

Policy Design and Enforcement for data security

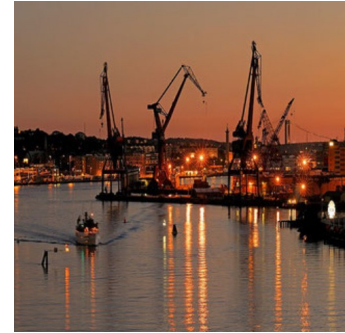
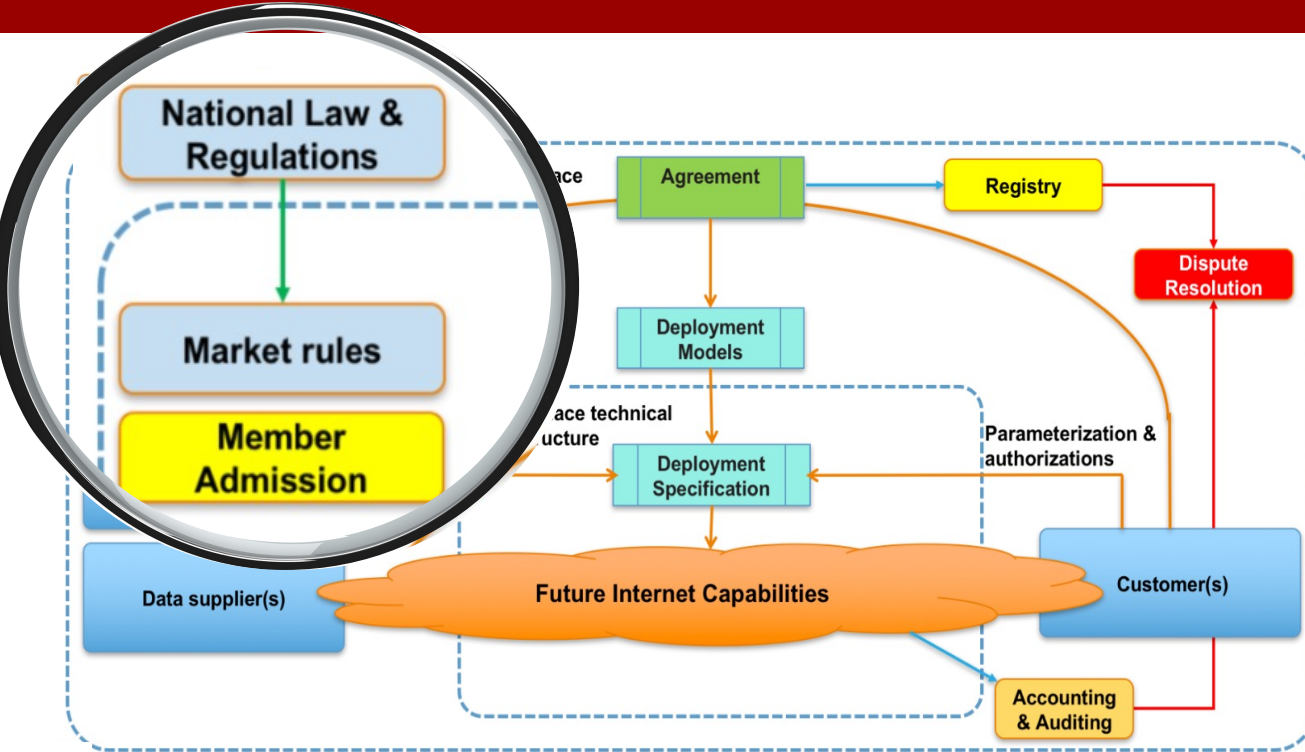
Research Display of project **Data Logistic for Logistic Data**



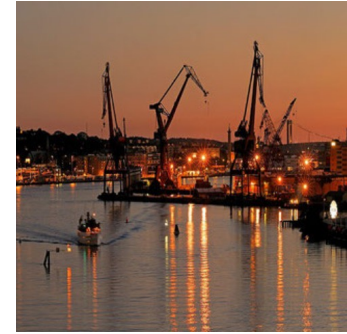
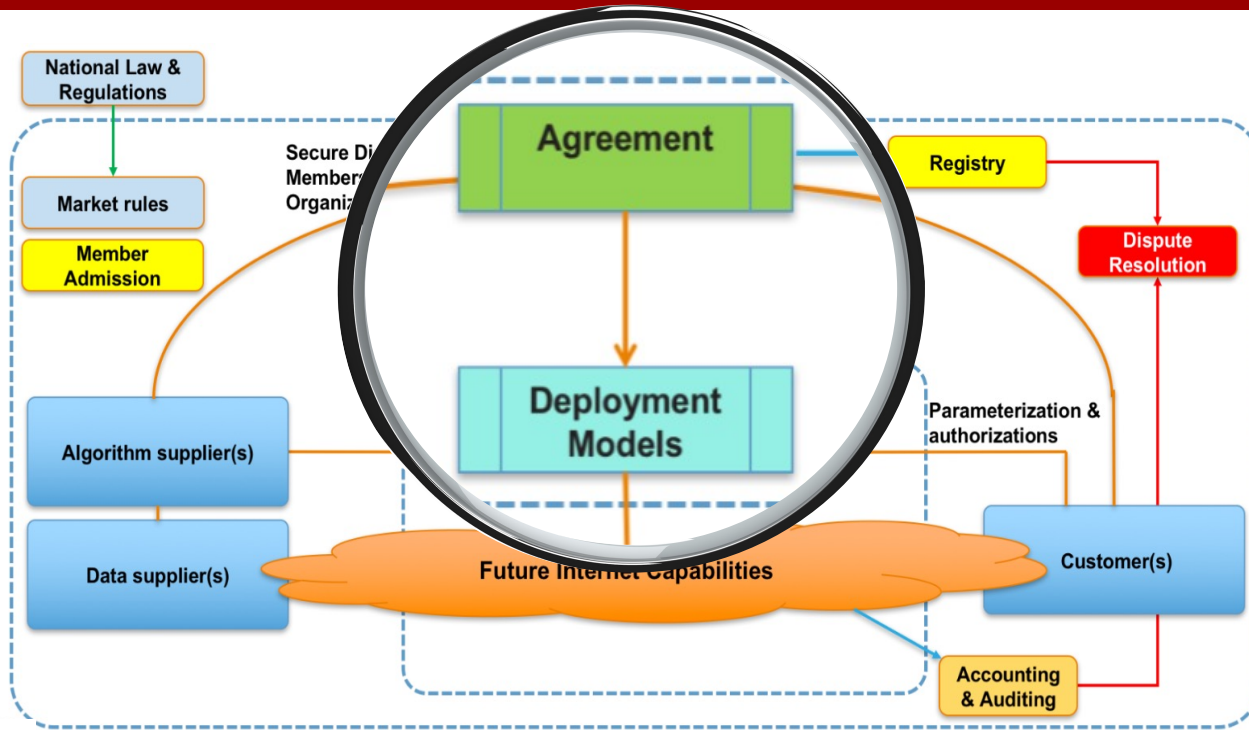
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Complex Cyber Infrastructure

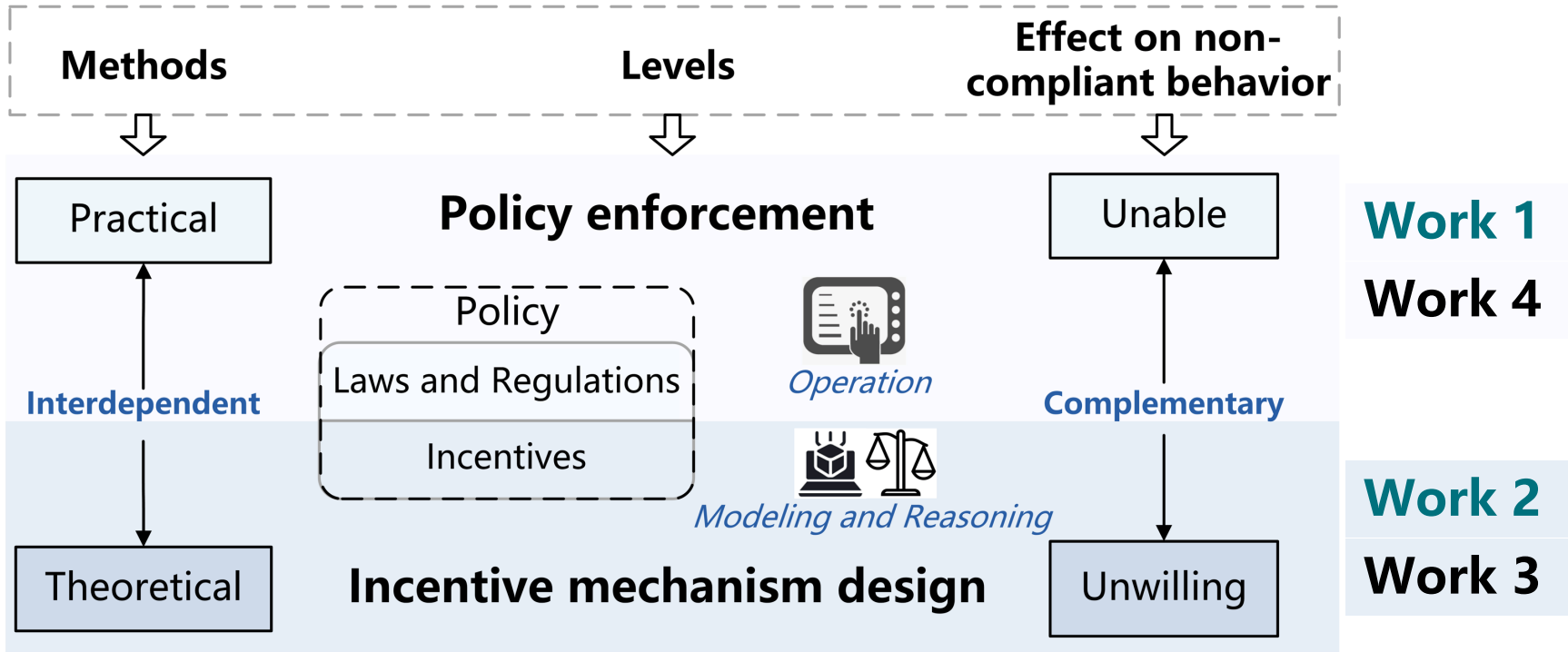
Overview of DL4LD



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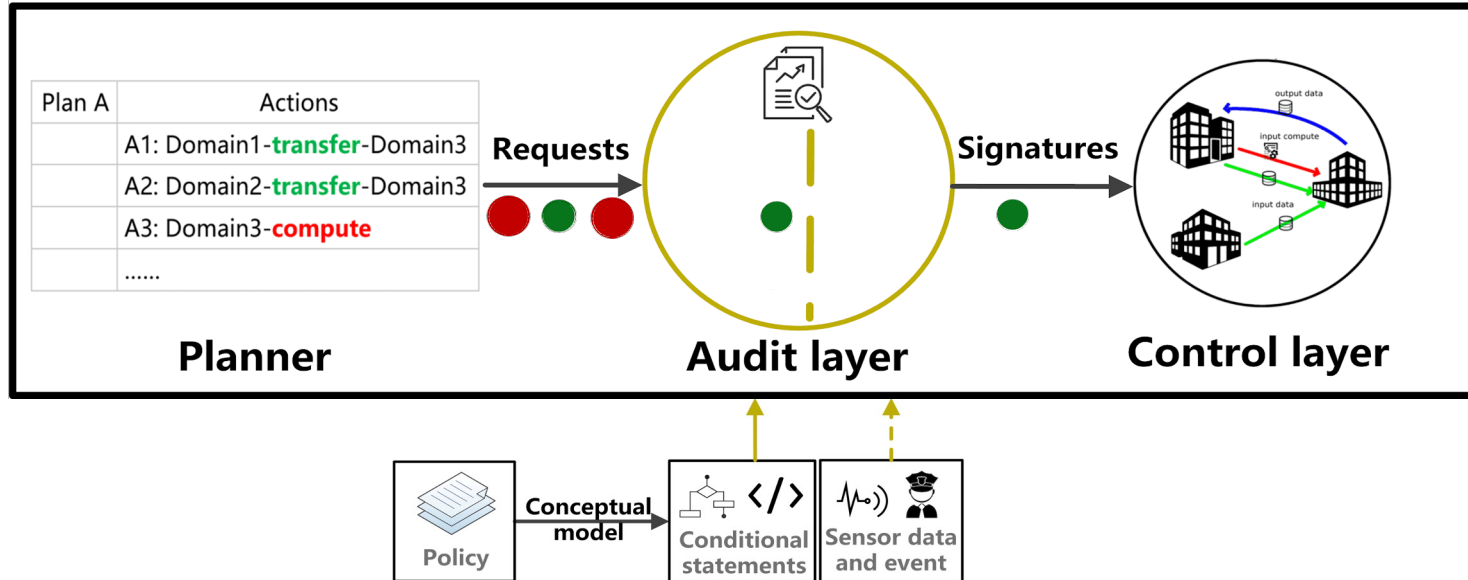
Policy enforcement and design



Work 1 Policy Enforcement

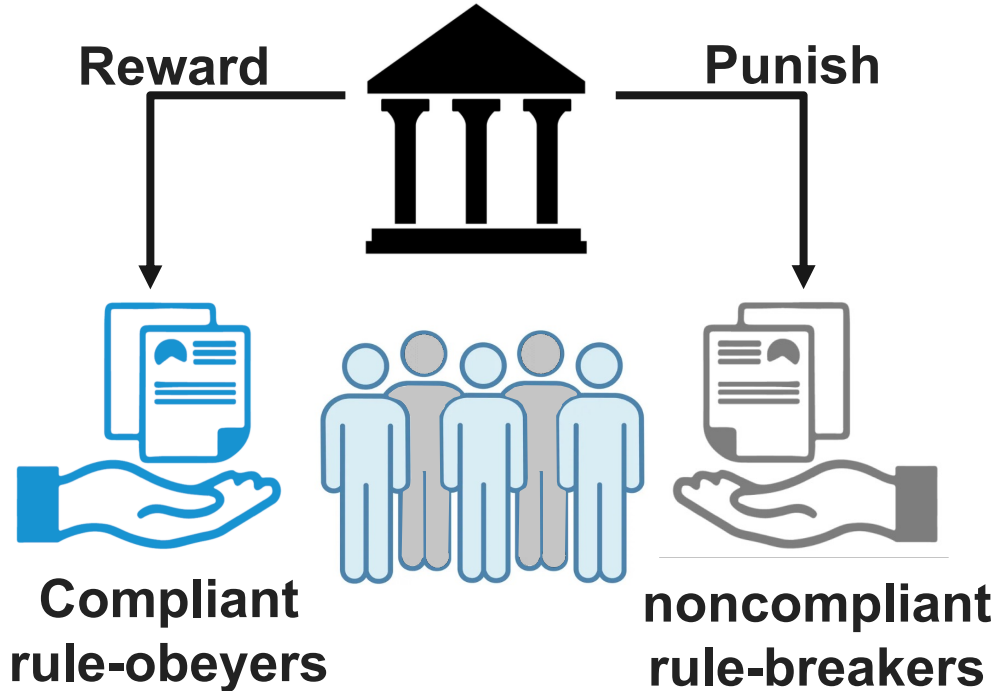


Auditable network overlays



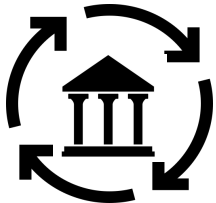
Zhou X, Cushing R, Koning R, et al. **Policy enforcement for secure and trustworthy data sharing in multi-domain infrastructures**[C], 2020 IEEE 14th International Conference on Big Data Science and Engineering (BigDataSE). IEEE, 2020: 104-113.

Work 2 Costly incentives design



Zhou X, Belloum A, Lees M H, et al. **Costly incentives design from an institutional perspective: cooperation, sustainability and affluence**[J]. Proceedings of the Royal Society A, 2022, 478(2265): 20220393.

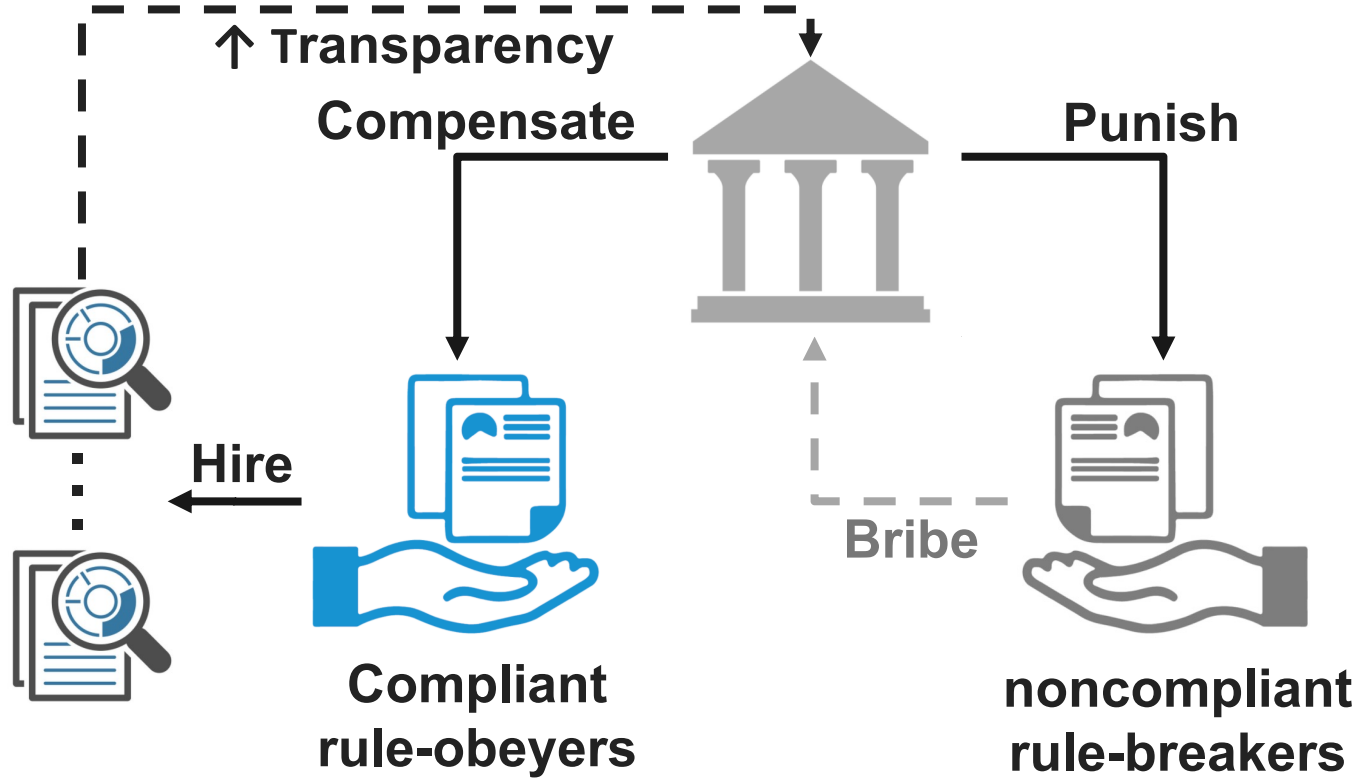
Work 2 Costly incentives design



- **Light punishment** leads to a reduction of the market size, yet **heavier punishment** is beneficial to the market size
- **Mixed incentives** will generally lead to different wealth of the third party and of the participants. While under moderate strength, the overall wealth is maximal
- For **sustainability**, pure punishment is sustainable, the sustainability of mixed incentives depends on both their strength and participants' rationality level.

Zhou X, Belloum A, Lees M H, et al. **Costly incentives design from an institutional perspective: cooperation, sustainability and affluence**[J]. Proceedings of the Royal Society A, 2022, 478(2265): 20220393.

Work 3 Role of external supervision



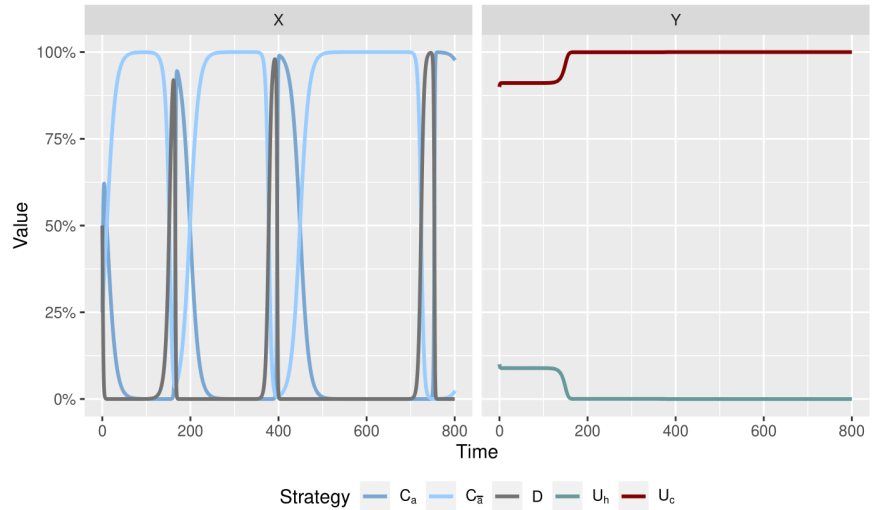
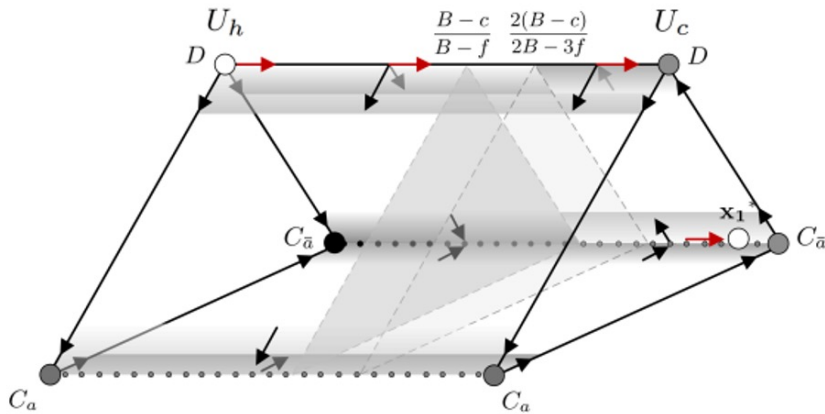
Work 3 Role of external supervision



- **Honest** U_h
Lower risk
- **Corrupt** U_c
Additional income

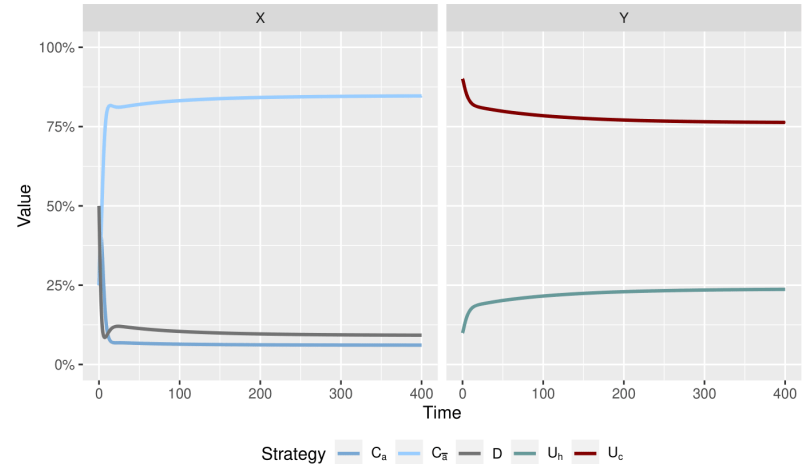
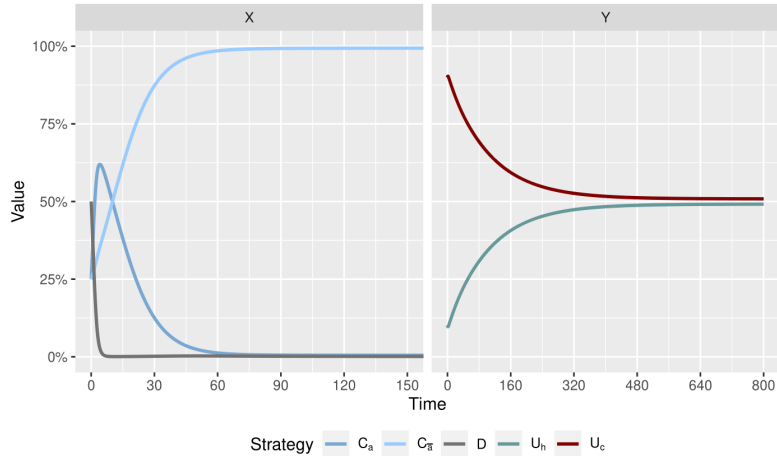
- **Cautious C** C_a
Engage service
Additional cost
- **Trusting C** $C_{\bar{a}}$
Low trading cost
Cheating risk
- **Defector** D
Bribe
Additional cost

Work 3 Role of external supervision



$N \rightarrow \infty$, the initial state of the system matters

Work 3 Role of external supervision



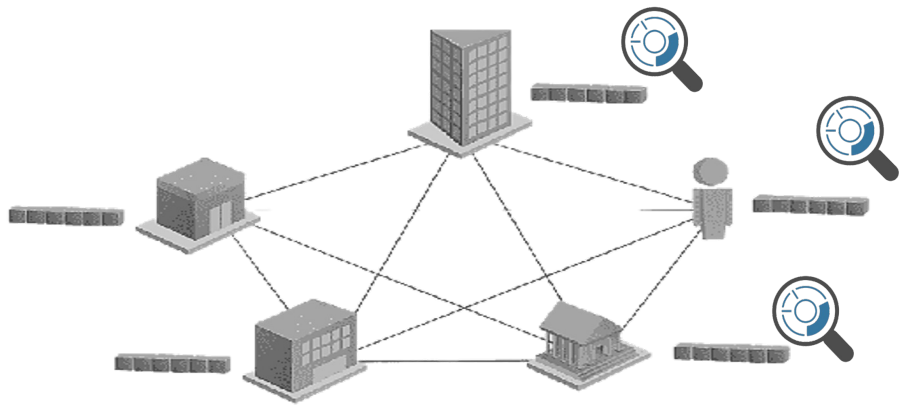
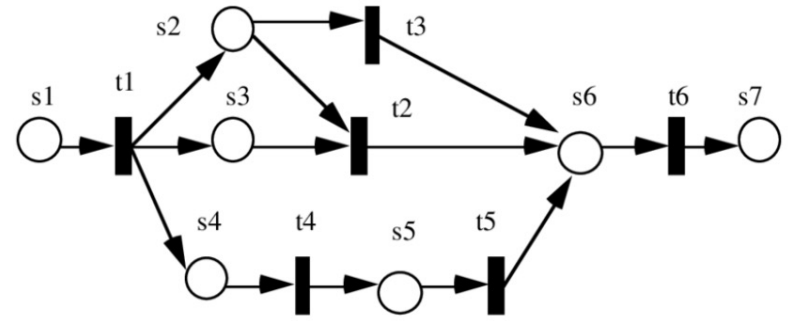
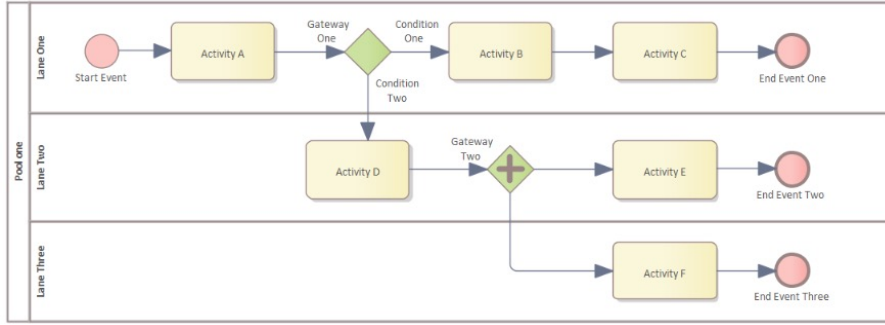
Exploration rate of umpires > that of participants,

$$U_h : U_c = 1 : 1$$

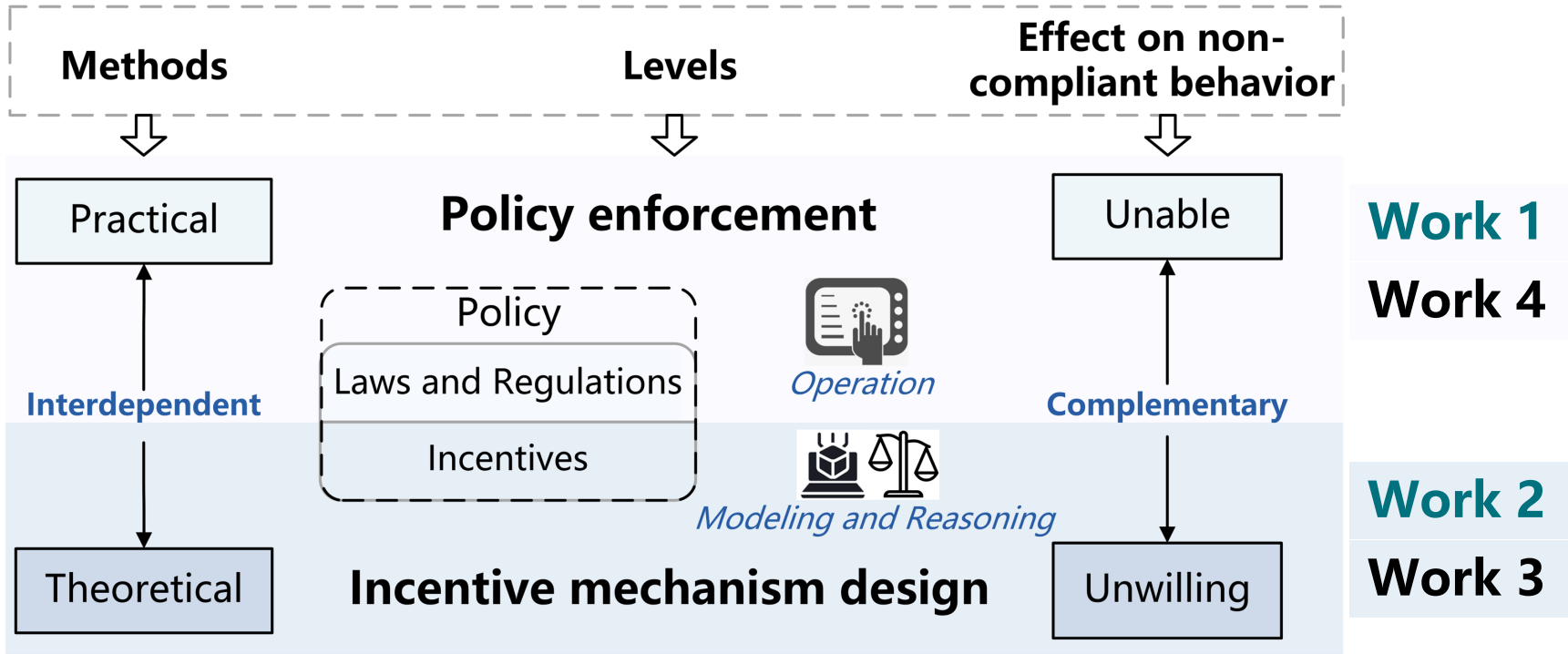
Otherwise $U_h : U_c < 1 : 1$

Higher supervision cost  \rightarrow more U_c , more D

Work 4 Post-auditing by blockchain



Policy enforcement and design



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