

????Numpy
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?????Numpy???

 Numpy LAPACK

[illegible]

☐ ☐ ☐ ☐ ☐ ☐ ☐ Numpy ☐ ☐ ☐ ☐ LAPACK

☐ MKL ☒ OpenBLAS ☐ ATLAS

Intel CPU MKL

```
conda install numpy
```

☐ Anaconda ☐ CPU ☐ Intel ☐ MKL ☐ AMD ☐ OpenBLAS

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ conda-forge ☐ ☐ ☐ ☐ ☐ ☐

pip

```
pip install numpy
```

OpenBLAS

MKL???

MKL

Numpy

MKL_NUM_THREADS

Numpy

-

CPU

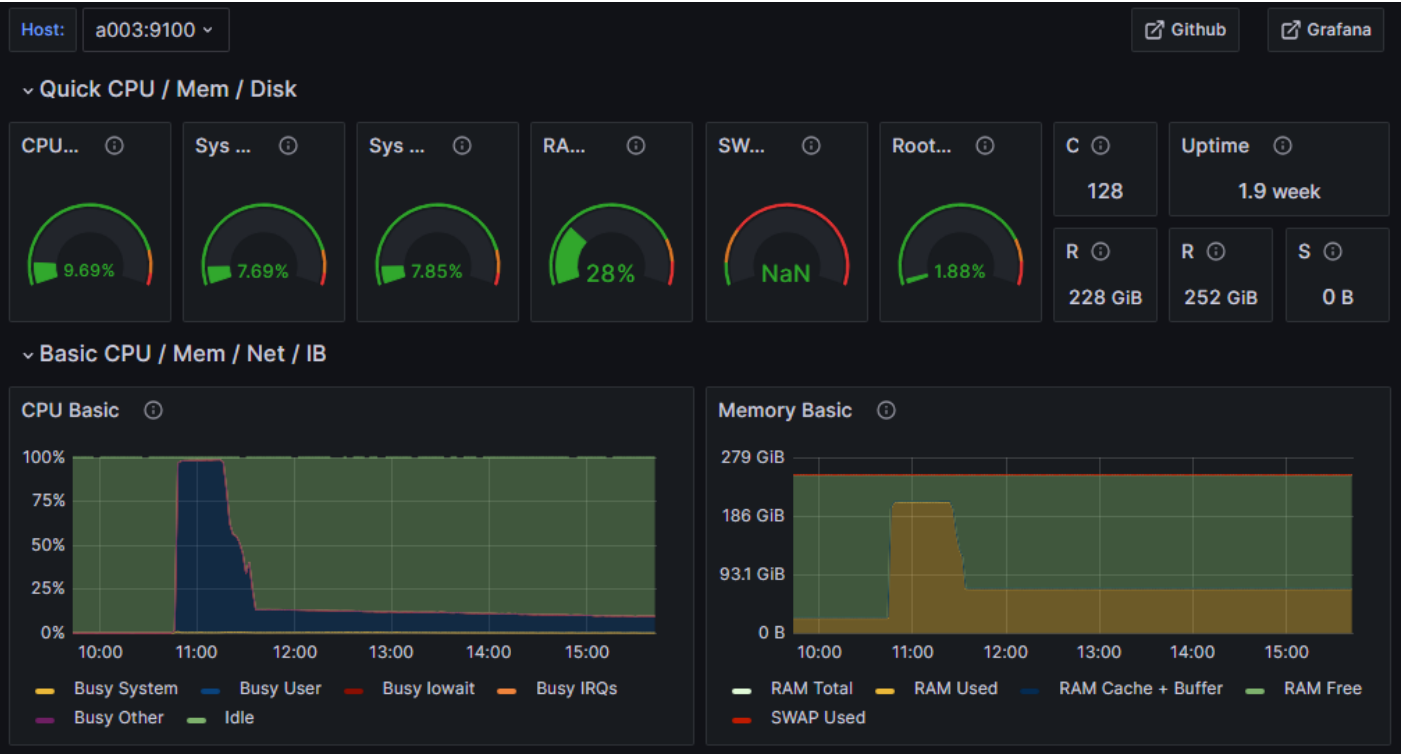
MKL

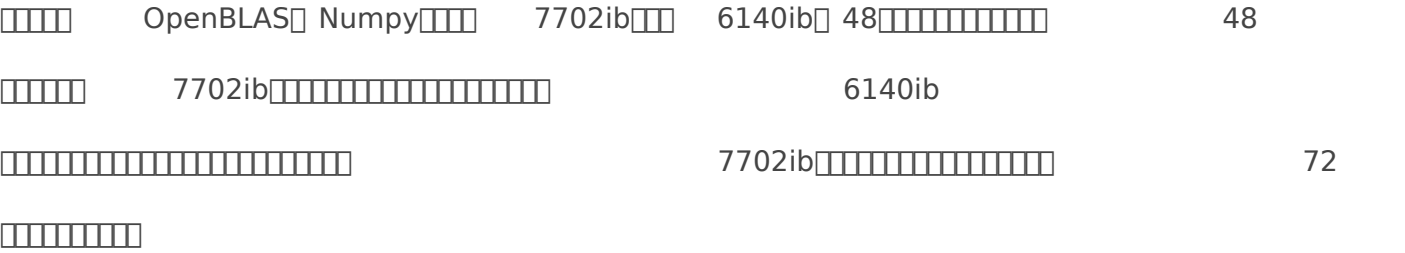
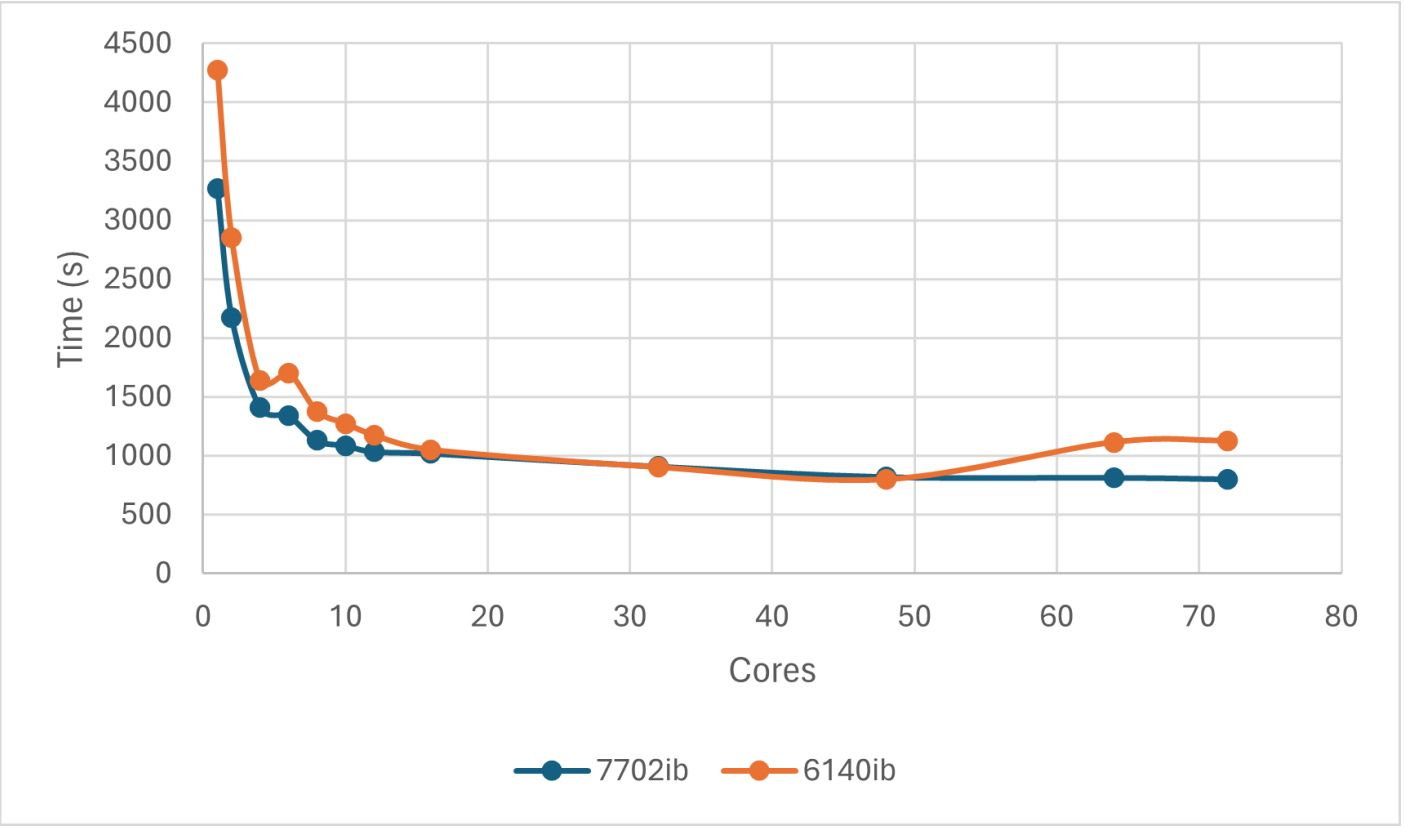
OpenBLAS

AMD

MKL_DEBUG_CPU_TYPE=5

MKL





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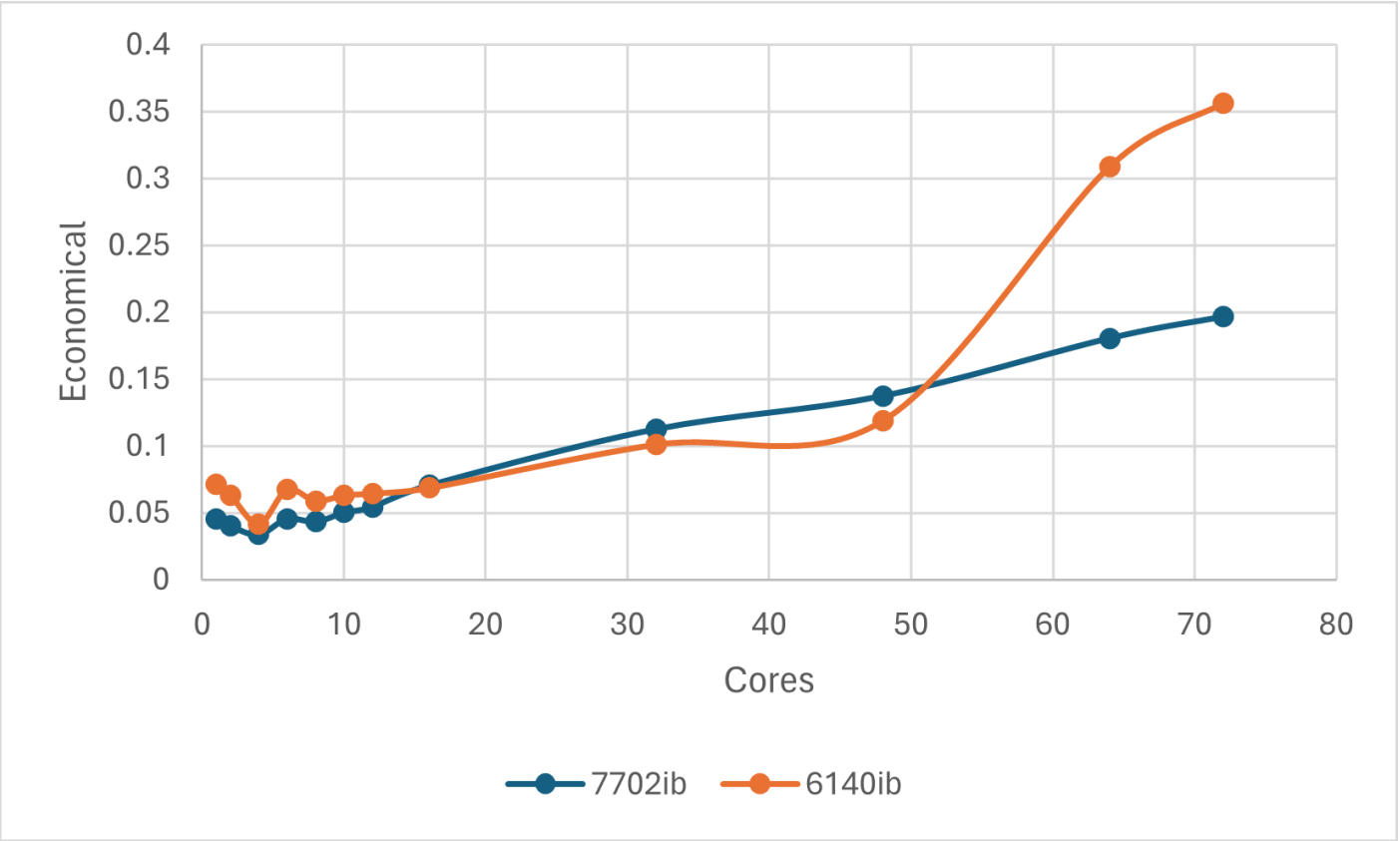
$$T_{total} = N_{task} \times \left(\frac{N_{max}}{N_{cores}} \right)^{-1} \times T_p(N_{cores})$$

$$= \frac{N_{task}}{N_{max}} \times N_{cores} \times T_p(N_{cores})$$

```

def main(N_task, N_max, N_cores, T_p):
    # N_cores = N_max // N_task
    # T_p = T_p(N_cores)
    T_total = (N_task / N_max) * N_cores * T_p
    return T_total

```



```

import numpy as np
from openblas import openblas

# 4 cores

```

??

NumPy

1. NumPy

2. MKL NumPy NumPy

LAPACK MKL
OpenBLAS

3. NumPy 4~5

4~16 4