

Commitment Concession

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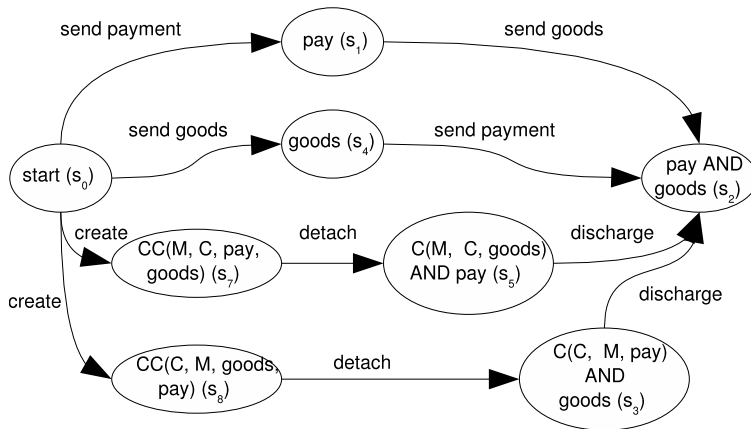
Strategies for creating commitments

- Commitments create risk for its debtor
- Keep the risk minimum
- Consider a purchase protocol
 - Customer will pay; merchant will deliver a product
 - Who should act first?
 - How much should one commit to?
- Possible strategies:
 - Cautious creation: Disable protocol progress
 - Incautious creation: Too much obligations without a payback

Commitment concession

- Start with weak commitments (e.g., conditional rather than a base-level commitment)
- Incrementally commit at each round (e.g., discharge a commitment only after guaranteeing a benefit from other agents)
 - Increase the risk taken
 - Expect others to increase their risks
- Calculate the consequence of a move
- Continue if others are increasing their risks appropriately

Example purchasing enactments



Benefits and risks

- Benefit of a commitment: What the agent will gain by creating the commitment
- Risk of a commitment: What the agent will lose by creating the commitment
- Consider the following from customer's point of view:

Commitment made	Risk	Benefit
CC(C, M, goods, pay)	C(C, M, pay)	goods
CC(C, M, C(M, C, goods), pay)	C(C, M, pay)	C(M, C, goods)
C(C, M, pay)	pay	None

Commitment concession rules: 1

- Start with a weak commitment (e.g., conditional rather than base-level)

$$\frac{G(x, p)}{CC(x, y, p, q)} \quad \text{(create-CC)}$$

- Discharge a commitment after guaranteeing a benefit from other agents

$$\frac{C(x, y, q) \quad C(y, x, p) \quad G(x, p)}{q} \quad \text{(discharge-C)}$$

Commitment concession rules: 2

- Cooperate by increasing risk when other (trustworthy) agents make commitments

$$\frac{CC(y, x, q, p) \quad G(x, p)}{C(x, y, q)} \quad (\text{accept})$$

- Create a counter conditional commitment: in essence, request further commitment from other agents if they are not immediately trusted

$$\frac{CC(y, x, q, p) \quad G(x, p)}{CC(x, y, p, q)} \quad (\text{challenge})$$

Commitment concession rules: 3

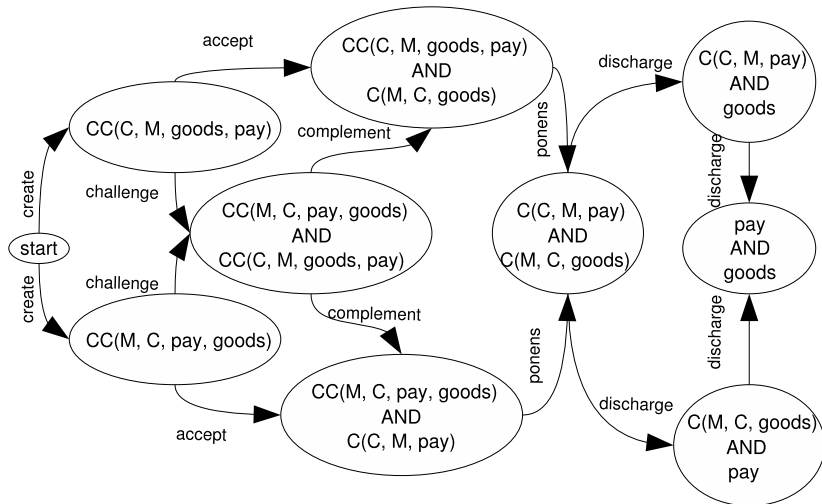
- If all agents have taken some risk, take some more risk

$$\frac{CC(x, y, p, q) \quad CC(y, x, q, p)}{C(x, y, q) \quad \neg CC(x, y, p, q)} \quad (\text{complement})$$

- When other agents are apparently at greater risk, commit more

$$\frac{C(x, y, q) \quad CC(y, x, q, p)}{C(y, x, p) \quad \neg CC(y, x, q, p)} \quad (\text{ponens})$$

Applying the concession rules



Private valuations of propositions

- Valuation is negative for the agent's actions and positive for others' actions
- We assume that a creditor benefits from a commitment
- In either case, a proposition itself can't have a lower magnitude than a commitment for it:

$$|v_x(p)| \geq |v_x(C(\cdot, \cdot, p))|$$

- As creditor, a proposition is valued above a commitment
- As debtor, the other way around

Coherent valuations of states: 1

- Null. Valuation of an empty set is zero: $v_x(\{\}) = 0$
- Separability. Valuation of a union of two sets is the sum of their valuations: $v_x(S_1 \cup S_2) = v_x(S_1) + v_x(S_2)$
- As creditor. Commitment for goal is worth less than the deed: $v_x(p) > 0$ implies $0 \leq v_x(C(y, x, p)) \leq v_x(p)$
- As debtor. Commitment for task is worth more than the deed: $v_x(p) < 0$ implies $0 \geq v_x(C(x, y, p)) \geq v_x(p)$

Coherent valuations of states: 2

- As creditor of conditional commitment: Value to creditor of conditional commitment:

$$v_x(C(y, x, p)) \geq v_x(CC(y, x, q, p)) \geq v_x(q) + v_x(C(y, x, p))$$

- As debtor of conditional commitment: Value to debtor of conditional commitment: $v_x(C(x, y, q)) \leq v_x(CC(x, y, p, q)) \leq v_x(p) + v_x(C(x, y, q))$

Valuations in protocol enactment

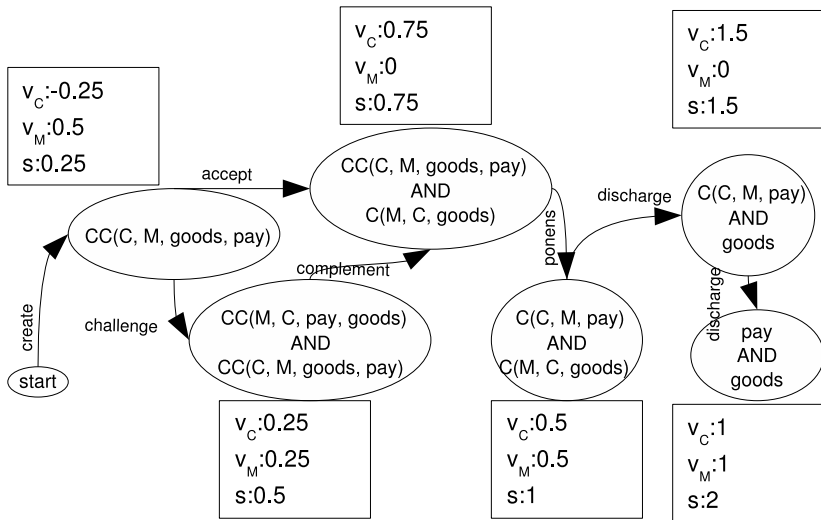
- Goal states: valued higher by all than non-goal states
 - $v_C(\text{pay}) + v_C(\text{goods}) > 0$
 - $v_M(\text{pay}) + v_M(\text{goods}) > 0$
- Goal states have compatible incentives
- Social welfare of a state: sum of the valuations for all agents
- Inference rules to help agents reach such states while enacting a protocol

Example valuations

Condition	C's valuation
goods	2.00
C(M, C, goods)	1.00
CC(M, C, pay, goods)	0.50
pay	−1.00
C(C, M, pay)	−0.50
CC(C, M, goods, pay)	−0.25

M's valuations are the additive inverses of these

Example enactment with concession rules



Properties of commitment concession

- Concession rules decrease the valuation of acting agents and increase the valuations of others
- Final states always have positive social welfare
- The concession rules moves the protocol to states with higher social welfare
- The concession rules guarantee that the protocol ends in a final state

Discussion

- Application of monotonic concession to commitment protocols
- Concession moves can be used
 - Independent from the domain protocol
 - Embedded into the domain protocol
- Directions
 - Treatment of general kinds of concession
 - Study of valuation functions with different characteristics