Structural Considerations in Defining Executable Process Models

Borislava I. Simidchieva, Leon J. Osterweil, Alexander Wise
Laboratory for Advanced Software Engineering Research
University of Massachusetts, Amherst
Amherst, MA 01003, USA

Motivation

- Formal process definitions can be developed to model real world processes
- Such definitions can then be analyzed and used to guide improvements in the real process
- Process definitions can then be used to guide execution
- Case Study: In collaboration with the National Mediation Board (NMB), developed a process definition of their online dispute resolution (ODR) brainstorming process

Is a single process representation enough?

Outline

- Introduction
  - Necessity for instance-level support
- ODR brainstorming process overview
- The Little-JIL process definition language
- Narrative representation of the ODR process
- Role-based representation of the ODR process
- Assessment of both representations
- Conclusion
- Related work
- Future work

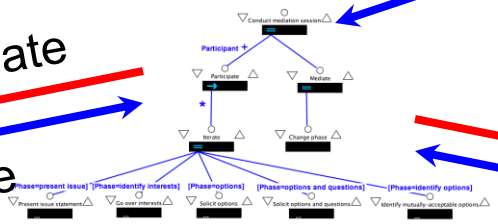
Why develop a formal process definition?

Three directing goals:

1. Help the NMB to improve their understanding of the process so that they may improve it
2. Facilitate the active involvement of disputants in the definition of the ODR process used to negotiate conflicts
3. Provide process automation to improve efficiency

coordinate

participate



Problem

- To support process automation, the process definition needs to be able to effectively coordinate multiple participants engaging in the process at once, so the process must be able to distinguish among different agent *instances*
- A single process definition representation (structural model) may not suffice in modeling the real-world process that the NMB uses
  - May address some of the goals, but not all of them

ODR Brainstorming Process Overview

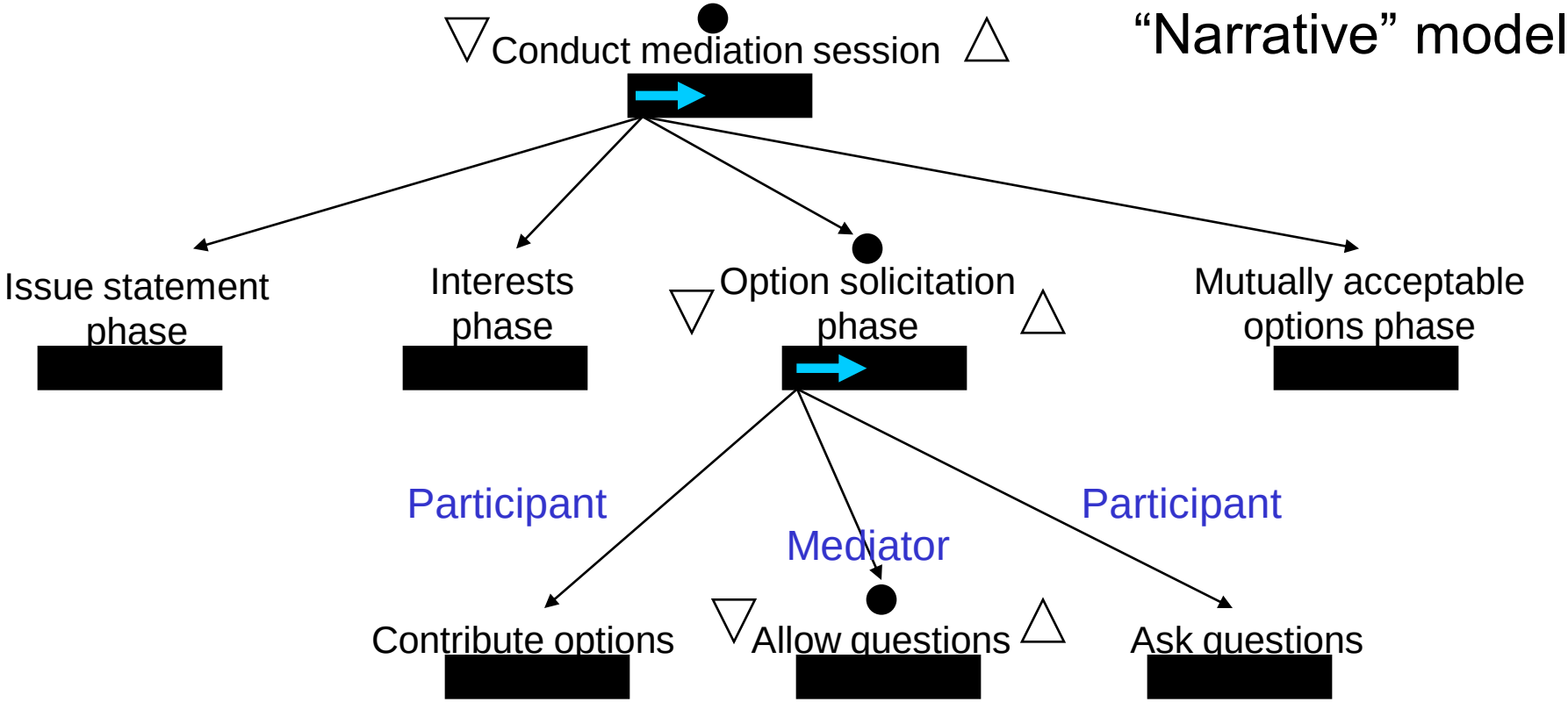
- One mediator, two parties
  - Each party comprises several participants
  - Each party has a Party Representative
- Process consists of several main phases:
  - Issue Statement
  - Interests
  - Options and Questions
  - Mutually Acceptable Options

Little-JIL Process Modeling Language

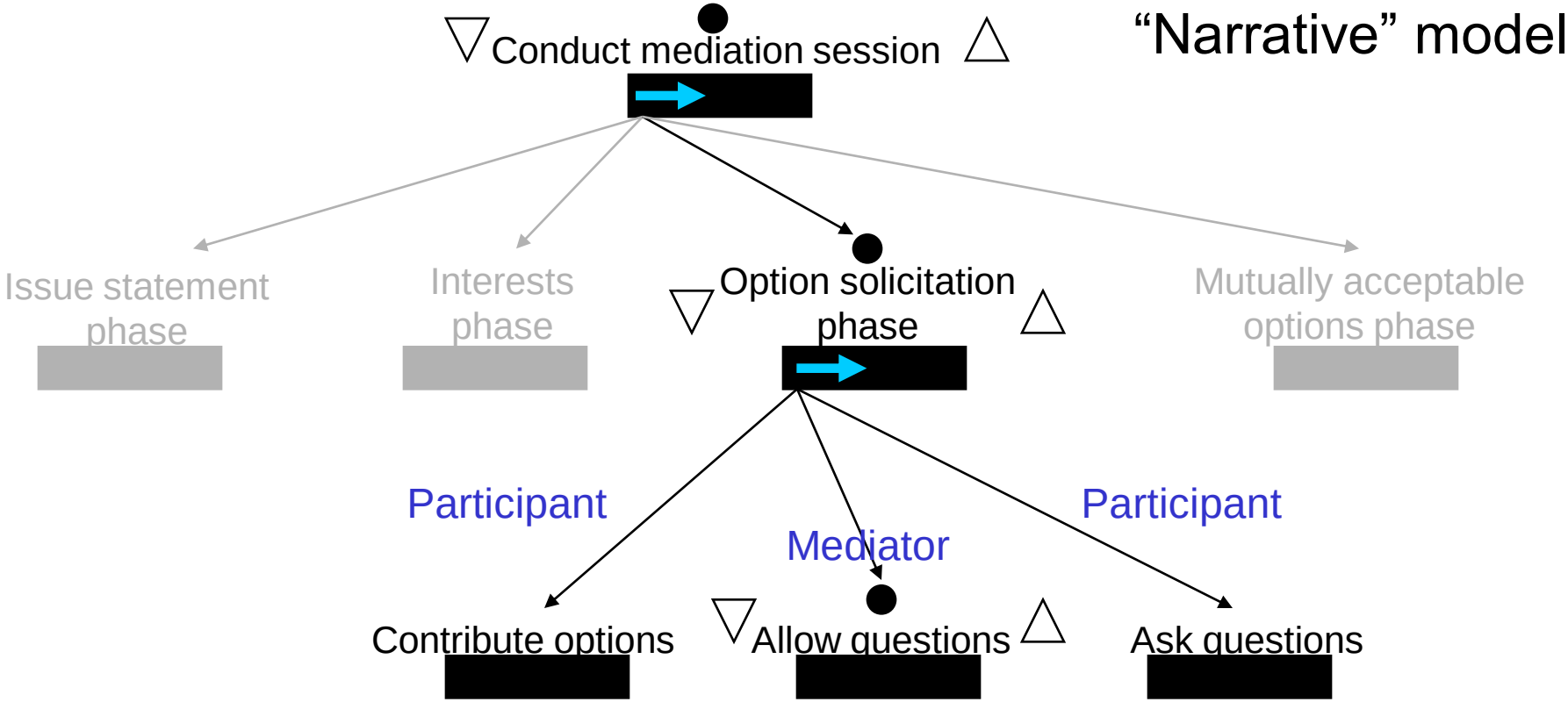
We use Little-JIL process definition language to model the ODR brainstorming process because it provides several useful features

- Visual representation
  - Hierarchical decomposition of steps
- Separation of concerns
  - Coordination specification
  - Agents
  - Artifacts
- Formal semantics supporting execution

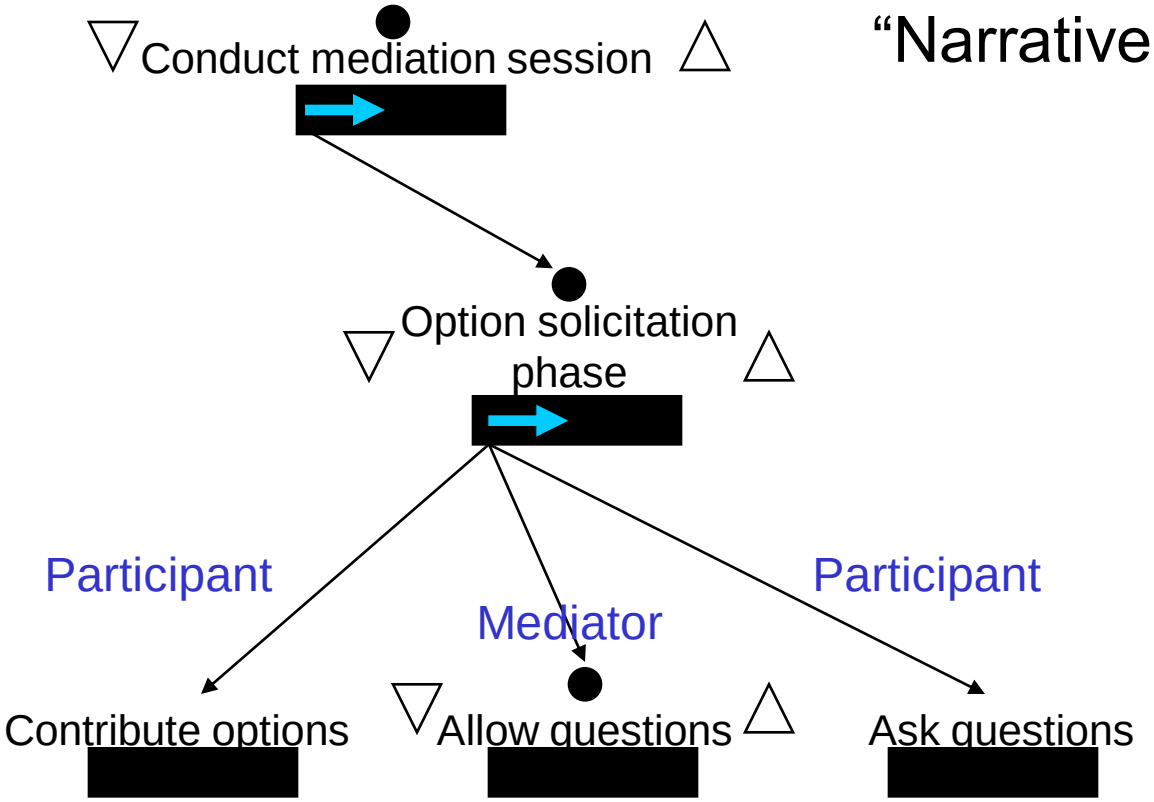
ODR Brainstorming Process in Little-JIL



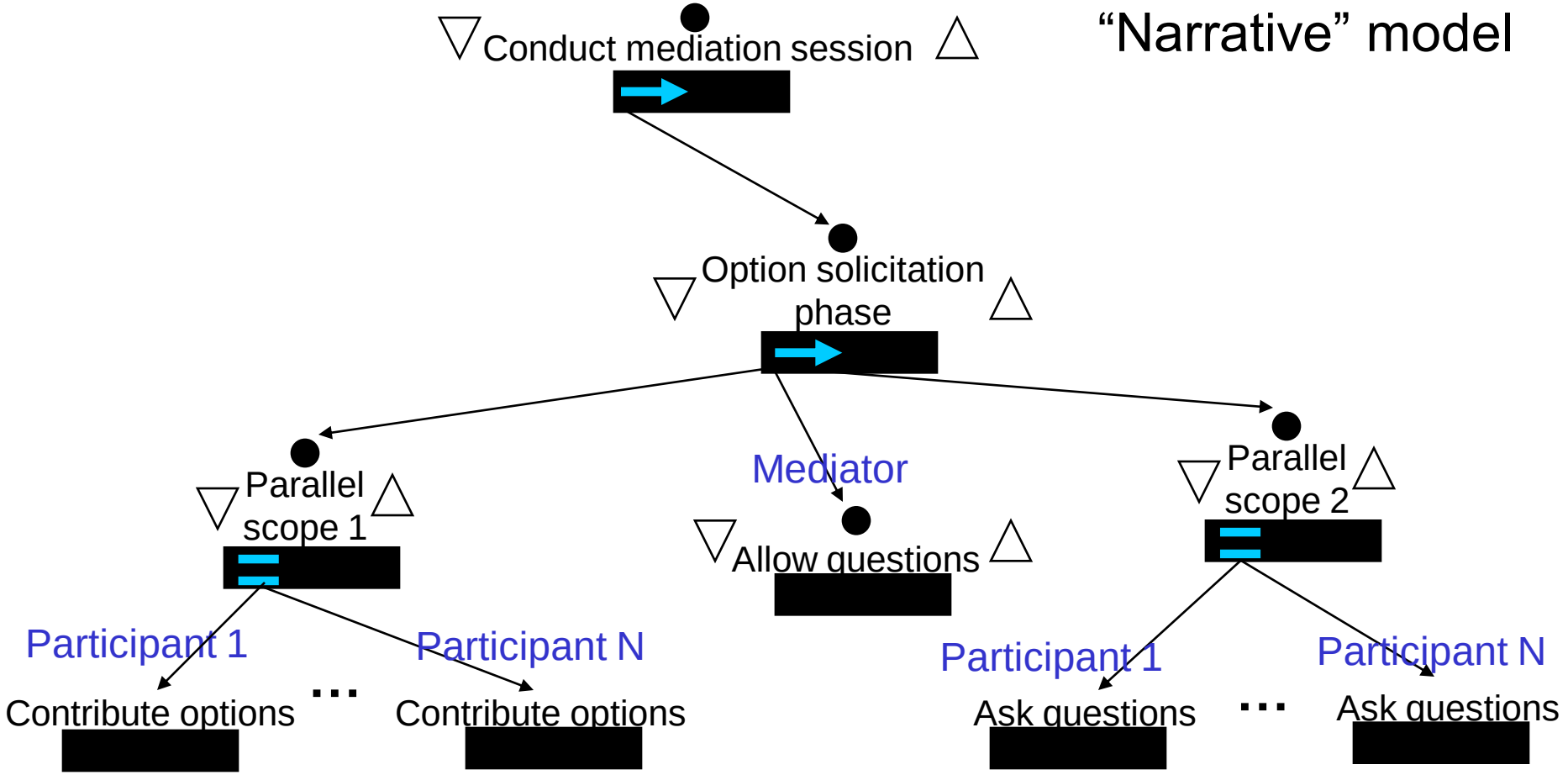
ODR Brainstorming Process in Little-JIL



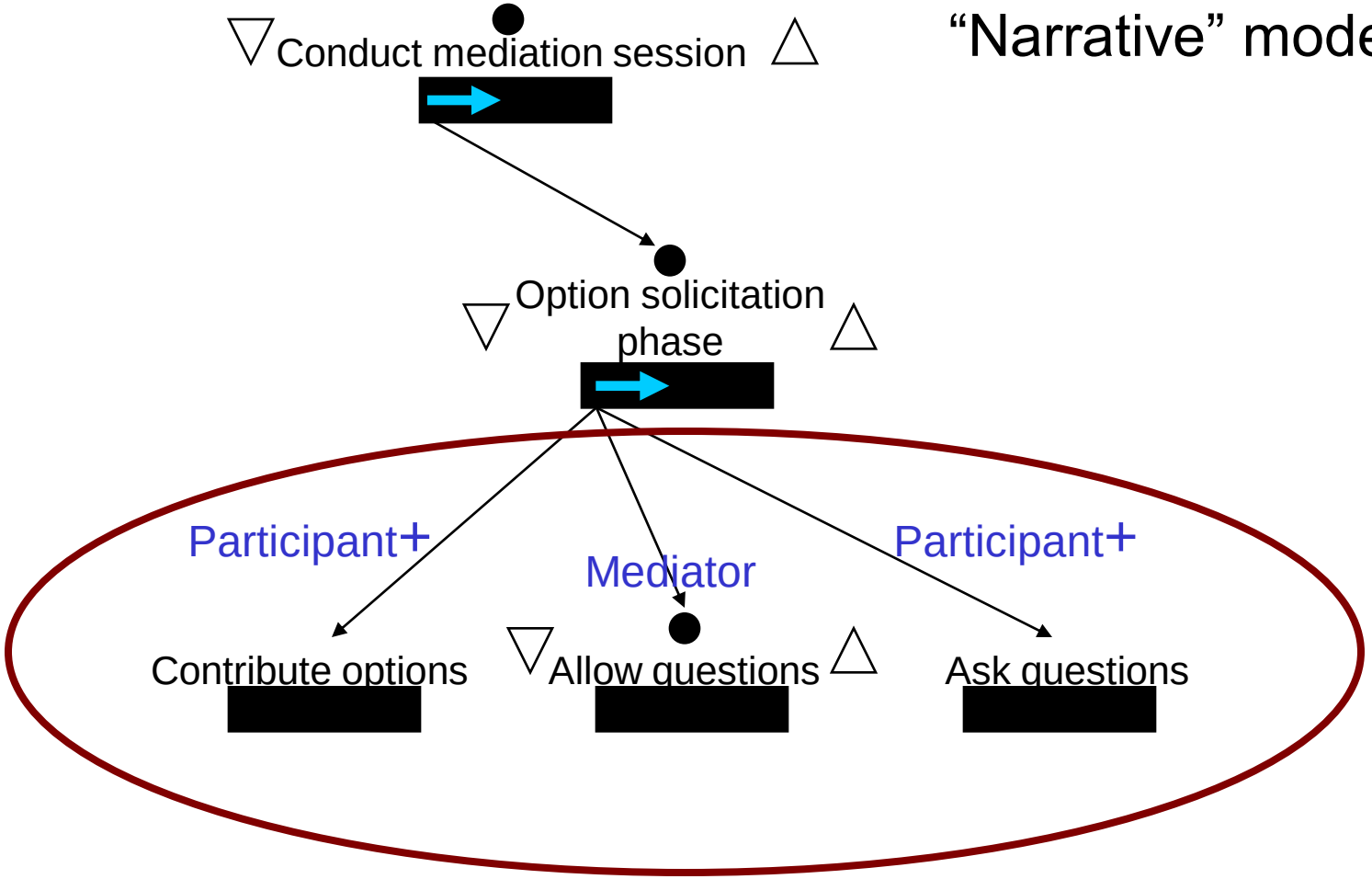
ODR Brainstorming Process in Little-JIL



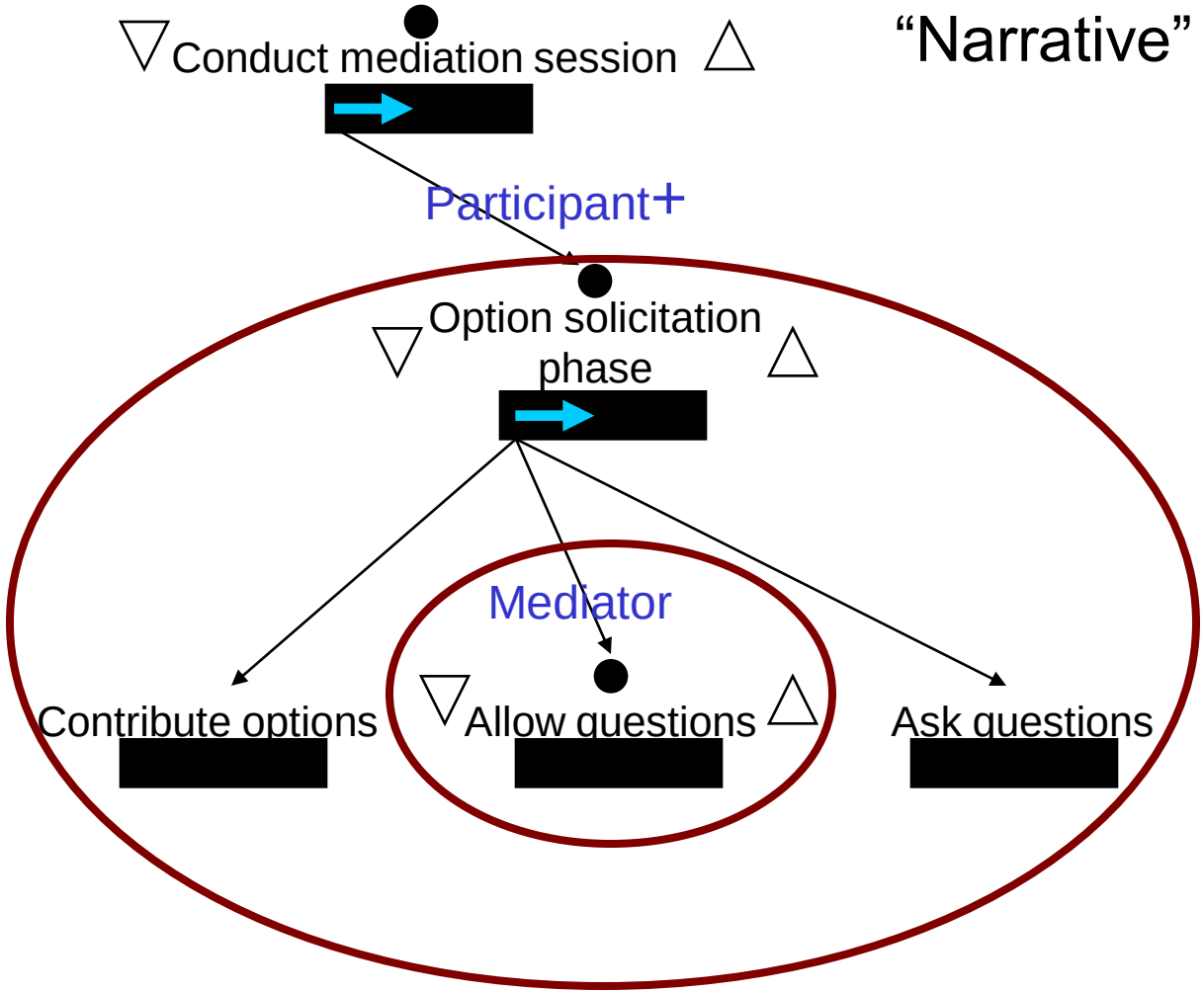
ODR Brainstorming Process in Little-JIL



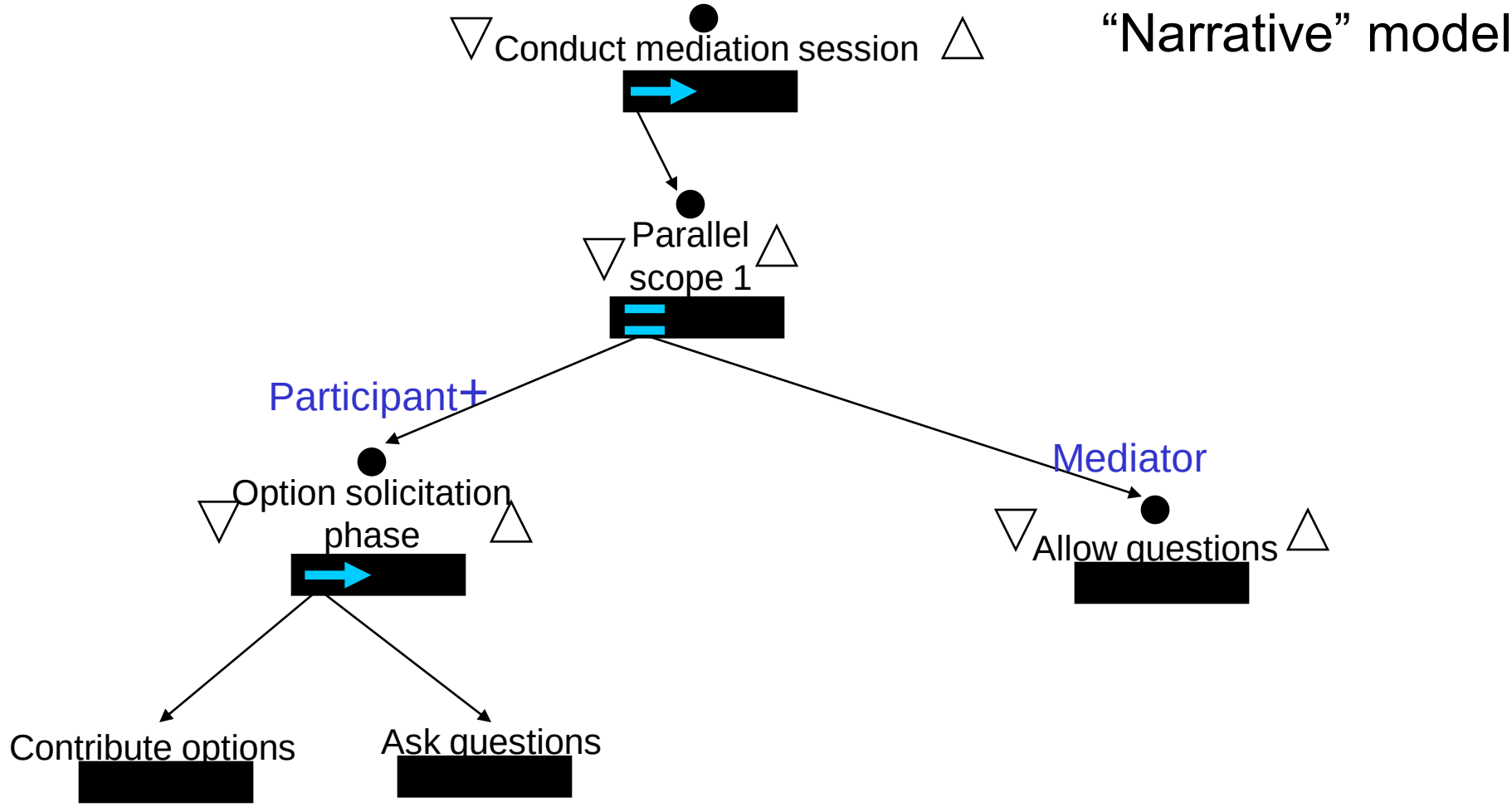
ODR Brainstorming Process in Little-JIL



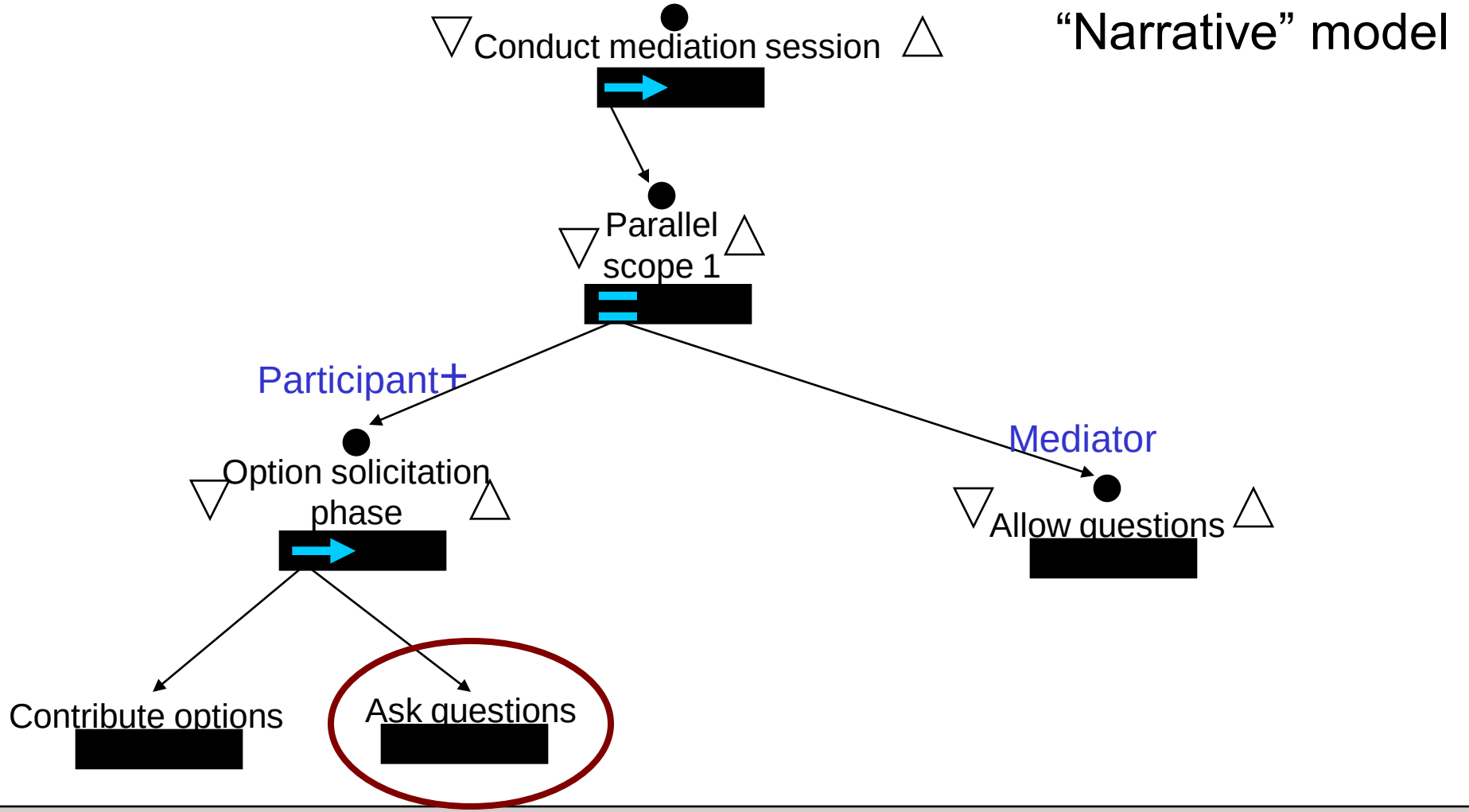
ODR Brainstorming Process in Little-JIL



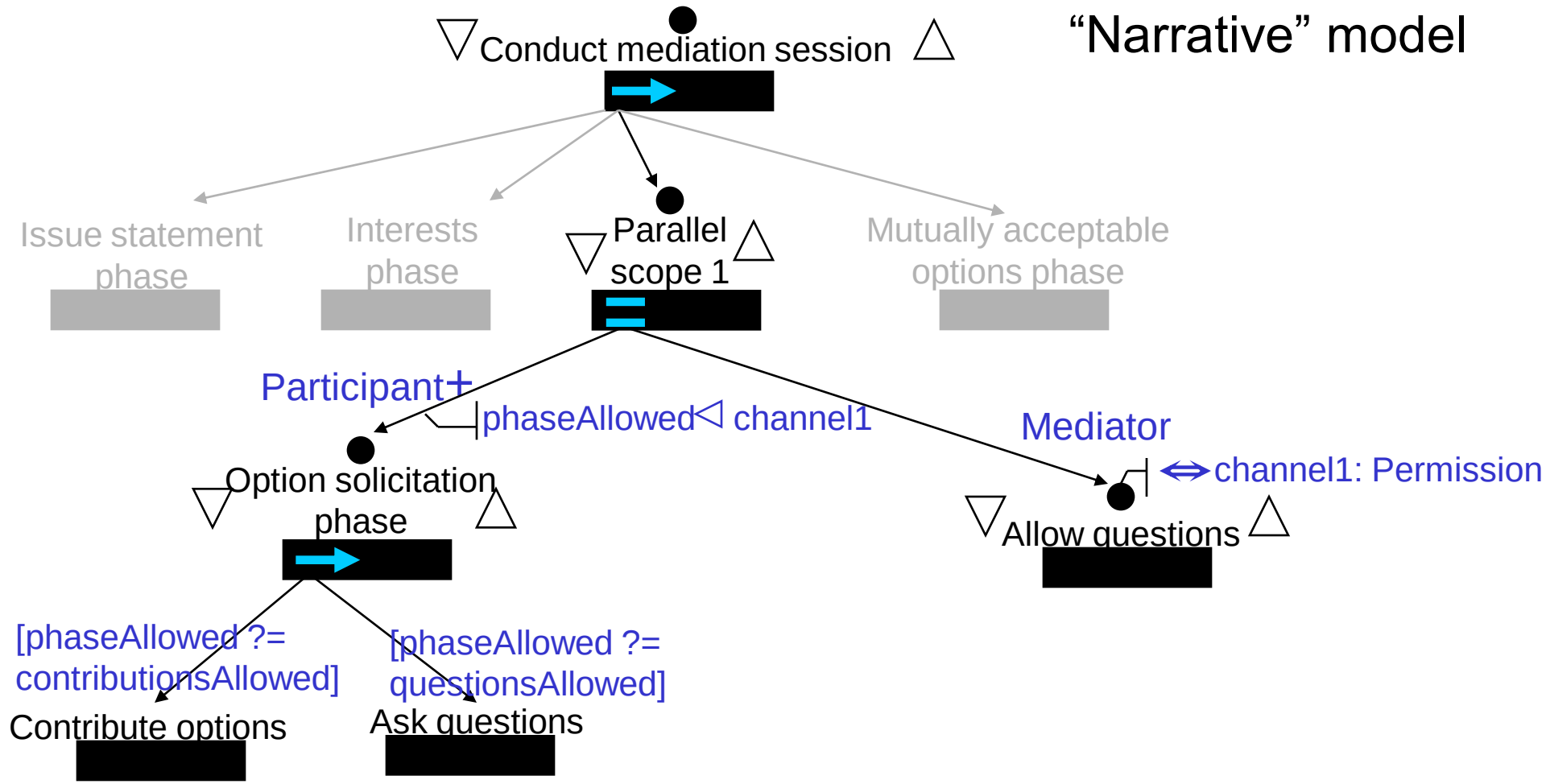
ODR Brainstorming Process in Little-JIL



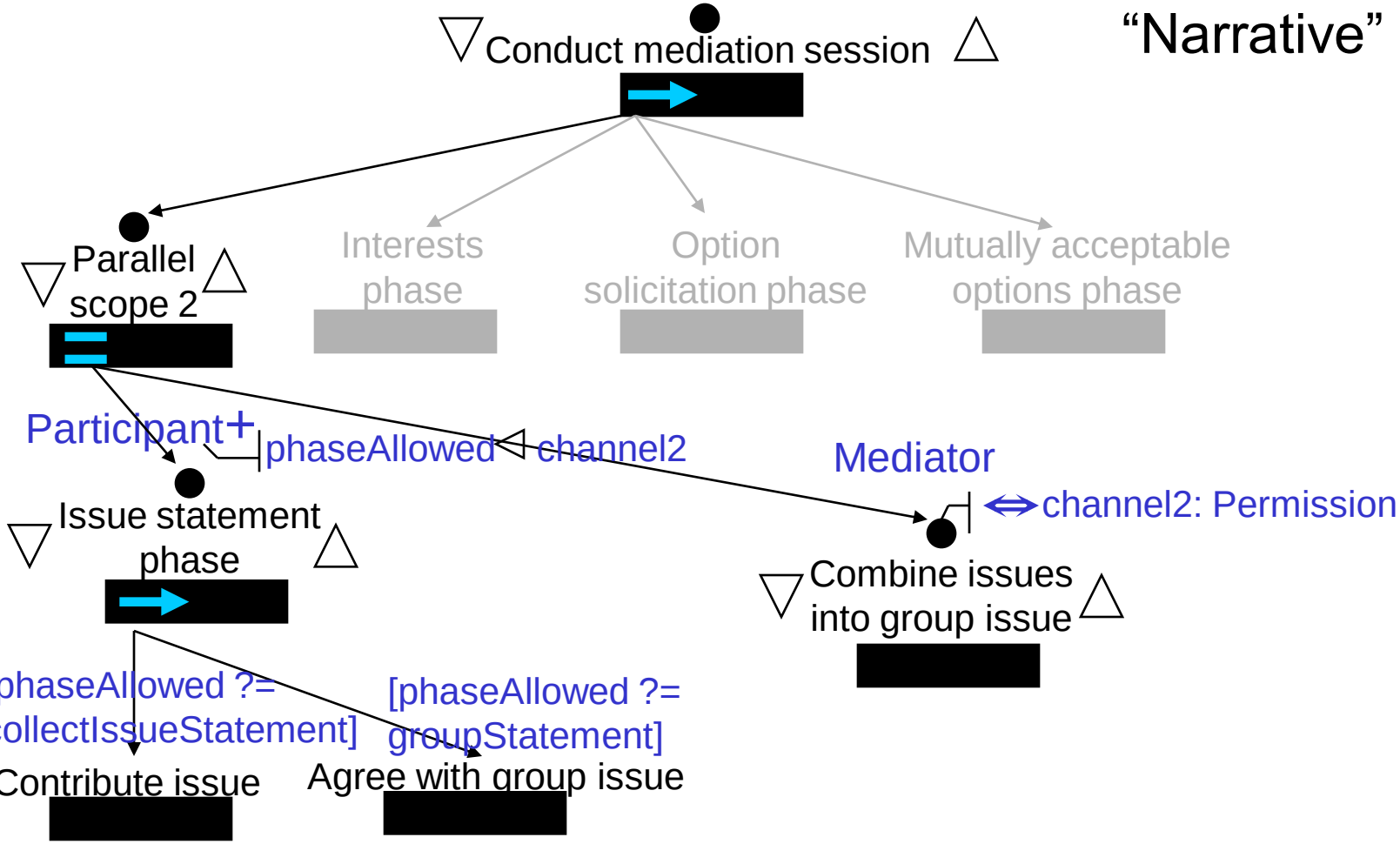
ODR Brainstorming Process in Little-JIL



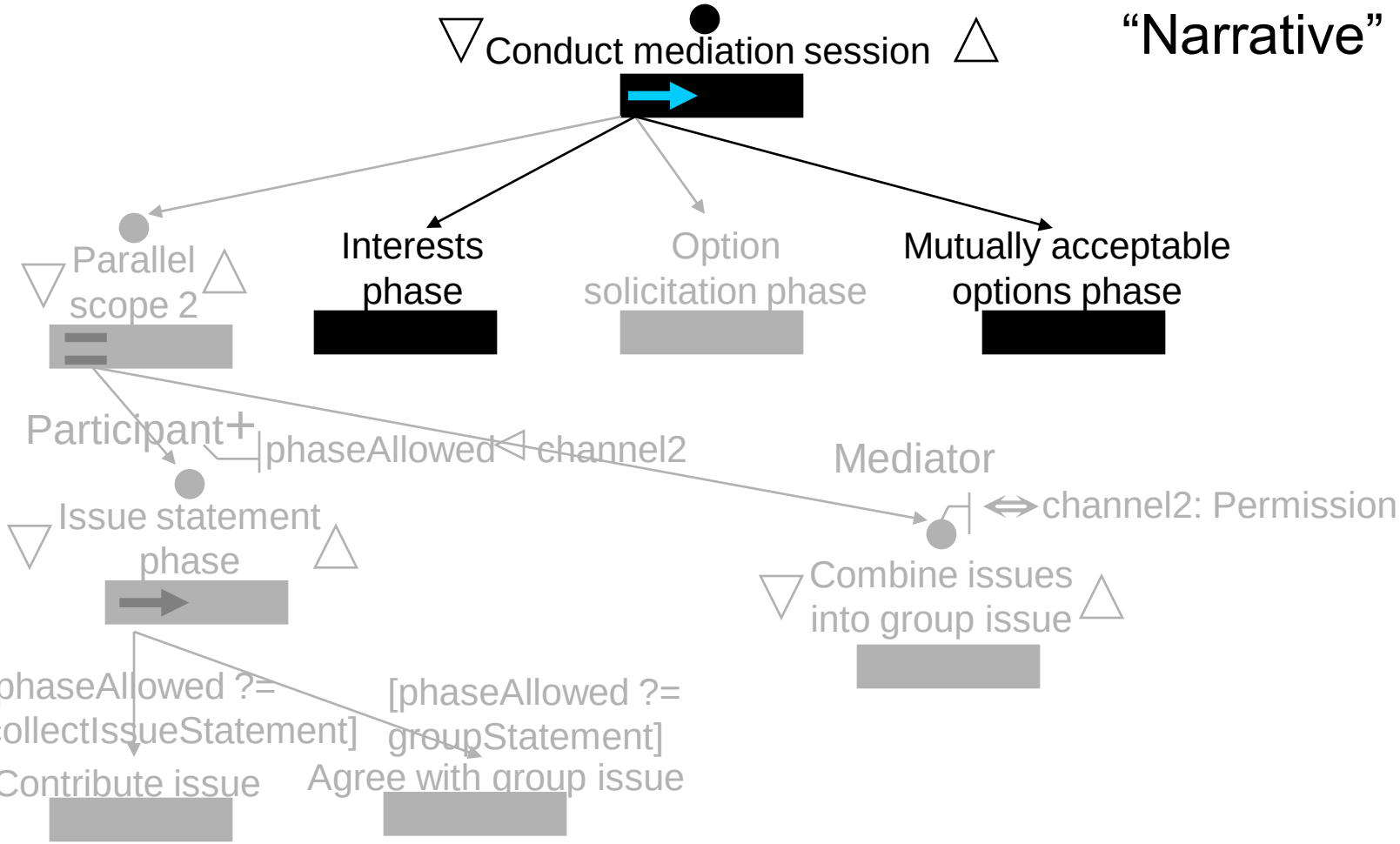
ODR Brainstorming Process in Little-JIL



ODR Brainstorming Process in Little-JIL

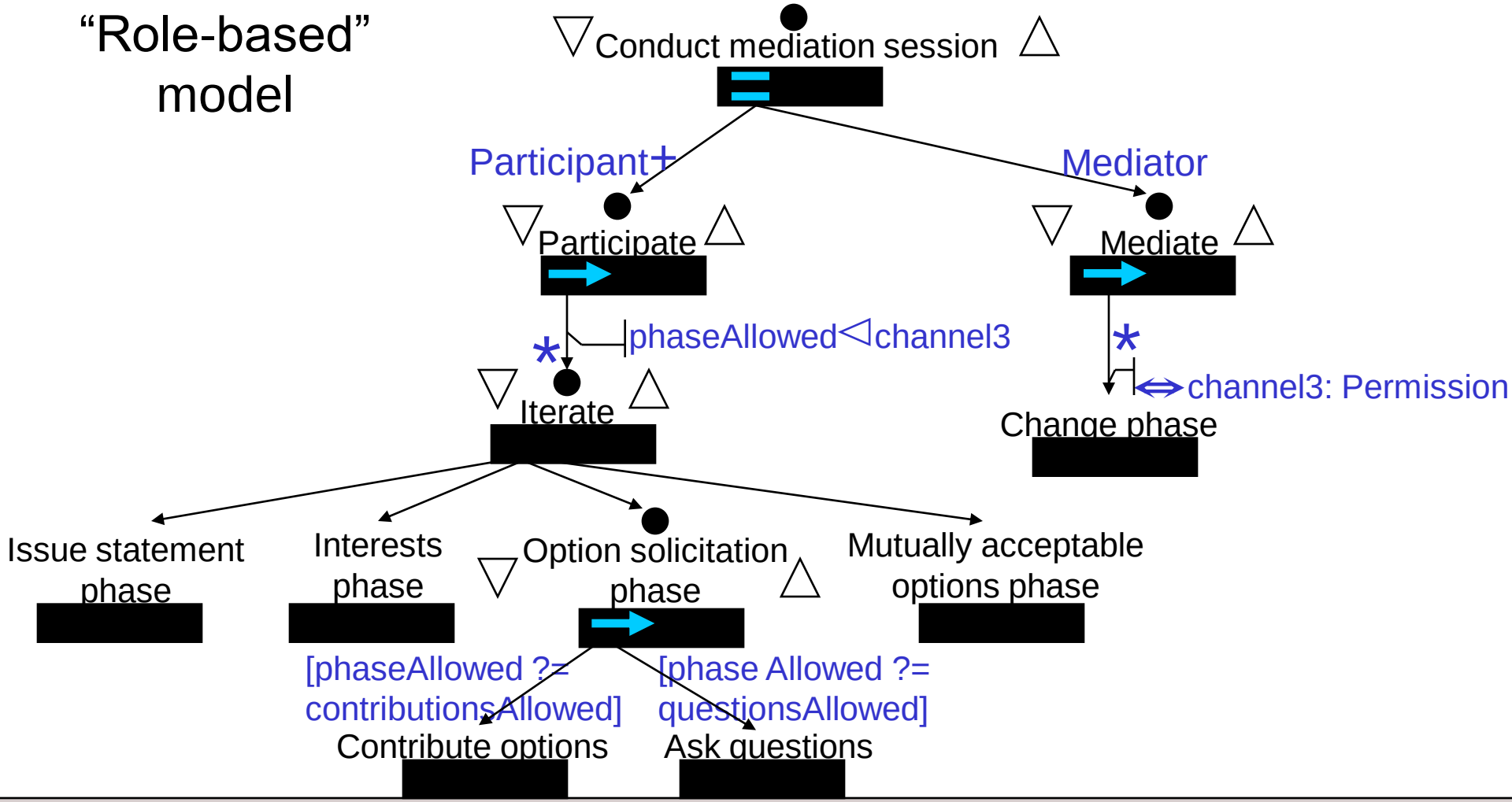


ODR Brainstorming Process in Little-JIL



ODR Brainstorming Process in Little-JIL, Refactored

"Role-based" model



How Well Do the Two Different Models Meet the Goals?

	Narrative	Role-Based
1. Help the NMB to improve their understanding of the process so that they may improve it	✓	✗
2. Enable NMB to actively involve disputants in the mediation process used to negotiate conflicts	✓	✗
3. Facilitate process automation to improve efficiency	✗	✓

How Well Do the Two Different Models Meet the Goals?

	Narrative	Role-Based
1. Help the NMB to improve their understanding of the process so that they may improve it	✓	✗
2. Enable NMB to actively involve disputants in the mediation process used to negotiate conflicts	✓	✗
3. Facilitate process automation to improve efficiency	✗	✓

- Provides excellent overall view, facilitates presentation of high-level/design process
- Synchronization, communication implicit within coordination model

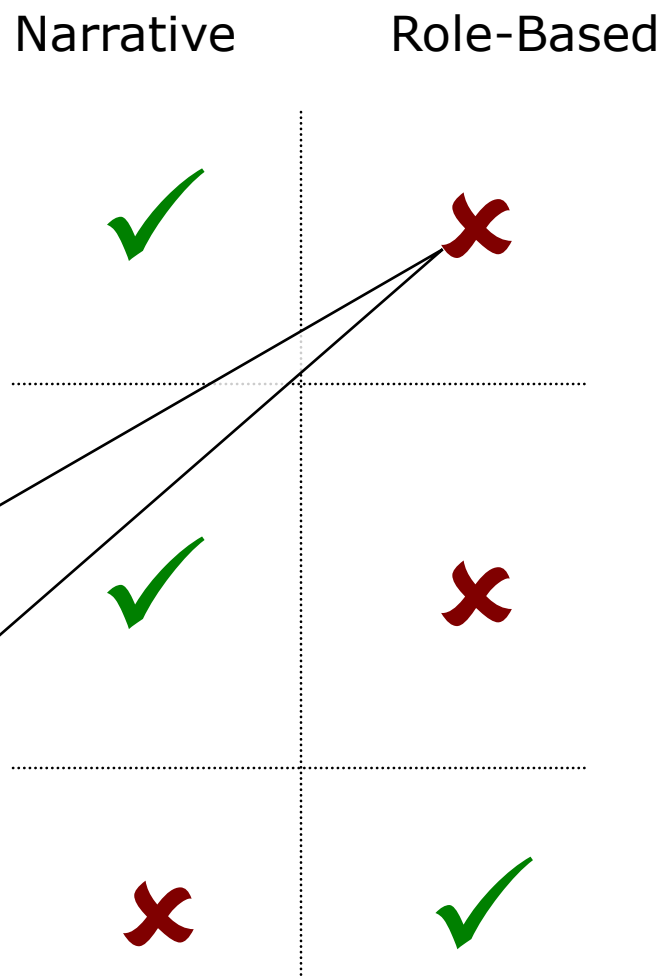
How Well Do the Two Different Models Meet the Goals?

1. Help the NMB to improve their understanding of the process so that they may improve it

2. Enable NMB to actively involve disputants in the mediation process used to negotiate conflicts

3. Facilitate process automation to improve efficiency

- May be more difficult to understand the overall process
- Synchronization and communication between parallel threads must be explicitly defined via inter-thread communication mechanisms



How Well Do the Two Different Models Meet the Goals?

- May be hard to synthesize from process elicitations by role/responsibility but it facilitates communication about how disputants' actions fit within overall process

1. Help the NMB to improve their understanding of the process so that they may improve it
2. Enable NMB to actively involve disputants in the mediation process used to negotiate conflicts
3. Facilitate process automation to improve efficiency

	Narrative	Role-Based
1. Help the NMB to improve their understanding of the process so that they may improve it	✓	✗
2. Enable NMB to actively involve disputants in the mediation process used to negotiate conflicts	✓	✗
3. Facilitate process automation to improve efficiency	✗	✓

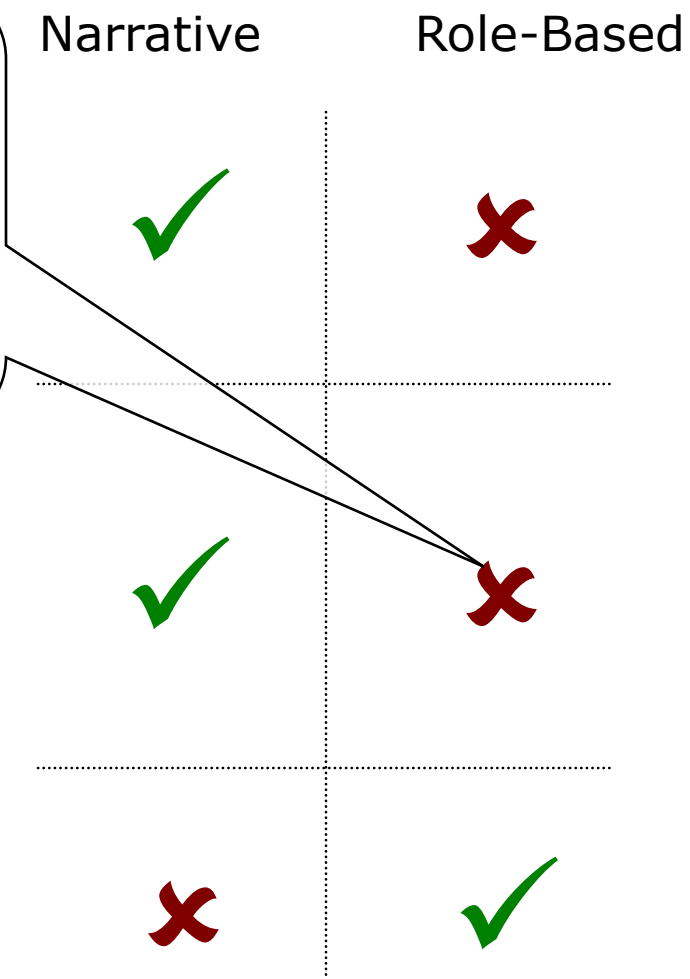
How Well Do the Two Different Models Meet the Goals?

- Usually easier to elicit from individual disputants, however, it may be harder for them to understand how their responsibilities fit within the overall brainstorming process

1. Help the NMB to improve their understanding of the process so that they may improve it

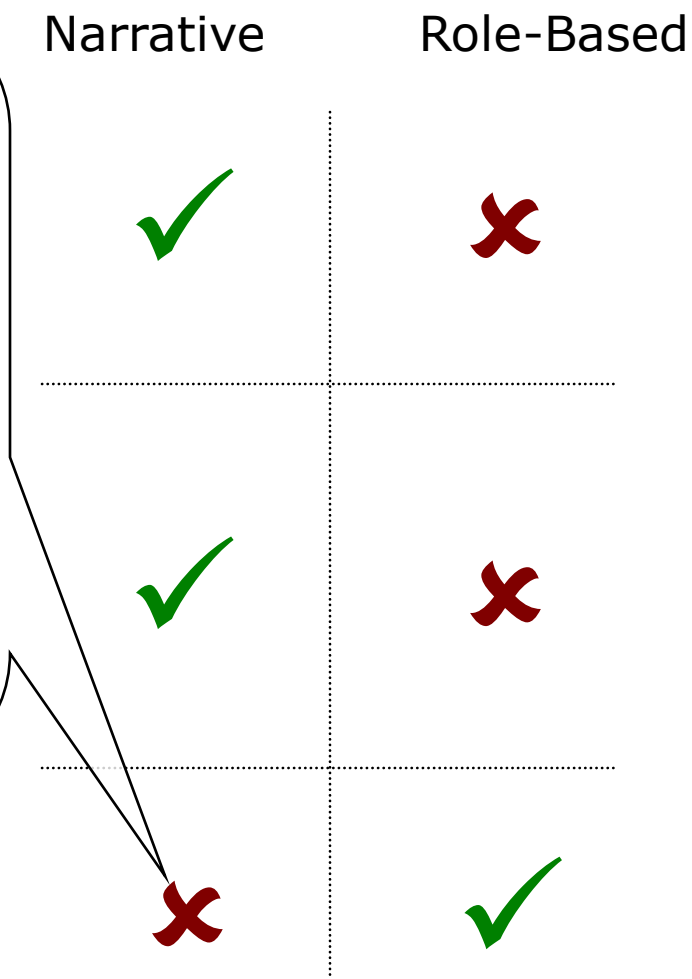
2. Enable NMB to actively involve disputants in the mediation process used to negotiate conflicts

3. Facilitate process automation to improve efficiency



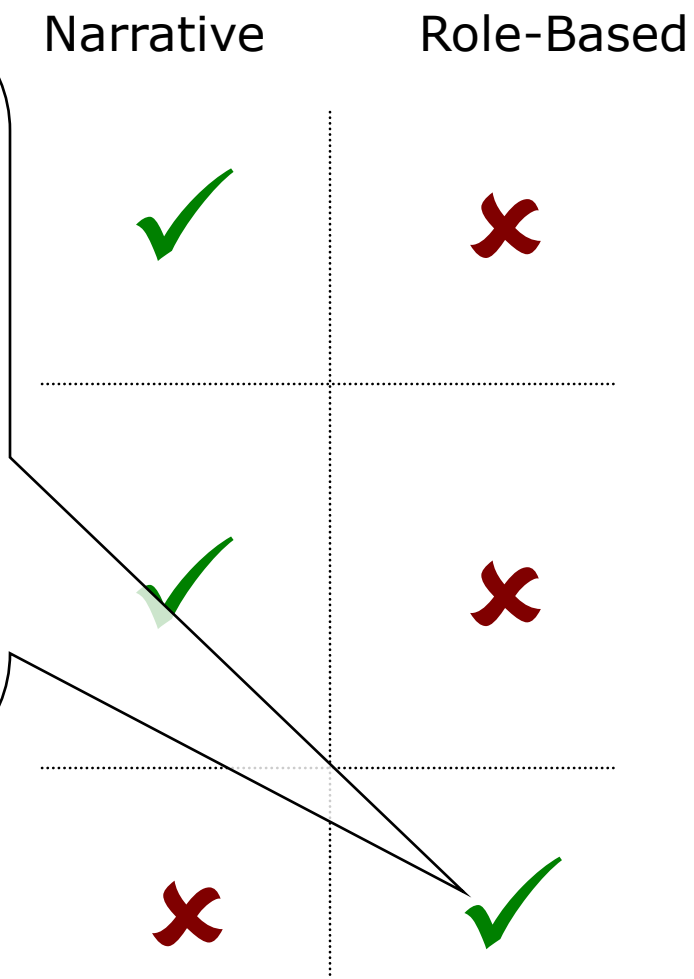
How Well Do the Two Different Models Meet the Goals?

1. Help the NMB to improve their understanding of the process so that they may improve it
   - Static model of agent *types*, may not handle *instances* well because it does not model the dynamic process execution state closely
2. Enable NMB to actively involve disputants in the mediation process used to negotiate conflicts
3. Facilitate process automation to improve efficiency



How Well Do the Two Different Models Meet the Goals?

1. Help the NMB to improve their understanding of the process so that they may improve it
   - Closer in structure to dynamic process execution model, therefore may be able to provide instance-level support in a more natural way
2. Enable NMB to actively involve disputants in the mediation process used to negotiate conflicts
3. Facilitate process automation to improve efficiency



Conclusion

- It is important for process languages to provide adequate instance-level support
- Top-down refinement is not adequate for resolving instance-level issues
- Narrative and role-centric process representations are more suitable for addressing different goals because they are structured after different underlying process states
  - Narrative representation may be more appropriate for studying the static state of the process
  - Role-based representation may be more appropriate for supporting the dynamic process execution state

Related Work

- Process definition
- Narrative process modeling
  - IDEF diagrams
  - UML module interaction diagrams
  - Kepler
- Role-centric process modeling
  - UML ladder charts
  - Viewpoints

Future Work

- When is one architecture more appropriate?
- How can we ensure consistency between the two?
- Can we develop mechanisms for transforming one into the other?
- Are they different members of the same process family?

Questions?

Thank you!