va * vb
= ((ha << 16) + la) * ((hb << 16) + lb)
= (ha << 16) * (hb << 16) + (ha << 16) * lb + la *(hb << 16) + la * lb
= ((ha * hb) << 32) + (ha << 16) * lb + la *(hb << 16) + la * lb

input [31:0] operand_a,
input [31:0] operand_b,

32 x 32

```
assign a_upper = operand_a[31:16];
assign a_lower = operand_a[15:0];
assign b_upper = operand_b[31:16];
assign b_lower = operand_b[15:0];
```

Stage 1

a_upper b_upper p0

16 x 16

p0_padded = {p0, 32'h0000};

Stage 2

a_upper b_lower p1

16 x 16

p1_padded = {16'h0000, p1, 16'h0000};

Stage 3

a_lower b_upper p2

16 x 16

p2_padded = {16'h0000, p2, 16'h0000};

Stage 4

a_lower b_lower p3

16 x 16

p3_padded = {32'h0000, p3};

result = p0_padded + p1_padded + p2_padded + p3_padded;

```
wire [31:0] p0;
wire [31:0] p1;
wire [31:0] p2;
wire [31:0] p3;
```