Commitment Concession

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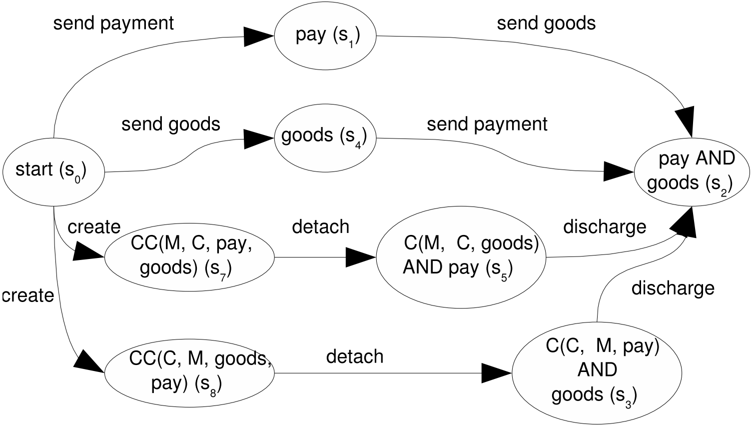
Strategies for creating commitments

- 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, where the goal of the customer is goods: $G(customer, goods)$

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)

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

- Discharge a commitment after guaranteeing a benefit from other agents

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

Commitment concession rules: 2

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

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

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

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

Commitment concession rules: 3

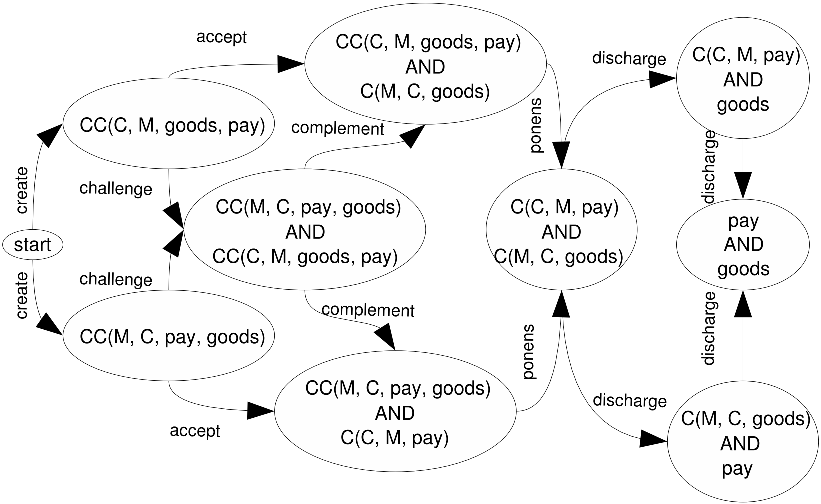
- If all agents have taken some risk, take some more risk

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

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

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

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 $0 \leq v_x(\mathrm{C}(y, x, p)) \leq v_x(p)$
- As debtor. Commitment for task is worth more than the deed: $v_x(p) < 0$ implies $0 \geq v_x(\mathrm{C}(x, y, p)) \geq v_x(p)$

Coherent valuations of states: 2

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

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

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

Valuations in protocol enactment

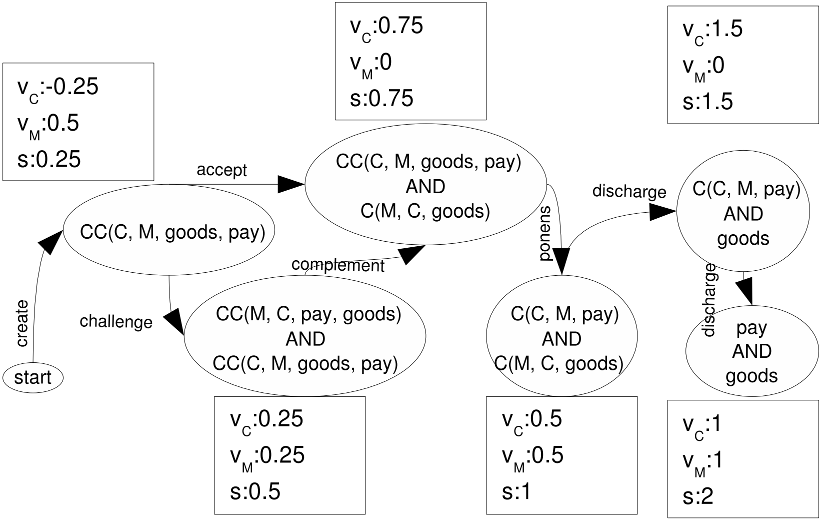
- Goal states: valued higher by all than non-goal states
  - $v_C(pay) + v_C(goods) > 0$
  - $v_M(pay) + v_M(goods) > 0$
- Goal states have compatible incentives
- Social welfare of a state: sum of the valuations for all agents
- Inference rules to help agents reach such states while enacting a protocol

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