**Definition** (Algebraic definition Monotone Co-Design Problems). An MCDP is a tuple $\langle \mathcal{A}, \mathsf{T}, \boldsymbol{v} \rangle$, where:

1. $\mathcal{A}$ is any set of atoms, to be used as labels.
2. The term $\mathsf{T}$ in the $\{\mathsf{series}, \mathsf{par}, \mathsf{loop}\}$ algebra describes the structure of the graph:
$$\mathsf{T} \in \mathsf{Terms}(\{\mathsf{series}, \mathsf{par}, \mathsf{loop}\}, \mathcal{A}).$$
3. The *valuation* $\boldsymbol{v}$ is a map $\boldsymbol{v} : \mathcal{A} \to \mathbf{DP}$ that assigns a DP to each atom.