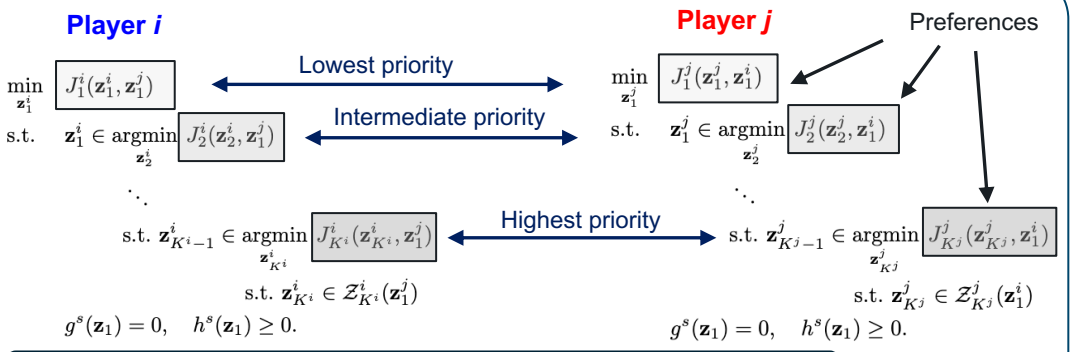
GOOP Formulation



KKT Reformulation: From multi-level to single-level problem

$$\min_{z_{K^i-1}^i} J_{K^i-1}^i\left(z_{K^i-1}^i, z_1^j\right)$$

$$s.t. \quad z_{K^i-1}^i \in \arg\min_{z_{K^i}^i} J_{K^i}^i\left(z_{K^i}^i, z_1^j\right)$$
$$s.t.\ g\left(z_{K^i}^i, z_1^j\right) = 0, \quad h\left(z_{K^i}^i, z_1^j\right) \geq 0$$

λ_{K^i}, μ_{K^i}: induced primals

$$\min_{z_{K^i-1}^i, \lambda_{K^i}, \mu_{K^i}} J_{K^i-1}^i\left(z_{K^i-1}^i, z_1^j\right)$$

$$s.t. \quad \nabla_{z_{K^i}^i} \mathcal{L}_{\mathcal{K}^i}\left(z_{K^i-1}^i, z_1^j, \lambda_{K^i}, \mu_{K^i}\right) = 0, \quad 0 \leq h\left(z_{K^i-1}^i, z_1^j\right) \perp \lambda_K^i \geq 0, \ g\left(z_{K^i-1}^i, z_1^j\right) = 0$$