Interface Adaptation: Bridging Collaboration Agreements and Web Services

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Let’s first agree on what we’re talking about…

What is a Service?

Business

Product involving a performance which results in added value in forms (such as convenience, amusement, timeliness …) which are essentially intangible to the first purchaser.

Zeithalm & Bitner "Services Marketing Management"

IT

Abstract resource that represents a capability of performing tasks that form a coherent functionality from the point of view of providers entities and requesters entities…

W3C WS Glossary

More concretely in the context of the Web

Software application identified by a URI [with] interface and binding [that can be] defined, described, and discovered by XML artifacts, and supports direct interactions with other software applications using XML-based messages via Internet-based protocols.

W3C WS-Architecture Group

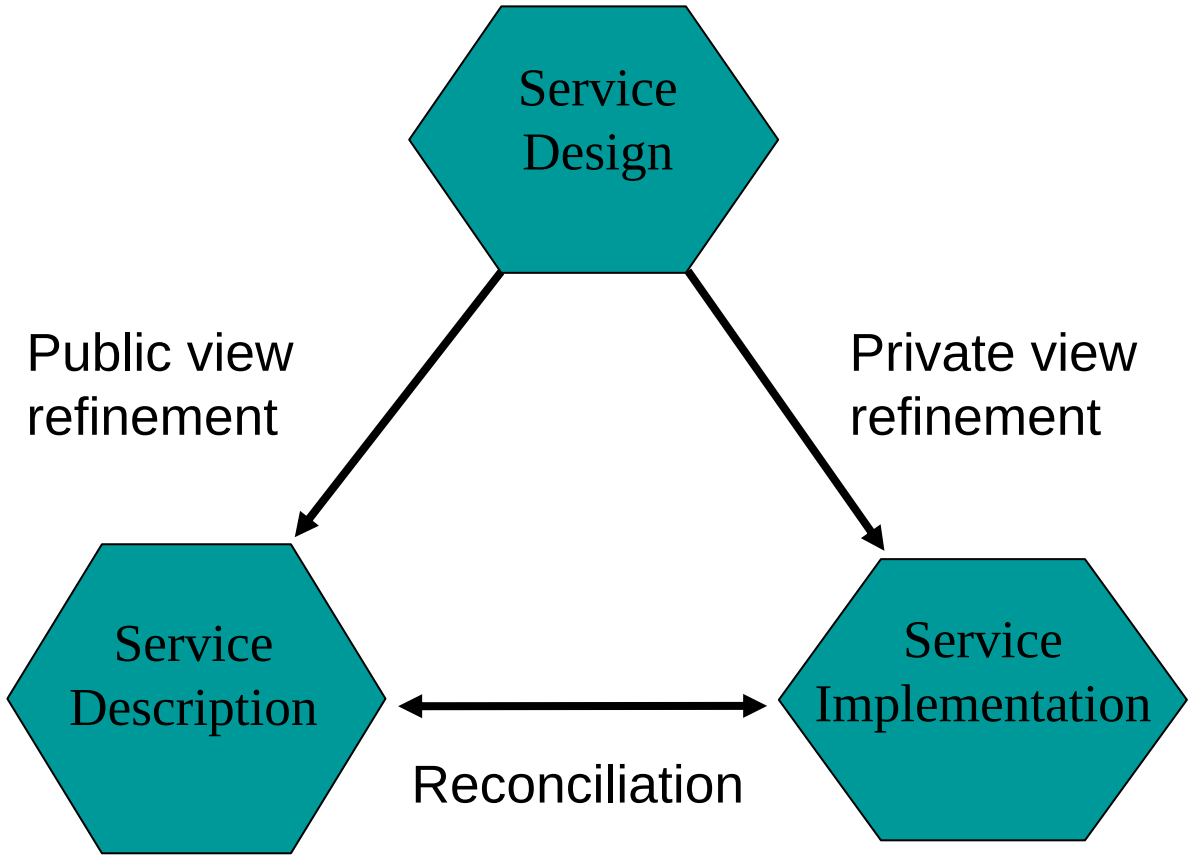
Loosely coupled, reusable software components that semantically encapsulate discrete functionality and are distributed and programmatically accessible over standard Internet protocols.

Stencil Group

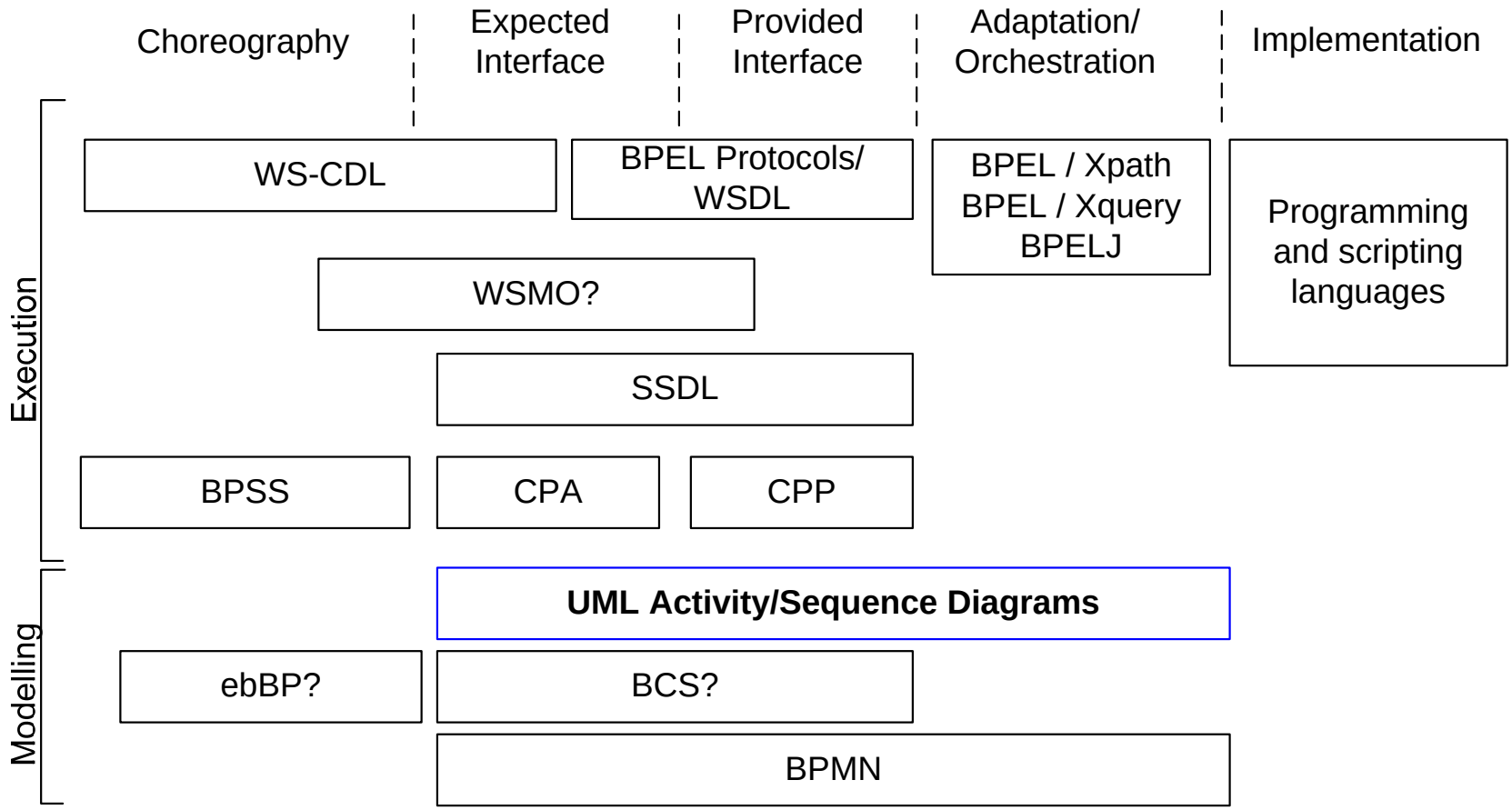
Things to keep in mind

- Services interact through (XML) messages ➔
  - Breaks traditional design/programming languages
- Services provide a “capability” or “coherent functionality” that requestors need.
  - Raises requestor-to-provider matching issues
- Services are “semantically” described (more so than traditional components) ➔
  - Service description is more than WSDL + UDDI
  - Service implementation and description on par

The Public-Private Reconciliation Triangle



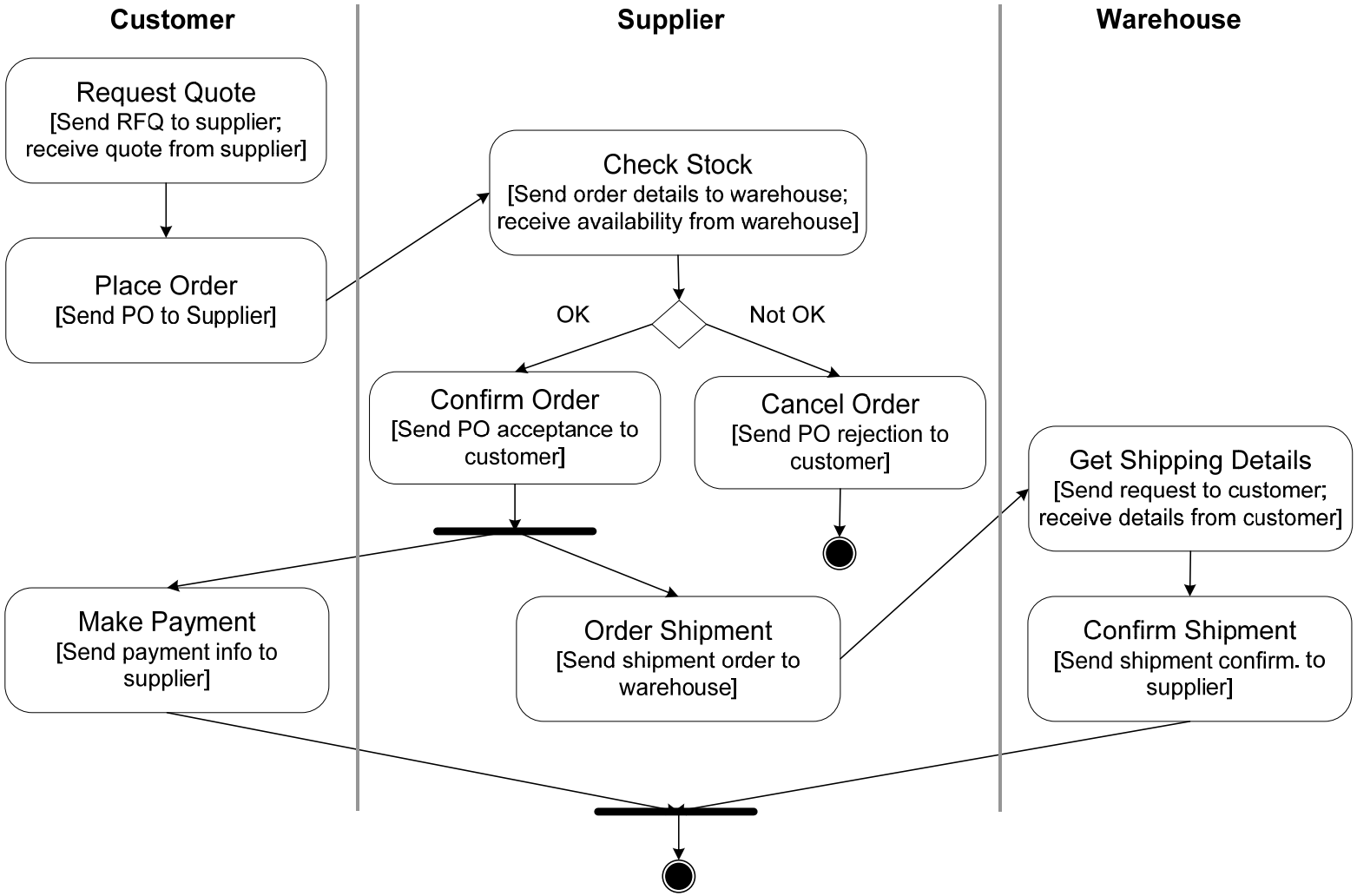
Service interaction description languages
Pick your favourite...



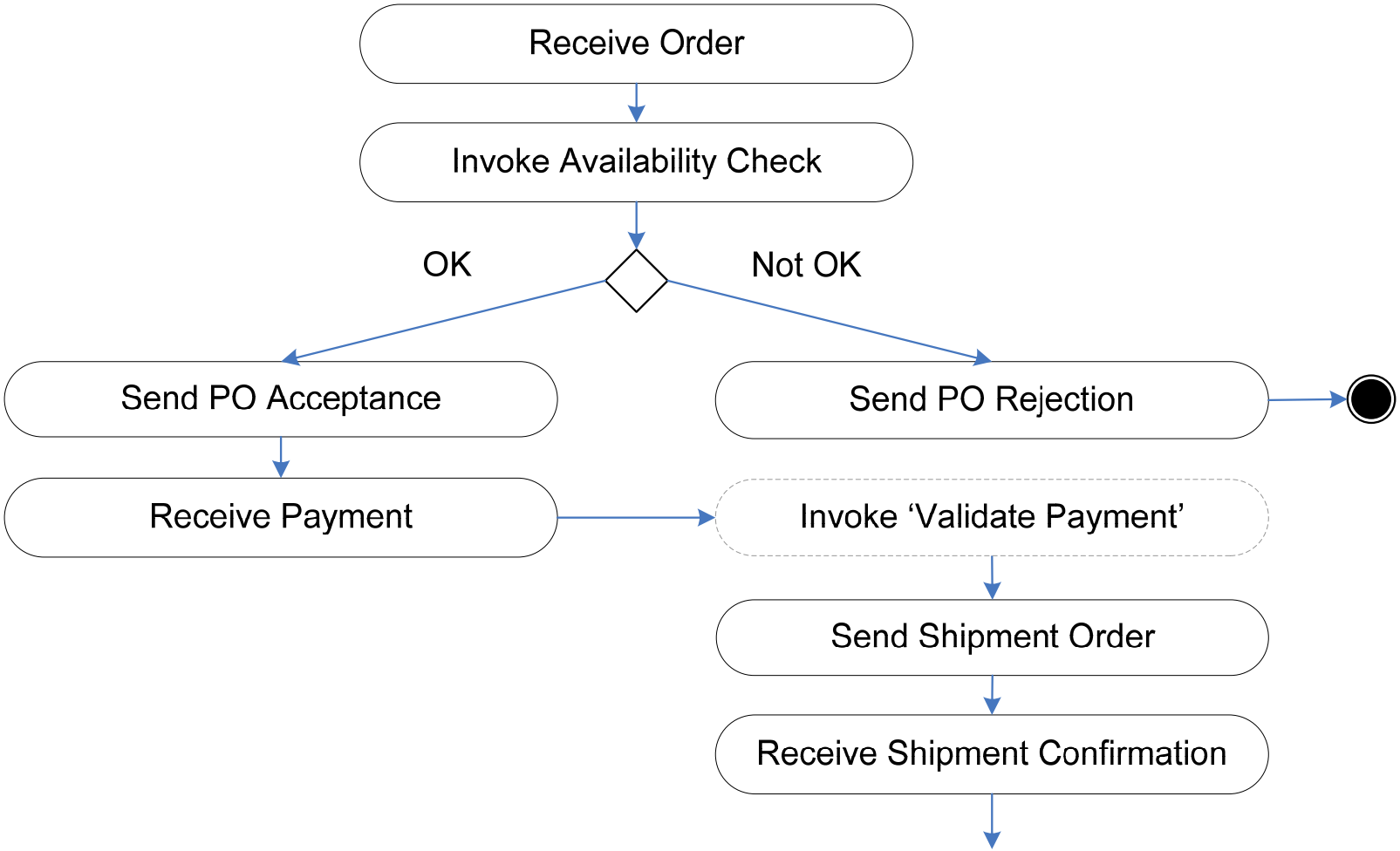
Viewpoints on service interactions

- *Choreography*: Global model of interactions between two or more services as established in a *Collaboration Agreement*
- Interface:
  - Model of the interactions between a service and one or several other services
  - Encompasses both structural (WSDL) and behavioural aspects (BPEL business protocols)
- Orchestration: executable description of internal actions and interactions required to deliver a service

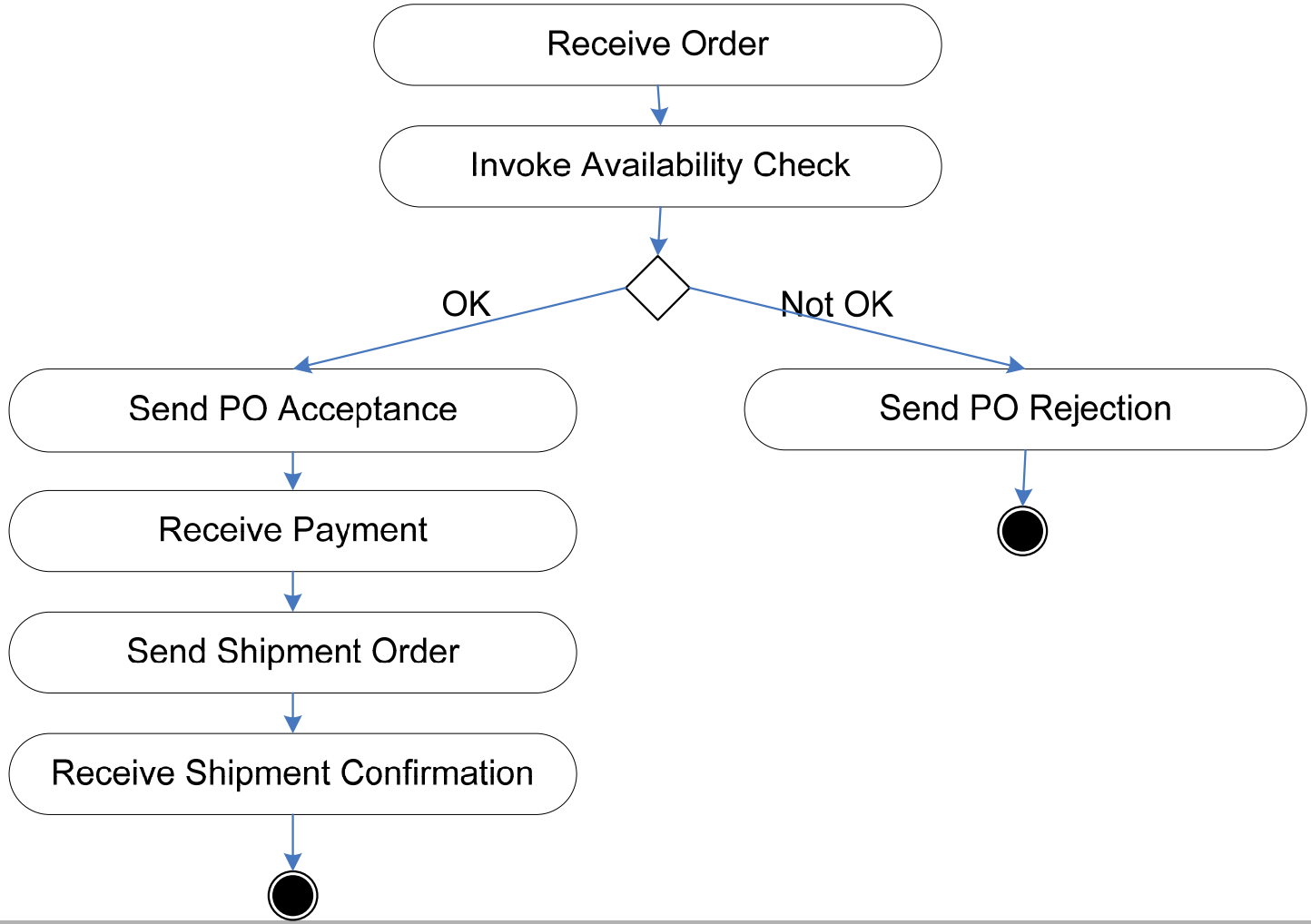
Choreography example



Orchestration example (supplier)

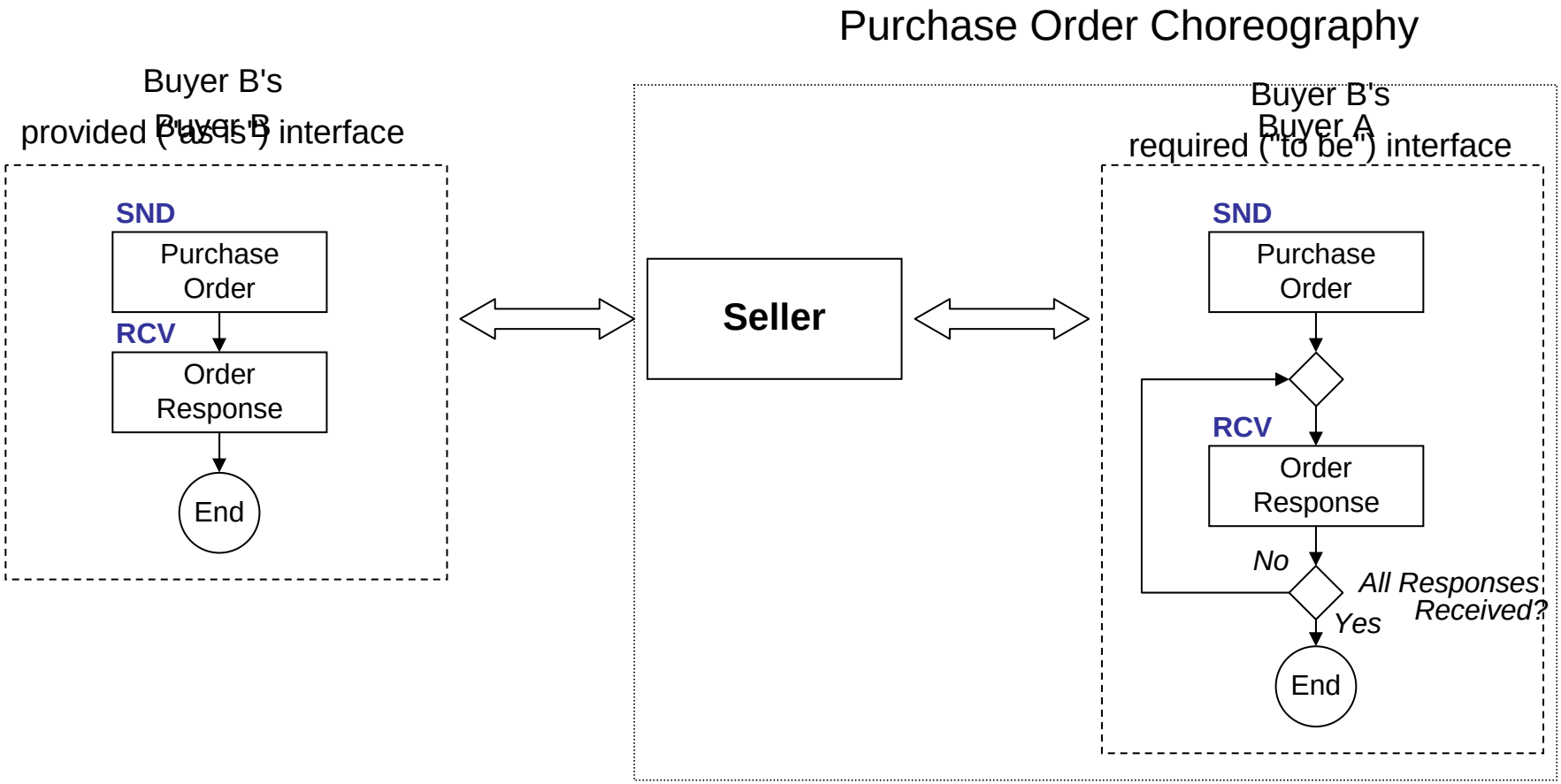


Between Choreography and Orchestration: Behavioural Interface



So what’s the problem…

A Fundamental Dichotomy: Provided vs. Required Interfaces



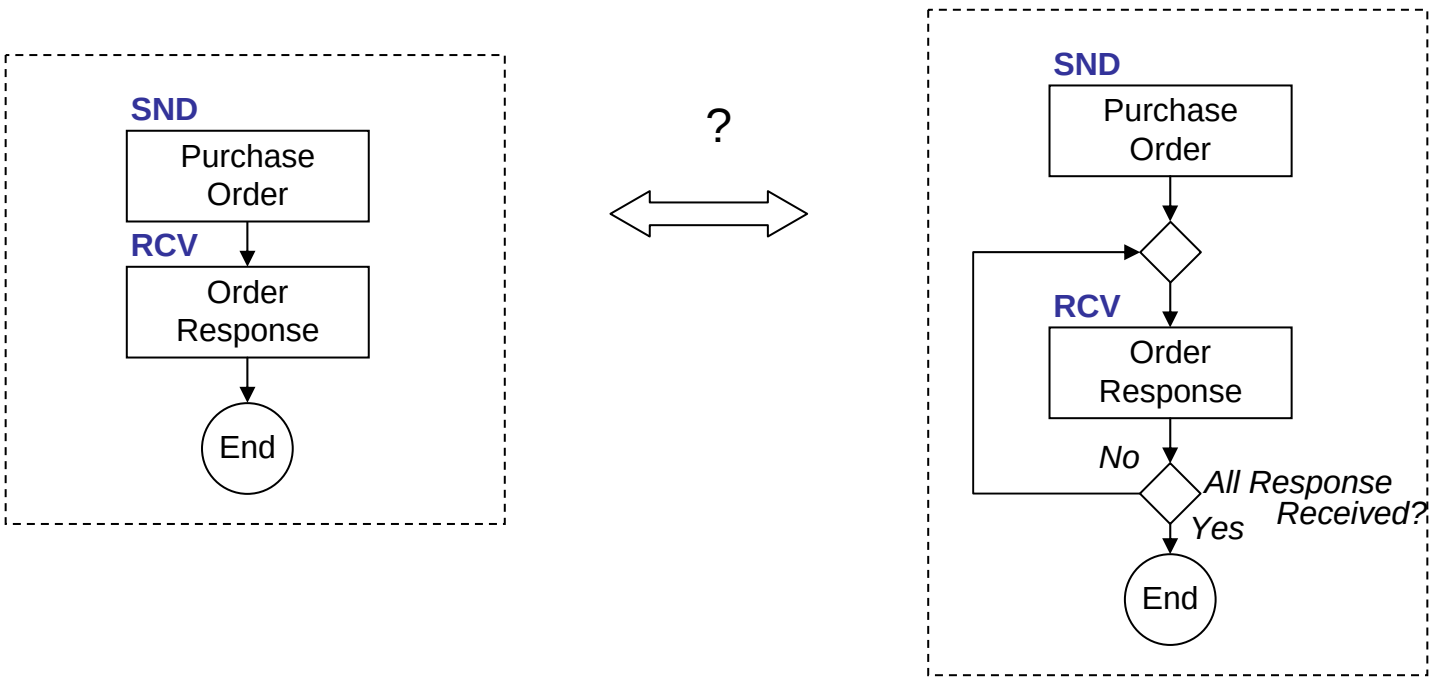
Provided vs. Required Interfaces
Mismatch example

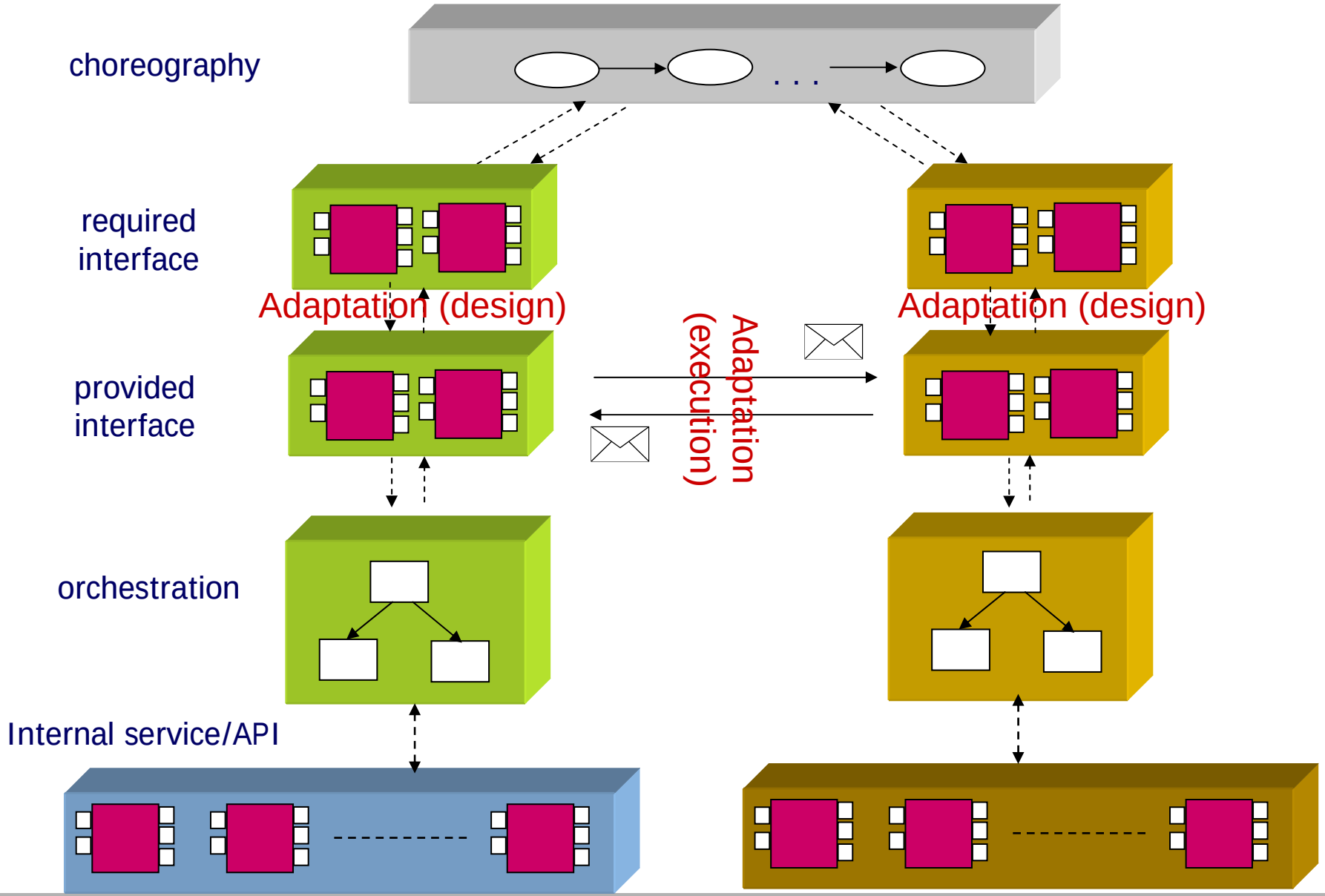
Provided interface:

abstraction of a private process

Required interface:

one-sided view on a choreography




choreography
required interface
provided interface
orchestration
Internal service/API
Adaptation (design)
Adaptation (design)
Adaptation (execution)

Existing tool support for interface adaptation

For structural aspects:

- Adapters written in general-purpose or specialised languages (e.g. XSLT)
- Graphical tools (XI Mapping Editor, BizTalk Mapper...)

For behavioural aspects:

- Adapters written in general-purpose or specialised languages (e.g. BPEL/XSLT) – is this appropriate?
- Graphical tools?

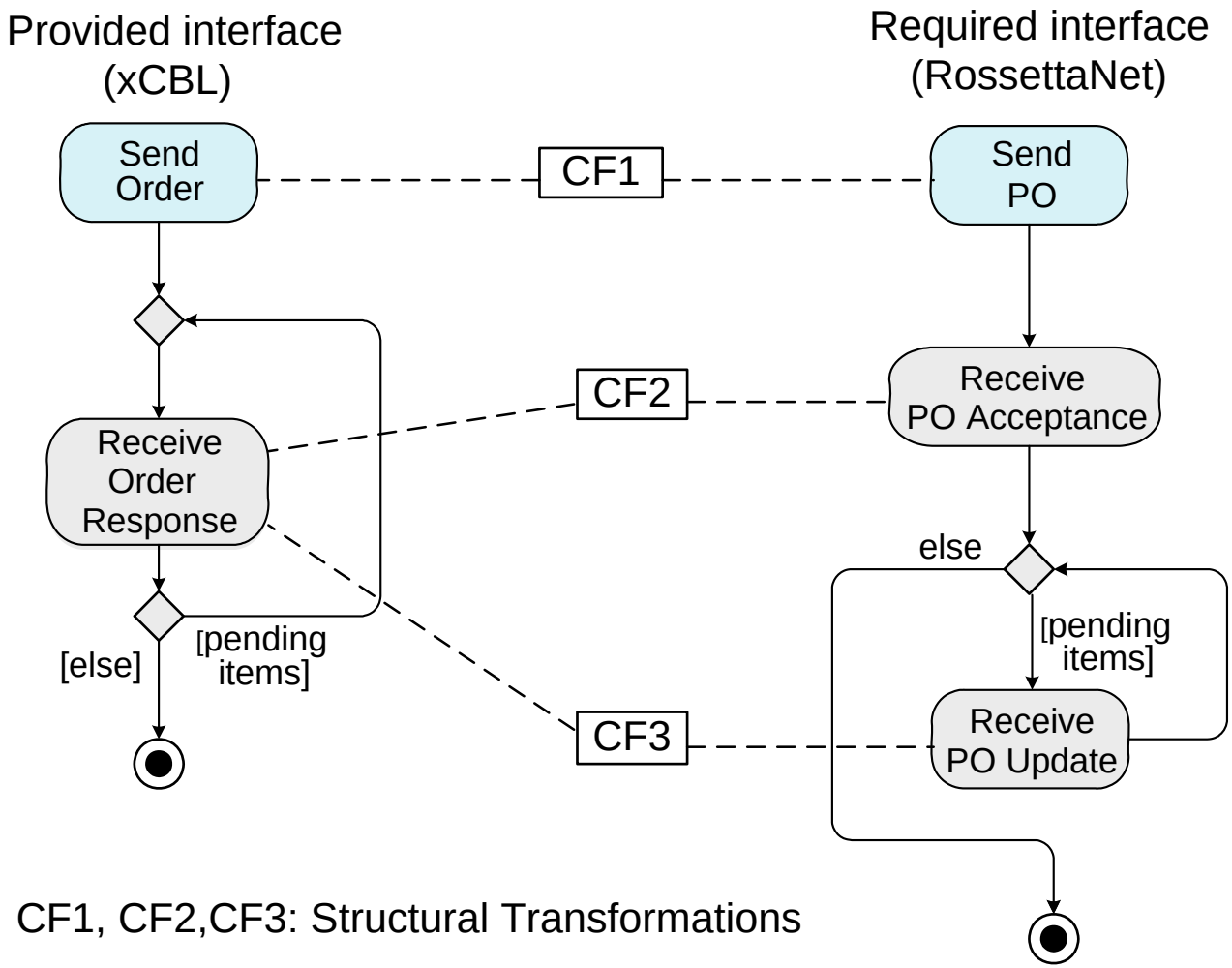
➔ Current interface adaptation approaches are implementation-driven

Proposal

High-level Interface Mapping Operators

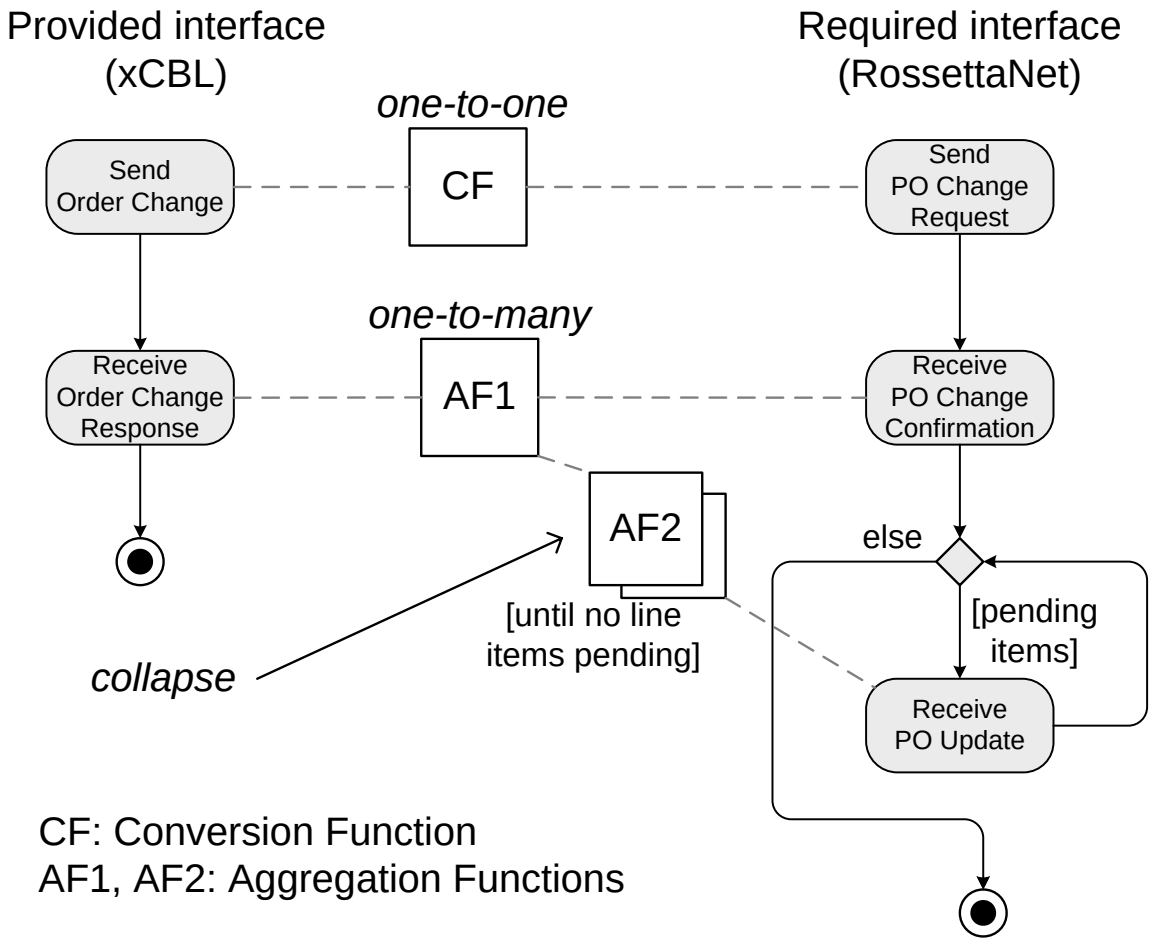
- For interactions that may execute zero or one time each:
  - Flow: One-to-one interaction mapping
  - Gather, Scatter: One-to-many interaction mapping
- For interactions that may execute multiple times
  - Collapse
  - Burst
- For all interactions
  - Hide (kind of "N-to-zero interaction mapping")

One-to-one Mapping Examples

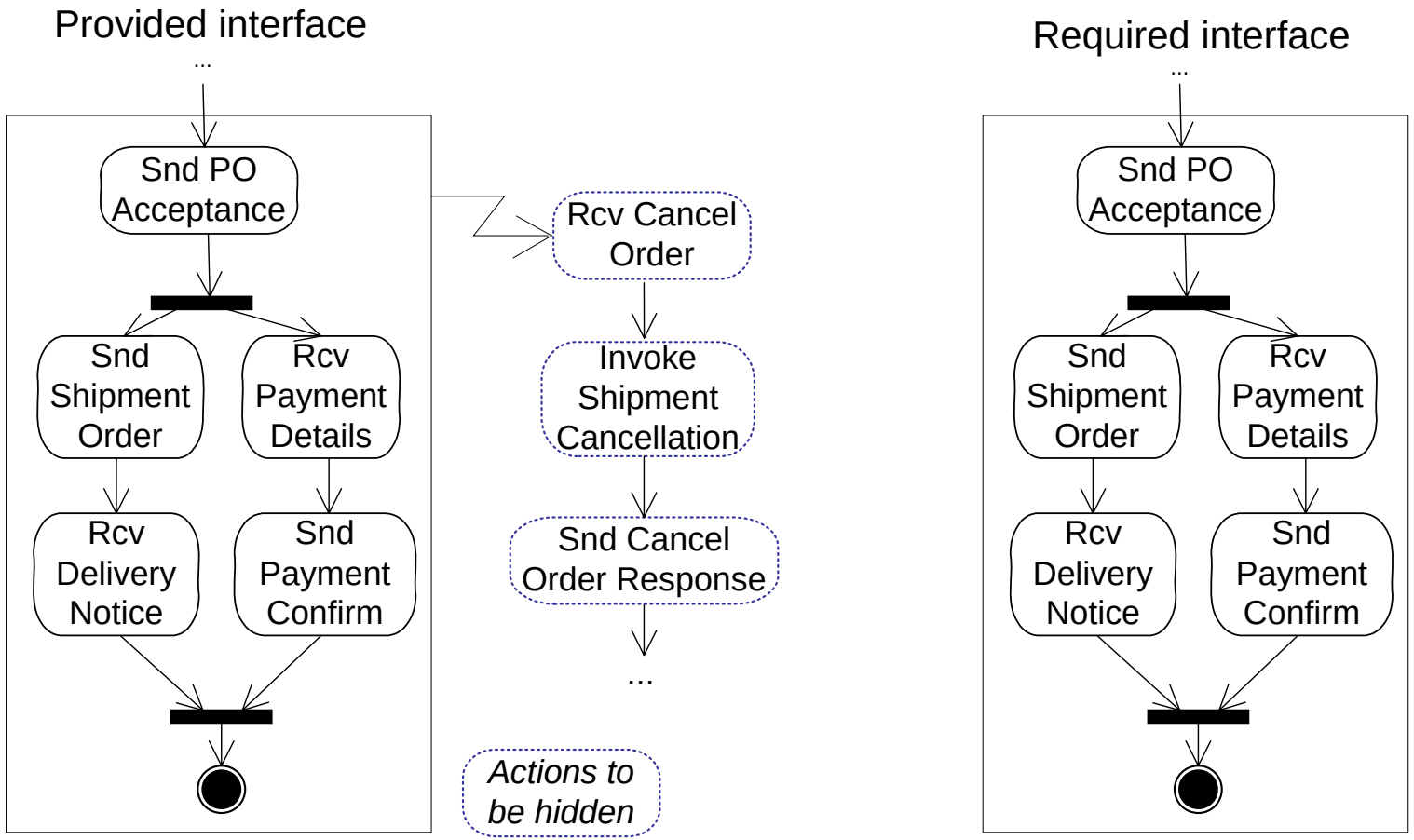


CF1, CF2,CF3: Structural Transformations

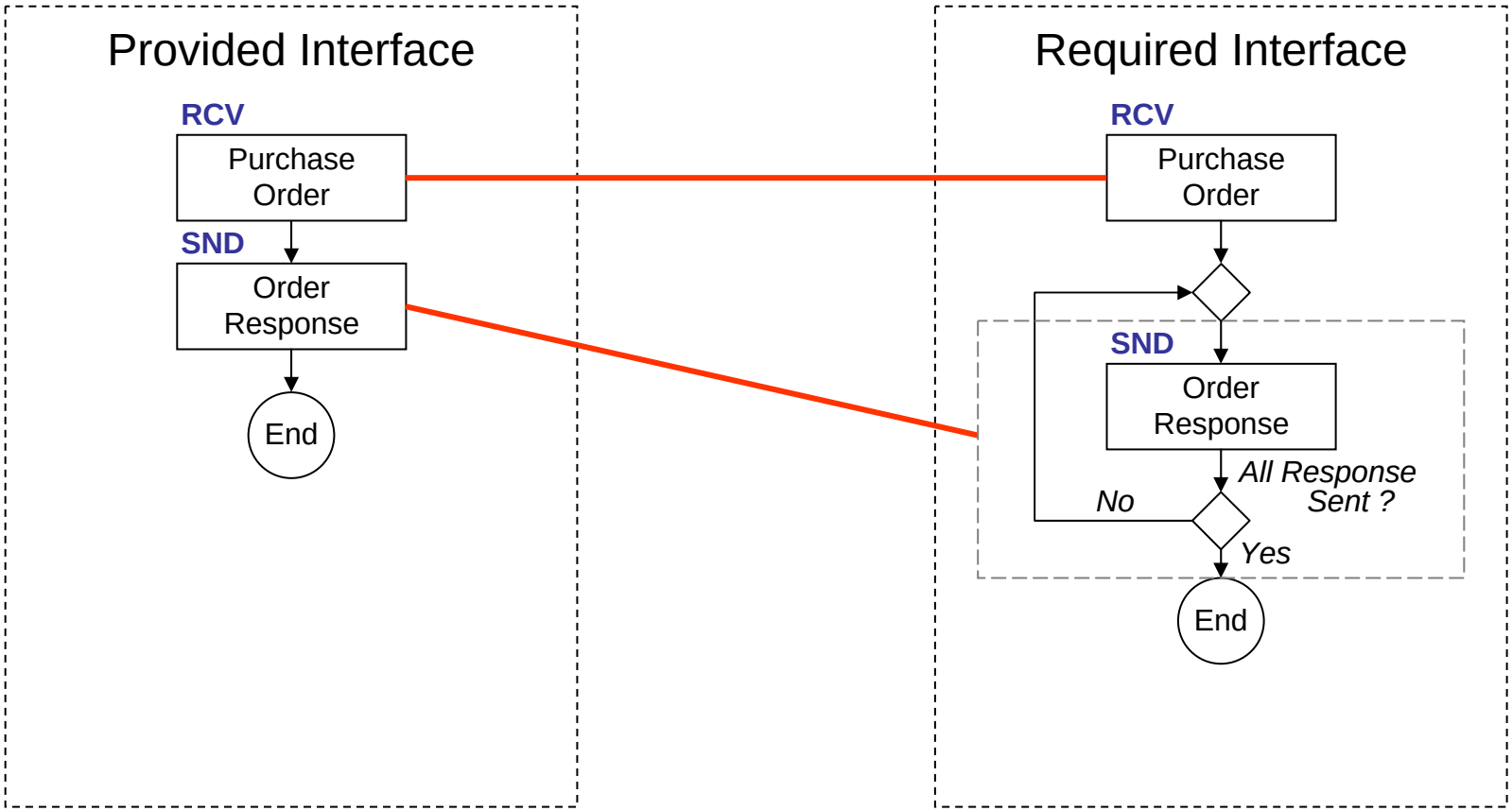
One-to-many and Collapse Examples



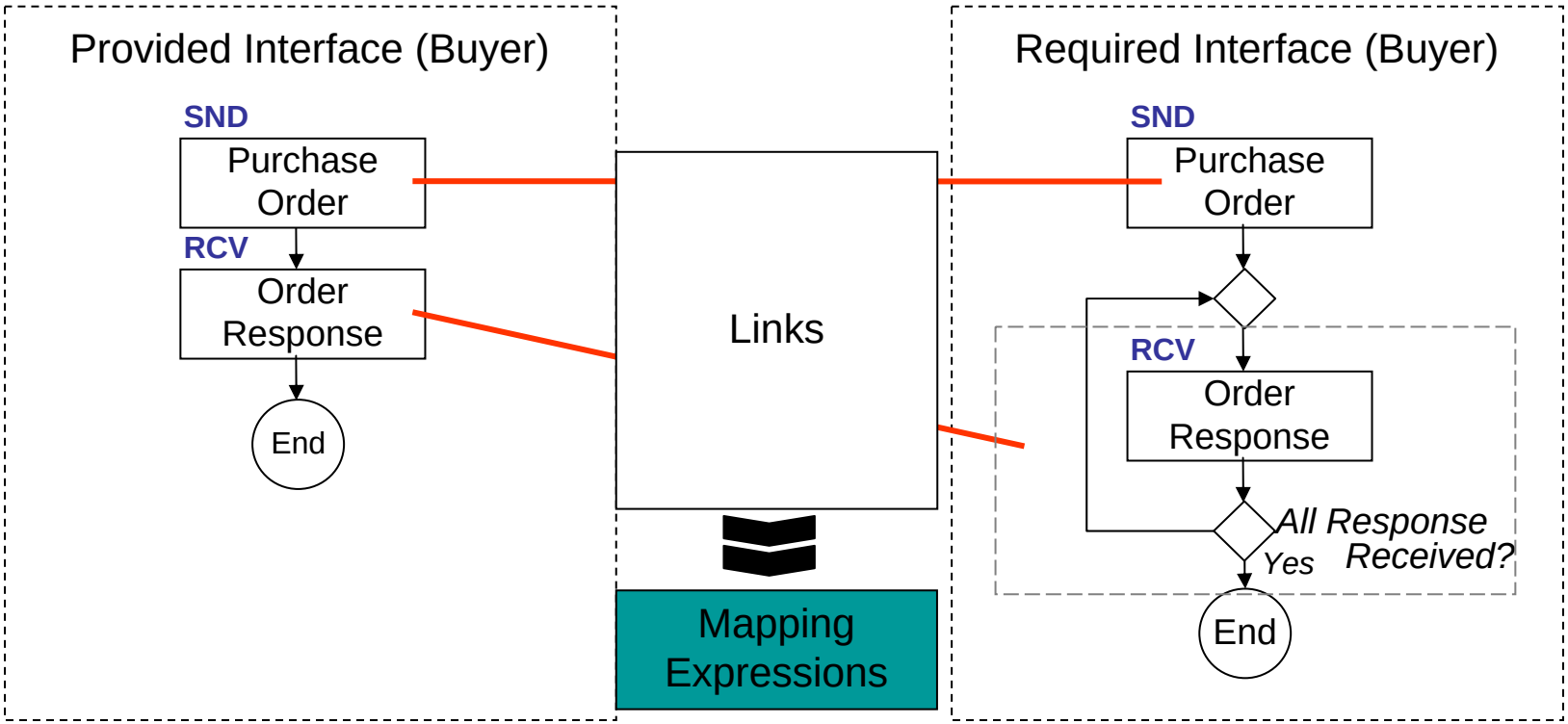
Hiding Example
(*Qui peut le plus peut le moins...)*



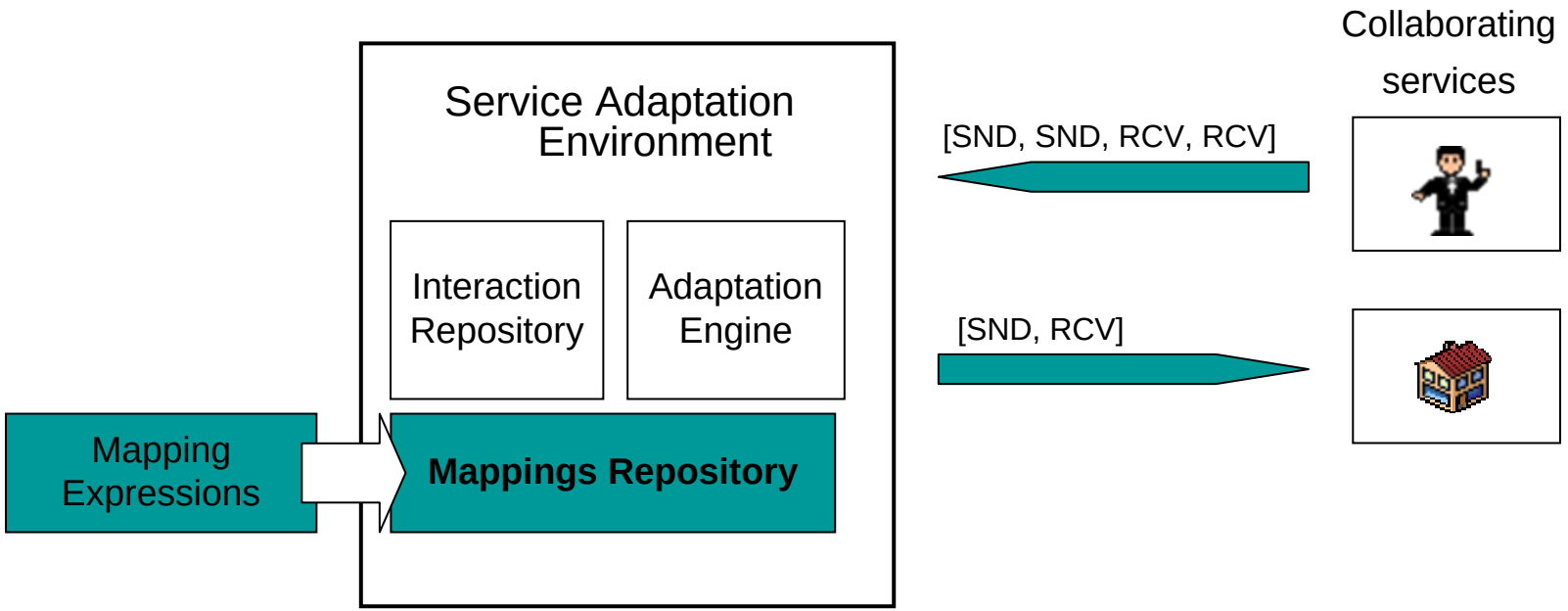
Facilitating Interface Adaptation
Graphical interface mapping



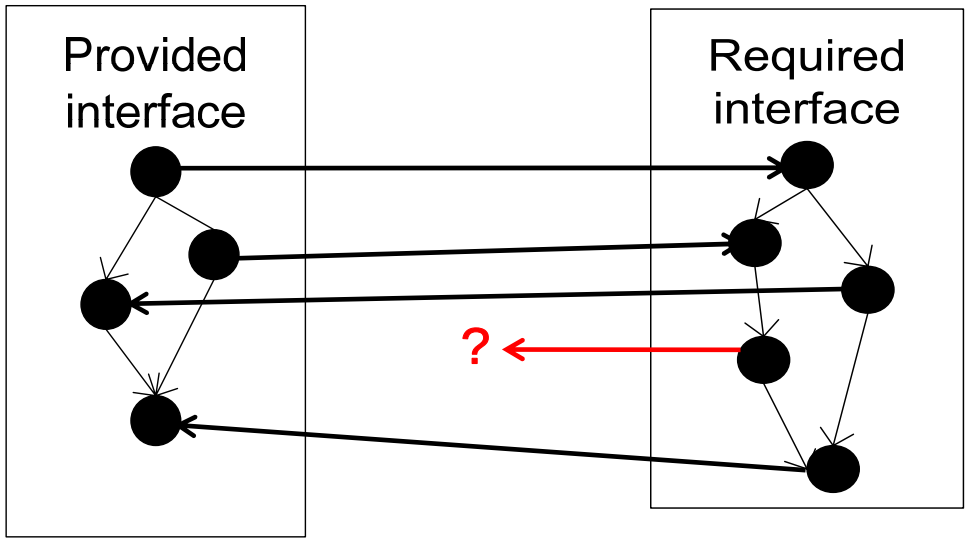
Service Adaptation Platform Design tool



Service Adaptation Platform Runtime environment



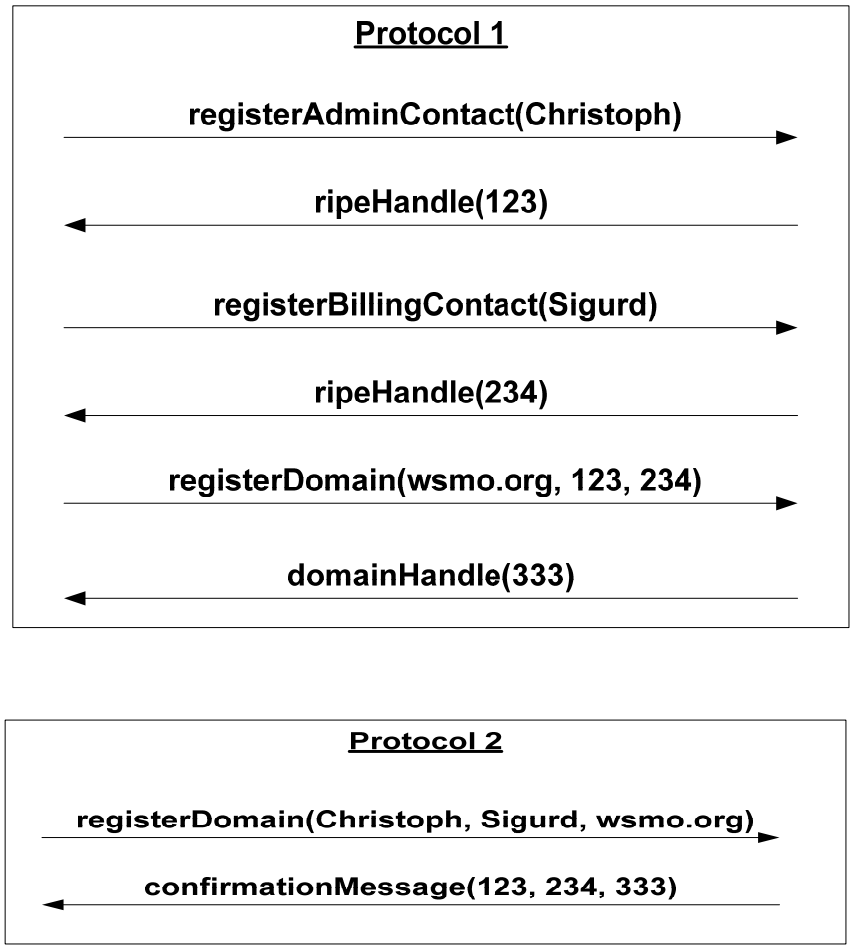
Life is not Always Rose...
Problematic adaptation example



Business logic needs to be added...

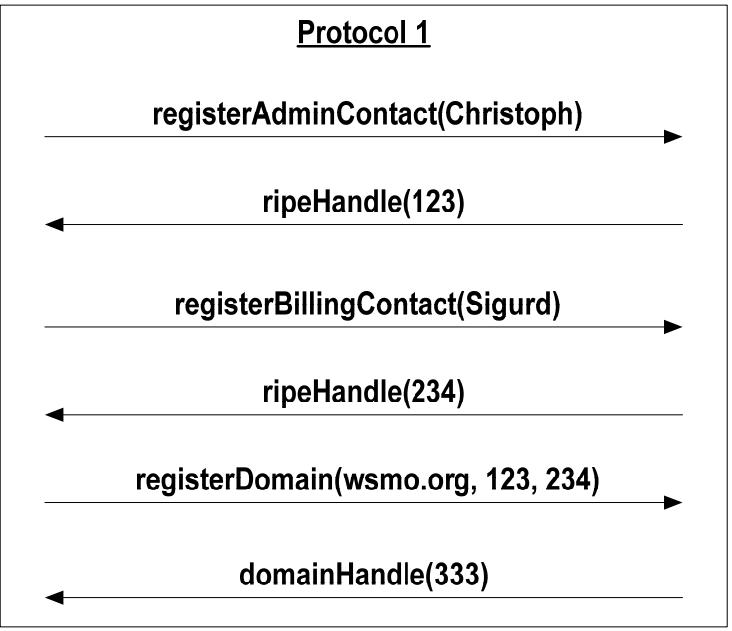
Additive Adaptation Example (from Altenhofen et al. 2005)

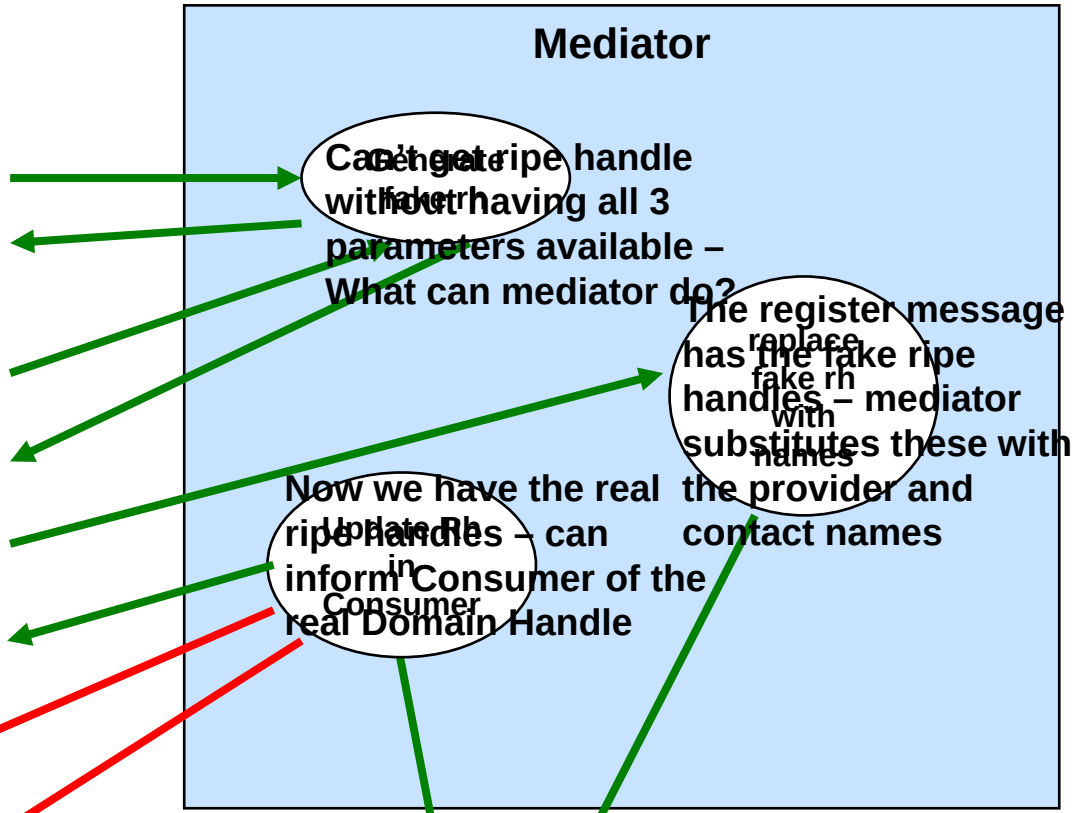
Domain registration client

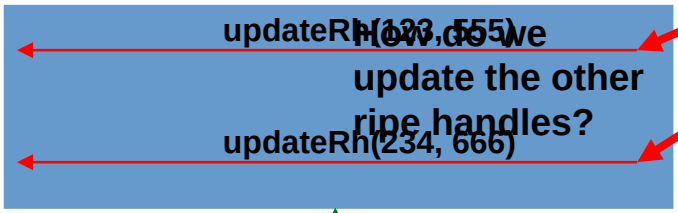


Domain registration service

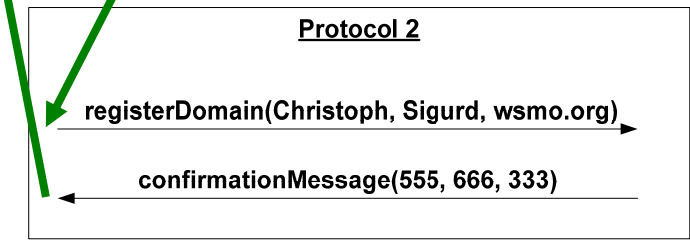
Required interface







Provided interface



What if these operations don't exist?

Need to be added...

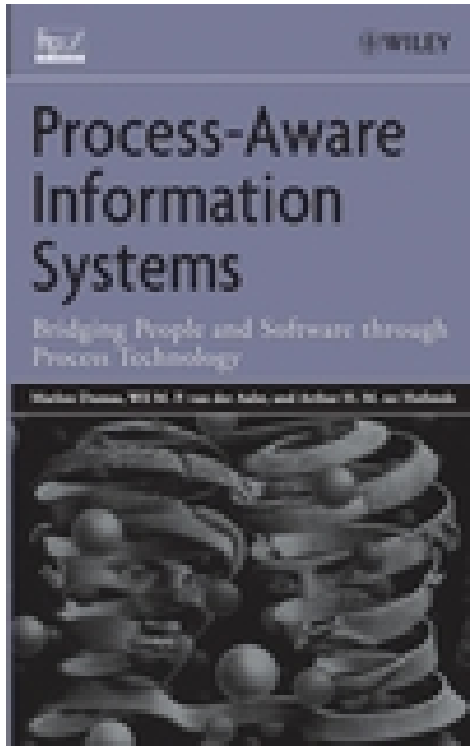
Conclusion

- Graphical interface adaptation tools currently restricted to structural mapping
- Our work aims at extending these to cover behavioural mapping
  - Definition of operators completed
  - Prototyping and testing ongoing
  - Future extensions for adaptation in multi-party interaction scenarios
- This is a first step towards a platform supporting mediation in a broader sense, including:
  - Partner management
  - SLAs
  - Business exceptions handling

Other Research @ QUT

- Workflow Patterns and YAWL (with TU-Eindhoven):
  - http://www.workflowpatterns.com & http://www.yawl-system.com
- Service interaction modelling (with SAP):
  - http://www.serviceinteraction.com
- Conceptual models of non-functional service properties
  - http://www.service-description.com
- Verification of BPEL Processes: BPEL2PNML and WofBPEL (with TU-Eindhoven):
  - http://www.bpm.fit.qut.edu.au/projects/babel/tools

A bit of publicity



Marlon Dumas, Wil van der Aalst, Arthur ter Hofstede (editors)

Process Aware Information Systems: Bridging People and Software Through Process Technology

John Wiley & Sons

432 pages

September 2005

Available at Amazon

Further readings

- R. Bradley. "Solving the mediation challenge: The Heart of an ESB", 25 July 2005, http://www.integrationconsortium.org/icblog
- H.W. Schmidt and R.H. Reussner. "Generating Adapters for Concurrent Component Protocol Synchronisation". In *Proceedings of the Fifth IFIP International Conference on Formal Methods for Open Object-Based Distributed Systems*, Enschede, The Netherlands, March 2002. Kluwer Academic Publishers.
- B. Benatallah et al. "Developing Adapters for Web Services Integration". In *Proceedings of the International Conference on Advanced Information Systems Engineering (CAiSE)*, Porto, Portugal, June 2005. Springer.
- E. Ciampian and A. Mocan. *Process Mediation in WSMX*. WSMX Working Draft 16 May 2005. http://www.wsmo.org/TR/d13/d13.7/v0.1
- M. Altenhofen et al. "An Execution Semantics for Mediation Patterns". In *BPM'2005 Workshops: Workshop on Choreography and Orchestration for Business Process Management*, Nancy, France, September 2005. (Available as SAP Research internal report)