A Simple Model of Negotiation for Cooperative Updates on Database Schema Components

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Sweden

The Update Problem for Database Views

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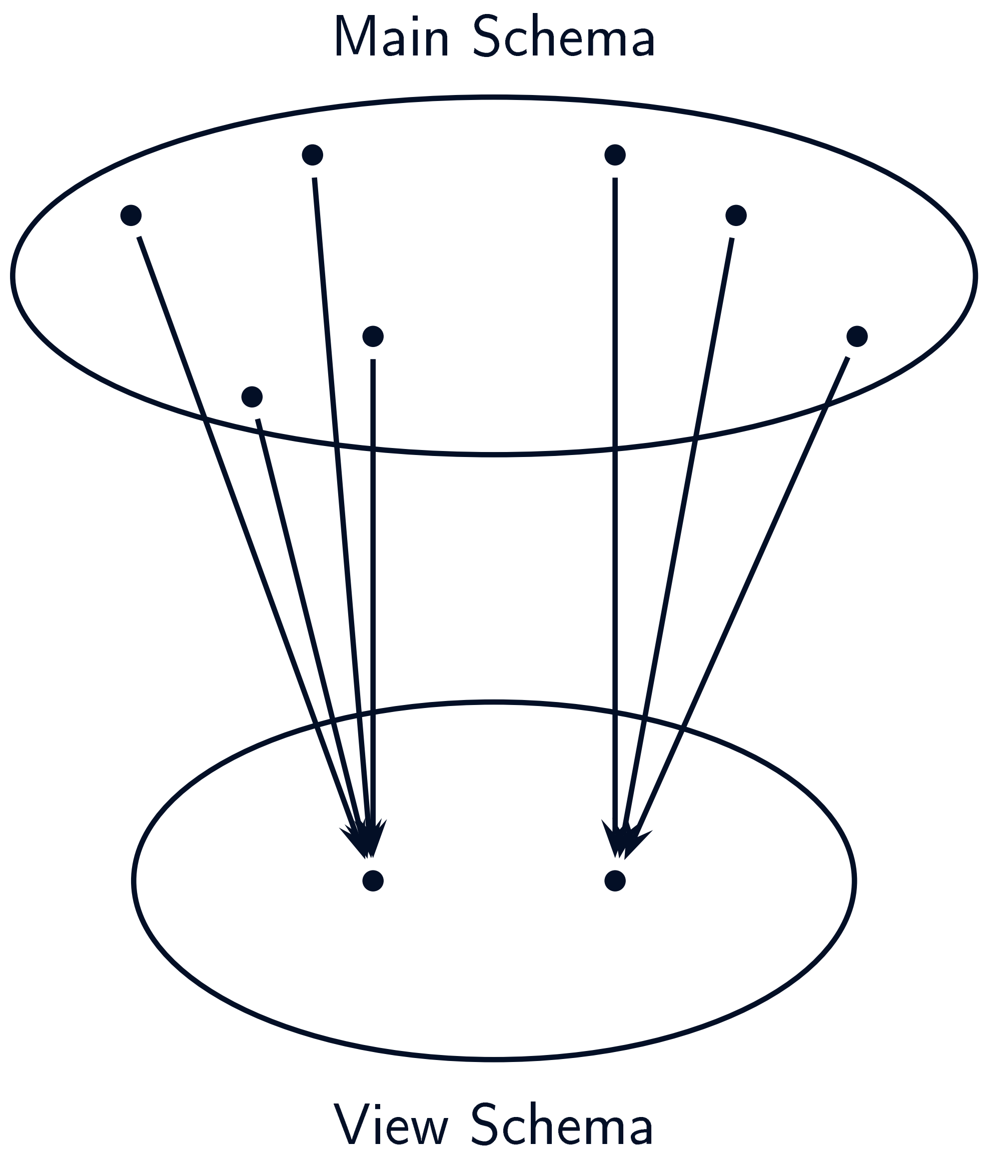

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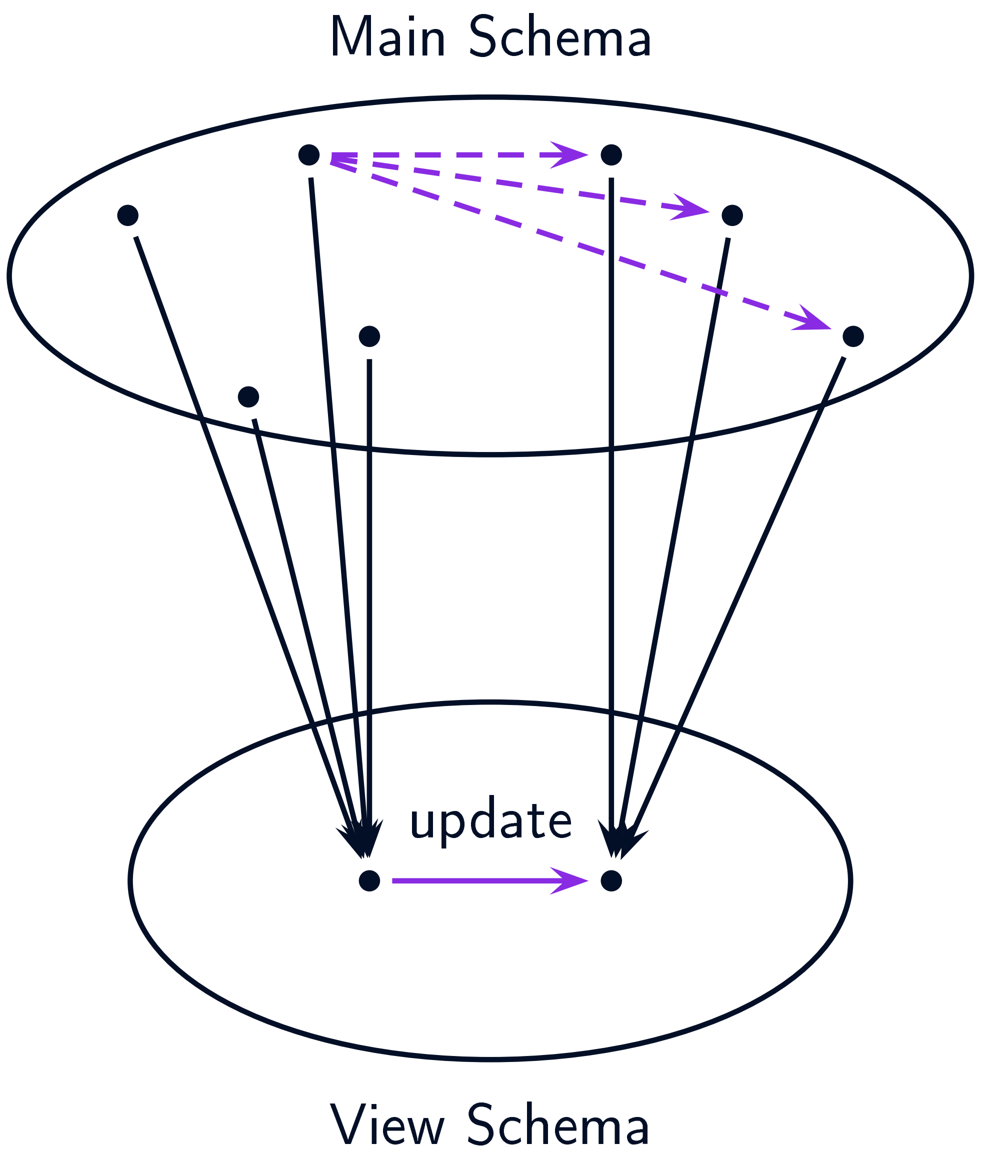

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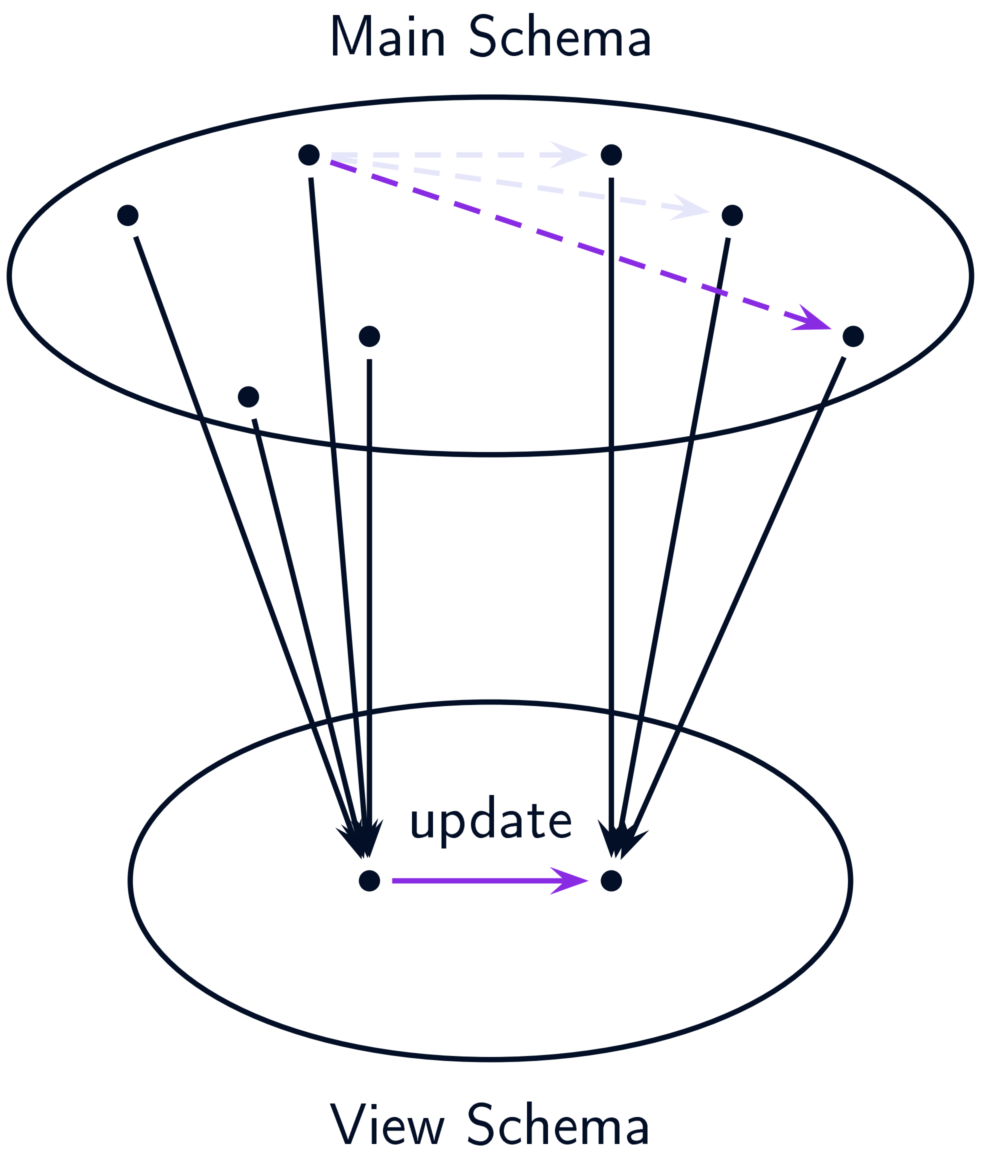

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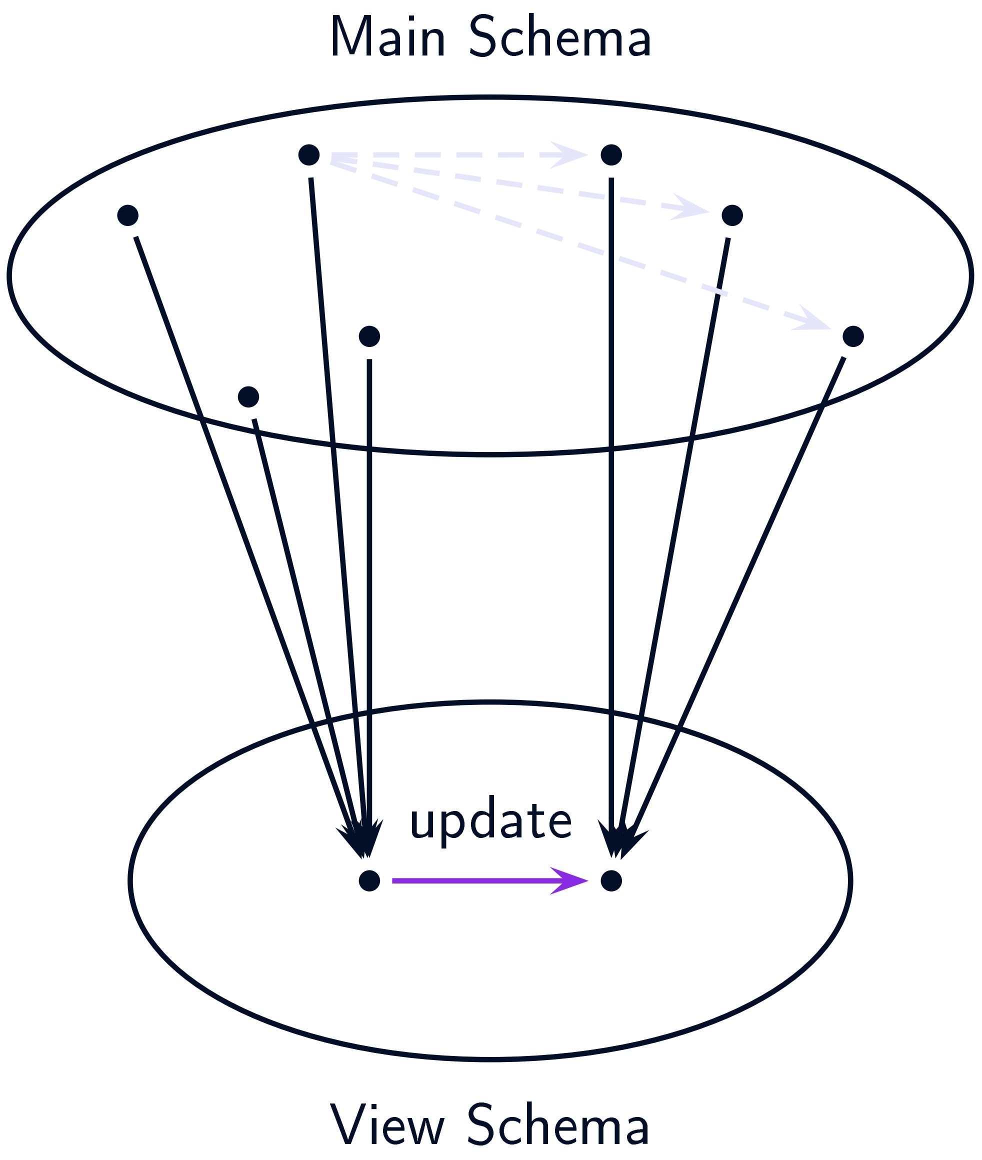
Question: How is the appropriate translation for a given situation selected?



Traditional Approaches to View Update Translation

Policy-based approaches:

Disguised-access approaches:

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- Will not be considered further in this presentation.

Limitations of Policy-Based Approaches

Two main limitations to policy-based approaches.

Lack of a canonical choice: There may be no least-change or other canonical reflection.

Insufficient user privileges: The user of the view may have insufficient privileges to make the needed changes to the main schema.

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- Applies even to disguised-access approaches.

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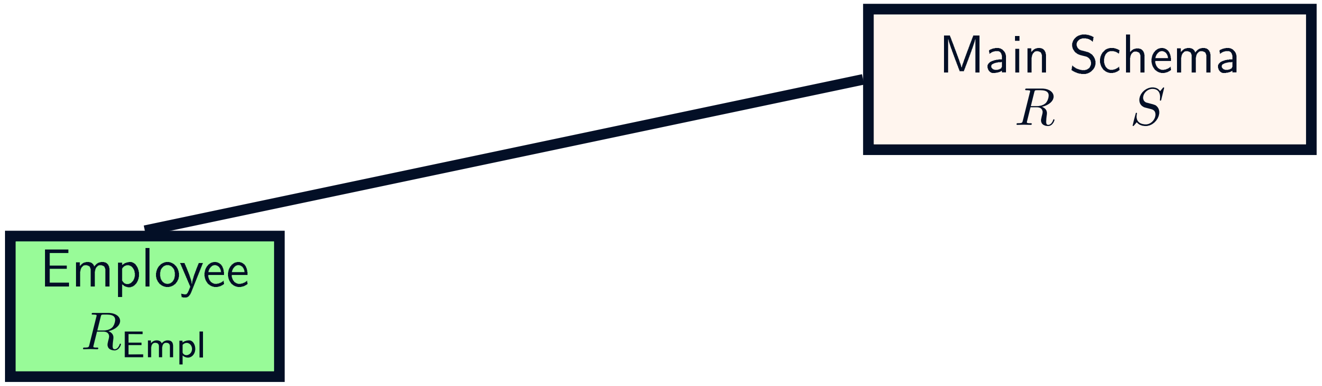

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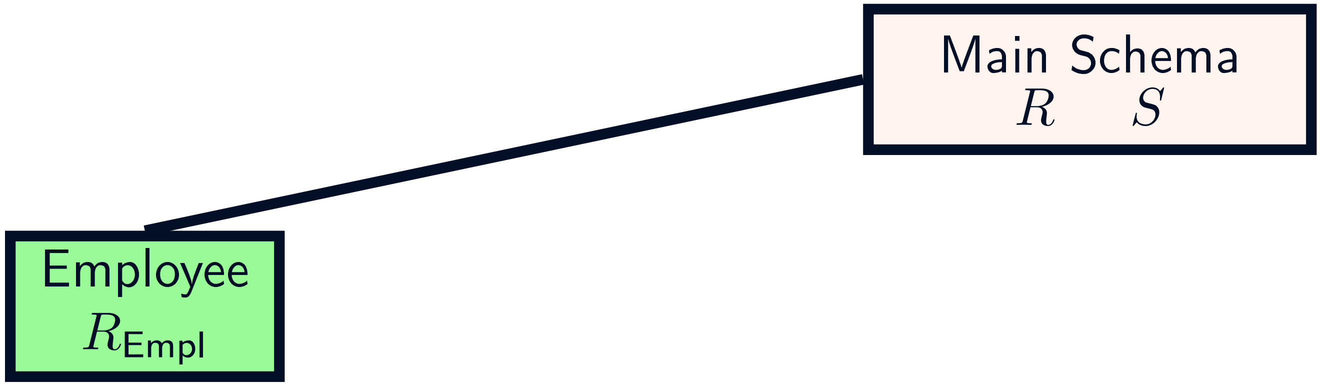

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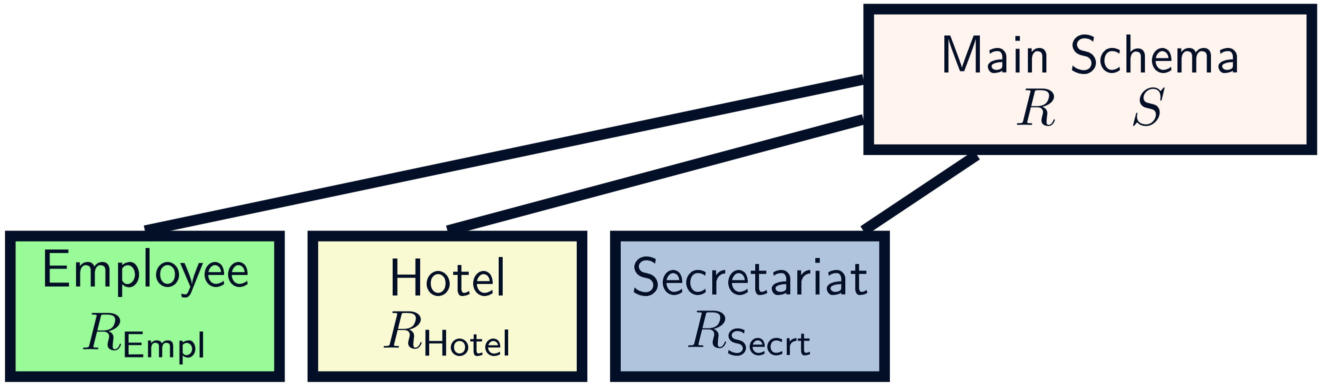

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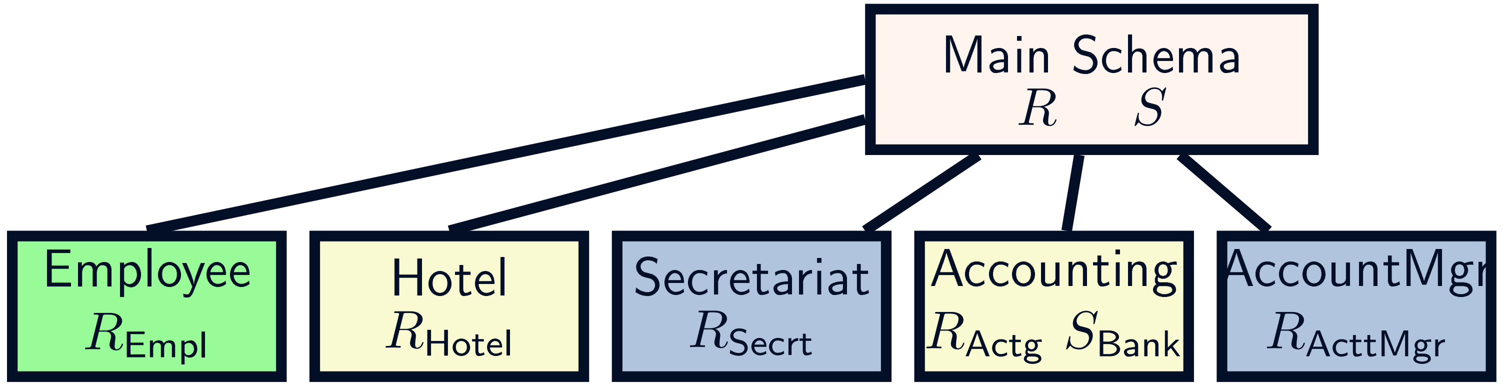

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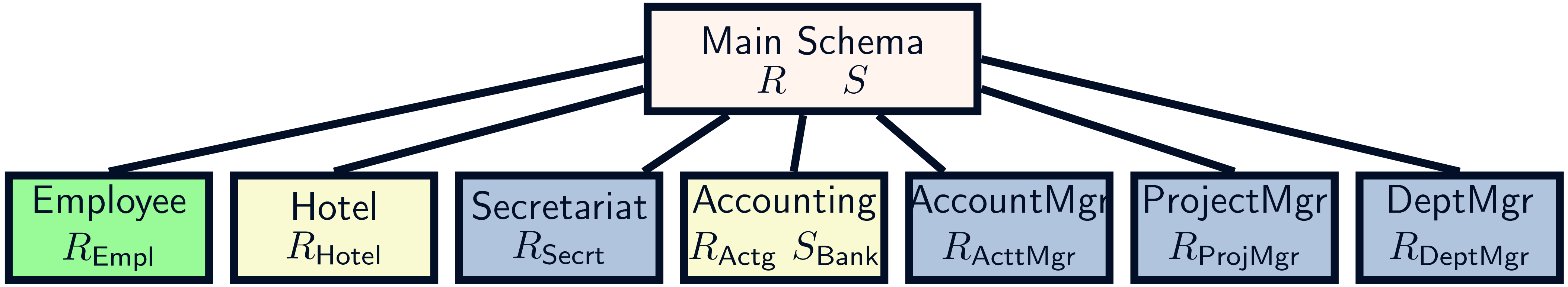

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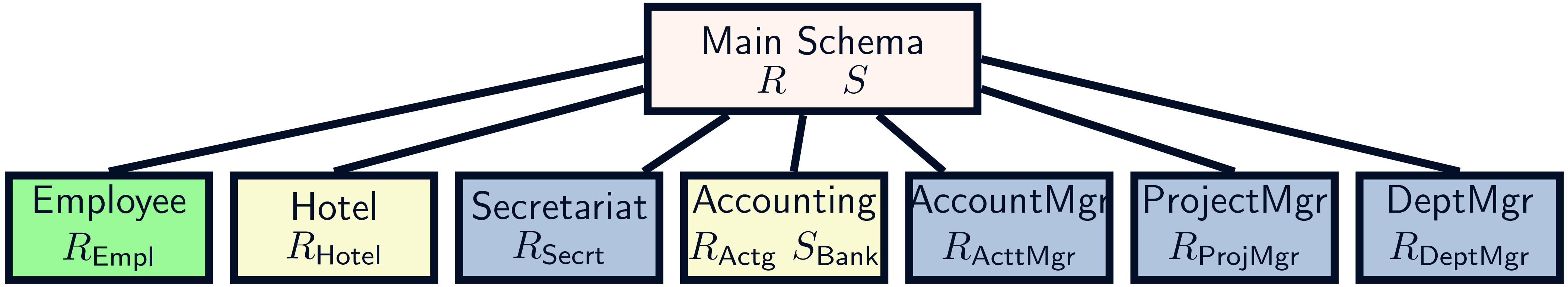

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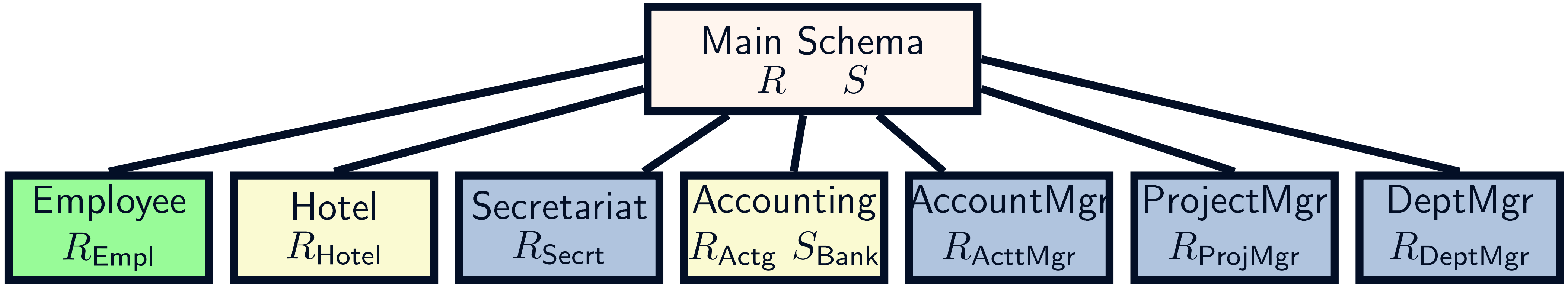

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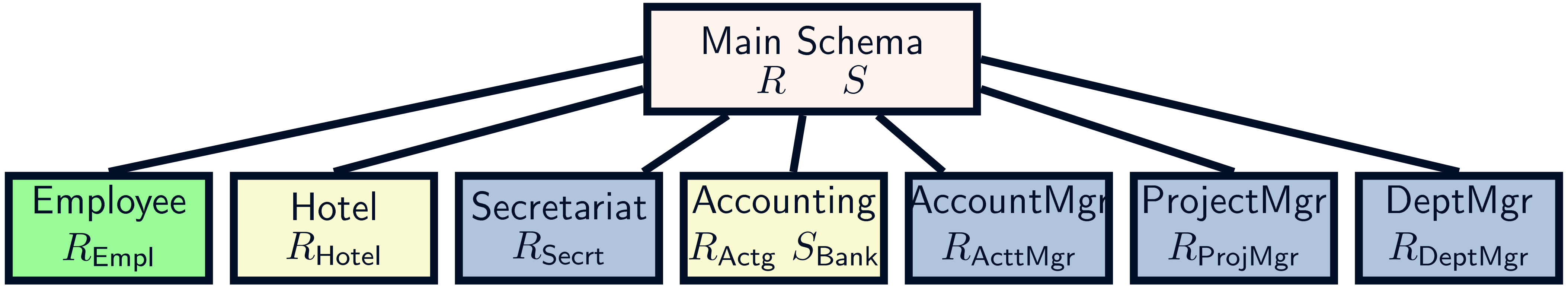

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Goal of this work: How to achieve such cooperation.

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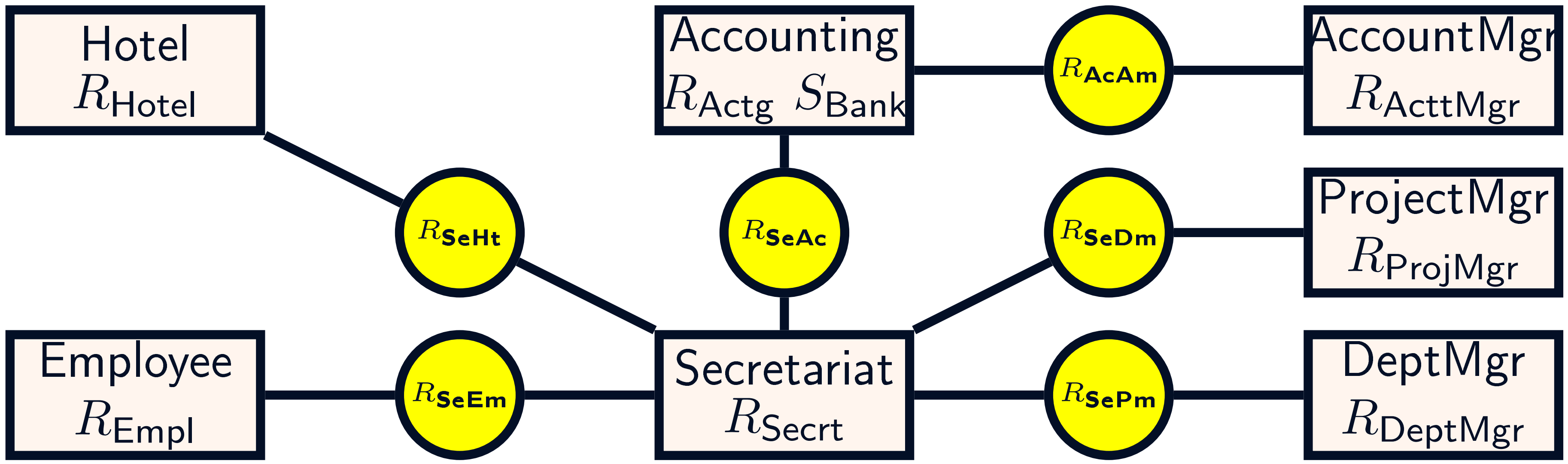

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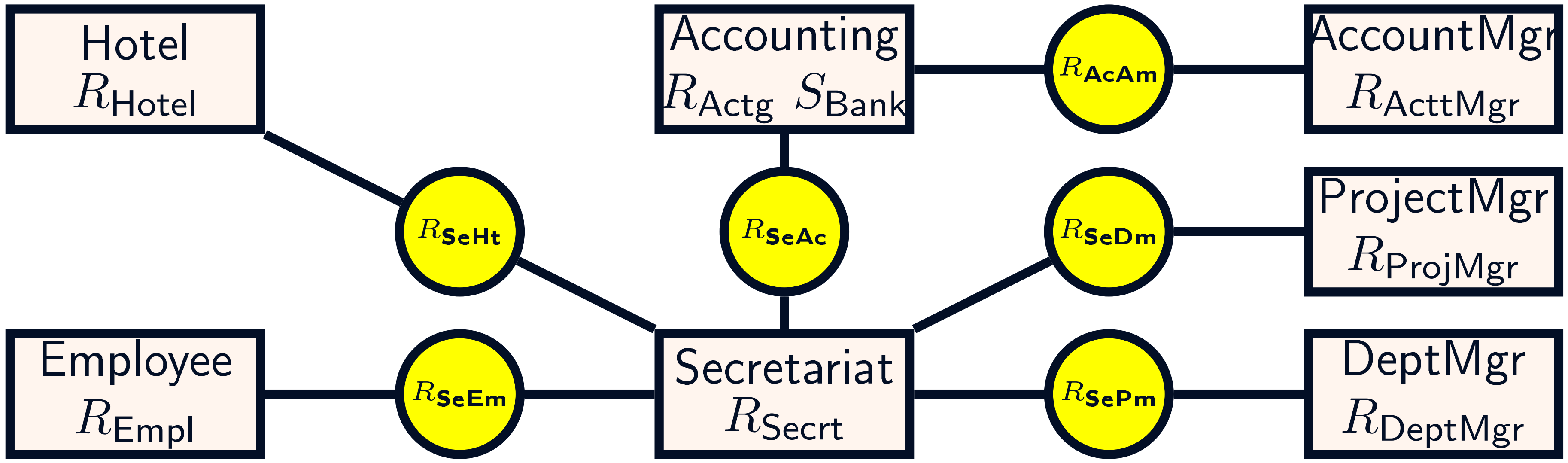

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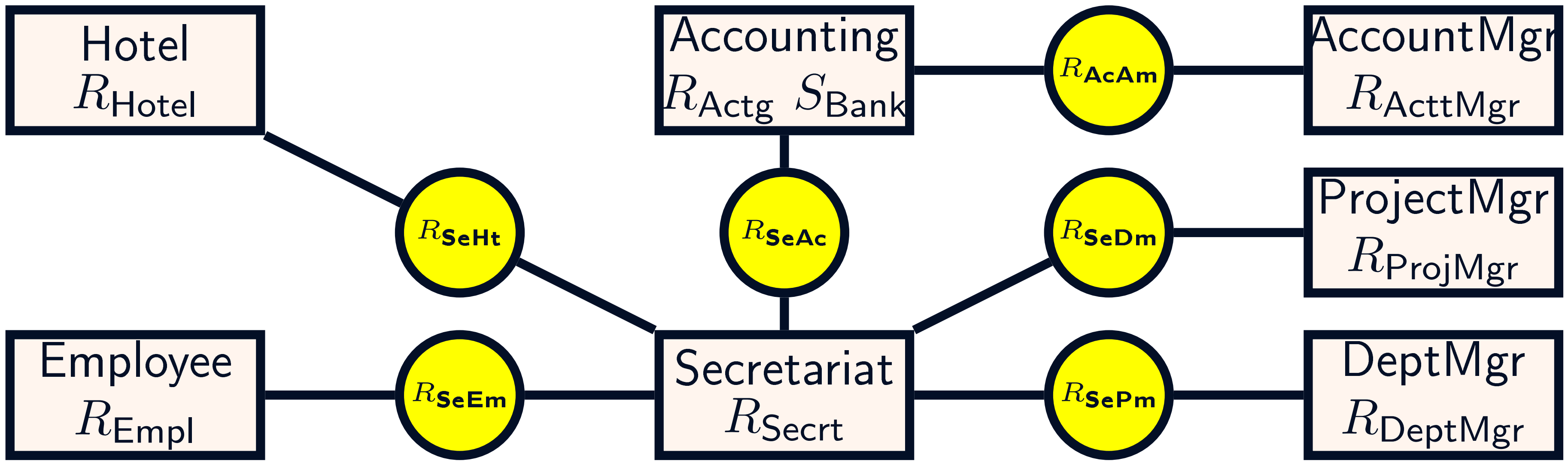

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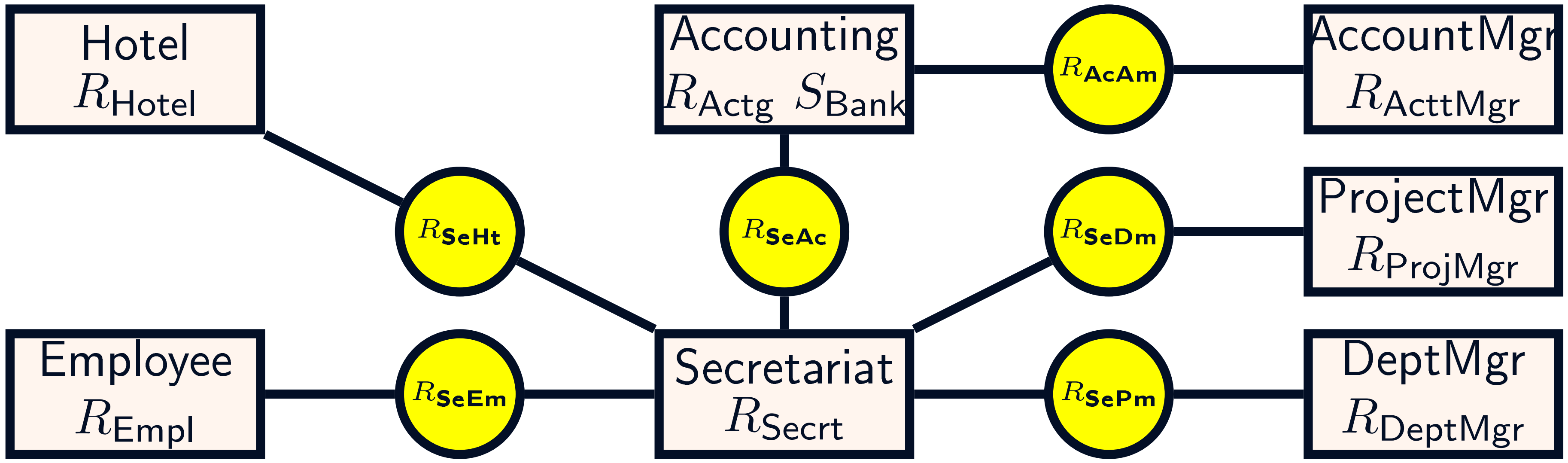

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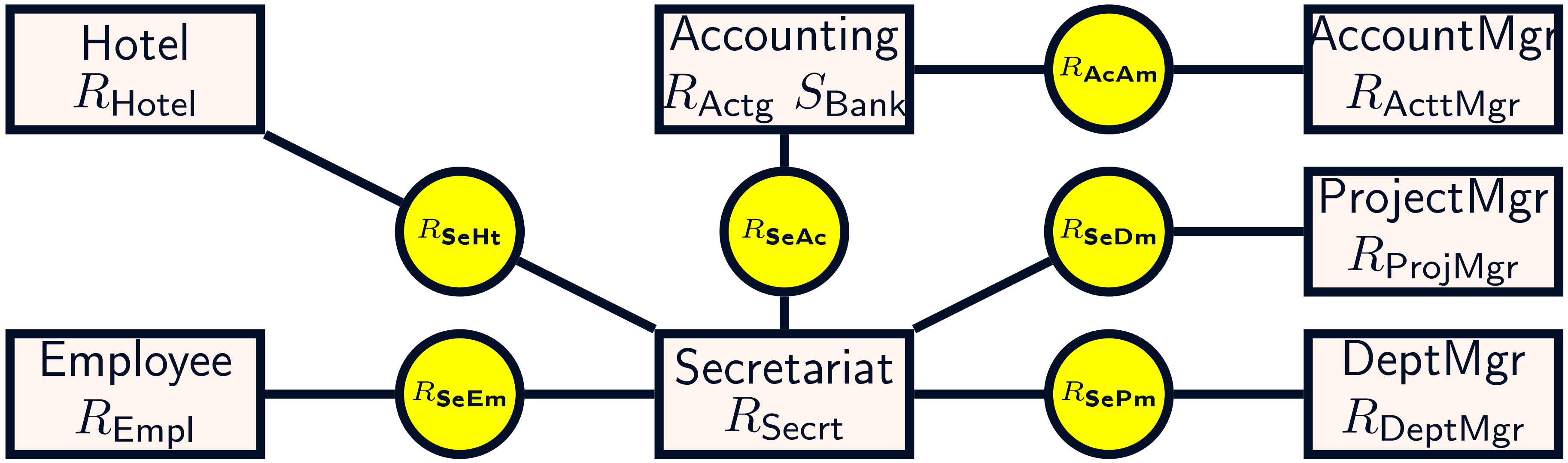
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- In this work, it is also assumed that the interconnection is acyclic.

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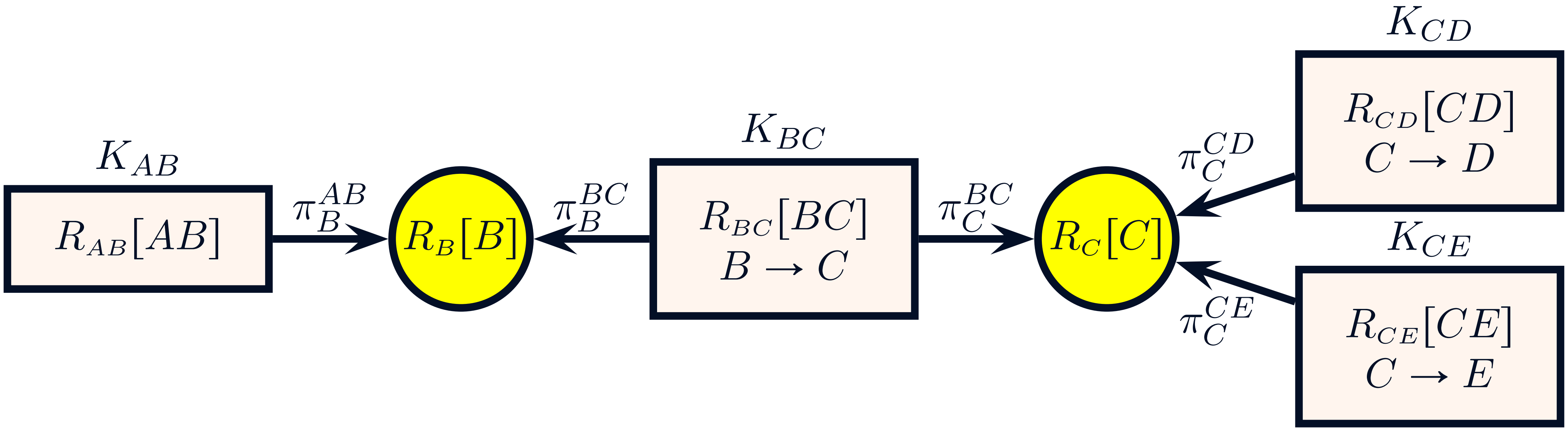

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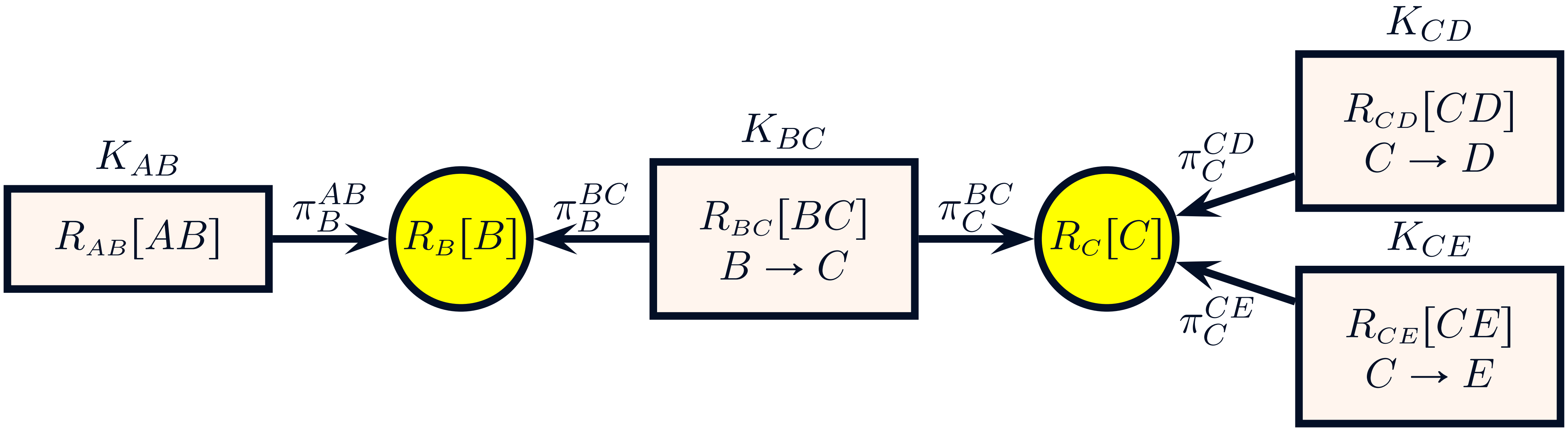

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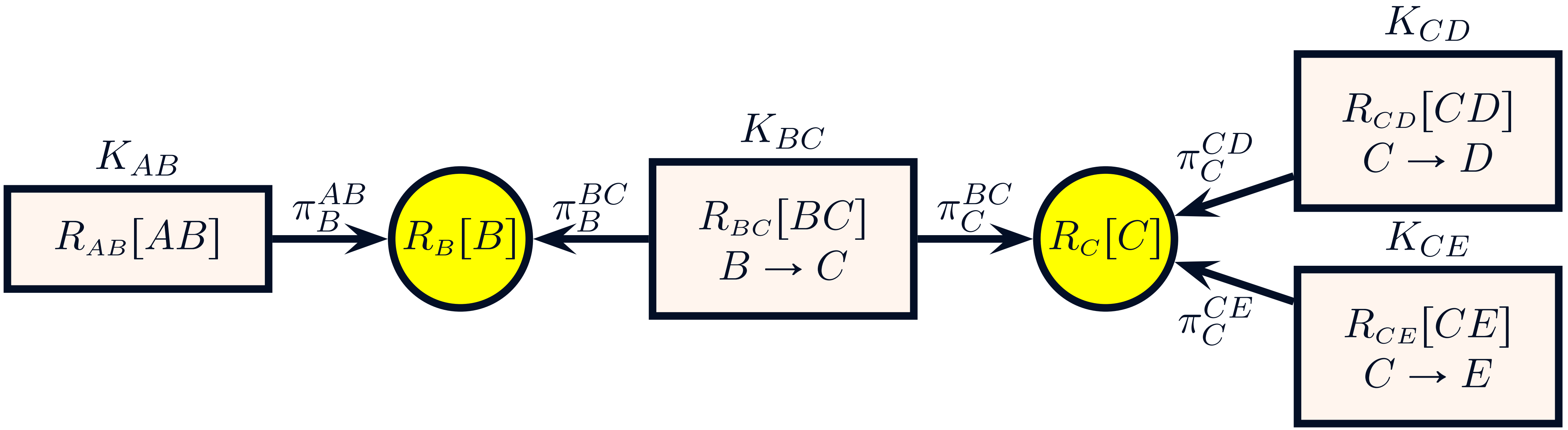

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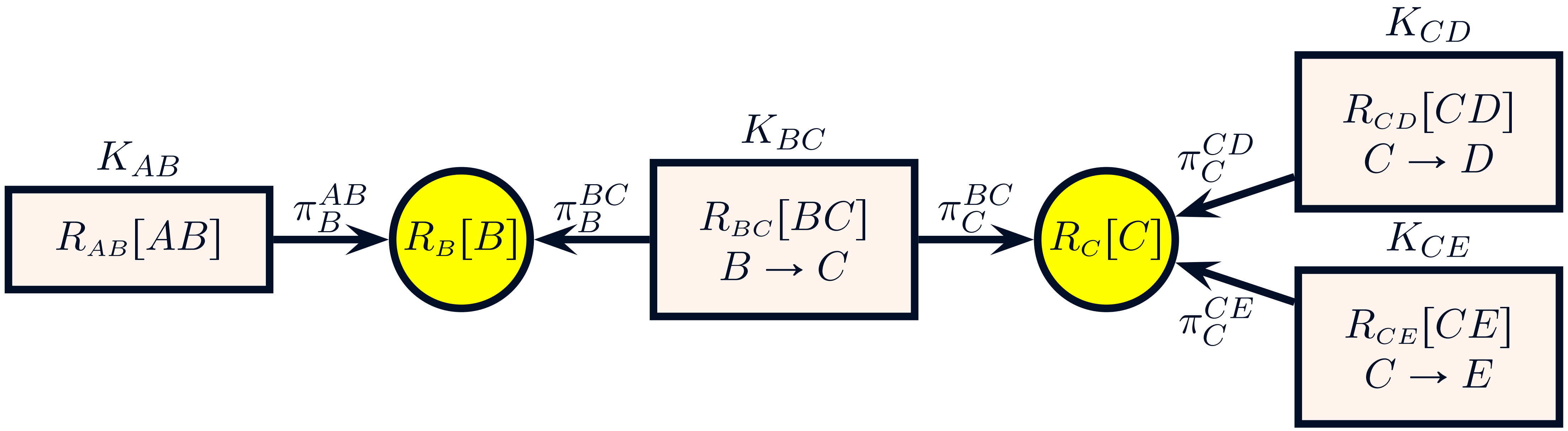

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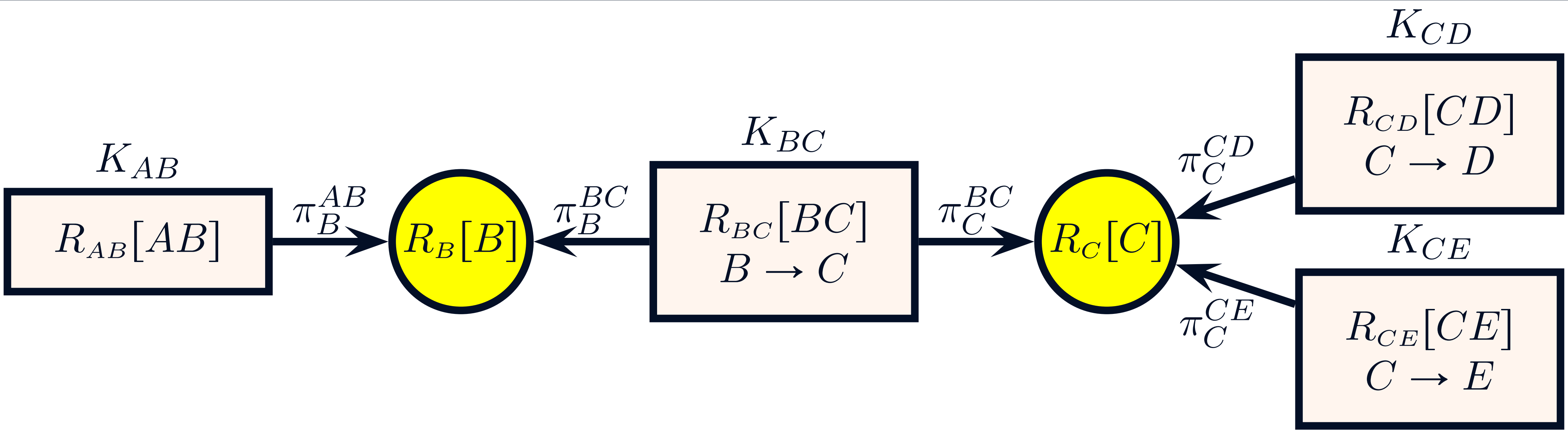

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- A *refinement* of a nondeterministic update specification is any subset of that specification.

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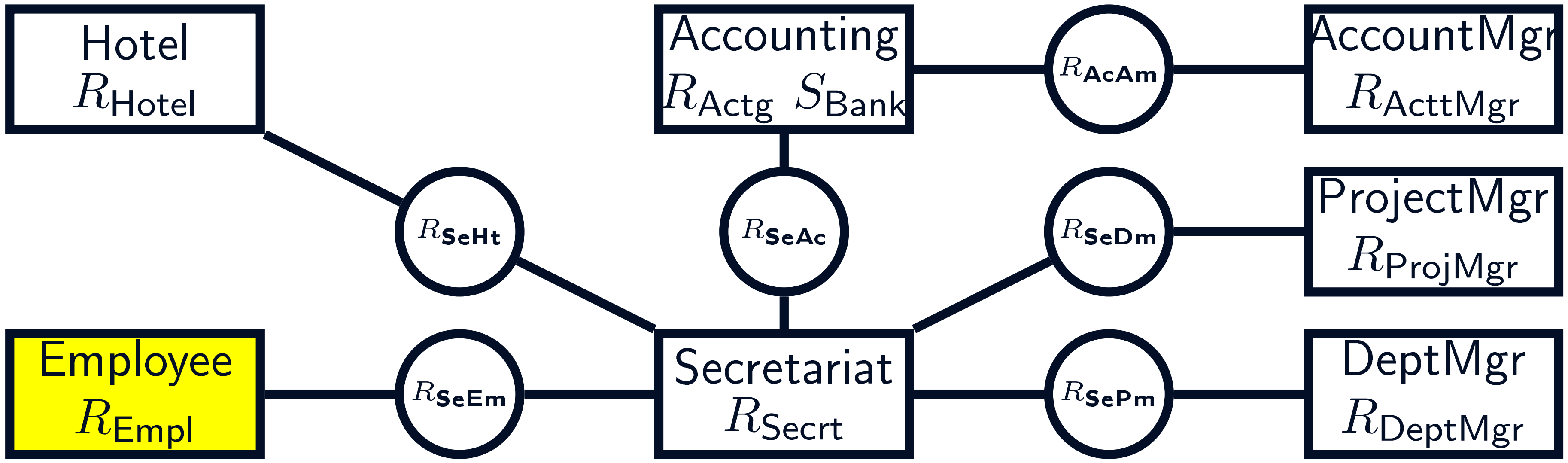
Stage 1 — Outward Propagation



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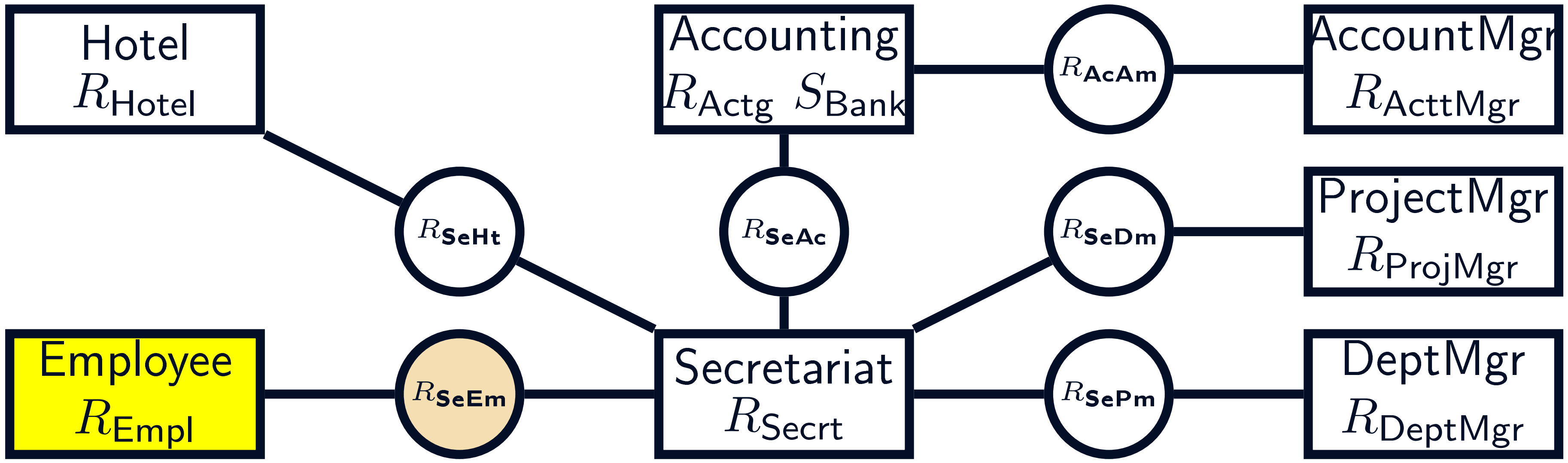

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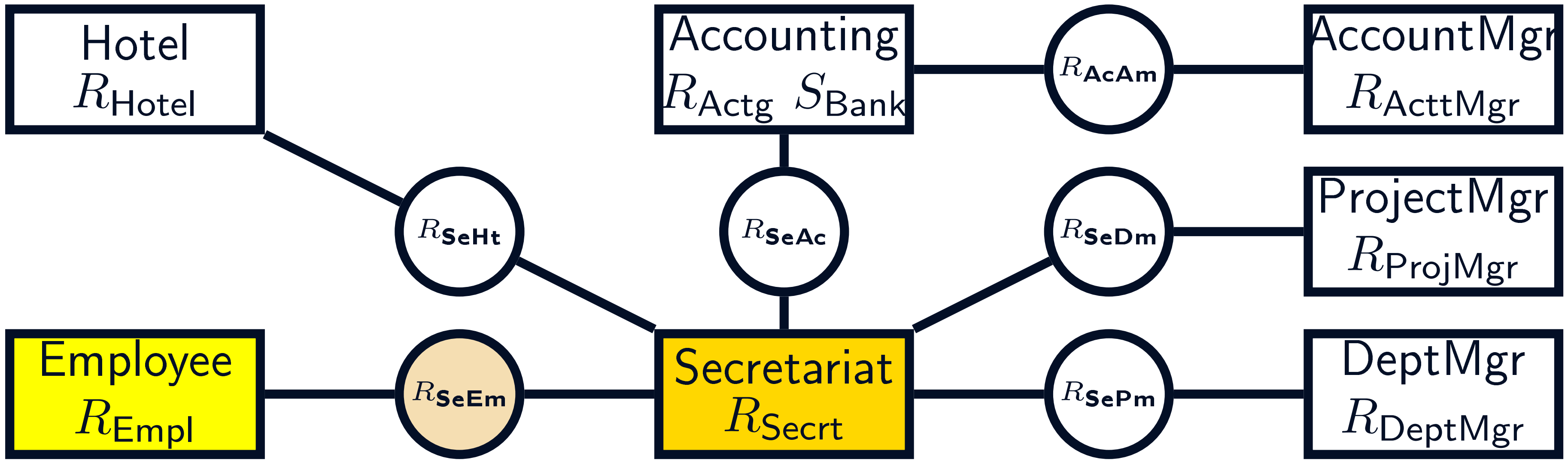

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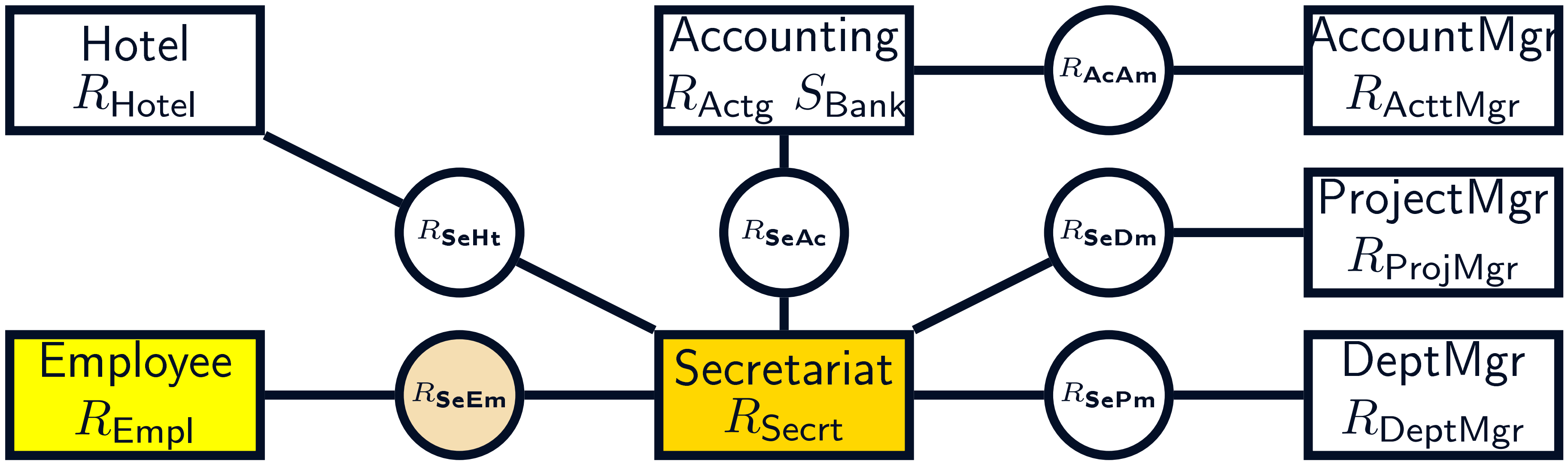

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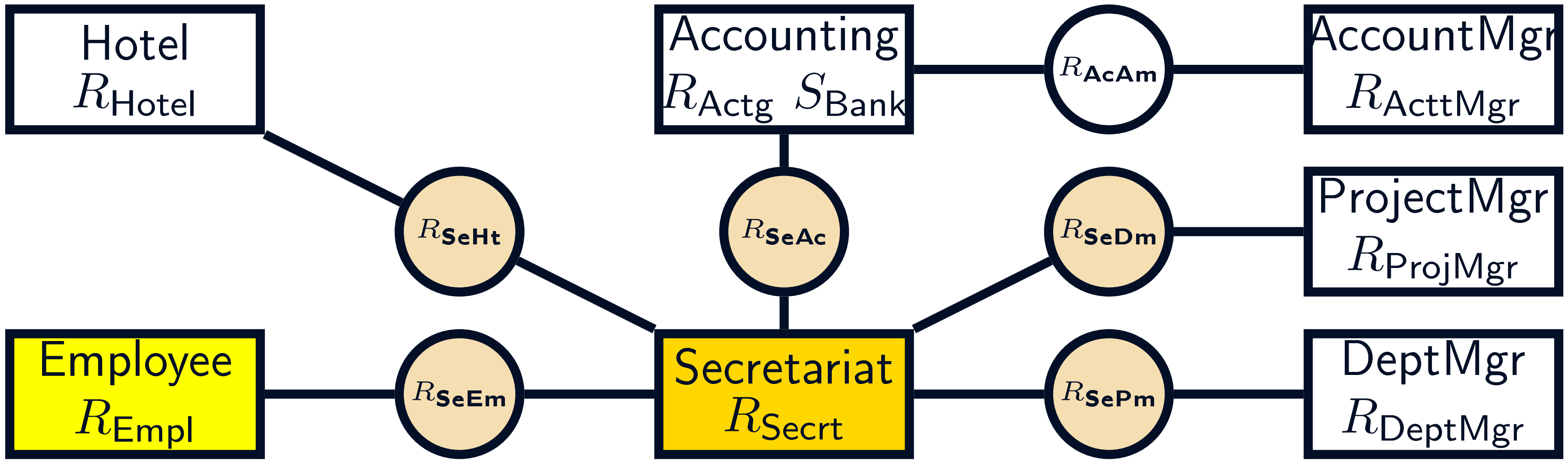

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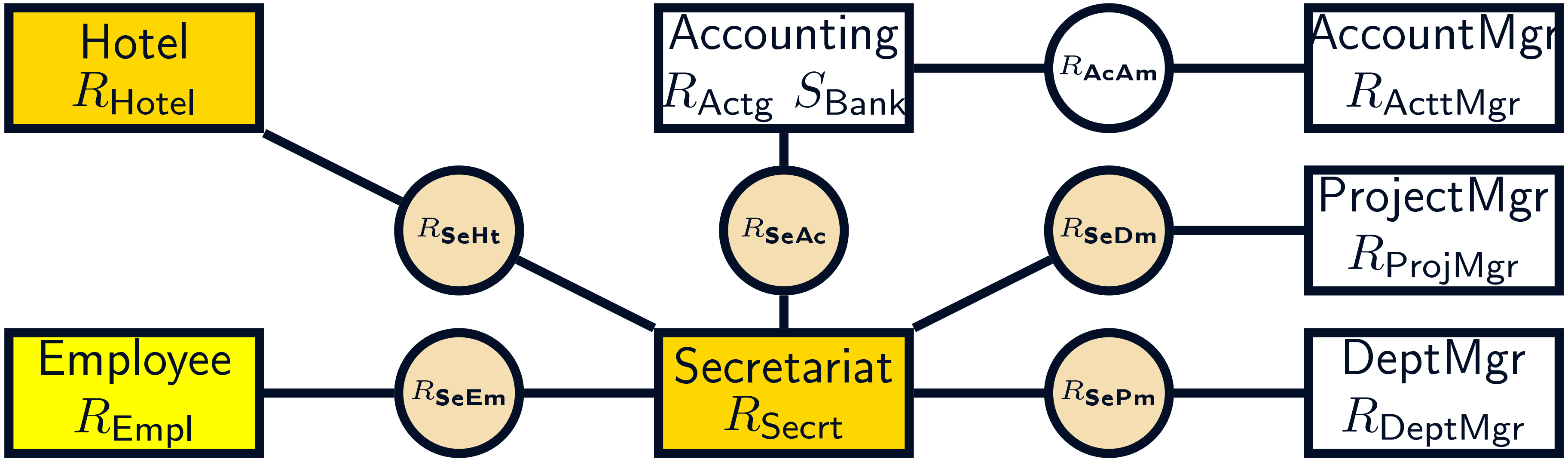
Employee R_{Empl}
$R_{\mathbf{SeEm}}$
Secretariat R_{Secrt}
$R_{\mathbf{SePm}}$
DeptMgr R_{DeptMgr}

- The initiating component projects the initial update family onto its ports.
- The receiving component *lifts* the projected update family to a set of possible updates on its schema.
  - ➽ This receiving component agrees not to retract these possibilities.
- The receiving component projects the liftings onto its *outer* ports.

Stage 1 — Outward Propagation



Hotel R_{Hotel}
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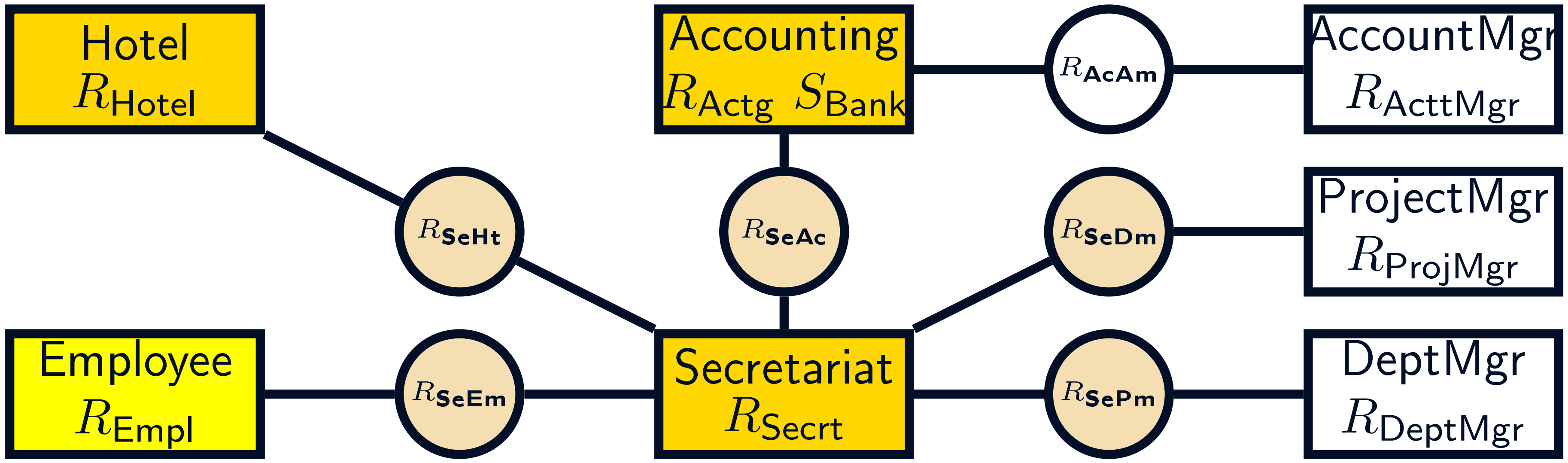

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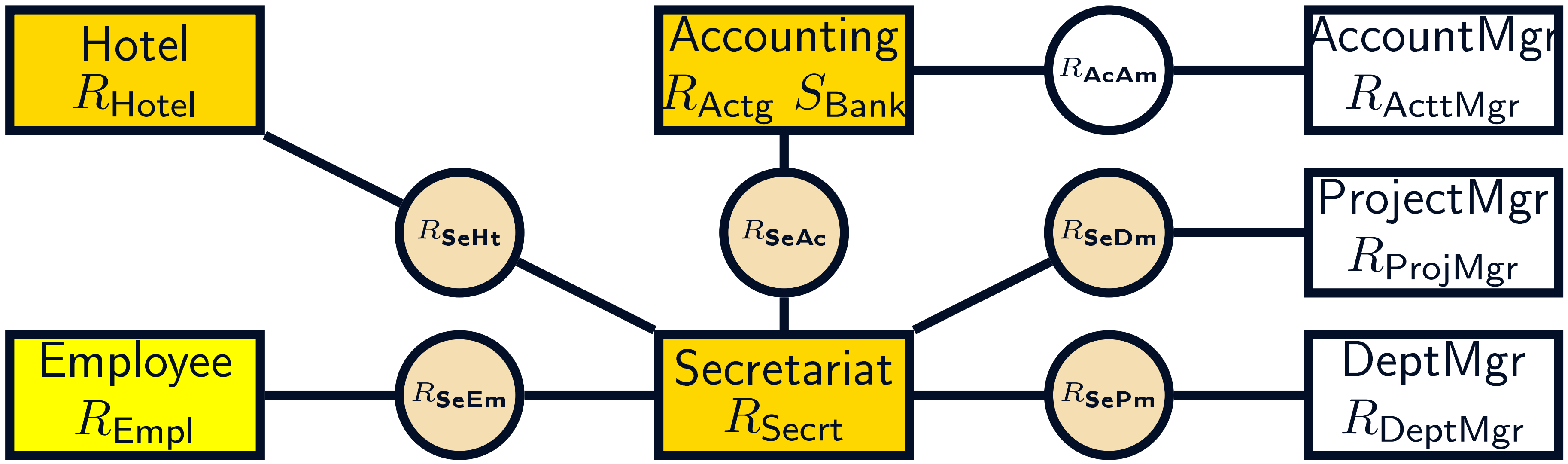
- The process continues.
- Note that not all components need be lifted simultaneously.

Stage 2 — Inward Propagation and Merging


Hotel R_{Hotel}
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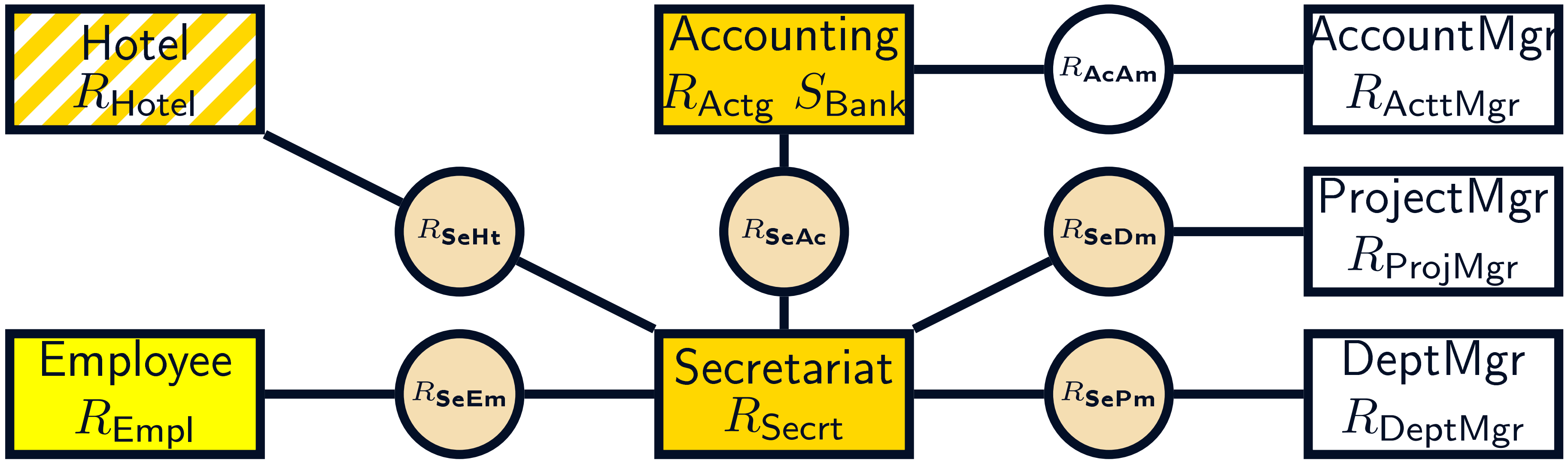

Hotel R_{Hotel}
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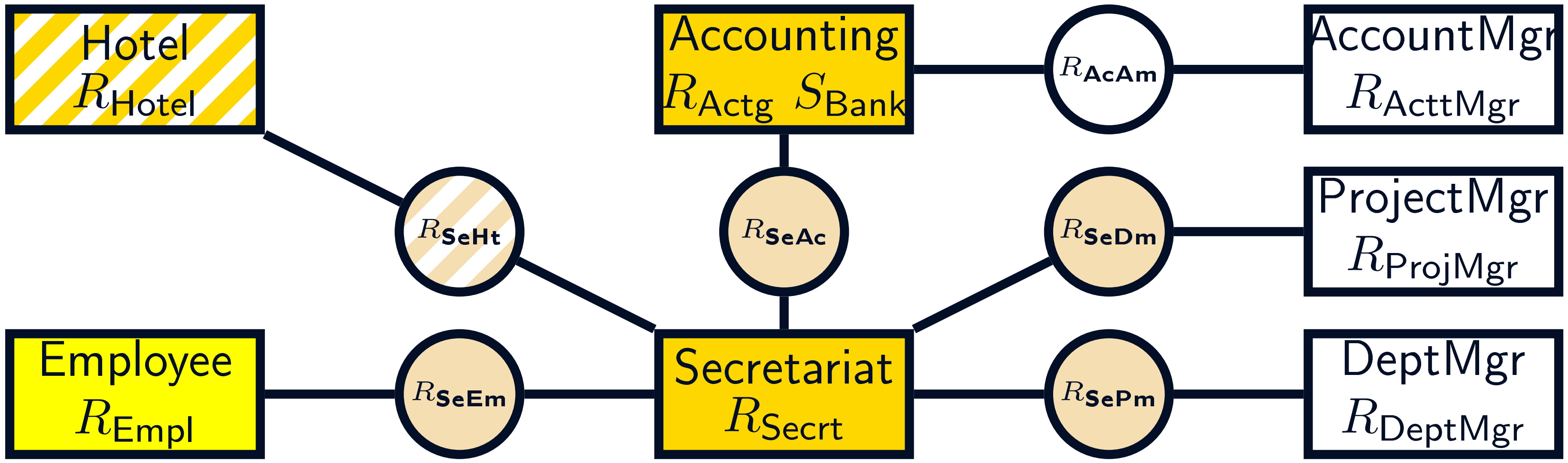

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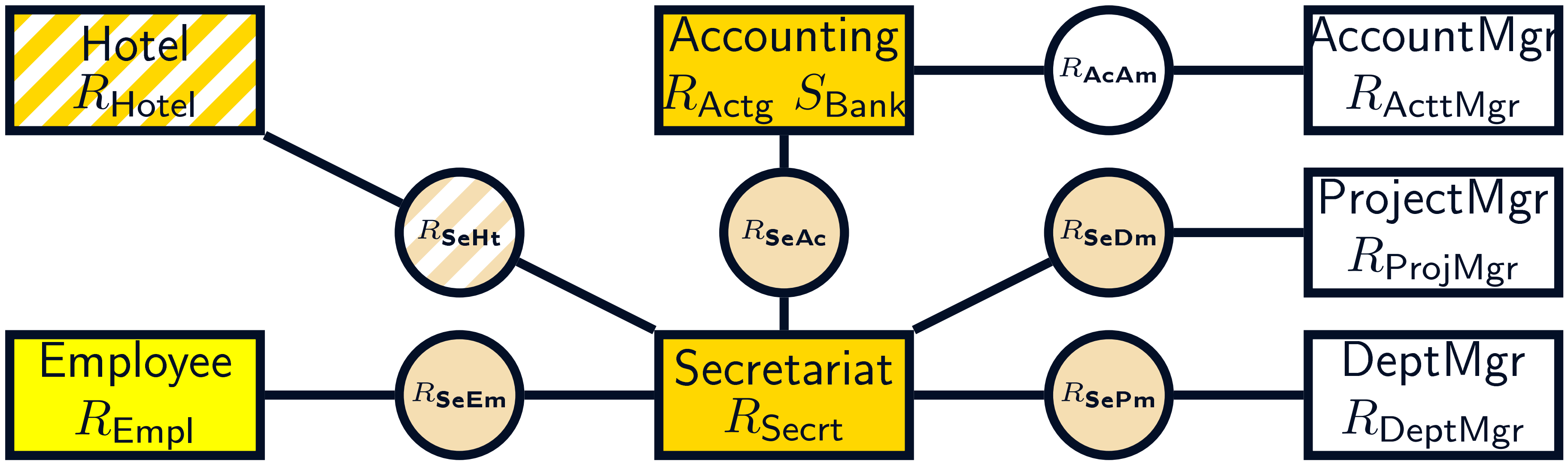

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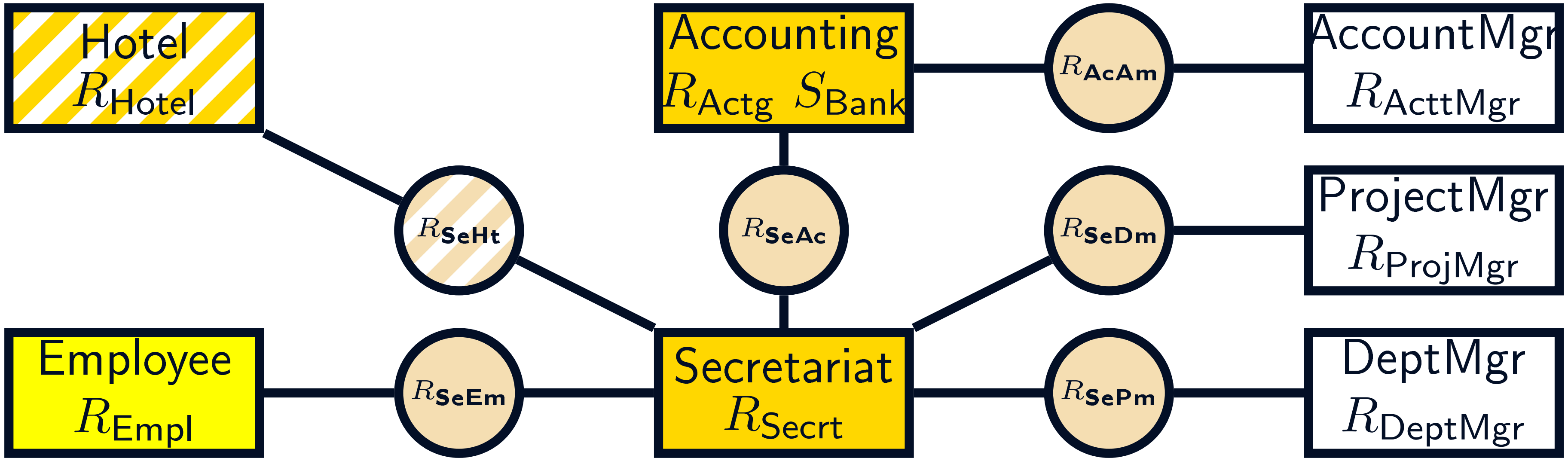
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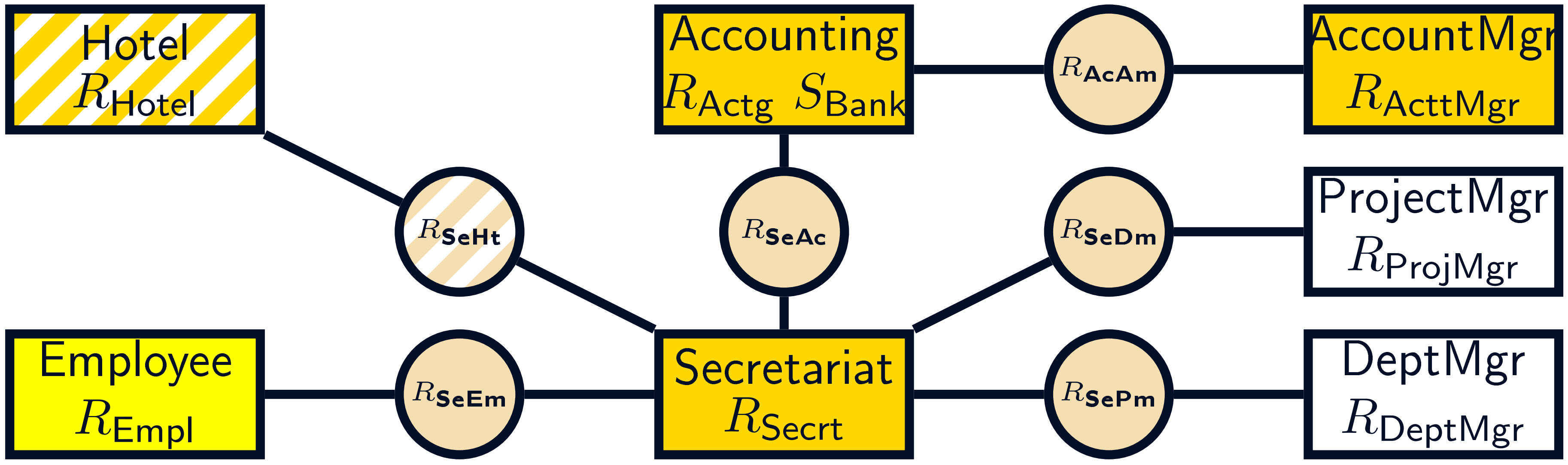

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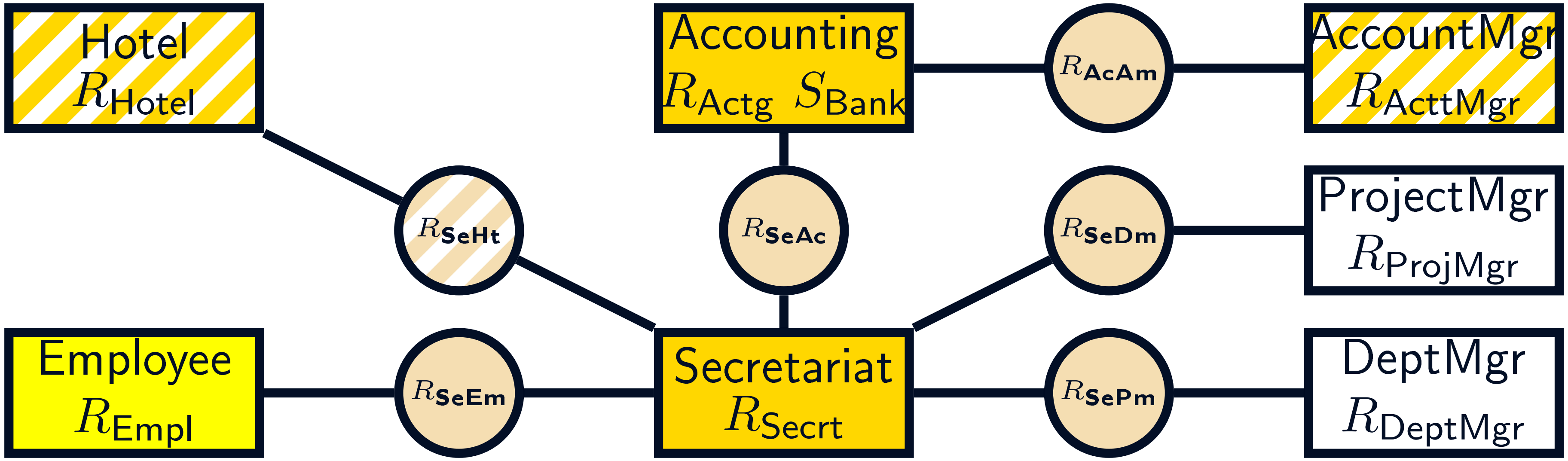

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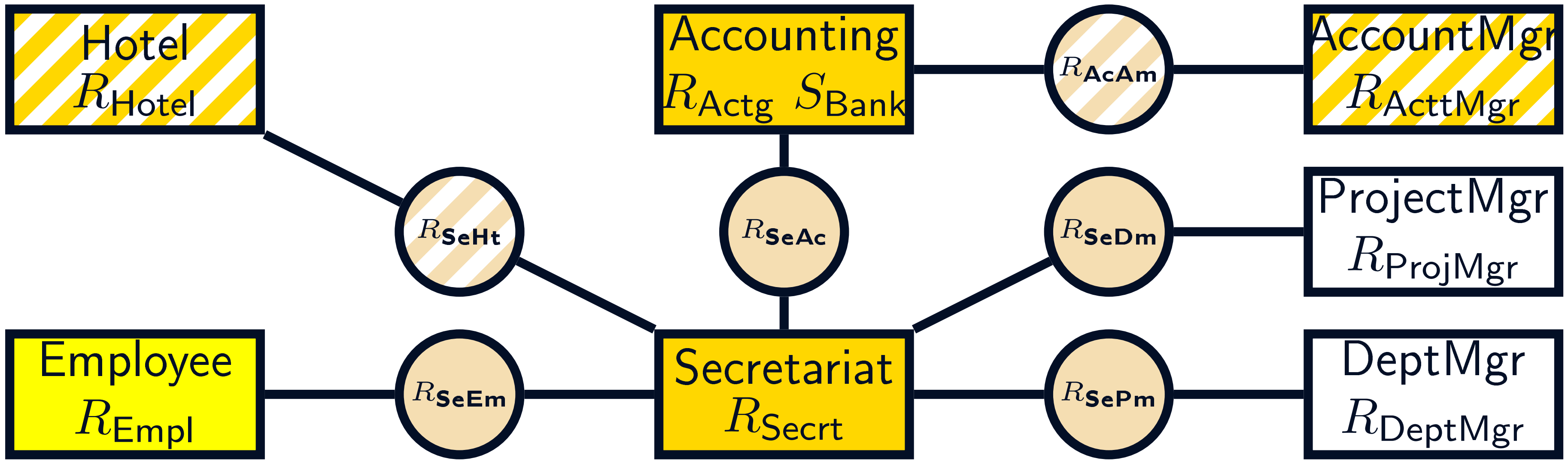

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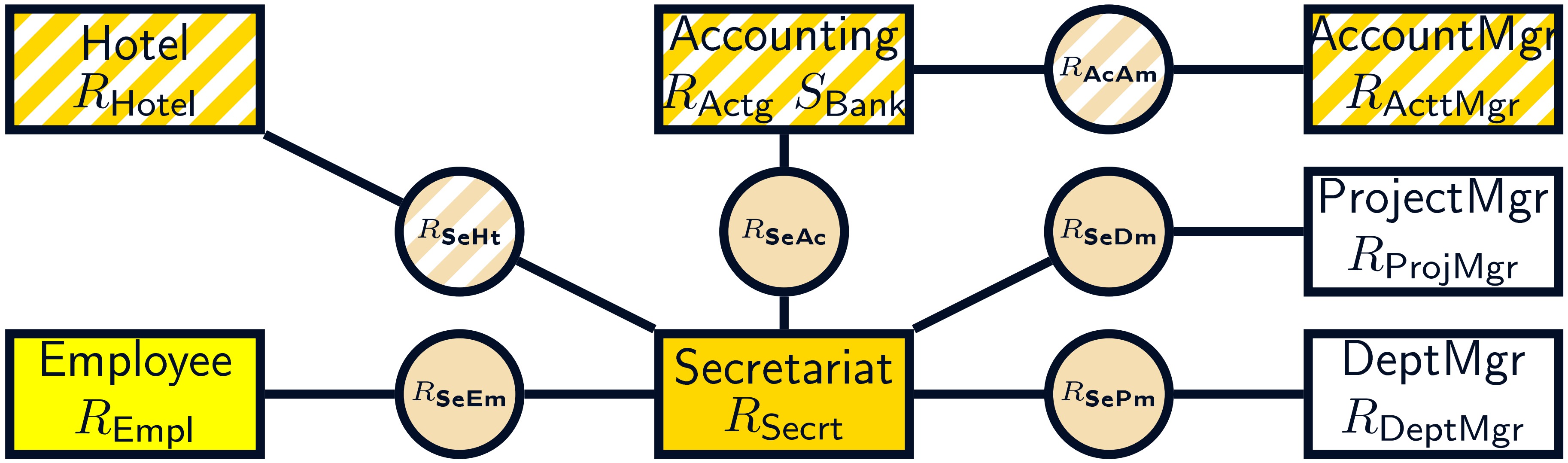

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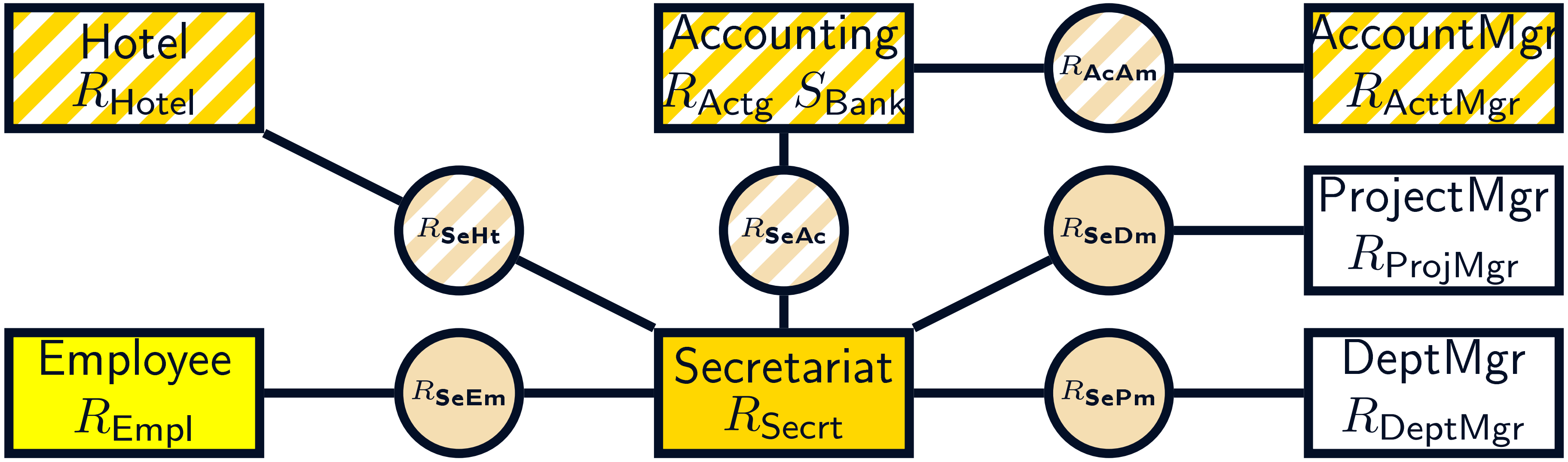

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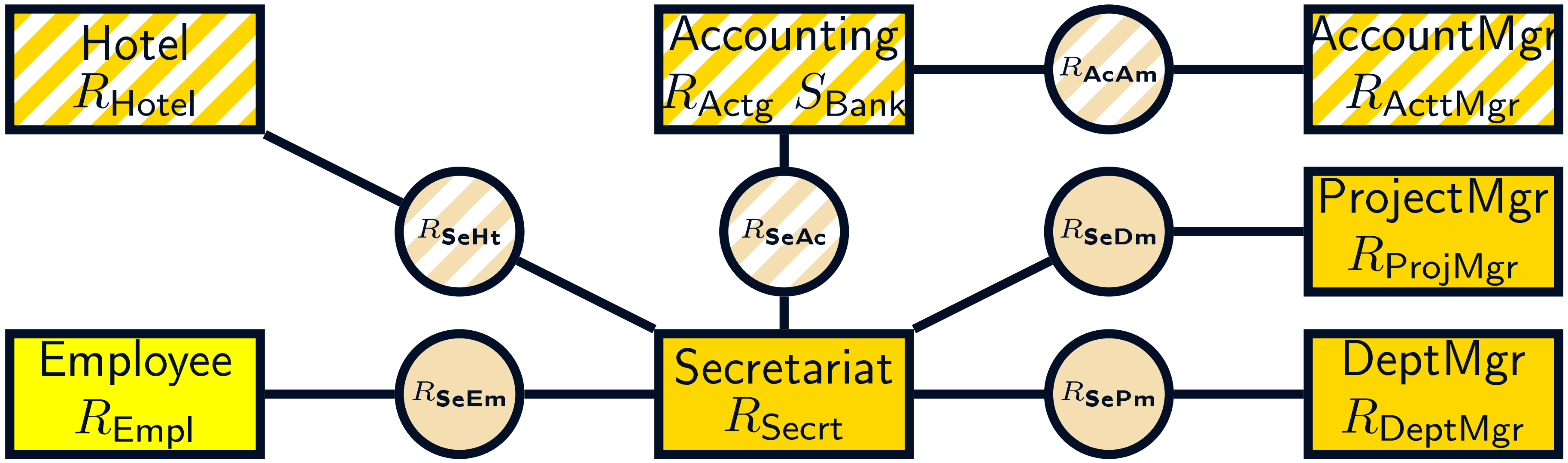

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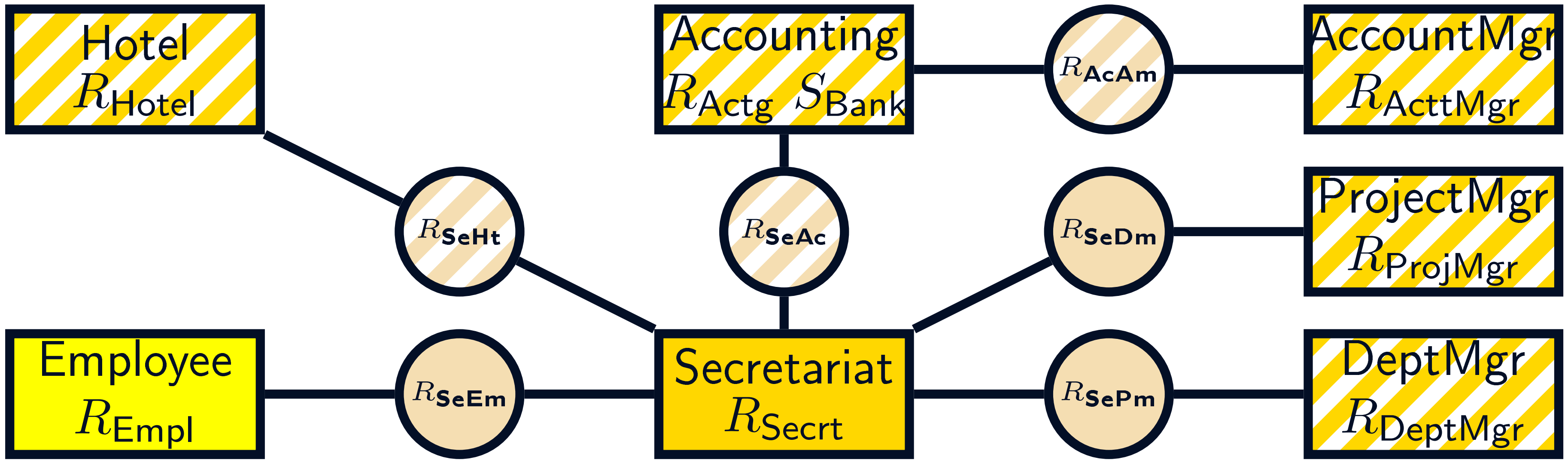

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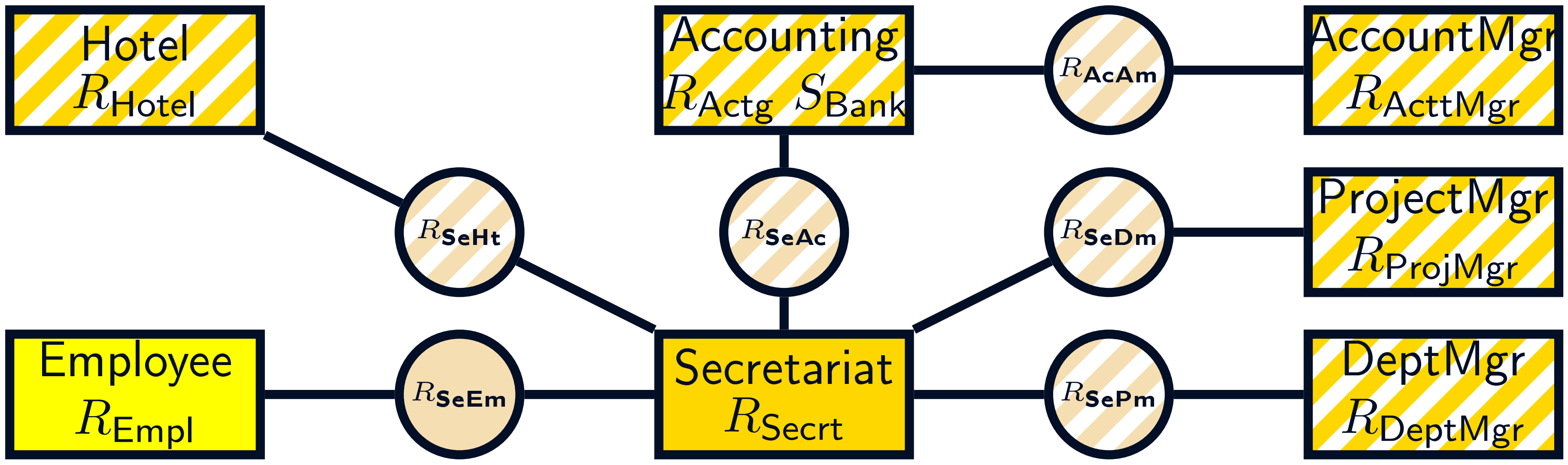

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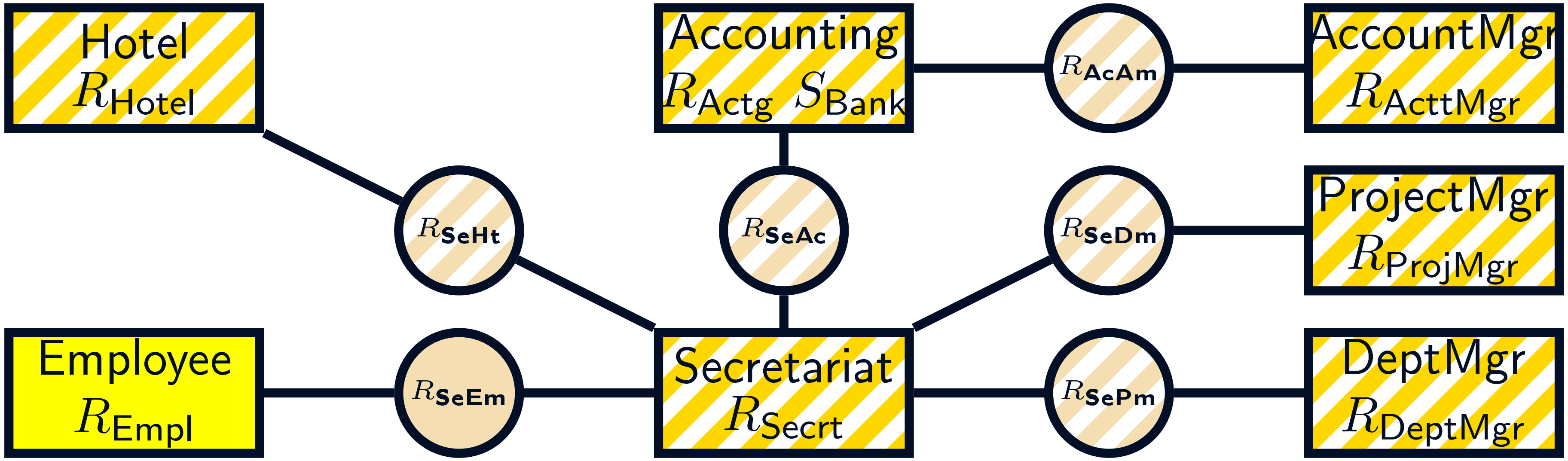

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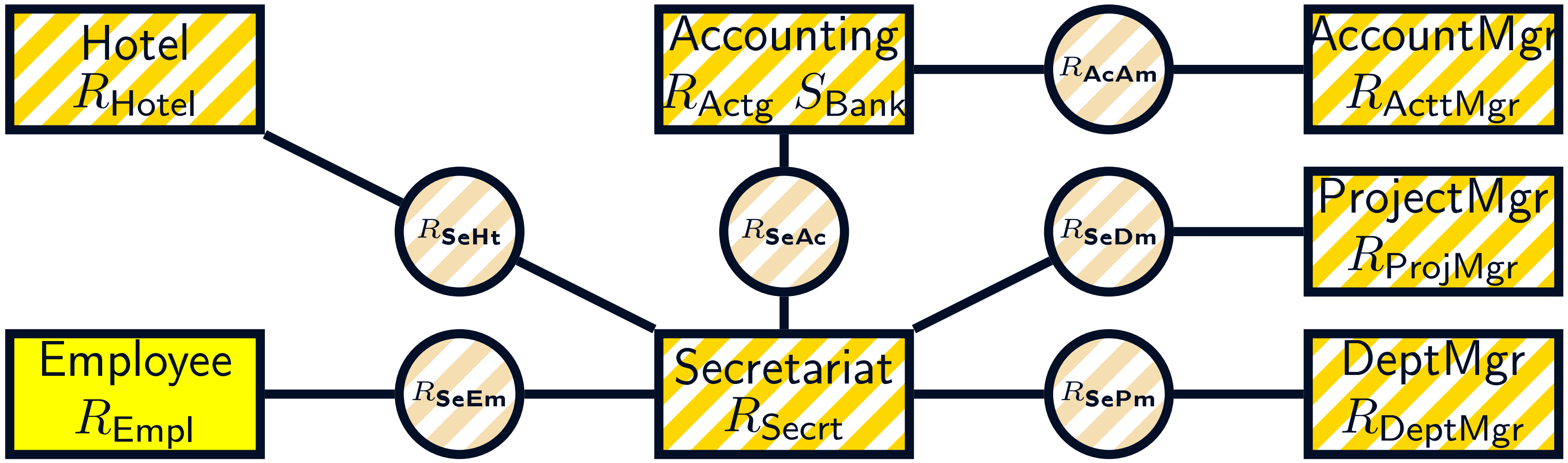

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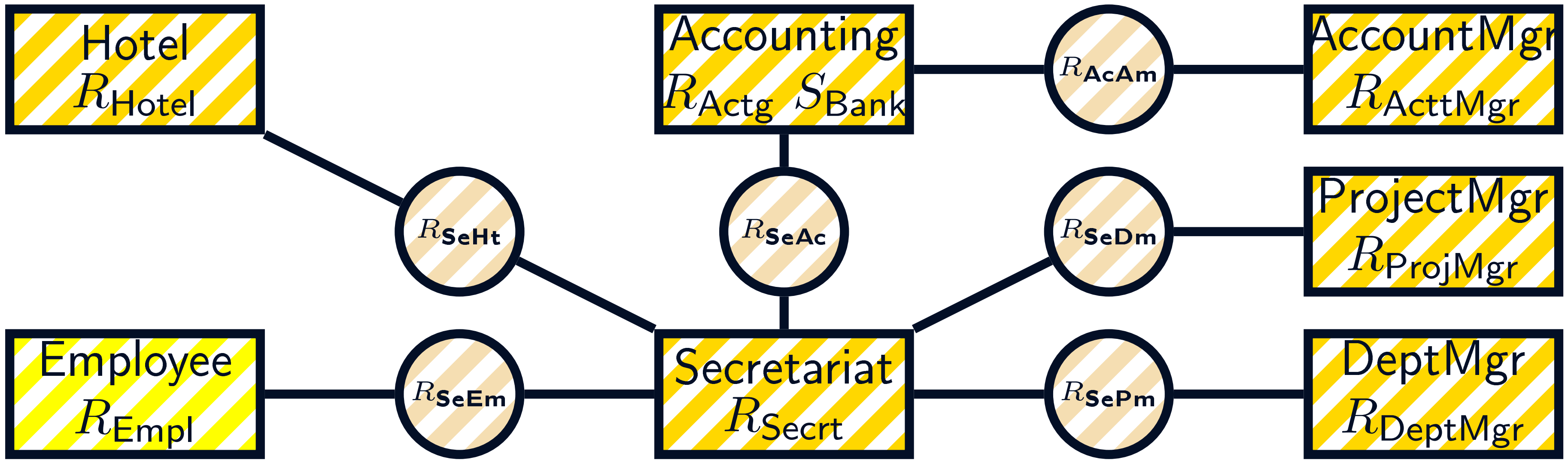
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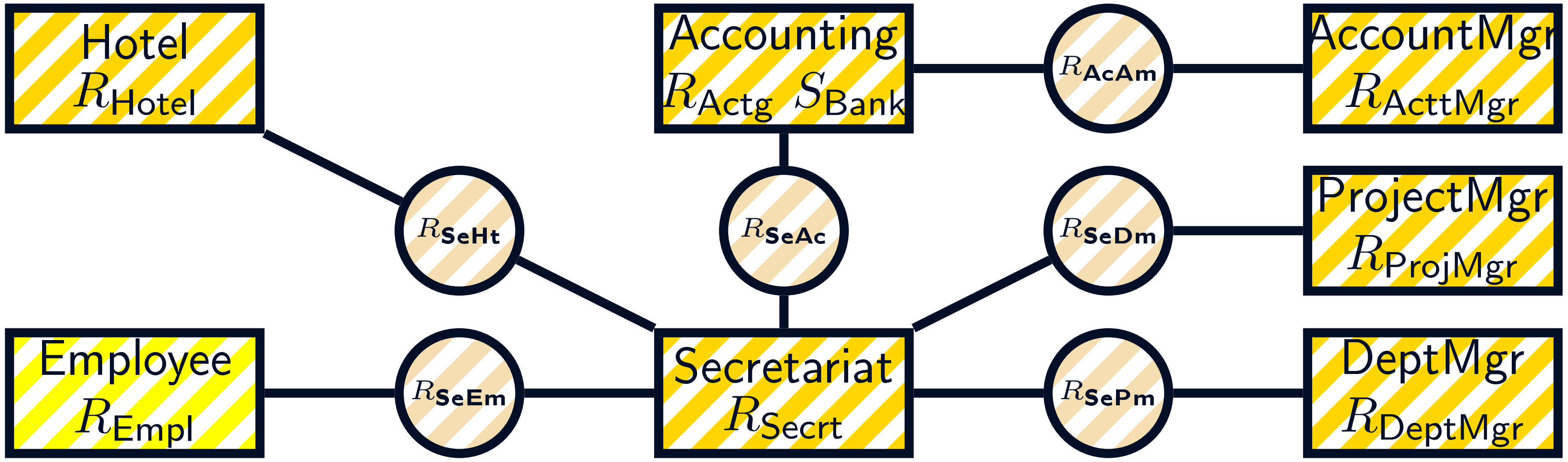
- An *internal component* executes this step after receiving a Stage-1 message from each of its *outer* neighbors relative to the initiator.
- Finally, the initiator enters Stage 2, terminating that stage.

Stage 3 — Select Final State and Commit



- In Stage 3, the final update is identified from the set of agreed-upon alternatives.

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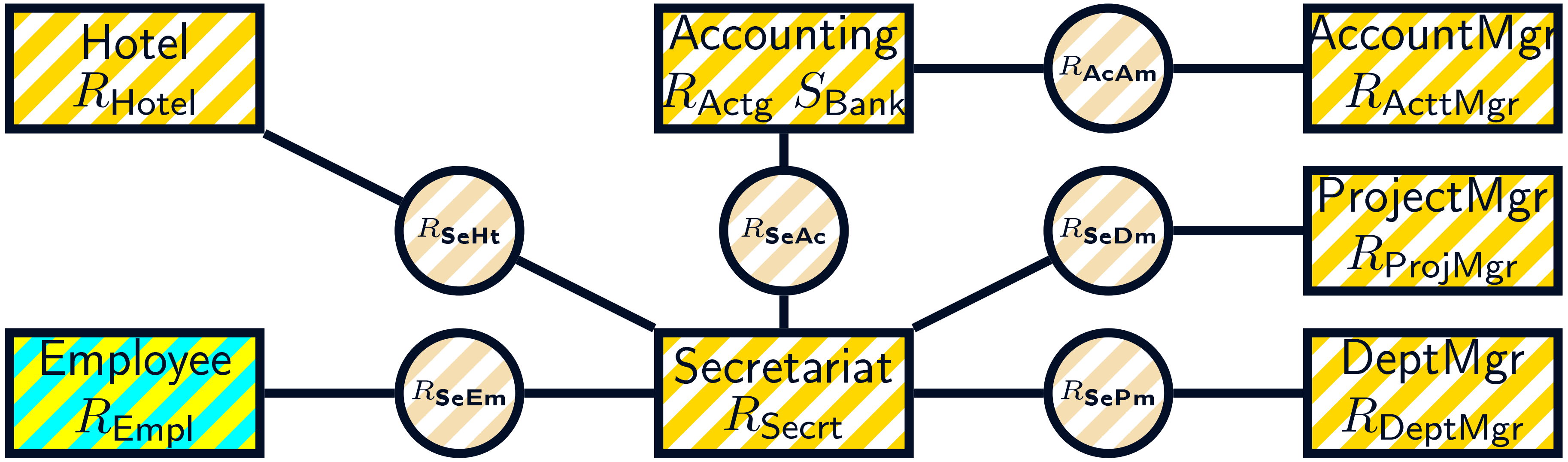

- In Stage 3, the final update is identified from the set of agreed-upon alternatives.
- First, the initiator identifies a specific update.

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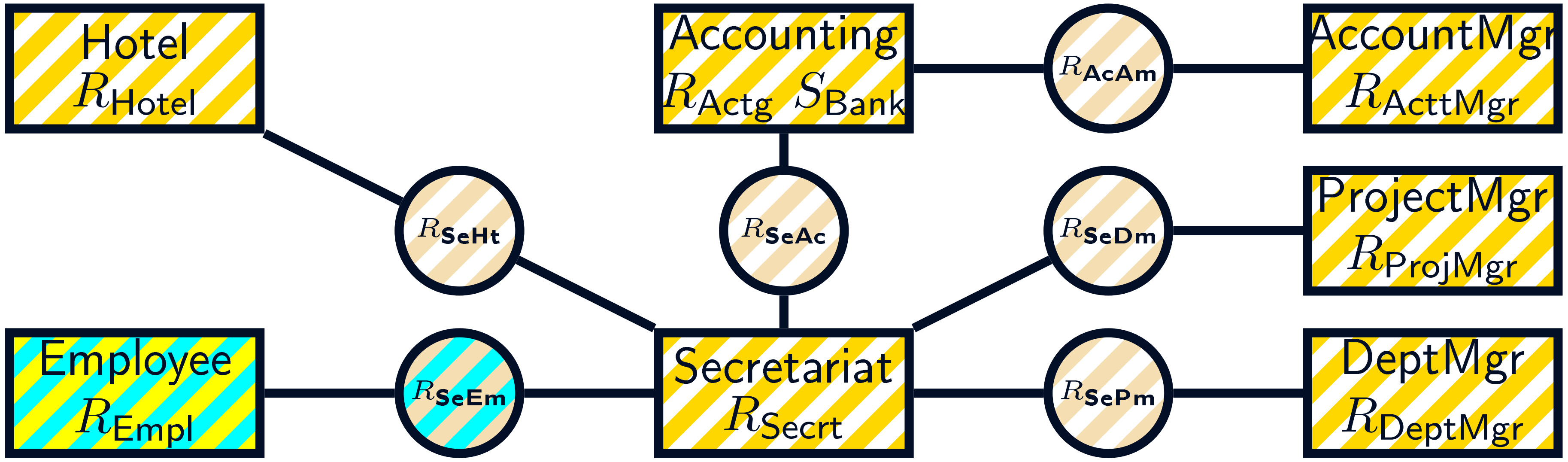

Hotel R_{Hotel}
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- In Stage 3, the final update is identified from the set of agreed-upon alternatives.
- First, the initiator identifies a specific update.
- And transmits this choice to its ports.

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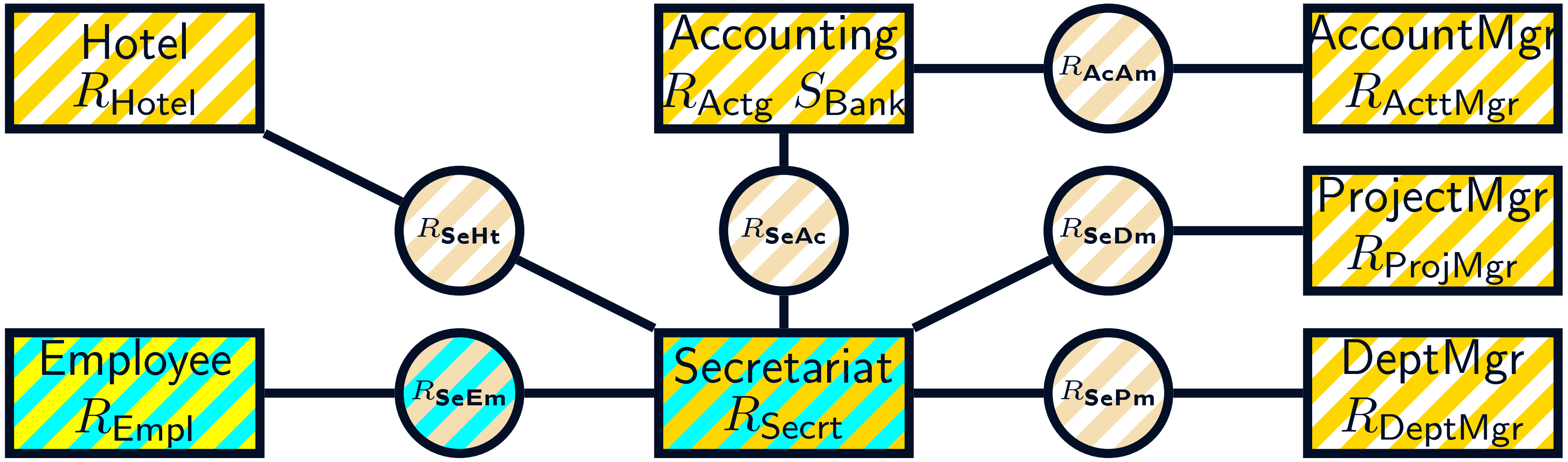

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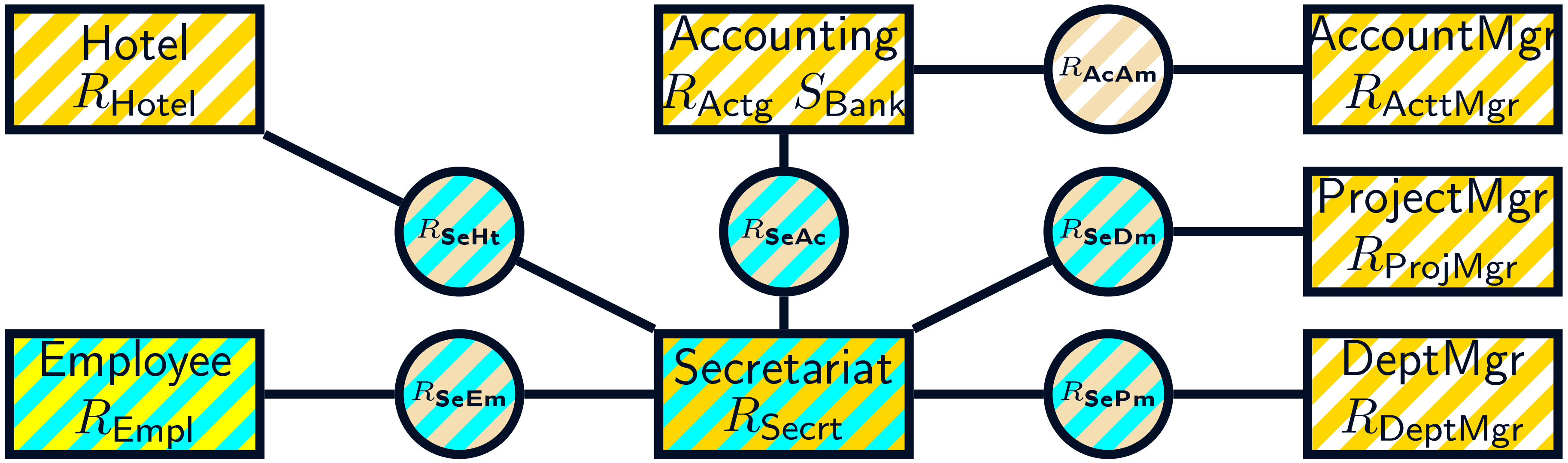

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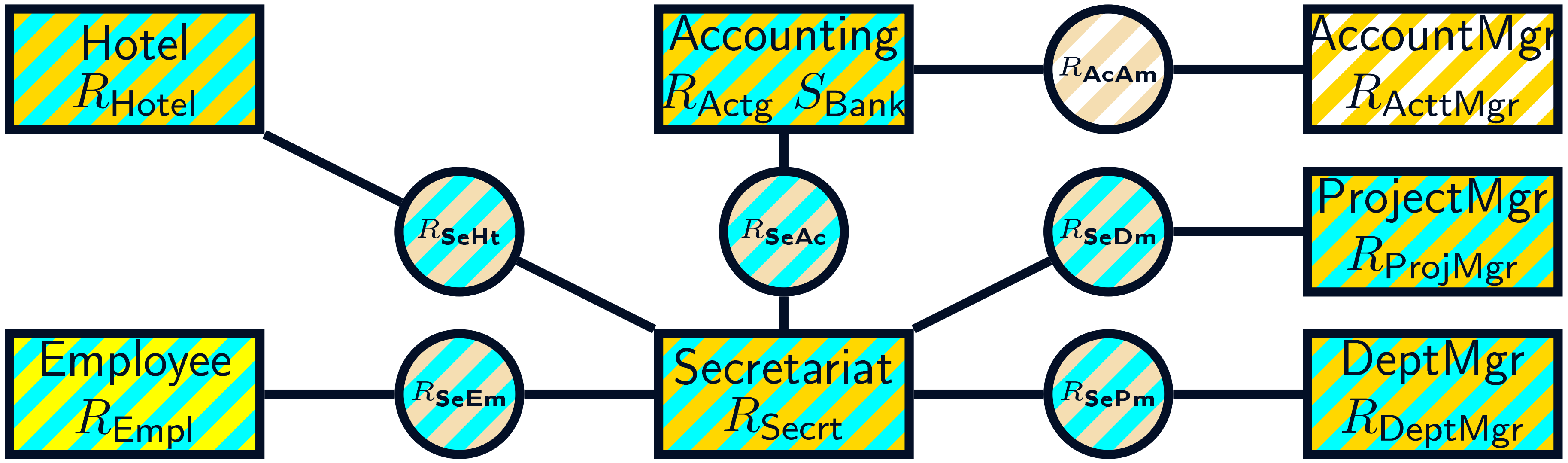

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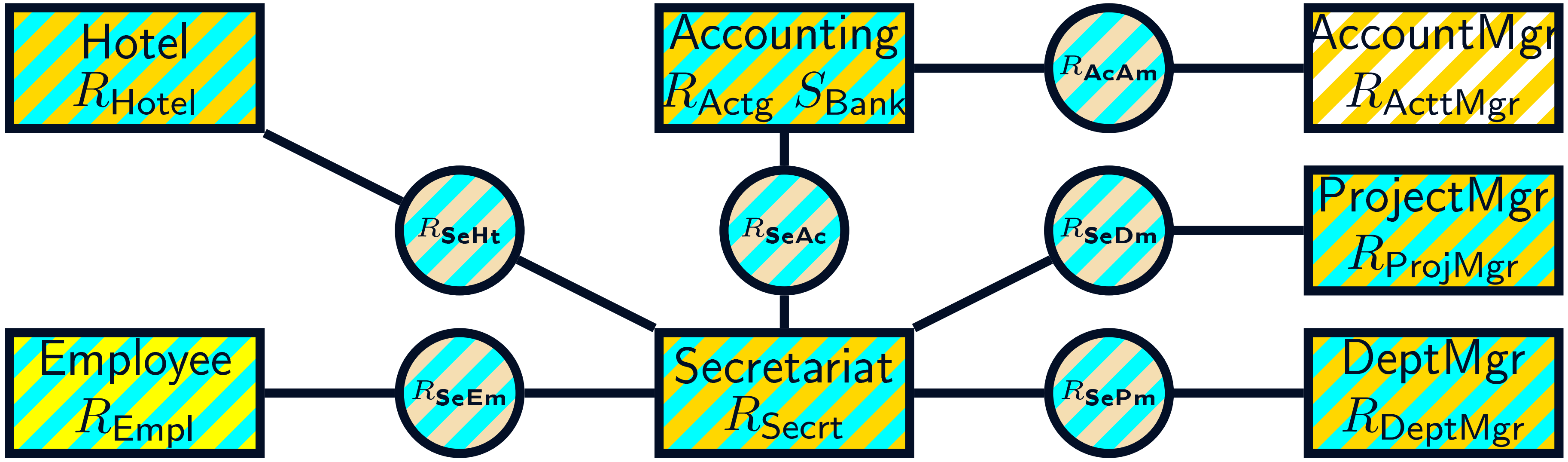

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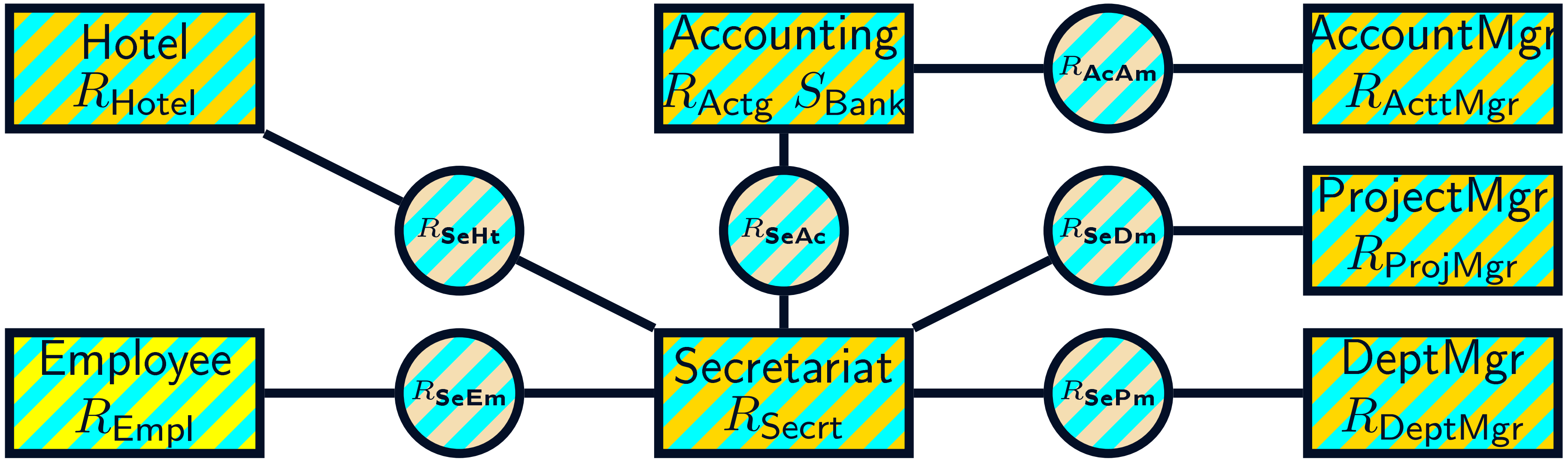

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- When all components have made the final choice, the update may be committed.

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Conclusions

- A simple three-stage model of negotiation for cooperative view update has been presented.
- In this process, decisions are made only in Stages 1 and 3.
    - In Stage 1, the set of alternatives which each view supports is determined.
    - In Stage 3, the final update is chosen from amongst the compatible alternatives identified in Step 1.
- The simplicity of the approach suggests that it may allow efficient implementations.

Further Directions

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