Behavioral Conformance of Artifact-Centric Process Models

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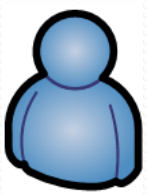
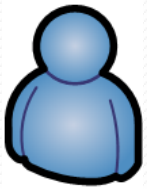
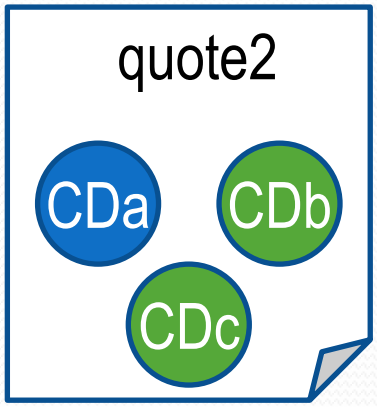
CD SHOP'S BACKEND PROCESS



Customer 1



Customer 2



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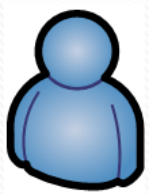
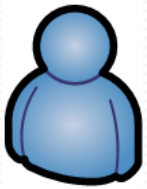
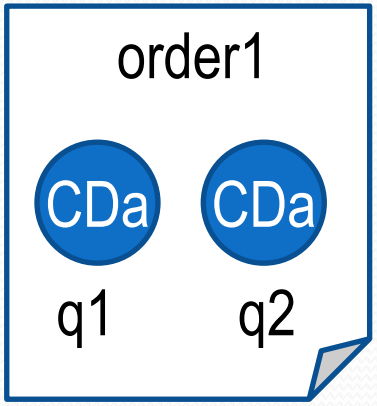
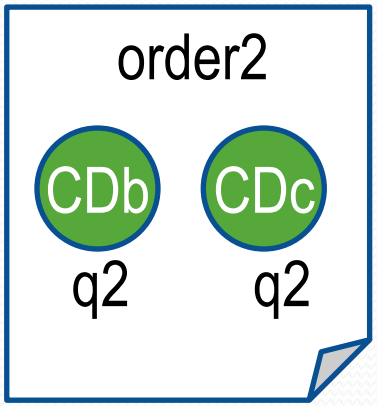


Customer 1

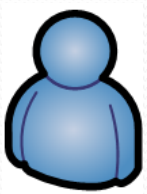


Customer 2



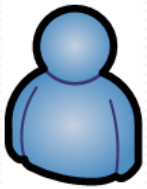


CD SHOP'S BACKEND PROCESS



Customer 1

CDa



Customer 2

CDa

CDb

CDc

quote1

quote2

order1

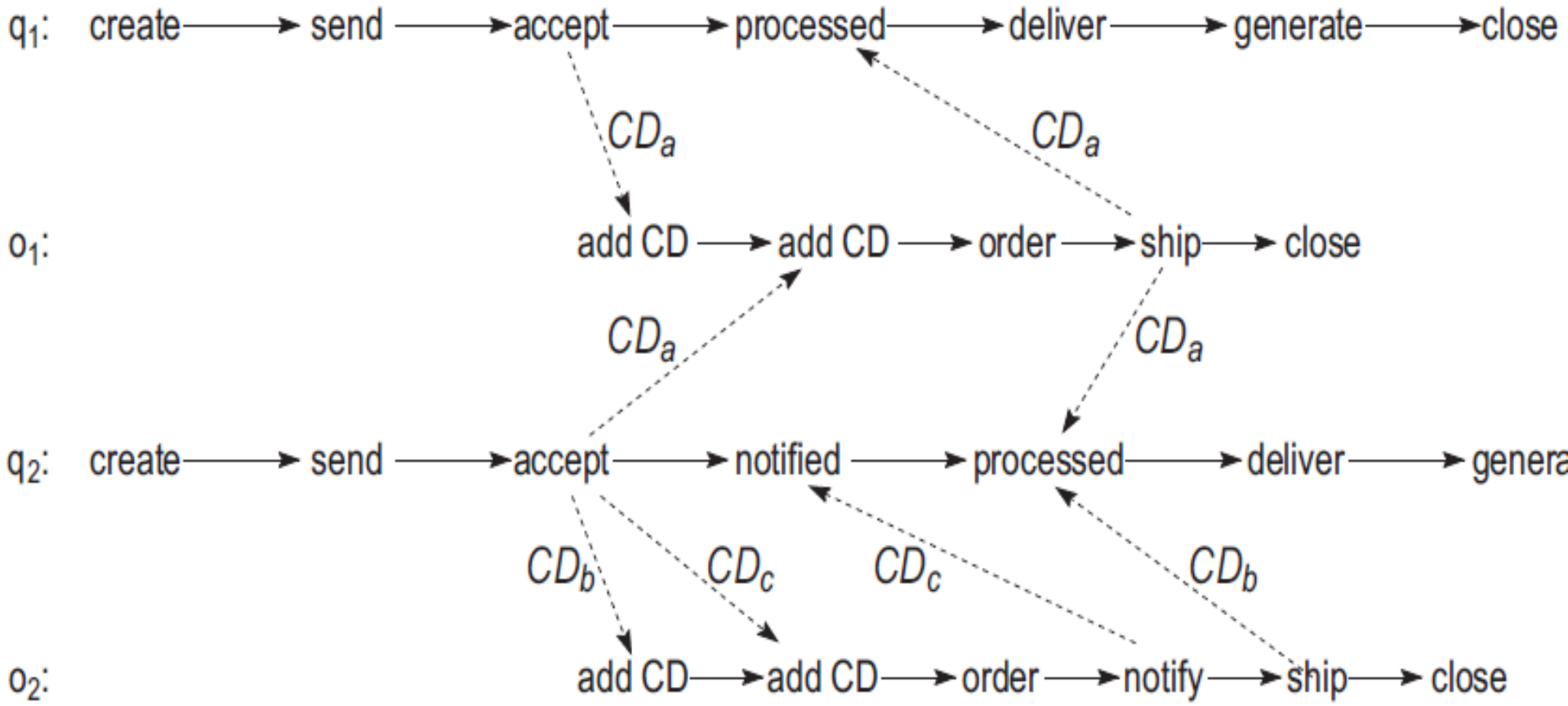
q1 q2

order2

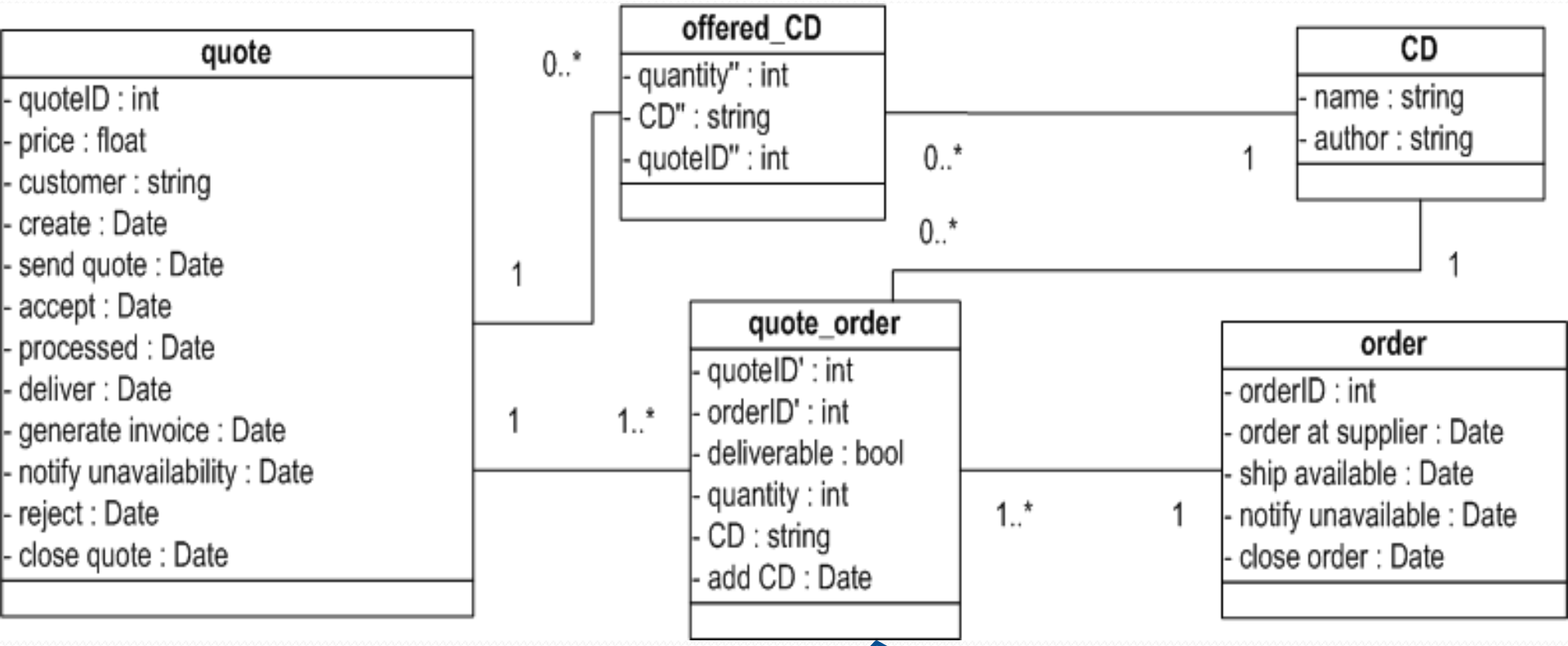
q2 q2

AN EXECUTION – MANY CASES

What is a case here?

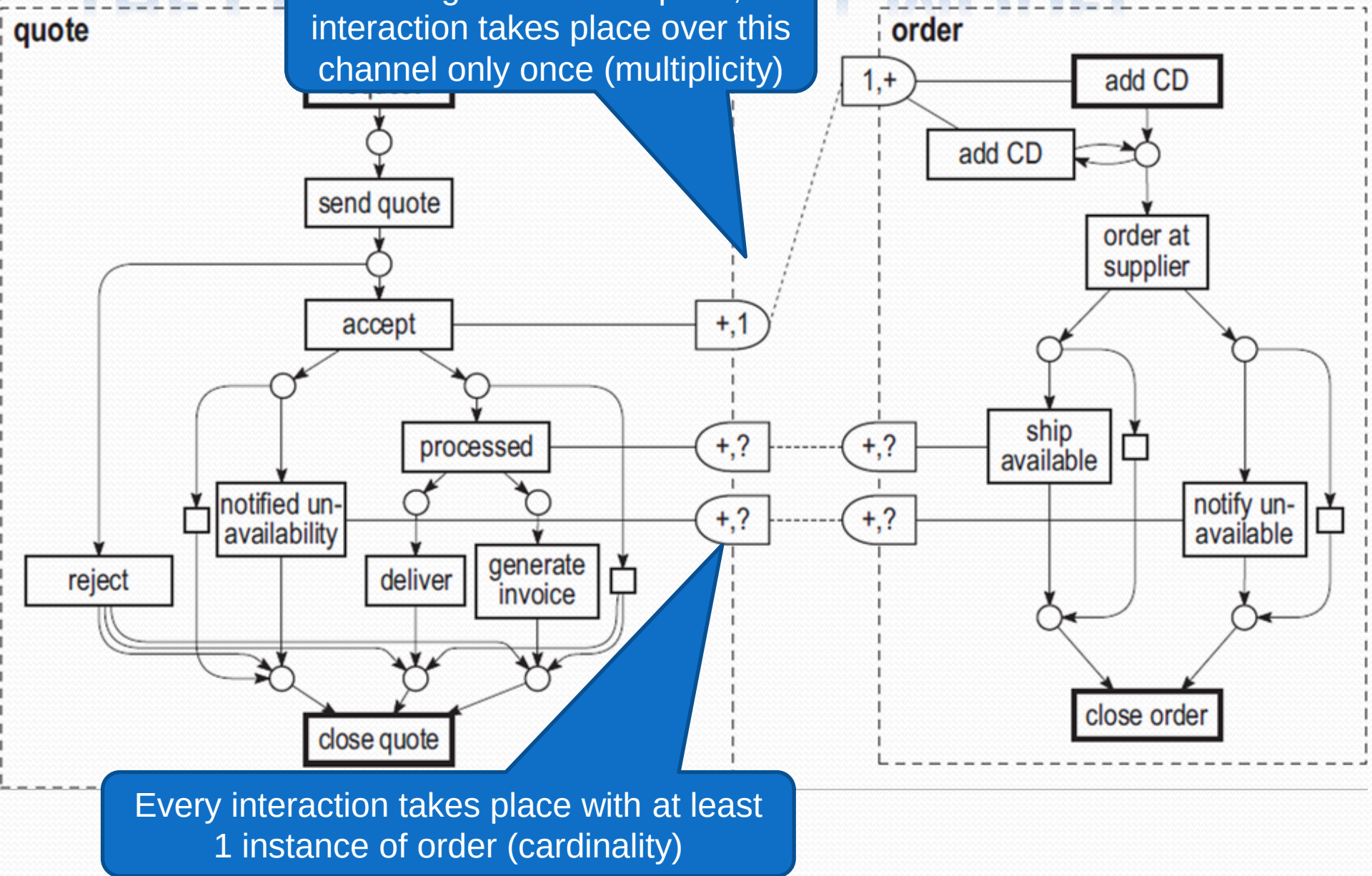


DATA OF THE ONLINE SHOP

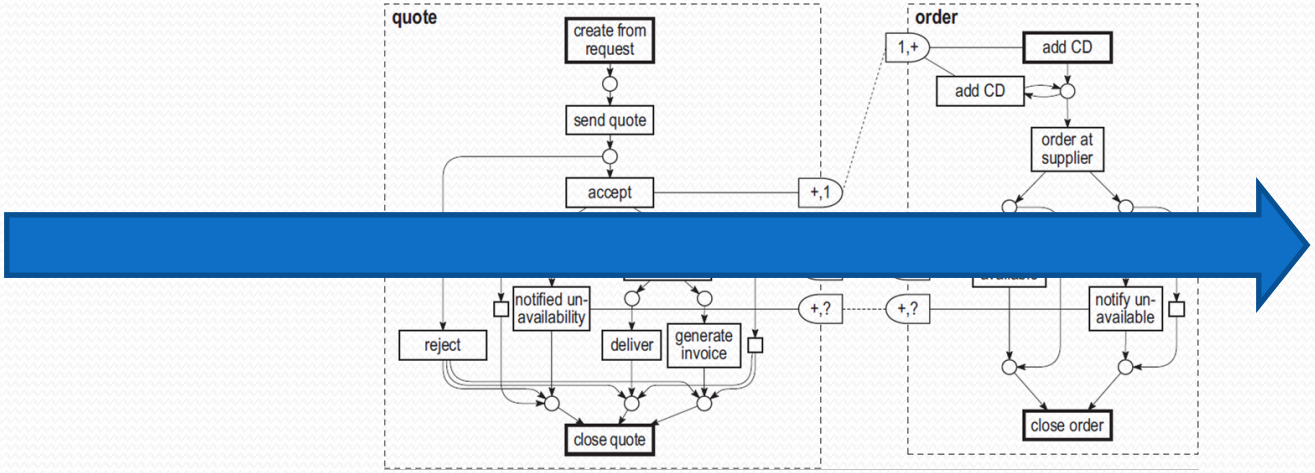


Each quote relates to several orders and each order contains items of several quotes

THE CD SHOP PROCLET MODEL



MODEL QUALITY?



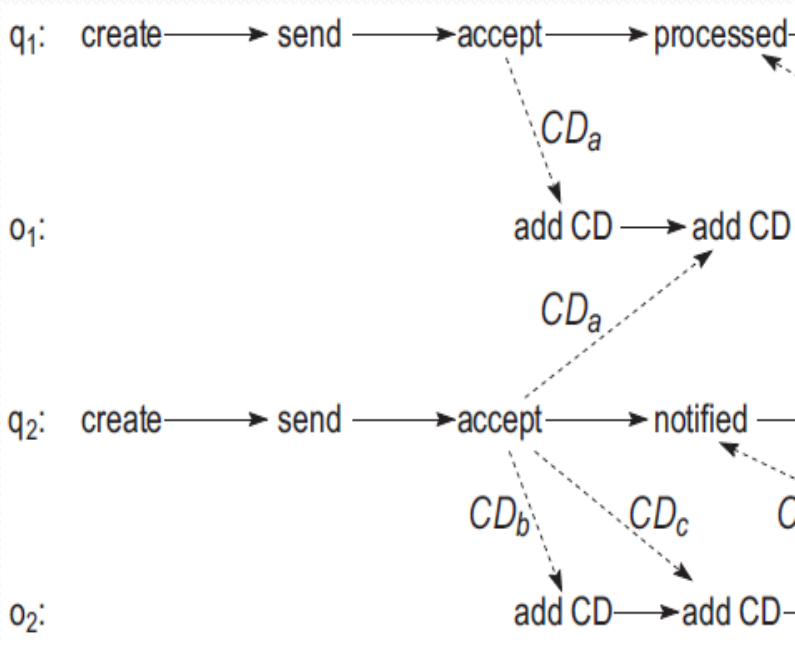
information system of the CD shop

model of the process

conformance checking: can we replay the behavior of the IS on the model? if yes, then the model is good

PROBLEM SETTING

- Classical process modeling techniques view operational processes as “cases being executed”
- But what if there is no unique notion of a “case”?
- Artifact modeling allows for models with multiple notions of a case
- **Can we then still check for conformance?**



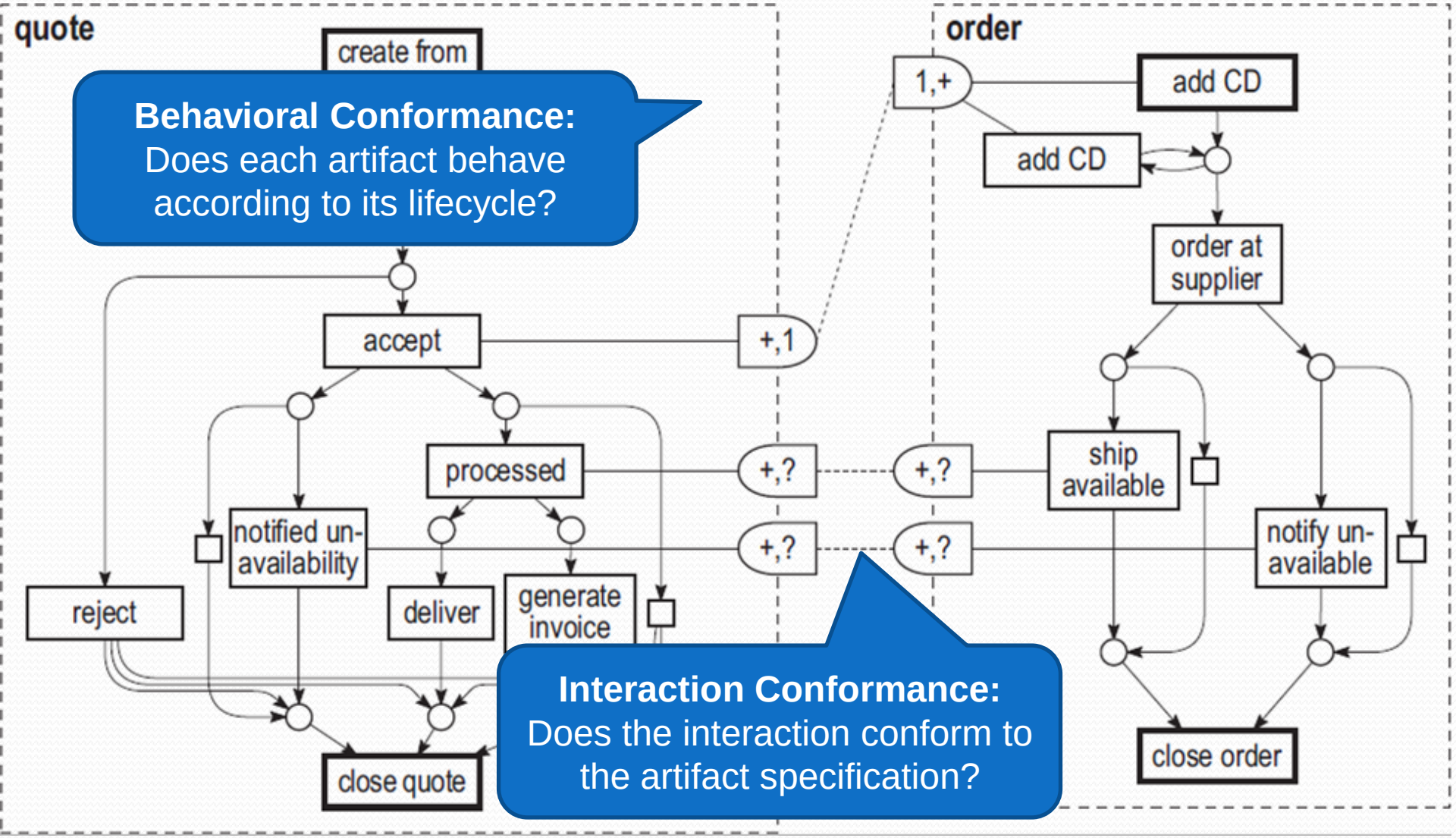
TWO PROBLEMS TO SOLVE

- data generally stored in a database
  but: conformance checkers require logs
  our solution: **extract logs from a database**

- behavioral information in database much (much much) larger than in classical logs

- conformance checking explores a search-space exponential in the number of events
  our solution: **decompose problem**

PROBLEM DECOMPOSITION



LOG EXTRACTION

- The observed behavior of an artifact-centric interoperation hub is a relational database with temporal attributes representing state changes.

quote

quoteID	create	send quote	accept	processed	notify	deliver	generate	reject	close quote
q_1	24-11,17:12	24-11,17:13	25-11,7:20	5-12,9:34	null	6-12,5:23	null	null	6-12,5:25
q_2	24-11,19:56	24-11,19:57	25-11,8:53	5-12,11:50	3-12,14:54	6-12,7:14	3-12,14:55	null	6-12,7:20

order

orderID	ship	order	notify	close order
o_1	5-12,9:32	28-11,8:12	null	5-12,11:37
o_2	5-12,11:33	28-11,12:22	3-12,14:34	5-12,13:03

CD

name	author
a	xyz
b	zyx
c	yxz

offered_CDs

quoteID"	CD"	quantity"
q_1	a	2
q_2	a	1
q_2	b	3
q_2	c	1

foreign key-primary key relations

quote_order

quoteID'	orderID'	add CD	deliverable	CD
q_1	o_1	25-11,8:31	true	a
q_2	o_1	25-11,12:11	true	a
q_2	o_2	26-11,9:30	true	b
q_2	o_2	26-11,9:31	false	c

BEHAVIORAL CONFORMANCE

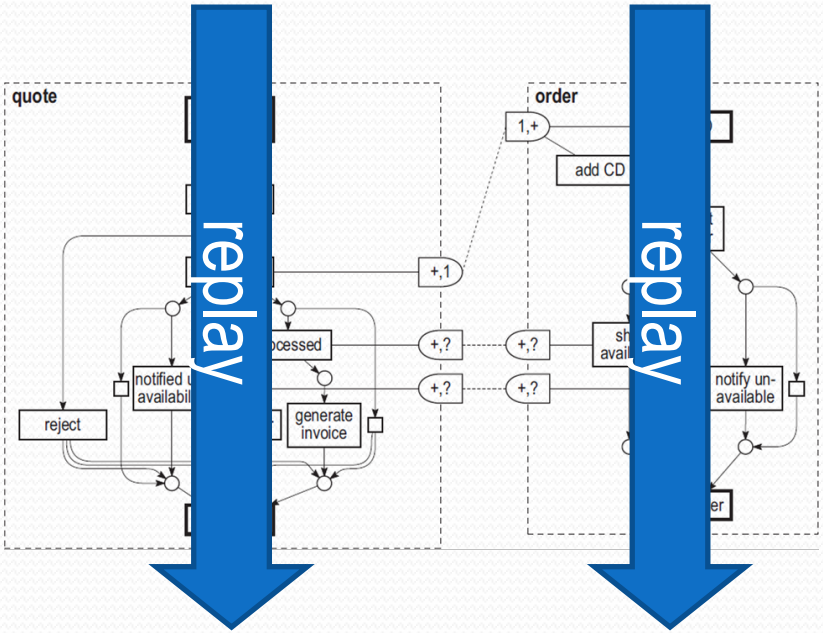
extract

using foreign key-primary key relations

quote log

order log

relational DB of the CD shop



proclets, including multiplicities of ports → Petri nets with reset and inhibitor arcs

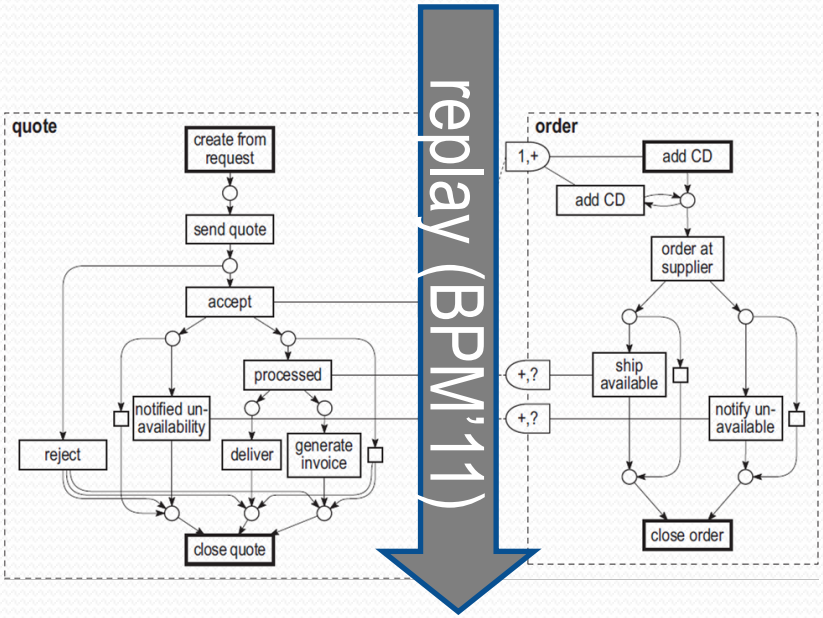
INTERACTION CONFORMANCE

extract

quote log

order log

relational DB of the CD shop

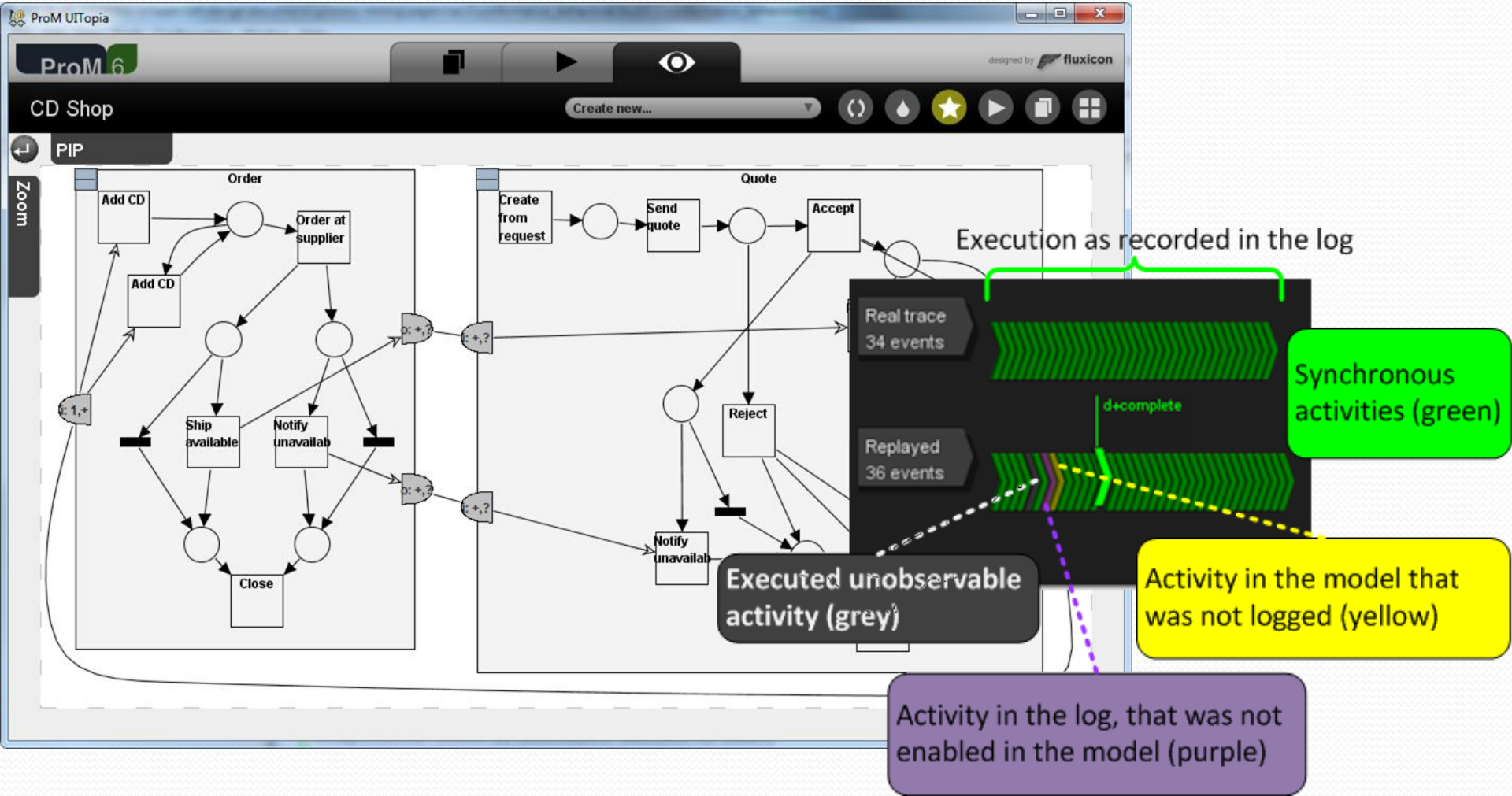


proclet + its environment and the ports

(D. Fahland, M. de Leoni et al., Conformance Checking of Interacting Processes With Overlapping Instances, BPM 2011)

IMPLEMENTATION

- All the work is implemented in ProM and available trough http://www.processmining.org



CONCLUSIONS

- When no unique notion of a “case” exists, processes can be seen as **sets of interacting artifacts**.
- Using **key/foreign key relations**, a database can be converted into a **collection of event logs**, each describing the data from the perspective of a single artifact.
- Both behavioral and interaction conformance checking can be done for artifact systems, using these logs and **translations of the models to Petri nets** (with reset and inhibitor arcs).