On the following slides we show the tensor contractions
of the DMRG algorithm which
scale as χ^3, making them the most expensive.
(There are other subleading contractions not shown.)

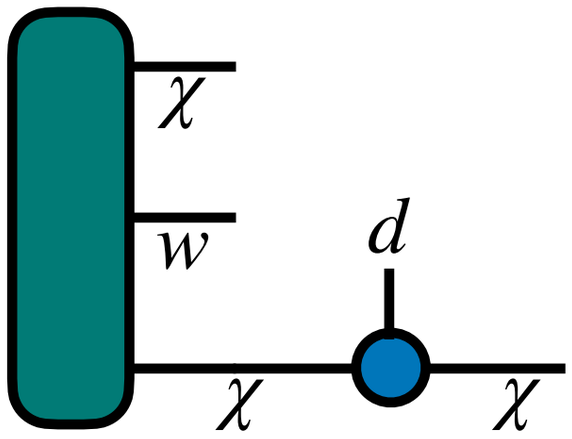
Each tensor has indices with one of three sizes
(dimensions): χ, w, and d.

χ is by far the largest dimension.
The typical sizes of each dimension is:

- $\chi > 60{,}000$ to beat state-of-art calculations
  ($100 \leq \chi \leq 10{,}000$ for more 'day to day' calculations)
- typically $w \sim 10 - 100$
- typically $d = 2 - 10$ (usually just d = 2,3, or 4)

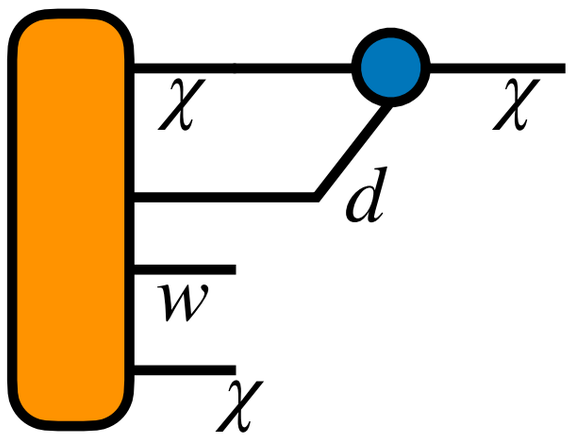
These are the two steps dominating the cost of the "environment building" step of DMRG:

(E1)



Cost: $\chi^3 w d$

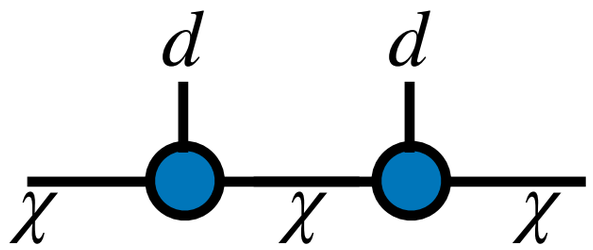
(E2)



Cost: $\chi^3 w d$

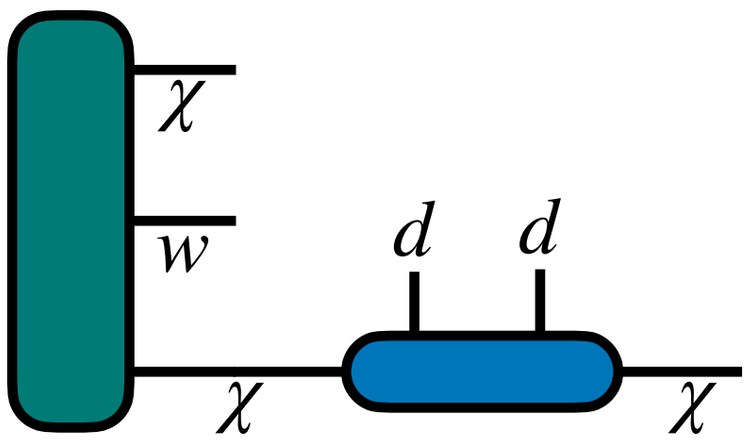
These are the three steps dominating the cost of the "solving" step of DMRG:

(S1)



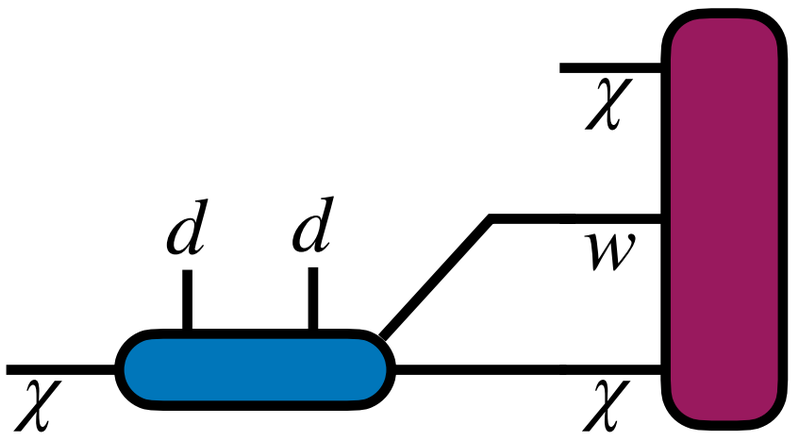
Cost: $\chi^3 d^2$

(S2)



Cost: $\chi^3 w d^2$

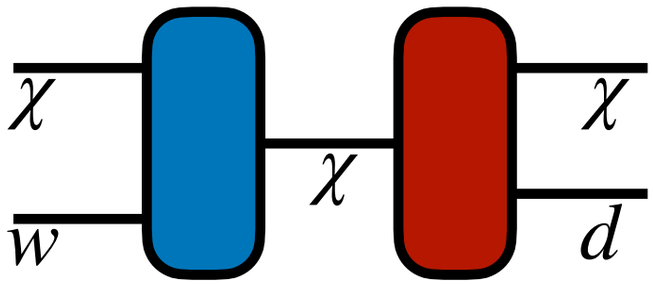
(S3)



Cost: $\chi^3 w d^2$

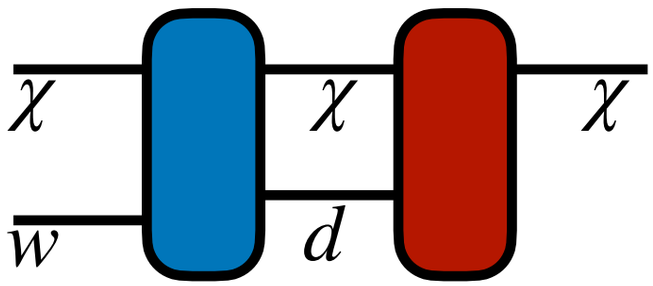
Same contractions as above, but a simplified simplified presentation:

(E1)



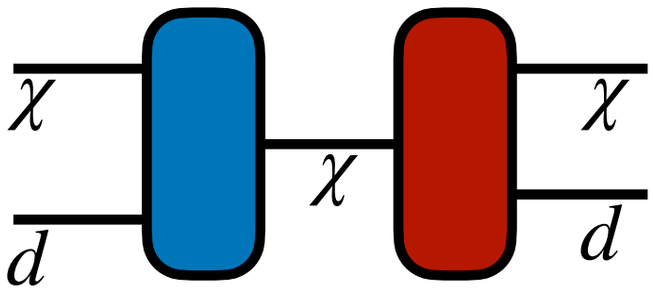
Cost: $\chi^3 wd$

(E2)



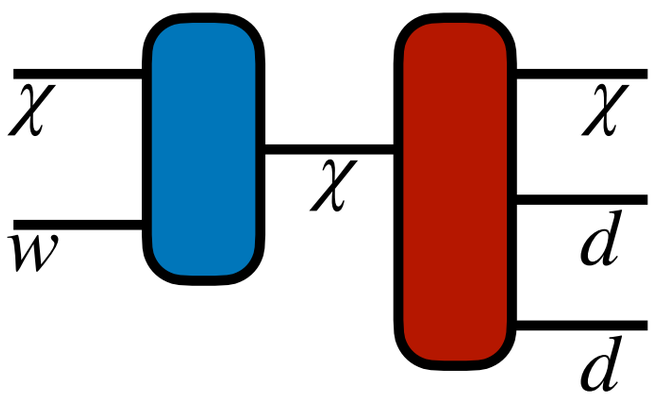
Cost: $\chi^3 wd$

(S1)



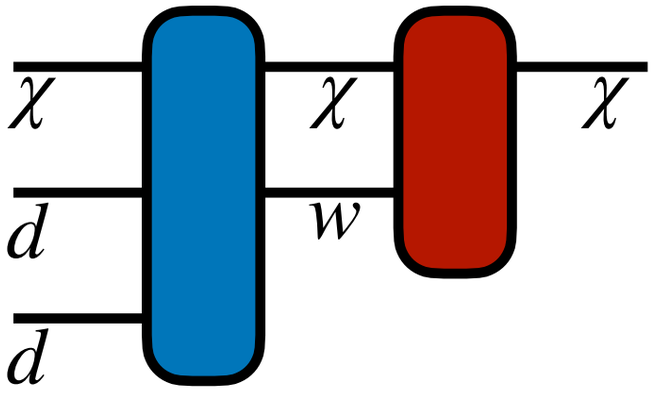
Cost: $\chi^3 d^2$

(S2)



Cost: $\chi^3 w d^2$

(S3)



Cost: $\chi^3 w d^2$