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# Representing Interaction Protocols in DAML

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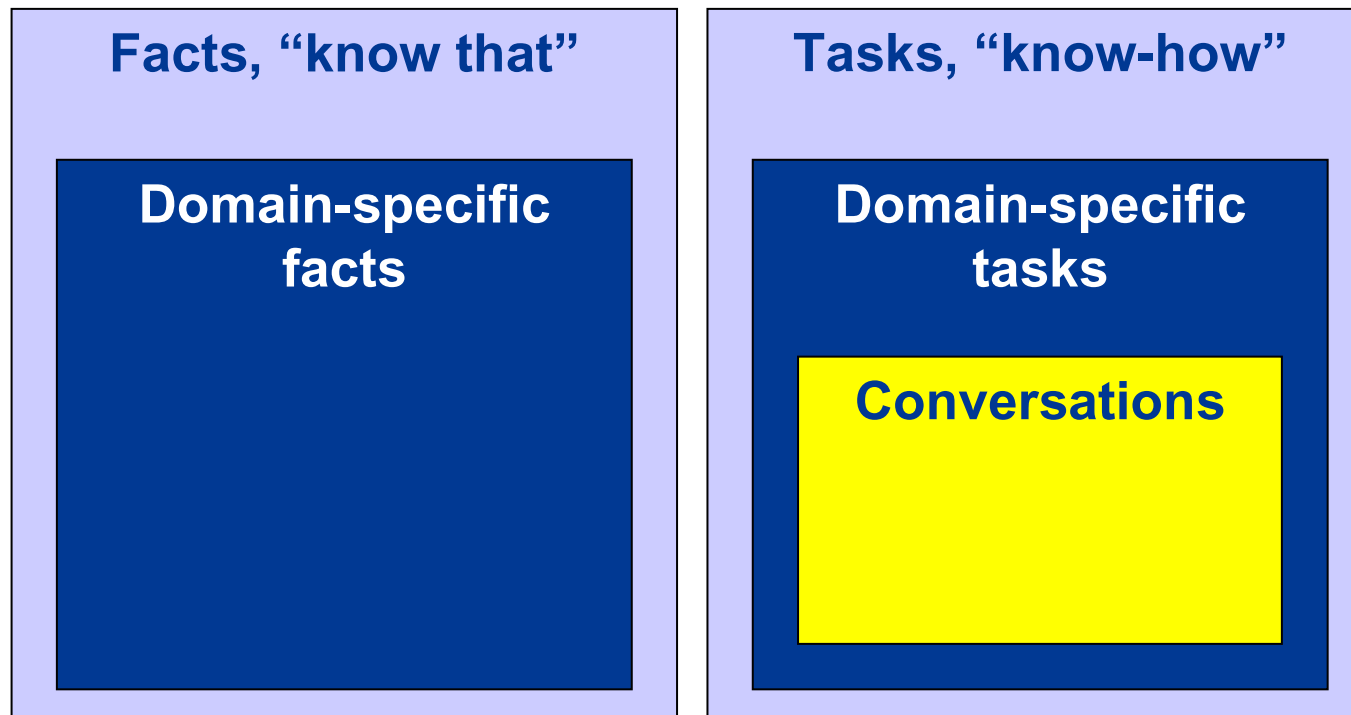
- Motivation: Distribution of cognition
- Example scenario
- Agent conversation elements
- Interaction protocol ontology + an example IP serialization
- Conclusions
- Future work

## Motivation

- Software agents will operate in an open, heterogeneous and dynamic environment
  - no sense in programming "everything" in the agent code
  - not easy to code simple task-specialist agents for every task
    - this would require complete knowledge about the state and available services of the whole environment at all times
- Instead something in between
- Some of the information useful to the agents could be **distributed across** the environment
- Agents have to be able to **adapt** to this distributed knowledge
- Influence from the theory of distributed cognition

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## What is distributed?

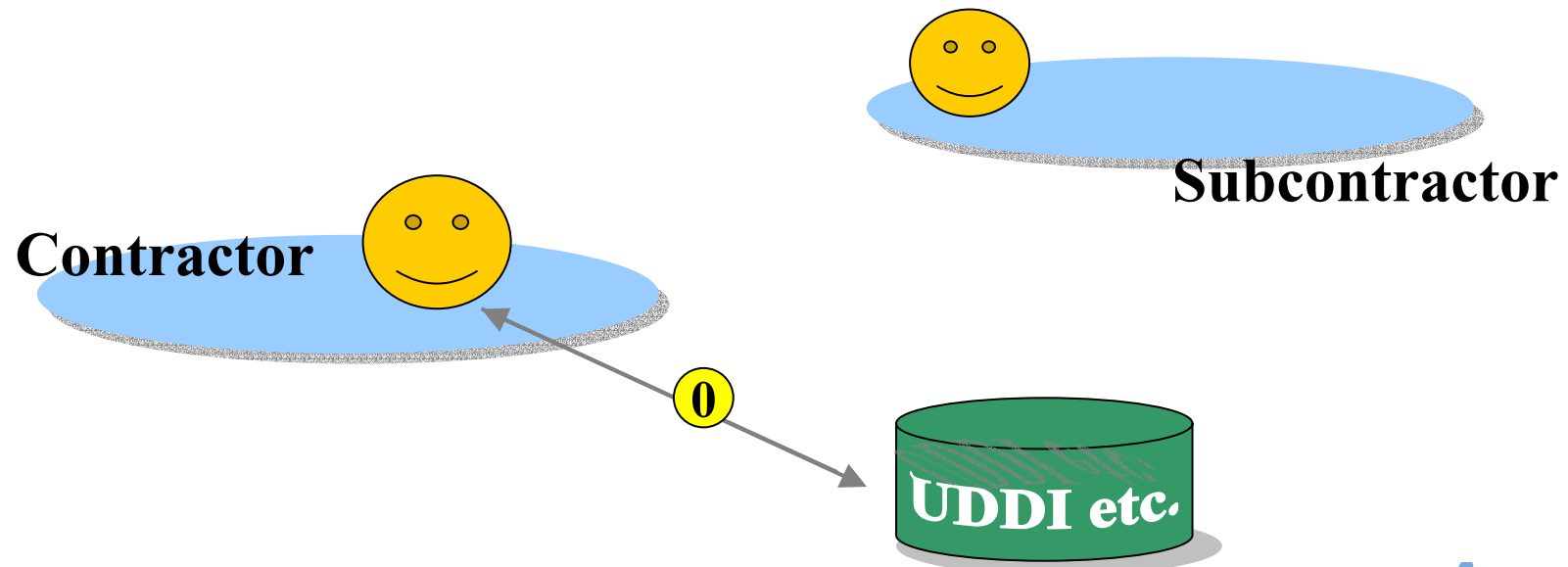


## What is distributed (contd.)?

	<b>primitive</b>	<b>composite</b>
<b>type-level</b>	<b>communicative act</b>	<b>interaction protocol</b>
<b>instance-level</b>	<b>message</b>	<b>entire conversation</b>

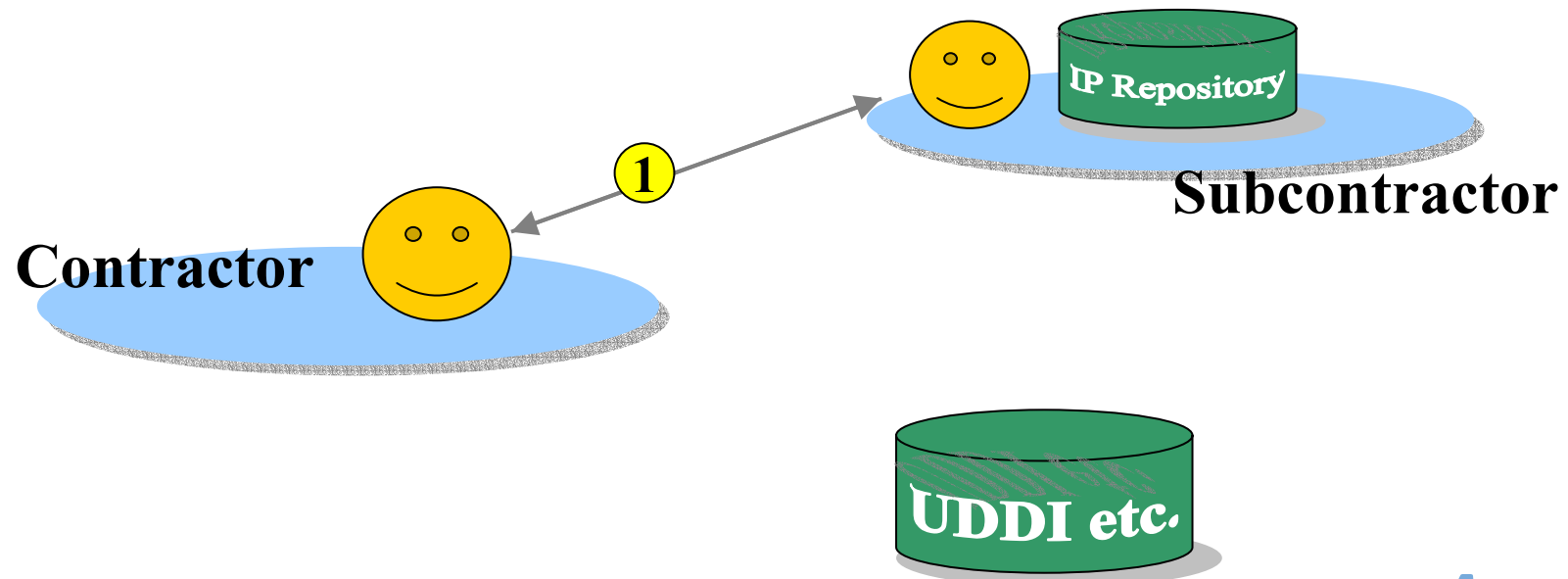
## Contractor-subcontractor example

0: "Find subcontractor"



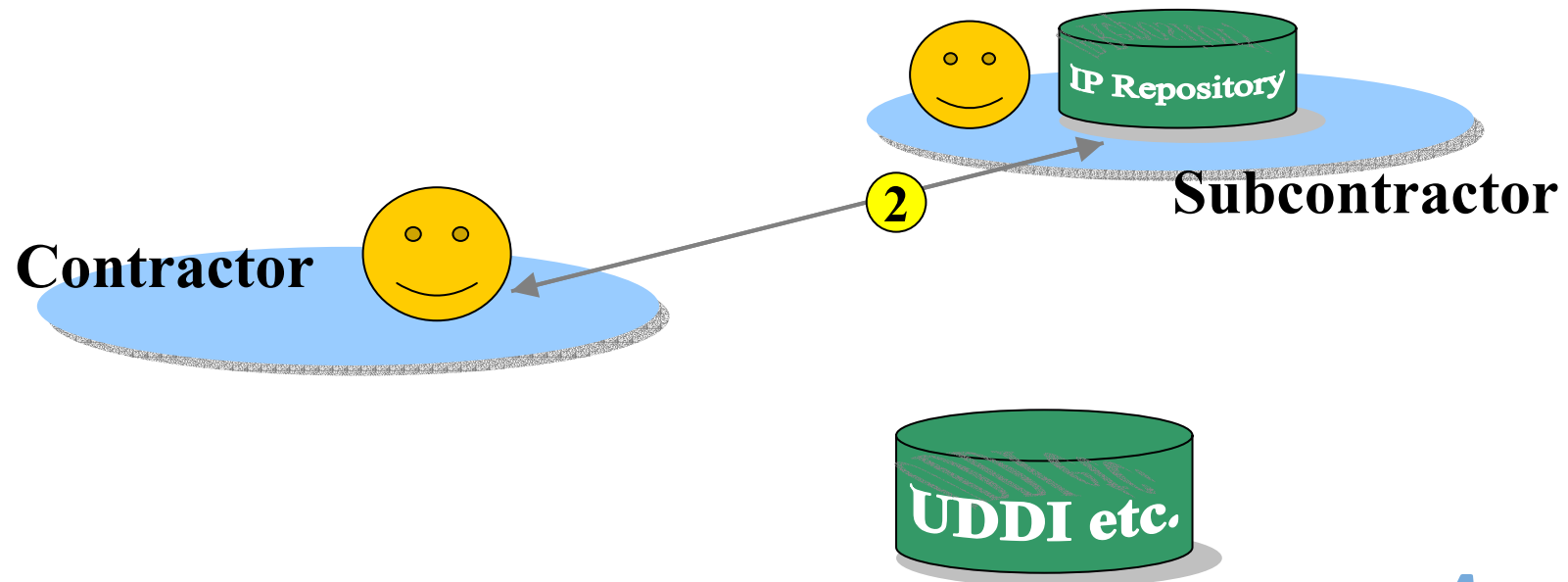
## Contractor-subcontractor example

1: *"Receive pointer to IP Repository"*



## Contractor-subcontractor example

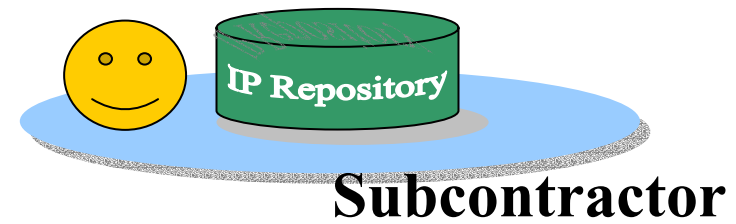
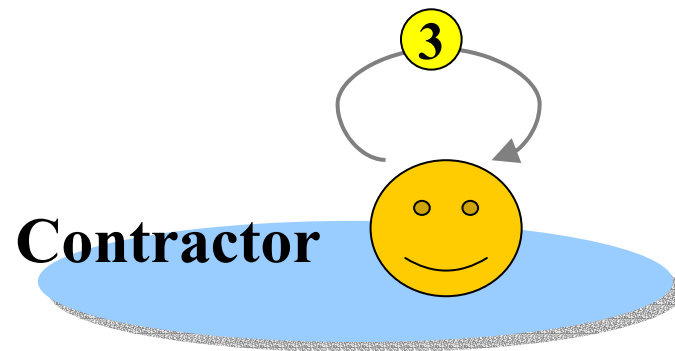
2: "Download IP descriptions"





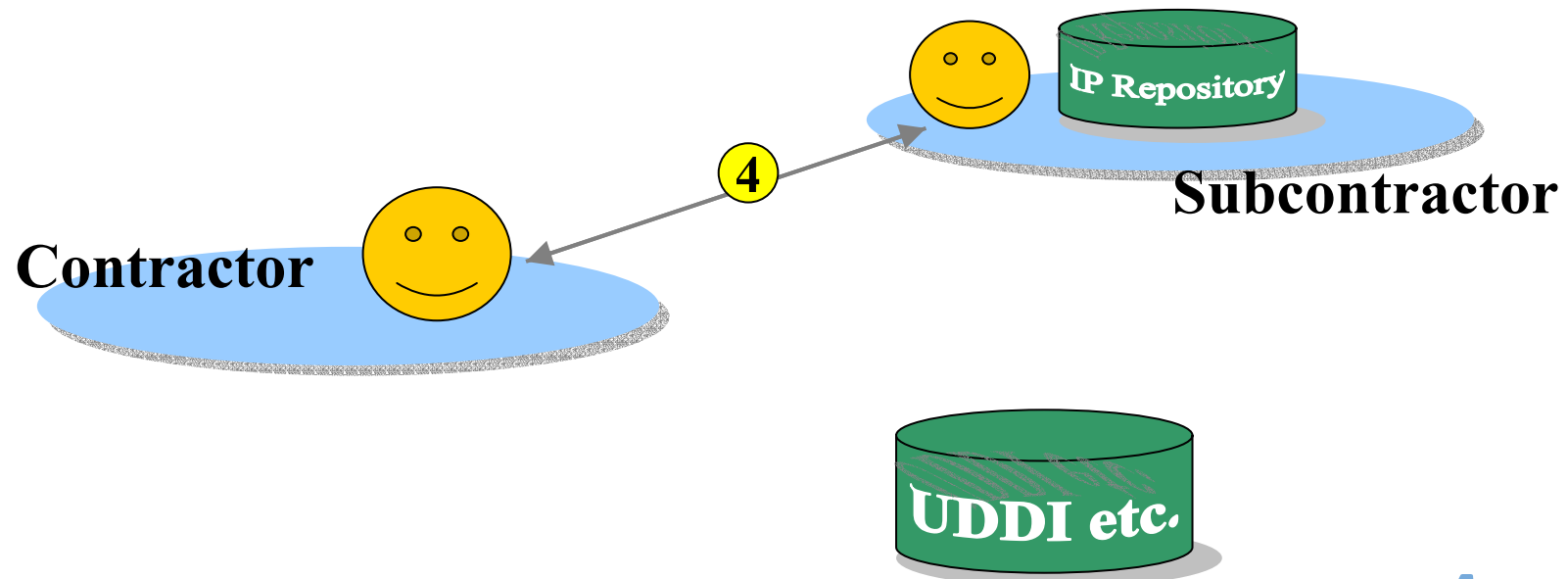
## Contractor-subcontractor example

3: *"Modify behavior, adapt"*



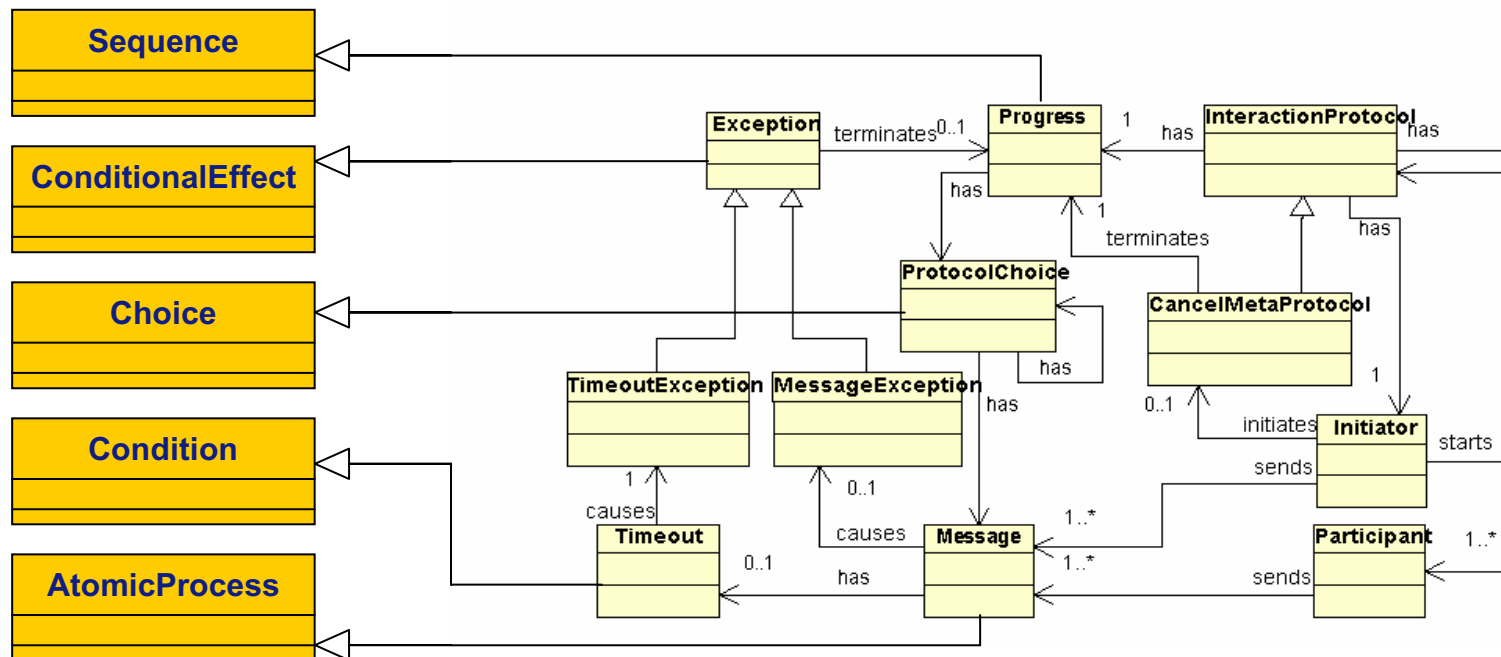
## Contractor-subcontractor example

4: "Interact"

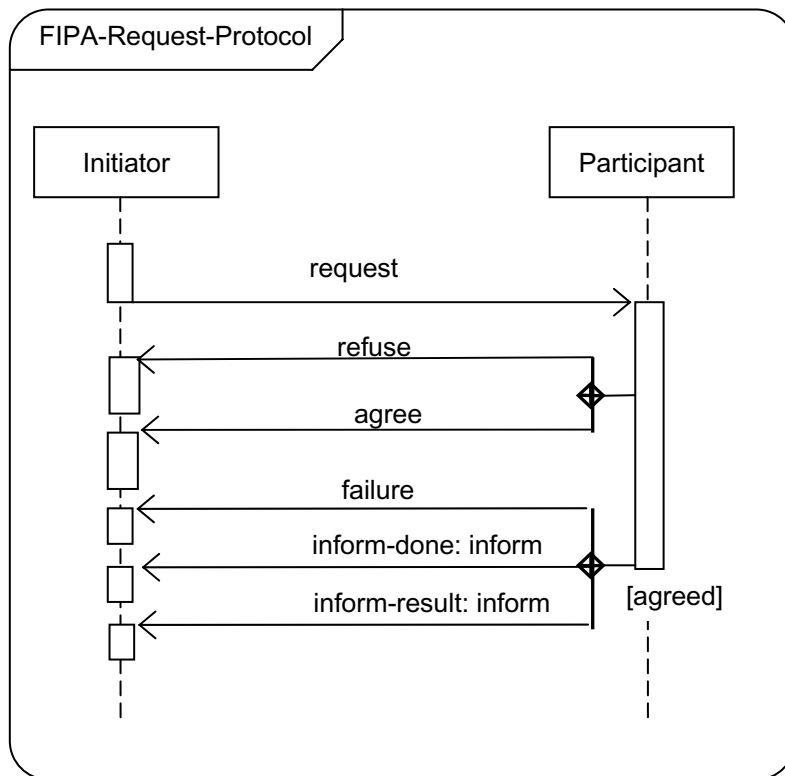


## Interaction protocol ontology

- Define concepts useful for describing interaction protocol instances
- Utilize selected concepts from **DAML-S** process ontology



## An example IP serialization: FIPA Request



REQUEST Message

→ ProtocolChoice

→ REFUSE Message or

→ AGREE Message

([AGREED] and no Exceptions nor  
CancelMetaProtocol)

→ ProtocolChoice

→ FAILURE Message or

→ INFORM Message (content: Done or  
the result)

• **Agents:** Initiator and Participant

• FIPA-Request-Protocol is a  
subclass of InteractionProtocol

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## Conclusions

- Software agents acting in dynamically changing and heterogeneous environment(s) benefit from **adaptability**
- Agents can adapt to task-related information such as conversation descriptions in addition to fact-related information
- **Interaction protocol ontology** specifies useful concepts to be used when serializing individual interaction protocols
- Interaction protocols can be serialized for example using **DAML-S** and stored in a repository external to the agents
  - the agents can download the IP descriptions and modify their behavior (i.e. adapt) based on the descriptions

## Ongoing and future work

- Incorporate more concepts from DAML-S and modify existing ones as new versions of the specification emerge
- Divide the interaction protocol ontology into layers
  - From layers enabling simple descriptions into ones that enable more complex ones
  - IP descriptions conforming with complex IP ontology layers enable better adaptability for the agents
- Consider distributing and serializing other conversation elements

	primitive	composite
type-level	communicative act	interaction protocol
instance-level	message	entire conversation

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Thank you!

- Questions?
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