

In order to implement additions with DSPs we should use the RESOURCE directive and bind the addition to AddSub\_DSP core.

```
#pragma HLS RESOURCE variable=r core=AddSub_DSP
```

In this directive, we should explicitly mention the name of the target variable (here *r*). But some additions may be removed or added to the expression by the synthesis optimisation techniques.

To prevent this phenomenon, we can define a separate function for addition and disable the *inlining* feature. Then add the resource directive as shown in the code below. In this code, all additions are implemented by DSPs, and LUTs implement all multiplications.

```
int mult_func(int a, int b) {
#pragma HLS INLINE off
    int r;
#pragma HLS RESOURCE variable=r core=Mul_LUT
    r = a*b;
    return r;
}

int add_func(int a, int b) {
#pragma HLS INLINE off
    int r;
#pragma HLS RESOURCE variable=r core=AddSub_DSP
    r = a+b;
    return r;
}

void arith_exp_dsp(int a, int b, int c, int *f ) {

#pragma HLS INTERFACE ap_ctrl_none port=return
#pragma HLS INTERFACE ap_none port=a
#pragma HLS INTERFACE ap_none port=b
#pragma HLS INTERFACE ap_none port=c
#pragma HLS INTERFACE ap_none port=f

    int m1 = mult_func(a, b);
    int m2 = mult_func(a, c);
    int m3 = mult_func(c, b);
    int m4 = mult_func(m1, c);

    int a1 = add_func(m1, m2);
    int a2 = add_func(a1, m3);
    *f = add_func(a2, m4);
}
```

The synthesis report shown in Figure 1 shows that the resulted hardware utilises only 2 instances of DSPs.

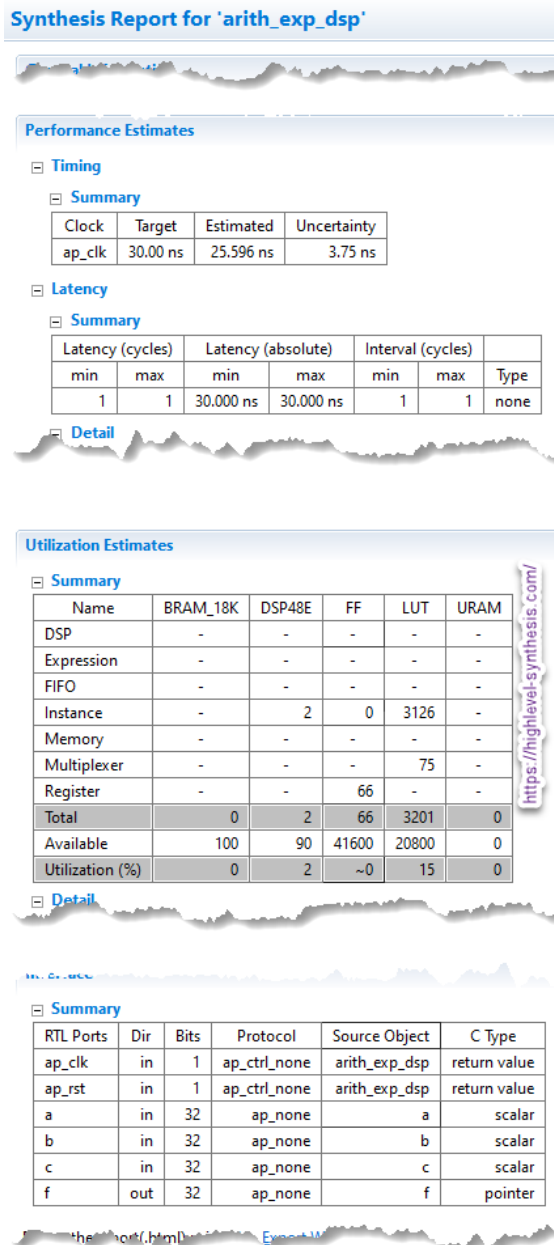


Figure 1

To make sure that DSPs implement all additions, you can have a look at the analysis perspective, as shown in Figure 2. As can be seen, the addition operator (labelled with 1) inside the corresponding function is implemented by the AddSub\_DSP code labelled by 2.

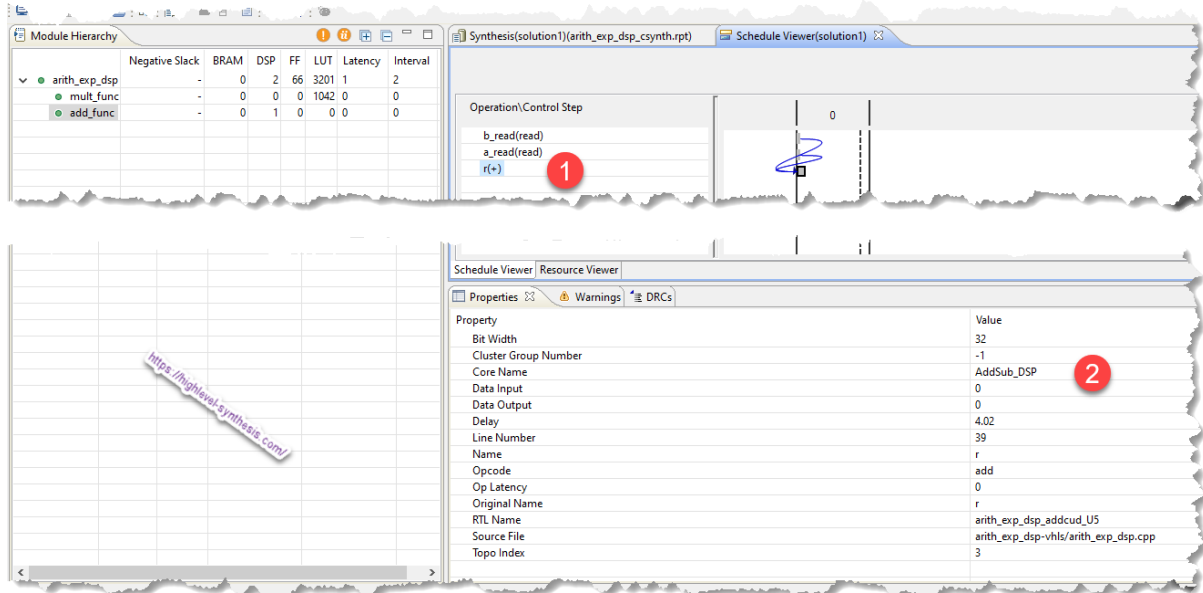


Figure 2