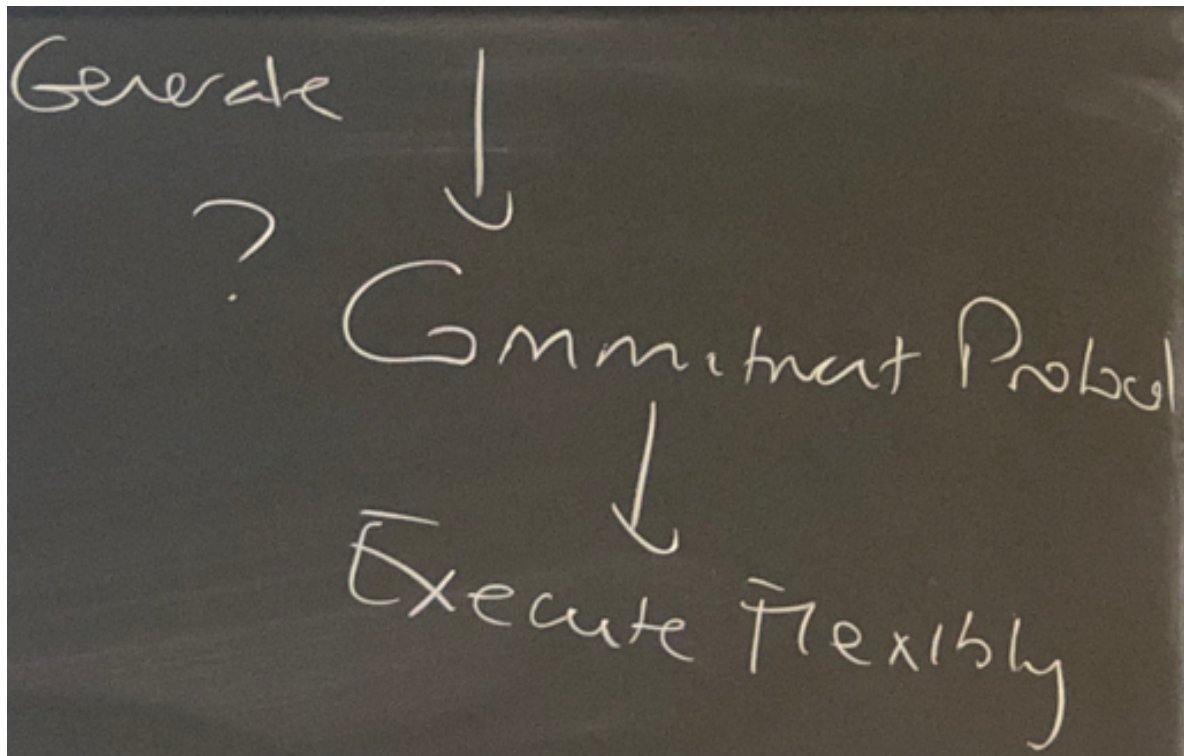


## L11 Dynamically generated commitment protocols

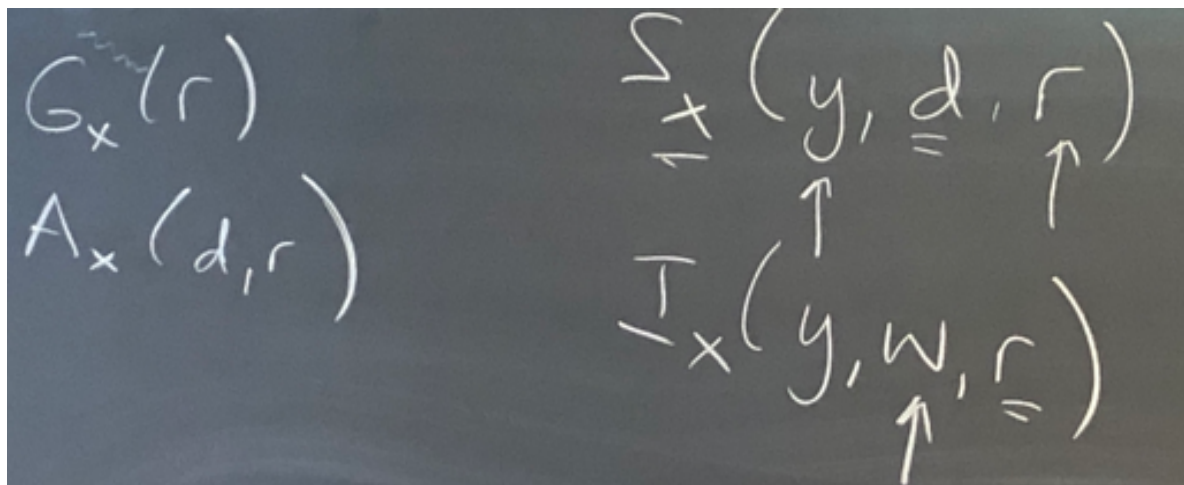


Goal - agent 'x' wants 'r' to be true in the world

Ability - agent 'x' is able to bring about 'r' if 'd' is true

Belief (service) - agent 'x' believes that 'y' can do 'r' if 'd' is true (does not have to be correct as it's a belief, right ;))

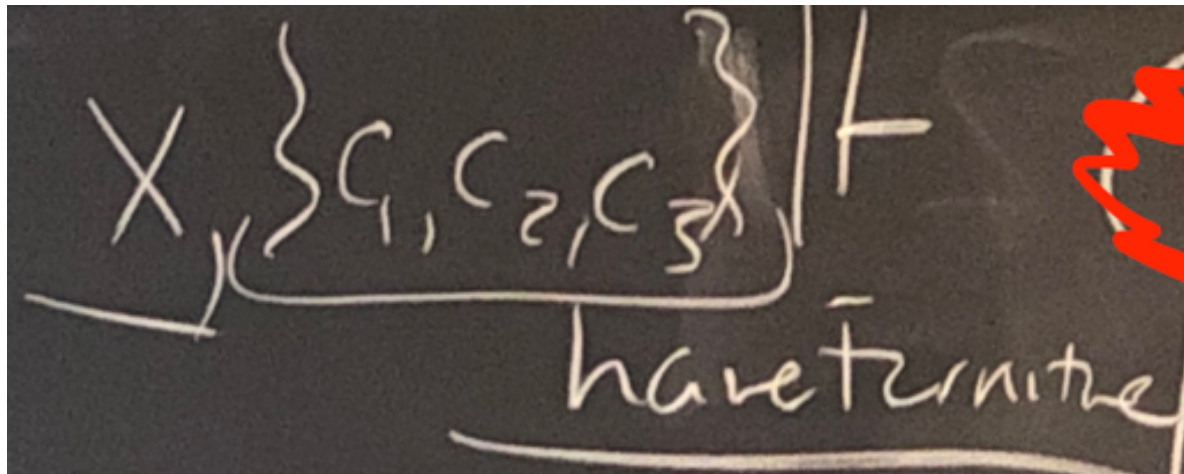
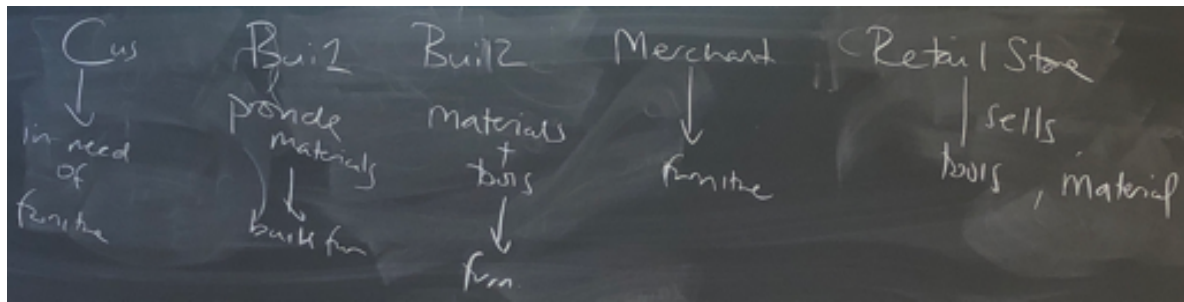
Belief (incentive) - agent 'x' believes that 'y' has an incentive 'w' to do 'r'



x can support d' (d-prime) with commitments 'C'

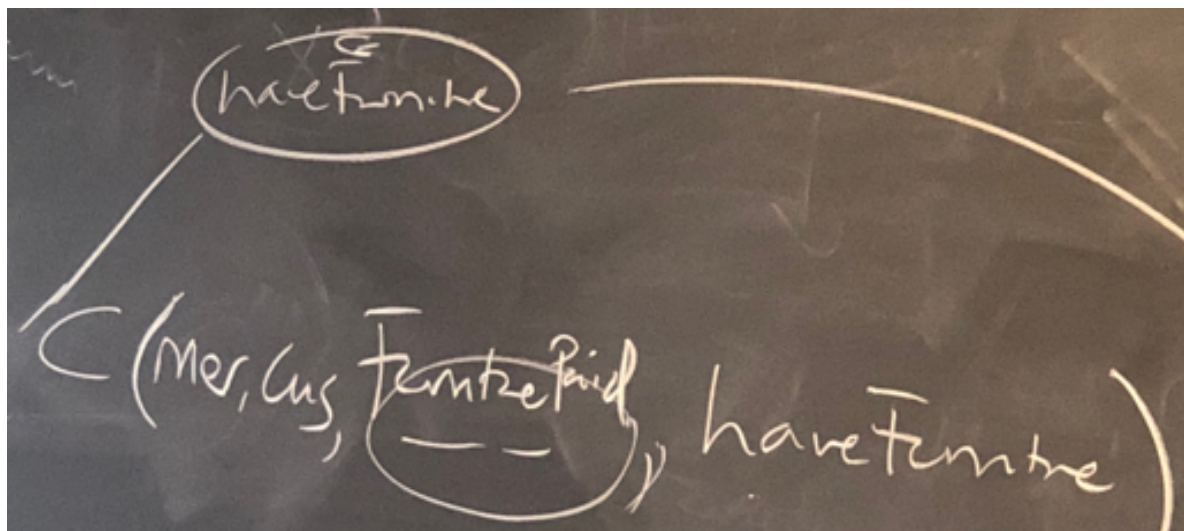
(x has certain goals, abilities beliefs to work towards the commitments)

Running example from the slides:



Protocol generation example (1):

'Cus' has a belief 'n1' and will generate a commitment 'C' to achieve goal 'haveFurniture'.



Protocol generation example (2):

'Cus' has a belief 's4' and will generate a commitment 'C' to achieve goal 'haveFurniture'. The second commitment 'C' is for achieving the goal 'haveMaterials' to satisfy the first commitment

1)  $C(\text{Built}, \text{Cus}, \text{Built Materials Provided}, \text{Have Furniture})$   
 (Add Have Materials as a goal)  
 2)  $C(\text{Ret}, \text{Cus}, \text{Materials Paid}, \text{Have Materials})$

There are seven protocols generated in the slides where not all will provide you with the valid resolution 'haveFurniture'. This is because of the high dependency on the beliefs.

## Ranking

Calculating benefit and cost (p5 from the slides)

**Utility of a protocol**

Important to factor in evidence once (e.g., ToolsPaid is the precondition for two commitments, count the cost only once).

$$\text{utility}_i(p) = \text{benefit}_i(p) - \text{cost}_i(p)$$

$$\text{benefit}_i(p) = \sum_{r \in m, g} \text{benefit}_i(r) \quad (1)$$

where  $m = \bigcup_{c \in p} \text{rel}^{\text{benefit}}(c)$  and  $g = \{r : G_i(r) \in G\}$

$$\text{cost}_i(p) = \sum_{r \in m} \text{cost}_i(r)$$

where  $m = \bigcup_{c \in p} \text{rel}^{\text{cost}}(c)$

- Cost of  $p_1$ :  
 $\text{cost}_{\text{tool}}(a_1) + \text{cost}_{\text{tool}}(a_2) + \text{cost}_{\text{tool}}(a_3) + \text{cost}_{\text{tool}}(a_4) = 3 + 1 + 5 + 5 = 14$
- Benefit of  $p_1$ : Computed based on relevant propositions, HaveMaterials, HaveTools and HaveFurniture:  $0 + 8 + 15 = 23$
- Utility of  $p_1$ :  $23 - 14 = 9$

Have Furniture: 15  
 Have Tools: 8  
 Have Materials: 0

$23$

$C(\text{Ret}, \text{Cus}, \text{ToolsPaid}, \text{HaveMaterials})$   
 $C(\text{Ret}, \text{Cus}, \text{ToolsPaid}, \text{HaveTools})$   
 $C(\text{Built}, \text{Cus}, \text{Built Materials Provided}, \text{HaveFurniture})$   
 $C(\text{Built}, \text{Cus}, \text{Built Materials Provided}, \text{HaveTools})$

$C(\text{ToolsPaid}) + C(\text{ToolsPaid}) + C(\text{ToolsPaid}) + C(\text{ToolsPaid})$   
 $C(a_3) + C(a_1) = 3 + 5 + 1 + 5 = 14$