PARAPY

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WHY PARAPY?

- Python is simple to use, but incredibly slow
- Limited modules to exploit parallelism
  - CPU Only

WHAT IS PARAPY?

- Module which allows user to utilize GPU
- Almost NO deviation from standard, easy Python code
- Never write a CUDA kernel or C++ code

HOW IT WORKS – USER PERSPECTIVE

```python
def mandelbrotPy(c_re,c_im,maxiter):
    z_re = c_re
    z_im = c_im
    for i in xrange(maxiter):
        if (z_re * z_re + z_im * z_im > 4.0):
            return i
        new_re = z_re*z_re - z_im*z_im
        new_im = 2 * z_re * z_im
        z_re = c_re + new_re
        z_im = c_im + new_im
    return maxiter
```

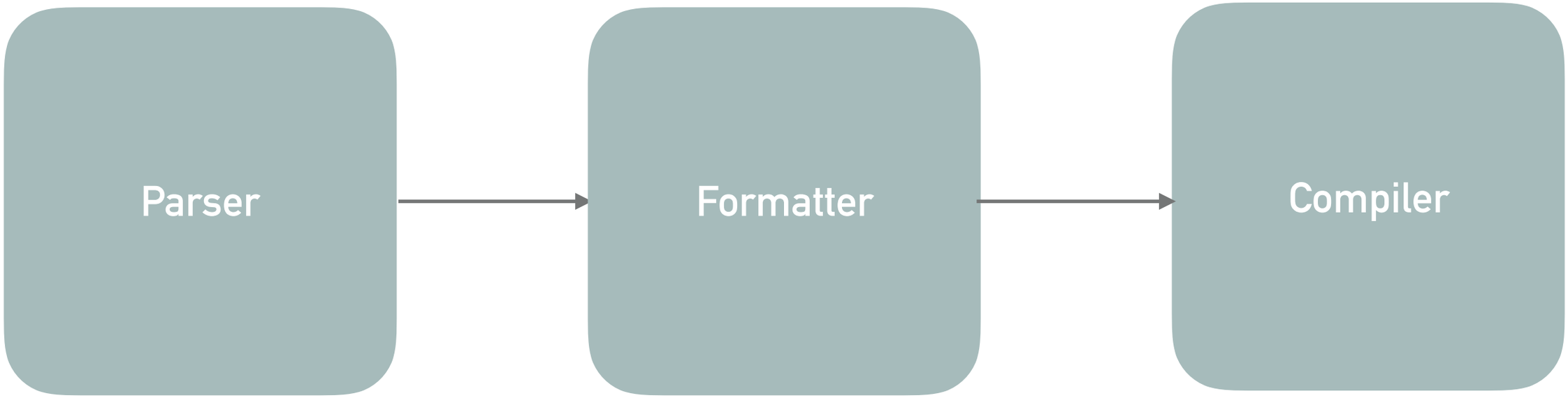
Original Python Code

```python
def mandelDemo(rArray,iArray,maxiter,output):
    c_re = rArray[index]
    c_im = iArray[index]
    z_re = c_re
    z_im = c_im
    for i in xrange(maxiter):
        if (z_re * z_re + z_im * z_im > 4.0):
            output[index]= i
            return None
        new_re = z_re*z_re - z_im*z_im
        new_im = 2 * z_re * z_im
        z_re = c_re + new_re
        z_im = c_im + new_im
    output[index]= maxiter
```

Modified Python Code

```python
c = Compiler("CUDA-MAP",blocksize,mandelDemo,length,rArray,iArray,maxiter,output)
```

HOW IT WORKS – INSIDE THE MODULE



HOW IT WORKS – INSIDE THE MODULE – PARSER

- User's Python function is broken down into a syntax tree
- Inspect and AST modules are used
- Each line is broken down into nodes

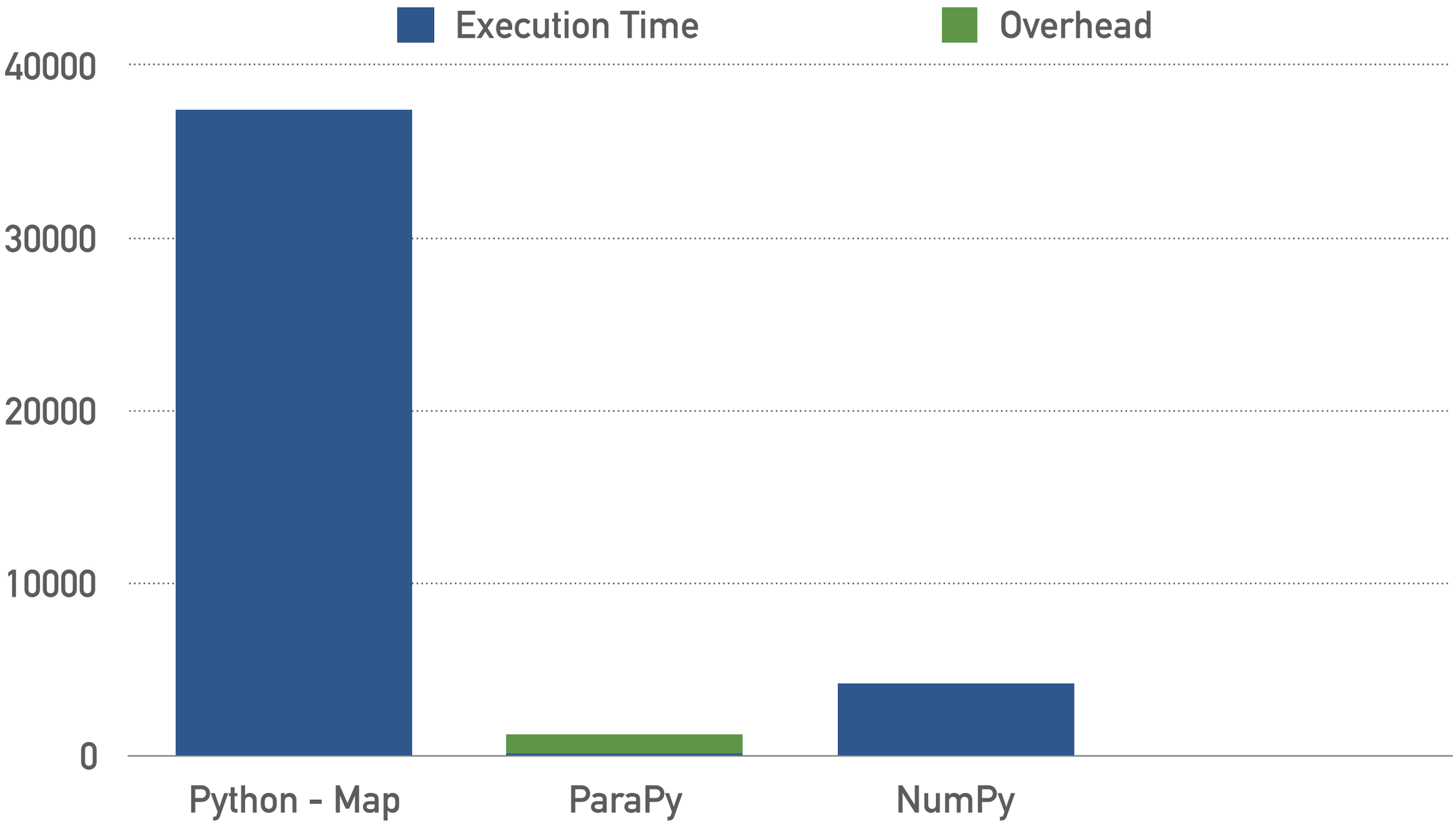
HOW IT WORKS – INSIDE THE MODULE – FORMATTER

- Formatter takes the nodes
- Based on the option specified, outputs corresponding CUDA or C++ code as a code-string

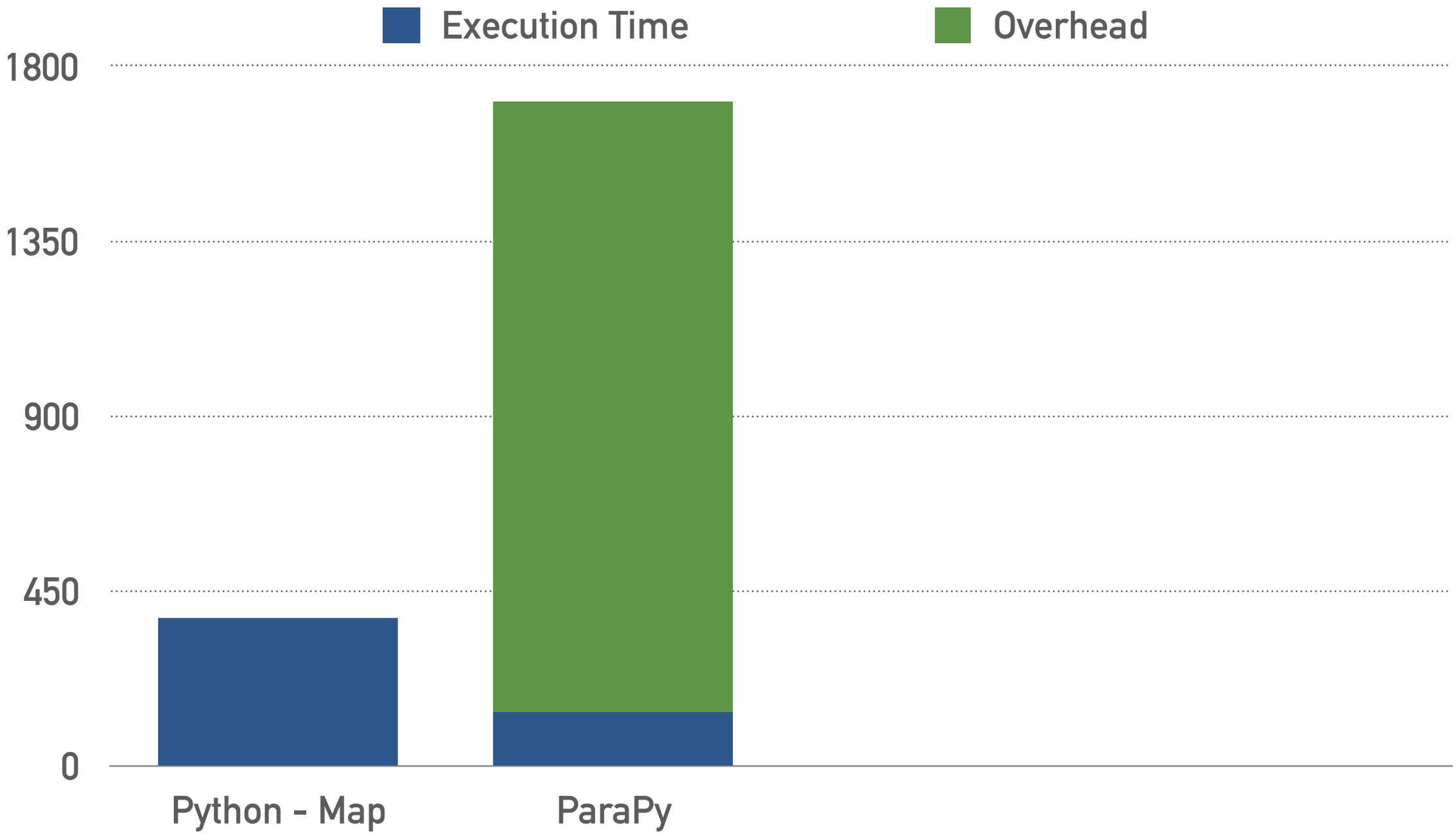
HOW IT WORKS – INSIDE THE MODULE – COMPILER

- Takes the code-string and makes a file
- Compiles file with the appropriate compiler (nvcc, c++)

EXAMPLE – MANDELBROT



EXAMPLE – SAXPY (1000000 ELEMENTS)



Questions?