Software V&V

#System Testing Result & Static Analysis

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  1. Pause Timer

   ➔ 내용 수정으로 반영

  2. Reset Timer

   ➔ 내용 구체화로 반영

  3. Check Timer

   ➔ 내용 수정으로 반영

  4. Ring Timer

   ➔ 내용 구체화로 반영

  5. Show Timer

   i. (S) 시계 내의 임의로 정의해둔 시간마다 ":"가 깜빡이도록 한다.

   ➔ 임의로 정의해둔 시간이 "몇 초" 인지에 대한 구체적인 명시가 필요함

  6. Set Alarm

   ➔ 내용 수정으로 반영

  7. Next Alarm

   i. (S) 알람 index 값을 1 증가시킨다.

   ➔ 알람 index 값이 1 증가하고 그 이후에 대한 내용이 누락되어 있음. (다음 번에 있는 알람을 가리킨다 등)

   ➔ 수정이 되어있지 않음

  8. Check Alarm

   ➔ 내용 수정으로 반영

  9. Ring Alarm

    i.   (S) buzzer를 울린다.

- ➔ 위에 Timer도 단순히 Buzzer만 울리는 기능이 있는데, 단순 buzzer만 울리는 기능이면 다 합쳐도 될 것 같다.

- ➔ 1000번대 문서에는 '알람 시간이 되면' 이라고 명시되어 있는데, 단순히 buzzer를 울리는 기능으로만 묘사되어 있음. 일관성이 없다.

- ➔ 수정이 되어있지 않음

10. Show Alarm

    i.   (S) 시계 내의 임의로 정의해둔 시간마다 ":"가 깜빡이도록 한다.

- ➔ 임의로 정의해둔 시간이 "몇 초" 인지에 대한 구체적인 명시가 필요함

11. Record Lap

- ➔ 내용 수정으로 반영

12. Run Stopwatch

- ➔ 내용 수정으로 반영

13. Show Stopwatch

    i.   (S) 시계 내의 임의로 정의해둔 시간마다 ":"가 깜빡이도록 한다.

- ➔ 임의로 정의해둔 시간이 "몇 초" 인지에 대한 구체적인 명시가 필요함

14. Timezone To Right

- ➔ 내용 수정으로 반영

15. Set Timekeeping

- ➔ 내용 수정으로 반영

16. Show Timekeeping

    i.   (S) 시계 내의 임의로 정의해둔 시간마다 ":"가 깜빡이도록 한다.

- ➔ 임의로 정의해둔 시간이 "몇 초" 인지에 대한 구체적인 명시가 필요함

17. Reset Lottery

    ➔ 내용 수정으로 반영

18. Change Mode

    ➔ 내용 수정으로 반영

  ii.   Activity 2033. Define System Sequence Diagrams

    1.   Set Mode Selection
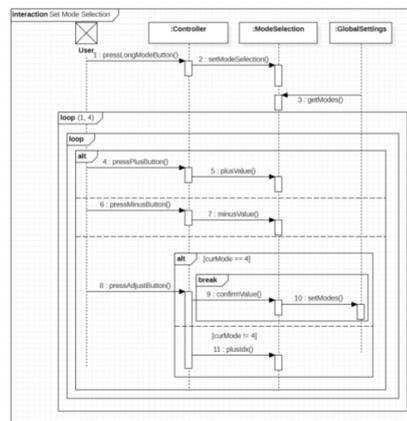
    ➔ plusValue, minusValue가 위에서는 숫자 값을 변경하는 것인데, 여기서는 어떠한 값을 어떻게 변경하는지 명시되어 있지 않다.

    ➔ 수정이 되어있지 않음

iii.   Activity 2035. Define Domain Model
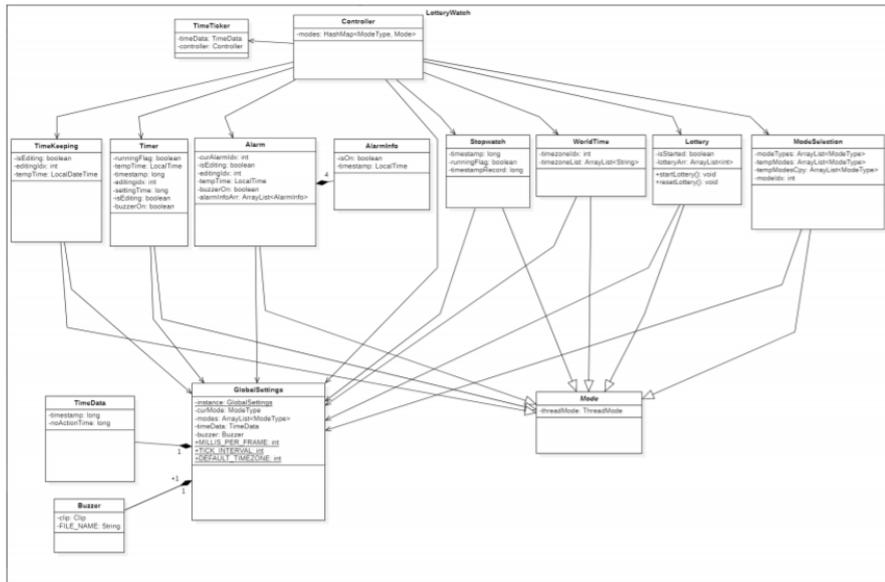
C.   Stage 2040 Design

i.   Activity 2041. Design Real Use Cases

1.   Pause Timer

➔ 내용 수정으로 반영

2.   Reset Timer

➔ 내용 수정으로 반영

3.   Ring Timer

➔ 내용 추가로 반영

4.   Stop Ring Timer

➔ 내용 수정으로 반영

5.   Show Timer

➔ 내용 추가로 반영

6.   Set Alarm

i.   (S) (초는 0으로 설정한다.)

➔ 2030 문서에 기재된 '시 분 초 값을 수정완료 한다.' 와 내용이 일치하지 않다.

➔ 수정이 되어있지 않음

7. On Alarm

➔ 내용 수정으로 반영

8. Off Alarm

➔ 내용 수정으로 반영

9. Show Alarm

　i. (S) isEditing이 true이고, 현재 초를 tickInterval로 나눈 나머지가 0이라면 editingIdx에 해당하는 자리를 출력하지 않습니다.

➔ tickInterval에 대한 설명이 누락되어 있고, 이 조건이 무엇을 의미하는지 해석하기 어렵다.

➔ 수정이 되어있지 않음

10. Check Alarm

➔ 내용 추가로 반영

11. Ring Alarm

　i. (S) buzzer를 울린다.

➔ Ring Timer를 비롯한 Ring 계열 함수들과 기능이 다를 게 없는데, 굳이 buzzer를 울리는 것을 나눠놓을 필요가 없어 보인다.

➔ 내용이 수정되지 않음

12. Reset Stopwatch

➔ 내용 수정으로 반영

13. Run Stopwatch

➔ 내용 추가로 반영

14. Set Timekeeping

   ➔ 내용 구체화로 반영

15. Start Lottery

   ➔ 내용 추가로 반영

16. Show Lottery

   ➔ 내용 수정으로 반영

17. Change Mode

   ➔ 내용 수정으로 반영

18. Check Timeout

   ➔ 내용 수정으로 반영

2. Category-partition Testing Report

   A. Test Case

      i. Category Partitioning Test

Group	Category	Value	Description
Mode	Mode	TimeKeeping	TimeKeeping 모드
		Alarm	Alarm 모드
		Timer	Timer 모드
		Stopwatch	Stopwatch 모드
		World Time	World Time 모드
		Lottery	Lottery 모드
		functionSelector	기능 Selection 모드
Config	Config	Set Mode	Set 모드
		Default Mode	Default 모드
Clock	Clock	Running (start)	시간이 흐르는 중인지
		notRunning (pause)	시간이 흐르지 않는 중인지
Buzzer	Buzzer	Running	Buzzer가 작동하는 중인지
		notRunning	Buzzer가 작동하지 않는 중인지
Action	Action	pressNone	아무 입력이 없는 상태
		pressMode	Mode 버튼
		pressAdjust	Adjust 버튼
		pressUp	+ 버튼
		pressDown	– 버튼
		pressLongMode	Mode 버튼을 길게 누름

		pressMultiBtn	두 개 이상의 버튼 입력 (error)
Function Count	Function Count	under 4	모드 4개 미만 (error)
		equals 4	모드 4개
		over 4	모드 4개 초과 (error)
Value	Year	under 0000	0000 미만 (error)
		inRange	0000~9999
		over 9999	9999 초과 (error)
	Month	under 1	1 미만 (error)
		inRange	1~12
		over 12	12 초과 (error)
	Day	under 1	1 미만 (error)
		inRange	1~Lastday
		over Lastday	Lastday 초과 (error)
	NormalHour	under 00	00 미만 (error)
		inRange	00~60
		over 23	60 초과 (error)
	EvHour	under 00	00 미만 (error)
		inRange	00~60
		over 99	99 초과 (error)
	Min	under 00	00 미만 (error)
		inRange	00~Maxmin
		over Maxmin	Maxmin 초과 (error)
	Sec	under 00	00 미만 (error)

		inRange	00~59
		over 59	59 초과 (error)
		under 01	01 미만 (error)
	Lottery	inRange	01~45
		over 45	45 초과 (error)

B. Testing Result

    i. TimeKeeping Mode

No	Mode	Config	Clock	Buzzer	Action	FunctionCount	Year	Month	Day	NormalHour	Min	Sec	Result
1	timeKeeping 1000	set	running(start)	running	pressNone	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
2	timeKeeping 1000	set	running(start)	running	pressMode	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
3	timeKeeping 1000	set	running(start)	running	pressAdjust	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
4	timeKeeping 1000	set	running(start)	running	pressUP	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
5	timeKeeping 1000	set	running(start)	running	pressDOWN	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
6	timeKeeping 1000	set	running(start)	running	pressLongMode	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
7	timeKeeping 1000	set	running(start)	notRunning	pressNone	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
8	timeKeeping 1000	set	running(start)	notRunning	pressMode	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
9	timeKeeping 1000	set	running(start)	notRunning	pressAdjust	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
10	timeKeeping 1000	set	running(start)	notRunning	pressUP	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
11	timeKeeping 1000	set	running(start)	notRunning	pressDOWN	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
12	timeKeeping 1000	set	running(start)	notRunning	pressLongMode	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
13	timeKeeping 1000	default	running(start)	running	pressNone	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
14	timeKeeping 1000	default	running(start)	running	pressMode	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
15	timeKeeping 1000	default	running(start)	running	pressAdjust	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
16	timeKeeping 1000	default	running(start)	running	pressUP	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
17	timeKeeping 1000	default	running(start)	running	pressDOWN	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
18	timeKeeping 1000	default	running(start)	running	pressLongMode	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
19	timeKeeping 1000	default	running(start)	notRunning	pressNone	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
20	timeKeeping 1000	default	running(start)	notRunning	pressMode	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
21	timeKeeping 1000	default	running(start)	notRunning	pressAdjust	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
22	timeKeeping 1000	default	running(start)	notRunning	pressUP	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
23	timeKeeping 1000	default	running(start)	notRunning	pressDOWN	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P
24	timeKeeping 1000	default	running(start)	notRunning	pressLongMode	equals 4	inRange	inRange	inRange	inRange	inRange	inRange	P

ii.   Alarm Mode

No	Mode	Config	Clock	Buzzer	Action	FunctionCount	NormalHour	Min	Result
25	alarm 1100	set	running(start)	running	pressNone	equals 4	inRange	inRange	P
26	alarm 1100	set	running(start)	running	pressMode	equals 4	inRange	inRange	P
27	alarm 1100	set	running(start)	running	pressAdjust	equals 4	inRange	inRange	P
28	alarm 1100	set	running(start)	running	pressUP	equals 4	inRange	inRange	P
29	alarm 1100	set	running(start)	running	pressDOWN	equals 4	inRange	inRange	P
30	alarm 1100	set	running(start)	running	pressLongMode	equals 4	inRange	inRange	P
31	alarm 1100	set	running(start)	notRunning	pressNone	equals 4	inRange	inRange	P
32	alarm 1100	set	running(start)	notRunning	pressMode	equals 4	inRange	inRange	P
33	alarm 1100	set	running(start)	notRunning	pressAdjust	equals 4	inRange	inRange	P
34	alarm 1100	set	running(start)	notRunning	pressUP	equals 4	inRange	inRange	P
35	alarm 1100	set	running(start)	notRunning	pressDOWN	equals 4	inRange	inRange	P
36	alarm 1100	set	running(start)	notRunning	pressLongMode	equals 4	inRange	inRange	P
37	alarm 1100	set	notRunning(pause)	running	pressNone	equals 4	inRange	inRange	P
38	alarm 1100	set	notRunning(pause)	running	pressMode	equals 4	inRange	inRange	P
39	alarm 1100	set	notRunning(pause)	running	pressAdjust	equals 4	inRange	inRange	P
40	alarm 1100	set	notRunning(pause)	running	pressUP	equals 4	inRange	inRange	P
41	alarm 1100	set	notRunning(pause)	running	pressDOWN	equals 4	inRange	inRange	P
42	alarm 1100	set	notRunning(pause)	running	pressLongMode	equals 4	inRange	inRange	P
43	alarm 1100	set	notRunning(pause)	notRunning	pressNone	equals 4	inRange	inRange	P
44	alarm 1100	set	notRunning(pause)	notRunning	pressMode	equals 4	inRange	inRange	P
45	alarm 1100	set	notRunning(pause)	notRunning	pressAdjust	equals 4	inRange	inRange	P
46	alarm 1100	set	notRunning(pause)	notRunning	pressUP	equals 4	inRange	inRange	P
47	alarm 1100	set	notRunning(pause)	notRunning	pressDOWN	equals 4	inRange	inRange	P
48	alarm 1100	set	notRunning(pause)	notRunning	pressLongMode	equals 4	inRange	inRange	P
49	alarm 1100	default	running(start)	running	pressNone	equals 4	inRange	inRange	P
50	alarm 1100	default	running(start)	running	pressMode	equals 4	inRange	inRange	P
51	alarm 1100	default	running(start)	running	pressAdjust	equals 4	inRange	inRange	P
52	alarm 1100	default	running(start)	running	pressUP	equals 4	inRange	inRange	P
53	alarm 1100	default	running(start)	running	pressDOWN	equals 4	inRange	inRange	P
54	alarm 1100	default	running(start)	running	pressLongMode	equals 4	inRange	inRange	P
55	alarm 1100	default	running(start)	notRunning	pressNone	equals 4	inRange	inRange	P
56	alarm 1100	default	running(start)	notRunning	pressMode	equals 4	inRange	inRange	P
57	alarm 1100	default	running(start)	notRunning	pressAdjust	equals 4	inRange	inRange	P
58	alarm 1100	default	running(start)	notRunning	pressUP	equals 4	inRange	inRange	P
59	alarm 1100	default	running(start)	notRunning	pressDOWN	equals 4	inRange	inRange	P
60	alarm 1100	default	running(start)	notRunning	pressLongMode	equals 4	inRange	inRange	P
61	alarm 1100	default	notRunning(pause)	running	pressNone	equals 4	inRange	inRange	P
62	alarm 1100	default	notRunning(pause)	running	pressMode	equals 4	inRange	inRange	P
63	alarm 1100	default	notRunning(pause)	running	pressAdjust	equals 4	inRange	inRange	P
64	alarm 1100	default	notRunning(pause)	running	pressUP	equals 4	inRange	inRange	P
65	alarm 1100	default	notRunning(pause)	running	pressDOWN	equals 4	inRange	inRange	P
66	alarm 1100	default	notRunning(pause)	running	pressLongMode	equals 4	inRange	inRange	P
67	alarm 1100	default	notRunning(pause)	notRunning	pressNone	equals 4	inRange	inRange	P
68	alarm 1100	default	notRunning(pause)	notRunning	pressMode	equals 4	inRange	inRange	P
69	alarm 1100	default	notRunning(pause)	notRunning	pressAdjust	equals 4	inRange	inRange	P
70	alarm 1100	default	notRunning(pause)	notRunning	pressUP	equals 4	inRange	inRange	P
71	alarm 1100	default	notRunning(pause)	notRunning	pressDOWN	equals 4	inRange	inRange	P
72	alarm 1100	default	notRunning(pause)	notRunning	pressLongMode	equals 4	inRange	inRange	P

iii. Timer Mode

No	Mode	Config	Clock	Buzzer	Action	FunctionCount	EvHour	Min	Sec	Result
73	timer 1200	set	running(start)	running	pressNone	equals 4	inRange	inRange	inRange	P
74	timer 1200	set	running(start)	running	pressMode	equals 4	inRange	inRange	inRange	P
75	timer 1200	set	running(start)	running	pressAdjust	equals 4	inRange	inRange	inRange	P
76	timer 1200	set	running(start)	running	pressUP	equals 4	inRange	inRange	inRange	P
77	timer 1200	set	running(start)	running	pressDOWN	equals 4	inRange	inRange	inRange	P
78	timer 1200	set	running(start)	running	pressLongMode	equals 4	inRange	inRange	inRange	P
79	timer 1200	set	running(start)	notRunning	pressNone	equals 4	inRange	inRange	inRange	P
80	timer 1200	set	running(start)	notRunning	pressMode	equals 4	inRange	inRange	inRange	P
81	timer 1200	set	running(start)	notRunning	pressAdjust	equals 4	inRange	inRange	inRange	P
82	timer 1200	set	running(start)	notRunning	pressUP	equals 4	inRange	inRange	inRange	P
83	timer 1200	set	running(start)	notRunning	pressDOWN	equals 4	inRange	inRange	inRange	P
84	timer 1200	set	running(start)	notRunning	pressLongMode	equals 4	inRange	inRange	inRange	P
85	timer 1200	set	notRunning(pause)	running	pressNone	equals 4	inRange	inRange	inRange	P
86	timer 1200	set	notRunning(pause)	running	pressMode	equals 4	inRange	inRange	inRange	P
87	timer 1200	set	notRunning(pause)	running	pressAdjust	equals 4	inRange	inRange	inRange	P
88	timer 1200	set	notRunning(pause)	running	pressUP	equals 4	inRange	inRange	inRange	P
89	timer 1200	set	notRunning(pause)	running	pressDOWN	equals 4	inRange	inRange	inRange	P
90	timer 1200	set	notRunning(pause)	running	pressLongMode	equals 4	inRange	inRange	inRange	P
91	timer 1200	set	notRunning(pause)	notRunning	pressNone	equals 4	inRange	inRange	inRange	P
92	timer 1200	set	notRunning(pause)	notRunning	pressMode	equals 4	inRange	inRange	inRange	P
93	timer 1200	set	notRunning(pause)	notRunning	pressAdjust	equals 4	inRange	inRange	inRange	P
94	timer 1200	set	notRunning(pause)	notRunning	pressUP	equals 4	inRange	inRange	inRange	P
95	timer 1200	set	notRunning(pause)	notRunning	pressDOWN	equals 4	inRange	inRange	inRange	P
96	timer 1200	set	notRunning(pause)	notRunning	pressLongMode	equals 4	inRange	inRange	inRange	P
97	timer 1200	default	running(start)	running	pressNone	equals 4	inRange	inRange	inRange	P
98	timer 1200	default	running(start)	running	pressMode	equals 4	inRange	inRange	inRange	P
99	timer 1200	default	running(start)	running	pressAdjust	equals 4	inRange	inRange	inRange	P
100	timer 1200	default	running(start)	running	pressUP	equals 4	inRange	inRange	inRange	P
101	timer 1200	default	running(start)	running	pressDOWN	equals 4	inRange	inRange	inRange	P
102	timer 1200	default	running(start)	running	pressLongMode	equals 4	inRange	inRange	inRange	P
103	timer 1200	default	running(start)	notRunning	pressNone	equals 4	inRange	inRange	inRange	P
104	timer 1200	default	running(start)	notRunning	pressMode	equals 4	inRange	inRange	inRange	P
105	timer 1200	default	running(start)	notRunning	pressAdjust	equals 4	inRange	inRange	inRange	P
106	timer 1200	default	running(start)	notRunning	pressUP	equals 4	inRange	inRange	inRange	P
107	timer 1200	default	running(start)	notRunning	pressDOWN	equals 4	inRange	inRange	inRange	P
108	timer 1200	default	running(start)	notRunning	pressLongMode	equals 4	inRange	inRange	inRange	P
109	timer 1200	default	notRunning(pause)	running	pressNone	equals 4	inRange	inRange	inRange	P
110	timer 1200	default	notRunning(pause)	running	pressMode	equals 4	inRange	inRange	inRange	P
111	timer 1200	default	notRunning(pause)	running	pressAdjust	equals 4	inRange	inRange	inRange	P
112	timer 1200	default	notRunning(pause)	running	pressUP	equals 4	inRange	inRange	inRange	P
113	timer 1200	default	notRunning(pause)	running	pressDOWN	equals 4	inRange	inRange	inRange	P
114	timer 1200	default	notRunning(pause)	running	pressLongMode	equals 4	inRange	inRange	inRange	P
115	timer 1200	default	notRunning(pause)	notRunning	pressNone	equals 4	inRange	inRange	inRange	P
116	timer 1200	default	notRunning(pause)	notRunning	pressMode	equals 4	inRange	inRange	inRange	P
117	timer 1200	default	notRunning(pause)	notRunning	pressAdjust	equals 4	inRange	inRange	inRange	P
118	timer 1200	default	notRunning(pause)	notRunning	pressUP	equals 4	inRange	inRange	inRange	P
119	timer 1200	default	notRunning(pause)	notRunning	pressDOWN	equals 4	inRange	inRange	inRange	P
120	timer 1200	default	notRunning(pause)	notRunning	pressLongMode	equals 4	inRange	inRange	inRange	P

iv. Stopwatch Mode

No	Mode	Config	Clock	Buzzer	Action	FunctionCount	EvHour	Min	Sec	Result
121	stopwatch 1300	default	running(start)	running	pressNone	equals 4	inRange	inRange	inRange	P
122	stopwatch 1300	default	running(start)	running	pressMode	equals 4	inRange	inRange	inRange	P
123	stopwatch 1300	default	running(start)	running	pressAdjust	equals 4	inRange	inRange	inRange	P
124	stopwatch 1300	default	running(start)	running	pressUP	equals 4	inRange	inRange	inRange	P
125	stopwatch 1300	default	running(start)	running	pressDOWN	equals 4	inRange	inRange	inRange	P
126	stopwatch 1300	default	running(start)	running	pressLongMode	equals 4	inRange	inRange	inRange	P
127	stopwatch 1300	default	running(start)	notRunning	pressNone	equals 4	inRange	inRange	inRange	P
128	stopwatch 1300	default	running(start)	notRunning	pressMode	equals 4	inRange	inRange	inRange	P
129	stopwatch 1300	default	running(start)	notRunning	pressAdjust	equals 4	inRange	inRange	inRange	P
130	stopwatch 1300	default	running(start)	notRunning	pressUP	equals 4	inRange	inRange	inRange	P
131	stopwatch 1300	default	running(start)	notRunning	pressDOWN	equals 4	inRange	inRange	inRange	P
132	stopwatch 1300	default	running(start)	notRunning	pressLongMode	equals 4	inRange	inRange	inRange	P
133	stopwatch 1300	default	notRunning(pause)	running	pressNone	equals 4	inRange	inRange	inRange	P
134	stopwatch 1300	default	notRunning(pause)	running	pressMode	equals 4	inRange	inRange	inRange	P
135	stopwatch 1300	default	notRunning(pause)	running	pressAdjust	equals 4	inRange	inRange	inRange	P
136	stopwatch 1300	default	notRunning(pause)	running	pressUP	equals 4	inRange	inRange	inRange	P
137	stopwatch 1300	default	notRunning(pause)	running	pressDOWN	equals 4	inRange	inRange	inRange	P
138	stopwatch 1300	default	notRunning(pause)	running	pressLongMode	equals 4	inRange	inRange	inRange	P
139	stopwatch 1300	default	notRunning(pause)	notRunning	pressNone	equals 4	inRange	inRange	inRange	P
140	stopwatch 1300	default	notRunning(pause)	notRunning	pressMode	equals 4	inRange	inRange	inRange	P
141	stopwatch 1300	default	notRunning(pause)	notRunning	pressAdjust	equals 4	inRange	inRange	inRange	P
142	stopwatch 1300	default	notRunning(pause)	notRunning	pressUP	equals 4	inRange	inRange	inRange	P
143	stopwatch 1300	default	notRunning(pause)	notRunning	pressDOWN	equals 4	inRange	inRange	inRange	P
144	stopwatch 1300	default	notRunning(pause)	notRunning	pressLongMode	equals 4	inRange	inRange	inRange	P

v. WorldTime Mode

No	Mode	Config	Clock	Buzzer	Action	FunctionCount	Min	Sec	Result
157	world time 1400	default	running(start)	running	pressNone	equals 4	inRange	inRange	P
158	world time 1400	default	running(start)	running	pressMode	equals 4	inRange	inRange	P
159	world time 1400	default	running(start)	running	pressAdjust	equals 4	inRange	inRange	P
160	world time 1400	default	running(start)	running	pressUP	equals 4	inRange	inRange	P
161	world time 1400	default	running(start)	running	pressDOWN	equals 4	inRange	inRange	P
162	world time 1400	default	running(start)	running	pressLongMode	equals 4	inRange	inRange	P
163	world time 1400	default	running(start)	notRunning	pressNone	equals 4	inRange	inRange	P
164	world time 1400	default	running(start)	notRunning	pressMode	equals 4	inRange	inRange	P
165	world time 1400	default	running(start)	notRunning	pressAdjust	equals 4	inRange	inRange	P
166	world time 1400	default	running(start)	notRunning	pressUP	equals 4	inRange	inRange	P
167	world time 1400	default	running(start)	notRunning	pressDOWN	equals 4	inRange	inRange	P
168	world time 1400	default	running(start)	notRunning	pressLongMode	equals 4	inRange	inRange	P

vi.　　Lottery Mode

No	Mode	Config	Clock	Buzzer	Action	FunctionCount	Lottery	Result
169	Lottery 1500	set	running(start)	running	pressNone	equals 4	inRange	P
170	Lottery 1500	set	running(start)	running	pressMode	equals 4	inRange	P
171	Lottery 1500	set	running(start)	running	pressAdjust	equals 4	inRange	P
172	Lottery 1500	set	running(start)	running	pressUP	equals 4	inRange	P
173	Lottery 1500	set	running(start)	running	pressDOWN	equals 4	inRange	P
174	Lottery 1500	set	running(start)	running	pressLongMode	equals 4	inRange	P
175	Lottery 1500	set	running(start)	notRunning	pressNone	equals 4	inRange	P
176	Lottery 1500	set	running(start)	notRunning	pressMode	equals 4	inRange	P
177	Lottery 1500	set	running(start)	notRunning	pressAdjust	equals 4	inRange	P
178	Lottery 1500	set	running(start)	notRunning	pressUP	equals 4	inRange	P
179	Lottery 1500	set	running(start)	notRunning	pressDOWN	equals 4	inRange	P
180	Lottery 1500	set	running(start)	notRunning	pressLongMode	equals 4	inRange	P
181	Lottery 1500	default	running(start)	running	pressNone	equals 4	inRange	P
182	Lottery 1500	default	running(start)	running	pressMode	equals 4	inRange	P
183	Lottery 1500	default	running(start)	running	pressAdjust	equals 4	inRange	P
184	Lottery 1500	default	running(start)	running	pressUP	equals 4	inRange	P
185	Lottery 1500	default	running(start)	running	pressDOWN	equals 4	inRange	P
186	Lottery 1500	default	running(start)	running	pressLongMode	equals 4	inRange	P
187	Lottery 1500	default	running(start)	notRunning	pressNone	equals 4	inRange	P
188	Lottery 1500	default	running(start)	notRunning	pressMode	equals 4	inRange	P
189	Lottery 1500	default	running(start)	notRunning	pressAdjust	equals 4	inRange	P
190	Lottery 1500	default	running(start)	notRunning	pressUP	equals 4	inRange	P
191	Lottery 1500	default	running(start)	notRunning	pressDOWN	equals 4	inRange	P
192	Lottery 1500	default	running(start)	notRunning	pressLongMode	equals 4	inRange	P

vii.　　FunctionSelector Mode

No	Mode	Config	Clock	Buzzer	Action	FunctionCount	Result
193	functionSelector 1600	set	running(start)	running	pressNone	equals 4	P
194	functionSelector 1600	set	running(start)	running	pressMode	equals 4	P
195	functionSelector 1600	set	running(start)	running	pressAdjust	equals 4	P
196	functionSelector 1600	set	running(start)	running	pressUP	equals 4	P
197	functionSelector 1600	set	running(start)	running	pressDOWN	equals 4	P
198	functionSelector 1600	set	running(start)	running	pressLongMode	equals 4	P
199	functionSelector 1600	set	running(start)	notRunning	pressNone	equals 4	P
200	functionSelector 1600	set	running(start)	notRunning	pressMode	equals 4	P
201	functionSelector 1600	set	running(start)	notRunning	pressAdjust	equals 4	P
202	functionSelector 1600	set	running(start)	notRunning	pressUP	equals 4	P
203	functionSelector 1600	set	running(start)	notRunning	pressDOWN	equals 4	P
204	functionSelector 1600	set	running(start)	notRunning	pressLongMode	equals 4	P
205	functionSelector 1600	set	notRunning(pause)	running	pressNone	equals 4	P
206	functionSelector 1600	set	notRunning(pause)	running	pressMode	equals 4	P
207	functionSelector 1600	set	notRunning(pause)	running	pressAdjust	equals 4	P
208	functionSelector 1600	set	notRunning(pause)	running	pressUP	equals 4	P
209	functionSelector 1600	set	notRunning(pause)	running	pressDOWN	equals 4	P
210	functionSelector 1600	set	notRunning(pause)	running	pressLongMode	equals 4	P
211	functionSelector 1600	set	notRunning(pause)	notRunning	pressNone	equals 4	P
212	functionSelector 1600	set	notRunning(pause)	notRunning	pressMode	equals 4	P
213	functionSelector 1600	set	notRunning(pause)	notRunning	pressAdjust	equals 4	P
214	functionSelector 1600	set	notRunning(pause)	notRunning	pressUP	equals 4	P
215	functionSelector 1600	set	notRunning(pause)	notRunning	pressDOWN	equals 4	P
216	functionSelector 1600	set	notRunning(pause)	notRunning	pressLongMode	equals 4	P

=〉 총 216개의 Test 중 216개 통과 = 100%

3. Pairwise Testing Report

A. Test Case, Test Result

No	Mode	Config	Clock	Buzzer	Action	FunctionCount	Year	Month	Day	Hour	Min	Sec	Lottery	AlarmPage	Result
1	FunctionSelector	Set	Running	Running	pressSet	equals4	NotUse	NotUse	NotUse	NotUse	NotUse	NotUse	NotUse	NotUse	P
2	Timer	Default	NotRunning	NotRunning	pressMode	equals4	NotUse	NotUse	NotUse	valid	valid	valid	NotUse	NotUse	P
3	Timer	Set	Running	Running	pressUP	equals4	NotUse	NotUse	NotUse	valid	valid	valid	NotUse	NotUse	P
4	Stopwatch	Default	NotRunning	NotRunning	pressSet	equals4	NotUse	NotUse	NotUse	valid	valid	valid	NotUse	NotUse	P
5	TimeKeeping	Default	Running	Running	pressMode	equals4	valid	valid	valid	valid	valid	valid	NotUse	NotUse	P
6	TimeKeeping	Set	Running	NotRunning	pressDown	equals4	valid	valid	valid	valid	valid	valid	NotUse	NotUse	P
7	Lottery	Default	Running	NotRunning	pressUP	equals4	NotUse	NotUse	NotUse	NotUse	NotUse	NotUse	valid	NotUse	P
8	TimeKeeping	Default	Running	Running	pressSet	equals4	valid	valid	valid	valid	valid	valid	NotUse	NotUse	P
9	Timer	Set	NotRunning	Running	pressNone	equals4	NotUse	NotUse	NotUse	valid	valid	valid	NotUse	NotUse	P
10	Lottery	Set	Running	Running	pressDown	equals4	NotUse	NotUse	NotUse	NotUse	NotUse	NotUse	valid	NotUse	P
11	Worldtime	Set	Running	NotRunning	pressUP	equals4	NotUse	NotUse	NotUse	valid	valid	valid	NotUse	NotUse	P
12	Worldtime	Default	Running	NotRunning	pressNone	equals4	NotUse	NotUse	NotUse	valid	valid	valid	NotUse	NotUse	P
13	Lottery	Set	Running	Running	pressMode	equals4	NotUse	NotUse	NotUse	NotUse	NotUse	NotUse	valid	NotUse	P
14	Alarm	Set	NotRunning	NotRunning	pressMode	equals4	NotUse	NotUse	NotUse	valid	valid	NotUse	NotUse	valid	P
15	Stopwatch	Default	Running	Running	pressUP	equals4	NotUse	NotUse	NotUse	valid	valid	valid	NotUse	NotUse	P
16	Lottery	Default	Running	NotRunning	pressSet	equals4	NotUse	NotUse	NotUse	NotUse	NotUse	NotUse	valid	NotUse	P
17	Stopwatch	Default	NotRunning	Running	pressNone	equals4	NotUse	NotUse	NotUse	valid	valid	valid	NotUse	NotUse	P
18	Worldtime	Default	Running	Running	pressMode	equals4	NotUse	NotUse	NotUse	valid	valid	valid	NotUse	NotUse	P
19	FunctionSelector	Set	Running	NotRunning	pressUP	equals4	NotUse	NotUse	NotUse	NotUse	NotUse	NotUse	NotUse	NotUse	P
20	FunctionSelector	Set	Running	NotRunning	pressDown	equals4	NotUse	NotUse	NotUse	NotUse	NotUse	NotUse	NotUse	NotUse	P
21	Stopwatch	Default	NotRunning	Running	pressDown	equals4	NotUse	NotUse	NotUse	valid	valid	valid	NotUse	NotUse	P
22	Worldtime	Set	Running	NotRunning	pressSet	equals4	NotUse	NotUse	NotUse	valid	valid	valid	NotUse	NotUse	P
23	Alarm	Default	Running	Running	pressUP	equals4	NotUse	NotUse	NotUse	valid	valid	NotUse	NotUse	valid	P
24	TimeKeeping	Set	Running	Running	pressNone	equals4	valid	valid	valid	valid	valid	valid	NotUse	NotUse	P
25	Alarm	Default	NotRunning	Running	pressDown	equals4	NotUse	NotUse	NotUse	valid	valid	NotUse	NotUse	valid	P
26	Worldtime	Default	Running	Running	pressDown	equals4	NotUse	NotUse	NotUse	valid	valid	valid	NotUse	NotUse	P
27	Timer	Set	NotRunning	Running	pressDown	equals4	NotUse	NotUse	NotUse	valid	valid	valid	NotUse	NotUse	P
28	TimeKeeping	Set	Running	NotRunning	pressUP	equals4	valid	valid	valid	valid	valid	valid	NotUse	NotUse	P
29	FunctionSelector	Set	Running	NotRunning	pressNone	equals4	NotUse	NotUse	NotUse	NotUse	NotUse	NotUse	NotUse	NotUse	P
30	Lottery	Set	Running	Running	pressNone	equals4	NotUse	NotUse	NotUse	NotUse	NotUse	NotUse	valid	NotUse	P
31	Timer	Default	NotRunning	Running	pressSet	equals4	NotUse	NotUse	NotUse	valid	valid	valid	NotUse	NotUse	P
32	Stopwatch	Default	NotRunning	Running	pressMode	equals4	NotUse	NotUse	NotUse	valid	valid	valid	NotUse	NotUse	P
33	Alarm	Default	Running	Running	pressSet	equals4	NotUse	NotUse	NotUse	valid	valid	NotUse	NotUse	valid	P
34	Alarm	Default	NotRunning	NotRunning	pressNone	equals4	NotUse	NotUse	NotUse	valid	valid	NotUse	NotUse	valid	P
35	Timer	Default	NotRunning	Running	pressUP	equals4	NotUse	NotUse	NotUse	valid	valid	valid	NotUse	NotUse	P
36	FunctionSelector	Set	Running	NotRunning	pressMode	equals4	NotUse	NotUse	NotUse	NotUse	NotUse	NotUse	NotUse	NotUse	P

=〉총 36개의 항목 중 36개 통과 = 100%

4. Brute Force Test

No	Use Case	Detail	Result
1-1	Set TimeKeeping	년의 최댓값 혹은 최소값에서 각각 +, – 버튼을 누를 경우, 최댓값에서 최솟값으로, 최솟값에서 최댓값으로 값이 변하는가?	T
1-2		십의 자리와 일의 자리가 서로 독립적인가?	T
1-3		일의 최댓값이 월 마다 다르고 윤년도 존재하는데, 프로그램에 그 부분이 적용되어 있는가?	T
2-1	Set Timer	최댓값 혹은 최솟값에서 각각 +, – 버튼을 누를 경우, 최댓값에서 최솟값으로, 최솟값에서 최댓값으로 값이 변하는가?	T
2-2		십의 자리와 일의 자리가 서로 독립적인가?	T
3-1	Set Stopwatch	99:59:59까지 스톱워치 값이 변한 뒤 1초가 지날 경우 Pause 하는가?	T
4-1	Set Alarm	알람 2개가 동시에 울릴 때, 버튼 하나에 동시에 꺼지는가?	T
5-1	Show Alarm	알람 화면에 처음 접근 시, 제일 마지막에 설정되었던 알람이 보이는가?	T
6-1	Ring Alarm, Ring Timer	타이머와 알람이 동시에 울릴 경우, 버튼 하나에 동시에 꺼지는가?	T
7-1	Show WorldTime	마지막 혹은 첫 번째 도시에서 각각 다음/이전을 누를 경우, 마지막 도시에서 첫 번째 도시로, 첫 번째 도시에서 마지막 도시로 이동하는가?	T
8-1	Set Mode Selection	각 기능이 중복되지 않게 선택되나?	T
8-2		중복된 기능을 선택할 시, 중복된 위치에 있는 모드와 위치가 교체되는가?	T

| 9-1 | Show 계열 | 정확히 4개의 기능이 모두 활성화가 가능한가? | T |

=〉총 16개의 항목 중 16개 통과 = 100%

3. Static Analysis

A. Sonarqube

i. Rules

1. Findbugs

No	Category
1	Bad practice
2	Correctness
3	Experimental
4	Internationalization
5	Malicious code vulnerability
6	Multithreaded coreectness
7	Performance
8	Security
9	Dodgy code

2. PMD

No	Category
1	Best practice
2	Code Style
3	Documentation
4	Error phone
5	Multithreading
6	Performance
7	Security

3. CheckStyle

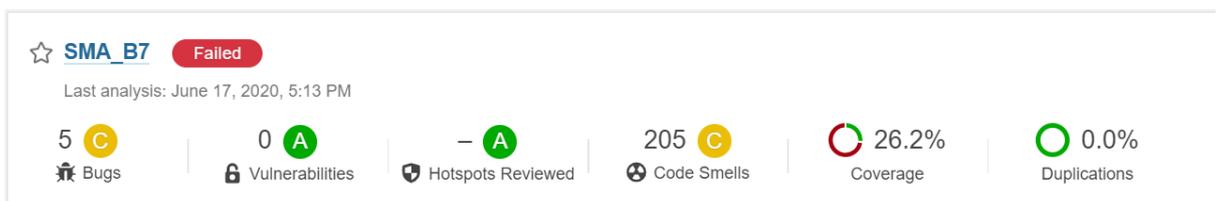| No	Category
1	Annotations
2	Block Checks
3	Class Design
4	Coding
5	Headers
6	Imports
7	Javadoc Comments
8	Metrics
9	Miscellaneous
10	Modifiers
11	Naming Conventions
12	Regexp
13	Size Violations
14	Whitespace

=〉이 3개의 정적 분석 툴 Rule들에 대하여 자체적인 검수 작업을 통해 보다 중요하지 않은 Rule들을 일차적으로 제거하였음.

ii. Jacoco

1. Java Code Coverage

2. Junit Test의 진행을 기반으로 Jacoco Test Report 작성

B. Static Analysis Result

i. Overview

☆ **SMA_B7** Failed

Last analysis: June 17, 2020, 5:13 PM

5 C	0 A	– A	205 C	26.2%	0.0%
🐛 Bugs	🔒 Vulnerabilities	🛡 Hotspots Reviewed	⊗ Code Smells	Coverage	Duplications

ii.   Bugs

No	Tag	Rule	Count
1	Correctness	Class has a circular dependency with other classes	2
2	Multi-threading	Method calls wait, notify or notifyAll on a Thread instance	2
3	Multi-threading	Inconsistent synchronization	1

iii.   Code Smell

(Java) Use Assert True Instead Of Asse…	19
(Java) "if ... else if" constructs should en…	12
(Java) Import Order	12
(Java) Branches should have sufficient …	11
(Java) Lines should have sufficient cove…	10
(Java) Cyclomatic Complexity	9
(Java) Declarations should use Java coll…	9
(Java) Methods should not be too complex	9
(Java) The diamond operator ("<>") shou…	9
(Java) "Thread.sleep" should not be use…	7
(Java) Declaration Order	6
(Java) Visibility Modifier	6
(Java) Anonymous inner classes containi…	5
(Java) Boolean Get Method Name	5
(Java) The names of methods with boole…	5

=〉Code의 일관성, 맥락, 흐름 등 치명적인 오류는 아니지만 권장되는 항목들로 구성되어 있다.

iv.   Code Coverage Report

Condition Coverage **17.9%** 📈

	Condition Coverage	Uncovered Conditions
📄 src/main/java/Timer.java	0.0%	78
📄 src/main/java/WorldTime.java	0.0%	6
📄 src/main/java/Stopwatch.java	13.6%	19
📄 src/main/java/TimeKeeping.java	14.3%	60
📄 src/main/java/Alarm.java	20.7%	46
📄 src/main/java/TimeTicker.java	25.0%	3
📄 src/main/java/Lottery.java	33.3%	12
📄 src/main/java/ModeSelection.java	35.1%	24
📄 src/main/java/Mode.java	50.0%	4
📄 src/main/java/GlobalSettings.java	58.3%	5

10 of 10 shown

=〉전체적으로 Coverage가 매우 낮음. 분석 결과, 실행 코드에 비해 Test Code가 너무나 겉핥기 식임.