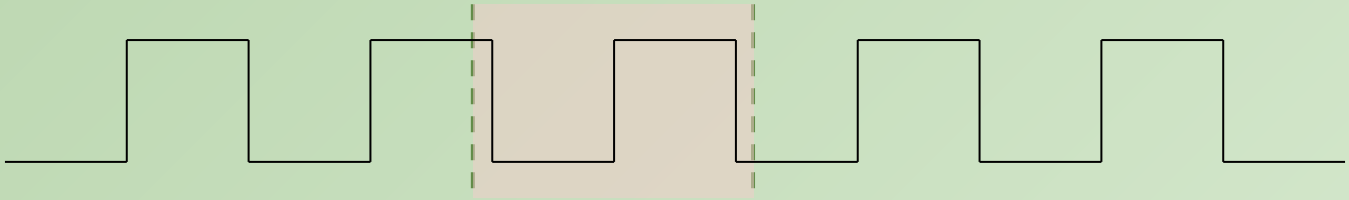

OX
CB
BARE
METAL

Evaluating performance

Time elapsed

Clock cycles

1 clock cycle



(The Pico does 125,000,000 per second.)

$$\frac{125000000\,cycles}{1\,second} = 125\,MHz$$

Clock speed

- Governs the number of operations executed in a given second
- Some instructions take more than one cycle, others can be performed in parallel

DISASSEMBLY

```
100003b4 <f_recursive>:
100003b4:    b510          push{r4, lr}
100003b6:    0004          movsr4, r0
100003b8:    2801          cmp  r0, #1
100003ba:    d003          beq.n    100003c4 <f_recursive+0x10>
100003bc:    3801          subsr0, #1
100003be:    f7ff fff9     bl   100003b4 <f_recursive>
100003c2:    4360          mulsr0, r4
100003c4:    bd10          pop  {r4, pc}
```

DISASSEMBLY

```
100003c6 <f_iterative>:
100003c6:    0003        movs r3, r0
100003c8:    e001        b.n  100003ce <f_iterative+0x8>
100003ca:    3b01        subs r3, #1
100003cc:    4358        muls r0, r3
100003ce:    2b01        cmp  r3, #1
100003d0:    dcfb        bgt.n    100003ca <f_iterative+0x4>
100003d2:    4770        bx   lr
```

DISASSEMBLY

```
10000400 <a_array>:
10000408:    2300         movs r3, #0
1000040a:    e000         b.n  1000040e <a_array+0xe>
1000040c:    3301         adds r3, #1
1000040e:    42a3         cmp  r3, r4
10000410:    dbfc         blt.n    1000040c <a_array+0xc>
```

DISASSEMBLY

```
10000428 <a_struct>:
10000430:    e000         b.n  10000434 <a_struct+0xc>
10000432:    6864         ldr  r4, [r4, #4]
10000434:    2c00         cmp  r4, #0
10000436:    d1fc         bne.n    10000432 <a_struct+0xa>
```

Amdahl's Law

"the overall performance improvement gained by optimizing a single part of a system is limited by the fraction of time that the improved part is actually used