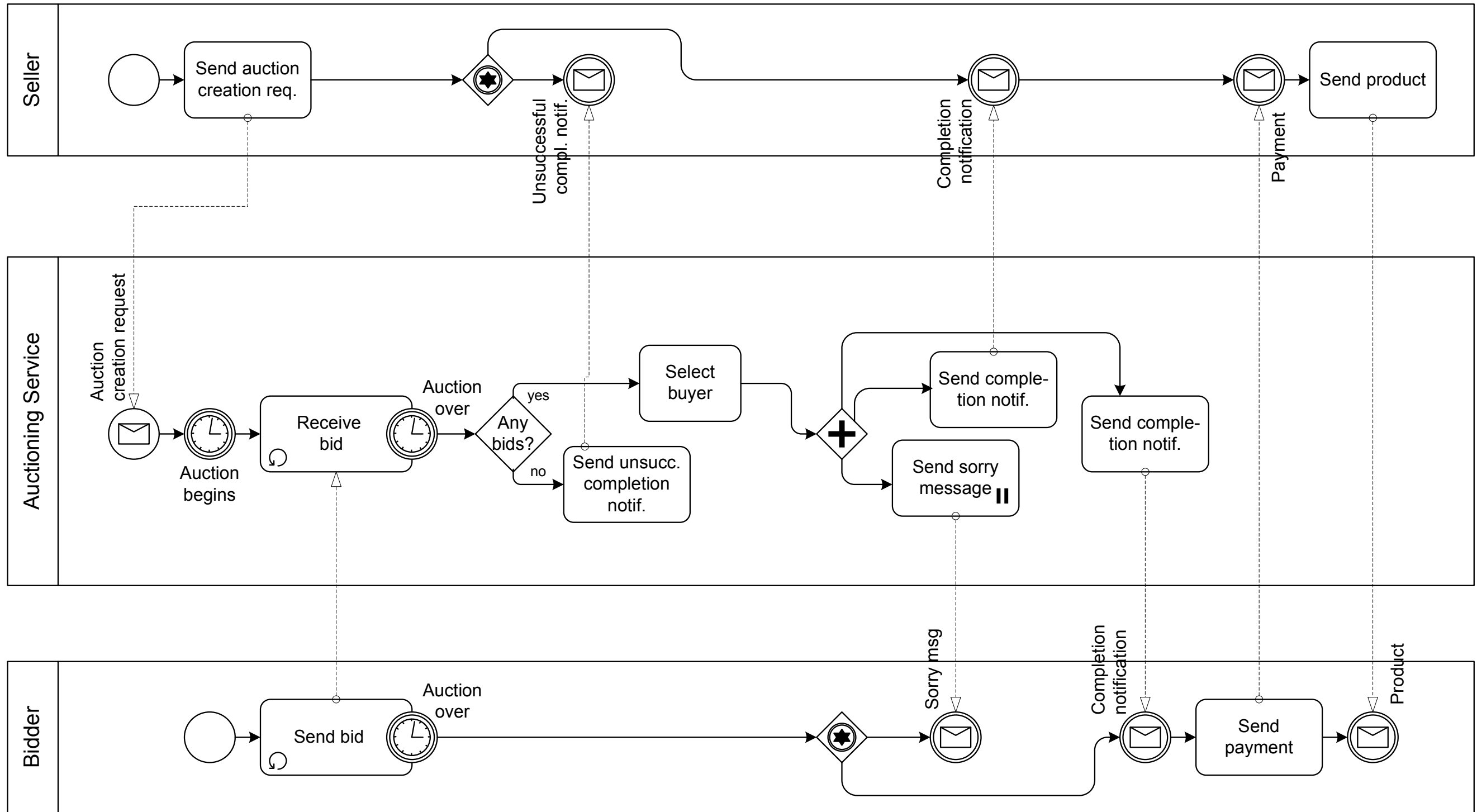


# Extending BPMN for Modeling Complex Choreographies

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# Auctioning Scenario

# Open Aspects

- Multiplicity of participants
  - We need to distinguish the buyers
- Correlations
  - Between auctioning service and bidders
- Participant reference passing
  - The winning bidder needs to contact the seller

# Proposed BPMN Extensions

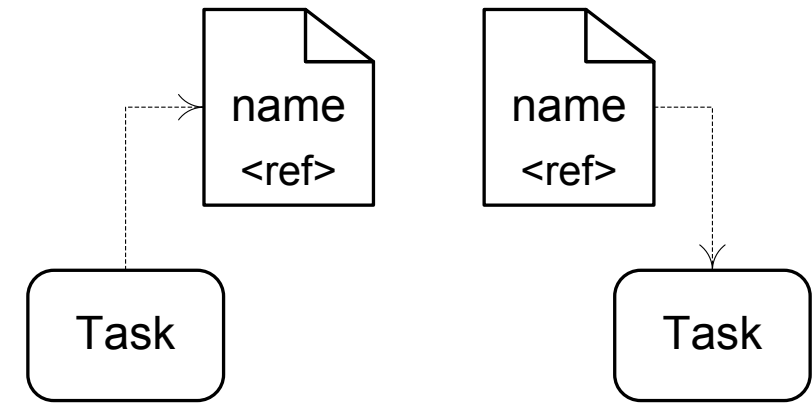
- Participant sets to represent multiple participants
- Correlations via references
- Reference passing

# Participant Sets



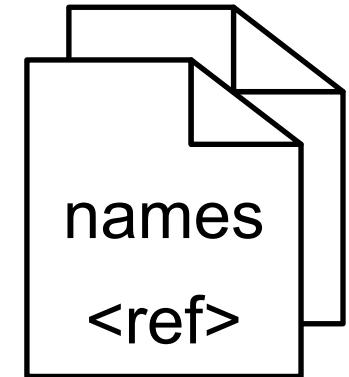
- A participant set represents a set of participants of the same type
- Allows distinction between scenarios where at most one or more participants are involved in a conversation

# References



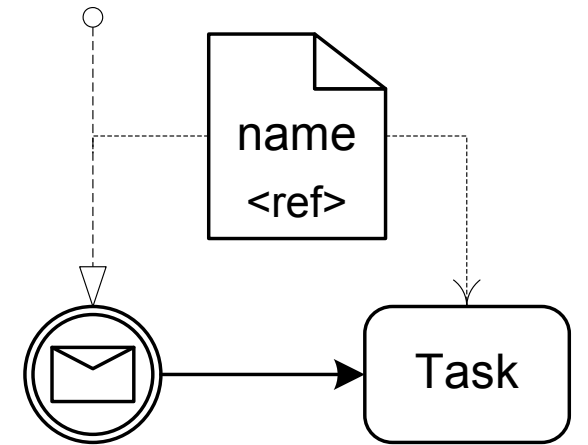
- A reference is a special data element connected to a flow element
- It can either be written or read
- Write: If the flow object is a receive activity, the reference will point to the sender upon receipt
- Read 1: If the flow object is a send activity, the message will be sent to the participant the reference points to
- Read 2: If the flow object is a receive activity, the message is only awaited from the referred participant

# Reference Sets



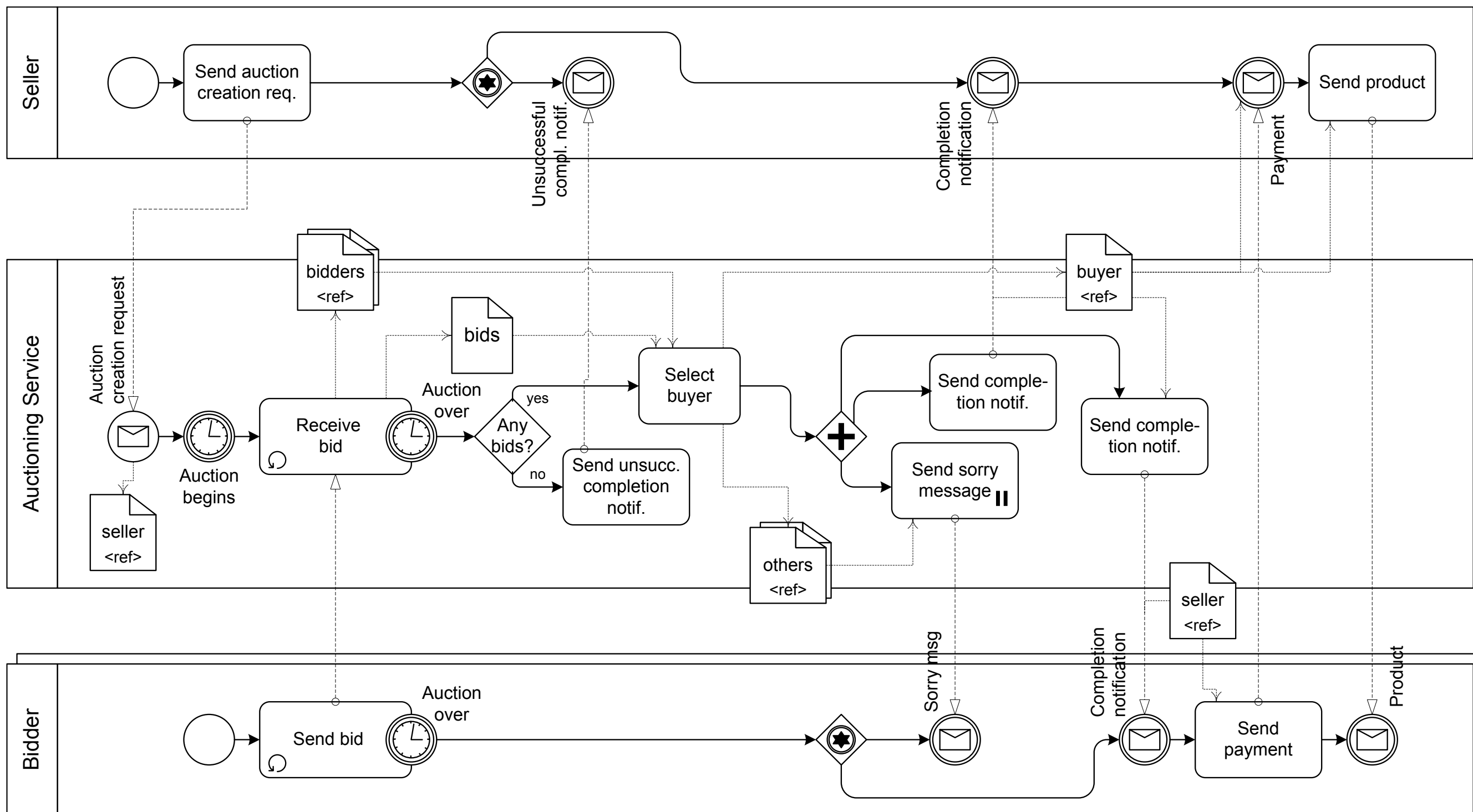
- Covers sets of participants involved in one conversation
- A reference set can be modified or read
- Modify: If the flow object is a receive activity, a reference to the sender will be added to the set
- Read: If the flow object is a looped activity, the reference set determines the number of repetitions or instances
- Looped send: A message is sent to each participant of the reference set

# References Passing



- References can be passed to other participants
- This is done via an association between a reference (set), a message flow and a flow object

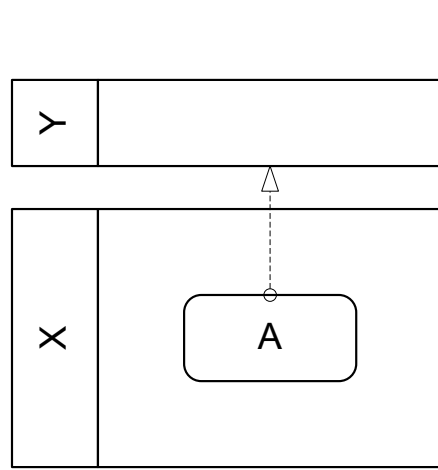




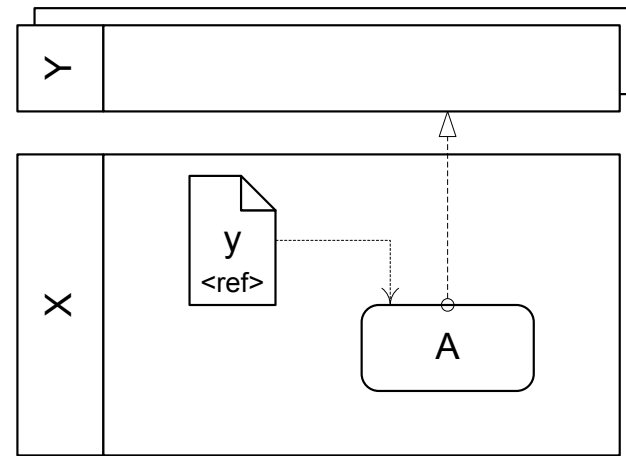
# Enhanced Auctioning Scenario

# Validation

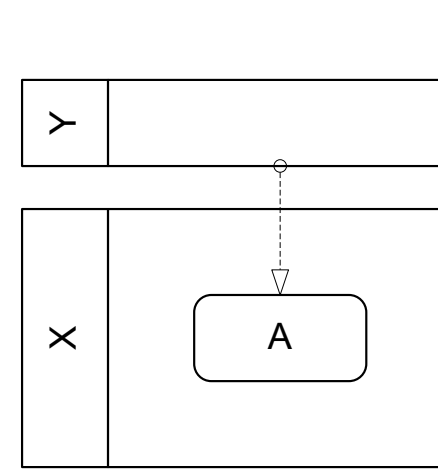
Pattern	BPMN	ext. BPMN
Send	+	+
Receive	+	+
Send/Receive	+	+
Racing Incoming Messages	+	+
One-to-many Send	-	+
One-from-many Receive	-	+
One-to-many Send/Receive	-	+
Multi-reponses	+	+
Contingent Request	-	+/-
Atomic Multicast Notification	-	-
Request with a Referral	-	+
Relayed Request	-	+



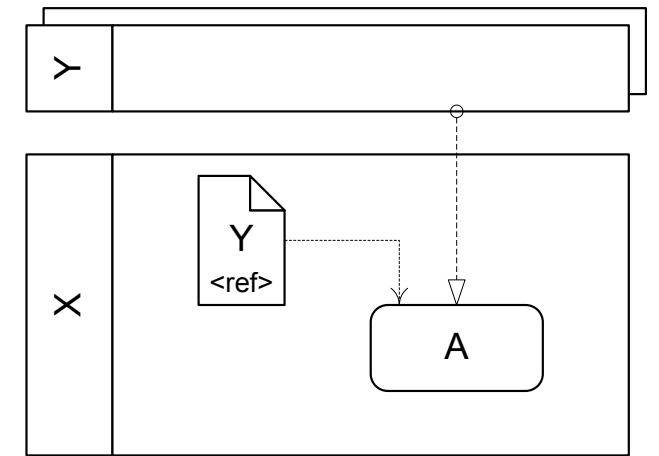
(a) Send



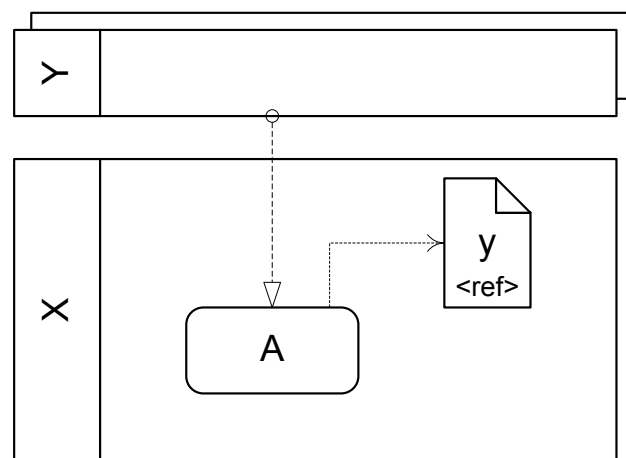
(b) Send to Reference



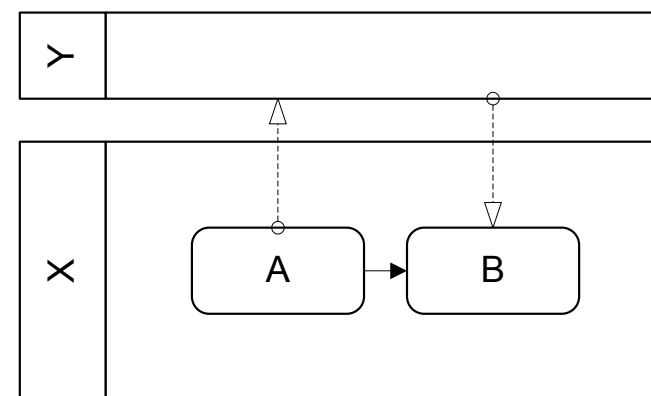
(c) Receive



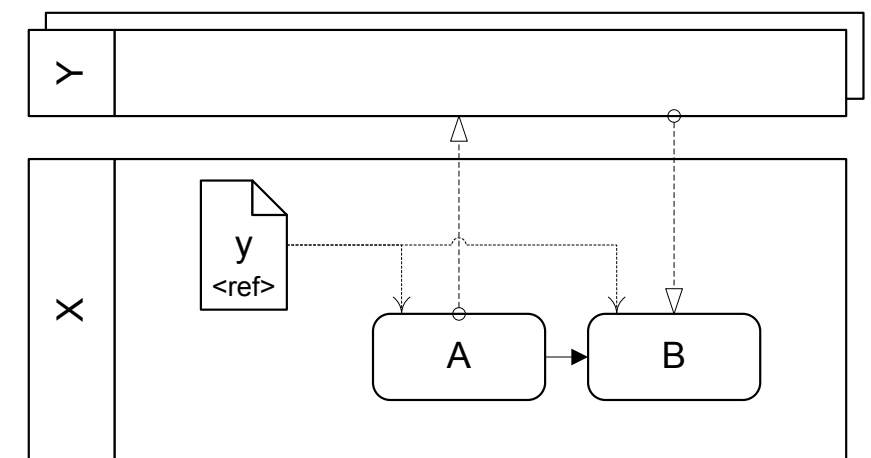
(d) Receive from Reference



(e) Receive Reference



(f) Send/Receive



(g) Send/Receive from/to Reference

# Example: Single Transmission Bilateral Interaction Patterns

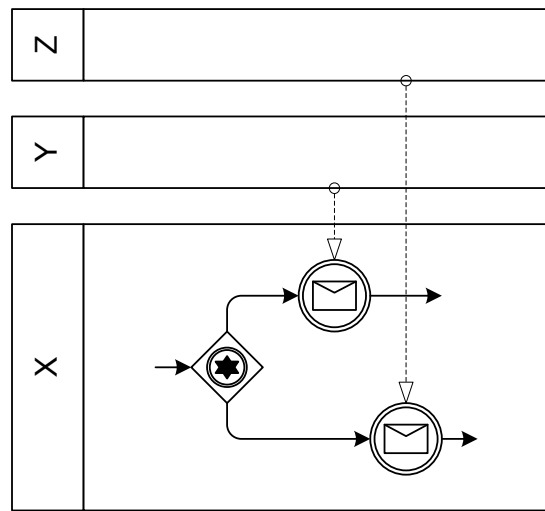
# Discussion

- Informal style of the extensions
- "Heavy use" of Data Objects
  - Not clearly specified in BPMN
- Related to BPEL4Chor
- Limited set of supported reference passing scenarios
- Only minor extensions to BPMN

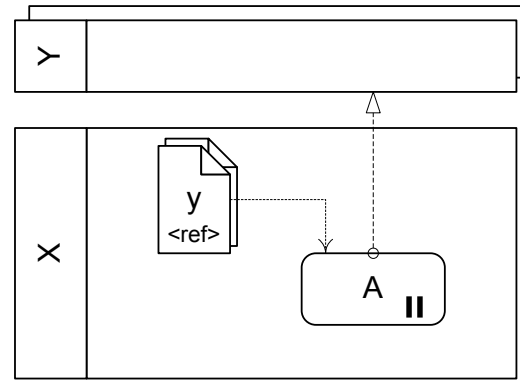
# Conclusions

- We showed weaknesses of the BPMN regarding choreography modeling
- We proposed participant sets, reference (sets) and reference passing as extensions
- Using only these few extensions, 11 out of 12 service interaction patterns are supported (instead of 5 out of 12)

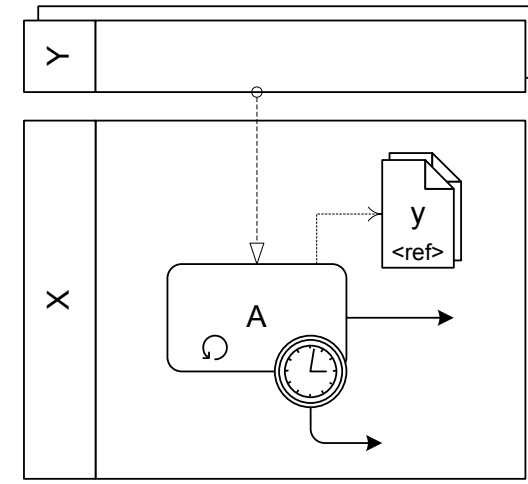
**Thank you!**



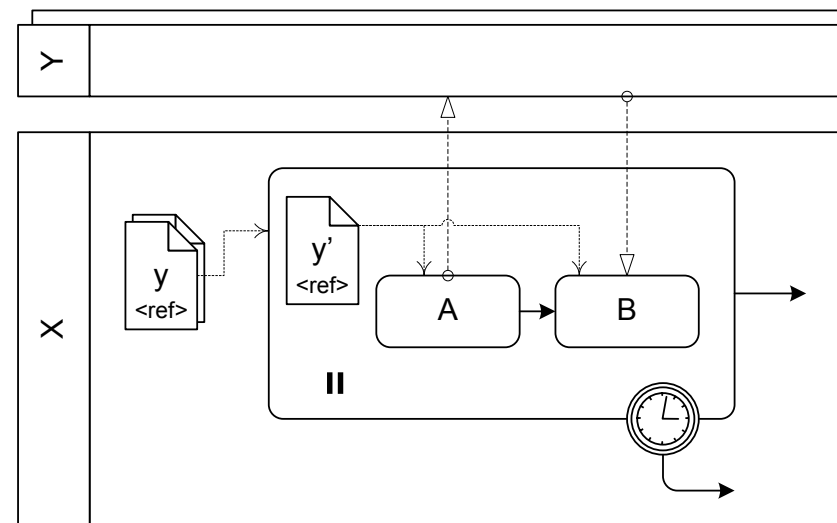
(a) Racing incoming messages



(b) One-to-many send

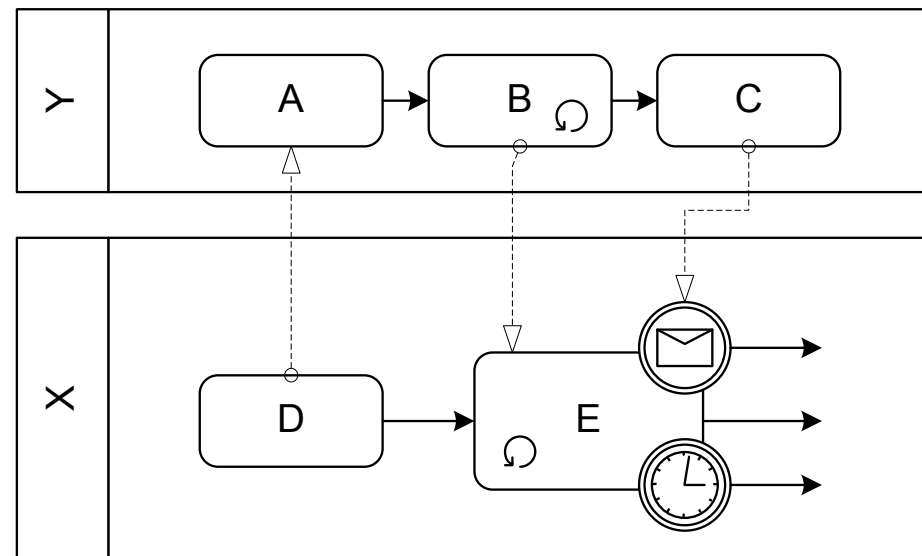


(c) One-from-many receive

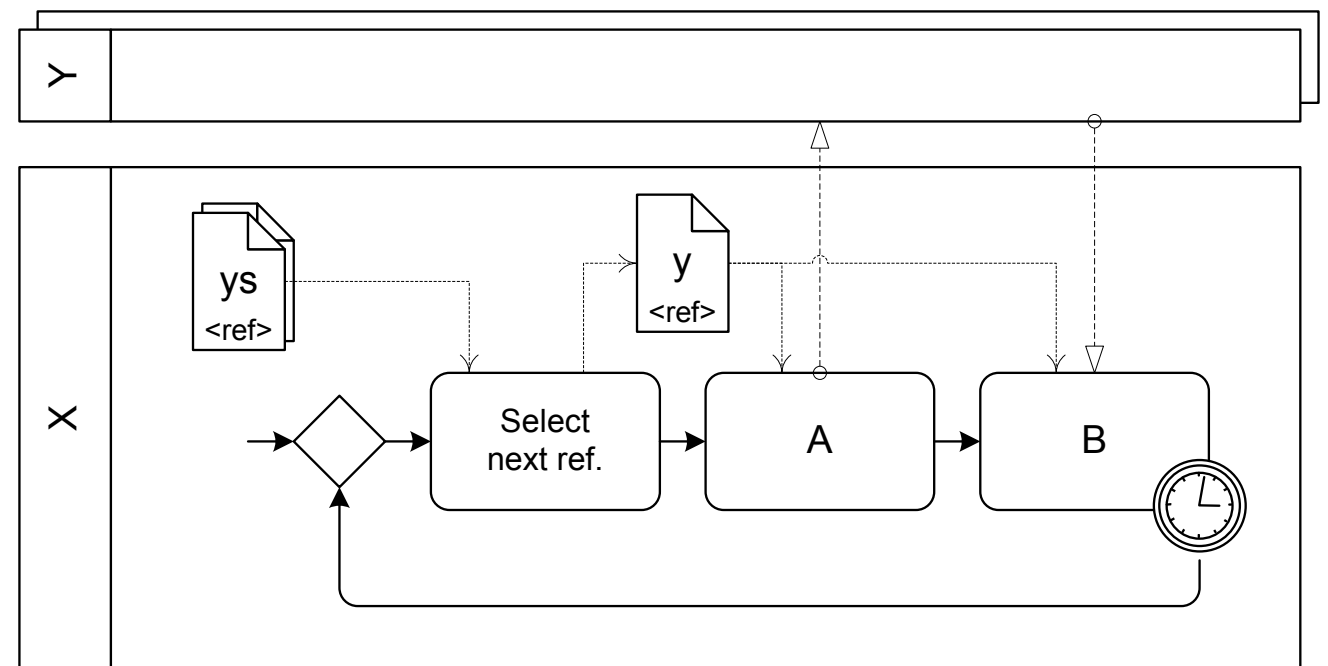


(d) One-to-many send/receive

# Appendix I: Single Transmission Multilateral Interaction Patterns



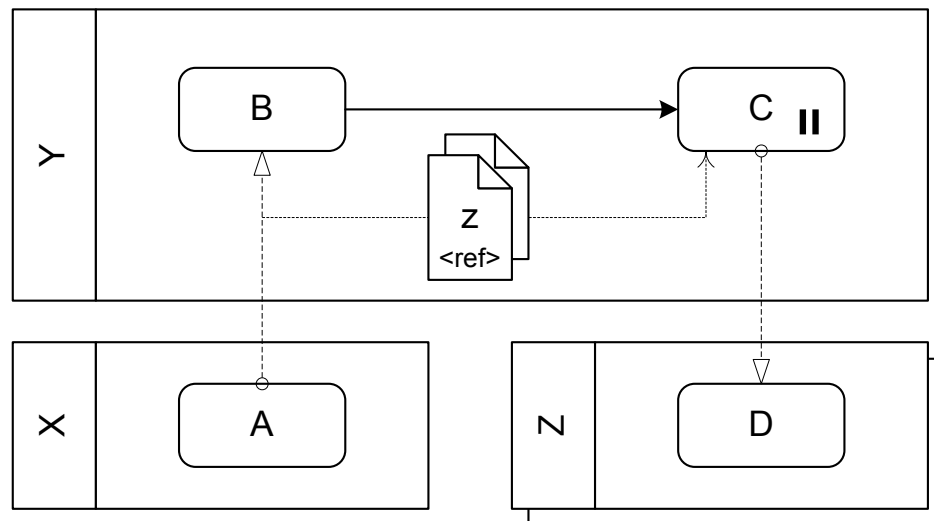
(a) Multi-responses



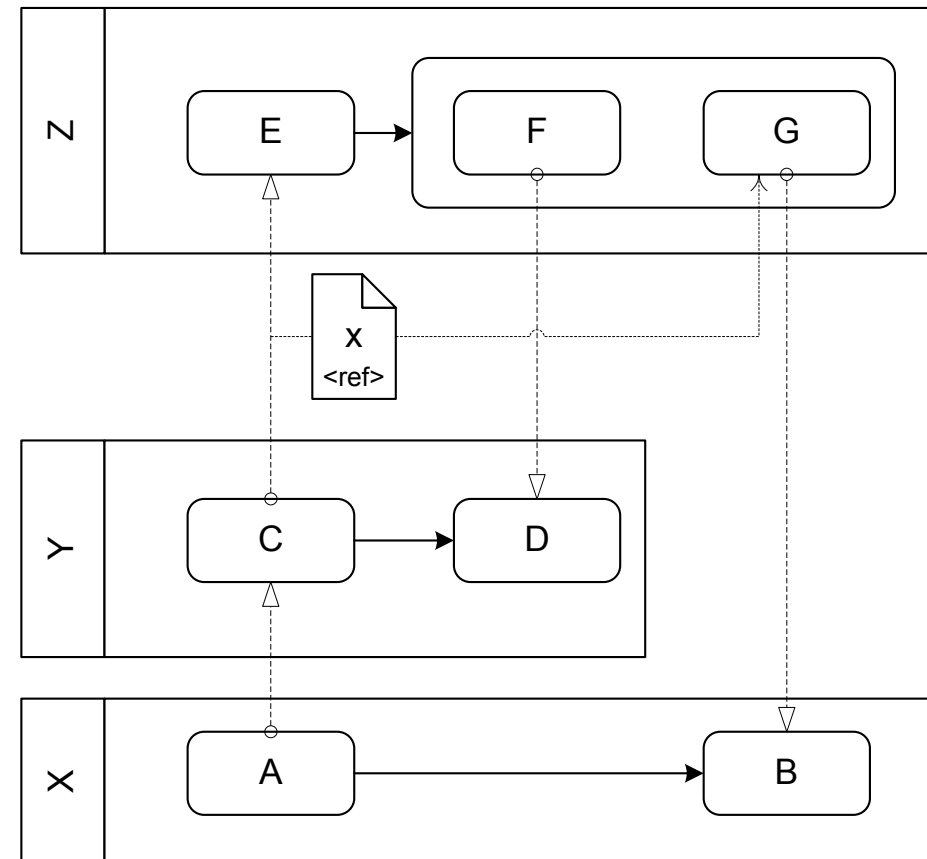
(b) Contingent requests

# Appendix II: Multi Transmission Interaction Patterns





(a) Request with Referral



(b) Relayed Request

# Appendix III: Routing Patterns