Towards Co-Creation and Co-Production in Production Chains in DEMO with REA Support

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Motivation

- Provide a generic, application and business independent foundation for IT systems, directly derived from enterprise models.

- Detailed specification:
  - the world of co-creation and co-production;
  - proposal of ontological DEMO model for co-creation and co-production;
  - notion of value in the proposed model.

Outline

- Introduction to DEMO, REA and Software Technologies;

- World of Co-Creation and Co-Production;

- Proposal of Ontological DEMO model for Co-Creation and Co-Production;

- Notion of Value in the Proposed DEMO Model;

- Conclusion and Future Research.

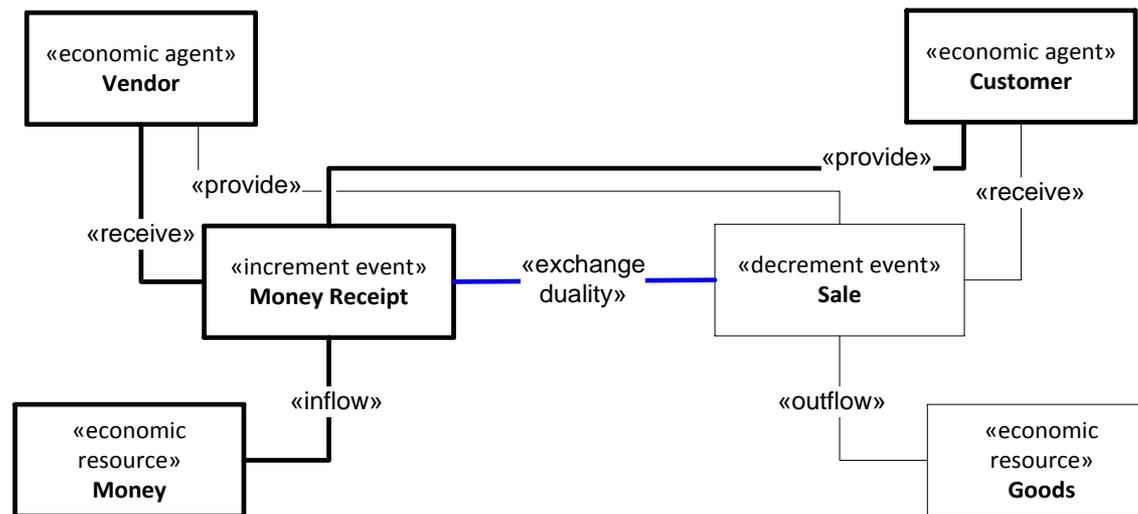# Introduction to DEMO, REA and Software Technologies

- DEMO a methodology to derive conceptual models of enterprise

  - base on the theory of Enterprise Ontology,

  - meets the strictest requirements provided by conceptual modeling theories,

- Specific results of C4-ness qualities are:

  - that any imaginable enterprise can be modeled in one and only one way (including virtual CC-CP enterprise);

  - that the DEMO model(s) for any such enterprise must provide concise and comprehensive *factual knowledge* about the operation of the enterprise.

Introduction to DEMO, REA and Software Technologies

- The generic pattern of DEMO transactions represents a basic unit of operation of an enterprise and provides participating enterprises with a powerful conceptual framework.

- An enterprise in operation is defined as a social system of *actors* who communicate about their productions by communicative acts which result in communication facts.

- All communication facts represent a shared understanding and binding agreement of all actors about their production.

Introduction to DEMO, REA and Software Technologies

- REA (Resource, Event, Agent) modeling approach known for *REA model driven* financial information systems.

- One of the main REA features is the concept of duality – relationship binding increment and decrement economic events together, thus forming value adding process.

«economic agent»
Vendor

«economic agent»
Customer

«provide»

«provide»

«receive»

«receive»

«increment event»
Money Receipt

«exchange duality»

«decrement event»
Sale

«inflow»

«outflow»

«economic resource»
Money

«economic resource»
Goods

Introduction to DEMO, REA and Software Technologies

Introduction to DEMO, REA and Software Technologies

- For modeling paired transfers the following requirements are identified:
  - identification of production and price specification (contract);
  - the ability of both transfers to explicitly expose their promise state (actors enters into agreement – signing contract),
  - the ability to check conclusion of both transfers. There is usually a time lag between the conclusions of them (claim entity).

REA Challenges

- Due to its complete orientation to the *production world* - REA does not have a state machine in the sense of the DEMO pattern.

- REA model does not provide revoking operations such as cancellation.

- It is difficult to capture other events such as business events or information events.

Notion of Value in REA

- Notion of value overloaded in REA, coming from economics.

- Each resource that is subject to exchange has a *different value* for the economic agents participating in the exchange.

- For rational economic agents, an economic exchange can occur only if both economic agents perceive the value of the received economic resources *higher* than the value of the given resources; otherwise, they will not exchange them.

Introduction to DEMO, REA and Software Technologies

- Enterprise Operating System
  - analogous to an operating system;
  - represents the active abstraction layer between human actors of the organization "enterprise in operation" and the enterprise information systems such as intended REA based information system.

Introduction to DEMO, REA and Software Technologies

- Enterprise Operation System founded on:
  - DEMO methodology and EO and EE theories;
  - DEMO Engine – a software engine that executes DEMO models "as native code";
  - state of art process mining tools.
- The EOS has been implemented precisely following the *Generic Development Process* for *Model-Driven Engineering*.

Enterprise Operating System
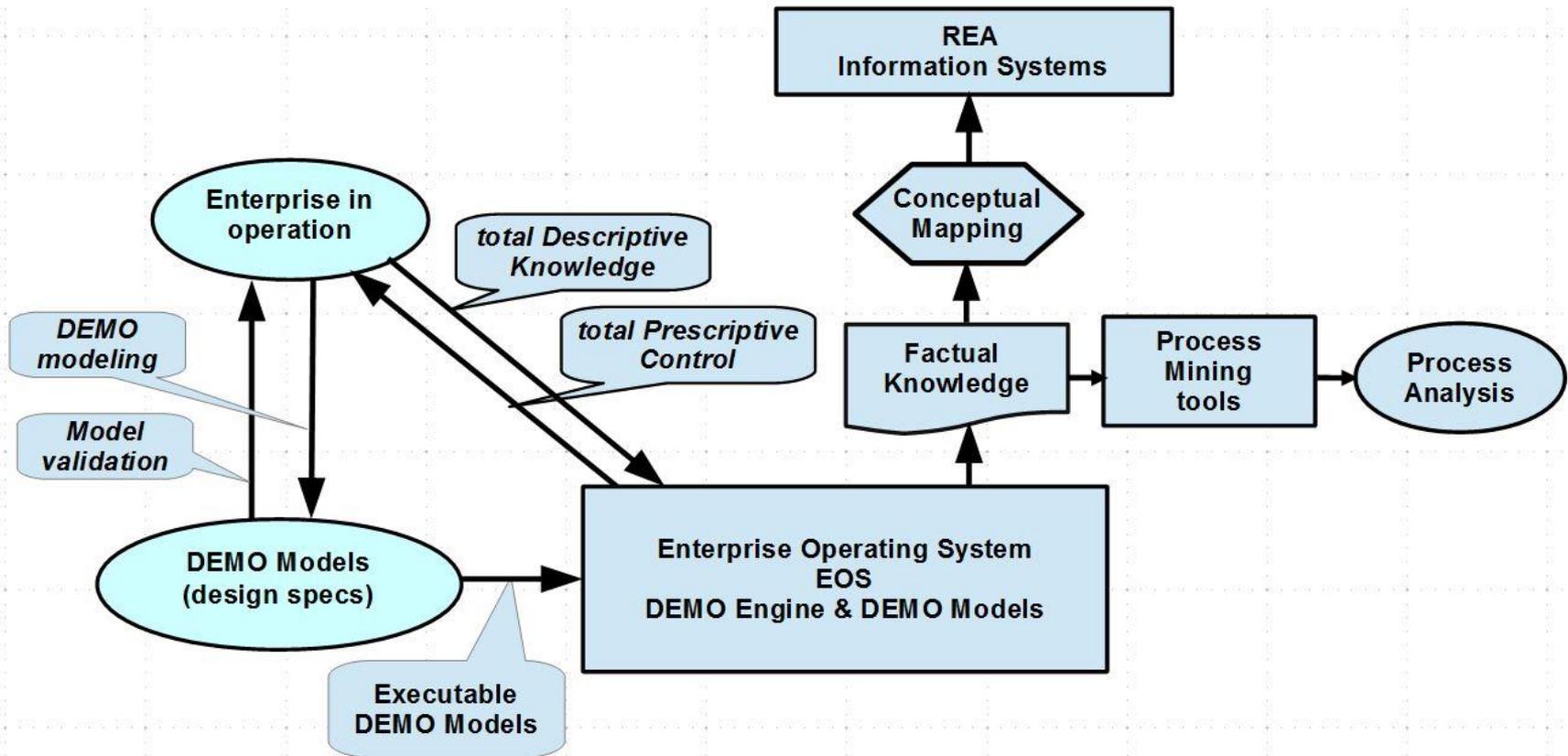
Support for REA

- Provision of factual knowledge to REA based information systems.

- This demands some yet unknown conceptual mapping system to be devised.

- The challenge is to map factual knowledge to REA defined facts for financial information systems, in such a way that *correctness* and *completeness* is guaranteed.

World of Co-Creation and Co-Production

- Highly specialized enterprises rather offer their *capabilities* to meet the specific requirements of their Principals.

- **Co-creation** captures the *principal* and the *contractor(s) working together* on the engineering of an acceptable artifact;

- **Co-production** captures the *shared production* of the engineering artifact by both *principal* and *contractor(s)*, including matching financial transactions.

World of Co-Creation and Co-Production
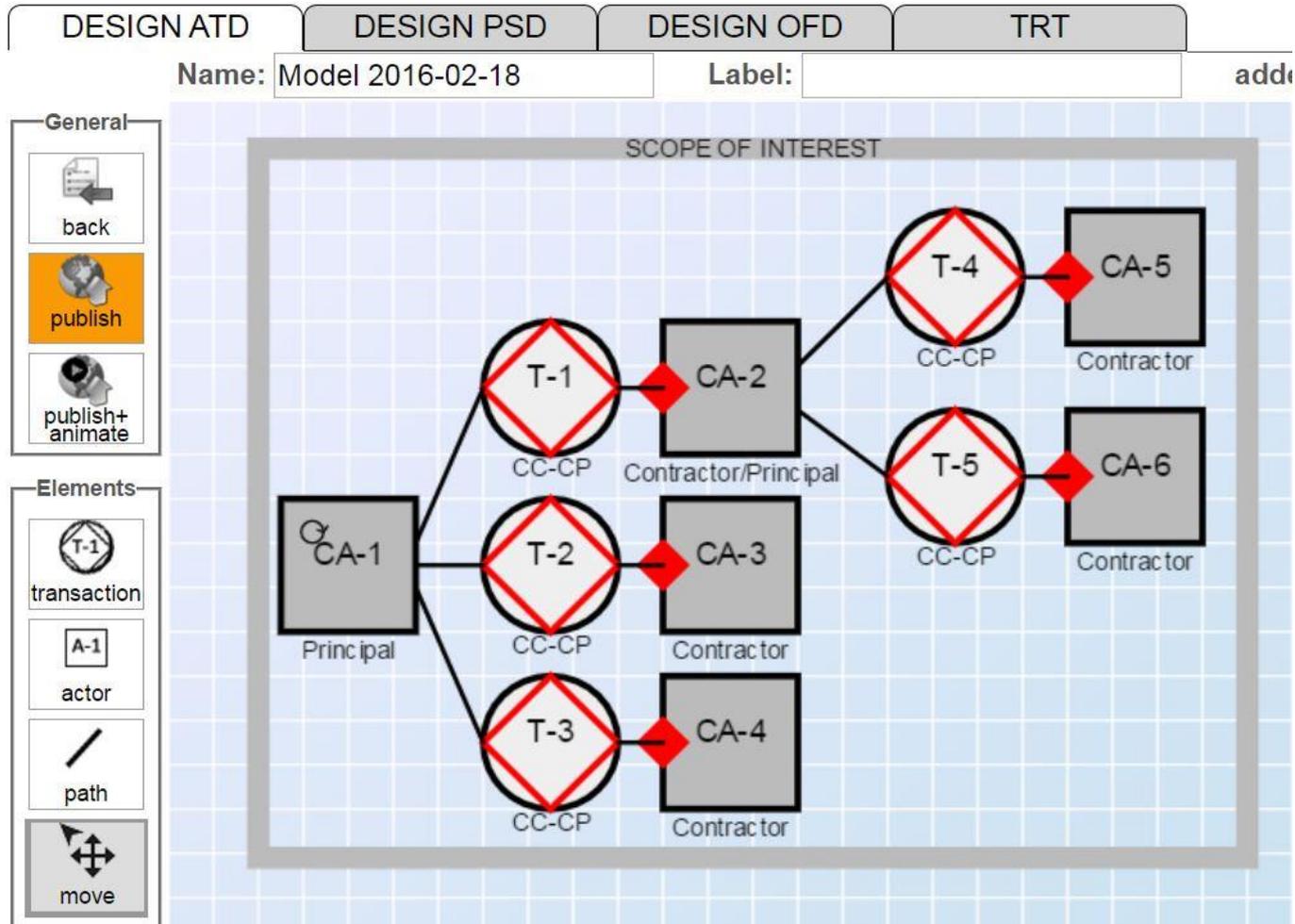
Production chain example of virtual CC-CP enterprises
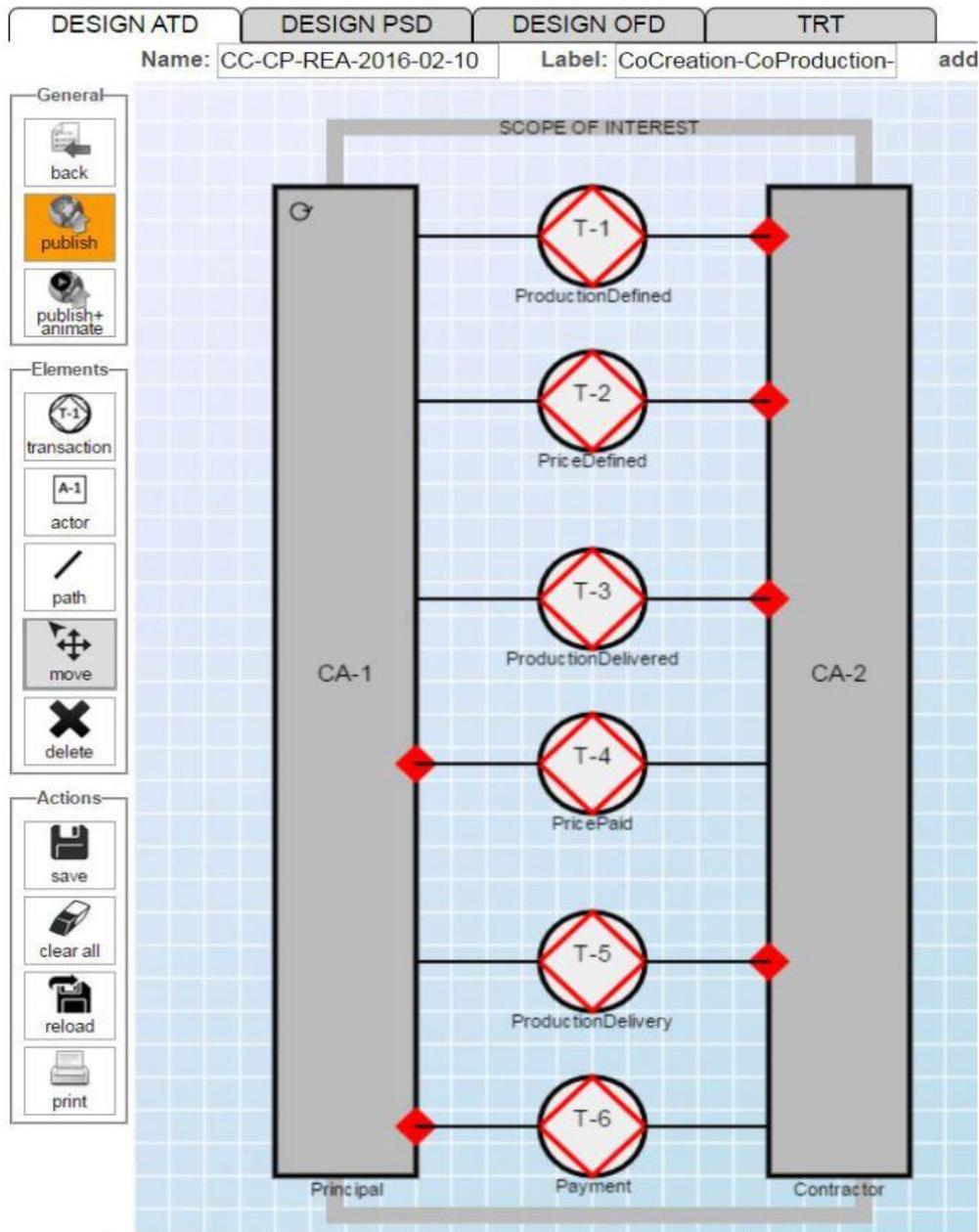
Proposal of Ontological DEMO CC-CP Model

Proposal of Ontological DEMO CC-CP Model – Model Duality

- Strong duality between:
  - specification of the *product* and the *price* to be paid in T-1 and T-2;
  - the two sides of the *contract* in T-3 and T-4;
  - two sides of the *deliveries* of *products* and *price* to be paid in T-5 and T-6.
- Strong correspondence with the reality (even with REA model despite its incompleteness).

Notion of Value in DEMO Models

- Notion of value – TAO theory of Enterprise Engineering.

- Notion of value is *inherently subjective*.

- A resource has a *particular value* to the *customer* and a *different value* to the *salesman*.

- **Value** can be considered as a specification of the degree in which *affordance* satisfies a *purpose* of the subject.

Conclusion – Future research

- Extensive ontological CC-CP model validation
  - the ontological model is generic, application-independent and suitable for real life applications.
- The CC-CP model extension with implementation specific transactions
  - so-called *infological* and *datalogical* transactions are defined, requirement for perfect correctness, meaning that the model reflects precisely the business case.

Conclusion – Future research

- Conceptual mapping of DEMO to REA
  - factual knowledge rendered by the EOS mapped to the REA in such a way that a REA-based IS can operate directly.

- REA value chain analysis
  - REA models are linked together by resource flows creating a value chain;
  - value chain captures continually repeated transaction cycles.

Thank you for your attention.