Definition (Design problems with implementation as monotone functions) Suppose that $\mathbf{F}$, $\mathbf{R}$ are posets. A *design problem with implementation* is a monotone map (a **Set**-enriched profunctor) $\langle \mathbf{I}_d, \mathsf{prov}, \mathsf{req}\rangle : \mathbf{F} \nrightarrow \mathbf{R}$, where $\mathbf{I}_d$ is a set, prov and req are functions from $\mathbf{I}_d$ to $\mathbf{F}$ and $\mathbf{R}$, respectively

$$\mathbf{F} \xleftarrow{\mathsf{prov}} I \xrightarrow{\mathsf{req}} \mathbf{R},$$

and $\langle \mathbf{I}_d, \mathsf{prov}, \mathsf{req}\rangle : \mathbf{F} \nrightarrow \mathbf{R}$ is given by

$$\begin{aligned}\langle \mathbf{I}_d, \mathsf{prov}, \mathsf{req}\rangle : \mathbf{F} \nrightarrow \mathbf{R} : \mathbf{F}^{\mathrm{op}} \times \mathbf{R} &\to_{\mathbf{Pos}} \mathscr{P}(\mathbf{I_d}) \\ \langle f^*, r\rangle &\mapsto \{i \in \mathbf{I_d} : (f \preceq_{\mathbf{F}} \mathsf{prov}(i)) \wedge (\mathsf{req}(i) \preceq_{\mathbf{R}} r)\},\end{aligned}$$

where the partial order on $\mathscr{P}\mathbf{I}$ is given by subset inclusion.