Test Document

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Event Ordering by Synchronized Physical times(Test cases)-

Test case 1- When user comes into home-

When user comes into home, door sensor first detects and then motion signal detects. Hence messages should be processed in the order of door sensor and later motion sensor at server. To do that first signals are stored in latest events entry and then after processing these messages and taking a decision, these entries are discarded from latest entry table.

In this scenario, door signal should be processed first and then motion signal as per the FSM, now the server waits at state 2 for presence beacon. Server searches for beacon signal in latest entries if it doesn't find, it will wait for 5 seconds there. In the following figure, this test case is simulated where messages can be clearly seen. First door sensor data received and then motion, server waits for both data and take a decision to process door first because it happened first and motion next as can be seen by physical clock times. Server searches for presence in database entries, which doesn't have waited for 5 seconds in which it reached the server. Now server changes system state to HOME and switch on bulbs and outlets.

```
| 1371-04-03 04-23-15,748 | 1NFO | - deded device to db., |
| 1371-04-03 04-23-15,748 | 1NFO | - deded device to db., |
| 1371-04-03 04-23-15,748 | 1NFO | - Processing register request., |
| 1371-04-03 04-23-15,748 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,748 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,748 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,748 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,748 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,748 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,748 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,748 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,748 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,748 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,748 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,748 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,748 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,749 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,749 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,749 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,749 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,749 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,749 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,749 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,749 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,749 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,749 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,749 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,749 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,749 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,749 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,749 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,749 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,749 | 1NFO | - Moded device to db., |
| 1371-04-03 04-23-15,749 | 1NFO | - Moded device to db.,
```

Figure 1. User Enters Home

Test case 2 - When user exit home-

In this case motion happened before door sensor which can be seen in physical time stamps printed in simulations. Hence user is exiting home and server changes its state to AWAY and switches off bulbs and outlets.

Figure 2. User Exits Home

Test case 3- Intruder-

This is a case happened in case 1, If there is no beacon entry in latest entry of database and there is no signal for some wait time then it means the one entered doen't have a beacon. Hence he is not a user. Server changes its state to ALERT and switches on bulbs and switches off bulbs. These messages flows can be seen in the snapshot below.

```
017-04-03 04:24:34,506
                                                   18,
2017-04-03 04:24:38,491
                                    INFO
2017-04-03 04:24:47,535
                                    INFO
2017-04-03 04:24:55,833
2017-04-03 04:25:00,549
                                    INFO
2017-04-03 04:25:12,866
                                             [2, 15, 1, 1, 2, 0, 0, [2, 16, 1, 1, 2, 0, 0, [2, 17, 1, 1, 2, 0, 0, Pushed state to server
2017-84-83 04:25:13,574
                                                                             0
2017-04-03 04:25:26,604
2017-04-03 04:25:29,891
2017-04-03 04:25:39,073
                                                                             0
                                    INFO
                                    INFO
2017-04-03 04:25:39,077
2017-04-03 04:25:39,077
                                              *********STATE IDLE********
                                    INFO
                                             [2, 17, 2, 1, 2, 0, 0, 0]
[2, 18, 1, 1, 2, 0, 0, 0]
[2, 19, 2, 1, 2, 0, 0, 0]
Pushed state to server
                                    INFO
2017-04-03 04:25:39,081
                                    INFO
2017-84-83 04:25:39,633
                                    INFO
2017-04-03 04:25:46,012
                                    INFO -
2017-84-03 04:25:46,013
                                    INFO -
                                             Door sensor data received
2017-04-03 04:25:46,014
2017-04-03 04:25:46,016
                                             [2, 19, 3, 1, 2, 0, 0, [2, 20, 2, 1, 2, 0, 0, [2, 21, 3, 1, 2, 0, 0, Pushed state to server
                                    INFO -
                                    INFO
2017-04-03 04:25:46,923
                                    INFO -
2017-04-03 04:25:47,096
                                    INFO
2017-04-03 04:25:47,098
2017-04-03 04:25:47,100
                                    INFO -
                                             Motion sensor data received
                                             Door sensor data received at2760.023079
2017-04-03 04:25:47,101
                                             Motion sensor data received at2820.110245
2017-04-03 04:25:52,104
2017-04-03 04:25:52,106
                                             Presence sensor data received
                                             presence sensor data is not received
 **********INTRUDER ALERT
2017-04-03 04:25:52,106 - INFO -
                                             Switching on lightbulb
                                             2017-04-03 04:25:52,118
                                   INFO
2017-04-03 04:25:52,122
                                   INFO
2017-04-03 04:25:52,122
                                             [2, 21, 3, 1, 2, 0, 0, 0]
[2, 22, 3, 1, 2, 0, 0, 0]
Switching off outlets
                                   INFO -
2017-04-03 04:25:52,126
                                   INFO
2017-04-03 04:25:52,134
                                   INFO -
                                             Pushed state to server
2017-84-03 04:25:52,149
                                    INFO -
2017-04-03 04:25:52,152
2017-04-03 04:25:52,152
                                             Motion sensor data received
                                    INFO -
                                             [2, 21, 3, 1, 2, 0, 0, 0
[3, 23, 3, 1, 2, 0, 0, 0
                                    INFO
2017-04-03 04:25:52,157
                                    INFO -
                                                                             0
                                             [2, 21, 3, 2, 2, 0,
[3, 24, 3, 1, 2, 0,
[4, 25, 3, 2, 2, 0,
[4, 26, 3, 2, 2, 0,
2017-04-03 04:25:52,160
                                    INFO
                                                                             0
2017-04-03 04:25:52,164
                                    INFO
2017-04-03 04:25:52,645
                                    INFO
                                                                         0,
2017-04-03 04:26:03,948
                                    INFO
2017-04-03 04:26:05,675
                                                        3, 2,
                                                  27,
                                                                    0.
```

Figure 3 Intruder

Event Ordering by Vector clock(Test cases)-

Test case 1 in physical clock synchronizations are now simulated to order events by vector clock. User enters home because of the vector data, door opened first and then motion is detected. Hence system state will be HOME and bulbs and outlets will be switched on.

```
2017-08-03 08-145:14,182 - INFO - added device to db...
2017-08-03 08-145:17,191 - INFO - processing register request...
2017-08-03 08-145:13,140 - INFO - Processing register request...
2017-08-03 08-145:13,140 - INFO - Processing register request...
2017-08-03 08-145:13,140 - INFO - Processing register request...
2017-08-03 08-145:14,151 - INFO - added device to db...
2017-08-03 08-145:14,161 - INFO - Processing register request...
2017-08-03 08-145:14,161 - INFO - added device to db...
2017-08-03 08-145:14,161 - INFO - added device to db...
2017-08-03 08-145:14,163 - INFO - added device to db...
2017-08-03 08-145:14,163 - INFO - added device to db...
2017-08-03 08-145:14,163 - INFO - added device to db...
2017-08-03 08-145:14,163 - INFO - added device to db...
2017-08-03 08-145:14,163 - INFO - added device to db...
2017-08-03 08-145:14,163 - INFO - added device to db...
2017-08-03 08-145:15,163 - INFO - added device to db...
2017-08-03 08-145:15,163 - INFO - started vector clock
2017-08-03 08-145:15,163 - INFO - started vector clock
2017-08-03 08-145:15,163 - INFO - started vector clock
2017-08-03 08-145:15,163 - INFO - boor sensor data received
2017-08-03 08-145:15,163 - INFO - Door sensor data received
2017-08-03 08-145:15,163 - INFO - Door sensor data received
2017-08-03 08-145:15,163 - INFO - [0, 1, 0, 0, 0, 0, 0]
2017-08-03 08-145:15,163 - INFO - [0, 2, 0, 0, 0, 0, 0]
2017-08-03 08-145:15,161 - INFO - Posted state to server
2017-08-03 08-145:15,161 - INFO - Motion sensor data received
2017-08-03 08-145:15,161 - INFO - Motion sensor data received
2017-08-03 08-145:15,161 - INFO - Motion sensor detected beacon
2017-08-03 08-145:15,111 - INFO - Motion sensor detected beacon
2017-08-03 08-145:15,111 - INFO - Motion sensor detected beacon
2017-08-03 08-145:15,111 - INFO - Statiching on Outlets
2017-08-03 08-146:15,111
```

Figure 4. User Enters Home

Test case 2 is simulated with vector clocks. Since motion happened first and the door opened later as seen from the vector clocks in the snapshot.

System changes to AWAY and switches off bulbs and outlets.

Figure 5. User eiting home

Test case 3 is now simulated with vector clocks. As presence beacon is not reached. The one entered is not user. Hence system changes to Intruder and switches on lights and offs outlets

Figure 6. Intruder