

# **Dynamic Context-Sensitive Deliberation**

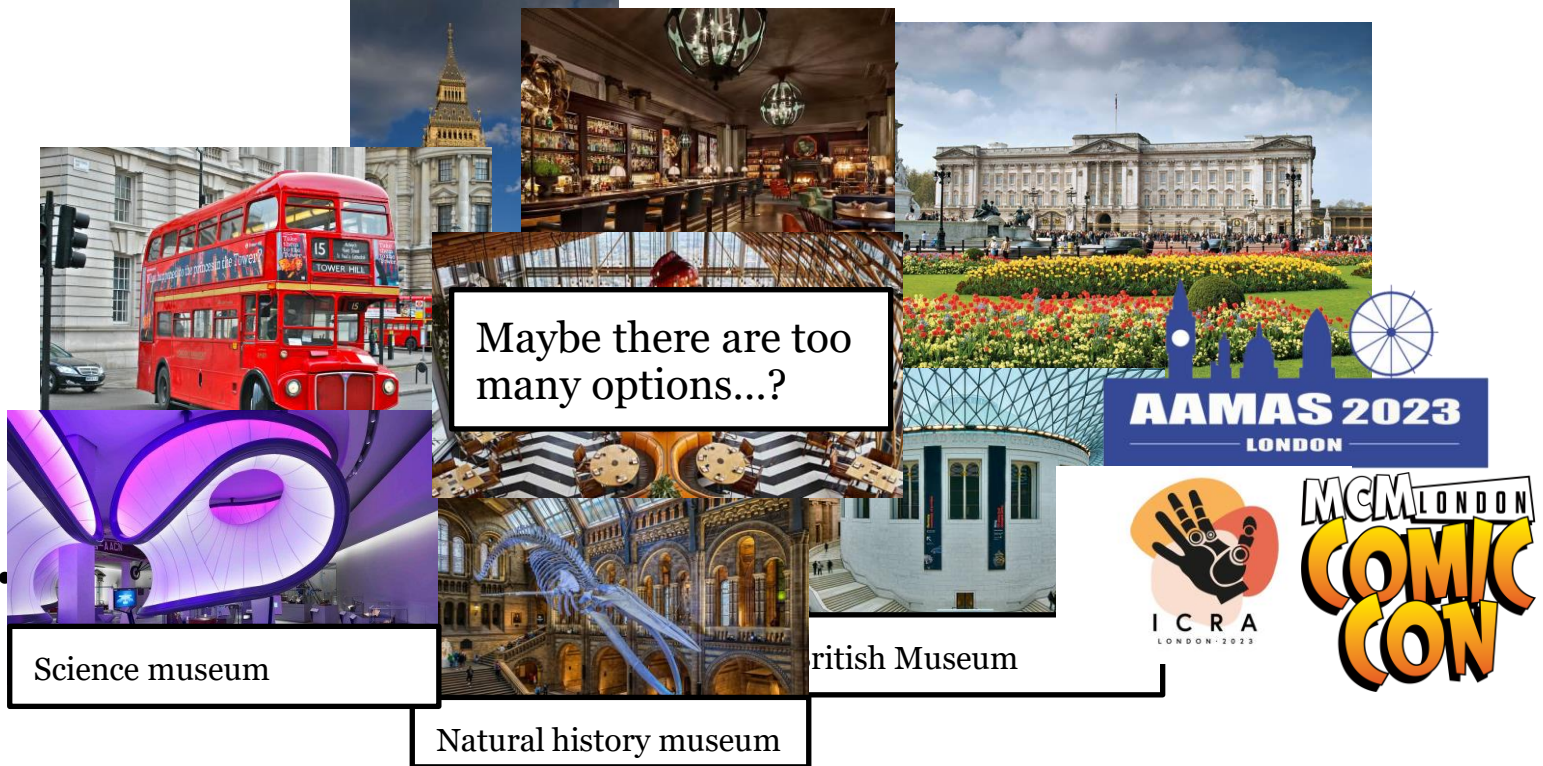
**Maarten Jensen**

**Collaborators: Frank Dignum & Lois Vanhée**



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# What do you do in London?



# Take a step back

- What do you do in London?
- More specifically?



# What do you do in London?

- When?
- In the evening after MABS?



# What do you do in London?

- Typical options?

When: Evening after MABS?



Rest at hotel

Work at hotel



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# What do you do in London?

- Other typical options?

When: Evening after MABS?



Eat at a restaurant



Go to a bar

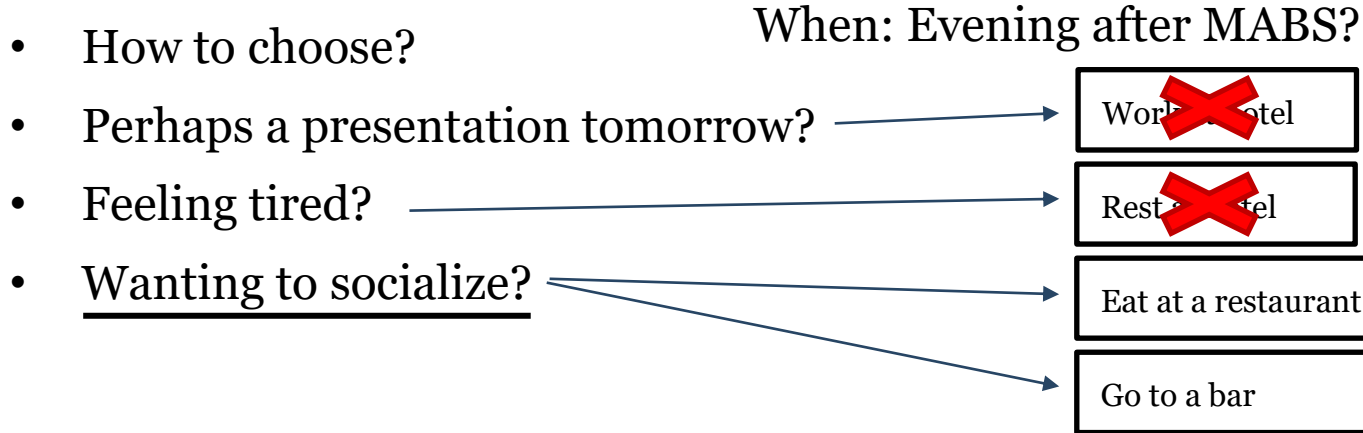
Work at hotel

Rest at hotel



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# What do you do in London?

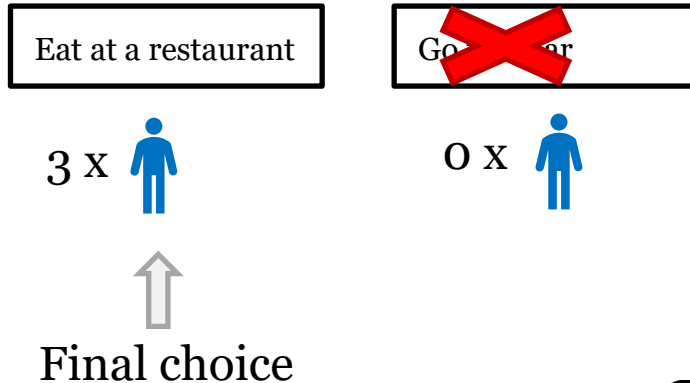


# What do you do in London?

- Since we wanted to socialize
- What will the others do?

When: Evening after MABS?

Goal: To socialize



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# How was the choice made?

- Gradually get information from situation

Where? London, MABS

When? Today, evening

Typical options: rest/work at hotel

Extra options: restaurant, concert

What I want: to socialize

People's preferences: restaurant

This is decision context!

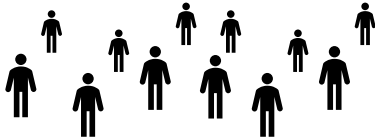


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# Why context in Agent Simulations?

- Scalability and realism trade-off

1. Simple: e.g.  
probabilistic



Both?

2. Complex: many social  
aspects



3. Simple by default, more complex  
by necessity (Kahnemann?)

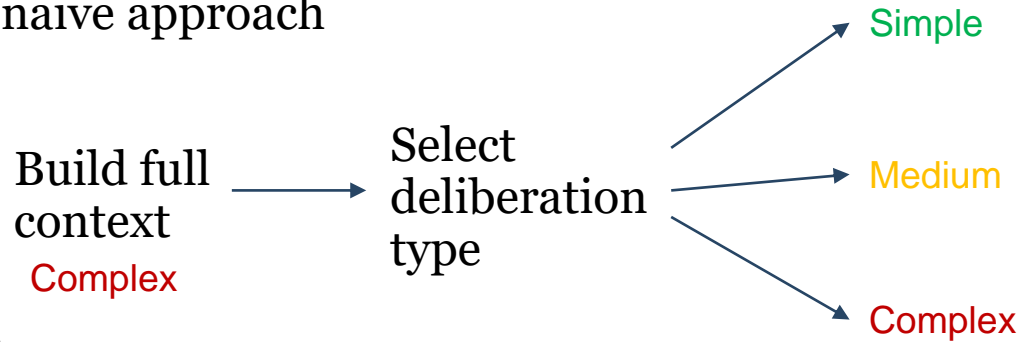
- What determines this?
- The decision context!



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# Deliberation with context

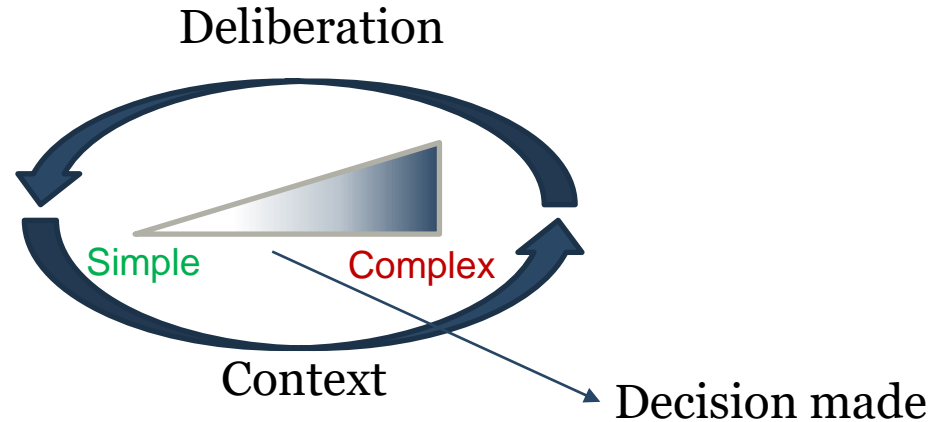
- Most naïve approach



- Done?
- NO, complexity moved to context determination
- How?



# Dynamic deliberation with context



Context is vague



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# Handles for context

- CAFCA matrix [1] 3x3
  - a Contextual Action Framework for Computational Agents
- Decision situations for an agent

	Individual	Social	Collective
Automatic	repetition	imitation	joining-in
Strategic	rational choice	game theory	team reasoning
Normative	(institutional) rules	(social) norms	(moral) values

[1] Elsenbroich, C., & Verhagen, H. (2016). The simplicity of complex agents: a Contextual Action Framework for Computational Agents. *Mind & Society*, 15, 131-143.



# Information relevance in context

- Based on CAFCA
- Relevant information [2]
- Framework components?

[2] Jensen, M., Verhagen, H., Vanhée, L., & Dignum, F. (2022, March). Towards Efficient Context-Sensitive Deliberation. In *Advances in Social Simulation* Cham: Springer International Publishing.

Simple

	Individual	Social	Collective
Habitual	<p>Accessible objects, Accessible people, Actions currently performed</p> <p>Accessible means being accessible to the DB in the current context.</p>	<p>Theory of Mind: G, B, I Actions performed by relevant people</p> <p>Accessible objects, Accessible people, Actions currently performed</p> <p>Relevant people are those who have a similar goal to the DB. There is a minimal theory of mind.</p>	<p>Theory of Group: G, B, I Expected action as team member</p> <p>ToM: G, B, I Actions performed by relevant people</p> <p>The group considered is the group that the DB wants to join. The DB need information to perform actions to belong to the group.</p>
Strategic	<p>Useful objects, useful people, Utility</p> <p>Accessible objects, Accessible people, Actions currently performed</p> <p>The set of objects and people is extended to include also not directly accessible objects for plan making.</p>	<p>ToM: Mental attitudes ToM: G, B, I Actions performed by relevant people, Utility, Useful objects, Useful people</p> <p>Relevant people are those who can aid or hinder the DB. Mental attitudes refer to the information needed to make an estimation of the actions that other agents will perform.</p>	<p>ToG: Mental attitudes, roles Agents in my group</p> <p>ToM: Mental attitudes, Theory of Group: G, B, I Expected action as team member</p> <p>The mental attitudes and roles are information needed for the DB to make decisions in the group. E.g. status, structure of team, mental models, roles</p>
Normative	<p>Related rules, Related laws, Useful objects, Useful people, Utility</p> <p>Rules and laws that are relevant for the current context</p>	<p>Related social norms People's opinion towards those norms</p> <p>Related rules, Related laws, ToM: Mental attitudes</p> <p>Social norms related to the current context. That may hinder or lead behavior of the DB.</p>	<p>(Moral) values of self, Theory of Mind: values, Theory of Group: values</p> <p>ToG: Mental attitudes, roles Agents in my group</p> <p>Related social norms People's opinion towards those norms</p> <p>Consider values of self, others, group.</p>

Complex



# The framework

Abstract & Simple

Deliberate deliberation

All social behavior

Too much!  
Slow

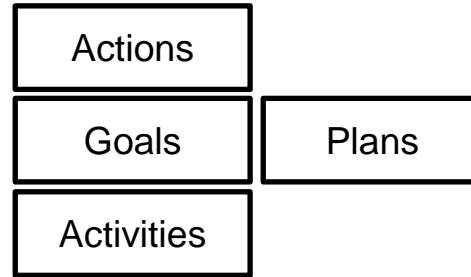
habits, rules, groups, imitation, social norms, values, needs, motives, social practices, conventions, game theory, etc.



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# What is the meta-deliberation?

- Tuple of basic elements
  1. Output of deliberation
  2. Agent wants to achieve
  3. Handling context

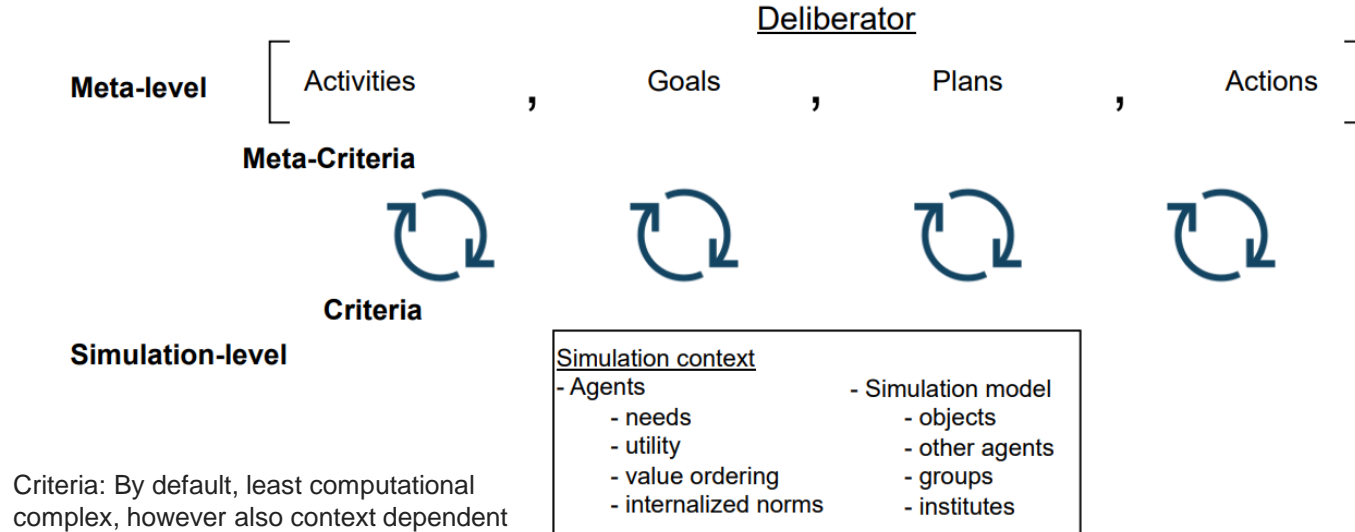


- Not set in stone

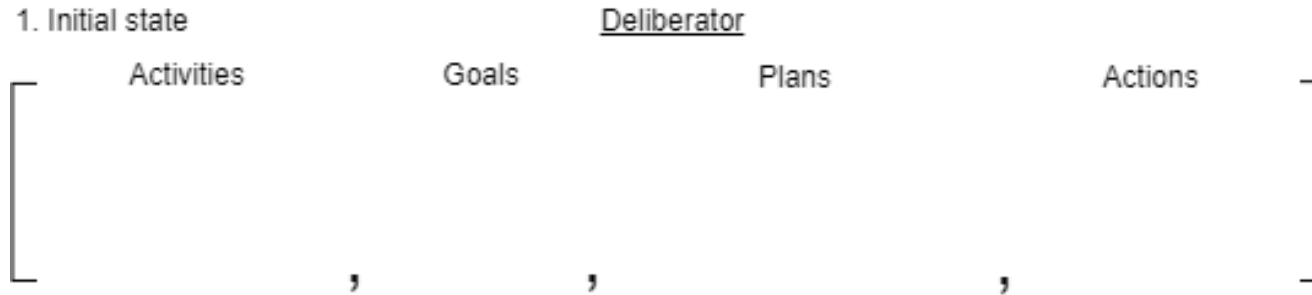




# Dynamic Context-Sensitive Deliberation



# Example of deliberation



# Example of deliberation

2. Filling in the tuple

Deliberator

Meta-criteria:  
Expand\_actions

Criteria:  
Typical actions

Activities

Goals

Plans

Actions

,

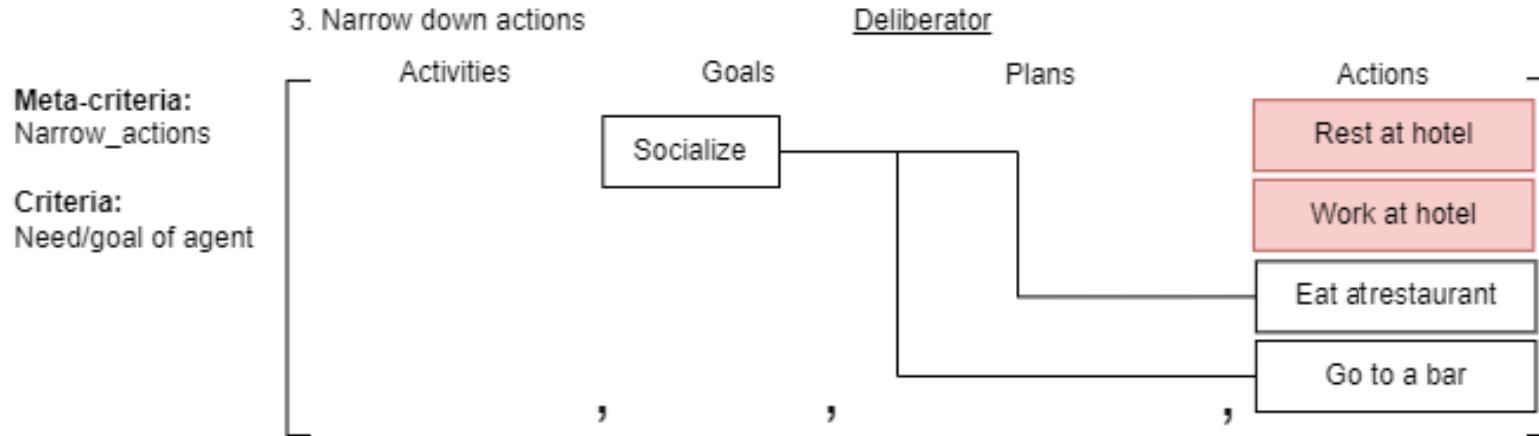
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# Example of deliberation



# Example of deliberation



Final choice: Eat at a restaurant



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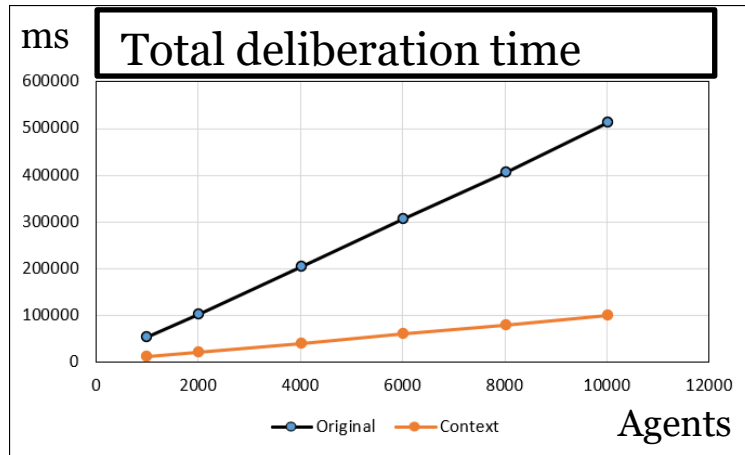
# **Increase scalability while retain realism?**

- MABS paper shows proof-of-concept
- SSC2023 (under review) shows new results



# Results from SSC paper (under review)

- Test in large scale model



- Not total execution time

[4 Under review] Jensen, M., Vanhée, L., Dignum, F.:  
Context-Sensitive Deliberation for Scalability in Realistic  
Social Simulations - Social Simulation Conference (2023)



# Main take aways

- Scalability and realism trade-off
- Complexity by need
  - Requires context
- Dynamic Context-Sensitive Deliberation
  - Increases scalability while retaining realism
  - Potentially increase realism, while retaining scalability (future work)





# The End

- Thank you for attending!
- Questions?



# The end

**Maarten Jensen**

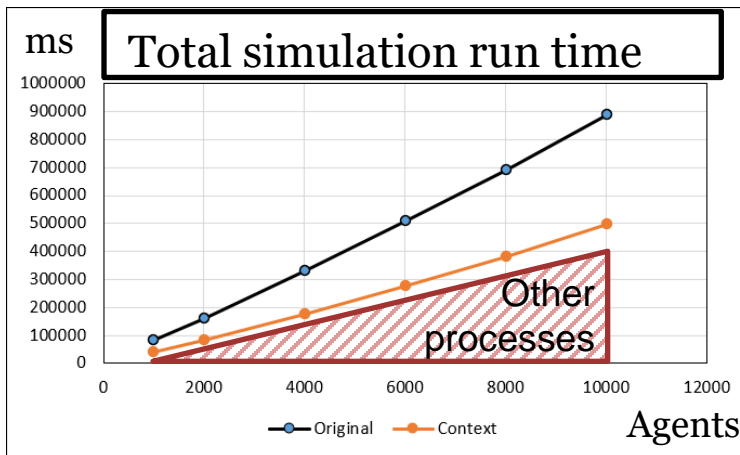
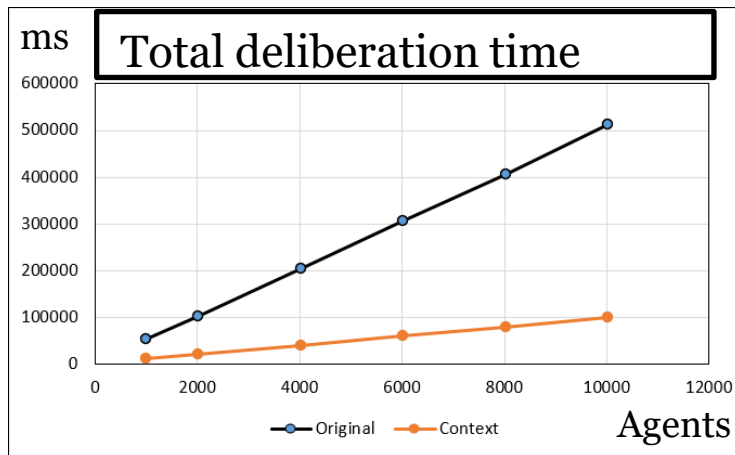
**Supervisors: Frank Dignum & Lois Vanhée**



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# Results from SSC paper

- Test in large scale model



- One piece of puzzle



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