COL215: LAB ASSIGNMENT 1
Student_1: Pavas Goyal (2018CS10363)
Student_2: Dipen Kumar (2018CS50098)

DESIGN DECISIONS

We have defined Above_up, In_up and Above_down as the situation when someone at above floor w.r.t lift wants to go up, someone inside the lift wants to up and someone above wants to come down respectively.
Similarly, we have also defined Below_down, In_down and Below_up as someone below wants to go down, someone inside wants to go down and someone below wants come up respectively.

Following list show how the values of these terms are dependent on the input given:
Above_down =
(F0 AND (DN1 OR DN2 OR DN3)) OR (F1 AND (DN2 OR DN3)) OR (F2 AND DN3)
Above_up =
(F0 AND (UP1 OR UP2)) OR (F1 AND UP2)
In_up =
(F0 AND (B1 OR B2 OR B3)) OR (F1 AND (B2 OR B3)) OR (F2 AND B3)
In_down =
(F1 AND B0) OR (F2 AND (B0 OR B1)) OR (F3 AND (B0 OR B1 OR B2))
Below_down =
(F2 AND DN1) OR (F3 AND (DN2 OR DN1))
Below_up =
(F1 AND UP0) OR (F2 AND (UP0 OR UP1)) OR (F3 AND (UP0 OR UP1 OR UP2))

Now whenever any of Above_up OR Above_down OR In _up is/are true implies there is a request for lift to go up.
Similarly Below_down OR Below_up OR In_down implies request for the lift to go down.
So, let us define two more terns UP and DOWN.
UP = Above_up OR Above_down OR In_up
DOWN = Below_down OR Below_up OR In_down

Now there are three obvious situation and one conflict situation.

Go_up and Go_down are the two outputs controlling lift to go up and down respectively.

Table_1

UP	DOWN	Conclusion
0	0	Go_up = 0, Go_down = 0
0	1	Go_up = 0, Go_down = 1
1	0	Go_up = 1, Go_down = 0
1	1	Case of conflict. Further condition to be checked.

Whenever both UP and DOWN are true, i.e. there is request for lift from both side to come up and come down respectively. In this case lift should continue in same direction.
Let us define two more input ASCENDING and DESCENDING

```
IF ( (UP = 1) AND (DOWN = 1) )
{
```

Table_2

ASCENDING	DESCENDING	Implication	Conclusion
1	0	Lift was ascending	Go_up = 1
0	1	Lift was descending	Go_down = 1
0	0	Lift is at rest	Case of conflict Further condition to be checked.

```
}
ELSE
{
        Follow Table_1;
}
```

Whenever there is no input from ASCENDING AND DESCENDING implies that there is no previous direction for lift to resolve the conflict between UP = 1 AND DOWN = 1. In this case we will give preference to those passengers who want to go in upward direction over those who want to go in downward direction.

```
IF ( (UP = 1) AND (DOWN = 1) AND (ASCENDING = 0) AND (DESCENDING = 0) )
{
```

Table_3

Above_up OR In_up	Below_up	Conclusion
1	0	Go_up = 1
1	1	Case of conflict
0	0	Case of conflict
0	1	Go_down = 1

```
}
ELSE
{
        Start from Table_1;
        followed by Table_2 if necessary ;
}
```

Explanation Of Table_3:
As mentioned before Table_3, Passengers who want to go in upward direction should be given preference over those who want to go in downward direction. Row_1 is Go_up because there exist a person above or inside the life who want to go up and not person exist below who want to go up. Similarly row_4 is Go_down because there exist a person below who want to go up and no one exist above or inside the lift to go up.
In row_2, there exist someone at both above_or_inside and below who want to go up and in row_3 there exist no one at both. Hence to resolve this case we have given priority to Go_up.
Considering this, Table_3 modifies to:

Table_3_modified

Above_up OR In_up	Below_up	Conclusion
1	0	Go_up = 1
1	1	Go_up = 1
0	0	Go_up = 1
0	1	Go_down = 1

DESIGN EXPLANATION

From Table_1
Go_up = (UP AND (NOT DOWN)) OR (UP AND DOWN AND ……)
Go_down = (DOWN AND (NOT UP)) OR (UP AND DOWN AND ……)

From Table_2

Go_up = (UP AND (NOT DOWN)) OR (UP AND DOWN AND ASCENDING) OR (UP AND DOWN AND (NOT ASCENDING) AND (NOT DESCENDING) AND ……)

Go_down = (DOWN AND (NOT UP)) OR (UP AND DOWN AND DESCENDING) OR (UP AND DOWN AND (NOT ASCENDING) AND (NOT DESCENDING) AND ……)

From Table_3

Go_up = (UP AND (NOT DOWN)) OR (UP AND DOWN AND ASCENDING) OR (UP AND DOWN AND (NOT ASCENDING) AND (NOT DESCENDING) AND Above_up) OR (UP AND DOWN AND (NOT ASCENDING) AND (NOT DESCENDING) AND In_up) OR (UP AND DOWN AND (NOT ASCENDING) AND (NOT DESCENDING) AND (NOT Below_up))

Go_down = (DOWN AND (NOT UP)) OR (UP AND DOWN AND DESCENDING) OR (UP AND DOWN AND (NOT ASCENDING) AND (NOT DESCENDING) AND (NOT Above_up) AND (NOT In_up) AND Below_up)

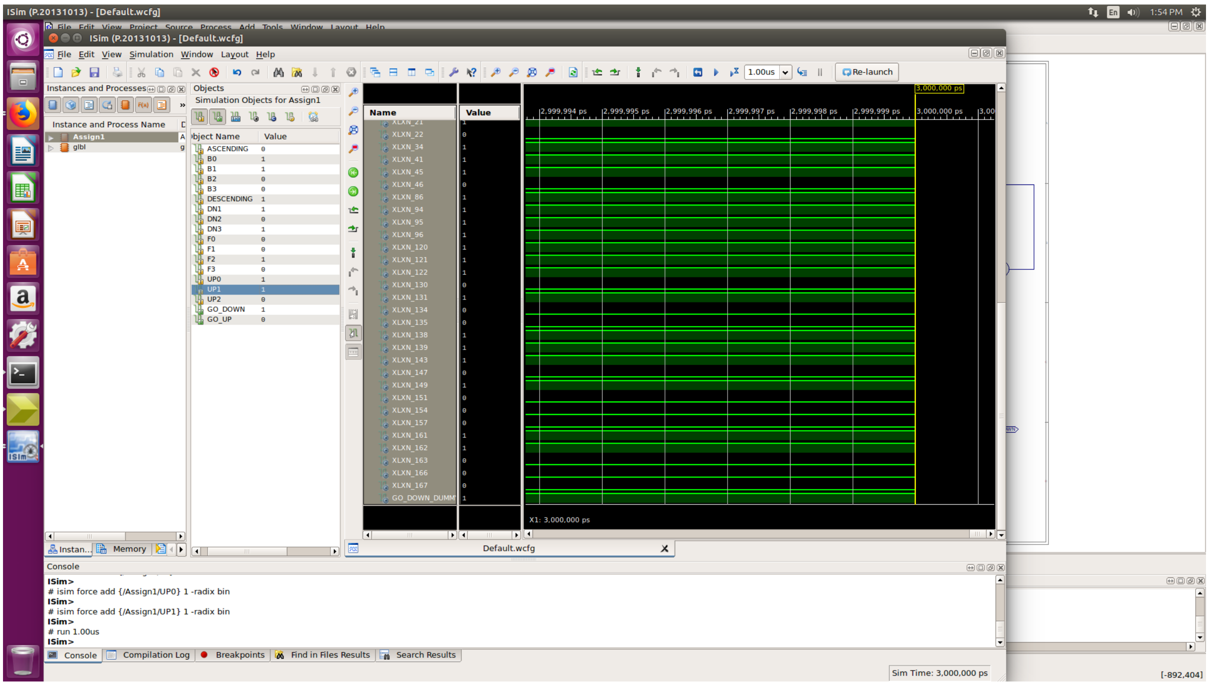
TEST CASES

	Test1	Test2	Test3	Test4	Test5	Test6	Test7	Test8
UP0	1	0	1	0	0	0	1	1
UP1	0	1	1	1	1	1	0	1
UP2	1	1	0	0	1	0	1	1
DN1	1	1	1	0	0	1	0	0
DN2	0	0	0	0	1	0	1	0
DN3	1	1	1	1	0	1	0	1
B0	0	1	1	1	0	0	1	1
B1	1	0	1	0	0	0	0	1
B2	1	0	0	0	0	1	0	0
B3	0	0	1	0	1	1	0	0
F0	1	0	0	0	1	0	0	0
F1	0	1	0	0	0	1	0	0
F2	0	0	1	0	0	0	1	0
F3	0	0	0	1	0	0	0	1
ASCENDING	1	1	1	1	1	1	1	1
DESCENDING	0	0	0	0	0	0	0	0
Go_up	1	1	1	0	1	1	0	0
Go_down	0	0	0	1	0	0	1	1

	Test9	Test10	Test11	Test12	Test13	Test14	Test15
UP0	1	0	1	0	0	0	1
UP1	0	1	1	1	1	1	0
UP2	1	1	0	0	1	0	1
DN1	1	1	1	0	0	1	0
DN2	0	0	0	0	1	0	1
DN3	1	1	1	1	0	1	0
B0	0	1	1	1	0	0	1
B1	1	0	1	0	0	0	0
B2	1	0	0	0	0	1	0
B3	0	0	1	0	1	1	0
F0	1	0	0	0	1	0	0
F1	0	1	0	0	0	1	0
F2	0	0	1	0	0	0	1
F3	0	0	0	1	0	0	0
ASCENDING	0	0	0	0	0	0	0
DESCENDING	1	1	1	1	1	1	1
Go_up	1	0	0	0	1	1	0
Go_down	0	1	1	1	0	0	1

	Test16	Test17	Test18	Test19	Test20	Test21	Test22
UP0	1	0	1	0	0	0	1
UP1	0	1	1	1	1	1	0
UP2	1	1	0	0	1	0	1
DN1	1	1	1	0	0	1	0
DN2	0	0	0	0	1	0	1
DN3	1	1	1	1	0	1	0
B0	0	1	1	1	0	0	1
B1	1	0	1	0	0	0	0
B2	1	0	0	0	0	1	0
B3	0	0	1	0	1	1	0
F0	1	0	0	0	1	0	0
F1	0	1	0	0	0	1	0
F2	0	0	1	0	0	0	1
F3	0	0	0	1	0	0	0
ASCENDING	0	0	0	0	0	0	0
DESCENDING	0	0	0	0	0	0	0
Go_up	1	1	1	0	1	1	0
Go_down	0	0	0	1	0	0	1

SIMULATION



ISim (P.20131013) - [Default.wcfg]
File Edit View Simulation Window Layout Help
Re-launch
Instances and Processes
Assign1
glbl
Default.wcfg

Simulation Objects for Assign1

Object Name	Value
ASCENDING	0
B0	1
B1	1
B2	0
B3	0
DESCENDING	1
DN1	1
DN2	0
DN3	1
F0	0
F1	0
F2	1
F3	0
UP0	1
UP1	1
UP2	0
GO_DOWN	1
GO_UP	0

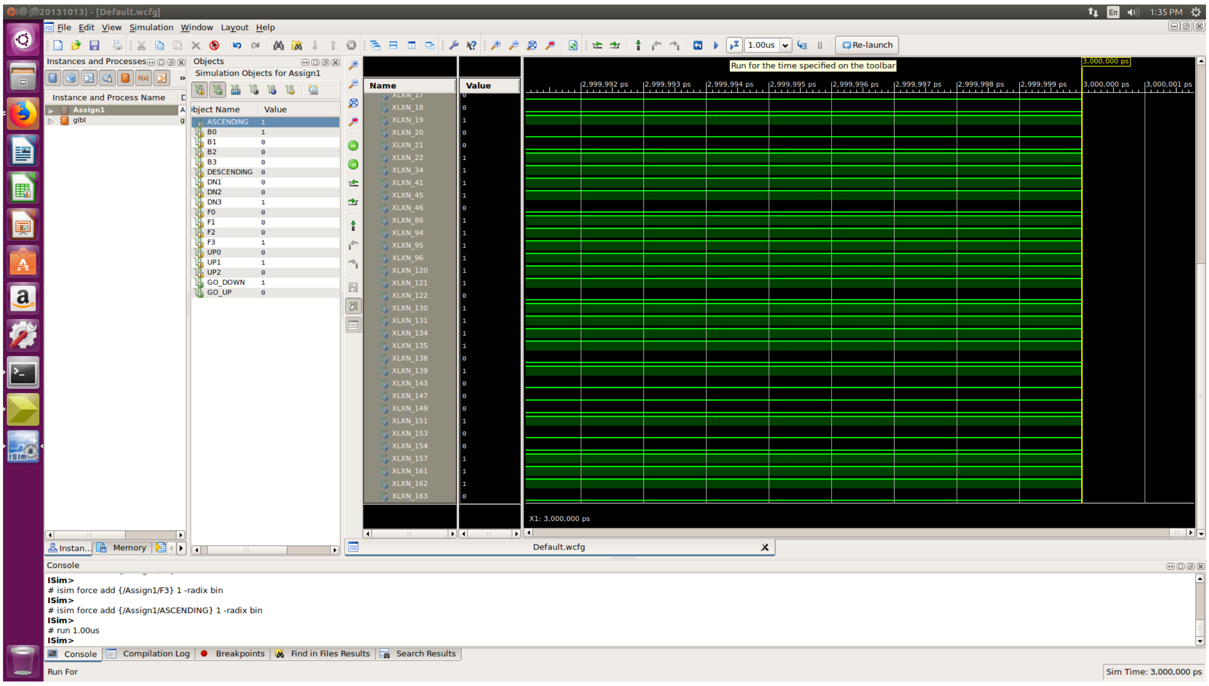
Name	Value
XLXN_21	1
XLXN_22	0
XLXN_34	1
XLXN_41	1
XLXN_45	1
XLXN_46	0
XLXN_86	1
XLXN_94	1
XLXN_95	1
XLXN_96	1
XLXN_120	1
XLXN_121	1
XLXN_122	1
XLXN_130	0
XLXN_131	1
XLXN_134	0
XLXN_135	0
XLXN_138	1
XLXN_139	1
XLXN_143	1
XLXN_147	0
XLXN_149	1
XLXN_151	0
XLXN_154	0
XLXN_157	0
XLXN_161	1
XLXN_162	1
XLXN_163	0
XLXN_166	0
XLXN_167	0
GO_DOWN_DUMM	1

X1: 3,000,000 ps

Console

```
ISim>
# isim force add {/Assign1/UP0} 1 -radix bin
ISim>
# isim force add {/Assign1/UP1} 1 -radix bin
ISim>
# run 1.00us
ISim>
```

Sim Time: 3,000,000 ps



ISim (P.20131013) - [Default.wcfg]
File Edit View Simulation Window Layout Help
Re-launch
Run for the time specified on the toolbar
Instances and Processes
Assign1
glbl
Default.wcfg

Simulation Objects for Assign1

Object Name	Value
ASCENDING	1
B0	1
B1	0
B2	0
B3	0
DESCENDING	0
DN1	0
DN2	0
DN3	1
F0	0
F1	0
F2	0
F3	1
UP0	0
UP1	1
UP2	0
GO_DOWN	1
GO_UP	0

Name	Value
XLXN_17	0
XLXN_18	0
XLXN_19	1
XLXN_20	0
XLXN_21	0
XLXN_22	1
XLXN_34	1
XLXN_41	1
XLXN_45	1
XLXN_46	0
XLXN_86	1
XLXN_94	1
XLXN_95	1
XLXN_96	1
XLXN_120	1
XLXN_121	1
XLXN_122	0
XLXN_130	1
XLXN_131	1
XLXN_134	1
XLXN_135	1
XLXN_138	0
XLXN_139	1
XLXN_143	0
XLXN_147	0
XLXN_149	0
XLXN_151	1
XLXN_153	0
XLXN_154	0
XLXN_157	1
XLXN_161	1
XLXN_162	1
XLXN_163	0

X1: 3,000,000 ps

Console

```
ISim>
# isim force add {/Assign1/F3} 1 -radix bin
ISim>
# isim force add {/Assign1/ASCENDING} 1 -radix bin
ISim>
# run 1.00us
ISim>
```

Run For

Sim Time: 3,000,000 ps