Signal Drivers

- **What if there is more than one assignment to the same signal within a process?**
- Every signal assignment in a process creates a *driver for that signal.*

- *The driver of a signal holds its current value and all its future values as a sequence of one or more transactions, where each transaction identifies the value to appear on the signal along with the time at which the value is to appear.*

Signal Drivers Cont..

- Consider the following signal assignment statement with three waveform elements and the driver that is created for that signal.

- **process**

- **begin**

  ○ RESET **<= *3 after 5 ns, 21 after 10 ns, 14 after 17 ns;***

- **end process;**

Signal Drivers Cont..

RESET ← | curr@now | 3@T+5 ns | 21@T+10 ns | 14@T+17 ns |
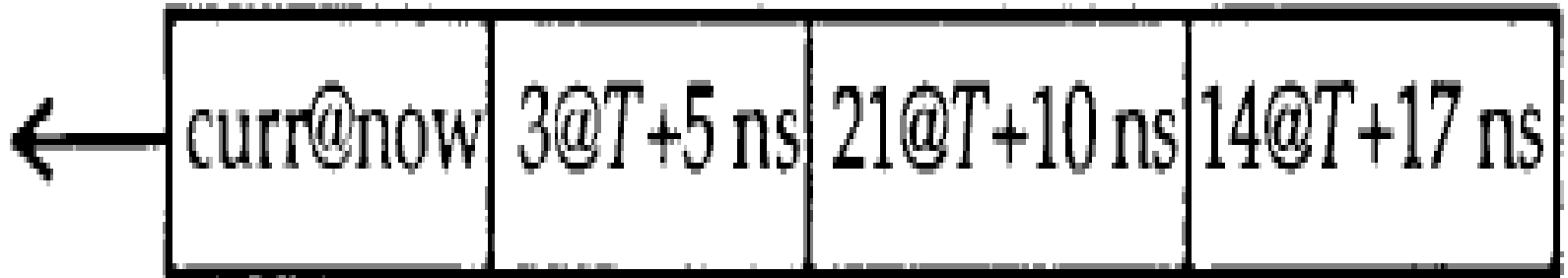
Effect of Transport Delay on Signal Drivers

- Here is an example of a process having three signal assignments to the same signal RX_DATA.

signal RX_DATA: NATURAL;

……

process
begin
   RX_DATA **<= transport 11 after 10 ns:**
   RX_DATA **<= transport 20 after 22 ns;**
   RX_DATA **<= transport 35 after 18 ns;**
end process;

Effect of Transport Delay on Signal Drivers cont..

RX_DATA ← | curr@now | 11@T+10 ns | 20@T+22 ns |

RX_DATA ← | curr@now | 11@T+10 ns | 35@T+18 ns |

Effect of Transport Delay on Signal Drivers cont..

- Here is another example.
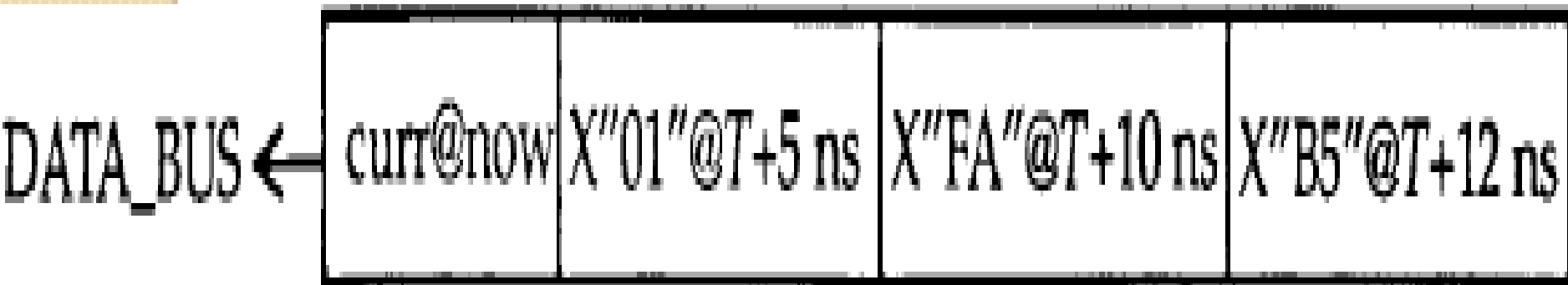
process

--DATA_BUS is a signal of type BIT_VECTOR.

begin

DATA_BUS **<= transport X"01" after 5 ns, X"FA" after 10 ns,**

X"E8" **after 15 ns;**

DATA_BUS *<= transport X"B5" after 12 ns;*

end process;

Effect of Transport Delay on Signal Drivers cont..

DATA_BUS ← | curr@now | X"01"@T+5 ns | X"FA"@T+10 ns | X"E8"@T+15 ns |

DATA_BUS ← | curr@now | X"01"@T+5 ns | X"FA"@T+10 ns | X"B5"@T+12 ns |

Effect of Transport Delay on Signal Drivers cont..

- The following summarizes the rules for adding a new transaction to a driver in the transport delay mode.

- 1. If the delay time of the new transaction is greater than those of all the transactions already present on the driver, then the new transaction is added at the end of the driver.

- 2. If the delay time of the new transaction is earlier than or equal to one or more transactions on the driver, then these transactions are deleted from the driver and the new transaction is added at the end of the driver.

Effect of Inertial Delay on Signal Drivers

- When inertial delays are used, both the signal value being assigned and the delay value affect the deletion and addition of transactions.

- If the delay of the new transaction is earlier than an existing transaction, the latter is deleted and the new one is added at the end of the driver, regardless of the signal values of the two transactions.

Effect of Inertial Delay on Signal Drivers cont..

- On the other hand, if the delay of the new transaction is greater than an already existing one, the signal values of the two transactions are compared.

- If they are the same, the new transaction is simply added at the end of the driver, if not, the existing one is deleted before adding the new transaction. Deletion occurs for every existing transaction with a signal value that is different from the new transaction.

Effect of Inertial Delay on Signal Drivers cont..

- Consider the following process statement.

process

begin

    TX_DATA **<= 11 after 10 ns;**

    TX_DATA **<= reject 15ns inertial 22 after 20 ns;**

    TX_DATA **<= 33 after 15 ns;**

    wait; -- Suspends indefinitely.

end process;

Effect of Inertial Delay on Signal Drivers cont..

TX_DATA ← | curr@now | 22@20 ns |

TX_DATA ← | curr@now | 33@15 ns |