```
1   --================================================================================
2   -- TrafficTopLevel.vhd
3   --
4   -- Traffic light system to control an intersection
5   --
6   --
7   --================================================================================
8   library IEEE;
9   use IEEE.STD_LOGIC_1164.ALL;
10  use IEEE.STD_LOGIC_ARITH.ALL;
11  use IEEE.STD_LOGIC_UNSIGNED.ALL;
12
13  entity Traffic is
14     Port (   Reset : in STD_LOGIC;
15              Clock : in STD_LOGIC;
16
17              -- Car and pedestrian buttons
18              Train : in STD_LOGIC; -- Train on EW road
19              CarNS : in STD_LOGIC; -- Car on NS road
20              PedNS : in STD_LOGIC; -- Pedestrian moving NS (crossing EW road)
21
22              -- Light control
23              HLights : out STD_LOGIC_VECTOR (1 downto 0); -- controls EW lights
24              VLights : out STD_LOGIC_VECTOR (1 downto 0); -- controls NS lights
25              Motor    : out STD_LOGIC_VECTOR (3 downto 0)   -- controls Motor
26           );
27  end entity Traffic;
28
29  architecture Behavioral of Traffic is
30     COMPONENT SyncButton
31        PORT ( reset : in  STD_LOGIC;
32             clock : in  STD_LOGIC;
33             TrainButton : in  STD_LOGIC; -- Train Button Input --
34             CarButton : in  STD_LOGIC; -- Car Button Input --
35             PedButton : in  STD_LOGIC; -- Pedestrain Button Input --
36             Counter : in  STD_LOGIC_VECTOR (4 downto 0); -- Timer --
37             MotorEnabler : out  STD_LOGIC; -- Enable And Disable Stepper Motor --
38             TrainAction : out  STD_LOGIC; -- Tran Button Output --
39             CarWaitOutput : out  STD_LOGIC; -- Car Output When Train Is And Is Not
   Passing Through --
40             PedWaitOutput : out  STD_LOGIC -- Pedestrain Output When Train Is And Is
   Not Passing Through --
41             );
42        END COMPONENT;
43
44     COMPONENT TimerReset
45        PORT ( reset : in  STD_LOGIC;
46             clock : in  STD_LOGIC;
47             TrainButton : in  STD_LOGIC; -- Train Button Input --
48             CarButton : in  STD_LOGIC; -- Car Button Input --
49             PedButton : in  STD_LOGIC; -- Pedestrain Button Input --
50             Found : out  STD_LOGIC -- Output To Reset Timer --
51             );
52        END COMPONENT;
53
54     COMPONENT Timer
55        PORT ( reset : in  STD_LOGIC;
```

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56              clock : in  STD_LOGIC;
57              timer_reset : in  STD_LOGIC; -- To Reset Timer --
58              FourHzPulse : out  STD_LOGIC; -- Four Hz Pulse --
59              MotorPulseOutput : out STD_LOGIC; -- Pulse For Stepper Motor --
60              CounterOutput : out  STD_LOGIC_VECTOR (4 downto 0) -- Timer Output --
61              );
62        END COMPONENT;
63
64     COMPONENT MotorController
65        PORT ( reset : in  STD_LOGIC;
66              MotorPulseInput : in  STD_LOGIC; -- Pulse For Stepper Motor --
67              Enable : in  STD_LOGIC; -- To Enable The Motor To Turn --
68              Clockwise : in  STD_LOGIC; -- To Choose Direction To Turn --
69              MotorEnablerInput : in  STD_LOGIC; -- To Enable Stepper Motor --
70              MotorOutput : out  STD_LOGIC_VECTOR (3 downto 0) -- Output for Motor --
71              );
72        END COMPONENT;
73
74     COMPONENT TrafficLights
75        PORT ( reset : in  STD_LOGIC;
76              clock : in  STD_LOGIC;
77              FourHzPulse : in  STD_LOGIC; -- 4Hz Pulse --
78              Flash : in  STD_LOGIC; -- Train Button is Pressed --
79              TrafficGreen : in  STD_LOGIC; -- Car Button is Pressed --
80              PedGreen : in  STD_LOGIC; -- Pedestrian Button is Pressed --
81              MotorEnable : out  STD_LOGIC; -- Enable The Stepper Motor To Rotate --
82              MotorClockwise : out  STD_LOGIC; -- Direction Of Rotation For Stepper
    Motor--
83              HTrafficLightOutput : out  STD_LOGIC_VECTOR (1 downto 0); -- Output for
    Horizontal Traffic Light --
84              VTrafficLightOutput : out  STD_LOGIC_VECTOR (1 downto 0) -- Output for
    Vertical Traffic Light --
85              );
86        END COMPONENT;
87
88     signal TrainInputButton : std_logic;
89     signal CarInputButton : std_logic;
90     signal PedInputButton : std_logic;
91     signal ResetTimer : std_logic;
92     signal MotorEnableDetector : std_logic;
93     signal MotorClockwiseDetector : std_logic;
94     signal MotorPulseOutputDetector : std_logic;
95     signal FourHzOutput : std_logic;
96     signal MotorEnablerDetector : std_logic;
97     signal TimerOutput : std_logic_vector (4 downto 0);
98
99     begin
100
101    --Insert your code here --
102
103    ButtonInput : SyncButton PORT MAP (
104       reset => Reset,
105       clock => Clock,
106       TrainButton => Train,
107       CarButton => CarNS,
108       PedButton => PedNS,
109       Counter => TimerOutput,
```

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110         MotorEnabler => MotorEnablerDetector,
111         TrainAction => TrainInputButton,
112         CarWaitOutput => CarInputButton,
113         PedWaitOutput => PedInputButton
114      );
115
116      TimerResetting : TimerReset PORT MAP (
117         reset => Reset,
118         clock => Clock,
119         TrainButton => TrainInputButton,
120         CarButton => CarInputButton,
121         PedButton => PedInputButton,
122         Found => ResetTimer
123      );
124
125      SystemTimer : Timer PORT MAP (
126         reset => Reset,
127         clock => Clock,
128         timer_reset => ResetTimer,
129         FourHzPulse => FourHzOutput,
130         MotorPulseOutput => MotorPulseOutputDetector,
131         CounterOutput => TimerOutput
132      );
133
134      StepperModule : MotorController PORT MAP (
135         reset => Reset,
136         MotorPulseInput => MotorPulseOutputDetector,
137         Enable => MotorEnableDetector,
138         Clockwise => MotorClockwiseDetector,
139         MotorEnablerInput => MotorEnablerDetector,
140         MotorOutput => Motor
141      );
142
143      TrafficLight : TrafficLights PORT MAP (
144         reset => Reset,
145         clock => Clock,
146         FourHzPulse => FourHzOutput,
147         Flash => TrainInputButton,
148         TrafficGreen => CarInputButton,
149         PedGreen => PedInputButton,
150         MotorEnable => MotorEnableDetector,
151         MotorClockwise => MotorClockwiseDetector,
152         HTrafficLightOutput => HLights,
153         VTrafficLightOutput => VLights
154      );
155
156   end architecture Behavioral;
```