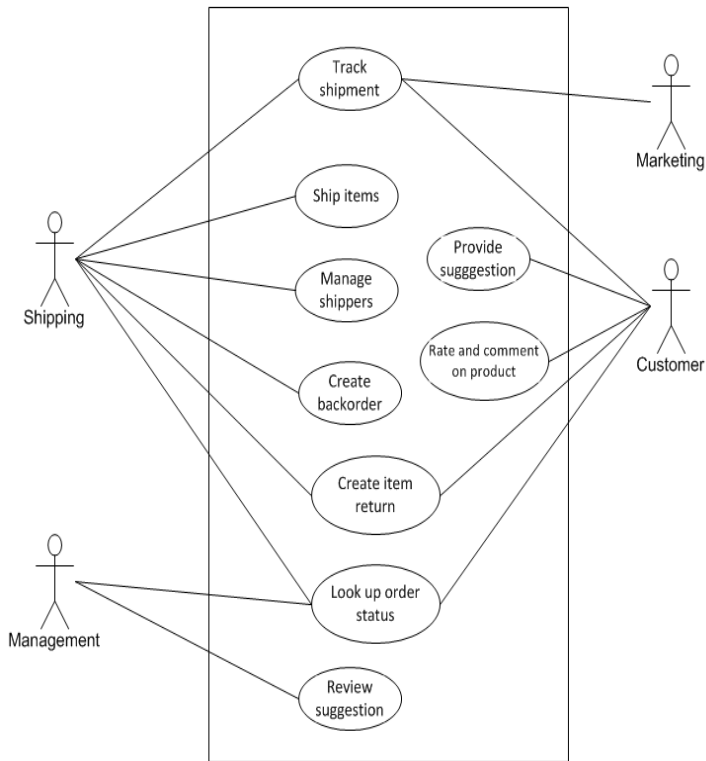
12. Again for the Order Fulfillment subsystem, draw a use case diagram showing just the use cases for the shipping department in preparation for a meeting with them about the system requirements. Use a drawing tool such as Microsoft Visio if it is available.
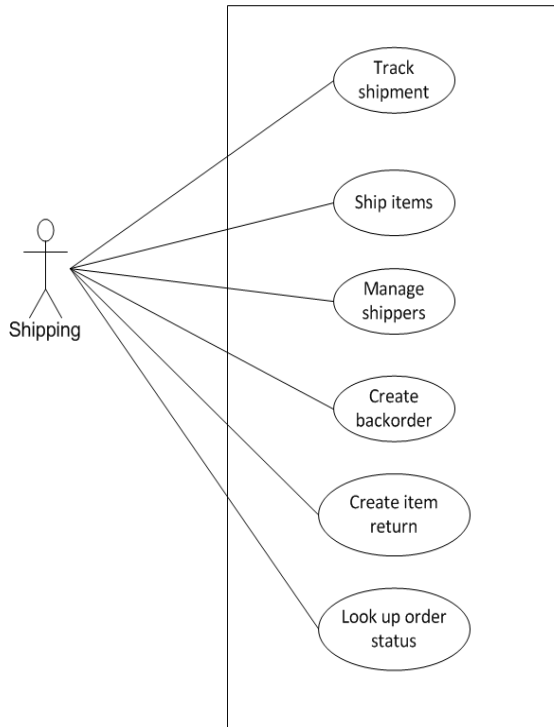
13. Refer to the RMO CSMS Marketing subsystem shown in Figure 3-11. Draw a use case diagram that shows all actors and all use cases. Use a drawing tool such as Microsoft Visio if it is available.
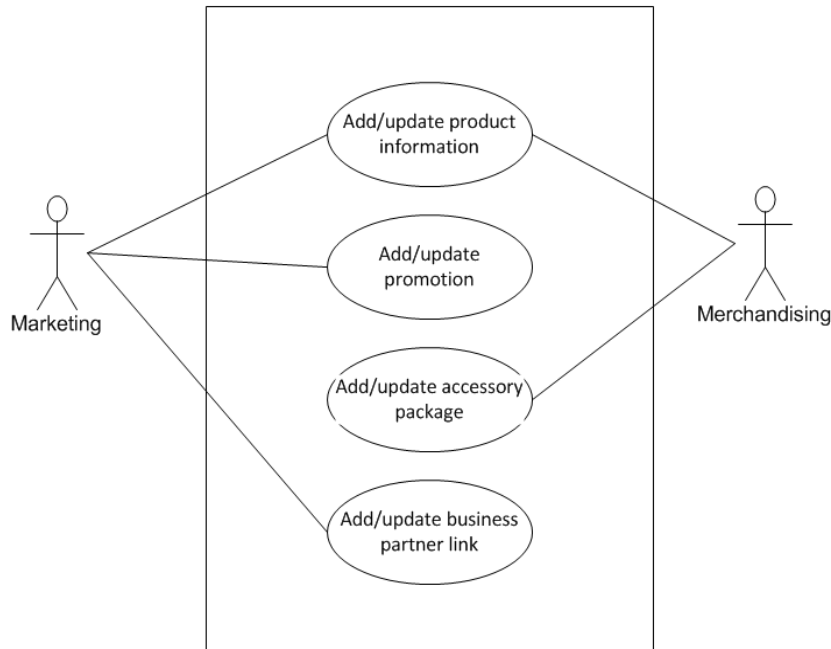
14. Refer to the RMO CSMS Reporting subsystem shown in Figure 3-11. These reports were identified by asking users about temporal events, meaning points in time that require the system to produce information of value. In most actual systems today, an actor is assigned responsibility for producing the reports or other outputs when they are due. Recall that the actor is part of the system—the manual, non-automated part. Thus, this is one way the "system" can be responsible for producing an output at a point in time. In the future, more outputs will be produced automatically. Draw a use case diagram that shows the use cases and actors, as shown in Figure 3-11. Use a drawing tool such as Microsoft Visio if it is available.
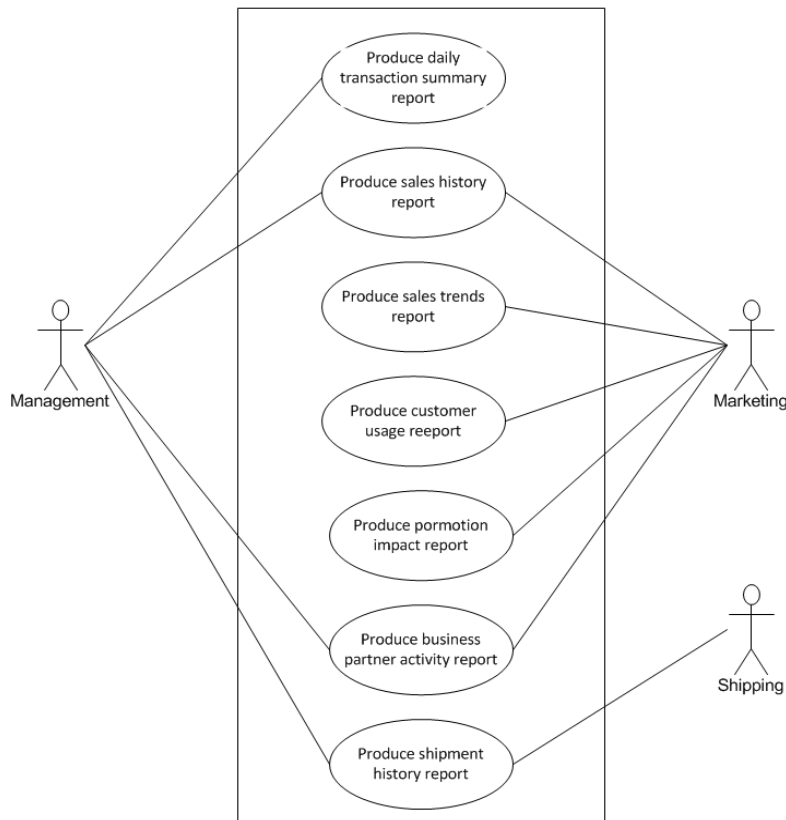
Solutions to End-of-Chapter Cases

Case Study: The State Patrol Ticket-Processing System

1. To what events must the ticket-processing system respond? List each event, the type of event, and the resulting use case.

Event	Type	Use case
Officer submits a ticket	External	Record new ticket
Driver sends in fine payment	External	Record fine payment
Driver requests trial	External	Process trial request
Court sends verdict	External	Record verdict
Time to produce warrant request	Temporal	Produce warrant request

2. Write a brief use case description for each use case.

Use case	Description
Record new ticket	A clerk will enter the data recorded on a paper ticket which has been sent in from the officer.
Record fine payment	A clerk will enter the data from the payment sent in by the driver.
Process trial request	A clerk will enter the data from the trial request check-box and the envelop sent in by the driver. The system must generate a trial request and send it to the court system. It also produces a questionnaire for the driver.
Record verdict	The system records the verdict information sent by the court system.
Produce warrant request	After two weeks, the system produces a warrant request to be sent to the court.

3. The portion of the database used with the ticket-processing system involves driver data, ticket data, officer data, and court data. Driver data, officer data, and court data are read by the system, and the ticket-processing system creates and updates ticket data. In an integrated system like the ticket-processing system, some domain classes are created by and updated by other systems, as described in this case. Create a table with systems down the rows and the four types of data (domain classes) across the columns. Indicate C, R, U, or D for each domain class and each system.

Use Case/Class	Driver	Ticket	Officer	Court
TICKET SYSTEM				
Record new ticket	R	C	R	
Record fine payment		U		
Process trial request		U		
Record verdict		U		R
Produce warrant request	U	U		
ACCIDENT SYSTEM	U	R		
DRIVING RECORDS SYSTEM	RU	R		
DRIVER'S LICENSE SYSTEM	CRU			

Running Cases: Community Board of Realtors

1. To what events must the MLS system respond? List each event, the type of event, and the resulting use case. Be sure to consider all the use cases that would be needed to maintain the data in the MLS system, thinking in terms of the CRUD technique.

Event	Type	Use case
Real estate office submits new listing	External	Add new listing
Agent request listing information	External	Provide listing information
Time to produce multiple listing book	Temporal	Produce multiple listing book
Real estate office submits listing change request	External	Record listing change
New real estate office opens (implied)	External	Add new real estate office
Change real estate office information	External	Update real estate office info
New agent is hired (implied)	External	Add new real estate agent
Change agent information	External	Update real estate agent info
House is sold (from CRUD)	External	Delete listing
Real estate office closes (from CRUD)	External	Delete real estate office
Agent retires/quits (from CRUD)	External	Delete real estate agent

2. Draw a use case diagram based on the actors and use cases you identified in question 1.


3. Given the information available in the system, consider yourself a potential customer looking for real estate. List as many specific use cases you would like to see based on your specific goals.

Answers will vary.
- Find real estate agent
- Search for property (by various criteria)
- View property details
- View property images (video or pictures)
- Request a property visit
- Send a message to real estate agent

4. Draw a use case diagram for all the use cases for the potential customer you identified in question 3.
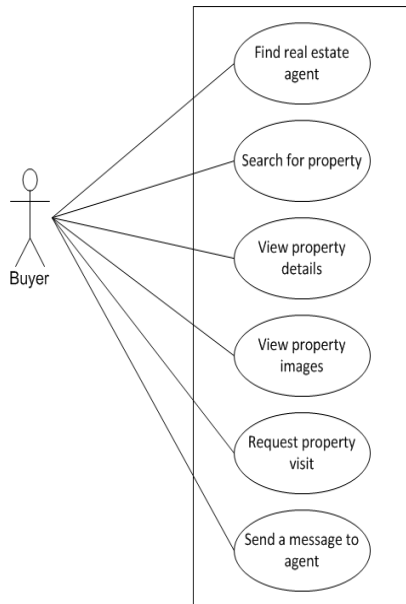
## Running Cases: The Spring Breaks 'R' Us Travel Service

1. Using the event decomposition technique for each event you identify in the description here, name the event, state the type of event, and name the resulting use case. Draw a use case diagram for these use cases.

Event (Booking subsystem)	Type	Use Case
Student browses resorts	External	Display resort information
Student browses resort packages	External	Display resort package information
Student group requests reservations	External	Book student group
Group adds/deletes participants	External	Change group booking
Time to send out payment requirements	Temporal	Send payment notices
Check on booking details	External	Display booking details
Students check in	External	Update reservation info (hotel)
Students check out	External	Update reservation info (hotel)

2. Consider the new Social Networking subsystem that SBRU is researching. Think in terms of the user goal technique to identify as many use cases as you can think of that you would like to have in the system. SBRU is guessing you might want to join, send messages, and so forth, but there must be many interesting and useful things the system could do before, during, and after the trip. Draw a use case diagram for these use cases.

Answers will vary. A few possibilities
- Create an individual account (join)
- Set preferences on account
- Create a group account
- Assign admin rights to account
- Search for a person or group
- Link up with a person or group
- Send a private message to a friend
- Chat with friend(s)
- Post a comment to a friend/group/photo
- Upload photo or video
- Tag photo
- Write/update vacation experience
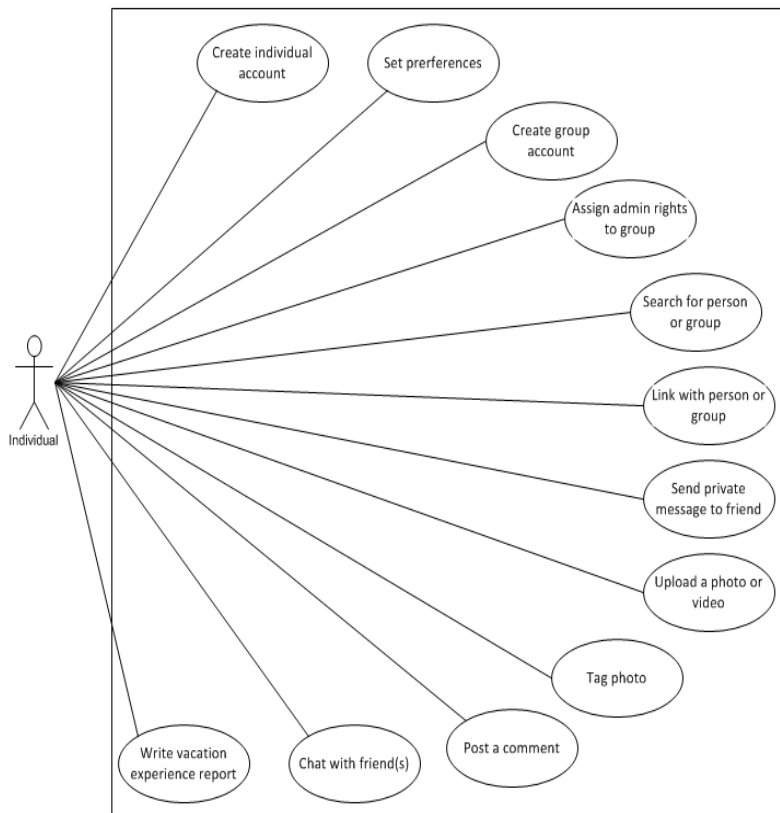
Running Cases: On the Spot Courier Services

1. From this description as well as the information from Chapter 2, identify all the actors that will be using the system.

- Bill Wiley (owner and manager)
- Delivery person
- Warehouse person
- Customer

2. Using the actors that you identified in question 1, develop a list of use cases based on the user goal technique. Draw a use case diagram for these use cases.

Note: This list is based on the use case descriptions so far. See Chapter 9 for a more complete list of use cases based on narratives and CRUD analysis.

Bill Wiley
- Enter a request for pickup
- Enter package pickup info
- Print label (may be part of pickup, or may request independently)
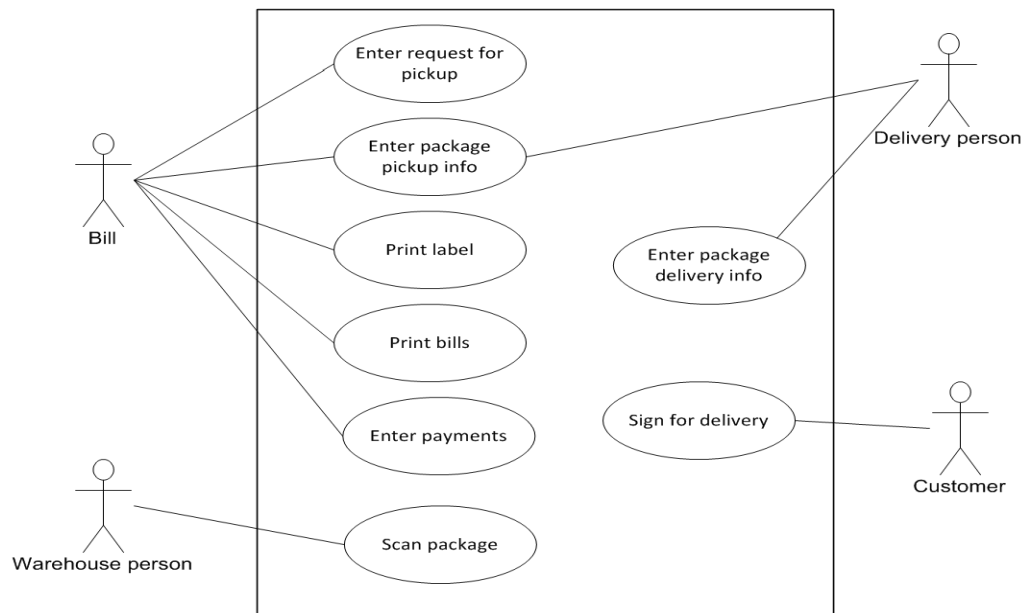- Print bills
- Enter payments

Delivery person
- Enter package pickup info
- Enter package delivery info

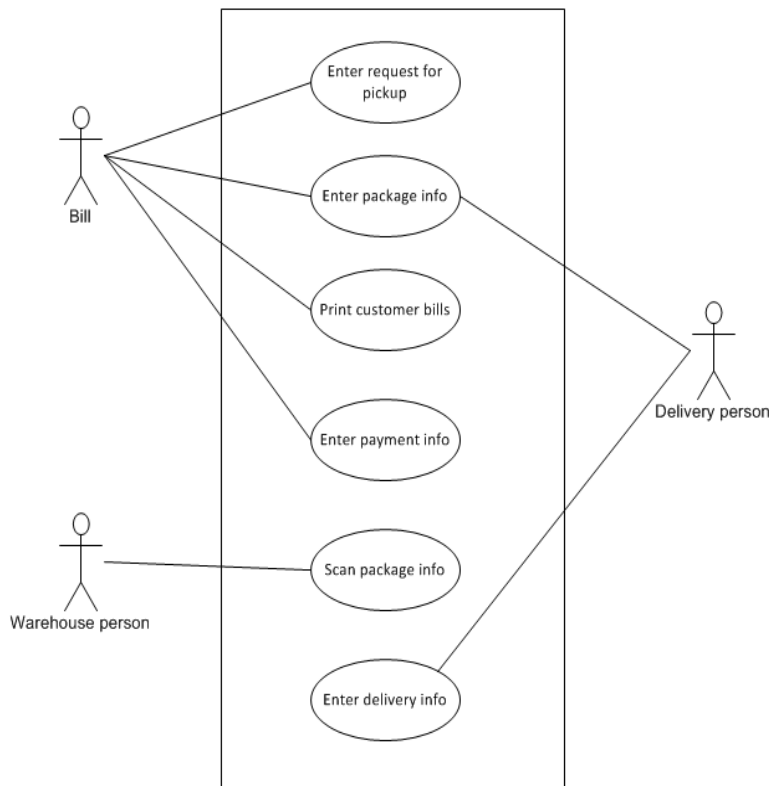Warehouse person
- Scan package

Customer
- Sign for delivery

3. Using the event decomposition technique for each event you identify in the description here, name the event, state the type of event, and name the resulting use case. Draw a use case diagram for these use cases.

Event	Type	Use case
Request package pickup	External	Enter pickup request info
Pickup package	External	Enter package info
Time to print bills	Temporal	Print customer bills
Receive payments	External	Enter payment info
Package scanned in warehouse	External	Scan package info
Deliver package	External	Enter delivery info

It is interesting in this case the event decomposition yielded fewer use cases. Individual use cases (*Print label* and *Sign for delivery)* are part of other business events and do not immediately show up.

Running Cases: Sandia Medical Devices

1. Identify all the actors that will use RTGM.

Patient

Health-care provider (Physician)

Nurse (physician assistant)

2. Using the actors that you identified in question 1, develop a list of use cases based on the user goal technique. Draw a use case diagram for these use cases.
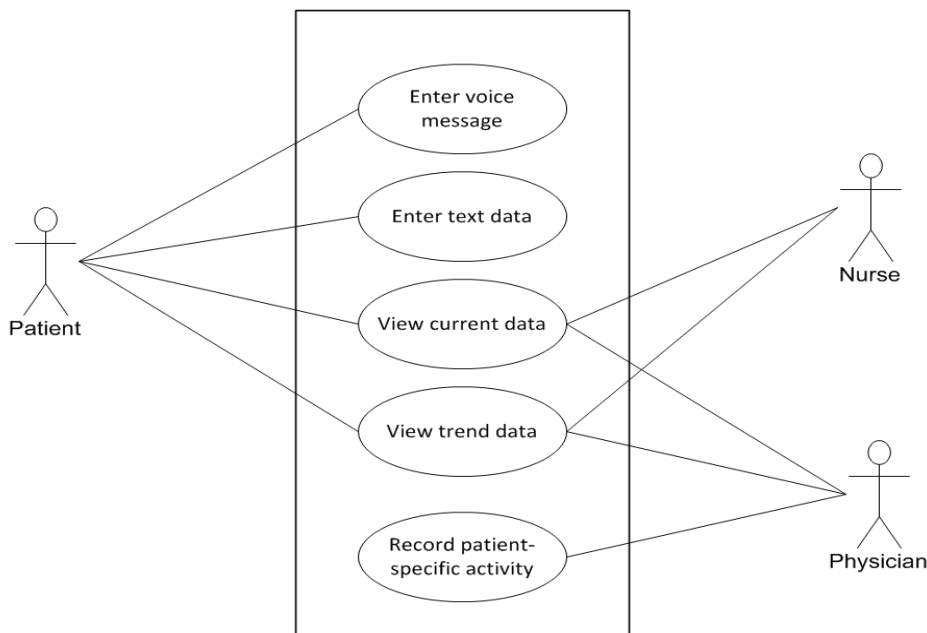
Patient:
- View current data
- View trend data
- Enter text message
- Enter voice message

Nurse:
- View current data
- View trend data

Physician:
- View current data
- View trend data
- Record patient-specific activity

3. Using the event decomposition technique for each event you identified in the description, name the event, state the type of event, and name the resulting use case. Draw a use case diagram for these use cases.

Event	Type	Use Case
Monitor records data value	Temporal	Record data value
Patient views current value	External	View data value
Patient views trend chart	External	View trend data
Nurse views current value	External	View data value
Nurse views trend chart	External	View trend data
Physician views current value	External	View data value
Physician views trend chart	External	View trend data
Physician responds to data	External	Record activity
Patient responds to data	External	Record message (voice or text)

Note: Physician activity and patient activity may be quite different, hence we have identified separate use cases.