Definition (Union of design problems). Given two design problems $\mathbf{d} : \mathbf{P} \nrightarrow \mathbf{Q}$ and $\mathbf{e} : \mathbf{P} \nrightarrow \mathbf{Q}$, their *union* $\mathbf{d} \vee \mathbf{e} : \mathbf{P} \nrightarrow \mathbf{Q}$ is defined by

$$(\mathbf{d} \vee \mathbf{e}) : \mathbf{P}^{\mathrm{op}} \times \mathbf{Q} \to_{\mathbf{Pos}} \mathbf{Bool}$$

$$\langle p^*, q \rangle \mapsto \mathbf{d}(p^*, q) \vee \mathbf{e}(p^*, q).$$