Summary

CoCoA:

- Separating organisational and transactional properties
- Free-style vs. strict cooperation
- Declarative specification style

Ongoing work:

- proving commutativity by mapping TM to Isabelle/HOL

Conditions on execution rules

Declaration:

```
data operation order
chapter_rule :
   forall c : chapter
   order addChapter(c);
         (editChapter(c,_) "edited" | spellCheck(c)) *;
         delChapter(c)
```

Usage:

```
when ed issues writingDone()
iff forall c : chapters
       | (query document on chapter_rule(c) <> "edited")
```

CoCoA: Integration of organisational and transactional aspects

Dependencies between enabled operations and workspace histories:

- **data operations** and **data exchange operations** must be enabled.
- a **communication** can have a condition expression that queries a workspace history.

CoCoA: Execution rules

```
data operation order
    forall c : chapter
    order addChapter(c); editChapter(c,_) *; delChapter(c)
```

CoCoA: History rules

```
history rules
    forall c : chapter
    noncommutative editChapter(c,_) and editChapter(c,_)
```

CoCoA: Data exchange operations

Declaration:

```
data exchange operations
  Chapter(c : string) =
  select addChapter(c), editChapter(c,_), delChapter(c)
```

Usage:

```
on revise enable
  ed : export Chapter("intro") to document,
       import Chapter("intro") from document
endon
```

CoCoA: Transactional aspects

Features introduced to support CoAct requirements on scenario specifications:

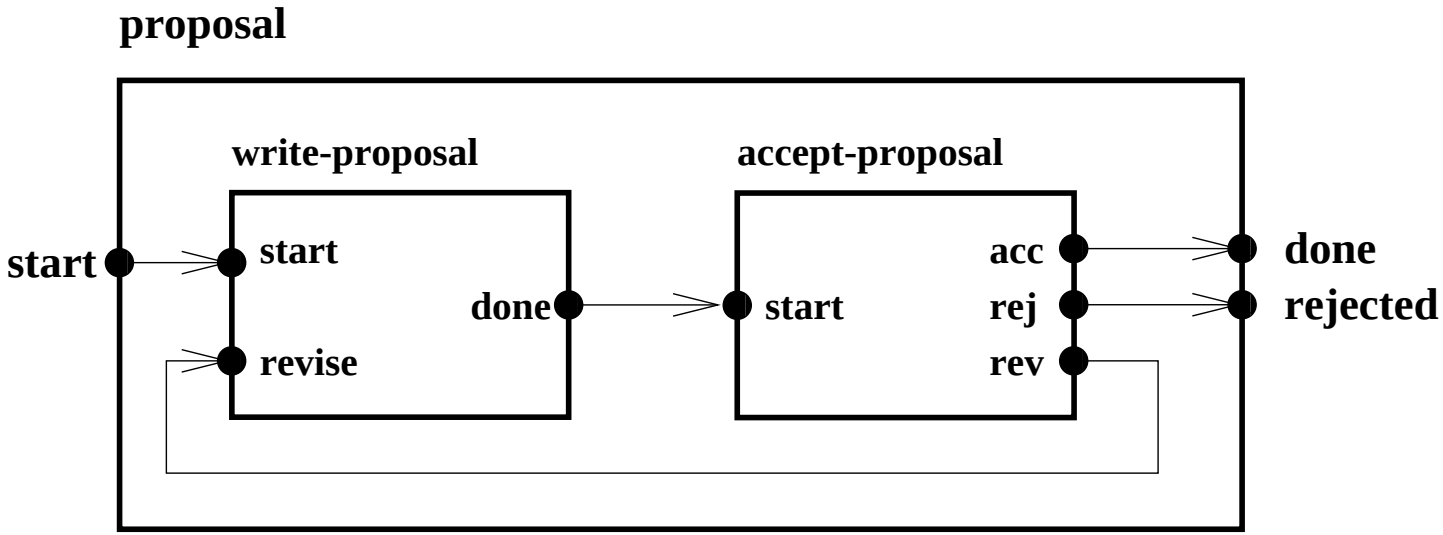
- **data exchange operations** based on workspace histories
- execution rules (keyword: **data operation order**)
- merge/commutativity rules (keyword: **history rules**)

CoCoA: Operation enabling

Declaration:

```
step write_proposal [in start, revise out done]
begin
   on start enable
      ed : addChapter("intro"),
           editChapter("intro", _),
           ...
      when ed issues introWritten() do done
   endon
end
```

CoCoA: Steps




```
step proposal [in start out done, rejected]
begin
   ...
   on write_proposal.done do accept_proposal.start
   ...
end
```

CoCoA: Organisational aspects

Steps:

- sequential, parallel, repetitive, hierarchical
- enable operations based on user roles
- many users per step, many steps per user

Communications:

- user-initiated transitions between steps
- optional parameters

Structure of a CoCoA scenario definition

```
scenario write_document
    data types ···
    data operations ···
    workspace types cda = ···
    user types ···
    communications ···
    data exchange operations ···
    procedure (ed: editor, authors : ℙ author) [in start out done]
        begin
            shared workspace document : cda
            ···
        end
    data operation order ···
    history rules ···
end write_document
```

Summary of CoCoA features

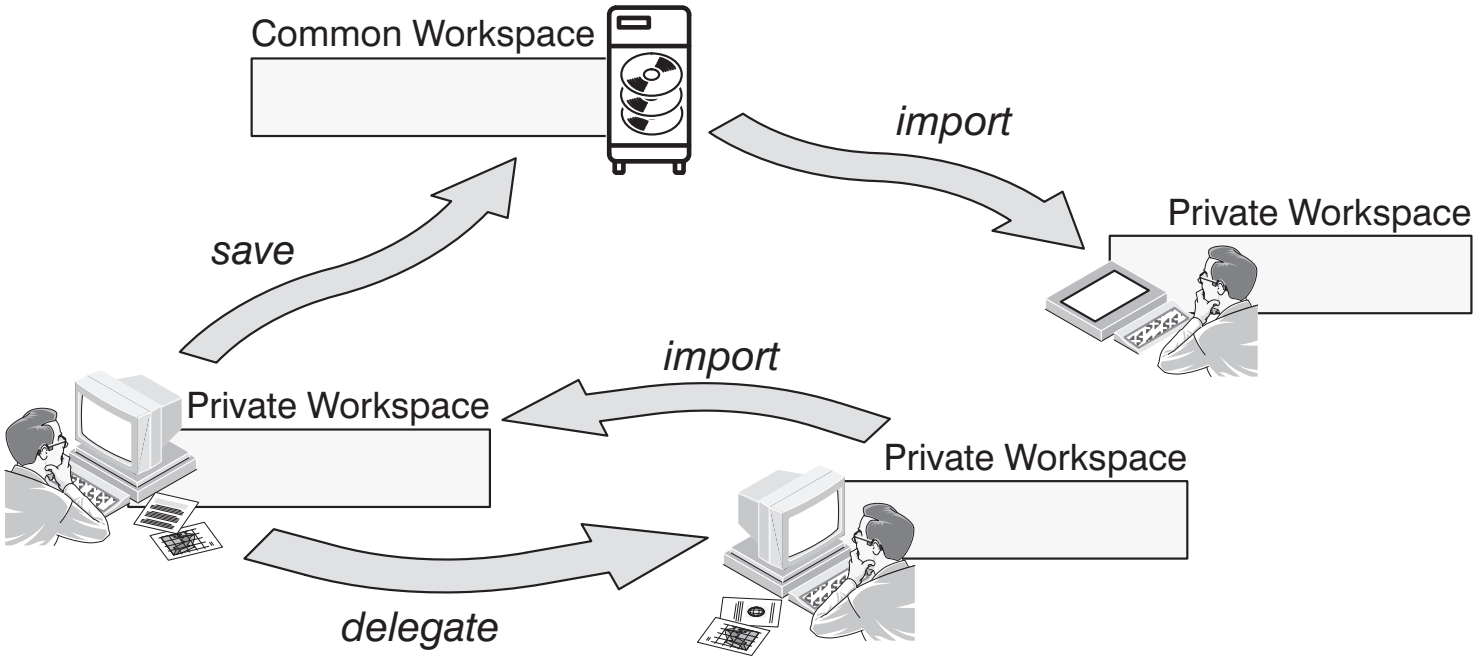
Distinction of three kinds of operation:

- data operations
- data exchange operations (import/export)
- communications

Organisational aspects: users, and work coordination

Transactional aspects: consistent data manipulation and exchange

Conceptual Organisation of the TransCoop Cooperative Transaction Model



Characteristics of CoCoA

- Designed for broad range of application domains:
  CDA, DfM, and WF
- Separation of organisational and transactional aspects
- Flexibility: not prescriptive, but descriptive
- Integrated with the CoAct transaction model
- Based on LOTOS and TM

TransCoop

ESPRIT LTR project

- GMD-IPSI, Darmstadt, Germany
- VTT, Espoo, Finland
- University of Twente, Enschede, The Netherlands

Integrating Organisational and Transactional Aspects of Cooperative Activities

Frans Faase, Susan Even, Rolf de By, Peter Apers

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