

## **Version with $2^{10} = 1,024$**

Difference: 10,235 cycles , which represents 0,00569%

With: 179836107

```
D:\Repos\llvm-rl78\tests\lit\tests\tickets\ticket_3126\merkle-trees\version2>clang -fsim -O3 -fdata-sections -ffunction-sections -WL,--gc-sections -Tlinker_script.ld merkle-tree-v2-full-code.c -o merkle-tree-v2-full-code-with-function-speed-O3.out
```

```
D:\Repos\llvm-rl78\tests\lit\tests\tickets\ticket_3126\merkle-trees\version2>rl78-elf-sim -v merkle-tree-v2-full-code-with-function-speed-O3.out Exit code: 0 total clocks: 179836107
```

Without: 179846342

```
D:\Repos\llvm-rl78\tests\lit\tests\tickets\ticket_3126\merkle-trees\version2>clang -fsim -O3 -fdata-sections -ffunction-sections -WL,--gc-sections -Tlinker_script.ld merkle-tree-v2-full-code.c -o merkle-tree-v2-full-code-without-function-speed-O3.out
```

```
D:\Repos\llvm-rl78\tests\lit\tests\tickets\ticket_3126\merkle-trees\version2>rl78-elf-sim -v merkle-tree-v2-full-code-without-function-speed-O3.out Exit code: 0 total clocks: 179846342
```

## **Version with $2^{20} = 1,048,576$**

Difference: 10,485,755 , which represents 0,0 056 930 729 %

Without function: 184184450304

```
D:\Repos\llvm-rl78\tests\lit\tests\tickets\ticket_3126\merkle-trees\version2>clang -fsim -O3 -fdata-sections -ffunction-sections -WL,--gc-sections -Tlinker_script.ld merkle-tree-v2-full-code.c -o merkle-tree-v2-full-code-20-without-function.out
```

```
D:\Repos\llvm-rl78\tests\lit\tests\tickets\ticket_3126\merkle-trees\version2>rl78-elf-sim -v merkle-tree-v2-full-code-20-without-function.out Exit code: 0 total clocks: 184184450304
```

With function: 184173964549

```
D:\Repos\llvm-rl78\tests\lit\tests\tickets\ticket_3126\merkle-trees\version2>clang -fsim -O3 -fdata-sections -ffunction-sections -WL,--gc-sections -Tlinker_script.ld merkle-tree-v2-full-code.c -o merkle-tree-v2-full-code-20-with-function.out
```

```
D:\Repos\llvm-rl78\tests\lit\tests\tickets\ticket_3126\merkle-trees\version2>rl78-elf-sim -v merkle-tree-v2-full-code-20-with-function.out Exit code: 0 total clocks: 184173964549
```

**Formula:  $[\text{inaltime}(\text{nr frunze}) + \text{inaltime} - 1(\text{nr parinti})] * 5 = \text{cicluri castigate}$**

**Formula Simplificata:  $(2^N - 1) * 5 = \text{cicluri castigate}$** , unde N este numarul de noduri ( $2^x$ ).

**1.  $2^{10} = 1,024$**

Fara optimizare: 179,846,342 cicluri

Cu optimizare: 179,836,107 cicluri

Câştig/ Diferenţă: 10,235 cicluri

Verificare:

$(1,024 + 1,023) * 5 = 10,235 \Leftrightarrow 2,047 * 5 = 10,235 \Leftrightarrow 10,235 = 10,235$  **ADEVARAT**

**2.  $2^{20} = 1,048,576$**

Fara optimizare: 184184450304 cicluri

Cu optimizare: 184173964549 cicluri

Câștig/ Diferență: 10,485,755 cicluri

Verificare:

$$(1,048,576 + 1,048,575) * 5 = 10,485,755 \Leftrightarrow 2,097,151 * 5 = 10,485,755$$

$$\Leftrightarrow 10,485,755 = 10,485,755 \text{ ADEVARAT}$$

### Extrapolări

**Formula:  $[\text{inaltime (nr frunze)} + \text{inaltime} - 1 \text{ (nr parinti)}] * 5 = \text{cicluri castigate}$**

**1.  $2M = 2^{21} = 2,097,152$**

$$(2,097,152 + 2,097,151) * 5 = 4,194,303 * 5 = \mathbf{20,971,515}$$

**2.  $4M = 2^{22} = 4,194,304$**

$$(4,194,304 + 4,194,303) * 5 = 8,388,607 * 5 = \mathbf{41,943,035}$$

**3.  $8M = 2^{23} = 8,388,608$**

$$(8,388,608 + 8,388,607) * 5 = 16,777,215 * 5 = \mathbf{83,886,075}$$

## Viteză

Link: <https://www.renesas.com/en/products/rl78-g23?srsId=AfmBOoqjsbyTxXR3ot15l8mLBEzNXS58rrF-Nm06PgyAEw-Y1m-6ElSP>

Conform linkului de mai sus, familia **RL78/G23** are 3 diferite:

*On-chip Oscillator Freq. (MHz): High-Speed: up to 32MHz*

*Middle-Speed: up to 4MHz*

*Low-speed: 32.768kHz*