A Process Implementation of REA models

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The REA Accounting Model: A Generalized Framework for Accounting Systems in a Shared Data Environment

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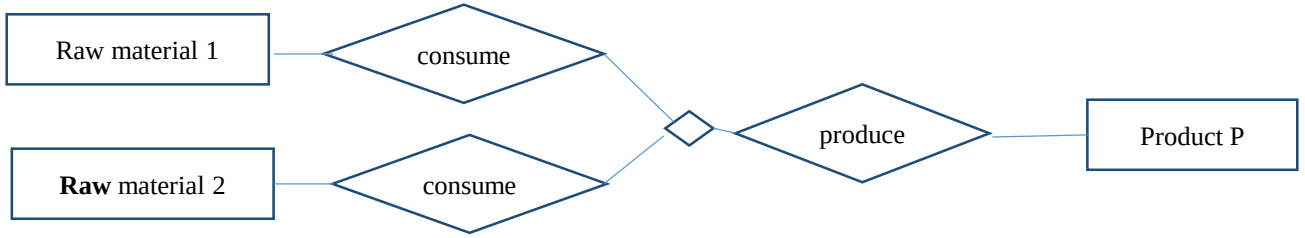
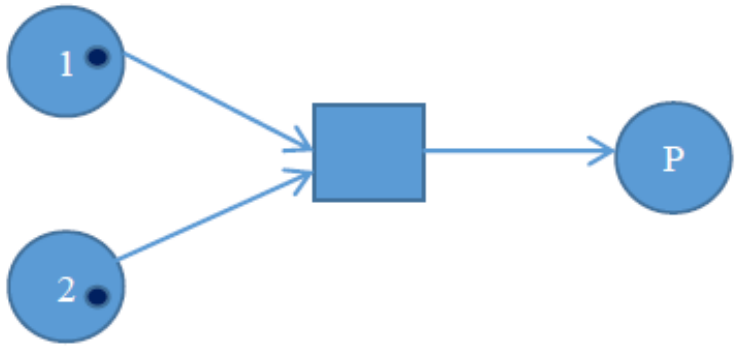
ABSTRACT: This paper proposes a generalized accounting framework designed to be used in a shared data environment where both accountants and non-accountants are interested in maintaining information about the same set of phenomena. This framework, called the REA accounting model, is developed using data modeling techniques, and its underlying structure is found to consist of sets representing economic resources, economic events, and economic agents plus relationships among those sets. Correspondence of REA elements with the accounting theories of Ijiri and Mattessich is discussed. Finally, practical use of the model in the database design phases of view modeling and view integration is presented, and some REA representations of accounting objects are reconciled with those representations found in conventional double-entry systems.

Dynamic interpretation – Petri Nets



This model corresponds directly to the following Petri Net:



Mapping of basic REA concepts

REA	Petri Net
Resource (material, human, monetary, service)	Place
Duality	Transition
Consume stockflow event	Incoming arc (to input place)
Produce stockflow event	Outgoing arc (to output place)

Conservation laws

Basically, mass in (kg) = mass out (kg).

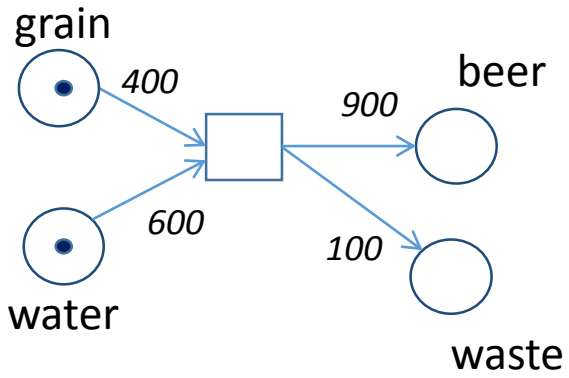
In practice, the conservation law is an empirically grounded equation relating input and output, e.g.

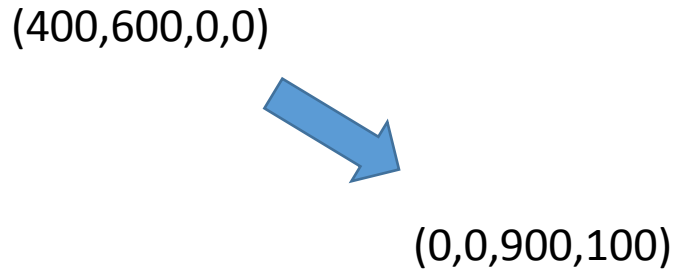
$$1.P + C.W \approx A.RM1 + B.RM2$$

that says, that for the production of one P element and C units of waste you need *A* RM1 and *B* RM2 elements, where A and B are coefficients.

This equation, or part of it, can be used for auditing purposes. For instance, RM1/P ratio is A.

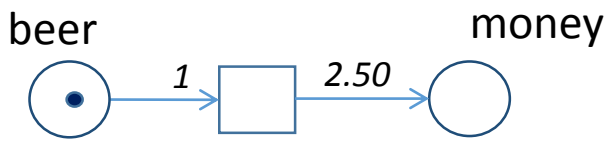
Petri Net annotation





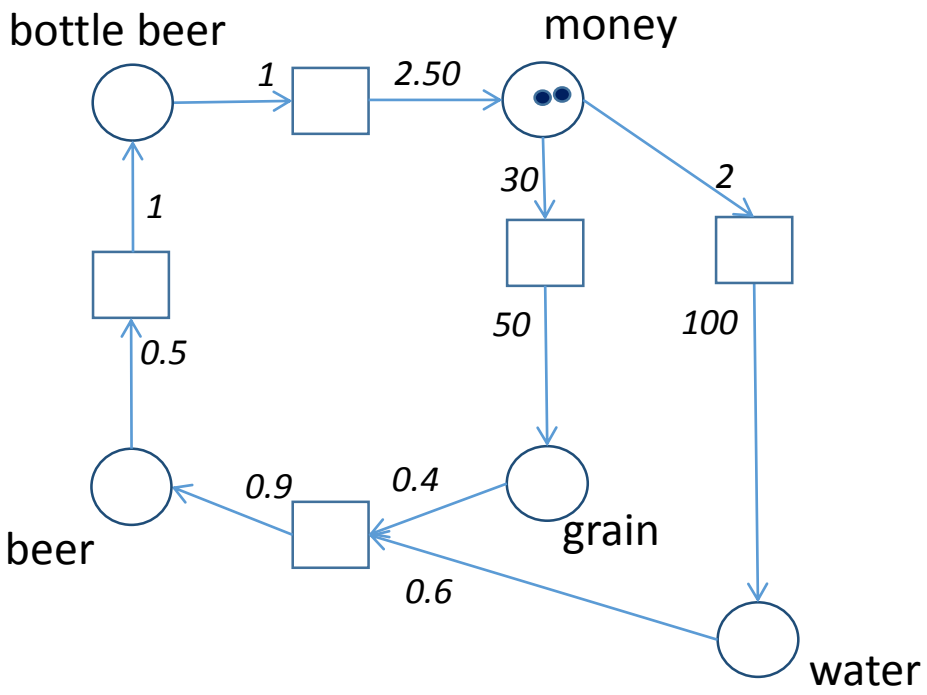
BREWING PROCESS

Exchange duality – operational level



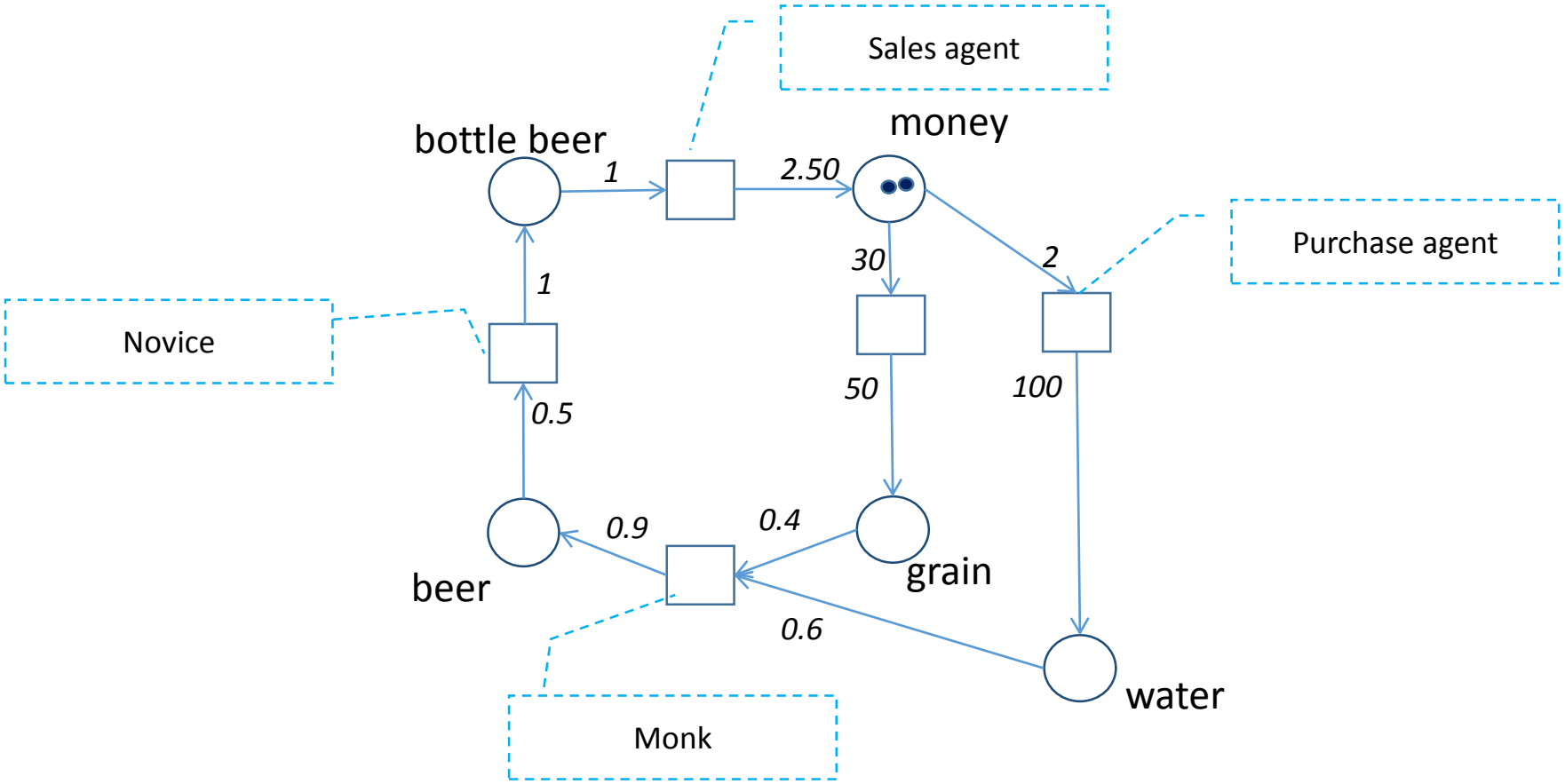
Most simple representation …

Value cycle



Sustainability axiom: cycle effect must be positive

REA model, agents included

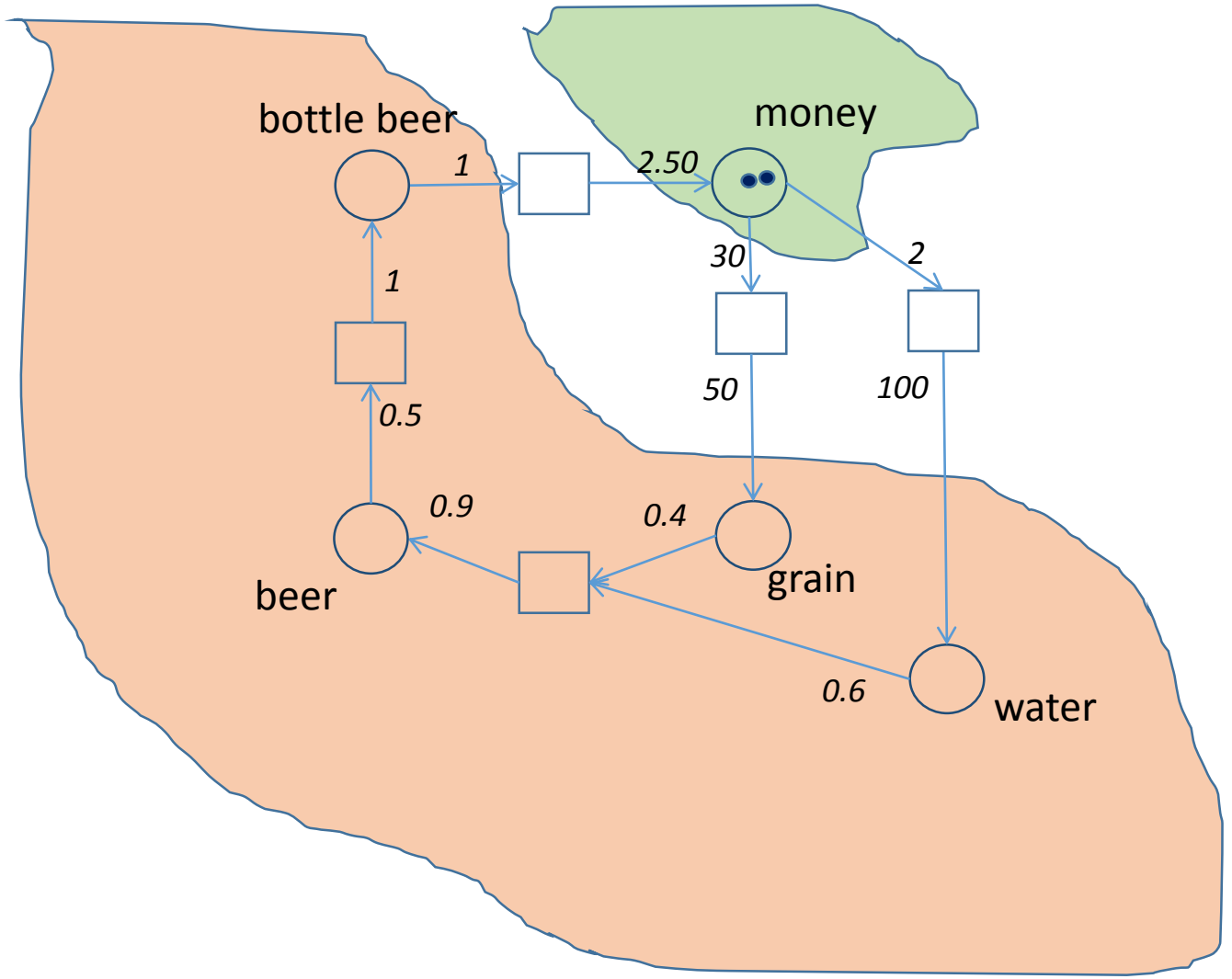


Note: value cycle corresponds to “primary value chain”. Secondary processes are related as services.

Value cycle - applications

- Process modeling
- Auditing based on normative relationships (SOLL system)
- Production planning
- Process management (benchmarking)

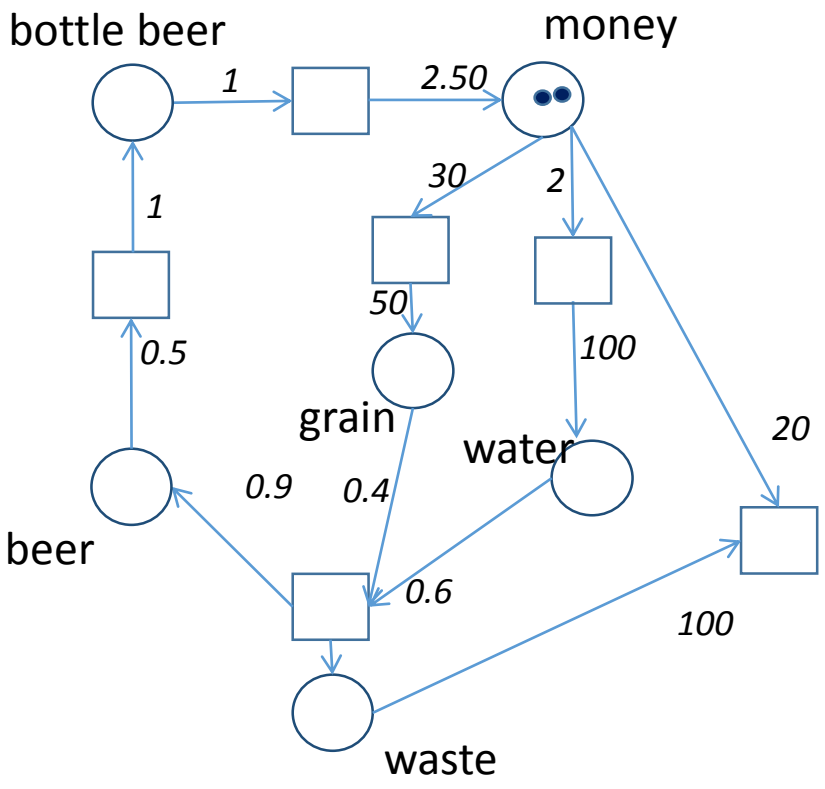
Value cycle



money flow

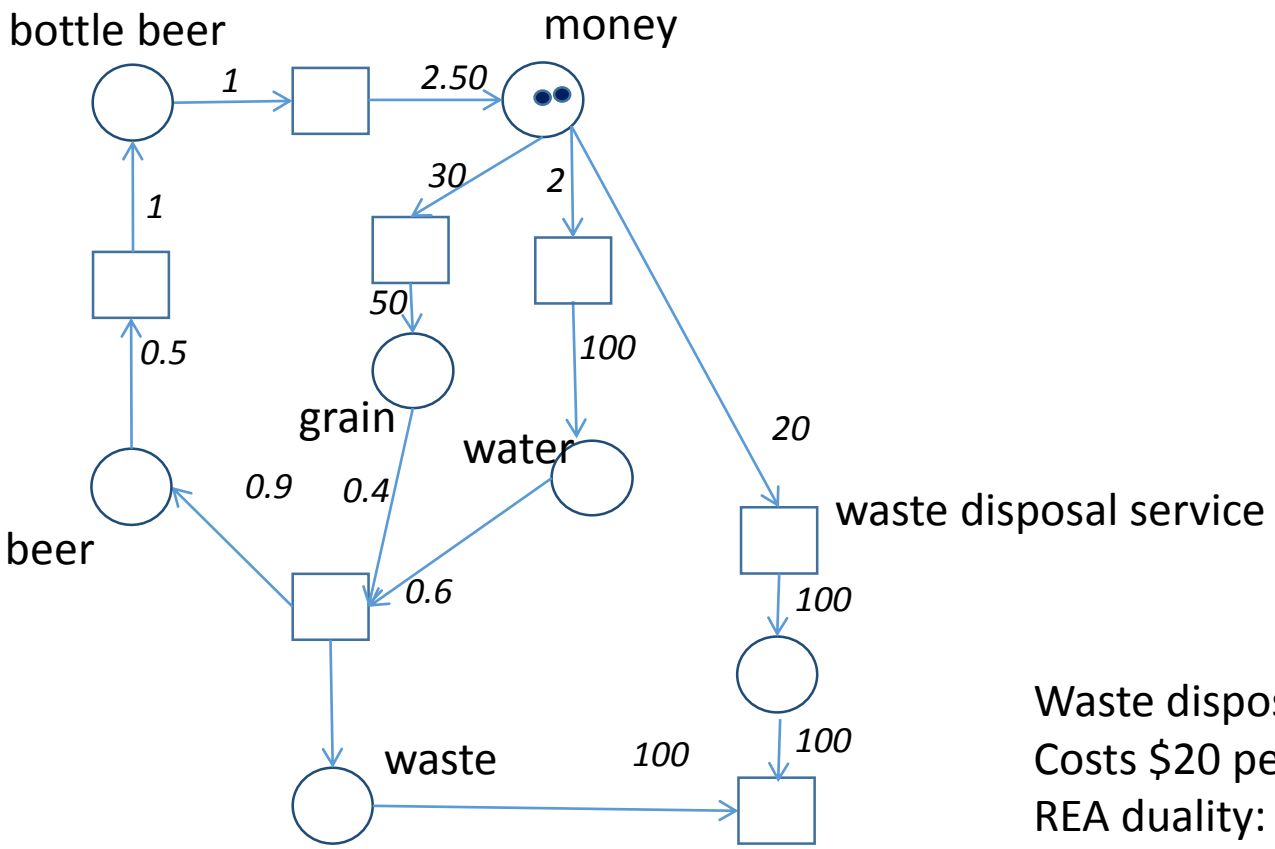
physical flow

Value cycle including waste disposal



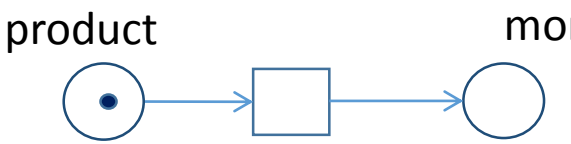
Waste disposal as “a dead end”
Costs $20 per 100 kg
REA exchange of NPO

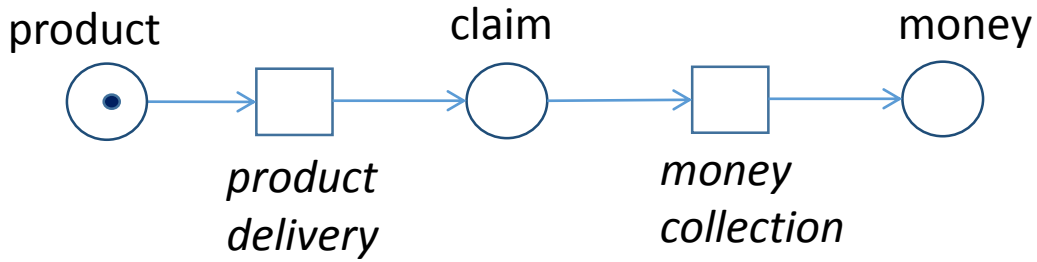
Value cycle including waste disposal



Waste disposal as “a dead end”
Costs $20 per 100 kg disposal
REA duality: waste with NPO

Exchange pattern





Model levels

NAME	VIEW	KEY CONCEPTS
Network	Supply chain, value network	(independent) agent, exchange
Business process	Enterprise view, value cycle	REA event, resource
Workflow	Control	contract, commitment, policy, agent
Dataflow	Communication	record

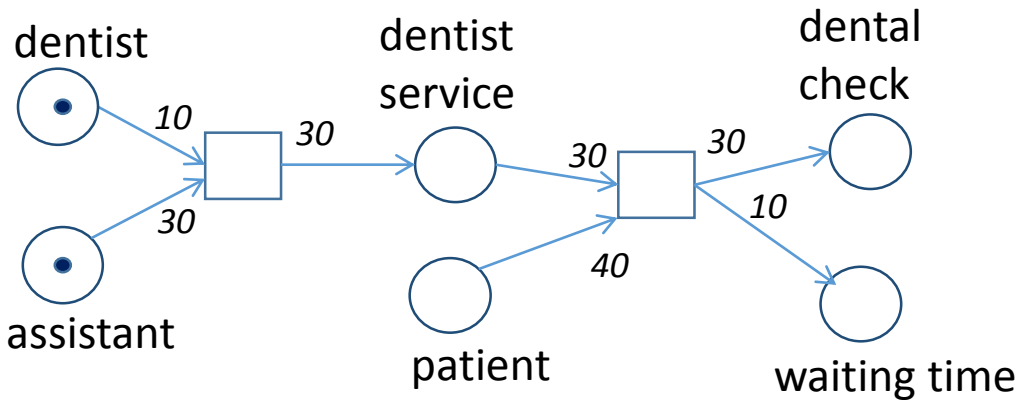
What about services?

- Services are measured in terms of capacity and time, e.g. 300m^2/month
- Services may have zero contribution to the physical conversion duality
- In addition to the physical duality equation, we have a temporal conservation law: time in = time out
  - However, there may be waiting times, subservices may overlap in time
  - Conservation law provides normative ratio's (cf. T-ABC)

    #assistant ≈ #dentist_service

    #dentist ≈ 1/3.#dentist_service

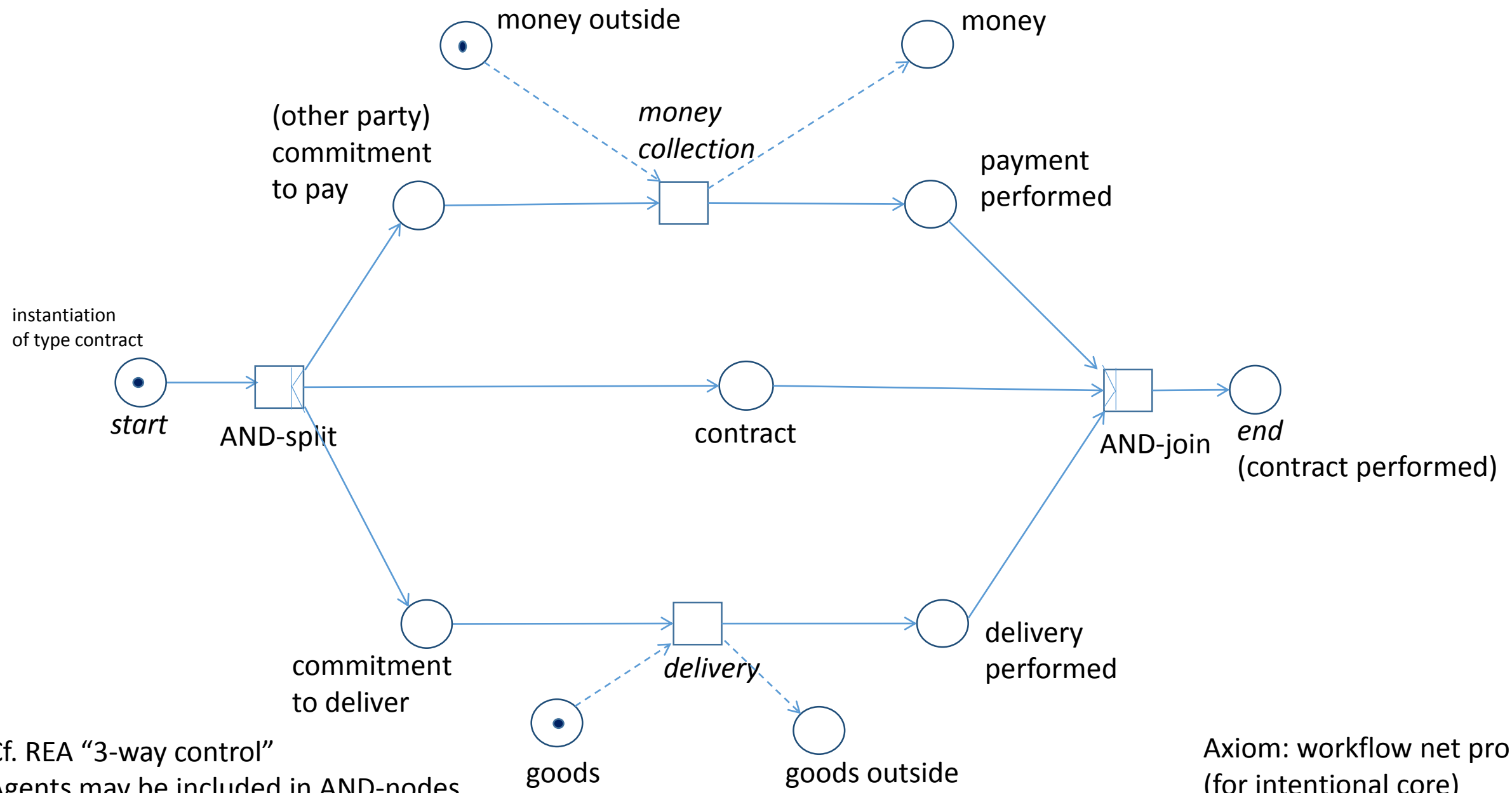
    40.#patient ≈ 10.#waiting_time



Conclusion

- REA models can be represented as Petri Net models
- REA business model can be seen as composed of value cycles
- Normative value cycle is needed for auditing purposes
- Temporal conservation law formulation?

Extended exchange pattern



Cf. REA “3-way control”
Agents may be included in AND-nodes

Axiom: workflow net property
(for intentional core)