The Buddy Ring

The application area for this exam is similar to the Obligatory Exercise 3 for INF5150 in 2010: We are considering a set of smart mobile phones like those running on Android and they will communicate with each other through SMS, but we will assume that the users of the smart phones may not necessarily have to read these SMSes.

We are designing an application (an "app") on the smart phone that shall be used to keep track of all the participants in a "buddy ring". A "buddy ring" is a set of persons with smart phones with location possibilities (through a GPS app). The buddy ring is a ring because we shall assume that the smart phones are organized in a ring with forwards and backwards references. Thus every member of the buddy ring will know only the address (telephone number) of one next person (forwards) and one previous person (backwards) in the ring.

To explain what happens when the *BuddyApp* is started, please look at the sequence diagram in Figure 1.

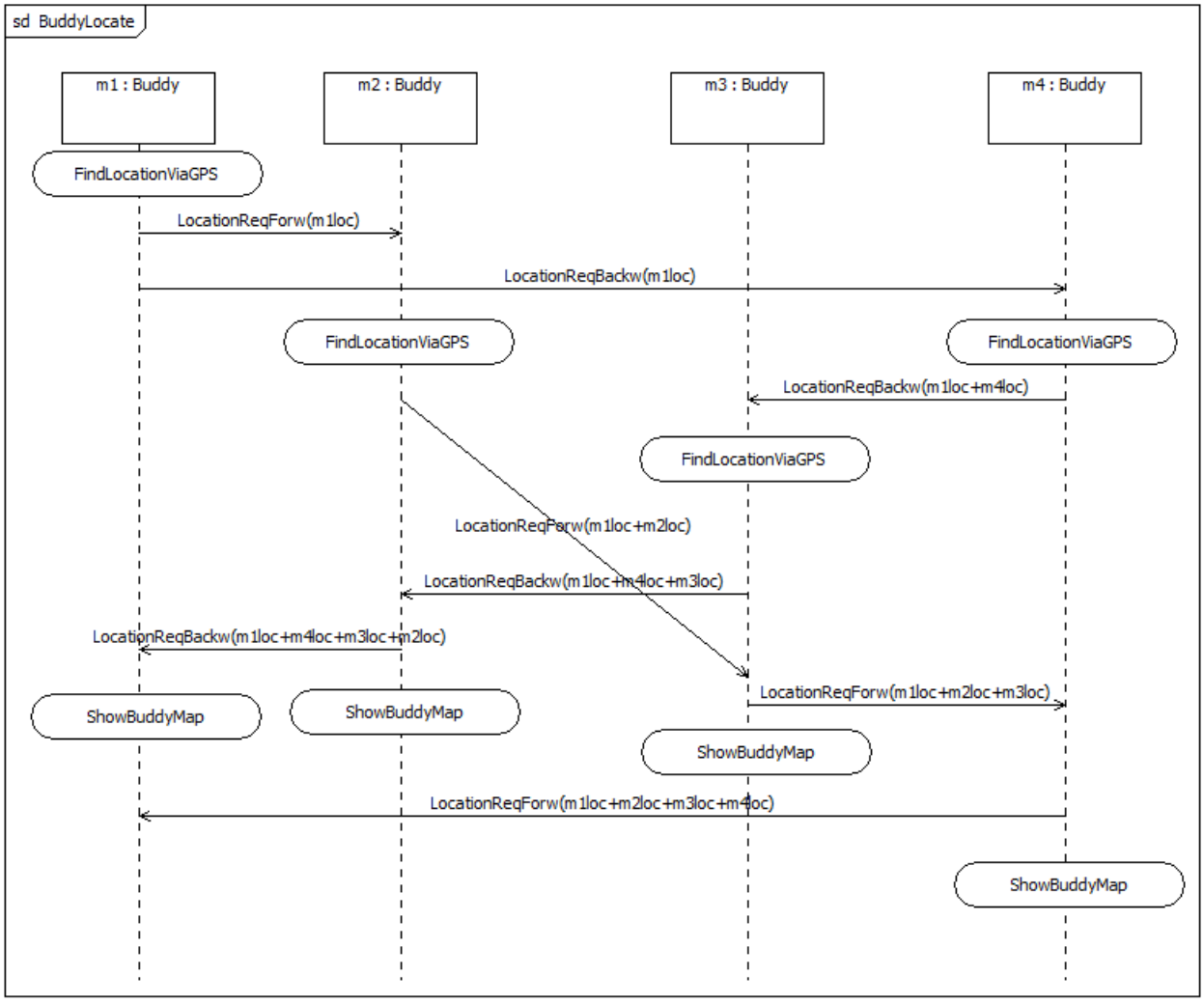

Figure 1 *BuddyLocate* the normal sequence for the *BuddyApp*

The *BuddyApp* is initiated from the *Buddy m1*. He or she will provide their own position and send forwards and backwards requests for locations of the others in the buddy ring. When the

request, either forwards or backwards comes back *m1* knows all the positions and can have the map drawn by the application *MAPS*.

The nice thing with this *BuddyApp* is that also all the others in the buddy ring will get the necessary information and can produce the map of the members of the buddy ring as indicated in the sequence diagram.

1 a) Events

The STAIRS Tutorial associates two events with each message, a transmission event and a reception event.

I: How many reception events take place on the lifeline ***m3***? Explain your answer.

II: What is (are) the first reception event(s) of Figure 1? (If there is more than one possibility, list all the possibilities.) Explain your answer.

1 b) Traces

I: The diagram of Figure 1 describes a set of more than one positive trace. Describe one of these traces as a sequence of events. Use the convention that **!*x*** and **?*x*** represent respectively the transmission event and the reception event of the message ***x***.

II: Ignore for the sake of this sub-exercise (**1b II**) the two messages sent by m2, how many positive traces does what is left of the diagram in Figure 1 describe?

III: How many inconclusive traces correspond to the diagram in Figure 1? Explain your answer.

2 c) Refinement

I: Let ***BuddyLocate2*** be the diagram obtained from the diagram in Figure 1 by removing the last message (***LocationReqForw*** from ***m4*** to ***m3***). Is ***BuddyLocate2*** a refinement of ***BuddyLocate***? Explain your answer.

II: Is ***BuddyLocate*** a refinement of ***BuddyLocate2***? Explain your answer.

III: Draw a sequence diagram that is (A) a refinement of the sequence diagram in Figure 1 and (B) contains both the ***xalt***-operator and the ***ref***-operator. Explain your answer.

IV: Assume ***BuddyApp*** has been correctly implemented in accordance with the diagram in Figure 1. In what way may the positive behaviour captured by the diagram in Figure 1 be reflected in the implementation?

V: Assume ***BuddyApp*** has been correctly implemented in accordance with the diagram in Figure 1. In what way may the inclusive behaviour corresponding to Figure 1 be reflected in the implementation?