Vector Files in Quartus II Wilfrid Laurier University

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Introduction Basic Structure Simple example

Why use vector files?

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Introduction Basic Structure Simple example

Why use vector files?

• For a small circuit, creating the vector waveform file graphically is easy

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Introduction Basic Structure Simple example

Why use vector files?

• For a small circuit, creating the vector waveform file graphically is easy

For circuits with lots of inputs, no so much

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Introduction Basic Structure Simple example

Why use vector files?

• For a small circuit, creating the vector waveform file graphically is easy

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• If you already have a truth table for your circuit, creating a vector file is easy

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Introduction Basic Structure Simple example

Why use vector files?

• For a small circuit, creating the vector waveform file graphically is easy

For circuits with lots of inputs, no so much

• If you already have a truth table for your circuit, creating a vector file is easy

It's a text file based on the truth table

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Introduction Basic Structure Simple example

Basic Structure

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Introduction Basic Structure Simple example

Basic Structure

• **START** time

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Introduction Basic Structure Simple example

Basic Structure

• **START** time (ns)

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Introduction Basic Structure Simple example

Basic Structure

- **START** time (ns)
- STOP time

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Basic Structure

- **START** time (ns)
- **STOP** time (ns)

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Introduction Basic Structure Simple example

Basic Structure

- **START** time (ns)
- **STOP** time (ns)
- INTERVAL time

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Introduction Basic Structure Simple example

Basic Structure

- **START** time (ns)
- **STOP** time (ns)
- INTERVAL time (ns)

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Introduction Basic Structure Simple example

Basic Structure

- **START** time (ns)
- STOP time (ns)
- INTERVAL time (ns) 20 is a good default value

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Introduction Basic Structure Simple example

Basic Structure

- **START** time (ns)
- STOP time (ns)
- INTERVAL time (ns) 20 is a good default value
- INPUTS name(s)

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Introduction Basic Structure Simple example

Basic Structure

- **START** time (ns)
- STOP time (ns)
- INTERVAL time (ns) 20 is a good default value
- INPUTS name(s)
- PATTERN string

-

Introduction Basic Structure Simple example

Basic Structure

- **START** time (ns)
- STOP time (ns)
- INTERVAL time (ns) 20 is a good default value
- INPUTS name(s)
- PATTERN string

can be *absolute*

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- **START** time (ns)
- **STOP** time (ns)
- INTERVAL time (ns) 20 is a good default value
- INPUTS name(s)
- PATTERN string
 - can be *absolute*
 - or *relative*

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- **START** time (ns)
- **STOP** time (ns)
- INTERVAL time (ns) 20 is a good default value
- INPUTS name(s)
- PATTERN string

can be *absolute*

or *relative*

• **OUTPUTS** name(s)

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- **START** time (ns)
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- INTERVAL time (ns) 20 is a good default value
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can be *absolute*

or *relative*

- **OUTPUTS** name(s)
- All statements end with a semicolon.

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- **START** time (ns)
- **STOP** time (ns)
- INTERVAL time (ns) 20 is a good default value
- INPUTS name(s)
- PATTERN string

can be *absolute*

or *relative*

- **OUTPUTS** name(s)
- All statements end with a semicolon.
- Comments go between percent signs.

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Introduction Basic Structure Simple example

Simple example

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Introduction Basic Structure Simple example

Simple example

• Simple circuit

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Introduction Basic Structure Simple example

Simple example

- Simple circuit
- 2 inputs, a and b

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Introduction Basic Structure Simple example

Simple example

- Simple circuit
- 2 inputs, a and b
- 1 output, c

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Introduction Basic Structure Simple example

Example.vec (absolute timing)

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Introduction Basic Structure Simple example

Example.vec (absolute timing)

START 0;

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Introduction Basic Structure Simple example

Example.vec (absolute timing)

START 0; STOP 100;

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Introduction Basic Structure Simple example

Example.vec (absolute timing)

START 0; STOP 100; INTERVAL 20;

Introduction Basic Structure Simple example

Example.vec (absolute timing)

START 0; STOP 100; INTERVAL 20; INPUTS a b;

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Introduction Basic Structure Simple example

Example.vec (absolute timing)

START 0; STOP 100; INTERVAL 20; INPUTS a b; % These are the inputs %

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Example.vec (absolute timing)

START 0; STOP 100; INTERVAL 20; INPUTS a b; % These are the inputs % PATTERN

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Example.vec (absolute timing)

START 0; STOP 100; INTERVAL 20; INPUTS a b; % These are the inputs % PATTERN 0> 0 0;

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Introduction Basic Structure Simple example

Example.vec (absolute timing)

START 0; STOP 100; INTERVAL 20; INPUTS a b; % These are the inputs % PATTERN 0> 0 0; 20> 0 1:

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Introduction Basic Structure Simple example

Example.vec (absolute timing)

START 0; STOP 100; INTERVAL 20; INPUTS a b; % These are the inputs % PATTERN 0> 0 0; 20> 0 1; 40> 1 0;

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Introduction Basic Structure Simple example

Example.vec (absolute timing)

START 0; STOP 100; INTERVAL 20; INPUTS a b; % These are the inputs % PATTERN 0> 0 0; 20> 0 1; 40> 1 0;

60> **1 1**;

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Introduction Basic Structure Simple example

Example.vec (absolute timing)

START 0; STOP 100; INTERVAL 20;

INPUTS a b; % These are the inputs %

PATTERN

0> 0 0;

20> 0 1;

40> 1 0;

60> **1 1**;

80> 0 0;

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Introduction Basic Structure Simple example

Example.vec (absolute timing)

START 0: STOP 100: INTERVAL 20: **INPUTS a b;** % These are the inputs % PATTERN **0**> **0 0**: **20**> 0 1: **40**> **1 0**: **60**> **1 1**:

 $80{>}$ 0 0; % Make sure the simulation goes to 80 ns %

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Introduction Basic Structure Simple example

Example.vec (absolute timing)

START 0: STOP 100: INTERVAL 20: **INPUTS a b;** % These are the inputs % PATTERN **0**> **0 0**: **20**> 0 1: **40**> **1 0**: **60**> **1 1**: 80 > 0 0; % Make sure the simulation goes to 80 ns % **OUTPUTS c:**

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Introduction Basic Structure Simple example

Example.vec (absolute timing)

START 0: STOP 100: INTERVAL 20: **INPUTS a b;** % These are the inputs % PATTERN **0**> **0 0**: **20**> 0 1: **40**> **1 0**: **60**> **1 1**: 80 > 0 0; % Make sure the simulation goes to 80 ns % **OUTPUTS c;** % This is the output %

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Introduction Basic Structure Simple example

Using absolute timing, you specify what values each variable should have at certain times.

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Introduction Basic Structure Simple example

Using absolute timing, you specify what values each variable should have at certain times.

So, in the example, the line

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Introduction Basic Structure Simple example

Using absolute timing, you specify what values each variable should have at certain times.

So, in the example, the line

0> 0 0;

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Introduction Basic Structure Simple example

Using absolute timing, you specify what values each variable should have at certain times.

So, in the example, the line

0> 0 0;

means "At time Ons, set inputs to 0 0 "

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Introduction Basic Structure Simple example

Using absolute timing, you specify what values each variable should have at certain times.

So, in the example, the line

0> 0 0;

means "At time Ons, set inputs to 0 0 " and line

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Introduction Basic Structure Simple example

Using absolute timing, you specify what values each variable should have at certain times. So, in the example, the line 0> 0 0; means "At time Ons, set inputs to 0 0 " and line

20> **0 1**;

200

Introduction Basic Structure Simple example

Using absolute timing, you specify what values each variable should have at certain times. So, in the example, the line 0>00; means "At time Ons, set inputs to 00" and line 20>01; means "At time 20ns, set inputs to 01"

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Introduction Basic Structure Simple example

Using absolute timing, you specify what values each variable should have at certain times. So, in the example, the line 0>00; means "At time Ons, set inputs to 00" and line 20>01; means "At time 20ns, set inputs to 01"

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Introduction Basic Structure Simple example

Example.vec (relative timing)

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Introduction Basic Structure Simple example

Example.vec (relative timing)

START 0;

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Introduction Basic Structure Simple example

Example.vec (relative timing)

START 0; STOP 100;

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Introduction Basic Structure Simple example

Example.vec (relative timing)

START 0; STOP 100; INTERVAL 20;

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Introduction Basic Structure Simple example

Example.vec (relative timing)

START 0; STOP 100; INTERVAL 20; INPUTS a b;

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Introduction Basic Structure Simple example

Example.vec (relative timing)

START 0; STOP 100; INTERVAL 20; INPUTS a b; % These are the inputs %

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Introduction Basic Structure Simple example

Example.vec (relative timing)

START 0; STOP 100; INTERVAL 20; INPUTS a b; % These are the inputs % PATTERN

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Introduction Basic Structure Simple example

Example.vec (relative timing)

START 0; STOP 100; INTERVAL 20; INPUTS a b; % These are the inputs % PATTERN 0 0

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Introduction Basic Structure Simple example

Example.vec (relative timing)

START 0; STOP 100; INTERVAL 20; INPUTS a b; % These are the inputs % PATTERN 0 0

01

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Introduction Basic Structure Simple example

Example.vec (relative timing)

START 0; STOP 100; INTERVAL 20; INPUTS a b; % These are the inputs % PATTERN 0 0 0 1

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Introduction Basic Structure Simple example

Example.vec (relative timing)

START 0: **STOP 100: INTERVAL 20: INPUTS a b;** % These are the inputs % PATTERN 00 01 10

1 1;

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Introduction Basic Structure Simple example

Example.vec (relative timing)

START 0: **STOP 100: INTERVAL 20: INPUTS a b;** % These are the inputs % PATTERN 00 01 10 **1** 1; % Note the single semicolon at the end %

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Introduction Basic Structure Simple example

Example.vec (relative timing)

START 0: **STOP 100:** INTERVAL 20: **INPUTS** a b; % These are the inputs % PATTERN 00 01 10 **1** 1; % Note the single semicolon at the end % OUTPUTS c:

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Introduction Basic Structure Simple example

Example.vec (relative timing)

START 0: **STOP 100:** INTERVAL 20: **INPUTS a b;** % These are the inputs % PATTERN 0 0 01 10 **1** 1; % Note the single semicolon at the end % **OUTPUTS c:** % This is the output %

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Introduction Basic Structure Simple example

Using relative timing, you specify what values each variable should have at each *interval*.

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Introduction Basic Structure Simple example

Using relative timing, you specify what values each variable should have at each *interval*. So, in the example, the line

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Introduction Basic Structure Simple example

Using relative timing, you specify what values each variable should have at each *interval*. So, in the example, the line $0 \ 0$

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Introduction Basic Structure Simple example

Using relative timing, you specify what values each variable should have at each *interval*. So, in the example, the line 0 0

means "Set inputs to 0 0 at time 0"

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and the line

Introduction Basic Structure Simple example

Using relative timing, you specify what values each variable should have at each *interval*. So, in the example, the line **0** means *"Set inputs to 0 0 at time 0"*

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Introduction Basic Structure Simple example

Using relative timing, you specify what values each variable should have at each *interval*. So, in the example, the line **00** means *"Set inputs to 0 0 at time 0"* and the line **01**

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Introduction Basic Structure Simple example

Using relative timing, you specify what values each variable should have at each *interval*. So, in the example, the line **00** means *"Set inputs to 0 0 at time 0"* and the line **01** means *"Set inputs to 0 1 at the first interval"*

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Introduction Basic Structure Simple example

Notice that in the relative timing file,

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Introduction Basic Structure Simple example

Notice that in the relative timing file, INPUTS a b; % These are the inputs % PATTERN

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Using vector Files in Quartus II

Introduction Basic Structure Simple example

Notice that in the relative timing file,

INPUTS a b; % These are the inputs % **PATTERN**

- 0 0
- 01
- 1 0
- 11;

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Using vector Files in Quartus II

Introduction Basic Structure Simple example

Notice that in the relative timing file,

INPUTS a b; % These are the inputs % PATTERN

- 0 0
- 01
- 1 0
- 11;

the highlighted lines are directly from the truth table.

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Using vector Files in Quartus II

Introduction Basic Structure Simple example

Notice that in the relative timing file,

```
INPUTS a b; % These are the inputs % PATTERN
```

- 01
- 10
- 11,

the highlighted lines are directly from the truth table. This makes it easy to use the truth table to make a vector file.

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