

**three little
modeling problems**

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april 15, 2011

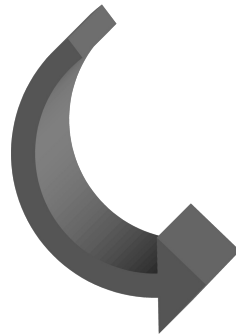
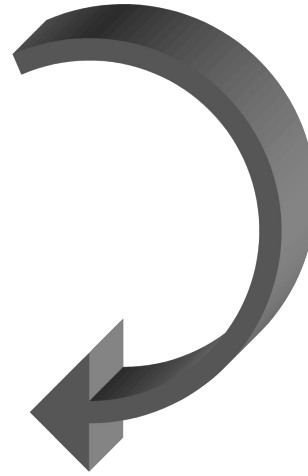
`http://irs.gov/`

404 tax return not found...



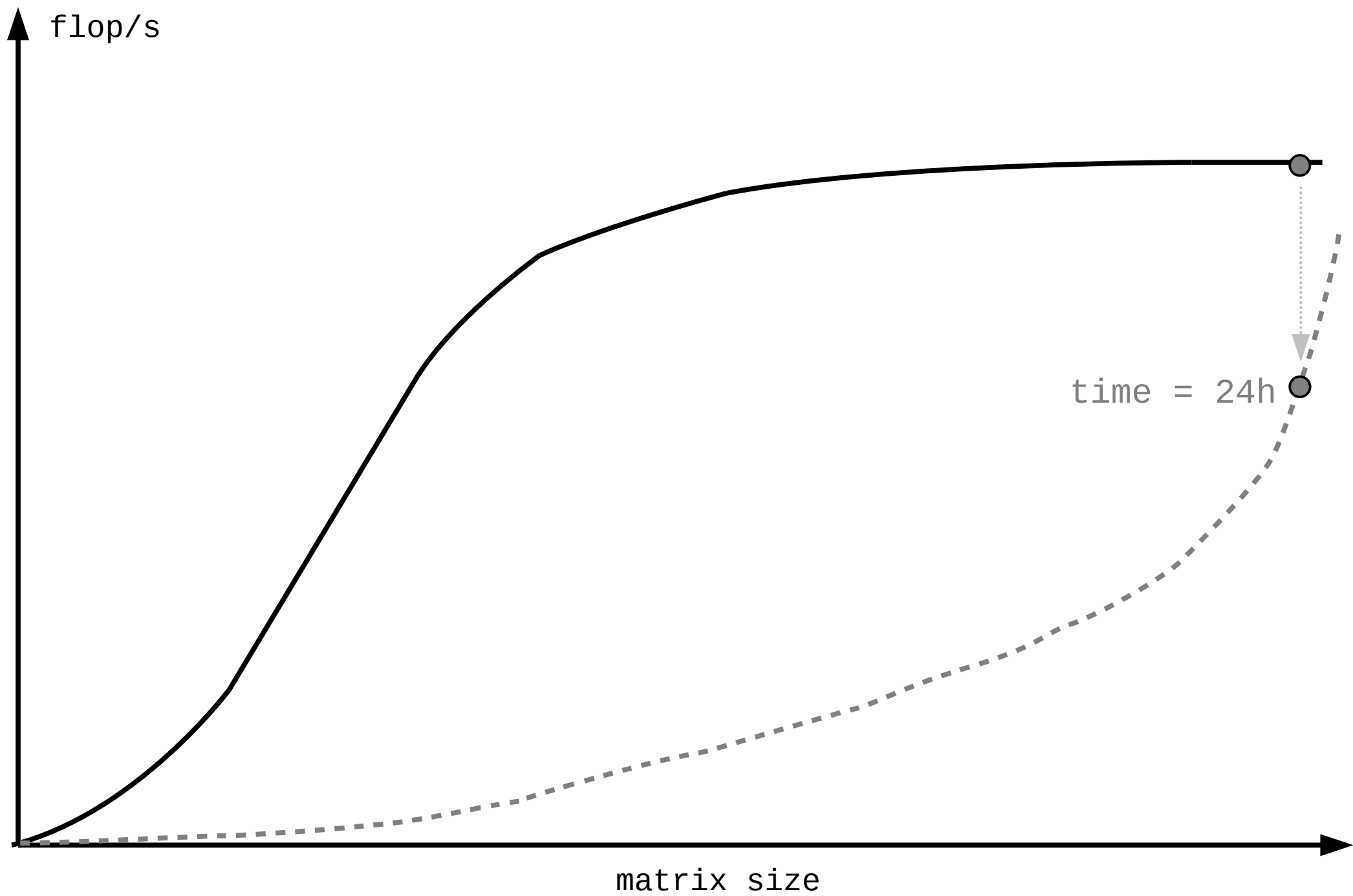
Run LINPACK

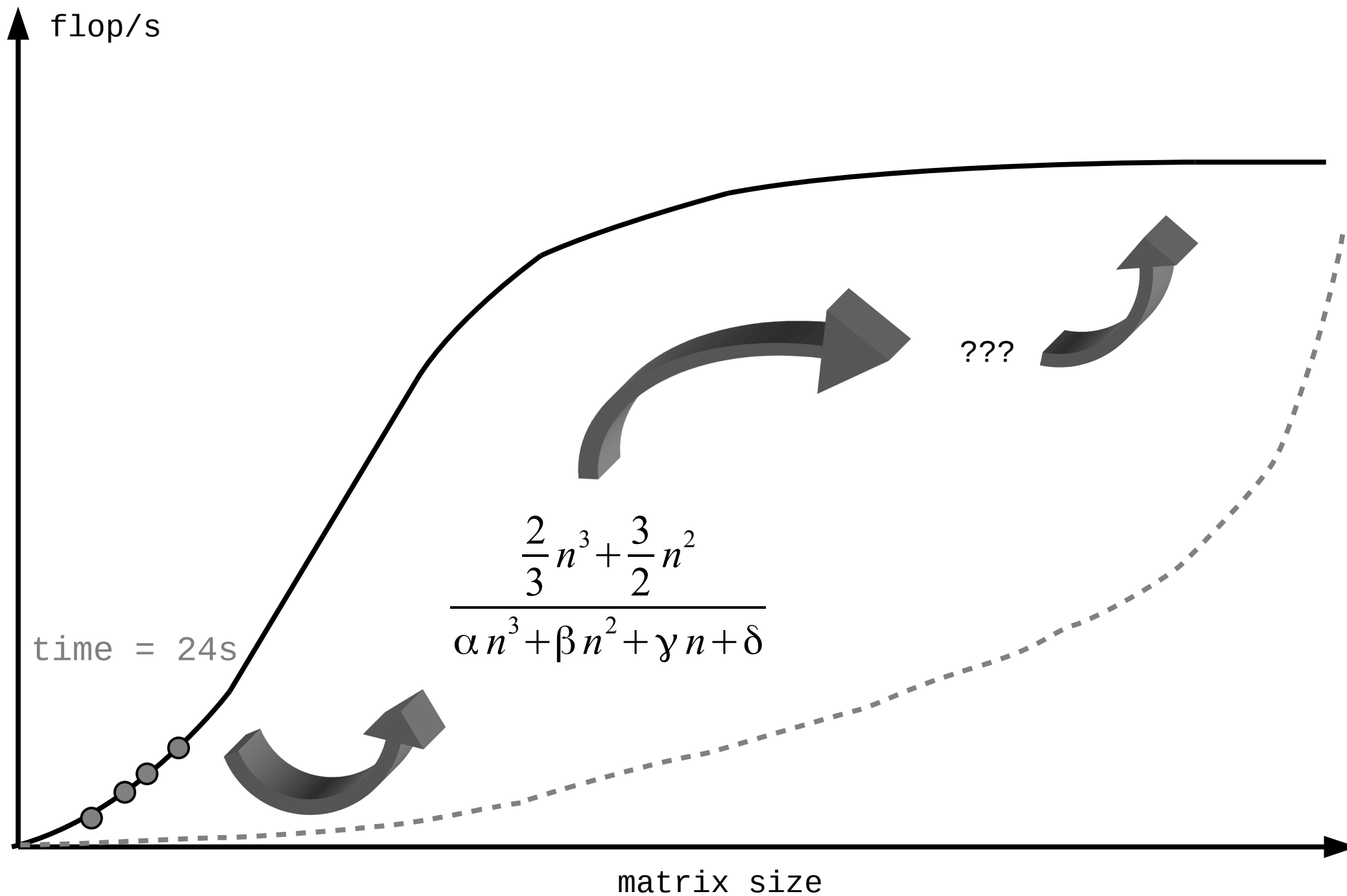
24h later...



<http://top500.org/>

1.	titanormous	101	Eflop/s
2.	manticore	97	Eflop/s
3.	night hawk	85	Eflop/s
4.	early dawn	56	
5.	red cliff	32	
6.	late dusk	10	
7.			





Step 1 : $Ax = \lambda x$

Step 2 : $T_b x = \lambda x \quad \wedge \quad V_b T_b = A V_b$

Step 3 : $T x = \lambda x \quad \wedge \quad V T = A V$

$$A = U \Sigma V^T$$

$$B_b = U_b \Sigma V_b$$

$$B = U' \Sigma V'$$

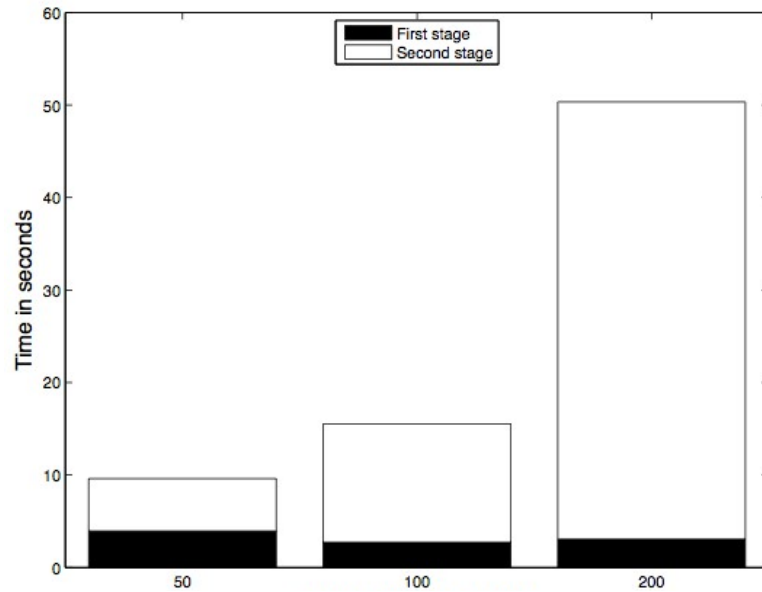


Step 1: $Tx = \lambda x$

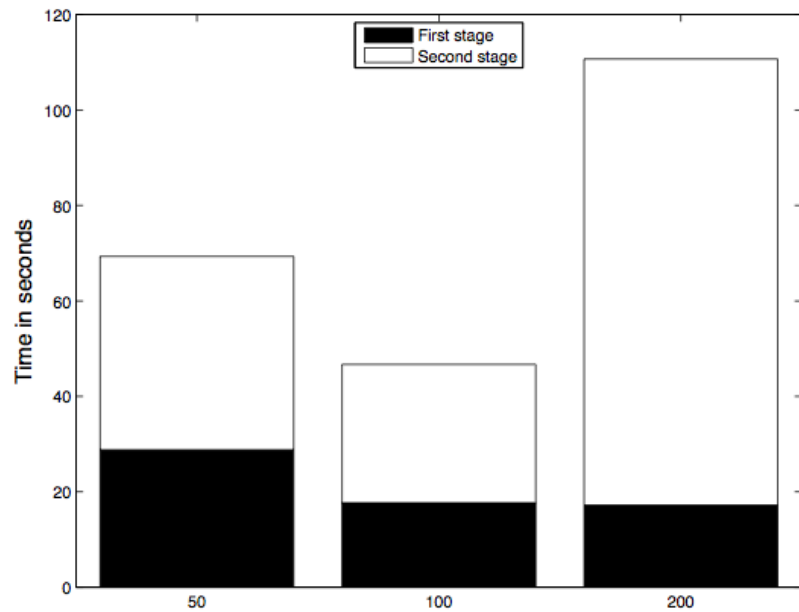
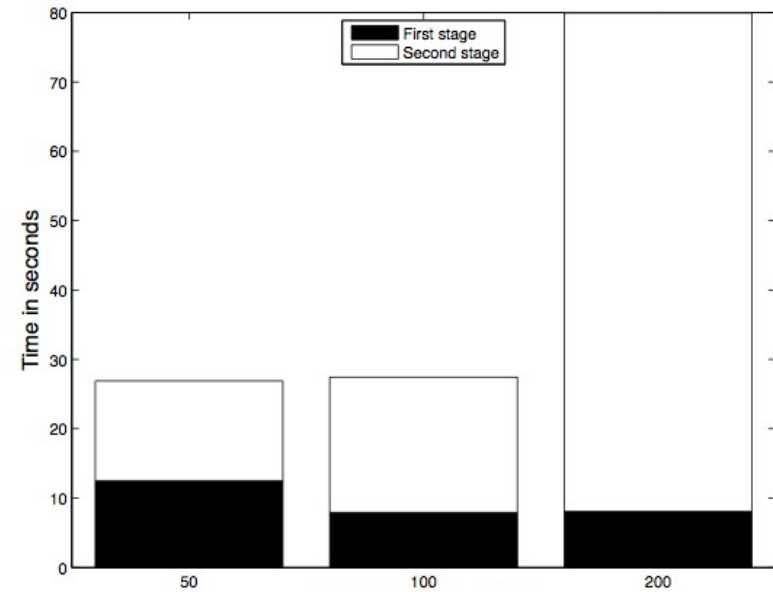
Step 2: $T_b x = \lambda x \wedge V_b T_b = A V_b$

Step 3: $T x = \lambda x \wedge V T = A V$

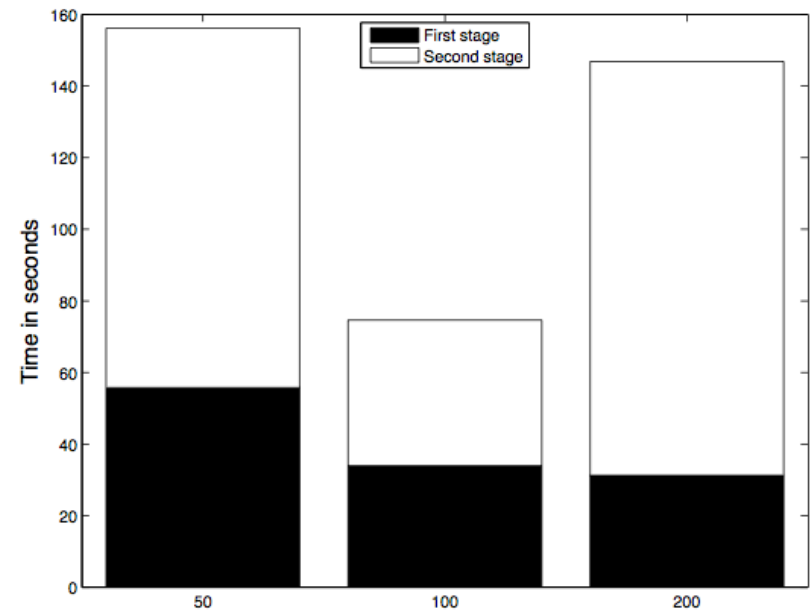
4000



6000

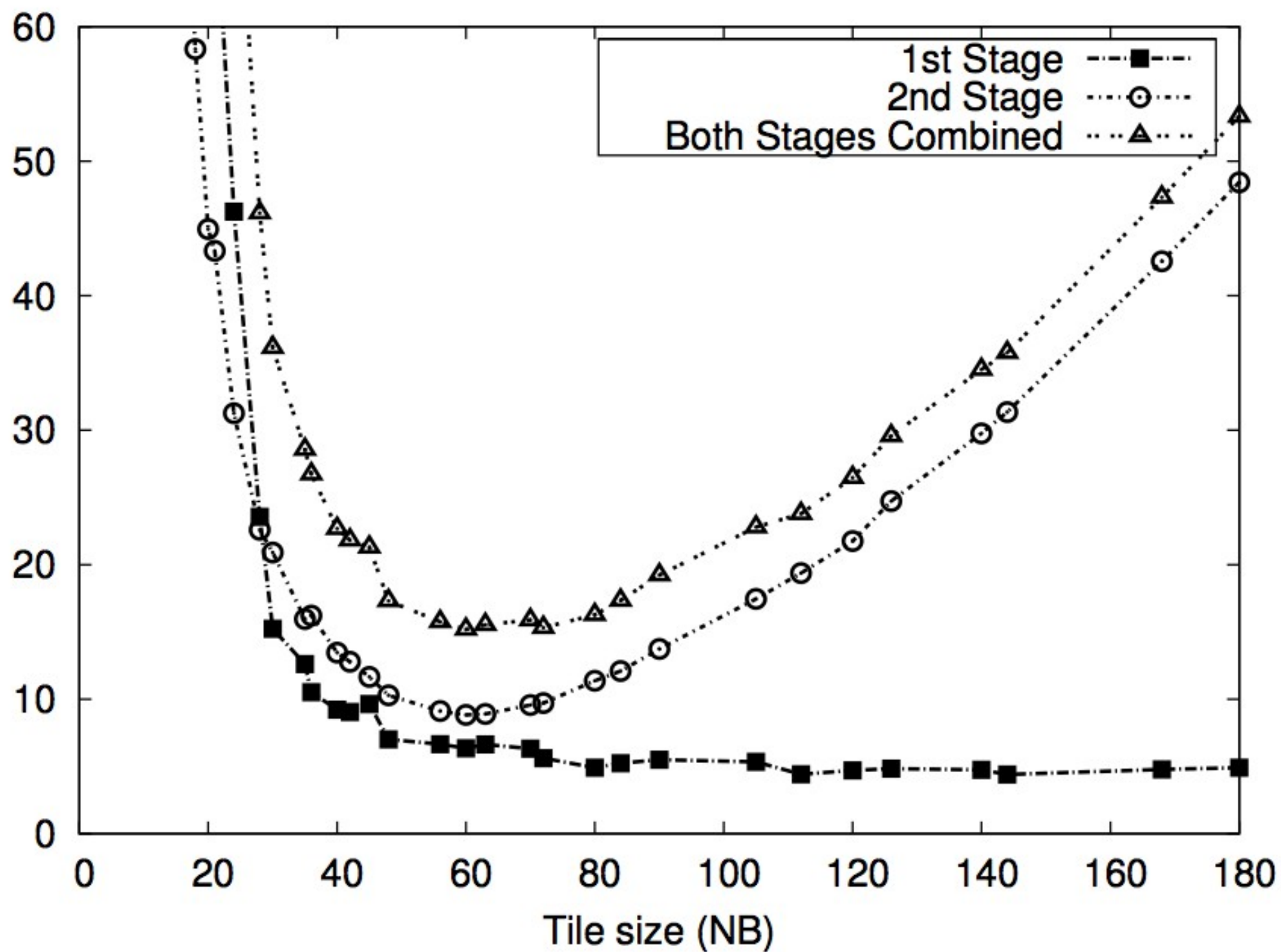


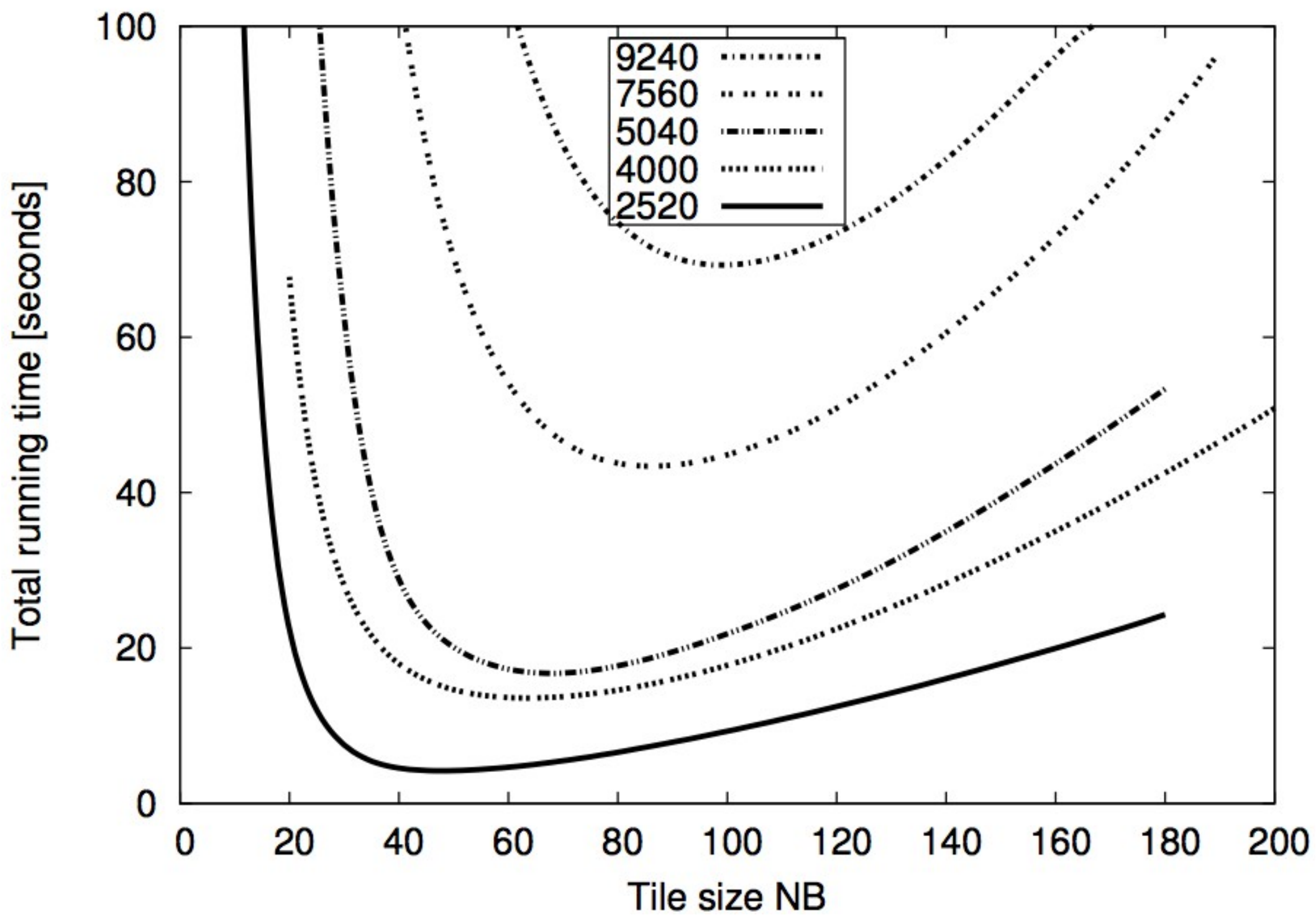
8000



10000

Total running time [seconds]





Step 1

$$t_x(N, NB) = \underbrace{\left(\frac{N}{NB}\right)^3}_{\text{number of tasks}} \cdot \underbrace{NB^2}_{\text{number of flops per task}} = N^3$$

$$t_c(N, NB) = \underbrace{\left(\frac{N}{NB}\right)^3}_{\text{number of tasks}} \cdot \left(\underbrace{NB^2}_{\text{items to transfer}} + \underbrace{\mathbf{1}}_{\text{latency}} \right)$$

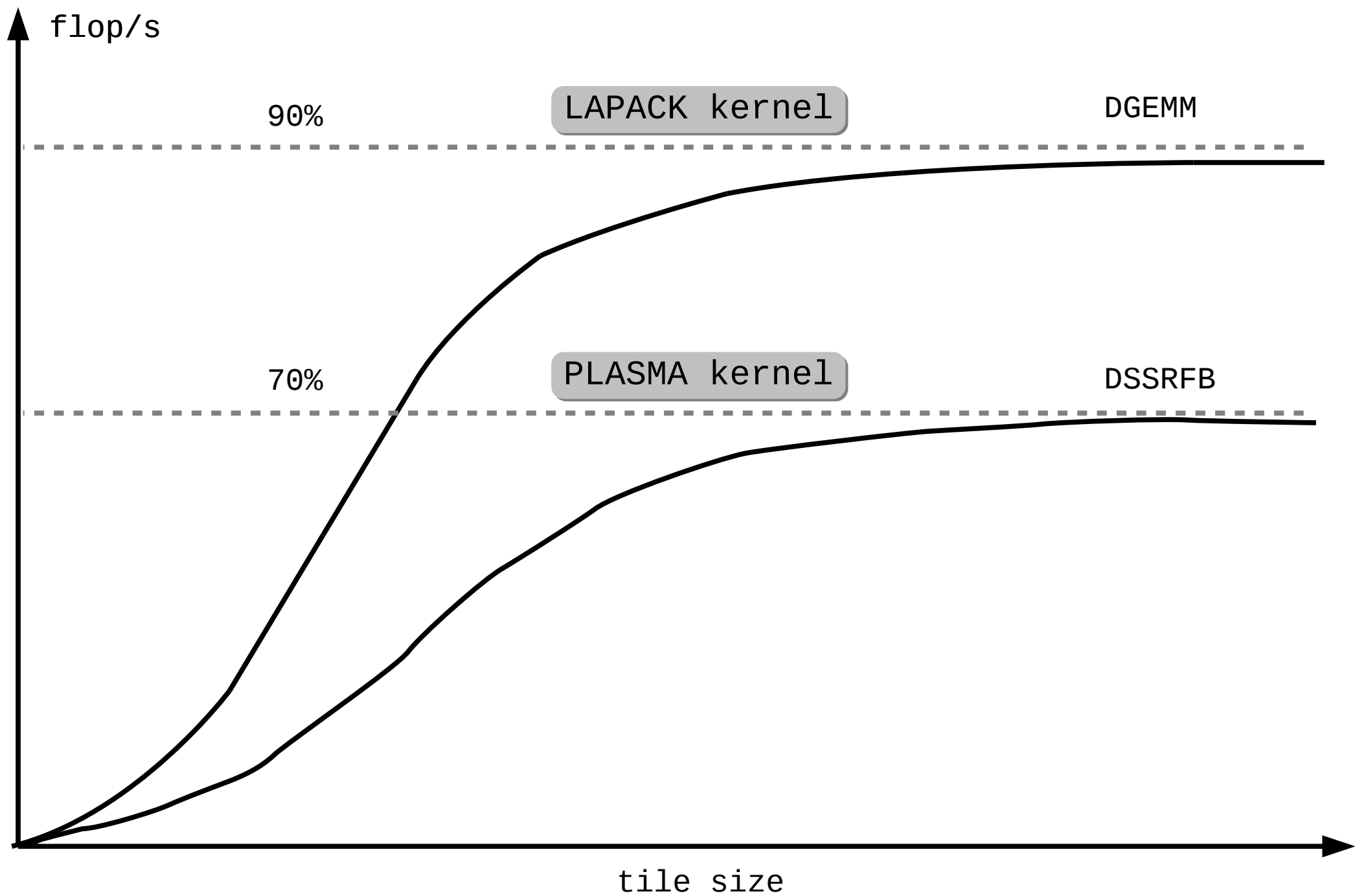
$$= \frac{N^3}{NB^2} \cdot \left(1 + \frac{1}{NB} \right)$$

Step 2

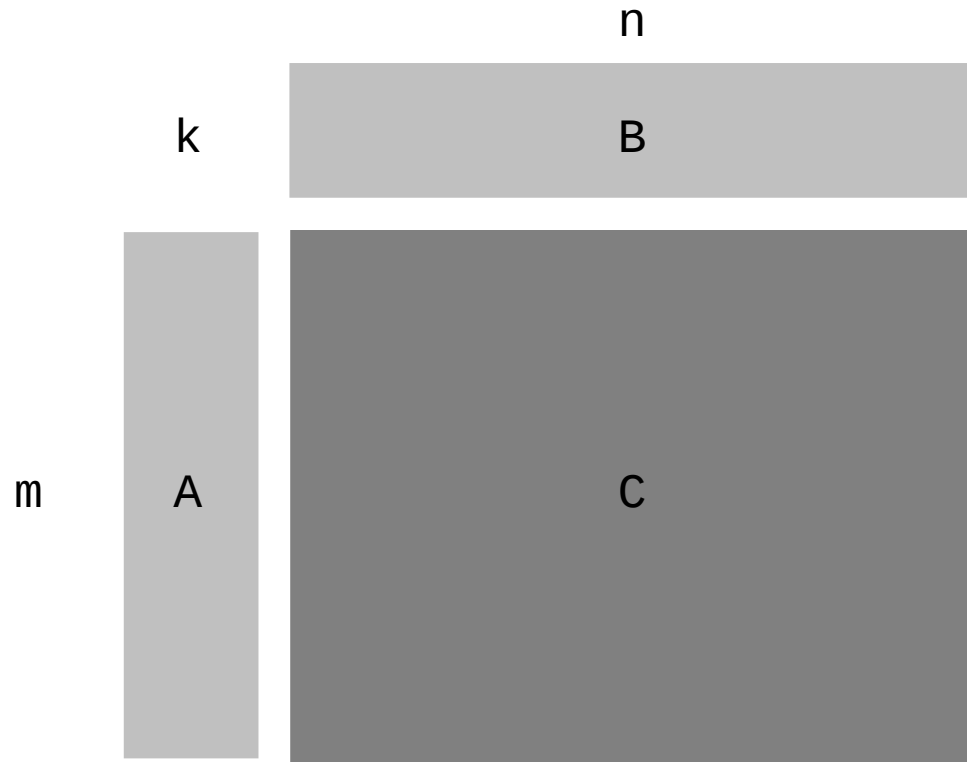
$$t_x(N, NB) = \underbrace{N}_{\text{No. of columns}} \cdot \underbrace{\frac{N}{NB}}_{\text{number of bulges}} \cdot \underbrace{NB^2}_{\text{number of flops}} = N^2 \cdot NB$$

$$t_c(N, NB) = \underbrace{N}_{\text{columns}} \cdot \underbrace{\frac{N}{NB}}_{\text{number of bulges}} \cdot \left(\underbrace{NB^2}_{\text{items to transfer}} + \underbrace{1}_{\text{latency}} \right)$$

$$= N^2 \cdot \left(NB + \frac{1}{NB} \right)$$



$$C \leftarrow \beta C + \alpha A \cdot B$$



Best instruction schedule:

$$\max_{m+n+k \leq R} \frac{2mnk}{2mnk + (mn + mk + nk)}$$

