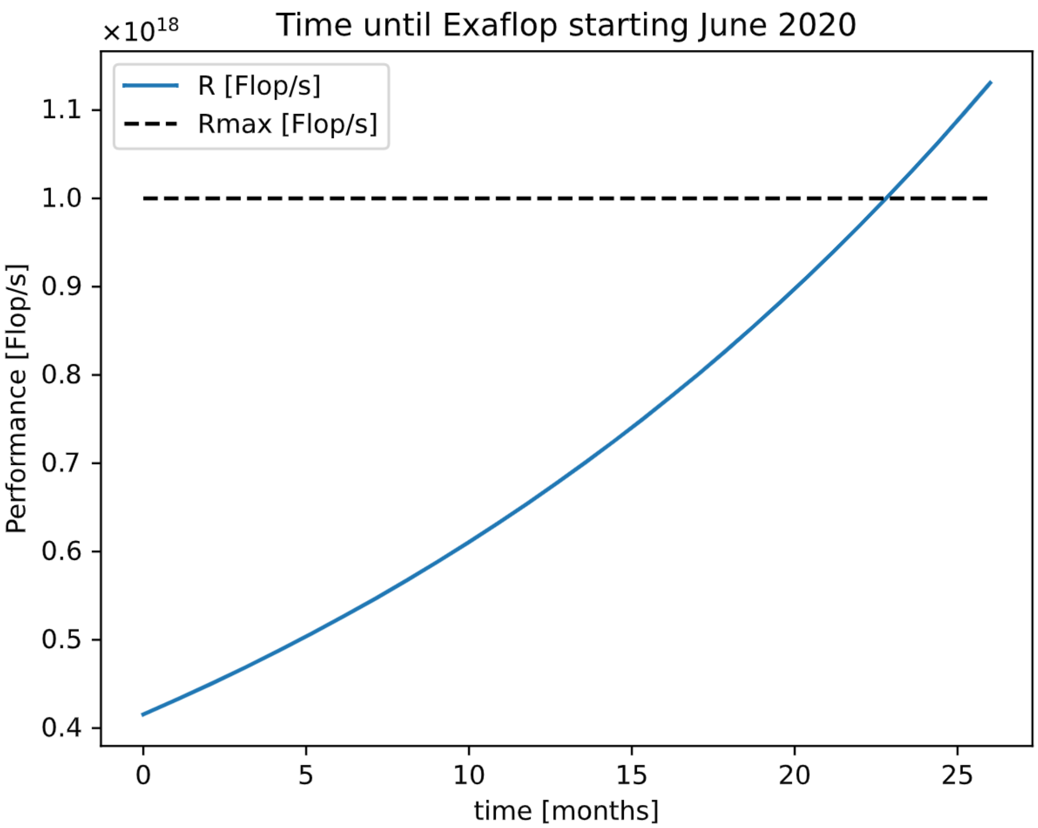
1.2 Moore's Law

1.2.1

double performance every 18 months: $R(t) = N_0 \cdot 2^{\frac{1}{18} t}$

where N0 is 415.53 PetaFlops/s (Supercomputer Fugaku) (1) data from 06/2020 $N_0 := 415.53 \cdot 10^{15}$ "Flops/s"

solve for t, when performance reaches one Exaflop $10^{18} = N_0 \cdot 2^{\frac{1}{18} t} \xrightarrow{solve, t \atop float, 3} 22.8$ "months"



summary: the datapoint June 2020 was choosen, because it is the first appearance of the supercomputer Fugaku. Ttaking this data in consideration, it is expected to reach the one Exaflop era after 22.8 months, concluding in the year 2022.

Checking the result against available data, it shows that the one Exaflop threshold was indeed achieved in june 2022 by the supercomputer Frontier

1 https://www.top500.org/lists/top500/2020/06/
2 https://www.top500.org/lists/top500/2022/06/

1.2.2

11/2007 Blue Gen 478.2 TFlops/s 3
11/2011 K computer 10510.0 TFlops/s 4

growthrate: $100 \cdot \frac{10510 - 478.2}{478.2} \xrightarrow{float,3} 2097.0$ "%"

exponential growing process: $R(t) = N_0 \cdot a^{\lambda \cdot t}$

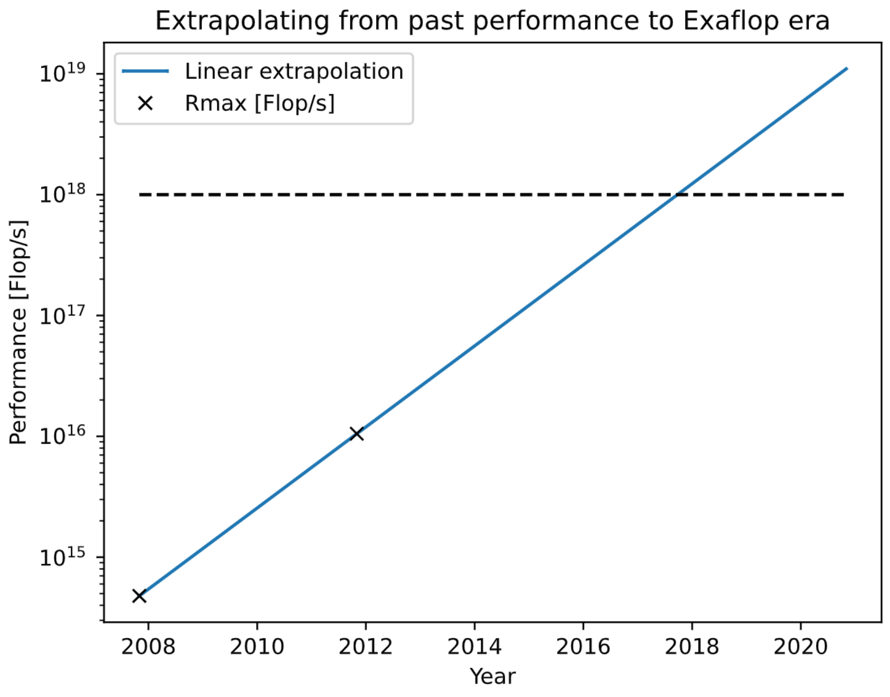
start value: $N_0 := 478.2 \cdot 10^{12}$ "Flops/s"

second datapoint: year after start and value $t := 4$ "year" $R := 10510 \cdot 10^{12}$ "Flops/s"

solve for λ: $\lambda := R = N_0 \cdot a^{\lambda \cdot t} \xrightarrow[float,3]{solve,\lambda} \frac{0.773}{\ln(a)}$

calculate the amount of years to reache one Exaflop/s $10^{18} = N_0 \cdot a^{\lambda \cdot t_{exa}} \xrightarrow[float,3]{solve,t_{exa}} 9.89$ "years"

summary: extrapolate from give data, the one Exaflop/s threshold will be overcome after 9.89 years. The calculation shows that the one ExaFlop/s era is predicted for End of 2017. It need to be mentioned that extrapolation is not a robust method.



3 https://www.top500.org/lists/top500/2007/11/
4 https://www.top500.org/lists/top500/2011/11/