Adaptive choreographies

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Choreographies

- Allow to describe the behavior of a distributed communicating system at the very abstract level
- Based on interactions of the form $a \rightarrow b$
- Composed using different operators (sequence, parallel, ...)
- Possibly extended with other information (data, ...)
- Very similar to global types in multiparty session types
Choreography projection

- Allow to automatically derive from a choreography a description of the behavior of each participant
- When interacting, the participant behave as specified by the choreography
  - Requires some conditions on the choreography
- The projection of $a \rightarrow b; b \rightarrow c$ is $[\bar{o}]_a \parallel [o; \bar{o}']_b \parallel [o']_c$
Adaptation

- Systems should live for long periods of time in ever changing environments
- Users can change their minds
- The system should adapt to satisfy new requirements
  - Adaptation at runtime
  - Adaptation details not known when the system has been designed or even started
- Lots of works on adaptation
- Very little guarantees on what happens after adaptation
  - Which properties does the system satisfy?
  - Is it still safe?
Our approach

- Extend choreographies with adaptation scopes
  - Part of the choreography that may be adapted
- Adaptation is specified by adaptation rules
  - Include the new code for the scope
  - Include information on when and where the rule can be applied
- The effect of the rules at choreography level is clear
- The projection of the rules is applied to the projected system
Our approach, graphically
Our approach, graphically
Our approach, graphically
Results

- We can adapt distributed communicating systems
- The adaptive system follows the behavior prescribed by the choreography under all possible adaptations
- The adapted system is deadlock free by construction
Open issues

- Is it possible to restate/extend this approach using multiparty session types?
- What is needed to go towards an implementation?
  - More concrete language
  - Add data
- Can we specify other forms of adaptation?
End of talk

Thanks!

Questions?