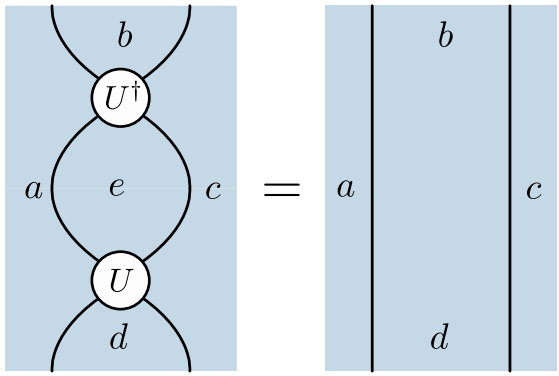
Dual-unitarity from biunitarity

- A fully shaded biunitary corresponds to **dual-unitary clockwork**

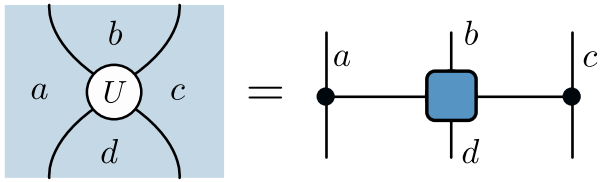
Vertical unitarity:



$$\sum_e \left(U_{a,c}\right)^\dagger_{b,e} \left(U_{a,c}\right)_{e,d} = \delta_{bd}, \qquad \forall a, c$$

- Can express fully shaded biunitary as **2-controlled 1-site unitary**

$$\left(U_{a,c}\right)_{b,d} =$$



- **Horizontal** unitarity enforces unitarity of $\tilde{U}_{a,c}$ with $(\tilde{U}_{a,c})_{b,d} = (U_{b,d})_{a,c}$