Fourth SDL and MSC Workshop

SAM'04

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Alkiviadis Yiannakoulias

NTUA

ayian@telecom.ece.ntua.gr

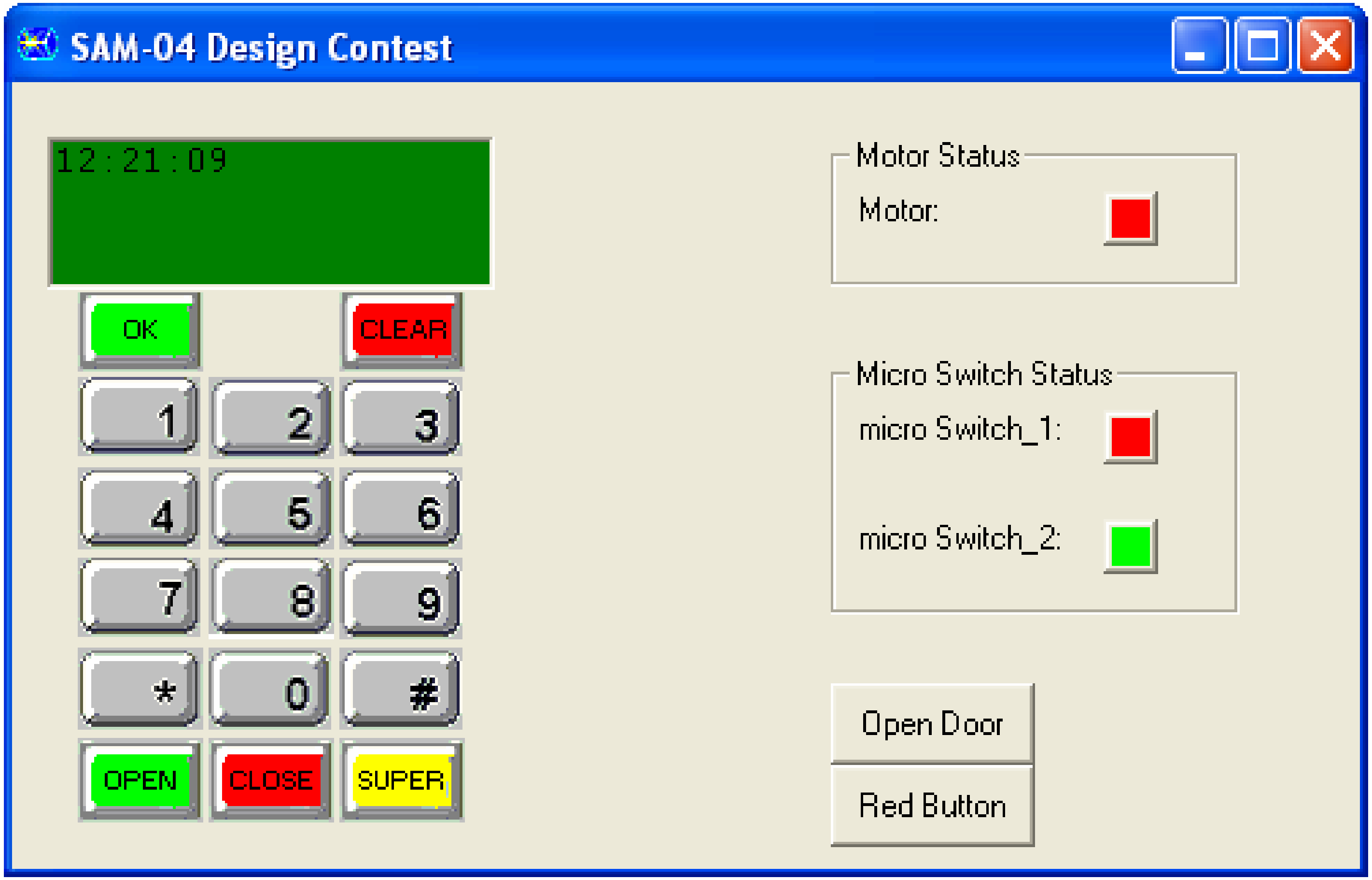
National Technical University of Athens

N.T.U.A.

Presentation Layout

- Design issues
- Top level system design
- Use of tool chain (SAFIRE)
  - Implementation
  - Testing / Validation
  - Documentation
- Demonstration
- Summary

Design issues



Motor Status

Motor: 🟥

Micro Switch Status

micro Switch_1: 🟥

micro Switch_2: 🟩

Design issues (Contd.)

- The door is allowed to be open for a maximum period, once the correct code is entered (***Max_Open_Duration_Tmr***).
- An alarm is generated when the door is not closed within the allowed time.
- Time to open or close the door has a maximum value (***Transition_Tmr***).
- Solenoid aborts releasing of lock procedure if door is not moving within the allowed time (***Guard_Tmr***).

Design issues (Contd.)

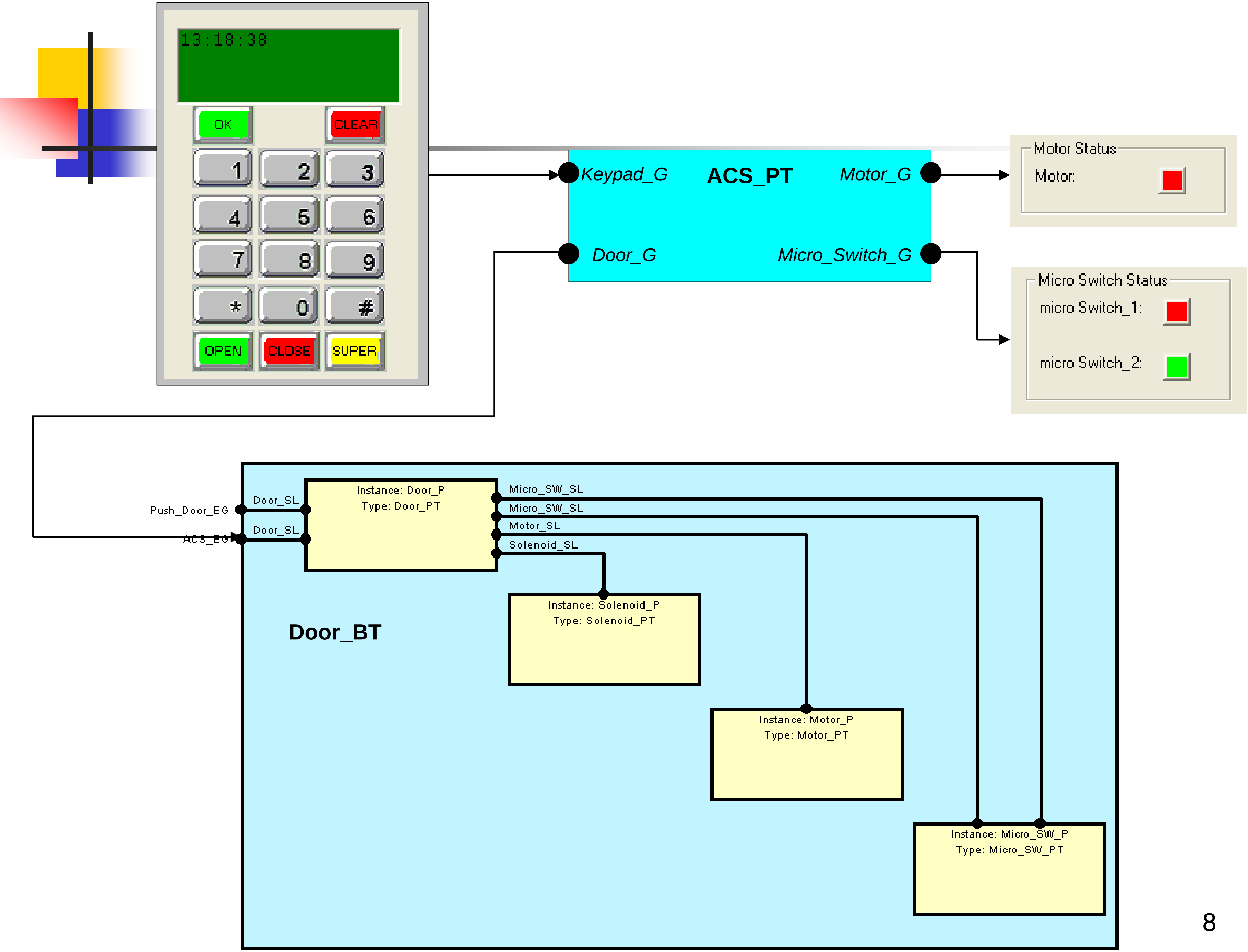
- Time is always displayed in the console.
- ACS Commands:
  - ✓ Stay Open: Allow door to be open for longer. Information needed:
    - Time (HH:MM),
    - Access Code
  - ✓ Close Now: 15 seconds to close door
  - ✓ Supervisor mode

Supervisor Mode Commands

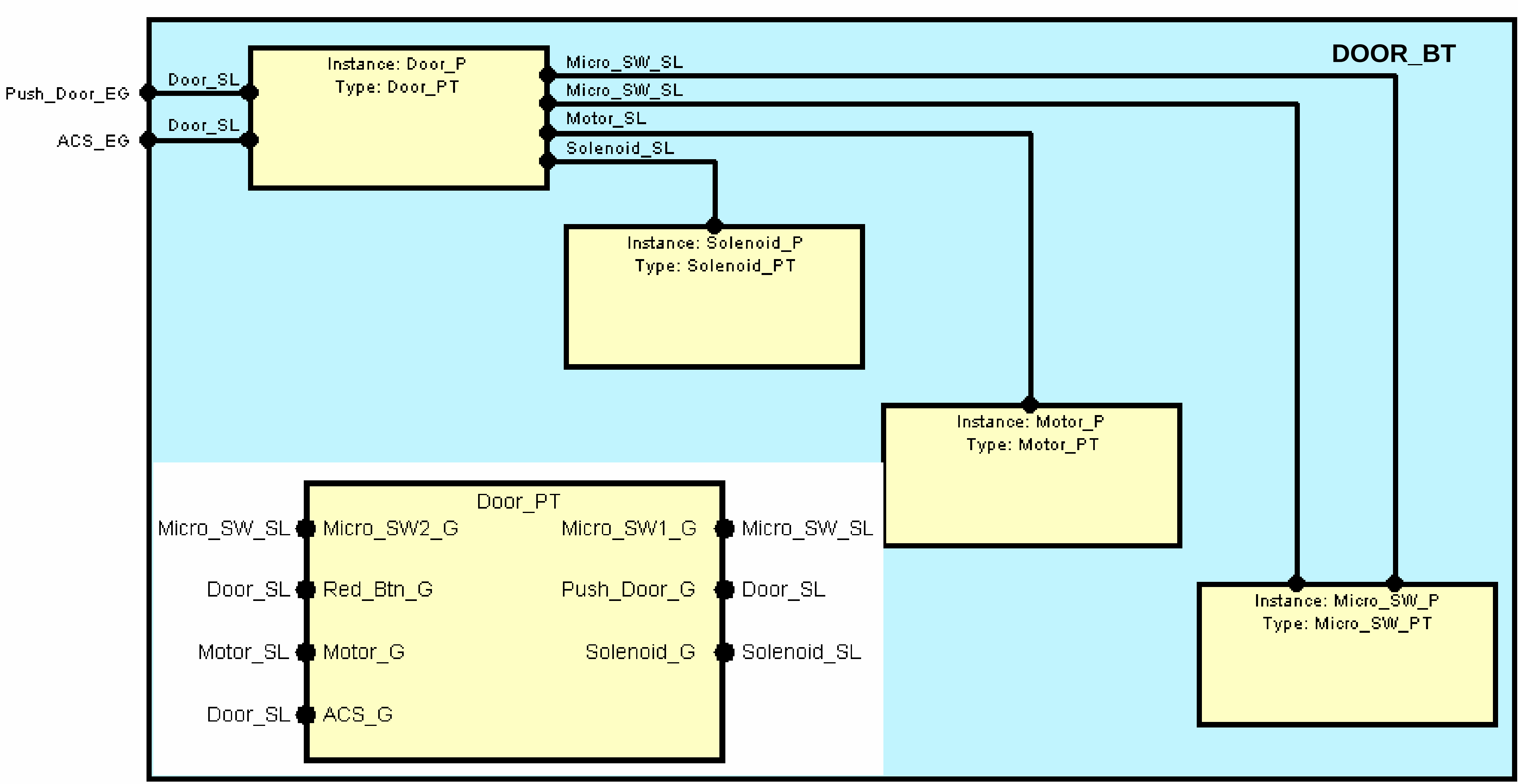
1. Double-check safety procedure,
2. Change supervisor code,
3. Statistics for:
    - #Times door open outside,
    - #Times door open inside,
    - When was last opened and how long
4. Set time,
5. Exit.

Design issues (Contd.)

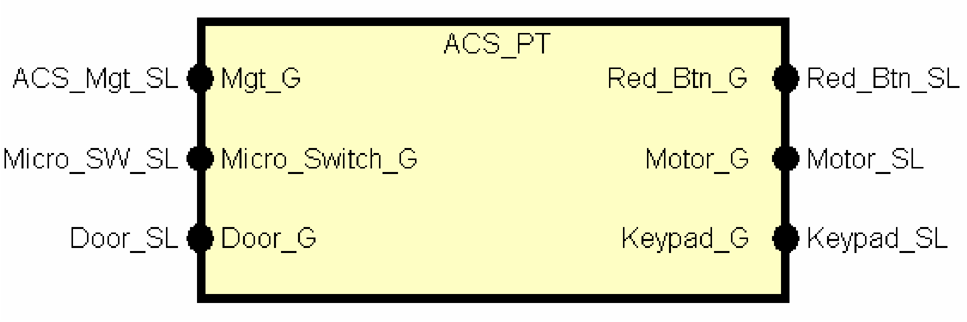
- Use of query mechanism to get door state, for controller state transitions
  - Reduce number of states
  - Data Hiding
- Reset procedure initializes configuration parameters and ACK completion
  - Improve testability

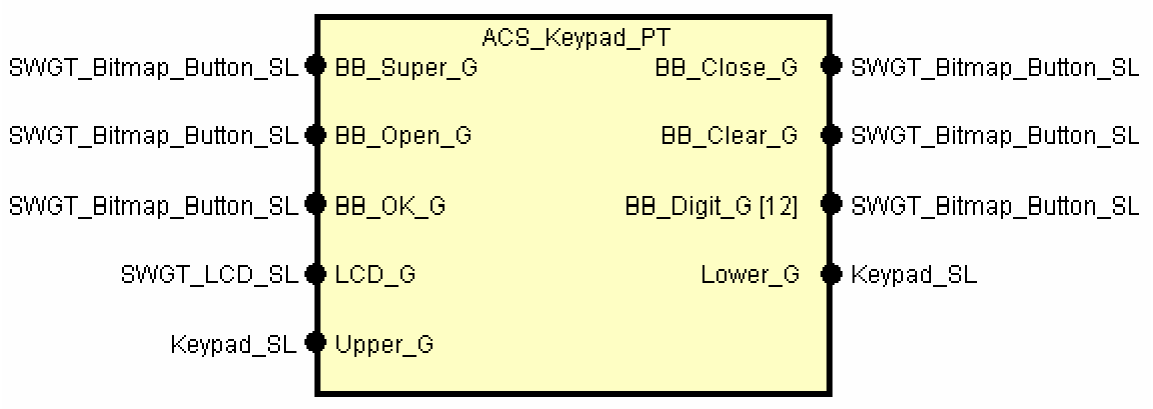

13:18:38
OK
CLEAR
1
2
3
4
5
6
7
8
9
*
0
#
OPEN
CLOSE
SUPER
Keypad_G
ACS_PT
Motor_G
Door_G
Micro_Switch_G
Motor Status
Motor:
Micro Switch Status
micro Switch_1:
micro Switch_2:
Push_Door_EG
ACS_EG
Door_SL
Door_SL
Instance: Door_P
Type: Door_PT
Micro_SW_SL
Micro_SW_SL
Motor_SL
Solenoid_SL
Instance: Solenoid_P
Type: Solenoid_PT
Door_BT
Instance: Motor_P
Type: Motor_PT
Instance: Micro_SW_P
Type: Micro_SW_PT

Top-Level Design

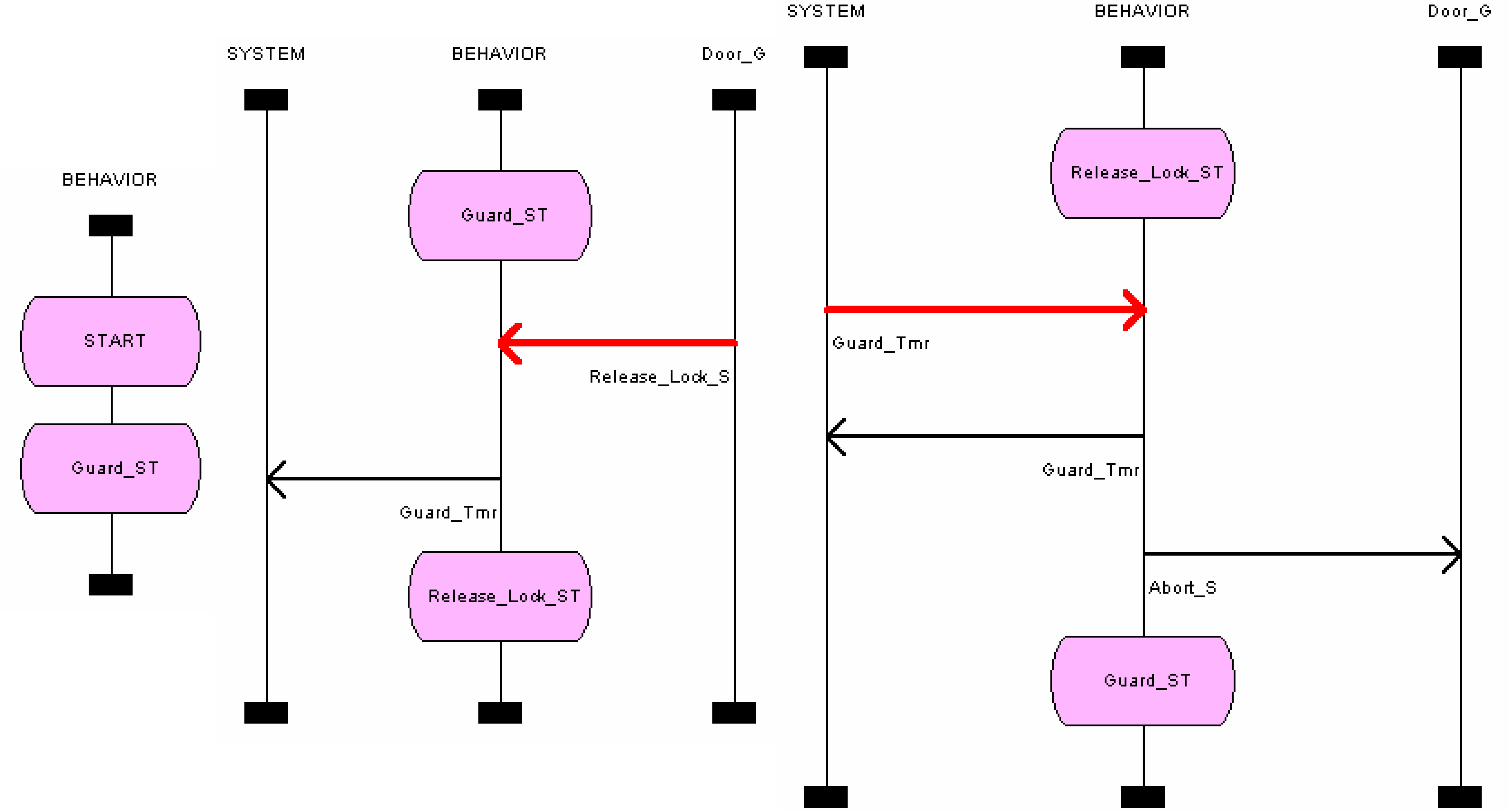


Top-Level Design

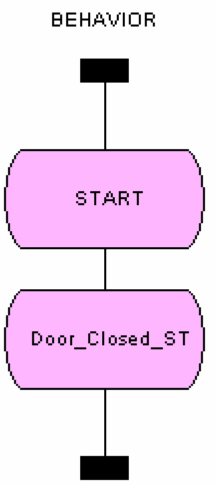


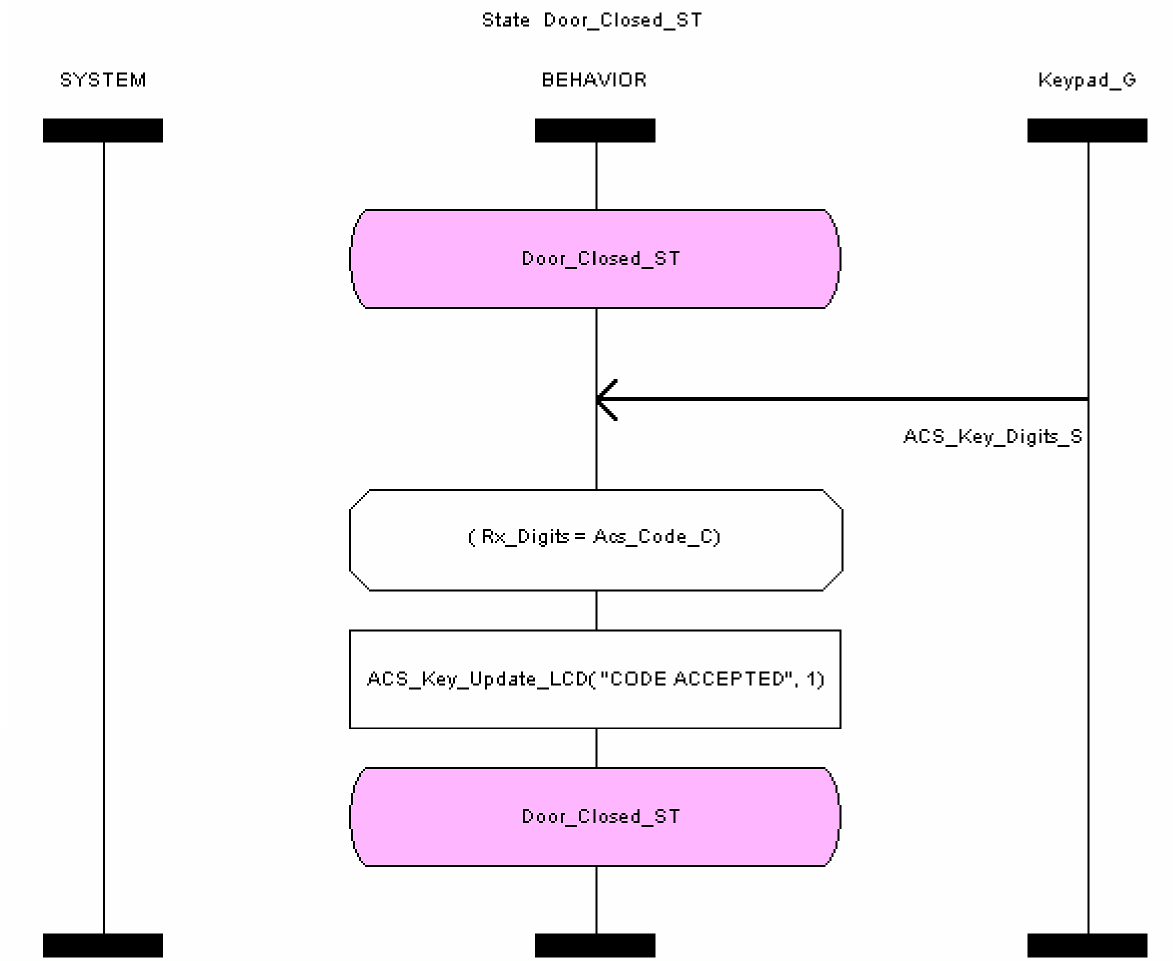


Solenoid Process

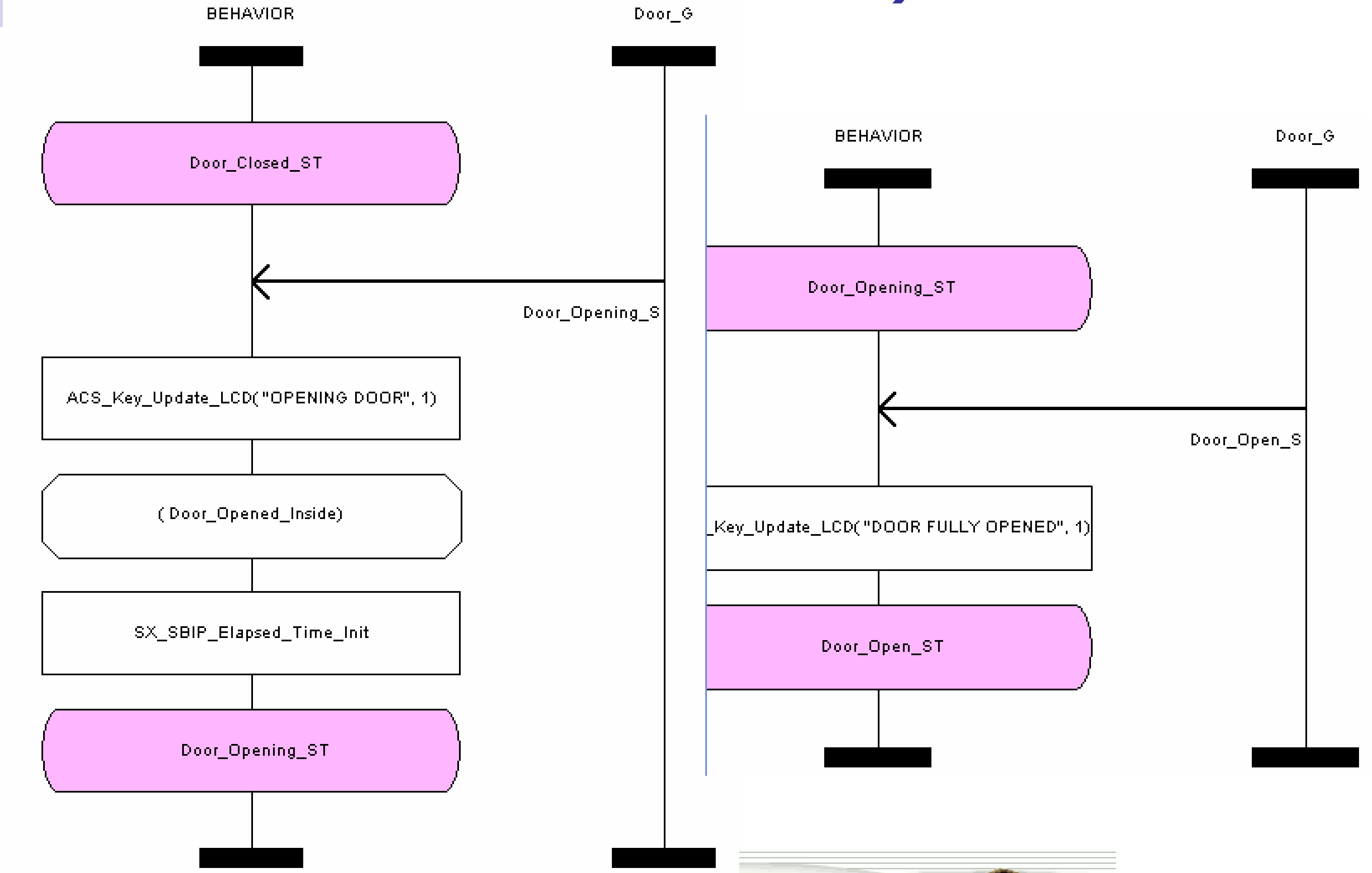


ACS Process


BEHAVIOR
START
Door_Closed_ST


State Door_Closed_ST
SYSTEM
BEHAVIOR
Keypad_G
Door_Closed_ST
ACS_Key_Digits_S
(Rx_Digits = Acs_Code_C)
ACS_Key_Update_LCD("CODE ACCEPTED", 1)
Door_Closed_ST

ACS Process (Contd.)



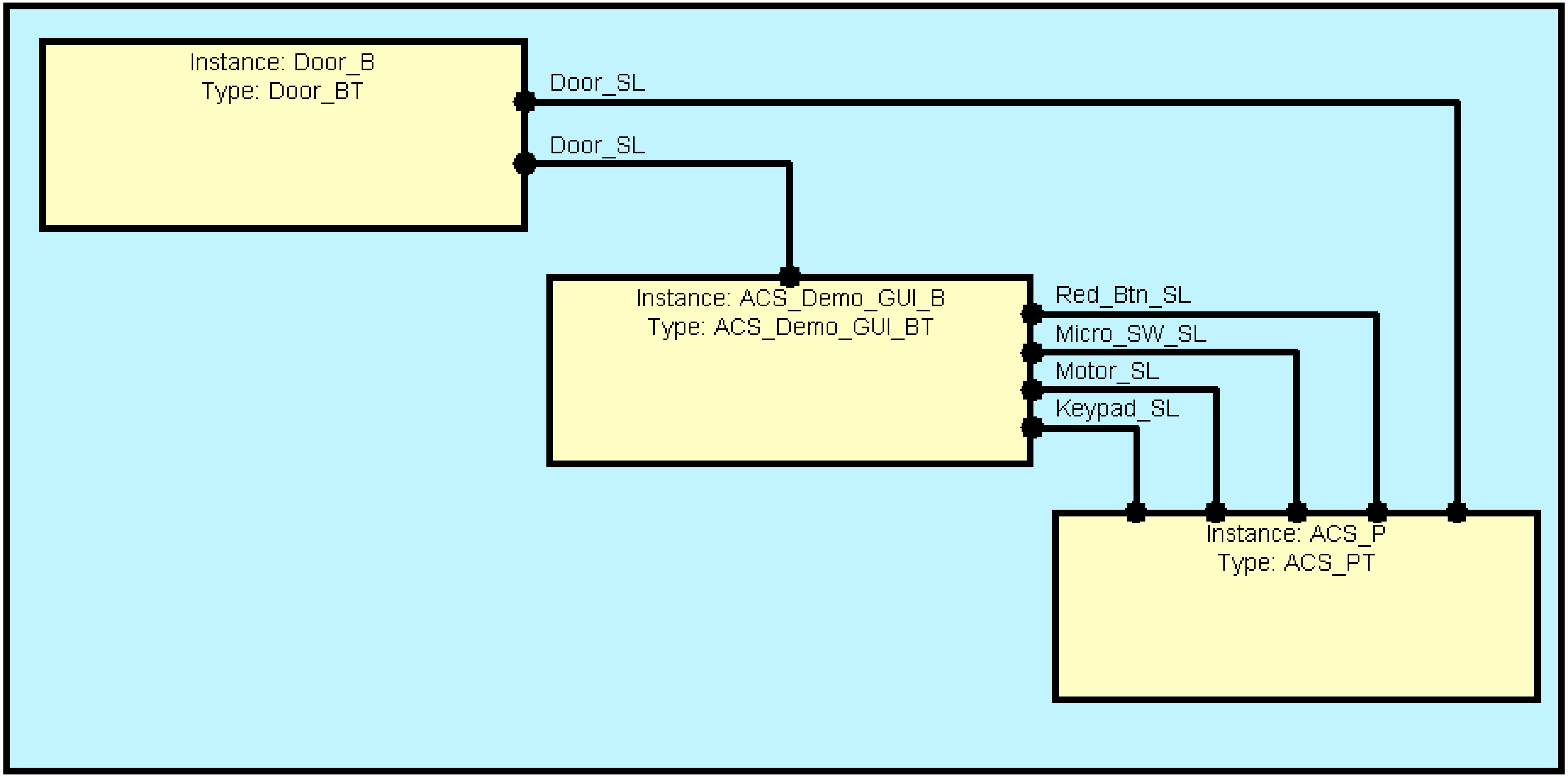
Door Process

Design summary

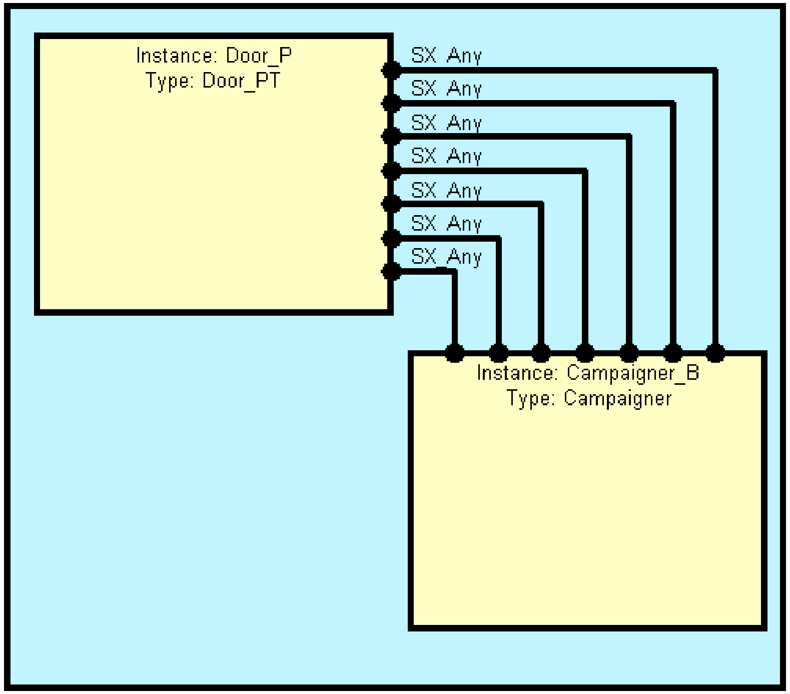
- Clear organization
- Hierarchical structure
- Data hiding
- Use of types
  - ✓ Reuse of design information
- Simple language elements

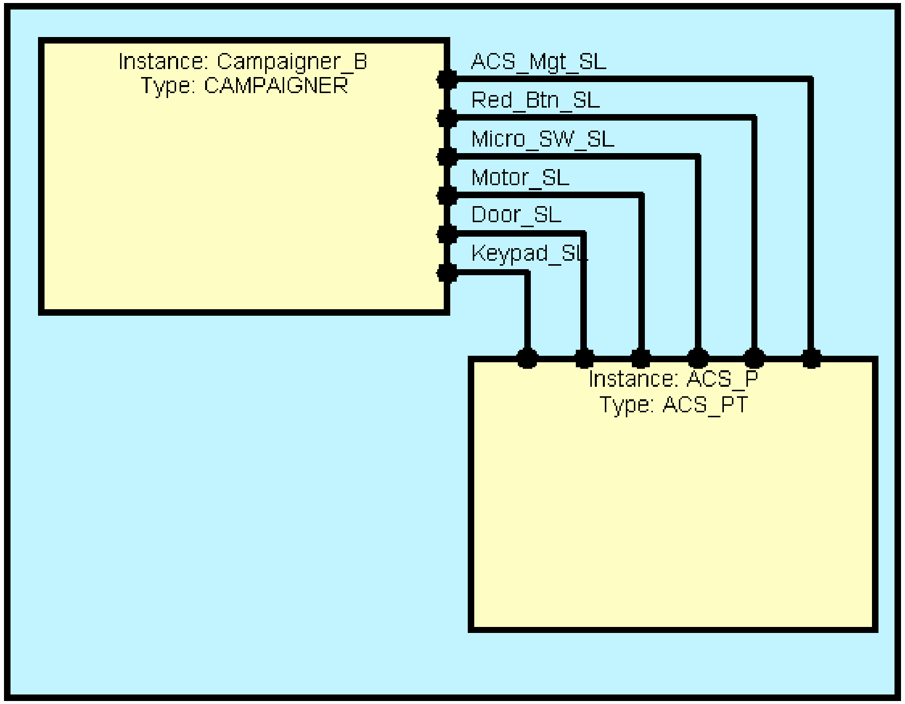
Documentation of Test Harness

Test harness (UI)



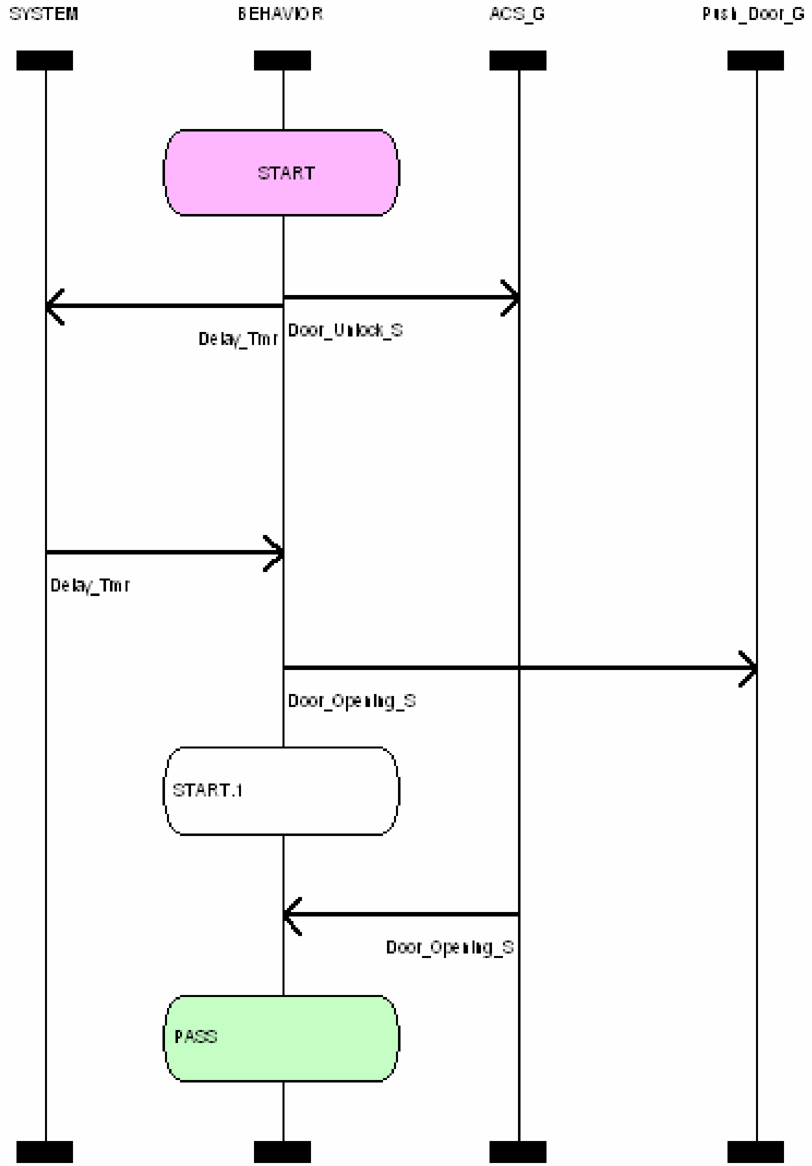
Test harness (SIM)



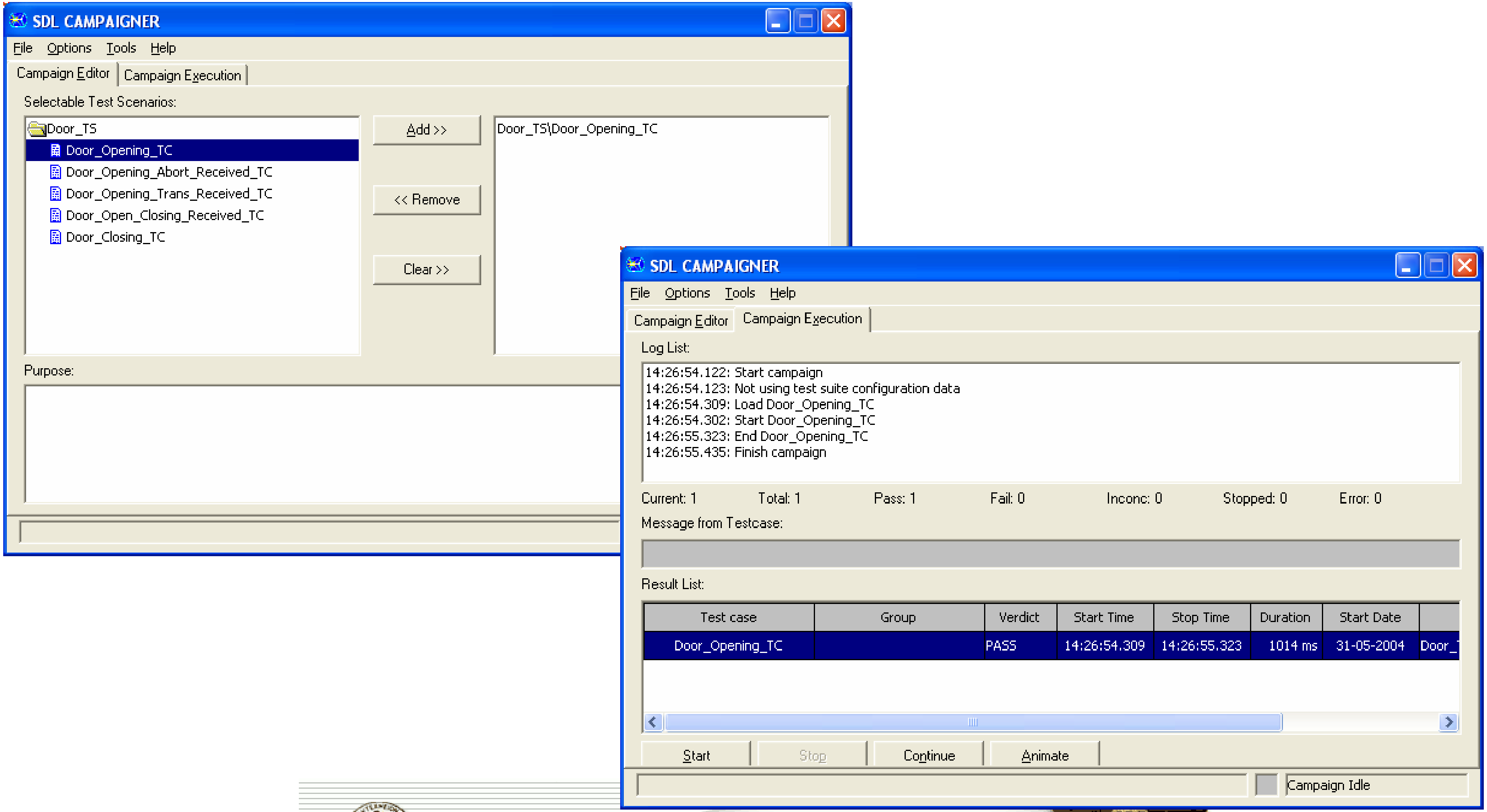


Documentation of Test Suite / Test Purposes

Test Case Sample (Door_Opening_TC)



Test Case Sample (Contd.)



Selectable Test Scenarios:

- Door_TS
  - Door_Opening_TC
  - Door_Opening_Abort_Received_TC
  - Door_Opening_Trans_Received_TC
  - Door_Open_Closing_Received_TC
  - Door_Closing_TC

Door_TS\Door_Opening_TC

Purpose:

Log List:

```
14:26:54.122: Start campaign
14:26:54.123: Not using test suite configuration data
14:26:54.309: Load Door_Opening_TC
14:26:54.302: Start Door_Opening_TC
14:26:55.323: End Door_Opening_TC
14:26:55.435: Finish campaign
```

Current: 1 Total: 1 Pass: 1 Fail: 0 Inconc: 0 Stopped: 0 Error: 0

Message from Testcase:

Result List:

Test case	Group	Verdict	Start Time	Stop Time	Duration	Start Date	
Door_Opening_TC		PASS	14:26:54.309	14:26:55.323	1014 ms	31-05-2004	Door_

Test Report

Test Report

System Execution Trace

Summary of results

- All test scenarios executed (PASS)
- Test coverage
  - ✓ All main transitions: timeouts and normal behavior
- Each transition has been tested independently
  - ✓ Assumes no interaction between transitions (reasonable as no global variables)

Conclusions

- Maximum usage of tool chain has minimized the effort for:
  - ✓ Design, Testing, Documentation
- Interesting challenge on how to keep design simple and use all the tool features to maximize automation