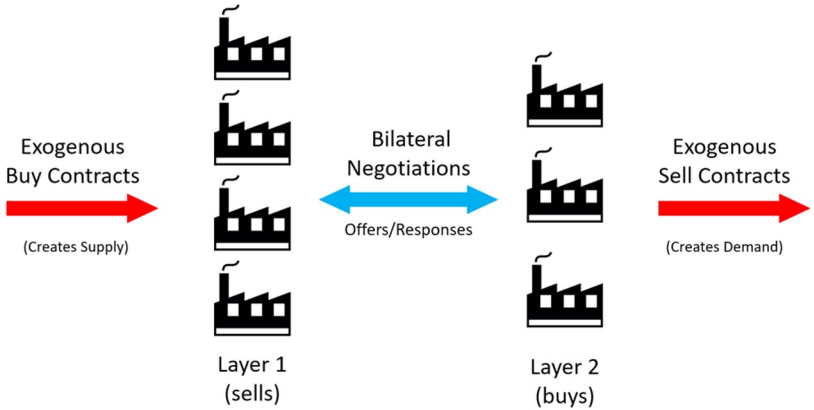
Quantity Oriented Agent

Pedro Hrosz Turini
Professor: Jaime Simão Sichman
Polytechnic School of the University of São Paulo

The OneShot Simulation

- The simulation replicates a supply chain with **2 layers**, and each agent controls a factory.
- Each day, the agents are bound to and **exogenous contract**, that creates the supply and demand.
- The agents negotiate the **price** and **quantity** of the intermediary products, through contracts.
- The negotiations are made through alternating offers, with a time limit of **20 steps**.



SCML OneShot 2023 changes

In the SCML 2023 competition, the price range is reduced to 1.

That means that the maximum price is only 1 unit higher than the minimum price:

$$p_{max} = p_{min} + 1$$

This makes the **quantity** to be negotiated the single most important aspect to be considered.

Definitions: Quantities

- **Exogenous quantity:** the amount established by the exogenous contract, which must be matched during the negotiations:

$$\max\{q_{exogenous}\}=10$$

- **Secured quantity:** the total number of products the agent successfully negotiated through all its contracts:

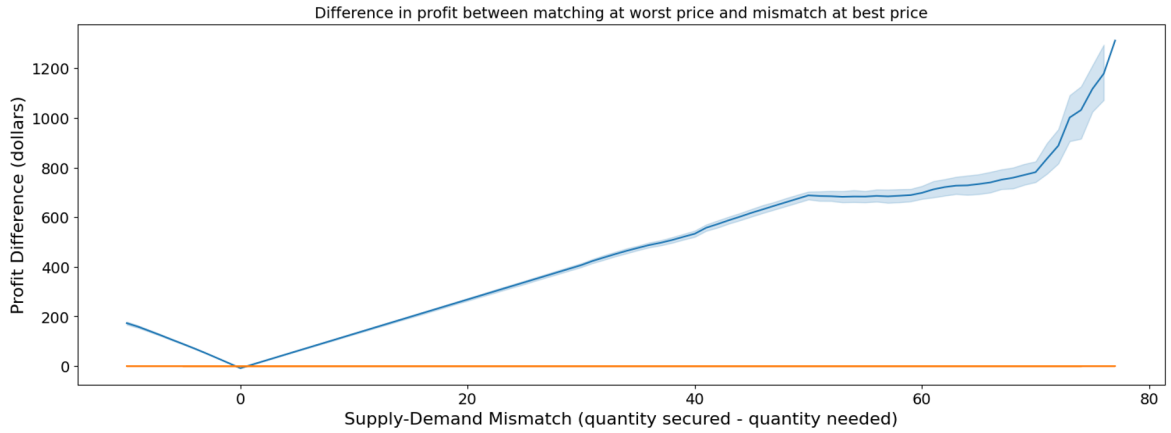
$$q_{secured}=\Sigma q_{negotiated}$$

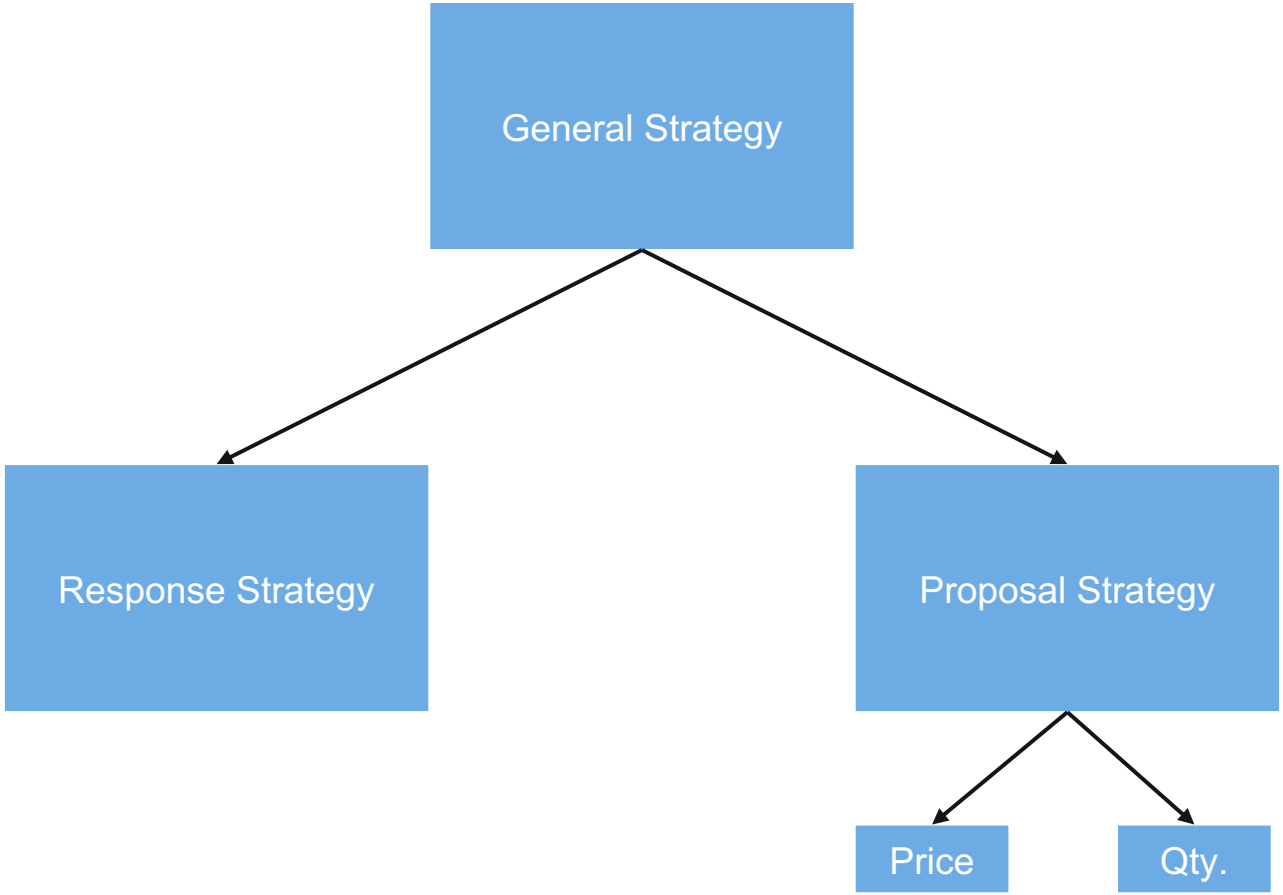
- **Agent's needs:** the difference between the exogenous amount and the secured amount. (The main objective of the agent is to nullify this value):

$$q_{needs}=q_{exogenous}-q_{secured}$$

General Strategy

- Minimize the difference between the exogenous quantity and the amount of products secured through contracts.
  - There are penalties are proportional to this difference (in modulus).
  - The price is not too relevant*




General Strategy
Response Strategy
Proposal Strategy
Price
Qty.

Response Strategy

Quantity Oriented Agent accepts *any* offers, as long as the amount offered is lower or equal to its needs.

$$\textbf{Accepts if: } q_{offer} \leq q_{needs}$$

At the **last offer** it receives, it attempts to minimize the modulus of difference between the quantity determined by the exogenous contract and the number of products negotiated.

$$\textbf{Accepts if: } |q_{needs} - q_{offer}| < q_{needs}$$

Proposal Strategy: Prices

- **Best Price:** the price that maximizes the agent's utility function.

  Layer 1: $p_{best}=p_{max}$

  Layer 2: $p_{best}=p_{min}$

- **Worst Price:** only at the very last offer sent, it is the price that minimizes the agent's utility function.

  Layer 1: $p_{worst}=p_{min}$

  Layer 2: $p_{worst}=p_{max}$

Proposal Strategy: Quantity

- With the objective of minimizing the risks of its offers being turned down based on quantity, the agent **divides its needs** by two , if its needs are superior, or equal to 5.

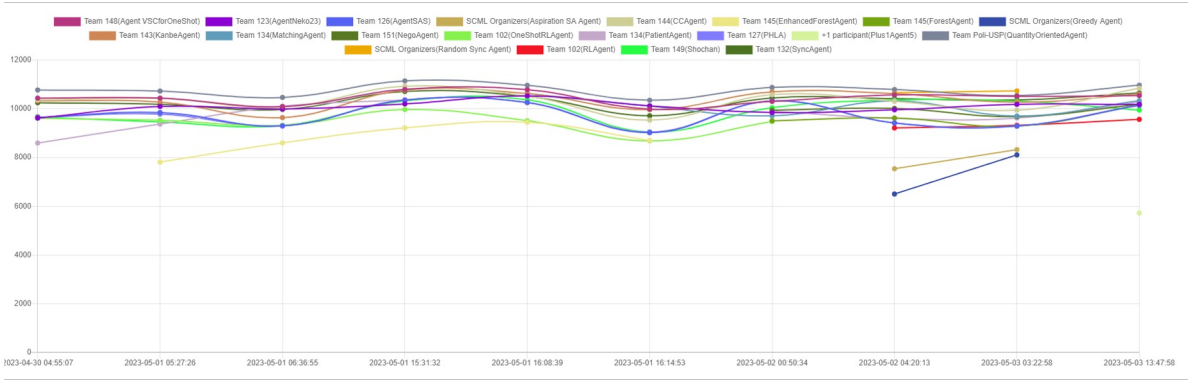
  Sets: $q_{offer} = \lceil q_{needs}/2 \rceil$

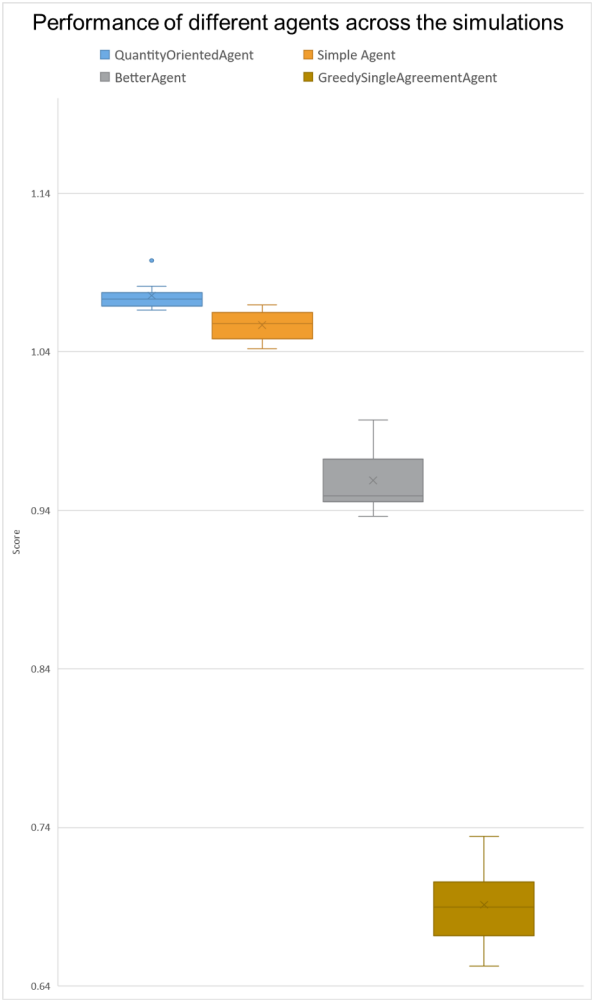
- Otherwise, it simply offers what it currently needs.

  Sets: $q_{offer} = q_{needs}$

Performance

Higher mean, median and lower variance ➔ Generally more consistent than the competitions' standard agents.





Thank you!

References:

Y. Mohammad, ”Developing an agent for SCML2023 (OneShot)- OneShotAgent” www.yasserm.com. http://www.yasserm.com/scml/scml2020docs/tutorials/02.develop_agent_scml2020_oneshot.html#oneshotagent (accessed May 1, 2023).

Y. Mohammad, ”Developing an agent for SCML2023 (OneShot)” www.yasserm.com. http://www.yasserm.com/scml/scml2020docs/tutorials/02.develop_agent_scml2020_oneshot.html (accessed May 1, 2023).