```
-------------------------------------------------------------------------------
--
--  Purpose:
--
--    Ripple Carry Adder
--
--  Discussion:
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--
--  Licensing:
--
--    This code is distributed under the GNU LGPL license.
--
--  Modified:
--
--    2012.03.29
--
--  Author:
--
--    Young W. Lim
--
--  Parameters:
--
--    Input:
--
--    Output:
--------------------------------------------------------------------------------

library STD;
use STD.textio.all;

library IEEE;
use IEEE.std_logic_1164.all;
use IEEE.numeric_std.all;


entity adder is
  generic (
    WD     : in natural := 32);

  port (
    an     : in   std_logic_vector (WD-1 downto 0) := (others=>'0');
    bn     : in   std_logic_vector (WD-1 downto 0) := (others=>'0');
    ci     : in   std_logic := '0';
    cn     : out  std_logic_vector (WD-1 downto 0) := (others=>'0');
    co     : out  std_logic := '0');

end adder;

architecture rca of adder is
begin
  process (an, bn, ci)
    variable sn : std_logic_vector (WD-1 downto 0) := (others=>'0');
    variable c  : std_logic := '0';
  begin  -- process
    c := ci;
    for i in 0 to WD-1 loop
      sn(i) := an(i) xor bn(i) xor c;
      c := (an(i) and bn(i)) or (an(i) and c) or (bn(i) and c);
    end loop;  -- i

    cn <= sn;
    co <= c;
  end process;

end rca;
```