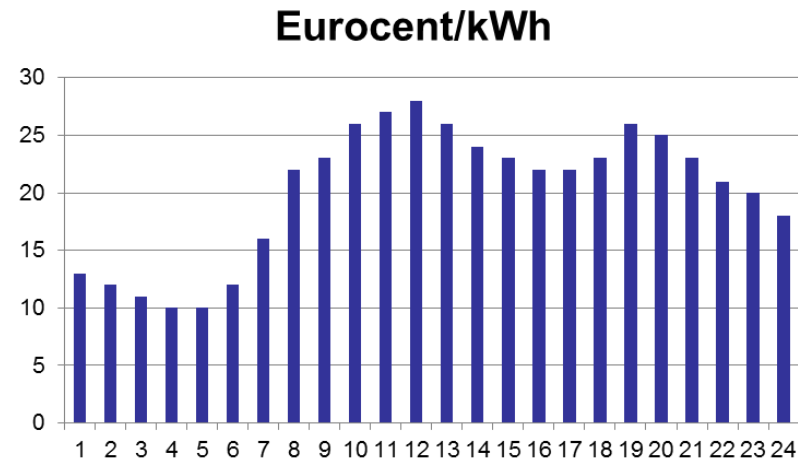# USING MULTI-ATTRIBUTE COMBINATORIAL AUCTIONS FOR RESOURCE ALLOCATION

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- ◎ Energy related issues
    - – Variable prices
    - – Environmental impact
    - – ISO:50001
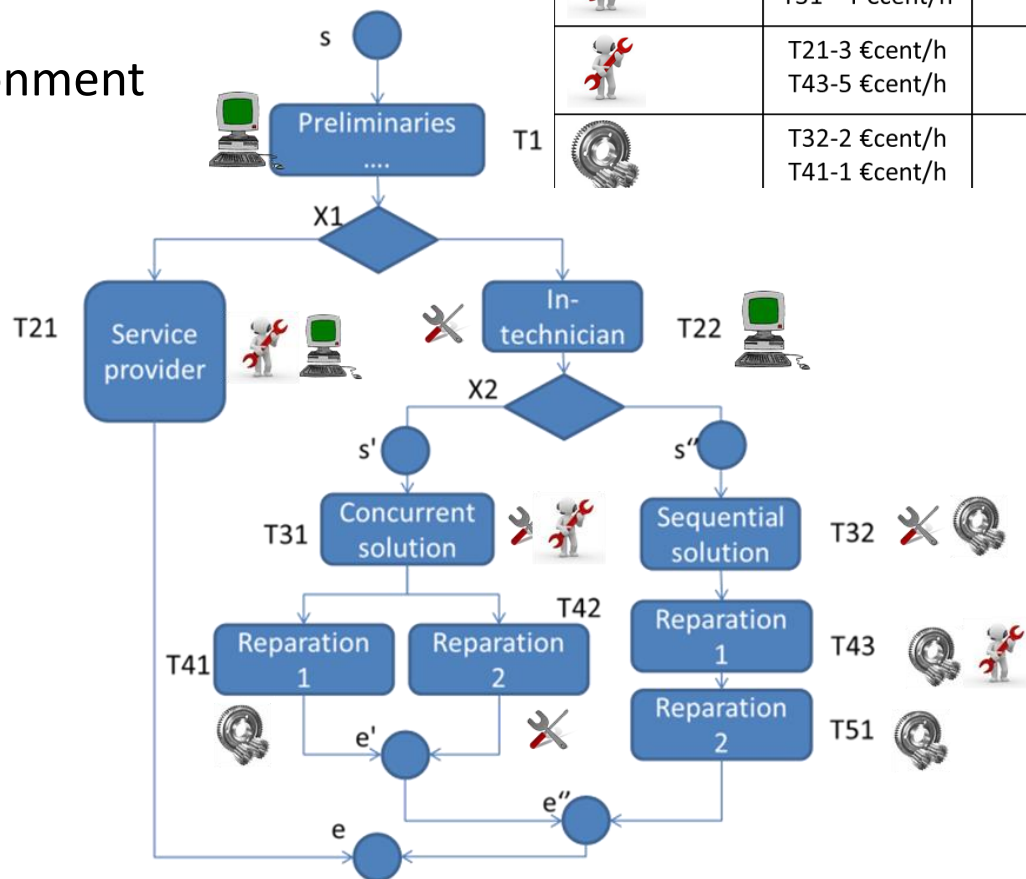
Eurocent/kWh

- ◎ Business processes
    - – Need of resource allocation under demand
    - – Need to consider energy consumption, resource prices, delivery times, etc.

- Allocation of resource to tasks

- Dynamic environment

|	⚡	💲	🕐
🔧	T21 - 3 €cent/h T31 - 4 €cent/h	100 €/h	T21 - 2h T31 - 1h
🔧	T21-3 €cent/h T43-5 €cent/h	120 €/h	T21-5h T43-1h
⚙	T32-2 €cent/h T41-1 €cent/h	60 €/h	T32-1h T41-1h

- ◉ Auctions allow an optimal allocation for just-in-time
- ◉ Competitive market
- ◉ Special domains:
  - – Production under demand / Supply chain under demand
  - – Handling unexpected tasks (provoked by faults)
  - – Unknown resource status
  - – Outsource resources
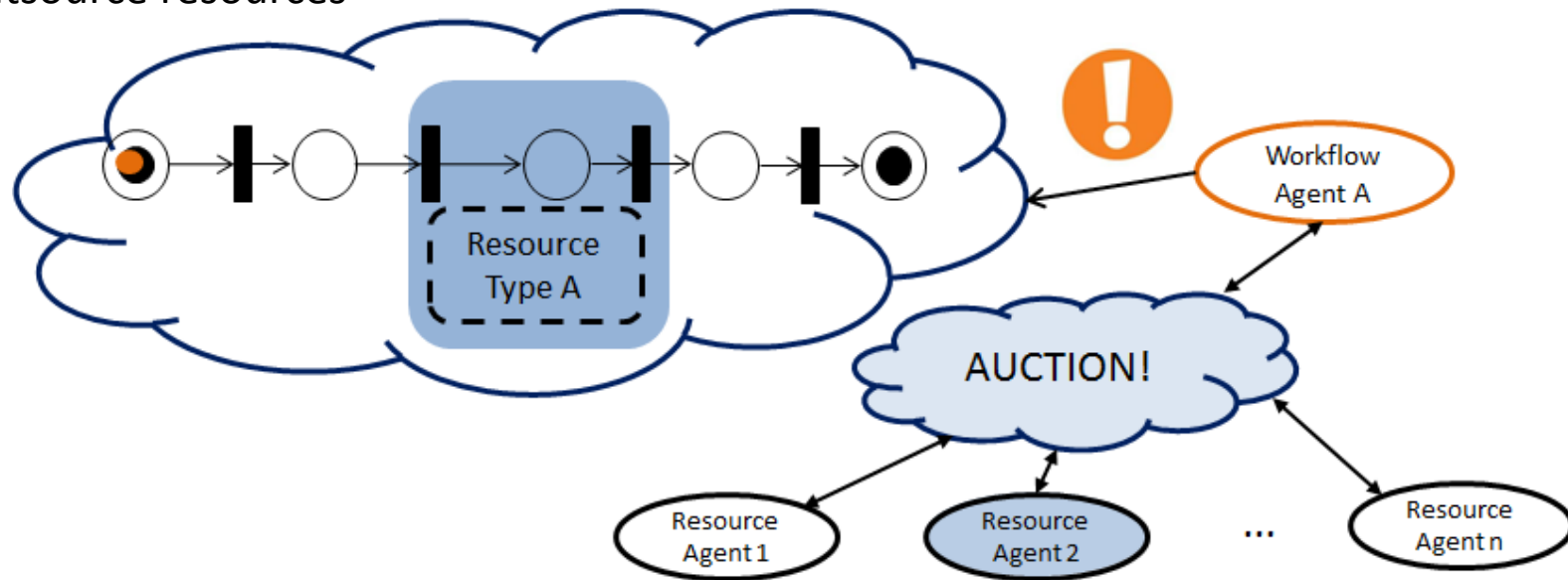
◉ Combinatorial multi-attribute auctions → Optimisation according to a given criteria.
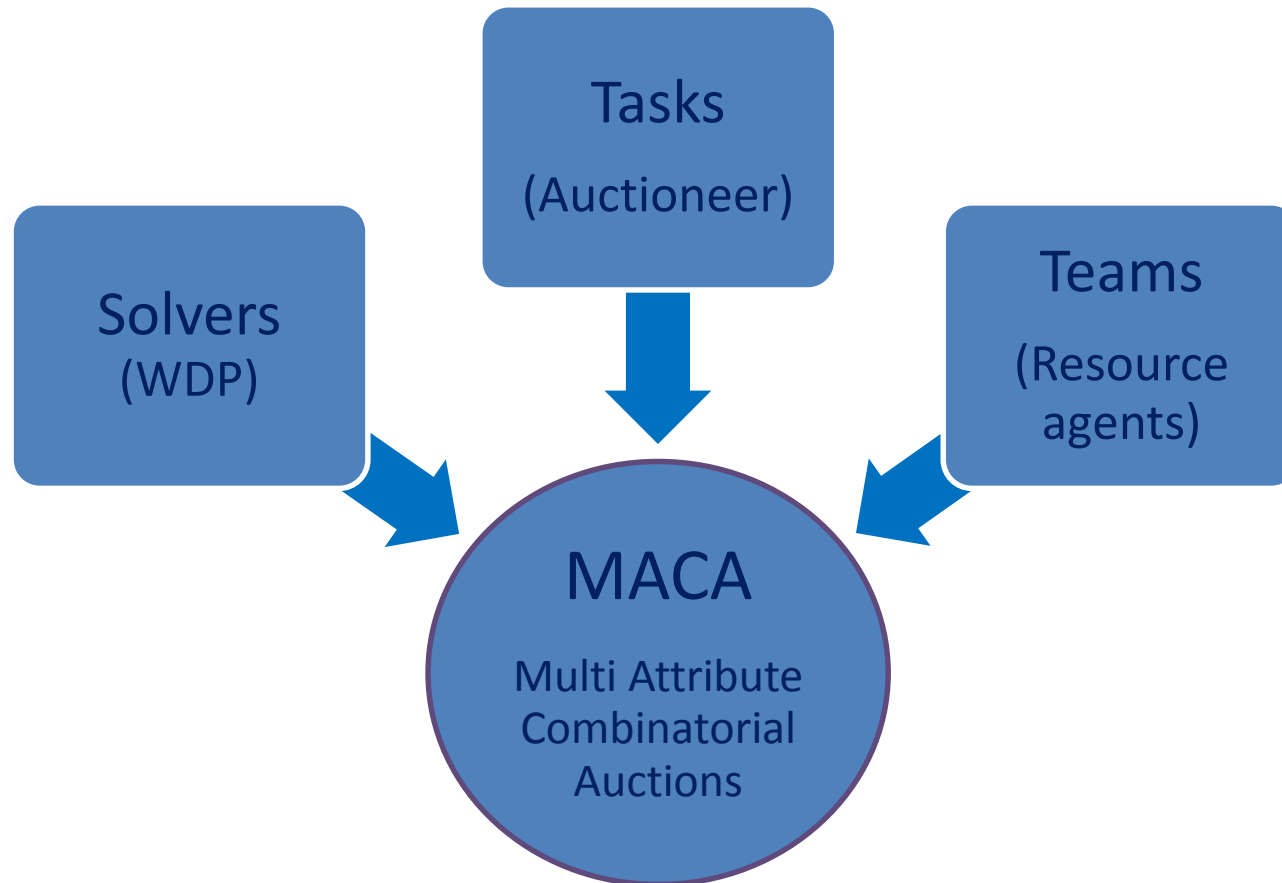
1. Call for proposals (CFP)
2. Bidding
3. Winner determination problem (WDP)
4. Payment
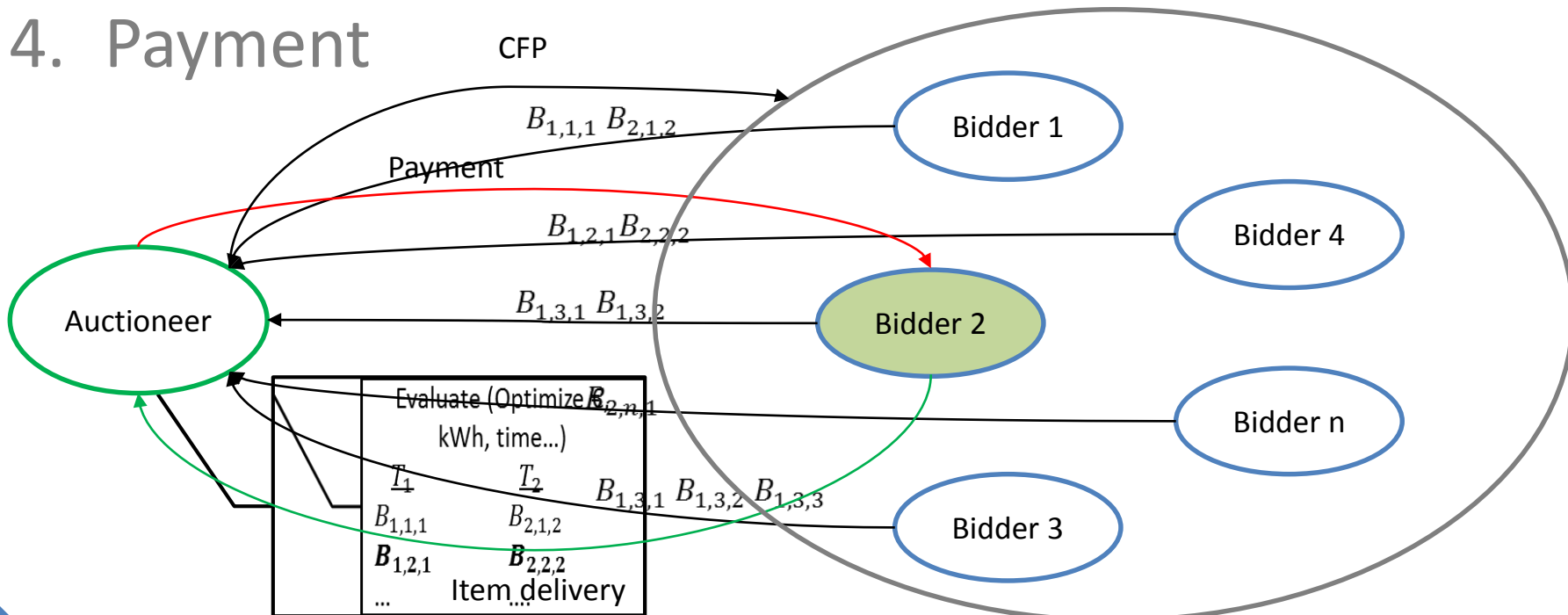
◉ Payment method (2-case method)

1. Good delivery → it receives a (modified for MA) **second price** (VCG) payment

2. Bad delivery → it receives a payment in such a way that the valuation of the obtained payment and the delivered attributes matches the valuation of the bid

$$V\left(p_{i,j,k}, t'_{i,j,k}, e'_{i,j,k}\right) = V\left(b_{i,j,k}, t_{i,j,k}, e_{i,j,k}\right)$$

- ◉ Experimentation over a maintenance and reparation system
  - – An agent offers (maintenance/reparation) tasks and a group of agents compete to perform these tasks
- ◉ The use of meta-heuristic algorithms such as GA provide very good solutions to the WDP
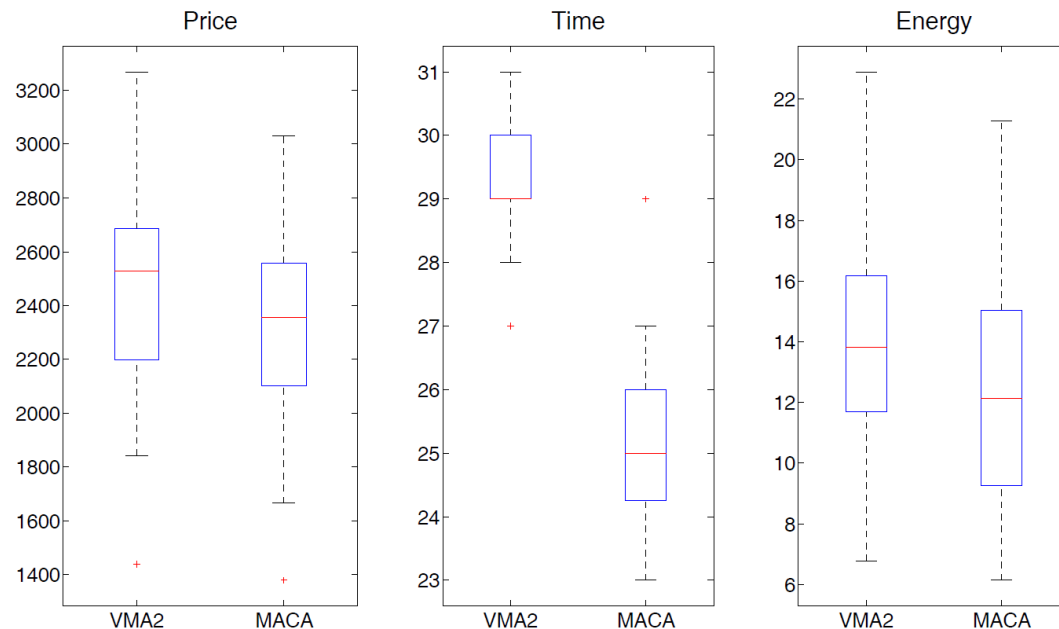
- ✓ Merge of multi-attribute and combinatorial auctions
- ✓ MACA:
  - ✓ Allows the wished balance between attributes
  - ✓ Manages variable electricity prices and the environmental footprint
  - ✓ Outperforms other uni-item auctions
- ✓ Meta-heuristics provide very good solutions to the WDP in a small amount of time

THANKS!!