Homework 3

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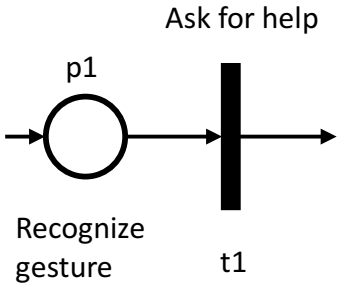
Answer to question a:

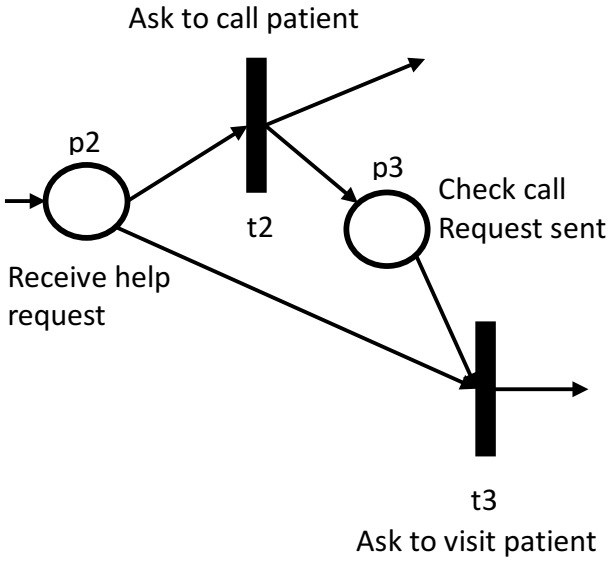
In this part we have to convert the active index from exercise 2 to a petri-net. In exercise 2 we drew three index cells. Here are the petri-net diagrams for the three index cells –

Gesture Recognition Index Cell



A gesture recognition index cell always monitors to recognize patient's hand gestures. If it detects "I need help" gesture at places p1 it will gain a token and then the transition t1 will be enabled. t1 will fire the message "Patient Smith needs help" to the emergency manager index cell.

Emergency Manager Index Cell

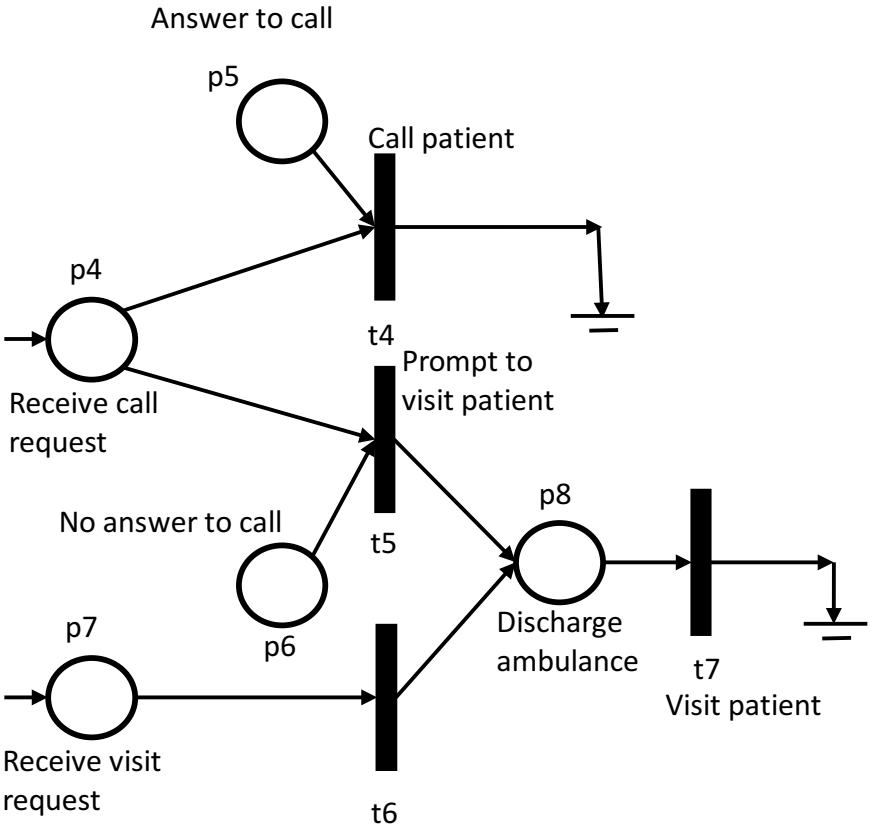


At first the emergency manager index cell try to recognize if it has received a message help request "Patient Smith needs help" from the patient at place p2. If it receives the token then

transition t2 is enabled and it fires “Call patient Smith” to homecare staff index cell. t2 also sends a token to p3 which check if a first call request has been sent to the homecare staff.

If p2 receives the same token message “Patient Smith needs help” again, only then t3 will be enabled. So t3 is enabled in case of multiple help request not a single help request. t3 will send “Visit patient Smith” token to the homecare staff index cell.

Homecare Staff Index Cell



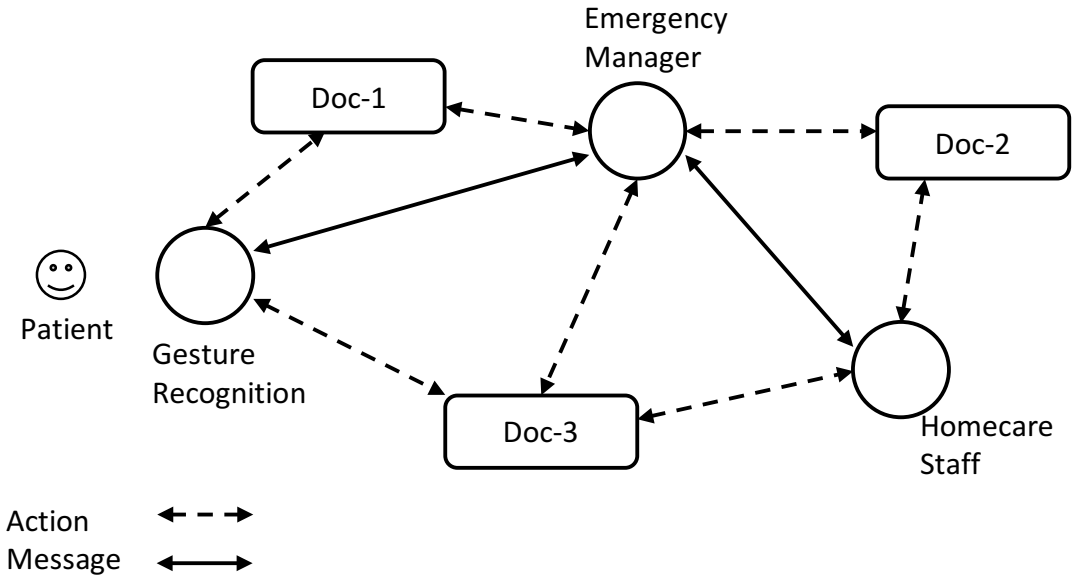
Prompt to Visit patient

At first the homecare staff index cell can receives token from either call request in p4 or from visit request in p7. When it receives token from the message “Call patient Smith” in p4, it calls the patient either enabling t4 or t5. If the patient receives the call p5 receives a token. Then t4 will fire and the homecare staff talks with patient. If the patient does not answer to the call, then t5 fires and sends token to p8. P8 enables t7 and the homecare staff goes to visit patient.

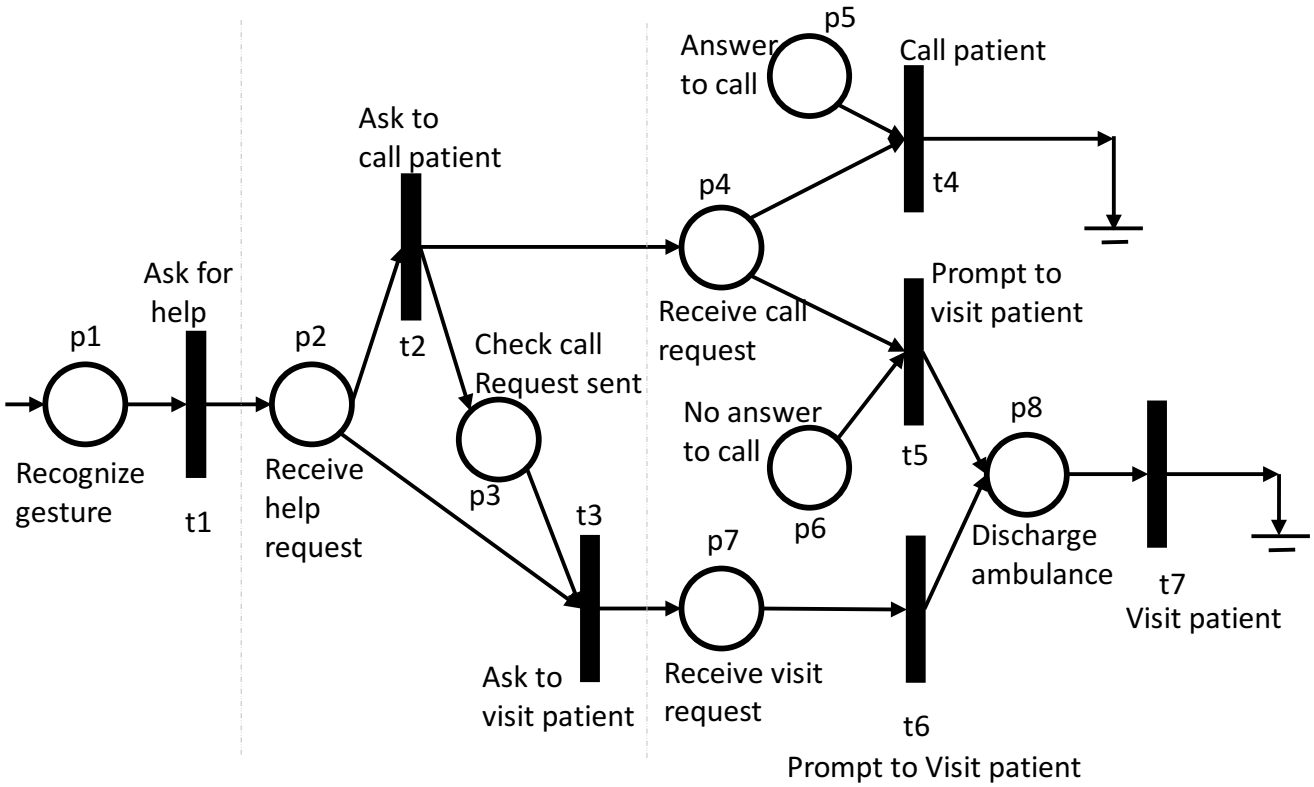
If it receives message “Visit patient Smith” in p7, the homecare staff will not call the patient m, instead it will discharge ambulance in p8 and goes to visit patient by ambulance, which is firing t7.

Answer to question b:

In question (c) from exercise 2, we drew a diagram showing three multimedia interfaces (webpages such as doc-1, …, doc-3) enhanced with the index cells to illustrate how these index cells work together to form an active index system. The diagram is given below –



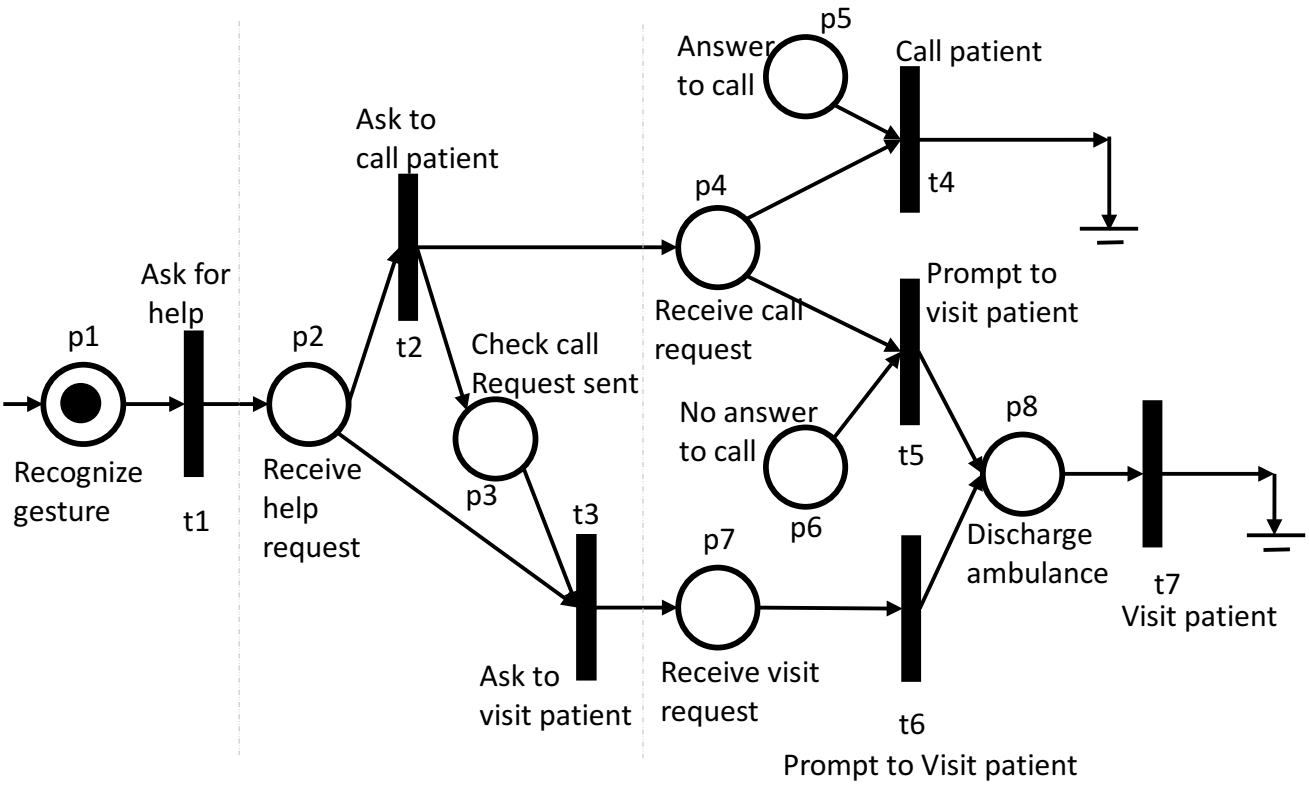
We can draw the diagram again using the petri-net diagram in question (a). Then the active index system will look like this –



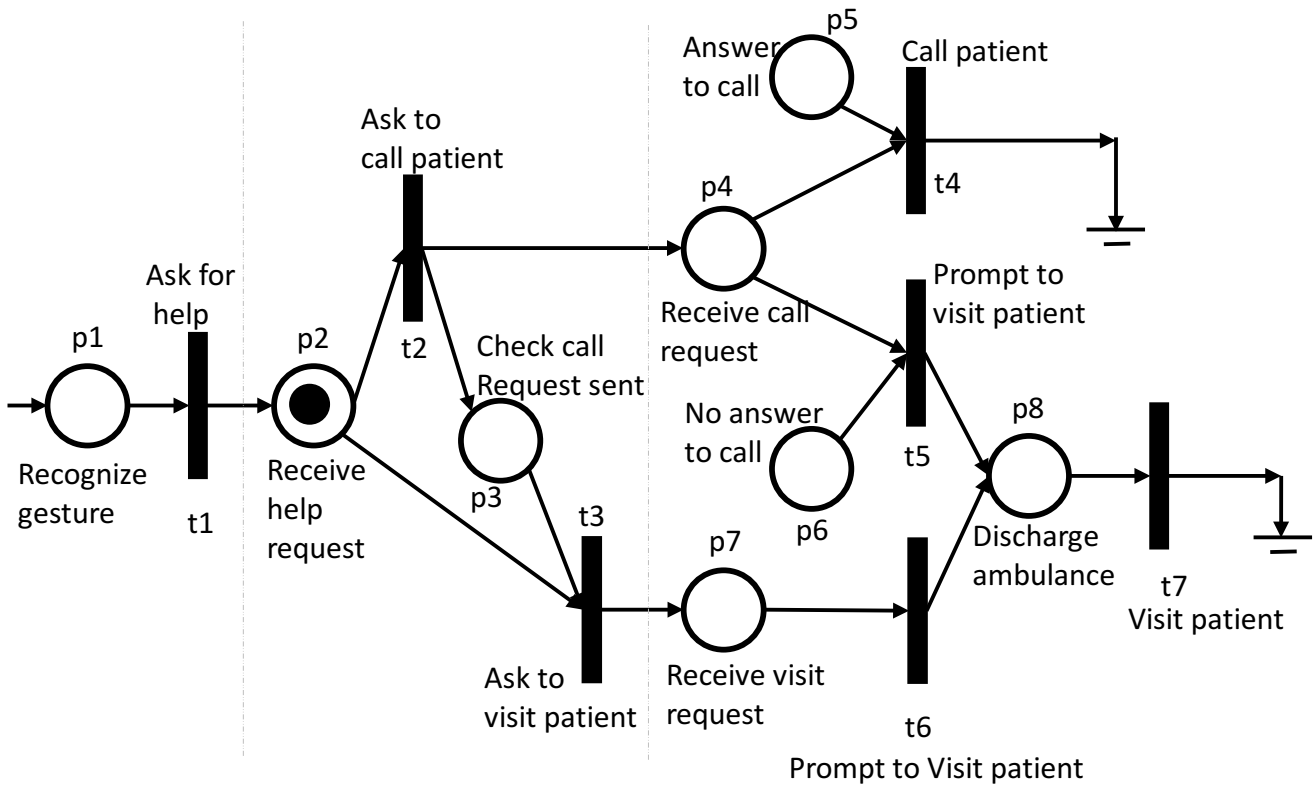
Let's look at two scenarios on this petri-net diagram. In scenario 1 we will see when the call request is sent only once and the patient picks up the phone. Scenario 2 will show when multiple call request is sent and the homecare staff visits patient. The scenarios will show marked petri-net diagram and the movement of the token.

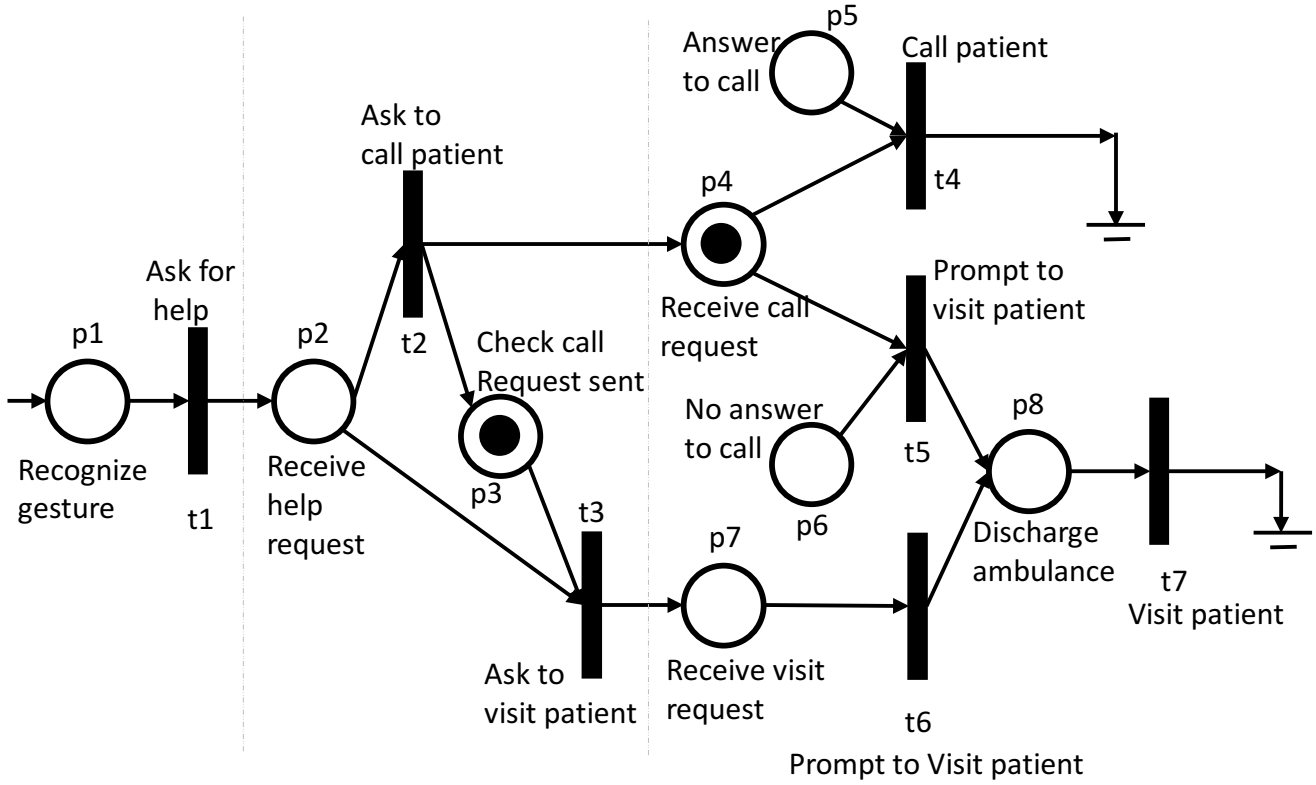
Scenario 1

At the beginning p1 recognizes a gesture by the patient. Hence p1 has the token and it is marked.

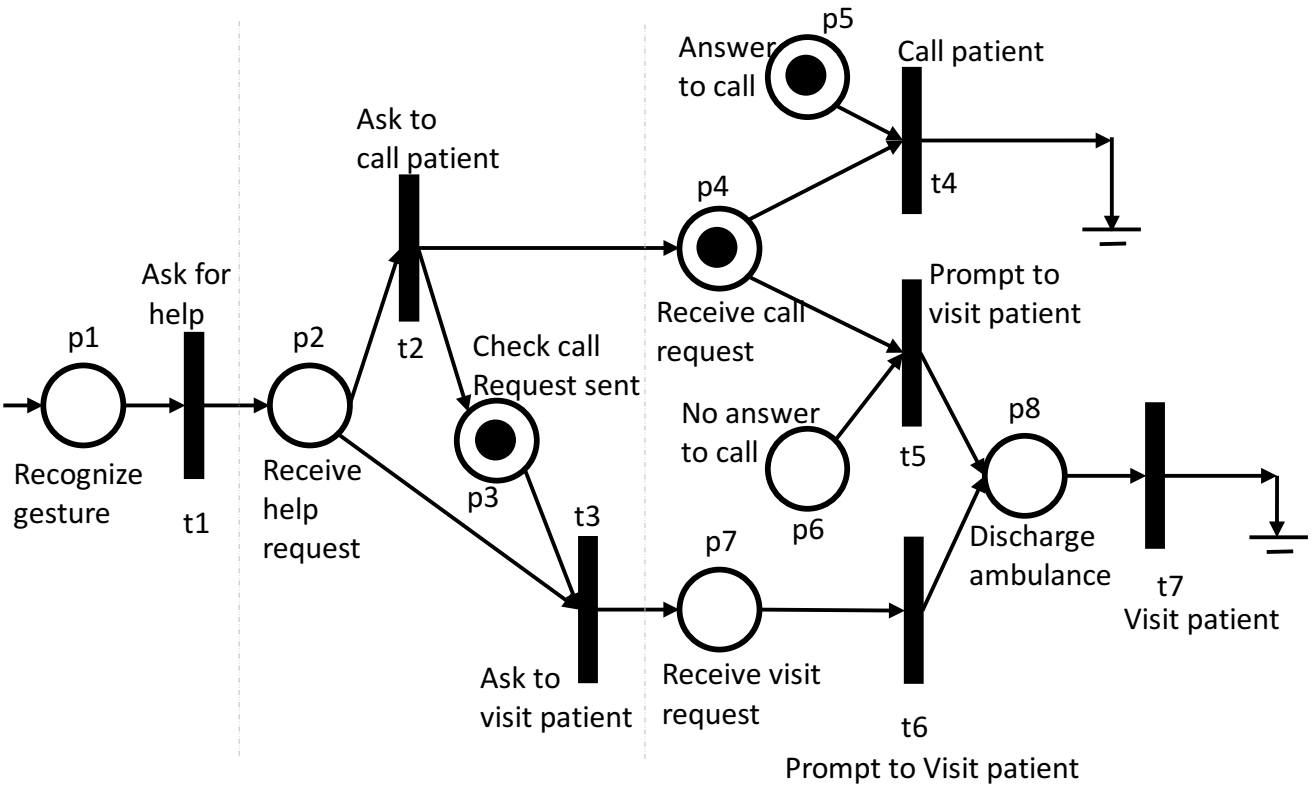


So t1 is enabled. If t1 fires and sends help request to the emergency manager cell, then p2 will receive a token. After p2 receives the token t2 is enabled but t3 is not enabled. Because, both p2 and p3 needs to have token for t3 to e enabled. So, at this point t2 will fire and p4 and p3 will receive tokens. But also none of the t3, t4 or t5 is enabled because they depends on other tokens. These diagrams are shown on the next page.


p5
Answer to call
Call patient
Ask to call patient
t4
p4
Ask for help
Prompt to visit patient
Receive call request
p1
p2
t2
Check call Request sent
No answer to call
p8
t5
Recognize gesture
t1
Receive help request
p3
t3
p6
Discharge ambulance
p7
t7
Visit patient
Ask to visit patient
Receive visit request
t6
Prompt to Visit patient

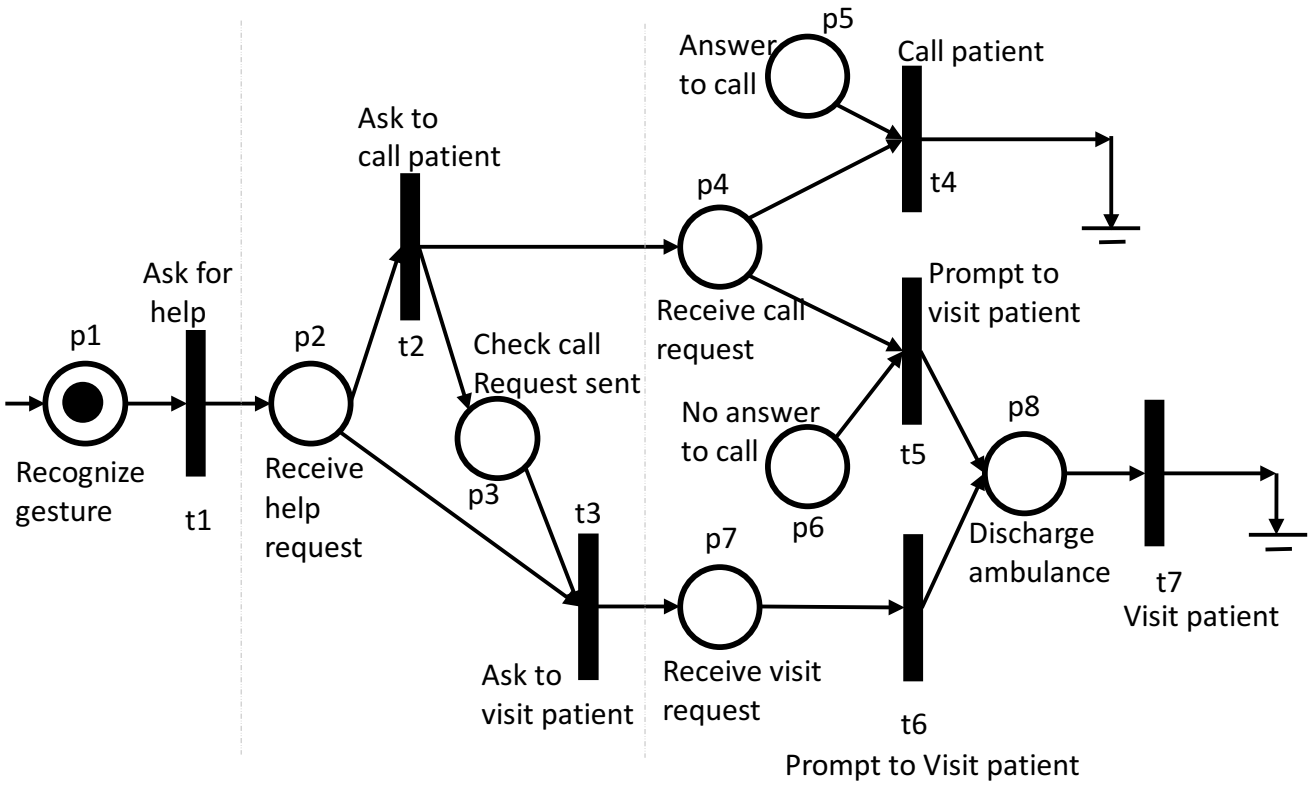

p5
Answer to call
Call patient
Ask to call patient
t4
p4
Ask for help
Prompt to visit patient
Receive call request
p1
p2
t2
Check call Request sent
No answer to call
p8
t5
Recognize gesture
t1
Receive help request
p3
t3
p6
Discharge ambulance
p7
t7
Visit patient
Ask to visit patient
Receive visit request
t6
Prompt to Visit patient

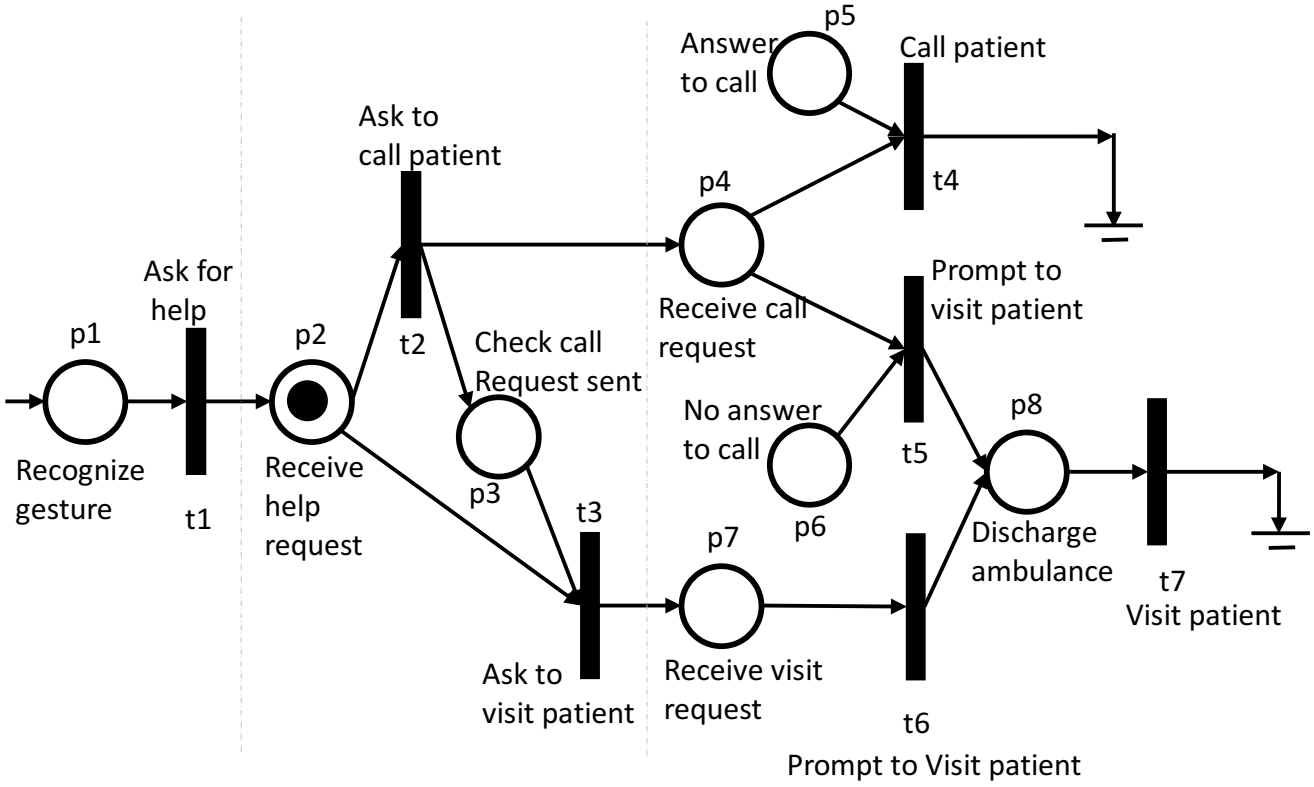
In this scenario, we assumed that the patient will answer the phone. In that case p5 have a token. If p5 have a token and p4 also have a token, then t4 will be enabled and the homecare staff will succeed calling the patient. After that if no more help request is sent, there will be no more tokens.



Scenario 2

In this scenario we assume that there will be multiple help requests from the patient and the homecare staff will visit the patient. The first three steps are same as the previous scenario. At the beginning p1 recognizes a gesture by the patient. Hence p1 has the token and it is marked. So t1 is enabled. If t1 fires and sends help request to the emergency manager cell, then p2 will receive a token. After p2 receives the token t2 is enabled but t3 is not enabled. Because, both p2 and p3 needs to have token for t3 to e enabled. So, at this point t2 will fire and p4 and p3 will receive tokens. But also none of the t3, t4 or t5 is enabled because they depends on other tokens.


p5
Answer to call
Call patient
Ask to call patient
t4
p4
Ask for help
Prompt to visit patient
p1
p2
t2
Check call Request sent
Receive call request
No answer to call
t5
p8
Recognize gesture
t1
Receive help request
p3
t3
p6
p7
Discharge ambulance
t7 Visit patient
Ask to visit patient
Receive visit request
t6
Prompt to Visit patient


p5
Answer to call
Call patient
Ask to call patient
t4
p4
Ask for help
Prompt to visit patient
p1
p2
t2
Check call Request sent
Receive call request
No answer to call
t5
p8
Recognize gesture
t1
Receive help request
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t3
p6
p7
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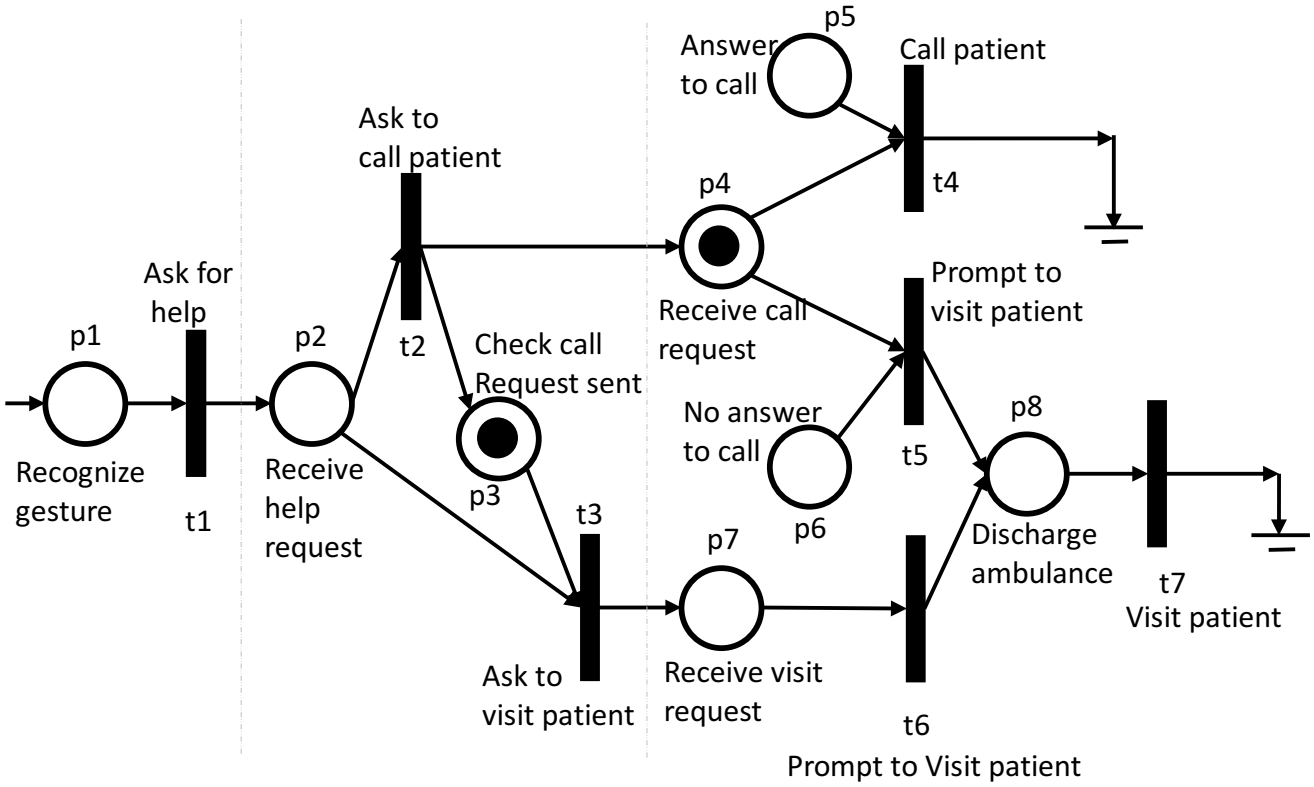
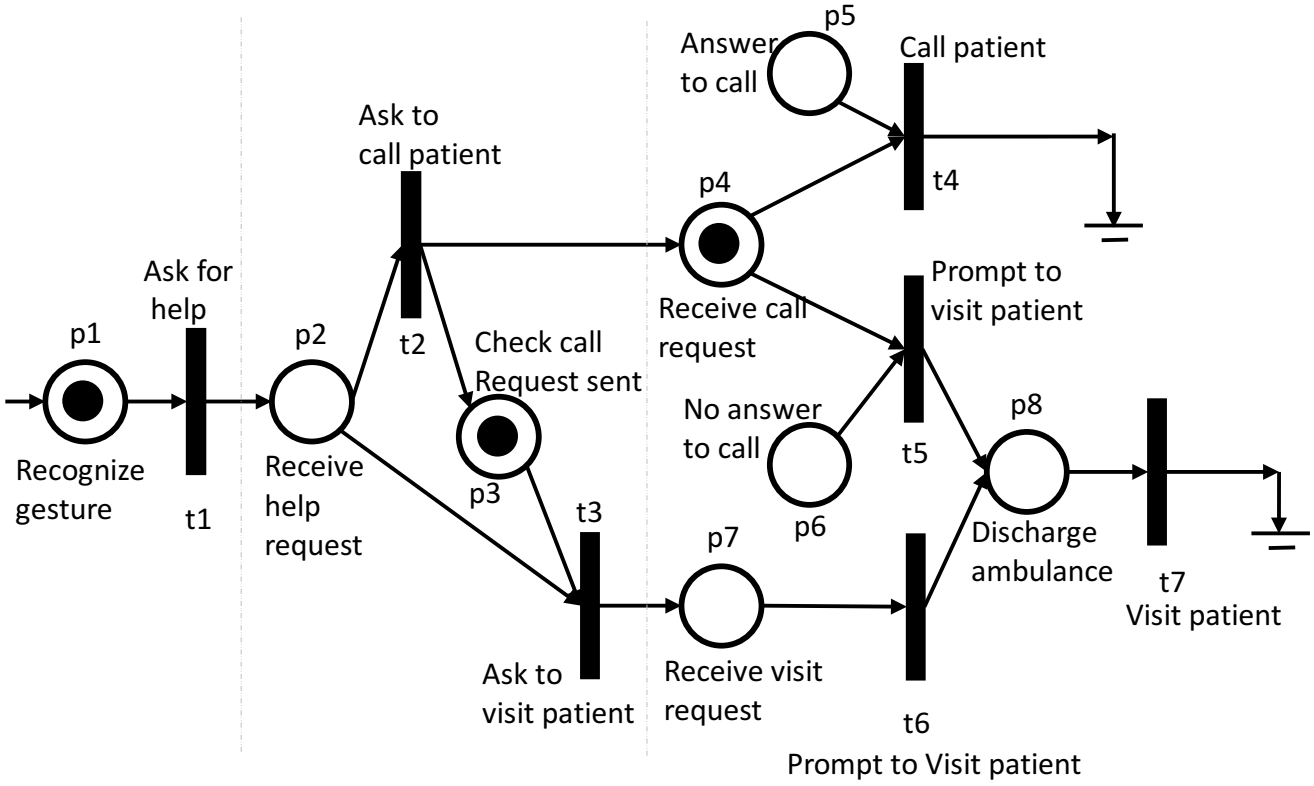
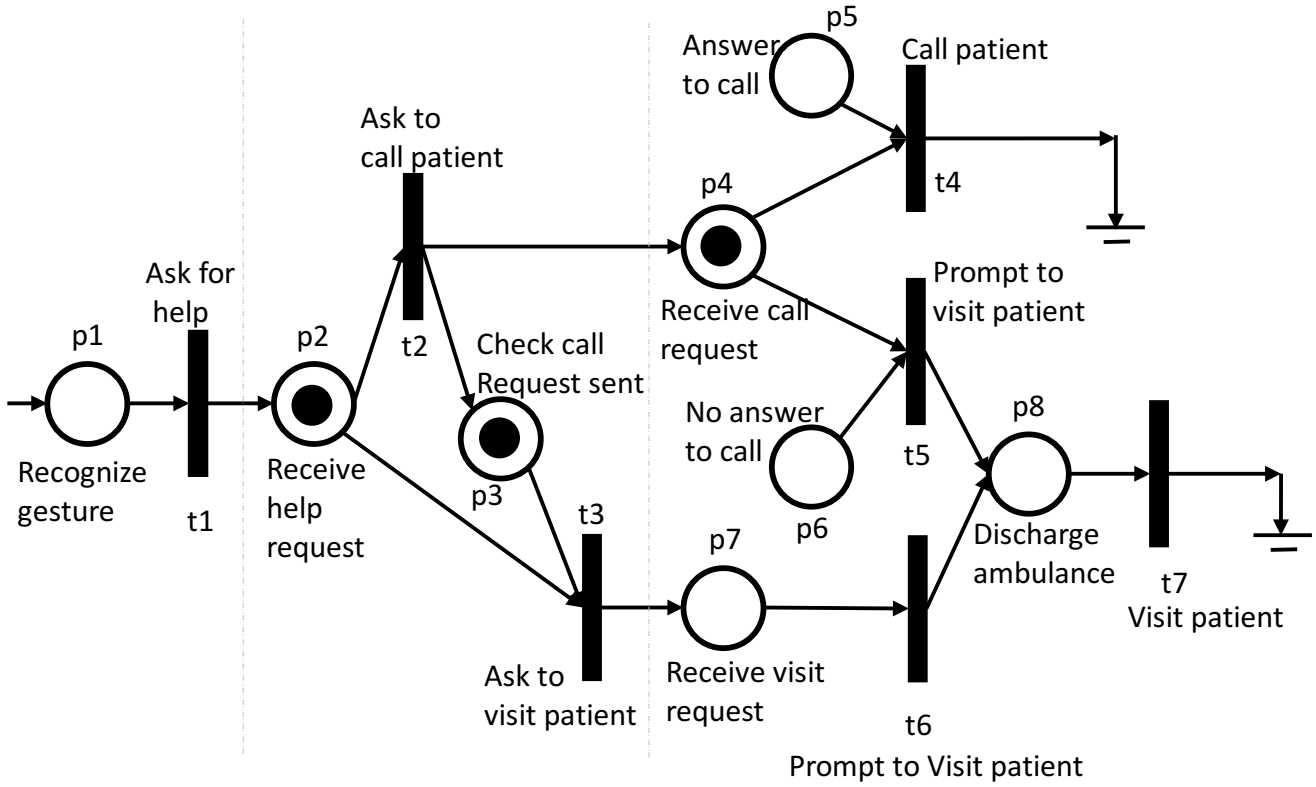
Prompt to Visit patient



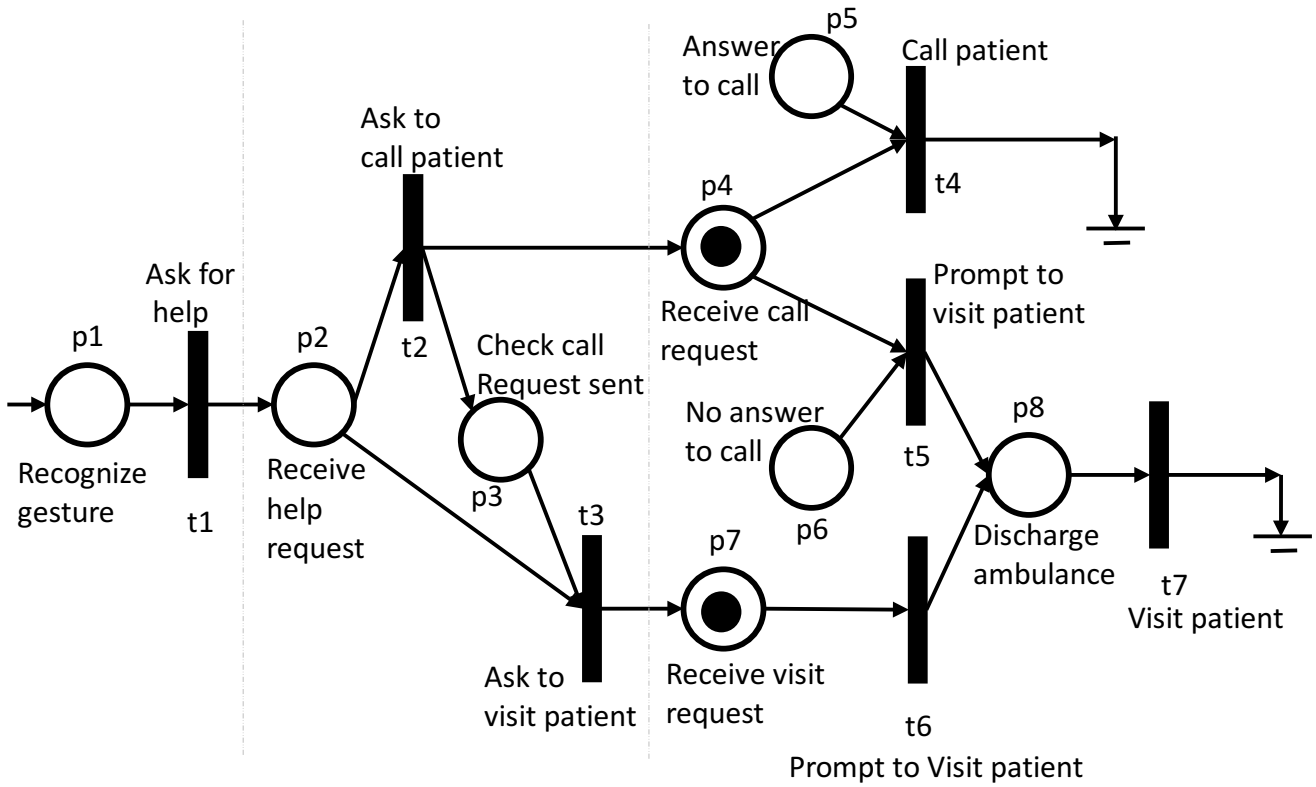
After that we assume that p1 again recognizes a gesture.



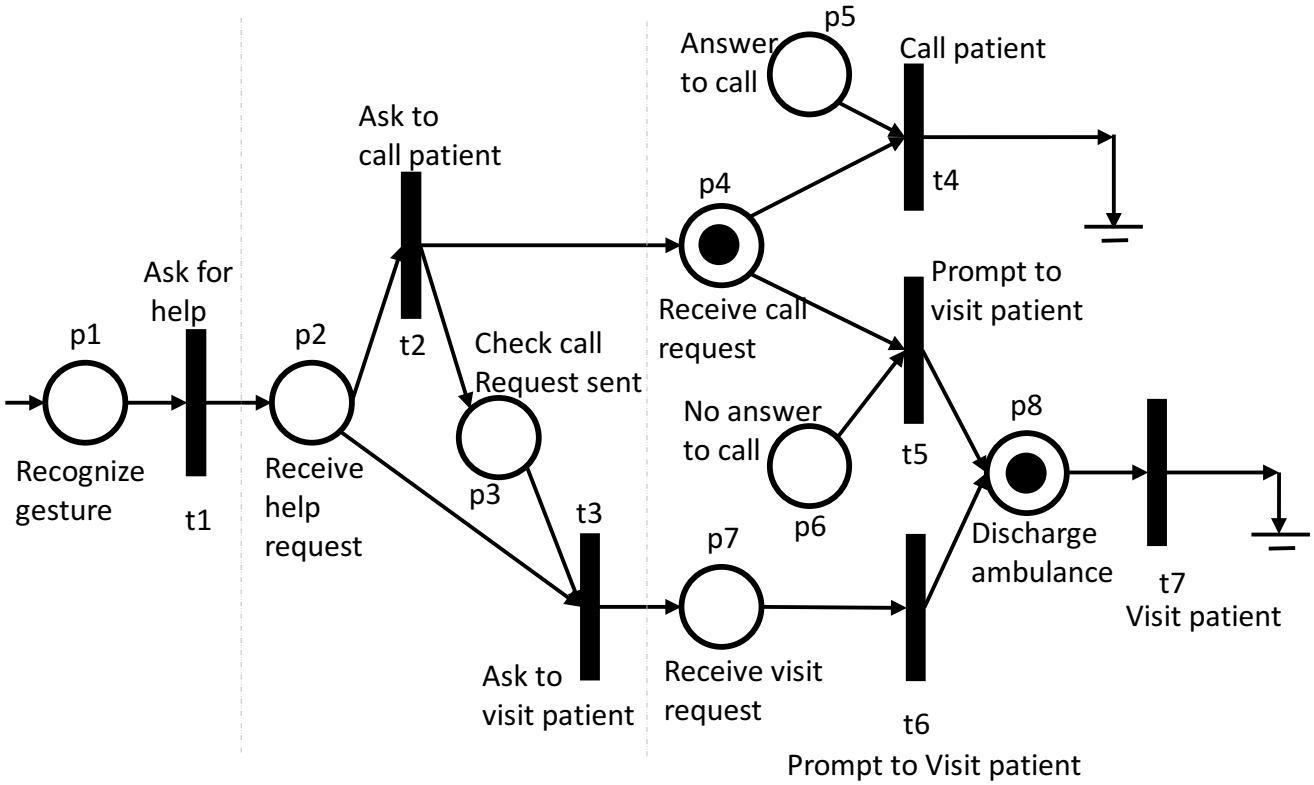
Then t1 will fire and p2 will receive the token.



At this point both p2 and p3 has token, so now t3 is enabled and it will fire and p7 will receive the token.

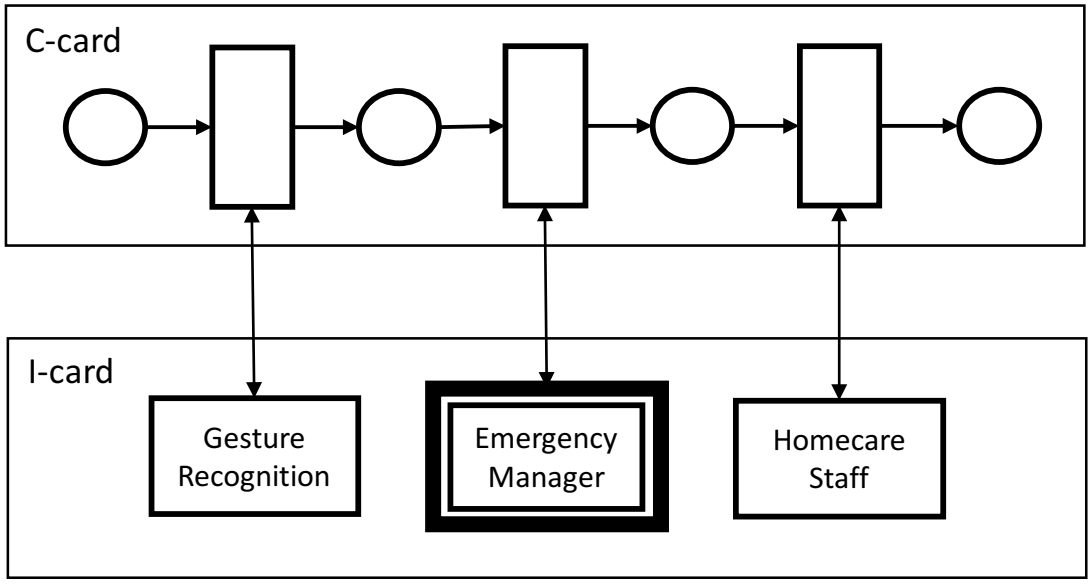


Then t6 will be enabled. It will fire the token to p8. Then t7 will be enabled and the homecare staff will visit the patient.



Answer to question c :

Here we convert the personal health care system into an ordinary petri-net. I-card and C-card are the refinements of IC-card. C-card is the control card and I-card is the information card. In the I-card, double box means super components. According to the question, emergency manager should be a super component. So we showed it in bold boxes. Here are the cards for personal health-care system –



On next figure the super components for the emergency manager is shown. We assumed emergency manager has 3 components.