Definition (Union of design problems). Given two design problems $\mathbf{f} : \mathbf{A} \nrightarrow \mathbf{B}$ and $\mathbf{g} : \mathbf{A} \nrightarrow \mathbf{B}$, their *union* $\mathbf{f} \vee \mathbf{g} : \mathbf{A} \nrightarrow \mathbf{B}$ is defined by

$$(\mathbf{f} \vee \mathbf{g}) : \mathbf{A}^{\mathrm{op}} \times \mathbf{B} \to_{\mathbf{Pos}} \mathbf{Bool}$$

$$\langle a^*, b \rangle \mapsto \mathbf{f}(a^*, b) \vee \mathbf{g}(a^*, b).$$