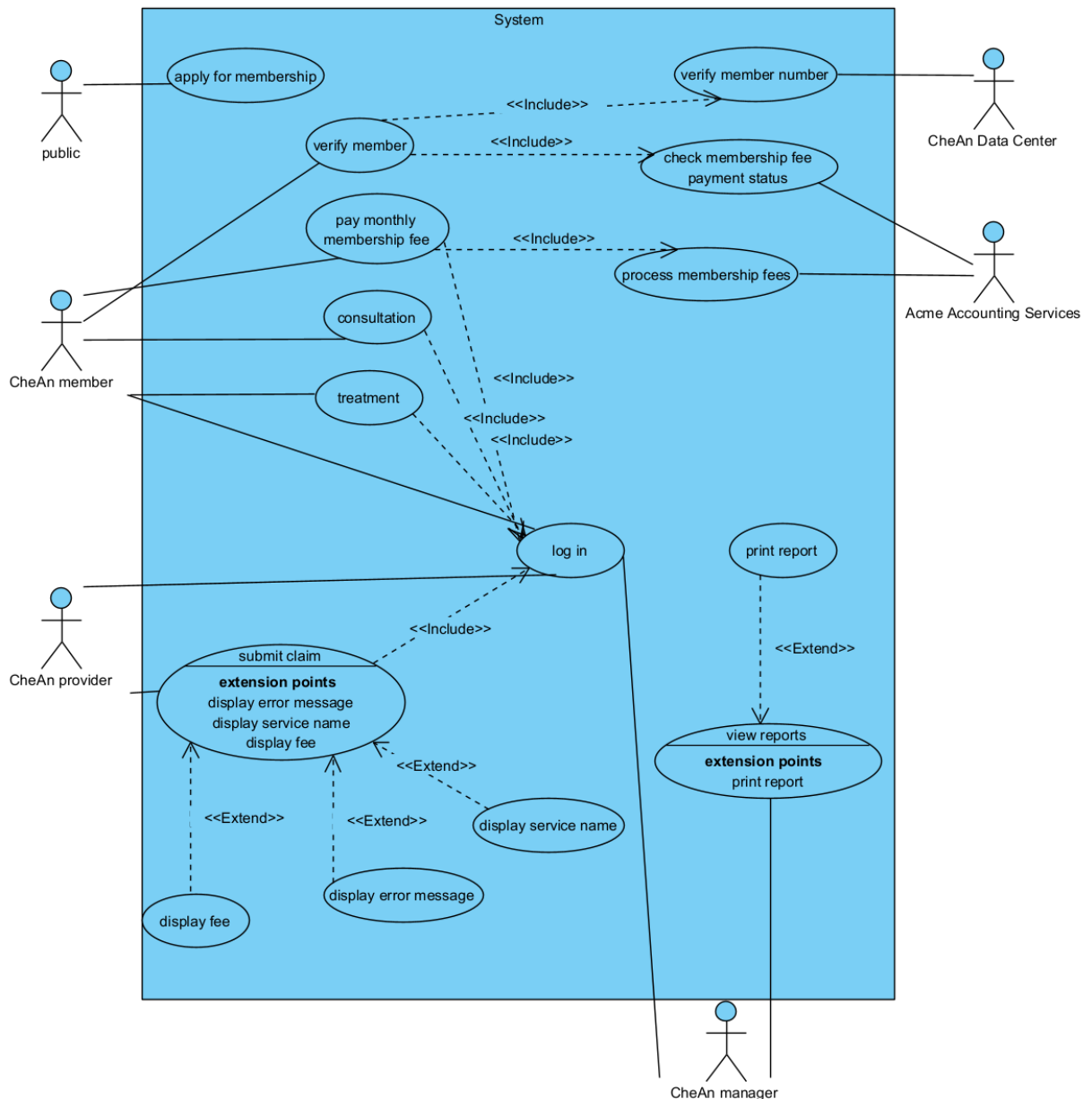


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1 (a)



(b) Membership status verification

1. System displays membership verification screen and prompts user for member number.
2. User enters a member number.
3. System connects to external CheAn Data Center computer.
4. System sends member number to the computer for verification.
5. The computer returns valid.
6. System connects to Acme Accounting Services to check the membership fee payment status tagged to that member number.
7. Acme Accounting Services returns valid.
8. System displays the word "Validated" on the screen.

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Alternate Flows

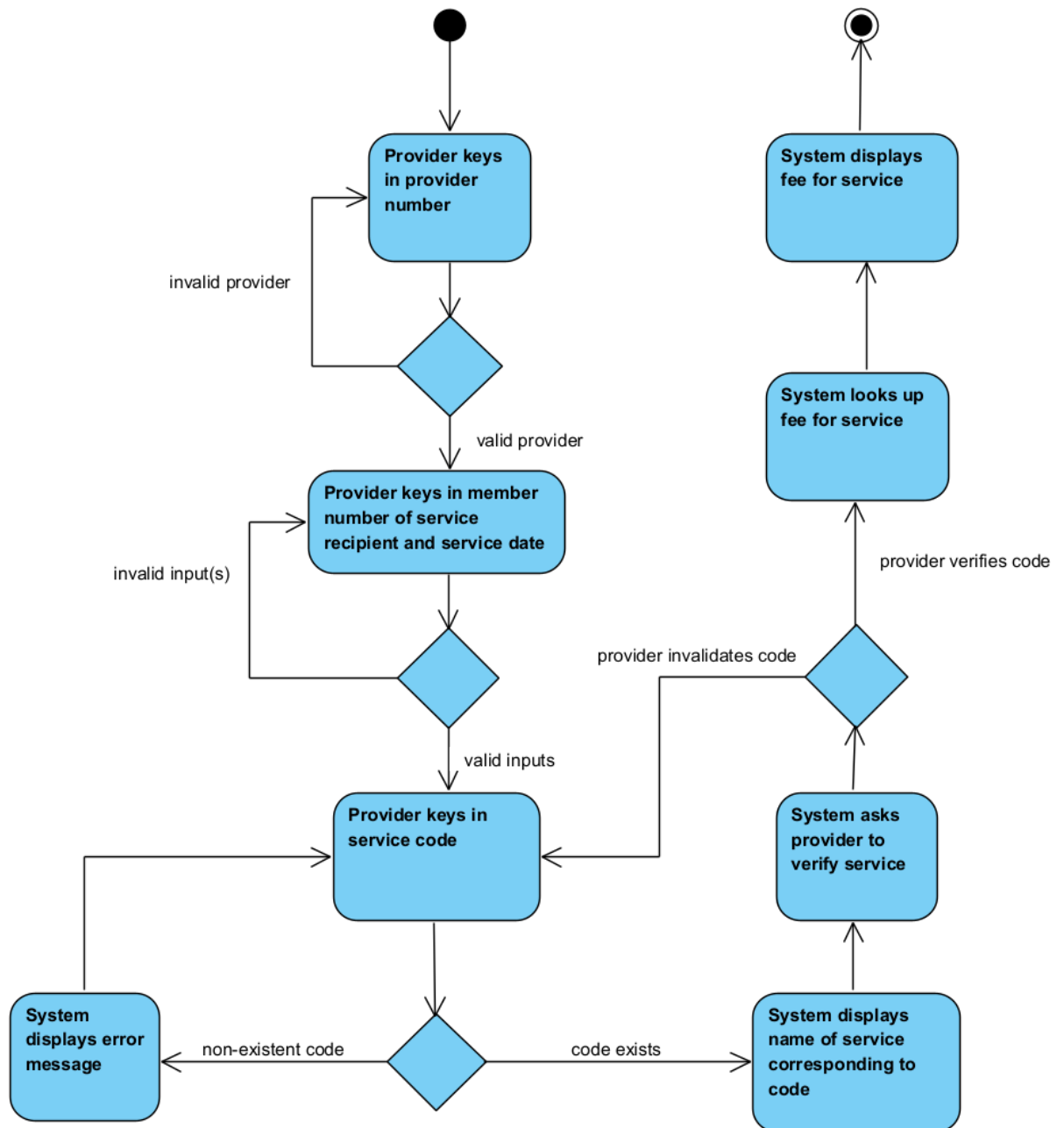
AF.1 (branch from step 5)

1. The computer returns invalid.
2. System displays “Invalid number” on screen.
3. Return to step 1

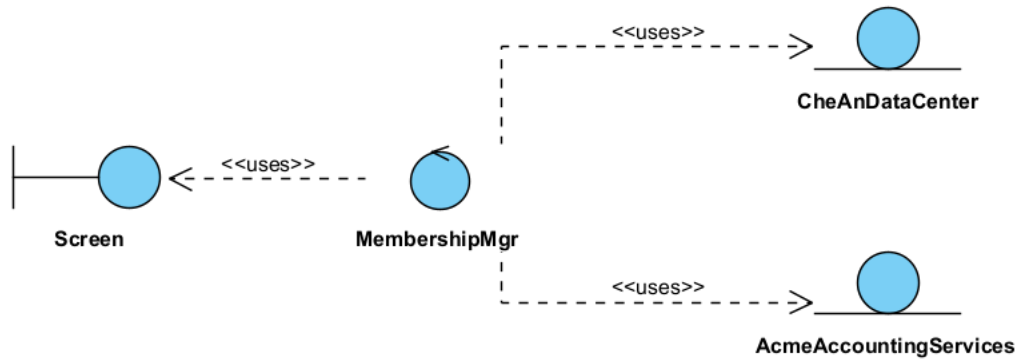
AF.2 (branch from step 7)

1. Acme Accounting Services returns invalid.
2. System displays “Member suspended due to owned fees for at least a month” on screen.
3. Return to step 1.

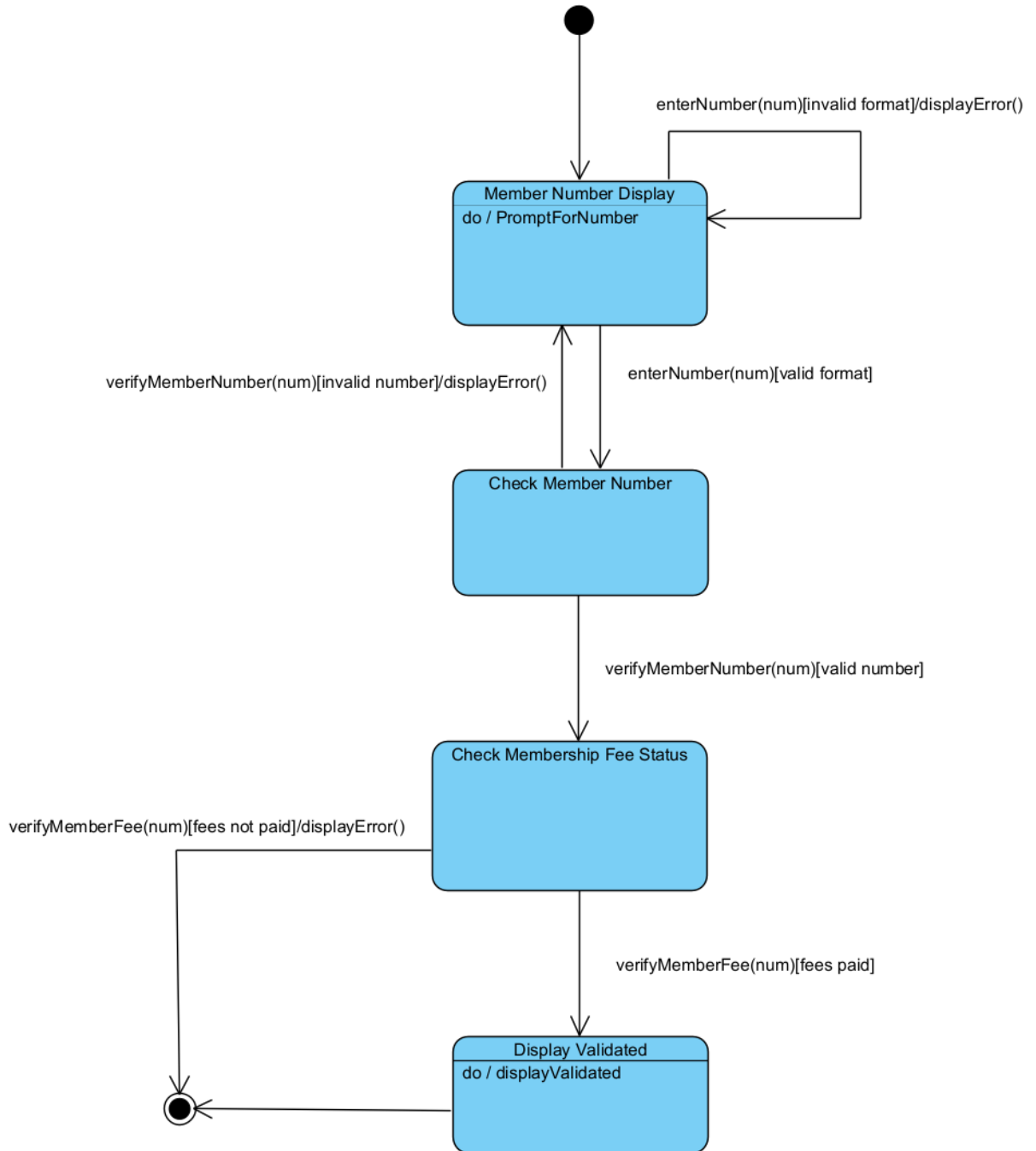
(c)



2 (a)



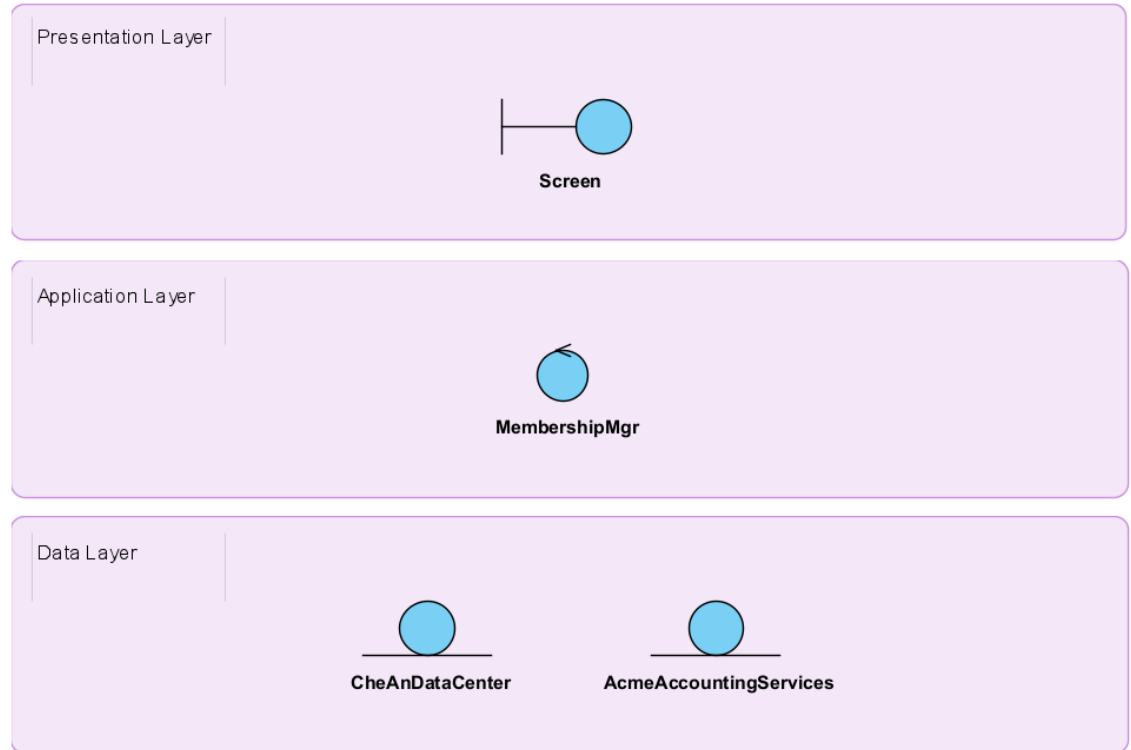
(b)



(c) Not in the current syllabus (AY21/22), refer to SC3040/CZ3002 Advanced Software Engineering instead.

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3 (a) (i)



- (ii)** Presentation Layer: Screen
Application Layer: MembershipMgr
Data Layer: CheAnDataCenter, AcmeAccountingServices

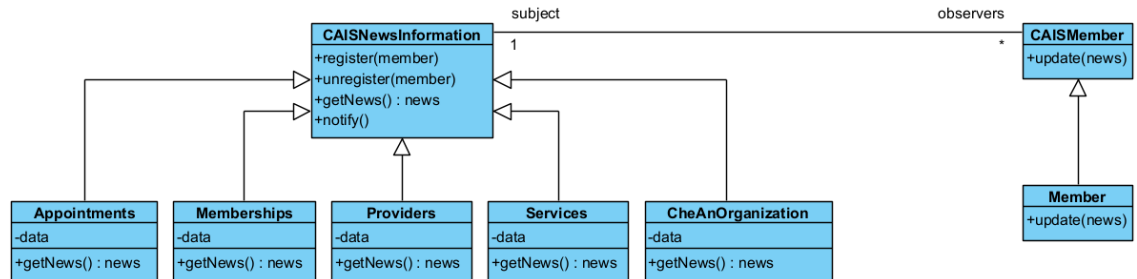
Application Layer uses Presentation Layer to display data.
Application Layer uses Data Layer to fetch data.

- (iii)** Boundary: Interaction between actor and system: receives input and provides output from and to user.
Control: Logic to realise use cases.
Entity: stores information tracked by system.

- (b) (i)** 1. Tight coupling with core functionality and data, CAIS needs to go through all active members and send them notifications based on their interests.
2. Active members should be able to freely register or unregister their interest in different types of news information and this should be reflected immediately in the application.
- (ii)** Observer Pattern. The subscription mechanism allows observers (active members) to freely register or unregister their interest in the different types of news information. The notification mechanism allows the subject (news information) to send updates to the observers whenever there are news in the type they subscribed to.

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(iii)



CAISNewsInformation is the subject while CAISMember is the observer. Members are able to subscribe to different types of News Information and will receive updates from them.

- 4 (a) (i) R1 Equivalence Classes: valid format, invalid format
 R2 Equivalence Classes: ≤ 3 digits, 4-6 digits, ≥ 7 digits

- (ii) R1 Boundaries:
1. D: D-MM-YYYY, DD-MM-YYYY, DDD-MM-YYYY
 2. M: DD-M-YYYY, DD-MM-YYYY, DD-MMM-YYYY
 3. Y: DD-MM-YYY, DD-MM-YYYY, DD-MM-YYYYY

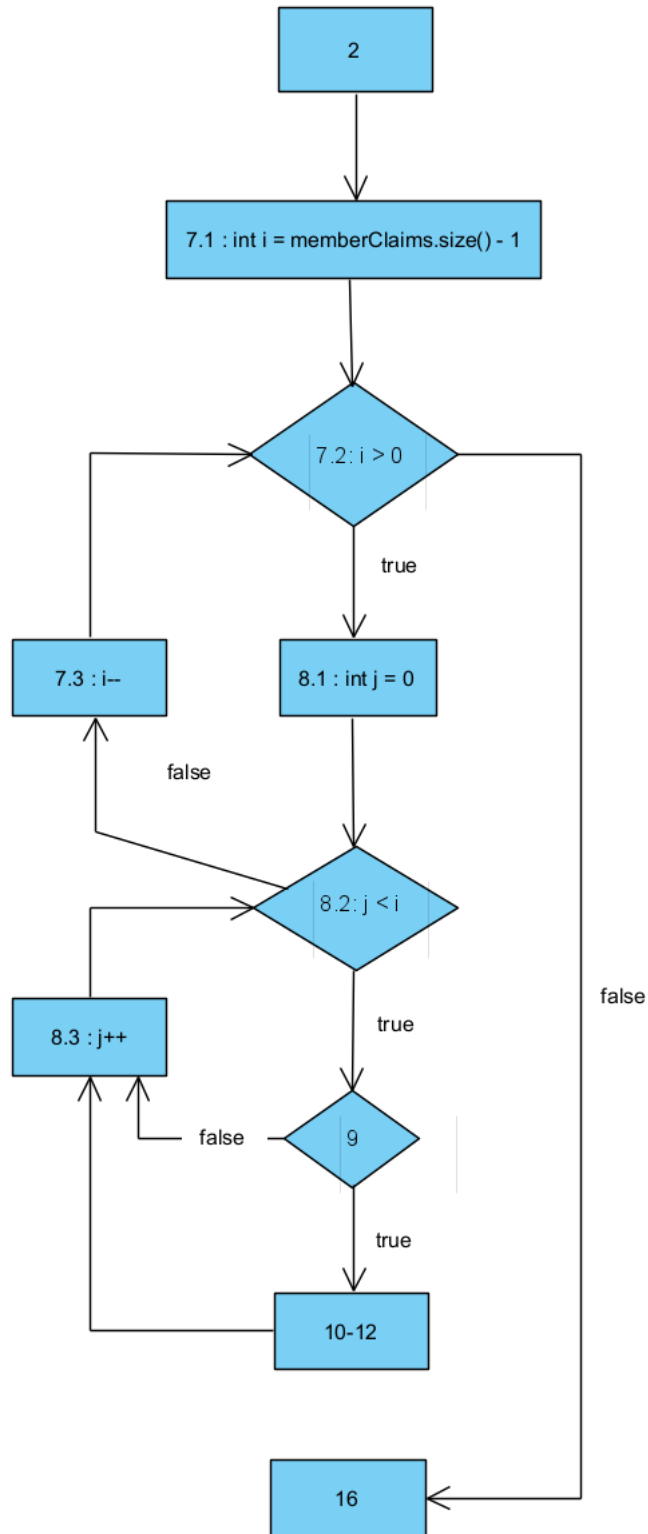
Editor's note: Discrete values do not have boundary values, but here are the possible boundary values for formatting in a hypothetical situation.

- R2 Boundaries:
1. 0000: 999, 0000, 0001
 2. 999999: 999998, 999999, 0000000

(iii)

Date of Service	Service Code	Expected Output
03-11-2018	0000	Valid
27-05-2017	999999	Valid
15-03-2014	999	Invalid
18-12-2016	0000000	Invalid
4-06-2015	3213	Invalid
09-233-2014	83290	Invalid
24-08-20101	378298	Invalid

(b) (i)



(ii) *cyclomatic complexity* = #edges – #nodes + 2 = 12 – 10 + 2 = 4

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(iii) Linearly Independent Paths:

1. 2, 7.1, 7.2, 8.1, 8.2, 9, 10-12, 8.3, 8.2, 7.3, 7.2, 16
2. 2, 7.1, 7.2, 16
3. 2, 7.1, 7.2, 8.1, 8.2, 7.3, 7.2, 16 (infeasible path)
4. 2, 7.1, 7.2, 8.1, 8.2, 9, 8.3, 8.2, 7.3, 7.2, 16

Test Cases:

Path Number	memberClaims.size()	Boolean result of line 9	Return Value
1	2	true	memberClaims
2	1	true	memberClaims
4	2	false	memberClaims

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